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

Application Note

Products:

- R&S®CMU200

Most of the tests specified in standard TS 34.121 [1] for 3GPP Rel-99 can be performed with R&S®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®CMU200. Test cases that require additional instruments e.g. fading generator (R&S®SMU200A or R&S®AMU200A) or spectrum analyzer (R&S®FSQ) will be discussed in brief in this application note with recommended reference. A set of *.sav files based on R&S®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.

Application Note

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ROHDE&SCHWARZ

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1 Introduction

Most of the tests specified in standard TS 34.121 [1] for 3GPP Rel-99 can be performed with R&S®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®CMU200 for UE supporting operating band I and power class 3. Test cases that require additional instruments e.g. fading generator (R&S®SMU200A or R&S®AMU200A) or spectrum analyzer (R&S®FSQ) will be discussed in brief in this application note with recommended reference. A set of *.sav files based on R&S®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®CMU200.

Transmitter characteristics, receiver characteristics and performance tests of 3GPP Rel-99 supported by R&S®CMU200		
Test	**Clause**	**Test Parameter**
Transmitter characteristics	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
	5.7	Power setting in uplink compressed mode
	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
Receiver characteristics	6.2	Reference sensitivity level
	6.3	Maximum input level
	6.4	Adjacent Channel Selectivity (ACS) (Rel-99 and Rel-4)*
	6.4A	Adjacent Channel Selectivity (ACS) (Rel-5 and later releases)*
	6.5	Blocking characteristics*
	6.6	Spurious response*
	6.7	Intermodulation characteristics*
	6.8	Spurious emissions*
Performance tests	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*
	7.8.1	Power control in the downlink, constant BLER target (Release 5 and earlier)*
	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®CMU200

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

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®CMU200:
BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → RMC
BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 12.2 kbps Downlink/Uplink

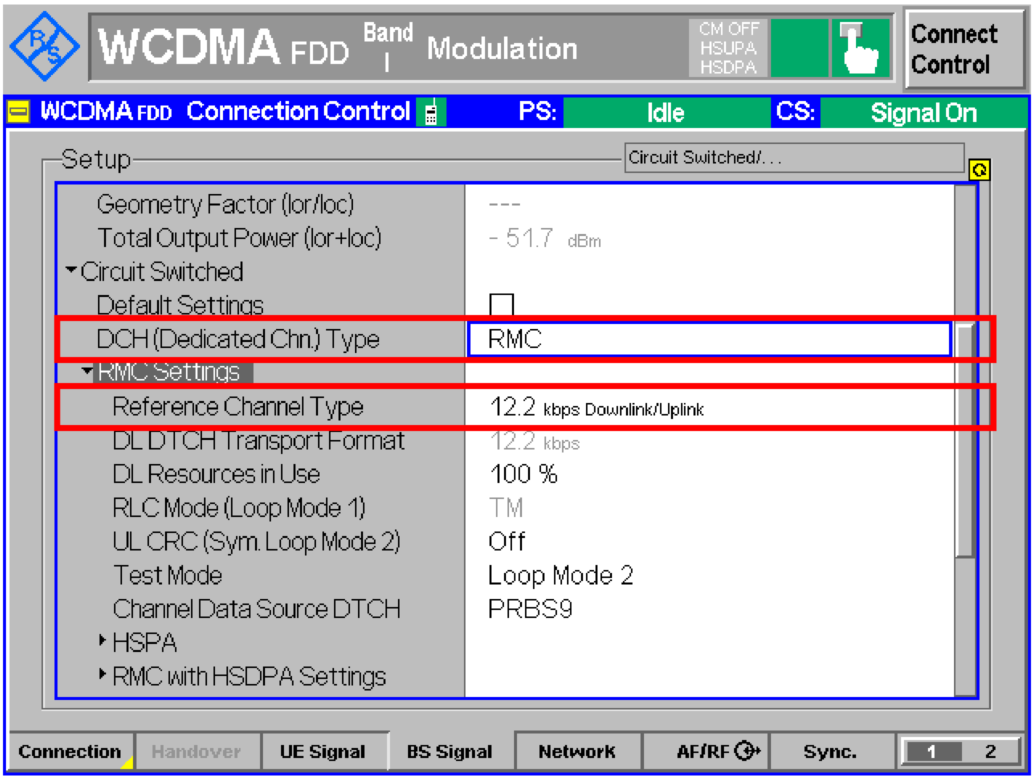


Figure 1: RMC 12.2 kbps dedicated channel setup

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.

Downlink physical channels transmitted during a connection	
Physical Channel	**Power**
Ior	–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®CMU200:

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

BS Signal → Node-B Settings → Output Channel Power (Ior) → -93.0 dBm

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 → -10.3 dB

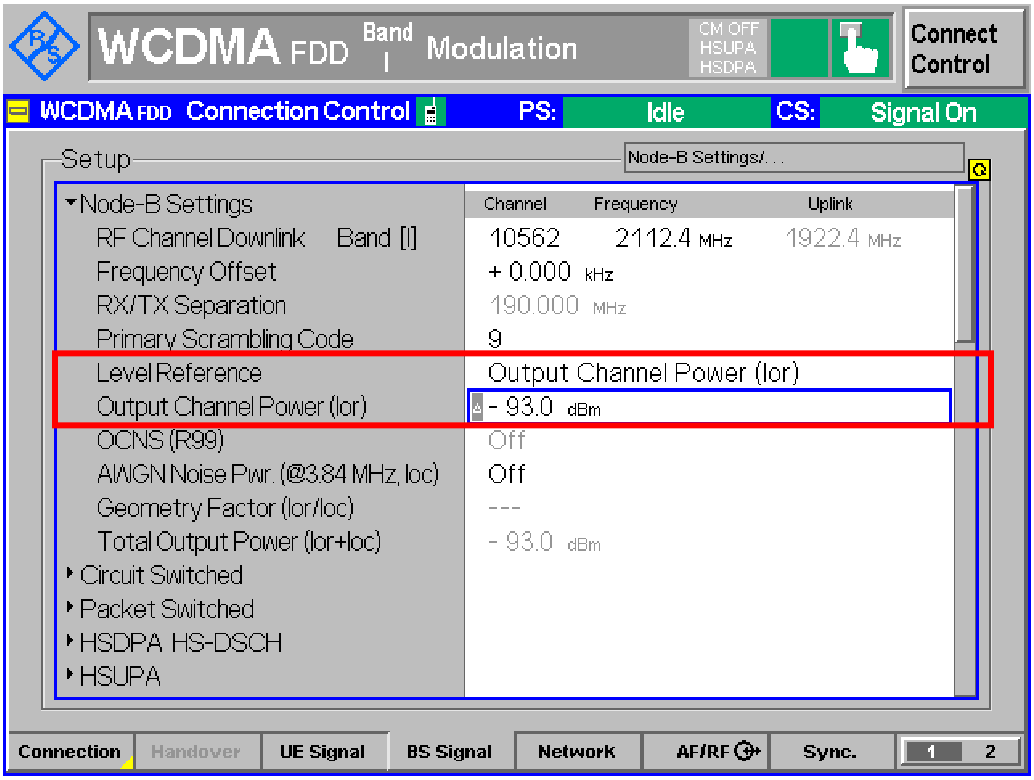


Figure 2(a) : Downlink physical channels configuration according to Table 2

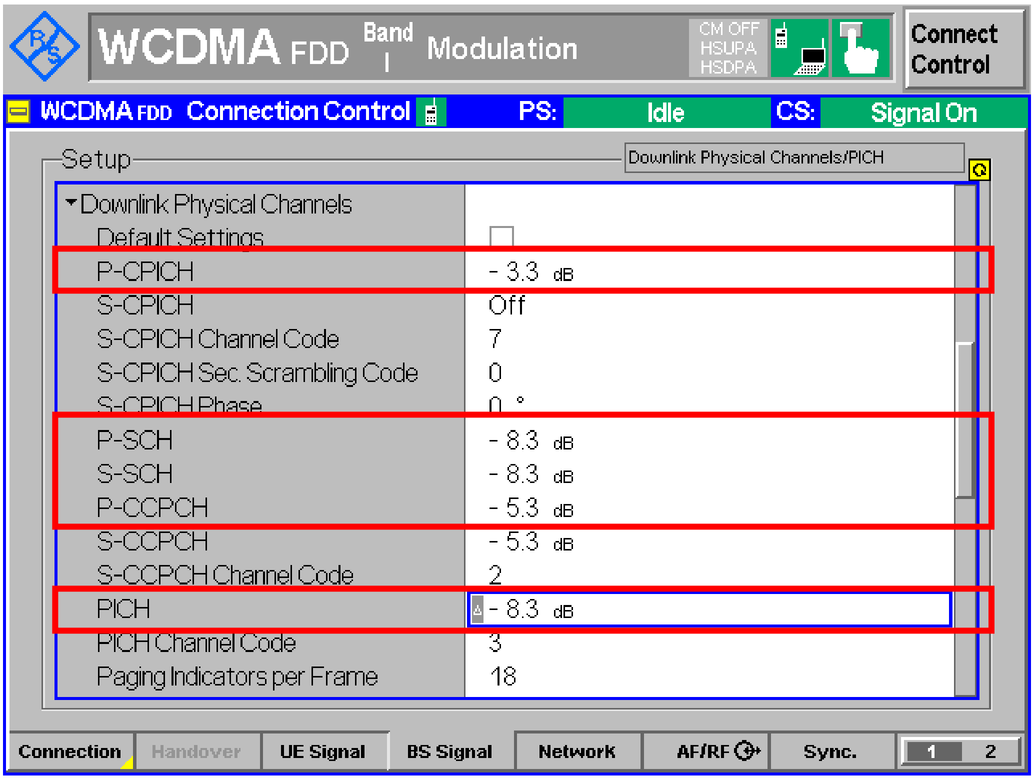


Figure 2(b): Downlink physical channels configuration according to Table 2

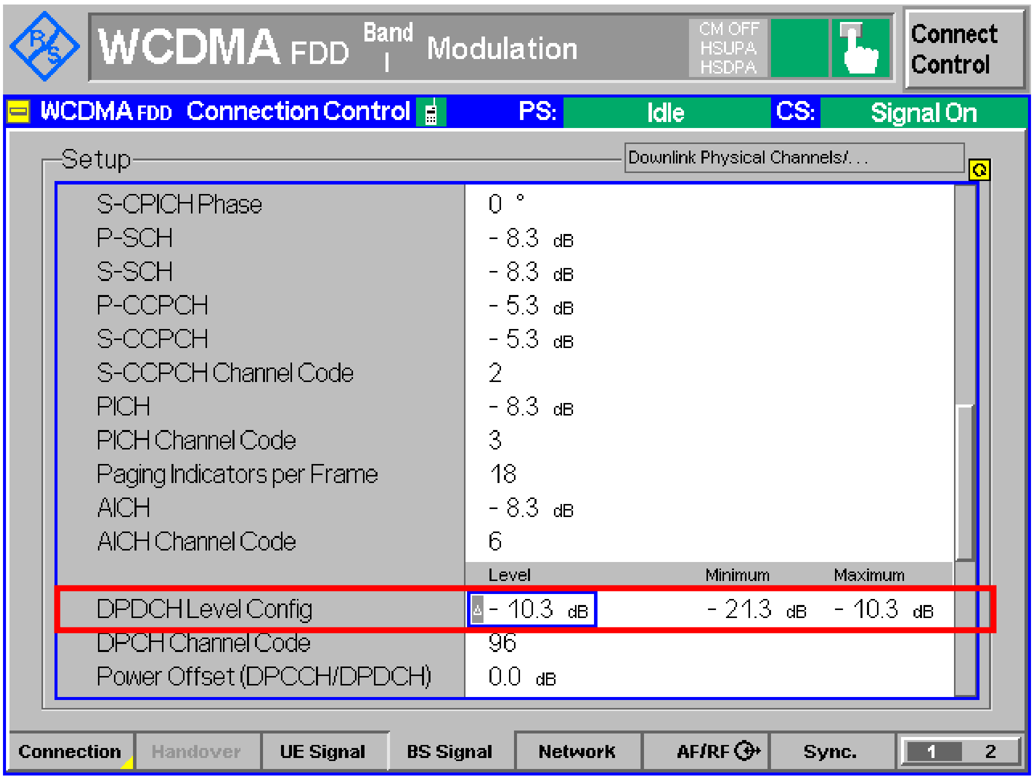


Figure 2(c): Downlink physical channels configuration according to Table 2

To establish a WCDMA connection, press 'Connect UE (CS)' on R&S®CMU200 once UE has registerd with R&S®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 + α) 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 Band	Power Class 1		Power Class 2		Power Class 3		Power Class 3bis		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
Band I	+33	+1.7/-3.7	+27	+1.7/-3.7	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band II	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band III	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band IV	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band V	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band VI	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band VII	-	-	-	-	+24	+1.7/-3.7	+23	+2.7/-2.7	+21	+2.7/-2.7
Band VIII	-	-	-	-	+24	+1.7/-3.7	+23	+2.7/-2.7	+21	+2.7/-2.7
Band IX	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band X	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band XI	-	-	-	-	+24	+1.7/-3.7	-	-	+21	+2.7/-2.7
Band XII	-	-	-	-	+24	+1.7/-3.7	+23	+2.7/-2.7	+21	+2.7/-2.7
Band XIII	-	-	-	-	+24	+1.7/-3.7	+23	+2.7/-2.7	+21	+2.7/-2.7
Band XIV	-	-	-	-	+24	+1.7/-3.7	+23	+2.7/-2.7	+21	+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®CMU200, continuously UP power control commands is automatically configured when user select Maximum Power measurement in R&S®CMU200.

Configuration in R&S®CMU200:
Menus → Power → Application → Maximum Power

Figure 3 shows the maximum output power measurement result.

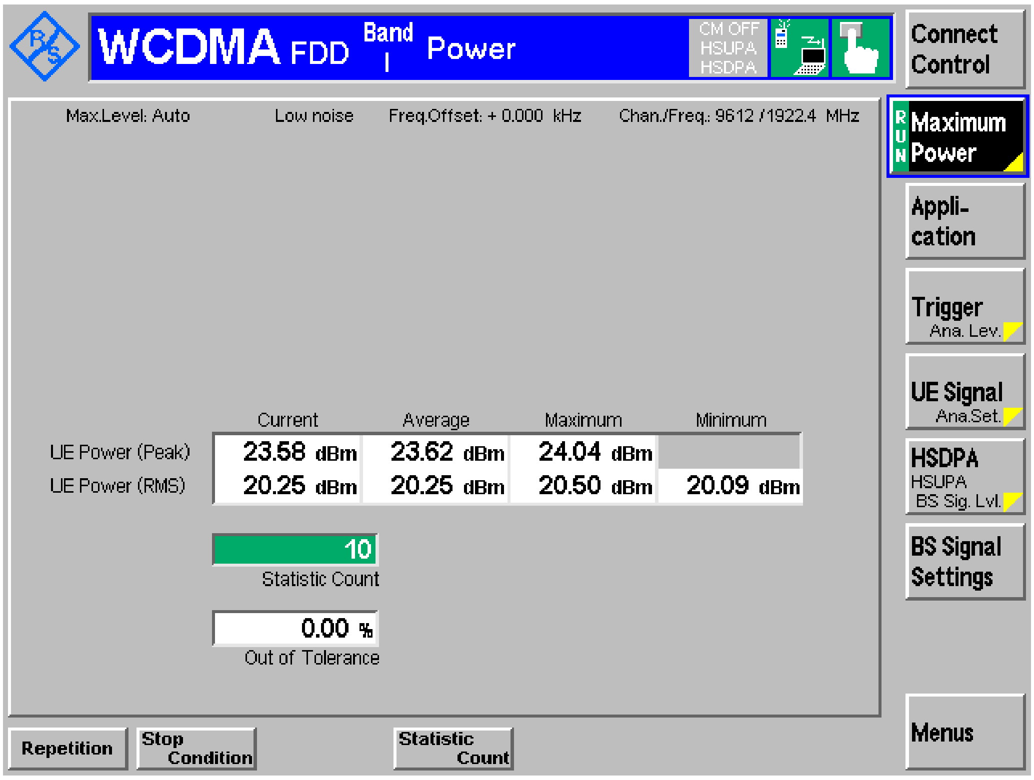


Figure 3: Maximum output power measurement result

Recall TX_meas.sav and establish CS call. Measurement result is available at:
Menus → Power → Application → Maximum Power

2.3 Frequency Error (5.3)

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 ±(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®CMU200.

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>**	**<REFIor>**
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
X	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®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -106 dBm
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 → -10.3 dB

These downlink physical channels 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 reaches its maximum output power as shown in Figure 4. The frequency error delta is measured.

Configuration in R&S®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

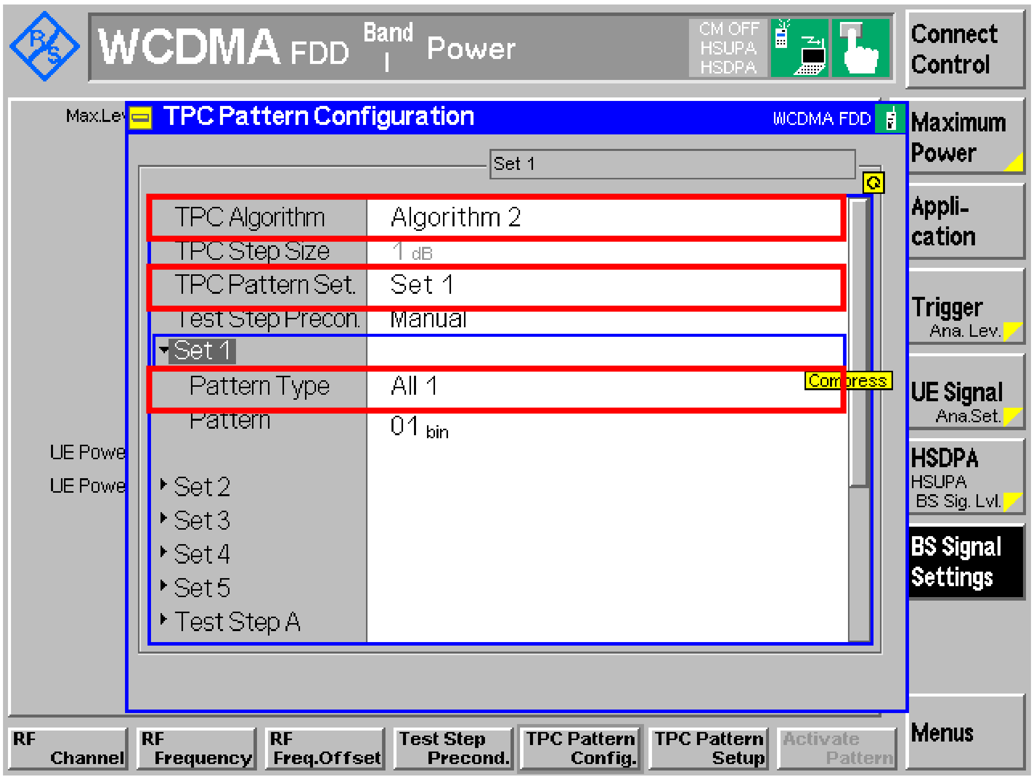


Figure 4: Continuous UP power control command configuration

Measurement result for frequency error is available in Overview WCDMA in R&S®CMU200.

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 1 → Overview WCDMA

Figure 5 shows the frequency error measurement result.

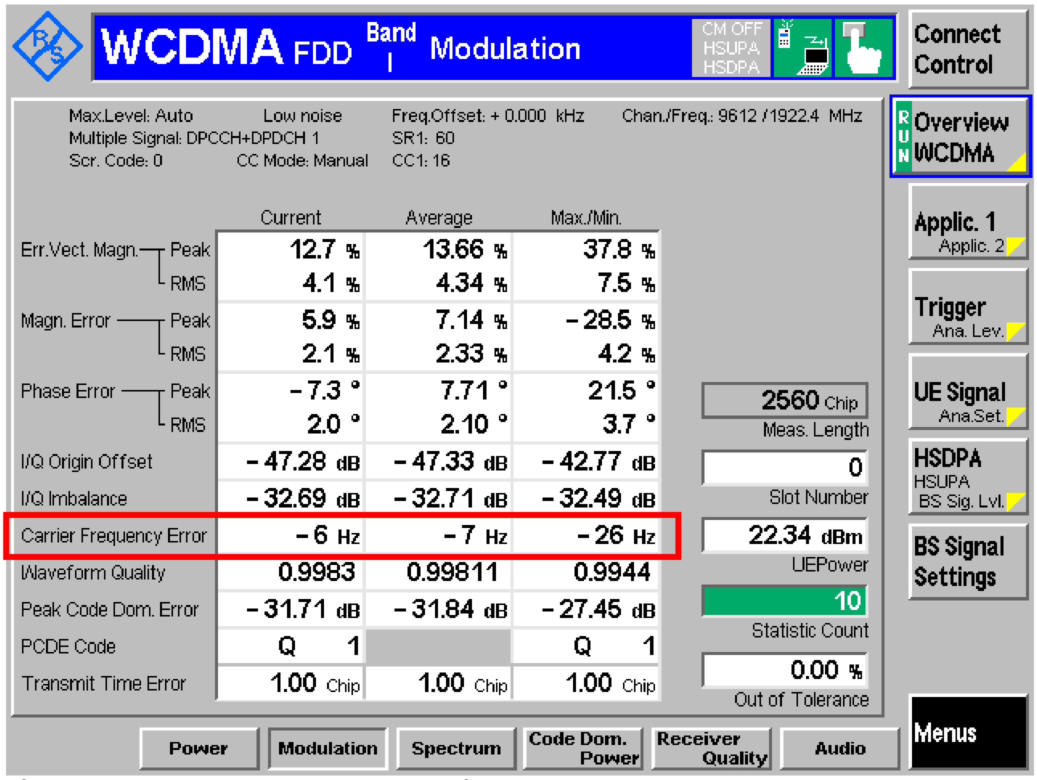


Figure 5: Frequency error measurement result

Recall TX_meas.sav, modify the following configurations and establish CS call.
BS Signal → Node-B Settings → Output Channel Power (Ior) → -106.0 dBm

Measurement result is available at:
Menus → Modulation → Applic. 1 → 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**
Ior	Test dependent power
CPICH	CPICH_Ec / Ior = –3.9 dB
P-CCPCH	P-CCPCH_Ec / Ior = –8.3 dB
SCH	SCH_Ec / Ior = –8.3 dB
PICH	PICH_Ec / Ior = –8.3 dB
S-CCPCH	S-CCPCH_Ec / Ior = –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®CMU200.

