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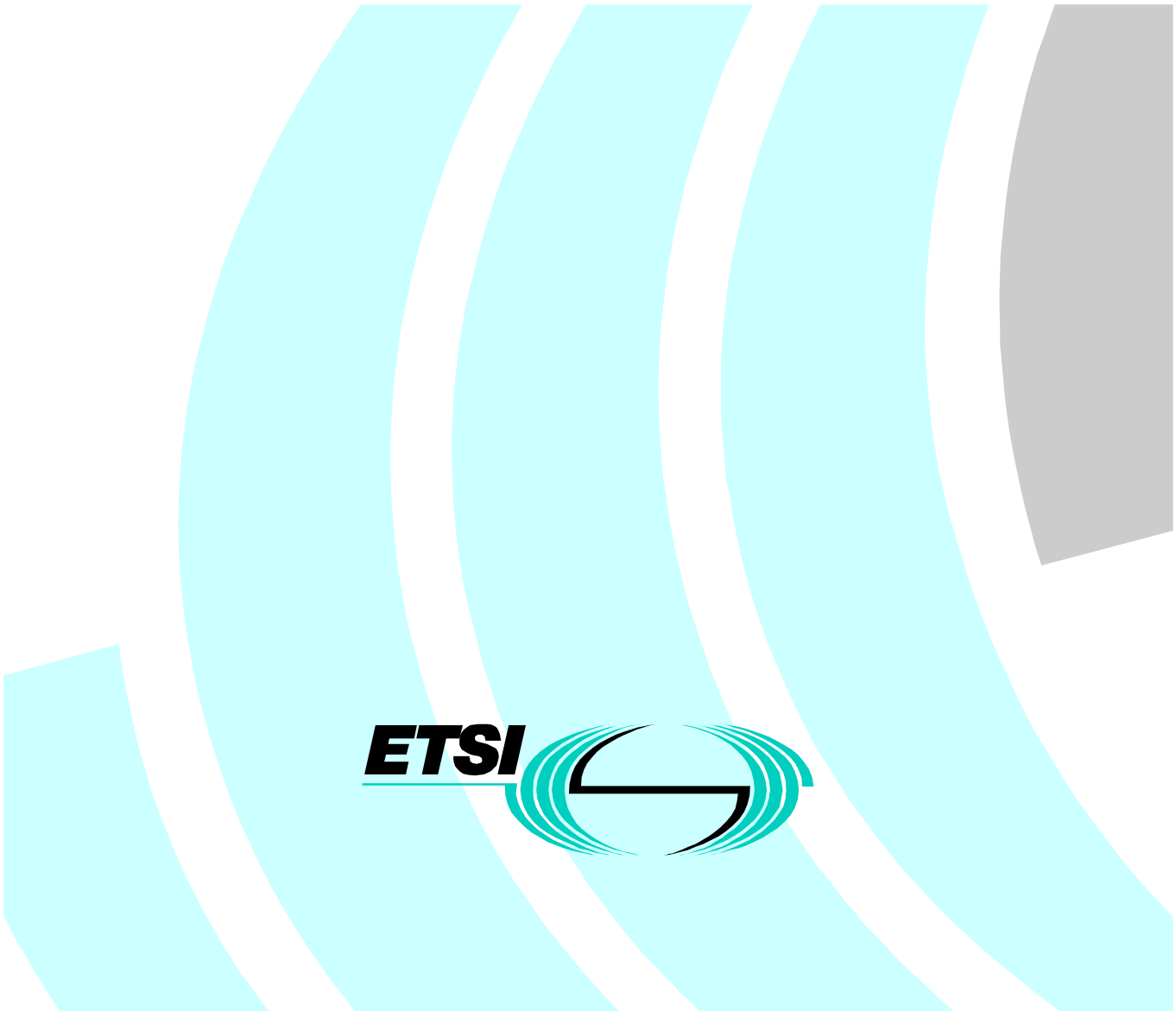
Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 3: Network specifications;
Sub-part 7: Discontinuous Reception (DRX);
GMR-1 03.013



