

# ETSI TS 125 222 V13.0.0 (2016-01)



**Universal Mobile Telecommunications System (UMTS);  
Multiplexing and channel coding (TDD)  
(3GPP TS 25.222 version 13.0.0 Release 13)**



---

Reference

RTS/TSGR-0125222vd00

---

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.....	10
1 Scope .....	11
2 References .....	11
3 Definitions, symbols and abbreviations .....	11
3.1 Definitions .....	11
3.2 Symbols.....	12
3.3 Abbreviations .....	12
4 Multiplexing, channel coding and interleaving for the 1.28 Mcps, 3.84 Mcps and 7.68 Mcps options .....	14
4.1 General .....	14
4.2 General coding/multiplexing of TrCHs.....	14
4.2.1 CRC attachment.....	18
4.2.1.1 CRC calculation .....	18
4.2.1.2 Relation between input and output of the CRC attachment block.....	18
4.2.2 Transport block concatenation and code block segmentation.....	19
4.2.2.1 Concatenation of transport blocks.....	19
4.2.2.2 Code block segmentation .....	19
4.2.3 Channel coding .....	20
4.2.3.1 Convolutional coding .....	21
4.2.3.2 Turbo coding.....	22
4.2.3.2.1 Turbo coder .....	22
4.2.3.2.2 Trellis termination for Turbo coder.....	23
4.2.3.2.3 Turbo code internal interleaver.....	23
4.2.3.2.3.1 Bits-input to rectangular matrix with padding .....	24
4.2.3.3 Concatenation of encoded blocks.....	27
4.2.4 Radio frame size equalisation .....	27
4.2.5 1st interleaving.....	27
4.2.5.1 Relation between input and output of 1 <sup>st</sup> interleaving.....	28
4.2.6 Radio frame segmentation .....	28
4.2.7 Rate matching .....	29
4.2.7.1 Determination of rate matching parameters .....	30
4.2.7.1.1 Uncoded and convolutionally encoded TrCHs.....	31
4.2.7.1.2 Turbo encoded TrCHs .....	31
4.2.7.2 Bit separation and collection for rate matching.....	32
4.2.7.2.1 Bit separation.....	34
4.2.7.2.2 Bit collection .....	35
4.2.7.3 Rate matching pattern determination .....	35
4.2.8 TrCH multiplexing.....	36
4.2.9 Bit Scrambling.....	37
4.2.10 Physical channel segmentation .....	37
4.2.11 2nd interleaving .....	37
4.2.11.1 Frame related 2nd interleaving.....	38
4.2.11.2 Timeslot related 2 <sup>nd</sup> interleaving .....	39
4.2.11A Sub-frame segmentation for the 1.28 Mcps option.....	41
4.2.12 Physical channel mapping .....	41
4.2.12.1 Physical channel mapping for the 3.84 Mcps and 7.68Mcps options .....	41
4.2.12.1.1 Mapping scheme.....	42
4.2.12.2 Physical channel mapping for the 1.28 Mcps option .....	43
4.2.12.2.1 Mapping scheme.....	43

