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Technical Specification

GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 1: General specifications; Sub-part 3: General System Description GMR-1 3G 41.202

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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 1, sub-part 3 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications (Release 3) Third Generation Satellite Packet Radio Service, as identified below:

Part 1: "General specifications":

Sub-part 1: "Abbreviations and acronyms";

Sub-part 2: "Introduction to the GMR-1 family";

Sub-part 3: "General System Description";

Part 2: "Service specifications";

Part 3: "Network specifications";

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.

The present document is part of the GMR Release 3 specifications. Release 3 specifications are identified in the title and can also be identified by the version number:

- Release 1 specifications have a GMR 1 prefix in the title and a version number starting with "1" (V1.x.x).
- Release 2 specifications have a GMPRS 1 prefix in the title and a version number starting with "2" (V2.x.x).
- Release 3 specifications have a GMR-1 3G prefix in the title and a version number starting with "3" (V3.x.x).

The GMR release 1 specifications introduce the GEO-Mobile Radio interface specifications for circuit mode Mobile Satellite Services (MSS) utilizing geostationary satellite(s). GMR release 1 is derived from the terrestrial digital cellular standard GSM (phase 2) and it supports access to GSM core networks.

The GMR release 2 specifications add packet mode services to GMR release 1. The GMR release 2 specifications introduce the GEO-Mobile Packet Radio Service (GMPRS). GMPRS is derived from the terrestrial digital cellular standard GPRS (included in GSM Phase 2+) and it supports access to GSM/GPRS core networks.

The GMR release 3 specifications evolve packet mode services of GMR release 2 to 3rd generation UMTS compatible services. The GMR release 3 specifications introduce the GEO-Mobile Radio Third Generation (GMR-1 3G) service. Where applicable, GMR-1 3G is derived from the terrestrial digital cellular standard 3GPP and it supports access to 3GPP core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM or 3GPP standard are necessary. Some GSM and 3GPP specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM and 3GPP specifications do not apply, while some GMR specifications have no corresponding GSM or 3GPP specification.

Since GMR is derived from GSM and 3GPP, the organization of the GMR specifications closely follows that of GSM or 3GPP as appropriate. The GMR numbers have been designed to correspond to the GSM and 3GPP numbering system. All GMR specifications are allocated a unique GMR number. This GMR number has a different prefix for Release 2 and Release 3 specifications as follows:

- Release 1: GMR n xx.zyy
- Release 2: GMPRS n xx.zyy
- Release 3: GMR-1 3G xx.zyy

where:

- xx.0yy (z = 0) is used for GMR specifications that have a corresponding GSM or 3GPP specification. In this case, the numbers xx and yy correspond to the GSM or 3GPP numbering scheme.
- xx.2yy (z = 2) is used for GMR specifications that do not correspond to a GSM or 3GPP specification. In this case, only the number xx corresponds to the GSM or 3GPP 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 and 3GPP specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM or 3GPP specification (if any). This precedence rule applies to any references in the corresponding GSM or 3GPP specifications.

NOTE: Any references to GSM or 3GPP 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 or 3GPP specification.

- If a GMR specification does not exist, the corresponding GSM or 3GPP specification may or may not apply. The applicability of the GSM specifications is defined in GMR-1 3G 41.201 [2].

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1 Scope

The present document is an introduction to Release 3 of the GMR-1 system (GMR-1 3G) and the associated Release 3 of the air interface specification. It is intended to point out some of the differences between the cellular 3GPP and GSM system and the mobile satellite GMR-1 system.

The GMR-1 system is designed to provide mobile services via a single geostationary satellite as compared to the thousands of geographically separated cell sites that are used by a typical GSM system. This offers both challenges to be overcome and opportunities for enhanced services and features.

GMR-1 3G is an extension of the published ETSI TS 101 376 and TIA (S-J-STD-782) specifications for mobile satellite communications, GMR-1, to support IMT-2000 services. GMR-1 is currently used in mobile satellite systems covering Europe, Africa, Asia and Middle East. GMR-1 3G is currently being deployed in North America.

2 References

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.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] GMPRS-1 01.004 (ETSI TS 101 376-1-1): "GEO-Mobile radio Interface Specifications; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms".

