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Technical Specification

**GEO-Mobile Radio Interface Specifications (Release 3);
Third Generation Satellite Packet Radio Service;
Part 3: Network specifications;
Sub-part 22: Overall description of the GMPRS
radio interface; Stage 2;
GMR-1 3G 43.064**

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Foreword

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- 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 22 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";

Part 2: "Service specifications";

Part 3: "Network specifications":

Sub-part 1: "Network Functions";

Sub-part 2: "Network Architecture";

Sub-part 3: "Numbering, addressing and identification";

Sub-part 4: "Organization of Subscriber Data";

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

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

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

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

Sub-part 9: "Security related Network Functions";

Sub-part 10: "Functions related to Mobile Earth Station (MES) in idle mode";

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

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

- Sub-part 13: "Technical realization of group 3 facsimile using transparent mode of transmission";
- Sub-part 14: "Transmission Planning Aspects of the Speech Service in the GMR-1 system";
- Sub-part 15: "Line Identification supplementary service - Stage 2";
- Sub-part 16: "Call Barring (CB) supplementary services - Stage 2";
- Sub-part 17: "Unstructured Supplementary Service Data (USSD) - Stage 2";
- Sub-part 18: "Terminal-to-Terminal Call (TtT)";
- Sub-part 19: "Optimal Routing technical realization";
- Sub-part 20: "Technical realization of High-Penetration Alerting";
- Sub-part 21: "Position Reporting services; Stage 2 Service description";
- Sub-part 22: "Overall description of the GMPRS radio interface; Stage 2";**
- Sub-part 23: "Radio Access Network; Overall description - Stage 2";
- 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 or 3GPP specifications are not subject to this precedence rule. For example, a GMR or 3GPP 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 or 3GPP specifications is defined in GMR-1 3G 1 41.201 [10].

1 Scope

The present document provides the overall description for lower-layer functions of the GEO-Mobile Radio Third Generation Satellite Packet Radio Service (GMR-1 3G) radio interface.

The overall description provides the following information:

- The services offered to higher-layer functions.
- The distribution of required functions into functional groups.
- A definition of the capabilities of each functional group.
- Service primitives for each functional group, including a description of what services and information flows are to be provided.
- A model of operation for information flows within and between the functions.

The present document is applicable to the following GMR-1 3G functional layers:

- Radio Link Control functions.
- Medium Access Control functions.
- Physical Link Control functions.

The present document describes the information transfer and control functions to be used across the GMR-1 3G radio interface for communication between the MES and the Network (see figure 1).



Figure 1: Scope of GMR-1 3G logical radio interface architecture

The overall GMR-1 3G logical architecture and the GMR-1 3G functional layers above the Radio Link Control and Medium Access Control layer are the same as GSM/GPRS as described in TS 101 344 [3].

GMPRS-1 04.007 [5] contains a description in general terms of the structured functions and procedures of this protocol and the relationship of this protocol with other layers and entities.

GMR-1 3G 44.008 [6] contains the definition of GMR-1 3G RLC/MAC procedures when operating on the Common Control Channel (CCCH).

GMR-1 3G 44.060 [7] contains the definition of RLC/MAC functions when operating on a Packet Data Channel (PDCH).

The functional procedures for the Logical Link Control (LLC) layer above the RLC/MAC are the same as GSM/GPRS as described in TS 101 351 [8].

GMR-1 05.001 and the GMR-1 3G 45-series defines the Physical Link layer and Physical RF layer (see [11] to [17]).

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.
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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 (Release 2) General Packet Radio Service; 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] GSM 02.60 (ETSI EN 301 113): "Digital cellular telecommunications system (Phase 2+) (GSM); General Packet Radio Service (GPRS); Service description; Stage 1 (Release 1997)".
- [3] 3GPP TS 03.60 (ETSI TS 101 344): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Service description; Stage 2 (Release 1997)".
- [4] GMR-1 04.004 (ETSI TS 101 376-4-4): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 4: Layer 1 General Requirements".

