

ETSI TS 125 224 V13.0.0 (2016-01)



Universal Mobile Telecommunications System (UMTS); Physical layer procedures (TDD) (3GPP TS 25.224 version 13.0.0 Release 13)



Reference

RTS/TSGR-0125224vd00

Keywords

UMTS

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

The present document can be downloaded from:
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (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:
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2016.
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.

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 (<https://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 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	8
1 Scope	9
2 References	9
3 Abbreviations	10
4 Physical layer procedures for the 3.84 Mcps option	11
4.1 General	11
4.2 Transmitter Power Control	11
4.2.1 General Parameters	11
4.2.2 Uplink Control	11
4.2.2.1 General Limits.....	11
4.2.2.2 PRACH	12
4.2.2.3 DPCH, PUSCH and HS-SICH	12
4.2.2.3.1 Gain Factors	12
4.2.2.3.2 Out of synchronisation handling.....	13
4.2.2.4 E-PUCH	13
4.2.2.4.1 Gain Factors for E-PUCH.....	14
4.2.2.5 E-RUCCH	15
4.2.3 Downlink Control	15
4.2.3.1 P-CCPCH	15
4.2.3.2 S-CCPCH, PICH	15
4.2.3.2A MICH	15
4.2.3.3 SCH.....	16
4.2.3.3A PNBSCH.....	16
4.2.3.4 DPCH, PDSCH	16
4.2.3.4.1 Out of synchronisation handling.....	17
4.2.3.5 HS-PDSCH	17
4.2.3.6 HS-SCCH.....	17
4.2.3.7 E-AGCH	17
4.2.3.8 E-HICH	17
4.3 Timing Advance	17
4.4 Synchronisation procedures.....	18
4.4.1 Cell Search.....	18
4.4.2 Dedicated channel synchronisation.....	18
4.4.2.1 Synchronisation primitives.....	18
4.4.2.1.1 General	18
4.4.2.1.2 Downlink synchronisation primitives	18
4.4.2.1.2A Downlink synchronisation primitives for HS-channels	19
4.4.2.1.3 Uplink synchronisation primitives.....	19
4.4.2.2 Radio link monitoring	20
4.4.2.2.1 Downlink radio link failure	20
4.4.2.2.2 Uplink radio link failure/restore	20
4.5 Discontinuous transmission (DTX) procedure	20
4.5.1 Description of Special Bursts.....	20
4.5.2 Use of Special Bursts during DTX	21
4.5.3 Use of Special Bursts for Initial Establishment / Reconfiguration	21
4.5.4 Use of Special Bursts for DTX on Beacon Channels	21
4.6 Downlink Transmit Diversity.....	21
4.6.1 Transmit Diversity for PDSCH, DPCH, HS-SCCH, HS-PDSCH and E-AGCH	21
4.6.2 Transmit Diversity for SCH and S-CCPCH	22
4.6.2.1 SCH Transmission Scheme.....	22

4.6.2.2	S-CCPCH Transmission Scheme	23
4.6.3	Transmit Diversity for Beacon Channels	23
4.6.3.1	SCTD Transmission Scheme	23
4.7	Random access procedure	24
4.7.1	Physical random access procedure.....	24
4.7A	E-RUCCH transmission procedure	25
4.8	DSCH procedure	25
4.8.1	DSCH procedure with TFCI indication	25
4.8.2	DSCH procedure with midamble indication.....	26
4.9	Node B Synchronisation Procedure over the Air	26
4.9.1	Frequency Acquisition Phase.....	26
4.9.2	Initial Synchronisation.....	26
4.9.3	Steady-State Phase.....	26
4.9.4	Late entrant cells.....	26
4.10	Idle periods for IPDL location method.....	27
4.10.1	General.....	27
4.10.2	Parameters of IPDL	27
4.10.3	Calculation of idle period position.....	27
4.11	HS-DSCH Procedure.....	28
4.11.1	Link Adaptation Procedure.....	28
4.11.2	HS-DSCH Channel Quality Indication Procedure	29
4.12	Macro-diversity procedure	30
4.13	E-DCH related procedures	30
4.13.1	ACK/NACK detection.....	30
4.13.2	Serving and neighbour cell pathloss metric derivation	30
4.13.3	Channelisation code hopping procedure for E-PUCH	31
4.14	Physical Layer Procedures for 3.84 Mcps MBSFN IMB	33
4.14.1	Radio frame timing on the MBSFN layer	33
4.14.2	Downlink Power Control	33
4.14.2.1	S-CCPCH.....	33
4.14.2.2	MICH.....	33
4.14.2.3	P-CPICH	34
4.14.2.4	T-CPICH.....	34
5	Physical layer procedures for the 1.28 Mcps option	34
5.1	Transmitter Power Control	34
5.1.1	Uplink Control	34
5.1.1.1	General limits.....	34
5.1.1.2	UpPCH.....	34
5.1.1.3	PRACH	35
5.1.1.4	DPCH and PUSCH	35
5.1.1.4.1	Gain Factors	35
5.1.1.4.2	Out of synchronization handling	35
5.1.1.5	HS-SICH	36
5.1.1.6	E-PUCH	37
5.1.1.6.1	Gain Factors for E-PUCH.....	38
5.1.1.7	E-RUCCH	39
5.1.1.8	Standalone midamble channel.....	39
5.1.2	Downlink Control	39
5.1.2.1	P-CCPCH	39
5.1.2.2	The power of the FPACH	39
5.1.2.3	S-CCPCH, PICH	39
5.1.2.3A	MICH.....	40
5.1.2.4	DPCH, PDSCH	40
5.1.2.4.1	Out of synchronisation handling.....	40
5.1.2.5	HS-PDSCH	40
5.1.2.6	HS-SCCH.....	40
5.1.2.7	PLCCH.....	41
5.1.2.8	E-AGCH	41
5.1.2.9	E-HICH	41
5.2	UL Synchronisation.....	41
5.2.1	General Description	41

