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Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; 1.28 Mcps TDD UE Radio Access Capabilities (Release 4)



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Foreword

This Technical Report 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 UE radio access capabilities for 1.28 Mcps TDD, identifies the commonalities and explains the differences to 3.84 Mcps TDD.

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.

This specification may contain references to pre-Release-4 GSM specifications. These references shall be taken to refer to the Release 4 version where that version exists. Conversion from the pre-Release-4 number to the Release 4 (onwards) number is given in subclause 6.1 of 3GPP TR 41.001.

- [1] 3GPP TR 25.926: "UE Radio Access Capabilities".
- [2] 3GPP TR 25.928: "1.28 Mcps functionality for UTRA TDD Physical Layer".

3 Abbreviations

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

UE	User Equipment
UMTS	Universal Mobile Telecommunications System

4 Background and Introduction

Low chip rate TDD UE radio access capabilities is a release 2000 work item that was agreed in RAN#8 plenary meeting. This work item involves the definition of UE radio access capabilities 1.28 Mcps TDD. It is assumed that the physical parameter set of the 1.28 Mcps TDD is basically the same as the 3.84 Mcps TDD .

Therefore many UE radio access capability parameters do not need to be changed. However, due to the specific physical layer structure and key features of 1.28 Mcps TDD specific parameters have to be added or modified.

The aim of this report is to describe the UE radio access capabilities for 1.28 Mcps TDD as well as to identify the commonalities and to explain the differences to 3.84 Mcps TDD.

5 UE radio access capability parameters

NOTE: This section needs to be reviewed by TSG RAN WG1.

5.1 PDCP parameters

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.2 BMC parameters

No UE radio access capability parameters identified (as in [1]).

5.3 RLC parameters

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.4 MAC parameters

No UE radio access capability parameters identified (as in [1]).

5.5 PHY parameters

5.5.1 Transport channel parameters in downlink

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.5.2 Transport channel parameters in uplink

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.5.3 Physical channel parameters in downlink

An additional parameter Support of 8PSK is needed:

Support of 8PSK

Defines whether 8PSK modulation is supported or not.

[Explanation of difference:]

The modulation scheme for FDD and 3.84 Mcps TDD is QPSK. For 1.28 Mcps TDD 8PSK modulation is additionally needed to provide high data rate services up to 2 Mbps.

The parameter Maximum number of timeslots per frame for 3.84 Mcps TDD is replaced by Maximum number of timeslots per subframe for 1.28 Mcps TDD. The parameter Maximum number of physical channels per frame for 3.84 Mcps TDD is replaced by Maximum number of physical channels per subframe for 1.28 Mcps TDD.

[Explanation of difference:]

1.28 Mcps TDD has a different frame structure than 3.84 Mcps TDD. Each 10ms radio frame consists of two 5ms subframes.

No further modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.5.4 Physical channel parameters in uplink

The parameter Maximum number of timeslots per frame for 3.84 Mcps TDD is replaced by Maximum number of timeslots per subframe for 1.28 Mcps TDD.

[Explanation of difference:]

1.28 Mcps TDD has a different frame structure than 3.84 Mcps TDD. Each 10ms radio frame consists of two 5ms subframes.

No further modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.5.5 RF parameters

It is proposed to remove the Chip rate capability parameter and to indicate the support of 1.28 Mcps TDD and / or 3.84 Mcps TDD by the Multi-Mode related parameters.

5.6 Multi-mode related parameters

For simplification, it is proposed to replace the parameter Support of UTRA FDD/TDD by three separate parameters Support of UTRA FDD, Support of UTRA TDD 3.84 Mcps and Support of UTRA TDD 1.28 Mcps:

Support of UTRA FDD

Defines whether UTRA FDD is supported.

Support of UTRA TDD 3.84 Mcps

Defines whether UTRA TDD 3.84 Mcps is supported.

Support of UTRA TDD 1.28 Mcps

Defines whether UTRA TDD 1.28 Mcps is supported.

5.7 Multi-RAT related parameters

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.8 LCS related parameters

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

5.9 Measurement related capabilities

No modifications for 1.28 Mcps TDD are required compared to 3.84 Mcps TDD.

6 Possible UE radio access capability parameter settings

NOTE: This section needs to be reviewed by WG1 and WG2.

6.1 Value ranges

Compared to [1], table 6.1 contains additional rows for TDD 1.28Mcps physical channel parameters in uplink, TDD physical channel parameters in downlink and TDD 1.28Mcps RF parameters. Furthermore, some restructuring of the multi-mode related parameters was required. The parameter Support of UTRA FDD/TDD was replaced by three separate parameters Support of UTRA FDD, Support of UTRA TDD 3.84Mcps and Support of UTRA TDD 1.28Mcps. Therefore, the parameter Chip rate capability of the RF parameters is no longer needed.