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

- [5] GMPRS-1 04.007 (ETSI TS 101 376-4-7): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 7: Mobile Radio Interface Signalling Layer 3 General Aspects".

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

- [6] 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".
- [7] 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".
- [8] 3GPP TS 04.64 (ETSI TS 101 351): "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) layer specification (Release 1997)".

- [9] GSM 04.65 (ETSI TS 101 297): "Digital cellular telecommunications system (Phase 2+) (GSM); General Packet Radio Service (GPRS); Mobile Station (MS) - Serving GPRS Support Node (SGSN); Subnetwork Dependent Convergence Protocol (SNDPC) (Release 1997)".
- [10] 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".
- [11] GMR-1 05.001 (ETSI TS 101 376-5-1): "GEO-Mobile Radio Interface Specifications (Release 1); Part 5: Radio interface physical layer specifications; Sub-part 1: Physical Layer on the Radio Path: General Description".

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

- [12] 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".
- [13] 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".
- [14] GMR-1 3G 45.004 (ETSI TS 101 376-5-4): "GEO-Mobile Radio Interface Specifications (Release 3); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation".
- [15] 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".
- [16] 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".
- [17] 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".
- [18] 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".
- [19] 3GPP 23.060 (ETSI TS 123 060): "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description; Stage 2".

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 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in GMR-1 3G 41.201 [20], EN 301 113 [2] and TS 101 344 [3] and the following apply:

A/Gb mode: mode of operation of the MES when connected to the Core Network via GERAN and the A and/or Gb interfaces

Iu mode: mode of operation of the MES when connected to the Core Network via GERAN or UTRAN and the Iu interface

3.2 Symbols

For the purposes of the present document, the following symbols apply:

GMR-1 3G Interface between MES and Satellite BSS

3.3 Abbreviations

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

UAT Uplink Allocation Type

4 Packet data logical channels

NOTE: The text in this clause is informative. The normative text is in GMR-1 3G 45.002 [12]. Where there is a conflict between these descriptions, the normative text has precedence.

4.1 General

This clause describes the packet data logical channels that are supported by the radio subsystem. The packet data logical channels are mapped onto the physical channels that are dedicated to packet data.

The physical channel dedicated to packet data traffic is called a Packet Data Channel (PDCH) for A/Gb mode and PDCH3 for Iu mode. A PDCH or PDCH3 can carry common control channel (PCCCH) with the data and dedicated control channels.

Packet channels are defined for PDCH for 125 kHz and for 156,25 kHz carriers, which are each three timeslots or for 156,25 kHz which are twelve timeslots wide. Packet channels are also defined for PDCH for uplink 31,25 kHz carriers and downlink 62,5 kHz carriers, which are six timeslots wide.

Packet channels are defined for PDCH3 for 156,25 and 312,5 kHz which are each three timeslots wide or for 31,25 and 62,5 kHz which are each six timeslots wide or for 156,25 kHz which are twelve timeslots wide. Timeslots are defined in GMR-1 3G 45.002 [12].

In the context of RLC/MAC and other higher layers, the term *MAC-slot* is used to define a triad of timeslots containing a single Packet Access Burst or Packet Normal Burst. Thus there can be eight packet channels or one or more CCCH and packet channels carrying PCCCH in a 24 slot (8 MAC-slot) frame. The term 4-MAC-slot is used to define four consecutive MAC slots or twelve consecutive timeslots. The starting MAC-slot of a 4-MAC-slot can be any one of the eight MAC-slots in a frame. Depending on the starting MAC-slot, a 4-MAC-slot may span two consecutive frames.

An additional term is defined, which is the dual MAC-slot abbreviated as D-MAC-slot. A D-MAC-slot represents two consecutive MAC slots or six consecutive timeslots. A D-MAC slot k ($0 \leq k \leq 3$) can be defined as a combination of MAC-slot $2k$ and MAC-slot $2k + 1$.