

3G TR 25.928 V0.0.3 (2000-03)

Technical Report

**3rd Generation Partnership Project (3GPP);
Technical Specification Group (TSG);
Radio Access Network (RAN);
1.28Mcps functionality for UTRA TDD Physical Layer**



Reference

DTS/TSGR-0125223 (25223-300.PDF)

Keywords

<keyword[, keyword]>

3GPP

Postal address

Office address

Internet

secretariat@3gpp.org
Individual copies of this deliverable
can be downloaded from
<http://www.3gpp.org>

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.

© 1999, 3GPP Organizational Partners (ARIB, CWTS, ETSI, T1, TTA, TTC).
All rights reserved.

Contents

Foreword	7
1 Scope	8
2 References	8
3 Abbreviations	8
4 Radio Requirements	9
4.1 Radio environments	9
4.2 Services	9
4.3 Operational requirements	9
4.3.1 Deployment scenarios	9
4.4 Handover and Cell selection/reselection	9
4.5 Particular characteristics of the low chip rate TDD	9
5 High level characteristics	10
6 Physical layer - General description	11
6.1 General description of Layer 1	11
6.2 Document structure of the physical layer specification	11
7 Physical channels and mapping of transport channels onto physical channels	12
7.1 Transport channels	12
7.1.1 Transport channels	12
7.1.1.1 Dedicated transport channels	12
7.1.1.2 Common transport channels	12
7.2 Physical channels	12
7.2.1 Frame structure	12
7.2.2 Dedicated physical channel (DPCH)	12
7.2.2.1 Spreading	12
7.2.2.1.1 Spreading for Downlink Physical Channels	12
7.2.2.1.2 Spreading for Uplink Physical Channels	12
7.2.2.2 Burst Types	12
7.2.2.2.1 Transmission of TFCI	12
7.2.2.2.2 Transmission of TPC	12
7.2.2.2.3 Timeslot formats	12
7.2.2.2.3.1 Downlink timeslot formats	12
7.2.2.2.3.2 Uplink timeslot formats	12
7.2.2.3 Training sequences for spread bursts	12
7.2.2.3.1 Midamble Transmit Power	12
7.2.2.4 Beamforming and Transmit Diversity	12
7.2.3 Primary common control physical channel (P-CCPCH)	12
7.2.3.1 Primary common control physical channel (P-CCPCH)	12
7.2.3.1.1 P-CCPCH Spreading	12
7.2.3.1.2 P-CCPCH Burst Types	13
7.2.3.1.3 P-CCPCH Training sequences	13
7.2.3.1.4 Block STTD antenna diversity for P-CCPCH	13
7.2.3.2 Secondary common control physical channel (S-CCPCH)	13
7.2.3.2.1 S-CCPCH Spreading	13
7.2.3.2.2 S-CCPCH Burst Types	13
7.2.3.2.3 S-CCPCH Training sequences	13
7.2.3.3 The physical random access channel (PRACH)	13
7.2.3.3.1 PRACH Spreading	13
7.2.3.3.2 PRACH Burst Types	13
7.2.3.3.3 PRACH Training sequences	13
7.2.3.3.4 Association between Training Sequences and Channelisation Codes	13
7.2.3.4 The physical synchronisation channel (PSCH)	13

