



Report No: SYBH(R)91032007EB-1
FCC ID: QISE870

**FCC TEST REPORT OF
HUAWEI E870 HSPA EXPRESS
PCI Modem
M/N: E870**

Nov.12, 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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REPORT ON **FCC Test of HUAWEI E870 HSPA EXPRESS PCI MODEM**

M/N: E870

Report No: SYBH(R)91032007EB-1

REGULATION **FCC CFR47 Part 2: Subpart J;**

FCC CFR47 Part 22: Subpart H;

CONCLUSION There are 3 items need to be tested, 3 items have been tested. The sample of the model completely meets the requirements

Final Judgement: Pass

General Manager

2007.11.12

Date

张兴海

Name

signature



**Technical Responsibility
For Area of Testing**

2007.11.11

Date

余 辉

Name

signature

A handwritten signature in black ink, appearing to be "余辉".

Test Lab Engineer

2007.11.09

Date

胡 俊

Name

signature

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1 Summary

The table below summarizes the measurements and results for the HUAWEI E870 HSPA EXPRESS PCI MODEM. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	22.913	Effective Radiated Power of Transmitter	PASS
2.1046	22.913	Conducted Power of Transmitter	PASS
2.1051	22.917	Band Edges compliance	PASS

2 Product Description

2.1 Production Information

2.1.1 General Description

HUAWEI E870 HSPA EXPRESS PCI Modem is subscriber equipment in the GSM system. The frequency band is 850M. The E870 implements such functions as RF signal receiving / Transmitting, HSPA/UMTS/EDGE/GPRS/GSM protocol processing and data service etc. Externally it provides EXPRESS PCI interface (to connect to the notebook etc.), USIM card interface and antenna interface. It has an internal antenna and an external antenna as default. E870 uses Qualcomm MSM7200 chipset and Zero-IF technologies.

2.1.2 Support function and Service

The HUAWEI E870 HSPA EXPRESS PCI MODEM support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: QPSK	TM2/TM1	HSUPA/WCDMA

2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable				

3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.
P.O. Box 518129
Huawei base, bantian,
Longgang District, Shenzhen, China***

The test site description has been submitted to  and registration granted under the registration number **97456** on April 20. 2006. The test site has been accredited by



and the accredited number is **2174.01** in Jan of 2006.

3.1 Testing Period

The test have been performed during the period of

Sept. 10, 2007 –Sept. 28, 2007

3.2 General Set up Description

HUAWEI E870 HSPA EXPRESS PCI MODEM can support GPRS/EDGE mode and 850M Band. During this measurement, the HUAWEI E870 HSPA EXPRESS PCI MODEM just works in WCDMA mode and 850M Band.

TM1: WCDMA test mode

TM2: HSUPA test mode

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	824 to 849 MHz
Downlink band:	869 to 894 MHz

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

	WCDMA/HSUPA
Channel spacing	200k Hz
Channel separation:	5M Hz

4.1.3 Type of Emission

Table 6 Type of Emission

	WCDMA/HSUPA
Emission Designation:	5M0F9W

According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%RH

4.1.5 Power Source

Table 8 Power Source

DC voltage nominal:	 +3.3V; Supplied by EXPRESS PCI port of notebook
DC voltage range	 +3.0-3.6V
DC current maximal:	750mA

4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF Module DC Voltages and Currents

Voltage:	 +2.85V
Current:	150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

4.2 EUT Identification List

4.2.1 Board Information

Table 10 Board Information

850MHz HUAWEI E870 HSPA EXPRESS PCI MODEM		
E870		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
-MAINBOARD	EH1AC10782900011	TCPU VER.B

4.2.2 Adapter Technical Data

No Applicable.

4.2.3 Battery Technical Data

No Applicable.

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: E870
FCC Identification: QISE870

5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Signal Analyzer	R&S	FSQ 26	100266	07.18.2008
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	04.22.2008
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	04.22.2008
Receiver	R&S	ESIB 26	100318	05.29.2008
Receiver	R&S	ESCS30	830245/018	05.29.2008
Pre-Amplifier	Agilent	8447D	2944A10146	07.30.2008
Pre-Amplifier	Agilent	83017A	3950M00246	08.03.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	02.15.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	06.07.2008
BiLog Antenna	Schaffner	CBL 6112B	2536	05.19.2008
Horn Antenna	ETS-Lindgren	3117	006006	05.19.2008
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	05.19.2008
Signal Generator	R&S	SMT06	830264/009	09.28.2008
Signal Generator	R&S	SMR 40	100325	07.15.2008
Power Supply	Keithley	2306	1045337	08.28.2008
Climate Chamber	WEISS	ACS-1	105025	07.20.2008
Universal Radio Communication Tester	R&S	CMU200	108035	07.19.2008
Wireless communication test set	Agilent	8960	GB43461081	08.23.2008

6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (ERP)

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25℃
Relative humidity:	55%
Test Configurations:	TM1/TM2 at frequency Bottom、Middle、Top

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V6.1.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.1.2.3 Limits

Compliance with part 22.913, mobile/portable stations are limited to 7 watts ERP peak power.
 $W \text{ (dBm)} = 10 \cdot \log(W_{\text{in mWs}})$.

Table 14 Limits

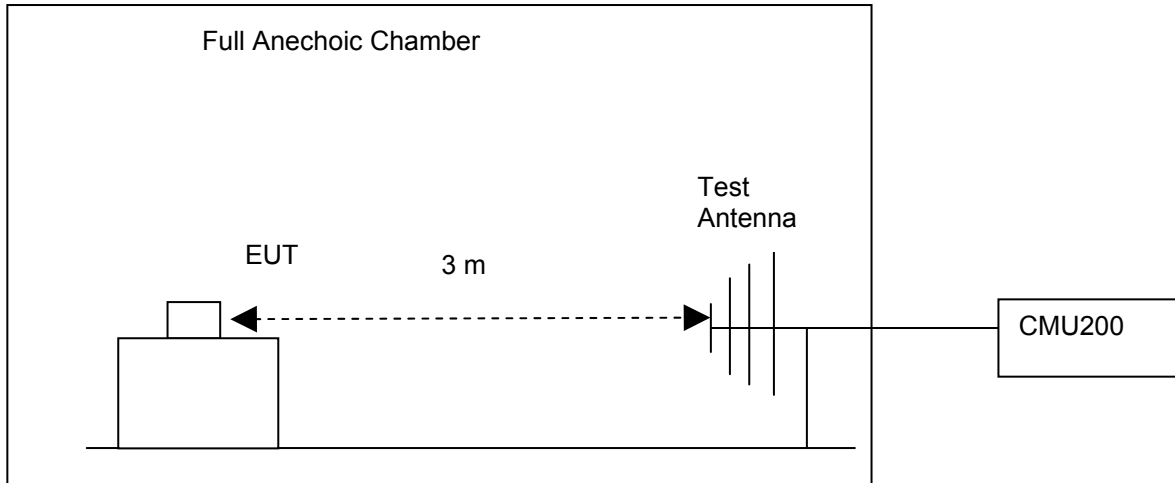
Maximum Output Power (Watts)	< 7 Watts
Maximum Output Power (dBm)	< 38.5 dBm

