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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Mobile Station - Base Station System (MS - BSS) interface;
Channel structures and access capabilities
(GSM 04.03 version 8.0.1 Release 1999)**

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document provides a mechanism giving reliable transfer of signalling messages within the digital cellular telecommunications system.

The contents of the present document may be 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 re-submitted for formal approval procedures by ETSI with an identifying change of release date and an increase in version number as follows:

Version 8.x.y

where:

8 GSM Phase 2+ Release 1999.

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.

1 Scope

The present document defines limited sets of channel types, access capabilities and channel configurations at reference point Um (radio interface).

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 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 02.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 1".

[3] 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 / Medium Access Control (RLC/MAC) protocol".

[4] GSM 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

1.2 Abbreviations

For the purposes of the present document, the abbreviations used in the present document are listed in GSM 01.04.

2 General definitions

A channel represents a specified portion of the information-carrying capacity of an interface.

Channels are classified by channel types, which have common characteristics. Channel types appearing on the radio interface are specified in clauses 3 and 4.

At a given time, the complete interface between a Base Station and the set of Mobile Stations in relation corresponds to some interface structure. The interface structure may change in time. The number of possible different such interface structures can be large. The BS access capability is a description of all the possible interface structures of the considered BS. BS access capabilities are specified in clause 5.

At a given moment, the channel configuration of a Mobile Station is the interface structure this Mobile Station actually uses to transmit information to or receive information from the Base Station. The channel configuration may change in time. A limited number of channel configurations are identified, and are specified in clause 6.

A Mobile Station access capability is the description of the set of its possible channel configurations. MS access capabilities are specified in clause 7.

3 Channel types and their use: Traffic channels and user channels

3.1 User channels

User channels are intended to carry a wide variety of user information streams. A distinguishing characteristic is that user channels do not carry signalling information for Connection Management (CM), Mobility Management (MM) or Radio Resource (RR) management. This signalling information is carried over other types of channels, namely the control channels.

User channels may be used to provide access to the PLMN and the networks it permits access to.

Different types of user channels are distinguished by their rates.

3.2 Bm Channel

A Bm channel is a bi-directional or uni-directional user channel able to carry:

- a 13 kbit/s rate bit stream with an error structure and a transmission delay compatible with some grade of service, intended to carry voice encoded according to Technical Specifications in GSM 06-series; or
- a bit stream at a rate of 14,5 kbit/s, 12 kbit/s, 6 kbit/s or 3,6 kbit/s, with an error structure and a transmission delay adapted to a wider range of services, including data transmission; or other kinds of bit stream adapted to a wider range of services (for further study).

User information streams are carried on the Bm channel on a dedicated, alternate (within one call or as separate calls), or simultaneous basis, consistent with the Bm channel carrying capability. The following are samples of user information streams:

i) voice encoded at 13 kbit/s according to Technical Specifications in GSM 06-series; and

ii) data information corresponding to circuit switching user classes of services at bit rates compatible with the channel capability.

A Bi-directional Bm Channel uses the radio resources referred to as TCH/F. Bi-directional downlink Bm Channel uses the radio resources referred to as TCH/FD. The Uni-directional Bm Channel is only defined in downlink direction. Traffic channels (TCH) are fixed physical gross rate channels, accompanied with timing (see GSM 05.02).

3.3 Lm Channels

A Lm channel is a user channel with a carrying capability lower than a Bm channel.

A Lm channel is a user channel able to carry:

- some bit stream to be defined with an error structure and a transmission delay compatible with some grade of service, intended to carry voice encoded according to a method to be defined;
- a bit stream at a rate of 6 kbit/s or 3,6 kbit/s, with an error structure and a transmission delay adapted to a wider range of services, including data transmission; or
- other kinds of bit stream adapted to a wider range of services (for further study).

User information streams are carried on a Lm channel on a dedicated, alternate (within one call or as separate calls), or simultaneous basis, consistent with the TCH/H channel carrying capability. The following are samples of user information streams:

i) voice encoded at some rate according to a method to be specified in the future; and

ii) data information corresponding to circuit switching user classes of services at bit rates compatible with the channel capability.

A Lm Channel uses the radio resources referred to as TCH/H. Traffic channels (TCH) are fixed physical gross rate channels, accompanied with timing (see GSM 05.02).

3a Channel types and their use: Packet data traffic channels

Packet data traffic channels are used to carry a wide variety of information streams, including user information and signalling information for, e.g. Session Management (SM) and Mobility Management (MM) in packet mode. A distinguishing characteristic is that a packet data traffic channel allows a plurality of information streams, associated with different users, to be multiplexed in a pre-emptive and dynamic fashion. Signalling functions between the MS and the BSS are carried out over other types of channels, namely the control channels.

Uni-directional information streams are carried on the packet data traffic channel on an alternate, or simultaneous basis, consistent with the packet data traffic channel carrying capability. The packet data traffic channel uses the radio resources referred to as PDTCH (see GSM 05.02).