7.2.3.5	Physical Uplink Shared Channel (PUSCH).....	13
7.2.3.6	Physical Downlink Shared Channel (PDSCH).....	13
7.2.3.7	The Page Indicator Channel (PICH)	13
7.2.4	Beacon function of physical channels	13
7.2.4.1	Location of physical channels with beacon function.....	13
7.2.4.2	Physical characteristics of the beacon function.....	13
7.2.5	Midamble Allocation for Physical Channels	13
7.3	Mapping of transport channels to physical channels	13
7.3.1	Dedicated Transport Channels	13
7.3.2	Common Transport Channels	13
7.3.2.1	The Broadcast Channel (BCH).....	13
7.3.2.2	The Paging Channel (PCH).....	14
7.3.2.2	The Forward Channel (FACH)	14
7.3.2.3	The Random Access Channel (RACH).....	14
7.3.2.4	The Synchronisation Channel (SCH).....	14
7.3.2.5	Common Transport Channels for ODMA networks	14
7.3.2.6	The Uplink Shared Channel (USCH)	14
7.3.2.7	The Downlink Shared Channel (DSCH).....	14
Annex A (Normative): Basic Midamble Codes.....		14
A.1	Basic Midamble Codes for Burst Type 1 and PRACH Burst Type.....	14
A.2	Basic Midamble Codes for Burst Type 2	14
A.3	Association between Midambles and Channelisation Codes	14
A.3.1	Association for Burst Type 1 and K=16 Midambles.....	14
A.3.2	Association for Burst Type 1 and K=4 Midambles.....	14
A.3.4	Association for Burst Type 2 and K=6 Midambles.....	14
A.3.5	Association for Burst Type 2 and K=3 Midambles.....	14
Annex B (Informative): CCPCH Multiframe Structure		14
8	Multiplexing and channel coding	16
8.1	Transport channel coding/multiplexing.....	16
8.1.1	Error detection.....	16
8.1.1.1	CRC calculation	16
8.1.1.2	Relation between input and output of the Cyclic Redundancy Check.....	16
8.1.2	Transport block concatenation and code block segmentation	16
8.1.2.1	Concatenation of transport blocks	16
8.1.2.2	Code block segmentation.....	16
8.1.3	Channel coding	16
8.1.3.1	Convolutional Coding	16
8.1.3.2	Turbo coding	16
8.1.3.2.1	Turbo coder.....	16
8.1.3.2.2	Trellis termination in turbo code	16
8.1.3.2.3	Turbo code internal interleaver.....	16
8.1.4	Radio frame size equalisation.....	16
8.1.5	1st interleaving.....	16
8.1.6	Radio frame segmentation.....	16
8.1.7	Rate matching.....	16
8.1.7.1	Determination of rate matching parameters.....	16
8.1.7.2	Bit separation for rate matching.....	16
8.1.7.3	Rate matching pattern determination	16
8.1.8	TrCH multiplexing.....	16
8.1.9	Physical channel segmentation.....	16
8.1.10	2nd interleaving	17
8.1.10.1	Frame related 2nd interleaving	17
8.1.10.2	Timeslot related 2 nd interleaving.....	17
8.1.11	Physical channel mapping.....	17
8.1.11.1	Mapping scheme after frame related 2 nd interleaving.....	17
8.1.11.2	Mapping scheme after timeslot related 2 nd interleaving	17
8.1.12	Multiplexing of different transport channels onto one CCTrCH, and mapping of one CCTrCH onto physical channels	17

8.1.12.1	Allowed CCTrCH combinations for one UE.....	17
8.1.12.1.1	Allowed CCTrCH combinations on the uplink	17
8.1.12.1.2	Allowed CCTrCH combinations on the downlink.....	17
8.1.13	Transport format detection	17
8.1.13.1	Blind transport format detection.....	17
8.1.13.2	Explicit transport format detection based on TFCI	17
8.1.13.2.1	Transport Format Combination Indicator (TFCI)	17
8.2	Coding for layer 1 control.....	17
8.2.1	Coding of transport format combination indicator (TFCI)	17
8.2.1.1	Default TFCI word.....	17
8.2.1.2	Coding of short TFCI lengths	17
8.2.2	Coding of Paging Indicator (PI).....	17
8.2.3	Coding of Transmit Power Control (TPC).....	17
9	Spreading and Modulation	18
9.1	Data modulation	18
9.1.1	Symbol rate	18
9.1.2	Mapping of bits onto signal point constellation	18
9.2	Spreading modulation	18
9.2.1	Basic spreading parameters	18
9.2.2	Spreading codes	18
9.2.3	Scrambling codes.....	18
9.2.4	Spread and scrambled signal of data symbols and data blocks	18
9.3	Synchronisation codes	18
9.3.1	Code Generation	18
9.3.2	Code Allocation.....	18
9.3.2.1	Code allocation for Case 1:	18
9.3.2.2	Code allocation for Case 2:	18
9.3.2.3	Code allocation for Case 3:	18
9.3.3	Evaluation of synchronisation codes.....	18
10	Physical layer procedures	20
10.1	Transmitter Power Control.....	20
10.1.1	General Parameters	20
10.1.2	Uplink Control.....	20
10.1.2.1	Common Physical Channel.....	20
10.1.2.2	Dedicated Physical Channel.....	20
10.1.3	Downlink Control.....	20
10.1.3.1	Common Physical Channel.....	20
10.1.3.2	Dedicated Physical Channel.....	20
10.2	Timing Advance.....	20
10.2.1	With UL Synchronization.....	20
10.3	Synchronisation and Cell Search Procedures	20
10.3.1	Cell Search	20
10.4	ODMA Relay Probing.....	20
10.4.1	Initial Mode Probing	20
10.4.2	Idle Mode Probing.....	20
10.4.3	Active Mode Probing	20
10.5	Discontinuous transmission (DTX) of Radio Frames	20
10.6	Downlink Transmit Diversity	20
10.6.1	Transmit Diversity for DPCH.....	20
10.6.1.1	Determination of Weight Information	20
10.6.1.1.1	STD Weights	20
10.6.1.1.2	TxAA Weights	21
10.6.2	Transmit Diversity for SCH.....	21
10.6.2.1	SCH Transmission Scheme	21
10.6.3	Transmit Diversity for P-CCPCH.....	21
10.6.3.1	P-CCPCH Transmission Scheme	21