6.1.3 Test Method and Setup

- For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI E870 HSPA EXPRESS PCI MODEM to the wireless communication tester CMU200 via the air interface. The band is set as 850M.
- Test the Radiated maximum output power by the CMU200 received from test antenna.
- Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on Agilent 8960, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

Test setup

Step 1: Pre-test



Step 2: Substitution method to verify the maximum ERP

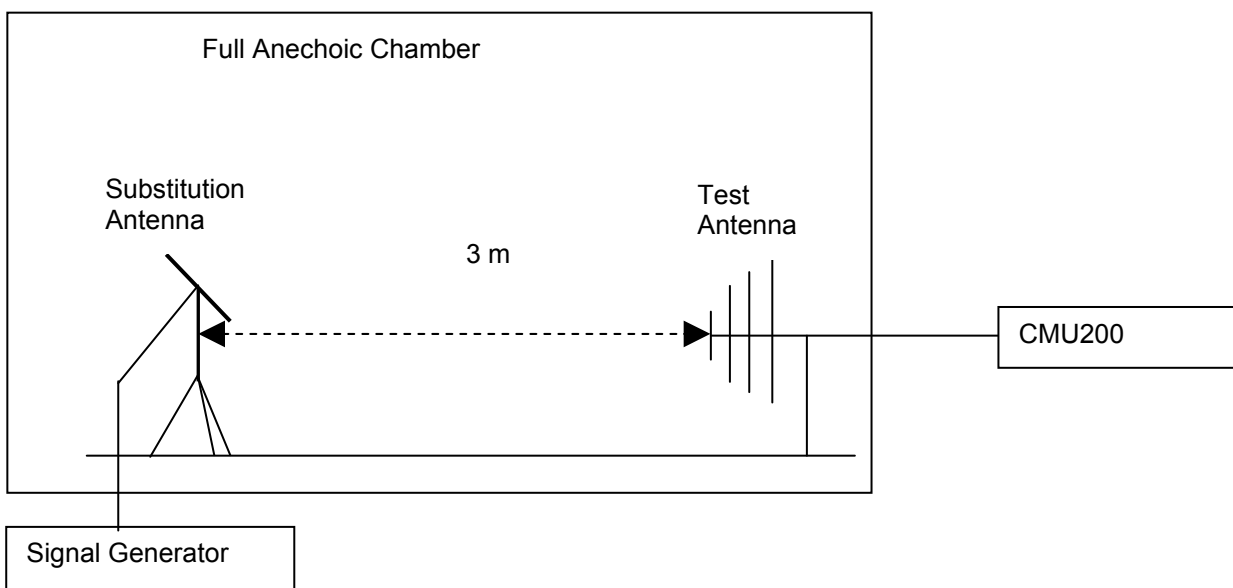


Figure 1. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

ERP was measured using 3 hosts.

Host 1: BenQ Joy book S72

Host 2: BenQ R55V

Host 3: Acer ZH1

6.1.4 Measurement Results

6.1.4.1 Pre-test Results

For HSUPA test mode, there are 5 sub-test for different configuration. For the sub-test 1, the max power of E870 is the maximum as followed table..

The channel is mid range.

Table 15 HSUPA conducted max power pre-scan

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (Codes)	CM (dB)	MPR (dB)	Test result
1	8/15	15/15	64	8/15	16/15	16/15	448/75	4	1	1.0	0.0	22.72
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	22.40
3	15/15	5/15	64	15/5	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4 4	2	2.0	1.0	22.51
4	1/15	15/15	64	1/15	2/15	2/15	56/75	4	1	3.0	2.0	22.10
5	12/15	15/15	64	12/15	24/15	24/15	224/25	4	1	1.0	0.0	22.55

For the following test, the sub-test 1 was used for HSUPA.

Table 16 Measurement Results

		RF Output Power (ERP)					
TEST CONDITIONS		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1- Host 1	T_{nom} (25 °C) V_{nom} (3.3V)	22.85	38.5	22.91	38.5	22.89	38.5
TM2(sub-test1) - Host 1	T_{nom} (25 °C) V_{nom} (3.3V)	22.60	38.5	22.72	38.5	22.65	38.5
TM1- Host 2	T_{nom} (25 °C) V_{nom} (3.3V)	22.78	38.5	22.71	38.5	22.52	38.5
TM2(sub-test1) - Host 2	T_{nom} (25 °C) V_{nom} (3.3V)	22.32	38.5	22.58	38.5	22.64	38.5
TM1- Host 3	T_{nom} (25 °C) V_{nom} (3.3V)	22.66	38.5	22.69	38.5	22.79	38.5
TM2(sub-test1) - Host 3	T_{nom} (25 °C) V_{nom} (3.3V)	22.46	38.5	22.44	38.5	22.52	38.5

6.1.4.2 Substitution Results

Table 17 Substitution Results

Test	Freq.	Meas.	Substitution	SGP	Substit	Cable	Substit	Limit	Result
------	-------	-------	--------------	-----	---------	-------	---------	-------	--------