5.2.1.1	Preparation of uplink synchronization (downlink synchronization)	41
5.2.1.2	Establishment of uplink synchronization	41
5.2.1.3	Maintenance of uplink synchronisation	42
5.2.2	UpPCH.....	42
5.2.3	PRACH.....	42
5.2.4	DPCH and PUSCH	42
5.2.4.1	Out of synchronization handling	43
5.2.5	HS-SICH.....	43
5.2.6	E-PUCH.....	43
5.2.7	E-RUCCH.....	43
5.2.8	Standalone midamble channel	44
5.3	Synchronisation procedures.....	44
5.3.1	Cell search	44
5.3.2	DCH synchronization	44
5.3.2A	Shared physical channel synchronization	44
5.3.2A.1	Synchronisation primitives.....	44
5.3.2A.1.1	General	44
5.3.2A.1.2	Downlink synchronisation primitives	44
5.3.2A.1.3	Uplink synchronisation primitives.....	45
5.3.2A.2	Radio link monitoring	45
5.3.2A.2.1	Downlink radio link failure	45
5.3.2A.2.2	Uplink radio link failure/restore	45
5.3.3	Synchronization procedure in CELL_FACH state	46
5.3.3.1	Uplink synchronization status detection.....	46
5.3.3.2	Establishment of uplink synchronization	46
5.4	Discontinuous transmission (DTX) procedure	46
5.4.1	Description of Special Bursts.....	46
5.4.2	Use of Special Bursts during DTX	47
5.4.3	Use of Special Bursts for Initial Establishment / Reconfiguration	47
5.5	Downlink Transmit Diversity.....	47
5.5.1	Transmit Diversity for PDSCH, DPCH, HS-SCCH, HS-PDSCH and E-AGCH	47
5.5.1.1	TSTD for PDSCH and DPCH.....	47
5.5.1.2	Closed Loop Tx Diversity for PDSCH, DPCH, HS-SCCH, HS-PDSCH and E-AGCH	48
5.5.2	Transmit Diversity for DwPCH	49
5.5.3	Transmit Diversity for P-CCPCH.....	49
5.5.3.1	TSTD Transmission Scheme for P-CCPCH	49
5.5.4	SCTD Transmission Scheme for Beacon Channels.....	49
5.6	Random Access Procedure	50
5.6.1	Definitions	50
5.6.1A	UpPCH sub-channel	51
5.6.2	Preparation of random access	51
5.6.3	Random access procedure.....	52
5.6.3.1	The use and generation of the information fields transmitted in the FPACH	53
5.6.3.1.1	Signature Reference Number.....	53
5.6.3.1.2	Relative Sub-Frame Number	54
5.6.3.1.3	Received starting position of the UpPCH (UpPCH _{POS}).....	54
5.6.3.1.4	Transmit Power Level Command for the RACH message.....	54
5.6.3A	E-RUCCH procedure.....	54
5.6.4	Random access collision.....	55
5.7	Node B Synchronisation Procedure over the Air	55
5.7.1	Initial Synchronisation.....	55
5.7.2	Steady-State Phase.....	55
5.7.3	Late entrant cells.....	56
5.8	Idle periods for IPDL location method.....	56
5.8.1	General.....	56
5.8.2	Parameters of IPDL	56
5.8.3	Calculation of idle period position.....	56
5.9	HS-DSCH Procedure in CELL_DCH state	57
5.9.1	Link Adaptation Procedure.....	57
5.9.2	HS-DSCH Channel Quality Indication Procedure.....	58
5.9.3	HS-SCCH monitoring procedure.....	59
5.9A	HS-DSCH Procedure in CELL_FACH state.....	60

