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GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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Contents

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Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS provides a mechanism giving reliable transfer of signalling messages within the digital cellular telecommunications system (Phase 2/Phase 2+).

This GTS is a TC-SMG approved GSM technical specification version 5, which contains GSM Phase 2+ enhancements/features to the version 4 GSM technical specification. The ETS from which this Phase 2+ GTS has evolved is Phase 2 GSM 04.03 version 4.1.1.

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

Version 5.x.y

where:

y   the third digit is incremented when editorial only changes have been incorporated in the specification;

x   the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

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1 Scope

This Global System for Mobile communications Technical Specification (GTS) defines limited sets of channel types, access capabilities and channel configurations at reference point Um (radio interface).

1.1 Normative references

This GTS 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 GTS 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 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2]   GSM 05.02   (ETS 300 908):   "Digital   cellular   telecommunications   system (Phase 2+); Multiplexing and multiple access on the radio path".

1.2 Abbreviations

Abbreviations used in this GTS 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, 12, 7.4, 6 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 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).

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.

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 subclause 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 (BCCH) is a point-to-multipoint uni-directional control channel, from the fixed sub-system to the Mobile Stations.

A BCCH is intended to broadcast a variety of informations to MSs, including informations necessary for MS to register in the system (e.g. synchronization data).

A BCCH uses a protocol specified in Technical Specifications in GSM 04-Series.

4.1.2 Common Control Channel

A common control channel (CCCH) is a point-to-multipoint bi-directional control channel.

A CCCH is primarily intended to carry signalling information necessary for access management functions (e.g. allocation of dedicated channels). The CCCH can be used for other signalling purposes.

A CCCH uses 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 AGCH (Access Grant Channel) is the part of the downlink (network to MS) part of the CCCH reserved 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 PCH (Paging Channel) is the remaining part of the downlink part of the CCCH.

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).

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); and

> iv)   n4 (Bm + SACCH);

> with the constraint

> n1 + n2 + n3 + n4 lower than some value characterizing the BS access capability.

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

6 Channel configurations

At a given moment, a Mobile Station accesses only a limited number of the 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..8).

Configuration i) is 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.

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.

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.

History

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