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GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

# Digital cellular telecommunications system (Phase 1); Mobile station conformance test system Part 3: DCS 1 800 mobile station conformity specification (GSM 11.10-DCS)


## ETSI

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## Foreword

This Interim European Telecommunication Standard (I-ETS) has been produced by the Special Mobile Group (SMG) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This I-ETS 300 020-3 second edition has been produced as a result of further updating work carried out by TC-SMG on the base document GSM 11.10-DCS. This I-ETS 300 020-3, corresponds to ETSI Technical Specification GSM 11.10-DCS version 3.14.0.

This part of the I-ETS (Part 3), contains conformity specifications for which DCS 1 800 mobile stations, within the digital cellular telecommunications system (Phase 1), are tested for compliance. This I-ETS describes the test procedures, test conditions and test site and the provisions within the DCS 1 800 mobile station, to support the process of conformance testing.

I-ETS 300 020 consists of the following three parts:

I-ETS 300 020-1 — Digital cellular telecommunications system (phase 1)
Mobile station conformance test system
System simulator specification
(Part 1)

Reference: GSM 11.10.

I-ETS 300 020-2 — Digital cellular telecommunications system (phase 1)
Mobile station conformance test system
System simulator specification
(Part 2)

Reference: GSM 11.40.

**I-ETS 300 020-3 — Digital cellular telecommunications system (phase 1)**
**Mobile station conformance test system**
**System simulator specification**
**Part 3: DCS 1 800 mobile station conformity specification**

**Reference: GSM 11.10-DCS.**

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These GSM-TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM documents.

The specification from which this I-ETS has been derived was originally based on CEPT documentation, hence the presentation of this I-ETS is not in accordance with the ETSI/PNE rules.

**The page numbering of the main part of this I-ETS is aligned with GSM-TS 11.10 version 3.14.0. This I-ETS contains 245 pages in total.**

| **Proposed announcement date** | |
|---|---|
| Date of adoption | 25 October 1996 |
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ETSI/TC SMG

Updated by: ETSI/PT12/48V

Date: May 1996

ETSI TECHNICAL SPECIFICATION GSM 11.10-DCS

DCS 1 800 Mobile Station Conformity Specification

Version 3.14.0

Table of Contents

NOTE 1: GSM 11.10-DCS consists of GSM 11.10 V3.19.0 with the following parts replaced by those contained in this specification.

NOTE 2: Complete parts are included.

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# 0 Introduction

This document gives details of the paragraphs in GSM11.10 which have changed for a mobile station intended for use with a DCS 1 800 PLMN. The sections are given the same numbering as in GSM11.10. All other sections of GSM 11.10 are applicable to a DCS 1 800 mobile station.

All references to GSM recommendations in this document shall mean the GSM series of recommendations as modified by the DCS 1 800 delta recommendations.

For the purpose of type approval of a mobile station for the DCS 1 800 service the tests in GSM 11.10 are applicable except for those listed herein as annex X, where the test given below is applicable.

# 1 GENERAL

## 1.1 Scope

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

In these specifications, a ~~GSM~~(DCS 1 800) 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 station equipment in the ~~GSM~~DCS 1 800 system and to prevent interference to other services or to other users, and to GSM and DCS 1 800 PLMNs. Where the 900 MHz service is referred to in sections of GSM 11.10 not included in this document then this shall be considered as the 1 800 MHz service.

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~~DCS 1 800 system, using constant envelope modulation and operating on radio frequencies in the ~~900~~1 800 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 GSMDCS 1 800 system. This specification lists the requirements, and provides the methods of testing for use by test houses when testing a ~~GSM~~DCS 1 800 mobile station for conformance.

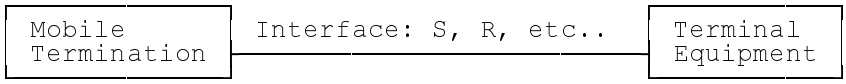
For a full description of the ~~GSM~~DCS 1 800 system, please refer to all the ~~GSM~~ recommendations plus the set of delta recommendations~~which are grouped into 12 different series~~. A complete list of the ~~GSM~~ recommendations, on which these conformance test specifications are based, is listed in ~~paragraph 1.5~~ GSM 11.10.A list of the recommendations amended for DCS 1 800 is given in paragraph 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~~A Mobile Station is the complete equipment configuration ~~that is present in a vehicle, and~~ which may take part in ~~the~~a 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~~ DCS1 800 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.




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 setup 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-DCS.

### 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 that, ~~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 document, Recommendation GSM 11.40-DCS. ~~This System Simulator is a mandatory tool for conformance testing of GSM MSs~~.The use of such a SS is assumed throughout GSM 11.10-DCS.

## 1.3 Definitions

Only a limited set of definitions, with special relevance to the MS and to conformance testing are included. For a more complete set of expressions see rec. GSM 01.04

**~~GSM~~ DCS1 800 Mobile Station (~~GSM~~ DCS1 800 MS) ref.: ~~01.04~~ GSM 02.06-DCS**

Equipment intended to access a set of ~~GSM~~ DCS1 800 PLMN telecommunication services. Services may be accessed while the equipment capable of surface movement within the ~~GSM~~ DCS1 800 system area is in motion or during halts at unspecified points.

**Mobile termination**

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-C0MB | Logical variable that indicates the combination of dedicated and associated control channels on the same physical channel | 05.02 |
| BS_PA_MFR_MS | 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) | |
| 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) | |
| RA | RAndom mode request information field | |
| RACH | Random Access CHannel | 05.02 |
| RADIO-LINK-TIME0UT | The time-out 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/T | 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 |
| 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-DCS):

E (dBµV/m) = P (dBm) + ~~136.5~~142.3 (valid for a frequency of ~~925~~17 95 MHz).

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

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

where: $E_{in}$ = input signal level to~~ coupling device~~ 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, Ein 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-DCS.

They are expressed by typical profiles:

| | |
|---|---|
| static | |
| rural area | (RA); |
| hilly terrain | (HT); |
| urban area | (TU); |
| or for equalization test | (EQ). |

The non-static profiles are also related to typical speeds of movement of the MS expressed in km/h, e.g. TU~~3~~1.5, 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 delta recommendations, on which these test specifications are based

| Number | Version | Title |
|---|---|---|
| ~~02.02~~ | ~~3.01.01~~ | ~~Bearer Services Supported by a GSM PLMN~~ |
| ~~02.03~~ | ~~3.04.00~~ | ~~Teleservices Supported by a GSM PLMN~~ |
| ~~02.04~~ | ~~3.06.01~~ | ~~Description of Supplementary Services~~ |
| 02.06-DCS | ~~3.02.00~~3.0.0 | Types of Mobile Stations |
| ~~02.07~~ | ~~3.03.00~~ | ~~Mobile Station Features~~ |
| ~~02.09~~ | ~~3.00.01~~ | ~~Security Aspects~~ |
| 02.11-DCS | ~~3.04.00~~3.0.1 | Service Accessibility |
| ~~02.16~~ | ~~3.00.01~~ | ~~International MS Equipment Identities~~ |
| ~~02.17~~ | ~~3.02.00~~ | ~~Subscriber Identity Modules, Functional Characteristics~~ |
| ~~02.30~~ | ~~3.05.00~~ | ~~Man-machine Interface of the Mobile Station~~ |
| ~~02.40~~ | ~~3.02.00~~ | ~~Procedures for Call Progress Indications~~ |
| ~~02.82~~ | ~~3.06.00~~ | ~~Call Offering Supplementary Services~~ |
| ~~02.88~~ | ~~3.06.00~~ | ~~Call Restriction Supplementary Services~~ |
| ~~03.03~~ | ~~3.04.01~~ | ~~Numbering, Addressing and Identification~~ |
| ~~03.10~~ | ~~3.03.00~~ | ~~GSM PLMN Connection Types~~ |
| ~~03.13~~ | ~~3.00.02~~ | ~~Discontinuous Reception (DRX) in the GSM System~~ |
| ~~03.14~~ | ~~3.00.02~~ | ~~Support of DTMF via the GSM System~~ |
| ~~03.20~~ | ~~3.03.00~~ | ~~Security-related Network Functions~~ |
| ~~03.40~~ | ~~3.04.00~~ | ~~Technical Realization Short Message Service Point-to-point~~ |
| ~~03.41~~ | ~~3.02.00~~ | ~~Technical Realization of Short Message Service Cell Broadcast~~ |
| ~~03.43~~ | ~~3.00.01~~ | ~~Technical Realization of Videotex~~ |
| ~~03.44~~ | ~~3.00.01~~ | ~~Support of Teletex in a GSM PLMN~~ |
| ~~03.45~~ | ~~3.00.01~~ | ~~Technical Realization of Facsimile Group 3 Service - transparent~~ |
| ~~03.46~~ | ~~3.00.00~~ | ~~Technical Realization of Facsimile Group 3 Service - non transparent~~ |

| | | |
|---|---|---|
| ~~03.50~~ | ~~3.01.00~~ | ~~Transmission Planning Aspects of the Speech Service in the GSM PLMN System~~ |
| ~~04.01~~ | ~~3.00.01~~ | ~~MS-BSS Interface - General Aspects and Principles~~ |
| ~~04.02~~ | ~~3.00.02~~ | ~~GSM PLMN Access Reference Configuration~~ |
| ~~04.03~~ | ~~3.00.03~~ | ~~MS-BSS Interface: Channel Structures and Access Capabilities~~ |
| ~~04.04~~ | ~~3.03.00~~ | ~~MS-BSS Layer 1 - General Requirements~~ |
| ~~04.05~~ | ~~3.01.04~~ | ~~MS-BSS Data Link Layer - General Aspects~~ |
| ~~04.06~~ | ~~3.06.00~~ | ~~MS-BSS Data Link Layer Specification~~ |
| ~~04.07~~ | ~~3.03.02~~ | ~~Mobile Radio Interface Signalling Layer 3 - General Aspects~~ |
| 04.08-DCS | ~~3.08.00~~3.1.0 | Mobile Radio Interface - Layer 3 Specification |
| ~~04.10~~ | ~~3.02.01~~ | ~~Mobile Radio Interface Layer 3 - Supplementary Services Specification - General Aspects~~ |
| ~~04.11~~ | ~~3.01.00~~ | ~~Point-to-point Short Message Service Support on Mobile Radio Interface~~ |
| ~~04.12~~ | ~~3.02.00~~ | ~~Cell Broadcast Short Message Service Support on Mobile Radio Interface~~ |
| ~~04.21~~ | ~~3.02.00~~ | ~~Rate Adaptation on MS-BSS Interface~~ |
| ~~04.22~~ | ~~3.04.00~~ | ~~Radio Link Protocol for Data and Telematic Services on the MS-BSS Interface~~ |
| ~~04.80~~ | ~~3.00.01~~ | ~~Mobile Radio Interface Layer 3 - SS Specification - Formats and Coding~~ |
| ~~04.82~~ | ~~3.01.01~~ | ~~Mobile Radio Interface Layer 3 - Call Offering SS Specification~~ |
| ~~04.88~~ | ~~3.01.01~~ | ~~Mobile Radio Interface Layer 3 - Call Restriction SS Specification~~ |
| 05.01-DCS | ~~3.03.01~~3.0.0 | Physical Layer on the Radio Path (General Description) |
| ~~05.02~~ | ~~3.04.01~~ | ~~Multiplexing and Multiple Access on the Radio Path~~ |
| ~~05.03~~ | ~~3.05.01~~ | ~~Channel Coding~~ |
| ~~05.04~~ | ~~3.01.01~~ | ~~Modulation~~ |
| 05.05-DCS | ~~3.11.00~~3.1.0 | Radio Transmission and Reception |
| 05.08-DCS | ~~3.06.00~~3.0.0 | Radio Subsystem Link Control |
| ~~05.10~~ | ~~3.04.00~~ | ~~Radio Subsystem Synchronization~~ |
| ~~06.01~~ | ~~3.00.00~~ | ~~Speech Processing Functions: General Description~~ |
| ~~06.10~~ | ~~3.02.00~~ | ~~GSM Full Rate Speech Transcoding~~ |
| ~~06.11~~ | ~~3.00.00~~ | ~~Substitution and Muting of Lost Frames for Full-rate Speech Traffic Channels~~ |
| ~~06.12~~ | ~~3.00.00~~ | ~~Comfort Noise Aspects for Full Rate Speech Traffic Channels~~ |
| ~~06.31~~ | ~~3.00.01~~ | ~~Discontinuous Transmission (DTX) for Full Rate Speech Traffic Channels~~ |
| ~~06.32~~ | ~~3.00.00~~ | ~~Voice Activity Detection~~ |
| ~~07.01~~ | ~~3.08.00~~ | ~~General on Terminal Adaptation Functions for MSs~~ |
| ~~07.02~~ | ~~3.06.00~~ | ~~Terminal Adaptation Functions for Services Using Asynchronous Bearer Capabilities~~ |
| ~~07.03~~ | ~~3.01.00~~ | ~~Terminal Adaptation Functions for Services Using Synchronous Bearer Capabilities~~ |
| 09.02-DCS | ~~3.05.01~~3.0.0 | Mobile Application Part Specification |
| ~~11.01~~ | ~~3.00.00~~ | ~~Principles of Type Approval Procedures for GSM MSs~~ |
| 11.11-DCS | ~~3.03.00~~3.0.0 | Specification of the Internal Logical Organization of the SIM and its Interfaces |
| 11.40-DCS | ~~3.00.00~~3.1.0 | System Simulator Specification (MS conformance test system) |

# Aspect I: FORMAL PROCEDURES AND GENERAL REQUIREMENTS

## I.1 Formal procedures ref.: 11.01

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 functions or procedures 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 2 special conformance test facilities is mandatory:

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

- provision of a Digital Audio Interface (only for MS's which support speech services, or alternate speech/data services);

- for equipment which does not have a permanent external 50 ohm connector, a temporary 50 ohm antenna connector shall be provided in accordance with the requirements of annex 1 GC6.

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 $D_m$-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 testing 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~~ DCS1 800 PLMNs, see GSM 02.02-DCS and GSM 02.03-DCS.

With the application for conformance testing, the applicant indicates which services are supported by the MS. Refusal by the MS to support services for which the MS provides no support is tested in section II.10.3. 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 test 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.10.3 Testing of Call Set-up and Release for Data Services
II.16 MS features
II.12 Supplementary services
II.17 Selftesting of the MS

MSs supporting speech teleservices shall in addition undergo the tests in section:

(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 section:

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~~[-10] 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.

# II.2 The Transceiver

**Ref. GSM 05.05-DCS**

**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.: 05.05-DCS ~~clause 2~~

A ~~GSM~~DCS 1 800 mobile station (M.S.) shall be able to transmit in the frequency band ~~890 - 915~~1 710 - 1 785 MHz and receive in the frequency band ~~935 - 960~~1 805 - 1 880 MHz.

### II.2.1.2 RF Channels and channel numbering ref.: 05.05-DCS cl.2

The channel spacing shall be 200 kHz.

A ~~GSM~~DCS 1 800 MS shall be equipped to transmit on each of the RF channels within the transmit band. The nominal centre frequency for each RF channel is given by the following expression:

Fc = ~~890~~1 710.2 + ~~n x~~ 0.2 *(n-512) MHz, where n ranges from ~~1~~512 to ~~124~~885.

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

A ~~GSM~~DCS 1 800 MS 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~~1805.2 + ~~n x~~ 0.2 * (n-512) MHz. where n ranges from ~~1~~512 to ~~124~~885.

### 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, GC, unless otherwise indicated in the individual tests.

## 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 ~~an~~ 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 test sample using the integral antenna (or, if preferred, this test may be performed on a single test sample prior to the fitting of the temporary antenna connector).

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 6 dB 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~~ 690 to 710.

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<br>to 50 MHz | - | 10 kHz | 30 kHz |
| 50 MHz<br>to 500 MHz | - | 100 kHz | 300 kHz |
| 500 MHz<br>to 12.75 GHz<br><br>Excl. 890 MHz<br>to 915 MHz<br>and 935 MHz<br>to 960 MHz<br><br>and 1 710 MHz<br>to 1 785 MHz<br><br>and 1 805 MHz<br>to 1 880 MHz | >= 2 MHz<br>>= 5 MHz<br>0 MHz - 10 MHz<br>>= 10 MHz<br>>= 20 MHz<br>> 30 MHz<br><br>(offset from edge of MS TX Band) | 30 kHz<br>100 kHz<br>100 kHz<br>300 kHz<br>1 MHz<br>3 MHz | 100 kHz<br>300 kHz<br>300 kHz<br>1 MHz<br>3 MHz<br>10 MHz<br><br>=> 3 MHz |
| 890 1 710 MHz<br>to 915 1 785 MHz | 1.8 MHz to 6.0 MHz<br>> 6.0 MHz<br>(offset from carrier) | 30 kHz<br>100 kHz | 100 kHz<br>300 kHz |

NOTE a) Due to practical implementation of a SS, the video bandwidth is restricted to a maximum of 3 MHz.

NOTE b) The filter bandwidth for frequencies below 500 MHz is reduced from 3 MHz due to increasing internal noise of available test equipment.

