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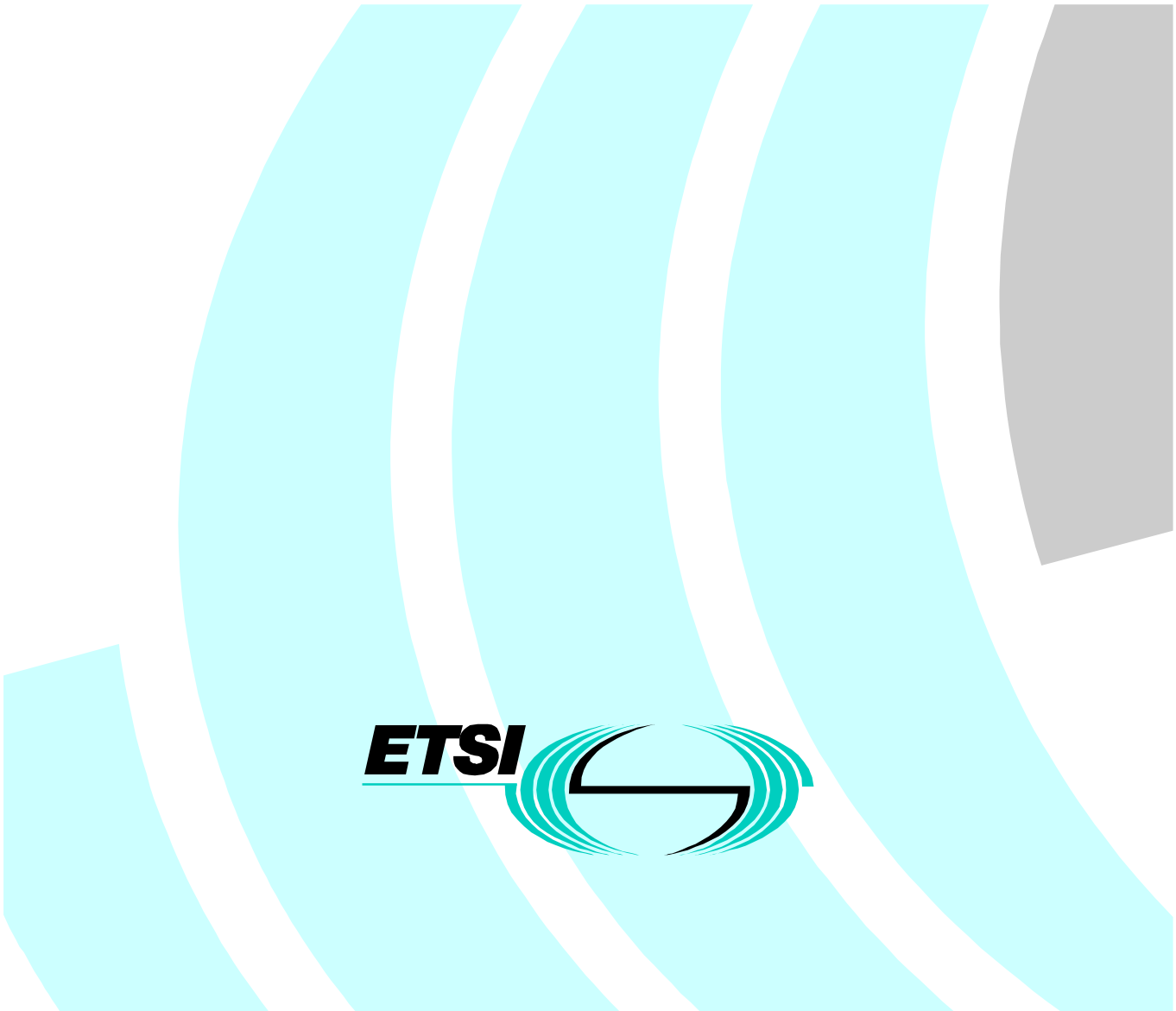
Technical Specification

GEO-Mobile Radio Interface Specifications;
Part 6: Speech coding specifications;
Sub-part 4: Vocoder: Comfort Noise Aspects;
GMR-1 06.012



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Contents

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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

IPR Owner: Lockheed Martin Global Telecommunications, Inc.
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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 6, sub-part 4 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";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications";

Sub-part 1: "Speech Processing Functions; GMR-1 06.001";

Sub-part 2: "Vocoder: Speech Transcoding; GMR-1 06.010";

Sub-part 3: "Vocoder: Substitution and Muting of Lost Frames; GMR-1 06.011";

Sub-part 4: "Vocoder: Comfort Noise Aspects; GMR-1 06.012";

Sub-part 5: "Vocoder: Discontinuous Transmission (DTX); GMR-1 06.031";

Sub-part 6: "Vocoder: Voice Activity Detection (VAD); GMR-1 06.032";

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 [5].

1 Scope

The present document provides the transmit and receive requirements for the correct operation of comfort noise insertion in the GMR-1 system.

