SLOVENSKI STANDARD
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Evropski digitalni celiļ ni telekomunikacijski sistem (faza 2) ï Kodiranje kanalov (GSM 05.03)

European digital cellular telecommunications system (Phase 2); Channel coding (GSM 05.03)

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35.040	Nabori znakov in kodiranje informacij	Character sets and information coding

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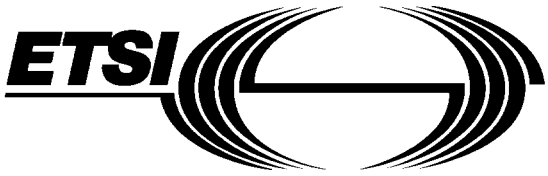

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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

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

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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 channel coding of used within the European digital cellular telecommunications system (Phase 2).

This ETS correspond to GSM technical specification, GSM 05.03 version 4.2.0.

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-TSs). 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.

Proposed transposition dates	
Date of adoption of this ETS:	30 July 1995
Date of latest announcement of this ETS (doa):	31 October 1995
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Date of withdrawal of any conflicting National Standard (dow):	30 April 1996

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1.1 Scope

A reference configuration of the transmission chain is shown in GSM 05.01. According to this reference configuration, this technical specification specifies the data blocks given to the encryption unit.

It includes the specification of encoding, reordering, interleaving and the stealing flag. It does not specify the channel decoding method.

The definition is given for each kind of logical channel, starting from the data provided to the channel encoder by the speech coder, the data terminal equipment, or the controller of the MS or BS. The definitions of the logical channel types used in this technical specification are given in GSM 05.02, a summary is in annex 1.

1.2 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 04.08 (ETS 300 557): "European digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

[3] GSM 04.21 (ETS 300 562): "European digital cellular telecommunication system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[4] GSM 05.01 (ETS 300 573): "European digital cellular telecommunication system (Phase 2); Physical layer on the radio path; General description".

[5] GSM 05.02 (ETS 300 574): "European digital cellular telecommunication system (Phase 2); Multiplexing and multiple access on the radio path".

[6] GSM 05.05: (ETS 300 577): "European digital cellular telecommunication system (Phase 2); Radio Transmission and Reception".

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

[8] GSM 06.20 (ETS 300 581-2): "European digital cellular telecommunication system; Half rate speech Part 2: Half rate speech transcoding".

1.3 Definitions and abbreviations

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

2. General

2.1 General Organization

Each channel has its own coding and interleaving scheme. However, the channel coding and interleaving is organized in such a way as to allow, as much as possible, a unified decoder structure.

Each channel uses the following sequence and order of operations:

- The information bits are coded with a systematic block code,uilding words of information + parity bits.

- These information + parity bits are encoded with a convolutional code, building the coded bits.

- Reordering and interleaving the coded bits, and adding a stealing flag, gives the interleaved bits.

All these operations are made block by block, the size of which depends on the channel. However, most of the channels use a block of 456 coded bits which is interleaved and mapped onto bursts in a very similar way for all of them. Figure 1 gives a diagram showing the general structure of the channel coding.

This block of 456 coded bits is the basic structure of the channel coding scheme. In the case of full rate speech TCH, this block carries the information of one speech frame. In case of control channels, it carries one message.

In the case of half rate speech TCH, the information of one speech frame is carried in a block of 228 coded bits.

In the case of FACCH, a coded message block of 456 bits is divided into eight sub-blocks. The first four sub-blocks are sent by stealing the even numbered bits of four timeslots in consecutive frames used for the TCH. The other four sub-blocks are sent by stealing the odd numbered bits of the relevant timeslot in four consecutive used frames delayed 2 or 4 frames relative to the first frame. Along with each block of 456 coded bits there is, in addition, a stealing flag (8 bits), indicating whether the block belongs to the TCH or to the FACCH. In the case of SACCH, BCCH or CCCH, this stealing flag is dummy.

Some cases do not fit in the general organization, and use short blocks of coded bits which are sent completely in one timeslot. They are the random access messages of the RACH on uplink and the synchronization information broadcast of the SCH on downlink.

