

Annex 1 (Normative): Reference test methods

A1.1 General Conditions (GC)

A1.1.1 Outdoor test site and general arrangements for measurements involving the use of radiated fields (GC4)

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 polarization 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.

A1.1.2 Anechoic shielded chamber (GC5)

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.

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.

A1.1.3 Temporary antenna connector (GC7)

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 (section 13.3).
- Radiated spurious emissions (section 12).

For tests in the MS Receive band (925-960 MHz):- The temporary antenna coupling factor is determined using the procedure defined in annex 1, 1.1.5. 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 (880-915 MHz):- The temporary antenna coupling factor is determined using the procedure defined in 13.3.4.2 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 (880-915 MHz and 925-960 MHz) the temporary antenna coupling factor is assumed to be 0 dB.

NOTE 1: 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 13.3.4.2 step n) and annex 1, 1.1.5.2 (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 2: The accommodation of the uncertainty in the temporary antenna coupling factor in the MS receive band (925-960 MHz) for the tests in section 14 is for further study.

NOTE 3: The uncertainty in the temporary antenna coupling factor in the MS transmit band (880-915 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 12.1.2.
- Sections annex 1, 1.1.5.1 and annex 1, 1.1.5.2.
- Section 13.3.4.2 (during this step the MS is modified).
- Section annex 1, 1.1.5.3.
- All remaining tests of sections 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 and 22.

A1.1.4 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 impedance 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.

A1.1.5 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 low mid and high ARFCN ranges. 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.

A1.1.5.1 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 low ARFCN range. 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 figure A1-1 to give an MS receiver input level of approximately 32 dB μ V_{emf}. This corresponds to a field strength of 55,5 dB μ V/m at the MS position. The signal shall be the Standard Test Signal C1.

NOTE 1: 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 A1-1 shall now be followed.

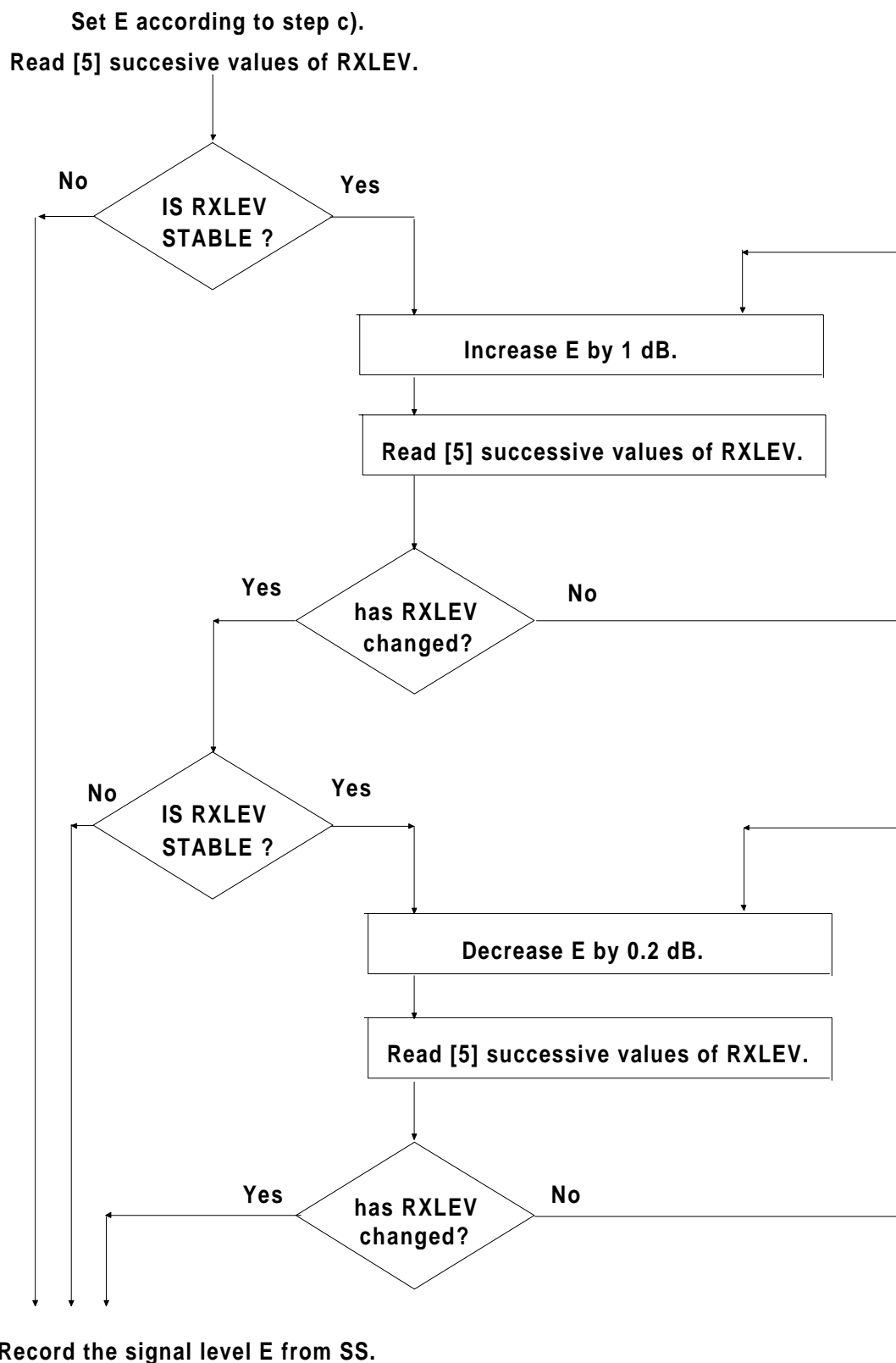


Figure A1-1

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 2: 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} .
- 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:

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

- g) Repeat steps b) to f), except in step b) use an ARFCN in the mid ARFCN range 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 high ARFCN range to obtain a mean signal level E_3 .

Ensure the same RXLEV transition is used.

A1.1.5.2 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 annex 1, 1.1.5.1. 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 annex 1, 1.1.5.1 measure the field strength E_{fr} corresponding to the respective signal levels E_r determined in steps f), g) and h) of annex 1, 1.1.5.1 record these values as E_{f1} , E_{f2} , E_{f3} .

A1.1.5.3 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, 1.1.3. 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 low ARFCN range. 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 annex 1, 1.1.5.1, 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 mid ARFCN range and the high ARFCN range. 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 μV at the frequency $\mu V/m$ 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:

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

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

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

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

- 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 (dB μV_{emf})
 E_{req} = signal level required by the test (dB μV_{emf})
 F = coupling factor at the respective ARFCN (dB)

This is indicated in the test procedures as E_{req} , dB μV_{emf} (), 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.]

