HSUPA RF Measurements with the R&S®CMW500 in line with 3GPP TS 34.121

Application Note

Products:

- R&S®CMW500

Most of the tests specified in the 3GPP standard TS 34.121 [1] Release 6 (Rel-6) can be performed with the R&S®CMW500. This document provides a step-by-step guide on how to use a stand-alone R&S®CMW500 to take Rel-6 measurements on transmitter characteristics and execute performance tests according to TS 34.121 V9.7.0, clauses 5 and 10. Test cases that require fading simulation can also be carried out with the aid of a standalone R&S®CMW500 that has been configured with a built-in fading simulator option. That greatly reduces test setup complexity. Furthermore, the R&S®CMW500's wizard enables easy configuration of the test setup for various HSUPA subtests as specified by TS 34.121 [1]. The procedure detailing how the wizard is used is also explained for each test case. The test cases mentioned in this application note are carried out using Rel-6 user equipment (UE) that supports Operating Band I and Power Class 3.

Application Note

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1 Introduction

Most of the tests specified in the 3GPP standard TS 34.121 [1] Release-6 (Rel-6) can be performed with the R&S®CMW500. This document provides a step-by-step guide on how to take Rel-6 measurements on transmitter characteristics and execute performance tests according to TS 34.121 V9.7.0, clauses 5 and 10, using a standalone R&S®CMW500 and user equipment (UE) supporting Operating Band I and Power Class 3. Performance test cases meant to be tested in the presence of fading can be carried out with the aid of a standalone R&S®CMW500equipped with a built-in fading simulator option. That greatly reduces the test setup complexity. These test cases will be discussed in brief in this application note. Optionally, external fading simulators like the R&S®AMU200A or the R&S®SMU200A can be used for those test cases as well. The R&S®CMW500's wizard provides easy recall of preconfigured settings as required such as Subtests 1 through 5). The procedure for carrying out each test case within this application note using the wizard is detailed at the end of each test case and is marked with this symbol:

1.1 Covered Tests in Line with TS 34.121

Table 1 shows the Rel-6 transmitter characteristics and performance tests that can be performed with the R&S®CMW500.

Transmitter-characteristic and performance tests for 3GPP Rel-6 supported by the R&S®CMW500		
Test	**Clause**	**Test Parameter**
Transmitter characteristics	5.2B	Maximum output power with HS-DPCCH and E-DCH
	5.2D	UE relative code domain power accuracy for HS-DPCCH and E-DCH
	5.9B	Spectrum emission mask with E-DCH
	5.10B	Adjacent channel leakage power ratio (ACLR) with E-DCH
	5.13.2B	Relative code domain error with HS-DPCCH and E-DCH
Performance requirements	10.2.1.1	Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single Link Performance (10 ms TTI)*
	10.2.1.1A	Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single Link Performance (10 ms TTI and Type 1)*
	10.2.1.2	Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single Link Performance (2 ms TTI)*
	10.2.1.2A	Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single Link Performance (2 ms TTI and Type 1)*

* Requires built-in fading simulation on the R&S®CMW500.

Table 1: 3GPP Rel-6 measurements supported by the R&S®CMW500.

1.2 Information on Using the R&S®CMW500's Wizard

In order to use the wizard to recall the preconfigured settings for the Subtests 1 through 5), activate the WCDMA-UE signaling application before using the wizard.

Press the "WIZARD" hardkey located on the front panel of the R&S®CMW500.

Application Wizards → HSUPA Maximum Output Power Settings → Subtest Selection → Subtest 1 → Finish

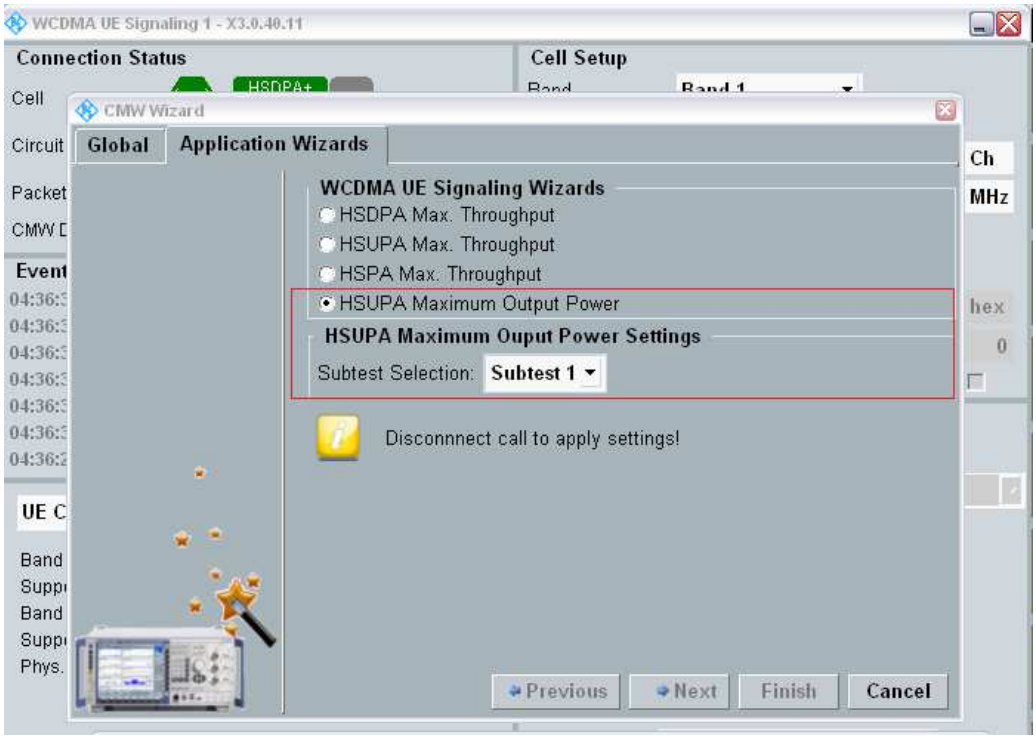


Figure 1: Activating the WCDMA-UE signaling application.

2 Rel-6 Transmitter Characteristics

2.1 Generic Call Setup for Transmitter Characteristics

Most of the test cases used to determine the transmitter characteristics for Rel-6 UE need to be tested for Subtests 1 through 5.

For Subtests 1 through 4, enter the UE into Loopback Test Mode 1, looping back both the 12.2 kbps RMC and HSDPA to E-DCH according to Procedure 7.3.9.3.1 in TS 34.108 [3], and start the loopback test.

For Subtest 5, enter the UE into Loopback Test Mode 1, looping back HSDPA to E-DCH according to Procedure 7.3.9.3.2 in TS 34.108 [3], and start the loopback test.

Table 2 shows the UL RLC SDU size for the E-DCH transmitter characteristics that the R&S®CMW500 supports.

UL RLC SDU size for E-DCH tests supported by the R&S®CMW500					
TC clause	**TS 34.121-1 E-DCH test cases**	**Inter-TTI**	**DL SDU size [bits]**	**Number of DL SDUs per DL transmission**	**UL RLC SDU size [bits]**
5.2B	Maximum Output Power with HS-DPCCH and E-DCH	3 (H-Set 1)	2936	1	For Subtests 1 to 4: 2936 For Subtest 5: 11744
5.2D	UE Relative Code Domain Power Accuracy for HS-DPCCH and E-DCH	3 (H-Set 1)	2936	1	2936 bits
5.9B	Spectrum Emission Mask with E-DCH	3 (H-Set 1)	2936	1	For Subtests 1 to 4: 2936 For Subtest 5: 11744
5.10B	ACLR with E-DCH	3 (H-Set 1)	2936	1	For Subtests 1 to 4: 2936 For Subtest 5: 11744
5.13.2B	Relative Code Domain Error with HS-DPCCH and E-DCH	3 (H-Set 1)	2936	1	2936 bits
10.2.1.1	Detection of E-HICH -Single Link Performance (10ms)	3 (H-Set 1)	2936	1	2936 bits
10.2.1.2	Detection of E-HICH -Single Link Performance (2ms)	3 (H-Set 1)	2936	1	5872 bits

Table 2: UL RLC SDU size for E-DCH tests supported by the R&S®CMW500 (subset of Table C.11.3.1 from TS 34.121 [1]),

Subtest 1 to 4 verifies the maximum UE power for different RMC plus HSPA signals.
For Subtests 1 through 4, configure the R&S®CMW500 as follows:
WCDMA-UE Signaling → PS Domain → On [check mark]
WCDMA-UE Signaling → UE Term. Connect → Test Mode
WCDMA-UE Signaling → RMC Data Rate → DL RMC 12.2 UL 12.2
WCDMA-UE Signaling → Test Mode → Loop Mode 1 RLC
WCDMA-UE Signaling → Procedure → RMC on CS Domain + HSPA 34.108
WCDMA-UE Signaling → Direction → HSPA
Config → Connection Configuration → HSPA → HSUPA UL RLC SDU Size → 2936

Subtest 5 verifies the maximum UE power for an SRB plus HSPA signal (no RMC).
It requires algorithm 1 and an "All 1" TPC pattern.
For Subtest 5, configure the R&S®CMW500 as follows:
WCDMA-UE Signaling → UE Term. Connect → Test Mode
WCDMA-UE Signaling → Test Mode → HSPA
WCDMA-UE Signaling → Direction → HSPA
Config → Connection Configuration → HSPA → HSUPA UL RLC SDU Size → 11744

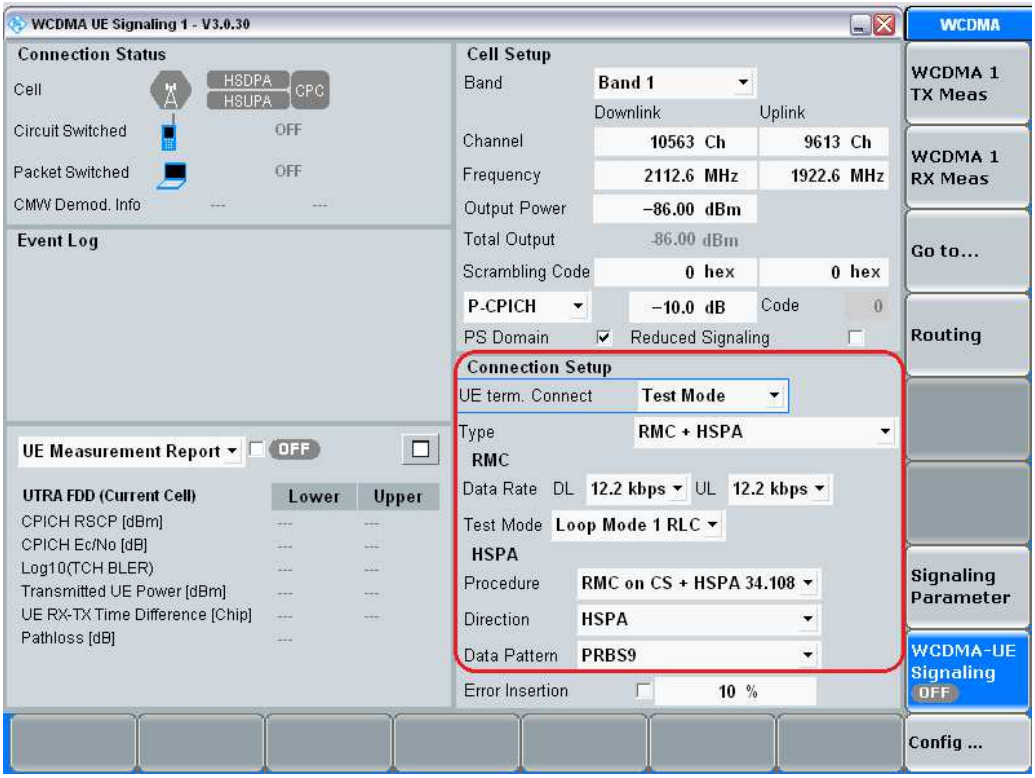


Figure 2: RMC 12.2kbps + HSDPA 34.108 configuration.

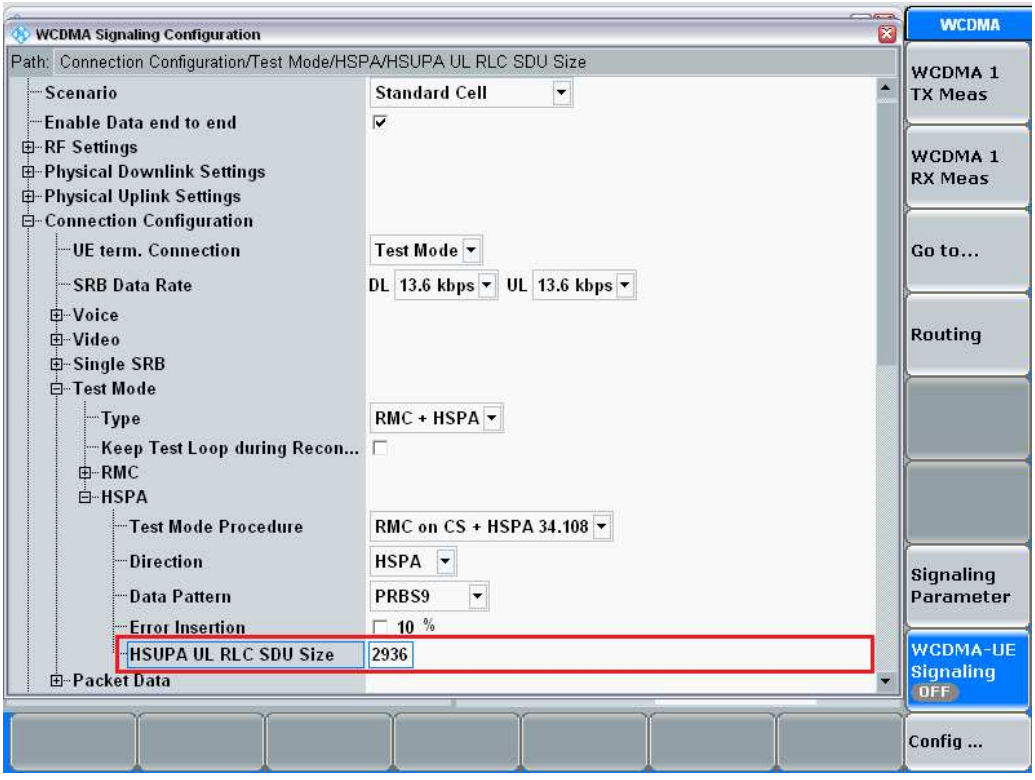


Figure 3: RLC SDU size configuration.

Use the RADIO BEARER SETUP message in 9.2.1 of TS 34.108 [3], as shown in Table 3, to configure an E-DCH call with the exceptions shown as in Tables 4 through 8.

Contents of RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA)			
Information element	**Condition**	**Value/remark**	**Version**
Added or reconfigured TrCH information list	A1	1 TrCH added	
– E-DCH transmission time		10 ms	
– HARQ RV configuration		Rv0	
– Added or reconfigured E-DCH MAC-d flow			
– E-DCH MAC-d flow power offset		0	
– E-DCH MAC-d flow maximum number of retransmissions		7	
Added or reconfigured UL TrCH information list	A1	1 TrCH added	
– E-DCH transmission time interval		2 ms	
– HARQ RV configuration		Rv0	
– Added or reconfigured E-DCH MAC-d flow		(for DCCH)	
– E-DCH MAC-d flow power offset		0	
– E-DCH MAC-d flow maximum number of retransmissions		7	
E-DCH info	A1, A2		Rel-6
– MAC-es/e reset indicator		TRUE	
– E-DPCCH info			
– E-DPCCH/DPCCH power offset		0	
– Happy bit delay condition		100 ms	
– E-TFCI boost info		Not present	Rel-7
– E-TFCI BetaED SwitchE-DPDCH power interpolation		Not present	Rel-7
– E-DPDCH info	A1		
– E-TFCI table index		0	
– E-DCH minimum set E-TFCI		9	
– Maximum channelization codes		2sf4	
– PLnon-max		0.84	
– Power offset for scheduling info		0	
– E-DPDCH info	A2		
– E-TFCI table index		0	
– E-DCH minimum set E-TFCI		9	
– Maximum channelization codes		2sf2 and 2sf4	
– PLnon-max		0.84	
– Power offset for scheduling info		0	
– Scheduled transmission configuration	A1, A2		
– 2 ms scheduled transmission grant HARQ process allocation		Not present	
– Serving grant		Not present	

Notes:
Condition A1: not using E-DCH 4 codes
Condition A2: using E-DCH 4 codes

Table 3: ***Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) (Subset of 9.2.1 from TS 34.108 [3]).***

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA)	
Information element	**Value/Remark**
UL transport channel information for all transport channels	
– 2-bit CTFC	3
– Power offset Information	
– CHOICE gain factors	Signaled gain factors
– CHOICE mode	FDD
– Gain factor ßc	Value used in test: see Table 10
– Gain factor ßd	Value used in test: see Table 10
CHOICE channel requirement	Uplink DPCH info
– Power control algorithm	Algorithm2
Note: All other 2 bit CTFC values use computed gain factors as in the default message.	

Table 4: Contents of the RADIO BEARER SETUP message: AM or UM (Test Loop Mode 1), Table 5.2B.1A of TS 34.121 [1].

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtests 1, 2, 4	
Information element	**Value/Remark**
E-DCH info	Uplink DPCH info
– E-DPDCH info	
– Reference E-TFCIs	5 E-TFCIs
– Reference E-TFCI	11
– Reference E-TFCI PO	4
– Reference E-TFCI	67
– Reference E-TFCI PO	18
– Reference E-TFCI	71
– Reference E-TFCI PO	23
– Reference E-TFCI	75
– Reference E-TFCI PO	26
– Reference E-TFCI	81
– Reference E-TFCI PO	27

Table 5: Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtests 1, 2, 4, 5 (Tables 5.2B.2, 10.2D.3 and 10.13.2B.4 of TS 34.121 [1]).