NOTE c) The frequency ranges 935 MHz to 960 MHz and 1 805 MHz to 1 880 MHz are excluded as these ranges are tested in section II.3.4.

NOTE d) The filter abd video bandwidths and frequency offsets are only correct for measurements on a MS transmitting on an ARFCN in the range 690 to 710.

#### II.2.2.2.2 MS in Idle Mode

Spurious emissions shall be measured as the power level of any discrete signal, greater than 6 dB 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 Reorganization 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~~690 to 710.

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 30 MHz to 4 GHz.

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 polarization 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<br>to 50 MHz | - | 10 kHz | 30 kHz |
| 50 MHz<br>to 500 MHz | - | 100 kHz | 300 kHz |
| 500 MHz<br>to ~~1~~4 GHz<br>Excl. ~~890 MHz~~<br>~~to 915 MHz~~<br><br>1710 MHz<br>to 1785 MHz | 0 MHz - 10 MHz<br>~~> 2 MHz~~<br>~~>= 5 MHz~~<br>>= 10 MHz<br>>= 20 MHz<br>>= 30 MHz<br>offset from edge of band | 100 kHz<br>~~30 kHz~~<br>~~100 kHz~~<br>300 kHz<br>1 MHz<br>3 MHz | 300 kHz<br>~~100 kHz~~<br>~~300 kHz~~<br>1 MHz<br>3 MHz<br>~~10 MHz~~<br>=> 3 MHz |
| ~~890 MHz~~<br>~~to 915 MHz~~<br><br><br>1 710 MHz<br>to 1 785 MHz | 1.8 MHz to 6.0 MHz<br><br>> 6.0 MHz<br><br>(offset from carrier) | 30 kHz<br><br>100 kHz | 100 kHz<br><br>300 kHz |

NOTE a) Due to practical implementation of a SS, the video bandwidth is restricted to a maximum of 3 MHz.

NOTE b) The filter bandwidth for frequencies below 500 MHz is reduced from 3 MHz due to increasing internal noise of available test equipment.

NOTE c) The filter and video bandwidths and frequency offsets are only correct for measurements on a MS transmitting on an ARFCN in the range 690 to 710.

#### 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 Reorganization 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 30 MHz to 4 GHz.

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 polarization 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)(1 microwatt)~~ | ~~-30 dBm~~ |
| ~~IDLE-mode~~ | ~~57 dBm (2 nanowatt)(20 nanowatt)~~ | ~~47 dBm~~ |

| | **100 kHz to 1 000 MHz** | **1 GHz to 1 710 MHz 1 785 to 1 805 MHz 1 880 MHz to 12.75 MHz** | **1 710 to 1 785 MHz** | **1 805 to 1 880 MHz** |
|---|---|---|---|---|
| Allocated Channel | -36 dBm | -30 dBm | -36 dBm- | -30 dBm |
| Idle Mode | -57 dBm | -47 dBm | -57 dBm | -57 dBm |

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-DCS**

## 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 ~~direct~~ to the permanent antenna connector for a MS~~ having an~~ which is equipped with one~~ antenna connector~~ or shall use a modified test sample fitted with a temporary antenna connector as defined in annex 1 GC6~~ via an antenna coupling device~~ 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 the 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:

$ø_m = ø_m(0)...ø_m(n)$

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:

$ø_c = ø_c(0)...ø_c(n)$.

f.3) The error array is represented by the vector:
$ø_e = \{ø_m(0) - ø_c(0)\}.....\{ø_m(n) - ø_c(n)\} = ø_e(0)...ø_e(n)$.

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 $ø_e$.

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

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

f.7) The frequency error is given by k/(360 * t), where t 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:

$ø_e(j) - k*t(j)$.

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

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

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~~ 10 for class 1 MS or 13 for class 2 MS, 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 & Interference Conditions

**Ref. 05.10 clause 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: Rec. GSM 05.10-DCS 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~~ 22 dBµVemf(...) to enable the mobile station to acquire synchronization.

#### II.3.2.1 Method of Measurement

a) Set up call on a traffic channel in the range ARFCN 690 - 710 ~~60-65~~ with the SS fading function set to ~~RA250~~ RA130 and with an MS input level of ~~-20~~ 22 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 two ~~six~~ adjacent cell BCCH's having signal levels in the range ~~-14~~ 19 dBµVemf( ) to 60dBµVemf( ). 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 (say five channels separated) if it is set to maximum level.

- Of the two ~~six~~ adjacent cell BCCH's, ~~two~~ one should be located near the band edges.

The amplitude and ARFCN of ~~all six~~ the two 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~~ 13 dBµVemf( ) ~~for handheld MS's and 9 dBµVemf( ) for all other MS's.~~

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 BCCH's 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 Recommendation 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~~ 22 dBµVemf( ) and sets up a call on the traffic channel with an MS input level of ~~-20~~ 22 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~~ 22 dBµVemf( ) and sets up a call on the traffic channel with an MS input level of ~~-20~~ 22 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~~ 30 dBµVemf( ) and sets up a call on the traffic channel with an MS input level of 30 dBµVemf( ), with each channel applied to the MS via the SS fading function set at TU1.5. The SS shall capture the first transmitted burst from the MS during call establishment.~~, with the fading function set to TU3.~~

~~The SS sets up a cal on the traffic channel with an MS input level of 28 dBµVemf ( ), with the SS fading function set to 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 independent interfering signals on the same nominal carrier frequencies as the active channels ~~serving cell BCCH and the traffic channels~~. These interfering signals shall be at a level of ~~-18~~ 21 dBuVemf( ) each via a fading function set to TU1.5 ~~-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) - (n) are repeated for ARFCN of ~~1~~513 - ~~5~~523 and ~~120~~874 - ~~124~~884.

p) Repeat steps (i) and (j) for the combinations of extreme voltage and temperature (see annex 1, TC 2.2 and TC 3) 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** |
|---|---|
| RA~~250~~130 | +/- ~~300~~400 Hz |
| HT100 | +/- ~~175~~350 Hz |
| TU50 | +/- ~~135~~260 Hz |
| TU~~3~~1.5 | +/- ~~95~~180 Hz |

### II.3.3 Peak transmitter carrier power & burst timing

**Ref.: 05.05-DCS**

### 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 bursts 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 rising and falling edge each by 1/2 bit (1.84 us) as shown in figure App.3-1 of GSM 11.40-DCS, 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 to the Test Report.

### II.3.3.2 Methods of measurement

Two methods of measurement are described, separately for:

1) Equipment fitted with ~~an~~ 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~~ a permanent 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~~690 - ~~65~~710 (ARFCN), power control level set to Max power and timing advance 0.

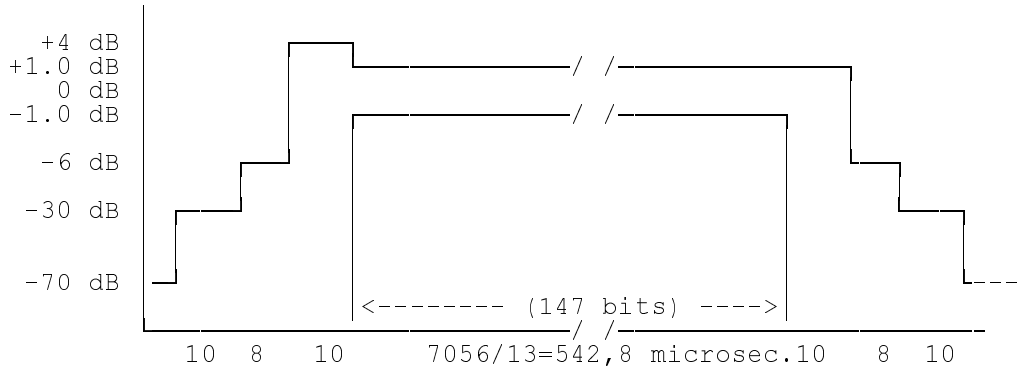



**Figure II.3.3: Power/time template. For a transmitter carrier power lower than ~~3~~423 dBm, where the level of -70 dB is lower than - ~~36~~47 dBm, the -70 dB shall be replaced by a value which is equivalent to - ~~36~~47 dBm.**

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, optionally this could be done by two consecutive measurements with at least 40 dB dynamic range each to cover the full dynamic range of 70 dB. 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~~14 power control levels (see table II.3.3) and steps (b) - (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~~512 to 527, 605 to 620, 791 to 806, 869 to 884.~~.~~

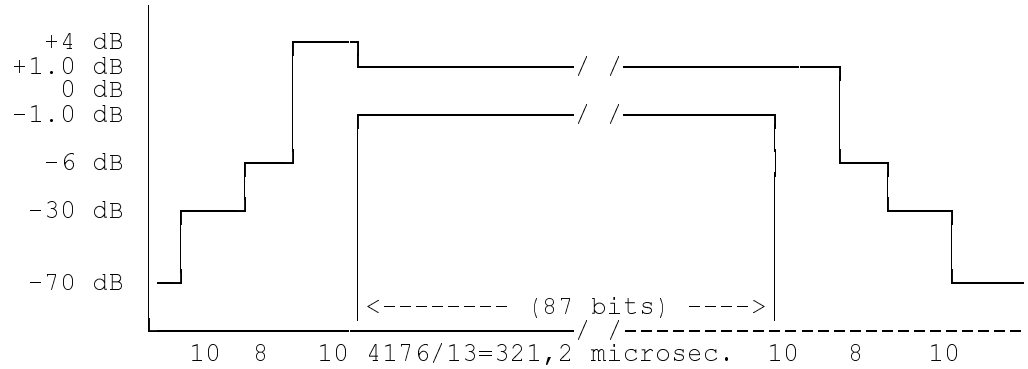



**Figure II.3.4: Power/Time Template for Access Burst. For a transmitter carrier power lower than ~~3~~23 dBm, where the level of -70 dB is lower than - ~~36~~47 dBm, the -70 dB shall be replaced by a value which is equivalent to -~~36~~47 dBm.**

g) The SS shall cause the MS to generate an Access Burst on an ARFCN in the range ~~60~~690 - ~~65~~710. 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 control level 10 (+~~23~~10 dBm). Steps (g) to (j) shall be repeated.

l) Tests (a) to (k) shall be repeated for the following extreme test conditions (see annex 1, TC2.2 and TC3) except that for step e) only ~~power control levels 10 and 15~~ the minimum power control level and the level 10 dB above that 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 subclause II.3.3.2.1 shall be applied.

The tests in this section shall be performed on an unmodified test sample or on a single test sample prior to the fitting of the temporary antenna connector (see annex 1, GC6)

The MS shall be in the anechoic shielded chamber (subclause A1.1.2.5) or on the 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~~690 - ~~65~~710, 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 mid amble, 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 mid amble 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~~11 power control levels applicable to the MS power class(see table II.3.3) and steps (b) - (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~~512 to 527, 605 to 620, 791 to 806, 869 to 884.

g) The SS shall cause the MS to generate an access burst on an ARFCN in the range ~~60~~690 - ~~65~~710. 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).

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(~~+23~~10 dBm). Steps (g) to (j) shall be repeated.

l) The MS shall be rotated by n*45° for all values of n in the range 1-7. 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~~ 1 747.5 MHz), connected to an RF generator.

n) The output power of the RF generator shall be adjusted to reproduce the peak received transmitter power 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 (b). Record values in the form Pnc where n = MS rotation and c = channel number.

For each channel number used compute:

$$P_{ac}\ (\text{Watts into dipole}) = 0.125 * \sum_{n=0}^{n=7} P_{nc}$$

from which: $P_{ac}\ (\text{Tx dBm}) = 10\log10(P_{ac}) + 30 + 2.15$

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) The MS is now modified to allow connection to a temporary antenna connector, or a separate test sample equipped with a temporary antenna connector is placed in the climatic test chamber and is linked to the SS ~~via an antenna coupling device~~ by means of the temporary antenna connector.

q) Under normal test conditions steps (a) - (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~~ the minimum power control level and the level 10 dB above the minimum shall be tested.

NOTE: The values noted here are related to the peak transmitter carrier power level 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~~coupling device~~ 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~~ the minimum power control level and the level 10 dB above the minimum 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 (n).

### 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.

**Table II.3.3: Peak transmitted carrier power for different power classes**

| POWER CLASS | POWER CONTROL LEVEL | PEAK TRANSMITTED CARRIER POWER | TOLERANCES | |
|---|---|---|---|---|
| 1 2 ~~3 4 5~~ | | dBm | N.T.C. | E.T.C. |
| X | 0 | ~~43~~30 | +/-2.0 dB | +/-2.5 dB |
| X | 1 | ~~41~~28 | +/-3 dB | +/-4 dB |
| X ~~X~~ | 2 | ~~39~~26 | +/-3 dB*) | +/-4 dB*) |
| X X ~~X~~ | 3 | ~~37~~24 | +/-3 dB*) | +/-4 dB*) |
| X X ~~X~~ | 4 | ~~35~~22 | +/-3 dB | +/-4 dB |
| X X ~~X X~~ | 5 | ~~33~~20 | +/-3 dB | +/-4 dB |
| X X ~~X X~~ | 6 | ~~31~~18 | +/-3 dB | +/-4 dB |
| X X ~~X X X~~ | 7 | ~~29~~16 | +/-3 dB | +/-4 dB |
| X X ~~X X X~~ | 8 | ~~27~~14 | +/-3 dB | +/-4 dB |
| X X ~~X X X~~ | 9 | ~~25~~12 | +/-~~3~~4 dB | +/-~~4~~5 dB |
| X X ~~X X X~~ | 10 | ~~23~~10 | +/-~~3~~4 dB | +/-~~4~~5 dB |
| ~~X~~ X ~~X X X~~ | 11 | ~~21~~ 8 | +/-~~3~~4 dB | +/-~~4~~5 dB |
| ~~X~~ X ~~X X X~~ | 12 | ~~19~~ 6 | +/-~~3~~4 dB | +/-~~4~~5 dB |
| ~~X~~ X ~~X X X~~ | 13 | ~~17~~ 4 | +/-~~3~~4 dB | +/-~~4~~5 dB |
| ~~X X X X X~~ | ~~14~~ | ~~15~~ | ~~+/-3 dB~~ | ~~+/-4 dB~~ |
| ~~X X X X X~~ | ~~15~~ | ~~13~~ | ~~+/-3 dB~~ | ~~+/-4 dB~~ |

*) 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.

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~~ level 10 (10 dBm) for class 1 or 13 (4 dBm)for class 2 up to the maximum peak power corresponding to the class of the particular mobile station 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~~ not 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~~ the closest power control level 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 ( 731 microsecond) ~~+~~± 1~~/2~~ bit period (±~~1.8~~3.69 microsecond) 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-DCS section 4.3**

#### 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~~ a permanent 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 ~~an~~ a permanent antenna connector, then either the MS is modified to accept a temporary antenna connector (see annex 1, GC6) or a second test sample is used fitted with such a temporary antenna connector.~~coupled to the SS via an antenna coupling device (annex 1, GC6), and is~~The SS is connected to the temporary antenna 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~~ 513 to 523, a second one with an ARFCN in the range ~~60 to 65~~ 690 to 710 and the third one with an ARFCN in the range ~~120 to 124.~~ 874 to 884.

Range 512 format of frequency list (GSM 04.08-DCS section 10.5.2.9a.4) shall be used to address the mobile allocation used for frequency hopping.

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

When averaging is in use during frequency hopping mode, the averaging shall only include bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement.

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 23 dBmicroVolt 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~~690 to 710.

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 and 9
and FT = RF channel nominal centre frequency.

g1) The analyser settings shall be adjusted to

Zero frequency scan
Resolution bandwidth 100 kHz
Video bandwidth 100 kHz
Video averaging

The power level measurement shall be continued beyond the range of the step g) measurements and extending over the whole MS Tx band.

1 710.2 + 0.2*(n-512) MHz (512<= n <= 885)

For each frequency the averaging shall be done for 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 50 transmitted bursts per group.

NOTE: For offsets greater than 6 MHz, the following changes to the test method apply to take into account the dynamic range limitations of the system simulator.

Measurements will be carried out in non-hopping mode.

A notch filter centred on the transmit frequency will be used to reduce the power level of the carrier. Measured power levels will be adjusted based on the filter calibration to create relative power values.

h) The measurement at frequencies up to FT +/- 1 800 kHz shall be repeated for the minimum MS 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~~maximum 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 the minimum power control level.~~s 7 and 11.~~

l) The spectrum analysis function shall be tuned to the hop pattern channel with an ARFCN in the range 513 to 523. Steps f) to g1) and i) to j) shall be repeated except that at step j) the MS shall be commanded to minimum power level.

m) The spectrum analysis function shall be tuned to the hop pattern channel with an ARFCN in the range~~ 120 to 124.~~874 to 884. Steps f) to g1) and i) to j) shall be repeated except that at step j) the MS shall be commanded to minimum power level.

n) The MS shall be commanded to full power and ~~steps e) and f) shall be repeated, except that~~ the System Simulator set to the conditions of e) and g1). T~~-t~~he power level shall be measured ~~over the range 935 to 960 MHz in 30 kHz steps,~~at the following frequencies:

1 805.2 + 0.2*(n-512) (512<= n <=885)
935.2 + ).2*(n-1) (1<= n <=124)

and with the spectrum analyser set to a resolution bandwidth of 100 kHz and a video bandwidth of ~~300~~100 kHz.~~ and at each step,~~For each frequency the averaging shall be done for~~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~~ the antenna coupling device is also placed in the test chamber~~ the MS under test shall be modified to accept a temporary antenna connector, or if preferred, a second test sample equipped with a temporary antenna connector (see annex 1 GC6) shall be used.

p) Steps e) to g1) and i) to j) shall be repeated - except that at step i) the MS shall be commanded to ~~power level 11~~ the minimum power applicable to the MS power class - 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 relative to a measurement in 30 kHz on the carrier frequency shall not exceed the values shown in table II.3.4.2. Offsets from the carrier frequency are shown in kHz.