4.2.13	Multiplexing of different transport channels onto one CCTrCH, and mapping of one CCTrCH onto physical channels .....	44
4.2.13.1	Allowed CCTrCH combinations for one UE .....	45
4.2.13.1.1	Allowed CCTrCH combinations on the uplink .....	45
4.2.13.1.2	Allowed CCTrCH combinations on the downlink .....	45
4.2.14	Transport format detection.....	45
4.2.14.1	Blind transport format detection .....	45
4.2.14.2	Explicit transport format detection based on TFCI .....	45
4.2.14.2.1	Transport Format Combination Indicator (TFCI).....	45
4.3	Coding for layer 1 control for the 3.84 Mcps and 7.68Mcps TDD options.....	46
4.3.1	Coding of transport format combination indicator (TFCI) .....	46
4.3.1.1	Coding of long TFCI lengths .....	46
4.3.1.2	Coding of short TFCI lengths.....	47
4.3.1.2.1	Coding very short TFCIs by repetition.....	47
4.3.1.2.2	Coding short TFCIs using bi-orthogonal codes .....	47
4.3.1.3	Mapping of TFCI code word.....	48
4.3.2	Coding and Bit Scrambling of the Paging Indicator .....	48
4.3.3	Coding and Bit Scrambling of the MBMS Notification Indicator .....	49
4.4	Coding for layer 1 control for the 1.28 Mcps option.....	49
4.4.1	Coding of transport format combination indicator (TFCI) for QPSK and 16QAM.....	49
4.4.1.1	Mapping of TFCI code word.....	49
4.4.2	Coding of transport format combination indicator (TFCI) for 8PSK .....	51
4.4.2.1	Coding of long TFCI lengths .....	51
4.4.2.2	Coding of short TFCI lengths.....	53
4.4.2.2.1	Coding very short TFCIs by repetition.....	53
4.4.2.2.2	Coding short TFCIs using bi-orthogonal codes .....	53
4.4.2.3	Mapping of TFCI code word.....	54
4.4.3	Coding and Bit Scrambling of the Paging Indicator .....	55
4.4.4	Coding of the Fast Physical Access Channel (FPACH) information bits .....	55
4.4.5	Coding and Bit Scrambling of the MBMS Notification Indicator .....	56
4.4.6	Coding of PLCCCH .....	56
4.5	Coding for HS-DSCH .....	57
4.5.1	CRC attachment for HS-DSCH .....	59
4.5.2	Code block segmentation for HS-DSCH .....	59
4.5.3	Channel coding for HS-DSCH.....	60
4.5.4	Hybrid ARQ for HS-DSCH .....	60
4.5.4.1	HARQ bit separation.....	60
4.5.4.2	HARQ First Rate Matching Stage.....	60
4.5.4.3	HARQ Second Rate Matching Stage .....	61
4.5.4.4	HARQ bit collection .....	62
4.5.5	Bit scrambling.....	63
4.5.6	Interleaving for HS-DSCH .....	63
4.5.7	Constellation re-arrangement for 16 QAM and 64 QAM.....	64
4.5.8	Physical channel mapping for HS-DSCH.....	65
4.6	Coding/Multiplexing for HS-SCCH.....	67
4.6.1	HS-SCCH information field mapping .....	69
4.6.1.1	Channelisation code set information mapping .....	69
4.6.1.1.1	1.28Mcps TDD and 3.84Mcps TDD .....	69
4.6.1.1.2	7.68Mcps TDD .....	70
4.6.1.2	Timeslot information mapping.....	71
4.6.1.2.1	1.28 Mcps TDD .....	71
4.6.1.2.2	3.84 Mcps TDD and 7.68Mcps TDD .....	71
4.6.1.3	Modulation scheme information mapping .....	72
4.6.1.4	Redundancy and constellation version information mapping .....	73
4.6.1.5	HS-SCCH cyclic sequence number.....	73
4.6.1.6	UE identity .....	73
4.6.1.7	HARQ process identifier mapping .....	73
4.6.1.8	Transport block size index mapping .....	73
4.6.2	Multiplexing of HS-SCCH information.....	73
4.6.3	CRC attachment for HS-SCCH .....	74
4.6.4	Channel coding for HS-SCCH.....	74
4.6.5	Rate matching for HS-SCCH.....	74