4 Channel types and their use: Control channels

NOTE: The term "Dm channel" may be used to refer to the controls channels used by a Mobile Station at a given moment, independently of their type. (The term "Dm channel" in conjunction with the packet control channels shall be avoided.)

Control channels are used to provide all active Mobile Stations with a continuous frame oriented means of communication across the MS-BS interface.

A Mobile Station Channel Configuration contains one or more control channels. These control channels may change in time, with the channel configuration. Access management signalling functions are used to insure the continuity when a change in the control channels occurs.

Control channels are classified by control channel types, which have common characteristics. These control channel types are specified in clause 4.1.

The control channels are primarily intended to carry signalling information for Connection management (CM), Mobility Management (MM) and Radio Resource (RR) management.

In addition to signalling information control channels may also be used to carry other data, including those relating to Short Message Services.

4.1 Control channel types

4.1.1 Broadcast Control Channel

A broadcast control channel is a point-to-multipoint uni-directional control channel, from the fixed sub-system to the Mobile Stations. Broadcast control channels are physically sub-divided into the broadcast control channel (BCCH) , packet broadcast control channel (PBCCH), and Compact packet broadcast control channel (CPBCCH).

BCCH, PBCCH, and CPBCCH are intended to broadcast a variety of information to MSs, including information necessary for MS to register in the system (e.g. synchronization data).

BCCH, PBCCH, and CPBCCH use a protocol specified in Technical Specifications in GSM 04-Series.

4.1.2 Common Control Channel

A common control channel is a point-to-multipoint bi-directional control channel. Common control channels are physically sub-divided into the common control channel (CCCH), the packet common control channel (PCCCH), and the Compact packet common control channel (CPCCCH).

CCCH, PCCCH, and CPCCCH are primarily intended to carry signalling information necessary for access management functions (e.g., allocation of dedicated channels or radio resource on a packet data traffic channel). The CCCH can be used for other signalling purposes.

CCCH, PCCCH, and CPCCCH use a layered protocol according to Technical Specifications in GSM 04-Series. In particular the multipoint to point management is achieved through random access techniques.

The following terms may be used when the context requires it:

- The RACH (Random Access Channel) is the uplink (MS to network) part of the CCCH.
- The PRACH (Packet Random Access Channel) is the uplink part of the PCCCH.
- The CPRACH (Compact Packet Random Access Channel) is the uplink part of the CPCCCH.
- The AGCH (Access Grant Channel) is the part of the downlink (network to MS) part of the CCCH reserved for assignment messages.
- The PAGCH (Packet Access Grant Channel) is the part of the downlink part of the PCCCH used for assignment messages.
- The CPAGCH (Compact Packet Access Grant Channel) is the part of the downlink part of the CPCCCH used for assignment messages.
- The NCH (Notification Channel) is the part of the downlink part of the CCCH reserved for voice group and/or voice broadcast calls notification messages.
- The PNCH (Packet Notification Channel) is the part of the downlink part of the PCCCH reserved for GPRS PTM-M, voice group and/or voice broadcast calls notification messages.
- The CPNCH (Compact Packet Notification Channel) is the part of the downlink part of the PCCCH reserved for GPRS PTM-M voice group and/or voice broadcast calls notification messages.
- PCH (Paging Channel) is the remaining part of the downlink part of the CCCH.
- PPCH (Packet Paging Channel) is the remaining part of the downlink part of the PCCCH.
- CPPCH (Compact Packet Paging Channel) is the remaining part of the downlink part of the CPCCCH.

4.1.3 Dedicated Control Channel

A dedicated control channel (DCCH) is a point-to-point bi-directional or uni-directional control channel.

DCCHs exist with a variety of bit rates.

DCCHs are further classified as follows according to some technical particularities:

A SDCCH (Stand-alone DCCH) is a bi-directional DCCH whose allocation is not linked to the allocation of a TCH. The bit rate of a SDCCH is 598/765 kbit/s.

A FACCH (Fast Associated DCCH) is a bi-directional DCCH obtained by pre-emptive dynamic multiplexing on respectively a TCH/F or a TCH/H channel. The allocation of a FACCH is obviously linked to the allocation of a TCH. The bit rate of a FACCH is 9 200 or 4 600 bit/s.

A SACCH (Slow Associated DCCH) is either a bi-directional or uni-directional DCCH of rate 115/300 or a bi-directional DCCH of rate 299/765 kbit/s. An independent SACCH is always allocated together with a TCH or a SDCCH. The co-allocated TCH and SACCH shall be either both bi-directional or both uni-directional.

NOTE 1: A Multislot Configuration (described in clause 6) is an example of a case where uni-directional SACCHs may be used.

The terms Bm, or Bm + ACCHs can be used to refer to a Bm channel together with the corresponding FACCH and the co-allocated SACCH when the context avoids any ambiguities. Similar remarks apply to the terms Lm, Lm + ACCHs, Lm + Lm, Lm + Lm + ACCHs. The term SDCCH can be used to refer specifically to a SDCCH together with the co-allocated SACCH when the contexts avoids any ambiguities.

