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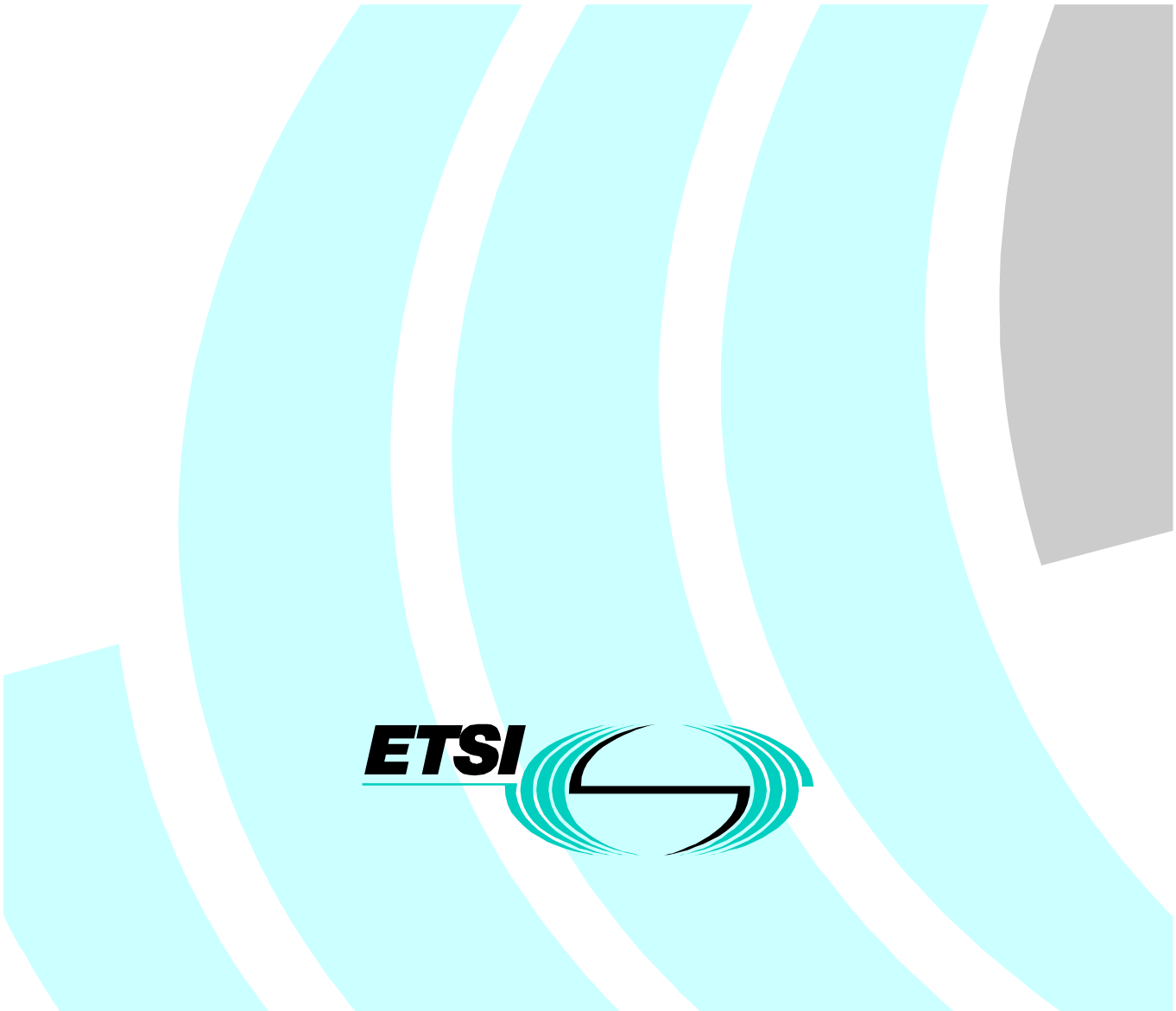
Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 1: General specifications;
Sub-part 3: General System Description;
GMR-1 01.202



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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 ThroughputCellular 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:

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.

