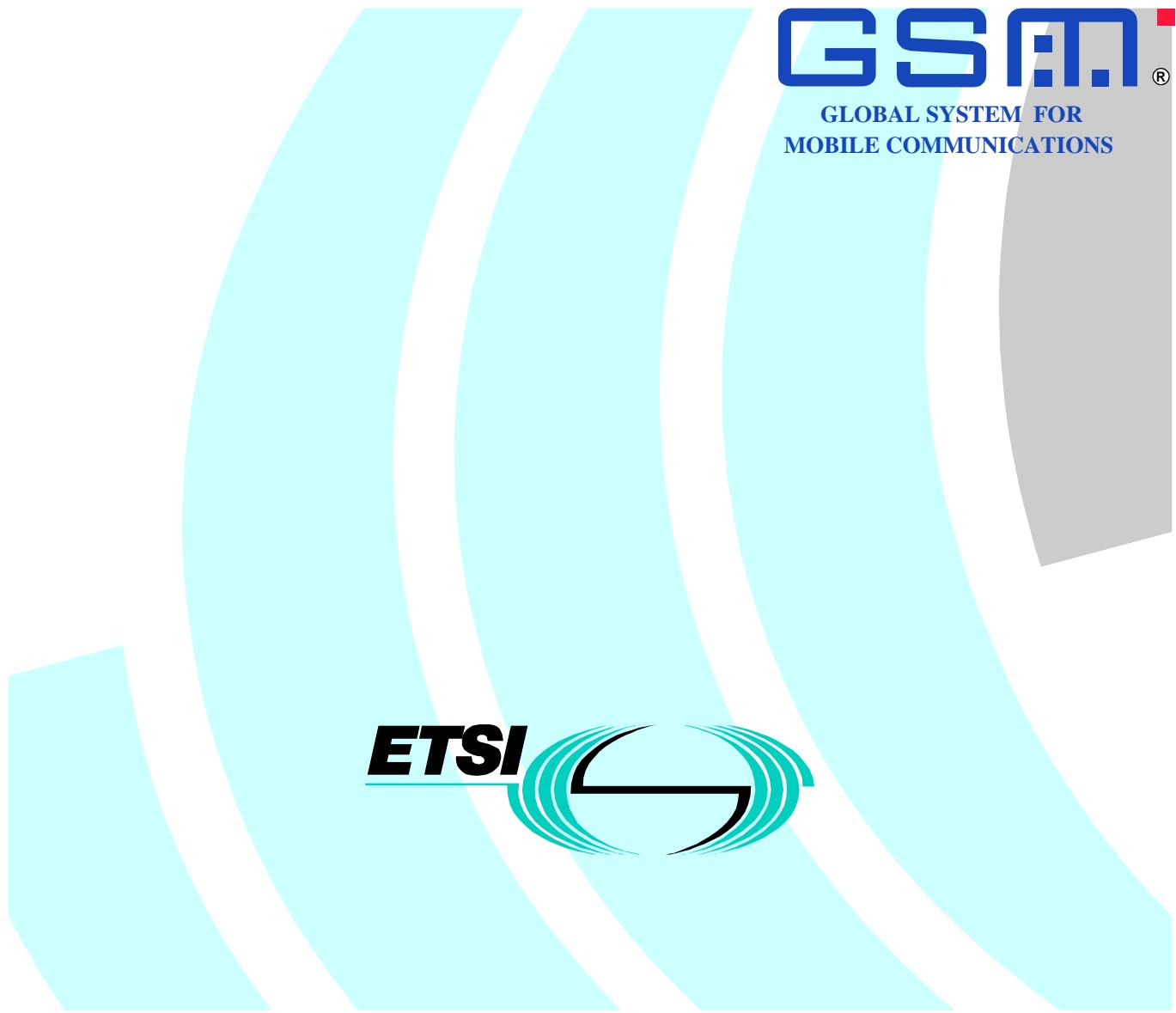# ETSI TS 100 615 V7.0.0 (2000-02)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Performance data measurements
(GSM 12.04 version 7.0.0 Release 1998)

GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document describes the functionality of charging in GPRS needed to support the first phase of GPRS within the digital cellular telecommunications system.

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document, it will be re-released by SMG with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

7   indicates GSM Phase 2+ Release 1998;

x   the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.;

y   the third digit is incremented when editorial only changes have been incorporated in the specification.

Introduction

The present document is aprt of a set of documents which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of a multi-vendor PLMN.

During the lifetime of a PLMN, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the PLMN resources. These changes will be executed through PLMN configuration management activities and/or network engineering, see GSM 12.06 [10].

Many of the activities involved in the daily operation and future network planning of a PLMN require data on which to base decisions. This data refers to the load carried by the PLMN and the grade of service offered. In order to produce this data performance measurements are executed in the NEs which comprise the PLMN. The data can then be transferred to an external system, e.g. an Operations System (OS) in TMN terminology, for further evaluation. The purpose of the present document is to describe the mechanisms involved in the collection of the data and the normalisation of the data itself.

1 Scope

The present document describes the requirements for the management of performance measurements and the collection of performance measurement data across a Public Land Mobile Network (PLMN). It defines the administration of measurement schedules, the generation of measurement results in the Network Elements (NEs) and the transfer of these results to the Operations System (OS). It also describes how the various requirements can be modelled as part of the generic PLMN information model.

A set of measurements available for collection by NEs are described in annex B, effort has been made to ensure consistency in the definition of measurements between different NEs.

The following is beyond the scope the present document:

- how the data, once accumulated and collected, could or should be processed, stored, or presented to an end user;

- the information which may be obtained through the collection and processing of call or event related records which have been produced by the NEs primarily for the purpose of raising bills and other charges.

The management requirements have been derived from existing telecommunications operations experience. The management definitions were then derived from other standardisation work so as to minimise the re-invention factor. References are given as appropriate.

The objectives of the present documentisation are: to normalise the description of each measurement; and to produce a common description of the management technique for result accumulation and transmission across a management interface. The normalisation is intended to result in comparability of measurement data produced in a multi-vendor PLMN.

As far as possible, existing standardisation in the area of performance management has been re-used and enhanced where particular requirements, peculiar to the mobile telephony environment, have been recognised.

Field of application

The present document considers all aspects of performance management for a PLMN and its NEs defined in the GSM core Technical Specifications. However, only those aspects which are GSM specific and particular to PLMN operation are included in the present document. Other performance measurement aspects of described NEs and performance measurement aspects of NEs not described by the GSM core Technical Specifications are included for information purposes in annex E or may be found in referenced documents.

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1]   GSM 02.16: "Digital cellular telecommunication system (Phase 2+); International Mobile station Equipment Identities (IMEI)".

[2]   GSM 04.08: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[3]   GSM 04.11: "Digital cellular telecommunication system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[4]   GSM 05.08: "Digital cellular telecommunication system (Phase 2+); Radio subsystem link control".

[5]   GSM 08.08: "Digital cellular telecommunication system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[6]   GSM 08.58: "Digital cellular telecommunication system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 3 specification".

[7]   GSM 09.02: "Digital cellular telecommunication system (Phase 2+); Mobile Application Part (MAP) specification".

[8]   GSM 12.00 (ETS 300 612-1): "Digital cellular telecommunication system (Phase 2); Objectives and structure of Network Management (NM)".

[9]   GSM 12.01 (ETS 300 612-2): "Digital cellular telecommunication system (Phase 2); Common aspects of GSM Network Management (NM)".

[10]   GSM 12.06 (ETS 300 617): "Digital cellular telecommunication system (Phase 2); GSM Network Configuration Management ".

[11]   GSM 12.30 (ETR 128): "Digital cellular telecommunication system (Phase 2); ETSI Object Identifier tree; Common domain; Mobile domain; Operation and Maintenance (O&M), managed object registration definition".

[12]   CCITT Recommendation E.880: "Field data collection and evaluation on the performance of equipment, network and services".

[13]   CCITT Recommendation X.710: "Common management information service definition for CCITT applications".

[14]   CCITT Recommendation X.721: "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[15]   CCITT Recommendation X.730: "Information technology - Open Systems Interconnection - Systems Management: Object management function".

[16]   CCITT Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

[17]   CCITT Recommendation X.734: "Information technology - Open Systems Interconnection - Systems Management: Event report management function".

[18]   CCITT Recommendation X.735: "Information technology - Open Systems Interconnection - Systems Management: Log control function".

[19]   CCITT Recommendation X.738: "Information technology - Open Systems Interconnection - Systems management: Summarization function".

[20]   CCITT Recommendation X.739: "Information technology - Open Systems Interconnection - Systems Management: Metric objects and attributes".

[21]   ISO 8571: "File Transfer, Access and Management".

[22]   GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service Description; Stage 2".

[23]   GSM 04.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol".

[24]   GSM 04.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Logical Link Control (LLC)".

[25]   GSM 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Subnetwork Dependent Convergence Protocol (SNDCP)".

[26]   GSM 08.16: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Network Service".

[27]   GSM 09.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[28]   IETF RFC 959 File Transfer Protocol (FTP)

[29]   IETF RFC 783 Trivial File Transfer Protocol (TFTP) revision 2

[30]   IETF RFC 1157 A Simple Network Management Protocol (SNMP)

1.2   Abbreviations

For the purposes of the present document, the following abbreviations apply:

AGCH	Access Grant Channel
APN	Access Point Name
AuC	Authentication Centre
BSC	Base Station Controller
BSS	Base Station System
BSSAP	BSS Application Part
BTS	Base Transceiver Station
CBCH	Cell Broadcast Channel
CCCH	Common Control Channel
CCITT	The International Telegraph and Telephone Consultative Committee
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CMISE	Common Management Information Service Element
DCCH	Dedicated Control Channel
DCN	Data Communication Network
EIR	Equipment Identity Register
ETSI	European Telecommunications Standards Institute
FACCH	Fast Associated Control Channel
FTAM	File Transfer Access and Management
FTP	File Transfer Protocol
GMSC	Gateway Mobile Services Switching Centre
GGSN	Gateway GPRS Service Node
GPRS	General Packet Radio Service
GSN	GPRS Service Node
HLR	Home Location Register
HO	Handover
HPLMN	Home PLMN
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Service Digital Network
ISO	International Standards Organisation
LLC	Logical Link Control
LR	Location Register
MMI	Man-Machine Interface
MML	Man-Machine Language
MOC	Managed Object Class
MOI	Managed Object Instance
MS	Mobile Station
MSC	Mobile Services Switching Centre
MSRN	Mobile Subscriber Roaming Number
MTP	Message Transfer Part
NE	Network Element
NMC	Network Management Centre
NSS	Network Sub System (including EIR, HLR, SMS-IWMSC, MSC and VLR)
OACSU	Off Air Call Set Up
OA&M	Operation, Administration and Maintenance
OMAP	(CCITT) Operations, Maintenance and Administration Part
OMC	Operations and Maintenance Centre
OS	Operations System
OSI	Open System Interconnection
O&M	Operations and Maintenance
PCCCH	Packet Common Control Channel
PCCH	Packet Paging Channel
PCH	Paging Channel
PLMN	Public Land Mobile Network (including BSS and NSS)
PM	Performance Management

PTCH	Packet Traffic Channel
PVLR	Previous VLR
QOS	Quality of Service
RACH	Random Access Channel
Rec.	Recommendation
Ref.	Reference
RF	Radio Frequency
RR	Radio Resource
RXLEV	Reception Level
RXQUAL	Reception Quality
ROSE	Remote Operation Service Element
SACCH	Slow Associated Control Channel
SDCCH	Stand alone Dedicated Control Channel
SCCP	(CCITT) Signalling Connection Control Part
SGSN	Serving GPRS Service Node
SNDCP	Sub Network Dependency Control Protocol
SNMP	Simple Network Management Protocol
SMS-IWMSC	Short Message Service Inter Working MSC
Spec.	Specification
SS	Supplementary Service
TCAP	(CCITT) Transaction Capabilities Application Part
TCH	Traffic Channel
TMSI	Temporary Mobile Subscriber Identity
TMN	Telecommunications Management Network
TS	Technical Specification
VLR	Visitors Location Register

2 Performance measurement concept

Any evaluation of PLMN system behaviour will require performance data collected and recorded by its NEs according to a schedule established by the OS. This aspect of the management environment is termed Performance Management. The purpose of any performance management activity is to collect data which can be used to verify the physical and logical configuration of the PLMN and to localise potential problems as early as possible. The type of data to be collected is defined by the equivalent measurements, refer to annex B. The present document concentrates on the requirements of PLMN management to produce this data. Any management actions performed at the OS subsequently to analyse the performance data are not considered in the present document.

Data is required to be produced by the NEs to support the following areas of performance evaluation:

- traffic levels within the PLMN, including the level of both the user traffic and the signalling traffic;

- verification of the network configuration;

- resource access measurements;

- Quality of Service (e.g. delays during call set-up); and

- resource availability (e.g. the recording of begin and end times of service unavailability).

The production of the measurement data by the NEs also needs to be administered by the OS. Several phases of administration of performance measurements can be distinguished:

- the management of the performance measurement collection process;

- the generation of performance measurement results;

- the local storage of measurement results in the NE;

- the transfer of measurement results from the NE to an OS; and

- the storage, preparation and presentation of results to the operating personnel.

It is not the task of the present document to describe the last phase mentioned above, viz. the preparation and presentation of the results to operating personnel: this is regarded as being specific to each PLMN Operator.

2.1 Measurement data requirements

This subclause describes the typical requirements for performance data to be produced by the NEs which comprise a PLMN. It is important to note that an actual measurement value collected from the PLMN may be used to satisfy requirements in more than one category of measurement as described below.

2.1.1 Traffic measurements

Traffic measurements provide the data from which, among other uses, the planning and operation of the network can be carried out.

The types of traffic evaluations for which PLMN specific measurements may be used include:

- traffic load on the radio interface (signalling and user traffic);

- usage of resources within the network nodes;

- user activation and use of Supplementary services, etc.

Examples of measured values may include:

- Pages per Location area per hour;

- Busy Hour Call Attempts per BSC, MSC;

- Handovers per BSC per hour, etc.

2.1.2 Network configuration evaluation

Once a network plan, or changes to a network plan, have been implemented it is important to be able to evaluate the effectiveness of the plan or planned changes. Typically, the measurements required to support this activity will indicate the traffic levels with particular relevance to the way the traffic uses the network.

2.1.3 Resource access

For accurate evaluation of resource access, each count would need to be produced for regular time intervals across the network, or for a comparable part of the network.

2.1.4 Quality Of Service (QOS)

The user of a PLMN views the provided service from outside the network. That perception can be described in observed QOS terms. QOS can indicate the PLMN performance expected to be experienced by the user, for further detail see CCITT Recommendation E.880 [12].

2.1.5 Resource availability

The availability performance is dependent on the defined objectives, i.e. the availability performance activities carried out during the different phases of the life cycle of the system, and on the physical and administrative conditions, for further detail see CCITT Recommendation E.880 [12].

2.2 Measurement administration

The range of measurements which will be available from the NEs are expected to cover all of the requirements described in subclause 2.1. However, not all of these measurements will be required all of the time, from every occurrence, of every relevant NE. With a highly distributed network like a PLMN it is also necessary to gather the measurement data so as to perform consistent analysis of the results and to evaluate the interactions between the NEs.

This subclause describes the requirements for the various areas of administration of measurements.

2.2.1 Measurement job administration

Measurement jobs, i.e. the processes which accumulate the data and assemble it for collection and/or inspection, will need to be scheduled for the period or periods for which gathering of data should be performed.

The administration of measurement jobs comprise the following actions:

1) create/delete a measurement job;

2) modifying a measurement job;

3) definition of measurement job scheduling;

4) reporting and routing of results (to one or more OSs);

5) Suspend/Resume an active measurement job;

6) retrieval of information related to measurement jobs.

2.2.2   Measurement result collection method

Each measurement job will be collecting result data at a particular frequency, known as the granularity of the measurement.

The measurement data can be collected in each NE of the PLMN in a number of ways:

-    cumulative incremental counters triggered by the occurrence of the measured event;

-    status inspection (i.e. a mechanism for high frequency sampling of internal counters at pre-defined rates);

-    gauges (i.e. high tide mark, low tide mark);

-    discrete event registration, where data related to a particular event is captured.

These are described in the following paragraphs.

Cumulative counters: The NE maintains a running count of the event being counted.

Status inspection: Network elements maintain internal counts for resource management purposes. These counts are read at a predetermined rate, the rate is usually based upon the expected rate of change of the count value.

Gauges: Gauges represent dynamic variables that may change in either direction. Gauges can be integer or real valued.

Discrete Event Registration: This is a measurement of a specified event where every Nth event would be taken into account. The value of N is dependant on the frequency of occurrence of the event being measured.

2.2.3   Local storage of results at the Network Element

It shall be possible for the NE to retain measurement data it has produced until they are retrieved by the OS. This data will be retained at the NE as an explicit request from the OS. The storage capacity and the duration for which the data will be retained at the NE will be PLMN Operator and implementation dependent.

2.2.4   Measurement result transfer

The results of the measurement job can be forwarded to the OS when available or be stored in the NE and retrieved by the OS when required. Additionally, the measurement result can be retrieved from the NE by the OS on request, this will return the current value of the measurement job with any other related information, but will not affect the scheduled execution of this or any other measurement jobs actively reporting that same data item.

In a network with more than one OS, the data produced may also be required by other OSs, it is, therefore, necessary to support the possibility for multiple destinations for transfer of data.

2.2.5   Performance data presentation

The performance data presentation is considered to be a PLMN Operator concern.

2.3 Measurement definition

This subclause looks at the requirements for the definition of the individual measurements.

2.3.1 Nature of the result

The measurements defined for the PLMN have to be collected in the NEs. As each NE has its own role to play in the provision of the mobile telephony service then each will have a different perspective on the performance of the network. The measurement definitions shall, therefore, contain a description of the intended result of the measurement in terms of what is being measured.

2.3.2 Perceived accuracy

The accuracy of measurements can be seen in three ways:

- whether the result produced represents all occurrences of the defined event;

- whether related measurements produced for the same period refer to the same events; or,

- whether a measurement result refers to the whole or part of a granularity period.

Representation of all occurrences:

The definition of a measurement needs to accurately reflect which types of events are to be included in the collection of the data. If a general event description can be characterised by several Sub-types then the measurement definition will have to be precise as to which Sub-types are included or specifically excluded from that measurement.

Same period for the same two event:

Consider two events being counted which refer to the same allocation attempt, falling on either side of a granularity period boundary. i.e. the attempt is counted in one period while the termination with a successful cause is counted in the subsequent period. This will lead to discrepancies appearing in the actual figures when trying to compare attempts and successes for the same period.

The discrepancy may be statistically insignificant if the expected use of the procedure is high. If the expected use is low then it may prove more acceptable to count the procedure termination by causes, e.g. successful termination, unsuccessful termination for all reasons. (If the definition of a measurement refers to specific unsuccessful termination causes then care should be taken to assess whether all causes are included - the sum of which can provide the total number of unsuccessful termination's - or whether the total is defined as well as the specific causes).

Measurement collection periods:

A typical measurement collection period can be interrupted by system events.

These interruptions can be one or more of the following:

- failure of the resource;

- failure of procedure being measured;

- resource only becomes available after the measurement period has commenced;

- procedure only becomes available after the measurement period has commenced.

In these cases the measurement result should highlight such interruptions to indicate that the result is suspect. Any actions to be taken subsequently with regards to the usefulness of the data will depend on the circumstances and the requirements of individual PLMN Operators.

2.3.3 Comparability of measurement data

In a multi-vendor network it can be important to know that measurement data produced by a NE from one supplier is equivalent to the measurement data being produced by the equivalent NE from a another supplier. This is particularly important when analysing data across the whole Network.

The measurement definitions (in annex B), while not being explicit about precisely where a measurement should be performed, shall use a common understanding of the events being measured so as to produce comparable results.

2.3.4 Measurement identification

In complex Networks it is easy to generate large amounts of performance data. It is essential that all data is recognisable in respect of each request made. As all the required information which can distinguish each request already exists (part of the request), it makes sense to use this information, rather than create anything new.

3 Performance management requirements

3.1 Introduction

This subclause describes all basic functions to allow the system operator to collect measurement data from the NEs and to forward the results to the OS. All functions are gathered to provide the system operator with the means to administer, plan, execute measurements and to store and evaluate the measurement results.

3.1.1 Basic functions

The performance management concept as applicable in this specification is outlined in figure 1 and is based on the general framework for PLMN management as outlined in GSM 12.00 [8] and GSM 12.01 [9].
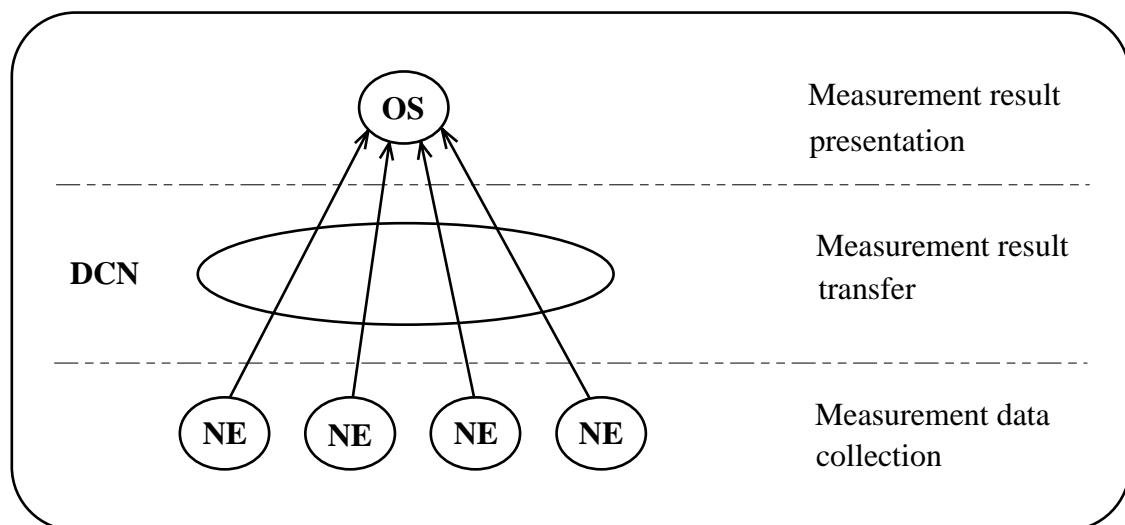
Figure 1: Performance management concept

The basic requirement from an NE for measurements is to collect data according to the definition of the measurements and to return results to the OS.

The OS shall be able to administer the measurements and to receive and store the collected data. The measurements that will generate this data are defined in annex B. This data may be used in its original form or processed according to the system operator requirements.

The data collected in the NE will be made available according to measurement parameters (scheduled reports), or on request from the OS (request current results).

Using OSI standardised mechanisms, the OS can control:

- the transfer of scheduled reports from the NE to the OS;

- the storage of scheduled reports in the NE; and

- deferred retrieval of scheduled reports stored in the NE.

The present document does not address the latter aspects in full detail, as general and generic functions apply. It does, however, describe the use of these functions in the PLMN measurement system.

As mentioned in subclause 2.2.5, measurement result presentation is considered to be a PLMN Operator concern. It is therefore not a subject of the present document. The format of the returned measurement results from OS point of view, however, will be ASN.1 using basic encoding rules.

3.1.2 Measurement administration

(Performance) measurement administration functions allow the system operator to determine measurement data collection and forwarding to an OS.

A (performance) measurement concept covers:

1) measurement data collection requirements:

- **Measurement types.** Corresponds to the measurements as defined in annex B;

- **Measured network resources.** The resource(s) to which the measurement types shall be applied have to be specified, e.g. one or more BTS(s);

- **Measurement recording**, consisting of periods of time at which the NE is collecting (that is, making available in the NE) measurement data.

2) measurement reporting requirements:

- the measurement related information to be reported and the layout of this report have to be specified as part of the measurement. The frequency at which scheduled result reports shall be generated has to be defined.

3) measurement result transfer requirements:

- measurement results can be transferred from the NE to the OS according to the measurement parameters, and/or they are stored in the NE and can be retrieved by the OS when required. Current measurement results can be transferred from the NE to the OS on explicit OS request.

A (performance) measurement job, covers the measurement data collection and measurement reporting requirements, as described in points 1 and 2 above. A measurement job can be created, modified, displayed or deleted in the OS. In addition, measurement job activities can be suspended and resumed, and, if the measurement job is not suspended, the current values of the measurements that are included in the measurement job can be requested by the OS at any time, independent of the measurement parameters.

The system operator shall specify the required measurement parameters on initiation of a measurement job. These parameters consist of, among others, recording schedule, granularity, and measurement type(s).

3.2 Measurement jobs

When defining a measurement job, the following aspects have to be considered:

3.2.1 Measurement job characteristics

3.2.1.1 Measurement types

Every measurement job consists of one or more measurement types (defined in annex B), for which it collects measurement data. The measurement type(s) contained in a job may apply to one or more network resources of the same type, e.g. a measurement job may be related to one or several BTSs. A measurement job will only produce results for the measurement type(s) it contains.

3.2.1.2 Measurement schedule

The measurement schedule specifies the time frame during which the measurement job will be active. The measurement job is active as soon as the starttime - if supplied in the schedule - is reached. The system shall support a job starttime of up to at least 90 days from the job creation date. If no starttime is provided, the measurement job shall become active immediately. The measurement job remains active until the stoptime - if supplied in the schedule - is reached. If no job stoptime is specified the measurement job will run indefinitely and can only be stopped by manual intervention.

The time frame defined by the measurement schedule may contain one or more recording intervals. These recording intervals may repeat on a daily and/or weekly basis and specify the time periods during which the measurement data is collected within the NE. A recording interval is identified by an interval starttime and an interval endtime which lie between 00.00 and 24.00 hours, aligned on granularity period boundaries. Thus the length of a recording interval will be a multiple of the granularity period (if non-zero). For a single measurement type it shall be possible to specify several measurement jobs with different recording intervals as long as these intervals do not overlap. If it is required that a measurement type be observed by multiple measurement jobs with overlapping schedules than the system shall support multiple instances of that measurement type.

3.2.1.3 Granularity period

The granularity period is the time between the initiation of two successive gatherings of measurement data. Required values for the granularity period are 5 minutes, 15 minutes, 30 minutes, 1 hour. The minimum granularity period is 5 minutes in most cases, but for some measurements it may only make sense to collect data in a larger granularity period. The granularity period shall be synchronised on the full hour and its value is not required to be changeable during the lifetime of the job. If the specified granularity period is zero then the measurement data can only be gathered on request from the OS.

3.2.1.4 Measurement reporting

Scheduled measurement reports are produced at the end of each granularity period. All reports generated by a particular measurement job have the same layout and contain the information requested by the system operator. This information may consist of:

- an identification of the measurement job that generated the report;

- an identification of the involved measurement type(s) and the measured network resource(s) (e.g. BTS);

- a time stamp, referring to the end of the granularity period;

- for each measurement type, the result value and an indication of the validity of the result value;

- an indication that the scan is not complete, and the reason why the scan could not be completed.

Whatever method of data compression is selected, the returned measurement result shall not be compromised, i.e. it shall not result in loss of any necessary information.

Some flexibility is provided in order to limit the information that is to be reported by the NE, reducing the amount of data to be transferred between NE and OS. Options that can be selected are:

- suppressing the reporting of the identification of the observed network resource;

- reporting the measurement results in an agreed order, so an explicit identification of the associated measurement type is not required in the measurement reports;

- suppressing multiple reporting of measurement results when they are the same across all observed network resources.

3.2.2 Measurement job state and status attributes

According to the OSI systems management concept, the state of a resource is reflected in indicators (attributes). Status attributes are provided to qualify these state attributes. Full details are provided in CCITT Recommendation X.731 [16]. As for a measurement job, the following information is provided:

Administrative state: The administrative state attribute allows the system operator to permit or prohibit administratively the execution of the measurement job.

Operational state: The operational state attribute reflects the operability of the measurement job.

Availability status: The availability status attribute denotes particular conditions applicable to the measurement job. It indicates:

- whether or not the measurement job is collecting measurement data according to its schedule;

- if, for whatever reason, some of the requested measurement data cannot be collected by the measurement job, in particular whether the measurement schedule inhibits the collection of measurement data.

3.2.3 Measurement job administration

Creating a measurement job: On creation of a measurement job, all information has to be supplied in order to collect the required data from the selected network resources as specified by the measurement job characteristics (see subclause 3.2.1).

Modifying a measurement job: In general, the modification of measurement job parameters may be requested by the OS during the lifetime of a measurement job when the job is suspended (explained below).

Displaying a measurement job: The system operator shall be able to get a list of all measurements that are currently defined, together with all available actual information as stored in the NE. This information consists of the data that is supplied on creation/modification and the actual state and status information of the measurement job.

Deleting a measurement job: A measurement job is automatically deleted by the system when it reaches the job endtime and all scheduled or explicitly requested measurement reports have been generated. A created measurement job can also be deleted by manual intervention at any time. When deleted, the measurement process associated with the job is stopped, and all allocated resources are freed.

Suspending/resuming a measurement job: On normal operation, the measurement job collects measurement data within the NE according to the actual values of the measurement job parameters. However, the system operator may decide for some reason to discard temporarily the collection of measurement data (e.g. in case of system overload or congestion, measurement results not used, ...). The system operator therefore is able to suspend a defined measurement job at any time, using the Administrative State. This implies that the measurement job definition remains in the system, but that no measurement gathering activities are performed for this job. When the measurement job is resumed, measurement data collection is started again at the next granularity period within the measurement schedule.

Requesting the current measurement result values of a measurement job: The system operator may for some reason be interested in the current values of the measurement results of a particular measurement job, independently of the scheduled data collection and subsequent reporting, e.g. for tracing the increment of some of the counters. To this aim, the system operator is able to request the actual values of the measurement results for the same network resources as defined in the measurement job. The current results are returned in the reply message for this request in a format which is identical to scheduled reports that are generated by the measurement job at the end of the granularity period. Any such request does not affect the measurement job, and may only be issued when the measurement job is active and not suspended, otherwise an error will be returned.

3.3 Measurement results

3.3.1 Measurement result characteristics

Each measurement produces a result at the end of the granularity period or on request of the OS, see above. Annex B provides for each measurement type a description of the expected measurement result.

Scheduled reports: Measurement results for all measurements of a particular measurement job are gathered in a single report at the end of the granularity period. The system operator may to some extent determine in what format the measurement results are to be reported, since reporting requirements can be included in the measurement job definition. The report may contain, in addition to the specific measurement results, fixed information that is global for all measurement results associated with that measurement job, such as an identification of the involved network resources and a time stamp referring to the time at which the NE started collecting the measurement results.

Request current results: On receipt of the request, the appropriate result values are produced, and a reply to the request is generated. The measurement job specific information contained in the reply and its format is identical to scheduled reports.

3.3.2 Transfer of measurement results

The measurement results are contained in scheduled reports and are generated by the measurement job according to the measurement job definition parameters, or they are sent to the OS as a result of a "request current results"-operation.

Scheduled measurement reports: Are generated at the end of each granularity period if the measurement job is not suspended. They can be transferred to the OS in two ways:

1) immediate notifications:

   The reports are automatically forwarded to the OS at the end of the granularity period.

2) deferred retrieval:

   The reports are stored locally in the NE, where they can be retrieved when required.

For each individual report, the transfer of measurement results in either one or both ways is to be established by the system operator. These requirements are covered completely by OSI standardised functions (Event Report Management Functions CCITT Recommendation X.734 [17], Log Control Functions CCITT Recommendation X.735 [18], CMIS, CCITT Recommendation X.710 [13], FTAM, ISO 8571 [21], SNMP Recommendation IETF RFC 1157 [24], FTP Recommendation IETF RFC 959 [28]), Common Management Functions that are provided in GSM 12.00 [8] and the generic services that are provided in annex D of the present document.

Request current results: Upon receipt of the request, the NE will generate an appropriate reply and send it immediately to the OS. There is no further control of the forwarding of the reply and no storage of the reply in the NE.

4 Detailed description of the measurement system for a PLMN

4.1 Introduction

Clause 3 of the present document describes the required functions for the administration of performance measurements and the retrieval of their results. For this purpose, the characteristics of measurement jobs and measurement results have been defined.

