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GEO-Mobile Radio Interface Specifications (Release 3);
Third Generation Satellite Packet Radio Service;
Part 5: Radio interface physical layer specifications;
Sub-part 2: Multiplexing and Multiple Access;
Stage 2 Service Description;
GMR-1 3G 45.002

Reference

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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Foreword

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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 3); Third Generation Satellite 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 3 specifications. Release 3 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).
- Release 3 specifications have a GMR-1 3G prefix in the title and a version number starting with "3" (V3.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.

The GMR release 3 specifications evolve packet mode services of GMR release 2 to 3rd generation UMTS compatible services. The GMR release 3 specifications introduce the GEO-Mobile Radio Third Generation (GMR-1 3G) service. Where applicable, GMR-1 3G is derived from the terrestrial digital cellular standard 3GPP and it supports access to 3GPP core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM or 3GPP standard are necessary. Some GSM and 3GPP specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM and 3GPP specifications do not apply, while some GMR specifications have no corresponding GSM or 3GPP specification.

Since GMR is derived from GSM and 3GPP, the organization of the GMR specifications closely follows that of GSM or 3GPP as appropriate. The GMR numbers have been designed to correspond to the GSM and 3GPP numbering system. All GMR specifications are allocated a unique GMR number. This GMR number has a different prefix for Release 2 and Release 3 specifications as follows:

- Release 1: GMR n xx.zyy.
- Release 2: GMPRS n xx.zyy.
- Release 3: GMR-1 3G xx.zyy.

where:

- xx.0yy (z = 0) is used for GMR specifications that have a corresponding GSM or 3GPP specification. In this case, the numbers xx and yy correspond to the GSM or 3GPP numbering scheme.
- xx.2yy (z = 2) is used for GMR specifications that do not correspond to a GSM or 3GPP specification. In this case, only the number xx corresponds to the GSM or 3GPP 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 and 3GPP specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM or 3GPP specification (if any). This precedence rule applies to any references in the corresponding GSM or 3GPP specifications.

NOTE: Any references to GSM or 3GPP 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 or 3GPP specification.

- If a GMR specification does not exist, the corresponding GSM or 3GPP specification may or may not apply. The applicability of the GSM or 3GPP specifications is defined in TS 101 376-1-2 [2].

1 Scope

The present document defines the structure of the physical channels for the radio subsystem in the GMR-1 3G Mobile Satellite System. It describes the GMR-1 3G 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

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest release and the latest version of that document up to and including Release 7.

In the case of a reference to a GMR-1 3G document, a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 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; GMPRS-1 01.004".

NOTE: This is a reference to a GMR-1 Release 2 specification. See the introduction for more details.

[2] ETSI TS 101 376-1-2: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 1: General specifications; Sub-part 2: Introduction to the GMR-1 family; GMR-1 3G 41.201".

[3] ETSI TS 101 376-4-8: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications; GMR-1 3G 44.008".

[4] ETSI TS 101 376-5-3: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding; GMR-1 3G 45.003".

[5] ETSI TS 101 376-5-4: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 4: Modulation; GMR-1 3G 45.004".

[6] ETSI TS 101 376-5-5: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception; GMR-1 3G 45.005".

[7] ETSI TS 101 376-5-7: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization; GMR-1 3G 45.010".

[8] ETSI TS 101 376-3-22: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 22: Overall description of the GMPRS radio interface; Stage 2; GMR-1 3G 43.064".

[9] ETSI TS 101 376-4-12: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite 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; GMR-1 3G 44.060".

[10] 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; Sub-part 2: Multiplexing and Multiple Access; Stage 2 Service Description; GMR-1 05.002".

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

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 101 376-1-2 [2] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TS 101 376-1-1 [1] apply.

4 General

Same as clause 4 in TS 101 376-5-2 [10].

5 Logical channels

5.1 General

Same as clause 5.1 in TS 101 376-5-2 [10].

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 TS 101 376-5-2 [10].

5.2.3 Data traffic channels

Same as clause 5.2.3 in TS 101 376-5-2 [10].

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 Fax: 2 kbps, 4 kbps or 4,8 kbps	11,70 kbps (= 46,8 / 8 x 2)
TCH9	User data: 9,6 kbps Fax: 2 kbps, 4 kbps, 4,8 kbps, or 9,6 kbps	17,55 kbps (= 46,8 / 8 x 3)

5.2.5 Packet Data Traffic CHannels (PDTCH) (A/Gb mode only)

The following Packet Data Traffic CHannels (PDTCH) apply to A/Gb mode.

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 $\pi/2$-BPSK, $\pi/4$-QPSK,16 APSK, or 32 APSK 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. PDTCH and PDTCH2 traffic data channels may be multiplexed on the same physical carrier.

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, $m \times 31{,}25$ 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, PDTCH (m, 6), (m = 1, 2), where the burst duration is 10 ms, and PDTCH (m, 12), (m = 5), where the burst duration is 20 ms.

Table 5.2: Packet Traffic Data Channels (Peak Transmission Rates)

Channels	Direction (U: Uplink, D: Downlink)	Transmission symbol rate (ksps)	Channel Coding	Modulation	Peak payload transmission rate (without CRC) (kbps)	Peak payload transmission rate (with CRC) (kbps)
PDTCH(4,3)	U/D	93,6	Conv.	π/4-QPSK	113,6	116,8
PDTCH(5,3)	U/D	117,0	Conv.	π/4-QPSK	145,6	148,8
PDTCH(1,6)	U	23,4	Conv.	π/4-QPSK	27,2	28,8
PDTCH(2,6)	D	46,8	Conv.	π/4-QPSK	62,4	64,0
PDTCH2(5,12)	D	117,0	LDPC	π/4-QPSK	199,2	199,6
PDTCH2(5,12)	D	117,0	LDPC	16-APSK	354,8	355,2
PDTCH2(5,12)	D	117,0	LDPC	32-APSK	443,6	444,0
PDTCH2(5,12)	U	117,0	LDPC	π/4-QPSK	199,2	199,6
PDTCH2(5,12)	U	117,0	LDPC	16-APSK	399,2	399,6
PDTCH2(5,3)	U/D	117,0	LDPC	π/4-QPSK	169,6	171,2
PDTCH2(5,3)	U/D	117,0	LDPC	16-APSK	342,4	344,0
PDTCH2(5,3)	U/D	117,0	LDPC	32-APSK	380,8	382,4

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). The peak rates of LDPC coded PDTCH2(5,12) and LDPC coded PDTCH2(5,3) are achieved for different modulation schemes with the following coding rate combinations:

- Downlink: 32 APSK Rate 4/5, 16 APSK Rate 4/5, π/4-QPSK Rate 9/10.
- Uplink: 16 APSK Rate 9/10, π/4-QPSK Rate 9/10.

NOTE: All the above coding rates are approximate rates. Refer to TS 101 376-5-3 [4] for the exact coding rates.

5.2.5a Packet Data Traffic Channels (PDTCH3) (Iu mode only)

The following Packet Data Traffic Channels3 (PDTCH3) apply to Iu mode.

A PDTCH3 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 PDTCH3. The PDTCH3 uses π/2-BPSK, π/4-QPSK,16 APSK, or 32 APSK modulation. All packet data traffic channels are unidirectional, either uplink (PDTCH3/U), for a mobile-originated packet transfer or downlink (PDTCH3/D) for a mobile-terminated packet transfer. PDTCH3 may not be multiplexed with PDTCH and PDTCH2 on the same physical carrier.

PDTCH3s are used to carry packet data traffic. Different PDTCH3s are defined by the suffix (m,n) where m indicates the bandwidth of the physical channel in which the PDTCH3 is mapped, m × 31,25 kHz, and n defines the number of timeslots allocated to this physical channel. Table 5.3 summarizes different types of packet traffic data channels, PDTCH3(m, 3), (m = 1, 5 and 10), where the burst duration is 5 ms, PDTCH3(m, 6), (m = 1, 2), where the burst duration is 10 ms, and PDTCH3(m, 12), (m = 5), where the burst duration is 20 ms.

Table 5.3: Packet Traffic Data Channels (Peak Transmission Rates)

Channels	Direction (U: Uplink, D: Downlink)	Transmission symbol rate (ksps)	Channel Coding	Modulation	Peak payload transmission rate (without CRC) (kbps)	Peak payload transmission rate (with CRC) (kbps)
PDTCH3(1,6)	U/D	23,4	Conv.	π/4-QPSK	27,2	28,8
PDTCH3(2,6)	U/D	46,8	Conv.	π/4-QPSK	62,4	64,0
PDTCH3(2,6)	U/D	46,8	Turbo	π/4-QPSK	62,4	64,0
PDTCH3(5,3)	U/D	117,0	Turbo	π/4-QPSK	156,8	160,0
PDTCH3(5,3)	D	117,0	Turbo	16-APSK	252,8	256,0
PDTCH3(5,12)	U/D	117,0	Turbo	π/4-QPSK	185,2	186,0
PDTCH3(5,12)	U/D	117,0	Turbo	16-APSK	256,8	258,4
PDTCH3(5,12)	D	117,0	Turbo	16-APSK	294,4	296,0
PDTCH3(10,3)	D	234,0	Turbo	π/4-QPSK	344,0	347,2
PDTCH3(10,3)	D	234,0	Turbo	16-APSK	587,2	590,4

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 4/5 for PDTCH3(1,6) and PDTCH3(2,6). The peak rates of Turbo coded PDTCH3(5,12) and PDTCH3(5,3) are achieved for different modulation schemes with the following coding rate combinations:

- Downlink: 16 APSK Rate 2/3, π/4-QPSK Rate 5/6.
- Uplink: 16 APSK Rate 4/7, π/4-QPSK Rate 5/6.

The peak rates of Turbo coded PDTCH3(10,3) are achieved for different modulation schemes with the following coding rate combinations:

- Downlink: 16 APSK Rate 2/3, π/4-QPSK Rate 5/6.

5.2.6 Packet Mode Dedicated Channels (Iu mode only)

The following Packet Mode Dedicated CHannels apply to Iu mode.

A Dedicated Traffic Channel (DTCH) is used to carry user traffic when a dedicated channel (DCH) is allocated to the terminal in packet dedicated mode. A DTCH is unidirectional. DTCH/U is used for the uplink and a DTCH/D is used for the downlink. A DTCH may support either 2,45 kbps or 4,0 kbps encoded speech.

Table 5.4: Dedicated Traffic Channels (Peak Transmission Rates)

Channels	Direction (U: Uplink, D: Downlink)	Transmission symbol rate (ksps)	Channel Coding	Modulation	Transmission bandwidth (kHz)	Peak payload transmission rate (without CRC) (kbps)	Peak payload transmission rate (with CRC) (kbps)
DTCH(1,3)	U/D	23,4	Conv.	π/4-QPSK	31,25	28,8	32,0
DTCH(1,6)	U/D	23,4	Conv.	π/2-BPSK	31,25	14,4	16,0
DTCH(1,6)	U/D	23,4	Conv.	π/4-QPSK	31,25	8,8	10,4
DTCH(1,8)	U/D	23,4	Conv.	π/2-BPSK	31,25	10,8	12,0

5.3 Control channels

5.3.1 General

Same as clause 5.3.1 in TS 101 376-5-2 [10].

5.3.2 Broadcast channels

5.3.2.1 Frequency Correction CHannel (FCCH)

Same as clause 5.3.2.1 in TS 101 376-5-2 [10] with the following additional text:

The FCCH may be broadcast using the FCCH burst or the FCCH3 burst.

5.3.2.2 GPS Broadcast control CHannel (GBCH)

Same as clause 5.3.2.2 in TS 101 376-5-2 [10] with the following additional text:

The GBCH shall be broadcast using the DC6 burst. The GBCH3 contains the same information as the GBCH but is formatted to fit a DC12 burst structure. Different channel codings are used for GBCH and GBCH3, as described in TS 101 376-5-3 [4].

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 TS 101 376-4-8 [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.

Whenever the FCCH3 is present on the downlink, the BCCH shall be broadcast using the DC12 burst structure. Different channel codings are used for BCCH when it is transmitted over DC12, as described in TS 101 376-5-3 [4].

5.3.3 Common Control Channel (CCCH)

Same as clause 5.3.3 in TS 101 376-5-2 [10] with the following additional text.

The CCCH shall be transmitted using the DC6 burst when the FCCH burst is transmitted in the spot beam and the DC12 burst when the FCCH3 is used. Different channel codings are used for CCCH when it is transmitted over DC12, as described in TS 101 376-5-3 [4].

Whenever the FCCH3 is present on the downlink, the BACH shall be broadcast using the BACH3 burst structure.

5.3.4 Dedicated control channels

Same as clause 5.3.4 in TS 101 376-5-2 [10].

5.3.5 Cell Broadcast CHannel (CBCH)

The Cell Broadcast CHannel (CBCH) is downlink only and used to broadcast Short Message Service Cell Broadcast (SMSCB) information to MESs on a per-spot beam basis.

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.

4) Dedicated Associated Control Channel (DACCH): The DACCH is unidirectional. For description purposes DACCH/U is used for the uplink and DACCH/D is used for the downlink. The DACCH is used to transmit dedicated associated control signalling when a terminal is allocated a DCH.

6 The physical resource

6.1 General

Same as clause 6.1 in TS 101 376-5-2 [10].

6.2 Radio frequency channels

6.2.1 Spot beam allocation

Same as clause 6.2.1 in TS 101 376-5-2 [10].