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

Part 1: "General specifications";

Sub-part 1: "Abbreviations and acronyms; GMR-1 01.004";

Sub-part 2: "Introduction to the GMR-1 family; GMR-1 01.201";

Sub-part 3: "General System Description; GMR-1 01.202";

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.

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 is an introduction to the GMR-1 system and the associated air interface specification. It is intended to point out some of the differences between the cellular 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.

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".

[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".

[3] GSM 02.02 (ETSI ETS 300 501): "European digital cellular telecommunications system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.03 (ETSI ETS 300 502): "European digital cellular telecommunications system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[5] GSM 02.04 (ETSI ETS 300 503): "European digital cellular telecommunications system (Phase 2); General on supplementary services (V4.9.1)".

[6] GSM 02.17 (ETSI ETS 300 509): "European digital cellular telecommunications system (Phase 2); Subscriber Identity Module (SIM), Functional Characteristics".

[7] 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".

[8] 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".

[9] 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".

[10] 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)".

[11] 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".

[12] GMR-1 03.298 (ETSI TS 101 376-3-20): "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 20: Technical realization of High-Penetration Alerting".

[13] 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".

[14] GMR-1 04.002 (ETSI TS 101 376-4-2): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 2: GMR-1 Satellite Network Access Reference Configuration".

[15] GMR-1 04.003 (ETSI TS 101 376-4-3): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 3: Channel Structures and Access Capabilities".

[16] GMR-1 04.006 (ETSI TS 101 376-4-6): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 6: Mobile earth Station-Gateway Station Interface Data Link Layer Specifications".

[17] 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".

[18] GSM 04.10 (ETSI ETS 300 558): "Digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 Supplementary services specification; General aspects (V4.10.1)".

[19] GSM 04.11 (ETSI ETS 300 559): "Digital cellular telecommunications system (Phase 2); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface (V4.10.0)".

[20] GSM 04.12 (ETSI ETS 300 943): "Digital cellular telecommunications system (Phase 2+); Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface. (V5.0.2)".

[21] GMR-1 04.022 (ETSI TS 101 376-4-11): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 11: Radio Link Protocol (RLP) for Data Services".

[22] GMR-1 05.002 (ETSI TS 101 376-5-2): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 2: Multiplexing and Multiple Access; Stage 2 Service Description".

[23] GMR-1 05.003 (ETSI TS 101 376-5-3): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding".

[24] GMR-1 05.004 (ETSI TS 101 376-5-4): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation".

[25] GMR-1 05.005 (ETSI TS 101 376-5-5): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception".

[26] 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".

[27] GMR-1 05.010 (ETSI TS 101 376-5-7): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization".

[28] GSM 08.02 (ETSI ETS 300 587): "European digital cellular telecommunications system (Phase 2); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Interface principles. (V4.2.0)".

[29] GSM 08.08 (ETSI ETS 300 590): "Digital cellular telecommunications system (Phase 2); Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification. (V4.12.1)".

[30] GSM 09.02 (ETSI ETS 300 974): "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification. (V5.10.1)".

[31] GSM 09.07 (ETSI ETS 300 976): "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN). (V5.7.1)".

[32] GPS Interface Control Document - ICD-GPS-200 Navstar GPS Space Segment and Navigation User Interfaces, Public Release Version. February 1995.

NOTE: Where the relevant GMR document does not exist, the equivalent GSM document shall apply. The GMR document shall always take precedence over the equivalent GSM document.

3 Abbreviations

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

4 General introduction to the GMR-1 system

4.1 Overview and system elements

The GMR-1 system extends terrestrial GSM cellular system coverage. The GMR-1 system provides GSM-like services and features such as voice, data, fax, point-to-point short message service (see GSM 04.11 [19]), cell broadcast short message service (see GSM 04.12 [20]) and supplemental services (see GSM 04.10 [18]) between mobile and fixed users and provides world-wide connectivity through public and private switched telecommunications networks. Fixed network connectivity includes the Public Switched Telephone Network (PSTN); Public Land Mobile Networks (PLMNs); and private networks (PN) (see GSM 09.07 [31]).

