SLOVENSKI STANDARD
SIST EN 300 908 V6.8.1:2003

01-december-2003

Digitalni celiļ ni telekomunikacijski sistem (faza 2+) ï Multipleksiranje in veļ kratni dostop na radijski poti (GSM 05.02, razliļ ica 6.8.1, izdaja 1997)

Digital cellular telecommunications system (Phase 2+) (GSM); Multiplexing and multiple access on the radio path (GSM 05.02 version 6.8.1 Release 1997)

Ta slovenski standard je istoveten z: EN 300 908 Version 6.8.1

ICS:

33.070.50	Globalni sistem za mobilno telekomunikacijo (GSM)	Global System for Mobile Communication (GSM)

SIST EN 300 908 V6.8.1:2003 **en**

ETSI EN 300 908 V6.8.1 (2000-09)

European Standard (Telecommunications series)

Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path (GSM 05.02 version 6.8.1 Release 1997)

GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

Reference
REN/SMG-020502Q6R6

Keywords
Digital cellular telecommunications system,
Global System for Mobile communications (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://www.etsi.org/tb/status/

If you find errors in the present document, send your comment to:
editor@etsi.fr

Copyright Notification

Contents

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://www.etsi.org/ipr).

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 European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document defines the physical channels of the radio sub-system required to support the logical channels of the digital mobile cellular and personal communication systems operating in the 900 MHz and 1 800 MHz band (GSM 900 and DCS 1 800).

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

Version 6.x.y

where:

6 indicates release 1997 of GSM Phase 2+.

x the second digit is incremented for 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:	25 August 2000
Date of latest announcement of this EN (doa):	30 November 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 2001
Date of withdrawal of any conflicting National Standard (dow):	31 May 2001

1 Scope

The present document defines the physical channels of the radio sub-system required to support the logical channels. It includes a description of the logical channels and the definition of frequency hopping, TDMA frames, timeslots and bursts.

1.1 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 1997 document, references to GSM documents are for Release 1997 versions (version 6.x.y).

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

[2] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[3] GSM 04.03: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface Channel structures and access capabilities".

[4] GSM 04.06: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

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

[6] GSM 05.03: "Digital cellular telecommunications system (Phase 2+); Channel coding".

[7] GSM 05.04: "Digital cellular telecommunications system; Modulation".

[8] GSM 05.05: "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception".

[9] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[10] GSM 05.10: "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization".

[11] GSM 03.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".

[12] GSM 04.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS interface; Radio Link Control (RLC) and Medium Access Control (MAC) Layer Specification".

1.2 Abbreviations

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

2 General

The radio subsystem is required to support a certain number of logical channels that can be separated into two categories as defined in GSM 04.03:

i) the traffic channels (TCH's);

ii) the control channels.

More information is given about these logical channels in clause 3 which also defines a number of special channels used by the radio sub-system.

Clause 4 of the present document describes the physical resource available to the radio sub-system, clause 5 defines physical channels based on that resource and clause 6 specifies how the logical channels shall be mapped onto physical channels. Figure 1 depicts this process.

3 Logical channels

3.1 General

This subclause describes the logical channels that are supported by the radio subsystem.

3.2 Traffic channels

3.2.1 General

Traffic channels (TCH's) are intended to carry either encoded speech or user data in circuit switched mode. Two general forms of traffic channel are defined:

i) full rate traffic channel (TCH/F). This channel carries information at a gross rate of 22,8 kbit/s;

ii) half rate traffic channel (TCH/H). This channel carries information at a gross rate of 11,4 kbit/s.

Packet data traffic channels (PDTCH's) are intended to carry user data in packet switched mode. For the purpose of the present document, any reference to traffic channel does not apply to PDTCH unless explicitly stated.

All traffic channels are bi-directional unless otherwise stated. Unidirectional downlink full rate channels, TCH/FD, are defined as the downlink part of the corresponding TCH/F.

Multiple full rate channels can be allocated to the same MS. This is referred to as multislot configurations, which is defined in subclause 6.4.2.1.