6.2.2 Downlink and uplink

Same as clause 6.2.2 in TS 101 376-5-2 [10].

6.3 Timeslots and TDMA frames

6.3.1 General

Same as clause 6.3.1 in TS 101 376-5-2 [10].

6.3.2 Timeslot number

Same as clause 6.3.2 in TS 101 376-5-2 [10].

6.3.3 TDMA frame number

Same as clause 6.3.3 in TS 101 376-5-2 [10].

7 Bursts

7.1 General

Same as clause 7.1 in TS 101 376-5-2 [10], with the following additions. Tables 7.1 to 7.19 in TS 101 376-5-2 [10] apply to the appropriate bursts described the present document.

The physical channel burst for PDCH(m,n) is denoted as a Packet Normal Burst, PNB(m,n) or PNB2(m,n). The physical channel burst for the PDCH3(m,n) is denoted as the PNB3(m,n). The exception to this rule is the PNB(1,6) burst which may be used in the uplink only of the PDCH(1,6) and both the downlink and the uplink for a PDCH3(1,6). 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, for m = 1 and 2, n = 6, and for m = 5, n = 12.

The PNB(m,n), PNB2(m,n) and PNB3(m,n) bursts may be n = 3, 6, 8or 12 timeslots long. The burst data is modulated either using π/4-QPSK, 16 APSK, or 32 APSK modulation, which maps two, four and five bits to one symbol, respectively. For additional details concerning the modulation of PNB(m,n), PNB2(m,n) and PNB3(m,n) bursts, see TS 101 376-5-4 [5].

The physical channel burst for PRACH is denoted as Packet Access Burst (PAB). The physical channel burst for PRACH3 is denoted as Packet Access Burst3 (PAB3). Both the PAB and the PAB3 are 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 × *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 either HSN 5 × *m* or with HSN 5. Table 7.0 lists the useful duration for different packet normal bursts.

Table 7.0: Useful Duration For Different Packet Normal Burst Types

Burst	Direction	Beginning HSN	Useful Durations in Half-Symbol Periods
PNB(1,6)	U/D	5	458
PNB(2,6)	D	5	926
PNB(4,3)	U/D	5 x m	896
PNB(5,3)	U/D	5 x m	1 120
PNB2(5,3)	U/D	5 x m	1 120
PNB2(5,12)	U/D	5 x m	4 630
PNB3(1,3)	U/D	5	224
PNB3(1,6)	U/D	5	458
PNB3(1,8)	U/D	5	614
PNB3(2,6)	U	5 x m	916
PNB3(2,6)	D	5	926
PNB3(5,3)	U	5 x m	1 120
PNB3(5,3)	D	5	1 160
PNB3(5,12)	U	5 x m	4 630
PNB3(5,12)	D	5	4 670
PNB3(10,3)	D	5	2 330

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 either 5 × m or 5 half-symbol periods before its useful duration, and a similar guard period with a duration of 5 × m or 5 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.

The PNB3(1,3) PNB3(1,6) and the PNB3(1,8) contain different unique word patterns to distinguish between speech and data. Data can be either user data or control signalling.

7.4 Types of bursts

Same as clause 7.4 in TS 101 376-5-2 [10].

7.4.1 BACH burst

Same as clause 7.4.1 in TS 101 376-5-2 [10].

7.4.1.1 BACH3 burst

The BACH3 burst format, which occupies six timeslots, is modulated with $\pi/2$ BPSK modulation and contains the information shown in table 7.1a. The BACH3 burst contains three BACH3 sequences of length 76.

Table 7.1a: BACH3 burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 156	152	BACH3 sequence S_j
157 to 308	152	BACH3 sequence S_l
309 to 460	152	BACH3 sequence S_m
461 to 462	2	Idle bits
463 to 467	5	Guard period in half symbols

For additional details concerning the modulation of the BACH3 bursts and BACH3 sequences S_j, S_l, S_m, see TS 101 376-5-4 [5].

7.4.2 BCCH burst

Same as clause 7.4.2 in TS 101 376-5-2 [10].

7.4.3 CICH burst

Same as clause 7.4.3 in TS 101 376-5-2 [10].

7.4.4 DC2 burst

Same as clause 7.4.4 in TS 101 376-5-2 [10].

7.4.5 DC6 burst

Same as clause 7.4.5 in TS 101 376-5-2 [10].

7.4.6 DKAB bursts

Same as clause 7.4.6 in TS 101 376-5-2 [10].

7.4.6.1 KAB3 burst

The keep-alive bursts (KAB3s) burst for three, six, and eight-slot dedicated traffic channels (DTCH(1,3), DTCH(1,6), and DTCH(1,8)) are KAB3(1,3), KAB3(1,6), and KAB3(1,8), respectively. KAB3(1,3), KAB3(1,6) and KAB3(1,8) are all $\pi/2$ binary phase-shift keying (BPSK) modulated. Note that for $\pi/2$ BPSK modulation, two half-symbols only transfer one bit of information. The KAB3(1,3), KAB3(1,6) and KAB3(1,8) burst definitions and UW patterns are listed in tables 7.7a, 7.7b and 7.7c, respectively.

Table 7.7a: KAB3(1,3) burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Idle bits (No signals)
21 to 36	16	Unique word; [0 0 1 1 0 1 1 0]
37 to 44	8	Encoded bits e0 to e3
45 to 190	146	Idle bits (No signals)
191 to 198	8	Encoded bits e4 to e7
199 to 212	14	Unique word; [1 1 1 0 1 0 0]
213 to 228	16	Idle bits (No signals)
229 to 233	5	Guard period in half symbols

Table 7.7b: KAB3(1,6) burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Idle bits (No signals)
21 to 40	20	Unique word; [0 1 0 1 0 1 1 0 1 0]
41 to 48	8	Encoded bits e0 to e3
49 to 214	166	Idle bits (No signals)
215 to 222	8	Encoded bits e4 to e7
223 to 244	22	Unique word; [0 0 1 1 0 1 0 1 0 0 1]
245 to 252	8	Encoded bits e8 to e11
253 to 418	166	Idle bits (No signals)
419 to 426	8	Encoded bits e12 to e15
427 to 446	20	Unique word; [0 1 0 1 0 1 1 0 1 0]
447 to 462	16	Idle bits (No signals)
463 to 467	5	Guard period in half symbols

Table 7.7c: KAB3(1,8) burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Idle bits (No signals)
21 to 36	16	Unique word; [1 0 0 1 0 0 1 1]
37 to 44	8	Encoded bits e0 to e3
45 to 292	248	Idle bits (No signals)
293 to 300	8	Encoded bits e4 to e7
301 to 322	22	Unique word; [0 0 1 1 0 1 0 1 0 0 1]
323 to 330	8	Encoded bits e8 to e11
331 to 578	248	Idle bits (No signals)
579 to 586	8	Encoded bits e12 to e15
587 to 602	16	Unique word; [1 0 0 1 0 0 1 1]
603 to 618	16	Idle bits (No signals)
619 to 623	5	Guard period in half symbols

7.4.7 FCCH burst

Same as clause 7.4.7 in TS 101 376-5-2 [10].

7.4.7.1 FCCH3 burst

The FCCH3 burst occupies twelve timeslots, and it has the format shown in table 7.8a.

Table 7.8a: FCCH3 burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 930	926	Chirp modulation
931 to 935	5	Guard period in half symbols

For additional details concerning the modulation of the FCCH3 bursts, see TS 101 376-5-4 [5].

7.4.8 NT3 burst

Same as clause 7.4.8 in TS 101 376-5-2 [10].

7.4.8.1 NT3 burst for encoded speech

Same as clause 7.4.8.1 in TS 101 376-5-2 [10].

7.4.8.2 NT3 burst for FACCH

Same as clause 7.4.8.2 in TS 101 376-5-2 [10].

7.4.9 NT6 burst

Same as clause 7.4.9 in TS 101 376-5-2 [10].

7.4.10 NT9 burst

Same as clause 7.4.10 in TS 101 376-5-2 [10].

7.4.11 RACH burst

Same as clause 7.4.11 in TS 101 376-5-2 [10].

7.4.11.1 RACH3 burst

The RACH3 burst has a total duration of nine timeslots. The burst is π/2 BPSK modulated including UW and CW. Two half-symbols only transfer one bit of information. The burst format is as shown in table 7.17a.

Table 7.17a: RACH3 Burst definition and UW Patterns

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 50	46	Unique word [0,0,0,0,0,1,0,1,0,0,1,1,0,0,1,1,0,1,0,1,1,1,1]
51 to 222	172	Encoded bits e0 to e85
223 to 306	84	CW (coded as all 1 bits)
307 to 394	88	Encoded bits e86 to e129
395 to 478	84	CW (coded as all 1 bits)
479 to 650	172	Encoded bits e130 to e215
651 to 696	46	Unique word [0,0,0,0,0,1,0,1,0,0,1,1,0,0,1,1,0,1,0,1,1,1,1]
697 to 701	5	Guard period in half symbols

7.4.12 SDCCH burst

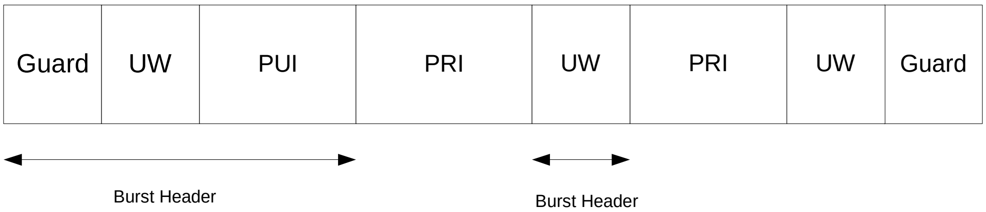
Same as clause 7.4.12 in TS 101 376-5-2 [10].

7.4.13 Packet Normal Bursts (PNB)

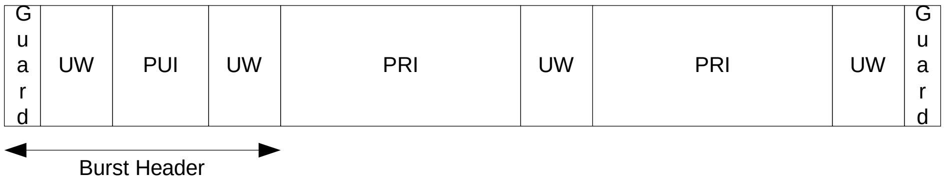
The Packet Normal Bursts (PNB) comprises of two parts.

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) and PNB2(m,n) is shown in figure 7.1 and for PNB3(m,n) is shown in figures 7.2 and 7.3. Refer to clauses 7.4.13.1 to 7.4.13.3 for a description on the different parts of PNB(m,n) and PNB2(m,n) shown in figure 7.1 and PNB3(m,n) shown in figures 7.2 and 7.3.

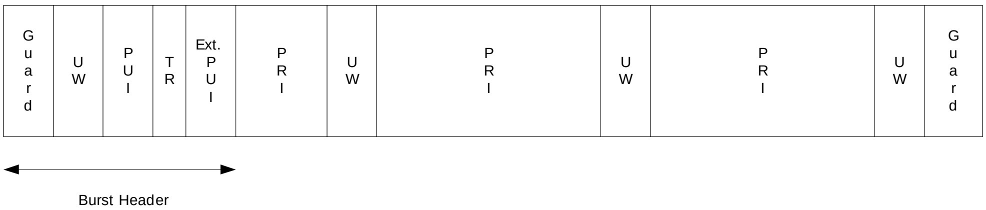
(a) Convolutionally coded PNB(4,3) and PNB(5,3) Downlink/Uplink



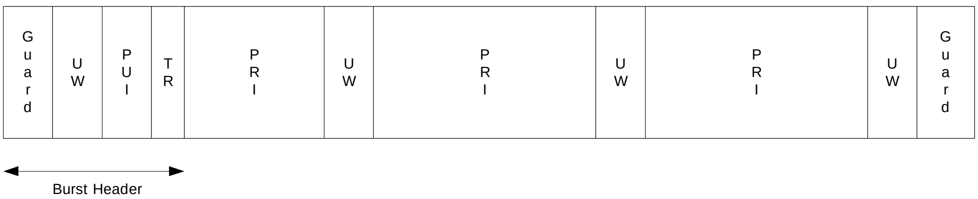
(b) PNB(1,6) Downlink/Uplink



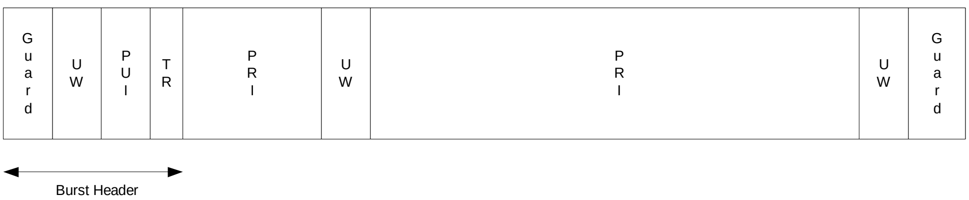
(c) PNB(2,6) Downlink



(d) LDPC coded PNB2(5,12) Downlink



(e) LDPC coded PNB2(5,12) Uplink



(f) LDPC coded PNB2(5,3) Downlink/Uplink

Figure 7.1: Burst header and PRI within PNB(m,n) and PNB2(m,n)

