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Technical Specification

GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 1: Network Functions; GMR-1 03.001



Reference

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IPRs:

Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,226,084	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,715,365	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,826,222	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,754,974	US
TS 101 376 V1.1.1	Digital Voice Systems Inc		US	US 5,701,390	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Ericsson Mobile Communication	Improvements in, or in relation to, equalisers	GB	GB 2 215 567	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Power Booster	GB	GB 2 251 768	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Receiver Gain	GB	GB 2 233 846	GB
TS 101 376 V1.1.1	Ericsson Mobile Communication	Transmitter Power Control for Radio Telephone System	GB	GB 2 233 517	GB

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 V1.1.1	Hughes Network Systems		US	Pending	US

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Project	Company	Title	Country of Origin	Patent n°	Countries Applicable
TS 101 376 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 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Cellular Spacecraft TDMA Communications System with Call Interrupt Coding System for Maximizing Traffic Throughput	US	US 5,717,686	US
TS 101 376 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 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,314	US
TS 101 376 V1.1.1	Lockheed Martin Global Telecommunic. Inc	Spacecraft Cellular Communication System	US	US 5,974,315	US
TS 101 376 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 101 376 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 contents of the present document are subject to continuing work within TC-SES and may change following formal TC-SES approval. Should TC-SES modify the contents of the present document it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

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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.

The present document is part 3, sub-part 1 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications, as identified below:

Part 1: "General specifications";

Part 2: "Service specifications";

Part 3: "Network specifications";

Sub-part 1: "Network Functions; GMR-1 03.001";

Sub-part 2: "Network Architecture; GMR-1 03.002";

Sub-part 3: "Numbering, Addressing and identification; GMR-1 03.003";

Sub-part 4: "Organization of Subscriber Data; GMR-1 03.008";

Sub-part 5: "Technical realization of Supplementary Services; GMR-1 03.011";

Sub-part 6: "Location Registration and Position Identification Procedures; GMR-1 03.012";

Sub-part 7: "Discontinuous Reception (DRX); GMR-1 03.013";

Sub-part 8: "Support of Dual-Tone Multifrequency Signalling (DTMF); GMR-1 03.014";

Sub-part 9: "Security related Network Functions; GMR-1 03.020";

Sub-part 10: "Functions related to Mobile Earth station (MES) in idle mode; GMR-1 03.022";

Sub-part 11: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP); GMR-1 03.040";

Sub-part 12: "Technical realization of the Short Message Service Cell Broadcast (SMSCB); GMR-1 03.041";

Sub-part 13: "Technical realization of group 3 facsimile using transparent mode of transmission; GMR-1 03.045";

Sub-part 14: Transmission Planning Aspects of the Speech Service in the GMR-1 system; GMR-1 03.050";

Sub-part 15: "Line Identification supplementary service - Stage 2; GMR-1 03.081";

Sub-part 16: "Call Barring (CB) supplementary services - Stage 2; GMR-1 03.088";

Sub-part 17: "Unstructured Supplementary Service Data (USSD) - Stage 2; GMR-1 03.290";

Sub-part 18: "Terminal-to-Terminal Call (TtT); GMR-1 03.296";

Sub-part 19: "Optimal Routing technical realization; GMR-1 03.297";

Sub-part 20: "Technical realization of High-Penetration Alerting; GMR-1 03.298";

Sub-part 21: "Position Reporting services; Stage 2 Service description; GMR-1 03.299";

Part 4: "Radio interface protocol specifications";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications";

Part 7: "Terminal adaptor specifications".

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-1 01.201 [2].

1 Scope

The present document defines network functions which are necessary to support services and facilities in the GMR-1 Mobile Satellite System.

A summary of the network functions is given in table 4.1, where also an indication is given whether the network shall support the function.

All functions require signalling on the radio path as specified in Technical Specification GMR-1 04.008 [8].

The present document is based on GSM 03.01 [10].

