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Digitalni celiļ ni telekomunikacijski sistem (faza 2) ï Nezvezno oddajanje (DTX) pri prometnih kanalih za izboljġani govor s polno hitrostjo (EFR) (GSM 06.81, razliļ ica 4.1.1)

Digital cellular telecommunications system (Phase 2) (GSM); Discontinuous Transmission (DTX) for Enhanced Full Rate (EFR) speech traffic channels (GSM 06.81 version 4.1.1)

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Foreword

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

The present document describes the general baseband operation of Enhanced Full Rate speech traffic channels in the transmitter and in the receiver of GSM Mobile Stations and Base Station Systems during Discontinuous Transmission (DTX) within the digital cellular telecommunications system.

The present document corresponds to GSM technical specification, GSM 06.81, version 4.1.0.

National transposition dates	
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1 Scope

The present document gives a description of the general baseband operation of Enhanced Full Rate speech traffic channels in the transmitter and in the receiver of GSM Mobile Stations (MS)s and Base Station Systems (BSS)s during Discontinuous Transmission (DTX).

For clarity, the description is structured according to the block diagrams in figures 1 and 4. Except in the case described next, this structure of distributing the various functions between system entities is not mandatory for implementation, as long as the operation on the air interface and on the speech decoder output remains the same.

In the case of BSSs where the speech transcoder is located remotely in the Base Station Controller (BSC), the implementation of the interfaces between the DTX handlers and the Radio Sub System (RSS) as described in the present document together with all their flags is mandatory, being part of the A-bis interface as described in GSM 08.60 (ETS 300 737) [13].

The DTX functions described in the present document are mandatory for implementation in the GSM MSs. The receiver requirements are mandatory for implementation in all GSM BSSs, the transmitter requirements 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.

[1] GSM 01.04 (ETR 100): "Digital cellular telecommunications system (Phase 2); Abbreviations and acronyms".

[2] GSM 04.08 (ETS 300 557): "Digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 specification".

[3] GSM 05.03 (ETS 300 575): "Digital cellular telecommunications system (Phase 2); Channel coding".

[4] GSM 05.05 (ETS 300 577): "Digital cellular telecommunications system (Phase 2); Radio transmission and reception".

[5] GSM 05.08 (ETS 300 578): "Digital cellular telecommunications system (Phase 2); Radio subsystem link control".

[6] GSM 06.51 (EN 301 243): "Digital cellular telecommunications system; Enhanced Full Rate (EFR) speech processing functions; General description".

[7] GSM 06.53 (EN 301 244): "Digital cellular telecommunications system; ANSI-C code for the GSM Enhanced Full Rate (EFR) speech codec".

[8] GSM 06.54 (EN 301 250): "Digital cellular telecommunications system (Phase 2); Test vectors for the GSM Enhanced Full Rate (EFR) speech codec".

[9] GSM 06.60 (EN 301 245): "Digital cellular telecommunications system; Enhanced Full Rate (EFR) speech transcoding".

[10] GSM 06.61 (EN 301 246): "Digital cellular telecommunications system; Substitution and muting of lost frame for Enhanced Full Rate (EFR) speech traffic channels".

[11] GSM 06.62 (EN 301 247): "Digital cellular telecommunications system; Comfort noise aspects for Enhanced Full Rate (EFR) speech traffic channels".

[12] GSM 06.82 (EN 301 249): "Digital cellular telecommunications system; Voice Activity Detector (VAD) for Enhanced Full Rate (EFR) speech traffic channels".

