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MOBILE STATION CONFORMITY SPECIFICATIONS

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The parts of this version 3.23.1 of GSM 11.10 contain the following number of pages :

Part:	no. of pages:
front page	2
index	12
part I	15 + 1 blank
part II.1	10
part II.2	6
part II.3	16
part II.4	22
part II.5 (.0)	1 + 1 blank
part II.5.1	1 + 1 blank
part II.5.2	36
part II.5.3 (.0)	1 + 1 blank
part II.5.3.1	2
part II.5.3.2	12
part II.5.3.3	3 + 1 blank
part II.5.3.4	1 + 1 blank
part II.5.3.5	21 + 1 blank
part II.5.3.6	48
part II.5.3.7	30
part II.5.3.8	40
part II.5.3.9	11 + 1 blank
part II.6	29 + 1 blank
part II.7	- (reserved)
part II.8	35 + 1 blank
part II.9	4
part II.10	1 + 1 blank
part II.11	20
part II.12	43 + 1 blank
part II.13	8
part II.14	1 + 1 blank
part II.15	2
part II.16	12
part II.17	1 + 1 blank
part III	26
annex 1	7 + 1 blank
annex 2	4
annex 3	12
annex 4	1 + 1 blank
appendix A	1 + 1 blank
appendix B	4
appendix C	3 + 1 blank
in total	503 + 1 blank

This number does not include GSM 11.40 v.3.7.0 (46 pages).

GSM 11.40 may be inserted after Annex 4.

DETAILED TABLE OF CONTENTS

1 GENERAL

1.1 SCOPE

These are the technical characteristics and methods of measurement for mobile stations, for the Pan European Digital Mobile Radio System standardised by the ETSI Technical Committee "Special Mobile Group" (SMG).

In these specifications, a GSM Mobile Station can be:

- a vehicle mounted station;
- a transportable station;
- a handheld station;
- a vehicle mounted/transportable station;
- a vehicle mounted/handheld station.

These specifications cover the minimum characteristics considered necessary in order to provide sufficient equipment performance for mobile equipment in the GSM system and to prevent interference to other services or to other users, and to GSM PLMNs.

They do not necessarily include all the characteristics which may be required by a user, nor do they necessarily represent the optimum performance achievable.

They apply to the public land mobile radio telephone service in the GSM system, using constant envelope modulation and operating on radio frequencies in the 900 MHz band with a channel separation of 200 kHz and carrying 8 full rate traffic channels or 16 half rate channels per carrier according to the TDMA principle.

1.2 INTRODUCTION

1.2.1 Relation with other GSM recommendations

This specification is part of the GSM-series of recommendations. This specification neither replaces any of the other GSM recommendations , nor is it created to provide full understanding of (parts of) the GSM system. This specification lists the requirements, and provides the methods of testing for use by test houses when testing a GSM Mobile Station for conformance.

For a full description of the GSM system, please refer to all the GSM recommendations which are grouped into 12 different series. A complete list of the GSM recommendations, on which these conformance test specifications are based, is listed in section 1.5.

If it is judged that there is a difference of interpretation between these conformance test specifications, and any other GSM recommendation, then the other GSM recommendation shall prevail.

1.2.2 Terminology on mobile station configurations

According to the GSM definition, a Mobile Station is the complete configuration that is present in a vehicle, and which may take part in the communication. However, this might not be the mobile station as it is offered to a test house for conformance testing. Whilst the definition above includes terminal equipment which is connected to the "mobile termination", such Terminal Equipment (TE) is in general submitted to a separate type approval procedure, on the basis of Rec. T/TE-04-08.

In general, the GSM Mobile Station, as it will be presented to a test house for conformance testing, is the station without all the additional terminal equipment. Such a piece of hardware is also called a Mobile Termination (MT), but in this specification, the expression Mobile Station (MS) is used for any form of the hardware as it is offered to the test house.

Mobile Termination	Interface: S, R, etc..	Terminal Equipment

During the tests, the interfaces of the "MT" will be connected to a "System Simulator" (SS), which will also emulate the TE. For some tests, it may be necessary to establish a pre-configured set-up of the MS. As an example: for reception of automatic fax group 3 to a fax machine on the R-interface, the MS needs configuration information about the presence of such a machine on that interface.

As an alternative, the terminal equipment may be physically integrated.

For a more detailed description of MS-configurations, see GSM 02.06.

1.2.3 Applicability of these specifications

These specifications apply to the unit which includes the hardware to establish a connection across the radio interface.

If a Mobile Station is equipped with a connector, to connect terminal equipment on an S or R interface, then testing of the Mobile Station will include testing of appropriate functioning to and from this connector.

These specifications do not apply to terminal equipment which is to be connected to that connector (which constitutes a public interface), even if it is delivered with the MS.

These specifications do not apply to a MS where the user-interface offers 2-wire or 4-wire PSTN type connection.

1.2.3.1 Application to terminal equipment

If an MS is delivered for conformance testing, and it contains physically integrated terminal equipment, then this specification applies to the complete Mobile Station including that terminal equipment.

These specifications also apply to separate terminal equipment, if it is delivered for conformance testing with the Mobile Station, and it should be connected via a non-public type of interface. The MS is then tested as an MT0. In that case, the specific terminal equipment with which the Mobile Station is tested is documented in the test report.

1.2.4 The System Simulator

In order to bring the MS into operation, it should be necessary to provide the MS with some signals, and the MS's output signals should be analysed. Rather than describing the hardware configuration of the measuring arrangement (and the requirements to it) in each individual test, the part thereof which is contained in the System Simulator (SS) is described in a separate specification GSM 11.40. This System Simulator is a mandatory tool for conformance testing of GSM Mobile Stations.

1.3 DEFINITIONS

Only a limited set of definitions, with special relevance to the MS and to conformance testing are included. Further definitions may be found in GSM 01.04.

GSM Mobile Station (MS) ref: GSM 02.06

Equipment intended to access a set of GSM PLMN telecommunication services. Services may be accessed while the equipment capable of surface movement within the GSM system area is in motion or during halts at unspecified points.

Mobile Termination (MT)

The part of the Mobile Station which terminates the radio transmission to and from the network and adapts terminal equipment (TE) capabilities to those of this radio transmission.

Conformity specification ref: TG 01-01

A document giving a precise and full description of the technical characteristics of the relevant telecommunications terminal equipment (such as safety, technical parameters, functions and procedures and service requirements) together with a precise definition of the tests and test methods enabling the conformity of the equipment with the prescribed technical characteristics to be verified.

Telecommunications terminal equipment ref: TG 01-01

Equipment directly or indirectly connected to public telecommunications networks or for use with public telecommunications services.

1.4 TERMINOLOGY

1.4.1 Abbreviations and Acronyms

Abbreviation	Full Term	Reference GSM
AB	Access Burst	05.02
AC	Access Class (C0 to C15)	02.11
ACCH	Associated Control Channel	
AGCH	Access Grant CHannel	05.02
ARFCN	Absolute Radio Frequency Channel Number	
ARQ	Automatic Request for Retransmission	
ATT (flag)	Attach	
BA	BCCH Allocation	05.08
BCC	BS Colour Code	03.03
BCCH	Broadcast Control Channel	05.02
BCCH_FREQ_NCELL	Frequency of the RF carrier on which the BCCH of a neighbouring cell is transmitted	05.08
BCD	Binary Coded Decimal	
BER	Bit Error Ratio	05.05
BFI	Bad Frame Indication	05.05
Bm	full rate traffic channel	
BN	Bit Number	05.02
BS-AG-BLKS-RES	Number of blocks on each common control channel reserved for access grant messages	05.02
BS-BCCH-SDCCH-COMB	Logical variable that indicates the combination of dedicated and associated control channels on the same physical channel	05.02
BS_PA_MFRMS	Number of multiframes between two transmissions of the same paging message to MSs of the same paging group	05.02
CC	Call Control	04.07
CCH	Control CHannels	05.01
CELL-BAR-ACCESS	Cell Access Barred	
CELL_RESELECT_HYSTERESIS	RXLEV Hysteresis required for Cell Reselection	
CM	Connection Management	04.07
CMD	Command	
COM	Complete	
CONN	Connect	
CRC	(3 bit) Cyclic Redundancy Check	05.05/11.10
DCCH	Dedicated Control Channel	04.08
DET	Detach	
DISC	DISConnect	
DRX	Discontinuous Reception (Mechanism)	
DTE	Data Terminal Equipment	
DTMF	Dual Tone Multi Frequency (signalling)	04.08
DTX	Discontinuous Transmission (Mechanism)	

Abbreviation	Full Term	Reference GSM
Ec/No	Ratio of energy per modulating bit to the noise spectral density	
EMMI	Electrical Man Machine Interface	
FACCH	Fast Associated Control Channel	
FACCH/F	Full rate Fast Associated Control Channel	
FACCH/H	Half rate Fast Associated Control Channel	
FEC	Forward Error Correction	
FER	Frame Erasure Ratio	05.05
FH	Frequency Hopping	05.05
GMSK	Gaussian Minimum Shift Keying (modulation)	
HPU	Hand Portable Unit	
IMEI	International Mobile station Equipment Identity	03.03
IMSI	International Mobile Subscriber Identity	03.03
L1	Layer 1	
L2R	Layer 2 Relay	
L3	Layer 3	04.07
LAC	Location Area Code	03.03
LAI	Location Area Identification	03.03
LAP-Dm	Link Access Protocol on the Dm channel	
Lm	Traffic channel with capacity lower than Bm	
LPLMN	Local PLMN	
LTE	Local Terminal Emulator	
MCC	Mobile Country Code	03.03
MM	Mobility Management	04.07
MMI	Man Machine Interface	
MNC	Mobile Network Code	03.03
MS	GSM Mobile Station	02.06
MS_TXPWR_MAX_CCH	Maximum Allowed Transmitted RF Power for MSs to Access the System until commanded otherwise	
MT	Mobile Termination	
NCC	PLMN Colour Code	03.03
PAD	Packet Assembly/Disassembly facility	
PAGING_GROUP	The set of MSs monitoring a particular paging block	05.02
PCH	Paging CHannel	05.02
PIN	Personal Identification Number	
PLMN	Public Land Mobile Network	
PLMN_PERMITTED	PLMN Permitted for handover purposes	05.08
PSPDN	Packet Switched Public Data Network	
PSTN	Public Switched Telephone Network	
R	Value of Reduction of the MS Transmitted RF Power relative to the maximum allowed output power of the highest power class of MS (A)	

Abbreviation	Full Term	Reference GSM
RA	RAndom mode request information field	
RACH	Random Access CHannel	05.02
RADIO-LINK-TIMEOUT	The timeout period for radio link failure. Maximum value of the radio link timer.	05.08
RADIO_LINK_TIMER	Parameter which is incremented or decremented according to the success with which SACCH messages are decoded	05.08
RAND	RANDom Number (authentication)	
RBER	Residual Bit Error Ratio	05.05
REL	RELease	
REQ	REQuest	
RLP	Radio Link Protocol	
RMS	Root Mean Square (value)	05.05
RTE	Remote Terminal Emulator	
RXLEV	Received Signal Level	05.08
RXLEV_ACCESS_MIN	The minimum received signal level at a MS for access to a cell	05.08
RXLEV_MIN	The minimum received signal level at a MS from a neighbouring cell for handover to be permitted	
RXLEV_NCELL	Received signal level of neighbouring or current serving cell measured on the BCCH carrier	05.08
RXLEV_SERVING_CELL	Received signal level in the serving cell measured on the BCCH carrier	05.08
RXQUAL	Received Signal Quality	05.08
RXQUAL_FULL	Received signal quality assessed over the full set of TDMA frames within a SACCH block	05.08
RXQUAL_SERVING_CELL	Received signal quality of serving cell	05.08
RXQUAL_SUB	Received signal quality assessed over a subset of 12 TDMA frames	05.08
SABM	Set Asynchronous Balanced Mode	
SACCH	Slow Associated Control CHannel	
SACCH/C4	Slow, SDCCH/4 Associated, Control CHannel	
SACCH/C8	Slow, SDCCH/8 Associated, Control CHannel	
SACCH/T	Slow, TCH-Associated, Control CHannel	
SACCH/TF	Slow, TCH/F-Associated, Control CHannel	
SACCH/TH	Slow, TCH/H-associated, Control CHannel	
SAPI	Service Access Point Identifier	04.05
SDCCH	Stand-alone Dedicated Control CHannel	05.02
SDCCH/4	Stand-alone Dedicated Control CHannel/4	
SDCCH/8	Stand-alone Dedicated Control CHannel/8	
SID	Silence Descriptor	05.02

Abbreviation	Full Term	Reference GSM
SIM	Subscriber Identity Module	
SMSCB	Short Message Service Cell Broadcast	05.02
SRES	Signed RESponse (authentication)	
SS	System Simulator	11.40
TA	Terminal Adapter	
TAC	Type Approval Code	
TCH	Traffic CHannel	05.02
TCH/F	Full rate Traffic CHannel	05.02
TCH/FS	Full rate Traffic CHannel for Speech	05.02
TCH/F2.4	Full rate TCH for <=2.4kbit/s user data	05.02
TCH/F4.8	Full rate TCH for 4.8kbit/s user data	05.02
TCH/F9.6	Full rate TCH for 9.6kbit/s user data	05.02
TCH/H	Half rate Traffic CHannel	05.02
TCH/HS	Half rate Traffic CHannel for Speech	05.02
TCH/H2.4	Half rate TCH for <=2.4kbit/s user data	05.02
TCH/H4.8	Half rate TCH for 4.8kbit/s user data	05.02
TE	Terminal Equipment	
Tei	Terminal endpoint identifier	
TI	Transaction Identifier	
TMSI	Temporary Mobile Subscriber Identity	
TN	Timeslot Number	
TXPWR	Transmit power: Tx power level in the MS_TXPWR_REQUEST and MS_TXPWR_CONF parameters	
UI	Unnumbered Information (Frame)	
VAD	Voice Activity Detection	05.03/05.04/ 06.32
V(SD)	SenD state Variable	04.08

1.4.2 Conventions for mathematical notations

Some mathematical terms cannot easily be expressed in ASCII characters. The exceptions used throughout this specification are shown below.

Mathematical signs

The "plus or minus" sign is expressed by "+/-".
The sign "multiplied by" is expressed by "*".
The sign "divided by" is expressed by "/", or the common division bar.

The sign "greater or equal to" is expressed by ">=".
The sign "smaller or equal to" is expressed by "<=".

Roots are expressed by potentials.

Powers to the base 10

Powers to the base 10 are expressed by "10Ex", where x is the potential figure, e.g. 10E-5, 10E6.

1.4.3 Conventions on electrical terms

RF input signal level

In general, the RF input signal level to the MS is expressed in terms of the received field strength E in dBμVemf (assuming a 0 dBi gain antenna). This is related to the power level P in dBm by the following formula (ref. GSM 05.05):

E (dBμV/m) = P (dBm) + 136.5 (valid for a frequency of 925 MHz).

According to section II.4.2.2.3, in all tests in which a handheld MS normally only equipped with an integral antenna is the unit under test, the equivalent input signal level into a temporary test connector is determined from :

$$E_{in} = E_{req} + F$$

where:

E_{in} = input signal level to a temporary antenna connector (dBμVemf);
E_{req} = signal level required by the test (dBμVemf);
F = coupling factor (dB) at the respective ARFCN.

Since F has to be determined by each test house individually, E_{in} cannot be given as a figure in test procedures. If the case of integral antenna is applicable, the input signal level, therefore, is expressed in the test procedures as:

E_{req} dBμVemf( ),

where the empty parenthesis is to be read as E_{in}.

1.4.4 Terms on test conditions

Radio test conditions

The radio propagation conditions refer to multipath propagation models of GSM 05.05.

They are expressed by typical profiles:

static	
rural area	(RA),
hilly terrain	(HT),
urban area	(TU),
or for equalisation test	(EQ).

The non-static profiles are also related to typical speeds of movement of the MS expressed in km/h, e.g. TU3, TU50, HT100, EQ50.

The "ideal radio conditions" for this test specification are defined in Annex 1, Part GC General Conditions, GC3.

Environmental test conditions

The following terms are used with their meaning shown for indication of environmental conditions in this specification (ref. Annex 1, Part TC).

Term:	Meaning:
E.T.C.	extreme test conditions
Hi	high
Lo	low
N.T.C.	normal test conditions
Temp	temperature
Volt	voltage

1.5 LIST OF THE GSM SPECIFICATIONS, ON WHICH THIS TEST SPECIFICATION IS BASED

Number GSM	Version	Title
02.02	3.2.0	Bearer Services Supported by a GSM PLMN
02.03	3.4.0	Teleservices Supported by a GSM PLMN
02.04	3.7.1	Description of Supplementary Services
02.06	3.2.0	Types of Mobile Stations
02.07	3.4.1	Mobile Station Features
02.09	3.1.0	Security Aspects
02.11	3.7.0	Service Accessibility
02.16	3.0.1	International MS Equipment Identities
02.17	3.2.0	Subscriber Identity Modules, Functional Characteristics
02.30	3.9.0	Man-machine Interface of the Mobile Station
02.40	3.2.0	Procedures for Call Progress Indications
02.82	3.6.1	Call Offering Supplementary Services
02.88	3.6.1	Call Restriction Supplementary Services
03.03	3.5.0	Numbering, Addressing and Identification
03.05	3.2.0	Technical performance objectives
03.10	3.3.0	GSM PLMN Connection Types
03.13	3.0.2	Discontinuous Reception (DRX) in the GSM System
03.14	3.0.2	Support of DTMF via the GSM System
03.20	3.3.2	Security-related Network Functions
03.40	3.7.0	Technical Realization Short Message Service Point-to-point
03.41	3.4.0	Technical Realization of Short Message Service Cell Broadcast
03.43	3.0.1	Technical Realization of Videotex
03.44	3.0.1	Support of Teletex in a GSM PLMN
03.45	3.3.0	Technical Realization of Facsimile Group 3 Service - transparent
03.46	3.2.1	Technical Realization of Facsimile Group 3 Service - non transparent
03.50	3.2.2	Transmission Planning Aspects of the Speech Service in the GSM PLMN System
04.01	3.0.1	MS-BSS Interface - General Aspects and Principles
04.02	3.0.2	GSM PLMN Access Reference Configuration
04.03	3.0.3	MS-BSS Interface : Channel Structures and Access Capabilities
04.04	3.3.4	MS-BSS Layer 1 - General Requirements
04.05	3.1.5	MS-BSS Data Link Layer - General Aspects
04.06	3.9.0	MS-BSS Data Link Layer Specification
04.07	3.3.3	Mobile Radio Interface Signalling Layer 3 - General Aspects
04.08	3.13.0	Mobile Radio Interface - Layer 3 Specification
04.10	3.2.3	Mobile Radio Interface Layer 3 - Supplementary Services Specification - General Aspects
04.11	3.3.0	Point-to-point Short Message Service Support on Mobile Radio Interface
04.12	3.2.1	Cell Broadcast Short Message Service Support on Mobile Radio Interface
04.21	3.4.0	Rate Adaptation on MS-BSS Interface
04.22	3.7.0	Radio Link Protocol for Data and Telematic Services on the MS-BSS Interface
04.80	3.2.0	Mobile Radio Interface Layer 3 - SS Specification - Formats and Coding
04.82	3.1.3	Mobile Radio Interface Layer 3 - Call Offering SS Specification
04.88	3.1.3	Mobile Radio Interface Layer 3 - Call Restriction SS Specification
05.01	3.3.2	Physical Layer on the Radio Path (General Description)
05.02	3.6.1	Multiplexing and Multiple Access on the Radio Path
05.03	3.5.1	Channel Coding
05.04	3.1.2	Modulation

05.05	3.15.0	Radio Transmission and Reception
05.08	3.7.0	Radio Subsystem Link Control
05.10	3.5.1	Radio Subsystem Synchronization
06.01	3.0.0	Speech Processing Functions : General Description
06.10	3.2.0	GSM Full Rate Speech Transcoding
06.11	3.0.1	Substitution and Muting of Lost Frames for Full-rate Speech Traffic Channels
06.12	3.0.1	Comfort Noise Aspects for Full Rate Speech Traffic Channels
06.31	3.1.0	Discontinuous Transmission (DTX) for Full Rate Speech Traffic Channels
06.32	3.0.0	Voice Activity Detection
07.01	3.14.0	General on Terminal Adaptation Functions for MSs
07.02	3.8.0	Terminal Adaptation Functions for Services Using Asynchronous Bearer Capabilities
07.03	3.4.0	Terminal Adaptation Functions for Services Using Synchronous Bearer Capabilities
09.02	3.8.0	Mobile Application Part Specification
11.11	3.14.0	Specification of the Internal Logical Organization of the SIM and its Interfaces
11.40	3.6.0	System Simulator Specification (MS conformance test system)

Aspect I: FORMAL PROCEDURES AND GENERAL REQUIREMENTS

I.1 FORMAL PROCEDURES

The administrative procedures that govern:

- the accreditation of test houses,

- the issue and use of certificates of conformity,

- the formal approval procedures,

are referenced directly or indirectly, or specified in

* CEPT Rec. T/R 21-08 relating to type approval procedures and free circulation of GSM Mobile Stations,

* Council Directive 86/361 on the initial stage of the mutual recognition of type approval for telecommunications terminal equipment.

I.2 TESTING AND APPROVAL METHODOLOGY IN GENERAL (L1, L2, L3)

I.2.1 Testing of optional functions and procedures

Conformance shall be tested using the test specified in this specification.

Any function or procedure which is optional, as indicated in this specification, shall be subject to a conformance test if it is implemented in the MS.

The means to determine whether an optional function/procedure has been implemented can be by either apparatus supplier's declaration or as a result of performing the conformance tests on the MS under test. In this respect, the test in II.1, where it is verified that a MS refuses towards the network the support of any service that it can not support is of special interest.

Where no declaration is made by the Apparatus Supplier as to the implementation (or not) of an optional function/procedure, and the conformance test reveals that the option is incorrectly (or partially) implemented, the option shall be deemed to have been implemented and the apparatus shall be tested accordingly.

I.2.2 Access

The user - network interface at Um reference point provides the main test access for the purpose of performing conformance tests. The provision of the following special conformance test facilities is mandatory, where applicable:

- support of special conformance test functions, which are enabled by the insertion of a dedicated Subscriber Identity Module for testing (Test-SIM);

- provision of a Digital Audio Interface (only for MSs which support speech services, or alternate speech/data services).

- for equipment which does not have a permanent external 50 ohm antenna connector, a temporary 50 ohm antenna connector shall be provided in accordance with the requirements of Annex 1 GC7.

- for MS supporting diversity, or for any other reason having more than one RF connector (or temporary connector in the case of an integral antenna MS), the manufacturer shall supply coupling and/or terminating devices so that the tests can be performed via a single transmit/receive RF connection.

Furthermore, provision of an extra special type testing function, the Electrical Man Machine Interface (EMMI), is highly recommended to the manufacturer.

All these special conformance test functions are described in section III.1 of these specifications.

Actions at the user side of the equipment under test (e.g. at the Man-machine Interface, at the S- or R- interface, at the SIM-interface, execution of higher layer processes in the case of data services) shall be used to invoke actions at Layers 1, 2 and 3 of the Dm-channel protocol within the equipment under test.

I.2.3 Different layers

The conformance tests for each layer of the Dm-channel protocol are specified separately and the test configuration(s) to be used in testing each layer is specified in the section of this specification relating to the conformance tests for that layer.

I.2.4 Information to be provided by the Apparatus Supplier

The apparatus supplier shall provide two kinds of information:

- information with respect to the protocol: Protocol Implementation Conformance Statement (PICS);

- information with respect to the Man-machine Interface: Protocol Implementation eXtra Information for Testing (PIXIT).

The complete list of the information to be provided by the apparatus supplier is a matter between the apparatus supplier and the test house but an example of the information to be supplied is given for information in Annex 3 of this specification.

I.3 Applicability of the individual chapters

These test specifications contain a number of chapters in which the test procedures are described. The test procedures which are actually carried out on the MS are determined on the basis of the services which are supported via the MS.

A MS is tested only on aspects related to the services for which it provides network access. For all the other services, for which a MS should not deliver support, the MS must produce a rejection, if any attempt to invoke the MS's support for such a service is made.

For a list of bearer and teleservices, supported by GSM PLMNs, see GSM 02.02 and GSM 02.03.

With the application for conformance testing, the applicant indicates which services are supported by the MS. The MS shall be tested in relation with each service, for which it does not refuse support, and it must pass all the corresponding tests.

Since the current GSM Standard does not support half-rate traffic channels, an MS shall not support these channels, and the tests on half-rate traffic channels are not applicable.

All MSs shall undergo the tests in the following sections:
(The order of the tests is recommended.)

II.2	Transceiver
II.3	Transmitter
II.4	Receiver
II.5	Signalling
II.6	Radio-link management
II.8	MS-SIM interface testing
II.1.2.1	Testing of support and non-support of Services.
II.16	MS features
II.12	Supplementary services
II.17	Test of low battery voltage detection

MSs supporting speech teleservices shall in addition undergo the tests in sections:
(The order of the tests is recommended.)

II.11.1	Transmission characteristics
II.13	Speech transcoding functions.

MSs supporting the short message service shall in addition undergo the tests in sections:

II.11.2	Short message service.

I.4 GENERAL REQUIREMENTS CONCERNING SAFETY OF PEOPLE AND PROTECTION OF THE NETWORK AND TERMINAL

I.4.1 Interference to car management systems

Note: It is considered that if other equipment is hardened to the transmitter's wanted output, then the unwanted emissions will not cause further interference.

I.4.2 Requirements concerning environmental conditions for operation

The Mobile Station shall function correctly under ambient temperatures in the range of -20 to +55 degrees Celsius.

There is no special test to verify this. In some sections of module "Aspect II", tests are being described, which will be carried out under various temperatures within this range.

The Mobile Station shall function correctly, whilst the power supply voltage has any value within a range which is specified in Annex 1, TC2.2, separately for different types of power supply as "extreme test voltages".

There is no special test to verify this. In some sections of module "Aspect II", tests are being described, which will be carried out under various power supply voltages within this range.

Aspect II: NETWORK INTERFACING

II.1 GENERAL TESTS AND PROCEDURES

II.1.1 INTRODUCTION TO VERIFICATION OF SUPPORT FOR SERVICES

Purpose of the verification

The purpose of the verification is threefold:

1) To verify which services are implemented in the MS under test, as declared by the manufacturer in the Protocol Implementation Information according to Annex 3.
2) To verify that the MS, when it receives a mobile terminating call, reacts correctly according to the principles of the single and/or multi numbering scheme as well as for ISDN originated calls.
3) To verify that the MS, when it receives an incompatible mobile terminating call, reacts correctly according to the principles of the multi numbering scheme as well as for ISDN originated calls.

Method of verification

ref: GSM 04.08 Annex B.3.2; GSM 07.01; GSM 09.07

All the possible configuration set-ups of an MS need to be tested with regard to their support for any of the GSM bearer services and teleservices defined in GSM 02.02 and 02.03. These services are reflected during the signalling phase within the GSM PLMN in the GSM Bearer Capability Information Element (BC-IE), LLC and HLC, if applicable. The possible settings of the parameters in the GSM BC-IE, LLC and HLC are shown in GSM 07.01, Annex II.

In the cases of a multi numbering scheme as well as for ISDN originating calls, the SETUP message sent to the MS carries a valid GSM BC-IE (plus the ISDN LLC/HLC, if applicable) of the service under verification, according to Annex II of GSM 07.01. If the MS does not support the offered service it shall

- ignore the call or

- reject the call by responding with a RELEASE COMPLETE message with cause "incompatible destination" or

- apply the re-negotiation option.

Note: covering the conflicting statements currently in GSM 04.08: Annex B.3.2 allows "ignoring", whereas section 5.2.2.2 requests a RELEASE COMPLETE message. However when a call has to be rejected the preferred behaviour is the sending of the RELEASE COMPLETE message.

In case of the single numbering scheme (e.g. PSTN), where for a mobile terminating call no BC-IE is contained in the SETUP message, the expected (pre-set) 3.1 kHz audio ex PLMN related service shall be indicated in the CALL CONFIRMED message by the MS.

For the services which the MS accepts/indicates, the support is deemed to be implemented in the MS. The support for these services shall function correctly and is tested specifically, see part I, I.2.

Configuration set-up and setting of service parameters

An MS is constructed to support a finite number of services. For the support of a particular set of services, a specific configuration set-up of the MS may be required. An example of this would be to create an MS configuration set-up in which one interface at the R reference point is to be dedicated to handling automatic fax group 3 only. In case of single numbering scheme an expected 3.1kHz audio ex PLMN related service is to be pre-set.

The MS may support at its R reference point various DTE/DCE interfaces and Procedures, such as:

- V.21 DTE/DCE interface
- V.22 DTE DCE interface
- V.22 bis DTE DCE interface
- V.23 DTE DCE interface
- V.26 ter DTE DCE interface
- V.32 DTE DCE interface
- X.21 Procedure
- X.21 bis Procedure
- V.25 bis Procedure.

However, the setting of the value of the parameter Modem Type in the BC-IE depends exclusively on the actually required type of modem - bound to the requested user data rate signified in the BC-IE - for the individual connection.

In the case of data services, the setting of the parameter values of the BC-IE as outlined in GSM 07.01, Annex II, falls into 3 categories:

- common to all data and telematic services
- variable according to the individual service and non re-negotiable
- variable, partly related to an individual service, but re-negotiable.

The setting of the variable values is described as a single path through a set of graphs established for each group of services and type of Information Transfer Capability (ITC) (see relationship diagrams in GSM 07.01 Annex II, which indicate the individual graph pertinent to the service group, ITC and condition concerned).

MS responses

CALL CONFIRMED indicates that the MS accepts the incoming call. The configuration of the MS is either compatible to the BC-IE, LLC and HLC, if applicable or will enter the type of service signified by the BC-IE. The MS may also apply the re-negotiation option.

RELEASE COMPLETE (with a cause field) indicates that the MS rejects the incoming call.

No response message from the MS arriving within 15 s at the SS, after having sent the SETUP message, shall be interpreted as if the MS ignores the incoming call but it should be noted that in such a case the preferred behaviour is the sending of the RELEASE COMPLETE message.

II.1.2.1 Verification of support and non-support of services. (Multiple numbering scheme or ISDN)

Purpose of the test:

Ensure that for incoming calls the MS will react in accordance with the manufacturer's declaration for support and non-support of services.

Initial conditions:

For an MS with an external interface the interface shall be setup in such a way that the MS will be able to successfully receive the call for the service in question. The manufacturer must state how this is done in a PIXIT statement. The same applies to features which must be activated by MMI before an incoming call can be accepted.

The generic call set-up procedure shall be implemented in accordance with sections II.1.3 or II.1.4 as applicable up to and including the reception of the CIPHERING MODE COMPLETE message from the MS.

Procedure:

SS: transmit SETUP

Note: The SETUP shall contain a single BC-IE with either speech or one of the possibilities defined in 07.01 Annex I. If applicable to the tested Bearer Service/Teleservice the SETUP contains LLC-IE and HLC-IE.

The test must be performed with a speech BC and with all the possible Bearer Service/Teleservice described in 07.01 Annex II. For negotiable parameters only one value has to be used, and that value must be supported by the MS. Negotiation is not checked here.

Result checking:

Not applicable

Requirement:

One of the following requirements must be met:

1) Expect a RELEASE COMPLETE message with cause value 88 - incompatible destination. The MS is deemed not to support the service.
2) Expect no response within 15 seconds. The MS is deemed not to support the service.
3) Expect a CALL CONFIRMED message. The MS is deemed to support the service.

II.1.2.2 Verification of support of the single numbering scheme

Purpose of Test

Ensure that the MS will send a valid BC in the CALL CONFIRMED message as a response to an incoming call with no BC, LLC, or HLC element.

Initial conditions

If possible, the MS shall be configured to respond with a specified preferred BC, in the CALL CONFIRMED message, in reply to a SETUP message with no BC, LLC, or HLC element. The manufacturer must state how this is done in a PIXIT statement. The same applies to features which must be activated by MMI before an incoming call can be accepted. If the MS can not be configured the test is performed with the MS as supplied.

The generic call set-up procedure shall be implemented in accordance with sections II.1.3 or II.1.4 as applicable up to and including the reception of the CIPHERING MODE COMPLETE message from the MS.

Procedure

SS: transmit SETUP

Note: The SETUP does not contain a BC, LLC, or HLC element.

The test is repeated with the MS configured for all possible preferred Bearer Capabilities, as declared in the PIXIT statement.

Negotiation of parameters is not checked in this test.

Result Checking

Expect a CALL CONFIRMED message

Requirement

The CALL CONFIRMED message shall contain the BC for which the MS is configured, if applicable. Otherwise the BC shall be among those supported by the MS and as declared by the manufacturer.

Where two BCs are contained in the CALL CONFIRMED message, it shall be checked that the combination is allowed, according to GSM 07.01, and that a REPEAT INDICATOR is also included.

II.1.3 Generic call set-up procedures for speech calls

In the test procedures described in this specification, unless otherwise stated in the test description, the call set-up procedure shall be as follows:

Note: In test cases where a fading profile is required, a different and appropriate ARFCN may be selected, for instance if the fading simulator bandwidth does not allow use of the default ARFCN.

a) Mobile terminating call

- The MS shall be operated under normal test conditions (see Annex 1 TC.2.1)

- The special Test-SIM (see section III.1.6) shall be inserted and a MS terminating call shall be established following the steps described in section II.5.3.9.5 "MS terminating call establishment, late assignment" using the parameters of section II.5.3.9.4.2 with the following exceptions:
  - Ideal radio conditions (see Annex 1, GC3).
  - Timing advance set to 0.

b) Mobile originating call

- The MS shall be operated under normal test conditions (see Annex 1 TC.2.1)

- The special Test-SIM (see section III.1.6) shall be inserted and a MS originating call shall be established following the steps described in section II.5.3.9.3 "MS originating call, late assignment" using the parameters of section II.5.3.9.2.2 with the following exceptions:
  - Ideal radio conditions (see Annex 1, GC3).
  - Timing advance set to 0.

II.1.4 Generic Call Set-up/Release procedures for data calls

II.1.4.1 Description of data call set-up/release procedures

In the test procedures, described in this specification, unless otherwise stated in the test description, the call set-up/release procedure shall be as follows:

Note: In test cases where a fading profile is required, a different and appropriate ARFCN may be selected, for instance if the fading simulator bandwidth does not allow use of the default ARFCN.

a) The MS shall be operated under normal test conditions (see Annex 1, TC.2.1).

The MS shall be operated under ideal radio conditions (see Annex 1, GC3) and the timing advance shall be set to zero.

b1) Mobile terminating call (MTC):

The special Test-SIM (see section III.1.6) shall be inserted and a call shall be established following the steps described in section II.5.3.9.4 "MS terminating call, early assignment" using the parameters and method of section II.5.3.9.4.2.

The requirements of section II.5.3.9.4.3 are used.

b2) Mobile originating call (MOC):

The special Test-SIM (see section III.1.6) shall be inserted and a call shall be established following the steps described in section II.5.3.9.3 "MS originating call establishment, late assignment " using the parameters and method of section II.5.3.9.3.2 with the following exceptions:

- In section II.5.3.9.3.2, step b) shall be skipped.

Note: This means that the correct behaviour of the MS is tested in the case where the ALERTING message is not sent. The test for the case where it is sent is performed in II.5.3.9.3.2. Hence both cases are covered.

- In section II.5.3.9.3.2 step d), the words 'after message ALERTING 'shall be replaced by 'after message CALL PROCEEDING'.

II.1.4.2 State Diagram Model for GSM data services testing

General

The diagrams in Figures II.1.4-1 and II.1.4-2 are intended as a simplified model to aid in the description of the tests for GSM data services. It is not intended to replace in any way the state diagrams in other GSM documents defining the various machine states permissible. The definition of these simplified (compound in some cases) states are defined related to the figures.

Note: In step k), of section II.5.3.9.4 "MS terminating call, early assignment", the conversation state shall be replaced by the Data Transfer Phase, see Figures II.1.4-1 and II.1.4-2.

Definition of states in Figure II.1.4-1

IDLE The Mobile Termination (MT) does not have a dedicated channel established to a Base Station and will, in general, be listening to the downlink BCCH.

RR Set-Up The MT has completed the process of establishing the initial Radio Resource, i.e. a dedicated control channel to the network, thus enabling the set-up of the Mobility Management (MM) entity.

MM Set-Up The MT has completed the process of establishing the Mobility Management (MM) entity, thus enabling the set-up of the Call Control (CC) entity.

CC Set-Up The MT has completed the process of establishing the Call Control (CC) entity, thus enabling the establishment of the Data Transfer Phase.

For expansion of this (compound) state see Figure II.1.4-2.

DATA TRANSFER PHASE (T DATA)

This state describes the situation where the MT is transmitting and receiving data to and from the far end user. This state encompasses data services requiring only transparent bearer capabilities.

DATA TRANSFER PHASE (NT DATA)

This state describes the situation where the MT is transmitting and receiving data to and from the far end user. This state encompasses data services requiring only non-transparent bearer capabilities.

DATA TRANSFER PHASE (VOICE)

This state describes the situation where the MT is transmitting and receiving encoded GSM voice data to and from the far end user.

CC Release The MT has completed the process of releasing the Call Control (CC) entity.

MM Release The MT has completed the process of releasing the Mobility Management (MM) entity.

RR Release The MT has completed the process of releasing the Radio Resource.

Definition of states in Figure II.1.4-2

Mobile Originating Call (MOC)

CC procedures perform the Layer 3 functions for a mobile originating call attempt.

Mobile Terminating Call (MTC)

CC procedures perform the Layer 3 functions for a mobile terminating call attempt.

SETUP, MOC CC has sent the SETUP message.

SETUP, MTC CC has received the SETUP message.

CALL PROCEEDING

CC of the MT has received the CALL PROCEEDING message, which contains a BC-IE, if the parameter Connection Element needs to be determined. The radio channel related parameters are still to be determined.

CALL CONFIRMED

CC of the MT has sent the CALL CONFIRMED message, if the MT accepts the call (also when parameter values of the BC-IE are to be re-negotiated). The radio channel related parameters are still to be determined.

TCH Assignment Pending

The TCH has been assigned. The radio channel related parameters are now determined.

Pre-Data Transfer Phase

The Synchronization process and the RLP establishment, respectively, took place, consequently the connection can enter the DATA TRANSFER PHASE (T/NT).

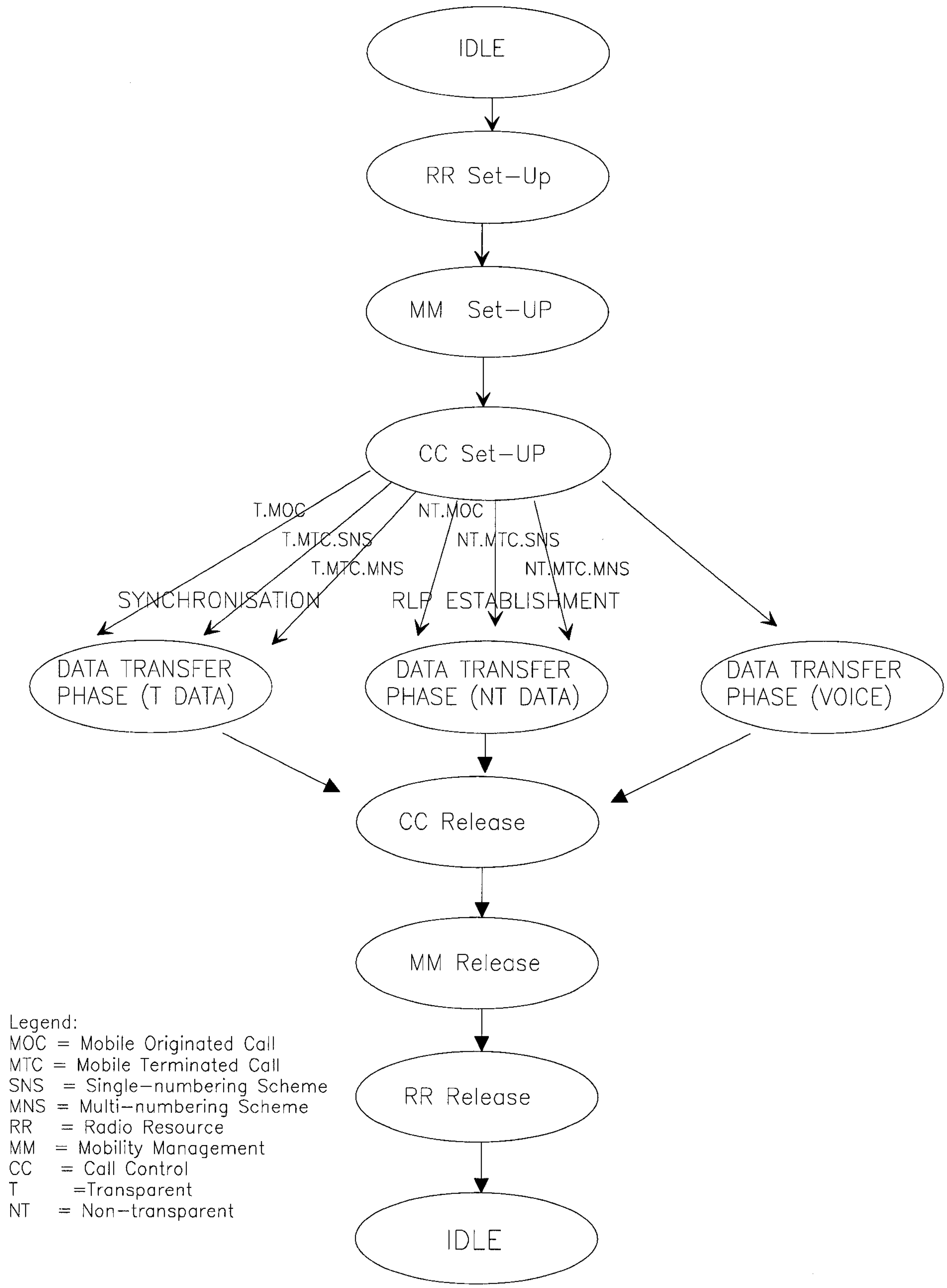


FIGURE II.1.4-1 / GSM 11.10 :

State Diagram Model for Call Set-up / Release for GSM Data Services Testing

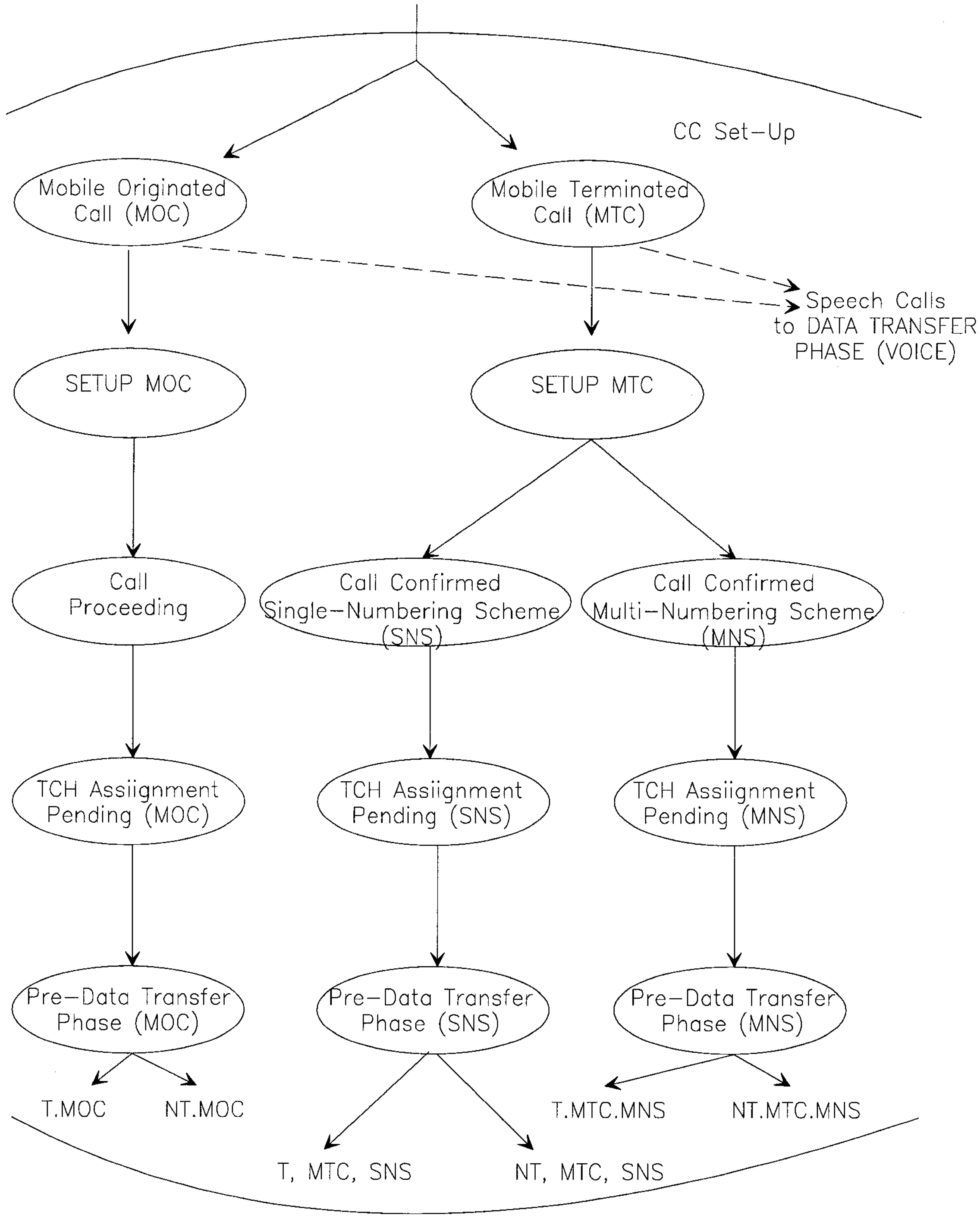


FIGURE II.1.4-2 / GSM 11.10 :

Expansion of Call Control (CC Set-Up) State as seen in Fig. II.1.4-1 above

II.2 THE TRANSCEIVER

Ref. GSM 05.05

General

This section addresses those aspects of a transceiver which are broader than only the transmitter or the receiver. It may be noted that frequency hopping and encryption are not tested explicitly. As many of the measurements on the transceiver are carried out whilst frequency hopping and encryption are active it is expected that these aspects will be tested implicitly to a sufficient degree.

However, the ability to switch to frequency hopping or non-hopping, and the ability to change the encryption key mode setting are specifically verified in other chapters.

A special Test-SIM (section III.1) is required throughout this test procedure, and all test methods assume the functions provided by that SIM are available.

II.2.1 RADIO FREQUENCY ASPECTS

II.2.1.1 Frequency bands

ref: GSM 05.05 section 2

A GSM Mobile Station shall be able to transmit in the frequency band 890 to 915 MHz and receive in the frequency band 935 to 960 MHz.

II.2.1.2 RF Channels and channel numbering

ref: GSM 05.05 section 2

The channel spacing shall be 200 kHz.

A GSM Mobile Station shall be equipped to transmit on each of the RF channels within the transmit band. The nominal centre frequency Fc for each RF channel is given by the following expression:

$Fc = 890 + n * 0.2$ MHz, where n ranges from 1 to 124.

The value n is called the ABSOLUTE RADIO FREQUENCY CHANNEL NUMBER (ARFCN).

A GSM Mobile Station shall be equipped to receive on each of the RF channels within the receive band. The nominal centre frequency for each RF channel is given by the following expression:

$Fc = 935 + n * 0.2$ MHz, where n ranges from 1 to 124.

II.2.1.3 Frequency hopping

Frequency hopping is described in GSM 05.02, section 6.2.

Frequency hopping is an optional feature for the network. For the MS however, this function is mandatory.

The parameters to be used for frequency hopping tests throughout this document are described in Annex 1, Part General Conditions, GC1.

II.2.2 SPURIOUS EMISSIONS

II.2.2.1 Definition

Spurious emissions are emissions at frequencies other than those of the carrier and sidebands associated with normal modulation. The level of these spurious emissions shall be measured as:

(a) Their power level in a specified load.

(b) Their effective radiated power when radiated by the cabinet and structure of the mobile station, including all interconnecting cables.

Note: (b) is also known as "cabinet radiation".

For Mobile Stations having a permanent antenna connector both (a) and (b) shall be measured.

For Mobile Stations with an integral antenna and no permanent means of connecting an external antenna only (b) shall be measured on an unmodified sample using the integral antenna.

For Mobile Stations with an integral antenna and means for connecting an external antenna both (a) and (b) shall be measured at the permanent antenna connector and integral antenna respectively.

II.2.2.2 Method of Measurement (a)

II.2.2.2.1 Mobile Allocated Channel

Spurious emissions shall be measured as the power level of any discrete signal, greater than 6dB below the appropriate limit value, delivered into a 50 ohms load. The transceiver is connected to the System Simulator (SS) and the absolute level of any such emission at the connector of the transceiver is measured.

a) The SS shall originate a call to the MS on a TCH/F in the range ARFCN 60 to 65.

b) The SS shall command the mobile to loop back its channel decoder output to channel encoder input.

c) The SS shall command the MS to operate in encrypted mode, and shall generate Standard Test Signal C1.

d) The MS shall be set to operate at its maximum output power, with DTX off.

e) Measurements are made in the frequency range 100 kHz to 12.75 GHz.

The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to Table II.2.1. The power indication shall be the peak power detected by the measuring system.

f) The test shall be conducted under normal test conditions and under extreme test conditions (Annex 1, TC). For the extreme test conditions, the following combinations shall be applied:

Temp	Hi	Hi	Lo	Lo
Volt	Hi	Lo	Hi	Lo

TABLE II.2.1

Frequency Range	Frequency Offset	Filter Bandwidth	Approx Video Bandwidth
100 kHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
500 MHz to 12.75 GHz Excl. 890 MHz to 915 MHz and 935 MHz to 960 MHz	(see Note) 0 MHz to 10MHz 10 MHz to 20 MHz 20 MHz to 30 MHz > 30 MHz offset from edge of TX band	 100 kHz 300 kHz 1 MHz 3 MHz	 300 kHz 1 MHz 3 MHz 3 MHz
890 MHz to 915 MHz	1.8 MHz to 6.0 MHz > 6.0 MHz offset from carrier	30 kHz 100 kHz	100 kHz 300 kHz

Note: The filter, Video bandwidths and frequency offsets are only correct for measurements on a MS transmitting on an ARFCN in the range 60 to 65.

II.2.2.2.2 MS in Idle Mode

Spurious emissions shall be measured as the power level of any discrete signal, greater than 6dB below the appropriate limit value.

Precondition: The BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used and that page mode is continuously set to Paging Reorganisation and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

a) The MS is connected to the SS.

b) The MS shall be in idle mode, already camped on the serving cell.

c) The absolute level of all spurious emissions at the antenna connector of the MS shall be measured over the frequency range 100 kHz to 12.75 GHz.

The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to Table II.2.2. The power indication shall be the peak power detected by the measuring system.

TABLE II.2.2

Frequency range	Filter Bandwidth	Video Bandwidth
100 kHz to 50 MHz	10 kHz	30 kHz
50 MHz to 12.75 GHz	100 kHz	300 kHz

d) The test shall be conducted under normal test conditions and under extreme test conditions (Annex 1, TC). For the extreme test conditions, the following combinations shall be applied:

Temp	Hi	Hi	Lo	Lo
Volt	Hi	Lo	Hi	Lo

II.2.2.3 Method of Measurement (b)

On an outdoor test site, fulfilling the requirements of GC4 of Annex 1 or in an anechoic shielded chamber (GC5 of Annex 1), the sample shall be placed at the specified height on the support.

Note: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used then additional precautions are necessary to ensure correct measurement. These measures are familiar to test houses which perform spurious emissions tests and are:

a) Raise/lower the test antenna through the specified height range during both the emission detection and substitution parts of the test.

b) Perform a qualitative pre-search in a shielded environment for test sites where the ambient RF environment can prevent the detection of spurious emissions which exceed the limit.

c) Detect emissions at a more sensitive threshold to that specified in II.2.2.3.1 e) to allow for destructive interference due to ground plane reflections at the test antenna search height.

II.2.2.3.1 MS Allocated a Channel

a) The SS shall originate a call to the MS on a TCH/F in the range ARFCN 60 to 65.

b) The SS shall command the MS to loop back its channel decoder output to its channel encoder input.

c) The SS shall command the MS to operate in encrypted mode and shall generate Standard Test Signal C1.

d) The transmitter is set to its maximum power and DTX off.

e) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS shall be detected by the test antenna and receiver in the range 30MHz to 4GHz.

Note: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

f) The test antenna separation is set to the appropriate measurement distance and at each frequency at which an emission has been detected, the MS shall be rotated to obtain maximum response and the effective radiated power of the emission determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

g) The measurements shall be repeated with the test antenna in the orthogonal polarisation plane.

h) The measurement bandwidth, based on a 5 pole synchronously tuned filter, shall be according to Table II.2.3.

i) The power indication shall be the peak power detected by the measuring system.

j) The test shall be conducted under normal test conditions and under extreme voltage test conditions (see Annex 1, TC).

TABLE II.2.3

Frequency Range	Frequency Offset	Filter Bandwidth	Approx Video Bandwidth
30 MHz to 50 MHz	-	10 kHz	30 kHz
50 MHz to 500 MHz	-	100 kHz	300 kHz
500 MHz to 1 GHz Excl. 890 MHz to 915 MHz	(see Note) 0 MHz to 10 MHz 10 MHz to 20 MHz 20 MHz to 30 MHz > 30 MHz offset from edge of TX band	 100 kHz 300 kHz 1 MHz 3 MHz	 300 kHz 1 MHz 3 MHz 3 MHz
890 MHz to 915 MHz	1.8 MHz to 6.0 MHz > 6.0 MHz offset from carrier	30 kHz 100 kHz	100 kHz 300 kHz
1 GHz to 4 GHz	-	1 MHz	3 MHz

Note: The Filter, Video bandwidths and frequency offsets are only correct for measurements on an MS transmitting on an ARFCN in the range 60 to 65.

II.2.2.3.2 MS in Idle Mode

Precondition: The MS shall be in idle mode, already camped on the serving cell. The BCCH message content from the serving cell shall ensure that Periodic Location Updating is not used and that page mode is continuously set to Paging Reorganisation and BS_AG_BLKS_RES is set to 0 so that the MS receiver will operate continually.

a) Initially the test antenna is closely coupled to the MS and any spurious emission radiated by the MS shall be detected by the test antenna and receiver in the range 30MHz to 4GHz.

Note: This is a qualitative step to identify the frequency and presence of spurious emissions which are to be measured in subsequent steps.

b) The test antenna separation is set to the appropriate measurement distance and at each frequency at which a spurious emission has been detected the MS shall be rotated to obtain a maximum response. The effective radiated power of the emission shall be determined by a substitution measurement. In case of an anechoic shielded chamber pre-calibration may be used instead of a substitution measurement.

The measurement bandwidth based on a 5 pole synchronously tuned filter shall be according to Table II.2.4. The power indication shall be the peak power detected by the measuring system.

TABLE II.2.4

Frequency range	Filter Bandwidth	Video Bandwidth
30 MHz to 50 MHz	10 kHz	30 kHz
50 MHz to 4 GHz	100 kHz	300 kHz

c) The measurements shall be repeated with the test antenna in the orthogonal polarisation plane.

d) The power indication shall be the peak power detected by the measuring system.

e) The test shall be conducted under normal test conditions and under extreme voltage test conditions (see Annex 1, TC).

II.2.2.4 Requirements

The power of any spurious emission shall not exceed the values given below:

	100 kHz to 1 GHz	1 GHz to 12.75 GHz
Tx operating	-36 dBm (0.25 microwatt)	-30 dBm (1 microwatt)
IDLE-mode	-57 dBm (2 nanowatt)	-47 dBm (20 nanowatt)

Note: For the filter bandwidths quoted in the test method some difficulties may be experienced with noise floor above required measurement limit. This will depend on the gain of the test antenna and adjustment of the measuring system bandwidth is permissible when carrying out method (b). Alternatively, for test frequencies above 900 MHz, the test antenna separation from the MS may be reduced to 1 metre.

II.3 TRANSMITTER

Ref GSM 05.05

II.3.1 PHASE ERROR AND FREQUENCY ERROR

The GSM radio subsystem uses a GMSK modulation system with an equivalent pre modulation gaussian filter having a bandwidth defined by B * T = 0.3, where B is the filter bandwidth and T is the modulation symbol time.

In order to measure the accuracy of the modulation process a sampled measurement of the transmitted phase trajectory is obtained. This is compared with the theoretically expected phase trajectory. The regression line of the difference between the expected trajectory and the measured trajectory is an indication of the frequency error, whilst the departure of the phase differences from this trajectory is a measure of the phase error.

II.3.1.1 Method of Measurement

a) The MS is connected to the SS. This connection will be to the permanent antenna connector for a MS which is equipped with one or shall use a modified sample fitted with a temporary antenna connector, as defined in Annex 1 GC7, for a MS with an integral antenna and not normally having means of connecting an external antenna.

b) The SS shall originate a call to the MS and the MS shall be made to answer the call. The SS shall command the MS to hopping mode. The hopping bandwidth shall be according to GC1 of Annex 1. The SS shall activate ciphering mode.

Note: Ciphering mode is active during that test to give a pseudo-random bitstream to the modulator.

c) The SS shall command the MS to complete the traffic channel loop back (channel decoder output to channel encoder input). The SS shall generate Standard Test Signal C1.

d) For each transmitted burst, the receiving section of the SS shall capture the signal as a series of phase samples over the period of the burst. These samples shall be evenly distributed over the duration of the burst with a minimum sampling rate of 2/T, where T is the modulation symbol period. The received phase trajectory is then represented by this array of at least 294 samples.

e) The SS must then calculate, from the known bit pattern and the formal definition of the modulator contained in GSM 05.04, the expected phase trajectory.

f) From d) and e) the phase trajectory error is calculated, and a linear regression line plotted through this phase trajectory error. The slope of this regression line is the frequency error of the mobile transmitter relative to the simulator reference. The difference between the regression line and the individual sample points is the phase error of that point.

f.1) The sampled array of at least 294 phase measurements is represented by the vector $\phi_m = \phi_m(0)\ldots\phi_m(n)$, where the number of samples in the array n+1 >= 294.

f.2) The calculated array, at the corresponding sampling instants, is represented by the vector $\phi_c = \phi_c(0)\ldots\phi_c(n)$.

f.3) The error array is represented by the vector:

$$\phi_e = \{\phi_m(0) - \phi_c(0)\}\ldots\ldots\ldots\{\phi_m(n) - \phi_c(n)\} = \phi_e(0)\ldots\phi_e(n).$$

f.4) The corresponding sample numbers form a vector t = t(0)...t(n).

f.5) Plot a scattergram with the abscissa represented by the linear values of the vector t and the ordinate by the corresponding value of ϕ_e.

f.6) This scattergram can now be considered as a graph of the equation $\phi_e = k * t$, and by regression theory:

$$k = \frac{\sum_{j=0}^{j=n} t(j) * \phi_e(j)}{\sum_{j=0}^{j=n} t(j)^2}$$

f.7) The frequency error is given by $k/(360 * \tau)$, where τ is the sampling interval in seconds and all phase samples are measured in degrees.

f.8) The individual phase errors from the regression line are given by $\phi_e(j) - k*t(j)$.

f.9) The RMS value ϕ_E of the phase errors is given by:

$$\phi_E(\mathrm{RMS}) = \left[\frac{\sum_{j=0}^{j=n} \{\phi_e(j) - k*t(j)\}^2}{n+1} \right]^{1/2}$$

g) Steps d) to f) shall be repeated for 20 bursts, not necessarily contiguous.

h) The SS shall instruct the MS to its maximum power level, all other conditions remaining constant. Steps d) to g) shall be repeated.

i) The SS shall instruct the MS to power level 15, all other conditions remaining constant. Steps d) to g) shall be repeated.

j) The MS shall be hard mounted on a vibration table and vibrated at the frequency/amplitudes specified in Annex 1, TC4.

During the vibration steps a) to i) shall be repeated.

Note: If the MS does not have an antenna connector, then the MS and coupling device will need to be mounted together onto the vibration table and the test performed under vibration.

k) The MS shall be repositioned on the vibration table in the two orthogonal planes to the plane used in step j). For each of the orthogonal planes step j) shall be repeated.

l) The MS is placed in a climatic test chamber and steps d) to i) are repeated for the following combinations of extreme test voltages and ambient temperatures (see Annex 1, TC2.2 and TC3):

Temp	Hi	Hi	Lo	Lo
Voltage	Lo	Hi	Lo	Hi

Note: The series of samples taken to determine the phase trajectory could also be used, with different post-processing, to determine the transmitter burst characteristics of II.3.3. Although described independently, it is at the discretion of the test house whether to combine the tests of II.3.1 and II.3.3, giving both answers from single sets of captured data.

II.3.1.2 Limits

II.3.1.2.1 Frequency Error

The frequency error, derived in step f.7), for all measured bursts shall be less than 10E-7.

II.3.1.2.2 Phase Error

For every burst, the RMS phase error from step f.9) shall be less than 5 degrees. An individual phase error from step f.8) shall not exceed 20 degrees.

II.3.2 FREQUENCY ERROR UNDER MULTIPATH AND INTERFERENCE CONDITIONS

Ref. GSM 05.10 section 6

The Mobile Station is required to maintain frequency synchronization with the received signal under conditions of Doppler shift, multipath reception and interference.

By using the techniques of section II.3.1 this section checks the correct functioning of this feature under various conditions.

Note 1: GSM 05.10 requires that frequency synchronization should be maintained for input signals 3 dB below reference sensitivity. Due to the Radio Link Failure counter this test condition can not be established. Hence all tests in this section are conducted at reference sensitivity level, for normal bursts.

Note 2: For call set-up the BCCH/TCH levels are set to 20 dBμVemf( ) to enable the mobile station to acquire synchronisation.

II.3.2.1 Method of Measurement

a) Set up call on a traffic channel in the range ARFCN 60 to 65 with the SS fading function set to RA250 and an MS input level of 20 dBμVemf( ) on the serving cell BCCH. The SS shall capture the first transmission burst from the MS during call establishment.

The SS shall also set up six adjacent cell BCCHs having signal levels in the range 14 dBμVemf( ) to 60 dBμVemf( ). The exact level and ARFCN of each signal is not critical, but some simple rules need to be observed:

- No adjacent cell BCCH shall be set on ARFCN close to the serving cell BCCH or TCH (e.g. five channels separated) if it is set to maximum level.

- Of the six adjacent cell BCCHs, two shall be located near the band edges.

The amplitude and ARFCN of all six could with benefit be varied continuously throughout the test, but observing the simple rules given here.

b) The SS shall set the serving cell BCCH and TCH to 11 dBμVemf( ) for handheld MSs and 9 dBμVemf( ) for all other MSs. Wait 30 seconds for the MS to stabilize to these conditions.

c) The SS shall capture subsequent bursts from the traffic channel in the manner described in II.3.1.1. Throughout the test the SS shall monitor the status message from the MS to verify that the adjacent cell BCCHs are being correctly measured by the MS.

d) Due to the very low signal level at the MS receiver input the MS receiver is liable to error.

The "looped back" bits are therefore also liable to error, and hence the SS does not know the expected bit sequence.

From the received burst from the MS transmitter the SS must demodulate the signal to derive (error free) the transmitter burst bit pattern. Using this bit pattern the SS can calculate the expected phase trajectory according to the definition within GSM 05.04.

e) From a), c) and d) the phase error trajectory is determined and the regression line calculated. This regression line is used to determine the frequency error for the single burst.

f) Steps c) to e) are repeated for 5 traffic channel bursts spaced over a period of not less than 20 seconds.

g) The SS shall release the call, The SS increases the level of the serving cell BCCH to 20 dBμVemf( ) and sets up a call on the traffic channel with an MS input level of 20 dBμVemf( ), with the fading function set to HT100. The SS shall capture the first transmitted burst from the MS during call establishment.

h) Repeat steps b) to f).

i) The SS shall release the call. The SS increases the level of the serving cell BCCH to 20 dBμVemf( ) and sets up a call on the traffic channel with an MS input level of 20 dBμVemf( ), with the fading function set to TU50. The SS shall capture the first transmitted burst from the MS during call establishment.

j) Repeat steps b) to f).

k) The SS shall release the call. The SS increases the level of the serving cell BCCH to 28 dBμVemf( ), with the fading function set to TU3.

The SS sets up a call on the traffic channel with an MS input level of 28 dBμVemf( ), with the SS fading function set at TU3. The SS shall capture the first transmitted burst from the MS during call establishment.

l) The SS shall now apply to the MS two interfering signals on the same nominal frequency as the serving cell BCCH and the traffic channels. These interfering signals shall be at a level of 18 dBμVemf( ), via a fading function set to TU3 and shall be modulated with random data, including the midamble period.

m) Wait 100 seconds for the MS to stabilize to these conditions.

n) Repeat steps c) to f), except that at step f) the measurement period must be extended to 200 seconds and the number of measurements increased to 20.

o) Steps a) to n) are repeated for ARFCN of 1 to 5 and 120 to 124.

p) Repeat steps i) and j) for the combinations of extreme voltage and temperature (see Annex 1, TC2.2 and TC3) shown below:

Temp.	Hi	Hi	Lo	Lo
Volt.	Lo	Hi	Lo	Hi

II.3.2.2 Limits

For all test conditions specified in II.3.2.1 the frequency error, with reference to the SS carrier frequency, for every burst shall be less than the values shown in the table below.

Propagation Condition	Permitted Frequency Error
RA250	+/- 300 Hz
HT100	+/- 180 Hz
TU50	+/- 160 Hz
TU3	+/- 230 Hz

II.3.3 PEAK TRANSMITTER CARRIER POWER AND BURST TIMING

ref: GSM 05.05 section 4.1 and 05.08 section 4

II.3.3.1 Definition

The transmitter carrier power is the power delivered to an artificial antenna or radiated by the MS and its integral antenna.

The peak transmitter carrier power is the average value of the transmitter carrier power over the time that the useful information bits of one burst are transmitted.

The peak received transmitter carrier power is the peak transmitter carrier power, attenuated by propagation and as received by the SS during measurements on equipment with an integral antenna.

The peak transmitter carrier power is defined for each power control level at which a MS may operate.

The power class (the class of maximum peak transmitter carrier power) shall be stated by the manufacturer.

The power control level is a parameter which indicates a specific value for the peak transmitter carrier power.

The transmit burst under reference conditions should be timed to occur 3 burst periods (Timing Advance = 0) after the corresponding received burst. The timings are referenced to the transition from bit 13 to bit 14 of the Training Sequence ("midamble") before differential decoding.

Note: Within the current standard, also an ME implementation with a deviation of the burst by 1/2 bit prior to the defined timing reference is acceptable. In this case the manufacturer has to notify the test house. For type testing to the current standard, this is taken into account by considering the uncertainty margins within the SS as if extended in front of the raising and the falling edge each by 1/2 bit (1.84 μs) as shown in Figure App.3-1 of GSM 11.40, Appendix 3. In case of such an ME failing the test, the test house will have to revise the test result of the SS to assess the appropriate verdict to be given in the Test Report.

II.3.3.2 Methods of measurement

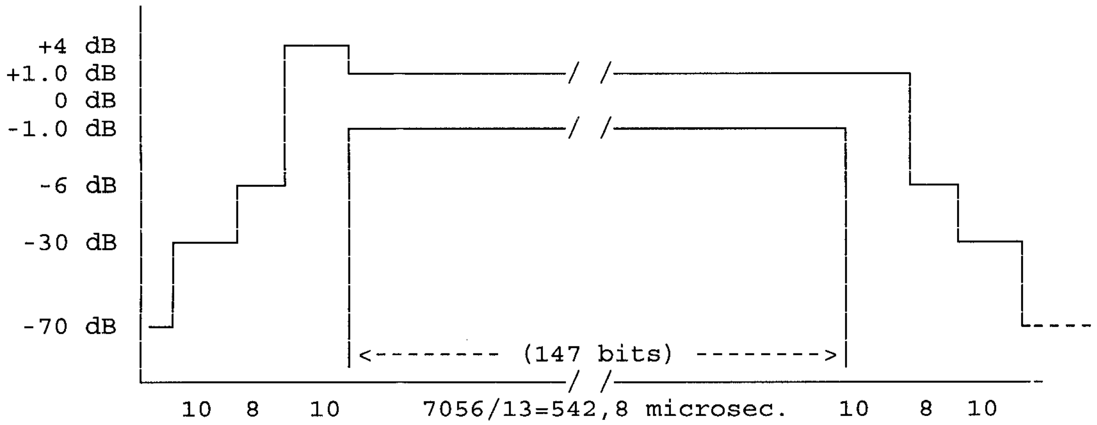
Two methods of measurement are described, separately for:

1) equipment fitted with a permanent antenna connector and for

2) equipment fitted with an integral antenna, and which cannot be connected to an external antenna except by the fitting of a temporary test connector as a test fixture.

II.3.3.2.1 Method of measurement for equipment with an antenna connector

a) The MS shall be connected to the SS. A call shall be originated by the SS to the MS and answered by the MS. The call shall be on a radio frequency in the range 60 to 65 (ARFCN), power control level set to Max power and timing advance 0.



For a transmitter carrier power lower than 34 dBm, where the level of -70 dB is lower than -36 dBm, the -70 dB shall be replaced by a value which is equivalent to -36 dBm.

Figure II.3.3 : Power/Time Template

b) Measure Peak Transmitter Carrier Power

Using a sampling power measurement method with a sampling rate of at least 2/T, where T is bit duration, capture a representation of the MS transmit burst's amplitude and timing. From the array of samples the SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference. This enables the peak transmitted carrier power over the 147 useful bits to be calculated and used as the 0 dB reference.

c) Measure Burst Timing

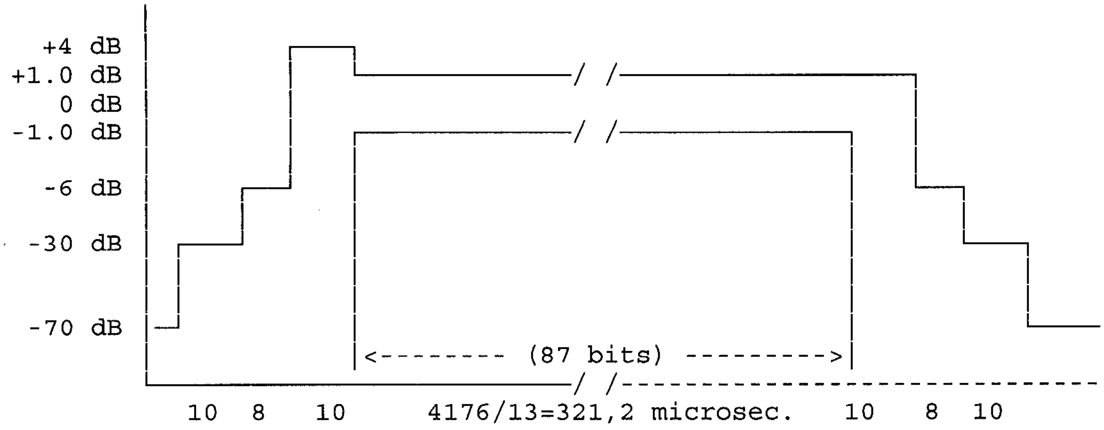
The transition point identified in b) above is referred to the corresponding transition in the MS received burst.

d) Match Power/Time Template

The array of power samples shall be tested for a fit within the template of Figure II.3.3. The centre of the template must be centred on the measured transition from bit 13 to bit 14 of the midamble of the measured burst.

e) The SS shall then command the MS to each of the 16 power control levels (see Table II.3.3) and steps b) to d) shall be repeated.

f) The SS shall command the MS to the maximum power control level and steps b) to d) shall be repeated for ARFCN in the ranges 1 to 5, 30 to 35, 90 to 95 and 120 to 124.



For a transmitter carrier power lower than 34 dBm, where the level of -70 dB is lower than -36 dBm, the -70 dB shall be replaced by a value which is equivalent to -36 dBm.

Figure II.3.4 : Power/Time Template for Access Burst

g) The SS shall cause the MS to generate an Access Burst on an ARFCN in the range 60 to 65. The SS shall capture this burst as described in b) above. However, in this case the SS needs to locate the centre of the useful bits of the burst by identifying the transition from the last bit of the sync sequence. The centre of the burst, as the timing reference, is then five data bits prior to this point.

h) Determine the peak transmitted carrier power of the useful 87 bits of the burst, the 87 bits being symmetrically disposed about the centre point derived in g). This gives the 0 dB reference.

i) Determine the time of the centre point derived in g) with respect to the MS received data on the common control channel.

j) The captured burst shall fit the template of Figure II.3.4 with the centre of the template horizontal axis located on the centre located in g) above.

k) The SS shall modify the control data on the serving cell BCCH in order to limit the MS transmit power on the Access burst to power level 10 (+23 dBm). Steps g) to j) shall be repeated.

l) Steps a) to k) shall be repeated for the following combinations of extreme test conditions (see Annex 1, TC2.2 and TC3) except that for step e) only power control levels 10 and 15 shall be tested:

Temp.	Hi	Hi	Lo	Lo
Volt.	Lo	Hi	Lo	Hi

II.3.3.2.2 Method of measurement for equipment with an integral antenna

Note: If the MS is equipped with a permanent connector, such that the antenna can be disconnected and the SS be connected directly, then the method of section II.3.3.2.1 shall be applied.

The tests in this section shall be performed on an unmodified test sample.

The MS shall be in the anechoic shielded chamber (Annex 1, GC5) or on the outdoor test site, on an isolated support, in the position for normal use.

A test antenna, connected to the SS, shall be in the anechoic shielded chamber or on the test site, at a distance of at least 3 metres from the MS.

Note: The test method described has been written for measurement in an anechoic shielded chamber. If an outdoor test site is used, then it is additionally necessary to raise/lower the test antenna through the specified height range to maximize the received power levels from both the test sample and the substitution antenna.

a) A call shall be originated by the SS to the MS and the MS shall be made to answer the call. The call shall be on an ARFCN, in the range 60 to 65, power control level set at MS maximum power, and timing advance 0.

b) Measure Peak Received Transmitter Carrier Power

Using a sampling power measurement method with a sampling rate of at least 2/T, where T is bit duration, capture a representation of the MS transmit burst's amplitude and timing. From the array of samples the SS identifies the centre of the useful 147 transmitted bits, i.e. the transition from bit 13 to bit 14 of the midamble, as the timing reference. This enables the peak received transmitter carrier power over the 147 useful bits to be calculated and used as the 0 dB reference.

c) Match Power/Time Template

The array of power samples shall be tested for a fit within the template of Figure II.3.3. The centre of the template must be centred on the measured transition from bit 13 to bit 14 of the midamble of the measured burst.

d) Measure Burst Timing

The transition point identified in b) above is referred to the corresponding transition in the MS received burst.

e) The SS shall then command the MS to each of the 16 power control levels (see Table II.3.3) and steps b) to d) shall be repeated.

f) The SS shall command the MS to the maximum power control level and steps b) to d) shall be repeated for ARFCN in the ranges 1 to 5, 30 to 35, 90 to 95 and 120 to 124.

g) The SS shall cause the MS to generate an access burst on an ARFCN in the range 60 to 65. The SS shall capture this burst as described in b) above. However, in this case the SS needs to locate the centre of the useful bits of the burst by identifying the transition from the last bit of the sync sequence. The centre of the burst, as the timing reference, is then five data bits prior to this point.

h) Determine the peak received transmitter carrier power of the useful 87 bits of the burst, the 87 bits being symmetrically disposed about the centre point derived in g). This gives the 0 dB reference.

i) The captured burst shall fit the template of Figure II.3.4 with the centre of the template horizontal axis located on the centre located in g) above.

j) Determine the time of the centre point derived in g) with respect to the MS received data on the common control channel.

k) The SS shall modify the control data on the serving cell BCCH in order to limit the transmit power on the Access Burst to power control level 10 (+23dBm). Steps g) to j) shall be repeated.

l) The MS shall be rotated by n*45 degrees for all values of n in the range 1 to 7. At each rotation step b) shall be repeated for all channels of steps f) and a) at the maximum power control level.

m) The MS shall be replaced by a half-wave dipole, resonating at the centre frequency of the transmit band (902.5 MHz), connected to an RF generator.

n) The output power of the RF generator shall be adjusted to reproduce the peak received transmitter powers recorded in steps e) (maximum power control level), f) and l). For each indication the power, delivered by the generator (in Watts) to the half-wave dipole, shall be recorded. These values shall be ordered in a matrix where the columns of the matrix represent the eight orientations of the MS and the rows of the matrix represent the 5 channels specified in steps a) and f). Record values in the form Pnc, where n = MS rotation and c = channel number.

For each channel number used compute:

$$\text{Pac (Watts into dipole)} = \frac{1}{8} * \sum_{n=0}^{n=7} \text{Pnc}$$

from which: Pac (Tx dBm) = $10\log_{10}(\text{Pac}) + 30 + 2.15$

o) The difference for each of the five channels between the actual peak transmitter carrier power level averaged over the 8 measurement orientations determined in step n), and the relative peak transmitter carrier power level for the maximum power control level derived in steps e) and f), is used to relate the relative measurement results of steps e), f), g) and k) to actual peak transmitter carrier powers for all measured power control levels, which can be checked against the requirements of Table II.3.3.

Note: The next steps are to determine the peak transmitter carrier power under extreme test conditions. Basically the procedure is such that:
- the power/time template is tested in the "normal" way,
- the radiated power is measured by measuring the difference with respect to the radiation under normal test conditions.

p) A modified test sample, equipped with a temporary antenna connector, is placed in a climatic test chamber and is linked to the SS by means of the temporary antenna connector.

q) Under normal test conditions steps a) to k) shall be repeated. The peak received power level shall be noted again for all power control levels and the access burst on every frequency used except that for step e) only power control levels 10 and 15 shall be tested.

Note: The values noted here are related to the peak transmitter carrier power levels under normal test conditions, which are known after step o). Therefore frequency dependent calibration factors that account for the effects of the temporary antenna connector can be determined.

r) Steps a) to k) shall be repeated for the following combinations of extreme test conditions (see Annex 1, TC2.2 and TC3) except that for step e) only power control levels 10 and 15 shall be tested:

Temperature:	Hi	Hi	Lo	Lo.
Test voltage:	Hi	Lo	Hi	Lo.

s) The peak transmitter carrier power under extreme test conditions is calculated for each power control level and for every frequency used by adding the calibration factor, i.e. the difference, obtained in the readings of step o) with respect to the reading obtained in step q) to the values obtained in step r).

II.3.3.3 Requirements

a) The peak transmitter carrier power, under normal and under extreme test conditions, at each frequency and for each power class shall be within the tolerances as shown in Table II.3.3.

POWER CLASS					POWER CONTROL LEVEL	PEAK TRANSMITTED CARRIER POWER	TOLERANCES	
1	2	3	4	5		dBm	N.T.C.	E.T.C.
*					0	43	+/-2.0dB	+/-2.5dB
*					1	41	+/-3dB	+/-4dB
*	*				2	39	+/-3dB*)	+/-4dB*)
*	*	*			3	37	+/-3dB*)	+/-4dB*)
*	*	*			4	35	+/-3dB	+/-4dB
*	*	*	*		5	33	+/-3dB*)	+/-4dB*)
*	*	*	*		6	31	+/-3dB	+/-4dB
*	*	*	*	*	7	29	+/-3dB*)	+/-4dB*)
*	*	*	*	*	8	27	+/-3dB	+/-4dB
*	*	*	*	*	9	25	+/-3dB	+/-4dB
*	*	*	*	*	10	23	+/-3dB	+/-4dB
*	*	*	*	*	11	21	+/-3dB	+/-4dB
*	*	*	*	*	12	19	+/-3dB	+/-4dB
*	*	*	*	*	13	17	+/-3dB	+/-4dB
*	*	*	*	*	14	15	+/-3dB	+/-4dB
*	*	*	*	*	15	13	+/-3dB	+/-4dB

*) When the power control level corresponds to the power class of the Mobile Station, then the maximum tolerances shall be 2.0 dB under normal test conditions and 2.5 dB under extreme test conditions.

TABLE II.3.3 : Peak transmitted carrier power for different power classes

b) The difference of the peak transmitted carrier power for two adjacent power control levels (measured at the same frequency, under the same combination of test conditions), shall not be less than 0.5 dB and not be more than 3.5 dB, and the power control steps must form a monotonic sequence.

c) The power/time curve shall be within the limits of the power time template of Figure II.3.3 at each frequency, at each power control level and under every combination of normal and extreme test conditions.

d) All the power control levels, for the power class of the MS as stated by the manufacturer, from the maximum power control level down to (including) power control level 15 shall be implemented in the MS

e) When the transmitter is commanded to a power control level with a peak transmitted carrier power exceeding the peak transmitter carrier power corresponding to the power class of the MS as stated by the manufacturer, then the transmitter carrier power shall be within the tolerances for the highest peak transmitted carrier power corresponding to the power class as stated by the manufacturer.

f) The centre of the transmitted burst as defined by the transition of bits 13/14 of the midamble shall be 3 timeslot periods (1731 microseconds) +/- 1 bit period (+/- 3.69 microseconds) after the corresponding received burst.

g) The access burst shall fit the power time template of Figure II.3.4 for all conditions of test.

h) The centre of the transmitted access burst as defined by the bit transition described in II.3.3.1 shall be an integer number of timeslot periods less 30 bit periods relative to any CCCH midamble centre. The permitted tolerance is +/- 1 bit period (+/- 3.69 microseconds).

II.3.4 Output RF Spectrum

Ref: GSM 05.05 section 4.2

II.3.4.1 Definition

The output RF power spectrum is the radio frequency spectrum, produced by the MS due to the effect of modulation and power ramping, on frequency bands adjacent to the nominal carrier frequency of the MS.

II.3.4.2 Modulation and switching transients

II.3.4.2.1 Method of Measurement

a) If the Mobile Station is equipped with an antenna connector, then the MS is connected to the SS and is operated under normal test conditions.

If the MS is normally equipped with an integral antenna, and it cannot be operated via a permanent antenna connector, then a second test sample is used fitted with a temporary antenna connector (see Annex 1, GC7). The SS is connected to the temporary connector and is operated under normal test conditions.

b) A call shall be originated by the SS to the MS. The MS shall be made to answer the call.

The MS shall be commanded into the hopping mode. The hopping pattern shall include only three channels, namely one with an ARFCN in the range 1 to 5, a second one with an ARFCN in the range 60 to 65 and the third one with an ARFCN in the range 120 to 124.

Note: Although the measurement is made whilst the MS is in hopping mode, each measurement is on one single channel.

c) The SS commands the MS to create the loop back facility from the receiver decoder output to the transmitter encoder input.

d) The MS is operated in the encrypted mode.

e) The SS shall send Standard Test Signal C1 to the MS at a level of 23dBmicroVolt emf( ). The transmitter signal received from the MS shall be applied to a spectrum analysis function within the SS. The centre frequency of the spectrum analysis function shall be tuned to the hop pattern channel with an ARFCN in the range 60 to 65.

f) The MS shall be commanded to the MS Max power level. The settings of the spectrum analyser shall be adjusted as follows:

Zero frequency scan		
Resolution bandwidth	:	30 kHz
Video bandwidth	:	30 kHz
Video averaging	:	may be used, depending on the implementation of the test

The video signal of the spectrum analyser is "gated" such that the spectrum generated by at least 40 of the bits 87 to 132 of the burst is the only spectrum measured. This gating may be analogue or numerical, dependent upon the design of the spectrum analyser.

Only measurements during transmitted bursts on the nominal carrier of the measurement shall be included. The spectrum analyser shall average over the gated period and over 200 such bursts, using numerical and/or video averaging.

g) The power level shall be measured at the following frequencies:

FT	
FT + 100 kHz	FT - 100 kHz
FT + 200 kHz	FT - 200 kHz
FT + 250 kHz	FT - 250 kHz
FT + 200 kHz * N	FT - 200 kHz * N

where N = 2, 3, 4, 5, 6, 7, 8 & 9
and FT = RF channel nominal centre frequency.

h) The measurement at frequencies up to FT +/- 1800 kHz shall be repeated for power control level 15.

i) The analyser settings are adjusted to:

Zero frequency scan
Resolution bandwidth: 30 kHz
Video bandwidth : 100 kHz
Peak hold

j) The MS shall be commanded to power level 0. The spectrum analyser power levels shall be measured at the following frequencies:

FT + 400 kHz	FT - 400 kHz
FT + 600 kHz	FT - 600 kHz
FT + 1,2 MHz	FT - 1,2 MHz
FT + 1,8 MHz	FT - 1,8 MHz

where FT = RF channel nominal centre frequency.

The duration of each measurement (at each frequency) shall be such as to cover at least 10 burst transmissions.

k) Step j) shall be repeated for power control levels 7 and 11.

l) The spectrum analysis function shall be tuned to the hop pattern channel with an ARFCN in the range 1 to 5. Steps f) to g) and i) to j) shall be repeated, except that at step j) the MS shall be commanded to power level 11.

m) The spectrum analysis function shall be tuned to the hop pattern channel with an ARFCN in the range 120 to 124. Steps f) to g) and i) to j) shall be repeated, except that at step j) the MS shall be commanded to power level 11.

n) Step f) shall be repeated, except that the resolution bandwidth shall be set to 100 kHz. The power level shall be measured over the frequency range 935 to 960 MHz in 200 kHz steps, and at each step, the averaging shall be done in 3 separate groups of bursts, each group corresponding to when the transmitter is on one of the 3 hop frequencies. The averaging shall be over at least 50 transmitted bursts per group.

o) The MS is placed in a climatic test chamber (for extreme test conditions see Annex 1, TC). If the MS cannot normally be operated via an antenna connector, then a second test sample equipped with a temporary antenna connector (see Annex 1 GC7) shall be used.

p) Steps e) to g) and i) to j) shall be repeated - except that at step j) the MS shall be commanded to power level 11 - under the following combinations of extreme test voltages and ambient temperatures (Annex 1, TC2.2 and TC3):

Temp.	Hi	Hi	Lo	Lo
Volt.	Hi	Lo	Hi	Lo

II.3.4.2.2 Limits

For the modulation sidebands of steps g) and h), the power level shall not exceed the values shown in Table II.3.4.2.

power control level	power level (dBm)	Maximum level, relative to measurement on the carrier frequency (dB) at the listed frequency offsets from the nominal carrier frequency (kHz)							
		0	100	200	250	400		>=600	
						ant. con.	int. ant.	ant. con.	int. ant.
0	43	0	+0.5	-30	-33	-60		-70	
2	39	0	+0.5	-30	-33	-60		-66	
3	37	0	+0.5	-30	-33	-60	-58	-64	-58
>= 5	<= 33	0	+0.5	-30	-33	-60	-54	-60	-54

ant. con. = for MS with a permanent antenna connector
int. ant. = for MS not with a permanent antenna connector

TABLE II.3.4.2

For all power levels tested the maximum power measured at step n) in the band 935 MHz to 960 MHz shall be:

-71 dBm for class 1 MSs, and
-79 dBm for class 2, 3, 4 or 5 MSs.

For absolute measurements performed on a temporary antenna connector in the frequency band 935-960 MHz, the temporary antenna connector coupling factor, determined according to Annex 1 GC7, shall be used.

For absolute measurements performed on a temporary antenna connector in the frequency band 890-915 MHz, the temporary antenna connector coupling factor, determined according to II.3.3.2.2 for the nearest relevant frequency, shall be used.

Note 1: For each value of FT, 1 measurement in the combined range FT + 400kHz to FT + 1800 kHz, and FT - 400 kHz to FT - 1800 kHz may be at -36 dBm ( ).

In the range 935 to 960 MHz, within each group of bursts, measurements within 5 GSM RF channels may be at -36 dBm ( ).

Note 2: MSs of power class 1 will test power control levels 0 and 15,
class 2 will test power control levels 2 and 15,
class 3 will test power control levels 3 and 15,
class 4 will test power control levels 5 and 15 and
class 5 will test power control levels 7 and 15.

For the power ramp sidebands of steps j) and k) the power levels must not exceed:

POWER LEVEL	MAXIMUM LEVEL FOR VARIOUS OFFSETS FROM CARRIER FREQUENCY: 400 kHz	600 kHz	1200 kHz	1800 kHz
43 dBm	-9 dBm	-21 dBm	-21 dBm	-24 dBm
41 dBm	-11 dBm	-21 dBm	-21 dBm	-24 dBm
39 dBm	-13 dBm	-21 dBm	-21 dBm	-24 dBm
37 dBm	-15 dBm	-21 dBm	-21 dBm	-24 dBm
35 dBm	-17 dBm	-21 dBm	-21 dBm	-24 dBm
33 dBm	-19 dBm	-21 dBm	-21 dBm	-24 dBm
31 dBm	-21 dBm	-23 dBm	-23 dBm	-26 dBm
29 dBm	-23 dBm	-25 dBm	-25 dBm	-28 dBm
27 dBm	-23 dBm	-26 dBm	-27 dBm	-30 dBm
25 dBm	-23 dBm	-26 dBm	-29 dBm	-32 dBm
23 dBm	-23 dBm	-26 dBm	-31 dBm	-34 dBm
<= +21 dBm	-23 dBm	-26 dBm	-32 dBm	-36 dBm
	(8 dB allowance)	(6 dB allowance)		(3 dB allowance)

Note: These figures are different from the requirements in GSM 05.05 because at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. This allowance is given in the table.

The results of the measurements on MSs with an antenna connector shall be in dBm.

II.4 RECEIVER

ref: GSM 05.05

In this section on receiver measurements, the procedures to test equipment which is fitted with a permanent antenna connector, and the procedures to test equipment which is designed to only be used with an integral antenna, are in general combined into one single test description.

Tests on Mobile Stations fitted with an integral antenna and having no means of connecting an external antenna are specified in terms of received field strength. In order to perform most tests on such Mobile Stations without the need to access a calibrated test site a temporary antenna connector shall be used as defined in General Conditions GC7 of Annex 1 of part GC. The detailed description of its calibration is contained within section II.4.2.2.

In practice the temporary antenna connector may be used for transmitter measurements described in section II.3, but the calibration factors determined in II.4.2.2 will only be usable for measurements in the receive band. The detailed calibration, when needed, for transmission tests are described in the relevant sections of II.3.

Wherever in this section, for FACCH tests, the SS is required to send a Layer 3 message not requiring a Layer 3 response from the MS the message can be a TEST_INTERFACE message or a STATUS message, possibly with an unknown Protocol Discriminator.

Testing philosophy

Certain assumptions concerning the functional mechanisms of GSM receivers have been made in order to define tests that will verify the receiver performance without excessive redundancy and excessive test times.

The receiver functions can be divided into:
- Analogue RF and IF stages that are affected by input levels, temperature and power supply levels.
- Demodulator that is affected by input levels and interfering signals.
- Decoders that are affected by the different logical channels and input levels.

The tests are designed to stress each of these blocks with a minimum of redundancy.

Statistical testing of receiver BER/FER performance

Error Definition

1) Frame Erasure Ratio (FER)

A frame is defined as erased if the error detection functions in the receiver, operating in accordance with GSM 05.03, indicate an error. For full rate speech this is the result of the 3 bit cyclic redundancy check (CRC) as well as other processing functions that cause a Bad Frame Indication (BFI). For signalling channels it is the result of the FIRE code or any other block code used. For data traffic FER is not defined.

2) Residual Bit Error Ratio (RBER)

The Residual Bit Error Ratio is defined as the Bit Error Ratio (BER) in frames which have not been declared as erased.

3) Bit Error Ratio (BER)

The Bit Error Ratio is defined as the ratio of the bits wrongly received to all data bits sent.

Test method

Each test is performed in the following manner:

a) Set up the required test conditions. Set the parameters Max-samples (maximum number of samples) and Max-events (maximum number of error events) to specific values for each test.

b) Perform the test and record the number of offered samples (bits or frames sent) and the number of occurred events (bit or frame errors).

c) Terminate the test and determine the test result ("pass" or "fail") when either of the following conditions become true:

- Number of offered samples >= Max-samples ---> "PASS"
- Number of (error) events > Max-events ---> "Fail"

In practice it may be sufficient to generate "Max-samples" and later look at Number of error events observed.

Note: At least one measurement reporting period must be left, after the conditions for any measurement has been set, before measuring RF performance.

Test criteria

The limits on number of samples and events shall be defined in order to comply with different requirements :

1) to keep reasonably low the risk of passing a bad unit through the individual tests;
2) to have high probability of passing a good unit through the individual tests;
3) to perform a measurement with a significant statistics;
4) to keep the test time as low as possible.

The risk of passing a bad unit (point 1) should be kept lower than 0.2%. A unit is generally considered "bad" if its BER (or FER) performance is 1.5 times worse than that specified in AWGN (Additive White Gaussian Noise) and 1.26 times worse than that specified in multipath environment. These values have been adopted (taking into account the expected shapes of the BER performance) in order not to pass a unit with performance worse than the specifications by more than 1 dB.

The probability of passing a good unit (point 2) should be at least 99.7%.

If the error events can be assumed to be random independent variables, outputs of stationary random processes with identical Gaussian distributions, the previous figures lead to consider a number of events (point 3) not lower than 200 in AWGN channel and not lower than 600 in multipath environment, and to test a BER (or FER) performance 1.22 times worse than that specified in AWGN and 1.12 times worse than that specified in multipath environment (this corresponds to test a performance at the most 0.5 dB worse than that specified).

For multipath propagation conditions the hypothesis of stationary random processes does not generally hold. In case of non frequency hopping operation mode, the radio channel may be assumed to change 10 times per wavelength of travelled distance and to be short term stationary in between. So, in this case, the required observation time for having good statistical properties should not be lower (with some rounding) than that reported in the following table.

