TSG RAN Meeting #17 **RP-020495**
Biarritz, France, 3 - 6 September, 2002

Title **CRs (Rel-5) for WI "High Speed Downlink Packet Access (HSDPA) - RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing"**

Source **TSG RAN WG4**

Agenda Item **7.4.5**

RAN4 Tdoc	Spec	CR	R	Cat	Rel	Curr Ver	Title	Work Item
R4-021388	25.101	188	2	F	Rel-5	5.3.0	Performance requirements for the HSDPA Fixed Reference Channel (FRC)	HSDPA-RF
R4-021331	25.102	126		B	Rel-5	5.1.0	Addition of HSDPA UE requirements for 1.28 Mcps TDD option for 16QAM and QPSK for fixed reference channels	HSDPA-RF
R4-021364	25.141	239	1	B	Rel-5	5.3.1	Node-B EVM Test for Transmission of HSDPA 16QAM Signals	HSDPA-RF
R4-021221	25.142	143		F	Rel-5	5.1.0	Correction of 16QAM EVM/PCDE testing for HSDPA for 1.28 Mcps TDD option	HSDPA-RF

3GPP TSR RAN WG4 Meeting #24 **R4-021388**

Helsinki, Finland 12 - 16 August 2002

CR-Form-v7

CHANGE REQUEST

⌘	**25.101**	**CR**	**188**	⌘ **rev**	**2**	⌘	Current version:	**5.3.0** ⌘

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Proposed change affects:	UICC apps⌘ [ ]	ME [X]	Radio Access Network [ ]	Core Network [ ]

Title: ⌘	Performance requirements for the HSDPA Fixed Reference Channel (FRC)			
Source: ⌘	RAN WG4			
Work item code: ⌘	HSDPA-RF		***Date:*** ⌘	21/08/2002
Category: ⌘	**F**		***Release:*** ⌘	Rel-5
	Use one of the following categories: ***F*** *(correction)* ***A*** *(corresponds to a correction in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* Detailed explanations of the above categories can be found in 3GPP TR 21.900.			*Use one of the following releases:* *2 (GSM Phase 2)* *R96 (Release 1996)* *R97 (Release 1997)* *R98 (Release 1998)* *R99 (Release 1999)* *Rel-4 (Release 4)* *Rel-5 (Release 5)* *Rel-6 (Release 6)*

Reason for change: ⌘	The current requirements are in [] and do not include implementation margin. This CR updates the requirement based on revised simulations in RAN4
Summary of change: ⌘	Revised performance requirements for FRC for QPSK/16QAM for SET 1/2/3
Consequences if not approved: ⌘	Performance requirements for HSPDA are not specified. No impact on implementation as this is REL-5.

Clauses affected: ⌘	Section 9 (HSDPA) is revised				
	Y	**N**			
Other specs Affected: ⌘		**N**	Other core specifications	⌘	This requirement is not specified in the test specification
	Y		Test specifications		
		N	O&M Specifications		
Other comments: ⌘					

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9 Performance requirement (HSDPA)

9.1 General

The performance requirements for the UE in this subclause apply for the reference measurement channels specified in Annex A.7, the propagation conditions specified in table B.1B of Annex B and the Down link Physical channels specified in Annex C.5.

9.2 Demodulation of HS-DSCH (fixed reference channel)

9.2.1 Single Link performance

The receiver single link performance of the High Speed Physical Downlink Shared Channel (HS-DSCH) in different multi-path fading environments are determined by the information bit throughput R

9.2.1.1 Minimum requirement QPSK, Fixed Reference Channel (FRC) H-Set 1/2/3

For the parameters specified in Table 9.1, the requirements are specified in terms of a minimum information bit throughput R as shown in Table 9.2 for the DL reference channels specified in Annex A.7.1

The performance requirement for a particular UE shall be the specified requirement corresponding to the largest H-Set index (i.e. H-Set index 1/2/3) that is supported by the UE.

Table 9.1

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
I_{oc}	dBm/3.84 MHz	-60			
Redundancy and constellation version coding sequence		{0,2,5,6}			
Maximum number of HARQ transmission		4			

Table 9.2

Test Number	Propagation Conditions	Reference value		
		HS-PDSCH E_c / I_{or} (dB)	T-put R (kbps) * $\hat{I}_{or} / I_{oc}$ = 0 dB	T-put R (kbps) * $\hat{I}_{or} / I_{oc}$ = 10 dB
1	PA3	-6[-6]	65[109]	309[372]
		-3[-3]	147[208]	423[428]
2	PB3	-6[-6]	23[77]	181[251]
		-3[-3]	138[201]	287[421]
3	VA30	-6[-6]	22[76]	190[260]
		-3[-3]	142[205]	295[418]
4	VA120	-6[-6]	13[66]	181[242]
		-3[-3]	140[201]	275[405]

* Note
1. The reference value R shown in Table 9.2 is for the Fixed Reference Channel (FRC) H-Set 1
2. For Fixed Reference Channel (FRC) H-Set 2 the reference values for R in Table 9.2 should be scaled (multiplied by 1.52)
3. For Fixed Reference Channel (FRC) H-Set 3 the reference values for R in Table 9.2 should be scaled (multiplied by 3)

NOTE: Throughput values in table 9.2 do not include any reduction due to implementation impairments. Therefore, the values in table 9.2 will be changed in future versions of this document.

9.2.1.2 Minimum requirement 16QAM, Fixed Reference Channel (FRC) H-Set 1/2/3

For the parameters specified in Table 9.3, the requirements are specified in terms of a minimum information bit throughput R as shown in Table 9.4 for the DL reference channels specified in Annex A.7.1.

The performance requirement for a particular UE shall be the specified requirement corresponding to the largest H-Set index (i.e. H-Set index 1/2/3) that is supported by the UE.

Table 9.3

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
I_{oc}	dBm/3.84 MHz	-60			
Redundancy and constellation version coding sequence		{6,2,1,5}			
Maximum number of HARQ transmission		4			

Table 9.4

Test Number	Propagation Conditions	Reference value	
		HS-PDSCH E_c / I_{or} (dB)	T-put R (kbps) * $\hat{I}_{or} / I_{oc}$ = 10 dB
1	PA3	-6[-6]	198[332]
		-3[-3]f	368[507]
2	PB3	-6[-6]	34[164]
		-3[-3]	219[333]
3	VA30	-6[-6]	47[183]
		-3[-3]	214[351]
4	VA120	-6[-6]	28[155]
		-3[-3]	167[324]

* Note
4. The reference value R shown in Table 9.4 is for the Fixed Reference Channel (FRC) H-Set 1
5. For Fixed Reference Channel (FRC) H-Set 2 the reference values for R in Table 9.4 should be scaled (multiplied by 1.52)
6. For Fixed Reference Channel (FRC) H-Set 3 the reference values for R in Table 9.4 should be scaled (multiplied by 3)

NOTE: Throughput values in table 9.4 do not include any reduction due to implementation impairments. Therefore, the values in table 9.2 will be changed in future versions of this document.

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A.7.1 Fixed Reference Channel (FRC)

A.7.1.1 Fixed Reference Channel Definition H-Set 1

Table A.25: Fixed Reference Channel H-Set 1

Parameter	Unit	Value	
Nominal Avg. Inf. Bit Rate	kbps	533	784
Inter-TTI Distance	TTI's	3	3
Number of HARQ Processes	Processes	2	2
Information Bit Payload (N_{INF})	Bits	3200	4704
Number Code Blocks	Blocks	1	1
Binary Channel Bits Per TTI	Bits	4800	7680
Total Available SML's in UE	SML's	19200	19200
Number of SML's per HARQ Proc.	SML's	9600	9600
Coding Rate		0.67	0.62
Number of Physical Channel Codes	Codes	5	4
Modulation		QPSK	16QAM

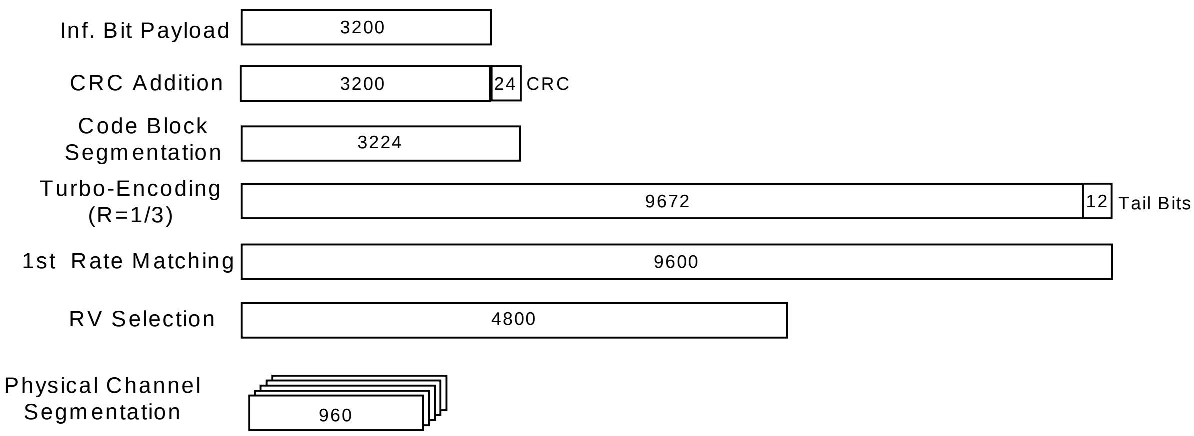

Figure A.12: Coding rate for Fixed Reference Channel H-Set 1 (QPSK)

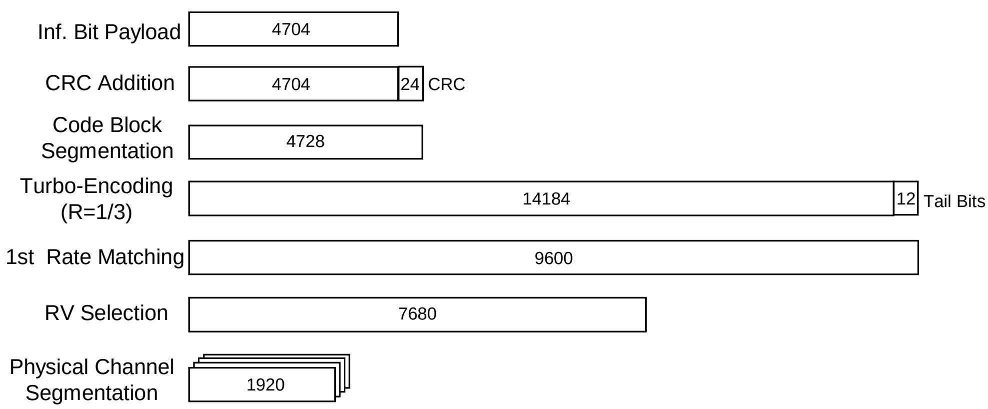

Figure A.13: Coding rate for Fixed Reference Channel H-Set 1 (16-QAM)

