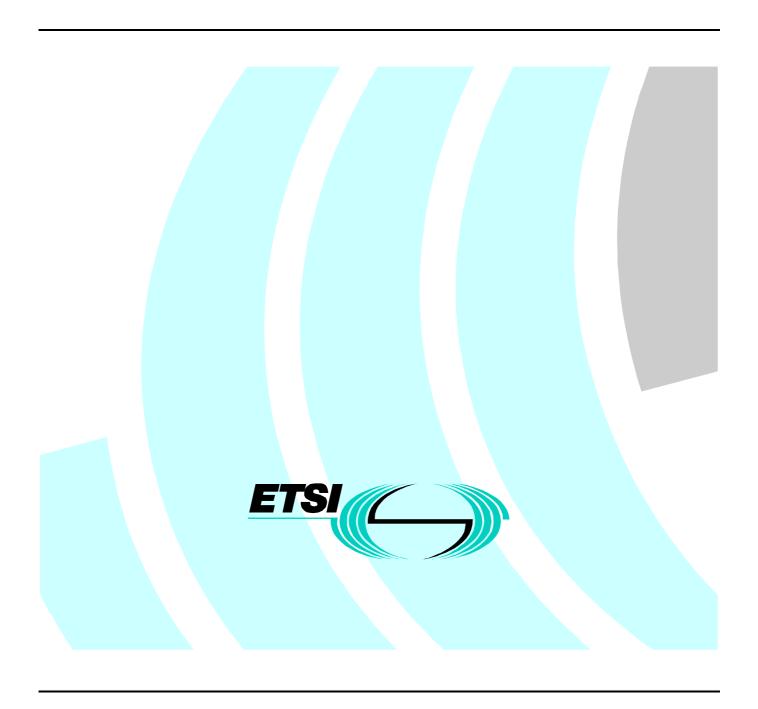# ETSI TS 101 377-2-6 V1.1.1 (2001-03)

Technical Specification

**GEO-Mobile Radio Interface Specifications;
Part 2: Service specifications;
Sub-part 6: Service Accessibility;
GMR-2 02.011**

Reference
DTS/SES-002-02011

Keywords
ACCES, GMR, GSM, GSO, interface, location,
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IPRs:

Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,715,365	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,754,974	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,226,084	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,701,390	US
TS 101 377 V1.1.1	Digital Voice Systems Inc		US	US 5,826,222	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Ericsson Mobile Communication	Improvements in, or in relation to, equalisers	GB	GB 2 215 567	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Power Booster	GB	GB 2 251 768	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Receiver Gain	GB	GB 2 233 846	GB
TS 101 377 V1.1.1	Ericsson Mobile Communication	Transmitter Power Control for Radio Telephone System	GB	GB 2 233 517	GB

IPR Owner: Ericsson Mobile Communications (UK) Limited
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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Hughes Network Systems		US	Pending	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	2.4-to-3 KBPS Rate Adaptation Apparatus for Use in Narrowband Data and Facsimile Communication Systems	US	US 6,108,348	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Cellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic ThroughputCellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic Throughput	US	US 5,717,686	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Enhanced Access Burst for Random Access Channels in TDMA Mobile Satellite System	US	US 5,875,182	
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,314	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,315	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Mutual Offset High-argin Forward Control Signals	US	US 6,072,985	US
TS 101 377 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System with Spot Beam Pairing for Reduced Updates	US	US 6,118,998	US

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is part 2, sub-part 6 of a multi-part deliverable covering Geo-Mobile Radio Interface Specification, as identified below:

Part 1: "General specifications";

Part 2: "Service specifications":

Sub-part 1: "Teleservices supported by a GMR-2 Public Satellite Mobile Network (PSMN); GMR-2 02.003";

Sub-part 2: "General on Supplementary Services; GMR-2 02.004";

Sub-part 3: "Security Aspects; GMR-2 02.009";

Sub-part 4: "Call Waiting (CW) and Call Hold (HOLD) Supplementary Services - Stage 1; GMR-2 02.083";

Sub-part 5: "Multiparty (MPTY) Supplementary Services; GMR-2 02.084";

Sub-part 6: "Service Accessibility; GMR-2 02.001";

Sub-part 7: "Operator Determined Barring (ODB); GMR-2 02.041";

Sub-part 8: "Call Barring Supplementary Services; GMR-2 02.088";

Sub-part 9: "Bearer Services (BS) supported by a GMR-2 Public Satellite Mobile Network (PSMN); GMR-2 02.002".