A1.2 Normal and extreme Test Conditions (TC)

A1.2.1 Power sources and ambient temperatures (TC2)

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 1.2.2 and 1.2.3. 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 $\pm 3\%$ relative to the voltage at the beginning of each test.

A1.2.2 Normal test conditions (TC2.1)

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

Temperature: +15 °C to +35 °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.

A1.2.3 Extreme test conditions (TC2.2)

For tests under extreme test conditions the 4 combinations of extreme voltages and extreme temperatures in table A1.1 shall be applied.

Table A1.1

	1	2	3	4
Temperature	High	High	Low	Low
Voltage	High	Low	High	Low

For tests at extreme ambient temperatures measurements shall be made at the temperatures given in table A1.2, following the testing procedures given in IEC publications 68-2-1 and 68-2-2 for the low and high temperature tests.

For tests at the high temperature, after thermal balance has been achieved, the MS is 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 MS shall meet the specified requirements.

For tests at the low temperature, after thermal balance has been achieved, the MS is switched to the idle mode (non DRX) for a period of one minute after which the MS shall meet the specified requirements.

Table A1.2

	Temperature (degrees Celsius)	
	Low	High
Handheld	-10	+55
Vehicular or Portable	-20	+55

For tests at extreme voltages measurements shall be made at the lower and higher extreme voltages as declared by the MS manufacturer. For MS that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified in table A1.3.

Table A1.3

Power source:	Voltage (relative to nominal)		
	Lower extreme	Higher extreme	Normal cond.
AC mains	0,9	1,1	1,0
Regulated lead acid battery	0,9	1,3	1,1
Non regulated batteries:			
Leclanché/ lithium	0,85	1,0	1,0
mercury/ nickel cadmium	0,9	1,0	1,0

A1.2.4 Vibration requirements (TC4)

When the MS is to be tested under vibration, then random vibration is used, where the acceleration spectral densities (ASD) and the frequency ranges of GSM 05.05 [annex D.2.3] apply. These are given in table A1.4.

Table A1.4

frequency in Hz	ASD in m^2/s^3
5- 20	0,96
20 - 500	0,96 at 20 Hz, thereafter -3 dB / octave

The test shall be performed as described in IEC publication 68-2-36.

Annex 2: Not used

Text deleted.

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.

A3.1 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.

A3.1.1 LAPDm protocol (GSM 04.05 and 04.06)

A3.1.1.1 Simplified protocol - GSM 04.06 section 6

Statement about the choice made by the manufacturer.

A3.1.1.2 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.

A3.1.2 Mobility management

A3.1.2.1 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 finished, or can be omitted.

A3.1.2.2 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 sub-layer on the MS side should be aborted without waiting for something from the network.

A3.1.2.3 MM specific procedures - GSM 04.08 section 4.4 and 4.5.1.1

During the lifetime of an MM specific procedure, if an 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 and, provided that the network has not sent a "follow-on proceed" indication, the RR connection is released.

If the LOCATION UPDATING REQUEST message has not been sent, the mobile station may include a "follow-on request" indicator in the message. The mobile station shall then delay the request until the MM specific procedure is completed, when it may be given the opportunity by the network to use the RR connection.

A3.1.2.4 Receiving an MM STATUS message - GSM 04.08 section 4.6

If the MM-entity of the Mobile Station receives a MM-STATUS message no state transition and no specific action shall be taken as seen from the radio interface, i.e. local actions are possible.

A3.1.3 Call control

A3.1.3.1 Status enquiry procedures - GSM 04.08 section 5.5.3.1

The MS may send a STATUS ENQUIRY and take the appropriate actions based on the answer (STATUS) of the network.

A3.1.3.2 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.

A3.1.3.3 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.

A3.1.3.4 Disconnect on incoming call

The mobile equipment may or may not offer the possibility to disconnect an incoming call:

- a) after having confirmed an incoming call, but before alerting.
- b) after alerting, but before connecting.

GSM 02.30 (5.2.3) allows the combination of SEND and END function in one key.

A3.1.4 Layer 1

A3.1.4.1 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 may 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.

A3.1.5 Autocalling - (ref.: GSM 02.07, annex 1)

Cause number 27 implemented in:

- category 2 (preferred);
- category 3.

A3.1.6 Transient states

The following call control states may be transient in the mobile station:

State U6

State U6 may be transient if the mobile station is not configured to support explicit refusal of an incoming call by the (human or non-human) user (e.g. via a terminal interface) before call confirmation.

If U6 is transient, there is an internal transition

CALL CONFIRMED

U6 > U9

or an internal transition

RELEASE COMPLETE

U6 > U0.

State U7

State U7 is transient if the implementation allows for automatic connect after an implementation specific time T.

If U7 is transient, there is an internal transition:

after T, CONNECT

U7 > U8.

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

If the implementation supports immediate connect, there is an internal transition:

CONNECT

U9 > U8.

If the appropriate TCH is available or the signalling element was present in SETUP, there is an internal transition:

ALERTING

U9 > U7.

State U12

U12 is a stable state, if an appropriate speech traffic channel is connected and progress indicator #8 was present in the DISCONNECT message. Otherwise U12 is transient, and there is an internal transition:

A3.2 Protocol Implementation Extra Information for Testing (PIXIT)

A3.2.0 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.

A3.2.1 Basic characteristics

A3.2.1.1 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.

A3.2.1.2 Power supply

- Type of battery (if any).
- Type of power supply.
- Nominal voltage(s).
- End-point voltage(s) of battery(s) (if any).
- Details of MS shut-down voltage.

A3.2.1.3 Power class of the MS

- Different class declared.
- Class mark change: description of the means to change the RF power capabilities.

A3.2.1.4 Channel modes supported

Speech full rate
 Speech half rate
 Data 12 kbit/s full rate T/NT
 Data 6 kbit/s full rate T/NT
 Data 6 kbit/s half rate T/NT
 Data 3,6 kbit/s full rate T
 Data 3,6 kbit/s half rate T

A3.2.1.5 Teleservices supported

- 11) Telephony
- 12) Emergency calls
- 21) Short message MT/PP
- 22) Short message MO/PP
- 23) Short message transmission cell broadcast
- 61) Alternate speech and facsimile group 3 T/NT
- 62) Automatic facsimile group 3 T/NT

A3.2.1.6 Supplementary services supported

Call forwarding.
 Call restriction.
 Handling of undefined GSM Supplementary Services.

