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Contents

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS specifies the substitution and muting of lost frames for full rate speech channels for the European digital cellular telecommunications system (Phase 2).

This ETS correspond to GSM technical specification, GSM 06.11 version 4.0.4.

The specification from which this ETS has been derived was originally based on CEPT documentation, hence the presentation of this ETS may not be entirely in accordance with the ETSI/PNE rules.

Reference is made within this ETS to GSM Technical Specifications (GSM-TSs) (NOTE).

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TS). These TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in GSM ETSs.

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0.1 Scope

This technical specification defines a frame substitution and muting procedure which shall be used by the RX DTX handler when one or more lost speech or SID frames are received from the radio subsystem.

The requirements of this technical specification are mandatory for implementation in all GSM Base Station Systems and Mobile Stations.

0.2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] GSM 01.04 (ETR 100): "European digital cellular telecommunication system (Phase 2); Definitions, abbreviations and acronyms".

[2] GSM 06.10 (ETS 300 580-2): "European digital cellular telecommunication system (Phase 2); Full rate speech transcoding".

[3] GSM 06.31 (ETS 300 580-5): "European digital cellular telecommunication system (Phase 2); Discontinuous Transmission (DTX) for full rate speech traffic channel".

0.3 Definitions and abbreviations

Definitions and abbreviations used in this specification are listed in GSM 01.04.

1 General

The definitions of terms used in this technical specification can be found in GSM 06.31.

The purpose of the frame substitution is to conceal the effect of lost frames.

The purpose of muting the output in the case of several lost frames is to indicate the breakdown of the channel to the user.

2 Requirements

2.1 First lost speech frame

Normal decoding of lost speech frames would result in very unpleasant noise effects. In order to improve the subjective quality, the first lost speech frame shall be substituted with either a repetition or an extrapolation of the previous good speech frame(s). Lost speech frames shall not be delivered to the speech decoder, nor shall the output be muted directly.

2.2 Subsequent lost speech frames

For subsequent lost speech frames, a muting technique shall be used that will gradually decrease the output level, resulting in silencing of the output after a maximum of 320 ms. Section 3 gives an example solution.

2.3 First lost SID frame

A single lost SID frame shall be substituted by the last valid SID frame and the procedure for valid SID frames be applied as described in GSM 06.31.

2.4 Subsequent lost SID frame

For the second lost SID frame, a muting technique shall be used on the comfort noise that will gradually decrease the output level, resulting in silencing of the output after a maximum of 320 ms. Section 3 gives an example solution.

For subsequent lost SID frames, the muting of the output shall be maintained.

3 Example solution

For guidance, an example solution is given.

The first lost speech frame is replaced at the speech decoder input by the previous good speech frame. Normal decoding is then performed.

The muting procedure to be used in the case of subsequent lost speech frames or for comfort noise frames following the second lost SID frame is as follows:

The pseudo-logarithmic encoded block amplitude Xmaxcr (GSM 06.10), coded on the interval from 0 to 63, is decreased with a constant value d=4 in each frame, down to the lowest possible value. Consequently, Xmaxcr will be reduced gradually, and the output muted after a maximum of 320 ms. The grid position parameters are chosen randomly between 0 and 3 during this time.

For subsequent unusable frames, after the frame where Xmaxcr reached the lowest possible value, "silence frames" are passed from the RX DTX handler to the speech decoder to guarantee a low output level under all conditions. The silence frame is defined in table 3-1.

Table 3-1. Encoded parameters (GSM 06.10) of the silence frame

```
Log area ratio 1 = 42
Log area ratio 2 = 39
Log area ratio 3 = 21
Log area ratio 4 = 10
Log area ratio 5 = 9
Log area ratio 6 = 4
Log area ratio 7 = 3
Log area ratio 8 = 2

 LTP gain         = 0
 LTP lag          = 40

 Grid position    = 1
 Block amplitude  = 0

 RPE pulse no. 1  = 3
 RPE pulse no. 2  = 4
 RPE pulse no. 3  = 3
 RPE pulse no. 4  = 4
 RPE pulse no. 5  = 4
                          - repeated for each subsegment
 RPE pulse no. 6  = 3
 RPE pulse no. 7  = 3
 RPE pulse no. 8  = 3
 RPE pulse no. 9  = 3
 RPE pulse no. 10 = 4
 RPE pulse no. 11 = 4
 RPE pulse no. 12 = 3
 RPE pulse no. 13 = 3
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History

Document history	
September 1994	First Edition
November 1995	Converted into Adobe Acrobat Portable Document Format (PDF)