This part of the ETS explains how these requirements can be met using standard OSI systems management functions or SNMP management operations and, where necessary, tailoring them for PLMN use. In the following, managed object classes and their properties (attributes, notifications, etc.) to be used on the object oriented interface between OS and NEs for the execution of performance management functions are specified.

4.1.1 Basic measurement system functions

Before measurement data from the NEs can be collected and the results be forwarded to the OS, the measurement jobs that generate the required data shall be activated in the system. In object oriented terms, this corresponds to the instantiation of managed objects which model the measurement process. In order to control the measurement process, appropriate attributes of these objects shall be defined and have to be set to the required/desired values, either when the objects are created or during the lifetime of the objects. The specific attributes and their values will determine the measurement schedule, the measured network resources, the measurement types and the generation of scheduled result reports as well as the layout of the reports. Scheduled results can be forwarded to the OS using a notification that is defined specifically for this purpose as a part of the measurement object class definitions. A dedicated action will be used for requesting current results of active measurements.

4.1.2 Measurement Object Administration

The management of objects in an open system is performed utilising the internationally standardised "Common Management Information Service Element" (CMISE CCITT Recommendation X.710 [13] or IETF RFC 1157 A Simple Network Management Protocol (SNMP) [30]). Managed objects for the execution of PLMN performance measurement functions can be instantiated and deleted using the M-CREATE and M-DELETE services or SNMP SET and GET operations. Reading and modifying attributes of these objects can be achieved employing the M-GET and M-SET services of CMISE or SET and GET operations of SNMP. The CMISE M-EVENT-REPORT service and SNMP TRAP is defined for the emission of notifications, while actions can be executed using the M-ACTION service.

Specific notifications defined in the OSI object management function (see CCITT Recommendation X.730 [15]) are used to notify the OS of the creation and deletion of managed objects and of the change of attribute values. For the formal definition of the PLMN performance management object model, refer to annex C.

The measurement job can be ideally modelled by the managed object class "simpleScanner" as defined in CCITT Recommendation X.738 [19]. The "simpleScanner" is derived from the "homogeneousScanner" object class (see CCITT Recommendation X.738 [19]), which in turn is a specialisation of the "scanner" class of managed objects (see CCITT Recommendation X.738 [19]). The "simpleScanner" object has attributes to determine:

- the measurement types;

- the measured network resources;

- the recording periods; and

- the reporting requirements;

of the measurement job. The "simpleScanner" generates measurement result reports in the form of notifications, according to the attributes that prescribe the reporting requirements. The measurement transfer requirements are not modelled in the scanner objects, since generic and general services are used (see subclause 4.3.2 and annex D).

4.2 Modelling of measurement jobs

A measurement job is represented by a "simpleScanner" object. The following subclauses define how the measurement job characteristics are mapped onto the properties of the "simpleScanner" managed object class, and how the measurement types of a measurement job are modelled in the PLMN performance measurement system.

4.2.1 Measurement job characteristics

4.2.1.1 Measurement Function

Every measurement job collects measurement data from selected measurement types across one or more network resources of the same type. The selected measurement types shall be identical throughout all network resources observed by a measurement job. For each network resource, the related measurement types have been grouped in one or more measurement functions.

Measurement functions, are modelled by various "measurementFunction" object classes (see annex C). The measurement types for the PLMN performance measurement system are defined in annex B, and their result values are included as attributes in the appropriate "measurementFunction" object class. In case the measurement type is a counter, the attribute represents the counter value as is. In all other cases, the attribute delivers a calculated value (e.g. a mean), over the observed period. The "measurementFunction" objects are contained in the objects that represent the network resource to which the measurement types included in the "measurementFunction" refer. All measurement types that relate only to a network resource alone are grouped into one "measurementFunction" class which is unique for that network resource. Measurement types that are related to the network resource and the same type(s) of adjacent resource(s) (e.g. Handover neighbour cell) are also grouped into one unique type of measurement function which may exist once or more per instance or per set of that adjacent resource(s). The instances of the adjacent resources that are to be addressed by the measurement function are identified by the values of attributes which are part of that specific "measurementFunction" object class definition.

Measurement types that belong together are grouped together in the same package (e.g. "immediateAssignmentProcedurePackage" has attributes "attemptedImmediateAssignmentProcedures" and "successfullImmediateAssignmentProcedures" - for details refer to annex C). Since all measurement types defined in annex B may or may not be supported by the system, all packages of a "measurementFunction" which contain measurement attributes are conditional. A "measurementFunction" needs to be created before a "simpleScanner" can scan its attributes, i.e. before actual measurements can be taken. The create request from the OS shall specify the values of attributes that identify adjacent resources (like Handover neighbour cell), if any, but it may not specify any measurement attributes of the "measurementFunction" object. Upon creation of a "measurementFunction" object, the system will determine the measurement packages that are included in the object according to the measurement types the system supports. If multiple instances of the same "measurementFunction" object class are created, the packages included in the various instances may be different from instance to instance since the system may have restrictions on how many measurement packages of the same type it supports. The OS can inquire the measurement types supported by a "measurementFunction" object from the system, by reading the "packages" attribute or the attribute list of the object (see CCITT Recommendation X.721 [14]). Unlike the former operation, the latter, however, will also return values of the measurement attributes which are not expected to be meaningful at this time (see below). Deletion of the "measurementFunction" will render the measurement types that correspond to the "measurementFunction" attributes unavailable to the OS. Creation and deletion of a "measurementFunction" will be notified to the OS using the object creation and deletion notifications as defined in CCITT Recommendation X.730 [15].

Each measurement job may collect data from one or more measurement types across one or more network resources, i.e. a "simpleScanner" object may make a choice of one or more "measurementFunction" instances and scan the same set of attributes across all selected measurement functions. For this purpose, it can scope the set of measurement functions that are eligible for inclusion in the observation, and it may select measurement functions using filtering criteria (similar to the concept of scoping and filtering as described in CCITT Recommendation X.710 [13]). Alternatively, it can use an explicit list of "measurementFunction" objects for scanning. The "simpleScanner" does not explicitly identify the network resource(s) it measures. Instead, this information is derived from the containment relationship between the selected "measurementFunction" instances and the objects that model the network resources, and, where necessary, through specific attributes of the "measurementFunction" objects that identify adjacent resources. In principle, a "simpleScanner" is able to scan attributes of any defined "measurementFunction", but for the purpose of the present document, each "simpleScanner" instance is only required to scan attributes of "measurementFunction" objects that are contained in the same "xxxFunction" object as the "simpleScanner" itself, where "xxx" stands for "bss", "msc", "hlr", "vlr", "eir" or "smsc", respectively (see figure C.1).

All measurement attributes of any "measurementFunction" should only be read by a "simpleScanner" that has been instantiated for this purpose. By definition they can be read directly by systems management protocol, but their values are not expected to have any meaning apart from the scan. Therefore, the system will not return the "attribute list" in the create reply, and the "attributeList" will also not be included in the object creation notification.

4.2.1.2 Measurement schedule

The measurement schedule specifies the time frame during which the measurement job will be active. The schedule consist of a measurement start- and stoptime and one or more recording intervals which may repeat on a daily or weekly basis. The semantics of the scheduling parameters are described in subclause 3.2.1.2.

All of the above parameters are formally defined as attributes of conditional packages of the "simpleScanner" managed object class. The starttime and stoptime are included in the "duration" package and indicate, if the package is present, the specific point in time at which the "simpleScanner" will become active or inactive, respectively. If the "simpleScanner" is instantiated after the specified starttime, this will have the same effect as if no starttime was specified (see subclause 3.2.1.2).

The optional recording intervals, if specified, further restrict the time during which the "simpleScanner" actively collects measurement data within the time frame determined by the duration package. The "dailyScheduling" package may be used to define one or more intervals during each day. Alternatively, the "weeklyScheduling" package can be used to define individual intervals for each day of the week. The recording interval should be a multiple of the granularity period (if non-zero) and the start- and endtimes shall be aligned with granularity period boundaries for the system to accept the values.

It is possible to create several "simpleScanner" objects which scan the same attributes of the same "measurementFunction" instances according to different recording intervals. In this case it is, however, required that these intervals do not overlap. Consequently, if it is required to measure the same measurement type with overlapping schedules, it is necessary to have an appropriate number of instances of the same "measurementFunction" available which all support the required attributes (see subclause 4.2.1.1).

For the definition of the syntactical and additional behavioural aspects of the above parameters, refer to CCITT Recommendation X.721 [14] and CCITT Recommendation X.738 [19].

4.2.1.3 Granularity period

The granularity period defines the periodicity of the generation of results by a measurement job within the timeframe specified in the scheduling attributes. The granularity period of a measurement job is determined by the value of the "granularityPeriod" attribute of the "simpleScanner". The present document requires, as a minimum, the support of granularity periods of 5, 15, 30 and 60 minutes.

The value of this attribute shall specify the required value in minutes. The underlying International Standards allow the modification of the "granularityPeriod" attribute, but for an implementation claiming conformance to the present document, it is not required that its value be changeable during the lifetime of the "simpleScanner" object. If this value is 60, measurement results will be generated every full hour. If the value is 30, results will be generated every 0 and 30 minutes past the full hour. If the value is 15, result output will occur every 0, 15, 30 and 45 minutes past the full hour, and finally, if the value is 5, the "simpleScanner" will generate output every 5 minutes, synchronised on the full hour. Again, measurement results are only reported at the end of each granularity period within the recording interval. Due to these definitions, synchronisation of granularity periods through the conditional "periodSynchronisationPackage" of the "simpleScanner" is not supported in the scope of the present document.

If periodical generation of results is not required from a "simpleScanner" instance, this can be achieved by specifying the value 0 for the "granularityPeriod" attribute. In this case, it will only be possible to request current measurement results from the "simpleScanner" (see below).

4.2.1.4 Scan reports

At the end of each granularity period within the measurement schedule, the "simpleScanner" will emit a "scanReport" notification, defined in CCITT Recommendation X.738 [19], which contains the measurement results generated by the scanner at the end of that granularity period. The information in the notification shall comprise:

- the managed object class and managed object instance of the "simpleScanner" that emitted the notification, plus the notification type (i.e. "scan report"),

- a time stamp that indicates the time at which the measurement results were taken, i.e. the end time of the respective granularity period,

- for each "measurementFunction" object from which measurements were taken by the scanner, a list of measurement attribute values and optional attribute identifiers, plus a suspect flag for each attribute that indicates the validity of the result value. Missing data is indicated in the list. The time stamp that indicates the time offset forward from scan initiation until the value of the measurement attribute was actually taken is not supported in the PLMN measurement system,

- for an incomplete scan the reason why the scan could not be completed.

The definition of the "scanReport" notification in CCITT Recommendation X.738 [19] provides some flexibility with respect to the actual layout of the report. In the PLMN performance measurement system, the following options can be selected:

- suppressing the reporting of the identification of the "measurementFunction" object from which the measurements reported in the notification were collected. This is only useful when the identification of the "measuremntFunction" can be determined by other means, or if the identification is not required by the OS (e.g. when the statistics are to be calculated).

- omitting the attribute identifiers from the report. In this case, the attribute values are reported in an agreed order, which is defined by an attribute of the "simpleScanner".

- measurement values that are identical throughout all "mesurementFunction" instances from which the scanner takes measurements may be included in the report only once.

CCITT Recommendation X.738 [19] defines in detail the attributes of the "simpleScanner" which are used to control the above features. Additional options of CCITT Recommendation X.738 [19] which are not listed here are not supported in the PLMN performance measurement system (see conformance requirements in subclause 4.4).

4.2.2 Scanner state and status attributes

State and status indicators are defined for the measurement job in subclause 3.2.2 of the present document. These are modelled through appropriate attributes which reflect the state and status of the "simpleScanner" object. These attributes are: administrativeState, operationalState and availabilityStatus.

administrativeState: the administrativeState attribute is used to suspend and resume the scanning performed by the "simpleScanner". This attribute can be altered by means of CMISE M-SET service or SNMP SET operation for the applicable "simpleScanner" object instance.

operationalState: The operationalState attribute represents the operational capability of the scanner to perform it's functions.

availabilityStatus: The availabilityStatus attribute reflects whether or not the simpleScanner object instance is active according to the measurement schedule.

Any changes to the values of the administrativeState and the operationalState attributes will be reported to the OS using the "stateChange" notification, as defined in CCITT Recommendation X.731 [16].

Further details about these attributes can be found in CCITT Recommendation X.738 [19].

4.2.3 Scanner administration

The generic CMISE services M-CREATE, M-DELETE, M-GET and M-SET or SNMP SET and GET, applied to a simpleScanner managed object instance respectively represent creation, deletion, display and modification of a measurement job. A CMISE M-ACTION primitive or SNMP SET with a specific action type for activating a scan report is defined for the retrieval of the current values of measurement results.

Creating a "simpleScanner": A "simpleScanner" can be created by issuing an appropriate M-CREATE request or SNMP SET request. On creation of the object, all attribute values have to be supplied that determine:

- the selection of "measurementFunction" instances and their attributes which shall be measured;

- the schedule of the "simpleScanner"; and

- the reporting requirements

as defined in previous subclauses. The "measurementFunction" objects shall be created before the scanner can be instantiated, and the measurement attributes specified in the scanner shall be present in the selected "measurementFunction" instances, for the scan to return its results. For each object that does not exist, an empty report shall be returned and for each attribute that does not exist, an empty value shall be returned within the report. The relationship between the scan attributes and the scanner is explained in CCITT Recommendation X.738 [19].

Modifying "simpleScanner" attributes: Modification of "simpleScanner" attributes may be requested by the OS during the lifetime of a scanner, using the CMISE M-SET or SNMP SET operation. The conditions for modification of attributes of the "simpleScanner" are specified in CCITT Recommendation X.738 [19] and CCITT Recommendation X.738 [19], but some additional restrictions, defined in the present document with respect to the changeability of "simpleScanner" attributes, apply in the PLMN performance measurement system.

Displaying scanner objects: The system operator can get a list of all "simpleScanner" objects that currently exist in the system, together with all available information as stored in the NE. This information consists of the data that was supplied on creation/modification of the objects and the values of the state and status attributes of the "simpleScanner" objects. The CMISE M-GET or SNMP GET operation can be used to selectively retrieve the required information from the system. For details see CCITT Recommendation X.710 [13].

Deleting a "simpleScanner": A "simpleScanner" instance is automatically deleted by the system when the scheduled endtime is reached and all result reports, either scheduled or on request have been generated. A "simpleScanner" object can also be deleted by manual intervention, utilising the CMISE M-DELETE or SNMP SET operation, at any time. When deleted, the measurement process associated with the scanner is stopped, and all allocated resources are released.

Suspending/resuming scanner operation: On normal operation, the "simpleScanner" collects measurement data from the selected "measurementFunction" objects according to the values of the "simpleScanner" attributes. However, the system operator may decide for some reason to discard temporarily the collection of measurement data (e.g. in case of system overload or congestion, measurement results not used, ...). The system operator therefore is able to suspend scanner operation at any time, setting the administrativeState attribute to "locked". This implies that the "simpleScanner" instance remains in the system, but no measurement gathering and result reporting activities are performed for this scanner. When scanner operation is resumed, i.e. the administrativeState is "unlocked", measurement data collection and result reporting is started again at the next full granularity period within the measurement schedule.

Requesting current measurement result values: The system operator may for some reason be interested in the current values of the measurement results of a particular measurement process, independently of the scheduled data collection and reporting of the respective scanner, e.g. for tracing the increment of some of the measurement attributes. To this aim, the "activateScanReport" CMISE M-ACTION or SNMP GET is used as defined in CCITT Recommendation X.738 [19]. The action reply will return current results according to the attributes of the scanner that govern the generation of the "scanReport" notification, i.e. the format of the reply is identical to that of scheduled reports generated by the scanner. Any such request does not affect the underlying measurement process, and may only be issued when the scanner is operating according to its schedule and not suspended (i.e. "offduty" not present in the availability status , administrative state equals "unlocked"), otherwise an error will be returned.

4.3 Modelling of measurement results

Each measurement produces a result at the end of the granularity period or on request of the OS. Annex B provides for each measurement type a description of the expected measurement result. Annex C contains the formal definition of the attribute that represents the measurement type.

4.3.1 Characteristics of the result report

A scheduled result report is generated in the form of a "scanReport" notification. Current measurement results requested by the OS using the "activateScanReport" action will be supplied by the system in the reply to the request. All measurement attributes that are observed by a "simpleScanner" object are included in a single report or action reply, respectively. The layout of the two result reports - notification or action reply - is identical, as far as the contained measurement information is concerned. For details on the result report characteristics, please refer to the previous subclauses.

4.3.2 Result report transfer control

Result reports from a "simpleScanner" object are either produced according to the measurement schedule (notification) or on receipt of an explicit request (action) from the OS. There are no mechanisms to control the forwarding of the reply to that request (action reply), or to store it in the NE. There are, however, functions to determine the forwarding, local storage in the NE and deferred retrieval of the "scanReport" notification. These functions are described in the following paragraphs.

The forwarding of notifications can be controlled by the OS via "Event Forwarding Discriminator" (EFD) objects, as defined in CCITT Recommendation X.734 [17]. For each EFD, the OS can specify a discriminator construct which will be applied as a filter to any event report generated in the system. If an event report passes the filter, a notification will be forwarded to the OS accordingly. The following filter criteria are allowed in an EFD for the PLMN performance measurement system:

- the event type, which allows to enable or disable completely the forwarding of scan report notifications;

- the "simpleScanner" managed object instance, which allows to restrict forwarding of result reports to those that are generated by specific scanner instances;

- the time stamp contained in the scan report ("scanInitiationTime"), which allows to selectively enable the forwarding of result reports that were generated at a specific time or during specific periods of time;

- any operation on the above attributes in any combination.

Measurement result reports can be stored in the NE. This property is modelled through the managed object class "log", as specified in CCITT Recommendation X.721 [14] and "log control function" as specified in CCITT Recommendation X.735 [18]. The storage of event reports in the "log" can be controlled through a discriminator construct, similar to the event forwarding control. The present document requires for the "log" discriminator construct the same criteria as for the EFD discriminator construct.

All scan report notifications that pass the discriminator construct of the "log" will create a "scanReportRecord" object which is contained in the log. These records can be retrieved by the OS at any time, as defined in CCITT Recommendation X.735 [18] and CCITT Recommendation X.710 [13], using either CMISE, SNMP, FTP or using FTAM (see annex D). The use of FTAM or FTP services is especially suitable for bulk data transfer. From the common procedures defined in GSM TS 12.00 [8] for data transfer in a PLMN, only the method that provides logged information into file(s) can be used for the measurement system. The "resultType" requested in the action will identify the appropriate log instance(s) as the source of the measurement data, and optionally additional filter criteria which determines the actual records to be put into the file(s) can be supplied. The filter criteria that shall be supported are identical to those defined for the discriminator construct of the logs. On receipt of the action, the requested records will be put into one or more files, which will then be made available to the OS. The format of the records in the file shall be according to the definition of the "scanReportRecord" as given in CCITT Recommendation X.738 [19].

Since all measurement attributes and the identification of the network resource observed by a "simpleScanner" are included in a single attribute of the result reports, it is not possible to filter on the measured resource or the measurement type. If the selective forwarding/logging/retrieval of measurement results referring to individual network resources or individual measurement types is required by the system operator, then "simpleScanner" objects shall be instantiated such that the scanner identity will implicitly identify the measured resource and measurement types, i.e. the scanner attributes should be set such that the scanner observes only the specific resources and/or the specific measurement attributes which shall be filtered, according to the system operator's requirements.

4.4 Conformance requirements

In the following subclause, conformance requirements for object classes, notifications and actions defined in CCITT Recommendation X.738 [19] are specified. In cases where requirements in the present document restrict options of CCITT Recommendation X.738 [19], like e.g. changeability of attribute values, the conditions of the present document shall apply.

4.4.1 Simple scanner

The following subclause lists the attributes and packages of the "simpleScanner", as defined in CCITT Recommendation X.738 [19], and those inherited from the "scanner" as defined in CCITT Recommendation X.738 [19]. It specifies which properties shall be supported to conform with the present document.

MANDATORY PACKAGES:

scannerPackage

scannerId: this attribute identifies a "simpleScanner" instance. It is a mandatory attribute of the "simpleScanner" managed object class and will be supported in the PLMN measurement system.

granularityPeriod: this attribute specifies the granularity period of the scanner, as defined in subclause 4.2.1.3. It is a mandatory attribute of the "simpleScanner" managed object class and will be supported in the PLMN measurement system.

administrativeState and operationalState: (see subclause 4.2.2) are mandatory attributes of the "simpleScanner" managed object class and will be supported in the PLMN measurement system. Their semantics are defined in CCITT Recommendation X.738 [19].

homogeneousScannerPackage

scanAttributeIdList: this attribute is interrelated with the "numericAttributeIdArray" attribute of the "simpleScannerPackage". It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

simpleScannerPackage

numericAtributeIdArray: this attribute is interrelated with the "scanAttributeIdList" attribute of the "homogeneousScannerPackage". It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

suppressObjectInstance: this attribute determines whether or not the object instance of the observed measurement function is included in the measurement results. It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

activateScanReport: this action is supported in the PLMN measurement system (see below).

scanReport: this notification is supported in the PLMN measurement system (see below).

CONDITIONAL PACKAGES:

availabilityStatusPackage

availabilityStatus: this attribute is supported in the PLMN measurement system (see subclause 4.2.2) according to the definition of CCITT Recommendation X.738 [19].

duration

startTime and stopTime: these attributes constitute the start- and stoptime of the scanner. They are supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

dailyScheduling

intervalsOfDay: this attribute defines the periods within a day during which the scanner actively collects measurement data. It is supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

weeklyScheduling

weekMask: this attribute defines, for each day of the week, the periods during which the scanner actively collects measurement data. It is supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

externalScheduler

The support of this package is not required in the PLMN measurement system.

periodSynchronisationPackage

The support of this package is not required in the PLMN measurement system. Synchronisation of granularity periods is described in subclause 4.2.1.3.

createDeleteNotificationsPackage

This package contains the object creation and object deletion notifications. Both are required in the PLMN measurement system.

attributeValueChangeNotificationPackage

This package contains the attribute value change notification. It is required in the PLMN measurement system.

stateChangeNotificationPackage

This package contains the state change notification. It is required in the PLMN measurement system.

timeStampReportPackage

timeStampReportMode: this attribute specifies the time stamping requirements for the measurement results. The value "1" ("globalTimeStampOnly") shall be used.

scopedSelectionPackage and managedObjectInstanceSelectionPackage

Either one of these packages is present in any scanner instance. The attributes contained in the packages determine the measurement functions selected for observation by the scanner. They are supported according to the definitions of CCITT Recommendation X.738 [19].

timingSelectionPackage

The support of this package is not applicable in the PLMN measurement system, since the observed "measurementFunction" managed objects do not contain any time attributes.

onceReportAttributeIdListPackage

onceReportAttributeIdList: this attribute contains a list of attribute identifiers. The values of these attributes shall be included in a result report only once if they are identical throughout all "measurementFunction" objects observed by the "simpleScanner". It may be supported in the PLMN measurement system as an option, see CCITT Recommendation X.738 [19].

4.4.2   Scan report record

The "scanReportRecord" managed object class will be supported in the PLMN measurement system as defined in CCITT Recommendation X.738 [19] and CCITT Recommendation X.721 [14].

4.4.3   Scan report notification

The "scanReport" notification will be supported in the PLMN measurement system as defined in subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

4.4.4   Activate scan report action

In the scope of the present document, there are no specific conformance requirements for the action request. The action reply will be supported according to the requirements for the scan report notification.

4.5   Application Context

The Application Context Name of the 12.04 application context shall have the following object identifier value:

{gsm-OM-DomainId gsm-12-04 (4) protocolSupport (1) applicationContext (0) gsm-Management (0)}

and the following object description value:

"gsm12.04 management application context"

The object identifier gsm-OM-DomainId is defined in the GSM 12.30 (ETR 128) [11].

5 Future Enhancements

The simple scanner can scan an attribute, but is unable to perform any calculations on it. This means that the simple scanner is unable to apply any algorithm on any attribute to derive a master value, e.g. a calculation of the mean value. Therefore, within the present document, an approach has been chosen where the attribute itself represents a mean value, derived from system internal sampling procedures, if generation of a mean value is desired. As a result, the values of such attributes are only meaningful at the time of scanning, so that the scanner and the measurement process that generates the attribute value shall be synchronised. How this synchronisation and the generation of processed attributes is achieved is a matter of internal implementation.

The situation described above will also prohibit that a single attribute be observed by more than one scanner if the reporting periods of the scanners overlap and contain different granularity periods. If it is required to have multiple scanners generating results for the same measurement type simultaneously, it is necessary to create multiple instances of the same "measurementFunction" that includes the attribute which corresponds to the required measurement type. In practical terms, this means that a measurement has to be implemented more than once in a NE if this feature is supported.

In order to circumvent this problem, a change has been proposed to ISO 10165-13 to incorporate a new scanner object class which will be based on simple counter-type measurements only and allow to attach any desired algorithm in order to process the attribute values and report the result of that processing, e.g. evaluating the mean over the observed values. Pending future extensions of the international standard, this may eventually lead to associated changes to the present document (subject of Phase 2+).

Annex A (informative): Graphical examples

This annex gives some graphical examples to demonstrate how the measurements in annex B, can be combined to express a specific function.

EXAMPLE 1:   Authentication and Authentication Set requests.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Authentication of a subscriber.
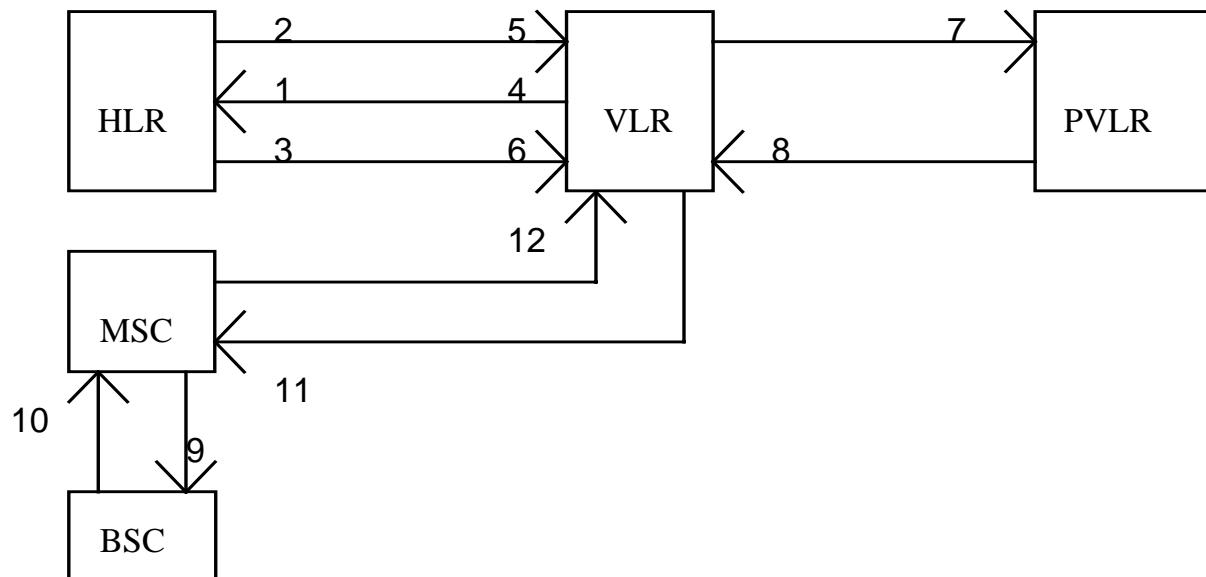
EXAMPLE 1: Authentication and Authentication Set requests

Nbr.	Measurement Attribute Name	Measurement Name
1	attReqForAuthSetsReceivedByHLRFromVLRs	Attempted requests for Authentication sets received by HLR from VLRs
2	succReturnedAuthSetsFromHLRToVLRs	Successful returned Authentication sets from HLR to VLRs
3	emptyResponsesForAuthSetsFromHLRToVLRs	Empty responses to request for Authentication sets from HLR to VLRs
4	attReqForAuthSetsSentToHLR	Attempted requests for Authentication sets sent to HLR by the VLRs
5	succReceivedAuthSetsFromHLR	Successful received Authentication sets from the HLR to the VLRs
6	emptyResponsesForAuthFromHLR	Empty responses to request for Authentication sets from HLR to VLRs
7	attIdentificationReqToPVLRs	Attempted identification requests to PVLRs
8	succIdentificationReqToPVLRs	Successful identification requests to PVLRs
9	attCipheringModeControlProcs	Attempted ciphering mode controlled procedures
10	succCipheringModeControlProcs	Successful ciphering mode controlled procedures
11	attAuthProcsInVLR	Attempted authentication procedures in the VLR
12	succAuthProcsInVLR	Successful authentication procedures in the VLR

EXAMPLE 2:   Interrogation of HLR for routing.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Routing.
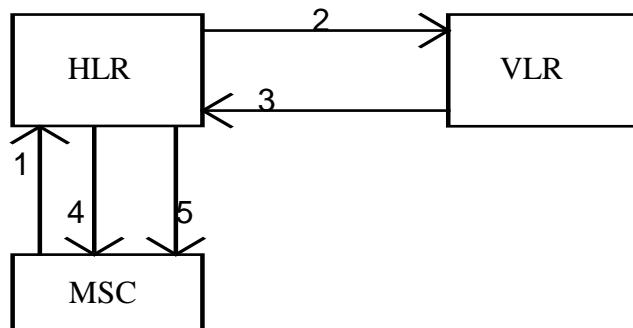
Example 2: Interrogation of HLR for routing

Nbr.	Measurement Attribute Name	Measurement Name
1	attInterrogationOfHLRsForRouting	Attempted interrogations of HLRs for routing
2	attReqForMSRN	Attempted request for MSRN
3	succReqForMSRN	Successful request for MSRN
4	succInterrogationOfHLRsMSRNObtained	Successful interrogations of HLR (MSRN obtained)
5	succInterrogationOfHLRsCallForwarding	Successful interrogations of HLR (call forwarding)

EXAMPLE 3:   Location Updating.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Location Updating.
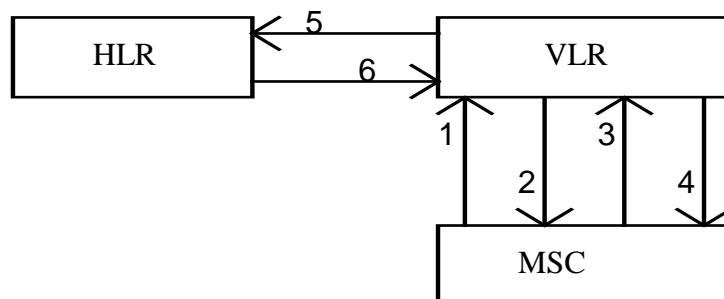
EXAMPLE 3: Location Updating

Nbr.	Measurement Attribute Name	Measurement Name
1	attIntraVLRLocationUpdates	Attempted intra-VLR location updates
2	succIntraVLRLocationUpdates	Successful intra-VLR location updates
3	attInterVLRLocationUpdates	Attempted inter-VLR location updates
4	succInterVLRLocationUpdates	Successful inter-VLR location updates
5	attLocationUpdate	Attempted location updates
6	succLocationUpdate	Successful location updates

Annex B (normative): Performance Measurement Requirements Summary

Following is the template used to describe the measurements contained in this annex.

A. **Description**

A short explanation of the measurement operation.

B. **Collection Method**

The form in which this measurement data is obtained:

- CC (Cumulative Counter);

- GAUGE (dynamic variable), used when data being measured can vary up or down during the period of measurement;

- DER (Discrete Event Registration), when data related to a particular event are captured every nth event is registered, where n can be 1 or larger;

- SI (Status Inspection).

C. **Condition**

The GSM condition which causes this measurement data to be updated. Where it is not possible to give a precise GSM condition, then the conditional circumstances leading to the update is stated.

D. **Measurement Attribute Name**

The Measurement Attribute Name which will be referenced by the Object Model.

E. **Measurement Result** (measured value, Unit)

A short description of expected result value (e.g. A single integer value).

F. **Measurement Function Name**

Measurement Function Name for which this measurement is defined.