Mode	[MHz]	Level [dBm]	Antenna Type	[dBm]	Antenna Gain [dBd]	Loss [dB]	ERP Level (ERP) [dBm]	[dBm]	
TM1-Host 1	826.4	22.85	Dipole Ant.	26.19	-2.95	0.6	22.64	38.5	Pass
TM1-Host 1	836.4	22.91	Dipole Ant.	26.35	-3.05	0.6	22.70	38.5	Pass
TM1-Host 1	846.6	22.89	Dipole Ant.	26.45	-3.11	0.6	22.69	38.5	Pass
TM2-Host 1	826.4	22.60	Dipole Ant.	26.04	-2.95	0.6	22.49	38.5	Pass
TM2-Host 1	836.4	22.72	Dipole Ant.	26.20	-3.05	0.6	22.55	38.5	Pass
TM2-Host 1	846.6	22.65	Dipole Ant.	26.17	-3.11	0.6	22.46	38.5	Pass
TM1-Host 2	826.4	22.78	Dipole Ant.	26.08	-2.95	0.6	22.53	38.5	Pass
TM1-Host 2	836.4	22.71	Dipole Ant.	26.23	-3.05	0.6	22.58	38.5	Pass
TM1-Host 2	846.6	22.52	Dipole Ant.	26.35	-3.11	0.6	22.59	38.5	Pass
TM2-Host 2	826.4	22.32	Dipole Ant.	25.84	-2.95	0.6	22.29	38.5	Pass
TM2-Host 2	836.4	22.58	Dipole Ant.	25.98	-3.05	0.6	22.33	38.5	Pass
TM2-Host 2	846.6	22.64	Dipole Ant.	25.97	-3.11	0.6	22.26	38.5	Pass
TM1-Host 3	826.4	22.66	Dipole Ant.	25.88	-2.95	0.6	22.33	38.5	Pass
TM1-Host 3	836.4	22.69	Dipole Ant.	26.25	-3.05	0.6	22.60	38.5	Pass
TM1-Host 3	846.6	22.79	Dipole Ant.	26.45	-3.11	0.6	22.69	38.5	Pass
TM2-Host 3	826.4	22.46	Dipole Ant.	25.9	-2.95	0.6	22.39	38.5	Pass
TM2-Host 3	836.4	22.44	Dipole Ant.	26.00	-3.05	0.6	22.35	38.5	Pass
TM2-Host 3	846.6	22.52	Dipole Ant.	26.07	-3.11	0.6	22.36	38.5	Pass

Note: a, For get the ERP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, A WCDMA signal with bandwidth of 5MHz are created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 5MHz for TM1 and TM2.

6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

Table 18 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2 at frequency Bottom、Middle、 Top

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H

6.2.2.2 Supporting Standards

Table 19 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V6.1.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$\text{ERP(dBm)} = 10 \cdot \log(\text{ERP}_{\text{in watts}}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$P_{\text{cod}}(\text{dBm}) = \text{ERP(dBm)} - \text{Gain(dBd)}.$$

and $\text{Gain(dBd)} = \text{Gain(dBi)} - 2.15\text{dB}$

Table 20 Limits

Maximum Output Power (Watts)	< 7 Watts (38.5dBm)
Antenna Gain(dBi):	2
Antenna Gain(dBd):	-0.15dB
Maximum Conducted Output Power (dBm)	< 38.65dBm

6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI E870 HSPA EXPRESS PCI Modem to the wireless communication tester CMU200 via the antenna connector. The band class is set as US Cellular.

(b) Test the Conducted maximum output power by the CMU200.

Test setup

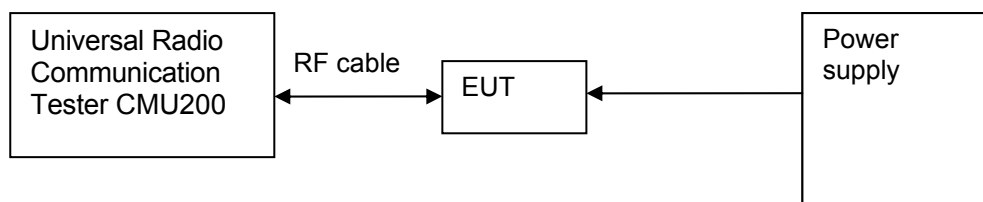


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 21 Measurement Results

		RF Output Power (Conducted)					
TEST CONDITIONS		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T _{nom} (25 °C) V _{nom} (3.3V)	22.90	38.65	23.08	38.65	22.99	38.65
TM2(sub-test1)	T _{nom} (25 °C) V _{nom} (3.3V)	22.88	38.65	22.90	38.65	22.80	38.65
TM2(sub-test2)	T _{nom} (25 °C) V _{nom} (3.3V)	22.52	38.65	22.59	38.65	22.50	38.65
TM2(sub-test3)	T _{nom} (25 °C) V _{nom} (3.3V)	22.64	38.65	22.71	38.65	22.63	38.65
TM2(sub-test4)	T _{nom} (25 °C) V _{nom} (3.3V)	22.21	38.65	22.30	38.65	22.24	38.65
TM2(sub-test5)	T _{nom} (25 °C) V _{nom} (3.3V)	22.65	38.65	22.73	38.65	22.68	38.65

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the “code domain power over time” measurement results refer to appendix A.

6.3 Band Edges Compliance

6.3.1 Test Conditions

Table 22 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2 at frequency Bottom、Top

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

6.3.2.2 Supporting Standards

Table 23 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V6.1.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;

6.3.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$ (W) . (Whereas P is the rated power of the EUT).

Table 24 Limits

	TM1	TM2
Rated Power:	24 dBm	24 dBm
Required attenuation:	$43 + 10 \log (0.25) = 37$ 24 dBm - 37 dB	$43 + 10 \log (0.25) = 37$ 24 dBm - 37 dB
SAbsolute level	- 13 dBm	- 13 dBm

6.3.3 Test Method and Setup

HUAWEI E870 HSPA EXPRESS PCI Modem was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as 850M. HUAWEI E870 HSPA EXPRESS PCI Modem was controlled to transmit maximum power. Measure and record band edges compliance of the HUAWEI E870 HSPA EXPRESS PCI Modem by the R&S FSU26.

In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed. According to FCC part22.917.The FCC rules define the fundamental emission as -26dBc bandwidth.

The limit is -13dBm.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 100 kHz (Resolution bandwidth)

Video bandwidth (VBW): 300 kHz

Test Set-up

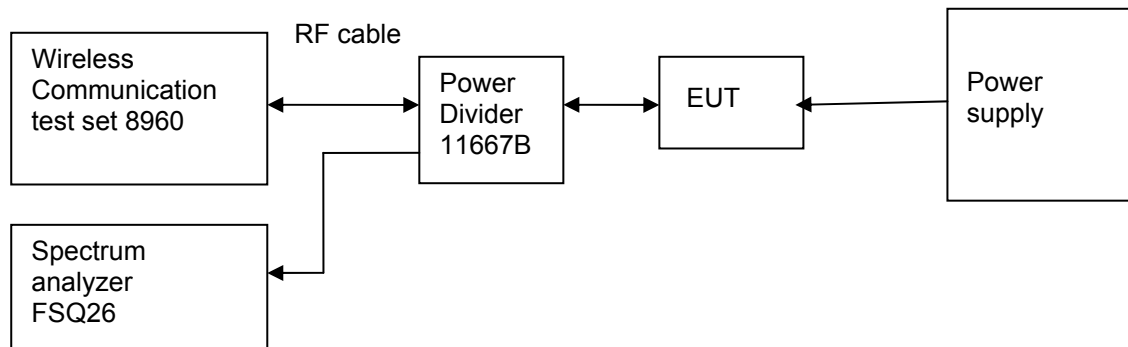


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 25 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
Cellular	T_{nom} (25 °C), V_{nom} (3.3V)					
	826.4	4132	TM1	<-13(See appendix A)	- 13 dBm	Pass
	846.6	4233	TM1	<-13(See appendix A)	- 13 dBm	Pass
	826.4	4132	TM2	<-13(See appendix A)	- 13 dBm	Pass
	846.6	4233	TM2	<-13(See appendix A)	- 13 dBm	Pass

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix B.