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → 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 → PICH → -8.3 dB

These downlink physical channels can be configured in R&S®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®CMU200:
Network → Cell Reselection Information → Qqualmin → -24 dB
Network → Cell Reselection Information → Qrxlevmin → -58 dBm
Network → Random Access Settings → Preamble → Max Retransmission → 1
UE Signal → UE Power Control → Max. Allowed UE Power → 21.0 dBm

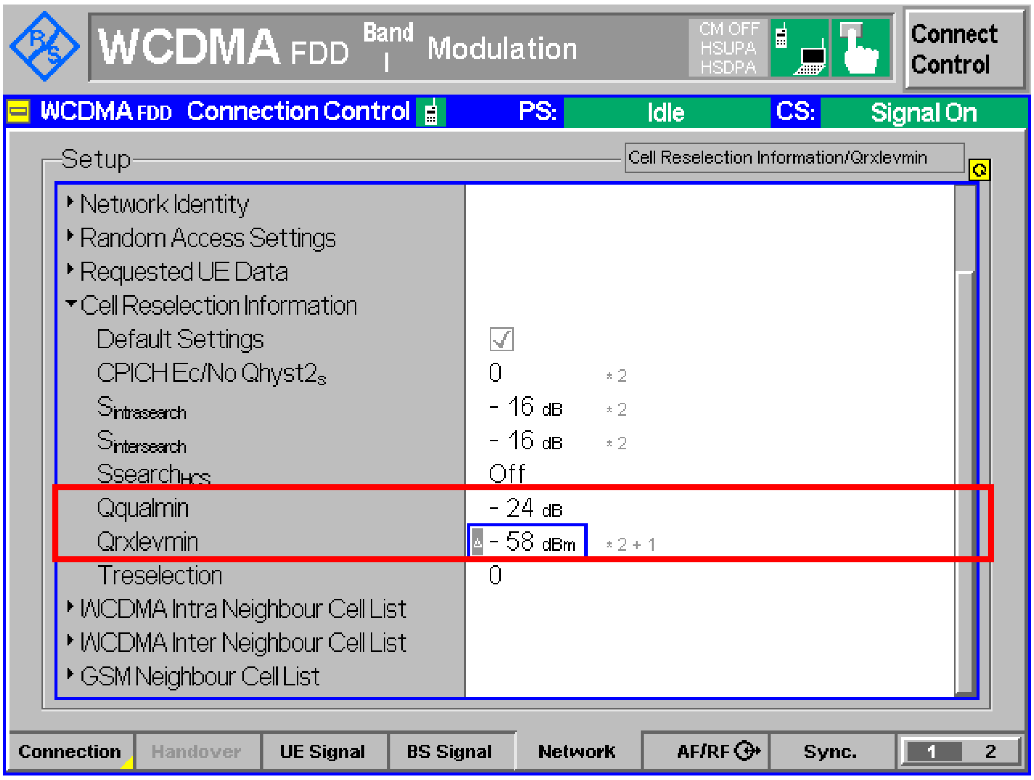


Figure 6(a): Settings for the serving cell configuration

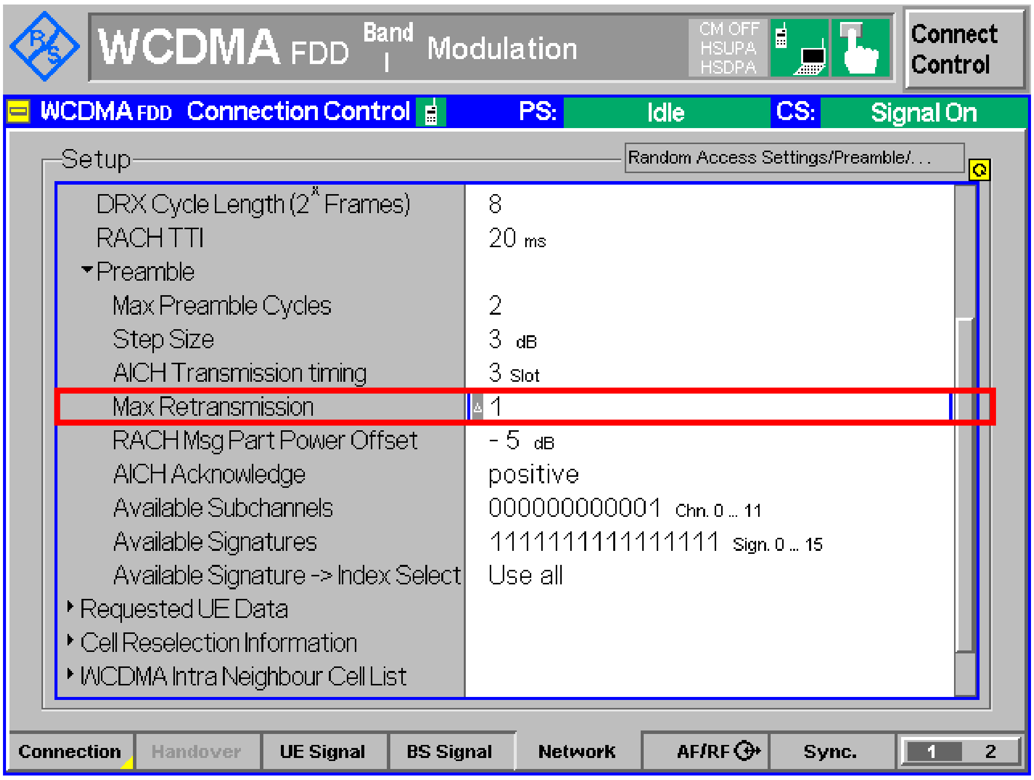


Figure 6(b): Settings for the serving cell configuration

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.

<table>
<tr><th colspan="5">Test parameters for open loop power control</th></tr>
<tr><th colspan="2">Parameter</th><th>RX-Upper dynamic end</th><th>RX-middle</th><th>RX-Sensitivity level</th></tr>
<tr><td colspan="2">Ior</td><td>–25.0 dBm / 3.84 MHz</td><td>–65.7 dBm / 3.84 MHz</td><td><REFIor> dBm / 3.84 MHz (Note)</td></tr>
<tr><td colspan="2">CPICH_RSCP</td><td>-28.9 dBm</td><td>-69.6 dBm</td><td><REFIor> + CPICH_Ec / Ior (Note)</td></tr>
<tr><td colspan="2">Primary CPICH DL TX power</td><td>+19 dBm</td><td>+28 dBm</td><td>+19 dBm</td></tr>
<tr><td colspan="2">Simulated path loss = Primary CPICH DL TX power – CPICH_RSCP</td><td>+47.9 dB</td><td>+97.6 dB</td><td>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</td></tr>
<tr><td rowspan="4">UL interference</td><td>Band I, IV, VI, X</td><td rowspan="4">–75 dBm</td><td rowspan="4">–101 dBm</td><td>–110 dBm</td></tr>
<tr><td>Band II, V, VII, XI</td><td>–108 dBm</td></tr>
<tr><td>Band III, VIII, XII, XIII, XIV</td><td>–107 dBm</td></tr>
<tr><td>Band IX</td><td>-109 dBm</td></tr>
<tr><td colspan="2">Constant Value</td><td>–10 dB</td><td>–10 dB</td><td>–10 dB</td></tr>
<tr><td colspan="2">Expected nominal UE TX power</td><td>-37.1 dBm</td><td>-13.4 dBm</td><td>+8.9 dBm</td></tr>
</table>

Note: <REFIor> is specified in Table 5, and CPICH_Ec / Ior 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®CMU200:

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

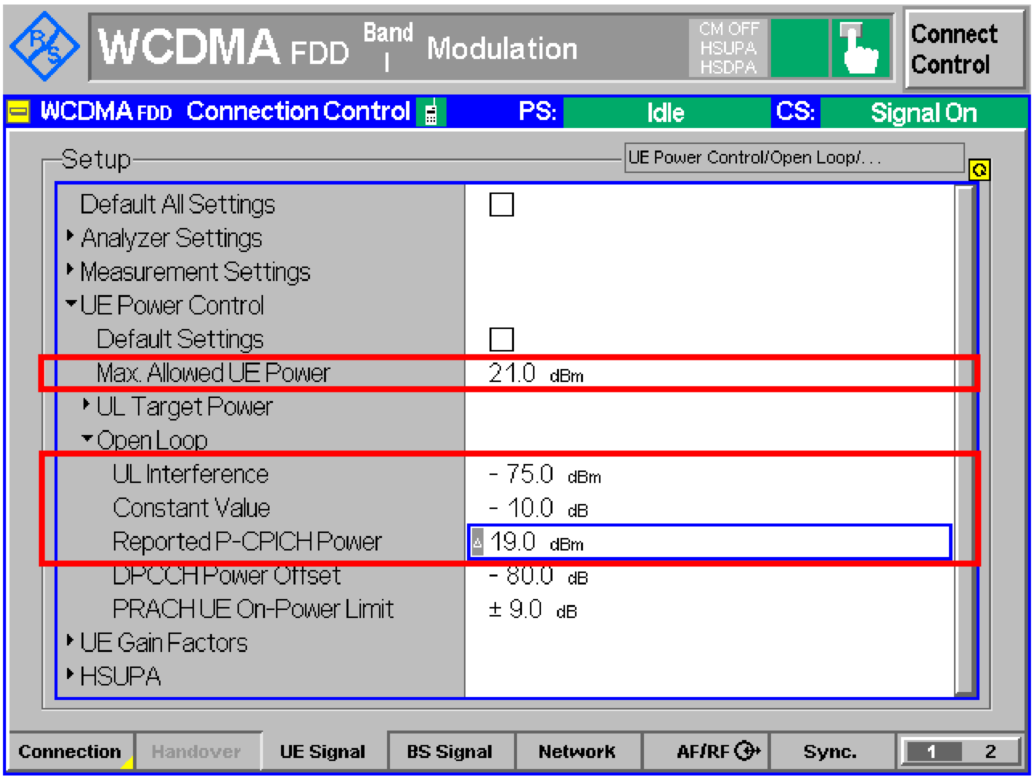


Figure 6(c): Open loop power control parameter configuration

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

Configuration in R&S®CMU200:
Menus → Power → Application → On/Off Time Mask
On/Off Time Mask → On / Off

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

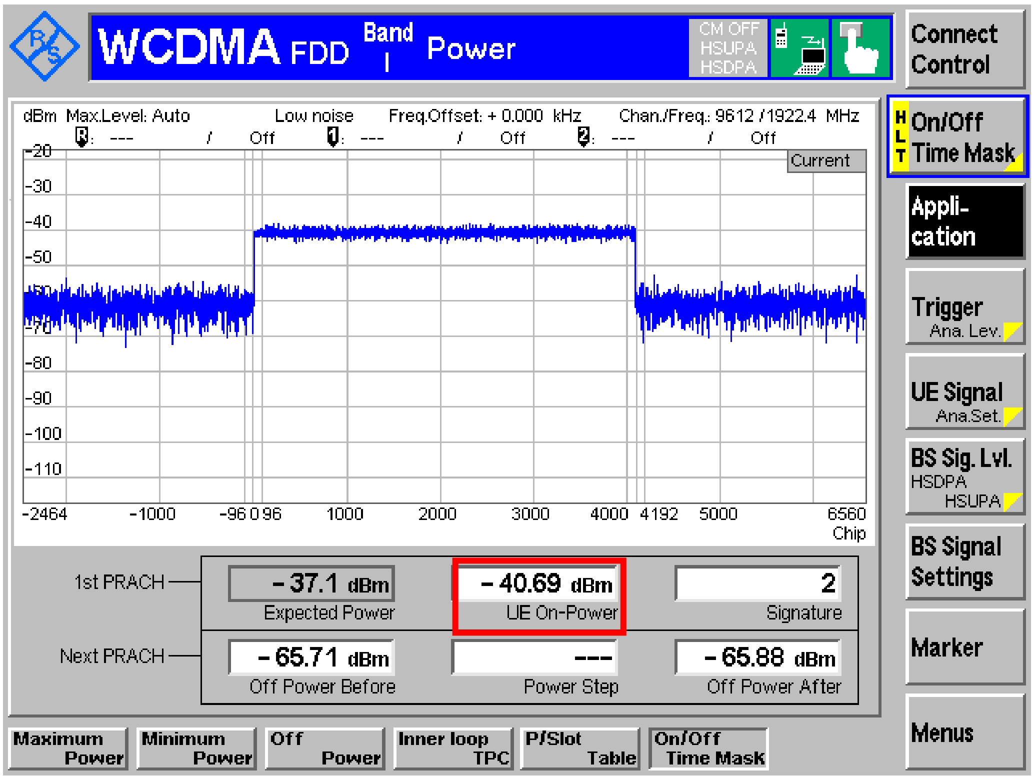


Figure 7: Open loop power control in the uplink measurement result

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 → Node-B Settings → Output Channel Power (Ior) → -106.0 dBm
UE Signal → UE Power Control → Open Loop → UL Interference → -110.0 dBm

Measurement result is available at:
Menus → Power → Application → On/Off Time Mask

2.5 Inner Loop Power Control in the Uplink (5.4.2)

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 Δ_{TPC} or $\Delta_{RP\text{-}TPC}$, 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	**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 group	**Transmitter power control range after 10 equal TPC_cmd group (all units are in dB)**				**Transmitter power control range after 7 equal TPC_cmd groups (all units are in dB)**	
	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.

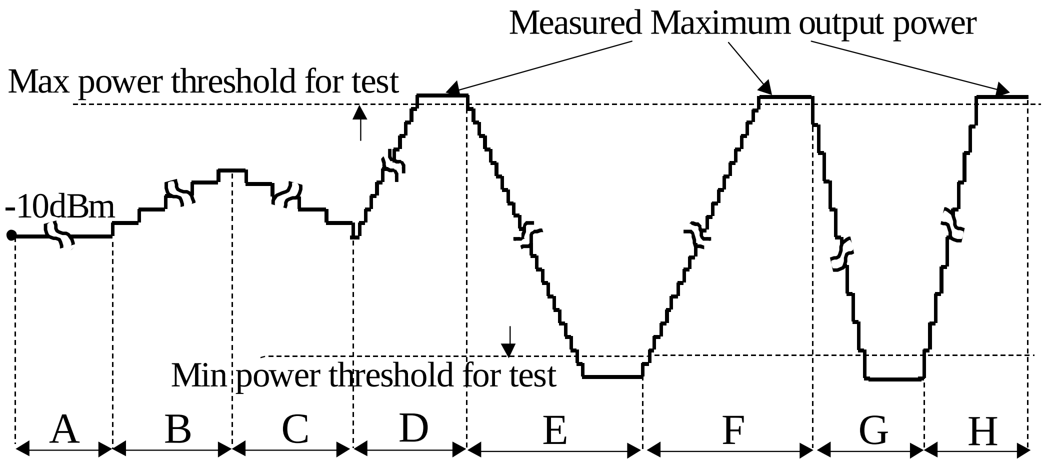


Figure 8: Inner loop power control test steps (Figure 5.4.2.4 of TS 34.121 [1])

Summary of test step conformance requirement		
Test step	**Difference in mean power between adjacent slots**	**Change in mean power over consecutive slots**
A	TPC_cmd = 0	TPC_cmd group = 0 for 10 consecutive slots
B	Every 5th 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
C	Every 5th 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 step 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)
H	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®CMU200.

Configuration in R&S®CMU200:
Menus → Power → Application → 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®CMU200:
Menus → Power → Application → P/Slot Table
P/Slot Table → Display Mode → Delta Step, Absolute, Delta step Graph or Absolute Graph

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

Configuration in R&S®CMU200:
BS Signal Settings → TPC Pattern Setup → Test Step A, B, C, D, E, F, G or H
BS Signal Settings → Activate Pattern

Before starting test step A, the output power of the UE is set to be in the range –10 ± 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®CMU200:
BS Signal Settings → Test Step Precond. → Auto
UE signal → UL Target Power → Power → -10 dBm (for test step A)

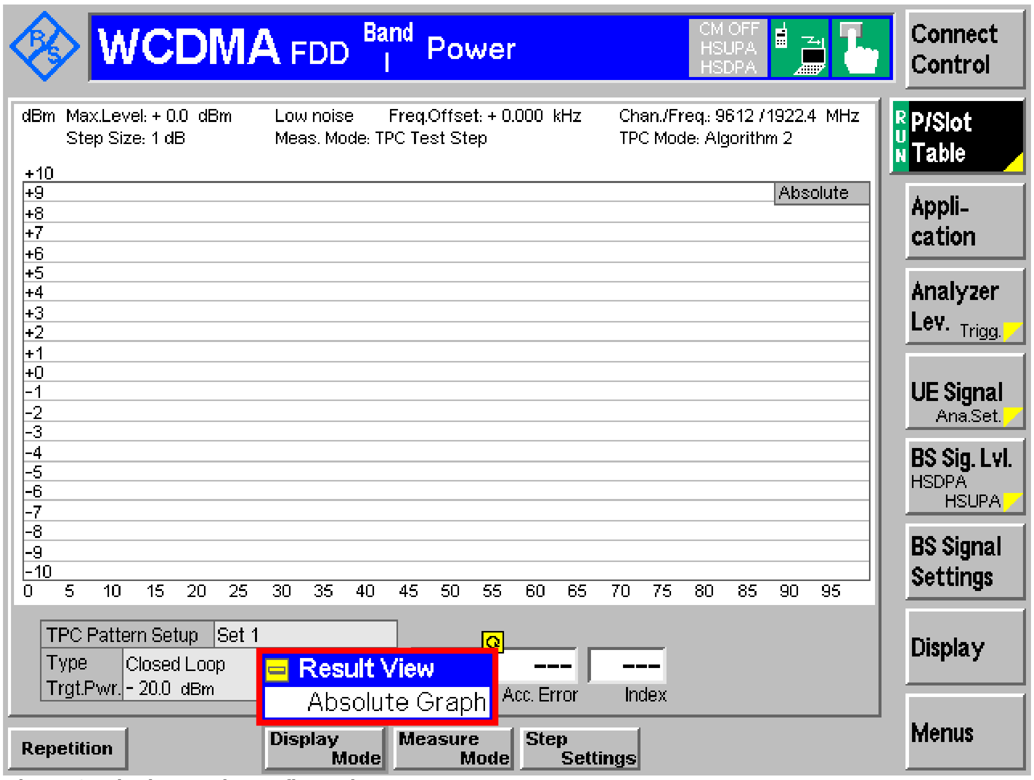


Figure 9: Display mode configuration

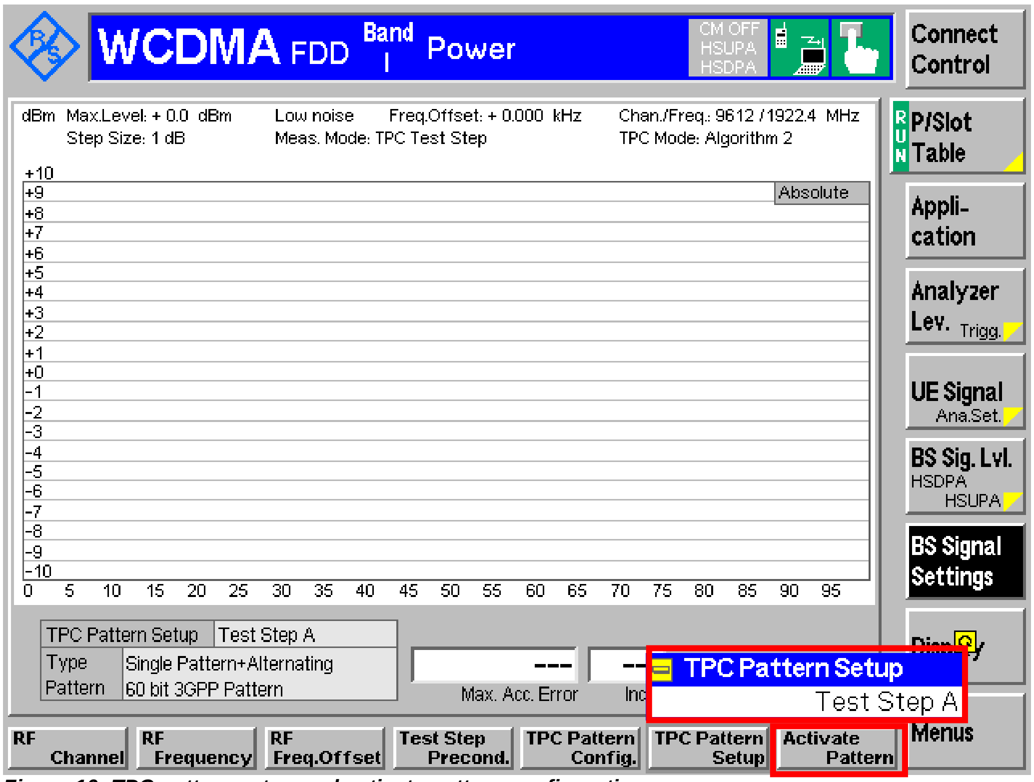


Figure 10: TPC pattern setup and activate pattern configuration

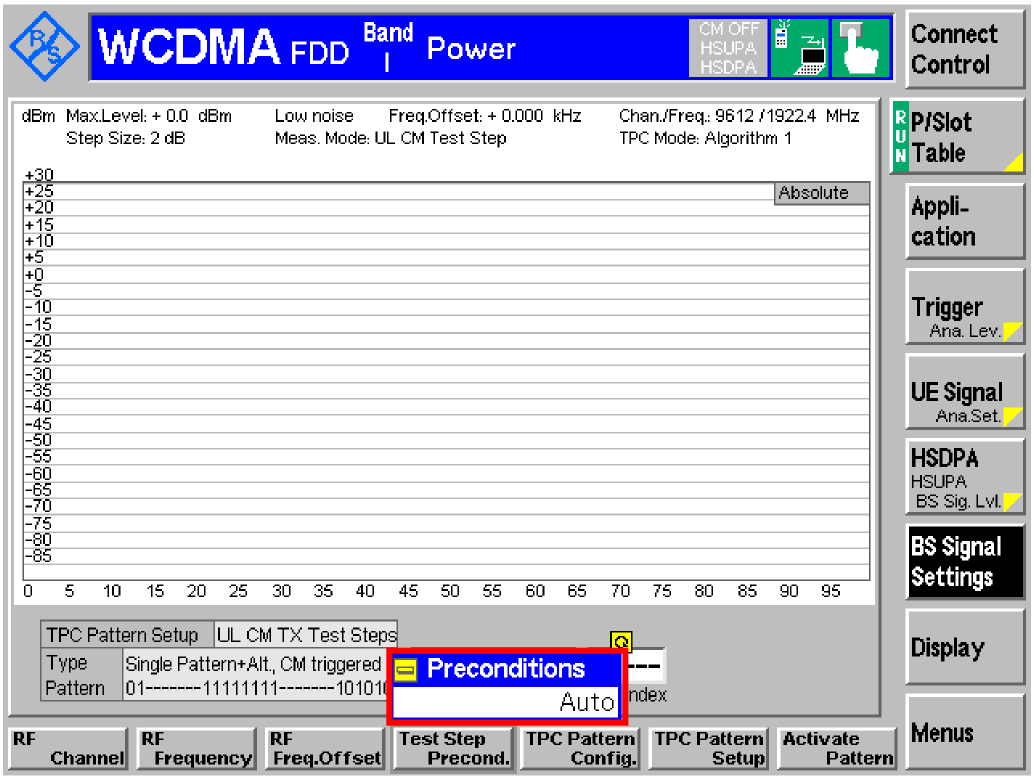


Figure 11: Auto test step preconditions setting

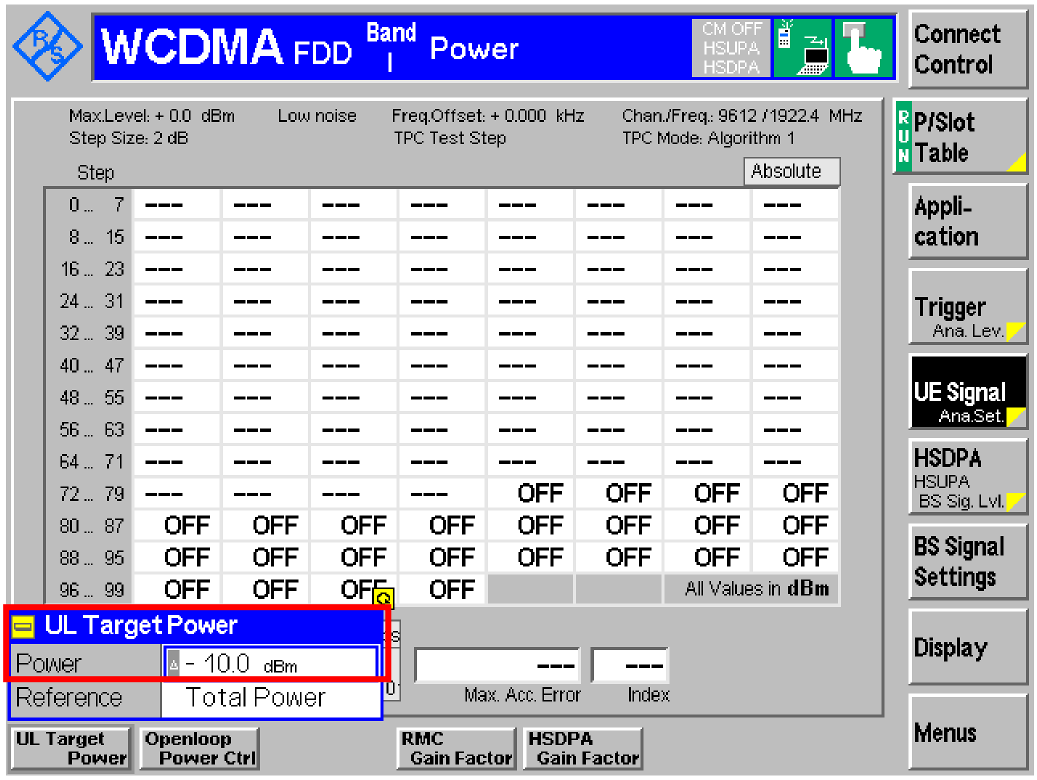


Figure 12: UE's UL target power (for test step A)