Part 3: "Network specifications";

Part 4: "Radio interface protocol specifications";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications".

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Version 1.m.n

where:

- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;

- the second digit (m) is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

Introduction

GMR stands for GEO (Geostationary Earth Orbit) Mobile Radio interface, which is used for mobile satellite services (MSS) utilizing geostationary satellite(s). GMR is derived from the terrestrial digital cellular standard GSM and supports access to GSM core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM standard are necessary. Some GSM specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM specifications do not apply, while some GMR specifications have no corresponding GSM specification.

Since GMR is derived from GSM, the organization of the GMR specifications closely follows that of GSM. The GMR numbers have been designed to correspond to the GSM numbering system. All GMR specifications are allocated a unique GMR number as follows:

GMR-n xx.zyy

where :

- xx.0yy (z = 0) is used for GMR specifications that have a corresponding GSM specification. In this case, the numbers xx and yy correspond to the GSM numbering scheme.

- xx.2yy (z = 2) is used for GMR specifications that do not correspond to a GSM specification. In this case, only the number xx corresponds to the GSM numbering scheme and the number yy is allocated by GMR.

- n denotes the first (n = 1) or second (n = 2) family of GMR specifications.

A GMR system is defined by the combination of a family of GMR specifications and GSM specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM specification (if any). This precedence rule applies to any references in the corresponding GSM specifications.

NOTE: Any references to GSM specifications within the GMR specifications are not subject to this precedence rule. For example, a GMR specification may contain specific references to the corresponding GSM specification.

- If a GMR specification does not exist the corresponding GSM specification may or may not apply. The applicability of the GSM specifications is defined in GMR-n 01.201.

1 Scope

The present document describes the service access procedures as presented to the user.

The technical realization of service accessibility in terms of registration, handover, roaming and system selection is defined in the 03-series of GMR-2 specifications.

Definitions and procedures are provided in the present document for international roaming, national roaming and regionally provided service. These are mandatory in relation to the technical realization of the Mobile Station.

2 References

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

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

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

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

[1]   GMR-2 01.004 (ETSI TS 101 377-1-1): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms; GMR-2 01.004".

[2]   GSM 02.07 (ETSI ETS 300 505 Edition 3): "Digital cellular telecommunications system (Phase 2); Mobile Station (MS) features (GSM 02.07 version 4.8.2)".

[3]   GMR-2 03.002 (ETSI TS 101 377-3-2): "GEO Mobile Radio interface specification; Part 3: Network architecture; Sub-part 2: Network Architecture; GMR-2 03.002".

[4]   GMR-2 03.012 (ETSI TS 101 377-3-8): "GEO Mobile Radio interface specification; Part 3: Network architecture; Sub-part 8: Location Registration Procedures; GMR-2 03.012".

[5]   GMR-2 03.022 (ETSI TS 101 377-3-11): "GEO Mobile Radio interface specification; Part 3: Network architecture; Sub-part 11: Functions Related to Mobile Earth Station (MES) in idle Mode; GMR-2 03.022".

[6]   GMR-2 04.008 (ETSI TS 101 377-4-7): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specification; Sub-part 7: Mobile radio interface Layer 3 Specifications; GMR-2 04.008".

[7]   GMR-2 05.008 (ETSI TS 101 377-5-6): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control; GMR-2 05.008".

[8]   GSM 11.11 (ETSI ETS 300 608 Edition 8): "Digital cellular telecommunications system (Phase 2); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface (GSM 11.11 version 4.20.1)".

3   Definitions and abbreviations

3.1   Definitions

PSMN   A Public Satellite Mobile Network (PSMN) is a network established and operated by an
                    Administration or RPOA for the specific purpose of providing land mobile communication
                    services to the public. It provides communication possibilities for mobile users. For
                    communications between mobile and fixed users, interworking with a fixed network is necessary.