**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 antenna connector

int. ant. = for MS with integral antenna

| **power level (dBm)** | **measurement bandwidth** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **30 kHz** | | | | | **100 kHz** | |
| | 100 | 200 | 250 | 400 | 600 to 1 800 | >1 800 to 6 000 | >6 000 |
| 30 | +0.5 | -30 | -33 | -60 | -60 | -63 | -75 |
| 28 | +0.5 | -30 | -33 | -60 | -60 | -63 | -73 |
| 26 | +0.5 | -30 | -33 | -60 | -60 | -61 | -71 |
| <= 24 | +0.5 | -30 | -33 | -60 | -60 | -59 | -69 |

NOTE: The limit of 6 MHz and 30 dBm differs from the 05.05-DCS values because of equipment limitations.

For all power levels tested tThe maximum power measured at step n) in the band 935 to 960 MHz shall be shall be no more than -77 dBm and in the band 1 805 to 1 880 MHz shall be no more than -71 dBm except in up to 5 measurements where a level of up to -36 dBm is permitted in each set of measurements grouped by the hopping frequencies.

For measurements using frequency offset greater than 6 MHz with no frequency hopping the results only refer to one frequency group and must be interpreted accordingly.

For measurements performed on a temporary antenna connector it is not possible to accurately calibrate the connector coupling loss outside the MS transmit band. Absolute levels less than the -77 dBm or -36 dBm (as appropriate) figure require no further investigation.

For recorded levels above the appropriate limit further investigation shall be performed on an unmodified test sample using the internal antenna.

Using the spectrum analyser settings of step n), measurements shall be performed in a shielded anechoic chamber (subclause A1.1.2.5) or on the test site. An 8 position average emission level shall be calculated using the substitution method of II.3.3.2.2.

~~-76 dBm for class 1 MSs, and~~

~~-84 dBm for class 2, 3, 4 or 5 MSs.~~

NOTE 1: For each value of FT in the combined frequency range formed both by:

1) Step g) measurements in the range FT-1 800 kHz to FT-600 kHz and FT+600 kHz to FT+1 800 kHz;

and

2) Step g1) measurements in the range FT-6 000 kHz to FT-1 800 kHz and FT+1 800 kHz to FT+6 000 kHz.

Up to a total of 3 measurements in the combined set of measurements grouped by the hopping frequencies can be up to -36 dBm.

~~NOTE 1: For each value of FT, 1 measurement in the combined range FT + 400 kHz to FT + 1 800 kHz, and FT - 400 kHz to FT - 1 800 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.~~

NOTE 2: Up to 12 measurements (in each set of measurements grouped by the hopping frequencies) above 6 MHz offset from the nominal carrier frequency to the edge of the transmit band in test g1) may be at a level up to -36 dBm ( ).

NOTE 3: As a result of GSM 05.05-DCS section 4.2.1 note iii, relaxations of the measurements in steps g and h are possible where:

1) For offsets between 100 kHz and 600 kHz if the table indicates that measurements performed in a 30 kHz bandwidth relative to a measurement in 30 kHz on the carrier would result in an absolute level measured in 30 kHz of less than -36 dBm ( ) then a value of -36 dBm ( ) shall apply for offsets of up to (and including) 600 kHz from the carrier.

2) For offsets greater than 600 kHz up to (and including) 1 800 kHz. if the table indicates that measurements performed in a 30 kHz bandwidth relative to a measurement in 30 kHz on the carrier would result in an absolute level measured in 30 kHz of less than -56 dBm ( ) then a value of -56 dBm ( ) shall apply.

3) For offsets greater than 1 800 kHz if the table indicates that measurements performed in a 100 kHz bandwidth relative to a measurement in 30 kHz on the carrier would result in an absolute level measured in 100 kHz of less than -51 dBm then a value of -51 dBm shall apply.

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 | 1 200 kHz | 1 800 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)~~ | |

| **POWER LEVEL** | **MAXIMUM LEVEL FOR VARIOUS OFFSETS FROM CARRIER FREQUENCY: 400 kHz** | **600 kHz** | **1 200 kHz** | **1 800 kHz** |
|---|---|---|---|---|
| 30 dBm | -22 dBm | -24 dBm | -24 dBm | -27 dBm |
| 24 dBm | -23 dBm | -26 dBm | -30 dBm | -33 dBm |
| <= +20 dBm | -23 dBm | -26 dBm | -32 dBm | -36 dBm |

NOTE: These figures are different from the requirements in GSM 05.05-DCS because of alignment with GSM 05.05 where it was found that at higher power levels it is the modulation spectrum which is being measured using a peak hold measurement. ~~This~~ The GSM 11.10 allowance has an impact down to the lower power levels of GSM 05.05-DCS resulting ~~is given~~ in the given table.

The results of the measurements on MSs with an antenna connector shall be in dBm. ~~The results of the measurements on equipment with no possibility to use an antenna connector shall be in dBs relative to the average transmitter carrier power (see section II.3.3) and then converted into dBm by subtracting this value from the average transmitter carrier power, taking the actual power level and filter bandwidths into account.~~

### II.3.5 Intermodulation attenuation

#### II.3.5.1 Definition

The intermodulation attenuation is a measure of the capability of an RF transmit equipment to inhibit the generation of signals in its non-linear elements caused by the presence of the carrier and an interfering signal reaching the equipment via its antenna.

The intermodulation attenuation is expressed as the ratio in dB of the output power level of the transmitter under test to the power level of the highest intermodulation component.

For further information see recommendation GSM 05.05-DCS section 4.7.3.

#### II.3.5.2 Methods of Measurement

Two methods of measurement are described separately for:

1) equipment fitted with an antenna connector and for;

2) equipment fitted with an integral antenna, and for which a temporary antenna connector shall be used.

SFH shall be disabled during this measurement.

#### II.3.5.2.1 Method of measurement for equipment with a permanent 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 690 to 710 (ARFCN), power control level set to maximum power.

b) The antenna output of the MS shall be connected to the SS via a coupling device, presenting to the MS a load with an impedance of 50 ohms. The coupling device may consist of a circulator one port of which is to be connected by a coaxial cable to the output terminal of the MS, the second port is to be correctly terminated with 50 ohms into a selective measuring device (e.g. a spectrum analyser, peak hold) with a measurement bandwidth of 300 kHz. The third port of the circulator is to be connected to the unwanted test signal source by means of an isolator.

c) The unwanted test signal shall be unmodulated and the frequency shall be 800 kHz above the frequency of the MS under test. The unwanted test signal power level shall be adjusted to be 40 dB below the power level of the MS.

d) The power level of the test signal shall be measured at the antenna output end of the coaxial cable, when disconnected from the RF transmit equipment and then correctly matched into 50 ohm. The antenna output power of the MS shall be measured directly at the antenna output terminal connected to an artificial antenna.

e) Any intermodulation components shall then be measured in the band indicated in table xx (of section II.3.5.2.3) by means of the selective measuring device.

f) This measurement shall be repeated with the test signal at a frequency 800 kHz below the transmitted frequency.

NOTE: When the above measurements are performed precautions must be taken, so that non-linearities in the selective measuring device do not influence the results appreciably. Furthermore it should be ensured that intermodulation components which may be generated by non-linear elements in the test equipment (e.g. signal generator, circulators, selective measuring device) are sufficiently reduced. The RF transmit equipment under test and the test signal source shall be physically separated in such a way that the measurement is not influenced by direct radiation.

#### II.3.5.2.2 Method of measurement for equipment normally equipped only with an integral antenna

a) The MS shall be placed in the anechoic chamber as in section II.3.3.2.2.and the procedure of part a) of that section shall be repeated. The coupling factor F between the temporary antenna connector and the MS integral antenna shall be calculated as the difference in dB between Pac as defined in section II.3.3.2.2 and the power measured.

b) The test antenna shall be connected to the SS via a coupling device, presenting to the antenna a load with an impedance of 50 ohm. The coupling device may consist of a circulator one port of which is to be connected by a coaxial cable to the antenna terminal, the second port is to be correctly terminated with 50 ohm into a selective measuring device (e.g. a spectrum analyser, peak hold) with a measurement bandwidth of 300 kHz. The third port of the circulator is to be connected to the unwanted test signal source by means of an isolator.

c) The unwanted test signal shall be unmodulated and the frequency shall be 800 kHz above the frequency of the MS under test. The standard test signal $I_O$, power level shall be adjusted to be 40 dB below the power level of the MS at the MS antenna. This is given by:

$$P_{ac}(\text{Tx dBm}) - 40 + F \quad \text{dBm}$$

d) The power level of the test signal shall be measured at the antenna output end of the coaxial cable, when disconnected from the RF transmit equipment and then correctly matched into 50 ohms.

e) Any intermodulation components shall then be measured in the band indicated in table xx (of section II.3.5.2.3) by means of the selective measuring device.

f) This measurement shall be repeated with the test signal at a frequency 800 kHz below the transmitted frequency.

NOTE: When the above measurements are performed precautions must be taken, so that non-linearities in the selective measuring device do not influence the results appreciably. Furthermore it should be ensured that intermodulation components which may be generated by non-linear elements in the test equipment (e.g. signal generator, circulators, selective measuring device) are sufficiently reduced. The RF transmit equipment under test and the test signal source shall be physically separated in such a way that the measurement is not influenced by direct radiation.

#### II.3.5.2.3 Requirements

The intermodulation limit is as indicated below under normal test conditions. The limits express the minimum intermodulation attenuation in dB.

| **Test Signal displacement (x)** | **Limit** | **Frequency Band** |
|---|---|---|
| 0.8 MHz | 50 dB | 1 710 - 1 785 MHz |

# II.4 RECEIVER

**ref.: GSM 05.05-DCS**

In this section on receiver measurements, the procedures to test equipment which is fitted with ~~an~~ a permanent antenna connector, and the procedures to test equipment which ~~can~~is designed to only be used with an integral antenna, are in general combined into one single test description. ~~The sections which contain separate descriptions for testing these two kinds of equipment are blocking and spurious response (section II.4.7).~~

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 for separated access to a calibrated test site a temporary antenna connector shall be used as ~~an antenna coupling device is~~ defined in General Conditions GC6 of annex 1 of part GC. In accordance with ETS 300 086 for equipment of this type tests of receiver maximum usable sensitivity are performed only using the integral antenna. The detailed description of its calibration is contained within section II.4.2.2.

In practice ~~this~~ the temporary antenna connector ~~coupling device~~ may be used for transmitter measurements described in section II.3, but the calibration factors determined in II.4.2.2 will not be directly usable. 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** | **TU~~3~~ 1.5** | **TU50** | **HT100** | **RA~~250~~130** |
|---|---|---|---|---|
| MIN. TEST TIME (sec) | 500 | ~~30~~15 | ~~15~~7.5 | 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 | PROP./ 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 | 4.000*α | 4.478*α | 600*α | 13400 | 99.743 | 5.040*α | 0.133 |
| ,, | TCH/FS Class Ib | TU50/No FH | 0.300/α | 0.320/α | 4800/α | 1500000 | 100.000 | 0.378/α | <0.001 |
| ,, | TCH/FS Class II | TU50/No FH | 8.000 | 8.333 | 5000 | 60000 | 99.865 | 10.080 | <0.001 |
| ,, | TCH/FS Class II | HT100/No FH | 9.000 | 9.333 | 2800 | 30000 | 97.826 | 11.340 | <0.001 |
| ,, | TCH/FS Class II | RA130/No FH | 7.000 | 7.500 | 1800 | 24000 | 99.873 | 8.820 | <0.001 |
| ,, | FACCH | TU50/No FH | 9.000 | 10.084 | 600 | 5950 | 99.813 | 11.340 | 0.103 |
| ,, | TCH/F9.6 | HT100/No FH | 0.700 | 0.784 | 600 | 76500 | 99.721 | 0.882 | 0.176 |
| ,, | 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 |
| INPUT LEVEL | TCH/FS Class II | STATIC-23dBm | 0.500 | 0.610 | 200 | 32800 | 99.769 | 0.750 | 0.135 |
| RANGE | TCH/FS Class II | STATIC | 0.010 | 0.012 | 200 | 1640000 | 99.716 | 0.015 | 0.141 |
| | TCH/FS Class II | EQ50 | 3.000 | 3.250 | 1950 | 60000 | 99.981 | 3.780 | <0.001 |
| CO-CHANNEL | TCH/FS | TU1.5/No FH | 21.00*α | 24.00*α | 6000*α | 25000 | 100.000 | 26.460*α | <0.001 |
| REJECTION | TCH/FS Class Ib | TU1.5/No FH | 2.000/α | 2.091/α | 69000/α | 3300000 | 100.000 | 2.520/α | <0.001 |
| ,, | TCH/FS Class II | TU1.5/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 | TU1.5/No FH | 22.000 | 24.000 | 6000 | 25000 | 100.000 | 27.720 | <0.001 |
| ,, | TCH/F9.6 | 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 | TU50/FH | 0.010 | 0.011 | 600 | 5350000 | 99.732 | 0.0126 | 0.197 |
| ADJACENT | TCH/FS | TU50/No FH | 3.000*α | 3.371*α | 600*α | 17800 | 99.797 | 3.780*α | 0.194 |
| CHANNEL | TCH/FS Class Ib | TU50/No FH | 0.250/α | 0.270/α | 5400/α | 2000000 | 100.000 | 0.315/α | <0.001 |
| 200 kHz | TCH/FS Class II | TU50/No FH | 8.100 | 8.333 | 100000 | 1200000 | 100.000 | 10.206 | <0.001 |
| ,, | FACCH | TU50/No FH | 9.000 | 10.084 | 600 | 5950 | 99.813 | 11.340 | 0.103 |
| ADJACENT | TCH/FS | TU50/No FH | 5.100*α | 5.714*α | 600*α | 10500 | 99.773 | 6.426*α | 0.134 |
| CHANNEL | TCH/FS Class Ib | TU50/No FH | 0.450/α | 0.483/α | 5800/α | 1200000 | 100.000 | 0.567/α | <0.001 |
| 400 kHz | TCH/FS Class II | TU50/No FH | 8.900 | 9.167 | 66000 | 720000 | 100.000 | 11.214 | <0.001 |
| ,, | FACCH | TU50/No FH | 6.100 | 6.832 | 600 | 8782 | 99.777 | 7.686 | 0.122 |
| INTERMOD. | TCH/FS Class II | STATIC | 2.000 | 2.439 | 200 | 8200 | 99.741 | 3.000 | 0.122 |
| | FACCH | TU50/No FH | 9.000 | 10.084 | 600 | 5950 | 99.813 | 11.340 | 0.103 |
| BLOCKING & | TCH/FS Class II | STATIC | 2.000 | 2.439 | 200 | 8200 | 99.741 | 4.000 | <0.001 |
| SPURIOUS | FACCH | TU50/No FH | 9.000 | 10.084 | 600 | 5950 | 99.813 | 11.340 | 0.103 |
| RESP. | | | | | | | | | |

NOTE 1: $\alpha$ is a parameter which ranges from 1 to 1.6. The value of $\alpha$ 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 $\alpha$ may be different for a TU50 sensitivity test and an ~~RA250~~ RA130 sensitivity test. The value of $\alpha$ 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 $\alpha$=1; if the result of the division is lower than 1, a value of $\alpha$=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 $\alpha$=1, and would be slightly different for other values of $\alpha$.

NOTE 2: In order to save time the sensitivity test and co-channel 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-DCS 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: DTX is used to prevent the MS dropping 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~~690 to 710 (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 emf( ). SACCH shall be transmitted normally at a level of 28 dBµV emf( ). The SID frame shall be transmitted in its correct time interval with valid information at a level of 28 dBµV emf( ). 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 - 82 000 (excluding SID frames).