PROPAGATION CONDITIONS	TU3	TU50	HT100	RA250
MIN. TEST TIME (sec)	500	30	15	6

The table below details, for the different test conditions, the number of events and samples required in order to meet points 1) to 3): the corresponding test time (point 4) can be consequently computed.

As it can be seen in the table, in the cases in which both FER and RBER have to be tested on the same channel the same time as the FER measurement has been adopted. This is longer than that required for the RBER only according to the discussed criteria, but allows the relevant accuracy to be improved without increasing the total test time.

TABLE OF TEST CONDITIONS

Type of test	Type of channel	PROPAGATION/ Frequency Conditions	SPECIFIED FER/BER %	TESTED FER/BER %	Max No of EVENTS	Max No of SAMPLES	Prob that GOOD UNIT will pass	BAD UNIT BER/FER %	Risk that BAD UNIT will pass
BFI	TCH/FS	STATIC	0.200	0.244	200	82000	99.719	0.300	0.139
Sensitivity	TCH/FS	STATIC/FH	0.100*α	0.122*α	200*α	164000	99.717	0.150*α	0.140
,,	TCH/FS Class Ib	STATIC/FH	0.400/α	0.410/α	82000/α	20000000	100.000	0.600/α	<0.001
,,	TCH/FS Class II	STATIC/FH	2.000	2.439	200	8200	99.714	3.000	0.001
,,	TCH/FS	TU50/No FH	6.000*α	6.742*α	600*α	8900	99.825	7.560*α	0.162
,,	TCH/FS Class Ib	TU50/No FH	0.400/α	0.420/α	4200/α	1000000	99.919	0.504/α	<0.001
,,	TCH/FS Class II	TU50/No FH	8.000	8.333	10000	120000	99.999	10.080	<0.001
,,	TCH/FS Class II	HT100/No FH	9.000	9.333	5600	60000	99.779	11.340	<0.001
,,	TCH/FS Class II	RA250/No FH	7.000	7.500	1800	24000	99.873	8.694	<0.001
,,	FACCH	TU50/No FH	13.000	14.634	600	4100	99.899	16.380	0.119
,,	TCH/F9.6&H4.8	HT100/No FH	0.700	0.778	1400	180000	99.995	0.882	<0.001
,,	TCH/F4.8	HT100/No FH	0.010	0.011	600	5350000	99.732	0.013	0.197
,,	TCH/F2.4	HT100/No FH	0.001	0.001	150	11900000	99.734	0.002	<0.001
,,	TCH/H2.4	HT100/No FH	0.010	0.011	600	5350000	99.732	0.013	0.197
INPUT LEVEL	TCH/FS Class II	STATIC<-40dBm	0.010	0.012	200	1640000	99.716	0.015	0.141
RANGE	TCH/FS Class II	STATIC<-15dBm	0.100	0.122	200	164000	99.717	0.150	0.140
	TCH/FS Class II	EQ50	3.000	3.250	3900	120000	100.000	3.780	<0.001
CO-CHANNEL	TCH/FS	TU3/No FH	21.000*α	24.000*α	6000*α	25000	100.000	27.720*α	<0.001
REJECTION	TCH/FS Class Ib	TU3/No FH	2.000/α	2.091/α	69000/α	3300000	100.000	2.520/α	<0.001
,,	TCH/FS Class II	TU3/No FH	4.000	4.300	86000	2000000	100.000	5.040	<0.001
,,	TCH/FS	TU50/FH	3.000*α	3.371*α	600*α	17800	99.797	3.780*α	0.194
,,	TCH/FS Class Ib	TU50/FH	0.200/α	0.215/α	4300/α	2000000	100.000	0.252/α	<0.001
,,	TCH/FS Class II	TU50/FH	8.000	8.333	100000	1200000	100.000	10.080	<0.001
,,	FACCH	TU3/No FH	22.000	24.000	6000	25000	100.000	27.720	<0.001
,,	TCH/F9.6 or H4.8	TU50/FH	0.300	0.336	600	178500	99.716	0.378	0.180
,,	TCH/F4.8	TU50/FH	0.010	0.011	600	5350000	99.732	0.0126	0.197
,,	TCH/F2.4	TU50/FH	0.001	0.001	150	11900000	99.734	0.002	<0.001
,,	TCH/H2.4	TU3/FH	0.010	0.011	600	5350000	99.732	0.0126	0.197
ADJACENT	TCH/FS	TU50/No FH	6.000*α	6.742*α	600*α	8900	99.825	7.560*α	0.162
CHANNEL	TCH/FS Class Ib	TU50/No FH	0.400/α	0.420/α	4200/α	1000000	99.919	0.504/α	<0.001
200 KHz	TCH/FS Class II	TU50/No FH	8.000	8.333	50000	600000	100.000	10.080	<0.001
,,	FACCH	TU50/No FH	13.000	14.634	600	4100	99.899	16.380	0.119
ADJACENT	TCH/FS	TU50/No FH	10.200*α	11.461*α	1020*α	8900	99.995	12.852*α	0.004
CHANNEL	TCH/FS Class Ib	TU50/No FH	0.720/α	0.756/α	7560/α	1000000	99.999	0.907/α	<0.001
400 kHz	TCH/FS Class II	TU50/No FH	8.800	9.167	55000	600000	100.000	11.088	<0.001
,,	FACCH	TU50/No FH	17.100	19.152	600	3133	99.878	21.546	0.052
INTERMOD.	TCH/FS Class II	STATIC	2.000	2.439	200	8200	99.741	3.000	0.122
	FACCH	TU50/No FH	13.000	14.634	600	4100	99.899	16.380	0.119
BLOCKING &	TCH/FS Class II	STATIC	2.000	2.439	200	8200	99.741	4.000	<0.001
SPURIOUS RESP.	FACCH	TU50/No FH	13.000	14.634	600	4100	99.899	16.380	0.119

Note 1: α is a parameter which ranges from 1 to 1.6. The value of α for a RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions. For example, the value of α may be different for a TU50 sensitivity test and an RA250 sensitivity test. The value of α is determined by dividing the measured number of events for the FER test by the value of the maximum number of events listed in the table corresponding to α=1; if the result of the division is lower than 1, a value of α=1 shall be used. The probabilities that a good unit will pass and the risks that a bad unit will pass, listed in the table are valid for α=1, and would be slightly different for other values of α.

Note 2: In order to save time the sensitivity test and co-channel rejection test for the TCH/F2.4 channel do not comply with the above said constraints. In fact, a bad unit which performs 2 times (instead of 1.26) worse than that specified is accounted for, so reducing the required number of events to 150, instead of 600. On the other hand, the specified RBER is in this case 10E-5 and, on the basis of simulations and hardware validation results, doubling this RBER results in a drop in performance of less than 1 dB.

II.4.1 BAD FRAME INDICATION PERFORMANCE

ref: GSM 05.05 section 6.4

II.4.1.1 Definition

The performance of the bad frame indication (BFI) is a measure of the effectiveness of the MS under DTX conditions. It includes the effect of the 3 bit Cyclic Redundancy Check (CRC) and all other processing associated with the DTX function. The BFI is measured on a full rate speech TCH (TCH/FS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier described in g) below.

This test is only applicable to MS supporting speech.

Note: The DTX is used to prevent that the MS would drop the call.

II.4.1.2 Method of measurement

a) A call shall be originated by the SS to the MS, and the MS shall be made to answer the call.

   The call shall occupy a full rate channel and shall be in a non-hopping mode on one of the radio frequencies in the range 60 to 65 (ARFCN). Throughout the test the BCCH shall be transmitted by the SS at an EMF of 28dBμV( ).

b) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder input and at the same time to signal the bad frame indication to the SS.

c) The SS shall simulate a BSS in DTX mode. During the period when no transmission would occur the SS shall transmit a GSM carrier modulated with random data at a level of 19 dBμV( ). SACCH shall be transmitted normally at a level of 28 dBμV( ). The SID frame shall be transmitted in its correct time interval with valid information at a level of 28 dBμV( ). During transmission of SACCH or SID the random data shall be discontinued.

d) The SS will proceed to transmit Max-samples of frames of TCH/FS information and will check the bad frame indication (BFI) of the looped back signal from the MS. The SS shall record the number of frames where the bad frame indication is not set. During transmission by the SS of SID the SS shall check that the BFI is not set.

NOTE: Further explanations on the mechanism of signalling the BFI to the SS will be found in sections III.1.1 and III.1.3.

II.4.1.3 Limits

The BFI performance is accepted if the number of undetected BFIs does not exceed the Max-events:

Max-events - 200
Max-samples - 82000 (excluding SID frames).

During loop back of SID frames no BFI shall be set.

II.4.2 SENSITIVITY

The reference sensitivity (GSM 05.05) is the signal level at the MS receiver input at which a certain BER or FER must be achieved.

II.4.2.1 Reference Sensitivity for TCH/FS - compliance

ref: GSM 05.05 section 6.2

II.4.2.1.1 Definition

Compliance with the requirements for reference sensitivity level is tested by setting the receiver at an input signal at the specification limit for reference sensitivity level and at the nominal frequency with standard test modulation, and checking that, after demodulation and decoding, a data signal with a BER or a FER less than the specified values is produced.

II.4.2.1.2 Method of measurement

a) Set up a call on a traffic channel in the range ARFCN 60 to 65. The SS shall also set up six adjacent cell BCCH's having signal strengths in the range 15 dBμVemf( ) to 35 dBμVemf( ). The ARFCNs for the serving and adjacent cell BCCHs shall not be co-channel with, or on adjacent channel to the wanted traffic channel.

Note: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in Annex 1, GC1.

b) The MS shall be commanded to the maximum power level.

c) The SS traffic channel shall be the Standard Test Signal C1 at a MS level of 28 dBμVemf( ).

d) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder's input and at the same time to signal the frame erasure event to the SS. The fading function of the SS is set to TU50.

e) The amplitude of the wanted signal shall be set to 11dBμVemf( ) for handheld MSs and to 9dBμVemf( ) for other MSs.

f) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication. Also throughout the test, the SS monitors the status message from the MS to confirm correct reporting of the adjacent cell BCCH's.

g) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of Max-samples of consecutive bits of class II, where bits are taken only from those frames for which no bad frame indication was given.

h) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of Max-samples of consecutive bits of class Ib, where bits are taken from those frames for which no bad frame indication was given.

i) The SS also determines the frame erasure events by examining sequences of Max-samples of consecutive frames and assuming a frame is received successfully when there is no bad frame indication concerning it.

j) The MS is placed in a climatic test chamber (for extreme test conditions see Annex 1, TC), and steps a) up to including g) are repeated for the following combinations of temperatures and power supply voltages:

Temp	:	Hi	Hi	Lo	Lo
Voltage	:	Hi	Lo	Lo	Hi

k) Steps a) to j) shall be repeated for a channel in the range 1 to 5 (ARFCN) and for a channel in the range 120 to 124 (ARFCN).

l) Steps a) to g) shall be repeated, except under step d) the SS fading function shall be set in turn to RA250 and HT100.

m) Steps a) to j) shall be repeated, except at step d) the SS fading function shall be set to static and the MS shall be commanded by the SS into hopping mode using the hopping sequence of GC1 of Annex 1, full band.

The amplitude of the wanted signal shall be set as in step e). All the other time slots, except the active ones, shall be set to 28dBμVemf( ). This will implicitly test adjacent time slot rejection.

II.4.2.1.3 Limits

The Max-events measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the values given in the table below:

Channels	Propagation Conditions TU50		Propagation Conditions RA250		Propagation Conditions HT100		Static Conditions	
TCH/FS	Max-Events	Max-samples	Max-events	Max-samples	Max-events	Max-samples	Max-events	Max-samples
FER	600*α	8900					200*α	164000
class Ib(RBER)	4200/α	1000000					82000/α	20000000
class II(RBER)	10000	120000	1800	24000	5600	60000	200	8200

where α is a parameter which can range from 1 to 1.6. The value of α for a RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

II.4.2.2 Calibration of the temporary antenna connector

For equipments fitted with an integral antenna and not provided with a permanent means for connection to an external antenna a calibration procedure is required to allow subsequent measurements to be performed on the temporary antenna connector.

Once calibrated this temporary antenna connector enables all receiver test procedures to be identical for equipments with an integral antenna and for equipments with an antenna connector.

The calibration procedure shall be carried out at three frequencies, namely an ARFCN in the range 1 to 5, an ARFCN in the range 60 to 65 and an ARFCN in the range 120 to 124. The procedure consists of three distinct stages as follows :

1) Establish the MS antenna radiation pattern for the three selected frequencies.

2) Calibrate the test range (or anechoic shielded chamber) for the conditions needed in 1).

3) Determine the temporary antenna connector coupling factor.

II.4.2.2.1 Antenna Radiation Pattern

a) The MS shall be in the anechoic shielded chamber, or on an outdoor test site, on an isolated support in a vertical position at an orientation specified by the manufacturer. This position is the 0 degree position.

   A test antenna, connected to the SS shall be in the anechoic shielded chamber, or on the outdoor test site, at a distance of at least 3 metres from the MS.

b) A call shall be originated by the SS to the MS on a frequency in the range ARFCN 1 to 5. The MS shall be made to answer the call. The SS shall command the MS to maximum transmit power.

c) The SS shall, using estimated parameters for the outdoor test site or anechoic shielded chamber, set its output level 'E' (see Fig. II.4-1) to give an MS receiver input level of approximately 32 dBμVemf. This corresponds to a field strength of 55.5 dBμV/m at the MS position. The signal shall be the Standard Test Signal C1.

Note: The absolute value of the received signal level is not critical. The value suggested however will ensure that the MS receiver is operating essentially error free, yet is low enough to avoid any non linear effects in the receiver.

d) The SS shall use the RXLEV message from the MS to determine a measure of the received field strength. The procedure detailed in the flow chart of figure II.4-1 shall now be followed. The signal level from the SS that just results in the transition from $RXLEV_a$ to $RXLEV_b$ shall be recorded as E_i.

Note: The actual values of $RXLEV_a$ and $RXLEV_b$ will need to be recorded, because this transition will be used as the reference point for all further stages of the calibration procedure.

e) Step d) shall be repeated after the MS has been rotated by n * 45 degrees in the horizontal plane. Ensuring that the same RXLEV transition is used, the signal levels from the SS shall be recorded as E_{in}.

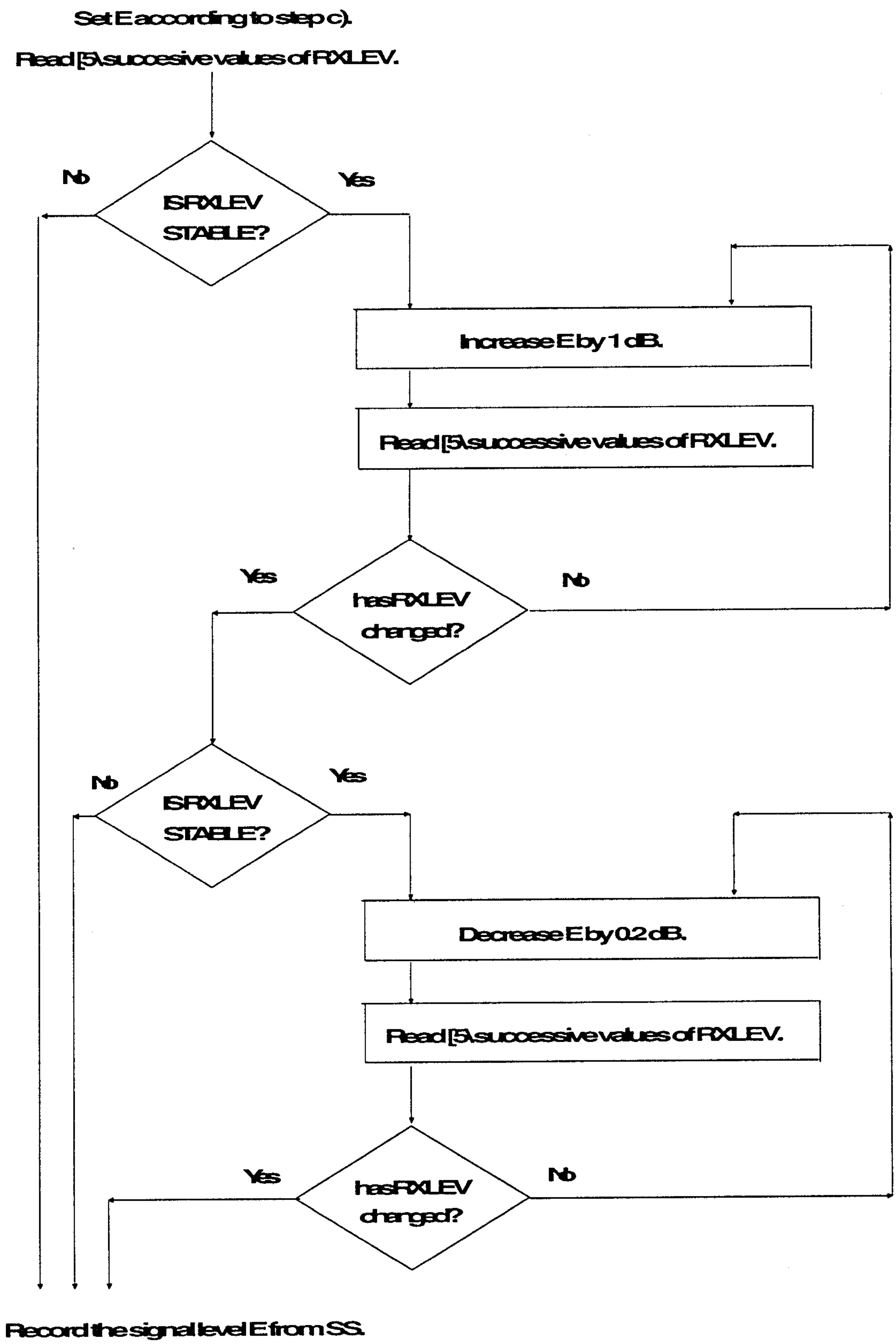


FIGURE II.4-1 / GSM 11.10

f) Calculate the effective mean signal level from the RMS value of the eight signal levels obtained in d) and e) above by using the following formula :

$$E_1 = \left[\frac{8}{\sum_{n=0}^{n=7} \frac{1}{E_{in}^2}} \right]^{1/2}$$

g) Repeat steps b) to f), except in step b) use an ARFCN in the range 60 to 65 to obtain a mean signal level E_2. Ensure the same RXLEV transition is used.

h) Repeat steps b) to f), except in step b) use an ARFCN in the range 120 to 124 to obtain a mean signal level E_3.

Ensure the same RXLEV transition is used.

II.4.2.2.2 Test Range Calibration

The objective of this step is to determine the actual field strength at the MS corresponding to the three signal levels E_1, E_2 and E_3 established in II.4.2.2.1. The following procedure shall be used :

a) Replace the MS by a calibrated reception antenna connected to a measuring receiver.

b) For each frequency used in II.4.2.2.1 measure the field strength E_{fr} corresponding to the respective signal levels E_r determined in steps f), g) and h) of II.4.2.2.1 record these values as E_{f1}, E_{f2}, E_{f3}.

II.4.2.2.3 Temporary Antenna Connector Coupling Factor

The coupling factor of the temporary antenna connector is the relationship expressed in dB, between the output signal of the SS and the effective receiver input signal for the MS.

The test sample MS is modified to fit a temporary antenna connector in accordance with Annex 1 GC7. Or alternatively a second MS shall be provided, fitted with such a temporary antenna connector.

Note: If only one MS is supplied for testing, the tests of radiated spurious emissions (transmit and receive) and receiver sensitivity shall be performed before the MS is modified to accept a temporary antenna connector.

The calibration procedure shall be as follows :

a) The MS temporary connector is connected to the output of the SS.

b) A call shall be originated by the SS to the MS using a frequency in the range ARFCN 1 to 5. The MS shall be made to answer the call. The SS shall command the MS to maximum transmit power, non hopping encrypted mode.

c) The SS shall, using the procedures of II.4.2.2.1, adjust its output signal level to determine the $RXLEV_a$ to $RXLEV_b$ transition. This signal level shall be recorded as E_{c1}.

d) Repeat steps b) and c) for frequencies in the range ARFCN 60 to 65 and 120 to 124. Record the RXLEV transitions as E_{c2} and E_{c3} respectively.

e) The temporary antenna connector coupling factor F is then calculated from:

$$F_n = 20 \log_{10} \left[\frac{E_{cn}}{E_{fn} * K_n} \right]$$

where K_n = conversion factor of an isotropic antenna expressed as $\frac{\mu V}{\mu V/m}$ at the frequency corresponding to the ARCFN used.

f) The mean antenna coupling factor F_m to be used for measurements requiring hopping shall be calculated from the RMS value of all parameters in e) as follows :

$$E_{cm} = \left[\frac{3}{1/E_{c1}^2 + 1/E_{c2}^2 + 1/E_{c3}^2} \right]^{1/2}$$

$$E_{fm} = \left[\frac{3}{1/E_{f1}^2 + 1/E_{f2}^2 + 1/E_{f3}^2} \right]^{1/2}$$

$$k_m = \left[\frac{k_1^2 + k_2^2 + k_3^2}{3} \right]^{1/2}$$

$$F_m = 20 \log_{10} \left[\frac{E_{cm}}{E_{fm} * k_m} \right]$$

g) In all tests in which a MS with integral antenna is the unit under test, the signal level at the temporary antenna connector is determined from :

$$E_{in} = E_{req} + F$$

where: E_{in} = signal level at coupling device (dBμVemf)
E_{req} = signal level required by the test (dBμVemf)
F = coupling factor at the respective ARFCN (dB)

This is indicated in the test procedures as E_{req}, dBμVemf( ), where the empty parenthesis is to be read as E_{in}.

For frequencies not in the receive band or the transmit band, 0dBi antenna gain shall be assumed.

II.4.2.3 Sensitivity for data channels and control channels

II.4.2.3.1 Definition

Compliance with the requirements for reference sensitivity on control channels is tested by setting the receiver at an input signal at the specification limit for reference sensitivity and at the nominal frequency with standard test modulation, and checking that, after demodulation and decoding, a FER less than the specified value be produced. For data channels, reference sensitivity is defined in terms of BER.

II.4.2.3.2 Method of Test

a) The SS originates a call to the MS on a traffic channel having a ARFCN in the range 60 to 65.

b) The MS is made to answer the call, and is commanded to it's maximum power level.

c) The SS output on the traffic channel is set to 28 dBμVemf( ), producing Standard Test Signal C1.

d) The fading function of the SS is set to TU50.

e) The wanted signal is set to a level of 11 dBμVemf( ) for hand held MS or 9 dBμV for any other MS.

f) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

g) The SS determines the frame erasure events during Max-samples of FACCH frames.

h) The wanted signal is set to 28dBμV and the SS commands the MS to a TCH/F9.6 channel. It also commands the MS to close its TCH loop, specifying that erased frames are to be signalled by the MS (see section III.1.2.1.1.1) in order to loop back received data from the channel decoder via the channel encoder to the uplink TCH.

i) Set the SS fading function to HT100 and the wanted signal to 11dBμV( ) for a hand portable MS or 9dBμV for any other MS.

j) The SS compares transmitted data with received data for Max-samples consecutive bits and records every error bit as an error event.

k) Steps h) to j) are repeated for data channels of TCH/H4.8, TCH/F4.8, TCH/F2.4 and TCH/H2.4.

Note 1: Not all Mobile Stations will be equipped with all data channels. The test procedure will need to be adapted to cater for limited sub sets for Mobile Stations offering a restricted data capability.

Note 2: The SACCH, SDCCH, AGCH and PCH channels are not tested because the coding is identical to the FACCH. These channels are tested implicitly in Layer 3.

II.4.2.3.3 Limits

Channels	Max-events	Max-samples
FACCH	600	4100
TCH/F9.6&H4.8	1400	180000
TCH/F4.8	600	5350000
TCH/F2.4	150	11900000
TCH/H2.4	600	5350000

II.4.3 USABLE RECEIVER INPUT LEVEL RANGE

ref: GSM 05.05 section 6.1

II.4.3.1 Definition

The usable receiver input level range is the range of the radio frequency input level of a specified modulated signal over which bit error ratio or frame erasure ratios stay between specified limits.

This test is only applicable to MS supporting speech.

II.4.3.2 Method of measurement

a) The SS shall originate a call to the MS and the MS shall be made to answer the call on a TCH/FS having an ARFCN in the range 60 to 65.

b) The SS shall be set on the TCH/FS to produce Standard Test Signal C1 at a level of 28 dBμVemf( ).

c) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder's input without signalling the frame erasure event (III.1.2.1.1.2).

d) The SS compares the data that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding.

The SS tests the bit error ratio for the non-protected bits of TCH/FS class II, by examining sequences of Max-samples consecutive bits of class II. The number of error events is recorded.

e) Step d) shall be repeated with the amplitude of the wanted signal increased to input levels of respectively 73 dBmicroVoltemf( ) and 98 dBmicroVoltemf( ) at the receiver input.

f) The SS fading function is set to EQ50.

g) Step d) shall be repeated with the amplitude of the wanted signal set to respectively 28dBmicroVoltemf( ) and 73dBmicroVoltemf( ) at the receiver input.

h) The Mobile Station is placed in a climatic chamber and steps a) to g) are repeated for the following combinations of extreme test conditions (Annex 1, TC2.2 and TC3):

Temp	:	Hi	Hi	Lo	Lo
Voltage	:	Hi	Lo	Lo	Hi

II.4.3.3 Limits

The number of error events recorded in this test shall not exceed the Max-events values given in the table below when Number of samples = Max-samples. This shall apply for any combination of normal and extreme test voltages and ambient temperature, for the different propagation conditions and for any level of input signal to the receiver.

Propagation conditions	Max-events	Max-samples
Static <=73dBmicroVoltemf	200	1640000
Static 98dBmicroVoltemf	200	164000
EQ50	3900	120000

II.4.4 CO-CHANNEL REJECTION

II.4.4.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

II.4.4.2 Method of Measurement

a) A call shall be originated by the SS to the MS on a channel in the range ARFCN 60 to 65, and the MS shall be made to answer the call. For MS supporting speech this shall be a TCH/FS, for MS not supporting speech any one of the supported TCH/ (F9.6, H4.8, F4.8, F2.4 or H2.4) shall be used and the test of TCH not frequency hopping is not performed.

   The wanted signal shall be the Standard Test Signal C1. It shall be at the nominal frequency of the receiver and at a level of 28dBmicroVoltemf( ).

   The unwanted signal shall have no fixed relationship with the bit transitions of the wanted signal, and it shall be modulated with random data. Its amplitude shall be 9dB below that of the wanted signal. The unwanted signal shall be continuous.

b) The MS shall be operated in the encrypted mode.

c) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder's input and at the same time to signal the frame erasure event to the SS. (ref III.1.2.1.1.1)

d) The SS is set to produce a wanted signal and an independent, uncorrelated interfering (unwanted) signal at the same time. The fading characteristic of the wanted and the interfering signal shall be TU3. The channel frequency shall be in the range 60 to 65 (ARFCN).

e) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

   The SS tests the frame erasure ratio compliance for the TCH/FS, by examining Max-samples consecutive frames of TCH/FS information where a frame is assumed to be received successfully if there is no bad frame indication. The number of frame erasure events is recorded. During the Max-samples of the frame erasure measurement, the RBER of the class II and class Ib bits are also determined.

f) The SS commands the MS to open the TCH loop (ref III.1.2.1.1.1)

g) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during Max-samples of consecutive FACCH frames.

h) Steps c) to e) shall be repeated except that in step d), both the wanted and interfering signal shall be hopping and the SS shall command the MS into hopping mode with a hop pattern covering at least 10 frequencies in a range not exceeding 5 MHz. The hopping band shall be centred around an ARFCN in the range 60 to 65, according to the narrow band hop of GC1 of Annex 1. The fading profile shall be changed to TU50.

II.4.4.3 Limits

The number of events recorded in this test shall not exceed the Max-events values given in the table below when the Number of samples = Max-samples.

Channel	Propagation conditions	Type of measurement	Max-events	Max-samples
FACCH	TU3/No FH	FER	6000	25000
TCH/FS	TU3/No FH	FER	6000*α	25000
TCH/FS Class Ib	TU3/No FH	RBER	69000/α	3300000
TCH/FS Class II	TU3/No FH	RBER	86000	2000000
TCH/FS	TU50/FH	FER	600*α	17800
TCH/FS Bits class Ib	TU50/FH	RBER	4300/α	2000000
TCH/FS Bits class II	TU50/FH	RBER	100000	1200000
TCH/F9.6 or H4.8	TU50/FH	RBER	600	178500
TCH/F4.8	TU50/FH	RBER	600	5350000
TCH/F2.4	TU50/FH	RBER	150	11900000
TCH/H2.4	TU3/FH	RBER	600	5350000

The parameter α can range from 1 to 1.6. The value of α for the RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

II.4.5 ADJACENT CHANNEL REJECTION

ref: GSM 05.05 section 6.3.2

II.4.5.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this section.
2) Adjacent Time Slot selectivity, which is implicitly tested in test II.4.2.1.

II.4.5.2 Method of Measurement

For a MS supporting speech step f) is not required.

For a data only MS, steps c) and e) are not required.

a) A call shall be originated by the SS to the MS, and the MS shall be made to answer the call. For MS's supporting speech a TCH/FS call shall be used, otherwise a data bearer declared in section 2.1.7 of the PIXIT shall be used.

b) The MS shall be operated in the encrypted mode.

c) For MS's supporting speech the System Simulator commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder's input and at the same time to signal the frame erasure event to the SS.

d) The SS is set to produce a wanted Standard Test Signal C1 and an independent, uncorrelated interfering (unwanted) Standard Test Signal I1 at the same time. The fading characteristic of the wanted and the interfering signal is TU50. The channel frequency shall be in the range 60 to 65 (ARFCN).

   The wanted signal shall be the Standard Test Signal C1. It shall be at the nominal frequency of the receiver and at a level of 28 dBmicroVoltemf( ).

   The unwanted signal shall have no fixed relationship with the bit transition of the wanted signal and it shall be modulated with random data. Its amplitude shall be 9 dB above that of the wanted signal. The unwanted signal shall be continuous, with a nominal frequency 200 kHz above the nominal frequency of the wanted signal.

e) For MS's supporting speech the SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

   The SS tests the frame erasure compliance for the TCH/FS by examining Max-samples of consecutive frames. The number of frame erasure events is recorded.

   The SS determines the number of residual bit error events for bits of class Ib and class II by examining sequences of Max-Samples of consecutive bits of class Ib and class II. Bits are only taken from those frames for which no bad frame indication was given.

f) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the adjacent channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during Max-samples of consecutive FACCH frames.

g) The measurement of steps d) and e) or f), whichever is applicable, shall be repeated with the unwanted signal on a frequency at the same displacement from, but below, the frequency of the wanted signal.

h) The measurement of steps d) to g) shall be repeated for a displacement of the unwanted signal of 400 kHz, and with the amplitude of the unwanted signal 41 dB above the level of the wanted input signal, and the unwanted signal static.

i) The Mobile Station is placed in a climatic test chamber (for extreme test conditions see Annex 1, part TC), and steps d) to h) are repeated for the following combinations of temperatures and power supply voltages:

Temp. :	Hi	Hi	Lo	Lo
Volt. :	Hi	Lo	Lo	Hi

II.4.5.3 Limits

Interference at	Channel	Type of measurement	Max-events	Max-samples
200 kHz	TCH/FS	FER	600*α	8900
	class Ib	RBER	4200/α	1000000
	class II	RBER	50000	600000
	FACCH	FER	600	4100
400 kHz	TCH/FS	FER	1020*α	8900
	class Ib	RBER	7560/α	1000000
	class II	RBER	55000	600000
	FACCH	FER	600	3133

The number of events recorded in this test shall not exceed the Max-events given in the table when the Number of samples = Max-samples. This shall apply for any combination of normal and extreme test voltages and ambient temperature, and with the interfering signals at either side of the wanted frequency.

The parameter α can range from 1 to 1.6. The value of α for the RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

Note: A static unwanted signal is used to avoid a potential problem with the noise floor of the fading simulator.

II.4.6 INTERMODULATION REJECTION

ref: GSM 05.05 section 5.2

II.4.6.1 Definition

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

II.4.6.2 Method of measurement

NOTE: The measurements address the third order intermodulation, which represents the most serious case.

The compliance with the requirements for the bit error ratio of TCH/FS class II bits and FER of FACCH is checked in order to verify the receiver's intermodulation rejection under normal and extreme test conditions.

For a MS supporting speech, step g2) is not required (FACCH not tested).

For a data only MS, steps e) and g1) are not required.

a) A call shall be originated by the SS to the MS and the MS shall be made to answer the call. The call shall be on a TCH in the range 60 to 65 (ARFCN).

b) The MS shall be operated in the encrypted mode.

c) The MS shall be operated under normal test conditions.

d) The wanted signal shall be the Standard Test Signal C1. The wanted signal shall be at the nominal frequency of the receiver. The level of the wanted signal shall correspond to 4 dB above the reference sensitivity level (see Table II.4.6-1).

e) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder input and at the same time to signal the frame erasure event to the SS.

f) For a speech MS the SS is set to produce a static wanted signal, and two static interfering (unwanted) signals at the same time. For a non speech MS the SS is set to produce a TU50 wanted signal, and two static interfering (unwanted) signals at the same time. There shall be no correlation in the modulation between the signals.

   The first interfering signal shall be on a frequency equal to the centre frequency of an ARFCN four above that of the receiver. This signal shall be static and shall be unmodulated.

   The second interfering signal shall be on an ARFCN eight above that of the receiver. This signal shall be static, continuous and shall be modulated by random data.

   The amplitude of both the interfering signals shall be set according to Table II.4.6-1.

g1) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

   The SS tests the RBER compliance of class II bits by examining Max-samples of consecutive bits, with bits only taken from those frames which do not signal frame erasure. The number of error events are recorded.

g2) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. The SS determines the number of frame erasure events during Max-samples of consecutive FACCH frames.

h) The measurement of step g1) or g2), whichever is applicable, shall be repeated with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

i) Steps a) to h), as applicable, shall be repeated but with the receiver operating on an ARFCN in the range 1 to 5.

j) Steps a) to h), as applicable, shall be repeated but with the receiver operating on an ARFCN in the range 120 to 124.

k) The Mobile Station is placed in a climatic test chamber (for conditions see Annex 1, part TC), and steps a) to j) are repeated for the following combinations of temperature and power supply voltage:

Temp. :	Hi	Lo	Hi	Lo
Volt. :	Hi	Lo	Lo	Hi

MS CLASS	MS HANDHELD	Wanted signal dBμVemf( )	First interferer dBμVemf( )	Second interferer dBμVemf( )
1,2	NO	13	74	63
3,4,5	YES	15	64	63

Table II.4.6-1: Intermodulation test signal levels

Note: The levels in Table II.4.6-1 are different to those specified in GSM 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.

II.4.6.3 Limits

The Number of error events recorded in this test shall not exceed the Max-events values given below when the Number of samples = Max-samples. This shall apply under normal condition and under any combination of normal and extreme test voltages and ambient temperature, and with the two interfering signals at either side of the wanted frequency.

Channel	Type of measurement	Max-events	Max-samples
TCH/FS Class II Static	RBER	200	8200
FACCH	FER	600	4100

II.4.7 BLOCKING AND SPURIOUS RESPONSE

ref: GSM 05.05 section 5.1

II.4.7.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation.

The method of test aligns with ETS 300 086.

For MS not supporting speech, step e1) and j1) are not required. For all other MS, step e2) and j2) are not required.

II.4.7.2 Method of measurement

a) The MS is connected to the SS. The MS is operated under normal test conditions.

b) A call shall be originated by the SS to the MS, and the MS shall be made to answer the call. The call shall occupy a full rate channel and shall be on one of the radio frequencies in the range 60 to 65 ARFCN.

c) The MS shall be operated in the encrypted mode.

d) The wanted signal shall be the Standard Test Signal C1. The wanted signal shall be at the nominal frequency of the receiver.

e1) The SS commands the MS to create the loop back facility from the receiver's speech channel decoder output to the transmitter's encoder's input and at the same time to signal the frame erasure event to the SS.

e2) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to interfering signals, the MS may not be able to acknowledge the Layer 2 frame. Frame erasures are indicated by repeated L2 frames.

f) For a speech MS the SS is set to produce a static wanted signal and a static interfering signal at the same time. For a non-speech MS the SS is set to produce a TU50 wanted signal and a static interfering signal at the same time. The level of the wanted signal shall be 15 dBmicroVoltemf for hand portable MSs or 13 dBmicroVoltemf for all other MSs (this corresponds to 4 dB above the reference sensitivity level.

g) The unwanted signal shall be a C.W. signal (Standard test signal I0) of frequency FB. It shall in turn be applied on the subset of frequencies calculated at step h) in the overall range 100 kHz to 12.75 GHz, where FB is an integer multiple of 200 kHz.

Frequencies in the range FR +/- 600 kHz shall, however, be excluded.

Note: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at subharmonic frequencies nFB where n = 2, 3, 4, 5 etc.

h) The frequencies at which the test shall be performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) below :-

i) The total frequency range formed by :-

the frequencies between F_{lo} + (IF_1 + IF_2 + ... +IF_n +12.5 MHz) and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12.5 MHz).

and

the frequencies + 100 MHz and - 100 MHz from the edge of the relevant receive band.

Measurement shall be made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz, if they lie in the range 100 kHz to 12.75 GHz.

iii) The frequencies mF_{lo} + IF_1, mF_{lo} - IF_1, where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12.75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

iv) Outside the range defined in i) above, spot frequencies shall be measured at 10 MHz from the range edge and repeated at 10 MHz intervals from 100 kHz to 12.75 GHz.

Where :-

F_{lo} - local oscillator applied to first receiver mixer
IF_1 ... IF_n - are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n shall be declared by the manufacturer in the PIXIT statement GSM 11.10 Annex 3.

i) The level of the unwanted signal shall be set according to the following table.

FREQUENCY	LEVEL FOR MSs WITH POWER CLASSES 3, 4, 5	1, 2
FR +/- 600 kHz to FR +/- 800 kHz	70 dBμV	75 dBμV
FR +/- 800 kHz to FR +/- 1.6 MHz	70 dBμV	80 dBμV
FR +/- 1.6 MHz to FR +/- 3 MHz	80 dBμV	90 dBμV
915 MHz to FR - 3 MHz	90 dBμV	90 dBμV
FR + 3 MHz to 980 MHz	90 dBμV	90 dBμV
835 MHz to 915 MHz	113 dBμV	113 dBμV
980 MHz to 1000 MHz	113 dBμV	113 dBμV
100 kHz to 835 MHz	90 dBμV	90 dBμV
1000 MHz to 12.75 GHz	90 dBμV	90 dBμV

Note: These values differ from GSM 05.05 because of practical signal generator limits in the SS.

j1) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

The SS tests the RBER compliance for the bits of class II, by examining sequences of Max-samples consecutive bits of class II, where bits are taken only from those frames for which no bad frame indication was given. The number of error events is recorded.

If a failure is indicated it shall be noted and counted towards the allowed exemption totals.

In the case of failures discovered at the predicted frequencies at steps h ii), iii) or iv) the test shall be repeated on the adjacent channels +/- 200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond shall also be tested. This process shall be repeated until all channels constituting the group of failures is known.

j2) The SS determines the number of frame erasure events during Max-samples. If a failure is indicated, it should be noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps h ii), iii) or iv) the test shall be repeated on the adjacent channels +/- 200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond shall also be tested. This process shall be repeated until all channels constituting the group of failures is known.

k) Steps g) to j1) or j2), whichever is applicable, shall be repeated, for the MS operating on an ARFCN in the range 1 to 5.

l) Steps g) to j1) or j2), whichever is applicable, shall be repeated, for the MS operating on an ARFCN in the range 120 to 124.

II.4.7.3 Reserved

II.4.7.4 Limits

The number of error events recorded in this test shall not exceed the Max-events values given below when the Number of Samples = Max-samples. This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Channel	Type of measurement	Max-events	Max-samples
non speech MS FACCH	FER	600	4100
other MS TCH/FS Class II	RBER	200	8200

A maximum of six failures are allowed in the range FR +/- 45 MHz, with the exclusion of FR +/- 800 kHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures are allowed in the range 100 kHz to 12.75 GHz for the equipment with antenna connector outside FR +/- 45 MHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated before, at those frequencies at which the failures occur the test stated in II.4.7.2 (or II.4.7.3) shall be repeated, but with a level of the unwanted signal set at 70 dBμV emf. The performance requirement is once again that stated above, that is:

(non speech MS)
Max-events - 600 Max-samples - 4100

(other MS)
Max-events - 200 Max-samples - 8200

The number of Error Events recorded in this test shall not exceed the Max-events values given above, when the number of samples = Max-samples.

No failures are allowed at this lower unwanted signal level.

II.5 TESTING OF MS SIGNALLING FUNCTIONS

Testing of the MS's signalling functions is related to signalling on layers 1, 2 and 3.

Section II.5.1 contains references for tests on Layer 1 (signalling).

Section II.5.2 contains testing of signalling Layer 2. The present text on testing of Layer 2 is based on implementation of the simplified protocol, as described in GSM 04.06.

Section II.5.3 contains testing of signalling Layer 3.

II.5.1 TESTS OF THE LAYER 1 SIGNALLING FUNCTIONS

Testing of Layer 1 signalling functions is included in the tests in section II.6. Other Layer 1 functions are tested in sections II.2, II.3 and II.4. Some testing of Layer 1 functions is integrated with Layer 3 signalling testing (II.5.3).

II.5.2 TESTS OF THE LAYER 2 SIGNALLING FUNCTIONS

References:

1 ETSI Recommendations GSM 04.05, 04.06 and 04.08.
2 CCITT Rec. X.290: OSI Conformance Testing Methodology and Framework for CCITT applications, Part 2: Abstract Test Suite Specification.

II.5.2.1 INTRODUCTION

II.5.2.1.1 Objective and Scope

II.5.2.1.1.1 General

The objective of section II.5.2 is to provide detail of how Layer 2 of the MS is tested to verify conformance to the testable parameters given in GSM 04.06. The tests cover SAPI = 0, and they will be carried out on both SDCCH and FACCH. Testing of unnumbered information transfer on SACCHs is covered implicitly by the test in section II.5.3.6.3.

The testing is performed using the test configuration described in section II.5.2.1.1.2. This configuration does not provide for testing of conformance of any maintenance functions.

The MS under test shall conform to the test configuration, and the Remote Single layer (RS) test method (CCITT X.290, section 8.1.4) will be used.

II.5.2.1.1.2 Test Configurations

The Layer 2 test configuration defines the Layer 2 functional blocks of a MS being tested and the access arrangement between MS and tester.

Note: These functional blocks provide the Layer 2 basic capabilities which have to be implemented in accordance with the specification given in GSM 04.06. However, the definition of Layer 2 in the form of a number of functional blocks places no requirements on the Layer 2 implementation in a MS.

An example of a functional composition of the MS Layer 2 is given in GSM 04.05. These function blocks provide basic capabilities which have to be implemented in accordance with GSM 04.05 and 04.06.

Also there are alternatives or options included in GSM 04.05 and 04.06, these are provided as complementary capabilities.

II.5.2.1.1.3 Pre-conditions

Before carrying out any Layer 2 tests the tests specified in Aspect II, Part II.2, II.3, II.4 and II.6 (Layer 1 tests) shall be performed.

Apart from powering up the MS to be tested and being able to establish a call the only access to the MS needed and used for Layer 2 testing is the radio interface. It therefore is necessary that the MS is able to synchronize to the System Simulator and to decode its BCCH and CCCH. Furthermore, the MS must be able to perform the following elementary Layer 3 procedures:

- Paging
- Immediate Assignment
- Dedicated Channel Assignment
- Handover
- Channel Release.

It is necessary that the tests are performed in the order specified, except where the starting point is set (II.5.2.1.1.5).

The data link is maintained by the MS and the SS sending fill frames (c.f. GSM 04.06, sect. 5.4.2.3) on the SDCCH when no other frames are to be transmitted. Fill frames are also sent on the FACCH while the channel mode is set to signalling. The default mode is signalling. The tests will normally be performed with the MS sending fill frames on the main DCCH (i.e. FACCH or SDCCH). Consequently throughout the tests fill frames will be sent and received even while waiting for other Layer 2 frames. The scheduling of the fill frame sending cannot be specified as this sending is closely linked to the processing times in the MS. Therefore, the instants of transmission of fill frames cannot be tested nor the number of these transmissions.

II.5.2.1.1.4 Layer 2 Test Frames

The Layer 2 conformance test is accomplished by sequences of those frames which are contained in GSM 04.06 (Layer 2 frame repertoire etc.).

These frame sequences are under control of the System Simulator and are related to the state that the System Simulator perceives the MS to be in as a result of frames transferred across the MS-BS interface.

These frame sequences shall comply with the following rules:

1) The test sequences exchanged between the System Simulator and MS are assumed to be free from transmission errors.

2) The tester may introduce errors in the direction tester to MS by inserting wrong parameters in the address, control and length indication field.

3) The tester may simulate errors in the direction MS to tester by ignoring the receipt of frames.

4) The tester may violate the protocol rules related to the control of state variables to provoke sequence gaps.

5) There is no contention on the Dm channel at Layer 1 (Layer 1 point-to-point).

6) With respect to contention on the Dm channel at Layer 2, two distinct situations are defined:

i) Test of the protocol procedure supported by a single entity. In this case there is no contention on the Dm channel (one peer-to-peer information transfer invoked at a time). This test applies to all MSs and is performed for SAPI = 0.

ii) Test of Layer 2 multiplexing and MS processing capacity in terms of the number of SAPs and links which a MS is able to support simultaneously. In this case there is contention on the Dm channel at Layer 2 and this contention is resolved within Layer 2 based on the SAPI. This test applies to MSs which are designed for supporting SAPI in addition to SAPI = 0.

Examples of special GSM Layer 2 functions to be tested:

- Correct L2 functions on specific GSM control channels
- Length indication
- Fill bits
- Segmentation, more data bit
- SABM/UA containing information for contention resolution
- Abnormal release.

II.5.2.1.1.5 Establishment of the dedicated physical resource

The System Simulator shall simulate a BS with BCCH/CCCH on one carrier. The MS shall be listening to this CCCH and able to respond to paging messages. The system simulator sends Paging Request to the MS on the paging channel. The MS shall respond with Channel Request on the random access channel. The system simulator sends Immediate Assign to the MS, thereby ordering the MS either to a SDCCH or to a TCH, that is FACCH. Each test is performed twice, once on SDCCH and once on FACCH except where tests on both is inherent in the test description.

II.5.2.1.1.6 Release of the dedicated physical resource

After a test has been performed the System Simulator shall initiate the release of the SDCCH or FACCH, as laid out in GSM 04.08, section 7.1.6. This shall return the MS to the idle mode, i.e. the MS shall again be listening to the CCCH of the System Simulator.

II.5.2.2 TEST SEQUENCES

Timing requirement:

The MS shall respond to a command within T200 as defined in GSM 04.06.

The MS shall repeat a command after timeout of T200 if the command has not been acknowledged as defined in GSM 04.06.

Constant bit values:

In each frame from the MS:

- bits 6 through 8 of the address field shall be set to zero as defined in GSM 04.06.
- except for test II.5.2.2.7, the address extension bit (EA bit) shall be set to 1 as defined in GSM 04.06.
- except for test II.5.2.2.7, the length indicator field extension bit (EL bit) shall be set to 1 as defined in GSM 04.06.

This shall be checked each time a frame from the MS is received.

Fill bits:

The fill bits transmitted with each frame from the MS whose length indicator L is less than N201 as defined in GSM 04.06 shall be set as defined in GSM 04.06.

Frame format description

The frames are described by the following parameter sets:
SABM (C, P, M = 0, L = 0) (* SABM without an information field*)
SABM (C, P, M = 0, L > 0) (* SABM with an information field*)
DISC (C, P, M = 0, L = 0)
UA, (F, M = 0, L = 0) (* UA without an information field*)
UA, (F, M = 0, L > 0) (* UA with an information field*)
DM (R, F, M = 0, L = 0)
RR (C, P, M = 0, L = 0, N(R))
RR (R, F, M = 0, L = 0, N(R))
REJ (C, P, M = 0, L = 0, N(R))
REJ (R, F, M = 0, L = 0, N(R))
I (C, P, M = 0, L < N201, N(S), N(R))
I (C, P, M = 1, L = N201, N(S), N(R))
UI (C, P = 0, M = 0, L = 0)
UI (C, P = 0, M = 0, L < N201)

where:
C = command
R = response
P = poll
F = final
M = M bit
L = length indicator
N(S) = send sequence number
N(R) = receive sequence number.

II.5.2.2.1 Initialisation

II.5.2.2.1.1 Initialisation when contention resolution required

II.5.2.2.1.1.1 Normal initialisation

Purpose:

To test the normal establishment of multiple frame operation between the SS and the MS when contention resolution is required.

Method of test:

The MS is paged as described in the Layer 2 tests general section at II.5.2.1.1.5.

The MS shall then continue the setup by sending a SABM frame.

The SS responds with a UA frame.

The MS shall send a UI fill frame.

The SS waits for at least T200 after the UA to ensure the SABM frame is not repeated. This confirms that the UA has been received.

The MS is returned to the idle state as described in II.5.2.1.1.6.

Expected sequence:

```
MS                                                              SS

 1--------------------SABM (SAPI, C, P, M, L)------------------->

 <---------------------UA (SAPI, R, F, M, L)--------------------2
         Fill
 3------------------------UI (C, P, M, L)----------------------->
         FRAME
                                               Wait T200
```

The frames from the SS will be:

2: One UA frame containing:
   SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM
   information field = information field of SABM

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
   SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
   information field = Page Response

3: One UI frame containing:
   C = 0, P = 0, M = 0, L = 0

II.5.2.2.1.1.2 Initialisation failure

II.5.2.2.1.1.2.1 Loss of UA frame

Purpose:

To test the MS response to the loss of a Layer 2 UA frame during initialisation.

Method of test:

The MS is paged as described in the Layer 2 tests general section at II.5.2.1.1.5.

The MS shall then continue the setup by sending an SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for timeout of timer T200 and then send a second SABM frame.

The SS responds with a UA frame.

The MS shall send a UI fill frame.

The SS waits for at least T200 to ensure the SABM frame is not repeated

The MS is returned to the initial condition by clearing of the call (not part of this test).

Expected sequence:

```
MS                                                                SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <-------------------UA (SAPI, R, F, M, L)---------------------2

 3------------------------UI (C, P, M, L)---------------------->
    Fill FRAME
                                  Wait T200
```

The frames from the SS will be:

2: One UA frame containing:
   SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM
   information field = information field of SABM

Requirements:

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:
   SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
   information field = Page Response

   The second SABM frame shall follow the first SABM frame after timeout of timer T200.

3: One UI frame containing:
C = 0, P = 0, M = 0, L = 0

II.5.2.2.1.1.2.2 UA frame with different information field

Purpose:

To test that the MS will leave the channel and return to the idle state when multiple frame establishment fails because a UA frame with a different information field is received in response to the SABM frame.

Method of test:

The MS is paged as described in the general section for Layer 2 testing in section II.5.2.1.1.5. The MS is now in a condition to test the Layer 2 aspects of multiple frame establishment with contention resolution and a UA frame with an information field different from the one in its SABM frame.

The MS shall send an SABM frame.

The SS shall respond with an UA frame whose information field is different from the one in the SABM frame.

The SS shall wait for 3*T200 to check that the MS does not send any other L2 frames than L2 fill frames.

After a time equal to 3*T200 the SS checks that there are no more Layer 2 frames, for a period of 1 second.

Note: Possible fill frames are allowed in order to take into account processing time inside the MS.

The SS shall then page the MS according to II.5.2.2.1.1.1 to make sure that the MS has returned to the idle state.

Expected sequence:

```
MS                                                                SS

 1------------------SABM (SAPI, C, P, M, L)-------------------->

 <------------------UA (SAPI, R, F, M, L)----------------------2
```

Wait for at least 3*T200

The frames from the SS will be:

2: One UA frame containing:
SAPI = 0, R = 0, F = 1, M = 0, L = 0

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = Page Response

3: Fill frames may occur.

II.5.2.2.1.1.2.3 Information frame and supervisory frames in response to an SABM frame

Purpose:

To test that the MS will ignore receipt of frames other than a UA when received in response to the SABM frame.

Method of test:

As in II.5.2.2.1.1.2.2, but instead of returning a UA frame the SS will respond with an I frame, RR frame, REJ frame. (So this test will actually be performed 3 times.). The MS shall ignore receipt of the frames sent by the SS and therefore resend its SABM frame after timeout of T200.

Expected sequence:

```
MS                                                                SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <----------I, RR, REJ (SAPI, C, P, M, L, N(R), N(S))-----------2
    Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
```

The frames from the SS will be:

2: One I frame containing:
SAPI = 0, C = 1, P = 1, M = 0, 0 <= L <= N201 (arbitrary)
N(R), N(S) arbitrary
information field arbitrary

or One RR frame containing:
SAPI = 0, C = 1, P = 1, N(R) arbitrary

or One REJ frame containing:
SAPI = 0, C = 1, P = 1, N(R) arbitrary

Requirements:

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:
SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = Page Response

The second SABM frame shall follow the first SABM frame after timeout of timer T200.

II.5.2.2.1.1.3 Initialisation Denial

Purpose:

To test that the MS takes appropriate action if the network side indicates that it can not enter the multiple frame established state.

Method of test:

The MS is paged as described in the Layer 2 tests general section at II.5.2.1.1.5.

The MS shall then continue the setup by sending a SABM frame.

The SS responds with a DM frame.

The SS then waits at least T200 for the MS to transmit.

The MS shall not repeat the SABM frame.

Expected sequence:

```
MS                                                              SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <-------------------DM (SAPI, R, F, M, L)---------------------2
Wait for at least T200.
```

The frames from the SS will be:

2: One DM frame containing:
   SAPI = 0, R = 0, F = 1, M = 0, L = 0

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
   SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
   information field = Page Response

II.5.2.2.1.1.4 Total initialisation failure

Purpose:

To test the MS response to the lack of the system to respond to requests to initialise the data link.

Method of test:

The MS is paged as described in the Layer 2 tests general section at II.5.2.1.1.5.

The MS shall then continue the setup by sending a SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for timeout of timer T200 and then send a second SABM frame.

This is repeated until the MS has sent the SABM frame six times. The MS shall not send the SABM any more than six times.

The SS continues to send paging messages on the BCCH/CCCH and the test continues as in test II.5.2.2.1.1.1.

Expected sequence:

```
MS                                                                 SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
```

Requirements:

The frames from the MS shall be:

1: One SABM frame (occurs six times) containing:
   SAPI = 0, C = 0, P = 1, M = 0, <= L <= N201
   information field = Page Response

   The subsequent SABM frames shall follow the previous SABM frame after timeout of timer T200.

II.5.2.2.1.2 Initialisation, contention resolution not required

This procedure is used after a data link has been established with contention resolution and a new data link is established on a new channel e.g. handover, dedicated channel assignment.

II.5.2.2.1.2.1 Normal initialisation without contention resolution

Purpose:

To test the normal initialisation of multiple-frame operation when contention resolution is not required.

Method of test

The data link is setup between the MS and the SS as in test II.5.2.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign an SDCCH.

The MS shall then continue the setup by sending a SABM frame without contention resolution.

The SS responds with a UA frame.

The MS shall then send an I frame containing the ASSIGNMENT COMPLETE message.

The SS shall acknowledge the I frame with an RR frame.

The SS then waits for the MS to send a UI fill frame.

The SS then initiates the dedicated channel assignment procedure to assign an FACCH.

The expected sequence is then repeated. The SS waits for at least T200 to ensure that the SABM is not repeated.

Expected sequence:

```
MS                                                              SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <-------------------UA (SAPI, R, F, M, L)---------------------2

 3-------------------I (SAPI, C, P, M, L, N(S), N(R)------------>

 <-------------------RR (SAPI, R, F, M, L, N(R)-----------------4
        Fill
 5-----------------------UI (C, P, M, L)----------------------->
        FRAME
```

The frames from the SS will be:

2: One UA frame containing:
   SAPI = 0, R = 0, F = 1, M = 0, L = 0

4: One RR frame containing:
   SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
SAPI = 0, C = 0, P = 1, M = 0, L = 0

3: One I frame containing:
SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201
N(S) = 0, N(R) = 0
Information field = Assignment Complete

5 One UI frame containing:
C = 0, P = 0, M = 0, L = 0

II.5.2.2.1.2.2 Initialisation failure

Purpose:

To test the MS response to the loss of a Layer 2 UA frame during initialisation.

Method of test

The SS initiates the dedicated channel assignment procedure to assign an SDCCH.

The MS shall then continue the setup by sending a SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for timeout of timer T200 and then send a second SABM frame.

The SS responds with a UA frame.

The MS shall then send an I frame containing the assignment complete message.

The SS shall acknowledge the I frame with an RR frame.

The SS then waits for the MS to send a UI fill frame.

The SS then initiates the dedicated channel assignment procedure to assign a FACCH.

The expected sequence is then repeated. The SS waits for at least T200 to ensure that the SABM is not repeated.

The MS is returned to the idle state as described in II.5.2.1.1.6.

Expected sequence:

```
MS                                                                    SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <-------------------UA (SAPI, C, F, M, L)----------------------2

 3-------------------I (SAPI, C, P, M, L, N(S), N(R)------------>

 <-------------------RR (SAPI, R, F, M, L, N(R)-----------------4

 5------------------------UI (C, P, M, L)----------------------->
    Fill FRAME
```

The frames from the SS will be:

2: One UA frame containing:
SAPI = 0, R = 0, F = 1, M = 0, L = 0

4: One RR frame containing:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1

Requirements:

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:
SAPI = 0, C = 0, P = 1, M = 0, L = 0

The second SABM frame shall follow the first SABM frame after timeout of timer T200.

3: One I frame containing:
SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201
N(S) = 0, N(R) = 0
Information field = Assignment Complete

5: One UI frame containing:
C = 0, P = 0, M = 0, L = 0

II.5.2.2.1.2.3 Initialisation Denial

Purpose:

To test that the MS takes appropriate action if the data link can not be initialised if the network side indicates the Layer 3 process is busy.

Method of test

The data link is setup between the MS and the SS as in test II.5.2.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign a SDCCH.

The MS shall then continue the setup by sending a SABM frame.

The SS responds with a DM frame.

The SS then waits at least T200.

The MS shall not repeat the SABM frame. However the MS will attempt to re-establish the link on the previous channel.

The test is repeated, but a FACCH is assigned in place of the SDCCH.

Expected sequence:

```
MS                                                          SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->

 <-------------------DM (SAPI, C, P, M, L)----------------------2
```

The frames from the SS will be:

2: One DM frame containing:
   SAPI = 0, R = 0, F = 1, M = 0, L = 0

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
   SAPI = 0, C = 0, P = 1, M = 0, L = 0

II.5.2.2.1.2.4 Total initialisation failure

Purpose:

To test the MS response to the lack of the system to respond to requests to initialise the data link.

Method of test

The data link is setup between the MS and the SS as in test II.5.2.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign a SDCCH.

The MS shall then continue the setup by sending a SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for timeout of timer T200 and then send a second SABM frame.

This is repeated until the MS has sent the SABM frame six times.

The MS shall not send the SABM any more than six times.

The test is repeated, but a FACCH is assigned in place of the SDCCH.

Expected sequence:

```
MS                                                                  SS

 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
   Timeout of T200
 1-------------------SABM (SAPI, C, P, M, L)-------------------->
```

Requirements:

The frames from the MS shall be:

1: One SABM frame (occurs six times) containing:
   SAPI = 0, C = 0, P = 1, M = 0, L = 0

   The subsequent SABM frames shall follow the previous SABM frame after timeout of timer T200.

II.5.2.2.2 Normal information transfer

II.5.2.2.2.1 Sequence counting and I frame acknowledgements

Purpose:

To test the operation of Layer 2 sequence numbering. Since there are 8 sequence numbers the test cycles through 9 information frame transfers.

Method of test

The MS is brought into the multiple frame established state as described in test II.5.2.2.1.1.1.

The SS sends an Identity Request message asking for IMEI to the MS.

The MS shall acknowledge this I frame with an Identity Response I frame or a RR frame.

This is repeated a further 8 times as rapidly as possible assuming a window size 1.

The MS Layer 3 response time should be less than 4*T200 and therefore the MS responses to at least the 5th, 6th, 7th, 8th and 9th I frames must be an I frame on the SDCCH. On the FACCH it is possible that all MS responses at Layer 2 will be RR frames.

The frames from the SS will be:

1,3,5,7,9,11,13,15,17:
  One I frame (occurs nine times) containing:
  SAPI = 0, C = 1, P = 0, M = 0, 0<= L <= N201
  N(S) = 0, 1, 2, 3....7, 0
  N(R) = (number of I frames received in the test sequence hitherto) mod 8
  information field = Identity Request (IMEI)

19,21, and so on, until the SS has received 9 I frames from the MS:
  One RR frame containing:
  SAPI=0, R=0, F=0, M=0, L=0
  N(R) = (number of I frames received in the test sequence hitherto) mod 8

Requirements

There shall be an integer k>=0 such that for i=1,2,.....,k+9 the following conditions (a) and (b) both hold:

(a) The MS sends 9 I frames and k RR-frames during the test

(b) The frames sent by the MS in step 2*i is:
(b1) if the frame is an RR frame (occurs k times):
    one RR frame containing:
      SAPI=0, R=1, F=0, M=0, L=0
      N(R) = ((Value of N(S) in the last received I frame from the SS)+1) mod 8
(b2) if the frame is an I frame (occurs 9 times):
    one I frame containing:
      SAPI=0, C=0, P=0, M=0, 0<=L<=N201
      N(R) = ((Value of N(S) in the last received I frame from the SS)+1) mod 8
      N(S) = (number of I frames sent hitherto by the MS to SS excluding the actual I frame) mod 8
      information field=identity response (IMEI)

Example of Expected sequence (assuming 3xT200 < L3 reaction time < 4xT200):

```
MS                                                                 SS

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------1

 2----------------RR (SAPI, R, M, L, N(R), F)-------------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------3

 4----------------RR (SAPI, R, M, L, N(R), F)-------------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------5

 6----------------RR (SAPI, R, M, L, N(R), F)-------------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------7

 8----------------RR (SAPI, R, M, L, N(R), F)-------------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------9

10----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))-------------11

12----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))-------------13

14----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))-------------15

16----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------I (SAPI, C, P, M, L, N(S), N(R))-------------17

18----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------RR (SAPI, R, M, L, N(R), F)------------------19

20----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------RR (SAPI, R, M, L, N(R), F)------------------21

22----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------RR (SAPI, R, M, L, N(R), F)------------------23

24----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------RR (SAPI, R, M, L, N(R), F)------------------25

26----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 <----------------RR (SAPI, R, M, L, N(R), F)------------------27
```

The frames from the SS will be:

1,3,5,7,9,11,13,15,17:
One I frame (occurs nine times) containing:
SAPI = 0, C = 1, P = 0, M = 0, 0<= L <= N201
N(S) = 0, 1, 2, 3....7, 0
N(R) = 0, 0, 0, 0, 0, 1, 2, 3, 4
information field = Identity Request (IMEI)

19,21,23,25,27:
One RR frame (occurs five times) containing:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 5, 6, 7, 0, 1

The frames from the MS shall be:

2,4,6,8:
One RR frame (occurs four times) containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1,2,3,4

10,12,14,16,18,20,22,24,26:
One I frame (occurs nine times) containing:
SAPI = 0, C = 0, P = 0, M = 0, 0<= L <= N201
N(R) = 5,6,7,0,1,1,1,1,1
N(S) = 0,1,2,3,4,5,6,7,0
information field = Identity Response (IMEI)

II.5.2.2.2.2 Receipt of an I frame in the timer recovery state

Purpose:

To test that the MS is able to respond to I frames whilst in the timer recovery state.

Method of test

The MS is brought into the multiple frame established state as described in test II.5.2.2.1.1.1.

The SS sends a IDENTITY REQUEST message asking for IMEI to the MS.

The MS shall respond with a RR frame though this may be incorporated with the Identity Response I frame.

The SS does not respond to the I frame.

The MS shall wait for expiry of timer T200 and then repeat the I frame but with the P bit set to 1.

The SS then sends a valid Identity Request I frame asking for IMEI which does not acknowledge receipt of the I frame from the MS.

On the FACCH the MS may send an RR frame acknowledging the I frame.

The MS shall repeat the I frame, this frame will acknowledge receipt of the second I frame from the SS.

The SS then acknowledges receipt of the MS I frame by sending a RR frame.

The MS shall send the next I frame. The SS acknowledges this I frame.

Expected sequence:

```
MS                                                            SS

 <-------------I (SAPI, C, P, M, L, N(S), N(R))-----------------1

 2------------RR (SAPI, R, M, L, N(R), F)--------------------->
 May be incorporated
 3-------------I (SAPI, C, P, M, L, N(S), N(R))---------------->
 Timeout of T200
 4-------------I (SAPI, C, P, M, L, N(S), N(R))---------------->

 <-------------I (SAPI, C, P, M, L, N(S), N(R))-----------------5

 5bis----------RR (SAPI, R, M, L, N(R), F) may be sent---------->

 6-------------I (SAPI, C, P, M, L, N(S), N(R))---------------->
 Timeout of T200
 <-------------RR (SAPI, R, M, L, N(R), F)----------------------7

 8-------------I (SAPI, C, P, M, L, N(S), N(R))---------------->

 <-------------RR (SAPI, R, M, L, N(R), F)----------------------9
```

The frames from the SS will be:

1,5:
One I frame (occurs twice) containing:
SAPI = 0, C = 1, P = 0, M = 0, 0<= L <= N201
N(S) = 0,1 N(R) = 0
information field = Identity Request

7,9:
One RR frame (occurs twice) containing:
SAPI = 0, R = 0, F = 1,0, M = 0, L = 0, N(R) = 1,2

Requirements:

The frames from the MS shall be:

2:
One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

3,8:
One I frame (occurs twice) containing:
SAPI = 0, C = 0, P = 0, M = 0, 0<= L <= N201, N(R) = 1,2
N(S) = 0,1
information field = Identity Response

4,6:
One I frame (occurs twice) containing:
SAPI = 0, C = 0, P = 1, M = 0, 0<= L <= N201, N(R) = 1,2
N(S) = 0
information field = Identity Response

5bis: (possible only on the FACCH)
One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 2

II.5.2.2.2.3 Segmentation and Concatenation

Purpose:

To test the proper use of segmentation and concatenation, Suspend and resume.

Method of test

If the MS supports the UnStructuredSSData operation, then the MS is made to activate an unknown supplementary service as defined in GSM 02.30 with the following sequence *NN*si: NN is chosen to be undefined in GSM 02.30 Annex 2 and si is an IA5 string of length 20 digits.

If the MS does not support the UnStructuredSSData operation, then the MS is made to initiate a call.

The SS responds with the Immediate Assign procedure firstly allocating a SDCCH and on the second repeat of the test a TCH.

The MS is brought into the multiple frame established state by continuing as described in test II.5.2.2.1.1.1. The layer three message element in the SABM will be CM Serv Request.

The SS sends the UA and waits for 10 seconds. The SS then sends an I frame with CM Serv Accept.

The MS sends either:

- a Register message with an information element of more than 21 octets. This message is segmented between two I frames.

or

- a SETUP message.

The SS shall acknowledge only the I frame with More bit set to 1 (if any) but it shall not acknowledge the I frame with More bit set to 0.

The SS then performs a handover (in the case of SDCCH this shall be finely synchronised) while still on the assigned channel and without acknowledging the last I frame of the MS Layer 3 message, making sure to fill the Handover command to more than 21 octets (for example by using the cell channel description element).

On the SDCCH the MS will go into timer recovery and resend the last I frame of the Layer 3 message with the P bit set to 1 when it acknowledges the two I frames of the Handover Command. On the FACCH the MS may simply acknowledge both I frames.

The MS does not attempt to resend the last I frame of the Register or SETUP message on the old channel but instead goes to the new channel where it performs a random access using the Handover Access message and then multiple frame establishment without contention resolution as described in test II.5.2.2.1.2.1.

The MS shall then send an I frame with the Handover complete message. Assuming this is a finely synchronised handover.

The SS acknowledges this I frame.

The MS shall then resend the previous Register or SETUP message, that is all frames which are acknowledged in the usual way.

The test has to be repeated on the FACCH.

Expected sequence:

```
MS                                                              SS

 1--------------------SABM (SAPI, C, P, M, L)------------------->

 <---------------------UA (SAPI, R, F, M, L)--------------------2

 <--------------I (SAPI, C, P, M, L, N(S), N(R))----------------3

 4--------------RR (SAPI, R, F, M, L, N(R))--------------------->
  May be incorporated
 5-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->
  May be absent
 <-------------RR (SAPI, R, M, L, N(R), F)----------------------6

 7-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->

 <--------------I (SAPI, C, P, M, L, N(S), N(R))----------------8

 9-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->
    (see Note 1)
 <--------------I (SAPI, C, P, M, L, N(S), N(R))---------------10

11-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->
    (see Note 2)


************************* Channel Change ***********************
******************* including Handover Access ******************


12--------------------SABM (SAPI, C, P, M, L)------------------->

 <---------------------UA (SAPI, R, F, M, L)-------------------13

14--------------I (SAPI, C, P, M, L, N(S), N(R))---------------->

 <--------------RR (SAPI, R, F, M, L, N(R))--------------------15

16-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->
  May be absent
 <-------------RR (SAPI, R, M, L, N(R), F)---------------------17

18-------------I (SAPI, C, P, M, L, N(S), N(R))----------------->

 <-------------RR (SAPI, R, M, L, N(R), F)---------------------19
    Fill
20---------------------UI (C, P, M, L)-------------------------->
    FRAME
```

Note 1: The MS may send RR frames on the FACCH in addition to the I frames in 9 and 11.

Note 2: The I frame in 11 is optional.

The frames from the SS will be:

2:
One UA frame containing:
SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM
information field = information field of SABM

3:
One I frame containing:
SAPI = 0, C = 1, P = 0, M = 0, 0 < L <N201
N(S) = 0, N(R) = 0
information field = CM Service Accept

6:
This frame is sent only if frame 5 was received
One RR frame containing:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1

8,10:
Two I frames containing:
SAPI = 0, C = 1, P = 0, M = 1,0, L = N201,<=N201
N(S) = 1,2, N(R) = 1 or 0
information field = Handover

13: One UA frame containing:
SAPI = 0, R = 0, F = 1, M = 0, L = 0

15,17,19:
Two or three RR frames containing:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1,2 or 1,2,3

Requirements:

The frames from the MS shall be:

1: One SABM frame containing:
SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = CM Service Request

4:
One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

5,7:
The first I frame may be missing
Two I frames containing:
SAPI = 0, C = 0, P = 0, M = 1,0, L = N201,<=N201, N(S) = 0,1 or 0
N(R) = 1
information field = Register or Setup

9,11:
Two I frames containing:
SAPI = 0, C = 0, P = 1, M = 0, 0< L <= N201, N(S) = 1 or 0
N(R) = 2,3
information field = Register or Setup

Note : The I frame in 11 is optional.

12:
One SABM frame containing:
SAPI = 0, C = 0, P = 1, M = 0, L = 0

14:
One I frame containing:
SAPI = 0, C = 0, P = 0, M = 0, 0< L <N201, N(S) = 0,
N(R) = 0
information field = Handover Complete

16,18:
The first I frame may be missing
Two I frames containing:
SAPI = 0, C = 0, P = 0, M = 1,0, L = N201, 0< L <= N201,
N(S) = 1,2 or 1 N(R) = 0
information field = Register or Setup

20: UI frame containing:
C = 0, P = 0, M = 0, L = 0

II.5.2.2.3 Normal Layer 2 Disconnection

Purpose:

To test the normal data link disconnection sequences.

Method of test

The data link is setup between the MS and the SS as in test II.5.2.2.1.1.1.

The SS sends a Layer 2 Disconnect message to the MS.

The MS shall respond with a UA frame and return to the idle state; no more Layer 2 (I, S or U) frames, except possibly one or more 'fill' frames, shall be sent. This is checked during a time defined as 4 * T200.

The SS confirms that the MS has returned to the idle state by performing test II.5.2.2.1.1.1.

Expected sequence:

```
MS                                                                      SS

 <------------------DISC (SAPI, C, P, M, L)--------------------1

 2------------------UA (SAPI, R, M, L, F)---------------------->
```

The frames from the SS will be:

1: One DISC frame containing:
   SAPI = 0, C = 1, P = 1, M = 0, L = 0

Requirements:

The frames from the MS shall be:

2: One UA frame containing:
   SAPI = 0, R = 1, F = 1, M = 0, L = 0

No other Layer 2 (I, S or U) frames, except possibly one or more 'Fill' frames, shall occur.

II.5.2.2.4 Test of Link failure

II.5.2.2.4.1 I Frame loss (MS to SS)

Covered in test II.5.2.2.2.2.

II.5.2.2.4.2 RR Response frame loss (SS to MS)

Covered in test II.5.2.2.2.2.

II.5.2.2.4.3 RR response frame loss (MS to SS)

Purpose:

To test the Layer 2 recovery mechanism in the event of RR frame loss.

Method of test

The MS is brought into the multiple frame established state as described in test II.5.2.2.1.1.1.

The SS sends a I frame containing a Layer 3 message using PD=1111 (e.g. 0FH) to the MS. The L3 message is TEST_INTERFACE with tested device equal to 0.

The MS shall respond with a RR frame.

The SS ignores the RR frame from the MS but after T200 from the I frame sent by the SS the SS repeats the I frame but with the P bit set to 1. This simulates loss of the RR from the MS.

The MS shall respond with either an RR or REJ frame.

Note: This requirement is less restrictive than TS GSM 04.06.

Expected sequence:

```
MS                                                                SS

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------1

 2----------------RR (SAPI, R, M, L, N(R), F)------------------->
                                                   Timeout of T200
 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------3

 4----------------RR (SAPI, R, M, L, N(R), F)------------------->

OR

 4----------------REJ (SAPI, R, M, L, N(R), F)------------------>
```

The frames from the SS will be:

1: One I frame containing:
   SAPI = 0, C = 1, P = 0, M = 0, L = 3
   N(S) = 0, N(R) = 0

3: One I frame containing:

SAPI = 0, C = 1, P = 1, M = 0, L = 3
N(S) = 0, N(R) = 0

Requirements:

The frames from the MS shall be:

2: One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

4: One RR frame containing:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

OR

4: One REJ frame containing:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

II.5.2.2.5 Test of Frame transmission with incorrect C/R values

Purpose:

To test that the MS will react correctly upon the reception of a frame with incorrect C/R value.

Method of test:

Perform the establishment of the dedicated physical resource according to II.5.2.1.1.5 and initialize the link as in II.5.2.2.1.1.1. Then proceed as stated below.

II.5.2.2.5.1 I frame with C bit set to zero

Purpose:

To test that the MS will take no action when it receives an I frame with the C bit set to zero (R).

Method of test:

The data link is set up between the MS and the SS as in test II.5.2.2.1.1.1.

The SS shall send an I frame with the C bit set to zero to the MS.

The SS shall then wait for at least 4 times T200 to make sure that the MS does not respond to that I frame but that the MS keeps sending fill frames.

The SS shall after 4 times T200 send a RR command, P bit set to 1.

The MS shall respond with a RR response, F bit set to 1.

Expected sequence:

```
MS                                                                SS

 <---------------I (SAPI, C, P, M, L, N(S), N(R))-------------1
      Fill
 2----------------------UI (C, P, M, L)---------------------->
      FRAME
 <---------------RR (SAPI, C, M, L, N(R), P)------------------3

 4---------------RR (SAPI, R, M, L, N(R), F)------------------>
```

The frames from the SS will be:

1: One I frame containing:
   SAPI = 0, C = 0, P = 1, M = 0, 0<= L <= N201
   N(R) = 0, N(S) = 0
   Information field = Identity Request

3: One RR frame containing:
   SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

Requirements:

The frames from the MS shall be:

2: UI frames containing:
C = 0, P = 0, M = 0, L = 0

4: One RR frame containing:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 0

II.5.2.2.5.2 SABM frame with C bit set to zero

Purpose:

To test that the MS will take no action when it receives an SABM frame with the C bit set to zero (R).

Method of test:

The MS is brought into the multiple Frame established state as described in test II.5.2.2.1.1.1.

The SS sends an I frame containing a Layer 3 message using PD=1111 (e.g. 0FH) in order to raise V(R) in the MS to 1. The L3 message is TEST_INTERFACE with tested device equal to 0.

The MS shall acknowledge this by the appropriate RR frame.

The SS sends SABM with the C bit set to zero.

The SS shall after 4 times T200 send a RR command, P bit set to 1.

The MS shall respond with a RR response, F bit set to 1.

The MS is returned to the idle state as described in II.5.2.2.1.1.6.

Expected sequence:

```
MS                                                                 SS

 <----------------I (SAPI, C, P, M, L, N(S), N(R))--------------1

 2----------------RR (SAPI, R, M, L, N(R), F)------------------->

 <----------------SABM (SAPI, C, P, M, L)-----------------------3
   Fill
 4------------------------UI (C, P, M, L)----------------------->
   FRAME
 <----------------RR (SAPI, C, M, L, N(R), P)------------------5

 6----------------RR (SAPI, R, M, L, N(R), F)------------------->
```

The frames from the SS will be:

1: One I frame containing:
SAPI = 0, C = 1, P = 0, M = 0, L = 3
N(S) = 0, N(R) = 0

3: One SABM frame containing:
SAPI = 0, C = 0, P = 1, M = 0, L = 0

5: One RR frame containing:
SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

Requirements:

The frames from the MS shall be:

2: One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

4: One UI frame containing:
C = 0, P = 0, M = 0, L = 0

6: One RR frame containing:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

II.5.2.2.6 Test of Errors in the Control Field

Purpose:

To test that the MS will react in the proper way to errors in the Control Field.

II.5.2.2.6.1 N(S) sequence error

Purpose:

To test that the MS will ignore the contents of the I field of an out-of-sequence I frame from the SS.

Method of test:

The MS is brought into the multiple Frame established state as described in test II.5.2.2.1.1.1.

The SS shall send a correct I frame containing Identity Request.

The MS shall acknowledge this in a RR frame or piggy back the acknowledgement onto the I frame carrying Identity Response.

The SS shall then send an I frame containing Identity Request with incorrect N(S) but correctly acknowledging the MS's I frame; P bit set to zero.

The MS shall send a REJ frame.

The SS shall, after T200, send another I frame with incorrect N(S), P bit set to 1 this time.

The MS shall respond with a REJ, F bit set to 1.

The MS shall resume the transmission of fill frames.

Expected sequence:

```
MS                                                                       SS

 &lt;----------------I (SAPI, C, P, M, L, N(S), N(R))--------------1

 2----------------RR (SAPI, R, M, L, N(R), F)------------------->
  May be incorporated
 3----------------I (SAPI, C, P, M, L, N(S), N(R))-------------->

 &lt;----------------I (SAPI, C, P, M, L, N(S), N(R))--------------4

 5----------------REJ (SAPI, R, P, M, L, N(R))------------------>
                                                   Time out of T200.
 &lt;----------------I (SAPI, C, P, M, L, N(S), N(R))--------------6

 7----------------REJ (SAPI, R, F, M, L, N(R))------------------>
     Fill
 8------------------------UI (C, P, M, L)----------------------->
     FRAME
```

The frames from the SS will be:

1: One I frame containing:
SAPI = 0, C = 1, P = 0, M = 0, 0 <= L <= N201
N(S) = 0, N(R) = 0
information field = Identity Request

4: One I frame containing:
SAPI = 0, C = 1, P = 0, M = 0, 0 <= L <= N201
N(S) = 0, N(R) = 1
information field = Identity Request

6: One I frame containing:
SAPI = 0, C = 1, P = 1, M = 0, 0 <= L <= N201
N(S) = 0, N(R) = 1
information field = Identity Request

Requirements:

The frames from the MS shall be:

2: One RR frame containing:
SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

3: One I frame containing:
SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201
N(R) = 1, N(S) = 0
information field = Identity Response

5: One REJ frame containing:
SAPI = 0, R = 1, P = 0, M = 0, L = 0, N(R) = 1

7: One REJ frame containing:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

8: One UI frame containing:
C = 0, P = 0, M = 0, L = 0

II.5.2.2.6.2 N(R) sequence error

Purpose:

To test that the MS will detect a N(R) sequence error and react in the proper way to it.

Method of test:

The MS is brought into the multiple Frame established state as described in test II.5.2.2.1.1.1.

The SS shall send an I frame containing an information field of length N201 and an incorrect receive sequence number.

The MS may
a) send a DISC frame within N200*T200 or
b) perform a "local end release".

In case a) the SS shall respond with a UA frame. In case b) it detects a lower layer failure.

Note: The delay N200*T200 is specified for test purpose only. It is assumed that the L3 reaction time within the MS to command a release is less than this delay, which is less than the delay before the SS would detect a L2 failure.

Expected sequence:

```
MS                                                                SS

<-----------------I (SAPI, C, P, M, L, N(R), N(S))--------------1
 optional:
2-----------------DISC (C, P, M, L)----------------------------->

<-----------------UA (R, F, M, L)------------------------------3
```

The frames from the SS are:

1: One I frame:
SAPI = 0, C = 1, P = 0, M = 1, L = N201
N(R) = 1, N(S) = 0

In case a):
3: One UA frame:
SAPI = 0, R = 0, F = 1, M = 0, L = 0

Requirements:

The frame from the MS in case a) shall be:

2: One DISC frame:
SAPI = 0, C = 0, P = 1, M = 0, L = 0

II.5.2.2.6.3 Improper F bit

Purpose:

To test that the MS, being in the timer recovery state, will return to the multiple frame established state only after having received an RR response with the F bit set to 1. This test is covered in test II.5.2.2.2.2.

II.5.2.2.7 Test on Receipt of invalid frames

Purpose:

To test that the MS will ignore all invalid frames.

Method of test:

The data link is set up between the MS and the SS as in test II.5.2.2.1.1.1.

The SS shall then transmit an:

- RR frame with the Length Indicator greater than zero and a faulty N(R)
- REJ frame with the EA bit set to zero and a faulty N(R)
- SABM frame with the EL bit set to zero
- DM frame with the Length Indicator greater than zero
- DISC frame with the M bit set to 1
- UA frame with the EA bit set to zero
- I frame with the Length Indicator greater than N201
- I frame with the M bit set to 1 and the Length Indicator less than N201.
- command frames with correct Address and Length Indicator field and a non-implemented control field.

After T200 the SS shall in every case transmit an RR command, P bit set to 1.

The MS shall respond with an RR response, F bit set to 1.

Expected sequence:

```
MS                                                                  SS

<------------------RR (SAPI, R, F, M, L, N(R))-------------------1
      Fill
2--------------------------UI (C, P, M, L)-----------------------> 
      FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------->

<------------------REJ (SAPI, R, F, M, L, N(R)-------------------3

     Fill
2--------------------------UI (C, P, M, L)----------------------->
     FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------->

<------------------SABM (SAPI, C, P, M, L)-----------------------4
     Fill
2--------------------------UI (C, P, M, L)----------------------->
     FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------>

<------------------DM (SAPI, R, F, M, L)-------------------------5
      Fill
2--------------------------UI (C, P, M, L)----------------------->
      FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------>

<------------------DISC (SAPI, C, P, M, L)-----------------------6
      Fill
2--------------------------UI (C, P, M, L)----------------------->
      FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------>

<------------------UA (SAPI, R, F, M, L)------------------------->7
       Fill
2--------------------------UI (C, P, M, L)----------------------->
       FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------>

<------------------I (SAPI, C, P, M, L, N(R), N(S))--------------8
      Fill
2--------------------------UI (C, P, M, L)----------------------->
      FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10

11-----------------RR (SAPI, R, F, M, L, N(R))------------------>

<------------------I (SAPI, C, P, M, L, N(R), N(S))--------------9
      Fill
2--------------------------UI (C, P, M, L)----------------------->
      FRAME
<------------------RR (SAPI, C, P, M, L, N(R))------------------10
```

```
11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------12
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------13

      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------14
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------15
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------16
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------17
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->

<--------------------------------------------------------------18
      Fill
2-------------------------UI (C, P, M, L)----------------------->
      FRAME
<-----------------RR (SAPI, C, P, M, L, N(R))------------------10

11----------------RR (SAPI, R, F, M, L, N(R))------------------->
```

The frames from the SS are:

1: A RR frame:
SAPI = 0, R = 0, F = 0, M = 0, L > 0, N(R) = 1

3: A REJ frame:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1, EA = 0

4: A SABM frame:
SAPI = 0, C = 1, P = 1, M = 0, L = 0, EL = 0

5: A DM frame:
SAPI = 0, R = 0, F = 1, M = 0, L > 0

6: A DISC frame:
SAPI = 0, C = 1, P = 1, M = 1, L = 0,

7: A UA frame:
SAPI = 0, R = 0, F = 0, M = 0, L = 0, EA = 0

8: An I frame:
SAPI = 0, C = 1, P = 0, M = 0, L > N201, N(R) = 0, N(S) = 6

9: An I frame:
SAPI = 0, C = 1, P = 0, M = 1, L < N201, N(R) = 0, N(S) = 7

10: An RR frame:
SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

12: A command frame with
Control Field = xxx1 1101

13: A command frame with
Control field = xxx1 1011

14: A command frame with
Control field = xxx1 0111

15: A command frame with
Control field = 01x1 1111

16: A command frame with
Control field = 1xx1 1111

17: A command frame with
Control field = 0011 0011

18: A command frame with
Control field = 1xx1 0011

Note: An "x" stands for an arbitrary bit value.

Requirement:

The frames from the MS shall be:

2: A UI frame:
C = 0, P = 0, M = 0, L = 0

11: A RR frame:
SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 0

II.5.3 TESTING OF LAYER 3 FUNCTIONS

ref: GSM 04.08

Note: The tests on functioning of the elementary procedures in the MS are grouped as the description of those procedures in GSM 04.08. However, the test procedures are carried out in an order which is more logic for the purpose of testing.

II.5.3.2 INITIAL TESTS

II.5.3.2.1 CHANNEL REQUEST

The Random Access procedure is specified in section 3.3.1.1 of GSM 04.08. To verify the correct performance of the random access procedure by the MS, two initial tests are performed, described in II.5.3.2.1.1 and in II.5.3.2.1.2.

II.5.3.2.1.1 TEST 1

II.5.3.2.1.1.1 Purpose of the test

The purpose of this test is to verify that the MS

(a) spreads an initial CHANNEL REQUEST message with equal probability on approximately the correct number of time slots,

(b) spreads retransmissions of a CHANNEL REQUEST message with equal probability on Tx-integer timeslots,

(c) retransmits exactly Max-retrans times a CHANNEL REQUEST message if the network never responds to a CHANNEL REQUEST message.

Note: It is not possible to verify that a Mobile Station spreads an initial CHANNEL REQUEST message on exactly the correct number of time slots, because the exact moment is not known when the Mobile station initially starts timer T3120. It is assumed that a Mobile Station that is paged, will initially start timer T3120 in less than 0.95 seconds, and that the time to initially start timer T3120 will not vary more than 5 ms between different performances of the random access procedure.

II.5.3.2.1.1.2 Method of measurement

For each of the two cases:

- non combined CCCH/SDCCH, and
- combined CCCH/SDCCH,

(a), (b) and (c) from II.5.3.2.1.1.1 are checked with low values for Tx-integer and for Max-retrans in test cases 1 and 2.

The tests are repeated in reduced form with randomly chosen values for Tx-integer and Max-retrans in test cases 3 and 4.

II.5.3.2.1.1.3 Test case 1

II.5.3.2.1.1.3.1 Initial conditions

The SS simulates a BSS with exactly one cell.

a) The MS has successfully performed a location update.

b.1) RACH Control Parameters (GSM 04.08, 10.5.2.17)
- Tx-integer is set at 5 slots used to spread transmission, (coded as 0010).
- Max retransmission is set to 1, (coded as 00).

b.2) Control Channel description (GSM 04.08, 10.5.2.8)
- CCCH-CONF indicates 1 basic physical channel used for CCCH not combined with SDCCH, (encoded as 000).

II.5.3.2.1.1.3.2 Procedure 1

In the following, let

N0 = max (8, Tx-integer)
T1 = 0,25
K = 200.

The following procedure shall be repeated for k= 1, ... , K.

a) The SS sends a PAGING REQUEST TYPE 1 message on the paging subchannel corresponding to the MS's IMSI with the correct TMSI.

b) The SS measures the number f(0,k) of CCCH RACH slots between the sending of the PAGING REQUEST message and the reception of a CHANNEL REQUEST message from the MS.

c) The SS stores f(0,k).

d) For i= 1, ..., Max-retrans the following steps are performed:

d.1) The SS measures the number f(i,k) of CCCH RACH slots between
- the moment where the last CHANNEL REQUEST message has been received and an additional time of T1 seconds has elapsed, and
- the reception of a new CHANNEL REQUEST message from the MS.

If f(i,k) exceeds Tx-integer-1 before a new channel request was received, the complete test is finished with non-conformance.

d.2) The SS stores f(i,k).

e) After reception of the last CHANNEL REQUEST message of d), the SS sends an IMMEDIATE ASSIGNMENT REJECT message; the first Request reference information element of this IMMEDIATE ASSIGNMENT REJECT message corresponds to the last CHANNEL REQUEST message received; the first Wait indication information element of this IMMEDIATE ASSIGNMENT REJECT message specifies 0 seconds.

II.5.3.2.1.1.3.3 Analysis of test results

For i= 0, ..., Max-retrans and n=0, ..., Max f(i,k)
let S(i,n) = CARD {k | f(i,k) = n}.

Note: CARD {k | f(k) = n} is mathematical notation for the number of times that f(k) equals n.

II.5.3.2.1.1.3.4 Requirements

1) All CHANNEL REQUEST messages sent by the MS during the procedure shall specify the establishment cause "Answer to paging" (encoded as 100).

2) After step a), the MS shall send a CHANNEL REQUEST message within 1 second.

3) S(0,n) <= 41 for all n; there is an integer n0 such that S(0,n) = 0 for all n < n0 and all n > n0 + N0 + 1.

4) S(1,n) <= 60 for all n.

Note: The test limit has been computed to give a confidence of 99.74 % that a unit which follows the requirements will pass. The number of samples [200] has been chosen to get a good compromise between the test time and the risk of passing a bad unit. (Increase of the collision rate !)

II.5.3.2.1.1.4 Test case 2

II.5.3.2.1.1.4.1 Initial conditions

The SS simulates a BSS with exactly one cell.

a) The MS has successfully performed a location update.

b.1) RACH Control Parameters (GSM 04.08, 10.5.2.17)
- Tx-integer is set at 5 slots used to spread transmission, (coded as 0010).
- Max retransmission is set to 1, (coded as 00).

b.2) Control Channel description (GSM 04.08, 10.5.2.8)
- CCCH-CONF indicates 1 basic physical channel used for CCCH, combined with SDCCH, (encoded as 001).

II.5.3.2.1.1.4.2 Procedure 2

In the following, let

N0 = max (8, Tx-integer)
T1 = 0,35
K = 200.

The following procedure shall be repeated for k= 1, ... , K.

a) The SS sends a PAGING REQUEST TYPE 1 message on the paging subchannel corresponding to the MS's IMSI with the correct TMSI.

b) The SS measures the number f(0,k) of CCCH RACH slots between the sending of the PAGING REQUEST message and the reception of a CHANNEL REQUEST message from the MS.

c) The SS stores f(0,k).

d) For i= 1, ..., Max-retrans the following steps are performed:

d.1) The SS measures the number f(i,k) of CCCH RACH slots between
- the moment where the last CHANNEL REQUEST message has been received and an additional time of T1 seconds has elapsed, and
- the reception of a new CHANNEL REQUEST message from the MS.

If f(i,k) exceeds Tx-integer-1 before a new CHANNEL REQUEST message was received, the complete test is finished with non-conformance.

d.2) The SS stores f(i,k).

e) After reception of the last CHANNEL REQUEST message of d), the SS sends an IMMEDIATE ASSIGNMENT REJECT message; the second Request reference information element of this IMMEDIATE ASSIGNMENT REJECT message corresponds to the last CHANNEL REQUEST message received; the second Wait indication information element of this IMMEDIATE ASSIGNMENT REJECT message specifies 0 seconds.

II.5.3.2.1.1.4.3 Analysis of test results

For i= 0, ..., Max-retrans and n= 0, ..., Max f(i,k)
let $S(i,n) = CARD \{k \mid f(i,k) = n\}$.

Note: $CARD \{k \mid f(k) = n\}$ is mathematical notation for the number of times that f(k) equals n.

II.5.3.2.1.1.4.4 Requirements

1) All CHANNEL REQUEST messages sent by the MS during the procedure shall specify the establishment cause "Answer to paging" (encoded as 100).

2) After step a), the MS shall send a CHANNEL REQUEST message within 1 second.

3) $S(0,n) <= 41$ for all n; there is an integer n0 such that
$S(0,n) = 0$ for all $n < n0$ and for all $n > n0 + N0 + 1$.

4) $S(1,n) <= 60$ for all n.

Note: The test limit has been computed to give a confidence of 99.74 % that a unit which follows the requirements will pass. The number of samples [200] has been chosen to get a good compromise between the test time and the risk of passing a bad unit. (Increase of the collision rate !)

II.5.3.2.1.1.5 Test case 3

II.5.3.2.1.1.5.1 Initial conditions

The SS simulates a BSS with exactly one cell.

a) The MS has successfully performed a location update.

b.1) RACH Control Parameters (GSM 04.08, 10.5.2.17)

- Tx-integer is randomly chosen in the range {6,...,12, 14, 16, 20, 25, 32, 50} (encoded as 0011, ..., 1111).