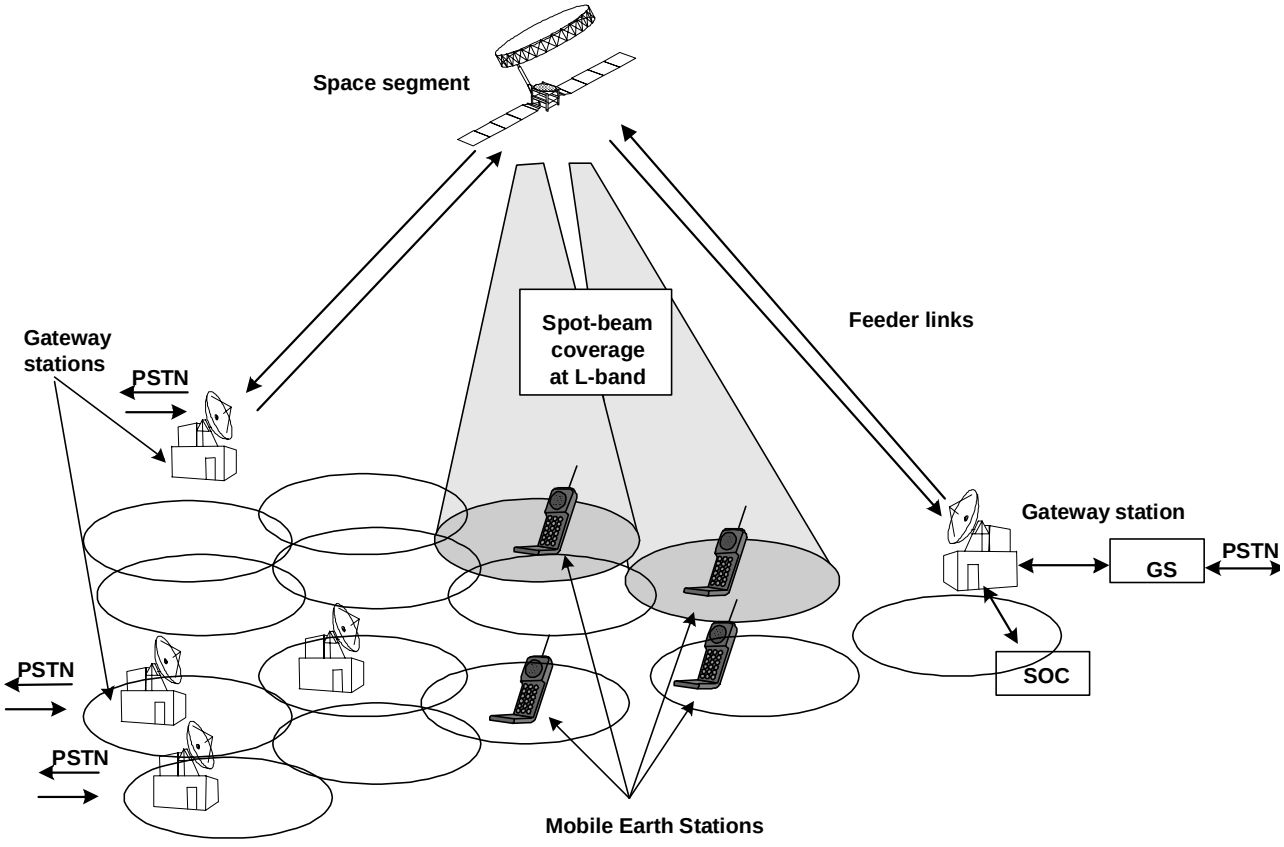

Figure 1: Example of GMR-1 system elements

The elements of a typical GMR-1 system are shown in figure 1. The system elements include one or more geostationary satellites, a Satellite Operations Center (SOC), a number of Gateway Stations (GS), and a large number of user terminals, referred to as Mobile Earth Stations (MES) in the GMR-1 specifications. The range of possible MESs include handportable terminals (handsets), vehicle terminals, and fixed terminals. The Gateway stations have external interfaces to existing fixed telecommunications infrastructure as well as to the GSM mobility management networks. A GS includes one or more gateway transceiver subsystems (GTS) which correspond to a GSM BTSs, one or more gateway station controllers (GSC), which correspond to a GSM BSCs, one or more mobile switching centers (MSC) which may be GSM MSCs, and one Traffic Control Subsystem (TCS) which has no corresponding functional element in the GSM base station. The GMR-1 TCS is required to support position based services, optimal routing and other satellite specific services and features, not found in GSM.

