



FCC RF Test Report

Product Name: UMTS/GSM/GPRS Mobile Phone

Model Number: HUAWEI U2800/U2800-5

**Report No: SYBH(Z-RF)015062011-2002
FCC ID: QISU2800-5**

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Notice

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Notice 2

Modification Information:

Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	<i>Not Applicable!</i>
	5	
	6	
	7	



REGULATION	FCC CFR47 Part 2: Subpart J;
	FCC CFR47 Part 24: Subpart E;
START OF TEST	Jun.20, 2011
END OF TEST	Jun.25, 2011
Final Judgement:	Pass

Approved By Jun.28, 2011 Chenxiaohong Chen Xiaohong
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Contents

1	<u>Summary</u>	6
2	<u>Product Description</u>	7
2.1	PRODUCTION INFORMATION	7
2.2	MODIFICATION INFORMATION	7
3	<u>Test Site Description</u>	8
3.1	TESTING PERIOD	8
3.2	GENERAL SET UP DESCRIPTION	8
4	<u>Product Description</u>	9
4.1	TECHNICAL CHARACTERISTICS.....	9
4.2	EUT IDENTIFICATION LIST.....	11
5	<u>Main Test Instruments</u>	12
6	<u>Transmitter Measurements</u>	13
6.1	EFFECTIVE ISOTROPIC RADIATED POWER OF TRANSMITTER (EIRP)	13
6.2	CONDUCTED POWER OF TRANSMITTER	17
6.3	MODULATION CHARACTERISTICS.....	20
6.4	OCCUPIED BANDWIDTH.....	22
6.5	BAND EDGES COMPLIANCE	25
6.6	SPURIOUS EMISSION AT ANTENNA TERMINAL.....	27
6.7	RADIATED SPURIOUS EMISSIONS	30
6.8	FREQUENCY STABILITY	33
7	<u>System Measurement Uncertainty</u>	37
8	<u>Appendices</u>	38

1 Summary

The table below summarizes the measurements and results for the EUT. 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	24.232	Effective Isotropic radiated power of Transmitter	PASS
2.1046	24.232	Conducted Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	24.238	Band Edges Compliance	PASS
2.1051	24.238	Spurious Emission at Antenna Terminal	PASS
2.1055	24.235	Frequency Stability	PASS
2.1053	24.238	Radiated Spurious Emissions	PASS

2 Product Description

2.1 Production Information

2.1.1 General Description

UMTS/GSM/GPRS Mobile Phone HUAWEI U2800/U2800-5 is subscriber equipment in the WCDMA/GSM system. The UMTS frequency band is Band II and Band V, Band II and Band V test data included in this report. The GSM/GPRS frequency band includes GSM850 and PCS1900, GSM850MHz and PCS1900MHz band test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, UMTS and GSM/GPRS protocol processing, voice, video, MMS service etc.

2.1.2 Support function and Service

The EUT support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: GMSK	TM1	GPRS/GSM
Data	Modulation: QPSK	TM2	WCDMA

Note: * The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0 .The WCDMA test condition & settings are defined in 3GPP TS 34.121 V8.7.0:2009.

2.2 Modification Information

For original equipment, following table is not application.

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***

3.1 Testing Period

The test have been performed during the period of

Jun.20, 2011 – Jun.25, 2011

3.2 General Set up Description

TM1: GSM/GPRS Mode with GMSK Modulation

TM2: WCDMA Mode with QPSK Modulation

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Frequency Range

Uplink band:	1850 to 1910 MHz
Downlink band:	1930 to 1990 MHz

4.1.2 Channel Spacing / Separation

Channel Spacing / Separation

	GPRS/GSM	WCDMA
Channel raster	200k Hz	200k Hz
Channel spacing:	200k Hz	5MHz

4.1.3 Type of Emission

Type of Emission

	GPRS/GSM	WCDMA
Emission Designation:	300KGXW	5M00F9W

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

4.1.4 Environmental Requirements

Table 3 Environmental Requirements

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

4.1.5 Power Source

Table 4 Power Source

AC voltage nominal:	~ 120 V
AC voltage range	~ 100 V to ~ 240 V
AC current maximal:	1A

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:

Applied RF Module Voltages and Currents

Voltage:	== 2.85V (for the RF IC)
Current:	150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)
Voltage:	== 3.6V (for the PA module)
Current:	350mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

4.2 EUT Identification List

4.2.1 Board Information

Table 5 Board Information

UMTS/GSM/GPRS Mobile Phone		
HUAWEI U2800/U2800-5 Board and Module		
Equipment Designation / Description	Serial Number	Software Version
Main board of Mobile Phone	2TA9MA115310065	U2800C27B101

4.2.2 Adapter Technical Data

Adapter Model	HS-050040U6
Manufacturer	Huawei Technologies Co., Ltd.
Input Voltage	~100-240V 50/60Hz 0.2A
Output Voltage	5V  0.4A
Rated Power	2W

4.2.3 Battery

Battery Model:	HB5A2
Rated capacity:	1000 mAh
Nominal Voltage:	 3.7 V
Charging Voltage:	 4.2 V

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: U2800-5
FCC Identification: QISU2800-5

5 Main Test Instruments

Table 6 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2012
Signal Analyzer	R&S	FSQ40	100025	Oct.09,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	ESPEC	MW3030	611403	May.12,2012
Signal Generator	R&S	SMR40	100325	May.12,2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Spectrum Analyzer	R&S	FSU26	EG26725	Mar.07,2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	April.27, 2012
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2012
Test receiver	R&S	ESU26	36090302083	Jun.17.2012
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011
Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011

6 Transmitter Measurements

6.1 Effective Isotropic radiated power of Transmitter (EIRP)

6.1.1 Test Conditions

Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
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 24 subpart E

6.1.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.1.2.3 Limits

Compliance with part 24.232, mobile/portable stations are limited to 2 watts EIRP peak power.
 $W(\text{dBm}) = 10 \cdot \log(W_{\text{In mW}})$.

Limits

Maximum Output Power (Watts)	< 2 Watts
Maximum Output Power (dBm)	< 33 dBm

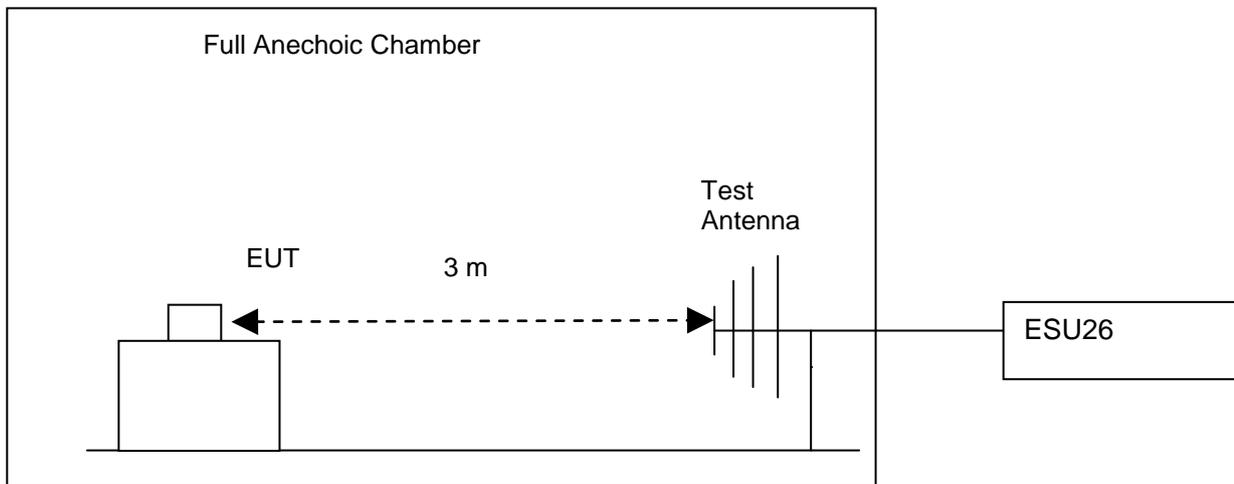
6.1.3 Test Method and Setup

- (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP 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 EUT to the wireless communication tester CMU200 via the air interface. The band is set as PCS.
- (b) Test the Radiated maximum output power by the CMU200 received from test antenna.

- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a horn antenna. The horn 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 CMU200, 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 EIRP

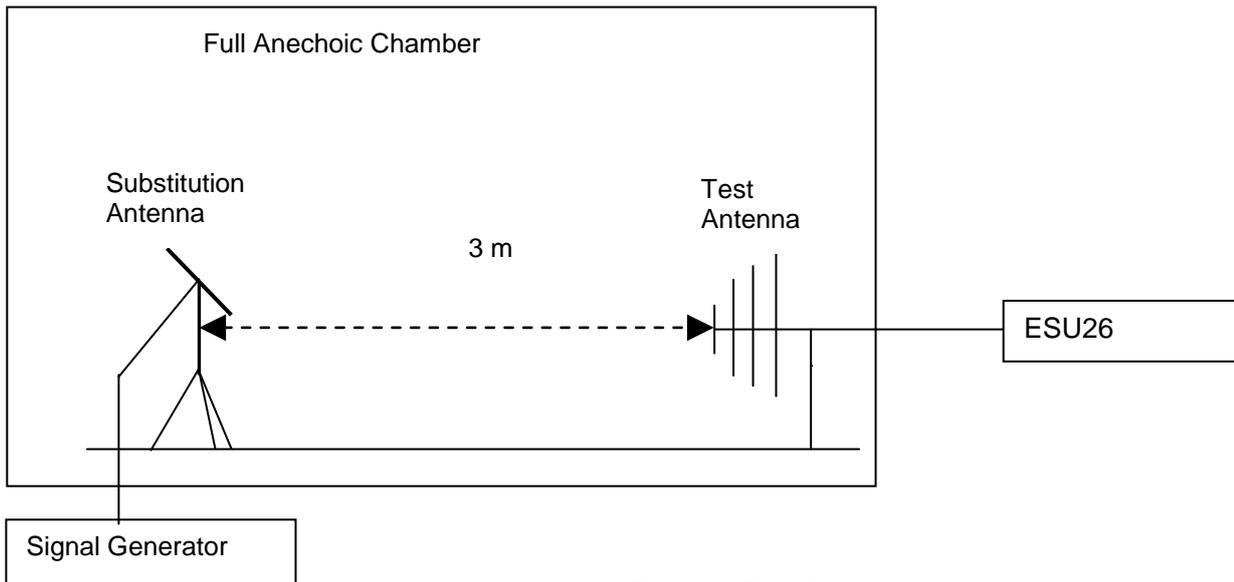


Figure 1. Test Set-up

NOTE: Effective Isotropic radiated power (EIRP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave horn antennas. There is a constant difference of 2.15 dB between EIRP and ERP. $EIRP (dBm) = ERP (dBm) + 2.15$ (ITU-R Recommendation SM.329-10). EIRP was measured using 1 host.

6.1.4 Measurement Result

6.1.4.1 Pre-test Results

Measurement Results

RF Output Power (EIRP)						
TEST CONDITIONS	Channel512(B) 1850.2MHz		Channel661(M) 1880.0MHz		Channel810(T) 1909.8MHz	
	dBm		dBm		dBm	
T _{nom} (25 °C)/ V _{nom} (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	28.79	33	28.95	33	28.73	33
TEST CONDITIONS	Channel9262(B) 1852.4MHz		Channel9400(M) 1880.0MHz		Channel9538(T) 1907.6MHz	
	dBm		dBm		dBm	
T _{nom} (25 °C)/ V _{nom} (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM2	21.62	33	21.65	33	21.40	33

6.1.4.2 Substitution Results

Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP) [dBm]	FCC limit [dBm]	Result
TM1	1850.2	28.79	Horn Ant.	25.22	4.5	1	28.72	33	Pass
TM1	1880.0	28.95	Horn Ant.	25.43	4.5	1	28.93	33	Pass
TM1	1909.8	28.73	Horn Ant.	24.83	4.8	1	28.63	33	Pass
TM2	1852.4	21.62	Horn Ant.	18.15	4.5	1	21.65	33	Pass
TM2	1880.0	21.65	Horn Ant.	18.15	4.5	1	21.65	33	Pass
TM2	1907.6	21.40	Horn Ant.	17.61	4.8	1	21.41	33	Pass

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

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

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1 and 5M



for TM2.