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtest 3	
Information element	**Value/Remark**

E-DCH info	Uplink DPCH info
– E-DPDCH info	
– Reference E-TFCIs	2 E-TFCIs
– Reference E-TFCI	11
– Reference E-TFCI PO	4
– Reference E-TFCI	92
– Reference E-TFCI PO	18

Table 6: Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtest 3 (Tables 5.2B.3, 10.2D.4 and 10.13.2B.5 of TS 34.121 [1]).

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtest 5	
Information element	**Value/Remark**
E-DCH info	Uplink DPCH info
– E-DPDCH info	
– E-DCH minimum set of E-TFCI	67
– Reference E-TFCIs	1 E-TFCIs
– Reference E-TFCI	67
– Reference E-TFCI PO	18
– Maximum channelization codes	Sf4

Table 7 : Contents of RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) for Subtest 5 (Tables 5.2B.3A, 10.2D.4 and 10.13.2B.5 of TS 34.121 [1])

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA)	
Information element	**Value/Remark**
CHOICE channel requirement	Uplink DPCH info
– Power control algorithm	For Subtests 1 to 4: Algorithm2 For Subtest 5: Algorithm 1
– ΔACK	Value used in test: see Table 10
– ΔNACK	Value used in test: see Table 10
– Ack-Nack repetition factor	3 (required for continuous HS-DPCCH signal)
E-DCH info	
– E-DPCCH/DPCCH power offset	Value used in test: see Table 10
Downlink HS-PDSCH Information	

– Measurement feedback info	
– CQI feedback cycle, k	4 ms
– CQI repetition factor	2 (required for continuous HS-DPCCH signal)
– ΔCQI	Value used in test: see Table 10

Table 8: Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) Tables 5.2B.4, 10.2D.5 and 10.13.2B.6 of TS 34.121 [1]).

Summary of the R&S®CMW500 settings in line with Table 4 (a,b,c,d)			
Subtest	**R&S®CMW500 radio bearer setup**	**Necessary E-DCH channelization**	**Mandatory TTI mode**
1 to 4	12.2 kbps + HSPA 34.108 (CS connection)	UE categories 1 to 6: 2xSF2 (condition A1, A2 from 34.108)	10 ms only (in line with conditions in Table 10.2B.2 and Table 10.2B.3)
5 (for all UE-categories)	SRB 2.5 kbps + HSPA (ßd=0) (PS connection)	1xSF4 (in line with conditions in 5.13.2B.5)	10 ms only (in line with. conditions in 5.2B.3A)

Table 9: Summary of the connection setup configuration on the R&S®CMW500 to be used for the different subtests (Subtests 1 through 5).

Configure the R&S®CMW500 for **Subtests 1 through 5** as follows**:**

Config → HSDPA → CQI Feedback Cycle → 4 ms
Config → HSDPA → CQI Repetition Factor → 2
Config → HSDPA → ACK/NACK Repetition Factor → 3
Config → HSDPA → Channel Configuration → Configuration Type → Fixed Reference Channel
Config → HSDPA → Fixed Reference Channel → H-Set → H-Set 1 QPSK

Config → HSUPA → TTI Mode → 10 ms
Config → HSUPA → E-TFCI Table Index → 0
Config → HSUPA → Minimum Set E-TFCI → 9 (checkmark ON)
Config → HSUPA → Happy Bit Delay Condition → 100 ms
Config → HSUPA → Puncturing Limit PLnon-max → 0.84
Config → HSUPA → Maximum Channelization Code
→ for Subtests 1 to 4: 2xSF2 (for all UE categories)
→ for Subtest 5: 1xSF4 (for all UE categories)

Config → HSUPA → Initial Serving Grant → Value → Off
Config → HSUPA → RAB H-ARQ Profile → H-ARQ Power Offset → 0 dB
Config → HSUPA → RAB H-ARQ Profile → Maximum No. of Retransmissions → 7

Config → Physical Uplink Settings → Gain Factors → HSUPA →Number of Reference E-TFCIs → 5 (Subtests 1, 2 and 4) or 2 (Subtest 3) or 1 (Subtest 5)

Config → Physical Uplink Settings → Gain Factors → HSUPA → Reference E-TFCI 1…4 → 11 67 71 75 (for Subtests 1, 2, 4) or 11 92 (for Subtest 3) or 67 (for Subtest 5)

Config → Physical Uplink Settings → Gain Factors → HSUPA → Reference E-TFCI 5 → 81 (for Subtests 1, 2, 4)

Config → Physical Uplink Settings → Gain Factors → HSUPA → Reference E-TFCI → Power Offset → 4 18 23 26 27 (for Subtests 1, 2, 4) or 4 18 (for Subtest 3) or 18 (for Subtest 5)

Config → Physical Uplink Settings → TX Power Control (TPC) → Alg. Step Size → Alg. 2 /1dB (for Subtests 1, 2, 3, 4) or Alg. 1 /1 dB (for Subtest 5)

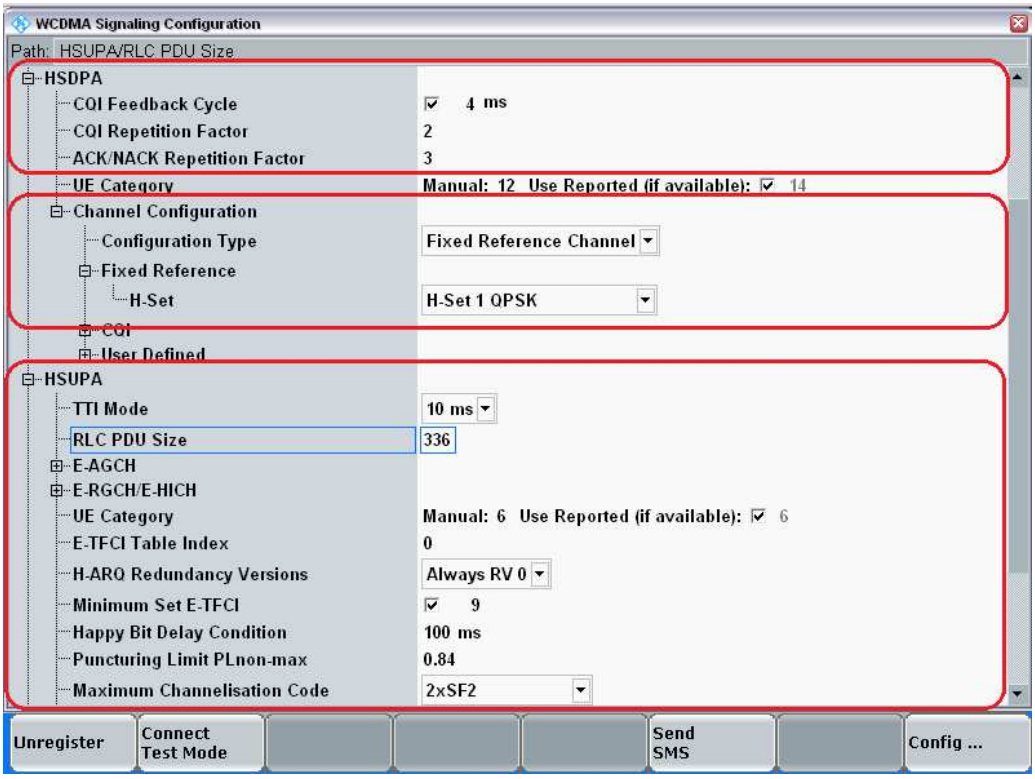


Figure 4: RADIO BEARER SETUP message configuration.

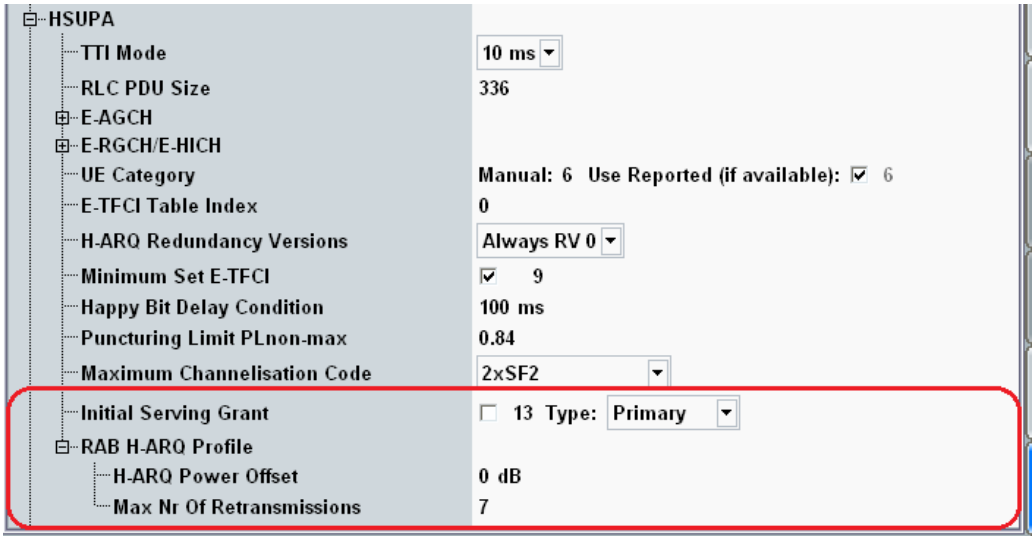


Figure 5: RADIO BEARER SETUP message configuration.

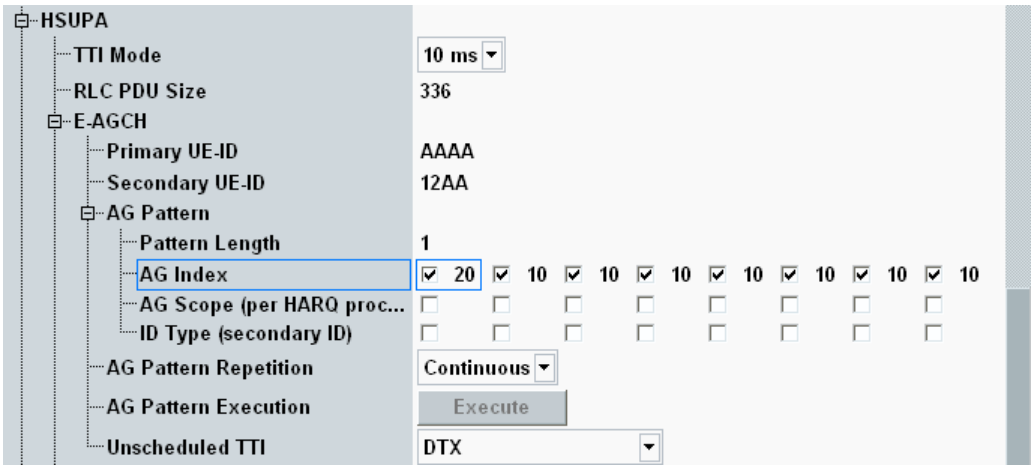


Figure 6: RADIO BEARER SETUP message configuration.

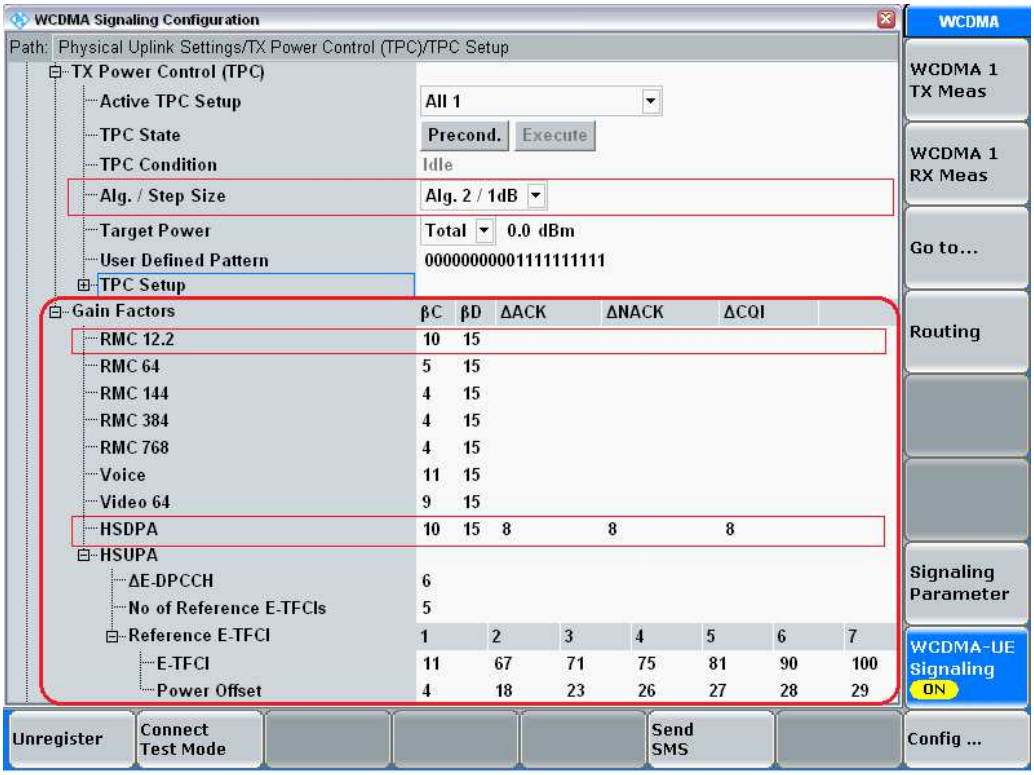


Figure 7: β values for transmitter characteristics tests with HS-DPCCH and E-DCH configuration.

Tables 10, 11, 12 and 13 show the β values for transmitter characteristics with HS-DPCCH and E-DCH, the signaled value for gain factors βc, βd, ΔACK, ΔNACK, ΔCQI and ΔE-DPCCH in the R&S®CMW500, and a summary of gain factor settings in the R&S®CMW500.

β values for transmitter characteristic tests with HS-DPCCH and E-DCH													
Sub-test	**β_c**	**β_d**	**β_d *(SF)***	**β_c/β_d**	**β_{HS} *(Note 1)***	**β_{ec}**	**β_{ed} *(Note 5, Note 6)***	**β_{ed} *(SF)***	**β_{ed} *(Codes)***	***CM (dB) (Note 2)***	***MPR (dB) (Note 2)***	***AG Index (Note 6)***	***E-TFCI***
1	11/15 *(Note 3)*	15/15 *(Note 3)*	64	11/15 *(Note 3)*	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Notes:

Note 1: For Subtests 1 to 4, ΔACK, ΔNACK and ΔCQI = 30/15 with $\beta_{hs} = 30/15 * \beta_c$. For Subtest 5, ΔACK, ΔNACK and ΔCQI = 5/15 with $\beta_{hs} = 5/15 * \beta_c$.

Note 2: CM = 1 for βc/βd =12/15, βhs/βc=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For Subtest 1 the βc/βd ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to βc = 10/15 and βd = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Subtest 3 is omitted according to TS25.306 Table 10.1g.

Note 5: βed cannot be set directly; it is set using the absolute grant value.

Note 6: For Subtests 2, 3 and 4, the UE may perform E-DPDCH power scaling at max. power, which could results in slightly smaller MPR values.

Table 10: β values for transmitter characteristics tests with HS-DPCCH and E-DCH configuration (Table C.11.1.3 of TS 34.121 [1]).

Signaled value for gain factors βc and βd	
Signaled value for βc and βd	**Quantized amplitude ratio for βc and βd**
15	15/15
14	14/15
13	13/15
12	12/15
11	11/15
10	10/15
9	9/15
8	8/15
7	7/15
6	6/15
5	5/15

4	4/15
3	3/15
2	2/15
1	1/15

Table 11: Signaled value for gain factors βc and βd on the R&S®CMW500 in line with 3GPP TS-25213.

Signaled value for gain factors ΔACK, ΔNACK and ΔCQI	
Signaled value for ΔACK, ΔNACK and ΔCQI	**Quantized amplitude ratio (β_{HS} / βc)**
8	30/15
7	24/15
6	19/ 5
5	15/15
4	12/15
3	9/15
2	8/15
1	6/15
0	5/15

Table 12: Signaled value for gain factors ΔACK, ΔNACK and ΔCQI on the R&S®CMW500.

Signaled value for gain factors ΔE-DPCCH	
Signaled value for ΔE-DPCCH	**Quantized amplitude ratio (β_{ec} / βc)**
8	30/15
7	24/15
6	19/ 5
5	15/15
4	12/15
3	9/15
2	8/15
1	6/15
0	5/15

Table 13: Signaled value for gain factors ΔE-DPCCH on the R&S®CMW500.

Summary of gain factor settings on the R&S®CMW500								
Subtest	***βc***	***βd***	***ΔACK***	***ΔNACK***	***ΔCQI***	***ΔE-DPCCH***	***AG Index***	***E-TFCI***
1	10	15	8	8	8	6	20	75
2	6	15	8	8	8	8	12	67
3	15	9	8	8	8	8	15	92
4	2	15	8	8	8	5	17	71
5	15	1	0	0	0	0	12	67

Table 14: Summary of gain factors to be set on the R&S®CMW500.

Configure the R&S®CMW500 as follows:
The following parameters have to be configured according to the summary provided in Table 14. Refer to Figure 7.

Config → Physical Uplink Settings → Gain Factors → RMC 12.2 → βc
Config → Physical Uplink Settings → Gain Factors → RMC 12.2 → βd
Config → Physical Uplink Settings → Gain Factors → HSDPA → βc
Config → Physical Uplink Settings → Gain Factors → HSDPA → βd
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔACK
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔNACK
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔCQI
Config → Physical Uplink Settings → Gain Factors → HSUPA → ΔE-DPCCH
Config → HSUPA → E-AGCH → AG Pattern → AG Index

Settings for the serving cell during measurement with HS-DPCCH and E-DCH		
Parameter	**Unit**	**Cell 1**
Cell type		Serving cell
UTRA RF Channel Number		Test dependent value
Qqualmin	dB	–24
Qrxlevmin	dBm	–115
UE_TXPWR_MAX_RACH	dBm	+21
Ior	dBm/3.84 MHz	–86

Table 15: Settings for the serving cell during measurement with HS-DPCCH and E-DCH (Tables 5.2B.4A, 5.2D.6, 5.9B.2, 5.10B.1A and 5.13.2B.7 of TS 34.121 [1]).