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

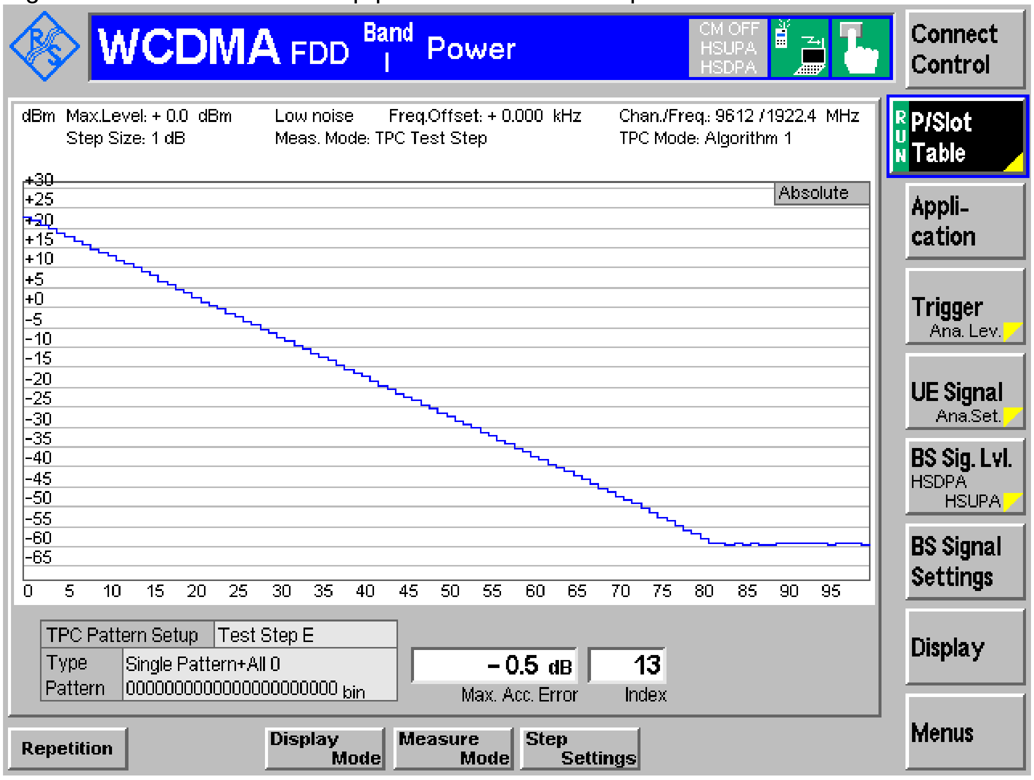
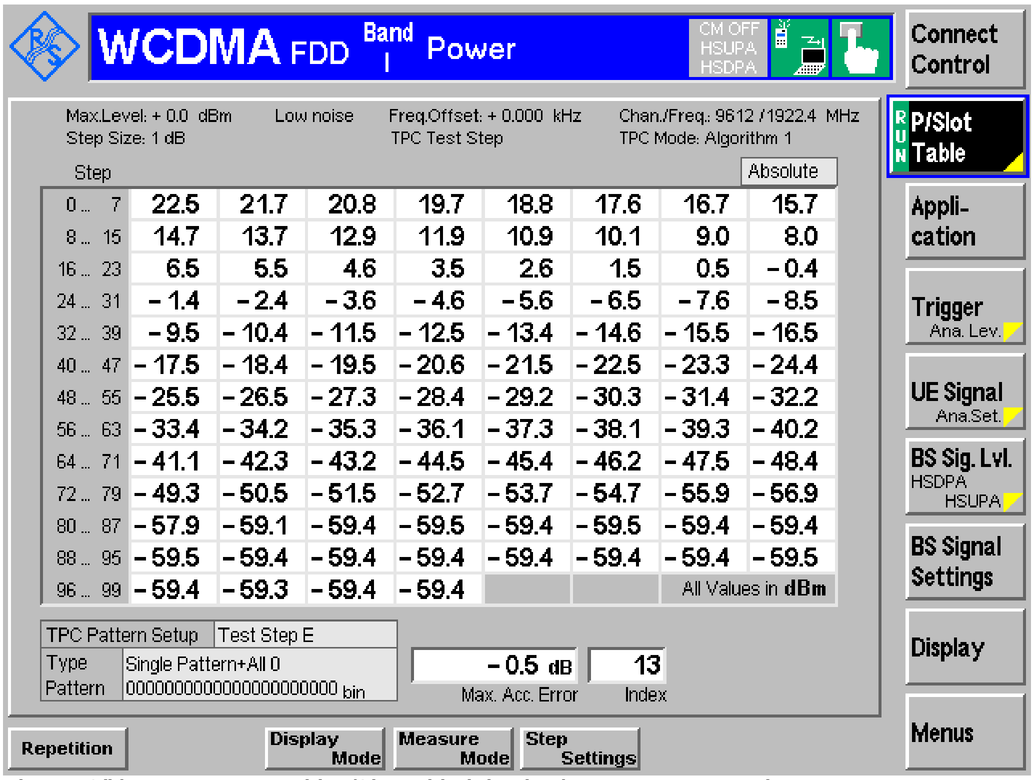


Figure 13(a): Test pattern E with P/Slot Table (Absolute Graph) measurement result



Step								
0 ... 7	22.5	21.7	20.8	19.7	18.8	17.6	16.7	15.7
8 ... 15	14.7	13.7	12.9	11.9	10.9	10.1	9.0	8.0
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
32 ... 39	- 9.5	- 10.4	- 11.5	- 12.5	- 13.4	- 14.6	- 15.5	- 16.5
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
56 ... 63	- 33.4	- 34.2	- 35.3	- 36.1	- 37.3	- 38.1	- 39.3	- 40.2
64 ... 71	- 41.1	- 42.3	- 43.2	- 44.5	- 45.4	- 46.2	- 47.5	- 48.4
72 ... 79	- 49.3	- 50.5	- 51.5	- 52.7	- 53.7	- 54.7	- 55.9	- 56.9
80 ... 87	- 57.9	- 59.1	- 59.4	- 59.5	- 59.4	- 59.5	- 59.4	- 59.4
88 ... 95	- 59.5	- 59.4	- 59.4	- 59.4	- 59.4	- 59.4	- 59.4	- 59.5
96 ... 99	- 59.4	- 59.3	- 59.4	- 59.4			All Values in dBm	

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

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®CMU200, continuously DOWN power control commands is automatically configured when user select Minimum Power measurement in R&S®CMU200.

Configuration in R&S®CMU200:
Menus → Power → Application → Minimum Power

Figure 14 shows the minimum output power measurement result.

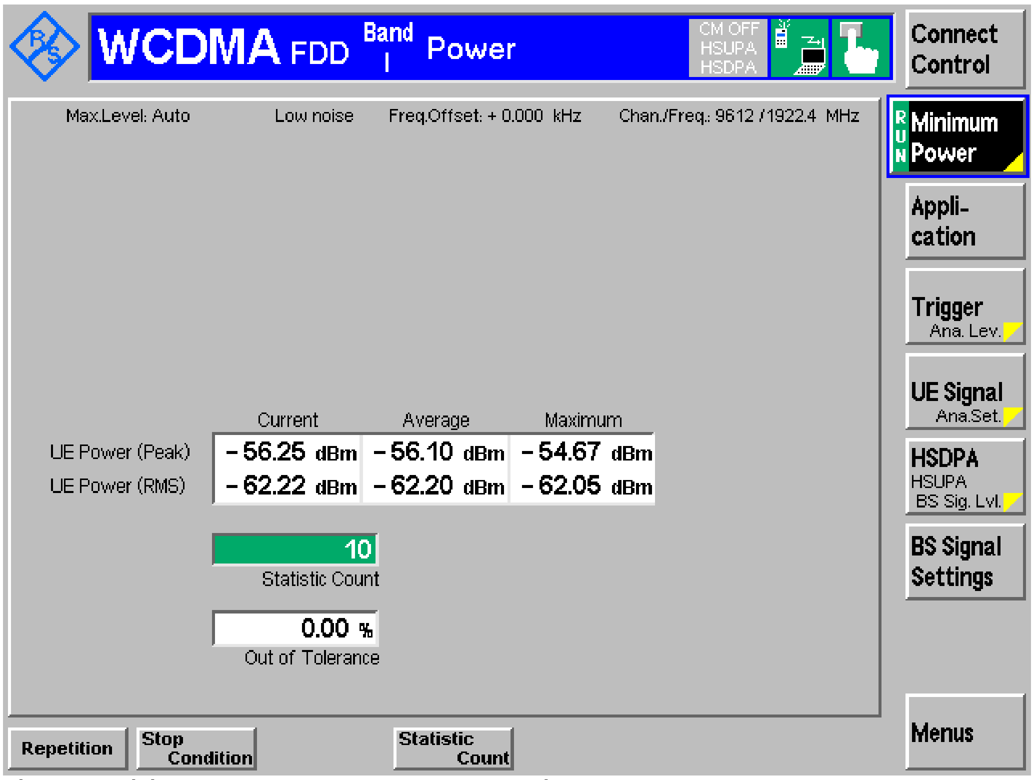


Figure 14: Minimum output power measurement result

Recall TX_meas.sav and establish CS call. Measurement result is available at:
Menus → Power → Application → 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 transmssion. 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.

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

Measurement result is available at:
Menus → Power → Application → On/Off Time Mask

2.8 Transmit ON/OFF Time Mask (5.5.2)

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.

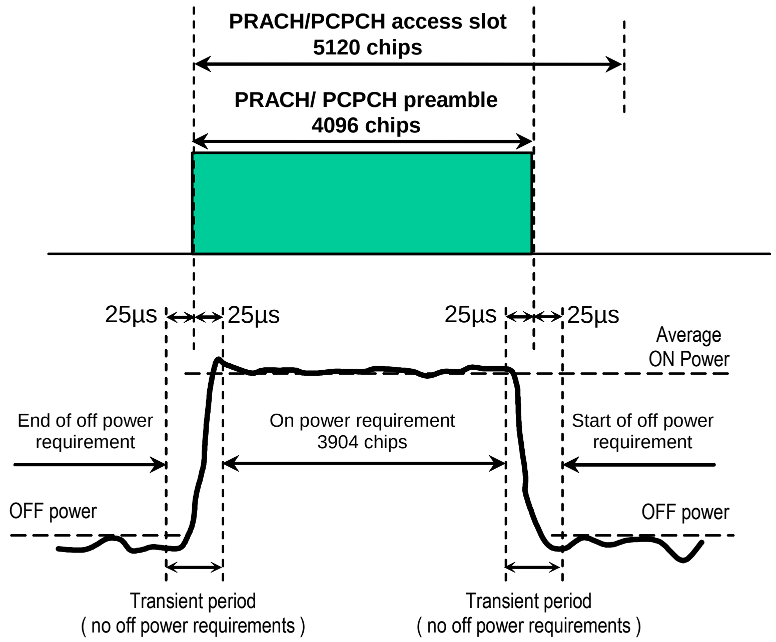


Figure 15: Transmit ON/OFF template for PRACH preambles (Figure 5.5.1 of TS 34.121 [1])

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®CMU200.

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → 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 → PICH → -8.3 dB

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

Settings for the serving cell					
Parameter	**Unit**	**Cell 1**			
		Power class 1	**Power class 2**	**Power class 3**	**Power class 4**
Cell type		Serving cell			
UTRA RF Channel Number		Channel 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®CMU200:
Network → Cell Reselection Information → Qqualmin → -24 dB
Network → Cell Reselection Information → Qrxlevmin → -58 dBm
UE Signal → UE Power Control → Max. Allowed UE Power → 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®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**
Ior (Note)		<REFIor>	<REFIor>	<REFIor>	<REFIor>	dBm/3.84 MHz
CPICH_RSCP		<REFIor> + CPICH_Ec / Ior	<REFIor> + CPICH_Ec / Ior	<REFIor> + CPICH_Ec / Ior	<REFIor> + CPICH_Ec / Ior	dBm
Primary CPICH DL TX power		+19	+19	+19	+19	dBm
Simulated path loss = Primary CPICH DL TX power – CPICH_RSCP	Band I, IV, VI, X	128.9	128.9	128.9	128.9	dB
	Band II, V, VII, XI	126.9	126.9	126.9	126.9	
	Band III, VIII, XII, XIII, XIV	125.9	125.9	125.9	125.9	
	Band IX	127.9	127.9	127.9	127.9	
UL interference	Band I, IV, VI, X	–86	–92	–95	–98	dBm
	Band II, V, VII, XI	–84	–90	–93	–96	
	Band III, VIII, XII, XIII, XIV	–83	–89	–92	–95	
	Band IX	-85	-91	-94	-97	
Constant Value		–10	–10	–10	–10	dB
Expected nominal 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®CMU200:
Network → Random Access Settings → Preamble → Step Size → 1 dB
Network → Random Access Settings → Preamble → Max Retransmission → 5
Network → Random Access Settings → Preamble → AICH Acknowledge → OFF
Network → Random Access Settings → Preamble → Available Subchannels → 000000000001

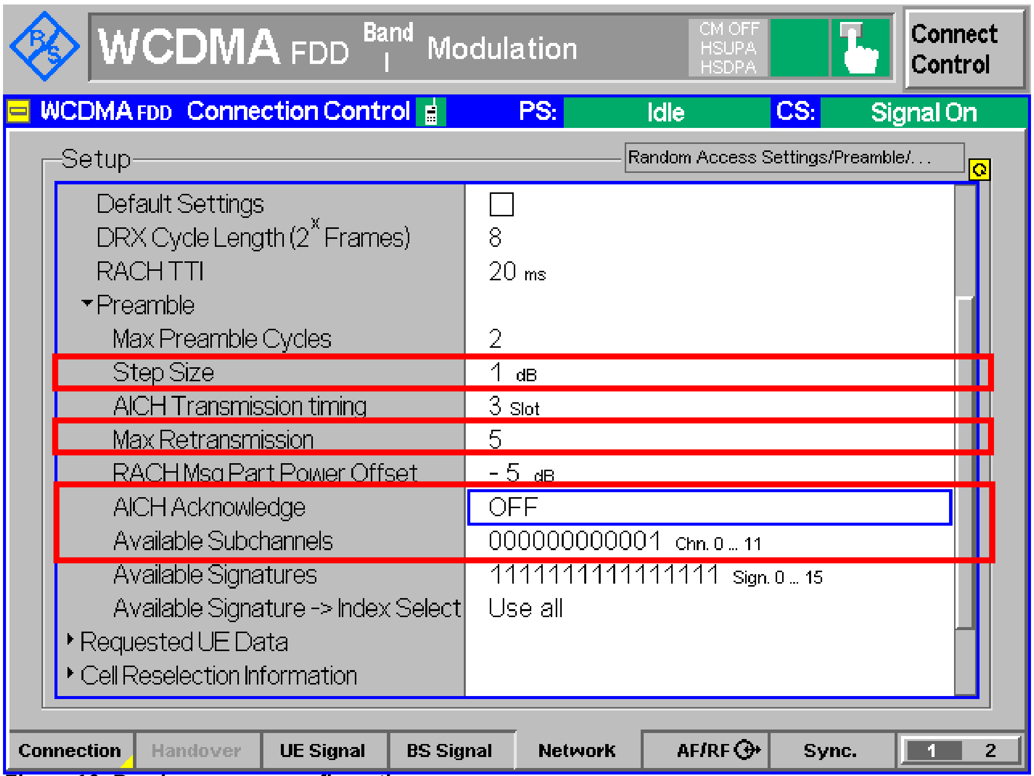


Figure 16: Random access configuration

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

Configuration in R&S®CMU200:
Menus → Power → Application → On/Off Time Mask
On/Off Time Mask → On / Off

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

Note: With AICH Acknowledge OFF, R&S®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.

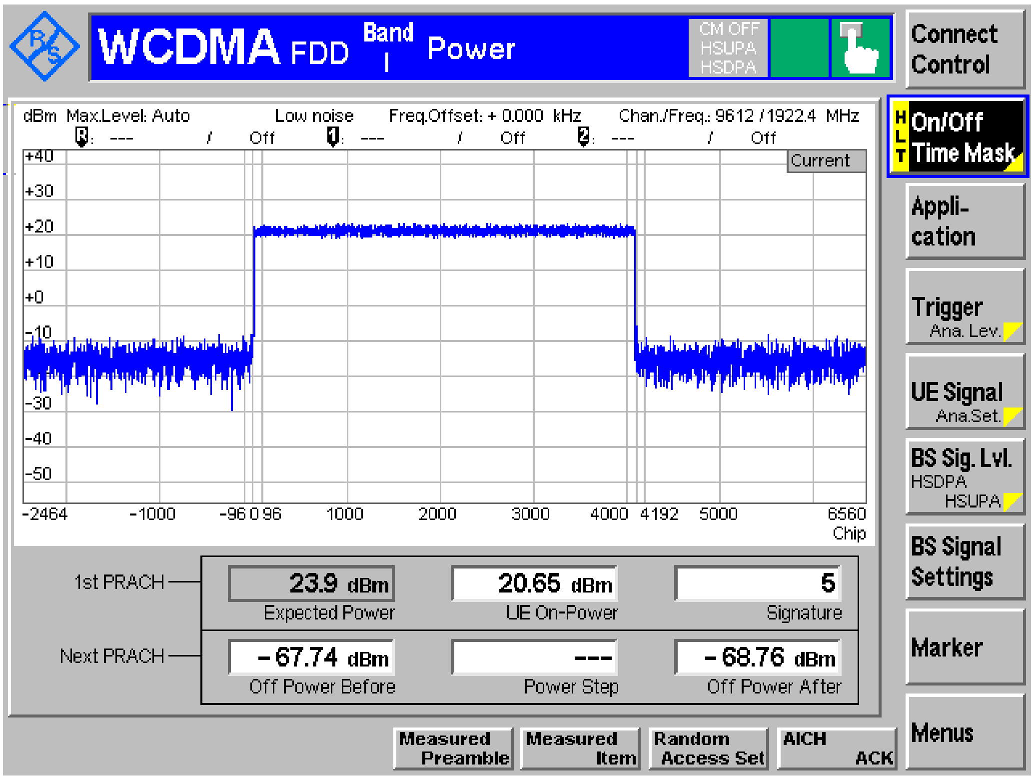


Figure 17: Transmit ON/OFF time mask measurement result

Recall TxOnOff.sav, and wait for UE registration. Modify the following configurations after UE registration and establish CS call:

Network → Random Access Settings → Preamble → Step Size → 1 dB
Network → Random Access Settings → Preamble → Max Retransmission → 5
Network → Random Access Settings → Preamble → AICH Acknowledge → OFF
BS Signal → Node-B Settings → Output Channel Power (Ior) → -106 dBm
UE Signal → UE Power Control → Open Loop → UL Interference → -95 dBm

Measurement result is available at:
Menus → Power → Application → On/Off Time Mask

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 µs before the slot boundary to 25 µs 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.

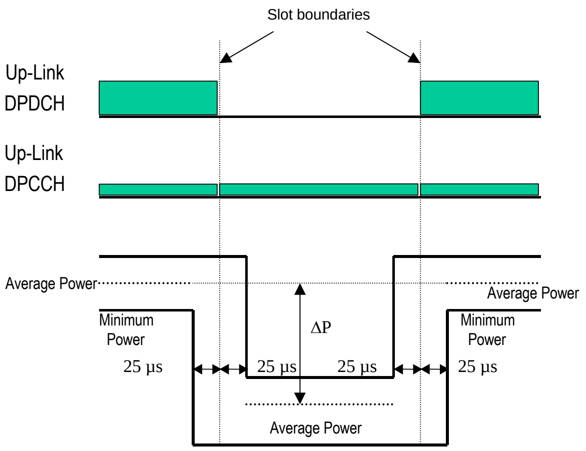


Figure 18: Transmit template during DTX (Figure 5.6.2 of TS 34.121 [1])

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

Transmitter power step tolerance		
Quantized amplitude ratios β_c and β_d	**Power control step size (Up or down) ΔP [dB]**	**Transmitter power step tolerance [dB]**
β_c = 0,5333, β_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 β_c = 0.5333 and β_d = 1.0 is setup in non-compressed frames as shown in Figure 19.

Configuration in R&S®CMU200:
UE Signal → UE Gain Factors → RMC → Uplink 122 → β_c → 8
UE Signal → UE Gain Factors → RMC → Uplink 122 → β_d → 15

Discontinuous DPDCH is setup as shown in Figure 20.