7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 26 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=3dB; k=2
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2

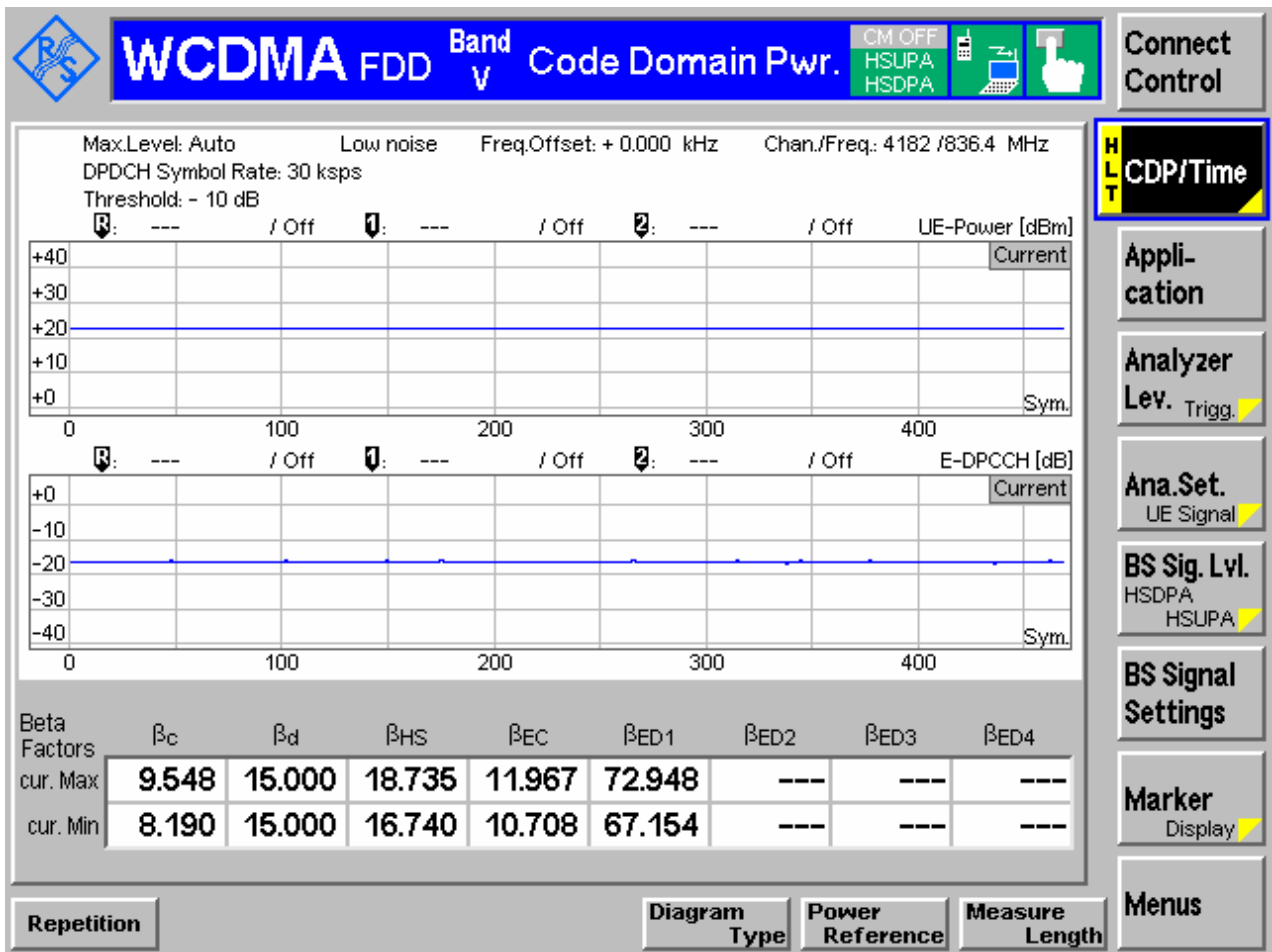
8 Appendices

Appendix A	Measurement Results Code domain power over time	6 pages
Appendix B	Measurement Results Band Edges Compliance	5 pages

