# Operation Guide for WCDMA Test Setup according to 3GPP TS 34.121

# **Application Note**

#### **Products:**

| R&S<sup>®</sup>CMU200

Most of the tests specified in standard TS 34.121 [1] for 3GPP Rel-99 can be performed with R&S<sup>®</sup>CMU200. This document provides a step by step guide on how to perform Rel-99 measurement on transmitter characteristics, receiver characteristics and performance tests according to TS 34.121 V8.4.0 clauses 5, 6 and 7 with standalone R&S<sup>®</sup>CMU200. Test cases that require additional instruments e.g. fading generator (R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A) or spectrum analyzer (R&S<sup>®</sup>FSQ) will be discussed in brief in this application note with recommended reference. A set of \*.sav files based on R&S<sup>®</sup>CMU200 firmware V5.22A for UE supporting operating band I with power class 3 in RMC 12.2 kbps downlink/uplink is attached to this application note.



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Covered Tests in Accordance with TS 34.121

## 1 Introduction

Most of the tests specified in standard TS 34.121 [1] for 3GPP Rel-99 can be performed with R&S<sup>®</sup>CMU200. This document provides a step by step guide on how to perform Rel-99 measurement on transmitter characteristics, receiver characteristics and performance tests according to TS 34.121 V8.4.0 clauses 5, 6 and 7 with standalone R&S<sup>®</sup>CMU200 for UE supporting operating band I and power class 3. Test cases that require additional instruments e.g. fading generator (R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A) or spectrum analyzer (R&S<sup>®</sup>FSQ) will be discussed in brief in this application note with recommended reference. A set of \*.sav files based on R&S<sup>®</sup>CMU200 firmware V5.22A for UE supporting operating band I and power class 3 in RMC 12.2 kbps downlink/uplink is attached to this application note. Information on these \*.sav files within this application note is marked with symbol



## 1.1 Covered Tests in Accordance with TS 34.121

Table 1 shows the Rel-99 transmitter characteristics, receiver characteristics and performance tests that can be performed with R&S<sup>®</sup>CMU200.

#### Covered Tests in Accordance with TS 34.121

Transmitter characteristics, receiver characteristics and performance tests of 3GPP ReI-99 supported by R&S <sup>®</sup> CMU200						
Test	Clause	Test Parameter				
	5.2	Maximum output power				
	5.3	Frequency error				
	5.4.1	Open loop power control in the uplink				
	5.4.2	Inner loop power control in the uplink				
	5.4.3	Minimum output power				
	5.5.1	Transmit OFF power				
	5.5.2	Transmit ON/OFF time mask				
	5.6	Change of TFC				
Transmitter	5.7	Power setting in uplink compressed mode				
characteristics	5.8	Occupied Bandwidth (OBW)				
	5.9	Spectrum emission mask				
	5.10	Adjacent Channel Leakage Power Ratio (ACLR)				
	5.11	Spurious emissions*				
	5.12	Transmit intermodulation*				
	5.13.1	Error Vector Magnitude (EVM)				
	5.13.2	Peak code domain error				
	5.13.3	UE phase discontinuity				
	5.13.4	PRACH preamble quality				
	6.2	Reference sensitivity level				
	6.3	Maximum input level				
	6.4	Adjacent Channel Selectivity (ACS) (Rel-99 and Rel-4)*				
Receiver	6.4A	Adjacent Channel Selectivity (ACS) (Rel-5 and later releases)*				
characteristics	6.5	Blocking characteristics*				
	6.6	Spurious response*				
	6.7	Intermodulation characteristics*				
	6.8	Spurious emissions*				
	7.2	Demodulation of Dedicated channel (DCH) in static propagation conditions				
	7.3	Demodulation of DCH in multi-path fading propagation conditions*				
	7.4	Demodulation of DCH in moving propagation conditions*				
	7.5	Demodulation of DCH in birth-death propagation conditions*				
Performance	7.8.1	Power control in the downlink, constant BLER target (Release 5 and earlier)*				
16515	7.8.1A	Power control in the downlink, constant BLER target (Release 6 and later)*				
	7.9.1	Downlink compressed mode, single link performance (Release 5 and earlier)*				
	7.9.1A	Downlink compressed mode, single link performance (Release 6 and later)*				
	7.10	Blind transport format detection*				

\* Required additional instruments besides R&S<sup>®</sup>CMU200

 Table 1: 3GPP Rel-99 measurement supported by R&S<sup>®</sup>CMU200

Generic Call Setup for Transmitter Characteristics

## 2 Rel-99 Transmitter Characteristics

### 2.1 Generic Call Setup for Transmitter Characteristics

All parameters of transmitter characteristics are defined using the UL reference measurement channel (RMC) 12,2 kbps as specified in TS 34.121 Annex C.2.1 unless stated otherwise.

Configuration in R&S<sup>®</sup>CMU200: BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  12.2 kbps Downlink/Uplink

Ś	WCDMA FDD	odulation	CM OFF HSUPA HSDPA	<b>L</b>	Connect Control
<u> </u>	NCDMA FDD Connection Control 🛔	PS:	Idle	CS: S	Signal On
Г	-Setup		- Circuit Switched	(	<mark>0</mark>
	Geometry Factor (lor/loc) Total Output Power (lor+loc) ▼Circuit Switched Default Settings	 -51.7 dBm			
	DCH (Dedicated Chn.) Type	RMC			
	Reference Channel Type	12.2 kbps Dov	unlink/Uplink		
	DL DTCH Transport Format DL Resources in Use RLC Mode (Loop Mode 1) UL CRC (Sym. Loop Mode 2) Test Mode	12.2 kbps 100 % TM Off Loop Mode	2		
	Channel Data Source DTCH  HSPA  RMC with HSDPA Settings	PRBS9		Sunc	

Figure 1: RMC 12.2 kbps dedicated channel setup

All parameters of transmitter characteristics are defined using the common RF test conditions as specified in TS 34.121 Annex E.3.1 except for TS 34.121 clauses 5.3, 5.4.1, 5.4.4 and 5.5.2.

#### Generic Call Setup for Transmitter Characteristics

Downlink physical channels transmitted during a connection						
Physical Channel	Power					
lor	–93 dBm / 3.84MHz					
CPICH	CPICH_Ec / DPCH_Ec = 7 dB					
P-CCPCH	P-CCPCH_Ec / DPCH_Ec = 5 dB					
SCH	SCH_Ec / DPCH_Ec = 5 dB					
PICH	PICH_Ec / DPCH_Ec = 2 dB					
DPCH	–103.3 dBm / 3.84MHz					

 Table 2: WCDMA downlink physical channels transmitted during a connection (Table E.3.1 of TS 34.121 [1])

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Level Reference  $\rightarrow$  Output Channel Power (Ior)

BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -93.0 dBm

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-CPICH  $\rightarrow$  -3.3 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-CCPCH  $\rightarrow$  -5.3 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-SCH  $\rightarrow$  -8.3 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  S-SCH  $\rightarrow$  -8.3 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  PICH  $\rightarrow$  -8.3 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  DPDCH Level Config  $\rightarrow$  -10.3 dB

WCDMA FDD I Mo	dulation	CM OFF HSUPA HSDPA		Connect Control
😑 WCDMA FDD Connection Control 🛔	PS:	ldle	CS: Si	gnal On
Setup-		Node-B Settings.	l	<mark>0</mark>
▼Node-B Settings	Channel	Frequency	Uplink	
RF Channel Downlink Band [1]	10562	2112.4 мнz	1922.4 мн	z
Frequency Offset	+ 0.000 к	Hz		
RX/TX Separation	190.000	MHz		
Primary Scrambling Code	9			
Level Reference	Output C	hannel Power (	lor)	
Output Channel Power (lor)	⊿-93.0 dBn	n		
OCNS (R99)	Off			
AWGN Noise Pwr. (@3.84 MHz, loc)	Off			
Geometry Factor (lor/loc)				
Total Output Power (lor+loc)	- 93.0 dBr	n		
<ul> <li>Circuit Switched</li> </ul>				
Packet Switched				
▶ HSDPA HS-DSCH				
▶ HSUPA				
Connection Handover UE Signal BS Sign	nal Netwo	rk AF/RF 🕀	Sync.	1 2

Figure 2(a) : Downlink physical channels configuration according to Table 2

Generic Call Setup for Transmitter Characteristics

🛞 Wa		A FDD Ba	ulation	CM OFF HSUPA HSDPA	' <b>-</b>	Connect Control	
😑 WCDMA FI	DD Conne	ction Contr	ol 🛔	PS:	Idle	CS: Si	gnal On
-Setup-					Downlink Physical	Channels/PICH	
▼Downlin Defa	ik Physical It Settings	Channels					
P-CP	ICH		-	-3.3 dB			
S-CP S-CP	'ICH 'ICH Chann	el Code	(	Off 7			
S-CP	ICH Sec. S ICH Phase	crambling Co	ide (	) ]•			
P-SC	Ή			-8.3 dB			
S-SC	:Н		-	-8.3 dB			
P-CC	PCH		-	-5.3 dB			
S-CC	PCH			-5.3 dB			
S-CC	PCH Char	inel Code		2			_
PICH			∆	-8.3 dB			
PICH Channel Code				3			
Pagin	gindicators	sper Frame		18			
Connection	Handover	UE Signal	BS Signal	Network	AF/RF ↔	Sync.	1 2

Figure 2(b): Downlink physical channels configuration according to Table 2

WCDMA FDD I MO	dulation	CM OFF HSUPA HSDPA	<b>L</b>	Connect Control
😑 WCDMA FDD Connection Control 🔮	PS:	ldle	CS: Si	gnal On
-Setup	[	Downlink Physical (	Channels/	
S-CPICH Phase P-SCH S-SCH P-CCPCH S-CCPCH S-CCPCH Channel Code PICH PICH Channel Code Paging Indicators per Frame	0° -83 ав -83 ав -53 ав -53 ав 2 -83 ав 3 18			
AICH AICH Channel Code	- 0.3 dB 6 Level	Minimum	Maximur	n –
DPDCH Level Config	⊿-10.3 dB	- 21.3	ав - 10.3	dB
DPCH Channel Code Power Offset (DPCCH/DPDCH)	96 0.0 ав			
Connection Handover UE Signal BS Sign	nal Network	AF/RF ⊕+	Sync.	1 2

Figure 2(c): Downlink physical channels configuration according to Table 2

To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

Recall TX\_meas.sav and establish CS call.

### 2.2 Maximum Output Power (5.2)

The maximum output power measures the maximum power the UE can transmit in a bandwidth of at least  $(1 + \alpha)$  times the chip rate of the radio access mode. An excess maximum output power may interfere other channels or other systems. A small maximum output power decreases the coverage area. Table 3 shows the nominal maximum output power and tolerence.

Nominal maximum output power										
Operating	Power Cla	ass 1	Power C	lass 2	Power C	lass 3	Power Cla	ass 3bis	Power C	lass 4
Band	Power	Tol	Power	Tol	Power	Tol	Power	Tol	Power	Tol
Buna	(dBm)	(dB)	(dBm)	(dB)	(dBm)	(dB)	(dBm)	(dB)	(dBm)	(dB)
Band I	+33	+1.7/-	+27	+1.7/-	+24	+1.7/-	-	-	+21	+2.7/-
		3.7		3.7		3.7				2.7
Band II	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band III	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band IV	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band V	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band VI	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band VII	-	-	-	-	+24	+1.7/-	+23	+2.7/-	+21	+2.7/-
						3.7		2.7		2.7
Band VIII	-	-	-	-	+24	+1.7/-	+23	+2.7/-	+21	+2.7/-
						3.7		2.7		2.7
Band IX	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band X	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band XI	-	-	-	-	+24	+1.7/-	-	-	+21	+2.7/-
						3.7				2.7
Band XII	-	-	-	-	+24	+1.7/-	+23	+2.7/-	+21	+2.7/-
						3.7		2.7		2.7
Band XIII	-	-	-	-	+24	+1.7/-	+23	+2.7/-	+21	+2.7/-
						3.7		2.7		2.7
Band XIV	-	-	-	-	+24	+1.7/-	+23	+2.7/-	+21	+2.7/-
						3.7		2.7		2.7

Table 3: Test requirements for nominal maximum output power (Table 5.2.2 of TS 34.121 [1])

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE and the mean power of the UE is measured. In R&S<sup>®</sup>CMU200, continuously UP power control commands is automatically configured when user select Maximum Power measurement in R&S<sup>®</sup>CMU200.

Frequency Error (5.3)

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Maximum Power

Figure 3 shows the maximum output power measurement result.

🗞 WCDI		and Power		CM OFF HSUPA HSDPA	- <b>L</b>	Connect Control
Max.Level: Auto	Low noise	Freq.Offset: + 0.	000 kHz Chan <i>.</i> /	Freq.: 9612 /1922.	4 MHz	Maximum Power
						Appli- cation
						<b>Trigger</b> Ana. Lev.
	Current	Average	Maximum	Minimum		<b>UE Signal</b> Ana.Set.
UE Power (Peak)	23.58 dBm	23.62 dBm	24.04 dBm			HSDPA
UE Power (RMS)	20.25 dBm	20.25 dBm	20.50 dBm	20.09 dBm		BS Sig. Lvl
I	10 Statistic Count	l t				BS Signa Settings
ſ	0.00 %					
I	Out of Tolerance					
Repetition Stop Condi	ition	Statistic Count				Menus
gure 3: Maximum o	utput power me	asurement res	sult			
Recall TX meas	.sav and esta	blish CS cal	I. Measureme	ent result is	availabl	e at:

## 2.3 Frequency Error (5.3)

Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Maximum Power

The UE transmitter tracks to the RF carrier frequency received from the Node B. The frequency error is the difference between the RF modulated carrier frequency transmitted from the UE and the assigned frequency. Frequency error occurs due to Node B frequency error and Doppler shift.

The frequency error shall not exceed  $\pm$ (0.1 ppm + 10 Hz). An excess error of the carrier frequency increases the transmission errors in the uplink own channel. This test verifies the ability of the receiver to derive correct frequency information for the transmitter, when locked to the DL carrier frequency.

A RMC 12.2 kbps is setup as shown in Figure 1. Downlink physical channels in Table 4 and 5 are configured in R&S<sup>®</sup>CMU200.

Frequency Error (5.3)

Downlink physical channels transmitted during a connection						
Physical Channel	Power					
CPICH	CPICH_Ec / DPCH_Ec	= 7 dB				
P-CCPCH	P-CCPCH_Ec / DPCH_Ec	= 5 dB				
SCH	SCH_Ec / DPCH_Ec	= 5 dB				
PICH	PICH_Ec / DPCH_Ec	= 2 dB				
DPCH	Test dependent power					

Table 4: Downlink physical channels transmitted during a connection (Table E.3.2.1 of TS 34.121 [1])

Reference sensitivity level							
Operating Band	Unit	DPCH_Ec <refsens></refsens>	<reflor></reflor>				
I	dBm/3.84 MHz	-116.3	-106				
II	dBm/3.84 MHz	-114.3	-104				
III	dBm/3.84 MHz	-113.3	-103				
IV	dBm/3.84 MHz	-116.3	-106				
V	dBm/3.84 MHz	-114.3	-104				
VI	dBm/3.84 MHz	-116.3	-106				
VII	dBm/3.84 MHz	-114.3	-104				
VIII	dBm/3.84 MHz	-113.3	-103				
IX	dBm/3.84 MHz	-115.3	-105				
Х	dBm/3.84 MHz	-116.3	-106				
XI	dBm/3.84 MHz	-114.3	-104				
XII	dBm/3.84 MHz	-113.3	-103				
XIII	dBm/3.84 MHz	-113.3	-103				
XIV	dBm/3.84 MHz	-113.3	-103				

Table 5: Reference sensitivity level (Table 6.2.2 of TS 34.121 [1])

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Level Reference  $\rightarrow$  Output Channel Power (Ior) BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -106 dBm BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-CPICH  $\rightarrow$  -3.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-CCPCH  $\rightarrow$  -5.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  P-SCH  $\rightarrow$  -8.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  S-SCH  $\rightarrow$  -8.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  PICH  $\rightarrow$  -8.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  PICH  $\rightarrow$  -8.3 dB BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  DPDCH Level Config  $\rightarrow$  -10.3 dB

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c). To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

A continuously UP power control commands is sent to the UE until the UE reaches its maximum output power as shown in Figure 4. The frequency error delta is measured.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Algorithm  $\rightarrow$  Algorithm 2 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  All 1

🚸 W		<sup>Band</sup> Power	CM OFF HSUPA HSDPA	Č 🔒	Connect Control
Max.Le•	TPC Pattern Conf	iguration Set 1			Maximum Power
UE Powe UE Powe	TPC Algorithm TPC Step Size TPC Pattern Set. Test Step Precon. •Set 1 Pattern Type Pattern • Set 2 • Set 3 • Set 4 • Set 5 • Test Step A	Algorithm 2 1 dB Set 1 Manual All 1 01 bin		Compress:	Appli- cation Trigger Ana. Lev. UE Signal Ana.Set. HSUPA BS Sig. Lvl. BS Signal Settings
RF Channel	RF RF Frequency Freq.Offse	t Test Step Precond. C	attern TPC Pattern onfig. Setup	Activate Pattern	Menus

Figure 4: Continuous UP power control command configuration

Measurement result for frequency error is available in Overview WCDMA in  $R\&S^{\$}CMU200$ .

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA

Figure 5 shows the frequency error measurement result.

		and Modula	ation		Connect Control
Max.Level: Auto Multiple Signal: DPC Scr. Code: 0	Low noise CH+DPDCH 1 CC Mode: Manual	Freq.Offset: + 0. SR1: 60 CC1: 16	.000 kHz Chan	./Freq.: 9612 / 1922.4 MHz	R Overview WCDMA
	Current	Average	Max./Min.		Applic. 1
Err.Vect. Magn.— Peak	12.7 %	13.66 %	37.8 %		Applic, 2
L RMS	4.1 %	4.34 %	7.5 %		Trisgor
Magn. Error —— Peak	5.9 %	7.14 %	- 28.5 %		Ana. Lev. /
L RMS	2.1 %	2.33 %	4.2 %		
Phase Error — Peak	- 7.3 °	7.71 °	21.5 °	<b>2560</b> Chip	UE Signal
L RMS	2.0 °	2.10 °	3.7 °	Meas. Length	Ana.Set.
I/Q Origin Offset	– 47.28 dB	– 47.33 dB	– 42.77 dB	0	HSDPA
I/Q Imbalance	- 32.69 dB	– 32.71 dB	– 32.49 dB	Slot Number	BS Sig. Lvl.
Carrier Frequency Error	-6 нz	– 7 Hz	<b>– 26</b> нz	22.34 dBm	BS Signal
Waveform Quality	0.9983	0.99811	0.9944	UEPower	Settings
Peak Code Dom. Error	– 31.71 dB	– 31.84 dB	-27.45 dB	10	
PCDE Code	Q 1		Q 1	Statistic Count	
Transmit Time Error	<b>1.00</b> Chip	<b>1.00</b> Chip	<b>1.00</b> Chip	0.00 %	
				Out of Tolerance	Monue
Роме	m Modulation	Spectrum	Code Dom. F	Receiver Quality Audio	Internus

Figure 5: Frequency error measurement result



Recall TX\_meas.sav, modify the following configurations and establish CS call. BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -106.0 dBm

Measurement result is available at: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA

## 2.4 Open Loop Power Control in the Uplink (5.4.1)

The UE open loop power is defined as the mean power in a timeslot or ON power duration. Open loop power control in the uplink measures the ability of the UE transmitter to set its output power with the target to transmit at the lowest power acceptable for proper communication. This function is used for PRACH transmission and based on the power measured by the UE of the received CPICH signal and the signalled BCCH information from Node B.

The test stresses the ability of the receiver to measure the received power correctly over the receiver dynamic range. An excess error of the open loop power control decreases the system capacity. Table 6 shows the open loop power control tolerance.

Open loop power control tolerance	
Normal conditions	±10 dB
Extreme conditions	±13 dB

 Table 6: Open loop power control tolerance (Table 5.4.1.4 of TS 34.121 [1])

Downlink physical channels transmitted without dedicated connection					
Physical Channel	Power				
lor	Test dependent power				
СРІСН	$CPICH\_Ec / lor = -3.9 dB$				
P-CCPCH	P-CCPCH_Ec / lor	= -8.3 dB			
SCH	SCH_Ec / lor	= -8.3 dB			
PICH	PICH_Ec / lor	= -8.3 dB			
S-CCPCH	S-CCPCH_Ec / lor	= -5.3 dB			

Table 7: Downlink physical channels transmitted without dedicated connection (Table E.2.2 of TS 34.121 [1])

Settings for the serving cell						
Parameter	Unit	Cell 1				
Cell type		Serving cell				
UTRA RF channel number		Channel 1				
Qqualmin	dB	-24				
Qrxlevmin	dBm	-115				
UE_TXPWR_MAX_RACH	dBm	21				
Preamble Retrans Max		1				

Table 8(a): Settings for the serving cell (Table 5.4.1.1a of TS 34.121 [1])

A RMC 12.2 kbps is setup as shown in Figure 1. Downlink physical channels in Table 7 are configured in R&S<sup>®</sup>CMU200.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → Test dependent power BS Signal → Downlink Physical Channels → P-CPICH → -3.9 dB BS Signal → Downlink Physical Channels → P-CCPCH → -8.3 dB BS Signal → Downlink Physical Channels → S-CCPCH → -5.3 dB BS Signal → Downlink Physical Channels → P-SCH → -11.3 dB BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c).

Table 8(a) shows the settings for the serving cell. These parameters can be configured as shown in Figure 6(a), 6(b) and 6(c).