6.1.5 Conclusion

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

6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

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 24 subpart E

6.2.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.2.2.3 Limits

Compliance with part 24.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

$$EIRP(dBm) = 10 \cdot \log(EIRP_{in\ mW})$$

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

$$P_{cond}(dBm) = EIRP(dBm) - Gain(dBi)$$

and Gain (dBi) = Gain(dBd) + 2.15dB

Limits

Maximum Output Power (Watts)	< 2 Watts (33 dBm)
Antenna Gain(dBi):	-1.0

Maximum Conducted Output Power (dBm)	< 34.0
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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 EUT to the wireless communication tester CMU200 via the antenna connector. The band class is set as PCS.

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

Test setup

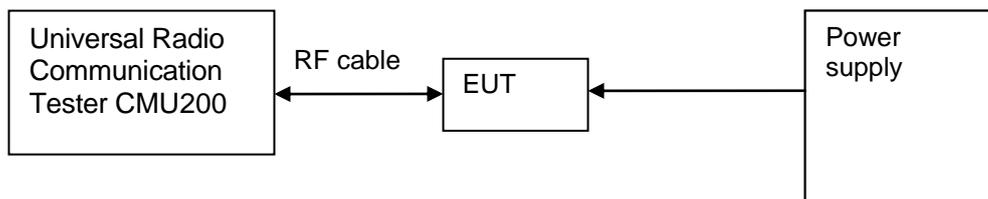


Figure 2. Test Set-up

6.2.4 Measurement Results

Measurement Results

Measurement Results						
RF Output Power (Conducted)						
TEST CONDITIONS	Channel 512(B)		Channel 661(M)		Channel 810(T)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dBm		dBm		dBm	
T_{nom} (25 °C)/ V_{nom} (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	29.79	34.0	29.95	34.0	29.73	34.0
TEST CONDITIONS	Channel9262(B)		Channel9400(M)		Channel9538(T)	
	1852.4MHz		1880.0MHz		1907.6MHz	
	dBm		dBm		dBm	
T_{nom} (25 °C)/ V_{nom} (3.7V)	Measured	Limit	Measured	Limit	Measured	Limit
TM2	22.62	34.0	22.65	34.0	22.40	34.0



6.2.5 Conclusion

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

6.3 Modulation Characteristics

6.3.1 Test Conditions

Test Conditions

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

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24 subpart E

6.3.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 24 subpart E.

Limits

Limits	Not applicable
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6.3.3 Test Method and Setup

Connect the EUT to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as PCS; the EUT's output is matched with 50 Ω load, test method was according to 3GPP TS 51.010 and 3GPP TS 34.121. The waveform quality and constellation of the EUT was tested.

Test setup

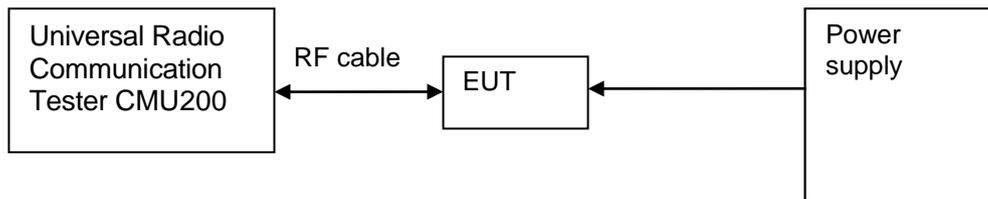


Figure 3. Test Set-up

6.3.4 Measurement Results

Measurement Results

		Modulation Characteristic
TEST CONDITIONS		Channel661(M) 192MHz
		Measured
		TM1
T _{nom} (25 °C)	V _{nom} (3.7V)	Refer to Appendix A
TEST CONDITIONS		Channel9400(M) 192MHz
		Measured
		TM2
T _{nom} (25 °C)	V _{nom} (3.7V)	Refer to Appendix A

6.3.5 Conclusion

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

For the measurement results refer to appendix A.

6.4 Occupied Bandwidth

6.4.1 Test Conditions

Test Conditions

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

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24 subpart E

6.4.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.4.2.3 Limits

No specific occupied bandwidth requirement in part 24 subpart E, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Limits

Upper /lower frequency limits	0.5% of the mean power
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6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as PCS; the EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT by the R&S FSQ31.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

For TM1/TM2 following RBW and VBW are employed:

Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)

Video bandwidth (VBW): 10 kHz

For TM3 following RBW and VBW are employed:

Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)

Video bandwidth (VBW): 500 kHz

Test Set-up

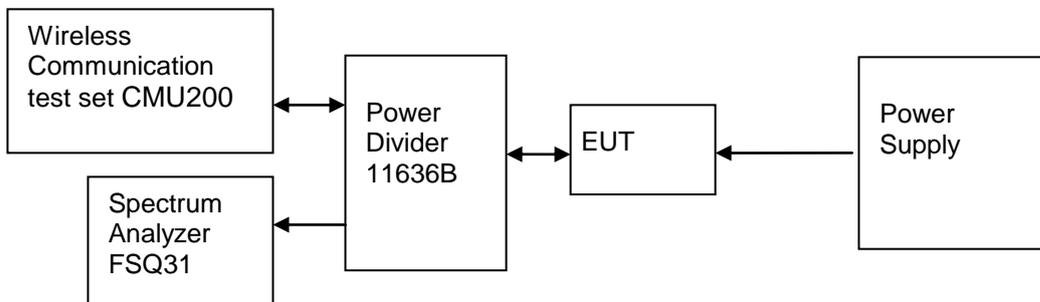


Figure 4. Test Set-up

6.4.4 Measurement Results

Measurement Results

TEST CONDITIONS		Occupied Bandwidth		
Center Frequency		Channel512(B) 1850.2MHz	Channel661(M) 1880.0MHz	Channel810(T) 1909.8MHz
		Measured (kHz)	Measured (kHz)	Measured (kHz)
		TM1	TM1	TM1
T _{nom} (25 °C) V _{nom} (3.7V)	99%	246.79	243.59	250.00
Center Frequency		Channel9262(B) 1852.4MHz	Channel9400(M) 1880.0MHz	Channel9538(T) 1907.6MHz



		Measured (MHz)	Measured (MHz)	Measured (MHz)
		TM2	TM2	TM2
T_{nom} (25 °C) V_{nom} (3.7V)	99%	4.17	4.15	4.17

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix B.

6.5 Band Edges Compliance

6.5.1 Test Conditions

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

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part24 Subpart E

6.5.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.5.2.3 Limits

Compliance with part 24.238, 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).

	TM1	TM2
Rated Power:	30 dBm	24 dBm
Required attenuation:	$43 + 10 \log(1) = 43$, 30 dBm - 43 dB	$43 + 10 \log(0.25) = 37$, 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm

6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as PCS. The EUT was controlled to transmit maximum power. Measure and record band edges compliance of the EUT by the R&S FSQ31.

For TM1 following RBW and VBW are employed:
 Measurement bandwidth (RBW): 3 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 10 kHz
 For TM2 following RBW and VBW are employed:
 Measurement bandwidth (RBW): 50 kHz (Resolution bandwidth)
 Video bandwidth (VBW): 200 kHz

Test Set-up

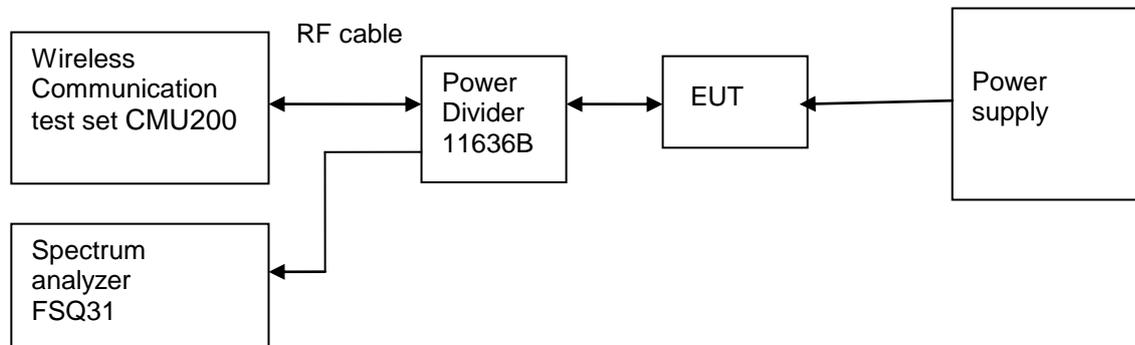


Figure 5. Test Set-up

6.5.4 Measurement Results

Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (3.7\text{V})$						
PCS	1850.2	512	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1909.8	810	TM1	<-13(See appendix C)	- 13 dBm	Pass
	1852.4	9262	TM2	<-13(See appendix C)	- 13 dBm	Pass
	1907.6	9538	TM2	<-13(See appendix C)	- 13 dBm	Pass

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to appendix C.

6.6 Spurious Emission at Antenna Terminal

6.6.1 Test Conditions

Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1/TM2 at frequency Bottom, Middle ,Top

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part24 Subpart E

6.6.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.6.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

	TM1	TM2
Rated Power:	30 dBm	24 dBm
Required attenuation:	$43 + 10 \log(1) = 43$, 30 dBm - 43 dB	$43 + 10 \log(0.25) = 37$, 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm

6.6.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the

band class is set as PCS. The EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSQ31.

According to part 24.238, the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
Measurement bandwidth (RBW) for 150 kHz up to 30MHz: 10 kHz;
Measurement bandwidth (RBW) for 30 MHz up to 20GHz: 1MHz;

Test Set-up

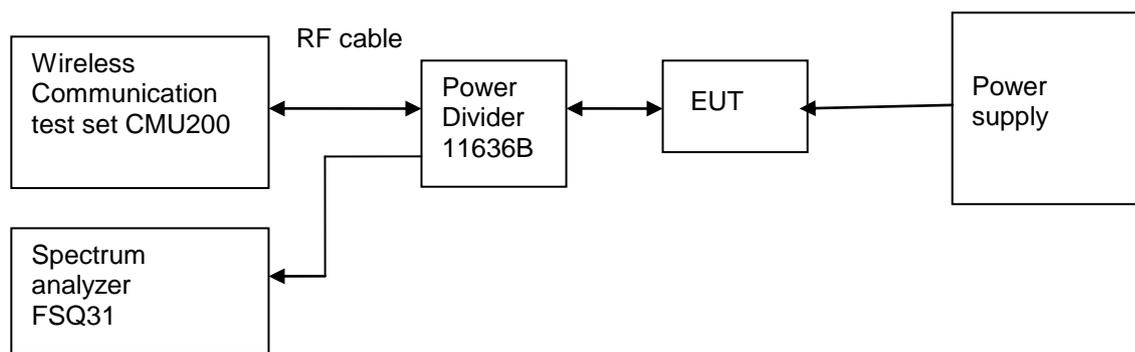


Figure 6. Test Set-up

6.6.4 Measurement Results

Measurement Results						
Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 512(B)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 9262(B)	TM2	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 661(M)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 9400(M)	TM2	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 810(T)	TM1	9 kHz~20GHz	30	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 9538(T)	TM2	9 kHz~20GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass



6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix D.