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

### II.4.2 Sensitivity

The reference sensitivity (GSM 05.05-DCS) 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-DCS 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~~690 to 710. The SS shall also set up two ~~six~~ adjacent cell BCCH's having signal strengths in the range 15 dBµVemf( ) to 35 dBµVemf( ). The ARFCNs for these serving and adjacent cell BCCH's shall not be co-channel with, or on the 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(see GSM 11.40-DCS) 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 ~~11~~13 dBµVemf( ) ~~for hand portable MSs and to 9 dBµVemf( ) 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~~513 to 523 (ARFCN) and for a channel in the range ~~120 to 124~~874 to 884 (ARFCN).

l) Steps a) to g) shall be repeated, except under step d) the SS fading function shall be set in turn to RA~~250~~130 and HT100.

m) Steps a) to j) shall be repeated, except at step g) 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 28 dBµVemf( ). 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 RA~~250~~130** | | **Propagation Conditions HT100** | | **Static Conditions** | |
|---|---|---|---|---|---|---|---|---|
| TCH/FS | Max-Events | Max-samples | Max-events | Max-sample | Max-events | Max-samples | Max-events | Max-samples |
| FER | 600*$\alpha$ | ~~19100~~ 13400 | | | | | 200*$\alpha$ | 164000 |
| class Ib(RBER) | ~~5000/$\alpha$~~ 4800/$\alpha$ | ~~2000000~~ 1500000 | | | | | 82000/$\alpha$ | 20000000 |
| class II(RBER) | ~~9200~~ 5000 | ~~120000~~ 60000 | 1800 | 24000 | ~~5200~~ 2800 | ~~60000~~ 30000 | 200 | 8200 |

where $\alpha$ is a parameter which can range from 1 to 1.6. The value of $\alpha$ 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 Sensitivity Measurements for Equipment without an 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.

In accordance with ETS 300 086 tests of receiver sensitivity on MSs with no permanent external antenna connector are performed on the integral antenna only.

The calibration procedure shall be carried out at three frequencies, namely an ARFCN in the range ~~1 to 5~~513 to 523, an ARFCN in the range ~~60 to 65~~690 to 710 and an ARFCN in the range ~~120 to 124~~874 to 884. 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 device~~ 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~~513 to 523. 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 II.4-1) to give an MS receiver input level of approximately 32 dBµVemf. This corresponds to a field strength of ~~55.5~~61.3 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~~ between two values of the parameter RXLEV, defined as RXLEVa to RXLEVb shall be recorded as Ei.

   NOTE: The actual values of RXLEVa and RXLEVb 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 for all values of n in the range 1-7. Ensuring that the same RXLEV transition is used, the signal levels from the SS shall be recorded as Ein.

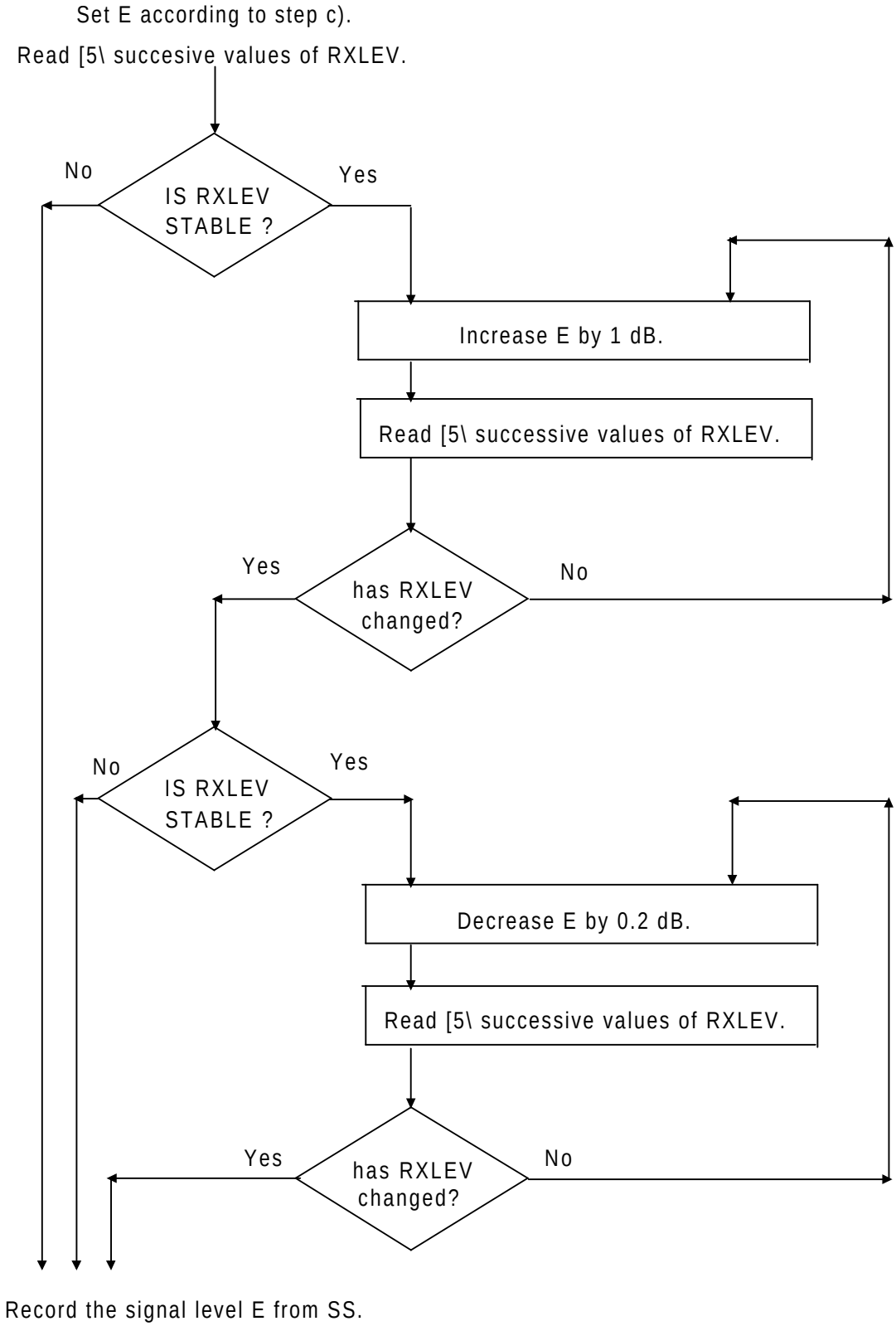

Set E according to step c).
Read [5\ succesive values of RXLEV.
IS RXLEV STABLE ?
No
Yes
Increase E by 1 dB.
Read [5\ successive values of RXLEV.
has RXLEV changed?
Yes
No
IS RXLEV STABLE ?
No
Yes
Decrease E by 0.2 dB.
Read [5\ successive values of RXLEV.
has RXLEV changed?
Yes
No
Record the signal level E from SS.

**Figure II.4-1**

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:

$$E1 = \left[ \frac{8}{\sum_{n=0}^{n=7} \frac{1}{Ein^2}} \right]^{1/2}$$

g) Repeat steps b) to f), except in step b) use an ARFCN in the range ~~60 to 65~~690 to 710 to obtain a mean signal level E2. 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~~874 to 884 to obtain a mean signal level E3.

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 E1, E2 and E3 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 Efr corresponding to the respective signal levels Er determined in steps f), g) and h) of II.4.2.2.1 record these values as Ef1, Ef2, Ef3.

#### II.4.2.2.3 Temporary Antenna Connector~~coupling Device~~ Coupling Factor

The coupling factor of the temporary antenna connector ~~coupling device~~ is the relationship expressed in dB, between the output signal of the SS and the effective receiver input signal for the MS. The antenna gain is assumed to be O dBi.

The sample MS is now modified to fit a temporary antenna connector in accordance with annex 1 GC6. Alternatively a second MS shall be provided fitted with such a temporary antenna connector.

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

The calibration procedure shall be as follows:

a) The MS temporary antenna connector is connected to~~is fixed to the antenna coupling device and the~~ output of the SS ~~is connected to the antenna coupling device~~.

b) A call shall be originated by the SS to the MS using a frequency in the range ARFCN ~~1 to 5~~513 to 523. 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 RXLEVa to RXLEVb transition. This signal level shall be recorded as Ec1.

d) Repeat steps b) and c) for frequencies in the range ARFCN ~~60 to 65~~690 to 710 and ~~120 to 124~~874 to 884. Record the RXLEV transitions as Ec2 and Ec3 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~~ ARFCN used.

f) The mean antenna coupling factor Fm 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 handheld MS with integral antenna is the unit under test, the input signal level into the temporary antenna connector is determined from:

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

where: $E_{in}$ = input signal level to 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 $E_{in}$.

### 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.

For MSs fitted with a permanent antenna connector the method of test below applies.

For MSs fitted with no permanent antenna connector the method of test below applies except:

a) The MS shall be in the anechoic shielded chamber as described in II.4.2.2.1.

b) At step e) the wanted signal is generated at the SS to give a field strength Ef2 equivalent to a wanted signal level of 13 dB microvolt emf at the receiver front end when the MS antenna radiation pattern and test range characteristics have been allowed for.

#### II.4.2.3.2 Method of Test~~measurement~~

a) The SS originates a call to the MS on a traffic channel having a ARFCN in the range ~~60 to 65~~690 to 710.

b) The MS is made to answer the call, and is commanded to its 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~~13 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~~the STATUS message~~. 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 ~~28~~30 dBµV 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 ~~11~~13 dBµV( ) ~~for a hand portable MS or 9 dBµV 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~~,~~ and 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

The Max-events measured for different channels and under the different propagation conditions shall not exceed the values given in the table below:

| Channels | Type of measurement | Propagation | Max-events | Max-samples |
|---|---|---|---|---|
| FACCH | FER | TU50 | 600 | ~~6700~~5950 |
| TCH/F9.6~~&H4.8~~ | BER | HT100 | ~~1400~~600 | ~~180000~~76500 |
| TCH/F4.8 | BER | HT100 | 600 | 5350000 |
| TCH/F2.4 | BER | HT100 | 150 | 11900000 |
| ~~TCH/H2.4~~ | BER | HT100 | ~~600~~ | ~~5350000~~ |

### II.4.3 Usable receiver input level range ref.: GSM 05.05-DCS 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~~690 to 710.

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 an input level~~s~~ of ~~respectively 63~~73 dBmicroVoltemf( ) ~~and 103 dBmicroVoltemf( )~~ at the receiver input.

e1) Step d) shall be repeated with the amplitude of the wanted signal increased to an input level of 90 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 28 dBmicroVoltemf( ) and 73 dBmicroVoltemf( ) 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 | |
|---|---|---|---|
| Step e) | Static | 200 | 1640000 |
| Step e1) | Static | ~~400~~200 | 3280~~1640000~~ |
| | EQ50 | ~~3900~~1950 | ~~120000~~ 60000 |

### 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~~690 to 710, 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 28 dBmicroVoltemf( ).

   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 9 dB 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 TU~~3~~1.5. The channel frequency shall be in the range ~~60 to 65~~690 to 710 (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~~the STATUS message~~. 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 error events (frames erasures) for Max-samples of consecutive frames.

h) Steps c) to e) shall be repeated except that in step d), both the wanted and interfering signal shall be hopping TU50 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~~ 690 to 710~~, according to the narrow band hop of GC1 of annex 1.~~

NOTE: The frequency range of this test is dependant on the fading simulator.

### 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 | TU~~3~~1.5/No FH | FER | 6000 | 25000 |
| TCH/FS | TU~~3~~1.5/No FH | FER | 6000*α | 25000 |
| TCH/FS Class Ib | TU~~3~~1.5/No FH | RBER | 69000/α | 3300000 |
| TCH/FS Class II | TU~~3~~1.5/No FH | RBER | 86000 | 2000000 |
| TCH/FS | TU~~3~~50/FH | FER | 600*α | 17800 |
| TCH/FS Bits class Ib | TU~~3~~50/FH | RBER | 4300/α | 2000000 |
| TCH/FS Bits class II | TU~~3~~50/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 | TU50/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-DCS 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 during many receiver tests, including the tests in this section.

### 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~~690 to 710 (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 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~~the STATUS message~~. 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 g) 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 | Channel | Type of measurement | Max-events | Max-samples |
|---|---|---|---|---|
| at 200 kHz | TCH/FS | FER | 600*α | 17800 |
| | class Ib | RBER | 5400/α | 2000000 |
| | class II | RBER | 100000 | 1200000 |
| | FACCH | FER | 600 ~~6000~~ | 5950 ~~25000~~ |
| | | | | |
| at 400 kHz | TCH/FS | FER | 600*α | 10500 |
| | class Ib | RBER | 5800/α | 1200000 |
| | class II | RBER | 66000 | 720000 |
| | FACCH | FER | 600 | 8782 |

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-DCS 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~~690 to 710 (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 STATUS message~~. 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~~513 to 523.

j) Steps a) to h), as applicable, shall be repeated but with the receiver operating on an ARFCN in the range ~~120 to 124~~874 to 884.

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 |

**Table II.4.6-1: Intermodulation test signal levels**

| **MS CLASS** | ~~**MS HANDHELD**~~ | **Wanted signal dBµVemf( )** | **First interferer dBµVemf( )** | **Second interferer dBµVemf( )** |
|---|---|---|---|---|
| 1,2~~NO~~ | ~~13~~17 | ~~74~~64 | ~~63~~64 | |
| ~~3,4,5~~ | ~~YES~~ | ~~15~~ | ~~64~~ | ~~63~~ |

~~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 | 5950 |

## II.4.7 Blocking and Spurious Response ref.: GSM 05.05-DCS section 5.1

### II.4.7.1 Definition

Blocking is a measure of~~for~~ 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 - equipment with antenna connector

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~~690 to 710 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~~the STATUS message~~. 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 17~~15~~ dBmicroVoltemf. ~~for handportable 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 $F_{lo}$ + ($IF_1$ + $IF_2$ + ... +$IF_n$ + 37.5~~12.5~~ MHz)
and
$F_{lo}$ - ($IF_1$ + $IF_2$ + ... + $IF_n$ + 37.5~~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.

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~~70 dBµVemf |
| FR +/- 800 kHz TO FR +/- 1.6 MHz | ~~70 dBµV~~ | ~~80~~70 dBµVemf |
| FR +/- 1.6 MHz TO FR +/- 3 MHz | ~~80 dBµV~~ | ~~90~~80 dBµVemf |
| ~~915~~1785 MHz TO FR - 3 MHz | ~~90 dBµV~~ | ~~90~~87 dBµVemf |
| FR + 3 MHz TO ~~980~~1920 MHz | ~~90 dBµV~~ | ~~90~~87 dBµVemf |
| ~~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~~ |
| ~~1 000 MHz TO 12.75 GHz~~ | ~~90 dBµV~~ | ~~90 dBµV~~ |
| 100 kHz TO 1705 MHz | | 113 dBµVemf |
| 1705 MHz TO 1785 MHz | | 101 dBµVemf |
| 1920 MHz TO 1980 MHz | | 101 dBµVemf |
| 1980 MHz TO 12.75 GHz | | 90 dBµVemf |

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~~ 513 to 523.

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~~874 to 884.

### 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<br>FACCH | FER | 600 | 5 950 |
| other MS<br>TCH/FS<br>Class II | RBER | 200 | 8 200 |

A maximum of ~~six~~ twelve failures are allowed in the range FR +/- 95 MHz ~~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 ~~(or 80 MHz to 4 GHz for the equipment with integral antenna)~~ outside FR +/- 95 MHz ~~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 ~~(or 93.5 dBµV/m for the equipment with integral antenna)~~. The performance requirement is once again that stated above, that is:

(non speech MS)
Max-events - 600 Max-samples - 5 950

(other MS)
Max-events - 200 Max-samples - 8 200

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.5.3.1 Default conditions and structured sequence of tests

### II.5.3.1.1 Default test conditions during L3-tests

During tests in section II.5.3 the following default test conditions shall apply if not otherwise stated within the test description. In the table below, decimal values are normally used. Sometimes a hexadecimal value, indicated with a "H", or a binary value, indicated with a "B" is given.

| | |
|---|---|
| General signalling conditions for all carriers | |
| Ciphering | yes |
| | |
| General RF-conditions for all carriers | |
| Frequency hopping mode | Non-hopping |
| Propagation profile | Static |
| Downlink Input Level | 63 dBmicroVolt emf |
| Uplink output power | Minimum according to MS power class |
| | |
| Serving cell, BCCH/CCCH carrier | |
| Channel | ARFCN ~~20~~ 590 |
| Alternative channels | ARFCN ~~40 or 60~~ 690 or 830 |
| | |
| Serving cell, Traffic channel, SDCCH | |
| Channel | ARFCN ~~30~~ 650 |
| Alternative channels | ARFCN ~~50 or 70~~ 750 or 850 |
| Power Control Indicator (PWRC) | 0 |
| | |
| Neighbouring cells BCCH/CCCH carriers | |
| Channels (ARFCN): | ~~10,80,90,100,110,120~~ 520,600,700,780,810,870 |
| Alternative channels: | ~~15,85,95,105,115,122~~ 530,610,710,790,820,880 |
| Input level | 53 dBmicroVolt emf |
| | |
| Network dependent parameters | |
| Cell identity | 0001H |
| Mobile country code, MCC | 001 (decimal) |
| Mobile network code, MNC | 01 (decimal) |
| Location area code, LAC | 0001H |
| BCCH allocation number, BA-NO | 00B band number 0 |
| BCCH allocation sequence number(BA-IND) | 0 |
| Cell allocation number, CA-NO | 00B band number 0 |
| PLMN colour code, NCC | 1 |
| BS colour code, BCC | 5 |
| SMS Cell Broadcast | not active |
| DTX | MS must not use |
| IMSI Attach-detach allowed | 0 MS shall not apply |
| CCCH-CONF | set to 1 basic physical channel used for CCCH,combined with SDCCHS, encoded as 001B |
| BS-AG-BLKS-RES | 0 blocks reserved for access grant |
| BS-PA-MFRMS | 5 paging subgroups, encoded as 011B |
| CELL-BAR-ACCESS | 0 the cell is not barred |
| Call-reestablishment allowed (RE) | 1 |
| Emergency Call allowed (EC) | 0 |
| Access Control Class (AC) (0..9,11..15) | 0 |
| | |
| Network dependent timers | |
| Radio Link Time-out | 8 |
| T3212 Periodic updating in decihours | Infinite |

| | |
|---|---|
| Access control parameters | |
| Max retrans (1, 2, 4 or 7) | 1 |
| Tx-integer, number of slots | 5 |
| CELL-RESELECT-HYSTERESIS | 12 dB |
| MS-TXPWR-MAX-CCH | minimum level |
| RXLEV-ACCESS-MIN | minimum |

These information are provided by system information 1, 2, 3 and 4 messages.