Configure the R&S®CMW500 as follows:
Config → Network → Cell Reselection → Qqualmin → –24 dB
Config → Network → Cell Reselection → Qrxlevmin → –115
Config → Physical Uplink Settings → Maximum UE Power → 21.0 dBm
Config → RF Settings → RF Power Downlink → Output Power (Ior) → –86 dBm

Table 16 shows the downlink physical channels for HSUPA measurements for subclauses 5.2B, 5.2D, 5.9B, 5.10B and 5.13.2B as specified in Table E.5A.1 of TS 34.121 [1].

Downlink physical channel parameters for E-DCH transmitter characteristic tests		
Parameter during measurement	**Unit**	**Value**
P-CPICH_Ec/Ior	dB	–10
P-CCPCH and SCH_Ec/Ior	dB	–12
PICH_Ec/Ior	dB	–15
HS-PDSCH	dB	–3 (Note 1)
HS-SCCH_1	dB	–8 (Note 2)

Table 16: Downlink physical channels for E-DCH transmitter characteristic tests (Table E.5A.1 of TS 34.121 [1]).

DPCH_Ec/Ior	dB	–10
E-AGCH	dB	–20
E-HICH	dB	–20
E-RGCH	dB	DTX'd
OCNS_Ec/Ior	dB	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one
Notes: 1. During TTIs in which the HS-PDSCH is not allocated to the UE via HS-SCCH signaling, the HS-PDSCH shall be transmitted continuously with constant power. 2. During TTIs in which the HS-SCCH is not allocated to the UE, the HS-SCCH shall be transmitted continuously with constant power.		

Configure the R&S®CMW500 as follows:

Config → RF Settings → RF Power Downlink → Output Power (Ior)
Config → Physical Downlink Settings → P-CPICH → –10.0 dB
Config → Physical Downlink Settings → P-SCH → –15.0 dB
Config → Physical Downlink Settings → S-SCH → –15.0 dB
Config → Physical Downlink Settings → P-CCPCH → –12.0 dB
Config → Physical Downlink Settings → PICH → –15.0 dB
Config → Physical Downlink Settings → DPDCH → –10.0 dB
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH#1 → Level → –8.0 dB
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH#2 → Level → Off
Config → Physical Downlink Settings → HS-SCCH#3 → Level → Off
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH#4 → Level → Off
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH Enhanced → Selection → No.1
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH Enhanced → Number of HS-SCCH → 4
Config → Physical Downlink Settings → HS-SCCH → HS-SCCH Enhanced → Unscheduled Subframes → Transmit Dummy UEID
Config → Physical Downlink Settings → HS-PDSCH → –3.0 dB
Config → Physical Downlink Settings → E-AGCH → E-AGCH → –20.0 dB
Config → Physical Downlink Settings → E-HICH → –20.0 dB
Config → Physical Downlink Settings → E-RGCH → Off [uncheck]

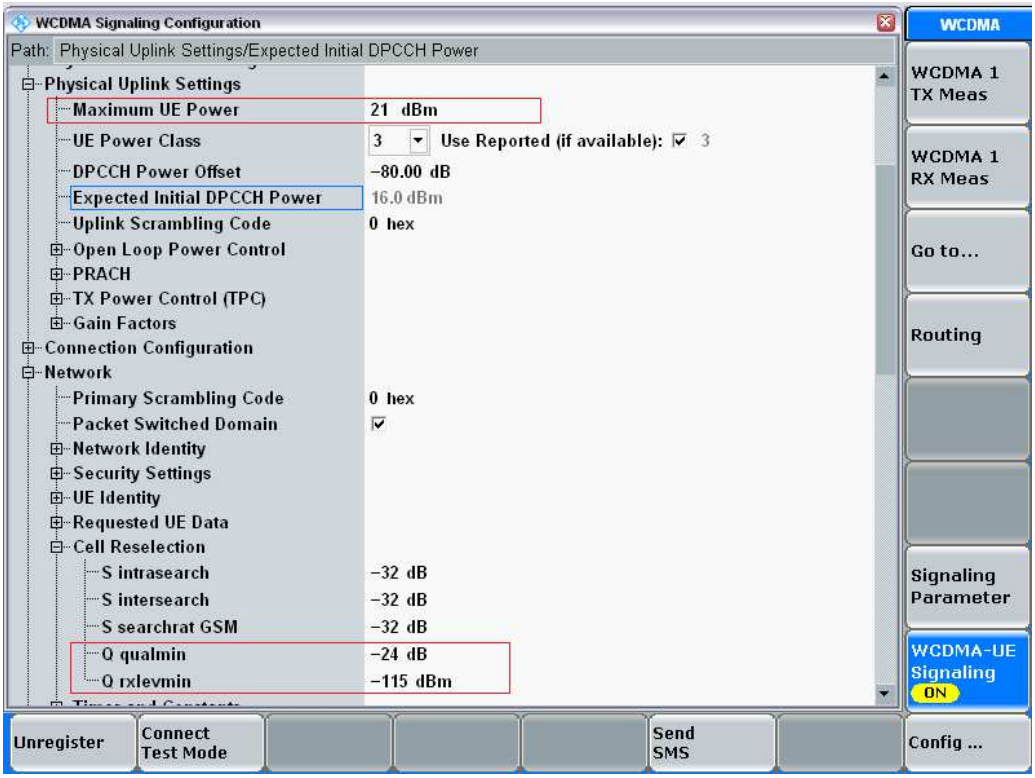


Figure 8: Serving cell parameters.

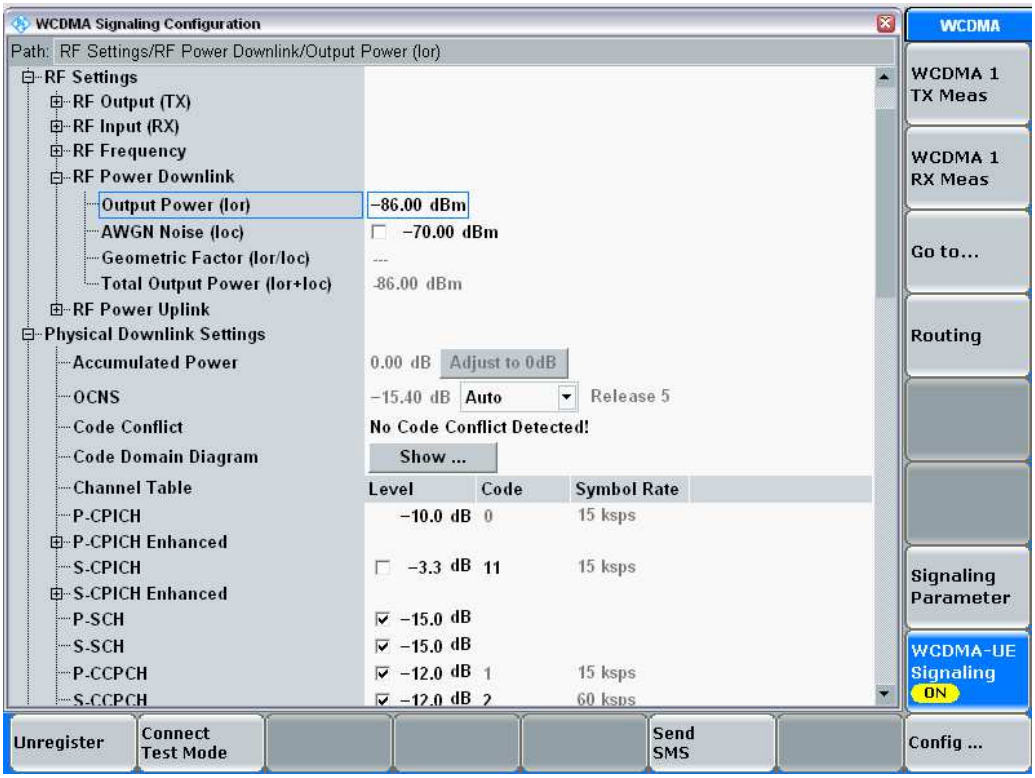


Figure 9: Downlink physical channel configuration in line with Table 16.

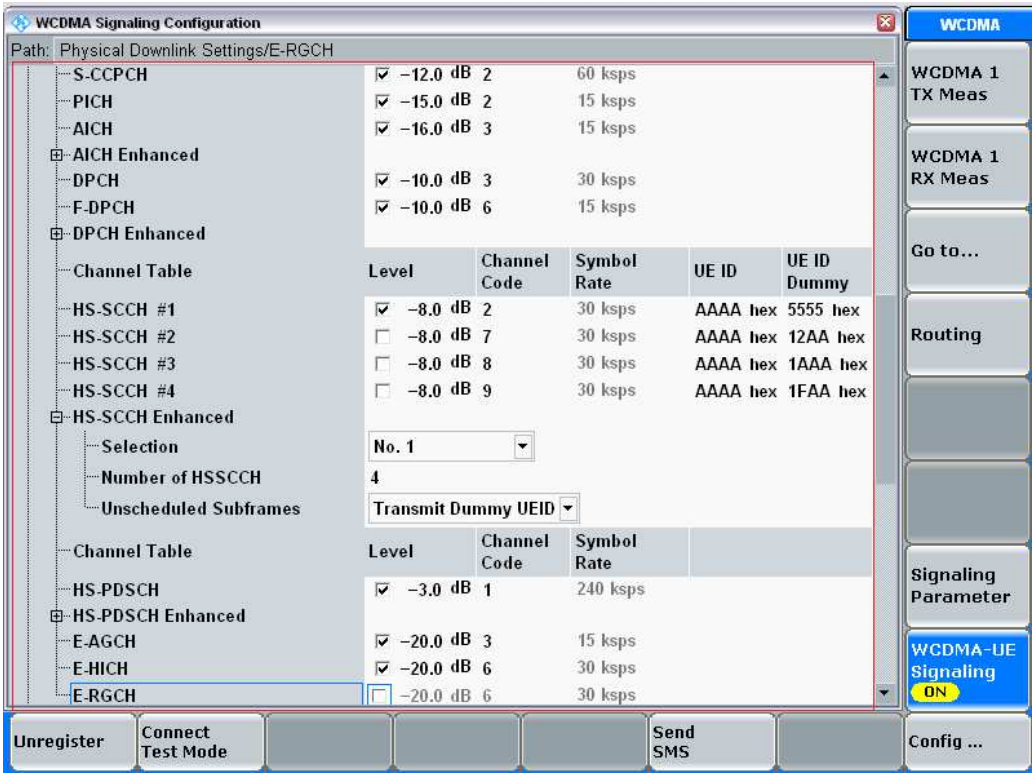


Figure 10: Downlink physical channel configuration in line with Table 16.

Set up an HSUPA call in line with TS 34.108 [3], subclause 7.3.9. To establish an HSUPA connection, press "Connect Test Mode" (for Subtests 1 through 4) or "Connect HSPA TM" (for Subtest 5) on the R&S®CMW500 once the UE has registered with/attached to the R&S®CMW500.

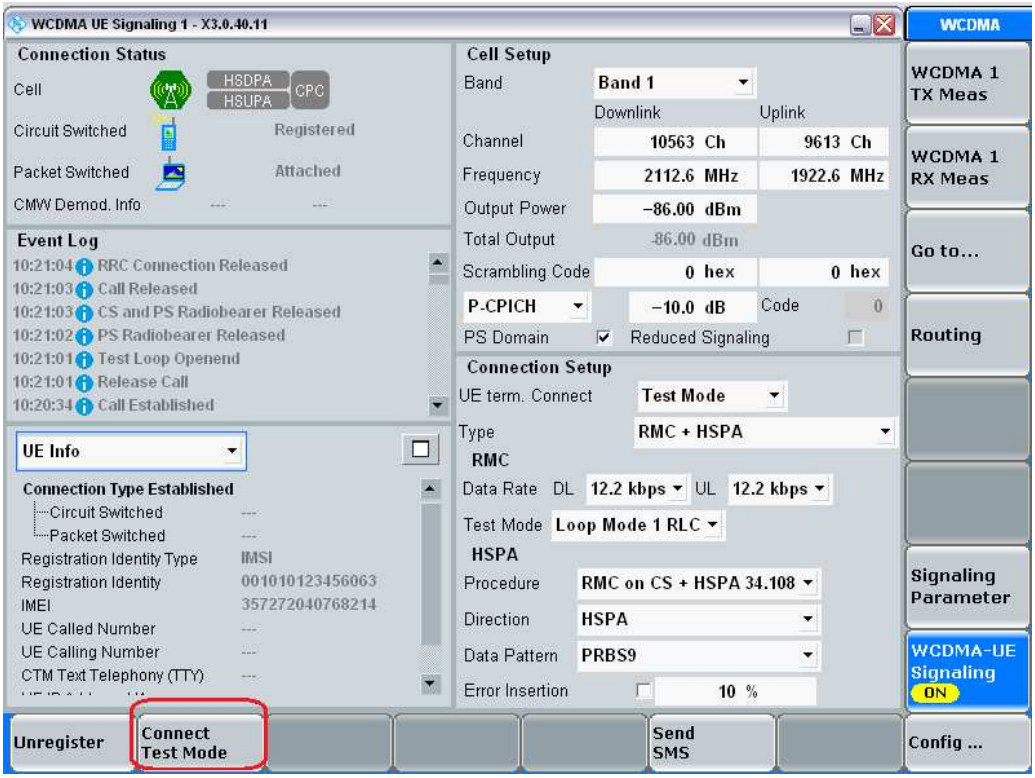


Figure 11: RMC 12.2 kbps + HSPA 34.108 call setup procedure for Subtests 1 through 4.

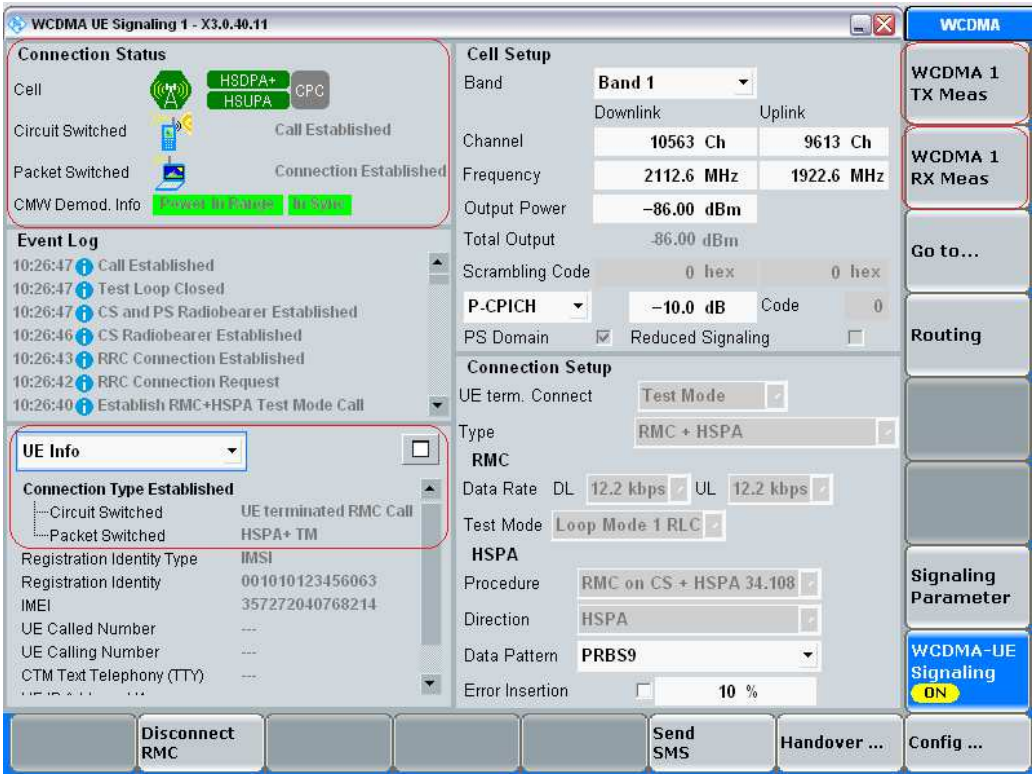


Figure 12: RMC 12.2 kbps + HSPA 34.108 call setup procedure for Subtests 1 through 4.

2.2 Maximum Output Power with HS-DPCCH and E-DCH (5.2B)

The maximum output power with HS-DPCCH and E-DCH measures the maximum power that the UE can transmit when HS-DPCCH and E-DCH are fully or partially transmitted during a DPCCH timeslot. The measurement period shall be at least one timeslot. An excess maximum output power may interfere with other channels or other systems. A low maximum output power decreases the coverage area. Table 10 shows the test requirements for maximum output power with HS-DPCCH and E-DCH. This test applies to all FDD UE for Release 6 and later releases that support HSDPA and E-DCH.

Maximum output power with HS-DPCCH and E-DCH				
Subtest in Table 10	Power Class 3		Power Class 4	
	Power (dBm)	Tol. (dB)	Power (dBm)	Tol. (dB)
1	+24	+1.7/-6.7	+21	+2.7/-5.7
2	+22	+3.7/-5.2	+19	+4.7/-4.2
3	+23	+2.7/-5.2	+20	+3.7/-4.2
4	+22	+3.7/-5.2	+19	+4.7/-4.2
5	+24	+1.7/-3.7	+21	+2.7/-2.7
Notes: The test procedure will result in a power slightly below the maximum; therefore, the lower limits in Table 17 are made lower by 1.5 dB. The test procedure allows a UE to decrease its maximum transmit power for E-TFC selection in Subtests 1 and 5; therefore, the lower limits of Subtests 1 and 5 in Table 17 are made lower by 1.5 dB.				

Table 17: Maximum output power with HS-DPCCH and E-DCH (Table 5.2B.5 of TS 34.121 [1]).

