



SLOVENSKI STANDARD

SIST EN 300 971 V7.0.1:2003

01-december-2003

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Digital cellular telecommunications system (Phase 2+) (GSM); Half rate speech; Comfort noise aspects for the half rate speech traffic channels (GSM 06.22 version 7.0.1 Release 1998)

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ICS:

33.070.50	Globalni sistem za mobilno telekomunikacijo (GSM)	Global System for Mobile Communication (GSM)
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ETSI EN 300 971 V7.0.1 (2000-01)

European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
Half rate speech;
Comfort noise aspects for the half rate
speech traffic channels
(GSM 06.22 version 7.0.1 Release 1998)**

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Reference

REN/SMG-110622Q7

Keywords

Digital cellular telecommunications system,
Global System for Mobile communications (GSM)**ETSI**

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Association à but non lucratif enregistrée à la
Sous-Prefecture de Grasse (06) N° 7803/88

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Contents

Intellectual Property Rights	4
Foreword.....	4
1 Scope	6
2 References	6
3 Definitions, symbols and abbreviations	6
3.1 Definitions	6
3.2 Symbols	7
3.3 Abbreviations	7
4 General	7
5 Functions on the transmit (TX) side	8
5.1 Background acoustic noise evaluation.....	8
5.2 Modification of the speech encoding algorithm during SID frame generation	9
5.3 SID-frame encoding	10
6 Functions on the receive (RX) side.....	11
6.1 Averaging of the GS parameters.....	11
6.2 Comfort noise generation and updating.....	12
7 Computational details.....	12
Annex A (informative): Change Request History	13
History	14

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Foreword

This European Standard (Telecommunications series) has been produced by the Special Mobile Group (SMG).

The present document gives the detailed requirements for the correct operation of the background acoustic noise evaluation, noise parameter encoding/decoding and comfort noise generation within the digital cellular telecommunications system. The present document is part of a series covering the half rate speech traffic channels as described below:

- | | |
|------------------|--|
| GSM 06.02 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Half rate speech processing functions". |
| GSM 06.06 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; ANSI-C code for the GSM half rate speech codec". |
| GSM 06.07 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Test sequences for the GSM half rate speech codec". |
| GSM 06.20 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Half rate speech transcoding". |
| GSM 06.21 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Substitution and muting of lost frames for half rate speech traffic channels". |
| GSM 06.22 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Comfort noise aspects for half rate speech traffic channels". |
| GSM 06.41 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Discontinuous Transmission (DTX) for half rate speech traffic channels". |
| GSM 06.42 | "Digital cellular telecommunications system (Phase 2+); Half rate speech; Voice Activity Detector (VAD) for half rate speech traffic channels". |

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document it will be re-released with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

- 7 indicates Release 1998 of GSM Phase 2+.
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

National transposition dates

Date of adoption of this EN:	31 December 1999
Date of latest announcement of this EN (doa):	31 March 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 2000
Date of withdrawal of any conflicting National Standard (dow):	30 September 2000

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1 Scope

The present document gives the detailed requirements for the correct operation of the background acoustic noise evaluation, noise parameter encoding/decoding and comfort noise generation in GSM Mobile Stations (MS)s and Base Station Systems (BSS)s during Discontinuous Transmission (DTX) on half rate speech traffic channels.

The requirements described in the present document are mandatory for implementation in all GSM MSs capable of supporting the half rate speech traffic channel.

The receiver requirements are mandatory for implementation in all GSM BSSs capable of supporting the half rate speech traffic channel, the transmitter requirements are only for those where downlink DTX will be used.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

- [1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".
<https://standards.iteh.ai/catalog/standards/sist/36cdfaf1-a0d6-4d09-93ff-79521101e57/sist-en-300-971-v7-0-1-2003>
- [2] GSM 06.20: "Digital cellular telecommunications system (Phase 2+); Half rate speech transcoding".
- [3] GSM 06.41: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Discontinuous Transmission (DTX) for half rate speech traffic channels".
- [4] GSM 06.42: "Digital cellular telecommunications system (Phase 2+); Half rate speech; Voice Activity Detector (VAD) for half rate speech traffic channels".
- [5] GSM 06.06: "Digital cellular telecommunications system (Phase 2+); Half rate speech; ANSI-C code for the GSM half rate speech codec".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

frame: Time interval of 20 ms corresponding to the time segmentation of the half rate speech transcoder, also used as a short term for a traffic frame.

H(Z): Combination of the short term (spectral) filter $A(z)$ and the spectral weighting filter $W(z)$.

SID codeword: Fixed bit pattern for labelling a traffic frame as a SID frame.

SID field: The bit positions of the SID codeword within a SID frame.

SID frame: Frame characterized by the SID (Silence Descriptor) codeword. It conveys information on the acoustic background noise.

SP flag: SPeech flag.

speech frame: Traffic frame that cannot be classified as a SID frame.

VAD flag: Voice Activity Detector flag.

W(Z): Spectral weighting filter of the GSM half rate speech codec.

Other definitions of terms used in the present document can be found in GSM 06.20 [2] and GSM 06.41 [3]. The overall operation of DTX is described in GSM 06.41 [3].

3.2 Symbols

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

GS	Energy tweak parameter.
R0	Frame energy value.
R(i)	Unquantised (normalized) autocorrelation sequence.
r_j	Optimal reflection coefficient.
b	
$\text{SUM} (x(n))$ $n=a$	$= x(a) + x(a+1) + \dots + x(b-1) + x(b)$; (Accumulation).
GSP0 codeword	Vector quantization index, joint vector quantization of the parameters GS and P0.
P0	Power contribution of the first excitation vector as a fraction of the total excitation power at a subframe.

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3.3 Abbreviations

SIST EN 300 971 V7.0.1:2003

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

AFLAT	Autocorrelation Fixed Point Lattice Technique (used in the GSM half rate speech codec for the vector quantization of the LPC coefficients)
BSS	Base Station System
DTX	Discontinuous Transmission
ETS	European Telecommunication Standard
GSM	Global System for Mobile communications
MS	Mobile Station
SID	Silence Descriptor
RX	Receive
TX	Transmit
VAD	Voice Activity Detector
VQ	Vector Quantization

For abbreviations not given in this subclause, see GSM 01.04 [1].

4 General

A problem when using DTX is that the background acoustic noise, which is transmitted together with the speech, would disappear when the radio transmission is switched off, resulting in a modulation of the background noise. Since the DTX switching can take place rapidly, it has been found that this effect may be annoying for the listener, especially in a car environment with high background noise levels. In bad cases, the speech may be hardly intelligible.

The present document specifies a solution to overcome this problem by generating synthetic noise similar to the transmit (TX) side background noise on the receive (RX) side. The comfort noise parameters are estimated on the TX side and transmitted to the RX side before the radio transmission is switched off and at a regular low rate afterwards. This allows the comfort noise to adapt to the changes of the noise on the TX side.