A.7.1.2 Fixed Reference Channel Definition H-Set 2

Table A.26: Fixed Reference Channel H-Set 2

Parameter	Unit	Value	
Nominal Avg. Inf. Bit Rate	kbps	800	1176
Inter-TTI Distance	TTI's	2	2
Number of HARQ Processes	Processes	3	3
Information Bit Payload (N_{INF})	Bits	3200	4704
Number Code Blocks	Blocks	1	1
Binary Channel Bits Per TTI	Bits	4800	7680
Total Available SML's in UE	SML's	28800	28800
Number of SML's per HARQ Proc.	SML's	9600	9600
Coding Rate		0.67	0.62
Number of Physical Channel Codes	Codes	5	4
Modulation		QPSK	16QAM

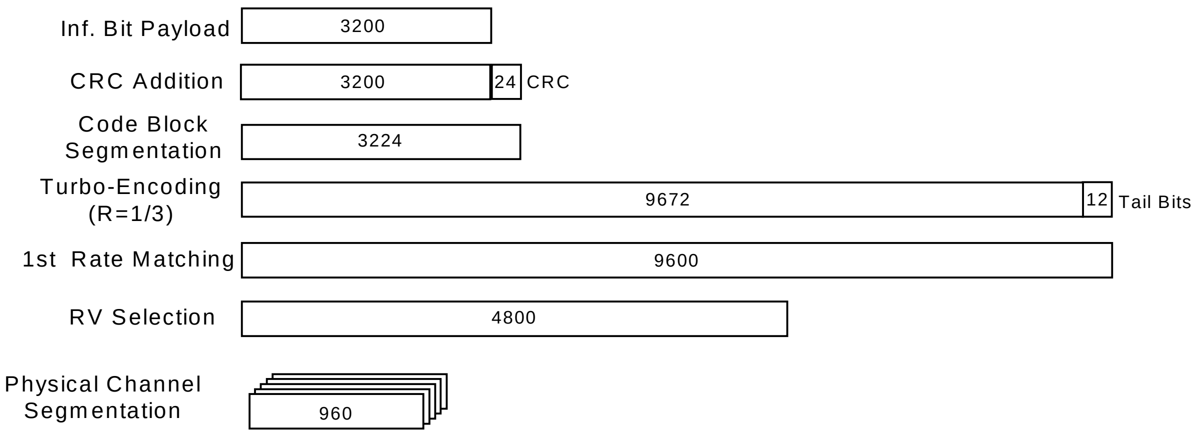

Figure A.14: Coding rate for Fixed Reference Channel H-Set 2 (QPSK)

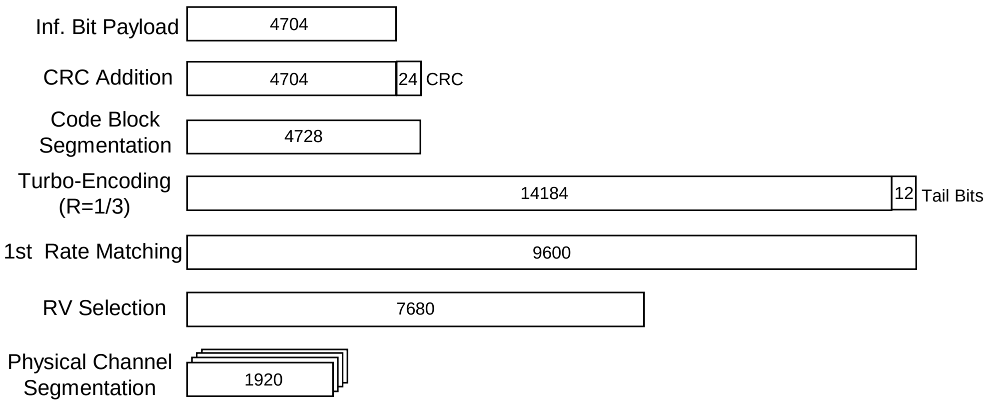

Figure A.15: Coding rate for Fixed Reference Channel H-Set 2 (16QAM)

A.7.21.3 Fixed Reference Channel Definition H-Set 23

Table A.276: Fixed Reference Channel H-Set 23

Parameter	Unit	Value	
Nominal Avg. Inf. Bit Rate	kbps	1600	2352
Inter-TTI Distance	TTI's	1	1
Number of HARQ Processes	Processes	6	6
Information Bit Payload (N_{INF})	Bits	3200	4704
Number Code Blocks	Blocks	1	1
Binary Channel Bits Per TTI	Bits	4800	7680
Total Available SML's,in UE	SML's	57600	57600
Number of SML's per HARQ Proc.	SML's	9600	9600
Coding Rate		0.67	0.62
Number of Physical Channel Codes	Codes	5	4
Modulation		QPSK	16QAM

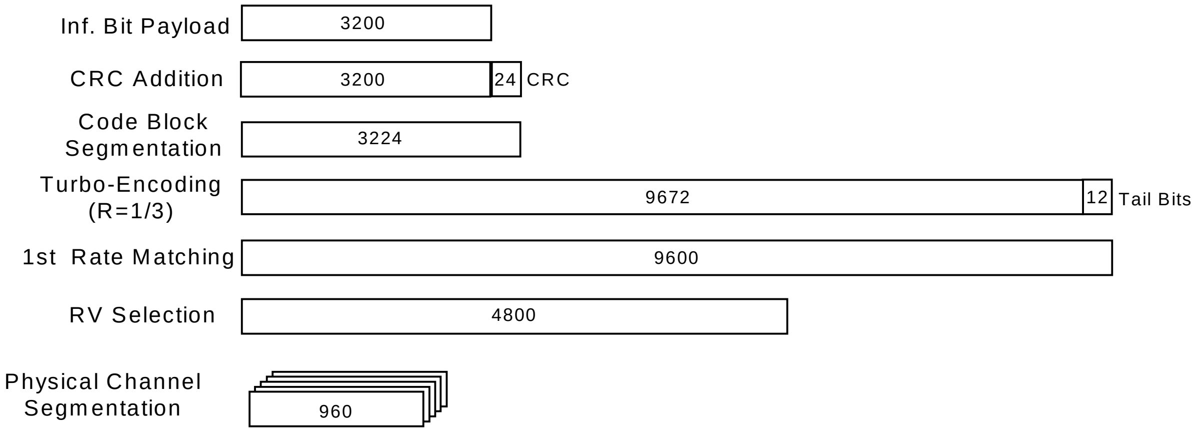

Figure A.164: Coding rate for Fixed Rreference Channel H-Set 2 3 (QPSK)

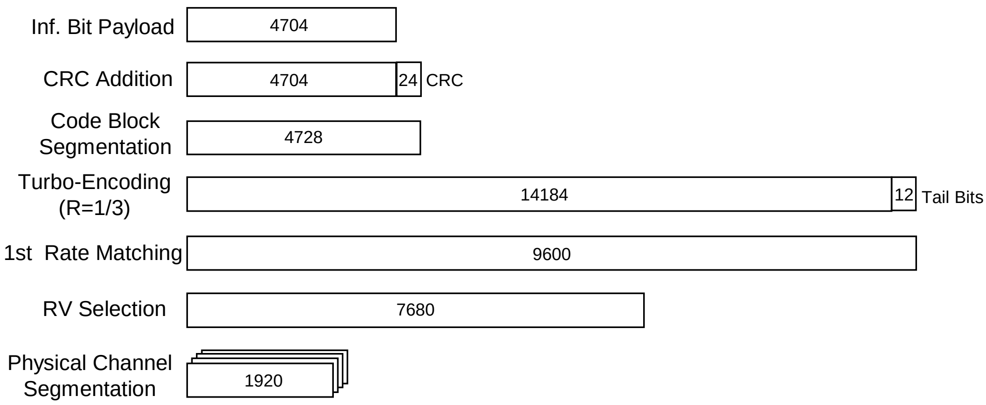

Figure A.1517: Coding rate for Fixed Rreference Channel H-Set 2 3 (16-QAM)

Table B1B: Propagation Conditions for Multi-Path Fading Environments for HSDPA Performance Requirements

ITU Pedestrian A Speed 3km/h (PA3)		ITU Pedestrian B Speed 3km/h (PB3)		ITU vehicular A Speed 30km/h (VA30)		ITU vehicular A Speed 120km/h (VA120)	
Relative Delay [ns]	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**
0	0	0	0	0	0	0	0
110	-9.7	200	-0.9	310	-1.0	310	-1.0
190	-19.2	800	-4.9	710	-9.0	710	-9.0
410	-22.8	1200	-8.0	1090	-10.0	1090	-10.0
		2300	-7.8	1730	-15.0	1730	-15.0
		3700	-23.9	2510	-20.0	2510	-20.0

Note: The propagation conditions used in simulations were based on the TR 25.890. The effect of re-mapping of channel rays to integer sample locations is FFS.

C.5 HSDPA DL Physical channels

C.5.1 Downlink Physical Channels connection set-up

Table C.9 is applicable for the measurements for tests in table 9.1

Table C.8: Downlink physical channels for HSDPA receiver testing.

Physical Channel	Parameter	Value	Note
P-CPICH	P-CPICH_Ec/Ior	-10dB	
P-CCPCH	P-CCPCH_Ec/Ior	-12dB	Mean power level is shared with SCH.
SCH	SCH_Ec/Ior	-12dB	Mean power level is shared with P-CCPCH – SCH includes P- and S-SCH, with power split between both. P-SCH code is S_dl,0 as per TS25.213 S-SCH pattern is scrambling code group 0
PICH	PICH_Ec/Ior	-15dB	
DPCH	DPCH_Ec/Ior	Test-specific	12.2 kbps DL reference measurement channel as defined in Annex A.3.1
HS-SCCH_1	HS-SCCH_Ec/Ior	Test-specific	Specifies fraction of Node-B radiated power transmitted when TTI is active (i.e. due to minimum inter-TTI interval).
HS-SCCH_2	HS-SCCH_Ec/Ior	DTX'd	No signalling scheduled, or power radiated, on this HS-SCCH, but signalled to the UE as present.
HS-SCCH_3	HS-SCCH_Ec/Ior	DTX'd	As HS-SCCH_2.
HS-SCCH_4	HS-SCCH_Ec/Ior	DTX'd	As HS-SCCH_2.
HS-PDSCH	HS-PDSCH_Ec/Ior	Test-specific	.
OCNS		Necessary power so that total transmit power spectral density of Node B (Ior) adds to one ~~Test-specific~~	~~Balance of power I_{or} of the Node-B is assigned to OCNS.~~ OCNS interference consists of 6 dedicated data channels as specified in table C.9.