Maximum output power with HS-DPCCH and E-DCH for tests in band XXV and XXVI				
Subtest in Table 10	Power Class 3		Power Class 4	
	Power (dBm)	Tol. (dB)	Power (dBm)	Tol. (dB)
1	+24	+1.7/-7.7	+21	+2.7/-6.7
2	+22	+3.7/-6.2	+19	+4.7/-5.2
3	+23	+2.7/-6.2	+20	+3.7/-5.2
4	+22	+3.7/-6.2	+19	+4.7/-5.2
5	+24	+1.7/-4.7	+21	+2.7/-3.7
Notes: The test procedure will result in a power slightly below the maximum; therefore, the lower limits in Table 17 are made lower by 1.5 dB. The test procedure allows the UE to decrease its maximum transmit power for E-TFC selection in subtests 1 and 5; therefore, the lower limits of Subtests 1 and 5 in Table 17 are made lower by 1.5 dB.				

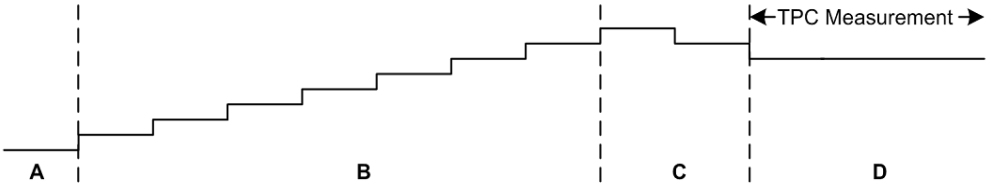
Table 18: Maximum output power with HS-DPCCH and E-DCH (Table 5.2B.6 of TS 34.121 [1]).

Configure the fixed reference channels (FRC H-Set 1, QPSK version), RADIO BEARER SETUP message, downlink physical channels, and serving cell parameters on the R&S®CMW500 as specified in section 2.1. The test comprises five subtests with

different signal configurations. The test procedure is common for Subtests 1 through 4 and differs for Subtest 5. The test procedure for Subtests 1 through 4 requires a dynamic TPC pattern, reacting to the E-TFCI received from the UE.

The test procedure to be followed to determine the maximum output power for **Subtests 1 through 4** is described below.

a. Set the initial UE power to be at least 7.5 dB lower than the maximum UE power.
b. Increase the UE power via TPC commands until the UE sends a decreased E-TFCI.
c. Use Algorithm 2 and check the E-TFCI after each +1 TPC_cmd (11111 pattern).
d. Decrease the UE power via a single –1 TPC_cmd (00000 pattern, algorithm 2). If the UE still sends a decreased E-TFCI, repeat the –1 TPC_cmd once.
e. Check that the UE sends the expected target E-TFCI (for Subtests 1 through 4: 75, 67, 92, 71). If the target E-TFCI is not reached, the UE has failed the test.
f. Keep the power constant (alternating pattern, algorithm 2), and measure the UE power (mean value over at least one slot).
g. The progress of the test can be monitored via the displayed TPC state, target E-TFCI and monitored E-TFCI as listed in the legend of the following figure.

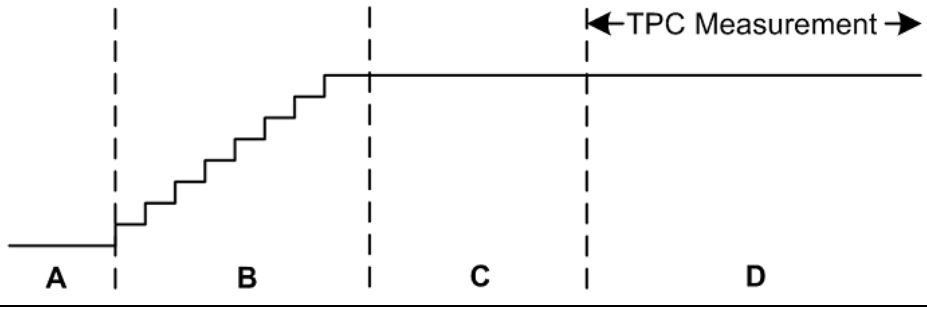


A = state "Target Power Locked", initial target power reached, monitored E-TFCI = target E-TFCI
B = state "Searching", 11111 pattern, monitored E-TFCI = target E-TFCI
C = state "Searching", 00000 pattern, monitored E-TFCI < target E-TFCI
D = state "Max. Power", alternating pattern, monitored E-TFCI = target E-TFCI

Figure 13: Arriving at the max. power condition for Subtests 1 through 4.

Subtest 5 requires only a static "All 1" TPC pattern. The basic test procedure is as follows:

a. Set the initial UE power to be at least 7.5 dB lower than the maximum UE power.
b. Send an "All 1" TPC pattern, using algorithm 1.
c. When the maximum power is reached, the signaling application monitors the sent E-TFCI for 150 ms.
d. Measure the UE power (mean value over at least one slot).



A = state "Target Power Locked", initial target power reached, monitored E-TFCI = target E-TFCI
B = state "Searching", all 1 pattern, no monitored E-TFCI
C = state "Searching", all 1 pattern, monitored E-TFCI = target E-TFCI
D = state "Max. Power", all 1 pattern, monitored E-TFCI = target E-TFCI

Figure 14: Arriving at the max. power condition for Subtest 5.

Establish an HSUPA call as mentioned in section 2.1. The R&S®CMW500 automatically handles the test procedure mentioned above to arrive at the maximum output power for Subtests 1 through 4. The end user only needs to configure the TPC pattern to be "Max. Power E-DCH" and wait for the measurement to be completed. The measurement results are available in the "TPC Measurement" application in the "WCDMA Tx Meas" function group or, alternatively, under the "UE Power" display available under "WCDMA Multi Evaluation".

For Subtest 1, configure the R&S®CMW500 as follows:
Refer to section 2.1, Table 10 and Figure 7 to configure the gain factors, AG Index and E-TFCI in line with Subtest 1. In addition, the following TPC setting is to be made:

WCDMA-UE Signaling → Connect Test Mode
Goto → WCDMA1 Tx Meas. → TPC Measurement
TPC Measurement → TPC Setup → Max. Power E-DCH (for Subtests 1 through 4),
→ All 1 (for Subtest 5)
TPC Measurement → ON

Repeat the test for Subtests 2 through 5 by changing the following configuration:

WCDMA-UE Signaling → Config → Physical Uplink Settings → Gain Factors → change βc and βd values according to Table 10
Signaling Parameter → HSUPA → E-AGCH → AG Pattern → AG Index → change value according to the subtest
TPC Measurement → Restart/Stop

The measurement results for the maximum output power, along with an indication of the expected target E-TFCI and monitored current E-TFCI values, are displayed on the R&S®CMW500 in the TPC Measurement application. If the values for the Current E-TFCI and the Target E-TFCI differ, this indicates that the UE failed the test.

Figure 15 shows the measurement results for a Power Class 3 device transmitting HS-DPCCH and E-DCH simultaneously.

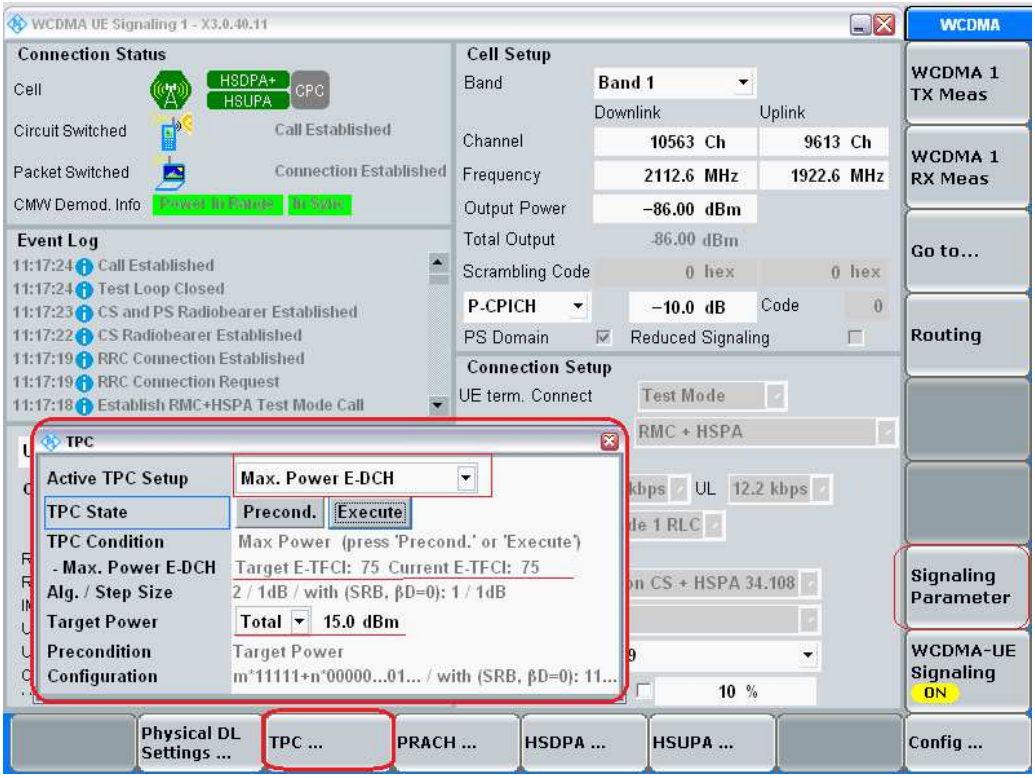


Figure 15: TPC pattern for the Max. Power condition.

Figure 16: Measurement results for Maximum Output Power with HS-DPCCH and E-DCH.

The limit lines are configured according to Table 17 when you navigate from the signaling function to the "WCDMA Tx Meas" using the "Goto" tab. Alternatively, it is also user configurable as shown in Figure 17.

TPC Measurement → Config → Measurement Control → Max. Power E-DCH → TPC Auto Execute → ON (checkmark)
TPC Measurement → Config → Limit → Max. Power E-DCH → ON (checkmark)
TPC Measurement → Config → Limit → Max. Power E-DCH → Nominal Maximum Power → set according to power class of the UE as per Table 17
TPC Measurement → Config → Limit → Max. Power E-DCH → Upper Limit → set according to the UE's power class in line with Table 17
TPC Measurement → Config → Limit → Max. Power E-DCH → Lower Limit → set according to the UE's power class in line with Table 17

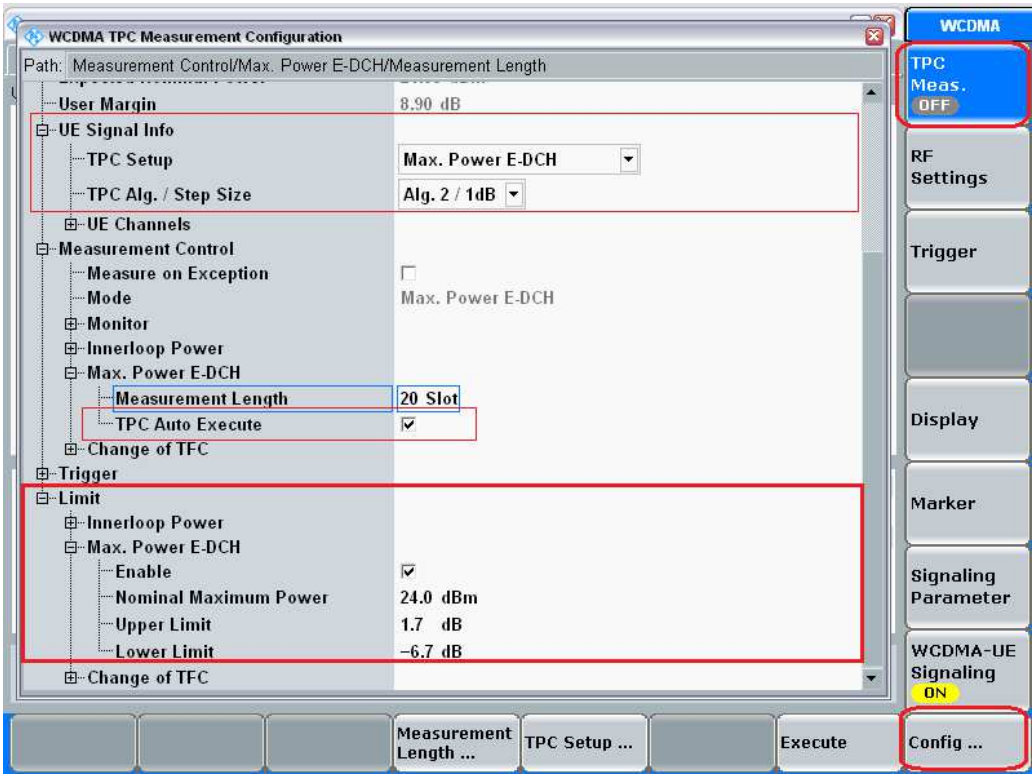


Figure 17: Configuration of limit lines in line with Table 17.

Press the "WIZARD" hardkey without the call established, and choose:

Application Wizard → HSUPA Maximum Ouput Power → Subtest Selection → Subtest1…5 → Finish
WCDMA-UE Signaling → Connect Test Mode
Goto → WCDMA Tx Meas. → TPC Measurement → ON

For Subtests 1 through 5:
Disconnect the call and repeat the above steps with "Subtest Selection" set accordingly.

2.3 UE Relative Code Domain Power Accuracy for HS-DPCCH and E-DCH (5.2D)

"UE relative code domain power accuracy" measures the UE's ability to correctly set the level of the individual code power relative to the total power of all active codes. The measure of accuracy is the difference between two dB ratios:

UE Relative CDP accuracy = (Measured CDP ratio) – (Nominal CDP ratio)

where:

$$\text{Measured CDP ratio} = 10 * \log\left(\frac{\text{Measured code power}}{\text{Measured total power of all active codes}}\right)$$

$$\text{Nominal CDP ratio} = 10 * \log\left(\frac{\text{Nominal CDP}}{\text{Sum of all nominal CDPs}}\right)$$

A code's nominal CDP is relative to the sum of all codes and is derived from beta factors. The sum of all nominal CDPs will equal 1 by definition. The "UE relative CDP accuracy" shall be maintained over the period during which the sum of all active code powers remains unchanged or for one timeslot, whichever is longer. This test applies to all FDD user equipment for Release 6 and for later releases that support HSDPA and E-DCH.

Figure 18 shows the transmit power profile for "UE relative code domain power accuracy." A repeating pattern with alternating value of absolute grants as shown in Table 10 and an absolute grant index of Zero_Grant is generated. This will generate a repeating pattern on the E-DPDCH(s) with a level corresponding to the sending of scheduling information every other 10 ms E-DCH TTI as shown in Figure 18.

The relative code domain power of each active code is measured at the measurement points as specified in Figure 18. Each measurement is over a half-slot period. Measurement Point 1 is the last timeslot before TTI1. Measurement Point 2 is the first timeslot of TTI1 and Measurement Point 3 is the first timeslot of TTI2. The 25 µs transient periods at the ends of each measured timeslot shall not be included.

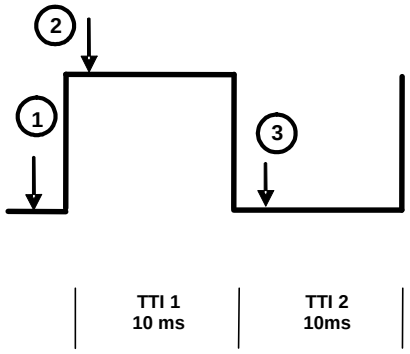


Figure 18: Transmit power profile for UE CDP accuracy.

Nominal ratios for the UE relative code domain power							
Subtest in Table 10	Measurement point	Expected relative code domain power in dB					
		DPCCH	DPDCH	HS-DPCCH	E-DPCCH	E-DPDCH1	E-DPDCH2
1	1	–9.3	–6.6	–3.3	–7.3	–18.9	OFF
	2	–18.5	–15.8	–12.5	–16.5	–0.5	OFF
	3	–9.3	–6.6	–3.3	–7.3	–18.9	OFF
2	1	–11.9	–3.9	–5.8	–5.8	–21.4	OFF
	2	–14.0	–6.0	–8.0	–8.0	–4.1	OFF
	3	–11.9	–3.9	–5.8	–5.8	–21.4	OFF
3	1	–9.8	–14.2	–3.7	–3.7	–19.3	OFF
	2	–14.6	–19.1	–8.6	–8.6	–4.7	–4.7
	3	–9.8	–14.2	–3.7	–3.7	–19.3	OFF
4	1	–17.9	–0.4	–11.9	–17.9	–27.5	OFF
	2	–19.7	–2.2	–13.7	–19.7	–4.7	OFF
	3	–17.9	–0.4	–11.9	–17.9	–27.5	OFF

Table 19: Nominal ratios for the "UE relative code domain power" (Table 5.2D.7 of TS 34.121 [1]).

Test requirements for the UE relative code domain power accuracy	
Nominal CDP ratio	Accuracy (dB)
≥ –10 dB	±1.7
–10 dB to ≥ –15 dB	±2.3
–15 dB to ≥ –20 dB	±2.9

Table 20: Test requirements for the UE relative code domain power accuracy (Table 5.2D.8 of TS 34.121 [1]).

Configure the fixed reference channels (FRC H-Set 1, QPSK version), RADIO BEARER SETUP message, Subtest 1, downlink physical channels, and serving cell are configured on the R&S®CMW500 as specified in section 2.1.

Establish an HSUPA call. Set the UE power to 15 dBm ± 2 dB by referring to Figure 19. Send alternating "0" and "1" TPC commands in the downlink to satisfy the condition of obtaining TPC_cmd = 0.