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-1 01.004 (ETSI TS 101 376-1-1): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms; GMR-1 01.004".
- [2] GMR-1 01.201 (ETSI TS 101 376-1-2): "GEO-Mobile Radio Interface Specifications; Part 1: General specifications; Sub-part 2: Introduction to the GMR-1 Family; GMR-1 01.201".
- [3] GMR-1 03.014 (ETSI TS 101 376-3-8): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 8: Support of Dual-Tone Multifrequency Signalling (DTMF); GMR-1 03.014".
- [4] GMR-1 03.020 (ETSI TS 101 376-3-9): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 9: Security related Network Functions; GMR-1 03.020".
- [5] GMR-1 03.296 (ETSI TS 101 376-3-18): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 18: Terminal-to-Terminal Call (TtT); GMR-1 03.296".
- [6] GMR-1 03.297 (ETSI TS 101 376-3-19): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 19: Optimal Routing technical realization; GMR-1 03.297".
- [7] GMR-1 03.299 (ETSI TS 101 376-3-21): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 21: Position Reporting services; Stage 2 Service description; GMR-1 03.299".
- [8] GMR-1 04.008 (ETSI TS 101 376-4-8): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications; GMR-1 04.008".
- [9] GMR-1 05.008 (ETSI TS 101 376-5-6): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control; GMR-1 05.008".

- [10] GSM 03.01 (ETSI ETS 300 521): "European digital cellular telecommunications system (Phase 2); Network functions (GSM 03.01 V4.0.4)".
- [11] GSM 12.00 (ETSI ETS 300 612-1): "Digital cellular telecommunications system (Phase 2); Network Management (NM); Part 1: Objectives and structure of network management (GSM 12.00 V4.5.1)".

3 Abbreviations

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

MES	Mobile earth station
GMR-1	GEO-Mobile Radio
GSS	Gateway station system
GSC	Gateway station controller
GTS	Gateway transceiver station

4 Network functions for basic service provision

4.1 Call handling

This set of functions enables the establishment of communications between a mobile subscriber and another network subscriber in one of the following types of network PSTN, ISDN, PSPDN, CSPDN, GMR-1 Satellite Network and GSM PLMN.

4.1.1 Call from a mobile earth station subscriber registered in VLR

Same as clause 2.1.1 of GSM 03.01 [10].

4.1.2 Call from a mobile earth station subscriber not registered in VLR

Same as clause 2.1.2 of GSM 03.01 [10].

4.1.3 Call to a mobile earth station subscriber

The call is routed (re-routed or forwarded) according to location data obtained from the HLR to the actual MSC and the MES-MS is paged over the standardized radio interface.

Table 4.1: Overview of network functions

Class of Network Function (NF)	Network Function	Network Support	Interworking with MAP
NF for basic service provision	Call Handling	M	X
	Subscriber Authentication	M	X
	Emergency calls	M	-
	Supplementary Services	M	X
	Short Message Service (SMS)	M	X
	Signalling information element confidentiality	M	X
NF for supporting:	Location registration	M	X
	Handover-within the same GSS	M	-
	Call re-establishment	Not supported	-
Additional NF for call handling	Position reporting services	M	-
	Queuing	O	-
	Security related services	M	X
	Discontinuous reception	M	-
	Discontinuous transmission	M	-
	DTMF	M	-

Class of Network Function (NF)	Network Function	Network Support	Interworking with MAP
	Optimal routing	M	-
	Terminal-to-Terminal (TtT) calls	M	-
Network management oriented NF		M (Note)	X
NOTE: The function will not be fully specified by GSM (national specifications will complement).			

4.1.4 Call handling functions in HLR

Same as clause 2.1.4 of GSM 03.01 [10].

4.1.5 Call handling functions in VLR

Same as clause 2.1.5 of GSM 03.01 [10].

4.1.6 Call handling functions in MSC

The MSC shall perform normal call routing and call control functions. The MSC shall obtain subscriber parameters from its associated VLR.

The MSC should not perform handover. (See clause 5.2)

In some cases, the MSC shall be able to act as a gateway MSC to provide an interface to other circuit-switched networks.

4.2 Subscriber identity authentication

Same as clause 2.2 of GSM 03.01 [10].

4.3 Emergency call

4.3.1 General

Same as clause 2.3.1 of GSM 03.01 [10].

4.3.2 Routing

Same as clause 2.3.2 of GSM 03.01 [10].

4.4 Supplementary services

Same as clause 2.4 of GSM 03.01 [10].

4.5 Short message service

Same as clause 2.5 of GSM 03.01 [10].

4.5.1 Short message handling functions in the HLR

Same as clause 2.5.1 of GSM 03.01 [10].

4.5.2 Short message handling functions in the VLR

Same as clause 2.5.2 of GSM 03.01 [10].