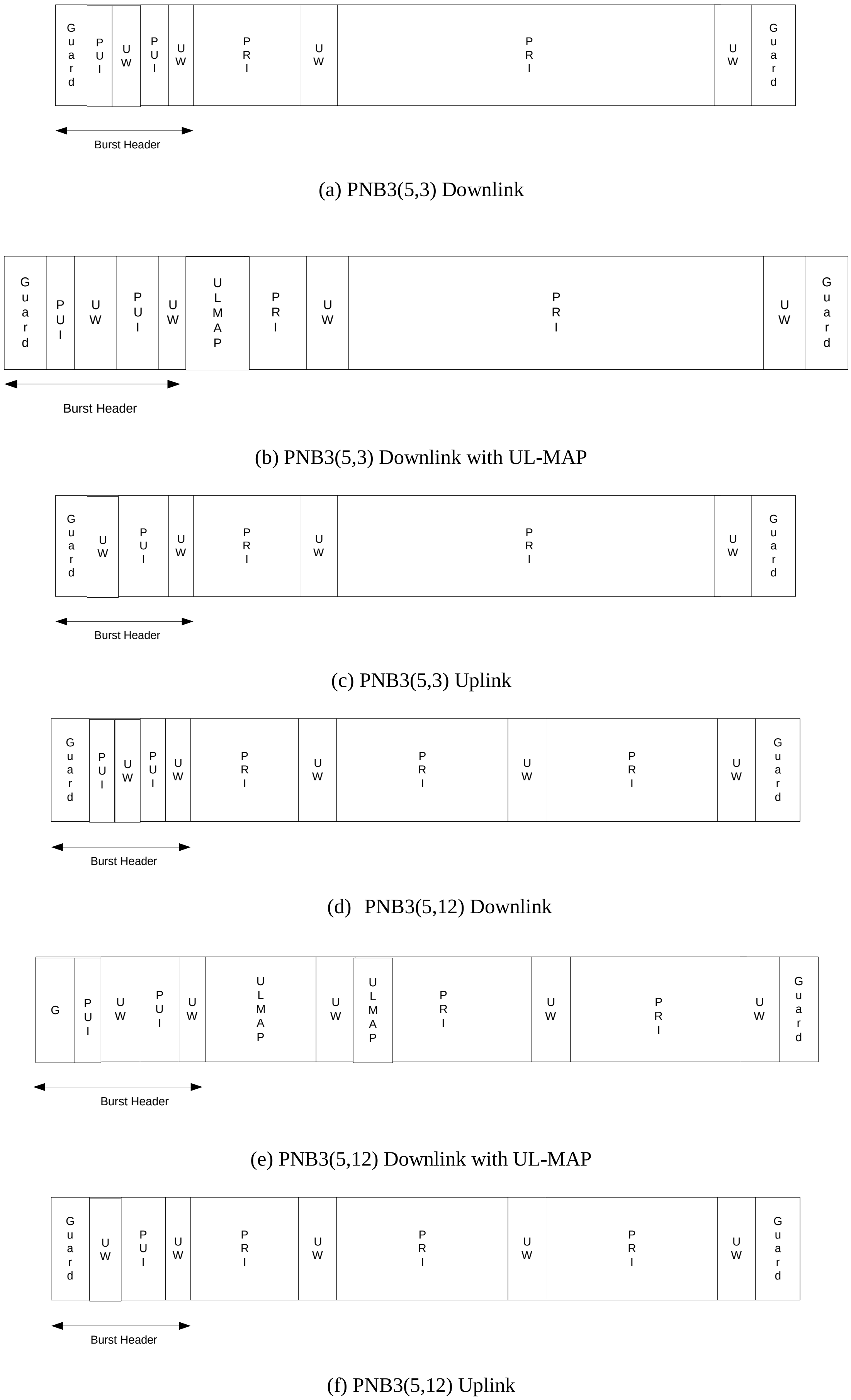
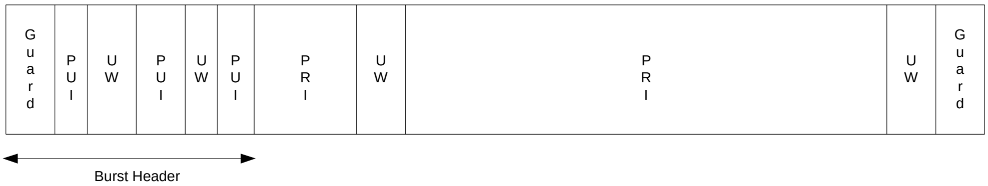
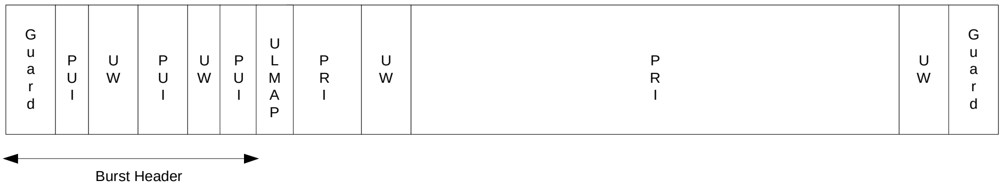


Figure 7.2: Burst header and PRI within PNB3(m,n)

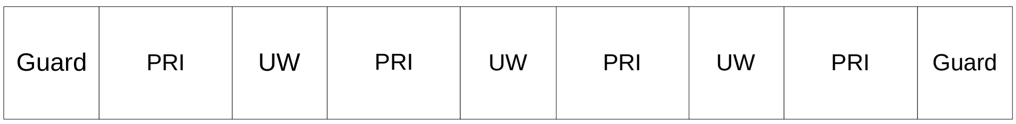


(a) PNB3(10,3) Downlink

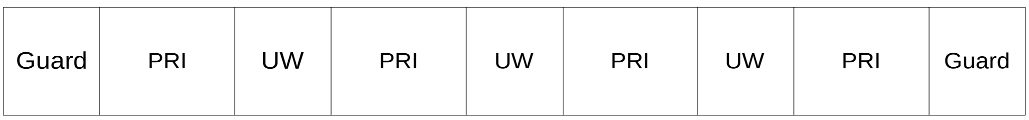


(b) PNB3(10,3) Downlink with UL-MAP

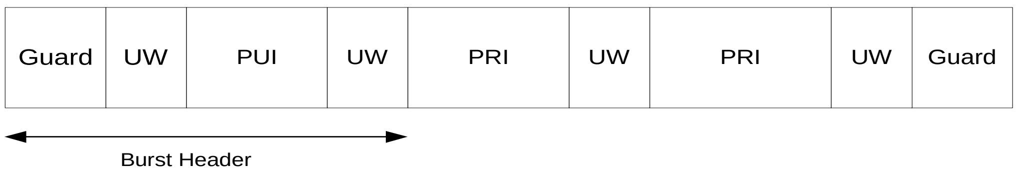
(c) PNB3(1,3) Downlink/Uplink



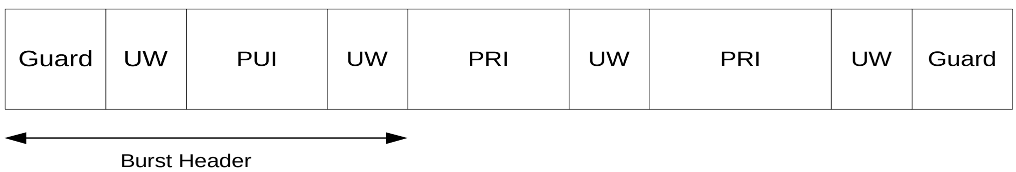
(d) PNB3(1,6) Downlink/Uplink



(e) PNB3(1,8) Downlink/Uplink



(f) PNB3(2,6) Downlink



(g) PNB3(2,6) Uplink

Figure 7.3: Burst header and PRI within PNB3(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 TS 101 376-5-5 [6]) 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 TS 101 376-5-7 [7] and TS 101 376-4-12 [9] for further description.

An MES of terminal types E and above which do not support full duplex operation shall be able to transmit an uplink PNB(1,6) or PNB3(m,n) immediately after RX-TX switching time (see TS 101 376-5-5 [6]) from the reception of the last symbol of the burst header of downlink PNB3(m,n) including ULMAP if any. Consequently, an MES of terminal type E and above which do not support full duplex operation shall be capable of decoding and interpreting the burst header received prior to this transmission on uplink PNB3(m,n) or PNB(1,6). See also TS 101 376-5-7 [7] and TS 101 376-4-12 [9] for further description.

Similarly, MES operating in Iu-PS mode that do not support full duplex operation shall be capable of detecting the presence or absence of PUI in the received portion of the downlink burst. If the MES determines that it has not received the PUI in the downlink portion of the burst, it shall disregard the received burst portion, and shall attempt to receive the PUI in the subsequent reception window. The following is an example scenario where a half-duplex MES might not receive PUI in the received portion of the downlink burst: Suppose a half duplex MES transmits on the uplink and after TX-RX switching time after the last symbol has been transmitted it starts to listen to downlink burst. The time at which the MES starts to listen to downlink burst might be such that it has just missed the PUI part of a 20 ms downlink burst. Given that the MES is unaware whether the network transmitted a 5 ms, 10 ms or 20 ms downlink burst, the MES attempts to decode a PUI at every 5 ms boundary. Given that a 20 ms downlink burst was in progress at the time of switching to downlink, there will not be a PUI at 5 ms intervals where the MES is attempting to decode PUI. If the MES blindly attempted to decode a PUI without a PUI detection hypothesis, it could incorrectly infer that an uplink allocation has been granted to it and therefore collide on uplink with a legitimate uplink transmission of a different user. A PUI detection hypothesis is therefore necessary to determine presence or absence of a PUI in downlink in such scenarios.

7.4.13.1 Burst header

The burst header of the PNB(m,n) is modulated using π/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) or PNB2(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.

PNB3(1,3), PNB3(1,6), PNB3(1,8) have 5 guard bits at the beginning of the burst and 5 guard bits at the end of the burst.

PNB3(5,3) and PNB3(5,12) uplink burst have 25 guard bits at the beginning of the burst (as a part of the burst header) and 25 guard bits at the end of the burst.

PNB3(5,3) and PNB3(5,12) downlink burst have 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.

PNB3(10,3) 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 convolutionally coded PNB(m,3), m = 4 or 5.

The burst header of PNB2(5,12) has total of 50 bits of UW. There are additional 82 bits of UW within the PRI portion of PNB(5,12). The burst header of PNB2(5,3) has total of 50 bits of UW. There are additional 54 bits of UW within the PRI portion of PNB2(5,3).

The burst header of PNB3(5,12) has total of 60 bits of UW. There are additional 82 bits of UW within the PRI portion of PNB3(5,12). The burst header of PNB3(5,3) has total of 60 bits of UW. There are additional 54 bits of UW within the PRI portion of PNB3(5,3).

The burst header of PNB3(10,3) has total of 60 bits of UW. There are additional 54 bits of UW within the PRI portion of PNB3(10,3).

PNB3(1,3) has a total of 30 bits of UW except KAB3(1,3), which is π/2-BPSK modulated and has 15 bits of UW. PNB3(1,6) 2,45 kbps has a total of 31 bits of UW, PNB3(1,6) 4,0 kbps has a total of 62 bits of UW and PNB3(1,8) has a total of 27 bits of UW. Note that, for PNB3(1,3) 2,45 kbps and 4,0 kbps and PNB3(1,6) 4,0 kbps, the unique words are QPSK modulated and there is no extra π/4-rotation, although the payload portion of the burst is π/4-QPSK modulated. For KAB3(1,3), PNB3(1,6) 2,45 kbps voice/data, KAB3(1,6), PNB3(1,8) 4,0 kbps voice/data, and KAB3(1,8) bursts, the modulation scheme is identical for both payload and unique words, which is π/2-BPSK.

The UW is modulated with π/4-QPSK or QPSK for PNBs with payload modulated with 16 APSK and 32 APSK, the amplitude of all the UW will be equivalent to the amplitude of the outermost constellation of each payload modulation scheme. For the UW within the PRI portion of the PNB2(5,3), PNB3(5,3), PNB2(5,12), PNB3(5,12), and PNB3(10,3), a constant π/4 phase shift is performed across QPSK modulated UW, instead of π/4 QPSK modulation. In the transmission of the π/4-QPSK PNB2(5,12) and PNB2(5,3) with rate ½ LDPC coded payload, the amplitude of the UW symbols will be 2,04 dB (i.e. amplitude of 1,2658) higher than the payload amplitude. In the transmission of the downlink π/4-QPSK PNB3(5,12), PNB3(5,3), and PNB3(10,3) with rate ½ Turbo coded payload, the amplitude of the UW symbols will be 1,02 dB (i.e. amplitude of 1,125) higher than the payload amplitude.

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. The size of downlink PUI3 that is transmitted over PNB3(5,3) is 32 bits (including 3 bit CRC), and the size of the encoded PUI3 is 128 bits. The size of downlink PUI3 that is transmitted over PNB3(5,12) is 80 bits (including 3 bit CRC), and the size of the encoded PUI3 is 320 bits. The size of downlink PUI3 that is transmitted over PNB3(10,3) is 64 bits (including 3 bit CRC), and the size of the encoded PUI3 is 256 bits. Refer to TS 101 376-4-12 [9] for detailed description of PUI and PUI3. The detailed description of the PUI coding is in TS 101 376-5-3 [4].

In addition to the PUI, the burst PNB2(5,12) in the down link has an extended PUI. The size of the downlink extended PUI is 30 bits. The size of encoded PUI is 96 bits. Refer to TS 101 376-4-12 [9] for detailed description of PUI. The detailed description of the extended PUI coding is in TS 101 376-5-3 [4].