A3.2.1.7 Bearer services supported

- | | | | |
|------|----------------------------------|---------------|------|
| 21) | Data circuit Duplex asynchronous | 300 bit/s | T/NT |
| 22) | Data circuit Duplex asynchronous | 1200 bit/s | T/NT |
| 23) | Data circuit Duplex asynchronous | 1200/75 bit/s | T/NT |
| 24) | Data circuit Duplex asynchronous | 2400 bit/s | T/NT |
| 25) | Data circuit Duplex asynchronous | 4800 bit/s | T/NT |
| 26) | Data circuit Duplex asynchronous | 9600 bit/s | T/NT |
| 31) | Data circuit Duplex synchronous | 1200 bit/s | T |
| 32) | Data circuit Duplex synchronous | 2400 bit/s | T/NT |
| 33) | Data circuit Duplex synchronous | 4800 bit/s | T/NT |
| 34) | Data circuit Duplex synchronous | 9600 bit/s | T/NT |
| 41) | PAD Access circuit asynchronous | 300 bit/s | T/NT |
| 42) | PAD Access circuit asynchronous | 1200 bit/s | T/NT |
| 43) | PAD Access circuit asynchronous | 1200/75 bit/s | T/NT |
| 44) | PAD Access circuit asynchronous | 2400 bit/s | T/NT |
| 45) | PAD Access circuit asynchronous | 4800 bit/s | T/NT |
| 46) | PAD Access circuit asynchronous | 9600 bit/s | T/NT |
| 51) | Data Packet Duplex synchronous | 2400 bit/s | NT |
| 52) | Data Packet Duplex synchronous | 4800 bit/s | NT |
| 53) | Data Packet Duplex synchronous | 9600 bit/s | NT |
| 61) | Alternate Speech/Data | | |
- (here Data offers the same service
 as bearer services 21-34 with "3,1kHz" information transfer capability)

- 81) Speech followed by Data
(here Data offers the same service
as bearer services 21-34 with "3,1kHz" information transfer capability)

A3.2.1.8 SIM removal

- Removal of the SIM is possible without disconnection of the power supply (Y/N).

A3.2.1.9 Classmark

The coding of Mobile station classmark 1, 2, and 3 and the fact whether and under which conditions the classmark 3 information element is included in a CLASSMARK CHANGE message, has to be declared by the manufacturer. The declaration has to fulfil the following requirements:

- Mobile station classmark 1: Bits 4, 5, and 8 of the first (and only) octet of the value part of the information element shall be coded as "0". The "Revision level" and "RF power capability" field shall specify the value that is correct for the MS.
- Mobile station classmark 2: Bits 4, 5, and 8 of the first octet, bits 2, 3, and 8 of the second octet, bits 3 to 7 of the third octet of the value part of the information element shall be coded as "0". The "Revision level" field, "RF power capability" field, "PS capability" field, "SS Screening indicator" field, "SM capability" field, "Frequency capability" field, "Classmark 3" field, "A5/2 algorithm supported" field, and "A5/3 algorithm supported" field shall specify the value that is correct for the MS.
- Mobile station classmark 3: Bits 5 to 8 of the first octet of the value part of the information element shall be coded as "0". If the value part contains more octets, they shall be coded as "0000 0000". The "A5/4 algorithm supported" field, "A5/5 algorithm supported" field, "A5/6 algorithm supported" field, and "A5/7 algorithm supported" field shall specify the value that is correct for the MS (that is, they shall be set to "0").

NOTE: The requirements to the classmark may be subject to changes. That is why test cases are expected to verify the manufacturer's declaration, whereas the correctness of the manufacturer's declaration is to be verified "off line".

A3.2.1.10 Type of SIM/ME interface (ref. GSM 11.11 and GSM 11.12)

- 5V SIM/ME interface (5V only ME)
- 3V SIM/ME interface (3V only ME)
- 5V/3V SIM/ME interface (3V technology ME)

A3.2.2 Man machine interface

A3.2.2.1 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 hands 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 re-try 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.

A3.2.2.2 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.

A3.2.2.3 Supplementary services

A3.2.2.3.1 Call forwarding

- Description of the user's commands and of the display of the answers from the network for:
 - registration,
 - erasure,
 - activation,
 - deactivation,
 - 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.

A3.2.2.3.2 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.

A3.2.2.3.3 Handling of (undefined) GSM supplementary services

- Description of the user's commands and the display of the answer from the network.

A3.2.3 Electrical Man Machine Interface (EMMI)**A3.2.3.1 Methods supported for activation/deactivation of EMMI**

- all possibilities specified in GSM 11.10, section 36.2.2;
- all possibilities specified in GSM 11.10, section 36.2.2, 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, section 36.2.2.

A3.2.3.2 Transmission rate supported by the ME on the EMMI**A3.2.3.3 Layer 3 messages supported on the EMMI**

- Layer 3 messages as specified in GSM 11.10, section 36.3.5.3.2, except: (followed by the list of messages not supported);
- others than defined in GSM 11.10 section 36.3.5.3.1 table 9.

A3.2.3.4 Keystroke sequence messages

Non standard keystroke sequences to be used on the EMMI (in line with GSM 11.10, 36.3.5.3.2):

- related to tests of the mobile station features (GSM 11.10, section 33);
- related to testing of the ME/SIM interface (GSM 11.10, section 27);
- related to tests of autocalling restrictions (GSM 11.10, section 28);
- related to tests of supplementary services (GSM 11.10, section 31);
- related to tests of data services (GSM 11.10, section 29);
- related to tests of short message service (GSM 11.10, section 34);
- related to other tests.

A3.2.3.5 Internal malfunction detected messages

List of the error indicators provided.

A3.2.4 Digital Audio Interface (DAI)

Description of the speech data routing:

- via the control lines;
- or via the test interface message.

A3.2.5 Characteristics related to bearer services or teleservices

A3.2.5.1 Access interface

Description of the access interface to connect the DTE (e.g. V series (V.24, V.28), X series, two wire analogue interface for use with fax group 3, I.420 (S-reference point).

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.

A3.2.5.2 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.

For the purpose of test of MOC, the manufacturer shall describe precisely how it is possible to put the MT in the different configurations to generate the capability information of the Mobile according to section 3.2.5.3, and described as supported by the MS.

For the purpose of test of MTC, the manufacturer shall describe how to verify the correct selection by the MT of the required function with regard to the capability information as described below, 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.

A3.2.5.3 Capability information

Description of the capability information, related to supported bearer services:

- bearer capabilities,
- higher layer capabilities,
- lower layer capabilities,

The manufacturer shall describe for every capability the associated terminal functions and their characteristics.