Configure the R&S®CMW500 as follows:
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg.2 /1 dB
Signaling Parameter → TPC → Target Power → Total → 15.0 dBm

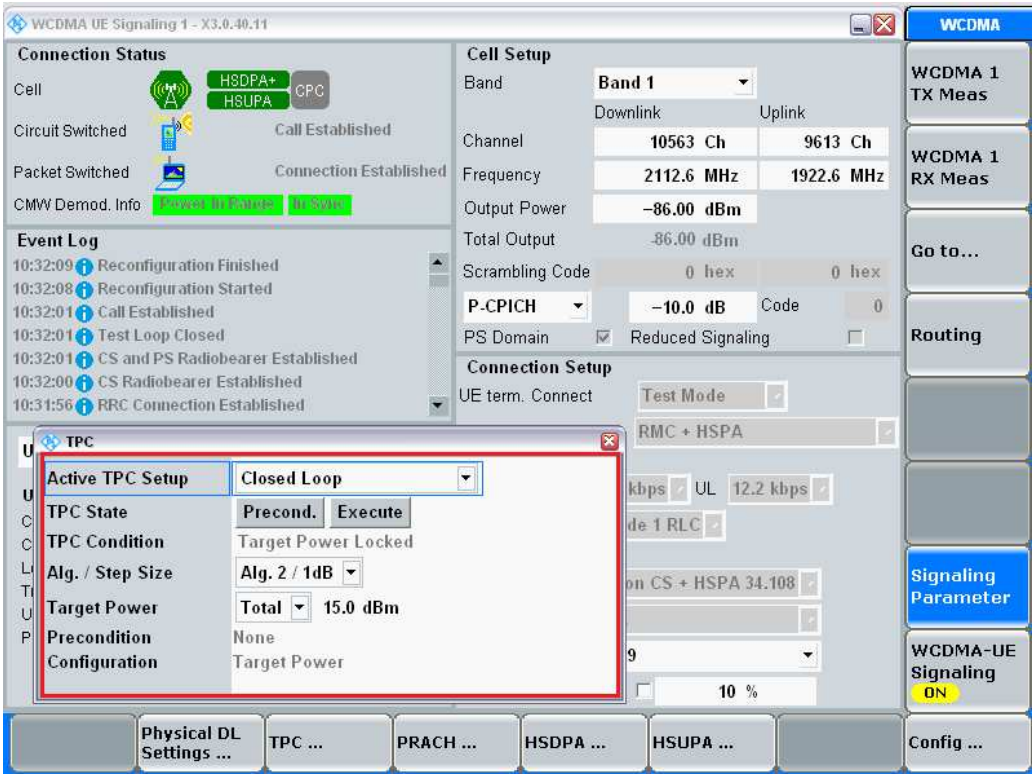


Figure 19: TPC setup to stimulate a UE transmitting at 15dBm ±2dB.

A repeating pattern with alternating value of absolute grants for Subtest 1 and an absolute grant index of Zero_Grant is generated.

Configure the R&S®CMW500 as follows:
Signaling Parameter → HSUPA → E-AGCH → AG Pattern → Pattern Length → 2
Signaling Parameter → HSUPA → E-AGCH → AG Pattern → AG Index → 20, 0

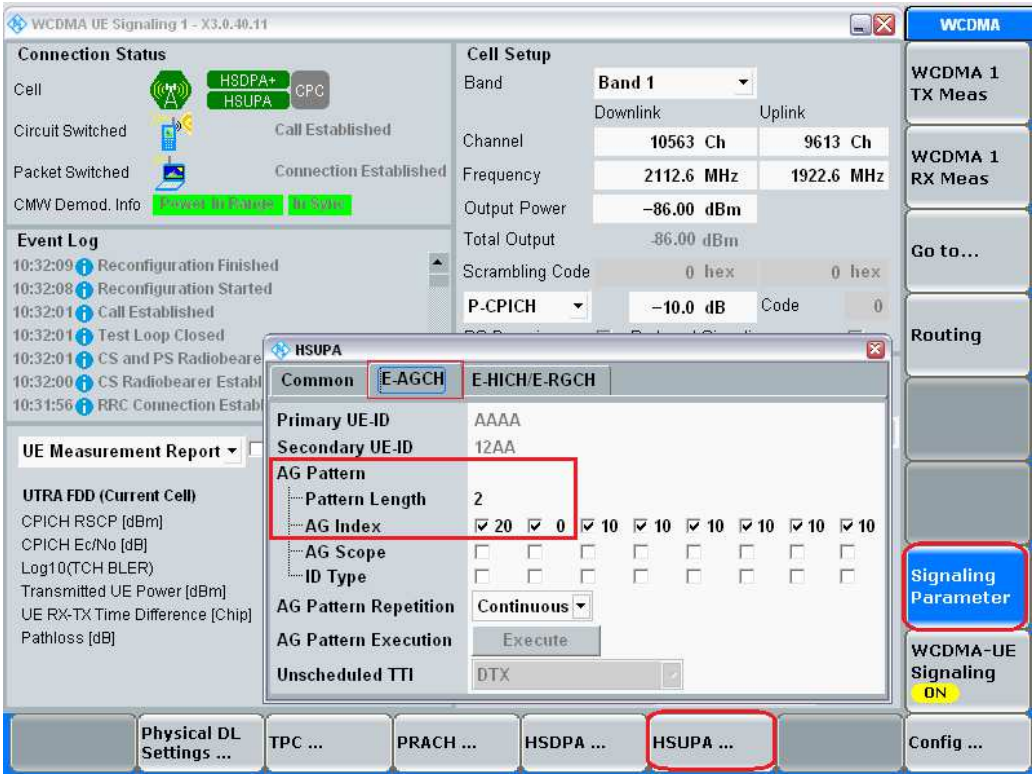


Figure 20: Alternating pattern of absolute grant allocation to the UE.

The E-TFCI transmitted by the UE is verified and has to be confirmed to be equal to the target E-TFCI in Table 10. If the values for the Current E-TFCI and the Target E-TFCI differ, this indicates that the UE failed the test.

The E-TFCI measurement results are available on the R&S®CMW500 under *WCDMA Rx Meas.*:

Goto → WCDMA Rx Meas. → UL Logging → E-TFCI

Figure 21 shows the E-TFCI transmitted by the UE.

The UE relative code domain power accuracy for HS-DPCCH and E-DCH is repeated with different combinations of β values for Subtests 2, 3 and 4 as specified in Table 10.

The measurement results for the UE relative code domain power accuracy with HS-DPCCH and E-DCH are available in the R&S®CMW500's *CDP vs. Slot measurement.*

Configure the R&S®CMW500 as follows:
WCDMA Tx Meas → Multi Evaluation → Display → CDP vs. Slot

Rohde & Schwarz recommends using frame triggering for UE relative code domain power accuracy with HS-DPCCH and E-DCH.

Configure the R&S®CMW500 as follows:
Trigger → Trigger Source → Frame

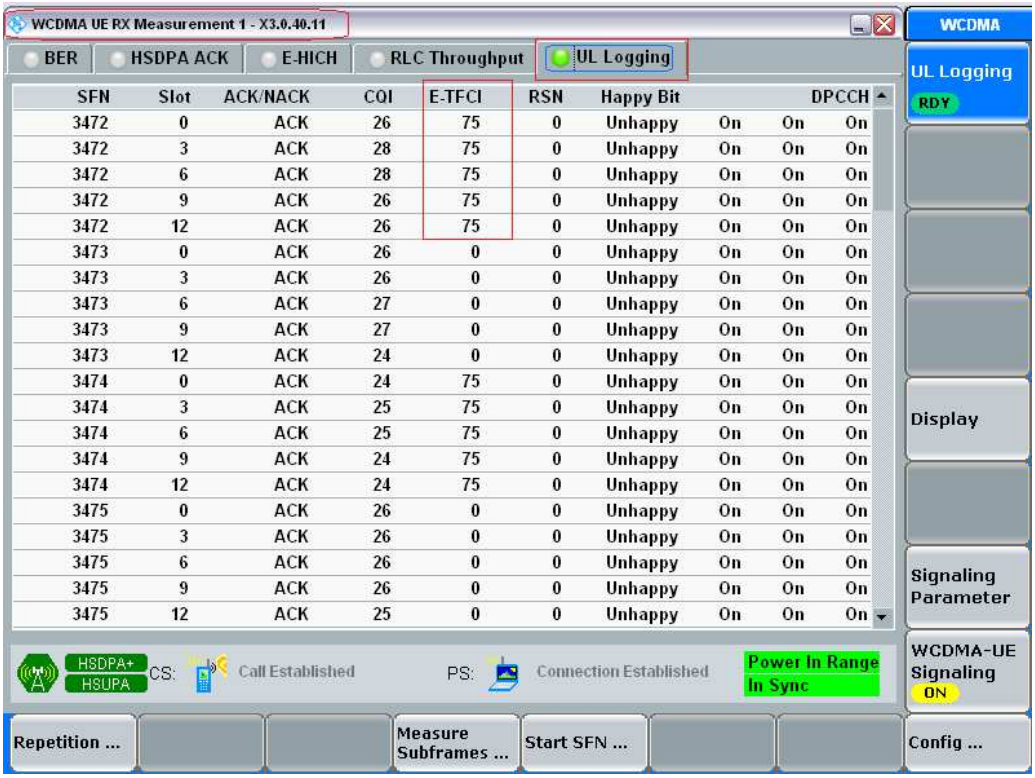


Figure 21: Verification of the E-TFCI value in line with the selected subtest (refer to Table 10).

Figure 22 shows the UE relative code domain power accuracy for HS-DPCCH and E-DCH measurement results.

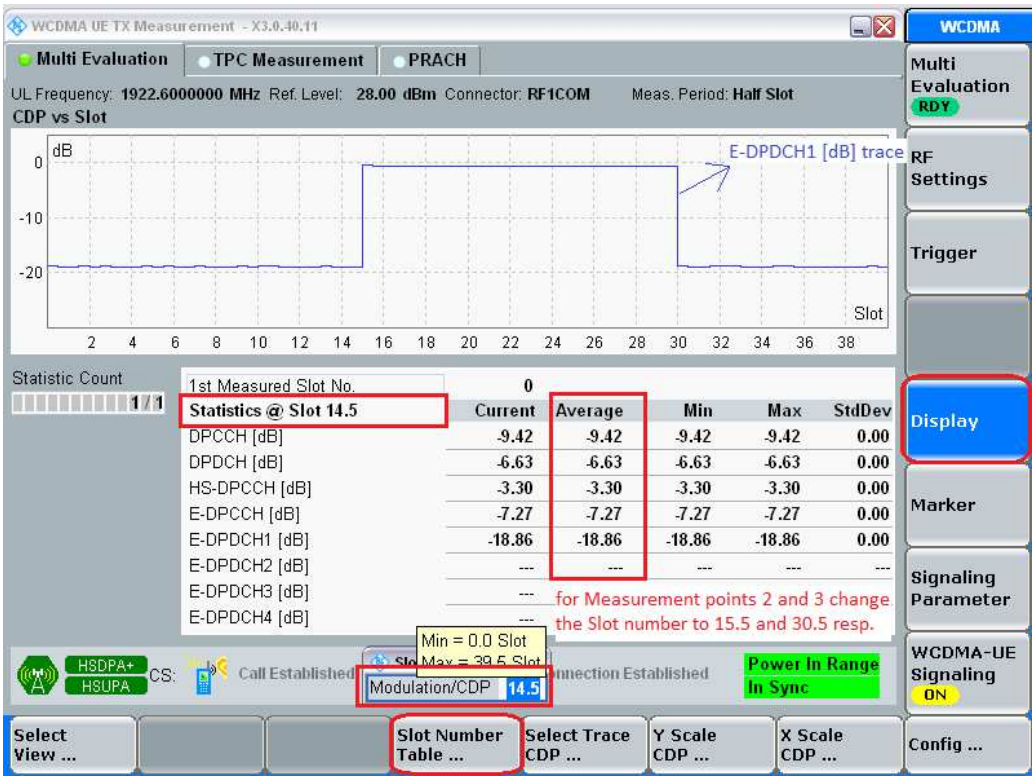


Figure 22: UE relative code domain power accuracy for HS-DPCCH and E-DCH measurement results.

You can configure the position of the measurement points by changing the *Slot Number* as required for the different measure points in the R&S®CMW500.

Configure the R&S®CMW500 as follows:
Menus → Code Dom. Power → Applic. 1 → CDP/Relative
WCDMA MultiEvaluation → Display → Slot Number Table → 0.0 [Measure Point 1]
WCDMA MultiEvaluation → Display → Slot Number Table → 0.5 [Measure Point 2]
WCDMA MultiEvaluation → Display → Slot Number Table → 1.5 [Measure Point 3]

The diagram of the measurement result shows the E-DPDCH transmission from the UE, which matches the transmit power profile in Figure 18. The diagram can be configured to display either DPCCH, DPDCH1, HS-DPCCH, E-DPCCH, E-DPDCH1 or E-DPDCH2 (or all of them) by choosing the trace to be displayed.

Configure the R&S®CMW500 as follows:
WCDMA MultiEvaluation → Display → Select View → CDP vs. Slot
WCDMA MultiEvaluation → Display → Select Trace CDP → E-DPDCH1 [dB]

The span of the X- and Y-scale of both diagrams can be configured by changing *Scale X* and *Scale Y* in the R&S®CMW500.

Configure the R&S®CMW500 as follows:
Display → Y Scale CDP

Display → X Scale CDP

Press the "WIZARD" hardkey without the call established, and choose:

Application Wizard → HSUPA Maximum Output Power → Subtest Selection → Subtest1 → Finish
WCDMA-UE Signaling → Connect Test Mode
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg. 2 /1 dB
Signaling Parameter → TPC → Target Power → 15 dBm

Signaling Parameter → HSUPA → E-AGCH → AG Pattern → Pattern Length → 2
Signaling Parameter → HSUPA → E-AGCH → AG Index → 20, 0
WCDMA Tx Meas → Multi Evaluation → Display → CDP vs. Slot

For Subtests 2 to 4:
Disconnect the call and repeat the above steps with subtest selection set accordingly.

Signaling Parameter → HSUPA → E-AGCH → AG Index → 12, 0 (for Subtest 2)
Signaling Parameter → HSUPA → E-AGCH → AG Index → 15, 0 (for Subtest 3)
Signaling Parameter → HSUPA → E-AGCH → AG Index → 17, 0 (for Subtest 4)

2.4 Spectrum Emission Mask with E-DCH (5.9B)

The UE's spectrum emission mask applies to frequencies that are between 2.5 MHz and 12.5 MHz away from the UE's center carrier frequency. The out-of-channel emission is specified relative to the UE carrier's RRC filtered mean power. This test applies to all FDD UE for Release 6 and for later releases that support HSDPA and E-DCH.

This test verifies that the UE emission's power does not exceed the limit in Table 21 even in the presence of the E-DCH for all values of βc, βd, β_{HS}, β_{ec} and β_{ed} as specified in Table 10. The maximum output power with HS-DPCCH and/or E-DCH is specified in

section 2.2. Excess emission increases interference with other channels or with other systems.

Tables 21, 22, 23 and 24 show the spectrum emission mask requirement and additional spectrum emission limits. Δf is the separation between the carrier frequency and the center of the measurement bandwidth. The minimum requirement is calculated from the relative requirement or the absolute requirement, whichever is the higher power.

Spectrum emission mask requirement			
Δf in MHz	**Minimum requirements**		**Measurement bandwidth**
	Relative requirement	**Absolute requirement**	
2.5 to 3.5	$\left\{-33.5-15.\left(\frac{\Delta f}{MHz}-2.5\right)\right\}$ dBc	–69.6 dBm	30 kHz
3.5 to 7.5	$\left\{-33.5-1.\left(\frac{\Delta f}{MHz}-3.5\right)\right\}$ dBc	–54.3 dBm	1 MHz
7.5 to 8.5	$\left\{-37.5-10.\left(\frac{\Delta f}{MHz}-7.5\right)\right\}$ dBc	–54.3 dBm	1 MHz
8.5 to 12.5	–47.5 dBc	–54.3 dBm	1 MHz

Table 21: Spectrum emission mask requirements (Table 5.9B.3 of TS 34.121 [1]).

Additional spectrum emission limits for Bands II, IV, X			
Δf in MHz	**Frequency offset of measurement filter center frequency, f_offset**	**Additional requirements Band II, IV, X**	**Measurement bandwidth**
2.5 MHz ≤ Δf < 3.5 MHz	2.515 MHz ≤ f_offset < 3.485 MHz	–15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ 12.5 MHz	4.0 MHz ≤ f_offset < 12.0 MHz	–13 dBm	1 MHz

Table 22: Additional spectrum emission limits for Bands II, IV, X (Table 5.9B.3A of TS 34.121 [1]).

Additional spectrum emission limits for Band V			
Δf in MHz	**Frequency offset of measurement filter center frequency, f_offset**	**Additional requirements Band V**	**Measurement bandwidth**
2.5 MHz ≤ Δf < 3.5 MHz	2.515 MHz ≤ f_offset < 3.485 MHz	–15 dBm	30 kHz
3.5 MHz ≤ Δf ≤ 12.5 MHz	3.55 MHz ≤ f_offset < 12.45 MHz	–13 dBm	100 kHz

Table 23: Additional spectrum emission limits for Bands V (Table 5.9B.3B of TS 34.121 [1]).

Additional spectrum emission limits for Bands XII, XIII, XIV			
Δf in MHz	**Frequency offset of measurement filter center frequency, f_offset**	**Additional requirements Band XII, XIII, XIV**	**Measurement bandwidth**
2.5 MHz ≤ Δf < 2.6 MHz	2.515 MHz ≤ f_offset < 2.585 MHz	–13 dBm	30 kHz
2.6 MHz ≤ Δf ≤ 12.45 MHz	2.65 MHz ≤ f_offset < 12.45 MHz	–13 dBm	100 kHz

Table 24: Additional spectrum emission limits for Bands XII, XIII, XIV (Table 5.9B.3C of TS 34.121 [1]).

Configure the fixed reference channels (FRC H-Set 1, QPSK version), RADIO BEARER SETUP message, Subtest 1, downlink physical channels, and serving cell on the R&S®CMW500 as specified in section 2.1. Establish an HSUPA call. Set the UE's maximum output power as specified in section 2.2.

Repeat the spectrum emission mask with E-DCH with different combinations of β values as specified in Table 10.

The measurement results for the spectrum emission mask with E-DCH are available in the *Emission Mask* display on the R&S®CMW500:

WCDMA Multi Evaluation → Display → Emission Mask

Figure 23 shows the spectrum emission mask while the UE is transmitting E-DCH.