NOTE: This is a reference to a GMR-1 Release 2 specification. See the Introduction for more details.

- [2] GMR-1 3G 41.201 (ETSI TS 101 376-1-2): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 1: General specifications; Sub-part 2: Introduction to the GMR-1 Family".

- [3] GMPRS-1 03.003 (ETSI TS 101 376-3-3): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 3: Network specifications; Sub-part 3: Numbering, addressing and identification".

NOTE: This is a reference to a GMR-1 Release 2 specification. See the Introduction for more details.

- [4] GMR-1 3G 43.022 (ETSI TS 101 376-3-10): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth Station (MES) in idle mode".

- [5] GMR-1 3G 44.008 (ETSI TS 101 376-4-8): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications".
- [6] GMR-1 3G 45.002 (ETSI TS 101 376-5-2): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 2: Multiplexing and Multiple Access; Stage 2 Service Description".
- [7] GMR-1 3G 45.003 (ETSI TS 101 376-5-3): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding".
- [8] GMR-1 3G 45.004 (ETSI TS 101 376-5-4): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation".
- [9] GMR-1 3G 45.005 (ETSI TS 101 376-5-5): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception".
- [10] GMR-1 3G 45.008 (ETSI TS 101 376-5-6): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control".
- [11] GMR-1 3G 45.010 (ETSI TS 101 376-5-7): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization".
- [12] GMR-1 3G 44.060 (ETSI TS 101 376-4-12): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 12: Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".
- [13] GMR-1 3G 44.118 (ETSI TS 101 376-4-13): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 13: Radio Resource Control (RRC) protocol; Iu Mode".
- [14] 3GPP TS 44.018 (ETSI TS 144 018): "3rd Generation Partnership Project; Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol".
- [15] 3GPP TS 44.118 (ETSI TS 144 118): "3rd Generation Partnership Project; Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification, Radio Resource Control (RRC) protocol; Iu mode".
- [16] 3GPP TS 25.323 (ETSI TS 125 323): "3rd Generation Partnership Project; Universal Mobile Telecommunications System (UMTS); Packet Data Convergence Protocol (PDCP) specification".
- [17] GMR-1 3G 44.160: (ETSI TS 101 376-4-14): "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 14: Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; Iu Mode".
- [18] ITU-R Recommendation M.1457-6: "Detailed specifications of the radio interfaces of International Mobile Telecommunications (IMT-2000)".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

3 Abbreviations

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

APSK	Amplitude and Phase Shift Keying
BPSK	Binary Phase Shift Keying
DC12	twelve-slot Downlink Control
DCH	Dedicated CHannel
DTCH	Dedicated Traffic CHannel
EDGE	Enhanced Data rates for GSM Evolution
FDD	Frequency Division Duplex
GBCH3	GPS Broadcast Channel 3
GERAN	GSM EDGE Radio Access Network
GMM/SM	GPRS Mobility Management and Session Management
GMPRS-1	GEO-Mobile Packet Radio Service - 1
GMR-1 3G	GEO-Mobile Radio interface - 1 Third Generation
GRA	GERAN Registration Area
GTP	GPRS Tunnelling Protocol
GTP-U	GPRS Tunnelling Protocol - User plane
IMS	IP Multimedia System
IP	Internet Protocol
IPv6	Internet Protocol version 6
Iu	Interface between BSS and core network
Iu-PS	Interface between BSS and core network - Packet Switched
ksp/s	kilo symbols per second
L1 bis	Layer 1 bis
L2	Layer 2
LAPSAT	Link Access Protocol for SATellite
LDPC	Low Density Parity Check
LLC	Logical Link Control
MSS	Mobile Satellite Service
MTP-1	Message Transfer Part - 1
MTP-2	Message Transfer Part - 2
MTP-3	Message Transfer Part - 3
NAS	Non Access Stratum
Nwk	Network
PAPR	Peak to Average Power Ratio
PDA	Personal Digital Assistant
PDCP	Packet Data Convergence Protocol
PDTCH/D	Packet Data Traffic Channel/ Downlink
PDTCH/U	Packet Data Traffic Channel/ Uplink
PSD	Power Spectral Density
QPSK	Quaternary Phase Shift Keying
RACH3	Random Access Channel - 3
RR	Radio Resource
RRC	Radio Resource Control
SBSS	Serving Base Station Subsystem
SES	Satellite Earth Stations and Systems
TCP	Transmission Control Protocol
TDM	Time Division Multiplex
UDP	User Datagram Protocol
UL	UpLink