[13] GSM 08.60 (ETS 300 737): "Digital cellular telecommunications system (Phase 2+); Inband control of remote transcoders and rate adaptors for Enhanced Full Rate (EFR) and full rate traffic channels".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

accepted SID frame: A traffic frame which is flagged with SID="1" or SID="2" by the Radio Subsystem.

bad traffic frame: A traffic frame flagged BFI flag ="1" (Bad Frame Indication) by the Radio Subsystem.

frame: Time interval of 20 msec. corresponding to the time segmentation of the Enhanced Full Rate speech transcoder (GSM 06.60 (EN 301 245) [9]), also used as a short term for a traffic frame.

good speech frame: A good traffic frame which is not an accepted SID frame.

good traffic frame: A traffic frame flagged BFI flag ="0" by the Radio Subsystem.

hangover period: A period of 7 frames added at the end of a speech burst in which VAD flag ="0" and SP flag ="1".

invalid SID frame: An accepted SID frame which was not classified as valid SID frame. This frame is not valid for updating comfort noise parameters, but the frame conveys information that comfort noise generations should be started or continued.

lost SID frame: An unusable frame received when the RX DTX handler is generating comfort noise and a SID frame is expected (Time Alignment Flag, TAF="1").

lost speech frame: An unusable frame received when the RX DTX handler is passing on traffic frames directly to the speech decoder.

SID code word: Fixed bit pattern defined in GSM 06.62 (EN 301 247) [11], for labelling a traffic frame as a SID frame.

SID field: The bit positions defined in GSM 06.62 (EN 301 247) [11], of the SID codeword within a SID frame.

SID frame: Frame characterized by the SID (SIlence Descriptor) code word. It conveys information on the acoustic background noise.

SP flag: Boolean flag, generated by the TX DTX handler, indicating the presence of a speech frame ("1") or the presence of a SID frame ("0").

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

TAF flag: Time Alignment Flag. Boolean flag, marks with TAF=1 those traffic frames that are aligned with the SACCH multiframe structure (see GSM 05.08 (ETS 300 578) [5]). The next SID frame is expected at the decoder when TAF=1.

traffic frame: Block of 244 information bits transmitted on the Enhanced Full Rate speech traffic channel.

unusable frame: A bad traffic frame that is not an accepted SID frame.

VAD flag: Boolean flag, generated by the VAD algorithm defined in GSM 06.82 (EN 301 249) [12] indicating the presence ("1") or the absence ("0") of a speech frame.

valid SID frame: A good traffic frame flagged with SID="2" by the Radio Subsystem. This frame is valid for updating of comfort noise parameters at any time.

3.2 Symbols

For the purposes of the present document, the following symbol applies:

$N_{elapsed}$ Number of elapsed frames since the last updated SID frame.

3.3 Abbreviations

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

BFI	Bad Frame Indicator
BSC	Base Station Controller
BSS	Base Station System
DTX	Discontinuous Transmission
ETS	European Telecommunication Standard
FACCH	Fast Associated Control CHannel
GSM	Global System for Mobile Telecommunications
MS	Mobile Station
RSS	Radio Sub System
RX	Receive
SACCH	Slow Associated Control CHannel
SID	SIlence Descriptor
TX	Transmit
VAD	Voice Activity Detector

For abbreviations not given in this subclause, see GSM 01.04 (ETR 100) [1].

4 General

Discontinuous Transmission (DTX) is a mechanism which allows the radio transmitter to be switched off most of the time during speech pauses for the following two purposes:

- to save power in the Mobile Station (MS);
- to reduce the overall interference level over the air interface;

DTX shall be in operation in GSM MS if commanded so by the network, see GSM 04.08 (ETS 300 557) [2].

4.1 General organization

The overall DTX mechanism described in this draft EN requires the following functions:

- a Voice Activity Detector (VAD) on the transmit (TX) side;
- evaluation of the background acoustic noise on the transmit (TX) side, in order to transmit characteristic parameters to the receive (RX) side;
- generation on the receive (RX) side of a similar noise, called comfort noise, during periods where the radio transmission is switched off.

The Voice Activity Detector (VAD) is defined in GSM 06.82 (EN 301 249) [12] and the comfort noise functions in GSM 06.62 (EN 301 247) [11]. Both are based partly on the speech transcoder and its internal variables, defined in GSM 06.60 (EN 301 245) [9].