GMR-2 PSMN   A GMR-2 PSMN is a PSMN which is in accordance with the GMR-2 specifications. A GMR-2
                    PSMN may provide service in the frequency band in the GMR-2 specifications. As a rule, a
                    GMR-2 PSMN is not limited by the borders of a country. Depending on national regulations there
                    may be more than one GMR-2 PSMN per country.
                    A relationship exists between each subscriber and his home GMR-2 PSMN (HPSMN). If
                    communications are handled over another GMR-2 PSMN, this PSMN is referred to as the visited
                    GMR-2 PSMN (VPSMN). If communications are handled over a GSM PLMN, this PLMN is
                    referred to as the visited GSM PLMN (VPLMN). The HPSMN may be either a GMR-2 PSMN or
                    a GSM PLMN.

                    GMR-2 PSMN provides communication services according to the GMR-2 specifications to mobile
                    users. Several Gateways may share a PSMN ID or may have unique PSMNs. In the GPA, the
                    mobile user can set up calls to a user of a terminating network. The terminating network may be a
                    fixed network, the same or different GMR-2 PSMN, a GSM PLMN or other types of PLMN.
                    Terminating network users can also set up calls to the GMR-2 PSMN.
                    A GPA may span a large geographic region, such as several countries. A GPA may span a
                    complete country or may have a region of coverage within a country. Multiple GPAs may cover
                    mutually exclusive regions of service coverage or they may overlap.

GMR-2 Service Area   A GMR-2 Service Area is defined as a geographic region of coverage of permanent
                    signalling resources. The signalling resources are useable by a MES from a signal strength
                    perspective. An MES can camp on a Gateway when it is in the Service Area of the Gateway.

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in GMR-2 01.004 [1] apply.

4   Roaming - General requirements

A MES with a valid IMSI may roam and access service in the area authorized by the entitlement of the subscription.

If a communication has been established, the MES will in principle not suffer an interruption within the GMR-2 PSMN
area (provided the entitlement of the subscription allows it). Exceptions are possible if no network resources or radio
coverage are available locally.

However, if the MES leaves the GMR-2 PSMN area, an established communication may terminate. If the user then
wants to continue, another network providing service has to be selected and a new communication has to be established
(see clause 5).

4.1   Roaming

Roaming is a service whereby an MES of a given PSMN is able to obtain service from any other PSMN.

The availability of Roaming is subject to inter-PSMN agreements.

5 Provisions for providing continuity of service

5.1 Location registration

GMR-2 PSMNs shall provide a location registration function with the main purpose of providing continuity of service to mobile stations over the entire subscriber area. The location registration function shall be such as to allow:

- Fixed subscribers to call a MES by only using the directory number of the MES irrespective of where the MES is located in the GMR-2 system area at the time of the call.

- Mobile Earth Stations to access the system irrespective of the location of the MES.

- Mobile Earth Stations to identify when a change in location area has taken place in order to initiate automatic location updating procedures.

The system architecture enabling implementation of the above requirements is defined in specification GMR-2 03.002 [3]. The technical realization of location registration is defined in specification GMR-2 03.012 [4].

Specification GMR 03.012 [4] also gives the conditions when a location updating has to take place.

5.2 Network selection

5.2.1 General

The MES shall support both manual and automatic network selection mechanisms (modes). The MES shall select the last mode used, as the default mode, at every switch-on.

NOTE: By defaulting to the last mode used, e.g. manual network selection, the undesired automatic selection of an adjacent PSMN instead of the desired HPSMN in border areas, can be avoided at switch-on.

The user shall be given the opportunity to change mode at any time.

Except as defined below, the MMI shall be at the discretion of the MES manufacturer.

The MES shall contain display functions in accordance with GSM 02.07 [2], by which Available PLMNs and the Selected PLMN can be indicated.

5.2.2 Procedures

5.2.2.1 General

In the following procedures the MES selects and attempts registration on PSMNs.

In the present document, the term "PSMN Selection" defines an MES based procedure, whereby candidate PSMNs are chosen, one at a time, for attempted registration.

If registration on a PSMN is successful, the MES shall indicate this PSMN (the "registered PSMN") and be capable of making and receiving calls on it. The identity of the registered PSMN shall be stored on the SIM. However, if registration is unsuccessful, the MES shall ensure that there is no registered PSMN stored in the SIM.