- Max retransmission is randomly chosen in the range {1, 2, 4, 7}, (coded as 00, ..., 11).

b.2) Control Channel description (GSM 04.08, 10.5.2.8)

- CCCH-CONF indicates 1 basic physical channel used for CCCH not combined with SDCCH, (encoded as 000).

c) The upper rounded value of 230/Max-retrans is computed, let K be this integer.

d.1) The upper rounded value of 0.5 * Tx-Integer is computed, let s be this integer.

d.2) A counter S is put to 0.

II.5.3.2.1.1.5.2 Procedure 3

In the following, let

N0 = max(8,Tx-Integer)
T1 = 0.25.

The following procedure shall be repeated for k= 1, ..., K.

a) The SS sends a PAGING REQUEST TYPE 1 message on the paging subchannel corresponding to the MS's IMSI with the correct TMSI.

b) The SS measures the number f(0,k) of CCCH RACH slots between the sending of the PAGING REQUEST message and the reception of a CHANNEL REQUEST message from the MS.

c) For i= 1, ..., Max-retrans the following is performed:

The SS measures the number f(i,k) of CCCH RACH slots between
- the moment where the last CHANNEL REQUEST message has been received and an additional time of T1 seconds has elapsed, and
- the reception of a new CHANNEL REQUEST message from the MS.

If f(i,k) exceeds Tx-integer-1 before a new CHANNEL REQUEST message was received, the complete test is finished with non-conformance.

d) If f(i,k) is greater or equal to s, the SS increments the counter S by one,
(in other words f(i,k) >= s ==> S = S+1).

e) Depending on the value of k, step e.1) or e.2) is performed:

e.1) k < K:
After reception of the last CHANNEL REQUEST message of d), the SS sends an IMMEDIATE ASSIGNMENT REJECT message; the third Request reference information element of this IMMEDIATE ASSIGNMENT MESSAGE corresponds to the last CHANNEL REQUEST message received; the third Wait indication information element of this IMMEDIATE ASSIGNMENT REJECT message specifies 0 seconds.

e.2) k = K:
After receipt of the last CHANNEL REQUEST message of d), the SS monitors the RACH for 1 second.

II.5.3.2.1.1.5.3 Requirements

1) All CHANNEL REQUEST messages sent by the MS during the procedure shall specify the establishment cause "Answer to paging" (encoded as 100).

2) After step a), the MS shall send a CHANNEL REQUEST message within 1 second.

3) S / (K * Max-Retrans) shall be inside the following interval:
[0.8 - s / Tx-Integer ; 1.2 - s / Tx-Integer]

4) For k = K, after step d), the Mobile Station shall send no more CHANNEL REQUEST messages, but perform cell reselection.

Note: The confidence interval and the number of samples in requirement 3) are chosen in such a way that the possibility of non accepting a correct MS is less than 0.26 %.

II.5.3.2.1.1.6 Test case 4

Test case 4 is identical to case 3, with only the following difference:

II.5.3.2.1.1.6.1 Initial conditions

As an initial condition, CCCH-CONF indicates "1 basic physical channel used for CCCH and SDCCH" (encoded as 001).

All the other initial conditions remain the same.

II.5.3.2.1.1.6.2 Procedure

As II.5.3.2.1.1.5.2, except that T1 is set to 0.35.

II.5.3.2.1.1.6.3 Requirements

As II.5.3.2.1.1.5.3.

II.5.3.2.1.2 TEST 2

II.5.3.2.1.2.1 Purpose of the test

Both for the value of timer T3120 and the random reference which is used as a parameter of the CHANNEL REQUEST message, random numbers must be generated in the range 0, ..., 31 (random reference), or, respectively, 0, ..., K-1 where K = 3,...,12,14,16,20,25,32,50.

It must be sure that different MSs of one product series do not produce the same sequences of random values. In order to test that, it is verified that a MS produces different random references for a CHANNEL REQUEST after having been switched off and on.

II.5.3.2.1.2.2 Initial Conditions

The MS is updated idle. The SS simulates a BS with exactly one cell. The channel configuration will be non-combined CCCH/SDCCH.

II.5.3.2.1.2.3 Procedure

Let K = 7, D = 4.

The following steps a) to d) are performed for k = 1, ..., K:

a) The MS is switched off.

b) The MS is switched on.

c) After the MS is in service, the SS sends a PAGING REQUEST TYPE 1 message on the paging subchannel corresponding to the MS's IMSI with the correct TMSI.

d) The SS stores the random reference r(k) contained as a parameter in the next CHANNEL REQUEST message sent by the MS.

Note: 8.5 seconds in step c) allow the Mobile Station to camp on the cell, cf. II.6.1.5.1.

II.5.3.2.1.2.4 Requirements

1) After step c), the MS must send a CHANNEL REQUEST message within one second.

2) At least D values of r(1), ..., r(K) must be different.

Note: For the time of 1 second in requirement 1), cf. the note in II.5.3.2.1.1.1.

D has been computed such that the probability of refusing a correct MS is less then 0.027 %.

II.5.3.2.2 IMSI DETACH/ATTACH (BASIC)

The procedure IMSI attach is described in GSM 04.08 section 4.4.3.
The procedure IMSI detach is described in GSM 04.08 section 4.3.4.

II.5.3.2.2.1 Purpose of the test

The purpose of the test is to verify that the MS correctly performs IMSI detach/attach procedures when it is required by the network and upon deactivation/activation or SIM removal/insertion and does not perform these procedures when not required.

II.5.3.2.2.2 Method of test

a) The SS simulates a base station with BCCH/CCCH, with LAI equal to the one stored in the SIM.

b) The SS sends SYSTEM INFORMATION TYPE 3 providing the ATT flag value.

Message SYSTEM INFORMATION TYPE 3 (GSM 04.08, 9.1.31)

Information Element	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	not relevant	0000
Message Type		0001 1011
Cell Identity	default value	
LAI	the one stored in the SIM	
Control Channel Description	ATT flag (bit 7 in octet 2) (see procedures)	
Cell Options	default value	
Cell Selection Parameters	" "	
RACH Control Parameters	" "	

II.5.3.2.2.3 Procedure 1

a) The broadcasted ATT flag value is set to 0, that is "The MSs in the cell are not allowed to apply IMSI attach and detach".

b) The MS is brought in "idle updated" state.

c) The MS is powered off.

d) The MS is powered on.

II.5.3.2.2.4 Requirements 1

1) After step c), the MS shall not initiate the IMSI detach procedure.

2) After step d), the MS shall not initiate the IMSI attach procedure.

II.5.3.2.2.5 Procedure 2

This procedure is only performed if SIM removal is possible without disconnection of the power supply (see PIXIT statement).

a) The broadcasted ATT flag value is set to 0, that is "The MSs in the cell are not allowed to apply IMSI attach and detach".

b) The MS is brought in "idle updated" state.

c) the SIM is removed from the MS.

d) The SIM is inserted in the MS.

II.5.3.2.2.6 Requirements 2

1) After step c), the MS shall not initiate the IMSI detach procedure.

2) After step d), the MS shall not initiate the IMSI attach procedure.

II.5.3.2.2.7 Procedure 3

a) The broadcasted ATT flag value is set to 1, that is "The MSs in the cell are allowed to apply IMSI attach and detach".

b) The MS is brought in "idle updated" state.

c) The MS is powered off.

II.5.3.2.2.8 Requirements 3

1) After step c), the MS shall establish a RR-connection and sends the IMSI DETACH INDICATION message.

Message IMSI DETACH IND

Information Element	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	not relevant	0000
Message Type		0x00 0001
Mobile Classmark 1	as specified by the manufacturer	
Mobile Identity	TMSI	

II.5.3.2.2.9 Procedure 4

a) The MS is switched on.

b) The SS shall respond to the channel request with IMMEDIATE ASSIGN allocating a SDCCH. It shall initiate no authentication or cipher mode setting but just respond to the location updating request with a LOCATION UPDATED ACCEPT (provided the request is correct) allocating a new TMSI.

II.5.3.2.2.10 Requirements 4

1) After step a), the MS shall initiate a location updating with the type "IMSI attach"

2) After step b), the MS shall answer with a TMSI REALLOCATION COMPLETE.

Message LOCATION UPDATE REQUEST (GSM 04.08, 9.2.13)

Information Element	Comment	Value	
Protocol Discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type		0x00	1000
Location Updating Type	IMSI attach		0010
Ciphering key sequence number		0000	
LAI	the one stored in the SIM		
Mobile station Classmark 1	as specified by the manufacturer		
Mobile Identity	TMSI		

Message LOCATION UPDATE ACCEPT (GSM 04.08, 9.2.11)

Information Element	Comment	Value	
Protocol Discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type		0000	0010
LAI	the one stored in the SIM		
Mobile Identity	TMSI		

Message TMSI REALLOCATION COMPLETE (GSM 04.08, 9.2.15)

Information Element	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	not relevant	0000
Message Type		0x01 1011

II.5.3.2.2.11 Procedure 5

This procedure is only performed if SIM removal is possible without disconnection of the power supply (see PIXIT).

a) The broadcasted ATT flag value is set to 1, that is "The MSs in the cell are allowed to apply IMSI attach and detach".

b) The MS is brought in "idle updated" state.

c) the SIM is removed from the MS.

II.5.3.2.2.12 Requirements 5

1) After step c), the MS shall establish a RR-connection and sends the IMSI DETACH INDICATION message.

Message IMSI DETACH IND

Information Element	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	not relevant	0000
Message Type		0x00 0001
Mobile Classmark 1	as specified by the manufacturer	
Mobile Identity	TMSI	

II.5.3.2.2.13 Procedure 6

This procedure is only performed if SIM removal is possible without disconnection of the power supply (see PIXIT).

a) The MS is switched on and then the SIM is inserted.

b) The SS shall respond to the channel request with IMMEDIATE ASSIGN allocating a SDCCH. It shall initiate no authentication or cipher mode setting but just respond to the location updating request with a LOCATION UPDATED ACCEPT (provided the request is correct) allocating a new TMSI.

II.5.3.2.2.14 Requirements 6

1) After step a), the MS shall initiate a location updating with the type "IMSI attach"

2) After step b), the MS shall answer with a TMSI REALLOCATION COMPLETE.

Message LOCATION UPDATE REQUEST (GSM 04.08, 9.2.13)

Information Element	Comment	Value	
Protocol Discriminator	MM	0101	
Transaction Identifier	not relevant	0000	
Message Type		0x00	1000
Location Updating Type	IMSI attach		0010
Ciphering key sequence number		0000	
LAI	the one stored in the SIM		
Mobile station Classmark 1	as specified by the manufacturer		
Mobile Identity	TMSI		

Message LOCATION UPDATE ACCEPT (GSM 04.08, 9.2.11)

Information Element	Comment	Value	
Protocol Discriminator	MM	0101	
Transaction Identifier	not relevant	0000	
Message Type		0000	0010
LAI	the one stored in the SIM		
Mobile Identity	TMSI		

Message TMSI REALLOCATION COMPLETE (GSM 04.08, 9.2.15)

Information Element	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	not relevant	0000
Message Type		0x01 1011

II.5.3.2.3 TEST OF SEQUENCED MM/CC MESSAGE TRANSFER

II.5.3.2.3.1 General

According to GSM 04.08, section 2.4.1 [Variables and sequence numbers] the RR sublayer of the MS shall have an associated send state variable V(SD) ("Send duplicated") for sending MM and CM messages. This send state variable has been introduced to avoid the duplication of MM and CM messages, e.g. in the case of Handover.

II.5.3.2.3.2 Purpose of the test

- Check that the V(SD) is set correctly to 0 by the MS at the beginning of the establishment of the first RR connection.

- Check that the MS increments correctly this variable.

II.5.3.2.3.3 Method of test

a) The SS originates a link establishment and the following messages are sent on the air-interface:

   - PAGING REQUEST(#1) (SS>MS)
   - CHANNEL REQUEST (MS>SS)
   - IMMEDIATE ASSIGNMENT (SS>MS)
   - PAGING RESPONSE (MS>SS) (Layer 2 establishment).

b) The SS sends the Mobility Management Message IDENTITY REQUEST.

c) Step b) is repeated 10 times.

II.5.3.2.3.4 Requirements

1) The MS shall send an IDENTITY RESPONSE message where N(SD)=0.

2) In step c), the MS shall send alternately the value 1 and 0 in the N(SD) field of the IDENTITY RESPONSE message.

II.5.3.3 TEST OF MS FUNCTIONS IN IDLE MODE

II.5.3.3.1 INITIAL CONDITIONS

The SIM shall contain a PLMN-Selector that contains only the HPLMN of the MS, and an empty forbidden PLMN list.

During the tests in II.5.3.3.2 and II.5.3.3.3, the following parameters apply:

RACH control parameters

In cells 1 to 7:
Max retrans = 01, 2 retransmissions
Tx-integer = 0111, (10) slots for spreading
CB, Cell Barred = 0, access is allowed
RE = 1, reestablishment not allowed
AC C00 to AC C15 = 0, access is not barred

In cell 8:
Max retrans = 01, 2 retransmissions
Tx-integer = 0111, (10) slots for spreading
CB, Cell Barred = 1, access is not allowed
RE = 1, reestablishment not allowed
AC C00 to AC C15 = 0, access is not barred

Cell	PLMN perm.	BA - ARFCN bit = 1
1	00000100	7, 39, 65, 66, 85, 97, 124
2	00000100	8, 40, 67, 68, 86, 98, 123
3	00000100	9, 41, 69, 70, 87, 99, 122
4	00000100	10, 42, 71, 72, 88, 100, 121
5	00000100	11, 43, 73, 74, 89, 101, 120
6	00000100	12, 44, 75, 76, 90, 102, 119
7	00000100	13, 45, 77, 78, 91, 103, 118
8	00000100	124

Location area identification

Cell	MCC1	MCC2	MCC3	MNC1	MNC2	LAC	
1	0	0	2	0	F	x	
2	0	0	3	2	F	x	
3	0	0	4	3	F	x	
4	0	0	5	4	F	x	
5	0	0	6	5	F	x	
6	0	0	7	6	F	x	
7	0	0	8	7	F	x	
8	0	0	1	0	1	x	The HPLMN of the MS

Note 1: 'x' denotes any value.

Note 2: The MS representation of the MCC, MNC on the Handset can be manufacturer dependant.

Note 3: The NCC values of each cell must be different.

Control channel description and BS options

All 8 cells:

CELL - RESELECT - HYSTERESIS = 010, 4dB RXLEV hysteresis
MS-TXPWR-MAX-CCH is given the value corresponding to the maximum available output power from the MS under test.
RXLEV-ACCESS-MIN = 30
ATT = 0, no IMSI attach and detach
DTX = 0, no discontinuous transmission
BS-AG-BLKS-RES = 1, 1 block reserved for access grant
CCCH-CONF = 001, 1 SDCCHs combined with the CCCH
RADIO-LINK-TIMEOUT = 5, 10 seconds timeout
BS-PA-MFRMS = 010, 4 multiframes periods for paging
T3212 timeout value = H'00

Cell	level(dBmicroVolt emf)	BCCH ARFCN
1	+65	1
2	+63	7
3	+61	39
4	+55	65
5	+59	66
6	+57	85
7	+55	97
8	+53	124

Note: The SIM should contain a PLMN-Selector that contains only the HPLMN of the MS, and an empty forbidden PLMN list.

II.5.3.3.2 MS INDICATION OF AVAILABLE PLMNS

II.5.3.3.2.1 Purpose of the test

To verify that a MS can present the available PLMNs to the user when asked to do so in manual mode according to the requirements of GSM 05.08 and 02.11.

II.5.3.3.2.2 Procedure

a) The MS is switched on, equipped with a SIM containing default values except for those values listed under section II.5.3.3.1 (initial conditions).

b) The MS is put into manual network selection mode (see PIXIT).

II.5.3.3.2.3 Requirements

1) On entering manual network selection mode, the MS shall present a list of available PLMNs (MCC and MNC values, or any other valid indications, see PIXIT), within 2 minutes. The list shall include the MCC and MNC of cells 1 to 7, but not of cell 8.

II.5.3.3.3 MS WILL SEND ONLY IF BSS IS "ON AIR"

II.5.3.3.3.1 Purpose of the test

To verify that the MS will not produce any RF transmission if no BSS is received.

II.5.3.3.3.2 Procedure

a) The RF-signal for the BCCHs of cell 1 to 8 is switched off.

b) The SS shall wait 20 seconds to allow the MS to detect the loss of cells.

c) By MMI, an attempt to originate a call is made.

d) By MMI, an attempt to originate an emergency call is made.

Step d) is only performed if the MS supports speech (see PICS/PIXIT statement).

II.5.3.3.3.3 Requirements

1) The MS must not give "service indication".

2) In steps c) and d) the MS shall not produce any RF output.

II.5.3.4 LOWER LAYER FAILURES IN LAYER 3 TESTING

II.5.3.4.1 Introduction

The text in this section is intended to develop a standardized way of creating lower layer failures whilst testing the performance of Layer 3 signalling.

References: GSM 04.08, 04.06, 05.08

There are two groups of lower layer failures:

1) Detected by analysis of reception at Layer 1 (GSM 05.08, 04.08),

2) Data link layer failures.

II.5.3.4.2 Layer 1 reception failures

- The absence of reception of correct frames on the SACCH until the S counter reaches value 0 will be interpreted as a Layer 1 failure.

II.5.3.4.3 Data Link layer failures

- Many kinds of error cases can be caused in Layer 2. For example to many "T200 - timeout/retrying" - pairs.

Notes:

- All types of Data Link failures are indicated similarly to the RR - layer (Release Indication).
- All types of L1 - failures are indicated similarly to each layer (Abort Indication, Error Indication).

II.5.3.4.4 Lower layer failures, used for the tests in section II.5.3

For L3 - testing different lower layer failures are performed:

1) T100 - timeout in Layer 1.

2) To many T200 - timeouts consecutively in Layer 2.

II.5.3.5 TEST OF L3 ERROR HANDLING

ref: GSM 04.08

II.5.3.5.1 ERRORS IN L3 MESSAGES

II.5.3.5.1.1 Wrong protocol discriminator

Purpose

To verify that the MS ignores messages containing protocol discrimination errors.

Test method

a) The SS simulates a base station with BCCH/CCCH.

b) The MS is paged and allocated a TCH.

c) With the MS having a call in progress, the SS sends a Status Enquiry message with an error in the protocol discriminator.

Message: STATUS ENQUIRY

Information Element	Comment	Value	
Protocol discriminator	The value is reserved		0000
Transaction identifier	Selected by SS		0XXX
Message Type		0011	0100

Note: If a MM message is sent with an error giving it a CC protocol discriminator, this could be treated by the MS as being a CC message with errors in the Message Type information Element. To make the test unambiguous, the test uses a protocol discriminator that is reserved.

Requirements:

1) The MS shall ignore the message.

II.5.3.5.2 TEST OF MS REACTION TO ERRORS IN TRANSACTION IDENTIFIER

ref: GSM 04.08 section 8.4

II.5.3.5.2.1 Test of TI error in RR management message

Purpose of the test

To verify that the MS ignores RR messages with incorrect TI.

Initial conditions

The SS simulates a base station with BCCH/CCCH. The MS is in the MM-state 'idle,updated' and shall have successfully passed the test of section II.5.3.6.2.1 ('normal paging') thus ensuring that errors are the result of erroneous TI.

Procedure

a) The MS is consecutively paged with PAGING REQUEST TYPE 1, using TI values in the range 0001 - 0110 (binary) and also with TI set to 1000 i.e. non-zero value.
ref: GSM 04.08 section 10.3 Transaction Identifier

Message: PAGING REQUEST TYPE 1

Information element	comment	value	
Protocol Discriminator	RR		0110
transaction Identifier	invalid	0001	
		-	0110
	and also		1000
message type	type 1	0010	0001
page mode	normal	0000	0000
mobile identity	TMSI		

Requirement

1) The MS shall not respond to any paging request with TI set to non-zero (coding includes TI flag).

II.5.3.5.2.2 Test of TI error in MM message

Purpose of the test

To verify that the MS ignores MM messages with incorrect TI.

Initial conditions

The MS is in the MM-active state of a mobile terminating call (TI assigned by the SS).

Procedure

a) The SS sends the IDENTITY REQUEST message using TI values 0001 - 0110 inclusive and also with TI set to 1000. A period of 1 second (nominal) shall separate the transmission of messages in order to allow time for a response from the MS.

Requirement

1) The MS shall ignore each IDENTITY REQUEST message

2) No response shall be returned to the SS up to and including the duration of T3270 after the last IDENTITY REQUEST is transmitted.

Message: IDENTITY REQUEST (GSM 04.08, 9.2.8)

Information element	comment	value
Protocol Discriminator	MM	0101
Transaction Identifier	invalid	0001 - 0110
	and also	1000
message type		0001 1000
identity type	IMSI	0000 0001

II.5.3.5.2.3 Test of TI error in CC message

Purpose of the test

To verify that the MS responds correctly to messages which include Transaction Identifier (with TI value different from 111) which is not recognised as relating to active call or call in progress.

Initial conditions

The MS is in the active state of a Mobile-Terminating call (SS has allocated the TI).

Procedure (1)

a) The SS sends a DISCONNECT message to the MS with a TI value which has not been allocated and which is different from 111 (reserved value).

b) The SS sends a STATUS ENQUIRY message to the MS with correct TI.

Requirement (1)

1) The MS shall respond to the DISCONNECT message with a RELEASE COMPLETE message including cause #81 and the received value of TI.

2) The MS shall respond to the STATUS ENQUIRY message by sending a STATUS message with CC-state U10 (active) i.e. no state change.

Procedure (2)

a) With the MS in the active state (U10),the SS sends a RELEASE COMPLETE message to the MS with a TI value which has not been allocated (this shall be the first call clearing message) and which is different from 111 (reserved value).

b) The SS sends a STATUS ENQUIRY message to the MS with correct TI.

Requirement (2)

1) The MS shall not respond to the RELEASE COMPLETE message.

2) The MS shall send a STATUS message with CC-state U10 (active) and with TI relating to the active call.

Procedure (3)

a) The SS sends a SETUP message to the MS with a TI coded as related to a mobile-originated call i.e. TI-flag indicates wrong end of TI origin, and with a TI value which is different from 111 (reserved value).

b) The SS waits [5 seconds] and then sends a STATUS ENQUIRY message to the MS with correct TI.
Note: The value of 5 seconds is set to be sure that the MS would have answered if the SETUP were taken into account.

Requirement (3)

1) The MS shall ignore the SETUP message.

2) The MS respond to the STATUS ENQUIRY by sending a STATUS message with CC-state U10 (active) and with TI relating to the initial call.

Procedure (4)

a) The SS sends a SETUP message to the MS with a TI (flag and value) identical to that of the active call (as allocated by SS).

b) The SS sends a STATUS ENQUIRY message to the MS with correct TI.

Requirement (4)

1) The MS shall ignore the SETUP message .

2) The MS respond to the STATUS ENQUIRY by sending a STATUS message with CC-state U10 (active) and with TI relating to the active call.

Message: DISCONNECT from SS (GSM 04.08, 9.3.7)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	correct TI flag	0xxx	
(SS originates the TI)	unallocated TI value different from 111)		
message type	disconnect	0010	0101
cause(mandatory)	length	0000	0010
	coding/loc.	1110	0000
	(#16)normal	1001	0000

Message: RELEASE COMPLETE from MS (GSM 04.08, 9.3.15)
(used as first call clearing message)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	the same as sent	1xxx	
message type	rel com	0x10	1010
cause(optional)	IEI	0000	1000
	length	0000	0010
	coding/loc.	1110	0000
	#81(invalid TI)	1101	0001

Message: RELEASE COMPLETE from SS (GSM 04.08, 9.3.15)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier (SS originates the TI)	correct TI flag unallocated TI value	0xxx	
Message Type	Release complete	0010	1010
Cause (optional)	IEI	0000	1000
	length	0000	0010
	coding/loc	1110	0000
	#16 normal	1001	0000

Message: SETUP from SS (GSM 04.08 9.3.16)

Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	3)wrong TI flag correct TI value	1xxx	
	4)correct TI flag and TI value	0xxx	
Message Type	SETUP	0000	0101

Message: STATUS ENQUIRY from SS (GSM 04.08, 9.3.21)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated		0xxx
message type	status enq	0011	0100

Message: STATUS from MS (GSM 04.08, 9.3.20)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	as allocated		1xxx
message type	status	0x11	1101
cause	length is varying		
	coding/loc.	1110	0000
	(#30)response to status enquiry	1001	1110
call state	coding(U10)	1100	1010

II.5.3.5.3 TEST OF MESSAGE TYPE ERRORS

ref: GSM 04.08 section 8.5

II.5.3.5.3.1 Test of MS reaction to non-existent message type

Purpose of the test

To verify that the MS reacts correctly to a message which is non-existent in the GSM library.

Initial conditions

The MS is in the MM state 'idle,updated' listening to the BCCH/CCCH.

Procedure

a) The SS pages the MS and a normal call is established (CC state = U10).

b) The SS sends an ERRONEOUS message to the MS, with TI applying to the active call and PD referring to Call Control.

c) The SS sends the STATUS ENQUIRY message (correctly coded) to the MS.

Requirement

1) In response to the ERRONEOUS message, the MS shall return the STATUS message to the SS with cause #97 'message type non-existent or not implemented' or #98.

2) In response to the STATUS ENQUIRY, the MS shall return the STATUS message with cause #30 'response to status enquiry' and call state U10.

II.5.3.5.3.2 Test of MS reaction to message inconsistent with PD

Purpose of the test

To verify that the MS reacts correctly to a message which is inconsistent with the Protocol Discriminator.

Initial conditions

The MS is in the active (CC state = U10) state of a MT call with the CC TI having the value 0..

Procedure

a) The SS sends the DISCONNECT message to the MS , correctly coded and using the active call TI but with PD indicating Mobility Management (MM).

b) The SS sends the STATUS ENQUIRY message (correctly coded) to the MS.

Requirements

1) In response to the DISCONNECT message, the MS shall return the MM - STATUS message to the SS with cause #97 or #98.

2) In response to the STATUS ENQUIRY, the MS shall return the STATUS message with cause #30 'response to status enquiry' and call state U10.

II.5.3.5.3.3 Test of MS reaction to message inconsistent with call state

Purpose of the test

To verify that the MS reacts correctly to a message which is inconsistent with the current state.For the purposes of this test, the Call Control entity is chosen since specific states are defined by GSM.

Initial conditions

The MS is in the active state (U10) of a call.

Procedure

a) The SS sends the CALL PROCEEDING message to the MS , correctly coded and referring to the active transaction.

b) The SS sends the STATUS ENQUIRY message to the MS.

Requirements

1) The MS shall respond to the CALL PROCEEDING message with a STATUS message including the call control state U10 and with cause value #98 'message incompatible with call state' or #97.

2) In response to the STATUS ENQUIRY message, the MS shall return a STATUS message to the SS with cause #30 'response to status enquiry' and with call state U10.

Message: DISCONNECT with invalid PD (GSM 04.08, 9.3.7)

Information element	comment	value	
Protocol Discriminator	MM		0101
Transaction Identifier	SS allocated	0xxx	
message type	disconnect	0010	0101
cause	length	0000	0010
	coding/loc.	1110	0000
	#16(normal)	1001	0000

Message: CALL PROCEEDING (GSM 04.08, 9.3.3)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	call proc	0000	0010

Message: ERRONEOUS

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	non existent	1111	1111

Note: In messages from the network, bit 7 is always coded 0 in the message type: refer GSM 04.08 Table 10.5.

Message: STATUS ENQUIRY from SS (GSM 04.08, 9.3.21)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	status enq	0x11	0100

Message:STATUS from MS (GSM 04.08, 9.3.20)

Information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	as allocated	1xxx	
message type	status	0x11	1101
cause	length is varying		
	coding/loc.	1110	0000
	1) #97	1110	0001
	#98	1110	0010
	2) #30	1001	1110
call state	coding(U10)	1100	1010

Message: MM-STATUS from MS (GSM 04.08, 9.2.13)

Information element	Comment	Value	
Protocol Discriminator	MM		0101
Transaction Identifier		0000	
Message Type		0x11	0001
Reject Cause	#98	0110	0010
	#97	0110	0001

II.5.3.5.4 TEST OF GENERAL INFORMATION ELEMENT ERRORS

ref: GSM 04.08 section 8.6

It is considered that message out-of-sequence errors may occur only as the result of a faulty network and therefore no tests are specified in this section.

Note: In addition, there are limitations as to what could be tested and these are detailed below.

II.5.3.5.4.1 Test of MS response to information elements out of sequence

The prescribed sequence for information elements is defined in GSM 04.08 sections 9 and 10.5.

a) Mandatory information elements

For the case of Mandatory Information elements, the information element identifier is not included in the message and therefore no sequence information is available. No test is specified in this section.

b) Optional information elements

It is not possible for an MS to differentiate between an optional information element occurring early and one occurring late. The MS may therefore report the incorrect information element in a STATUS message to the network. The prescribed STATUS response of section 8.8 does not make provision for sequence errors. Clarification is required since the MS software implementation is being forced by this section i.e. an MS may detect an out-of-sequence information element but still fully understand it.

In conclusion, as it is not possible to design a comprehensive test for out of sequence information elements, no test is specified in this section.

II.5.3.5.4.2 Test of MS response to duplicated information elements

Purpose of the test

To verify that the MS ignores duplicated optional information elements which are not permitted.

Initial conditions

a) The SS simulates two cells, A and B , belonging to different location areas (default values as specified in II.5.3.1).

b) The MS is in the MM-state 'idle,updated' listening to the BCCH/CCCH of cell A (TMSI assigned).

c) The test of 'normal location updating' (section II.5.3.6.5.1) shall have been previously passed thus ensuring that TMSI is deleted if location update accept contains IMSI.

Procedure

a) The Rf level of cell A is lowered until the MS selects cell B (according to the cell-selection procedures of GSM 05.08). The MS shall establish an RR connection and perform the 'normal' location updating procedure (using TMSI).

b) The SS responds to the location update request with the LOCATION UPDATE ACCEPT message containing IMSI and also TMSI (i.e. duplication of information element).

c) The SS shall page the MS using the PAGING REQUEST TYPE 1 message including the TMSI which was previously used in the LOCATION UPDATE ACCEPT message.

d) The SS shall wait T3113 (see GSM 04.08 sect. 11.1.2) seconds for the response from the MS.

e) The SS shall then page the MS using IMSI.

Requirement

1) The MS shall not respond to the paging request using TMSI but shall respond on cell B to the paging request using IMSI by initiating the immediate assignment procedure using the CHANNEL REQUEST message.

Message: LOCATION UPDATE ACCEPT (GSM 04.08, 9.2.11)

Information element	comment	value	
Protocol Discriminator	MM		0101
Transaction Identifier	not relevant	0000	
message type	loc upd acc.	0000	0010
location area id	cell B(5 bytes)		
mobile identity	IEI	0000	0111
	length	0000	xxxx
	ID type	xxxx	x001
	IMSI		
mobile identity(duplication)	IEI	0000	0111
	length	0000	xxxx
	ID type	xxxx	x100
	TMSI(as allocated)		

(where length is dependent on the choice of IMSI/TMSI).

Message: PAGING REQUEST TYPE 1 (GSM 04.08, 9.1.21)

Information element	comment	value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
message type	type 1	0010	0001
page mode	normal	1011	0000
mobile identity	(i) TMSI		xxxx
	(ii) IMSI		

Message: CHANNEL REQUEST (GSM 04.08, 9.1.8)

establishment cause	answer to paging	100.	....
random reference	(bits 5-1)	...x	xxxx

II.5.3.5.5 TEST OF MS REACTION TO MANDATORY INFORMATION ELEMENT ERRORS

II.5.3.5.5.1 Test of MS reaction to Mandatory Information Element errors in RR message

ref: GSM 04.08 section 8.7.1

Purpose of the test

To verify that the MS reacts correctly to RR messages containing error in mandatory information elements.

Initial conditions

The MS shall be in the MM state 'idle,updated' and listening to the BCCH/CCCH.

Procedure (i)

a) The SS shall page the MS and establish an RR connection with the IMMEDIATE ASSIGNMENT message.

b) It shall wait for the PAGING RESPONSE from the MS and then send the CHANNEL RELEASE message to the MS with missing mandatory information element RR-CAUSE .

Requirement (i)

1) The MS shall respond with the PAGING RESPONSE message following the IMMEDIATE ASSIGN message.

2) The MS shall respond to the CHANNEL RELEASE message by releasing the RR connection and returning to the MM state 'idle,updated'.

Message CHANNEL RELEASE (GSM 04.08, 9.1.7)

Information element	Comment	Value	
Protocol discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type		0000	1101
RR cause	missing		

Procedure (ii)

a) Same as in Procedure (i)

b) The SS shall wait for the PAGING RESPONSE from the MS and then send a CIPHERING MODE COMMAND message without information field "Cipher Mode Setting".

Requirement (ii)

1) The MS shall respond with the PAGING RESPONSE message following the IMMEDIATE ASSIGNMENT message.

2) The MS shall send an RR-STATUS message with cause value 'Invalid information element contents'.

Message	CIPHERING MODE COMMAND (GSM 04.08, 9.1.9)		
Information element	Comment	Value	
Protocol discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type		0011	0101
Cipher Mode Setting	missing		

II.5.3.5.5.2 Test of MS reaction to Mandatory Information Elements errors in MM message

ref: GSM 04.08 section 8.7.2

Purpose of the test

To verify that the MS takes appropriate action upon receipt of an MM message containing error in a mandatory information element.

Initial conditions

a) The SS simulates a BS with BCCH/CCCH.

b) The MS shall be brought in the active state of a mobile-terminating call (Call state = U10), as specified in the test of call control state.

Procedure

a) The SS sends an IDENTITY REQUEST message to the MS with incorrectly coded information element (mandatory).

b) The SS shall send a STATUS ENQUIRY message to the MS.

Requirement

1) The MS shall respond to the IDENTITY REQUEST with a MM-STATUS message including cause value #100 ('invalid information element contents').

2) The MS shall respond to the STATUS ENQUIRY message with a STATUS message including CC state = U10 (active) and cause value #30 ('response to status enquiry').

Message:	IDENTITY REQUEST (GSM 04.08, 9.2.8)		
information element	comment	value	
Protocol Discriminator	MM		0101
Transaction Identifier	not relevant	0000	
message type	identity req.	0001	1000
erroneous message content	invalid	0000	1111

Message	MM-STATUS (GSM 04.08 9.2.15a)		
Information Element	Comment	Value	
Protocol discriminator	MM		0101
Transaction identifier		0000	
Message type	MM-STATUS	0x11	0001
Reject cause	"invalid i.e. content"	0110	0100

Message	STATUS ENQUIRY (GSM 04.08 9.3.21)		
Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated		
Message Type		0011	0100

Message	STATUS (GSM 04.08 9.3.20)		
Information element	Comment	Value	
Protocol discriminator	CC		0011
Transaction Identifier			
Message Type		0011	1101
Cause	30		
Call State	U10	1100	1010

II.5.3.5.5.3 Test of MS reaction to missing Cause IE in the first call clearing message and to Mandatory Information Element errors in CC message

ref: GSM 04.08 section 8.7.3

Purpose of the test

To verify that the MS responds correctly to CC messages which include mandatory information element errors.

Initial conditions

The MS is in the MM-state 'idle,updated' and listening to the BCCH/CCCH in all cases.

Procedure (i)

a) The MS is paged and brought to the CC-active state (U10) of a call.

b) The SS sends the RELEASE message to the MS (as the first call-clearing message) with no 'cause' information element.

Requirement (i)

1) The MS shall respond to the erroneous RELEASE message by returning a RELEASE COMPLETE message.

Message: RELEASE from SS (GSM 04.08, 9.3.14)

information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	release	0010	1101
cause	missing	----	----

Procedure (ii)

a) The MS is paged and brought to the active state of a call (CC state = U10). The SS sends a DISCONNECT message to the MS with a missing mandatory 'cause' information element.

Requirement (ii)

1) The MS shall respond to the erroneous DISCONNECT message by clearing the call with a RELEASE message including cause #100.

Message: DISCONNECT from SS (GSM 04.08, 9.3.7)

information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	disconnect	0010	0101
cause	missing	----	----

Message: RELEASE from MS (GSM 04.08, 9.3.14)

information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	1xxx	
message type	release	0x10	1101
cause	IEI	0000	1000
	length	0000	0010
	coding/loc.	0110	0000
	(#100)	1110	0100

Procedure (iii)

(Reserved)

Requirement (iii)

(Reserved)

Procedure (iv)

a) The MS is paged and brought to the active state of a call (CC state = U10).

b) The SS sends a STATUS message to the MS with a missing mandatory 'cause' information element.

c) The SS sends a correctly coded STATUS ENQUIRY message to the MS .

Requirement (iv)

1) The MS shall respond to the erroneous STATUS message by sending a STATUS message with cause #100.

2) The MS shall respond to the STATUS ENQUIRY with a STATUS message including the cause 'response to status enquiry' and CC state = U10 (active).

Message: STATUS from SS (GSM 04.08, 9.3.20)

information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	0xxx	
message type	status	0011	1101

Message: STATUS from MS (GSM 04.08, 9.3.20)

information element	comment	value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS allocated	1xxx	
message type	status	0x11	1101
cause	length	0000	0010
	coding/loc.	0110	0000
	1)(#100)	1110	0100
	2)(#30)	1001	1110
call state	coding(U10)	1100	1010

II.5.3.5.6 TEST OF MS REACTION TO NON-MANDATORY INFORMATION ELEMENT ERRORS

For the selection of coding of unrecognized optional information elements the following shall apply:

1) Unrecognized information elements shall be:

   a) coded as "unrecognized in the sublayer indicated by the protocol discriminator of the message";

   b) of type 4, and the length shall be greater than zero.

2) Unrecognized information elements coded to indicate "Comprehension required" shall have a length greater than zero.

II.5.3.5.6.1 Test of MS reaction to Non-mandatory information element errors in RR messages

ref: GSM 04.08 section 8.8.1.1

II.5.3.5.6.1.1 Reserved

II.5.3.5.6.1.2 Reserved

II.5.3.5.6.1.3 Test of MS reaction to unrecognised information element in RR message on a dedicated control channel

Purpose of the test

To verify that the MS responds correctly to unrecognised information elements included in RR messages on the DCCH.

Initial conditions

The SS simulates two cells A and B. The MS is in the MM state 'idle,updated' in cell A listening to the BCCH/CCCH. The MS is paged and brought to the active state (U10) of a call in cell A.

Procedure 1

The SS sends a HANDOVER COMMAND message on the DCCH (specifying cell B) with an optional information element which is not recognisable as applicable to the RR message but is coded 'comprehension required'.

Requirements 1

1) The MS shall not initiate the handover procedure

2) The MS shall return an RR-STATUS message with cause value 'Invalid information element contents' to the SS.

3) The MS shall maintain the link on the previous channel.

Message: HANDOVER COMMAND (GSM 04.08, 9.1.14)

information element	comment	value	
Protocol Discriminator	not relevant		
Transaction Identifier	RR		
message type	handover		
cell description	as required		
channel description	"		
handover reference	"		
power command	"		
comprehension required	IEI	0000	0000
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Procedure 2

The SS sends a HANDOVER COMMAND message on the DCCH with an optional information element which is not recognisable as applicable to the RR message but is NOT coded 'comprehension required'.

Requirements 2

The MS shall initiate the handover procedure and then return an RR-STATUS message to the SS.

Message: HANDOVER COMMAND (GSM 04.08, 9.1.14)

Information element	comment	value	
Protocol Discriminator	RR		
Transaction Identifier	not relevant		
message type	handover		
cell description	as required		
channel description	"		
handover reference	"		
power command	"		
unrecognised IEI	(see note)	0110	1111
	length	0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier for this message.

II.5.3.5.6.2 Test of MS reaction to Non-mandatory information element errors in MM messages

ref: GSM 04.08 section 8.8.1.2

Purpose of the test

To verify that the MS takes appropriate action upon receipt of an MM message containing error in an optional information element.

Initial conditions

a) The SS simulates two cells, A and B , belonging to different location areas (default values as specified in II.5.3.1).

b) The MS is in the MM-state 'idle,updated' listening to the BCCH/CCCH of cell A.

Note: The test of 'normal location updating' (section II.5.3.7.4) shall have been previously passed.

Procedure 1

a) The Rf level of cell A is lowered until the MS selects cell B (according to the cell-selection procedures of GSM 05.08).

b) The SS responds to the location updating request with the LOCATION UPDATING ACCEPT message containing an optional information element coded 'comprehension required'.

c) On receipt of the new LOCATION UPDATING REQUEST, the SS sends a LOCATION UPDATING ACCEPT correctly coded with TMSI 2.

Requirements 1

1) The MS shall establish an RR connection and perform the 'normal' location-updating procedure (using TMSI 1).

2) The MS shall return the MM-STATUS message with cause #100 in response to the LOCATION UPDATING ACCEPT.

3) The MS shall abort the RR-connection ("local release") after a period of T3210 seconds from transmission of the initial LOCATION UPDATING REQUEST. After a period of T3211 seconds a new location updating procedure shall be started.

4) Following receipt of the LOCATION UPDATING ACCEPT with TMSI, the MS shall send a TMSI REALLOCATION COMPLETE and then return to the MM-state 'idle,updated' in cell B (this is verified in Procedure 2).

Message: LOCATION UPDATING ACCEPT (GSM 04.08, 9.2.11)

information element	comment	value	
Protocol Discriminator	MM		
Transaction Identifier	not relevant		
message type	loc upd acc.		
location area id	cell B (5 bytes)		
b) comprehension required	IEI	0000	0000
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx
c) Mobile Identity	TMSI 2		

Procedure 2

a) With the MS now in the 'idle,updated' state in cell B, (default values as specified in II.5.3.1) the RF level of cell B is lowered until the MS selects cell A (according to the cell-selection procedures of GSM 05.08).

b) The SS responds to the location updating request with the LOCATION UPDATING ACCEPT message containing an optional information element which is incorrect for the message and NOT coded 'comprehension required'.

c) The SS waits at least a period of T3210.

d) The SS shall page the MS on cell A with the PAGING REQUEST TYPE 1 message using the TMSI originally supplied by the MS in the LOCATION UPDATING REQUEST.

Requirements 2

1) The MS shall establish an RR connection and perform the 'normal' location-updating procedure (using TMSI).

2) The MS shall respond to the LOCATION UPDATING ACCEPT message with an MM-STATUS message including cause value #99 ('information element non-existent or not implemented').

3) The MS shall abort the RR connection ("local release")

4) The MS shall respond to the PAGING REQUEST TYPE 1 message by initiating the immediate assignment procedure i.e. sends a CHANNEL REQUEST message with establishment cause set to "Answer to paging".

Message: LOCATION UPDATING ACCEPT (GSM 04.08, 9.2.11)

information element	comment	value	
Protocol Discriminator	MM		
Transaction Identifier	not relevant		
message type	loc upd acc.		
location area id	cell A(5 bytes)		
unrecognised IEI	(see note)	0110	1111
	length	0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier.

II.5.3.5.6.3 Test of MS reaction to Non-mandatory information element errors in CC messages

ref: GSM 04.08 section 8.8.1.3

Note: The provision of 'diagnostic' information (as described by GSM 04.08) is optional and therefore not included in the tests described here.

Purpose of the test

To verify that the MS reacts correctly to errors in non-mandatory information elements included in CC messages. To verify that if present the diagnostic field element shall take the value described.

Initial condition for procedure 1

a) The SS simulates a BS with BCCH/CCCH.

b) The MS is made to originate a call and is brought to the CC state U1 (call- initiated).

Procedure 1

a) With the MS in the U1 state, the SS sends the CALL PROCEEDING message to the MS with an erroneous optional information element.

b) After response from the MS,the SS sends the STATUS ENQUIRY message to the MS.

Requirements 1

1) The MS shall respond to the CALL PROCEEDING message by returning a STATUS message (1) with cause #99 and CC-state = U1.

2) The MS shall respond to the STATUS ENQUIRY message by returning a STATUS message (2) with cause #30 'response to status enquiry' and with CC-state = U3.

Procedure 2

a) The SS sends the CONNECT message to the MS with the coding 'comprehension required' in an optional indicator information element.

b) The SS sends a STATUS ENQUIRY message to the MS.

Requirements 2

1) The MS shall respond to the CC message indicating 'comprehension required' by returning a STATUS message (3) with cause #100 and CC-state U3 (call proceeding).

2) The MS shall respond to the STATUS ENQUIRY message by returning a STATUS message (2) with cause #30 'response to status enquiry' and with CC-state U3.

Procedure 3

a) With the MS in the state U10 (active) of the mobile terminating call, the SS sends the DISCONNECT message to the MS with an error in an optional information element (causing it to be unrecognised).

b) The SS sends a STATUS ENQUIRY message to the MS.

Requirements 3

1) The MS shall respond to the DISCONNECT message with a RELEASE message including cause #99 'information element non-existent or not implemented'.

2) The MS shall respond to the STATUS ENQUIRY message by returning a STATUS message (4) with cause #30 and CC-state = U19 (release request).

Procedure 4

a) The MS is again brought to the active state (U10) of a mobile terminating call.

b) The MS is made to end the call and consequently sends a DISCONNECT message to the SS.

c) The SS sends the RELEASE message to the MS with an error in the optional 'cause' information element.

Requirements 4

1) The MS shall respond to the RELEASE message with a RELEASE COMPLETE message including cause #99 'information element non-existent or not implemented'.

2) The MS shall release the link.

Procedure 5

a) The MS is again brought to the active state (U10) of a mobile terminating call.

b) The SS ends the call by sending a DISCONNECT message to the MS.

c) Following the RELEASE message from the MS, the SS sends a RELEASE COMPLETE message to the MS with an error in the optional 'cause' information element.

Requirements 5

1) The MS shall respond to the RELEASE COMPLETE message by releasing the link.

Message: CALL PROCEEDING (GSM 04.08, 9.3.3)

information element	comment	value	
Protocol Discriminator	CC		
Transaction Identifier	MS allocated		
message type	call proc		
unrecognised IEI	(see note)	0111	1111
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier for this message.

Message: CONNECT from SS (including IEI 'comprehension required' ref: GSM 04.08, Table 10.45)

Note: This is intended for extension of codesets: no specific message is defined presently by GSM.

information element	comment	value	
Protocol Discriminator	CC		
Transaction Identifier	MS allocated		
message type	connect		
comprehension required	IEI	0000	0000
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Message: DISCONNECT from SS (GSM 04.08, 9.3.7)

information element	comment	value	
Protocol Discriminator	CC		
Transaction Identifier	SS allocated		
message type	disconnect		
Cause			
- length			
- coding standard	standard defined for the GSM PLMN		
- cause value	16 (normal clearing)		
unrecognised IEI	(see note)	0111	1111
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier for this message.

Message: RELEASE from SS (GSM 04.08, 9.3.14)

information element	comment	value	
Protocol Discriminator	CC		
Transaction Identifier	SS allocated		
message type	release		
unrecognised IEI	(see note)	0111	1111
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier for this message.

Note: Length may vary by optional diagnostic elements.

Message: RELEASE COMPLETE from SS (GSM 04.08, 9.3.15)

information element	comment	value	
Protocol Discriminator	CC		
Transaction Identifier	SS allocated		
message type	rel com		
unrecognised IEI	(see note)	0111	1111
	length		
		0000	0001
	unrecognised IE contents	xxxx	xxxx

Note: The coding chosen is not recognisable as a valid information element identifier for this message.

II.5.3.5.7 TEST OF MS REACTION TO CONTENT ERRORS IN NON-MANDATORY INFORMATION ELEMENTS

ref: GSM 04.08 section 8.8.2

In this stage, no tests are included to verify the behaviour of the MS under such conditions.

II.5.3.6 THE ELEMENTARY PROCEDURES FOR RADIO RESOURCE MANAGEMENT

II.5.3.6.1 IMMEDIATE ASSIGNMENT

II.5.3.6.1.1 Introduction

The immediate assignment is used by the network to allocate Radio Resource to a MS requesting service. This is necessary to establish a dedicated control channel for the MS and network to communicate the detail of the MS service requested. The immediate assignment is described in section 3.3.1 of GSM 04.08.

II.5.3.6.1.2 Purpose of the tests

The purpose of these tests is to verify that the MS can :

- correctly set up the dedicated control channel (SDCCH or TCH/FACCH),
- correctly identify its own assignment in case of an extended assignment,
- accept an assignment rejection,
- ignore an assignment for another MS while waiting for an assignment of its own,
- correctly react in the case of many random accesses, it must react only to Immediate Assignment messages including one of its three last request references and ignore the previous ones.

At the end of each test, the SS releases the dedicated resource when it has been successfully established.

II.5.3.6.1.3 SDCCH Assignment

II.5.3.6.1.3.1 Initial conditions

CCCH_CONF is set to non combined case.
The MS has successfully performed a location update.

II.5.3.6.1.3.2 Procedure

a) The SS sends a Paging Request with correct TMSI.

b) The SS draws a random value between 0 and 7, coded as TTT.

c) The SS responds to the MS Channel Request with an immediate assignment message allocating a SDCCH.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR man. message		0110
Transaction Identifier	not relevant	0000	
Message Type	immediate assignment	0011	1111
Page Mode	normal paging	00	
Channel Description	SDCCH /8	01TT	Txxx
Request Reference			
Timing Advance	30 bit periods	011110	
Mobile Allocation	empty		
Starting Time	optional field		

II.5.3.6.1.3.3 Requirement

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS goes to the correct SDCCH indicated in the Immediate Assignment message and sends a Paging Response message.

Message: PAGING RESPONSE

Information Element	Comment	Value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type	paging response	0010	0111
Ciph. key sequence number	not relevant	000	
Mobile Station Classmark 2	as specified by the manufacturer		
Mobile Identity	TMSI		

II.5.3.6.1.4 TCH Assignment

Max_retrans is set to 1 (coding 00).
CCCH_CONF is set to non combined.

II.5.3.6.1.4.1 Procedure

a) The SS sends a Paging Request with the correct TMSI.

b) The SS responds to the MS Channel Request with an Immediate Assignment message allocating a TCH.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR man. message		0110
Transaction Identifier	not relevant	0000	
Message Type	immediate assignment	0011	1111
Page Mode	normal paging	00	
Channel Description	Bm+ACCHs	0000	1xxx
Request Reference			
Timing Advance	30 bit periods	011110	
Mobile Allocation	empty		
Starting Time	optional field		

II.5.3.6.1.4.2 Requirements

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS shall go to the correct TCH indicated in the Immediate Assignment message.

3) The MS shall send a Paging Response message on the FACCH.

Message: PAGING RESPONSE

Information Element	Comment	Value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type	paging response	0010	0111
Ciph. key sequence number	not relevant	000	
Mobile Station Classmark 2	as specified by the manufacturer		
Mobile Identity	TMSI		

II.5.3.6.1.5 Extended Assignment

Initial conditions

CCCH-CONF is set to combined case.
The maximum number of retransmissions Max-retrans shall be set to 7.

II.5.3.6.1.5.1 Procedure 1

a) The SS sends a Paging Request with correct TMSI.

b) The SS draws a random integer value n between 1 and 8, and another value between 0 and 3, coded as TT.

c) Immediately after having received n Channel Requests, the SS responds to the MS with an Immediate Assignment Extended message allocating an SDCCH.

Message: IMMEDIATE ASSIGNMENT EXTENDED

information Element	Comment	Value	
Protocol Discriminator	RR man.	0110	
Transaction Identifier	not relevant	0000	
Message Type	immediate assignment extended	0011	1001
Page Mode	normal paging	00	
Channel Description 1	} SDCCH/4	001T	Txxx
Request Reference 1	} for MS under test		
Timing Advance 1	} see the following note		
Channel Description 2	}		
Request Reference 2	} arbitrary (not MS under test)		
Timing Advance 2	}		
Mobile Allocation			
Starting Time.			

Note: The request reference is the one which pertains to the i-th Channel Request sent by the MS, where i is an integer between max(1,n-2) and n, its value being randomly drawn by the SS.

II.5.3.6.1.5.2 Requirements 1

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS goes to the correct SDCCH indicated in the Immediate Assignment message and sends a Paging Response message.

Message: PAGING RESPONSE

Information Element	Comment	Value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type	paging response	0010	0111
Ciph. key sequence number	not relevant	000	
Mobile Station Classmark 2	as specified by the manufacturer		
Mobile Identity	TMSI		

II.5.3.6.1.5.3 Procedure 2

a) The SS sends a Paging Request with the correct TMSI.

b) The SS draws a random integer value n between 4 and 8, and another value between 0 and 3, coded as TT.

c) Immediately after having received n Channel Requests, the SS responds to the MS with an Immediate Assignment Extended message allocating an SDCCH.

Note: The SS will allow 30 seconds between this test and the following test, for the MS to complete the channel request procedure and to perform cell reselection.

Message: IMMEDIATE ASSIGNMENT EXTENDED

information Element	Comment	Value	
Protocol Discriminator	RR man.	0110	
Transaction Identifier	not relevant	0000	
Message Type	immediate assignment extended	0011	1001
Page Mode	normal paging	00	
Channel Description 1	} SDCCH/4	001T	Txxx
Request Reference 1	} for-MS under test		
Timing Advance 1	} see the following note		
Channel Description 2	}		
Request Reference 2	} arbitrary (not MS under test)		
Timing Advance 2	}		
Mobile Allocation			
Starting Time.			

Note: The request reference is the one which pertains to the i-th Channel Request sent by the MS, where i is an integer between 1 and n-3, its value being randomly drawn by the SS.

II.5.3.6.1.5.4 Requirements 2

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS shall ignore the immediate assignment.

II.5.3.6.1.5.5 Procedure 3

a) The SS draws:
a random integer value n between 4 and 8
a random integer value S between 0 and 7, and
a random integer value l between n-2 and n.

b) The SS sends a PAGING REQUEST message addressing the MS with the correct TMSI.

c) Immediately after having received n CHANNEL REQUEST messages, the SS responds to the MS with an IMMEDIATE ASSIGNMENT EXTENDED message allocating in the "Channel description 2" Information Element the SDCCH number S of an SDCCH(8).
The "Request reference 2" Information Element refers to the l-th Channel Request sent by the MS.

II.5.3.6.1.5.6 Requirements 3

1) After step b) the MS shall respond to the PAGING REQUEST message by sending between n and (Max retrans) + 1 CHANNEL REQUEST messages with establishment cause set to "Answer to Paging)

2) After step c) the MS shall go to the correct SDCCH indicated in the IMMEDIATE ASSIGNMENT EXTENDED message and send a PAGING RESPONSE message.

II.5.3.6.1.6 Assignment Rejection

Initial condition

Max-retrans is set to 7.

II.5.3.6.1.6.1 Procedure 1

a) The SS sends a Paging Request with correct TMSI.

b) x is randomly drawn between 1 and 255 s by the SS. n is an integer randomly drawn by the SS between 1 and 8.

c) Immediately after having received n channel requests, the SS responds to the MS with an Immediate Assignment Reject message and continues to send Paging messages for more than x seconds.

Message: IMMEDIATE ASSIGNMENT REJECT

Information Element	Comment	Value	
Protocol Discriminator	Radio Resource management		0110
Transaction Identifier	Not relevant	000	
Message Type	immediate assignment reject	0011	1010
Page Mode	Normal paging	00	
Request Reference			
Wait Indication	not the MS under test		
Request Reference	MS		
Wait Indication	x seconds (maximum=255)		
Request Reference			
Wait Indication	not the MS under test		
Request Reference			
Wait Indication	not the MS under test		

Note: The request reference is the one which pertains to the i-th Channel Request sent by the MS, where i is an integer between max(1,n-2) and n, its value being randomly drawn by the SS.

II.5.3.6.1.6.2 Requirements 1

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) After the reception of IMMEDIATE ASSIGNMENT REJECT, the MS shall not transmit for x seconds, and then answer to the paging request.

II.5.3.6.1.6.3 Procedure 2

a) The SS responds to the MS Channel Request with an Immediate Assignment Reject message.

b) The MS is made to perform a cell reselection.

Message: IMMEDIATE ASSIGNMENT REJECT

Information Element	Comment	Value	
Protocol Discriminator	Radio Resource management		0110
Transaction Identifier	Not relevant	000	
Message Type	immediate assignment reject	0011	1010
Page Mode	Normal paging	00	
Request Reference			
Wait Indication	not the MS under test		
Request Reference			
Wait Indication	not the MS under test		
Request Reference	MS		
Wait Indication	255 seconds		
Request Reference			

c) The SS pages the MS in the new cell.

II.5.3.6.1.6.4 Requirement 2

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS shall not transmit until the cell reselection, and after that it shall answer to the paging.

II.5.3.6.1.7 Ignore Assignment for another MS

II.5.3.6.1.7.1 Procedure

a) The SS sends a Paging Request with the correct TMSI.

b) The SS responds to the MS Channel Request with an Immediate Assignment message allocating a SDCCH, but to a different Request Reference:
   b.1) wrong request reference = actual frame number +2 and correct random access info,
   b.2) wrong request reference = actual frame number and wrong random access info.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR man. message		0110
Transaction Identifier	not relevant	0000	
Message Type	immediate assignment	0011	1111
Page Mode	normal paging	00	
Channel Description	SDCCH/8	01TT	Txxx
Request Reference	Wrong request reference		
Timing Advance	30 bit periods	011110	
Mobile Allocation	empty		
Starting Time	optional field		

II.5.3.6.1.7.2 Requirement

1) The MS shall respond to the Paging Request message by sending a Channel Request message with establishment cause set to "Answer to Paging".

2) The MS shall continue sending its Channel Requests and not go to the assigned SDCCH.

II.5.3.6.2 TEST OF PAGING

The paging procedures are specified in sections 3.3.2 of GSM 04.08 and in section 6.5 of GSM 05.02.

Note: Mobile Identity information fields, not specified in the method of test, shall either be non-existent or not address the mobile under test.

II.5.3.6.2.1 Normal paging

II.5.3.6.2.1.1 Purpose

To test that the MS is able to determine its CCCH group and paging group correctly and that the MS will respond to a PAGING REQUEST message (page mode set to "normal paging").

II.5.3.6.2.1.2 Initial conditions

1) The SS simulates a BSS. The SYSTEM INFORMATION messages on the BCCH are indicating a cell with: Max-retrans is set to 2 (encoded as 01). A legal combination of parameters (CCCH-CONF,BS-AG-BLKS-RES, BS-PA-MFRMS) has to be chosen at the beginning of each following test case.

2) The MS is in idle updated state. It has been switched on 90 seconds ago. The SS knows the MS's IMSI and the MS has been assigned a TMSI.

Note: The 90 seconds are needed by the MS, so that it can acquire the synchronisation of the six strongest BCCHs of its list and also read the SYSTEM INFO of these BCCHs (required in GSM 05.08, section 6.6.1 "Monitoring of Received level and BCCH data"). After this initialisation has been performed there remains a probability that a correct MS will be rejected because of non reception of a paging request message. This probability will be less than 0.04 %.

II.5.3.6.2.1.3 Procedure 1: PAGING REQUEST TYPE 1

a) The SS sends a PAGING REQUEST TYPE 1 message on the paging subchannel which corresponds to the MS's IMSI. The page mode is set to "normal paging". The test is carried out for each of the following 6 cases, as there is 6 times a return from step d) to step a).

Message: PAGING REQUEST TYPE 1

Information Element	Comment	Value
Protocol Discriminator	RR management	0110
Transaction Identifier	not relevant	0000
Message Type	Paging Request type 1	0010 0001
Page mode	Normal paging	0000
Mobile identity	Mandatory	
Mobile identity	Optional	

Normal cases

a.1) The MS is addressed with its IMSI which is conveyed in the first Mobile Identity information field. The optional Mobile Identity information element is not present.

a.2) The MS is addressed with its TMSI which is conveyed in the first Mobile Identity information field. The optional Mobile Identity information element specifies an IMSI different from that of the MS's.

a.3) The first Mobile Identity information element specifies a TMSI different from that of the MS. The optional Mobile Identity information element addresses the MS by its IMSI.

a.4) The first Mobile Identity information element specifies a TMSI which is different from that of the MS. The optional Mobile Identity information element contains the correct TMSI for the MS.

a.5) The MS is addressed in the first Mobile Identity field with its IMEI. The optional Mobile Identity information element is not included in the Paging Request message.

a.6) The MS is addressed in the first Mobile Identity field with its TMSI, but the type of identity in this field is set to "No Identity". The optional Mobile Identity information element is not included in the Paging Request message.

b) The SS provides a positive response to the 2nd channel request, i.e. the SS responds with an immediate assignment.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Immediate Assignment	0011	1111
Page mode	normal paging		00
Channel Description	SDCCH/8	01TT	Txxx
	TTT is value randomly chosen between 0 and 7		
Request Reference			
Timing Advance	30 bit periods	01	1110
Mobile Allocation	empty		
Starting Time	optional field		

c) The SS receives a Paging Response message in each of the test cases a.1) to a.4).

d) For test cases a.1) to a.4) the SS sends a Channel Release message. For test cases a.5) and a.6) the SS waits 1 second to confirm that the MS does not respond to the paging.

Message: CHANNEL RELEASE

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Channel Release	0000	1101
RR cause	Normal release	0000	0000

II.5.3.6.2.1.4 Requirements 1

1) For cases a.1) to a.4) the MS shall respond with CHANNEL REQUEST (ESTABL. CAUSE = Answer to paging) until the SS answers. The number of CHANNEL REQUEST messages is limited by the parameter Max-retrans. For case a.5) and a.6) the MS shall ignore the message.

2) In each of the test cases a.1) to a.4), the MS shall send a PAGING RESPONSE message on the channel assigned by the SS.

Message: PAGING RESPONSE

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Paging Response	0010 0111	
Ciphering key seq. number	not relevant	000	
Mobile Station classmark 2	according to manufacturer specification		
Mobile Identity	TMSI		

II.5.3.6.2.1.5 Procedure 2: PAGING REQUEST TYPE 2

a) The SS sends a PAGING REQUEST TYPE 2 message on the paging subchannel which corresponds to the MS's IMSI. The page mode is set to "normal paging". The test is carried out for each of the following 6 cases, as there is 6 times a return from step d) to step a).

Message: PAGING REQUEST TYPE 2

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Paging Request type 2	0010 0010	
Page mode	normal paging	0000	
TMSI	Mandatory		
TMSI	Mandatory		
Mobile Identity	Optional		

Normal cases

a.1) The MS is addressed in the first TMSI field.

a.2) The MS is addressed in the second TMSI field.

a.3) The MS is addressed in the Mobile Identity information field with its TMSI.

a.4) The MS is addressed in the Mobile Identity information field with its IMSI.

a.5) The MS is addressed in the optional Mobile Identity field with its IMEI.

a.6) The MS is addressed in the optional Mobile Identity field with its TMSI, but the type of identity in this field is set to "No Identity".

b) The SS provides a positive response to the 2nd channel request, i.e. the SS responds with an immediate assignment.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Immediate Assignment	0011	1111
Page mode	normal paging		00
Channel Description	SDCCH/8	01TT	Txxx
	TTT is value randomly chosen between 0 and 7		
Request Reference			
Timing Advance	30 bit periods	01	1110
Mobile Allocation	empty		
Starting Time	optional field		

c) The SS receives a Paging Response message in each of the test cases a.1) to a.4).

d) For test cases a.1) to a.4) the SS sends a Channel Release message. For test cases a.5) and a.6) the SS waits 1 second to confirm that the MS does not respond to the paging.

Message: CHANNEL RELEASE

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Channel Release	0000	1101
RR cause	Normal release	0000	0000

II.5.3.6.2.1.6 Requirements 2

1) For cases a.1) to a.4) the MS shall respond with CHANNEL REQUEST (ESTABL. CAUSE = Answer to paging) until the SS answers. The number of CHANNEL REQUEST messages is limited by the parameter Max-retrans. For case a.5) and a.6) the MS shall ignore the message.

2) In each of the test cases a.1) to a.4), the MS shall send a PAGING RESPONSE message on the channel assigned by the SS.

Message: PAGING RESPONSE

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Paging Response	0010	0111
Ciphering key seq. number	not relevant	000	
Mobile Station classmark 2	according to manufacturer specification		
Mobile Identity	TMSI		

II.5.3.6.2.1.7 Procedure 3: PAGING REQUEST TYPE 3

a) The SS sends a PAGING REQUEST TYPE 3 message on the paging subchannel which corresponds to the MS's IMSI. The page mode is set to "normal paging". The test is carried out for each of the following 4 cases, as there is 4 times a return from step d) to step a).

Message: PAGING REQUEST TYPE 3

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Paging Request type 3	0010	0100
Page mode	normal paging	0000	
TMSI	Mandatory		
TMSI	Mandatory		
TMSI	Mandatory		
TMSI	Mandatory		

Normal cases

a.1) The MS is addressed in the first TMSI field.

a.2) The MS is addressed in the second TMSI field.

a.3) The MS is addressed in the third TMSI field.

a.4) The MS is addressed in the fourth TMSI field.

b) The SS provides a positive response to the 2nd channel request, i.e. the SS responds with an immediate assignment.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Immediate Assignment	0011	1111
Page mode	Normal paging		00
Channel Description	SDCCH/8	01TT	Txxx
	TTT is value randomly chosen between 0 and 7		
Request Reference			
Timing Advance	30 bit periods	01	1110
Mobile Allocation	empty		
Starting Time	optional field		

c) The SS receives a Paging Response message in each of the test cases a.1) to a.4).

d) For test cases a.1) to a.4) the SS sends a Channel Release message.

Message: CHANNEL RELEASE

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Channel Release	0000	1101
RR cause	Normal release	0000	0000

II.5.3.6.2.1.8 Requirements 3

1) For cases a.1) to a.4) the MS shall respond with CHANNEL REQUEST (ESTABL. CAUSE = Answer to paging) until the SS answers. The number of CHANNEL REQUEST messages is limited by the parameter Max-retrans.

2) In each of the test cases a.1) to a.4), the MS shall send a PAGING RESPONSE message on the channel assigned by the SS.

Message: PAGING RESPONSE

Information Element	Comment	Value
Protocol Discriminator	RR management	0110
Transaction Identifier	not relevant	0000
Message Type	Paging Response	0010 0111
Ciphering key seq. number	not relevant	000
Mobile Station classmark 2	according to manufacturer specification	
Mobile Identity	TMSI	

II.5.3.6.2.1.9 Procedure 4

The MS is made to go in "idle roaming not allowed" state (the MS is made to perform a location updating procedure to which the SS answers by a location updating reject with cause #11), that is no more TMSI available.

All those tests from II.5.3.6.2.1.3 to II.5.3.6.2.1.8 are repeated using the TMSI previously allocated to the MS.

II.5.3.6.2.1.10 Response Requirement 4

The MS shall ignore all paging requests which address the MS with a TMSI.

II.5.3.6.2.2 Extended paging

Purpose:

To test that the MS is operating in the extended page mode when this is ordered by the BSS as specified in GSM 04.08 sect. 3.3.2.1 (and answers paging messages in the next but one paging sub block).

Procedure 1

a) The SS simulates a BSS which is configured as in II.5.3.6.2.1.

b) The MS is in idle updated state. The MS's IMSI is known to the SS and the MS has been assigned a TMSI.

c) The SS sends a PAGING REQUEST TYPE 1 message not addressing the MS under test but on the paging subchannel which corresponds to the MS's identity. The page mode is set to "extended paging".

Message: PAGING REQUEST TYPE 1

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 1	0010	0001
Page Mode	Extended Paging	0000	0001
Mobile Identity	NOT the identity of MS under test		
-type of identity	IMSI	001	

Note: Extended paging can be chained only once.

d) In the next but one paging subblock on the same CCCH the SS sends a PAGING REQUEST TYPE 1 message specifying paging reorganisation and addressing the MS by TMSI.

Message: PAGING REQUEST TYPE 1

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 1	0010	0001
Page Mode	Paging reorganisation	0000	0010
Mobile Identity	the identity of MS under test		
-type of identity	TMSI	100	

e) The SS shall respond to the second CHANNEL REQUEST by sending a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Message: IMMEDIATE ASSIGNMENT REJECT

Information Elements	Comments	Value	
Protocol Discriminator	RR		0110
Transaction Identifier		0000	
Message Type	Immediate Assignment Rej	0011	1010
Page Mode	normal	0000	0000
Request Reference	the 2nd channel request		
Wait indication	0 second	0000	0000

other fields not referring to the MS under test.

Requirements 1

1) In case of step c) the MS shall not respond.

2) In case of step d) the MS shall send at least two CHANNEL REQUEST messages on its RACH.

Procedure 2

a) The SS simulates a BSS which is configured as in II.5.3.6.2.1.

b) The MS is in idle updated state. The MS's IMSI is known to the SS and the MS has been assigned a TMSI.

c) The SS sends an IMMEDIATE ASSIGNMENT on the paging subchannel which corresponds to the MS's identity. The page mode is set to "extended paging".

Message: IMMEDIATE ASSIGNMENT

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	immediate assignment	0011	1111
Page Mode	Extended Paging	0000	0001
Channel description	not relevant		
request reference	not relevant		
timing advance	not relevant		
mobile allocation	not relevant		
starting time	not relevant		

Note: Extended paging can be chained only once.

d) In the next but one paging subblock on the same CCCH the SS sends a PAGING REQUEST TYPE 1 message specifying paging reorganisation and addressing the MS by TMSI.

Message: PAGING REQUEST TYPE 1

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 1	0010	0001
Page Mode	Paging reorganisation	0000	0010
Mobile Identity	the identity of MS under test		
-type of identity	TMSI	100	

e) The SS shall respond to the second CHANNEL REQUEST by sending a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Message: IMMEDIATE ASSIGNMENT REJECT

Information Elements	Comments	Value	
Protocol Discriminator	RR		0110
Transaction Identifier		0000	
Message Type	Immediate Assignment Rej	0011	1010
Page Mode	normal	0000	0000
Request Reference	the 2nd channel request		
Wait indication	0 second	0000	0000

other fields not referring to the MS under test.

Requirements 2

1) In case of step c) the MS shall not respond.

2) In case of step d) the MS shall send at least two CHANNEL REQUEST messages on its RACH.

II.5.3.6.2.3 Paging reorganisation

Purpose:

To test that the MS is operating in the paging reorganisation page mode as specified in GSM 04.08 sect. 3.3.2.1 (and answers to paging messages sent on any block of the full downlink CCCH during the reorganisation and receives the relevant BCCH messages during the reorganisation).

Procedure 1

a) The SS simulates a BSS which is configured as in II.5.3.6.2.1.

BS-PA-MFRMS shall be set to a value different from 9.

b) The MS is in idle-updated state. The MS has been assigned a TMSI, its IMSI is known to the SS.

c) The SS sends, in the MS's paging sub-channel, a IMMEDIATE ASSIGNMENT EXTENDED message containing paging reorganisation page mode.

Message: IMMEDIATE ASSIGNMENT EXTENDED

Information Elements	Comments	Value
Message Type	IMM ASS EXT	
Page Mode	paging reorganisation	
request reference	Arbitary	

d1) Before the MS's original paging sub-channel re-occurs, the SS pages it on its old CCCH by TMSI in some paging block which is not belonging to the MS's paging sub-channel. A PAGING REQUEST TYPE 2 message is used, the page mode set to "normal paging".

Message: PAGING REQUEST TYPE 2

Information Elements	Comments	Value
Message Type	Paging request type 2	
Page Mode	Normal Paging	
TMSI	TMSI of MS under test	
TMSI	NOT TMSI of MS under test	

d2) The SS shall respond to the second CHANNEL REQUEST by sending, in a paging blcok which does not belong to the MS's paging sub-channel, a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Message: IMMEDIATE ASSIGNMENT REJECT

Information Elements	Comments	Value
Message Type	Immediate Assignment Rej	
Page Mode	normal	
Request Reference	the 2nd channel request	
Wait indication	0 second	

other fields not referring to the MS under test.

The SS then starts sending fill frames on the PCH with page mode set to "paging reorganisation".

d3) Same as in d1).

d4) Same as in d2).

e) The SS changes the following BCCH parameters as indicated:

CCCH-CONF is set to "1 basic physical channel used for CCCH, combined with SDCCH".

BS-AG-BLKS-RES is set to 2 blocks reserved for access grant.

BS-PA-MFRMS is set to 9 multiframe periods.

f) The SS waits until all four SYSTEM INFO messages (SYSTEM INFORMATION TYPE 1, 2, 3 and 4) have been transmitted on the BCCH.

g) The SS starts sending paging fill frames on the PCH with page mode set to "normal paging". At least 3 seconds after step f), the MS is paged on its new paging subchannel.

Message: PAGING REQUEST TYPE 1

Protocol Discriminator	RR management		0110
Transaction Identifier		0000	
Message Type	Paging request type 1	0010	0001
Page Mode	Normal Paging	0000	0000
Mobile Identity	Identity of MS under test		
-type of identity	TMSI	100	

h) The SS shall respond to the second CHANNEL REQUEST by sending a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Message: IMMEDIATE ASSIGNMENT REJECT

Information Elements	Comments	Value	
Protocol Discriminator	RR		0110
Transaction Identifier		0000	
Message Type	Immediate Assignment Rej	0011	1010
Page Mode	normal	0000	0000
Request Reference	the 2nd channel request		
Wait indication	0 second	0000	0000

other fields not referring to the MS under test.

i) The MS is paged on its new paging subchannel. A PAGING REQUEST TYPE 2 message is used, the page mode set to "normal paging".

Message: PAGING REQUEST TYPE 2

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 2	0010	0010
Page Mode	Normal Paging	0000	0000
TMSI	TMSI of MS under test		
TMSI	Not TMSI of MS under test		

Requirements 1

1) In case of step d1) the MS shall transmit at least two CHANNEL REQUEST messages on its RACH.

1a) In case of step d3) the MS shall transmit at least two CHANNEL REQUEST messages on its RACH.

2) In case of step g) the MS shall transmit at least two CHANNEL REQUEST messages on its new RACH.

3) In case of step i) the MS shall transmit at least two CHANNEL REQUEST messages on its RACH.

Procedure 2

Procedure 1 is repeated, but in step e) "CCCH-CONF" is set to "2 basic physical channels used for CCCH, not combined with SDCCHs".

Parameters and IMSI used shall be chosen in order to be sure that the MS will be listening on the second CCCH.

Requirements 2

Same requirements as "Requirements 1".

Procedure 3

a) The SS simulates a BSS which is configured as in II.5.3.6.2.1.

b) The MS is in idle-updated state. The MS has been assigned a TMSI, its IMSI is known to the SS.

c) BCCH info is set such that Max-retrans = 1 (coded as 00).

d) The SS sends an IMMEDIATE ASSIGNMENT EXTENDED message as in Procedure 1 c).

e) The MS is paged immediately in a former AG block, as in Procedure 1 d). The SS shall respond to the second CHANNEL REQUEST by sending a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Requirements 3

1) In step e), the MS shall produce at least two channel requests.

II.5.3.6.2.4 No change of page mode

Purpose:

To test that the MS remembers the page mode from the previous paging request message.

Method of test

a) The SS simulates a BSS which is configured as in II.5.3.6.2.1.

b) The MS is in the idle updated state. The MS has been assigned a TMSI and its IMSI is known to the SS.

c) The SS sends an IMMEDIATE ASSIGNMENT REJECT message on the MS's paging channel. The page mode is set to "extended paging".

Message: IMMEDIATE ASSIGNMENT REJECT

Information Elements	Comments
Protocol Discriminator	RR management
Transaction Identifier	
Message Type	Imm Ass Rej
Page Mode	Extended Paging
Request reference	NOT for the MS under test
Wait indication	

d) When the MS's specific paging multiframe and paging subblock reoccurs for the second time, PAGING REQUEST TYPE 3 is sent. Page mode set to "no change".

Message: PAGING REQUEST TYPE 3

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 3	0010	0100
Page Mode	no change	0000	0011
TMSI	Not TMSI of a MS under test		
TMSI	Not TMSI of a MS under test		
TMSI	Not TMSI of a MS under test		
TMSI	Not TMSI of a MS under test		

e) In the next but one paging subblock on the same CCCH the SS sends a PAGING REQUEST TYPE 1 message specifying paging reorganisation and addressing the MS by TMSI.

Message: PAGING REQUEST TYPE 1

Information Elements	Comments	Value	
Protocol Discriminator	RR management	0110	
Transaction Identifier		0000	
Message Type	Paging request type 1	0010	0001
Page Mode	Paging reorganisation	0000	0010
Mobile Identity	the identity of MS under test		
-type of identity	TMSI	100	

f) The SS shall respond to the second CHANNEL REQUEST by sending a IMMEDIATE ASSIGNMENT REJECT message (to avoid a cell reselection).

Requirements

1) In case of steps c) and d) the MS shall not respond.

2) In case of step e) the MS shall send at least two CHANNEL REQUEST messages on its RACH.

II.5.3.6.3 MEASUREMENT REPORT

The Measurement Report Procedure is described in section 3.4.1.2 of GSM 04.08.

II.5.3.6.3.1 Introduction and purpose of test

When having a RR-connection, the MS sends measurement reports. The report contains reception characteristics from serving and neighbouring cells.

Note: The capability of calculating RxLev and RxQual is tested in section II.6.1.2. Here, only the signalling aspect is verified. The interval between two successive Layer 2 frames containing measurements reports shall not exceed one Layer 2 frame.

The MS shall be able to indicate:

- if no neighbouring cells are identified,
- the six best BCCH's out of a list taken from System Information,
- only permitted BCCH's out of a list.

II.5.3.6.3.2 Method of Measurement

a) The SS uses one serving cell and seven additional transmitters in stable conditions on different frequencies and levels.

b) On the serving cell the MS is having a call in progress.

c) First the SS sends an empty BCCH allocation in System Information Type 5.

d) Then the SS sends a non-empty BCCH allocation in System Information Type 5 and changes the BA ARFCN list and colourcodes to verify the MS.

e) The MS is forced to make a handover in a new cell when DTX shall be used and PWRC indicates that the MS has not to measure the BCCH carrier.

II.5.3.6.3.3 Procedures

Procedure 1 No Neighbouring Cells

Transmitter		Level	NCC	BS Colour Code	ARFCN
Serving 1	S1	-60	1	3	002
Neighbour	N1	-85	1	5	008
" "	N2	-80	1	7	014
" "	N3	-75	1	1	020
" "	N4	-55	1	3	026
" "	N5	-50	1	5	032
" "	N6	-45	1	7	038
" "	N7	-40	1	1	044

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08, 9.1.33)

Information Element	Comment	Value
Protocol Discriminator	RR management	
Transaction Identifier	not relevant	
Message Type	sys info 5	
Neighbour cell descr		-
- BA-NO	Band number 0	
- BA ARFCN (124..001)	no BCCH allocation	all 0

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08, 9.1.34)

Information Element	Comment	Value
Protocol Discriminator	RR management	
Transaction Identifier	not relevant	
Message Type		
Cell Identity	default	
LAI	default	
Cell Options		
- PWRC	PWRC is not set	
- DTX	shall not be used	
- RADIO-LINK-TIMEOUT	default	
PLMN permitted	only NCC 1 permitted	

Requirements 1

1) The MS shall continuously send measurement reports on every SACCH blocks and the measurement valid indication shall be set to valid (0) within the second block at the latest.

Message: MEASUREMENT REPORT (GSM 04.08, 9.1.20)

Information Element	Comment	Value
Protocol Discriminator	RR management	
Transaction Identifier	not relevant	
Message type	measurement report	
Measurement results		-
- BA-USED	"Same value as BA-IND sent on SACCH"	
- DTX USED	Dtx not used	
- RXLEV-FULL-SERVING-CELL	Actual value not checked	
- RXLEV-SUB-SERVING-CELL		
- MEAS-VALID	as specified in the text	
- RXQUAL-FULL-SERVING-CELL	Actual value not checked	
- RXQUAL-SUB-SERVING-CELL	Actual value not checked	
- NO-NCELL-M	"No neighbour cell measurement result" or "Neighbour cell information not available for serving cell"	
- RXLEV-NCELL 1	no result	all bits set to 0
- BCCH-FREQ-NCELL 1	no result	
- BSIC--NCELL 1	no result	
. . .	. .	
. . .	. .	
- RXLEV-NCELL 6	no result	
- BCCH-FREQ-NCELL 6	no result	
- BSIC--NCELL 6	no result	

Procedure 2 **All neighbours present**

Transmitter			Level	NCC	BS Colour Code	ARFCN
Serving 1	S1		-60	1	3	002
Neighbour	N1		-85	1	5	008
"	"	N2	-80	1	7	014
"	"	N3	-75	1	1	020
"	"	N4	-55	1	3	026
"	"	N5	-50	1	5	032
"	"	N6	-45	1	7	038
"	"	N7	-40	1	1	044

TCH channel is allocated in ARFCN = 030

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08, 9.1.33)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	sys info 5	0001	1101
Neighbour cell descr		-	
- BA-NO	gsm band 0	00	
- BA-IND		0	
- BA ARFCN	(2,4,5,6,7,8,9,10,11,12,14,16,17,18,19,20,21,		
-	22,23,24,26,28,29,32,34,35,36,38,40,		
-	41,42,44)=open		
-	(all others)=closed		

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08, 9.1.34)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type		0001	1110
Cell Identity	default		
LAI	default		
Cell Options			
- PWRC	PWRC is not set		
- DTX	shall not be used	10	
- RADIO-LINK-TIMEOUT	default		
PLMN permitted	only NCC 1 permitted	0000	0010

Requirements 2

1) The MS shall continuously send measurement reports on every SACCH blocks and the measurement valid indication shall be set to valid (0) within the second block at the latest.

Message: MEASUREMENT REPORT (GSM 04.08, 9.1.20)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	measurement report	0001	0101
Measurement results		-	
- DTX USED	Dtx not used	0	
- BA-USED			
- MEAS-VALID	as specified in the text		
- RXLEV-FULL-SERVING-CELL	Actual value not checked	xx	xxxx
- RXLEV-SUB-SERVING-CELL	Actual value not checked	xx	xxxx
- RXQUAL-FULL-SERVING-CELL	Actual value not checked		xxx
- RXQUAL-SUB-SERVING CELL	Actual value not checked		xxx
- NO-NCELL-N	number of neighbours=six		110
- RXLEV-NCELL 1	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 1	the index foi	x	xxxx
- BSIC--NCELL 1	as in table	xx	xxxx
. . .	. .	.	.
. . .	. .	.	.
- RXLEV-NCELL 6	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 6	as in table	x	xxxx
- BSIC--NCELL 6	as in table	xx	xxxx

2) The SS shall keep the signal levels and BCCH information stable for at least 20 seconds before using the reported RX_LEV values. After the signal conditions have been stable for at least 20 seconds, the order of values in the MEASUREMENT REPORT, when put in the order of increasing RX LEV, shall be N3, S1, N4, N5, N6, N7.

Note: The actual values in the MEASUREMENT REPORT are not checked.

Procedure 3: Combination of barred cells and unpermitted PLMNs

Transmitter			Level	NCC	BS Colour Code	ARFCN
Serving 1	S1		-60	1	3	002
Neighbour	N1	(no info)	-85	1	5	008
" "	N2		-80	1	7	014
" "	N3		-75	2	1	020
" "	N4	(no info)	-55	3	3	026
" "	N5	(no info)	-50	4	5	032
" "	N6		-45	1	7	038
" "	N7		-40	1	1	044

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08, 9.1.33)

Information Element	Comment	Value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type	sys info 5	0001	1101
Neighbour cell descr		-	
- BA-NO	gsm band 0	00	
- BA ARFCN	(2,14,20,38,44)=open	1	
-	(all others)=closed	0	

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08, 9.1.34)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type		0001	1110
Cell Identity	default		
LAI	default		
Cell Options			
- PWRC	PWRC is not set		
- DTX	shall not be used	10	
- RADIO-LINK-TIMEOUT	default		
PLMN permitted	only NCC 1 permitted	0000	0010

Requirements 3

1) The MS shall continuously send measurement reports on every SACCH blocks and the measurement valid indication shall be set to valid (0) within the second block at the latest.

Message: MEASUREMENT REPORT (GSM 04.08, 9.1.20)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	measurement report	0001	0101
Measurement results		-	
- BA-USED			
- MEAS-VALID	as specified in the text		
- DTX USED	Dtx not used	0	
- RXLEV-FULL-SERVING-CELL	Actual value not checked	xx	xxxx
- RXLEV-SUB-SERVING-CELL	Actual value not checked	xx	xxxx
- RXQUAL-FULL-SERVING-CELL	Actual value not checked		xxx
- RXQUAL-SUB-SERVING-CELL	Actual value not checked		xxx
- NO-NCELL-N	number of neighbours=four		100
- RXLEV-NCELL 1	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 1	the index in neighbour		
- BSIC--NCELL 1	cell description	xxxx	
. . .	. .	.	.
. . .	. .	.	.
- RXLEV-NCELL 4	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 4	as in table		
- BSIC--NCELL 4	as in table	xx	xxxx

2) The SS shall keep the signal levels and BCCH information stable for at least 20 seconds before using the reported RX_LEV values. After the signal conditions have been stable for at least 20 seconds, the order of values in the MEASUREMENT REPORT, when put in the order of increasing RX LEV, shall be N2, S1, N6, N7.

Note: The actual values in the MEASUREMENT REPORT are not checked.

Procedure 4: *Use of DTX in the Measurement Report*

Transmitter			Level	NCC	BS Colour Code	ARFCN
Serving	1	S1	-60	1	3	002
Neighbour		N1	-85	1	5	008
"	"	N2	-80	1	7	014
"	"	N3	-75	1	1	020
"	"	N4	-55	1	3	026
"	"	N5	-50	1	5	032
"	"	N6	-45	1	7	038
"	"	N7	-40	1	1	044

The MS is forced to make a handover in a new cell, where the following SYSTEM INFO TYPE 5 and 6 are broadcasted.

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08, 9.1.33)

Information Element	Comment	Value	
Protocol Discriminator	RR		0110
Transaction Identifier	not relevant	0000	
Message Type	sys info 5	0001	1101
Neighbour cell descr		-	
- BA-NO	gsm band 0	00	
- BA ARFCN	(2,8,14,20,26,32,38,44)=open		
-	(all others)=closed		

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08, 9.1.34)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type		0001	1110
Cell Identity	default		
LAI	default		
Cell Options			
- PWRC	PWRC is set	1	
- DTX	shall be used	01	
- RADIO-LINK-TIMEOUT	default		
PLMN permitted	only NCC 1 permitted	0000	0010

Requirements 4

Note: For an MS only supporting transparent data services the value DTX-USED is not checked.

1) After the sending of the HANDOVER COMPLETE message, the MS shall continuously send measurement reports on every SACCH blocks, the measurement valid indication shall be set to valid (0) within the second block at the latest and DTX-USED shall be set to "DTX used".

Message: MEASUREMENT REPORT (GSM 04.08, 9.1.20)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	measurement report	0001	0101
Measurement results		-	
- BA-USED			
- MEAS-VALID	as specified in the text		
- DTX USED	Dtx used	1	
- RXLEV-FULL-SERVING-CELL	Actual value not checked	xx	xxxx
- RXLEV-SUB-SERVING-CELL	Actual value not checked	xx	xxxx
- RXQUAL-FULL-SERVING-CELL	Actual value not checked		xxx
- RXQUAL-SUB-SERVING-CELL	Actual value not checked		xxx
- NO-NCELL-M	number of neighbours=six		110
- RXLEV-NCELL 1	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 1	the index in neighbour		
- BSIC--NCELL 1	cell description	xxxx	
. . .	. .	.	.
. . .	. .	.	.
- RXLEV-NCELL 6	only order checked	xx	xxxx
- BCCH-FREQ-NCELL 6	as in table		
- BSIC--NCELL 6	as in table	xx	xxxx

2) The SS shall keep the signal levels and BCCH information stable for at least 20 seconds before using the reported RX LEV values. After the signal conditions have been stable for at least 20 seconds, the order of values in the MEASURMENT REPORT, when put in the order of increasing RXLEV, shall be N3, S1, N4, N5, N6, N7.

Note: The actual values in the MEASUREMENT REPORT are not checked.

II.5.3.6.4 TEST OF DEDICATED CHANNEL ASSIGNMENT

II.5.3.6.4.1 Introduction

An intracell change of channel can be requested by upper layers for changing the channel type, or decided by the RR-sublayer, e.g. for an internal handover. This change is performed through the dedicated channel assignment.

The purpose of the dedicated channel assignment procedure is to completely modify the physical channel configuration of the MS while staying in the same cell.

This is described in section 3.4.3 of GSM 04.08.

II.5.3.6.4.2 Purpose of the test Assignment completion

The purpose of this test is to verify that the MS can seize the channel defined in the command. Just a subset of all possible channels transitions will be tested:

SDCCH -> TCH/F	
TCH/F -> TCH/H	
TCH/H -> TCH/F	
TCH/F -> TCH/F,	In this particular test we check that the MS does not increment V(SD) when repeating a message, after completion.
TCH/F -> TCH/F,	In this particular test we check that the MS takes into account the value specified in the field "starting time".

Note 1: TCH/H is tested only if supported (i.e. step b) might be skipped).

Note 2: Throughout this test case it is allowed to use an ARFCN < 10 or ARFCN > 114 for the non hopping channels.

II.5.3.6.4.2.1 Procedure

a) The SS pages the MS. On response of the MS a SDCCH is allocated. Then the SS sends an ASSIGNMENT COMMAND allocating a traffic channel TCH/F with frequency hopping used.

b) After reception of the ASSIGNMENT COMPLETE message, the SS sends a ASSIGNMENT COMMAND message allocating an traffic channel TCH/H with frequency hopping not used.

c) Same as b) but the new channel is an TCH/F with frequency hopping not used.

d) The SS sends an AUTHENTICATION REQUEST message to the MS.
The SS does not Layer 2 acknowledge the AUTHENTICATION RESPONSE message sent by the MS and stores this message.

e) The SS sends an ASSIGNMENT COMMAND message allocating a TCH/F with frequency hopping used, just after having received the AUTHENTICATION RESPONSE.

f) The SS sends an ASSIGNMENT COMMAND message allocating a traffic channel with frequency hopping not used. This command includes the optional field "starting time" filled with current frame number +100.

Note: At each step, the channel allocation is changed by increasing by one the time slot number modulo 8.

Message: ASSIGNMENT COMMAND

Information Element	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	not relevant	0000
Message Type	ass command	0010 1110
Channel Description	as specified in the text	
Power Command	randomly drawn (Note 1)	
Starting time	Optional field used when specified in the text	
Mobile allocation	Use or not of frequency hopping	

Note 1: The power command is, at each step, randomly drawn between the minimum and maximum power control level applicable to the class of MS, and with a different value.

II.5.3.6.4.2.2 Requirements

1) In step a), the MS shall switch to the assigned channel, establish the link with the power level specified in the command message and send an ASSIGNEMENT COMPLETE message.

2) In step b), same as 1).

3) In step c), same as 1).

4) In step d), the MS shall send an AUTHENTICATION RESPONSE message.

5) In step e), same as 1).
Then the MS shall send an AUTHENTICATION RESPONSE message with V(SD) at the same value as in the first AUTHENTICATION RESPONSE sent (the SS shall compare the two messages).

6) In step f) same as 1) but this shall be done after the time specified in the field "Starting Time".

Message: ASSIGNMENT COMPLETE

II.5.3.6.4.3 Assignment Failure

The purpose of the test is to verify that when not succeeding to seizing the new channel, the MS reactivates the old one with the previous power used on this channel.

II.5.3.6.4.3.1 Procedure

a) A Mobile Terminated call is initiated. After establishment of the call, an ASSIGNMENT COMMAND message is sent allocating a new TCH/F.

b) The SS does not set up the new channel.

Message: ASSIGNMENT COMMAND

Information Element	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	not relevant	0000
Message Type		0010 1110
Channel Description	as specified in the text	
Power Command	Randomly drawn (see Note 1)	

Note 1: The power command is, at each step, randomly drawn between the minimum and maximum power control level applicable to the class of MS, and with a different value.

II.5.3.6.4.3.2 Requirement

1) The MS shall try to activate the new channel. The MS shall reactivate the old one with the previous power used on this channel, reconnect the TCH and trigger the establishment of the main signalling link.

The MS shall then send an ASSIGNMENT FAILURE message.

Message: ASSIGNMENT FAILURE

II.5.3.6.5 TEST OF HANDOVER

The Handover procedure is specified in section 3.4.4 of GSM 04.08.

II.5.3.6.5.1 Introduction

With the handover procedure, it is possible to completely alter the channels allocated to a MS. This makes possible in particular to switch a call in progress from one cell to another. The procedure is always initiated by the network, with the MS in a dedicated mode.

II.5.3.6.5.2 Purpose of the Test

The purpose of the test is to verify that the MS during handover

- disconnects and connects channels,
- releases and establishes data links,
- is capable of handling failures and abnormal cases related to the handover procedure.

II.5.3.6.5.3 Method of Measurement

The SS simulates two cells, A and B, where A is the old cell and B is the target for the handover. All test procedures start with the MS being allocated a dedicated resource on cell A. Cell A and B are running under ideal radio conditions. Appropriate information on both cell A and B is given to the MS on the BCCHs of both cells according to the default conditions for the serving cell (A) and the neighbouring cell (B). Depending on the procedure frequency hopping is in use or not. Each time frequency hopping has to be used the SS has to draw randomly the value of N (number of frequency) between 1 and 64, HSN (hopping sequence number), MAIO (mobile allocation offset) and include it in the relevant messages (IMMEDIATE ASSIGNMENT, ASSIGNMENT COMMAND, HANDOVER COMMAND).

The power used by the MS on the channel belonging to the old cell is set to the maximum Power level supported by the MS.

