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Technical Specification

**GEO-Mobile Radio Interface Specifications;
Part 4: Radio interface protocol specifications;
Sub-part 9: Performance Requirements
on the Mobile Radio Interface;
GMR-1 04.013**

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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

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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).

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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 9 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 specifies measurable performance requirements for signalling aspects of mobile earth stations in the GMR-1 Mobile Satellite System.

To allow implementation flexibility it has been chosen to specify requirements on the whole mobile station rather than to specify requirements on each "OSI layer". As a consequence, the performance requirements do not fit conveniently in specifications such as GMR-1 04.008 [5] (layer 3 only) or GMR-1 04.006 [4] (layer 2 only).

The main aim of the present document is to provide the justification for testing of requirements that are not included in other GMR-1 specifications. Where specific requirements are included in other GMR-1 specifications they are not duplicated here.

Mobile Earth Stations have to perform a wide variety of functions. As a consequence most performance measurements have to be made under a set of defined conditions: where necessary, these are included in the present document.

Where necessary certain assumptions are made about the interaction times between the mobile equipment and the SIM. If the (test) SIM does not respond within the assumed time then appropriate allowances shall be made.

Additionally, it is intended that the present document should contain sufficient requirements to enable some undefined network timers in GMR-1 04.008 [5] to be calculated.

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 03.022 (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".

[4]   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; GMR-1 04.006".

[5]   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".

[6]   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".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

Ready to transmit: in the present document, the phrase "ready to transmit the message before time x" is defined to
mean that the MES shall transmit part of that message no later than the first burst of the first TCH or control channel
block that occurs after time x

Delay: delay time requirements in the present document are triggered by a message transmission in the
Gateway-to-MES direction. All such delay times are measured from receipt of a message by the MES to transmit of a
message by the MES. They do not include propagation delay between the Gateway Station and the MES, or between the
satellite and the MES

3.2   Abbreviations

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

4   Default conditions

Unless otherwise stated, throughout the present document, the following conditions are associated with the
requirements:

- ideal radio link with an insignificant bit error rate;

- no other signalling is in progress on the main DCCH;

- messages sent by the network are correctly formed;

- the only established data link (or the only data link to be established) is on SAPI 0;

- any Starting Time IE that is included in a message sent by the network does not require the action to be delayed;

- cells are not barred and all access classes are allowed;

- the layer 2 performance of the network shall satisfy the "System Performance Requirements" of
  GMR-1 04.006 [4];

- messages sent by the network may contain any set of optional Ies, and any permitted set of conditional Ies;

- the mobile has a valid SIM inserted, is powered on, and the SIM's update status is "updated"; and on the CCCH,
  the Page Mode IE is not set to "paging reorganization" or "same as before".

5 Requirements

5.1 General requirements

5.1.1 Response to layer 3 message

The requirements of clause 5.1.1 apply if there are no specific requirements for a layer 3 message in other parts of clause 5.

If the last timeslot of the message block containing a network command occurs at time T, then the MES shall be ready to transmit the response before time T + 500 ms.

5.1.2 Response to an erroneous layer 3 message

If the last timeslot of the message block containing an erroneous RR, MM or CC message occurs at time T and if GMR-1 04.008 [5] requires a status message to be returned to the network then the MES shall be ready to transmit the RR-STATUS or MM-STATUS or STATUS message before T + 500 ms.

5.2 Layer 3 Radio Resource signalling

5.2.1 Paging

If access to the network is allowed and the MES has been camped on a suitable cell for at least 2 seconds and if the last timeslot of the message block containing a PAGING REQUEST message addressing the MES occurs at time T, and the MES does not need to obtain a new GPS position before sending the CHANNEL REQUEST, then the MES shall be ready to transmit the CHANNEL REQUEST message before T + 0,7 s.

5.2.2 Channel release

5.2.2.1 Paging and cell reselection after channel release

If the last timeslot of the message block containing a CHANNEL RELEASE message occurs at time T the MES shall respond to PAGING REQUEST messages that occur later than T + 1,0 seconds.

5.2.2.2 Registration after channel release

If the last timeslot of the message block containing a CHANNEL RELEASE message occurs at time T, and the MES is required to reregister, the MES shall be ready to send the CHANNEL REQUEST message before T + 1,0 seconds.

5.2.3 Paging commands and Immediate Assignment Rejection (Timer T3122)

If the last timeslot of the message block containing an IMMEDIATE ASSIGNMENT REJECT message is sent at time T and contains a Wait Indication of W seconds then the MES shall at least respond to PAGING REQUEST messages sent later than T + (W + 1) seconds.