4.5.3 Short message handling functions in the MSC

Same as clause 2.5.3 of GSM 03.01 [10].

4.6 Signalling information element confidentiality

Same as clause 2.6 of GSM 03.01 [10].

5 Network functions for supporting cellular operation

5.1 Location registration

5.1.1 Definitions

Same as clause 3.1.1 of GSM 03.01 [10].

5.1.2 Procedures

Same as clause 3.1.2 of GSM 03.01 [10].

5.1.3 Information stored in location registers

Same as clause 3.1.3 of GSM 03.01 [10].

5.2 Handover

5.2.1 Definitions

For GMR-1 telecommunication system only handover between physical channels of same Gateway Station System (GSS) are required. This capability may be used in the following situations:

- when the physical channel carrying the call is subject to interference or other disturbances;
- when a physical channel or channel equipment carrying a call has to be taken out of service for maintenance or other reasons.

5.2.2 Procedures

Not applicable.

5.3 Call re-establishment

Re-establishment of a call is not supported.

5.4 Position reporting services

In the GMR-1 satellite telecommunication network the MES position is used during network access procedures such as the spotbeam selection, call routing, position reporting and active call disconnection.

More detailed information is given in GMR-1 03.299 [7].

6 Additional network functions for call handling

6.1 Queuing

Same as clause 4.1 of GSM 03.01 [10].

6.2 Off-air-call-set-up (OACSU)

Void.

6.3 Security related services

Same as clause 4.3 of GSM 03.01 [10].

6.3.1 Identity confidentiality

Same as clause 4.3.1 of GSM 03.01 [10].

6.3.2 User data confidentiality

This service provides for the confidentiality of anything transmitted on a traffic channel. Encryption/decryption is done in the MES and GSS with a key which is calculated in both the MES and network.

Detailed information is given in GMR-1 03.020 [4].

6.3.3 Signalling information element confidentiality

This service provides for the confidentiality of anything transmitted on a signalling channel: signalling information to control the service offered to a subscriber or connectionless user data. Encryption/Decryption is done in the MES and GSS with a key which is calculated in both the MES and the network.

Detailed information is given in GMR-1 03.020 [4].

6.4 Discontinuous reception

Same as clause 4.4 of GSM 03.01 [10].

6.5 Discontinuous transmission

Discontinuous transmission is a technique used to reduce overall interference level on the air interface, to reduce the satellite power consumption and to reduce the battery consumption of Mobile Earth Station (MES). The operation of the technique is specified in GMR-1 05.008 [9]. The function shall be supported by the MES and network.

6.6 Support of DTMF

DTMF is supported as defined in GMR-1 03.014 [3].

6.7 Optimal routing service

The purpose of optimal routing is to reduce the number of Satellite Network and PSTN call legs are required to complete a call using a GMR-1 network.

Optimal routing for a GMR-1 network consists of the following areas:

- Mobile termination optimal routing - a network feature that enables calls to be routed directly to the mobile subscriber's actual location or to the forwarded-to destination while minimizing the use of network trunks.
- Mobile origination optimal routing - a network feature that enables the selection of a gateway station and subsequent registration of the subscriber within that gateway station to minimize the PSTN/GMR-1 terrestrial network usage or facilitate MES-MES single-hop and double-hop calls.

More detailed information is given in GMR-1 03.297 [6].

6.8 Terminal to terminal (TtT) calls

The terminal-to-terminal (TtT) call in the GMR-1 can be established in either single-hop mode or double-hop mode.

The Single-hop mode call is established only for a voice call. The TtT double-hop mode call is established between two terminals for data, fax, and some voice calls when terminals are in geographically restricted position.

In single-hop mode of operation, certain supplementary services and all the short message service (SMS) are blocked by the MSC.

More detailed information about TtT calls is given in GMR-1 03.296 [5].

7 Network management oriented network functions

Network management functions are dealt with in the 12 series of GSM Technical Specifications. An overview is given in GSM 12.00 [11].