C.5.2 OCNS Definition

The selected channelization codes and relative power levels for OCNS transmission during for HSDPA performance assessment are defined in Table C.9. The selected codes are designed to have a single length-16 parent code.

Table C.9: OCNS definition for HSDPA receiver testing.

Channelization Code at SF=128	Relative Level setting (dB)	DPCH Data
2	-6	The DPCH data for each channelization code shall be uncorrelated with each other and with any wanted signal over the period of any measurement.
3	-8	
4	-8	
5	-10	
6	-7	
7	-9	

3GPP TSR RAN WG4 Meeting #24 **R4-021331**
Helsinki, Finland 12 - 16 August 2002

CR-Form-v7

CHANGE REQUEST

⌘	25.102	CR	126	⌘ rev		⌘	Current version:	5.1.0	⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	Addition of HSDPA UE requirements for 1,28 Mcps TDD option for 16QAM and QPSK for fixed reference channels
Source:	⌘	RAN WG4
Work item code:	⌘	HSDPA-RF
Date:	⌘	21/08/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
- *2 (GSM Phase 2)*
- *R96 (Release 1996)*
- *R97 (Release 1997)*
- *R98 (Release 1998)*
- *R99 (Release 1999)*
- *Rel-4 (Release 4)*
- *Rel-5 (Release 5)*
- *Rel-6 (Release 6)*

Reason for change:	⌘	Requirements for fixed reference channels with 16QAM are missing Simulation assumptions for fixed reference channels have been updated to take into account RAN1/2 status
Summary of change:	⌘	Requirements for fixed reference channels with 16QAM are added for PA3, PB3, VA30. Requirements for fixed reference channels with QPSK are updated according to new simulation results. Reference measurement channel mapping for QPSK and 16QAM are corrected in Annex A. ITU model Pedestrian A 3 km/h is added in Annex B.2.2
Consequences if not approved:	⌘	HSDPA requirements for 16QAM will not be covered by the specification.

Clauses affected:	⌘	9.2, A.3, B.2.2				
		Y	**N**			
Other specs affected:	⌘		X	Other core specifications	⌘	
		X		Test specifications		34.122
			X	O&M Specifications		
Other comments:	⌘					

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9 Performance requirements (HSDPA)

9.1 Performance requirement for 3.84 Mcps TDD option

void

9.2 Performance requirements for 1.28 Mcps TDD option

The requirements are stated for the HSDPA UE reference combination classes specified in [2] and under the multipath propagation conditions specified in Annex B. The performance metric for HS-DSCH requirements in multi-path propagation conditions is the throughput R measured on HS-DSCH.

9.2.1 HS-DSCH throughput for fixed reference channels

~~For each HSDPA UE reference combination class tested with a fixed reference measurement channel, information bit payload, number of allocated RUs, coding and modulation scheme are fixed as specified in Annex A.~~

The performance requirements in this subclause apply for the reference measurement channels specified in Annex A.3.2.

9.2.1.1 Minimum requirement QPSK, Fixed Reference Channel -1.4 Mbps UE class

For the parameters specified in Table [9.1], the measured throughput R shall exceed the throughput specified in Table [9.2] for each radio condition.~~ and modulation scheme.~~

Table [9.1]: Test parameters for fixed reference measurement channel requirements for 1.4 Mbps UE class (1.28 Mcps TDD Option) – QPSK

Parameters	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Propagation conditions	-	Case 4	Case 4	Case 5	Case 5	Case 6	Case 6
HS-PDSCH Modulation	-	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Number of $DPCH_o$	-	2	0	2	0	2	0
Scrambling code and basic midamble code number*	-	0	0	0	0	0	0
HS-PDSCH Channelization Codes*	C(k,Q)	C(i,16) I=1..8	C(i,16) i=1…7	C(i,16) i=1…8	C(i,16) i=1…7	C(i,16) i=1..8	C(i,16) i=1…7
$DPCH_o$ Channelization Codes*	C(k,Q)	C(i,16) 9≤ i ≤10	-	C(i,16) 9≤ i ≤10	-	C(i,16) 9≤ i ≤10	-
Number of Hybrid ARQ processes	-	4	4	4	4	4	4
Maximum number of Hybrid ARQ transmissions	-	4	4	4	4	4	4
Redundancy and constellation version coding sequence	-	{0,0,0,0}	{0,0,0,0}	{0,0,0,0}	{0,0,0,0}	{0,0,0,0}	{0,0,0,0}
$\frac{DPCH_o\_E_c}{I_{or}}$	dB	-10	-	-10	-	-10	-
I_{oc}	dBm/1.28 MHz	-60					
*Note: Refer to TS 25.223 for definition of channelization codes, scrambling code and basic midamble code.							

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
HS-PDSCH Modulation	-	QPSK			
Scrambling code and basic midamble code number*	-	0			
HS-PDSCH Channelization Codes*	C(k,Q)	C(i,16) i=1..10			
Number of Hybrid ARQ processes	-	4			
Maximum number of Hybrid ARQ transmissions	-	4			
Redundancy and constellation version coding sequence	-	{0,0,0,0}			
$\frac{HS-PDSCH\_E_c}{I_{or}}$	dB	-10			
I_{oc}	dBm/1.28 MHz	-60			
*Note: Refer to TS 25.223 for definition of channelization codes, scrambling code and basic midamble code.					

Table [9.2]: Performance requirements for fixed reference measurement channel requirement in multipath channels for 1.4 Mbps UE class (1.28 Mcps TDD Option) -QPSK

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	R (Throughput) [kbps]
1	10	365
2	TBD	TBD
3	10	300
4	TBD	TBD
5	10	220
6	TBD	TBD

Test Number	Propagation conditions	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	R (Throughput) [kbps]
1	PA3	10	355
2	PB3	10	370
3	VA30	10	325
4	VA120	10	TBD

9.2.1.2 Minimum requirement 16QAM, Fixed Reference Channel - 1.4 Mbps UE class

For the parameters specified in Table [9.3], the measured throughput R shall exceed the throughput specified in Table [9.4] for each radio condition. and modulation scheme.

Table [9.3]: Test parameters for fixed reference measurement channel requirementsfor 1.4 Mbps UE class (1.28 Mcps TDD Option) – 16QAM

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
HS-PDSCH Modulation	-	16QAM			
Scrambling code and basic midamble code number*	-	0			
HS-PDSCH Channelization Codes*	C(k,Q)	C(i,16) i=1..9			
Number of Hybrid ARQ processes	-	4			
Maximum number of Hybrid ARQ transmissions	-	4			
Redundancy and constellation version coding sequence	-	{6,2,1,5}			
$\frac{HS-PDSCH\_E_c}{I_{or}}$	dB	-9.5			
I_{oc}	dBm/1.28 MHz	-60			
*Note: Refer to TS 25.223 for definition of channelization codes, scrambling code and basic midamble code.					

Table [9.4]: Performance requirements for fixed reference measurement channel requirement in multipath channels for 1.4 Mbps UE class (1.28 Mcps TDD Option) – 16QAM

Test Number	Propagation conditions	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	R (Throughput) [kbps]
1	PA3	10	375
2	PB3	10	360
3	VA30	10	330
4	VA120	10	TBD

---NEXT SECTION---

A.3 HSDPA reference measurement channels

A.3.1 void

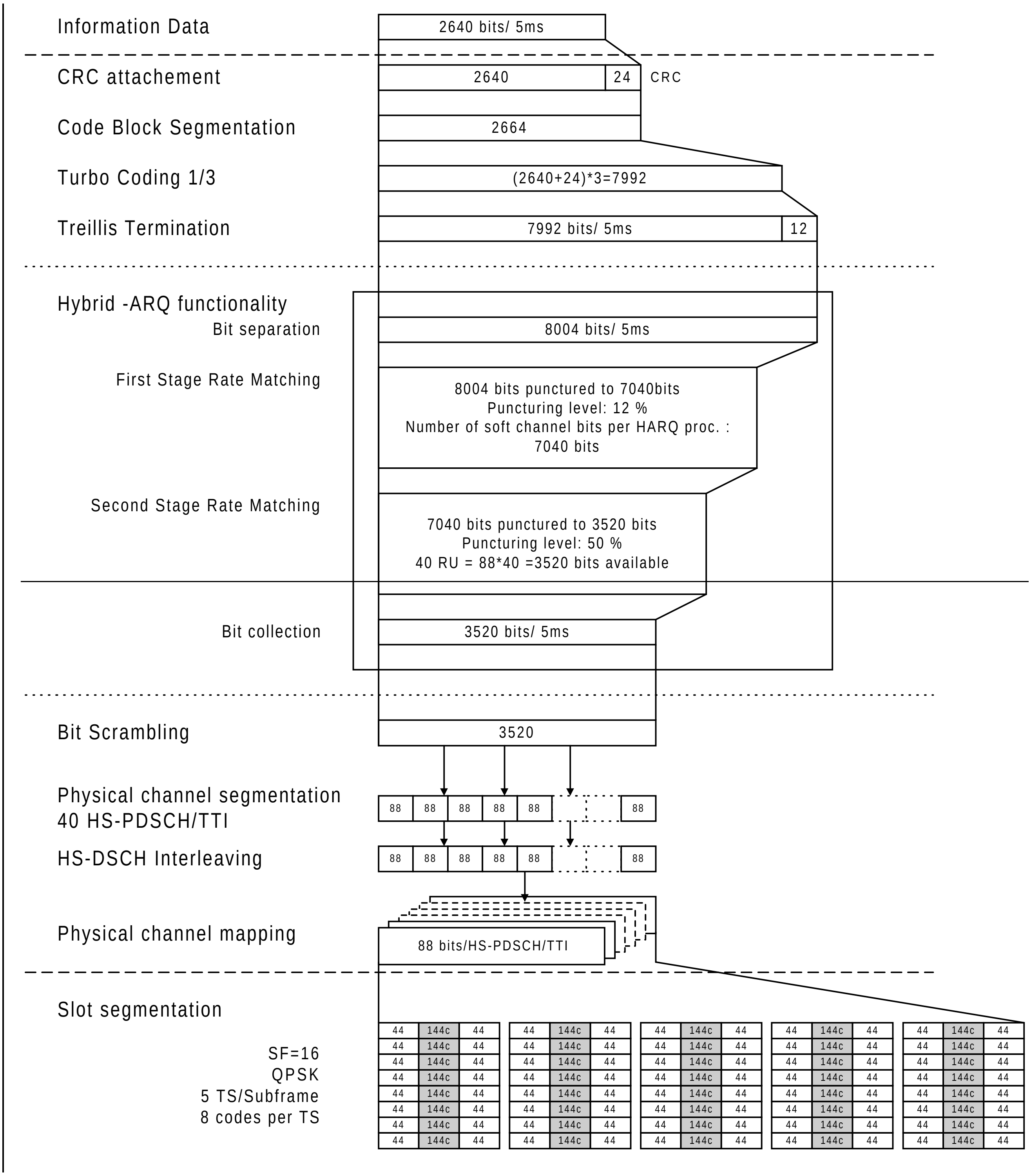
A.3.2 HSDPA reference measurement channels for 1.28 Mcps TDD option