G. **Switching Technology**

The Switching product this Measurement is applicable to. Circuit Switched and / or Packet Switched (GPRS). When packet switching (GPRS) is identified for an MSC measurement function, this measurement type is related to a combined circuit/packet switched event.

B.1 Measurements Related To The BSC

B.1.1 BSC Measurement Function

B.1.1.1 Unsuccessful requests for service

A. This measurement provides the number of unsuccessful mobile originated services for the BSC. Note, the "reject cause" indicates why the service request was rejected. Possible causes include, B-Subscriber busy, network out of order, protocol errors.

B. CC.

C. Transmission of "CM-SERVICE REJECT" Message to MS requesting service (GSM 04.08 [2]).

D.   unsuccReqsForService.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.2   Unsuccessful requests for service, per cause

A.   This measurement provides the number of unsuccessful mobile originated services for the BSC per cause. Note, the "reject cause" indicates why the service request was rejected. Possible causes include, B-Subscriber busy, network out of order, protocol errors.

B.   CC.

C.   Transmission of "CM-SERVICE REJECT" Message to MS requesting service (GSM 04.08 [2]).

D.   unsuccReqsForServicePerCause.

E.   An integer value per cause.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.3   Mean Inter-arrival Time (Circuit Switched)

A.   This measurement provides the arithmetic mean of the sum of time intervals between consecutive mobile originating call attempts.

B.   CC.

C.   This measurement is obtained by accumulating the time segments between receipt of consecutive access Message on the RACH with establishment cause "MOBILE ORIGINATING CALL" and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanInterArrivalTime

E.   A single real value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.4   Attempted Transmission of Paging Messages, per BSC

A.   This measurement provides the number of Paging messages transmitted, on a per BSC basis (these are counted as attempts).

B.   CC.

C.   Transmission of "PAGING REQUEST" (GSM 04.08 [2]).

D.   attTransOfPagingMessagesPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit and packet switching.

B.1.1.5   Unsuccessful Transmission of Paging Messages, per BSC

A.   This measurement provides the number of unsuccessful Paging requests, on a per BSC basis.

B.   CC.

C.   No "PAGING RESPONSE" received for the "PAGING REQUEST", expiry of timer T3113 (GSM 04.08 [2]).

D.   unsuccTransOfPagingMessagesPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit and packet switching.

B.1.1.6   Attempted IMMEDIATE ASSIGNMENT Procedures, per BSC

A.   This measurement provides the number of attempted immediate assignment procedures, on a per BSC basis.

B.   CC.

C.   Receipt of "CHANNEL REQUEST" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING", "ONE PHASE PACKET ACCESS", "SINGLE BLOCK PACKET ACCESS" and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

D.   attImmediateAssingProcsPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit and packet switching.

B.1.1.7   Successful IMMEDIATE ASSIGNMENT Procedures, per BSC

A.   This measurement provides the number of successful immediate assignment procedures, on a per BSC basis.

B.   CC.

C.   Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This Message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message. If an "IMMEDIATE ASSIGNMENT EXTENDED" Message is transmitted, the counter shall be incremented by two, because that Message contains assignment information for two mobiles (GSM 04.08 [2]).

D.   succImmediateAssingProcsPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit and packet switching.

B.1.1.8   Successful Internal Handovers, intra-CELL, per BSC

A.   This measurement provides the number of times a call moves from the occupied channel of the CELL to another free channel of the same CELL, on a per BSC basis.

B.   CC.

C.   Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D.   succInternalHDOsIntraCellPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.9   Unsuccessful Internal Handovers, intra-CELL, per BSC

A.   This measurement provides the number of unsuccessful intra CELL Handovers, i.e. an attempt was made to move a call .from the occupied channel of the CELL to another free channel of the same CELL, on a per BSC basis.

B.   CC.

C.   Receipt of "ASSIGNMENT FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D.   unsuccInternalHDOsIntraCellPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.10 Successful Internal Handovers per BSC

A.   This measurement provides the number of successful Handovers on a per BSC basis, it includes intra-CELL as well as inter-CELL Handovers.

B.   CC.

C.   Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D.   succInternalHDOsPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.11 Successful Internal Handovers per cause

A.   This measurement provides the number of successful Handovers per cause, it includes intra-CELL as well as inter-CELL Handovers.

B.   CC.

C.   Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D.   succInternalHDOsPerCause.

E.   An integer value per Handover cause.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.12 Unsuccessful Internal Handovers with reconnection to old channels, per BSC

A.   This measurement provides the number of unsuccessful Handovers, on a per BSC basis (with reconnection to the original channels).

B.   CC.

C.   Receipt of "HANDOVER FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D.   unsuccInternalHDOsWithReconnectionPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.13 Unsuccessful Internal Handovers with loss of connection, per BSC

A.   This measurement provides the number of unsuccessful Handovers that end in loosing the call, on a per BSC basis.

B.   CC.

C.   Expiry of timer T3103 for Inter CELL Handovers and Expiry of timer T3107 for Intra CELL Handovers (GSM 04.08 [2]).

D.   unsuccInternalHDOsWithLossOfConnectionPerBSC.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for circuit switching.

B.1.1.14 Flush Requests Received

A.   This measurement provides the total number of flush request messages received from the SGSN to flush the PDUs for a given cell.

B.   CC.

C.   Update count for each receipt of a PDU flush request message from the SGSN.

D.   flushReqReceived.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for packet switching.

B.1.1.15 Paging Requests Received from SGSN

A.   This measurement provides the total number of "PAGING" messages received by the BSS from the SGSN.

B.   CC.

C.   Update count for each receipt of a "PAGING" message by the BSS from the SGSN.

D.   pagingReqReceivedfromSGSN.

E.   A single integer value.

F.   BSC Measurement Function.

G.   Valid for packet switching.

B.1.1.16 Mean Inter-arrival Time (Packet Switched)

A.   This measurement provides the arithmetic mean of the sum of time intervals between consecutive mobile
        originating packet channel access request .

B.   CC.

C.   This measurement is obtained by accumulating the time segments between receipt of consecutive 'PACKET
        CHANNEL REQUEST' message with the establishment cause being either one phase packet access or single
        block packet access, on the PRACH and then taking the arithmetic mean GSM 04.60 [23].

D.   meanPSInterArrivalTime

E.   A single real value.

F.   BSC Measurement Function.

G.   Valid for packet switching.

B.2   Measurements related to the BTS

B.2.1   CELL Measurement Function

B.2.1.1   Mean PCH-AGCH queue length

A.   This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the
        PCH-AGCH. Note: this is valid for circuit only when a PCCCH is provided.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the PCH-AGCH queue
        length and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanPCHAGCHQueueLength.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.2   Attempted Transmission of Paging Messages (the PCH)

A.   This measurement provides the number of Paging messages transmitted (these are counted as attempts). Note:
        this is valid for circuit only when a PCCCH is provided.

B.   CC.

C.   Transmission of "PAGING REQUEST" (GSM 04.08 [2]).

D.   attTransOfPagingMessagesThePCH.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.3   Unsuccessful Transmission of Paging Messages (the PCH)

A.   This measurement provides the number of unsuccessful Paging requests .

B.   CC.

C.   No "PAGING RESPONSE" received for the "PAGING REQUEST", expiry of timer T3113 (GSM 04.08 [2]). Note: this is valid for circuit only when a PCCCH is provided.

D.   unsuccTransOfPagingMessagesThePCH.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.4   Attempted IMMEDIATE ASSIGNMENT Procedures

A.   This measurement provides the number of attempted immediate assignment procedures.

B.   CC.

C.   Receipt of "CHANNEL REQUIRED" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING", "ONE PHASE PACKET ACCESS", "SINGLE BLOCK PACKET ACCESS" and and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

D.   attImmediateAssingProcs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.5   Successful IMMEDIATE ASSIGNMENT Procedures

A.   This measurement provides the number of successful immediate assignment procedures.

B.   CC.

C.   Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message. If an "IMMEDIATE ASSIGNMENT EXTENDED" Message is transmitted, the counter shall be incremented by two, because that Message contains assignment information for two mobiles (GSM 04.08 [2]).

D.   succImmediateAssingProcs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.6   Attempted IMMEDIATE ASSIGNMENT Procedures, per cause

A.   This measurement provides the number of attempted immediate assignment procedures, per cause.

B.   CC.

C.   Receipt of "CHANNEL REQUIRED" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING" and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

   NOTE: System implementation will allow the establishments causes of **PS *** Att IMM ASS Poc** can be incorporated in this measurement.

F.   attImmediateAssingProcsPerCause.

G.   An integer value per cause.

H.   CELL Measurement Function.

I.   Valid for circuit and packet switching.

B.2.1.7   Successful IMMEDIATE ASSIGNMENT Procedures, per cause

A.   This measurement provides the number of successful immediate assignment procedures, per cause.

B.   CC.

C.   Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This Message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message, per cause. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING" and "OTHER PROCEDURES". The "IMMEDIATE ASSIGNMENT EXTENDED" Message contains assignment information for two mobiles (GSM 04.08 [2]). If the establishment cause is identical for the the two mobile stations, the counter shall be incremented by two. Otherwise the affected counters shall be incremented by one.

   NOTE: System implementation will allow the establishments causes of **PS *** Att IMM ASS Poc** can be incorporated in this measurement.

D.   succImmediateAssingProcsPerCause.

E.   An integer value per cause.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.8   Number of Pages Discarded from the PCH Queue

A.   This measurement provides the number of Paging messages which are discarded from the PCH queue before they could be transmitted .

B.   CC.

C.   Pages can be discarded from the queues (assuming queuing is in operation) for a number of reasons, including queue overflow, priority insertion in the queue causing an overflow and in-queue timer expiry (GSM 04.08 [2]). Note: this is valid for circuit only when a PCCCH is provided.

D.   nbrOfPagesDiscardedFromPCHQueue.

E.   An integer value for the paging queue in the CELL.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.9 Mean duration of a successful Paging Procedure

A.   This measurement provides the arithmetic mean duration of a successful Paging procedure, i.e. from transmission of the page request towards the MS and receipt of a positive response.

B.   CC.

C.   An accumulation is performed for the time taken by each Paging procedure during the granularity period and an arithmetic mean is taken from the observed values. The measured time will be between Transmission of a "PAGING REQUEST" service request to Receipt of "PAGING RESPONSE" service confirmation (GSM 04.08 [2]).

D.   meanDurationOfSuccPagingProcs.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.10 Number of Time Slots Available for Traffic (Prevoiusly TCHs)

A.   This measurement provides the number of TS which are available for use by either CS or PS traffic(including those which are actually in use).

B.   GAUGE.

C.   The gauge will be incremented when the TS becomes available and decremented when it becomes unavailable. The TS is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of TS with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled", (GSM 04.08 [2]).

D.   nbrOfAvailableTCHs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.11 Mean number of busy Time Slots Occupied by Circuit Traffic

A.   This measurement provides the arithmetic mean number of TS which are simultaneously in use for CS traffic (TCHs).

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of TS which are carrying circuit traffic (TCHs) and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanNbrOfBusyTCHs.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.12 Maximum number of busy Time Slots Occupied by Circuit Traffic

A.   This measurement provides the highest recorded value for the number of TS simultaneously in use for Circuit switched traffic.

B.   GAUGE.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of TSs which are "busy", and then taking the maximum of all such values at the end of the granularity period. A TS is busy between an "ASSIGNMENT COMPLETE" Message and the complementary "RELEASE" Message, (GSM 04.08 [2]).

D.   maxNbrOfBusyTCHs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.13 Mean number of idle Time Slots per interference band (Previously TCHs)

A.   This measurement provides the arithmetic mean of the number of idle TS per interference band. The TS is said to be idle if it can be allocated for a request. Idle TS are allocated in five classes (GSM 05.01) depending on the measured interference level.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of idle TS per interference band and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanNbrOfIdleTCHsPerInterferenceBand.

E.   A real value per interference band.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.14 Attempted Time Slots seizures (Previously TCHs)

A.   This measurement provides the number of attempted TS seizures.

B.   CC.

C.   Transmission of "ASSIGNMENT COMMAND" Message to the MS, (GSM 04.08 [2]).

D.   attTCHSeizures.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.15 Successful TCH/PDTCH seizures (Previously TCHs)

A.   This measurement provides the number of successful TCH/PDTCH seizures.

B.   CC.

C.   Receipt of "ASSIGNMENT COMPLETE" Message from the MS, (GSM 04.08 [2]).

D.   succTCHSeizures.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit and packet switching.

B.2.1.16 Attempted TCH Seizures meeting an TCH blocked state

A.   This measurement provides the number of attempted TCH seizures meeting all busy TCH state.

B.   CC.

C.   Receipt of "SETUP" Message from the MS meeting all TCH busy state (GSM 04.08 [2]).

D.   attTCHSeizuresMeetingTCHBlockedState.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.17 All Available TCH Allocated Time

A.   This measurement provides the accumulated time during the granularity period when all available Time slots available for CS traffic were in use or otherwise unavailable to be allocated.

B.   CC.

C.   Each time segment represents the elapsed time from the last available TS being allocated to the next occurrence of a release of a TCH, so making it available for allocation. The allocation event can be for any reason e.g. new call, Handover and is represented by an "ASSIGNMENT COMPLETE" Message. These time segments are accumulated to give a single total (GSM 04.08 [2]).

D.   allAvailableTCHAllocatedTime.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.18 Mean busy time of allocated CS Time Slots

A.   This measurement provides the arithmetic mean of the busy time of the maximum number of Time slots allocated for CS TCHs in a CELL,.

B.   SI.

C.   This measurement is obtained by accumulating each Timeslots busy time. A TS is considered busy when it carries one or more TCHs, i.e. between an "ASSIGNMENT COMPLETE" Message and the complementary "RELEASE" Message for those TCHs. All values are added up and divided by the number of TS (maximum allocated for circuit on this Cell) at the end of the granularity period to obtain the arithmetic mean. (Further information can be found in GSM 04.08 [2]).

D.   meanTCHBusyTime.

E.   A single real value

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.19 Mean TCH queue length

A.   This measurement provides the arithmetic mean of the number of queued TCH assignment procedures.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the TCH queue length and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanTCHQueueLength.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.20 Number of lost Radio links while using a TCH

A.   This measurement provides the number of calls terminated due to RF failure on the radio path.

B.   CC.

C.   A local end release due to a "RADIO LINK FAILURE" experienced by the BTS when using a TCH (GSM 05.08 [4]).

D.   nbrOfLostRadioLinksTCH.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.21 Number of Available SDCCHs

A.   This measurement provides the number of SDCCHs which are available to be used (including those actually in use).

B.   GAUGE.

C.   The gauge will be incremented when the SDCCH becomes available and decremented when it becomes unavailable. The SDCCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of SDCCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled", (GSM 04.08 [2]).

D.   nbrOfAvailableSDCCHs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.22 Mean number of busy SDCCHs

A.   This measurement provides the arithmetic mean of the number of SDCCHs which are simultaneously in use.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the SDCCHs which are busy and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanNbrOfBusySDCCHs.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.23 Maximum number of busy SDCCHs

A.   This measurement provides the highest recorded value for the number of SDCCHs simultaneously in use.

B.   GAUGE.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of SDCCHs which are "busy", and then taking the maximum of all such values at the end of the granularity period, (GSM 04.08 [2]).

D.   maxNbrOfBusySDCCHs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.24 Attempted SDCCH Seizures meeting an SDCCH blocked state

A.   This measurement provides the number of attempted SDCCH seizures meeting all busy SDCCH state.

B.   CC.

C.   Receipt of "CHANNEL REQUEST" Message from the MS sent on the RACH meeting all SDCCH busy state (GSM 04.08 [2]).

D.   attSDCCHSeizuresMeetingSDCCHBlockedState.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.25 All Available SDCCH Allocated Time

A.   This measurement provides the accumulated time during the granularity period when all available SDCCHs are in use or otherwise unavailable to be allocated.

B.   CC.

C.   Each time segment represents the elapsed time from the last available SDCCH being allocated to the next occurrence of a release of a SDCCH, so making it available for allocation. The allocation event can be for any reason e.g. new call, Handover, and is represented by a SABM Message. These time segments are accumulated to give a single total (GSM 04.08 [2]).

D.   allAvailableSDCCHAllocatedTime.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.26 Mean SDCCH queue length

A.   This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the SDCCH.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the SDCCH queue length and then taking the arithmetic mean (GSM 04.08 [2]).

D.   meanSDCCHQueueLength.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.27 Number of lost Radio links while using an SDCCH

A.   This measurement provides the number of RF failure while using the SDCCH.

B.   CC.

C.   A local end release, due to a "RADIO LINK FAILURE", experienced by the BTS when using an SDCCH (GSM 08.58 [6]).

D.   nbrOfLostRadioLinksSDCCH.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.28 Relative time downlink power control at maximum

A.   This measurement provides the time downlink power control was running at maximum level for the busy TCHs over the measured period, relative to the total TCH busy time.

B.   CC.

C.   Each time segment represents the elapsed time when BS_TXPWR_MAX is at maximum for each busy TCH. These time segments are accumulated to give a single total. From this information a value is derived such that it reflects a percentage of the total channel busy time, (GSM 05.08 [4]).

D.   relativeTimeDLPowerControlAtMax.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.29 Relative time uplink power control at maximum

A.   This measurement provides the time uplink power control was running at maximum level for the seized TCHs over the measured period, relative to the total TCH busy time.

B.   CC.

C.   Each time segment represents the elapsed time when MS_TXPWR_MAX is at maximum for each busy TCH. These time segments are accumulated to give a single total. From this information a value is derived such that it reflects a percentage of the total channel busy time, (GSM 05.08 [4]).

D.   relativeTimeULPowerControlAtMax.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.30 Successful Internal Handovers, intra-CELL

A.   This measurement provides the number of times a call moves from the occupied channel of the CELL to another free channel of the same CELL.

B.   CC.

C.   Transmission of "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D.   succInternalHDOsIntraCell.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.31 Unsuccessful Internal Handovers, intra-CELL

A.   This measurement provides the number of unsuccessful intra CELL Handovers, i.e. an attempt was made to move a call .from the occupied channel of the CELL to another free channel of the same CELL.

B.   CC.

C.   Receipt of "ASSIGNMENT FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D.   unsuccInternalHDOsIntraCell.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.32 Attempted incoming Internal inter CELL Handovers

A.   This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs controlled by the same BSC, further information can be found in GSM 04.08 [2], 08.08 [5] and 08.58 [6].

B.   CC.

C.   An occurrence of a BSC internal event, depending on Handover algorithm.

D.   attIncomingInternalInterCellHDOs.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.33 Successful incoming Internal inter CELL Handovers

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succIncomingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.34 Attempted outgoing Internal inter CELL Handovers

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER COMMAND" Message (GSM 08.08 [5]).

D. attOutgoingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.35 Successful outgoing Internal inter CELL Handovers

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succOutgoingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.36 Unsuccessful Internal Handovers with reconnection to old channels

A. This measurement provides the number of unsuccessful Handovers (with reconnection to the original channels), for the observed CELL.

B. CC.

C. Receipt of "HANDOVER FAILURE" Message received for the attempted handover (GSM 04.08 [2]).

D. unsuccHDOsWithReconnection.

E. A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.37 Unsuccessful Internal Handovers with loss of connection

A.   This measurement provides the number of unsuccessful Handovers that end in loosing the speech channel, for the observed CELL.

B.   CC.

C.   Expiry of timer T3103 for Inter CELL Handovers and Expiry of timer T3107 for Intra CELL Handovers (GSM 04.08 [2]).

D.   unsuccHDOsWithLossOfConnection.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for circuit switching.

B.2.1.38 Number of Available PDCH

A.   This measurement provides the current number of PDCHs which are available to be used (including those actually in use).

B.   GAUGE.

C.   The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D.   availablePDCH

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.39 Mean Number of Available PDCH

A.   This measurement provides the mean number of PDCHs which are available to be used (including those actually in use) over the measured period.

B.   GAUGE.

C.   The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D.   meanNbrAvailablePDCH

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.40 Maximum Number of Available PDCH

A.   This measurement provides the maximum number of PDCHs which are available to be used (including those actually in use) over the measured period.

B.   GAUGE.

C.   The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D.   maxNbrAvailablePDCH

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.41 Minimum Number of Available PDCH

A.   This measurement provides the minimum number of PDCHs which are available to be used (including those actually in use) over the measured period.

B.   GAUGE.

C.   The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D.   minNbrAvailablePDCH

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.42 Mean number of occupied PDCHs

A.   This measurement provides the arithmetic mean number of occupied PDCHs.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of PDCHs which are carrying packet traffic and then taking the arithmetic mean (GSM 04.60 [23]).

D.   meanNbrOfOccPDCHs.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.43 Maximum number of occupied PDCHs

A.   This measurement provides the highest recorded value for the number occupied by PDCHs..

B.   GAUGE.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the maximum number of PDCHs which are carrying packet traffic. (GSM 04.60 [23]).

D.   maxNbrOfOccPDCHss.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.44 Minimum number of occupied PDCHs

A.   This measurement provides the lowest recorded value for the number of occupied PDCHs.

B.   GAUGE.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the maximum number of PDCHs which are carrying packet traffic. (GSM 04.60 [23]).

C.   minNbrOfOccPDCHss.

D.   A single integer value

E.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.45 All available PDCH allocated time

A.   This measurement gives the total amount of time in the granularity period, where all PDCHs were allocated.

B.   SI

C.   This time is computed with starting time when the last PDCH is assigned and the end time when a PDCH is first released.

D.   availablePDCHAllocatedTime

E.   A single integer value.

F.   CELL Measurement Function

G.   Valid for packet switching.

B.2.1.46 Transmission of Packet Paging Messages on the PCCCH

A.   This measurement provides the number of Packet Paging messages transmitted over PCCCH(these are counted as attempts).

B.   CC.

C.   Transmission of "PACKET PAGING REQUEST" (GSM 04.60 [23]).

D.   nbrPacketPagingMessagesPCHOnPCCCH.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.47 Mean PPCH-PAGCH queue length on PCCCH

A.   This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the PPCH-PAGCH sub channel on the PCCCH.

B.   SI.

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the PPCH-PAGCH queue length and then taking the arithmetic mean (GSM 04.60 [23]).

D.   meanPPCHPAGCHQueueLengthOnPCCCH.

E.   A single real value.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.48 Number of Packet Pages Discarded from the PPCH Queue on PCCCH

A.   This measurement provides the number of Packet Paging messages which are discarded from the PPCH queue before they could be transmitted on PCCCH.

B.   CC.

C.   Pages can be discarded from the queues (assuming queuing is in operation) for a number of reasons, including queue overflow, priority insertion in the queue causing an overflow and in-queue timer expiry (GSM 04.60 [23]).

D.   nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH.

E.   An integer value for the paging queue in the CELL.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.49 Number of Packet Channel Assignment Requests, per cause

A.   This measurement provides the number of packet channel assignment requests, per cause.

B.   CC.

C.   Receipt of "PACKET CHANNEL REQUEST" message sent from the MS on the PRACH or by the "CHANNEL REQUEST" message sent on the RACH.. Note, the establishment causes are: defined in (GSM 04.08 [2]) for channel request message and (GSM 04.60[ ] for the packet channel request message.

D.   attPCReqAssPerCause.

E.   An integer value per cause.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.50 Successful Packet Channel Assignment Procedures, per cause

A.   This measurement provides the number of successful packet channel assignment procedures, per cause. Note: A packet channel assignment is considered successful when either the "PACKET UPLINK ASSIGNMENT" message or the "IMMEDIATE ASSIGNMENT COMMAND" message is sent.

B.   CC.

C.   Transmission of "IMMEDIATE ASSIGN COMMAND" message on the AGCH or the "PACKET UPLINK ASSIGNMENT" message on the PAGCH. Note, If the message contains assignment information for two mobiles (GSM 04.60 [23]). If the establishment cause is identical for the two mobile stations, the counter shall be incremented by two. Otherwise the affected counters shall be incremented by one.

   NOTE: System implementation will allow these establishment causes to be incorporated into B 2.1.7.

D.   succPDTCHAssProcsPerCause.

E.   An integer value per cause.

F.   CELL Measurement Function.

G.   Valid for packet switching.

B.2.1.51 Successful PDTCH seizures

A.   This measurement provides the number of successful PDTCH seizures.

B.   CC.

C.   Receipt of the first RLC Block (PDU) on the PDTCH from the MS, (GSM 04.60 [23]).

D.   succPDTCHSeizures.

E.   A single integer value.

F.   CELL Measurement Function.

G.   Valid for Packet switching.

B.2.1.52 Mean PDTCH queue length

A.   This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the PDTCH.

B.   CC

C.   This measurement is obtained by sampling at a predefined interval (System design), , the PDTCH queue length and then taking the arithmetic mean.

D.   meanPacketQueueLength

E.   A single real value

F.   CELL Measurement function

G.   Valid for packet switching

B.2.1.53   Number of service upgrades/downgrades

A.   With service upgrade and downgrade it is meant a switch from the used coding scheme (CS1, CS2, ...) to another one. This measurement counts the number of these upgrades / downgrades per cell.

B.   CC

C.   The Trigger Event is a Service upgrade or downgrade for the observed object.

D.   nbrOfServiceChanges

E.   A single integer value for Upgrades and a single integer value for downgrades

ETSI

F. CELL Measurement function

G. Valid for packet switching

B.2.2 Internal HDO Measurement Function

This measurement function allows Internal Handover information per observed CELL to be collected on a per adjacent originating or target CELL basis. This is achieved by specifying the adjacent originating or target CELL identity as parameter when initiating the Measurement Function.

B.2.2.1 Attempted incoming Internal inter CELL Handovers per originating CELL

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this BSC, further information can be found in GSM 04.08 [2], 08.08 [5] and 08.58 [6].

B. CC.

C. An occurrence of a BSC internal event, depending on Handover algorithm.

D. attIncomingInternalInterCellHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.2.2.2 Successful incoming Internal inter CELL Handovers per originating CELL

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL controlled by this BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succIncomingInternalInterCellHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.2.2.3 Attempted outgoing Internal inter CELL Handovers per target CELL

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL controlled by this BSC.

B. CC.

C. Transmission of a "HANDOVER COMMAND" Message (GSM 04.08 [2]).

D. attOutgoingInternalInterCellHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. Internal HDO Measurement Function.

G.   Valid for circuit switching.

B.2.2.4   Successful outgoing Internal inter CELL Handovers per target CELL

A.   This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL controlled by this BSC.

B.   CC.

C.   Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D.   succOutgoingInternalInterCellHDOsPerTargetCell.

E.   A single integer value for the observed CELL to the target CELL.

F.   Internal HDO Measurement Function.

G.   Valid for circuit switching.

B.3   Measurements Related to the MSC

B.3.1   MSC Measurement Function

B.3.1.1   Number of class mark updates

A.   This measurement provides the number of classmark updates received from the BSS at the MSC.

B.   CC.

C.   Receipt of "CLASSMARK UPDATE" Message (GSM 08.08 [5]).

D.   nbrOfClassMarkUpdates.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.2   Attempted mobile originating calls

A.   This measurement provides the number of call attempts for mobile originating traffic.

B.   CC.

C.   Receipt of "CM_SERV_REQ" Message from the originating MS, with service type set to originating call establishment (GSM 04.08 [2]).

D.   attMobileOriginatingCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.3   Successful mobile originating calls

A.   This measurement provides the number of successful calls for mobile originating traffic.

B.   CC.

C.   Receipt of "ASSIGNMENT COMPLETE" Message from the originating MS, for the requested mobile originating call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D.   succMobileOriginatingCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.4   Answered mobile originating calls

A.   This measurement provides the number of answered calls for mobile originating traffic.

B.   CC.

C.   Receipt of "CONNECT ACKNOWLEDGE" Message from the originating MS, for the requested mobile originating call (GSM 04.08 [2]).

D.   ansMobileOriginatingCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.5   Attempted mobile terminating calls

A.   This measurement provides the number of call attempts for mobile terminating traffic.

B.   CC.

C.   Transmission of "SETUP" Message to the called MS, for the requested mobile terminating call (GSM 04.08 [2]).

D.   attMobileTerminatingCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.6   Successful mobile terminating calls

A.   This measurement provides the number of successful calls for mobile terminating traffic.

B.   CC.

C.   Receipt of "ASSIGNMENT COMPLETE" Message from the called MS, for the requested mobile terminating call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D.   succMobileTerminatingCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.7 Answered mobile terminating calls

A. This measurement provides the number of answered calls for mobile terminating traffic.

B. CC.

C. Transmission of "CONNECTION ACKNOWLEDGE" Message to the called MS, for the requested mobile terminating call (GSM 04.08 [2]).

D. ansMobileTerminatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.8 Attempted Mobile Emergency calls

A. This measurement provides the number of emergency call attempts.

B. CC.

C. Receipt of "CM_SERV_REQ" Message from the originating MS, with service indicator set to emergency call (GSM 04.08 [2]).

D. attMobileEmergencyCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.9 Successful Mobile Emergency calls

A. This measurement provides the number of successful emergency calls.

B. CC.

C. Receipt of "ASSIGNMENT COMPLETE" Message from the originating MS, for the requested emergency call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D. succMobileEmergencyCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.10 Answered Mobile Emergency calls

A. This measurement provides the number of answered emergency calls.

B. CC.

C. Receipt of "CONNECTION ACKNOWLEDGE" Message from the originating MS, for the requested emergency call (GSM 04.08 [2]).

D.   ansMobileEmergencyCalls.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.11 Attempted ciphering mode control procedures

A.   This measurement provides the number of ciphering mode control procedures transmitted (these are counted as attempts).

B.   CC.

C.   Transmission of "CIPHER MODE COMMAND" (GSM 08.08 [5]).

D.   attCipheringModeControlProcs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.12 Successful ciphering mode control procedures

A.   This measurement provides the number of successful ciphering mode control procedures.

B.   CC.

C.   Receipt of "CIPHER MODE COMPLETE" Message (GSM 08.08 [5]).

D.   succCipheringModeControlProcs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.13 Attempted interrogations of HLRs for routing

A.   This measurement provides the number of HLR interrogations by the GMSC with the purpose of routing incoming calls (these are counted as attempts).

B.   CC.

C.   Transmission of a "MAP_SEND_ROUTING_INFORMATION" service request (GSM 09.02 [7]).

D.   attInterrogationOfHLRsForRouting.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.14 Successful interrogations of HLR (MSRN obtained)

A.   This measurement provides the number of successful HLR interrogations, where MSRN is obtained.

B.   CC.

C.   Receipt of "MAP_SEND_ROUTING_INFORMATION" service confirmation containing a "MSRN"
        parameter value (GSM 09.02 [7]).

D.   succInterrogationOfHLRsMSRNObtained.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.15 Successful interrogations of HLR (call Forwarding)

A.   This measurement provides the number of successful HLR interrogations, by the GMSC for call forwarding.

B.   CC.

C.   Receipt of "MAP_SEND_ROUTING_INFORMATION" service confirmation containing a "Forwarding Data"
        parameter value (GSM 09.02 [7]).

D.   succInterrogationOfHLRsCallForwarding.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.16 Attempted operations for mobile originating point to point SMs

A.   This measurement provides the number of operations for mobile originating point to point short messages
        (these are counted as attempts).

B.   CC.

C.   Receipt of "RP-DATA" Message (GSM 04.11 [3]).

D.   attOpForMobileOriginatingPointToPointSMs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.17 Successful operations for mobile originating point to point SMs

A.   This measurement provides the number of successful operations for mobile originating point to point short
        messages.

B.   CC.

C.   Transmission of "RP-ACK" Message (GSM 04.11 [3]).

D.   succOpForMobileOriginatingPointToPointSMs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.18 Attempted operations for mobile terminating point to point SMs

A.   This measurement provides the number of operations for mobile terminating point to point short messages (these are counted as attempts).