Appendix A

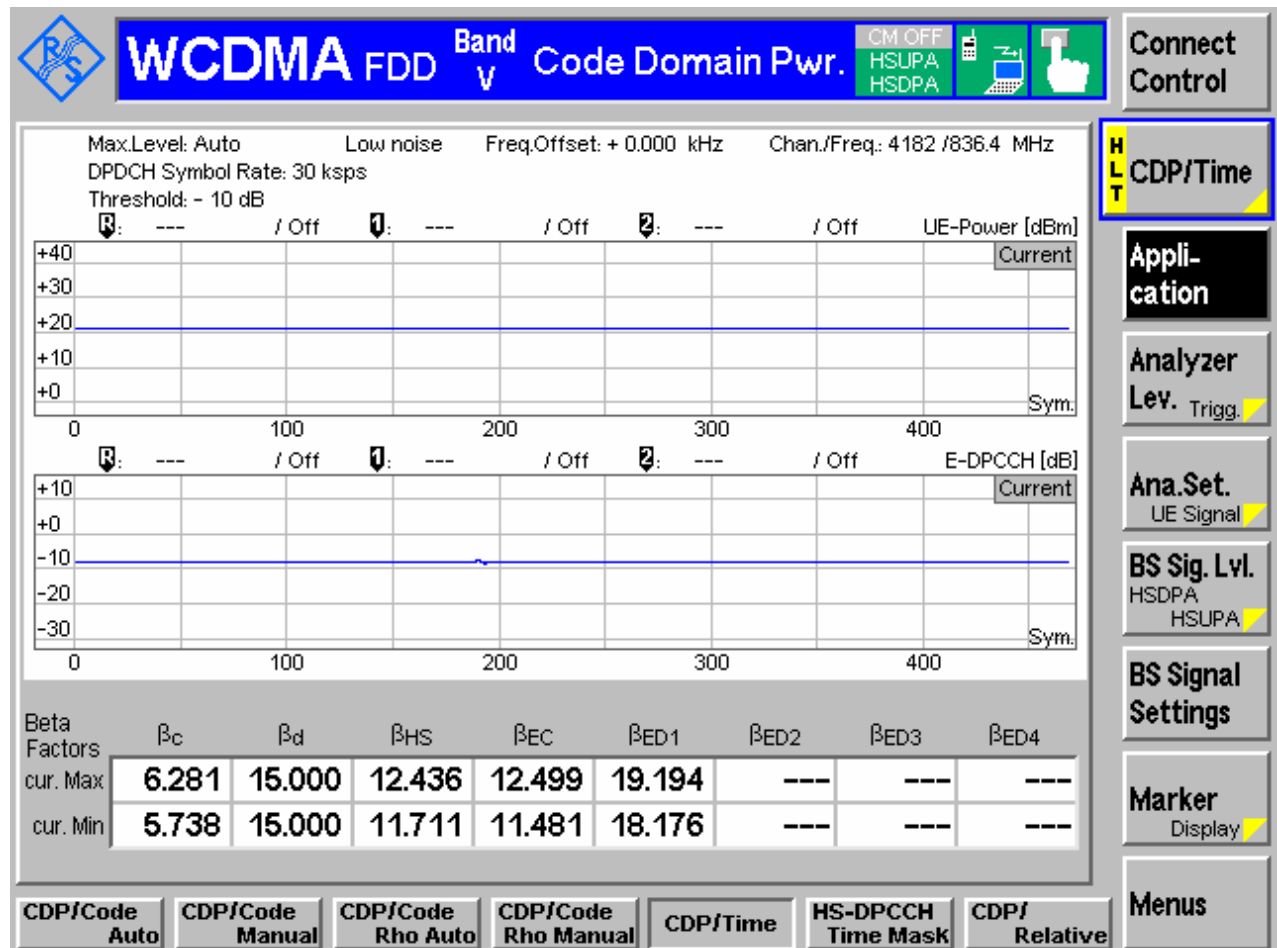
Code domain power over time

TM2:HSUPA
subtest1
Channel 4182



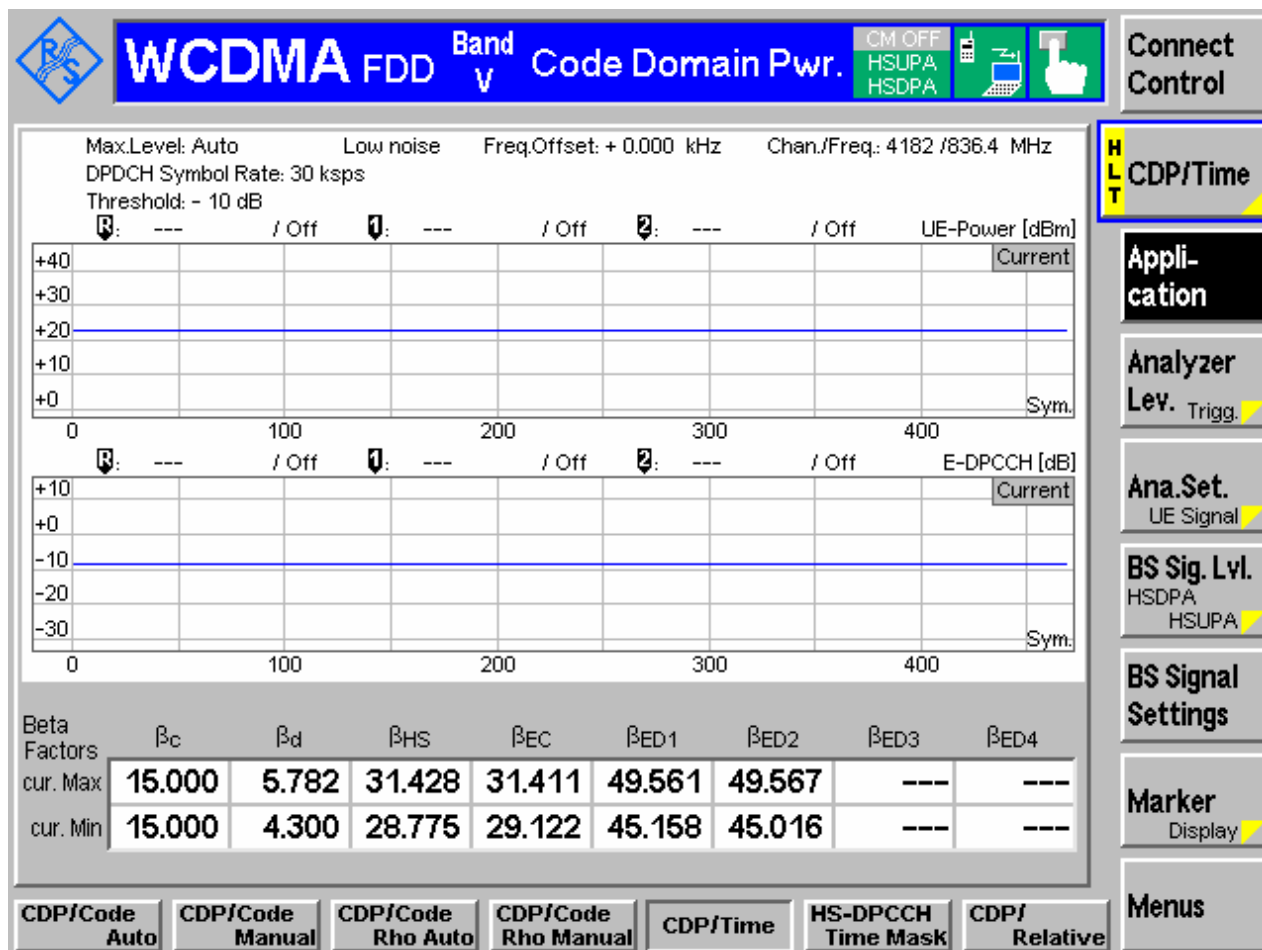
Subtest2

Channel 4182



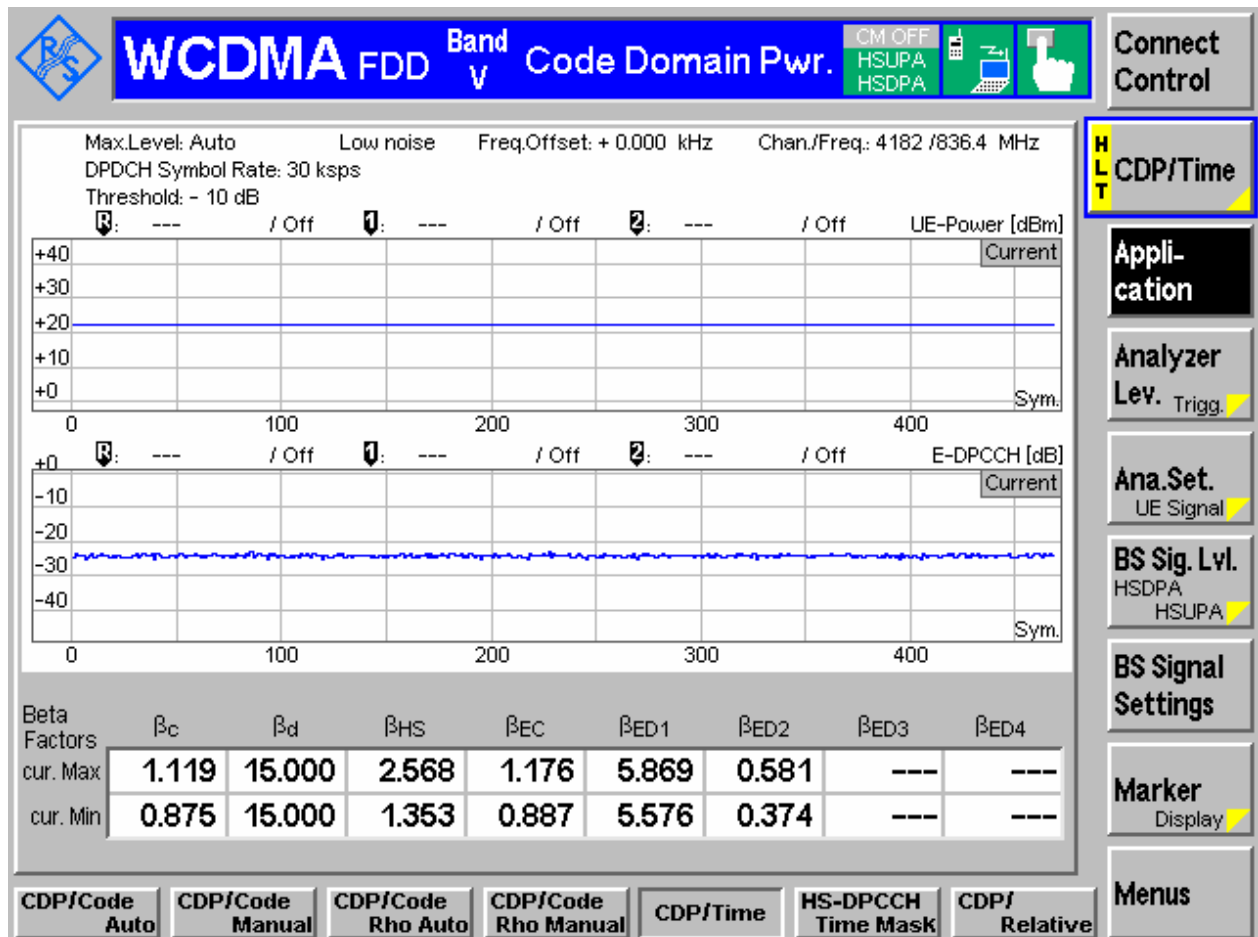