Configuration in R&S®CMU200:
BS Signal → Circuit Switched → RMC Settings → DL Resources in Use → 50 %

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

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

Configuration in R&S®CMU200:
Menus → Power → Application → Inner Loop TPC
Inner Loop TPC → Measure Mode → Change of TFC

The output power of the UE is set to be in 0 ± 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®CMU200:
UE signal → UL Target Power → Power → 0.0 dBm
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → 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®CMU200:
Trigger → Trigger Source → Change of TFC

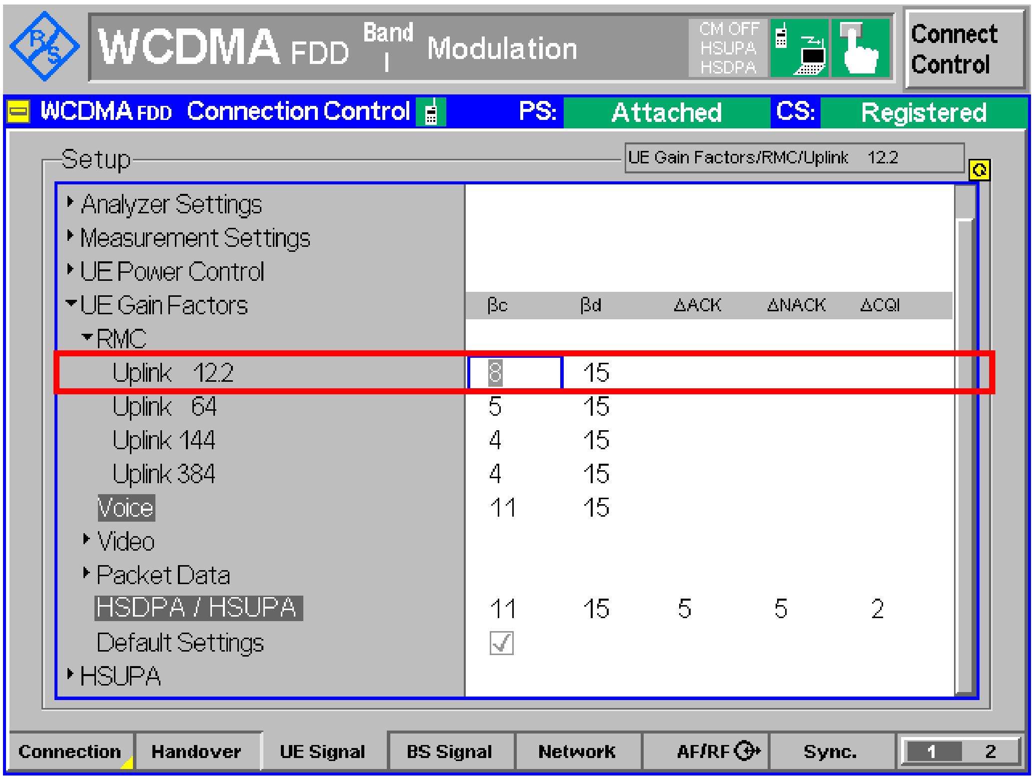


Figure 19: Gain factor configuration

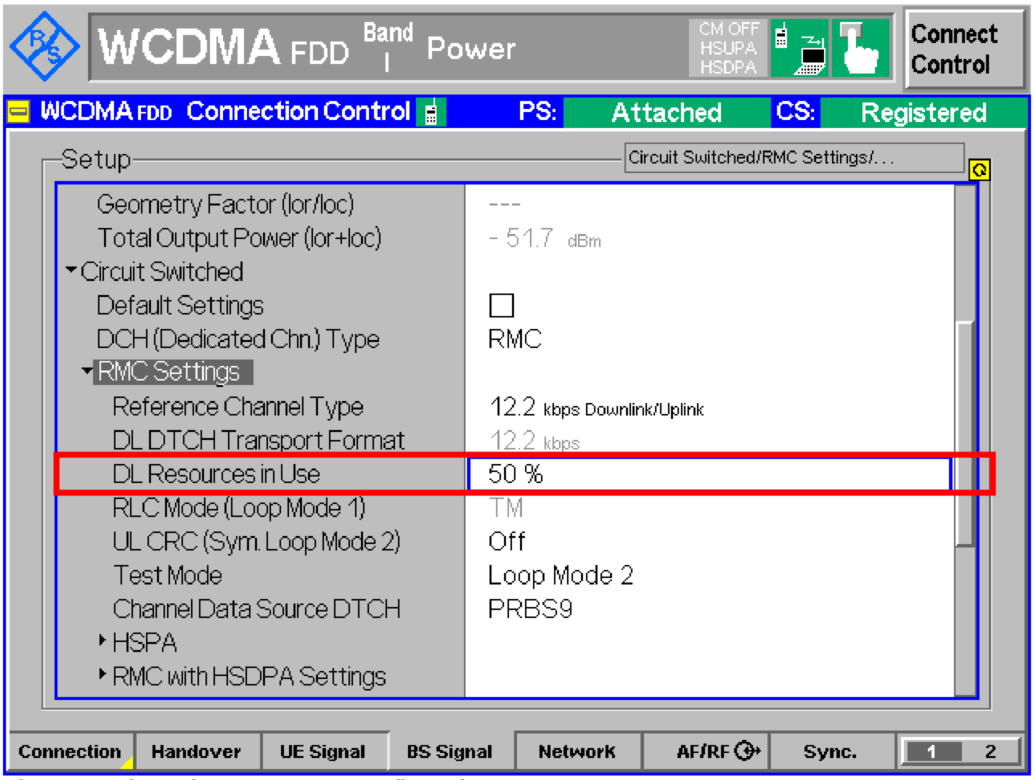


Figure 20: Discontinuous DPDCH configuration

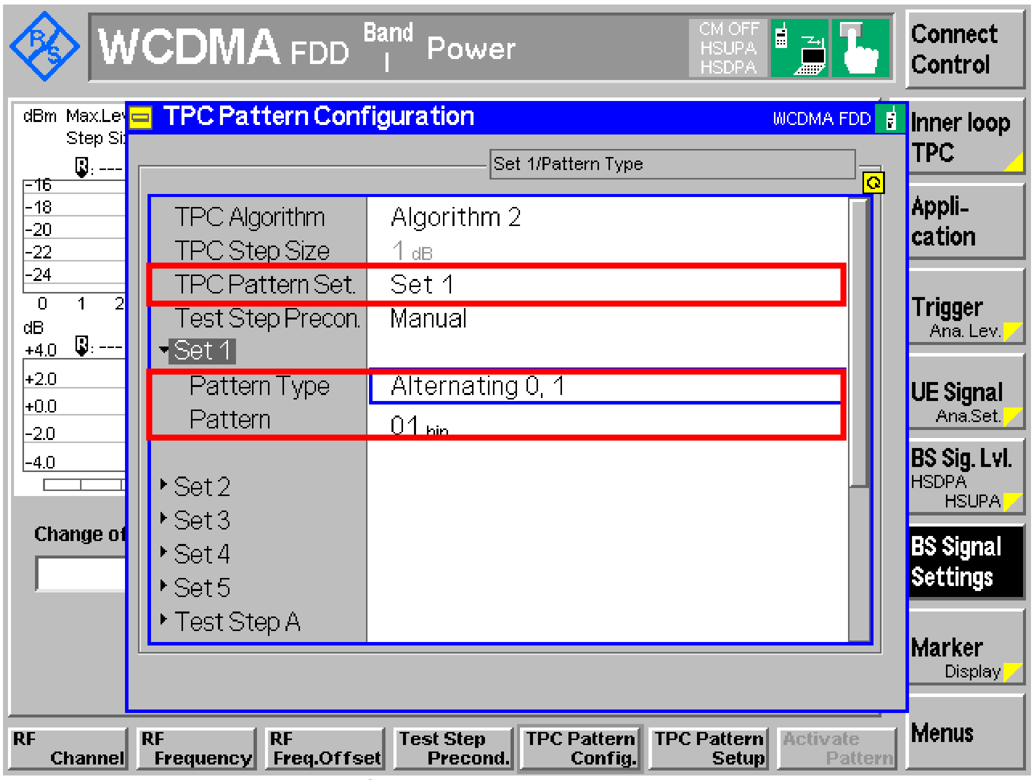


Figure 21 :Alternating '0' and '1' TPC configuration

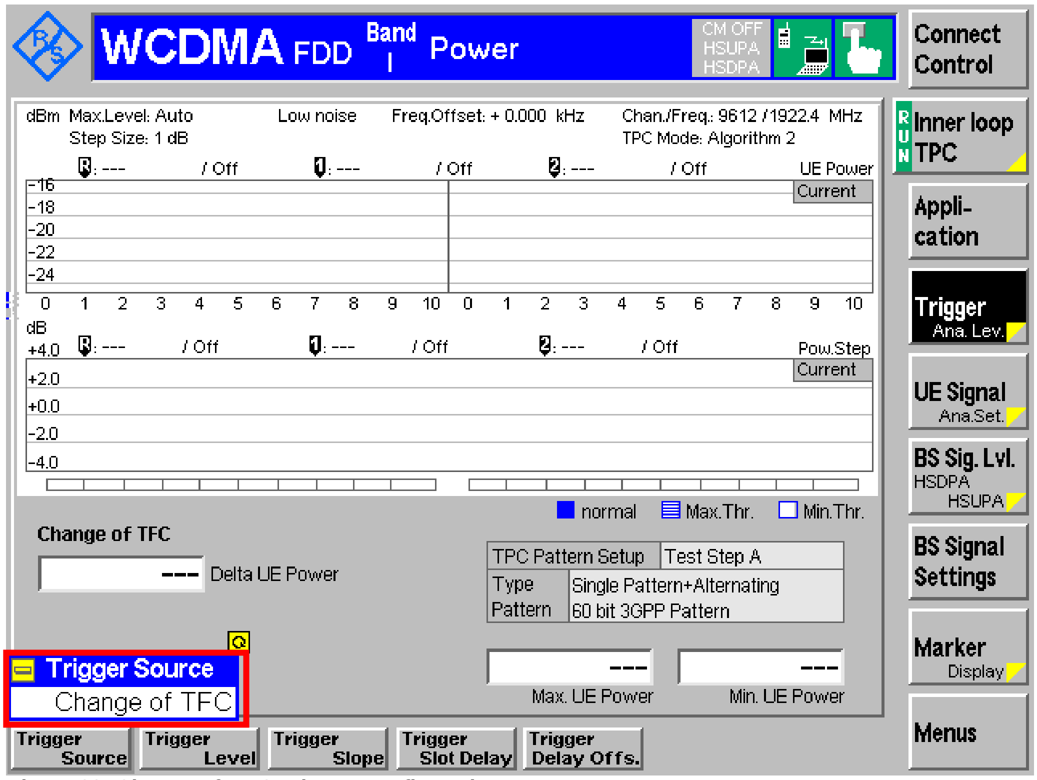


Figure 22: Change of TFC trigger configuration

Figure 23 shows the change of TFC measurement result.

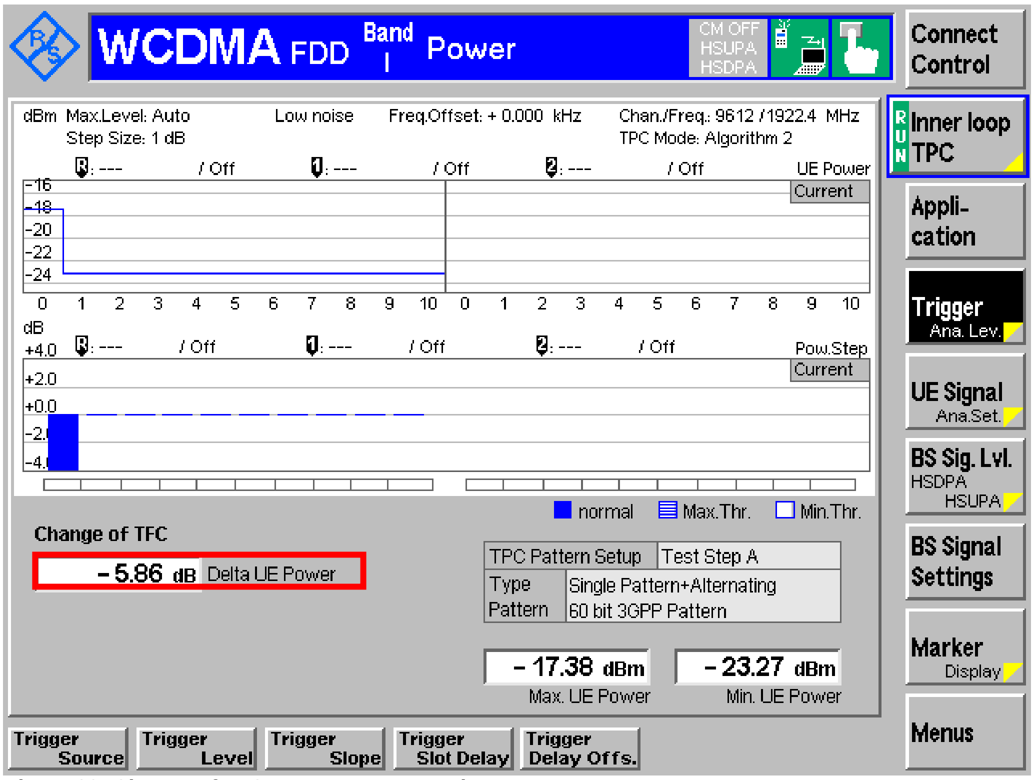


Figure 23: Change of TFC measurement result

Recall TX_meas.sav, modify the following configuration and establish CS call.
BS Signal → Circuit Switched → RMC Settings → DL Resources in Use → 50 %

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

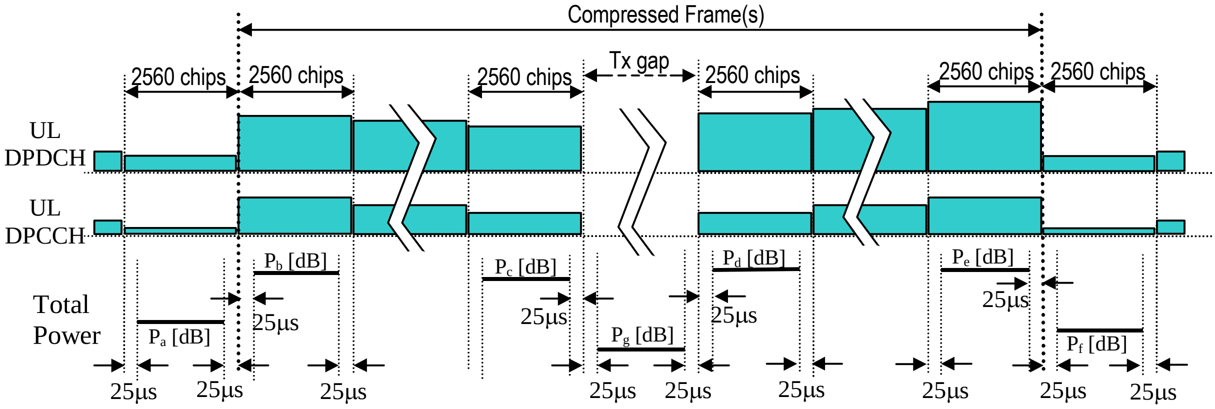
Measurement result is available at:
Menus → Power → Application → Inner Loop TPC
Inner Loop TPC → Measure Mode → Change of TFC

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_cmd	Transmitter power control range for 3dB step size	
	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 power control range for 3dB step size		
TPC_cmd group	Transmitter power control range after 7 equal TPC_cmd groups	
	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 1from 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 β_c = 0.5333 and β_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.

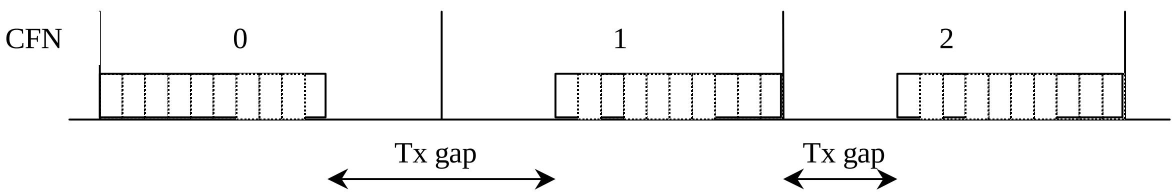


Figure 25: Pattern A for compressed mode test (Figure 5.7.2 of TS 34.121 [1])

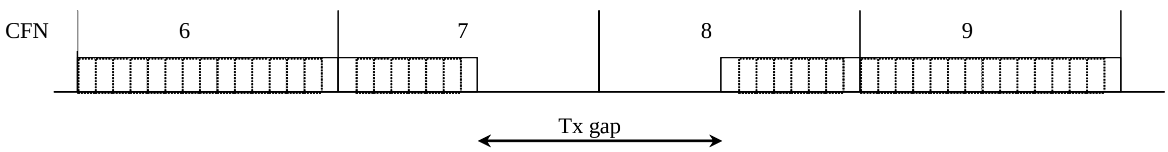


Figure 26: Pattern B for compressed mode test (Figure 5.7.3 of TS 34.121 [1])

Table 17 shows the TPC commands transmitted in the downlink and the corresponding R&S®CMU200 parameter name.

TPC commands transmitted in downlink		
CFN	**TPC commands in downlink**	**R&S®CMU200 parameter name**
0	0 1 - - - - - - - 1 1 1 1 1 1	Pattern A (rising TPC)
1	1 1 - - - - - - - 1 0 1 0 1 0	
2	1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	
3	0 1 - - - - - - - 0 0 0 0 0 0	Pattern A (falling TPC)
4	0 0 - - - - - - - 0 1 0 1 0 1	
5	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	
6	0 0 0 0 0 0 0 0 0 0 0 0 1 1 1	Pattern B
7	1 1 1 1 1 1 1 1 - - - - - - -	
8	- - - - - - - 0 0 0 0 0 0 0 0	
9	0 0 0 1 1 1 1 1 1 1 1 1 1 1 1	

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®CMU200:
BS signal → Compressed Mode Settings → Pattern Selection → UL CM TX Test Steps
BS signal → Compressed Mode Settings → UL CM TX Test Pattern → Pattern Type → Pattern A (rising TPC), Pattern A (falling TPC) or Pattern B

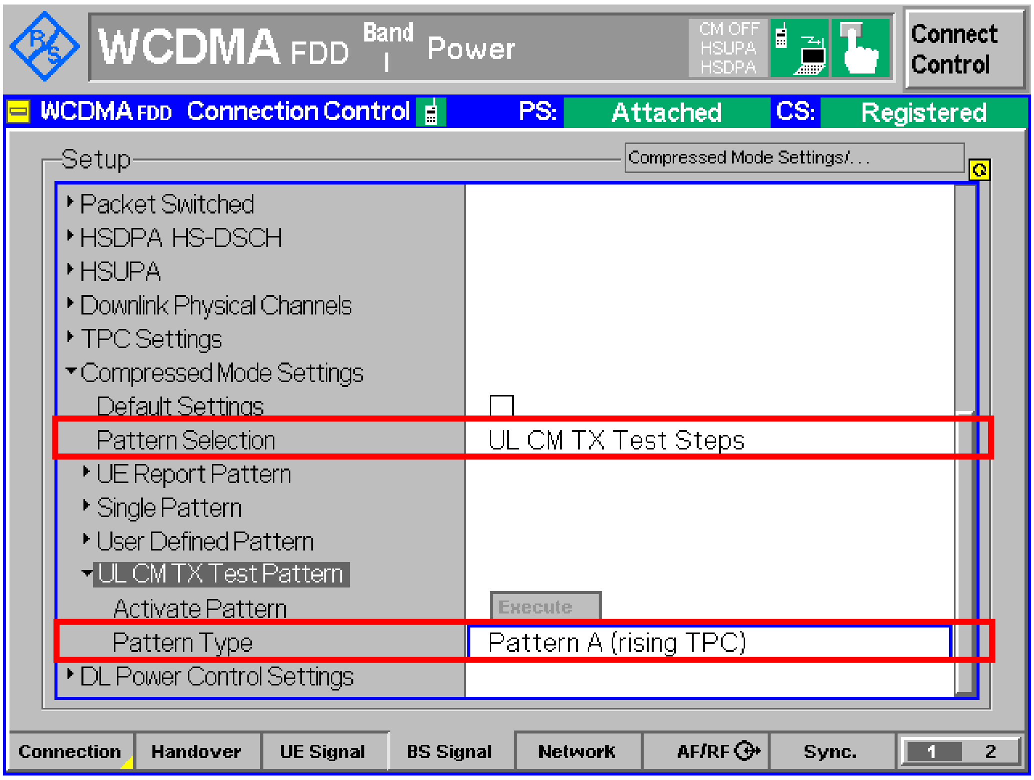


Figure 27: Uplink compressed mode and pattern type selection

Measurement result for uplink compressed mode is available in P/Slot Table by selecting UL CM Test Step under Measure Mode in R&S®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®CMU200:
Menus → Power → Application → P/Slot Table
P/Slot Table → Measure Mode → UL CM Test Step
P/Slot Table → Display Mode → Delta Step, Absolute, Delta step Graph or Absolute Graph
Trigger → Trigger source → Compressed Mode, Signaling or Auto

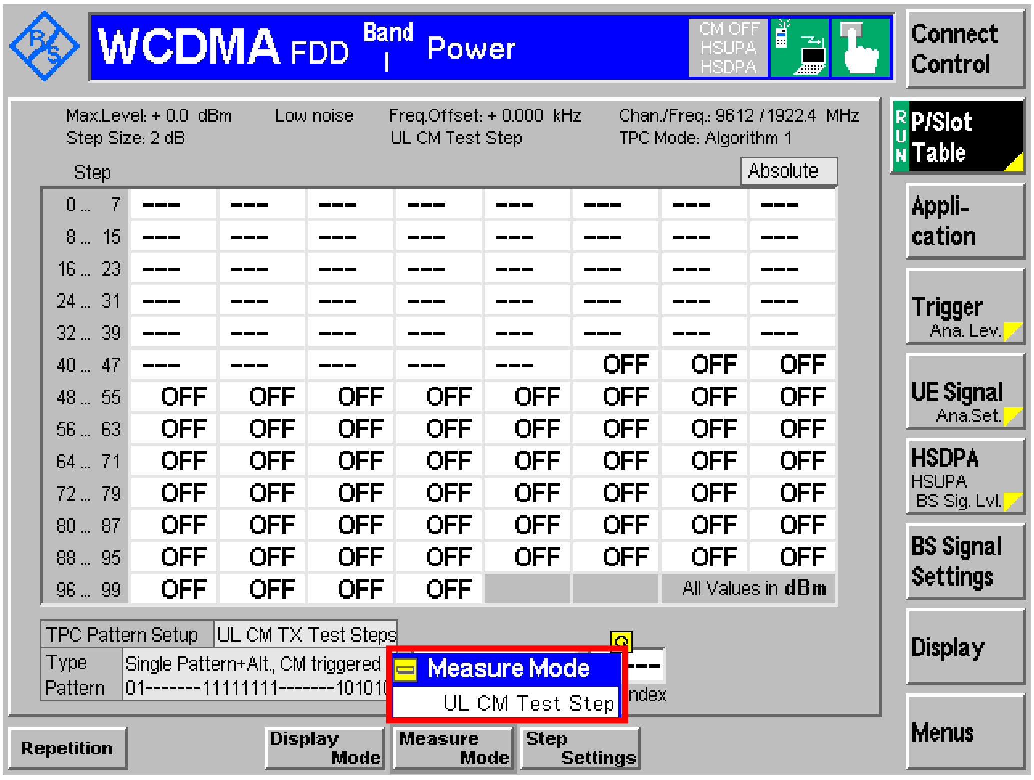


Figure 28: Measure mode configuration for uplink compressed mode

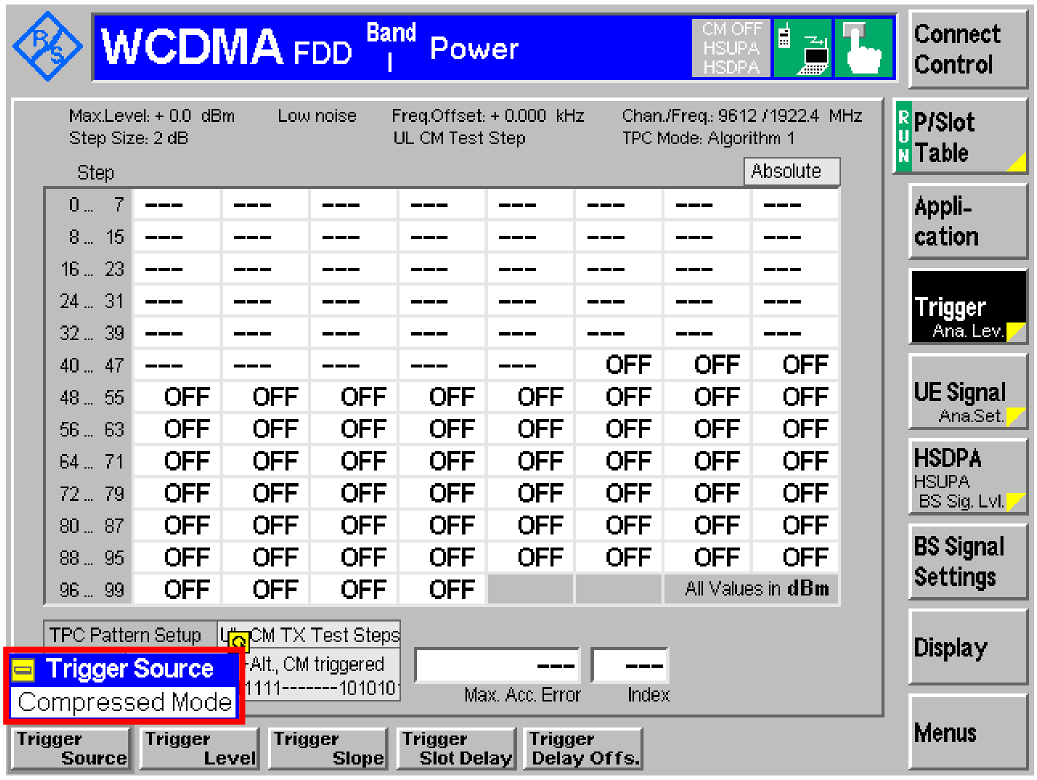


Figure 29: Trigger configuration for uplink compressed mode

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 ± 9 dBm for Pattern A (rising TPC), range 2 ± 9 dBm for Pattern A (falling TPC) or –10 ± 9 dBm for Pattern B by referring to Figure 12.