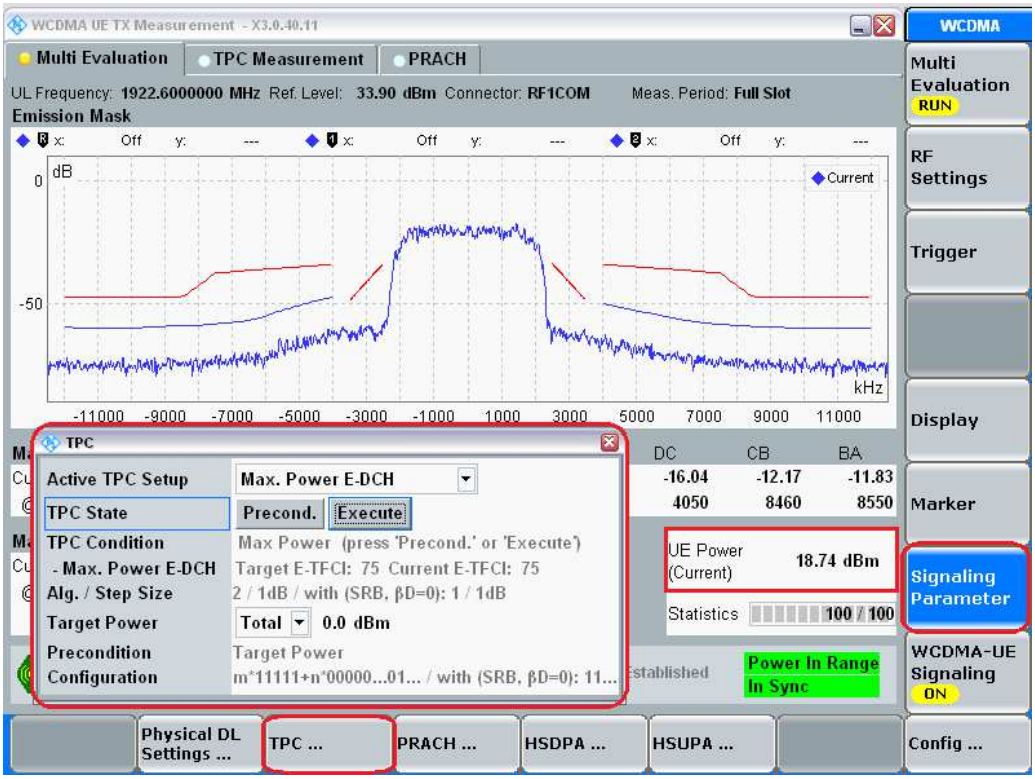


Figure 23: Measurement results for the spectrum emission mask.

Press the "WIZARD" hardkey without the call established, and choose:

Application Wizard → HSUPA Maximum Output Power → Subtest Selection → Subtest1 → Finish
WCDMA-UE Signaling → Connect Test Mode
WCDMA Tx Meas → Multi Evaluation → Display → Emission Mask

For Subtests 2 through 5:
Disconnect the call and repeat the above steps with Subtest Selection set accordingly.

2.5 Adjacent Channel Leakage Power Ratio (ACLR) with E-DCH (5.10B)

ACLR is defined as the ratio of the RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency. Excess ACLR increases interference with other channels or with other systems. This test applies to all FDD UE for Release 6 and for later releases that support HSDPA and E-DCH.

This test verifies that a UE emission's power does not exceed the limit in Table 25 for all values of βc, βd and β_{HS}, β_{ec} and β_{ed} as specified in Table 10. The maximum output power with E-DCH is specified in section 2.2.

Configure the fixed reference channels (FRC H-Set 1, QPSK version), RADIO BEARER SETUP message, Subtest 1, downlink physical channels, and serving cell on the R&S®CMW500 as specified in section 2.1. Establish an HSUPA call. Set the UE's maximum output power as specified in section 2.2.

The ACLR with HS-DPCCH is repeated with different combinations of β values as specified in Table 10.

The measurement results for ACLR with E-DCH are available in the *ACLR Filter* on the R&S®CMW500.

Configure the R&S®CMW500 as follows:
WCDMA Tx Meas → Multi Evaluation → Display → ACLR

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 25: UE ACLR (Table 5.10B.2 of TS 34.121 [1]).

Figure 24: ACLR with E-DCH measurement results.

The measured ACLR shall be higher than the limit specified in Table 25.

Press the "WIZARD" hardkey without the call established, and choose:

Application Wizard → HSUPA Maximum Output Power → Subtest Selection → Subtest1 → Finish
WCDMA-UE Signaling → Connect Test Mode
WCDMA Tx Meas → Multi Evaluation → Display → ACLR

For Subtests 2 through 5:
Disconnect the call and repeat the above steps with Subtest Selection set accordingly.

2.6 Relative Code Domain Error with HS-DPCCH and E-DCH (5.13.2B)

The relative code domain error for every non-zero beta code in the domain measures the ratio of the mean power of the projection onto the non-zero beta code to the mean power of the non-zero beta code in the composite reference waveform. The measurement interval is one timeslot except when the mean power between slots is expected to change, whereupon the measurement interval is reduced by 25 µs at each end of the slot.

The relative code domain error is affected by both the spreading factor and beta values of the various code channels in the domain. Effective code domain power (ECDP) for each used code k is defined using the nominal CDP ratio as specified in TS 25.101 [4].

$$ECDP_k = (\text{Nominal CDP ratio})_k + 10 * \log 10 (SF_k / 256)$$

The relative code domain error is not applicable when either of the following channel conditions occurs (or if both occur):

i) ECDP of any code channel is < –30 dB
ii) Nominal code domain power of any code channel is < –20 dB

The relative code domain error only considers code channels with non-zero beta in the composite reference waveform and does not apply to the PRACH preamble and message parts. This test applies to all FDD UE for Release 6 and for later releases that support HSDPA and E-DCH.

Tables 26, 27 and 28 show the parameters for relative code domain error with HS-DPCCH and E-DCH, nominal ECDP ratios and relative code domain error test requirement respectively. The relative code domain error must meet the test requirements in Table 28 for the parameters specified in Table 26.

Parameters for relative code domain error with HS-DPCCH and E-DCH			
Parameter		**Unit**	**Level**
UE output power		dBm	≥ –20
Operating conditions			Normal conditions
Power control step size		dB	1
Measurement period[1]	PRACH	Chips	3904
	Any DPCH		From 1280 to 2560[2]
Notes: 1. Less any 25 µs transient periods 2. The longest period over which the nominal power remains constant			

Table 26: Parameters for relative code domain error with HS-DPCCH and E-DCH (Table 5.13.2B.2 of TS 34.121 [1]).

Nominal ECDP ratios				
Subtest in Table 10	**Code**	**Nominal Code Domain Power**	**Spreading factor**	**Nominal ECDP**
1	DPCCH	–18.5	256	–18.5
	DPDCH	–15.8	64	–21.8
	HS-DPCCH	–12.5	256	–12.5
	E-DPCCH	–16.5	256	–16.5
	E-DPDCH	–0.5	4	–18.6
2	DPCCH	–14.0	256	–14.0
	DPDCH	–6.0	64	–12.0
	HS-DPCCH	–8.0	256	–8.0
	E-DPCCH	–8.0	256	–8.0
	E-DPDCH	–4.1	4	–22.2
3	DPCCH	–14.6	256	–14.6
	DPDCH	–19.1	64	–25.1
	HS-DPCCH	–8.6	256	–8.6
	E-DPCCH	–8.6	256	–8.6
	E-DPDCH1	–4.7	4	–22.8
	E-DPDCH2	–4.7	4	–22.8
4	DPCCH	–19.7	256	–19.7
	DPDCH	–2.2	64	–8.2
	HS-DPCCH	–13.7	256	–13.7
	E-DPCCH	–19.7	256	–19.7
	E-DPDCH	–4.7	4	–22.8

Table 27: Nominal ECDP ratios (Table 5.13.2B.8 of TS 34.121 [1]).

Relative code domain error test requirements	
ECDP (dB)	**Relative code domain error (dB)**
–21 < ECDP	≤ –15.5
–30 ≤ ECDP ≤ –21	≤ –36.5 – ECDP
ECDP < –30	No requirement

Table 28: Relative code domain error test requirements (Table 5.13.2B.9 of TS 34.121 [1]).

Configure the fixed reference channels (FRC H-Set 1, QPSK version), RADIO BEARER SETUP message, Subtest 1, downlink physical channels, and serving cell on the R&S®CMW500 as specified in section 2.1.

Measure the relative code domain error with HS-DPCCH and E-DCH at a UE power level of 15 dBm ±2 dB, and repeat this measurement for –18 dBm ±2 dB.

Establish an HSUPA call. Set the UE power to 15 dBm ± 2 dB by referring to Figure 19.

Configure the R&S®CMW500 as follows:
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg.2 /1 dB
Signaling Parameter → TPC → Target Power → Total → 15.0 dBm

Verify the E-TFCI transmitted by the UE. It has to be confirmed to be equal to the target E-TFCI in Table 10. If the values for the Current E-TFCI and the Target E-TFCI differ, this indicates that the UE failed the test.
The measurement results for E-TFCI are available in the R&S®CMW500 under *HSUPA E-AGCH* as shown in Figure 20.

Configure the R&S®CMW500 as follows:
Goto → WCDMA Rx Meas. → UL Logging

Repeat the relative code domain error measurement at a UE power level of –18 dBm with a ±2 dB tolerance. You can configure these settings on the R&S®CMW500 by referring to Figure 19.

Configure the R&S®CMW500 as follows:
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg.2 /1 dB
Signaling Parameter → TPC → Target Power → Total → -18.0 dBm

Repeat the relative code domain error measurement with different combinations of β values for Subtests 2, 3 and 4 as specified in Table 10 at a UE power level of 15 dBm ±2 dB and –18 dBm with a ±2 dB tolerance.

To calculate the ECDP and the nominal CDP, the instrument must know the configured channels, their beta factors and the spreading factors (SF). Use the "Expected ECDP" section of the configuration dialog box to specify this information. If the combined signal path scenario is active, the required information is delivered by the signaling application and displayed as shown in Figure 25.

Rohde & Schwarz recommends using frame triggering for UE relative code domain power accuracy with HS-DPCCH and E-DCH.

Configure the R&S®CMW500 as follows:
Trigger → Trigger Source → Frame

Depending on the gain factor values, you might need to adjust the measurement threshold. The recommended value is –10 dB.

Configure the R&S®CMW500 as follows:
WCDMA Multi Evaluation → Measurement Control → Modulation / CDP → Chn. Detect Threshold → –10 dB

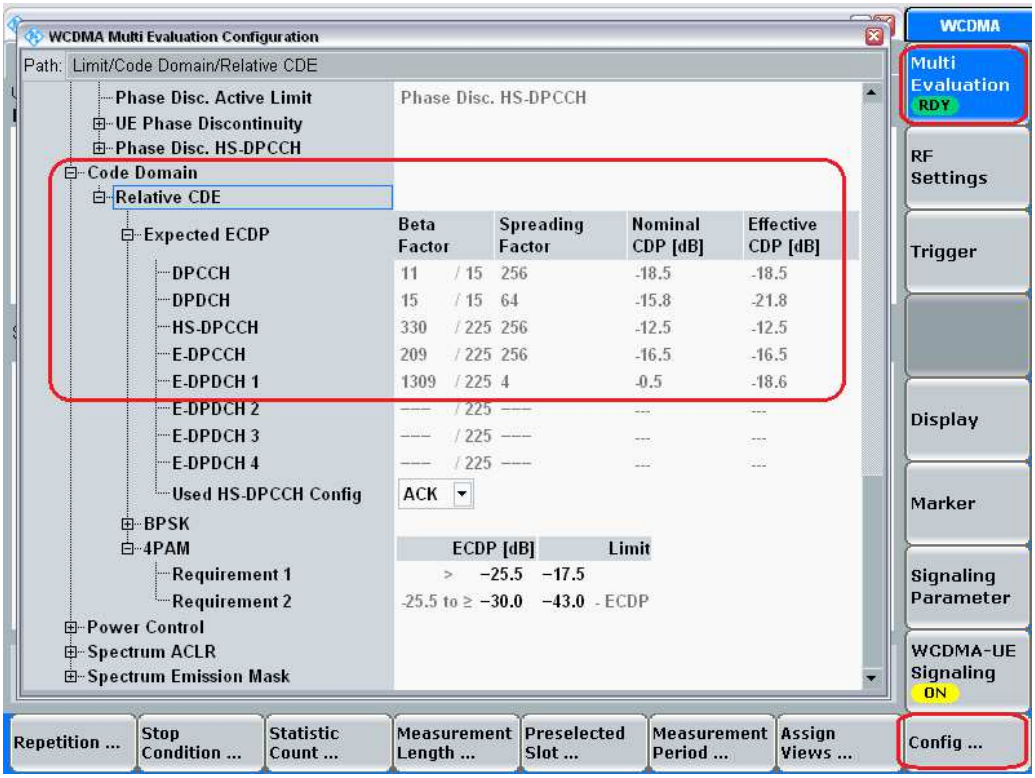


Figure 25: Expected ECDP displayed on the R&S®CMW500.

The measurement results for the relative code domain error with HS-DPCCH and E-DCH is available on the R&S®CMW500 under *Relative CDE*.

Configure the R&S®CMW500 as follows:
WCDMA Multi Evaluation → Display → Relative CDE

Figure 26 shows the relative code domain error with HS-DPCCH and E-DCH measurement results.

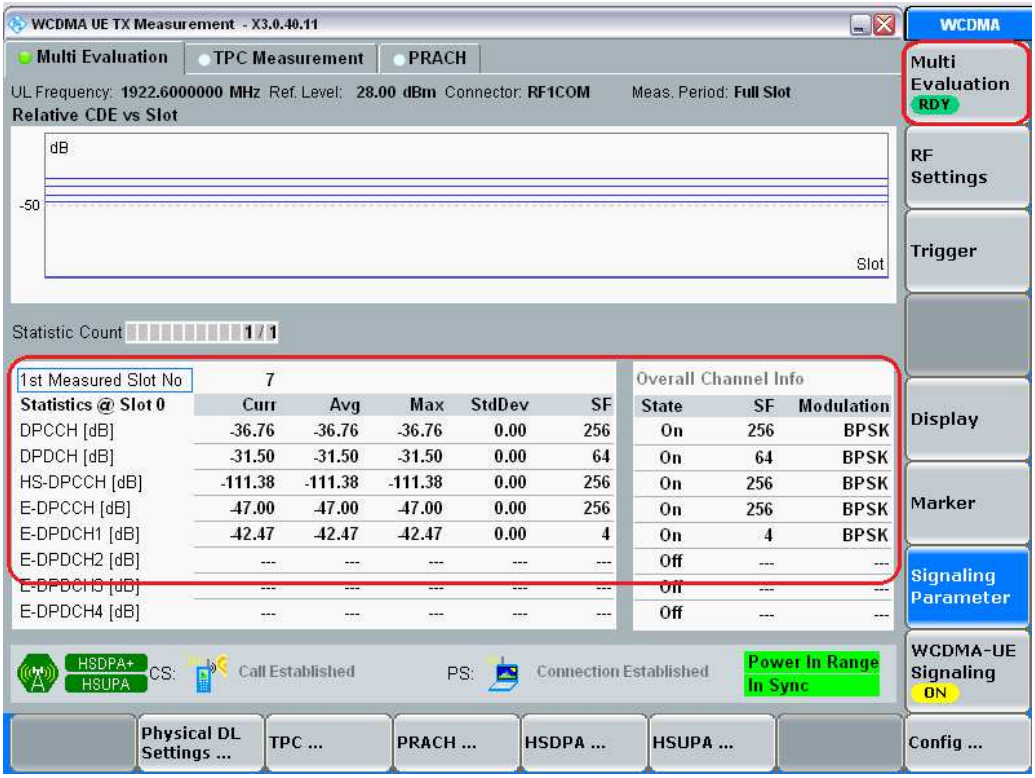


Figure 26: Measurement results for the relative code domain error with HS-DPCCH and E-DCH.

Press the "WIZARD" hardkey without the call established, and choose:

Application Wizard → HSUPA Maximum Output Power → Subtest Selection → Subtest1 → Finish
WCDMA-UE Signaling → Connect Test Mode
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg. 2 /1 dB
Signaling Parameter → TPC → Target Power → 15 dBm
WCDMA Multi Evaluation → Display → Relative CDE

For Subtests 2 through 4:
Disconnect the call, and repeat the above steps with Subtest Selection set accordingly.

Repeat the test again for Subtests 1 to 4 with the UE output power set to:
–18 dBm
Signaling Parameter → TPC → Target Power → –18 dBm

3 Rel-6 Performance Requirements

3.1 Generic Call Setup for Performance Requirements

All parameters for the performance requirements are defined using the UL reference measurement channel (RMC) 12.2 kbps and fixed reference channels (FRC H-Set 1, QPSK) as specified in TS 34.121, Annex C.11, unless stated otherwise. Loopback Test Mode 1, as specified in 5.3.2.3 and 5.3.2.6 of TS 34.109 [2], is used for looping back both the 12.2 kbps RMC and HSDPA to E-DCH. The E-DCH call is setup according to 7.3.9 of TS 34.108 [3]. Table 2 shows the UL RLC SDU size for the E-DCH performance requirements supported by the R&S®CMW500. Configure an HSUPA call on the R&S®CMW500 as shown in Figure 1 and 2.

The UE output power for all performance requirements must be greater than –10 dBm unless stated otherwise.

Configure the R&S®CMW500 as follows:
Signaling Parameter → TPC → Active TPC Setup → Closed Loop
Signaling Parameter → TPC → Alg. /Step Size → Alg.2 /1 dB
Signaling Parameter → TPC → Target Power → Total → 0.0 dBm

Configure the UL RLC SDU size on the R&S®CMW500 according to Table 2.

Configure the R&S®CMW500 as follows:
Config → Connection Configuration → Test Mode → HSPA → HSUPA UL RLC SDU Size → 2936 bits (for section 3.2, 3.3) or 5872 bits (for section 3.4, 3.5)

Use the RADIO BEARER SETUP message in 9.2.1 of TS 34.108 [3], as shown in Tables 29 and 30, to configure the E-DCH call.

