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Contents

Intellectual Property Rights 2
Foreword 2
Modal verbs terminology 2
Foreword 6
1 Scope 7
2 References 7
3 Definitions and abbreviations 8
3.1 Definitions 8
3.2 Abbreviations 8
4 Main concepts of the CTS radio interface 8
4.1 Beacon concept 8
4.2 Adaptive Frequency Allocation (AFA) concept 8
4.3 Total Frequency Hopping (TFH) concept 9
5 Radio Transmission and Reception 9
5.1 Frequency Band and Channel Arrangement 9
5.2 Receiver Characteristics 9
5.2.1 CTS-MS characteristics 9
5.2.2 CTS-FP characteristics 9
5.3 Transmitter Characteristics 10
5.3.1 CTS-MS characteristics 10
5.3.2 CTS-FP characteristics 10
5.4 CTS transmitter / receiver performance 10
6 Modulation and Raw Data Rates 10
7 Channel Coding and Interleaving 10
8 Time Slots and TDMA-Frames 10
9 Bursts 11
10 Logical Channels 11
10.1 CTS Beacon Channel (CTSBCH) 11
10.1.1 CTSBCH format 11
10.1.2 CTSBCH timing 12
10.1.3 CTSBCH radio frequency channel 12
10.1.4 CTSBCH-SB information 12
10.2 CTS Access Request Channel (CTSARCH) 12
10.2.1 CTSARCH format 12
10.2.2 CTSARCH timing 12
10.2.3 CTSARCH radio frequency channel 13
10.2.4 CTSARCH information 13
10.3 CTS Access Grant Channel (CTSAGCH) 13
10.3.1 CTSAGCH format 13
10.3.2 CTSAGCH timing 13
10.3.3 CTSAGCH radio frequency channel 13
10.3.4 CTSAGCH information 14
10.4 CTS Paging Channel (CTSPCH) 14
10.4.1 CTSPCH format 14
10.4.2 CTSPCH timing 14
10.4.3 CTSPCH radio frequency channel 14
10.4.4 CTSPCH information 14
10.5 SACCH 14
10.6 FACCH 15

10.7 TCH 15
10.8 Mapping of the Logical Channels onto Physical Channels 15
10.8.1 Mapping in time of the logical channels onto the physical channels 15
10.8.2 Mapping in frequency of the logical channels onto the physical channels 16
10.8.3 Permitted Channel Combinations 16

11 Lower Layer Procedures 17
11.1 CTSBCH transmission 17
11.2 CTSBCH timeslot management 17
11.3 CTSBCH-FB detection 17
11.4 CTSBCH-SB decoding 17
11.5 Discontinuous transmission (DTX) 17
11.6 Interference measurements 17
11.7 MS timing offset measurements 18

12 Radio Resource Management Procedures 18
12.1 Radio Resources management states 18
12.2 General procedures 18
12.2.1 Initial synchronization of a CTS-MS and CTS-FP 18
12.2.2 Frequency management 18
12.2.2.1 Interference measurements exchange 19
12.2.2.2 Adaptive Frequency Allocation (AFA) algorithm 19
12.2.2.3 AFA / TFH interworking 19
12.2.2.4 CTSBCH frequency selection 19
12.2.3 CTSBCH-SB information 20
12.2.4 Control of CTS-FP service range 20
12.2.5 CTS-FP selection 20
12.3 RR Idle state procedures 20
12.3.1 CTSBCH monitoring 20
12.3.2 Alive check 20
12.3.3 Establishment of a dedicated RR connection 20
12.3.3.1 Timeslot assignment for dedicated connection 20
12.3.3.2 CTS-MS initiated RR connection establishment 21
12.3.3.2.1 Non-hopping access procedure 21
12.3.3.2.2 Hopping access procedure 21
12.3.3.3 CTS-FP initiated RR connection establishment 21
12.3.4 CTSBCH failure detection 22
12.4 RR Active state procedures 22
12.4.1 Radio link failure detection 22
12.4.2 RF power control 22
12.4.3 Intracell handover 22
12.4.4 Channel release 22

Annex A (informative): GSM backwards compatibility issues 23

A.1 Reasons for possible impact of a CTS-FP on a GSM-MS in the PLMN 23
A.1.1 Power measurement of BCCH carrier 23
A.1.1.1 Power on CTS-FP beacon frequency seen by the GSM-MS in cell selection 23
A.1.1.2 Power on CTS-FP hopping frequencies seen by the GSM-MS in cell selection 24
A.1.2 Synchronisation of a GSM-MS 24

A.2 Scenario 1: PLMN and CTS-GFL have no common frequency in whole coverage area 24
A.2.1 Cell Selection 24
A.2.1.1 GSM-MS has no BA list stored on the SIM 24
A.2.1.2 GSM-MS has a stored BA list on the SIM (optional) 24
A.2.2 Cell reselection 25
A.2.3 Handover 25

A.3 Scenario 2: PLMN and CTS-GFL have locally no common frequency 25
A.3.1 Cell Selection 25
A.3.1.1 GSM-MS has no BA list stored on the SIM 25
A.3.1.2 GSM-MS has a stored BA list on the SIM (optional) 25
A.3.2 Cell reselection 25
A.3.2.1 GSM-MS camping on its home PLMN 25

A.3.2.2 GSM-MS camping on a visited PLMN in home country....26
A.3.3 Handover....26
A.4 Scenario 3: PLMN and CTS-GFL have locally some common frequencies....26
A.4.1 Cell selection....26
A.4.2 Cell reselection....26
A.4.3 Handover....27
A.5 Conclusion....27
Annex B (informative): Change history....28
History....29

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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 contains the CTS Stage 1 service description.

GSM 03.56 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.

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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".

[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".

[7] GSM 05.02 (V6.3): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

[8] GSM 05.03 (V6.1): "Digital cellular telecommunications system (Phase 2+); Channel coding".

[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: GSM-MS supporting CTS.

CTS Fixed Part: 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). 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.

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

5.1 Frequency Band and Channel Arrangement

The frequency band and channel arrangement for the GSM-CTS are as specified in GSM 05.05 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 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 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 clause 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 subclause 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 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 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 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.

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.

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 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 x 51 x 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 x 51 x 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);