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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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Foreword

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1 Scope

The present document is the overall technical specification for the support of the 7.68Mcps TDD option in UTRA.

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.
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- For a non-specific reference, the latest version applies. 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 the same Release as the present document*.

[1] 3GPP TR 25.895 (V6.0.0): "Analysis of higher chip rates for UTRA TDD evolution".

[2] 3GPP TS 25.221: "Physical channels and mapping of transport channels onto physical channels (TDD)".

[3] 3GPP TS 25.222: "Multiplexing and channel coding (TDD)".

[4] 3GPP TS 25.223: "Spreading and modulation (TDD)".

[5] 3GPP TS 25.224: "Physical layer procedures (TDD)".

[6] 3GPP TS 25.225: "Physical layer; Measurements (TDD)".

[7] 3GPP TS 25.301: "Radio Interface Protocol Architecture".

[8] 3GPP TS 25.306: "UE Radio Access capabilities".

[9] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[10] 3GPP TS 25.102: "User Equipment (UE) radio transmission and reception (TDD)".

[11] 3GPP TS 25.105 "UTRAN (BS) TDD; Radio transmission and reception".

[12] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [12] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [12].

(void)

3.2 Symbols

For the purposes of the present document, the following symbols apply:

(void)

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [12] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [12].

BCH	Broadcast Channel
CCPCH	Common Control Physical Channel
DCH	Dedicated Channel
DPCH	Dedicated Physical Channel
DSCH	Downlink Shared Channel
E-AGCH	E-DCH Absolute Grant Channel
E-DCH	Enhanced Dedicated Channel
E-HICH	E-DCH Hybrid ARQ Indicator Channel
E-PUCH	E-DCH Physical Uplink Channel
E-RUCCH	E-DCH Random Access Uplink Control Channel
FACH	Forward Access Channel
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	Shared Control Channel for HS-DSCH
HS-SICH	Shared Information Channel for HS-DSCH
P-CCPCH	Primary CCPCH
PCH	Paging Channel
PDSCH	Physical Downlink Shared Channel
PI	Paging Indicator (value calculated by higher layers)
PICH	Page Indicator Channel
PRACH	Physical Random Access Channel
PUSCH	Physical Uplink Shared Channel
RACH	Random Access Channel
S-CCPCH	Secondary CCPCH
SCH	Synchronisation Channel
TrCH	Transport Channel
USCH	Uplink Shared Channel

4 Background and introduction

The 7.68Mcps TDD option is an evolution of the 3.84Mcps TDD option to a higher chip rate. There exists a great degree of commonality between the 3.84Mcps TDD option and the 7.68Mcps TDD option. Nevertheless, there are many aspects of the 7.68Mcps TDD option that require separate specification to the 3.84Mcps TDD option. The following aspects are specified at a high level in this document:

- Physical layer structure;
- Physical layer procedures;
- UE capabilities;
- Layer 2/3 protocol aspects;
- Iub / Iur aspects;
- Radio aspects;

5 Requirements

- The 7.68Mcps TDD option shall provide significant enhancements in terms of user experience (throughput and delay) and/or capacity (at least to the extent shown in [1]).
- Full mobility shall be supported, i.e., mobility should be supported for high-speed UE cases also, but optimisation should be for low-speed to medium-speed scenarios.
- It is highly desirable for the 7.68Mcps TDD option to maintain commonality with the 3.84Mcps TDD option. New features shall therefore provide significant incremental gain for an acceptable complexity.
- The UE and network complexity shall be minimised for a given level of system performance.
- The impact on current releases in terms of both protocol and hardware perspectives shall be taken into account.

6 Physical layer structure

6.0 Services offered to higher layers

The 7.68Mcps TDD option supports an identical set of transport channels and indicators to the 3.84Mcps TDD option.

6.1 Frame structure

The 7.68Mcps TDD option frame is of length 10ms and consists of 15 timeslots of duration 5120 * T_c, where T_c is the chip duration (T_c = 1 / 7.68 * 10^6 = 130.2ns). Any timeslot in the frame can be either uplink or downlink. At least one timeslot in the frame is assigned to the uplink and at least one timeslot in the frame is assigned to the downlink. The frame structure is shown in Figure 6.1.1.