Table 6.1: UE radio access capability parameter value ranges

		UE radio access capability parameter	Value range
PDCP parameters		Header compression algorithm supported	Yes/No
RLC parameters		Total RLC AM buffer size	2,10,50,100,150,500,1000 kBytes
		Maximum number of AM entities	3,4,5,6,8,16,32
PHY parameters	Transport channel parameters in downlink	Maximum sum of number of bits of all transport blocks received in TTIs that end within the same arbitrary interval of length $T < 10$ ms	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all convolutionally coded transport blocks received in TTIs that end within the same arbitrary interval of length $T < 10$ ms	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all turbo coded transport blocks received in TTIs that end within the same arbitrary interval of length $T < 10$ ms	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum number of simultaneous transport channels	4, 8, 16, 32
		Maximum number of simultaneous CCTrCH	1, 2, 3, 4, 5, 6, 7, 8
		Maximum total number of transport blocks received within TTIs that end within the same 10 ms interval	4, 8, 16, 32, 48, 64, 96, 128, 256, 512
		Maximum number of TFC in the TFCS	16, 32, 48, 64, 96, 128, 256, 512, 1024
		Maximum number of TF	32, 64, 128, 256, 512, 1024
		Support for turbo decoding	Yes/No
	Transport channel parameters in uplink	Maximum sum of number of bits of all transport blocks transmitted in TTIs that start at the same time	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all convolutionally coded transport blocks transmitted in TTIs that start at the same time	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all turbo coded transport blocks transmitted in TTIs that start at the same time	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum number of simultaneous transport channels	2, 4, 8, 16, 32
		Maximum number of simultaneous CCTrCH of DCH type (TDD only)	1, 2, 3, 4, 5, 6, 7, 8
		Maximum total number of transport blocks transmitted within TTIs that start at the same time	2, 4, 8, 16, 32, 48, 64, 96, 128, 256, 512
		Maximum number of TFC in the TFCS	4, 8, 16, 32, 48, 64, 96, 128, 256, 512, 1024
		Maximum number of TF	32, 64, 128, 256, 512, 1024
		Support for turbo encoding	Yes/No
	FDD Physical channel parameters in downlink	Maximum number of DPCH/PDSCH codes to be simultaneously received	1, 2, 3, 4, 5, 6, 7, 8
		Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH)	600, 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 48000, 57600, 67200, 76800
Support for SF 512		Yes/No	
Support of PDSCH		Yes/No	
Simultaneous reception of SCCPCH and DPCH		Yes/No	
Simultaneous reception of SCCPCH, DPCH and PDSCH		Yes/No	

		UE radio access capability parameter	Value range
		Maximum number of simultaneous S-CCPCH radio links	1 NOTE: Only the value 1 is part of R99
	FDD Physical channel parameters in uplink	Maximum number of DPDCH bits transmitted per 10 ms	600, 1200, 2400, 4800, 960, 19200, 28800, 38400, 48000, 57600
		Support of PCPCH	Yes/No
	TDD 3.84 Mcps physical channel parameters in downlink	Maximum number of timeslots per frame	1..14
		Maximum number of physical channels per frame	1,2,3,..,224
		Minimum SF	16, 1
		Support of PDSCH	Yes/No
	TDD 3.84 Mcps physical channel parameters in uplink	Maximum number of physical channels per timeslot	1..16
		Maximum number of timeslots per frame	1..14
		Maximum number of physical channels per timeslot	1, 2
		Minimum SF	16,8,4,2,1
	TDD 1.28 Mcps physical channel parameters in downlink	Support of PUSCH	Yes/No
		Maximum number of timeslots per subframe	1..6
		Maximum number of physical channels per subframe	1,2,3,..,96
		Minimum SF	16,1
	TDD 1.28 Mcps physical channel parameters in uplink	Support of PDSCH	Yes/No
		Maximum number of physical channels per timeslot	1..16
		Support of 8PSK	Yes/No
		Maximum number of timeslots per subframe	1..6
	TDD 1.28 Mcps physical channel parameters in uplink	Maximum number of physical channels per timeslot	1,2
		Minimum SF	16,8,4,2,1
		Support of PUSCH	Yes/No
		Support of PDSCH	Yes/No
RF parameters	FDD RF parameters	UE power class (25.101 subclause 6.2.1)	3, 4 NOTE: Only power classes 3 and 4 are part of R99
		Tx/Rx frequency separation (25.101 subclause 5.3) . NOTE: Not applicable if UE is not operating in frequency band a	190 MHz 174.8-205.2 MHz 134.8-245.2 MHz
	TDD 3.84 Mcps RF parameters	UE power class (25.102)	2,3 NOTE: Only power classes 2 and 3 are part of R99
		Radio frequency bands (25.102)	a), b), c), a+b), a+c), a+b+c)
	TDD 1.28 Mcps RF parameters	UE power class (25.102)	2,3
		Radio frequency bands (25.102)	a), b), c), a+b), a+c), a+b+c)
Multi-mode related parameters		Support of UTRA FDD	Yes/No
		Support of UTRA TDD 3.84 Mcps	Yes/No
		Support of UTRA TDD 1.28 Mcps	Yes/No
Multi-RAT related parameters		Support of GSM	Yes/No
		Support of multi-carrier	Yes/No
LCS related parameters		Standalone location method(s) supported	Yes/No
		Network assisted GPS support	Network based / UE based / Both/ None