A3.2.5.4 Subaddress or DDI number

Subaddress or a DDI number of the MT.

Procedure to allocate or change DDI number or subaddress, if possible.

A3.2.5.5 User to user signalling

Description of the function and the user's access to it.

A3.2.5.6 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.

A3.2.5.7 Characteristics of non-transparent data services

Description of Radio Link Protocol (RLP) features supported.

Description of flow control mechanism:

- INBAND (XON/XOFF);
- OUTBAND COPnoFICt (CT105 and CT106).

A3.2.5.8 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.

A3.2.5.9 Application layer causing automatic call termination.

State whether the call termination facility can be disabled and if so, describe in detail how.

A3.2.5.10 Call re-establishment for MS not supporting speech

Applicability of call re-establishment.

A3.2.6 International mobile station equipment identity

IMEI of the MS.

A3.2.7 Receiver intermediate frequencies

F_{lo} - Local Oscillator frequency applied to first receiver mixer.

$IF_1 \dots IF_n$ - intermediate frequencies.

A.3.2.8 Artificial ear

The manufacturer shall declare which type of artificial ear (type 1 or type 3.2) is used for teleservices speech testing.

Annex 4: Test SIM Parameters

A4.1 Introduction

This section defines default parameters for programming the elementary files of the test SIM. The requirements of this annex do not apply to the SIM/ME tests of section 27.

A4.1.1 Definitions

"Test SIM card":

A SIM card supporting the test algorithm for authentication, programmed with the parameters defined in this section. The electrical, mechanical and environmental requirements of the test SIM card are specified in GSM 11.11.

"Test SIM":

Either a test SIM card or the SIM simulator programmed with the parameters defined in this section.

A4.1.2 Definition of the test algorithm for authentication

The following procedure employs bit wise 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

$$\text{RES1} = \text{RAND XOR Ki}$$

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.

A4.2 Default Parameters for the test SIM

Ki:

The authentication key "Ki" will be chosen by the test house and will be non zero. The "Ki" value used by the SS will align with this value.

PIN Disabling

The PIN enabled / disabled flag will be set to "PIN Disabled". This ensures that when the Test SIM is inserted into a MS the user will not be prompted for PIN entry. This requires a specific card capability defined by the SIM service table (see section 2.9).

A4.3 Default settings for the Elementary Files (EFs)

The format and coding of elementary files of the SIM are defined in GSM 11.11. The following sections define the default parameters to be programmed into each elementary file. Some files may be updated by the MS based on information received from the SS. These are identified in the following sections.

A4.3.1 EF_{ICCID} (ICC Identification)

The programming of this EF is a test house option.

A4.3.2 EF_{LP} (Language preference)

The programming of this EF is a test house option.

A4.3.3 EF_{IMSI} (IMSI)

The IMSI value will be chosen by the test house. The IMSI used by the SS will align this value.

File size: 9 bytes
 Default values: Byte 1 (DEC): 8
 Bytes 2-9 (HEX): 09 10 10 ** * * * * *

"*" indicates any number between 0 and 9 subject to the restriction that IMSI mod 1000 (i.e. bytes 7, 8 and 9) lies in one of the following ranges:

063-125, 189-251, 315-377, 441-503, 567-629, 693-755, 819-881 or 945-999

NOTE: This ensures that the MS can listen to the second CCCH when more than one basic physical channel is configured for the CCCH. This is necessary for the test of "paging re-organization".

A4.3.4 EF_{Kc} (Cipherring key Kc)

File size: 9 Bytes
 Default values (HEX): Bytes 1-8: Align with Kc used by SS
 Byte 9: 07

Byte 9 is set to 07 to indicate that there is no key available at the start of a test.

The bytes within this elementary file may be updated by the MS as a result of a successful authentication attempt.

A4.3.5 EF_{PLMNsel} (PLMN selector)

File size: 102 bytes
 Default values (HEX): Bytes 1-3: 32 F4 10 (MCC, MNC) - Translates to 234, 01
 Bytes 4-6: 32 F4 20 (MCC, MNC)
 Bytes 7-9: 32 F4 30 (MCC, MNC)

 Bytes 94-96: 32 F4 23 (MCC, MNC)
 Bytes 97-99: 32 F4 33 (MCC, MNC)
 Bytes 100-102: 32 F4 43 (MCC, MNC)

34 PLMNs are shown coded above since this is the largest number required for a test - see section 27.9.4.1. It is necessary to take this into account since the SIM cards must be dimensioned to cope with this number of records.

A4.3.6 EF_{HPLMN} (HPLMN search period)

File size: 1 byte
 Default value (HEX): 00 (no HPLMN search attempts)

A4.3.7 EF_{ACMmax} (ACM maximum value)

File size: 3 bytes
 Default: Byte 1: 00
 Byte 2: 00
 Byte 3: 00

The above translates to: "Not valid".

A4.3.8 EF_{SST} (SIM service table)

Services will be allocated and activated as follows:

Service	Allocated	Activated
No. 1: CHV1 disable function	Yes	Yes
No. 2: Abbreviated Dialling numbers (ADN)	Yes	Yes
No. 3: Fixed dialling numbers (FDN)	Yes	Optional
No. 4: Short Message Storage (SMS)	Yes	Yes
No. 5: Advice of Charge (AoC)	Yes	Yes
No. 6: Capability Configuration Parameters (CCP)	Yes	Yes
No. 7: PLMN Selector	Yes	Yes
No. 8: Reserved for future use	No	No
No. 9: MSISDN	Optional	Optional
No. 10: Extension 1	Yes	Optional
No. 11: Extension 2	Yes	Optional
No. 12: SMS Parameters	Yes	Yes
No. 13: Last Dialed Number (LND)	Yes	Yes
No. 14: Cell Broadcast Message Identifier	Yes	Yes
No. 15: Group identifier Level 1	Yes	Optional
No. 16: Group identifier Level 2	Yes	Optional

A4.3.9 EF_{ACM} (Accumulated call meter)

File size: 3 bytes
 Default: Byte 1: 00
 Byte 2: 00
 Byte 3: 00

The above translates to: "Not yet implemented".

A4.3.10 EF_{PUCT} (Price per unit and currency table)

File size: 5 bytes
 Default: Byte 1-3: FF
 Byte 4-5: 00

A4.3.11 EF_{CBMI} (Cell broadcast Message Identifier Selection)

The programming of this EF is a test house option.

The file size is 2n bytes, where n is the number of Cell broadcast message identifier records - each record defining a type of Cell Broadcast message which may be accessed by the MS. Care should be taken when dimensioning the SIM to take into account the number of Cell Broadcast message identifier records required.

