# ETSI TS 101 376-5-2 V2.2.1 (2005-03)

*Technical Specification*

**GEO-Mobile Radio Interface Specifications (Release 2)**
**General Packet Radio Service;**
**Part 5: Radio interface physical layer specifications;**
**Sub-part 2: Multiplexing and Multiple Access;**
**Stage 2 Service Description;**
**GMPRS-1 05.002**

Reference

RTS/SES-00229-5-2

Keywords

GMPRS, GMR, GPRS, GSM, GSO, interface, MES, mobile, MSS, MUX, radio, satellite, S-PCN, TDMA

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# Contents

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# Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

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- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;
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The present document is part 5, sub-part 2 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications (Release 2) General Packet Radio Service, as identified below:

Part 1: "General specifications";

Part 2: "Service specifications";

Part 3: "Network specifications";

Part 4: "Radio interface protocol specifications";

**Part 5: "Radio interface physical layer specifications":**

Sub-part 1: "Physical Layer on the Radio Path: General Description";

**Sub-part 2: "Multiplexing and Multiple Access; Stage 2 Service Description";**

Sub-part 3: "Channel Coding";

Sub-part 4: "Modulation";

Sub-part 5: "Radio Transmission and Reception";

Sub-part 6: "Radio Subsystem Link Control";

Sub-part 7: "Radio Subsystem Synchronization";

Part 6: "Speech coding specifications";

Part 7: "Terminal adaptor specifications".

# Introduction

GMR stands for GEO (Geostationary Earth Orbit) Mobile Radio interface, which is used for mobile satellite services (MSS) utilizing geostationary satellite(s). GMR is derived from the terrestrial digital cellular standard GSM and supports access to GSM core networks.

The present document is part of the GMR Release 2 specifications. Release 2 specifications are identified in the title and can also be identified by the version number:

- Release 1 specifications have a GMR-1 prefix in the title and a version number starting with "1" (V1.x.x.).
- Release 2 specifications have a GMPRS-1 prefix in the title and a version number starting with "2" (V2.x.x.).

The GMR release 1 specifications introduce the GEO-Mobile Radio interface specifications for circuit mode mobile satellite services (MSS) utilizing geostationary satellite(s). GMR release 1 is derived from the terrestrial digital cellular standard GSM (phase 2) and it supports access to GSM core networks.

The GMR release 2 specifications add packet mode services to GMR release 1. The GMR release 2 specifications introduce the GEO-Mobile Packet Radio Service (GMPRS). GMPRS is derived from the terrestrial digital cellular standard GPRS (included in GSM Phase 2+) and it supports access to GSM/GPRS core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM standard are necessary. Some GSM specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM specifications do not apply, while some GMR specifications have no corresponding GSM specification.

Since GMR is derived from GSM, the organization of the GMR specifications closely follows that of GSM. The GMR numbers have been designed to correspond to the GSM numbering system. All GMR specifications are allocated a unique GMR number. This GMR number has a different prefix for Release 2 specifications as follows:

- Release 1: GMR-n xx.zyy.
- Release 2: GMPRS-n xx.zyy.

where:

- xx.0yy (z = 0) is used for GMR specifications that have a corresponding GSM specification. In this case, the numbers xx and yy correspond to the GSM numbering scheme.
- xx.2yy (z = 2) is used for GMR specifications that do not correspond to a GSM specification. In this case, only the number xx corresponds to the GSM numbering scheme and the number yy is allocated by GMR.
- n denotes the first (n = 1) or second (n = 2) family of GMR specifications.

A GMR system is defined by the combination of a family of GMR specifications and GSM specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM specification (if any). This precedence rule applies to any references in the corresponding GSM specifications.

NOTE: Any references to GSM specifications within the GMR specifications are not subject to this precedence rule. For example, a GMR specification may contain specific references to the corresponding GSM specification.

- If a GMR specification does not exist, the corresponding GSM specification may or may not apply. The applicability of the GSM specifications is defined in GMPRS-1 01.201 [2].

# 1 Scope

The present document defines the structure of the physical channels for the radio subsystem in the GMR-1 Mobile Satellite System. It describes the GMR-1 concept of logical channels and the timing concepts of TDMA frames, timeslots, and bursts. It defines the relationship between logical and physical channels, and defines the logical channels in terms of size, structure and timing relationships.

# 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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] GMPRS-1 01.004 (ETSI TS 101 376-1-1): "GEO-Mobile Radio Interface Specifications (Release 2) General Packet Radio Service; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms".

[2] GMPRS-1 01.201 (ETSI TS 101 376-1-2): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 1: General specifications; Sub-part 2 : Introduction to the GMR-1 family".

[3] GMR-1 04.008 (ETSI TS 101 376-4-8): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

[4] Void.

[5] Void.

[6] Void.

[7] GMPRS-1 03.022 (ETSI TS 101 376-3-10): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth Station (MES) in idle mode".

[8] GMPRS-1 04.008 (ETSI TS 101 376-4-8): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications".

[9] GMPRS-1 05.003 (ETSI TS 101 376-5-3): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding".

[10] GMPRS-1 05.004 (ETSI TS 101 376-5-4): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation".

[11] GMPRS-1 05.005 (ETSI TS 101 376-5-5): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception".

[12] GMPRS-1 05.008 (ETSI TS 101 376-5-6): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control".

[13] GMPRS-1 05.010 (ETSI TS 101 376-5-7): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization".

[14] GMPRS-1 03.064 (ETSI TS 101 376-3-22): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 3: Network specifications; Sub-part 22: Overall description of the GMPRS radio interface; Stage 2".

[15] GMPRS-1 04.060 (ETSI TS 101 376-4-12): "GEO-Mobile Radio Interface Specifications (Release 2); General Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 12: Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[16] GMR-1 05.002 (ETSI TS 101 376-5-2): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 2: Multiplexing and Multiple Access; Stage 2 Service Description".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in GMPRS-1 01.201 [2] apply.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in GMPRS-1 01.004 [1] apply.

# 4 General

Same as clause 4 in GMR-1 05.002 [16].

# 5 Logical channels

## 5.1 General

Same as clause 5.1 in GMR-1 05.002 [16].

## 5.2 Traffic channels

### 5.2.1 General

TCHs are intended to carry either encoded speech or user data. Three general types of traffic channels are defined:

1) TCH3: This channel carries data at a gross rate of 5,20 kbps.

2) TCH6: This channel carries data at a gross rate of 10,75 kbps.

3) TCH9: This channel carries data at a gross rate of 16,45 kbps.

The data gross rate is defined as the number of encoded bits in NT3, NT6 and NT9 burst, respectively, excluding the number of power control bits, divided by 40 ms frame time.

All traffic channels are bidirectional.

The types of traffic channels capable of speech and user data are identified in the following clauses.

### 5.2.2 Speech traffic channels

Same as clause 5.2.2 in GMR-1 05.002 [16].

### 5.2.3 Data traffic channels

Same as clause 5.2.3 in GMR-1 05.002 [16].

### 5.2.4 Summary of traffic channel characteristics

Table 5.1 summarizes the characteristics of traffic channels, where the gross transmission rate is the channel transmission bit rate (2 times channel transmission symbol rate) multiplied by the duty cycle of the channel.