Configuration in R&S®CMU200:
BS Signal Settings → Test Step Precond. → Auto
UE signal → UL Target Power → Power → -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®CMU200. Uplink compressed mode test pattern will be displayed in R&S®CMU200 after activating the pattern.

Configuration in R&S®CMU200:
BS Signal Settings → TPC Pattern Setup → UL CM TX Test Steps
BS Signal Settings → Activate Pattern

Figure 30 shows uplink compressed mode measurement result.

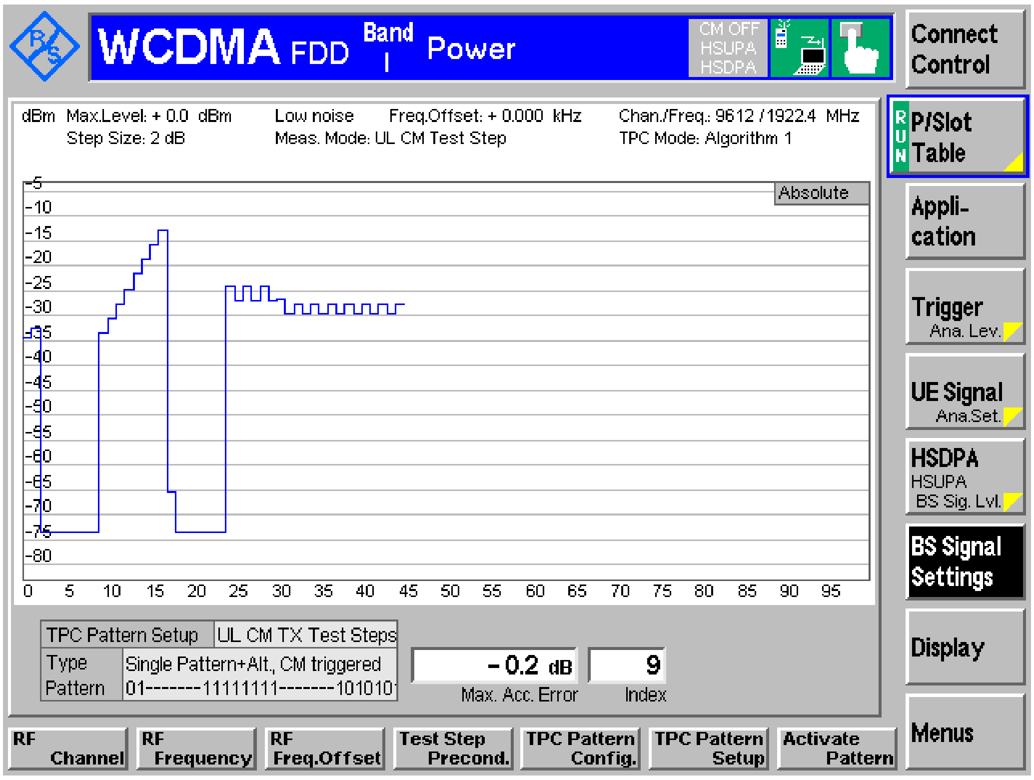


Figure 30(a): Pattern A (rising TPC) uplink compressed mode (absolute graph) measurement result

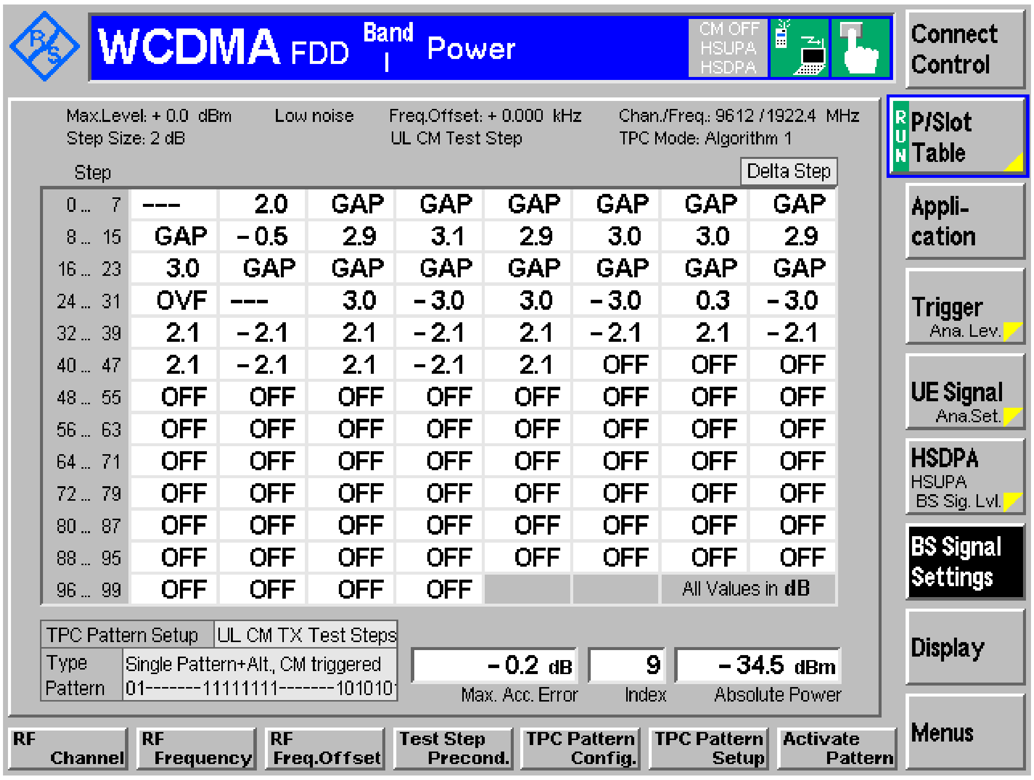


Figure 30(b): Pattern A (rising TPC) uplink compressed mode (delta step) measurement result

Recall UlComp.sav and establish CS call. Modify the following configurations:
Menus → Power → Application → P/Slot Table
BS signal → Compressed Mode Settings → UL CM TX Test Pattern → Pattern Type → Pattern A (rising TPC), Pattern A (falling TPC) or Pattern B
UE signal → UL Target Power → Power → -36 dBm (for Pattern A rising TPC), 2 dBm (for Pattern A failing TPC) or -10 dBm (for Pattern B)
BS Signal Settings → 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®CMU200.

Configuration in R&S®CMU200:
Menus → Spectrum → Application → ACLR FFT/OBW

Figure 31 shows the occupied bandwidth measurement result.

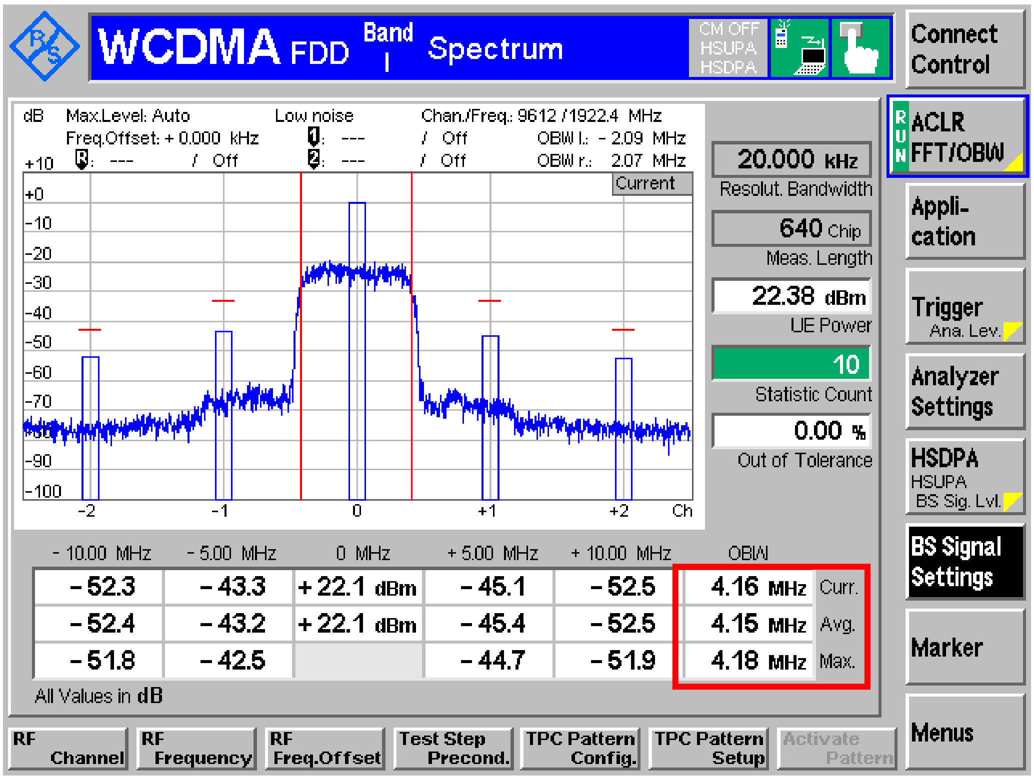


Figure 31: Occupied bandwidth measurement result

Recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → Set 3

Measurement result is available at:
Menus → Spectrum → Application → 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. Δf is the separation between the carrier frequency and the centre of the measurement bandwidth.

Spectrum Emission Mask Requirement			
Δf in MHz	Minimum requirement		Measurement bandwidth
	Relative requirement	Absolute requirement	
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 ≤ Δf < 3.5 MHz	2.515MHz ≤ f_offset < 3.485MHz	-15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ 12.5 MHz	4.0MHz ≤ 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 ≤ Δf < 3.5 MHz	2.515MHz ≤ f_offset < 3.485MHz	-15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ 12.5 MHz	3.55MHz ≤ 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 filter centre frequency, f_offset	Additional requirements Band XII, XIII, XIV	Measurement bandwidth
2.5 MHz ≤ Δf < 2.6 MHz	2.515MHz ≤ f_offset < 2.585MHz	-13 dBm	30 kHz
2.6 MHz ≤ Δf ≤ 12.45 MHz	2.65MHz ≤ 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 R&S®CMU200.

Configuration in R&S®CMU200:
Menus → Spectrum → Application → Emission Mask

Figure 32 shows the spectrum emission mask measurement result.

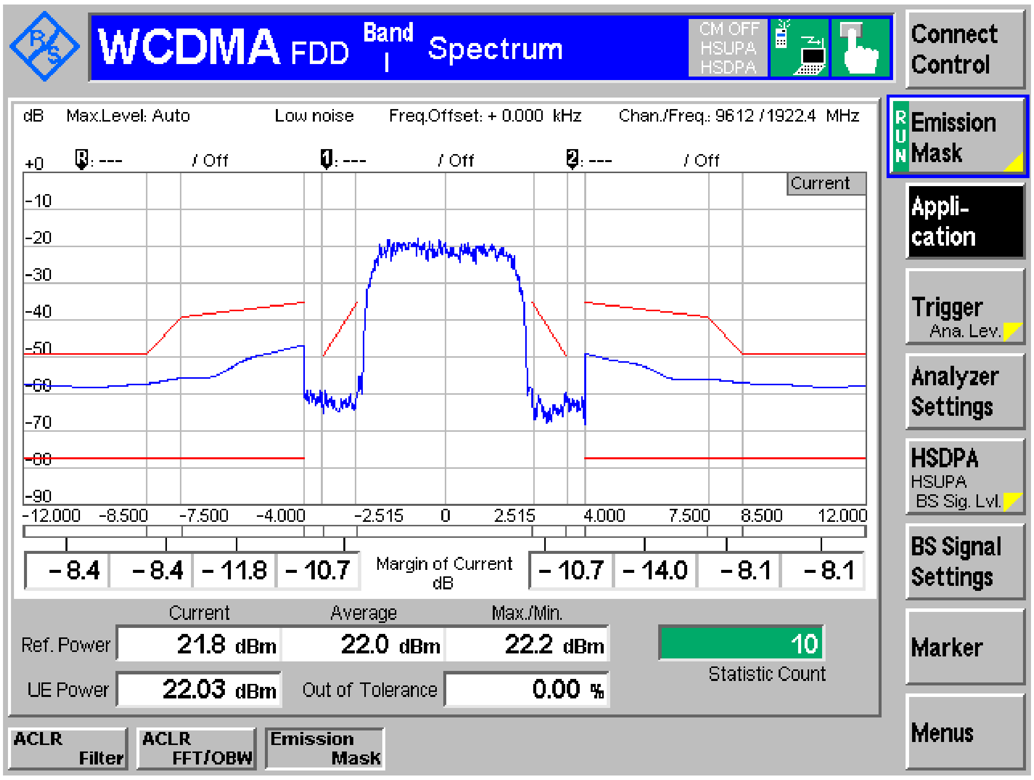


Figure 32: Spectrum emission mask measurement result

Recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → Set 3

Measurement result is available at:
Menus → Spectrum → Application → 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.

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®CMU200.

Configuration in R&S®CMU200:
Menus → Spectrum → Application → ACLR Filter

Figure 33 shows the ACLR measurement result.

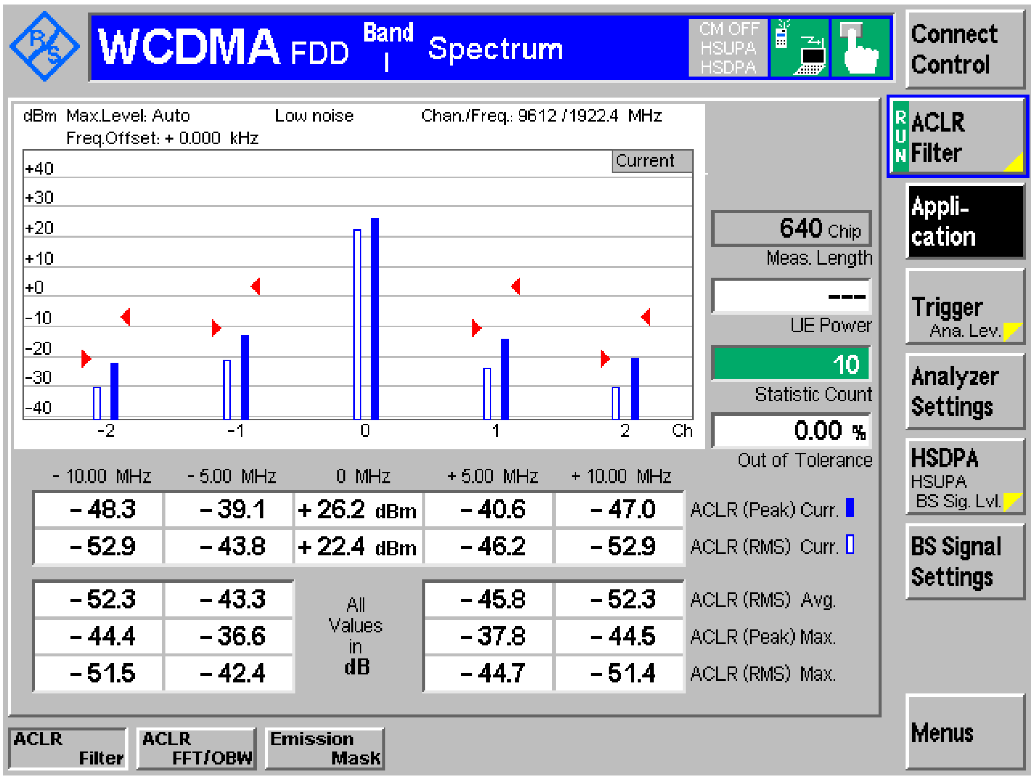


Figure 33: ACLR measurement result

Recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → Set 3

Measurement result is available at:
Menus → Spectrum → Application → ACLR Filter

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®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®FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S®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®CMU200:
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → All 1

Measurement result is available in spectrum analyzer.

Recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → 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®SMU200A, to generate an interfering CW signal and a spectrum analyzer, e.g. R&S®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®SMU200A, R&S®FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S®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®CMU200:
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → All 1

Measurement result is available in spectrum analyzer.

Recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → 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 α = 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®CMU200:
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → All 1

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

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 1 → Overview WCDMA

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

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 1 → EVM WCDMA, Magn. Error WCDMA or Phase Error WCDMA

Figure 34 shows the EVM measurement result.

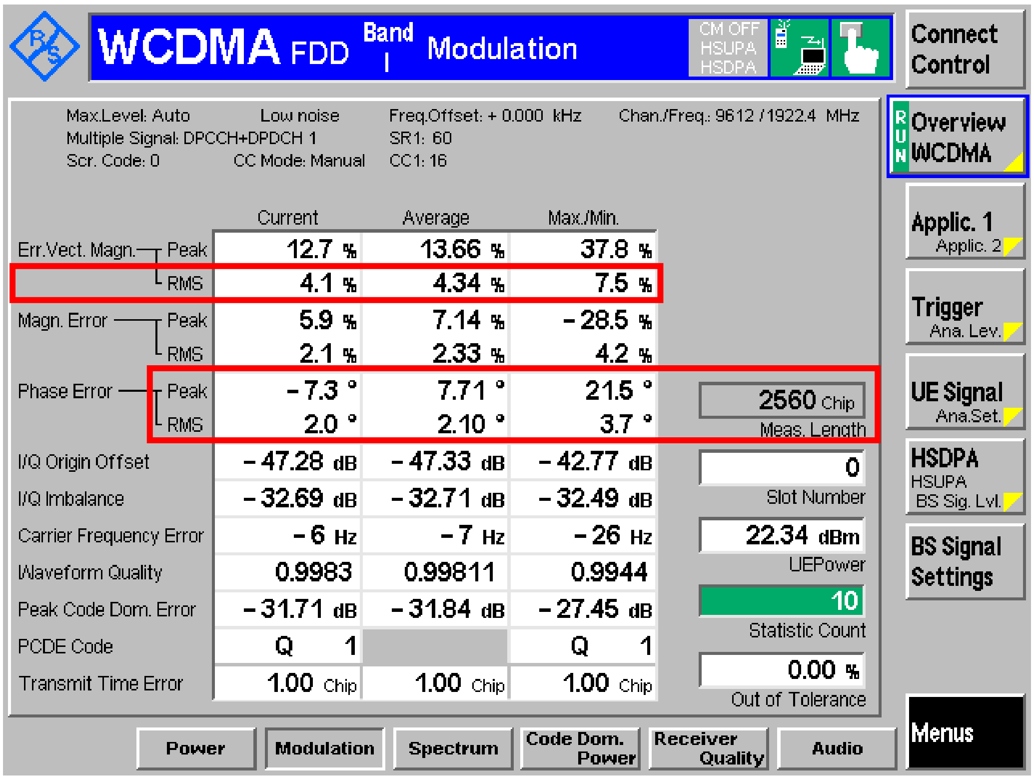


Figure 34: EVM measurement result

For UE maximum output power, recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → Set 3

For UE output power = -18 dBm, recall TX_meas.sav and establish CS call. Modify the following configurations:
BS Signal Settings → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → -18.0 dBm

Measurement result is available at:
Menus → Modulation → Applic. 1 → 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®CMU200 supports single DPDCH code. A WCDMA call with UL RMC 384 kbps is setup by referring to Figure 1.

Configuration in R&S®CMU200:
BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → RMC
BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 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®CMU200:
BS Signal Settings → TPC Pattern Config. → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → Pattern Type → All 1

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

Configuration in R&S®CMU200:
BS Signal Settings → Set 1 → Pattern Type → Closed Loop
BS Signal Settings → Set 1 → UL Target Power → -18.0 dBm

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

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 1 → Overview WCDMA

Figure 35 shows the peak code domain error measurement result.

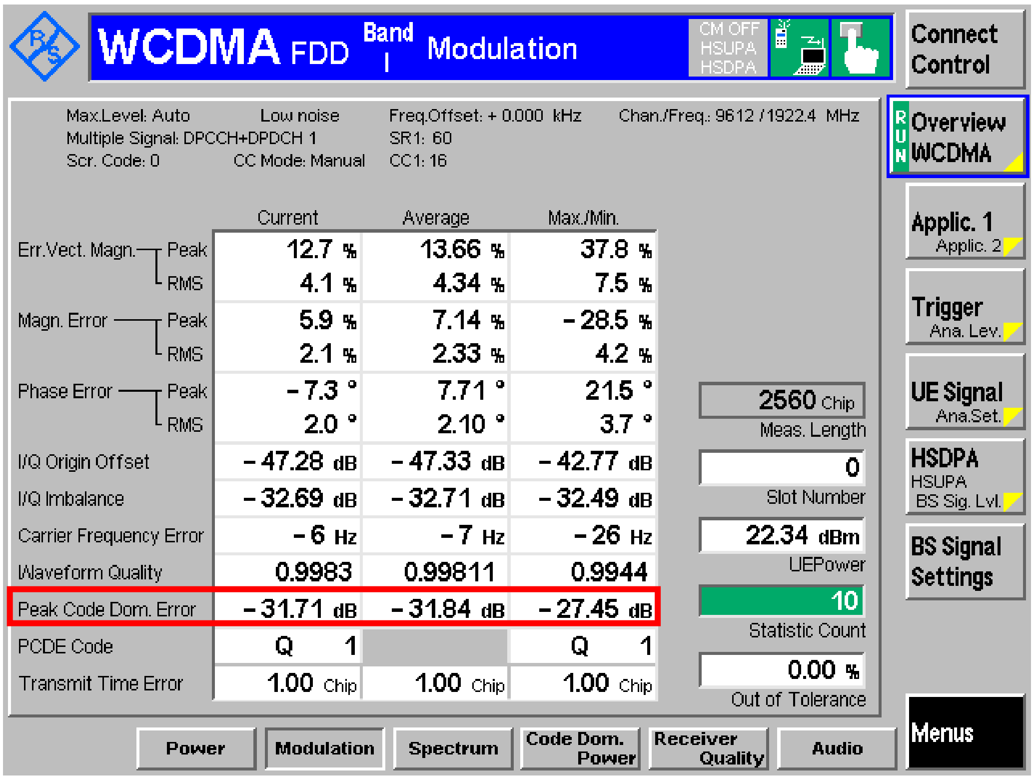


Figure 35: Peak code domain error measurement result

For UE maximum output power, recall TX_meas.sav, modify the following configurations and establish CS call.
*BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 384 kbps Downlink/Uplink **
BS Signal Settings → TPC Pattern Set → Set 3

For UE output power = - 18 dBm, recall TX_meas.sav, modify the following configurations and establish CS call.
*BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 384 kbps Downlink/Uplink **
BS Signal Settings → TPC Pattern Set → Set 1
BS Signal Settings → TPC Pattern Config. → Set 1 → UL Target Power → -18.0 dBm

Measurement result is available at:
Menus → Modulation → Applic. 1 → 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 ±(0.1 ppm + 10 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 66 degrees then the next four measurements shall be 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 ±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 ±2 dB tolerance.