B.   CC.

C.   Transmission of "RP-DATA" Message (GSM 04.11 [3]).

D.   attOpForMobileTerminatingPointToPointSMs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.19 Successful operations for mobile terminating point to point SMs

A.   This measurement provides the number of successful operations for mobile terminating point to point short messages.

B.   CC.

C.   Receipt of "RP-ACK" Message (GSM 04.11 [3]).

D.   succOpForMobileTerminatingPointToPointSMs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.20 Number of transmitted check IMEI request

A.   This measurement provides the number of check IMEI request sent from MSC to the EIR.

B.   CC.

C.   Transmission of "MAP_CHECK_IMEI" service request (GSM 09.02 [7]).

D.   nbrOfTransCheckIMEIRequests.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.21 Number of white answers in MSC

A.   This measurement provides the number of white answers received from the EIR.

B.   CC.

C.   Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to white listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D.   nbrOfWhiteAnsInMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.22 Number of grey answers in MSC

A.   This measurement provides the number of grey answers received from the EIR.

B.   CC.

C.   Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to grey listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D.   nbrOfGreyAnsInMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.23 Number of black answers in MSC

A.   This measurement provides the number of black answers received from the EIR.

B.   CC.

C.   Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to black listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D.   nbrOfBlackAnsInMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.24 Number of unknown IMEI answers

A.   This measurement provides the number of unknown IMEI answers received from the EIR.

B.   CC

C.   Receipt of "MAP_CHECK_IMEI" service confirmation with a parameter "user error" referring to unknown equipment (GSM 09.02 [7]).

D.   nbrOfUnknownIMEIAnsInMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.25 Mean time to provide the CALL SETUP service

A.   This measurement provides the arithmetic mean of the time to provide the CALL SETUP service to a requesting MS.

B.   DER.

C.   This measurement is obtained by accumulating the time intervals between "SETUP" and the corresponding "ASSIGNMENT COMPLETE" messages over a granularity period using DER. This end value of the time will

then be divided by the number of call set-ups observed in the granularity period to give the arithmetic mean (GSM 04.08 [2], GSM 08.08 [5]).

D.   meanTimeToCallSetupService.

E.   A single real value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.26 Mean time to provide the LOCATION UPDATING service

A.   This measurement provides the arithmetic mean of the time to provide the LOCATION UPDATING service to an MS changing Location area.

B.   DER.

C.   This measurement is obtained by accumulating the time interval between "LOCATION UPDATING REQUEST" and the corresponding "LOCATION UPDATING ACCEPT" Message over a granularity period using DER. This end value of the time will then be divided by number of Location Updating requests observed in the granularity period to give the arithmetic mean (GSM 04.08 [2]).

D.   meanTimeToLocationUpdateService.

E.   A single real value.

F.   MSC Measurement Function.

G.   Valid for circuit and packet switching.

B.3.1.27 Transactions on the MM-layer where subscriber was identified with TMSI

A.   This measurement provides the number of transactions on the MM-layer where the mobile subscriber was identified with his TMSI.

B.   CC.

C.   Any MM-layer transaction which causes the MS to be identified with his TMSI (GSM 04.08 [2]) i.e. CM_Re-establishment, CM_Service request, Identity response, IMSI detach indication, Location updating accept, Location updating request, TMSI re-allocation command.

D.   transSubIdentifiedWithTMSI.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.28 Transactions on the MM-layer where subscriber was identified with IMSI

A.   This measurement provides the number of transactions on the MM-layer where the mobile subscriber was identified with his IMSI.

B.   CC.

C.   Any MM-layer transaction which causes the MS to be identified with his IMSI (GSM 04.08 [2]), i.e. CM_Re-establishment, CM_Service request, Identity response, IMSI detach indication, Location updating accept, Location updating request, TMSI re-allocation command.

D.   transSubIdentifiedWithIMSI.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.29 Attempted TMSI re-allocations

A.   This measurement provides the number of TMSI re-allocation, invoked either explicitly as part of TMSI re-allocation procedure or implicitly as part of Location Update procedure.

B.   CC.

C.   Transmission of "TMSI REALLOCATION COMMAND" Message, or a "LOCATION UPDATING ACCEPT" Message where the MS is identified with TMSI (GSM 04.08 [2]).

D.   attTMSIReallocations.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.30 Successful TMSI re-allocations

A.   This measurement provides the number of successfully performed TMSI re-allocations.

B.   CC.

C.   Receipt of "TMSI REALLOCATION COMPLETE" Message (GSM 04.08 [2]).

D.   succTMSIReallocations.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.31 IMSI detach procedures

A.   This measurement provides the number of IMSI procedures that involve a detach within one MSC area, (see BSC Measurement Function for IMSI attach procedures)

B.   CC.

C.   Receipt of "IMSI DETACH INDICATION" Message from the MS (GSM 04.08 [2]).

D.   imsiDetachProcs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit and packet switching.

B.3.1.32 IMSI attach procedures

A.   This measurement provides the number of IMSI procedures that involve an attach within one MSC area.

B.   CC.

C.   Receipt of "LOCATION UPDATING REQUEST" Message from the MS, indicating an IMSI attach, (GSM 04.08 [2]) (see MSC Measurement Function for IMSI detach procedures).

D.   imsiAttachProcs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching and packet switched.

B.3.1.33 Attempted incoming External intra-MSC Handovers

A.   This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs controlled by this MSC.

B.   CC.

C.   Transmission of a "HANDOVER REQUEST" Message to the BSC (GSM 08.08 [5]).

D.   attIncomingExternalIntraMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.34 Successful incoming External intra-MSC Handovers

A.   This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs controlled by this MSC.

B.   CC.

C.   Receipt of a "HANDOVER COMPLETE" Message from the BSC (GSM 08.08 [5]).

D.   succIncomingExternalIntraMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.35 Attempted outgoing External intra-MSC Handovers

A.   This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by this MSC (only first attempt shall be counted).

B.   CC.

C.   Receipt of a "HANDOVER REQUIRED" Message from the BSC (GSM 08.08 [5]).

D.   attOutgoingExternalIntraMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.36 Successful outgoing External intra-MSC Handovers

A.   This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by this MSC, further information can be found in GSM 04.08 [2], 08.08 [5], and 08.58 [6].

B.   CC.

C.   Completion of release procedure for the involved channel.

D.   succOutgoingExternalIntraMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.37 Attempted incoming inter-MSC Handovers

A.   This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs NOT controlled by this MSC.

B.   CC.

C.   Receipt of a "MAP_PERFORM_HANDOVER" service indication with target CELL identity equal to the observed CELL (GSM 09.02 [7]).

D.   attIncomingInterMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.38 Successful incoming inter-MSC Handovers

A.   This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs NOT controlled by this MSC.

B.   CC.

C.   Receipt of a "MAP_SEND_END_SIGNAL" service confirmation (GSM 09.02 [7]).

D.   succIncomingInterMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.39 Attempted outgoing inter-MSC Handovers

A.   This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs NOT controlled by this MSC.

B.   CC.

C.   Transmission of a "MAP_PERFORM_HANDOVER" service request (GSM 09.02 [7]).

D.   attOutgoingInterMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.40 Successful outgoing inter-MSC Handovers

A.   This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs NOT controlled by this MSC.

B.   CC.

C.   Transmission of "MAP_SEND_END_SIGNAL" service response (GSM 09.02 [7]).

D.   succOutgoingInterMSCHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.41 Attempted subsequent inter-MSC Handovers (back to MSCa)

A.   This measurement provides the number of attempted subsequent inter-MSC Handovers, where the call is handed back to the anchor MSC (MSCa), i.e. the first hand over takes place from MSCa to MSCb then subsequently an attempt is made to hand back to MSCa.

B.   CC.

C.   Receipt of "MAP_PERFORM_SUBSEQUENT_HANDOVER" service indication with target MSC identity equal to MSCa (GSM 09.02 [7]).

D.   attSubsequentInterMSCHDOsMSCa.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.42 Successful subsequent inter-MSC Handovers (back to MSCa)

A.   This measurement provides the number of successful subsequent inter-MSC Handovers, where the call is handed back to the anchor MSC (MSCa). i.e. the first hand over takes place from MSCa to MSCb then the call is subsequently successfully handed back to MSCa.

B.   CC.

C.   Transmission of "MAP_SEND_END_SIGNAL" service response (Handover to MSCa) (GSM 09.02 [7]).

D.   succSubsequentInterMSCHDOsMSCa.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.43 Attempted subsequent inter-MSC Handovers (to MSCc)

A.   This measurement provides the number of attempted subsequent inter-MSC Handovers, where the call is handed over to MSCc, i.e. the first hand over takes place from MSCa to MSCb then subsequently an attempt is made to hand over to MSCc.

B.   CC.

C.   Receipt of "MAP_PERFORM_SUBSEQUENT_HANDOVER" service indication, with target MSC identity equal to MSCc (GSM 09.02 [7]).

D.   attSubsequentInterMSCHDOsMSCc.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.44 Successful subsequent inter-MSC Handovers (to MSCc)

A.   This measurement provides the number of successful subsequent inter-MSC Handovers, where the call is handed over to MSCc, i.e. the first hand over takes place from MSCa to MSCb then the call is subsequently successfully handed over to MSCc.

B.   CC.

C.   Transmission of "MAP_SEND_END_SIGNAL" service response (Handover to MSCc) (GSM 09.02 [7]).

D.   succSubsequentInterMSCHDOsMSCc.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.45 External Handovers

A.   This measurement provides the number of attempted MSC controlled Handovers.

B.   CC.

C.   Receipt of a "HANDOVER REQUIRED" Message (GSM 08.08 [5]).

D.   externalHDOs.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.46 External Handovers per cause

A.   This measurement provides the number of attempted MSC controlled Handovers, per cause.

B.   CC.

C.   Receipt of a "HANDOVER REQUIRED" Message (GSM 08.08 [5]).

D.   externalHDOsPerCause.

E.   An integer value per cause.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.47 Unsuccessful External Handovers with reconnection to old channels, per MSC

A.   This measurement provides the number of unsuccessful Handovers with reconnection to the original channels (TCH & SDCCH), on a per MSC basis.

B.   CC.

C.   Receipt of: "HANDOVER FAILURE" Message for the attempted handover (GSM 08.08 [5]).

D.   unsuccExternHDOsWithReconnectionPerMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.1.48 Unsuccessful External Handovers with loss of connection, per MSC

A.   This measurement provides the number of unsuccessful Handovers, with loss of the call, on a per MSC basis.

B.   CC.

C.   Receipt of "CLEAR REQUEST" Message for the requested Handover (GSM 08.08 [5]).

D.   unsuccExternHDOsWithLossOfConnectionPerMSC.

E.   A single integer value.

F.   MSC Measurement Function.

G.   Valid for circuit switching.

B.3.2   External HDO Measurement Function

This measurement function allows external Handover information per observed CELL to be collected on a per adjacent originating or target CELL basis. For the external Handovers both the observed CELL and the adjacent originating or target CELL identity has to be specified as the parameter when initiating the Measurement Function.

B.3.2.1   Attempted incoming External intra-MSC Handovers per originating CELL

A.   This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this MSC.

B.   CC.

C.   Transmission of a "HANDOVER REQUEST" Message to the BSC (GSM 08.08 [5]).

D.   attIncomingExternalIntraMSCHDOsPerOriginatingCell.

E.   A single integer value for the observed CELL from the originating CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.2   Successful incoming External intra-MSC Handovers per originating CELL

A.   This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this MSC.

B.   CC.

C.   Receipt of a "HANDOVER COMPLETE" Message from the BSC (GSM 08.08 [5]).

D.   succIncomingExternalIntraMSCHDOsPerOriginatingCell.

E.   A single integer value for the observed CELL from the originating CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.3   Attempted outgoing External intra-MSC Handovers per target CELL

A.   This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL, controlled by this MSC (only first attempt shall be counted).

B.   CC.

C.   Receipt of a "HANDOVER REQUIRED" Message from the BSC (GSM 08.08 [5]).

D.   attOutgoingExternalIntraMSCHDOsPerTargetCell.

E.   A single integer value for the observed CELL to the target CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.4   Successful outgoing External intra-MSC Handovers per target CELL

A.   This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL, controlled by this MSC, further information can be found in GSM 04.08 [2], 08.08 [5], and 08.58 [6].

B.   CC.

C.   Completion of release procedure for the involved channel.

D.   succOutgoingExternalIntraMSCHDOsPerTargetCell.

E.   A single integer value for the observed CELL to the target CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.5   Attempted incoming inter-MSC Handovers per originating CELL

A.   This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, NOT controlled by this MSC.

B.   CC.

C.   Receipt of a "MAP_PERFORM_HANDOVER" service indication with target CELL identity equal to the observed CELL (GSM 09.02 [7]).

D.   attIncomingInterMSCHDOsPerOriginatingCell.

E.   A single integer value for the observed CELL from the originating CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.6   Successful incoming inter-MSC Handovers per originating CELL

A.   This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL, NOT controlled by this MSC.

B.   CC.

C.   Receipt of a "MAP_SEND_END_SIGNAL" service confirmation (GSM 09.02 [7]).

D.   succIncomingInterMSCHDOsPerOriginatingCell.

E.   A single integer value for the observed CELL from the originating CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.7   Attempted outgoing inter-MSC Handovers per target CELL

A.   This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL, NOT controlled by this MSC.

B.   CC.

C.   Transmission of a "MAP_PERFORM_HANDOVER" service request (GSM 09.02 [7]).

D.   attOutgoingInterMSCHDOsPerTargetCell.

E.   A single integer value for the observed CELL to the target CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.3.2.8   Successful outgoing inter-MSC Handovers per target CELL

A.   This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL, NOT controlled by this MSC.

B.   CC.

C.   Transmission of "MAP_SEND_END_SIGNAL" service response (GSM 09.02 [7]).

D.   succOutgoingInterMSCHDOsPerTargetCell.

E.   A single integer value for the observed CELL to the target CELL.

F.   External HDO Measurement Function.

G.   Valid for circuit switching.

B.4 Measurements Related to the HLR

B.4.1 HLR Measurement Function

B.4.1.1 Number of current MS's Roaming outside HPLMN

A.   This measurement provides the current number of home subscribers roaming outside HPLMN.

B.   GAUGE.

C.   The gauge is updated (increased or decreased) on receipt of a "MAP_UPDATE_LOCATION" service indication in the HLR(GSM 09.02 [7]).

D.   nbrOfCurrentMSsRoamingOutsideHPLMN.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.2 Attempted requests for Authentication sets received by HLR

A.   This measurement provides the number of requests for Authentication sets received by the HLR (these are counted as attempts).

B.   CC.

C.   Receipt of an "MAP_SEND_AUTHENTICATION_INFO" service indication requesting Authentication sets (parameter "AuthenticationSetKind" present GSM 09.02 [7]).

D.   attReqForAuthSetsReceivedByHLR.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.3 Successful returned Authentication sets from HLR

A.   This measurement provides the number of successful requests for Authentication sets from the HLR.

B.   CC.

C.   Transmission of an "MAP_SEND_AUTHENTICATION_INFO" service response containing Authentication sets (parameter "AuthenticationSetList" present GSM 09.02 [7]).

D.   succReturnedAuthSetsFromHLR.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.4 Empty responses to request for Authentication sets from HLR

A.   This measurement provides the number of empty responses sent in response to requests for Authentication sets (the implication is that the destination node will have to reuse old Authentication sets).

B.   CC.

C.   Transmission of an "MAP_SEND_AUTHENTICATION_INFO" service response, no Authentication sets
        present (GSM 09.02 [7]).

D.   emptyResponsesForAuthSetsFromHLR.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.5   Attempted insert subscriber data service

A.   This measurement provides the number of insert subscriber data services sent (these are counted as attempts).

B.   CC.

C.   Transmission of "MAP_INSERT_SUBSCRIBER_DATA" service request (GSM 09.02 [7]).

D.   attInsertSubDataService.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.6   Successful insert subscriber data service

A.   This measurement provides the number of successful insert subscriber data services sent.

B.   CC.

C.   Receipt of "MAP_INSERT_SUBSCRIBER_DATA" service indication without "user error" parameter value
        (GSM 09.02 [7]).

D.   succInsertSubDataService.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.7   Attempted Location Updates

A.   This measurement provides the number of Location Updates to be performed by the HLR (these are counted as
        attempts).

B.   CC.

C.   Receipt of "MAP_UPDATE_LOCATION" service indication (GSM 09.02 [7]).

D.   attLocationUpdate.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.8   Successful Location Updates

A.   This measurement provides the number of successfully performed Location Updates in the HLR,.

B.   CC.

C.   Transmission of "MAP_UPDATE_LOCATION" service response without "user error" parameter value (GSM 09.02 [7]).

D.   succLocationUpdate.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.9   Attempted SS related operations in HLR

A.   This measurement provides the number of attempted SS related operations.

B.   CC.

C.   Receipt of a MAP service indication of: registerSS, eraseSS, activateSS, deactivateSS, registerPassword, interrogateSS, processSSrequest operations in the HLR, (GSM 09.02 [7]).

D.   attSSRelatedOperationsInHLR.

E.   A single integer value per SS operation.

F.   HLR Measurement Function.

G.   Valid for circuit switching.

B.4.1.10 Successful SS related operations in HLR

A.   This measurement provides the number of successful SS related operations.

B.   CC.

C.   Transmission of MAP service response to: registerSS, eraseSS, activateSS, deactivateSS, registerPassword, interrogateSS, processSSrequest operations in the HLR without "user error" parameter (GSM 09.02 [7]).

D.   succSSRelatedOperationsInHLR.

E.   A single integer value per SS operation.

F.   HLR Measurement Function.

G.   Valid for circuit switching.

B.4.1.11 Attempted request for SM routing information

A.   This measurement provides the number of requests for short Message routing information (these are counted as attempts).

B.   CC.

C.   Receipt of "MAP_SEND_ROUTING_INFO_FOR_SM" service indication (GSM 09.02 [7]).

D.   attReqForSMRoutingInfo.

E.   A single integer value.

F.	HLR Measurement Function.

G.	Valid for circuit and packet switching.

B.4.1.12 Successful request for SM routing information

A.	This measurement provides the number of successful requests for short Message routing information.

B.	CC.

C.	Transmission of "MAP_SEND_ROUTING_INFO_FOR_SM" service response without "user error" parameter (GSM 09.02 [7]).

D.	succReqForSMRoutingInfo.

E.	A single integer value.

F.	HLR Measurement Function.

G.	Valid for circuit and packet switching.

B.4.1.13 Attempted SM delivery status report procedures

A.	This measurement provides the number of requests to set Message waiting data into HLR or to inform HLR of successful SM transfer after polling (these are counted as attempts).

B.	CC.

C.	Receipt of "MAP_REPORT_SM_DELIVERY_STATUS" service indication (GSM 09.02 [7]).

D.	attSMDeliveryStatusReportProcs.

E.	A single integer value.

F.	HLR Measurement Function.

G.	Valid for circuit and packet switching.

B.4.1.14 Successful SM delivery status report procedures

A.	This measurement provides the number of successful requests to set Message waiting data into HLR or to inform HLR of successful SM transfer after polling.

B.	CC.

C.	Transmission of "MAP_REPORT_SM_DELIVERY_STATUS" service response without "user error" parameter value (GSM 09.02 [7]).

D.	succSMDeliveryStatusReportProcs.

E.	A single integer value.

F.	HLR Measurement Function.

G.	Valid for circuit and packet switching.

B.4.1.15 Attempted number of send alerts

A.	This measurement provides the number of transmissions of send alerts (these are counted as attempts).

B.	CC.

C.	Transmission of a "MAP_ALERT_SERVICE_CENTRE" service request (GSM 09.02 [7]).

D.   attNbrOfSendAlerts.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.16 Successful number of send alerts

A.   This measurement provides the successful transmissions of send alerts.

B.   CC.

C.   Receipt of a "MAP_ALERT_SERVICE_CENTRE" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D.   succNbrOfSendAlerts.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit and packet switching.

B.4.1.17 Attempted request for MSRN

A.   This measurement provides the number of requests for MSRN from the VLR (these are counted as attempts).

B.   CC.

C.   Transmission of "MAP_PROVIDE_ROAMING_NUMBER" service request (GSM 09.02 [7]).

D.   attReqForMSRN.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit switching.

B.4.1.18 Successful request for MSRN

A.   This measurement provides the successful responses for allocations of MSRN received from the VLR.

B.   CC.

C.   Receipt of "MAP_PROVIDE_ROAMING_NUMBER" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D.   succReqForMSRN.

E.   A single integer value.

F.   HLR Measurement Function.

G.   Valid for circuit switching.

B.5 Measurements Related to the VLR

B.5.1 VLR Measurement Function

B.5.1.1 Attempted MS memory available notifications

A. This measurement provides the number of times a VLR informs the HLR that a MS is available for receiving short messages once again (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_READY_FOR_SM" service request (GSM 09.02 [7]).

D. attMSMemoryAvailableNotifications.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.2 Successful MS memory available notifications

A. This measurement provides the number of times a VLR successfully informs the HLR that a MS is available for receiving short messages once again.

B. CC.

C. Receipt of "MAP_READY_FOR_SM" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D. succMSMemoryAvailableNotifications.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.3 Attempted Identification requests to PVLRs

A. This measurement provides the number of identification information requests to the PVLR for subscribers registering afresh in this VLR (these are counted as attempts).

B. CC.

C. Transmission of "MAP_SEND_IDENTIFICATION" service request (GSM 09.02 [7]).

D. attIdentificationReqToPVLRs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.4 Successful Identification requests to PVLRs

A. This measurement provides the number of successful identification requests to the PVLR for subscriber registering afresh in this VLR.

B.   CC.

C.   Receipt of "MAP_SEND_IDENTIFICATION" service confirmation without "user error" parameter value
        (GSM 09.02 [7]).

D.   succIdentificationReqToPVLRs.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.5   Attempted page requests

A.   This measurement provides the number of page requests (these are counted as attempts).

B.   CC.

C.   Transmission of "MAP_PAGE" service request (GSM 09.02 [7]).

D.   attPageReqs.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.6   Successful page requests

A.   This measurement provides the number of successful page requests.

B.   CC.

C.   Receipt of "MAP_PAGE" service confirmation without a "user error" parameter value (GSM 09.02 [7]).

D.   succPageReqs.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.7   Attempted page requests per Location Area

A.   This measurement provides the number of page requests per Location Area (these are counted as attempts).

B.   CC.

C.   Transmission of "MAP_PAGE" service request (GSM 09.02 [7]).

D.   attPageReqsPerLocationArea.

E.   An integer value per Location Area.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.8   Successful page requests per Location Area

A.   This measurement provides the number of successful page requests per Location Area.

B.   CC.

C.   Receipt of "MAP_PAGE" service confirmation without a "user error" parameter value (GSM 09.02 [7]).

D.   succPageReqsPerLocationArea.

E.   An integer value per Location Area.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.9   Attempted requests for Authentication sets sent to HLR by VLRs

A.   This measurement provides the number of requests to the HLR by the VLR for Authentication sets (these are counted as attempts).

B.   CC.

C.   Transmission of a "MAP_SEND_AUTHENTICATION_INFO" service request, requesting Authentication sets (parameter "AuthenticationSetKind" present GSM 09.02 [7]).

D.   attReqForAuthSetsSentToHLR.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.10 Successful received Authentication sets from HLR to VLRs

A.   This measurement provides the number of successful requests for Authentication sets from the HLR to the VLR.

B.   CC.

C.   Receipt of a "MAP_SEND_AUTHENTICATION_INFO" service confirmation, containing requested Authentication sets parameter "AuthenticationSetList" present (GSM 09.02 [7]).

D.   succReceivedAuthSetsFromHLR.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.11 Empty responses to request for Authentication sets from HLR to VLRs

A.   This measurement provides the number of empty responses received by the VLR in response to requests for Authentication sets (the implication is that the VLR will have to reuse old Authentication sets).

B.   CC.

C.   Receipt of a "MAP_SEND_AUTHENTICATION_INFO" service confirmation, no Authentication sets present (GSM 09.02 [7]).

D.   emptyResponsesForAuthFromHLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.12 Attempted authentication procedures in VLR

A. This measurement provides the number of authentication requests which are sent to the MSC (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_AUTHENTICATE" service request (GSM 09.02 [7]).

D. attAuthProcsInVLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.13 Successful authentication procedures in the VLR

A. This measurement provides the number of successful authentication procedures in the VLR.

B. CC.

C. Receipt of a "MAP_AUTHENTICATE" service confirmation, where the received SRES parameter value matches value stored in the Location register (GSM 09.02 [7]).

D. succAuthProcsInVLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.14 Attempted intra-VLR Location Updates

A. This measurement provides the number of Location Updates, between Location areas of the same VLR (these are counted as attempts).

B. CC.

C. Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, with previous Location Area identification parameter referring to the Location Area identity of the same VLR (GSM 09.02 [7]).

D. attIntraVLRLocationUpdates.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.15 Successful intra-VLR Location Updates

A. This measurement provides the successful Location Updates between Location Areas of the same VLR.

B. CC.

C.   Transmission of "MAP_UPDATE_LOCATION_AREA" service response without "user error" parameter value, for attempted intra-VLR Location Update (GSM 09.02 [7]).

D.   succIntraVLRLocationUpdates.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.16 Attempted inter-VLR Location Updates

A.   This measurement provides the number of Location Updates between Location Areas of different VLR (these are counted as attempts).

B.   CC.

C.   Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, with previous Location Area identification parameter referring to the Location Area identity of the different VLR, or no previous VLR identity (GSM 09.02 [7]).

D.   attInterVLRLocationUpdates.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.17 Successful inter-VLR Location Updates

A.   This measurement provides the number of successful Location Updates between Location Areas of different VLRs.

B.   CC.

C.   Transmission of "MAP_UPDATE_LOCATION_AREA" service response without "user error" parameter value, for attempted inter-VLR Location Update (GSM 09.02 [7]).

D.   succInterVLRLocationUpdates.

E.   A single integer value.

F.   VLR Measurement Function.

G.   Valid for circuit switching.

B.5.1.18 Arrivals of Visitors from other PLMNs

A.   This measurement provides the number of arrivals of visitors from other PLMNs i.e. exclude own MS's returning to HPLMN. This measurement has to be taken in each VLR of the HPLMN to get the total.

B.   CC.

C.   Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, the previous Location of the subscriber was another PLMN (GSM 09.02 [7]).

D.   arrivalOfVisitorsFromOtherPLMNs.

E.   A single integer value.

F.   VLR Measurement Function.

G. Valid for circuit switching.

B.6 Measurements Related to the EIR

B.6.1 EIR Measurement Function

B.6.1.1 Number of received IMEI check requests

A. This measurement provides the number of IMEI check requests received by the EIR.

B. CC.

C. Receipt of "MAP_CHECK_IMEI" service indication (GSM 09.02 [7]).

D. nbrOfReceivedIMEICheckReqs.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.2 Number of white answers in EIR

A. This measurement provides the number of white answers transmitted by the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a white listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfWhiteAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.3 Number of grey answers in EIR

A. This measurement provides the number of grey answers transmitted by the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a grey listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfGreyAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.4 Number of black answers in EIR

A. This measurement provides the number of black answers transmitted by the EIR.

B.   CC.

C.   Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a black listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D.   nbrOfBlackAnsInEIR.

E.   A single integer value.

F.   EIR Measurement Function.

G.   Valid for circuit and packet switching.

B.6.1.5　Number of unknown IMEI answers

A.   This measurement provides the number of unknown IMEI answers transmitted by the EIR.

B.   CC

C.   Transmission of "MAP_CHECK_IMEI" service response containing a parameter "user error" referring to a unknown equipment (GSM 09.02 [7]).

D.   nbrOfUnknownIMEIAnsInEIR.

E.   A single integer value.

F.   EIR Measurement Function.

G.   Valid for circuit and packet switching.

B.7　Measurements Related to the SMS IWMSC/GMSC

B.7.1　SMS Measurement Function

B.7.1.1　Attempted mobile originating SM Forwarding

A.   This measurement provides the number of attempted short Message forwarding handeled by the interworking MSC.

B.   CC.

C.   Receipt of "MAP_FORWARD_SHORT_MESSAGE" service indication (GSM 09.02 [7]).

D.   attMobileOriginatingSMForwardings.

E.   A single integer value.

F.   SMS Measurement Function.

G.   Valid for circuit and packet switching.

B.7.1.2　Successful mobile originating SM Forwarding

A.   This measurement provides the number of successful short Message forwarding handeled by the interworking MSC.

B.   CC.

C.   Transmission of "MAP_FORWARD_SHORT_MESSAGE" service response without a "user error" parameter value (GSM 09.02 [7]).

D.   succMobileOriginatingSMForwardings.

E.   A single integer value.

F.   SMS Measurement Function.

G.   Valid for circuit and packet switching.

B.7.1.3   Attempted Mobile Terminating SM Forwarding

A.   This measurement provides the number of short messages forwarding from SMS-GMSC to the service node,
        MSC or SGSN (these are counted as attempts).

B.   CC.

C.   Transmission of a "MAP_FORWARD_SHORT_MESSAGE" service request (GSM 09.02 [7]).

D.   attMobileTerminatingSMForwardings.

E.   A single integer value.

F.   SMS Measurement Function.

G.   Valid for circuit and packet switching.

B.7.1.4   Successful Mobile Terminating SM Forwarding

A.   This measurement provides the number of successful of short Message forwarding from SMS-GMSC to the
        service node, MSC or SGSN.

B.   CC.

C.   Receipt of a "MAP_FORWARD_SHORT_MESSAGE" service response without a "user error" parameter
        value (GSM 09.02 [7]).

D.   succMobileTerminatingSMForwardings.

E.   A single integer value.

F.   SMS Measurement Function.

G.   Valid for circuit and packet switching.

B.8   Measurements Related to the SGSN

B.8.1   SGSN Measurement Function

B.8.1.1   LLC Measurements

B.8.1.1.1   Number of LLC frames sent

A.   This measurement provides the number of LLC frames sent by the SGSN.

B.   CC

C.   Transmission of LLC frame to a peer entity GSM TS 04.64 [24].

D.   nbrLlcFramesSent

E.   A single integer value.

F.   SGSN Measurement Function

G.   Valid for packet switching.

B.8.1.1.2   Number of LLC frames Received

A.   This measurement provides the number of received LLC frames by the SGSN.

B.   CC

C.   Receipt of a LLC frames from a peer entity and before any error checking(GSM TS 04.64).

D.   nbrLlcFramesReceived

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.1.3   Erroneously received LLC frames detected by SGSN

A.   This measurement provides the number of erroneously received LLC frames in case of error detection in the
        SGSN (uplink transmission, SGSN).

B.   CC

C.   Discard of a received frame in the SGSN, GSM TS 04.64 [24].

D.   errLlcFramesDetectedBySgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.1.4   Number of Retransmitted LLC frames in Acknowledge Mode

A.   This measurement provides the number of retransmitted LLC frames in LLC acknowledge mode, detected in
        the MS and signalled to the SGSN (downlink transmission, MS).

B.   CC

C.   Receipt of a NACK or SACK frame from the peer entity (MS), GSM TS 04.64 [24].

D.   retransmittedLlcFramestoMs

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.2   SNDCP Measurements

B.8.1.2.1   Number of received SNDCP N-PDUs

A.   This measurement provides the number of incoming N-PDUs received by the SNDCP protocol.

B.   CC

C.   Receipt of the "SN-DATA.ind" or "SN-UNITDATA.ind" primitive, GSM TS 04.65 [25].

D.   uplinkSndcpNpduReceived

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.2.2   Number of received SNDCP N-PDU octets

A.   This measurement provides the number of octets in incoming N-PDUs received by the SNDCP protocol layer.

B.   CC

C.   Receipt of the "SN-DATA.ind" or "SN-UNITDATA.ind" primitive,GSM TS 04.65 [25].

D.   uplinkSndcpOctetReceivedMode

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.2.3   Number of sent SNDCP N-PDUs

A.   This measurement provides the number of outgoing N-PDUs sent by the SNDCP protocol layer.

B.   CC

C.   Sent of the "SN-DATA.req" and "SN-UNITDATA.ind" primitive(GSM TS 04.65).

D.   downlinkSndcpNpduSent

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.2.4   Number of sent SNDCP N-PDU octets

A.   This measurement provides the number of octets in outgoing N-PDUs sent by the SNDCP protocol layer.

B.   CC

C.   Sent of the "SN-DATA.req" and "SN-UNITDATA.ind" primitive(GSM TS 04.65).

D.   downlinkSndcpOctetSent

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.3   BSSGP Measurements

FFS, to be defined.

B.8.1.4   MM Measurements

B.8.1.4.1   Attempted GPRS attach procedures

A.   This measurement provides the number of attempted GPRS attach procedures initiated within this SGSN area.

B.   CC

C.   Receipt of "ATTACH REQUEST" message from the MS, indicating a GPRS

        attach(GSM 04.08).