The amplitude of both PUI and extended PUI will be equivalent to the amplitude of the outermost constellation of each payload modulation scheme. In the transmission of the π/4-QPSK PNB2(5,12) and PNB2(5,3) with rate 1/2 LDPC coded payload, the amplitude of PUI and extended PUI symbols will be 2,04 dB (i.e. amplitude of 1,2658) higher than the payload amplitude. In the transmission of the downlink π/4-QPSK PNB3(5,12), PNB3(5,3), and PNB3(10,3) with rate 1/2, the amplitude of PUI3 will be 1,02 dB (i.e. amplitude of 1,125) higher than the payload amplitude.

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). PNB2(5,12) downlink has m symbols for transition between the PUI and the extended PUI.

The amplitude of transition symbols will be equivalent to the amplitude of the outermost constellation of each payload modulation scheme. In the transmission of the π/4-QPSK PNB2(5,12) and PNB2(5,3) with rate 1/2 LDPC coded payload, the amplitude of the transition symbols will be 2,04 dB (i.e. amplitude of 1,2658) higher than the payload amplitude.

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 either π/4-QPSK, 16 APSK or 32 APSK.

The PRI includes the MAC layer header. Refer to TS 101 376-4-12 [9] 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.

The PRI in PNB2(5,12) and PNB2(5,3) is encoded with LDPC. The channel coding rate is variable for each modulation scheme.

The PRI in PNB3(2,6), PNB3(5,12), PNB3(5,3), and PNB3(10,3) is encoded with Turbo Code. The channel coding rate is variable for each modulation scheme. In the downlink, PNB3(5,12), PNB3(5,3), and PNB3(10,3) may carry ULMAP (Uplink MAP) in a burst. In such case, the beginning portion of the PRI is replaced with ULMAP. Different coding will be applied to ULMAP and PRI, as described in TS 101 376-5-3 [4].

For further description of the modulation and channel coding schemes for the Public Information (PUI) field, the extended Public Information (PUI) field and the Private Information (PRI) bits, refer to TS 101 376-5-4 [5] and TS 101 376-5-3 [4], respectively.

7.4.13.3 Formats of packet normal burst

This clause specifies different PNB(m,n), PNB2(m,n) and PNB3(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 7.20.

Table 7.20: 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 7.21.

Table 7.21: 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 7.22.

Table 7.22: 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 7.23.

Table 7.23: 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 7.24.

Table 7.24: 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 7.25.

Table 7.25: 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 (HSN227, HSN228 …HSN242)
(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 7.26.

Table 7.26: 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 7.27.

Table 7.27: 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)

7.4.13.3.6 LDCP coded PNB2(5,12)/Downlink

This burst has 2 340 symbols and 4 680 half symbols, which are transmitted in a twelve-timeslot (20 ms) duration. The channel transmission rate is 117 ksps (2 340 symbols/20 ms). The transmission bandwidth is 156,25 kHz. The modulation is $\pi/4$-QPSK for the header including the first UW. The PRI is modulated with $\pi/4$-QPSK, 16 APSK, or 32 APSK. The second, third and fourth UW is modulated with QPSK with a constant $\pi/4$ phase shift. See table 7.28.

Table 7.28: LDPC coded PNB2(5,12)/Downlink 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 228	96	Encoded Extended public (PUI) field d0,…, d96
229 to 420	192	Encoded bits
421 to 448	28	Unique Word
449 to 2 524	2 076	Encoded bits
2 525 to 2 550	26	Unique Word
2 551 to 4 626	2 076	Encoded bits
4 627 to 4 654	28	Unique Word
4 655 to 4 679	25	Guard period in half symbols

The unique word pattern for PNB2(5,12) burst is shown in table 7.29.

Table 7.29: LDPC coded PNB2(5,12) unique word definition for PDCH(5,12)/Downlink

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)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN2525, HSN2526 …HSN2550)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)
Unique word bits (HSN4627, HSN4628 …HSN4654)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)

7.4.13.3.7 LDPC coded PNB2(5,12)/Uplink

This burst has 2 340 symbols and 4 680 half symbols, which are transmitted in a twelve-timeslot (20 ms) duration. The channel transmission rate is 117 ksps (2 340 symbols/20 ms). The transmission bandwidth is 156,25 kHz. The modulation is π/4-QPSK for the header including the first UW. The PRI is modulated with π/4-QPSK or 16 APSK. The second, third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.30.

Table 7.30: LDPC coded PNB2(5,12)/Uplink 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 420	288	Encoded bits
421 to 448	28	Unique Word
449 to 2 524	2 076	Encoded bits
2 525 to 2 550	26	Unique Word
2 551 to 4 626	2 076	Encoded bits
4 627 to 4 654	28	Unique Word
4 655 to 4 679	25	Guard period in half symbols

The unique word pattern for PNB2(5,12) burst is shown in table 7.31.

Table 7.31: LDPC coded PNB2(5,12) unique word definition for PDCH(5,12)/Uplink

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)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN2525, HSN2526 …HSN2550)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)
Unique word bits (HSN4627, HSN4628 …HSN4654)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)

7.4.13.3.8 LDPC coded PNB2(5,3)/Downlink

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 for the header including the first UW. The PRI is modulated with π/4-QPSK, 16 APSK, or 32 APSK. The second, third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.32.

Table 7.32: LDPC coded PNB2(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 420	288	Encoded bits
421 to 448	28	Unique Word
449 to 1 118	670	Encoded bits
1 119 to 1 144	26	Unique Word
1 145 to 1 169	25	Guard period in half symbols

The unique word pattern for PNB2(5,3) burst is shown in table 7.33.

Table 7.33: LDPC coded PNB2(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)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN1 119, HSN1 120 …HSN1 144)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)

7.4.13.3.9 LDPC coded PNB2(5,3)/Uplink

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 for the header including the first UW. The PRI is modulated with π/4-QPSK or 16 APSK. The second, third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.34.

Table 7.34: LDPC coded PNB2(5,3)/Uplink 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 420	288	Encoded bits
421 to 448	28	Unique Word
449 to 1 118	670	Encoded bits
1 119 to 1 144	26	Unique Word
1 145 to 1 169	25	Guard period in half symbols

The unique word pattern for PNB2(5,3) burst is shown in table 7.35.

Table 7.35: LDPC coded PNB2(5,3) unique word definition for PDCH(5,3)/Uplink

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)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN1 119, HSN1 120 …HSN1 144)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)

7.4.13.3.10 PNB3(5,12)/Uplink

This burst has 2 340 symbols and 4 680 half symbols, which are transmitted in a twelve-timeslot (20 ms) duration. The channel transmission rate is 117 ksps (2 340 symbols/20 ms). The transmission bandwidth is 156,25 kHz. The modulation is π/4-QPSK for the header including the first and second UW. The PRI is modulated with π/4-QPSK or 16-APSK.The third, fourth and fifth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.36.

Table 7.36: PNB3(5,12)/Uplink 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	Unique Word (coded as all 1 bits)
133 to 420	288	Encoded bits
421 to 448	28	Unique Word
449 to 2 524	2 076	Encoded bits
2 525 to 2 550	26	Unique Word
2 551 to 4 626	2 076	Encoded bits
4 627 to 4 654	28	Unique Word
4 655 to 4 679	25	Guard period in half symbols

The unique word pattern for PNB3(5,12) burst is shown in table 7.37.

Table 7.37: PNB3(5,12) unique word definition for PDCH(5,12)

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)
Unique word bits (HSN123, HSN124 …HSN132)
(1 1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN2525, HSN2526 …HSN2550)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)
Unique word bits (HSN4627, HSN4628 …HSN4654)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)

7.4.13.3.11 PNB3(5,12)/Downlink

This burst has 2 340 symbols and 4 680 half symbols, which are transmitted in a twelve-timeslot (20 ms) duration. The channel transmission rate is 117 ksps (2 340 symbols/20 ms). The transmission bandwidth is 156,25 kHz. The modulation is π/4-QPSK for the header including the first and second UW. The PRI is modulated with π/4-QPSK or 16 APSK. The third, fourth and fifth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.38.

Table 7.38: PNB3(5,12)/Downlink definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 440	288	Encoded bits
441 to 468	28	Unique Word
469 to 2 544	2 076	Encoded bits
2 545 to 2 570	26	Unique Word
2 571 to 4 646	2 076	Encoded bits
4 647 to 4 674	28	Unique Word
4 675 to 4 679	5	Guard period in half symbols

When the burst is carrying a UL-MAP, the burst definition is given in table 7.39.

Table 7.39: PNB3(5,12)/Downlink with UL-MAP definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 440	288	UL-MAP field
441 to 468	28	Unique Word
469 to 500	32	UL-MAP field
501 to 2 544	2 044	Encoded bits
2 545 to 2 570	26	Unique Word
2 571 to 4 646	2 076	Encoded bits
4 647 to 4 674	28	Unique Word
4 675 to 4 679	5	Guard period in half symbols

The unique word pattern for PNB3(5,12) burst is shown in table 7.40.

Table 7.40: PNB3(5,12) unique word definition for PDCH3(5,12)

Unique word bits (HSN45, HSN46 …HSN94)
(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)
Unique word bits (HSN143, HSN144 …HSN152)
(1 1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1 1)
Unique word bits (HSN441, HSN442 …HSN468)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN2545, HSN2546 …HSN2570)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)
Unique word bits (HSN4647, HSN4648 …HSN4674)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)

7.4.13.3.12 PNB3(5,3)/Uplink

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 for the header including the first and second UW. The PRI is modulated with π/4-QPSK. The third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.41.

Table 7.41: PNB3(5,3)/Uplink 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	Unique Word (coded as all 1 bits)
133 to 420	288	Encoded bits
421 to 448	28	Unique Word
449 to 1 118	670	Encoded bits
1 119 to 1 144	26	Unique Word
1 145 to 1 169	25	Guard period in half symbols

The unique word pattern for PNB3(5,3) burst is shown in table 7.42.

Table 7.42: PNB3(5,3) unique word definition for PDCH3(5,3)/Uplink

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)
Unique word bits (HSN123, HSN124 …HSN132)
(1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1)
Unique word bits (HSN421, HSN422 …HSN448)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN1 119, HSN1 120 …HSN1 144)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)

7.4.13.3.13 PNB3(5,3)/Downlink

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 for the header including the first and second UW. The PRI is modulated with π/4-QPSK or 16 APSK. The third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.43.

Table 7.43: PNB3(5,3)/Downlink definition

HSN	Length of field in half symbols	Contents of field
0 to 5	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 440	288	Encoded bits
441 to 468	28	Unique Word
469 to 1 138	670	Encoded bits
1 139 to 1 164	26	Unique Word
1 165 to 1 169	5	Guard period in half symbols

When the burst is carrying a UL-MAP, the burst definition is given in table 7.44.

Table 7.44: PNB3(5,3)/Downlink with UL-MAP definition

HSN	Length of field in half symbols	Contents of field
0 to 5	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 280	128	UL-MAP field
281 to 440	160	Encoded bits
441 to 468	28	Unique Word
469 to 1 138	670	Encoded bits
1 139 to 1 164	26	Unique Word
1 165 to 1 169	5	Guard period in half symbols

The unique word pattern for PNB3(5,3) burst is shown in table 7.45.

Table 7.45: PNB3(5,3) unique word definition for PDCH3(5,3)/Downlink

Unique word bits (HSN45, HSN46 …HSN94)
(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)
Unique word bits (HSN143, HSN144 …HSN152)
(1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1 1)
Unique word bits (HSN441, HSN442 …HSN468)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN1 139, HSN1 140 …HSN1 164)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)

7.4.13.3.14 PNB3(10,3) Downlink

This burst has 1 170 symbols and 2 340 half symbols, which are transmitted in a three-timeslot (5 ms) duration. The channel transmission rate is 234 ksps (1 170 symbols/5 ms). The transmission bandwidth is 312,5 kHz. The modulation is π/4-QPSK for the header including the first and second UW. The PRI is modulated with π/4-QPSK or 16 APSK. The third and fourth UW is modulated with QPSK with a constant π/4 phase shift. See table 7.46.

Table 7.46: PNB3(10,3) Downlink definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 172	20	Encoded public information (PUI) field c88,…,c107
173 to 728	556	Encoded bits
729 to 756	28	Unique Word
757 to 2 308	1 552	Encoded bits
2 309 to 2 334	26	Unique Word
2 335 to 2 339	5	Guard period in half symbols

When the burst is carrying a UL-MAP, the burst definition is given in table 7.47.

Table 7.47: PNB3(10,3) Downlink with UL-MAP definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 172	20	Encoded public information (PUI) field C88,…,c107
173 to 428	256	UL-MAP field
429 to 728	300	Encoded bits
729 to 756	28	Unique Word
757 to 2 308	1 552	Encoded bits
2 309 to 2 334	26	Unique Word
2 334 to 2 339	5	Guard period in half symbols

The unique word pattern for PNB3(10,3) burst is shown in table 7.48.