Mobile services are provided in a large regional coverage area, defined by the orbital location of the geosynchronous satellite and the satellite payload performance. Subscribers located anywhere in the coverage area may have full use of the GMR-1 system services. An example of a regional coverage area showing a typical distribution of spot beams is shown in figure 2.

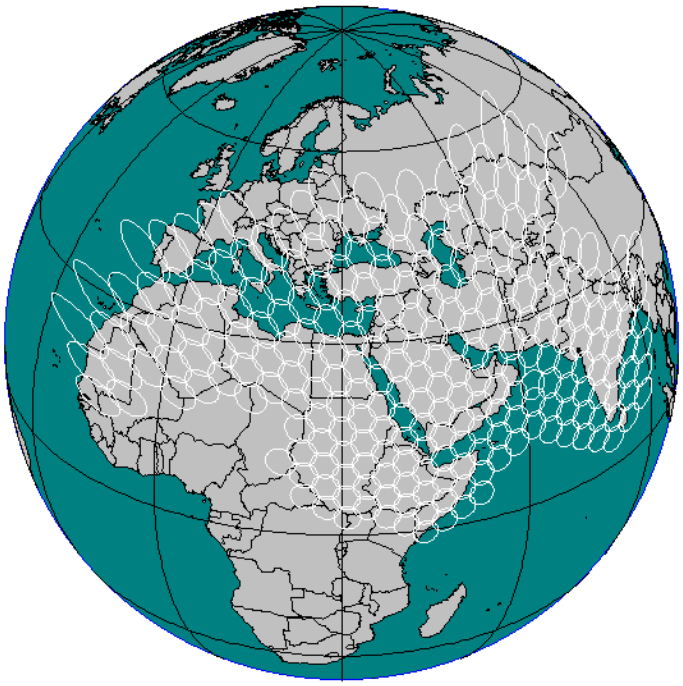

Figure 2: Example of regional coverage by multiple spot beams from a geosynchronous satellite

Satellite spot beams differ from GSM cells in that they are large, regularly shaped and all originate from the same point source, i.e., the satellite, and thus are synchronized. Because of their large size, several hundred kilometres in diameter, they overlap national boundaries and service areas. GSM cells, on the other hand, are very small, irregularly shaped by terrain features and buildings and originate from different geographical locations. GSM cells are always assumed to be contained within a single country. These differences necessitate very different treatments. Idle mode behaviour, as described in GMR-1 03.022 [26] and GMR-1 05.008 [26], adapts to these differences.

4.2 System architecture and external interfaces

User voice and data is transmitted in traffic channels between user terminals and Gateways, or directly between user terminals. Signalling to access the system, set-up calls, and manage link quality occurs on the broadcast, common, and dedicated signalling links. Each GS provides its own set of common control channels (CCCH) (see GMR-1 04.003 [15]) into the spot beams within its service area (SA). The protocol architecture is shown in figure 3.

In the first case, the GMR-1 system provides two-way connectivity between a user terminal and a fixed network subscriber, using L-band and Feeder links to the satellite (shown with solid lines in figure 1). Access to fixed telecommunications networks is provided by connections through the Gateway Station. Fixed network connectivity includes the Public Switched Telephone Network (PSTN); Public Land Mobile Networks (PLMNs); and private networks (PN) (see GSM 09.07 [31]).

In the second case, the GMR-1 system provides two-way connectivity between two user terminals in the same or different spot beams by performing direct connection of the two L-band to L-band connections in the satellite. This special case of single-hopped terminal to terminal (TtT) calls is described in clause 6.1.