D.   attGprsAttach

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.2   Successful GPRS attach procedures

A.   This measurement provides the number of successfully performed GPRS attach procedures within this SGSN
        area.

B.   CC

C.   Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS only attached (GSM 04.08).

D.   succGprsAttach

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.3   Attempt of combined GPRS/IMSI attach procedures

A.   This measurement provides the number of attempt of combined GPRS/IMSI attach procedures initiated within
        this SGSN area.

B.   CC

C.   Receipt of "ATTACH REQUEST" message from the MS, indicating combined GPRS/IMSI attach(GSM
        04.08).

D.   attCombiAttach

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.4   Successfully combined GPRS/IMSI attach procedures

A.   This measurement provides the number of successfully completed of Combined GPRS/IMSI attach procedures
        initiated within this SGSN area.

B.   CC

C.   Transmission of "ATTACH ACCEPT" message to the MS, indicating combined GPRS/IMSI attach(GSM
        04.08).

D.   succCombiAttach

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.5   Attempted GPRS attach procedures with IMSI already attached

A.   This measurement provides the number of attempted GPRS attach procedures,while IMSI is already attached. The attempts initiated within this SGSN area are counted.

B.   CC

C.   Receipt of "ATTACH REQUEST" Message from the MS, indicating GPRS attach while IMSI attached(GSM 04.08).

D.   attImsiAttach

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.6   Successful GPRS attach procedures with IMSI already attached

A.   This measurement provides the number of successfully performed GPRS attach procedures,while IMSI is already attached. The attempts initiated within this SGSN area are counted.

B.   CC

C   Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS attach while IMSI attached (GSM 04.08).

D   succImsiAttach

E   A single integer value.

F.   SGSN Measurement Function

G.   Valid for packet switching.

B.8.1.4.7   Number of attached subscriber

A.   This measurement provides the number of attached subscriber within this SGSN area.

B.   GAUGE

C.   The gauge will be incremented at transmission of a "ATTACH ACCEPT" message to the MS and will be decremented at transmission of a "DETACH ACCEPT" message to the MS (GSM 04.08).

D.   nbrOfAttachedSub

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.8   Mean number of attached subscriber

A.   This measurement provides the arithmetic mean of the number of attached subscriber within this SGSN area.

B.   GAUGE

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscribers which are attached and then taking the arithmetic mean (GSM 04.08).

D.   meanNbrOfAttachedSub

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.9   Maximum number of attached subscriber

A.   This measurement provides the highest recorded value for the number of attached subscriber within this SGSN area.

B.   GAUGE

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscriber which are "attached", and then taking the maximum of all such values at the end of the granularity period, (GSM 04.08).

D.   maxNbrOfAttachedSub

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.10   Attempted GPRS detach procedures initiated by MS

A.   This measurement provides the number of attempted GPRS detach procedures within this SGSN area.

B.   CC

C.   Receipt of "DETACH REQUEST" message from the MS, indicating a GPRS

        detach(GSM 04.08).

D.   attGprsDetachMs

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.11   Attempt of Combined GPRS/IMSI detach procedures initiated by MS

A.   This measurement provides the number of attempted Combined GPRS/IMSI detach procedures MS-initiated within this SGSN area.

B.   CC

C.   Receipt of "DETACH REQUEST" message from the MS, indicating a Combined GPRS/IMSI detach(GSM 04.08).

D.   attCombiDetachMs

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.12   Attempt of IMSI detach procedures initiated by MS

A.   This measurement provides the number of attempted IMSI detach procedures MS-initiated within this SGSN area.

B.   CC

C   Receipt of "DETACH REQUEST" message from the MS, indicating a IMSI detach(GSM 04.08).

D.   attImsiDetachMS

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.13   Attempted GPRS detach procedures initiated by SGSN

A.   This measurement provides the number of attempted GPRS detach procedures initiated by SGSN.

B.   CC

C.   Transmission of a "DETACH REQUEST" message to the MS(GSM 04.08).

D.   attGprsDetachSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.14   Successful GPRS detach procedures initiated by SGSN

A.   This measurement provides the number of successfully completed GPRS detach procedures SGSN-initiated within this SGSN area.

B.   CC

C.   Receipt of "DETACH ACCEPT" message from the MS(GSM 04.08).

D.   succGprsDetachSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.15   Attempted intra-SGSN Routing Area Update procedures initiated in this SGSN

A.   This measurement provides the number of attempted intra-SGSN Routing Area Update procedures initiated within this SGSN area.

B.   CC

C.   Receipt of a "ROUTING AREA UPDATE REQUEST" message from the MS, where the old RA and the new RA are served by this SGSN(GSM 04.08).

D.   attIntraSgsnRaUpdate

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.16   Successful intra-SGSN Routing Area Update procedures initiated in this SGSN

A.   This measurement provides the number of successfully performed intra-SGSN Routing Area Update procedures initiated in this SGSN.

B.   CC

C.   Transmission of "ROUTING AREA UPDATE ACCEPT" message to the MS, GSM 04.08 [2].

D.   succIntraSgsnRaUpdate

E.:   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.17   Attempted inter-SGSN Routing Area Update procedures initiated in this SGSN

A.   This measurement provides the number of attempted inter-SGSN Routing Area Update procedures initiated in this SGSN, where the old RA is served by another SGSN, GSM 04.08 [2].

B.   CC

C.   Receipt of an "ROUTING AREA UPDATE REQUEST" message from the MS,GSM 04.08 [2].

D.   attInterSgsnRaUpdate

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.4.18   Successful inter-SGSN Routing Area Update procedures initiated in this SGSN

A.   This measurement provides the number of successfully completed inter-SGSN Routing Area Update procedures in this SGSN.

B   CC

C.   Receipt of a "ROUTING AREA UPDATE COMPLETE" message from the MS, GSM 04.08 [2]..

D.   succInterSgsnRaUpdate

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5   Security

B.8.1.5.1   Attempted P-TMSI reallocation procedures

A.   This measurement provides the number of attempted P-TMSI reallocation, or implicitly as part of the Location Updating, procedures in this SGSN.

B.   CC

C.   Transmission of "P-TMSI REALLOCATION COMMAND" message by the SGSN, GSM 04.08 [2].

D.   attPTMSIRealloc

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5.2   Successful P-TMSI reallocation procedures

A.   This measurement provides the number of successfully performed P-TMSI reallocation procedures in this SGSN.

B.   CC

C.   Receipt of "P-TMSI REALLOCATION COMPLETE" message by the SGSN, GSM 04.08 [2].

D.   succPTMSIRealloc

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5.3   Attempted requests for authentication sets sent to HLR by SGSN

A.   This measurement provides the number of number of attempted requests for authentication sets, sent to the HLR by SGSN, these are counted as attempts.

B.   CC

C.   Transmission of a "MAP SEND_AUTHENTICATION_INFO" service request, requesting authentication sets parameter "AuthenticationSetKind" present, GSM 09.02 [7] .

D.   attReqAuthSetsSentToHlrBySgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.4   Successful requests for authentication sets to HLR

A.   This measurement provides the number of successful requests for authentication sets that were sent from the HLR to the SGSN.

B.   CC

C.   Receipt of a "MAP SEND_AUTHENTICATION_INFO" service confirmation, containing requested authentication sets (parameter "AuthenticationSetList" present GSM 09.02 [7]

D.   succReqAuthSetsHlr

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5.5   Empty responses to the request for authentication sets to the HLR

A.   This measurement provides the number of empty responses to the request for authentication sets that were sent to the HLR.

B: CC

C.   Receipt of a "MAP_SEND_AUTHENTICATION_INFO " service confirmation, no Authentication sets present, GSM 09.02 [7]

D.   emptyResponsesForAuthSetsFromHlr

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5.6   Attempt of authentication procedures started by SGSN

A.   This measurement provides the number of authentication procedures that are started within this SGSN area.

B.   CC

C.   Transmission of an "AUTHENTICATION AND CIPHERING REQUEST" message to the MS (GSM 04.08).

D.   attAuthInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.5.7   Successful authentication procedures started by the SGSN

A.   This measurement provides the number of successful authentication procedures within this SGSN area.

B.   CC

C.   Receipt of an "AUTHENTICATION AND CIPHERING RESPONSE" message from the MS, where the receipt SRES parameter value matches the value stored in the SGSN (GSM 04.08).

D.   succAuthInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G_.   Valid for packet switching.

B.8.1.5.8   Attempted Identity Request procedures

A.   This measurement provides the number of attempted Identity Request procedures initiated by this SGSN.

B.   CC

C. Transmission of an "IDENTITY REQUEST" message to the MS (GSM 04.08).

D. attIdentityReq

E. A single integer value.

F. SGSN Measurement Function.

G_. Valid for packet switching.

B.8.1.5.9 Successful Identity Request procedures

A. This measurement provides the number of successfully completed Identity Request procedures initiated by this SGSN.

B. CC

C. Receipt of an "IDENTITY RESPONSE" message with IMSI by the SGSN from the MS(GSM 04.08).

D. succIdentityReq

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.10 Attempted ciphering mode control procedures

A. This measurements provides the number of ciphering mode control procedures initiated in the SGSN.

B. CC

C. Transmission of "CIPHER MODE COMMAND" (GSM 08.08).

D. attCipheringModeControlPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.11 Successful ciphering mode control procedures

A. This measurement provides the number of successfully completed ciphering mode control procedures that were initiated in this SGSN.

B. CC

C. Receipt of "CIPHER MODE COMPLETE" Message (GSM 08.08).

D. succCipheringModeControlPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6   State

B.8.1.6.1   Number of subscribers in the SGSN in STANDBY state.

A.   This measurement provides the number of subscribers in 'STANDBY' state within this SGSN area.

B.   GAUGE

C.   Transition of a GPRS subscriber registered in the SGSN into / from the operational state 'STANDBY'.

D.   nbrOfSubStandby

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.6.2   Mean number of subscribers in the SGSN in STANDBY state.

A.   This measurement provides the arithmetic mean of the number of subscriber in 'STANDBY' state within this SGSN area.

B.   SI

C.   This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscribers in the STANDBY state, and then taking the arithmetic mean.

D.   meanNbrOfSubStandby

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.6.3   Maximum number of subscribers in the SGSN in STANDBY state.

A.   This measurement provides the highest recorded value for number of subscribers in 'STANDBY' state within this SGSN area.

B.   GAUGE

C.   This measurement is obtained by comparing on an update of the actual number of subscribers in the STANDBY state, this value with the currently maximal value within the actual granularity period.

D.   maxNbrOfSubStandby

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.6.4   Number of subscribers in the SGSN in READY state

A.   This measurement provides the number of subscribers in 'READY' state within this

   SGSN area.

B.   GAUGE

C.   Transition of a GPRS subscriber registered in the SGSN into / from the operational state 'READY'.

D.   nbrOfSubReady

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.6.5   Mean number of subscribers in the SGSN in READY state

A.   This measurement provides the arithmetic mean of the number of subscriber in 'READY' state within this SGSN area.

B.   SI

C.   This measurement is obtained by sampling at a pre-defined interval (System design), the number of subscribers in the READY state, and then taking the arithmetic mean.

D.   meanNbrOfSubReady

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.6.6   Maximum number of subscribers in the SGSN in READY state

A.   This measurement provides the highest recorded value for number of subscribers in 'READY' state within this SGSN area.

B.   GAUGE

C.   This measurement is obtained by comparing on an update of the actual number of subscribers in the READY state, this value with the currently maximal value within the actual granularity period.

D.   maxNbrOfSubReady

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.7 Equipment

B.8.1.7.1   Number of transmitted check IMEI requests

A.   This measurement provides the number of check IMEI requests sent to the EIR.

B.   CC

C.   Transmission of "MAP_IMEI_CHECK" service request (GSM 09.02 [7])

D.:   nbrOfCheckIMEIRequest

E.   A single integer value.

F.   SGSN Measurement Function.

G.:   Valid for packet switching.

B.8.1.7.2 Number of white answers in SGSN

A.   This measurement provides the number of white list answers received from the EIR.

B.   CC

C.   Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the white listed equipment.(GSM 09.02, and GSM 02.16).

D.   nbrOfWhiteAnswerInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.7.3 Number of grey answers in SGSN

A.   This measurement provides the number of grey list answers received from the EIR.

B.   CC

C.   Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the grey listed equipment.(GSM 09.02, and GSM 02.16)

D.   nbrGreyAnswerInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.7.4 Number of black answers in SGSN

A.   This measurement provides the number of black list answers received from the EIR.

B.   CC

C.:   Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the black listed equipment.(GSM 09.02, and GSM 02.16)

D.   nbrOfBlackAnswerInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.7.5 Number of unknown IMEI answers

A.   This measurement provides the number of unknown IMEI answers received from the EIR.

B.   CC

C.   Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to unknown equipment.(GSM 09.02)

D.   nbrOfUnknownAnswerInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.8   RRM Measurements

B.8.1.8.1   Attempt of packet switched paging procedures

A.   This measurement provides the number of attempted packet switched paging procedures, for GPRS services, within this SGSN area. The initial paging procedures as well the repeated paging procedures are counted.

B.   CC

C.   Transmission of "GMM-PAGING.req" message (GSM 08.18).

D.   attPacketSwitchingPaging

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.8.2   Unsuccessful packet switched paging procedures

A.   This measurement provides the number of unsuccessfull packet switched paging (GPRS) procedures within this SGSN area, i.e. packed switching paging procedures that are re-started when the previous attempt has timed out.

B.   CC

C.   Receipt of timeout for the "GMM-PAGING.req" message (GSM TS 08.18).

D.   unsuccPacketSwitchingPaging

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.8.3   Attempt of packet switched paging procedures per Routing Area

A.   This measurement provides the number of attempted packet switched paging procedures, for GPRS services, within this Routing Area. The initial paging procedures as well the repeated paging procedures are counted.

B.   CC

C.   Transmission of "GMM-PAGING.req" message (GSM 08.18).

D.   attPsPagingPerRoutingArea

E.   A single integer value per Routing Area.

F.   SGSN Measurement Function.

G.:   Valid for packet switching.

B.8.1.8.4   Unsuccessful packet switched paging procedures per Routing Area

A.   This measurement provides the number of unsuccessfull packet switched paging (GPRS) procedures within this Routing Area, i.e. packed switching paging procedures that are re-started when the previous attempt has timed out.

B.   CC

C.   Receipt of timeout for the "GMM-PAGING.req" message (GSM TS 08.18).

D.   unsuccPsPagingPerRoutingArea

E.   A single integer value per Routing Area.

F.   SGSN Measurement Function.

G.:   Valid for packet switching.

B.8.1.9   SM Measurements

B.8.1.9.1   Attempted PDP context activation procedures initiated by MS

A.   This measurement provides the number of attempted PDP context activation procedures. These include the static as well as the dynamic PDP addresses.

B.   CC

C.   Receipt of a "Activate PDP Context Request" message from the MS (GSM TS 04.08).

D.   attActPdpContextMSPerSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.:   Valid for packet switching.

B.8.1.9.2   Successful PDP context activation procedures initiated by MS

A.   This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully.

B.   CC

C.   Transmission of a "Activate PDP Context Accept" message to the MS (GSM TS 04.08).

D.:   succActPdpContextMSPerSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.9.3   Attempted dynamic PDP context activation procedures initiated by MS

A.   This measurement provides the number of attempted PDP context activation requests where a dynamic PDP address is required to be used.

B.   CC

C.   Receipt of a "Activate PDP Context Request" message from the MS with an empty PDP address (GSM TS 04.08).

D.   attActPdpContextDynMSPerSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.8.1.9.4 Successful dynamic PDP context activation procedures initiated by MS

A. This measurement provides the number of successfully completed PDP context activations where a dynamic PDP address is used.

B. CC

C. Transmission of a "Activate PDP Context Accept" message to the MS (GSM TS 04.08) when the PDP address has been dynamically assigned.

D. succActPdpDynContextDynMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.5 Attempted PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of PDP context deactivation procedures.

B. CC

C. Receipt of a "Deactivate PDP Context Request" message from the MS (GSM TS   04.08)

D. attDeactPdpContextMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.6 Successful PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of successfully completed PDP context deactivations. For these context deactivations, the GGSN is updated successfully (i.e. deletion of the PDP context).

B. CC

C. Transmission of a "Deactivate PDP Context Accept" message to the MS (GSM TS 04.08).

D. succDeactPdpContextMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.7 Attempted PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of PDP context deactivation procedures initiated by the GGSN.

B. CC

C. Receipt of a "Delete PDP Context Request" message from the GGSN (GSM TS 09.60).

D. attDeactPdpContextGgsnPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.8   Successful PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of successfully handled PDP context deactivations initiated by the GGSN. For these context deactivations, the MS has accepted the PDP context deactivation.

B. CC

C. Transmission of a "Delete PDP Context Response" message to the GGSN (GSM TS 09.60).

D. succDeactPdpContextGgsnPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G Valid for packet switching.

B.8.1.9.9   Number of subscribers with activated PDP context in SGSN

A. This measurement provides the number of mobile subscribers with activated PDP

context (i.e. subscribers that can send/receive GPRS packet data).

B. GAUGE

C. Addition of first PDP context or removal of last PDP context in SGSN location register for a perticular subscriber.

D. nbrSubsWithActivePdpInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G.: Valid for packet switching.

B.8.1.9.10   Mean number of subscribers with activated PDP context in SGSN

A. This measurement provides the arithmetic mean number value of subscribers that have activated PDP context (i.e. subscribers that can send/receive GPRS packet data).

B. SI

C. This measurement is obtained by sampling at a pre-defined interval (System design), the number of subscribers with activated PDP context in SGSN, and then taking the arithmetic mean.

D. meanSubsWithActivePdpInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.11   Maximum number of subscribers with activated PDP context in SGSN

A. This measurement provides the highest recorded value for number of subscribers with activated PDP contexts (i.e. subscribers that can send/receive GPRS packet data).

B. GAUGE

C.   This measurement is obtained by comparing on an update of the actual number of subscribers with activated PDP context in SGSN, this value with the currently maximal value within the actual granularity period.

D.   maxSubsWithActivePdpInSgsn

E.   A single integer value.

F.   SGSN Measurement Function.

G.   Valid for packet switching.

B.9   Measurements Related to the GGSN

B.9.1   GGSN Measurement Function

B.9.1.1   Number of PDP context activation procedures initiated by the MS Per APN

A.   This measurement provides the number of PDP context activation procedures initiated by the MS on a per APN of the GGSN.

B.   CC

C.   Receipt of a "Create PDP Context Request" message from the SGSN(GSM TS 09.60).

D.   attActPdpContextPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

B.9.1.2 Successful PDP context activation procedures initiated by the MS Per APN

A.   This measurement provides the number of successfully completed activation PDP context procedures initiated by the MS on a per APN of the GGSN.

B.   CC

C.:   Transmission of "Create PDP Context Response" from GGSN (GSM TS 09.60).

D.:   succActPdpContextPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G_.   Valid for packet switching.

B.9.1.3 Number of dynamic PDP context activation procedures initiated by the MS Per APN

A.   This measurement provides the number of dynamic PDP context activation procedures initiated by the MS where a dynamic PDP address is requested on a per APN of the GGSN.

B.   CC

C.   Receipt of a "Create PDP Context Request" message MS with an empty PDP address (GSM TS 09.60).

D.   attActPdpContextDynPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

B.9.1.4   Successful +dynamic PDP context activation procedures initiated by the MS Per APN

A.   This measurement provides the number of successfully attempted dynamic PDP context activation procedures initiated by the MS where a dynamic PDP address is requested on a per APN of the GGSN.

B.   CC

C.   Transmission of "Create PDP Context Response" from GGSN (GSM TS 09.60) , the PDP address has been dynamically assigned.

D.   succActPdpContextDynPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

B.9.1.5   Number of PDP context deactivation procedures initiated by the MS Per APN

A.   This measurement provides the number of PDP context deactivation procedures initiated by the MS on a per APN of the GGSN.

B.   CC

C.   Receipt of a "Delete PDP Context Request" message from the SGSN (GSM TS 09.60)

D.   attDeactPdpContextPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

B.9.1.6   Successful PDP context deactivation procedures initiated by the MS Per APN

A.   This measurement provides the number of successfully completed PDP context deactivation procedures initiated by the MS on a per APN of the GGSN.

B.   CC

C.   Transmission of a "Delete PDP Context Response" message to the SGSN (GSM TS 09.60).

D.   succDeactPdpContextPerApnOfGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

B.9.1.7 Number of PDP context deactivation procedures initiated by the GGSN Per APN

A. This measurement provides the number of PDP context deactivation procedures initiated by the GGSN, on a per APN of the GGSN.

B. CC

C. Transmission of a "Deactivate PDP Context Request" message to the SGSN (GSM TS 09.60).

D. attDeactPdpContextByGgsnPerApn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.8 Successful PDP context deactivation procedures initiated by the GGSN Per APN

A. This measurement provides the number of successfully completed PDP context deactivation procedures initiated by the GGSN, on a per APN of the GGSN.

B. CC

C. Receipt of "Delete PDP Context Response" message from the SGSN (GSM TS 09.60).

D.: succDeactPdpContextByGgsnPerApn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.9 Number of active PDP context in GGSN Per APN

A. This measurement provides the number of active PDP context in this GGSN.

B. GAUGE

C. Addition or removal of a PDP context in GGSN.

D.: nbrOfActivePdpContextsPerApnAtGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.10 Mean number of active PDP context in GGSN Per APN

A. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of active PDP context in GGSN per APN, and then taking the arithmetic mean.

B. SI

C. Addition or removal of a PDP context in GGSN.

D. meanNbrOfActivePdpContextsPerApnAtGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.11 Maximum number of PDP context in GGSN Per APN

A.   This measurement is obtained by comparing on an update of the actual number of active PDP context in GGSN per APN, this value with the currently maximal value within the actual granularity period.

B_.   GAUGE

C.   Addition a PDP context in GGSN.

D.   maxnbrOfActivePdpContextsPerApnAtGgsn

E.   A single integer value.

F.   GGSN Measurement Function.

G.   Valid for packet switching.

Annex C (normative):
Performance Measurement Object Model

This annex to GSM 12.04 comprises the Object Model for Performance Measurement to complement the high level Object Model in GSM 12.00 [8].

The whole management approach defined in GSM 12.00 [8] defines all entities of GSM network as managed functions. These are BSS, MSC, HLR etc. and one or more of these can be contained in managed element and each of these functions can contain it's own measurement function.

The SGSN and GGSN detailed, are additional to GSM 12.00 [8] due to the introduction of GPRS.

Model Structure and Content

The following measurement function model takes its basis from the proposed GSM 12.00 [8] high level model. Figure C.1: below shows the containment tree of all the measurement Object Classes. The formal GDMO definitions of the Managed Object Classes concerning measurement functions are described in this subclause, except the "log", which is described in annex D under data transfer requirements.
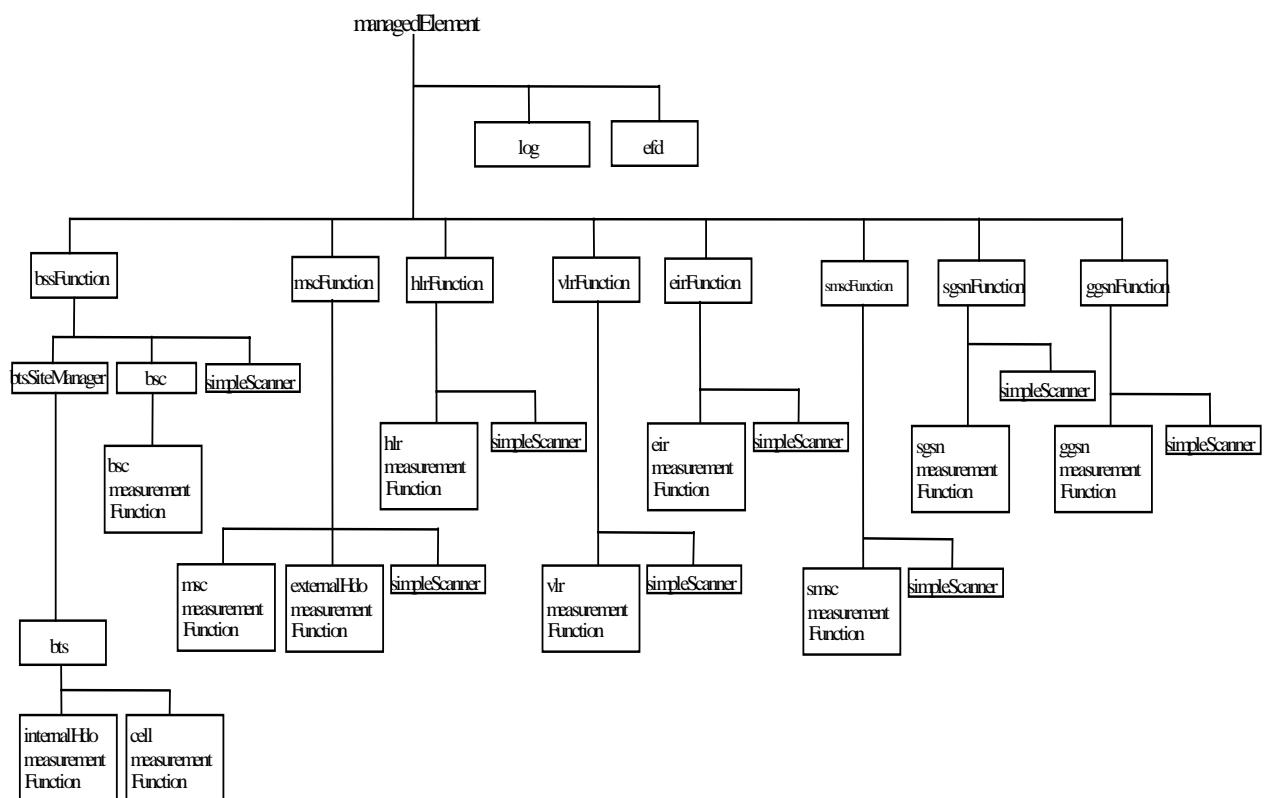
Figure C.1: GSM 12.04 Performance Measurement Object Class Containment

C.1   Measurement Managed Object Classes

C.1.1   object class from CCITT ISO

The object class used by the present document is the simple scanner, as defined in [ISO 10164-13]. Within the realm of the present document, each "simpleScanner" instance is only required to scan attributes of "measurementFunction" objects that are contained in the same "xxxFunction" object as the "simpleScanner" itself, where "xxx" stands for "bss", "msc", "hlr", "vlr", "eir", "sgsn", "ggsn" or "smsc", respectively (see containment tree diagram on previous page).

C.1.2   bscMeasurementFunction

bscMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES

requestForServicePackage	**PRESENT IF** "an instance supports it",
requestForServicePerCausePackage	**PRESENT IF** "an instance supports it",
interArrivalTimePackage	**PRESENT IF** "an instance supports it",
pagingMessagePerBSCPackage	**PRESENT IF** "an instance supports it",
immediateAssignmentProceduresPerBSCPackage	**PRESENT IF** "an instance supports it",
internalHandoversIntraCellPerBSCPackage	**PRESENT IF** "an instance supports it",
internalHandoversPerBSCPackage	**PRESENT IF** "an instance supports it",
internalHandoversPerCausePackage	**PRESENT IF** "an instance supports it",
internalHandoverFailuresPerBSCPackage	**PRESENT IF** "an instance supports it",
gprsPDUFlushReqPackage	**PRESENT IF** "an instance supports it",
gprsPagingRequestPackage	**PRESENT IF** "an instance supports it",
gprsInterArrivalPackage	**PRESENT IF** "an instance supports it";

    REGISTERED AS {gsm1204managedobjectClass 121};

C.1.3   cellMeasurementFunction

cellMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES

pchagchQueuePackage	**PRESENT IF** "an instance supports it",
pagingMess	

agePackage **PRESENT IF** "an instance supports it",

immediateAssignmentProceduresPackage **PRESENT IF** "an instance supports it",

immediateAssignmentProceduresPerCausePackage **PRESENT IF** "an instance supports it",

pageDiscardPackage **PRESENT IF** "an instance supports it",

durationOfPagingProceduresPackage **PRESENT IF** "an instance supports it",

tchAvailablePackage **PRESENT IF** "an instance supports it",

tchBusyPackage **PRESENT IF** "an instance supports it",

idleTCHsPerInterferenceBandPackage **PRESENT IF** "an instance supports it",

tchSeizuresPackage **PRESENT IF** "an instance supports it",

tchAllocatedTimePackage **PRESENT IF** "an instance supports it",

tchBusyTimePackage **PRESENT IF** "an instance supports it",

tchQueuePackage **PRESENT IF** "an instance supports it",

lostRadioLinksPerTCHPackage **PRESENT IF** "an instance supports it",

sdcchAvailablePackage **PRESENT IF** "an instance supports it",

sdcchBusyPackage **PRESENT IF** "an instance supports it",

sdcchSeizuresPackage **PRESENT IF** "an instance supports it",

sdcchAllocatedTimePackage **PRESENT IF** "an instance supports it",

sdcchQueuePackage **PRESENT IF** "an instance supports it",

lostRadioLinksPerSDCCHPackage **PRESENT IF** "an instance supports it",

downlinkPowerControlPackage **PRESENT IF** "an instance supports it",

uplinkPowerControlPackage **PRESENT IF** "an instance supports it",

internalHandoversIntraCellPackage **PRESENT IF** "an instance supports it",

incomingInternalInterCellHandoversPackage **PRESENT IF** "an instance supports it",

outgoingInternalInterCellHandoversPackage **PRESENT IF** "an instance supports it",

internalHandoverFailurePackage **PRESENT IF** "an instance supports it",

gprsPDCHAvailablePackage **PRESENT IF** "an instance supports it",

gprsPDCHOccupiedPackage **PRESENT IF** "an instance supports it",

gprsPDCHAllocatedPackage **PRESENT IF** "an instance supports it",

gprsPCCCHPagingPackage **PRESENT IF** "an instance supports it",

gprsPPCHQueueOnPCCCHPackage   **PRESENT IF** "an instance
supports it",
gprsPDTCHAssignmentPackage   **PRESENT IF** "an instance
supports it",
gprsPDTCHQueuePackage   **PRESENT IF** "an instance
supports it",
gprsCSChangePackage   **PRESENT IF** "an instance
supports it";
   REGISTERED AS {gsm1204managedobjectClass 131};

C.1.4   internalHdoMeasurementFunction

internalHdoMeasurementFunction **MANAGED OBJECT CLASS**
   DERIVED FROM
    "Recommendation X.721: 1992": top;
   CHARACTERIZED BY
    basicMeasurementFunctionPackage,
    internalHdoMeasurementFunctionPackage;
   CONDITIONAL PACKAGES
    incomingInternalInterCellPerCellHandoversPackage   **PRESENT IF** "an instance
                      supports it",
    outgoingInternalInterCellPerCellHandoversPackage   **PRESENT IF** "an instance
                      supports it";
   REGISTERED AS {gsm1204managedobjectClass 140};

internalHdoMeasurementFunctionPackage **PACKAGE**
   BEHAVIOUR
    internalHdoMeasurementFunctionBehaviour;
   ATTRIBUTES
    "gsm1220: 1993": adjacentCellId   **GET;**
   REGISTERED AS {gsm1204package 140};

internalHdoMeasurementFunctionBehaviour **BEHAVIOUR**
   DEFINED AS
    "This object is defined to contain the various optional measurement packages and will
    exist in multiple instances. Creation is only allowed if the value of the adjacent cell
    attribute is identical to the value of the adjacent cell attribute in one of the <HDO
    adjacent Cell> objects. There can be one or more instance(s) of the HDO
    measurement function for each created instance of <HDO adjacent cell> MOC. If the
    adjacent Cell Object is re-named or deleted during the lifetime of the
    internalHdoMeasurementFunction of its associated internalHdoMeasurementFunction
    then the corresponding internalHdoMeasurementFunction(s) is/are automatically
    deleted, as the adjacent Cell Attribute of the mesurementFunction shall not be
    changeable. The scanner may scan attributes of the object class in various
    combinations and permutations of packages, and further may scan simultaneously as
    many times as necessary within the processing limits of the network."
    ;