Table 7.48: PNB3(10,3) unique word definition for PDCH3(10,3)

Unique word bits (HSN45, HSN46 …HSN94)
(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)
Unique word bits (HSN143, HSN144 …HSN152)
(1 1 1 1 1 1 1 1 1 1 11 1 1 1 1 1 1 1 1 1)
Unique word bits (HSN729, HSN730 …HSN756)
(0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 1 1 0 1)
Unique word bits (HSN2309, HSN2310 …HSN2334)
(0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 1 1 0 1 0 0)

7.4.13.3.15 PNB3(1,3) Burst

PNB3(1,3) is intended to carry either encoded 2,45 kbps or 4,0 kbps speech or user data. The three-slot PNB3(1,3) burst contains the information shown in table 7.49. Since there are two types of information bits in speech, i.e. perceptually important and perceptually unimportant bits, to maximize interleaving gain the bits are arranged in a specific order. However, for data no such arrangement is required. For 2,45 kbps speech, the 194 encoded bits in the payload {e0,e1,…..,e193} are assigned to the 112 perceptually important, {c0,c1,…..,c111}, and 82 perceptually unimportant bits {c'0,c'1,….,c'81}, according to following arrangement; {e0,e1,…,.e15}={c'0,c'1,…,c'15}, {e16,e17,….,e71}={c0,c1,…,c55}, {e72,e73,….,e121}={c'16,c'17,…,c'65}, {e122,e123,….,e177}={c56,c57,…,c111}, {e178,e179,….e193}={c'66,c'67,…,c'81}. For 4,0 kbps speech, the arrangements are {e0,e1,…,.e15}={c'0,c'1,…,c'15}, {e16,e17,….,e80}={c0,c1,…,c64}, {e81,e82,….,e112}={c'16,c'17,…,c'47}, {e113,e114,….,e177}={c65,c66,…,c129}, {e178,e179,….e193}={c'48,c'49,…,c'63}. Note that for 4,0 kbps speech the perceptually unimportant bits are not actually encoded or punctured. So {c'0,c'1,….,c'63} refer to the information bits in this particular case.

Table 7.49: PNB3(1,3) burst

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Encoded bits e0 to e15
21 to 36	16	Unique word
37 to 198	162	Encoded bits e16 to e177
199 to 212	14	Unique word
213 to 228	16	Encoded bits e178 to e193
229 to 233	5	Guard period in half symbols

The 30-bit unique word pattern is shown in table 7.50. Note that, even though PNB3(1,3) payloads are $\pi/4$-QPSK modulated, the UWs are only QPSK modulated.

Table 7.50: VoIP PNB3(1,3) burst unique word definition

Unique word pattern	Unique word bits (HSN21, …,HSN36; HSN199…HSN212)
1 (2,45 kbps Speech)	(1 0 1 1 0 1 0 0 0 1 0 0 1 0 1 1 ---0 0 0 1 0 0 1 0 1 1 1 0 0 0)
2 (2,45 kbps User Data)	(0 1 0 0 0 1 0 0 1 0 0 0 1 0 0 0 ----0 0 1 0 1 1 0 1 1 1 0 1 0 0)
3 (4,0 kbps Speech)	(0 1 1 1 0 1 0 0 1 0 1 1 0 1 1 1 ----1 1 1 0 1 1 1 0 0 0 1 0 0 0)
4 (4,0 kbps User Data)	(0 1 0 0 0 1 1 1 0 1 1 1 1 0 1 1 ---1 1 0 1 1 1 0 1 1 1 1 0 1 1)

7.4.13.3.16 PNB3(1,6) burst

PNB3(1,6) is intended to carry either encoded 2,45 kbps or 4,0 kbps speech or user data. The PNB3(1,6) burst is either modulated by π/2-BPSK or π/4-QPSK. For 2,45 kbps speech, the 198 encoded bits in the payload {e0,e1,…..,e197} are assigned to the 114 perceptually important, {c0,c1,…..,c113}, and 84 perceptually unimportant bits {c'0,c'1,….,c'83}, according to following arrangement; {e0,e1,…,.e7}={c'0,c'1,…,c'7}, {e8,e9,….,e35}={c0,c1,…,c27}, {e36,e37,….,e69}={c'8,c'9,…,c'41}, {e70,e71,….,e98}={c28,c29,…,c56}, {e99,e100,….,e127}={c57,c58,…,c85}, {e128,e129,….,e161}={c'42,c'43,…,c'75}, {e162,e163,….,e189}={c86,c87,…,c113}, {e190,e191,….,e197}={c'76,c'77,…,c'83}.

The six-slot π/2-BPSK modulated PNB3(1,6) burst contains the information shown in table 7.51.

Table 7.51: PNB3(1,6) π/2 BPSK burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Encoded bits e0 to e7
21 to 40	20	Unique word
41 to 222	182	Encoded bits e8 to e98
223 to 244	22	Unique word
245 to 426	182	Encoded bits e99 to e189
427 to 446	20	Unique word
447 to 462	16	Encoded bits e190 to e197
463 to 467	5	Guard period in half symbols

Where two 62-bit unique word patterns are defined for the π/2-BPSK modulated PNB3(1,6) burst, as shown in table 7.52. For PNB3(1,6) 2,45 kbps burst, π/2-BPSK modulation is applied across the whole burst including the unique words.

Table 7.52: PNB3(1,6) π/2 BPSK burst unique word definition

Unique word pattern	Unique word bits (HSN21, HSN22 …HSN40; HSN223 … HSN244; HSN427, …, HSN446)
1 (2,45 kbps Speech)	(1 0 0 1 1 0 0 1 1 0----1 0 0 1 1 0 0 1 1 0 0-----1 0 0 1 1 0 0 1 1 0)
2 (2,45 kbps User Data)	(1 1 1 0 1 0 1 0 0 0----1 0 1 0 0 0 1 1 1 0 1-----1 1 1 0 1 0 1 0 0 0)

The six-slot π/4-QPSK modulated PNB3(1,6) burst contains the information shown in table 7.53. For 4,0 kbps speech, 396 encoded bits are assigned to 266 perceptually important and 130 perceptually unimportant bits according to the following arrangement; {e0,e1,…,.e15}={c'0,c'1,…,c'15}, {e16,e17,….,e81}={c0,c1,…,c65}, {e82,e83,….,e130}={c'16,c'17,…,c'64}, {e131,e132,….,e197}={c66,c67,…,c132}, {e198,e199,….e264}={c133,c134,…,c199}, {e265,e266,….,e313}={c'65,c'66,…,c'113}, {e314,e315,….,e379}={c200,c201,…,c265}, {e380,e381,….,e395}={c'114,c'115,…,c'129}.

Table 7.53: PNB3(1,6) π/4 QPSK burst unique word definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Encoded bits e0 to e15
21 to 40	20	Unique word
41 to 222	182	Encoded bits e16 to e197
223 to 244	22	Unique word
245 to 426	182	Encoded bits e198 to e379
427 to 446	20	Unique word
447 to 462	16	Encoded bits e380 to e395
463 to 467	5	Guard period in half symbols

Where two 62-bit unique word patterns are defined for the QPSK modulated PNB3(1,6) burst, as shown in table 7.54. Note that, unlike 2,45 kbps bursts, the unique words for 4 kbps PNB3(1,6) bursts do not require the extra π/4-rotation.

Table 7.54: PNB3(1,6) QPSK burst unique word definition

Unique word pattern	Unique word bits (HSN21, HSN22 …HSN40; HSN223 … HSN244; HSN427, …, HSN446)
1 (4,0 kbps Speech)	(1 0 1 1 0 1 1 1 0 1 1 1 0 1 0 0 0 1 0 0---0 0 0 1 0 0 1 0 1 1 0 1 0 0 0 1 0 0 1 0 1 1---1 1 0 1 0 0 0 1 0 0 0 1 0 0 1 0 0 0 1 0)
2 (4,0 kbps User Data)	(0 1 0 0 1 0 1 1 1 0 0 0 1 0 0 0 0 1 0 0---1 1 1 0 0 0 1 0 1 1 1 0 1 1 0 1 0 0 0 1 1 1---0 0 1 0 1 1 0 1 1 1 1 0 1 1 1 0 0 0 1 0)

7.4.13.3.17 PNB3(1,8) burst

PNB3(1,8) is intended to carry encoded 4,0 kbps speech or user data. The eight-slot π/2-BPSK modulated PNB3(1,8) burst contains the information shown in table 7.55. For speech, the 280 encoded bits in the payload {e0,e1,…..,e279} are assigned to the 186 perceptually important, {c0,c1,…..,c185}, and 94 unimportant bits {c'0,c'1,….,c'93}, according to following arrangement; {e0,e1,…,.e7}={c'0,c'1,…,c'7}, {e8,e9,….,e53}={c0,c1,…,c45}, {e54,e55,….,e92}={c'8,c'9,…,c'46}, {e93,e94,….,e139}={c46,c47,…,c92}, {e140,e141,….,e186}={c93,c94,…,c139}, {e187,e188,….,e225}={c'47,c'48,…,c'85}, {e226,e227,….,e271}={c140,c141,…,c185}, {e272,e273,….,e279}={c'86,c'87,…,c'93}.

Table 7.55: PNB3(1,8) burst definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Encoded bits e0 to e7
21 to 36	16	Unique word
37 to 300	264	Encoded bits e8 to e139
301 to 322	22	Unique word
323 to 586	264	Encoded bits e140 to e271
587 to 602	16	Unique word
603 to 618	16	Encoded bits e272 to e279
619 to 623	5	Guard period in half symbols

Where two 54-bit unique word patterns are defined for the PNB3(1,8), as shown in table 7.56. Like the payload, the unique words are π/2-BPSK modulated.

Table 7.56: PNB3(1,8) burst unique word definition

Unique word pattern	Unique word bits (HSN21, HSN22 …HSN36; HSN301 … HSN322; HSN587, …, HSN602)
1 (Speech)	(1 0 0 0 1 1 1 0 ----1 0 0 1 1 0 0 1 1 0 0 ---- 1 0 0 0 1 1 1 0)
2 (User Data)	(0 0 1 1 0 1 1 0 ---- 1 0 1 0 0 0 1 1 1 0 1 ---- 0 0 1 1 0 1 1 0)

7.4.13.3.18 PNB3(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.

The PNB3(2,6) uplink burst structure is defined in table 7.57.

Table 7.57: PNB3(2,6) Uplink definition and UW Patterns

HSN	Length of field in half symbols	Contents of field
0 to 9	10	Guard period in half symbols
10 to 27	18	Unique word (00 01 11 01 00 10 00 10 00)
28 to 75	48	Encoded public information (PUI) field c0,…,c23, c0,…, c23
76 to 93	18	Unique word (00 01 11 01 00 10 00 10 00)
94 to 494	400	Encoded bits e0 to e399
494 to 509	16	Unique word (00 01 11 01 00 10 00 10)
510 to 909	400	Encoded bits e400 to e799
910 to 925	16	Unique word (00 01 11 01 00 10 00 10)
926 to 935	10	Guard period in half symbols

The PNB3(2,6) downlink burst structure is defined in table 7.58.

Table 7.58: PNB3(2,6) Downlink definition and UW Patterns

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 (00 01 11 01 00 10 00 10 00)
23 to 102	80	Encoded public information (PUI3) field c0,…,c39, c0,…, c39
103 to 120	18	Unique word (00 01 11 01 00 10 00 10 00)
121 to 510	390	Encoded bits e0 to e389
511 to 526	16	Unique word (00 01 11 01 00 10 00 10)
527 to 914	388	Encoded bits e390 to e778
915 to 930	16	Unique word (00 01 11 01 00 10 00 10)
931 to 935	5	Guard period in half symbols

7.4.14 Packet Access Burst (PAB)

PAB has 8 byte information, PAB3 has 5 byte information.

The PAB has an 8-byte information field (64 bits) and is coded with K=7 convolutional code and PAB3 has a 5-byte information field (40 bits) and is coded with K=9 convolutional code. The information field of both PAB and PAB3 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 and PAB3use π/4-QPSK modulation, in which two bits are mapped to one symbol. Thus, the PAB and PAB3 have 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 and PAB3, see TS 101 376-5-3 [4] and TS 101 376-5-4 [5], respectively. See table 7.59 for the burst format definition.

Table 7.59: PAB and PAB3 burst 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 7.60, which is common for both PAB and PAB3.

Table 7.60: PAB and PAB3 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 7.61 and 7.62 respectively.

Table 7.61: 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 7.62: 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 7.63.

Table 7.63: 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 to 935	5	Guard period in half symbols

The PKAB3 burst format corresponding to PNB3(2,6) is shown in table 7.34b. The PKAB burst corresponding to PNB3(2,6) comprises of two unique words separated by encoded PUI3 as shown in table 7.64.

Table 7.64: PKAB3 regarding PNB3(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 102	80	Encoded public information (PUI3) field c0,…,c39, c0,…, c39
103 to 120	18	Unique word
121 to 930	810	No transmission
931 to 935	5	Guard period in half symbols

The PKAB3 burst format corresponding to PNB(1,6) is shown in table 7.34c. The PKAB3 burst corresponding to PNB(1,6) comprises of two unique words separated by encoded PUI as shown in table 7.65.

Table 7.65: PKAB3(1,6) definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 18	14	Unique word - UW1
19 to 66	48	Encoded public information (PUI) field c0,…,c23, c0,…, c23
67 to 226	160	No transmission
227 to 242	16	Unique word - UW2
243 to 462	220	No transmission
463 to 467	5	Guard period in half symbols

The PKAB3 burst format corresponding to PNB3(5,3) is shown in table 7.66.

Table 7.66: PKAB3(5,3) definition

HSN	Length of field in half symbols	Contents of field
0 to 5	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 280	128	UL-MAP field
281 to 440	160	No transmission
441 to 468	28	Unique Word
469 to 1 138	670	No transmission
1 139 to 1 164	26	No transmission
1 165 to 1 169	5	Guard period in half symbols

The PKAB3 burst format corresponding to PNB3(10,3) is shown in table 7.67.