**Table 5.1: Summary of traffic channel characteristics**

| Channel type | User information capability | Gross transmission rate |
|---|---|---|
| TCH3 | Encoded speech | 5,85 kbps (=46,8/8) |
| TCH6 | User data: 4,8 kbps<br>Fax: 2,4 or 4,8 kbps | 11,70 kbps (=46,8/8 x 2) |
| TCH9 | User data: 9,6 kbps<br>Fax: 2,4, 4,8, or 9,6 kbps | 17,55 kbps(=46,8/8 x 3) |

### 5.2.5 Packet Data Traffic CHannels (PDTCH)

A PDTCH corresponds to the resource allocated to a single MES on one physical channel for user data transmission. Different logical channels may be dynamically multiplexed on to the same PDTCH. The PDTCH uses π/4-QPSK modulation. All packet data traffic channels are unidirectional, either uplink (PDTCH/U), for a mobile-originated packet transfer or downlink (PDTCH/D) for a mobile-terminated packet transfer.

PDTCHs are used to carry packet data traffic. Different PDTCHs are defined by the suffix (m,n) where m indicates the bandwidth of the physical channel in which the PDTCH is mapped, m × 31,25 kHz, and n defines the number of timeslots allocated to this physical channel. Table 5.2 summarizes different types of packet traffic data channels, PDTCH (m, 3), (m = 4 and 5), where the burst duration is 5 ms and PDTCH (m, 6), (m = 1, 2), where the burst duration is 10 ms.

**Table 5.2: Packet Traffic Data Channels**

| Channels | Transmission symbol rate (ksps) | Transmission bandwidth (kHz) | Peak payload transmission rate (without CRC) (kbps) | Peak payload transmission rate (with CRC) (kbps) |
|---|---|---|---|---|
| PDTCH(4,3) | 93,6 | 125,0 | 113,6 | 116,8 |
| PDTCH(5,3) | 117,0 | 156,25 | 145,6 | 148,8 |
| PDTCH(1,6) | 23,4 | 31,25 | 27,2 | 28,8 |
| PDTCH(2,6) | 46,8 | 62,5 | 62,4 | 64,0 |

The payload is the Private Information (PRI) delivered to the physical layer by the link layer. The PRI includes the MAC header and the other higher layer overhead. The peak payload transmission rate (without CRC) is defined as the maximum attainable PRI data rate with continuous transmission, i.e. using all 24 timeslots in a frame. The above peak-rates are achieved with rate 3/4 coding for PDTCH(4,3) and PDTCH(5,3) and are achieved with rate 4/5 for PDTCH(1,6) and PDTCH(2,6).

## 5.3 Control channels

### 5.3.1 General

Same as clause 5.3.1 in GMR-1 05.002 [16].

### 5.3.2 Broadcast channels

#### 5.3.2.1 Frequency Correction CHannel (FCCH)

Same as clause 5.3.2.1 in GMR-1 05.002 [16].

#### 5.3.2.2 GPS Broadcast control CHannel (GBCH)

Same as clause 5.3.2.2 in GMR-1 05.002 [16].

#### 5.3.2.3 Broadcast Control CHannel (BCCH)

The BCCH broadcasts system information to the MESs, and is downlink only. The BCCH system information parameters are described in GMPRS-1 04.008 [3].System information parameters that are referenced in the present document are summarized in clause 10.

The network shall indicate to the MES via BCCH whether or not packet-switched traffic is supported.

### 5.3.3 Common Control Channel (CCCH)

Same as clause 5.3.3 in GMR-1 05.002 [16].

### 5.3.4 Dedicated control channels

Same as clause 5.3.4 in GMR-1 05.002 [16].

### 5.3.5 Cell Broadcast CHannel (CBCH)

Same as clause 5.3.5 in GMR-1 05.002 [16].

### 5.3.6 Packet Common Control CHannels (PCCCH)

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 the circuit-switched operation.

1) Packet Random Access Channel (PRACH): Uplink only, used to request allocation of one or several PDTCHs (for uplink or downlink direction).

2) Packet Access Grant Channel (PAGCH): Downlink only, used to allocate one or several PDTCHs.

### 5.3.7 Packet dedicated control channels

1) The Packet Associated Control Channel (PACCH): The PACCH is bidirectional. For description purposes PACCH/U is used for the uplink and PACCH/D for the downlink.

2) Packet Timing Advance Control Channel Uplink (PTCCH/U): Used to transmit packet normal bursts to allow estimation of the timing advance for one MES in packet transfer mode.

3) Packet Timing Advance Control Channel Downlink (PTCCH/D): Used to transmit timing advance updates for several MESs. One PTCCH/D is paired with several PTCCH/Us.

# 6 The physical resource

## 6.1 General

Same as clause 6.1 in GMR-1 05.002 [16].

## 6.2 Radio frequency channels

### 6.2.1 Spot beam allocation

Same as clause 6.2.1 in GMR-1 05.002 [16].

### 6.2.2 Downlink and uplink

Same as clause 6.2.2 in GMR-1 05.002 [16].

## 6.3 Timeslots and TDMA frames

### 6.3.1 General

Same as clause 6.3.1 in GMR-1 05.002 [16].

### 6.3.2 Timeslot number

Same as clause 6.3.2 in GMR-1 05.002 [16].

### 6.3.3 TDMA frame number

Same as clause 6.3.3 in GMR-1 05.002 [16].

# 7 Bursts

## 7.1 General

Same as clause 7.1 in GMR-1 05.002 [16], with the following additions.

The physical channel burst for PDCH(m,n) is denoted as a Packet Normal Burst, PNB(m,n). Here, the bandwidth factor, m, refers to the integer multiple of the bandwidth, 31,25 kHz, of the basic channel, and the time factor, n, refers to the number of timeslots. The ranges of these two variables are as follows: for m = 4 and 5, n = 3 and for m = 1 and 2, n = 6.

The PNB(m,n) bursts are n = 3 and 6 timeslots long. The burst data is modulated using $\pi/4$-QPSK modulation, which maps two bits to one symbol. For additional details concerning the modulation of PNB(m,n) bursts, see GMPRS-1 05.004 [10].

The physical channel burst for PRACH is denoted as Packet Access Burst (PAB). The PAB is transmitted in the basic channel bandwidth 31,25 kHz. It occupies 4,3 ms in a 5 ms time-slot, which results in ± 0,35 ms guard-time.

# 7.2 Timing

## 7.2.1 Half-symbol period

The fundamental unit of burst timing is the half-symbol period. The half-symbol period is a function of the bandwidth factor, m. A timeslot consists of (78 *x m*) half-symbol periods, each of $\frac{5}{234 \, x \, m}$ ms duration. A particular half-symbol period within a burst is referenced by a half-symbol number (HSN), with the first half-symbol period numbered 0. In the following clauses, the transmission timing of a burst is defined in terms of half-symbol numbers. The half symbol with the lowest half-symbol number is transmitted first.

## 7.2.2 Useful duration

Different types of bursts exist in the system. One characteristic of a burst is its useful duration. The useful duration of a burst for circuit service is defined as beginning with HSN5. This present document defines bursts with useful durations of 146, 224, 458, 614, and 692 half-symbol periods, based on total durations of 2, 3, 6, 8, and 9 timeslots.

The useful duration for packet normal bursts is defined as beginning with HSN 5 *x m* (if m = 4, 5) and with HSN 5 (if m = 1, 2). The present document defines bursts with useful durations of 458, 926, 896, and 1 120 half-symbol periods, for PNB(1,6), PNB(2,6), PNB(4,3) and PNB(5,3), respectively.

## 7.2.3 Guard period

The period between the useful durations of successive bursts is termed the guard period. Each burst has a guard period with a duration of 5 × m (if m = 4, 5) and 5 (if m = 1, 2) half-symbol periods before its useful duration, and a similar guard period with a duration of 5 × m *(*if m = 4, 5) and 5 (if m = 1, 2) half-symbol periods after its useful duration, which has the effect of centering a burst's useful duration within its timeslot(s).

