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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 8.0.1 Release 1999)

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee 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".

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Version 8.x.y

where:

8 indicates Release 1999 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:	3 November 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 1999 document, references to GSM documents are for Release 1999 versions (version 8.x.y).

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[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: 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 SUM (x(n)) n=a	= x(a) + x(a+1) + ... + 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.

3.3 Abbreviations

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
RX	Receive
SID	SIlence Descriptor
TX	Transmit
VAD	Voice Activity Detector
VQ	Vector Quantization

For abbreviations not given in this clause, 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.