The system information elements which are broadcasted on the SACCH during the dedicated mode should be consistent with those sent on the BCCH when the MS was in idle mode prior to the channel request.

#### II.5.3.1.2 Structured sequence of the tests

The tests shall be performed in the order as indicated in the following table.

The validity of the tests depends upon the results of the tests performed before.

| | | |
|---|---|---|
| Channel request (basic test) | RR | II.5.3.2.1 |
| Immediate assignment | RR | II.5.3.6.1 |
| IMSI attach/detach (basic) | RR | II.5.3.2.2 |
| Paging | RR | II.5.3.6.2 |
| Test of the mobile station functions in idle mode | RR | II.5.3.3 |
| Frequency redefinition | RR | II.5.3.6.6 |
| Measurement report (incl. system info not idle) | RR | II.5.3.6.3 |
| Authentication | MM | II.5.3.7.2 |
| Cipher mode setting | RR | II.5.3.6.8 |
| Identification | MM | II.5.3.7.3 |
| Sequenced MM/CC message transfer | .. | II.5.3.2.3 |
| Channel release | RR | II.5.3.6.12 |
| Location updating | MM | II.5.3.7.4 |
| TMSI reallocation | MM | II.5.3.7.1 |
| Classmark change | RR | II.5.3.6.11 |
| Call control (verification on CC state diagram) | CC | II.5.3.8.1 |
| Call rearrangement | CC | II.5.3.8.* missing |
| DTMF information transfer | CC | II.5.3.8.4 |
| Handover | RR | II.5.3.6.5 |
| Additional assignment | RR | II.5.3.6.9 |
| Partial release | RR | II.5.3.6.10 |
| Re-establishment | CC | II.5.3.8.3 |
| Dedicated channel assignment (during calls) | RR | II.5.3.6.4 |
| Emergency call establishment | CC | II.5.3.8.2 |
| Transmission mode change | RR | II.5.3.6.7 |
| Mobility management connection establishment | MM | II.5.3.7.5 |
| Test of Layer 3 error handling | .. | II.5.3.5 |
| User to user signalling | CC | II.5.3.8.5 |
| Testing of structured procedures | .. | II.5.3.9 |

### II.5.3.1.3 General Rules for message parameters

The following rules concerning message parameters apply to section II.5.3:

1) Those values of parameters which are a consequence of the context of a test and which are not specific to that test need not be defined.

2) 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 stated otherwise.

3) An optional field or optional Information Element of a downlink message (Network to MS), the presence of which is not a consequence of a test description, shall be absent in that test.

4) If an optional field or Information Element is not indicated for the uplink (MS to Network) - unless specified otherwise -, it may be included or not.

5) The Protocol Discriminator, Transaction Identifier and Message Type of all uplink messages have to be checked.

### II.5.3.1.4 General Rules for L3 Testing

Unless otherwise specified, before the SS pages the MS, the MS must be given the necessary time to camp on the cell (see section II.6.1.6.1).

### 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~~ 3:
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~~ 4:
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~~ Neighbour cells indicated |
|---|---|---|
| 1 | 00000100 | ~~7,39,65,66,85, 97,124~~ 520,580,610,702,703,830,885 |
| 2 | 00000100 | ~~8,40,67,68,86, 98,123~~ 521,581,612,704,705,831,884 |
| 3 | 00000100 | ~~9,41,69,70,87, 99,122~~ 522,582,614,706,707,832,883 |
| ~~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~~ |
| 4~~8~~ | 00000100 | 880 |

Location area identification

| Cell | MCC1 | MCC2 | MCC3 | MNC1 | MNC2 | LAC | Comments |
|---|---|---|---|---|---|---|---|
| 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~~ | ~~F~~ | ~~7~~ | ~~x~~ | |
| 4~~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~~4 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 time-out
BS-PA-MFRMS = 010, 4 multiframes periods for paging
T3212 time-out value = H'00

| Cell | level(dBmicroVolt emf) | BCCH ARFCN |
|---|---|---|
| 1 | +65 | ~~1~~ 520 |
| 2 | +63 | ~~7~~ 580 |
| 3 | +61 | ~~39~~ 610 |
| ~~4~~ | ~~+55~~ | ~~65~~ |
| ~~5~~ | ~~+59~~ | ~~66~~ |
| ~~6~~ | ~~+57~~ | ~~85~~ |
| ~~4~~7 | +55 | ~~97~~ 885 |
| 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-DCS and 02.11-DCS.

#### II.5.3.3.2.2 Procedure

a) The MS is switched on and 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~~ 6, but not of cell ~~8~~ 7.

### 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~~ 4 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.5.3.6 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-DCS.

#### 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 integer random 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-the 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-DCS 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

**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").

**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 synchronization of the six strongest BCCHs of its list and also read the SYSTEM INFO of these BCCHs (required in GSM 05.08-DCS, section 6.6.1 "Monitoring of Received level and BCCH data"). After this initialization 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.5.3.6.2.1.1 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.5.3.6.2.1.2 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.5.3.6.2.1.3 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.5.3.6.2.1.4 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.5.3.6.2.1.5 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.5.3.6.2.1.6 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.5.3.6.2.1.7 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 tests from II.5.3.6.2.1.1 to II.5.3.6.2.1.6 which address the MS by its TMSI are repeated in this condition.

#### II.5.3.6.2.1.8 Response Requirement 4

The MS shall ignore the paging request.

### 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-DCS section 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 reorganization 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 reorganization | 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 reorganization 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 reorganization | 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 reorganization

**Purpose**

To test that the MS is operating in the paging reorganization page mode as specified in GSM 04.08-DCS section 3.3.2.1 (and answers to paging messages sent on any block of the full downlink CCCH during the reorganization and receives the relevant BCCH messages during the reorganization).

**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 reorganization page mode.

| Message: IMMEDIATE ASSIGNMENT EXTENDED | |
|---|---|
| Information Elements | Comments |
| Message Type | IMM ASS EXT |
| Page Mode | paging reorganization |
| request reference | Arbitrary |

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 |
| 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 block 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 | | |
| Message Type | Immediate Assignment Rej | | |
| Page Mode | normal | | |
| Request Reference | the 2nd channel request | | |
| Wait indication | 0 second | 0000 | 0000 |

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 reorganization".

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, 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 sub channel.

| 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 d) 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 reorganization 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 reorganization | 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-DCS.

#### 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~~ 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~~ four 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 two ~~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 levels and colourcodes to verify the MS.

e) The MS with RR connection established on SDDCH/4 is forced to make a handover ~~in a new cell when~~ into cell N5 TCH/FS where 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 Information**

| Transmitter | | Level | NCC | BS Colour Code | ARFCN |
|---|---|---|---|---|---|
| Serving 1 | S1 | -60 | 1 | 3 | ~~002~~514 |
| Neighbour | N1 | -85 | 1 | 5 | ~~008~~530 |
| ~~" "~~ | ~~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 | ~~0~~44702 |

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08-DCS, 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~~ | ~~gsm band 0~~ | ~~00~~ |
| ~~- BA ARFCN (124..001)~~ | ~~no BCCH allocation~~ | ~~all 0~~ |
| - FORMAT | 1 024 range | |
| - EXT_IND | set | 1 |
| - W(i) | null | |

Message: SYSTEM INFORMATION TYPE 5 bis (GSM 04.08-DCS)

| Information Element | Comment | Value |
|---|---|---|
| Protocol discriminator | RR management | |
| Transaction identifier | not relevant | |
| Message type | sys info 5bis | |
| Neighbour cell descr | | |
| - FORMAT | 1 024 range | |
| - EXT IND | set | 1 |
| - W(i) | null | |

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08-DCS, 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-DCS, 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~~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<br>"No neighbour cell measurement result"<br>or<br>"Neighbour cell information not available for seving 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~~514 |
| Neighbour | N1 | -85 | 1 | 5 | ~~008~~530 |
| " " | ~~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~~702 |

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08-DCS, 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 | | | |
| - FORMAT | 1024 range | | |
| - EXT IND | set | 1 | |
| - W(i) | non null for ARFCN 514,530,549,602,649 (GSM 10.5.2.1.3-DCS) | | |

Message: SYSTEM INFORMATION TYPE 5 bis

| Information Element | Comment | Value |
|---|---|---|
| Protocol discriminator | RR management | |
| Transaction Identifier | not relevant | |
| Message type | sys info 5bis | |
| Neighbour cell descr | | |
| -FORMAT | 1 024 range | |
| -EXT IND | null | 0 |
| -W(i) | non null for ARFCN 665,686,702 (GSM 10.5.2.1.3-DCS) | |

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08-DCS, 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-DCS, 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~~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=3 ~~six~~ | 011~~110~~ | |
| - RXLEV-NCELL 1 | only order checked | xx | xxxx |
| - BCCH-FREQ-NCELL 1 | the index and neighbouring cell description | | xxxx |
| - BSIC-NCELL 1 | as in table | xx | xxxx |
| - RXLEV-NCELL 2 | as in table | xx | xxxx |
| - BCCH-FREQ-NCELL 2 | as in table | x | xxxx |
| - BSIC--NCELL 2 | as in table | xx | xxxx |
| - RXLEV-NCELL 3 | only order checked | xx | xxxx |
| - BCCH-FREQ-NCELL 3 | as in table | x | xxxx |
| - BSIC--NCELL 3 | as in table | xx | xxxx |
| - RXLEV-NCELL 4 | No result | all bits set to 0 | |
| - BCCH-FREQ-NCELL 4 | No result | " | |
| - BSIC--NCELL 4 | No result | " | |
| . . . | . . . | . | |
| . . . | . . . | . | |
| - RXLEV-NCELL 6 | No result~~only order checked~~ | "~~xx~~ | ~~xxxx~~ |
| - BCCH-FREQ-NCELL 6 | No result~~as in table~~ | "~~x~~ | ~~xxxx~~ |
| - BSIC-NCELL 6 | No result~~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 N1, S1, N7.~~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 1S1 | -60 | 1 | 3 | ~~002~~514 |
| Neighbour N1 (no info) | -85 | 1 | 5 | ~~008~~530 |
| ~~" " N2~~ | ~~-80~~ | ~~1~~ | ~~7~~ | ~~014~~ |
| " " N3 | -75 | 2 | 1 | ~~020~~602 |
| ~~" " 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-DCS, 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~~ | | | |
| - FORMAT | 1024 range | | |
| - EXT_IND | set | 1 | |
| - W(i) | non null for ARFCN 514,549,602 (GSM 10.5.2.1.3-DCS) | | |

Message: SYSTEM INFORMATION TYPE 5 Bis

| Information element | Comment | Value |
|---|---|---|
| Protocol Discriminator | RR management | |
| Transaction identifier | not relevant | |
| Message type | sys info 5 bis | |
| Neighbour cell desc | | |
| -FORMAT | 1024 range | |
| -EXT_ID | null | 0 |
| -W(i) | non null for ARFCN 686,702 (GSM 10.5.2.1.3-DCS) | |

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08-DCS, 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-DCS, 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=1 ~~four~~ | 001~~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 2 | No result | all bits set to 0 | |
| - BCCH-FREQ-NCELL 2 | No result | " | |
| - BSIC-NCELL 2 | No result | " | |
| - . . | No result | " | |
| - . . | No result | " | |
| - RXLEV-NCELL 6 | No result | all bits set to 0 | |
| - BCCH-FREQ-NCELL 6 | No result | " | |
| - BSIC-NCELL 6 | No result | " | |
| ~~. . . . . .~~ | ~~.~~ | | ~~.~~ |
| ~~. . . . . .~~ | ~~.~~ | | ~~.~~ |
| ~~- 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, the MS shall only report on S1. The SS shall keep the signal levels and BCCH information stable for at least 20 seconds before using the reported RXLEV values.

**Procedure 4: Use of DTX in the Measurement Report**

| Transmitter | Level | NCC | BS Colour Code | ARFCN |
|---|---|---|---|---|
| Serving 1S1 | -60 | 1 | 3 | ~~002~~514 |
| Neighbour N1 | -85 | 1 | 5 | ~~008~~530 |
| ~~" " N2~~ | ~~-80~~ | ~~1~~ | ~~7~~ | ~~014~~ |
| ~~" " N3~~ | ~~-75~~ | ~~1~~ | ~~1~~ | ~~020~~ |
| ~~" " N4~~ | ~~-55~~ | ~~1~~ | ~~3~~ | ~~026~~ |
| " " N5 | -50 | 1 | 5 | ~~032~~665 |
| ~~" " N6~~ | ~~-45~~ | ~~1~~ | ~~7~~ | ~~038~~ |
| ~~" " N7~~ | ~~-40~~ | ~~1~~ | ~~1~~ | ~~044~~ |

The MS is forced to make a handover ~~in a new cell~~ into N5 TCH/FS, where the following SYSTEM INFO TYPE 5 and 6 are broadcasted.

Message: SYSTEM INFORMATION TYPE 5 (GSM 04.08-DCS, 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~~ | | |
| - FORMAT | 1024 range | | |
| - EXT IND | null | | |
| - W(i) | non null for ARFCN 514,530,549,602,649,665,686,702 | | |

Message: SYSTEM INFORMATION TYPE 6 (GSM 04.08-DCS, 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-DCS, 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=three~~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 3~~6~~ | only order checked | xx | xxxx |
| - BCCH-FREQ-NCELL 3~~6~~ | as in table | | |
| - BSIC--NCELL 3~~6~~ | as in table | xx | xxxx |
| - RXLEV-NCELL 4 | no result | all bits set to 0 | |
| . . . | . . | | " |
| . . . | . . | | " |
| - BSIC-NCELL 6 | no result | " | |

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 RXLEV, shall be N1, S1, N5.~~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-DCS.

#### 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~~ 522 or ARFCN >~~114~~ 879 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) | | |
| Frequency list | use of frequency hopping (GSM 10.5.2.9a-DCS) or not | | |
| -Starting time | Optional field used when specified in the text | | |
| ~~Mobile allocation~~ | ~~Use or not of frequency hopping~~ | | |

NOTE: 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 ASSIGNMENT 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 : 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-DCS.

#### 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 supplied 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 | 5 dec | 0000 | 0101 |
| 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 (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 Synchronization Indication information element may 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 synchronized, 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 synchronized, 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 synchronized, 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 prodedure. 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 synchronized, 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 synchronized, 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 | 5 dec | 0000 | 0101 |
| 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 Rec. 04.08-DCS 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~~ 112 is drawn.

A random subset CA(1) of the set {~~1~~ 512,...,~~124~~ 885} containing ca(1) elements, within a range of 112 ARFCN, is drawn.

An element B of the set CA(1) is randomly drawn.

Let T(1) = 91, T(2) = 42 000.

A random value T(3) in the range 92,...,41 999 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~~ 512,...,~~124~~ 885} with ca(i) elements, restricted in ARFCN range if necessary, 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~~512,...,~~124~~885} 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-DCS.

3) A frame number FN modulo 42432 is encoded as described in section 10.5.2.20 of GSM 04.08-DCS.

### II.5.3.6.7 Transmission mode change

The Transmission Mode Change procedure is described in section 3.4.6 of GSM 04.08-DCS.

#### 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 speech 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-DCS, 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 000 | | |
| - 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-DCS, 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-DCS.

#### 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 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-Time-out 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-DCS figure 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 COMMAND with cipher mode setting = "start ciphering" and start deciphering.

Message: CIPHERING MODE COMMAND (GSM 04.08-DCS section 9.1.9)

| Information Element | Comment | Value | |
|---|---|---|---|
| Protocol Discriminator | RR management | 0110 | |
| Transaction identifier | not relevant | 0000 | |
| Message type | | 0011 | 0101 |
| Cipher mode setting | "start ciphering" | 0001 | |

c) The SS sends a message AUTHENTICATION REQUEST.

#### 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 cipher key as determined during authentication and continue to establish the call with a SETUP message.

Message: CIPHERING MODE COMPLETE (GSM 04.08-DCS section 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 + 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-DCS.

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-DCS 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 GSM 04.08-DCS.

**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-DCS 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-DCS 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-DCS.

#### 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 N220+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 2s 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-DCS, 9.1.7)

## II.5.3.7 Elementary procedures of mobility management

The tests are based on GSM 04.08-DCS, 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-DCS.