# 7.3 Multiple unique word patterns in bursts

Many bursts contain a pattern of bits known as a unique word pattern, used to resolve phase ambiguities inherent in the modulation. The NT3, NT6, and NT9 bursts, described later, allow multiple patterns for the unique word to distinguish bursts that contain signalling (FACCH) from those that contain user information (speech/data). The SDCCH bursts use multiple unique word patterns to identify a subchannel associated with each SDCCH burst. Additional details concerning SDCCH subchannels use of multiple unique word patterns are in clause 8.5.4.

# 7.4 Types of bursts

Same as clause 7.4 in GMR-1 05.002 [16].

## 7.4.1 BACH burst

Same as clause 7.4.1 in GMR-1 05.002 [16].

## 7.4.2 BCCH burst

Same as clause 7.4.2 in GMR-1 05.002 [16].

## 7.4.3 CICH burst

Same as clause 7.4.3 in GMR-1 05.002 [16].

## 7.4.4 DC2 burst

Same as clause 7.4.4 in GMR-1 05.002 [16].

### 7.4.5 DC6 burst

Same as clause 7.4.5 in GMR-1 05.002 [16].

### 7.4.6 DKAB bursts

Same as clause 7.4.6 in GMR-1 05.002 [16].

### 7.4.7 FCCH burst

Same as clause 7.4.7 in GMR-1 05.002 [16].

### 7.4.8 NT3 burst

Same as clause 7.4.8 in GMR-1 05.002 [16].

#### 7.4.8.1 NT3 burst for encoded speech

Same as clause 7.4.8.1 in GMR-1 05.002 [16].

#### 7.4.8.2 NT3 burst for FACCH

Same as clause 7.4.8.2 in GMR-1 05.002 [16].

### 7.4.9 NT6 burst

Same as clause 7.4.9 in GMR-1 05.002 [16].

### 7.4.10 NT9 burst

Same as clause 7.4.10 in GMR-1 05.002 [16].

### 7.4.11 RACH burst

Same as clause 7.4.11 in GMR-1 05.002 [16].

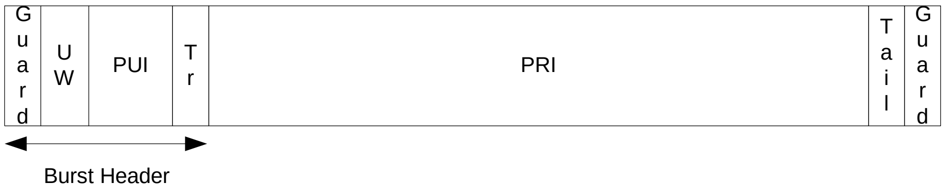
### 7.4.12 SDCCH burst

Same as clause 7.4.12 in GMR-1 05.002 [16].

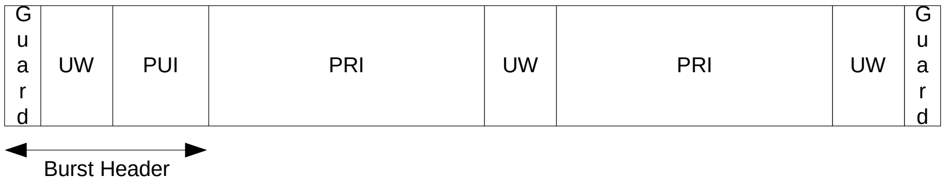
### 7.4.13 Packet Normal Bursts (PNB)

The Packet Normal Bursts (PNB) comprises of two parts.

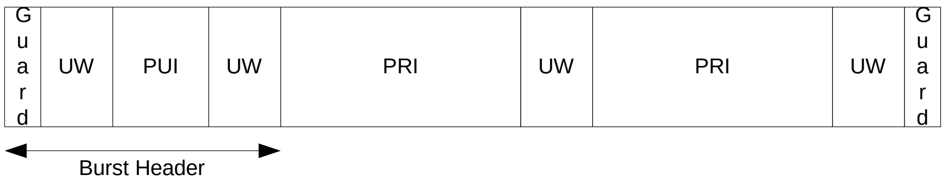
The first part, the burst header, is common to all PNBs that share the same suffix (m,n). The burst header comprises guard bits, a unique word, and encoded Public Information (PUI) field. The second part is the encoded Private Information (PRI). Pictorial description of the different PNB(m,n) is shown in figure 7.1. Refer to clauses 7.4.13.1 to 7.4.13.3 for a description on the different parts of PNB(m,n) shown in figure 7.1.




(a). PNB(4,3) and PNB(5,3)




(b). PNB(1,6)




(c ). PNB(2,6)

**Figure 7.1: Burst header and PRI within PNB(m,n)**

An MES of terminal type C shall be able to transmit an uplink PNB(1,6) immediately after RX-TX switching time (see GMPRS 05.005 [11]) from the reception of the last symbol of the burst header of downlink PNB(2,6). Consequently, an MES of terminal type C shall be capable of decoding and interpreting the burst header received prior to this transmission on uplink PNB(1,6). See also GMPRS 05.010 [13] and GMPRS 04.060 [15] for further description.

### 7.4.13.1 Burst header

The burst header of the PNB(m,n) is modulated using $\pi/4$-QPSK. The various fields of the burst header are described below.

#### 7.4.13.1.1 Guard bits

If m = 4 or m = 5, the PNB(m,n) has 5 × m guard bits at the beginning of the burst (as a part of the burst header) and 5 × m guard bits at the end of the burst.

If m = 1 or m = 2, the PNB(m,n) has 5 guard bits at the beginning of the burst (as a part of the burst header) and 5 guard bits at the end of the burst.

#### 7.4.13.1.2 Unique Word (UW)

The burst header of PNB(1,6) has 14 bits of Unique Word (UW). There are additional 30 bits of UW within the PRI portion of PNB(1,6).

The burst header of PNB(2,6) has total of 36 bits of UW; 18 UW bits are located before the PUI and another 18 UW bits are located after the PUI. There are additional 32 bits of UW within the PRI portion of PNB(2,6).

The Unique Word (UW) size for the PNB(m,3), (m = 4, 5) is 10 × m bits. The entire UW is located within the burst header for PNB(m,3), m = 4 or 5.

#### 7.4.13.1.3 PUblic Information (PUI) field

The size of the uplink and the downlink PUI is 12 bits. The size of encoded PUI is 48 bits. Refer to GMPRS-1 04.060 [15] for detailed description of PUI. The detailed description of the PUI coding is in GMPRS-1 05.003 [9].

#### 7.4.13.1.4 Transition symbols

Each PNB(m,n), except PNB(1,6) and PNB(2,6), has m symbols for transition between the two burst parts. There are no transition symbols for PNB(1,6) and PNB(2,6).

### 7.4.13.2 Encoded PRivate Information (PRI)

The second part of the burst carries the Private Information (PRI) delivered to the physical layer. The PRI is modulated using π/4-QPSK.

The PRI includes the MAC layer header. Refer to GMPRS-1 04.060 [15] for detailed description of PRI content.

The PRI in PNB(5,3) and PNB(4,3) is encoded using convolutional code with a constraint length of 7. The channel coding rate is variable, approximately 3/4, 5/8, or 1/2. The variable channel coding rate allows link margin control. The PRI in PNB(1,6) and PNB(2,6) is encoded using convolutional code with a constraint length of 9. The channel coding rate is variable, approximately 3/5, 7/10, or 4/5. The variable channel coding rate allows link margin control.