Table 7.67: PKAB3(10,3) definition

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 44	40	Encoded public information (PUI) field c0,…, c39
45 to 94	50	Unique word
95 to 142	48	Encoded public information (PUI) field c40,…,c87
143 to 152	10	Unique Word (coded as all 1 bits)
153 to 172	20	Encoded public information (PUI) field c88,…,c107
173 to 428	256	UL-MAP field
429 to 728	300	No transmission
729 to 756	28	Unique Word
757 to 2 308	1 552	No transmission
2 309 to 2 334	26	No transmission
2 335 to 2 339	5	Guard period in half symbols

7.4.16 DC12 burst

The twelve-slot π/2-BPSK modulated downlink control (DC12) burst contains the information shown in table 7.68.

Table 7.68: DC12 burst definition and UW patterns

HSN	Length of field in half symbols	Contents of field
0 to 4	5	Guard period in half symbols
5 to 20	16	Encoded bits e0 to e7
21 to 40	20	Unique word: [0, 0, 1, 0, 0, 0, 1, 1, 1, 1]
41 to 456	416	Encoded bits e8 to e215
457 to 478	22	Unique word [0, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1]
479 to 894	416	Encoded bits e216 to e423
895 to 914	20	Unique word: [0, 0, 1, 0, 0, 0, 1, 1, 1, 1]
915 to 930	16	Encoded bits e424 to e431
931 to 935	5	Guard period in half symbols

8 Logical-physical channel mapping

8.1 General

Same as clause 8.1 in TS 101 376-5-2 [10].

8.1.1 Frequency-domain description

Same as clause 8.1.1 in TS 101 376-5-2 [10].

8.1.2 Time-domain description

8.1.2.1 Physical channels

Same as clause 8.1.2.1 in TS 101 376-5-2 [10].

8.1.2.2 Logical channels

Same as clause 8.1.2.2 in TS 101 376-5-2 [10].

8.2 Physical Channel (PC) types and names

Same as clause 8.2 in TS 101 376-5-2 [10], with the following additional physical channels:

- PC12d a physical channel with a length of 12 timeslots for use only by the downlink.

8.3 Logical channel parameters

Same as clause 8.3 in TS 101 376-5-2 [10] with the following additions:

Table 8.1a: Summary of logical channel parameters

Channel designation	Direction	Burst type	Modulation type	Timeslots per burst	Frame assignment
FCCH3	D	FCCH3	Dual Chirp	12	See sys. Info. Cycle
BCCH	D	DC12	π/2-BPSK	12	See sys. Info. Cycle
PCH	D	DC12	π/2-BPSK	12	See sys. Info. Cycle
AGCH	D	DC12	π/2-BPSK	12	See sys. Info. Cycle
CBCH	D	DC12	π/2-BPSK	12	See sys. Info. Cycle
BACH	D	BACH3	π/2-BPSK	6	See sys. Info. Cycle
GBCH3	D	DC12	π/2-BPSK	12	All
RACH3	U	RACH3	π/2-BPSK	9	All
NOTE: Use of FCCH3 or FCCH is a network implementation choice. If FCCH3 used then RACH3, BACH3, and DC12, carrying BCCH, PCH, GBCH3 and AGCH shall always be used and when present CBCH shall use DC12.					

8.4 Permitted channel configurations

Same as clause 8.4 in TS 101 376-5-2 [10] with the following additions:

Table 8.2a: Permitted channel configurations

Config. number	Physical channel type	Logical channel configuration
13	PC12d	FCCH3 + BCCH + CCCH (PCH + BACH + AGCH) + GBCH3 This channel configuration is also known as a BCCH/CCCH
14	PC12d	CCCH (PCH + BACH + AGCH) This channel configuration is also known as a "normal CCCH"
15	PC12d	CCCH (AGCH) This channel configuration is also known as an AGCH/CCCH
16	PC12u	RACH3
17	PC12d	CBCH

8.5 Logical channel frame sequencing concepts

Same as clause 8.5 in TS 101 376-5-2 [10].

8.5.1 Simple frame sequence

Same as clause 8.5.1 in TS 101 376-5-2 [10].

8.5.1.1 Simple frame sequence subchannels

Same as clause 8.5.1.1 in TS 101 376-5-2 [10].

8.5.2 Simple paired-frame sequence

Same as clause 8.5.2 in TS 101 376-5-2 [10].

8.5.2.1 Simple paired-frame sequence subchannels

Same as clause 8.5.2.1 in TS 101 376-5-2 [10].

8.5.3 Configured paired-frame sequence (A/Gb mode only)

Same as clause 8.5.3 in TS 101 376-5-2 [10].

8.5.3.1 CBCH configuration

Same as clause 8.5.3.1 in TS 101 376-5-2 [10].

8.5.3a CBCH configuration (Iu mode only)

CBCH in Iu mode shall not be paired with SDCCH. If the CBCH is present the SA_CBCH_Config parameter is set to 1111 and if it is not present is set to 0000. All other values are reserved.

8.5.4 Statistically multiplexed paired-frame sequence (A/Gb mode only)

Same as clause 8.5.4 in TS 101 376-5-2 [10].

8.5.4.1 Pool size

Same as clause 8.5.4.1 in TS 101 376-5-2 [10].

8.5.4.2 Statistically multiplexed paired-frame sequence subchannels

Same as clause 8.5.4.2 in TS 101 376-5-2 [10].

8.5.4.3 Example using SDCCH

Same as clause 8.5.4.3 in TS 101 376-5-2 [10].

8.5.5 System information cycle sequencing

Same as clause 8.5.5 in TS 101 376-5-2 [10].

8.5.5.1 Physical-Channel-Relative Timeslot Number (PCRTN)

Same as clause 8.5.5.1 in TS 101 376-5-2 [10].

8.5.5.2 System-Information-Relative Frame Number (SIRFN)

Same as clause 8.5.5.2 in TS 101 376-5-2 [10].

8.5.5.3 Graphical representation of system information cycle timeslots

Same as clause 8.5.5.3 in TS 101 376-5-2 [10].

8.6 Mapping of logical channels to BCCH/CCCH

Same as clause 8.6 in TS 101 376-5-2 [10].

8.6.1 Fixed reserved-slot logical channels

Same as clause 8.6.1 in TS 101 376-5-2 [10].

8.6.1.1 FCCH

Same as clause 8.6.1.1 in TS 101 376-5-2 [10].

8.6.1.1a FCCH3

Each system information cycle has eight FCCH3 bursts.

The FCCH3 burst positions are at:

(0, 0, 12),	(16, 0, 12),	(32, 0, 12),	(48, 0, 12),
(8, 0, 12),	(24, 0, 12),	(40, 0, 12),	(56, 0, 12).

8.6.1.2 CICH

Same as clause 8.6.1.2 in TS 101 376-5-2 [10].

8.6.1.3 BCCH

Same as clause 8.6.1.3 in TS 101 376-5-2 [10], with the following additions for BCCH when mapped to the DC12 burst.

DC12 bursts carrying the BCCH occur at the following ordered triples:

(2, 0, 12),	(18, 0, 12),	(34, 0, 12),	(50, 0, 12),
(10, 0, 12),	(26, 0, 12),	(42, 0, 12),	(58, 0, 12).

System information cycle when FCCH3 is used is shown in table 8.7a.

Table 8.7a: Fixed bursts in BCCH/CCCH when mapped to PC12d

SIRFN	PC12d-2 PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
0	FCCH3											
1												
2	BCCH											
3												
4												
5												
6												
7												
8	FCCH3											
9												
10	BCCH											
11												
12												
13												
14												
15												

SIRFN	PC12d-2 PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
16	FCCH3											
17												
18	BCCH											
19												
20												
21												
22												
23												
24	FCCH3											
25												
26	BCCH											
27												
28												
29												
30												
31												

SIRFN	PC12d-2 PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
32	FCCH3											
33												
34	BCCH											
35												
36												
37												
38												
39												
40	FCCH3											
41												
42	BCCH											
43												
44												
45												
46												
47												

SIRFN	PC12d-2 PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
48	FCCH											
49												
50	BCCH											
51												
52												
53												
54												
55												
56	FCCH3											
57												
58	BCCH											
59												
60												
61												
62												
63												

8.6.2 Optional reserved-slot logical channels

Same as clause 8.6.2 in TS 101 376-5-2 [10] with the following illustration (see table 8.8a) when FCCH3 and DC12 are used.

Table 8.8a: Reserved logical channel bursts in a BCCH/CCCH when mapped to PC12d

SIRFN	PC12d PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
0	FCCH3											
1	GBCH3											
2	BCCH											
3	PCH#0											
4	BACH#4						BACH#2					
5	GBCH3											
6	BACH#0						BACH#6					
7												
8	FCCH3											
9	GBCH3											
10	BCCH											
11	PCH#1											
12	BACH#1						BACH#5					
13	GBCH3											
14	BACH#3						BACH#7					
15	BACH#1						BACH#5					

SIRFN	PC12d PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
16	FCCH3											
17	GBCH3											
18	BCCH											
19	PCH#0											
20	BACH#4						BACH#2					
21	GBCH3											
22	BACH#0						BACH#6					
23												
24	FCCH3											
25	GBCH3											
26	BCCH											
27	PCH#1											
28	BACH#3						BACH#7					
29	GBCH3											
30	BACH#1						BACH#5					
31	BACH#3						BACH#7					

SIRFN	PC12d PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
32	FCCH3											
33	GBCH3											
34	BCCH											
35	PCH#0											
36	BACH#4						BACH#2					
37	GBCH3											
38	BACH#0						BACH#6					
39												
40	FCCH3											
41	GBCH3											
42	BCCH											
43	PCH#1											
44	BACH#1						BACH#5					
45	GBCH3											
46	BACH#3						BACH#7					
47	BACH#0						BACH#6					

SIRFN	PC12d PCRTN											
	0	1	2	3	4	5	6	7	8	9	10	11
48	FCCH3											
49	GBCH3											
50	BCCH											
51	PCH#0											
52	BACH#4						BACH#2					
53	GBCH3											
54	BACH#0						BACH#6					
55												
56	FCCH3											
57	GBCH3											
58	BCCH											
59	PCH#1											
60	BACH#1						BACH#5					
61	GBCH3											
62	BACH#3						BACH#7					
63	BACH#4						BACH#2					

8.6.2.1 PCH

Same as clause 8.6.2.1 in TS 101 376-5-2 [10] with the following additions.

When FCCH3 is used, the potential PCH bursts of every BCCH/CCCH and normal CCCHs are organized into either two or four paging groups, identified as PCH#0 and PCH#1 or PCH#0, PCH#1, PCH#2 and PCH#3. A PCH message is not transmitted if there are no pages for any MESs in a paging group. Every BCCH/CCCH and normal CCCH reserves the timeslots of at least one of these paging groups for PCH bursts, based on the value of the BCCH parameters SA_PCH_CONFIG and SA_PCH_CONFIG_ext, as follows in table 8.9b.

Table 8.9b: Paging groups reserved by SA_PCH_CONFIG

SA_PCH_CONFIG value	SA_PCH_CONFIG_ext value	Paging cycle	Reserved paging groups	SA_PCH_GROUPS
01	0	640 ms	PCH#0	1
10	0	640 ms	PCH#1	1
11	0	640 ms	PCH#0 and PCH#1	2
01	1	1 280 ms	PCH#0	1
10	1	1 280 ms	PCH#1	1
11	1	1 280 ms	PCH#0 and PCH#1	2
00	1	1 280 ms	PCH#0, PCH#1, PCH#2, and PCH#3	4

When FCCH3 is used, PCH shall always use a DC12 burst. PCH bursts occur at the following ordered triples:

When SA_PCH_CONFIG_ext = 0

For PCH#0 paging group:

(3, 0, 12), (19, 0, 12), (35, 0, 12) and (51, 0, 12).

For PCH#1 paging group:

(11, 0, 12), (27, 0, 12), (43, 0, 12) and (59, 0, 12).

And when SA_PCH_CONFIG_ext = 1

For PCH#0 paging group:

(3, 0, 12), and (35, 0, 12)

For PCH#1 paging group:

(11, 0, 12), and (43, 0, 12)

For PCH#2 paging group:

(19, 0, 12) and (51, 0, 12).

For PCH#3 paging group:

(27, 0, 12), and (59, 0, 12).

Assignment of MESs to paging groups is described later, in clause 9.7.2.

8.6.2.2 BACH

Same as clause 8.6.2.2 in TS 101 376-5-2 [10] with the following additions:

Table 8.11: Bursts corresponding to alerting groups in correspondence with FCCH3

Alerting Group	Bursts
BACH#0	(6, 0, 6), (22, 0, 6), (38, 0, 6), (47, 0, 6), (54, 0, 6)
BACH#1	(12, 0, 6), (15, 0, 6), (30, 0, 6), (44, 0, 6), (60, 0, 6)
BACH#2	(4, 6, 6), (20, 6, 6), (36, 6, 6), (52, 6, 6), (63, 6, 6)
BACH#3	(14, 0, 6), (28, 0, 6), (31, 0, 6), (46, 0, 6), (62, 0, 6)
BACH#4	(4, 0, 6), (20, 0, 6), (36, 0, 6), (52, 0, 6), (63, 0, 6)
BACH#5	(12, 6, 6), (15, 6, 6), (30, 6, 6), (44, 6, 6), (60, 6, 6)
BACH#6	(6, 6, 6), (22, 6, 6), (38, 6, 6), (47, 6, 6), (54, 6, 6)
BACH#7	(14, 6, 6), (28, 6, 6), (31, 6, 6), (46, 6, 6), (62, 6, 6)

8.6.3 Unreserved-slot logical channels

Same as clause 8.6.3 in TS 101 376-5-2 [10] with the following additions.