6.7 Radiated Spurious Emissions

6.7.1 Test Conditions

Table 7 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2 at frequency Middle

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 24.238

6.7.2.2 Supporting Standards

Table 8 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.7.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

Table 9 Limits

Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$, 24 dBm – 37 dB
Absolute level	- 13 dBm

6.7.3 Test Method and Setup

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

According to part 24.238, the defined measurement bandwidth as following:

24.238(b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

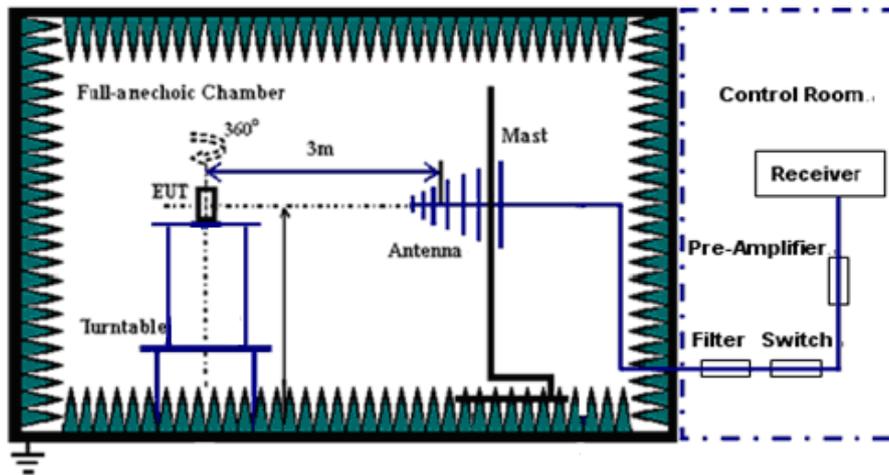
Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
 Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;
 Measurement bandwidth (RBW) for 30MHz up to 26.5GHz: 1MHz;

Test Set-up

Step 1:

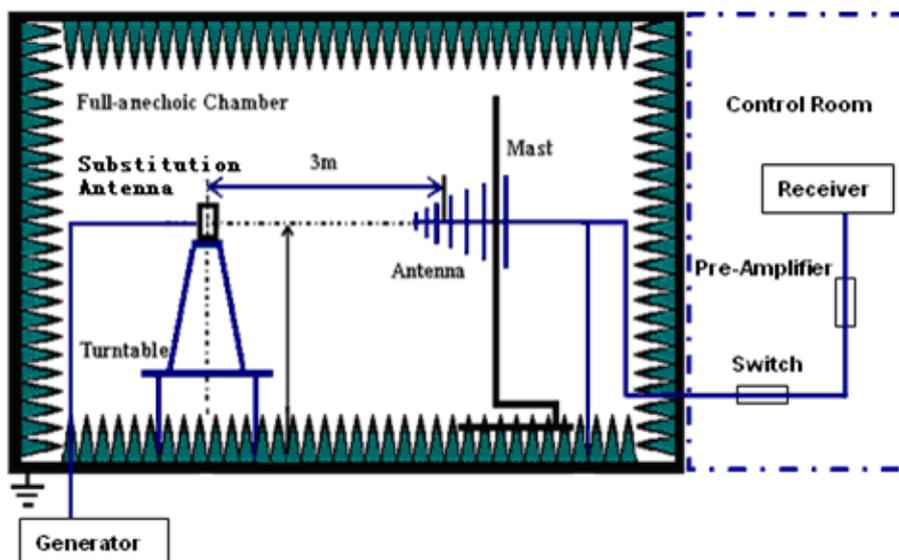
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the Test Receiver from test antenna.



Step 2:

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 step1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.



Test should be performed in normal voltage condition.

No peak found in pre- test. All frequency points' margin is bigger than 20dB, so the substitution method isn't used.

Calculation Sample:

Table 10 Substitution Results

Freq. [MHz]	Measurement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result

Note: For get the E.R.P. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{E.R.P. [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

6.7.4 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix_E

6.8 Frequency Stability

6.8.1 Test Conditions

Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	TM1/TM2 at frequency Middle

6.8.2 Test Specifications and Limits

6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and Part24 Subpart E

6.8.2.2 Supporting Standards

Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 V5.4.0.0:2005	Digital cellular telecommunications system Mobile Station (MS) conformance specification;
3GPP TS 34.121 V8.7.0:2009	Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD);

6.8.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 24.235.

6.8.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From -30 ° to +50 ° centigrade for all equipment except that specified in subparagraphs
- (2) and (3) of paragraph 2.1055

(a) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(b) The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(c) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

The EUT can only work in such extreme voltage 3.6V and 4.2V, so here the EUT is tested in the 3.6V and 4.2V.

Test Set up

Connect the EUT to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The EUT's output is matched with a 50 Ω load.

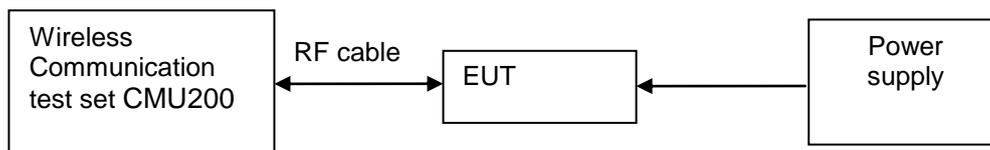


Figure 7. Test Set up

6.8.4 Measurement Results

6.8.4.1 Measurement Results vs. Variation of Temperature

- **TM1, 3.7V DC Channel No.661(1880.0MHz)**

Measurement Results vs. Variation of Temperature – TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1880.0	-22	Pass
-20 °C	1880.0	-12	Pass
-10 °C	1880.0	-13	Pass
0 °C	1880.0	12	Pass
+10 °C	1880.0	17	Pass
+20 °C	1880.0	-16	Pass
+30 °C	1880.0	19	Pass
+40 °C	1880.0	-13	Pass

+50 °C	1880.0	12	Pass
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● **TM2, 3.7V DC Channel No.9400(1880.0MHz)**

Measurement Results vs. Variation of Temperature – TM2

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1880.0	-11	Pass
-20 °C	1880.0	-16	Pass
-10 °C	1880.0	12	Pass
0 °C	1880.0	-28	Pass
+10 °C	1880.0	-15	Pass
+20 °C	1880.0	-13	Pass
+30 °C	1880.0	-12	Pass
+40 °C	1880.0	-18	Pass
+50 °C	1880.0	-14	Pass

6.8.4.2 Measurement Results vs. Variation of Voltage

● **TM1, 25 °C ,Channel No. 661(1880.0MHz)**

Measurement Results vs. Variation of Voltage – TM1

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2V	1880.0	-15	Pass
3.7V	1880.0	-12	Pass
3.6 V	1880.0	-16	Pass

● **TM2, 25 °C ,Channel No. 9400(1880.0MHz)**

Measurement Results vs. Variation of Voltage – TM2

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
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4.2V	1880.0	-12	Pass
3.7V	1880.0	-14	Pass
3.6 V	1880.0	12	Pass

6.8.5 Conclusion

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

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:

System Measurement Uncertainty

Items		Extended Uncertainty
Effective Isotropic 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
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2

8 Appendices

Appendix A	Measurement Results Modulation Characteristics	3 Pages
Appendix B	Measurement Results Occupied Bandwidth	7 Pages
Appendix C	Measurement Results Band Edges	5 Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	19 Pages
Appendix E	Measurement Results Radiated Spurious Emissions	13 Pages
Appendix F	Photos of Radiated Spurious Emissions	5 Pages

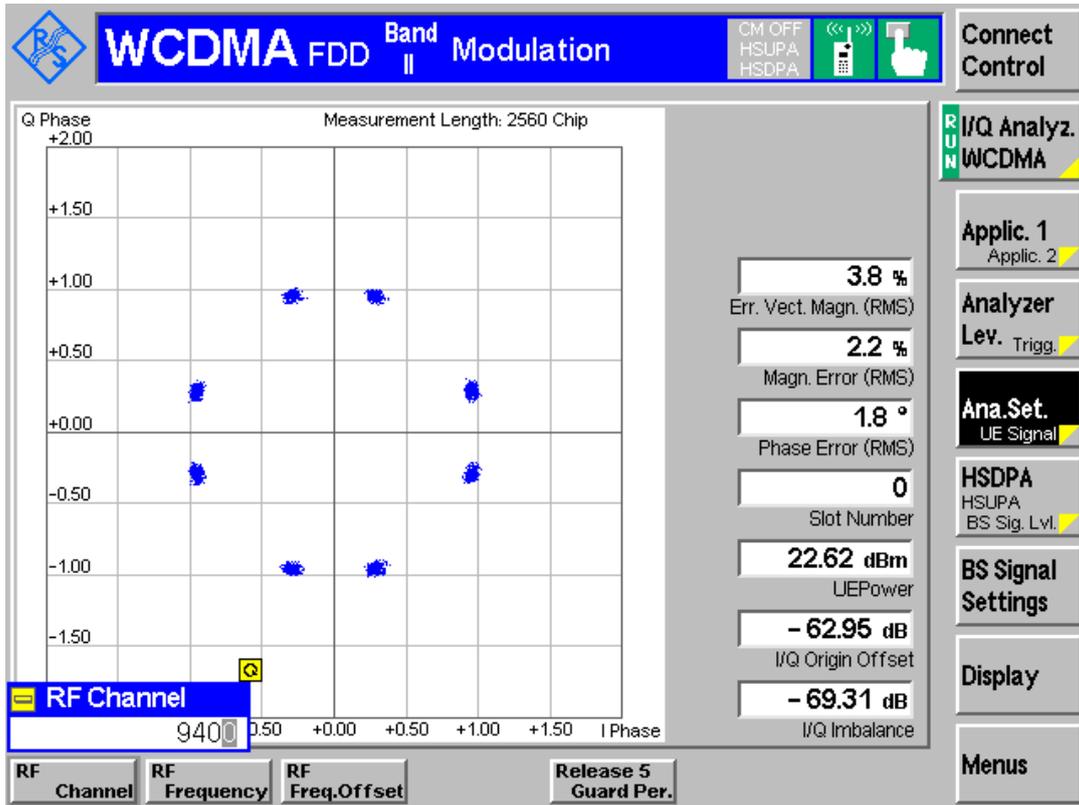


Appendix A

Modulation Characteristics According to FCC Part 2.1047 & Part24 Subpart E



TM3: WCDMA Channel 9400





Appendix B

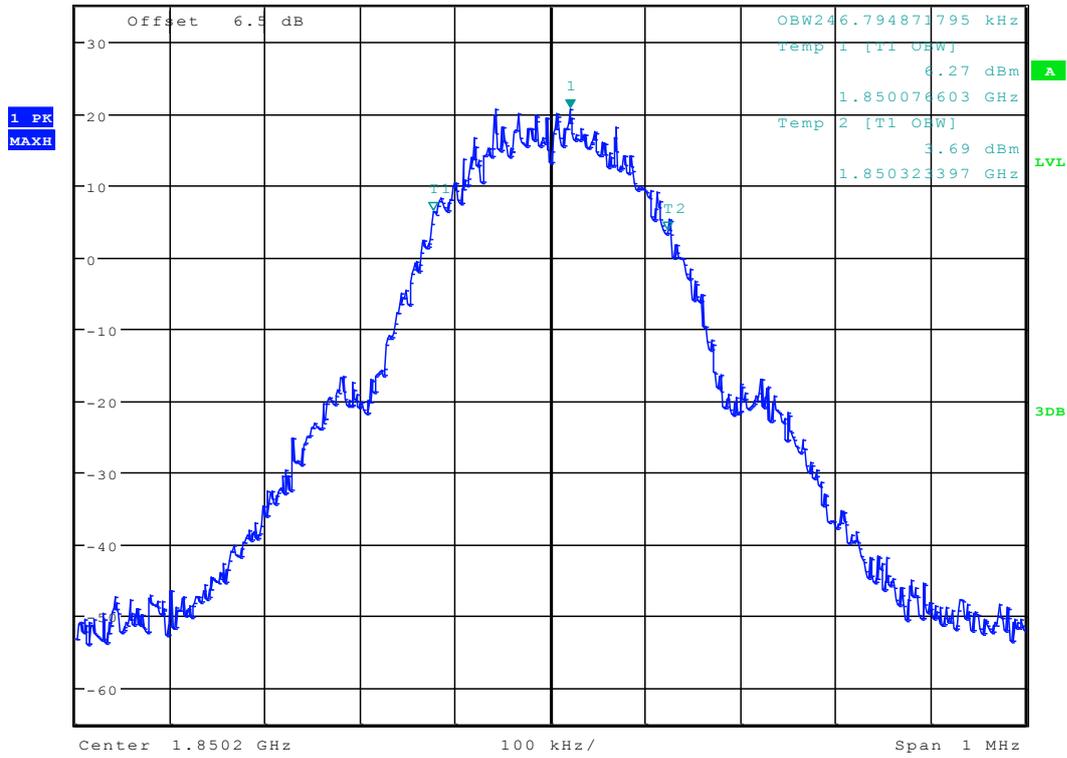
Occupied Bandwidth According to FCC Part 2.1049 & Part 24 Subpart E