C.1.5   mscMeasurementFunction

mscMeasurementFunction **MANAGED OBJECT CLASS**
   DERIVED FROM
    "Recommendation X.721: 1992": top;
   CHARACTERIZED BY
    basicMeasurementFunctionPackage;

CONDITIONAL PACKAGES

classMarkPackage	**PRESENT IF** "an instance supports it",
mobileOriginatingCallsPackage	**PRESENT IF** "an instance supports it",
mobileTerminatingCallsPackage	**PRESENT IF** "an instance supports it",
mobileEmergencyCallsPackage	**PRESENT IF** "an instance supports it",
cipheringModePackage	**PRESENT IF** "an instance supports it",
interrogatingHLRPackage	**PRESENT IF** "an instance supports it",
mobileOriginatingPointToPointSMPackage	**PRESENT IF** "an instance supports it",
mobileTerminatingPointToPointSMPackage	**PRESENT IF** "an instance supports it",
imeiRequestPackage	**PRESENT IF** "an instance supports it",
whiteAnswersInMSCPackage	**PRESENT IF** "an instance supports it",
greyAnswersInMSCPackage	**PRESENT IF** "an instance supports it",
blackAnswersInMSCPackage	**PRESENT IF** "an instance supports it",
unknownIMEIAnswersInMSCPackage	**PRESENT IF** "an instance supports it",
callSetupServicePackage	**PRESENT IF** "an instance supports it",
locationUpdatingServicePackage	**PRESENT IF** "an instance supports it",
subscriberIdentifiedWithTMSIPackage	**PRESENT IF** "an instance supports it",
subscriberIdentifiedWithIMSIPackage	**PRESENT IF** "an instance supports it",
tmsiReallocationsPackage	**PRESENT IF** "an instance supports it",
imsiDetachAttachProceduresPackage	**PRESENT IF** "an instance supports it",
incomingExternalIntraMSCHandoversPackage	**PRESENT IF** "an instance supports it",
outgoingExternalIntraMSCHandoversPackage	**PRESENT IF** "an instance supports it",
incomingInterMSCHandoversPackage	**PRESENT IF** "an instance supports it",
outgoingInterMSCHandoversPackage	**PRESENT IF** "an instance supports it",
subsequentInterMSCHandoversToMACaPackage	**PRESENT IF** "an instance supports it",
subsequentInterMSCHandoversToMACcPackage	**PRESENT IF** "an instance supports it",
externalHandoversPackage	**PRESENT IF** "an instance supports it",
externalHandoversPerCausePackage	**PRESENT IF** "an instance supports it",
externalHandoverFailurePerMSCPackage	**PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 150};

C.1.6 externalHdoMeasurementFunction

externalHdoMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage,
        externalHdoMeasurementFunctionPackage;
    CONDITIONAL PACKAGES
        incomingExternalIntraMSCHandoversPerCellPackage **PRESENT IF** "an instance
        supports it",
        outgoingExternalIntraMSCHandoversPerCellPackage   **PRESENT IF** "an
        instance   supports it",
        incomingExternalInterMSCHandoversPerCellPackage **PRESENT IF** "an instance
        supports it",
        outgoingExternalInterMSCHandoversPerCellPackage   **PRESENT IF** "an
        instance   supports it";
REGISTERED AS {gsm1204managedobjectClass 160};

externalHdoMeasurementFunctionPackage **PACKAGE**
    BEHAVIOUR
        externalHdoMeasurementFunctionBehaviour;
    ATTRIBUTES
        observedCell   **GET,**
        adjacentCell   **GET;**
REGISTERED AS {gsm1204package 160} ;

externalHdoMeasurementFunctionBehaviour **BEHAVIOUR**
    DEFINED AS
        "This object is defined to contain the various optional measurement packages and will
        exist in multiple instances. It can only be instantiated if the cell attribute belongs to the
        msc area which is served by the msc function that contain the external HDO
        measurement function. The scanner may scan attributes of the object class in various
        combinations and permutations of packages, and further may scan simultaneously as
        many times as necessary within the processing limits of the network.";

C.1.7 hlrMeasurementFunction

hlrMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES
        msRoamingOutsideHPLMNPackage   **PRESENT IF** "an instance
        supports it",
        authenticationSetsHLRToVLRPackage   **PRESENT IF** "an instance
        supports it",
        insertSubscriberDataServicePackage   **PRESENT IF** "an instance
        supports it",
        locationUpdatePackage   **PRESENT IF** "an instance
        supports it",

ssRelatedOperationsInHLRPackage	**PRESENT IF** "an instance
supports it",	
requestForSMRoutingPackage	**PRESENT IF** "an instance
supports it",	
smDeliveryStatusReportProceduresPackage	**PRESENT IF** "an instance
supports it",	
sendAlertsPackage	**PRESENT IF** "an instance
supports it",	
requestForMSRNPackage	**PRESENT IF** "an instance
supports it";	

REGISTERED AS {gsm1204managedobjectClass 170};

C.1.8   vlrMeasurementFunction

vlrMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES

msMemoryAvailableNotificationsPackage	**PRESENT IF** "an instance supports
it",	
identificationRequestToPVLRPackage	**PRESENT IF** "an instance
supports it",	
pageRequestPackage	**PRESENT IF** "an instance
supports it",	
pageRequestPerLocationAreaPackage	**PRESENT IF** "an instance
supports it",	
authenticationSetsVLRToHLRPackage	**PRESENT IF** "an instance
supports it",	
authenticationInVLRPackage	**PRESENT IF** "an instance
supports it",	
intraVLRLocationUpdatePackage	**PRESENT IF** "an instance
supports it",	
interVLRLocationUpdatePackage	**PRESENT IF** "an instance
supports it",	
visitorsFromOtherPLMNPackage	**PRESENT IF** "an instance
supports it";	

REGISTERED AS {gsm1204managedobjectClass 180};

C.1.9   eirMeasurementFunction

eirMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES

receivedIMEIcheckRequestPackage	**PRESENT IF** "an instance supports it",
whiteAnswersInEIRPackage	**PRESENT IF** "an instance supports it",
greyAnswersInEIRPackage	**PRESENT IF** "an instance supports it",
blackAnswersInEIRPackage	**PRESENT IF** "an instance supports it",
unknownIMEIAnswersInEIRPackage	**PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 190};

C.1.10   smsMeasurementFunction

smsMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES
        mobileOriginatingSMForwardingPackage   **PRESENT IF** "an instance
        supports it",
        mobileTerminatingSMForwardingPackage   **PRESENT IF** "an instance
        supports it";
    REGISTERED AS {gsm1204managedobjectClass 1101};

C.1.11   sgsnMeasurementFunction

sgsnMeasurementFunction **MANAGED OBJECT CLASS**
    DERIVED FROM
        "Recommendation X.721: 1992": top;
    CHARACTERIZED BY
        basicMeasurementFunctionPackage;
    CONDITIONAL PACKAGES
        sgsnLLCPackage   **PRESENT IF** "an instance
        supports it",
        sgsnSNDCPPackage   **PRESENT IF** "an instance
        supports it",
        gprsAttachPackage   **PRESENT IF** "an instance
        supports it",
        gprsIMSIAttachPackage   **PRESENT IF** "an instance
        supports it",
        gprsIMSIAlreadyAttachedPackage   **PRESENT IF** "an instance
        supports it",
        gprsAttachedSubscribersPackage   **PRESENT IF** "an instance
        supports it",
        gprsMSDetachPackage   **PRESENT IF** "an instance
        supports it",
        gprsSGSNDetachPackage   **PRESENT IF** "an instance
        supports it",
        gprsRouting AreaUpdatePackage   **PRESENT IF** "an instance
        supports it",
        pTMSIReallocationPackage   **PRESENT IF** "an instance
        supports it",
        sgsnHLRAuthenticationPackage   **PRESENT IF** "an instance
        supports it",
        sgsnAuthenticationProcPackage   **PRESENT IF** "an instance
        supports it",
        sgsnIdentityRequestPackage   **PRESENT IF** "an instance
        supports it",
        sgsnCipheringModePackage   **PRESENT IF** "an instance
        supports it",
        gprsSubsStandbyStatePackage   **PRESENT IF** "an instance
        supports it",
        gprsSubsReadyStatePackage   **PRESENT IF** "an instance
        supports it",

ETSI

sgsnIMEICheckRequestsPackage supports it",	**PRESENT IF** "an instance
whiteAnswersInSGSNPackage supports it",	**PRESENT IF** "an instance
greyAnswersInSGSNPackage supports it",	**PRESENT IF** "an instance
blackAnswersInSGSNPackage supports it",	**PRESENT IF** "an instance
unknownIMEIAnswersInSGSNPackage supports it",	**PRESENT IF** "an instance
sgsnPacketSwitched PagingPackage supports it",	**PRESENT IF** "an instance
sgsnPacketSwitched PagingPerRAPackage supports it",	**PRESENT IF** "an instance
sgsnPDPContextActivationByMSPackage supports it",	**PRESENT IF** "an instance
sgsnDynamicPDPContextActivationByMSPackage supports it",	**PRESENT IF** "an instance
sgsnPDPContextDeactivationByMSPackage supports it",	**PRESENT IF** "an instance
sgsnPDPContextDeactivationByGGSNPackage supports it",	**PRESENT IF** "an instance
subscriberPDPContextsInSGSNPackage supports it";	**PRESENT IF** "an instance

  REGISTERED AS {gsm1204managedobjectClass 1110};

C.1.12 ggsnMeasurementFunction

ggsnMeasurementFunction **MANAGED OBJECT CLASS**
 DERIVED FROM
  "Recommendation X.721: 1992": top;
 CHARACTERIZED BY
  basicMeasurementFunctionPackage;
 CONDITIONAL PACKAGES

ggsnPDPContextActivationByMSPackage supports it",	**PRESENT IF** "an instance
ggsnDynamicPDPContextActivationByMSPackage supports it",	**PRESENT IF** "an instance
ggsnPDPContextDeactivationByMSPackage supports it",	**PRESENT IF** "an instance
ggsnPDPContextDeactivationByGGSNPackage supports it",	**PRESENT IF** "an instance
ActivePDPContextsAtGGSNPackage supports it";	**PRESENT IF** "an instance

  REGISTERED AS {gsm1204managedobjectClass 1120}

C.2 Measurement Package Definitions

The following describes the individual measurements defined in GSM 12.04, annex B, as packages of attributes to be referenced by the appropriate managed object class.

C.2.1 General Measurement Function Packages

C.2.1.1 basicMeasurementFunctionPackage

```
basicMeasurementFunctionPackage PACKAGE
    BEHAVIOUR
        generalMeasurementFunctionBehaviour;
    ATTRIBUTES
        measurementFunctionId                          GET;
    NOTIFICATIONS
        "Recommendation X.721: 1992": objectCreation,
        "Recommendation X.721: 1992": objectDeletion;
    REGISTERED AS {gsm1204package 211};
```

C.2.2 BSC Measurement Function Related Packages

C.2.2.1 requestForServicePackage

```
requestForServicePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        unsuccReqsForService                           GET;
    REGISTERED AS {gsm1204package 221};
```

C.2.2.2 requestForServicePerCausePackage

```
requestForServicePerCausePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        unsuccReqsForServicePerCause                   GET;
    REGISTERED AS {gsm1204package 222};
```

C.2.2.3 interArrivalTimePackage

```
interArrivalTimePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanInterArrivalTime                           GET;
    REGISTERED AS {gsm1204package 223};
```

C.2.2.4 pagingMessagePerBSCPackage

```
pagingMessagePerBSCPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attTransOfPagingMessagesPerBSC              GET,
        unsuccTransOfPagingMessagesPerBSC           GET;
REGISTERED AS {gsm1204package 224};
```

C.2.2.5 immediateAssignmentProceduresPerBSCPackage

```
immediateAssignmentProceduresPerBSCPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImmediateAssingProcsPerBSC               GET,
        succImmediateAssingProcsPerBSC              GET;
REGISTERED AS {gsm1204package 225};
```

C.2.2.6 internalHandoversIntraCellPerBSCPackage

```
internalHandoversIntraCellPerBSCPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        succInternalHDOsIntraCellPerBSC             GET,
        unsuccInternalHDOsIntraCellPerBSC           GET;
REGISTERED AS {gsm1204package 226};
```

C.2.2.7 internalHandoversPerBSCPackage

```
internalHandoversPerBSCPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        succInternalHDOsPerBSC                      GET;
REGISTERED AS {gsm1204package 227};
```

C.2.2.8 internalHandoversPerCausePackage

```
internalHandoversPerCausePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        succInternalHDOsPerCause                    GET;
REGISTERED AS {gsm1204package 228};
```

C.2.2.9 internalHandoverFailuresPerBSCPackage

```
internalHandoverFailuresPerBSCPackage PACKAGE
    BEHAVIOUR
```

generalMeasurementPackageBehaviour;
    ATTRIBUTES
        unsuccInternalHDOsWithReconnectionPerBSC   **GET**,
        unsuccInternalHDOsWithLossOfConnectionPerBSC **GET**;
  REGISTERED AS {gsm1204package 229};

C.2.2.10   gprsPDUFlushReqPackage

gprsPDUFlushReqPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        FlushReqReceived   **GET**;
  REGISTERED AS {gsm1204package 2210};

C.2.2.11   gprsPagingRequestPackage

gprsPagingRequestPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        pagingReqReceivedfromSGSN   **GET**;
  REGISTERED AS {gsm1204package 2211};

C.2.2.12   gprsInterArrivalPackage

gprsInterArrivalPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanPSInterArrivalTime   **GET**;
  REGISTERED AS {gsm1204package 2212};

C.2.3 CELL Measurement Function Related Packages

C.2.3.1   pchagchQueuePackage

pchagchQueuePackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanPCHAGCHQueueLength   **GET**;
  REGISTERED AS {gsm1204package 231};

C.2.3.2   pagingMessagePackage

pagingMessagePackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

```
        attTransOfPagingMessagesThePCH                    GET,
        unsuccTransOfPagingMessagesThePCH                 GET;
    REGISTERED AS {gsm1204package 232};
```

C.2.3.3   immediateAssignmentProceduresPackage

```
immediateAssignmentProceduresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImmediateAssingProcs                           GET,
        succImmediateAssingProcs                          GET;
    REGISTERED AS {gsm1204package 233};
```

C.2.3.4   immediateAssignmentProceduresPerCausePackage

```
immediateAssignmentProceduresPerCausePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImmediateAssingProcsPerCause                   GET,
        succImmediateAssingProcsPerCause                  GET;
    REGISTERED AS {gsm1204package 234};
```

C.2.3.5   pageDiscardPackage

```
pageDiscardPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfPagesDiscardedFromPCHQueue                   GET;
    REGISTERED AS {gsm1204package 235};
```

C.2.3.6   durationOfPagingProceduresPackage

```
durationOfPagingProceduresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanDurationOfSuccPagingProcs                     GET;
    REGISTERED AS {gsm1204package 236};
```

C.2.3.7   tchAvailablePackage

```
tchAvailablePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfAvailableTCHs                                GET;
    REGISTERED AS {gsm1204package 237};
```

C.2.3.8 tchBusyPackage

```
tchBusyPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanNbrOfBusyTCHs                              GET,
        maxNbrOfBusyTCHs                               GET;
    REGISTERED AS {gsm1204package 238};
```

C.2.3.9 idleTCHsPerInterferenceBandPackage

```
idleTCHPerInterferenceBandPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanNbrOfIdleTCHsPerInterferenceBand          GET;
    REGISTERED AS {gsm1204package 239};
```

C.2.3.10 tchSeizuresPackage

```
tchSeizuresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attTCHSeizures                                GET,
        succTCHSeizures                               GET,
        attTCHSeizuresMeetingTCHBlockedState          GET;
    REGISTERED AS {gsm1204package 2310};
```

C.2.3.11 tchAllocatedTimePackage

```
tchAllocatedTimePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        allAvailableTCHAllocatedTime                  GET;
    REGISTERED AS {gsm1204package 2311};
```

C.2.3.12 tchBusyTimePackage

```
tchBusyTimePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanTCHBusyTime                               GET;
    REGISTERED AS {gsm1204package 2312};
```

C.2.3.13 tchQueuePackage

```
tchQueuePackage PACKAGE
    BEHAVIOUR
```

```
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanTCHQueueLength                              GET;
    REGISTERED AS {gsm1204package 2313};
```

C.2.3.14   lostRadioLinksPerTCHPackage

```
lostRadioLinksPerTCHPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfLostRadioLinksTCH                          GET;
    REGISTERED AS {gsm1204package 2314};
```

C.2.3.15   sdcchAvailablePackage

```
sdcchAvailablePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfAvailableSDCCHs                             GET;
    REGISTERED AS {gsm1204package 2315};
```

C.2.3.16   sdcchBusyPackage

```
sdcchBusyPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanNbrOfBusySDCCHs                             GET,
        maxNbrOfBusySDCCHs                              GET;
    REGISTERED AS {gsm1204package 2316};
```

C.2.3.17   sdcchSeizuresPackage

```
sdcchSeizuresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attSDCCHSeizuresMeetingSDCCHBlockedState       GET;
    REGISTERED AS {gsm1204package 2317};
```

C.2.3.18   sdcchAllocatedTimePackage

```
sdcchAllocatedTimePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        allAvailableSDCCHAllocatedTime                 GET;
    REGISTERED AS {gsm1204package 2318};
```

C.2.3.19 sdcchQueuePackage

sdcchQueuePackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanSDCCHQueueLength   **GET**;
REGISTERED AS {gsm1204package 2319};

C.2.3.20 lostRadioLinksPerSDCCHPackage

lostRadioLinksPerSDCCHPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfLostRadioLinksSDCCH   **GET**;
REGISTERED AS {gsm1204package 2320};

C.2.3.21 downlinkPowerControlPackage

downlinkPowerControlPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        relativeTimeDLPowerControlAtMax   **GET**;
REGISTERED AS {gsm1204package 2321};

C.2.3.22 uplinkPowerControlPackage

uplinkPowerControlPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        relativeTimeULPowerControlAtMax   **GET**;
REGISTERED AS {gsm1204package 2322};

C.2.3.23 internalHandoversIntraCellPackage

internalHandoversIntraCellPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        succInternalHDOsIntraCell   **GET**,
        unsuccInternalHDOsIntraCell   **GET**;
REGISTERED AS {gsm1204package 2323};

C.2.3.24 incomingInternalInterCellHandoversPackage

incomingInternalInterCellHandoversPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

       attIncomingInternalInterCellHDOs   **GET**,
       succIncomingInternalInterCellHDOs   **GET**;
    REGISTERED AS {gsm1204package 2324};

C.2.3.25   outgoingInternalInterCellHandoversPackage

    outgoingInternalInterCellHandoversPackage **PACKAGE**
       BEHAVIOUR
          generalMeasurementPackageBehaviour;
       ATTRIBUTES
          attOutgoingInternalInterCellHDOs   **GET**,
          succOutgoingInternalInterCellHDOs   **GET**;
    REGISTERED AS {gsm1204package 2325};

C.2.3.26   internalHandoverFailurePackage

    internalHandoverFailurePackage **PACKAGE**
       BEHAVIOUR
          generalMeasurementPackageBehaviour;
       ATTRIBUTES
          unsuccHDOsWithReconnection   **GET**,
          unsuccHDOsWithLossOfConnection   **GET**;
    REGISTERED AS {gsm1204package 2326};

C.2.3.27   gprsPDCHAvailablePackage

    gprsPDCHAvailablePackage **PACKAGE**
       BEHAVIOUR
          generalMeasurementPackageBehaviour;
       ATTRIBUTES
          availablePDCH   **GET**,
          meanNbrAvailablePDCH   **GET,**
          maxNbrAvailablePDCH   **GET**,
          minNbrAvailablePDCH   **GET;**
    REGISTERED AS {gsm1204package 2327};

C.2.3.28   gprsPDCHOccupiedPackage

    gprsPDCHOccupiedPackage **PACKAGE**
       BEHAVIOUR
          generalMeasurementPackageBehaviour;
       ATTRIBUTES
          meanNbrOfOccPDCH   **GET**,
          maxNbrOfOccPDCH   **GET,**
          minNbrOfOccPDCH   **GET;**
    REGISTERED AS {gsm1204package 2328};

C.2.3.29   gprsPDCHAllocatedPackage

    gprsPDCHAllocatedPackage **PACKAGE**
       BEHAVIOUR
          generalMeasurementPackageBehaviour;

ATTRIBUTES
availablePDCH AllocatedTime **GET;**
REGISTERED AS {gsm1204package 2329};

C.2.3.30 gprsPCCCHPagingPackage

gprsPCCCHPagingPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrPacketPagingMessagesPCHOnPCCCH **GET;**
REGISTERED AS {gsm1204package 2330};

C.2.3.31 gprsPPCHQueueOnPCCCHPackage

gprsPPCHQueueOnPCCCHPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanPPCHPAGCHQueueLengthOnPCCCH **GET,**
nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH **GET;**
REGISTERED AS {gsm1204package 2331};

C.2.3.32 gprsPDTCHAssignmentPackage

gprsPDTCHAssignmentPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attPCReqAssPerCause **GET,**
succPDTCHAssProcsPerCause **GET,**
succPDTCHSeizures **GET;**
REGISTERED AS {gsm1204package 2332};

C.2.3.33 gprsPDTCHQueuePackage

gprsPDTCHQueuePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanPacketQueueLength **GET;**
REGISTERED AS {gsm1204package 2333};

C.2.3.34 gprsCSChangePackage

gprsCSChangePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfServiceChanges **GET;**
REGISTERED AS {gsm1204package 2334};

C.2.4 internal HDO Measurement Function Related Packages

C.2.4.1 incomingInternalInterCellPerCellHandoversPackage

```
incomingInternalInterCellPerCellHandoversPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIncomingInternalInterCellHDOsPerOriginatingCell        GET,
        succIncomingInternalInterCellHDOsPerOriginatingCell GET;
REGISTERED AS {gsm1204package 241};
```

C.2.4.2 outgoingInternalInterCellPerCellHandoversPackage

```
outgoingInternalInterCellPerCellHandoversPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attOutgoingInternalInterCellHDOsPerTargetCell GET,
        succOutgoingInternalInterCellHDOsPerTargetCell        GET;
REGISTERED AS {gsm1204package 242};
```

C.2.5 MSC Measurement Function Related Packages

C.2.5.1 classMarkPackage

```
classMarkPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfClassMarkUpdates                             GET;
REGISTERED AS {gsm1204package 251};
```

C.2.5.2 mobileOriginatingCallsPackage

```
mobileOriginatingCallsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMobileOriginatingCalls                         GET,
        succMobileOriginatingCalls                        GET,
        ansMobileOriginatingCalls                         GET;
REGISTERED AS {gsm1204package 252};
```

C.2.5.3 mobileTerminatingCallsPackage

```
mobileTerminatingCallsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMobileTerminatingCalls                         GET,
```

succMobileTerminatingCalls	**GET**,
ansMobileTerminatingCalls	**GET**;

REGISTERED AS {gsm1204package 253};

C.2.5.4   mobileEmergencyCallsPackage

mobileEmergencyCallsPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

attMobileEmergencyCalls	**GET**,
succMobileEmergencyCalls	**GET**,
ansMobileEmergencyCalls	**GET**;

REGISTERED AS {gsm1204package 254};

C.2.5.5   cipheringModePackage

cipheringModePackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

attCipheringModeControlProcs	**GET**,
succCipheringModeControlProcs	**GET**;

REGISTERED AS {gsm1204package 255};

C.2.5.6   interrogatingHLRPackage

interrogatingHLRPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

attInterrogationOfHLRsForRouting	**GET**,
succInterrogationOfHLRsMSRNObtained	**GET**,
succInterrogationOfHLRsCallForwarding	**GET**;

REGISTERED AS {gsm1204package 256};

C.2.5.7   mobileOriginatingPointToPointSMPackage

mobileOriginatingPointToPointSMPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

attOpForMobileOriginatingPointToPointSMs	**GET**,
succOpForMobileOriginatingPointToPointSMs	**GET**;

REGISTERED AS {gsm1204package 257};

C.2.5.8   mobileTerminatingPointToPointSMPackage

mobileTerminatingPointToPointSMPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES

```
                attOpForMobileTerminatingPointToPointSMs           GET,
                succOpForMobileTerminatingPointToPointSMs           GET;
        REGISTERED AS {gsm1204package 258};
```

C.2.5.9 imeiRequestPackage

```
    imeiRequestPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
    nbrOfTransCheckIMEIRequests            GET;
    REGISTERED AS {gsm1204package 259};
```

C.2.5.10 whiteAnswersInMSCPackage

```
    whiteAnswersInMSCPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrOfWhiteAnsInMSC                     GET;
    REGISTERED AS {gsm1204package 2510};
```

C.2.5.11 greyAnswersInMSCPackage

```
    greyAnswersInMSCPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrOfGreyAnsInMSC                      GET;
    REGISTERED AS {gsm1204package 2511};
```

C.2.5.12 blackAnswersInMSCPackage

```
    blackAnswersInMSCPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrOfBlackAnsInMSC                     GET;
    REGISTERED AS {gsm1204package 2512};
```

C.2.5.13 unknownIMEIAnswersInMSCPackage

```
    unknownIMEIAnswersInMSCPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrOfUnknownIMEIAnsInMSC               GET;
    REGISTERED AS {gsm1204package 2513};
```

C.2.5.14 callSetupServicePackage

```
    callSetupServicePackage PACKAGE
```

   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    meanTimeToCallSetupService   **GET**;
   REGISTERED AS {gsm1204package 2514};

C.2.5.15   locationUpdatingServicePackage

  locationUpdatingServicePackage **PACKAGE**
   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    meanTimeToLocationUpdateService   **GET**;
   REGISTERED AS {gsm1204package 2515};

C.2.5.16   subscriberIdentifiedWithTMSIPackage

  subscriberIdentifiedWithTMSIPackage **PACKAGE**
   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    transSubIdentifiedWithTMSI   **GET**;
   REGISTERED AS {gsm1204package 2516};

C.2.5.17   subscriberIdentifiedWithIMSIPackage

  subscriberIdentifiedWithIMSIPackage **PACKAGE**
   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    transSubIdentifiedWithIMSI   **GET**;
   REGISTERED AS {gsm1204package 2517};

C.2.5.18   tmsiReallocationsPackage

  tmsiReallocationsPackage **PACKAGE**
   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    attTMSIReallocations   **GET**,
    succTMSIReallocations   **GET**;
   REGISTERED AS {gsm1204package 2518};

C.2.5.19   imsiDetachProceduresPackage

  imsiDetachProceduresPackage **PACKAGE**
   BEHAVIOUR
    generalMeasurementPackageBehaviour;
   ATTRIBUTES
    imsiDetachProcs   **GET**,
    imsiAttachProcs   **GET**;
   REGISTERED AS {gsm1204package 2519};

C.2.5.20 incomingExternalIntraMSCHandoversPackage

incomingExternalIntraMSCHandoversPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIncomingExternalIntraMSCHDOs   **GET**,
        succIncomingExternalIntraMSCHDOs   **GET**;
    REGISTERED AS {gsm1204package 2520};

C.2.5.21 outgoingExternalIntraMSCHandoversPackage

outgoingExternalIntraMSCHandoversPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attOutgoingExternalIntraMSCHDOs   **GET**,
        succOutgoingExternalIntraMSCHDOs   **GET**;
    REGISTERED AS {gsm1204package 2521};

C.2.5.22 incomingInterMSCHandoversPackage

incomingInterMSCHandoversPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIncomingInterMSCHDOs   **GET**,
        succIncomingInterMSCHDOs   **GET**;
    REGISTERED AS {gsm1204package 2522};

C.2.5.23 outgoingInterMSCHandoversPackage

outgoingInterMSCHandoversPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attOutgoingInterMSCHDOs   **GET**,
        succOutgoingInterMSCHDOs   **GET**;
    REGISTERED AS {gsm1204package 2523};

C.2.5.24 subsequentInterMSCHandoversToMACaPackage

subsequentInterMSCHandoversToMACaPackage **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attSubsequentInterMSCHDOsMSCa   **GET**,
        succSubsequentInterMSCHDOsMSCa   **GET**;
    REGISTERED AS {gsm1204package 2524};

C.2.5.25   subsequentInterMSCHandoversToMACcPackage

```
subsequentInterMSCHandoversToMACcPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attSubsequentInterMSCHDOsMSCc              GET,
        succSubsequentInterMSCHDOsMSCc             GET;
    REGISTERED AS {gsm1204package 2525};
```

C.2.5.26   externalHandoversPackage

```
externalHandoversPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        externalHDOs                               GET;
    REGISTERED AS {gsm1204package 2526};
```

C.2.5.27   externalHandoversPerCausePackage

```
externalHandoversPerCausePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        externalHDOsPerCause                       GET;
    REGISTERED AS {gsm1204package 2527};
```

C.2.5.28   externalHandoverFailurePerMSCPackage

```
externalHandoverFailurePerMSCPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        unsuccExternHDOsWithReconnectionPerMSC  GET,
        unsuccExternHDOsWithLossOfConnectionPerMSC    GET;
    REGISTERED AS {gsm1204package 2528};
```

C.2.6 external HDO Measurement Function Related Packages

C.2.6.1   incomingExternalIntraMSCHandoversPerCellPackage

```
incomingExternalIntraMSCHandoversPerCellPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIncomingExternalIntraMSCHDOsPerOriginatingCell GET,
        succIncomingExternalIntraMSCHDOsPerOriginatingCell    GET;
    REGISTERED AS {gsm1204package 261};
```

C.2.6.2   outgoingExternalIntraMSCHandoversPerCellPackage

```
outgoingExternalIntraMSCHandoversPerCellPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attOutgoingExternalIntraMSCHDOsPerTargetCell      GET,
        succOutgoingExternalIntraMSCHDOsPerTargetCell     GET;
REGISTERED AS {gsm1204package 262};
```

C.2.6.3   incomingExternalInterMSCHandoversPerCellPackage

```
incomingExternalInterMSCHandoversPerCellPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIncomingInterMSCHDOsPerOriginatingCell      GET,
        succIncomingInterMSCHDOsPerOriginatingCellGET;
REGISTERED AS {gsm1204package 263};
```

C.2.6.4   outgoingExternalInterMSCHandoversPerCellPackage

```
outgoingExternalInterMSCHandoversPerCellPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attOutgoingInterMSCHDOsPerTargetCell         GET,
        succOutgoingInterMSCHDOsPerTargetCell        GET;
REGISTERED AS {gsm1204package 264};
```

C.2.7 HLR Measurement Function Related Packages

C.2.7.1   msRoamingOutsideHPLMNPackage

```
msRoamingOutsideHPLMNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfCurrentMSsRoamingOutsideHPLMN           GET;
REGISTERED AS {gsm1204package 271};
```

C.2.7.2   authenticationSetsHLRToVLRPackage

```
authenticationSetsHLRToVLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attReqForAuthSetsReceivedByHLRFromVLRs       GET,
        succReturnedAuthSetsFromHLRToVLRs            GET,
        emptyResponsesForAuthSetsFromHLRToVLRs       GET;
REGISTERED AS {gsm1204package 272};
```

C.2.7.3   insertSubscriberDataServicePackage

```
insertSubscriberDataServicePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attInsertSubDataService                        GET,
        succInsertSubDataService                       GET;
    REGISTERED AS {gsm1204package 273};
```

C.2.7.4   locationUpdatePackage

```
locationUpdatePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attLocationUpdate                              GET,
        succLocationUpdate                             GET;
    REGISTERED AS {gsm1204package 274};
```

C.2.7.5   ssRelatedOperationsInHLRPackage

```
ssRelatedOperationsInHLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attSSRelatedOperationsInHLR                    GET,
        succSSRelatedOperationsInHLR                   GET;
    REGISTERED AS {gsm1204package 275};
```

C.2.7.6   requestForSMRoutingPackage

```
requestForSMRoutingPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attReqForSMRoutingInfo                         GET,
        succReqForSMRoutingInfo                        GET;
    REGISTERED AS {gsm1204package 276};
```

C.2.7.7   smDeliveryStatusReportProceduresPackage

```
smDeliveryStatusReportProceduresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attSMDeliveryStatusReportProcs                 GET,
        succSMDeliveryStatusReportProcs                GET;
    REGISTERED AS {gsm1204package 277};
```