In the first two procedures, normal handover is made and the next three procedures test handover during call establishment. These five procedures are first tested with non synchronized cells, and then with finely synchronized cells. All tests are repeated with starting time specified in HANDOVER COMMAND message.

The two last procedures test the function of timer T3124, first on a Layer 3 failure, then on a Layer 1 failure. Layer 3 failure is introduced by the SS by not sending PHYSICAL INFORMATION on cell B whereas Layer 1 failure is introduced by the SS by not sending anything at all, with the exception of BCCH, on cell B.

II.5.3.6.5.4 Procedures

II.5.3.6.5.4.1 Procedure 1: Handover during call in progress, TCH/F, Non Synchronized, without frequency hopping

II.5.3.6.5.4.1.1 Purpose of the test

To verify that when the MS is made to make a handover to a non synchronized cell, it continuously sends access bursts on the main DCCH until it receives a PHYSICAL INFORMATION message from the SS.

To verify that it then activates the channels.

II.5.3.6.5.4.1.2 Test

a) The SS sends a HANDOVER COMMAND message on the main DCCH on cell A.

b) The SS observes the access bursts which are now continuously being sent by the MS on its main DCCH of cell B. After receiving n (randomly drawn between values according to table below) access bursts, the SS sends PHYSICAL INFORMATION with a Timing Advance in the range 0..63 (=k) bit periods of 48/13 µs each.
In the first test k=20 will apply.

Target cell channel type	TCH/F	TCH/H
n	10-20	5-10

Message: HANDOVER COMMAND

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type	handover command	0010	1011
Cell description	default		
Channel description	Bm + ACCHs, TN = 0	0000	1000
	TSC, H=0, FB-NO	xxx0	0000
	ARFCN	0xxx	xxxx
Handover reference	100 dec	0110	0100
Power command	8 dec		
Synchronization indic	non synchronized cells	1101	0000

Message: PHYSICAL INFO

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type	physical info	0010	1101
Timing advance	k*48/13 µs	0001	0100

c) The test is repeated for a Timing Advance (k) of 50 bit periods (encoded as 0011 0010).

II.5.3.6.5.4.1.3 Requirements

1) The MS shall send continuously access bursts at the power level specified in HANDOVER COMMAND including the correct handover reference on the main DCCH of the target cell until the reception of the PHYSICAL INFORMATION.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) s after the transmission time of the PHYSICAL INFORMATION.

3) The MS shall use the correct timing advance, as specified by the PHYSICAL INFORMATION sent by the SS.

4) The MS shall establish a signalling link.

5) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND.

Message: HANDOVER COMPLETE

6) HANDOVER COMPLETE shall not be received before UA frame has been sent by the SS.

II.5.3.6.5.4.2 Procedure 2: Handover during call in progress, TCH/H without FH to TCH/H with FH, non synchronized

This test shall be skipped if the MS does not support TCH/H.

II.5.3.6.5.4.2.1 Purpose

To verify that when the MS is made to make a handover to a non synchronized cell, it continuously sends access bursts on the main DCCH until it receives a PHYSICAL INFORMATION message from the SS.
To verify that it then activates the channels.

II.5.3.6.5.4.2.2 Test

As in procedure 1 except that call establishment shall be performed on TCH/H and that channel description in HANDOVER COMMAND message shall indicate TCH/H.

Message: HANDOVER COMMAND

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction identifier	not relevant	0000	
Message type	handover command	0010	1011
Cell description	default		
Channel description	Lm + ACCHs, TN = 5	0001	1101
	TSC, H=1, MAIO (high part)	xxx1	xxxx
	MAIO (low part), HSN	xxxx	xxxx
Handover reference	255	1111	1111
Power command	6	0000	0110
Frequency Channel seq.	IEI	0110	1001
	as specified in GSM 04.08		

II.5.3.6.5.4.2.3 Requirements

1) The MS shall send continuously access bursts at the power level specified in HANDOVER COMMAND including the correct handover reference on the main DCCH of the target cell until the reception of the PHYSICAL INFORMATION.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) s after the transmission time of the PHYSICAL INFORMATION.

3) The MS shall use the correct Timing Advance, as specified by the PHYSICAL INFORMATION sent by the SS.

4) The MS shall establish a signalling link.

5) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND.

Message: HANDOVER COMPLETE

6) HANDOVER COMPLETE shall not be received before UA frame has been sent by the SS.

II.5.3.6.5.4.3 Procedure 3: Handover during Call establishment, SDCCH without FH to SDCCH with FH, Non synchronized

(Reserved)

II.5.3.6.5.4.4 Procedure 4: Handover during call establishment, TCH/F to TCH/F all with FH, Non synchronized

Hopping sequence sets have to be drawn for each cell.

II.5.3.6.5.4.4.1 Purpose

When the SS sends HANDOVER COMMAND, it may occur that the MS had just sent a (MM or CC) Layer 3 message which has not yet been acknowledged. The purpose of this test is to check that the MS will send again this message after the HANDOVER COMPLETE (using the same value in the N(SD) field).

II.5.3.6.5.4.4.2 Test

A TCH/F shall have been assigned for call establishment with the channel mode set to "signalling only" and the channel description information element in the HANDOVER COMMAND message shall indicate TCH/F. The Synchronisation Indication information element shall be omitted from the HANDOVER COMMAND.

a) The Call establishment shall be performed for a TCH/F, with the channel mode set to "signalling only".

   The test of Procedure 1 will be used, except that the HANDOVER COMMAND message will be sent at a very well selected time. For example, the HANDOVER COMMAND will be sent in a mobile originating call establishment procedure.

   The channel description information element in the HANDOVER COMMAND message shall indicate TCH/F. The SS shall wait 10 seconds after having received the CM Service Request message to give sufficient time to the MS to monitor the neighbouring cell BCCHs.

b) The SS will store the SETUP message and send a HANDOVER COMMAND message before having acknowledged the last Layer 2 frame of the SETUP message.

II.5.3.6.5.4.4.3 Requirements

1) The MS shall send continuously access bursts at the power level specified in HANDOVER COMMAND including the correct handover reference on the main DCCH of the target cell until the reception of the PHYSICAL INFORMATION.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) s after the transmission time of the PHYSICAL INFORMATION.

3) The MS shall use the correct Timing Advance, as specified by the PHYSICAL INFORMATION sent by the SS.

4) The MS shall establish a signalling link.

5) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND.

Message: HANDOVER COMPLETE

6) HANDOVER COMPLETE shall not be received before UA frame has been sent by the SS.

7) The MS shall send again the SETUP message to the SS using the same value in the N(SD) field, just after the HANDOVER COMPLETE message has been sent.

II.5.3.6.5.4.5 Procedure 5: Handover during call establishment, SDCCH with FH to TCH/F without FH, Non synchronized

II.5.3.6.5.4.5.1 Purpose

When the SS sends HANDOVER COMMAND, it may occur that the MS had just sent a (MM or CC) Layer 3 message which has not yet been acknowledged. The purpose of this test is to check that the MS will send again this message after the HANDOVER COMPLETE (using the same value in the N(SD) field).

II.5.3.6.5.4.5.2 Test

a) The Call establishment shall be performed on a SDCCH/8.

The test of Procedure 1 will be used, except that the HANDOVER COMMAND message will be sent at a very well selected time. For example, the HANDOVER COMMAND will be sent in a mobile originating call establishment procedure.

The channel description information in the HANDOVER COMMAND message shall indicate TCH/F, and the channel mode Information Element shall be present and set to "signalling only".

b) The SS will store the SETUP message and send a HANDOVER COMMAND message before having acknowledged the last Layer 2 frame of the SETUP message.

II.5.3.6.5.4.5.3 Requirements

1) The MS shall send continuously access bursts at the power level specified in HANDOVER COMMAND including the correct handover reference on the main DCCH of the target cell until the reception of the PHYSICAL INFORMATION.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) s after the transmission time of the PHYSICAL INFORMATION.

3) The MS shall use the correct timing advance, as specified by the PHYSICAL INFORMATION sent by the SS.

4) The MS shall establish a signalling link.

5) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND.

Message: HANDOVER COMPLETE

6) HANDOVER COMPLETE shall not be received before UA frame has been sent by the SS.

7) The MS shall send again the SETUP message to the SS using the same value in the N(SD) field, just after the HANDOVER COMPLETE message has been sent.

II.5.3.6.5.4.6 Procedure 6: Handover during call in progress, TCH/F with FH to TCH/F without FH, Synchronized

II.5.3.6.5.4.6.1 Purpose of the test

To verify that when the MS is made to make a handover to a synchronized cell, it sends a specific number of access burst on the main DCCH, and then activates the channels.

II.5.3.6.5.4.6.2 Test

a) The SS sends a HANDOVER COMMAND on the main DCCH on cell A, indicating a handover to a synchronized cell (B).

b) The SS then waits for reception of a HANDOVER COMPLETE message.

Message: HANDOVER COMMAND

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type	handover command	0010	1011
Cell description	default		
Channel description	Bm + ACCHs, TN = 4	0000	1100
	TSC, H=0, FB-NO	xxx0	0000
	ARFCN	0xxx	xxxx
Handover reference	64	0100	0000
Power command	7 dec	0000	0111
Synchronization indic	synchronized cells	1101	0001

II.5.3.6.5.4.6.3 Requirements

1) In four successive slots on the main DCCH, the MS shall send access bursts at the power level specified in HANDOVER COMMAND with the correct handover reference.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) seconds after the transmission of the HANDOVER COMMAND on the SS-side.

3) The MS shall establish a link.

4) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND message, using the correct Timing Advance defined according to the previous case in cell A and the value of k (see note).

Note: The two cells A and B are synchronised, but the SS will simulate the case where distance (A,MS) is unequal to distance (B,MS). For example, the BCCH(A) will be sent a [k] bits period before BCCH(B), Timing Advance in cell B = 2k + Timing Advance in cell A > 0.

Message: HANDOVER COMPLETE

II.5.3.6.5.4.7 Procedure 7: Handover during call in progress, TCH/H with FH to TCH/H without FH, Synchronized

This test shall be skipped if the MS does not support TCH/H.

II.5.3.6.5.4.7.1 Purpose of the test

To verify that when the MS is made to make a handover to a synchronized cell, it sends a specific number of access burst on the main DCCH, and then activates the channels.

II.5.3.6.5.4.7.2 Test

As in procedure 6 except that the channel description information element shall indicate TCH/H.

II.5.3.6.5.4.7.3 Requirements

1) In four successive slots on the main DCCH, the MS shall send access bursts at the power level specified in HANDOVER COMMAND with the correct handover reference.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) seconds after the transmission of the HANDOVER COMMAND on the SS-side.

3) The MS shall establish a link.

4) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND message, using the correct Timing Advance defined according to the previous case in cell A and the value of k (see note).

Note: The two cells A and B are synchronised, but the SS will simulate the case where distance (A,MS) is unequal to distance (B,MS). For example, the BCCH(A) will be sent a [k] bits period before BCCH(B), Timing Advance in cell B = 2k + Timing Advance in cell A > 0.

Message: HANDOVER COMPLETE

II.5.3.6.5.4.8 Procedure 8: Handover during call establishment, SDCCH to SDCCH all with FH, Synchronized

Hopping sequence sets have to be drawn for each cell.

II.5.3.6.5.4.8.1 Purpose

When the SS sends HANDOVER COMMAND, it may occur that the MS had just sent a (MM or CC) Layer 3 message which has not yet been acknowledged. The purpose of this test is to check that the MS will send again this message after the HANDOVER COMPLETE (using the same value in the N(SD) field).

To verify that when the MS is made to make a handover to a synchronized cell, it sends a specific number of access burst on the main DCCH, and then activates the channels.

II.5.3.6.5.4.8.2 Test

a) The Call establishment shall be performed on a SDCCH/8.

The test of Procedure 6 will be used, except that the HANDOVER COMMAND message will be sent at a very well selected time. For example, the HANDOVER COMMAND will be sent in a mobile originating call establishment procedure.

The channel description information will be set to SDCCH/8 with FH.

b) The SS will store the SETUP message and send a HANDOVER COMMAND message before having acknowledged the last Layer 2 frame of the SETUP message.

II.5.3.6.5.4.8.3 Requirements

1) In four successive slots on the main DCCH, the MS shall send access bursts at the power level specified in HANDOVER COMMAND with the correct handover reference.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) seconds after the transmission of the HANDOVER COMMAND on the SS-side.

3) The MS shall establish a link.

4) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND message, using the correct Timing Advance defined according to the previous case in cell A and the value of k (see note).

Note: The two cells A and B are synchronised, but the SS will simulate the case where distance (A,MS) is unequal to distance (B,MS). For example, the BCCH(A) will be sent a [k] bits period before BCCH(B), Timing Advance in cell B = 2k + Timing Advance in cell A > 0.

Message: HANDOVER COMPLETE

5) The MS shall send again the SETUP message to the SS using the same value in the N(SD) field, just after the HANDOVER COMPLETE message has been sent.

II.5.3.6.5.4.9 Procedure 9: Handover during call establishment, TCH/F without FH to TCH/F with FH, Synchronized

II.5.3.6.5.4.9.1 Purpose

When the SS sends HANDOVER COMMAND, it may occur that the MS had just sent a (MM or CC) Layer 3 message which has not yet been acknowledged. The purpose of this test is to check that the MS will send again this message after the HANDOVER COMPLETE (using the same value in the N(SD) field).

To verify that when the MS is made to make a handover to a synchronized cell, it sends a specific number of access burst on the main DCCH, and then activates the channels.

II.5.3.6.5.4.9.2 Test

a) The Call establishment shall be performed on a TCH/F.

The test of Procedure 6 will be used, except that the HANDOVER COMMAND message will be sent at a very well selected time. For example, the HANDOVER COMMAND will be sent in a mobile originated call establishment procedure.

The channel description information element in the HANDOVER COMMAND message will be set to TCH/F with FH, and the channel mode Information Element shall be present and set to "signalling only".

b) The SS will store the SETUP message and send a HANDOVER COMMAND message before having acknowledged the last Layer 2 frame of the SETUP message.

II.5.3.6.5.4.9.3 Requirements

1) In four successive slots on the main DCCH, the MS shall send access bursts at the power level specified in HANDOVER COMMAND with the correct handover reference.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) seconds after the transmission of the HANDOVER COMMAND on the SS-side.

3) The MS shall establish a link.

4) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND message, using the correct Timing Advance defined according to the previous case in cell A and the value of k (see note).

Note: The two cells A and B are synchronised, but the SS will simulate the case where distance (A,MS) is unequal to distance (B,MS). For example, the BCCH(A) will be sent a [k] bits period before BCCH(B), Timing Advance in cell B = 2k + Timing Advance in cell A > 0.

Message: HANDOVER COMPLETE

5) The MS shall send again the SETUP message to the SS using the same value in the N(SD) field, just after the HANDOVER COMPLETE message has been sent.

II.5.3.6.5.4.10 Procedure 10: Handover during call establishment, SDCCH to TCH/F all without FH, Synchronized

II.5.3.6.5.4.10.1 Purpose

When the SS sends HANDOVER COMMAND, it may occur that the MS had just sent a (MM or CC) Layer 3 message which has not yet been acknowledged. The purpose of this test is to check that the MS will send again this message after the HANDOVER COMPLETE (using the same value in the N(SD) field).

To verify that when the MS is made to make a handover to a synchronized cell, it sends a specific number of access burst on the main DCCH, and then activates the channels.

II.5.3.6.5.4.10.2 Test

a) The Call establishment shall be performed on a SDCCH/8.

The test of Procedure 6 will be used, except that the HANDOVER COMMAND message will be sent at a very well selected time. For example, the HANDOVER COMMAND will be sent in a mobile originating call establishment procedure.

The channel description information element in the HANDOVER COMMAND message shall indicate TCH/F, and the channel mode Information Element shall be present and set to "signalling only".

b) The SS will store the SETUP message and send a HANDOVER COMMAND message before having acknowledged the last Layer 2 frame of the SETUP message.

II.5.3.6.5.4.10.3 Requirements

1) In four successive slots on the main DCCH, the MS shall send access bursts at the power level specified in HANDOVER COMMAND with the correct handover reference.

2) The MS shall activate the channel in sending and receiving mode, and connect the channel in the range of (0..3) seconds after the transmission of the HANDOVER COMMAND on the SS-side.

3) The MS shall establish a link.

4) The MS shall send HANDOVER COMPLETE on the target cell so that the SS receives the message less than 10 seconds after sending the HANDOVER COMMAND message, using the correct Timing Advance defined according to the previous case in cell A and the value of k (see note).

Note: The two cells A and B are synchronised, but the SS will simulate the case where distance (A,MS) is unequal to distance (B,MS). For example, the BCCH(A) will be sent a [k] bits period before BCCH(B), Timing Advance in cell B = 2k + Timing Advance in cell A > 0.

Message: HANDOVER COMPLETE

5) The MS shall send again the SETUP message to the SS using the same value in the N(SD) field, just after the HANDOVER COMPLETE message has been sent.

II.5.3.6.5.4.11 Procedure 11: Handover with time specified

II.5.3.6.5.4.11.1 Purpose

To verify that the MS can perform any type of handover, according to procedures 1 to 10 taking into account the optional field "starting time".

II.5.3.6.5.4.11.2 Test

All tests according to procedures 1 to 10 are repeated with the following difference: the HANDOVER COMMAND message contains a starting time information element set to a value corresponding to 1 second + 0.1 second after the point in time when the HANDOVER COMMAND message was sent.

II.5.3.6.5.4.11.3 Requirement

As in Procedures 1 to 10, except that the MS shall start transmitting access bursts at the ordered point in time.

II.5.3.6.5.4.12 Procedure 12: Handover Failure, Layer 3 Failure on the Target Cell, TCH/F with FH to TCH/F without FH

II.5.3.6.5.4.12.1 Purpose of the test

To verify the function of timer T3124 and the contents in message HANDOVER FAILURE.

Note: A time out on timer T3124 is produced in the following way: the PHYSICAL INFORMATION does not arrive from the target cell.

II.5.3.6.5.4.12.2 Test

a) After sending the HANDOVER COMMAND on the cell A, cell B is not transmitting PHYSICAL INFORMATION as expected by the MS.

Message: HANDOVER COMMAND

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type	handover command	0010	1011
Cell description	default		
Channel description	Bm + ACCHs, TN = 7	0000	1111
	TSC, H=0, FB-NO	xxx0	0000
	ARFCN	0xxx	xxxx
Handover reference	100 dec	0110	0100
Power command	8 dec		
Synchronization indic	non synchronized cells	1101	0000

II.5.3.6.5.4.12.3 Requirements

1) The MS shall establish a link

2) The MS shall send HANDOVER FAILURE on cell A at the previously assigned power level. The transmission time shall be in the range of (0..3) s after transmission time of HANDOVER COMMAND on SS-side.

Message: HANDOVER FAILURE

3) The MS shall use the power level used before the HANDOVER COMMAND.

II.5.3.6.5.4.13 Procedure 13: Handover Failure, Layer 1 Failure on the Target Cell, TCH/F without FH to TCH/F with FH

II.5.3.6.5.4.13.1 Purpose of the test

To verify the function of timer T3124 and the contents of HANDOVER FAILURE.

Note: A time out on timer T3124 in this test indicates that the Layer 1 signalling on cell B is not operating.

II.5.3.6.5.4.13.2 Test

After sending the HANDOVER COMMAND on cell A, cell B is not transmitting at all (except for normal BCCH signalling). The MS will have a time out on timer T3124. The MS will take no further action at all on cell B. It activates channels on cell A and sends HANDOVER FAILURE on cell A.

II.5.3.6.5.4.13.3 Requirements

1) The MS shall send HANDOVER FAILURE on cell A at the previously assigned power level. The transmission time shall be in the range of (0..3) seconds after the transmission time of HANDOVER COMMAND on SS-side.

Message: HANDOVER FAILURE

II.5.3.6.6 FREQUENCY REDEFINITION

The procedure is specified in GSM 04.08 section 3.4.5.

II.5.3.6.6.1 Purpose of the test

To verify that the MS, after receiving a frequency redefinition message, starts using the new frequencies and hopping sequence at the time indicated in the message.

II.5.3.6.6.2 Setup of the test parameters

A random value ca(1) in the range 80,...,124 is drawn.

A random subset CA(1) of the set {1,...,124} containing ca(1) elements is drawn.

An element B of the set CA(1) is randomly drawn.

Let T(1) = 91, T(2) = 42000.

A random value T(3) in the range 92,...,41999 is drawn.

II.5.3.6.6.3 Initial conditions

The SS simulates a BSS with exactly one cell. The cell uses the frequency hopping mode. CCCH-CONF indicates 1 basic physical channel, not combined with SDCCHs. The cell allocation of the cell corresponds to the set CA(1) (see Note 2 of II.5.3.6.6.6).

II.5.3.6.6.4 Procedure

a) The procedure described in b) to e) is performed for each combination of a value T(k) (k = 1,2,3) on the one side, and one of the channel types

- TCH/F, TCH/H, or SDCCH, if the MS is able to manage TCH/H;
- TCH/F, or SDCCH, if the MS is not able to manage TCH/H.

(This results in 9 or 6 test cases.)

b) Random values ca(2) in the range 20,...,79, and ca(3) in the range 4,...,19 are randomly drawn. Subsets CA(i) of {1,...,124} with ca(i) elements and containing B are randomly drawn (i = 2,3).

For j = 1,2,3, values ma(j) in the range j,...,min(64, ca(j)-1) and values maio(j) in the range 0,...,ma(j)-1 are randomly drawn.

Subsets MA(j) of CA(j) not containing B and having ma(j) elements are randomly drawn.

c) As described in II.5.3.6.1, the MS is paged, and it is allocated a dedicated channel of the appropriate type by an IMMEDIATE ASSIGNMENT message.

Parameters of this message:
Starting time: not present.
Mobile allocation: corresponds to the set MA(1) (cf. Note 2 of II.5.3.6.6.6).
Channel description:
Channel type as specific for the test case with randomly generated subchannel if appropriate.
RF hopping channel indicated (encoded as H = 1).
HSN indicates hopping sequence number 0 (encoded as 000000).
MAIO indicates MAIO(1).
Other values as in II.5.3.6.1.3.2.

d) The SS sends on the main DCCH a FREQUENCY REDEFINITION message to the MS.

Parameters of this message:
Cell channel description: corresponds to the set CA(2) (see note 2 of II.5.3.6.6.6).
Mobile allocation: corresponds to the set MA(2) (see note 2 of II.5.3.6.6.6).
Starting time: corresponds to the frame number modulo 42432 which is T(k) frames ahead of the transmission time of the last burst of the first L2 frame containing the beginning of the message (see note 3 of II.5.3.6.6.6).
MAIO indicates MAIO(2).
All other parameters are as in the IMMEDIATE ASSIGNMENT of c).

e) The SS sends on the main DCCH a FREQUENCY REDEFINITION message to the MS.

Parameters of this message:
Cell channel description: corresponds to the set CA(3) (see note 2 of II.5.3.6.6.6).
Mobile allocation: corresponds to the set MA(3) (see note 2 of II.5.3.6.6.6).
Starting time: corresponds to the frame number modulo 42432 which is T(k) frames ahead of the transmission time of the last burst of the first L2 frame containing the beginning of the message (see note 3 of II.5.3.6.6.6).
MAIO indicates MAIO(3).

II.5.3.6.6.5 Requirements

1) In step d) and e), the MS must correctly modify the frequencies/hopping sequences it uses at the exact indicated time slot.

II.5.3.6.6.6 Notes

1) The MS transmits fill frames, and the SS checks for each burst whether or not a burst is transmitted at the right frequency.

2) A subset of {1,...,124} corresponds to the cell allocation (or mobile allocation) of those RF channels whose ARFCN belongs to the subset. The cell allocation (mobile allocation) is encoded as described in section 10.5.2.1 of GSM 04.08.

3) A frame number FN modulo 42432 is encoded as described in section

10.5.2.20 of GSM 04.08.

II.5.3.6.7 TRANSMISSION MODE CHANGE

The Transmission Mode Change procedure is described in section 3.4.6 of GSM 04.08.

II.5.3.6.7.1 Purpose of test

The purpose of the test is to verify that the MS changes mode of operation, and acknowledges this to the NW.

Note: The Transmission Mode Change Procedure is used to change from different modes of coding (e.g. from 9.6/F to 4.8/F).

II.5.3.6.7.2 Method of measurement

a) The test starts with the MS having a call in progress on a channel.

b) The SS sends CHANNEL MODE MODIFY.

Note: The MS is supposed to respond with CHANNEL MODE MODIFY ACKNOWLEDGE. Only parameter valued within the messages are verified. The coding is not tested here.

II.5.3.6.7.3 Procedure

a) The MS is put into a call in progress on a TCH/F-channel in the mode 'signalling only'.

b) The MS sends CHANNEL MODE MODIFY message.

Message: CHANNEL MODE MODIFY (GSM 04.08, 9.1.5)

Information Element	Comment	Value	
Protocol Discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Ch mode modif	0001	0000
Channel description		-	
- Ch type and offset	Bm + ACCH's no offset	0	0001
- TN	Timeslot number	(current)	
- Hopping channel	Non-hopping	0	
- Channel selector	used ARFCN	(current)	
- CA-NO	Cell allocation number, band 0	00	
- HSN	Non-hopping mode	00	0000
Channel mode		-	
- Mode (select one)	1 Signalling	0000	0000
- " "	2 speech full rate	0000	0001
- " "	3 speech half rate	0000	0101
- " "	4 data 9.6	0000	0011
- " "	5 4.8/F	0000	1011
- " "	6 4.8/H	0000	0000
- " "	7 2.4/F	0001	0011
- " "	8 2.4/H	0001	0111

b.1) b) with Channel mode set to 4 (if the MS supports data 9.6, otherwise step b.1) is skipped).
b.2) b) with Channel mode set to 5 (if the MS supports data 4.8/F, otherwise step b.2) is skipped).
b.3) b) with Channel mode set to 7 (if the MS supports data 2.4/F, otherwise step b.3) is skipped).
b.4) b) with Channel mode set to 2 (if the MS supports speech/F, otherwise

step b.4) is skipped).

c) If the MS supports half-rate, steps a) and b) are repeated with a half-rate channel and

c.1) Channel mode is set to 6 (if the MS supports data 4.8/H, otherwise step c1) is skipped).

c.2) Channel mode is set to 8 (if the MS supports data 2.4/H, otherwise step c2) is skipped).

c.3) Channel mode is set to 3 (if the MS supports speech/H, otherwise step c3) is skipped).

II.5.3.6.7.4 Requirements

1) For every change of mode that the MS is capable to handle, it sends CHANNEL MODE MODIFY ACKNOWLEDGE with corresponding value.

Message: CHANNEL MODE MODIFY ACKNOWLEDGE (GSM 04.08, 9.1.6)

Information Element	Comment	Value	
Protocol Discriminator	RR management		011
Transaction Identifier	RR	0000	
Message Type	Ch mode modif ack	0001	0001
Channel description		-	
- IEI	Ch descr	0110	0100
- Ch type and offset	Bm + ACCH's no offset	0	0001
- TN	Timeslot number	(current)	
- Hopping channel	Non-hopping	0	
- Channel selector	used ARFCN	(current)	
- CA-NO	Cell allocation number, band 0	00	
- HSN	Non-hopping mode	00	0000
Channel mode		-	
- IEI	Ch mode	0110	0110
- Mode (select one)	1 Signalling	0000	0000
- " "	2 speech full rate	0000	0001
- " "	3 speech half rate	0000	0101
- " "	4 data 9.6	0000	0011
- " "	5 4.8/F	0000	1011
- " "	6 4.8/H	0000	0000
- " "	7 2.4/F	0001	0011
- " "	8 2.4/H	0001	0111

II.5.3.6.8 CIPHERING MODE SETTING

The procedure of Ciphering Mode Setting is specified in section 3.4.7 of GSM 04.08 and GSM 04.08-EXT.

II.5.3.6.8.1 Purpose of the test

To verify that the MS responds correctly to the CIPHERING MODE COMMAND message and adopts the mode and algorithm as indicated in the cipher mode setting.

II.5.3.6.8.2 Initial conditions

a) The SS shall simulate a BSS with CCCH and BCCH. Radio-Link-Timeout shall be set to 64.

b) The MS shall be placed in the MM-state "idle,updated" (ref. location updating accepted II.5.3.7.4.1).

II.5.3.6.8.3 Method of the test

II.5.3.6.8.3.1 Procedure 1

a) The MS shall be made to originate a call (sequence described in GSM 04.08 fig 7.8a) and shall successfully authenticate to the SS.

b) On receipt of the successful AUTHENTICATION RESPONSE message from the MS, the SS shall send the CIPHERING MODE COMMMAND with cipher mode setting = "start ciphering; cipher with algorithm A5/1" and start deciphering with A5/1.

Message: CIPHERING MODE COMMAND (GSM 04.08, 9.1.9)

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type		0011	0101
Cipher mode setting	algorithm A5/1 "start ciphering"	000	

c) The SS sends a message AUTHENTICATION REQUEST.

d) If the MS supports the A5/2 algorithm then steps a), b), and c) are repeated but with algorithm A5/2 used in step b).

Message: CIPHERING MODE COMMAND (GSM 04.08-EXT, 9.1.9)

Information Element	Comment	Value	
Protocol Discriminator	RR management	0110	
Transaction identifier	not relevant	0000	
Message type		0011	0101
Cipher mode setting	algorithm A5/2 "start ciphering"	001	

II.5.3.6.8.3.2 Procedure 2

a) With initial conditions as specified, repeat Procedure 1, points a) and b) with cipher mode setting = "no ciphering".
Same message, but with cipher mode setting set to no ciphering, encoded as 0000.

II.5.3.6.8.3.3 Procedure 3

a) With initial conditions as specified, with a cipher key previously stored, and authenticated, the MS shall be made to originate a call.

b) Upon receipt of the CM SERVICE REQUEST message from the MS, the SS shall send the CIPHERING MODE COMMAND with cipher mode setting = "start ciphering".

II.5.3.6.8.3.4 Procedure 4

a) With initial conditions as specified, repeat Procedure 1, points a) and b).

b) The SS ignores messages coming from the MS.

II.5.3.6.8.4 Requirements

The following requirements apply to the corresponding Procedures in the previous section II.5.3.6.8.3.

II.5.3.6.8.4.1 Requirements 1

1) The MS shall respond with the CIPHERING MODE COMPLETE message in ciphered mode using the correct algorithm and using the cipher key as determined during authentication and continue to establish the call with a SETUP message.

Message: CIPHERING MODE COMPLETE (GSM 04.08, 9.1.10)

Information Element	Comment	Value
Protocol Discriminator	RR management	0110
Transaction Identifier		0000
Message type		0011 0010

2) After reception of AUTHENTICATION REQUEST, the MS shall respond with AUTHENTICATION RESPONSE, it shall store the new ciphering key, and continue to use the old one.

II.5.3.6.8.4.2 Requirements 2

1) The MS shall respond to the CIPHERING MODE COMMAND with a CIPHERING MODE COMPLETE message in non-ciphered mode and continue call establishment.

II.5.3.6.8.4.3 Requirements 3

1) The MS shall respond with the CIPHERING MODE COMPLETE message in ciphered mode using the old cipher key.

2) The MS shall continue to establish the call with a SETUP message.

II.5.3.6.8.4.4 Requirements 4

1) The MS shall respond with the CIPHER MODE COMPLETE message in ciphered mode.

2) The MS shall repeat this message after T200 expiry, N200 times. Then the MS shall release the RR connection.

II.5.3.6.9 TEST OF ADDITIONAL ASSIGNMENT

The Additional Assignment procedure is used to change an MS channel configuration from Lm + ACCH to Lm + Lm + ACCH. It is therefore only relevant to those mobiles which perform such operation. The procedure is described in section 3.4.8 of GSM 04.08.

The configuration is not yet applicable to the GSM Standard. A test is not specified.

II.5.3.6.10 TEST OF PARTIAL RELEASE

The elementary procedure of Partial Release is specified in GSM 04.08 section 3.4.9.
As this procedure applies to the transition of the configuration Lm + Lm + ACCHs to Lm + ACCHs, it is not carried out on a "simple MS".

The configuration is not yet applicable to the GSM Standard. A test is not specified.

II.5.3.6.11 CLASSMARK CHANGE

The Classmark Change procedure is specified in section 3.4.10 of GSM 04.08.

Purpose of the test

The test shall verify that any change in the classmark of the MS shall be communicated on a DCCH to the network. The procedure described shall apply only to an MS which supports this feature.

Initial conditions

1) The SS shall simulate a BSS with CCCH and BCCH. using the default values as specified in II.5.3.1.

2) The MS shall be placed in the MM-state "idle,updated" (ref. location updating accepted II.5.3.7.4.1).

3) The MS shall have no additional power amplification applied.

Procedure 1 Mobile originating

a) With the MS in the "idle,updated" state, the RF power capability shall be changed by the addition of power amplification.

b) The MS shall be made to originate a call.

Requirements 1

1) The MS shall include the new RF power capability in the CLASSMARK2 information element of the CM SERV REQ message (GSM 04.08 section 9.2.7).

Procedure 2

a) In the course of the call, the RF power capability of the MS shall be changed by removal of the additional power amplification.

Requirements 2

1) The MS shall send a CLASSMARK CHANGE message to the SS with the new CLASSMARK2 information element.

Procedure 3

a) In the course of the call, the RF power capability of the MS shall be changed by addition of power amplification.

Requirements 3

1) The MS shall send a CLASSMARK CHANGE message to the SS with the new CLASSMARK2 information element.

Procedure 4 Mobile terminating

a) The MS shall be placed in the state "idle,updated" and the additional power amplification removed.

b) The SS shall page the MS.

Requirements 4

1) The MS shall include the new RF power capability in the CLASSMARK2 information element of the PAGING RESPONSE message (GSM 04.08 section 9.1.24).

II.5.3.6.12 CHANNEL RELEASE

The procedure of Channel Release is specified in section 3.5.1 of GSM 04.08.

II.5.3.6.12.1 Purpose of the test

The purpose of the test is to verify that the MS correctly frees its dedicated channels after having received a CHANNEL RELEASE message.

II.5.3.6.12.2 Method of test

a) The SS shall simulate a BSS with BCCH/CCCH.

b) The MS is paged and allocated a dedicated channel and the Layer 2 signalling link is established.

c) The SS sends a Channel Release message.

Procedure 3 and 4 shall be repeated with the allocation of all supported TCH types (Annex 3, 2.1.4 Channel Modes Supported).

Note: Timer T3110 is currently not defined, however, a value of 2s is used in the test. This is the time taken to transmit N200+1 DISC frames. (see GSM 04.06)

Procedure 1

a) The dedicated channel assigned is a SDCCH, the SS sends Channel Release with a valid RR cause value field.

Procedure 2

a) This procedure is the same as Procedure 1 except that the SS does not acknowledge any Layer 2 disconnection initiated by the MS.

Procedure 3

a) The dedicated channel assigned is a TCH, the SS sends a CHANNEL RELEASE message with a valid RR cause field value.

Procedure 4

a) The dedicated channel assigned is a TCH, the SS sends a CHANNEL RELEASE message with cause 'abnormal release unspecified' (#1).

b) The SS does not acknowledge any Layer 2 disconnection initiated by the MS.

II.5.3.6.12.3 Requirements

The requirements below apply to the corresponding procedures in section II.5.3.6.12.2.

Requirements 1

1) The MS shall initiate a Layer 2 disconnection process on the main signalling link.

2) After the acknowledgement of the Layer 2 disconnection by the SS, the MS shall not produce any further RF-transmission.

3) The MS shall return to the idle state. It is verified through the paging procedure at which the MS should respond.

Requirements 2

1) The MS sends at least two L2 disconnect frames.

2) After having received the first L2 disconnect frame, the SS waits 2 s and verifies that there is no more transmissions from the MS.

3) The MS shall return to the idle state. It is verified through the paging procedure at which the MS should respond.

Requirements 3

1) The MS shall initiate a Layer 2 disconnection process on the main signalling link.

2) After the acknowledgement of the Layer 2 disconnection by the SS, the MS shall not produce any further RF-transmission.

3) The MS shall return to the idle state. It is verified through the paging procedure at which the MS should respond.

Requirements 4

1) The MS sends at least two L2 disconnect frames.

2) After having received the first L2 disconnect frame, the SS waits 2 s and verifies that there is no more transmissions from the MS.

3) The MS shall return to the idle state. It is verified through the paging procedure at which the MS should respond.

Message: CHANNEL RELEASE (GSM 04.08, 9.1.7)

Information Element	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	not relevant	0000
Message Type		0000 1101
RR cause	normal release	0000 0000

II.5.3.6.13 Classmark Interrogation

This procedure allows the network to request the MS to supply all its classmark information to the network. This procedure is specified in section 3.4.11 of GSM 04.08-EXT.

Networks may systematically use this procedure (eg. during location updating) and, if it is incorrectly implemented in the MS, the basic connection establishment procedure may systematically fail.

II.5.3.6.13.1 Purpose of test

To verify that if the network requests the MS to supply all its classmark information then this information is communicated on the DCCH to the network.

II.5.3.6.13.2 Initial conditions

1) The SS shall simulate a BSS with CCCH and BCCH, using the default values as specified in II.5.3.1.

2) The MS shall have an RR connection established with the SS.

II.5.3.6.13.3 Procedure

a) The SS sends a CLASSMARK ENQUIRY message to the mobile station.

Message: CLASSMARK ENQUIRY (GSM 04.08-EXT, 9.1.11a)

Information Element	Comment	Value
Protocol Discriminator	RR management	0110
Transaction Identifier	not relevant	0000
Message type		0001 0011

II.5.3.6.13.4 Requirements

1) The MS shall reply with a CLASSMARK CHANGE message containing a mobile station classmark 2 information element that correctly indicates the supported encryption algorithms.

II.5.3.7 ELEMENTARY PROCEDURES OF MOBILITY MANAGEMENT

The tests are based on GSM 04.08, GSM 03.03 and GSM 03.20.

II.5.3.7.1 TEST OF TMSI REALLOCATION PROCEDURE

The TMSI Reallocation Procedure is defined in section 4.3.1 of GSM 04.08.

II.5.3.7.1.1 Purpose of test

The test verifies that the MS is able to receive and acknowledge a new TMSI.

II.5.3.7.1.2 Method of measurement

a) The SS establishes a data link with the MS and activates ciphered mode.

b) The SS sends a TMSI reallocation command with a TMSI different of the old one and starts timer T3250.

Note: The MS is supposed to store the received TMSI and LAI in non-volatile memory.

c) The SS observes the transmission of TMSI REALLOCATION COMPLETE by the MS, and verifies its contents and timing.

d) The network releases the channel.

e) The MS is switched off, its power supply is then interrupted for 1 minute. Then the power supply is resumed and the MS is switched on again.

f) The MS is paged by the SS, using the newly distributed TMSI.

g) The SS then releases the main signalling link by sending a Channel Release message.

h) The MS is made to perform a location updating as described in the method of test of II.5.3.7.4.

i) The SS sends a TMSI REALLOCATION COMMAND message with a new TMSI.

j) The SS sends the LOCATION UPDATING ACCEPT message containing neither IMSI nor TMSI.

k) The SS then releases the main signalling link by sending a Channel Release message.

l) The SS sends the PAGING REQUEST TYPE 1 message containing the TMSI allocated with the TMSI REALLOCATION COMMAND message.

II.5.3.7.1.3 Requirements

1) In step c), the MS shall send a TMSI REALLOCATION COMPLETE message within T3250 (5 seconds in GSM 04.08) after the SS has send the TMSI REALLOCATION command.

Message: TMSI REALLOCATION COMPLETE (GSM 04.08, 9.2.15)

Protocol discriminator	MM		0101
Transaction Identifier	nor relevant	0000	
Message Type	TMSI realloc com (note seq var)	0x01	1011

2) In step f), the MS shall respond to the TMSI, which was allocated to it in step b).

3) In step h), the MS sends a normal LOCATION UPDATING REQUEST message.

4) In step i), the MS sends a TMSI REALLOCATION COMPLETE message.

5) In step j), the MS shall wait for the SS to release the link.

6) In step l), the MS shall respond tp paging by sending the PAGING RESPONSE message containing the new TMSI.

II.5.3.7.2 TEST OF AUTHENTICATION ELEMENTARY PROCEDURE

The Authentication Procedure is described in section 4.3.2 of GSM 04.08.

II.5.3.7.2.1 Purpose of test

To verify that the MS
- correctly handles the authentication elementary procedure,
- correctly manages the new ciphering key which it should establish in this procedure,
- correctly manages the ciphering key sequence number, which was distributed to it in this procedure,
- acts correctly upon failure of the procedure.

This test is not intended to do any test of correct handling of authentication algorithm by the SIM.

II.5.3.7.2.2 Method of measurement

Initial conditions

1) The MS is provided with a SIM, of which the relation between the incoming RAND and the resulting SRES is known. For the purpose of this test, the algorithm may even be a look-up table, or or very simple standard manipulation of the incoming RAND.

2) The MS is brought in the MM-state "Idle updated" and receives the BCCH/CCCH of the serving cell. A dedicated channel has been assigned with an IMMEDIATE ASSIGNMENT.

Procedure

a) The SS sends AUTHENTICATION REQUEST and starts timer T3260

Message: AUTHENTICATION REQUEST (GSM 04.08, 9.2.2)

Information element	Comment	Value	
Protocol discriminator	MM message		0101
Transaction Identifier	not relevant	0000	
Message Type	Auth req	0001	0010
Ciphering key seq no	key number 0	1111	0000
Auth parameter RAND	MF, 16 octets	-	

b) The SS observes the transmission of AUTHENTICATION RESPONSE by the MS.

c) The MS is brought back into idle mode by releasing the channel.

d) The MS is paged by the SS.

e) The SS observes the transmission of PAGING RESPONSE by the MS and compared the transmitted cipher key sequence number with the value that was sent to the MS in step a).

f) The SS releases the RR connection.

g) Steps a) and b) are repeated after the assignment of a dedicated channel.

h) The SS sends AUTHENTICATION REJECT

Message: AUTHENTICATION REJECT (GSM 04.08, 9.2.1)

Information element	Comment	Value	
Protocol discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type	Auth reject	0001	0001

i) The SS releases the RR connection.

j) The SS sends PAGING REQUEST to the MS, and the SS observes any RF transmission that the MS might produce (CHANNEL REQUEST).

k) After 30 seconds, the MS is made to make a normal call, and the SS observes any RF transmission that the MS might produce (CHANNEL REQUEST).

l) After 30 seconds, via (E)MMI, the MS is made to make an emergency call, and the SS observes any RF transmission that the MS might produce (CHANNEL REQUEST).

II.5.3.7.2.3 Requirement

1) Within timer T3260 (5 sec. in GSM 04.08) the MS shall respond with AUTHENTICATION RESPONSE, as detailed below.

Message: AUTHENTICATION RESPONSE (GSM 04.08, 9.2.3)

Information element	Comment	Value	
Protocol discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type	Auth res (note seq variable)	0x01	0100
Auth parameter SRES	32 bits	-	

2) The value SRES should be bitexact with the value as produced by the authentication algorithm.

3) In step e), the cipher key sequence number shall be the same as the value that was sent in step a).

4) In step j), the MS shall not produce any RF transmission.

5) In step k), the MS shall not produce any RF transmission.

6) In step l), the MS shall produce a CHANNEL REQUEST message.

Step l) of the procedure and requirement 6) apply only if the MS supports speech (see PICS/PIXIT statement).

II.5.3.7.3 TEST OF IDENTIFICATION ELEMENTARY PROCEDURE

The Identification Procedure is described in section 4.3.3 of GSM 04.08.

II.5.3.7.3.1 Purpose of test

To verify that a MS sends identity information as requested by the system.

II.5.3.7.3.2 Method of test

a) The SS sends a PAGING REQUEST to the MS.

b) The MS sends a CHANNEL REQUEST message.

c) The SS sends an IMMEDIATE ASSIGN message, establishing an SDCCH.

Notes:
- A TMSI has been allocated before in the structured sequence of tests.
- Cyphering mode is not set at this stage.

d) The SS sends an IDENTITY REQUEST.

Message: IDENTITY REQUEST (GSM 04.08, 9.2.8)

Information element	Comment	Value	
Protocol discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type	Identity request	0001	1000
Identity type		1100	0
- id type	IMSI		.001

e) The SS observes the message from the MS.

Note: IDENTITY RESPONSE is anticipated.

f) Step d is repeated, but the IDENTITY REQUEST message now contains id.type 100 (TMSI).

g) The SS observes the message from the MS.

h) The SS activates the cyphering mode.

i) Step d is repeated, the IDENTITY REQUEST message contains id.type 010 (IMEI).

j) The SS observes the message from the MS.

Requirements

1) In step e), the MS shall transmit an IDENTITY RESPONSE message

Message: IDENTITY RESPONSE (GSM 04.08, 9.2.9)

Information element	Comment	Value	
Protocol discriminator	MM		0101
Transaction Identifier	not relevant	0000	
Message Type	Identity response	0x01	1001
Mob. Identity	length		
Type of identity	IMSI		.001
Identity	As many nibbles as necessary	xxxx	....

2) In step g), the MS shall transmit an IDENTITY RESPONSE message, with:

Type of identity	TMSI	....	.100

and the TMSI shall correspond to the TMSI allocated to the MS by the SS. (a TMSI is allocated during the test of IMSI attach in the structured sequence of tests).

3) In step j), the MS shall transmit an IDENTITY RESPONSE, with:

Type of identity	IMEI	....	.010

and the IMEI shall correspond to the IMEI which is stored in the Mobile Equipment.

II.5.3.7.4 TEST OF LOCATION UPDATING PROCEDURES

Purpose

To verify the normal location updating, the periodic updating and the IMSI-attach procedures as specified in GSM 04.08, 4.4.

This test description is invoked frequently by the tests, further on in this section of GSM 11.10.

Initial Conditions

The SS simulates two cells, A and B, belonging to different location areas a and b. The MS shall be placed in the MM-state "idle,updated" listening to the BCCH/CCCH of cell A (i.e. updated in cell A).

The ATT parameter is set to 1 in the SYSTEM INFORMATION TYPE 3 message (control channel description), ie IMSI attach/detach is allowed.

The T3212 timeout value in the SYSTEM INFORMATION TYPE 3 message is equal to 1: corresponding to 1/10 hour, ie 6 minutes between periodic updatings.

Method of test

The RF level of cell A is lowered until the MS selects cell B (according to the cell selection procedures as described in GSM 05.08).

The MS should then establish an RR connection and initialise a normal location updating.

The MS behaviour is tested with different network reactions to the location updating request:

- Location updating accepted by the network;
- Location updating rejected by the network, subdivided in:
  1) "IMSI unknown in the HLR" or "illegal MS",
  2) "roaming not allowed",
  3) "Location Area not allowed.

Subsequent location updatings are triggered by decreasing the RF level of the cell the MS is currently listening to and increasing the RF level of the other cell.

Message descriptions:

Message: Location Update Request

Protocol discriminator	MM		0101
Transaction identifier	not relevant	0000	
Message type		0x00	1000
Location updating type	00:normal, 10:IMSI attach or 01:periodic		
Ciphering key sequence number:		00 to 110 or 111	
Location area identification	(as required by text)		
Mobile station classmark 1	as specified by the manufacturer.		
Mobile identity			

Message: Location Update Accept (GSM 04.08, 9.2.11)

Protocol discriminator	MM		0101
Transaction identifier	not relevant	0000	
Message type		0000	0010
Location area identification	(as required by text)		
Mobile identity			

Message: Location Update Reject (GSM 04.08, 9.2.12)

Protocol discriminator	MM		0101
Transaction identifier	not relevant	0000	
Message type		0000	0100
Reject cause	(as required by text)		

Message: TMSI Reallocation Complete (GSM 04.08, 9.2.15)

Protocol discriminator	MM		0101
Transaction identifier	not relevant	0000	
Message type		0x01	1011

Procedures:

II.5.3.7.4.1 Location updating accepted

ref: GSM 04.08, section 4.4.4.5

For this network response, three different cases are identified:

1) TMSI is allocated,
2) Location updating accept contains neither TMSI nor IMSI,
3) Location updating accept contains IMSI.

Procedure 1 **TMSI is allocated; the MS shall accept the new TMSI.**

a) The MS is made to perform a location updating as described in the method of test of II.5.3.7.4.

b) The SS sends a LOCATION UPDATING ACCEPT containing a new TMSI.

c) The SS pages the MS using the PAGING REQUEST TYPE 1 message with the new TMSI.

Requirements 1

1) In response to the LOCATION UPDATE ACCEPT, the MS shall return a TMSI REALLOCATION COMPLETE and wait for the SS to release the link.

2) In response to the paging request using the new TMSI, the MS shall send the CHANNEL REQUEST message on the random access channel, it shall establish the main signalling link and respond with a PAGING RESPONSE message containing the correct TMSI.

Procedure 2 **Neither TMSI nor IMSI is sent by the network**

a) The MS is made to perform a location updating as described in the method of test of II.5.3.7.4. The SS sends the LOCATION UPDATING ACCEPT message containing neither IMSI nor TMSI.

b) The SS sends the PAGING REQUEST TYPE 1 message containing the old TMSI.

Requirements 2

1) The MS shall wait for the SS to release the link.

2) The MS shall respond to paging by sending the PAGING RESPONSE message containing this TMSI.

Procedure 3: **The Location Updating Accept message contains an IMSI**

a) The MS is made to perform a normal location updating as described in the method of test of II.5.3.7.4, using IMSI.

b) Following completion of the procedure, the SS pages the MS using:-

b.1) a PAGING REQUEST TYPE 1 with the old TMSI.
b.2) a PAGING REQUEST TYPE 1 with the IMSI.

Requirements 3

1) The MS shall wait for the SS to release the link.

2) 2.1) The MS shall ignore the PAGING REQUEST TYPE 1 message containing TMSI.

2.2) The MS shall respond to the PAGING REQUEST TYPE 1 containing its IMSI.

II.5.3.7.4.2 Location Update Rejected

ref: GSM 04.08, sections 4.4.4.6 and 4.4.4.8

II.5.3.7.4.2.1 Location Updating Rejected, "IMSI unknown in HLR" or "Illegal MS"

Procedure

a) The MS is made to perform a normal location updating as described in the method of test of II.5.3.7.4.

The SS sends LOCATION UPDATING REJECT with cause value #2, 'IMSI unknown in HLR' and then releases the link.

b) The RF levels are then changed again to make the MS reselect cell.

c) The SS waits at least 7 minutes for a possible periodic updating.

d) The MS is paged first with IMSI and then with TMSI.

e) A mobile originating normal call establishment is attempted.

f) An MS initiated emergency call is established.

g) The MS is powered down.

Requirements

1) The MS shall perform cell reselection and initiate a first location updating attempt (and enter the state 'idle, no imsi' when the link is released).

2) After the second change of RF levels, the MS must perform cell reselection according to procedure as specified in GSM 05.08 but shall not perform normal location updating.

3) The MS shall not perform periodic updating. This is checked for a period of 7 minutes after release of the link by the SS following the location updating reject.

4) The MS shall not respond to paging with IMSI or TMSI.

5) The MS shall not initiate the immediate assignment procedure to establish a link in response to the normal call establishment request.

6) The MS shall be establish the emergency call correctly as described in test II.5.3.8.2.

7) When powered down, the MS must not perform an IMSI detach.

Step f) of the procedure and requirement 6) apply only if the MS supports speech (see PICS/PIXIT statement).

II.5.3.7.4.2.2 Location Updating Rejected, "PLMN not Allowed"

Initial conditions

1) The MS shall be in the 'idle,updated' state (TMSI assigned) listening to BCCH/CCCH of the relevant cell. The MS is in manual mode for PLMN selection.

2) The ATT flag value is set to 1 that is IMSI attach and detach allowed.

3) The timer T3212 (periodic updating) is set to 6 minutes encoded as 1.

4) The MS is switched off.

5) The PLMN number is changed in the SS.

6) The MS is switched on.

Procedure

a) When the MS offers the new PLMN, as available, the PLMN is manually selected. The SS responds to a Location Updating message with the LOCATION UPDATING REJECT message containing cause value #11: "PLMN not allowed" and then releases the link.

b) The SS waits for a possible periodic updating for 7 minutes.

c) The MS is switched off and then switched on again but no network is manually selected. (The SS does not change the location area or the PLMN.).

d) An MS initiated emergency call is established.

e) The MS is switched off. The RF levels are changed to make the MS reselect cell when switched on. The MS is switched on but no network is manually selected..

f) The LAI is changed.

g) The MS is switched off. The PLMN is changed (back to the default values which indicate the HPLMN). The MS is switched on.

Requirements

1) The MS shall offer the new PLMN as available to the user. After it has been selected, the MS shall initiate the normal location updating procedure (the MS shall store the LAI received on the BCCH in the new location area and delete the TMSI).

2) The MS shall not perform periodic updating within 7 minutes after release of the link by the SS following the Location Updating Reject message.

3) The MS shall not perform IMSI detach when powered down nor IMSI attach when powered up.

4) The MS shall establish the emergency call correctly as described in test II.5.3.8.2. with the following exceptions:

   The CM service request sent by the MS shall have the Mobile identity set to IMSI.

   The two way audio path shall not be checked.

5) No access to the network shall be registered by the SS within one minute.

6) No access to the network shall be registered by the SS within one minute.

7) The MS shall initiate a normal location updating.

Step d) of the procedure and requirement 4) apply only if the MS supports speech (see PICS/PIXIT statement).

II.5.3.7.4.2.2a Location Updating Rejected, "PLMN not Allowed"

Initial conditions

1) The MS shall be in the 'idle,updated' state (TMSI assigned) listening to BCCH/CCCH of the relevant cell. The MS is in manual mode for PLMN selection.

2) The ATT flag value is set to 1 that is IMSI attach and detach allowed.

3) The timer T3212 (periodic updating) is set to 6 minutes encoded as 1.

4) The MS is switched off.

5) The PLMN number is changed in the SS.

6) The MS is switched on.

Procedure

a) When the MS offers the new PLMN, as available, the PLMN is manually selected. The SS responds to a Location Updating message with the LOCATION UPDATING REJECT message containing cause value #11: "PLMN not allowed" and then releases the link.

b) The MS is made to search for PLMNs and the PLMN indicated by the SS is manually reselected.

Requirements

1) In step a), the MS shall offer the new PLMN as available to the user. After it has been selected, the MS shall initiate the normal location updating procedure (the MS shall store the LAI received on the BCCH in the new location area and delete the TMSI).

2) After step b), the MS shall transmit a normal LOCATION UPDATING REQUEST message.

II.5.3.7.4.2.3 Location updating rejected "Location Area not allowed"

Initial conditions

The MS shall be in the 'idle,updated' state (TMSI assigned) listening to BCCH/CCCH of the relevant cell.

Procedure

a) The MS is made to perform a normal location updating as described under method of test of II.5.3.7.4. The SS responds with the LOCATION UPDATING REJECT message containing cause value #12: "Location Area not allowed" and then releases the link.

b) The SS waits for a possible periodic updating for 7 minutes.

c) The MS is paged first with TMSI then with IMSI.

d) An MS originated normal call is attempted.

e) An MS initiated emergency call is established.

f) The RF levels are changed to make the MS reselect cell (new cell has different LAI).

The SS continues to respond to a location updating attempt from the MS with LOCATION UPDATING REJECT cause #12.

g) The MS is switched off.

Requirements

1) In step a), the MS shall perform the normal location updating procedure and return to the idle state upon link-release by the SS.

2) In step b), the MS shall not perform periodic updating within 7 minutes after release of the link by the SS following the Location Updating Reject message.

3) In step c), the MS shall not respond to TMSI paging but shall respond to IMSI paging. The CKSN in the PAGING RESPONSE message shall indicate "no key available" as described in GSM 04.08 Table 10.8.

4) In step d), the MS shall not initiate the immediate assignment procedure for call establishment.

5) In step e), the MS shall establish the emergency call correctly as described in test II.5.3.8.2.

6) In step f), the MS shall initiate a normal location updating after the change of RF levels.

7) In step g), the MS shall not perform IMSI detach when powered down.

Step e) of the procedure and requirement 5) apply only if the MS supports speech (see PICS/PIXIT statement).

Message: PAGING RESPONSE (GSM 04.08, 9.1.24)

Information element	Comment	Value	
Protocol discriminator	RR management		0110
Transaction Identifier	not relevant	0000	
Message Type	Paging Response	0010	0111
CKSN	no key		0111
MS classmark 2	as specified by the manufacturer		
Mobile identity	IMSI		

II.5.3.7.4.3 Abnormal cases

II.5.3.7.4.3.1 The random access fails

Purpose of the test

To verify that when during the RR connection establishment phase of a location updating procedure, channel requests are not answered by the network, after expiry of T3213 the complete procedure is repeated if still necessary.

Initial conditions

For both procedure 1 and procedure 2 the initial conditions of II.5.3.7.4 shall apply.

Procedure 1

a) The MS is made to perform a normal location updating as described in the method of the test of II.5.3.7.4.

b) Cell B as simulated by the SS does not answer to (Max-retrans + 1) CHANNEL REQUEST messages.

During this step b), the RF level of cell A as simulated by the SS is set sufficiently low to ensure that cell A is not suitable as defined in GSM 05.08 section 6.6.2.

c) After reception of the first CHANNEL REQUEST message, cell B as simulated by the SS no longer refuses the establishment of the RR connection.

Requirements 1

1) In step b), the MS must send (Max-retrans + 1) CHANNEL REQUEST messages to cell B as simulated by the SS.

2) Within a period t seconds, where T3213 < t < 15, after having sent the last CHANNEL REQUEST message the MS must restart establishing an RR connection with cell B as simulated by the SS.

3) The RR connection having been established, the MS must initialize a normal location updating to cell B as simulated by the SS.

Note: The upper limit of 15s, for t, is to allow time for the MS to perform cell reselection and because it is unclear at which point the timer T3213 is started.

Procedure 2

a) The MS is made to perform a normal location updating as described in the method of the test of II.5.3.7.4.

b) Cell B as simulated by the SS does not answer to (Max-retrans + 1) CHANNEL REQUEST messages.

After reception of the (Max-retrans + 1)-th CHANNEL REQUEST message, after 2 seconds the RF level of cell A as simulated by the SS is set sufficiently high to ensure that cell A is suitable as defined in 6.6.2 of GSM 05.08 (taking into account the cell reselection hysteresis).

Requirements 2

1) In step b), the MS shall send (Max-retrans + 1) CHANNEL REQUEST messages to cell B as simulated by the SS.

2) After step b) the MS shall not initiate a normal location updating procedure. (This is checked during 6 seconds.)

II.5.3.7.4.3.2 Attempt counter smaller than 4, stored LAI different from broadcast LAI

Initial conditions

The MS shall be in the "idle updated" state (TMSI, LAI, Kc and Kc sequence number are in the MS) listening to BCCH/CCCH of the relevant cell. These initial conditions shall be met before each of the following Procedures 1 to 6.

Procedure 1: To verify that the MS performs normal location updating procedures when its attempt counter is smaller than 4.

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4

b) The SS sends a LOCATION UPDATING REJECT message with cause #i. (This cause value is randomly chosen in Table 10.44 of GSM 04.08, causes #2, #3, #11 and #12 being excluded.)

c) During the location updating procedure, the SS stops sending error free SACCH frames (in order to trigger a radio link failure in the MS).

d) During the location updating procedure the SS sends a CHANNEL RELEASE message before the normal end of the procedure (i.e. before sending the LOCATION UPDATING ACCEPT message).

Requirements 1

1) After each of steps b), c) and d) the MS shall:

1.1) - wait T3211 seconds (in steps b) and d) the SS checks that there is no procedure attempted by the MS during T3211 after the channel release occuring during the Location Updating Failure); in step c) the SS checks that there is no procedure attempted by the MS during T3211+3 s after the moment when the SS has stopped sending error free SACCH frames),

1.2) - after that send a CHANNEL REQUEST message in order to perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The Location updating type is put to "Normal location updating" encoded as 0 0, the location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded as 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

Procedure 2: To check that the MS does not perform the IMSI detach procedure when in "idle not updated" state.

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) The MS is paged continuously during 8 seconds with the TMSI it used before the location updating failure.

d) The MS is switched off.

Requirements 2

1) After step c) of Procedure 2, the MS shall ignore the paging request. The SS checks that there is no answer to the paging from the MS during 12s after the sending of the first paging request.

Note: If the MS tries a Location Updating procedure, the SS shall react as in step b).

2) After step d) during at least 30 seconds, the MS shall not trigger any procedure.

Procedure 3 To verify that the MS can perform an emergency call.

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS triggers n authentication procedures.

Note: 'n' shall be chosen in such a way that T3210 expires.

c) The MS is made to perform an emergency call.

d) The SS allocates the MS a DCCH through the immediate assignment procedure.

Requirements 3

1) After step b) the MS shall abort the RR connection.

2) After step c) the MS applies for a dedicated radio resource.

3) After step d) the MS sends a CM SERVICE REQUEST message with CM service type put to "Emergency call establishment" encoded as 0010.

   3.1) The key sequence in the ciphering key sequence number shall be encoded as 1 1 1 indicating "No key is available".

   3.2) The identity field shall contain the IMSI of the MS.

4) The MS sends an EMERGENCY SET UP message on the main DCCH.

Procedure 3 and Requirements 3 only apply to MS supporting speech (see PICS/PIXIT statement).

Procedure 4 **To verify that in "idle not updated" state the MS uses requests from CM layer other than emergency call as triggering of a normal location updating procedure.**

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) The MS is made to perform a mobile originating call set-up.

d) The SS allocates the MS a DCCH through the immediate assignment procedure.

Requirements 4

1) After step c) the MS sends a CHANNEL REQUEST message with establishment cause "All other cases" encoded as 0 0 0 .

2) After step d) the MS sends a LOCATION UPDATING REQUEST message. This message is encoded as indicated in Requirement 1.

Procedure 5 **To check that in the "idle not updated" state the MS answers to paging with IMSI.**

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) The MS is paged with its IMSI.

d) The SS allocated a DCCH to the MS.

Requirements 5

1) After step c) the MS sends a CHANNEL REQUEST message, the establishment cause being "Answer to paging" encoded as 100.

2) After step d) the MS sends a PAGING RESPONSE message, the Ciphering key sequence number information element indicates that no key is available (i.e. bits 1, 2 and 3 are encoded as 1 1 1 .) and the mobile identity information element includes the IMSI of the MS.

Procedure 6 **To verify that the MS performs a normal location updating procedure if it enters a new cell while being in the "idle not updated" state.**

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) Cell B is switched off.

d) The SS measures the time interval between the channel release (This is the one due to the location updating failure occurring during step b).) and the sending of the CHANNEL REQUEST (This is the one used by the MS because of the normal location updating procedure triggered by step c).).

Requirements 6

1) The MS shall perform a normal location updating procedure after step c).

2) The time interval between the channel release and the sending of the CHANNEL REQUEST measured in step d), shall be less than 20 seconds.

Note: 20 seconds is chosen to give sufficient time for the MS to reselect onto cell A and perform a Random Access.

II.5.3.7.4.3.3 Attempt counter greater or equal to 4, Stored LAI different from broadcast LAI

Initial conditions

The initial conditions of II.5.3.7.4.3.2 shall be met before each of the following procedures 1 to 5.

Purpose of test procedure 1

To verify that the MS performs only periodic location updating procedures, that it does not perform normal location updating procedures when its attempt counter has reached value 4 and that the MS reset its attempt counter after a timer T3212 expiry.

Procedure 1

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

d) The SS triggers n authentication procedures.

Note: 'n' shall be chosen in such a way that T3210 expires.

e) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

f) During the location updating procedure caused by step e) the SS sends a LOCATION UPDATING REJECT message with cause #17 "Network failure".

Requirements 1

1) After the channel release procedure occuring during step e) the MS shall not trigger any procedure within a time defined as T3212 minus 15 seconds.

2) After this delay the MS shall perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded as 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

3) After step f) the MS shall:

   3.1) - wait T3211 seconds (the SS checks that there is no procedure attempted by the MS during T3211 after the channel release occuring during the Location Updating Failure),

   3.2) - after that send a CHANNEL REQUEST message in order to perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The Location updating type is put to "Normal location updating" encoded as 0 0, the location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded as 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

Purpose of the procedures 2 to 5

To verify that the MS still follows the "idle not updated" state requirements after its attempt counter has reached value 4. (In the procedures of II.5.3.7.4.3.2 the attempt counter has reached value 1.) To verify that the attempt counter is reset in the cases where it has to be done.

Procedure 2 To verify that the MS can perform an emergency call

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS sends a LOCATION UPDATING REJECT message with cause #i. (This cause value is randomly chosen in Table 10.44 of GSM 04.08, causes #2, #3, #11 and #12 being excluded.)

c) During the location updating procedure, the SS stops sending error free SACCH frames (in order to trigger a radio link failure in the MS).

d) During the location updating procedure the SS sends a CHANNEL RELEASE message before the normal end of the procedure (i.e. before sending the LOCATION UPDATING ACCEPT message).

e) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

f) The MS is made to perform an emergency call.

g) The SS allocates the MS a DCCH through the immediate assignment procedure.

h) The MS is switched off.

Requirements 2

1) After step f) the MS applies for a dedicated resource.

2) After step g), the MS sends a CM SERVICE REQUEST message with CM service type put to "Emergency call establishment" encoded as 0010.

   2.1) The key sequence in the ciphering key sequence number shall be encoded as 1 1 1 indicating "No key is available".

   2.2) The identity field shall contain the IMSI of the MS.

3) The MS sends an EMERGENCY SET UP message on the main DCCH.

Procedure 2 and Requirements 2 only apply to MS supporting speech (see PICS/PIXIT statement).

Procedure 3 **To verify that in "idle not updated" state the MS uses requests from CM layer other than emergency call as triggering of a normal location updating procedure. To verify that the attempt counter is reset after a location updating triggered by request from CM layer.**

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS sends a LOCATION UPDATING REJECT message with cause #i. (This cause value is randomly chosen in Table 10.44 of GSM 04.08, causes #2, #3, #11 and #12 being excluded.)

c) During the location updating procedure, the SS stops sending error free SACCH frames (in order to trigger a radio link failure in the MS).

d) During the location updating procedure the SS sends a CHANNEL RELEASE message before the normal end of the procedure (i.e. before sending the LOCATION UPDATING ACCEPT message).

e) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

f) The MS is made to perform a mobile originating call set-up.

g) The SS allocates the MS a DCCH through the immediate assignment procedure.

h) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

Requirements 3

1) After step f) the MS sends a CHANNEL REQUEST message with establishment cause "All other cases" encoded as 0 0 0 .

2) After step g) the MS sends a LOCATION UPDATING REQUEST message. The Location Updating type is put to 'Normal Location Updating' encoded as 00, the key sequence in the ciphering key sequence number is encoded as 111 indicating 'No Key Available', the identity field contains the IMSI of the MS.

3) After step h), the MS shall:

3.1) - wait T3211 seconds (the SS checks that there is no procedure attempted by the MS during T3211 after the channel release occuring during the Location Updating Failure),

3.2) - immediately after that send a CHANNEL REQUEST message in order to perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The Location updating type is put to "Normal location updating" encoded as 0 0, the location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded as 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

Procedure 4 To check that in the "idle not updated" state the MS answers to paging with IMSI.

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS sends a LOCATION UPDATING REJECT message with cause #i. (This cause value is randomly chosen in Table 10.44 of GSM 04.08, causes #2, #3, #11 and #12 being excluded.)

c) During the location updating procedure, the SS stops sending error free SACCH frames (inorder to trigger a radio link failure in the MS).

d) During the location updating procedure the SS sends a CHANNEL RELEASE message before the normal end of the procedure (i.e. before sending the LOCATION UPDATING ACCEPT message).

e) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

f) The MS is paged with its IMSI.

g) The SS allocates the MS a DCCH through the immediate assignment procedure.

Requirements 4

1) After step f) the MS sends a CHANNEL REQUEST message, the establishment cause being "Answer to paging" encoded as 100.

2) After step g) the MS sends a PAGING RESPONSE message, the Ciphering key sequence number information element indicates that no key is available (i.e. bits 1, 2 and 3 are encoded as 1 1 1 .) and the mobile identity information element includes the IMSI of the MS.

Procedure 5 **To verify that the MS performs a normal location updating procedure if it enters a new cell while being in the "idle not updated" state.**
To verify that the attempt counter is reset after a new location area is entered.

a) The MS is brought to perform a location updating procedure as described in the method of test of II.5.3.7.4.

b) The SS sends a LOCATION UPDATING REJECT message with cause #i. (This cause value is randomly chosen in Table 10.44 of GSM 04.08, causes #2, #3, #11 and #12 being excluded.)

c) During the location updating procedure, the SS stops sending error free SACCH frames (inorder to trigger a radio link failure in the MS).

d) During the location updating procedure the SS sends a CHANNEL RELEASE message before the normal end of the procedure (i.e. before sending the LOCATION UPDATING ACCEPT message).

e) The SS chooses randomly either step b) or d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

f) The RF power level of cell B is reduced until the MS selects cell A.

g) The SS chooses randomly either step b) or d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

Requirement 5

1) After step f), the MS shall perform a normal location updating procedure.

2) After step g) the MS shall:

  2.1) - wait T3211 seconds (the SS checks that there is no procedure attempted by the MS during T3211 after the channel release occuring during the Location Updating Failure),

  2.2) - after that send a CHANNEL REQUEST message in order to perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The Location updating type is put to "Normal location updating" encoded as 0 0, the location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded as 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

II.5.3.7.4.3.4 Attempt counter smaller than 4, Stored LAI equal to broadcast LAI

Initial conditions

The initial conditions described at the beginning of II.5.3.7.4.3.2 shall be met before each of the following procedures of this section.

Purpose of the test procedures 1 and 2

To verify that the MS is the "idle updated" state. To verify that timer T3211 is reset after a MM connection establishment.

Procedure 1

a) The MS is made to perform a periodic updating procedure.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) Immediately after that the MS is made to perform a mobile originated call.

d) The SS allocates the MS a DCCH through the immediate assignment procedure.

e) After the SETUP message is received (Note: this transmission shows that the MM connection is successfully established.) from the MS, the SS sends to the MS a CHANNEL RELEASE message.

f) The SS observes wether a location updating procedure is attempted by the MS during 0.5*T3212 after the reception of the SETUP message.

Requirements 1

1) After step c) the MS shall send a CHANNEL REQUEST with the establishment cause "Other services required by the mobile user" encoded as 1 1 1.

2) After step d) the MS shall transmit on the DCCH a CM SERVICE REQUEST message, the CM service type indicates "Mobile originating call establishment" encoded as 0 0 0 1, the ciphering key sequence number and the LAI are those which have been allocated to the MS, the Mobile identity field contains the TMSI which has been allocated to the MS.

3) The MS shall not attempt a location updating procedure during at least 0.5*T3212 after the reception of the SET UP message.

Procedure 2

a) The MS is made to perform an IMSI attach procedure.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) Immediately after that the MS is made to perform a mobile originated call.

d) The SS allocates the MS a DCCH through the immediate assignment procedure.

e) The SS observes wether a location updating procedure is attempted by the MS during 0.5*T3212 after the reception of the SET UP message.

Requirements 2

1) After step c) the MS shall send a CHANNEL REQUEST with the establishment cause "Other services required by the mobile user" encoded as 1 1 1.

2) After step d) the MS shall transmit on the DCCH a CM SERVICE REQUEST message, the CM service type indicates "Mobile originating call establishment" encoded as 0 0 0 1, the ciphering key sequence number and the LAI are those which have been allocated to the MS, the Mobile identity field contains the TMSI which has been allocated to the MS.

3) The MS shall not attempt a location updating procedure during at least 0.5*T3212 after the reception of the SETUP message.

Purpose of the test procedures 3, 4 and 5

To verify that the MS uses the T3211 timer. and that it enters the "idle not updated" state when its attempt counter reaches value 4 even in the case where the stored LAI is equal to the broadcast LAI.

Procedure 3

a) The MS is made to perform a periodic location updating procedure.

b) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

c) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

d) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

e) The SS chooses randomly one among the two steps b) and d) of Procedure 1 of section II.5.3.7.4.3.2, let (i) be this choice. The SS performs step (i) of Procedure 1 of section II.5.3.7.4.3.2.

Requirements 3

1) After each of steps a), b), c), d) the MS shall transmit on the DCCH a LOCATION UPDATING REQUEST message. The location updating type is put to "Periodic updating" encoded as 0 1, the ciphering key sequence number and the LAI are those which have been allocated to the MS; the Mobile identity field contains the TMSI which has been allocated to the MS.

2) After each of steps b), c) and d) the MS shall

2.1) - wait T3211 seconds (the SS checks that there is no procedure attempted by the MS during T3211 after the channel release occuring during the Location Updating Failure),

2.2) - immediately after that send a CHANNEL REQUEST message in order to perform a location updating procedure.

3) After the channel release procedure occuring during step e) the MS shall not trigger any procedure within a time defined as T3212 minus 15 seconds.

4) After this delay the MS shall perform a location updating procedure. The MS shall transfer on the main DCCH a LOCATION UPDATING REQUEST message. The location area information is set to "deleted" (the MNC and MCC hold the previous values, both octets of the LAC are coded with zeros), the key sequence in the ciphering key sequence number is encoded ad 1 1 1 indicating "No key is available", the identity field contains the IMSI of the MS.

Procedure 4

a) Steps a) to e) of Procedure 3 are performed.

b) The MS is made to perform a mobile originated call set-up.

c) The SS allocates the MS a DCCH through the immediate assignment procedure.

Requirements 4

1) After step b) the MS sends a CHANNEL REQUEST message with establishment cause "All other cases" encoded as 0 0 0 .

2) After step c) the MS sends a LOCATION UPDATING REQUEST message.

Procedure 5

Perform again Procedures 3 and 4 after having replaced step a) in Procedure 3 each time by:

a) The MS is made to perform an IMSI attach procedure.

Requirements 5

"Requirements 3" or "Requirements 4" apply, as applicable, but using location update type "IMSI attach" in Requirements 3 step 1.

II.5.3.7.4.4 Test of RR Connection Release after Location Updating

Procedure

a) The MS is made to perform a successful location updating as described in the method of measurement of II.5.3.7.4.

b) The SS does not release the RR connection within timer value T3240.

Requirement

1) The MS shall abort the RR connection ("local release") after T3240 expiry and go to the "Idle" state (with appropriate updated status).

II.5.3.7.4.5 Periodic Updating

II.5.3.7.4.5.1 Reduction of Location updating Timer.

No unique test could be defined for the following conformance requirement.

When the location updating timer value is reduced MSs, of which the last location updating has taken place longer ago than the new timer value indicates, shall spread their reaction time before performing a location updating, to prevent a collision of many location updatings from all those MSs.

There is no exact requirement on how this spread should be achieved, and various options are open to the manufacturer.

II.5.3.7.4.5.2 Test of Periodic Updating

Initial Conditions

1) The T3212 timeout value in the SYSTEM INFORMATION TYPE 3 message is set to 1; corresponding to 1/10 hour, i.e. 6 minutes between periodic updatings.

2) The MS is brought in state "Idle,updated".

3) Different cases of resetting timer T3212 are tested. The ATT flag is set to 0 to forbid IMSI attach and detach procedures.

Procedure 1

a) The MS is made to perform a normal successful location updating as described in II.5.3.7.4.

b) An MS originated call is established 1 minute after the location updating.

c) The time when the call is cleared is noted.

d) The SS waits until the periodic location updating.

e) The MS is paged with IMSI 1 minute after the periodic updating.

f) The SS sends an IMMEDIATE ASSIGNMENT message and then releases the link.

g) The SS waits for periodic updating.

h) After this periodic updating the MS is switched off for 1 minute (including the time needed for the MS switch off and switch on tasks) and then on again.

i) The SS waits for a periodic updating.

Requirements 1

1) The MS shall perform periodic updating:

   1.1) In step d) in a time interval defined as 6 minutes - 15 seconds to 6 minutes + 45 seconds after the release of the RR connection by the SS.

   1.2) In step g) in a time interval defined as 6 minutes - 15 seconds to 6 minutes + 45 seconds after the release of the RR connection by the SS.

   1.3) In step i) in a time interval defined as 7 minutes - 15 seconds to 7 minutes + 45 seconds after periodic updating (this value includes the power off time).

Procedure 2

a) The ATT parameter in the SYSTEM INFORMATION TYPE 3 message shall be set to 1 (attach/detach allowed).

b) The MS is brought in state "idle,updated".

c) If the MS offers a switch off facility, the MS is switched off. Otherwise, if removal of the SIM without disconnection of the power supply is possible (see PIXIT statement), the SIM is removed; else, the power supply is disconnected.

d) The SS waits 20 s. During that time, the MS may initiate an IMSI detach procedure.

e) If in step c) the MS had been switched off, the MS is switched on. Otherwise if in step c) the SIM was removed the SIM is re-inserted; else, the power supply is connected to the MS and, if necessary, the MS is activated.

f) The SS shall answer to the location updating request (with type IMSI attach).

g) The SS waits for the periodic location updating.

Requirement 2

1) If in step c) the MS had been switched off or the SIM had been removed, the MS must initiate and IMSI detach procedure after step c).

2) The MS shall send a LOCATION UPDATING REQUEST with type IMSI attach after step e).

3) The MS shall perform a periodic location updating in a time interval defined as 6 minutes - 15 seconds to 6 minutes + 45 seconds after 2).

Procedure 3

This procedure is the same as Procedure 1 except that the broadcasted value of the T3212 is set to 12 minutes, encoded as 2.

Requirements 3

1) The MS shall perform periodic updating:

   1.1) In step d) in a time interval defined as 12 minutes - 15 seconds to 12 minutes + 45 seconds after the release of the RR connection by the SS.

   1.2) In step g) in a time interval defined as 12 minutes - 15 seconds to 12 minutes + 45 seconds after the release of the RR connection by the SS.

   1.3) In step i) in a time interval defined as 13 minutes - 15 seconds to 13 minutes + 45 seconds after periodic updating (this value includes the power off time).

II.5.3.7.5 MM CONNECTION ESTABLISHMENT

II.5.3.7.5.1 Introduction

MM connection establishment is only of particular relevance in the case of MS origination, this is because MM connection establishment is a CM service provision and for the network originated case that is inherent in the paging elementary procedure.

The call re-establishment aspects of CM service provision are dealt with in the next test.

The emergency call establishment aspects of CM service provision are dealt with in test II.5.3.8.2.

II.5.3.7.5.2 Successful MM connection establishment, with cipher mode setting

II.5.3.7.5.2.1 Purpose of the test

The purpose of this test is to verify that the MS can correctly set up an MM connection in an origination and interpret cipher mode setting as acceptance of its CM service request.

II.5.3.7.5.2.2 Initial conditions

1) The SS simulates a cell with BCCH, CCCH, SDCCH and TCH.

2) The MS shall be in the "idle updated" state as after a successful location update as in test II.5.3.7.4.

II.5.3.7.5.2.3 Procedure 1

a) After the initial conditions have been set up, the MS is made to initiate a call.

b) The SS responds to the MS Channel Request with an Immediate Assignment message as described in II.5.3.6.1.3.

II.5.3.7.5.2.4 Requirements 1

1) The MS goes to the correct SDCCH and sends a CM service request message.

Message: CM Service Request

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant	000	
Message type		0x10	0100
CM Service type	MO call establishment	0001	
Ciphering key sequence number	as stored in the MS		
Mobile station classmark 2	as specified by the manufacturer		
Mobile identity	TMSI		

II.5.3.7.5.2.5 Procedure 2

a) The SS performs a successful authentication with the MS as tested in II.5.3.7.2.

b) The SS performs a successful cipher mode setting with the MS as tested in II.5.3.6.8.

c) The SS ceases all transmissions and allows the MS to timeout.

II.5.3.7.5.2.6 Requirements 2

1) The MS shall consider the cipher mode setting as acceptance of its CM service request and so send its set up message.

II.5.3.7.5.3 Successful MM Connection Establishment, without cipher mode setting

II.5.3.7.5.3.1 Purpose of the test

The purpose of this test is to verify that the MS can correctly set up an MM connection in an origination when cipher mode setting is not required.

II.5.3.7.5.3.2 Initial conditions

1) The SS simulates a cell with BCCH, CCCH, SDCCH and TCH.

2) The MS shall be in the "idle updated" state as after a successful location update in test II.5.3.7.4.

II.5.3.7.5.3.3 Procedure 1

a) After the initial conditions have been set up, the MS is made to initiate a call.

b) The SS responds to the MS Channel Request with an Immediate Assignment message as described in II.5.3.6.1.3.

II.5.3.7.5.3.4 Requirements 1

1) The MS goes to the correct SDCCH and sends a CM service request message.

Message: CM Service Request

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant	000	
Message type		0x10	0100
CM Service type	MO call establishment	0001	
Ciphering key sequence number	as stored in the MS		
Mobile station classmark 2	as specified by the manufacturer		
Mobile identity	TMSI		

II.5.3.7.5.3.5 Procedure 2

a) The SS sends a CM Service Accept message.

Message: CM Service Accept

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant		
Message type	CM service accept	0010	0001

b) The SS ceases all transmissions and allows the MS to timeout.

II.5.3.7.5.3.6 Requirements 2

1) The MS shall commence sending its SETUP message.

II.5.3.7.5.4 MM Connection Establishment rejected

II.5.3.7.5.4.1 Purpose of the test

The purpose of this test is to verify that the MS can correctly set up a CM Service Reject in an origination.

II.5.3.7.5.4.2 Initial conditions

1) The SS simulates a cell with BCCH, CCCH, SDCCH and TCH.

2) The MS shall be in the "idle updated" state as after a successful location update in test II.5.3.7.4.

II.5.3.7.5.4.3 Procedure 1

a) After the initial conditions have been set up, the MS is made to initiate a call.

b) The SS responds to the MS Channel Request with an Immediate Assignment message as described in II.5.3.6.1.3.

II.5.3.7.5.4.4 Requirements 1

1) The MS goes to the correct SDCCH and sends a CM service request message.

Message: CM Service Request

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant	000	
Message type		0x10	0100
CM Service type	MO call establishment	0001	
Ciphering key sequence number	as stored in the MS		
Mobile station classmark 2	as specified by the manufacturer		
Mobile identity	TMSI		

II.5.3.7.5.4.5 Procedure 2

a) The SS sends a CM Service Reject message.

Message: CM Service Reject

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant		
Message type		0010	0010
Reject cause	Service Option not subscribed	33	

II.5.3.7.5.4.6 Requirements 2

1) The MS shall not send its SETUP message.

II.5.3.7.5.5 MM Connection Establishment rejected (cause 4)

II.5.3.7.5.5.1 Purpose of the test

The purpose of this test is to verify that the MS can correctly accept a CM Service Reject message with cause #4.

II.5.3.7.5.5.2 Initial conditions

1) The SS simulates a cell with BCCH, CCCH, SDCCH and TCH.

2) The MS shall be in the "idle updated" state as after a successful location update in test II.5.3.7.4.

II.5.3.7.5.5.3 Procedure 1

a) After the initial conditions have been set up, the MS is made to initiate a call.

b) The SS responds to the MS Channel Request with an Immediate Assignment message as described in II.5.3.6.1.3.

II.5.3.7.5.5.4 Requirement 1

1) The MS goes to the correct SDCCH and sends a CM service request message.

Message: CM Service Request

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	Not relevant	000	
Message type		0x10	0100
CM Service type	MO call establishment	0001	
Ciphering key sequence number	as stored in the MS		
Mobile station classmark 2	as specified by the manufacturer		
Mobile identity	TMSI		

II.5.3.7.5.5.5 Procedure 2

a) The SS sends a CM Service Reject message.

Message: CM Service Reject

Information Element	Comment	Value	
Protocol Discriminator	MM message		0101
Transaction Identifier	not relevant	000	
Message type		0010	0010
Reject cause	IMSI unknown in VLR	4	

II.5.3.7.5.5.6 Requirements 2

1) The MS shall wait for the network to release the RR connection and change its status to "not updated".

2) The MS shall carry out a location updating.

II.5.3.7.5.6 Expiry of timer T 3230

Note: This test is not applicable.

II.5.3.7.6 MM CONNECTION RELEASE

Note: This comes basically down to testing the functioning of timer T3240. Testing of that timer is sufficiently covered by the tests on location updating. No separate test on MM connection release is foreseen.

II.5.3.8 TESTS RELATED TO CIRCUIT SWITCHED CALL CONTROL

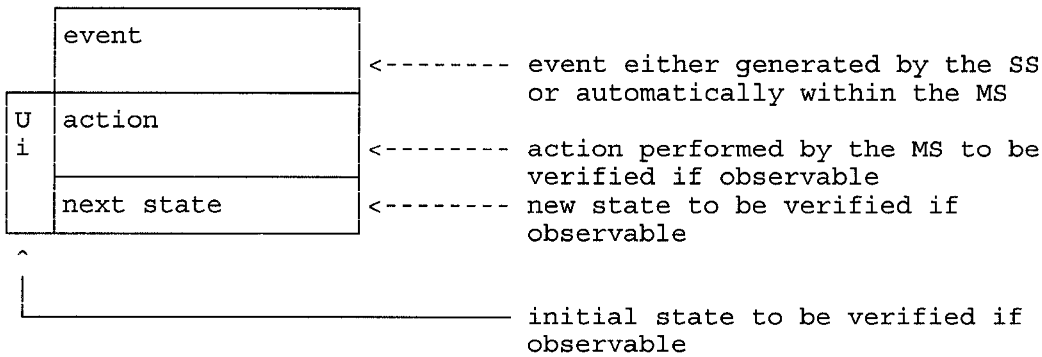
II.5.3.8.1 CIRCUIT SWITCHED CALL CONTROL STATE MACHINE VERIFICATION

The principle of checking the Call Control functions consists in the validation of each Call Control identified state.

Hence Call Control functions are tested by means of a state table. The state table partly relies upon Fig 5.1a/GSM 04.08. A square of the table provides:

- an observable action triggered by a particular event in a defined state,
- the next state.

This picture describes how to use the state table in the test procedure.



State table element description

A couple event/state can be considered as passed if both the new state and action performed by the MS are right provided they are observable.

State U0 as an initial state is not verified in the tests of II.5.3.8.1.2 (Establishment of an outgoing call).

State U0.1 is never verified.

Each square of the table must be passed through to ensure that all the possibilities of leaving a state to another state are tested.

The steps to be followed within each performed test are:

- bring the MS into the required state,
- trigger the tested event,
- check the MS response and new state.

In sections II.5.3.8.1.2 and II.5.3.8.1.3 different tables are defined to bring the MS into the required initial state. The exact table to be chosen is specified individually in each test. For each test, unless otherwise specified, a bearer capability among those supported by the MS must be chosen randomly, and the test must be performed according to that bearer capability.

The pairs event/state which are not mentioned shall result in no observable action or state modification besides the sending of a status message if the event was a message not compatible with the state (cf. GSM 04.08, section 8.5).

The events are either messages sent by the SS or actions performed through the Man Machine Interface (e.g. the depression of a key to send a DTMF).

The following table provides a way of generating the primitives used in this test:

MNCC_SETUP_REQ	MMI action Request to initiate an outgoing call.
MNCC_SETUP_RSP	MMI action (or internally generated) Response to a CONNECT message to indicate call acceptance by the terminating MS.
MNCC_START_DTMF_REQ	MMI action A DTMF key is pressed.
MNCC_STOP_DTMF_REQ	MMI action A DTMF key is released.
MNCC_ALERT_REQ	MS internally generated when an alerting indication is generated locally at the MS. The service primitive requests CC to send an ALERTING message to the NW.
MNCC_REJ_REQ	MS internally generated The call cannot be accepted by the MS because of a) missing compatibility (cause #88) b) an internal rejection of the call (cause #21) after a SETUP message (depends on PICS/PIXIT statement) c) the user being busy (cause #17).
MNCC_DISC_REQ	MMI action hook on
MNCC_REL_REQ	MS internally generated
MMCC_REL_IND	SS action The SS sends a RELEASE message.
MMCC_EST_CNF	SS action The SS positively acknowledges the outgoing MM connection establishment either by establishing the cipher mode or by sending the message CM SERVICE ACCEPT.
MMCC_ERR_IND	SS action The SS generates a lower layer failure at Layer 1 or Layer 2 level.
MMCC_SYNC_IND	SS action The SS assigns a new channel by sending e.g. the message ASSIGNMENT_COMMAND.
MNCC_CALL_CONF_REQ	MS internally generated when an incoming SETUP message meets the MS's bearer capability.
MNCC_MODIFY_REQ	MMI action
MNCC_NOTIFY_REQ	MMI action (see PICS/PIXIT statement)

The states are checked through STATUS_ENQ messages sent by the SS (when feasible both initial and final states are checked).

For the special case of U0, the state is checked by sending STATUS ENQUIRY message with all possible values of Transaction Identifier (seven values) as U0 is the only state in which for every TI the MS will answer with RELEASE COMPLETE with cause #81. If U0 is to be verified when no RR connection exists, first a mobile terminating radio connection must be established.

The MS responses are either Call Management messages received by the SS or lower layers functions activated within the MS or MMI actions (e.g. the buzzing of an alerting tone).

A timeout within the MS is triggered by the SS when it does not answer back an MS expected response.

The test sequences may be split in 3 main groups:

- establishment and release of an outgoing call;
- establishment and release of an incoming call;
- in call functions.

Note: Throughout section II.5.3.8.1, abbreviations for the names of CM messages are used such as "MODIFY_REJ" instead of "MODIFY REJECT". This may cause name conflicts with L2 message names (e.g. "DISC" as an abbreviation for "DISCONNECT"). Unless otherwise indicated, a CM message is meant in such cases.

Remark on verification of transient states:

The following states may be transient, depending on implementation and previous messages:

State U6:

State U6 may be transient if the implementation allows it (see Annex 3, section 1.6). Then there is an internal transition:

$$U6 \xrightarrow{\text{CALL CONF}} U9$$

State U9:

State U9 is not transient if
- the implementation does not support immediate connect and
- an appropriate TCH is not yet assigned and
- the signalling element has not been present in the SETUP.

If the implementation supports immediate connect, there is an internal transition:

```
            CONN
U9 ----------------> U8
```

If the appropriate TCH is available or the signalling element was present in SETUP, there is an internal transition:

```
            ALERT
U9 ----------------> U7
```

State U7:

If the implementation allows for automatic connect after an implementation specific time T, then there is an internal transition:

```
        after T, CONN
U7 ----------------> U8
```

State U12:

U12 is stable if the implementation supports it and progress indicator is present in DISCONNECT and indicates the availability of in-band announcements, otherwise there is an internal transition:

```
            REL
U12 ---------------> U19
```

A test ending in a transient state (this fact may depend on the implementation) can be executed by verifying that the SS receives the message that accompanies the (next) internal transition (see above).

If a test starts in a transient state, then the test is executed without verification of the starting state.

Note that there are situations of chained transient states, e.g.

```
     CALL CONF        ALERT            CONN
U6 -----------> U9 -----------> U7 -----------> U8
```

In these cases, still the above described way to execute the tests holds.

II.5.3.8.1.1 Message definition

messages	fields provided
all messages	protocol discriminator transaction identifier message type
ALERTING	none
CALL_PROCEED	none
CONNECT	none
CONNECT_ACK	none
DISCONNECT	cause progress indicator
MODIFY	bearer capability
MODIFY_COM	bearer capability
MODIFY_REJ	cause bearer capability
NOTIFY	notification indicator
PROGRESS	progress indicator = #8
RELEASE	none
RELEASE_COM	none
SETUP	signal up to 2 bearer capabilities progress indicator
START_DTMF	keypad facility
START_DTMF_ACK	keypad facility
START_DTMF_REJ	cause
STOP_DTMF	none
STOP_DTMF_ACK	none
STATUS_ENQ	none
STATUS	cause call state

Fields provided in the downlink messages

II.5.3.8.1.2 Establishment of an outgoing call

II.5.3.8.1.2.1 Initial conditions

As a minimum requirement the MS is updated and has been given a TMSI, a Ciphering Key and Cipher Key Sequence Number, and the Layer 2, RR and MM functionalities have been verified.

There are as many CM initial conditions as states to be checked.
The tables below describe message exchanges which bring the MS in the requested initial states.

A state may be taken as initial only when all the states which lead to this initial states have been validated. The order followed in the test procedure will be U0, U0.1, U1, U3, U4, U10, U12, U19, U11 as seen in the table underneath.

The MS is brought again in the initial state starting with U0 at each new test performed.