For further description of the modulation and channel coding schemes for the Public Information (PUI) field and the Private Information (PRI) bits, refer to GMPRS-1 05.004 [10] and GMPRS-1 05.003 [9], respectively.

### 7.4.13.3 Formats of packet normal burst

This clause specifies different PNB(m,n) formats.

#### 7.4.13.3.1 Void

#### 7.4.13.3.2 PNB(4,3)

This burst has 468 symbols and 936 half symbols, which are transmitted in a three-timeslot (5 ms) duration. The channel transmission rate is 93,6 ksps (468 symbols/5 ms). The transmission bandwidth is 125 kHz. The modulation is π/4-QPSK. See table 7.22.

**Table 7.1 to 7.21: Void**

**Table 7.22: PNB(4,3) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 19 | 20 | Guard period in half symbols |
| 20 to 59 | 40 | Unique word |
| 60 to 107 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 108 to 115 | 8 | Burst transition (coded as all 1 bits) |
| 116 to 907 | 792 | Encoded bits e0 to e791 |
| 908 to 915 | 8 | Tail (coded as all 1 bits) |
| 916 to 935 | 20 | Guard period in half symbols |

The Unique Word pattern for PNB(4,3) burst is shown in table 7.23.

**Table 7.23: PNB(4,3) unique word definition for PDCH(4,3)**

| Unique word bBits (HSN20, HSN21 …HSN59) |
|---|
| (00 01 00 01 00 01 11 10 11 01 00 10 11 10 11 01 11 01 11 01) |

#### 7.4.13.3.3 PNB(5,3)

This burst has 585 symbols and 1 170 half symbols, which are transmitted in a three-timeslot (5 ms) duration. The channel transmission rate is 117 ksps (585 symbols/5 ms). The transmission bandwidth is 156,25 kHz. The modulation is π/4-QPSK. See table 7.24.

**Table 7.24: PNB(5,3) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 24 | 25 | Guard period in half symbols |
| 25 to 74 | 50 | Unique word |
| 75 to 122 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 123 to 132 | 10 | Burst transition (coded as all 1 bits) |
| 133 to 1 134 | 1 002 | Encoded bits e0 to e1 001 |
| 1 135 to 1 144 | 10 | Tail (coded as all 1 bits) |
| 1 145 to 1 169 | 25 | Guard period in half symbols |

The unique word pattern for PNB(5,3) burst is shown in table 7.25.

**Table 7.25: PNB(5,3) unique word definition for PDCH(5,3)**

| Unique word bits (HSN25, HSN26 …HSN74) |
|---|
| ( 00 01 11 10 00 10 11 01 00 01 00 01 00 01 00 01 00 10 11 01 11 10 00 10 00) |

#### 7.4.13.3.4 PNB(1,6)

This burst has 234 symbols and 468 half symbols, which are transmitted in a six-timeslot (10 ms) duration. The channel transmission rate is 23,4 ksps (234 symbols/10 ms). The transmission bandwidth is 31,25 kHz. The modulation is π/4-QPSK. See table 7.26.

**Table 7.26: PNB(1,6) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 4 | 5 | Guard period |
| 5 to 18 | 14 | Unique word – UW1 |
| 19 to 66 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 67 to 226 | 160 | PRI – Encoded bits e0 to e159 |
| 227 to 242 | 16 | Unique word – UW2 |
| 243 to 448 | 206 | PRI – Encoded bits e160 to e365 |
| 449 to 462 | 14 | Unique word –UW3 |
| 463 to 467 | 5 | Guard period |

The unique word pattern for PNB(1,6) burst is shown in table 7.27.

**Table 7.27: PNB(1,6) unique word definition for PDCH(1,6)**

| Unique word bits (HSN5, HSN6 …HSN18) |
|---|
| ( 00 01 11 01 00 10 00 ) |
| **Unique word bits (HSN225, HSN226 …HSN240)** |
| ( 00 01 11 01 00 10 00 10 ) |
| **Unique word bits (HSN449, HSN450 …HSN462)** |
| ( 00 01 11 01 00 10 00 ) |

#### 7.4.13.3.5 PNB(2,6)

This burst has 468 symbols and 936 half symbols, which are transmitted in a six to timeslot (10 ms) duration. The channel transmission rate is 46.8 ksps (468 symbols/10 ms). The transmission bandwidth is 62,5 kHz. The modulation is π/4-QPSK. See table 7.28.

**Table 7.28: PNB(2,6) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 4 | 5 | Guard period in half symbols |
| 5 to 22 | 18 | Unique word |
| 23 to 70 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 71 to 88 | 18 | Unique word |
| 89 to 494 | 406 | Encoded bits e0 to e405 |
| 495 to 510 | 16 | Unique word |
| 511 to 914 | 404 | Encoded bits e406 to e809 |
| 915 to 930 | 16 | Unique word |
| 931 to 935 | 5 | Guard period in half symbols |

The unique word pattern for PNB(2,6) burst is shown in table 7.29.

**Table 7.29: PNB(2,6) unique word definition for PDCH(2,6)**

| Unique word bits (HSN5, HSN6 …HSN22) |
|---|
| ( 00 01 11 01 00 10 00 10 00) |
| **Unique word bits (HSN71, HSN72 …HSN88)** |
| ( 00 01 11 01 00 10 00 10 00) |
| **Unique word bits (HSN495, HSN496 …HSN510)** |
| ( 00 01 11 01 00 10 00 10) |
| **Unique word bits (HSN915, HSN916 …HSN930)** |
| ( 00 01 11 01 00 10 00 10) |

## 7.4.14 Packet Access Burst (PAB)

The PAB has an 8-byte information field (64 bits). The information field is encoded to 106 bits. The encoded bits, the CW, the UW bits and the guard bits form a total of 234 bits. The PAB uses π/4–QPSK modulation, in which two bits are mapped to one symbol. Thus, the PAB has 117 symbols transmitted at 23,4 ksps (117 symbols/5 ms). The transmission bandwidth is 31,25 kHz.

For additional details concerning the coding and the modulation of the PAB, see GMPRS-1 05.003 [9] and GMPRS-1 05.004 [10], respectively. See table 7.30 for the PAB definition.

**Table 7.30: PAB definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 15 | 16 | Guard period in half symbols |
| 16 to 47 | 32 | CW (coded as all 1 bits) |
| 48 to 59 | 12 | Unique word |
| 60 to 111 | 52 | Encoded bits e0 to e51 |
| 112 to 143 | 32 | CW (coded as all 1 bits) |
| 144 to 155 | 12 | Unique word |
| 156 to 209 | 54 | Encoded bits e52 to e105 |
| 210 to 217 | 8 | CW (coded as all 1 bits) |
| 218 to 233 | 16 | Guard period in half symbols |

The 12-bit Unique Word pattern is shown in table 7.31.

**Table 7.31: PAB unique word definition**

| Unique word bits (HSN48, HSN49,…,HSN59) |
|---|
| **Unique word bits (HSN144, HSN145,…,HSN155)** |
| (00 00 11 00 11 10) |

## 7.4.15 Packet Keep-Alive Burst (PKAB)

The PKAB burst formats are the same as PNB(m,n) formats, except the PRI portion is not transmitted (no power). The PKAB burst formats corresponding to PNB(4,3) and PNB(5,3) are shown in tables 7.32 and 7.33 respectively.