Subtest3

Channel 4182



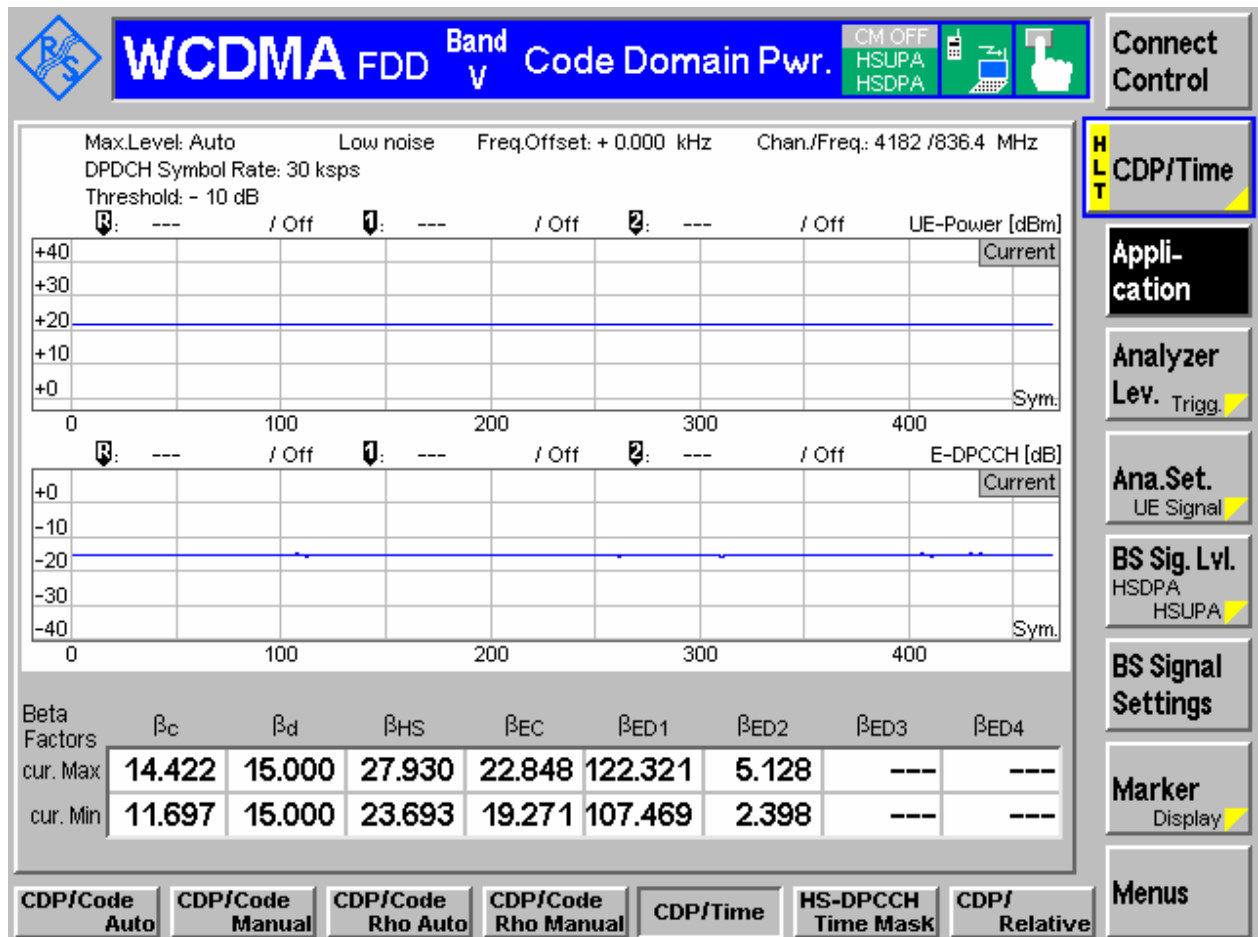
Subtest4

Channel 4182



Subtest5

Channel 4182

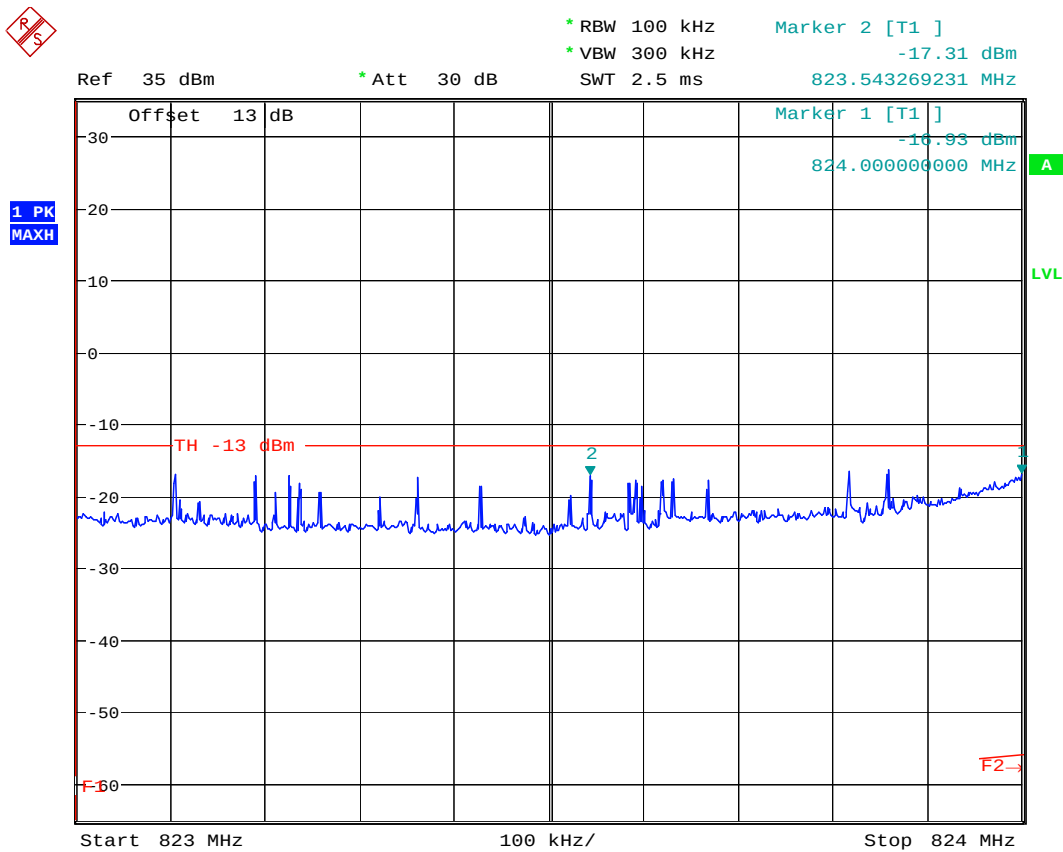


Appendix B