TABLE 1

actions	messages exchanged	MS SS	next state
init outgoing call	CHANN_REQ	-->	
	IMM_ASSIGN (SDCCH)	<--	U0
	CM_SERV_REQ	-->	U0.1
	CIPH_MOD_CMD	<--	
	CIPH_MOD_COM	-->	
	SETUP	-->	U1
	CALL_PROC	<--	U3
	ALERT	<--	U4
	ASSIGN (TCH)	<--	
	ASSIGN_COM	-->	
	CONN	<--	
	CONN_ACK	-->	U10
	DISC	<--	U12
	REL	-->	U19
on hook	(from U10) DISC	-->	U11

TABLE 2

actions	messages exchanged	MS SS	next state
init outgoing call	CHANN_REQ	-->	
	IMM_ASSIGN (TCH)	<--	U0
	CM_SERV_REQ	-->	U0.1
	CHAN_MOD_MODIFY 1)	<--	
	CHAN_MOD_MODIFY_ACK	-->	
	CIPH_MOD_CMD	<--	
	CIPH_MOD_COM	-->	
	SETUP	-->	U1
	CALL_PROC	<--	U3
	ALERT	<--	U4
	CONN	<--	
	CONN_ACK	-->	U10
	DISC	<--	U12
	REL	-->	U19
on hook	(from U10) DISC	-->	U11

Note 1): Assigned channel is appropriate for the chosen bearer capability (see II.5.3.8.1)

TABLE 3

actions	messages exchanged (MS SS)		next state
init outgoing call	CHANN_REQ	-->	
	IMM_ASSIGN (SDCCH)	<--	U0
	CM_SERV_REQ	-->	U0.1
	CIPH_MOD_CMD	<--	
	CIPH_MOD_COM	-->	
	SETUP	-->	U1
	AUTH_REQ	<--	
	AUTH_RESP	-->	
	CALL_PROC	<--	U3
	ASSIGN (TCH)	<--	
	ASSIGN_COM	-->	
	ALERT	<--	U4
	CONN	<--	
	CONN_ACK	-->	U10
	DISC	<--	U12
	REL	-->	U19
on hook	(from U10) DISC	-->	U11

TABLE 4

actions	messages exchanged (MS SS)		next state
init outgoing call	CHANN_REQ	-->	
	IMM_ASSIGN (TCH)	<--	U0
	CM_SERV_REQ	-->	U0.1
	IDENTITY_REQ	<--	
	IDENTITY_RESP	-->	
	CIPH_MOD_CMD	<--	
	CIPH_MOD_COM	-->	
	SETUP	-->	U1
	CHAN_MOD_MODIFY 1)	<--	
	CHAN_MOD_MODIFY_ACK	-->	
	CALL_PROC	<--	U3
	ALERT	<--	U4
	CONN	<--	
	CONN_ACK	-->	U10
	DISC	<--	U12
	REL	-->	U19
on hook	(from U10) DISC	-->	U11

Note 1): Assigned channel is appropriate for the chosen bearer capability (see II.5.3.8.1)

II.5.3.8.1.2.2 Test procedures

II.5.3.8.1.2.2.1 U0 null state

State U0 is reached using Table 2.

	MNCC_SETUP_REQ 2)			
U0	MM connection est. 1)			
	U0.1			

1) MS sends CM_SERVICE_REQ, verify the type of call which is asked for "basic" or "emergency" by the MS.

2) The test is performed for basic call.

II.5.3.8.1.2.2.2 U0.1 MM connection pending

State U0.1 is reached using Table 1.

	MMCC_REL_IND 1)	MMCC_EST_CNF 2)		
U0.1		send SETUP 3)		
	U0	U1		

1) SS sends CM_SERVICE_REJ.

2) SS sends CM_SERVICE_ACC.

3) With called party BCD number.

State U0.1 is reached using Table 1.

	MMCC_ERR_IND 1)			
U0.1	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

II.5.3.8.1.2.2.3 U1 call initiated

State U1 is reached using Table 2.

	CALL_PROC received	REL_COM received 3)	timeout T303 4)	
U1	tone generation 1)	MM connection rel. 2)	send DISC	
	U3	U0	U11	

1) Not mandatory, hence not tested.

2) MS waits for MM layer release initiated by SS.

3) With a valid cause value among:

related to numbering,
#1 unallocated number
#3 no route to destination
#22 number changed
#28 invalid number format

related to bearer capabilities,
#57 bearer capability not authorized
#58 bearer capability not presently available
#63 service or option not available
#65 bearer service not implemented
#34 no circuit/channel available (call queueing).

4) Check T303 timer accuracy (T303 +/-20%) between reception of CM SERVICE REQUEST and DISC by SS.

State U1 is reached using Table 4.

	MMCC_ERR_IND 1)	ALERTING received	CONN received	
U1	MM connection rel.	alerting indication 2)	send CONN_ACK	
	U0	U4	U10	

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

2) Optional, not tested.

State U1 is reached using Table 1.

	unknown message received 1)				
U 1	send STATUS 2)				
	U1				

1) The "message type" field is unknown.

2) With cause value #97 or #98, state U1.

II.5.3.8.1.2.2.4 U3 MS originating call proceeding

State U3 is reached using Table 2.

	ALERT received	CONN received	PROGRESS received 3) 4)	
U 3	tone generation 1)	send CONN_ACK 2)	5) 4)	
	U4	U10	U3	

1) Not mandatory.

2) Stop tone generation if any.

3) Tested with a valid cause value among:
   - #1 call is not end to end PLMN/ISDN
   - #2 destination address is not PLMN/ISDN
   - #4 call has returned to PLMN/ISDN
   - #8 in band information or appropriate pattern now available.

4) It is verified that T310 is stopped, ie at T310 timeout no DISC message is sent by the MS.

5) With progress description value #8 check the availability of in band information at MS side after a TCH has been allocated.

State U3 is reached using Table 2.

	DISC received 2)	DISC received 1)	REL received 4)	
U3	3)	send REL	send REL_COM MM connection rel.	
	U12	U19	U0	

1) Sent without progress indicator.

2) Sent with progress indicator value #8 in band information available.

3) This behaviour may happen, otherwise the MS must send a RELEASE and go to state U19.

4) In case of causes mentioned in GSM 04.08, section 5.4.2.

State U3 is reached using Table 3.

	MNCC_DISC_REQ	MMCC_SYNC_IND (TCH allocation)	timeout T310	
U3	send DISC	L2 establishment on FACCH	send DISC 1)	
	U11	U3	U11	

1) Check T310 timer accuracy from CALL_PROC emission to DISC reception by SS.

State U3 is reached using Table 4.

	MMCC_ERR_IND 1)			
U3	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U3 is reached using Table 1.

	unknown message received 1)				
U3	send STATUS 2)				
	U3				

1) The "message type" field is unknown.

2) With cause value #97 or #98, and state U3.

II.5.3.8.1.2.2.5 U4 call delivered

State U4 is reached using Table 3.

	CONN	MNCC_DISC_REQ		
U4	send CONN_ACK 1)	send DISC		
	U10	U11		

1) Stop alerting indication if applicable.

State U4 is reached using Table 2.

	DISC received 2)	DISC received 1)	REL received 4)	
U4	3)	send REL	send REL_COM MM connection rel.	
	U12	U19	U0	

1) Sent without progress indicator.

2) Sent with progress indicator value #8 in band information available and a TCH channel has been allocated.

3) This behaviour may happen, otherwise the MS must send a RELEASE and go to state U19.

4) In case of causes mentioned in GSM 04.08, section 5.4.2.

State U4 is reached using Table 2.

	MMCC_ERR_IND 1)			
U4	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U4 is reached using Table 3.

	MMCC_SYNC_IND (TCH allocation)			
U4	L2 establishment on FACCH			
	U4			

State U4 is reached using Table 4.

	unknown message received 1)			
U4	send STATUS 2)			
	U4			

1) The "message type" field is unknown.

2) With cause value #97 or #98, and state U4.

II.5.3.8.1.2.2.6 U10 call active

State U10 is reached using Table 1.

	MNCC_DISC_REQ	REL received 1)		
U10	send DISC	send REL_COM MM connection rel.		
	U11	U0		

1) In case of causes mentioned in GSM 04.08, section 5.4.2.

State U10 is reached using Table 2.

	DISC received 2)	DISC received 1)		
U10	3)	send REL		
	U12	U19		

1) Sent without progress indicator.

2) Sent with progress indicator value #8 in band information available.

3) This behaviour may happen, otherwise the MS must send a RELEASE and go to state U19.

II.5.3.8.1.2.2.7 U11 disconnect request

State U11 is reached using Table 3.

	DISC received	REL received	timeout T305	
U11	send REL	send REL_COM MM connection rel.	send REL 2) 1)	
	U19	U0	U19	

1) Check that the time between reception of DISC and REL by the SS exceeds T305.

2) With the same cause value as originally contained in the DISC message. An additional cause information element (#102 recovery on timer expiry) may be included.

State U11 is reached using Table 4.

	MMCC_ERR_IND 1)			
U11	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U11 is reached using Table 4.

	unknown message received 1)			
U11	send STATUS 2)			
	U11			

1) The "message type" field is unknown.

2) With cause value #97 or #98, and state U11.

II.5.3.8.1.2.2.8 U12 disconnect indication

The tests of this section are only applicable if the MS implementation has a stable U12.

State U12 is reached using Table 1.

	MNCC_REL_REQ (on hook)	REL received 1)		
U12	send REL	send REL_COM MM connection rel.		
	U19	U0		

1) In case of causes mentioned in GSM 04.08, section 5.4.2.

State U12 is reached using Table 2.

	MMCC_ERR_IND 1)			
U12	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U12 is reached using Table 3.

	unknown message received 1)			
U12	send STATUS 2)			
	U12			

1) The "message type" field is unknown.

2) With cause value #97 or #98, and state U12.

II.5.3.8.1.2.2.9 U19 release request

State U19 is reached using Table 4.

	1st timeout T308	2nd timeout T308	REL received 2)	REL_COM received
U19	send REL 1)	MM connection rel.	MM connection rel.	MM connection rel.
	U19	U0	U0	U0

1) Check T308 timer accuracy between the 2 receptions of REL by SS.

2) With same cause number as originally contained in DISC and optional cause #102 recovery on timer expiry.

State U19 is reached using Table 1.

	MMCC_ERR_IND 1)			
U19	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

II.5.3.8.1.3 Incoming Call

II.5.3.8.1.3.1 Initial conditions

The tables below describe message exchanges which bring the MS in the requested initial states in case of an incoming call.

A state may be taken as initial only when all the states which lead to this initial states have been validated. The order will be U0, U6, U9, U7, U8, U10, U26 etc. as in the following tables.

TABLE 1

actions	messages exchanged	MS SS	next state
SS sends PAGING with	CHANN_REQ	-->	
	IMM_ASSIGN (SDCCH)	<--	U0
	PAG_RESP	-->	
	AUTH_REQ	<--	
	AUTH_RESP	-->	
	CIPH_MODE_CMD	<--	
	CIPH_MODE_COM	-->	
	SETUP	<--	U6
	CALL_CONF	-->	U9
	ALERT 1)	-->	U7
off hook	CONN	-->	U8
	ASSIGN (TCH)	<--	
	ASSIGN_COM	-->	
	CONN_ACK	<--	U10
initiate modify	MODIFY	-->	U26

Note 1): Depending on a PICS/PIXIT statement, which itself may involve a condition of dependence from the bearer capability chosen for the test, the MS may skip sending the ALERT message.

TABLE 2

actions	messages exchanged	MS SS	next state
SS sends PAGING with	CHANN_REQ	-->	
	IMM_ASSIGN (SDCCH)	<--	U0
	PAG_RESP	-->	
	CIPH_MODE_CMD	<--	
	CIPH_MODE_COM	-->	
	SETUP	<--	U6
	CALL_CONF	-->	U9
	ALERT 1) 2)	-->	U7
	ASSIGN (TCH)	<--	
	ASSIGN_COM	-->	
	CONN	-->	U8
	AUTH_REQ	<--	
	AUTH_RESP	-->	
	CONN_ACK	<--	U10
initiate modify	MODIFY	-->	U26

Note 1): Depending on a PICS/PIXIT statement, which itself may involve a condition of dependence from the bearer capability chosen for the test, the MS may skip sending the ALERT message.

Note 2): It would be possible for the SS to send the ASSIGN command before the ALERT from the MS. In this case the MS shall send the ASSIGN_COM before ALERT; it may send an additional ALERT between ASSIGN and ASSIGN_COM.

TABLE 3

actions	messages exchanged	MS SS	next state
SS sends PAGING with	CHANN_REQ	-->	
	IMM_ASSIGN (TCH)	<--	U0
	PAG_RESP	-->	
	AUTH_REQ	<--	
	AUTH_RESP	-->	
	CIPH_MODE_CMD	<--	
	CIPH_MODE_COM	-->	
	CHAN_MOD_MODIFY 1)	<--	
	CHAN MOD MODIFY ACK	-->	
	SETUP	<--	U6
	CALL_CONF	-->	U9
	ALERT 2)	-->	U7
	CONN	-->	U8
	CONN_ACK	<--	U10
initiate modify	MODIFY	-->	U26

Note 1): Assigned channel is appropriate for the chosen bearer capability (see II.5.3.8.1)

Note 2): Depending on a PICS/PIXIT statement, which itself may involve a condition of dependence from the bearer capability chosen for the test, the MS may skip sending the ALERT message.

TABLE 4

actions	messages exchanged	MS SS	next state
SS sends PAGING with	CHANN_REQ	-->	
	IMM_ASSIGN (SDCCH)	<--	U0
	PAG_RESP	-->	
	CIPH_MODE_CMD	<--	
	CIPH_MODE_COM	-->	
	SETUP (Note 1)	<--	U6
	CALL_CONF	-->	U9
	ASSIGN (TCH)	<--	
	ASSIGN_COM	-->	
	ALERT 2)	-->	U7
	CONN	-->	U8
	AUTH_REQ	<--	
	AUTH_RESP	-->	
	CONN_ACK	<--	U10
initiate modify	MODIFY	-->	U26

Note 1: the signal information element is not included.

Note 2): Depending on a PICS/PIXIT statement, which itself may involve a condition of dependence from the bearer capability chosen for the test, the MS may skip sending the ALERT message.

II.5.3.8.1.3.2 Test procedures

II.5.3.8.1.3.2.1 U0 null state

State U0 is reached using Table 1.

	SETUP received 1)	SETUP received 3)	SETUP received 5)	SETUP received 6)
U0		send REL_COM 4)		
	U6 2)	U0	U6 2)	U6 2)

1) With no optional parameter provided.

2) This state may not be observable if MS immediately responds with CALL_CONF.

3) With bearer capability not supported by the MS.

4) With one of the following cause field values:
#57 bearer capability not authorized
#58 bearer capability not presently available
#65 bearer service not implemented
#88 incompatible destination.

5) With signal information present in the SETUP.

6) With one of the following values for the progress indicator field:
#1 call is not end to end PLMN/ISDN
#3 originating address is not PLMN/ISDN.

II.5.3.8.1.3.2.2 U6 call present

State U6 is reached using Table 2.

	MNCC_CALL_CONF_REQ	MNCC_REJ_REQ 1)	DISC received 5)	REL received 5) 4)
U6	send CALL_CONF	send REL_COM 2)		send REL_COM MM connection rel.
	U9 3)	U0	U19	U0

1) If the ME supports the ability to refuse a call.

2) With cause value #21 call rejected.

3) May not be observable if MS immediately sends ALERT.

4) In case of causes mentioned in GSM 04.08, section 5.4.2.

5) If U6 is transient (implementation option) this is not tested.

State U6 is reached using Table 3.

		MMCC_ERR_IND 2) 1)			
U 6		MM connection rel.			
		U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

2) If U6 is transient (implementation option) this is not tested.

State U6 is reached using Table 1.

		unknown message received 3) 1)			
U 6		send STATUS 2)			
		U6			

1) The "message type" field is unknown.

2) With cause value #97 or #98, and state U6.

3) If U6 is transient (implementation option) this is not tested.

II.5.3.8.1.3.2.3 U9 MS terminating call confirmed

State U9 is reached using Table 2. | State U9 is reached using Table 4.

	MNCC_ALERT_REQ 2)	MNCC_SETUP_RSP 2)	MMCC_SYNC_IND (TCH assignment)	MNCC_DISC_REQ
U 9	send ALERT 1)	send CONN	L2 establishment on FACCH	send DISC 3)
	U7	U8	U9	U11

1) Verify that it is sent only if an alerting indication is given at the MS side.

2) This primitive is internally generated. The MS is allowed to behave as specified for any of the internally generated primitives.

3) If the MS supports the sending of a DISC in state U9.

State U9 is reached using Table 4.

	DISC received 1)	REL received 2)	
U9	send REL	send REL_COM MM connection rel.	
	U19	U0	

1) Sent with or without progress indicator.

2) In case of causes mentioned in GSM 04.08, section 5.4.2.

State U9 is reached using Table 1.

	MMCC_ERR_IND 1)			
U9	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U9 is reached using Table 4.

	unknown message received 1)			
U9	send STATUS 2)			
	U9			

1) The "message type" field is unknown.

2) With cause #97 message type non existent or #98 message not compatible with control state or message type non-existent.
state U9.

II.5.3.8.1.3.2.4 U7 call received

State U7 is reached using Table 3.

	MNCC_SETUP_RSP	MNCC_DISC_REQ		
U7	send CONN	send DISC 1)		
	U8	U11		

1) If the MS supports the sending of a DISC in state U7.

State U7 is reached using Table 1.

	DISC received 1)	DISC received 2)	REL received 3)	
U7	send REL	send REL	send REL_COM MM connection rel.	
	U19	U19	U0	

1) Sent with progress indicator value #8 in band information available.

2) Sent without progress indicator.

3) In case of causes mentioned in GSM 04.08, section 5.4.2 a) or b).

State U7 is reached using Table 2.

	MMCC_ERR_IND 1)			
U7	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U7 is reached using Table 3.

	unknown message received 1)			
U7	send STATUS 2)			
	U7			

1) The "message type" field is unknown.

2) With cause #97 or #98 message not compatible with control state or message type non-existent.

state U7.

State U7 is reached using Table 1.

	MMCC_SYNC_IND (TCH assignment)				
U7	L2 establishment on FACCH				
	U7				

II.5.3.8.1.3.2.5 U8 connect request

State U8 is reached using Table 2.

	CONN_ACK	timeout T313	MNCC_DISC_REQ	
U8		send DISC	send DISC	
	U10	U11	U11	

State U8 is reached using Table 3.

	DISC received 2)	DISC received 1)	REL received 4)	
U8	3)	send REL	send REL_COM MM connection rel.	
	U12	U19	U0	

1) Sent without progress indicator.

2) Sent with progress indicator value #8 in band information available.

3) This behaviour may happen, or the MS may send a RELEASE message and then go to state U19 (see GSM 04.08, 5.4.4.1)

4) In case of causes mentioned in GSM 04.08, section 5.4.2 a) or b).

State U8 is reached using Table 1.

	MMCC_ERR_IND 1)			
U8	MM connection rel.			
	U0			

1) Due to a low layer failure initiated by the SS (e.g. the SS does not respond at L2 level).

State U8 is reached using Table 1.

	MMCC_SYNC_IND (TCH assignment)	unknown message received 1)		
U 8	L2 establishment on FACCH	send STATUS 2)		
	U8	U8		

1) The "message type" field is unknown.

2) With cause #97 message type non existent or #98 message not compatible with control state or message type non-existent.

II.5.3.8.1.4 In call functions

II.5.3.8.1.4.1 Test procedures

II.5.3.8.1.4.1.1 U10 call active

State U10 is reached using Table 2.

	MNCC_START_DTMF_RE	START_DTMF_ACK received 4)	START_DTMF_REJ received 3)	MNCC_STOP_DTMF_REQ 4)
U 10	send START_DTMF 2) 1)			send STOP_DTMF 1)
	U10	U10	U10	U10

1) Verify To > Tomin, Ts > Ts min.
To time between STOP_DTMF_ACK and next START_DTMF sent.
Ts time between START_DTMF_ACK and next STOP_DTMF sent.

2) The test is repeated for each of the characters 0-9, #, * and if applicable A,B,C,D (see PICS Annex 3). It should be verified that the transmitted information corresponds to the digit pressed.

3) Column 1 will always precede column 3.

4) Column 1 will always precede column 2, which will always precede column 4.

State U10 is reached using Table 3.

	STOP_DTMF_ACK received			
U 10				
	U10			

Note: The following test is not yet applicable.

State U10 is reached using Table 1.

	MNCC_NOTIFY_REQ 1)	NOTIFY received 2)		
U10	send NOTIFY			
	U10	U10		

1) May never be created by MS.

2) With notification indicator with successive values: user suspended, user resumed, bearer changed.

State U10 is reached using Table 2.

	MMCC_SYNC_IND 1)	MMCC_SYNC_IND 2)3)		
U10				
	U10	U10		

1) Corresponding to channel assignment or channel mode modify initiated by SS at RM layer.

2) The MS returns to the old channel after a handover failure.

3) SS reestablishes correctly the link.

State U10 is reached using Table 1.

	MODIFY received 1)	MODIFY received 3)	MODIFY received 5)	MODIFY received 7)
U10	send MODIFY_COM 2)	send MODIFY_COM	send MODIFY_REJ 6)	send MODIFY_REJ 8)
	U10	U10	U10	U10

1) With new mode same as actual mode.

2) Contains actual mode as bearer capability.

3) With new mode different from actual mode, but one of those already negotiated and agreed during the establishment phase of the call. This test is not applicable to an MS if it doesn't support dual bearer capability.

4) (reserved).

5) With bearer capability not supported by the MS.

6) With cause value #58 bearer capability not presently available and with old bearer capability.

7) The bearer capability indicated in the MODIFY message does not belong to that already given in the initiating SETUP message. However it is a bearer capability supported by the MS. This test is not applicable to an MS that doesn't support dual bearer capability.

8) With cause value #57 bearer capability not authorized.

Note: The following test is not yet applicable.

State U10 is reached using Table 2.

	MNCC_MODIFY_REQ			
U10	send MODIFY 2) 1)			
	U26			

1) Verify that the bearer capability provided in the MODIFY message is one of that already given in the initial SETUP.

2) Verify that the MS stops sending Bm channel information according to old mode.

II.5.3.8.1.4.1.2 U26 MS originating modify

Note: The tests in this subsection are not yet applicable.

State U26 is reached using Table 1.

	MODIFY_COM rec.	MODIFY_REJ rec. 1)	MODIFY_COM rec. 3)	MODIFY_REJ rec. 5)
U26		2)	4)	4)
	U10	U10	U26	U26

1) With cause #58 bearer capability not presently available and with old bearer capabilities.

2) Verify that the MS resumes sending Bm channel information according to old mode.

3) With a mode that does not correspond to the requested one.

4) No action, the message is ignored.

5) With a mode that does not correspond to the actual one.

State U26 is reached using Table 2.

	timeout T323	MMCC_SYNC_IND 3)		
U26	send DISC 2) 1)			
	U11	U26		

1) Check T323 timer accuracy between emission of MODIFY and reception of DISC by SS.

2) Sent with cause value #102 recovery on timer expiry.

3) Corresponding to channel assignment or channel mode modify initiated by SS at RM layer.

State U26 is reached using Table 3.

	MMCC_SYNC_IND 1)2)			
U26				
	U26			

1) The MS returns to the old channel after a handover failure.

2) SS reestablishes correctly the link.

State U26 is reached using Table 1.

	unknown message received 1)			
U26	send STATUS 2)			
	U26			

1) The "message type" field is unknown.

2) With cause #97 or #98 message not compatible with control state or message type non-existent.
state U26.

II.5.3.8.2 EMERGENCY CALL ESTABLISHMENT

II.5.3.8.2.1 Introduction

Emergency call establishment can be initiated by an MS in any state of the mobility management sub-layer i.e. whether location updating has been successful or failed for any reason, including SIM removal.

The emergency call establishment uses a unique EMERGENCY SETUP message and includes a field identified as emergency in the CHANNEL REQUEST message and the CM SERVICE REQUEST message. An MS shall only perform an emergency call establishment if it is equipped for voice telephony. Therefore the tests in section II.5.3.8.2 are not applicable to Mobile Stations not supporting speech (see PICS/PIXIT statement).

It seems obvious that the network would not want to initiate an authentication procedure if IMEI has been sent in the CM SERVICE REQUEST message because the MS has no SIM, so this is not tested, even though it is not specifically prohibited in REC GSM 04.08.

The passages of unique interest to emergency call establishment in REC GSM 04.08 are 5.2.1.2 and 4.5.1.5.

II.5.3.8.2.2 Purpose of the test

The purpose of this test is to verify that the MS can :

- correctly setup an emergency call;
- set up an emergency call if it has no IMSI, TMSI allocated;
- be rejected during an emergency call establishment.

It is not the purpose of this test to verify that the MS can send an emergency call when any MS features have been set. In these cases, as directed in other tests, only the section II.5.3.8.2.4 or 6 should be tested.

II.5.3.8.2.3 Initial conditions

The SS simulates one cell with BCCH, CCCH, SDCCH and TCH.

The MS shall be in the "idle updated" state as after a successful location update in test II.5.3.2.4.

II.5.3.8.2.4 Emergency call establishment (idle updated)

II.5.3.8.2.4.1 Procedure 1

After the initial conditions have been established the number 112 is dialled on the MS to initiate an emergency call.

II.5.3.8.2.4.2 Response requirement 1

The MS sends a Random Access channel request.

Message: CHANNEL REQUEST.

Information Element	Comment	Value
Establ. cause	Emergency	101 (binary)
reference random	arbitrary	

All other requirements of this random access have been tested in II.5.3.3.2.2.

II.5.3.8.2.4.3 Procedure 2

The SS responds to the MS with an immediate assignment message allocating a SDCCH.

Message : IMMEDIATE ASSIGNMENT.

Information Element	Comment	Value
Protocol discriminator	RR management	0110 (bin)
Transaction identifier		0000 (bin)
Message type	Immediate assignment	0011 1111 (binary)
Page mode	normal paging	
Channel description	SDCCH	
Request reference	as sent by the MS	
Timing advance		
Mobile allocation		
Starting time		

II.5.3.8.2.4.4 Response requirement 2

The MS goes to the correct SDCCH. The message sent on the SDCCH is CM service request with CM service type set to Emergency.

Message : CM SERVICE REQUEST.

Information Element	Comment	Value
Protocol discriminator	MM message	0101
Transaction identifier	not relevant	000
Message type		0x10 0100
CM service type	emergency call	0010
Ciphering key sequence number	as stored in the MS	
Mobile station classmark 2	as specified by manufacturer	
Mobile identity	TMSI	

II.5.3.8.2.4.5 Procedure 3

The SS performs a successful authentication with the MS as tested in II.5.3.7.2.2.

The SS performs a successful cipher mode setting with the MS as tested in II.5.3.6.8.3.1.

II.5.3.8.2.4.6 Response requirement 3

The MS shall consider the cipher mode setting as acceptance of its CM service request and so send an emergency setup message.

Message: EMERGENCY SETUP

Information Element	Comment	Value	
Protocol discriminator	CC		0011
Transaction identifier			
Message type		0x00	1110
Bearer capability	Optional		

II.5.3.8.2.4.7 Procedure 4

The SS continues the call setup with the MS as tested in II.5.3.9.2 or by :

- sending a call proceeding message
- sending an alert message
- assigning the appropriate full rate or half rate speech traffic channel
- performing a connect procedure.

The SS shall check that a two way audio path has been established.

The SS then clears the call as tested in II.5.3.9.2 by :

- sending a disconnect
- sending a release complete in response to the MS release
- sending a channel release.

II.5.3.8.2.5 Emergency call establishment (Idle Updated) Exception testing

II.5.3.8.2.5.1 Description

If an MS is equipped for both full rate and half rate speech, test II.5.3.8.2.4 shall be performed for the MS operating at its preferred rate and then repeated with its non-preferred rate. The MS shall send the bearer capability of the non-preferred rate in the emergency setup.

II.5.3.8.2.6 Emergency call establishment (Idle, no IMSI)

II.5.3.8.2.6.1 Procedure 1

The SS simulates one cell. The MS is powered on without the SIM inserted. The number 112 is dialled on the MS to initiate an emergency call.

II.5.3.8.2.6.2 Response requirement 1

The MS sends a Random Access Channel request.

Message: CHANNEL REQUEST

Information Element	Comment	Value
Establ. cause	Emergency	101 (binary)
random reference	arbitrary	

All other requirements of this random access have been tested in II.5.3.3.2.2.

II.5.3.8.2.6.3 Procedure 2

The SS responds to the MS with an immediate assignment message allocating a SDCCH.

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value
Protocol discriminator	RR Management	0110 (bin)
Transaction identifier	orig. side and RR	0000 (bin)
Message type	Immediate Assignment	0011 1111 (binary)
Page mode	normal paging	00
Channel description	SDCCH	
Request reference	as sent by the MS	
Timing advance		
Mobile allocation		
Starting time		

II.5.3.8.2.6.4 Response requirement 2

The MS goes to the correct SDCCH. The message sent on the SDCCH is CM service request.

Message : CM SERVICE REQUEST.

Information Element	Comment	Value
Protocol discriminator	MM message	0101
Transaction identifier	not relevant	000
Message type		0x10 0100
CM service type	emergency call	0010
Ciphering key sequence number	as stored in the MS	
Mobile station classmark 2	as specified by manufacturer	
Mobile identity	IMEI	

Note: IMEI Mobile Identity.

II.5.3.8.2.6.5 Procedure 3

The SS responds to the MS with a CM service accept message.

Messag: CM SERVICE ACCEPT

Information Element	Comment	Value
Protocol discriminator	MM message	0101
Transaction identifier	not relevant	000
Message type		0010 0001

II.5.3.8.2.6.6 Response requirement 3

The MS shall send an Emergency Setup message.

Message: EMERGENCY SETUP

Information Element	Comment	Value	
Protocol discriminator	CC message		0011
Transaction identifier			
Message type		0x00	1110
Bearer capability	Optional		

II.5.3.8.2.6.7 Procedure 4

The SS continues the call setup with the MS as tested in II.5.3.9.2 or by:

- sending a call proceeding message
- sending an alert message
- assigning the appropriate full rate or half rate speech traffic channel
- performing a connect procedure.

The SS shall check that a two way audio path has been established.

The SS then clears the call as tested in II.5.3.9.2 by :

- sending a disconnect
- sending a release complete in response to the MS release
- sending a channel release.

II.5.3.8.2.7 Emergency Call Rejection

The only rejection test for emergency call establishment is for the SIM removed case.

II.5.3.8.2.7.1 Procedure 1

The SS simulates one cell. The MS is powered on without the SIM inserted. The number 112 is dialled on the MS to initiate an emergency call.

II.5.3.8.2.7.2 Response requirement 1

The MS sends a Random Access Channel request.

Message: CHANNEL REQUEST

Information Element	Comment	Value
Establ. cause	Emergency	101 (binary)
random reference	arbitrary	

All other requirements of this random access have been tested in II.5.3.3.2.2.

II.5.3.8.2.7.3 Procedure 2

Message: IMMEDIATE ASSIGNMENT

Information Element	Comment	Value	
Protocol discriminator	RR Management	bin	0110
Transaction identifier	not relevant	0000	(bin)
Message type	Immediate Assignment	0011	1111 (binary)
Page mode	normal paging		
Channel description	SDCCH		
Request reference	as sent by the MS		
Timing advance			
Mobile allocation			
Starting time			

II.5.3.8.2.7.4 Response Requirement 2

The MS goes to the correct SDCCH as tested in II.5.3.3.2.3 except that the message sent on the SDCCH is CM service request.

Message: CM SERVICE REQUEST

Information Element	Comment	Value	
Protocol discriminator	MM message		0101
Transaction identifier	not relevant	000	
Message type		0x10	0100
CM service type	emergency call	0010	
Ciphering key sequence number	as stored in the MS		
Mobile station classmark 2	as specified by manufacturer		
Mobile identity	IMEI		

Note: IMEI Mobile Identity.

II.5.3.8.2.7.5 Procedure 3

The SS responds to the MS with a CM Service Reject message .

Message: CM SERVICE REJECT

Information Element	Comment	Value	
Protocol discriminator	MM message		0101
Transaction identifier	not relevant	000	
Message type		0010	0010
Reject cause	IMEI not accepted	0000	0101

There shall be no emergency call set up from MS.

II.5.3.8.3 CALL RE-ESTABLISHMENT

II.5.3.8.3.1 Introduction

The call re-establishment procedure is used to re-instate a call which has failed due to a lower layer failure. It is described in GSM 04.08, sections 4.5.1.6 and 5.5.4.

This test only applies to MS supporting speech and to non-speech MS supporting call re-establishment (see PIXIT).

II.5.3.8.3.2 Purpose of the test

The purpose of these test is to verify that the MS can correctly perform a call re-establishment and that re-establishment attempts are carried out only when this is allowed.

II.5.3.8.3.3 Call present, re-establishment allowed

II.5.3.8.3.3.1 Initial conditions

The SS simulates cells A and B which have equal LAI. The conditions of cells A and B shall allow call re-establishment:

Cell B is not barred, the RACH control parameters Information Element sent in SYSTEM INFORMATION TYPE 1 to 4 of cell B specifies 'Call Reestablishment allowed in the cell', the NCC of cell B is indicated as permitted in the PLMN permitted Information Element of SYSTEM INFORMATION TYPE 2 and 6 of cell A.

II.5.3.8.3.3.2 Procedure

The MS is brought into the idle, updated state in cell A, and a call is established according to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to k).

The SS then stops transmission on the TCH/SACCH. The RF level of cell A is lowered in order to force the MS to select cell B.

In the required re-establishment of the call, after the radio link time-out, the SS applies the following procedure on cell B:

a) The SS accepts the CHANNEL REQUEST message and returns the IMMEDIATE ASSIGNMENT message.

b) The SS accepts the CM-REESTABLISHMENT REQUEST message from the MS via the data link establishment procedure.

c) The SS sends message CIPHERING MODE COMMAND and starts deciphering.

d) After reception of CIPHERING MODE COMPLETE the SS starts enciphering.

e) The SS then sends message ASSIGNMENT COMMAND.

f) Having received message ASSIGNMENT COMPLETE, the SS enters conversation state.

The contents of the messages shall be according to section "Structured procedures, Mobile originating call, early assignment, Method of test".

II.5.3.8.3.3.3 Requirements

After expiry of the radio link timeout the MS shall re-establish the call according to the following procedure:

1) Before step a) the MS shall initiate immediate assignment by sending the CHANNEL REQUEST message with establishment cause set to call re-establishment.

2) After step a) the MS shall send a Layer 2 SABM frame containing the CM REESTABLISHMENT REQUEST message to the SS.

3) After step c) the MS shall activate ciphering and send the message CIPHERING MODE COMPLETE.

4) After step e) the MS shall send the message ASSIGNMENT COMPLETE on the correct channel.

The MS shall then through-connect the speech path in both directions.

The contents of the messages shall be according to section "Structured procedures, Mobile originating call, early assignment, Requirements" with the following change/addition:

In message CHANNEL REQUEST the establishment cause shall be call re-establishment.

Message: CM-REESTABLISHMENT REQUEST (GSM 04.08, 9.2.4) to the SS:

Information Element	Comment	Value
Protocol discriminator	MM	0101
Transaction identifier	Not used	0000
Message type		0x10 1000
Ciphering key seq.number	As applic.from loc.upd	xxx
MS classmark 2		
- Revision level	As applicable	xxx
- Encryption algorithm	A5	00
- RF power capability	As applicable	xxx
- Short message capability	As applicable	x
- Frequency band	Band no 0	000
Mobile identity		
- Odd/even no of digits	As applicable	x
- Type of identity	TMSI	100
- Identity digits	As applicable	
Location area identification	Cell B	

II.5.3.8.3.4 Call present, re-establishment not allowed

II.5.3.8.3.4.1 Initial conditions

The RE field of the RACH control parameters information element broadcast in messages SYSTEM INFO TYPE 1, 2, 3 and 4 of the serving cell is set to "Call Reestablishment not allowed in the cell".

II.5.3.8.3.4.2 Procedure

a) The MS is brought into the idle, updated state and a call is established according to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to k).

b) The SS then stops transmission on the TCH/SACCH.

II.5.3.8.3.4.3 Requirements

1) The MS shall not try to re-establish the call, but return to the idle, updated state.

II.5.3.8.3.5 Call under establishment, re-establishment allowed

II.5.3.8.3.5.1 Initial conditions

The default conditions of the serving cell shall allow call re-establishment (bit RE is set to 0).

II.5.3.8.3.5.2 Procedure

a) The MS is brought into the idle, updated state.

b) Call establishment is started according to the procedures of section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to h).

c) The SS then stops transmission on the SDCCH/SACCH.

II.5.3.8.3.5.3 Requirements

1) The MS shall not try to re-establish the call, but return to the idle, updated state.

II.5.3.8.4 DTMF INFORMATION TRANSFER

Note: The values [Ts] and [To] are used below. [Ts] is the minimum send duration and [To] is the minimum off time between tones as specified in CEPT T/CS 46-02.

II.5.3.8.4.1 Purpose

The purpose of this test is to verify that the MS can cause DTMF tones to be generated by the network in a correct manner.

II.5.3.8.4.2 Procedure 1

a) The MS is brought into the idle, updated state and a call is established according to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to k).

b) The MS is made to send one DTMF character.

c) The character is acknowledged by the SS using message START DTMF ACK.

Message: START DTMF ACK (GSM 04.08, 9.3.18) to the MS:

information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	MS orig.	1xxx	
Message Type		0011	0110
Keypad facility	IEI	0010	1100
	IA5 character	xxxx	xxxx

II.5.3.8.4.3 Requirements 1

1) The MS shall send message START DTMF on the main DCCH.

Message: START DTMF (GSM 04.08, 9.3.17) to the SS:

Information element	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	0xxx
Message Type		0x11 0101
Keypad facility	IEI	0010 1100
	IA5 character	xxxx xxxx

II.5.3.8.4.4 Procedure 2

a) The MS is made to trigger stopping of transmission of the DTMF tone at a point in time greater than or equal to [Ts] after receiving START DTMF ACK.

b) After reception of message STOP DTMF the SS sends message STOP DTMF ACK on the main DCCH indicating that the sending of the DTMF tone has been stopped.

Message: STOP DTMF ACK (GSM 04.08, 9.3.23) to the MS:

Information element	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	1xxx
Message Type		0011 0010

II.5.3.8.4.5 Requirements 2

1) The MS shall send message STOP DTMF on the main DCCH at minimum [Ts] after reception of message START DTMF ACK.

Message: STOP DTMF (GSM 04.08, 9.3.22) to the SS:

Information element	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	0xxx
Message Type		0x11 0001

II.5.3.8.4.6 Procedure 3

a) Procedures 1 and 2 are repeated after one another in such a way that the following characters should be transmitted: 0, 1, ... 9, *, # (, A, B, C, D if available on the MS). The time between characters (from STOP DTMF ACK to next START DTMF) shall be greater than [To].

II.5.3.8.4.7 Requirements 3

1) The requirements 1 and 2 above apply and the MS shall transmit the characters in the sequence in which they were keyed in.

II.5.3.8.4.8 Procedure 4

a) Procedures 1 and 2 are repeated after one another in such a way that two different, arbitrary, characters are transmitted. The time between characters (from STOP DTMF ACK to next START DTMF) shall be less than [To].

II.5.3.8.4.9 Requirements 4

1) The MS shall transmit the characters in the sequence in which they were keyed in.

2) The time between the first STOP DTMF ACK and the second START DTMF shall be at least [To].

II.5.3.8.4.10 Procedure 5

a) Procedures 1 and 2 are repeated after one another in such a way that two different, arbitrary, characters are transmitted. However, the "sending time" (from START DTMF to STOP DTMF) shall be less than [Ts]. The time between characters (from STOP DTMF ACK to next START DTMF) shall be less than [To].

II.5.3.8.4.11 Requirements 5

1) The MS shall transmit the characters in the sequence in which they were keyed in.

2) The second START DTMF message shall be sent at least [To] after the STOP DTMF ACK of the first character.

3) Each STOP DTMF message shall be sent at least [Ts] after its corresponding START DTMF ACK message.

II.5.3.8.4.12 Procedure 6

The purpose of this procedure is to ensure future compatibility when downlink DTMF has been introduced.

a) The MS is brought into the idle, updated state and a call is established according to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to l).

b) The SS sends message START DTMF.

Message: START DTMF (GSM 04.08, 9.3.17) to the MS:

Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS orig.	0xxx	
Message Type		0011	0101
Keypad facility	IEI	0010	1100
	IA5 character	xxxx	xxxx

c) The SS then checks the call state of the MS by sending message STATUS ENQUIRY.

Message: STATUS ENQUIRY (GSM 04.08, 9.3.21) to the MS:

Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS orig.	0xxx	
Message Type		0011	0100

d) After the MS has reported its call state the SS sends message STOP DTMF.

Message: STOP DTMF (GSM 04.08, 9.3.22) to the MS:

Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS orig.	0xxx	
Message Type		0011	0001

e) The SS again checks the call state of the MS by sending message STATUS ENQUIRY as above.

II.5.3.8.4.13 Requirement 6

1) The MS shall not transmit any of the messages START DTMF ACK or STOP DTMF ACK. The MS may send a STATUS message with cause value #97 or #98 as a response to START DTMF or STOP DTMF messages. The MS shall not change its call state. The MS response to message STATUS ENQUIRY shall in both cases be message STATUS.

Message: STATUS (GSM 04.08, 9.3.20) to the SS:

Information element	Comment	Value	
Protocol Discriminator	CC		0011
Transaction Identifier	SS orig.	1xxx	
Message Type		0x11	1101
Cause			
- Coding standard	GSM	11	
- Location	User	0000	
- Cause value	30 (Rsp to STAT.ENQ)	001	1110
Call state			
- Coding standard	GSM	11	
- Call state value	U10 - Active	00	1010

Note 1: DTMF rejection by the network is not tested since no requirements on the MS are defined in GSM 04.08.

Note 2: There is no test for DTMF in the downlink direction.

II.5.3.8.5 USER TO USER SIGNALLING

II.5.3.8.5.1 Purpose of the test

The purpose of this test is to verify that inclusion of the 'user-user' information element in a 'call-control' message causes no adverse effects on MS operation.

The 'user to user' information element is used to convey information between the mobile user and a remote ISDN user.

Note: There is no test for an MS originating call including a 'user-user' information element since it is not a mandatory MS feature.

II.5.3.8.5.2 Method of test

II.5.3.8.5.2.1 Initial conditions.

1) The SS shall simulate a BSS with CCCH and BCCH.

2) The MS shall be placed in the MM-state "idle,updated" (refer location updating accepted II.5.3.6.4.1).

II.5.3.8.5.2.2 Procedure 1

a) The SS shall page the MS and establish a normal call.

b) The SETUP message from the SS shall contain a 'user-user' information element.

Message: SETUP (GSM 04.08, 9.3.15)

Information Element	Comment	Value	
Message type	setup		
Bearer capabilities	(see note 2)B.C. iei		
	length		
	full rate speech		
User-user	user-user iei		
	length		
	PD (see note 1)	0000	0000
	user-user(see note 1)	0000	0000

NOTE 1: The codings above are for example only. For the case of an MS which supports 'user-user' signalling it may be necessary to add meaning to the data fields.

NOTE 2: An applicable bearer capability shall be used, see PICS/PIXIT statement.

II.5.3.8.5.2.3 Procedure 2

a) The SS shall initiate call cleardown and include in the subsequent DISCONNECT message a 'user-user' information element.

Message: DISCONNECT (GSM 04.08, 9.4.16)

Information Element	Comment	Value	
Protocol discriminator	call-control		0011
Transaction identifier	originating	1xxx	
Message type	disconnect	0x10	0101
Cause	(MV)		
	length (4 bytes)	0000	0010
	coding std(gsm)	0110	0000
	cause (normal)	1001	0000
User-user	user-user iei	0111	1110
	length (4 bytes)	0000	0010
	PD (see note)	0000	0000
	user-user(see note)	0000	0000

NOTE: The coding above is for example only. For the case of an MS which supports 'user-user' signalling it may be necessary to add meaning to the data fields.

II.5.3.8.5.3 Requirements

II.5.3.8.5.3.1 Requirement to Procedure 1

1) The MS shall respond to paging.

2) The MS shall not be adversely affected by the inclusion of the information element and shall successfully establish a normal call.

II.5.3.8.5.3.2 Requirements to Procedure 2

1) The MS shall not respond adversely to the inclusion of the 'user-user' information element in the DISCONNECT message and shall continue to clear the call normally.

II.5.3.9 TESTING OF STRUCTURED PROCEDURES

Ref: GSM 04.08 sections 7.3.2 through 7.3.4

II.5.3.9.1 GENERAL

The purpose of these tests is to complement the testing of elementary procedures to verify that the MS functions also in the "field" and not only on the "test bench".

The elementary procedures are combined into sequences, "structured procedures" as defined in GSM 04.08 section 7, representing true sequences of events for normal MS operation.

Only the main structured procedures are deemed necessary to test.
Mobile originating and terminating calls are tested in cases of both early and late assignment of traffic channel.
In two of the cases the call establishment test is followed by testing of call release initiated by network and mobile respectively.

The tests are performed only for a successful outcome of each elementary procedure.

Time requirements are indicated typically "(T3240-MM-MS)", showing timer identity, sublayer and (MS/NW) side where the timer is used (NW = Network).

The timer values are defined in GSM 04.08, section 11.

For an MS supporting speech the test procedures in II.5.3.9.2, II.5.3.9.3, II.5.3.9.4 and II.5.3.9.5 are performed for speech (teleservice 11, telephony)

For an MS not supporting speech, for each of the test procedures in II.5.3.9.2, II.5.3.9.3, II.5.3.9.4, and II.5.3.9.5 a teleservice supported by the MS (see PICS/PIXIT statement) is chosen, and the test is performed corresponding to that teleservice.

In cases where the tested teleservice is supported via an R or S interface and initiation of a Mobile Originated Call (MOC) can be performed via the MMI, or through the appropriate interface, procedure II.5.3.9.2 shall be performed when initiating the MOC from the MMI and procedure II.5.3.9.3 shall be performed when initiating the MOC through the appropriate interface.

II.5.3.9.2 MS ORIGINATING CALL ESTABLISHMENT, EARLY ASSIGNMENT, RELEASE INIT. BY NETWORK

II.5.3.9.2.1 Purpose of the test

a) To test the MS ability to originate a call following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.2.1a.

b) To test the MS ability to release a call, when the release is initiated by the network, following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.4a.

c) To verify the MS display of the called number (cf. PICS/PIXIT statement).

II.5.3.9.2.2 Method of test

a) The SS simulates one cell using the default parameter values for "cell 1" in section II.5.3.3 "Test of MS functions in Idle Mode".

b) The MS is brought into the MM state "idle, updated", with a TMSI assigned, listening to the BCCH/CCCH of the active cell.

c) The MS is made to initiate a call for the teleservice selected for the test and the SS accepts the CHANNEL REQUEST message and returns the IMMEDIATE ASSIGNMENT message before the timer (T3120-RR-MS) has expired, assuming that the randomly drawn value of T3120 is the lowest possible.

d) The SS accepts the service request from the MS via the data link establishment procedure.

e) The SS sends message AUTHENTICATION REQUEST.

f) After reception of AUTHENTICATION RESPONSE the SS sends message CIPHERING MODE COMMAND within (T3230-MM-MS) seconds after the first access burst, and starts deciphering.

g) After reception of CIPHER MODE COMPLETE the SS starts enciphering.

h) The SS sends the message CALL PROCEEDING within (T303-CC-MS) seconds after the SS has received the message SETUP.

i) The SS then sends message ASSIGNMENT COMMAND.

j) Having received message ASSIGNMENT COMPLETE, the SS sends the message ALERTING within (T310-CC-MS) seconds after the sending of CALL PROCEEDING.

k) Within (T301-CC-MS) seconds after ALERTING the SS sends the CONNECT message.

l) The SS initiates clearing of the call by sending the message DISCONNECT.

m) Within (T308-CC-MS) seconds after reception of the message RELEASE the SS sends RELEASE COMPLETE followed, within a further (T3240-MM-MS) seconds, by CHANNEL RELEASE.

Message IMMEDIATE ASSIGNMENT (GSM 04.08, 9.1.17) to the MS:

	Comment	Value
Protocol Discriminator	RR	011
Transaction Identifier	Not used	0000
Message Type		0011 1111
Page mode	Normal	00
Channel description		
- Channel type ...	SDCCH/SACCH 1(4)	0 0100
- Time slot number	Arbitrary	xxx
- Training seq.code		(default)
- Hopping	No	0
- FB no.	Band no 0	000
- ARFCN		(default)
Random reference		
- Random access info	As in CHAN REQ	111x xxxx
- N51, N32, N26	As applicable	....
Timing advance	Arbitrary	xx xxxx
Mobile allocation	Length=0 (due to hopping)	0

Message AUTHENTICATION REQUEST (GSM 04.08, 9.2.2) to the MS:

	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	Not used	0000
Message Type		0001 0010
Ciphering key seq.number	As applic.from loc.upd	xxx
Authent.parameter RAND	As applicable	(128 bits)

Message CIPHERING MODE COMMAND (GSM 04.08, 9.1.9) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0011 0101
Cipher mode setting	Start ciphering	1

Message CALL PROCEEDING (GSM 04.08, 9.3.3) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	1xxx
Message Type		0000 0010

Message ASSIGNMENT COMMAND (GSM 04.08, 9.1.2) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0010 1110
Channel description		
- Channel type ...	Bm+ACCHs	0 0001
- Time slot number	Arbitrary	xxx
- Training seq.code		(default)
- Hopping	No	0
- FB no	Band no 0	000
- ARFCN		(default)
Power level	As applicable	x xxxx
Channel mode	Appropriate for teleservice selected for the test	

Message ALERTING (GSM 04.08, 9.3.1) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	1xxx
Message Type		0000 0001

Message CONNECT (GSM 04.08, 9.3.5) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	1xxx
Message Type		0000 0111

Message DISCONNECT (GSM 04.08, 9.3.7) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	SS orig.	0xxx
Message Type		0010 0101
Cause		
- Coding standard	GSM	11
- Location	User	0000
- Cause value	Normal clearing	001 0000

Message RELEASE COMPLETE (GSM 04.08, 9.3.15) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	SS orig.	0xxx
Message Type		0010 1010

Message CHANNEL RELEASE (GSM 04.08, 9.1.7) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0000 1101
RR cause	Normal release	0000 0000

II.5.3.9.2.3 Requirements

1) In step c) the MS shall display the dialled number in the way described in a PICS/PIXIT statement.

2) In step c) the MS shall initiate immediate assignment by sending the CHANNEL REQUEST message.

3) In step d) the MS shall send a layer 2 SABM frame containing the CM SERVICE REQUEST message to the SS. (The same message is returned in a layer 2 UA frame from the SS). The SABM frame shall be sent after reception of the IMMEDIATE ASSIGNMENT message.

4) In step e) the MS shall send the message AUTHENTICATION RESPONSE with the correct signed response. (Time requirements should be tested in the elementary procedure)

5) In step f), within 1 second from CIPHERING MODE COMMAND, the MS shall activate ciphering and send the message CIPHERING MODE COMPLETE followed by the SETUP message

Note: In requirement 5), the time of 1 second is not intended to be a performance requirement, it is introduced only because it is necessary to indicate how long the SS will wait until it decides that there is a failure.

6) In step i) the MS shall send the message ASSIGNMENT COMPLETE on the correct channel after reception of the ASSIGNMENT COMMAND.

7) Reserved.

8) In step k) the MS shall send the message CONNECT ACKNOWLEDGE after reception of CONNECT, and through-connect the traffic channel in both directions.

9) In step l) the MS shall send the message RELEASE after it has received the message DISCONNECT from the SS, initiating call release.

10) After step m) the MS shall enter the idle, updated state.

Message CHANNEL REQUEST (GSM 04.08, 9.1.8) to the SS:

	Comment	Value
Random reference		x xxxx
Cause	Orig. call	111

Message CM SERVICE REQUEST (GSM 04.08, 9.2.7) to the SS:

	Comment	Value
Protocol discriminator	MM	0101
Transaction identifier	Not used	0000
Message type		0x10 0100
CM service type	Mob.orig.call est.	0001
Ciphering key seq.number	As applic.from loc.upd	xxx
MS classmark 2		
- Revision level	As applicable	xxx
- Encryption algorithm	A5	00
- RF power capability	As applicable	xxx
- Short message capability	As applicable	x
- Frequency band	Band no 0	000
Mobile identity		
- Odd/even no of digits	As applicable	x
- Type of identity	TMSI	100
- Identity digits	As applicable	....

Message AUTHENTICATION RESPONSE (GSM 04.08, 9.2.3) to the SS:

	Comment	Value
Protocol discriminator	MM	0101
Transaction identifier	Not used	0000
Message type		0x01 0100
Authentication parameter	SRES, as applicable (32 bits)	

Message CIPHERING MODE COMPLETE (GSM 04.08, 9.1.10) to the SS:

	Comment	Value
Protocol discriminator	RR	0110
Transaction identifier	Not used	0000
Message type		0011 0010

Message SETUP (GSM 04.08, 9.3.16) to the SS:

	Comment	Value
Protocol discriminator	CC	0011
Transaction identifier	MS orig.	0xxx
Message type		0x00 0101
Bearer capability	appropriate to the teleservice selected for the test	
Mobile identity	Info element may be present	
- Odd/even no of digits	As applicable	x
- Type of identity	TMSI	100
- Identity digits	As applicable	....
Called party BCD number		
- Type of number	As applicable	xxx
- Numbering plan id.	As applicable	xxxx
- Digits	As applicable	....

Message ASSIGNMENT COMPLETE (GSM 04.08, 9.1.3) to the SS:

Message CONNECT ACKNOWLEDGE (GSM 04.08, 9.3.6) to the SS:

	Comment	Value
Protocol discriminator	CC	0011
Transaction identifier	MS orig.	0xxx
Message type		0x00 1111

Message RELEASE (GSM 04.08, 9.3.14) to the SS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	SS orig.	1xxx
Message Type		0x10 1101

II.5.3.9.3 MS ORIGINATING CALL ESTABLISHMENT, LATE ASSIGNMENT

II.5.3.9.3.1 Purpose of the test

To test the MS ability to originate a call following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.2.1b.

II.5.3.9.3.2 Method of test

a) The first part of the method of test is identical to the case of early assignment of traffic channel (see previous section) up to and inclusive of the SS sending the CALL PROCEEDING message. Thereafter, the following applies:

b) The SS sends the message ALERTING within (T310-CC-MS) seconds after the message CALL PROCEEDING was sent. The ALERTING message contents shall be the same as in section II.5.3.9.2.2.

c) The SS then sends message ASSIGNMENT COMMAND. The message contents shall be the same as in section II.5.3.9.2.2.

d) Having received message ASSIGNMENT COMPLETE, the SS sends message CONNECT within (T301-CC-MS) seconds after message ALERTING was sent. The CONNECT message contents shall be the same as in section II.5.3.9.2.2.

Note: Clearing of the call is not part of the test procedure.

II.5.3.9.3.3 Requirements

1) The first part of the requirements is identical to the case of early assignment of traffic channel (see previous section) up to and inclusive of the MS sending the SETUP message. Thereafter, the following applies:

2) Reserved.

3) In step c) the MS shall send the message ASSIGNMENT COMPLETE on the correct channel after reception of ASSIGNMENT COMMAND. The ASSIGNMENT COMPLETE message contents shall be the same as in section II.5.3.9.2.3.

4) In step d) the MS shall send the message CONNECT ACKNOWLEDGE after reception of CONNECT, and through-connect the traffic channel in both directions.

II.5.3.9.4 MS TERMINATING CALL ESTABLISHMENT, EARLY ASSIGNMENT, RELEASE INIT. BY MS

II.5.3.9.4.1 Purpose of the test

a) To test the MS ability to respond correctly to a mobile terminating call following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.2.1b.

b) To test the MS ability to initiate and fulfil the release of a call, following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.4b.

II.5.3.9.4.2 Method of test

a) The SS simulates one cell using the default parameter values for "cell 1" in section II.5.3.3 "Test of MS functions in Idle Mode".

b) The MS is brought into the MM state "idle, updated", with a TMSI assigned, listening to the BCCH/CCCH of the active cell.

c) The MS is paged by means of a PAGING REQUEST TYPE 1 message on the correct paging subchannel.

d) After reception of the CHANNEL REQUEST the SS returns the IMMEDIATE ASSIGNMENT message before the timer (T3120-RR-MS) has expired, assuming that the randomly drawn value of T3120 is the lowest possible.

e) The SS accepts the paging response from the MS via the data link establishment procedure.

f) Immediately after the data link establishment the SS sends AUTHENTICATION REQUEST.

g) Following the correct AUTHENTICATION RESPONSE from the MS the SS sends CIPHERING MODE COMMAND and then starts ciphering.

h) The SS sends the message SETUP immediately after reception of CIPHERING MODE COMPLETE. The SETUP message shall not include the 'signal' information element.

i) When the SS has received a CALL CONFIRMED message, it sends message ASSIGNMENT COMMAND.

j) If and when, after step i) the SS has received the message ASSIGNMENT COMPLETE and then the message ALERT, the MS is made to accept the call (e.g by performing off-hook on the MS, or by an MS internal action, see PICS/PIXIT statement).

Otherwise, if and when the SS has received at least one CONNECT message after step h), and received an ASSIGNMENT COMPLETE message after step i), it shall proceed with step k).

k) The SS sends message CONNECT ACKNOWLEDGE within (T313-C-MS) seconds after reception of message CONNECT.

l) The MS is initiated to clear the call.

m) Within (T305-CC-MS) seconds after reception of the message DISCONNECT the SS sends the RELEASE message.

n) Within (T3240-MM-MS) seconds after reception of the message RELEASE COMPLETE the SS releases the RR connection by sending the message CHANNEL RELEASE.

Message PAGING REQUEST TYPE 1 (GSM 04.08, 9.1.21) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0010 0001
Page mode	Normal	00
Mobile identity		
- Odd/even no of digits	As applicable	x
- Type of identity	TMSI	100
- Identity digits	As applicable	....

Message IMMEDIATE ASSIGNMENT (GSM 04.08, 9.1.17) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0011 1111
Page mode	Normal	00
Channel description		
- Channel type ...	SDCCH/SACCH 1(4)	0 0100
- Time slot number	Arbitrary	xxx
- Training seq.code		(default)
- Hopping	No	0
- FB no	Band no 0	000
- ARFCN		(default)
Random reference		
- Random access info	As in CHAN REQ	100x xxxx
- N51, N32, N26	As applicable	
Timing advance	Arbitrary	xx xxxx
Mobile allocation	Length=0 (due to hopping)	0

Message AUTHENTICATION REQUEST (GSM 04.08, 9.2.2) to the MS:

	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	Not used	0000
Message Type		0001 0010
Ciphering key seq.number	As applic.from loc.upd	xxx
Authent.parameter RAND	As applicable	(128 bits)

Message CIPHERING MODE COMMAND (GSM 04.08, 9.1.9) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0011 0101
Cipher mode setting	Start ciphering	1

Message SETUP (GSM 04.08, 9.3.16) to the MS:

	Comment	Value
Protocol discriminator	CC	0011
Transaction identifier	SS orig.	0xxx
Message type		0000 0101
Bearer Capability	appropriate to teleservice used in test	

Message ASSIGNMENT COMMAND (GSM 04.08, 9.1.2) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0010 1110
Channel description		
- Channel type ...	Bm+ACCHs	0 0001
- Time slot number	Arbitrary	xxx
- Training seq.code		(default)
- Hopping	No	0
- FB no	Band no 0	000
- ARFCN		(default)
Power level	As applicable	x xxxx
Channel mode	appropriate to teleservice used in test	

Message CONNECT ACKNOWLEDGE (GSM 04.08, 9.3.6) to the MS:

	Comment	Value
Protocol discriminator	CC	0011
Transaction identifier	SS orig.	0xxx
Message type		0000 1111

Message RELEASE (GSM 04.08, 9.3.14) to the MS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	1xxx
Message Type		0010 1101

Message CHANNEL RELEASE (GSM 04.08, 9.1.7) to the MS:

	Comment	Value
Protocol Discriminator	RR	0110
Transaction Identifier	Not used	0000
Message Type		0000 1101
RR cause	Normal release	0000 0000

II.5.3.9.4.3 Requirements

1) In step c) the MS shall initiate immediate assignment by sending the CHANNEL REQUEST message.

2) In step d) the MS shall send a layer 2 SABM frame containing the PAGING RESPONSE message to the SS. (The same message is returned in a Layer 2 UA frame from the SS). The SABM frame shall be sent after reception of the IMMEDIATE ASSIGNMENT message.

3) In step f) the MS shall send the message AUTHENTICATION RESPONSE with the correct signed response. (Time requirements should be tested in the elementary procedure.)

4) In step g) the MS shall activate ciphering and send the message CIPHERING MODE COMPLETE.

5) In step h) the MS shall send the message CALL CONFIRMED after reception of SETUP. It may then send a CONNECT message.

6) After receiving the ASSIGNMENT COMMAND message in step i) the MS shall send the message ASSIGNMENT COMPLETE on the correct channel .

   The MS may then send a CONNECT message if one of the following conditions holds:
   - the MS did not send a CONNECT message in 5).
   - the MS has sent a CONNECT message during 5). In this case the N(SD) of both CONNECT messages must be equal.

   If the MS has sent at least one CONNECT message in 5) or 6), the following requirements 7) and 9) do not apply.

7) After step i) the MS shall, in any order,
- generate an alerting indication (e.g by an appropriate tone),
- send the message ALERTING..

This requirement applies unless the MS has sent at least one CONNECT message during 5) or 6).

8) Reserved.

9) In step j), the MS shall send the message CONNECT. This requirement applies unless the MS has sent at least one CONNECT message during 5) or 6).

10) In step j) the MS shall through-connect the traffic channel in both directions.

11) In step l) the MS shall send the message DISCONNECT at the initiation of call release.

12) In step m) the MS shall send the message RELEASE COMPLETE after reception of the message RELEASE.

13) After step n) the MS shall enter the idle, updated state.

Message CHANNEL REQUEST (GSM 04.08, 9.1.8) to the SS:

	Comment	Value
Random reference		x xxxx
Cause	Answer to paging	100

Message PAGING RESPONSE (GSM 04.08, 9.1.24) to the SS:

	Comment	Value
Protocol discriminator	RR	0110
Transaction identifier	Not used	0000
Message type		0010 0111
Ciphering key seq.number	As applic.from loc.upd	xxx
MS classmark 2		
- Revision level	As applicable	xxx
- Encryption algorithm	A5	00
- RF power capability	As applicable	xxx
- Short message capability	As applicable	x
- Frequency band	Band no 0	000
Mobile identity		
- Odd/even no of digits	As applicable	x
- Type of identity	TMSI	100
- Identity digits	As applicable	....

Message AUTHENTICATION RESPONSE (GSM 04.08, 9.2.3) to the SS:

	Comment	Value
Protocol discriminator	MM	0101
Transaction identifier	Not used	0000
Message type		0x01 0100
Authentication parameter	SRES, as applicable	(32 bits)

Message CIPHERING MODE COMPLETE (GSM 04.08, 9.1.10) to the SS:

	Comment	Value
Protocol discriminator	RR	0110
Transaction identifier	Not used	0000
Message type		0011 0010

Message CALL CONFIRMED (GSM 04.08, 9.3.2) to the SS:

	Comment	Value
Protocol discriminator	CC	0011
Transaction identifier	SS orig.	1xxx
Message type		0x00 1000

Message ASSIGNMENT COMPLETE (GSM 04.08, 9.1.3) to the SS:

Message ALERTING (GSM 04.08, 9.3.1) to the SS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	SS orig.	1xxx
Message Type		0x00 0001

Message CONNECT (GSM 04.08, 9.3.5) to the SS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	SS orig.	1xxx
Message Type		0x00 0111

Message DISCONNECT (GSM 04.08, 9.3.7) to the SS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	0xxx
Message Type		0x10 0101
Cause		
- Coding standard	GSM	11
- Cause value	normal clearing	001 0000

Message RELEASE COMPLETE (GSM 04.08, 9.3.15) to the SS:

	Comment	Value
Protocol Discriminator	CC	0011
Transaction Identifier	MS orig.	0xxx
Message Type		0x10 1010

II.5.3.9.5 MS TERMINATING CALL ESTABLISHMENT, LATE ASSIGNMENT

II.5.3.9.5.1 Purpose of the test

To test the MS ability to respond correctly to a mobile terminated call following the sequence of elementary signalling procedures given in GSM 04.08 section 7.3.3.1b.

II.5.3.9.5.2 Method of test

a) The first part of the method of test is identical to the case of early assignment of traffic channel (see previous section) up to and inclusive of the SS sending the SETUP message, except that the SETUP message shall include the 'signal' information element. Thereafter, the following applies:

b) If and when the SS has received the message ALERTING, the MS is made to accept the call, see PICS/PIXIT statement.

c) After the SS has received the message CONNECT the SS sends message ASSIGNMENT COMMAND.

d) Having received message ASSIGNMENT COMPLETE, the SS sends message CONNECT ACKNOWLEDGE within (T313-CC-MS) seconds after reception of message CONNECT.

Note: Clearing of the call is not part of the test procedure.

II.5.3.9.5.3 Requirements

1) The first part of the requirements is identical to the case of early assignment of traffic channel (see previous section) up to and inclusive of the MS sending the CIPHER MODE COMPLETE message. Thereafter, the following applies:

2) After receiving the SETUP message in step a), the MS shall proceed in one of the following ways:

a) The MS sends a CALL CONFIRMED message followed by an ALERTING message. It shall generate an alerting indication (e.g by an appropriate tone).
b) The MS sends a CALL CONFIRMED message followed by a CONNECT message.

3) Reserved.

4) In step b) the MS shall send the message CONNECT within 0.5 seconds from the acceptance of the call (off hook) at the MS.

   This requirement applies only if the MS di not send a CONNECT message in 2).

Note: In requirement 4), the time of 0.5 second is not intended to be a performance requirement, it is introduced only because it is necessary to indicate how long the SS will wait until it decides that there is a failure.

5) In step c) the MS shall send the message ASSIGNMENT COMPLETE on the correct channel after reception of ASSIGNMENT COMMAND.

6) In step d) the MS shall through-connect the traffic channel in both directions.

II.6 LINK MANAGEMENT

II.6.1 SYNCHRONISATION TO THE SYSTEM

This chapter specifies the requirements concerning synchronisation of the MS to the system.

II.6.1.1 Network Properties

The MS has to cope with certain properties of the channels it has to synchronize to. These properties are summarized in this section II.6.1.1. All information given primarily reflects the fixed part of the network. However, since these properties affect the requirements for the MS, this information is summarized here in GSM 11.10.

The ability of the MS to cope with these network properties is implicitly tested under II.6.1.2 to II.6.1.4. Thus no explicit measurements are described in this present section.

In the following, the term BTS refers to an entity controlling exactly one BCCH as well as all control and traffic channels associated to that BCCH.

II.6.1.1.1 BTS Frequency Tolerance

II.6.1.1.1.1 Absolute Tolerance

The carrier frequency of any channel transmitted by any BTS may have an absolute frequency error of +/- 0.05 ppm with respect to the nominal values.

II.6.1.1.1.2 Relative Tolerance

For all channels transmitted by one BTS, the carrier frequencies are locked to a common reference.

II.6.1.1.2 BTS Timing Tolerance

The timing tolerance of any two channels transmitted is the delay between the frame structures of these channels measured at the BTS antenna outputs. For any two channels transmitted by the same BTS, the timing tolerance will be less than 1.0 microsecond. For channels transmitted by different BTSs, the timing tolerance may be undefined.

II.6.1.1.3 Synchronisation between Carrier and Data Clocks

For any channel transmitted by the BTS, the data clock frequencies are locked to the same reference as the carrier.

II.6.1.1.4 Multipath Effects

The MS shall cope with the fact that both the wanted and interfering signals may be influenced by any of the propagation conditions specified in GSM 05.05.

II.6.1.2 Receive/Transmit Delay

Whenever the MS transmitter is activated, proper timing in relation to the received frame structure must be provided and additionally all specifications laid down in II.3 must be fulfilled.

The absolute receive/transmit delay of the MS is the delay between a common burst reference point within the received and the transmitted RF burst. Equivalently the delay can be referenced to the modulator input vs. the demodulator output or to the differential encoder input vs. the differential decoder output, provided the measured delay is corrected for the additional delays in the signal path. E.g., in the latter case at least an inherent delay of 2 bit periods due to the differential coding must be subtracted frpm the measured value.

For normal or dummy bursts, the common burst reference point is defined to be the transition from bit 13 to bit 14 of the midamble. For an access burst it is defined to be the transition from bit 48 to bit 49 of the burst.

The numbering of bits within a burst is defined in GSM 05.02 section 5.2 (which defines midambles as modulating bits).

II.6.1.2.1 Absolute Delay and Timing Advance Setting

Definition

The MS must set the TA value signalled to it.

Method of Measurement

The test is carried out under ideal radio conditions (Annex 1, GC3).

The MS does not use DTX, "MAX retrans = 7" and "TX-integer = 3" signalled on the BCCH.

After 10 s the SS pages the MS.

The first 7 channel requests from the MS shall not be answered, the 8th channel request from the MS on the RACH shall be answered by the SS with an IMMEDIATE ASSIGNMENT, timing advance set to 0.

The MS is then brought into conversation state.

During the conversation state the values 10, 20, 30, 40, 50, 60, 63 and one random value other than these values for timing advance (TA) are signalled to the MS in consecutive SACCH blocks.

The SS shall monitor the TA value set in the L1 header on the uplink SACCH for each timing advance.

The absolute delays for all MS bursts are measured.

Requirements:

The measured receive/transmit delay shall equal the following nominal values with an absolute tolerance of +/- 1 bit period:

access bursts: 3 timeslots (= 45/26 ms)

normal bursts: 3 timeslots (= 45/26 ms) minus the last timing advance value received from the SS.

The MS shall use the new timing advance at the first TDMA frame belonging to the next reporting period after the SACCH frame containing the new TA value.

The value of the TA field in the uplink SACCH L1 header shall correspond to the most recently ordered value.

II.6.1.2.2 Reception Time Tracking Speed

Definition:

Reception time tracking speed is the speed at which the MS adapts its transmit time to a change in the timing of the received signal.

Note: The conformance requirement for this test is given in GSM 05.10 section 6.2, not GSM 05.10 section 6.4 which specifies the time of transmission of the MS relative to the BS transmission and should be regarded as timing offset not jitter.

Method of Measurement:

a) The SS shall originate a call to the MS using a traffic channel with an ARFCN in the range 60-65. The MS shall answer the call.

b) The SS introduces propagation condition TU50.

c) After 10 seconds the SS sets the input signal level to 11dBμVemf( ) for a handheld and 9dBμVemf( ) for all other classes. For the last second before step d) the SS takes an average receive/transmit delay of all bursts in that 1s.

d) The SS increases the delay of the transmitted signal to the MS by a 2 bit step (7.4 μs) and keeps this delay for 20 seconds.

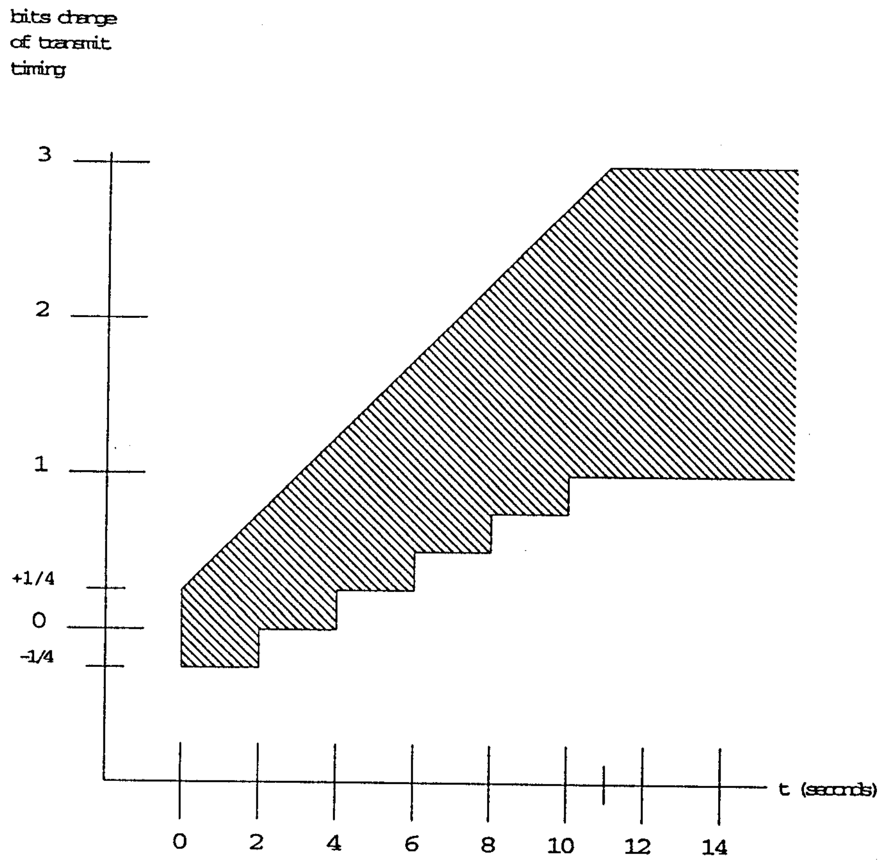
e) The SS measures the absolute receive/transmit delay for each burst.

f) The SS increases the input signal level to 14dBμVemf( ) and sets multipath condition RA250.

g) Steps c) to e) are repeated.

Requirements:

The MS shall adjust the timing of its transmit burst back to the correct receive/transmit timing delay. All burst timings shall be within the shaded part of the following figure.



t = 0 is the time at which the SS makes the transmission timing step change

II.6.1.3 Access Times During Handover

In this section, the maximum access times allowed for the MS during resynchronization from one channel to another are tested.

II.6.1.3.1 Intra-Cell Handover

Definition

Intra-cell handover occurs when the MS is required to change from one channel/timeslot in the serving cell to another channel/timeslot in the same cell. Intra-cell handover can occur either to a timeslot on a new carrier or to a different timeslot on the same carrier.

Method of Measurement

a) The SS uses ARFCN 1 and ARFCN 124 to simulate two carriers on the same cell, under ideal radio conditions, with the following properties:

- Relative frequency tolerance: 0
- Relative timing tolerance : 1/4 Bit.

b) The MS is brought into conversation state on ARFCN 1 timeslot 1, DTX not active.

c) The SS sends an ASSIGNMENT COMMAND to the MS allocating a full rate traffic channel on ARFCN 124 and timeslot 2 with a Power Command of 7.

d) After it has sent the assignment command the SS shall measure the reception time of bursts received on the new channel and the time that transmission ceases on the old channel.

Requirements:

1) The MS shall transmit its first burst on the new channel at the latest, in the first timeslot of the first traffic or control channel block, of the new assignment, beginning 120 ms after the sending of the last bit of the ASSIGNMENT COMMAND on the downlink. The 120 ms time will expire right at the beginning of a new downlink burst on timeslot 2 which will be the last burst of a traffic channel block, the following frame could be an IDLE frame and the MS would then transmit in the next frame. Taking into account the three timeslot shift between up and downlink this could mean that the MS first transmits on the new channel after 131 ms (26 frames + 2 frames + 3 timeslots).

2) The MS shall transmit its first burst on the new channel at the latest, in the first timeslot of the first traffic or control channel block, of the new assignment, beginning 20 ms after the sending of the last bit on the uplink of the old channel. The 20 ms time will expire at just over 4 frames after the sending of the last bit on the old channel. The next frame could be an IDLE frame and the MS would then transmit in the next frame. This equates to exactly 6 frames so in the worst case the MS might take 27.7 ms between cessation of transmission on the old channel and transmission beginning on the new channel.

II.6.1.3.2 Inter-Cell Handover

Definition

Inter-cell handover occurs when the MS is required to change from a channel/timeslot in one cell to another channel/timeslot in a different cell.

Method of Measurement

a) The SS simulates two cells, A and B, under ideal radio conditions. A is the old cell and B is the target for the handover. Appropriate information on both cell A and B is given to the MS on the BCCHs of both cells.

b) The SS uses two channels with the following properties:

Cell A	TN=2	ARFCN 1 with an offset of +267Hz
Cell B	TN=0	ARFCN 124 with an offset of -267Hz.

This offset is representing worst cases for doppler shift at 250km/hr and frequency inaccuracy of 0.05ppm.

c) The simulated BCCHs for the two cells shall have the following differences in timing:

Timer T1	50
Timer T2	15
Timer T3	40
1/4 bit number	17
Timeslots	2

d) The MS is brought into conversation state on a full rate traffic channel on cell A, DTX not active and timing advance 0.

e) The SS sends a HANDOVER COMMAND on the main DCCH on cell A ordering the MS to go to cell B on a full rate traffic channel (ARFCN=124, timeslot 0). Cells A and B are not synchronised cells. The Power Command is set to 7.

f) After the SS has sent the Handover command it shall measure the reception time of bursts received on the new channel and the time that transmission ceases on the old channel.

g) The SS also measures the absolute transmit/receive delay for the access bursts on the new channel.

h) The SS sends the Physical Information with timing advance set to 50. The SS shall then measure the reception time and absolute delay of the bursts transmitted on the new cell.

Requirements

1) The MS shall transmit its first burst on cell B at the latest, in the first timeslot of the first traffic or control channel block, of the new assignment, beginning 120 ms after the sending of the last bit of the HANDOVER COMMAND on the downlink. The 120 ms time will expire right at the end of the last burst of a downlink traffic channel block on the old channel. Due to the two timeslot difference in cell timing, the two timeslots difference in the channel allocation and the 15 frames difference in multiframe timing, this point could occur 2.5 frames before the end of the last burst of a downlink traffic channel block on the new channel. The following frame could be an IDLE frame and the MS would then transmit in the next frame. Taking into account the three timeslot shift between up and downlink this could mean that the MS first transmits on the new channel after 142.6 ms (26 frames + 2.5 frames + 2 frames + 3 timeslots).

2) The MS shall transmit its first burst on cell B at the latest, in the first timeslot of the first traffic or control channel block, of the new assignment, beginning 20 ms after the sending of the last bit on the uplink of the old channel. The 20 ms time will expire at just over 4 frames after the sending of the last bit on the old channel. Due to the two timeslot difference in cell timing, the two timeslots difference in the channel allocation and the 15 frames difference in multiframe timing, this point could occur 2 frames before the end of the last burst of an uplink traffic channel block on the new channel. The following frame could be an IDLE frame and the MS would then transmit in the next frame. This equates to 8.5 frames so in the worst case the MS might take 39.2 ms between cessation of transmission on the old channel and transmission beginning on the new channel.

3) The MS shall transmit using the TA value in the physical information within 50 milliseconds from the end of the last timeslot of the message block containing the new TA value.

4) The measured absolute delay in steps g) and h) shall equal the following nominal values with an absolute tolerance of +/- 1 bit:

   access burst : 3 timeslots (=45/26 ms)

II.6.1.4 Behaviour Under Insufficient Reception Conditions

Note: This test is performed for all MS except where, as indicated by the manufacturer in the PIXIT statement, an application layer is always running which would perform a normal release of the call due to loss of traffic.

II.6.1.4.1 Temporary Reception Gaps

Definition:

If reception is interrupted for a certain limited time (temporary reception gap) the MS must maintain the frequency and timing of its transmission within specifications.

Ref: GSM 05.10 sections 6.1 and 6.2
GSM 05.08 section 5.2

Method of Measurement

The MS is put into idle state with RADIO_LINK_TIMEOUT = 64 and "DTX OFF" signalled on the BCCH. After 10 s the MS is brought into conversation state. A temporary reception gap is introduced as follows:

a) In a TDMA frame immediately following the transmission of a complete SACCH block the downlink signal is removed for 63 SACCH blocks (the maximum temporary reception gap - the radio link counter S decrements by 1 for each SACCH block not successfully decoded and hence now S=1).

b) The frequency and timing of the MS transmitter are measured immediately before and at least 5 times at approximately equally spaced intervals during the gap, one of these measurements being at the end of the gap.

c) The downlink transmission is resumed for a period sufficient to allow reception of 1 SACCH block (the radio link counter increments by 2 for each SACCH block successfully decoded and hence now S=3).

d) The downlink transmission is again removed for a period equal to at least 3 SACCH blocks. The MS transmission frequency and timing are measured immediately before and during the reception gap (as the MS fails to decode each of these SACCH blocks the radio link counter S decrements by 1 and hence at the end of 3 failed SACCH blocks S=0).

Requirements

1) The MS carrier frequency shall be accurate to within 0.2 ppm compared to signals received from the SS.

2) The receive/transmit delay timing shall be 3 timeslots +/- 1 bit.

3) During the second reception gap the MS shall maintain transmission for a period up to but not exceeding 3 SACCH blocks (when the radio link counter S reaches zero a radio link failure is declared and the MS transmission ceases).

4) During the first, maximum, reception gap the MS transmission timing may have drifted resulting in an error of not greater than +/- 6.048 μs. The error at the start of the reception gap (not greater than +/- 2 μs) will have been determined by the first measurement of MS transmission frequency and timing.

II.6.1.5 Channel release after unrecoverable errors

ref: GSM 04.08, 5.08

Note: This test is performed for all MS except where, as indicated by the manufacturer in the PIXIT statement, an application layer is always running which would perform a normal release of the call due to loss of traffic.

Radio link failure

The aim of determining radio link failure in the MS is to ensure that calls with unacceptable voice/data quality, which cannot be improved either by RF power control or handover, are either reestablished or released in a defined manner. In general the parameter that control the forced release should be set such that the forced release will not normally occur until the call has degraded to a quality below that at which the majority of subscribers would have manually released. This ensures that, for example, a call on the edge of a radio coverage area, although of bad quality, can usually be completed if the subscriber wishes.

II.6.1.5.1 Purpose of the test and introduction

This test will verify the management by the MS of the radio link failure criterion: the Radio Link Counter S (GSM 05.08).

The Radio Link Counter S is initialized with the value of the parameter RADIO_LINK_TIMEOUT.

Call re-establishment is not allowed in any cell.

The parameter is sent on a BCCH inside a message SYSTEM INFORMATION TYPE 3. It can also be sent on SACCH inside a message SYSTEM INFORMATION TYPE 6, but is taken into account by the MS only in case of hand over or channel assignment.

If the MS is unable to decode SACCH message, counter S is decreased by 1; in case of successful reception, counter S is increased by 2, but will not exceed the value of RADIO_LINK_TIMEOUT (GSM 05.08).

If the Radio Link Counter S reaches 0 a radio link failure shall be declared, the MS aborts the RR connection.

The parameter RADIO_LINK_TIMEOUT can take 16 values N with
N = 4 * n while 1<= n <= 16.

II.6.1.5.2 Method of test A

To initialise the Radio Link Counter S in the MS, on the BCCH on which the MS camps a message SYSTEM INFORMATION TYPE 3 is sent with a randomly chosen value N for the parameter RADIO_LINK_TIMEOUT.

The MS originates a call according to the chapter "structured procedures" (II.5.3.9).

Once the call is established, unrecoverable errors shall be introduced inside the SACCH messages by using the System Simulator.

The System Simulator shall send 32 errorfree SACCH messages, then N erroneous SACCH messages and then continuously send error free SACCH messages.

Repetition of the test:
The test shall be repeated once with a different value of N.

II.6.1.5.3 Requirements A

After receiving the N erroneous SACCH messages, the MS shall abort the RR-connection, i.e that there is no more MS activity on the SACCH channel..

II.6.1.5.4 Method of test B

The Radio Link Counter S is initialised with a randomly chosen value N of the parameter RADIO_LINK_TIMEOUT.

A call shall be established as in Method A.

The System Simulator is programmed to send 32 errorfree SACCH messages.

Then the SS shall send 2 SACCH messages with unrecoverable errors followed by one error free SACCH message. This step is repeated 64 times.

Repetition of the test:
This test shall be repeated once with a different value of N.

II.6.1.5.5 Requirements B

The MS shall not abort the RR-connection.

II.6.1.5.6 Method of test C

The Radio Link Counter S is initialised with a randomly chosen value N of the parameter RADIO_LINK_TIMEOUT.

A call shall be established as in Method A.

The System Simulator is programmed to send 32 error free SACCH messages.

Then the SS shall send 3 SACCH messages with unrecoverable errors followed by one error free SACCH message. This step is repeated N - 2 times.

Then the SS shall continuously send error free SACCH messages.

Repetition of the test:
This test shall be repeated once with a different value of N.

II.6.1.5.7 Requirements C

After receiving the 3 * (N - 2) erroneous SACCH messages the MS shall abort the RR-connection, i.e there is no more activity on the SACCH channel.

II.6.1.6 Cell Selection/Reselection

II.6.1.6.1 General Points

GSM 05.08 does not give times for how quickly an MS has to select or reselect a cell. For the purposes of these tests, the following times are allowed:

(a) Time to read and average signal strength on 124 RF carriers. If one signal strength sample is read on an RF carrier every TDMA frame, the time to take 5 samples on each is about 3 seconds. However the averaging time is 3-5 second or 5 paging block intervals (which equals 5.9 s for the case of BS_PA_MFRMS= 5 frames). 6 seconds will be allowed.

(b) Time to attempt to read SCH on a BCCH carrier. SCH is sent 5 times every 235.4 ms. We will allow 0.5 s per carrier on which SCH is searched for. Hence for a BA with 16 carriers 8 seconds will be allowed.

(c) Time to read all 4 System Information messages on one BCCH carrier. GSM 05.02 specifies that the all system information blocks should be sent every 8 multiframes, i.e. 1.9 s.

(d) Time to do random access (RA) attempts. Assuming a non combined CCCH and MAX retrans = 1, the whole RA attempt process will take around 1 second.

(e) Time between paging blocks for an MS - This is 1.2 s for BS_PA_MFRMS = 5.

For the cell selection tests below, the maximum response time will be (a) + (b) + 4(c) + (d) + (e) = 23.8 s. A time of 30 s is allowed in the tests below. For cell reselection, the maximum response time is (a) + (c) + (d) + (e) = 10.1 s. A time of 12 s is allowed in the tests below.

The accuracy of signal level measurements is assumed to be up to +/- 6 dB absolute and +/- 2 dB relative between carriers. The tests below allow, for cases of discrimination between C1 and 0, a difference of at least 8 dB, and for discrimination between C1 values on different carriers, a difference of at least 5 dB.

Note: The timing tolerances in all the tests shall be -0%, +10%.

Note: The initial conditions that apply to all the tests in II.6.1.6 Cell Selection/Reselection shall be as follows:-
The MS is brought into the idle updated state with the values of PLMN and LAC as in Table II.6-1 and then switched off.

II.6.1.6.2 Definition - Cell Selection

Cell Selection is the process in which an MS selects a suitable cell to camp on. The algorithms to be followed are given in GSM 05.08 section 6.1 to 6.4.

II.6.1.6.3 Method of Test

a) A number of BCCH carriers are transmitted by the SS. The System Information on these carriers is as given in Table II.6-1 unless otherwise stated. The ARFCN and power levels of each of the carriers are as given in case 1 of Table II.6-2, and the System Information parameters on these carriers which are different to those in Table II.6-1 are given in Table II.6-2.

b) Paging messages for the MS are transmitted on each of the BCCH carriers in each of the paging blocks of the MS (as defined in GSM 05.02). The SS ignores any Random Access (RA) messages sent in response to pages, unless otherwise stated.

c) The MS is switched on.

d) The SS checks that MS makes a response according to Requirement 1 of case 1 of Table II.6-2 within 30 seconds.

e) The MS is turned off.

f) Steps c) to e) are repeated, this time checking that the MS makes a response according to Requirement 2 of case 1 of Table II.6-2 within 30 seconds.

g) Steps a) to f) above are repeated for cases 2 to 4 of Table II.6-2. (The System Information parameters in Table II.6-2 only apply to the case given and are not continued into the next case unless explicitly stated.)

II.6.1.6.4 Requirement

The MS shall respond as in d) and f) above for each case in Table II.6-2.

II.6.1.6.5 Definition - Cell Reselection

Cell reselection is the process in which the MS ensures that it is camped on the most appropriate cell. The algorithms to be followed are given in GSM 05.08 sections 6.4 to 6.6.

II.6.1.6.6 Method of Test

Note: The SS looks for a response from the MS, when required, within 12 s, unless otherwise stated.

a) The SS does steps a) to c) of case 1 of the cell selection test above, but with RAM=-93 on carrier 6. (The values of C1 on the 6 BCCH carriers are then respectively 25, 15, 10, 20, -8, <=5.)

b) The SS checks that the MS does at least one RA request on carrier 3 within 30 s followed by at least one RA request on carrier 4 within a further 12 s.

Note: Carrier 3 has a higher level than Carrier 4 but a lower C1. Therefore initial cell selection should choose Carrier 3 and cell reselection should choose carrier 4.

c) The SS stops all paging messages and then sets CBA=0 on carrier 1. After 6 minutes the SS pages the MS once on carrier 1 and repeatedly on carrier 4 in every paging block of the MS until the end of this test. (6 minutes allows time for the MS to read the BCCH data on carrier 1. The MS should then reselect carrier 1.)

d) The SS checks that the MS makes at least one RA request on carrier 1 followed by at least 1 RA request on carrier 4. (The MS should temporarily reselect carrier 4 because of lack of response to RA requests on carrier 1, and then revert to carrier 1.)

e) The SS transmits carrier 1 at 68 dBmicroVoltemf( ) for 10 s, 38 dBmicroVoltemf( ) for 2 s, 68 dBmicroVoltemf( ) for 10 s and back to 48 dBmicroVoltemf( ). (This gives a minimum averaged level of 48 dBmicroVoltemf( ), i.e. minimum C1 of 25.)

f) The SS checks that the MS does not make a RA request on either carrier 1 or carrier 4.

g) The SS waits 10 seconds, then stops transmitting on carrier 1 for 18 seconds, and then transmits as before. (The averaging of signal level can take 6 s, C1 is checked at least every 5 s, and C1 low must be detected for 5 s. Adding 10% tolerance gives 17.6 s.)

h) The SS checks that the MS makes at least 1 RA request on carrier 4.

i) The SS changes the ARFCN of carrier 4 to 18 and then waits 120 seconds (to ensure the MS reselects carrier 1). It then puts random data into 4 successive paging blocks of the MS on carrier 1, and then reverts to sending normal data. (DSC will be initialised to 90/5 = 18, hence after 4 erroneous blocks, DSC will equal 2, hence no signalling failure.)

j) The SS checks that the MS makes no RA requests on either carrier 1 or carrier 4.

k) After at least 16 successive paging blocks of the MS on carrier 1 with normal data, the SS puts random data into 5 successive paging blocks of the MS followed by normal data. (This will cause DSC to reach 0.)

l) The SS checks that the MS makes at least one RA request on carrier 4.

m) The SS sets CBA = 1 on carriers 1 and 4.

n) The SS waits 1 minute and then pages the MS on carriers 1,2,3 and 4.

o) The SS checks that the MS makes at least one RA request on carrier 3 but none on carrier 1.

p) The SS pages the MS on carriers 2 and 4 and checks that the MS makes no RA request on carriers 2 and 4.

q) The SS sets CBA=O on carriers 1 and 4.

r) The SS sets the level on carrier 3 to 33 dBmicroVoltemf( ) (giving C1 = 5).

s) The SS waits 6 minutes.

t) The SS reduces the level on carrier 1 to 38 dBmicroVoltemf( ) for 18 seconds and then reverts to 48 dBmicroVoltemf( ). (This gives C1 = 15 on carrier 1 and 20 on carrier 4.)

u) The SS checks that the MS makes at least one RA request on carrier 4.

v) The SS waits for 30 seconds (to allow the MS to revert to carrier 1). It then sets LAC on carrier 4 to 1112(Hex) and reduces the level of carrier 1 to 38 dBmicroVoltemf( ) for 18 seconds, and then reverts to 48 dBmicroVoltemf( ).

w) The SS checks that the MS makes no RA requests on carriers 1 and 4.

x) The SS reduces the level on carrier 1 to 28 dBmicroVoltemf( ) for 18 seconds (giving C1 = 5 on carrier 1, i.e. more than CRH below C1 on carrier 4) and then reverts to 48 dBmicroVoltemf( ).

y) The SS checks that the MS makes at least one RA request on carrier 4.

II.6.1.6.7 Requirement

1) The MS shall respond as indicated in steps b), d), f), h), j), l), o), p), u), w) and y).

II.6.1.6.8 Definition - Cell Selection after Release of TCH and SDCCH

The requirement for cell selection after release of a TCH or SDCCH is given in GSM 05.08 section 6.7.

II.6.1.6.9 Method of Test

a) The SS does steps a) to c) of Case 1 of the cell selection test in II.6.1.6.3 above, but with no pages being sent and with RAM = -70 on carriers 4 and 6. (This gives negative C1 on both carriers.)

Radio_Link_Timeout is set to 8.

b) The SS sets up a call and brings it into the active state by paging the MS on BCCH carrier 3 and setting up a call on a TCH with ARFCN of 22.

c) The SS starts paging the MS repeatedly on all the BCCH carriers.

d) The SS causes a normal channel release.

e) The SS checks that the MS does at least one RA request (with establishment cause = answer to paging) on carrier 3, but none on carrier 5.

f) The MS is switched off and on; the MS responds to the ongoing paging on BCCH carrier 3; and the SS brings the call into the active state on TCH with ARFCN of 22.

g) Transmissions on all dedicated channels are switched off. (This triggers call re-establishment.)

h) The SS checks that the MS does at least one RA request (with establishment cause = call re-establishment) on Carrier 3 within 16s.

i) The MS is switched off and on; the MS responds to the ongoing paging on BCCH carrier 3; and the SS brings the call into the active state on TCH with ARFCN of 22. On carrier 3, RE is set to 1 and the SS stops paging the MS on carrier 3.

j) The RXLEV_ACCESS_MIN on carrier 4 is set to RAM = -100.

k) Transmissions on all dedicated channels are switched off.

l) The SS checks that the MS does at least one RA request (with establishment cause = call re-establishment) on carrier 4 within 16s.

Note: Steps g) to l) are not applicable for an MS not supporting speech (see PIXIT).

II.6.1.6.10 Requirements

The MS shall respond as indicated in steps e), h) and l) above.

II.6.1.6.11 Definition - Cell Selection (Abnormal Cases and Emergency Calls)

Cell selection in abnormal conditions is defined in GSM 05.08 section 6.8.