**Table 7.32: PKAB regarding PNB(4,3) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 19 | 20 | Guard period in half symbols |
| 20 to 59 | 40 | Unique word |
| 60 to 107 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 108 to 115 | 8 | Burst transition (coded as all 1 bits) |
| 116 to 907 | 792 | No transmission |
| 908 to 915 | 8 | Tail (coded as all 1 bits) |
| 916 to 935 | 20 | Guard period in half symbols |

**Table 7.33: PKAB regarding PNB(5,3) definition**

| HSN | Length of field in half symbols | Contents of field |
|---|---|---|
| 0 to 24 | 25 | Guard period in half symbols |
| 25 to 74 | 50 | Unique word |
| 75 to 122 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 123 to 132 | 10 | Burst transition (coded as all 1 bits) |
| 133 to 1 134 | 1 002 | No transmission |
| 1 135 to 1 144 | 10 | Tail (coded as all 1 bits) |
| 1 145 to 1 169 | 25 | Guard period in half symbols |

The PKAB burst format corresponding to PNB(2,6) is shown in table 7.34. The PKAB burst corresponding to PNB(2,6) comprises of two unique words separated by encoded PUI as shown in table 7.34.

**Table 7.34: PKAB regarding PNB(2,6) definition**

| HSN | Length of field in half symbols | Contents of Field |
|---|---|---|
| 0 to 4 | 5 | Guard period in half symbols |
| 5 to 22 | 18 | Unique word |
| 23 to 70 | 48 | Encoded public information (PUI) field c0,…,c23, c0,…, c23 |
| 71 to 88 | 18 | Unique word |
| 89 to 930 | 842 | No transmission |
| 931 – 935 | 5 | Guard period in half symbols |

# 8 Logical-physical channel mapping

## 8.1 General

Same as clause 8.1 in GMR-1 05.002 [16].

### 8.1.1 Frequency-domain description

Same as clause 8.1.1 in GMR-1 05.002 [16].

### 8.1.2 Time-domain description

#### 8.1.2.1 Physical channels

Same as clause 8.1.2.1 in GMR-1 05.002 [16].

#### 8.1.2.2 Logical channels

Same as clause 8.1.2.2 in GMR-1 05.002 [16].

## 8.2 Physical Channel (PC) types and names

Same as clause 8.2 in GMR-1 05.002 [16].

## 8.3 Logical channel parameters

Same as clause 8.3 in GMR-1 05.002 [16].

## 8.4 Permitted channel configurations

Same as clause 8.4 in GMR-1 05.002 [16].

## 8.5 Logical channel frame sequencing concepts

Same as clause 8.5 in GMR-1 05.002 [16].

### 8.5.1 Simple frame sequence

Same as clause 8.5.1 in GMR-1 05.002 [16].

#### 8.5.1.1 Simple frame sequence subchannels

Same as clause 8.5.1.1 in GMR-1 05.002 [16].

### 8.5.2 Simple paired-frame sequence

Same as clause 8.5.2 in GMR-1 05.002 [16].

#### 8.5.2.1 Simple paired-frame sequence subchannels

Same as clause 8.5.2.1 in GMR-1 05.002 [16].

### 8.5.3 Configured paired-frame sequence

Same as clause 8.5.3 in GMR-1 05.002 [16].

#### 8.5.3.1 CBCH configuration

Same as clause 8.5.3.1 in GMR-1 05.002 [16].

### 8.5.4 Statistically multiplexed paired-frame sequence

Same as clause 8.5.4 in GMR-1 05.002 [16].

#### 8.5.4.1 Pool size

Same as clause 8.5.4.1 in GMR-1 05.002 [16].

#### 8.5.4.2 Statistically multiplexed paired-frame sequence subchannels

Same as clause 8.5.4.2 in GMR-1 05.002 [16].

#### 8.5.4.3 Example using SDCCH

Same as clause 8.5.4.3 in GMR-1 05.002 [16].

### 8.5.5 System information cycle sequencing

Same as clause 8.5.5 in GMR-1 05.002 [16].

#### 8.5.5.1 Physical-Channel-Relative Timeslot Number (PCRTN)

Same as clause 8.5.5.1 in GMR-1 05.002 [16].

#### 8.5.5.2 System-Information-Relative Frame Number (SIRFN)

Same as clause 8.5.5.2 in GMR-1 05.002 [16].

#### 8.5.5.3 Graphical representation of system information cycle timeslots

Same as clause 8.5.5.3 in GMR-1 05.002 [16].

## 8.6 Mapping of logical channels to BCCH/CCCH

Same as clause 8.6 in GMR-1 05.002 [16].

### 8.6.1 Fixed reserved-slot logical channels

Same as clause 8.6.1 in GMR-1 05.002 [16].

#### 8.6.1.1 FCCH

Same as clause 8.6.1.1 in GMR-1 05.002 [16].

#### 8.6.1.2 CICH

Same as clause 8.6.1.2 in GMR-1 05.002 [16].

#### 8.6.1.3 BCCH

Same as clause 8.6.1.3 in GMR-1 05.002 [16].

### 8.6.2 Optional reserved-slot logical channels

Same as clause 8.6.2 in GMR-1 05.002 [16].

#### 8.6.2.1 PCH

Same as clause 8.6.2.1 in GMR-1 05.002 [16].

#### 8.6.2.2 BACH

Same as clause 8.6.2.2 in GMR-1 05.002 [16].

### 8.6.3 Unreserved-slot logical channels

Same as clause 8.6.3 in GMR-1 05.002 [16].

## 8.7 Mapping of logical channels to normal CCCH

Same as clause 8.7 in GMR-1 05.002 [16].

## 8.8 Mapping in time of packet logical channels onto physical channels

### 8.8.1 General

A physical channel allocated to carry packet logical channels is called a Packet Data Channel (PDCH). A PDCH shall carry packet logical channels only. A PDCH is of size (m,n), where m is the bandwidth index and n is the number of timeslots. The logical channels PACCH and PDTCH use the PNB(m,n) associated with the physical channel PDCH(m,n) onto which they are mapped.

Packet-switched logical channels are mapped dynamically onto a 16-multiframe.

A multiframe consists of 16 consecutive frames, (see GMPRS-1 05.010 [13] and GMPRS-1 03.064 [14]). Figure 8.14 indicates the numbering of consecutive frames for the entire multiframe.

**Figure 8.1 to 8.13: Void**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 | B13 | B14 | B15 |

**Figure 8.14: Multiframe structure for PDCH**

The mapping of logical channels onto the successive MAC-slots or D-MAC-slots in a multiframe is defined GMPRS-1 03.064 [14]. Each MAC-slot or a D-MAC-slot carries a single RLC block.

In the downlink direction, the logical channel type is indicated by the message type.

In the uplink part for channels other than PRACH, the logical channel type shall be indicated by the message type. For the PRACH case the logical channel type is indicated by the USF (GMPRS-1 04.060 [15]), set on the corresponding block on the downlink on a frame-by-frame basis.

## 8.8.2 Mapping of the uplink channels

### 8.8.2.1 Mapping of uplink packet traffic channel (PDTCH/U) and PACCH/U

The PDCHs where the MES may expect occurrence of its PDTCH/U(s) or PACCH/U for a mobile-originated transfer is indicated in resource allocation messages (see GMPRS-1 04.060 [15]). PACCH/U shall be allocated respecting the resources allocated to the MES and the MES multislot class. A single USF (6 bits), is allocated to the MES for all the PDCHs that it has been allocated. Some of the PDCHs allocated in extended dynamic mode may not be associated with the allocated USF. See GMPRS-1 03.064 [14] for further details.