A.3.2.1 Reference measurement channels for 1.4 Mbps UE class

A.3.2.1.1 QPSK modulation scheme

Table [A.9]

Parameter	Value
Maximum information data rate	528 kbps
RU´s allocated	45TS (108*SF16) = 40RU/5ms
Midamble	144 chips
Puncturing level at code rate 1/3 : first stage/second stage	12% / 50%


Information Data
2640 bits/ 5ms
CRC attachement
2640
24
CRC
Code Block Segmentation
2664
Turbo Coding 1/3
(2640+24)*3=7992
Treillis Termination
7992 bits/ 5ms
12
Hybrid -ARQ functionality
Bit separation
8004 bits/ 5ms
First Stage Rate Matching
8004 bits punctured to 7040bits
Puncturing level: 12 %
Number of soft channel bits per HARQ proc. :
7040 bits
Second Stage Rate Matching
7040 bits punctured to 3520 bits
Puncturing level: 50 %
40 RU = 88*40 =3520 bits available
Bit collection
3520 bits/ 5ms
Bit Scrambling
3520
Physical channel segmentation
40 HS-PDSCH/TTI
88
HS-DSCH Interleaving
Physical channel mapping
88 bits/HS-PDSCH/TTI
Slot segmentation
SF=16
QPSK
5 TS/Subframe
8 codes per TS
44
144c

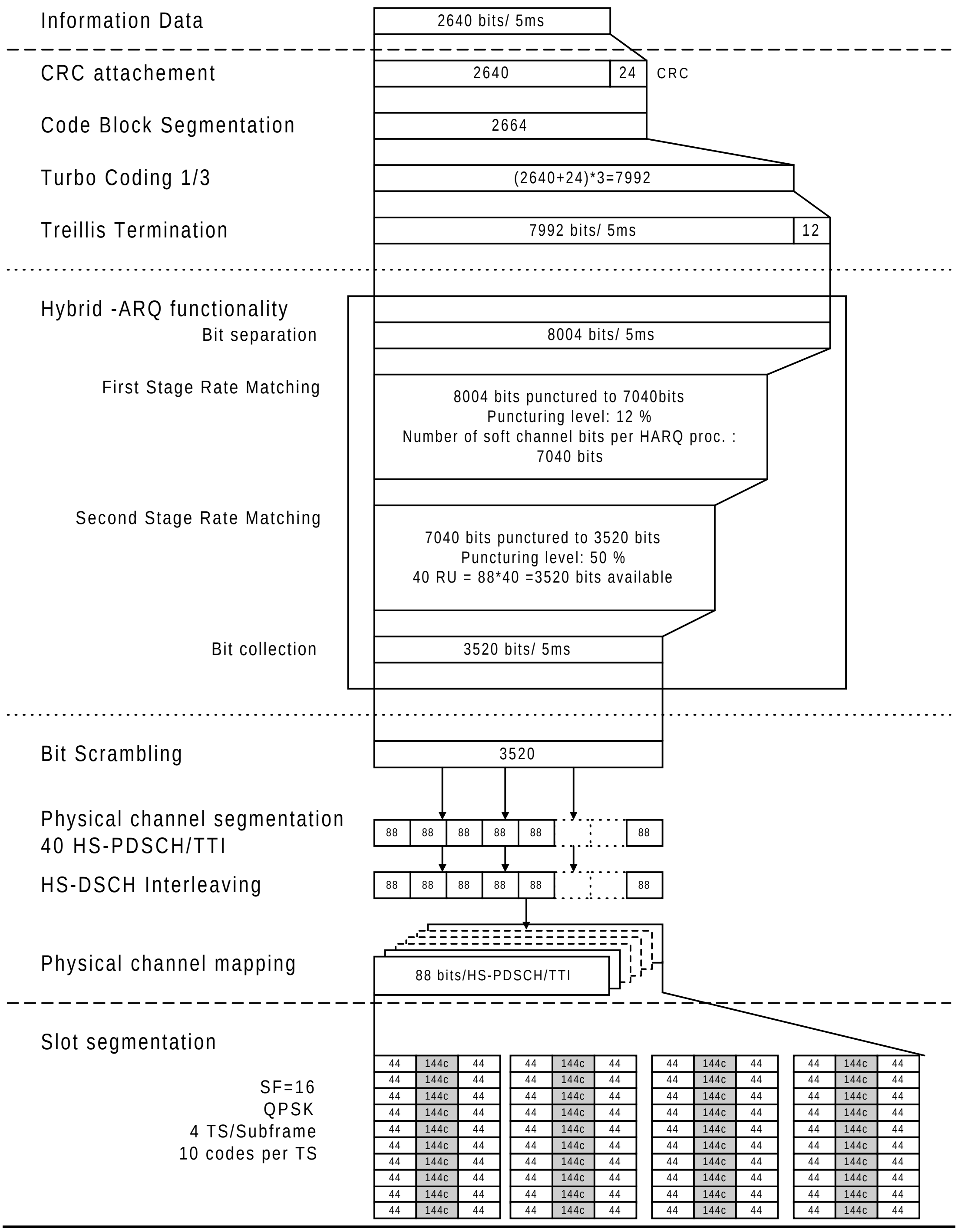
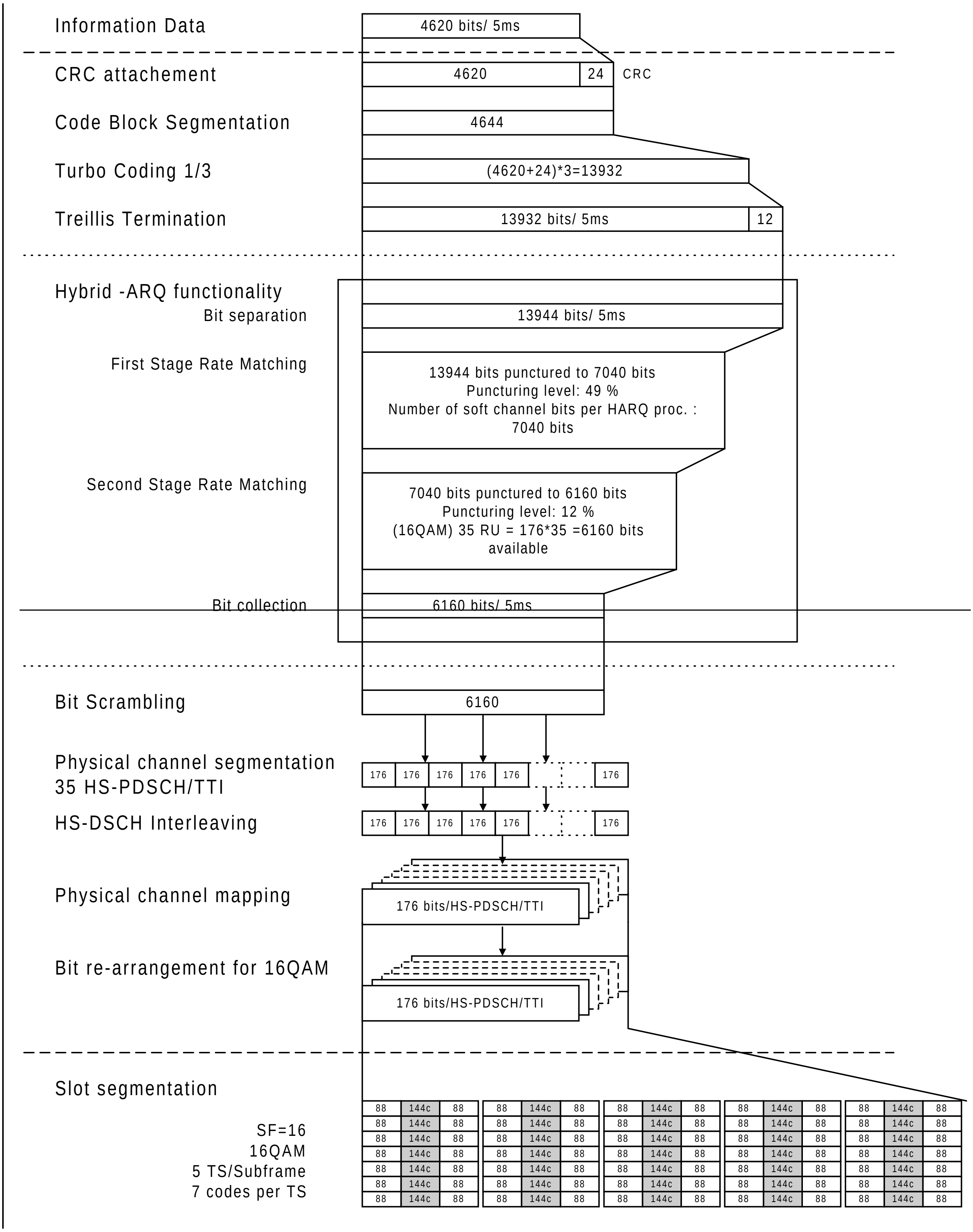


Figure [A.9]

A.3.2.1.2 16QAM modulation scheme

Table [A.10]

Parameter	Value
Maximum information data rate	750~~924~~ kbps
RU´s allocated	4~~5~~TS (9~~7~~*SF16) = 36~~5~~RU/5ms
Midamble	144 chips
Puncturing level at ~~C~~code rate 1/3 : first stage/second stage	38~~49~~% / 10~~12~~%