II.6.1.6.12 Method of Test

a) The SS performs steps a) to c) of II.6.1.6.3 using Table II.6-2 case 1, with the following exceptions:
   - the BCCH carriers belong to the same PLMN, which is not the MS's home PLMN.
   - no paging message for the MS is transmitted on the BCCH carriers.
   - automatic network selection shall be disabled, if possible, and the PLMN used in the BCCH shall be in the SIM's forbidden PLMN's list. No manual network selection shall be done during this test.

b) The SS checks that no RA requests are made by the MS.

c) 60 seconds after the MS is switched on an emergency call is initiated on the MS (30 seconds for cell selection of carrier 2 or 3 which have the highest signal strength, 18 seconds for comparison of C1, and 12 seconds for reselection of carrier 4 which has the highest C1).

d) The SS checks that the MS makes RA requests on carrier 4. (Carrier 4 has the highest value of C1 among the unbarred cells.)

e) The SS sets carrier 2 to have the same PLMN and LAC as in Table II.6-1 (changing the BSIC of the carrier) and starts paging the MS repeatedly on carrier 2.

f) The SS checks that the MS makes RA requests on carrier 2 within 72 seconds (30 seconds for MS detection of the change in BSIC, 30 seconds for decode of BCCH and 12 seconds for reselection of carrier 2).

g) The MS is switched off, the SIM is removed, carrier 2 is returned to having the PLMN of all the other BCCH carriers, and the MS is switched on again.

h) The SS checks that no further RA requests are made by the MS within 60 seconds.

i) 60 seconds after the MS is switched on an emergency call is initiated on the MS (30 seconds for cell selection of carrier 2 or 3 which have the highest signal strength, 18 seconds for comparison of C1, and 12 seconds for reselection of carrier 4 which has the highest C1).

j) The SS checks that the MS makes a RA request on carrier 4 within 12 s.

II.6.1.6.13 Requirement

The MS shall respond as indicated in steps b), d), f), h) and j) above.

Parameter	Reference in GSM 04.08	Abbre-viation	Normal Setting
Cell Channel Description	10.5.2.1	-	Any values
MAX retrans	10.5.2.17	-	1
TX-integer	10.5.2.17	-	Any value
CELL_BAR_ACCESS	10.5.2.17	CBA	0 (i.e. no barred)
AC CN	10.5.2.17	AC	All 0
RE	10.5.2.17	RE	0 (i.e. re-establishment allowed)
BA ARFCN	10.5.2.13	BA	All 0 except for ARFCN=3,9,18,25,41, 43,49,50,54,58,62, 66,70,80,92,124
NCC	10.5.2.15	NCC	Any value
Cell Identity	10.5.1.1	-	Any value
MCC, MNC	10.5.1.3	PLMN	Home PLMN of MS
LAC	10.5.1.3	LAC	1111 (Hex)
ATT, B_AG_BLKS_RES,T3212	10.5.2.8	-	Any values
BS_PA_MFRMS	10.5.2.8	BPM	5 frames
Cell Options	10.5.2.3	-	Any values
CELL_RESELECT_HYSTERESIS	10.5.2.4	CRH	10 dB
MS_TXPWR_MAX_CCH	10.5.2.4	MTMC	Maximum RF output power of MS. (P in GSM 05.08)
RXLEV_ACCESS_MIN	10.5.2.4	RAM	-90 dBm

TABLE II.6-1 : Normal System Information Fields

		Case 1	Case 2	Case 3	Case 4
BCCH	Level dBμVemf( )	48	60/30**	60/30**	60/30**
Carrier 1	Syst Info	CBA=1	MTMC =13 dBm	AC=1 for MS	Normal
	ARFCN	62	62	62	2
BCCH	Level dBμVemf( )	38	65	65	65
Carrier 2	Syst Info	PLMN not that of MS	PLMN not that of MS	PLMN not that of MS	PLMN not that of MS
	ARFCN	124	124	124	74
BCCH	Level dBμVemf( )	38	38	38	38
Carrier 3	Syst Info	RAM=-85	RAM=-85	RAM=-85	RAM=-85
	ARFCN	54	54	54	4
BCCH	Level dBμVemf( )	33	33	33	33
Carrier 4	Syst Info	RAM=-100	RAM=-100	RAM=-100	RAM=-100
	ARFCN	58	58	58	8
BCCH	Level dBμVemf( )	43	43	43	43
Carrier 5	Syst Info	RAM=-62	RAM=-62	RAM=-62	RAM=-62
	ARFCN	66	66	66	16
BCCH	Level dBμVemf( )	43/13*	61/31*	61/31*	61/31*
Carrier 6	Syst Info	RAM=-98	RAM=-62	Normal	RAM=-62
	ARFCN	70	70	70	20

The requirements that apply in the various cases are listed below.

* Power is alternately the higher level for 0.5 s and the lower level for 3.5 s.

** Power is alternately the higher level for 3.5 s and the lower level for 0.5 s.

TABLE II.6-2 : Cell Selection Test Parameters

Notes on Table II.6-2

Case 1: The averaging on carrier 6 should result in an average level in the range 25 to 13 dBmicroVoltemf( ). The values of C1 on the 6 BCCH carriers are respectively: 25,15,10,20,-8,10 to -2. Carrier 3 is the one with the highest level which has C1 > 0, is not barred and is of the correct PLMN.

Case 2: The averaging on Carriers 1 and 6 should result in an average level in the range of respectively: 60 to 48 dBmicroVoltemf( ) and 43 to 31 dBmicroVoltemf( ). Carrier 1 is the carrier with the highest level that satisfies the other constraints for cell selection.

Case 3: The MS should select Carrier 1 as for Case 2, but because AC is set, the MS should not make any response to the SS.

Case 4: Any stored BA information will be incorrect. The MS should therefore do a search of all 124 GSM carriers. It should then read BCCH data on Carrier 2 followed by Carrier 1. As Carrier 2 is the wrong PLMN, the BA on the carrier should be ignored.

Requirement 1 in connection with Table II.6-2

In case 1: RA response on carrier 3 before a response (if any) on carriers 4 or 6.

In case 2: RA response on carrier 1 before a response (if any) on carriers 3 or 4.

In case 3: No RA response on carriers 1, 2, or 3.

In case 4: RA response on carrier 1 before a response (if any) on carriers 3 or 4.

Requirement 2 in connection with Table II.6-2

In case 1: No RA response on carriers 1, 2 or 5.

In case 2: No RA response on carriers 2, 5 or 6.

In case 3: No RA response on carriers 4, 5 or 6.

In case 4: No RA response on carriers 2, 5 or 6.

II.6.2 RX MEASUREMENT

For evaluating the reception quality (the basis for handover and power control) the following two criteria are used:

- signal strength (RXLEV)
- signal quality (RXQUAL).

II.6.2.1 Signal Strength

II.6.2.1.1 Definition

The MS must be capable of measuring the received RF signal strength from reference sensitivity level up to 65dBmicroVolt emf. The measured RF signal strength has to be mapped by the MS into RXLEV values using the coding scheme specified in GSM 05.08 section 8.1.4.

II.6.2.1.2 Method of Measurement

a) The MS is connected to the SS. This connection will be direct for a MS having an antenna connector, or via a temporary antenna connector for a MS with an integral antenna.

b) The SS is set to produce the BCCH of the serving cell and the BCCHs of 6 adjacent cells at 28 dBmicroVolt emf( ). The BCCH of the serving cell shall indicate these BCCHs, but not the BCCH of the serving cell. The ARFCN of the serving cell is chosen so as not to interfere with the other channels and the RF power level will be 63 dBμV.

c) After 30 s the MS is brought into conversation state. The envelopes of the TCH of the serving cell and the BCCHs of the neighbouring cells shall be static. The SACCH shall indicate the same neighbouring BCCHs as the BCCH of the serving cell at step b).

The levels of the TCH and BCCHs will be set according to Table II.6.3 step 1. The SS shall wait 20 s before step d).

Step	TCH	BCCH1	BCCH2	BCCH3	BCCH4	BCCH5	BCCH6
ARFCN:	1	62	124	20	40	80	100
1+m*21	64.5-m*10	64.5-m*10	64.5-m*10	64.5-m*10	64.5-m*10	64.5-m*10	64.5-m*10
2+m*21	64.5-m*10	63.5-m*10	45 -m*10	55 -m*10	75 -m*10	15	25
3+m*21	64.5-m*10	62.5-m*10	45 -m*10	55 -m*10	75 -m*10	15	25
.	.	.	.	.	.	15	25
.	.	.	.	.	.	15	25
.	.	.	.	.	.	15	25
21+m*21	64.5-m*10	44.5-m*10	45 -m*10	55 -m*10	75 -m*10	15	25

m = 0, 1, 2, 3, 4.

TABLE II.6-3 : Average signal levels at RX input in dBμV( ) emf

d) The measurement is done in 105 steps. The initial signal levels of the TCH of the serving cell and the BCCHs of the neighbouring cells shall be adjusted according to Table II.6-3. At each step the SS keeps the signal levels stable for one reporting period, except at steps 21+m*21 where the level is held stable for 1.75 reporting periods. The RXLEV value for the period in which the change occurs (reported in the following period) is discarded.

Note: This extension at steps 21+m*21 is to allow an extra quarter reporting period for the MS to stabilise for steps 1+m*21.

At steps 1 to 30 the SS shall simulate a base station with DTX off and at steps 31 to 105 the SS shall simulate a base station with DTX on.

At steps 1 to 30 the SS shall check the accuracy of the measured signal strength of TCH by checking the values of the parameters RXLEV-FULL and RXLEV-SUB. At steps 31 to 105 the SS shall check only the value of the parameter RXLEV-SUB.

At step 64, within every 480 ms reporting period, out of the 4 SACCH and 8 SID timeslots the SS shall transmit the first six active timeslots of the TCH with signal level 39.5 dBmicroVolt emf( ) and the last six active timeslots of the TCH with signal level 29.5 dBmicroVolt emf( ).

e) The MS is placed in the climatic test chamber, and step d) is repeated for the following combinations of temperatures and power supply voltages:

Temp	:	Hi	Hi	Lo	Lo
Voltage	:	Hi	Lo	Lo	Hi

II.6.2.1.3 Requirements

1) Relative Accuracy

1.1) Relative Accuracy over the Frequency Band

For each of the steps 1, 22, 43, 64, 85 the 7 reported RXLEV values shall be checked. The minimum reported RXLEV value shall be subtracted from the maximum reported RXLEV value. The result for each of the five steps shall be less than or equal to 2.

1.2) Relative Accuracy at a single frequency, BCCH1

The reported value of RXLEV shall meet the following formula for signal levels above the sensitivity level. For a given value of m, all reported values of RXLEV must comply with one of the formulae a), b) or c) (see note 4):

For n <= 21 and $RXLEV_1$ = 63 (see note 3)

either a)

RXLEVn = 63

or

$$RXLEVn = (63 - n + r) \quad \left\{ \begin{matrix} +1 \\ -1 \end{matrix} \right.$$

or b)

RXLEVn = 63

or

$$RXLEVn = (63 - n + r) \quad \left\{ \begin{matrix} +2 \\ +0 \end{matrix} \right.$$

or c)

RXLEVn = 63

or

$$RXLEVn = (63 - n + r) \quad \left\{ \begin{matrix} +0 \\ -2 \end{matrix} \right.$$

Otherwise

either a)

$$RXLEV_n = (\ RXLEV_{(m*21+1)} - n + m*21 + 1\ )\ \left\{{}^{+1}_{-1}\right.\quad \left\{{}^{+2}_{-1}\right.\ \text{Note 1)}\ ,\ \left\{{}^{+3}_{-1}\right.\ \text{Note 2)}$$

or b)

$$RXLEV_n = (\ RXLEV_{(m*21+1)} - n + m*21 + 1\ )\ \left\{{}^{+2}_{+0}\right.\quad \left\{{}^{+3}_{+0}\right.\ \text{Note 1)}\ ,\ \left\{{}^{+4}_{+0}\right.\ \text{Note 2)}$$

or c)

$$RXLEV_n = (\ RXLEV_{(m*21+1)} - n + m*21 + 1\ )\ \left\{{}^{+0}_{-2}\right.\quad \left\{{}^{+1}_{-2}\right.\ \text{Note 1)}\ ,\ \left\{{}^{+2}_{-2}\right.\ \text{Note 2)}$$

where m = 0, 1, 2, 3, 4 (see Table II.6-3);

n = number of step so, that $n > m*21$ and $n <= (m+1)*21$.

r = number of last step where RXLEV of 63 was reported.

Note 1: This tolerance applies to signal levels below 25 dBμV emf for handhelds and to signal levels below 23 dBμV emf for other types of MSs.

Note 2: This tolerance applies to signal levels below 12 dBμV emf for handhelds and to signal levels below 10 dBμV emf for other types of MSs.

Note 3: These formulae allow for a MS with an absolute accuracy worse than + 0.5 dB and therefore reporting an RXLEV of 63 for more than one step. The absolute accuracy is checked in requirement 2).

Note 4: The options a), b) and c) allow for three conditions which satisfy the requirements when the results are measured relative to a fixed point in the measured 20 dB range.

Note: The relaxation for low signal levels is necessary due to the effect of receiver noise in the measurement results.

2) Absolute Accuracy

For each of the steps 1, 22, 43, 64, 85 the reported RXLEV values shall meet the following requirements:

For normal test conditions:

$$|RXLEV_{MS} - RXLEV_C| <= \begin{cases} 4 & \text{for steps 64, 85;} \\ 6 & \text{for steps 1, 22, 43;} \end{cases}$$

where $RXLEV_{MS}$ = reported RXLEV value;
$RXLEV_C$ = correct RXLEV value as stated in the Table II.6-4 below.

For extreme test conditions:

$$|RXLEV_{MS} - RXLEV_C| <= 6 \quad \text{for steps 1, 22, 43, 64, 85.}$$

Note: in step 64 $RXLEV_C$ is 32.

RXLEV	for Received Signal Level
0	less than 3 dBmicroVolt emf
1	3 dBmicroVolt emf to 4 dBmicroVolt emf
2	4 dBmicroVolt emf to 5 dBmicroVolt emf
.	.
62	64 dBmicroVolt emf to 65 dBmicroVolt emf
63	greater than 65 dBmicroVolt emf

TABLE II.6-4 : Correct values of RXLEV

For input signal levels below sensitivity level the reported value of RXLEV may be any value between that reported at sensitivity level and the actual input signal level, but never a value higher than that reported at sensitivity level. The cells with signal levels below the limit value of reference sensitivity need not be included.

II.6.2.2 Signal Quality

Definition

The MS must be capable of measuring the received signal quality, which is specified in terms of bit error ratio (BER) before channel decoding averaged over the reporting period of length of one SACCH multiframe defined in Section 8.4 of GSM 05.08. The MS has to map this BER into RXQUAL values using the coding scheme defined in Section 8.2.4 of GSM 05.08.

In order to assess the correct operation of the quality reporting algorithm in the MS, the SS will measure the BER of class II bits and will assume that it is equal to that before channel coding.

The test is performed for two channel propagation conditions: static and TU50. In static conditions two kind of channels are considered: full rate and DTX. In TU50 conditions, only the full-rate channel is considered.

This test is only applicable to MS supporting speech.

II.6.2.2.1 Test on signal quality under static conditions

II.6.2.2.1.1 Method of measurement

a) The MS shall be connected to the SS. A call shall be originated by the SS to the MS in the range ARFCN 60-65 and the MS shall be made to answer the call. The MS is operated under normal test conditions. The Radio Link Timeout is set to maximum. The SS is set to produce a wanted signal and an independent uncorralated interfering (unwanted) signal at the same time, both with static propagation characteristics. The wanted signal shall be the Standard Test Signal C1. It shall be at the nominal frequency of the receiver and its level shall be 28 dBuVemf ( ). The unwanted signal shall have no fixed relationship with the bit transitions of the wanted signal, and it shall be modulated with random data. The unwanted signal shall be continuous, with a nominal frequency 200 kHz above the nominal frequency of the wanted signal. The MS shall be operated in the encrypted mode.

b) The SS commands the MS to create the loop back facility from the receiver channel decoder output to the transmitter encoder input.

c) The SS performs a calibration of C/I to class II RBER over the range of the RXQUAL cases in the table in step d). It is expected that the range of the unwanted signal level will be approximately 35 dBμVemf( ) to 50 dBμVemf( ) and to calibrate over 2000 errors would give sufficient accuracy.

d) A curve of BER of class II bits is drawn vs the ratio of the level of the wanted to the unwanted signal (C/I) and the correspondence of the table below is derived from it.

CASE	AVERAGE BER	C/I
0	0,09%	(C/I)0
1	0,28%	(C/I)1
2	0,57%	(C/I)2
3	1,13%	(C/I)3
4	2,26%	(C/I)4
5	4,53%	(C/I)5
6	9,05%	(C/I)6
7	18,10%	(C/I)7

e) The level of the unwanted signal is set at a value for which C/I = (C/I)i, with i equal to one out of the numbers 0,1, ... 7. At such C/I the expected quality band reported by the MS is RXQUAL_i.

f) At the end of each SACCH block, the SS increases by 1 a counter of the number of errors in reporting the RXQUAL band only if such band is different from the expected one (that is RXQUAL_i). Moreover a counter of the number of errors of the class II bits is properly increased.

g) The procedure stated in f) is repeated 350 times (see note 3). If the ratio between the number of errors of the class II bits and the number of the class II bits occurring within 350 (see note 3) SACCH blocks is within +7% (or -7%) (see note 1) from the value of the BER corresponding to the case i, the value of Max-events is increased by the recorded number of errors in reporting the RXQUAL band and Max-samples is increased by 350. If outside the +/- 7% the level of the unwanted signal may be changed or not (see note 2).

Note 1: For RXQUAL_0, if it is not possible to adjust the BER for the +/- 7% band, it is acceptable to use the nearest RF power level which gives BER better than 0.1% (which is the value specified in GSM 05.08 section 8.2.4).

Note 2: If the BER measured over the 350 (see note 3) SACCH blocks is close to the +/- 7% target it may be preferable not to adjust the level but to repeat the sample.

h) Steps f) and g) shall be repeated until the number of samples of case i is equal to Max-samples_i, or the number of errors in reporting the RXQUAL band exceeds Max-events_i.

i) The SS is set to simulate a base station in DTX mode according to section 8.3 of GSM 05.08 and step f) is repeated until the number of samples of case i is equal to Max-samples_i or the number of errors in reporting the RXQUAL band exceeds Max-events_i.

j) The SS is set to simulate a base station in non DTX mode.

k) Steps from e) to i) shall be repeated for each of the (C/I)i values, with i = 0, 1, ... 7.

Note 3: Due to the high error rates involved with testing RXQUAL 5, 6 and 7 the MS may experience a radio link timeout. To avoid this the test is performed using 50 SACCH blocks instead of 350. In between measurements at least 35 SACCH blocks are transmitted with a lower level of the unwanted signal.

II.6.2.2.1.2 Requirements (static conditions)

The number of errors in reporting the RXQUAL bands recorded in each of the considered cases shall not exceed the corresponding value of Max-events shown in the following tables, when the number of samples relevant to the case under test is equal to Max-samples.

The two tables below refer to RXQUAL_FULL bands (relevant to the full-rate channel quality evaluation) and RXQUAL_SUB bands (relevant to the quality evaluation of the channel operating in DTX mode) respectively.

CASE	Expected RXQUAL_FULL	Specified reporting error rate	Max-events	Max-samples
0	RXQUAL_0	10%	211	1750
1	RXQUAL_1	25%	211	700
2	RXQUAL_2	15%	254	1400
3	RXQUAL_3	10%	211	1750
4	RXQUAL_4	10%	211	1750
5	RXQUAL_5	5%	213	3500
6	RXQUAL_6	5%	213	3500
7	RXQUAL_7	5%	200	3300

CASE	Expected RXQUAL_SUB	Specified reporting error rate	Max-events	Max-samples
0	RXQUAL_0	35%	300	750
1	RXQUAL_1	75%	400	495
2	RXQUAL_2	70%	400	525
3	RXQUAL_3	65%	400	560
4	RXQUAL_4	45%	300	590
5	RXQUAL_5	35%	300	750
6	RXQUAL_6	25%	200	665
7	RXQUAL_7	15%	200	1105

II.6.2.2.2 Test on signal quality under TU50 propagation conditions

II.6.2.2.2.1 Method of measurement

a) The MS shall be connected to the SS. A call shall be originated by the SS to the MS in the range ARFCN 60 to 65 and the MS shall be made to answer the call. The MS is operated under normal test conditions. The SS is set to produce the standard test signal C1 with TU50 propagation profile. It shall be at the nominal frequency of the receiver at a median level of 28dBuVemf( ). The MS shall be operated in the encrypted mode.

b) The SS commands the MS to create the loop back facility from the receiver channel decoder output to the transmitter encoder input.

c) The SS counts the number of errors of the class II bits (occurring in 50 SACCH blocks) and the relevant BER is computed. If such BER does not correspond to one out of the 5 different cases shown in the table below, the test shall be continued from step f). On the contrary, if such BER corresponds to one out of the 5 different cases shown in the table below, let us say case i (with i equal to 1 out of the 5 numbers 0, 1, ... 4), the procedure stated from step d) on shall be adopted.

d) The SS records all the RXQUAL bands reported at the end of each of the 50 SACCH blocks. A counter Max-samples_i shall be increased by 50, and the SS verifies whether each of the quality band reported by the MS is equal to RXQUAL i (with i = 0, 1, ... 4), or to one of the adjacent bands RXQUAL_(i-1) (with i = 1, 2, ..., 4) and RXQUAL_(i+1) (with i = 0, 1, ..., 3). For each failure (to be in the correct or one of the adjacent bands) that is found, if any, a counter Max-events_i shall be increased by one.

CASE	AVERAGE BER (%) OF THE CLASS II BITS
0	< 0.10
1	0.26 TO 0.30
2	0.51 TO 0.64
3	1.0 TO 1.3
4	1.9 TO 2.7

e) Step c) shall be repeated 20 times.

f) The SS is set to produce also an independent, uncorrelated interfering (unwanted) signal with TU50 propagation profile. The unwanted signal shall have no fixed relationship with the bit transitions of the wanted signal and it shall be modulated with random data. Its median level shall be 25 dB below the median level of the wanted signal.

g) The SS counts the number of error of the class II bits occurring in 50 SACCH blocks and the relevant BER is computed.

h) If such BER does not correspond to one out of the 5 cases shown in the table above, the median level of the unwanted signal shall be increased (or decreased) by 0.6 dB and step g) shall be repeated. On the contrary, if the computed BER correspond to one out of the 5 cases shown in the table above, step d) shall be repeated.

i) Steps g) and h) shall be repeated 20 times.

j) The median level of the unwanted signal is increased at step of 2 dB up to a value of 5 dB above that of the wanted signal and, at each step, the procedure stated from g) to i) shall be repeated.

k) Step j) shall be stopped when Max-samples is greater than 200.

Note: If, at the end of the whole test, one or more Max-samples_i (with i = 0, 1, ..., 4) is lower than 200, the corresponding case shall be skipped out, being statistically not significant.

II.6.2.2.2.2 Requirements (TU50 conditions)

For each of the examined cases of the table above, the error rate in reporting the quality band is computed as the ratio between the recorded number of reporting errors Max-events_i, and the corresponding number of the samples Max-samples_i. The test is passed if the computed reporting error rate does not exceed the Max_reporting error rate shown in the table below.

CASE	Expected RXQUAL_FULL	Specified reporting error rate	Max_reporting error rate
0	RXQUAL_0/1	15%	18%
1	RXQUAL_1/0/2	15%	18%
2	RXQUAL_2/1/3	15%	18%
3	RXQUAL_3/2/4	10%	12%
4	RXQUAL_4/3/5	10%	12%

II.6.3 TX POWER CONTROL

II.6.3.1 Definition

RF power control is employed to minimise the transmit power whilst maintaining the quality of the radio link. The RF power level to be employed by the MS is indicated by means of the 5 bit TXPWR field sent either in the layer 1 header of each downlink SACCH message block or in a dedicated signalling block.

The MS shall confirm the power level that it is currently employing by setting the MS-TXPWR-CONF field in the uplink SACCH L1 header to its current power setting.

The timing requirement on the MS power control behaviour and the MS-TXPWR-CONF field in the uplink SACCH L1 header will be tested here, while the transmitted output power used by the MS is tested in the transmitter section (see II.3.3).

Timing reference for this test: In this test case TDMA frame number 1 is the first TDMA frame belonging to the reporting period after the SS signals a change in TXPWR level (see GSM 05.08 section 4.7).

II.6.3.2 Method of Measurement

Note 1: The method of measuring the MS transmitter output power is given in section II.3.3.

a) The SS sets MS-TXPWR-MAX-CCH = 0 in its SYSTEM INFORMATION TYPE 3 message and " DTX = OFF " signalled on the BCCH. After 10 s the MS is brought into the conversation state on timeslot 0.

b) The SS shall measure the MS transmit power. The SS then signals TXPWR = 15 to the MS. (see note 2)

Note 2: Due to the high dynamic range required from the SS for a power level change from 0 to 15, it is an acceptable and equivalent test to perform steps a) to c) repeatedly with different values for TXPWR in steps a) and b) in order to reduce the dynamic range provided that the final value of TXPWR in step b) is 15. The TXPWR values chosen for the repeated step a) must ensure a minimum overlap of 2 to the value previously used for step b).

c) The SS shall measure the MS transmit power on TDMA frames 6, 19, 32 and every subsequent 13th TDMA frame to TDMA frame 201. The SS shall also monitor the MS-TXPWR-CONF field in the uplink SACCH L1 header.

d) The SS now sets TXPWR back to the maximum peak power appropriate to the class of the MS. (see note 3)

Note 3: Due to the high dynamic range required from the SS for a power level change from 15 to a possible maximum of 0, it is an acceptable and equivalent test to perform steps d) to e) repeatedly with different values for TXPWR in steps d) in order to reduce the dynamic range provided that the final value of TXPWR in step d) is the maximum peak power appropriate to the class of MS. The TXPWR values chosen for the repetition must ensure a minimum overlap of 2 to the value previously used for step d).

e) Step c) shall be repeated.

f) The SS now sets TXPWR = 8. After 3 s the SS then sets TXPWR = 9.

g) After the SS has set TXPWR = 9, the SS shall measure the MS transmit power on TDMA frame 6 (GSM 05.08 section 4.7).

h) The SS returns TXPWR to 8.

i) After the SS has set TXPWR = 8, the SS shall measure the MS transmit power on TDMA frame 6 (GSM 05.08 section 4.7).

j) Then the channel assignment is changed and the demanded power within the channel assignment is set to TXPWR=15. When the MS had changed channel its output power is measured on the first burst on the new channel.

II.6.3.3 Requirements

Refer to TABLE II.3.3 for relationship between the POWER CLASS, POWER CONTROL LEVEL, PEAK TRANSMITTED CARRIER POWER and the relevant TOLERENCES.

1) Step c). The peak transmitted carrier power of TDMA frame 6 shall correspond to one power control step below the value measured in step b). The peak transmitted carrier power of each subsequently measured TDMA frame shall correspond to one power control step lower than the previous measured TDMA frame until power control level 15 is reached. The value of the MS-TXPWR-CONF field in the uplink SACCH L1 header shall correspond to the measured MS transmitted power during the last active TDMA burst of the previous SACCH reporting period (GSM 05.08 section 4.2).

2) Step e). The peak transmitted carrier power of TDMA frame 6 shall correspond to power control level 14 (see following note). The peak transmitted carrier power of each subsequently measured TDMA frame shall correspond to one power control step higher than the previous measured TDMA frame until the maximum power control level is reached. The value of the MS TXPWR CONF field in the uplink SACCH L1 header shall correspond to the measured MS transmitted power during the last active TDMA burst of the previous SACCH reporting period.

Note: If steps d) and e) are repeated with reduced power control ranges, then the peak transmitted power shall correspond to one power control level higher than that at the end of the previous step e).

3) Steps g) and i). The peak transmitted carrier power of TDMA frame 6 shall correspond to the commanded power control level.

4) Step j). The MS output power measured immediately after the new channel assignment has been set, shall correspond to the commanded power level.

II.6.4 SINGLE FREQUENCY REFERENCE

The MS is required to use one single frequency reference for both RF generation/reception and baseband signals. A test method to verify this is not available.

Requirement

1) The manufacturer shall demonstrate that the MS is based on one single frequency reference.

II.8 TESTING OF THE ME/SIM (SUBSCRIBER IDENTIFICATION MODULE) INTERFACE

The SIM is specified in GSM 11.11.

Testing of the SIM itself is not part of this specification.

General

The following tests concentrate upon procedures which have an impact upon the performance of the ME on the network; i.e. following the usual criteria that type approval protects the network and other users, but does not validate the performance of the equipment under test.

The following sequence of tests for the SIM/ME interface confirms:

a) the correct interpretation of data read by the ME from the SIM;

b) the correct writing of data by the ME to the SIM;

c) the initiation of appropriate procedures by the ME involving transfer of information between ME and SIM.

The tests must be considered as a continuous sequence requiring that information written to or deleted from the SIM or ME memories is carried forward into the succeeding tests.

Note: A SIM Simulator will be required as part of the SS.

A SIM Programmer/Reader is required as part of the SS.

The tests of High Level Procedures (Test Sequences 1 to 8) have been designed using the substitution method of testing. It is probable that instead of a number of SIMs programmed to values defined in Tables II.8-1 and II.8-2 the SIM Simulator will be used. However, as these tests require use also of the Um interface, there is concern that RF may disturb the SIM Simulator. For the present, therefore, the tests are still described for the substitution method. If the SIM Simulator is found reliable for all tests then the requirement for a Programmer/Reader as part of the SS can be dropped.

TEST SEQUENCES 1 TO 8

To perform these test sequences SIMs will be required programmed with specific data field values as defined in Tables II.8-1 and II.8-2 following.

These tables also give the expected values of the data fields at the completion of each test sequence.

(For a full explanation of each data field see GSM 11.11.)

TABLE II.8-1: SIM DATA FIELD VALUES FOR THE SIM/ME INTERFACE TEST SEQUENCES

At start of test sequence.	1	2	3	4		5		6		8	10		13
At end of test sequence.	1	2	3		4		5		6	8		10	13
Data Field \ Value													
IMSI	A	A	A	B	B	B	B	A	A	see test 8	B	B	x
LOCATION INFORMATION (LAI & TMSI)	A	B	C	A	D	F	E	B	B	x	A	x	x
Kc and Cipher Key Sequence No. (n)	A	A	A	A	B	B	C	A	A	A	A	x	x
ACCESS CONTROL	A	A	A	A	A	A	A	A	A	see test 8	A	A	x
FORBIDDEN PLMNs	A	A	A	A	A	A	B	A	A	A	A	A	x
SIM SERVICE TABLE	A	A	A	A	A	A	A	A	A	A	A	A	A
PIN	x	x	x	x	x	x	x	x	x	x	x	x	A
UNBLOCKING KEY	x	x	x	x	x	x	x	A	A	x	x	x	A
PLMN SELECTOR	A	A	A	A	A	A	A	A	B	A	A	A	x

Note: 'x' indicates that the value is of no significance to the test.

TABLE II.8-2 : DEFINITION OF VALUES OF TABLE II.8-1

Data-Field 6F-07 : IMSI

	Value A	Value B	
	246813579	246811111111111	
byte 1	05 H	08 H	length of IMSI
byte 2	29 H	29 H	first digit, parity coding
byte 3	64 H	64 H	digits
byte 4	18 H	18 H	
byte 5	53 H	11 H	
byte 6	97 H	"	
byte 7	FF H	"	
byte 8	FF H	"	
byte 9	FF H	"	

TABLE II.8-2 cont.

Data-Field 6F-7E : Location Information

	Value A	Value B	Value C	Value D	Value E	Value F
LAI - MCC	246	246	246	246	234	234
MNC	81	81	81	81	06	01
TMSI	Null	00002143H	21436587H	32547698H	43658709H	32547698H
TMSI Time-	Null	Null	Null	Null	Null	Null
byte 1	FF H	00 H	21 H	32 H	43 H	32 H
byte 2	FF H	00 H	43 H	54 H	65 H	54 H
byte 3	FF H	21 H	65 H	76 H	87 H	76 H
byte 4	FF H	43 H	87 H	98 H	09 H	98 H
byte 5	42 H	42 H	42 H	42 H	32 H	32 H
byte 6	F6 H	F6 H	F6 H	F6 H	F4 H	F4 H
byte 7	18 H	18 H	18 H	18 H	60 H	10 H
byte 8	xx H	xx H	xx H	xx H	xx H	00 H
byte 9	xx H	xx H	xx H	xx H	xx H	00 H
byte 10	FF H	FF H	FF H	xx H	xx H	FF H
byte 11	00 H	00 H	00 H	xx H	xx H	00 H

xx = Don't care. Depends on MS and SS test implementations.

Data-Field 6F-20 : Cipher Key (Kc) and Cipher Key Sequence No. (n)

	Value A		Value B	Value C
byte 1	xx	Kc	bytes 1-8 as determined by Authentication Algorithm	xx H
byte 2	xx			xx H
byte 3	xx			xx H
byte 4	xx			xx H
byte 5	xx			xx H
byte 6	xx			xx H
byte 7	xx			xx H
byte 8	xx			xx H
byte 9	01 H	n=001	02 H n=010	07 H n = 111

Data-Field 6F-78 : Access Control

One Access Class from 0-9 to be allocated compatible with those allowed by the SS.

TABLE II.8-2 cont.

Data-Field 6F-7B : Forbidden PLMNs

	Value A		Value B		
byte 1	32 H	MCC = 234	32 H	MCC = 234	First forbidden PLMN (oldest)
byte 2	F4 H		F4 H		
byte 3	20 H	MNC = 02	30 H	MNC = 03	
byte 4	32 H	MCC = 234	32 H	MCC = 234	2nd forbidden PLMN
byte 5	F4 H		F4 H		
byte 6	30 H	MNC = 03	40 H	MNC = 04	
byte 7	32 H	MCC = 234	32 H	MCC = 234	3rd forbidden PLMN
byte 8	F4 H		F4 H		
byte 9	40 H	MNC = 04	50 H	MNC = 05	
byte 10	32 H	MCC = 234	32 H	MCC = 234	4th forbidden PLMN (newest)
byte 11	F4 H		F4 H		
byte 12	50 H	MNC = 05	10 H	MNC = 01	

Data-Field 6F-38 : SIM Service Table

Value A :
byte 1 xxxxxx11 - PIN Disable function allocated and activated
byte 2 xxxxxx11 - Charging Counter allocated and activated

Value B :
byte 1 xxxxxx01 - PIN Disable function allocated but not activated
byte 2 xxxxxx11 - Charging Counter allocated and activated

Data-Field 6F-30 : PLMN Selector

	Value A		Value B	
byte 1	32H	MCC = 234	32H	MCC = 234
byte 2	F4H		F4H	
byte 3	10H	MNC = 01	10H	MNC = 01
byte 4	32H	MCC = 234	65H	MCC = 567
byte 5	F4H		F7H	
byte 6	20H	MNC = 02	10H	MNC = 01
byte 7	32H	MCC = 234	32H	MCC = 234
byte 8	F4H		F4H	
byte 9	30H	MNC = 03	30H	MNC = 03
byte 10	32H	MCC = 234	32H	MCC = 234
byte 11	F4H		F4H	
byte 12	40H	MNC = 04	40H	MNC = 04
byte 13	32H	MCC = 234	32H	MCC = 234
byte 14	F4H		F4H	
byte 15	50H	MNC = 05	50H	MNC = 05
byte 16	32H	MCC = 234	32H	MCC = 234
byte 17	F4H		F4H	
byte 18	60H	MNC = 06	60H	MNC = 06
byte 19	42H	MCC = 246	42H	MCC = 246
byte 20	F6H		F6H	
byte 21	18H	MNC = 81	18H	MNC = 81
byte 22	42H	MCC = 246	42H	MCC = 246
byte 23	F6H		F6H	
byte 24	28H	MNC = 82	28H	MNC = 82

TABLE II.8-2 cont.

PIN

Value A
2468

UNBLOCKING KEY

Value : 13243546

Data-Field Values of other data fields are of no significance for the tests which follow.

II.8.1 TEST SEQUENCE 1

Purpose:

1) To confirm that the ME reads IMSI from SIM as part of the SIM/ME initialisation procedure.

2) To confirm that the ME can handle IMSIs of less than the maximum allowed value.

Procedure:

a) The SS is set up to transmit on the BCCH with the following network parameters:
Attached/detach disabled
LAI : MCC = 246
MNC = 81
Access Control: Unrestricted.

b) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME.

c) The MS is powered-on.

d) The SS sends PAGe REQuest to the MS using IMSI (value A).

Requirements:

1) The MS shall send CHANnel REQuest to the SS.

Procedure:

e) The SS shall send IMM ASSIGN to the MS.

Requirements:

2) The MS shall send PAG RES to the SS containing IMSI (value A).

Procedure:

f) The SS shall send RELEASE to the MS.

II.8.2 TEST SEQUENCE 2

Purpose:

1) To confirm that ME reads TMSI from SIM as part of SIM/ME initialisation procedure.

Procedure:

a) The SS sends PAGe REQuest to the MS using TMSI (value B).

Requirements:

b) The MS shall send CHANnel REQuest to the SS.

Procedure:

c) The SS shall send IMM ASSIGN to the MS.

Requirements:

d) The MS shall send PAG RES to the SS containing TMSI (value B).

Procedure:

e) The SS shall send RELEASE to the MS.

II.8.3 TEST SEQUENCE 3

Purpose:

1) To confirm that when a SIM with a different TMSI value is introduced into the ME, causing a new SIM/ME initialisation procedure to take place, that the values previously used by the ME have been deleted.

2) To confirm that the ME can handle a TMSI values of maximum length.

Procedure:

a) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME, and the MS powered-on.

b) The SS sends PAGe REQuest to the MS using TMSI (value B).

Requirements:

c) The MS shall not respond to the PAGe REQuest.

Procedure:

d) The SS sends PAGe REQuest to the MS using TMSI (value C).

Requirements:

e) The MS shall send CHANnel REQuest to the SS.

Procedure:

f) The SS shall send IMM ASSIGN to the MS.

Requirements:

g) The MS shall send PAG RES to the SS containing TMSI (value C).

h) The SS shall send RELEASE to the MS.

II.8.4 TEST SEQUENCE 4

Purpose:

1) To confirm that when a SIM with a different IMSI value is introduced into the ME, causing a new SIM/ME initialisation procedure to take place, that the value previously used by the ME has been deleted.

2) To confirm that the ME can handle a IMSI value of maximum length.

3) To confirm that after Ciphering Mode Setting the ME updates the SIM with the new value of Cipher Key Sequence Number (n), at call termination.

4) To confirm that the TMSI data field in the SIM is correctly updated by the ME at call termination.

Procedure:

a) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME, and the MS powered-on.

b) The SS sends PAGe REQuest to the MS using IMSI (value A).

Requirements:

1) The MS shall not respond to the PAGe REQuest.

Procedure:

c) The SS sends PAGe REQuest to the MS using IMSI (value B).

Requirements:

2) The MS shall send CHANnel REQuest to the SS.

Procedure:

d) The SS shall send IMMI ASSIGN to the MS.

Requirements:

3) The MS shall send PAG RES to the SS containing IMSI (value B).

4) The SS shall send AUThentication REQuest to the MS containing Cipher Key Sequence Number set to binary 010.

5) The MS shall send AUThentication RESponse to the SS.

6) The Cipher Key Sequence Number in the SIM shall be the value '010' when read in Requirement 9) below.

Procedure:

e) The SIM shall send TMSI REALlocation to the MS containing the TMSI (value D).

Requirement:

7) The MS shall send TMSI REALlocation Complete to the SS.

8) The TMSI data field in the SIM shall contain the value D when read in Requirement 9) below.

Procedure:

f) Within 5 seconds the SS shall send RELEASE to the MS.

g) The values in the SIM are examined after call termination. This can be done by examining the data in the SIM Simulator or by removing the SIM in the following way:
   i) If the SIM can simply be removed it is removed without powering down the MS.
   ii) If i) can not be performed the power supply is removed from the MS and the SIM then removed.

Requirements:

9) The SIM shall contain the values listed in Tables II.8-1 and II.8-2 above.

II.8.5 TEST SEQUENCE 5

Purpose:

1) To confirm that the ME reads the value of the Forbidden PLMN field as part of the SIM/ME Initialisation procedure and does not attempt to access these PLMNs in automatic PLMN selection mode.

2) To confirm that the Forbidden PLMN data field in the SIM is correctly updated by the ME at soft power-down.

3) To confirm that the Location Information data field in the SIM is correctly updated by the ME at soft power-down.

Procedure:

a) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME, and the MS powered-on. The MS is made to operate in automatic PLMN selection mode.

b) The SS provides a BCCH with default values and:
LAI : MCC = 234
MNC = 02.

Requirement:

1) The MS shall not attempt a LOCation UPDate.

Procedure:

c) The SS stops all RF output on the BCCH for a long enough period of time to cause a reselection in the MS. The BCCH is changed to contain:
LAI : MCC = 234
MNC = 03.

The SS then resumes RF output on the BCCH.

Requirement:

2) The MS shall not attempt a LOCation UPDate.

Procedure:

d) The SS stops all RF output on the BCCH for a long enough period of time to cause a reselection in the MS. The BCCH is changed to contain:
LAI : MCC = 234
MNC = 04.

The SS then resumes RF output on the BCCH.

Requirement:

3) The MS shall not attempt a LOCation UPDate.

Procedure:

e) The SS stops all RF output on the BCCH for a long enough period of time to cause a reselection in the MS. The BCCH is changed to contain:

LAI : MCC = 234
MNC = 05.

The SS then resumes RF output on the BCCH.

Requirement:

4) The MS shall not attempt a LOCation UPDate.

Procedure:

f) The SS stops all RF output on the BCCH for a long enough period of time to cause a reselection in the MS. The BCCH is changed to contain:

LAI : MCC = 234
MNC = 01.

The SS then resumes RF output on the BCCH.

Requirement:

5) The MS shall send CHANnel REQuest to the SS.

Procedure:

g) The SS shall send IMM ASSIGN to the MS.

Requirement:

6) The MS shall send Location UPDate Request to the SS.

Procedure:

h) The SS shall send LOC UPD REJ to the MS with the reason "PLMN Not Allowed", followed by CHANnel RELease.

Requirement:

7) The Forbidden PLMN data field in the SIM shall contain the Value B when read in Requirement 12) below.

Procedure:

i) The SS stops all RF output on the BCCH for a long enough period of time to cause a reselection in the MS. The BCCH is changed to contain:
LAI : MCC = 234
MNC = 06.

Requirement:

8) The MS shall send CHANNel REQuest to the SS.

Procedure:

j) The SS shall send IMM ASSIGN to the MS.

Requirement:

9) The MS shall send LOC UPD REQ to the SS.

Procedure:

k) The SS shall send LOC UPD ACC with
LAI : MCC = 234
MNC = 06
and TMSI: 43658709 H
to the MS.

Requirements:

10) The MS shall respond with TMSI REAL COM.

11) The Location Area Identification data field in the SIM shall contain the value E when read in Requirement 12 below.

Procedure:

l) The SS shall send RELEASE to the MS.

m) The MS is soft powered-down.

Requirements:

12) The SIM shall be removed from the MS, and installed in a SIM reader. It shall contain the values listed in Tables II.8-1 and II.8-2 above.

II.8.6 TEST SEQUENCE 6

Purpose:

To check PLMN Selector Updating Procedure.

Procedure:

a) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME.

b) The MS is powered-on.

c) The second PLMN in the PLMN selector list shall be entered as MCC = 567 MNC = 01. (MMI dependent)

d) The SIM shall be removed from the MS, and installed in a SIM reader.

Requirement:

The SIM shall contain the PLMN MCC = 567 MNC = 01 in the second position of the PLMN selector list. Erased fields are ignored for counting purposes.

II.8.7 TEST SEQUENCE 7 - ELECTRICAL TESTS

Purpose of the test

Testing of Electrical characteristics of the SIM/ME interface.

Whilst non-conformance in this area would be unlikely to cause difficulties to other users or the network (type approval criteria) significant deviations from the specifications (GSM 11.11 and ISO 7816) may damage the SIM. If an attempt is then made to use the SIM in a different ME, then its failure may reflect badly on both that ME and the network.

This sequence lists the electrical tests to be run and when.

The first part describes the tests to be run during each phase of a transaction with the card.

The second part deals with tests run on each contact, and with static and dynamic tests:

1 - All Power on/off phases;

2 - All voltages, currents and signals characteristics on each contacts.

However, due to the likely difficulty of accessing the terminals of the SIM/ME interface for the purposes of measurements, the ME manufacturer shall provide a test interface in accordance with section III.1.5 for the purpose of conformance testing.

These tests are mandatory for all SIM or Plug-in SIM/ME interfaces.

General Measurement conventions

The measurement conventions are specified in ISO 7816-3 section 4.2.1.

II.8.7.1 Test of Power Transition Phases

Note: For the tests of sections II.8.7.1.2 and II.8.7.1.3 the test SIM card should be inserted into the ME.

II.8.7.1.1 PHASE PRECEDING MS POWER ON

Purpose : Measurement of residual voltages.

Procedure : The MS is powered off. The voltages across the contacts (C1, C2, C3, C6 and C7) referenced to ground (C5) are measured. The measurement equipment shall have a nominal resistance of 50 kOhms when measuring the voltage on C2, C3, C6 and C7. The nominal resistance shall be 10 kOhms when measuring the voltage of C1.
The test is performed with the power supply connected to the MS.

Requirement : The measured voltages shall be between 0 and +/- 0.4 volts.

II.8.7.1.2 PHASE DURING SIM POWER ON

Purpose : Verification of contact activation sequence.

Procedure : The MS is soft powered on. The SIM/ME interface is monitored until it is fully activated (See ISO 7816-3 section 5.1).

Requirements : Contacts shall be activated in the following order:

1 - RST in State L,
2 - VCC powered,
3 - I/O in (ME) reception mode,
4 - Vpp powered (see GSM 11.11 section 6.1.2.)
5 - Clock signal provided with a suitable and stable clock.

When Vpp is connected to Vcc, as allowed by GSM 11.11 (clause 6.1.2), then Vpp is activated together with Vcc, at the time of Vcc (step 2 in the sequence above)

Note: The verification starts with the first contact leaving the inactive state.

II.8.7.1.3 PHASE DURING POWER OFF

Purpose : Verification of contacts deactivation sequence.

Procedure : The MS is soft powered off. The SIM/ME interface is monitored until it is fully deactivated (See ISO 7816-3 section 5.1).

Requirements : Contacts are deactivated in the following order:

1 - RST at low status,
2 - Clock stopped at low status,
3 - VPP cut off (if VPP was provided, See GSM 11.11 section 6.1.2.),
4 - I/O at status A,
5 - VCC cut off.

When Vpp is connected to Vcc, as allowed by GSM 11.11 (clause 6.1.2), then Vpp is deactivated together with Vcc, at the time of Vcc (step 5 in the sequence above)

Note: The above sections II.8.7.1.2 and II.8.7.1.3 give the requirements of IEC/ISO 7816-3: 1989. TS GSM 11.11 describes the practical realisation of these sequences.

II.8.7.2 ELECTRICAL TESTS ON EACH ME CONTACT

The electrical values, as given in the following table, must apply to all contacts, other than that under test, under both normal and extreme test conditions as defined in Annex 1, TC2.1 nad TC2.2.

Contacts	Low level	High level	Max capacitive load from test equipment
C1 (Vcc)		V = 5V +/-10% I = 10 mA	
C2 (RST)	0V<=V<=0.6V I= -200μA	4V<=V<=Vcc I= +20μA	30 pF
C3 (CLK)	0V<=V<=0.6V I= -200μA	4V<=V<=Vcc I= +20μA	30 pF
C5 (GND)	0V	0V	
C6 (Vpp)		5V +/-10%	
C7 (I/O) I	0V<=V<=0.8V I= -1mA	0.7*Vcc<=V<=Vcc I= +/-20μA	30 pF
C7 (I/O) O	0V<=V<=0.4V I= 1mA	3.8V<=V<=Vcc I= -20μA	30 pF

Note 1: Measurements of contacts voltage levels can be done at any time since the beginning of activation of the SIM and the end of deactivation of the SIM (ISO 7816-3 section 5.1).

Note 2: The reference point of all measurements is the contact C5 (Ground).

Note 3: Currents flowing into the SIM are considered positive.

II.8.7.2.1 Electrical tests on contact C1

C1 = Card power supply (Vcc)

II.8.7.2.1.1

Purpose : To verify the nominal voltage.

Procedure : Vcc is measured with the remaining contacts in nominal test conditions.

Requirement : The voltage shall be 5V +/-10% for Icc up to 10 mA.

II.8.7.2.1.2

Purpose : To verify that the voltage does not collapse when subjected to current spikes.

Procedure : Vcc is monitored and the following current spikes are applied:

1) a single spike:
Max current 190 mA
Min current 0 mA
Duration 150 ns

2) a single spike:
Max current 95 mA
Min current 0 mA
Duration 350 ns.

3) continuous spikes:
Max current 19 mA
Min current 0 mA
Duration 100 ns
Pause 100 ns

4) continuous spikes:
Max current 19 mA
Min current 0 mA
Duration 400 ns
Pause 400 ns

5) continuous spikes:
Max current 19 mA
Min current 5 mA
Duration 150 ns
Pause 300 ns

6) Pseudorandom spikes:
Max current 19 mA
Min current 5 mA
Duration 200 ns
Pause between 0.1 ms and 500 ms, randomly varied

Note 1: The specified spike durations are measured at 50% of the spike amplitude.

Note 2: Due to practical test implementation limits the core requirement in GSM 11.11 is not tested to its full extent.

Requirement: The voltage shall not fall below 4.5V.

II.8.7.2.2 Electrical tests on contact C2

C2 = Reset (RST)

Purpose : To verify the voltage on contact C2

Procedure : The voltage on C2 is measured with the remaining contacts in nominal test conditions.

II.8.7.2.2.1 Tests on contact C2 = low level RST

Requirement : The voltage shall be between -0.3V and +0.6V for a current of - 200 μA.

II.8.7.2.2.2 Tests on contact C2 = high level RST

Requirement : Make sure that the voltage is between 4V and Vcc +0.3V for a current of 20 μA.

II.8.7.2.3 Electrical tests on contact C3

C3 = Clock (CLK)

Purpose : To verify the voltage, the rise/fall time of the signal and the clock cycle ratio on contact C3

Procedure : The voltage on C3 is measured with the remaining contacts in nominal test conditions.

II.8.7.2.3.1 Tests on contact C3 = CLK at low level

Requirement : The voltage shall be between -0.3V and 0.6V for a current of - 200 μA.

II.8.7.2.3.2 Tests on contact C3 = CLK for switch from low level to high level. Verification of rise time.

Requirement : The rise time shall not exceed 9% of the total time period and shall not exceed 0.5 us.

II.8.7.2.3.3 Tests on contact C3 = CLK at high level

Requirement : The voltage shall be between 3.15 V and Vcc +0.3V for a current of 20 μA.

II.8.7.2.3.4 Tests on contact C3 = CLK for switch from high level to low level. Verification of fall time.

Requirement : The fall time shall not exceed 9% of the period and it shall not exceed 0.5 μs.

II.8.7.2.3.5 Clock cycle ratio test

Requirement : The cycle ratio of the clock signal shall be between 40% and 60% of the period, in steady state.

II.8.7.2.4 Electrical tests on contact C6

Purpose : To verify that the contact is in accordance with GSM 11.11.

Procedure : The voltage on C6 is measured with the remaining contacts in nominal test conditions.

Requirement :

- In the case of IC card SIM, the ME shall provide contact C6 and an idle state equal to the condition for Vcc. Contact C6 may be connected to Vcc in the ME.
- In the case of the Plug-in SIM, contact C6 need not to be provided by the ME. If it is present in the ME, the programming voltage may not be provided. C6 shall not be connected to ground in the ME.

II.8.7.2.5 Electrical tests on contact C7

C7 = Input - output (I/O)

Purpose:

To verify that the electrical conditions meet the requirements given in TS GSM 11.11.

Procedure

The requirements on contact C7 are verified during normal transmission while the other contacts are in nominal test conditions.

II.8.7.2.5.1 MS receiving state A (low state)

Purpose:

To verify that the current sourced by the ME receiver and the pull-up resistor do not exceed the specified value.

Requirement:

With an imposed voltage of 0V the current flowing out of the ME shall not exceed 1mA.

II.8.7.2.5.2 MS transmitting state A (low state)

Purpose:

To verify that the ME driver is able to sink the maximum specified current.

Requirement:

The voltage shall be between -0.3V and 0.4V when a current of 1mA, flowing into the ME, is applied.

Note: The voltage range is extended below the value given in TS GSM 11.11 to allow for overshoot during dynamic operation.

II.8.7.2.5.3 MS transmitting or receiving state Z (high state)

Purpose:

To verify that the pull-up resistor of the ME is able to source the specified maximum current.

Requirement:

The voltage shall be between 3.8V and Vcc + 0.3V when a current of 20μA, flowing out of the ME, is applied.

II.8.8 TEST SEQUENCE 8: ACCESS CONTROL

Purpose:

1) To confirm that the ME reads the Access Control value as part of the SIM/ME initialisation procedure -

2) To verify that the MS does not attempt a network access if its Access Control Class is invalid -

- in the following cases:

(a) No SIM in ME - Emergency Calls not allowed by network.

(b) No SIM in ME - Emergency Calls allowed by network.

(c) MS with Access Class 0 to 9 - No Calls allowed by network.

(d) MS with Access Class 0 to 9 - Emergency Calls only allowed by network.

(e) MS with Access Class 0 to 9 - All Calls allowed by network.

(f) MS with Access Class 11 and 15 not in HPLMN,
MS with Access Class 12, 13 and 14 not in HPLMN country.

(g) MS with Access Class 11 and 15 in HPLMN,)
MS with Access Class 12, 13 and 14 in HPLMN country.) - Emergency Calls only allowed by the network.

(h)	MS with Access Class 11 and 15 in HPLMN, MS with Access Class 12, 13 and 14 in HPLMN country.	- All calls allowed by the network.

Method of Test:

a) A SIM is installed in the ME containing IMSI and Access Control Class values as given in the following Table II.8-3.

b) The SS is set up to transmit on the BCCH with a LAI and RACH control parameters as given in the following Table II.8-3.

c) The MS is powered-on.

Note: Depending on the initial value of the data field 6F-7E, the MS may perform a location update. This should be accepted by the SS.

d) Using the MMI or EMMI a normal call set-up is attempted.

e) Using the MMI or EMMI an emergency call set-up is attempted.

f) The test is repeated for each set of values in Table II.8-3.

Requirement:

The MS will access the network, or make no access attempt, to set-up the normal call and the emergency call as stated in the following Table II.8-3. For the tests 8c, 8d and 8e it is only necessary that one of the access classes is tested.

TABLE II.8-3

SIM			NETWORK		Test Result	
	IMSI	Access Control Class	RACH octet 3 octet 4	BCCH/LAI MCC MNC	Normal Calls	Emergency Calls
See end of table for coding details of these parameters.						
TEST 8a	No SIM in ME		00000100 00000000	234 01	No	No
TEST 8b	No SIM in ME		00000000 00000000	234 01	No	Yes
TEST 8c	246813579	0	00000100 00000001	246 81	No	No
	"	1	00000100 00000010	"	No	No
	"	2	00000100 00000100	"	No	No
	"	3	00000100 00001000	"	No	No
	"	4	00000100 00010000	"	No	No
	"	5	00000100 00100000	"	No	No
	"	6	00000100 01000000	"	No	No
	"	7	00000100 10000000	"	No	No
	"	8	00000101 00000000	"	No	No
	"	9	00000110 00000000	"	No	No

TABLE II.8-3 cont.

SIM		NETWORK		Test Result	
IMSI	Access Control Class	RACH octet 3 octet 4	BCCH/LAI MCC MNC	Normal Calls	Emergency Calls
TEST 8d					
246813579	0	00000000 00000001	246 81	No	Yes
"	1	00000000 00000010	"	No	Yes
"	2	00000000 00000100	"	No	Yes
"	3	00000000 00001000	"	No	Yes
"	4	00000000 00010000	"	No	Yes
"	5	00000000 00100000	"	No	Yes
"	6	00000000 01000000	"	No	Yes
"	7	00000000 10000000	"	No	Yes
"	8	00000001 00000000	"	No	Yes
"	9	00000010 00000000	"	No	Yes

Note: See end of table for coding details of the parameters in the table.

TABLE II.8-3 cont.

SIM		NETWORK		Test Result	
IMSI	Access Control Class	RACH octet 3 octet 4	BCCH/LAI MCC MNC	Normal Calls	Emergency Calls
TEST 8e					
246813579	0	11111011 11111110	246 81	Yes	Yes
"	1	11111011 11111101	"	Yes	Yes
"	2	11111011 11111011	"	Yes	Yes
"	3	11111011 11110111	"	Yes	Yes
"	4	11111011 11101111	"	Yes	Yes
"	5	11111011 11011111	"	Yes	Yes
"	6	11111011 10111111	"	Yes	Yes
"	7	11111011 01111111	"	Yes	Yes
"	8	11111010 11111111	"	Yes	Yes
"	9	11111001 11111111	"	Yes	Yes

Note: See end of table for coding details of the parameters in the table.

TABLE II.8-3 cont.

SIM		NETWORK		Test Result	
IMSI	Access Control Class	RACH octet 3 octet 4	BCCH/LAI MCC MNC	Normal Calls	Emergency Calls
TEST 8f					
2468135x9	11 and x	00000111 11111111	246 82	No	No
"	"	00000011 11111111	"	No	Yes
"	"	00000000 00000000		Yes	Yes
Set 'x' to a random value between 0 & 9					
2468135x9	12 and x	00000111 11111111	234 01	No	No
"	"	00000011 11111111	"	No	Yes
"	"	00000000 00000000		Yes	Yes
Set 'x' to a random value between 0 & 9					
2468135x9	13 and x	00000111 11111111	234 01	No	No
"	"	00000011 11111111	"	No	Yes
"	"	00000000 00000000		Yes	Yes
Set 'x' to a random value between 0 & 9					
2468135x9	14 and x	00000111 11111111	234 01	No	No
"	"	00000011 11111111	"	No	Yes
"	"	00000000 00000000		Yes	Yes
Set 'x' to a random value between 0 & 9					
2468135x9	15 and x	00000111 11111111	246 82	No	No
"	"	00000011 11111111	"	No	Yes
"	"	00000000 00000000		Yes	Yes
Set 'x' to a random value between 0 & 9					

TABLE II.8-3 cont.

SIM		NETWORK		Test Result	
IMSI	Access Control Class	RACH octet 3 octet 4	BCCH/LAI MCC MNC	Normal Calls	Emergency Calls
TEST 8g					
246813579	11 and x	00001111 11111111	246 81	No	Yes
"	"	00001011 11111111	"	No	Yes
246813579	12 and x	00010111 11111111	246 82	No	Yes
"	"	00010011 11111111	"	No	Yes
246813579	13 and x	00100111 11111111	246 82	No	Yes
"	"	00100011 11111111	"	No	Yes
246813579	14 and x	01000111 11111111	246 82	No	Yes
"	"	01000011 11111111	"	No	Yes
246813579	15 and x	10000111 11111111	246 81	No	Yes
"	"	10000011 11111111	"	No	Yes
Set 'x' to a random value between 0 & 9					
TEST 8h					
246813579	11 and x	11110011 11111111	246 81	Yes	Yes
246813579	12 and x	11101011 11111111	246 82	Yes	Yes
246813579	13 and x	11011011 11111111	246 82	Yes	Yes
246813579	14 and x	10111011 11111111	246 82	Yes	Yes
246813579	15 and x	01111011 11111111	246 81	Yes	Yes
Set 'x' to a random value between 0 & 9					

Note: See following page for coding details of the parameters in the table.

CODING DETAILS

SIM **IMSI: Data Field 6F 07**

	Value 246813579	Value 2468135x9
byte 1	05H	05H
byte 2	29H	29H
byte 3	64H	64H
byte 4	18H	18H
byte 5	53H	53H
byte 6	97H	9xH
byte 7	FFH	FFH
byte 8	FFH	FFH
byte 9	FFH	FFH

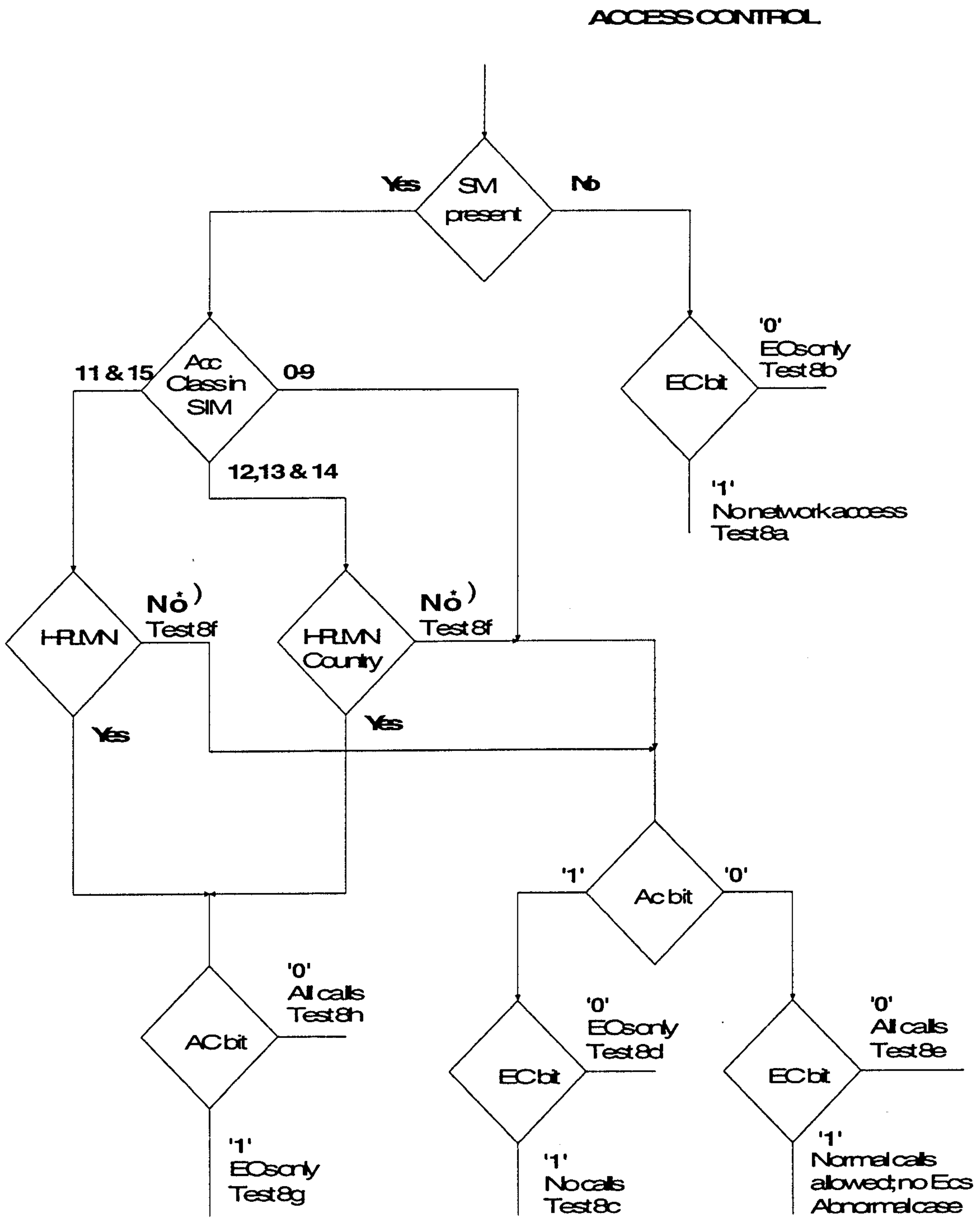
Access Class: Data Field 6F 78

See GSM 11.11.

NETWORK (SS)

RACH: As defined in GSM 04.08 section 10.5.2.17.

octet 1	01111000
octet 2	00001000
octet 3	}
octet 4	} as above



ECs = Emergency Calls

Access Class in SIM - See GSM 11.11 Data Field 6F78

EC bit = bit3 of octet 3 of RACH Control Parameters - See GSM 04.08 Para 10.5.2.17

AC bit = See bytes 3 & 4 of RACH Control Parameters

*) Mobile adopts Access Class 0-9, based on IMSI. See GSM 02.11

II.8.9 TEST SEQUENCE 9: EXCHANGE PROTOCOL TESTS

Purpose of the tests:

Testing of exchange protocol of the SIM/ME interface.

This sequence lists protocol tests used.

The list of SIM exchange protocol tests is divided into three subsections:

The first subsection deals with character transmission, which constitutes the basis for ME-SIM exchanges.

The following two subsections correspond to the two main parts of a transaction with a microprocessor card: the reset and the card answer then command processing. Both subsections describe the protocol tests to be run during each corresponding phase of the transaction.

The characteristics to be tested are :

II.8.9.1	CHARACTER TRANSMISSION
II.8.9.1.1	ETU variation
II.8.9.1.2	I/O line at zero before character transmission
II.8.9.1.3	Inter-character delay
II.8.9.1.4	Error handling
II.8.9.2	RESET AND ANSWER to reset
II.8.9.2.1	Sorts of RST
II.8.9.2.2	Characters of the Answer to Reset
II.8.9.2.3	PTS procedure
II.8.9.2.4	Reset repetition
II.8.9.3	COMMAND PROCESSING
II.8.9.3.1	Procedure bytes ACK

II.8.9.1 CHARACTER TRANSMISSION

Purpose: To verify the character frame during answer the transmission (See ISO 7816-3 section 6.1.2). For this test, use a SIM Simulator.

II.8.9.1.1 Bit/Character duration during the transmission from the ME to the SIM

Procedure :

A character transmitted from the transmitter to the receiver comprises ten elements plus the guard time.
The ten elements comprise:

- the start bit,
- eight data bits,
- the parity bit.

The SIM Simulator shall measure the bit/character duration of the request sent from the ME.

Requirement :

The bit/character duration of the request sent from the ME shall be in the range specified in GSM 11.11, section 5.4.

II.8.9.1.2 Bit/Character duration during the transmission from the SIM Simulator to the ME

Procedure :

The SIM Simulator shall send responses with the maximum and minimum bit/character durations specified in GSM 11.11 section 5.4.

Requirement :

The ME shall evaluate the response.

II.8.9.1.3 Inter-character delay

Procedure :

a) The requested inter-character delays from the ME to the SIM (or the SIM Simulator) are modified by changing the value of N in TC1 :

a.1) N = 0;

a.2) N = Values other than 0 and 255.

b) Verification is performed in the following two ways:

- observation using the oscilloscope or logical analyzer,
- non-acceptance by the SIM (or the SIM Simulator) of the byte transmitted too soon.

Requirement :

In case a.1) the ME shall work with the SIM.

In case a.2) the ME shall reject the SIM or repeat the reset between 2 and 5 times after receiving the Answer to reset and then reject the SIM.

II.8.9.1.4 Error Handling

II.8.9.1.4.1 Error Handling during the transmission from the ME to the SIM Simulator

Procedure:

The SIM Simulator shall transmit an error signal in response to a received character in accordance with ISO 7816-3, section 6.1.3.

Requirement:

The ME shall repeat the character in accordance with ISO 7816-3, section 6.1.3.

II.8.9.1.4.2 Error Handling during transmission from the SIM Simulator to the ME

Procedure:

The SIM Simulator shall send a response with a parity error and check that the ME performs error handling in accordance with ISO 7816-3, section 6.1.3.

Requirement:

The ME shall send an error signal in accordance with ISO 7816-3, section 6.1.3, and expect a repetition of the character.

II.8.9.2 ANSWER TO RESET (RST)

Purpose

To verify if the ME accepts the internal and the active low RESET (See ISO 7816-3 section 5.2).

II.8.9.2.1 Sorts of RST

Two sorts of RST are to be simulated:
- internal RST,
- active low RST,

The SIM (or the SIM Simulator) must be synchronized with the successive detection of Vcc and the clock signal in order to begin the reset routine.

II.8.9.2.1.1 Internal RST

Procedure :

The SIM (or the SIM Simulator) verifies that RST is at low status and starts its answer between (400/fi) s and (40000/fi) s after the clock signal has been detected fi is the initial frequency supplied by the ME.

Requirement :

The ME accepts the SIM with internal reset.

II.8.9.2.1.2 Active low RST

Procedure :

The SIM Simulator sends no internal reset and checks that the RST contact is put to state H after a minimum of (40,000/fi)s. The SIM Simulator verifies that the RST contact stays at this level for at least a further (40000/fi) s.

Requirement :

The ME shall accept the SIM with internal reset.

II.8.9.2.2 Characters of the Answer to Reset

Purpose :

This paragraph includes tests run on the TS, T0 and all the other bytes in accordance with standard 7816-3. The answer to reset consists of at most 33 characters. The ME shall be able to receive interface characters for other transmission protocols than T=0, historical characters and a check byte, even if only T=0 is used by the ME.

Procedure and Requirements :

The SIM (or the SIM Simulator) sends an Answer to reset with a set of Characters, according to GSM 11.11, clause 5.2.

II.8.9.2.3 PTS Procedure

Purpose : To verify that ME uses PTS procedure as specified in GSM 11.11 section 5.2.

Procedure : The SIM (or the SIM Simulator) gives an answer to reset with TA1 different of '11H'.

Requirement : Te ME shall send to the SIM (or the SIM Simulator) 'FF00FF'.

II.8.9.2.4 Reset repetition

Purpose : To verify that the ME repeats the Reset between 2 and 5 times after receiving a wrong answer to reset.

Procedure : The SIM Simulator sends a non understandable answer to reset to the ME. (e.g. a wrong TS byte).

Requirement : The ME shall repeat the Reset between 2 and 5 times after receiving a wrong Answer to reset.

Note: Between 3 up to 6 reset are done before rejecting the SIM.

II.8.9.3 COMMAND PROCESSING

II.8.9.3.1 Procedure bytes ACK :

Purpose : To verify that the ME uses correctly the different modes of data transmission defined in ISO 7816-3 section 8.2.2.1.

Procedure : Store data in the SIM (or the Sim simulator). The SIM (or the SIM Simulator) first answers ACK=INS or (INS+1) complemented and then changes ACK to INS or INS+1 during the transmission.

Requirement : The command shall be executed correctly.

II.8.10 TEST SEQUENCE 10: EVALUATION OF DIRECTORY CHARACTERISTICS

II.8.10.1 Test Sequence 10.1: OPERATING SPEED IN AUTHENTICATION Procedure

Purpose : To verify that the authentication procedure is done with a frequency of at least 13/4 MHz if the bit b2 of the directory characteristics is set to 1 (see GSM 11.11 section 6.2.1.).

Procedure :

a) The SS is set up to transmit on the BCCH with the following network parameters:
   attach/detach disabled
   LAI: MCC = 246, MNC = 81
   Access Control: Unrestricted

b) A SIM (or a SIM simulator) containing the data field values defined in tables II.8-1 and II.8-2 and bit b2 of the directory characteristics (byte 14 of the GSM directory status) set to "1" is connected to the ME, and the MS is powered on.

c) The SS sends PAGe REQuest to the MS using IMSI (value B)

d) The MS sends CHANnel REQuest to the SS

e) The SS sends IMSI ASSIGN to the MS

f) The MS sends PAGe RESponse to the SS containing IMSI (value B)

g) The SS sends AUThentication REQuest to the MS

h) The MS sends AUThentication RESponse to the SS

j) The SS sends RELEASE to the MS

Requirement : The frequency of the clock shall be at least 13/4 MHz during the authentication procedure.

II.8.10.2: Test Sequence 10.2: Clock stop

Purpose : To verify that the clock is only switched off if bit b1 of the directory characteristics is set to 1.

Procedure : A SIM (or a SIM Simulator) with b1 set to 0 is used.

Requirement : The ME shall not switched off the clock.

II.8.11 TEST SEQUENCE 11: MECHANICAL TESTS

II.8.11.1 Test Sequence 11.1 : Contact pressure

General The ME manufacturers shall provide a separate card reader (Mechanical components) to make the measurement possible.

Purpose : To verify that the contact pressure of each contacting element is not greater than 0.5 N (see GSM 11.11 section 6.1.2.2.) when each of the following types of card is used:
i) Unembossed
ii) Embossed on the contact side
iii) Embossed on the opposite side to the contacts.

NOTE: Only type i) applies to the plug-in SIM.

Procedure : The pressure of each contacting element is measured.

Requirement : The contact pressure of each contacting element shall be not greater than 0.5 N.

II.8.11.2 Test Sequence 11.2: Shape of contacts for IC card SIM card reader

General The ME manufacturers shall provide a separate card reader (Mechanical components) to make the measurement possible.

Purpose : To verify that the radius of curvature of the contacting elements is greater than or equal to 0.8 mm in the contact area on both axes (see GSM 11.11 section 6.1.2.3.).

Procedure : The radius of curvature of the contacting elements is measured on both axes.

Requirement : The radius of curvature of the contacting elements shall be greater than or equal to 0.8 mm in the contact area on both axes.

II.8.12 TEST SEQUENCE 12: MMI reaction to SIM status encoding

Purpose of the test

To verify the MMI reaction on the MS when error codes occur from the SIM on the SIM/ME interface.

Procedure

a) The SIM simulator is used to send the following error codes as reaction on an instruction from the ME:

- 9240 Memory Problem
- 9804 Access security policy not fulfilled or secret code rejected
- 9840 Secret code locked
- 9850 Increment cannot be performed
- 6FXX Technical problem with no diagnostic given as reaction on an instruction from the ME.

Requirement

The ME shall give an MMI indication.

II.8.13 TEST SEQUENCE 13: SECRET CODE USAGE

Purpose of the test

To verify the usage of the secret code on the MMI, as specified in GSM 02.30.

1) To confirm that it is possible to change the PIN.
2) To confirm that a PIN with 4 and 8 digits can be handled.
3) To check whether it is possible to unblock the SIM.
4) To check whether it is possible to store and recall an abbreviated number.

Procedure:

a) The SIM defined in Tables II.8-1 and II.8-2 above is installed into the ME, and the MS powered-on.

b) When the MS is in Mode "PIN check" enter "2468#".

Requirements:

1) The MS shall give an indication "OK".

Procedure:

c) Enter "**04*2468*01234567*01234567#".

Requirements:

2) The MS shall give an indication that the new PIN is accepted.

Procedure:

d) The MS is switched off and on.

e) When the MS is in mode "PIN-check", the sequence "01234567#" is entered.

Requirement

3) The MS shall give an indication "OK".

Procedure

f) Switch the MS off and on.

g) When the MS is in Mode "PIN check" enter "2468#".

Requirements:

4) The MS shall give an indication that the entered PIN is wrong.

Procedure:

h) Repeat f) to g) two times with wrong PIN numbers.

Requirements:

5) In step g), requirement 4 shall be met each time.

Procedure:

i) Enter "**05*13243546*2468*2468#".

Requirements:

6) The MS shall indicate that the unblocking was successful.

Procedure:

j) Switch the MS off and on.

k) When the MS is in Mode "PIN check" enter "2468#".

Requirements:

7) The MS shall give an indication that the entered PIN is ok.

Procedure:

l) The code "+123456789012345" is stored (entered) in the MS as abbreviated dialling number 7.

m) The code "00112233" is stored (entered) in the MS as abbreviated dialling number 6.

n) Enter "7#".

Requirements:

8) The number "+123456789012345" shall be displayed.

Procedure:

o) Enter "6#".

Requirements:

9) The number "00112233" shall be displayed.

II.9 TEST OF AUTOCALLING RESTRICTIONS

ref: GSM 02.07

II.9.1 General

It is essential that all autocalling apparatus is prevented from continuously dialling a given number, to avoid machines repeatedly disturbing PSTN subscribers in error, or numerous repeat attempts to unobtainable numbers which cause waste of valuable network resources. Therefore autocalling restrictions are defined by GSM 02.07.

The tests shall be performed using all of the call methods specified by the supplier in the PIXIT statement (Annex 3). The supplier shall state any autocalling procedures implemented and how many times they can be repeated to a single number and the minimum reattempt interval(s), i.e. the complete retry schedule or algorithm with parameter values. The supplier shall further describe any automatic methods for making repeated calls to a single number. The supplier shall also state in the PIXIT statement (Annex 3) the number of B-party numbers that can be stored on the list of blacklisted numbers as described in GSM 02.07. Annex 1.

For an external R-interface the supplier shall state in the PIXIT statement (Annex 3) the procedure for autocalling restrictions for that interface and the possible parameter settings for the number of times the LTE can make a reattempt and the minimum accepted time between reattempts accepted by the MS. The conditions for clearing the autocalling constraints shall be stated in the PIXIT statement (Annex 3).

For external interfaces the LTE must be programmed so that it clearly attempts to violate the autocalling constraints.

II.9.2 Constraining the access to a single number (GSM 02.07 Category 3)

During this test the SETUP messages shall contain the same B-party number.

No manual intervention shall be performed except to initiate and end the test.

Purpose of the test.

To ensure the correct behaviour of the MS to GSM 02.07 Category 3.

Initial condition.

There shall be no numbers in the list of blacklisted numbers in the MS. The time set between the first reattempt and the next reattempt is set to the minimum value possible. The number of reattempts is set to the lowest possible number, greater than 1, that is supported by the MS. The autocalling function is invoked for the B-party number to be used during the test.

Procedure:

MS:	1)	Initiate generic call setup procedure	(Step 1)
MS:		transmit SETUP	(Step 2)
SS:	2)	transmit RELEASE COMPLETE	(Step 3)
SS:		transmit CHANNEL RELEASE	(Step 4)
MS:	3)	Initiate generic call setup procedure	(Step 5)
MS:		transmit SETUP	(Step 6)
SS:	2)	transmit RELEASE COMPLETE	(Step 7)
SS:		transmit CHANNEL RELEASE	(Step 8)

Note:

1) Depending on the selected Bearer Capability, the generic call set-up procedure of 11.10 II.1.4 or II.1.3, as appropriate, shall be followed up to and including the CIPHERING MODE COMPLETE message of requirement 5 in II.5.3.9.2.3.
2) Cause value from Category 3 of GSM 02.07, Annex 1.
3) The procedure referenced in Note 1 is invoked by the autocalling function.

Result checking:

Note the time interval between Step 4 and Step 5.
Note the time at Step 8.

Requirements:

The time interval between Step 4 and Step 5 must be a minimum of 5 s.
Following Step 8 the MS must not initiate a call prior to manual intervention.

Postamble:

Clear the autocalling constraint by manual intervention after a minimum of 2 minutes from Step 8.

II.9.3 Constraining the access to a single number (GSM 02.07 Category 1 and 2)

During this test the SETUP messages shall contain the same B-party number.

No manual intervention shall be performed except to initiate and end the test.

Purpose of the test.

To ensure the correct behaviour of the MS to GSM 02.07 Categories 1 and 2.

Initial condition.

There shall be no numbers in the list of blacklisted numbers in the MS. The retry scheme is set to give the shortest possible intervals between retries. The number of reattempts is set to the maximum possible number (N), that is supported by the MS. The autocalling function is invoked for the B-party number to be used during the test.

Procedure.

MS:	1) Initiate generic call setup procedure	(Step 1)
MS:	transmit SETUP	(Step 2)
SS:	2) transmit RELEASE COMPLETE	(Step 3)
SS:	transmit CHANNEL RELEASE	(Step 4)
MS:	3) Initiate generic call setup procedure	(Step 5)
MS:	transmit SETUP	(Step 6)
SS:	2) transmit RELEASE COMPLETE	(Step 7)
SS:	transmit CHANNEL RELEASE	(Step 8)
Repeat Step 5 to Step 8 N-1 times		(Step 9)

Note:

1) Depending on the selected Bearer Capability, the generic call set-up procedure of 11.10 II.1.4 or II.1.3, as appropriate, shall be followed up to and including the CIPHERING MODE COMPLETE message of requirement 5 in II.5.3.9.2.3.
2) Cause value from Category 1 or 2 of GSM 02.07, Annex 1. This shall be chosen at random, from both categories. Cause No. 27 shall be excluded if the MS has implemented it in Category 3 of GSM 02.07, as declared in the PIXIT statement (Annex 3).
3) The procedure referenced in Note 1 is invoked by the autocalling function.

Result checking:

Note the time interval between Step 4 and Step 5 (1st reattempt).
Note the time interval between Step 8 and Step 9 (up to nine occurrences).
Note the time at final completion of Step 9.

Requirement:

The time intervals between reattempts shall be compliant with GSM 02.07 Annex 1.
Following the final completion of Step 9 the MS must not initiate a call prior to manual intervention.

Postamble:

Clear the autocalling constraint by manual intervention after a minimum of 4 minutes from the final completion of Step 9.

II.9.4 Behaviour of the MS when its list of blacklisted numbers is full.

The number of B-party numbers that can be stored in the list of blacklisted numbers, as stated in the PIXIT statement (Annex 3), is M.

This test shall only apply to MSs that are capable of autocalling more than M B-party numbers.

Purpose of the test.

To ensure the correct behaviour of the MS when its list of blacklisted numbers is full.

Initial condition.

The list of blacklisted numbers, in the MS, shall be full. This may be achieved as described in the procedure in II.9.2, applied to M B-party numbers.

Procedure:

The autocalling function is invoked for a B-party number that is not in the list of blacklisted number.

Result checking:

Note the outcome from the procedure.

Requirement:

The MS must not initiate a call.

Postamble:

Clear the autocalling constraint by manual intervention after a minimum of 10 s.

II.10 TESTING OF BEARER SERVICES

Ref: GSM 02.02, 04.21, 07.01, 07.02, 07.03

This section is reserved.

II.11 TESTING OF TELESERVICES

II.11.1 CATEGORY 1: SPEECH TELESERVICES - TRANSMISSION REQUIREMENTS

Ref: GSM 03.50, 06.10, (Draft NET 33)

This section provides for the testing of both handset (including hand held portable) and handsfree MSs. An MS may be of either type alone or a combined handset and handsfree MS. The test descriptions for handsfree operation, however, only covers the stability margin.

Note 1: The handsfree tests may be enhanced at a later date to include SLR and RLR etc., until now no agreement was found on the exact methods to be used.

Note 2: For tests in this section a dedicated channel may be need to be assigned in cases where the manufacturer has declared that the DAI is activated by means of a Layer 3 message on the air interface.

In this section all references to CCITT recommendations, unless otherwise stated, are to the Blue Book (1988).

Frequency settings in the following tests are taken from ISO 3, R10 series or R40 series or from Table 2 of REC CCITT P.79. A departure from the nominal frequencies of + 5% below 240Hz and + 2% at 240Hz and above is accepted. Any submultiple of the sampling frequency of 8kHz shall be avoided. In the case of 4kHz the departure is restricted to -2%.

The measurement accuracy for signal level is +/- 0.2dB and for sound pressure +/- 0.6dB.

The tests are performed with "DTX = off".

II.11.1.1 Sending sensitivity/frequency response

Definition

The sending sensitivity frequency response is, as a function of the input test tone frequency, the ratio expressed in dB between the output level, represented by the PCM bit stream at the Digital Audio Interface (DAI) (III.1.4) and the input sound pressure in the artificial mouth required to obtain this.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

A pure tone with a sound pressure of -4.7dBPa shall be applied at the mouth reference point (MRP) as described in REC CCITT P.64 using an artificial mouth conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

Measurements are made at one-twelfth-octave intervals as given by the R40 series of preferred numbers in ISO 3 for frequencies from 100Hz to 4000Hz inclusive.

At each frequency the output level represented by the PCM bit stream at the DAI (pin 23) is measured.

Requirement

The sending sensitivity/frequency response (from MRP to the DAI) shall be within a mask given in the following table. The mask can be drawn with straight lines between the breaking points in the table on a logarithmic (frequency) vs linear (dB sensitivity) scale.

All sensitivity levels are dB on an arbitrary scale.

Frequency [Hz]	Upper Limit [dB]	Lower Limit [dB]
a = 100	-12	
b = 200	0	
c = 300	0	-12
d = 1000	0	-6
e = 2000	4	-6
f = 3000	4	-6
g = 3400	4	-9
h = 4000	0	

Sending sensitivity/frequency mask

II.11.1.2 Sending Loudness Rating

Definition

The Sending Loudness Rating (SLR) is a means of expressing the sending frequency response based on objective single tone measurements in a way which relates to how a speech signal would be perceived by a listener.

Method of measurement

The sending sensitivity (II.11.1.1) is measured at each of the 14 frequencies listed in Table 2 of REC CCITT P.79, bands 4 to 17.

The sensitivity is expressed in terms of dBV/Pa and the SLR is calculated according to formula 4.19b of REC CCITT P.79, over bands 4 to 17, using the sending weighting factors from Table 2/CCITT P.79, adjusted according to Table 3/CCITT P.79.

Requirement

The SLR shall be 8 +/- 3dB.

II.11.1.3 Receiving sensitivity/frequency response

Definition

The receiving sensitivity frequency response is, as a function of the input test tone frequency, the ratio expressed in dB between the output sound pressure in the artificial ear and the input level, represented by the PCM bit stream at the Digital Audio Interface (DAI) (III.1.4), required to obtain this.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

The SS sends a PCM bit stream equivalent to a pure tone level of -16dBmO (see NET 33) over the DAI (pin 25) to the MS.

Measurements are made at one-twelfth-octave intervals as given by the R40 series of preferred numbers in ISO 3 for frequencies from 100Hz to 4000Hz inclusive.

At each frequency, the sound pressure in the artificial ear (the ear reference point - ERP) is measured by connecting a suitable measuring set to the artificial ear.

Requirement

The receiving sensitivity/frequency response (from the DAI to the ERP) shall be within the mask given by the following table. The mask can be drawn with straight lines between the breaking points in the following table on a logarithmic (frequency) vs linear (dB sensitivity) scale.

All sensitivity levels are dB on an arbitrary scale.

Frequency [Hz]	Upper Limit [dB]	Lower Limit [dB]
a = 100	-12	
b = 200	0	
c = 300	2	-7
d = 500	*)	-5
e = 1000	0	-5
f = 3000	2	-5
g = 3400	2	-10
h = 4000	2	

Receiving sensitivity/frequency mask

*) The limit at intermediate frequencies lies on a straight line drawn between the given values on a log (frequency) vs linear (dB) scale.

II.11.1.4 Receiving Loudness Rating

Definition

The Receiving Loudness Rating (RLR) is a means of expressing the receiving frequency response based on objective single tone measurements in a way which relates to how a speech signal would be perceived by a listener.

Method of measurement

The receiving sensitivity (II.11.1.3) is measured at each of the 14 frequencies listed in Table 2 of REC CCITT P.79, bands 4 to 17.

The sensitivity is expressed in terms of dBPa/V and the RLR is calculated according to formula 4.19c of REC CCITT P.79, over bands 4 to 17, using the receiving weighting factors from Table 2/CCITT P.79, adjusted according to Table 3/CCITT P.79. The artificial ear sensitivity must be corrected according to the real ear correction Table 4 of REC CCITT P.79.

Requirement

If no user controlled receive volume control is provided, the RLR shall be 2 +/- 3dB, (later referred as the nominal value).

If a user controlled receive volume control is provided, the RLR shall meet this value for at least one setting of the control.

When the control is set to maximum the RLR shall not be less than (ie louder than) -13dB.

II.11.1.5 Talker sidetone

II.11.1.5.1 Definition

The sidetone loudness ratings are a means of expressing the path loss from the artificial mouth to the artificial ear based on objective single tone measurements in a way that relates to how a speaker will perceive his own voice when speaking (talker sidetone, expressed by the sidetone masking rating - STMR), or how a listener will perceive the background noise picked up by the microphone (listener sidetone rating - LSTR).

Note: "Listener sidetone" testing is not included in this test specification.

II.11.1.5.2 Method of measurement

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

The SS sends a PCM bit stream coded with the value No 1 over the DAI (pin 25) to the MS.

Alternatively the activation of the A/D and D/A converters is performed via a call setup, in which case the DAI connections between the MS and the SS and the PCM bit stream are optional.

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

A pure tone with a sound pressure of -4.7dBPa shall be applied at the mouth reference point as described in REC CCITT P.64 using an artificial mouth conforming to REC CCITT P 51.

For each frequency given in Table 2 of REC CCITT P.79, bands 4 to 17, the sound pressure in the artificial ear is measured.

The sidetone path loss is expressed in dB and the STMR (in dB) is calculated from the formula 8.4 of REC CCITT P.79, using the weighting factors of column (3) in Table 6/CCITT P.79 (unsealed), and values of LE in accordance with Table 4/CCITT P.79.

II.11.1.5.3 Requirement

The STMR shall be 13 +/- 5dB.

Where a user controlled receive volume control is provided, the STMR shall meet the requirement given above at the setting where the RLR is equal to the nominal value.

Note: It is recommended that the talker sidetone is independent of the volume control.

II.11.1.6 Acoustic shock

(Reserved)

II.11.1.7 Telephone acoustic coupling loss (TAL)

II.11.1.7.1 Echo return loss (ERL)

Definition

The echo return loss is the path loss from the input of the reference speech encoder of the SS to the output of the reference speech decoder of the SS.

Method of measurement

The DAI of the MS is connected to the SS and is set to the operating mode "Normal operation".

A speech call is set up between MS and SS.

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

Where a user controlled volume control is provided it shall be set to maximum.

An analogue or digital signal generator delivering a signal equivalent to a pure tone level of 0dBm0 (see REC CCITT P.64 or P.66 respectively) is connected to the corresponding analogue or digital input of the reference speech encoder of the SS.

Measurements are made at one-twelfth-octave intervals as given by the R40 series of preferred numbers in ISO 3 for frequencies from 300Hz to 3400Hz.

At each frequency the level or, for a digital signal, equivalent level at the reference speech decoder output of the SS is measured in the band 300 to 3400 Hz.

The echo return loss is calculated according to REC CCITT G.122.

Note: The normal operation of the speech codec results in modulation of the amplitude of pure tone signals at a frequency that depends upon the frequency of the tone. This makes the measurement of TAL with pure tones uncertain. Choice of test signal is therefore important but, whilst a speech-like signal may be more suitable, insufficient information is available for a definitive choice.

Requirement

The echo return loss from the input to the output of the reference speech codec in the SS shall be at least 46 dB.

II.11.1.7.2 Stability margin

Definition

The receive-transmit stability margin is a measure of the gain that would have to be inserted between the go and return paths of the reference speech coder in the SS for oscillation to occur.

Method of measurement

A gain equivalent to the minimum stability margin is inserted in the loop between the go and return paths of the reference speech coder in the SS and any acoustic echo control is enabled.

A test signal according to REC CCITT O.131 is injected into the loop at the analogue or digital input of the reference speech codec of the SS and the stability is observed. The test signal shall have a level of -10dBm0 and a duration of 1s.

Where a user controlled volume control is provided it shall be set to maximum.

For handset operation the handset is placed on a hard plane surface with the transducers facing the surface.

For handsfree operation the test setup is shown in REC CCITT P.34 (Fig 3/CCITT P.34), but omitting the test table.

Requirement

The minimum stability margin shall be 6dB and no audible oscillation shall be detected.

II.11.1.8 Distortion

II.11.1.8.1 Sending

Definition

The transmit signal to total distortion ratio is a measure of the linearity of the transmitter equipment (excluding the speech codec).

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

A sine-wave signal with a frequency in the range 1004Hz to 1025Hz is applied to the MRP. The level of this signal is adjusted until the PCM bitstream at the DAI output (pin 23) corresponds to -10dBmO. The level of the signal at the MRP is then the acoustic reference level (ARL).

The test signal is applied at the following levels: -35, -30, -25, -20, -15, -10, -5, 0, 5, 10dB relative to the ARL.

The ratio of signal to total distortion power is measured at the DAI with the psophometric noise weighting (see RECs CCITT G.714 and O.132) at each signal level.

The measurement shall be carried out at sound pressures not exceeding +10dBPa.

Requirement

The ratio of signal to total distortion power measured at the DAI with the psophometric noise weighting (see Table 4/CCITT G.223) shall be above the limits given in the following table.

level dB relative to ARL	Level Ratio
-35 dB	17.5 dB
-30 dB	22.5 dB
-20 dB	30.7 dB
-10 dB	33.3 dB
0 dB	33.7 dB
7 dB	31.7 dB
10 dB	25.5 dB

Limits for the signal to total distortion ratio (sending) when using the sine wave method.

Limits for intermediate levels are found by drawing a straight line between breaking points in a linear (dB signal level) vs linear (dB ratio) scale.

II.11.1.8.2 Receiving

Definition

The receive signal to total distortion ratio is a measure of the linearity in the receive equipment.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

The SS sends via the DAI (Pin 25) a PCM bit stream simulating a sine-wave signal corresponding to REC CCITT O.132 at the following levels: -45, -40, -35, -30, -25, -20, -15, -10, -5, 0dBmO.

The ratio of signal to total distortion power is measured with the psophometric noise weighting in the artificial ear (see REC CCITT G.714) at each signal level.

The measurement shall be carried out at sound pressures between -50dBPa and +10dBPa.

Requirement

The ratio of signal to total distortion power measured at the artificial ear with the psophometric noise weighting (see Table 4/CCITT G.223) shall be above the limits given in the following table.

Level at the digital audio interface	Level Ratio
-45 dBm0	17.5 dB
-40 dBm0	22.5 dB
-30 dBm0	30.5 dB
-20 dBm0	33.0 dB
-10 dBm0	33.5 dB
-3 dBm0	31.2 dB
0 dBm0	25.5 dB

Limits for the signal to total distortion ratio (receiving) when using the sine wave method.

Limits for intermediate levels are found by drawing a straight line between breaking points in a linear (dB signal level) vs linear (dB ratio) scale.

II.11.1.8.3 Sidetone

Definition

The sidetone distortion expresses the linearity of the sidetone path in the handset.

Method of measurement

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A".

The SS sends the PCM bit stream coded with the value No 1 over the DAI (pin 25) to the MS.

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

An instrument capable of measuring the third harmonic distortion of signals with fundamental frequencies in the range 315Hz to 1000Hz is connected to the artificial ear.