4.6.6	Interleaving for HS-SCCH.....	74
4.6.7	Physical Channel Segmentation for HS-SCCH .....	74
4.6.8	Physical channel mapping for HS-SCCH .....	74
4.6A	Coding/Multiplexing for HS-SCCH orders type A .....	75
4.6A.1	HS-SCCH orders type A information field mapping.....	75
4.6A.1.1	Order type mapping.....	75
4.6A.1.2	UE identity mapping .....	75
4.6B	Coding/Multiplexing for HS-SCCH type 2 (1.28 Mcps TDD only) .....	75
4.6B.1	HS-SCCH type 2 information field mapping.....	77
4.6B.1.1	Type flag 1 mapping .....	77
4.6B.1.2	Resource repetition pattern index mapping.....	77
4.6B.1.3	Type flag 2 mapping .....	78
4.6B.1.4	Transport block size index mapping .....	78
4.6B.1.5	Timeslot information mapping.....	78
4.6B.1.6	Channelisation code set information mapping .....	78
4.6B.1.7	Modulation scheme information mapping .....	79
4.6B.1.8	HS-SICH indicator mapping .....	79
4.6B.1.9	HS-SCCH cyclic sequence number.....	79
4.6B.1.10	UE identity .....	79
4.6B.2	Multiplexing of HS-SCCH type 2 information.....	79
4.6B.3	CRC attachment for HS-SCCH type 2.....	80
4.6B.4	Channel coding for HS-SCCH type 2 .....	80
4.6B.5	Rate matching for HS-SCCH type 2 .....	80
4.6B.6	Interleaving for HS-SCCH type 2.....	80
4.6B.7	Physical Channel Segmentation for HS-SCCH type 2.....	80
4.6B.8	Physical channel mapping for HS-SCCH type 2 .....	80
4.6C	Coding/Multiplexing for HS-SCCH type 3 (1.28 Mcps TDD only) .....	80
4.6C.1	HS-SCCH type 3 information field mapping.....	82
4.6C.1.1	Type flag 1 mapping .....	82
4.6C.1.2	Resource repetition pattern index mapping.....	82
4.6C.1.3	Type flag 2 mapping .....	82
4.6C.1.4	Transport block size index mapping .....	82
4.6C.1.5	Timeslot information mapping.....	83
4.6C.1.6	Channelisation code set information mapping .....	83
4.6C.1.7	Modulation scheme information mapping .....	83
4.6C.1.8	Redundancy version information mapping .....	83
4.6C.1.9	Pointer to the previous transmission mapping .....	83
4.6C.1.10	HS-SCCH cyclic sequence number.....	83
4.6C.1.11	UE identity .....	83
4.6C.2	Multiplexing of HS-SCCH type 3 information.....	83
4.6C.3	CRC attachment for HS-SCCH type 3.....	84
4.6C.4	Channel coding for HS-SCCH type 3 .....	84
4.6C.5	Rate matching for HS-SCCH type 3 .....	84
4.6C.6	Interleaving for HS-SCCH type 3.....	84
4.6C.7	Physical Channel Segmentation for HS-SCCH type 3.....	84
4.6C.8	Physical channel mapping for HS-SCCH type 3 .....	84
4.6D	Coding/Multiplexing for HS-SCCH type 4 (1.28 Mcps TDD only) .....	85
4.6D.1	HS-SCCH type 4 information field mapping.....	86
4.6D.1.1	Type flag 1 mapping .....	86
4.6D.1.2	Type flag 2 mapping .....	86
4.6D.1.3	Channelisation code set information mapping .....	86
4.6D.1.4	Timeslot information mapping.....	87
4.6D.1.5	Modulation scheme information mapping .....	87
4.6D.1.6	Transport block size index mapping .....	87
4.6D.1.7	HARQ process identifier mapping.....	87
4.6D.1.8	Redundancy version information mapping .....	87
4.6D.1.9	HS-SCCH cyclic sequence number.....	87
4.6D.1.10	UE identity .....	88
4.6D.1.11	Midamble allocation scheme flag .....	88
4.6D.2	Multiplexing of HS-SCCH type 4 information.....	88
4.6D.3	CRC attachment for HS-SCCH type 4.....	88
4.6D.4	Channel coding for HS-SCCH type 4.....	88