Information Data
4620 bits/ 5ms
CRC attachement
4620
24
CRC
Code Block Segmentation
4644
Turbo Coding 1/3
(4620+24)*3=13932
Treillis Termination
13932 bits/ 5ms
12
Hybrid -ARQ functionality
Bit separation
13944 bits/ 5ms
First Stage Rate Matching
13944 bits punctured to 7040 bits
Puncturing level: 49 %
Number of soft channel bits per HARQ proc. : 7040 bits
Second Stage Rate Matching
7040 bits punctured to 6160 bits
Puncturing level: 12 %
(16QAM) 35 RU = 176*35 =6160 bits available
Bit collection
6160 bits/ 5ms
Bit Scrambling
6160
Physical channel segmentation
35 HS-PDSCH/TTI
176
HS-DSCH Interleaving
176
Physical channel mapping
176 bits/HS-PDSCH/TTI
Bit re-arrangement for 16QAM
176 bits/HS-PDSCH/TTI
Slot segmentation
SF=16
16QAM
5 TS/Subframe
7 codes per TS
88
144c
88

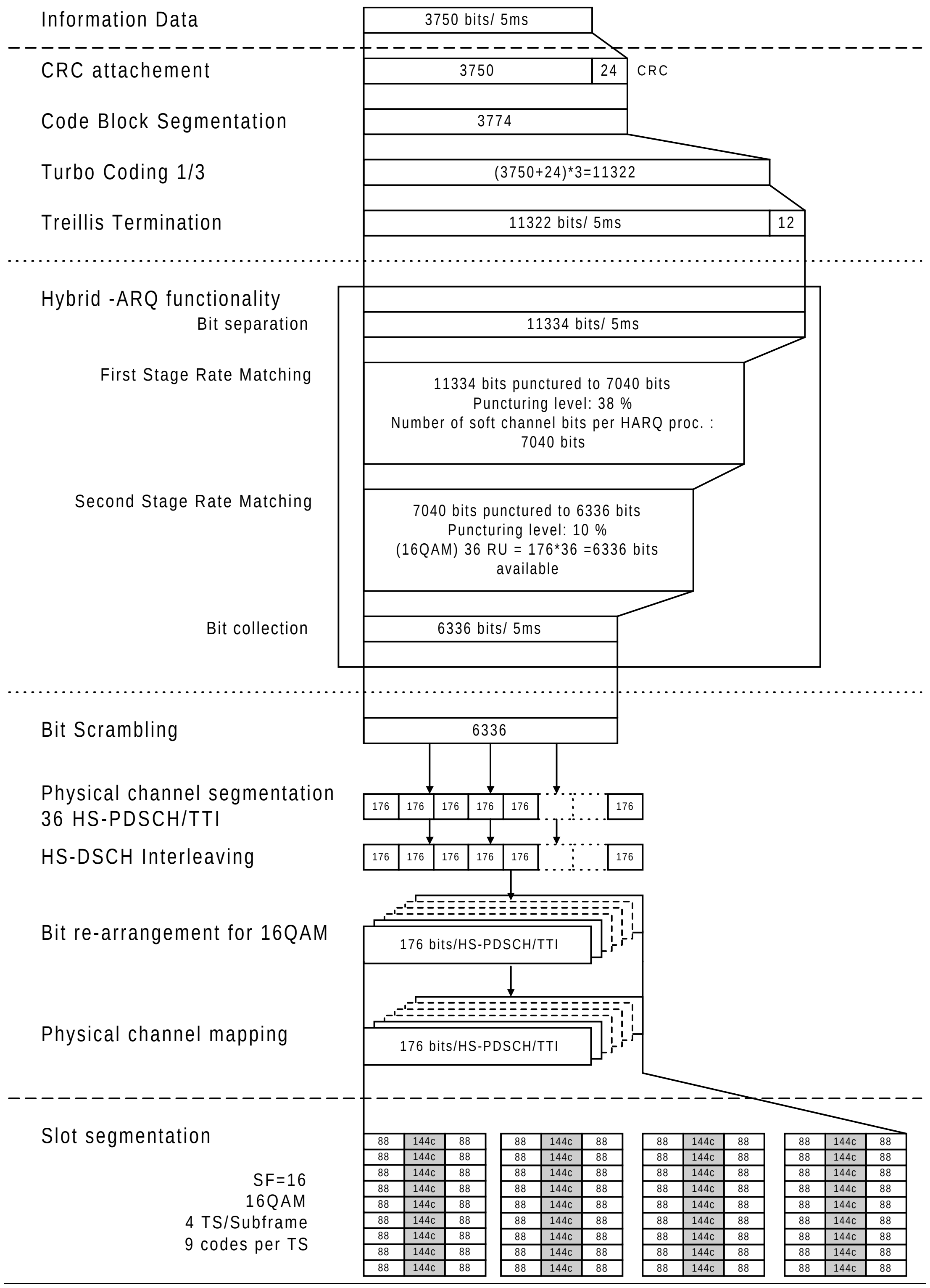


Figure [A.10]

---NEXT SECTION---

B.2.2 1.28 Mcps TDD Option

Table B.2 shows propagation conditions that are used for the general performance measurements in multi-path fading environment. Table B.3 shows propagation conditions that are used for HSDPA performance measurements in multi-path fading environments. All taps in both tables have classical Doppler spectrum.

Table B.2: Propagation Conditions for Multi-Path Fading Environments

Case 1, speed 3km/h		Case 2, speed 3km/h		Case 3, speed 120km/h	
Relative Delay [ns]	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**
0	0	0	0	0	0
2928	-10	2928	0	781	-3
		12000	0	1563	-6
				2344	-9

Table B.3: Propagation Conditions for Multi-Path Fading Environments for HSDPA Performance Requirements

ITU Pedestrian A Speed 3km/h (PA3)		~~Case 4, speed 3km/h~~ ITU Pedestrian B Speed 3km/h (PB3)		~~Case 5, speed 30km/h~~ ITU vehicular A Speed 30km/h (VA30)		~~Case 6, speed 120km/h~~ ITU vehicular A Speed 120km/h (VA120)	
Relative Delay [ns]	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**	**Relative Delay [ns]**	**Relative Mean Power [dB]**
0	0	0	0	0	0	0	0
110	-9.7	200	-0.9	310	-1.0	310	-1.0
190	-19.2	800	-4.9	710	-9.0	710	-9.0
410	-22.8	1200	-8.0	1090	-10.0	1090	-10.0
		2300	-7.8	1730	-15.0	1730	-15.0
		3700	-23.9	2510	-20	2510	-20

3GPP TSR RAN WG4 Meeting #24 **R4-021364**
Helsinki, Finland 12 - 16 August 2002

CR-Form-v7

CHANGE REQUEST

⌘	**25.141**	**CR**	**239**	⌘ **rev**	**1**	⌘ Current version:	**5.3.1** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [X] Core Network [ ]

Title:	⌘	Node-B EVM Test for Transmission of HSDPA 16QAM Signals
Source:	⌘	RAN WG4
Work item code:	⌘	HSDPA-RF — ***Date:*** ⌘ 21/08/2002
Category:	⌘	**B** — ***Release:*** ⌘ Rel-5

Use one of the following categories:
- ***F*** *(correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(addition of feature),*
- ***C*** *(functional modification of feature)*
- ***D*** *(editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
- *2 (GSM Phase 2)*
- *R96 (Release 1996)*
- *R97 (Release 1997)*
- *R98 (Release 1998)*
- *R99 (Release 1999)*
- *Rel-4 (Release 4)*
- *Rel-5 (Release 5)*
- *Rel-6 (Release 6)*

Reason for change:	⌘	Introduction of EVM test for HS-PDSCH transmission using 16QAM
Summary of change:	⌘	1) HSDPA acronyms 2) Test Model 5 for testing EVM on base stations supporting HS-PDSCH Tx using 16QAM 3) Minimum and test requirements for the new EVM test 4) Test procedures for the new EVM test
Consequences if not approved:	⌘	Higher quality signal waveform that is necessary for a satisfactory performance of 16QAM demodulation would not be ensured in HSDPA operation

Clauses affected:	⌘	3.3, 6.1.1, 6.7.1, Annex F

Other specs affected: ⌘

Y	N		
	X	Other core specifications	⌘
	X	Test specifications	
	X	O&M Specifications	

Other comments: ⌘

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3.3 Abbreviations

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

16QAM	16 Quadrature Amplitude Modulation
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BER	Bit Error Ratio
BLER	Block Error Ratio
BS	Base Station
CW	Continuous Wave (unmodulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel. DCH contains the data
DL	Down Link (forward link)
DPCH	Dedicated Physical Channel
E_b	Average energy per information bit for the PCCPCH, SCCPCH and DPCH, at the antenna connector
E_c	Average energy per PN chip
EVM	Error Vector Magnitude
FDD	Frequency Division Duplexing
F_{uw}	Frequency of unwanted signal
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	Shared Control Channel for HS-DSCH
MS	Mobile Station
PCCPCH	Primary Common Control Physical Channel
PCDE	Peak Code Domain Error
PCH	Paging Channel
PPM	Parts Per Million
QPSK	Quadrature Phase Shift Keying
SCCPCH	Secondary Common Control Physical Channel
TDD	Time Division Duplexing
TPC	Transmit Power Control
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

6 Transmitter

6.1 General

Unless otherwise stated, all tests in this clause shall be performed at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a diplexer, a filter or the combination of such devices is used, the tests according to subclauses 4.6.2 and/or 4.6.4, depending on the device added, shall be performed to ensure that the requirements are met at test port B.

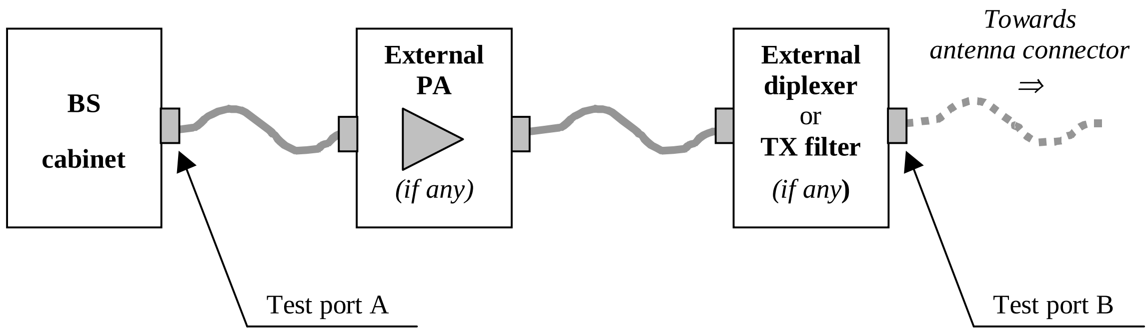


Figure 6.1: Transmitter test ports

Power levels are expressed in dBm.