The occurrence of the PDTCH/U and/or the PACCH/U for a given MES on a given PDCH shall be indicated by the value of the USF contained in the header of the block transmitted in the downlink MAC-slot of the same PDCH. When the network transmits on a PDTCH(2,6) carrier, it will do so on D-MAC slots 0 ,1, 2 and 3. As a result, an MES listening to a PDTCH(2,6) will receive the USF on D-MAC slots 0, 1, 2, and 3. When the network transmits on a PDTCH(4,3) and PDTCH(5,3) it will do so on all the MAC slots, and the MES listening to a PDTCH(4,3) or PDTCH(5,3) will receive the USF on all MAC slots. The relationship between the downlink MAC-slot in which the block containing the USF is transmitted and the uplink MAC-slot to which it applies is described in GMPRS-1 05.010 [13]. The relationship between the downlink D-MAC-slot in which the block containing the USF is transmitted and the uplink D-MAC-slot to which it applies is described in GMPRS-1 05.010 [13]. The MES may transmit on any of the uplink MAC-slots allocated to the MES. The MES shall transmit on every D-MAC-slot allocated to the MES. The occurrence of the PACCH/U associated to a PDTCH/D shall be indicated by the network by polling the MES (see GMPRS-1 04.060 [15]).

NOTE: This clause specifies how the network shall signal that the MES is allowed to use the uplink. The operation of the MES is specified in GMPRS-1 04.060 [15]. In particular cases of fixed allocation or extended dynamic allocation, the MES may not need to monitor the USF on all allocated PDCHs.

### 8.8.2.2 Mapping of the packet timing advance control channel (PTCCH/U)

When an MES transmits a PTCCH/U on the same carrier as a PDTCH(4,3) or a PDTCH(5,3), the PTCCH/U shall be mapped to one of the MAC-slots 0, 2, 4, or 6 for an even numbered multiframe and slots 1, 3, 5, 7 in an odd numbered multiframe. When an MES transmits a PTCCH/U on the same carrier as a PDTCH(1,6), the PTCCH/U shall be mapped to one of the D-MAC-slots 0, 1, 2, or 3. PTCCH/U shall be allocated respecting the resources allocated to the MES and the MES multislot class. An MES shall be allocated a subchannel of the PTCCH/U, where the subchannel number is derived from the Timing Advance Index (TAI), indicated in the uplink/downlink assignment or immediate assignment message (see GMPRS-1 04.060 [15] and GMPRS-1 03.064 [14]). See GMPRS-1 05.010 [13] for details regarding deriving the PTCCH/U slot from the Timing Advance Index.

### 8.8.2.3 Mapping of the uplink PCCCH, i.e. PRACH

The PRACH is dynamically allocated on individual PDCH MAC-slots. The occurrence of a PRACH opportunity on the uplink is indicated by USF = USF_FREE in the PUI of the block which is received in the corresponding MAC-slot on the downlink.

Similarly, the PRACH may be dynamically allocated on individual PDCH D-MAC-slots. If an MES, which is receiving PDTCH(2,6) on downlink, detects a USF value equal to USF_FREE in a D-MAC-slot k (k = 0, 1, 2 or 3) beginning at timeslot T (T = 0, 1, 2…,or 23) of a downlink frame F, the MES may transmit the PRACH either on timeslots T, T + 1, T + 2 or on timeslots T + 3, T +4, T + 5, where timeslot T is in the uplink frame F + USF_DELAY and the timeslot numbers T + 1 to T + 5 are modulo 24 (see GMPRS 05.010 [13]). The MES shall randomly select either timeslot T or timeslot T + 3 as the start of the PRACH transmission.

Fixed PRACH opportunities may be statically allocated on individual PDCH D-MAC-slots on the paired 31,25 kHz carrier as described in annex B.

For a PDTCH(4,3) or a PDTCH(5,3), multiple PRACHs, of up to a maximum of m (where m = 4 or 5), may be overlaid on the same PDCH MAC-slot where m x 31,25 kHz is the PDCH bandwidth (m = 4 and 5). This is possible because the PRACH uses bandwidth of 31,25 kHz only, whereas the PDCH bandwidth is an integral multiple of 31,25 kHz. The multiple PRACH bursts overlaid on a singe MAC-slot use different carrier frequencies that are spaced 31,25 kHz apart. Number of overlaid channels supported by the network is indicated by BCCH system information parameters PRACH Overlay and Uplink PRACH Channels, see GMPRS-1 04.008 [8]. The MES shall randomly select one of the overlaid PRACH frequencies for transmission, see GMPRS-1 03.064 [14].

Table 8.1 shows valid PRACH frequencies when multiple PRACHs are overlaid on the same PDCH MAC-slot. Uplink frequency is derived from frequency parameters as specified in GMPRS-1 05.005 [11].

**Table 8.1: Overlaid PRACH frequencies**

| Bandwidth | PRACH frequency |
|---|---|
| m = 4 | PRACH1 = Uplink frequency – 48,875 kHz |
| | PRACH2 = Uplink frequency – 15,625 kHz |
| | PRACH3 = Uplink frequency + 15,625 kHz |
| | PRACH4 = Uplink frequency + 48,875 kHz |
| m = 5 | PRACH1 = Uplink frequency – 62,50 kHz |
| | PRACH2 = Uplink frequency – 31,25 kHz |
| | PRACH3 = Uplink frequency |
| | PRACH4 = Uplink frequency + 31,25 kHz |
| | PRACH5 = Uplink frequency + 62,50 kHz |

## 8.8.3 Mapping of the downlink channels

### 8.8.3.1 Mapping of the (PDTCH/D) and PACCH/D

The PDCH where the MES may expect occurrence of its PDTCH/D(s) for a mobile-terminated transfer, or its PACCH/D for both mobile-originated and mobile-terminated transfers, are indicated in resource allocation messages (see GMPRS-1 04.060 [15]). The logical channel type shall be indicated in the message header. The messages on these channels shall address the MES by the TFI (see GMPRS-1 04.060 [15]).

PDTCH/D or PACCH/D mapped to either PDCH(4,3) or PDCH(5,3) is carried on a MAC-slot (i.e., MAC-slot 0, 1, 2, …, or 7). PDTCH/D or PACCH/D mapped to PDCH(2,6) is carried on a D-MAC-slot (i.e., D-MAC-slot 0, 1, 2, or 3).

### 8.8.3.2 Mapping of the PTCCH/D

The PTCCH/D carries signalling messages containing timing advance and frequency correction information for MESs sharing the PTCCH/U on the same PDCH.

PTCCH/D mapped to downlink PDCH(4,3) or downlink PDCH(5,3) is always carried in a fixed frame B9 of PDCH on MAC-slot 0. The location of MAC-slot 0 with respect to the downlink frame boundary is defined using the parameter MAC_FORWARD_TS_OFFSET in the system information.

PTCCH/D mapped to downlink PDCH(2,6) is always carried in a fixed frame B9 of PDCH on D-MAC-slot 0 (refer to Figure 8.14). The location of D-MAC-slot 0 with respect to the downlink frame boundary is defined using the parameter MAC_FORWARD_TS_OFFSET in the system information.

### 8.8.3.3 Mapping of the PBCCH

The use of the PBCCH is currently not defined for the GMR-1 packet data service.

### 8.8.3.4 Mapping of the PCCCH

The PCCCH and its different logical channels (PAGCH) and the PDTCH and PACCH can be mapped dynamically and are identified by the message header.

## 8.8.4 Mapping of PBCCH data

The use of the PBCCH is currently not defined for GMR-1.