A4.3.12 EF_{BCH} (Broadcast control channels)

File size:	16 Bytes	
Default values (BIN):	Bytes 1-2:	11111111 11111111
	Bytes 3-4:	11111111 11111111
	Bytes 5-6:	11111111 11111111
	Bytes 7-8:	11111111 11111111
	Bytes 9-10:	11111111 11111111
	Bytes 11-12:	11111111 11111111
	Bytes 13-14:	11111111 11111111
	Bytes 15-16:	11111111 11111111

This field may be updated dependent on the MS implementation.

A4.3.13 EF_{ACC} (Access control class)

File size:	2 Bytes	
Default values (BIN):	Byte 1:	00000000
	Byte 2:	*****

The test house may set any single bit of byte 2 to "1". All remaining bits of byte 2 will be set to "0". This determines the access control class of the SIM.

A4.3.14 EF_{FPLMN} (Forbidden PLMNs)

Length:	12 Bytes	
Format (HEX):	Bytes 1-3:	FF FF FF
	Bytes 4-6:	FF FF FF
	Bytes 7-9:	FF FF FF
	Bytes 10-12:	FF FF FF

This coding corresponds to an empty "forbidden PLMN list". The bytes within this file may be updated if a LOCATION UPDATE REJECT message is received by the MS with cause, "PLMN not allowed".

A4.3.15 EF_{LocI} (Location information)

File size:	11 Bytes	
Default values:	Bytes 1-4 (HEX):	FF FF FF FF (TMSI)
	Bytes 5-9 (HEX):	42 F6 18 FF FE (LAI)
	Byte 10 (HEX):	FF (Periodic LU Time = "the timer is not running")
	Byte 11 (BIN):	00000001 (Location Update Status = "not updated")

Bytes 5-9: LAI-MCC = 246 (bytes 5-6) and LAI-MNC = 81 (byte 7) are frequently used in section 27. The LAC (bytes 8-9) is set to "FF FE" since this, in conjunction with byte 11 setting of "01", is used to ensure that the MS performs a location update at the beginning of a test.

Bytes in this file (e.g. TMSI in bytes 1-4) may be updated as a result of a location update attempt by the MS.

A4.3.16 EF_{AD} (Administrative data)

File size:	3 bytes	
Default values	Byte 1:	10000000 - (type approval operations)
	Byte 2:	11111111
	Byte 3:	11111111

A4.3.17 EF_{Phase} (Phase identification)

File size:	1 byte	
Default value (HEX):	02	Phase 2

A4.3.18 EF_{ADN} (Abbreviated dialling numbers)

The programming of this EF is a test house option. It should be noted that sufficient space should be provided on the SIM card for 101 records - see section 27.15.4.1.

A4.3.19 EF_{FDN} (Fixed dialling numbers)

Optional.

A4.3.20 EF_{SMS} (Short messages)

Default: Records 1-5	Byte 1:	00
	Byte 2:	FF
	Bytes 3-14:	FF FF FF FF FF FF FF FF FF FF FF FF
	Bytes 15-26:	FF FF FF FF FF FF FF FF FF FF FF FF
	Byte 27:	FF
	Byte 28:	FF
	Bytes 29-35:	FF FF FF FF FF FF FF
	Byte 36:	FF
	Bytes 37-176:	All Bytes set to FF

A4.3.21 EF_{CCP} (Capability configuration parameters)

File size:	14 bytes
Default values	Byte 1: 04
	Byte 2: 01
	Byte 3: A0
	Bytes 4-14: FF

The above translates to: "Full rate, GSM Standardized coding, circuit mode and speech".

A4.3.22 EF_{MSISDN} (MSISDN)

Optional.

A4.3.23 EF_{SMSP} (Short message service parameters)

The programming of this EF is a test house option.

Each record size is 28+Y bytes, where Y is the number of bytes in the Alpha Identifier. Care should be taken when dimensioning the SIM to take into account the number of Short message service parameter records required.

A4.3.24 EF_{SMSS} (SMS status)

File size: 2 bytes	Byte 1:	00
	Byte 2 (BIN):	11111111

The above translates to:

- (a) Last Mobile Originated Short Message had a TP Message Reference parameter of "00".
- (b) SMS Memory Capacity Exceeded, Notification Flag unset: memory capacity available.

A4.3.25 EF_{EXT1} (Extension 1)

Optional.

A4.3.26 EF_{EXT2} (Extension 2)

Optional.

Annex 5: Test equipment

A5.1 Introduction

A5.1.1 General

The test equipment is either an equipment or assembly of equipments which enables the tests described in this specification to be conducted.

This annex describes requirements for the test equipment which cannot be derived from and which are assumed in, the conformance test descriptions described in this specification.

Specifically stimulus setting and measurement uncertainties are defined.

A5.1.2 Test equipment terms

The term "System Simulator" (SS) is used to describe the complete suite of test equipment required to perform the tests in this specification when interacting with the following MS interfaces:

- Antenna (Connector or radiated);
- Acoustic;
- Data Port(s);
- Power supply;
- DAI.

NOTE: To perform a sub-set of tests, the SS may be simplified accordingly.

The term "SIM simulator" is used to describe the test equipment required to interact with the SIM/ME interface.

A "test SIM" has the physical characteristics of a standard SIM card, (see GSM 11.11) with specific parameters defined in annex 3.

A5.1.3 Confidence level

All uncertainty values stated in this annex are quoted for a Confidence Level of 95 %.

A5.2 Standard test signals

The Cx signals represent the wanted signals and the Ix signals represent the unwanted signals.

Signal C0	Unmodulated continuous carrier;
Signal C1	A standard GSM signal with the modulation derived by applying a data reversals signal to the input of a channel coder. The channel coder will depend on the test and the cipher mode shall be selectable by the test method. When using this signal in the non hopping mode, the unused seven time slots shall also contain dummy bursts, with power levels variable with respect to the used timeslot, see also 2.3.1.3.
Signal I0	Unmodulated continuous carrier;
Signal I1	A GMSK modulated carrier following the structure of the GSM signals, but with all modulating bits (including the midamble period) derived directly from a random or pseudo random data stream.
Signal I2	A standard GSM signal with valid midamble, different from C1. The data bits (including bits 58 and 59) shall be derived from a random or pseudo random data stream.

A5.3 SS functional requirements

A5.3.1 Level setting range

It is assumed that the SS is capable of setting stimulus levels, at the MS interface, to those required in the test specification extended by the measurement uncertainty defined in this annex.