4.6D.5	Rate matching for HS-SCCH type 4.....	88
4.6D.6	Interleaving for HS-SCCH type 4.....	89
4.6D.7	Physical Channel Segmentation for HS-SCCH type 4.....	89
4.6D.8	Physical channel mapping for HS-SCCH type 4.....	89
4.6E	Coding/Multiplexing for HS-SCCH type 5 (1.28 Mcps TDD only).....	89
4.6E.1	HS-SCCH type 5 information field mapping.....	90
4.6E.1.1	Type flag 1 mapping.....	90
4.6E.1.2	Type flag 2 mapping.....	90
4.6E.1.3	Timeslot information mapping.....	90
4.6E.1.4	Modulation scheme information mapping.....	90
4.6E.1.5	Transport block size offset information mapping.....	91
4.6E.1.6	Transport block size index mapping.....	91
4.6E.1.7	HARQ process identifier mapping.....	91
4.6E.1.8	Redundancy version information mapping.....	91
4.6E.1.9	HS-SCCH cyclic sequence number.....	91
4.6E.1.10	UE identity.....	91
4.6E.2	Multiplexing of HS-SCCH type 5 information.....	91
4.6E.3	CRC attachment for HS-SCCH type 5.....	92
4.6E.4	Channel coding for HS-SCCH type 5.....	92
4.6E.5	Rate matching for HS-SCCH type 5.....	92
4.6E.6	Interleaving for HS-SCCH type 5.....	92
4.6E.7	Physical Channel Segmentation for HS-SCCH type 5.....	92
4.6E.8	Physical channel mapping for HS-SCCH type 5.....	92
4.6F	Coding/Multiplexing for HS-SCCH type 6 (1.28 Mcps TDD only).....	92
4.6F.1	HS-SCCH type 6 information field mapping.....	94
4.6F.1.1	Type flag mapping.....	94
4.6F.1.2	Channelisation code set information mapping.....	94
4.6F.1.3	Timeslot information mapping.....	94
4.6F.1.4	Modulation scheme information mapping.....	94
4.6F.1.5	Resource repetition pattern index mapping.....	94
4.6F.1.6	Transport block size index mapping.....	95
4.6F.1.7	HS-SICH indicator mapping.....	95
4.6F.1.8	HS-SCCH cyclic sequence number.....	95
4.6F.1.9	UE identity.....	95
4.6F.2	Multiplexing of HS-SCCH type 6 information.....	95
4.6F.3	CRC attachment for HS-SCCH type 6.....	95
4.6F.4	Channel coding for HS-SCCH type 6.....	95
4.6F.5	Rate matching for HS-SCCH type 6.....	96
4.6F.6	Interleaving for HS-SCCH type 6.....	96
4.6F.7	Physical Channel Segmentation for HS-SCCH type 6.....	96
4.6F.8	Physical channel mapping for HS-SCCH type 6.....	96
4.6G	Coding/Multiplexing for HS-SCCH type 7 (1.28 Mcps TDD only).....	96
4.6G.1	HS-SCCH type 7 information field mapping.....	97
4.6G.1.1	Type flag mapping.....	97
4.6G.1.2	Channelisation code set information mapping.....	97
4.6G.1.3	Timeslot information mapping.....	97
4.6G.1.4	Modulation scheme information mapping.....	97
4.6G.1.5	Resource repetition pattern index mapping.....	98
4.6G.1.6	Transport block size index mapping.....	98
4.6G.1.7	Redundancy version information mapping.....	98
4.6G.1.8	Pointer to the previous transmission mapping.....	98
4.6G.1.9	HS-SCCH cyclic sequence number.....	98
4.6G.1.10	UE identity.....	98
4.6G.2	Multiplexing of HS-SCCH type 7 information.....	98
4.6G.3	CRC attachment for HS-SCCH type 7.....	98
4.6G.4	Channel coding for HS-SCCH type 7.....	99
4.6G.5	Rate matching for HS-SCCH type 7.....	99
4.6G.6	Interleaving for HS-SCCH type 7.....	99
4.6G.7	Physical Channel Segmentation for HS-SCCH type 7.....	99
4.6G.8	Physical channel mapping for HS-SCCH type 7.....	99
4.6H	Coding/Multiplexing for HS-SCCH type 8 (1.28 Mcps TDD only).....	99
4.6H.1	HS-SCCH type 8 information field mapping.....	100

