

ETSI TS 101 376-4-4 V3.3.1 (2012-12)



**GEO-Mobile Radio Interface Specifications (Release 3);  
Third Generation Satellite Packet Radio Service;  
Part 4: Radio interface protocol specifications;  
Sub-part 4: Layer 1 General Requirements;  
GMR-1 3G 44.004**

---

Reference

RTS/SES-00328-4-4

---

Keywords

3G, GMR, GSM, GSO, interface, layer 1, MES,  
mobile, MSS, radio, satellite, S-PCN

**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  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

[http://portal.etsi.org/chaicor/ETSI\\_support.asp](http://portal.etsi.org/chaicor/ETSI_support.asp)

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2012.  
All rights reserved.

DECT™, PLUGTESTS™, UMTS™ and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.  
3GPP™ and LTE™ are Trade Marks of ETSI registered for the benefit of its Members and  
of the 3GPP Organizational Partners.  
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

# Contents

Intellectual Property Rights .....	4
Foreword.....	4
Introduction .....	5
1 Scope .....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	8
3 Definitions and abbreviations.....	8
3.1 Definitions.....	8
3.2 Abbreviations .....	8
4 Interfaces to the physical layer.....	8
4.1 Interface to the data link layer .....	8
4.2 Interface to radio resource management.....	8
4.3 Interface to other functional units.....	8
5 Service of the physical layer .....	8
5.1 Service Access Point .....	8
5.2 Service of the physical layer.....	8
5.2.1 Specific services of the physical layer in the MES.....	9
6 Block transmission .....	9
6.1 SACCH3 block format (A/Gb mode only).....	9
6.2 SACCH6 block format (A/Gb mode only).....	9
6.3 SACCH9 block format (A/Gb mode only).....	9
6.4 BCCH/PCH/AGCH/CBCH block format .....	9
6.5 BACH block format (A/Gb mode only).....	9
6.6 GBCH block format (A/Gb mode only).....	9
6.6a GBCH3 block format (Iu mode only).....	9
6.7 RACH block format (A/Gb mode only).....	10
6.7a RACH3 block format (Iu mode only).....	10
6.8 SDCCCH block format (A/Gb mode only).....	10
6.9 FACCH3 block format (A/Gb mode only).....	10
6.10 FACCH6 block format (A/Gb mode only).....	10
6.11 FACCH9 block format (A/Gb mode only).....	10
6.12 TACCH block format (A/Gb mode only).....	10
6.13 Packet Data Traffic Channel (PDTCH) block format .....	11
6.14 Dedicated Channel (DCH) block formats (Iu mode only).....	11
6.14.1 2,6 kbps DACCH Block .....	11
6.14.2 4,0 kbps DACCH Block .....	11
6.14.3 2,45 kbps Speech Block.....	12
6.14.4 4,0 kbps Speech Block.....	12
6.15 PRACH format (A/Gb mode).....	12
6.15a PRACH3 format (Iu mode) .....	13
6.16 Order of bit transmission.....	13
7 Power Control Status Field.....	13
8 Public User Information (PUI).....	13
9 Uplink Map (ULMAP) (Iu mode only).....	14
<b>Annex A (informative): Bibliography.....</b>	<b>15</b>
History .....	16

---

# Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

---

## Foreword

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

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

Version 3.m.n

where:

- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;
- the second digit (m) is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The present document is part 4, sub-part 4 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":**

Sub-part 1: "Mobile Earth Station-Gateway Station System (MES-GSS) Interface; GMR-1 04.001";

Sub-part 2: "GMR-1 Satellite Network Access Reference Configuration; GMR-1 04.002";

Sub-part 3: "Channel Structures and Access Capabilities; GMR-1 04.003";

**Sub-part 4: "Layer 1 General Requirements; GMR-1 3G 44.004";**

Sub-part 5: "Data Link Layer General Aspects; GMR-1 04.005";

Sub-part 6: "Mobile earth Station-Gateway Station Interface Data Link Layer Specifications; GMR-1 04.006";

Sub-part 7: "Mobile Radio Interface Signalling Layer 3 General Aspects; GMR-1 3G 24.007";