Contents of the RADIO BEARER SETUP message: AM or UM (Test Loop Mode 1)			
Information element	**Condition**	**Value/remark**	**Version**
– Power offset information			
– CHOICE Gain Factors		Signaled gain factors	
– CHOICE mode		FDD	
– Gain factor βc		8	
– Gain factor βd		15	

Table 29: Contents of the RADIO BEARER SETUP message: AM or UM (Test Loop Mode 1; Subset of 9.2.1 of TS 34.108 [3]).

Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA)			
Information element	**Condition**	**Value/remark**	**Version**
– RLC PDU size		336 bits	
CHOICE channel requirement – Power Control Algorithm – TPC step size – Δ_{ACK} – Δ_{NACK} – Ack-Nack repetition factor		Uplink DPCH info Algorithm1 0 (1 dB) 3 3 1	Rel-5 and earlier Rel-6
E-DCH info – E-DPCCH info – Happy bit delay condition	A1, A2	 100 ms	
– E-DPDCH info – E-TFCI table index – E-DCH minimum set E-TFCI – Reference E-TFCIs – Reference E-TFCI – Reference E-TFCI PO – Maximum channelization codes – PLnon-max	A1	 0 9 1 E-TFCI 11 4 2sf4 0.84	
– E-DPDCH info – E-TFCI table index – E-DCH minimum set E-TFCI – Reference E-TFCIs – Reference E-TFCI – Reference E-TFCI PO – Reference E-TFCI – Reference E-TFCI PO – Maximum channelization codes – PLnon-max	A2	 0 9 2 E-TFCI 11 4 83 16 2sf2 and 2sf4 0.84	
Downlink HS-PDSCH Information – Measurement Feedback Info – CHOICE mode – CQI Feedback cycle, k – CQI repetition factor – Δ_{CQI}		 FDD 2 ms 1 5 (corresponds to 0 dB in relative power offset)	
– Scheduled Transmission configuration – 2 ms scheduled transmission grant HARQ process allocation – Serving Grant	A1, A2	 Not present Not present	

Notes:
Condition A1: not using E-DCH 4 codes
Condition A2: using E-DCH 4 codes

Table 30: Contents of the RADIO BEARER SETUP message: AM or UM (E-DCH and HSDPA) (Subset of 9.2.1 of TS 34.108 [3])

Configure the R&S®CMW500 as follows:
Config → HSDPA → CQI Feedback Cycle → 2 ms
Config → HSDPA → CQI Repetition Factor → 1
Config → HSDPA → ACK/NACK Repetition Factor → 1
Config → HSDPA → Channel Configuration Type → Fixed Reference Channel
Config → HSDPA HS-DSCH → Channel Configuration → Fixed Reference Channel →
Config → HSDPA HS-DSCH → Channel Configuration → Fixed Reference → H-Set →
H-Set 1 QPSK
Config → HSUPA → RLC PDU Size → 336
Config → HSUPA → E-TFCI Table Index → 0
Config → HSUPA → Minimum Set E-TFCI → 9
Config → HSUPA → Happy Bit Delay Condition → 100 ms
Config → HSUPA → Puncturing Limit PLnon-max → 0.84
Config → HSUPA → Maximum Channelization Code → 2xSF4 (for E-DCH Category 1 to 5) or 2xSF2 and 2xSF4 (for E-DCH Category 6)
Config → HSUPA → Initial Serving Grant → Value → Off
Config → Physical Uplink Settings → Gain Factors → HSUPA → Number of Reference E-TFCIs → 1 (for E-DCH Category 1 to 5) or 2 (for E-DCH Category 6)
Config → Physical Uplink Settings → Gain Factors → HSUPA → Reference E-TFCI 1…4 → 11 (for E-DCH Category 1 to 5) or 11 83 (for E-DCH Category 6)
Config → Physical Uplink Settings → Gain Factors → HSUPA → Reference E-TFCI Power Offset → 4 (for E-DCH Category 1 to 5) or 4 16 (for E-DCH Category 6)
Config → Physical Uplink Settings → Gain Factors → HSDPA → βc → 8
Config → Physical Uplink Settings → Gain Factors → HSDPA → βd → 15
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔACK → 3
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔNACK → 3
Config → Physical Uplink Settings → Gain Factors → HSDPA → ΔCQI → 5

You can configure the R&S®CMW500 for these settings by referring to section 2.1 in Figures 3 to 6.

Table 31 shows the downlink physical channels for the E-DCH single-link performance tests for subclauses 10.2.1, 10.3.1, 10.4.1 and 10.4.1A as specified in Table E.5A.2 of TS 34.121 [1].

Downlink physical channel parameters for E-DCH single-link performance tests		
Parameter during measurement	**Unit**	**Value**
P-CPICH_Ec/Ior	dB	–10
P-CCPCH and SCH_Ec/Ior	dB	–12
PICH_Ec/Ior	dB	–15
HS-PDSCH	dB	–3 (Note 1)
HS-SCCH_1	dB	–7.5 (Note 2)
DPCH_Ec/Ior	dB	–10
E-AGCH	dB	Test specific (Note 3)
E-HICH	dB	Test specific (Note 4)
E-RGCH	dB	Test specific (Note 4)

OCNS_Ec/Ior	dB	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one

Notes:
1. During TTIs in which the HS-PDSCH is not allocated to the UE via HS-SCCH signaling, the HS-PDSCH shall be transmitted continuously with constant power.
2. During TTIs in which the HS-SCCH is not allocated to the UE, the HS-SCCH shall be transmitted continuously with constant power.
3. Test-specific value or –20 dB is used
4. Test-specific value or DTX'd is used.

Table 31: Downlink physical channel parameters for the E-DCH single-link performance tests (Table E.5A.2 of TS 34.121 [1]).

Configure the R&S®CMW500 as follows:
Config → Physical Downlink Settings → P-CPICH → –10.0 dB
Config → Physical Downlink Settings → P-SCH → –15.0 dB
Config → Physical Downlink Settings → S-SCH → –15.0 dB
Config → Physical Downlink Settings → P-CCPCH → –12.0 dB
Config → Physical Downlink Settings → PICH → –15.0 dB
Config → Physical Downlink Settings → DPCH → –10.0 dB
Config → Physical Downlink Settings → HS-SCCH#1 → Level → –7.5 dB
Config → Physical Downlink Settings → HS-SCCH#2 → Level → Off
Config → Physical Downlink Settings → HS-SCCH#3 → Level → Off
Config → Physical Downlink Settings → HS-SCCH#4 → Level → Off
Config → Physical Downlink Settings → HS-SCCH Enhanced → Selection → 1
Config → Physical Downlink Settings → HS-SCCH Enhanced → Number of HS-SCCH → 4
Config → Physical Downlink Settings → HS-SCCH Enhanced → Unscheduled Subframes → Transmit Dummy UEID
Config → Physical Downlink Settings → HS-PDSCH → –3.0 dB
Config → Physical Downlink Settings → E-AGCH → –20.0 dB
Config → Physical Downlink Settings → E-HICH → Test-specific value
Config → Physical Downlink Settings → E-RGCH → OFF (ON for E-RGCH test-specific value)

You can configure the R&S®CMW500 for these settings by referring to Figures 3 to 6. Set the value for the absolute grant scope to 0 ("All HARQ Processes").

Configure the R&S®CMW500 as follows:
Config → HSUPA → E-AGCH → AG Pattern → AG Scope (per HARQ proc.) → (unchecked)

All performance requirements mentioned in this application note require fading channel simulation to generate a VA30 multipath fading signal. An R&S®CMW500 with the necessary hardware and software installed can induce multipath fading in accordance with the profiles as described in TS 34.121 [1]. This application note explains such a setup using a standalone R&S®CMW500 with a built-in fading simulator.

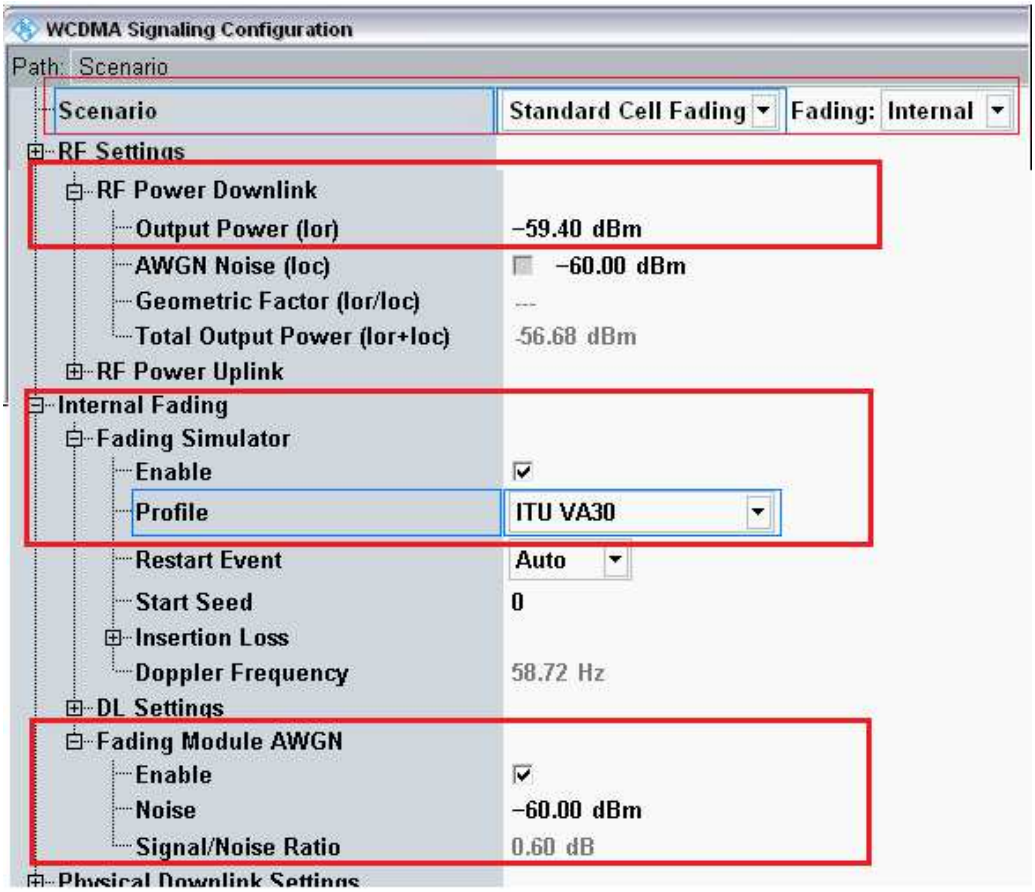


Figure 27: Internal fading simulator on the R&S®CMW500.

Set the Output Power (Ior) according to the test requirements as mentioned under the specific test case. Enable the AWGN under Fading Module AWGN, and set the noise power so as to maintain the Ior/Ioc ratio required for the test case at hand. The noise power enabled under "Internal Fading" ensures that the AWGN is added after the fading as required by 3GPP TS 34.121[1], Figure A.10.

Configure the R&S®CMW500 as follows:
Config → Scenario → Standard Cell Fading → Internal
Config → Internal Fading → Fading Simulator → Enable → ON (check mark)
Config → Internal Fading → Fading Simulator → ITU VA30
Config → RF Settings → Fading Module AWGN → Enable → ON (check mark)
Config → RF Settings → Fading Module AWGN → Noise → –60 dBm
Config → RF Settings → Fading Module AWGN → Signal/Noise Ratio → 0.6 dB (satisfies the condition Ior/Ioc = 0.6 dB)

Set up an HSUPA call according to TS 34.108 [3], subclause 7.3.9. To establish an HSUPA connection, press "Connect Test Mode" (E-DCH category 1 to 5) or "Connect

HSPA" (E-DCH category 6) on the R&S®CMW500 once the UE has registered with/ attached to the R&S®CMW500.

3.2 Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single-Link Performance for 10 ms TTI (10.2.1.1)

The receive characteristics of the E-DCH HARQ ACK Indicator Channel (E-HICH) in different multipath fading environments are determined by the Missed ACK and False ACK values. This test will verify the average probability for Missed ACK and False ACK, when E-HICH is transmitted using 12 consecutive slots. The test applies to all FDD UE for Release 6 and to later releases that support HSDPA and E-DCH.

Upon the UE transmission on E-DPCCH and E-DPDCH, the system simulator (SS, i.e. the R&S®CMW500) reacts with E-HICH = ACK or DTX. The UE transmits new data or retransmissions on the corresponding E-DPCCH and E-DPDCH. New data is a sign for ACK, received by the UE, while retransmission is a sign for NACK or DTX, received by the UE. The latter is interpreted as NACK by higher layers and causes retransmission.

Configure the fixed reference channels (FRC H-Set 1, QPSK version) and the RADIO BEARER SETUP message as specified in section 3.1 on the R&S®CMW500 adding the settings defined in the in Table 32, RADIO BEARER SETUP message.
Configure the internal fading simulator with the VA30 fading signal.

RADIO BEARER SETUP: Specific message content	
Information Element	**Value/remark**
RLC PDU size – E-DCH Transmission Time	112 10 ms
E-DCH MAC-d flow maximum number of retransmissions	15 (max.)
E-DCH info – Happy bit delay condition	 10 ms (indication of exhausted resources on frame basis)

Table 32: RADIO BEARER SETUP: Specific message content (section 10.2.1.1.4.2 and section 10.2.1.1A.4.2 of TS 34.121 [1]).

Configure the R&S®CMW500 as follows:
Config → HSUPA → TTI Mode → 10 ms
Config → HSUPA → RLC PDU Size → 112
Config → HSUPA → Happy Bit Delay Condition → 10 ms
Config → HSUPA → RAB H-ARQ Profile → Max. Number of Retransmission → 15

These settings can be configured in the R&S®CMW500 by referring to Figures 3 to 6 in section 2.1.

The tables 33 and 34 show the test parameters for E-HICH-Missed ACK when the hybrid ARQ acknowledgment indicator is transmitted using 12 consecutive slots.
In addition, tables 33 and 35 show the test parameters E-HICH-False ACK when hybrid ARQ acknowledgement indicator is transmitted using 12 consecutive slots – single link respectively.

Test parameters for E-HICH – Serving E-DCH cell			
Parameter	**Unit**	**Missed ACK**	**False ACK**
Ioc	dBm/3.84 MHz	–60	
Phase reference	-	P-CPICH	
E-HICH Ec/Ior	dB	–35 (Test 1)	–∞ (Test 2)
E-HICH signaling pattern	-	100 % ACK	100 % DTX

Table 33: Test parameters for E-HICH – Serving E-DCH cell (Table 10.2.1.1.5.1 of TS 34.121 [1]).

Test requirements for Missed ACK when the hybrid ARQ acknowledgment indicator is transmitted using 12 consecutive slots – Serving E-DCH cell				
Test Number	**Propagation Conditions**	**Reference Value**		
		E-HICH Ec/Ior (dB)	**Ior/Ioc (dB)**	**Missed ACK probability**
1	VA30	–35.0	0.6	0.01

Table 34: Test requirements for Missed ACK when the hybrid ARQ acknowledgement indicator is transmitted using 12 consecutive slots – Serving E-DCH cell (Table 10.2.1.1.5.2 of TS 34.121 [1]).

Test requirements for False ACK when the hybrid ARQ acknowledgement indicator is transmitted using 12 consecutive slots – Single link			
Test Number	**Propagation Conditions**	**Reference Value**	
		Ior/Ioc (dB)	**False ACK probability**
2	VA30	0.6	0.5

Table 35: Test requirements for False ACK when the hybrid ARQ acknowledgment indicator is transmitted using 12 consecutive slots – Single link (Table 10.2.1.1.5.3 of TS 34.121 [1]).

Configure the downlink physical channels in section 3.1, Tables 33, 34 and 35 in the R&S®CMW500. Set the absolute grant to 5. The relative grant is not configured. The expected UL data rate is 71.6 kbps, which corresponds to E-TFC Index 45.

Configure the R&S®CMW500 as follows:
Signaling Parameter → Physical Downlink Settings → Output Power (Ior) → –59.4 dBm
Signaling Parameter → Physical Downlink Settings → E-HICH → –35.0 dB
Signaling Parameter → Physical Downlink Settings → E-RGCH → Off (unchecked)
Signaling Parameter → HSUPA → E-AGCH → AG Pattern → AG Index → 5

You can configure the R&S®CMW500 for these settings by referring to Figures 8 and 9.

Establish an HSUPA call. Then switch on the internal fading simulator as shown in Figure 27, and set the fading profile to ITU VA30.

Missed ACK test:
For Missed ACK, the SS is configured to respond with 100 % ACK, than the UE can reacts in 2 possible ways:

- If the UE indicates on the E-DPCCH a retransmission, the UE received the ACK from the SS as NACK or DTX and this is counted as a missed ACK.

- If the UE indicates new data on the E-DPCCH, the UE received the ACK from the SS as an ACK, and this is counted as a correct ACK.

The number of retransmissions reaches the maximum number of retransmissions, because several false or missed ACK detections have occurred in series, the first new data on the E-DPDCH with E-DPCCH is not caused by the ACK, and this case is not counted as sample.

Configure the R&S®CMW500 as follows:
Signaling Parameter → HSUPA → E-HICH/E-RGCH → HARQ Feedback (E-HICH) → Mode → All ACK

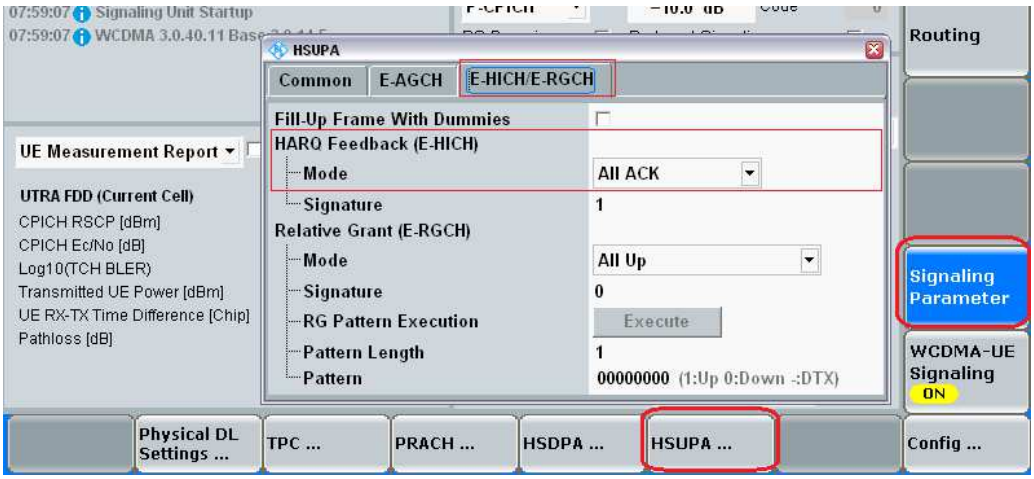


Figure 28: E-HICH configuration.

