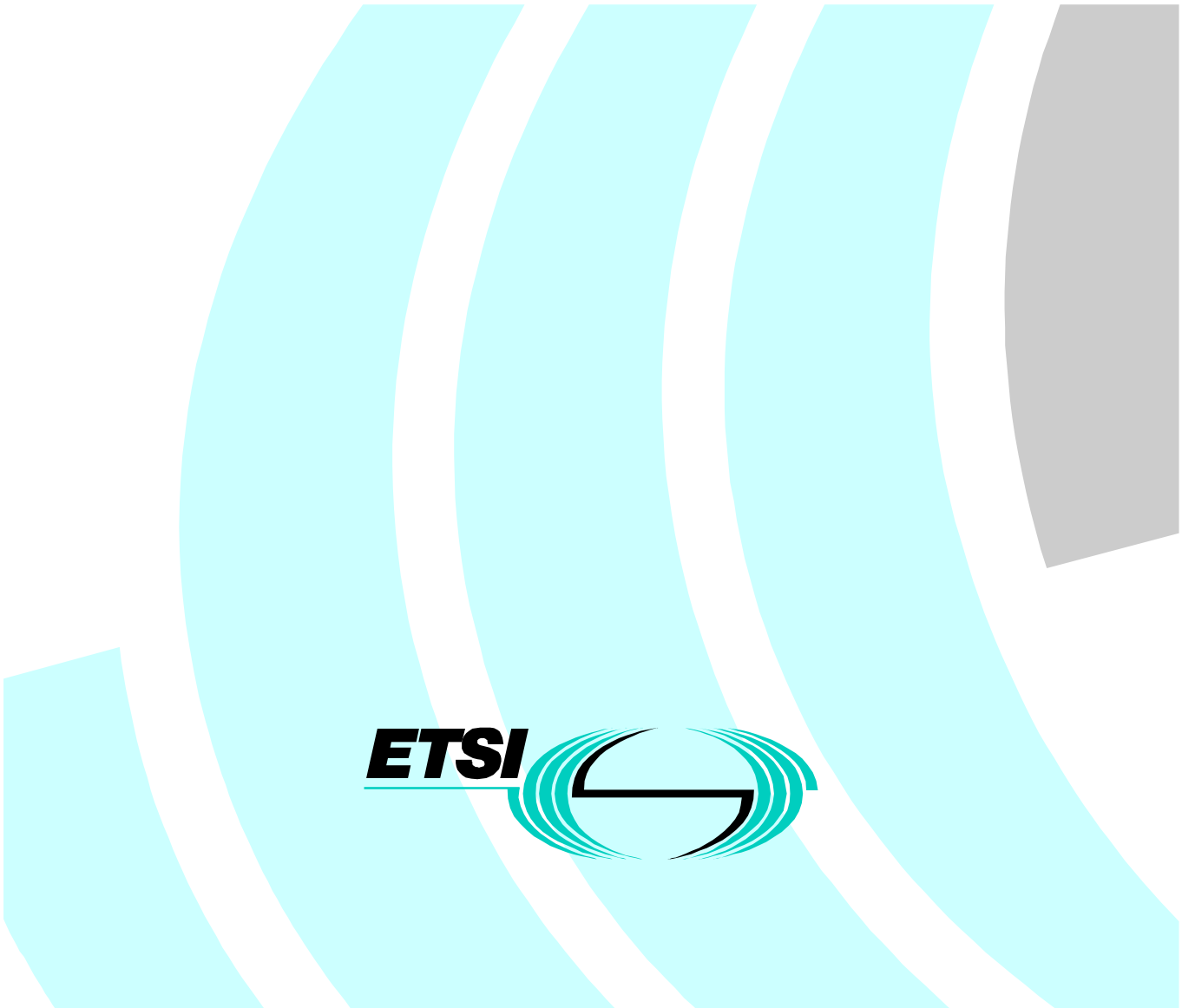
ETSI TS 101 376-4-10 V1.1.1 (2001-03)

Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 4: Radio interface protocol specifications;
Sub-part 10: Rate Adaptation on the Access Terminal-Gateway Station Subsystem (MES-GSS) Interface;
GMR-1 04.021



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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

IPR Owner: Ericsson Mobile Communications (UK) Limited
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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

IPR Owner: Hughes Network Systems
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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 4, sub-part 10 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";

Part 4: "Radio interface protocol specifications";

Sub-part 1: "Mobile Earth Station-Gateway Station System (MES-GSS) Interface; GMR-1 04.001";

Sub-part 2: "GMR-1 Satellite Network Access Reference Configuration; GMR-1 04.002";

Sub-part 3: "Channel Structures and Access Capabilities; GMR-1 04.003";