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Contents

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IPRs:

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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 3, sub-part 7 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";

Sub-part 1: "Network Functions; GMR-1 03.001";

Sub-part 2: "Network Architecture; GMR-1 03.002";

Sub-part 3: "Numbering, Addressing and identification; GMR-1 03.003";

Sub-part 4: "Organization of Subscriber Data; GMR-1 03.008";

Sub-part 5: "Technical realization of Supplementary Services; GMR-1 03.011";

Sub-part 6: "Location Registration and Position Identification Procedures; GMR-1 03.012";

Sub-part 7: "Discontinuous Reception (DRX); GMR-1 03.013";

Sub-part 8: "Support of Dual-Tone Multifrequency Signalling (DTMF); GMR-1 03.014";

Sub-part 9: "Security related Network Functions; GMR-1 03.020";

Sub-part 10: "Functions related to Mobile Earth station (MES) in idle mode; GMR-1 03.022";

Sub-part 11: "Technical realization of the Short Message Service (SMS) Point-to-Point (PP); GMR-1 03.040";

Sub-part 12: "Technical realization of the Short Message Service Cell Broadcast (SMSCB); GMR-1 03.041";

Sub-part 13: "Technical realization of group 3 facsimile using transparent mode of transmission; GMR-1 03.045";

Sub-part 14: Transmission Planning Aspects of the Speech Service in the GMR-1 system; GMR-1 03.050";

Sub-part 15: "Line Identification supplementary service - Stage 2; GMR-1 03.081";

Sub-part 16: "Call Barring (CB) supplementary services - Stage 2; GMR-1 03.088";

Sub-part 17: "Unstructured Supplementary Service Data (USSD) - Stage 2; GMR-1 03.290";

Sub-part 18: "Terminal-to-Terminal Call (TtT); GMR-1 03.296";

Sub-part 19: "Optimal Routing technical realization; GMR-1 03.297";

Sub-part 20: "Technical realization of High-Penetration Alerting; GMR-1 03.298";

Sub-part 21: "Position Reporting services; Stage 2 Service description; GMR-1 03.299";

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-1 01.201 [2].

1 Scope

The present document specifies a system wide view of the operation of discontinuous reception on the GMR-1 Mobile Satellite System.

The present document gives an overview of the implementation of discontinuous reception DRX within the GMR-1 mobile satellite system (MSS), the actions required at the MSC, the GSS, and the mobile earth station (MES). It also specifies the support of the facility via the radio interface, and some operational aspects of the facility.

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

[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 05.002 (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; GMR-1 05.002".

3 Abbreviations

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

DRX	Discontinuous Reception
GMR	GEO-Mobile Radio interface
GSS	Gateway Station System
MES	Mobile Earth Station
MES-ME	Mobile Earth Station-Mobile Equipment
MES-MS	Mobile Earth Station-Mobile Station
MSC	Mobile Switching Centre
MSS	Mobile Satellite System

4 Overview of discontinuous reception

Discontinuous reception (DRX) is a technique that allows the mobile earth station (MES) to power down significant amounts of its internal circuitry for a high percentage of the time when it is in the idle mode while avoiding the problem of not decoding valid page requests or alert requests transmitted by the network in the idle mode periods. DRX is also used to allow the MES to schedule other idle-mode tasks.

The technique works by dividing the MESs within a spot beam into a set of paging groups and a separate set of alerting groups. The paging group and the alerting group in which an MES resides are both known locally at both the MES and the GSS. All paging requests and all alerting requests to each group are then scheduled and transmitted at a particular time on a particular physical channel, where both the time and the channel are derived from the TDMA frame number in conjunction with the IMSI of the MES and some BCCH transmitted data.