If a registration is unsuccessful because the IMSI is unknown in the home network, or the MES is illegal, then the MES shall not allow any further registration attempts on any network, until the MES is next powered-up or a SIM is inserted.

If the registration is unsuccessful due to the lack to service entitlement, specific behaviour by the mobile station may be required, see clause 5.2.2.4.

To avoid unnecessary registration attempts, lists of forbidden PSMNs and LAs are maintained in the Mobile Earth Station, see clause 5.2.2.4 and GMR-2 03.022 [5].

Registration attempts shall not be made by MESs without a SIM inserted.

An MES/ME which has not successfully registered shall nevertheless be able to make emergency call attempts on an available PSMN, without the need for the user to select a PSMN. An available PSMN is determined by radio characteristics (GMR-2 03.022 [5]/05.008 [7] refers).

5.2.2.2   At switch-on or recovery from lack of coverage

If the MES is within coverage (at switch-on) or returns to coverage of the PSMN on which it is already registered (as indicated by the registered PSMN stored in the SIM), the MES shall perform a location update to a new location area if necessary.

If there is no registered PSMN stored in the SIM, or if this PSMN is unavailable, or the attempted registration fails, the MES shall follow one of the following two procedures depending on its network selection mode, automatic or manual:

A) Automatic network selection mode

The MES shall select and attempt registration on other PSMNs, if available and allowable and the location area is not in the list of "forbidden LSs for roaming" (see GMR-2 03.022 [5]), in the following order:

   1) HPSMN;

   2) each PSMN in the "PSMN Selector" data field in the SIM (in priority order);

   3) other PSMNs with sufficient received signal level (See GMR-2 03.022 [5]) in random order;

   4) all other PSMNs in order of decreasing signal strength.

An allowable PSMN is one which is not in the "Forbidden PSMN" data field in the SIM (see clause 5.2.2.4).

If successful registration is achieved, the MES shall indicate the selected PSMN.

If registration cannot be achieved on any PSMN, the MES shall indicate "no service" to the user, wait until a new PSMN is detected, or new location areas of an allowed PSMN are found which are not in the forbidden LA list(s), and then repeat the procedure. When registration cannot be achieved, different (discontinuous) PSMN search schemes may be used in order to minimize the access time while maintaining battery life, e.g. by prioritizing the search in favour of BCCH carriers which have a high probability of belonging to an available and allowable PSMN.

B) Manual network selection mode

The MES shall indicate whether there are any PSMNs, including "Forbidden PSMNs", which are available. If there are none, this shall also be indicated.

Any available PSMN's shall be presented in the following order:

   1) HPSMN;

   2) PSMNs contained in the "PSMN Selector" data field in the SIM (in priority order);

   3) Other PSMNs with sufficient received signal level (see GMR-2 03.022 [5]) in random order;

   4) all other PSMNs in order of decreasing signal strength.

The user may select his desired PSMN and the MES shall attempt registration on this PSMN (this may take place at any time during the presentation of PSMNs).

If the registration cannot be achieved on the selected PSMN, the MES shall indicate "No Service". The user may then select and attempt to register on another or the same PSMN following the above procedure. The MS shall not attempt to register on a PSMN which has not been selected by the user.

If a PSMN is selected but the MES cannot register on it because registration is rejected with the cause "PSMN not allowed", the MES shall not re-attempt to register on that network unless the same PSMN is selected again by the user.

If a PSMN is selected but the MES cannot register on it for other reasons, the MES shall, upon detection of a new LA (not in a forbidden LA list) of the selected PSMN, attempt to register on the PSMN.

If the MES is registered on a PSMN but loses coverage, different (discontinuous) carrier search schemes may be used to minimize the time to find a new valid BCCH carrier and maintain battery life, e.g. by prioritizing the search in favour of BCCH carriers of the registered PSMN.

5.2.2.3 User reselection

At any time, the user may request the MES to initiate reselection and registration onto an alternative available PSMN, according to the following procedures, dependent upon the operating mode.

A) Automatic Network Selection Mode

The MES shall select the HPSMN. If the HPSMN is not available, the MES shall select the PSMNs in the "PSMN Selector" list in order of priority and, if necessary, other available and allowable PSMNs according to the procedure defined in GMR-2 03.022 [5].