Configuration in R&S<sup>®</sup>CMU200:

```
Network \rightarrow Cell Reselection Information \rightarrow Qqualmin \rightarrow -24 dB
Network \rightarrow Cell Reselection Information \rightarrow Qrxlevmin \rightarrow -58 dBm
Network \rightarrow Random Access Settings \rightarrow Preamble \rightarrow Max Retransmission \rightarrow 1
UE Signal \rightarrow UE Power Control \rightarrow Max. Allowed UE Power \rightarrow 21.0 dBm
```

WCDMA FDD Band I MC	dulation	CM HS HS	OFF	Connect Control
🗏 WCDMA FDD Connection Control 🛔	PS:	Idle	CS:	Signal On
-Setup		Cell Reselec	tion Information/Q	rxlevmin
<ul> <li>Network Identity</li> <li>Random Access Settings</li> <li>Requested UE Data</li> <li>Cell Reselection Information Default Settings CPICH Ec/No Qhyst2s</li> <li>Sintrasearch Sintersearch Searchurcs</li> </ul>	0 - 16 ав - 16 ав Off	* 2 * 2 * 2		
Qqualmin Qrxlevmin	-24 dB ⊿-58 dBm	*2+1		
Treselection • WCDMA Intra Neighbour Cell List • WCDMA Inter Neighbour Cell List • GSM Neighbour Cell List	0			
Connection Handover UE Signal BS Sig	inal Netwo	ork AF/RI	F 🕀 Sync.	1 2

Figure 6(a): Settings for the serving cell configuration

Ŷ	WCDMA FDD Band Me	odulation	CM OFF HSUPA HSDPA		Connect Control
<u> </u>	ICDMA FDD Connection Control 🛔	PS:	Idle	CS: S	ignal On
Г	-Setup		Random Access	Settings/Pream	ble/
	DRX Cycle Length (2 <sup>×</sup> Frames)	8			
	RACHITTI	20 ms			
	▼Preamble				
	Max Preamble Cycles	2			
	Step Size	3 dB			
	AICH Transmission timing	3 Slot			
	Max Retransmission	⊿ 1			
	RACH Msg Part Power Offset	-5 dB			
	AICH Acknowledge	positive			
	Available Subchannels	000000000	)001 Chn. 0 1	1	
	Available Signatures	1111111111	11111111 sig	n. 0 15	
	Available Signature -> Index Select	: Use all			
	<ul> <li>Requested UE Data</li> </ul>				
	Cell Reselection Information				_
	<ul> <li>WCDMA Intra Neighbour Cell List</li> </ul>				
Con	nection Handover UE Signal BS Sig	gnal Network	AF/RF ↔	Sync.	1 2

Figure 6(b): Settings for the serving cell configuration

Channel conditions are initially setup with received CPICH\_RSCP > -85 dBm. For example, test parameters for RX-Upper dynamic range and RX-middle in Table 8(b) can be used for UE registration. UE is switched on and wait until UE has registered and entered idle mode. After the UE has performed registration and entered idle mode, test parameters for open loop power control are configured.

Test parameters for open loop power control							
Parameter		RX-Upper dynamic end	RX-middle	RX-Sensitivity level			
lor		–25.0 dBm / 3.84 MHz	–65.7 dBm / 3.84 MHz	<reflor> dBm / 3.84 MHz (Note)</reflor>			
CPICH_RSCP		-28.9 dBm	-69.6 dBm	<reflor> + CPICH_Ec / lor (Note)</reflor>			
Primary CPICH DL TX power		+19 dBm	+28 dBm	+19 dBm			
Simulated path loss = Primary CPICH DL TX power – CPICH_RSCP		+47.9 dB	+97.6 dB	Band I, IV, VI, X: +128.9 dB Band II, V, VII, XI: +126.9 dB Band III, VIII, XII, XIII, XIV: +125.9 dB Band IX: +127.9 dB			
1.11	Band I, IV, VI, X Band II, V, VII,			110 dBm 108 dBm			
interference	Band III, VIII, XII, XIII, XIV	- −75 dBm	–101 dBm	-107 dBm			
	Band IX			-109 dBm			
Constant Value		-10 dB	-10 dB	-10 dB			
Expected nom	nal UE TX	-37.1 dBm	-13.4 dBm	+8.9 dBm			

Note: <REFlor> is specified in Table 5, and CPICH\_Ec / lor is specified in Table 7.

Table 8(b): Test parameters for open loop power control (Table 5.4.1.3 of TS 34.121 [1])

Table 8(b) shows the UE open loop power control test parameters. These parameters can be configured as shown in Figure 6(c). Ior is setup by referring to Figure 2(a).

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → Test dependent power UE Signal → UE Power Control → Open Loop → Reported P-CPICH Power → 19.0 dB UE Signal → UE Power Control → Open Loop → UL Interference → -75.0 dBm UE Signal → UE Power Control → Open Loop → Constant Value → -10.0 dB

	lodulation	CM OFF HSUPA HSDPA		Connect Control
😑 WCDMA FDD Connection Control 🛔	PS:	ldle	CS: Si	gnal On
-Setup		UE Power Contro	l/Open Loop/	
Default All Settings				
UL Target Power     Open Loop	21.0 dbm			
UL Interference Constant Value Reported P-CPICH Power	-75.0 dB -10.0 dB ⊿19.0 dBm	m		
DPCCH Power Offset PRACH UE On-Power Limit • UE Gain Factors • HSUPA	-80.0 ав ±9.0 ав			
Connection Handover UE Signal BS S	Signal Netwo	ork AF/RF 🕀	Sync.	1 2

Figure 6(c): Open loop power control parameter configuration

Measurement result for open loop power control in the uplink is available in On/Off Time Mask measurement in R&S<sup>®</sup>CMU200. 'RUN' state of On/Off Time Mask is enabled.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  On/Off Time Mask On/Off Time Mask  $\rightarrow$  On / Off

To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200. Figure 7 shows the open loop power control in the uplink measurement result.



Figure 7: Open loop power control in the uplink measurement result

Note: For open loop power measurement with RX Sensitivity level, registration is performed with CPICH\_RSCP > -85 dBm. RX Sensitivity level settings as shown in Table 8(b) are configured after UE registration. CS call is established and open loop power is measured.

#### For RX upper dynamic end, recall TxOnOff.sav and establish CS call.

For RX-middle, recall TxOnOff.sav, modify the following configurations and establish CS call:

BS Signal → Node-B Settings → Output Channel Power (Ior) → -65.7 dBm UE Signal → UE Power Control → Open Loop → Reported P-CPICH Power → 28.0 dB

UE Signal → UE Power Control → Open Loop → UL Interference → -101.0 dBm

For RX-sensitivity level, recall TxOnOff.sav, and wait for UE registration. Modify the following configurations after UE registration and establish CS call: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -106.0 dBm UE Signal  $\rightarrow$  UE Power Control  $\rightarrow$  Open Loop  $\rightarrow$  UL Interference  $\rightarrow$  -110.0 dBm

Measurement result is available at: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  On/Off Time Mask

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Inner loop power control in the uplink measures the ability of the UE transmitter to adjust its output power in accordance with one or more TPC commands received in the downlink. The power control step is the change in the UE transmitter output power in response to a single TPC command, TPC\_cmd, derived at the UE. The UE transmitter shall change the output power with a step size of 1 dB, 2 dB and 3 dB according to the value of  $\Delta$ TPC or  $\Delta$ RP-TPC, in the slot immediately after the TPC\_cmd can be derived. An excess error of the inner loop power control decreases the system capacity.

Table 9 and 10 show the transmitter power control range and transmitter aggregate power control tolerance respectively. 3 dB inner loop power control steps are only used in compressed mode.

Transmitter power control range						
TPC_cmd	nd Transmitter power control range (all units are in dB)					
	1 dB step size 2 dB step size 3 dB step size					
	Lower Upper Lower Upper Lower Upper					
+1	+0.4	+1.6	+0.85	+3.15	+1.3	+4.7
0	-0.6	+0.6	-0.6	+0.6	-0.6	+0.6
-1	-0.4	-1.6	-0.85	-3.15	-1.3	-4.7

Table 9: Transmitter power control range (Table 5.4.2.5.1 of TS 34.121 [1])

Transmitter aggregate power control tolerance						
TPC_cmd	Transmitter p TPC_cmd gro (all units are	oower control r oup in dB)	Transmitter power control range after 7 equal TPC_cmd groups (all units are in dB)			
9. • • •	1 dB step size 2 dB step size				3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+1	+7.7	+12.3	+15.7	+24.3	+15.7	+26.3
0	-1.1	+1.1	-1.1	+1.1	-1.1	+1.1
-1	-7.7	-12.3	-15.7	-24.3	-15.7	-26.3
0,0,0,0,+1	+5.7	+14.3	N/A	N/A	N/A	N/A
0,0,0,0,-1	-5.7	-14.3	N/A	N/A	N/A	N/A

Table 10: Transmitter aggregate power control tolerance (Table 5.4.2.5.2 of TS 34.121 [1])

Figure 8 shows the inner loop power control test steps. Table 11 shows the summary of test step conformance requirement.



Figure 8: Inner loop por	wer control test steps	(Figure 5.4.2.4 of TS	5 34.121 [1])
i igui o oi iiiiioi ioop poi		(ingalo of mail of its	

Summary	of test step conformance requirement	
Test step	Difference in mean power between adjacent slots	Change in mean power over consecutive slots
А	TPC_cmd = 0	TPC_cmd group = 0 for 10 consecutive slots
В	Every 5 <sup>th</sup> TPC commands should have TPC_cmd = +1 with step size = 1 dB, all other should have TPC_cmd = 0	TPC_cmd group = $\{0, 0, 0, 0, +1\}$ for 50 consecutive slots
С	Every 5 <sup>th</sup> TPC commands should have TPC_cmd = -1 with step size = 1 dB, all other should have TPC_cmd = 0	TPC_cmd group = {0, 0, 0, 0, -1} for 50 consecutive slots
D	Power Control Algorithm is set to algorithm 1 with TPC s	tep size of 1 dB and measured maximum output power
E	TPC_cmd = -1 with step size = 1 dB between the min power threshold and the max power threshold derived from the measured maximum output power in test step D (Note 1)	TPC_cmd group = -1 with step size = 1 dB for 10 consecutive slots between the min power threshold and the max power threshold derived from the measured maximum output power in test step D (Note 2)
F	TPC_cmd = +1 with step size = 1 dB between the min power threshold and the max power threshold derived from the measured maximum output power in test step F (Note 1)	TPC_cmd group = +1 with step size = 1 dB for 10 consecutive slots between the min power threshold and the max power threshold derived from the measured maximum output power in test step F (Note 2)
G	TPC_cmd = -1 with step size = 2 dB between the min power threshold and the max power threshold derived from the measured maximum output power in test step F (Note 1)	TPC_cmd group = -1 with step size = 2 dB for 10 consecutive slots between the min power threshold and the max power threshold derived from the measured maximum output power in test step F (Note 2)
Н	TPC_cmd = +1 with step size = 2 dB between the min power threshold and the max power threshold derived from the measured maximum output power in test step G (Note 1)	TPC_cmd group = +1 with step size = 2 dB for 10 consecutive slots between the min power threshold and the max power threshold derived from the measured maximum output power in test step G (Note 2)

Note: 1. The lower step size requirement does not apply for the power step adjacent to the Min or Max power threshold for test.

2. The power step adjacent to the Min or Max power threshold for test should not be part of the 10 consecutive slots.

Table 11: Summary of test step conformance requirement (Summary of 5.4.2.5 in TS 34.121 [1])

A WCDMA call is setup as specified in section 2.1.

Measurement result for Inner loop TPC in the uplink is available in Inner Loop TPC in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Inner Loop TPC

Additional information for power in each slot is available in P/Slot Table. Four result view is available in P/Slot Table, i.e. Delta Step, Absolute, Delta Step Graph and Absolute Graph as shown in Figure 9.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  P/Slot Table P/Slot Table  $\rightarrow$  Display Mode  $\rightarrow$  Delta Step, Absolute, Delta step Graph or Absolute Graph

Configuration with different TPC pattern can be set in TPC Pattern Setup in R&S<sup>®</sup>CMU200. Inner loop TPC pattern will be displayed in R&S<sup>®</sup>CMU200 after activating the pattern as shown in Figure 10.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  TPC Pattern Setup  $\rightarrow$  Test Step A, B, C, D, E, F, G or H BS Signal Settings  $\rightarrow$  Activate Pattern

Before starting test step A, the output power of the UE is set to be in the range  $-10 \pm 9$  dBm as shown in Figure 12. It is recommended to set the Test Step Precond. to Auto as shown in Figure 11.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  Test Step Precond.  $\rightarrow$  Auto UE signal  $\rightarrow$  UL Target Power  $\rightarrow$  Power  $\rightarrow$  -10 dBm (for test step A)

	A FDD Band Power		Connect Control
dBm Max.Level:+0.0 dBm Step Size:1 dB	Low noise Freq.Offset: + 0.000 kHz Meas. Mode: TPC Test Step	Chan./Freq.: 9612 /1922.4 MHz TPC Mode: Algorithm 2	P/Slot N Table
+10 +9 +8 +7 +6		Absolute	Appli- cation
+5 +4 +3 +2			Analyzer Lev. <sub>Trigg.</sub>
+1 +0 -1 -2 -3			<b>UE Signal</b> Ana.Set.
-4 -5 -6 -7			BS Sig. LVI. HSDPA HSUPA
-8 -9 -10 0 5 10 15 20 25	30 35 40 45 50 55 60 65	70 75 80 85 90 95	BS Signal Settings
TPC Pattern Setup Set 1 Type Closed Loop	Result View		Display
Repetition	Absolute Graph Acc. Error Display Measure Step Mode Setti	ings	Menus

Figure 9: Display mode configuration

	A FDD Band Power	CM OFF HSUPA HSDPA	Connect Control
dBm Max.Level:+0.0 dBm Step Size:1 dB +10	Low noise Freq.Offset: + 0.00 Meas. Mode: TPC Test Step	0 kHz Chan./Freq.: 9612 /1 TPC Mode: Algorithm	922.4 MHz 1 2 N Table
+9 +8 +7 +6			Absolute Appli- cation
+5 +4 +3 +2 +1			Analyzer Lev. <sub>Trigg.</sub>
+0 -1 -2 -3			UE Signal Ana.Set.
-4 -5 -6 -7 -8			BS Sig. Lvl. HSDPA HSUPA
-9 -10 0 5 10 15 20 25	30 35 40 45 50 55 E	0 65 70 75 80 85	90 95 BS Signal Settings
TPC Pattern Setup Test Type Single Pattern+A Pattern 60 bit 3GPP Patt	Step A	<mark> TPC Pa</mark> Error Inc	ttern Setup
RF Channel Frequency	RF Test Step 1 Freq.Offset Precond.	PC Pattern Config. Setup	Activate Menus Pattern

Figure 10: TPC pattern setup and activate pattern configuration

	A FDD Band Powe	CM OFF HSUPA HSDPA	i - I	Connect Control
dBm Max.Level:+0.0 dBm Step Size:2 dB	Low noise Freq.Offset: + 0 Meas. Mode: UL CM Test Step	000 kHz Chan./Freq.: 9612 /1 TPC Mode: Algorithm	922.4 MHz R n 1 V	P/Slot Table
+25 +20 +15 +10 +5			Absolute	Appli- cation
+0 -5 -10 -15 -20				<b>Trigger</b> Ana. Lev. <mark>/</mark>
-25 -30 -35 -40 -45				<b>JE Signal</b> Ana.Set.
-50 -55 -60 -65 -70 -70				<b>-ISDPA</b> HSUPA BS Sig. LvI. <mark>/</mark>
-80 -85 0 5 10 15 20 25	30 35 40 45 50 55	60 65 70 75 80 85	90 95	BS Signal Settings
TPC Pattern Setup UL C Type Single Pattern+A	M TX Test Steps	ditions		Display
RF Channel Frequency	RF Test Step Freq.Offset Precond.	Auto ndex TPC Pattern Config. Setup	Activate Pattern	vlenus

Figure 11: Auto test step preconditions setting

R	<mark>ک ا</mark>	VCDI	VIA F	DD Bai	<sup>1d</sup> Pow	ver		CM OF HSUP, HSDP,	F J	Ъ	Connect Control
	Max.Le Step S Step	evel: + 0.0 dB Size: 2 dB	im Low	noise F	Freq.Offset: TPC Test St	+0.000 kH ep	z Chan TPC≬	./Freq.: 961) Mode: Algori	2 / 1922.4 M ithm 1 Absolute	Hz	P/Slot Table
	0 7	7									Appli-
	8 19	5									cation
	16 23	3									
	24 31	1									Trigger
	32 39	3									Ana, Lev. 🖊
	40 47	7									
	48 59	5									UE Signal
	56 63	3									Ana.Set
	64 71	1									HSDPA
	7279	3				OFF	OFF	OFF	OFF		BS Sig. Lvl.
	80 87	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		DO Olaval
	88 95	5 OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		BS Signal
	96 99	OFF	OFF	OF	OFF			All Value	es in <b>dBm</b>		Settings
	UL Tai	get Powe	er		]						
Po	wer	<u>a</u> - 10	0.0 dBm				[				Display
Rei	ference	e To	tal Powe	er O	1 Ma	ix. Acc. Erro	r Inde:	х			
UL	Target Powe	r Openioo Power	p Ctrl		RMC Gain Fac	tor Gain	PA Factor				Menus

Figure 12: UE's UL target power (for test step A)



Figure 13 shows the inner loop power control in the uplink measurement result.

Figure 13(a): Test pattern E with P/Slot Table (Absolute Graph) measurement result

<mark>ک (</mark>	/CD	MA F	DD Ba	<sup>nd</sup> Pov	ver		CM O HSUF HSDF		τ.	Connect Control
Max.Lev Step Siz Step	/el:+0.0 dE ze:1 dB	3m Lou	) noise	Freq.Offset TPC Test S	::+0.000 kH tep	lz Char TPC	n./Freq.: 961 Mode: Algoi	12 / 1922.4 M rithm 1 Absolute	1Hz	P/Slot Table
0 7	22.5	21.7	20.8	19.7	18.8	17.6	16.7	15.7		Appli-
8 15	14.7	13.7	12.9	11.9	10.9	10.1	9.0	8.0		cation
16 23	6.5	5.5	4.6	3.5	2.6	1.5	0.5	- 0.4		
24 31	- 1.4	- 2.4	- 3.6	- 4.6	- 5.6	- 6.5	- 7.6	- 8.5		Trigger
32 39	- 9.5	- 10.4	- 11.5	- 12.5	- 13.4	- 14.6	- 15.5	- 16.5		Ana. Lev. /
40 47	- 17.5	- 18.4	- 19.5	- 20.6	- 21.5	- 22.5	- 23.3	- 24.4		
48 55	- 25.5	- 26.5	- 27.3	- 28.4	- 29.2	- 30.3	- 31.4	- 32.2		UE Signal
56 63	- 33.4	- 34.2	- 35.3	- 36.1	- 37.3	- 38.1	- 39.3	- 40.2		Ana.Set.
64 71	- 41.1	- 42.3	- 43.2	- 44.5	- 45.4	- 46.2	- 47.5	- 48.4		BS Sig. Lvl.
72 79	- 49.3	- 50.5	- 51.5	- 52.7	- 53.7	- 54.7	- 55.9	- 56.9		HSDPA HSUPA
80 87	- 57.9	- 59.1	- 59.4	- 59.5	- 59.4	- 59.5	- 59.4	- 59.4		DO Olemal
88 95	- 59.5	- 59.4	- 59.4	- 59.4	- 59.4	- 59.4	- 59.4	- 59.5		BS Signal
96 99	- 59.4	- 59.3	- 59.4	- 59.4			All Valu	es in <b>dBm</b>		Securitys
TPC Patte	ern Setup	Test Step I	E	]			_			Dieplay
Туре	Single Patte	ern+All O			- 0.5 dE	3 13	3			Dispiay
Pattern	000000000	00000000000000	0000 bin	Ma	ax. Acc. Erro	or Inde	ex			
petition		Disp	olay Mode	Measure M	ode Step	Settings				Menus

Figure 13(b): Test pattern E with P/Slot Table (Absolute) measurement result

Minimum Output Power (5.4.3)



Recall TX\_meas.sav and establish CS call. Modify the following configurations: Menus → Power → Application → P/Slot Table P/Slot Table → Display Mode → Delta Step, Absolute, Delta step Graph or Absolute Graph BS Signal Settings → Test Step Precond. → Auto UE signal → UL Target Power → Power → -10 dBm (for test step A) BS Signal Settings → TPC Pattern Setup → Test Step A, B, C, D, E, F, G or H BS Signal Settings → Activate Pattern

## 2.6 Minimum Output Power (5.4.3)

The minimum output power of the UE occurs when the power control setting is set to a minimum value, i.e. when both the inner loop and open loop power control indicate a minimum transmit output power is required. An excess minimum output power increases the interference to other channels and decreases the system capacity. The minimum output power is defined as the mean power in one timeslot. The minimum transmit power shall be less than –49 dBm.

A WCDMA call is setup as specified in section 2.1. A continuously DOWN power control commands is sent to the UE and the mean power of the UE is measured. In R&S<sup>®</sup>CMU200, continuously DOWN power control commands is automatically configured when user select Minimum Power measurement in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Minimum Power

Figure 14 shows the minimum output power measurement result.

Transmit OFF Power (5.5.1)



Recall TX\_meas.sav and establish CS call. Measurement result is available at: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Minimum Power

## 2.7 Transmit OFF Power (5.5.1)

Transmit OFF power is defined as the RRC filtered mean power when the transmitter is off. The transmit OFF power state is when the UE does not transmit or during periods when the UE is not transmitting DPCCH due to discontinuous uplink DPCCH transmission. During transmission gaps in UL compressed mode, the UE is not considered to be in the OFF state.

The requirement for the transmit OFF power shall be less than -55 dBm. An excess transmit OFF power increases the interference to other channels, and decreases the system capacity.

This tests is covered by Transmit ON/OFF Time Mask in section 2.8.

