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Digital cellular telecommunications system (Phase 2+) (GSM); GSM Cordless Telephony System (CTS), Phase 1; Lower Layers of the CTS Radio Interface; Stage 2; (GSM 03.52 version 7.1.1 Release 1998)

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European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
GSM Cordless Telephony System (CTS), Phase 1;
Lower Layers of the CTS Radio Interface;
Stage 2
(GSM 03.52 version 7.1.1 Release 1998)**

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document was submitted to Public Enquiry with the ETSI number 301 404. For vote the number was changed to 302 404 because the number 301 404 is reserved and was allocated accidentally.

The present document gives an overall description of the lower layers of the radio interface for GSM based Cordless Telephony Systems.

The contents of the present document is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document it will be re-released with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

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- 7 indicates Release 1998 of GSM Phase 2+
 - x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
 - y the third digit is incremented when editorial only changes have been incorporated in the specification.

National transposition dates

Date of adoption of this EN:	21 July 2000
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 April 2001
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1 Scope

The present document gives an overall description of the lower layers of the radio interface for GSM based Cordless Telephony Systems (GSM-CTS).

The GSM-CTS system is intended to provide a cordless connection between the fixed network and GSM-based CTS Mobile Stations (CTS-MS) via a private CTS Fixed Part (CTS-FP).

Stage 1 is an overall description, from the service subscribers and user's standpoint, that view the network as a single entity which provides service to the user. GSM 02.56 [2] contains the CTS Stage 1 service description.

GSM 03.56 [5] is a Stage 2 document that describes the system architecture of the GSM Cordless Telephone Systems (GSM-CTS), i.e. the system elements, the system interfaces and the functional capabilities.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

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- STANDARD PREVIEW**
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- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and Acronyms".
 - [2] GSM 02.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephone System (CTS); Service Description; Stage 1".
 - [3] GSM 03.22: "Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode", Version 6.x.x.
 - [4] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephone System (CTS); Security related network functions; Stage 2".
 - [5] GSM 03.56: "Digital cellular telecommunications system (Phase 2+); GSM Cordless Telephony System (CTS); CTS Architecture Description; Stage 2".
 - [6] GSM 04.08: "European digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification", Version 6.x.x.
 - [7] GSM 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path", Version 6.3.0.
 - [8] GSM 05.03: "Digital cellular telecommunications system (Phase 2+); Channel coding", Version 6.1.0.
 - [9] GSM 05.04: "Digital cellular telecommunications system (Phase 2+); Modulation".
 - [10] GSM 05.05: "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception".
 - [11] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

- [12] GSM 05.10: "Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CTS Mobile Station: a GSM-MS supporting CTS.

CTS Fixed Part: the CTS-FP is a device which acts as a link between the CTS-MS and the fixed network

GSM-CTS: Cordless Telephony System based on GSM

3.2 Abbreviations

The following list describes the abbreviations and acronyms used in the present document. The GSM abbreviations explained in GSM 01.04 [1] are not included below.

AFA	Adaptive Frequency Allocation
CTS	Cordless Telephony System
CTSAGCH	CTS Access Grant CHannel
CTSARCH	CTS Access Request CHannel
CTSBCH	CTS Beacon CHannel
CTS-FP	CTS Fixed Part
CTS-MS	CTS Mobile Station
CTSMSI	CTS Mobile Subscriber Identity
CTSPCH	CTS Paging CHannel
DPLMN	Donor Public Land Mobile Network
FPBI	Fixed Part Beacon Identity
GFL	Generic Frequency List
RX	Receive
TFH	Total Frequency Hopping
TX	Transmit

4 Main concepts of the CTS radio interface

The main assumption behind the CTS work item and in particular the CTS radio interface, is that a modified single timeslot state of the art GSM-MS chipset could be used for a home base station, i.e. as a CTS-FP.

The CTS radio interface has been designed to meet a requirement of low generated interference, either from the CTS to existing overlaying PLMNS, either from a CTS to another CTS. This requirement is achieved by the combined usage of the three concepts: beacon concept, AFA concept and TFH concept.

4.1 Beacon concept

A limited number of CTS-MS shall be served by one CTS-FP (see GSM 02.56 [2]). Therefore, a broadcast channel continuously transmitted such as the BCCH in GSM is not needed for CTS.

A channel called CTS beacon channel (CTSBCH) is proposed with the following main characteristics: it is transmitted by the CTS-FP every 26 frames in a 52-multiframe pattern, and allows the CTS-MS to synchronise with the CTS-FP. Minimum signalling is also supported by the CTSBCH, so that it is the only logical channel a CTS-FP shall periodically transmit on the CTS radio interface. Every other logical channel is only transmitted "on demand".