TM1:GPRS/GSM Channel 512



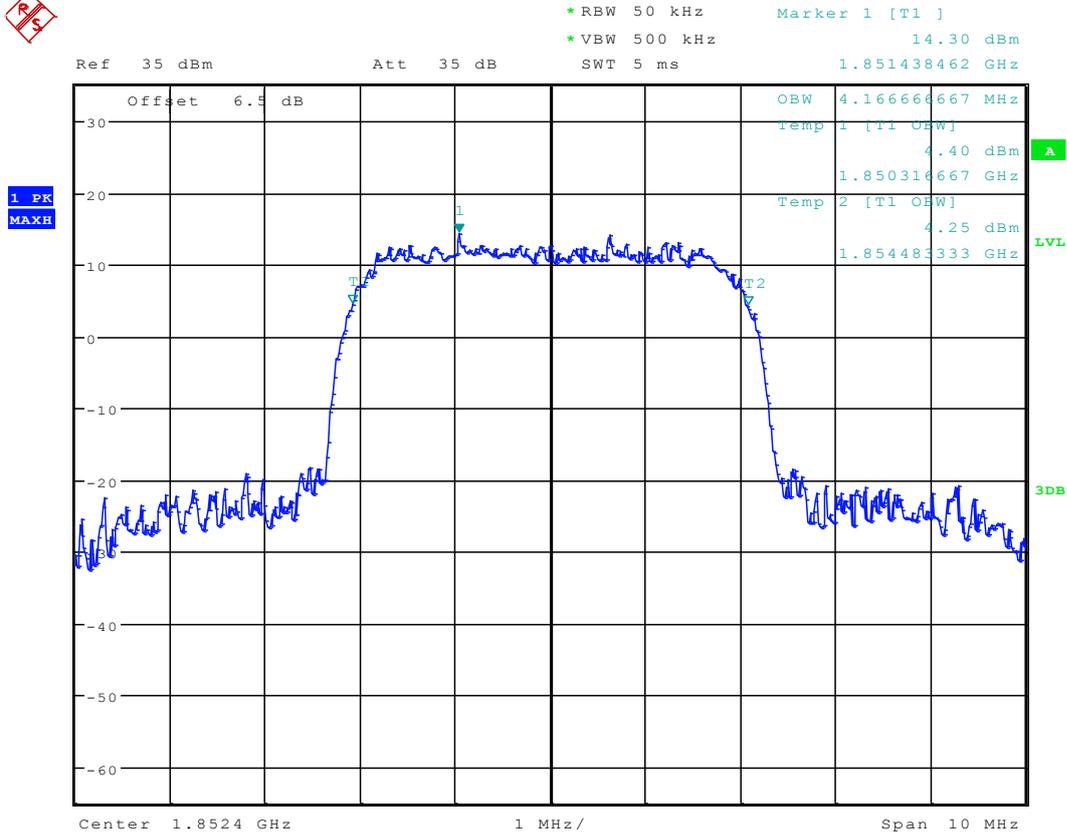
Ref 35 dBm Att 35 dB *RBW 3 kHz *VBW 10 kHz SWT 115 ms Marker 1 [T1] 20.64 dBm 1.850220833 GHz



Date: 24.JUN.2011 10:35:06



TM2: WCDMA Channel 9262



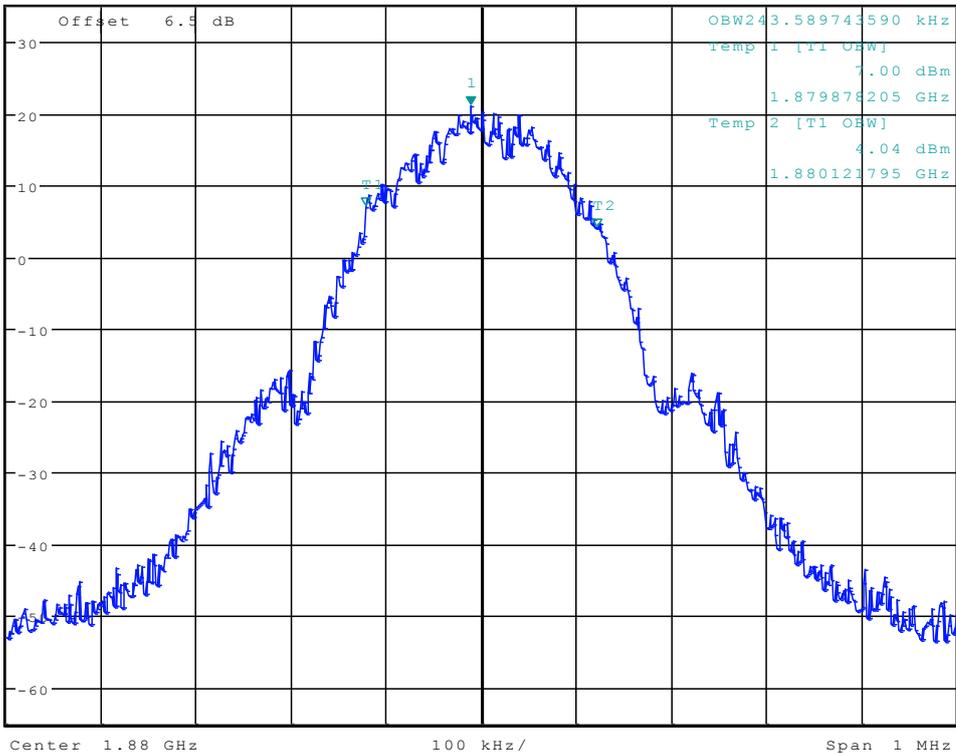
Date: 24.JUN.2011 10:28:53



TM1:GPRS/GSM Channel 661



Ref 35 dBm Att 35 dB *RBW 3 kHz *VBW 10 kHz SWT 115 ms
 Marker 1 [T1] 21.03 dBm 1.879878205 GHz



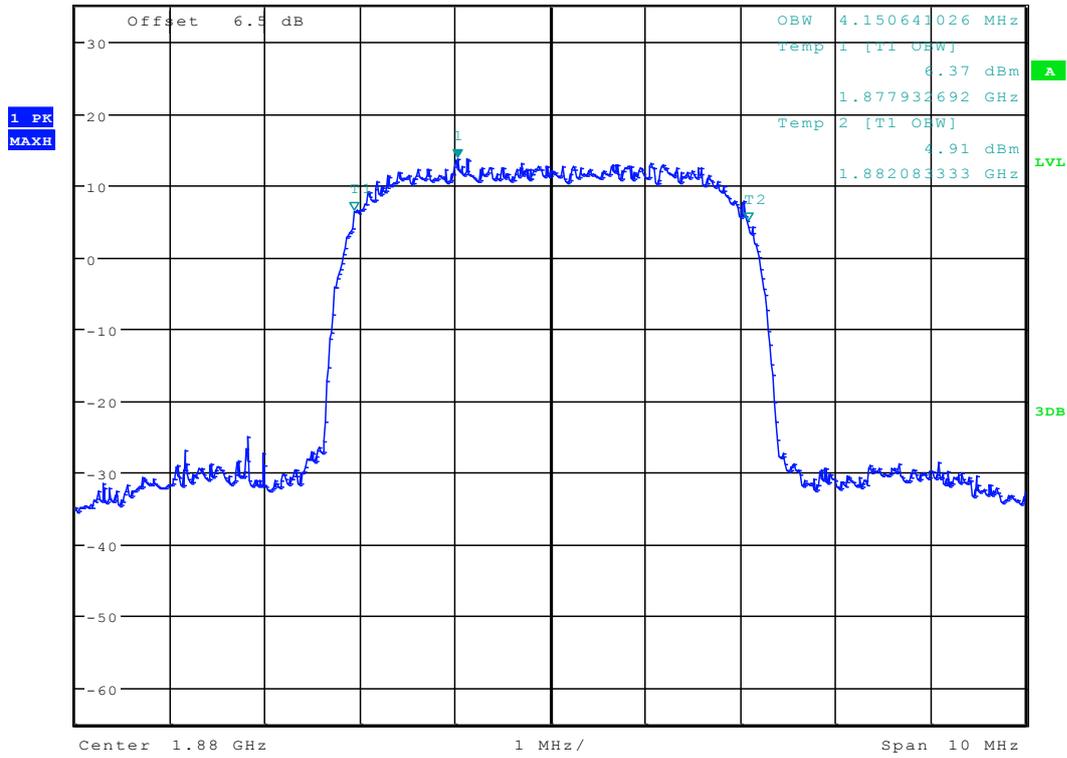
Date: 24.JUN.2011 10:35:19



TM2: WCDMA Channel 9400



*RBW 50 kHz Marker 1 [T1]
 *VBW 500 kHz 13.69 dBm
 Ref 35 dBm Att 35 dB SWT 5 ms 1.879022436 GHz



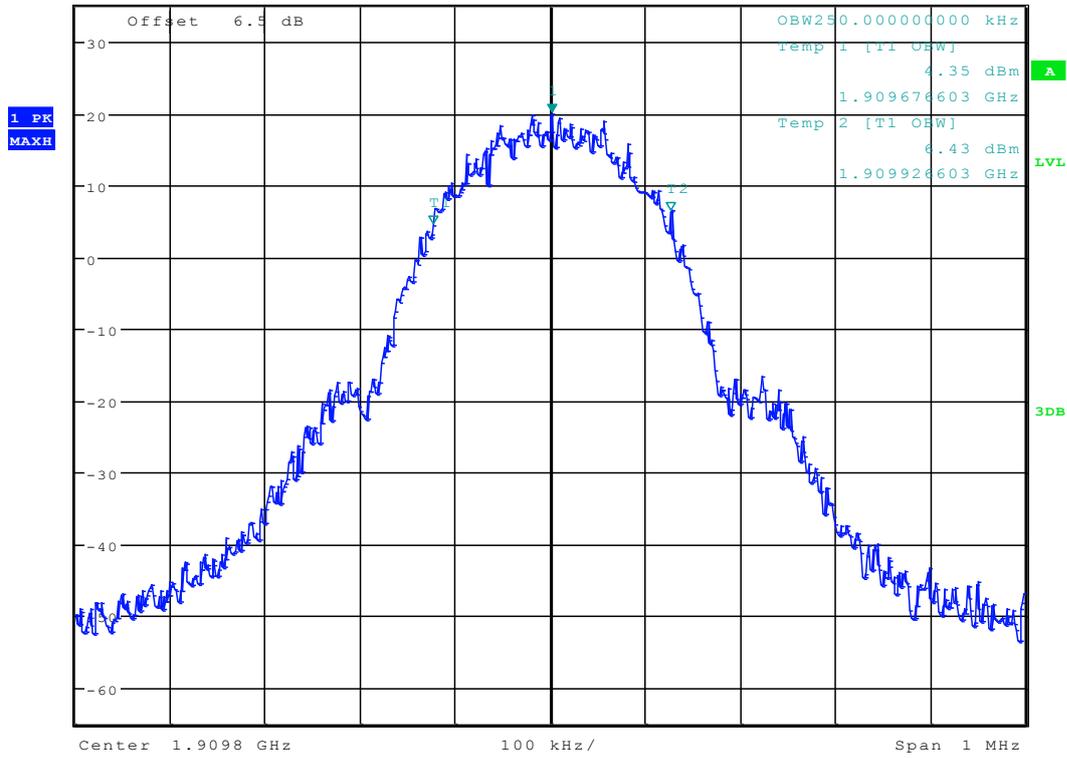
Date: 24.JUN.2011 10:29:06



TM1:GPRS/GSM Channel 810



Ref 35 dBm Att 35 dB *RBW 3 kHz *VBW 10 kHz SWT 115 ms Marker 1 [T1] 19.95 dBm 1.909801603 GHz