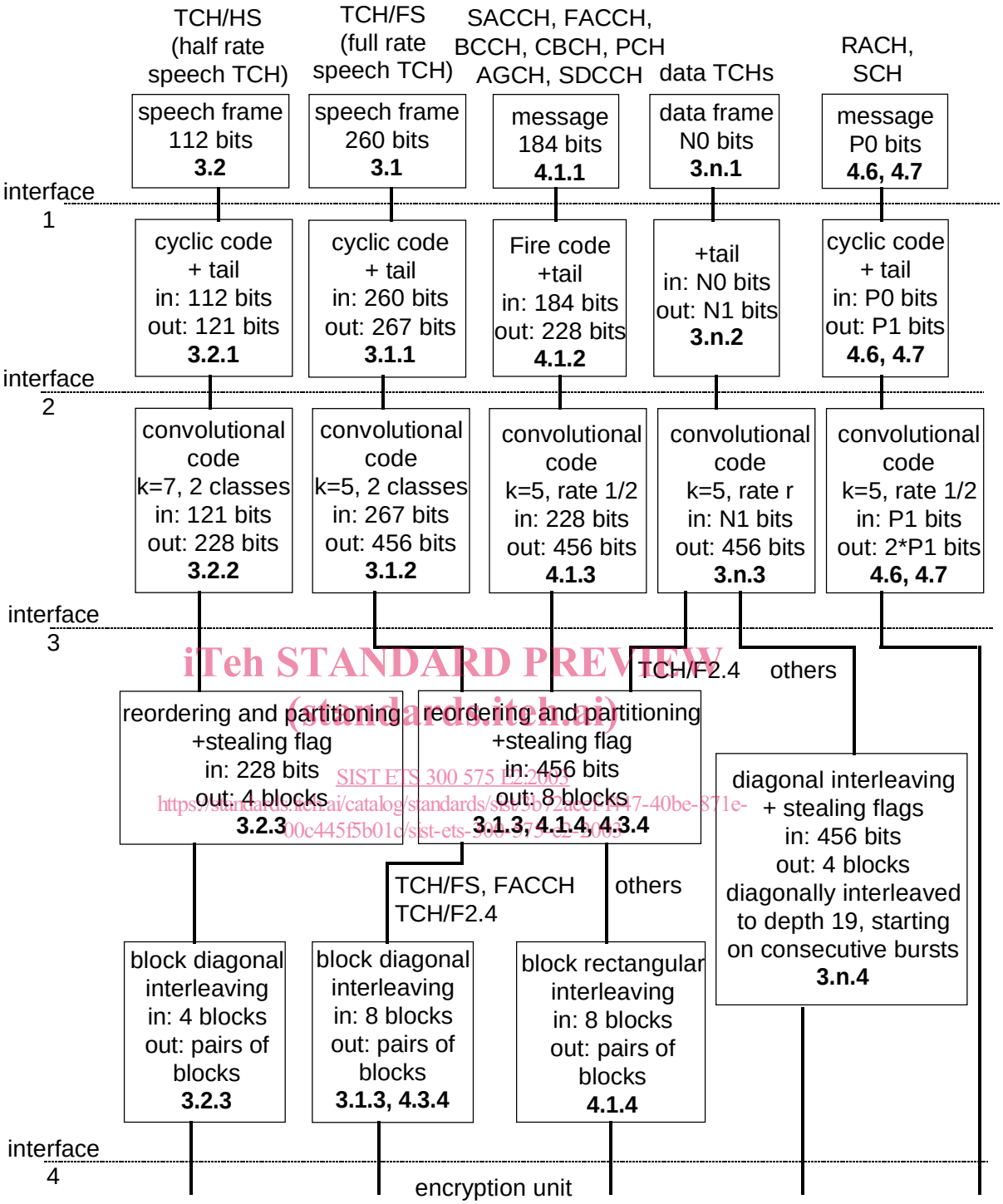

Figure 1: Channel Coding and Interleaving Organisation

In each box, the last line indicates the chapter defining the function.In the case of RACH, P0=8 and P1=18; in the case of SCH, P0=25 and P1=39. In the case of data TCHs, N0, N1 and n depend on the type of data TCH.

Interfaces:

1) information bits (d)
2) information + parity + tail bits (u)
3) coded bits (c)
4) interleaved bits (e)

2.2 Naming Convention

For ease of understanding a naming convention for bits is given for use throughout the technical specification:

- General naming

  "k" and "j" for numbering of bits in data blocks and bursts.

  "K_x" gives the amount of bits in one block, where "x" refers to the data type

  "n" is used for numbering of delivered data blocks where

  "N" marks a certain data block

  "B" is used for numbering of bursts or blocks where

  "B_0" marks the first burst or block carrying bits from the data block with n = 0 (first data block in the transmission)

- Data delivered to the encoding unit (interface 1 in figure 1):

  d(k) for $k = 0,1,...,K_d-1$

- Data after the first encoding step (block code, cyclic code; interface 2 in figure 1):

  u(k) for $k = 0,1,...,K_u-1$

- Data after the second encoding step (convolutional code ; interface 3 in figure 1):

  c(n,k) or c(k) for $k = 0,1,...,K_c-1$
  $n = 0,1,...N,N+1,...$

- Interleaved data:

  i(B,k) for $k = 0,1,...,K_i-1$
  $B = B_0, B_0+1,....$

- Bits in one burst (interface 4 in figure 1):

  e(B,k) for $k = 0,1,...,114,115$
  $B = B_0, B_0 + 1,....$

3 Traffic Channels (TCH)

Two kinds of traffic channel are considered: speech and data. Both of them use the same general structure (see fig.1), and in both cases, a piece of information can be stolen by the FACCH.

3.1 Speech channel at full rate (TCH/FS)

The speech coder delivers to the channel encoder a sequence of blocks of data. In case of a full rate speech TCH, one block of data corresponds to one speech frame. Each block contains 260 information bits,including 182 bits of class 1 (protected bits), and 78 bits of class 2 (no protection), (see Table 2).

The bits delivered by the speech coder are received in the order indicated in GSM 06.10 and have to be rearranged according to Table 2 before channel coding as defined in 3.1.1 to 3.1.4. The rearranged bits are labelled {d(0),d(1),...,d(259)}, defined in the order of decreasing importance.