A complete list of GMR-1 specifications and relevant GSM specification is given in GMR-1 01.201 [2].

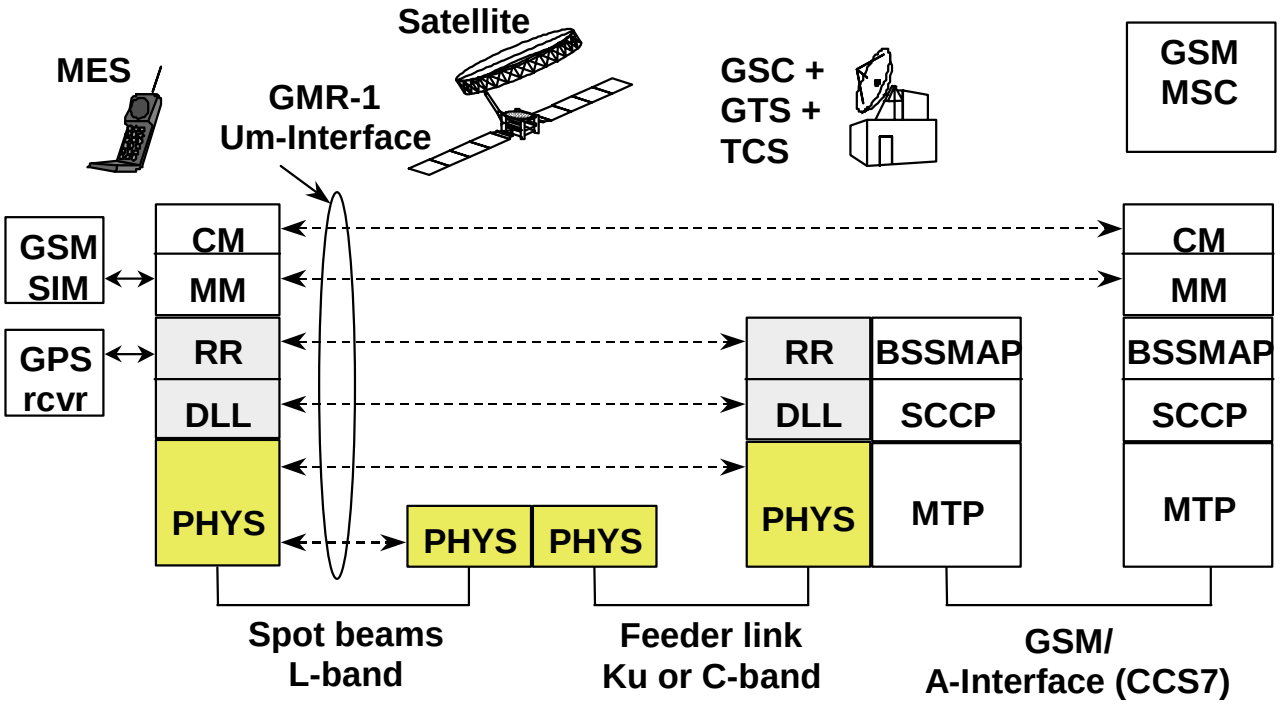

Figure 3: GMR-1 Protocol architecture

4.3 Functional description of system elements

The functional network elements shown in figure 1 are listed below. For a more detailed functional description of system elements see GMR-1 04.002 [14]. The satellite operations center (SOC), shown in figure 1, is part of the satellite subsystem and is beyond the scope of the GMR-1 technical specification. A gateway station (GS) consists of a gateway station subsystem, a mobile switching center and a traffic control subsystem (TCS).

4.3.1 The Gateway Station Subsystem (GSS)

The Gateway Station Subsystem (GSS) is the system of gateway station equipments (transceivers, controllers, etc.) which is viewed by the MSC through a single A-interface as being the entity responsible for communicating with Mobile Earth Stations in a certain coverage area. The radio equipment of a GSS may support one or more spot beams. The GSS consists of one Gateway Station Controller (GSC) and one or more Gateway Transceiver Stations (GTS). A Gateway Station Controller (GSC) is a network component in the Satellite Network that controls one or more GTS and that implements an A-interface. The A-interface functionality is described in GSM 08.02 [28]. A Gateway Transceiver Station (GTS) is a network component that serves one spot beam.