NOTE: This ensures that the SS is able adequately to stimulate the MS performance at and just beyond the limit requirement under all conditions.

A5.3.2 Level Measurement / operation range

It is assumed that the SS is capable of performing measurements, within the uncertainty defined in this annex, over a level range, at the MS interface, as required in the test specification extended by the SS measurement uncertainty defined in this annex and extended by a further 3dB on the MS conformity requirement.

NOTE: This ensures that the SS is able adequately to measure the MS performance at and just beyond the limit requirement under all conditions.

A5.3.3 MS power supply interface

Test DC power supply for MS:

Voltage setting uncertainty < 1 %.
Ripple < 10 mV RMS, 50 mV peak to peak.

Test AC power supply for MS:

Voltage setting uncertainty: < 1 %.

A5.3.4 MS antenna interface

The SS is assumed to offer a nominal 50 ohm impedance to the MS.

VSWR	GSM/DCS bands <= 1,3	< 4 GHz <= 2,0	< 10 GHz <= 3,0	< 12,75 GHz <= 3,5
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A5.3.4.1 Uplink receiver error

The SS receiver should be capable of performing the tests as specified in GSM 11.10 without the addition of bit errors in excess of 1 in 10E7 due to the receiver performance when operated with a MS which meets the transmitter requirements of GSM 05.05.

NOTE: This requirement is based on a minimum BER measurement of 1 in 10E5.

A5.3.4.2 Power versus time measurements

Measurement uncertainty of peak transmitter carrier power: +/- 1 dB

Measurement uncertainty of power level (relative to peak transmitter carrier power):

Power level	Measurement uncertainty
+ 6 dB to - 7 dB	+/-0,25 dB
- 7 dB to -20 dB	+/-1,0 dB
-20 dB to -32 dB	+/-2,0 dB
-32 dB to -45 dB	+/-5,0 dB
-45 dB to -71 dB	+/-1,0 dB
<-71 dB	+/-2,0 dB

NOTE: Due to the method of measurement (downconversion to I/Q baseband / filtering / A/D conversion / postprocessing) several uncertainties occur. The sources are:

- a) absolute level uncertainty;
- b) filter ripple,
I/Q gain imbalance,
I/Q imperfect quadrature;
- c) A/D conversion (resolution),
I/Q offset.

Items under b) and c) affect the individual samples and can be observed as a "ripple" in the horizontal part of the power time mask.

Items under b) are uncertainties which are proportional to the signal measured.

Items under c) are constant amounts of uncertainty, independent of the signal measured.

The item a) moves the entire power time template up or down.

The uncertainties b) and c) are added to the measured signal as an uncorrelated interferer.

The above mentioned absolute measurement uncertainty refers to a). The table covers uncertainties b) and c).

Uncertainty of time measurement

The relative timing uncertainty of the transition point:

- bit 13 to 14 in the midamble (normal burst);
- end of the sync sequence (access burst);

is +/- 1/8 bit.

Timing uncertainty of the measurement samples in the vertical part of the power time mask are displayed as marked fields in the figure A5.3-1