#### 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 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-DCS) after the SS has send the TMSI REALLOCATION command.

Message: TMSI REALLOCATION COMPLETE (GSM 04.08-DCS, 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 to 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-DCS.

#### 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 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-DCS, 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-DCS, 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-DCS) the MS shall respond with AUTHENTICATION RESPONSE, as detailed below.

Message: AUTHENTICATION RESPONSE (GSM 04.08-DCS, 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 1) 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-DCS.

#### 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.

NOTE 1: A TMSI has been allocated before in the structured sequence of tests.

NOTE 2: Ciphering mode is not set at this stage.

d) The SS sends an IDENTITY REQUEST.

Message: IDENTITY REQUEST (GSM 04.08-DCS, 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 ciphering 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-DCS, 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-DCS, 4.4.

This test description is invoked frequently by the tests, further on in this section of GSM 11.10-DCS.

**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), i.e. IMSI attach/detach is allowed.

The T3212 time-out value in the SYSTEM INFORMATION TYPE 3 message is equal to 1: corresponding to 1/10 hour, i.e. 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-DCS).

The MS should then establish an RR connection and initialize 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.";
    4) "National Roaming not allowed in this location area".

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-DCS 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-DCS 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-DCS 9.2.15) | | |
| Protocol discriminator | MM | 0101 | |
| Transaction identifier | not relevant | 0000 | |
| Message type | | 0x01 | 1011 |

#### II.5.3.7.4.1 Location updating accepted

**Ref.: GSM 04.08-DCS 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:-

(1) a PAGING REQUEST TYPE 1 with the old TMSI.
(2) a PAGING REQUEST TYPE 1 with the IMSI.

**Requirements 3**

1) The MS shall wait for the SS to release the link.

2) (1) The MS shall ignore the PAGING REQUEST TYPE 1 message containing TMSI.

(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-DCS 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-DCS 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 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.

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 selected.

**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-DCS 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-DCS 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.5.3.7.4.2.4 Location Updating rejected "National Roaming not allowed in this location area"

**Initial conditions**

1) The MS shall be in the "idle,updated" state (TMSI assigned) listening to the BCCH/CCCH of cell B. The list of "location areas not allowed for national roaming" shall be empty

   NOTE: This may be achieved by either removing the SIM or switching the MS OFF then ON.

2) Neither Location Area Identification a) of cell A or Location Area Identification b) of cell B shall have the MNC as the Home PLMN, however both a) and b) shall have the same MNC. The MCC shall be the same as that of the Home PLMN. The Location Area Identifications of cell A and cell B shall be different.

3) The MS shall be placed in automatic network selection mode.

These initial conditions apply to all the following procedures except where different conditions are explicitly stated within a procedure.

**Procedure 1**

**Purpose**

To test that on receipt of a rejection using the National Roaming cause code, the MS ceases trying to update on that cell, that this situation continues for at least one periodic location interval period, and that the rejected area list is re-set by powering down the MS. (The requirement given in GSM 04.08-DCS that the list shall be regularly deleted is not formally tested.)

a) The MS is made to perform a normal location updating on cell A as described under method of test II.5.3.7.4. The power transmitted by cell B is reduced but is kept high enough to ensure that for cell B, C1 > 0. The SS responds with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

b) The SS waits for a location update request on cell B, for 7 minutes. The SS responds to the LOCATION UPDATING REQUEST message with a LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

c) The SS waits for a possible location updating on either cell A or cell B for 10 minutes.

d) The MS is turned off.

e) The MS is turned on and placed in automatic network selection mode (if this is not the default mode).

f) The SS waits for a location update on either cell A or cell B for 2 minutes.

**Requirements 1**

1) In step a, the MS shall perform the normal location updating procedure on cell A and disconnect layer 2 upon channel release by the SS.

2) In step b, the MS shall perform the location updating procedure on cell B and disconnect layer 2 upon channel release by the SS.

3) In step c, the MS shall not perform location updating within 10 minutes after release of the link by the MS following the Location Updating Reject message.

4) In step f the MS shall perform the location updating procedure on either cell A or on cell B.

**Procedure 2**

**Purpose**

To test that if no cell is available for National Roaming, emergency calls can still be made.

a) The MS is made to perform a normal location updating request on cell A as described under method of test II.5.3.7.4. The power transmitted by cell B is reduced but is kept high enough to ensure that for cell B, C1 > 0. The SS responds with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

b) The SS waits for a possible periodic location updating on both cells A and B for 7 minutes.

c) A location updating request on cell B causes the SS to respond with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

d) The SS waits for possible location updating on both cells A and B for 2 minutes.

e) An emergency call is originated at the MS.

**Requirements 2**

1) In step a, the MS shall perform the normal location updating procedure and disconnect layer 2 upon channel release by the SS.

2) In step b, the MS shall not perform any location updating on cell A within 7 minutes after release of the link by the MS following the Location Updating Reject message. However, the MS shall perform a Location Updating Request on cell B within 7 minutes of the release of the link.

3) In step d, the MS shall not perform a location updating procedure on either cell A or cell B within 2 minutes after the release of the channel by the SS.

4) In step e, the MS shall correctly originate the emergency call as described in test II.5.3.8.2.

**Procedure 3**

**Purpose**

To test that at least 6 entries can be held in the list. (The requirement of the core recommendation is to store at least 10 entries. This is not fully tested by this procedure.)

a) The MS is made to perform a normal location updating request on cell A as described under method of test II.5.3.7.4. The power transmitted by cell B is reduced but is kept high enough to ensure that for cell B, C1 > 0. The SS responds with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

b) The SS waits for a possible location update request on both cells A and B for 7 minutes.

c) The SS responds to a location updating request on cell B with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

   The Location Area Identifier of cell A shall be changed within 5 seconds of the transmission of the reject message. The code shall be chosen randomly but shall be different from any previously used in this procedure. The code shall have the same MCC as the Home PLMN and shall not have the same MNC as the Home PLMN.

d) The SS waits for a possible location update request on both cells A and B for 2 minutes.

e) The SS responds to a location updating request on cell A with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

   The Location Area Identifier of cell B shall be changed within 5 seconds of the transmission of the reject message. The code shall be chosen randomly but shall be different from any previously used in this procedure. The code shall have the same MCC as the Home PLMN and shall not have the same MNC as the Home PLMN.

f) Procedures b and c are repeated once, except that for the repeat of step b the SS need only wait for 2 minutes.

g) Procedures d and e are repeated once.

h) The SS waits for a possible location updating request on both cells A and B for 2 minutes.

i) The SS responds to a location updating request on cell B with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

   The Location Area Identifier of cell A shall be changed within 5 seconds of the transmission of the reject message to that of the first Location Area Identifier rejected in this procedure.

j) The SS waits for a possible location updating request on both cells A and B for 10 minutes.

**Requirements 3**

1) In step a, the MS shall request a location update and disconnect layer 2 upon channel release by the SS.

2) In step b, the MS shall request a location update on cell B within 7 minutes and shall not request a location update on cell A within 7 minutes.

3) In step d, the MS shall request a location update on cell A within 2 minutes and shall not request a location update on cell B within 2 minutes.

4) In step f, the MS shall request a location update on cell B within 2 minutes and shall not request a location update on cell A within 2 minutes.

5) In step g, the MS shall request a location update on cell A within 2 minutes and shall not request a location update on cell B within 2 minutes.

6) In step h, the MS shall request a location update on cell B within 2 minutes and shall not request a location update on cell A within 2 minutes.

7) In step j, the MS shall not request a location update on cells A or B within 10 minutes.

**Procedure 4**

**Purpose**

The procedure tests that if a cell of the Home PLMN is available then the MS returns to it in preference to any other available cell.

a) The SS is made to simulate 3 cells A, B, C with 3 different location area codes. None of the cells are part of the Home PLMN.

Cells should differ in signal strength by 10 dB with cell A being the strongest and cell C the weakest. There should be a 20 dB range between A and C. A should be set to a level of -40 dBm.

The SS shall be set so that it accepts any location update requests on cells A and C.

(NOTE: The uplink frequency of cell B may be monitored by using the SS wideband receiver.)

b) The SS shall wait for a periodic location updating on cell A for 7 minutes.

c) The location area identity of cell C shall be changed to that of a location area in the Home PLMN.

d) At the next periodic location update on cell A the SS responds to the location updating request for cell A with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

e) The SS shall wait for a location update on cell C for 2 minutes.

**Requirements 4**

1) In step b) the MS should perform a periodic location updating procedure on cell A.

2) In step e) the MS shall not transmit on the uplink frequency of cell B and shall perform a normal location updating procedure on cell C within 2 minutes.

**Procedure 5**

**Purpose**

The procedure tests that if the SIM is removed the National Roaming forbidden list is cleared.

a) The MS is made to perform a normal location updating on cell A as described under method of test II.5.3.7.4. The power transmitted by cell B is reduced but is kept high enough to ensure that for cell B, C1 > 0. The SS responds with the LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

b) The SS waits for a location update request on cell B, for 2 minutes. The SS responds to the LOCATION UPDATING REQUEST message with a LOCATION UPDATING REJECT message containing cause value #13: "National Roaming not allowed in this location area" and then releases the channel.

c) The SS waits for a possible location updating on cell A or cell B for 7 minutes.

d) If removal of the SIM without disconnection of the power supply is possible (see PIXIT statement) the SIM is removed. Otherwise, if the MS offers a switch off facility, the MS is switched off; else the power supply is disconnected.

e) If in step d the SIM was removed, the SIM is re-inserted. Otherwise, if in step d the MS was switched off, the MS is switched on; else, the power supply is connected to the MS and, if necessary, the MS is activated. The MS is placed in automatic network selection mode (if this is not the default mode).

f) The SS waits for a location update on either cell A or cell B for 2 minutes.

**Requirements 5**

1) In step a, the MS shall perform the normal location updating procedure on cell A and disconnect layer 2 upon channel release by the SS.

2) In step b, the MS shall perform the location updating procedure on cell B and disconnect layer 2 upon channel release by the SS.

3) In step c, the MS shall not perform any location updating within 7 minutes after release of the link by the MS following the Location Updating Reject message.

4) In step f) the MS shall perform the location updating procedure on either cell A or cell B.

### 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-DCS 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) With in a period t seconds, where T3213 < t < 15, after having sent the last CHANNEL REQUEST messages 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 15 s, 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-DCS (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 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 #17 (network failure) or #22 (congestion) ~~#i. (This cause value is randomly chosen in table 10.44 of GSM 04.08-DCS, 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 occurring 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 12 s 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 Requirement 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 occurring 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 periodic 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.

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 occurring 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-DCS, causes #2, #3, #11 and #12 being excluded.)~~#17 or #22.

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 Requirement 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 #17 or #22~~#i. (This cause value is randomly chosen in table 10.44 of GSM 04.08-DCS, 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 occurring 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 #17 or #22 ~~#i. (This cause value is randomly chosen in table 10.44 of GSM 04.08 DCS, 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 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 #17 or #22 ~~#i. (This cause value is randomly chosen in table 10.44 of GSM 04.08-DCS, 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 either step b) or 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 occurring 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 whether 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 whether 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 occurring 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 occurring 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 periodic 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.

**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 Procedures 3 and 4 again 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 Test of 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 time-out 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 20s. 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 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 time-out.

##### 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 time-out.

##### 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.5.3.9 Testing of structured procedures

**Ref.: GSM 04.08-DCS 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-DCS 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-DCS, 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-DCS 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-DCS 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".

   NOTE: The default parameter values of section II.5.3.1.1 may alternatively be used.

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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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 the 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-DCS, 9.1.8) to the SS:

| | Comment | Value |
|---|---|---|
| Random reference | | x xxxx |
| Cause | Orig. call | 111 |

MESSAGE CM SERVICE REQUEST (GSM 04.08-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 9.1.3) to the SS:

MESSAGE CONNECT ACKNOWLEDGE (GSM 04.08-DCS, 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-DCS, 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-DCS 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-DCS 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-DCS 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".

NOTE: The default parameter values of section II.5.3.1.1 may alternatively be used.

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.

Drafting note: Timer values for authentication/ciphering are not specified.

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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 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 | | 0110 0011 |
| - speech full rate | | 0000 0001 |

MESSAGE CONNECT ACKNOWLEDGE (GSM 04.08-DCS, 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-DCS, 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-DCS, 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.

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-DCS, 9.1.8) to the SS:

| | Comment | Value |
|---|---|---|
| Random reference | | x xxxx |
| Cause | Answer to paging | 100 |

MESSAGE PAGING RESPONSE (GSM 04.08-DCS, 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-DCS, 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-DCS, 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-DCS, 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-DCS, 9.1.3) to the SS:

MESSAGE ALERTING (GSM 04.08-DCS, 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-DCS, 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-DCS, 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-DCS, 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 did 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 Synchronization to the System

This chapter specifies the requirements concerning synchronization 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 Rec. GSM 11.10-DCS.

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 Synchronization 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-DCS.

### 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 from 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)

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.

**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~~ 690 to 710. 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 ~~11~~ 13 dBµVemf( ) ~~for a handheld and 9 dBµVemf( ) 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 ~~14~~ 16 dBµVemf( ) and sets multipath condition RA~~250~~ 130.

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.

See timing figure in GSM 11.10 V3.8.0.

### 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~~ 512 and ARFCN ~~124~~ 885 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~~ ARFCN 512 timeslot 1, DTX not active.

c) The SS sends an ASSIGNMENT COMMAND to the MS allocating a full rate traffic channel on ARFCN ~~124~~ 885 and timeslot 2 with a Power Command of 5.

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~~ 512 with an offset of ~~+267~~ 320 Hz

Cell B TN=0 ARFCN ~~124~~ 885 with an offset of ~~-267~~ 320 Hz.

This offset is representing worst cases for doppler shift at ~~250~~ 130 km/hr and frequency inaccuracy of 0.05 ppm.

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~~ 885, timeslot 0). Cells A and B are not synchronized cells. The Power Command is set to 5.

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) |
| normal bursts: | 3 timeslots (=45/26 ms) minus the timing advance value received from the SS. |

### 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-DCS 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 +/- ~~1.344~~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 ~~03.06~~ and 05.08-DCS

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 re-established 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 counter S.

The 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 in 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.

If 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 initialize the counter S in the MS, on the BCCH on which the MS camps a message System Information is sent with a randomly chosen value N for the parameter RADIO_LINK_TIMEOUT.

The mobile originates a call according to chapter "structured procedures".

Once the call is established, unrecoverable errors will be introduced inside the SACCH messages by using the System Simulator.

The system simulator will send 32 errorfree SACCH messages, then N erroneous SACCH messages, and then continuously errorfree 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 activity on the SDCCH channel.

#### II.6.1.5.4 Method of test B

The counter S is initialized 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 message. Then it will send 2 SACCH messages with unrecoverable errors followed by one error free SACCH message This step is repeated 64 times.

**Repetition of the test**

The 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 counter S is initialized 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 it will send 3 SACCH messages with unrecoverable errors followed by 1 error free SACCH message. This step is repeated N - 2 times. Then the SS will send continuously errorfree SACCH message.

**Repetition of the test**

The 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-DCS 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 ~~12~~4374 RF carriers. If ~~one~~two signal strength samples ~~is~~are read on an RF carrier every TDMA frame, the time to take 5 samples on each is about ~~3~~4.5 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 a maximum of 5~~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. These times are assumed to be after self test has been completed and any PIN entry accepted.

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 1: The timing tolerances in all the tests shall be -0 %, +10 %.

NOTE 2: 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-DCS 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 the 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.~~

f~~g~~) Steps a) to e)~~f)~~ above are repeated for cases 2 to 5 ~~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-DCS 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 4.~~6.~~ (The values of C1 on the four ~~6~~ BCCH carriers are then respectively ~~-25, 15, 10, 20, -8, <=5.~~ 25, 10, 18, <=5.)

b) The SS checks that the MS does at least one RA request on carrier 2 ~~-3~~ within 30 s followed by at least one RA request on carrier three ~~4~~ within a further 12 s.