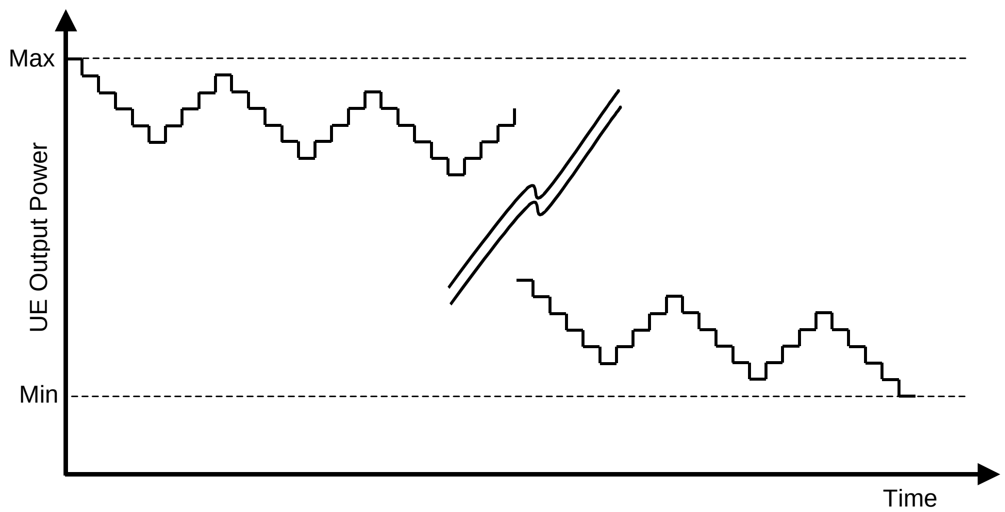


Figure 36: Five down four up hysteresis test pattern (Figure 5.13.3.4 of TS 34.121 [1])

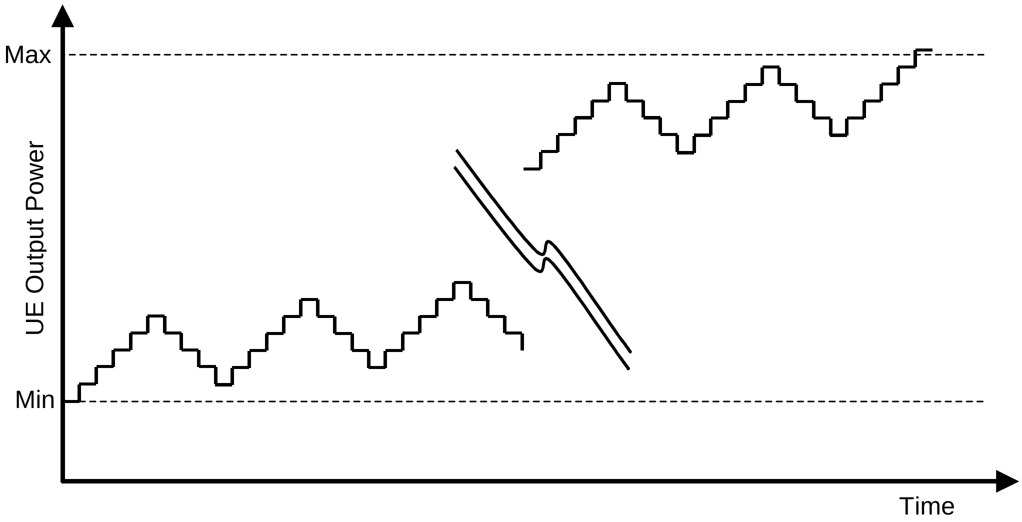


Figure 37: Five up four down hysteresis test pattern (Figure 5.13.3.5 of TS 34.121 [1])

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 2 → PHDisc

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

Configuration in R&S®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.

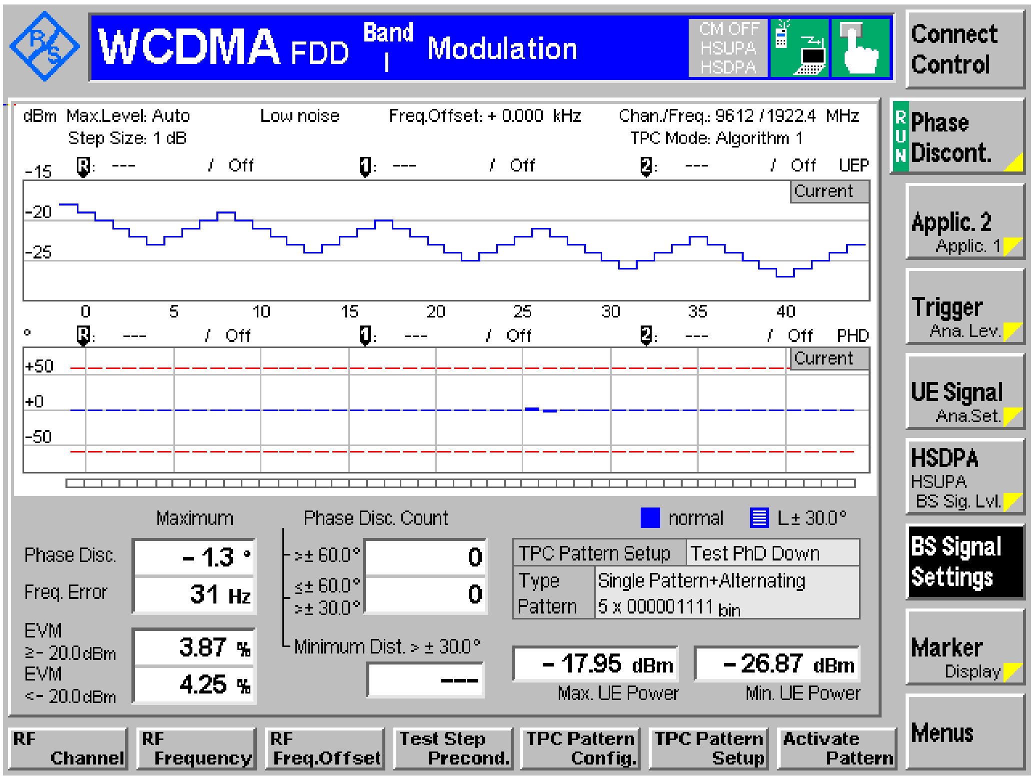


Figure 38: UE phase discontinuity measurement result

Recall TX_meas.sav and establish CS call. Modify the following configurations:

Menus → Modulation → Applic. 2 → PHDisc

BS Signal Settings → TPC Pattern Set → Set 3 (for PhD Down) or Set 4 (for PhD Up)

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

BS Signal Settings → 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 ±(0.1 ppm + 10 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®CMU200.

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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 → PICH → -8.3 dB

These downlink physical channels can be configured in R&S®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®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 → 000000000001 Chan. 0 … 11
Network → Random Access Settings → Preamble → Available Signatures → 0000000000000001 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**
I_{or}	–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])

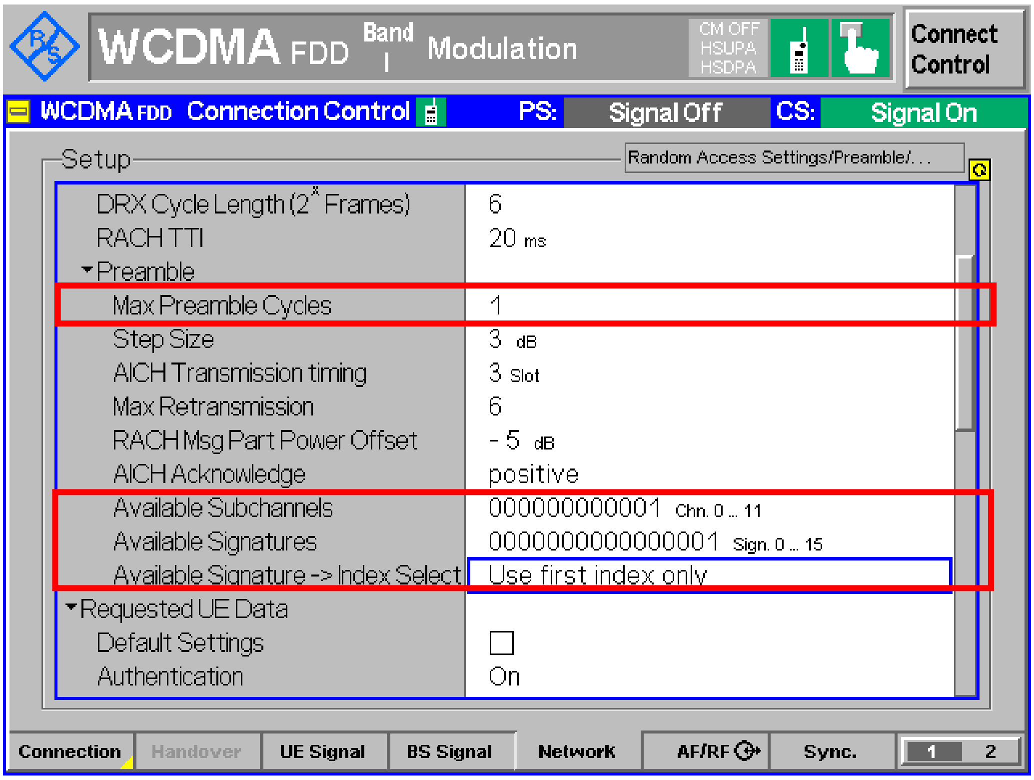


Figure 39: PRACH preamble quality test parameters configuration

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

Configuration in R&S®CMU200:
Menus → Modulation → Applic. 2 → PRACH Preamble
PRACH Preamble → Diagram Type → 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®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.

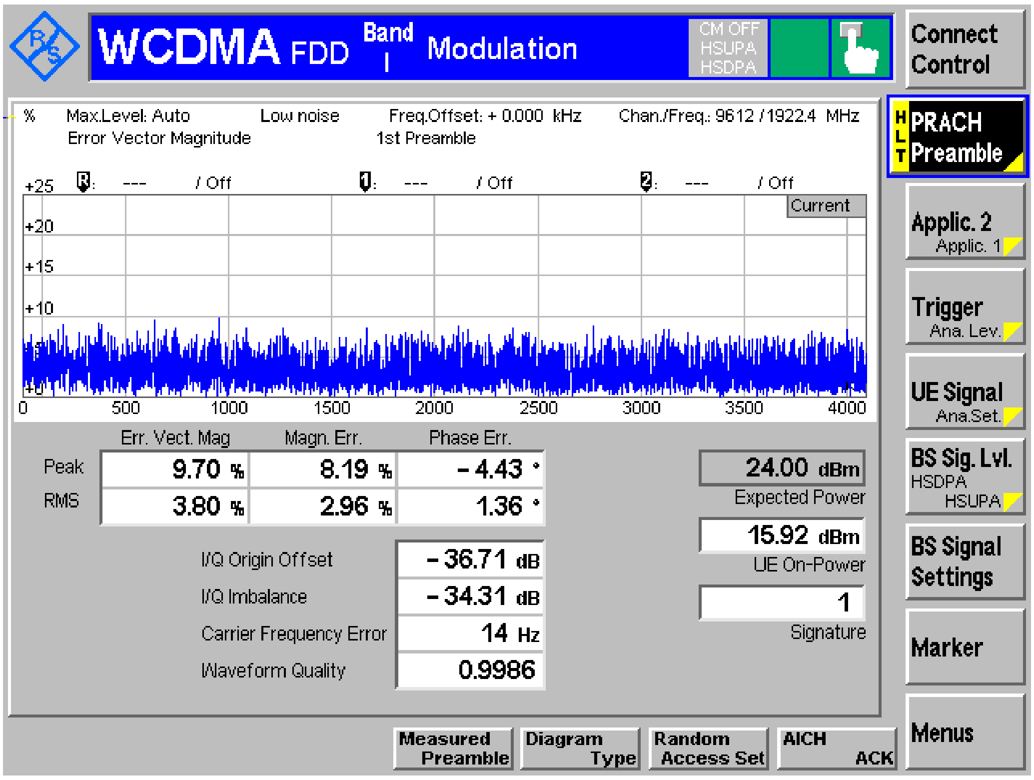


Figure 40: PRACH preamble quality (error vector magnitude) measurement result

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

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®CMU200:
BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → RMC
BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 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®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®CMU200 by referring to Figure 2(a), 2(b) and 2(c).

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 Ior 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 Ior are setup according to Table 5 (Reference sensitivity level, Table 6.2.2 of TS 34.121[1]).

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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 → 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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 41 shows the BER measurement result.

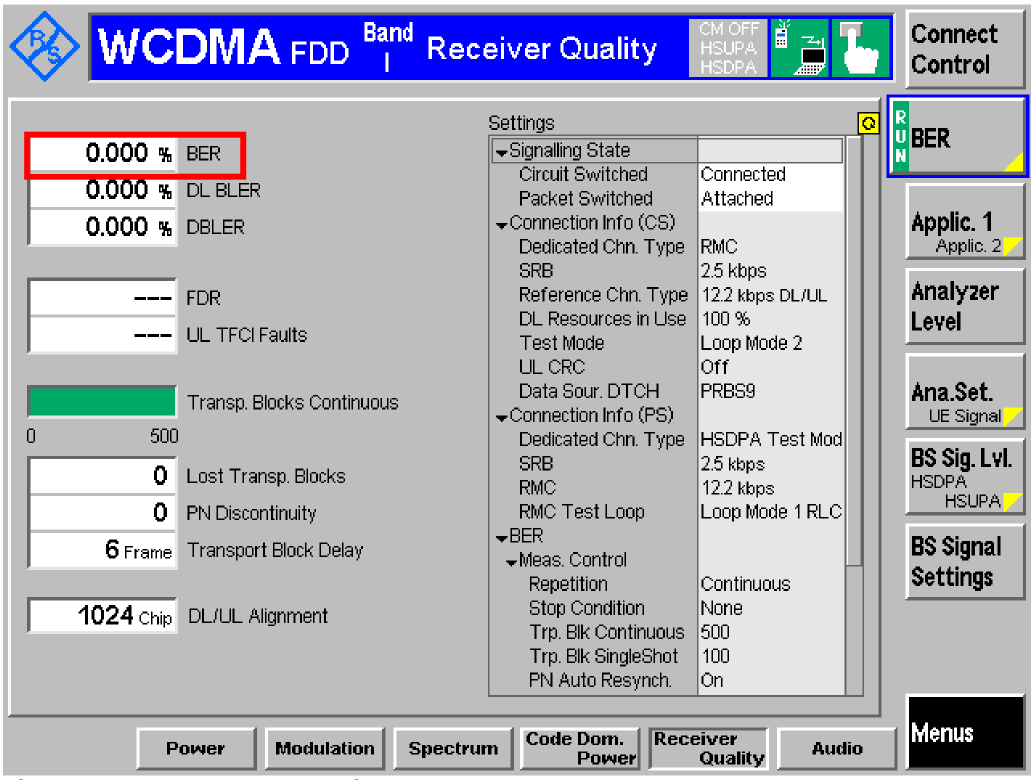


Figure 41: BER measurement result

Recall RX_meas.sav, modify the following configurations and establish CS call.:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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**
I_{or}	–25.7	dBm / 3.84MHz
DPCH_Ec / Ior	–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 / Ior = –10 dB
S-CPICH	S-CPICH_Ec / Ior = –10 dB (Note)
P-CCPCH	P-CCPCH_Ec / Ior = –12 dB
SCH	SCH_Ec / Ior = –12 dB
PICH	PICH_Ec / Ior = –15 dB
DPCH	Test dependent power
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) 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])

Configuration in R&S®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 → DPDCH Level Config → -19.0 dB

These downlink physical channels can be configured in R&S®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 ±1 dB tolerance.

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 41 shows the BER measurement result.

Recall MaxInput.sav and establish CS call. Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®SMU200A, to generate interfering WCDMA modulated signal. 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®CMU200, a WCDMA call is setup as specified in section 3.1. BER shall not exceed 0.001.

Configuration in R&S®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 ±1 dB tolerance.

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 41 shows the BER measurement result.

Recall RX_meas.sav and establish CS call. Modify the following configuration:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -92.7 dBm
BS Signal Settings → TPC Pattern Set → Set 1

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®SMU200A, to generate interfering WCDMA modulated signal. 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®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®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 ±1 dB tolerance.

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 41 shows the BER measurement result.

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

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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 ±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®CMU200, a WCDMA call is setup as specified in section 3.1. DPCH and Ior are configured to the requirement of blocking characteristics testing. The following configuration is used for UE supporting operating band I.

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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 ±1 dB tolerance. The following configuration is used for UE power class 3.

Configuration in R&S®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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 41 shows the BER measurement result.

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

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®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®SMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S®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 → Node-B Settings → Output Channel Power (Ior) → -103.0 dBm
BS Signal Settings → TPC Pattern Set → Set 1

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®SMU200A, to generate interfering WCDMA modulated and CW signals at ± 10 MHz and ± 20 MHz from assigned frequency channel. 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®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 → Node-B Settings → Output Channel Power (Ior) → -103.0 dBm
BS Signal Settings → TPC Pattern Set → Set 1

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®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®FSQ and remote control via CMUgo is available in application notes [3] and [4].

With R&S®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®CMU200:
BS Signal Settings → Circuit Switched → DCH (Dedicated Chn.) Type → 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])

Configuration in R&S®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®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.

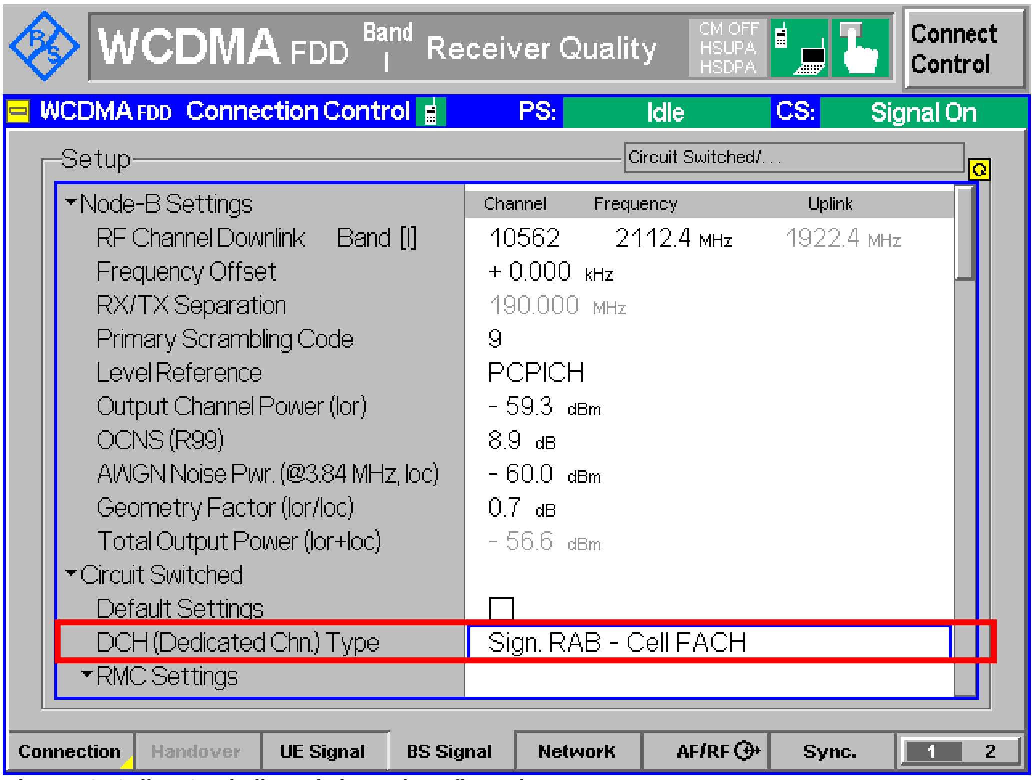


Figure 42: Cell FACH dedicated channel configuration

Measurement result is available in spectrum analyzer.

Recall SpuEmi.sav and establish CS call.