5.2.4 Immediate assignment (Timer T3101)

If the last timeslot of the message block containing an IMMEDIATE ASSIGNMENT (or IMMEDIATE ASSIGNMENT EXTENDED) message is transmitted at time T then, the MES shall be ready to transmit the SABM frame with its information field before T + 320 ms. This requirement shall apply for assignment to TCH and SDCCH.

5.2.5   Channel assignment

If the last timeslot of the message block containing an ASSIGNMENT COMMAND occurs at time T, then the MES shall be ready to transmit the ASSIGNMENT COMPLETE message before T + 600 ms.

If the last timeslot of the message block containing an ASSIGNMENT COMMAND occurs at time T and this ASSIGNMENT COMMAND is such that the MES tries but fails to establish a layer 2 link on the new channel and thus reverts to the old channel, then the MES shall be ready to transmit the ASSIGNMENT FAILURE message on the old channel before T + 2 seconds.

If the last timeslot of the message block containing an ASSIGNMENT COMMAND occurs at time T and this ASSIGNMENT COMMAND is such that the MES shall not attempt to establish a layer 2 link on the new channel, then the MES shall be ready to transmit any ASSIGNMENT FAILURE message on the old channel before T + 500 ms.

The requirements of this clause apply to both the ASSIGNMENT COMMAND 1 and ASSIGNMENT COMMAND 2 messages.

5.2.6   Channel mode modify

If the last timeslot of the message block containing a CHANNEL MODE MODIFY message occurs at time T, then the MES shall be ready to transmit the CHANNEL MODE MODIFY ACKNOWLEDGE message before T + 300 ms.

5.2.7   Handover access

If the last timeslot of the message block containing a HANDOVER COMMAND message occurs at time T then, the MES shall be ready to transmit the SABM frame before T + 320 ms. This requirement shall apply for handover to either a TCH or SDCCH.

During a handover procedure, if the last timeslot of the message block containing a UA frame occurs at time T, then the MES shall be ready to transmit the HANDOVER COMPLETE message before T + 350 ms. This requirement shall apply for handover to either a TCH or SDCCH.

5.2.8   Encryption

If the last timeslot of the message block containing a CIPHERING MODE COMMAND message occurs at time T, then the MES shall be ready to transmit the CIPHERING MODE COMPLETE message before T + 500 ms.

5.2.9   Classmark change

While the MES has an active RR connection, any change in the MES's capabilities that are indicated in the Mobile Station Classmark 2 or 3 Ies shall cause a CLASSMARK CHANGE message to be sent to the network. The MES shall be ready to transmit the CLASSMARK CHANGE message not later than 1 second after the change in capabilities.

5.2.10   Classmark interrogation

If the last timeslot of the message block containing a CLASSMARK ENQUIRY message occurs at time T, then the MES shall be ready to transmit the CLASSMARK CHANGE message before T + 300 ms.

5.2.11   Release (Timer T3110)

If the last timeslot of the message block carrying the CHANNEL RELEASE message occurs at time T, then the MES shall cease transmissions on all channels before T + 500 ms.

5.2.12   Early sending of the CLASSMARK CHANGE message

During a contention resolution procedure, if the last timeslot of the block containing a Layer 2 UA frame, occurs at time T, then the MES shall be ready to transmit the CLASSMARK CHANGE message, if applicable (see GMR-1 04.006 [4] and GMR-1 04.008 [5]), before T + 40 ms.

5.3 Layer 3 Mobility Management signalling

5.3.1 Periodic location updating timer

When the T3212 timeout value is set to the non-zero value P and the last timeslot of the message block containing a CHANNEL RELEASE message is transmitted at time T then, assuming the next event shall be the periodic location update, the next CHANNEL REQUEST message shall be transmitted between time T + P decihours – 15 seconds and time T + P decihours + 15 seconds.

5.3.2 Identification

If the last timeslot of the message block containing an IDENTITY REQUEST message occurs at time T, then the MES shall be ready to transmit the IDENTITY RESPONSE message before T + 600 ms. This requirement assumes that the MES-ME has to wait less than 100 ms to obtain any necessary responses from the SIM.

5.3.3 Authentication

If the last timeslot of the message block containing an AUTHENTICATION REQUEST message occurs at time T, then the MES shall be ready to transmit the AUTHENTICATION RESPONSE message before T + 1 second. This requirement assumes that the MES-ME has to wait less than 500 ms to obtain any necessary responses from the SIM.

5.3.4 T3240 expiry

If the last timeslot of the message block containing an AUTHENTICATION REJECT message; or a LOCATION UPDATING ACCEPT message (without a Follow On Proceed IE); or a LOCATION UPDATING REJECT message; or a CM SERVICE REJECT message (and no other MM connection is active) occurs at time T, and the network does not send a CHANNEL RELEASE message but does maintain the RR connection, then the MES shall cease transmission on all channels before T + 12 seconds.

