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Digital cellular telecommunications system (Phase 2+) (GSM); Full rate speech; Substitution and muting of lost frames for full rate speech channels (GSM 06.11 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 specifies the substitution and muting of lost frames for full rate speech channels for the digital cellular telecommunications system.

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 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
Date of latest announcement of this EN (doa):	28 February 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2001
Date of withdrawal of any conflicting National Standard (dow):	31 August 2001

1 Scope

The present document 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 the present document are mandatory for implementation in all GSM Base Station Systems (BSS) and Mobile Stations (MS).

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 telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 06.10: "Digital cellular telecommunications system (Phase 2+); Full rate speech; Transcoding".

[3] GSM 06.31: "Digital cellular telecommunications system (Phase 2+); Full rate speech; Discontinuous Transmission (DTX) for full rate speech traffic channel".

3 Definitions and abbreviations

Abbreviations used in the present document are listed in GSM 01.04 [1].

The definitions of terms used in the present document can be found in GSM 06.31 [3].

4 General

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.

5 Requirements

5.1 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.

5.2 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. Clause 6 gives an example solution.

5.3 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 [3].

5.4 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. Clause 6 gives an example solution.

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

6 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 [2]), 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 1.

Table 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
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

- repeated for each subsegment