4.2 Adaptive Frequency Allocation (AFA) concept

A precise radio frequency planning can not be applied to the CTS-FP/MS pair, as the CTS is intended to be deployed by the end-user. Therefore, a list of frequencies (the GFL) on which it is allowed to operate is given to the CTS. With the AFA, interference measurements will be performed on the frequencies in the GFL to provide a ranking in the AFA table, in order to exclude unacceptably interfered frequencies from the usage in CTS.

4.3 Total Frequency Hopping (TFH) concept

The remaining frequencies are used by the Total Frequency Hopping algorithm in order to reduce the interference of the CTS with the overlaying PLMN and other CTS-FP/MS pairs. With TFH the interference caused by the CTS link is spread across multiple GSM links (interference averaging) and the co-channel interference is due to different users at different locations (interference diversity).

A new hopping algorithm which is especially tailored for use in CTS with improved performance compared to the GSM hopping algorithms shall be used.

5 Radio Transmission and Reception

The CTS-FP and CTS-MS shall in Phase 1 GSM-CTS conform to the transmission and reception specifications of at least one or more of the following cellular standards:

- P-GSM900
- E-GSM900
- DCS1800
- PCS1900

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The final choice of characteristics and performance requirements depends on system scenario calculations.

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5.1 Frequency Band and Channel Arrangement

The frequency band and channel arrangement for the GSM-CTS are as specified in GSM 05.05 [10] clause 2.

5.2 Receiver Characteristics

5.2.1 CTS-MS characteristics

It is the intention to keep the CTS-MS characteristics in line with the GSM-MS characteristics as specified in GSM 05.05 [10] clause 5, but the final decision depends on system scenario calculations.

5.2.2 CTS-FP characteristics

It is the intention to keep the CTS-FP characteristics in line with the GSM-MS characteristics as specified in GSM 05.05 [10] clause 5, but with reversed frequency bands. The final decision depends on system scenario calculations.

5.3 Transmitter Characteristics

5.3.1 CTS-MS characteristics

It is the intention to keep the CTS-MS characteristics as far as possible in line with the GSM-MS characteristics as specified in GSM 05.05 [10] subclause 4, but the final decision depends on system scenario calculations.

In addition, it is intended to lower the maximum nominal output power and the lowest nominal output power to values which shall be determined by system scenario calculations. Both values could be below the nominal output powers specified in GSM 05.05 [10] clause 4.1.1.

5.3.2 CTS-FP characteristics

It is the intention to keep the CTS-FP characteristics as far as possible in line with the GSM-MS characteristics as specified in GSM 05.05 [10] subclause 4, but with reversed frequency bands. The final decision depends on system scenario calculations.

In addition, it is intended to lower the maximum nominal output power and the lowest nominal output power to values which shall be determined by system scenario calculations. Both values could be below the nominal output powers specified in GSM 05.05 [10] subclause 4.1.1.

5.4 CTS transmitter / receiver performance

It is the intention to keep the CTS transmitter / receiver performance in line with the GSM transmitter / receiver performance as specified in GSM 05.05 [10] clause 6.

The GSM requirement on receiver performance for frequency hopping where frequencies are interfered shall be fulfilled by both the CTS-MS and CTS-FP.

6 Modulation and Raw Data Rates

The modulation technique and raw data rates are as specified in GSM 05.04 [9].

7 Channel Coding and Interleaving

The channel coding algorithm and interleaving schemes of existing GSM channels used in the GSM CTS radio interface are as specified in GSM 05.03 [8].

Channel coding algorithms and interleaving schemes for new logical channels are defined in clause 10.

8 Time Slots and TDMA-Frames

The time slot organisation is as specified in GSM 05.02 [7] subclause 4.3.1.

The TDMA frames are organised in multiframes, superframes, and hyperframes. The hyperframe is the longest recurrent time period and consists of $26 \times 51 \times 2048$ TDMA frames. The TDMA frames are numbered modulo this hyperframe, which means that the frame number FN ranges from 0 to $FN_MAX = (26 \times 51 \times 2^{11}) - 1 = 2715647$. The CTS-FP keeps track of the frame numbering once initialised.

Two types of multiframes exist in the GSM-CTS system:

- a 26-multiframe with a duration of 120 ms, comprising 26 TDMA frames. This multiframe is used to carry TCH, SACCH, and FACCH (see clause 10).
- a 52-multiframe with a duration of 240 ms, comprising 52 TDMA frames. This multiframe is used to carry CTSBCH, CTSARCH, CTSAGCH and CTSPCH (see clause 10), and is indicated as CTSBCH multiframe.

Note that GSM-CTS uses a scheme slightly different from the GSM-based frame structure in that instead of 51-multiframes, 52-multiframes are used. The reason for this choice is that the bursts of the CTSBCH have a frame distance that coincides with the idle frames of a TCH/F connection ; it is therefore possible to support in the CTS-FP a speech connection and the CTSBCH transmission in parallel on the same timeslot, which allows the realisation of the CTS-FP hardware with a state of the art chipset for a GSM-MS supporting only a single timeslot.