Sub-part 8: "Mobile Radio Interface Layer 3 Specifications; GMR-1 3G 44.008";

Sub-part 9: "Performance Requirements on the Mobile Radio Interface; GMR-1 04.013";

Sub-part 10: "Rate Adaptation on the Access Terminal-Gateway Station Subsystem (MES-GSS) Interface; GMR-1 04.021";

- Sub-part 11: "Radio Link Protocol (RLP) for Data Services; GMR-1 04.022";
  - 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";
  - Sub-part 13: "Radio Resource Control (RRC) protocol; Iu Mode; GMR-1 3G 44.118";
  - Sub-part 14: "Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; Iu Mode; GMR-1 3G 44.160";
  - Sub-part 15: "Packet Data Convergence Protocol (PDCP) specification; GMR-1 3G 25.323";
- Part 5: "Radio interface physical layer specifications";
- 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].

The clause numbering and the table numbering and figure numbering in the present document are aligned to the corresponding numbering of TS 101 376-4-4 (Release 1) [3] as far as possible. In several places, this means that the table numbering and figure numbering is non-continuous in the present document in order to maintain this alignment, the following rules apply:

- A table that uses the same table number replaces the corresponding table in TS 101 376-4-4 (Release 1) [3];
- A table that uses a different table number is a new additional table.

---

# 1 Scope

The present document defines the service offered by the physical layer to the upper layers of the MES-GS interface in the GMR-1 Mobile Satellite System. Its main objective is to provide guidance for the interface between the GMR-1 Technical Specifications in the 45-series and the 44-series. It also specifies the format of signalling channels, traffic channels (Iu mode) and the order of bit transmission.

As far as possible, the present document makes use of the layering principles of the Reference Model for Open System Interconnection (OSI) as contained in ITU-T Recommendations X.200 [i.1] and X.210 [i.2].

---

## 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 version of that document in Release 7 or to the latest version of that document in the latest release less than 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] Void.
- [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 101 376-4-4: "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 4: Layer 1 General Requirements; GMR-1 04.004".

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

- [4] 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".
- [5] 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".
- [6] 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".

## 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.

- [i.1] ITU-T Recommendation X.200: "Information technology - Open Systems Interconnection - Basic reference model: The basic model".
- [i.2] ITU-T Recommendation X.210: "Information technology - Open Systems Interconnection - Basic Reference Model: Conventions for the definition of OSI services".

---

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 101 376-4-4 [3] apply.

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TS 101 376-4-4 [3] apply.

---

## 4 Interfaces to the physical layer

Same as clause 4 of TS 101 376-4-4 [3].

### 4.1 Interface to the data link layer

Same as clause 4.1 of TS 101 376-4-4 [3].

### 4.2 Interface to radio resource management

Same as clause 4.2 of TS 101 376-4-4 [3].

### 4.3 Interface to other functional units

Same as clause 4.3 of TS 101 376-4-4 [3].

---

## 5 Service of the physical layer

Same as clause 5 of TS 101 376-4-4 [3].

### 5.1 Service Access Point

Same as clause 5.1 of TS 101 376-4-4 [3].

### 5.2 Service of the physical layer

Same as clause 5.2 of TS 101 376-4-4 [3].



### 5.2.1 Specific services of the physical layer in the MES

Same as clause 5.2.1 of TS 101 376-4-4 [3].

## 6 Block transmission

### 6.1 SACCH3 block format (A/Gb mode only)

Same as clause 6.1 of TS 101 376-4-4 [3].

### 6.2 SACCH6 block format (A/Gb mode only)

Same as clause 6.2 of TS 101 376-4-4 [3].

### 6.3 SACCH9 block format (A/Gb mode only)

Same as clause 6.3 of TS 101 376-4-4 [3].

### 6.4 BCCH/PCH/AGCH/CBCH block format

Same as clause 6.4 of TS 101 376-4-4 [3].

### 6.5 BACH block format (A/Gb mode only)

Same as clause 6.5 of TS 101 376-4-4 [3].

### 6.6 GBCH block format (A/Gb mode only)

Same as clause 6.6 of TS 101 376-4-4 [3].