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Recall TxOnOff.sav, modify the following configurations and wait for UE registration. BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -106 dBm UE Signal  $\rightarrow$  UE Power Control  $\rightarrow$  Open Loop  $\rightarrow$  UL Interference  $\rightarrow$  -95 dBm

Measurement result is available at: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  On/Off Time Mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios for release 99 and release 4 only are PRACH, CPCH or uplink compressed mode. For release 5 and later the possible ON/OFF scenarios are PRACH, discontinuous uplink DPCCH transmission or uplink compressed mode. Figure 15 shows transmit ON/OFF time mask for PRACH preambles.



Figure 15: Transmit ON/OFF template for PRACH preambles (Figure 5.5.1 of TS 34.121 [1])

The deviation with respect to the Expected nominal UE TX power (ON power) in Table 12 shall not exceed the prescribed upper tolerance in Table 3 and lower tolerance in Table 6 for the first PRACH preamble. The measured RRC filtered mean power, OFF power, shall be less than -55 dBm. Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink's own channel.

A RMC 12.2 kbps is setup as shown in Figure 1. Downlink physical channels in Table 7 are configured in R&S<sup>®</sup>CMU200.

#### Configuration in R&S<sup>®</sup>CMU200:

```
BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor)
BS Signal → Node-B Settings → Output Channel Power (lor) → Test dependent power
BS Signal → Downlink Physical Channels → P-CPICH → -3.9 dB
BS Signal → Downlink Physical Channels → P-CCPCH → -8.3 dB
BS Signal → Downlink Physical Channels → S-CCPCH → -5.3 dB
BS Signal → Downlink Physical Channels → P-SCH → -11.3 dB
BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB
BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB
```

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c)).

Settings for the serving cell								
Parameter	Unit		Ce	II 1				
		Power class 1	Power class 2	Power class 3	Power class 4			
Cell type			Servir	ng cell				
UTRA RF Channel Number			Chan	inel 1				
Qqualmin	dB	-24						
Qrxlevmin	dBm	-115						
UE_TXPWR_MAX_RACH	dBm	33	27	24	21			

Table 12(a): Settings for the serving cell (Table 5.5.2.1A of TS 34.121 [1])

Table 12(a) shows the settings for the serving cell. These parameters can be configured as shown in Figure 6(a) and 6(c).

#### Configuration in R&S<sup>®</sup>CMU200:

Network  $\rightarrow$  Cell Reselection Information  $\rightarrow$  Qqualmin  $\rightarrow$  -24 dB Network  $\rightarrow$  Cell Reselection Information  $\rightarrow$  Qrxlevmin  $\rightarrow$  -58 dBm UE Signal  $\rightarrow$  UE Power Control  $\rightarrow$  Max. Allowed UE Power  $\rightarrow$  24.0 dBm

Channel conditions are initially setup with received CPICH\_RSCP > -85 dBm. For example, test parameters for RX-Upper dynamic range and RX-middle in Table 8(b) can be used for UE registration. UE is switched on and wait until UE has registered and entered idle mode. After the UE has performed registration and entered idle mode, test parameters for transmit ON/OFF time mask are configured.

Table 12(b) shows the transmit ON/OFF time mask test parameters. These parameters can be configured by referring to Figure 6(c).

Configuration in R&S<sup>®</sup>CMU200:

UE Signal → UE Power Control → Open Loop → Reported P-CPICH Power → 19.0 dB UE Signal → UE Power Control → Open Loop → UL Interference → -95 dBm UE Signal → UE Power Control → Open Loop → Constant Value → -10.0 dB

Test parameters for transmit ON/OFF time mask								
Parameter		Power Class 1	Power Class 2	Power Class 3	Power Class 4	Unit		
lor (Note)		<reflor></reflor>	<reflor></reflor>	<reflor></reflor>	<reflor></reflor>	dBm/3.84 MHz		
CPICH_RSCP		<reflor> + CPICH_Ec / lor</reflor>	dBm					
Primary CPICH E	DL TX power	+19	+19	+19	+19	dBm		
Simulated path	Band I, IV, VI, X	128.9	128.9	128.9	128.9			
loss = Primary	Band II, V, VII, XI	126.9	126.9	126.9	126.9	dB		
power – CPICH RSCP	Band III, VIII, XII, XIII, XIV	125.9	125.9	125.9	125.9			
	Band IX	127.9	127.9	127.9	127.9			
	Band I, IV, VI, X	-86	-92	-95	-98			
LII interference	Band II, V, VII, XI	-84	-90	-93	-96	dBm		
	Band III, VIII, XII, XIII, XIV	-83	-89	-92	-95	dBin		
	Band IX	-85	-91	-94	-97			
Constant Value	<u>.</u>	-10	-10	-10	-10	dB		
Expected nomina	al UE TX power	+32.9	+26.9	+23.9	+20.9	dBm		

Note: <REFIor> is specified in Table 5, and CPICH\_Ec / Ior is specified in Table 7.

Table 12(b): Test parameters for transmit ON/OFF time mask (Table 5.5.2.3 of TS 34.121 [1])

The number of the available subchannels should be limited to one. The preamble retransmission shall be at least 3 but limited to 5. The power ramping step size shall be 1 dB. UE shall not send either an ACK or a NACK. These parameters can be configured as shown in Figure 16.

#### Configuration in R&S<sup>®</sup>CMU200:

Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  Step Size  $\rightarrow$  1 dB Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  Max Retransmission  $\rightarrow$  5 Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  AICH Acknowledge  $\rightarrow$  OFF Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  Available Subchannels  $\rightarrow$ 000000000001

WCDMA FDD	<sup>ıd</sup> Modul	ation	CM OFF HSUPA HSDPA	7.	Connect Control
WCDMA FDD Connection Contro	ol 🛔	PS:	Idle	CS: Si	gnal On
-Setup		R	andom Access S	ettings/Preamb	le/
Default Settings DRX Cycle Length (2 <sup>×</sup> Frames RACH TTI	s) [20	) ms			
✓Preamble Max Preamble Cycles	2				
AICH Transmission timing	3	dB Slot			=#
RACH Msg Part Power Offs	et - (	∂ dB			
AICH Acknowledge Available Subchannels	0	FF 00000000000000000000000000000000000	)1 Chn. 0 11		
Available Signatures Available Signature -> Index: ▶ Requested UE Data	Select Us	1111111111 se all	111111 Sign.	0 15	
Cell Reselection Information					
Connection Handover UE Signal	BS Signal	Network	AF/RF ⊕+	Sync.	1 2

Figure 16: Random access configuration

Measurement result for transmit ON/OFF time mask is available in On/Off Time Mask measurement in R&S<sup>®</sup>CMU200. 'RUN' state of On/Off Time Mask is enabled.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  On/Off Time Mask On/Off Time Mask  $\rightarrow$  On / Off

To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200. The first PRACH preamble measurement result will be displayed in On/Off Time Mask measurement in R&S<sup>®</sup>CMU200.

Note: With AICH Acknowledge OFF, R&S<sup>®</sup>CMU200 does not transmit acknowledge or negative acknowledge on all UE transmission attempts. The UE will continue transmitting preambles and no call establishment.

Figure 17 shows the transmit ON/OFF time mask measurement result.

		ower	CM OFF HSUPA HSDPA	Connect Control
dBm MaxLevel: Auto	Low noise Freq.Off Off <b>Q</b> :	ˈset:+0.000 kHz Chan / Off 2⊉:	./Freq.: 9612 /1922.4 MHz / Off Current	HOn/Off Time Mask
+30 +20				Appli- cation
+0 -10 de neglative constant liberator			a ha a sa gala at ga sa hi ta ga da da sa a	<b>Trigger</b> Ana. Lev.
-30 -40			al row big glater opticlas paties pr	<b>UE Signal</b> Ana.Set.
-50 -2464 -1000	-96 0 96 1000 2000	0 3000 4000 41	92 5000 6560	BS Sig. Lvl. HSDPA HSUPA
1st PRACH	23.9 dBm	20.65 dBm	Chip 5	BS Signal Settings
Next PRACH	- 67.74 dBm     Off Power Before	DE On-Power	- 68.76 dBm	Marker
L	Measu	ured Measured Item	Random AICH Access Set ACK	Menus

Figure 17: Transmit ON/OFF time mask measurement result

Recall TxOnOff.sav, and wait for UE registration. Modify the following configurations after UE registration and establish CS call: Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  Step Size  $\rightarrow$  1 dB Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  Max Retransmission  $\rightarrow$  5 Network  $\rightarrow$  Random Access Settings  $\rightarrow$  Preamble  $\rightarrow$  AICH Acknowledge  $\rightarrow$  OFF BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -106 dBm UE Signal  $\rightarrow$  UE Power Control  $\rightarrow$  Open Loop  $\rightarrow$  UL Interference  $\rightarrow$  -95 dBm

Measurement result is available at: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  On/Off Time Mask

П

## 2.9 Change of TFC (5.6)

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink (ratio of amplitude between DPDCH code and DPCCH codes) varies according to the change in data rate. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control.

The power change due to a change in TFC is defined as the relative power difference between the mean power of the original (reference) timeslot and the mean power of the target timeslot, not including the transient duration. The transient duration is from 25  $\mu$ s before the slot boundary to 25  $\mu$ s after the slot boundary.

DTX (DPDCH is turned off) is a special case of variable data and is used to minimise the interference between UE by reducing the UE transmit power when voice, user or control information is not present. Figure 18 shows the transmit template during DTX.



Figure 18: Transmit template during DTX (Figure 5.6.2 of TS 34.121 [1])

Table 13 shows the transmitter power step tolerance for change of TFC conformance requirement.

Transmitter power step tolerance							
Quantized amplitude ratios $\beta_{C}$ and $\beta_{d}$	Power control step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]					
$\beta_{C} = 0,5333, \ \beta_{d} = 1,0$	7	±2.3					

Table 13: Transmitter power step tolerance (Table 5.6.3 of TS 34.121 [1])

A RMC 12.2 kbps and downlink physical channels are setup as specified in section 2.1. The 12,2 kbps UL RMC with gain factors  $\beta_c = 0.5333$  and  $\beta_d = 1.0$  is setup in non-compressed frames as shown in Figure 19.

Configuration in R&S<sup>®</sup>CMU200:

```
UE Signal \rightarrow UE Gain Factors \rightarrow RMC \rightarrow Uplink 122 \rightarrow \beta_{C} \rightarrow 8
UE Signal \rightarrow UE Gain Factors \rightarrow RMC \rightarrow Uplink 122 \rightarrow \beta_{d} \rightarrow 15
```

Discontinuous DPDCH is setup as shown in Figure 20.

Change of TFC (5.6)

Configuration in R&S<sup>®</sup>CMU200: BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  DL Resources in Use  $\rightarrow$  50 %

To establish a WCDMA connection, press 'Connect UE (CS) on R&S<sup>®</sup>CMU200 once UE has registered with R&S<sup>®</sup>CMU200.

Measurement result for change of TFC is available in Inner Loop TPC measurement in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Inner Loop TPC Inner Loop TPC  $\rightarrow$  Measure Mode  $\rightarrow$  Change of TFC

The output power of the UE is set to be in  $0 \pm 1$  dBm by referring to Figure 12. Then alternating "0" and "1" TPC commands is sent in the downlink as shown in Figure 21.

Configuration in R&S<sup>®</sup>CMU200:

UE signal  $\rightarrow$  UL Target Power  $\rightarrow$  Power  $\rightarrow$  0.0 dBm BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  Alternating 0, 1

The mean output power of the UE in two cases, both DPDCH and DPCCH are ON and only DPCCH is ON are measured. The measurement is most conveniently triggered by 'Change of TFC' trigger as shown in Figure 22.

Configuration in R&S<sup>®</sup>CMU200:

Trigger  $\rightarrow$  Trigger Source  $\rightarrow$  Change of TFC

WCDMA FDD	lodulati	on	CM OF HSUP HSDP	F <b>1</b>	Connect Control	
🗧 WCDMA FDD Connection Control 🛔	PS	S: At	tached	CS:	Registered	
-Setup		U	E Gain Factor	s/RMC/Uplinl	< 12.2 Q	
<ul> <li>Analyzer Settings</li> </ul>						
<ul> <li>Measurement Settings</li> </ul>						
► UE Power Control						
▼UE Gain Factors	βc	βd	ΔACK	ANACK	∆CQI	
▼RMC		_				
Uplink 12.2	8	15				
Uplink 64	5	15				
Uplink 144	4	15				
Uplink 384	4	15				
Voice	11	15				
► Video						
▶ Packet Data						
HSDPA / HSUPA	11	15	5	5	2	
Default Settings	$\checkmark$					
► HSUPA						
Connection Handover UE Signal BS S	Signal I	Network	AF/RF 🤆	→ Syn	c. <u>1</u> 2	
				1		

Figure 19: Gain factor configuration

Change of TFC (5.6)

ACDMA rpp. Connection Control						
	PS: Attached CS: Registered					
Setup-	Circuit Switched/RMC Settings/					
Geometry Factor (lor/loc)						
Total Output Power (lor+loc)	-51.7 dBm					
▼Circuit Switched						
Default Settings						
DCH (Dedicated Chn.) Type	RMC					
▼RMC Settings						
Reference Channel Type	12.2 kbps Downlink/Uplink					
DL DTCH Transport Format	12.2 kbps					
DL Resources in Use	50 %					
RLC Mode (Loop Mode 1)	ТМ					
UL CRC (Sym. Loop Mode 2)	Off –					
Test Mode	Loop Mode 2					
Channel Data Source DTCH	PRBS9					
▶ HSPA						
RMC with HSDPA Settings						

nuous DPDCH ıgι re isco 20. con ıgı

🤣 🛛		<sup>3and</sup> Power	CM OFF HSUPA HSDPA	Connect Control
dBm Max.Lev Step Si: B:	TPC Pattern Conf	iguration Set 1/Pattern Type	WCDMA FDD	Inner loop TPC
-16 -18 -20 -22	TPC Algorithm TPC Step Size	Algorithm 2 1 dB		Appli- cation
-24 0 1 2 dB +4.0 ₿:	TPC Pattern Set. Test Step Precon.	Set 1 Manual		<b>Trigger</b> Ana. Lev. <mark>/</mark>
+2.0 +0.0 -2.0	Pattern Type Pattern	Alternating 0, 1 01 <sub>bin</sub>		<b>UE Signal</b> Ana.Set.
-4.0	<ul> <li>Set 2</li> <li>Set 3</li> </ul>		-	BS Sig. LVI. HSDPA HSUPA
Change of	<ul><li>Set 4</li><li>Set 5</li></ul>			BS Signal Settings
	▶ Test Step A			<b>Marker</b> Display
RF Channel	RF Frequency Freq.Offse	Test Step Precond. Config.	C Pattern Activate Setup Pattern	Menus

Figure 21 :Alternating '0' and '1' TPC configuration

Change of TFC (5.6)

	Connect Control
dBm_MaxLevel: Auto     Low noise     Freq.Offset: + 0.000 kHz     Chan./Freq: 9612 / 1922.4 l       Step Size: 1 dB     TPC Mode: Algorithm 2       IB:     / Off     II:     / Off	MHz R Inner loop
-16 Curr -18 -20 -22	Appli- cation
-24 0 1 2 3 4 5 6 7 8 9 10 0 1 2 3 4 5 6 7 8 9 dB +4.0 ₽: /Off ₽: /Off ₽: /Off Pow	10 Trigger Ana. Lev.
+2.0 Curr +0.0 -2.0	UE Signal Ana.Set.
-4.0	BS Sig. Lvl. HSDPA HSUPA
Change of TPC     TPC Pattern Setup Test Step A     Type Single Pattern+Alternating     Pattern S0 bit 20PB Pattern	BS Signal Settings
Trigger Source	Marker Display
Change of TFC     Max. UE Power     Min. UE Power       Trigger     Trigger     Trigger       Source     Level     Slope       Slope     Slot Delay       Delay Offs.	Menus

Figure 22: Change of TFC trigger configuration

Figure 23 shows the change of TFC measurement result.



Figure 23: Change of TFC measurement result


Recall TX\_meas.sav, modify the following configuration and establish CS call. BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  DL Resources in Use  $\rightarrow$  50 %

Modify the followings configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Set.  $\rightarrow$  Set 2 Trigger  $\rightarrow$  Trigger Source  $\rightarrow$  Change of TFC

Measurement result is available at: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  Inner Loop TPC Inner Loop TPC  $\rightarrow$  Measure Mode  $\rightarrow$  Change of TFC

## 2.10 Power Setting in Uplink Compressed Mode (5.7)

Compressed mode in uplink means that the power in uplink is changed. A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control. Figure 24 shows the transmit template during compressed mode.

Table 14 and 15 show the transmitter power control range and transmitter aggregate power control range respectively. Excess error in transmit power setting in compressed mode increases the interference to other channels, or increases transmission errors in the uplink.

Table 16 shows the summary of power setting in uplink compressed mode conformance requirement.



Pg is the RRC filtered mean power in an uplink transmission gap, excluding the 25 µs transient periods.
Pa is the mean power in the last slot before a compressed frame (or pair of compressed frames), excluding the 25 µs transient periods.

- Pb is the mean power in the first slot of a compressed frame, excluding the 25 µs transient periods.

- Pc is the mean power in the last slot before a transmission gap, excluding the 25 µs transient periods.

- Pd is the mean power in the first slot after a transmission gap, excluding the 25 µs transient periods.

- Pe is the mean power in the last slot of a compressed frame, excluding the 25 µs transient periods.

- Pf is the mean power in the first slot after a compressed frame (or pair of compressed frames), excluding the 25 μs transient periods.

Figure 24: Transmit template during compressed mode (Figure 5.7.4 of TS 34.121 [1])

Transmitter power control range for 3dB step size								
TPC and	Transmitter power control range for 3dB step size							
TPC_cma	Lower	Upper						
+1	+1.3 dB	+4.7 dB						
0	–0.6 dB	+0.6 dB						
-1	-1.3 dB	-4.7 dB						

Table 14: Transmitter power control range for 3dB step size (Table 5.7.11 of TS 34.121 [1])

Transmitter aggregate pov	wer con	trol range fo	or 3dB ste	p size	
	_				

TDC and maxim	Transmitter power control range after 7 equal TPC_cmd groups				
TPC_cma group	Lower	Upper			
+1	+15.7dB	+26.3dB			
0	-1.1dB	+1.1dB			
-1	-15.7dB	-26.3dB			

Table 15: Transmitter aggregate power control range for 3dB step size (Table 5.7.12 of TS 34.121 [1])

Summary of power setting in uplink compressed mode conformance requirement	
Test	Conformance requirement
$P_{b} - P_{a}$ at the boundary between CFN 6 and CFN 7	+4 ± 2.3 dB
$P_d - P_c$ , power difference in slot #9 of CFN 1 from the power in slot #1 of CFN 1	-11 ± 4.3 dB
$P_d - P_c$ , power difference in slot #9 of CFN 4from the power in slot #1 of CFN 4	+11 ± 4.3 dB
$P_d - P_c$ , power difference in slot #7 of CFN 8 from the power in slot #7 of CFN 7	0 ± 3.2 dB
$P_{f} - P_{e}$ at the boundary between CFN 8 and CFN 9	-4 ± 2.3 dB
The change in mean power from the previous slot in the slots between slot #10 of CFN 0 and slot #1 of CFN 1 inclusive	TPC_cmd = +1
The aggregate change in mean power from slot #9 of CFN 0 to slot #1 of CFN 1	TPC_cmd = +1
The change in mean power from the previous slot in the slots between slot #10 of CFN 3 and slot #1 of CFN 4 inclusive	TPC_cmd = -1
The aggregate change in mean power from slot #9 of CFN 3 to slot #1 of CFN 4	TPC_cmd = -1

Table 16: Summary of power setting in uplink compressed mode conformance requirement (Summary of 5.7.5 in TS 34.121 [1])

A RMC 12.2 kbps and downlink physical channels are setup as specified in section 2.1. The 12,2 kbps UL RMC with gain factors  $\beta_c = 0.5333$  and  $\beta_d = 1.0$  is setup in non-compressed frames as shown in Figure 19.

Figure 25 and 26 shows the pattern A and B respectively for compressed mode test.



Figure 26: Pattern B for compressed mode test (Figure 5.7.3 of TS 34.121 [1])

Table 17 shows the TPC commands transmitted in the downlink and the corresponding  $R\&S^{\circledast}CMU200$  parameter name.

TPC commands transmitted in downlink									
CFN	TPC commands in downlink	R&S <sup>®</sup> CMU200 parameter name							
0	011111111								
1	11101010	Pattern A (rising TPC)							
2	10101010101010101	1							
3	01000000								
4	00010101	Pattern A (falling TPC)							
5	01010101010101010								
6	00000000000111								
7	11111111	Dettern D							
8	00000000	rauelli D							
9	0001111111111111	-							

Table 17: TPC commands transmitted in the downlink

Uplink Compressed mode is enable as shown in Figure 27. TPC commands in Table 17 corresponds to Pattern A (rising TPC), Pattern A (falling TPC) and Pattern B in  $R\&S^{@}CMU200$ .