	UE radio access capability parameter	Value range
	GPS reference time capable	Yes/No
	Support for IPDL	Yes/No
	Support for OTDOA UE based method	Yes/No
Measurement related capabilities	Need for downlink compressed mode	Yes/No (per frequency band, UTRA mode and RAT)
	Need for uplink compressed mode	Yes/No (per frequency band, UTRA mode and RAT)

6.2 Reference UE radio access capability combinations

6.2.1 Combinations of common UE Radio Access Parameters for UL and DL

NOTE: It is FFS whether measurement-related capabilities need to be included in the combinations. These capabilities are independent from the supported RABs.

Table 6.2.1.1: UE radio access capability parameter combinations, parameters common for UL and DL

Reference combination of UE Radio Access capability parameters common for UL and DL	32kbps class	64kbps class	128kbps class	384kbps class	768kbps class	2048kbps class
PDCP parameters						
Header compression algorithm supported	No	No/Yes NOTE 1	No/Yes NOTE 1	No/Yes NOTE 1	No/Yes NOTE 1	No/Yes NOTE 1
RLC parameters						
Total RLC AM buffer size (kbytes)	10	10	50	50	100	500
Maximum number of AM entities	4	4	5	6	8	8
Multi-mode related parameters						
Support of UTRA FDD	Yes/No NOTE 1					
Support of UTRA TDD 3.84 Mcps	Yes/No NOTE 1					
Support of UTRA TDD 1.28 Mcps	Yes/No NOTE 1					
Multi-RAT related parameters						
Support of GSM	Yes/No NOTE 1					
Support of multi-carrier	Yes/No NOTE 1					
LCS related parameters						
Standalone location method(s) supported	Yes/No NOTE 1					
Network assisted GPS support	Network based / UE based / Both/ None NOTE 1					
GPS reference time capable	Yes/No NOTE 1					
Support for IPDL	Yes/No NOTE 1					
Support for OTDOA UE based method	Yes/No NOTE 1					
RF parameters for FDD						
UE power class	3 / 4 NOTE 1					
Tx/Rx frequency separation	190 MHz					
RF parameters for TDD 3.84 Mcps						
UE power class	2 / 3 NOTE 1					
Radio frequency bands	A / b / c / a+b / a+c / a+b+c NOTE 1					
RF parameters for TDD 1.28 Mcps						
UE power class	2 / 3 NOTE 1					
Radio frequency bands	A / b / c / a+b / a+c / a+b+c NOTE 1					

NOTE 1: Options represent different combinations that should be supported with Conformance Tests.