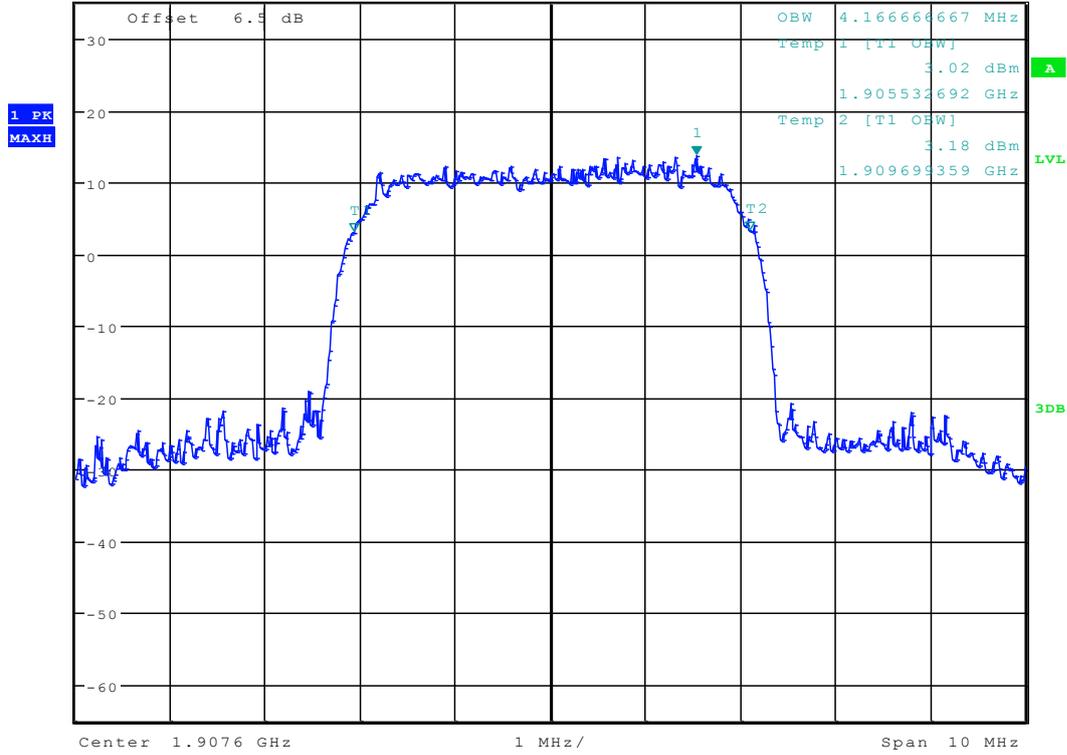
Date: 24.JUN.2011 10:35:33



TM2: WCDMA Channel 9538



Ref 35 dBm Att 35 dB SWT 5 ms
 *RBW 50 kHz *VBW 500 kHz
 Marker 1 [T1] 13.64 dBm 1.909138462 GHz