6.1.1 Test Models

The set-up of physical channels for transmitter tests shall be according to one of the test models below. A reference to the applicable table is made with each test.

A code "level setting" of -X dB is the setting that according to the base station manufacturer will result in a code domain power of nominally X dB below the maximum output power. The relative accuracy of the code domain power to the maximum output power shall have tolerance of ±1 dB.

6.1.1.1 Test Model 1

This model shall be used for tests on:

- occupied bandwidth;
- spectrum emission mask;
- ACLR;
- spurious emissions;
- transmit intermodulation;
- base station maximum output power.
- Total power dynamic range (at Pmax)
- Frequency error (at Pmax)
- Error Vector Magnitude (at Pmax)

64 DPCHs at 30 ksps (SF=128) distributed randomly across the code space, at random power levels and random timing offsets are defined so as to simulate a realistic traffic scenario which may have high PAR (Peak to Average Ratio).

Considering that not every base station implementation will support 64 DPCH, variants of this test model containing 32 and 16 DPCH are also specified. The conformance test shall be performed using the largest of these three options that can be supported by the equipment under test.

"Fraction of power" is relative to the maximum output power on the TX antenna interface under test.

Table 6.1: Test Model 1 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset (x256T_{chip})
P-CCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	1.6	-18	16	120
S-CCPCH containing PCH (SF=256)	1	1.6	-18	3	0
DPCH (SF=128)	16/32/64	76.8 in total	see table 6.2	see table 6.2	see table 6.2

Table 6.2: DPCH Spreading Code, Timing offsets and level settings for Test Model 1

Code	Timing offset ($x256T_{chip}$)	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)	Level settings (dB) (64 codes)
2	86	-10	-13	-16
11	134	-12	-13	-16
17	52	-12	-14	-16
23	45	-14	-15	-17
31	143	-11	-17	-18
38	112	-13	-14	-20
47	59	-17	-16	-16
55	23	-16	-18	-17
62	1	-13	-16	-16
69	88	-15	-19	-19
78	30	-14	-17	-22
85	18	-18	-15	-20
94	30	-19	-17	-16
102	61	-17	-22	-17
113	128	-15	-20	-19
119	143	-9	-24	-21
7	83		-20	-19
13	25		-18	-21
20	103		-14	-18
27	97		-14	-20
35	56		-16	-24
41	104		-19	-24
51	51		-18	-22
58	26		-17	-21
64	137		-22	-18
74	65		-19	-20
82	37		-19	-17
88	125		-16	-18
97	149		-18	-19
108	123		-15	-23
117	83		-17	-22
125	5		-12	-21
4	91			-17
9	7			-18
12	32			-20
14	21			-17
19	29			-19
22	59			-21
26	22			-19
28	138			-23
34	31			-22
36	17			-19
40	9			-24
44	69			-23
49	49			-22
53	20			-19
56	57			-22
61	121			-21
63	127			-18
66	114			-19
71	100			-22
76	76			-21
80	141			-19
84	82			-21
87	64			-19
91	149			-21
95	87			-20
99	98			-25
105	46			-25
110	37			-25
116	87			-24

Code	Timing offset ($x256T_{chip}$)	Level settings (dB) (16 codes)	Level settings (dB) (32 codes)	Level settings (dB) (64 codes)
118	149			-22
122	85			-20
126	69			-15

6.1.1.2 Test Model 2

This model shall be used for tests on:

- output power dynamics.
- CPICH power accuracy.

Table 6.3: Test Model 2 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset ($x256T_{chip}$)
P-CCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	5	-13	16	120
S-CCPCH containing PCH (SF=256)	1	5	-13	3	0
DPCH (SF=128)	3	2 x 10,1 x 50	2 x –10, 1 x –3	24, 72, 120	1, 7, 2

6.1.1.3 Test Model 3

This model shall be used for tests on:

- peak code domain error.

Table 6.4: Test Model 3 Active Channels

Type	Number of Channels	Fraction of Power (%) 16/32	Level settings (dB) 16/32	Channelization Code	Timing offset ($x256T_{chip}$)
P-CCPCH+SCH	1	12,6/7,9	-9 / -11	1	0
Primary CPICH	1	12,6/7,9	-9 / -11	0	0
PICH	1	5/1.6	-13/-18	16	120
S-CCPCH containing PCH (SF=256)	1	5/1.6	-13/-18	3	0
DPCH (SF=256)	16/32	63,7/80,4 in total	see table 6.5	see table 6.5	see table 6.5

As with Test Model 1, not every base station implementation will support 32 DPCH, a variant of this test model containing 16 DPCH are also specified. The conformance test shall be performed using the larger of these two options that can be supported by the equipment under test.

Table 6.5: DPCH Spreading Code, Toffset and Power for Test Model 3

Code	T_{offset}	Level settings (dB) (16 codes)	Level settings dB) (32 codes)
64	86	-14	-16
69	134	-14	-16
74	52	-14	-16
78	45	-14	-16
83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

6.1.1.4 Test Model 4

This model shall be used for tests on:

- EVM measurement (at Pmax -18 dB).
- Total power dynamic range (at Pmax – 18 dB)
- Frequency error (at Pmax – 18 dB)

Table 6.6: Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH when Primary CPICH is disabled	1	50 to 1.6	-3 to -18	1	0
PCCPCH+SCH when Primary CPICH is enabled	1	25 to 0.8	-6 to -21	1	0
Primary CPICH[1]	1	25 to 0.8	-6 to -21	0	0
Note 1: The CPICH channel is optional.					

6.1.1.4A Test Model 5

This model shall be used for tests on:

- EVM for base stations supporting HS-PDSCH transmission using 16QAM modulation (at Pmax)

Considering that not every base station implementation will support 8 HS-PDSCH + 30 DPCH, variants of this test model containing 4 HS-PDSCH + 14 DPCH and 2 HS-PDSCH + 6 DPCH are also specified. The conformance test shall be performed using the largest of these three options that can be supported by the equipment under test.

Each HS-PDSCH is modulated by 16QAM.

Table 6.a: Test Model 5 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset ($x256T_{chip}$)
P-CCPCH+SCH	1	7.9	-11	1	0
Primary CPICH	1	7.9	-11	0	0
PICH	1	1.3	-19	16	120
S-CCPCH containing PCH (SF=256)	1	1.3	-19	3	0
DPCH (SF=128)	30/14/6(*)	14/14.2/14.4 in total	see table 6.b	see table 6.b	see table 6.b
HS-SCCH	2	4 in total	see table 6.c	see table 6.c	see table 6.c
HS-PDSCH (16QAM)	8/4/2(*)	63.6/63.4/63.2 in total	see table 6.d	see table 6.d	see table 6.d

(*): 2 HS-PDSCH shall be taken together with 6 DPCH, 4 HS-PDSCH shall be taken with 14 DPCH, and 8 HS-PDSCH shall be taken together with 30 DPCH.

Table 6.b: DPCH Spreading Code, Timing offsets and level settings for Test Model 5

Code (SF=128)	Timing offset ($x256T_{chip}$)	Level settings (dB) (30 codes)	Level settings (dB) (14 codes)	Level settings (dB) (6 codes)
15	86	-20	-17	-17
23	134	-20	-19	-15
68	52	-21	-19	-15
76	45	-22	-20	-18
82	143	-24	-18	-16
90	112	-21	-20	-17
5	59	-23	-25	
11	23	-25	-23	
17	1	-23	-20	
27	88	-26	-22	
64	30	-24	-21	
72	18	-22	-22	
86	30	-24	-19	
94	61	-28	-20	
3	128	-27		
7	143	-26		
13	83	-27		
19	25	-25		
21	103	-21		
25	97	-21		
31	56	-23		
66	104	-26		
70	51	-25		
74	26	-24		
78	137	-27		
80	65	-26		
84	37	-23		
88	125	-25		
89	149	-22		
92	123	-24		

Table 6.c: HS-SCCH Spreading Code, Timing offsets and level settings for Test Model 5

Code (SF=128)	Timing offset (x256T_{chip})	Level settings (dB)
9	[0]	-15
29	[0]	-21

Table 6.d: HS-PDSCH Spreading Code, Timing offsets, level settings for Test Model 5

Code (SF=16)	Timing offset (x256T_{chip})	Level settings (dB) (8 codes)	Level settings (dB) (4 codes)	Level settings (dB) (2 codes)
4	[0]	-11	-8	-5
5	[0]	-11	-8	
6	[0]	-11		
7	[0]	-11		
12	[0]	-11	-8	-5
13	[0]	-11	-8	
14	[0]	-11		
15	[0]	-11		

6.1.1.5 DPCH Structure of the Downlink Test Models

For the above test models the following structure is adopted for the DPCH. The DPDCH and DPCCH have the same power level. The timeslot structure should be as described by TS 25.211-slot format 10 and 6 that are reproduced in table 6.7.

Table 6.7: DPCH structure of the downlink test models

Slot Format #I	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/Frame			Bits/ Slot	DPDCH Bits/Slot		DPCCH Bits/Slot		
				DPDCH	DPCCH	TOT		NData1	Ndata2	NTFCI	NTPC	Npilot
10	60	30	128	450	150	600	40	6	24	0	2	8
6	30	15	256	150	150	300	20	2	8	0	2	8

The test DPCH has frame structure so that the pilot bits are defined over 15 timeslots according to the relevant columns of TS 25.211, which are reproduced in table 6.8.

Table 6.8: Frame structure of DPCH

	N_{pilot} = 8			
Symbol #	**0**	**1**	**2**	**3**
Slot #0	11	11	11	10
1	11	00	11	10
2	11	01	11	01
3	11	00	11	00
4	11	10	11	01
5	11	11	11	10
6	11	11	11	00
7	11	10	11	00
8	11	01	11	10
9	11	11	11	11
10	11	01	11	01
11	11	10	11	11
12	11	10	11	00
13	11	00	11	11
14	11	00	11	11

The TPC bits alternate 00 / 11 starting with 00 in timeslot 0.

The aggregate 15 x 30 = 450 DPDCH bits per frame are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. In case there are less data bits/frame needed then the first bits of the aggregate shall be selected. To ensure non-correlation of the PN9 sequences, each DPDCH shall use its channelization code as the seed for the PN sequence at the start of each frame, according to its timing offset.

