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**Digital cellular telecommunications system (Phase 2+) (GSM);
Mobile Station - Base Station System (MS - BSS)
Interface Channel Structures and Access Capabilities
(3GPP TS 44.003 version 13.0.0 Release 13)**


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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

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# Contents

# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

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

# 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service description; Stage 1".

[3] 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[4] 3GPP TS 45.002: "Multiplexing and Multiple Access on the Radio Path".

# 3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 apply.

# 4 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 sub-clause 8.

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 sub-clause 9.

A Mobile Station access capability is the description of the set of its possible channel configurations. MS access capabilities are specified in sub-clause 8.

# 5 Channel types and their use: Traffic channels and user channels

## 5.1 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.

## 5.2 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 3GPP TS 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 3GPP TS 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 3GPP TS 45.002).

## 5.3 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 3GPP TS 45.002).

# 6 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 or Extended Coverage PDTCH (EC-PDTCH) (see 3GPP TS 45.002).

# 7 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 sub-clause 7.1.

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 (SMS).

## 7.1 Control channel types

### 7.1.1 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), Compact Packet Broadcast cControl CHannel (CPBCCH), and Extended Coverage Broadcast Control CHannel (EC-BCCH).

BCCH, PBCCH, CPBCCH and EC-BCCH 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, CPBCCH and EC-BCCH use a protocol specified in Technical Specifications in 3GPP TS 44-Series.

### 7.1.2 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), the Compact Packet Common Control CHannel (CPCCCH), and the Extended Coverage Common Control Channel (EC-CCCH)

CCCH, PCCCH, CPCCCH and EC-CCCH 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, CPCCCH and EC-CCCH use a layered protocol according to Technical Specifications in 3GPP TS 44-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 EC-RACH (Extended Coverage Random Access CHannel) is the uplink part of the EC-CCCH.
- 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 EC-AGCH (Extended Coverage Access Grant CHannel) is the downlink part of the EC-CCCH 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.
- 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.
- EC-PCH (Extended Coverage Paging CHannel) is the downlink part of the EC-CCCH used for paging messages.

### 7.1.3 Dedicated Control Channel (DCCH)

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 bit/s or 4 600 bit/s.

A SACCH (Slow Associated DCCH) is either a bi-directional or uni-directional DCCH of rate 115/300 kbit/s 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 sub-clause 9) 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.

An EC-PACCH (Extended Coverage Packet Associated Control CHannel) is a bi-directional DCCH obtained by multiplexing on an EC-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 3GPP TS 44.060).

The DCCHs use a layered protocol according to Technical Specifications in 3GPP TS 04- and 05-series.

# 8 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.

For EC-EGPRS capable BS, the BS access capability is composed of:

one BCCH and one EC-BCCH;

CCCH physically related to the BCCH;

EC-CCCH physically related to the EC-BCCH;

{{0 to 3 additional CCCHs and/or EC-CCCHs; and a global resource.}}

The global resource can be used to accommodate:

i) n10 (EC-PDTCH + EC-PACCH);

n10 lower than some value characterizing the BS access capability.

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

# 9 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

xiv) EC-BCCH;

xv) EC-CCCH;

xvi) EC-CCCH + EC-BCCH

Configurations i), xi) and xiv)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 44.060).

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 3GPP TS 45.002.

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 3GPP TS 45.002.

In addition, a MS of GPRS MS class A (see 3GPP TS 22.060) 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).

Configurations xiv) or xv) are used by active but idle EC-EGPRS MS or an EC-EGPRS MS in packet wait state.

## 9.1 Mandatory capabilities

The following access capabilities are mandatory for all MSs.

- All MSs supporting circuit-switched services shall support 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): Change History

| TSG # | TSG Doc. | CR | Rev | Subject/Comment | New |
|---|---|---|---|---|---|
| December 2015 | - | - | - | Release 13 version based on version 12.0.0 | 13.0.0 |
| GP-68 | GP-151170 | 0009 | 1 | Introduction of EC-EGPRS | 13.0.0 |

# History

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