C.2.7.8 sendAlertsPackage

```
sendAlertsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attNbrOfSendAlerts                              GET,
        succNbrOfSendAlerts                             GET;
    REGISTERED AS {gsm1204package 278};
```

C.2.7.9 requestForMSRNPackage

```
requestForMSRNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attReqForMSRN                                   GET,
        succReqForMSRN                                  GET;
    REGISTERED AS {gsm1204package 279};
```

C.2.8 VLR Measurement Function Related Packages

C.2.8.1 msMemoryAvailableNotificationsPackage

```
msMemoryAvailableNotificationsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMSMemoryAvailableNotifications               GET,
        succMSMemoryAvailableNotifications              GET;
    REGISTERED AS {gsm1204package 281};
```

C.2.8.2 identificationRequestToPVLRPackage

```
identificationRequestToPVLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIdentificationReqToPVLRs                     GET,
        succIdentificationReqToPVLRs                    GET;
    REGISTERED AS {gsm1204package 282};
```

C.2.8.3 pageRequestPackage

```
pageRequestPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPageReqs                                     GET,
        succPageReqs                                    GET;
    REGISTERED AS {gsm1204package 283};
```

C.2.8.4 pageRequestPerLocationAreaPackage

```
pageRequestPerLocationAreaPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPageReqsPerLocationArea                      GET,
        succPageReqsPerLocationArea                     GET;
    REGISTERED AS {gsm1204package 284};
```

C.2.8.5 authenticationSetsVLRToHLRPackage

```
authenticationSetsVLRToHLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attReqForAuthSetsSentToHLR                      GET,
        succReceivedAuthSetsFromHLR                     GET,
        emptyResponsesForAuthFromHLR                    GET;
    REGISTERED AS {gsm1204package 285};
```

C.2.8.6 authenticationInVLRPackage

```
authenticationInVLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attAuthProcsInVLR                               GET,
        succAuthProcsInVLR                              GET;
    REGISTERED AS {gsm1204package 286};
```

C.2.8.7 intraVLRLocationUpdatePackage

```
intraVLRLocationUpdatePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIntraVLRLocationUpdates                      GET,
        succIntraVLRLocationUpdates                     GET;
    REGISTERED AS {gsm1204package 287};
```

C.2.8.8 interVLRLocationUpdatePackage

```
interVLRLocationUpdatePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attInterVLRLocationUpdates                      GET,
        succInterVLRLocationUpdates                     GET;
    REGISTERED AS {gsm1204package 288};
```

C.2.8.9 visitorsFromOtherPLMNPackage

```
visitorsFromOtherPLMNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        arrivalOfVisitorsFromOtherPLMNs                 GET;
    REGISTERED AS {gsm1204package 289};
```

C.2.9 EIR Measurement Function Related Packages

C.2.9.1 receivedIMEIcheckRequestPackage

```
receivedIMEIcheckRequestPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfReceivedIMEICheckReqs                      GET;
    REGISTERED AS {gsm1204package 291};
```

C.2.9.2 whiteAnswersInEIRPackage

```
whiteAnswersInEIRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfWhiteAnsInEIR                              GET;
    REGISTERED AS {gsm1204package 292};
```

C.2.9.3 greyAnswersInEIRPackage

```
greyAnswersInEIRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfGreyAnsInEIR                               GET;
    REGISTERED AS {gsm1204package 293};
```

C.2.9.4 blackAnswersInEIRPackage

```
blackAnswersInEIRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfBlackAnsInEIR                              GET;
    REGISTERED AS {gsm1204package 294};
```

C.2.9.5 unknownIMEIAnswersInEIRPackage

```
unknownIMEIAnswersInEIRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
```

```
        ATTRIBUTES
            nbrOfUnknownIMEIAnsInEIR                        GET;
    REGISTERED AS {gsm1204package 295};
```

C.2.10   SMS Measurement Function Related Packages

C.2.10.1   mobileOriginatingSMForwardingPackage

```
    mobileOriginatingSMForwardingPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attMobileOriginatingSMForwardings             GET,
            succMobileOriginatingSMForwardings            GET;
    REGISTERED AS {gsm1204package 2101};
```

C.2.10.2   mobileTerminatingSMForwardingPackage

```
    mobileTerminatingSMForwardingPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attMobileTerminatingSMForwardings             GET,
            succMobileTerminatingSMForwardings            GET;
    REGISTERED AS {gsm1204package 2102};
```

C.2.11   SGSN Measurement Function Related Packages

C.2.11.1   sgsnLLCPackage

```
    sgsnLLCPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrLlcFramesSent                    GET,
            nbrllcFramesReceived                GET,
            errLlcFramesDetectedBySgsn          GET,
            retransmittedLlcFramestoMs          GET;
    REGISTERED AS {gsm1204package 2111};
```

C.2.11.2   sgsnSNDCPPackage

```
    sgsnSNDCPPackage PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            uplinkSndcpNpduReceived             GET,
            uplinkSndcpOctetReceivedMode        GET,
            downlinkSndcpNpdusent               GET,
            downlinkSndcpOctetSent              GET;
    REGISTERED AS {gsm1204package 2112};
```

C.2.11.3   gprsAttachPackage

```
gprsAttachPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attGprsAttach                   GET,
        succGprsAttach                  GET;
REGISTERED AS {gsm1204package 2113};
```

C.2.11.4   gprsIMSIAttachPackage

```
gprsIMSIAttachPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attCombiAttach                  GET,
        succCombiAttach                 GET;
REGISTERED AS {gsm1204package 2114};
```

C.2.11.5   gprsIMSIAlreadyAttachedPackage

```
gprsIMSIAlreadyAttachedPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImsiAttach                   GET,
        succImsiAttach                  GET;
REGISTERED AS {gsm1204package 2115};
```

C.2.11.6   gprsAttachedSubscribersPackage

```
gprsAttachedSubscribersPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfAttachedSub                GET,
        meanNbrOfAttachedSub            GET,
        maxNbrOfAttachedSub             GET;
REGISTERED AS {gsm1204package 2116};
```

C.2.11.7   gprsMSDetachPackage

```
gprsMSDetachPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attGprsDetachMs                 GET,
        attCombiDetachMs                GET,
        attImsiDetachMs                 GET;
REGISTERED AS {gsm1204package 2117};
```

C.2.11.8   gprsSGSNDetachPackage

```
gprsSGSNDetachPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attGprsdetachSgsn               GET,
        succGprsdetachSgsn              GET;
    REGISTERED AS {gsm1204package 2118};
```

C.2.11.9   gprsRouting AreaUpdatePackage

```
gprsRouting AreaUpdatePackage    PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attItraSgsnRaUpdate             GET,
        succIntraSgsnRaUpdate           GET,
        attInterSgsnRaUpdate            GET,
        succInterSgsnRaUpdate           GET;
    REGISTERED AS {gsm1204package 2119};
```

C.2.11.10   pTMSIReallocationPackage

```
pTMSIReallocationPackage    PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPTMSIRealloc                 GET,
        succPTMSIrealloc                GET;
    REGISTERED AS {gsm1204package 21110};
```

C.2.11.11   sgsnHLRAuthenticationPackage

```
sgsnHLRAuthenticationPackage   PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attreqAuthSetsSentToHlrBySgsn    GET,
        succReqAuthSetsHlr               GET,
        emptyResponsesForAuthSetsFromHlr GET;
    REGISTERED AS {gsm1204package 21111};
```

C.2.11.12   sgsnAuthenticationProcPackage

```
sgsnAuthenticationProcPackage   PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attAuthInSgsn                   GET,
        succAuthInSgsn                  GET;
    REGISTERED AS {gsm1204package 21112};
```

C.2.11.13   sgsnIdentityRequestPackage

```
sgsnIdentityRequestPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attIdentityReq              GET,
        succIdentityReq             GET;
REGISTERED AS {gsm1204package 21113};
```

C.2.11.14   sgsnCipheringModePackage

```
sgsnCipheringModePackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attCipheringModeControlPerSgsn    GET,
        succCipheringModeControlPerSgsn   GET;
REGISTERED AS {gsm1204package 21114};
```

C.2.11.15   gprsSubsStandbyStatePackage

```
gprsSubsStandbyStatePackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfSubStandby             GET,
        meanNbrOfSubStandby         GET,
        maxNbrOfSubStandby          GET;
REGISTERED AS {gsm1204package 21115};
```

C.2.11.16   gprsSubsReadyStatePackage

```
gprsSubsReadyStatePackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfSubReady               GET,
        meanNbrOfSubReady           GET,
        maxNbrOfSubReady            GET;
REGISTERED AS {gsm1204package 21116};
```

C.2.11.17   sgsnIMEICheckRequestsPackage

```
sgsnIMEICheckRequestsPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfCheckIMEIRequests          GET;
REGISTERED AS {gsm1204package 21117};
```

C.2.11.18   whiteAnswersInSGSNPackage

```
whiteAnswersInSGSNPackage      PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfWhiteAnswerInSgsn              GET;
    REGISTERED AS {gsm1204package 21118};
```

C.2.11.19   greyAnswersInSGSNPackage

```
greyAnswersInSGSNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfGreyAnswerInSgsn              GET;
    REGISTERED AS {gsm1204package 21119};
```

C.2.11.20   blackAnswersInSGSNPackage

```
blackAnswersInSGSNPackage      PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfBlackAnswerInSgsn             GET;
    REGISTERED AS {gsm1204package 21120};
```

C.2.11.21   unknownIMEIAnswersInSGSNPackage

```
unknownIMEIAnswersInSGSNPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfUnknownAnswerInSgsn           GET;
    REGISTERED AS {gsm1204package 21121};
```

C.2.11.22   sgsnPacketSwitched PagingPackage

```
sgsnPacketSwitched PagingPackage      PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPacketSwitchedPaging           GET,
        unsuccPacketSwitchedPaging        GET;
    REGISTERED AS {gsm1204package 21122};
```

C.2.11.23   sgsnPacketSwitched PagingPerRAPackage

```
sgsnPacketSwitched PagingPerRAPackage      PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
```

        attPsPagingPerRoutingArea   **GET**,
        unsuccPsPagingPerRoutingArea   **GET**;
    REGISTERED AS {gsm1204package 21123};

C.2.11.24   sgsnPDPContextActivationByMSPackage

sgsnPDPContextActivationByMSPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attActPdpContextMSPerSgsn   **GET**,
        succActPdpContextMSPerSgsn   **GET**;
    REGISTERED AS {gsm1204package 21124};

C.2.11.25   sgsnDynamicPDPContextActivationByMSPackage

sgsnDynamicPDPContextActivationByMSPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attActPdpContextDynMSPerSgsn   **GET**,
        succActPdpContextDynMSPerSgsn   **GET**;
    REGISTERED AS {gsm1204package 21125};

C.2.11.26   sgsnPDPContextDeactivationByMSPackage

sgsnPDPContextDeactivationByMSPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attDeactPdpContextMsPerSgsn   **GET**,
        succDeactPdpContextMsPerSgsn   **GET**;
    REGISTERED AS {gsm1204package 21126};

C.2.11.27   sgsnPDPContextDeactivationByGGSNPackage

sgsnPDPContextDeactivationByGGSNPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attDeactPdpContextGgsnPerSgsn   **GET**,
        succDeactPdpContextGgsnPerSgsn   **GET**;
    REGISTERED AS {gsm1204package 21127};

C.2.11.28   subscriberPDPContextsAtSGSNPackage

subscriberPDPContextsAtSGSNPackage   **PACKAGE**
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrSubsWithActivePdpInSgsn   **GET**,
        meanSubsWithActivePdpInSgsn   **GET**,

nmaxSubsWithActivePdpInSgsn **GET**;
REGISTERED AS {gsm1204package 21128};

C.2.12 GGSN Measurement Function Related Packages

C.2.12.1 ggsnPDPContextActivationByMSPackage

ggsnPDPContextActivationByMSPackage **PACKAGE**
   BEHAVIOUR
      generalMeasurementPackageBehaviour;
   ATTRIBUTES
      attActPdpContextPerApnOfGgsn **GET**,
      succActPdpContextPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2121}

C.2.12.2 ggsnDynamicPDPContextActivationByMSPackage

ggsnDynamicPDPContextActivationByMSPackage **PACKAGE**
   BEHAVIOUR
      generalMeasurementPackageBehaviour;
   ATTRIBUTES
      attActPdpContextDnyPerApnOfGgsn **GET**,
      succActPdpContextDnyPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2122};

C.2.12.3 ggsnPDPContextDeactivationByMSPackage

ggsnPDPContextDeactivationByMSPackage **PACKAGE**
   BEHAVIOUR
      generalMeasurementPackageBehaviour;
   ATTRIBUTES
      attDeactPdpContextMsPerApnOfGgsn **GET**,
      succDeactPdpContextMsPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2123};

C.2.12.4 ggsnPDPContextDeactivationByGGSNPackage

ggsnPDPContextDeactivationByGGSNPackage **PACKAGE**
   BEHAVIOUR
      generalMeasurementPackageBehaviour;
   ATTRIBUTES
      attDeactPdpContextByGgsnPerApn **GET**,
      succDeactPdpContextByGgsnMsPerApn **GET**;
REGISTERED AS {gsm1204package 2124};

C.2.12.5 ActivePDPContextsAtGGSNPackage

ActivePDPContextsAtGGSNPackage **PACKAGE**
   BEHAVIOUR
      generalMeasurementPackageBehaviour;

ATTRIBUTES
nbrOfActivePdpContextsPerApnAtGgsn **GET**,
meanNbrOfActivePdpContextsPerApnAtGgsn **GET**,
maxNbrOfActivePdpContextsPerApnAtGgsn **GET**;
REGISTERED AS {gsm1204package 2125};

C.3 Measurement Attribute Definitions

C.3.1 General Measurement Function Related Attributes

C.3.1.1 measurementFunctionId

measurementFunctionId **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementFunctionId;
BEHAVIOUR
measurementFunctionIdBehaviour;
REGISTERED AS {gsm1204attribute 311};

measurementFunctionIdBehaviour **BEHAVIOUR**
DEFINED AS
"This is the identity of the measurement function";

C.3.1.2 observedCell

observedCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMCellName;
BEHAVIOUR
observedCellBehaviour;
REGISTERED AS {gsm1204attribute 312};

observedCellBehaviour **BEHAVIOUR**
DEFINED AS
"This is the Cell that is to be observed for this measurement";

C.3.1.3 adjacentCell

adjacentCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMCellName;
BEHAVIOUR
adjacentCellBehaviour;
REGISTERED AS {gsm1204attribute 313};

adjacentCellBehaviour **BEHAVIOUR**
DEFINED AS
"This is the Cell that is adjacent to the observed cell for this measurement";

C.3.2 BSC Measurement Function Related Attributes

C.3.2.1 unsuccReqsForService

    unsuccReqsForService **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 321};

C.3.2.2 unsuccReqsForServicePerCause

    unsuccReqsForServicePerCause **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType3;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 322};

C.3.2.3 meanInterArrivalTime

    meanInterArrivalTime **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType2;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 323};

C.3.2.4 attTransOfPagingMessagesPerBSC

    attTransOfPagingMessagesPerBSC **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 324};

C.3.2.5 unsuccTransOfPagingMessagesPerBSC

    unsuccTransOfPagingMessagesPerBSC **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 325};

C.3.2.6 attImmediateAssingProcsPerBSC

    attImmediateAssingProcsPerBSC **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;

ETSI

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 326};

C.3.2.7   succImmediateAssingProcsPerBSC

succImmediateAssingProcsPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 327};

C.3.2.8   succInternalHDOsIntraCellPerBSC

succInternalHDOsIntraCellPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 328};

C.3.2.9   unsuccInternalHDOsIntraCellPerBSC

unsuccInternalHDOsIntraCellPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 329};

C.3.2.10 succInternalHDOsPerBSC

succInternalHDOsPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3210};

C.3.2.11 succInternalHDOsPerCause

succInternalHDOsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3211};

C.3.2.12 unsuccInternalHDOsWithReconnectionPerBSC

unsuccInternalHDOsWithReconnectionPerBSC **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3212};

C.3.2.13 unsuccInternalHDOsWithLossOfConnectionPerBSC

unsuccInternalHDOsWithLossOfConnectionPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3213};

C.3.2.14 flushRequestReceived

flushRequestReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3214};

C.3.2.15 pagingReqReceivedfromSgsn

pagingReqReceivedfromSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3215};

C.3.2.16 meanPSInterArrivalTime

meanPSInterArrivalTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3216};

C.3.3 CELL Measurement Function Related Attributes

C.3.3.1 meanPCHAGCHQueueLength

meanPCHAGCHQueueLength **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 331};

C.3.3.2 attTransOfPagingMessagesThePCH

attTransOfPagingMessagesThePCH **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 332};

C.3.3.3 unsuccTransOfPagingMessagesThePCH

unsuccTransOfPagingMessagesThePCH **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 333};

C.3.3.4 attImmediateAssingProcs

attImmediateAssingProcs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 334};

C.3.3.5 succImmediateAssingProcs

succImmediateAssingProcs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 335};

C.3.3.6 attImmediateAssingProcsPerCause

attImmediateAssingProcsPerCause **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType3;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 336};

C.3.3.7 succImmediateAssingProcsPerCause

succImmediateAssingProcsPerCause **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType3;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 337};

C.3.3.8 nbrOfPagesDiscardedFromPCHQueue

nbrOfPagesDiscardedFromPCHQueue **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType1;
 BEHAVIOUR
  generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 338};

C.3.3.9 meanDurationOfSuccPagingProcs

meanDurationOfSuccPagingProcs **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType2;
 BEHAVIOUR
  generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 339};

C.3.3.10 nbrOfAvailableTCHs

nbrOfAvailableTCHs **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType1;
 BEHAVIOUR
  generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3310};

C.3.3.11 meanNbrOfBusyTCHs

meanNbrOfBusyTCHs **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType2;
 BEHAVIOUR
  generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3311};

C.3.3.12 maxNbrOfBusyTCHs

maxNbrOfBusyTCHs **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType1;
 BEHAVIOUR
  generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3312};

C.3.3.13 meanNbrOfIdleTCHsPerInterferenceBand

meanNbrOfIdleTCHsPerInterferenceBand **ATTRIBUTE**
 WITH ATTRIBUTE SYNTAX
  GSM1204TypeModule.GSMMeasurementType4;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3313};

C.3.3.14 attTCHSeizures

attTCHSeizures **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3314};

C.3.3.15 succTCHSeizures

succTCHSeizures **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3315};

C.3.3.16 attTCHSeizuresMeetingTCHBlockedState

attTCHSeizuresMeetingTCHBlockedState **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3316};

C.3.3.17 allAvailableTCHAllocatedTime

allAvailableTCHAllocatedTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3317};

C.3.3.18 meanTCHBusyTime

meanTCHBusyTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3318};

C.3.3.19 meanTCHQueueLength

meanTCHQueueLength **ATTRIBUTE**

    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3319};

C.3.3.20 nbrOfLostRadioLinksTCH

  nbrOfLostRadioLinksTCH **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3320};

C.3.3.21 nbrOfAvailableSDCCHs

  nbrOfAvailableSDCCHs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3321};

C.3.3.22 meanNbrOfBusySDCCHs

  meanNbrOfBusySDCCHs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3322};

C.3.3.23 maxNbrOfBusySDCCHs

  maxNbrOfBusySDCCHs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3323};

C.3.3.24 attSDCCHSeizuresMeetingSDCCHBlockedState

  attSDCCHSeizuresMeetingSDCCHBlockedState **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 3324};

C.3.3.25 allAvailableSDCCHAllocatedTime

allAvailableSDCCHAllocatedTime **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3325};

C.3.3.26 meanSDCCHQueueLength

meanSDCCHQueueLength **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3326};

C.3.3.27 nbrOfLostRadioLinksSDCCH

nbrOfLostRadioLinksSDCCH **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3327};

C.3.3.28 relativeTimeDLPowerControlAtMax

relativeTimeDLPowerControlAtMax **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3328};

C.3.3.29 relativeTimeULPowerControlAtMax

relativeTimeULPowerControlAtMax **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3329};

C.3.3.30 succInternalHDOsIntraCell

succInternalHDOsIntraCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 3330};

C.3.3.31 unsuccInternalHDOsIntraCell

unsuccInternalHDOsIntraCell **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3331};

C.3.3.32 attIncomingInternalInterCellHDOs

attIncomingInternalInterCellHDOs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3332};

C.3.3.33 succIncomingInternalInterCellHDOs

succIncomingInternalInterCellHDOs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3333};

C.3.3.34 attOutgoingInternalInterCellHDOs

attOutgoingInternalInterCellHDOs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3334};

C.3.3.35 succOutgoingInternalInterCellHDOs

succOutgoingInternalInterCellHDOs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3335};

C.3.3.36 unsuccHDOsWithReconnection

unsuccHDOsWithReconnection **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3336};

C.3.3.37 unsuccHDOsWithLossOfConnection

unsuccHDOsWithLossOfConnection **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3337};

C.3.3.38 availablePDCH

availablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3338};

C.3.3.39 meanNbrAvailablePDCH

meanNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3339};

C.3.3.40 maxNbrAvailablePDCH

maxNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3340};

C.3.3.41 minNbrAvailablePDCH

minNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3341};

C.3.3.42 meanNbrOfOccPDCH

meanNbrOfOccPDCH **ATTRIBUTE**

> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3342};

C.3.3.43 maxNbrOfOccPDCH

> maxNbrOfOccPDCH **ATTRIBUTE**
> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3343};

C.3.3.44 minNbrOfOccPDCH

> minNbrOfOccPDCH **ATTRIBUTE**
> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3344};

C.3.3.45 availablePDCHAllocatedTime

> availablePDCHAllocatedTime **ATTRIBUTE**
> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3345};

C.3.3.46 nbrPacketPagingMessagesPCHOnPCCCH

> nbrPacketPagingMessagesPCHOnPCCCH **ATTRIBUTE**
> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3346};

C.3.3.47 meanPPCHPAGCHQueueLengthOnPCCCH

> meanPPCHPAGCHQueueLengthOnPCCCH **ATTRIBUTE**
> **WITH ATTRIBUTE SYNTAX**
>   GSM1204TypeModule.GSMMeasurementType1;
> **BEHAVIOUR**
>   generalMeasurementAttributeBehaviour;
> **REGISTERED AS** {gsm1204attribute 3347};

C.3.3.48 nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH

nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3348};

C.3.3.49 attPCReqAssPerCause

attPCReqAssPerCause **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3349};

C.3.3.50 succPDTCHAssProcsPerCause

succPDTCHAssProcsPerCause **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3350};

C.3.3.51 succPDTCHSeizures

succPDTCHSeizures **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 3351};

C.3.3.52 meanPacketQueueLength

meanPacketQueueLength **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3352};

C.3.3.53 nbrOfServiceChanges

nbrOfServiceChanges **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 3353};

C.3.4 internal HDO Measurement Function Related Attributes

C.3.4.1 attIncomingInternalInterCellHDOsPerOriginatingCell

attIncomingInternalInterCellHDOsPerOriginatingCell **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 341};

C.3.4.2 succIncomingInternalInterCellHDOsPerOriginatingCell

succIncomingInternalInterCellHDOsPerOriginatingCell **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 342};

C.3.4.3 attOutgoingInternalInterCellHDOsPerTargetCell

attOutgoingInternalInterCellHDOsPerTargetCell **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 343};

C.3.4.4 succOutgoingInternalInterCellHDOsPerTargetCell

succOutgoingInternalInterCellHDOsPerTargetCell **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 344};

C.3.5 MSC Measurement Function Related Attributes

C.3.5.1 nbrOfClassMarkUpdates

nbrOfClassMarkUpdates **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 351};

C.3.5.2   attMobileOriginatingCalls

attMobileOriginatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 352};

C.3.5.3   succMobileOriginatingCalls

succMobileOriginatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 353};

C.3.5.4   ansMobileOriginatingCalls

ansMobileOriginatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 354};

C.3.5.5   attMobileTerminatingCalls

attMobileTerminatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 355};

C.3.5.6   succMobileTerminatingCalls

succMobileTerminatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 356};

C.3.5.7   ansMobileTerminatingCalls

ansMobileTerminatingCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
     generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 357};

C.3.5.8   attMobileEmergencyCalls

attMobileEmergencyCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 358};

C.3.5.9   succMobileEmergencyCalls

succMobileEmergencyCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 359};

C.3.5.10 ansMobileEmergencyCalls

ansMobileEmergencyCalls **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3510};

C.3.5.11 attCipheringModeControlProcs

attCipheringModeControlProcs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3511};

C.3.5.12 succCipheringModeControlProcs

succCipheringModeControlProcs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3512};

C.3.5.13 attInterrogationOfHLRsForRouting

attInterrogationOfHLRsForRouting **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3513};

C.3.5.14 succInterrogationOfHLRsMSRNObtained

succInterrogationOfHLRsMSRNObtained **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3514};

C.3.5.15 succInterrogationOfHLRsCallForwarding

succInterrogationOfHLRsCallForwarding **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3515};

C.3.5.16 attOpForMobileOriginatingPointToPointSMs

attOpForMobileOriginatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3516};

C.3.5.17 succOpForMobileOriginatingPointToPointSMs

succOpForMobileOriginatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3517};

C.3.5.18 attOpForMobileTerminatingPointToPointSMs

attOpForMobileTerminatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3518};

C.3.5.19 succOpForMobileTerminatingPointToPointSMs

succOpForMobileTerminatingPointToPointSMs **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3519};

C.3.5.20 nbrOfTransCheckIMEIRequests

nbrOfTransCheckIMEIRequests **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3520};

C.3.5.21 nbrOfWhiteAnsInMSC

nbrOfWhiteAnsInMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3521};

C.3.5.22 nbrOfGreyAnsInMSC

nbrOfGreyAnsInMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3522};

C.3.5.23 nbrOfBlackAnsInMSC

nbrOfBlackAnsInMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3523};

C.3.5.24 nbrOfUnknownIMEIAnsInMSC

nbrOfUnknownIMEIAnsInMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3524};

C.3.5.25 meanTimeToCallSetupService

meanTimeToCallSetupService **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3525};

C.3.5.26 meanTimeToLocationUpdateService

meanTimeToLocationUpdateService **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType2;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3526};

C.3.5.27 transSubIdentifiedWithTMSI

transSubIdentifiedWithTMSI **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3527};

C.3.5.28 transSubIdentifiedWithIMSI

transSubIdentifiedWithIMSI **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3528};

C.3.5.29 attTMSIReallocations

attTMSIReallocations **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3529};

C.3.5.30 succTMSIReallocations

succTMSIReallocations **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 3530};

C.3.5.31 imsiDetachProcs

imsiDetachProcs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3531};

C.3.5.32 imsiAttachProcs

imsiAttachProcs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3532};

C.3.5.33 attIncomingExternalIntraMSCHDOs

attIncomingExternalIntraMSCHDOs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3533};

C.3.5.34 succIncomingExternalIntraMSCHDOs

succIncomingExternalIntraMSCHDOs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3534};

C.3.5.35 attOutgoingExternalIntraMSCHDOs

attOutgoingExternalIntraMSCHDOs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3535};

C.3.5.36 succOutgoingExternalIntraMSCHDOs

succOutgoingExternalIntraMSCHDOs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3536};

C.3.5.37 attIncomingInterMSCHDOs

attIncomingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3537};

C.3.5.38 succIncomingInterMSCHDOs

succIncomingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3538};

C.3.5.39 attOutgoingInterMSCHDOs

attOutgoingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3539};

C.3.5.40 succOutgoingInterMSCHDOs

succOutgoingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3540};

C.3.5.41 attSubsequentInterMSCHDOsMSCa

attSubsequentInterMSCHDOsMSCa **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3541};

C.3.5.42 succSubsequentInterMSCHDOsMSCa

succSubsequentInterMSCHDOsMSCa **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3542};

C.3.5.43 attSubsequentInterMSCHDOsMSCc

attSubsequentInterMSCHDOsMSCc **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3543};

C.3.5.44 succSubsequentInterMSCHDOsMSCc

succSubsequentInterMSCHDOsMSCc **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3544};

C.3.5.45 externalHDOs

externalHDOs **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3545};

C.3.5.46 externalHDOsPerCause

externalHDOsPerCause **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
    BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3546};

C.3.5.47 unsuccExternHDOsWithReconnectionPerMSC

unsuccExternHDOsWithReconnectionPerMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3547};

C.3.5.48 unsuccExternHDOsWithLossOfConnectionPerMSC

unsuccExternHDOsWithLossOfConnectionPerMSC **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3548};

C.3.6 external HDO Measurement Function Related Attributes

C.3.6.1 attIncomingExternalIntraMSCHDOsPerOriginatingCell

attIncomingExternalIntraMSCHDOsPerOriginatingCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 361};

C.3.6.2 succIncomingExternalIntraMSCHDOsPerOriginatingCell

succIncomingExternalIntraMSCHDOsPerOriginatingCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 362};

C.3.6.3 attOutgoingExternalIntraMSCHDOsPerTargetCell

attOutgoingExternalIntraMSCHDOsPerTargetCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 363};

C.3.6.4 succOutgoingExternalIntraMSCHDOsPerTargetCell

succOutgoingExternalIntraMSCHDOsPerTargetCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 364};

C.3.6.5 attIncomingInterMSCHDOsPerOriginatingCell

attIncomingInterMSCHDOsPerOriginatingCell **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX

```
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 365};
```

C.3.6.6   succIncomingInterMSCHDOsPerOriginatingCell

```
succIncomingInterMSCHDOsPerOriginatingCell ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 366};
```

C.3.6.7   attOutgoingInterMSCHDOsPerTargetCell

```
attOutgoingInterMSCHDOsPerTargetCell ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 367};
```

C.3.6.8   succOutgoingInterMSCHDOsPerTargetCell

```
succOutgoingInterMSCHDOsPerTargetCell ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 368};
```

C.3.7 HLR Measurement Function Related Attributes

C.3.7.1   nbrOfCurrentMSsRoamingOutsideHPLMN

```
nbrOfCurrentMSsRoamingOutsideHPLMN ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 371};
```

C.3.7.2   attReqForAuthSetsReceivedByHLRFromVLRs

```
attReqForAuthSetsReceivedByHLRFromVLRs ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 372};
```

C.3.7.3 succReturnedAuthSetsFromHLRToVLRs

succReturnedAuthSetsFromHLRToVLRs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 373};

C.3.7.4 emptyResponsesForAuthSetsFromHLRToVLRs

emptyResponsesForAuthSetsFromHLRToVLRs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 374};

C.3.7.5 attInsertSubDataService

attInsertSubDataService **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 375};

C.3.7.6 succInsertSubDataService

succInsertSubDataService **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 376};

C.3.7.7 attLocationUpdate

attLocationUpdate **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 377};

C.3.7.8 succLocationUpdate

succLocationUpdate **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 378};

C.3.7.9   attSSRelatedOperationsInHLR

attSSRelatedOperationsInHLR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType5;
  BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 379};

C.3.7.10 succSSRelatedOperationsInHLR

succSSRelatedOperationsInHLR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType5;
  BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3710};

C.3.7.11 attReqForSMRoutingInfo

attReqForSMRoutingInfo **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3711};

C.3.7.12 succReqForSMRoutingInfo

succReqForSMRoutingInfo **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3712};

C.3.7.13 attSMDeliveryStatusReportProcs

attSMDeliveryStatusReportProcs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3713};

C.3.7.14 succSMDeliveryStatusReportProcs

succSMDeliveryStatusReportProcs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
    GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
    generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3714};

C.3.7.15 attNbrOfSendAlerts

attNbrOfSendAlerts **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3715};

C.3.7.16 succNbrOfSendAlerts

succNbrOfSendAlerts **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3716};

C.3.7.17 attReqForMSRN

attReqForMSRN **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3717};

C.3.7.18 succReqForMSRN

succReqForMSRN **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3718};

C.3.8 VLR Measurement Function Related Attributes

C.3.8.1 attMSMemoryAvailableNotifications

attMSMemoryAvailableNotifications **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 381};

C.3.8.2   succMSMemoryAvailableNotifications

succMSMemoryAvailableNotifications **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 382};

C.3.8.3   attIdentificationReqToPVLRs

attIdentificationReqToPVLRs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 383};

C.3.8.4   succIdentificationReqToPVLRs

succIdentificationReqToPVLRs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 384};