### 8.8.5 Permitted combination of packet data channels

The following combinations of packet logical channels are permitted on PDCH(4,3) and PDCH(5,3).

i) PAGCH + PDTCH/D + PACCH/D + PTCCH/D on downlink.

ii) PDTCH/U + PACCH/U + PTCCH/U on uplink.

Similarly, the following combinations of packet logical channels are permitted on PDCH(1,6) and PDCH(2,6).

i) PAGCH + PDTCH/D + PACCH/D + PTCCH/D on PDCH(2,6) on downlink.

ii) PDTCH/U + PACCH/U + PTCCH/U on PDCH(1,6) on uplink.

## 8.9 Multislot configurations

A multislot configuration consists of multiple circuit or packet-switched traffic channels together with associated control channels, allocated to the same MES. The multislot configuration occupies up to eight PDCH(4,3) or PDCH(5,3) per frame. Similarly, the multislot configuration occupies up to four PDCH(2,6) or PDCH(1,6) per frame. The physical channels in a multislot configuration are with different Timeslots Numbers (TN) but with the same Absolute Radio Frequency Channel Number (ARFCN).

### 8.9.1 Multislot configurations for circuit switched connections

The use of multislot configurations for circuit-switched connections is not currently supported by GMR-1.

### 8.9.2 Multislot configurations for packet switched connections

An MES may be allocated several PDTCH/Us or PDTCH/Ds for one mobile-originated or one mobile-terminated communication, respectively. In this context, allocation refers to the list of PDCH that may dynamically carry the PDTCHs for that specific MES. The PACCH may be mapped onto any of the allocated PDCHs.

The occupied physical channels shall consist of a combination of configurations i, ii and iii, as defined in clause 8.8.5. The network shall leave a gap of at least one radio block between the old and the new configurations when the allocation is changed and the PDCHs with the lowest numbered timeslot are not the same in the old and new configurations.

# 9 Operation of channels

Same as clause 9 in GMR-1 05.002 [16].

## 9.1 PC6d and PC12u pairing

Same as clause 9.1 in GMR-1 05.002 [16].

## 9.2 Bidirectional channel timeslot assignments

Same as clause 9.2 in GMR-1 05.002 [16].

## 9.3 GBCH

Same as clause 9.3 in GMR-1 05.002 [16].

## 9.4 DKABs

Same as clause 9.4 in GMR-1 05.002 [16].

## 9.5 FCCH and CICH

Same as clause 9.5 in GMR-1 05.002 [16].

## 9.6 TACCH/2

Same as clause 9.6 in GMR-1 05.002 [16].

## 9.7 MES monitoring of paging and alerting groups

Same as clause 9.7 in GMR-1 05.002 [16].

### 9.7.1 Determination of assigned CCCH

Same as clause 9.7.1 in GMR-1 05.002 [16].

### 9.7.2 Determination of assigned paging group

Same as clause 9.7.2 in GMR-1 05.002 [16].

### 9.7.3 Determination of alerting group

Same as clause 9.7.3 in GMR-1 05.002 [16].

### 9.7.4 Determination of PCCCH_GROUP and PAGING_GROUP for MES in GMPRS attached mode

In the absence of PCCCH, CCCH shall be used in the GMPRS-attached mode for paging and access. If the determination of the specific paging multiframe and paging block index, as specified in this clause, are not supported on CCCH by both the MES and the BTS, the method defined in clauses 9.7.1 and 9.7.2 shall be used. This is negotiated at GMPRS attach.

## 9.8 MES selection of PC12U

Same as clause 9.8 in GMR-1 05.002 [16].

## 9.9 SDCCH vs. CBCH

Same as clause 9.9 in GMR-1 05.002 [16].

## 9.10 MES monitors paired CCCH for AGCH

Same as clause 9.10 in GMR-1 05.002 [16].

## 9.11 Additional air interface constraints

Same as clause 9.11 in GMR-1 05.002 [16].

# 10 BCCH parameters

Same as clause 10 in GMR-1 05.002 [16].

## 10.1 Types of BCCH parameters

Same as clause 10.1 in GMR-1 05.002 [16].

## 10.2 Information used to obtain synchronization

Same as clause 10.2 in GMR-1 05.002 [16].

## 10.3 Channel meta-information

SA_CCCH_CHANS (5 bits) Gives the total number of normal CCCHs + BCCH/CCCHs. The value can range from a minimum of 1 in very low traffic spot beams to a maximum value of 31 in the most highly congested spot beams.

SA_AGCH_CHANS (5 bits) The number of additional AGCH/CCCHs in the spot beam. The value can range from 0 to 31.

SA_PCCCH_CHANS (5 bits) This indicates the total number of PCCCHs of a supported bandwidth category and may occur more than once in a system information cycle if different bandwidths are supported.

## 10.4 Beam-configurable multichannel information

Same as clause 10.4 in GMR-1 05.002 [16].

## 10.5 Information specific to one instance of a channel

Same as clause 10.5 in GMR-1 05.002 [16].

# Annex A (normative): Multislot capability

## A.1 MES classes for multislot capability

When an MES supports the use of multiple timeslots it shall belong to a multislot class as defined in table A.1:

**Table A.1: Multislot class**

| Multislot class | Number of slots | | | Minimum number of slots | | | | Type |
|---|---|---|---|---|---|---|---|---|
| | Rx | Tx | Sum | $T_{ta}$ | $T_{tb}$ | $T_{ra}$ | $T_{rb}$ | |
| 1 | 24 (max) | 24 (max) | NA | NA | 0 | 6 | 0 | A |
| 2 | 24 (max) | 9 (avg) Note 1 | NA | NA | 0 | 0 | 0 | C |
| 3 | 24 (max) | 8 (avg) Note 2 | NA | NA | 0 | 0 | 0 | C |
| 4 | | | | | | | | reserved |
| 5 | | | | | | | | reserved |
| 6 | | | | | | | | reserved |
| 7 | | | | | | | | reserved |
| 8 | | | | | | | | reserved |
| NOTE 1: Average of 3 DMAC slots out of 8 DMAC slots yields an average of 9 transmit slots (slot = 1,667 ms) out of 24 slots.<br>NOTE 2: For example, 1-ON, 2-OFF (implying 1 DMAC slot ON followed by 2 DMAC slots OFF) transmission pattern yields an average of 8 transmit slots (slot = 1.667 ms) out of 24 slots. | | | | | | | | |

Type A MESs are required to be able to transmit and receive at the same time.

Type C MESs are not required to transmit and receive at the same time.

**Rx** Rx describes the maximum number of receive timeslots that the MES can use per TDMA frame (see table A.1). The MES must be able to support all integer values of receive TS from 0 to Rx (depending on the services supported by the MES). The receive TS need not be contiguous. For type C MES, the receive timeslots shall be allocated within window of size Rx. The network shall take into account the terminal multi-slot class and transmission capabilities into account while allocating Rx timeslots to MES (Refer to annex C).

**Tx** Tx describes the number of transmit timeslots that the MES can use per TDMA frame (see table A.1). The MES must be able to support all integer values of transmit TS from 0 to Tx (depending on the services supported by the MES). The transmit TS need not be contiguous.. The network shall take into account the terminal multi-slot class and transmission capabilities into account while allocating Tx timeslots to MES (Refer to annex C).

**Sum** Sum is the total number of uplink and downlink TS that can actually be used by the MES per TDMA frame. The MES must be able to support all combinations integer values of Rx and Tx TS where $1 \leq Rx + Tx \leq Sum$ (depending on the services supported by the MES). Sum is not applicable to all classes.

**$T_{ta}$** $T_{ta}$ relates to the time needed for the MES to perform adjacent spot-beam signal level measurement and get ready to transmit.