Multiple packet data traffic channels can be allocated to the same MS. This is referred to as multislot packet configurations, as defined in subclause 6.4.2.2.

The specific traffic channels available in the categories of speech and user data are defined in the subclauses following.

3.2.2 Speech traffic channels

The following traffic channels are defined to carry encoded speech:

i) full rate traffic channel for speech (TCH/FS);

ii) half rate traffic channel for speech (TCH/HS).

3.2.3 Circuit switched data traffic channels

The following traffic channels are defined to carry user data:

i) full rate traffic channel for 9,6 kbit/s user data (TCH/F9.6);

ii) full rate traffic channel for 4,8 kbit/s user data (TCH/F4.8);

iii) half rate traffic channel for 4,8 kbit/s user data (TCH/H4.8);

iv) half rate traffic channel for ≤ 2,4 kbit/s user data (TCH/H2.4);

v) full rate traffic channel for ≤ 2,4 kbit/s user data (TCH/F2.4);

vi) full rate traffic channel for 14,4 kbit/s user data (TCH/F14.4).

3.2.4 Packet data traffic channels (PDTCH)

A PDTCH corresponds to the resource allocated to a single MS on one physical channel for user data transmission. Due to the dynamic multiplexing onto the same physical channel of different logical channels (see subclause 6.3.2), a PDTCH carries information at an instantaneous bit rate ranging from 0 to 22,8 kbit/s.

All packet data traffic channels are uni-directional, either uplink (PDTCH/U), for a mobile originated packet transfer or downlink (PDTCH/D) for a mobile terminated packet transfer.

3.3 Control channels

3.3.1 General

Control channels are intended to carry signalling or synchronization data. Three categories of control channel are defined: broadcast, common and dedicated. Specific channels within these categories are defined in the subclauses following.

3.3.2 Broadcast channels

3.3.2.1 Frequency correction channel (FCCH)

The frequency correction channel carries information for frequency correction of the mobile station. It is required only for the operation of the radio sub-system.

3.3.2.2 Synchronization channel (SCH)

The synchronization channel carries information for frame synchronization of the mobile station and identification of a base transceiver station. It is required only for the operation of the radio sub-system. Specifically the synchronization channel shall contain two encoded parameters:

a) Base transceiver station identity code (BSIC): 6 bits (before channel coding) consists of 3 bits of PLMN colour code with range 0 to 7 and 3 bits of BS colour code with range 0 to 7 as defined in GSM 03.03.

b) Reduced TDMA frame number (RFN): 19 bits (before channel coding) =

T1 (11 bits) range 0 to 2047 = FN div (26 x 51)

T2 (5 bits) range 0 to 25 = FN mod 26

T3 ' (3 bits) range 0 to 4 = (T3 - 1) div 10

where

T3 (6 bits) range 0 to 50 = FN mod 51

and

FN = TDMA frame number as defined in subclause 4.3.3.

GSM 04.06 and GSM 04.08 specify the precise bit ordering, GSM 05.03 the channel coding of the above parameters and GSM 05.10 defines how the TDMA frame number can be calculated from T1, T2, and T3'.

3.3.2.3 Broadcast control channel (BCCH)

The broadcast control channel broadcasts general information on a base transceiver station per base transceiver station basis. Of the many parameters contained in the BCCH, the use of the following parameters, as defined in GSM 04.08 are referred to in subclause 6.5:

a) CCCH_CONF which indicates the organization of the common control channels:

From this parameter, the number of common control channels (BS_CC_CHANS) and whether or not CCCH or SDCCH are combined (BS_CCCH_SDCCH_COMB = true or false) are derived as follows:

CCCH_CONF	BS_CC_CHANS	BS_CCCH_SDCCH_COMB
000	1	false
001	1	true
010	2	false
100	3	false
110	4	false

b) BS_AG_BLKS_RES which indicates the number of blocks on each common control channel reserved for access grant messages:

3 bits (before channel coding) range 0 to 7.

c) BS_PA_MFRMS which indicates the number of 51-multiframes between transmission of paging messages to mobiles of the same paging group:

3 bits (before channel coding) range 2 to 9.

d) support of GPRS

The BCCH shall indicate whether or not packet switched traffic is supported. If packet switched traffic is supported and if the PBCCH exists, then the BCCH shall broadcast the position of the packet data channel (PDCH), as defined in subclause 6.3.2.1, carrying the PBCCH.