Continue the test until statistical significance is achieved as specified in Table F.6.4 of TS 34.121 [1].

False ACK test:
For False ACK, the SS is configured to respond with 100 % DTX, than the UE can reacts in 2 possible ways:

- If the UE indicates “new data” on the E-DPCCH, the UE has recognized the DTX from the SS as an ACK, and this is counted as a false ACK.

- If the UE indicates “retransmission” on the E-DPCCH, the UE correctly recognized the DTX from the SS as DTX or NACK, and this is counted as correct reception.

The number of retransmissions will reach the maximum number of retransmissions due to several retransmissions in series. The first new data on the E-DPDCH with E-DPCCH is not the consequence of an ACK being received by the UE, and this case is not counted as a sample.

Configure the R&S®CMW500 as follows:
Signaling Parameter → HSUPA → E-HICH/E-RGCH → HARQ Feedback (E-HICH) → Mode → All DTX

The R&S®CMW500 can be configured for this setting by referring to Figure 28.

Continue the test until statistical significance is achieved as specified in Table F.6.4 of TS 34.121 [1].

The measurement results for detection of the E-DCH HARQ indicator channel (E-HICH) are available on the R&S®CMW500 under *HSUPA E-HICH*.

Configure the R&S®CMW500 as follows:
WCDMA Rx Meas. → E-HICH → HSUPA E-HICH → ON

Figure 29 shows measurement results for detection of the E-DCH HARQ indicator channel (E-HICH).

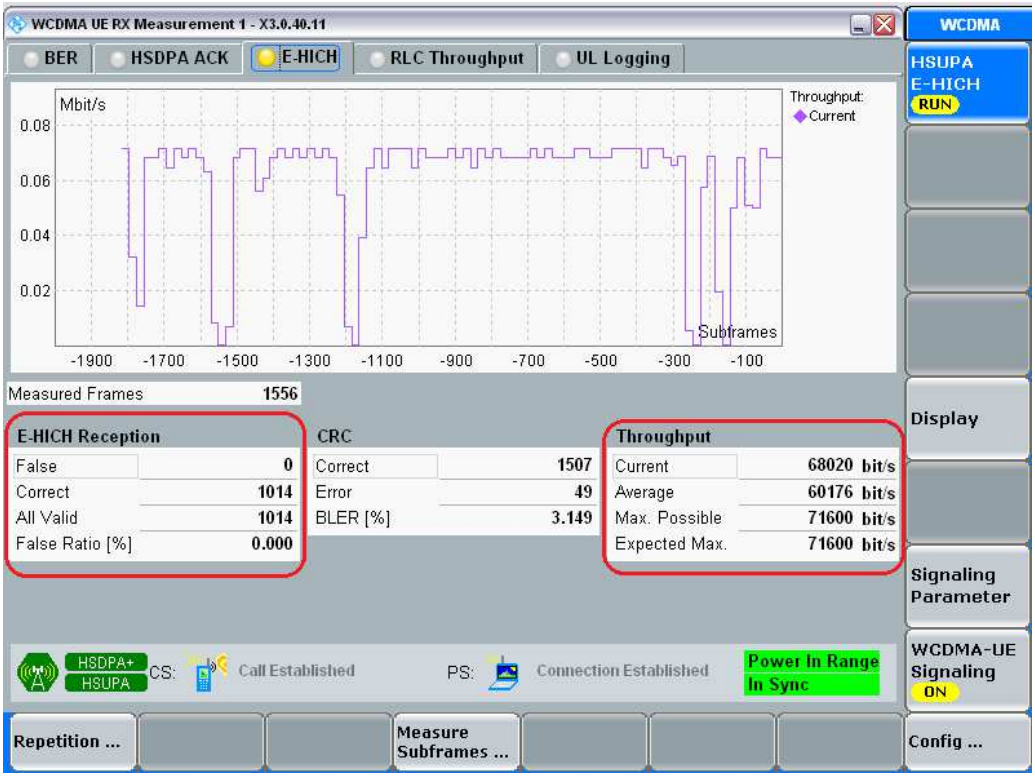


Figure 29: Measurement results for detection of the E-DCH HARQ indicator channel (E-HICH).

The False ratio for E-HICH reception must not exceed the limits as specified in Tables 34 and 35 for both cases, namely Missed ACK and False ACK respectively.

3.3 Detection of E-DCH HARQ ACK Indicator Channel (E-HICH): Single Link Performance for 2 ms TTI (10.2.1.2)

The receive characteristics of the E-DCH HARQ ACK Indicator Channel (E-HICH) in different multipath fading environments are determined by the Missed ACK and False ACK values. This test will verify the average probability for Missed ACK and False ACK, when E-HICH is transmitted using 3 consecutive slots. The test applies to all FDD UE for Release 6 and later releases that support HSDPA and E-DCH with 2 ms TTI.

Upon the UE transmission on E-DPCCH and E-DPDCH, the system simulator (SS, i.e. the Node-B simulator) reacts with E-HICH = ACK or DTX. The UE transmits new data or retransmissions on the corresponding E-DPCCH and E-DPDCH. New data is a sign for ACK, received by the UE, while retransmission is a sign for NACK or DTX, received by the UE. The latter is interpreted as NACK by higher layers, and it causes retransmission.

Configure the fixed reference channels (FRC H-Set 1, QPSK version), and the RADIO BEARER SETUP message as specified in section 3.1 on the R&S®CMW500 adding the settings defined in the in Table 36 (RADIO BEARER SETUP message). The internal fading simulator is configured with the VA30 fading signal.

RADIO BEARER SETUP: Specific message content	
Information Element	**Value/remark**
RLC PDU size – E-DCH Transmission Time	112 2 ms
E-DCH MAC-d flow maximum number of retransmissions	15 (max)
E-DCH info – Happy bit delay condition	 2 ms (indication of exhausted resources on frame basis)

Table 36: RADIO BEARER SETUP: Specific message content (Section 10.2.1.2.4.2 and section 10.2.1.2A.4.2 of TS 34.121 [1])

Configure the R&S®CMW500 as follows:
Config → Connection Configuration → Test Mode → HSUPA → HSUPA UL RLC SDU Size → 5872 bits
Config → HSUPA → TTI Mode → 2–ms
Config → HSUPA → RLC PDU Size → 112
Config → HSUPA → Happy Bit Delay Condition → 2–ms
Config → HSUPA → RAB H-ARQ Profile → Max. Number of Retransmission → 15

You can configure the R&S®CMW500 for these settings by referring to Figures 3 to 6.

The tables 38 and 39 show the test parameters for E-HICH-Missed ACK when the hybrid ARQ acknowledgment indicator is transmitted using 3 consecutive slots.
In addition, tables 38 and 40 show the test parameters for E-HICH-False ACK when hybrid ARQ acknowledgement indicator is transmitted using 3 consecutive slots – single link respectively.

Test parameters for E-HICH – Serving E-DCH cell			
Parameter	**Unit**	**Missed ACK**	**False ACK**
Ioc	dBm/3.84 MHz	–60	
Phase reference	-	P-CPICH	
E-HICH Ec/Ior	dB	–28.2 (test 1)	–∞ (test 2)
E-HICH signaling pattern	-	100 % ACK	100 % DTX

Table 37: Test parameters for E-HICH – Serving E-DCH cell (Table 10.2.1.2.5.1 of TS 34.121 [1]).

Test requirements for Missed ACK when the hybrid ARQ acknowledgment indicator is transmitted using 3 consecutive slots – Serving E-DCH cell				
Test Number	**Propagation Conditions**	**Reference Value**		
		E-HICH Ec/Ior (dB)	**Ior/Ioc (dB)**	**Missed ACK probability**
1	VA30	–28.2	0.6	0.01

Table 38: Test requirement for Missed ACK when the hybrid ARQ acknowledgment indicator is transmitted using 3 consecutive slots – Serving E-DCH cell (Table 10.2.1.2.5.2 of TS 34.121 [1]).

Test requirements for False ACK when the hybrid ARQ acknowledgment indicator is transmitted using 3 consecutive slots – Serving E-DCH cell			
Test Number	**Propagation Conditions**	**Reference Value**	
		Ior/Ioc (dB)	**False ACK probability**
2	VA30	0.6	0.5

Table 39: Test requirement for False ACK when the hybrid ARQ acknowledgment indicator is transmitted using 3 consecutive slots – Serving E-DCH cell (Table 10.2.1.2.5.3 of TS 34.121 [1]).

Configure the R&S®CMW500 for the downlink physical channels as described in section 3.1, Tables 37, 38 and 39. Set the absolute grant to 4. Do not set the relative grant. The expected UL data rate is 237 kbps, which corresponds to E-TFC Index 39.

Configure the R&S®CMW500 as follows:
Signaling Parameter → Physical Downlink Settings → Output Power (Ior) → –59.4 dBm
Signaling Parameter → Physical Downlink Settings → E-HICH → E-HICH → –28.2 dB
Signaling Parameter → Physical Downlink Settings → E-RGCH → Off
Signaling Parameter → HSUPA → E-AGCH → AG Pattern → AG Index → 4

Configure these settings on the R&S®CMW500 by referring to Figures 8 and 9.

Establish an HSUPA call. Switch on the internal fading simulator as shown in Figure 27, and set the fading profile to ITU VA30.

Missed ACK test:
For Missed ACK, the SS is configured to respond with 100 % ACK, than the UE can reacts in 2 possible ways:

- If the UE indicates on the E-DPCCH a retransmission, the UE received the ACK from the SS as NACK or DTX and this is counted as a missed ACK.

- If the UE indicates new data on the E-DPCCH, the UE received the ACK from the SS as an ACK, and this is counted as a correct ACK.

The number of retransmissions reaches the maximum number of retransmissions, because several false or missed ACK detections have occurred in series, the first new data on the E-DPDCH with E-DPCCH is not caused by the ACK, and this case is not counted as sample.

Configure the R&S®CMW500 as follows:
Signaling Parameter → HSUPA → E-HICH/E-RGCH → HARQ Feedback (E-HICH) → Mode → All DTX

You can configure this setting on the R&S®CMW500 by referring to Figure 28.

Continue the test until statistical significance is achieved as specified in Table F.6.4 of TS 34.121 [1].

False ACK test:
For False ACK, the SS is configured to respond with 100 % DTX, than the UE can reacts in 2 possible ways:

- If the UE indicates “new data” on the E-DPCCH, the UE has recognized the DTX from the SS as an ACK, and this is counted as a false ACK.

- If the UE indicates “retransmission” on the E-DPCCH, the UE correctly recognized the DTX from the SS as DTX or NACK, and this is counted as correct reception.

The number of retransmissions will reach the maximum number of retransmissions due to several retransmissions in series. The first new data on the E-DPDCH with E-DPCCH is not the consequence of an ACK being received by the UE, and this case is not counted as a sample.

Configure the R&S®CMW500 as follows:
Signaling Parameter → HSUPA → E-HICH/E-RGCH → HARQ Feedback (E-HICH) → Mode → All DTX

You can configure this setting on the R&S®CMW500 by referring to Figure 28.

Continue the test until statistical significance is achieved as specified in Table F.6.4 of TS 34.121 [1].

The measurement results for detection of the E-DCH HARQ indicator channel (E-HICH) are available on the R&S®CMW500 under *HSUPA E-HICH*.

Configure the R&S®CMW500 as follows:

WCDMA Rx Meas. → E-HICH → HSUPA E-HICH → ON

Figure 30 shows the detection of the E-DCH HARQ indicator channel (E-HICH) measurement results.

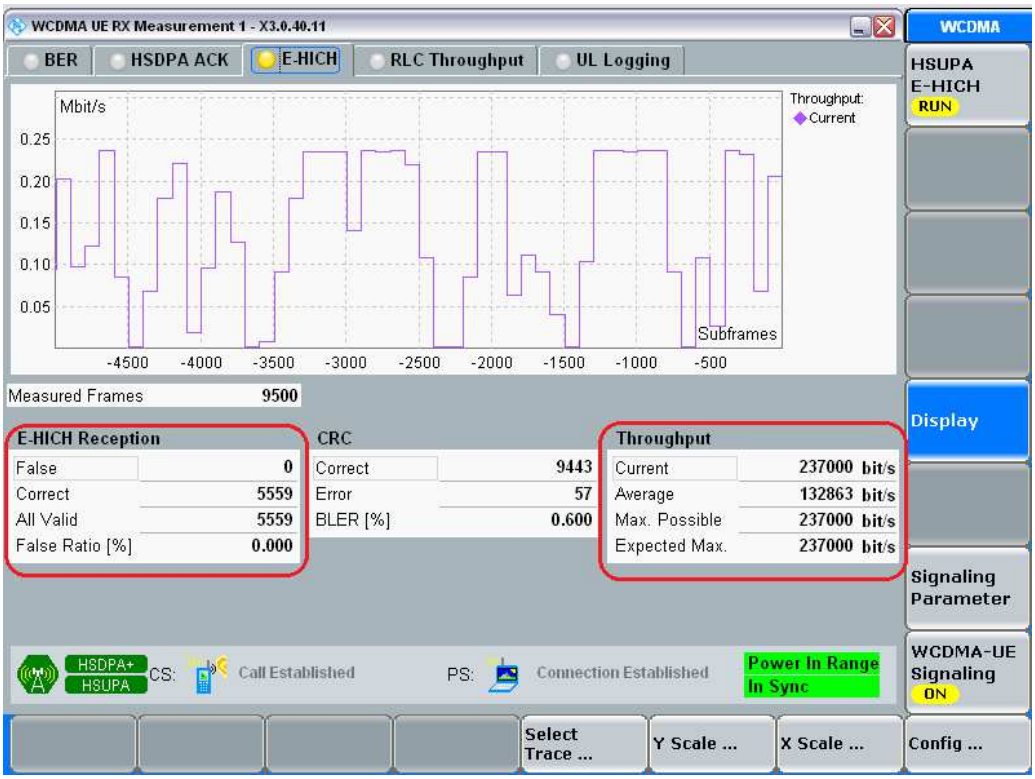


Figure 30: Measurement results for detection of E-HICH (2 ms case).

The False ratio for E-HICH reception must not exceed the limits as specified in Tables 38 and 39 for both cases, namely Missed ACK and False ACK respectively.

4 References

[1] Technical Specification Group Radio Access Network; User Equipment (UE) Conformance Specification; 3GPP TS 34.121-1 V9.5.0

[2] Technical Specification Group Radio Access Network; Common test environments for User Equipment (UE); 3GPP TS 34.108 V9.3.0

[3] Technical Specification Group Radio Access Network; Physical layer procedures (FDD); 3GPP TS 25.214 V9.5.0, May 2009

[4] Technical Specification Group Radio Access Network; User Equipment (UE) radio transmission and reception (FDD); 3GPP TS 25.101 V9.5.0

[5] Rohde & Schwarz; Reiner Stuhlfauth; High Speed Downlink Packet Access, HSDPA – RF measurements with CMW500 radio communication tester

[6] 1CM72 – Operation guide for HSDPA Test Setup according to 3GPP TS 34.121

5 Ordering Information

Ordering information		
Type	**Description**	**Order no.**
R&S®CMW500	Wideband Radio Communication Tester	1201.0002K50
R&S®CMW-PS502	CMW500 Basic Assembly (mainframe), including one RF Converter Module and one Baseband Measurement Unit	1202.5408.02
R&S®CMW-S550B	Baseband Interconnection Flexible Link	1202.4801.03
R&S®CMW-S590D	RF Frontend, advanced functionality, not installable post factory, CMW module H590A (selection)	1202.5108.03
R&S®CMW-S600B	CMW500 Front Panel with Display/Keypad	1201.0102.03
R&S®CMW-B300A	Signaling Unit Wideband (SUW), for WCDMA / LTE, CMW module H300A (hardware option)	1202.6304.02
R&S®CMW-B510F	Four Digital IQ Interfaces, connectors 1 to 4	1202.8007.07
R&S®CMW-KM400	WCDMA Release 99, TX measurement, uplink (software license)	1203.0700.02
R&S®CMW-KM401	WCDMA Release 5/6 HSPA , TX measurement, uplink (software license)	1203.2954.02
R&S®CMW-KM403	WCDMA Release 7 HSPA+, TX measurement, uplink (software license)	1203.9007.02
R&S®CMW-KS400	WCDMA Release 99, signaling/network emulation, basic functionality (software license)	1203.0751.02
R&S®CMW-KS410	WCDMA Release 99, signaling/network emulation, advanced functionality (software license)	1203.9807.02
R&S®CMW-KS401	WCDMA Release 5/6 HSPA, signaling/network emulation, basic functionality (software license)	1203.9907.02
R&S®CMW-KS411	WCDMA Release 5/6 HSPA, signaling/network emulation, advanced functionality (software license)	1207.3503.02
R&S®CMW-KS403	WCDMA Release 7 HSPA+, SISO, signaling/network emulation, basic functionality (software license)	1203.9959.02
R&S®CMW-KS404	WCDMA Release 8, signaling/network emulation, basic functionality (software license)	1207.6154.02
R&S®CMW-KE100	Fading enabler incl. AWGN generator(software license)	1207.5506.02
R&S®CMW-KE400	3GPP Fading profiles for 3G	1207.5606.02

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