A pure-tone signal of -4.7dBPa is applied at the mouth reference point at frequencies of 315Hz, 500Hz, and 1000Hz. For each frequency the third harmonic distortion is measured in the artificial ear.

Requirement

The third harmonic distortion generated shall not be greater than 10%.

II.11.1.9 Out-of-band signals

II.11.1.9.1 Sending

Definition

The discrimination against out-of-band input signals in the sending direction is a requirement on the in-band image frequencies created by any out-of-band input signals.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

A pure tone with a sound pressure of -4.7 dBPa shall be applied at the mouth reference point as described in REC CCITT P.64 using an artificial mouth conforming to REC CCITT P 51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

For input signals at frequencies of 4.65, 5, 6, 6.5, 7, and 7.5 kHz, the level represented by the PCM bit stream at the DAI (Pin 23) of any image frequency is measured.

Requirement

The level of any image frequency shall be below a reference obtained at 1 kHz by at least the amount as specified in the following table.

Applied sine-wave frequency	Limit (minimum)
4.6 kHz	30 dB
8 kHz	40 dB

Limits for the image frequency discrimination

The limit at intermediate frequencies lies on a straight line drawn between the given values on a log(frequency) vs linear(dB) scale.

II.11.1.9.2 Receiving

Definition

The discrimination against out-of-band signals in the receiving direction is a requirement on the out-of-band signals generated in the artificial ear from in-band input signals.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

The SS sends over the DAI (pin 25) a PCM bit stream simulating a sine-wave signal with a level of 0dBm0 .

For input signals at the nominal frequencies 500, 1000, 2000, and 3350Hz (bearing in mind the restriction on submultiples of the sampling frequency) the level of any out-of-band signals at frequencies up to 8kHz is measured in the artificial ear.

Requirement

The level of out-of-band signals shall be lower than the in-band acoustic level obtained by a digital signal at 1kHz set at the level specified in the following table.

Image Signal frequency	Equivalent Input Signal Level
4.6 kHz	-35 dBm0
8 KHz	-45 dBm0

Limits for the image frequency discrimination

The limit at intermediate frequencies lies on a straight line drawn between the given values on a log(frequency) vs linear(dB) scale.

II.11.1.10 Idle channel noise

II.11.1.10.1 Sending

Definition

The idle channel noise in the sending direction is the equivalent noise level produced at the DAI, when the mouth reference point is in a quiet environment.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51 in a quiet environment (ambient noise less than 30dBA).

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

The noise level represented by the PCM bit stream output at the DAI (pin 23) is measured with psophometric weighting according to REC CCITT G.223, Table 4.

Requirement

The noise produced by the MS in the sending direction shall not exceed -64dBmOp.

II.11.1.10.2 Receiving

Definition

The idle channel noise in the receiving direction is the acoustic sound pressure in the artificial ear when the digital input signal at the DAI, is the PCM coded value No 1.

Method of measurement

The handset shall be mounted in the LRGP (see annex 1 of REC CCITT P.76) and the earpiece shall be sealed to the knife-edge of the artificial ear conforming to REC CCITT P.51.

The DAI of the MS is connected to the SS and is set to the operating mode "Test of acoustic devices and A/D & D/A ".

The SS sends a PCM bit stream coded with the value No 1 over the DAI (Pin 25) to the MS.

The level of the noise is measured in the artificial ear with any volume control set at the position at which the RLR is equal to the nominal value.

Requirement

The measured noise generated by the MS shall not exceed -57dBPa (A).

Where a volume control is provided, the measured noise shall also not exceed -54dBPa (A) at the maximum setting of the volume control.

II.11.2 CATEGORY 2: SHORT MESSAGE SERVICE (SMS)

Ref : GSM 03.40, 04.11 (point to point)
GSM 03.41, 04.12 (cell broadcast)

II.11.2.1 GENERAL

The purpose of these tests is to verify the MS can handle GSM functions when submitting or receiving Short Messages (SM) between MS and a Short Message Service Centre as described in GSM 03.40.

The procedures are based upon services provided by the Mobility Management (MM) sublayer which is not tested in this case.

The SMS comprises three basic services. The SMS Point to Point services shall work in an active MS at any time independent of whether or not there is speech or data call in progress. The SMS Cell Broadcast service only works when the MS is in idle mode.

Since the timer TC1M currently is not standardised, the value of TC1M shall be declared by the manufacturer (to be used in II.11.2.2.1 steps d), e), g2), g3), h), i) and Requirements 4), 5) and 6), II.11.2.2.2, steps d), f), g), h2), h3) and Requirements 5) and 7)).

The manufacturer shall declare whether SMS messages are stored in the SIM and/or the ME. This shall be referred to as the SMS message store in the following tests.

Related PIXIT statements: according to GSM 11.10, Annex 3, sections 2.1.5, 2.2.2, 2.3.4.

II.11.2.2 Short Message Service Point to Point

II.11.2.2.1 SMS Mobile Terminated

Purpose of test :

This test verifies the ability of a Mobile Station to receive and decode the SMS where provided for the Point to Point service.

Method of test :

a) The Mobile Station shall be in idle, updated state. The SMS message store shall contain no messages.

b) - The System Simulator shall initiate the transmission of a Short Message using a paging request. Upon response of the Mobile Station to the paging the SS shall assign an SDCCH, authenticate the MS and activate ciphering. Then the SS shall establish SAPI 3 by sending a SABM frame with SAPI-3 on the SDCCH.
- When a UA frame (SAPI-3) is received in response, the System Simulator shall send a CP_DATA message. The information element of the CP_DATA message shall be RP_DATA.

c) The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message and then a maximum of 60 seconds for the CP_DATA message containing the RP_ACK.

d) The System Simulator shall send a CP_ACK to the Mobile Station within TC1M with no further CP-DATA messages and the System Simulator shall initiate channel release.

e) Steps b), c) and d) shall be repeated but the first CP-DATA message from the Mobile Station shall not be acknowledged. The second CP-DATA message from the Mobile Station shall be acknowledged by a CP-ACK within a time TC1M.

f1) Steps b), c) shall be repeated but the CP-DATA messages from the Mobile Station shall not be acknowledged. The SS then initiates the channnel release.

f2) The SMS message store shall be cleared.

g1) A data or speech call shall be established on a TCH with the System Simulator and the state U10 of Call Control shall be entered. The SS sends a SABM frame with SAPI-3 on the SACCH associated to the TCH. When a UA frame (SAPI-3) is received in response, the System Simulator shall send a CP_DATA message. The information element of the CP_DATA message shall be RP_DATA. The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message and then a maximum of 60 seconds for the CP_DATA message containing the RP_ACK.

g2) The System Simulator shall send a CP_ACK to the Mobile Station within TC1M with no further CP-DATA messages and the System Simulator shall initiate channel release. The SMS message store shall be cleared.

g3) steps g1) and g2) are repeated but the first CP-DATA message from the Mobile Station shall not be acknowledged. The second CP-DATA message from the Mobile Station shall be acknowledged by a CP-ACK within a time TC1M.

g4) steps g1) shall be repeated but the CP-DATA messages from the Mobile Station shall not be acknowledged. The SS then initiates the channnel release.

h) A data or speech call shall be established on a TCH with the System Simulator and the state U10 of Call Control shall be entered. The SS sends a SABM frame with SAPI-3 on the SACCH associated to the TCH. After the UA response on SAPI 3, the speech call shall be cleared by the SS with a Disconnect message (The call clearing shall be continued on the FACCH in parallel to the following exchange of messages related to SMS).

The System Simulator shall send a CP_DATA message. The information element of the CP_DATA message shall be RP_DATA.

The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message and then a maximum of 60 seconds for the CP_DATA message containing the RP_ACK.

The System Simulator shall send a CP_ACK to the Mobile Station within TC1M with no further CP-DATA messages and the System Simulator shall initiate channel release.

The SMS message store shall be cleared.

i) A data or speech call shall be established on a TCH with the System Simulator and the state U10 of Call Control shall be entered. The SS sends a SABM frame with SAPI-3 on the SACCH associated to the TCH. After the UA response on SAPI 3, the SS shall wait 15 seconds. During this time, the speech call shall be cleared from the MS (The call clearing shall be continued on the FACCH in parallel to the following exchange of messages related to SMS).

The System Simulator shall send a CP_DATA message. The information element of the CP_DATA message shall be RP_DATA.

The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message and then a maximum of 60 seconds for the CP_DATA message containing the RP_ACK.

The System Simulator shall send a CP_ACK to the Mobile Station within TC1M with no further CP-DATA messages and the System Simulator shall initiate channel release.

The SMS message store shall be cleared.

Requirements :

1) In the case of step b), after the paging response, authentication and ciphering the Mobile Station shall respond to the SABM frame on SAPI 3 by sending a UA frame with SAPI-3.

2) In the case of step c), the Mobile Station shall send a CP-ACK message within 25 seconds from the reception of the CP-DATA message followed by a CP-DATA message containing the RP-ACK to the System Simulator within 85 seconds.

3) In the case of step d), the Mobile Station shall return to idle mode (this is checked implicitely by paging the MS in step e)). The Mobile Station shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

4) In the case of step e), the Mobile Station shall repeat once the CP-DATA message containing the RP-ACK within twice TC1M. After receipt of the Channel Release message the MS shall return to idle mode (this is checked implicitely by paging the MS in step f1)). The MS shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

5) In the case of step f1), the Mobile Station shall repeat, once and only once, the CP-DATA message containing the RP-ACK within twice TC1M . After receipt of the Channel Release message the MS shall return to idle mode (this is checked implicitely by paging the MS in step g)). The MS shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

6) In the case of step g1), the Mobile Station shall respond to the SABM frame on SAPI 3 by sending a UA frame with SAPI-3. Then the Mobile Station shall send a CP-ACK message within 25 seconds from the reception of the CP-DATA message followed by a CP-DATA message containing the RP-ACK to the System Simulator within 85 seconds.

   In the case of step g2), the Mobile Station shall return to idle mode (this is checked implicitely by paging the MS in step g3)). The Mobile Station shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

   In the case of step g3), the Mobile Station shall respond to the SABM frame on SAPI 3 by sending a UA frame with SAPI-3. Then the Mobile Station shall send a CP-ACK message within 25 seconds from the reception of the CP-DATA message followed by a CP-DATA message containing the RP-ACK to the System Simulator within 85 seconds.

   The Mobile Station shall repeat once the CP-DATA message containing the RP-ACK within twice TC1M. After receipt of the Channel Release message the MS shall return to idle mode (this is checked implicitely by paging the MS in step g4)). The MS shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

In the case of step g4), the Mobile Station shall respond to the SABM frame on SAPI 3 by sending a UA frame with SAPI-3. Then the Mobile Station shall send a CP-ACK message within 25 seconds from the reception of the CP-DATA message followed by a CP-DATA message containing the RP-ACK to the System Simulator within 85 seconds.

The Mobile Station shall repeat, once and only once, the CP-DATA message containing the RP-ACK within twice TC1M. After receipt of the Channel Release message the MS shall return to idle mode (this is checked implicitely by paging the MS in step h)). The MS shall indicate that a Short Message has arrived. If the MS provides the functionnality to display MT messages, it is checked that the correct message is displayed (see PICS/PIXIT).

7) In the case of step h), the requirements for steps g1) and g2) shall be satisfied (Call clearing shall be performed in parallel on the FACCH).

8) In the case of step i), the requirements for steps g1) and g2) shall be satisfied (Call clearing shall be performed in parallel on the FACCH).

Note: time values in steps c), g1) and h) are chosen sufficiently high to be sure that the MS has enough time to respond to the different message

Mobile terminated Test Short Message content : SMS DELIVER TPDU included in the RP-DATA message, which is included in the CP-DATA message

Information element	Comment	Value	
Message type indication		MT	
More message to send	"more message waiting"		0
Originating address	an E164 number		
Protocol identifier		0	
Data coding scheme		0	
Service Centre timestamp	any legal value		
User Data length		160	
User Data (140 octets)	160 characters (text of message)		

Note: The 160 characters shall include at least one occurrence of each character in the default alphabet (see GSM 03.40 annex 2).

II.11.2.2.2 SMS Mobile Originated

Purpose of test :

This test verifies the Mobile Station's ability to correctly send a Short Message where the SMS is provided for the Point to Point service. It also verifies the Mobile Station's capability to simultaneously receive a network originated SM whilst sending a mobile originated SM.

Method of test :

a) The System Simulator shall be configured to support SMS and the Mobile Station shall be in idle, updated state. The SMS store shall contain no messages.

b) The Mobile Station shall be set up to send an SM to the System Simulator. The System Simulator shall respond to the Channel Request message by allocating an SDCCH. The SS shall answer correctly to the SABM on SAPI 0 and then perform the authentication and ciphering procedures.

c) The System Simulator shall respond with a UA frame SAPI-3 to the Mobile Station.

d) The System Simulator shall respond to the CP-DATA from the MS with a CP-ACK message within TC1M followed by a CP-DATA message containing the correct RP-ACK. The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message.

e) The System Simulator shall send a channel release message to the Mobile Station.

f) Steps b) and c) shall be repeated with the System Simulator configured not to send the CP-ACK. After a duration of 2*TC1M the MS aborts the RR connection.

g) Steps b) and c) shall be repeated. On receipt of the CP-DATA form the MS the System Simulator sends a CP-ERROR message within TC1M containing a "Network Failure" message as the cause. Then the SS initiates channel release.

h1) A data or speech call shall be established on a TCH with the System Simulator and the state U10 of Call Control shall be entered. The Mobile Station shall be set up to send an SM to the System Simulator. After the reception of the CM Service Request, the SS shall send a CM Service Accept message. The System Simulator shall respond with a UA frame SAPI-3 to the SABM with SAPI 3 received from the Mobile Station.

h2) The System Simulator shall respond to the CP-DATA from the MS with a CP-ACK message within TC1M followed by a CP-DATA message containing the correct RP-ACK. The System Simulator shall wait a maximum of 25 seconds for the CP_ACK message. Then the System Simulator shall send a channel release message to the Mobile Station.

h3) Step h1) is repeated. The SS shall be configured not to send the CP-ACK message. After a duration of 2*TC1M the MS aborts the RR connection.

i) The System Simulator shall be configured to receive a mobile originated SM. Step b) shall be repeated and, using the end of the CP-DATA message from the Mobile Station as a trigger, the System Simulator shall send SM to the Mobile Station. In this case a new transaction identifier shall be used in the CP messages of SMS mobile terminated.

j) The MS shall be set up to send an SM to the SS. On receipt of the CM Service Request the SS shall send a CM Service Reject message with the Reject Cause set to "Service Option not supported" or "Service Option temporarily out of order".After 5 seconds the SS initiates channel release.

Requirements :

1) In the case of step b), the Mobile Station shall send Channel Request with the Establishment cause set to "Other Services requested by the mobile user". After SDCCH allocation, the Mobile Station shall establish the Layer 2 on SAPI 0 by sending an SABM frame piggybacking a CM Service Request message with the CM service type set to "Short Message transfer". After the UA response the MS shall correctly answer to the authentication procedure and activate the ciphering when requested by the SS. Once the ciphering procedure is complete the Mobile Station shall send a SABM frame with SAPI-3.

2) In the case of step c), the Mobile Station shall send the CP-DATA which shall be displayed as correct by the System Simulator.

3) In the case of step d), the Mobile Station shall send a CP-ACK message within 25 seconds.

4) In the case of step e), the Mobile Station shall respond with a Layer 2 DISC frame with SAPI-O.

5) In the case of step f), the Mobile Station shall send the CP-DATA message and after time TC1M this CP-DATA message shall be repeated once only.

6) In the case of step g), after establishment of SAPI-3 the MS shall send the CP-DATA message which shall be displayed as correct by the System Simulator.

7) In the case of step h1), the MS shall send a CM Service Request message with the CM service type set to "Short Message transfer" sent in a Layer 2 I frame on the FACCH. After reception of the CM Service Accept from the SS, the MS shall send on the SACCH a SABM frame on SAPI 3.

   In the case of step h2), the Mobile Station shall send the CP-DATA which shall be displayed as correct by the System Simulator. The Mobile Station shall send a CP-ACK message within 25 seconds in response to the CP-DATA from the SS. After receipt of the Channel Release message, the Mobile Station shall respond with a Layer 2 DISC frame with SAPI-0

   In the case of step h3), the requirements for step h1) shall be satisfied. The Mobile Station shall send the CP-DATA message and after time TC1M this CP-DATA message shall be repeated once only. After receipt of the Channel Release message, the Mobile Station shall respond with a Layer 2 DISC frame with SAPI-0.

8) In the case of step i), the Mobile Station shall correctly receive the Short Message and indicate that a message has arrived. If the MS provides the functionnality to display MT message, it is checked that the correct message is displayed (see PICS/PIXIT). In the mobile originated case the Mobile Station shall send the CP-ACK message with transaction identifier assigned to this transfer. In the mobile terminated case the Mobile Station shall send a CP-ACK message and a CP-DATA message containing the RP-ACK. The transaction identifier shall be the same as the one chosen by the System Simulator for the mobile terminated transfer.

9) In the case of step j), the Mobile Station shall inititae establishment of MM connection. After receipt of the CM Service Reject message the MS shall not establish SAPI 3.

Note: time values in steps d) and h2 are chosen sufficiently high to be sure that the MS has enough time to respond to the different message

Mobile originated Test Short Message content : SMS SUBMIT TPDU

Information element	Comment	Value
Message Type Indication		MO
Validity Period Format	"TP-VP field present and integer represented (relative)"	
Destination address	an E164 number	
Protocol identifier	all zeros	0
Data coding scheme	standard alphabet	0
Validity period	24 Hours	
User data length	as applicable	
User Data (140 octets max)	maximum number of characters (text of message) as defined by the manufacturer (see PICS/PIXIT)	

II.11.2.3 Short Message Service Cell Broadcast

Purpose of test :

This test verifies that an MS is able to respond to a paging request during the transmission of a Cell Broadcast Short Message.

Method of test :

a) The Mobile Station shall be in idle mode. Periodic location updating is disabled.

b) The System Simulator shall provide a BCCH/CCCH to support the MS in idle mode.

c) Three Cell Broadcast (CB) messages shall be sent by the SS on the CBCH with sequence numbers 0,1,1.

d) Step c) shall be repeated, but the SS shall page the Mobile Station during the transmission of the second CB message.

Cell Broadcast Test Message Content

Information Element	Comment	Value
Sequence No.		See above
Message Identifier		0
Alpha/Language Identifier		0
Page Parameter		0001 0001
Characters of Message	93 user characters using all characters of default 7 bit coded alphabet	

Requirements :

This requirement applies to all MS types, whether or not they support Cell Broadcast.

1) In the case of step d), the MS shall respond to the page.

II.11.3 Category 3: Message Handling Service

Ref: GSM 03.42

(Reserved.)

II.11.4 Category 4: Videotex

Ref: GSM 03.43

(Reserved.)

II.11.5 Category 5: Teletex

Ref: GSM 03.44

(Reserved.)

II.11.6 Category 6: Facsimile

Ref: GSM 03.45 and 03.46

(Reserved.)

II.12 TEST OF SUPPLEMENTARY SERVICES

The general aspects of the specification of supplementary services at the Layer 3 radio interface are given in GSM 04.10.

The formats and coding are given in GSM 04.80. If the value of a parameter of an uplink message (MS to network) is specified in a test, the implicit meaning is that it has to be checked; if the value is not specified, it is not to be checked unless otherwise stated.

Unless otherwise stated, the MS shall be in the idle updated state at the begining of each test (including in case of repetition of a test).

In each test, before the MS sends the first REGISTER message, a MM connection shall be established.

GSM 04.81 to 04.88 give the procedures used at the radio interface for normal operation, registration, erasure, activation, deactivation, invocation and interrogation of supplementary services.

The supplementary services are described in GSM 02.04 and 02.81 to 02.88.

Whenever activation via the standard MMI is mentioned, if the MS doesn't support it but supports a different procedure, this procedure shall be used. However, all MMI functions, brand specific MMI and standardised MMI functions on the MMI shall be tested in the case of Activation of Call Barring Services (II.12.8.3) and Deactivation of Call Barring Services (II.12.8.4). In the SS tests, only the applicable (see GSM 02.8x series) MMI Service Code groups (GSM 02.30 Annex 4), which are supported by the MAP of the Basic Service Code in GSM 09.02 shall be used.

In all the following test cases, the mobile shouldn't be failed if it doesn't send a Facility information element in the initial REGISTER message, but in a subsequent FACILITY message (although only the first case is the normal behavior).

II.12.1 NUMBER IDENTIFICATION SUPPLEMENTARY SERVICES

(Reserved).

II.12.2 CALL OFFERING SUPPLEMENTARY SERVICES

II.12.2.1 Call forwarding supplementary services

Unless stated otherwise, the test procedures described in the following apply to all kinds of call forwarding supplementary services.

The following abbreviations are used:

CFU	:	Call Forwarding Unconditional
CFB	:	Call Forwarding on mobile subscriber Busy
CFNRy	:	Call Forwarding on No Reply
CFNRc	:	Call Forwarding on mobile subscriber Not Reachable
CFC	:	Call Forwarding Conditional (common name for CFB, CFNRy and CFNRc)
CF	:	Call Forwarding (common name for CFU, CFB, CFNRy and CFNRc).

These abbreviations are also used to represent the corresponding SS-Code; e.g. CFC is the SS-Code for all conditional forwarding services.

II.12.2.1.1 Registration

A) Registration accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message containing the following parameters (see GSM 04.82 section 1.2):

- for "call forwarding unconditional",
  "call forwarding on mobile subscriber busy" and
  "call forwarding on mobile subscriber non reachable" :

    - protocol discriminator
    - transaction identifier
    - message type
    - facility

      invoke = Registration
      Supplementary Service Code = CFU (or CFB, or CFNRc)
      Forwarded To Number
      Basic Service Code.

- for "call forwarding on no reply":

    - protocol discriminator
    - transaction identifier
    - message type
    - facility

      invoke = Registration
      Supplementary Service code = CFNRy
      Forwarded To Number
      No Reply Condition Time
      Basic Service Code.

Note: If Basic Service Code is not included the Forwarded To Number applies to all Basic Services.

Upon receipt of the REGISTER message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the RegisterSS operation with the following parameters with the same values as above:

- Forwarded To Number
- No Reply Condition Time (CFNRy only)
- Basic Service Code (Included if included in the invoke).

The invoke ID must be the same as in the invoke of the Register SS operation.

The test is repeated using different values for the SS-Code, Forwarded To Number, No Reply Condition Time and Basic Service Code and also with the Basic Service Code not included. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit succesively a CHANNEL REQUEST with establishment cause set to "other services requested by the mobile user": (coded as 111), a CM SERVICE REQUEST with CM service type indicating "supplementary service activation" (coded as 1000) and then the REGISTER message containing the invoke of the RegisterSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Registration rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE containing all parameter values found in REGISTER and additionally the cause for rejection.

The cause could be a return error (for instance SS not available) or a reject (for instance mistyped parameter).

RELEASE COMPLETE

Protocol discriminator.
Transaction identifier
Message type
Facility : return error code
Or facility : reject code.

For the return error and the reject, the invoke ID must be the same as in the invoke of the Register SS operation.

The possible errors are:

- IllegalSS-Operation
- SS-ErrorStatus (with parameter SS-Status indicating:
    - Not Provisioned, Not Registered and Not Active or
    - Provisioned, Registered and Active)
- SS-NotAvailable
- SS-SpecificError
- BearerServiceNotProvisioned
- TeleserviceNotProvisioned
- SS-SubscriptionViolation
- SS-Incompatibility
- UnexpectedDataValue
- DataMissing
- SystemFailure.

The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation

- Initiating Release.

The test is repeated with different errors and problems and when error is SS-ErrorStatus with different SS-Status indications.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.2.1.2 Erasure

II.12.2.1.2.1 Erasure by the subscriber

A) Erasure accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the EraseSS operation with the following parameters:

Facility Invoke = Erasure

- SS-Code (CFU, CFB, CFNRy or CFNRc)
- BasicServiceCode (Optional).

If Basic Service Code is not included Erasure applies to all Basic Services.

Upon receipt of the REGISTER message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the EraseSS operation with the following parameter with the same value as above:

Facility Return Result = Erasure

- BasicServiceCode (Included if included in the invoke).

The invoke ID must be the same as in the invoke of the EraseSS operation.

The test is repeated using different values for the SS-Code and BasicServiceCode and also with the BasicServiceCode not included. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the EraseSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Erasure rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the EraseSS operation.

If Facility = return error
The possible errors are:

- IllegalSS-Operation
- SS-ErrorStatus (with parameter SS-Status indicating:
  - Not Provisioned, Not Registered and Not Active or
  - Provisioned, Not Registered and Not Active)
- SS-SpecificError
- SS-SubscriptionViolation
- UnexpectedDataValue
- DataMissing
- SystemFailure.

If Facility = Reject
The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems and when error is SS-ErrorStatus with different SS-Status indications.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.2.1.3 Activation

Activation is not applicable to call forwarding services.

II.12.2.1.4 Deactivation

Causes no signalling on the radio path.

II.12.2.1.5 Invocation

Not applicable to the MS.
Causes no signalling on the radio path.

II.12.2.1.6 Interrogation

II.12.2.1.6.1 General data request

A) Interrogation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message containing the SS code for the specific call forwarding service to be tested.

REGISTER MESSAGE

- Protocol discriminator
- Transaction identifier
- Message type
- Facility

invoke = Interrogation
Supplementary Service Code = CFU or CFB, CFNRy, CFNRc.

As the Basic Service Code is not included, interrogation applies to all Basic Services.

Upon receipt of the REGISTER message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the InterrogateSS operation with zero, one or more than one triplet(s)/pair(s) of the following parameters:

- in case of Supplementary Service Code = CFNRy :

FACILITY :

Return Result = Interrogation

ForwardedToNumber NoReplyConditionTime (CFNRy only) BasicServiceCode	1st Basic Service
Forwarded to Number No Reply Condition Time Basic Service Code etc ...	2nd Basic Service

- in case of Supplementary Service Code = CFU or CFB or CFNRc :

  FACILITY :

  Return Result = Interrogation

Forwarded to Number Basic Service Code	1st Basic Service
Forwarded to Number Basic Service Code	2nd Basic Service
Forwarded to Number Basic Service Code etc ...	3rd Basic Service

The invoke ID must be the same as in the invoke of the InterrogateSS operation.

The test is repeated using different SS-Codes and different numbers of parameter triplets/pairs with different values. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the InterrogateSS operation with the expected parameter value.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Interrogation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the InterrogateSS operation.

If Facility = Return error
the possible errors are:

IllegalSS-Operation
SS-NotAvailable
SS-SpecificError
DataMissing
UnexpectedDataValue
SystemFailure.

If Facility = reject
the possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.2.1.6.2 Specific data request

A) Interrogation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a specific data request REGISTER containing the SS code for the specific call forwarding service and the basic service about which information is interrogated.

REGISTER message

- Protocol discriminator
- transaction identifier
- message type
- facility

Invoke = Interrogation
Supplementary Service Code = CFU (or CFB or CFNRy, or CFNRc)
Basic Service Code.

Upon receipt of the REGISTER message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the InterrogateSS operation with the following parameters:

- in case of Supplementary Service Code = CFNRy :

FACILITY

Return Result = Interrogation
Forwarded to Number
No Reply Condition Time
Basic Service Code.

- in case of Supplementary Service Code = CFU or CFB or CFNRc :

FACILITY

Return Result = Interrogation
Forwarded to Number
Basic Service Code.

The invoke ID must be the same as in the invoke of the InterrogateSS operation.

The test is repeated using different SS-Codes and BasicServiceCodes. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

1) For each case tested, the MS has to transmit the REGISTER message containing the invoke of the InterrogateSS operation with the expected parameter values.

2) Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Interrogation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the InterrogateSS operation.

If Facility = Return error
the possible errors are:

- IllegalSS-Operation
- SS-NotAvailable
- SS-SpecificError
- DataMissing
- UnexpectedDataValue
- SystemFailure

If Facility = Reject
the possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.2.1.7 Normal operation

II.12.2.1.7.1 Served mobile subscriber side

II.12.2.1.7.1.1 Notification of incoming call

This subscription option is only applicable to CFB and CFNRy.

Method of test:

a) The MS is brought to the call state U7 of an incomming call.

b) The System Simulator transmits a FACILITY message with the Facility information element containing an invoke of the NotifySS operation with the following parameters:

FACILITY
- protocol discriminator
- transaction identifier
- message type
- facility

invoke = Notification
Supplementary Service Code = CFNRy
SS notification = incoming call is forwarded
(call is forwarded indication to B suscriber).

c) The MS is brought to the call state U10 of an incomming call.

d) The System Simulator transmits a FACILITY message with the Facility information element containing an invoke of the NotifySS operation with the following parameters:

FACILITY
- protocol discriminator
- transaction identifier
- message type
- facility

invoke = Notification
Supplementary Service Code = CFB
SS notification = incoming call is forwarded
(call is forwarded indication to B suscriber).

e) A STATUS ENQUIRY message is sent to the MS.

Requirements:

After steps b) and d), upon receipt of the FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

After step e), the MS shall send a STATUS message with CC-state U10.

II.12.2.1.7.1.2 Notification during outgoing call

a) Method of test:

The MS is forced to place an outgoing call.

After having received a SETUP message and sent a CALL PROCEEDING message and after a TCH has been allocated the system simulator transmits an ALERTING message with the Facility information element described below and then a STATUS ENQUIRY message

Facility Invoke = Notification

- SS-Code (CFU or CFC)
- SS-Status (indicating: Provisioned, Registered and Active).

The test is repeated using different SS-Codes.

Requirements:

Upon receipt of the ALERTING message with the Facility information element, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). On receipt of the STATUS ENQUIRY message the MS shall send a STATUS message with CC-state U4.

b) Method of Test

The MS is forced to place an outgoing call.

After having received a SETUP message and sent a CALL PROCEEDING message and after a TCH has been allocated the system simulator transmits an ALERTING message and then a CONNECT with the Facility information element described below. After reception of a CONNECT ACKNOWLEDGE message the SS sends a STATUS ENQUIRY message.

Facility Invoke = Notification

- SS-Code (CFU or CFC)
- SS-Status (indicating: Provisioned, Registered and Active).

The test is repeated using different SS-Codes.

Requirements:

Upon receipt of the CONNECT message with the Facility information element, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). On receipt of the CONNECT message the MS shall send a CONNECT ACKNOWLEDGE message and then on receipt of the STATUS ENQUIRY message the MS shall send a STATUS message with CC-state U10.

c) **Method of Test**

The MS is forced to place an outgoing call.

After having received a SETUP message and sent a CALL PROCEEDING message the system simulator transmits a FACILITY message with the Facility Information Element described below. The SS then allocates a TCH and after the TCH has been allocated the SS sends a STATUS ENQUIRY message.

Facility Invoke = Notification

- SS-Code (CFU or CFC)
- SS-Status (indicating: Provisioned, Registered and Active).

The test is repeated using different SS-Codes.

Requirements:

Upon receipt of the FACILITY message with the Facility information element, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). After a TCH has been allocated the MS shall on receipt of the STATUS ENQUIRY message send a STATUS message with CC-state U3.

II.12.2.1.7.2 Forwarded-to mobile subscriber side

Method of test:

An incoming call is given to the MS with the SETUP message with the Facility information element containing an invoke of the NotifySS operation with the following parameters:

Facility Invoke = Notification

- SS-Code (CFU, CFB, CFNRy, CFNRc or CF)
- SS-Notification (indicating: Call is forwarded i.e. Call is forwarded indication to C-subscriber).

The test is repeated using different SS-Codes.

Requirements:

Upon receipt of the SETUP message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.2.1.7.3 Calling mobile subscriber side

Method of test:

A call is initiated by the mobile. Upon receipt of the SETUP message the System Simulator transmits a FACILITY message with the Facility information element containing an invoke of the NotifySS operation with the following parameters:

Facility Invoke = Notification

- SS-Code (CFU, CFB, CFNRy, CFNRc or CF)
- SS-Notification (Outgoing call has been forwarded i.e. Call is forwarded indication to A-subscriber).

The test is repeated using different SS-Codes.

Requirements:

Upon receipt of the FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.2.2 Call transfer and Mobile access hunting supplementary services

(Reserved).

II.12.3 CALL COMPLETION SUPPLEMENTARY SERVICES

(Reserved).

II.12.4 MULTY-PARTY SUPPLEMENTARY SERVICES

(Reserved).

II.12.5 COMMUNITY OF INTEREST SUPPLEMENTARY SERVICES

(Reserved).

II.12.6 CHARGING SUPPLEMENTARY SERVICES

(Reserved).

II.12.7 ADDITIONAL INFORMATION TRANSFER SUPPLEMENTARY SERVICES

(Reserved).

II.12.8 CALL RESTRICTION SUPPLEMENTARY SERVICES

Unless stated otherwise, the test procedures in the following apply to all kinds of call restriction supplementary services.

The following abbreviations are used

BO	:	Barring of Outgoing calls
BAOC	:	Barring of All Outgoing calls
BOIC	:	Barring of Outgoing International calls
BOIC-exHC	:	Barring of Outgoing international call Except those directed to the Home PLMN country
BI	:	Barring of Incoming calls
BAIC	:	Barring of All Incoming calls
BAIC-Roam	:	Barring of incoming when Roaming Outside the home PLMN country
B	:	Barring (common name for BAOC, BOIC, BOIC-exHC, BAIC and BAIC-Roam).

These abbreviations are also used to represent the corresponding SS-Code; e.g. B is the SS-Code for all call restriction (barring) services.

Note: The password(s) to be used during tests of this section II.12.8 may be randomly chosen - unless otherwise stated - in accordance with GSM 02.04 section 5.2.

II.12.8.1 Registration

This section allows the registration protocol for password registration to be tested. Both successful and unsuccessful outcomes are tested.

A) Registration accepted

General

The following steps shall be executed sequentially.

In the case of brand specific MMI, actions might have to be performed at the MS during the test (eg. entering new password).

Method of test, Step 1:

By means of either the standardized MMI functions as described in GSM 02.30 or the brand specific MMI, the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the RegisterPassword operation with the following parameter:

Facility Invoke = Register Password

- SS-Code (B).

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Requirement:

The MS has to transmit the REGISTER message with the expected parameter value.

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 2:

Upon receipt of the FACILITY message, the MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter New Password).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Requirements:

The MS has to transmit the FACILITY message with the expected parameter value.

Upon receipt of the FACILITY message the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 3:

Unless the standardized MMI functions of GSM 02.30 have been used, the new password is entered in the MS by means of procedures which are to be described by the manufacturer. The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result

- Password (the new password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter New Password Again).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Requirements:

The MS has to transmit the FACILITY message with the expected parameter value.

Upon receipt of the FACILITY message the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 4:

Unless the standardized MMI functions of GSM 02.30 have been used, the new password is entered again in the MS by means of procedures which are to be described by the manufacturer. The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the new password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return result of the RegisterPassword operation with the following parameter:

- Password (the new password).

The invoke ID must be the same as in the invoke of the RegisterPassword operation.

Requirements:

The MS has to transmit the FACILITY message with the expected parameter value.

Upon receipt of the RELEASE COMPLETE message the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Registration rejected

B1) Rejection after invoke of the RegisterPassword operation

Method of test:

The MS is forced to send a REGISTER message in the same way as described for case A), Step 1.

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem. The test is repeated with all different errors and problems described below.

For the return error or the reject, the invoke ID must be the same as in the invoke of the RegisterPassword operation.

If Facility = Return error
the possible errors are:

- SS-SubscriptionViolation
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject
the possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

B2) Rejection after password check with negative result

Method of test:

The MS is forced to send a REGISTER message in the same way as described for case A), Step 1, by using the standardized MMI as described in GSM 02.30.

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Upon receipt of the FACILITY message from the MS with the Facility information element containing a return result of the GetPassword operation, the system simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with the following error:

Facility Return error

- NegativePasswordCheck.

The invoke ID must be the same as in the invoke of the RegisterPassword operation.

Requirements:

Upon receipt of the RELEASE COMPLETE message the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B3) Rejection after use of two different new passwords

Method of test:

The MS is forced to send a REGISTER message in the same way as described for case A), Step 1. However, the new password and its repetition shall be different.

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues without interruption.

Upon receipt of the FACILITY message the MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the current password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter New Password).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues without interruption.

Upon receipt of the FACILITY message the MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the new password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter New Password Again).

The linked ID must be the same as the invoke ID in the invoke of the RegisterPassword operation.

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues without interruption.

Upon the receipt of the FACILITY message the MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (a different new password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with the following error:

Facility Return Error

- PasswordRegistrationFailure.

This error contains the following parameter:

- Diagnostic (indicating: NewPasswordMismatch).

The invoke ID must be the same as in the invoke of the RegisterPassword operation.

Requirements:

Upon receipt of the RELEASE COMPLETE message the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.8.2 Erasure

Causes no signalling on the radio path.

II.12.8.3 Activation

A) Activation accepted

General

The following steps shall be executed sequentially.

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to Test Step 1 (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating Test Step 1 while using these MMI functions.

This whole test case A) shall be repeated using different values for the SS-Code and BasicServiceCode and also with the BasicServiceCode not included. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY. Further repetitions of Test Step 1 for brand specific MMI functions are not required.

Method of test, Step 1:

By means of either the standardized MMI functions as described in GSM 02.30, or the brand specific MMI the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ActivateSS operation with the following parameters:

REGISTER

- protocol discriminator
- transaction identifier
- message type
- facility

Invoke = Activate SS
Supplementary Service Code (eg BAOC, BOIC, BOIC-exHC, BAIC, BAIC-Roam)
Basic Service Code.

Note: If Basic Service Code is not included the SS applies to all Basic Services.

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 2:

Unless the standardized MMI functions of GSM 02.30 have been used, the current password is entered in the MS by means of appropriate MMI functions (which are to be described by the manufacturer). The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the current password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ActivateSS operation with the following parameter with the same value as above:

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility
  - Return Result: Activate SS
    Basic Service Code
    (Included if included in the invoke).

The invoke ID must be the same as in the invoke of the ActivateSS operation.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ActivateSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Activation rejected

B1) Rejection after invoke of ActivateSS operation

General

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to the procedure under test (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating the test while using these MMI functions.

This test case B1) shall be repeated with different error and problem indications of the RELEASE COMPLETE message. Further repetitions of the test for brand specific MMI functions are not required.

Method of test:

By means of either the standardized MMI functions as described in GSM 02.30, or the brand specific MMI the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ActivateSS operation with the following parameters:

Facility Invoke = Activate SS

- SS-Code (BAOC, BOIC, BOIC-exHC, BAIC or BAIC-Roam)
- BasicServiceCode (Optional).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error or the reject, the invoke ID must be the same as in the invoke of the ActivateSS operation.

If Facility = Return error
the possible errors are:

- IllegalSS-Operation
- SS-ErrorStatus (with parameter SS-Status indicating:
  - Not Provisioned, Not Registered and Not Active or
  - Provisioned, Not Registered and Not Active or
  - Provisioned, Registered and Not Active)
- SS-NotAvailable
- SS-SpecificError
- BearerServiceNotProvisioned
- TeleserviceNotProvisioned
- SS-SubscriptionViolation
- SS-Incompatibility
- UnexpectedDataValue
- DataMissing
- SystemFailure.

If Facility = Reject
the possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

B2) Rejection after use of password procedure

General

The following steps shall be executed sequentially.

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to Test Step 1 (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating Test Step 1 while using these MMI functions.

This test case B2) shall be repeated with different error and problem indications of the RELEASE COMPLETE message. Further repetitions of Test Step 1 for brand specific MMI functions are not required.

Method of test, Step 1:

By means of either the standardized MMI functions as described in GSM 02.30 or the brand specific MMI, the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ActivateSS operation with the following parameters:

Facility Invoke = Activate SS

- SS-Code (BAOC, BOIC, BOIC-exHC, BAIC or BAIC-Roam)
- BasicServiceCode (Optional).

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 2:

Unless the standardized MMI functions of GSM 02.30 have been used, the current password is entered in the MS by means of appropriate MMI functions (which are to be described by the manufacturer). The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the current password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the ActivateSS operation.

If Facility = Return Error
the possible errors are:

- NegativePasswordCheck
- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject
the possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Return result problems:
- Unrecognized Invoke ID
- Mistyped Parameter.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ActivateSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.8.4 Deactivation

A) Deactivation accepted

General

The following steps shall be executed sequentially.

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to Test Step 1 (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating Test Step 1 while using these MMI functions.

This test case A) shall be repeated using the 2 different values for the SS-Code and BasicServiceCode and also with the BasicServiceCode not included. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY. Further repetitions of Test Step 1 for brand specific MMI functions are not required.

Method of test, Step 1:

By means of either the standardized MMI functions as described in GSM 02.30, or the brand specific MMI, the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the DeactivateSS operation with the following parameters:

REGISTER

- protocol discriminator
- transaction identifier
- message type
- facility

Invoke = Deactivate SS
Supplementary Service Code (BO or BI)
Basic service code.

Note: If Basic Service Code is not included the SS applies to all Basic Services.

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 2:

Unless the standardized MMI functions of GSM 02.30 have been used, the current password is entered in the MS by means of appropriate MMI functions (which are to be described by the manufacturer). The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the current password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the DeactivateSS operation with the following parameter with the same value as above:

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility

Return Result = Deactivation
Basic Service Code (Included if included in the invoke).

The invoke ID must be the same as in the invoke of the DeactivateSS operation.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the DeactivateSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Deactivation rejected

B1) Rejection after invoke of DeactivateSS operation

General

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to the procedure under test (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating the test while using these MMI functions.

This test case B1) shall be repeated with different error and problem indications of the RELEASE COMPLETE message. Further repetitions of the test for brand specific MMI functions are not required.

Method of test:

By means of either the standardized MMI functions as described in GSM 02.30, or the brand specific MMI, the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the DeactivateSS operation with the following parameters:

Facility Invoke = Deactivate SS

- SS-Code (BO or BI)
- BasicServiceCode (Optional).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the DeactivateSS operation.

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility

Return error = error code
Or Reject = problem code.

The possible errors are:

- IllegalSS-Operation
- SS-ErrorStatus (with parameter SS-Status indicating:
  - Not Provisioned, Not Registered and Not Active or
  - Provisioned, Not Registered and Not Active or
  - Provisioned, Registered and Active)
- SS-NotAvailable
- SS-SpecificError
- BearerServiceNotProvisioned
- TeleserviceNotProvisioned
- SS-SubscriptionViolation
- SS-Incompatibility
- UnexpectedDataValue
- DataMissing
- SystemFailure.

The possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

B2) Rejection after use of password procedure

General

The following steps shall be executed sequentially.

However, if the MS returns to the start of this test case B2) by sending the REGISTER message containing:

Facility Invoke = Deactivate SS

then the System Simulator shall repeat this test case B2).

When appropriate, Brand specific MMI functions which are described by the manufacturer and applicable to Test Step 1 (in addition to the standardized MMI functions as defined in GSM 02.30), shall be tested by repeating Test Step 1 while using these MMI functions.

This test case B2) shall be repeated with different error and problem indications of the RELEASE COMPLETE message. Further repetitions of the test for brand specific MMI functions are not required.

Method of test, Step 1:

By means of standardized MMI functions as described in GSM 02.30, including any password here, (and repeated for additional procedures which are to be described by the manufacturer) the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the DeactivateSS operation with the following parameters:

Facility Invoke = Deactivate SS

- SS-Code (BO or BI)
- BasicServiceCode (Optional).

Upon receipt of the REGISTER message, the System Simulator answers with the FACILITY message with the Facility information element containing an invoke of the GetPassword operation with the following parameter:

Facility Invoke = Get Password

- GuidanceInfo (indicating: Enter Password).

Note: No indication (on GuidanceInfo) is given to the user in case the standardized MMI functions of GSM 02.30 have been used, and the test continues to the next step without interruption.

Method of test, Step 2:

Unless the standardized MMI functions of GSM 02.30 have been used, the current password is entered in the MS by means of appropriate MMI functions (which are to be described by the manufacturer). The MS has to transmit a FACILITY message with the Facility information element containing a return result of the GetPassword operation with the following parameter:

Facility Return Result = Get Password

- Password (the current password).

The invoke ID must be the same as in the invoke of the GetPassword operation.

Upon receipt of the FACILITY message, the System Simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the DeactivateSS operation.

If Facility = Return Error
the possible errors are:

- NegativePasswordCheck
- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject
the possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Return result problems:

- Unrecognized Invoke ID
- Mistyped Parameter.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the DeactivateSS operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.8.5 Invocation

Causes no signalling on the radio path.

II.12.8.6 Interrogation

A) Interrogation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the InterrogateSS operation with the following parameter:

REGISTER

- protocol discriminator
- transaction identifier
- message type
- facility

invoke : interrogation
SS code (BAOC, BOIC, BOIC-exHC, BAIC or BAIC-Roam).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the InterrogateSS operation with zero, one or more than one number of the following parameter:

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility

Return Result = Interrogation
Basic Service Code n°1
Basic Service Code n°2
etc.

The invoke ID must be the same as in the invoke of the InterrogateSS operation.

The test is repeated using different values of the SS-Code and different numbers and values of the BasicServiceCode. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the InterrogateSS operation with the expected parameter value.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

B) Interrogation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject, the invoke ID must be the same as in the invoke of the InterrogateSS operation. For the reject the invoke ID may be the same as in the invoke of the InterrogateSS operation but the invoke ID tag can also be universal null together with the invoke ID length = 0.

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility

Return Error = Error Code
Or Reject = problem code.

The possible errors are:

- IllegalSS-Operation
- SS-NotAvailable
- SS-SpecificError
- DataMissing
- UnexpectedDataValue
- SystemFailure.

The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.8.7 Normal operation

In case of barring of outgoing call the calling mobile receives information about the activation of SS subscribed.

In case of barring of incoming call the calling mobile receives information about the activation of SS subscribed by the other party (the mobile called).

Method of test:

The MS is forced to place an outgoing call.

Upon receipt of the SET UP message, the system simulator answers either with the negative acknowledgment RELEASE COMPLETE (to simulate a case where call barring is activated).

RELEASE COMPLETE

- protocol discriminator
- transaction identifier
- message type
- facility

invoke = notification
SS code = BO or BI
SS status = activation indicator (indicating : Provisioned, Registered and Active)

The test is repeated with BO then BI..

Requirements:

For each case tested, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.12.9 HANDLING OF UNDEFINED (FUTURE) GSM SUPPLEMENTARY SERVICES

The MMI procedures for handling of GSM supplementary services not yet defined are described in GSM 02.30.

The ProcessUnstructuredSsData operation to be used on the radio path for such services is defined in GSM 09.02 and 04.80.

When the MS detects a MMI procedure for an SS where the coding of MMI and information elements is not yet specifically defined in GSM, it generates a REGISTER message with the Facility information element containing an Invoke of the Process Unstructured SS Data operation.

II.12.9.1 Test sequences

In sections II.12.9.2 to II.12.9.7 the test procedures for registration, erasure, activation, deactivation, interrogation and operations not yet defined in GSM 02.30 are described.

For registration, erasure, activation, deactivation and interrogation, the test sequence below is executed for a set of service codes NN(N) which have not yet been allocated for GSM supplementary services (see GSM 02.30 for service codes already specified).

This set of service codes is: 00, 000, 999, and two service codes randomly chosen in the range 01 to 99, and 001 to 998 (one service code in each) range). In that random selection, service codes for which explicit tests are carried out in earlier tests of section II.12 should not be selected.

Registration rejected

Registration accepted

Erasure rejected

Activation rejected

Activation accepted

Interrogation accepted

Interrogation rejected

Deactivation rejected

Deactivation accepted

Erasure accepted.

For operations not yet defined by GSM 02.30 the following test sequence is executed:

Operation accepted (see section II.12.9.7)
Operation rejected (see section II.12.9.7).

For each test in a test sequence the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

- SS-UserData.

The SS-UserData parameter will in an IA5String contain the keystrokes defined in the test case.

For Registration, Erasure, Activation, Interrogation and Deactivation, each test in a test sequence characterized by the service code NN(N) shall be executed three times:

- with no supplementary information
- with one supplementary information field Si containing a value chosen at random
- with two supplementary information fields Sia and Sib both containing values chosen at random.

Besides this, each test in a test sequence shall be repeated a number of times as described in sections II.12.9.2 to II.12.9.6.

II.12.9.2 Registration

A) Registration accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = Process Unstructured SS Data

- SS-UserData.

The SS-UserData parameter shall in an IA5String contain the following digits and symbols:

**NN(N)# (No supplementary information included)
or **NN(N)*Si# (One field of supplementary information included)
or **NN(N)*Sia*Sib# (Two fields of supplementary information included).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Return Result = Process Unstructured SS data

- SS-UserData (Optional).

The SS-UserData parameter may contain information in an IA5String.

The invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result. When SS-UserData is included in the return result the content of the IA5String is chosen at random. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5String information is included this shall be given to the user (in a way described by the manufacturer).

B) Registration rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the system simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = Return Error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject

The possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.9.3 Erasure

A) Erasure accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = Process Unstructured SS Data

- SS-UserData.

The SS-UserData parameter shall in an IA5String contain the following digits and symbols:

##NN(N)# (No supplementary information included)
or ##NN(N)*Si# (One field of supplementary information included)
or ##NN(N)*Sia*Sib# (Two fields of supplementary information included).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Return Result = Process Unstructured SS Data

- SS-UserData (Optional).

The SS-UserData parameter may contain information in an IA5String.

The invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result. When SS-UserData is included in the return result the content of the IA5String is chosen at random. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5String information is included this shall be given to the user (in a way described by the manufacturer).

B) Erasure rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the System Simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = Return error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject

The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.9.4 Activation

A) Activation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = Process Unstructured SS Data

- SS-UserData.

The SS-UserData parameter shall in an IA5String contain the following digits and symbols:

*NN(N)#	(No supplementary information included)
or *NN(N)*Si#	(One field of supplementary information included)
or *NN(N)*Sia*Sib#	(Two fields of supplementary information included).

Upon receipt of the REGISTER message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Result = Process Unstructured SS data

- SS-UserData (Optional).

The SS-UserData parameter may contain information in an IA5String.

The invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result. When SS-UserData is included in the return result the content of the IA5String is chosen at random. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5String information is included this shall be given to the user (in a way described by the manufacturer).

B) Activation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the System Simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = Return Error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject

The possible problems are:

General problems:

- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:

- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.9.5 Deactivation

A) Deactivation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = Process Unstructured SS Data

- SS-UserData.

The SS-UserData parameter shall in an IA5String contain the following digits and symbols:

#NN(N)#	(No supplementary information included)
or #NN(N)*Si#	(One field of supplementary information included)
or #NN(N)*Sia*Sib#	(Two fields of supplementary information included).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Return Result = Process Unstructured SS Data

- SS-UserData (Optional).

The SS-UserData parameter may contain information in an IA5String.

The invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result. When SS-UserData is included in the return result the content of the IA5String is chosen at random. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5String information is included this shall be given to the user (in a way described by the manufacturer).

B) Deactivation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the System Simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = return error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = reject

The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.9.6 Interrogation

A) Interrogation accepted

Method of test:

By means of appropriate MMI functions as defined by the basic public MMI described in GSM 02.30 the MS is forced to send a REGISTER message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = Process Unstructured SS Data

- SS-UserData.

The SS-UserData parameter shall in an IA5String contain the following digits and symbols:

*#NN(N)# (No supplementary information included)
or *#NN(N)*Si# (One field of supplementary information included)
or *#NN(N)*Sia*Sib# (Two fields of supplementary information included).

Upon receipt of the REGISTER message, the System Simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Return Result = Process Unstructured SS Data

- SS-UserData (Optional).

The SS-UserData parameter may contain information in an IA5String.

The invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result.

When SS-UserData is included in the return result the content of the IA5 string is chosen at random.

The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5String information is included this shall be given to the user (in a way described by the manufacturer).

B) Interrogation rejected

Method of test:

The MS is forced to send the REGISTER message in the same way as described for case A).

Upon receipt of the REGISTER message the System Simulator answers with a RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = Return Error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject

The possible problems are:

General problems:
- Unrecognized Component
- Mistyped Component
- Badly Structured Component.

Invoke problems:
- Unrecognized Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the Manufacturer).

II.12.9.7 Operations not yet specified in GSM 02.30 General test of transparency of MMI inputs

A) Operation accepted

Method of test:

The following tests shall be performed within a call.

By means of a specified MMI keypad operation (defined below) the MS is forced to send a REGISTER or FACILITY message with the Facility information element containing an invoke of the ProcessUnstructuredSsData operation with the following parameter:

Facility Invoke = ProcessUnstructuredSsData

- SS-UserData.

The SS-UserData parameter shall in an IA5 string contain exactly the digits and symbols expressed on the mobile equipment keypad. One test for each of the below expressed keypad procedures shall be performed.

MMI key depressions	IA5 string contents
0 SEND (note 1)	0
1 SEND	1
2 SEND	2
:	:
:	:
9 SEND	9

Note 1: The keyword "SEND" refers to the SEND function as defined in GSM 02.30.

Upon receipt of the REGISTER or FACILITY message, the system simulator answers with the RELEASE COMPLETE or FACILITY message with the Facility information element containing a return result of the ProcessUnstructuredSsData operation with the following parameter:

Facility Return Result = ProcessUnstructuredSsData

- SS-UserData (optional).

The SS-UserData parameter may contain information in an IA5 string.

The Invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

The test is repeated with and without the SS-UserData in the return result. When SS-UserData is included in the return result the content of the IA5 string is chosen at random. The test is also repeated using different answer messages RELEASE COMPLETE or FACILITY.

Requirements:

For each case tested, the MS has to transmit the REGISTER or FACILITY message containing the invoke of the ProcessUnstructuredSsData operation with the expected parameter values.

Upon receipt of the RELEASE COMPLETE or FACILITY message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer). If IA5 information is included this shall be given to the user (in a way described by the manufacturer).

B) Operation rejected

Method of test:

The MS is forced to send the REGISTER or FACILITY message in the same way as described for case A).

Upon receipt of the REGISTER or FACILITY message, the system simulator answers with the RELEASE COMPLETE message with the Facility information element containing a return error with an error or a reject with a problem.

For the return error and the reject the invoke ID must be the same as in the invoke of the ProcessUnstructuredSsData operation.

If Facility = Return Error

The possible errors are:

- DataMissing
- UnexpectedDataValue
- SystemFailure.

If Facility = Reject

The possible problems are:
General problems:
- Unrecognised Component
- Mistyped Component
- Badly Structured Component.

Invoke Problems:
- Unrecognised Operation
- Mistyped Parameter
- Resource Limitation
- Initiating Release.

The test is repeated with different errors and problems.

Requirements:

Upon receipt of the RELEASE COMPLETE message, the MS has to provide the appropriate user indication (which is to be described by the manufacturer).

II.13 TESTING OF SPEECH TRANSCODING FUNCTIONS

Ref: GSM 06.10, 06.11, 06,12, 06.31 and 06.32

The speech transcoding in the GSM Mobile Stations transforms the 13 kbit/s net bit stream, which is transmitted over the radio path via the functions described in the GSM 05 series of recommendations, to 104 kbit/s 13 bit linear PCM, or vice versa.

Following the 13 bit linear PCM there are audio parts like D/A conversion, filtering, microphones and loudspeakers. These are verified by the transmission requirements given in section II.11.1.

For further information see GSM 06.01 and GSM 06.10.

For all tests in this chapter II.13, the Layer 1 functions of the MS must already be verified and the tests must be performed under ideal radio conditions.

The test sequence SEQ02.COD should not be used for the downlink transcoding tests in II.13.1 and II.13.5.1.1.

Note: For a definition of the term "traffic frame" used in this chapter, refer to GSM 06.31. For a description of their allocation within the TDMA structure on the radio interface, see GSM 05.02. For a description of the method to achieve test data synchronism over the radio interface, see III.1.4.

II.13.1 DOWNLINK SPEECH TRANSCODING

Definition

This transcoding transforms the 13 kbit/s net radio path bit stream to 13 bit linear PCM.

For further information see GSM 06.10 and refer to the speech decoder parts.

Method of test

a) For this test DTX shall be off.

b) At 13 kbit/s level in the SS before channel coding a test sequence shall be input.

c) The test sequences for speech transcoding are defined in GSM 06.10 section 5 and are available on 5"1/4 floppy disks on IBM/AT MS/DOS format from the ETSI secretariate.

d) The sequences to be input in this test are contained in the files SEQxx.COD. The files contain 16 bit words for all speech encoded parameters and are justified as described in GSM 06.10 Table 5.1. 76 words must be input in a period of 20 ms and the speech decoder must be reset before the start of the test (see section III.1.4).

e) At 104 kbit/s level in the MS the output bit stream shall be output and recorded on the digital audio interface described in section III.1.4.

Requirements

1.a) The bit stream output shall be continuous and bit by bit exactly the same as the sequence given in the files SEQxx.OUT on the floppy disks. These files contain 16 bit words of 13 bit linear PCM left justified. See also GSM 06.10 Table 5.1.

1.b) This requirement shall be applied to all files of the type SEQxx.COD.

II.13.2 DOWNLINK RECEIVER DTX FUNCTIONS

Definition

The DTX/VAD receiver functions consist of a SID-frame detector, comfort noise generator functions and speech extrapolation and muting functions.

Details about the overall DTX operation for full-rate speech traffic channels are given in GSM 06.31, the speech extrapolation and muting functions are described in GSM 06.11 and the comfort noise aspects in GSM 06.12.

Method of test

a) At 13 kbits/s level in the SS(before channel encoding) coded "speech" traffic frames containing a special test signal defined below shall be input and transmitted over the radio path. All traffic frames shall be identical with the exception of some frames which are SID-frames as defined in GSM 06.31.

b) At the digital audio interface in the MS at 104 kbit/s level (13 bit/8kHz linear PCM), the signal shall be output and the signal energy of the PCM signal shall be evaluated (as a mean square average) and recorded for each block of 20 ms synchronized to the 20 ms speech frame structure.

c) The transmission of the TDMA frames of the TCH/FS on the radio path shall be ramped "on" or "off" on a traffic frame by traffic frame basis, taking into account the block diagonal interleaving scheme defined in GSM 05.03. The first traffic frame in step 1 shall occur one frame after the window of the SACCH multiframe (TDMA frame 60 modulo 104), allocated for the SID-frame (see GSM 05.02 and 05.08). The SACCH shall be transmitted.

Note: 8 timeslots in 8 consecutive TCH/FS TDMA-frames shall be seen as one traffic frame and the next traffic frame starts in the middle of the previous one (i.e. after 4 TDMA-frames of the previous one) due to the block diagonal interleaving scheme defined in GSM 05.03.

d) The special test frame is an encoded "speech" traffic frame of 260 bits obtained from white Gaussian noise band limited to 300 - 3400 Hz. When repeated, the special test frame results in a humming sound with a fairly constant level when decoded, and is defined in the following table.

Encoded parameter:	Value:
LARc(1)	38
LARc(2)	42
LARc(3)	24
LARc(4)	20
LARc(5)	10
LARc(6)	9
LARc(7)	5
LARc(8)	3

	Subblock n0:			
	0	1	2	3
Grid position (Mc)	1	3	2	0
Block amplitude (xmaxc)	40	40	40	40
LTP gain (Bc)	0	0	0	0
LTP lag (Nc)	40	120	40	120
RPE pulses (xmc)				
- pulse no 1	4	6	6	6
- pulse no 2	4	5	4	3
- pulse no 3	2	1	3	4
- pulse no 4	6	2	1	3
- pulse no 5	3	6	4	1
- pulse no 6	5	1	6	3
- pulse no 7	5	2	5	5
- pulse no 8	5	6	2	1
- pulse no 9	1	3	4	4
- pulse no 10	3	2	4	3
- pulse no 11	5	5	4	5
- pulse no 12	6	1	2	2
- pulse no 13	1	3	4	3

Table of special test traffic frame for receiver DTX tests

e) The level of the special test frame is controlled with the block amplitude parameter (xmaxc). Reducing xmaxc from 40 to 32 reduces the decoded level with 3 dB, and reducing xmaxc from 40 to 24 reduces the decoded level with 6 dB.

f) The sequence of traffic frames on the air interface shall be as follows:

f.1) 23 test frames "on".

f.2) 20 frames "off".

f.3) 20 test frames "on".

f.4) 1 SID-frame followed by 6 frames "off", another identical SID-frame and 23 frames "off". Except for the SID codeword, the SID-frames shall be identical to the test frame.

f.5) 1 different SID-frame, however with 2 to 15 errors inserted in the SID codeword, followed by 23 frames "off".

f.6) 20 test frames "on", but with the level parameter xmaxc=24.

f.7) 1 SID-frame followed by 50 frames "off". Except for the SID codeword, the SID-frames shall be identical to the test frame.

f.8) The whole test shall be repeated, but the frames "off" shall be replaced by frames "on" with the FACCH flag set.

Requirements

1) In the case of step f.1), the signal energy shall be fairly constant within +/- 3 dB.

2) In the case of step f.2), the signal energy shall decrease to less than -60 dBm within 17 frames.

3) In the case of step f.4), comfort noise shall be generated. The same requirements as in step 1) apply.

4) In the case of step f.5), the same requirements as in step 4) apply.

5) In the case of step f.6), the same requirements as in step 1) apply. However, the signal energy shall be 12 dB lower.

6) In the case of step f.7), the signal energy shall be fairly constant within +/- 3 dB for 28 frames. Then the signal energy shall decrease to less than -60 dBm within 16 frames.

7) In the case of step f.8), the same requirements as in all previous steps apply.

II.13.3 UPLINK SPEECH TRANSCODING

Definition

This transcoding transforms 13 bit linear PCM to the 13 kbit/s net radio path bit stream.

For further information see GSM 06.10 and refer to the speech encoder parts.

Method of test

a) For this test DTX shall be off.

b) At 104 kbit/s level, at the digital audio interface in the MS, a test sequence shall be input.

c) The test sequences for speech transcoding are defined in GSM 06.10 section 5 and are available on 5"1/4 floppy disks on IBM/AT MS/DOS format from the ETSI secretariate.

d) The sequences to be input in this test are contained in the files SEQxx.INP. The files contain 16 bit words for 13 bit linear PCM left justifed. See also GSM 06.10 Table 5.1. The speech decoder must be reset before the start of the test (see section III.1.4).

e) At 13 kbit/s level in the SS over the radio path the output bit stream shall be recorded.

Requirements

1.a) The bit stream output shall be bit by bit exactly the same as the sequence given in the files SEQxx.COD on the floppy disks. These files contain 16 bit words of all the 76 parameters in a speech frame justified as in GSM 06.10 Table 5.1. 76 codewords shall occur in a frame of 20 ms.

1.b) This requirement shall be applied to all files of the type SEQxx.INP.

II.13.4 UPLINK TRANSMITTER DTX FUNCTIONS

Definition

The DTX/VAD transmitter functions consist of a Voice Activity Detector (VAD) and a surrounding Discontinuous Transmission (DTX) system introducing additional "speech" traffic frames on the air compared to what the VAD itself would classify as speech frames containing real speech. The additional traffic frames on the air are introduced due to:

1) A "hangover" period at the end of speech bursts in order to be certain that the traffic frames contain only noise and to evaluate the background acoustic noise characteristics when no real speech is present.

2) Special traffic frames (SID-frames) added on the air at regular intervals containing only the evaluated background acoustic noise characteristics. These frames are used for generation of comfort noise in speaker silence periods on the receiving side.

Details about the overall DTX operation for full-rate speech traffic channels are given in GSM 06.31, the VAD is described in GSM 06.32 and the comfort noise aspects in GSM 06.12.

Method of test

a) A call shall be set up on a full-rate speech TCH.

b) A sequence of PCM samples, which are grouped into frames of 20 ms synchronized to the TDMA- and traffic frame structure on the radio path, shall be input at the digital audio test port in the MS at 104 Kbits/s (13 bit/8 kHz linear PCM).

   The start of the test sequences must be synchronized with the radio transmission on the air interface so that the first traffic frame on the air occurs just after the traffic frame allocated for the SID-frame (TDMA frame 56 modulo 104, see GSM 05.02 and GSM 05.08).

Note: 8 timeslots in 8 consecutive TCH/FS TDMA-frames shall be seen as one traffic frame and the next traffic frame starts in the middle of the previous one (i.e. after 4 TDMA-frames of the previous one) due to the block diagonal interleaving scheme defined in GSM 05.03.

c) For this test the input frames shall be taken from the file SEQ0x.INP defined in GSM 06.32.

d) The SS shall detect whether or not there is any power transmitted over the radio path on a timeslot basis excluding SACCH frames. The speech frame by speech frame on/off transmission (on=1) shall be recorded.

Requirements

1) In step d), the traffic frame on/off sequence recorded shall be bit-exact like the sequence of SP-flags stored as bit 15 of LAR(2) on the reference files *COD defined in GSM 06.32, with the following exceptions:

   1.1) The occurrence of a SID-frame in its allowed window within the SACCH multiframe as defined in GSM 05.08.

   1.2) The occurrence of a SID frame after 1 or more real speech frames consecutively transmitted on the air.

II.13.5 SPEECH CHANNEL TRANSMISSION DELAY

The total transmission delay within the various elements of a GSM system are specified as round trip delays. For the MS this would be equivalent to applying an RF equivalent of a speech signal to the MS receiver, closing an acoustic path from the ERP to the MRP, detecting the corresponding RF signal at the MS transmitter output and measuring the time interval between the signal originally fed to the MS receiver and that transmitted by the MS transmitter.

This simple approach cannot be demonstrated to be accurate due to the inherent non linear characteristic of the speech transcoder. The overall delay therefore is split into four identifiable and measurable delays. The delays are respectively:

- the downlink delay from RF input to DAI output,
- DAI output to ERP,
- MRP to DAI output, and
- DAI to uplink RF output.

Each delay is defined and its method of measurement described in the following sections.

II.13.5.1 Downlink processing delay

The downlink processing delay is the delay from the first bit of a speech block transmitted from the RF output of the SS up to the last bit of the corresponding speech block received at the DAI on the output of the speech transcoder.

II.13.5.1.1 Method of test

a) The test set up is that described in II.13.1 for downlink speech transcoding.

b) One of the test patterns described in II.13.1 is transmitted by the SS to the MS.

c) For each speech block transmitted by the SS the SS shall note the time of the first bit at the air interface and the time of the last bit of that speech block on the DAI.

d) As the processing time could be a variable, step c) shall be repeated 20 times and the maximum delay noted shall be recorded as TDP.

II.13.5.2 Downlink coding delay

II.13.5.2.1 Definition

The downlink coding delay is defined as the delay between the digital representation of an acoustic signal on the DAI and the corresponding acoustic signal at the ERP.

II.13.5.2.2 Method of measurement

a) The handset shall be mounted in the LRGP (see annex 1 of CCITT recommendation P.76) and the earpiece shall be sealed to the knife edge of the artificial ear conforming to CCITT recommendation P.51.

b) The SS shall be arranged to generate on the DAI a digital representation of a sine wave with a frequency of 1000Hz.

c) The SS shall measure the "phase shift" ϕ_1, in the range of 0 to 360 degrees, between the equivalent sine wave generated at the DAI and the sine wave at the input to the artificial ear.

d) The frequency shall be increased to 1100 Hz and the resulting phase shift ϕ_2 shall be noted.

e) The downlink coding delay TDC shall be calculated from either:

$$TDC = \frac{\phi_2 - \phi_1}{36} \text{ ms} \qquad \text{for } \phi_2 > \phi_1$$

or

$$TDC = \frac{\phi_2 + 360 - \phi_1}{36} \text{ ms} \qquad \text{for } \phi_2 < \phi_1$$

II.13.5.3 Uplink processing delay

II.13.5.3.1 Definition

The uplink processing delay is the delay from the first bit of a speech block on the DAI to the last bit of that speech block being transmitted on the air interface of the MS.

II.13.5.3.2 Method of measurement

a) The test set up is that described in II.13.3 for uplink speech transcoding.

b) One of the test patterns described in II.13.3 is input to the DAI of the MS by the SS.

c) For each speech block output by the SS on the DAI the SS shall note the time of the first bit on the DAI and at the air interface of the MS the time of the last transmitted bit of the block.

d) As the processing time could be a variable, step c) shall be repeated 20 times. The maximum delay noted shall then be recorded as TUP.

II.13.5.4 Uplink coding delay

II.13.5.4.1 Definition

The uplink coding delay is defined as the delay between an acoustic signal at the MRP and the digital representation of that signal on the DAI.

II.13.5.4.2 Method of measurement

a) The handset shall be mounted in the LRGP (see annex 1 of CCITT recommendation P.76) and the earpiece shall be sealed to the knife edge of the artificial ear conforming to CCITT recommendation P.51.

b) The SS shall to generate an acoustic signal at the artificial mouth of the LRGP, being a pure sine wave with a frequency of 1000 Hz.

c) The SS shall measure the "phase shift" ϕ_1, in the range of 0 to 360 degrees, between the signal at the MRP and its digital representation on the DAI.

d) The frequency of the SS shall be increased to 1100 Hz and the resulting phase shift ϕ_2 shall be noted.

e) The uplink coding delay TUC shall be calculated from either:

$$TUC = \frac{\phi_2 - \phi_1}{36} \text{ ms} \qquad \text{for } \phi_2 > \phi_1$$

or

$$TDC = \frac{\phi_2 + 360 - \phi_1}{36} \text{ ms} \qquad \text{for } \phi_2 < \phi_1$$

II.13.5.5 Requirement

1) The sum $\{TDP + TDC + TUP + TUC\} < 144.9$ milliseconds.

Note 1: This limit includes an allowance of 4*0.25 ms delay from the DAI to the MS transmission path.

Note 2: No allowances have been made for any delays within the measurement system. These must either be calibrated out or subtracted from the individual delays before performing the sum above.

II.14 TESTING OF SUPPORT FOR NON-TRANSPARENT SERVICES

Ref: GSM 04.22 / 07.01 / 07.02 / 07.03 / 09.07

(Reserved.)

II.15 TESTS FOR MOBILE STATIONS EQUIPPED WITH A CONNECTOR, TO CONNECT DATA TERMINAL EQUIPMENT

Ref: GSM 04.02, 07.01

Note: The transmission of user data shall be verified in the case where the MS is equipped with a data connector. This could be, a V series DTE/DCE interface or an X series DTE/DCE interface or an I.420 (S-bus) connection. In that case the Mobile Station shall perform a number of functions which shall make it possible to connect data terminal equipment. If the MS is equipped with an I.420 interface, it is possible to connect a standard ISDN terminal adapter (TA) equipment to allow the connection of other types of terminals (V or X series interfaces). As the bit rate on the radio channel is lower than the standard ISDN bit rate, the data terminals or data terminal adapters need to support the standard ISDN V110 rate adaptation for use on the MS's I.420 interface.

II.15.1 MOBILE STATION EQUIPPED WITH A CONNECTOR ACCOMMODATING AN S-INTERFACE (MT1)

Ref: GSM 07.01, 07.02, 07.03

(Reserved.)

II.15.2 MOBILE STATION EQUIPPED WITH A CONNECTOR ACCOMMODATING A V-SERIES DTE/DCE INTERFACE (MT2)

Ref: GSM 07.01, 07.02, 07.03

II.15.2.1 General

Section II.15.2 only applies to tests of those Mobile Stations which have a connector, accommodating a V-series DTE/DCE interface.

The electrical characteristics of such interface of the R type are not tested by this specification. It is assumed that they are in accordance with CCITT Recommendations V.28, V.10/X.26 and V.11/X.27.

II.15.2.2 V.25 bis default procedures for call set-up and release

II.15.2.2.1 Applicability of V.25 bis default procedures

These procedures are to be used for the execution of V-series DTE/DCE interface testing unless another way is provided which must be specified in a similar manner in the PIXIT statements (Annex 3).

The R-interface as such is not subject to test, but the MS will be considered to have failed if it does not adhere to the specified procedures. The signals on the V-series DTE/DCE interface will have to change according to the V.25 bis state diagrams, as they will be used by the LTE to give correct sequencing for the tests. The indications from the MS have to be proper V.25 bis indications (possibly extended) wherever appropriate. Any deviations or extensions are to be stated in the PIXIT statements (Annex 3).

The procedures are used to ensure the proper action on the Um interface as defined in the individual tests. The procedure below also states the expected actions of the LTE.

II.15.2.2.2 LTE initiated call.

Initial condition

The R-interface is in V.25 bis state 1 "DTE not ready".

Default procedure

LTE: shall set 108/2 = ON.

LTE: shall transmit CR_x command.

MS: shall transmit a SETUP message (on TAP4, reference II.10) after establishment of the Radio Link.

II.15.2.2.3 LTE call clearing.

Initial condition

The mobile shall be in state U10 following the successful completion of the procedure defined in II.15.2.2.2

Default procedure

LTE: shall set 108/2=OFF.

MS: shall transmit a DISCONNECT message (on TAP4, reference II.10)

II.15.3 MOBILE STATION EQUIPPED WITH A CONNECTOR ACCOMMODATING AN X-INTERFACE (MT2)

Ref: GSM 07.01, 07.02, 07.03

(Reserved.)

II.16 MOBILE STATION FEATURES

ref: GSM 02.07

Note: GSM 02.07 shows mandatory and optional Mobile Station features. Mandatory Mobile Station features must be implemented in the MS and their implementation shall be verified in the process of type approval. From GSM 02.07, the following list of mandatory Mobile Station features is derived.

The following Mobile Station features shall be provided in the GSM Mobile Station. Their presence and appropriate functioning shall be verified.

II.16.1 ENTRY AND DISPLAY OF CALLED NUMBER

Purpose of test

To verify that the MS correctly accepts the entry and display of the called number.

Initial Condition

The MS must be registered in a cell of the SS.

Procedure

a) A number (not including "+ function") is entered and then a call is set up.

b) After the SS has accepted the call the number displayed on the MS and the number received in the SS are compared.

c) The NPI and TON are examined in the SS.

d) Steps a) to c) are repeated, but in a), the number entered starts with the "+ function"

Note: This test may also be performed automatically using the EMMI.

Requirements

1) In step b), both numbers shall be identical

2) In step c), the NPI shall be "E164" and the TON shall be "unknown".

3) In step d), the NPI shall be "E164" and the TON shall be "international".

II.16.2 INDICATION OF CALL PROGRESS SIGNALS

ref: GSM 02.07 and GSM 02.40

II.16.2.1 Purpose of the tests

This test will verify the different call progress signals initiated by the SS emulating the PLMN and the resulting announcements generated by the MS if this feature is implemented. The feature, and thus the test is mandatory for an MS provided with a human interface.

It is acceptable that the tests be conducted by human comparison of the generated audio signals to a master tape copy. The pass criteria is then that the generated tones are easily recognisable.

II.16.2.2 Ringing tone

II.16.2.2.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to j).

II.16.2.2.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 7).

2) The ringing tone characteristics shall be as follows:

Tone	Frequency	Tolerance	Type
Ringing tone	425 Hz	15 Hz	Periodic Tone on 1 s, Silence 4 s

II.16.2.3 Busy tone

II.16.2.3.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to h).

b) The SS then sends message DISCONNECT with cause number 17.

Message DISCONNECT (GSM 04.08, 9.3.7) to the MS:

	Comment	Value
Protocol Discriminator	CM	001
Transaction Identifier	MS orig.	1xxx
Message Type		0010 0101
Cause		
- Coding standard	GSM	11
- Location	User	0000
- Cause value	#17 "user busy"	001 0001

II.16.2.3.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 5).

2) After the reception of DISCONNECT a busy tone shall be generated. The busy tone characteristics shall be as follows:

Tone	Frequency	Tolerance	Type
Busy tone	425 Hz	15 Hz	Periodic Tone on 500 ms, Silence 500 ms

II.16.2.4 Congestion tone

II.16.2.4.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to h).

b) The SS then sends message DISCONNECT with cause number 42.

DISCONNECT message: As in II.16.2.3.1 with cause value #42 "Switching equipment congestion" (0101010).

II.16.2.4.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 5).

2) After the reception of DISCONNECT a congestion tone shall be generated.

3) The congestion tone characteristics shall be as follows:

Tone	Frequency	Tolerance	Type
Congestion tone	425 Hz	15 Hz	Periodic Tone on 200 ms, Silence 200 ms

II.16.2.5 Authentication failure tone

II.16.2.5.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to e).

b) After reception of message AUTHENTICATION RESPONSE the SS sends message AUTHENTICATION REJECT.

Message AUTHENTICATION REJECT (GSM 04.08, 9.2.1) to the MS:

	Comment	Value
Protocol Discriminator	MM	0101
Transaction Identifier	not relevant	1xxx
Message Type		0001 0001

II.16.2.5.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 4).

2) After reception of AUTHENTICATION REJECT a tone shall be generated indicating authentication failure.

3) The authentication failure tone is the error/special information tone with characteristics as follows:

Tone	Frequency	Tolerance	Type
Error/Special	950 Hz	50 Hz	Triple tone
Information tone	1400 Hz	50 Hz	Tones on 330 ms
	1800 Hz	50 Hz	Silence 1.0 s

II.16.2.6 Number unobtainable tone

II.16.2.6.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to h).

b) The SS then sends message DISCONNECT with cause number 1.

DISCONNECT message: As in II.16.2.3.1 with cause value #1 "Unassigned (unallocated) number" (0000001).

II.16.2.6.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 5).

2) After reception of DISCONNECT a tone shall be generated indicating that the called number is unobtainable.

The number unobtainable tone is the error/special information tone with characteristics as in II.16.2.5.2.

II.16.2.7 Call dropped tone

II.16.2.7.1 Method of test

a) According to section "Structured procedures, Mobile originating call, early assignment, Method of test", paragraphs a) to l).
However, it shall be indicated in the system information messages that call re-establishment shall not be attempted (RACH control parameters).

b) When the call has been established the SS stops transmitting on the TCH/SACCH.

II.16.2.7.2 Requirements

1) According to section "Structured procedures, Mobile originating call, early assignment, Requirements", paragraphs 1) to 8).

2) After the radio link timeout period has expired a tone shall be generated indicating that the call has been dropped.

The call dropped tone characteristics shall be as follows:

Tone	Frequency	Tolerance	Type
Call dropped tone	425 Hz	15 Hz	Tone on 200 ms, Silence 200 ms 3 bursts of on/off

II.16.3 NETWORK SELECTION / INDICATION

II.16.3.1 Definition

Network selection and indication is defined in GSM 02.11.

Purpose of the tests

These tests verify the selection and indication of PLMNs by the MS.

II.16.3.2 Method of Test

PROCEDURE 1: This procedure applies to both automatic and manual mode for PLMN selection.

PROCEDURE 2: This procedure applies to the manual mode for PLMN selection.

PROCEDURE 1

1a) The MS is set up with a SIM which contains, in the "PLMN selector" data field, a list of 3 PLMNs in the priority order PLMN2 (highest priority), PLMN3, PLMN4 (lowest priority). PLMN1 is the Home PLMN of the MS as defined in the IMSI. The "Forbidden PLMN" data field shall contain NULL values.

1b) The SS transmits 4 BCCH carriers with the following parameters:

	PLMN	Level dBμVemf( )
Carrier 1	PLMN1	28
Carrier 2	PLMN2	33
Carrier 3	PLMN3	38
Carrier 4	PLMN4	43

Each carrier has the "IMSI attach" (ATT) flag set in the BCCH data. (The purpose of this is to force the MS to do Location Updating whenever it is switched on, so that the SS can determine which PLMN has been selected).

The other system information parameters are as in Table II.16.3.

1c) The MS is brought into the "on" condition with automatic selection mode active.

1d) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 1.

1e) The SS sends a "LOCATION UPDATING ACCEPT" message to the MS on Carrier 1. After 5s, the MS's "selected PLMN indicator" is checked.

1f) The SS switches off Carriers 1 and 2.

1g) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 3.

Note: Steps 1h) to 1j) test that the MS writes the forbidden PLMN to the correct location in the Test-SIM. The procedure will be invalid if the "Forbidden PLMN" data field in the SIM does not contain NULL values at the start of the procedure.

1h) The SS sends a "LOCATION UPDATING REJECT" message on Carrier 3 with the cause "PLMN not allowed".

1i) The MS is turned off. The MS is brought into the "on" condition with automatic selection mode active.

1j) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 4. (PLMN3 should not be selected because it should have been written to the SIM's "forbidden PLMN" data field in step 1h) above.)

1k) The SS sends a "LOCATION UPDATING ACCEPT" message on Carrier 4. After 5s, the MS's "selected PLMN indicator" is checked.

1l) Carriers 1 and 2 are turned on with the same parameters as in step 1b) above.

1m) The SS checks that the MS does not send a "LOCATION UPDATING REQUEST" on either Carrier 1 or 2.

1n) Carrier 4 is turned off. The SS then checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 1.

1o) The SS sends a "LOCATION UPDATING ACCEPT" message on Carrier 1. After 5s, the MS's "selected PLMN indicator" is checked.

1p) Carrier 1 is turned off. After 30s, the indication on the MS of available PLMNs is checked.

1q) PLMN3 is selected manually.

1r) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 3. (Although PLMN3 is in the "forbidden PLMN" list, it should still be able to be selected manually).

1s) The SS sends a "LOCATION UPDATING ACCEPT" message on Carrier 3. After 5s, the MS's "selected PLMN indicator" is checked.

1t) Carrier 3 is turned off. The "PLMN search procedure" is initiated manually. After 30s, the indication on MS of available PLMNs is checked.

1u) The MS is turned off. Carrier 2 is turned off and Carriers 3 and 4 are turned on with the parameters as in step 1b) above. The MS is brought into the "on" condition with automatic selection mode active.

1v) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 3. (PLMN 3 should have been deleted from the SIM's "forbidden PLMN" list in step 1u) above.)

1w) The SS sends a "LOCATION UPDATING ACCEPT" message on Carrier 3. After 5s, the MS's "selected PLMN indicator" is checked.

1x) Carrier 3 is turned off. The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 4.

1y) The SS sends a "LOCATION UPDATING REJECT" message on Carrier 4 with the cause "Location Area not allowed".

1z) The SS checks that the MS answers to the paging, with IMSI, to check that it camps on Carrier 4 in accordance with GSM 05.08.

Requirements 1

Requirement 1.1) is mandatory for all MSs. Requirements 1.2) and 1.3) only apply to MSs with a human interface.

1.1) The MS shall make a response as indicated in steps 1d), 1g), 1j), 1m), 1n), 1r), 1v), 1x) and 1z) above. In all cases, the MS shall respond within 30s.

1.2) The selected PLMN shall be indicated:

End of Step	1e)	1k)	1o)	1s)	1w)
PLMN indicated:	PLMN1	PLMN4	PLMN1	PLMN3	PLMN3

1.3) The following PLMNs shall be indicated as available:

Step 1p): PLMN2, PLMN3
Step 1t): PLMN2

PROCEDURE 2

2a) The MS is set up with a SIM which contains NULL values in the "PLMN selector" data field. PLMN1 is the Home PLMN of the MS as defined in the IMSI. The "Forbidden PLMN" data field shall contain PLMN3.

2b) The SS transmits 4 BCCH carriers with the following parameters:

	PLMN	Level dBμVemf( )
Carrier 1	PLMN1	28
Carrier 2	PLMN2	33
Carrier 3	PLMN3	38
Carrier 4	PLMN4	43

Each carrier has the "IMSI attach" (ATT) flag set in the BCCH data. (The purpose of this is to force the MS to do Location Updating whenever it is switched on, so that the SS can determine which PLMN has been selected.)

The other system information parameters are as in Table II.16.3.

2c) The MS is brought into the "on" condition with manual selection mode active.

2d) The SS checks that the MS sends a "LOCATION UPDATING REQUEST" on Carrier 1.

Requirements 2

2.1) The MS shall make a response as indicated in step 2d). The MS shall respond within 30s.

Table II.16.3 : Normal System Information Fields

Parameter	Reference in GSM 04.08	Abbre-viation	Normal Setting
Cell Channel Description	10.5.2.1	-	Any values
Max retrans	10.5.2.17	-	1
Tx-integer	10.5.2.17	-	Any value
CELL_BAR_ACCESS	10.5.2.17	CBA	0 (i.e. no barred)
AC CN	10.5.2.17	AC	All 0
RE	10.5.2.17	RE	0 (i.e. re-establishment allowed)
BA ARFCN	10.5.2.13	BA	One entry equal to the ARFCN of the carrier
NCC	10.5.2.15	NCC	Any value
Cell Identity	10.5.1.1	-	Any value
MCC, MNC	10.5.1.3	PLMN	Ref II.16.3.2, 1b) and II.16.3.2, 2b)
LAC	10.5.1.3	LAC	1111 (Hex)
ATT, B_AG_BLKS_RES,T3212, CCCH_CONF	10.5.2.8	-	ATT = '1' Other parameters any values.
BS_PA_MFRMS	10.5.2.8	BPM	5 frames
Cell Options	10.5.2.3	-	Any values
CELL_RESELECT_HYSTERESIS	10.5.2.4	CRH	10 dB
MS_TXPWR_MAX_CCH	10.5.2.4	MTMC	Maximum RF output power of MS.
RXLEV_ACCESS_MIN	10.5.2.4	RAM	-95dBm

II.16.4 (RESERVED)

II.16.5 INVALID AND BLOCKED PIN INDICATORS

Purpose of the test

This test verifies that an entry of an invalid PIN, and presentation of a PIN when the SIM is blocked, are indicated correctly.

Initial condition

The MS contains a SIM with the PIN enabled, and the SIM unblocking counter set to zero by previous presentation of the Personal Unblocking Key.

Procedure:

a) The MS is switched on.

b) Three wrong PINs are entered.
Activation may be either manual or via the EMMI.

Requirement:

For the first and second incorrect PINs the MS shall indicate that the PIN code has been rejected

For the third incorrect PIN the MS shall indicate that the PIN is blocked.

II.16.6 SERVICE INDICATOR

Purpose of the test

This test verifies the service indicator.

Initial condition:

a) The MS is in idle mode, unregistered.

b) The SS shall emulate perfect radio conditions so that the MS is able to register and to set up or receive a call.

Procedure:

a) The MS is brought in an active state by either switching it on or by inserting a SIM.

Requirements

1) The successful registration and the good condition shall be indicated by the MS indicator and by the SS.

II.16.7 SUBSCRIPTION IDENTITY MANAGEMENT

Procedure

a) A call is set up.

b) (Reserved)

c) Either:
(i) The SIM is removed.
(ii) Where this is not possible, the MS is powered down, the SIM is removed and the MS is powered on.
The SS observes wether the MS performs IMSI detach.

d) An attempt to establish a MO call is made (not an emergency call).

e) An attempt to establish a MT call is made.

Requirements

1) In step c(i), the MS shall perform an IMSI detach.
In step c(ii), the MS may perform an IMSI detach.

2) In step d) the MS shall not initiate to set up a new call via the Um interface.

3) In step e), the MS shall not initiate to set up a new call via the Um interface.

II.16.8 BARRING OF OUTGOING CALLS

Purpose of the test

To verify that, if an MS is equipped with a local facility to bar outgoing calls (see PIXIT in Annex 3), then this facility does not limit the possibility to establish an emergency call.

This test does not verify that the local facility to block outgoing calls really functions.

Procedure

a) The local facility to bar outgoing calls is activated.

b) Via MMI, the MS is actioned to establish an emergency call.

Requirements

1) The MS shall establish an emergency call.

II.16.9 PREVENTION OF UNAUTHORIZED CALLS

If an MS can only be used by operating a key, or by using a keyword, then this shall not be required to establish an emergency call.

Purpose of the test

To verify that, if an MS is or can be configured/constructed such that it can only be used by operating a key, or by using a password (see PIXIT in Annex 3), then this facility does not limit the possibility to establish an emergency call.

This test does not verify that operation of the MS is really limited and enabled only by the key or by the keyword.

Procedure

a) The local facility to restrict operation such that the MS can only be operated by using a key or a keyword is activated. The most restrictive situation is created.

b) Via MMI, the MS is actioned to establish an emergency call.

Requirements

1) The MS shall establish an emergency call.

II.17 TEST OF LOW BATTERY VOLTAGE DETECTION

ref: GSM 12.10

Purpose of the test:

This test checks that the MS inhibits RF transmission when the battery voltage falls below the manufacturer declared level.

Method of test

a) The MS is connected to the SS. In the case of a MS with an integrated antenna it is coupled to the temporary antenna connector.

The SS transmits a BCCH with a location updating time set to 0.1 hours.

b) The MS is operated under normal test conditions.

c) The SS sends a paging request message to the MS.

d) The MS responds with a channel request message.

e) The SS sends an immediate assignment message establishing an SDCCH.

f) The power supply voltage is gradually reduced to the value declared in the PIXIT statement to be the shutdown voltage of the MS.

g) The SS observes whether the MS ceases the production of RF output.

h) After 7 minutes, the SS sends a paging message to the MS.

i) The SS observes whether the MS produces any RF output.

This measurement shall be over the GSM Tx band.

The spectrum analyser is set to:
Band Width: 3 MHz
Peak Hold

j) The location area of the BCCH is modified.

k) For 7 minutes, the SS observes whether the MS produces any RF output.

Note: It is anticipated that the MS might attempt Location Updating.

l) The MS is switched off and on.

m) The MS is paged by the SS.

n) The SS observes whether the MS produces any RF output.

Requirements:

1) In step g), the MS shall cease the production of RF output.

2) In steps i), k) and n), the MS shall not produce any RF output above -30 dBm.

Aspect III: INDIVIDUAL EQUIPMENT TYPE REQUIREMENTS AND INTERWORKING

III.1 SPECIAL CONFORMANCE TESTING FUNCTIONS

III.1.1 GENERAL

This chapter specifies those ME functions which are required for conformance testing purposes only. However, except for the Electrical Man Machine Interface EMMI, they are required for every Mobile Station.

For conformance tests, functions are activated via radio interface, Test-SIM or dedicated pins. These functions can only be activated when a Test-SIM is present. In this state, the MS must be able to perform all functions specified in this MS conformity specification; in addition however, the special conformance testing functions must be operational.

The special conformance testing functions of the ME are enabled to operate by use of a dedicated Subscriber Identity Module (Test-SIM, see III.1.6). SIMs, in general, are described in GSM 11.11. The ME recognizes the Test-SIM by the Administrative Data Field.

III.1.2 ACTIVATION AND DEACTIVATION OF SPECIAL TEST FUNCTIONS IN THE MS

These functions can be activated and deactivated from a SS by sending appropriate Layer 3 commands to the MS. The protocol discriminator to be used is defined in GSM 04.08, section 10.2.

The Layer 3 commands are sent on the DCCH. On Layer 2, SAPI 0 is used in acknowledged mode. Furthermore, those commands are processed by the MS only if a Test-SIM is present; otherwise the MS will ignore those commands.

Apart from sending the appropriate deactivation command to the MS the functions can be deactivated by switching off the MS or removing the Test-SIM.

The following test functions can be activated (and deactivated):

- TCH Loop,
- Electrical MMI,
- Test via DAI.

The TCH loop and the test via DAI are test functions which are mutually exclusive.

III.1.2.1 Internal Test Loops

A number of internal test loops is required providing access to isolated functions of the MS without introducing new physical interfaces just for the reason of type approval testing. Fig III.1-1 shows a functional block diagram of a reference MS containing the different test loops.

Note: It should be emphasized that these test loops only describe the functional behaviour of the MS with respect to its external interfaces; physical implementation of the loops is completely left open to the manufacturer.

A particular loop is activated in an MS by transmitting the appropriate Command message to the MS.

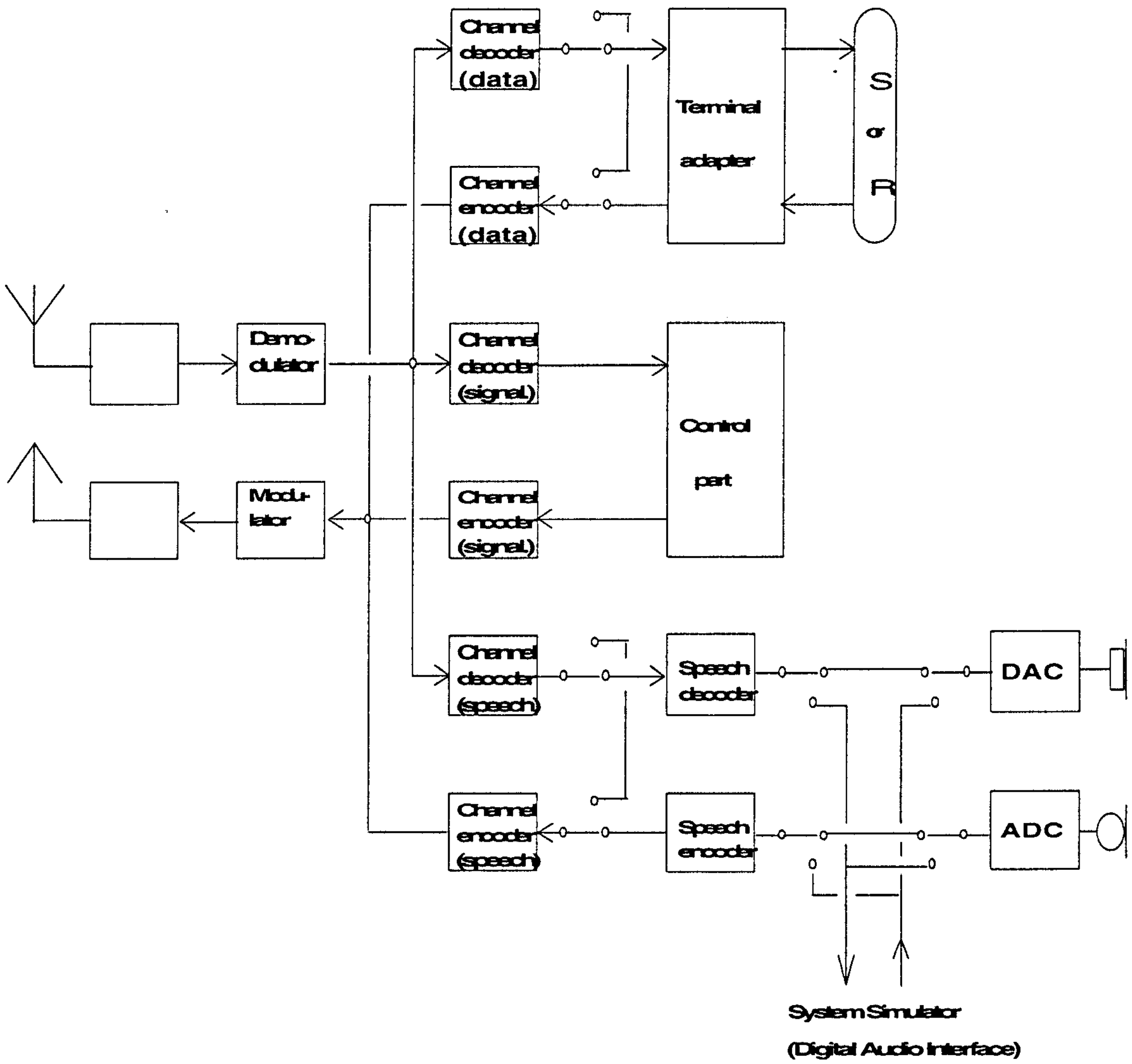


FIGURE III.1-1/GSM 11.10: Testloops in the MS

III.1.2.1.1 TCH Loop

Purpose:

To establish a transparent loop for TCH blocks between the output of the channel decoder and the input of the channel encoder in an MS. A TCH must be active between SS and MS. The TCH may be full or half rate, speech or data of any rate specified in the GSM system.