11	Physical layer measurements	22
11.1	Control of UE/UTRAN measurements	22
11.1.1	General measurement concept	22
11.1.2	Measurements for cell selection/reselection	22
11.1.3	Measurements for Handover	22
11.1.4	Measurements for DCA	22
11.1.5	Measurements for timing advance	22
11.2	Measurement abilities for UTRA TDD	22
11.2.1	UE measurement abilities	22
11.2.1.1	PCCPCH RSCP	22
11.2.1.2	CPICH RSCP	22
11.2.1.3	RSCP	22
11.2.1.4	Timeslot ISCP	22
11.2.1.5	UTRA carrier RSSI	22
11.2.1.6	GSM carrier RSSI	22
11.2.1.7	SIR	22
11.2.1.8	CPICH Ec/No	22
11.2.1.9	Physical channel BER	22
11.2.1.10	Transport channel BLER	22
11.2.1.11	UE transmitted power	22
11.2.1.12	SFN-SFN observed time difference	22
11.2.1.13	Observed time difference to GSM cell	22
11.2.2	UTRAN measurement abilities	22
11.2.2.1	RSCP	23
11.2.2.2	Timeslot ISCP	23
11.2.2.3	RSSI	23
11.2.2.4	SIR	23
11.2.2.5	Physical channel BER	23
11.2.2.6	Transport channel BLER	23
11.2.2.7	Transmitted carrier power	23
11.2.2.8	Transmitted code power	23
11.2.2.9	RX Timing Deviation	23
Annex A (informative):	Monitoring GSM from TDD: Calculation Results	23
A.1	Low data rate traffic using 1 uplink and 1 downlink slot	23
A.1.1	Higher data rate traffic using more than 1 uplink and/or 1 downlink TDD timeslot	23
12	Performance analysis of the low chip rate	24
13	History	25

Foreword

This Technical Report has been produced by the 3GPP.

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

Version 3.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification.

- [4] TS 25.223: "Spreading and modulation (TDD)"
- [5] TS 25.224: "Physical layer procedures (TDD)"
- [6] TS 25.225: "Physical layer – Measurements (TDD)"

3 Abbreviations

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

CDMA	Code Division Multiple Access
PN	Pseudo Noise
QPSK	Quadrature Phase Shift Keying
RACH	Random Access Channel