4.6H.1.1	Channelisation code set information mapping .....	100
4.6H.1.2	Transport block size index mapping .....	101
4.6H.1.3	Modulation scheme information mapping .....	102
4.6H.1.4	Timeslot information mapping .....	102
4.6H.1.5	Redundancy version information mapping .....	102
4.6H.1.6	Type flag mapping .....	102
4.6H.1.7	Field flag mapping .....	102
4.6H.1.8	Special Information mapping .....	102
4.6H.1.9	HARQ process identifier mapping .....	102
4.6H.1.10	HS-SCCH cyclic sequence number .....	102
4.6H.1.11	UE identity .....	102
4.6H.2	Multiplexing of HS-SCCH type 8 information .....	102
4.6H.3	CRC attachment for HS-SCCH type 8 .....	103
4.6H.4	Channel coding for HS-SCCH type 8 .....	103
4.6H.5	Rate matching for HS-SCCH type 8 .....	103
4.6H.6	Interleaving for HS-SCCH type 8 .....	103
4.6H.7	Physical Channel Segmentation for HS-SCCH type 8 .....	103
4.6H.8	Physical channel mapping for HS-SCCH type 8 .....	103
4.6I	Coding/Multiplexing for HS-SCCH type 9 (1.28 Mcps TDD only) .....	104
4.6I.1	HS-SCCH type 9 information field mapping .....	105
4.6I.1.1	Channelisation code set information mapping .....	105
4.6I.1.2	Transport block size offset information mapping .....	106
4.6I.1.3	Modulation scheme information mapping .....	106
4.6I.1.4	Timeslot information mapping .....	106
4.6I.1.5	Redundancy version information mapping .....	106
4.6I.1.6	HARQ process identifier mapping .....	106
4.6I.1.9	HS-SCCH cyclic sequence number .....	106
4.6I.1.10	UE identity .....	106
4.6I.2	Multiplexing of HS-SCCH type 9 information .....	106
4.6I.3	CRC attachment for HS-SCCH type 9 .....	107
4.6I.4	Channel coding for HS-SCCH type 9 .....	107
4.6I.5	Rate matching for HS-SCCH type 9 .....	107
4.6I.6	Interleaving for HS-SCCH type 9 .....	107
4.6I.7	Physical Channel Segmentation for HS-SCCH type 9 .....	107
4.6I.8	Physical channel mapping for HS-SCCH type 9 .....	107
4.6J	Coding/Multiplexing for HS-SCCH orders type B (1.28Mcps TDD only) .....	108
4.6J.1	HS-SCCH orders type B information field mapping .....	108
4.6J.1.1	Order type mapping .....	108
4.6J.1.2	UE identity mapping .....	108
4.7	Coding for HS-SICH .....	108
4.7.1	HS-SICH information field mapping .....	109
4.7.1.1	RMF information mapping .....	109
4.7.1.2	RTBS information mapping .....	109
4.7.1.3	ACK/NACK information mapping .....	109
4.7.2	Coding for HS-SICH .....	110
4.7.2.1	Field Coding of ACK/NACK .....	110
4.7.2.2	Field Coding of CQI .....	110
4.7.2.2.1	Field Coding of CQI for 1.28 Mcps TDD .....	110
4.7.2.2.2	Field Coding of CQI for 3.84 Mcps TDD and 7.68Mcps TDD .....	111
4.7.3	Multiplexing of HS-SICH information fields .....	111
4.7.4	Interleaver for HS-SICH .....	111
4.7.5	Physical channel mapping for HS-SICH .....	111
4.7A	Coding for HS-SICH type 2 (1.28 Mcps TDD only) .....	111
4.7A.1	HS-SICH type 2 information field mapping .....	112
4.7A.1.1	RMF information mapping .....	112
4.7A.1.2	RTBS information mapping .....	112
4.7A.1.3	ACK/NACK information mapping .....	113
4.7A.2	Coding for HS-SICH type 2 .....	113
4.7A.2.1	Field Coding of ACK/NACK .....	113
4.7A.2.2	Field Coding of CQI .....	113
4.7A.3	Multiplexing of HS-SICH type 2 information fields .....	113
4.7A.4	Interleaver for HS-SICH type 2 .....	114