Two types of TCH loop back are required. One includes the signalling of erased frames and is used to determine Frame Erasure Ratio (FER) and Residual Bit Error Ratio (RBER) for speech TCH and Bit Error Ratio (BER) for any data TCH. The second type is required to determine Class II Bit Error Ratio for the speech TCH.

III.1.2.1.1.1 TCH loop including signalling of erased frames

Procedure:

The SS orders the MS to close its TCH loop by transmitting a CLOSE_TCH_LOOP_CMD message, specifying the TCH to be looped and that erased frames are to be signalled by the MS. The SS then starts timer TT01.

If no TCH is active, or any test loop is already closed, the MS shall ignore any CLOSE_TCH_LOOP_CMD message.

If a TCH is active, the MS shall close its TCH loop for the TCH specified and send back to the SS a CLOSE_TCH_LOOP_ACK message. Upon reception of that message the SS stops timer TT01.

After the MS has closed its TCH loop, every good speech frame or any user data frame received by the MS on the specified TCH (downlink) shall be taken from the output of the channel decoder, input to the channel encoder and transmitted on the same TCH (uplink).

If the channel decoder detects a bad speech frame or if the MS decodes the stealing flags as indicating an FACCH frame, then this shall be signalled to the SS by setting the input frame to the channel encoder to zero's, and transmitting on the TCH (uplink).The FACCH channel shall operate normally.

III.1.2.1.1.2 Speech TCH loop without signalling of erased frames

Procedure

The SS orders the MS to close its TCH loop by transmitting a CLOSE_TCH_LOOP_CMD message, specifying the TCH to be looped. The SS then starts timer TT01.

If no TCH is active or any test loop is already closed, the MS shall ignore any CLOSE_TCH_LOOP_CMD message.

If a TCH is active, the MS shall close its TCH loop for the TCH specified and send back to the SS a CLOSE_TCH_LOOP_ACK message. Upon reception of that message the SS stops timer TT01.

After the MS has closed its TCH loop, any speech frame received by the MS on the specified TCH (downlink) shall be taken from the output of the channel decoder, input to the channel encoder, and transmitted on the same TCH (uplink).

The SS should avoid using the FACCH downlink in this situation until the test is complete.

III.1.2.1.1.3 Deactivating TCH Loops

The SS orders the MS to open any TCH loop by transmitting an OPEN_LOOP_CMD message.

If no loop is closed the MS shall ignore any OPEN_LOOP_CMD message.

If a TCH is looped, the MS shall open the loop.

All channels shall be open for normal use again.

III.1.2.2 Activating and deactivating EMMI

Activating EMMI requires the presence of a Test-SIM. EMMI shall be activated by any of the following:

- switching on the MS
- inserting a Test-SIM
- Layer 3 message on the radio interface (ACT_EMMI_CMD).

When the MS is ready to receive frames, it shall send one XON message.

EMMI shall be deactivated by any of the following:

- switching off the MS
- removing the Test-SIM
- Layer 3 message on the radio interface (DEACT_EMMI).

Note: No XOF shall be sent after deactivation.

The L3 message used on the radio interface to activate the EMMI is the activation command ACT_EMMI_CMD (see III.1.2.4.4). This message has to be acknowledged by the message ACT_EMMI_ACK on the radio interface sent by the MS (see III.1.2.4.5).

For deactivation of the EMMI in the MS through the radio interface, the message DEACT_EMMI is defined in III.1.2.4.6. An acknowledgement of this message is not required.

III.1.2.3 Activating and deactivating DAI tests

Purpose: to determine the routing of speech data (DAI or internal, i.e. normal mode) and which device is being tested (speech transcoder / DTX functions or A/D & D/A).

Prerequisites: a dedicated channel must be established if the manufacturer has stated that the DAI is activated by means of the Layer 3 message.

Procedure: the SS sends a TEST_INTERFACE message if the manufacturer has stated that the DAI is activated by means of the Layer 3 message or applies the appropriate control signal on the DAI if the manufacturer has declared that the DAI is activated this way.

When the test mode is established i.e. speech data comes from test interface, each new test function overrides the previous one.

III.1.2.4 Message Definitions and Contents

Note: For all messages the Protocol discriminator PD 111 (binary) is used.

III.1.2.4.1 CLOSE_TCH_LOOP_CMD

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	
Sub-channel		MF	1

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	0	octet 1

and Sub-channel is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	Y	X	octet 1

X = 0 If there is only one TCH active (so there is no choice) or if sub-channel 0 of two half rate channels is to be looped.

X = 1 If sub-channel 1 of two half rate channels is to be used.

Y = 0 If the looped TCH is a speech channel then the frame erasure is to be signalled.

Y = 1 If the looped TCH is a speech channel then frame erasure is not signalled.

III.1.2.4.2 CLOSE_TCH_LOOP_ACK

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	0	0	1	octet 1

III.1.2.4.3 OPEN_LOOP_CMD

Note: OPEN_LOOP_ACKNOWLEDGE message is not provided.

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	1	1	0	octet 1

III.1.2.4.4 Command for the activation of the EMMI, ACT_EMMI_CMD

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	1	1	0	0	octet 1

III.1.2.4.5 Acknowledge of the activation of the EMMI, ACT_EMMI_ACK

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	1	1	0	1	octet 1

III.1.2.4.6 Deactivation of the EMMI, DEACT_EMMI

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	

where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	1	0	0	0	0	octet 1

III.1.2.4.7 Test_Interface

Information Element	Reference	Type	Length
Protocol discriminator	GSM 04.08 sect. 10.2	MF	2
Transaction identifier	GSM 04.08 sect. 10.3	MF	
Message type		MF	
Tested device		MF	1

Where message type is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	1	0	1	0	0	octet 1

and Tested Device is:

8	7	6	5	4	3	2	1	bit no.
0	0	0	0	0	X	X	X	octet 1

Tested Devices:

000 = normal operation (no tested device via DAI)
001 = test of speech decoder / DTX functions (downlink)
010 = test of speech encoder / DTX functions (uplink)
100 = test of acoustic devices and A/D & D/A.

All other values are reserved.

III.1.2.5 Timer values

TT01: To be started when a CLOSE_TCH_LOOP_CMD is sent. To be stopped when the corresponding CLOSE_TCH_LOOP_ACK is received.
Recommended value: [2.5 seconds].

III.1.3 ELECTRICAL MAN MACHINE INTERFACE (EMMI)

III.1.3.1 Use of the EMMI

Conformity tests of Mobile Stations are made using the System Simulator specified in Annex 4.

Test signals are sent on the Um interface, and actions of the MS are registered. The Electrical Man Machine Interface (EMMI) is a half duplex communication link between the SS and the MS by which it is possible to automatically register the status, indications and performance of the MS. It is also possible to simulate actions normally made by the user on the keyboard of the MS.

III.1.3.2 Formal aspects

i) The EMMI is optional for the ME.

ii) The EMMI is mandatory for the SS.

iii) If the EMMI is to be used in conformance testing of an MS, it shall be possible to connect the SS to a connector on the MS, or to an adapter connected to the same MS. If an adapter is to be used, it shall be provided by the manufacturer.

iv) If the MS fulfils the requirements performed with the use of an EMMI, the MS is regarded as having passed that test.

v) If the MS is rejected in a test performed with EMMI, the test shall be repeated on the same mobile with the device carrying the EMMI to the MS removed. The MS shall be regarded as fulfilling the requirements, if it then passes the test.

vi) When using the EMMI, the MS does not necessarily conform to the RF requirements. Therefore, tests concerning Rx and Tx parameters on MSs with integral antenna and cabinet radiation tests for all types of MSs will never be performed with the use of the EMMI.

III.1.3.3 Layered structure of the interface

The definition of the EMMI is divided into three different layers. On Layer 1 the use of a 25-pole socket with standard electrical characteristics for serial communication is defined. On Layer 2, an extremely simple frame oriented protocol is defined. On Layer 3, messages for control and verification of functions and indications are defined. Each layer is defined independently of surrounding layers, and is therefore easy to replace.

The EMMI protocol structure takes into account that the SS only sends and receives Layer 3 frames when the corresponding step within a testcase is to be performed.

III.1.3.4 Terminology

EMMI	Electrical Man Machine Interface
MI	Message Identifier
ME	Mobile Equipment
MS	Mobile Station
SS	System Simulator
Frame	Used on Layer 2 to transfer messages to and from Layer 3
Message	Information on Layer 3

III.1.3.5 Description of the EMMI

III.1.3.5.1 EMMI, Layer 1

III.1.3.5.1.1 Mechanical and Electrical characteristics

If implemented, the EMMI interface shall use the same connector as the Digital Audio Interface (DAI), described in section III.1.4.3.

The pin assignments for the EMMI shall be as follows:

PIN	FUNCTION	SOURCE
2	Transmitted data	SS
3	Received data	MS
7	EMMI signal ground	

The electrical characteristics of the interface shall be as given in section III.1.4.3.2.

III.1.3.5.1.2 Transmission and reception characteristics

The EMMI uses asynchronous serial data transmission with 1 start bit (S), 8 data bits (D1 to D8), no parity and 1 stop bit (E).

S	D1	D2	D3	D4	D5	D6	D7	D8	E

-->

TABLE 3 : USE OF START AND STOP BITS

The conditions on start and stop characters are defined in REC CCITT V.1.

The transmission rates are: 600, 1200, 2400, 4800, 9600 bits per second. The ME shall support at least one of these speeds.

The SS will adapt its rate (manually or by MMI) to this ME rate.

III.1.3.5.2 EMMI, Layer 2

III.1.3.5.2.1 General Structure

On Layer 2, frames are used to carry data from higher layers. Frames consists of one or several octets. One frame with variable length is used to carry data from higher layers, and four other frames with the length of one character is used to control the flow of frames.

III.1.3.5.2.2 Control Frames

Special frames have been assigned to control the flow of frames on Layer 2. They are only one octet long.

Abbr.	Meaning	Dec.value	Bit pattern
ACK	Acknowledge	06	0000 0110
NAK	Not Acknowledge	21	0001 0101
XON	Resume sending data	17	0001 0001
XOF	Stop sending data	19	0001 0011

TABLE 4 : CHARACTERS FOR FLOW CONTROL

III.1.3.5.2.3 Frame Structure

Two octets, called characters, indicate start and stop of I-frames.

Abbr.	Meaning	Dec.value	Bit pattern
STX	Start of data	02	0000 0010
ETX	End of data	03	0000 0011

TABLE 5 : START AND STOP CHARACTERS

Information from higher layers are transferred in I-frames with the following structure.

Field name	No of octet	Value	Start at octet no	Note
Start	1	Character STX	1	-
Length	1	Length of data	2	1)
Data	0-255	Content of data	3	2)
Check	1	Error detection	Length+2	3)
End	1	Character ETX	Length+3	-

Notes:

1) Length: The total number of data octets in the data field of the frame is calculated. The value shall be in the range of (0..255 decimal). The corresponding binary value is put into the length field.

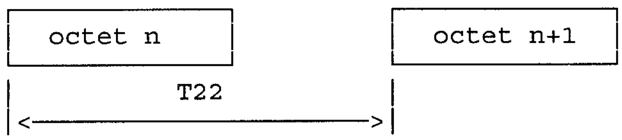
2) Data: Data to and from higher layers are in the form of octets (groups of 8 digital bits).

3) Check: Longitudinal checksum is created by exclusive OR on all characters starting with the Start field and ending with the last octet before the Check field. The value, one octet, is mapped into the Check field.

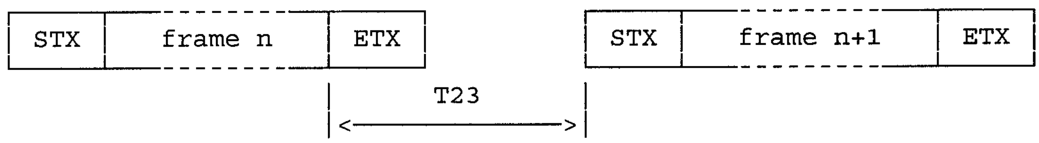
III.1.3.5.2.4 Flow of I-frames on Layer 2

III.1.3.5.2.4.1 Transmission of Frames

A multiple frame starts with the first octet being the character STX and stops with the last octet with content ETX. The time between the start bits of two consecutive octets shall not be longer than T22.



The time between two frames is measured from the start bit of the last octet of the n^{th} frame to the start bit of the first octet of the n+1st frame. The time between two consecutive frames shall not be less than T23.



III.1.3.5.2.4.2 Reception of Frames

Start of a frame is defined as (more than T22*2 since previous reception of octet) AND (Reception of STX).

End of a frame is defined as (Reception of ETX in octet number (length+2)) OR (more than T22*2 since last reception of octet).

III.1.3.5.2.4.3 Use of ACK and NAK on Receiving Side

ACK is used by the MS to acknowledge a frame on receiving side if all the following conditions are fulfilled. Otherwise NAK is used.

1) The content of Start field is STX.

2) The content of Check field corresponds to the exclusive OR sum of previous octets in the frame.

3) The content of the last octet is ETX.

NAK is used by the SS to request retransmission of a frame. Otherwise ACK is used.

Note: NAK shall not be used for Layer 3 errors, if the Layer 2 frame is correct. If the meaning of a Layer 3 message is undefined or not performable, then the problem is solved with Layer 3 messages.

III.1.3.5.2.4.4 Use of XON and XOF

XON and XOF are used for flow control of Layer 2.

XOF is sent if the unit (MS or SS) due to internal processing is not capable of receiving a following frame when a frame is being received.

XON is sent if XOF has been sent previously, but the reason for that XOF-transmission no longer exists.

III.1.3.5.2.4.5 Parameters on Layer 2

Bit rate	Value of T22	Value of T23
600	25.0 ms	58.3 ms
1200	12.5 ms	29.2 ms
2400	6.3 ms	14.6 ms
4800	3.1 ms	7.3 ms
9600	1.6 ms	3.6 ms

TABLE 7: TIMER VALUES ON LAYER 2

III.1.3.5.3 EMMI, Layer 3

III.1.3.5.3.1 Message Structure

Messages are used on Layer 3. They are defined by Message Identifiers (MI) in the range of (0..255). The Message Identifier is always the first, and often the only, octet of the message.

MI	Use
0-49	Not used.
50-179	General messages. All undefined values reserved for further evolution of the EMMI.
180-209	ME-type dependent blocks, may be used by the SS as a sender or receiver, if so requested by the manufacturer. Undefined values available for the manufacturer.
210-239	ME-type dependent blocks, never to be used by the SS in conformance testing. Undefined values available for the manufacturer.
240-255	Reserved for L3 error handling. All undefined values reserved for further evolution of the EMMI.

Note: Layer 2 is transparent, but to avoid unnecessary interference from Layer 3, MI with the same value as control frames on Layer 2 is not used.

TABLE 8 : USE OF MESSAGE IDENTIFIERS

Most of the messages, especially in the direction SS - MS contain only one octet, the Message Indicator. Some of the messages, especially in the direction MS - SS are quite long.

Note: If the interface is limited only to the minimum required for automatic conformity testing with the electrical man machine interface, then the included L3 messages should be RQTI, KEYS, BEL1, BEL0, HOK1, HOK0, BCAP and RSTI.

MI value	Abbr.	Meaning	Source MS	SS
051	VOL1	Increase volume (***)		X
052	VOL0	Decrease volume (***)		X
053	RQTS	Request for table, status		X
054	RQTI	Request for table, indication		X
055	RQPL	Request for power level		X
056	RQBE	Request for bell status		X
057	RQSM	Request for Short Message		X
058	KEYS	Perform Keystroke Sequence		X
060	BEL1	Indication User Alert On	X	
061	BEL0	Indication User Alert Off	X	
064	HOK1	Hook On		X
065	HOK0	Hook Off		X
070	BCAP	Selection of Bearer Capability		X
080	STPO	Set power level		X
091	RSTS	Response table, status	X	
092	RSTI	Response table, indication	X	
093	RSPO	Response, power level	X	
101	RXSM	Received Short Message	X	
102	RXSN	No Short Message received	X	
240	ER00	Internal Malfunction Detected	X	
241	ER01	L3 Message not recognized	X	X
242	ER02	L3 Message not performable	X	
255	RESE	Perform Hardware and Software Reset		X

(***): Note: Functioning of this should be verified, as the volume control in the ME might be of another type (non-incremental).

TABLE 9 : BLOCK TYPES

III.1.3.5.3.2 Definition of Messages

Messages are defined in the order of the value of the Message Identifier.

051 VOL1 Increase volume
052 VOL0 Decrease volume

Increase/decrease volume in the loudspeaker by one step.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier

053 RQTS Request for table, status
054 RQTI Request for table, indication
055 RQPL Request for power level

On receiving a request message RQxy, the corresponding table RSxy shall be sent.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier

056 RQBE Request for Bell status

On receiving a request message RQBE, the internal User Alert status (BEL1 or BEL0) shall be sent. BEL1 and BEL0 will indicate whether the ringing or alert procedure has been activated or not. (See also the definition of BEL1 and BEL0).

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier

057 RQSM Request for Short Message

In response to the RQSM Request the MS shall send either the short message type using the message RXSM or, in case of no Short Message received, the message RXSN.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier

058 KEYS Perform Keystroke Sequence

Perform the MS function related to the received Keystroke Sequence.

8 7 6 5 4 3 2 1	Octet	
	1	Message Identifier
	2	First Key
	N	Key number N-1

The possible Keystroke Sequences are based on the Basic Public Man Machine Interface as defined in GSM 02.30. There exists a minimum set of key characters.

The codes associated with these characters are defined as follows:

Key	Code (decimal)
#	35
*	42
+	43
0	48
1	49
2	50
3	51
4	52
5	53
6	54
7	55
8	56
9	57
END (function)	18
SEND (function)	20

060 BEL1 Indication User Alert On
061 BEL0 Indication User Alert Off

Indication User Alert shall indicate, on request of the SS, the internal status of the alert or ringing procedure. For this purpose, the SS shall send the RQBE (request for bell status) message to the MS.

BEL1 shall indicate that the alert procedure is active.
BEL0 shall indicate that the alert procedure is not active.

8 7 6 5 4 3 2 1	Octet	
	1	Message Identifier

064 HOK1 **Hook On**
065 HOKO **Hook Off**

Control of the Hook. The Hook On/Off command shall action the normal procedure associated with physically lifting the handset and replacing it whatever that maybe.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier

070 BCAP **Selection of Bearer Capability**

The EMMI BCAP message shall change the default Bearer Capability on all future calls made via the EMMI "Perform Keystroke Sequence" message. The new default Bearer Capability shall be in effect until the ME is switched off or until the ME receives another EMMI BCAP message.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier
								2 Bearer Capability (see Note 1)

Note 1: The field "Bearer Capability" in the BCAP message is mandatory and is coded bit for bit exactly as the "Bearer Capability" Information Element as described in GSM 04.08 section 10.5.4.4, beginning with octet 2 (length of the Bearer Capability contents). Because the "Bearer Capability" is mandatory, the first byte of the field shall be the length of the Bearer Capability content and not the Bearer Capability Information Element Identifier.

080 STPO **Set power level**

Used to control the Tx power level of the ME.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier
								2 Power Level (see Note 1)

Note 1: The power level is defined as the 2nd octet of the Power Command Information Element in GSM 04.08.

091 RSTS Response table, status

Response table status is send as an answer to the corresponding request.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier
F1				F2				2 Status Field (see Note 1)
F3								

Note 1:

F1
0 0 0 0 Spare

F2	(1=yes, 0=no)
Bit 4	L2 link on SACCH established
Bit 3	Speech connection on TCH establ
Bit 2	Listening to BCCH
Bit 1	SDCCH established

F3	
Bit 8	Frequency Hopping (yes/no)
Bit 7-1	ARFCN of BCCH of serving cell

092 RSTI Response table, indication

Response table indication send as an answer to the corresponding request.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier
F1							F2	2 Indication Field (see Note 1)

Note 1:

F1
0000000 Spare

F2	(yes=1, no=0)
Bit 1	Service Indication On (yes/no)

093 RSPO Response, power level

Response power level is sent as an answer to the corresponding request.

8	7	6	5	4	3	2	1	Octet
								1 Message Identifier
								2 Power Level (see Note 1)

Note 1: The power level is defined as the 2nd octet of the Power Command Information Element in GSM 04.08.

101 RXSM Received Short Message

The message RXSM has to be sent by the MS in response to the RQSM Request if a Short Message has been received.

8 7 6 5 4 3 2 1		Octet
	1	Message Identifier
	2	SM-field octet 1 (see note 1)
	N	SM field octet N-1

Note 1: The SM field is defined as the content of the Data field Short Message Storage defined in GSM 11.11 paragraph 3.5.1, excluding byte 1, as follows:

1 byte	NULL value
12 bytes	TP Originating Address
12 bytes	TS Service Centre Address
1 byte	TP Protocol Identifier
1 byte	TP Data Coding Scheme
7 bytes	TP Service Centre Time Stamp
1 byte	TP User Data Length
up to 140 bytes	TP User Data.

If the length of the address for TP and for TS service centre is less than 12 bytes, the remaining bytes are filled with null values.

102 RXSN No Short Message received

The message RXSN has to be sent by the MS in response to the RQSM Request if no Short Message has been received.

8 7 6 5 4 3 2 1		Octet
	1	Message Identifier

240 ER00 Internal Malfunction Detected

Used to indicate to the SS that the MS has discovered an internal error. This error message is to be handled in the same manner as the Layer 3 error messages (only to be sent to the SS in response to a Layer 3 message received at the MS).

8 7 6 5 4 3 2 1		Octet
	1	Message Identifier
	2	Error Indicator (see Note)

Note: The Error Indicator is defined by the manufacturer of the ME.

241 ER01 L3 Message not recognized

Used by the receiver to indicate to the sender that the message was correctly received, but ignored due to the fact that it was not understandable (eg a KEYS message with one or many values which are not part of the standard set of keys for the MSE). The message to the MS implies a request for resending the latest message sent.

8	7	6	5	4	3	2	1	Octet	
								1	Message Identifier

242 ER02 L3 Message not performable

Used by the receiver to indicate to the sender that the message was understood, but not performable due to intentional lack of functionality in the MS (eg as answer to a CALL message containing a type of service which the MS is not able to use) or to a message requesting a change to a state already existent.

8	7	6	5	4	3	2	1	Octet	
								1	Message Identifier

255 RESE Perform HW and SW Reset

The MS shall perform a total reset. The MS shall behave as if it has been switched "off" and "on".

8	7	6	5	4	3	2	1	Octet	
								1	Message Identifier

III.1.4 DIGITAL AUDIO INTERFACE

III.1.4.1 General

A special interface is required in order to perform the bit exact test of the speech coder/decoder and to test the SLR/RLR performance of the analogue and acoustic devices. It shall be possible to insert and extract speech data in both the transmit and receive directions. The interruption of the normal speech data paths can be commanded either by a Layer 3 message over the air interface or by special control lines in the test interface. The MS need react to only one of these command methods. The manufacturer shall state which method is to be used.

III.1.4.2 Formal aspects

It shall be possible to connect the SS to the ME or to an adaptor connected to the ME. If an adapter is to be used, it shall be provided by the manufacturer of the ME.

When using the DAI, the MS does not necessarily conform to all RF requirements.

When the DAI is connected the MS shall be able to correctly send and receive on a TCH and associated channels under ideal radio conditions.

Note: Prior to tests of the speech coder, other functional entities involved in the tests, such as the channel codec or RF units must have been verified successfully.

III.1.4.3 Hardware aspect of the interface

The data exchanged on the interface are 13 bit linear PCM at 8000 samples per second, which, in order to keep the pin-count low, are transferred on a duplex set of serial lines at 104 kbit/s.

One additional line resets the speech transcoder and the speech A/D and D/A functions. Two lines control the data flow direction and working mode of the interface, one mode being normal operation of the MS. These lines are controlled by the SS. Another line, controlled by the MS, clocks the data as required or available.

This is described in detail below.

III.1.4.3.1 Mechanical characteristics of the interface

The interface shall use a 25-pin DSUB socket, detailed in the ISO 2110 document. The ME shall use a female part.

The manufacturer may provide this interface on an external test "adapter".

The pin assignment of the connector shall be as follows:

Pin	Use	Function	Source
1		Chassis ground	ME
2-3	EMMI	signals	
4-6	Not used		
7	EMMI	Signal ground	
8-10	Not used		
11	DAI	Test control 1	SS
12	DAI	Signal ground	
13	DAI	Test control 2	SS
14-21	Not used		
22	DAI	Reset	SS
23	DAI	Data	ME
24	DAI	Data clock (104 kHz)	ME
25	DAI	Data	SS

Note: The EMMI interface is optional and is described in section III.1.3.

III.1.4.3.2 Electrical characteristics of the interface

The state of a signal pin is defined by the voltage (V) between the pin and its associated ground as follows:

Logical state	Voltage v
0 or "LOW" or "ON"	$0\ V < v < +0{,}8\ V$
1 or "HIGH" or "OFF"	$+3{,}5\ V < v < +5\ V$
undefined	$+0{,}8\ V < v < +3{,}5\ V$
forbidden	$v < 0\ V,\ v > +5\ V$

III.1.4.3.3 Timing characteristics of the interface

The following timing applies:

Parameter	Value
Clock frequency	104 kHz +/- 20 ppm
Duty cycle	40 to 60 %
Clock rising edge time	< 1 microsecond
Clock falling edge time	< 1 microsecond
Reset pulse duration	>= 4 millisecond

```
                     |<----------------- 9,6 µs ----------------->|
                     |                                            |
logical state        |                      |<--- 4,8µs +/-1µs --->|
1 or high            |                      |                      |
    ---------\       |<--- 4,8µs +/-1µs --->|  /---------------\   |
.............\..|.....................|./.................\..|.....90%
             |\ |                     |/|                  \ |
.............|.\.....................\/.|...................\......50%
             |  \                   /   |                    \
.............|...\................./....|.....................\....10%
             |   |\               /|    |                      \
             |   | \-------------/ |    |                       \------
             |   |                 |    |             logical state ^
             |<->|                 |<-> |              0 or  low  --┘
            falling               rising
           edge < 1µs            edge < 1µs
```

Data shall be stable during the period between 3 microseconds before and 1 microsecond after the rising edge of the clock (50% level).

III.1.4.4 Logical interface

The reset signal is active low.

The data consist of 13 bit words in two's complement format, with the most significant bit transmitted first.

Data are read in by the MS or SS at the rising edge and are output by the SS or MS at the falling edge of the clock, as defined in Figure III.1-2.

The clock signal is high when inactive.

The two test control lines determine the routing of the speech data (DAI or internal, i.e. normal mode) and which device is being tested (speech transcoder/DTX functions or A/D & D/A) as follows:

TEST CONTROL LINE 1	TEST CONTROL LINE 2	FUNCTION
LOW	LOW	Normal operation
LOW	HIGH	Test of speech decoder/DTX functions (downlink)
HIGH	LOW	Test of speech encoder/DTX functions (uplink)
HIGH	HIGH	Test of acoustic devices and A/D & D/A

The same test-setup may be achieved by the following Layer 3 TEST_INTERFACE message : see III.1.2.3 and III.1.2.4.7.

III.1.4.5 Functionality of the DAI

To initiate a test, the SS shall apply the appropriate test control signals or send the appropriate Layer 3 messages and then, more than 1 second later, apply a reset pulse.

Upon release of the reset pulse, the MS subsequently starts the test by issuing clock pulses when data are required or are ready.

When testing uplink speech transcoding or DTX functions, the first falling clock edge shall request from the SS the first bit of the speech samples to be encoded, the transmission of which shall start at the next earliest possible interleaved block TDMA frame (as defined in GSM 05.02) after the release of the reset pulse.

When testing downlink speech transcoding or DTX functions, the first falling clock edge shall output to the SS the first bit of the speech samples decoded from the first interleaved block TDMA frames, the reception of which is completed subsequently to the release of the reset pulse.

The MS speech transcoders shall be reset by the end of the reset pulse, whenever it occurs, whilst the DAI is in one of the active states (Test of speech decoder/DTX functions (downlink), Test of speech encoder/DTX functions (uplink), Test of acoustic devices and A/D and D/A).

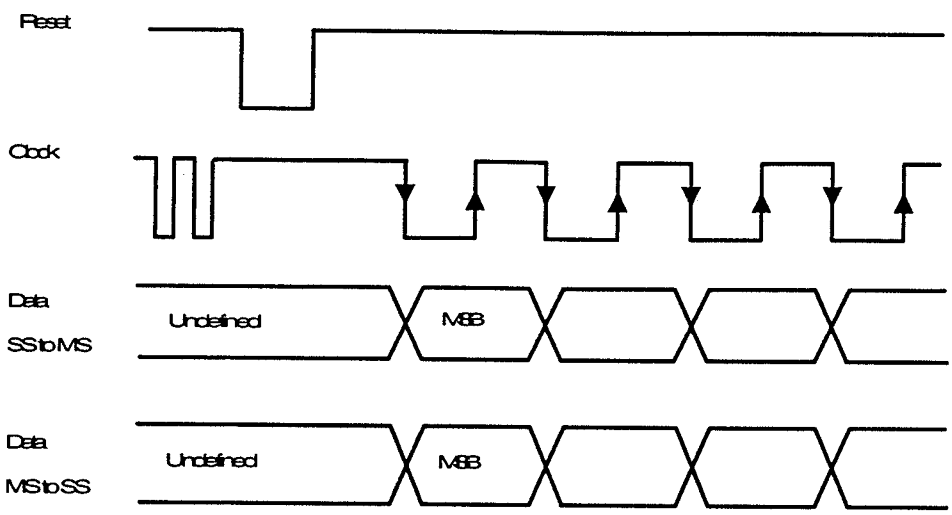


Figure III.1-2 / GSM 11.10 : DAI Timing

III.1.5 SIM/ME TEST INTERFACE

III.1.5.1 General

A special interface is required in order to perform the tests of the SIM/ME interface.

III.1.5.2 Formal aspects

It shall be possible to connect the SIM-simulator to the ME. If an adapter is to be used, it shall be provided by the manufacturer of the ME.

When using the SIM-simulator, the ME does not necessarily conform to all RF requirements.

When the SIM-simulator is connected the ME shall be able to correctly send and receive on a TCH and associated channels under ideal radio conditions (according to GC3 of Annex 1).

III.1.5.3 Hardware and logical aspects of the interface

The signals on this interface are specified in GSM 11.11.

III.1.5.4 Mechanical characteristics of the interface

The interface of the SIM-simulator offers two connection types-

i) a paddle which is inserted into the ME under test in place of an IC-card SIM, and connects with wires to the measuring equipment. The dimensions of the paddle are shown in Figure III.1-3.

ii) a connector with leads of length 12cm, terminated directly at the contacting elements inside the ME under test.

For ME which use the plug-in SIM, or when the paddle cannot be inserted due to constraints imposed by the ME design, then the ME manufacturer shall, for the purpose of testing the SIM/ME interface only, provide the ME with the connector of type ii) and the leads attached directly to the contacting elements. This connector with the flying leads shall be delivered by the test house.

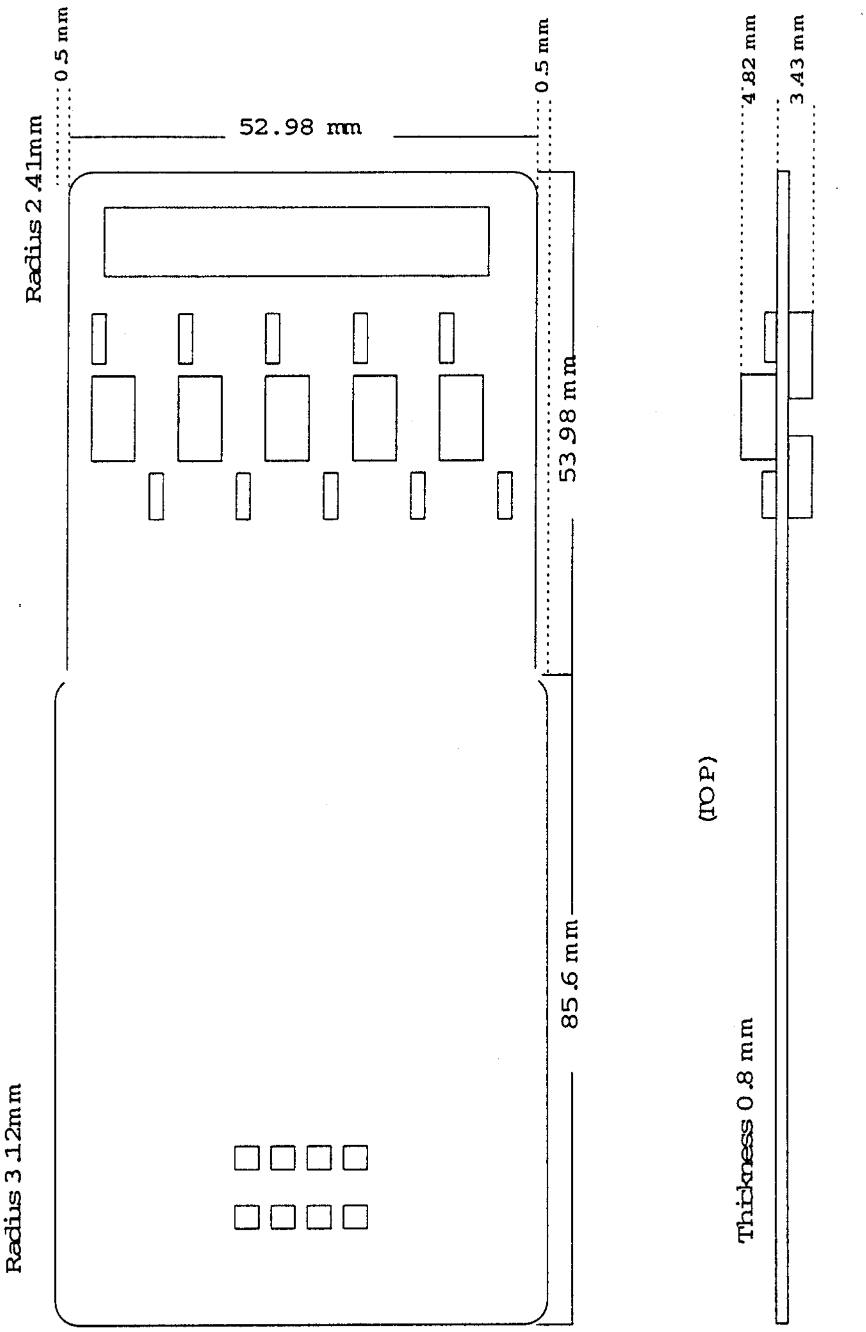


Figure III.1-3 / GSM 11.10 : Dimensions of Full Size Paddle.

III.1.6 TEST-SIM

III.1.6.1 General

A Test-SIM is required to allow the ME to operate its special conformance testing functions, and the tests of Section II to be performed.

The functionality may be provided by a SIM Simulator.

III.1.6.2 Requirements of the Test-SIM

1) The Test-SIM shall conform to GSM 11.11.

2) Byte 1 of the Administrative Data Field (Identifier 6F AD) shall be set to MS operation mode "Type approval operations", possibly including "Specific facilities" (see GSM 11.11). This allows the special conformance testing features of the ME, e.g. loopbacks, to be activated.

3) A Test Algorithm for authentication shall be incorporated.

4) The value of Ki stored in the SIM shall be known, to allow its value to be programmed into the SS.

III.1.6.3 Definition of the Test Algorithm for Authentication

The following procedure employs bitwise modulo 2 addition ("XOR").

The following convention applies:
In all data transfer the most significant byte is the first byte to be sent; data is represented so that the left most bit is the most significant bit of the most significant byte.

Step 1:

XOR to the challenge RAND, a predefined number Ki, having the same bit length (128 bits) as RAND. The result RES1 of this is

RES1 = RAND XOR Ki.

Step 2:

The most significant 32 bits of RES1 form SRES. The next 64 bits of RES1 form Kc. The remaining 32 bits are not used.

Annex 1: REFERENCE TEST METHODS

General

The general conditions, related to conformity testing of the Mobile Station or of the Mobile Termination, are described in Part GC of this Annex 1.

During the tests, the Mobile Station (or Mobile Termination) shall be exposed to power supply voltages and ambient temperatures (frequently referred to as the test conditions), as described in Part TC of this Annex 1.

During the tests, the measuring equipment shall be arranged as described in Annex 4 of these test specifications. This arrangement of measuring equipment is generally referred to as the System Simulator.

PART GC GENERAL CONDITIONS

GC1 Choice of frequencies in the frequency-hopping mode

The frequency hopping tests require 38 frequencies over a 21 MHz band to be used. The following algorithm specifies the channels (ARFCN) to be used:

channel = 10 + 4 * n ; n = 0, 1, ... 26
and channel = 10 + 7 * m ; m = 0, 1, ... 14.

Note: The range of frequencies available during tests under simulated fading conditions is restricted by the fading simulator bandwidth.

GC2 Power level of fading signal

The power level of a fading signal is defined as the total signal level averaged over time.

GC3 Ideal radio conditions

The "ideal" radio conditions referred to in several tests are defined as :

- No multipath conditions;
- MS power control level 7;
- RF level to MS : 63 dBμVemf( ).
- RF level to MS for tests in section II.4: 28 dBμVemf( ).
- RF level to MS for tests in section II.6.1.4: 28 dBμVemf( ).

GC4 **Outdoor Test site and general arrangements for measurements involving the use of radiated fields**

The outdoor test site shall be on a reasonably level surface or ground. At one point on the site a ground plane of at least 5 metres diameter shall be provided. In the middle of this ground plane a non-conducting support capable of rotation through 360 degrees in the horizontal plane shall be used to support the test sample at 1.5 metres above the ground plane.

The test site shall be large enough to allow the erection of a measuring or transmitting antenna at a distance of half a wavelength or at least 3 metres whichever is the greater. Sufficient precautions shall be taken to ensure that reflections from extraneous objects adjacent to the site and ground reflections do not degrade the measurement results.

The test antenna is used to detect the radiation from both the test sample and the substitution antenna, when the site is used for radiation measurements. Where necessary the substitution antenna is used as a transmitting antenna, when the site is used for the measurement of receiver characteristics. This antenna is mounted on a support such as to allow the antenna to be used in either the horizontal or vertical polarisation and for the height of its centre above ground to be varied over the range 1 to 4 metres. Preferably test antennas with pronounced directivity should be used. The size of the test antenna along the measurement axis shall not exceed 20% of the measuring distance.

For radiation measurements the test antenna is connected to a test receiver capable of being tuned to any frequency under investigation and of measuring accurately the relative levels of signals at its input. When necessary (for receiver measurements) the test receiver is replaced by a signal source.

The substitution antenna shall be a half-wave dipole, resonant at the frequency under consideration, or a shortened dipole, or (in the range 1 to 4 GHz) a horn radiator. Antennas other than a half-wave dipole shall have been calibrated to the half-wave dipole. The centre of this antenna shall coincide with the reference point of the test sample it has replaced. This reference point shall be the volume centre of the sample when its antenna is mounted inside the cabinet, or the point where an external antenna is connected to the cabinet. The distance between the lower extremity of the dipole and the ground shall be at least 30 cm.

The substitution antenna shall be connected to a calibrated signal generator when the site is used for radiation measurements and to a calibrated measuring receiver when the site is used for measurements of receiver characteristics. The signal generator and the receiver shall be operating at the frequencies under investigation and shall be connected to the antenna through suitable matching and balancing network.

GC5 **Anechoic shielded chamber**

As an alternative to the above mentioned outdoor test site an indoor test site, being a well-shielded anechoic chamber simulating free space environment may be used. If such a chamber is used, this shall be recorded in the Test Report.

Note: The anechoic shielded chamber is the preferred test site for testing to this specification.

The measurement site may be an electrically shielded anechoic chamber being 10 m long, 5 m broad and 5 m high. Walls and ceiling should be coated with RF absorbers of 1 m height. The ground should be covered with absorbing material 1 m thick able to carry test equipment and operators. A measuring distance of 3 to 5 m in the long middle axis of the chamber can be used for measurements up to at least 10 GHz. A possible layout of the anechoic shielded chamber is described in Appendix B.

The test antenna, test receiver, substitution antenna and calibrated signal generator are used in a way similar to that of the outdoor test site method with the exception that, because the floor absorbers reject floor reflections, the antenna height need not be changed and shall be at the same height as the test sample. In the range between 30 MHz and 100 MHz some additional calibration may be necessary.

GC6 **(Reserved)**

GC7 **Temporary Antenna Connector**

If the MS to be tested does not normally have a permanent external 50 ohm connector then for test purposes only it may be modified to fit a temporary 50 ohm antenna connector.

The permanent integral antenna shall be used for measurement of:

- Transmitter effective radiated power (II.3.3)
- Radiated spurious emissions (II.2.2)

For tests in the MS Receive band (935-960 MHz):- The temporary antenna coupling factor is determined using the procedure defined in II.4.2.2. When using the temporary antenna connector, the temporary antenna coupling factor needs to be taken into consideration when determining a stimulus or measured level in the receive band.

For tests in the MS Transmit band (890-915 MHz):- The temporary antenna coupling factor is determined using the procedure defined in II.3.3.2.2. When using the temporary antenna connector, the temporary antenna coupling factor needs to be taken into consideration when determining a stimulus or measured level in the transmit band.

For frequencies outside the GSM bands (890-915 MHz and 935-960 MHz) the temporary antenna coupling factor is assumed to be 0 dB.

Note: The uncertainty in the determined value of the temporary antenna coupling factor is directly related to the uncertainty of the field strength value measured in II.3.3.2.2 step n) and II.4.2.2.2 (approximately +/- [3dB]). By mutual agreement, between the MS manufacturer and the testing authority, a value of 0 dB for the temporary antenna coupling factor could be used.

Note: The accommodation of the uncertainty in the temporary antenna coupling factor in the MS receive band (935-960 MHz) for the tests in section II.4 is for further study.

Note: The uncertainty in the temporary antenna coupling factor in the MS transmit band (890-915 MHz) can be accommodated with appropriate adjustment of the measured levels by the uncertainty.

Testing must be performed in the following order to ensure that all the free field measurements are performed before the MS is modified.

- Section II.2.2.3
- Sections II.4.2.2.1 and II.4.2.2.2
- Section II.3.3.2.2 (during this step the MS is modified)
- Section II.4.2.2.3
- All remaining tests of II.2, II.3, II.4 and II.6

Temporary Antenna Connector characteristics

The method of connection of the temporary connector shall allow secure and repeatable connections to be made to the device under test.

The antenna connector shall present a nominal 50 ohm impedence over the GSM receive and transmit frequency ranges. The maximum loss within the frequency range 100 kHz to 12.75 GHz shall be less than 1 dB.

The connection circuitry shall be maximally broadband and shall contain no non-linear or active devices.

The characteristics of the connector shall not be significantly affected by temperatures in the range -25 to +60 degrees Celsius.

PART TC NORMAL AND EXREME TEST CONDITIONS

TC1 General

Type approval tests shall be made under normal test conditions, and also, where stated, under extreme test conditions. The test conditions and procedures shall be as specified in TC2 to TC3.

TC2 Power sources and ambient temperatures

During type approval tests the power source of the equipment shall be replaced by a test power source, capable of producing normal and extreme test voltages as specified in sections TC2.1 and TC2.2. The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the equipment. If the equipment is provided with a permanently connected power cable, the test voltage shall be that measured at the point of connection of the power cable to the equipment. In equipment with incorporated batteries the test power source shall be applied as close to the battery terminals as practicable.

During tests the power source voltages shall be maintained within a tolerance of +/-3% relative to the voltage at the beginning of each test.

TC2.1 Normal test conditions

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

Temperature : +15 ^{o}C to +35 ^{o}C (degrees Celsius)

Relative humidity : 20% to 75%

Note: When it is impracticable to carry out the tests under the conditions stated above, the actual temperature and relative humidity during the tests shall be recorded in the Test Report.

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of these specifications, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed. The frequency of the test power source corresponding to the mains shall be within 1 Hz of the nominal mains frequency.

When the radio equipment is intended for operation from the usual types of regulated lead-acid battery power source of vehicles, the normal test voltage shall be 1.1 times the nominal voltage of the battery (6 volts, 12 volts etc.).

For operation from other power sources or types of battery (primary or secondary) the normal test voltage shall be that declared by the equipment manufacturer.

TC2.2 Extreme test conditions

For tests at extreme ambient temperatures measurements shall be made at the upper and lower temperatures of the following range:

$-20\ ^{o}C$ to $+55\ ^{o}C$ (degrees Celsius).

The extreme test voltages for equipment to be connected to an AC mains source shall be the nominal mains voltage +/- 10%.

When the equipment is intended for operation from the usual types of regulated lead-acid battery power sources of vehicles the extreme test voltages shall be 1.3 and 0.9 times the nominal voltage of the battery (6 volts, 12 volts etc.).

The extreme test voltages for equipment with power sources using non regulated batteries shall be as follows. The upper extreme test voltage shall be the normal test voltage. The lower extreme test voltage shall be:

1) for the Leclanché or the lithium-type of battery:
   0.85 times the nominal voltage of the battery.

2) for the mercury-type or nickel cadmium type of battery:
   0.9 times the nominal voltage of the battery.

3) for other types of batteries:
   end point voltage declared by the equipment manufacturer.

However, the lower extreme test source voltages shall be those agreed between the equipment manufacturer and the testing authority for the following equipment:

- designed to use other power sources;
- capable of being operated from a variety of power sources;
- designed to include a shut-down facility to cease operation of the equipment at source voltages other than those referred to above.

The conditions shall be recorded in the Test Report and in the latter case the purpose of including this facility.

TC3 Procedure for tests at extreme temperatures

Before measurements are made the equipment shall have reached thermal balance in the test chamber. The equipment shall be switched off during the temperature stabilizing period. If the thermal balance is not checked by measurements, a temperature stabilizing period of at least one hour or such period as may be decided by the testing authority shall be allowed. The sequence of measurements shall be chosen, and the humidity content in the test chamber shall be controlled so that excessive condensation does not occur.

Before tests at the upper temperature the equipment shall be placed in the test chamber and left until thermal balance is attained. The equipment shall then be switched on in the transmit condition (non DTX) for a period of one minute followed by 4 minutes in the idle mode (non DRX) after which the equipment shall meet the specified requirements.

For tests at the lower temperature the equipment shall be left in the test chamber until thermal balance is attained, then switched to the idle mode (non DRX) for a period of one minute after which the equipment shall meet the specified requirements.

TC4 Vibration requirements

When the MS is to be tested under vibration the following frequency/amplitudes apply:

frequency	ASD (Acceleration Spectral Density)
10 Hz - 20 Hz	$0.005g^2/Hz$
20 Hz - 150 Hz	$0.005g^2/Hz$ at 20 Hz, thereafter -3dB/Octave

This equates to a total RMS vibration in the range 10 Hz to 150 Hz of 0.5g.

Note: This is considered as a special case of extreme test conditions.

ANNEX 2

Annex 2 : MEASUREMENT UNCERTAINTY

1 INTRODUCTION

Measurement uncertainty arises from a number of causes and is often classified into random and systematic uncertainty. The former results from the combined effects of a number of small independent random variables in the measuring system, while the latter can be the result of factors such as instrument calibration, measurement conditions (eg temperature), etc. The combined effect is to produce a range of values within which the true value of a measured result actually lies. Thus the value of the quantity to be measured can be expressed as a probability distribution and the usual mathematical techniques applied to the analysis.

An appreciation of these factors is of value in understanding the general problem and in ensuring that the smallest uncertainties are achieved in a particular test apparatus. For the type approval testing of GSM mobile stations a System Simulator is used and the various circuits of this equipment and the associated measuring equipment contribute to the total uncertainty in any measurement. These elements have been identified and the estimations are set out in GSM 11.40 at a confidence level of 95%.

Many of the uncertainties arise in the RF area where cables, connectors and switches with differing attenuation, VSWR, mismatch loss, etc, occur between the measuring point and the MS antenna terminal. These RF paths are systematically changed during testing and this causes further uncertainty. Also the input impedance of a mobile under test will not necessarily be known in advance which gives rise to possible additional mismatch loss, and the impedance at 12.5GHz will almost certainly not be the same as at 900MHz.

Given that the overall uncertainty is composed of several factors and that the random combination of a number of distributions tends towards a Gaussian distribution advantage can be taken of the relatively simple mathematical analysis that this affords.

The RF Tests set out in GSM 11.10, sections II.2, II.3, II.4 and II.6, Audio tests in section II.11 and the stimulus setting levels in other tests, are the tests that are most susceptible to measurement uncertainty due to the factors described.

2 DEFINITIONS

Some terms are here defined for the purpose of this Annex.

Measurand	A quantity subjected to measurement.
Uncertainty	An estimate characterising the range of values within which the true value of a measurand lies.
Confidence Level	The probability that the true value of the measurand lies within the range of values bounded by the uncertainty.
Design Limits	The range of values within which a measurand should lie to ensure satisfactory operation.

3 EFFECT OF UNCERTAINTY UPON THE PERCEIVED DESIGN TOLERANCE

Suppose that a design parameter has the value 10 dB with the design tolerances of +/- 2 dB and that the tester is perfect and has absolute precision, ie no uncertainty, then on test any indicated value between 8 dB and 12 dB will be acceptable; this can be said with complete confidence.

Suppose, however, that the tester is real and has an uncertainty of, say, +/- 1 dB when indicating any value within its range. At an indicated value of 8 dB, it can be stated that the true value of the measurand lies somewhere in the range 7 dB to 9 dB (ie 8 dB +/- 1 d B); similarly at an indicated value of 12 dB the true value of the measurand lies between 11 dB and 13 dB (ie 12 dB +/- 1 dB).

For an indicated value at the centre of the design range, in this example 10 dB, the true value of the measurand lies in the range 9 to 11 dB, which is entirely satisfactory. For some indicated values which lie off-centre the true value of the measurand still lies in the range 8 to 12 dB. For indicated values at the extremes of the design parameter, however, there is a significant probability that the true value of the measurand lies outside the design tolerances. There is, therefore, a finite probability that for an indicated value within design tolerance the true value actually lies outside the design parameter, eg in the lower sub-range 7 to 8 dB, or in the upper sub-range 12 to 13 dB.

Therefore for a pass result anywhere in the indicated range 8 dB to 12 dB the true value of the measurand lies between 7 dB and 13 dB. The indicated value will, however, be a single value not a range of values and for any single indicated value the uncertainty is +/- 1 dB.

4 CONFIDENCE LEVEL

The confidence level can be specified for a given magnitude of uncertainty 'u' expressed in terms of the standard deviation 's' of the distribution. The nature of the distribution of the uncertainties gives a clue as to this probability. For a Gaussian distribution with a standard deviation 's' the following well known standard results apply.

Estimated Confidence Probability	Uncertainty +/- u Equivalent to
95.0 %	+/-1.96 s
95.5 %	+/-2.0 s
99.0 %	+/-2.58 s
99.7 %	+/-3.0 s

For example, where the estimated confidence probability is 95 % the true value of the measurand lies within a range of +/-1.96 s from the mean. Thus in the example above if the uncertainty +/- u is +/-1 dB, at the 95 % confidence level, then there is a 95 % probability that the true value of the measurand lies within +/-1dB of the indicated value.

5 RESULT OF A TEST

From the foregoing it will be apparent that the result of a test can have several outcomes. The measurand may lie inside or outside the design limits. Where a result lies well within the design limits there is a high probability that the true value of the measurand also lies within the design limits. Where a result is exactly coincident with a design limit, there is still a significant probability that the true value of the measurand lies within the tolerance range but there is also a significant probability that the true value actually lies outside the range.

Where an indicated value lies outside the design limits but within the uncertainty range there is a high probability that the true value of the measurand also lies outside the design limits. However, there is a probability that the true value lies within the design limits. Depending upon the exact indicated value and its relation to the design limits, this probability can range from nearly 50 % for an indicated value just outside the design limits, to about 2.5 % for an indicated value at the edge of the design limits extended by the uncertainty; should this situation occur it should be noted.

Thus when a result lies close enough to a design limit for the distribution due to the measurement uncertainty to straddle that limit it is clear that the true value could lie on the other side of that limit. This poses a problem in interpretation and some rules have been formulated for the avoidance of doubt.

The result of a test shall be recorded in the Test Report in the following way:

1 Result within design limits.

2 Result outside the design limits.

If within the uncertainty this fact shall be stated.

Note: Result 1 includes the case of exact coincidence with a limit.

6 RECEIVER TESTS

Receiver tests present a particular difficulty due both to the statistical nature of the tests and to the rapid rate of change of performance with respect to stimulus level.

A very small change in stimulus level (eg within the setting error) can drastically affect the outcome of a test. Also the number of transmission errors due to the test propagation conditions must be statistically significant and at low error rates this impacts upon the duration of the test. These factors are catered for in the test method while Table Ann.2-1 shows the effect of the uncertainties (column headed "Max-events with Uncert.").

The outcome of each test shall be reported as described in Section 5 of this Annex.

Type of test	Type of channel	Propagation/ Frequency Conditions	Max-events Design Limit	Max-events with Uncert.	Max No of SAMPLES
BFI	TCH/FS	STATIC	200	same	82000
Sensitivity	TCH/FS	STATIC/FH	200*α	same	164000
,,	TCH/FS Class Ib	STATIC/FH	82000/α	same	20000000
,,	TCH/FS Class II	STATIC/FH	200	same	8200
,,	TCH/FS	TU50/No FH	600*α	1350*α	8900
,,	TCH/FS Class Ib	TU50/No FH	4200/α	9300/α	1000000
,,	TCH/FS Class II	TU50/No FH	10000	11100	120000
,,	TCH/FS Class II	HT100/No FH	5600	6250	60000
,,	TCH/FS Class II	RA250/No FH	1800	2050	24000
,,	FACCH	TU50/No FH	600	1100	4100
,,	TCH/F9.6&H4.8	HT100/No FH	1400	3800	180000
,,	TCH/F4.8	HT100/No FH	600	2300	5350000
,,	TCH/F2.4	HT100/No FH	150	550	11900000
,,	TCH/H2.4	HT100/No FH	600	2300	5350000
INPUT LEVEL	TCH/FS Class II	STATIC <-40dBm	200	same	1640000
RANGE	TCH/FS Class II	STATIC <-15dBm	200	same	164000
	TCH/FS Class II	EQ50	3900	same	120000
CO-CHANNEL	TCH/FS	TU3/No FH	6000*α	same	25000
REJECTION	TCH/FS Class Ib	TU3/No FH	69000/α	same	3300000
,,	TCH/FS Class II	TU3/N_O FH	86000	same	2000000
,,	TCH/FS	TU50/FH	600*α	800*α	17800
,,	TCH/FS Class Ib	TU50/FH	4300/α	6300/α	2000000
,,	TCH/FS Class II	TU50/FH	100000	110000	1200000
,,	FACCH	TU3/No FH	6000	same	25000
,,	TCH/F9.6 or H4.8	TU50/FH	600	720	178500
,,	TCH/F4.8	TU50/FH	600	same	5350000
,,	TCH/F2.4	TU50/FH	150	same	11900000
,,	TCH/H2.4	TU3/FH	600	same	5350000
ADJACENT	TCH/FS	TU50/No FH	600*α	1200*α	8900
CHANNEL	TCH/FS Class Ib	TU50/No FH	4200/α	8300/α	1000000
200 kHz	TCH/FS Class II	TU50/No FH	50000	61000	600000
,,	FACCH	TU50/No FH	600	810	4100
ADJACENT	TCH/FS	TU50/No FH	1020*α	2040*α	8900
CHANNEL	TCH/FS Class Ib	TU50/No FH	7560/α	14940/α	1000000
400 kHz	TCH/FS Class II	TU50/No FH	55000	67100	600000
,,	FACCH	TU50/No FH	600	863	3133
INTERMOD.	TCH/FS Class II	STATIC	200	500	8200
	FACCH	TU50/No FH	600	1650	4100
BLOCKING &	TCH/FS Class II	STATIC	200	same	8200
SPURIOUS RESP.	FACCH	TU50/No FH	600	same	4100

TABLE Ann.2-1 : Effect of uncertainties on "Max-events"

7 PASS/FAIL CRITERIA

The outcomes of these tests might be interpreted in terms of Pass/Fail but it is not the function of the System Simulator (SS) to do this interpretation. The SS reports the results of the tests; it is the task of the Type Approval Authority to interpret these tests in terms of Pass/Fail criteria taking account of all the available information which will, of course, consist substantially of the Test Results. In order not to confuse the meanings the terms Pass and Fail are specifically not used in the SS Report.

ANNEX 3

Annex 3 : PROTOCOL IMPLEMENTATION INFORMATION

GENERAL

The list of PICS and PIXIT gives all the information needed to perform the tests described in GSM 11.10.

1 PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (PICS)

For the points listed the manufacturer has the choice between different solutions in implementation. The manufacturer has to describe his choice if there is any consequence for the tests.

1.1 LAPDm PROTOCOL
(GSM 04.05 and 04.06)

1.1.1 Simplified protocol
GSM 04.06 section 6

Statement about the choice made by the manufacturer.

1.1.2 Management of SAPI = 3
GSM 04.11 section 2.3

Statement about the handling of SAPI = 3 on the Data Link Layer chosen by the manufacturer.

1.2 MOBILITY MANAGEMENT

1.2.1 IMSI detach initiation by the MS
GSM 04.08 section 4.3.4.1

During a location updating, if an IMSI detach has to be performed (SIM or power off), the IMSI detach can be delayed until the location updating is performed, or can be deleted.

1.2.2 IMSI detach completion by the MS
GSM 04.08 section 4.3.4.3

The MS should delay the local release of the channel to allow a normal release from the network after a detach by power off command, if possible.

If not possible the RR sublayer on the MS side should be aborted without waiting for something from the network.

1.2.3 MM specific procedures
GSM 04.08 section 4.4

During the lifetime of an MM specific procedure, if a MM connection establishment is required by a CM-entity, this request will either be rejected or delayed until the running MM specific procedure is terminated.

1.2.4 MM connection establishment initiated by the MS

GSM 04.08 section 4.5.1.1

If an MM specific procedure running at the time the request from the CM layer is received, the request will either be rejected, or delayed until the MM specific procedure is finished and the RR connection is released.

1.2.5 Receiving an MM STATUS message

GSM 04.08 section 4.6

Local actions to be taken on receiving an MM-STATUS message from the network are an implementation dependent option.

1.2.6 Call re-establishment

GSM 04.08 section 4.5.1.6

MM indicates a low layer failure to all the CM entities with an MM connection. The re-establishment procedure is done if one of the CM entities asks for this re-establishment, without waiting for the answers of the other CM entities, or when all the answers from the CM entities have been received.

1.2.7 Message type error

GSM 04.08 section 8.5

The MS shall return a status message with either of the causes
#98 "message not compatible with call state or
non-existent or not implemented",
#97 "message type non-existent or not implemented".

1.3 CALL CONTROL

1.3.1 Clearing when tones/announcements provided

GSM 04.08 section 5.4.4.1

If the traffic channel is connected, on receipt of the DISCONNECT message with progress indicator # 8, the MS shall connect to the in-band tone announcement and enter disconnect indication state.

Or continue clearing without connecting the in-band tone announcement.

1.3.2 Status enquiry procedures

GSM 04.08 section 5.5.3.1

The MS does not send STATUS ENQUIRY to the network. It analyses the STATUS ENQUIRY received and answers.

Or, the MS can send STATUS ENQUIRY and it takes the appropriate actions based on the answer (STATUS) of the network.

1.3.3 Receiving a STATUS message by a CC entity

GSM 04.08 section 5.5.3.2

The determination of which CC states are incompatible between the MS and the network is left as an implementation decision except in some particular cases.

1.3.4 Unrecognised CC optional information element
GSM 04.08 section 8.8.1.3

When a CC message is received from the network with an unrecognized information element, the MS sends a CC-STATUS message with cause # 99 "information element non existent or not implemented", and with an optional diagnostic field giving the unrecognized information element identifier.

1.3.5 CC optional information element content error
GSM 04.08 section 8.8.2.3

When a CC message is received from the network which has one or more non-mandatory information element with invalid content, the MS sends a CC-STATUS message with cause # 100 "invalid information element contents" and an optional diagnostic field giving the invalid information element identifier.

1.3.6 Called side compatibility checking
GSM 04.08 annex B.3

Compatibility checking can be performed in various ways from the viewpoint of execution order and information to be checked, e.g. first DDI number, sub-address and then compatibility or vice versa.

1.3.7 Disconnect on incoming call

The Mobile equipment may or maynot offer the possibility to disconnect an incoming call:

a) after having confirmed an incoming call, but before alerting.

b) after alerting, but before connecting.

02.30 (5.2.3) allows the combination of SEND and END function in one key.

1.3.8 Refuse an incoming call (GSM 04.08, 5.2.2.3.1)

The Mobile equipment may or may not offer the possibility to refuse an incoming call after receiving a SETUP message but before the CALL CONFIRMED message (i.e immediately after compatability checking).

1.4 LAYER 1

1.4.1 Optional storage of BCCH carrier information
GSM 05.08 section 6.3

The MS may include optional storage of BCCH carrier information. For instance, the MS store the BCCH carriers in use by the PLMN accessed when it was last active in the GSM network, or it may store BCCH carriers for more than one PLMN.

1.4.2 Call re-establishment option

GSM 05.08 section 5.2

This procedure allows the MS to resume a connection in progress after a lower layer failure, possibly in a new cell.

1.5 AUTOCALLING

(ref: GSM 02.07, Annex 1)

Cause number 27 implemented in:
- category 2 (preferred);
- category 3.

1.6 TRANSIENT STATES

The following states may be transient:

State U6

State U6 may be non-transient if the implementation allows it. If U6 is non-transient, there will be a way (to be declared by the manufacturer):

i) to generate a MNCC_CALL_CONF_REQ by external action (i.e to make the MS in CC state U6 send a CALL CONFIRMED message).

ii) to configure the MS so that U6 is not left by an internal transition.

Note The external action may be applicable after compatability checking has been performed internally by the MS; it may also be applicable without the MS having internally performed compatability checking.

State U7

If the implementation allows for automatic connect after an implementation specific time T.

State U9

State U9 is not transient if:
- the implementation does not support immediate connect
- an appropriate TCH is not yet assigned
- the signalling element has not been present in the SETUP

State U12

U12 is stable if the implementation supports it and the progress indicator is present in DISCONNECT and indicates the availability of in-band announcements.

2 PROTOCOL IMPLEMENTATION EXTRA INFORMATION FOR TESTING (PIXIT)

2.0 INTRODUCTION

Some of the features listed below are mandatory, others are not ; but in any case for each feature implemented the manufacturer must provide information to enable regulatory testing to be conducted.

2.1 BASIC CHARACTERISTICS

2.1.1 Type of antenna

- Integrated without a connector.

- Position for normal use (if integrated without a connector).

- With a connector allowing the connection of an external antenna.
  If with a connector, declare in band impedance.

2.1.2 Power supply

- Type of battery (if any).
- Type of power supply.
- Nominal voltage(s).
- End-point voltage(s) of battery(ies) (if any).
- Details of MS shutdown voltage.

2.1.3 Power class of the MS

- Different class declared.

- Class mark change : description of the means to change the RF power capabilities.

2.1.4 Channel modes supported

Speech full rate
Speech half rate
Data 9.6 full rate
Data 4.8 full rate
Data 4.8 half rate
Data 2.4 full rate
Data 2.4 half rate

2.1.5 Teleservices supported

11) Telephony
12) Emergency calls
21) Short message MT/PP
22) Short message MO/PP
23) Short message transmission cell broadcast
31) Advanced MHS access
41) Videotex access profile 1
42) Videotex access profile 2
43) Videotex access profile 3
51) Teletex
61a) Alternate speech and facsimile group 3 T
61b) Alternate speech and facsimile group 3 NT
62a) Automatic facsimile group 3 T
62b) Automatic facsimile group 3 NT

2.1.6 Supplementary services supported

Call forwarding.
Call restriction.
Handling of undefined GSM Supplementary Services.

2.1.7 Bearer services supported

21a)	Data circuit Duplex asynchronous	300 bit/s	T	
21b)	Data circuit Duplex asynchronous	300 bit/s	NT	
22a)	Data circuit Duplex asynchronous	1200 bit/s	T	
22b)	Data circuit Duplex asynchronous	1200 bit/s	NT	
23a)	Data circuit Duplex asynchronous	1200/75 bit/s	T	
23b)	Data circuit Duplex asynchronous	1200/75 bit/s	NT	
24a)	Data circuit Duplex asynchronous	2400 bit/s	T	
24b)	Data circuit Duplex asynchronous	2400 bit/s	NT	
25a)	Data circuit Duplex asynchronous	4800 bit/s	T	
25b)	Data circuit Duplex asynchronous	4800 bit/s	NT	
26a)	Data circuit Duplex asynchronous	9600 bit/s	T	
26b)	Data circuit Duplex asynchronous	9600 bit/s	NT	
31)	Data circuit Duplex synchronous	1200 bit/s	T	
32)	Data circuit Duplex synchronous	2400 bit/s	T	
33)	Data circuit Duplex synchronous	4800 bit/s	T	
34)	Data circuit Duplex synchronous	9600 bit/s	T	
41a)	PAD Access circuit asynchronous	300 bit/s	T	
41b)	PAD Access circuit asynchronous	300 bit/s	NT	
42a)	PAD Access circuit asynchronous	1200 bit/s	T	
42b)	PAD Access circuit asynchronous	1200 bit/s	NT	
43a)	PAD Access circuit asynchronous	1200/75 bit/s	T	
43b)	PAD Access circuit asynchronous	1200/75 bit/s	NT	
44a)	PAD Access circuit asynchronous	2400 bit/s	T	
44b)	PAD Access circuit asynchronous	2400 bit/s	NT	
45a)	PAD Access circuit asynchronous	4800 bit/s	T	
45b)	PAD Access circuit asynchronous	4800 bit/s	NT	
46a)	PAD Access circuit asynchronous	9600 bit/s	T	
46b)	PAD Access circuit asynchronous	9600 bit/s	NT	
51a)	Data Packet Duplex synchronous	2400 bit/s	T	
51b)	Data Packet Duplex synchronous	2400 bit/s	NT	
52a)	Data Packet Duplex synchronous	4800 bit/s	T	
52b)	Data Packet Duplex synchronous	4800 bit/s	NT	
53a)	Data Packet Duplex synchronous	9600 bit/s	T	
53b)	Data Packet Duplex synchronous	9600 bit/s	NT	
61a)	Alternate Speech/Unrestricted Digital (here unres dig offers the same service as bearer services 21-34)		T	for unres dig
61b)	Alternate Speech/Unrestricted Digital (here unres dig offers the same service as bearer services 21-26)		NT	for unres dig
71)	12 kbit/s Unrestricted Digital			
81a)	Speech followed by data (here unres dig offers the same service as bearer services 21-34)		T	for unres dig
81b)	Speech followed by data (here unres dig offers the same service as bearer services 21-26)		NT	for unres dig

2.1.8 Type of SIM interface

- Removal of the SIM is possible without disconnection of the power supply (Y/N).

2.2 MAN MACHINE INTERFACE

2.2.1 Mobile Station features

- Description of manual entry and display of a called number.
- Description of the basic way to send a call manually.
- Description of the basic way to take a call manually.
- Description of the basic way to end a call manually.
- Description of the basic way to send an emergency call manually.
- Description of the basic way to send DTMF manually.
- Description of the manual PLMN selector.
- Description of the automatic PLMN selector.
- Description of the indication of the country.
- Description of the indication of the available PLMN.
- Description of the indication of the automatic registration to a PLMN.
- Description of the service indicator.
- Description of the management of the SIM by the user:
  . keying PIN and changing PIN,
  . indication of acceptance or rejection of keyed PIN,
  . indication of blocked SIM,
  . indication of successful unblocking of the SIM,
  . storing an abbreviated number,
  . displaying an abbreviated number.
- Description of the selection of the hand free.
- Description of the volume control.
- Description of local barring of outgoing calls.
- Description of prevention of unauthorized calls.
- Description of the auto calling management:
  . selection of the auto calling,
  . indication that the call failed and a retry is attempted,
  . indication that the call finally failed.
- Description of the way in which the MS generates an MS originated NOTIFY, if possible. This feature may or may not be supported by the MS.

Note: All the above description could be extracted from the user's manual.

2.2.2 Short Message Service

- Description of the basic procedures to send a mobile originated Short Message.
- Description of the basic procedures to display a mobile terminated Short Message.
- Description of the basic procedures to display a cell broadcasted Short Message.
- The value of the timer TC1M.
- Whether SMS messages are stored in the SIM and/or the ME.
- Maximum length (characters) of a mobile originated Short Message.

2.2.3 Supplementary services

2.2.3.1) Call forwarding

- Description of the user's commands and of the display of the answers from the network for:
  registration,
  erasure,
  interrogation,
  specific data request.
- Description of the display of:
  . notification of an incoming call to the "served" mobile or the "forwarded to" mobile,
  . notification during out-going call,
  . information to the calling mobile.

2.2.3.2) Call restriction

- Description of the user's commands and the display of the answers from the network for:
  registration,
  change of the password,
  activation,
  deactivation,
  interrogation.
- Description of the display of the indication of call barring.

2.2.3.3) Handling of (undefined) GSM supplementary services

- Description of the user's commands and the display of the answer from the network.

2.3 EMMI - ELECTRICAL MAN MACHINE INTERFACE

2.3.1 Method(s) supported for activation/deactivation of EMMI

- all possibilities specified in GSM 11.10, III.1.2.2;
- all possibilities specified in GSM 11.10, III.1.2.2, except activation by inserting a Test-SIM (when the ME is already switched on);
- activation/deactivation only via Layer 3 messages on the radio interface according to GSM 11.10, III.1.2.2.

2.3.2 Transmission rate supported by the ME on the EMMI

2.3.3 Layer 3 messages supported on the EMMI

- Layer 3 messages as specified in GSM 11.10, III.1.3.5.3.2, except: (followed by the list of messages not supported);
- others than defined in GSM 11.10 Part III Table 9.

2.3.4 Keystroke sequence messages

Non-standardised Keystroke sequences as to be used on the EMMI (in line with GSM 11.10, III.1.3.5.3.2):

- related to tests of the Mobile Station features (GSM 11.10, II.16)
- related to testing of the ME/SIM interface (GSM 11.10, II.8)
- related to tests of Autocalling Restrictions (GSM 11.10, II.9)
- related to tests of Supplementary Services (GSM 11.10, II.12)
- related to tests of Data Services (GSM 11.10, II.10, II.14, II.15)
- related to tests of Short Message Service (GSM 11.10, II.11.2.2.2)
- related to other tests.

2.3.5 Internal malfunction detected messages

List of the error indicators provided.

2.4 DAI, DIGITAL AUDIO INTERFACE

Description of the speech data routing

- via the control lines
- or via the test interface message.

2.5 CHARACTERISTICS RELATED TO BEARER SERVICES OR TELESERVICES

2.5.1 Access interface

Description of the access interface to connect the DTE.

The MT may have various user interfaces, such as:

- V.21 DTE/DCE interface,
- V.22 DTE/DCE interface,
- V.22 bis DTE/DCE interface,
- V.23 DTE/DCE interface,
- V.26 ter DTE/DCE interface,
- V.32 DTE/DCE interface,
- X.21,
- X.25,
- S interface.

In case of a proprietary interface to a DTE (non standard), description of this interface (hardware and software).

In case of a non-standard connector provide a mechanical adapter.

2.5.2 Configuration of the MT

Description of the configuration information to be selected in the MT to connect a Terminal Equipment to the Mobile Termination.

Description of the (different) configuration(s) of the MT for each bearer service and each teleservice supported, with the range or value for the parameters and the configuration procedure.

2.5.3 Bearer capabilities

Description of the bearer capabilities, related to supported bearer services

- higher layer capabilities,
- lower layer capabilities,
- user to user capabilities,
  description with all the values for the parameters, supported by the MT,
- configuration of the MT.

The manufacturer shall describe precisely how it is possible to put the MT in the different configurations to test the bearer capabilities, the lower and higher layer capabilities, the user to user capabilities, described as supported by the MT.

The manufacturer shall describe for every capability the associated terminal functions and their characteristics. The manufacturer shall describe how to verify the correct selection by the MT of the appropriate function, especially using the messages at the Um interface if there is no R or S interface available (case MTO). The description shall be made for every combination of the parameter value valid for the MT.

2.5.4 Subaddress or DDI number

Subaddress or a DDI number of the MT.

Procedure to allocate or change DDI number or subaddress, if possible.

2.5.5 User to user signalling

Description of the function and the user's access to it.

2.5.6 Data call set-up and data call clearing

For each implemented transparent and non-transparent data service:

- Description of the Data Call Establishment Mechanism
  - Terminal initiated (CT108) (if possible),
  - MT (MMI/EMMI) initiated.

  - Description of DCE provided information (MT to TE), if any.

  - Declaration of optimal function and procedure, services supported by the MT.

- Description of the Data Call Clearing Mechanism
  - Terminal initiated (CT109) (if possible),
  - MT (MMI/EMMI) initiated.

  - Description of DCE provided information (MT to TE) related to a mobile or network initiated call clearing, if any.

2.5.7 Characteristics of non-transparent data services

Description of Radio Link Protocol (RLP) features supported
- SREJ command
- Piggybacking of I and S frames

Description of Flow Control Mechanism
- INBAND (XON/XOFF)
- OUTBAND (CT105 and CT106)

2.5.8 V.25 bis procedures for the V.-series R-interface

All procedures must be described to such a level of detail that the test house can program a terminal connected to the R-interface so that the tests in section II.10.3 can be performed. The procedures must conform to V.25 bis. It is recommended that the expected behaviour of the LTE is described.

- If the procedure of section II.15.2.2.2 is not used for call set-up through the R-interface then it is to be described here.

- If other procedures than that of section II.15.2.2.3 are used for call clearing through the R-interface then they are to be described here.

- Describe in detail one or more of the possible procedures to handle an incoming call through the R-interface.

2.5.9 Possible ways of setting-up a call from either an external interface or internally

Describe in detail all possible ways a call can be initiated from the MS or a connected terminal.

2.5.10 Application layer causing automatic call termination.

State whether the call termination facility can be disabled and if so describe in detail how.

2.5.11 Call re-establishment for MS not supporting speech.

Applicability of call re-establishment.

2.6 International Mobile Station Equipment Identity

IMEI of the MS.

2.7 Receiver Intermediate Frequencies

F_{lo} - Local Oscillator frequency applied to first receiver mixer.

IF_1 ... IF_n - intermediate frequencies.

APPENDIX A

Appendix A: GUIDANCE ON THE USE OF RADIATION TEST SITES

For measurements involving the use of radiated fields, use may be made of a test site in conformity with the requirements of Annex 1, GC4. When using such a test site, the following conditions should be observed to ensure consistency of measuring results.

A.1 Measuring distance

Evidence indicates that the measuring distance is not critical and does not significantly affect the measuring results, provided that the distance is not less than half a wavelength at the frequency of measurement, and the precautions described in Annex 1 are observed. Measuring distances of 3 m, 5 m, 10 m and 30 m are in common use in European test laboratories.

A.2 Test antenna

Different types of test antenna may be used, since in performing substitution measurements, calibration errors of the test antenna do not affect the measuring results. Height variation of the test antenna over a range of 1 to 4 metres is essential in order to find the point at which the radiation is a maximum. Height variation of the test antenna may not be necessary at the lower frequencies below about 100 MHz.

A.3 Substitution antenna

Variations in the measuring results may occur with the use of different types of substitution antenna at the lower frequencies below about 80 MHz. Where a shortened dipole antenna is used at these frequencies, details of the type of antenna used should be included with the results of the tests carried out on the site.

A.4 RF Connection to System Simulator

GSM Mobile Stations with antenna connectors are connected to the System Simulator during case radiation measurements by an RF cable which provides the signals to exercise the Mobile Station. In these cases means should be taken to reduce the radiation from this cable by, for example,the use of ferrite cores.

A.5 Auxiliary cables

The position of auxiliary cables (power supply and microphone cables etc) which are not adequately decoupled may cause variations in the measuring results. In order to get reproducible results, cables and wires of auxiliaries are mounted vertically downwards (through a hole in the isolating table).

APPENDIX B

Appendix B :

GUIDANCE ON THE CONSTRUCTION OF AN ANECHOIC SHIELDED CHAMBER

B.1 Construction of the anechoic shielded chamber

Free-field measurements can be simulated in an anechoic shielded chamber where the walls are coated with RF absorbers. Fig. App.B-1 shows the requirements for shielding loss and wall return loss of such a chamber. As dimensions and characteristics of usual absorber materials are critical below 100 MHz (height of absorbers approximately 1m, reflection attenuation < 20 dB) such a room is preferably suitable for measurements above 100 MHz.

The anechoic shielded chamber shall have dimensions of at least 5x5x10 metres. Ceilings and walls are covered with pyramidically shaped absorbers of about 1 meter. The floor is covered with floor absorbers, on which it is possible to walk. As the internal dimensions are 3 m x 3 m x 8 m, a measuring distance of max. 5 m length is available in the middle of the chamber. Fig. App.B-2 shows a possible layout of the chamber.

The wall absorbers and floor absorbers reject reflections so that the antenna height need not be changed.

B.2 Calibration of the anechoic shielded chamber

The calibration of the chamber should be checked, measuring the field strength as a function of the distance from the radiation antenna, for various frequencies over the measuring range. The calibration curve is used to correct the readings obtained during the measurements.

An example of calibration curve is given in Fig. App.B-3. In the range of 30 MHz to 10 GHz, the disturbing influences due to imperfections of the anechoic shielded chamber, may be in the order of 1 to 2 dB at a measuring distance of 3 metre.

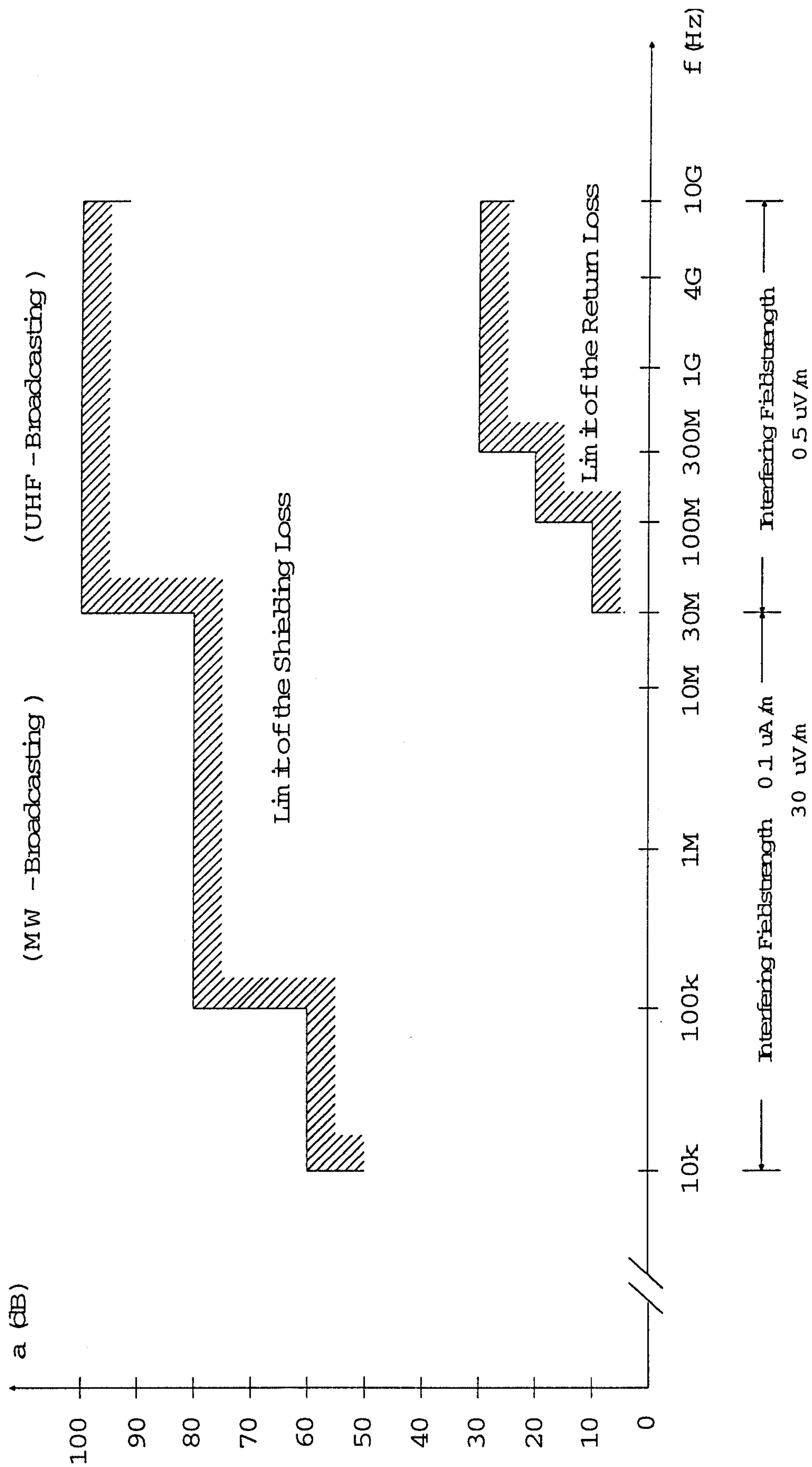


FIGURE App B-1 / GSM 11.10 : **Electrical Requirements for the Anechoic Shielded Chamber for Simulated Free Space Measurements**

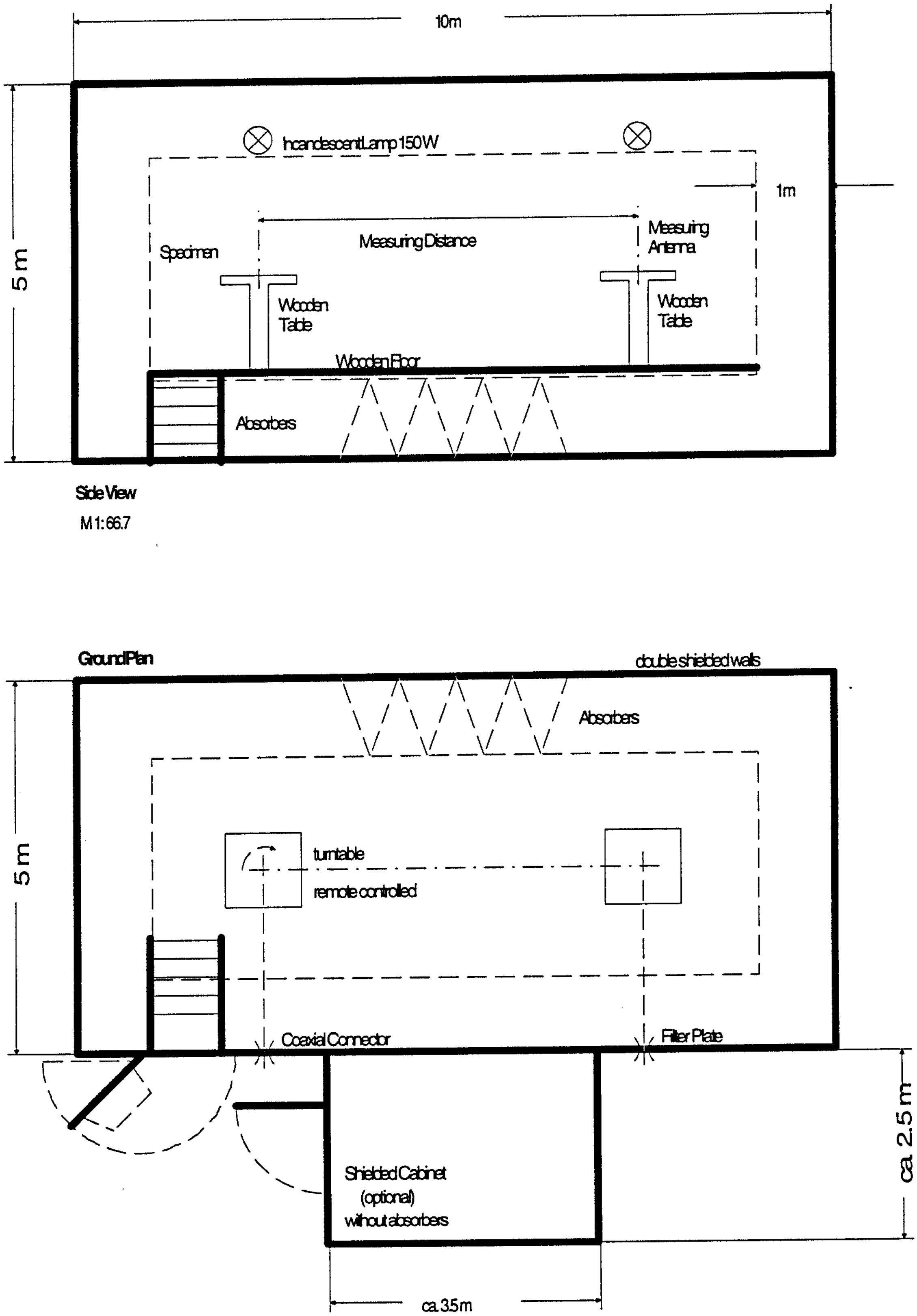


FIGURE App.B-2/GSM 11.10:
Anechoic Shielded Chamber for Simulated Free Space Measurements

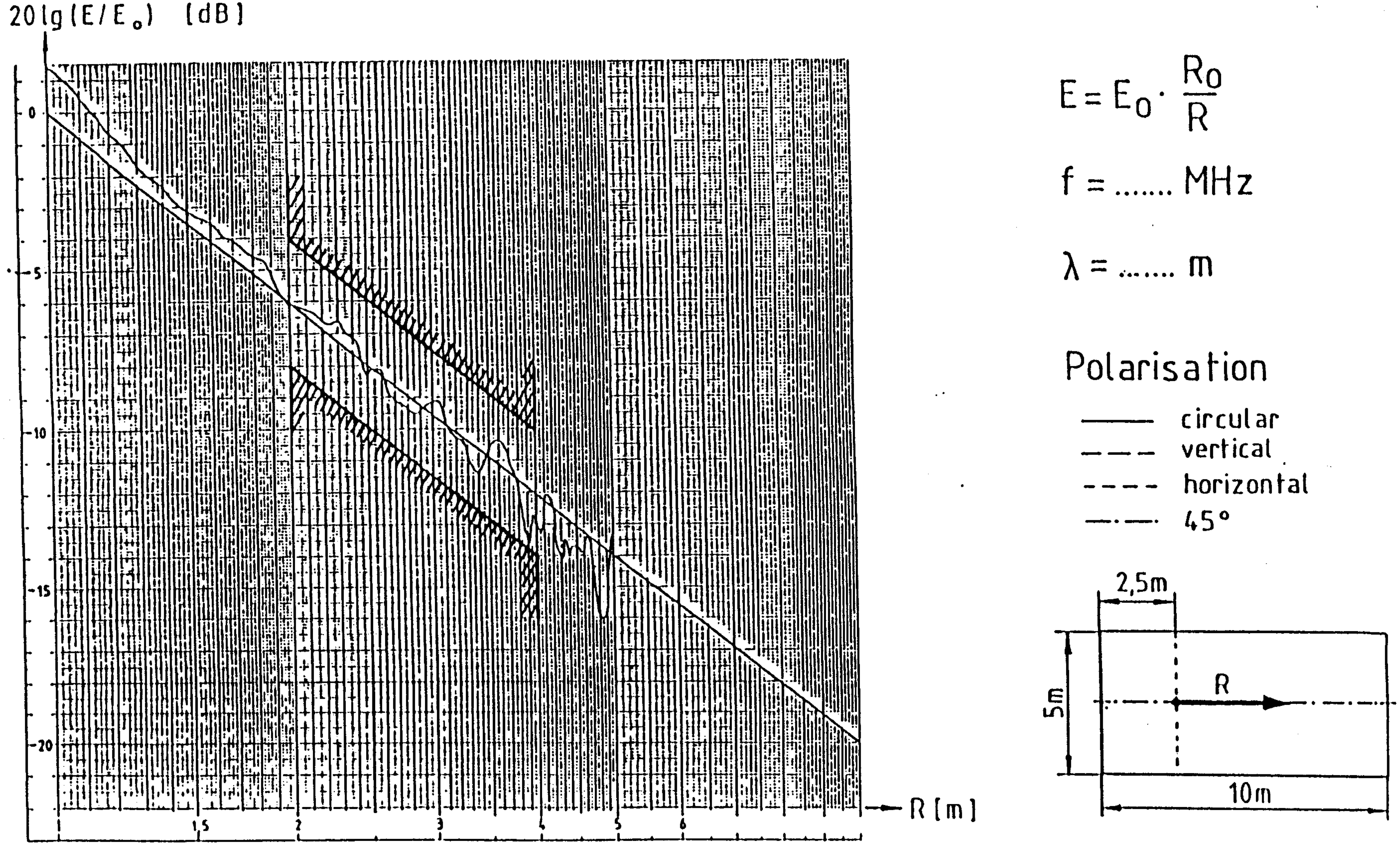


FIGURE App.B-3 / GSM 11.10 :
Example of Fieldstrength Distribution in an Anechoic Shielded Chamber

APPENDIX C

Appendix C : TEST REPORT

1 GENERAL

This appendix specifies the minimum contents of the Test Report that is to be issued by the accredited GSM test house as part of the certificate of conformance. It is separated in three main sections : Global, Test case and Summary.

All information required for the Test Report shall be storable/printable by the System Simulator (SS). Some information though, has to be entered by the SS operator, either on a test case basis or globally.

2 GLOBAL SECTION

Each Test Report shall contain the following information. Only information valid for all test cases shall be included in this section.

a) Title and Date of issue.

Name of the report e.g. "GSM test report ... 03-10-90"

b) Name, Address and Location of the laboratory.

c) Unique identification of the report (such as serial number), each page and a summary of the total number of pages.

d) Name and address of client.

e) Description and identification of test item, including photographs.

f) Test item reception date.

g) Test specification identification e.g. "GSM 11.10" without version number.

h) Test equipment identification.

i) Audio test date reference.

j) A statement limiting the validity of the Test Report to the tested item only.

k) A statement that partial reproduction of the report is not permitted without a written approval from the issuing laboratory.

l) A copy (or reference) to PICS and PIXIT (see GSM 11.10 Annex 3).

m) Nature of conformance testing.

n) A signature and title or an equivalent marking of person(s) accepting technical responsibility for the Test Report.

3 TEST CASE SECTION

The following information shall be provided for each test case. The information is not regarded as valid for any other test case unless otherwise stated.

3.1 RF and Audio test cases

a) A unique reference to GSM 11.10 including version number.

b) A unique Mobile Equipment (ME) reference. This shall define any optional or test specific equipment connected to the "basis" ME during test, e.g. Booster, HF equipment, EMMI etc.

c) Date and time.

d) Operator ID.

e) System Simulator software version.

f) Selected value of variable undefined in GSM 11.10. This may be globally stated for a number of test cases.

g) Temperature and Supply voltage (only included for tests that are, or can be, tested under extreme conditions).

h) Absolute result, e.g. indicated value.

i) Limits (without compensation for measurement uncertainty), i.e. design limits.

j) Measurement uncertainty.

k) Verdict (result inside or outside the limits mentioned in 3.1 i)).

3.2 Protocol test cases

a) A unique reference to GSM 11.10 including version number.

b) A unique ME reference. This shall define any optional or test specific equipment connected to the "basic" ME during test, e.g. Booster, HF equipment, EMMI etc.

c) Date and time.

d) Operator ID.

e) System Simulator software version.

f) Selected value of variables undefined in GSM 11.10. This may be globally stated for a number of test cases.

g) Actual Result (display of resulting or message(s) content).

h) Verdict.

4 SUMMARY SECTION

This shall be valid for all test cases covered by the global section.

a) Schedule of tests (listing of all tests with marking for any omitted tests).

b) Listing of test case where :

- test results are outside the design limits,
- test results are outside the design limits, but within the uncertainty.

c) Observations such as borderline results, hazards and other issues outside testing but worthy mentioning.