Sub-part 4: "Layer 1 General Requirements; GMR-1 04.004";

Sub-part 5: "Data Link Layer General Aspects; GMR-1 04.005";

Sub-part 6: "Mobile earth Station-Gateway Station Interface Data Link Layer Specifications; GMR-1 04.006";

Sub-part 7: "Mobile Radio Interface Signalling Layer 3 General Aspects; GMR-1 04.007";

Sub-part 8: "Mobile Radio Interface Layer 3 Specifications; GMR-1 04.008";

Sub-part 9: "Performance Requirements on the Mobile Radio Interface; GMR-1 04.013";

Sub-part 10: "Rate Adaptation on the Access Terminal-Gateway Station Subsystem (MES-GSS) Interface; GMR-1 04.021";

Sub-part 11: "Radio Link Protocol (RLP) for Data Services; GMR-1 04.022";

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 the rate adaptation functions in the GMR-1 Mobile Satellite System for adapting terminal interface data rates to the MES-GSS interface data rates, in accordance with GSM 03.10 [7]. The present document is based on GSM 04.21 [8].

The provision of these functions will depend on the services a particular station is designed to support.

NOTE: The present document should be considered together with GSM 08.20 [9] to give a complete description of satellite system rate adaptation.

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 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; GMR-1 05.003".

[4] GMR-1 07.001 (ETSI TS 101 376-7-1): "GEO-Mobile Radio Interface Specifications; Part 7: Terminal adaptor specifications; Sub-part 1: General on Terminal Adaptation Functions (TAF) for Mobile Earth Stations (MES); GMR-1 07.001".

[5] GMR-1 07.002 (ETSI TS 101 376-7-2): "GEO-Mobile Radio Interface Specifications; Part 7: Terminal adaptor specifications; Sub-part 2: Terminal Adaptation Functions (TAF) for Services Using Asynchronous Bearer capabilities; GMR-1 07.002".

[6] GMR-1 07.003 (ETSI TS 101 376-7-3): "GEO-Mobile Radio Interface Specifications; Part 7: Terminal adaptor specifications; Sub-part 3: Terminal Adaptation Functions (TAF) for Services Using Synchronous Bearer Capacities; GMR-1 07.003".

[7] GSM 03.10 (ETSI ETS 300 528): "European digital cellular telecommunications system (Phase 2); GSM Public Land Mobile Network (PLMN) connection types (GSM 03.10)".

[8] GSM 04.21 (ETSI ETS 300 562): "European digital cellular telecommunications system (Phase 2); Rate adaptation on the Mobile Station - Base Station System (MS - BSS) interface (GSM 04.21 (V4.6.0))".

[9] GSM 08.20 (ETSI ETS 300 591): "European digital cellular telecommunications system (Phase 2); Rate adaptation on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface (GSM 08.20 (V4.2.3))".

[10] ITU-T Recommendation V.110: "Support by an ISDN of data terminal equipments with V-series type interfaces".

3 Abbreviations

Abbreviations used in the present document are listed in GMR-1 01.004 [1].

4 General approach

Same as clause 3 of GSM 04.21 [8].

5 The RA0 function

Same as clause 4 of GSM 04.21 [8].

5.1 Asynchronous-to-Synchronous Conversion (RA0)

Same as clause 4.1 of GSM 04.21 [8].

5.2 Break signal

Same as clause 4.2 of GSM 04.21 [8].

5.3 Overspeed/underspeed

Same as clause 4.3 of GSM 04.21 [8].

5.4 Parity bits

Same as clause 4.4 of GSM 04.21 [8].

5.5 Flow control

Same as clause 4.5 of GSM 04.21 [8].

6 The RA1 function

This function is used to adapt between the synchronous user rates, or the output of the RA0 function and the intermediate rate of 8 or 16 kbps.

Table 6.1

Synchronous user rate	Intermediate rate
≤ 2,4 kbps	8 kbps
4,8 kbps	8 kbps
9,6 kbps	16 kbps

An ITU-T Recommendation V.110 80 bits frame is constructed using the user data bits received (from the RA0 in the asynchrounous case), and the values of the S bits are deduced from the R interface.
(See ITU-T Recommendation V.110 [10]).

Adaptation of 600 bps to 8 kbps is performed by 8 times consecutive duplication of each user data bit.

Adaptation of 1 200 bps to 8 kbps is performed by 4 times consecutive duplication of each user data bit.

Adaptation of 2 400 bps to 8 kbps is performed by 2 times consecutive duplication of each user data bit.

Adaptation of 4 800 bps to 8 kbps is performed by transmitting the bit stream with no duplication.