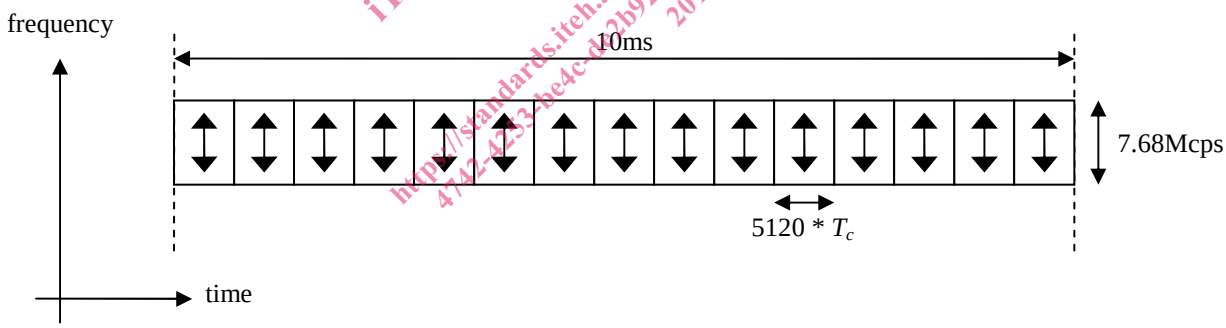

Figure 6.1.1: The 7.68Mcps TDD option frame structure

6.2 Burst structure

The 7.68Mcps burst consists of two data field portions, a midamble portion containing a training sequence and a guard period as shown in Figure 6.2.1. Several bursts can be transmitted at the same time where each burst uses a different OVSF channelisation code, but the same scrambling code.

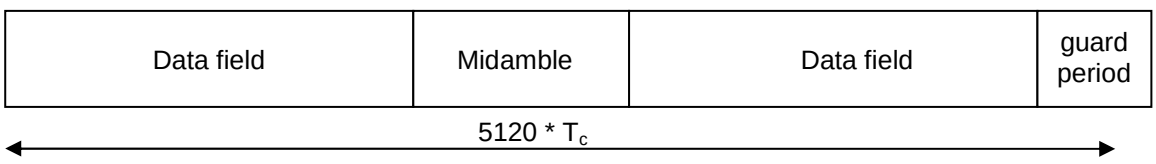

Figure 6.2.1: 7.68Mcps TDD option burst structure

Three burst types are specified: burst types 1, 2 and 3. The maximum number of training sequences supported in burst types 1 and 3 is either 4, 8 or 16 depending on cell configuration and either 4 or 8 for burst type 2 depending on cell configuration. The lengths of the fields within each burst are defined in Table 6.2.1.

Table 6.2.1: Number of chips within fields of the 7.68Mcps burst

Field	Burst Type 1	Burst Type 2	Burst Type 3
Data field 1	1952	2208	1952
Midamble	1024	512	1024
Data field 2	1952	2208	1760
Guard Period	192	192	384

On the downlink, a spreading factor of 32 is supported. Additionally for DPCH, PDSCH and HS-PDSCH, a spreading factor of 1 is supported on the downlink.

On the uplink, spreading factors of 1, 2, 4, 8, 16 and 32 are supported for DPCH, PUSCH and E-PUCH. PRACH and E-RUCCH only support spreading factors 16 and 32 and HS-SICH only supports spreading factor 32.

The spreading factors and burst types supported for different physical channels are defined in Table 6.2.2.

Table 6.2.2: Spreading factors and burst types supported by physical channels

Physical channel	Supported spreading factors	Supported burst types
UL DPCH	1, 2, 4, 8, 16, 32	1, 2, 3
DL DPCH	1, 32	1, 2
P-CCPCH	32	1
S-CCPCH	32	1, 2
PRACH	16, 32	3
PUSCH	1, 2, 4, 8, 16, 32	1, 2, 3
PDSCH	1, 32	1, 2
HS-PDSCH	1, 32	1, 2
HS-SCCH	32	1, 2
HS-SICH	32	1, 2
E-PUCH	1, 2, 4, 8 ,16, 32	1, 2, 3
E-AGCH	32	1, 2
E-HICH	32	1, 2
E-RUCCH	16, 32	3

Transmission of TPC and TFCI are performed in accordance with the general procedures used for the existing 3.84 Mcps TDD option. Due to the maximum spreading factor being increased from 16 (3.84Mcps) to 32 (7.68Mcps), usage of SF16 for TPC/TFCI is replaced with SF32 where appropriate.

6.3 Midambles

Midambles for burst types 1, 2 and 3 are created using the method applied for 3.84Mcps TDD. The basic midamble code for burst types 1 and 3 is of length 912; for burst type 2 the basic midamble code is of length 456.

Default, common and UE specific midamble modes are supported in the 7.68Mcps TDD option. The characteristics of these midamble allocations at 7.68Mcps are identical to their characteristics at 3.84Mcps. The number of active channelisation codes is signaled via midamble through an extension of the scheme applied at 3.84Mcps TDD (the extension accounts for the higher spreading factor supported at 7.68Mcps).