3.3.2.4 Packet Broadcast Control Channel (PBCCH)

The PBCCH broadcasts parameters used by the MS to access the network for packet transmission operation. In addition to those parameters the PBCCH reproduces the information transmitted on the BCCH to allow circuit switched operation, such that a MS in GPRS attached mode monitors the PBCCH only, if it exists. The existence of the PBCCH in the cell is indicated on the BCCH. In the absence of PBCCH, the BCCH shall be used to broadcast information for packet operation.

Of the many parameters contained in the PBCCH, the use of the following parameters, as defined in GSM 04.60 are referred to in subclauses 6.5 and 6.3.2:

a) BS_PBCCH_BLKS (1,...,4) indicates the number of blocks allocated to the PBCCH in the multiframe. The position of the PBCCH blocks is based on the ordered list as defined in subclause 6.3.2.1.

b) BS_PCC_CHANS indicates the number of physical channels carrying PCCCHs including the physical channel carrying the PBCCH

c) BS_PAG_BLKS_RES indicates the number of blocks on each PDCH carrying PCCCH per multiframe where neither packet paging nor PBCCH should appear. This number corresponds therefore to the number of blocks reserved for PAGCH, PNCH, PDTCH and PACCH.

d) BS_PRACH_BLKS indicates the number of blocks reserved in a fixed way to the PRACH channel on any PDCH carrying PCCCH. The position of the PRACH blocks is based on the ordered list as defined in subclause 6.3.2.1.

3.3.3 Common control type channels

3.3.3.1 Common control type channels, known when combined as a common control channel (CCCH)

i) Paging channel (PCH): Downlink only, used to page mobiles.

ii) Random access channel (RACH): Uplink only, used to request allocation of a SDCCH.

iii) Access grant channel (AGCH): Downlink only, used to allocate a SDCCH or directly a TCH.

iv) Notification channel (NCH): Downlink only, used to notify mobile stations of voice group and voice broadcast calls.

3.3.3.2 Packet Common control channels (PCCCH)

i) Packet Paging channel (PPCH): Downlink only, used to page MS.

ii) Packet Random access channel (PRACH): Uplink only, used to request allocation of one or several PDTCHs (for uplink or downlink direction).

iii) Packet Access grant channel (PAGCH): Downlink only, used to allocate one or several PDTCH.

iv) Packet Notification channel (PNCH): Downlink only, used to notify MS of PTM-M call.

If a PCCCH is not allocated, the information for packet switched operation is transmitted on the CCCH. If a PCCCH is allocated, it may transmit information for circuit switched operation.

3.3.4 Dedicated control channels

3.3.4.1 Circuit switched dedicated control channels

i) Slow, TCH/F associated, control channel (SACCH/TF).

ii) Fast, TCH/F associated, control channel (FACCH/F).

iii) Slow, TCH/H associated, control channel (SACCH/TH).

iv) Fast, TCH/H associated, control channel (FACCH/H).

v) Stand alone dedicated control channel (SDCCH/8).

vi) Slow, SDCCH/8 associated, control channel (SACCH/C8)

vii) Stand alone dedicated control channel, combined with CCCH (SDCCH/4).

viii) Slow, SDCCH/4 associated, control channel (SACCH/C4).

ix) slow, TCH/F associated, control channel for multislot configurations (SACCH/M).

All associated control channels have the same direction (bi-directional or unidirectional) as the channels they are associated to. The unidirectional SACCH/MD is defined as the downlink part of SACCH/M.