Configuration in R&S<sup>®</sup>CMU200:

BS signal → Compressed Mode Settings → Pattern Selection → UL CM TX Test Steps

BS signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  UL CM TX Test Pattern  $\rightarrow$  Pattern Type  $\rightarrow$  Pattern A (rising TPC), Pattern A (falling TPC) or Pattern B

	I <sup>nd</sup> Power		CM OFF HSUPA HSDPA	12	Connect Control
😑 WCDMA FDD Connection Cont	rol 🛔	PS: At	tached	CS: Re	gistered
-Setup		C	ompressed Mode	Settings/	
<ul> <li>Packet Switched</li> <li>HSDPA HS-DSCH</li> <li>HSUPA</li> <li>Downlink Physical Channels</li> <li>TPC Settings</li> <li>Compressed Mode Settings Default Settings</li> </ul>					
Pattern Selection	UL	. CM TX Te	st Steps		
<ul> <li>UE Report Pattern</li> <li>Single Pattern</li> <li>User Defined Pattern</li> <li>UL CM TX Test Pattern</li> <li>Activate Pattern</li> </ul>	E	Recute			
Pattern Type	Pa	attern A (ris	sing TPC)		
<ul> <li>DL Power Control Settings</li> </ul>					
Connection Handover UE Signal	BS Signal	Network	AF/RF ⊕+	Sync.	1 2

Figure 27: Uplink compressed mode and pattern type selection

Measurement result for uplink compressed mode is available in P/Slot Table by selecting UL CM Test Step under Measure Mode in R&S<sup>®</sup>CMU200 as shown in Figure 28. Four result view is available in P/Slot Table, i.e. Delta Step, Absolute, Delta Step Graph and Absolute Graph. Trigger is set to Compressed Mode, Signaling or Auto as shown in Figure 29. These three triggers are equivalent and denote a compressed mode trigger as long as the UL CM TX Test is active.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  P/Slot Table P/Slot Table  $\rightarrow$  Measure Mode  $\rightarrow$  UL CM Test Step P/Slot Table  $\rightarrow$  Display Mode  $\rightarrow$  Delta Step, Absolute, Delta step Graph or Absolute Graph Trigger  $\rightarrow$  Trigger source  $\rightarrow$  Compressed Mode, Signaling or Auto

Ø		W	CDI	VIA F	DD <sup>Bai</sup>	<sup>nd</sup> Pow	er		CM OF HSUP/ HSDP/	T A	Ъ	Connect Control
	Max. Step Ste	Leve Size	el:+0.0 dB e:2 dB	m Low	noise f	Freq.Offset: UL CM Test	+ 0.000 kH Step	lz Chan TPC I	./Freq.: 961) Mode: Algori	2 / 1922.4 M ithm 1 Absolute	1Hz	P/Slot Table
	0	7										Appli-
	8	15										cation
1	6	23										
2	4	31										Trigger
3	2	39										Ana, Lev.
4	0	47						OFF	OFF	OFF		
4	8	55	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		UE Signal
5	6	63	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		Ana.Set.
6	4	71	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		HSDPA
7	2	79	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		BS Sig. Lvl.
8	0	87	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		DO Olemal
8	8	95	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		BS Signal
9	6	99	OFF	OFF	OFF	OFF			All Value	es in <b>dBm</b>		Settings
TE	PC P	atter	n Setun		Test Stens	]						
Ту	/pe	9	ingle Patte	rn+Alt., CM	triggered	- Meas	ure Mod	10				Display
Pa	tterr	n 0	111	111111	101010			Stop nde	x			
	_	-		Disc	(I	ULI		Step				Menus
Repe	titio	n		Disp	Mode	measure Mo	ide Step	ettings				monus

Figure 28: Measure mode configuration for uplink compressed mode

R		W	CDI	VIA F	DD Bar	<sup>1d</sup> Pow	ver		CM OF HSUP, HSDP,	F A	τ.	Connect Control
	MaxLevel: + 0.0 dBm Low noise Freq.Offset: + 0.000 kHz Chan./Freq.: 9612 /1922.4 MHz R Step Size: 2 dB UL CM Test Step TPC Mode: Algorithm 1 Step Absolute										P/Slot Table	
ſ	0	7										Appli-
	8	15										cation
	16	23										
	24	31										Trigger
	32	39										Ana. Lev.
	40	47						OFF	OFF	OFF		
	48	55	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		UE Signal
	56	63	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		Ana.set.
	64	71	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		HSDPA
	72	79	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		BS Sig. Lvl.
	80	87	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		
	88	95	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		BS Signal
	96	99	OFF	OFF	OFF	OFF			All Value	s in <b>dBm</b>		Settings
Г		otto	rn Sotun		Toot Stope	1						
		arte			triagered							Display
	rngg	er	Source	11111		l Ma	x Acc Erro	r Inde:	x			
	Compressed Mode								b damage			
Trig	iger Sour	ce	Trigger Le	vel Trig	ger Slope	Trigger Slot Del	Trigg lay Dela	er y Offs.				Menus

Figure 29: Trigger configuration for uplink compressed mode

It is recommended to set the Test Step Precond. to Auto as shown in Figure 11, because it implicitly selects a closed loop TPC pattern type with the appropriate target power, causing the UE to transmit at the specified output power before the test is started. The output power of the UE is set to be in the range  $-36 \pm 9$  dBm for Pattern A (rising TPC), range  $2 \pm 9$  dBm for Pattern A (falling TPC) or  $-10 \pm 9$  dBm for Pattern B by referring to Figure 12.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  Test Step Precond.  $\rightarrow$  Auto UE signal  $\rightarrow$  UL Target Power  $\rightarrow$  Power  $\rightarrow$  -36 dBm (for Pattern A rising TPC), 2 dBm (for Pattern A failing TPC) or -10 dBm (for Pattern B)

Configuration with uplink compressed mode test pattern can be set in TPC Pattern Setup in R&S<sup>®</sup>CMU200. Uplink compressed mode test pattern will be displayed in R&S<sup>®</sup>CMU200 after activating the pattern.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  TPC Pattern Setup  $\rightarrow$  UL CM TX Test Steps BS Signal Settings  $\rightarrow$  Activate Pattern

Figure 30 shows uplink compressed mode measurement result.



Figure 30(a): Pattern A (rising TPC) uplink compressed mode (absolute graph) measurement result

🗞 W	CDI	VIA F	DD Bar	<sup>1d</sup> Pow	er		CM OF HSUP/ HSDP/		Connect Control
Max.Leve Step Size Step	el: + 0.0 dBi e: 2 dB	m Low	noise F l	req.Offset: JL CM Test :	+ 0.000 kH Step	z Chan. TPC N	/Freq.: 9612 1ode: Algori	2 / 1922.4 M thm 1 Delta Step	<sup>1Hz</sup> RP/Slot UN Table
0 7		2.0	GAP	GAP	GAP	GAP	GAP	GAP	Appli-
8 15	GAP	- 0.5	2.9	3.1	2.9	3.0	3.0	2.9	cation
16 23	3.0	GAP	GAP	GAP	GAP	GAP	GAP	GAP	
24 31	OVF		3.0	- 3.0	3.0	- 3.0	0.3	- 3.0	Trigger
32 39	2.1	- 2.1	2.1	- 2.1	2.1	- 2.1	2.1	- 2.1	Ana. Lev
40 47	2.1	- 2.1	2.1	- 2.1	2.1	OFF	OFF	OFF	
48 55	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	UE Signa
56 63	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Ana.set
64 71	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	HSDPA
72 79	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	BS Sig. Lvl
80 87	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	RS Signa
88 95	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Settings
96 99	OFF	OFF	OFF	OFF			All Value	s in <b>dB</b>	securigs
TPC Patter	'n Setup 🛛 🛛		Test Steps						Diaulau
Type S	ingle Patte	rn+Alt., CM	triggered		- 0.2 dB	9	- 3	4.5 dBm	Display
Pattern 0	111	111111	101010	Ma	x. Acc. Erro	r Index	Abso	olute Powe	er 🔰 💳
Channel	RF	RF	Offert	Test Step	TPCF	Pattern T	PC Patter	n Activa	ate Menus

Figure 30(b): Pattern A (rising TPC) uplink compressed mode (delta step) measurement result

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Recall UIComp.sav and establish CS call. Modify the following configurations: Menus  $\rightarrow$  Power  $\rightarrow$  Application  $\rightarrow$  P/Slot Table BS signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  UL CM TX Test Pattern  $\rightarrow$  Pattern Type  $\rightarrow$  Pattern A (rising TPC), Pattern A (falling TPC) or Pattern B UE signal  $\rightarrow$  UL Target Power  $\rightarrow$  Power  $\rightarrow$  -36 dBm (for Pattern A rising TPC), 2 dBm (for Pattern A failing TPC) or -10 dBm (for Pattern B) BS Signal Settings  $\rightarrow$  Activate Pattern

## 2.11 Occupied Bandwidth (OBW) (5.8)

Occupied bandwidth measures the bandwidth containing 99 % of the total integrated power of the transmitted spectrum, centred on the assigned channel frequency. The measured occupied bandwidth shall not exceed 5 MHz. Excess occupied channel bandwidth increases the interference to other channels or to other systems.

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4.

Measurement result for occupied bandwidth is available in ACLR FFT/OBW in R&S<sup>®</sup>CMU200.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus → Spectrum → Application → ACLR FFT/OBW



Figure 31 shows the occupied bandwidth measurement result.

Figure 31: Occupied bandwidth measurement result

Recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3

Measurement result is available at: Menus  $\rightarrow$  Spectrum  $\rightarrow$  Application  $\rightarrow$  ACLR FFT/OBW

## 2.12 Spectrum Emission Mask (5.9)

The spectrum emission mask measures the out of channel emission relative to the RRC filtered mean power of the UE carrier between 2.5 MHz and 12.5 MHz away from the UE centre carrier frequency. Excess emission increases the interference to other channels or to other systems. Table 18 and 19(a), 19(b) and 19(c) shows the spectrum emission mask requirement and additional spectrum emission limits.  $\Delta f$  is the separation between the carrier frequency and the centre of the measurement bandwidth.

#### Spectrum Emission Mask (5.9)

Spectrum Emission Mask Requirement									
Af in Mile	Minimum requirem	ent	Meeouroment hendwidth						
	Relative requirement	Absolute requirement	measurement bandwidth						
2.5 - 3.5	$\left\{-33.5 - 15 \cdot \left(\frac{\Delta f}{MHz} - 2.5\right)\right\} dBc$	-69.6 dBm	30 kHz						
3.5 - 7.5	$\left\{-33.5 - 1 \cdot \left(\frac{\Delta f}{MHz} - 3.5\right)\right\} dBc$	-54.3 dBm	1 MHz						
7.5 - 8.5	$\left\{-37.5 - 10 \cdot \left(\frac{\Delta f}{MHz} - 7.5\right)\right\} dBc$	-54.3 dBm	1 MHz						
8.5 - 12.5	-47.5 dBc	-54.3 dBm	1 MHz						

Table 18: Spectrum emission mask requirement (Table 5.9.2 of TS 34.121 [1])

Additional spectrum emission limits for Bands II, IV, X									
Δf in MHz	Frequency offset of measurement filter centre frequency, f_offset	Additional requirements Band II, IV, X	Measurement bandwidth						
2.5 MHz $\leq \Delta f < 3.5$ MHz	$2.515MHz \le f_offset < 3.485MHz$	-15 dBm	30 kHz						
$3.5 \text{ MHz} \le \Delta f \le 12.5 \text{ MHz}$	$4.0MHz \le f_offset < 12.0 MHz$	-13 dBm	1 MHz						

Table 19(a): Additional spectrum emission limits for Bands II, IV, X (Table 5.9.2A of TS 34.121 [1])

Additional spectrum emission limits for Band V									
Δf in MHz	Frequency offset of measurement filter centre frequency, f_offset	Additional requirements Band V	Measurement bandwidth						
2.5 MHz ≤ ∆f < 3.5 MHz	$2.515MHz \le f_offset < 3.485MHz$	-15 dBm	30 kHz						
$3.5 \text{ MHz} \leq \Delta f \leq 12.5 \text{ MHz}$	$3.55MHz \le f_{offset} < 12.45 MHz$	-13 dBm	100 kHz						

Table 19(b): Additional spectrum emission limits for Bands V (Table 5.9.2B of TS 34.121 [1])

Additional spectrum emission limits for Bands XII, XIII, XIV							
Δf in MHz         Frequency offset of measurement         Additional requirements         Measurement bandwi           filter centre frequency. f         offset         Band XII. XIII. XIV         Measurement bandwi							
2.5 MHz ≤ ∆f < 2.6 MHz	2.515MHz ≤ f_offset < 2.585MHz	-13 dBm	30 kHz				
$2.6 \text{ MHz} \le \Delta f \le 12.45 \text{ MHz}$	$2.65MHz \le f_{offset} < 12.45 MHz$	-13 dBm	100 kHz				

Table 19(c): Additional spectrum emission limits for Bands XII, XIII, XIV (Table 5.9.2C of TS 34.121 [1])

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4.

Measurement result for spectrum emission mask is available in Emission Mask in  ${\rm R\&S}^{\rm @}{\rm CMU200}.$ 

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Spectrum  $\rightarrow$  Application  $\rightarrow$  Emission Mask

Figure 32 shows the spectrum emission mask measurement result.



Adjacent Channel Leakage Power Ratio (ACLR) (5.10)

Figure 32: Spectrum emission mask measurement result

Recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3

Measurement result is available at: Menus  $\rightarrow$  Spectrum  $\rightarrow$  Application  $\rightarrow$  Emission Mask

# 2.13 Adjacent Channel Leakage Power Ratio (ACLR) (5.10)

ACLR is defined as the ratio of the RRC filtered mean power centred on the assigned channel frequency to the RRC filtered mean power centred on an adjacent channel frequency. Excess ACLR increases the interference to other channels or to other systems.

If the measured first and second adjacent channel RRC filtered mean power is greater than -50.0 dBm then the ratio of the power between RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency shall be higher than the limits in Table 20.

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Adjacent Channel Leakage Power Ratio (ACLR) (5.10)

UE ACLR							
Power Class	UE channel	ACLR limit					
3	+5 MHz or –5 MHz	32.2 dB					
3	+10 MHz or –10 MHz	42.2 dB					
4	+5 MHz or –5 MHz	32.2 dB					
4	+10 MHz or –10 MHz	42.2 dB					

Table 20: UE ACLR (Table 5.10.2 of TS 34.121 [1])

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4.

Measurement result for ACLR is available in ACLR Filter in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Spectrum  $\rightarrow$  Application  $\rightarrow$  ACLR Filter

Figure 33 shows the ACLR measurement result.



Figure 33: ACLR measurement result

Recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3

Measurement result is available at: Menus  $\rightarrow$  Spectrum  $\rightarrow$  Application  $\rightarrow$  ACLR Filter

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## 2.14 Spurious Emissions (5.11)

Spurious emissions are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, excluding out of band emissions. This test requires an external spectrum analyzer, e.g. R&S<sup>®</sup>FSQ, to sweep the frequency from 9 kHz to 12.75 GHz with different measurement bandwidth to capture spurious emissions.

This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  All 1

Measurement result is available in spectrum analyzer.



Recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3

## 2.15 Transmit Intermodulation (5.12)

Transmit intermodulation measures the capability of the transmitter to inhibit the generation of non linear signals caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna. These intermodulation products can fall into the UE, or Node B receive band as an unwanted interfering signal.

This test requires an external CW signal generator, e.g. R&S<sup>®</sup>SMU200A, to generate an interfering CW signal and a spectrum analyzer, e.g. R&S<sup>®</sup>FSQ, to measure RRC filtered mean power of the wanted signal and the RRC filtered mean power of the intermodulation product. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A, R&S<sup>®</sup>FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  All 1 Measurement result is available in spectrum analyzer.

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Recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3

#### 2.16 Error Vector Magnitude (EVM) (5.13.1)

The EVM measures the difference between the reference waveform and the measured waveform. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth 3.84 MHz and roll-off  $\alpha \equiv 0.22$ , and are 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 percentage. An excess EVM increases transmission errors in the up link own channel.

The EVM shall not exceed 17.5 % for the parameters specified in Table 21.

Test parameters for EVM						
Parameter	Level / Status	Unit				
Output power	≥-20	dBm				
Operating conditions	Normal conditions					
Power control step size	1	dB				

Table 21: Test parameters for EVM (Table 5.13.1 of TS 34.121 [1])

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4 and EVM is measured.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  All 1

The EVM measurement is repeated with UE power level of -18 dBm.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → Closed Loop BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → -18.0 dBm

Measurement result for EVM is available in Overview WCDMA in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA

Additional information, i.e. EVM, magnitude error and phase error are available in R&S<sup>®</sup>CMU200.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  EVM WCDMA, Magn. Error WCDMA or Phase Error WCDMA

Figure 34 shows the EVM measurement result.

	MA FDD <sup>B</sup>	and Modula	ation		Connect Control
Max.Level: Auto Multiple Signal: DPC Scr. Code: 0	Low noise CH+DPDCH 1 CC Mode: Manual	Freq.Offset: + 0 SR1: 60 CC1: 16	.000 kHz Chan	/Freq.: 9612 / 1922.4 MHz	ROverview WCDMA
Err Vect Mach — Peak	Current	Average	Max./Min. 37.8 ⊯		Applic. 1
Lint vect. magn. Freak	4.1 %	4.34 %	7.5 %		Tuisson
Magn. Error — Peak	5.9 % 2.1 %	7.14 % 2.33 %	-28.5 % 4.2 %		Ana. Lev. /
Phase Error	- 7.3 °	7.71 °	21.5 °	<b>2560</b> Chip	UE Signal
L RMS	2.0 ° - 47.28 dB	2.10 ° - 47.33 dB	3.7 ° - 42.77 dB	Meas. Length	HSDPA
I/Q Imbalance	- 32.69 dB	– 32.71 dB	- 32.49 dB	Slot Number	HSUPA BS Sig. Lvl.
Carrier Frequency Error	– 6 Hz	– 7 Hz	– 26 Hz	22.34 dBm	BS Signal
Waveform Quality	0.9983	0.99811	0.9944		Settings
Peak Code Dom. Error PCDE Code	- 31./1 dB Q 1	- 31.84 dB	-27.45 dB Q 1	Statistic Count	
Transmit Time Error	1.00 Chip	<b>1.00</b> Chip	1.00 Chip	0.00 % Out of Tolerance	
Роже	r Modulation	Spectrum	Code Dom. Power	Receiver Audio	Menus

Figure 34: EVM measurement result

For UE maximum output power, recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3 For UE output power = -18 dBm, recall TX\_meas.sav and establish CS call. Modify the following configurations: BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  UL Target Power  $\rightarrow$  -18.0 dBm Measurement result is available at: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA

## 2.17 Peak Code Domain Error (5.13.2)

The peak code domain error is computed by projecting power of the error vector onto the code domain at a specific spreading factor. The code domain error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform expressed in dB. The peak code domain error is defined as the maximum value for the code domain error for all codes. An excess peak code domain error increases transmission errors in the uplink own channel.

The peak code domain error shall not exceed -14 dB for the parameters specified in Table 22. The requirements and this test apply only to the UE in which the multi-code DPDCH transmission is provided.

Test parameters for peak code domain error						
Parameter Level / Status Unit						
Operating conditions	Normal conditions					
Uplink signal	multi-code					
Information bit rate	2*384	kbps				
Power control step size	1	dB				

Table 22: Test parameters for peak code domain error (Table 5.13.4 of TS 34.121 [1])

R&S<sup>®</sup>CMU200 supports single DPDCH code. A WCDMA call with UL RMC 384 kbps is setup by referring to Figure 1.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  384 kbps Downlink / Uplink

Downlink physical channels as specified in section 2.1 can be configured in  $R\&S^{\$}CMU200$  by referring to Figure 2(a), 2(b) and 2(c). To establish a WCDMA connection, press 'Connect UE (CS)' on  $R\&S^{\$}CMU200$  once UE has registerd with  $R\&S^{\$}CMU200$ .

A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4 and peak code domain error is measured.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  All 1

The peak code domain error measurement is repeated with UE power level of -18 dBm.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  Closed Loop BS Signal Settings  $\rightarrow$  Set 1  $\rightarrow$  UL Target Power  $\rightarrow$  -18.0 dBm

Measurement result for peak code domain error is available in Overview WCDMA in R&S<sup>®</sup>CMU200.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA

Figure 35 shows the peak code domain error measurement result.

		and Modula	ation		Connect Control
Max.Level: Auto Multiple Signal: DPC Scr. Code: 0	Low noise CH+DPDCH 1 CC Mode: Manual	Freq.Offset: + 0. SR1: 60 CC1: 16	000 kHz Chan	/Freq.: 9612 / 1922.4 MHz	ROverview WCDMA
	Current	Average	Max./Min.		Applic. 1
Err.Vect. Magn.— Peak	12.7 %	13.66 %	37.8 %		Applic, 2
L RMS	4.1 %	4.34 %	7.5 %		Triggor
Magn. Error — Peak	5.9 %	7.14 %	- 28.5 %		Ana. Lev.
L RMS	2.1 %	2.33 %	4.2 %		
Phase Error —— Peak	-7.3 °	7.71 °	21.5 °	<b>2560</b> Chip	UE Signal
L RMS	2.0 °	2.10 °	3.7 °	Meas. Length	Ana.Set.
I/Q Origin Offset	– 47.28 dB	- 47.33 dB	– 42.77 dB	0	HSDPA
I/Q Imbalance	- 32.69 dB	- 32.71 dB	– 32.49 dB	, Slot Number	BS Sig. Lvl.
Carrier Frequency Error	-6 нz	-7 нz	<b>– 26</b> нz	22.34 dBm	<b>BS Signal</b>
Waveform Quality	0.9983	0.99811	0.9944	UEPower	Settings
Peak Code Dom. Error	– 31.71 dB	- 31.84 dB	– 27.45 dB	10	
PCDE Code	Q 1		Q 1	Statistic Count	
Transmit Time Error	<b>1.00</b> Chip	<b>1.00</b> Chip	<b>1.00</b> Chip	0.00 %	
				Out of Tolerance	
Роме	r Modulation	Spectrum	Code Dom. F Power	Receiver Quality Audio	Menus

Figure 35: Peak code domain error measurement result

Ĭ For UE maximum output power, recall TX\_meas.sav, modify the following configurations and establish CS call. BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  384 kbps Downlink/Uplink \* BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3 For UE output power = - 18 dBm, recall TX\_meas.sav, modify the following configurations and establish CS call. BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  384 kbps Downlink/Uplink \* BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  UL Target Power  $\rightarrow$  -18.0 dBm Measurement result is available at: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 1  $\rightarrow$  Overview WCDMA \* Need to be done before registration, not in a call

## 2.18 UE Phase Discontinuity (5.13.3)

Phase discontinuity is the change in phase between any two adjacent timeslots, and is defined as the difference between the absolute phase used to calculate EVM for the preceding timeslot, and the absolute phase used to calculate EVM for the succeeding timeslot.