Date: 24.JUN.2011 10:29:20

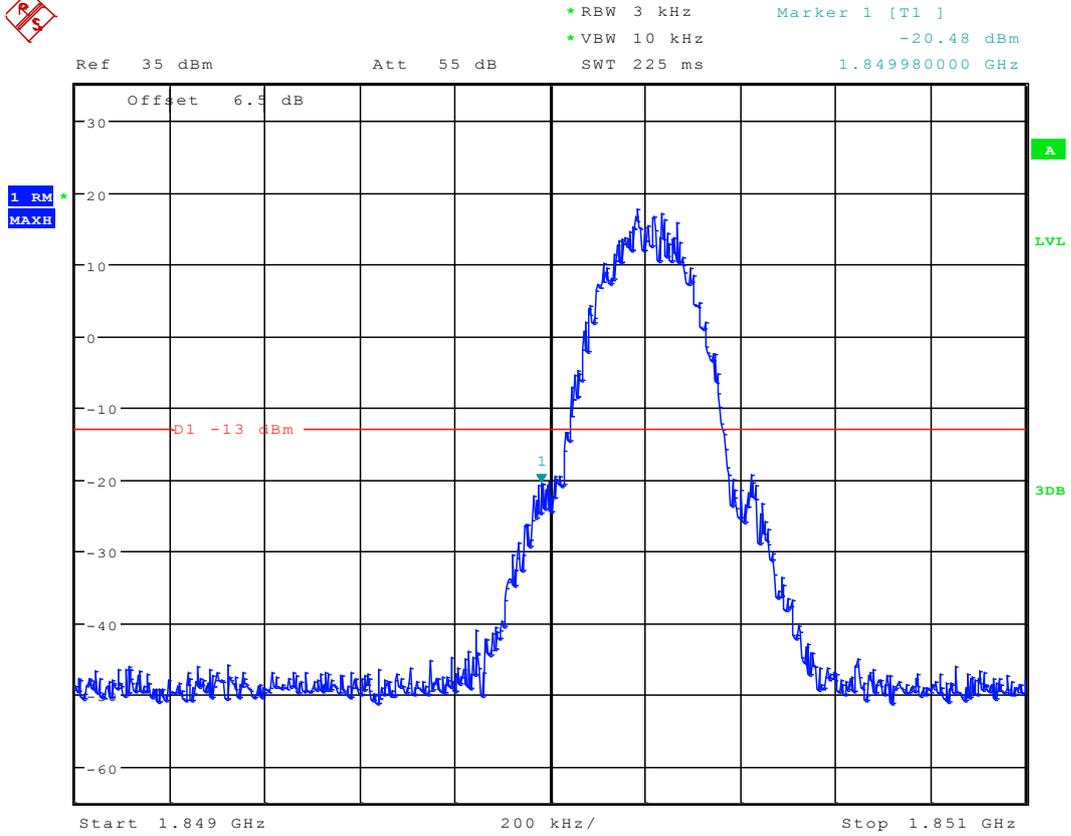


Appendix C

Band Edges Compliance According to FCC Part 2.1051 & 24.238



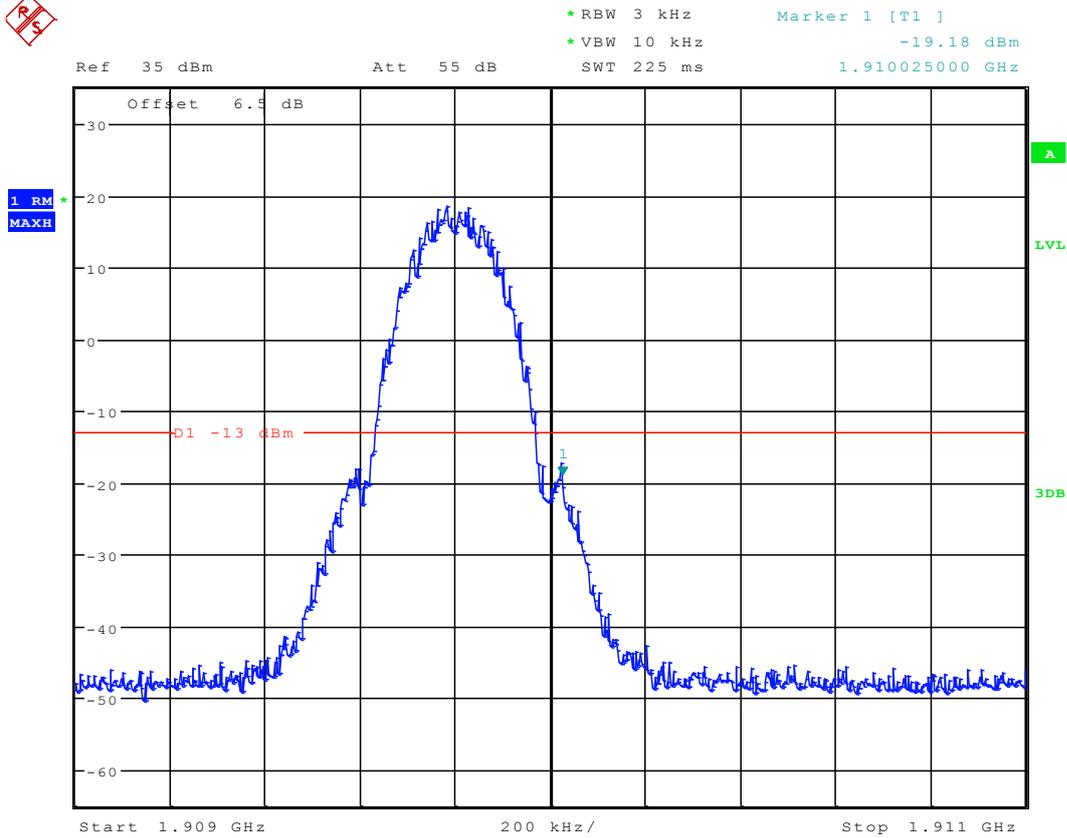
TM1:GPRS/GSM Left Edge Channel 512



Date: 24.JUN.2011 10:38:00



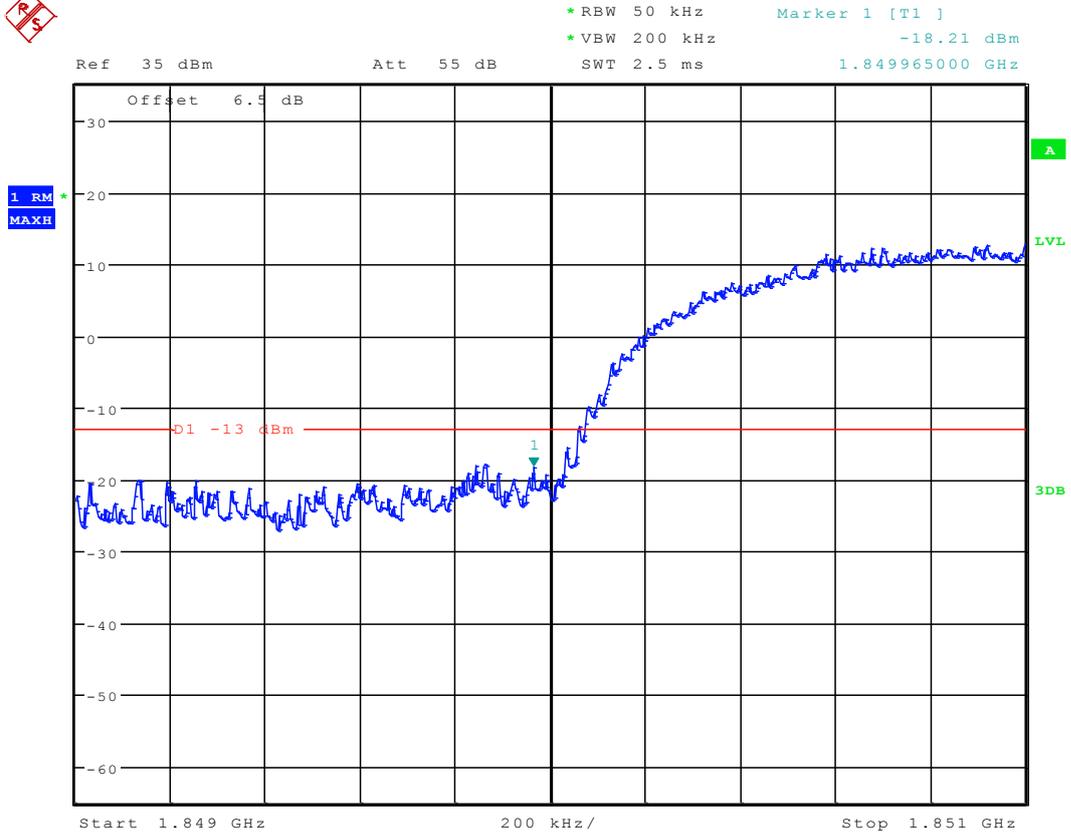
Right Edge Channel 810



Date: 24.JUN.2011 10:38:47



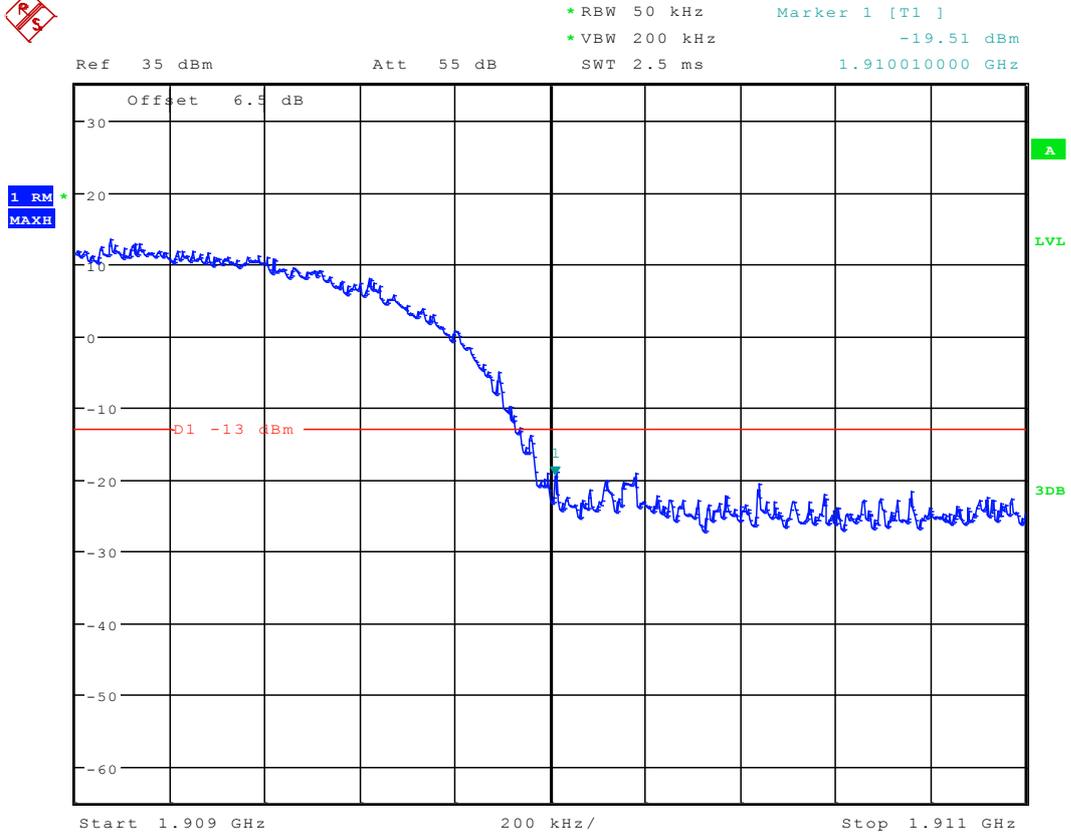
TM2: WCDMA Left dge Channel 9262



Date: 24.JUN.2011 10:29:35



Right Edge Channel 9538



Date: 24.JUN.2011 10:29:48



Appendix D

Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & 24.238

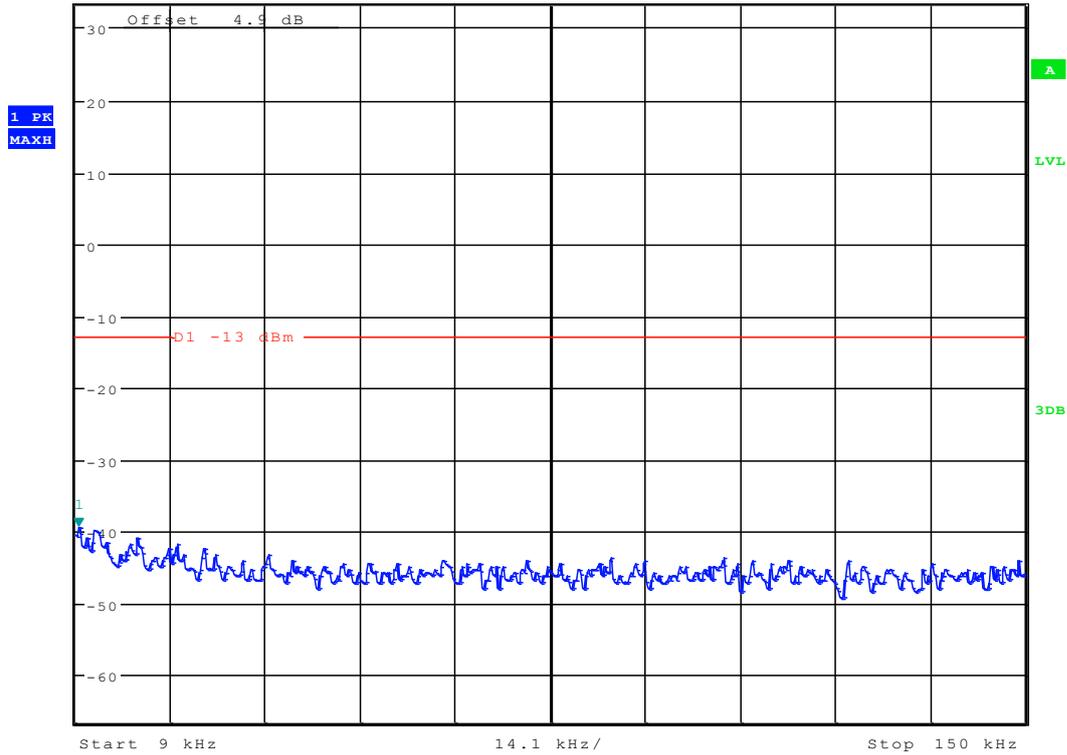


TM1:GPRS/GSM

Channel 512



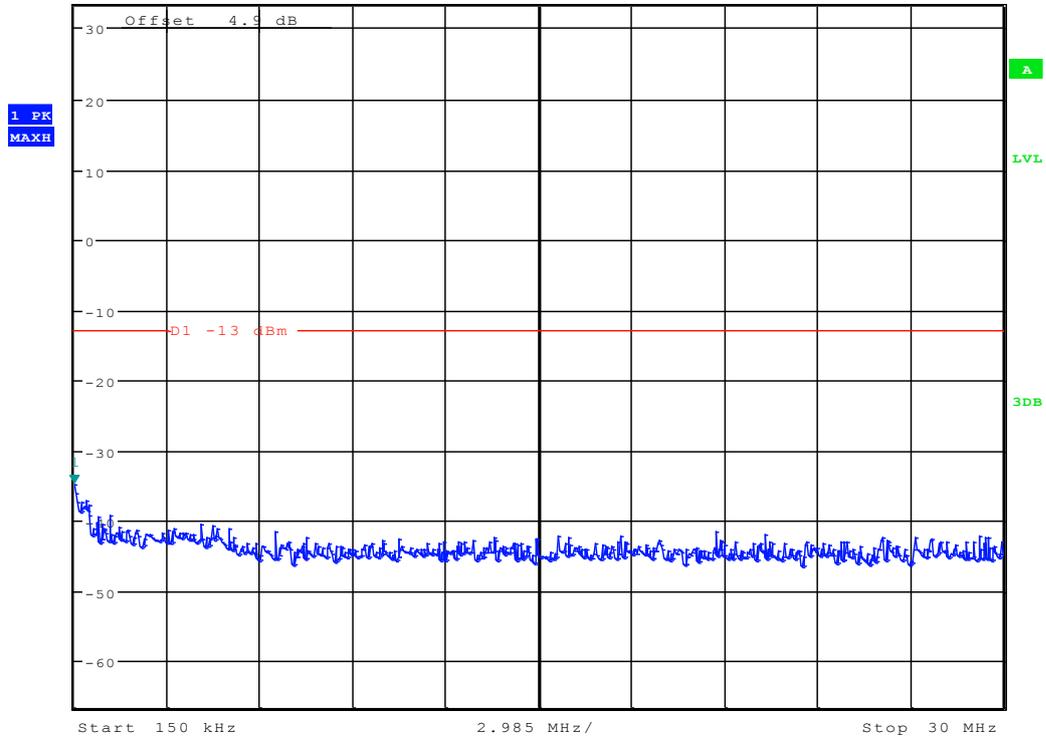
*RBW 1 kHz Marker 1 [T1]
*VBW 10 kHz -39.38 dBm
Ref 33.4 dBm Att 55 dB SWT 145 ms 9.451923077 kHz



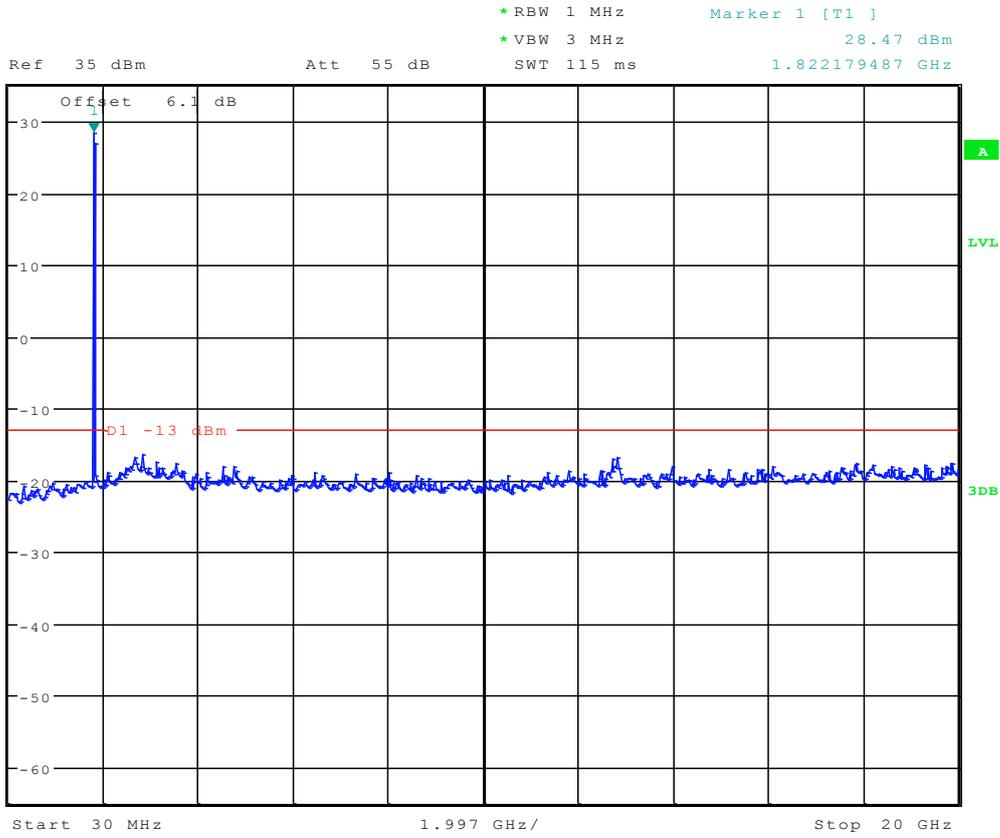
Date: 24.JUN.2011 10:49:27



* RBW 10 kHz Marker 1 [T1]
* VBW 30 kHz -34.70 dBm
Ref 33.4 dBm Att 55 dB SWT 300 ms 150.000000000 kHz