### 6.6a GBCH3 block format (lu mode only)

The 24 octets of GBCH3 blocks are used in the downlink in the following way.

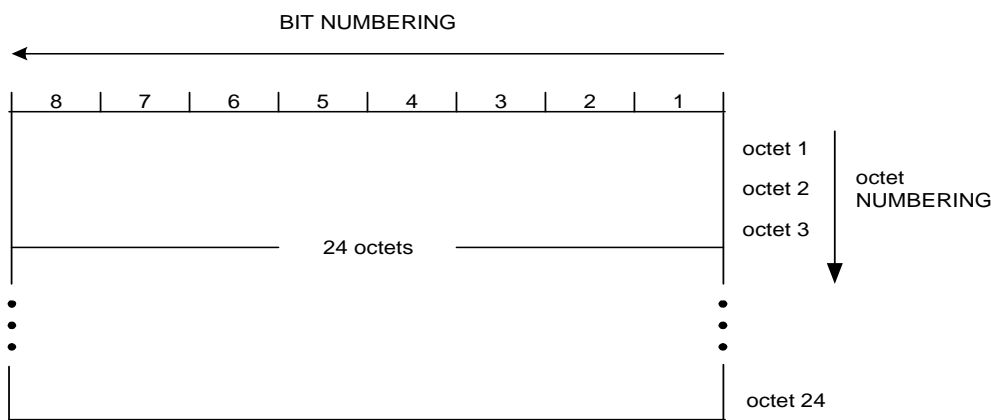


Figure 6.6a: GBCH3 block format

## 6.7 RACH block format (A/Gb mode only)

Same as clause 6.7 of TS 101 376-4-4 [3].

### 6.7a RACH3 block format (lu mode only)

The 68 bits of RACH3 block are used in the uplink in the following way:

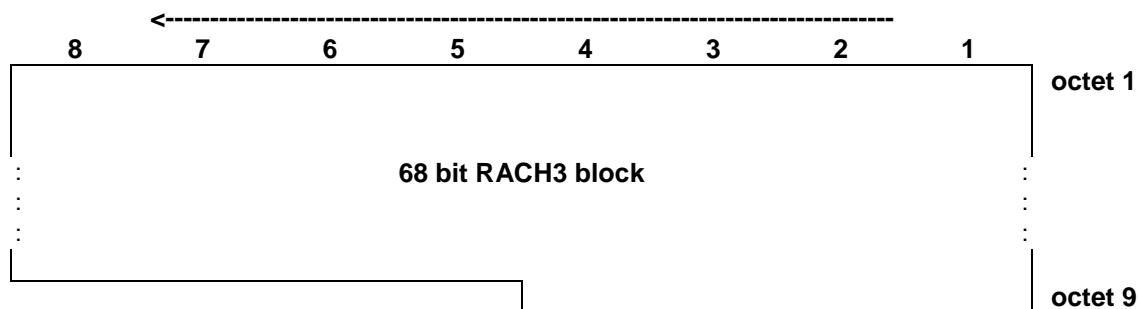


Figure 6.7a: RACH3 block format

## 6.8 SDCCH block format (A/Gb mode only)

Same as clause 6.8 of TS 101 376-4-4 [3].

## 6.9 FACCH3 block format (A/Gb mode only)

Same as clause 6.9 of TS 101 376-4-4 [3].

## 6.10 FACCH6 block format (A/Gb mode only)

Same as clause 6.10 of TS 101 376-4-4 [3].

## 6.11 FACCH9 block format (A/Gb mode only)

Same as clause 6.11 of TS 101 376-4-4 [3].

## 6.12 TACCH block format (A/Gb mode only)

Same as clause 6.12 of TS 101 376-4-4 [3].

### 6.13 Packet Data Traffic Channel (PDTCH) block format

The PDCH block always occupies integer number of octets. The number of octets depends on the bandwidth of the packet data channel, the number of time slots used and the coding scheme used. See TS 101 376-4-12 [6].