Thus both the GSS and the MES know when and where the relevant page request messages or alert request messages will be sent and the MES can power down, or schedule other idle mode tasks for the period when it knows that page requests or alert requests will not occur.

The page request or alert request message from the MSC contains both the TMSI and the IMSI in order to identify the MES concerned. The IMSI is used by the GSS to identify the appropriate paging or alerting group, and the TMSI is inserted into the appropriate radio interface message.

5 MSC functions

The MSC is almost transparent to DRX, since it has no real time knowledge of the absolute frame numbers on the radio interface. It should be noted, however, that the MSC defines which spot beam is to be paged in order to locate a particular MES.

The MSC constructs page requests and sends them to a specific GSS. Each page request should always include both the IMSI and the TMSI.

In the event that no response is received to a page request message, the MSC may repeat the page request message a configurable number of times. If no response is received at the end of these repeats the MSC may generate an alert request message using the same information that was used to produce the page request message.

The behaviour of the MSC is controlled by a set of changeable parameters as defined in GMR-1 03.298 [4] and these parameters may require modification depending upon the number of page groups and/or alert groups that are involved. If this is the case, then the parameters will be set by operations and management (OAM) commands at the same time as the number of paging groups and/or the number of alerting group in the spot beam are modified.

6 GSS functions

At the GSS page requests and alert requests are received from the MSC. The message explicitly identifies whether it is to be transmitted as a page request or an alert request and it is implicit within the requests from the MSC to which spot beam the request is destined.

If the request is a page request and it includes both a TMSI and an IMSI then the GSS analyses the IMSI in order to derive the paging group of the MES involved. The radio interface page request is then constructed: the TMSI is inserted into one or more page request messages and the messages are transmitted in the appropriate TDMA bursts. Each TMSI shall be inserted in a maximum of 4 successive paging messages according the current OAM configuration. The relationship between paging group and TDMA burst, and IMSI and paging group is given in GMR-1 05.002 [6].

If the request is a page request and it only includes an IMSI then the GSS analyses the IMSI in order to derive the paging group of the MES involved. The radio interface page request is then constructed: the IMSI is inserted into one or more page request messages and the messages are transmitted in the appropriate TDMA bursts. The repetition is optional in this case: each IMSI may be inserted in a maximum of 4 successive paging messages according the current OAM configuration. The relationship between paging group and TDMA burst, and IMSI and paging group is given in GMR-1 05.002 [6].

The scheduling of the page requests is therefore completely controlled by the GSS. The exact scheduling mechanism used at the GSS is not defined in the present document. However the GSS may set the "page-mode" bits as described in GMR-1 04.008 [5]. This can be used to optimize paging load and reduce missed page requests during system reconfiguration as described in clause 9.

If the request is an alert request and it includes both a TMSI and an IMSI, then the GSS analyses the IMSI in order to derive the alerting group of the MES involved. The radio interface alert request is then constructed: the TMSI is inserted into the actual alert request message and the message is transmitted in the appropriate TDMA burst. The relationship between alerting group and TDMA burst, and IMSI and alerting group is given in GMR-1 05.002 [6].

If the request is an alert request and it does not contain both an IMSI and a TMSI, the request is discarded by the GSS.

Under certain exception conditions, the GSS may discard an alert request without transmitting the corresponding radio interface alert request. The MSC is not notified if this exception occurs.

The scheduling of the alerting requests is therefore completely controlled by the GSS. The exact scheduling mechanism used at the GSS is not defined in the present document. However the GSS may set the "alert-mode" bits as described in GMR-1 04.008 [5]. These control bits can be used during system reconfiguration as described in clause 9.

7 MES functions

The MES shall derive its paging group and its alerting group from the information transmitted in the BCCH together with its IMSI as defined in GMR-1 05.002 [6].

The idle mode behaviour of the MES is defined in GMR-1 03.022 [3]. The MES can operate in either Idle-Mode/Paging or in Idle-Mode/Alerting according to the prevailing signal quality. DRX operation applies in both modes but the receive periods are different in the two modes.