4.7A.5	Physical channel mapping for HS-SICH type 2.....	114
4.8	Coding for E-DCH .....	114
4.8.1	CRC attachment for E-DCH .....	115
4.8.2	Code block segmentation for E-DCH .....	115
4.8.3	Channel coding for E-DCH .....	116
4.8.4	Physical layer HARQ functionality and rate matching for E-DCH .....	116
4.8.4.1	Determination of SF, modulation and number of physical channels.....	116
4.8.4.2	HARQ bit separation.....	116
4.8.4.3	HARQ Rate Matching Stage .....	116
4.8.4.4	HARQ bit collection .....	117
4.8.5	Bit scrambling.....	117
4.8.6	Interleaving for E-DCH .....	117
4.8.7	Constellation re-arrangement for 16 QAM.....	117
4.8.8	Physical channel mapping for E-DCH.....	117
4.9	Coding for E-UCCH.....	118
4.9.1	Coding for E-UCCH for the 3.84Mcps and 7.68Mcps TDD options.....	118
4.9.1.1	Overview.....	118
4.9.1.2	E-UCCH part 1.....	119
4.9.1.2.1	Information field mapping of E-TFCI .....	119
4.9.1.2.2	Channel coding for E-UCCH part 1 .....	119
4.9.1.2.3	Physical channel mapping for E-UCCH part 1.....	119
4.9.1.3	E-UCCH part 2.....	119
4.9.1.3.1	Information field mapping of retransmission sequence number.....	119
4.9.1.3.2	Information field mapping of HARQ process ID .....	119
4.9.1.3.3	Multiplexing of E-UCCH part 2 information .....	120
4.9.1.3.4	Channel coding for E-UCCH part 2 .....	120
4.9.1.3.5	Physical channel mapping for E-UCCH part 2.....	120
4.9.2	Coding for E-UCCH for the 1.28Mcps TDD option.....	120
4.9.2.1	E-UCCH information field mapping.....	121
4.9.2.1.1	Information field mapping of E-TFCI .....	121
4.9.2.1.2	RSN information mapping.....	121
4.9.2.1.3	HARQ information mapping .....	122
4.9.2.2	Multiplexing for E-UCCH .....	122
4.9.2.3	Coding for E-UCCH .....	123
4.9.2.4	Physical channel mapping for E-UCCH .....	123
4.10	Coding for E-AGCH .....	123
4.10.1	Information Field Mapping.....	124
4.10.1.1	Mapping of the Absolute Grant (Power) Value .....	124
4.10.1.2	Mapping of the Code Resource Related Information.....	126
4.10.1.3	Mapping of the Timeslot Resource Related Information .....	127
4.10.1.4	Mapping of the E-AGCH Cyclic Sequence Number (ECSN).....	127
4.10.1.5	Mapping of the Resource Duration Indicator .....	127
4.10.1.6	Mapping of the E-HICH Indicator (1.28Mcps option only).....	128
4.10.1.7	Mapping of the E-UCCH Number Indicator (1.28Mcps option only) .....	128
4.10.2	Field Multiplexing .....	128
4.10.3	CRC attachment.....	129
4.10.4	Channel Coding .....	129
4.10.5	Rate Matching.....	129
4.10.6	Interleaving .....	129
4.10.7	Physical Channel Segmentation.....	129
4.10.8	Physical Channel Mapping .....	129
4.10A	Coding for E-AGCH type 2 (1.28Mcps TDD only).....	129
4.10A.1	E-AGCH type 2 Information Field Mapping .....	131
4.10A.1.1	Mapping of the Absolute Grant (Power) Value .....	131
4.10A.1.2	Mapping of the Code Resource Related Information.....	131
4.10A.1.3	Mapping of the Timeslot Resource Related Information .....	131
4.10A.1.4	Mapping of the E-AGCH Cyclic Sequence Number (ECSN).....	131
4.10A.1.5	Mapping of the Field Flag.....	131
4.10A.1.6	Mapping of the Special Information 1 .....	131
4.10A.1.7	Mapping of the Special Information 2 .....	132
4.10A.1.8	Mapping of the E-UCCH Number Indicator.....	132
4.10A.2	Field Multiplexing of E-AGCH type 2 .....	132