3.3.4.2 Packet dedicated control channels

i) The Packet Associated Control channel (PACCH): The PACCH is bi-directional. For description purposes PACCH/U is used for the uplink and PACCH/D for the downlink.

ii) Packet Timing advance control channel uplink (PTCCH/U): Used to transmit random access bursts to allow estimation of the timing advance for one MS in packet transfer mode.

iii) Packet Timing advance control channel downlink (PTCCH/D): Used to transmit timing advance updates for several MS. One PTCCH/D is paired with several PTCCH/U's.

3.3.5 Cell Broadcast Channel (CBCH)

The CBCH, downlink only, is used to carry the short message service cell broadcast (SMSCB). The CBCH uses the same physical channel as the SDCCH.

3.4 Combination of channels

Only certain combinations of channels are allowed as defined in GSM 04.03. Subclause 6.4 lists the combinations in relation to basic physical channels.

4 The physical resource

4.1 General

The physical resource available to the radio sub-system is an allocation of part of the radio spectrum. This resource is partitioned both in frequency and time. Frequency is partitioned by radio frequency channels (RFCHs) divided into bands as defined in GSM 05.05. Time is partitioned by timeslots and TDMA frames as defined in subclause 4.3 of the present document.

4.2 Radio frequency channels

4.2.1 Cell allocation and mobile allocation

GSM 05.05 defines radio frequency channels (RFCHs), and allocates numbers to all the radio frequency channels available to the system. Each cell is allocated a subset of these channels, defined as the cell allocation (CA). One radio frequency channel of the cell allocation shall be used to carry synchronization information and the BCCH, this shall be known as BCCH carrier. The subset of the cell allocation, allocated to a particular mobile, shall be known as the mobile allocation (MA).

4.2.2 Downlink and uplink

The downlink comprises radio frequency channels used in the base transceiver station to Mobile Station direction.

The uplink comprises radio frequency channels used in the mobile station to base transceiver station direction.

4.3 Timeslots and TDMA frames

4.3.1 General

A timeslot shall have a duration of 3/5 200 seconds (≈ 577 µs). Eight timeslots shall form a TDMA frame (≈ 4,62 ms in duration).

At the base transceiver station the TDMA frames on all of the radio frequency channels in the downlink shall be aligned. The same shall apply to the uplink (see GSM 05.10).

At the base transceiver station the start of a TDMA frame on the uplink is delayed by the fixed period of 3 timeslots from the start of the TDMA frame on the downlink (see figure 2).

At the mobile station this delay will be variable to allow adjustment for signal propagation delay. The process of adjusting this advance is known as adaptive frame alignment and is detailed in GSM 05.10.

The staggering of TDMA frames used in the downlink and uplink is in order to allow the same timeslot number to be used in the downlink and uplink whilst avoiding the requirement for the mobile station to transmit and receive simultaneously. The period includes time for adaptive frame alignment, transceiver tuning and receive/transmit switching (see figure 4).

4.3.2 Timeslot number

The timeslots within a TDMA frame shall be numbered from 0 to 7 and a particular timeslot shall be referred to by its timeslot number (TN).

4.3.3 TDMA frame number

TDMA frames shall be numbered by a frame number (FN). The frame number shall be cyclic and shall have a range of 0 to FN_MAX where FN_MAX = (26 x 51 x 2048) -1 = 2715647 as defined in GSM 05.10. The frame number shall be incremented at the end of each TDMA frame.

The complete cycle of TDMA frame numbers from 0 to FN_MAX is defined as a hyperframe. A hyperframe consists of 2048 superframes where a superframe is defined as 26 x 51 TDMA frames. A 26-multiframe, comprising 26 TDMA frames, is used to support traffic and associated control channels and a 51- multiframe, comprising 51 TDMA frames, is used to support broadcast, common control and stand alone dedicated control (and their associated control) channels. Hence a superframe may be considered as 51 traffic/associated control multiframes or 26 broadcast/common control multiframes. A 52-multiframe, comprising two 26-multiframes, is used to support packet data traffic and control channels.

The need for a hyperframe of a substantially longer period than a superframe arises from the requirements of the encryption process which uses FN as an input parameter.