When FCCH3 is used AGCH shall always be mapped to a DC12 burst on the PC12d physical channel.

AGCH can use any of the PC12d frames that are unreserved due to the PCH or BACH channel configuration parameters in BCCH/CCCH.

AGCH can also use any of the PC12d frames that are optionally reserved, if the optionally-reserved-timeslot logical channel has no information to send in that frame.

8.6.4 Mapping of CBCH (Iu mode)

When present in Iu mode, the CBCH shall always use the same ARFCNs as the BCCH/CCCH and all normal CCCH in the cell. The CBCH shall be mapped to the PCRTN from 12 through 23. The CBCH broadcast shall begin with SIRFN = 0 and the first DC12 burst position shall be (0,12,12). In the case of conflict with reception of GBCH and BCCH and reception of CBCH, the MES shall receive the GBCH and BCCH.

8.7 Mapping of logical channels to normal CCCH

Same as clause 8.7 in TS 101 376-5-2 [10] with the following illustration (see table 8.12a) of reserved channels when normal CCCH is mapped to PC12d.

Table 8.12a: Reserved logical channel bursts in a normal CCCH when mapped to PC12d

SIRFN	PC12d PCRTN 0	1	2	3	4	5	6	7	8	9	10	11
0												
1												
2												
3	PCH#0											
4	BACH#4						BACH#2					
5												
6	BACH#0						BACH#6					
7												
8												
9												
10												
11	PCH#1											
12	BACH#1						BACH#5					
13												
14	BACH#3						BACH#7					
15	BACH#1						BACH#5					
16												
17												
18												
19	PCH#0											
20	BACH#4						BACH#2					
21												
22	BACH#0						BACH#6					
23												
24												
25												
26												
27	PCH#1											
28	BACH#3						BACH#7					
29												
30	BACH#1						BACH#5					
31	BACH#3						BACH#7					
32												
33												
34												
35	PCH#0											
36	BACH#4						BACH#2					
37												
38	BACH#0						BACH#6					
39												
40												
41												
42												
43	PCH#1											
44	BACH#1						BACH#5					
45												
46	BACH#3						BACH#7					
47	BACH#0						BACH#6					
48												
49												
50												
51	PCH#0											
52	BACH#4						BACH#2					
53												
54	BACH#0						BACH#6					
55												
56												
57												
58												
59	PCH#1											
60	BACH#1						BACH#5					
61												
62	BACH#3						BACH#7					
63	BACH#4						BACH#2					

8.7a Mapping of logical channels to SI extended/AGCH/CCCH (Iu mode only)

When PC12d is used in Iu mode, one AGCH/CCCH may be used within a spot beam to support the optional extended SI. Such as use would be configuration 18 in table 8.2a and is indicated by the value of the System Information Extended information element (see TS 101 376-4-8 [3]). The optional extended SI is illustrated in table 8.12b.

DC12 bursts carrying the extended SI may occur at the following ordered triples:

(7, 0, 12)	(23, 0, 12)	(39, 0, 12)	(55, 0, 12)

Table 8.12b: Optional extended SI in a normal CCCH when mapped to PC12d

SIRFN	PC12d-2 PCRTN 0	1	2	3	4	5	6	7	8	9	10	11
0												
1												
2												
3												
4												
5												
6												
7	Extended SI											
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23	Extended SI											
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39	Extended SI											
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55	Extended SI											
56												
57												
58												
59												
60												
61												
62												
63												

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) or a PDCH3. A PDCH/ PDCH3 shall carry packet logical channels only. A PDCH/ PDCH3 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. The logical channels PACCH and PDTCH use the PNB3(m,n) associated with the physical channel PDCH3(m,n) onto which they are mapped with the exception that PNB(1,6) may also be used.

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

A multiframe consists of 16 consecutive frames, (see TS 101 376-5-7 [7] and TS 101 376-3-22 [8]). Figure 8.2 indicates the numbering of consecutive frames for the entire multiframe.

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

Figure 8.2: Multiframe structure for PDCH

The mapping of logical channels onto the successive MAC-slots or D-MAC-slots in a multiframe is defined TS 101 376-3-22 [8]. 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 (TS 101 376-4-12 [9]), 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 TS 101 376-4-12 [9]). 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 TS 101 376-3-22 [8] 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 TS 101 376-5-7 [7]. 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 TS 101 376-5-7 [7]. 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 TS 101 376-4-12 [9]).

NOTE: This clause specifies how the network signals that the MES is allowed to use the uplink. The operation of the MES is specified in TS 101 376-4-12 [9]. 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) (A/Gb mode only)

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 TS 101 376-4-12 [9] and TS 101 376-3-22 [8]). See TS 101 376-5-7 [7] 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 (A/Gb mode only)

The PRACH is dynamically allocated on individual PDCH MAC-slots. The occurrence of a PRACH3 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 PRACH3 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 TS 101 376-5-7 [7]). The MES shall randomly select either timeslot T or timeslot T + 3 as the start of the PRACH transmission.

Fixed PRACH3 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 single 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 TS 101 376-4-8 [3]. The MES shall randomly select one of the overlaid PRACH frequencies for transmission, see TS 101 376-3-22 [8].

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 TS 101 376-5-5 [6].

Table 8.1: Overlaid PRACH frequencies

Bandwidth	PRACH frequency
m = 4	PRACH-1 = Uplink frequency - 48,875 kHz
	PRACH-2 = Uplink frequency - 15,625 kHz
	PRACH-3 = Uplink frequency + 15,625 kHz
	PRACH-4 = Uplink frequency + 48,875 kHz
m = 5	PRACH-1 = Uplink frequency - 62,50 kHz
	PRACH-2 = Uplink frequency - 31,25 kHz
	PRACH-3 = Uplink frequency
	PRACH-4 = Uplink frequency + 31,25 kHz
	PRACH-5 = Uplink frequency + 62,50 kHz

8.8.2.3a Mapping of the uplink PCCCH, i.e. PRACH3 (Iu mode only)

The PRACH3 is dynamically allocated on individual PDCH3 MAC-slots. The occurrence of a PRACH3 opportunity on the uplink is indicated by USF = USF_FREE in the PUI or the ULMAP of the block which is received in the corresponding MAC-slot on the downlink. Similarly, the PRACH3 may be dynamically allocated on individual PDCH3 D-MAC-slots.

TS 101 376-4-12 [9] describes the dynamic allocation of PRACH3 in PDCH3 channels.

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 TS 101 376-4-12 [9]). The logical channel type shall be indicated in the message header. The messages on these channels shall address the MES by the TFI (see TS 101 376-4-12 [9]).

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 (A/Gb mode only)

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 8.2). 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.

Similarly, the following combinations of packet logical channels are permitted on PDCH3(m,n).

i) PAGCH + PDTCH/D + PACCH/D +DCH on PDCH3(m,n) on downlink.

ii) PDTCH/U + PACCH/U +DCH on PDCH3(m,n) on uplink.

iii) DCH includes DTCH + DACCH.

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, and ii, 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 TS 101 376-5-2 [10].

9.1 PC6d and PC12u pairing

Same as clause 9.1 in TS 101 376-5-2 [10].

9.1a PC12d and PC12u pairing

A number of PC12d may be required in a spot beam to support the amount of paging or alerting traffic in that spot beam. One BCCH/CCCH is always assigned in every spot beam on the BCCH carrier.

Every PC12d shall be assigned in combination with a PC12u (RACH3) physical channel. In other words, the number of PC12u (RACH3) is equal to the number of normal CCCHs, plus the number of AGCH/CCCHs, plus 1 (for the BCCH/CCCH) and each RACH3's radio-frequency channel number shall be specified on the system information.

The PC12u shall start in the return link timeslots specified by the parameter RACH_TS_OFFSET, broadcast in BCCH. This relationship is shown by example in figure 9.2, where the value of RACH_TS_OFFSET can range from 0 to 23. The starting timeslot of the PC12u/R is equal to the starting timeslot of the corresponding PC12d/R plus RACH_TS_OFFSET, modulo 24.

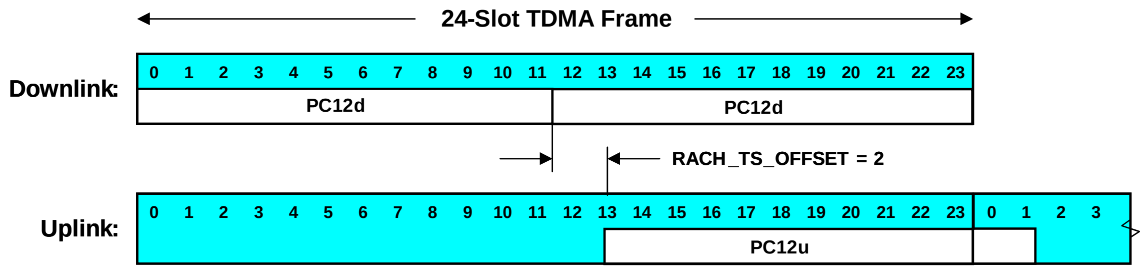


Figure 9.2: A RACH_TS_OFFSET example when PC12d and PC12u is used

A number of RACH3s may be required in a spot beam to support the amount of random access traffic in that spot beam. Additional PC12u physical channels required to support the RACH3 messages shall be paired on the forward link with PC12d physical channels on which the entire CCCH or only the AGCH may be mapped.

9.2 Bidirectional channel timeslot assignments

Same as clause 9.2 in TS 101 376-5-2 [10].

9.3 GBCH

Same as clause 9.3 in TS 101 376-5-2 [10].

9.3a GBCH3

GBCH3 shall be multiplexed on the same PC12d used for BCCH as shown in table 8.8a.

9.4 DKABs

Same as clause 9.4 in TS 101 376-5-2 [10].

9.5 FCCH and CICH

- Same as clause 9.5 in TS 101 376-5-2 [10] with the following additions: The FCCH3 and BCCH on a BCCH/CCCH carrier are used by the MESs for initial synchronization and spot beam selection. CICH shall not be present when FCCH3 is used.

9.6 TACCH/2

Same as clause 9.6 in TS 101 376-5-2 [10].

9.7 MES monitoring of paging and alerting groups

Same as clause 9.7 in TS 101 376-5-2 [10].

9.7.1 Determination of assigned CCCH

Same as clause 9.7.1 in TS 101 376-5-2 [10].

9.7.2 Determination of assigned paging group

Same as clause 9.7.2 in TS 101 376-5-2 [10] with the following additions.

- When FCCH3 is used: There may be one, two or four paging groups reserved per CCCH, determining the assigned paging group from the paging index reduces to the cases shown in table 9.2b.

Table 9.2b: Determining assigned paging group

N	SA_PCH_CONFIG	Paging groups in assigned CCCH	Paging index	Assigned paging group
1	01	PCH0	0	PCH0
1	10	PCH1	0	PCH1
2	11	PCH0, PCH1	0	PCH0
2	11	PCH0, PCH1	1	PCH1
4	00	PCH0, PCH1, PCH2, PCH3	0	PCH0
4	00	PCH0, PCH1, PCH2, PCH3	1	PCH1
4	00	PCH0, PCH1, PCH2, PCH3	2	PCH2
4	00	PCH0, PCH1, PCH2, PCH3	3	PCH3

9.7.3 Determination of alerting group

Same as clause 9.7.3 in TS 101 376-5-2 [10].

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 TS 101 376-5-2 [10] with the following addition:

> If the MES reads a system information from BCCH on a PC12d then it shall use a PC12u with RACH3 burst type.

9.9 SDCCH vs. CBCH

Same as clause 9.9 in TS 101 376-5-2 [10].

9.10 MES monitors paired CCCH for AGCH

Same as clause 9.10 in TS 101 376-5-2 [10].

9.11 Additional air interface constraints

Same as clause 9.11 in TS 101 376-5-2 [10].

10 BCCH parameters

Same as clause 10 in TS 101 376-5-2 [10].

10.1 Types of BCCH parameters

Same as clause 10.1 in TS 101 376-5-2 [10].

10.2 Information used to obtain synchronization

Same as clause 10.2 in TS 101 376-5-2 [10].

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 TS 101 376-5-2 [10] with the following additions.

When FCCH3 is used:

SA_PCH_CONFIG (2 bits) Provides a bitmap of configured paging groups, as shown in table 8.10, which is the same for all normal CCCHs and the BCCH/CCCH of a logical cell. SA_PCH_CONFIG may also be used to compute SA_PCH_GROUPS since the number of bits set to one in SA_PCH_CONFIG is equal to SA_PCH_GROUPS when SA_PCH_CONFIG_ext = 0. When SA_PCH_CONFIG_ext = 1, SA_PCH_GROUPS shall be defined as per table 8.9.

10.5 Information specific to one instance of a channel

Same as clause 10.5 in TS 101 376-5-2 [10].

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, H, I, L, M
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, J, K
4	24 (max)	12(max) note 3	NA	NA	0	0	0	C
5	24 (max)	6 (max) note 4	NA	NA	0	0	0	E, F, G, H, I
All other values are reserved								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.
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.
NOTE 3: For example, 2-ON, 2-OFF (implying 2 DMAC slot ON followed by 2 DMAC slots OFF) transmission pattern yields 12 transmit slots (slot = 1.667 ms) out of 24 slots.
NOTE 4: Transmit slots are contiguous.