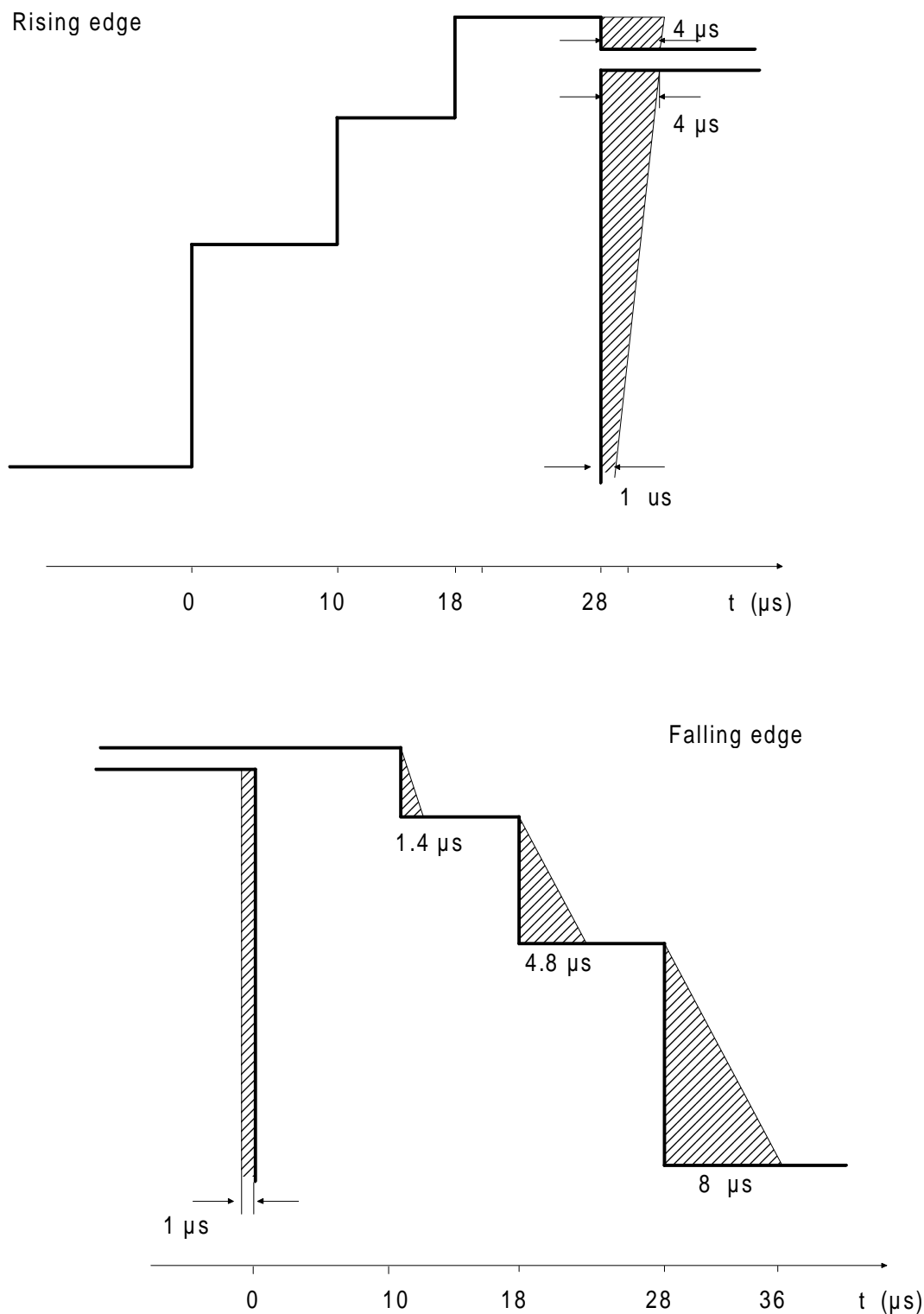


Figure A5.3-1 Time Measurement Uncertainty for the Power Time Mask

NOTE: With a real method of measurement one has to reckon on systematic measurement uncertainties in the vertical part of the power time template (figures 13-2 & 13-3). The reason for this is that the measurement is conducted through a filter which has to fulfil different requirements simultaneously, requirements in the frequency domain and in the time domain as well. The time behaviour of the filter causes the above mentioned measurement uncertainty. It occurs clearly when measuring the falling edge of the power burst. The measurement uncertainty, which in principle delays the actual performance, depends on the filter characteristics and on the signal shape. At favourable signal shapes the uncertainty is negligible, however, at unfavourable signal shapes it consumes the marked area in figure A5.3-1 (falling edge).

The underlying filter is:

type	inverse Chebycheff
passband	$\leq \pm 200$ kHz
stopband (40 dB stop att.)	$\geq \pm 541,67$ kHz.

To avoid aliasing with this filter the RF output spectrum must meet the requirements of section 13.4.

If the lowest limit line in the power time template is replaced by a -54 dBm line, measuring lower carrier powers, the area of measurement uncertainty is reduced equivalently.

The marked area in figure A5.3-1 describes the systematic measurement uncertainty of the test equipment and does not widen the design requirements.

Uncertainties associated with 13.3.5 requirement b) (power control levels, adjacent steps):

Repeatability	$\pm 0,3$ dB
Linearity	$\pm 0,03$ dB/dB

Combined uncertainty is: $\pm (0,3 + 0,03 \text{ dB/dB})$ dB

E.g. where the indicated value of the step size is 2,0 dB, the uncertainty is:
 $\pm (0,3 + 0,06)$ dB = $\pm 0,36$ dB.

A5.3.4.3 Wideband selective power measurement

Power is to be measured selectively for spurious emissions without frequency hopping (ref.: section 12).

Uncertainty conducted	100 kHz to 1GHz	$\pm 1,5$ dB
	1 GHz to 12,75 GHz	$\pm 3,0$ dB

Uncertainty radiated	30 MHz to 4 GHz	± 6 dB
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NOTE: The uncertainties include the effect of a worst case reflection from the MS of 0,7 for out of band signals.

It is acceptable to use a band stop filter in spurious emission measurements of the transceiver in order to fulfil the above requirements.

A5.3.4.4 Inband selective power measurements

Power is to be measured selectively for output RF spectrum.

The measurement is performed on a single frequency while the MS is frequency hopping (ref.: section 13.3)

Uncertainty	$< \pm 1,6$ dB
-------------	----------------

NOTE: 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.

A5.3.4.5 Phase trajectory and frequency error measurements

Ref.: Sections 13.1 & 13.2 for definitions and methods of measurement.

Phase measurement uncertainty	± 1 degree RMS
	± 4 degrees for individual
	phase measurement samples

The phase measurement uncertainties above apply during the useful bits.

Frequency measurement uncertainty: +/- 5 Hz.

A5.3.4.6 RF delay measurements relative to nominal times

Range	-140 to +140 bit periods
Resolution	1/4 bit period
Uncertainty	+/- 1/8 bit period

A5.3.4.7 The wanted signal or traffic channel of serving cell

The Wanted signal is used in most of the specified RF measurements. The traffic channel of the serving cell is used in most of the signalling tests.

FREQUENCY:

Uncertainty: < +/- 5*10E-9

PHASE:

Uncertainty: < +/- 1 degree RMS and
< +/- 4 degrees peak(as defined in GSM 05.05)

LEVEL:

Uncertainty: < +/- 1 dB in section 13, 14 except:-
< +/- 3 dB for test 14.2 radiated
< +/- 1,2 dB for test 14.6
< +/- 2,5 dB for all other tests.

Settling time: < 10 us

DYNAMIC LEVEL SETTING:

The SS shall be able to switch from any power level to any other power level within the range of 30 dB on a timeslot per timeslot basis. This dynamic switching requirement only applicable for a single channel for a limited number of tests.

MODULATION: GMSK (as specified in GSM 05.04)

SPURIOUS:

inchannel: Covered by phase error

outchannel:

Noise Power, 1 Hz bandwidth:

<-100 dBc for >100kHz carrier offset,
<-110 dBc for >300kHz carrier offset,
<-121 dBc for >1500kHz carrier offset.

Non harmonics: < -55 dBc for > 100kHz carrier offset,
< -68 dBc for >1500kHz carrier offset

FREQUENCY HOPPING:

The signal shall be capable of hopping according to the criteria of GSM 05.02. The timing of the frequency change shall be such that frequency transitions do not occur during the active timeslot of the MS.

A5.3.4.8 The first interfering signal or traffic channel of the first adjacent cell

The First interfering signal is used in measurements of co-channel rejection, adjacent channel rejection and intermodulation rejection. The Traffic channel of the first adjacent cell is used in handover tests.

FREQUENCY:

Uncertainty: < +/- 5*10E-9

PHASE:

Uncertainty: < +/- 1 degree RMS and
< +/- 4 degrees peak(as defined in GSM 05.05)

LEVEL:

Uncertainty

- < +/- 1 dB relative to the wanted signal for test 13.2 and 14.5
- < +/- 0,3 dB relative to the wanted signal for test 14.4
- < +/- 1 dB for test 14.6
- < +/- 2,5 dB for all other tests

MODULATION: GMSK (as specified in GSM 05.04)

The total relative single sideband power (noise + harmonics) in the frequency range 1,5 to 1,7 MHz offset from the nominal carrier frequency shall be less than -72 dBc.

SPURIOUS:

Inchannel: Covered by phase error

Outchannel:

Noise Power, 1 Hz bandwidth:

- <-100 dBc for > 100kHz carrier offset
- <-110 dBc for > 300kHz carrier offset
- <-127 dBc for >1500kHz carrier offset

non harmonics

- < -55 dBc for > 100kHz carrier offset
- < -68 dBc for >1500kHz carrier offset

FREQUENCY HOPPING:

The signal shall be capable of hopping according to the criteria of GSM 05.02. The timing of the frequency change shall be such that frequency transitions do not occur during the active timeslot of the MS.

A5.3.4.9 The second interfering signal

The second interfering signal is used in the measurements of intermodulation rejection and blocking.