4 Radio Requirements

4.1 Radio environments

4.2 Services

4.3 Operational requirements

4.3.1 Deployment scenarios

4.4 Handover and Cell selection/reselection

4.5 Particular characteristics of the low chip rate TDD

5 High level characteristics

6 Physical layer - General description

6.1 General description of Layer 1

6.2 Document structure of the physical layer specification

7 Physical channels and mapping of transport channels onto physical channels

7.1 Transport channels

7.1.1 Transport channels

7.1.1.1 Dedicated transport channels

7.1.1.2 Common transport channels

7.2 Physical channels

7.2.1 Frame structure

7.2.2 Dedicated physical channel (DPCH)

7.2.2.1 Spreading

7.2.2.1.1 Spreading for Downlink Physical Channels

7.2.2.1.2 Spreading for Uplink Physical Channels

7.2.2.2 Burst Types

7.2.2.2.1 Transmission of TFCI

7.2.2.2.2 Transmission of TPC

7.2.2.2.3 Timeslot formats

7.2.2.2.3.1 Downlink timeslot formats

7.2.2.2.3.2 Uplink timeslot formats

7.2.2.3 Training sequences for spread bursts

7.2.2.3.1 Midamble Transmit Power

7.2.2.4 Beamforming and Transmit Diversity

7.2.3 Primary common control physical channel (P-CCPCH)

7.2.3.1 Primary common control physical channel (P-CCPCH)

7.2.3.1.1 P-CCPCH Spreading

- 7.2.3.1.2 P-CCPCH Burst Types
- 7.2.3.1.3 P-CCPCH Training sequences
- 7.2.3.1.4 Block STTD antenna diversity for P-CCPCH
- 7.2.3.2 Secondary common control physical channel (S-CCPCH)
 - 7.2.3.2.1 S-CCPCH Spreading
 - 7.2.3.2.2 S-CCPCH Burst Types
 - 7.2.3.2.3 S-CCPCH Training sequences
- 7.2.3.3 The physical random access channel (PRACH)
 - 7.2.3.3.1 PRACH Spreading
 - 7.2.3.3.2 PRACH Burst Types
 - 7.2.3.3.3 PRACH Training sequences
 - 7.2.3.3.4 Association between Training Sequences and Channelisation Codes
- 7.2.3.4 The physical synchronisation channel (PSCH)
- 7.2.3.5 Physical Uplink Shared Channel (PUSCH)
- 7.2.3.6 Physical Downlink Shared Channel (PDSCH)
- 7.2.3.7 The Page Indicator Channel (PICH)
- 7.2.4 Beacon function of physical channels
 - 7.2.4.1 Location of physical channels with beacon function
 - 7.2.4.2 Physical characteristics of the beacon function
- 7.2.5 Midamble Allocation for Physical Channels
- 7.3 Mapping of transport channels to physical channels
 - 7.3.1 Dedicated Transport Channels
 - 7.3.2 Common Transport Channels
 - 7.3.2.1 The Broadcast Channel (BCH)

- 7.3.2.2 The Paging Channel (PCH)
- 7.3.2.2 The Forward Channel (FACH)
- 7.3.2.3 The Random Access Channel (RACH)
- 7.3.2.4 The Synchronisation Channel (SCH)
- 7.3.2.5 Common Transport Channels for ODMA networks
- 7.3.2.6 The Uplink Shared Channel (USCH)
- 7.3.2.7 The Downlink Shared Channel (DSCH)

Annex A (Normative): Basic Midamble Codes

- A.1 Basic Midamble Codes for Burst Type 1 and PRACH Burst Type
- A.2 Basic Midamble Codes for Burst Type 2
- A.3 Association between Midambles and Channelisation Codes
 - A.3.1 Association for Burst Type 1 and K=16 Midambles
 - A.3.2 Association for Burst Type 1 and K=4 Midambles
 - A.3.4 Association for Burst Type 2 and K=6 Midambles
 - A.3.5 Association for Burst Type 2 and K=3 Midambles