When the MES is operating in Idle-Mode/Paging the MES shall interpret all page request messages in its paging group according to the page-mode bits as described in GMR-1 04.008 [5].

When the MES is operating in Idle-Mode/Alerting the MES shall interpret all alert request messages in its alerting group according to the alert-mode bits as described in GMR-1 04.008 [5].

8 Support via the radio interface

The BCCH, paging channel and alerting channel messages are defined in GMR-1 04.008 [5]. GMR-1 05.002 [6] defines the algorithms which enable an MES to know the exact physical channel and the exact frame and burst when page requests or alert requests relevant to it might be transmitted.

9 Operational aspects

There will be occasions when it is necessary to modify the parameters of cell such that the paging group or the alerting group of the MES may change.

If (referring to GMR-1 05.002 [6]) any of the parameters SA_CCHC_CHANS, SA_CCCH_LIST, SA_PCH_GROUPS or SA_PCH_CONFIG have to be modified, then the period when page requests may be lost should be minimized by:

- Firstly setting the page mode to "page reorganization" in all page requests on the affected spot-beam for a duration of at least 6 superframes (approximately 15 seconds). The BCCH parameters should be set to the new values at the start of this reorganization period and the GSS shall then start transmitting each page request in both the old page group and the new page group.

- At the completion of this announcement period, the BCCH parameters remain set to the new values but the GSS ceases the duplication and starts scheduling the page request messages according to the new parameters alone. The page-mode is reset to any of the values "normal mode" or "extended mode" as required.

If (referring to GMR-1 05.002 [6]) any of the parameters SA_CCCH_CHANS, SA_CCCH_LIST, SA_BACH_GROUPS or SA_BACH_CONFIG have to be modified, this will normally be followed by a period when alert requests may be lost. This effect occurs because MESs that are in alerting mode are normally unable to receive the BCCH messages and are therefore unable to adjust to the reconfigured alert messages. The MESs should be notified of any changes to the broadcast alerting channel (BACH) organization using the SA_BACH_VERSION parameter as follows:

- The current value of this parameter is broadcast in the system information and the same value shall appear in the alert mode bits that are appended to every alert message.

- This value of this parameter should be modified whenever the BACH channels are reorganized. The interval between successive reorganizations of the BACH should be long enough to ensure that the first reorganization has been detected by all relevant MESs.

The use of the page mode bits and alert-mode bits by the MES is described in GMR-1 03.022 [3].

Annex A (informative): Relationship between BCCH parameters

A.1 Introduction

This clause describes the BCCH parameters that are used in the GMR system to control the arrangement of the paging groups and the alerting groups. The clause also indicates where these BCCH parameters correspond to the parameters used in the GSM system.

A.2 BCCH parameters

Table A.1

GMR parameter	Description	GSM parameter
SA_CCCH_CHANS	The total number of normal CCCH and BCCH/CCCH in this spot beam	CCCH-CONF
SA_CCCH_LIST	A table giving the co-ordinates of all the CCCH	No equivalent
SA_PCH_GROUPS	The number of paging groups on one CCCH. This parameter is the same for all normal CCCH and the BCCH/CCCH within the spot beam.	No equivalent
SA_PCH_CONFIG	Identifies the reserved paging groups within the relevant CCCH	No equivalent
SA_BACH_GROUPS	The number of alerting groups on one CCCH. This parameter is the same for all normal CCCH and the BCCH/CCCH within the spot beam.	No equivalent
SA_BACH_CONFIG	Identifies the reserved alerting groups within the relevant CCCH	No equivalent
TIMER T3112	The maximum time for the MES to respond to an Alert_Request message.	No equivalent

The following GSM BCCH parameters have no equivalent in the GMR system:

- BS-AG-BLKS-Restaurant
- BS-PA-MFRMS

History

Document history		
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