Band Edges Compliance According to FCC Part 2.1051 & 22.917



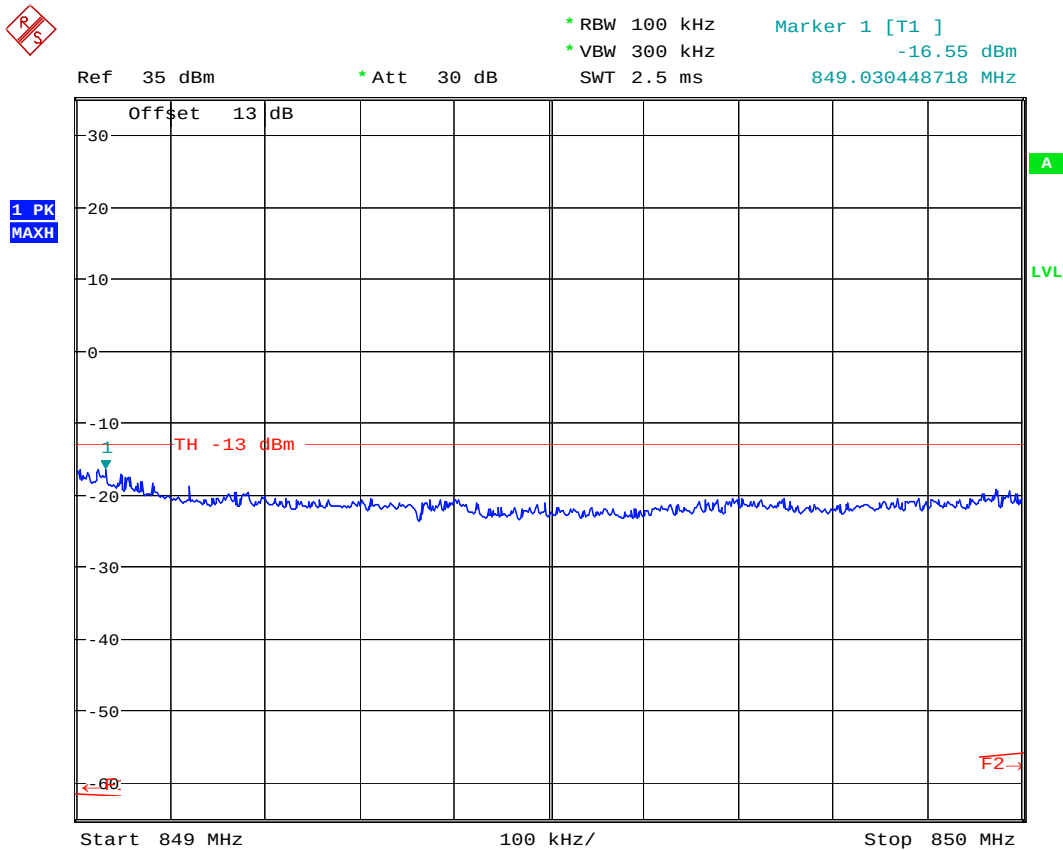
TM1:WCDMA
Left Edge
Channel 4132



Date: 10.SEP.2007 19:22:29



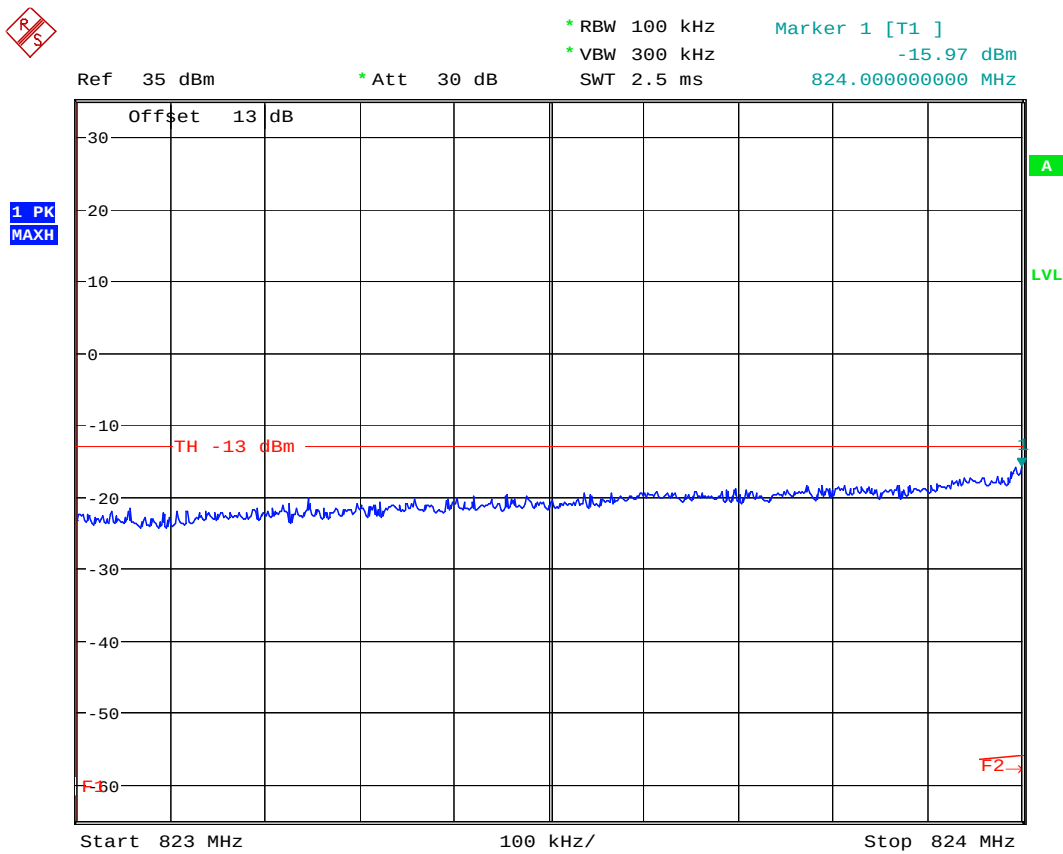
Right Edge