5.9A.1	Link Adaptation Procedure	60
5.9A.2	HS-DSCH Channel Quality Indication Procedure	60
5.9A.3	HS-SCCH monitoring procedure	60
5.9B	HS-DSCH Procedure in CELL_PCH or URA_PCH state	60
5.9B.1	Link Adaptation Procedure	60
5.9B.2	HS-DSCH Channel Quality Indication Procedure	61
5.9B.3	HS-SCCH monitoring procedure	61
5.10	Macro-diversity procedure	61
5.11	E-DCH Procedure	62
5.11.1	ACK/NACK detection	62
5.11.2	Serving and neighbour cell pathloss metric derivation	62
5.11.3	E-AGCH monitoring in CELL_DCH state	63
5.11.3A	E-AGCH monitoring in CELL_FACH state	63
5.12	MIMO operation of HS-DSCH	64
5.12.1	General procedure	64
5.12.2	Identification of MIMO dual stream	64
5.12.3	UE antennas Time Switched Transmission	65
5.12A	MU-MIMO operation of HS-DSCH and E-DCH	65
5.13	Control Channel Discontinuous reception procedures	66
5.13.1	Discontinuous downlink reception	67
5.13.2	HS-SCCH orders	67
6	Physical layer procedures for the 7.68 Mcps option	68
6.1	Transmitter Power Control	68
6.2	Timing Advance	68
6.3	Synchronisation procedures	68
6.4	Discontinuous transmission (DTX) procedure	68
6.5	Downlink Transmit Diversity	69
6.5.1	Transmit Diversity for PDSCH, DPCH, HS-SCCH, HS-PDSCH and E-AGCH	69
6.5.2	Transmit Diversity for SCH and S-CCPCH	69
6.5.3	Transmit Diversity for Beacon Channels	69
6.5.3.1	SCTD Transmission Scheme	69
6.6	Random access procedure	69
6.6.1	Physical random access procedure	70
6.6A	E-RUCCH transmission procedure	70
6.7	DSCH procedure	70
6.8	Idle periods for IPDL location method	70
6.9	HS-DSCH Procedure	70
6.9.1	Link Adaptation Procedure	70
6.9.2	HS-DSCH Channel Quality Indication Procedure	71
6.10	Macro-diversity procedure	71
6.11	E-DCH related procedures	71
6.11.1	ACK/NACK detection	71
6.11.2	Serving and neighbour cell pathloss metric derivation	71
6.11.3	Channelisation code hopping procedure for E-PUCH	71
Annex A (informative): Power Control		74
A.1	Example Implementation of Downlink Power Control in the UE	74
A.2	Example Implementation of Closed Loop Uplink Power Control in Node B for 1.28Mcps TDD	74
A.3	Example Implementation of Downlink Power Control in UE for 1.28Mcps TDD when TSTD is used	74
A.4	Example Implementation of open Loop Power Control for access procedure for 1.28Mcps TDD	75
A.5	Example Implementation of Closed Loop Uplink HS-SICH Power Control in Node B for 1.28Mcps TDD	75
Annex B (informative): Determination of Weight Information		76
B.1	STD Weights	76
B.2	TxAA Weights	76

Annex C (informative): Cell search procedure for 3.84Mcps TDD77
Annex CA (informative): Cell search procedure for 1.28Mcps TDD78
Annex CB (informative): Examples random access procedure for 1.28Mcps TDD.....80
Annex D (informative): Change history82
History85

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (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 the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater 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 document.

1 Scope

The present document describes the Physical Layer Procedures in the TDD mode of 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.
- For a specific reference, subsequent revisions do not apply.
- 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 TS 25.201: "Physical layer - general description".
- [2] 3GPP TS 25.102: "UE physical layer capabilities".
- [3] 3GPP TS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".
- [4] 3GPP TS 25.212: "Multiplexing and channel coding (FDD)".
- [5] 3GPP TS 25.213: "Spreading and modulation (FDD)".
- [6] 3GPP TS 25.214: "Physical layer procedures (FDD)".
- [7] 3GPP TS 25.215: "Physical Layer - Measurements (FDD)".
- [8] 3GPP TS 25.221: "Physical channels and mapping of transport channels onto physical channels (TDD)".
- [9] 3GPP TS 25.222: "Multiplexing and channel coding (TDD)".
- [10] 3GPP TS 25.223: "Spreading and modulation (TDD)".
- [11] 3GPP TS 25.225: "Physical Layer - Measurements (TDD)".
- [12] 3GPP TS 25.301: "Radio Interface Protocol Architecture".
- [13] 3GPP TS 25.302: "Services Provided by the Physical Layer".
- [14] 3GPP TS 25.401: "UTRAN Overall Description".
- [15] 3GPP TS 25.331: "RRC Protocol Specification"
- [16] 3GPP TS 25.433: "UTRAN Iub Interface NBAP Signalling"
- [17] 3GPP TS 25.105: "UTRA (BS) TDD; Radio transmission and Reception"
- [18] 3GPP TS 25.321: "MAC protocol specification"
- [19] 3GPP TS 25.303: "Interlayer Procedures in Connected Mode"
- [20] 3GPP TS 25.402: "Synchronisation in UTRAN Stage 2"