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®CMU200 (transparent mode (TM) loopback data + CRC):

BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → RMC

BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → 12.2 kbps Downlink/Uplink

Network → Random Access Settings → RACH TTI → 20ms

BS Signal → Circuit Switched → RMC Settings → UL CRC (Sym Loop Mode 2) → Off

BS Signal → Circuit Switched → RMC Settings → Test Mode → Loop Mode 2

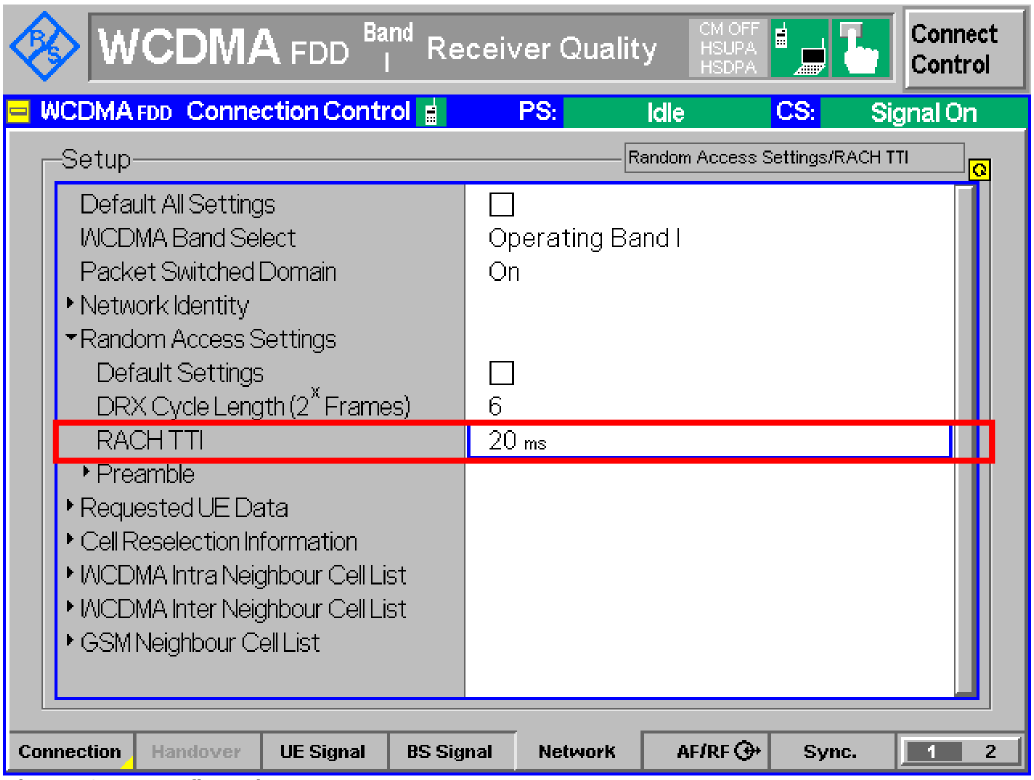


Figure 43: TTI configuration

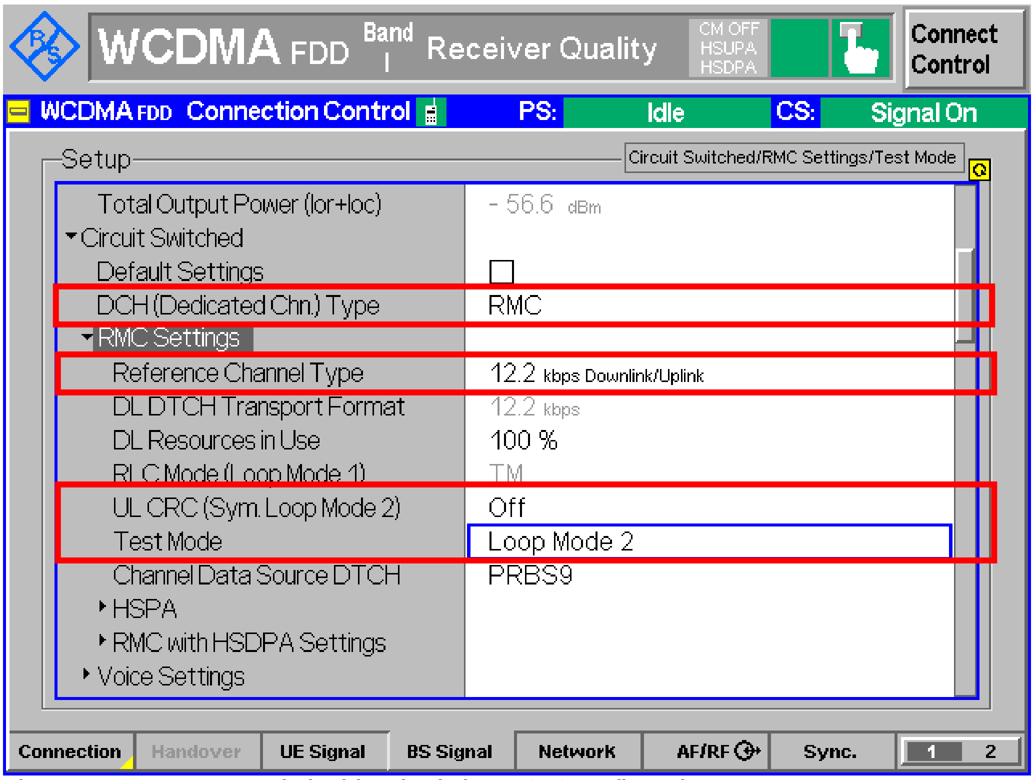


Figure 44: Transparent mode (TM) loopback data + CRC configuration

Configuration in R&S®CMU200 (acknowledged mode (AM) ACK / NACK):
BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → 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 → Random Access Settings → RACH TTI → 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 → Circuit Switched → RMC Settings → RLC Mode (Loop Mode 1) → AM
BS Signal → Circuit Switched → RMC Settings → Test Mode → Loop Mode 1

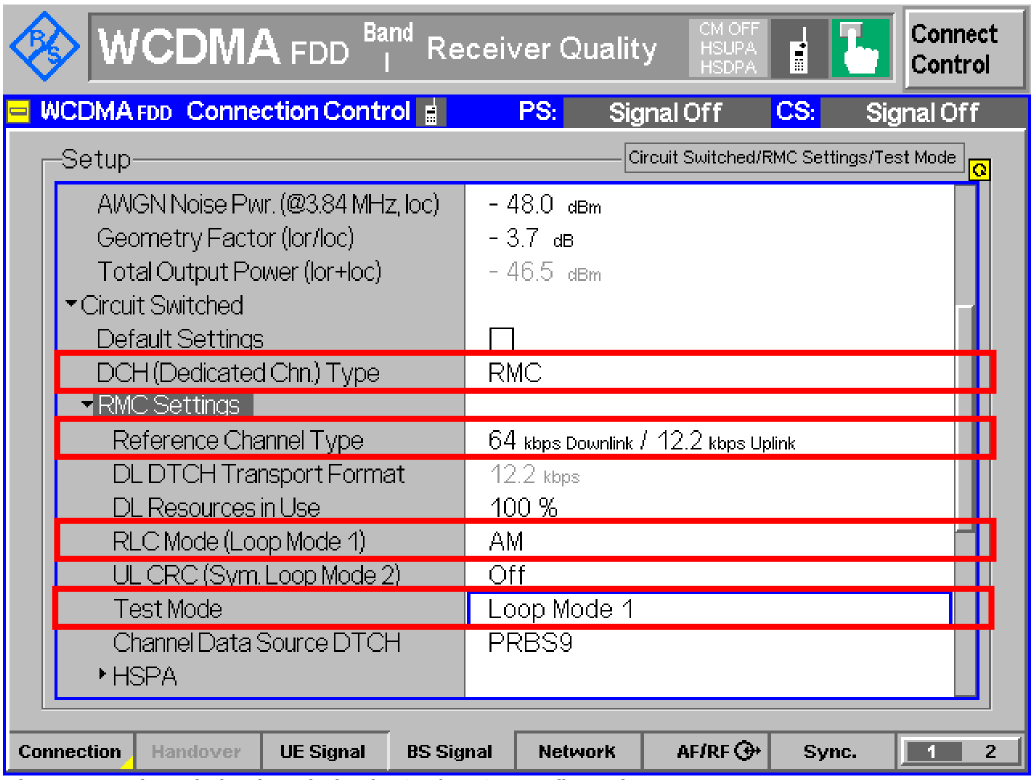


Figure 45: Acknowledged mode (AM) ACK / NACK configuration

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®CMU200 (transparent mode (TM) loopback data + CRC):
Menus → Receiver Quality → Applic. 1 → BER
BER → Stop Condition → Confidence Level

Configuration in R&S®CMU200 (acknowledged mode (AM) ACK / NACK):
Menus → Receiver Quality → Applic. 1 → RLC BLER

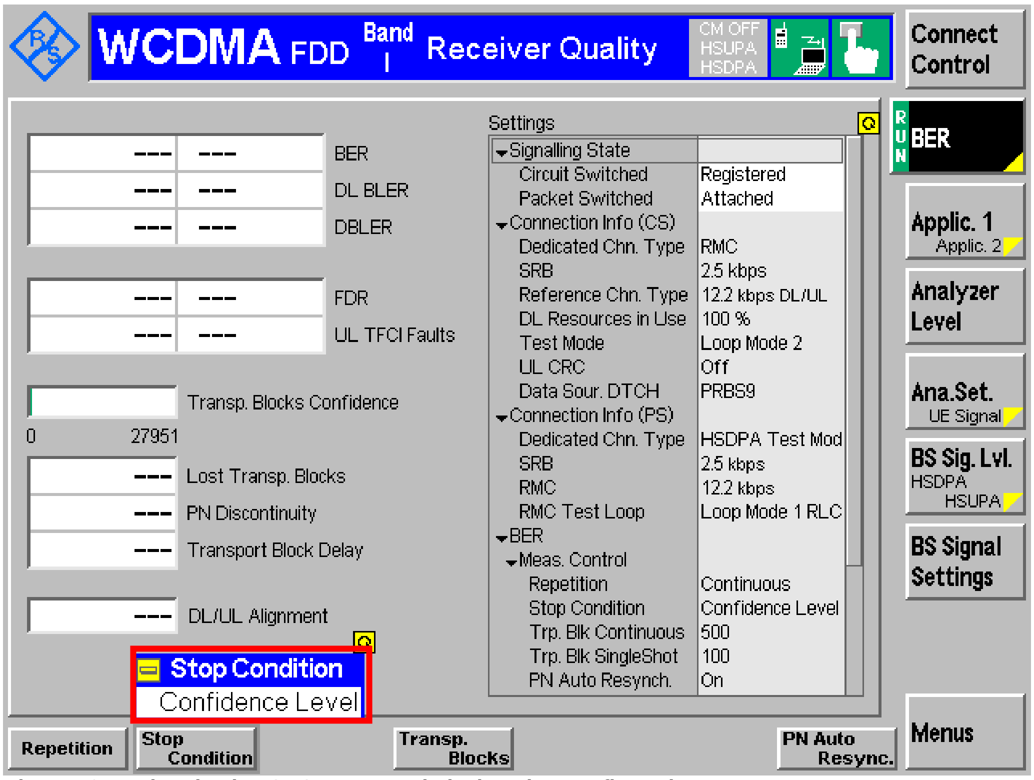


Figure 46: TM loopback + CRC BLER statistical testing configuration

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®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®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 → > -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®CMU200, a WCDMA call is setup as specified in section 4.1. Ior, Ioc, 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				
Ior / Ioc	– 0.7				dB
Ioc	–60				dBm / 3.84 MHz
Information Data Rate	12.2	64	144	384	kbps

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 / Ior***	**BLER**
1	–16.5 dB	10^{-2}
2	–13.0 dB	10^{-1}
	–12.7 dB	10^{-2}
3	–9.8 dB	10^{-1}
	–9.7 dB	10^{-2}
4	–5.5 dB	10^{-1}
	–5.4 dB	10^{-2}

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

Configuration in R&S®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 → Downlink Physical Channels → S-CPICH → Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → test dependent power

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

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER (TM loopback data + CRC) or
Menus → Receiver Quality → Applic. 1 → 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.

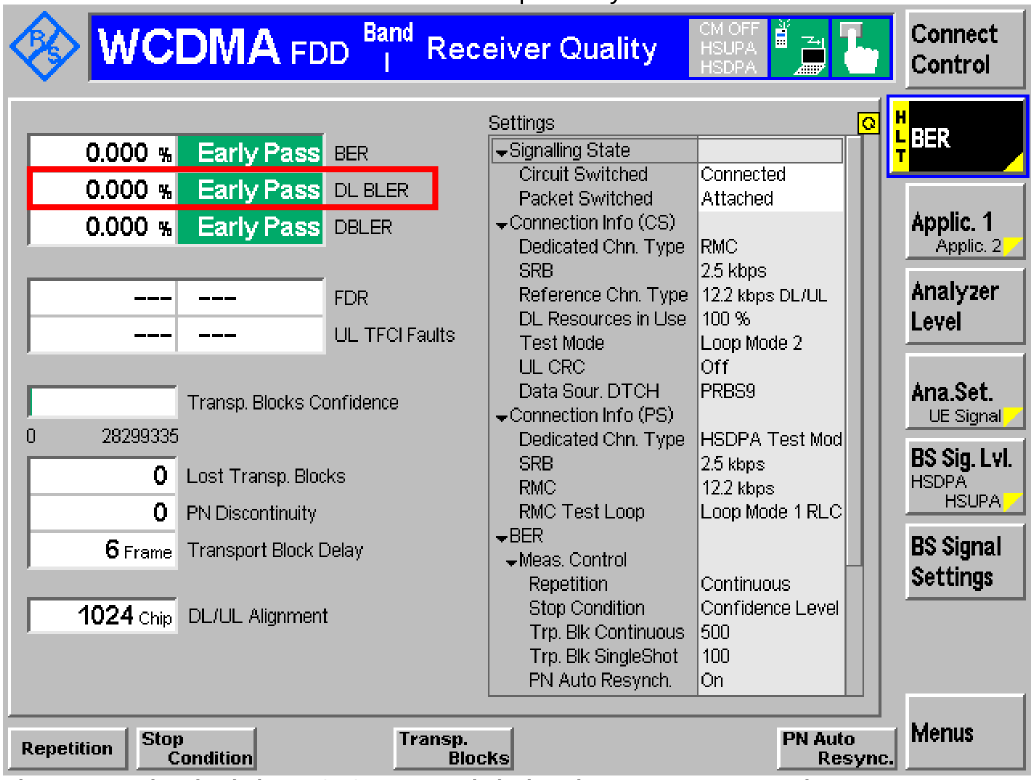


Figure 47: TM loopback data + CRC BLER statistical testing measurement result

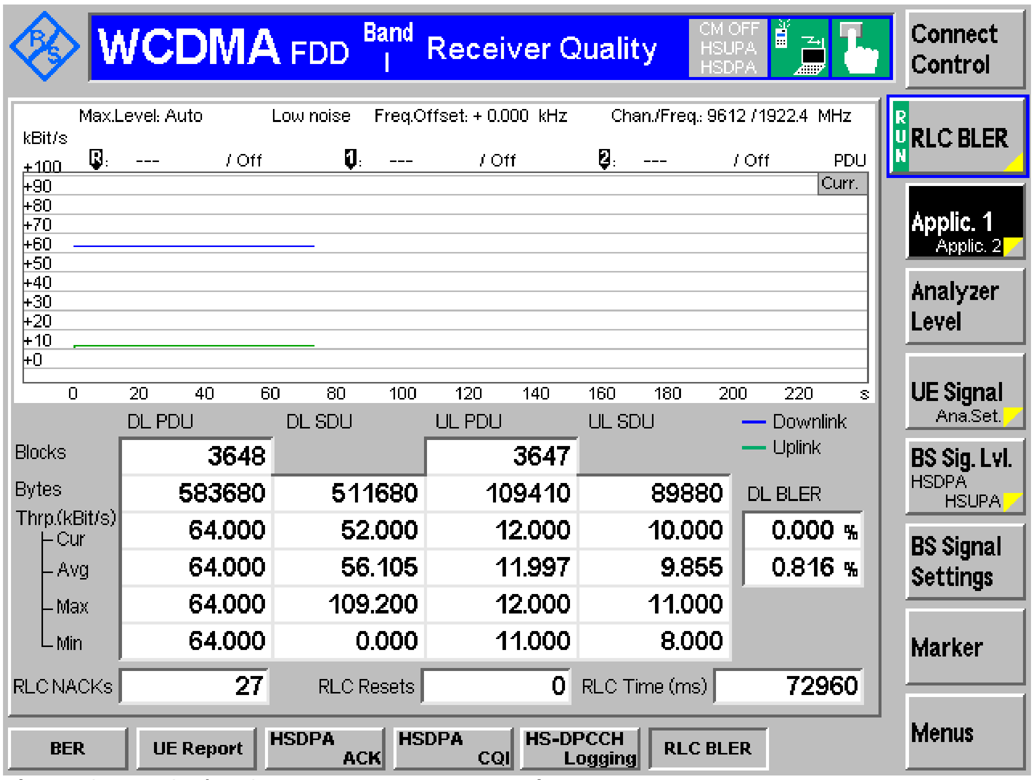


Figure 48: AM ACK / NACK BLER measurement result

For test number 1, recall PX_meas.sav and establish CS call.

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → 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®SMU200A or R&S®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®SMU200A or R&S®AMU200A and remote control via CMUgo is available in application notes [3] and [4].

With R&S®CMU200, a WCDMA call is setup as specified in section 4.1. Ior, Ioc, 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®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → 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)[Note]
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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER (TM loopback data + CRC) or
Menus → Receiver Quality → Applic. 1 → RLC BLER (AM ACK / NACK)

DCH parameters in multi-path fading propagation conditions

Test number	Case	Information data rate [kbps]	Phase reference	Ior / Ioc [dB]	Ioc [dBm / 3.84 MHz]	*DPCH_Ec / Ior* [dB]
1	1	12.2	P-CPICH	9.6	-60	–14.9
2	1	64				–13.8
						–9.9
3	1	144				–10.5
						–6.7
4	1	384				–6.2
						–2.1
5	2	12.2	P-CPICH	-2.4	-60	–7.6
6	2	64		-2.4		–6.3
						–2.6
7	2	144		3.6		–8.0
						–5.0
8	2	384		6.6		–5.4
						–3.1
9	3	12.2	P-CPICH	-2.4	-60	–11.7
10	3	64		-2.4		–8.0
						–7.3
						–6.7
11	3	144		3.6		–8.9
						–8.4
						–7.9
12	3	384		6.6		–5.8
						–5.0
						–4.3
13	1	12.2	S-CPICH	9.6	-60	–14.9
14	1	64				–13.8
						–9.9
15	1	144				–10.5
						–6.7
16	1	384				–6.2
						–2.1
17	6	12.2	P-CPICH	-2.4	-60	-8.7
18	6	64		-2.4		-5.0
						-4.3
						-3.7
19	6	144		3.6		-5.9
						-5.4
						-4.9
20	6	384		6.6		-2.8
						-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])

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 configurations:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -50.4 dBm
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc)→ Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → -14.9 dBm

For test number 5, recall PX_meas.sav and establish CS call. Modify the following configurations:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -62.4 dBm
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc)→ Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → -7.6 dBm

For test number 9, recall PX_meas.sav and establish CS call. Modify the following configurations:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -62.4 dBm
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc)→ Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → -11.7 dBm

For test number 13, recall PX_meas.sav and establish CS call. Modify the following configurations:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -50.4 dBm
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc)→ Off
BS Signal → Downlink Physical Channels → S-CPICH → -10.0 dB
BS Signal → Downlink Physical Channels → DPDCH Level Config → -14.9 dBm

For test number 17, recall PX_meas.sav and establish CS call. Modify the following configurations:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -62.4 dBm
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, loc)→ Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → -8.7 dBm

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → BER

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

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®SMU200A or R&S®AMU200A, to generate signal with moving propagation condition. This test is recommended to be performed remotely. Detail setup information on R&S®SMU200A or R&S®AMU200A and remote control via CMUgo is available in application notes [3] and [4].

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

Configuration in R&S®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, loc)→ 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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER (TM loopback data + CRC) or
Menus → Receiver Quality → Applic. 1 → 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, loc)→ Off
BS Signal → Downlink Physical Channels → DPDCH Level Config → -14.4 dBm

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → BER

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

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 birth-death 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®SMU200A or R&S®AMU200A, to generate signal with birth-death propagation condition. This test is recommended to be performed remotely. Detail setup information on R&S®SMU200A or R&S®AMU200A and remote control via CMUgo is available in application notes [3] and [4].

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

Configuration in R&S®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 → -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®CMU200.

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER (TM loopback data + CRC) or
Menus → Receiver Quality → Applic. 1 → 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 → Receiver Quality → Applic. 1 → BER

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

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 / Ior 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 / Ior	-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 / Ior	-15.6	-8.7	dB
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®SMU200A or R&S®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.

Test parameter for downlink power control, constant BLER target			
Parameter	**Test 1**	**Test 2**	**Unit**
Ior / Ioc	9.6	-0.4	dB
Ioc	–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		dB
Minimum_DL_Power (Note)	-18		dB
DL Power Control step size, Δ_{TPC}	1		dB
Limited Power Increase	"Not used"		-

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®CMU200:

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -50.4 dBm (Test 1) or -60.4 dBm (Test 2)
BS Signal → Node-B Settings →AWGN Noise Pwr. (@3.84 MHz, Ioc)→ 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®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.

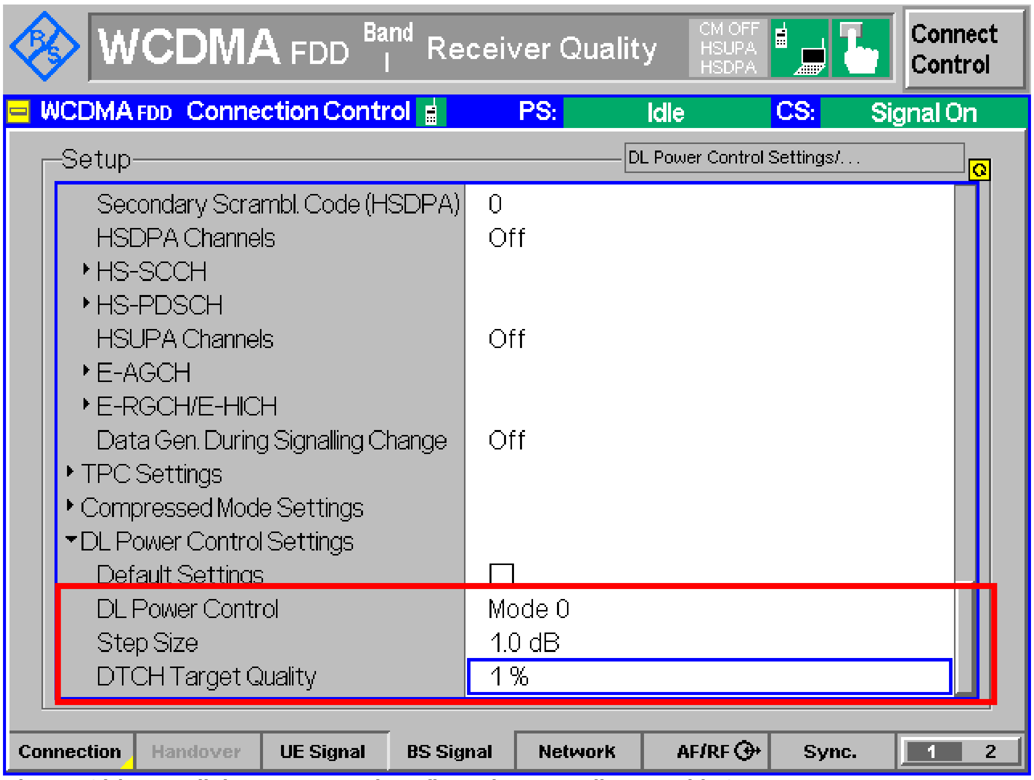


Figure 49(a): Downlink power control configuration according to Table 34

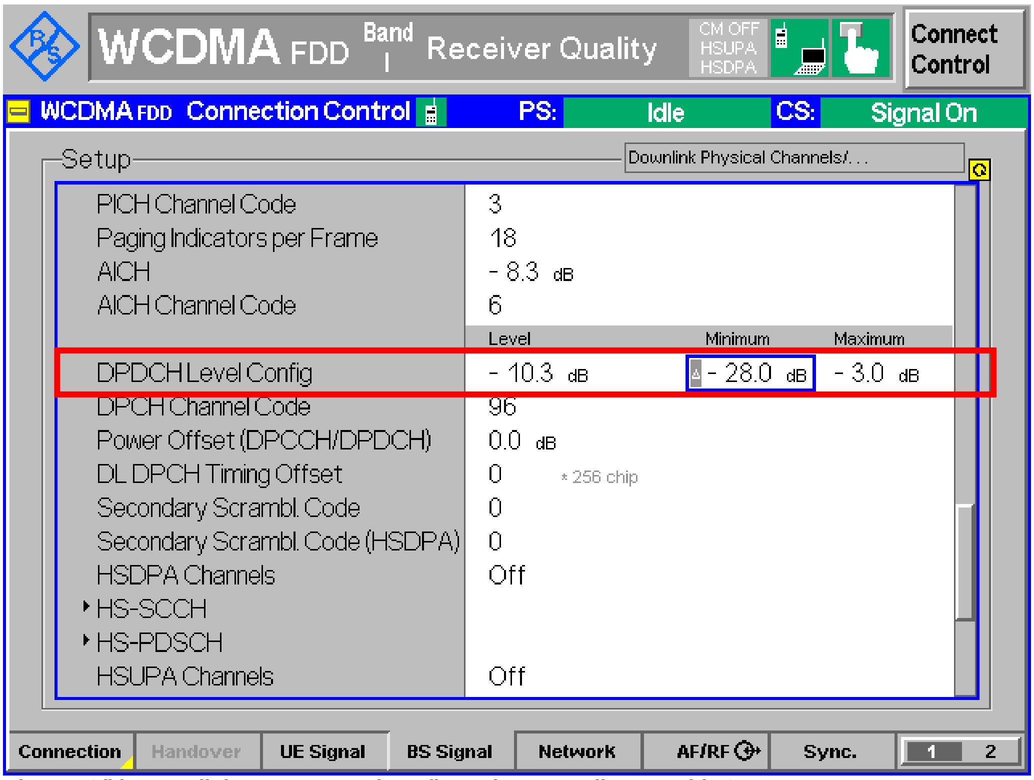


Figure 49(b): Downlink power control configuration according to Table 34

Measurement result for DPCH_Ec / Ior is available in BS Signal in R&S®CMU200.