Midamble transmit powers are allocated as for 3.84Mcps TDD.

The association between midambles and channelisation codes for burst types 1, 2 and 3 are as shown in figure 6.3.1 for K_{cell} = 16, figure 6.3.2 for K_{cell} = 8 and figure 6.3.3 for K_{cell} = 4. Secondary channelisation codes are marked with a *. These associations apply both for UL and DL.

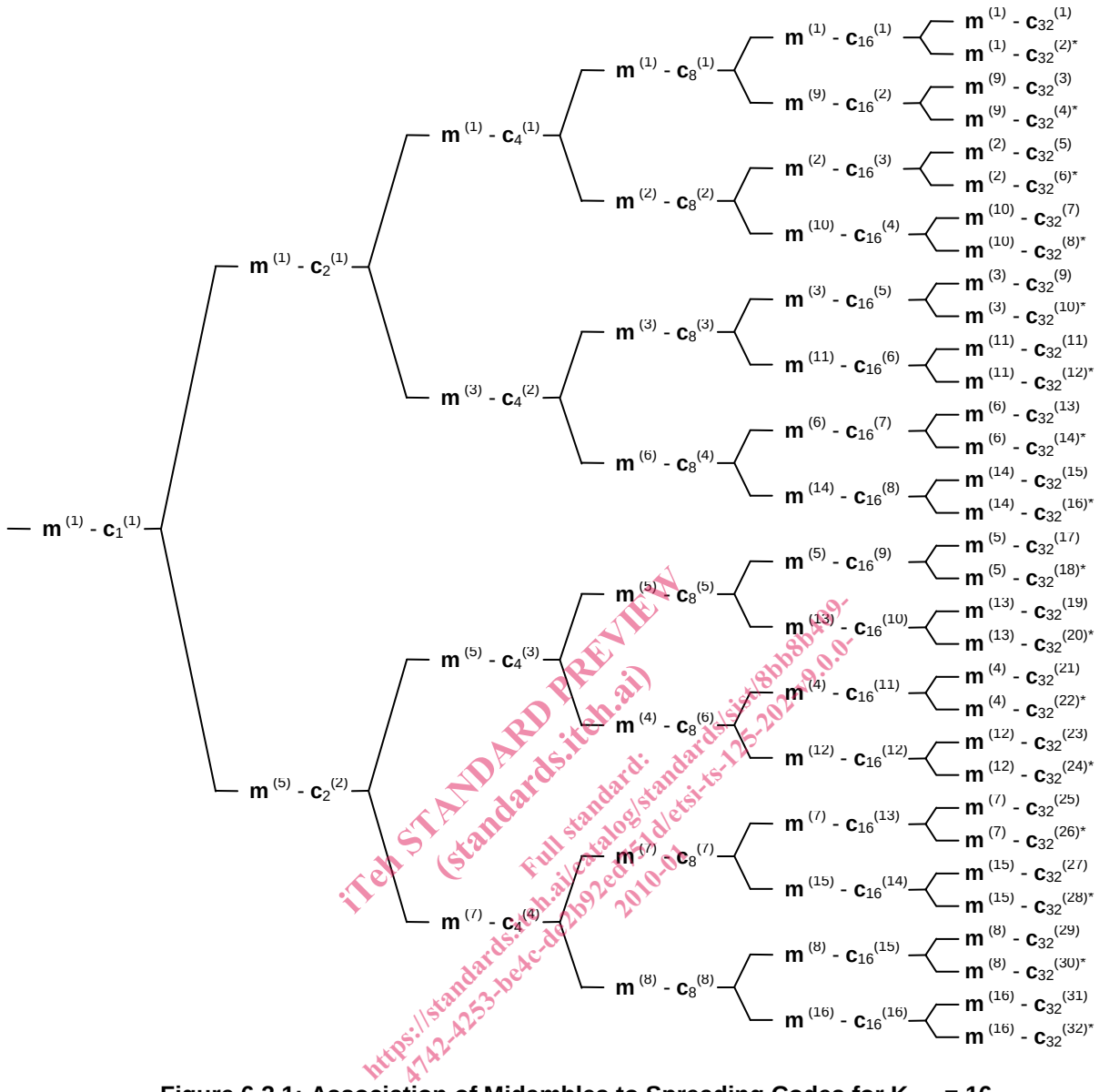

Figure 6.3.1: Association of Midambles to Spreading Codes for K_{Cell} = 16