Date: 24.JUN.2011 10:50:10



Date: 24.JUN.2011 10:50:54

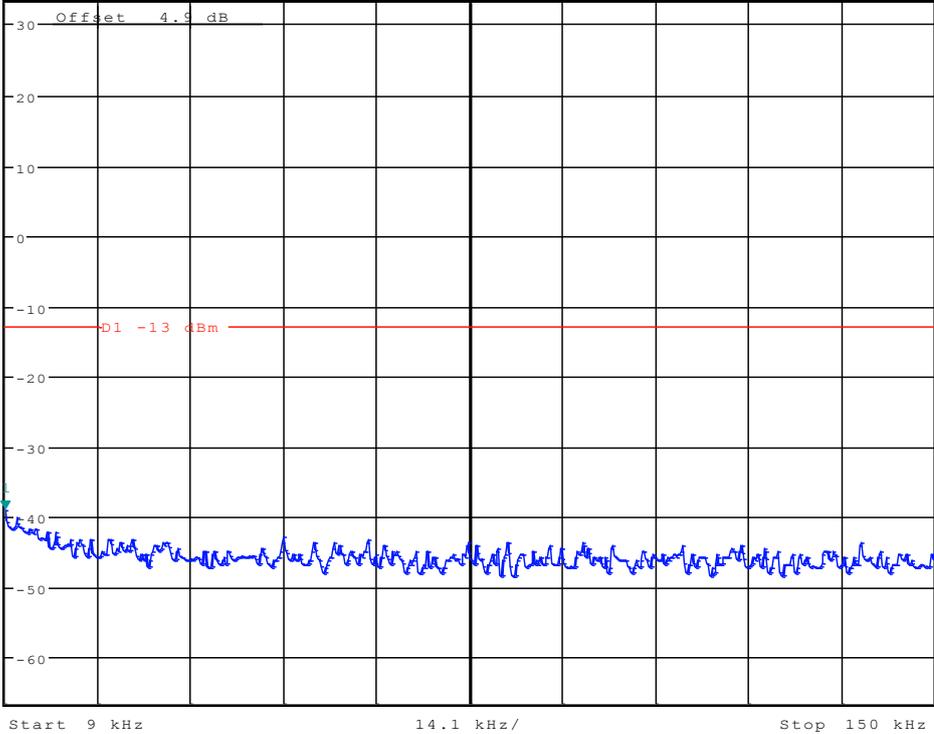


Channel 661



* RBW 1 kHz Marker 1 [T1]
* VBW 10 kHz -38.92 dBm
SWT 145 ms 9.000000000 kHz

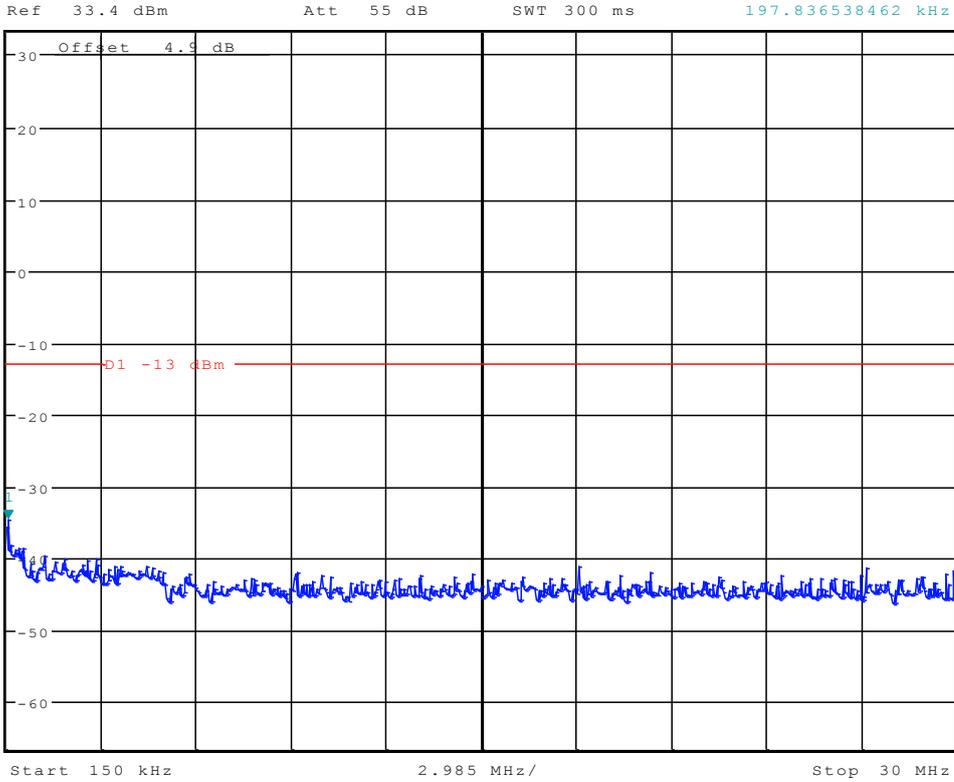
Ref 33.4 dBm Att 55 dB



Date: 24.JUN.2011 10:49:41



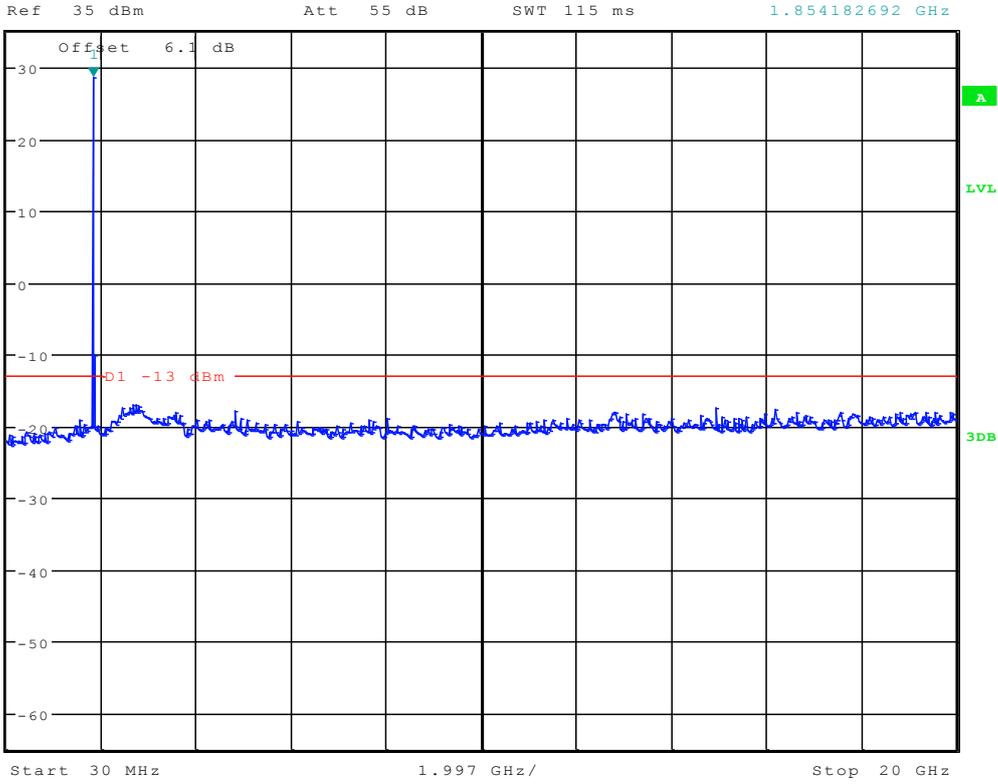
*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -34.53 dBm
SWT 300 ms 197.836538462 kHz



Date: 24.JUN.2011 10:50:25



*RBW 1 MHz Marker 1 [T1]
*VBW 3 MHz 28.50 dBm
SWT 115 ms 1.854182692 GHz



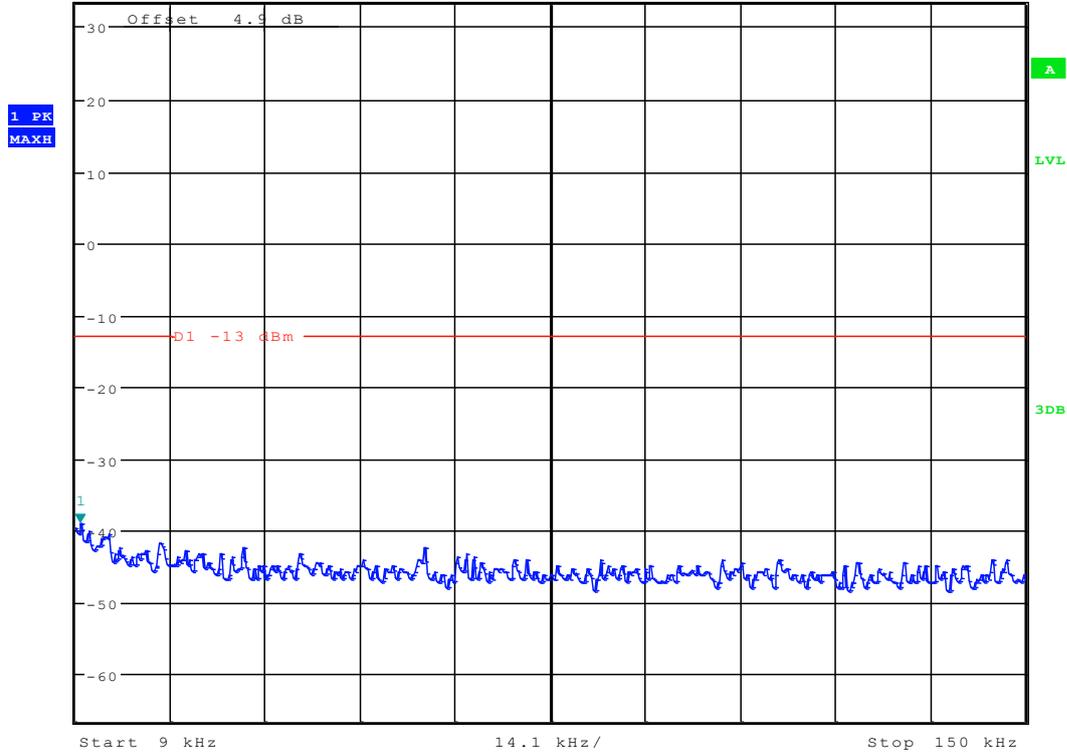
Date: 24.JUN.2011 10:51:08



Channel 810



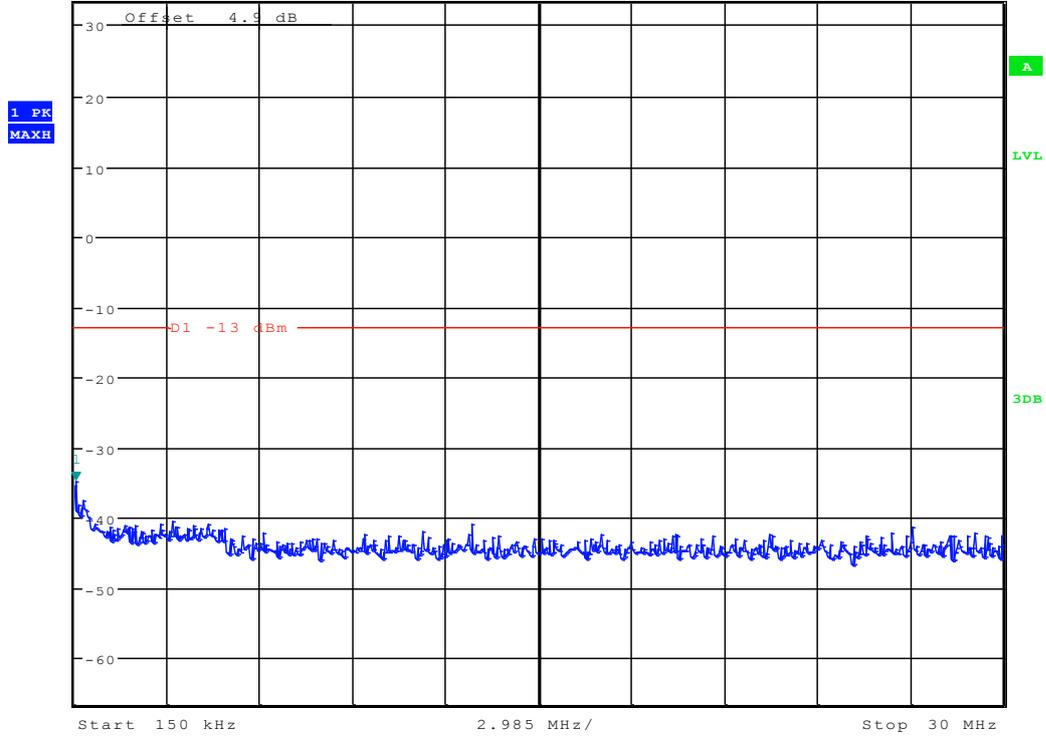
Ref 33.4 dBm Att 55 dB *RBW 1 kHz Marker 1 [T1] *VBW 10 kHz -38.92 dBm
SWT 145 ms 9.677884615 kHz