Multislot class 1 MESs are required to be able to transmit and receive at the same time.

Multislot class 2, 3, 4 and 5 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 shall 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, E, F, G, J, K MESs, 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 shall be able to support all integer values of transmit TS from 0 to Tx (depending on the services supported by the MES). Unless stated otherwise, 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 shall 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.

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 TS 101 376-3-22 [8] and TS 101 376-4-8 [3] 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.

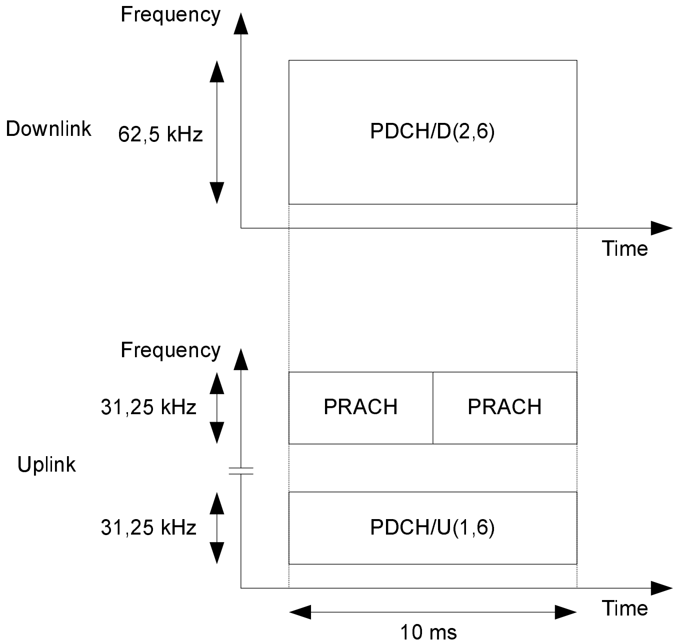


Figure B.1: Asymmetrical Pairing of PDCH/D(2,6) with PDCH/U(1,6)

Annex C (normative): GMR-1 3G Terminal Types

GMR-1 3G 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 GMR-1 3G terminal type identifier to a MES is the responsibility of the network operator.

Table C.1: Terminal Type Identifier

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
1 0 0 0 0 0 0	Reserved								
1 0 0 1 0 0 0	1	8 (Terminal type A)	PDCH(5,3) PDCH(4,3) PRACH BCCH/CCCH	Full duplex	Fixed	144 kbps GMPRS packet switched services only	Internal	Gb	L-Band
0 0 0 1 0 0 1	2	1 (Terminal type C)	PDCH(2,6) PDCH(1,6) PRACH BCCH/CCCH TCH3/6/9 FACCH3/6/9 SACCH6/9	Half duplex	Handheld	GMR Circuit switched services and 60 kbps GMPRS packet switched services.	Internal	A/Gb	L-Band
0 0 0 1 0 1 0	3	1 (Terminal type C)	PDCH(2,6) PDCH(1,6) PRACH BCCH/CCCH TCH3/6/9 FACCH3/6/9 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.	Internal	A/Gb	L-Band
0 0 0 1 0 1 1	4	1 (Terminal type C)	PDCH(2,6) PDCH(1,6) PRACH BCCH/CCCH TCH3/6/9 FACCH3/6/9 SACCH6/9	Half duplex	Handheld	GMR Circuit switched services and 60 kbps GMPRS packet switched services.	Internal	A/Gb	L-Band
0 0 0 1 1 0 0	1	1 (Terminal type C)	PDCH(2,6) PDCH(1,6) PRACH BCCH/CCCH TCH3/6/9 FACCH3/6/9 SACCH6/9	Full duplex	Handheld	GMR Circuit switched services and 60 kbps GMPRS packet switched services.	Internal	A/Gb	L-Band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 0 0 1 1 0 1	1	9 (Terminal type D)	PDCH(5,3) PDCH(5,12) PRACH BCCH/CCCH	Full duplex	Fixed	444 kbps GMPRS packet switched services in downlink; 202 kbps GMPRS packet switched services in uplink	Internal	Gb	L-Band
0 0 0 1 1 1 0	1	9 (Terminal type D)	PDCH(5,3) PDCH(5,12) PRACH BCCH/CCCH	Full duplex	Fixed	444 kbps GMPRS packet switched services in downlink; 384 kbps GMPRS packet switched services in uplink	Passive external	Gb	L-Band
0 0 0 1 1 1 1	1	9 (Terminal type D)	PDCH(5,3) PDCH(5,12) PRACH BCCH/CCCH	Full duplex	Fixed	444 kbps GMPRS packet switched services in downlink; 384 kbps GMPRS packet switched services in uplink	Active external	Gb	L-band
0 0 1 0 0 0 0	5	1 (Terminal type E)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half duplex with partial burst decoding capability (see clause 7.4.13) Maximum transmit duty cycle of 25 % In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 0 1 0 0 0 1	5	1 (Terminal type E)	PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half duplex with partial burst decoding capability (see clause 7.4.13) Maximum transmit duty cycle of 25 % In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Handheld	186 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band
0 0 1 0 0 1 0	5	1 (Terminal type E)	PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half duplex with partial burst decoding capability (see clause 7.4.13) Maximum transmit duty cycle of 25 % In-Call Vocoder rate change not supported Link adaptation and Handoff not supported	Handheld	96 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 0 1 0 1 0 1	3	1 (Terminal type F)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,6)/D DCH(1,3)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,6)/U DCH(1,3)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half duplex with partial burst decoding capability (see clause 7.4.13) Maximum transmit duty cycle of 33 % In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band
0 0 1 1 0 1 0	3	1 (Terminal type G)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/D DCH(1,6)/D DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half duplex with partial burst decoding capability (see clause 7.4.13) Maximum transmit duty cycle of 33 % In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	u-PS	S-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 0 1 1 1 1 1	1	2 (Terminal type H)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,3)/D DCH(1,6)/D DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full duplex. No transmit duty cycle restrictions In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Vehicular	590 kbps GMR-1 3G packet switched services in downlink; 186 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band
0 1 0 0 0 0 0	5	2 (Terminal type H)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,3)/D DCH(1,6)/D DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full duplex. Maximum transmit duty cycle of 25 % In-Call Vocoder rate change supported Full Link adaptation support Only Blind Handoff is supported	Vehicular	590 kbps GMR-1 3G packet switched services in downlink; 40 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 1 0 0 1 0 0	1	9 (Terminal type I)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,3)/D DCH(1,6)/D DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full duplex No transmit duty cycle restrictions In-Call Vocoder rate change supported Full Link adaptation support Handoff not supported	Fixed	590 kbps GMR-1 3G packet switched services in downlink; 186 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band
0 1 0 0 1 0 1	5	9 (Terminal type I)	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,3)/D DCH(1,6)/D DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full duplex Maximum transmit duty cycle of 25 % In-Call Vocoder rate change supported Full Link adaptation support Handoff not supported	Fixed	590 kbps GMR-1 3G packet switched services in downlink; 40 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	S-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 1 0 1 0 0 1	3	(Terminal type J)	PDCH3(10,3)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,6)/D DCH(1,8)/D DCH(1,6)/U DCH(1,8)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half-duplex Maximum transmit duty cycle of 33 % In-Call Vocoder rate change supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	L-band
0 1 0 1 1 1 0	3	(Terminal type K)	PDCH3(10,3)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,6)/D DCH(1,8)/D DCH(1,6)/U DCH(1,8)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Half-duplex Maximum transmit duty cycle of 33 % In-Call Vocoder rate change not supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 16 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	L-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 1 1 0 0 1 1	1	(Terminal type L)	PDCH3(10,3)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,6)/D DCH(1,8)/D DCH(1,6)/U DCH(1,8)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full-duplex Maximum transmit duty cycle of 33 % In-Call Vocoder rate change not supported	Handheld	590 kbps GMR-1 3G packet switched services in downlink; 64 kbps GMR-1 3G packet switched services in uplink.	Internal	Iu-PS	L-band
0 1 1 1 0 0 0	1	(Terminal type M)	PDCH3(10,3)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/D PDCH3(1,6)/U DCH(1,6)/D DCH(1,8)/D DCH(1,6)/U DCH(1,8)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3	Full-duplex No transmit duty cycle restrictions In-Call Vocoder rate change not supported	Fixed	590 kbps GMR-1 3G packet switched services in downlink; 186 kbps GMR-1 3G packet switched services in uplink.	external	Iu-PS	L-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 1 1 1 1 0 1	5	1	PDCH3(1,6)/D* DCH(1,6)/D DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH BACH AGCH GBCH3 CBCH * Rate 7/10, and 4/5 are not supported	Half duplex No receive duty cycle restrictions Maximum transmit duty cycle of 25 % In-Call Vocoder rate change not supported	Handheld-Inconspicuous	21 kbps GMR-1 3G packet switched services in downlink; 2,6 kbps GMR-1 3G packet switched services in uplink. 2,45 kbps vocoder only	Internal or External Linear Polarization	Iu-PS	L-band
0 1 1 1 1 1 0	5	1	PDCH3(5,12)/D* PDCH3(5,3)/D* PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH BACH FCCH3 RACH3 PCH AGCH GBCH3 CBCH * 16 APSK modulation is not supported	Half duplex No receive duty cycle restrictions Maximum transmit duty cycle of 25 % In-Call Vocoder rate change not supported	Handheld-Smartphone	186 kbps GMR-1 3G packet switched services in downlink; 120 kbps GMR-1 3G packet switched bearers in uplink. (30 kbps with 25 % duty cycle). 2,45 and 4,0 kbps vocoder	Internal or External Circular Polarization	Iu-PS	L-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
0 1 1 1 1 1 1	5	1	PDCH3(5,12)/D* PDCH3(5,3)/D* PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH BACH AGCH GBCH3 CBCH * 16 APSK modulation is not supported	Half duplex No receive duty cycle restrictions Maximum transmit duty cycle of 25 % In-Call Vocoder rate change not supported	Handheld-Ruggedized	186 kbps GMR-1 3G packet switched services in downlink; 120 kbps GMR-1 3G packet switched bearers in uplink. (30 kbps with 25 % duty cycle). 2,45 kbps vocoder only	Internal or External Circular Polarization	Iu-PS	L-band
1 0 0 0 0 0 0	5	1	PDCH3(1,6)/D PDCH3(1,6)/D* PDCH3(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3 CBCH * Rate 7/10, and 4/5 are not supported	Half duplex No receive duty cycle restrictions Maximum transmit duty cycle of 25 %	Asset Tracking	21 kbps GMR-1 3G packet switched services in downlink; 2,6 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
1 0 0 0 0 0 1	1	9	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH BACH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions DCH(1,3)/D 4 kbps voice and data with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Portable	590 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-Band
1 0 0 0 0 1 0	1	9	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH BACH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions In-Call Vocoder rate change not supported DCH(1,3) 4 kbps voice and data channel encoded with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Semi-Fixed	590 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-Band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
1 0 0 0 0 1 1	1	9	PDCH3(10,3) PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH BACH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions In-Call Vocoder rate change not supported DCH(1,3) 4 kbps voice and data channel encoded with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Vehicular	590 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-Band
1 0 0 0 1 0 0	1	9	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions In-Call Vocoder rate change not supported DCH(1,3) 4 kbps voice and data channel encoded with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Large Form Factor Maritime	590 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-Band

GMR-1 3G terminal type identifier (in binary) $b_7b_6b_5b_4b_3b_2b_1$	Multislot class (See annex-A)	Power class (See TS 101 376-5-5 [6])	Supported channel type(s) (See clause 5)	Key Attributes	Mode of use	Types of services supported	Antenna Type	Network interfaces supported	Operating Band
1 0 0 0 1 0 1	1	9	PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U* PDCH3(5,3)/U* PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions In-Call Vocoder rate change not supported DCH(1,3) 4 kbps voice and data channel encoded with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Aeronautical	256 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-band
1 0 0 0 1 1 0	1	9	PDCH3(10,3)/D PDCH3(5,12)/D PDCH3(5,3)/D PDCH3(2,6)/D PDCH3(1,6)/D DCH(1,3)/D DCH(1,6)/D PDCH3(5,12)/U PDCH3(5,3)/U PDCH3(2,6)/U PDCH3(1,6)/U DCH(1,3)/U DCH(1,6)/U PRACH3 BCCH FCCH3 RACH3 PCH AGCH GBCH3 CBCH	Full Duplex No receive duty cycle restrictions No duty transmit cycle restrictions In-Call Vocoder rate change not supported DCH(1,3) 4 kbps voice and data channel encoded with Conv. Code Type 2 (see TS 101 376-5-3 [4])	Small Form Factor Maritime	590 kbps GMR-1 3G packet switched services in downlink; 256 kbps GMR-1 3G packet switched services in uplink.	Internal or External Circular Polarization	Iu-PS	L-Band
All other values are reserved									

Annex D (informative): Bibliography

- 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; GMR-1 03.022".

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

- 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; GMR-1 04.008".

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

- 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; GMR-1 04.003".

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

- 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; GMR-1 04.006".

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

- 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; GMR-1 05.005".

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

- 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; GMR-1 05.008".

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

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

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

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

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

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

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

- ETSI TS 101 376-3-10: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth Station (MES) in idle mode; GMR-1 3G 43.022".

- ETSI TS 101 376-5-6: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control; GMR-1 3G 45.008".

History

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