The split of functions between GSS and MSC is described in the 08-series of GSM Technical Specifications.

4.3.2 The Mobile Earth Station (MES)

The Mobile Earth Station (MES) consists of the physical equipment used by a GMR-1 subscriber; it comprises the Mobile Equipment (ME) and the Subscriber Identity Module (SIM). The ME comprises the Mobile Termination (MT) which, depending on the application and services, may support various combinations of Terminal Adapter (TA) and Terminal Equipment (TE) functional groups. These functional groups are described in GMR-1 04.002 [14].

4.3.3 The GeoMobile Radio (GMR-1) Satellite

The GMR-1 satellite consists of the physical equipment that provides gateway-mobile, mobile-gateway, and mobile-mobile communication connectivity.

4.3.4 The Advanced Operations Center (AOC)

The Advanced Operations Center (AOC) performs the services of centralized functions. These include performing management of the system and monitoring and controlling resource allocation to the gateway stations. The AOC may be collocated with one of the gateway stations.

4.3.5 The Traffic Control Subsystem (TCS)

The Traffic Control Subsystem (TCS) manages the real-time resources that are allocated to the Gateway Station by the AOC. The TCS manages the GMR-1 specific enhanced services and features which are not normally associated with GSM such as single hopped terminal-to-terminal calls as described in GMR-1 03.296 [10], optimal routing, as described in GMR-1 03.297 [11], high penetration alerting, as described in GMR-1 03.298 [12], and position based services, as described in GMR-1 03.299 [13].

5 GSM-based services

5.1 Standard services

The GMR-1 system provides a standard set of services based on the GSM phase 2 services. The GMR-1 system offers the bearer capabilities described in GSM 02.02 [3], the teleservices described in GSM 02.03 [4] and the supplementary services described in GSM 02.04 [5].

5.2 Roaming

The GMR-1 system supports GMR subscribers roaming to GSM networks with their SIM card (see GSM 02.17 [6]) assuming appropriate roaming agreements are in place, and the participating networks can support GSM MAP protocols (see GSM 09.02 [30]).

5.3 Single number routing

The system can support dual mode GMR-1/GSM stations with automatic routing to a single number.

5.4 Numbers and addressing

The GMR-1 system uses the same numbering and addressing scheme as in GSM with the exception of the location area identification (LAI) which is modified to accommodate spot beam identification and gateway station identification. These differences are described in GMR-1 03.003 [7] and GMR-1 04.008 [17].

5.5 Authentication and privacy

GMR-1 preserves GSM authentication and privacy features including TMSI security as described in GMR-1 03.020 [8].

6 Enhanced services and features

Several new integrated services are introduced into the GMR-1 system which are not integrated into conventional Phase 2 GSM.

6.1 Single-hopped terminal-to-terminal calls

In order to avoid the large delay associated with a double satellite hopped mobile terminal to mobile terminal call, such calls can be routed directly through the satellite from any terminal in any spot beam to any other terminal in any other spot beam as a single hopped call. The detailed protocol is described in GMR-1 03.296 [10]. The privacy of such calls can be preserved by maintaining an encrypted link as described in GMR-1 03.020 [8].

6.2 Optimal routing

The GMR-1 system allows MES originated calls to be optimally routed to a preferred GS, different than the GS to which the MES is registered. Criteria for optimal routing can include the subscriber's service provider, the called party number and/or the MES position. This service is described in GMR-1 03.297 [11]. The network functionality to support this feature resides in the TCS.

6.3 High penetration alerting

The GMR-1 system allows subscribers to be paged even when the MES is normally out of coverage area due to additional propagation path losses. This service is described in GMR-1 03.298 [12].