NOTE: Carrier two ~~3~~ has a higher level than Carrier three ~~4~~ but a lower C1. Therefore initial cell selection should choose Carrier two ~~3~~ and cell reselection should choose carrier three.~~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 three ~~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 three.~~4.~~ (The MS should temporarily reselect carrier three ~~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 three.~~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 three.~~4.~~

i) The SS changes the ARFCN of carrier three ~~4~~ to 851 ~~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 initialized 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 three.~~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 three.~~4.~~

m) The SS sets CBA = 1 on carriers 1 and three.~~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 two ~~3~~ but none on carrier 1.

p) The SS pages the MS on carriers three ~~2~~ and 4 and checks that the MS makes no RA request on carriers three ~~2~~ and 4.

q) The SS sets CBA=O on carriers 1 and three.~~4.~~

r) The SS sets the level on carrier two ~~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 three.~~4.~~

v) The SS waits for 30 seconds (to allow the MS to revert to carrier 1). It then sets LAC on carrier three ~~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 three.~~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 three) ~~4)~~ and then reverts to 48 dBmicroVoltemf~~( )~~.

y) The SS checks that the MS makes at least one RA request on carrier three.~~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-DCS 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 carrier one switched off, no pages being sent and with RAM = -70 on carriers three ~~4~~ and four.~~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 two ~~3~~ and setting up a call on a TCH with ARFCN of ~~22~~534.

c) The SS starts paging the MS repeatedly on ~~all the~~ BCCH carriers two, three and four.

d) The SS causes a normal channel release (i.e. sends a DISCONNECT message).

e) The SS checks that the MS does at least one RA request (with establishment cause = answer to paging) on carrier two.~~3, but none on carrier 5.~~

f) The MS is switched off and on; the MS responds to the ongoing paging on BCCH carrier two; and the SS brings the call into the active state on a TCH with ARFCH of 534. ~~and steps a) and b) above are repeated.~~

g) Transmissions on all ~~any~~ dedicated channels are ~~is~~ 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 two ~~3~~ within 16 s.

i) The MS is switched off and on; the MS responds to the ongoing paging on BCCH carrier two; and the SS brings the call into the active state on a TCH with ARFCN of 534 on carrier two, RE is set to 1 ~~and steps a) and b) above are repeated but with RE=1 on carrier 3~~ and the SS stops paging the MS on carrier two ~~3~~.

j) The RXLEV_ACCESS_MIN on carrier three~~4~~ is set to RAM = -100.

k) Transmissions on all ~~any~~ dedicated channels are ~~is~~ switched off.

l) The SS checks that the MS does at least one RA request (with establishment cause = call re-establishment) on carrier three ~~4~~ within 16 s.

NOTE: The SS receiver must switch to the specified BCCH carrier immediately after the DISCONNECT message has been sent to the MS in step d), or the TCH is switched off in steps g) and j).

NOTE: Steps g) to l) ~~and h)~~ 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-DCS 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 carrier;
- 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 request 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 three ~~4~~ which has the highest C1).

d) The SS checks that the MS makes RA requests on carrier three ~~4.~~ (Carrier three ~~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 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 three ~~4~~ which has the highest C1).

j) The SS checks that the MS makes a RA request on carrier three ~~4~~ or carrier two within 12 s.

#### II.6.1.6.13 Requirement

The MS shall respond as indicated in steps b), d), f), h) and j) above.

**Table II.6-1: Normal System Information Fields**

| Parameter | Reference in GSM 04.08-DCS | 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 O |
| RE | 10.5.2.17 | RE | O (i.e. re-establishment allowed) |
| BA ARFCN | 10.5.2.13 | BA | All O except for ARFCN=~~3,9,18,25,41,43,49,50,54,58,62,66,70,80,92,124~~512,543 568,589,602,641,662,683, 696,711,732,754,794,851, 870,871,872,884, |
| 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-DCS) |
| RXLEV_ACCESS_MIN | 10.5.2.4 | RAM | -90 dBm |

**Table II.6-2: Cell Selection Test Parameters**

| | | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|---|
| BCCH Carrier 1 | Level dBµVemf( ) | 48 dBm | 60/30** | 60/30** | 60/30** |
| | Syst Info | CBA=1 | MTMC =13 dBm | AC=1 for MS | Normal |
| | ARFCN | 62 | 62 | 62 | 2 |
| BCCH Carrier 2 | Level dBµVemf( ) | 38 | 65 | 65 | 65 |
| | Syst Info | PLMN not that of MS | PLMN not that of MS | PLMN not that of MS | PLMN not |
| | ARFCN | 124 | 124 | 124 | 74 |
| BCCH Carrier 3 | Level dBµVemf( ) | 38 | 38 | 38 | 38 |
| | Syst Info | RAM=-85 | RAM=-85 | RAM=-85 | RAM=-85 |
| | ARFCN | 54 | 54 | 54 | 4 |
| BCCH Carrier 4 | Level dBµVemf( ) | 33 | 33 | 33 | 33 |
| | Syst Info | RAM=-100 | RAM=-100 | RAM=-100 | RAM=-100 |
| | ARFCN | 58 | 58 | 58 | 8 |
| BCCH Carrier 5 | Level dBµVemf( ) | 43 | 43 | 43 | 43 |
| | Syst Info | RAM=-62 | RAM=-62 | RAM=-62 | RAM=-62 |
| | ARFCN | 66 | 66 | 66 | 16 |
| BCCH Carrier 6 | Level dBµVemf( ) | 43/13* | 61/31* | 61/31* | 61/31* |
| | Syst Info | RAM=-98 | Normal | Normal | Normal |
| | 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.

| | | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|---|---|---|---|---|---|---|
| BCCH Carrier 1 | Level dBµV emf | 48 | 60/30** | 60/30** | 60/30** | 60/30** |
| | Syst Info | CBA=1 | MTMC = 10 dBm | AC=1 for MS | PLMN not that of MS | Normal |
| | ARFCN | 543 | 543 | 543 | 543 | 513 |
| BCCH Carrier 2 | Level dBµV emf | 38 | 38 | 38 | 38 | 38 |
| | Syst Info | RAM=-85 | RAM=-85 | RAM=-85 | RAM=-85 | RAM=-85 |
| | ARFCN | 696 | 696 | 696 | 604 | 603 |
| BCCH Carrier 3 | Level dBµV emf | 33 | 33 | 33 | 33 | 33 |
| | Syst Info | RAM=-98 | RAM=-98 | RAM=-98 | RAM=-100 | RAM=-100 |

**Table II.6-2: Cell Selection Test Parameters**

| | | | | | | |
|---|---|---|---|---|---|---|
| | ARFCN | 711 | 711 | 711 | 608 | 702 |
| BCCH Carrier 4 | Level dBµV emf | 43/13* | 61/31* | 61/31* | 43 | 61/31* |
| | Syst Info | RAM=-98 | Normal | Normal | RAM=-62 | Normal |
| | ARFCN | 568 | 568 | 568 | 851 | 660 |
| REQUIREMENT | | RA response on carrier 2 before a response (if any) on carrier 3 | RA response on carrier 1 before a response (if any) on carrier 2 | No RA response on carrier 1 or 2. | RA response on carrier 2 before a response (if any) on carrier 3 | RA response on carrier 1 before a response (if any) on carrier 2 |

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.

**Notes on table II.6-2**

Through these tests the system information type 2 and 2 bis will be tested by forcing neighbour cells description on two messages and verifying the correct cell selection.

Case 1: The averaging on carrier 4 ~~-6~~ should result in an average level in the range 25 to 13 dBmicroVoltemf~~( )~~. The values of C1 on the 4 ~~-6~~ BCCH carriers are respectively: 25, 10, 20, 10 to -2 ~~-25,15,10,20, 8,10 to -2~~. Carrier 2 ~~-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 4 ~~-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: Carrier 1 should be ignored since it is of the wrong PLMN. Carrier 2 has the highest level of the suitable cells and should therefore be selected first.

Case 5~~4~~: Any stored BA information will be incorrect. The MS should therefore do a search of all ~~124~~374 DCS 1 800~~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 65 dBmicroVolt 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-DCS 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 on AFRCN 700 at a level of 63 dBmicroVolt emf and the BCCHs of two ~~6~~ adjacent cells at 28 dBmicroVolt emf~~( )~~. The BCCH of the serving cell shall indicate serving and ~~these BCCHs~~ adjacent cell BCCH's on AFRCNs: 585, 660, 700, 735, 810 and 885.~~, 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 dBuV.~~

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 step1.

The SS shall wait 20 s before step d).

**Table II.6-3: Average signal levels at RX input in dBµV~~( )~~ emf**

| Step | ARFCN: | TCH ~~1~~512 | BCCH1 ~~62~~700 | BCCH2 ~~12~~4885 | ~~BCCH3~~ ~~20~~ | BCCH34 Note 1~~40~~ | ~~BCCH5~~ ~~80~~ | ~~BCCH6~~ ~~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 | 4~~5~~47-m*10 | ~~55-m*10~~ | 75-m*10 | ~~15~~ | ~~25~~ |
| 3+m*21 | | 64.5-m*10 | 62.5-m*10 | 4~~5~~47-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 | 4~~5~~47-m*10 | ~~55-m*10~~ | 75-m*10 | ~~15~~ | ~~25~~ |

m = 0, 1, 2, 3, 4.

NOTE: BCCH3 takes the ARFCN values as shown below:

| m | ARFCN |
|---|---|
| 0 | 585 |
| 1 | 660 |
| 2 | 735 |
| 3 | 810 |
| 4 | 585 |

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 1, 22, 43, 64 and 85 where the SS shall keep the signal levels stable for 20s before using the reported RXLEV values (this gives the MS time to synchronize on the BCCHs which have just been switched on)~~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 stabilize 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, ~~84,~~ 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~~(.)~~.

At steps 1, 22, 43, 64 and 85, the SS shall check the accuracy of the measured signal strengths by checking the values of the parameters TCH: RXLEV FULL (steps 1 & 22 only) / RXLEV SUB, BCCH1: RXLEV, BCCH2: RXLEV, and BCCH3: RXLEV.

For all steps, the SS shall check the accuracy of the measured signal strength of BCCH1 by checking the value of the parameter RXLEV reported for BCCH1.

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 n <= 21 and RXLEV1 = 63 (see note 3)
either
RXLEVn = 63
or

$$RXLEVn = (63 - n + r) \quad \{ \begin{matrix} +1 \\ -1 \end{matrix}$$

Otherwise

$$RXLEVn = ( RXLEV(m*21+1) - n + m*21 + 1 ) \quad \begin{matrix} +1 \\ -1 \end{matrix} \quad \{, \quad \begin{matrix} +2 \text{ note 1)} \\ -1 \end{matrix} \quad \{, \quad \begin{matrix} +3 \text{ note 2)} \\ -1 \end{matrix} \quad \{$$

where m = 0, 1, 2, 3, 4 (see table II.6-3);

n = number of step where n takes all values from n=m*21 to n = (m+1)*21;
r = number of last step where RXLEV of 63 was reported.

NOTE 1: This tolerance applies to signal levels below 27~~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 1412 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 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:

$$°RXLEV_{MS}~~MS~~ - RXLEV_c° <= \quad \begin{matrix} \text{(4 for steps 64, 85;} \\ \text{(6 for steps 1, 22, 43;} \end{matrix}$$

where $RXLEV_{MS}$ = reported RXLEV value;

$RXLEV_C$ = correct RXLEV value as stated in the table II.6-4 below.

For extreme test conditions:

$°RXLEV_{MS} - RXLEV_c° <= 6$ for steps 1, 22, 43, 64, 85.

NOTE: in step 64 $RXLEV_c$ is 32.

**Table II.6-4: Correct values of RXLEV**

| 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 |

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-DCS. The MS has to map this BER into RXQUAL values using the coding scheme defined in section 8.2.4 of GSM 05.08-DCS.

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~~90 to 710 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 uncorrelated 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 be on the same channel as the wanted signal but 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 dBuVemf ( ) to 50 dBuVemf ( ) and to calibrate over 2 000 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 time-out. 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_O | 10 % | 211 | 1 750 |
| 1 | RXQUAL_1 | 25 % | 211 | 700 |
| 2 | RXQUAL_2 | 15 % | 254 | 1 400 |
| 3 | RXQUAL_3 | 10 % | 211 | 1 750 |
| 4 | RXQUAL_4 | 10 % | 211 | 1 750 |
| 5 | RXQUAL_5 | 5 % | 213 | 3 500 |
| 6 | RXQUAL_6 | 5 % | 213 | 3 500 |
| 7 | RXQUAL_7 | 5 % | 200 | 3 300 |

| 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 | 1 105 |

### 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 690~~60~~ to ~~65~~710 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 28 dBuVemf( ). 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 be on the same channel as the wanted signal but 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 minimize 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~~13 to the MS for class 2 or TXPWR= 10 to the MS for class 1 (see note 2).

NOTE 2: Due to the high dynamic range required from the SS for a power level change from 0 to 13~~-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 13~~-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 frame 6, 19, 32 and every subsequent 13th TDMA frame to TDMA frame 136~~-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 13 ~~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 1 s the SS then sets TXPWR = 9.~~

For a class 1 mobile the SS now sets the TXPWR = 6, and after 3 s the SS sets TXPWR = 7.

For a class 2 mobile the SS now sets the TXPWR = 3, and after 3 s the SS sets TXPWR = 4.

g) After the SS has set TXPWR = ~~9~~7 for class 1 and TXPWR = 4 for class 2, the SS shall measure the MS transmit power on TDMA frame 6 (GSM 05.08-DCS section 4.7).

h) The SS returns TXPWR to 6~~8~~ for a class 1 mobile and to 3 for a class 2 mobile.

i) After the SS has set TXPWR = ~~8~~6 for a class 1 mobile and to 3 for a class 2 mobile, the SS shall measure the MS transmit power on TDMA frame 6 (GSM 05.08-DCS section 4.7).

j) Then the channel assignment is changed and the demanded power within the channel assignment is set to TXPWR=~~15~~10 for class 1 or TXPWR= 13 for class 2. When the MS has changed channel, its output power is measured on the first burst of 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 POWER and the relevant TOLERANCES.

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 previously measured TDMA frame until power control level ~~15~~10 (for class 1) or 13 (for class 2) 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-DCS section 4.2).

2) Step e). The peak transmitted carrier power of TDMA frame 6 shall correspond to power control level 9 (for class 1) or 12 (for class 2)~~14~~ (see note below). 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-ME interface is specified in GSM 11.11-DCS.

Testing of the SIM itself is not part of this specification.

The DCS 1 800 system shall use SIMs which support a DCS1 800 application with an associated DCS1 800 directory.

**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 access to the correct application directory and data;

b) the correct interpretation of data read by the ME from the SIM;

c) the correct writing of data by the ME to the SIM;

d) 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 $U_m$ 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 Initialization**

To perform these test sequences SIMs will be required programmed with specific data field values in the DCS 1 800 directory as defined in tables II.8-1 and II.8-2 following.

In some tests the SIM will be programmed with both a GSM and a DCS1 800 directory. In that case the GSM directory will be pre-programmed as in test sequence 1.

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-DCS.)

**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 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| At end of test sequence | 1 | 2 | 3 | | 4 | | 5 | | 6 | 8 | | 10 | 13 | 14 | 15 |
| Data Field \ Value | | | | | | | | | | | | | | | |
| IMSI | A | A | A | B | B | B | B | A | A | See test 8 | B | B | x | A | A |
| LOCATION INFORMATION (LAI & TMSI) | A | B | C | A | D | F | E | B | B | x | A | x | x | B | A |
| Kc and Cipher Key Sequence No. (n) | A | A | A | A | B | B | C | A | A | A | A | x | x | A | A |
| ACCESS CONTROL | A | A | A | A | A | A | A | A | A | see Test 8 | A | A | x | A | A |
| FORBIDDEN PLMNs | A | A | A | A | A | A | B | A | A | A | A | A | x | A | A |
| SIM SERVICE TABLE | A | A | 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 | x | x |
| UNBLOCKING KEY | x | x | x | x | x | x | x | A | A | x | x | x | A | x | x |
| PLMN SELECTOR | A | A | A | A | A | A | A | A | B | A | A | A | x | A | A |
| DIRECTORY | D | D | D | D | D | D | D | D | D | D | D | D | D | D | G/D |

NOTE: "x" indicates that the value is of no significance to the test.

G indicates GSM directory values

D indicates DCS directory values

**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 | 08H length of IMSI |
| byte 2 | 29 H | 29H first digit, parity coding |
| byte 3 | 64 H | 64H digits |
| byte 4 | 18 H | 18H |
| byte 5 | 53 H | 11H |
| byte 6 | 97 H | " |
| byte 7 | FF H | " |
| byte 8 | FF H | " |
| byte 9 | FF H | " |

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 | 00002143 H | 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 implementation.

Data-Field 6F-20: Cipher Key (Kc) and Cipher Key Sequence No. (n)

| | **Value A** | **Value B** | | **Value C** |
|---|---|---|---|---|
| byte 1 | xx | } | bytes 1-8 as | xx H |
| byte 2 | xx | } | determined by | xx H |
| byte 3 | xx | } | Authentication | xx H |
| byte 4 | xx | } | Algorithmxx H | |
| byte 5 | xx | } Kc | | 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.

Data-Field 6F-7B: Forbidden PLMNs

| | **Value A** | | **Value B** | | |
|---|---|---|---|---|---|
| byte 1 | 32 H | MCC = 234 | 32 H | MCC = 234 | } |
| byte 2 | F4 H | | F4 H | | } First forbidden |
| byte 3 | 20 H | MNC = 02 | 30 H | MNC = 03 | } PLMN (oldest) |
| byte 4 | 32 H | MCC = 234 | 32 H | MCC = 234 | } |
| byte 5 | F4 H | | F4 H | | } 2nd forbidden |
| byte 6 | 30 H | MNC = 03 | 40 H | MNC = 04 | } PLMN |
| byte 7 | 32 H | MCC = 234 | 32 H | MCC = 234 | } |
| byte 8 | F4 H | | F4 H | | } 3rd forbidden |
| byte 9 | 40 H | MNC = 04 | 50 H | MNC = 05 | } PLMN |
| byte 10 | 32 H | MCC = 234 | 32 H | MCC = 234 | } |
| byte 11 | F4 H | | F4 H | | } 4th forbidden |
| byte 12 | 50 H | MNC = 05 | 10 H | MNC = 01 | } PLMN (newest) |

**Table II.8-2 (continued)**

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 - PINDisable 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 = 8 | 28H | MNC = 82 |

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 initialization 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 initialization 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 initialization 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 initialization 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 IMM 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 Requirements 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 Requirements 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:

1) If the SIM can simply be removed it is removed without powering down the SIM.