4.10A.3	CRC attachment for E-AGCH type 2 .....	133
4.10A.4	Channel Coding for E-AGCH type 2.....	133
4.10A.5	Rate Matching for E-AGCH type 2 .....	133
4.10A.6	Interleaving for E-AGCH type 2.....	133
4.10A.7	Physical Channel Segmentation for E-AGCH type 2 .....	133
4.10A.8	Physical Channel Mapping for E-AGCH type 2.....	133
4.10B	Coding for E-AGCH orders.....	133
4.10B.1	E-AGCH orders information field mapping .....	133
4.10B.1.1	Order type mapping.....	133
4.10B.1.2	UE identity mapping .....	134
4.11	Coding for E-HICH ACK/NACK .....	134
4.11.1	Coding for E-HICH ACK/NACK for the 3.84Mcps and 7.68Mcps options .....	134
4.11.1.1	Overview.....	134
4.11.1.2	Coding of the HARQ acknowledgement indicator .....	134
4.11.1.3	Bit scrambling of the E-HICH .....	136
4.11.1.4	Physical channel mapping of the E-HICH .....	136
4.11.2	Coding for E-HICH for the 1.28Mcps option only .....	136
4.11.2.1	Overview .....	136
4.11.2.2	Coding of the HARQ acknowledgement indicator and TPC/SS.....	137
4.11.2.3	Bit scrambling and Physical channel mapping of the E-HICH .....	139
4.12	Coding for E-RUCCH .....	139
4.12.1	CRC attachment for E-RUCCH.....	140
4.12.2	Channel coding for E-RUCCH.....	140
4.12.3	Rate matching for E-RUCCH .....	140
4.12.4	Bit scrambling for E-RUCCH.....	140
4.12.5	Interleaving for E-RUCCH.....	140
4.12.6	Physical channel mapping for E-RUCCH .....	140
5	Multiplexing, channel coding and interleaving for the 3.84 Mcps MBSFN IMB option .....	140
5.1	General .....	140
5.2	General coding/multiplexing of TrCHs.....	141
5.2.1	CRC attachment.....	141
5.2.2	Transport block concatenation and code block segmentation.....	141
5.2.3	Channel coding .....	141
5.2.4	1 <sup>st</sup> Interleaving .....	141
5.2.5	Radio frame segmentation .....	141
5.2.6	Rate matching .....	141
5.2.7	TrCH multiplexing.....	141
5.2.8	Insertion of discontinuous transmission (DTX) indication bits .....	142
5.2.9	Physical channel segmentation .....	142
5.2.10	2 <sup>nd</sup> Interleaving .....	142
5.2.11	Physical channel mapping .....	142
5.2.12	Restrictions on different types of CCTrCHs.....	143
5.2.12.1	Broadcast channel (BCH) .....	143
5.2.12.2	Forward access channel (FACH) .....	143
5.2.13	Multiplexing of different TrCHs into one CCTrCH, and mapping of one CCTrCH onto physical channels .....	143
5.3	Transport format detection.....	143
5.3.1	Transport format detection based on TFCI.....	143
5.3.2	Coding of Transport-Format-Combination Indicator (TFCI) .....	143
5.3.3	Mapping of TFCI words .....	143
5.3.3.1	Mapping of TFCI bits for Secondary CCPCH .....	143
<b>Annex A (informative):</b>	<b>Change history .....</b>	<b>144</b>
History .....		147

---

## Foreword

This Technical Specification (TS) has been produced by the 3<sup>rd</sup> 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 multiplexing, channel coding and interleaving for UTRA Physical Layer TDD mode.

---

## 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 25.202: "UE capabilities".
- [2] 3GPP TS 25.211: "Transport channels and physical channels (FDD)".
- [3] 3GPP TS 25.212: "Multiplexing and channel coding (FDD)".
- [4] 3GPP TS 25.213: "Spreading and modulation (FDD)".
- [5] 3GPP TS 25.214: "Physical layer procedures (FDD)".
- [6] 3GPP TS 25.215: "Physical layer – Measurements (FDD)".
- [7] 3GPP TS 25.221: "Transport channels and physical channels (TDD)".
- [9] 3GPP TS 25.223: "Spreading and modulation (TDD)".
- [10] 3GPP TS 25.224: "Physical layer procedures (TDD)".
- [11] 3GPP TS 25.225: "Measurements".
- [12] 3GPP TS 25.331: "RRC Protocol Specification".
- [13] 3GPP TS 25.308: "High Speed Downlink Packet Access (HSDPA): Overall description (stage 2)".
- [14] ITU-T Recommendation X.691 (12/97) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".
- [15] 3GPP TS 25.321: 'Medium Access Control (MAC) protocol specification'
- [16] 3GPP TS 25.302: 'Services provided by the physical layer'
- [17] 3GPP TS 25.306: 'UE Radio Access Capabilities'

---

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**TrCH number:** The transport channel number identifies a TrCH in the context of L1. The L3 transport channel identity (TrCH ID) maps onto the L1 transport channel number. The mapping between the transport channel number and the