FREQUENCY:

Uncertainty: < +/- 5*10E-9

LEVEL:

Uncertainty:

- < +/- 1 dB for test 14.6
- < +/- 1,5 dB relative to the wanted signal for all other tests.

MODULATION: Unmodulated**SPURIOUS:**

Inchannel: No requirements

Outchannel:

Noise Power, 1 Hz bandwidth:

- <-135 dBc for > 500kHz carrier offset,
- <-140 dBc for > 700kHz carrier offset,
- <-150 dBc for >1500kHz carrier offset.

Non harmonics

- < -79 dBc for > 500kHz carrier offset,
- < -84 dBc for > 700kHz carrier offset,
- < -94 dBc for >1500kHz carrier offset

Harmonically related spuri \leq -40 dBc

A5.3.4.10 BCCH carriers of serving and adjacent cells

The BCCH of the serving cell is used for synchronizing the MS and to send network information to the MS under test. The BCCH signals of the adjacent cells are used in the handover tests. The MS measures the RF-levels of the BCCHs of adjacent cells.

FREQUENCY:

Uncertainty: < +/- 5*10E-9

PHASE:

Uncertainty: < +/- 1 degree RMS and
< +/- 4 degrees peak(as defined in GSM 05.05)

LEVEL:

Uncertainty: < 1 dB for tests 13.2 and 20
< 2,5 dB for all other tests
< 0,6 dB relative to each other and to TCH
for test 21 over the range 65 dBmicroVoltemf
to 3 dBmicroVoltemf
< 1,2 dB relative to each other and to TCH for test 26.3

MODULATION: GMSK (as specified in GSM 05.04)

SPURIOUS:

Inchannel: Covered by phase error

Outchannel:

Noise Power, 1Hz bandwidth:

<-100 dBc for > 100kHz carrier offset
<-125 dBc for >1500kHz carrier offset

Non harmonics < -55 dBc for > 100kHz carrier offset
< -72 dBc for >1500kHz carrier offset

A5.3.4.11 The wide frequency range signal

The wide frequency range signal is used in the measurements of spurious response.

FREQUENCY

Uncertainty: < +/- 5*10E-9

LEVEL

Uncertainty: < +/- 1,5 dB relative to the wanted signal for test 14.7
< +/- 1 dB error of substituted "wanted signal"

MODULATION: unmodulated

SPURIOUS in the MS receiving range

non harmonics: < -94 dBc

Harmonically related spurii: < -40 dBc

Noise: < -4 dBuVemf equivalent at the MS receiver input
when measured in a 200 kHz bandwidth.

A5.3.4.12 The multipath fading function

The multipath fading function simulates the fading effects of a broadband radio channel in mobile radio communication

The propagation conditions are specified in GSM 05.05, annex 3.

The multipath fading function shall be performed only within a 5 MHz bandwidth during one test case.

A5.3.5 MS audio interface and DAI**A5.3.5.1 General uncertainties**

Unless otherwise specified, the following uncertainties apply to the audio interface:--

Signal level measurement uncertainty: +/- 0,2 dB
Sound pressure measurement uncertainty: +/- 0,6 dB
Frequency Measurement uncertainty: +/- 0,1 %

Stimulus frequency setting uncertainty:

Frequency settings 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 $\pm 5\%$ below 240 Hz and $\pm 2\%$ at 240 Hz and above is accepted.

In the case of 4 kHz the departure is restricted to -2% .

A5.3.5.2 Analogue single test tone

Total distortion: $< 0,5\%$

A5.3.5.3 Delay measurement between Um and DAI

The delay measurement between the Um interface of the MS and its DAI in both directions is described in section 32.5.

Uncertainty: $< \pm 0,1\text{ ms}$

A5.4 SIM simulator functional requirements

A5.4.1 General

The SIM simulator shall implement the functions of a SIM as described in GSM 02.17 and 11.11.

The Test Algorithm for authentication incorporated in the SIM Simulator shall operate as described in annex 3

A5.4.2 Contacts C1, C2, C6, C7

A5.4.2.1 Default measurement / setting uncertainties

Unless stated otherwise below, the following uncertainties apply:

Voltage measurement uncertainty:	$< \pm 50\text{ mV}$
Voltage setting uncertainty:	$< \pm 20\text{ mV}$
Time measurement uncertainty:	$< \pm 100\text{ ns}$

A5.4.2.2 Contact C1

Continuous Spikes

Voltage measurement uncertainty:	$< \pm 100\text{ mV}$
Current Load Amplitude	0 mA - 20 mA
Adjustable Step Size	1 mA
Uncertainty	$< \pm 1\text{ mA}$
Additional Current Offset	0 mA - 5 mA
Adjustable Step Size	1 mA
Uncertainty	$< \pm 1\text{ mA}$
Pulse Width	100 ns - 500 ns
Adjustable Step Size	50 ns
Uncertainty	$< \pm 25\text{ ns}$
Rise and Fall Time	$\leq 50\text{ ns}$
Pause Width	100 ns - 500 ns
Adjustable Step Size	50 ns
Uncertainty	$< \pm 25\text{ ns}$

Random Spikes

Voltage measurement uncertainty:	< +/- 100 mV
Current Load Amplitude	50 mA - 200 mA
Adjustable Step Size	1 mA
Uncertainty	< +/- 1 mA
Additional Current Offset	0 mA - 5 mA
Adjustable Step Size	1 mA
Uncertainty	< +/- 0,1 mA
Pulse Width	100 ns - 500 ns
Adjustable Step Size	50 ns
Uncertainty	< +/- 25 ns
Rise and Fall Time	<= 50 ns
Pause Width	0,1 ms - 500 ms, randomly varied
Adjustable Step Size	0,1 ms
Uncertainty	< +/- 0,1 ms

A5.4.2.3 Contact C7

The Elementary Time Unit (etu) used in the sections below refer to the nominal bit duration on the I/O line, as defined in ISO 7816-3.

Rise & fall Time setting uncertainty:	< +/- 100 ns
Jitter measurement uncertainty:	< +/- 5*10E-3 etu
Jitter setting uncertainty:	< +/- 5*10E-3 etu

A5.4.3 Contact C3

Frequency measurement uncertainty:	< +/- 0,5 %
Voltage Measurement uncertainty:	< +/- 50 mV
Rise & fall time measurement uncertainty:	< +/- 5 ns
Duty cycle measurement uncertainty:	< +/- 2,5 %

A5.4.4 Definition of timing

It shall be possible to define all timings relative to the clock. The SIM simulator shall be able to calculate and to use the absolute values automatically, even if the ME changes the frequency during the communication.

History

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