2) If 1) 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 Initialization 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: 43658709H.

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.

**Requirement**

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 contact.

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 section 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 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 (subclause 6.1.2), then Vpp is activated together with Vcc, at the time of Vcc (step 2 in the sequence above).

#### 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 (subclause 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 realization 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 and TC2.2.

| Contacts | Low level | High level test equipment | Max capacitive load from |
|---|---|---|---|
| C1 (Vcc) | | V = 5V +/-10 %<br>I = 10 mA | |
| C2 (RST) | 0V<= V <=0.6V<br>I = - 200 µA | 4V<= V <=Vcc<br>I = + 20 µA | 30 pF |
| C3 (CLK) | 0V<= V <=0.6V<br>I = - 200 µA | 4V<= V <= Vcc<br>I = + 20 µA | 30 pF |
| C5 (GND) | 0V | 0V | |
| C6 (Vpp) | | 5 V +/- 10 % | |
| I<br><br>C7 (I/O) O | 0V<= V <=0.8V<br>I = -1 mA<br><br>0V<= V <=0.4V<br>I = 1 mA | 0.7*Vcc<= V <=Vcc<br>I = +/- 20 µA<br><br>3.8V<= V <=Vcc<br>I = - 20 µA | 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-DCS is not tested to its full extent.

Requirement: The voltage shall not fall below 4.5 V.

#### 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 µs.

##### 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 the voltage levels on contact C7.

Procedure: The voltage on C7 is measured with the remaining contacts in nominal test conditions.

**Requirements**

- On the ME input:
  The voltage shall be between 0 and 0.4V (low level) for I = -1 mA and between 3.8V and Vcc+0.5V (high level) for I = -20 µA.

- On the ME output:
  The voltage shall be between 0 and 0.8V (low level) for I = 1 mA and between 0.7*Vcc and Vcc+0.5V (high level) for I = +/-20 µA.

### II.8.8 Test Sequence 8: ACCESS CONTROL

NOTE: The figure at the end of test sequence 8 shows the various scenarii for access control, as defined in GSM 04.08 and 02.11.

**Purpose**

1) To confirm that the ME reads the Access Control value as part of the SIM/ME initialization 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 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 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 |

| | | | | | |
|---|---|---|---|---|---|
| TEST 8d | | | | | |
| 246813579 | 0 | 00000000<br>00000001 | 246<br>81 | No | Yes |
| " | 1 | 00000000<br>00000010 | " | No | Yes |
| " | 2 | 00000000<br>00000100 | " | No | Yes |
| " | 3 | 00000000<br>00001000 | " | No | Yes |
| " | 4 | 00000000<br>00010000 | " | No | Yes |
| " | 5 | 00000000<br>00100000 | " | No | Yes |
| " | 6 | 00000000<br>01000000 | " | No | Yes |
| " | 7 | 00000000<br>10000000 | " | No | Yes |
| " | 8 | 00000001<br>00000000 | " | No | Yes |
| " | 9 | 00000010<br>00000000 | " | No | Yes |

NOTE: See end of table for coding details of the parameters in the table.

**Table II.8-3 (Continued)**

| TEST 8e | | | | | |
|---|---|---|---|---|---|
| 246813579 | 0 | 11111011<br>11111110 | 246<br>81 | Yes | Yes |
| " | 1 | 11111011<br>11111101 | " | Yes | Yes |
| " | 2 | 11111011<br>11111011 | " | Yes | Yes |
| " | 3 | 11111011<br>11110111 | " | Yes | Yes |
| " | 4 | 11111011<br>11101111 | " | Yes | Yes |
| " | 5 | 11111011<br>11011111 | " | Yes | Yes |
| " | 6 | 11111011<br>10111111 | " | Yes | Yes |
| " | 7 | 11111011<br>01111111 | " | Yes | Yes |
| " | 8 | 11111010<br>11111111 | " | Yes | Yes |
| " | 9 | 11111001<br>11111111 | " | Yes | Yes |

NOTE: See end of table for coding details of the parameters in the table.

| | | | | | |
|---|---|---|---|---|---|
| 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 between0 & 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 between0 & 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 between0 & 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 between0 & 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 | | | | | |

NOTE: See end of table for coding details of the parameters in the table.

| | | | | | |
|---|---|---|---|---|---|
| TEST 8g | | | | | |
| 246813579 | 11 and x | 00001111<br>11111111 | 246<br>81 | No | Yes |
| " | " | 00001011<br>11111111 | " | No | Yes |
| 246813579 | 12 and x | 00010111<br>11111111 | 246<br>82 | No | Yes |
| " | " | 00010011<br>11111111 | " | No | Yes |
| 246813579 | 13 and x | 00100111<br>11111111 | 246<br>82 | No | Yes |
| " | " | 00100011<br>11111111 | " | No | Yes |
| 246813579 | 14 and x | 01000111<br>11111111 | 246<br>82 | No | Yes |
| " | " | 01000011<br>11111111 | " | No | Yes |
| 246813579 | 15 and x | 10000111<br>11111111 | 246<br>81 | No | Yes |
| " | " | 10000011<br>11111111 | " | No | Yes |
| TEST 8h | | | | | |
| 246813579 | 11 and x | 11110011<br>11111111 | 246<br>81 | Yes | Yes |
| 246813579 | 12 and x | 11101011<br>11111111 | 246<br>82 | Yes | Yes |
| 246813579 | 13 and x | 11011011<br>11111111 | 246<br>82 | Yes | Yes |
| 246813579 | 14 and x | 10111011<br>11111111 | 246<br>82 | Yes | Yes |
| 246813579 | 15 and x | 01111011<br>11111111 | 246<br>81 | Yes | Yes |

**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 |

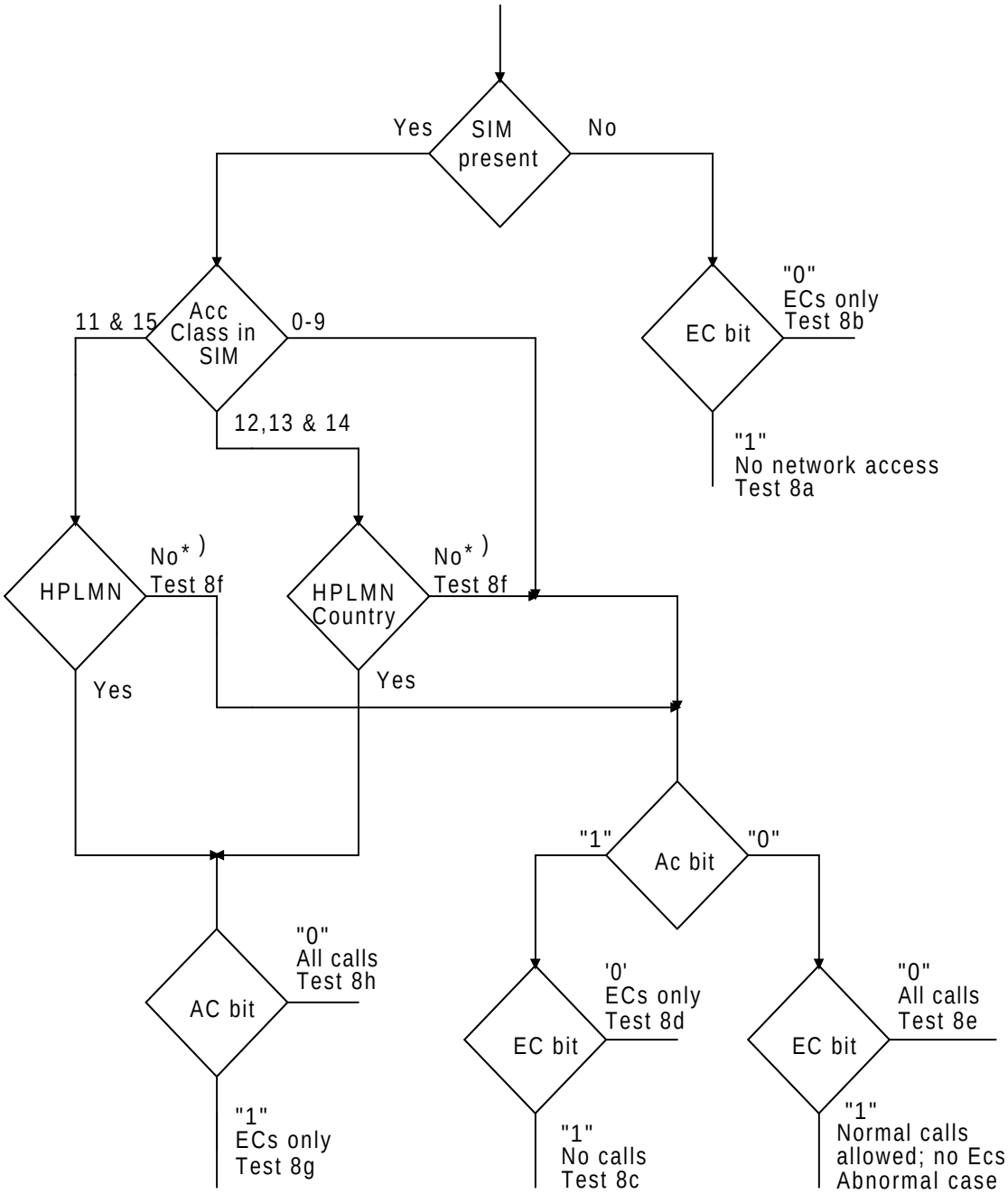
**SIM:** **Access Class: Data Field 6F 78**

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 6F 78)

EC bit = bit 3 of octet 3 of RACH Control Parameters (see GSM 04.08 subclause 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)

**Figure II.8-1: Access Control**

## 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 analyser;

   - 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 (40 000/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 (40 000/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, subclause 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: The 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.

i) 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 switch 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.8.14 TEST SEQUENCE 14: DCS and GSM directories access

Purpose: To verify that a DCS 1 800 ME reads the DCS directory of a SIM which has a GSM and DCS directory. The GSM directory is pre-programmed as at the end of test 1 (TMSI value A).

The TMSI value read must be the DCS 1 800 one( value B).

Procedure: The procedure is the same as in TEST SEQUENCE 2 with value B for TMSI read from SIM as part of the initialization procedure.

Requirements: The requirements are the same as in TEST SEQUENCE 2, the MS must return the value B for the TMSI.

### II.8.15 TEST SEQUENCE 15: GSM SIM in DCS 1 800 ME

Purpose: To verify that a DCS 1 800 ME rejects a SIM with a GSM directory only.

Procedure: a) A SIM with a GSM directory is installed into the ME.

b)The MS is powered on.

Requirement: The MS shall send a status information indicating" current directory inconsistent".

## 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~~ relevant 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.

# 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~~ 37~~ frequencies over a ~~20~~ 75 MHz band to be used. The following algorithm specifies the channels (ARFCN) to be used:

channel = ~~10~~522 + ~~4~~ 21 * n ; n = 0, 1, ...17 ~~26;~~

and channel = ~~10~~522 + ~~7~~ 17 * m ; m = 0, 1, ...21 ~~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 ~~5~~3;

- RF level to MS: 63 dBµVemf( );

- RF level to MS for tests in section II.4: 28 dBµVemf( );

- RF level to MS for test 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 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.

### 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 Temporary Antenna Connector~~Antenna coupling device~~

~~This device is used to induce a field strength to a MS with integral antenna or to pick up a radiated signal from that MS. It will enable most measurements on an MS with integral antenna to be performed without an anechoic shielded chamber.~~

~~It is necessary to establish a path-loss value for each combination of MS and antenna coupling device. This procedure involves using an anechoic shielded chamber and is described in II.4.2.2.~~

~~The manufacturer may be required to deliver an antenna coupling device which is appropriate for his specific equipment.~~

~~The testing authority may use its own antenna coupling device.~~

~~The antenna coupling device shall be designed so that it can be attached in a secure and repeatable manner in the near-field of a MS with integral antenna. It may be necessary to make special fixtures for MS designs.~~

~~The antenna coupling device shall present a 50 õ impedance at the frequencies which are used during the tests.~~

~~The following characteristics are of importance:~~

a) Coupling loss not to exceed 30 dB.

b) The coupling device shall be linear in the power range required.

c) The variation of the coupling loss as a function of frequency shall not cause measurement errors exceeding 2 dB at any test frequency.

d) The characteristics of the coupling device shall not change in the temperature range -25°C to +60°C (degrees Celsius).

~~The characteristics of the antenna coupling device under normal and extreme test conditions needs acceptance from the testing authority.~~

If the MS to be tested does not normally have a permanent external 50 ohm connector then for test purposes only, either:

a) an additional modified test sample shall be submitted fitted with a temporary 50 ohm antenna connector. This modified sample shall be used for the appropriate, non radiated measurements;

or

b) the manufacturer, or his authorized representative, shall attend the test laboratory at the conclusion of the radiated measurements, to disconnect the antenna and fit a temporary antenna connector.

In accordance with ETS 300 086 the temporary antenna connector shall not be used for measurement of:

- Transmitter effective radiated power (GSM 11.10 II.3.3).
- Transmitter radiated spurious emissions (GSM 11.10-DCS II.2.2).
- Receiver maximum usable sensitivity (field strength) (GSM 11.10-DCS II.4.2.2).
- Receiver radiated spurious emissions (GSM 11.10-DCS II.2.2).

**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 frequency ranges 1 710 to 1 785 MHz and 1 805 to 1 880 MHz. The maximum loss within these frequency ranges shall be less than 10 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 -10 to +55 degrees Celsius.

# PART TC NORMAL AND EXTREME 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. n 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°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.

### 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~~ 10°C to +55°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**

The MS shall fulfil the following vibration specifications when it is vibrated at the following frequencies/amplitudes:

| **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 -3 dB/Octave |

This equates to a total RMS vibration in the range 10 Hz to 150 Hz of 0.5 g.

# 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 (e.g. 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 12.5 GHz will almost certainly not be the same as at 900 MHz.

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 characterizing 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, i.e. 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 (i.e. 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 (i.e. 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, e.g. 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 +/-1 dB 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 (e.g. 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.

## Table Annex 2-1: Effect of uncertainties on "Max-events"

| Type of test | Propagation/ Type of channel | 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] | 13400 |
| ,, | TCH/FS Class Ib | TU50/No FH | 4800/α | [10600/α] | 1500000 |
| ,, | TCH/FS Class II | TU50/No FH | 5000 | [5500] | 60000 |
| ,, | TCH/FS Class II | HT100/No FH | 2800 | [3100] | 30000 |
| ,, | TCH/FS Class II | RA130/No FH | 1800 | [2050] | 24000 |
| ,, | FACCH | TU50/No FH | 600 | [1100] | 5950 |
| ,, | TCH/F9.6 | HT100/No FH | 600 | [1700] | 76500 |
| ,, | TCH/F4.8 | HT100/No FH | 600 | [2300] | 5350000 |
| ,, | TCH/F2.4 | HT100/No FH | 150 | [550] | 11900000 |
| INPUT LEVEL | TCH/FS Class II | STATIC (-23 dBm) | 200 | [same] | 32800 |
| RANGE | TCH/FS Class II | STATIC | 200 | [same] | 1640000 |
| | TCH/FS Class II | EQ50 | 1950 | [same] | 60000 |
| CO-CHANNEL | TCH/FS | TU1.5/No FH | 6000*α | [same] | 25000 |
| REJECTION | TCH/FS Class Ib | TU1.5/No FH | 69000/α | [same] | 3300000 |
| ,, | TCH/FS Class II | TU1.5/No 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 | TU1.5/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 | TU50/FH | 600 | [same] | 5350000 |
| ADJACENT | TCH/FS | TU50/No FH | 600*α | [1200*α] | 17800 |
| CHANNEL | TCH/FS Class Ib | TU50/No FH | 5400/α | [10700/α] | 2000000 |
| 200 kHz | TCH/FS Class II | TU50/No FH | 100000 | [122000] | 1200000 |
| ,, | FACCH | TU50/No FH | 600 | [830] | 5950 |
| ADJACENT | TCH/FS | TU50/No FH | 600*α | [1200*α] | 10500 |
| CHANNEL | TCH/FS Class Ib | TU50/No FH | 5800/α | [11500/α] | 1200000 |
| 400 kHz | TCH/FS Class II | TU50/No FH | 66000 | 80500 | 720000 |
| | FACCH | TU50/No FH | 600 | 1525 | 8782 |
| INTERMOD. | TCH/FS Class II | STATIC | 200 | [500] | 8200 |
| | FACCH | TU50/No FH | 600 | [2400] | 5950 |
| BLOCKING & | TCH/FS Class II | STATIC | 200 | [same] | 8200 |
| SPURIOUS | FACCH | TU50/No FH | 600 | [same] | 5950 |
| RESP | | | | | |

# 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.

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