NOTE 2: TCH/F is sometimes used to designate Bm associated with its control channel (FACCH and SACCH). TCH/H is sometime used to designate Lm associated with its control channel (FACCH and SACCH).

A PACCH (Packet Associated Control Channel) is a bi-directional DCCH obtained by pre-emptive dynamic multiplexing on a PDTCH.

A PTCCH (Packet Timing Control Channel) is a bi-directional DCCH carrying synchronization data for a group of up to 16 MSs in packet transfer state (see GSM 04.60).

The DCCHs use a layered protocol according to Technical Specifications in GSM 04- and 05-series.

5 BS access capability

The BS access capability is composed of:

one BCCH;

one CCCH physically related to the BCCH;

{{0 to 3 additional CCCHs; and a global resource.

OR:

BCCH, CCCH plus 4 SDCCHs and a global resource.}}

The global resource can be used to accommodate:

i) n1 (Bm + FACCH + SACCH);

ii) 2n2 (Lm + FACCH + SACCH);

iii) 8n3 (SDCCH of rate 598/765 kbit/s + SACCH);

iv) n4 (Bm + SACCH);

v) n5 (PBCCH + PCCCH + PDTCH + PACCH + PTCCH);

vi) n6 (PCCCH + PDTCH + PACCH + PTCCH);

vii) n7 (PBCCH + PCCCH); and

viii) n8 (PDTCH + PACCH + PTCCH);

with the constraints: n5 = 0 or 1;

n5 > 0 implies that n7 = 0;

n7 > 0 implies that n5 = 0 and n6 = 0; and

n1 + n2 + n3 + n4 + n5 + n6 + n7 + n8 lower than some value characterizing the BS access capability.

The exact use of the global resource may vary in time.

For Compact, the BS access capability is composed of:

CPBCCH;

CPCCCH physically related to the CPBCCH;

{{and a global resource.}}

The global resource can be used to accommodate:

i) n9 (PDTCH + PACCH + PTCCH);

n9 lower than some value characterizing the BS access capability.

The exact use of the global resources may vary in time.

6 Channel configurations

At a given moment, a Mobile Station accesses only a limited number of channels appearing on its radio interface. Different compositions for the accessed channels set are identified, and specified below.

Different channel configurations are:

i) BCCH;

ii) CCCH;

iii) CCCH + BCCH;

iv) SDCCH + SACCH;

v) Bm + FACCH + SACCH;

vi) Lm + FACCH + SACCH;

vii) Lm + Lm + FACCH + SACCH;

viii) (n + m) Bm + FACCH + (n + m) SACCH;

where n is the number of bi-directional channels and m is the number of uni-directional channels (n = 1..8, m = 0..7, n + m = 1..i);

ix) PCCCH + PBCCH;

x) (n + m) PDTCH + PACCH + PTCCH

where n is the number of channel allowing information streams in both directions and m is the number of channels allowing information streams in one direction (n = 0..8, m = 0..8, n + m = 1..8).

xi) CPBCCH;

xii) CPCCCH;

xiii) CPCCCH + CPBCCH

Configurations i) and xi) are normally used only in the phase when the physical connection is not set (i.e. just after switch-on, or after a too long interruption of the physical connection due to poor propagation conditions).

Configurations ii) or iii) are used by active but idle MS or MS in packet wait state (see GSM 04.60).

Configurations iv) is used in phases when only a dedicated control channel is needed.

Configurations v) to viii) are used in particular when a circuit-switched communication is in progress.

Configuration viii) is a Multislot Configuration. Possible combinations of bi- and uni-directional channels are defined in GSM 05.02.

Configurations ix), xii), and xiii) are used by MS in packet wait state.

Configuration x) is a Multislot Configuration on packet data traffic channels. Possible combinations of bi- and uni-directional channels are defined in GSM 05.02.

In addition, a MS of GPRS MS class A (see GSM 02.60) may combine one of the configurations i) to viii) (to support GSM circuit switched services and SMS) with one of the configurations ii), iii), ix), or x) (to support GSM GPRS services).

6.1 Mandatory capabilities

The following access capabilities are mandatory for all MSs.

- All MSs shall support the SDCCH.
- If a given service is supported by an MS on a TCH/H, this MS shall support this service on a TCH/F (but not necessarily vice versa).
- An MS supporting a service on TCH/F shall support the signalling only mode on TCH/F as well as the signalling modes associated with the TCH/F.
- An MS supporting a service on TCH/H shall support the signalling only mode on TCH/F as well as the signalling modes associated with the TCH/H.

Annex A (informative): Document change history

SPEC	CR	R	PHA	VER	SUBJECT	CAT	NEW_VER	WORKITEM
04.03	A006	1	R99	7.0.0	Introduction of compact logical channels	B	8.0.0	EDGE
04.03			R99	8.0.0	Publication		8.0.1	

History

Document history		
V8.0.1	September 2001	Publication