4 Introduction to the GMR-1 3G specifications

4.1 History of the GMR-1 air interface

The GMR-1 3G air interface is an evolutionary third generation (3G) Mobile Satellite System (MSS) air interface that is built upon the earlier Release 1 and Release 2 of the GMR-1 air interface.

The GMR-1 development and standardization path follows the evolution of GSM/EDGE Radio Access Network or GERAN as shown in figure 1.

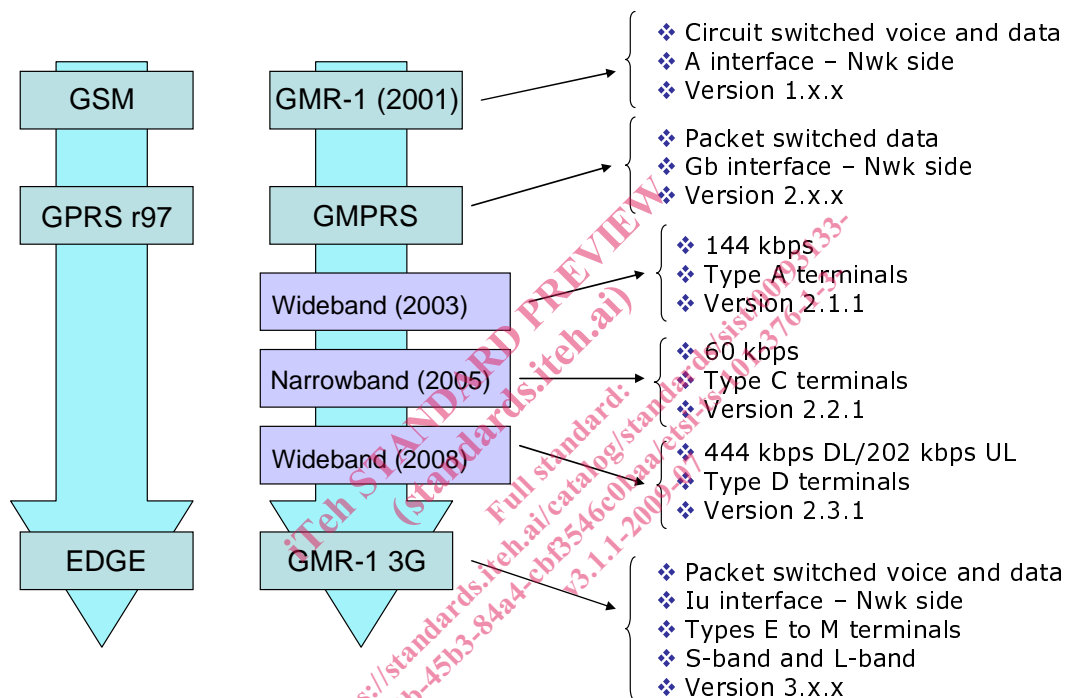


Figure 1: Evolution of GMR-1 specifications

The GMR-1 air interface specifications were first published in 2001 (GMR-1 Release 1) based on the GSM protocol architecture with satellite specific optimizations.

The GMR-1 Release 1 radio interface supports compatible services to GSM and reuses the GSM network infrastructure (see figure 2). It is designed to be used with dual-mode terminals (satellite/terrestrial) allowing the user to roam between GMR-1 satellite networks and GSM terrestrial networks. Features include spectrally efficient voice, delay tolerant fax, reliable non-transparent data services up to 9,6 kbps, SMS, cell broadcast services, position-based services, SIM roaming, high penetration alerting and single-satellite hop terminal-to-terminal calls. A system based on GMR-1 Release 1 is being widely used today in Europe, Africa, Asia and Middle East.

The GMR-1 Release 1 specifications have been revised and updated two additional times in 2002 (Version 1.2.1) and again in 2005 (Version 1.3.1).