This test requiries any timeslot used in the calculation of a phase discontinuity result also passes the frequency error and EVM requirements. The EVM of every measured slot which is greater than or equal to -20 dBm shall not exceed 17.5%. The Frequency error of every measured slot shall not exceed  $\pm(0.1 \text{ ppm} + 10 \text{ Hz})$ . The phase discontinuity measurements made between any two adjacent slots shall be less than or equal to 36 degrees. If a phase discontinuity measurement is greater than 36 degrees and less than or equal to 36 degrees. No measurement shall exceed 66 degrees.

A WCDMA call is setup as specified in section 2.1. A continuously UP power control commands is sent to the UE until the UE output power shall be at maximum level as shown in Figure 4. A sequence of five down four up TPC commands as shown in Figure 36 is sent until the UE has reached the minimum power in section 2.6 with  $\pm 2$  dB tolerance. The EVM of each slot and the phase discontinuity to the next slot are measured. A sequence of five up four down TPC commands as shown in Figure 37 is sent until the UE has reached its maximum power in section 2.2 with  $\pm 2$  dB tolerance.



Figure 36: Five down four up hysteresis test pattern (Figure 5.13.3.4 of TS 34.121 [1])



Figure 37: Five up four down hysteresis test pattern (Figure 5.13.3.5 of TS 34.121 [1])

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings → TPC Pattern Config. → TPC Algorithm → Algorithm 2 BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1 BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → All 1 (for PhD Down) or All 0 (for PhD Up)

Measurement result for UE phase discontinuity is available in Phase Discont. in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 2  $\rightarrow$  PHDisc

Configuration with different test pattern can be set in TPC Pattern Setup in R&S<sup>®</sup>CMU200. Phase discontinuity test pattern will be displayed in R&S<sup>®</sup>CMU200 after activating the pattern.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings → TPC Pattern Setup → Test PhD Down or Test PhD Up BS Signal Settings → Activate Pattern

In order to measure the entire dynamic range between min power threshold and max power thereshold, power control sequences can be segmented into smaller subsequence. This can be done by pressing Activate Pattern several times to measure the entire dynamic range. Except when within 5 dB of the upper or lower thresholds, segmentation will require sufficient overlap such that every power step in one direction is followed by four steps in the other direction.

Figure 38 shows the peak code domain error measurement result.

#### UE Phase Discontinuity (5.13.3)

WCDMA FDD Band I Modulation	Connect Control
dBm         Max.Level: Auto         Low noise         Freq.Offset: + 0.000         kHz         Chan./Freq: 9612 /1922.4         MHz           Step Size: 1 dB         TPC Mode: Algorithm 1         TPC Mode: Algorithm 1         1         1         15         0: / Off         0: /	Phase Discont.
-20 -20 -25 -20 -25 -20 -20 -20 -20 -20 -20 -20 -20 -20 -20	Applic. 2 Applic. 1
0 5 10 15 20 25 30 35 40 ° ₿: / Off ₿: / Off ₽HD +50	Trigger Ana. Lev.
+0 -50	UE Signal Ana.Set.
Maximum Phase Disc. Count Internal Inte	HSUPA BS Sig. LVI.
Phase Disc.     - 1.3 °     >± 60.0°     O     TPC Pattern Setup     Test PhD Down       Freq. Error     31 Hz     >± 60.0°     O     Type     Single Pattern+Alternating       Pattern     5 x 000001111 bin	BS Signal Settings
EVM         3.87 %         Minimum Dist. > ± 30.0°         - 17.95 dBm         - 26.87 dBm           EVM         4.25 %          Max. UE Power         Min. UE Power	Marker Display
RF RF Channel Frequency Freq.Offset Precond. Config. Setup Pattern	Menus

Figure 38: UE phase discontinuity measurement result

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Recall TX\_meas.sav and establish CS call. Modify the following configurations: Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 2  $\rightarrow$  PHDisc BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 3 (for PhD Down) or Set 4 (for PhD Up) BS Signal Settings  $\rightarrow$  TPC Pattern Setup  $\rightarrow$  Test PhD Down or Test PhD Up BS Signal Settings  $\rightarrow$  Activate Pattern

### 2.19 PRACH Preamble Quality (5.13.4)

PRACH preamble quality measures the ability of the UE to transmit the PRACH preamble so that the Node B can reliably decode the PRACH. This test verifies that the transmission quality of the first PRACH preamble meets the requirements for modulation quality, carrier frequency, access slot and signature. The EVM shall not exceed 17.5 %. The frequency error shall not exceed  $\pm(0.1 \text{ ppm} + 10 \text{ Hz})$ . The detected access slot and signature shall be correct according to the physical random access procedure.

A WCDMA call is setup as specified in section 2.1. Downlink physical channels in Table 7 are configured in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -98.1 BS Signal → Downlink Physical Channels → P-CPICH → -3.9 dB BS Signal → Downlink Physical Channels → P-CCPCH → -8.3 dB BS Signal → Downlink Physical Channels → S-CCPCH → -5.3 dB BS Signal → Downlink Physical Channels → P-SCH → -11.3 dB BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c)).

Table 23 and Table 24 show the static and random PRACH quality test parameters respectively. These parameters can be configured by referring to Figure 6 and as shown in Figure 39.

Configuration in R&S<sup>®</sup>CMU200:

UE Signal → UE Power Control → Open Loop → Reported P-CPICH Power → 24.0 dB UE Signal → UE Power Control → Open Loop → UL Interference → -92 dBm UE Signal → UE Power Control → Open Loop → Constant Value → -10.0 dB Network → Random Access Settings → Preamble → Max Preamble Cycles → 1 Network → Random Access Settings → Preamble → Available Subchannels → 00000000001 Chan. 0 ... 11 Network → Random Access Settings → Preamble → Available Signatures → 0000000000001 Sign. 0 ... 15 Network → Random Access Settings → Preamble → Available Signature → Index Select → Use first index only

Static test parameters for PRACH quality								
Static Parameters	Power Class 1	Power Class 2	Power Class 3	Power Class 4	Unit			
lor	-98.1	-98.1	-98.1	-98.1	dBm / 3.84 MHz			
Nominal CPICH_RSCP	-102	-102	-102	-102	dBm			
Primary CPICH TX power	+24	+24	+24	+24	dBm			
Simulated path loss = Primary CPICH TX power – CPICH_RSCP	+126	+126	+126	+126	dB			
UL interference	-83	-89	-92	-95	dBm			
Constant Value	-10	-10	-10	-10	dB			
Expected nominal UE TX power	+33	+27	+24	+21	dBm			
Preamble Retrans Max			1					

Table 23: Static test parameter for PRACH quality (Table 5.13.4.1 of TS 34.121 [1])

Random test parameters for PRACH quality					
Random Parameters (Note)	Value				
Available RACH Sub Channels	One sub-channel chosen at random from the 12-bit Available sub channel number				
Available PRACH Signatures	One signature chosen at random from the 16-bit Available signature number				
ASC Setting	Both Available signature Start Index and Available signature End Index are 0				
AICH transmission timing Chosen at random from the range 0 to1					

Note: In order to avoid a static test configuration, each time the RACH procedure is executed, the parameters in this table are to be chosen at random from the defined range. The random function used shall be such that each of the allowed selections is chosen with equal probability.

Table 24: Random test parameter for PRACH quality (Table 5.13.4.2 of TS 34.121 [1])

	dulation	CM OFF HSUPA HSDPA	1	Connect Control
😑 WCDMA FDD Connection Control 🛔	PS: Sig	nalOff	CS: Si	gnal On
-Setup	R	andom Access S	Settings/Preamb	le/
DRX Cycle Length (2 <sup>*</sup> Frames) RACH TTI	6 20 ms			
✓Preamble	20 110			
Max Preamble Cycles	1			
Step Size AICH Transmission timing	3 dB 3 Slot			
Max Retransmission	6			
RACH Msg Part Power Offset AICH Acknowledge	-5 ав positive			
Available Subchannels	00000000001 Chn. 0 11			
Available Signatures	000000000000001 sign. 0 15			
Available Signature -> Index Select	Use first inde	x only		
✓Requested UE Data				
Default Settings				
Authentication	On			
Connection Handover UE Signal BS Sig	nal Network	AF/RF ↔	Sync.	1 2

Figure 39: PRACH preamble quality test parameters configuration

Measurement result for PRACH preamble quality is available in PRACH Preamble in R&S<sup>®</sup>CMU200. Three result view is available in PRACH Preamble, i.e. Error Vector Magnitude, Magnitude Error and Phase Error.

#### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Modulation  $\rightarrow$  Applic. 2  $\rightarrow$  PRACH Preamble PRACH Preamble  $\rightarrow$  Diagram Type  $\rightarrow$  Error Vector Magnitude, Magnitude Error or Phase Error

UE is switched on, and measurement result for PRACH preamble quality of the UE is displayed in PRACH Preamble measurement in R&S<sup>®</sup>CMU200. This test is repeated for 10 times by choosing a new set of parameter from Table 24.

Figure 40 shows the PRACH preamble quality measurement result.

#### PRACH Preamble Quality (5.13.4)

S	W		<b>/IA</b> FD	D Band	Modulat	ion	CM HSL HSL	OFF JPA DPA		Connect Control
- %	Max.Leve Error Vec	l: Auto tor Magnitu	Low nois ude	e Freq 1st Pre	Offset: + 0.000 eamble	) kHz Ch	an./Freq.: 9(	612/1922.4 MHz		PRACH Preamble
+25 +20 +15	₿:	- / Of	f	Q:	/ Off		<b>3</b> :	/ Off Current		Applic. 2 Applic. 1
+10 1611 4041		d of Control of	phang the trappe		halad Haagaadhalla maannaa ay bhalla			ntoppeters de formes Antoppenerse		Trigger Ana. Lev.
0	500	10 Voet Maa	100 15 Mogan	500 2 Evr	000 25 Phoeo Err	00 30	00 :	3500 4000	a	Ana.Set.
Pea	ak 🗌	9.70	, Magn. % E	3.19 %	- 4.43 °			24.00 dBm		BS Sig. Lvl.
RM	s	3.80	% 2	2.96 %	1.36 •			Expected Power		HSDPA HSUPA
	,	1/Q 1/Q	Origin Offse	t	-36.71 d⊟ -34.31 d⊟			15.92 dBm UE On-Power		BS Signal Settings
		Car	rrier Frequenc	v Error	0-1.0 Г ub 14 нz	-		Signature		
		Wa	veform Quali	ity	0.9986					Marker
				Me	asured D Preamble	iagram Type	Random Access	AICH	ск	Menus

Figure 40: PRACH preamble quality (error vector magnitude) measurement result



Recall Prach.sav and wait for UE registration. Measurement result is available at: *Menus*  $\rightarrow$  *Modulation*  $\rightarrow$  *Applic.* 2  $\rightarrow$  *PRACH Preamble* 

Generic Call Setup for Receiver Characteristics

## 3 Rel-99 Receiver Characteristics

### 3.1 Generic Call Setup for Receiver Characteristics

All parameters for receiver characteristics are defined using the DL reference measurement channel (12,2 kbps) as specified in TS 34.121 Annex C.3.1 unless stated otherwise.

Configuration in R&S<sup>®</sup>CMU200: BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  12.2 kbps Downlink/Uplink

All parameters of receiver characteristics are defined using the common RF receiver test conditions as specified in TS 34.121 Annex E.3.2 unless stated otherwise. Table 4 (Downlink physical channels transmitted during a connection, Table E.3.2.1 of TS 34.121[1]) shows the common RF receiver test conditions.

Configuration in R&S<sup>®</sup>CMU200:

```
BS Signal → Downlink Physical Channels → P-CPICH → -3.3 dB
BS Signal → Downlink Physical Channels → P-CCPCH → -5.3 dB
BS Signal → Downlink Physical Channels → P-SCH → -8.3 dB
BS Signal → Downlink Physical Channels → S-SCH → -8.3 dB
BS Signal → Downlink Physical Channels → PICH → -8.3 dB
BS Signal → Downlink Physical Channels → DPDCH Level Config → Test dependent
power
```

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c).

ĹΪ

Recall RX\_meas.sav and establish CS call.

## 3.2 Reference Sensitivity Level (6.2)

The reference sensitivity level <REFSENS> is the minimum mean power received at the UE antenna port at which the Bit Error Ratio (BER) shall not exceed 0.001. Lack of reception sensitivity decreases the coverage area at the far side from Node B.

A DL reference measurement channel (12,2 kbps) is setup as specified in section 3.1. The relative power level of downlink physical channels to lor are set up according to Table 7 (Downlink physical channels transmitted without dedicated connection, Table E.2.2 of TS 34.121[1]). UE is switched on and a call is setup. DPCH and lor are setup according to Table 5 (Reference sensitivity level, Table 6.2.2 of TS 34.121[1]).

Reference Sensitivity Level (6.2)

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -106 dBm BS Signal → Downlink Physical Channels → P-CPICH → -3.9 dB BS Signal → Downlink Physical Channels → P-CCPCH → -8.3 dB BS Signal → Downlink Physical Channels → S-CCPCH → -5.3 dB BS Signal → Downlink Physical Channels → P-SCH → -11.3 dB BS Signal → Downlink Physical Channels → S-SCH → -11.3 dB BS Signal → Downlink Physical Channels → PICH → -8.3 dB BS Signal → Downlink Physical Channels → PICH → -8.3 dB BS Signal → Downlink Physical Channels → DPDCH Level Config → -10.3 dB

A continuously UP power control commands is sent to the UE as shown in Figure 4 until the UE reaches its maximum output power and measure BER.

Measurement result for reference sensitivity level is available in BER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 41 shows the BER measurement result.

WCDMA FDD I Re	ceiver Quality	CM OFF HSUPA	Connect Control
0.000 %       BER         0.000 %       DL BLER         0.000 %       DBLER          FDR          UL TFCI Faults         0       500         0       500         0       500         0       FDR         0       500         0       500         0       Forme         1024 Chip       DL/UL Alignment	Settings Circuit Switched Packet Switched Packet Switched Connection Info (CS) Dedicated Chn. Type SRB Reference Chn. Type DL Resources in Use Test Mode UL CRC Data Sour. DTCH Connection Info (PS) Dedicated Chn. Type SRB RMC RMC Test Loop FBER Meas. Control Repetition Stop Condition Trp. Blk Continuous Trp. Blk SingleShot PN Auto Resynch.	Connected Attached RMC 2.5 kbps 12.2 kbps DL/UL 100 % Loop Mode 2 Off PRBS9 HSDPA Test Mod 2.5 kbps 12.2 kbps Loop Mode 1 RLC Continuous None 500 100 On	Applic. 1 Applic. 2 Analyzer Level Ana.Set. UE Signal BS Sig. Lvl. HSDPA HSUPA BS Signal Settings
Power Modulation Spect	um Code Dom. Rece Power	eiver Quality Audio	Menus

Figure 41: BER measurement result

Maximum Input Level (6.3)

Ĭ /	Recall RX_meas.sav, modify the following configurations and establish CS call.:
	BS Signal $\rightarrow$ Node-B Settings $\rightarrow$ Output Channel Power (Ior) $\rightarrow$ -106 dBm
	BS Signal $\rightarrow$ Downlink Physical Channels $\rightarrow$ P-CPICH $\rightarrow$ -3.9 dB
	BS Signal $\rightarrow$ Downlink Physical Channels $\rightarrow$ P-CCPCH $\rightarrow$ -8.3 dB
	BS Signal $\rightarrow$ Downlink Physical Channels $\rightarrow$ S-CCPCH $\rightarrow$ -5.3 dB
	BS Signal $\rightarrow$ Downlink Physical Channels $\rightarrow$ P-SCH $\rightarrow$ -11.3 dB
	BS Signal $\rightarrow$ Downlink Physical Channels $\rightarrow$ S-SCH $\rightarrow$ -11.3 dB
	Measurement result is available at:
(	Menus $\rightarrow$ Receiver Quality $\rightarrow$ Applic. 1 $\rightarrow$ BER

## 3.3 Maximum Input Level (6.3)

Maximum input level is defined as the maximum mean power received at the UE antenna port, which BER shall not exceed 0.001. Lack of maximum input level causes loss of coverage near the Node B.

A DL reference measurement channel (12,2 kbps) is setup as in section 3.1. Table 25 and Table 26 show the test requirement for maximum input level and downlink physical channels transmitted during a connection respectively.

Test requirements for Maximum Input Level						
Parameter Level / Status Unit						
lor	-25.7	dBm / 3.84MHz				
DPCH_Ec / lor	-19	dB				
UE transmitted mean power	20 (for Power class 3 and 3bis) 18 (for Power class 4)	dBm				

Table 25: Test requirement for maximum input level (Table 6.3.3 of TS 34.121 [1])

Downlink Physical Channels transmitted during a connection					
Physical channel	Power				
P-CPICH	$P-CPICH_Ec / lor = -10 dB$				
S-CPICH	S-CPICH_Ec / lor = -10 dB (Note)				
P-CCPCH	$P-CCPCH_Ec / lor = -12 dB$				
SCH	$SCH_Ec / lor = -12 dB$				
PICH	$PICH_Ec / lor = -15 dB$				
DPCH	Test dependent power				
OCNS	Necessary power so that total transmit power spectral density of Node B (lor) adds to one				

Note: When S-CPICH is the phase reference in a test condition, the phase of S-CPICH shall be 180 degrees offset from the phase of P-CPICH. When S-CPICH is not the phase reference, it is not transmitted. *Table 26: Downlink physical channels transmitted during a connection (Table E.3.3 of TS 34.121 [1])* 

Maximum Input Level (6.3)

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior) BS Signal → Node-B Settings → Output Channel Power (Ior) → -25.7 dBm BS Signal → Downlink Physical Channels → P-CPICH → -10.0 dB BS Signal → Downlink Physical Channels → S-CPICH → Off BS Signal → Downlink Physical Channels → P-CCPCH → -12.0 dB BS Signal → Downlink Physical Channels → P-SCH → -15.0 dB BS Signal → Downlink Physical Channels → S-SCH → -15.0 dB BS Signal → Downlink Physical Channels → PICH → -15.0 dB BS Signal → Downlink Physical Channels → PICH → -15.0 dB BS Signal → Downlink Physical Channels → DPDCH Level Config → -19.0 dB

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c).

Power control algorithm 2 is sent to the UE so that UE output power shall be kept at the specified power level with  $\pm 1$  dB tolerance.

Configuration in R&S<sup>®</sup>CMU200:

```
BS Signal Settings → TPC Pattern Config. → TPC Algorithm → Algorithm 2
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → Closed Loop
BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → 20.0 dBm
```

Measurement result for maximum input level is available in BER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 41 shows the BER measurement result.



Recall MaxInput.sav and establish CS call. Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

## 3.4 Adjacent Channel Selectivity (ACS) (Rel-99 and Rel-4) (6.4)

Adjacent Channel Selectivity (ACS) measures the receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s). This test condition is equivalent to ACS value 33 dB.

This test requires an external WCDMA signal generator, e.g. R&S<sup>®</sup>SMU200A, to generate interfering WCDMA modulated signal. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 3.1. BER shall not exceed 0.001.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior) BS Signal → Node-B Settings → Output Channel Power (Ior) → -92.7 dBm BS Signal → Downlink Physical Channels → DPDCH Level Config → -10.3 dB

Power control algorithm 2 is sent to the UE so that UE output power shall be kept at the specified power level with  $\pm 1$  dB tolerance.

Configuration in R&S<sup>®</sup>CMU200:

```
BS Signal Settings → TPC Pattern Config. → TPC Algorithm → Algorithm 2
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → Closed Loop
BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → 20.0 dBm
```

Measurement result for adjacent channel selectivity is available in BER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 41 shows the BER measurement result.



Recall RX\_meas.sav and establish CS call. Modify the following configuration: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -92.7 dBm BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

# 3.5 Adjacent Channel Selectivity (ACS) (Rel-5 and later releases) (6.4A)

Adjacent Channel Selectivity (ACS) measures the receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s). This test condition is equivalent to ACS value 33 dB.

This test requires an external WCDMA signal generator, e.g. R&S<sup>®</sup>SMU200A, to generate interfering WCDMA modulated signal. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 3.1. BER shall not exceed 0.001. The following configuration is used for UE supporting operating band I.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior) BS Signal → Node-B Settings → Output Channel Power (Ior) → -92 dBm (Case 1) or -65 dBm (Case 2)(Note) BS Signal → Downlink Physical Channels → DPDCH Level Config → -10.3 dB

Power control algorithm 2 is sent to the UE so that UE output power shall be kept at the specified power level with  $\pm 1$  dB tolerance.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings → TPC Pattern Config. → TPC Algorithm → Algorithm 2 BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1 BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → Closed Loop BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → 20.0 dBm

Measurement result for adjacent channel selectivity is available in BER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 41 shows the BER measurement result.

Recall RX\_meas.sav and establish CS call. Modify the following configuration: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -92.0 dBm (Case 1) or -65 dBm (Case 2) BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

## **3.6 Blocking Characteristics (6.5)**

Blocking characteristic measures the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

BER shall not exceed 0.001 for blocking characteristic testing. Lack of blocking ability decreases the coverage area when other transmitter exists.

This test requires an external signal generator, e.g.  $R\&S^{@}SMU200A$ , to generate interfering WCDMA modulated or CW signals from 1 MHz to 12.75 GHz with  $\pm$ 10 MHz step size for in-band blocking and 1 MHz step size for out-of-band blocking. This test is recommended to be performed remotely. Detail setup information on  $R\&S^{@}SMU200A$  and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 3.1. DPCH and lor are configured to the requirement of blocking characteristics testing. The following configuration is used for UE supporting operating band I.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -103.0 dBm BS Signal → Downlink Physical Channels → DPDCH Level Config → -10.3 dB

Power control algorithm 2 is sent to the UE so that UE output power shall be kept at the specified power level with  $\pm 1$  dB tolerance. The following configuration is used for UE power class 3.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings → TPC Pattern Config. → TPC Algorithm → Algorithm 2 BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1 BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → Closed Loop BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → 20.0 dBm

Measurement result for blocking characteristic is available in BER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 41 shows the BER measurement result.

