

ETSI TS 146 011 V8.0.0 (2009-02)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Full rate speech;
Substitution and muting of lost frames for
full rate speech channels
(3GPP TS 46.011 version 8.0.0 Release 8)**



Reference

RTS/TSGS-0446011v800

Keywords

GSM

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2009.
All rights reserved.

DECT[™], **PLUGTESTS**[™], **UMTS**[™], **TIPHON**[™], the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP[™] is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTE[™] is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

GSM[®] and the GSM logo are Trade Marks registered and owned by the GSM Association.

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Contents

Intellectual Property Rights	2
Foreword.....	2
Foreword.....	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	5
4 General	5
5 Requirements.....	5
5.1 First lost speech frame.....	5
5.2 Subsequent lost speech frames	6
5.3 First lost SID frame	6
5.4 Subsequent lost SID frame	6
6 Example solution.....	6
Annex A (informative): Change history	8
History	9

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [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 X_{maxcr} (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, X_{maxcr} 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 X_{maxcr} 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

Annex A (informative): Change history

Change history					
SMG No.	TDoc. No.	CR. No.	Section affected	New version	Subject/Comments
SMG#07				4.0.4	ETSI Publication
SMG#20				5.0.1	Release 1996 version
SMG#27				6.0.0	Release 1997 version
SMG#28				6.0.1	ETSI Publication
SMG#29				7.0.0	Specification version 6.0.0 upgrade to Release 1998 version 7.0.0
				7.0.1	Version update for Publication
SMG#31				8.0.0	Release 1999 version

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
03-2001	11				Version for Release 4		4.0.0
06-2002	16				Version for Release 5	4.0.0	5.0.0
12-2004	26				Version for Release 6	5.0.0	6.0.0
06-2007	36				Version for Release 7	6.0.0	7.0.0
12-2008	42				Version for Release 8	7.0.0	8.0.0

History

Document history		
V8.0.0	February 2009	Publication