The sequence shall be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The generator shall be seeded so that the sequence begins with the channelization code starting from the LSB, and followed by 2 consecutive ONEs for SF=128 and 1 consecutive ONE for SF=256.

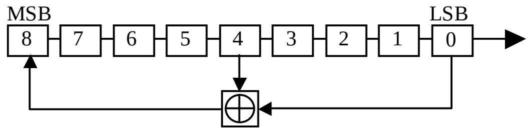


Figure 6.2

6.1.1.6 Common channel Structure of the Downlink Test Models

6.1.1.6.1 P-CCPCH

The aggregate 15 x 18 = 270 P-CCPCH bits per frame are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. Channelization code of the P-CCPCH is used as the seed for the PN sequence at the start of each frame.

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE.

6.1.1.6.2 PICH

PICH carries 18 Paging Indicators (Pq) sent in the following sequence from left to right [1 0 1 1 0 0 0 1 0 1 1 0 0 0 1 0 1 0]. This defines the 288 first bits of the PICH. No power is transmitted for the 12 remaining unused bits.

6.1.1.6.3 Primary scrambling code and SCH

The scrambling code should be 0.

Where multiple repetitions of the Test Model signals are being used to simulate a multi-carrier signal the scrambling code for the lower frequency is 0. Carriers added at successively higher frequencies use codes 1, 2,... and their frame structures are time offset by 1/5, 2/5... of a time slot duration.

The scrambling code defines the SSC sequence of the secondary SCH. In their active part, primary and secondary SCH share equally the power level defined for "PCCPCH+SCH".

6.1.1.6.4 S-CCPCH containing PCH

The aggregate 15 x 20 = 300 S-CCPCH bits per frame are used. Data bits are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. In case there are less data bits/frame needed then the first bits of the aggregate shall be selected.. Channelization code of the S-CCPCH is used as the seed for the PN sequence at the start of each frame. For test purposes, any one of the four possible slot formats 0,1, 2 and 3 can be supported. The support for all four slot formats is not needed..

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE. The test on S-CCPCH has a frame structure so that the pilot bits are defined over 15 timeslots to the relevant columns of TS 25.211. The TFCI bits are filled with ONEs whenever needed.

6.1.1.7 HS-PDSCH Structure of the Downlink Test Model 5

There are 640 bits per slot in a 16QAM-modulated HS-PDSCH. The aggregate 15 x 640 = 9600 bits per frame are filled with repetitions of a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. To ensure non-correlation of the PN9 sequences, each HS-PDSCH shall use its channelization code as the seed for the PN sequence at the start of each frame.

The generator shall be seeded so that the sequence begins with the channelization code starting from the LSB.

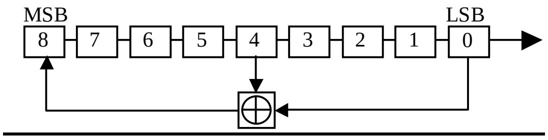


Figure 6.x

6.1.1.8 HS-SCCH Structure of the Downlink Test Model 5

There are 40 bits per time slot in a HS-SCCH. The aggregate 15 x 40 = 600 bits per frame are filled with repetitions of a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. Channelization code of the HS-SCCH is used as the seed for the PN sequence at the start of each frame. The generator shall be seeded so that the sequence begins with the channelization code starting from the LSB.

6.7 Transmit modulation

6.7.1 Error Vector Magnitude

6.7.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth 3.84 MHz and roll-off α =0.22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH._ The requirement is valid over the total power dynamic range as specified in 25.104 subclause 6.4.3. See Annex E of this specification for further details

6.7.1.2 Minimum Requirement

The Error Vector Magnitude shall be less than 17.5% when the base station is transmitting a composite signal using only QPSK modulation and shall be less than 12.5 % when the base station is transmitting a composite signal that includes 16QAM modulation.

The normative reference for this requirement is in TS 25.104 [1] subclause 6.8.2

6.7.1.3 Test Purpose

To verify that the Error Vector Magnitude is within the limit specified in 6.7.1.2

6.7.1.4 Method of Test

This test method includes the procedure for subclause 6.3.4 Frequency error and 6.4.4.4 Total power dynamic range.

6.7.1.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

Refer to annex B for a functional block diagram of the test set-up.

1) Connect the base station RF output port to the measurement equipment.
2) Set the base station to transmit a signal according to 6.1.1.1 (test model 1)
3) Set BS frequency

6.7.1.4.2 Procedure

1) Start BS transmission at Pmax
2) Measure the Error Vector Magnitude and frequency error as defined in annex E and the mean power of the signal. If the base station supports STTD or closed loop transmit diversity, the measurements shall be made on both main and diversity RF output ports.
3) Set the total output power to Pmax-18dB using 6.1.1.4 (test model 4) and repeat step 2)

The following test shall be additionally performed if the base station supports HS-PDSCH transmission using 16QAM.

4) Set the total output power to Pmax using 6.1.1.4A (test model 5)
5) Measure the Error Vector Magnitude as defined in annex E and the mean power of the signal. If the base station supports STTD, the measurements shall be made on both main and diversity RF output ports.

6.7.1.5 Test Requirement

The Error Vector Magnitude shall be less than 17.5% when the base station is transmitting a composite signal using only QPSK modulation and shall be less than 12.5 % when the base station is transmitting a composite signal that includes 16QAM modulation.

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

Annex F (informative): Derivation of Test Requirements

The Test Requirements in this specification have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in subclause 4.2. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for this relaxation is given in tables F.1, F.2 and F.3

Note that a formula for applying Test Tolerances is provided for all tests, even those with a test tolerance of zero. This is necessary in the case that the Test System uncertainty is greater than that allowed in subclause 4.1. In this event, the excess error shall be subtracted from the defined test tolerance in order to generate the correct tightened Test Requirements as defined in subclause 4.3.

For example, a Test System having 0.9 dB accuracy for test 6.2.1 Base Station maximum output power (which is 0.2 dB above the limit specified in subclause 4.) would subtract 0.2 dB from the Test Tolerance of 0.7 dB defined in subclause

4.2. This new test tolerance of 0.5 dB would then be applied to the Minimum Requirement using the formula defined in Table F.1 to give a new range of ±2.5 dB of the manufacturer's rated output power.

Using this same approach for the case where a test had a test tolerance of 0 dB, an excess error of 0.2 dB would result in a modified test tolerance of –0.2 dB.

Table F.1: Derivation of Test Requirements (Transmitter tests)

Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
6.2.1 Base station maximum output power	In normal conditions … within +2 dB and -2 dB of the manufacturer's rated output power In extreme conditions… within +2.5 dB and –2.5 dB of the manufacturer's rated output power	0.7 dB	Formula: Upper limit + TT Lower limit – TT In normal conditions … within +2.7 dB and –2.7 dB of the manufacturer's rated output power In extreme conditions… within +3.2 dB and –3.2 dB of the manufacturer's rated output power
6.2.2 CPICH Power accuracy	CPICH power shall be within ±2.1dB	0.8 dB	Formula: Upper limit + TT Lower limit – TT CPICH power shall be within ±2.9dB
6.3.4 Frequency error	Frequency error limit = 0.05 ppm	12 Hz	Formula: Frequency Error limit + TT Frequency Error limit = 0.05 ppm + 12 Hz
6.4.2 Power control steps	Lower and upper limits as specified in tables 6.9 and 6.10a	0.1 dB	Formula: Upper limits + TT Lower limits – TT 0.1 dB applied as above to tables 6.9 and 6.10a
6.4.3 Power control dynamic range	maximum power limit = BS maximum output power -3 dB minimum power limit = BS maximum output power –28 dB	1.1 dB	Formula: maximum power limit – TT minimum power limit + TT maximum power limit = BS maximum output power –4.1 dB minimum power limit = BS maximum output power –26.9 dB
6.4.4 Total power dynamic range	Total power dynamic range limit = 18 dB	0.3 dB	Formula: total power dynamic range limit – TT total power dynamic range limit = 17.7 dB
6.5.1 Occupied Bandwidth	occupied bandwidth limit = 5 MHz	0 kHz	Formula: Occupied bandwidth limit + TT Occupied bandwidth limit = 5 MHz
6.5.2.1 Spectrum emission mask	Maximum level defined in tables 6.11, 6.12, 6.13 and 6.14:	1.5 dB(0 dB for the additional Band II requirements)	Formula: Maximum level + TT Add 1.5 to Maximum level entries in tables 6.11, 6.12, 6.13 and 6.14.
6.5.2.2 Adjacent Channel Leakage power Ratio (ACLR)	ACLR limit = 45 dB at 5 MHz ACLR limit = 50 dB at 10 MHz	0.8 dB	Formula: ACLR limit – TT ACLR limit = 44.2 dB at 5 MHz ACLR limit = 49.2 dB at 10 MHz
6.5.3 Spurious emissions	Maximum level defined in tables 6.16 to 6.26	0 dB	Formula: Maximum limit + TT Add 0 to Maximum level in tables 6.16 to 6.26
6.6 Transmit intermodulation (interferer requirements) This tolerance applies to the stimulus and not the measurements defined in 6.5.2.1, 6.5.2.2 and 6.5.3.	Wanted signal level – interferer level = 30 dB	0 dB	Formula: Ratio + TT Wanted signal level – interferer level = 30 + 0 dB
6.7.1 EVM	EVM limit =17.5 % for a composite signal modulated only by QPSK EVM limit = 12.5 % for a composite signal modulated by QPSK and 16QAM	0 %	Formula: EVM limit + TT EVM limit = 17.5% for a composite signal modulated only by QPSK EVM limit = 12.5 % for a composite signal modulated by QPSK and 16QAM

6.7.2 Peak code Domain error	Peak code domain error limit = -33 dB	1.0 dB	Formula: Peak code domain error limit + TT Peak code domain error limit = -32 dB
Annex H.3 Transmitted code power (absolute)	Absolute accuracy limit = Pout,code – 3 dB Pout,code + 3 dB	0.9 dB	Formula: Absolute accuracy limit –TT Absolute accuracy limit +TT Absolute accuracy limit: minimum power limit = -3.9 dB maximum power limit = +3.9 dB
Annex H.3 Transmitted code power (relative)	Relative accuracy limit = $\mid$ Pout,code1 - Pout,code2 $\mid \leq$ 2 dB	0.2 dB	Formula: Relative accuracy limit + TT Relative accuracy limit = 2.2 dB