Recall RX\_meas.sav and establish CS call. Modify the following configuration: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -103.0 dBm BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

## 3.7 Spurious Response (6.6)

Spurious response measures the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out-of-band blocking limit is not met.

BER shall not exceed 0.001 for spurious response testing. Lack of spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

This test requires an external signal generator, e.g. R&S<sup>®</sup>SMU200A, to generate interfering CW signals at frequencies that do not meet out out-of-band blocking limit in section 3.5. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, the configuration and measurement result are same as specified in section 3.5 for UE supporting operating band I with power class 3.

Recall RX\_meas.sav and establish CS call. Modify the following configuration: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -103.0 dBm BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

## 3.8 Intermodulation Characteristics (6.7)

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection measures the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

BER shall not exceed 0.001 for intermodulation characteristics testing. Lack of intermodulation response rejection ability decreases the coverage area when two or more interfering signals, which have a specific frequency relationship to the wanted signal, exist.

This test requires an external signal generator, e.g. R&S<sup>®</sup>SMU200A, to generate interfering WCDMA modulated and CW signals at  $\pm$  10 MHz and  $\pm$  20 MHz from assigned frequency channel. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, the configuration and measurement result are same as specified in section 3.5 for UE supporting operating band I with power class 3.

П

Recall RX\_meas.sav and establish CS call. Modify the following configuration: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -103.0 dBm BS Signal Settings  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

## 3.9 Spurious Emissions (6.8)

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector. Excess spurious emissions increase the interference to other systems. This test requires external spectrum analyzer, e.g. R&S<sup>®</sup>FSQ, to sweep the frequency from 30 MHz to 12.75 GHz with different measurement bandwidth to capture spurious emissions.

This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, UE is setup in Cell\_FACH state where UE will continuously monitors the S-CCPCH and will not be transmitting as shown in Figure 42.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal Settings  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  Sign. RAB – Cell FACH

Table 27 shows the downlink physical channels transmitted during receiver spurious emissions test.

Downlink Physical Channels transmitted during the RX spurious emissions test					
Physical channel	Power				
CPICH	–86dBm / 3.84MHz				
P-CCPCH	P-CCPCH_Ec/ CPICH_Ec	= -2 dB			
SCH	SCH_Ec / CPICH_Ec	= -2 dB			
PICH	PICH_Ec / CPICH_Ec	= -5 dB			
S-CCPCH	S-CCPCH_Ec / CPICH_Ec	= -2 dB			

Table 27: Downlink physical channels transmitted during a connection (Table E.3.2.2 of TS 34.121 [1])

Spurious Emissions (6.8)

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → PCPICH BS Signal → Downlink Physical Channels → P-CPICH → -86.0 dB BS Signal → Downlink Physical Channels → P-CCPCH → -2.0 dB BS Signal → Downlink Physical Channels → S-CCPCH → -2.0 dB BS Signal → Downlink Physical Channels → P-SCH → -5.0 dB BS Signal → Downlink Physical Channels → S-SCH → -5.0 dB BS Signal → Downlink Physical Channels → PICH → -5.0 dB

These downlink physical channels can be configured in R&S<sup>®</sup>CMU200 by referring to Figure 2(a), 2(b) and 2(c). To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

WCDMA FDD I Re	ceiver G	Quality HSDF	F i ji	Connec Contro
NCDMA FDD Connection Control 🛔	PS:	ldle	CS: Si	gnal On
Setup		Circuit Switche	ed/	
▼Node-B Settings	Channel	Frequency	Uplink	
RF Channel Downlink Band [1]	10562	2112.4 мн <del>и</del>	1922.4 мн	z
Frequency Offset	+ 0.000	kHz		
RX/TX Separation	190.000	) MHz		
Primary Scrambling Code	9			
Level Reference	PCPICH	4		
Output Channel Power (lor)	-59.3 d	IBm		
OCNS (R99)	8.9 dB			
AMGN Noise Pwr. (@3.84 MHz, loc)	-60.0 d	IBm		
Geometry Factor (lor/loc)	0.7 dB			
Total Output Power (lor+loc)	- 56.6 d	IBm		
Default Settings				
DCH (Dedicated Chn.) Type	Sign, RA	AB - Cell FACH	1	
▼RMC Settings				
nection Handover UE Signal BS Sig	nal Neti	vork AF/RF (	➔ Sync.	1

Figure 42: Cell FACH dedicated channel configuration

Measurement result is available in spectrum analyzer.



Recall SpuEmi.sav and establish CS call.

Generic Call Setup for Performance Requirements

## 4 Rel-99 Performance Requirements

## 4.1 Generic Call Setup for Performance Requirements

Table 28 shows the measurement channels for performance requirements. Table 29 shows the Block Error Ratio (BLER) test method and measurement channels for BLER tests for UL DL data rate combinations in circuit switched domain as specified in TS 34.121 Annex C.6.

Bit / symbol rate for test channel							
Type of User Information	User bit rate	DL DPCH symbol rate	DL DPCH bit rate	TTI (ms)			
12,2 kbps reference measurement channel	12.2 kbps	30 ksps	60 kbps	20			
64 kbps reference measurement channel	64 kbps	120 ksps	240 kbps	20			
144 kbps reference measurement channel	144 kbps	240 ksps	480 kbps	20			
384 kbps reference measurement channel	384 kbps	480 ksps	960 kbps	10			

Table 28: Bit / symbol rate for test channel (Table 7.1.1 of TS 34.121 [1])

BLER test method and measurement channels for BLER tests for UL DL data rate combinations							
DL rate [kbps]	UE UL RMC rate capability [kbps]	BLER test method	DL RMC	UL RMC	UE test loop mode		
12.2	RMC 12.2	Loopback Data + CRC	DL TM RMC 12.2 kbps	UL TM AUXMC 12.2 kbps, no CRC	2		
64	RMC 12.2	AM ACK / NACK	DL AM RMC 64 kbps	UL AM AUXMC 12.2 kbps	1*		
64	RMC 12.2	AM ACK / NACK	DL AM RMC 64 kbps	UL AM AUXMC 12.2 kbps	1*		
144	RMC 12.2	AM ACK / NACK	DL AM RMC 144 kbps	UL AM AUXMC 12.2 kbps	1*		
384	RMC 12.2	AM ACK / NACK	DL AM RMC 384 kbps	UL AM AUXMC 12.2 kbps	1*		

Perform test in PS domain

Table 29: BLER test method and measurement channels for BLER tests for UL DL data rate combinations in circuit switched domain (Table C.6.2 of TS 34.121 [1])

Configuration in R&S<sup>®</sup>CMU200 (transparent mode (TM) loopback data + CRC): BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  12.2

kbps Downlink/Uplink

Network  $\rightarrow$  Random Access Settings  $\rightarrow$  RACH TTI  $\rightarrow$  20ms BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  UL CRC (Sym Loop Mode 2)  $\rightarrow$  Off BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Test Mode  $\rightarrow$  Loop Mode 2

#### Generic Call Setup for Performance Requirements

WCDMA FDD Band Re	eceiver Quality	iect rol
CDMA FDD Connection Control 📄	PS: Idle CS: Signal O	n
Setup	Random Access Settings/RACH TTI	
Default All Settings WCDMA Band Select Packet Switched Domain • Network Identity • Random Access Settings Default Settings DRX Cycle Length (2 <sup>X</sup> Frames)	Operating Band I On G	
RACHITTI	20 ms	
<ul> <li>Preamble</li> <li>Requested UE Data</li> <li>Cell Reselection Information</li> <li>WCDMA Intra Neighbour Cell List</li> <li>WCDMA Inter Neighbour Cell List</li> <li>GSM Neighbour Cell List</li> </ul>		

Figure 43: TTI configuration

<b>\$</b>	W	CDM/	A FDD B	and Re	ceiver Qua	ality HSU	PF PA PA	Connect Control
<mark>- W</mark>	CDMA	FDD Conne	ction Cont	rol 🛔	PS:	ldle	CS:	Signal On
Ę	Setup					- Circuit Switch	ed/RMC Setting:	s/Test Mode
	Tot Circui ⊡≏f	al Output Po t Switched ault Settings	wer (lor+loc)	I	-56.6 dBm			
E	DCI TRM	H (Dedicated C Settings	, I Chn.) Type		RMC			
	Reference Channel Type				12.2 kbps Do	wnlink/Uplink		
	DL Resources in Use RL C Mode (Loop Mode 1)			100 % TM				
	UL CRC (Sym. Loop Mode 2) Test Mode			Off Loop Mode	e 2			
	Ct	hannel Datas SPA MC with HSD se Settings	Source DTC PA Settings	Э С	PRBS9			
Conne	ection	Handover	UE Signal	BS Sig	inal Networ	K AF/RF	⊕• Sync.	1 2

igure 44: Ti nsparent mode (TM) loopback data + CRC configuration
Generic Call Setup for Performance Requirements

Configuration in R&S<sup>®</sup>CMU200 (acknowledged mode (AM) ACK / NACK): BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC

BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 64 kbps Downlink / 12.2 kbps Uplink, 144 kbps Downlink / 12.2 kbps Uplink or 384 kbps Downlink / 12.2 kbps Uplink

Network  $\rightarrow$  Random Access Settings  $\rightarrow$  RACH TTI  $\rightarrow$  20ms (64 kbps Downlink / 12.2 kbps Uplink, 144 kbps Downlink / 12.2 kbps Uplink) or 10ms (384 kbps Downlink / 12.2 kbps Uplink)

BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  RLC Mode (Loop Mode 1)  $\rightarrow$  AM BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Test Mode  $\rightarrow$  Loop Mode 1

WCDMA FDD Band Re	ceiver Quality
WCDMA FDD Connection Control 🛔	PS: Signal Off CS: Signal Off
-Setup	Circuit Switched/RMC Settings/Test Mode
AWGN Noise Pwr. (@3.84 MHz, loc) Geometry Factor (lor/loc) Total Output Power (lor+loc)	- 48.0 dBm - 3.7 dB - 46.5 dBm
Default Settings	
RMC Settings	
Reference Channel Type DL DTCH Transport Format	64 kbps Downlink / 12.2 kbps Uplink
DL Resources in Use RL C Mode (Loop Mode 1)	100 %
UL CRC (Sym. Loop Mode 2)	Off
l est Mode Channel Data Source DTCH	PRBS9
► HSPA	
Connection Handover UE Signal BS Sig	nal Network AF/RF 🗇 Sync. 🚺 2

Figure 45: Acknowledged mode (AM) ACK / NACK configuration

All Block Error ratio (BLER) measurements in clause 7 shall be performed according to statistical testing as specified in TS 34.121 Annex F.6.

Configuration in R&S<sup>®</sup>CMU200 (transparent mode (TM) loopback data + CRC): Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER BER  $\rightarrow$  Stop Condition  $\rightarrow$  Confidence Level

Configuration in R&S<sup>®</sup>CMU200 (acknowledged mode (AM) ACK / NACK): Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  RLC BLER

Generic Call Setup for Performance Requirements

	Receiver Quality	CM OFF HSUPA	Connect Control
BER          DL BLER          DBLER          FDR          FDR          UL TFCH         Transp. Blocks Confidence         0       27951          Lost Transp. Blocks          PN Discontinuity          DL/UL Alignment         Stop Condition         Confidence L evalue	Settings Settings Signalling State Circuit Switched Packet Switched Connection Info (CS) Dedicated Chn. Type SRB Reference Chn. Type DL Resources in Use Test Mode UL CRC Data Sour. DTCH Connection Info (PS) Dedicated Chn. Type SRB RMC RMC Test Loop SRB RMC RMC Test Loop Step Condition Trp. Blk Continuous Trp. Blk SingleShot PN Auto Resynch.	Registered Attached A RMC 2.5 kbps 12.2 kbps DL/UL 100 % Loop Mode 2 Off PRBS9 HSDPA Test Mod 2.5 kbps 12.2 kbps 12.2 kbps Loop Mode 1 RLC Continuous Confidence Level 500 100 On	BER Applic. 1 Applic. 2 Analyzer Level Ana.Set. UE Signal BS Sig. LVI. HSDPA HSUPA BS Signal Settings
Stop         T           Repetition         Stop         T	ransp. Blocks	PN Auto Resync	Menus

Figure 46: TM loopback + CRC BLER statistical testing configuration

All parameters of performance requirements are defined using the common RF performance test conditions as specified in TS 34.121 Annex E.3.3 unless stated otherwise. Table 26 shows the common RF performance test conditions.

### Configuration in R&S<sup>®</sup>CMU200:

```
BS Signal → Downlink Physical Channels → P-CPICH → -10.0 dB
BS Signal → Downlink Physical Channels → S-CPICH → -10.0 dB (when phase
reference is S-CPICH, otherwise Off)
BS Signal → Downlink Physical Channels → P-CCPCH → -12.0 dB
BS Signal → Downlink Physical Channels → P-SCH → -15.0 dB
BS Signal → Downlink Physical Channels → S-SCH → -15.0 dB
BS Signal → Downlink Physical Channels → PICH → -15.0 dB
BS Signal → Downlink Physical Channels → DPDCH Level Config → test dependent
power
```

Unless otherwise stated, the UE output power for the tests shall be greater than -10 dBm.

Configuration in R&S<sup>®</sup>CMU200: BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Algorithm  $\rightarrow$  Algorithm 2 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  TPC Pattern Set  $\rightarrow$  Set 1 BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  Pattern Type  $\rightarrow$  Closed Loop BS Signal Settings  $\rightarrow$  TPC Pattern Config.  $\rightarrow$  Set 1  $\rightarrow$  UL Target Power  $\rightarrow$  > -10 dBm



Recall PX\_meas.sav and establish CS call.

### 4.2 Demodulation of Dedicated Channel (DCH) in Static Propagation Conditions (7.2.1)

The receive characteristic of the Dedicated Channel (DCH) in the static environment is determined by the Block Error Ratio (BLER). The UE shall be tested only according to the supported data rate. This test verifies the ability of the receiver to receive a predefined test signal, representing a static propagation channel for the wanted and for the co-channel signals from serving and adjacent cells, with a BLER not exceeding a specified value.

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 4.1. lor, loc, DPCH and S-CPICH are configured to the requirement of demodulation of DCH in static propagation conditions. Table 30 and 31 show the DCH parameters and requirements in static propagation conditions respectively.

DCH parameters in static propagation conditions							
Parameter	Test 1	Test 2	Test 3	Test 4	Unit		
Phase reference		P-CPICH					
lor / loc		- 0.7					
loc	-60 dBm / 3.84						
Information Data Rate	12.2	12.2 64 144 384					

Table 30: DCH parameters in static propagation conditions (Table 7.2.1.3 of TS 34.121 [1])

DCH requirements in static propagation conditions				
Test Number	DPCH_Ec / lor	BLER		
1	–16.5 dB	10 <sup>-2</sup>		
_	-13.0 dB	10 <sup>-1</sup>		
2	−12.7 dB	10 <sup>-2</sup>		
_	–9.8 dB	10 <sup>-1</sup>		
3	–9.7 dB	10 <sup>-2</sup>		
4	–5.5 dB	10 <sup>-1</sup>		
	–5.4 dB	10 <sup>-2</sup>		

Table 31: DCH requirements in static propagation conditions (Table 7.2.1.4 of TS 34.121 [1])

### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior) BS Signal → Node-B Settings → Output Channel Power (Ior) → -60.7 dBm

BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → -60.0 dBm

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  S-CPICH  $\rightarrow$  Off

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  DPDCH Level Config  $\rightarrow$  test dependent power

Measurement result for BLER is available in BER and RLC BLER in R&S<sup>®</sup>CMU200.

### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER (TM loopback data + CRC) or Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  RLC BLER (AM ACK / NACK) Demodulation of Dedicated Channel (DCH) in Static Propagation Conditions (7.2.1)

0.000 %       Early Pass BER         0.000 %       Early Pass DL BLER         0.000 %       Early Pass DL BLER         0.000 %       Early Pass DBLER          FDR          FDR          FDR         UL TFCI Faults       Reference Chn. Type         Reference Chn. Type       122 kbps DL/UL         100 %       Lost Transp. Blocks Confidence         28299335       UL ST Transp. Blocks         0       Lost Transp. Blocks Confidence         28299335       Lost Transp. Block Delay         MC       122 kbps         MC       25 kbps         RMC       122 kbps         Dedicated Chn. Type       DL/UL         DL Resources in Use       Off         Transp. Blocks Confidence       Off         *Connection Info (PS)       Dedicated Chn. Type         Dedicated Chn. Type       HSDPA Test Mod         25 kbps       BS Signal         RMC       122 kbps         RMC       122 kbps         BS Signal       Stop Condition         Stop Condition       Confidence Level         Trp. Blk SingleShot       100	<b>WC</b>		) <sup>Band</sup> Rec	eiver Quality	CM OFF HSUPA HSDPA	Connect Control
PN Auto Resynch. On	0.000 % 0.000 % 0.000 %  28299335 0 0 6 Frame 1024 Chip	Early Pass I Early Pass I Early Pass I Early Pass I Transp. Blocks Cor Lost Transp. Blocks PN Discontinuity Transport Block De DL/UL Alignment	BER DL BLER DBLER DR JL TFCI Faults Infidence	Settings ✓ Signalling State Circuit Switched Packet Switched ✓ Connection Info (CS) Dedicated Chn. Type SRB Reference Chn. Type DL Resources in Use Test Mode UL CRC Data Sour. DTCH ✓ Connection Info (PS) Dedicated Chn. Type SRB RMC RMC Test Loop ✓ BER ✓ Meas. Control Repetition Stop Condition Trp. Blk Continuous Trp. Blk Continuous Trp. Blk Continuous	Connected Attached RMC 2.5 kbps 12.2 kbps DL/UL 100 % Loop Mode 2 Off PRBS9 HSDPA Test Mod 2.5 kbps 12.2 kbps 12.2 kbps Loop Mode 1 RLC Continuous Confidence Level 500 100 On	SER Applic. 1 Applic. 1 Analyzer .evel Ana.Set. UE Signa 3S Sig. L ISDPA HSUP/ BS Signa Settings

Figure 47 and 48 show the TM loopback data + CRC BLER statistical testing and AM ACK / NACK BLER measurement result respectively.

Figure 47: TM loopback data + CRC BLER statistical testing measurement result

🤣 🔽		FDD Band	Receiver C	עמ <mark>ונא איצ</mark> אשנייאים איצ		Connect Control
Max.L kBit/s <u>+100</u>	.evel: Auto	Low noise Freq.O <b>Q</b> :	ffset: + 0.000 kHz / Off	Chan./Freq.: 96	012 / 1922.4 MHz	
+90 +80 +70 +60					Curr.	Applic. 1 Applic. 2
+30 +40 +30 +20 +10						Analyzer Level
+0	20 40 60 DL PDU	0 80 100 DL SDU	120 140 UL PDU	160 180 2 UL SDU	200 220 s — Downlink	<b>UE Signal</b> Ana.Set.
Blocks	3648		3647		— Uplink	BS Sig. Lvl.
Bytes Thrn (kBit/s)	583680	511680	109410	89880	DL BLER	HSUPA
- Cur	64.000	52.000	12.000	10.000	0.000 %	BS Signal
– Avg	64.000	56.105	11.997	9.855	0.816 %	Settings
– Max	64.000	109.200	12.000	11.000		
LMin	64.000	0.000	11.000	8.000		Marker
RLCNACKS	27	RLC Resets	0	RLC Time (ms)	72960	
BER	UE Report	HSDPA ACK	DPA HS-DI CQI L	PCCH ogging RLC BL	.ER	Menus

Figure 48: AM ACK / NACK BLER measurement result

Demodulation of DCH in Multi-path Fading Propagation Conditions, Single Link Performance (7.3.1)



For test number 1, recall PX\_meas.sav and establish CS call.

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

### 4.3 Demodulation of DCH in Multi-path Fading Propagation Conditions, Single Link Performance (7.3.1)

The receive characteristics of the Dedicated Channel (DCH) in different multi-path fading environments are determined by the Block Error Ratio (BLER) values. The UE shall be tested only according to the supported data rate. This test verifies the ability of the receiver to receive a predefined test signal, representing a multi-path fading propagation channel for the wanted and for the co-channel signals from serving and adjacent cells, with a BLER not exceeding a specified value.

This test requires an external multi-path fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition case 1, case 2, case 3 and case 6. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 4.1. lor, loc, DPCH and S-CPICH are configured to the requirement of demodulation of DCH in multi-path fading propagation conditions. Table 32 shows the summary of test parameters for different multi-path fading conditions.

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → test dependent power BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → Off BS Signal → Downlink Physical Channels → S-CPICH → -10.0 dB (for test number 13, 14, 15 and 16. Off for all other test numbers)<sup>Note</sup> BS Signal → Downlink Physical Channels → DPDCH Level Config → test dependent power

Note: Activate S-CPICH for test number 13, 14, 15 and 16 which uses S-CPICH as phase reference. For all other test numbers, S-CPICH is set to off as P-CPICH is the phase reference.