Annex B (Informative): CCPCH Multiframe Structure

8 Multiplexing and channel coding

8.1 Transport channel coding/multiplexing

8.1.1 Error detection

8.1.1.1 CRC calculation

8.1.1.2 Relation between input and output of the Cyclic Redundancy Check

8.1.2 Transport block concatenation and code block segmentation

8.1.2.1 Concatenation of transport blocks

8.1.2.2 Code block segmentation

8.1.3 Channel coding

8.1.3.1 Convolutional Coding

8.1.3.2 Turbo coding

8.1.3.2.1 Turbo coder

8.1.3.2.2 Trellis termination in turbo code

8.1.3.2.3 Turbo code internal interleaver

8.1.4 Radio frame size equalisation

8.1.5 1st interleaving

8.1.6 Radio frame segmentation

8.1.7 Rate matching

8.1.7.1 Determination of rate matching parameters

8.1.7.2 Bit separation for rate matching

8.1.7.3 Rate matching pattern determination

8.1.8 TrCH multiplexing

8.1.9 Physical channel segmentation

8.1.10 2nd interleaving

8.1.10.1 Frame related 2nd interleaving

8.1.10.2 Timeslot related 2nd interleaving

8.1.11 Physical channel mapping

8.1.11.1 Mapping scheme after frame related 2nd interleaving

8.1.11.2 Mapping scheme after timeslot related 2nd interleaving

8.1.12 Multiplexing of different transport channels onto one CCTrCH, and mapping of one CCTrCH onto physical channels

8.1.12.1 Allowed CCTrCH combinations for one UE

8.1.12.1.1 Allowed CCTrCH combinations on the uplink

8.1.12.1.2 Allowed CCTrCH combinations on the downlink

8.1.13 Transport format detection

8.1.13.1 Blind transport format detection

8.1.13.2 Explicit transport format detection based on TFCI

8.1.13.2.1 Transport Format Combination Indicator (TFCI)

8.2 Coding for layer 1 control

8.2.1 Coding of transport format combination indicator (TFCI)

8.2.1.1 Default TFCI word

8.2.1.2 Coding of short TFCI lengths

8.2.2 Coding of Paging Indicator (PI)

8.2.3 Coding of Transmit Power Control (TPC)

9 Spreading and Modulation

9.1 Data modulation

9.1.1 Symbol rate

9.1.2 Mapping of bits onto signal point constellation

9.2 Spreading modulation

9.2.1 Basic spreading parameters

9.2.2 Spreading codes

9.2.3 Scrambling codes

9.2.4 Spread and scrambled signal of data symbols and data blocks

9.3 Synchronisation codes

9.3.1 Code Generation

9.3.2 Code Allocation

9.3.2.1 Code allocation for Case 1:

9.3.2.2 Code allocation for Case 2:

9.3.2.3 Code allocation for Case 3:

9.3.3 Evaluation of synchronisation codes

10 Physical layer procedures

10.1 Transmitter Power Control

10.1.1 General Parameters

10.1.2 Uplink Control

10.1.2.1 Common Physical Channel

10.1.2.2 Dedicated Physical Channel

10.1.3 Downlink Control

10.1.3.1 Common Physical Channel

10.1.3.2 Dedicated Physical Channel

10.2 Timing Advance

10.2.1 With UL Synchronization

10.3 Synchronisation and Cell Search Procedures

10.3.1 Cell Search

10.4 ODMA Relay Probing

10.4.1 Initial Mode Probing

10.4.2 Idle Mode Probing

10.4.3 Active Mode Probing

10.5 Discontinuous transmission (DTX) of Radio Frames

10.6 Downlink Transmit Diversity

10.6.1 Transmit Diversity for DPCH

10.6.1.1 Determination of Weight Information

10.6.1.1.1 STD Weights

10.6.1.1.2 TxAA Weights

10.6.2 Transmit Diversity for SCH

10.6.2.1 SCH Transmission Scheme

10.6.3 Transmit Diversity for P-CCPCH

10.6.3.1 P-CCPCH Transmission Scheme

-
- 11 Physical layer measurements
 - 11.1 Control of UE/UTRAN measurements
 - 11.1.1 General measurement concept
 - 11.1.2 Measurements for cell selection/reselection
 - 11.1.3 Measurements for Handover
 - 11.1.4 Measurements for DCA
 - 11.1.5 Measurements for timing advance
 - 11.2 Measurement abilities for UTRA TDD
 - 11.2.1 UE measurement abilities
 - 11.2.1.1 PCCPCH RSCP
 - 11.2.1.2 CPICH RSCP
 - 11.2.1.3 RSCP
 - 11.2.1.4 Timeslot ISCP
 - 11.2.1.5 UTRA carrier RSSI
 - 11.2.1.6 GSM carrier RSSI
 - 11.2.1.7 SIR
 - 11.2.1.8 CPICH E_c/N_0
 - 11.2.1.9 Physical channel BER
 - 11.2.1.10 Transport channel BLER
 - 11.2.1.11 UE transmitted power
 - 11.2.1.12 SFN-SFN observed time difference
 - 11.2.1.13 Observed time difference to GSM cell
 - 11.2.2 UTRAN measurement abilities

- 11.2.2.1 RSCP
- 11.2.2.2 Timeslot ISCP
- 11.2.2.3 RSSI
- 11.2.2.4 SIR
- 11.2.2.5 Physical channel BER
- 11.2.2.6 Transport channel BLER
- 11.2.2.7 Transmitted carrier power
- 11.2.2.8 Transmitted code power
- 11.2.2.9 RX Timing Deviation

Annex A (informative): Monitoring GSM from TDD: Calculation Results

- A.1 Low data rate traffic using 1 uplink and 1 downlink slot
 - A.1.1 Higher data rate traffic using more than 1 uplink and/or 1 downlink TDD timeslot

12 Performance analysis of the low chip rate

13 History

Document history		
V0.0.1	January 2000	Created in WG#10 in Beijing, Table of contents approved, R1-00-149
V0.0.2	March 2000	New structure created according to the comments at the WG1#11

Editor information:

Mirko Aksentijevic

Nokia Networks

Email: mirko.aksentijevic@nokia.com