C.3.8.5   attPageReqs

attPageReqs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 385};

C.3.8.6   succPageReqs

succPageReqs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 386};

C.3.8.7   attPageReqsPerLocationArea

attPageReqsPerLocationArea **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
     GSM1204TypeModule.GSMMeasurementType6;
  BEHAVIOUR
     generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 387};

C.3.8.8   succPageReqsPerLocationArea

succPageReqsPerLocationArea **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType6;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 388};

C.3.8.9   attReqForAuthSetsSentToHLR

attReqForAuthSetsSentToHLR **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 389};

C.3.8.10 succReceivedAuthSetsFromHLR

succReceivedAuthSetsFromHLR **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3810};

C.3.8.11 emptyResponsesForAuthFromHLR

emptyResponsesForAuthFromHLR **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3811};

C.3.8.12 attAuthProcsInVLR

attAuthProcsInVLR **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3812};

C.3.8.13 succAuthProcsInVLR

succAuthProcsInVLR **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3813};

C.3.8.14 attIntraVLRLocationUpdates

attIntraVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3814};

C.3.8.15 succIntraVLRLocationUpdates

succIntraVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3815};

C.3.8.16 attInterVLRLocationUpdates

attInterVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3816};

C.3.8.17 succInterVLRLocationUpdates

succInterVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3817};

C.3.8.18 arrivalOfVisitorsFromOtherPLMNs

arrivalOfVisitorsFromOtherPLMNs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3818};

C.3.9 EIR Measurement Function Related Attributes

C.3.9.1   nbrOfReceivedIMEICheckReqs

nbrOfReceivedIMEICheckReqs **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
   generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 391};

C.3.9.2   nbrOfWhiteAnsInEIR

nbrOfWhiteAnsInEIR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
   generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 392};

C.3.9.3   nbrOfGreyAnsInEIR

nbrOfGreyAnsInEIR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
   generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 393};

C.3.9.4   nbrOfBlackAnsInEIR

nbrOfBlackAnsInEIR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
   generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 394};

C.3.9.5   nbrOfUnknownIMEIAnsInEIR

nbrOfUnknownIMEIAnsInEIR **ATTRIBUTE**
  WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType1;
  BEHAVIOUR
   generalMeasurementAttributeBehaviour;
  REGISTERED AS {gsm1204attribute 395};

C.3.10 SMS Measurement Function Related Attributes

C.3.10.1 attMobileOriginatingSMForwardings

attMobileOriginatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3101};

C.3.10.2 succMobileOriginatingSMForwardings

succMobileOriginatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3102};

C.3.10.3 attMobileTerminatingSMForwardings

attMobileTerminatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3103};

C.3.10.4 succMobileTerminatingSMForwardings

succMobileTerminatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3104};

C.3.10.5 attMobileTerminatingSMForwardingsSgsn

attMobileTerminatingSMForwardingsSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3104};

C.3.10.6 succMobileTerminatingSMForwardingsSgsn

succMobileTerminatingSMForwardingsSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3106};

C.3.11 SGSN Measurement Function Related Attributes

C.3.11.1 nbrLlcFramesSent

nbrLlcFramesSent **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3111};

C.3.11.2 nbrllcFramesReceived

nbrllcFramesReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3112};

C.3.11.3 errLlcFramesDetectedBySgsn

errLlcFramesDetectedBySgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3113};

C.3.11.4 retransmittedLlcFramestoMs

retransmittedLlcFramestoMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3114};

C.3.11.5 uplinkSndcpNpduReceived

uplinkSndcpNpduReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3115};

C.3.11.6 uplinkSndcpOctetReceivedMode

uplinkSndcpOctetReceivedMode **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3116};

C.3.11.7 downlinkSndcpNpdusent

downlinkSndcpNpdusent **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3117};

C.3.11.8 downlinkSndcpOctetSent

downlinkSndcpOctetSent **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3118};

C.3.11.9 attGprsAttach

attGprsAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3119};

C.3.11.10 succGprsAttach

succGprsAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31110};

C.3.11.11 attCombiAttach

attCombiAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 31111};

C.3.11.12   succCombiAttach

succCombiAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31112};

C.3.11.13   attImsiAttach

attImsiAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31113};

C.3.11.14   succImsiAttach

succImsiAttach **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31114};

C.3.11.15   nbrOfAttachedSub

nbrOfAttachedSub **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31115};

C.3.11.16   meanNbrOfAttachedSub

meanNbrOfAttachedSub **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31116};

C.3.11.17   maxNbrOfAttachedSub

maxNbrOfAttachedSub **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31117};

C.3.11.18   attGprsDetachMs

attGprsDetachMs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31118};

C.3.11.19   attCombiDetachMs

attCombiDetachMs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31119};

C.3.11.20   attImsiDetachMs

attImsiDetachMs **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31120};

C.3.11.21   attGprsdetachSgsn

attGprsdetachSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31121};

C.3.11.22   succGprsdetachSgsn

succGprsdetachSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31122};

C.3.11.23   attItraSgsnRaUpdate

attItraSgsnRaUpdate **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31123};

C.3.11.24 succIntraSgsnRaUpdate

succIntraSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31124};

C.3.11.25 attInterSgsnRaUpdate

attInterSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31125};

C.3.11.26 succInterSgsnRaUpdate

succInterSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31126};

C.3.11.27 attPTMSIRealloc

attPTMSIRealloc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31127};

C.3.11.28 succPTMSIrealloc

succPTMSIrealloc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31128};

C.3.11.29   attreqAuthSetsSentToHlrBySgsn

attreqAuthSetsSentToHlrBySgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31129};

C.3.11.30   succReqAuthSetsHlr

SuccReqAuthSetsHlr **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31130};

C.3.11.31   emptyResponsesForAuthSetsFromHlr

emptyResponsesForAuthSetsFromHlr **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31131};

C.3.11.32   attAuthInSgsn

attAuthInSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31132};

C.3.11.33   succAuthInSgsn

succAuthInSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31133};

C.3.11.34   attIdentityReq

attIdentityReq **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 31134};

C.3.11.35 succIdentityReq

succIdentityReq **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31135};

C.3.11.36 attCipheringModeControlPerSgsn

attCipheringModeControlPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31136};

C.3.11.37 succCipheringModeControlPerSgsn

succCipheringModeControlPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31138};

C.3.11.38 nbrOfSubStandby

nbrOfSubStandby **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31138};

C.3.11.39 meanNbrOfSubStandby

meanNbrOfSubStandby **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31139};

C.3.11.40 maxNbrOfSubStandby

maxNbrOfSubStandby **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31140};

C.3.11.41   nbrOfSubReady

nbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31141};

C.3.11.42   meanNbrOfSubReady

meanNbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31142};

C.3.11.43   maxNbrOfSubReady

maxNbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31143};

C.3.11.44   nbrOfCheckIMEIRequests

nbrOfCheckIMEIRequests **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31144};

C.3.11.45   nbrOfWhiteAnswerInSgsn

nbrOfWhiteAnswerInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31145};

C.3.11.46   nbrOfGreyAnswerInSgsn

nbrOfGreyAnswerInSgsn **ATTRIBUTE**

        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31146};

C.3.11.47   nbrOfBlackAnswerInSgsn

    nbrOfBlackAnswerInSgsn **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31147};

C.3.11.48   nbrOfUnknownAnswerInSgsn

    nbrOfUnknownAnswerInSgsn **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31148};

C.3.11.49   attPacketSwitchedPaging

    attPacketSwitchedPaging **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31149};

C.3.11.50   unsuccPacketSwitchedPaging

    unsuccPacketSwitchedPaging **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType1;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31150};

C.3.11.51   attPsPagingPerRoutingArea

    attPsPagingPerRoutingArea **ATTRIBUTE**
        WITH ATTRIBUTE SYNTAX
            GSM1204TypeModule.GSMMeasurementType7;
        BEHAVIOUR
            generalMeasurementAttributeBehaviour;
    REGISTERED AS {gsm1204attribute 31151};

C.3.11.52   unsuccPsPagingPerRoutingArea

unsuccPsPagingPerRoutingArea **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType7;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31152};

C.3.11.53   attActPdpContextMSPerSgsn

attActPdpContextMSPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31153};

C.3.11.54   succActPdpContextMSPerSgsn

succActPdpContextMSPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31154};

C.3.11.55   attActPdpContextDynMSPerSgsn

attActPdpContextDynMSPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31155};

C.3.11.56   succActPdpContextDynMSPerSgsn

succActPdpContextDynMSPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31156};

C.3.11.57   attDeactPdpContextMsPerSgsn

attDeactPdpContextMsPerSgsn **ATTRIBUTE**
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementType1;
    BEHAVIOUR
        generalMeasurementAttributeBehaviour;

REGISTERED AS {gsm1204attribute 31157};

C.3.11.58 succDeactPdpContextMsPerSgsn

succDeactPdpContextMsPerSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31158};

C.3.11.59 attDeactPdpContextGgsnPerSgsn

attDeactPdpContextGgsnPerSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31159};

C.3.11.60 succDeactPdpContextGgsnPerSgsn

succDeactPdpContextGgsnPerSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31160};

C.3.11.61 nbrSubsWithActivePdpInSgsn

nbrSubsWithActivePdpInSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31161};

C.3.11.62 meanSubsWithActivePdpInSgsn

meanSubsWithActivePdpInSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31162};

C.3.11.63 nmaxSubsWithActivePdpInSgsn

nmaxSubsWithActivePdpInSgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31163};

C.3.12 GGSN Measurement Function Related Attributes

C.3.12.1 attActPdpContextPerApnOfGgsn

attActPdpContextPerApnOfGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3121};

C.3.12.2 succActPdpContextPerApnOfGgsn

succActPdpContextPerApnOfGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3122};

C.3.12.3 attActPdpContextDnyPerApnOfGgsn

attActPdpContextDnyPerApnOfGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3123};

C.3.12.4 succActPdpContextDnyPerApnOfGgsn

succActPdpContextDnyPerApnOfGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3124};

C.3.12.5 attDeactPdpContextMsPerApnOfGgsn

attDeactPdpContextMsPerApnOfGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3125};

C.3.12.6 succDeactPdpContextMsPerApnOfGgsn

succDeactPdpContextMsPerApnOfGgsn **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
   GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
   generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3126};

C.3.12.7 attDeactPdpContextByGgsnPerApn

attDeactPdpContextByGgsnPerApn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3127};

C.3.12.8 succDeactPdpContextByGgsnMsPerApn

succDeactPdpContextByGgsnMsPerApn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 3128};

C.3.12.9 nbrOfActivePdpContextsPerApnAtGgsn

nbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType1;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 3129};

C.3.12.10   meanNbrOfActivePdpContextsPerApnAtGgsn

meanNbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 31210};

C.3.12.11   maxNbrOfActivePdpContextsPerApnAtGgsn

maxNbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
   WITH ATTRIBUTE SYNTAX
      GSM1204TypeModule.GSMMeasurementType8;
   BEHAVIOUR
      generalMeasurementAttributeBehaviour;
   REGISTERED AS {gsm1204attribute 31211};

C.4 Name Bindings

C.4.1 BSS Name Binding

C.4.1.1 simpleScanner-bssFunction

```
simpleScanner-bssFunction NAME BINDING
    SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
    NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": bssFunction;
    WITH ATTRIBUTE scannerId;
    CREATE;
    DELETE;

    REGISTERED AS {gsm1204nameBinding 411};
```

C.4.2 BSC Name Binding

C.4.2.1 bscMeasurementFunction-bsc

```
bscMeasurementFunction-bsc NAME BINDING
    SUBORDINATE OBJECT CLASS bscMeasurementFunction;
    NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bsc;
    WITH ATTRIBUTE measurementFunctionId;
    CREATE;
    DELETE;

    REGISTERED AS {gsm1204nameBinding 421};
```

C.4.3 BTS Name Binding

C.4.3.1 cellMeasurementFunction-bts

```
cellMeasurementFunction-bts NAME BINDING
    SUBORDINATE OBJECT CLASS cellMeasurementFunction;
    NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bts;
    WITH ATTRIBUTE measurementFunctionId;
    CREATE;
    DELETE;

    REGISTERED AS {gsm1204nameBinding 431};
```

C.4.3.2 internalHdoMeasurementFunction-bts

```
internalHdoMeasurementFunction-bts NAME BINDING
    SUBORDINATE OBJECT CLASS internalHdoMeasurementFunction;
    NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bts;
    WITH ATTRIBUTE measurementFunctionId;
    CREATE;
    DELETE;
```

REGISTERED AS {gsm1204nameBinding 432};

C.4.4 MSC Name Binding

C.4.4.1   mscMeasurementFunction-mscFunction

mscMeasurementFunction-mscFunction **NAME BINDING**
   SUBORDINATE OBJECT CLASS mscMeasurementFunction;
   NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
   WITH ATTRIBUTE measurementFunctionId;
   CREATE;
   DELETE;

   REGISTERED AS {gsm1204nameBinding 441};

C.4.4.2   externalHdoMeasurementFunction-mscFunction

externalHdoMeasurementFunction-mscFunction **NAME BINDING**
   SUBORDINATE OBJECT CLASS externalHdoMeasurementFunction;
   NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
   WITH ATTRIBUTE measurementFunctionId;
   CREATE;
   DELETE;

   REGISTERED AS {gsm1204nameBinding 442};

C.4.4.3   simpleScanner-mscFunction

simpleScanner mscFunction-**NAME BINDING**
   SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
   NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
   WITH ATTRIBUTE scannerId;
   CREATE;
   DELETE;

   REGISTERED AS {gsm1204nameBinding 443};

C.4.5 HLR Name Binding

C.4.5.1   hlrMeasurementFunction-hlrFunction

hlrMeasurementFunction-hlrFunction **NAME BINDING**
   SUBORDINATE OBJECT CLASS hlrMeasurementFunction;
   NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": hlrFunction;
   WITH ATTRIBUTE measurementFunctionId;
   CREATE;
   DELETE;

   REGISTERED AS {gsm1204nameBinding 451};

C.4.5.2   simpleScanner-hlrFunction

simpleScanner-hlrFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": hlrFunction;
  WITH ATTRIBUTE scannerId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 452};

C.4.6 VLR Name Binding

C.4.6.1   vlrMeasurementFunction-vlrFunction

vlrMeasurementFunction-vlrFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS vlrMeasurementFunction;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
  WITH ATTRIBUTE measurementFunctionId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 461};

C.4.6.2   simpleScanner-vlrFunction

simpleScanner-vlrFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
  WITH ATTRIBUTE scannerId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 462};

C.4.7 EIR Name Binding

C.4.7.1   eirMeasurementFunction-eirFunction

eirMeasurementFunction-eirFunction **NAME BINDING**

  SUBORDINATE OBJECT CLASS eirMeasurementFunction;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": eirFunction;
  WITH ATTRIBUTE measurementFunctionId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 471};

C.4.7.2   simpleScanner-eirFunction

    simpleScanner-eirFunction **NAME BINDING**
        SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
        NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": eirFunction;
        WITH ATTRIBUTE scannerId;
        CREATE;
        DELETE;

        REGISTERED AS {gsm1204nameBinding 472};

C.4.8 SMS Name Binding

C.4.8.1   smsMeasurementFunction-smsGIWFunction

    smsMeasurementFunction-smsGIWFunction **NAME BINDING**
        SUBORDINATE OBJECT CLASS smsMeasurementFunction;
        NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": smsGIWFunction;
        WITH ATTRIBUTE measurementFunctionId;
        CREATE;
        DELETE;

        REGISTERED AS {gsm1204nameBinding 481};

C.4.8.2   simpleScanner-smsGIWFunction

    simpleScanner-smsGIWFunction **NAME BINDING**
        SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
        NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": smsGIWFunction;
        WITH ATTRIBUTE scannerId;
        CREATE;
        DELETE;

        REGISTERED AS {gsm1204nameBinding 482};

C.4.9 SGSN Name Binding

Enter sgsn Name binding to network element function

C.4.9.1   sgsnMeasurementFunction-sgsnFunction

    sgsnMeasurementFunction-sgsnFunction **NAME BINDING**
        SUBORDINATE OBJECT CLASS sgsnMeasurementFunction;
        NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": sgsnFunction;
        WITH ATTRIBUTE measurementFunctionId;
        CREATE;
        DELETE;

        REGISTERED AS {gsm1204nameBinding 491};

C.4.9.2   simpleScanner-sgsnFunction

simpleScanner-sgsnFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": sgsnFunction;
  WITH ATTRIBUTE scannerId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 492};

C.4.10 GGSN Name Binding

Enter ggsn Name binding to network element function

C.4.10.1 ggsnMeasurementFunction-vlrFunction

ggsnMeasurementFunction-ggsnFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS ggsnMeasurementFunction;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
  WITH ATTRIBUTE measurementFunctionId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 4101};

C.4.10.2 simpleScanner-ggsnFunction

simpleScanner-ggsnFunction **NAME BINDING**
  SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
  NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": ggsnFunction;
  WITH ATTRIBUTE scannerId;
  CREATE;
  DELETE;

  REGISTERED AS {gsm1204nameBinding 4102};

C.5   Behaviour Definitions

C.5.1 simple scanner behaviour

The behaviour of the simple scanner is defined in [ISO 10164-13] section 8.1.1.3.

C.5.2 general measurement function behaviour

generalMeasurementFunctionBehaviour **BEHAVIOUR**
  DEFINED AS
    "This object is defined to contain the various optional measurement packages, and
    one or more instances of this class may exist in the scope of the containing object.
    The scanner may scan the attributes of the object class in various combinations and

permutations of packages, and further may scan simultaneously as many times as necessary within the processing limits of the network."
;

C.5.3 general measurement package behaviour

generalMeasurementPackageBehaviour **BEHAVIOUR**
    DEFINED AS
    "Measurement packages are present in the Measurement Function Object (e.g. BSC Measurement Function), if the Network Element Function (e.g. BSC) containing the Measurement Function Object supports the required number of instances of the measurement included in the package according to the number of instances of the Measurement Function. The simple scanner has been designed to read the values of the attributes according to a given schedule."
;

C.5.4 general measurement attribute behaviour

generalMeasurementAttributeBehaviour **BEHAVIOUR**
    DEFINED AS
    "The measurement that corresponds to this attribute, is described in annex B. The name of this attribute is given in the description part (D) of each measurement definition contained in annex B."

    Note: to enable this attribute to be easily located, an index of these attributes is listed at the end of the present document.
;

C.6 Abstract syntax definitions

This clause contains the ASN.1 module defining the attribute, Action and notification syntax's referenced by the attribute, Action and notification templates.

GSM1204TypeModule{
               ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
               gsm-Operation-Maintenance (3)
               gsm-12-04 (4) informationModel (0) asn1Module (2)
               asn1TypeModule (0) }

   DEFINITIONS IMPLICIT TAGS ::=

BEGIN

  IMPORTS
      gsm-12-04
    FROM GSM-DomainDefinitions{
    ccitt (0) identified-organisation (4) etsi (0) mobileDomain (0)
    gsm-Operation-Maintenance (3) gsm-12-30 (30) informationModel (0)
    asn1Module (2) gsm-OM-DomainDefinitions (0) version1 (1)}
 ;

  -- Object Identifiers.

  -- Abstract Syntax

  gsm1204abstractSyntax   OBJECT IDENTIFIER ::= {gsm-12-04 protocolSupport (1)
  abstractSyntax (1)}
  --

```
-- Information Model Related Identifiers
gsm1204informationModel          OBJECT IDENTIFIER ::= {gsm-12-04 informationModel (0)}
gsm1204managedObjectClass        OBJECT IDENTIFIER ::= {gsm1204informationModel
managedObjectClass (3)}
gsm1204package                   OBJECT IDENTIFIER ::= {gsm1204informationModel package (4)}
gsm1204nameBinding               OBJECT IDENTIFIER ::= {gsm1204informationModel nameBinding
(6)}
gsm1204attribute                 OBJECT IDENTIFIER ::= {gsm1204informationModel attribute (7)}

-- Application Contexts
gsm1204ApplicationContext        OBJECT IDENTIFIER ::= {gsm-12-04 protocolSupport (1)
applicationContext (0) gsm-Management (0)}
```

-- The following measurement types are defined.

```
GSMMeasurementType1 ::= INTEGER
GSMMeasurementType2 ::= REAL

GSMMeasurementType3 ::= SET OF SEQUENCE{
                                         cause          Cause,
                                         value          INTEGER }

            Cause ::= INTEGER{

-- CM_SERVICE REJECT causes (GSM 04.08 [2]):

                         imsiUnknownInHlr                              ( 1),
                         illegalMs                                     ( 2),
                         imsiUnknownInVlr                              ( 3),
                         imeiNotAccepted                              ( 4),
                         illegalMe                                     ( 5),
                         plmnNotAllowed                               ( 6),
                         locationAreaNotAllowed                       ( 7),
                         nationalRoamingNotAllowedInLocationArea      ( 8),
                         networkFailure                              ( 9),
                         congestion                                   (10),
                         serviceOptionNotSupported                    (11),
                         requestedServiceOptionNotSubscribed          (12),
                         serviceOptionTemporarilyOutOfOrder           (13),
                         callCannotBeIdentified                       (14),
                         semanticallyIncorrectMessage                 (15),
                         invalidMandatoryInformation                  (16),
                         messageTypeNonExistentOrNotImplemented       (17),
                         messageTypeNotCompatibleWithProtocolState    (18),
                         informationElementNonExistentOrNotImplemented (19),
                         conditionalIeError                           (20),
                         messageNotCompatibleWithProtocolState        (21),
                         protocolError                                (22),
                         reservedRejectCause                          (23),

-- Internal and external Handover causes (GSM 08.08 [5]):

                         uplinkQuality                                (24),
                         uplinkStrength                               (25),
                         downlinkQuality                              (26),
                         downlinkStrenght                             (27),
                         distance                                     (28),
                         betterCell                                   (29),
                         operationAndMaintenanceIntervention          (30),
                         directedRetry                                (31),
```

```
                                              -- valid for external handovers only:
                                              responseToMscInvocation                    (32),

-- Immediate assignment procedure causes (GSM 04.08 [2]):

                                              emergencyCall                              (33),
                                              callReEstablishment                        (34),
                                              answerToPaging                             (35),
                                              originatingCall                            (36),
                                              locationUpdating                           (37),
                                              otherProcedures                            (38),
                                              reservedEstablishmentCause                 (39) }


-- Interference band definitions (GSM 04.08 [2]):

GSMMeasurementType4 ::= SEQUENCE{
                                      channelsPerInterferenceBand1           REAL,
                                      channelsPerInterferenceBand2           REAL,
                                      channelsPerInterferenceBand3           REAL,
                                      channelsPerInterferenceBand4           REAL,
                                      channelsPerInterferenceBand5           REAL }


GSMMeasurementType5 ::= SET OF SEQUENCE{
                                      ssOperation           SSOperation,
                                      value                 INTEGER
                                      }


-- SS operation definitions(GSM 09.02 [7]):

        SSOperation ::= INTEGER{
                                      register                               (0),
                                      erase                                  (1),
                                      activate                               (2),
                                      deactivate                             (3),
                                      registerPassword                       (4),
                                      interrogateSSOperation                 (5),
                                      processRequest                         (6) }

GSMMeasurementType6 ::= SET OF SEQUENCE{
                                      locationAreaCode      LAC,
                                      value                 INTEGER }


LAC                        ::= INTEGER (0..65535)
GSMMeasurementFunctionId   ::= INTEGER


GSMCellName ::= SEQUENCE{
                      cellId                INTEGER(0..65535),
                      locatioAreaCode       LAC }

GSMMeasurementType7 ::= SET OF SEQUENCE{
                                      routingAreaCode       RAC,
                                      value                 INTEGER }


RAC                        ::= INTEGER (0..255)

GSMMeasurementType8 ::= SET OF SEQUENCE{
                                      AccessPoint NameLogicalLinkID APNID,
                                      value                         INTEGER }
```

ETSI

APNID   ::= INTEGER (0..65535)

Editors Note: The APN Logical Link ID, is a numeric value for the assigned to each APN link in the GGSN. The ID is only unique when presented together with thew GGSN address.

END

Annex D (normative):
Data Transfer Requirements

This annex defines the data transfer requirements from the NE to the OS for this specification. This specification makes use of the generic approach to EFD, Log and File transfer facility as defined in GSM 12.00 [8].

D.1 Data Transfer Requirements

D.1.1 General

The GSM 12.04 defines how statistical information concerning various aspects of the NE's can be collected. Once this data is collected and available in the NE, it shall be possible to transfer it to the OS. The way in which this can be achieved is described in GSM 12.00 [8].

GSM 12.00 [8] describes the generic solutions to data transfer requirements which are used by GSM 12.04. This annex describes the additional information required to fully satisfy the data transfer requirements of GSM 12.04, containment of which is described in annex C.

Of the data transfer functions described in GSM 12.00 [8], GSM 12.04 requires the upload function, i.e. OS controlled data transfer from NE to OS.

D.2 Object Model

D.2.1 Managed Object Classes

D.2.1.1 "Recommendation X.721: 1992": log

Object instances of this class are used to store incoming event reports. An instance of this class can be created to store specifically scan report notifications (in form of "scanReportRecords" managed objects). This is achieved by using the discriminator construct and filtering on the event type information.

D.2.1.2 "Recommendation X.738: 1993": scanReportRecord

Objects of this class are used to represent logged information that resulted from Attribute Value Change Notifications and are contained in a 'log' instance.

D.2.2 Name Bindings

D.2.2.1 log-managedElement

log-managedElement **NAME BINDING**

    SUBORDINATE OBJECT CLASS "Recommendation X.721: 1992": log;

      NAMED BY SUPERIOR OBJECT CLASS "Recommendation M.3100: 1992": managedElement;

      WITH ATTRIBUTE "Recommendation X.721: 1992": logId;

    CREATE;

    DELETE;

REGISTERED AS { gsm1204NameBinding 221 };

D.2.2.2   scanReportRecord-log

scanReportRecord-log **NAME BINDING**

>   **SUBORDINATE OBJECT CLASS** "Recommendation X.738: 1993": scanReportRecord;

>>   **NAMED BY SUPERIOR OBJECT CLASS** "Recommendation X.721: 1992": log;

>>   **WITH ATTRIBUTE** "Recommendation X.721: 1992": logRecordId;

>   **DELETE**;

REGISTERED AS { gsm1204NameBinding 222 };

Annex E (informative):
Non Standardised Measurements of Interest to PLMN Management

Following is the template used to describe the measurements contained in this annex.

A. **Description**

A short explanation of the measurement operation.

B. **Collection Method**

The form in which this measurement data is obtained:

- <u>CC</u> (Cumulative Counter).

- <u>GAUGE</u> (dynamic variable), used when data being measured can vary up or down during the period of measurement.

- <u>DER</u> (Discrete Event Registration), when data related to a particular event are captured every nth event is registered, where n can be 1 or larger.

- <u>SI</u> (Status Inspection).

Inception of annex E

The annex E has been created to contain all the measurements that are **NOT** candidates for standardisation, (indication that they have been considered).

At the end of the annex there are also references to the Fixed Network measurements, which have been included for completeness.

NOTE: The measurements in this annex are for information only and as a consequence are **NOT** included in the Object Model (annex C).

E.1 Measurement Related to the BSC

E.1.1 BSC Measurement Function

None.

E.2 Measurement Related to the BTS

E.2.1 BTS Measurement Function

None.

E.2.2 CELL Measurement Function

None.

E.2.3 Internal HDO Measurement Function

None.

E.3 Measurement Related to the MSC

E.3.1 MSC Measurement Function

E.3.1.1 Attempted Mobile to Mobile Calls

A. This measurement provides the number of mobile to mobile call attempts received by the MSC.

B. CC.

E.3.1.2 Successful Mobile to Mobile Calls

A. This measurement provides the number of successful mobile to mobile calls.

B. CC.

E.3.1.3 Answered Mobile to Mobile Calls

A. This measurement counts the number of answered mobile to mobile calls.

B. CC.

E.3.1.4 Attempted Mobile to Land Calls

A. This measurement provides the number of mobile to land call attempts received by the MSC.

B. CC.

E.3.1.5 Successful Mobile to Land Calls

A. This measurement provides the number of successful mobile to land calls.

B. CC.

E.3.1.6 Answered Mobile to Land Calls

A. This measurement provides the number of answered mobile to land calls.

B. CC.

E.3.1.7 Attempted Land to Mobile Calls

A. This measurement provides the number of land to mobile call attempts received by the MSC.

B. CC.

E.3.1.8 Successful Land to Mobile Calls

A. This measurement provides the number of successful land to mobile calls.

B. CC.

E.3.1.9 Answered Land to Mobile Calls

A. This measurement indicates the number of answered land to mobile calls.

B. CC.

E.3.1.10 Mean Holding Time of Calls

A. This measurement provides the mean holding time of calls.

B. CC.

E.3.2 External HDO Measurement Function

None.

E.4 Measurements related to the HLR

E.4.1 HLR Measurement Function

E.4.1.1 Instantaneous number of HLR subscribers

A. This measurement provides a running total of the number of subscribers for whom information is currently held the HLR.

B. SI.

E.4.1.2 Barred subscribers in the HLR

A. This measurement provides the number of barred subscribers in the HLR.

B. SI.

E.4.1.3 Bearer service indication

A. This measurement provides the number of subscribers with the specified bearer service.

B. CC.

E.4.1.4 SS operation indication

A. This measurement provides the number of subscribers with the specified SS operation.

B. CC.

E.4.1.5 Attempted requests for Authentication sets from the AUC by the HLR

A. This measurement counts the number of triplets requested from the AUC by the HLR.

B. CC.

E.4.1.6 Successful returned Authentication sets from the AUC to the HLR

A. This measurement counts the successfully returned triplets from the AUC to the HLR.

B.	CC.

# E.5	Measurements related to the VLR

## E.5.1	VLR Measurement Function

### E.5.1.1	Subscribers from other PLMNs registered in the VLR

A.	This measurement provides the number of subscribers of other PLMNs registered in the VLR.

B.	SI.

### E.5.1.2	Number of roamers in the VLR

A.	This measurement provides the number of roamers which are registered in the VLR.

B.	SI.

# E.6	Measurements related to the EIR

None.

# E.7	Measurements related to the SMS-IWMSC/GMSC

None.

# E.8	Performance Measurements on non-specific GSM Objects

## E.8.1	Measurements related to a PCM system

According to CCITT Recommendation Q.79x.

## E.8.2	Measurements related to MTP

According to CCITT Recommendation Q.79x.

## E.8.3	Measurements related to SCCP and TCAP

According to CCITT Recommendation Q.79x.

## E.8.4	Measurements related to ISUP

According to CCITT Recommendation Q.79x.

E.8.5 Measurements related to Internet Protocols

According to IETF RFC Recommendations.

Annex F (informative):
Index of Measurement Attribute Names

The measurement description (part D of annex B) provides for each measurement the equivalent measurement attribute name. This clause provides an index of all the attribute names which are used in annex B. This index is provided to enable the reader to forward or backward reference, these attributes in annex C.

Measurement Attribute Name: Page

Annex G (informative): Bibliography

This subclause provides references to documents which are not directly referenced by the present document, but nevertheless are useful for back ground information on this subject.

- CCITT Recommendation. E.500 - E.600: "Traffic Engineering".

- CCITT Recommendation M.3010: "Principles for Telecommunications Management Network".

- CCITT Recommendation M.3200: "TMN Management Services: Overview".

- CCITT Recommendation M.3400: "TMN Management Functions".

- CCITT Recommendation M.251: "Maintenance functions to be implemented in CCITT-MML".

- CCITT Recommendation Q.542: "Design objectives - Operations and Maintenance".

- CCITT Recommendation Q.544: "Exchange measurements".

- CCITT Recommendation Q.822: "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".

- CCITT Recommendation Z.336: "Traffic Measurement Administration".

Annex H (informative):
Change history

This annex lists all phase2+ change requests approved for the present document by ETSI SMG.

SMG#	SMG tdoc	SMG6 tdoc	VERS	CR	RV	PH	CAT	SUBJECT	Resulting Version
s30	P-99-665	6-99-053	4.3.1	A001		R98	B	Addition of GPRS meansurements	7.0.0

History

Document history		
V7.0.0	February 2000	Publication