Measurement result for BLER is available in BER and RLC BLER in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200:

 $\begin{array}{l} \textit{Menus} \rightarrow \textit{Receiver Quality} \rightarrow \textit{Applic. 1} \rightarrow \textit{BER} (\textit{TM loopback data} + \textit{CRC}) \textit{ or } \\ \textit{Menus} \rightarrow \textit{Receiver Quality} \rightarrow \textit{Applic. 1} \rightarrow \textit{RLC BLER} (\textit{AM ACK} / \textit{NACK}) \end{array}$ 

### Demodulation of DCH in Multi-path Fading Propagation Conditions, Single Link Performance (7.3.1)

DCH para	ameters	in multi-path fadin	g propagatior	n conditions		
Test number	Case	Information data rate [kbps]	Phase reference	lor / loc [dB]	loc [dBm / 3.84 MHz]	DPCH_Ec / lor [dB]
1	1	12.2				-14.9
2	1	64				-13.8
						-9.9
3	1	144	P-CPICH	9.6	-60	-10.5
	'					-6.7
4	1	384				-6.2
-		004				-2.1
5	2	12.2		-2.4		-7.6
6	2	64		-2.4		-6.3
0	-			2.7		-2.6
7	2	144	P-CPICH	3.6	-60	-8.0
	-	177		0.0		-5.0
8	2	384		66		-5.4
0	-	004		0.0		-3.1
9	3	12.2		-2.4		-11.7
						-8.0
10	3	64		-2.4		-7.3
			P-CPICH			-6.7
	3	144			-60	-8.9
11				3.6	-00	-8.4
						-7.9
						-5.8
12	3	384		6.6		-5.0
						-4.3
13	1	12.2				-14.9
14	1	64				-13.8
14	I	04				-9.9
15	1	111	S-CPICH	9.6	-60	-10.5
10						-6.7
16	1	384				-6.2
10		504				-2.1
17	6	12.2		-2.4		-8.7
						-5.0
18	6	64		-2.4		-4.3
						-3.7
			P-CPICH		-60	-5.9
19	6	144		3.6	-00	-5.4
						-4.9
						-2.8
20	6	384		6.6		-2.0
						-1.3

Table 32: DCH parameters in multi-path fading propagation conditions (Summary of Table 7.3.1.11, 7.3.1.12, 7.3.1.13, 7.3.1.14, 7.3.1.15, 7.3.1.16, 7.3.1.17, 7.3.1.18, 7.3.1.19 and 7.3.1.20 of TS 34.121 [1])

Demodulation of DCH in Multi-path Fading Propagation Conditions, Single Link Performance (7.3.1)

Figure 47 and 48 show the TM loopback data + CRC BLER statistical testing and AM ACK / NACK BLER measurement result respectively.



### 4.4 Demodulation of DCH in Moving Propagation Conditions, Single Link Performance (7.4.1)

The receive single link performance of the Dedicated Channel (DCH) in dynamic moving propagation conditions are determined by the Block Error Ratio (BLER) values. The UE shall be tested only according to the supported data rate. This test verifies the ability of the receiver to receive a predefined test signal, representing a moving propagation channel for the wanted and for the co-channel signals from serving and adjacent cells, with a BLER not exceeding a specified value.

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate signal with moving propagation condition. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 4.1. lor, loc, DPCH and S-CPICH are configured to the requirement of demodulation of DCH in moving propagation conditions.

### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior) BS Signal → Node-B Settings → Output Channel Power (Ior) → -60.4 dBm BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, Ioc) → Off BS Signal → Downlink Physical Channels → S-CPICH → Off BS Signal → Downlink Physical Channels → DPDCH Level Config → -14.4 dB (for 12.2 kbps information data rate) or -10.8 dB (for 64 kbps information data rate)

Measurement result for BLER is available in BER and RLC BLER in R&S<sup>®</sup>CMU200.

### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER (TM loopback data + CRC) or Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  RLC BLER (AM ACK / NACK)

Figure 47 and 48 show the TM loopback data + CRC BLER statistical testing and AM ACK / NACK BLER measurement result respectively.



For test number 1, recall PX\_meas.sav and establish CS call. Modify the following configuration:

BS Signal → Node-B Settings → Output Channel Power (Ior) → -60.4 dBm BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, Ioc) → Off BS Signal → Downlink Physical Channels → DPDCH Level Config → -14.4 dBm

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

### 4.5 Demodulation of DCH in Birth-Death Propagation Conditions, Single Link Performance (7.5.1)

The receive single link performance of the Dedicated Channel (DCH) in dynamic birthdeath propagation conditions are determined by the Block Error Ratio (BLER) values. The UE shall be tested only according to the supported data rate. This test verifies the ability of the receiver to receive a predefined test signal, representing a birth-death propagation channel for the wanted and for the co-channel signals from serving and adjacent cells, with a BLER not exceeding a specified value.

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate signal with birth-death propagation condition. This test is recommended to be performed remotely. Detail setup information on R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S<sup>®</sup>CMU200, a WCDMA call is setup as specified in section 4.1. lor, loc, DPCH and S-CPICH are configured to the requirement of demodulation of DCH in moving propagation conditions.

### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -60.4 dBm BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → Off BS Signal → Downlink Physical Channels → S-CPICH → Off BS Signal → Downlink Physical Channels → DPDCH Level Config → -12.5 dB (for 12.2 kbps information data rate) or -8.6 dB (for 64 kbps information data rate)

Measurement result for BLER is available in BER and RLC BLER in R&S<sup>®</sup>CMU200.

### Configuration in R&S<sup>®</sup>CMU200:

Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER (TM loopback data + CRC) or Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  RLC BLER (AM ACK / NACK)

Figure 47 and 48 show the TM loopback data + CRC BLER statistical testing and AM ACK / NACK BLER measurement result respectively.



For test number 1, recall PX\_meas.sav and establish CS call. Modify the following configuration:

BS Signal → Node-B Settings → Output Channel Power (Ior) → -60.4 dBm BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, Ioc) → Off BS Signal → Downlink Physical Channels → DPDCH Level Config → -12.5 dBm

Measurement result is available at: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

### 4.6 Power Control in the Downlink, Constant BLER Target (Release 5 and earlier) (7.8.1)

Power control in the downlink is the ability of the UE receiver to converge to required link quality set by the network, while using as low power as possible in downlink. If a BLER target has been assigned to a DCCH, outer loop will be based on DTCH and not on DCCH.

Table 33(a) and 33(b) show the requirement for downlink power control with constant BLER target for UE supporting immediate TPC response time and UE supporting an additional one slot delay in TPC response time respectively. Downlink DPCH\_Ec / lor power ratio values, which are averaged over one slot, shall be below the values in Table 33(a) and 33(b) more than 90 % of the time.

Requirements in downlink power control, constant BLER target							
Parameter   Test 1   Test 2   Unit							
DPCH_Ec / lor	-15.9	-8.9	dB				
Measured quality on DTCH	0.01 ± 30 %	0.01 ± 30 %	BLER				

 Table 33(a): Requirement in downlink power control, constant BLER target (Table 7.8.1.4 of TS 34.121

 [1])

Requirements in downlink power control, constant BLER target using UE with an additional one slot delay in power control response time								
Parameter Test 1 Test 2 Unit								
DPCH_Ec / lor	-15.6	-8.7	dB					
Measured quality on DTCH	Measured quality on DTCH         0.01 ± 30 %         0.01 ± 30 %         BLER							

Table 33(b): Requirement in downlink power control, constant BLER target using UE with an additional one slot delay in power control response time (Table 7.8.1.4A of TS 34.121 [1])

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition Case 4. A RMC 12.2 kbps Downlink / Uplink is setup as specified in section 4.1 based on TM loopback data + CRC and downlink physical channels are configured as specified in section 4.1. Table 34 shows the test parameter for downlink power control with constant BLER target.

Power Control in the Downlink, Constant BLER Target (Release 5 and earlier) (7.8.1)

Test parameter for downlink power control, constant BLER target						
Parameter	Test 1 Test 2		Unit			
lor / loc	9.6	-0.4	dB			
loc	-60		dBm / 3,84 MHz			
Information Data Rate	12.2	kbps				
Target quality on DTCH	0.01	BLER				
Propagation condition	Case 4					
Maximum_DL_Power (Note)	7		ximum_DL_Power (Note) 7 dB		dB	
Minimum_DL_Power (Note)	-18		-18 dE		dB	
DL Power Control step size, $\Delta_{\text{TPC}}$	1		1 dB		dB	
Limited Power Increase	"Not use	ed"	-			

Note: Power is compared to P-CPICH

Table 34: Test parameter for downlink power control, constant BLER target (Table 7.8.1.3 of TS 34.121 [1])

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -50.4 dBm (Test 1) or -60.4 dBm (Test 2) BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → Off BS Signal → DL Power Control Settings → DL Power Control → Mode 0 BS Signal → DL Power Control Settings → Step Size → 1.0 dB BS Signal → DL Power Control Settings → DTCH Target Quality → 1 % BS Signal → Downlink Physical Channels → DPDCH Level Config → Maximum → -3.0 dB BS Signal → Downlink Physical Channels → DPDCH Level Config → Minimum → -28.0 dB

These settings can be configured in R&S<sup>®</sup>CMU200 as shown in Figure 49(a) and 49(b). To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

Power Control in the Downlink, Constant BLER	Target (Release 5 and earlier) (7.8.1)
--	--

	ceiver Qual	ity CM OFF HSUPA HSDPA	ه ا	Connect Control
😑 WCDMA FDD Connection Control 🛓	PS:	ldle	CS: Si	gnal On
-Setup		DL Power Control	Settings/	
Secondary Scrambl. Code (HSDPA) HSDPA Channels + HS-SCCH + HS-PDSCH	0 Off			
HSUPA Channels • E-AGCH • E-RGCH/E-HICH	Off			
Data Gen. During Signalling Change  TPC Settings  Compressed Mode Settings  DL Power Control Settings Default Settings	Off			
DL Power Control Step Size DTCH Target Quality	Mode 0 1.0 dB 1 %			
Connection Handover UE Signal BS Sign	nal Network	AF/RF ⊕•	Sync.	1 2

Figure 49(a): Downlink power control configuration according to Table 34

Ø	W	CDM/	A FDD B	and Re	ceive	r Qualit	CM OFF HSUPA HSDPA	<mark>ا ا</mark>	τ.	Connect Control
<b>-</b> W	CDMA	FDD Conne	ction Cont	rol 🛔	P	S:	Idle	CS:	Sig	nal On
Г	Setup					D	ownlink Physica	l Channel	s/	
	PIC Pag AIC AIC	H Channel Co jing Indicators H H Channel Co	ode s per Frame ode		3 18 - 8.3 6 Level	dB	Minimur	n	Maximum	
	DPI	DCH Level C	onfig		- 10.	3 dB	<u>a</u> - 28.0	) dB	- 3.0 a	IB
	DPO Pow Sec Sec HSI + HS- + HS- HS-	CH Channel ( ver Offset (D DPCH Timin ondary Scra ondary Scra DPA Channe SCCH PDSCH JPA Channel	Code PCCH/DP[ g Offset mbl. Code mbl. Code (H Is s	DCH) HSDPA)	96 0.0 0 0 0 0 0 0 0 0 0 0 ff	d <b>B</b> * 256 chip	1			
Coni	nection	Handover	UE Signal	BS Sig	nal	Network	AF/RF ⊕	Sy	nc.	1 2

Power Control in the Downlink, Constant BLER Target (Release 5 and earlier) (7.8.1)

Measurement result for DPCH\_Ec / Ior is available in BS Signal in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config

#### Figure 50 shows the DPCH\_Ec / lor measurement result.

WCDMA FDD Band Re	ceiver Quality
WCDMA FDD Connection Control 📓	PS: Attached CS: Connected
Setup	Downlink Physical Channels/
PICH Channel Code	3
Paging Indicators per Frame	18
AICH	- 8.3 dB
AICH Channel Code	6
	Level Minimum Maximum
DPDCH Level Config	-23.8 dB DLCtrl -28.0 dB -3.0 dB
DPCH Channel Code	96
Power Offset (DPCCH/DPDCH)	0.0 ав
DL DPCH Timing Offset	0 * 256 chip
Secondary Scrambl. Code	0
Secondary Scrambl. Code (HSDPA)	0
HSDPA Channels	Off
▶HS-SCCH	
▶HS-PDSCH	
HSUPA Channels	Off
nnection Handover UE Signal BS Sig	nal Network AF/RF 🕀 Sync. 🚺

Figure 50: DPCH\_Ec / lor measurement result

For test 1, recall D\_TPCtm.sav and establish CS call.

For test 2, modify the following configuration and establish CS call: BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (lor)  $\rightarrow$  -60.4 dBm

Measurement result is available at: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config

### 4.7 Power Control in the Downlink, Constant BLER Target (Release 6 and later) (7.8.1A)

Power control in the downlink is the ability of the UE receiver to converge to required link quality set by the network while using as low power as possible in downlink. If a BLER target has been assigned to a DCCH, outer loop will be based on DTCH and not on DCCH.

Table 35 shows the requirement for downlink power control with constant BLER target. Downlink DPCH\_Ec / lor power ratio values, which are averaged over one slot, shall be below the values in Table 35 more than 90 % of the time.

Requirements in downlink power control, constant BLER target							
Parameter	Test 1	Test 2	Test 3	Test 4	Unit		
DPCH_Ec / lor	-15.9	-8.9	-8.9	-10.2	dB		
Measured quality on DTCH	0.01 ± 30 %	0.01 ± 30 %	0.1 ± 30 %	0.001 ± 30 %	BLER		

 Table 35: Requirement in downlink power control, constant BLER target (Table 7.8.1A.4 of TS 34.121

 [1])

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition Case 4. Table 36 shows the test parameter for downlink power control with constant BLER target.

Test parameter for downlink power control, constant BLER target							
Parameter	Test 1	Test 2	Test 3	Test 4	Unit		
lor / loc	9.6	-0.4	4.6	9.6	dB		
loc		-6	60		dBm / 3,84 MHz		
Information Data Rate	12	2.2	6	4	kbps		
Reference channel	C.3.1 C.3.5		C.3.1		C.3.5		-
Target quality on DTCH	0.0	01	0.1	0.001	BLER		
Target quality on DCCH (Note 1)	-	-	0.1	0.1	BLER		
Propagation condition		Cas	se 4				
Maximum_DL_Power (Note 2)		-	7		dB		
Minimum_DL_Power (Note 2)	-18				dB		
DL Power Control step size,			1		dB		
Limited Power Increase		"Not	used"		-		

Note 1: Power is compared to P-CPICH

Note 2: Target quality on DCCH as 1(100%) for Test 1 and Test2.

Table 36: Test parameter for downlink power control, constant BLER target (Table 7.8.1A.3 of TS 34.121 [1])

R&S<sup>®</sup>CMU200 supports Test 1 and 2 which uses RMC 12.2 kbps Downlink / Uplink TM loopback data + CRC while Test 3 and 4 which uses RMC 64 kbps Downlink / 12.2 kbps Uplink AM ACK / NACK as specified in section 4.1. Downlink physical channels are configured as specified in section 4.1.

Power Control in the Downlink, Constant BLER Target (Release 6 and later) (7.8.1A)

### Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -50.4 dBm (Test 1), -60.4 dBm (Test 2), - 55.4 dBm (Test 3) or -50.4 dBm (Test 4) BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → Off BS Signal → DL Power Control Settings → DL Power Control → Mode 0 BS Signal → DL Power Control Settings → Step Size → 1.0 dB BS Signal → DL Power Control Settings → DTCH Target Quality → 1 % (Test 1 and 2), 10 % (Test 3) or 0.1 % (Test 4) BS Signal → Downlink Physical Channels → DPDCH Level Config → Maximum → -3.0 dB BS Signal → Downlink Physical Channels → DPDCH Level Config → Minimum → -28.0 dB

These settings can be configured in  $R\&S^{@}CMU200$  as shown in Figure 49(a) and 49(b). To establish a WCDMA connection, press 'Connect UE (CS)' on  $R\&S^{@}CMU200$  once UE has registerd with  $R\&S^{@}CMU200$ .

Measurement result for DPCH\_Ec / Ior is available in BS Signal in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config

Figure 50 shows the DPCH\_Ec / lor measurement result.

For test 1, recall D\_TPCtm.sav and establish CS call.
For test 2, recall D\_TPCtm.sav, modify the following configuration and establish CS call: BS Signal → Node-B Settings → Output Channel Power (lor) → -60.4 dBm
For test 3, recall D\_TPCam.sav and establish CS call.
For test 4, recall D\_TPCam.sav, modify the following configuration and establish CS call: BS Signal → Node-B Settings → Output Channel Power (lor) → -50.4 dBm
Es Signal → Node-B Settings → Output Channel Power (lor) → -50.4 dBm BS Signal → DL Power Control Settings → DTCH Target Quality → 0.1 %
Measurement result is available at: Connect Control → BS Signal → DPDCH Level Config

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH\_Ec / lor power ratio in the downlink. If a BLER target has been assigned to a DCCH, outer loop will be based on DTCH and not on DCCH.

Table 37 shows the requirement for downlink compressed mode. Downlink DPCH\_Ec / lor power ratio values, which are averaged over one slot, shall be below the values in Table 37 more than 90 % of the time. BLER measurements based on measured quality of compressed and recovery frames and measured quality on DTCH shall be performed according to the statistical testing as specified in TS 34.121 Annex F.6.1.10.

Requirements in downlink compressed mode							
Parameter	Test 1	Test 2	Test 3	Test 4	Unit		
DPCH_Ec / lor	-14.5	No requirements	-15.1	No requirements	dB		
Measured quality of compressed and recovery frames	No requirements	< 0,001	No requirements	< 0.001	BLER		
Measured quality on DTCH	0.01 ± 30 %			BLER			

Table 37: Requirements in downlink compressed mode (Table 7.9.4 of TS 34.121 [1])

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition Case 2. A RMC 12.2 kbps is setup as specified in section 4.1 based on TM loopback data + CRC and downlink physical channels are configured as specified in section 4.1. Table 38 shows the test parameter for downlink compressed mode.

Test parameter for downlink compressed mode						
Parameter	Test 1	Test 2	Test 3	Test 4	Unit	
Delta SIR1	0	3	0	3	dB	
Delta SIR after1	0	3	0	3	dB	
Delta SIR2 (Note 2)	0	0	0	0	dB	
Delta SIR after2 (Note 2)	0	0	0	0	dB	
lor / loc		9	.6		dB	
loc		-60				
Information Data Rate		12	2.2		kbps	
Propagation condition		Cas	se 2			
Target quality value on DTCH		0.	01		BLER	
Maximum DL Power (Note 1)		7	7		dB	
Minimum DL Power (Note 1)	-18				dB	
DL Power Control step size, $\Delta_{\text{TPC}}$	1			dB		
Limited Power Increase		"Not	used"		_	

Note 1: Power is compared to P-CPICH

Note 2: Delta SIR2 is not present in Test 1, Test 2, Test 3 and Test 4

Table 38: Test parameter for downlink compressed mode (Table 7.9.3 of TS 34.121 [1])

Configuration in R&S<sup>®</sup>CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -50.4 dBm BS Signal → Node-B Settings → AWGN Noise Pwr. (@3.84 MHz, loc) → Off BS Signal → DL Power Control Settings → DL Power Control → Mode 0 BS Signal → DL Power Control Settings → Step Size → 1.0 dB BS Signal → DL Power Control Settings → DTCH Target Quality → 1 % BS Signal → Downlink Physical Channels → DPDCH Level Config → Maximum → -3.0 dB BS Signal → Downlink Physical Channels → DPDCH Level Config → Minimum → -28.0 dB

The compressed mode parameters are given in clause C.5 of TS 34.121 [1] as shown in Table 39. Tests 1 and 2 are using Set 1 compressed mode pattern parameters from Table 39 while tests 3 and 4 are using Set 2 compressed mode patterns from Table 39. The requirements for compressed mode by spreading factor reduction (Test 1 and 2) apply to all types of UTRA for the FDD UE from Release 5 and earlier releases only. The requirements for compressed mode by puncturing (Test 3 and 4) apply to all types of UTRA for the FDD UE for Release 99 and Release 4 only.

Compressed mode reference pattern 1 parameters					
Parameter	Set 1	Set 2	Set 2A		
TGSN (Transmission Gap Starting Slot Number)	11	11	4		
TGL1 (Transmission Gap Length 1)	7	7	7		
TGL2 (Transmission Gap Length 2) (Note 1)	-	-	7		
TGD (Transmission Gap Distance) (Note 2)	0	0	15		
TGPL1 (Transmission Gap Pattern Length)	4	4	4		
TGPL2 (Transmission Gap Pattern Length) (Note 3)	-	-	-		
TGPRC (Transmission Gap Pattern Repetition Count) (Note 4)	NA	NA	NA		
TGCFN (Transmission Gap Connection Frame Number): (Note 4)	NA	NA	0		
UL/DL compressed mode selection	DL & UL	DL & UL	DL & UL		
UL compressed mode method	SF/2	SF/2	SF/2		
DL compressed mode method (Note 5)	SF/2	Puncturing	SF/2		
Downlink frame type and Slot format	11B	11A	11B		
Scrambling code change	No	No	No		
RPP (Recovery period power control mode)	0	0	0		
ITP (Initial transmission power control mode)	0	0	0		

Note 1: For Set 1 and Set 2, only one gap in use

Note 2: Only one gap in use. For Set 1 and Set 2 UNDEFINED is used for TGD.

Note 3: Only one pattern in use (R99 and Rel-4). Not applicable for Rel-5 and later releases:

Note 4: Defined by higher layers

Note 5: Compressed mode by puncturing is applicable for R99 and Rel-4 only.

Table 39: Compressed mode reference pattern 1 parameters (Table C.5.1 of TS 34.121 [1])

R&S<sup>®</sup>CMU200 supports downlink compression mode by SF/2 in Test 1 and Test 2. Test 3 and Test 4 are supported only with compressed mode by SF/2.