6.2.2 Combinations of UE Radio Access Parameters for DL

Table 6.2.2.1: UE radio access capability parameter combinations, DL parameters

Reference combination of UE Radio Access capability parameters in DL	32kbps class	64kbps class	128kbps class	384kbps class	768kbps class	2048kbps class
Transport channel parameters						
Maximum sum of number of bits of all transport blocks being received at an arbitrary time instant	640	3840	3840	6400	10240	20480
Maximum sum of number of bits of all convolutionally coded transport blocks being received at an arbitrary time instant	640	640	640	640	640	640
Maximum sum of number of bits of all turbo coded transport blocks being received at an arbitrary time instant	NA	3840	3840	6400	10240	20480 ⁽¹⁾ 10240 ⁽²⁾ NOTE 3
Maximum number of simultaneous transport channels	8	8	8	8	8	16
Maximum number of simultaneous CCTrCH (FDD)	1	2/1 NOTE 2	2/1 NOTE 2	2/1 NOTE 2	2	2
Maximum number of simultaneous CCTrCH (TDD)	2	3	3	3	4	4
Maximum total number of transport blocks received within TTIs that end at the same time	8	8	16	32	64	96
Maximum number of TFC in the TFCS	32	48	96	128	256	1024
Maximum number of TF	32	64	64	64	128	256
Support for turbo decoding	No	Yes	Yes	Yes	Yes	Yes
Physical channel parameters (FDD)						
Maximum number of DPCH/PDSCH codes to be simultaneously received	1	2/1 NOTE 2	2/1 NOTE 2	3	3	3
Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH).	1200	3600/2400 NOTE2	7200/4800 NOTE2	19200	28800	57600
Support for SF 512	No	No	No	No	No	No
Support of PDSCH	No	Yes/No NOTE 1	Yes/No NOTE 1	No/Yes NOTE 1	Yes	Yes
Maximum number of simultaneous S-CCPCH radio links	1	1	1	1	1	1
Physical channel parameters (TDD 3.84 Mcps)						
Maximum number of timeslots per frame	1	2	4	5	10	12
Maximum number of physical channels per frame	8	9	14	28	64	136
Minimum SF	16	16	16	1/16 NOTE 1	1/16 NOTE 1	1/16 NOTE 1
Support of PDSCH	Yes/No NOTE 1	Yes	Yes	Yes	Yes	Yes
Maximum number of physical channels per timeslot	8	9	9	9	9	13
Physical channel parameters (TDD 1.28 Mcps)						
Maximum number of timeslots per subframe	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>6</u>
Maximum number of physical channels per subframe	<u>8</u>	<u>12</u>	<u>18</u>	<u>43</u>	<u>77</u>	<u>77</u>
Minimum SF	<u>16</u>	<u>16</u>	<u>16</u>	<u>1/16</u> NOTE 1	<u>1/16</u> NOTE 1	<u>1</u>
Support of PDSCH	<u>f.f.s</u>	<u>f.f.s</u>	<u>f.f.s</u>	<u>f.f.s</u>	<u>f.f.s</u>	<u>f.f.s</u>
Maximum number of physical channels per timeslot	<u>8</u>	<u>11</u>	<u>14</u>	<u>14</u>	<u>14</u>	<u>14</u>
Support of 8PSK	No	No	No	No	No	Yes

NOTE 1: Options represent different combinations that should be supported with conformance tests.

NOTE 2: Options depend on the support of PDSCH. The highest value is required if PDSCH is supported.

NOTE3: (1) For FDD and 3.84Mcps TDD (2) For 1.28Mcps TDD

NOTE4: The parameters in table 6.2.2.1 need to be verified by RAN1 in more detail.

6.2.3 Combinations of UE Radio Access Parameters for UL

Table 6.2.3.1: UE radio access capability parameter combinations, UL parameters

Reference combination of UE Radio Access capability parameters in UL	32kbps class	64kbps class	128kbps class	384kbps class	768kbps class
Transport channel parameters					
Maximum sum of number of bits of all transport blocks being transmitted at an arbitrary time instant	640	3840	3840	6400	10240
Maximum sum of number of bits of all convolutionally coded transport blocks being transmitted at an arbitrary time instant	640	640	640	640	640
Maximum sum of number of bits of all turbo coded transport blocks being transmitted at an arbitrary time instant	NA	3840	3840	6400	10240
Maximum number of simultaneous transport channels	4	8	8	8	8
Maximum number of simultaneous CCTrCH(TDD only)	1	2	2	2	2
Maximum total number of transport blocks transmitted within TTIs that start at the same time	4	8	8	16	32
Maximum number of TFC in the TFCS	16	32	48	64	128
Maximum number of TF	32	32	32	32	64
Support for turbo encoding	No	Yes	Yes	Yes	Yes
Physical channel parameters (FDD)					
Maximum number of DPDCH bits transmitted per 10 ms	1200	2400	4800	9600	19200
Simultaneous reception of SCCPCH and DPCH NOTE 2	No	No	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1
Simultaneous reception of SCCPCH, DPCH and PDSCH NOTE 2	No	No	No	No	No
Support of PCPCH	No	No	No	No	No
Physical channel parameters (TDD 3.84 Mcps)					
Maximum number of timeslots per frame	1	2	3	7	9
Maximum number of physical channels per timeslot	1	1	1	1	2
Minimum SF	8	2	2	2	2
Support of PUSCH	Yes/No NOTE 1	Yes	Yes	Yes	Yes
Physical channel parameters (TDD 1.28 Mcps)					
Maximum number of timeslots per subframe	1	2	3	5	5
Maximum number of physical channels per timeslot	1	1	1	1	2
Minimum SF	4	2	2	2	2
Support of PUSCH	f.f.s	f.f.s	f.f.s	f.f.s	f.f.s

NOTE 1: Options represent different combinations that should be supported with conformance tests.

NOTE 2: The downlink parameters 'Simultaneous reception of SCCPCH and DPCH' and 'Simultaneous reception of SCCPCH, DPCH and PDSCH' are included in the combinations for uplink as their requirements relate to the uplink data rate. Simultaneous reception of SCCPCH and DPCH is required for the DRAC procedure that is intended for controlling uplink transmissions. In release 99, this is limited to 1 SCCPCH.

NOTE3: The parameters in table 6.2.3.1 need to be verified by RAN1 in more detail.

Annex A: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
12/00	RP-06	RP-000558	-		(to be) Approved at TSG-RAN #10 and placed under Change Control	-	3.0.0