Channel 4233



Date: 10.SEP.2007 19:24:38



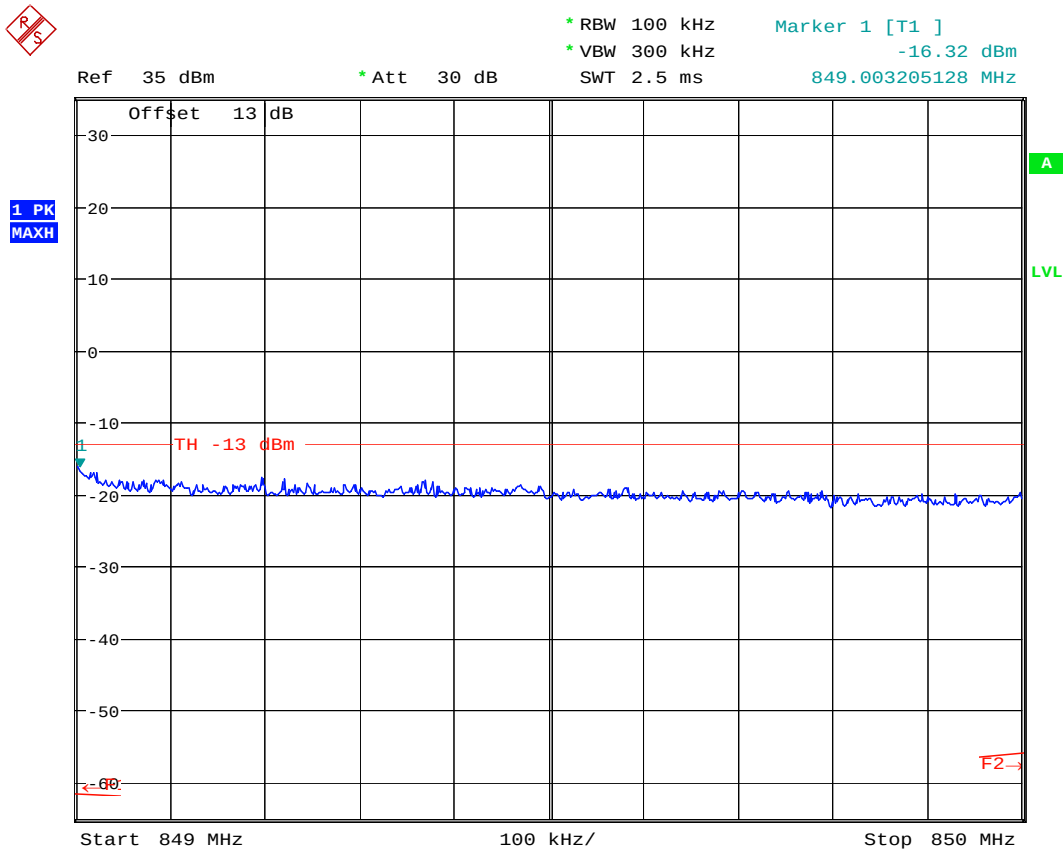
TM2:HSUPA
Left Edge
Channel 4132



Date: 10.SEP.2007 18:51:17



Right Edge
Channel 4233



Date: 10.SEP.2007 18:53:19