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  Pattern Selection  $\rightarrow$  User Defined Pattern BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Pattern Activation → RAB Setup BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  TGSN slot no.  $\rightarrow$ 11 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  TGPL 1 $\rightarrow$  4 Frame BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap(1) \rightarrow Enable$ BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission Gap  $\rightarrow$  TGL (1)  $\rightarrow$  7 slot BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap(2) \rightarrow Disable$ BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow Delta SIR(1) \rightarrow 0$  (Test 1) or 3 (Test 2) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow Delta SIR after (1) \rightarrow 0 (Test 1) or 3 (Test 2)$ BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  RPP  $\rightarrow$  Mode 0 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  ITP  $\rightarrow$  Mode 0 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  UL/DL Mode  $\rightarrow$ **Up- & Downlink** 

BS Signal → Compressed Mode Settings → User Defined Pattern → DL Compressed Mode → SF/2 BS Signal → Compressed Mode Settings → User Defined Pattern → UL Compressed Mode → SF/2 BS Signal → Compressed Mode Settings → User Defined Pattern → DL Frame Type → B (Test 1 and 2)

These settings can be configured in R&S<sup>®</sup>CMU200 as shown in Figure 51(a) and 51(b). To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

WCDMA FDD Band Rei	ceiver Quali	ty CM OFF HSUPA HSDPA	6	Connect Control
🗧 WCDMA FDD_Connection Control 🛓	PS:	ldle	CS: S	ignal On
-Setup	[	Compressed Mod	le Settings/	
Default Settings				
Pattern Selection	User defined	Pattern		
<ul> <li>UE Report Pattern</li> <li>Single Pattern</li> <li>User Defined Pattern</li> </ul>				
Pattern Activation	RAB Setup			
TGPRC TGCFN frame no. TG Pattern Info	0 0			
TGSN slot no. TGPL 1	11 4 Frame			
<ul> <li>Transmission Gap</li> <li>Measurement Purpose</li> <li>RPP</li> <li>ITP</li> </ul>	FDD Mode 0 Mode 0			
Connection Handover UE Signal BS Sign	nal Network	AF/RF 🕀	Sync.	1 2

Figure 51(a): Downlink compressed mode configuration according to Table 38 and Table 39

	WCDMA FDD I Re	ceiver Qu	ality HSUPA	<b>1</b>	Connect Control
<u> </u>	ICDMA FDD Connection Control 🛔	PS:	Idle	CS: S	ignal On
Г	-Setup		Compressed Mod	de Settings/	
	<ul> <li>Transmission Gap</li> <li>Enable</li> </ul>	1	2		
	TGL TGD	7 Slot	7 s 15 slot	Slot	
	Delta SIR Delta SIR after	0 0	0 0		
	Measurement Purpose	FDD			
	RPP ITP	Mode 0 Mode 0			
	UL/DL Mode	Up- & Do	wnlink		
	UL Compressed Mode	SF/2 SF/2			
	Downlink Frame Type	A			
	<ul> <li>► UL CM TX Test Pattern</li> <li>▼DL Power Control Settings</li> </ul>				
Con	nection Handover UE Signal BS Sig	nal Netwo	rk AF/RF 🕀	Sync.	1 2

Figure 51(b): Downlink compressed mode configuration according to Table 38 and Table 39

Measurement result for DPCH\_Ec / lor and BLER are available in BS Signal in R&S $^{\circ}$ CMU200.

Configuration in R&S<sup>®</sup>CMU200: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 47 and 50 show the BLER and DPCH\_Ec / Ior measurement result respectively.

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For test 1, recall DIComp.sav and establish CS call.

For test 2, recall DIComp.sav, modify the following configuration and establish CS call: BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$ Transmission Gap  $\rightarrow$  Delta SIR (1)  $\rightarrow$  3 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$ Transmission Gap  $\rightarrow$  Delta SIR after (1)  $\rightarrow$  3

Measurement results are available at: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH\_Ec / lor power ratio in the downlink. If a BLER target has been assigned to a DCCH, outer loop will be based on DTCH and not on DCCH.

Table 40 shows the requirement for downlink compressed mode. Downlink DPCH\_Ec / lor power ratio values, which are averaged over one slot, shall be below the values in Table 40 more than 90 % of the time. BLER measurements based on measured quality of compressed and recovery frames and measured quality on DTCH shall be performed according to the statistical testing as specified in TS 34.121 Annex F.6.1.10.

Requirements in downlink compressed mode						
Parameter	Test 1	Test 2	Unit			
DPCH_Ec / lor	-13.6	No requirements	dB			
Measured quality of compressed and recovery frames	No requirements	< 0.001	BLER			
Measured quality on DTCH	0.01 ± 30 % B		BLER			

Table 40: Requirements in downlink compressed mode (Table 7.9.4A of TS 34.121 [1])

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition Case 3 and 2. A RMC 12.2 kbps is setup as specified in section 4.1 based on TM loopback data + CRC and downlink physical channels are configured as specified in section 4.1. Table 41 shows the test parameter for downlink compressed mode.

Test parameter for downlink compressed mode					
Parameter	Test 1	Test 2	Unit		
Delta SIR1	0	3	dB		
Delta SIR after1	0	3	dB		
Delta SIR2 (note 2)	0	0	dB		
Delta SIR after2 (note 2)	0	0	dB		
Compressed Mode Patterns (Note 3)	C.5.1 Set 2A	C.5.1 Set 1	dB		
lor / loc	9.6		dB		
loc	-6	60	dBm / 3,84 MHz		
Information Data Rate	12	2.2	kbps		
Propagation condition	Case 3	Case 2			
Target quality value on DTCH	0.	01	BLER		
Maximum DL Power (note 1)	7	dB			
Minimum DL Power (note 1)	-18		dB		
DL Power Control step size,		dB			
Limited Power Increase	"Not	used"	-		

Note 1: Power is compared to P-CPICH

Note 2: Delta SIR2 is not present in Test 1 and Test 2

Note 3: Refer to Table 39

Table 41: Test parameter for downlink compressed mode (Table 7.9.3A of TS 34.121 [1])

#### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Level Reference  $\rightarrow$  Output Channel Power (lor)

BS Signal  $\rightarrow$  Node-B Settings  $\rightarrow$  Output Channel Power (Ior)  $\rightarrow$  -50.4 dBm

BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → Off

BS Signal  $\rightarrow$  DL Power Control Settings  $\rightarrow$  DL Power Control  $\rightarrow$  Mode 0

BS Signal  $\rightarrow$  DL Power Control Settings  $\rightarrow$  Step Size  $\rightarrow$  1.0 dB

BS Signal  $\rightarrow$  DL Power Control Settings  $\rightarrow$  DTCH Target Quality  $\rightarrow$  1 %

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  DPDCH Level Config  $\rightarrow$  Maximum  $\rightarrow$  -3.0 dB

BS Signal  $\rightarrow$  Downlink Physical Channels  $\rightarrow$  DPDCH Level Config  $\rightarrow$  Minimum  $\rightarrow$  -28.0 dB

Test 1 is using Set 2A compressed mode pattern parameters from Table 39 and Test 2 is using Set 1 compressed mode patterns from Table 39. The requirements for compressed mode by spreading factor reduction (Test 1 and 2) apply to all types of UTRA for the FDD UE from Release 6 and later releases.

### Configuration in R&S<sup>®</sup>CMU200:

BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  Pattern Selection  $\rightarrow$  User Defined Pattern BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Pattern Activation → RAB Setup BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  TGSN slot no.  $\rightarrow$ 4 (Test 1) or 11 (Test 2) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  TGPL 1.  $\rightarrow$  4 Frame BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap(1) \rightarrow Enable$ BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap(2) \rightarrow Enable (Test 1), Disable (Test 2)$ BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow TGL(1) \rightarrow 7$  slot BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow TGL(2) \rightarrow 7$  slot (Test 1) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow TGD \rightarrow 15$  slot (Test 1) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission  $Gap \rightarrow Delta SIR(1) \rightarrow 0$  (Test 1) or 3 (Test 2) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  Transmission Gap  $\rightarrow$  Delta SIR after (1)  $\rightarrow$  0 (Test 1) or 3 (Test 2) BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow \rightarrow$  RPP  $\rightarrow$  Mode 0 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  ITP  $\rightarrow$  Mode 0 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  UL/DL Mode  $\rightarrow$ **Up- & Downlink** BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  DL Compressed Mode  $\rightarrow$  SF/2 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  UL Compressed Mode  $\rightarrow$  SF/2 BS Signal  $\rightarrow$  Compressed Mode Settings  $\rightarrow$  User Defined Pattern  $\rightarrow$  DL Frame Type  $\rightarrow B$ 

These settings can be configured in  $R\&S^{\ensuremath{\mathbb{R}}}CMU200$  as shown in Figure 48(a) and 48(b). To establish a WCDMA connection, press 'Connect UE (CS)' on  $R\&S^{\ensuremath{\mathbb{R}}}CMU200$  once UE has registerd with  $R\&S^{\ensuremath{\mathbb{R}}}CMU200$ .

Measurement result for DPCH\_Ec / Ior and BLER are available in BS Signal in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Connect Control  $\rightarrow$  BS Signal  $\rightarrow$  DPDCH Level Config Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 47 and 50 show the BLER and DPCH\_Ec / lor measurement result respectively.



### 4.10 Blind Transport Format Detection (7.10)

Performance of Blind transport format detection is determined by the Block Error Ratio (BLER) values and by the measured average transmitted DPCH\_Ec / lor value. This test verifies the ability of the blind transport format detection to receive a predefined test signal, representing a static or multi-path propagation channel for the wanted and for the co-channel signals from serving and adjacent cells, with a block error ratio (BLER) and false transport format detection ratio (FDR) not exceeding a specified value.

Table 42 shows the test requirements for blind transport format detection. BLER and FDR shall not exceed the DPCH\_Ec / lor value specified in Table 42.

The Requirements for DCH reception in Blind transport format detection					
Test Number	DPCH_Ec / lor	BLER	FDR		
1	–17.6 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		
2	–17.7 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		
3	–18.3 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		
4	–12.9 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		
5	–13.1 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		
6	–13.7 dB	10 <sup>-2</sup>	10 <sup>-4</sup>		

Note: The value of DPCH\_Ec/lor, loc, and lor/loc are defined in case of DPCH is transmitted. *Table 42: Test requirements for blind transport format detection (Table 7.10.5 of TS 34.121 [1])* 

This test requires an external fading simulator, e.g. R&S<sup>®</sup>SMU200A or R&S<sup>®</sup>AMU200A, to generate multi-path fading signal with fading condition Case 3 for Test 4 to Test 6. Downlink physical channels are configured as specified in section 4.1. Table 43 shows the test parameters for blind transport format detection.

Test parameters for blind transport format detection							
Parameter	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Unit
lor / loc		-0.7			-2.4		dB
loc			-(	60			dBm / 3.84 MHz
Information Data Rate	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)	kbps
Propagation condition		static		multi-path fading case 3			-
TFCI	off			-			

Table 43: Test parameters for blind transport format detection (Table 7.10.4 of TS 34.121 [1])

Configuration in R&S<sup>®</sup>CMU200: BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  DCH (Dedicated Chn.) Type  $\rightarrow$  RMC BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Reference Channel Type  $\rightarrow$  BTFD BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  DL DTCH Transport Format  $\rightarrow$  12.2 kbps, 7.95 kbps or 1.95 kbps BS Signal  $\rightarrow$  Circuit Switched  $\rightarrow$  RMC Settings  $\rightarrow$  Test Mode  $\rightarrow$  Loop Mode 2

Blind Transport Format Detection (7.10)

BS Signal → Node-B Settings → Level Reference → Output Channel Power (lor) BS Signal → Node-B Settings → Output Channel Power (lor) → -60.7 dBm (Test 1 to Test 3) or -62.4 dBm (Test 4 to Test 6) BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc) → -60.0 dBm

These settings can be configured in R&S<sup>®</sup>CMU200 as shown in Figure 52. To establish a WCDMA connection, press 'Connect UE (CS)' on R&S<sup>®</sup>CMU200 once UE has registerd with R&S<sup>®</sup>CMU200.

WCDMA FDD Band No	dulation	CM OFF HSUPA HSDPA		Connect Control
🗏 WCDMA FDD Connection Control 📓	PS:	Idle	CS: Si	gnal On
-Setup		Circuit Switched/	RMC Settings/	
✓Circuit Switched Default Settings				
DCH (Dedicated Chn.) Type	RMC			
RMC Settings     Reference Channel Type     DL DTCH Transport Format     DL Resources in Use     RLC Mode (Loop Mode 1)     UL CRC (Svm. Loop Mode 2)     Tect Mode	BTFD 12.2 kbps 100 % TM Off	2		
Channel Data Source DTCH • HSPA • RMC with HSDPA Settings • Voice Settings • Signalling RAB Settings	PRBS9	~		
Connection Handover UE Signal BS Sign	nal Network	AF/RF ⊕•	Sync.	1 2

Figure 52: Blind transport format detection configuration

Measurement result for BLER and FDR are available in BS Signal in R&S<sup>®</sup>CMU200.

Configuration in R&S<sup>®</sup>CMU200: Menus  $\rightarrow$  Receiver Quality  $\rightarrow$  Applic. 1  $\rightarrow$  BER

Figure 53 shows the BLER and FDR measurement result.

Blind Transport Format Detection (7.10)

	eiver Quality	CM OFF HSUPA	Connect Control
0.000 %       Early Pass BER         0.000 %       Early Pass DL BLER         0.000 %       Early Pass DBLER         0.000 %       Early Pass FDR         0.000 %       Early Pass FDR         0.000 %       Early Pass UL TFCI Faults         Transp. Blocks Confidence       28299335         0       Lost Transp. Blocks         1       PN Discontinuity         8 Frame       Transport Block Delay         1024 Chip       DL/UL Alignment	<ul> <li>✓ Signalling State</li> <li>✓ Signalling State</li> <li>✓ Circuit Switched</li> <li>Packet Switched</li> <li>✓ Connection Info (CS)</li> <li>Dedicated Chn. Type</li> <li>SRB</li> <li>Reference Chn. Type</li> <li>DL DTCH Transp. F.</li> <li>DL Resources in Use</li> <li>Test Mode</li> <li>UL CRC</li> <li>Data Sour. DTCH</li> <li>✓ Connection Info (PS)</li> <li>Dedicated Chn. Type</li> <li>SRB</li> <li>RMC</li> <li>RMC Test Loop</li> <li>✓ BER</li> <li>✓ Meas. Control</li> <li>Repetition</li> <li>Stop Condition</li> <li>Trp. Blk Continuous</li> <li>Trp. Blk SingleShot</li> </ul>	Connected Attached RMC 2.5 kbps BTFD 12.2 kbps 100 % Loop Mode 2 Off PRBS9 HSDPA Test Mod 2.5 kbps 12.2 kb	H BER Applic. 1 Applic. 2 Analyzer Level Ana.Set. UE Signal BS Sig. LVI. HSDPA HSUPA BS Signal Settings
Repetition Stop Transp. Condition Block	ks	PN Auto Resynd	Menus

Figure 53: BLER and FDR measurement result



Blind Transport Format Detection (7.10)

## 5 Summary of R&S<sup>®</sup>CMU200 \*.SAV Files

Table below summarizes the available \*.sav files based on  $R\&S^{\mbox{\ensuremath{\mathbb{R}}}S\mbox{\ensuremath{\mathbb{R}}}}S\mbox{\ensuremath{\mathbb{R}}}S\mbox{\ensuremath{}}S\mbox{\ensuremath{\mathbb{R}}}S\mbox{\en$ 

Summary of *.SAV files (Firmware V5.22A, UE operating band I and power class 3)				
Clause	Test parameter	*.SAV filename		
5.2	Maximum output power	TX_meas.sav		
5.3	Frequency error	TX_meas.sav		
5.4.1	Open loop power control in the uplink	TxOnOff.sav		
5.4.2	Inner loop power control in the uplink	TX_meas.sav		
5.4.3	Minimum output power	TX_meas.sav		
5.5.1	Transmit OFF power	TxOnOff.sav		
5.5.2	Transmit ON/OFF time mask	TxOnOff.sav		
5.6	Change of TFC	TX_meas.sav		
5.7	Power setting in uplink compressed mode	UIComp.sav		
5.8	Occupied Bandwidth (OBW)	TX_meas.sav		
5.9	Spectrum emission mask	TX_meas.sav		
5.10	Adjacent Channel Leakage Power Ratio (ACLR)	TX_meas.sav		
5.11	Spurious emissions	TX_meas.sav		
5.12	Transmit intermodulation	TX_meas.sav		
5.13.1	Error Vector Magnitude (EVM)	TX_meas.sav		
5.13.2	Peak code domain error	TX_meas.sav		
5.13.3	UE phase discontinuity	TX_meas.sav		
5.13.4	PRACH preamble quality	Prach.sav		
6.2	Reference sensitivity level	RX_meas.sav		
6.3	Maximum input level	MaxInput.sav		
6.4	Adjacent Channel Selectivity (ACS) (Rel-99 and Rel-4)	RX_meas.sav		
6.4A	Adjacent Channel Selectivity (ACS) (Rel-5 and later releases)	RX_meas.sav		
6.5	Blocking characteristics	RX_meas.sav		
6.6	Spurious response	RX_meas.sav		
6.7	Intermodulation characteristics	RX_meas.sav		
6.8	Spurious emissions	SpuEmi.sav		
7.2	Demodulation of Dedicated channel (DCH) in static propagation conditions	PX_meas.sav		
7.3	Demodulation of DCH in multi-path fading propagation conditions	PX_meas.sav		
7.4	Demodulation of DCH in moving propagation conditions	PX_meas.sav		
7.5	Demodulation of DCH in birth-death propagation conditions	PX_meas.sav		
7.8.1	Power control in the downlink, constant BLER target (Release 5 and earlier)	D_TPCtm.sav		
7.8.1A	Power control in the downlink, constant BLER target (Release 6 and later)	D_TPCtm.sav D_TPCam.sav		
7.9.1	Downlink compressed mode, single link performance (Release 5 and earlier)	DIComp.sav		
7.9.1A	Downlink compressed mode, single link performance (Release 5 and earlier)	DIComp.sav		
7.10	Blind transport format detection	BlindDet.sav		

## 6 Reference

[1] Technical Specification Group Radio Access Network; User Equipment (UE) Conformance Specification; 3GPP TS 34.121-1 V 8.4.0, October 2008

[2] Technical Specification Group Radio Access Network; Common test environments for User Equipment (UE); 3GPP TS 34.108 V 8.4.0, October 2008

[3] Rohde & Schwarz; Application Note: Measurements on 3GPP WCDMA User Equipment According to Standard TS 34.121, 1MA68, October 2008

[4] Rohde & Schwarz; Application Note: Measurements on 3GPP UE's according to TS34.121 with CMUgo: Tests with combined Instruments, 1MA130, October 2008

[5] Rohde & Schwarz; Reiner Stuhlfauth; Wideband Code Division Multiple Access, WCDMA – RF measurement with CMU200 radio communication tester

# 7 Ordering Information

Ordering information				
Туре	Description	Order no.		
R&S <sup>®</sup> CMU200	Base unit with following accessories: power cord, operating and service manual for instrument	1100.0008.02		
R&S <sup>®</sup> CMU-B21	Unversal signaling unit; provides multistandard signaling hardware; required for WCDMA 3GPP FDD	1100.5200.54		
R&S <sup>®</sup> CMU-B56	WCDMA (3GPP FDD) signaling module for CMU-B21 model 14	1150.1850.14		
R&S <sup>®</sup> CMU-B68	Versatile baseband board for WCDMA (3GPP FDD) layer 1, DL and UL, non-signaling	1149.9809.02		
R&S <sup>®</sup> CMU-K16	WCDMA (3GPP FDD) band 10, UE test signaling software (R&S <sup>®</sup> CMU200-B68, R&S <sup>®</sup> CMU200-B21 model 14 or 54, R&S <sup>®</sup> CMU200-B56 necessary)	1200.9158.02		
R&S <sup>®</sup> CMU-K17	WCDMA (3GPP FDD) band 11, UE test signaling software (R&S <sup>®</sup> CMU200-B68, R&S <sup>®</sup> CMU200-B21 model 14 or 54, R&S <sup>®</sup> CMU200-B56 necessary)	1200.9258.02		
R&S <sup>®</sup> CMU-K57	WCDMA signaling 3GPP/FDD/UE, band 7 (R&S <sup>®</sup> CMU200-B68, R&S <sup>®</sup> CMU200-B21 model 14 or 54, R&S <sup>®</sup> CMU200-B56 necessary)	1200.7903.02		
R&S <sup>®</sup> CMU-K58	WCDMA signaling 3GPP/FDD/UE, band 8 (R&S <sup>®</sup> CMU200-B68, R&S <sup>®</sup> CMU200-B21 model 14 or 54, R&S <sup>®</sup> CMU200-B56 necessary)	1200.8000.02		
R&S <sup>®</sup> CMU-K59	WCDMA signaling 3GPP/FDD/UE, band 9 (R&S <sup>®</sup> CMU200-B68, R&S <sup>®</sup> CMU200-B21 model 14 or 54, R&S <sup>®</sup> CMU200-B56 necessary)	1200.8100.02		
R&S <sup>®</sup> CMU-K61	WCDMA (3GPP FDD) band 4, UE test signaling software	1157.3670.02		
R&S <sup>®</sup> CMU-K62	WCDMA (3GPP FDD) band 5, UE test signaling software	1157.3770.02		
R&S <sup>®</sup> CMU-K63	WCDMA (3GPP FDD) band 6, UE test signaling software	1157.3870.02		
R&S <sup>®</sup> CMU-K65	WCDMA (3GPP FDD) UL user equipment TX test, non-signaling test software	1115.4891.02		
R&S <sup>®</sup> CMU-K66	WCDMA (3GPP FDD) DL generator, non-signaling test software	1115.5100.02		
R&S <sup>®</sup> CMU-K67	WCDMA (3GPP FDD) band 3, UE test signaling software	1150.3000.02		
R&S <sup>®</sup> CMU-K68	WCDMA (3GPP FDD) band 1, UE test signaling software	1115.5300.02		
R&S <sup>®</sup> CMU-K69	WCDMA (3GPP FDD) band 2, UE test signaling software	1115.5400.02		

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