Adaptation of 9 600 bps to 16 kbps is performed by transmitting the bit stream with no duplication (the emitting period is halved with respect to the 4 800 bps case).

The ITU-T Recommendation V.110 [10] 80-bit frame shown in figure 3 of GSM 04.21 [8] is used. The D bits are used to convey user data and the S and X bits are used to convey channel control information according to the relevant terminal adapter function specification. (See ITU-T Recommendation V.110 [10]).

The E bits are used to convey the following information:

i) User data rate – E1, E2, E3 (see figure 4 of GSM 04.21 [8]);

ii) Network independent clocking – E4, E5, E6 – not used; reserved for future use;

iii) Multiframe synchronization – E7 – not used; reserved for future use.

The order of transmission of the 80-bit frame is from left to right and top to bottom.

6.1 Network independent clocking

Not applicable.

6.1.1 Multiframe structure

Not applicable.

6.1.2 Encoding and compensation

Not applicable.

7 The RA2 function

Same as clause 6 of GSM 04.21 [8].

8 The RA1/RA1' function

Same as clause 7 of GSM 04.21 [8].

8.1 Radio interface rate of 12 kbps

Same as clause 7.1 of GSM 04.21 [8].

8.2 Radio interface rate of 6 kbps

Same as clause 7.2 of GSM 04.21 [8].

8.3 Radio Interface rate of 3,6 kbps (transparent services only)

Same as clause 7.3 of GSM 04.21 [8].

8.4 Synchronization

Same as clause 7.4 of GSM 04.21 [8].

8.5 Idle frames

Same as clause 7.5 of GSM 04.21 [8].

9 The RA1' function

Same as clause 8 of GSM 04.21 [8].

10 Support of nontransparent bearer services

In the case of non-transparent services, the RA1' function provides access to the 12 and 6 kbps (alignment of RLP frames with the four TDMA slots makes it physically impossible to provide 3,6 kbps) radio interface data rates. Refer to figure 10 in GSM 04.21 [8].

Table 10.1

User rate	Radio interface rate
<= 4,8 kbps	6 kbps
9,6 kbps	12 kbps

This access results in the use of a modified ITU-T Recommendation V.110 [10] 60-bit frame for non-transparent services (see figure 10 of GSM 04.21 [8]. See ITU-T Recommendation V.110 [10]). In this case, the RA1' function also provides for alignment of four modified ITU-T Recommendation V.110 [10] 60-bit frames corresponding with each complete 240-bit frame to be encoded by the radio subsystem as a single unit (see GMR-1 05.003 [3]). The difference between the non-transparent 60-bit frame and the 60-bit frame for the transparent service is that the bit positions used for status in a transparent frame are for carrying data (designated as D' bits in figure 10 of GSM 04.21 [8]).

NOTE: The status bits SA and SB, and the X bit are embedded in the L2R-PDU frames (see GMR-1 07.001 [4], GMR-1 07.002 [5] and GMR-1 07.003 [6]).

The first bit of each RLP frame to be transmitted will correspond to the first bit (D1) of the first 60-bit frame in a four-frame sequence, while the last bit will correspond to the last bit (D'12) of the last 60-bit frame in a four frame sequence. Each 60-bit frame is filled from left to right starting at D1 (see figure 10 of GSM 04.21 [8]).

The radio subsystem provides for the synchronous transmission and reception of 240-bit RLP frames every 20 msec (12 kbps radio interface rate) or 40 msec (6 kbps radio interface rate) irrespective of the user rate.

The request to use 6 kbps radio interface rate on a Full Rate Channel is indicated in the BC-IE by setting the NIRR bit to 6 kbps (for the negotiation procedure see GMR-1 07.001 [4]) and selecting a full rate channel and nontransparent service.

Occasions may arise when there is no RLP frame ready to be transmitted. In this case a frame of 240 zeros will be transmitted. This frame will be discarded by the distant RLP function, due to FCS failure, but will allow physical link synchronization to be maintained between the MES and the MSC.

Refer to figures 3 to 10 in GSM 04.21 [8].

Annex A (informative): Stacks of rate adaptation

Same as annex A of GSM 04.21 [8].

Annex B (informative): Bibliography

ITU-T Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an Integrated Services Digital Network (ISDN)".

GSM 07.05 (ETSI ETS 300 585): "Digital cellular telecommunications system (Phase 2); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) (GSM 07.05 (V4.8.1))".

GSM 07.06 (ETSI ETS 300 586): "European digital cellular telecommunications system (Phase 2); Use of the V series Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface at the Mobile Station (MS) for Mobile Termination (MT) configuration (GSM 07.06)".

History

Document history		
V1.1.1	March 2001	Publication