For circuit switched multislot configurations as defined in clause 6.4.2.1, $T_{ta}$ is not applicable.

**$T_{tb}$** $T_{tb}$ relates to the time needed for the MES to get ready to transmit. This minimum requirement will only be used when adjacent spot-beam power measurements are not required by the service selected.

It is the minimum number of timeslots that will be allowed between the end of the last transmit burst in a TDMA frame and the first transmit burst in the next TDMA frame.

**$T_{ra}$** $T_{ra}$ relates to the time needed for the MES to perform adjacent spot-beam signal level measurement and get ready to receive.

It is the minimum number of timeslots that will be allowed between the end of the last receive burst in a TDMA frame and the first receive burst in the next TDMA frame.

**$T_{rb}$** $T_{rb}$ relates to the time needed for the MES to get ready to receive. This minimum requirement will only be used when adjacent spot-beam power measurements are not required by the service selected.

It is the minimum number of timeslots that will be allowed between the end of the last receive burst in a TDMA frame and the first receive burst in the next TDMA frame.

# A.2 Constraints imposed by the service selected

The service selected will impose certain restrictions on the allowed combinations of transmit and receive timeslots. Such restrictions are not imposed by this annex but should be derived from the description of the services. For example, in the case of circuit switched data the TS numbers used in the uplink will be a subset of those used in the downlink.

The service selected will determine whether or not adjacent cell power measurements are required and therefore whether $T_{ra}$ or $T_{rb}$ is allowed for.

# A.3 Network requirements for supporting MES multislot classes

The multislot class of the MES will limit the combinations and configurations allowed when supporting multislot communication.

It is necessary for the network to decide whether requested or current multislot configuration can be supported by distant MES. If actual TA is great enough it may be necessary for network to downgrade requested resources or it may be necessary for network to downgrade current resources.

It is necessary for the network to decide whether the MES needs to perform adjacent cell power measurement for the type of multislot communication intended and whether the service imposes any other constraints before the full restrictions on TS assignments can be resolved.

# Annex B (informative): Asymmetrical pairing of PDCH/D(2,m) with PDCH/U(1,m)

The downlink 62,5 kHz PDCH carrier (carrying PDCH(2,m)) is coupled with two uplink 31,25 kHz carriers; one carrying PDCH(1,6) and the other carrying PRACH. This is shown in the following diagram. Refer to GMPRS-1 03.064 [14] [14] and GMPRS-1 04.008 [8] for description on how the network conveys the information to the MES regarding its assignment of the one downlink 62,5 kHz channel and the corresponding two 31,25 kHz uplink channels.

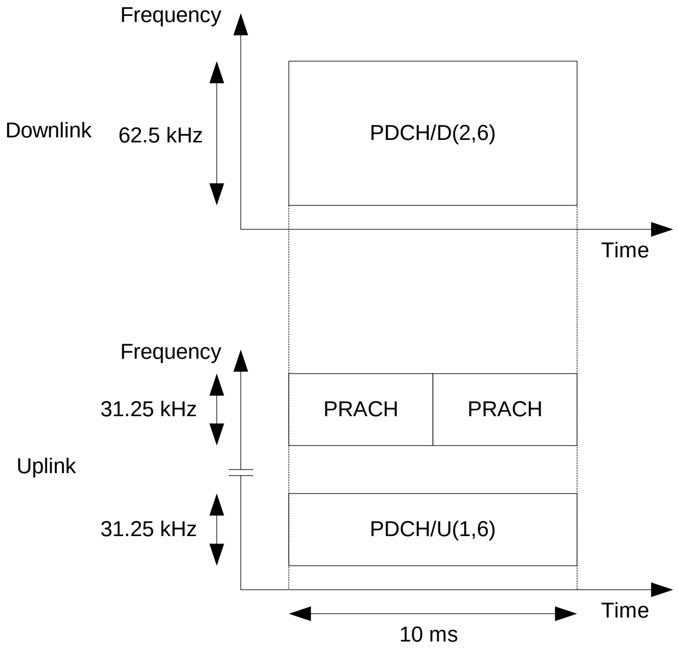



**Figure B.1: Asymmetrical Pairing of PDCH/D(2,6) with PDCH/U(1,6)**

# Annex C (normative): GMPRS Terminal Types

GMPRS supports multiple terminal types. The terminal type is determined based on the following MES attributes:

- MES RF power capability
- MES multislot class
- Types of physical channels supported
- Transmission capability
- Mode of use
- Use with a specific network infrastructure

This information is conveyed to the network in CHANNEL REQUEST TYPE-1, CHANNEL REQUEST TYPE-2 or PACKET CHANNEL REQUEST message.

Assignment of GMPRS terminal type identifier to a MES is the responsibility of the network operator.

**Table C.1: GMPRS Terminal Type Identifier**

| GMPRS terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$ | GMPRS multislot class (See annex-A) | Power class (See GMPRS 05.005 [11]) | Supported channel type(s) (See clause 5) | Transmission capability | Mode of use | Types of services supported | Packet service availability indicator used in conjunction with CELL_BAR_ACCESS |
|---|---|---|---|---|---|---|---|
| 1 0 0 0 0 0 0 | 1 | 8<br>(Terminal type A) | PDCH(5,3)<br>PDCH(4,3)<br>PRACH<br>CCCH | Full duplex | Fixed | 144 kbps GMPRS packet switched services only | CELL_BAR_ACCESS_EXTENSION |
| 1 0 0 1 0 0 0 | 1 | 8<br>(Terminal type A) | PDCH(5,3)<br>PDCH(4,3)<br>PRACH<br>CCCH | Full duplex | Fixed | 144 kbps GMPRS packet switched services only | CELL_BAR_ACCESS_EXTENSION2 |
| 0 0 0 1 0 0 1 | 2 | 1<br>(Terminal type C) | PDCH(2,6)<br>PDCH(1,6)<br>PRACH<br>CCCH<br>TCH3/6/9<br>FACCH3/6/9<br>SACCH6/9 | Half duplex | Handheld | GMR Circuit switched services and 60 kbps GMPRS packet switched services. | CELL_BAR_ACCESS_EXTENSION2 |
| 0 0 0 1 0 1 0 | 3 | 1<br>(Terminal type C) | PDCH(2,6)<br>PDCH(1,6)<br>PRACH<br>CCCH<br>TCH3/6/9<br>FACCH3/6/9<br>SACCH6/9 | Half duplex with partial burst decoding capability (see clause 7.4.13) | Handheld | GMR Circuit switched services and 60 kbps GMPRS packet switched services. | CELL_BAR_ACCESS_EXTENSION2 |
| All other values are reserved | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

# Annex D (informative):<br>Bibliography


- GMR-1 03.022 (ETSI TS 101 376-3-10): "GEO-Mobile Radio Interface Specifications;
  Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth station (MES) in idle mode".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 04.003 (ETSI TS 101 376-4-3): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 3: Channel Structures and Access Capabilities".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 04.006 (ETSI TS 101 376-4-6): "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 6: Mobile earth Station-Gateway Station Interface Data Link Layer Specifications".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 05.005 (ETSI TS 101 376-5-5): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 05.008 (ETSI TS 101 376-5-6): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 05.003 (ETSI TS 101 376-5-3): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 05.004 (ETSI TS 101 376-5-4): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

- GMR-1 05.010 (ETSI TS 101 376-5-7): "GEO-Mobile Radio Interface Specifications; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

# History

| Document history | | |
|---|---|---|
| V2.1.1 | March 2003 | Publication |
| V2.2.1 | March 2005 | Publication |
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