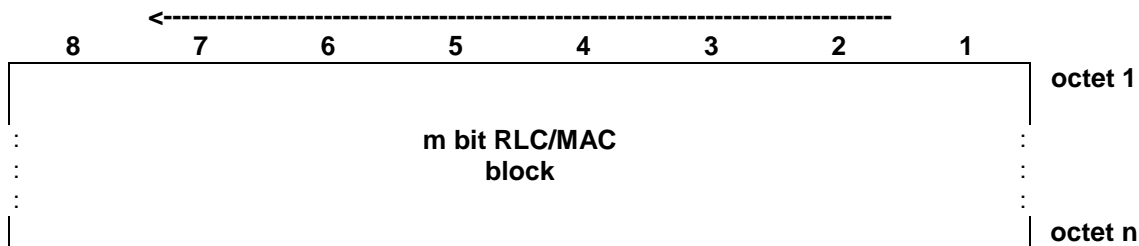


Figure 6.14: PDTCH block format

### 6.14 Dedicated Channel (DCH) block formats (lu mode only)

#### 6.14.1 2,6 kbps DACCH Block

The 83 bits of 2,6 kbps DACCH block are used in the following way:

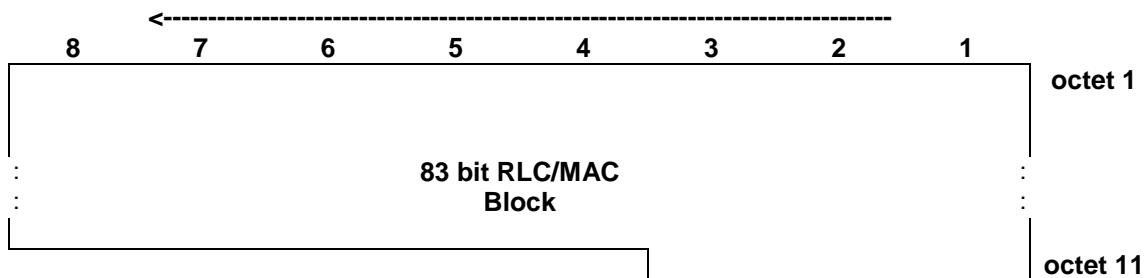


Figure 6.15: 2,6 kbps DACCH block format

#### 6.14.2 4,0 kbps DACCH Block

The 139 bits of 4,0 kbps DACCH block are used in the following way:

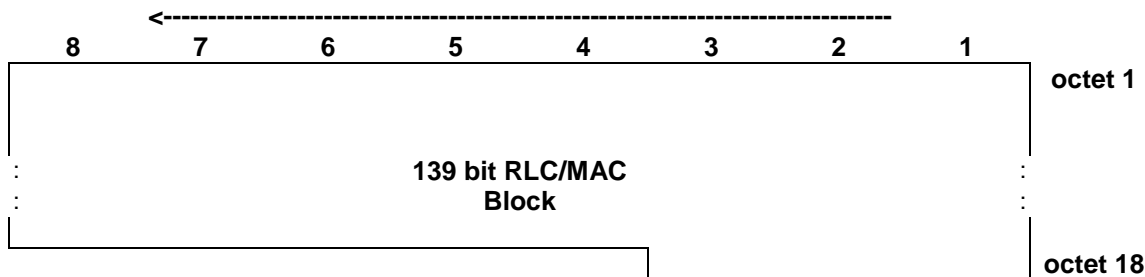


Figure 6.16: 4,0 kbps DACCH block format

### 6.14.3 2,45 kbps Speech Block

The 98 bits of 2,45 kbps Speech block are used in the following way:

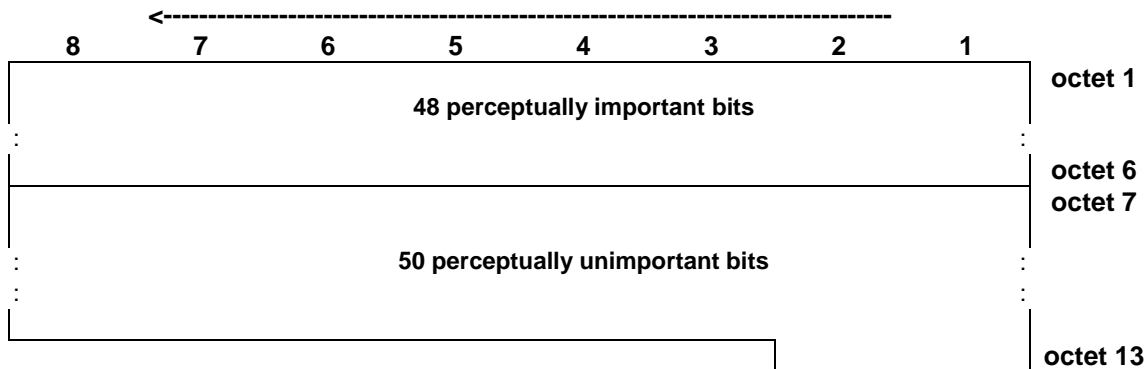


Figure 6.17: 2,45 kbps Speech block format

### 6.14.4 4,0 kbps Speech Block

The 160 bits of 4,0 kbps Speech block are used in the following way:

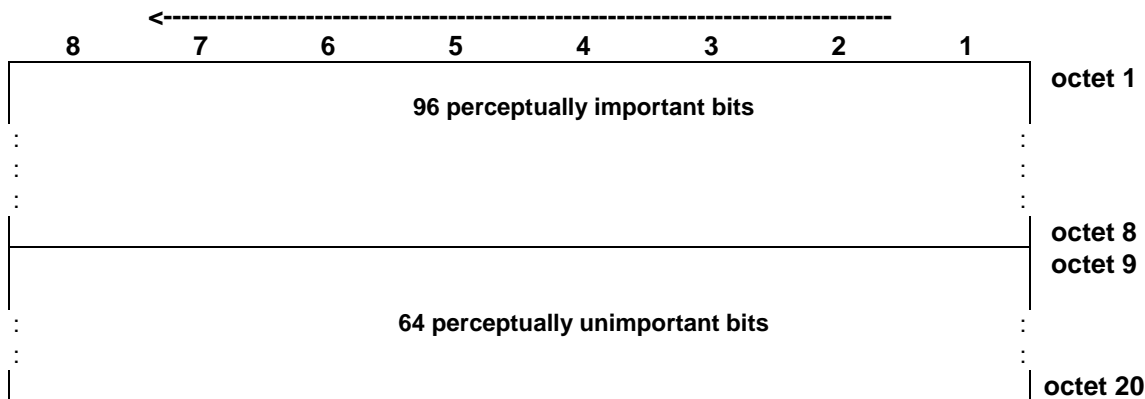


Figure 6.18: 4,0 kbps Speech block format

### 6.15 PRACH format (A/Gb mode)

The 64 bits of PRACH block are used in the uplink in the following way:

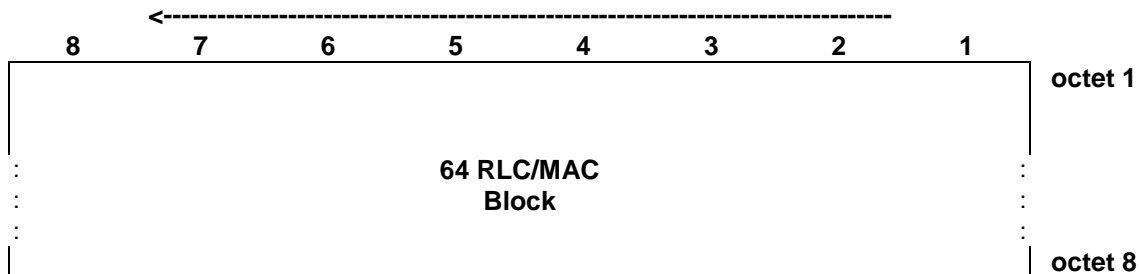


Figure 6.19: PRACH block format

### 6.15a PRACH3 format (lu mode)

The 68 bits of RACH3 block are used in the uplink in the following way:

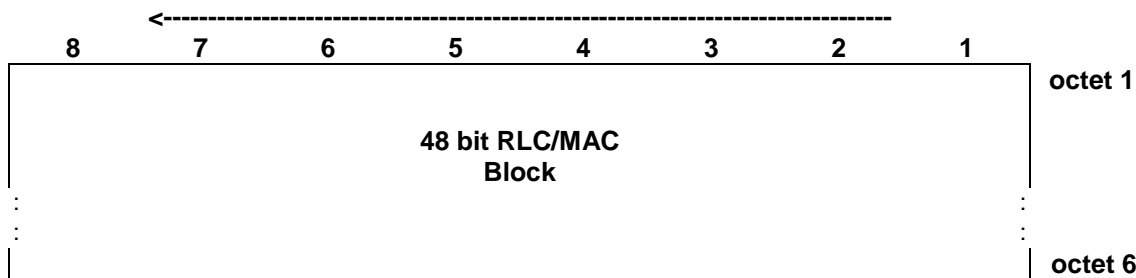


Figure 6.20: PRACH3 block format

### 6.16 Order of bit transmission

The following rule apply for order of bit transmission:

- Bit  $m$  of octet  $n$  shall be transmitted as bit  $d((n-1) \times 8 + m-1)$  with  $m = (1 \text{ to } x)$  and  $n = (1 \text{ to } y)$  where  $x$  and  $y$  are given by the definition of the respective layer 3 information in TS 101 376-4-8 [4] and  $d(i)$  are defined in TS 101 376-5-3 [5].

---

## 7 Power Control Status Field

Same as clause 4 of TS 101 376-4-4 [3].

---

## 8 Public User Information (PUI)

The number of bits in PUI depends on the bandwidth of the packet data channel. The bits in PUI are used in the following way:

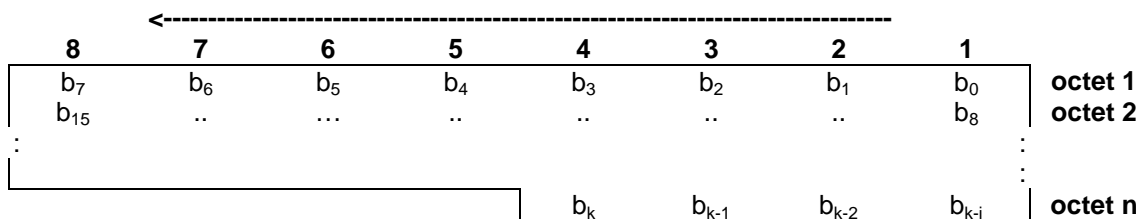
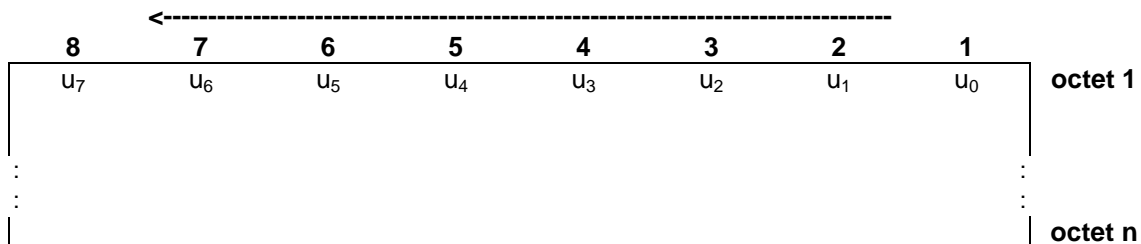


Figure 8.1: PUI format

$b_k$  in Figure 8.1 is defined in TS 101 376-4-12 [6].

## 9 Uplink Map (ULMAP) (lu mode only)

The ULMAP block always occupies integer number of octets. The number of octets in ULMAP is specified in TS 101 376-4-12 [6]. The bits of ULMAP are used in the following way:



**Figure 9.1: ULMAP format**

Each octet in ULMAP carries a USF (Uplink Status Flag, See TS 101 376-4-12 [6]). u<sub>0</sub> is the least significant bit and u<sub>7</sub> is the most significant bit of USF.

---

## Annex A (informative): Bibliography

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.

---

## History

<b>Document history</b>		
V3.2.1	February 2011	Publication
V3.3.1	December 2012	Publication