B) Manual Network Selection Mode

The procedure of clause 5.2.2.2 B) above is followed.

5.2.2.4 Mobile Earth Station reactions to indications of service restriction from the network

Different types of Mobile Earth Station behaviour is required to support roaming restrictions. The behaviour to be followed by the Mobile Earth Station is indicated by the network.

5.2.2.4.1 "Permanent" PSMN restriction

When a registration attempt by the mobile station is rejected by a network with an indication of "permanent" PSMN restriction. the PSMN identity shall be written to a list of "Forbidden PSMNs" stored in a data field in the SIM.

The structure of this data field is given in GSM 11.11 [8].

If a successful registration (whilst in manual mode) is achieved on a PSMN in the "Forbidden PSMN" list, the PSMN shall be deleted from the list.

When in automatic mode, the MES may indicate any PSMNs which will not be selected due to their presence in the "Forbidden PSMN" list.

5.2.2.4.2 "Partial" and "temporary" PSMN restrictions

When a registration attempt by the mobile station is rejected by a network due to a "partial" or a "temporary" PSMN restriction, the MES shall perform the following procedure determined by the indication in the location update reject cause sent by the network (see GMR-2 03.022 [5]).

The MES shall store the location area identity in the list of "forbidden LAs for roaming" and shall use one of the following procedures according to the PSMN selection Mode:

   A) Automatic network selection mode: The procedure of clause 5.2.2.2. A);

   B) Manual network selection mode: The procedure of clause 3.2.2.2. B).

5.2.2.5 Timer for return to HPSMN

If the MES in Automatic Mode has selected and registered on a VPSMN of its home country, it shall make periodic attempts to return to its HPSMN.

The interval between attempts shall be stored in the SIM. Only the service provider shall be able to set the timer value. The timer shall have a value between 6 minutes and 8 hours, with a step size of 6 minutes. One value shall be designated to indicate that no periodic attempts shall be made.

In the absence of a permitted value in the SIM, or the SIM is phase 1 and therefore does not contain the data field, then a default value of 30 minutes, shall be used by the MES.

NOTE: Use of values less than 30 minutes may result in excessive ME battery drain.

6 Access control

6.1 Purpose

Under certain circumstances, it will be desirable to prevent MES users from making access attempts (including emergency call attempts) or responding to pages in specified GMR-2 PSMNs. Such situations may arise during states of emergency, or where 1 of 2 or more co-located PSMNs has failed.

Broadcast messages should be available on a spot beam basis indicating the class(es) of subscribers barred from network access.

The use of this facility allows the network operator to prevent overload of the access channel under critical conditions.

It is not intended that access control be used under normal operating conditions.

6.2 Allocation

All MESs are members of one out of ten randomly allocated mobile populations, defined as Access Classes 0 to 9. The population number is stored in the SIM. In addition, mobiles may be members of one or more out of 5 special categories (Access Classes 11 to 15), also held in the SIM. These are allocated to specific high priority users as follows (the enumeration is not meant as a priority sequence):

- class 15: PSMN Staff;

- class 14: Emergency Services;

- class 13: Public Utilities (e.g. water/gas suppliers);

- class 12: Security Services;

- class 11: for PSMN Use.

6.3 Operation

If the MES is a member of at least one Access Class which corresponds to the permitted classes as signalled over the air interface, and the Access Class is applicable in the serving network, access attempts are allowed. Otherwise access attempts are not allowed.

Access Classes are applicable as follows:

- classes 0 - 9: Home and Visited PSMNs;

- classes 11 and 15: Home PSMN only;

- classes 12, 13, and 14: Home PSMN and visited PSMNs of home country only.

Any number of these classes may be barred at any one time.

6.4 Emergency Calls

An additional control bit known as "Access Class 10" is also signalled over the air interface to the MES. This indicates whether or not network access for Emergency Calls is allowed for MESs with access classes 0 to 9 or without an IMSI. For MESs with access classes 11 to 15, Emergency Calls are not allowed if both "Access class 10" and the relevant Access Class (11 to 15) are barred (GMR-2 04.008 [6] refers). Otherwise, Emergency Calls are allowed.

History

Document history		
V1.1.1	March 2001	Publication