6.4 Position based services

The position based services and protocols are described in GMR-1 03.299 [13]. The impact of position based services on idle mode behaviour is described in GMR-1 03.022 [9]. The radio resource (RR) sublayer and the mobility management (MM) sublayer modifications are described in GMR-1 04.008 [17]. Position based services depend on the use of the GPS satellite system (see GPS Interface Control Document [32]) to provide the raw position information to the GMR-1 user terminals.

7 Protocol modifications

7.1 L-band radio interface

The GMR-1 protocol architecture, shown in figure 3, is similar to GSM. However, the lower layers of the GMR-1 protocol contain several differences due to the combination of the physical reality of a very different propagation path and the enhanced services and features of the GMR-1 system. GSM cells are on the order of a few kilometres or less in radius, the propagation delay is a fraction of a millisecond and the path loss is model is characterized by Rayleigh fading. GMR-1 spot beams are on the order of a few hundred kilometres in radius, the one-way propagation delay via a geostationary earth orbit satellite system is approximately 270 milliseconds and the path loss model is characterized by Ricean fading with a typical k-factor of between 7 and 9.

Furthermore, spectrum resources are typically more constrained in a satellite system as compared with a cellular system because the frequency reuse distance is much greater. For a terrestrial cellular system the exponential loss factor is typically 4 or more so that signals rapidly deteriorate beyond the cell boundary. Thus, frequencies can be reused within a few kilometres or a few tens of kilometres at most. In a satellite system, all spot beam signals are transmitted by the same satellite, a point source, and propagate with a free space exponential loss factor of 2 and the segregation between neighbouring spot beams is determined by the satellite antenna sidelobe performance. Frequencies can only be reused within hundreds or thousands of kilometres. It is therefore important that spectral efficiencies of mobile satellite systems be greater than terrestrial cellular systems.

Since all spot beam signals are transmitted via the same satellite, the schedules for the broadcast of control channels from multiple spot beams can be coordinated, which benefits spot beam selection. This benefit of a mobile satellite system is described in GMR-1 05.002 [22] and GMR-1 05.008 [26].

7.2 Physical layer

The GMR-1 physical layer offers similar services to the GSM physical layer, but this layer contains substantial differences to accommodate the different radio propagation environment as described above. The organization of the control channels is described in GMR-1 05.002 [22], the physical channel coding is described in GMR-1 05.003 [23] and the modulation schemes are described in GMR-1 05.004 [24]. Frequencies of operation as well as power related requirements such as EIRP and G/T are described in GMR-1 05.005 [25]. Radio link tasks are described in GMR-1 05.008 [26]. The protocol modifications necessary to address synchronization issues associated with the additional propagation delay are described in GMR-1 05.010 [27].

7.3 Data link layer

The data link layer protocol is a modified version of the GSM data link layer protocol (LAPDm). The data link layer modifications include the use of a selective reject and repeat protocol called group reject. The modifications also include larger window size and new timer values. See GMR-1 04.006 [16] for a complete description of the data link layer protocol including the parameter changes.

Because of the additional propagation delay the radio link protocol (RLP) for data and telemetric services includes some phase 2+ features of GSM. The RLP is described in GMR-1 04.022 [21].

7.4 Radio Resource management sublayer

The radio resource (RR) management sublayer is modified from GSM to accommodate the physical differences in the radio interface. Of special note is the random access channel (RACH) procedure which is modified to accommodate the large differential path delay within a spot beam as well as to accommodate the enhanced services and features such as position based services, optimal routing and terminal-to-terminal call establishment, which are not part of the GSM phase 2 services. The RR sublayer protocol and procedures are described in GMR-1 04.008 [17].

7.5 Mobility Management sublayer

The mobility management (MM) sublayer entity in the MSC is unchanged from GSM. However, the peer entity in the MES is modified to accommodate position based services and optimal routing. The modifications to the mobility management protocol on the network side are handled by the TCS functional network element so that the MSC and the A-interface remain unchanged from the GSM specification (see GSM 08.08 [29]). These protocol differences on the air interface are described in GMR-1 04.008 [17].

History

Document history		
V1.1.1	March 2001	Publication