Configuration in R&S®CMU200:
Connect Control → BS Signal → DPDCH Level Config

Figure 50 shows the DPCH_Ec / Ior measurement result.

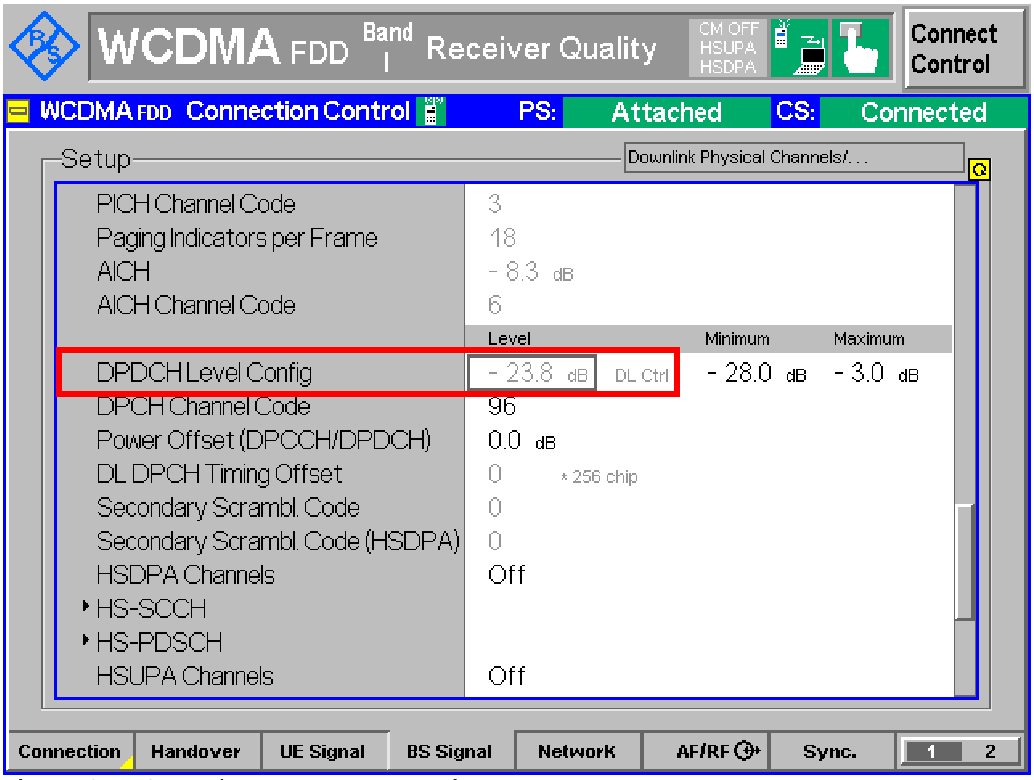


Figure 50: DPCH_Ec / Ior measurement result

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

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

Measurement result is available at:
Connect Control → BS Signal → DPDCH Level Config

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

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 / Ior 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 / Ior	-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®SMU200A or R&S®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**
Ior / Ioc	9.6	-0.4	4.6	9.6	dB
Ioc	-60				dBm / 3,84 MHz
Information Data Rate	12.2		64		kbps
Reference channel	C.3.1		C.3.5		-
Target quality on DTCH	0.01		0.1	0.001	BLER
Target quality on DCCH (Note 1)	-		0.1	0.1	BLER
Propagation condition	Case 4				
Maximum_DL_Power (Note 2)	7				dB
Minimum_DL_Power (Note 2)	-18				dB
DL Power Control step size, Δ_{TPC}	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®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.

Configuration in R&S®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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®CMU200.

Configuration in R&S®CMU200:
Connect Control → BS Signal → DPDCH Level Config

Figure 50 shows the DPCH_Ec / Ior 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 (Ior) → -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 (Ior) → -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

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

4.8 Downlink Compressed Mode, Single Link Performance (Release 5 and earlier) (7.9.1)

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 / Ior 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 / Ior 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 / Ior	-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®SMU200A or R&S®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
Ior / Ioc	9.6				dB
Ioc	–60				dBm / 3,84 MHz
Information Data Rate	12.2				kbps
Propagation condition	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, Δ_{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®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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®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®CMU200:
BS Signal → Compressed Mode Settings → Pattern Selection → User Defined Pattern
BS Signal → Compressed Mode Settings → User Defined Pattern → Pattern Activation → RAB Setup
BS Signal → Compressed Mode Settings → User Defined Pattern → TGSN slot no. → 11
BS Signal → Compressed Mode Settings → User Defined Pattern → TGPL 1 → 4 Frame
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap (1) → Enable
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGL (1) → 7 slot
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap (2) → Disable
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → Delta SIR (1) → 0 (Test 1) or 3 (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → Delta SIR after (1) → 0 (Test 1) or 3 (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → RPP → Mode 0
BS Signal → Compressed Mode Settings → User Defined Pattern → ITP → Mode 0
BS Signal → Compressed Mode Settings → User Defined Pattern → UL/DL Mode → 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®CMU200 as shown in Figure 51(a) and 51(b). To establish a WCDMA connection, press 'Connect UE (CS)' on R&S®CMU200 once UE has registerd with R&S®CMU200.

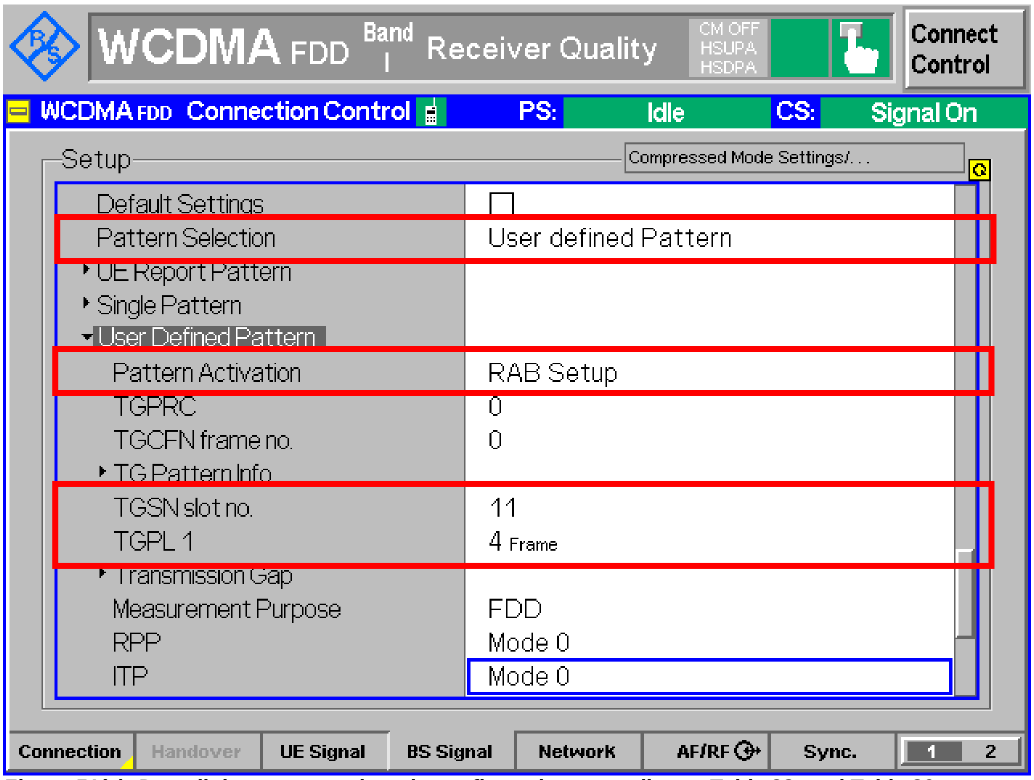


Figure 51(a): Downlink compressed mode configuration according to Table 38 and Table 39

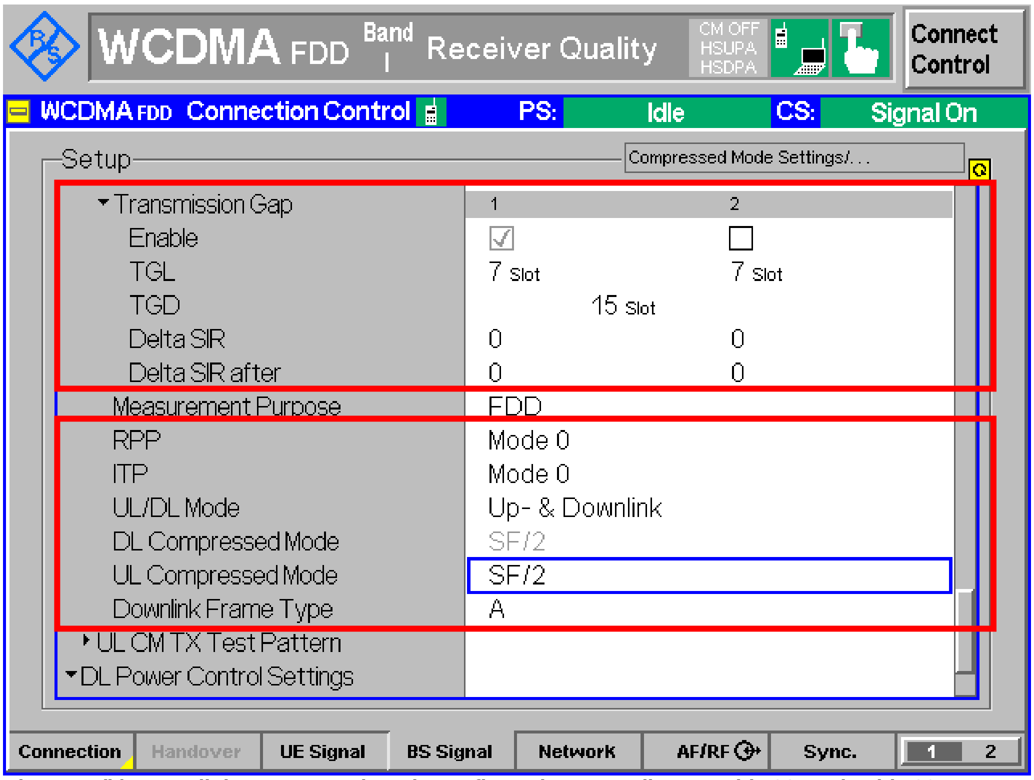


Figure 51(b): Downlink compressed mode configuration according to Table 38 and Table 39

Measurement result for DPCH_Ec / Ior and BLER are available in BS Signal in R&S®CMU200.

Configuration in R&S®CMU200:
Connect Control → BS Signal → DPDCH Level Config
Menus → Receiver Quality → Applic. 1 → BER

Figure 47 and 50 show the BLER and DPCH_Ec / Ior measurement result respectively.

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

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

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

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

4.9 Downlink Compressed Mode, Single Link Performance (Release 6 and later) (7.9.1A)

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 / Ior 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 / Ior 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 / Ior	-13.6	No requirements	dB
Measured quality of compressed and recovery frames	No requirements	< 0.001	BLER
Measured quality on DTCH	0.01 ± 30 %		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®SMU200A or R&S®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.

Downlink Compressed Mode, Single Link Performance (Release 6 and later) (7.9.1A)

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
Ior / Ioc	9.6		dB
Ioc	–60		dBm / 3,84 MHz
Information Data Rate	12.2		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, □$_{TPC}$	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 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®CMU200:
BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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

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®CMU200:
BS Signal → Compressed Mode Settings → Pattern Selection → User Defined Pattern
BS Signal → Compressed Mode Settings → User Defined Pattern → Pattern Activation → RAB Setup
BS Signal → Compressed Mode Settings → User Defined Pattern → TGSN slot no. → 4 (Test 1) or 11 (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → TGPL 1. → 4 Frame
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap (1) → Enable
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap (2) → Enable (Test 1), Disable (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGL (1) → 7 slot
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGL (2) → 7 slot (Test 1)
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGD → 15 slot (Test 1)
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → Delta SIR (1) → 0 (Test 1) or 3 (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → Delta SIR after (1) → 0 (Test 1) or 3 (Test 2)
BS Signal → Compressed Mode Settings → User Defined Pattern → → RPP → Mode 0
BS Signal → Compressed Mode Settings → User Defined Pattern → ITP → Mode 0
BS Signal → Compressed Mode Settings → User Defined Pattern → UL/DL Mode → 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

These settings can be configured in R&S®CMU200 as shown in Figure 48(a) and 48(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 and BLER are available in BS Signal in R&S®CMU200.

Configuration in R&S®CMU200:
Connect Control → BS Signal → DPDCH Level Config
Menus → Receiver Quality → Applic. 1 → BER

Figure 47 and 50 show the BLER and DPCH_Ec / Ior measurement result respectively.

For test 1, recall DlComp.sav and establish CS call.
BS Signal → Compressed Mode Settings → User Defined Pattern → TGSN slot no. → 4
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap (2) → Enable
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGL (2) → 7 slot
BS Signal → Compressed Mode Settings → User Defined Pattern → Transmission Gap → TGD → 15 slot

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

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

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

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 / Ior 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 / Ior value specified in Table 42.

The Requirements for DCH reception in Blind transport format detection

Test Number	DPCH_Ec / Ior	BLER	FDR
1	–17.6 dB	10^{-2}	10^{-4}
2	–17.7 dB	10^{-2}	10^{-4}
3	–18.3 dB	10^{-2}	10^{-4}
4	–12.9 dB	10^{-2}	10^{-4}
5	–13.1 dB	10^{-2}	10^{-4}
6	–13.7 dB	10^{-2}	10^{-4}

Note: The value of DPCH_Ec/Ior, Ioc, and Ior/Ioc 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®SMU200A or R&S®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
Ior / Ioc	–0.7			–2.4			dB
Ioc	–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®CMU200:

BS Signal → Circuit Switched → DCH (Dedicated Chn.) Type → RMC
BS Signal → Circuit Switched → RMC Settings → Reference Channel Type → BTFD
BS Signal → Circuit Switched → RMC Settings → DL DTCH Transport Format → 12.2 kbps, 7.95 kbps or 1.95 kbps
BS Signal → Circuit Switched → RMC Settings → Test Mode → Loop Mode 2

BS Signal → Node-B Settings → Level Reference → Output Channel Power (Ior)
BS Signal → Node-B Settings → Output Channel Power (Ior) → -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, Ioc)→ -60.0 dBm

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

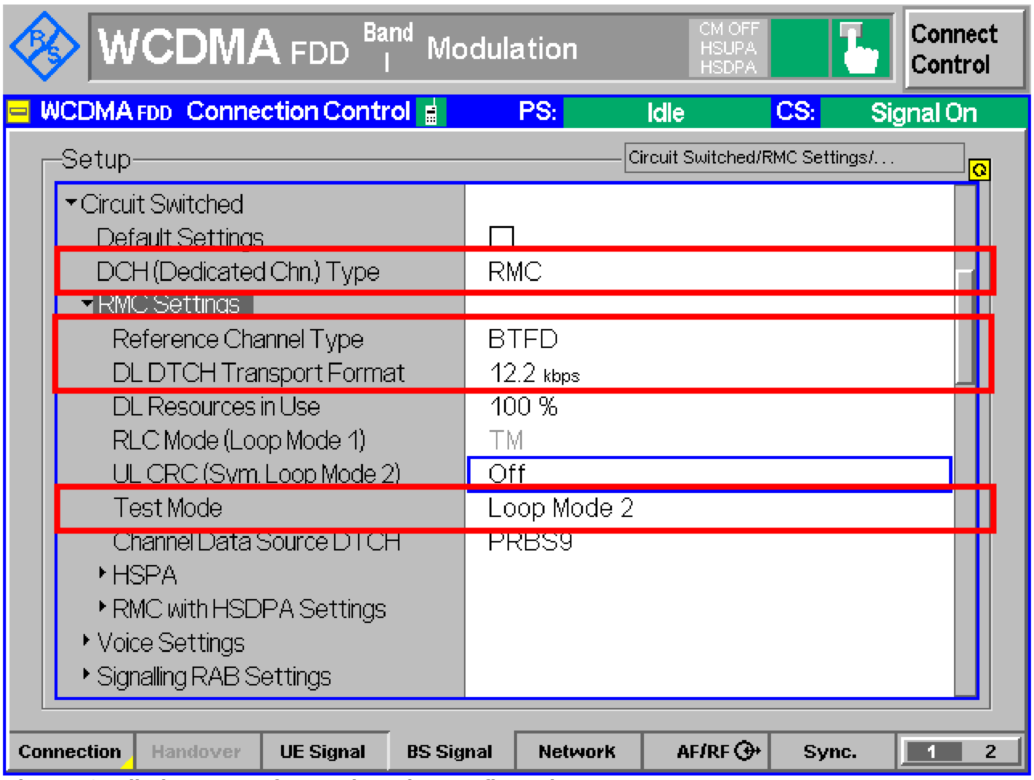


Figure 52: Blind transport format detection configuration

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

Configuration in R&S®CMU200:
Menus → Receiver Quality → Applic. 1 → BER

Figure 53 shows the BLER and FDR measurement result.

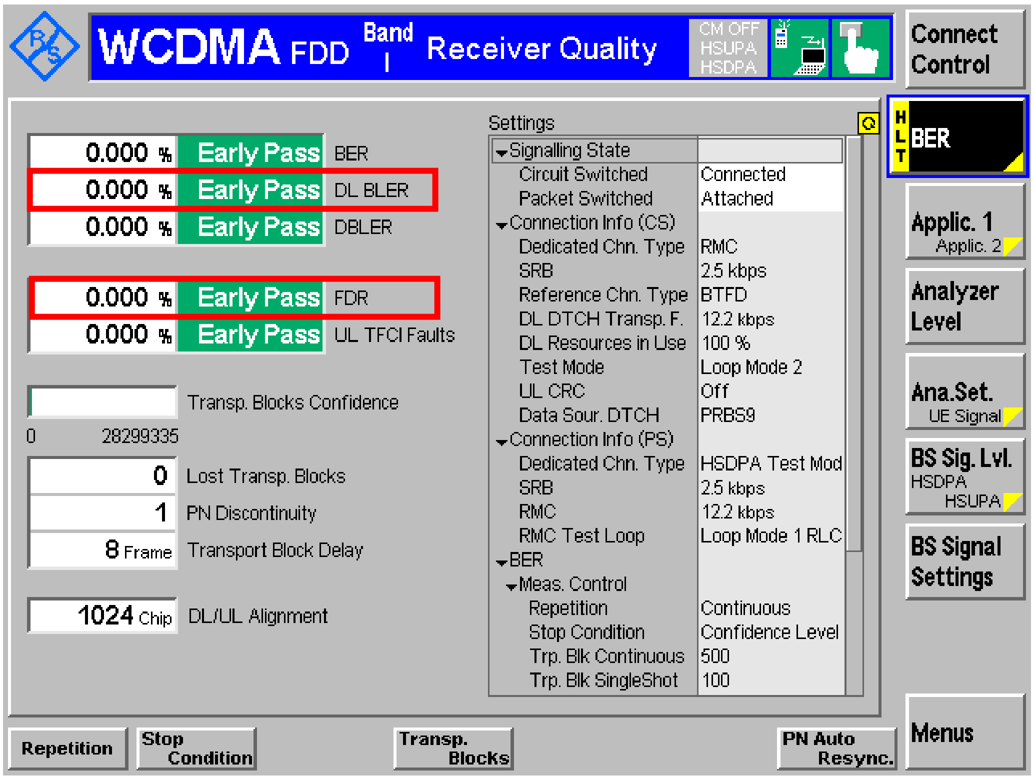


Figure 53: BLER and FDR measurement result

For Test 1 to Test 3, recall BlindDet.sav and establish CS call.

For Test 4 to Test 6, modify the following configuration:
BS Signal → Node-B Settings → Output Channel Power (Ior) → -62.4 dBm

Measurement result is available at:
Menus → Receiver Quality → Applic. 1 → BER

Note: AWGN is activated after fading simulator in R&S®SMU200A or R&S®AMU200 to fulfill test requirement as specified in TS 34.121 Figure A.10 or Figure A.21.

5 Summary of R&S®CMU200 *.SAV Files

Table below summarizes the available *.sav files based on R&S®CMU200 firmware V5.22A for UE supporting operating band I with power class 3 in RMC 12.2 kbps downlink/uplink.

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	UlComp.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)	DlComp.sav
7.9.1A	Downlink compressed mode, single link performance (Release 5 and earlier)	DlComp.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		
Type	**Description**	**Order no.**
R&S®CMU200	Base unit with following accessories: power cord, operating and service manual for instrument	1100.0008.02
R&S®CMU-B21	Unversal signaling unit; provides multistandard signaling hardware; required for WCDMA 3GPP FDD	1100.5200.54
R&S®CMU-B56	WCDMA (3GPP FDD) signaling module for CMU-B21 model 14	1150.1850.14
R&S®CMU-B68	Versatile baseband board for WCDMA (3GPP FDD) layer 1, DL and UL, non-signaling	1149.9809.02
R&S®CMU-K16	WCDMA (3GPP FDD) band 10, UE test signaling software (R&S®CMU200-B68, R&S®CMU200-B21 model 14 or 54, R&S®CMU200-B56 necessary)	1200.9158.02
R&S®CMU-K17	WCDMA (3GPP FDD) band 11, UE test signaling software (R&S®CMU200-B68, R&S®CMU200-B21 model 14 or 54, R&S®CMU200-B56 necessary)	1200.9258.02
R&S®CMU-K57	WCDMA signaling 3GPP/FDD/UE, band 7 (R&S®CMU200-B68, R&S®CMU200-B21 model 14 or 54, R&S®CMU200-B56 necessary)	1200.7903.02
R&S®CMU-K58	WCDMA signaling 3GPP/FDD/UE, band 8 (R&S®CMU200-B68, R&S®CMU200-B21 model 14 or 54, R&S®CMU200-B56 necessary)	1200.8000.02
R&S®CMU-K59	WCDMA signaling 3GPP/FDD/UE, band 9 (R&S®CMU200-B68, R&S®CMU200-B21 model 14 or 54, R&S®CMU200-B56 necessary)	1200.8100.02
R&S®CMU-K61	WCDMA (3GPP FDD) band 4, UE test signaling software	1157.3670.02
R&S®CMU-K62	WCDMA (3GPP FDD) band 5, UE test signaling software	1157.3770.02
R&S®CMU-K63	WCDMA (3GPP FDD) band 6, UE test signaling software	1157.3870.02
R&S®CMU-K65	WCDMA (3GPP FDD) UL user equipment TX test, non-signaling test software	1115.4891.02
R&S®CMU-K66	WCDMA (3GPP FDD) DL generator, non-signaling test software	1115.5100.02
R&S®CMU-K67	WCDMA (3GPP FDD) band 3, UE test signaling software	1150.3000.02
R&S®CMU-K68	WCDMA (3GPP FDD) band 1, UE test signaling software	1115.5300.02
R&S®CMU-K69	WCDMA (3GPP FDD) band 2, UE test signaling software	1115.5400.02

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