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CR-Form-v7

CHANGE REQUEST

⌘	**25.142**	**CR**	**143**	⌘ **rev**		⌘	Current version:	**5.1.0**	⌘

For ***HELP*** *on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects:	UICC apps⌘ [ ]	ME [ ]	Radio Access Network [X]	Core Network [ ]

Title:	⌘	Correction of 16QAM EVM/PCDE testing for HSDPA for 1.28 Mcps TDD option		
Source:	⌘	RAN WG4		
Work item code:	⌘	HSDPA-RF	***Date:*** ⌘	21/08/2002
Category:	⌘	**F**	***Release:*** ⌘	Rel-5
		Use one of the following categories: ***F*** *(correction)* ***A*** *(corresponds to a correction in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* Detailed explanations of the above categories can be found in 3GPP TR 21.900.		*Use one of the following releases:* *2 (GSM Phase 2)* *R96 (Release 1996)* *R97 (Release 1997)* *R98 (Release 1998)* *R99 (Release 1999)* *Rel-4 (Release 4)* *Rel-5 (Release 5)* *Rel-6 (Release 6)*

Reason for change:	⌘	1- For HS-DSCH with 16QAM, EVM is tested at maximum power with only **1** code. This does not sufficiently stress the Node B transmitter which will likely have the worst EVM performance when the multiple codes are transmitted. Moreover the EVM should be tested also at minimum output power with 16QAM. 2- Normally the maximum power of the Node B is reached when setting power to PRAT (rated output power). PRAT is the official denomination but the initial condition for the EVM test for 1,28 Mcps TDD option use a different wording. In all other cases, PRAT is used. An alignment with the correct wording is needed in order to prevent confusion. 3-The minimum output power setting is in contradiction with the core requirement (see CR131 for further explanation). 4- EVM and PCDE test should be performed with the same number of codes. It is proposed to align the number of code in both 16QAM tests.
Summary of change:	⌘	1-EVM is tested with **10** codes at maximum output power and **1** code at minimum output power. 2- The wording of the maximum output power setting is corrected. 3- The minimum output power setting is corrected. 4-PCDE is tested with **10** codes.
Consequences if not approved:	⌘	A node B passing the existing test would not be an indication that it would operate correctly when transmitting several codes. The EVM is not tested at for 16QAM at minimum power

Clauses affected:	⌘	6.8.1, 6.8.2

		Y	N			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.8 Transmit Modulation

6.8.1 Modulation accuracy

6.8.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth corresponding to the considered chip rate and roll-off α =0,22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot. The requirement is valid over the total power dynamic range as specified in 25.105 subclause 6.4.3. See Annex C of this specification for further details.

The requirements in this subclause shall apply to both Wide Area BS and Local Area BS.

NOTE: The theoretical modulated waveform shall be calculated on the basis that the transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off α =0,22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is

$$RC_0(t) = \frac{\sin\left(\pi \frac{t}{T_C}(1-\alpha)\right) + 4\alpha \frac{t}{T_C} \cos\left(\pi \frac{t}{T_C}(1+\alpha)\right)}{\pi \frac{t}{T_C}\left(1-\left(4\alpha \frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor α = 0,22 and T_C is the chip duration

6.8.1.2 Minimum Requirements

The error vector magnitude (EVM) shall not exceed 12,5 %. The requirement is valid over the total power dynamic range as specified in subclause 6.4.3 of TS 25.105.

The normative reference for this requirement is TS 25.105 [1] subclause 6.8.2.1.

6.8.1.3 Test purpose

The test purpose is to verify the ability of the BS transmitter to generate a sufficient precise waveform and thus to enable the UE receiver to achieve the specified error performance.

6.8.1.4 Method of test

6.8.1.4.1 Initial conditions

For 1,28 Mcps BS supporting 16QAM, the EVM requirements shall be tested with the general test set up specified in section 6.8.1.4.1.2 and also with the special test set up for 16QAM capable base station specified in section 6.8.1.4.1.2.

6.8.1.4.1.0 General test conditions

Test environment: normal; see subclause 5.9.1.

RF channels to be tested: B, M and T; see subclause 5.3.

6.8.1.4.1.1 3,84 Mcps TDD option

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.39.

Table 6.39: Parameters of the BS transmitted signal for modulation accuracy testing

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, ..., 14: transmit, if i is even; receive, if i is odd.
Number of DPCH in each active TS	1
BS power setting	PRAT
Data content of DPCH	real life (sufficient irregular)

6.8.1.4.1.2 1,28 Mcps TDD option– General test set up

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.39A.

Table 6.39A: Parameters of the BS transmitted signal for modulation accuracy testing for 1,28 Mcps TDD

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, ..., 6: Transmit, if i is 0,4,5,6; receive, if i is 1,2,3.
Number of DPCH in each active TS	1
Base station power	maximum, according to manufacturer's declaration
Data content of DPCH	real life (sufficient irregular)

6.8.1.4.1.3 1,28 Mcps TDD option – Special test set up for 16QAM capable BS

This test set up only applies for 16QAM capable BS.

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.39B.

Table 6.39B: Parameters of the BS transmitted signal for modulation accuracy testing at maximum BS output power setting for 1,28 Mcps TDD - 16QAM capable BS

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, 3, 4, 5, 6: transmit, if i is 0,4,5,6; receive, if i is 1,2,3.
HS-PDSCH modulation	16QAM
Number of HS-PDSCH in each active TS	10~~1~~
Power of each HS-PDSCH	1/10 of Base Station output power
BS station power	PRAT~~Maximum, according to manufacturer's declaration~~
Data content of HS-PDSCH	Real life (sufficient irregular)
Spreading factor	16

6.8.1.4.2 Procedure

6.8.1.4.2.1 3,84 Mcps TDD option

(1)Measure the error vector magnitude (EVM) by applying the global in-channel Tx test method described in Annex C.

(2) Set the BS output power to PRAT – 30 dB and repeat step (1) above.

6.8.1.4.2.2 1,28 Mcps TDD option – General procedure

(1) Measure the error vector magnitude (EVM) by applying the global in-channel Tx test method described in Annex C.

(2) Set the BS output power to PRAT – 30 dB and repeat step (1) above.

6.8.1.4.2.3 1,28 Mcps TDD option – Special procedure for 16QAM capable BS

(1) Measure the error vector magnitude (EVM)by applying the global in-channel Tx test method described in Annex C with the BS transmitted signal set as described in Table 6.39B.

(2) Set the BS transmitted signal according Table 6.39YY and measure the error vector magnitude (EVM) by applying the global in-channel Tx test method described in Annex C.

Table 6.39YY: Parameters of the BS transmitted signal for modulation accuracy testing at minimum BS output power setting for 1,28 Mcps TDD - 16QAM capable BS

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, 3, 4, 5, 6: transmit, if i is 0,4,5,6; receive, if i is 1,2,3.
HS-PDSCH modulation	16QAM
Time slots under test	TS4, TS5 and TS6
Number of HS-PDSCH in each time slot under test	1
BS output power setting	Maximum output power – 30 dB
Data content of HS-PDSCH	Real life (sufficient irregular)
Spreading factor	16

6.8.1.5 Test Requirements

NOTE: If the Test Requirement below differs from the Minimum Requirement, then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 5.11 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex D.

The error vector magnitude (EVM) measured according to subclause 6.8.1.4.2 shall not exceed 12,5 %.

6.8.2 Peak code domain error

6.8.2.1 Definition and applicability

The code domain error is computed by projecting the error vector power onto the code domain at a specific spreading factor. The error power for each code is defined as the ratio to the mean power of the reference waveform expressed in dB. And the Peak Code Domain Error is defined as the maximum value for Code Domain Error. The measurement interval is one timeslot.

The requirements in this subclause shall apply to both Wide Area BS and Local Area BS.

6.8.2.2 Minimum Requirements

The peak code domain error shall not exceed -28 dB at spreading factor 16.

The normative reference for this requirement is TS 25.105 [1] subclause 6.8.3.1.

6.8.2.3 Test purpose

The test purpose is to verify the ability of the BS transmitter to limit crosstalk among codes and thus to enable the UE receiver to achieve the specified error performance.

6.8.2.4 Method of test

6.8.2.4.1 Initial conditions

For 1,28 Mcps BS supporting 16QAM, the PCDE requirement shall be tested with the general test set up specified in section 6.8.2.4.2 and also with the special test set up for 16QAM capable BS specified in section 6.8.2.4.3.

6.8.2.4.1.0 General test conditions

Test environment: normal; see subclause 5.9.1.

RF channels to be tested: B, M and T; see subclause 5.3.

6.8.2.4.1.1 3,84 Mcps TDD option

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.40.

Table 6.40: Parameters of the BS transmitted signal

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, ..., 14: transmit, if i is even; receive, if i is odd.
BS output power setting	PRAT
Number of DPCH in each active TS	9
Power of each DPCH	1/9 of Base Station output power
Data content of DPCH	real life (sufficient irregular)
Spreading factor	16

6.8.2.4.1.2 1,28 Mcps TDD option– General test set up

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.40A.

Table 6.40A: Parameters of the BS transmitted signal for 1,28 Mcps TDD

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, ..., 6: transmit, if i is 0,4,5,6; receive, if i is 1,2,3.
BS output power setting	PRAT
Number of DPCH in each active TS	8
Power of each DPCH	1/8 of Base Station output power
Data content of DPCH	real life (sufficient irregular)
Spreading factor	16

6.8.2.4.1.3 1,28 Mcps TDD option – Special test set up for 16QAM capable BS

This test set up only applies for 16QAM capable BS.

(1) Connect the measuring equipment to the antenna connector of the BS under test.

(2) Set the parameters of the BS transmitted signal according to table 6.40B.

Table 6.40B: Parameters of the BS transmitted signal for 1,28 Mcps TDD – 16QAM capable BS

Parameter	Value/description
TDD Duty Cycle	TS i; i = 0, 1, 2, ..., 6: transmit, if i is 0,4,5,6; receive, if i is 1,2,3.
HS-PDSCH modulation	16QAM
BS output power setting	PRAT
Number of HS-PDSCH in each active TS	10~~8~~
Power of each HS-PDSCH	1/10~~8~~ of Base Station output power
Data content of HS-DSCH	real life (sufficient irregular)
Spreading factor	16

6.8.2.4.2 Procedure

Measure the peak code domain error by applying the global in-channel Tx test method described in Annex C.

6.8.2.5 Test Requirements

NOTE: If the Test Requirement below differs from the Minimum Requirement, then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 5.11 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex D.

The peak code domain error measured according to subclause 6.8.2.4.2 shall not exceed –27 dB.