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 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] GMR-1 06.031 (ETSI TS 101 376-6-5): "GEO-Mobile Radio Interface Specifications; Part 6: Speech coding specifications; Sub-part 5: Vocoder: Discontinuous Transmission (DTX); GMR-1 06.031".

[4] GMR-1 06.001 (ETSI TS 101 376-6-1): "GEO-Mobile Radio Interface Specifications; Part 6: Speech coding specifications; Sub-part 1: Speech Processing Functions; GMR-1 06.001".

[5] 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 Definitions and abbreviations

3.1 Definitions

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

Voice Activity Detection (VAD): method of classifying short segments of speech as either "voice" or "background noise." The decision is based upon comparing the current level and spectral characteristics of the input signal with that of a typical level and spectral characteristics

Comfort Noise Insertion (CNI): method of synthesizing low-level noise on the receive side during breaks in voice transmission. To increase the perceived voice quality, the synthesized noise has characteristics that are similar to the background noise present on the transmit side

Forward Error Correction (FEC): method of introducing redundancy to binary data that allows for the detection and/or correction of errors introduced during transmission of that data

V/UV(Voiced/Unvoiced): each spectral band is declared either "voiced" or "unvoiced", depending upon the amount of periodic energy in that band. This voicing decision is frequently referred to as a V/UV decision

frame: data representing a full 40 msec of continuous data input to or output from the vocoder. The frame data may consist of model parameters, quantized bits, FEC encoded channel data, or speech samples at various points in the vocoder

subframe: data representing 10 msec of continuous data input to or output from the vocoder, or the result of processing that data through various points in the vocoder. For example, "The second subframe of model parameters is passed to the quantizer" is a valid use of the term as is "The decoder outputs one subframe of 8 kHz speech samples"

subframe number: each frame is composed of four consecutive subframes that are each assigned a subframe number. The first, second, third, and fourth subframes within a frame are assigned subframe numbers 0, 1, 2, and 3 respectively

quantizer-frame: data representing the 20 msec of continuous vocoder data that is formed by combining subframes 0 and 1 or subframes 2 and 3

quantizer-frame number: each frame is composed of two consecutive quantizer-frames that are each assigned a quantizer frame number. The first and second quantizer-frames within a frame are assigned quantizer-frame numbers 0 and 1 respectively

voice frame: 40-msec frame that contains some voice data but no tone data. It may also contain comfort noise data

SID frame: (Silence Descriptor): 20-msec frame that contains only comfort noise data. No voice or tone data may be present in a SID frame

tone frame: 40-msec frame that contains tone data. It may also contain voice data or comfort noise data

3.2 Abbreviations

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

4 General

The overall operation of discontinuous transmission (DTX) is described in GMR-1 06.031 [3].

The purpose of comfort noise insertion is to eliminate the modulation of background noise that would occur if pure silence rather than background noise was inserted during intervals where the radio transmission rate is reduced. This modulation effect would be very annoying to the listener, particularly in high background noise environments.

This problem is overcome in the GMR-1 system by modeling the background noise at the transmit side and sending that information to the receive side where it is reconstructed. The characteristics of the background noise are transmitted once prior to the reduction in transmission rate and updated at a regular rate thereafter. This allows the comfort noise at the receive side to adapt to changes in the noise at the transmit side.

5 Functions on the transmit side

When no voice activity is present at the transmit side, the voice encoder measures the characteristics of the comfort noise, then this information is quantized and FEC encoded. It is then output into a special frame called a SID (Silence Descriptor) frame for transmission to the receive side. The first SID frame is transmitted as part of the final 208-bit frame before the transmission rate is reduced. Subsequent SID frames will be transmitted at 100 bps using a 104-bit frame. Consequently, during non-voice intervals, the receiver will receive a SID frame every 1,04 seconds. The actual transmission aspects of the SID frame on the radio link are described in GMR-1 05.008 [2].

6 Functions on the receive side

The conditions under which comfort noise will be generated on the receive side are defined in GMR-1 06.031 [3]. Typically, the comfort noise generation is started whenever a valid SID frame is received and the characteristics of that comfort noise are updated upon receiving subsequent SID frames. The voice decoder can distinguish the SID frame from a voice frame or a tone frame based upon the contents of the SID frame alone.

When the decoder receives the first SID frame, it generates the first frame of comfort noise. After the first SID frame is received and decoded, the voice decoder must be executed continuously at the regular frame rate with the mute flag set until the next SID, voice, or tone frame is received. Upon receiving a subsequent 104-bit SID frame, the mute flag will be deactivated when decoding quantizer-frame 0 and reactivated when decoding quantizer-frame 1 (which does not exist). The mute flag will remain activated during any interval where no frame was transmitted. When voice activity returns, the decoder will begin receiving voice frames and the mute flag will be deactivated.

The RX radio subsystem is responsible for queuing 104-bit SID frames that are received at a reduced transmission rate. Upon receiving a complete SID frame, the radio subsystem passes the SID frame to the RX DTX handler, which in turn passes it to the decoder. The RX DTX handler is responsible for activating or deactivating the mute flag appropriately.

History

Document history		
V1.1.1	March 2001	Publication