5.3.5 TMSI reallocation

If the last timeslot of the message block containing either a TMSI REALLOCATION COMMAND, or a LOCATION UPDATING ACCEPT with a TMSI in the Mobile Identity IE, occurs at time T, then the MES shall be ready to transmit the TMSI REALLOCATION COMPLETE message before T + 500 ms.

5.3.6 IMSI detach

The requirements of this clause only apply if the network indicates on the BCCH that IMSI detach shall be used.

An MES shall only apply these requirements if the requirements for CHANNEL REQUEST transmission given in GMR-1 05.008 [6] are met.

If it is possible to switch the mobile off, or if it is possible to remove the SIM whilst the mobile is powered on, then when such an action is performed in idle mode at time T, the first CHANNEL REQUEST message for the IMSI Detach procedure shall be transmitted before T + 2 seconds.

If it is possible to switch the mobile off, or if it is possible to remove the SIM whilst the mobile is powered on, then when such an action is performed in the Active (U10) state of a call at time T, the MES shall be ready to transmit the IMSI DETACH INDICATION message before T + 1 second.

If the last timeslot in which the IMSI DETACH message is sent occurs at time T then the MES shall cease transmission on all channels before T + 6 seconds.

5.3.7 Location updating with random access failure

In an environment with only one suitable BCCH (see GMR-1 03.022 [3] for the definition of a "suitable BCCH"), if a location updating attempt suffers a random access failure (see GMR-1 04.008 [5]) with the last CHANNEL REQUEST message being transmitted at time T, then the first re-attempt shall result in a CHANNEL REQUEST message being transmitted before T + 15 seconds.

5.3.8 Follow on call

If the last timeslot of the message block containing a LOCATION UPDATING ACCEPT message with a Follow on Proceed IE occurs at time T and the MES has a CM application request pending, then the MES shall be ready to the CM SERVICE REQUEST message before T + 500 ms.

5.4 Layer 3 Call Control signalling

5.4.1 Time to send SETUP message

In the case of a MES originated call, if the last timeslot of the message block containing a CM SERVICE ACCEPT message occurs at time T then the MES shall be ready to transmit the SETUP message before T + 500 ms.

In the case of a MES originated call, if the last timeslot of the message block containing a CIPHERING MODE COMMAND message occurs at time T, then the MES shall be ready to transmit the SETUP message before T + 750 ms.

5.4.2 Response times to CC messages

For the commands and responses listed in table 5.1, the following shall apply:

- if the last timeslot of the message block in which the "command" message is received occurs at time T, then the MES shall be ready to transmit any one of the possible "responses" before time T + W.

Table 5.1: Call control message response times

Command (network-→ MES)	Response (MES-→ network)	W
CONNECT	CONNECT ACKNOWLEDGE	500 ms
SETUP	(as first response message) CALL CONFIRMED or ALERTING or CONNECT or RELEASE COMPLETE	1 second
SETUP	(as second response message) ALERTING or CONNECT or DISCONNECT	2 seconds
SETUP	(as third response message) CONNECT	No requirement
DISCONNECT	RELEASE	500 ms
RELEASE	RELEASE COMPLETE	500 ms
STATUS ENQUIRY	STATUS	500 ms

5.4.3 User alerting

If the MES has some form of user alerting and if for a mobile terminating call the MES sends the ALERTING message before the CONNECT message then:

- if the last timeslot carrying a SETUP message containing the Signal IE occurs at time T, the user alerting shall be initiated before time T + 1 second.

5.4.4 Call establishment

If the MES's service indication indicates that service is available (see GMR-1 03.022 [3]) and after the entry of suitable number digits, then if the "SEND" or "Emergency SEND" function on the MES is activated at time T, the first CHANNEL REQUEST message shall be transmitted before time T + 2 second.

5.4.5 In call modification

For network originated in call modification, if the MES transmits the last timeslot of the message block containing the MODIFY message at time T then the MES shall be ready to transmit the MODIFY COMPLETE message before time T + 500 ms.

5.5 Short message services point to point

These requirements relate to signalling using SAPI 3.

5.5.1 CP-DATA

If the last timeslot of the message block containing a CP-DATA message occurs at time T, then the MES shall be ready to transmit the CP-ACK message before T + 500 ms.

5.5.2 RP-DATA

If the last timeslot of the message block containing a RP-DATA message for which the MES has storage room available occurs at time T, then the MES shall be ready to transmit the RP-ACK message before time T + 1 second.

History

Document history		
V1.1.1	March 2001	Publication