Annex A (informative): Bibliography

- GMR-1 03.003 (ETSI TS 101 376-3-3): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 3: Numbering, Addressing and identification; GMR-1 03.003".
- GMR-1 03.008 (ETSI TS 101 376-3-4): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 4: Organization of Subscriber Data; GMR-1 03.008".
- GMR-1 03.012 (ETSI TS 101 376-3-6): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 6: Location Registration and Position Identification Procedures; GMR-1 03.012".
- GMR-1 03.013 (ETSI TS 101 376-3-7): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 7: Discontinuous Reception (DRX); GMR-1 03.013".
- GMR-1 03.022 (ETSI TS 101 376-3-10): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth station (MES) in idle mode; GMR-1 03.022".
- GMR-1 03.040 (ETSI TS 101 376-3-11): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 11: Technical realization of the Short Message Service (SMS) Point-to-Point (PP); GMR-1 03.040".
- GMR-1 03.081 (ETSI TS 101 376-3-15): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 15: Line Identification supplementary service - Stage 2; GMR-1 03.081".
- GMR-1 03.088 (ETSI TS 101 376-3-16): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 16: Call Barring (CB) supplementary services - Stage 2; GMR-1 03.088".
- GSM 02.04 (ETSI ETS 300 503): "Digital cellular telecommunications system (Phase 2); General on supplementary services (GSM 02.04 V4.9.1)".
- GSM 02.09 (ETSI ETS 300 506): "Digital cellular telecommunications system (Phase 2); Security aspects (GSM 02.09 version 4.4.1)".
- GSM 03.07 (ETSI ETS 300 525): "European digital cellular telecommunications system (Phase 2); Restoration procedures (GSM 03.07 V4.3.1)".
- GSM 03.82 (ETSI ETS 300 543): "Digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services; Stage 2 (GSM 03.82 V4.8.1)".
- GSM 03.83 (ETSI ETS 300 544): "European digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services; Stage 2 (GSM 03.83 V4.4.1)".
- GSM 03.84 (ETSI ETS 300 545): "European digital cellular telecommunications system (Phase 2); Multi Party (MPTY) supplementary services; Stage 2 (GSM 03.84 V4.4.1)".
- GSM 03.85 (ETSI ETS 300 546): "Digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services; Stage 2 (GSM 03.85 V4.2.0)".
- GSM 03.86 (ETSI ETS 300 547): "European digital cellular telecommunications system (Phase 2); Advice of Charge (AoC) supplementary services; Stage 2 (GSM 03.86 V4.6.1)".
- GSM 09.02 (ETSI ETS 300 599): "Digital cellular telecommunications system (Phase 2); Mobile Application Part (MAP) specification (GSM 09.02 version 4.19.0)".
- GSM 12.01 (ETSI ETS 300 612-2): "Digital cellular telecommunications system (Phase 2); Network Management (NM); Part 2: Common aspects of GSM/DCS 1800 network management (GSM 12.01 V4.4.1)".
- GSM 12.02 (ETSI ETS 300 613): "Digital cellular telecommunications system (Phase 2); Subscriber, Mobile Equipment (ME) and services data administration (GSM 12.02 V4.6.1)".
- GSM 12.03 (ETSI ETS 300 614): "Digital cellular telecommunications system (Phase 2); Security management (GSM 12.03 V4.2.1)".

GSM 12.04 (ETSI ETS 300 615): "Digital cellular telecommunications system (Phase 2); Performance data measurements (GSM 12.04 V4.3.1)".

GSM 12.05 (ETSI ETS 300 616): "Digital cellular telecommunications system (Phase 2); Event and call data (GSM 12.05 version 4.3.1)".

GSM 12.06 (ETSI ETS 300 617): "Digital cellular telecommunications system (Phase 2); GSM network configuration management (GSM 12.06 V4.1.1)".

GSM 12.11 (ETSI EN 301 251): "Digital cellular telecommunications system (Phase 2); Fault management of the Base Station System (BSS); (GSM 12.11 version 4.2.1)".

GSM 12.20 (ETSI ETS 300 622): "Digital cellular telecommunications system (Phase 2); Base Station System (BSS) management information (GSM 12.20 V4.2.1)".

GSM 12.21 (ETSI ETS 300 623): "Digital cellular telecommunications system (Phase 2); Network Management (NM) procedures and messages on the A-bis interface (GSM 12.21 V4.5.4)".

GSM 12.22 (ETSI ETS 300 624): "Digital cellular telecommunications system (Phase 2); Interworking of GSM Network Management (NM) procedures and messages at the Base Station Controller (BSC) (GSM 12.22 V4.1.4)".

History

Document history		
V1.1.1	March 2001	Publication