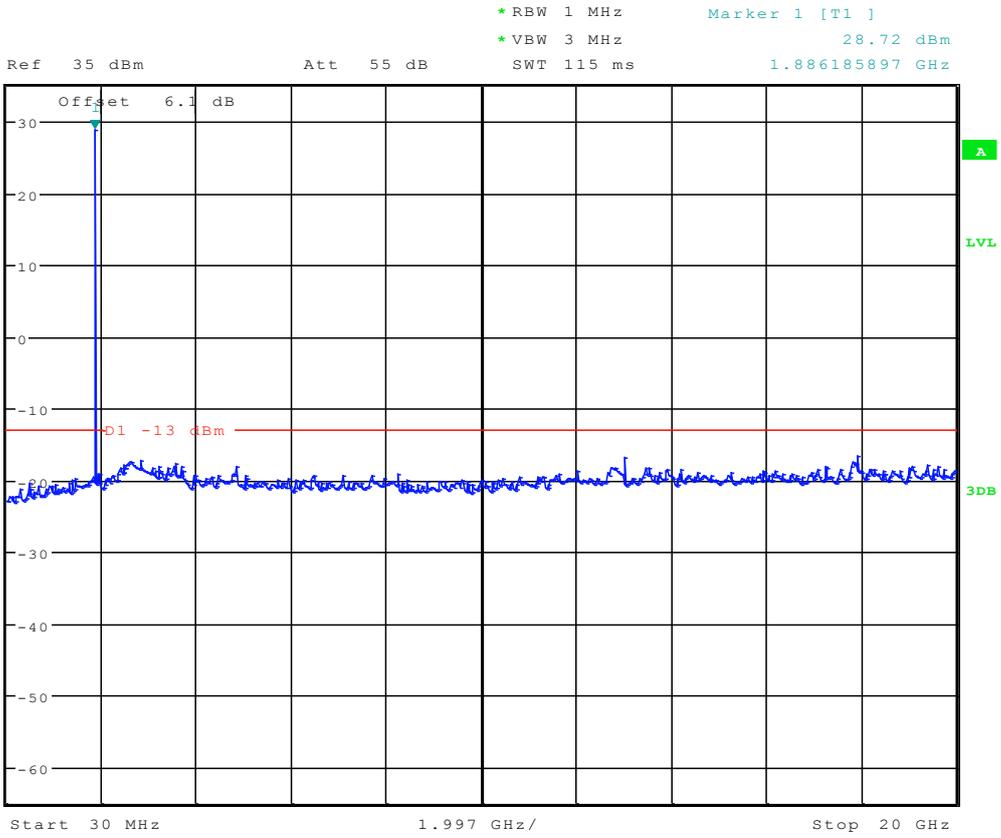
Date: 24.JUN.2011 10:49:55



* RBW 10 kHz Marker 1 [T1]
* VBW 30 kHz -34.76 dBm
Ref 33.4 dBm Att 55 dB SWT 300 ms 197.836538462 kHz



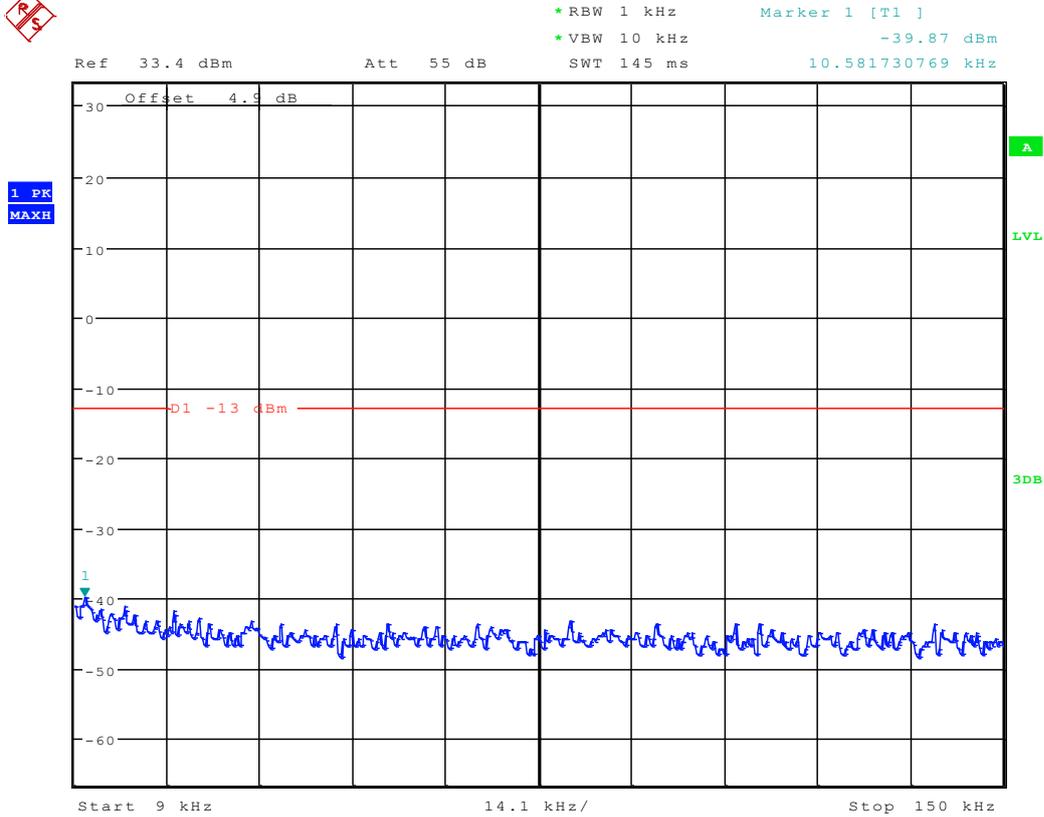
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Date: 24.JUN.2011 10:51:23



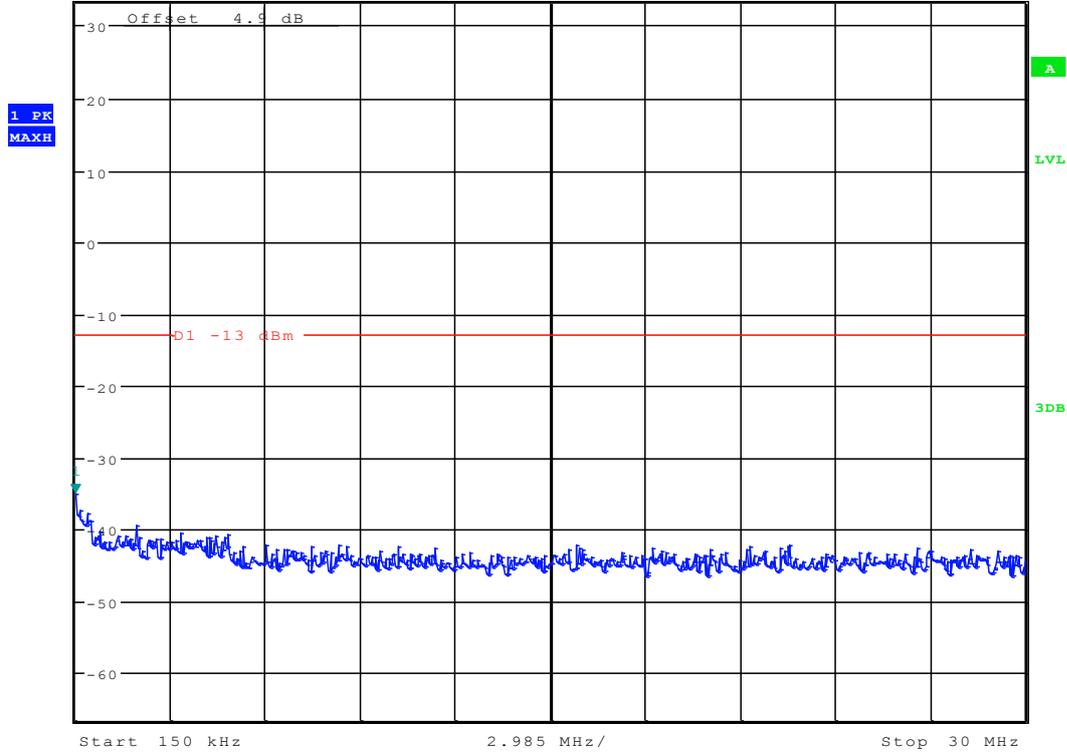
TM2: WCDMA Channel 9262



Date: 24.JUN.2011 10:30:03



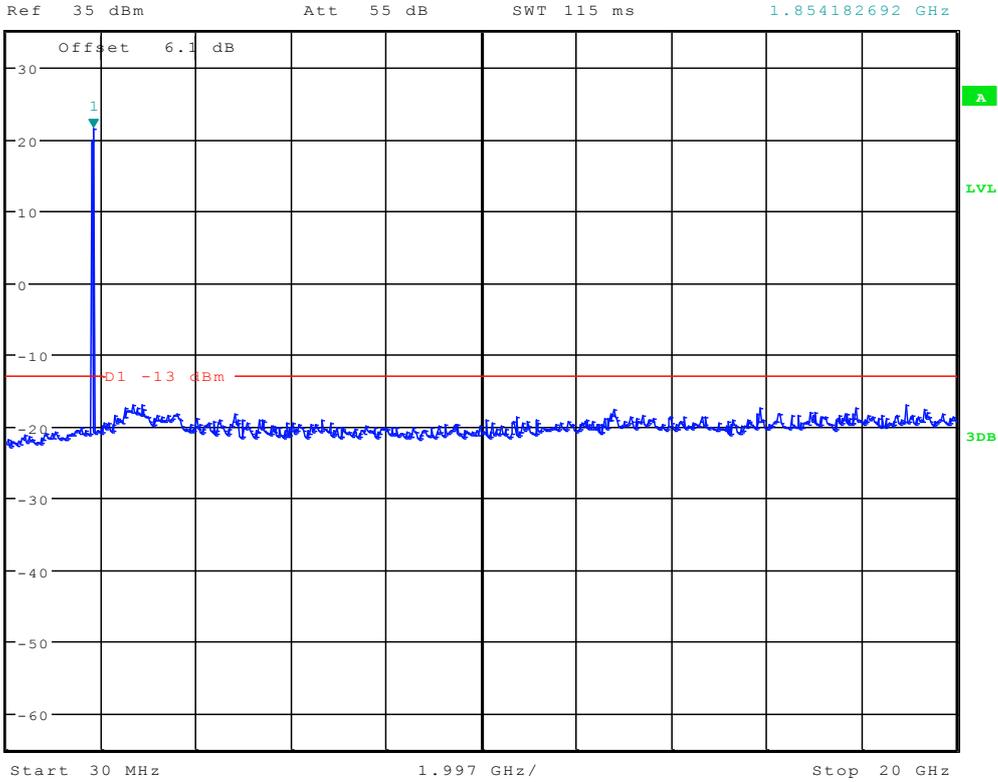
*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -35.04 dBm
Ref 33.4 dBm Att 55 dB SWT 300 ms 150.000000000 kHz



Date: 24.JUN.2011 10:30:46



*RBW 1 MHz Marker 1 [T1]
*VBW 3 MHz 21.46 dBm
SWT 115 ms 1.854182692 GHz



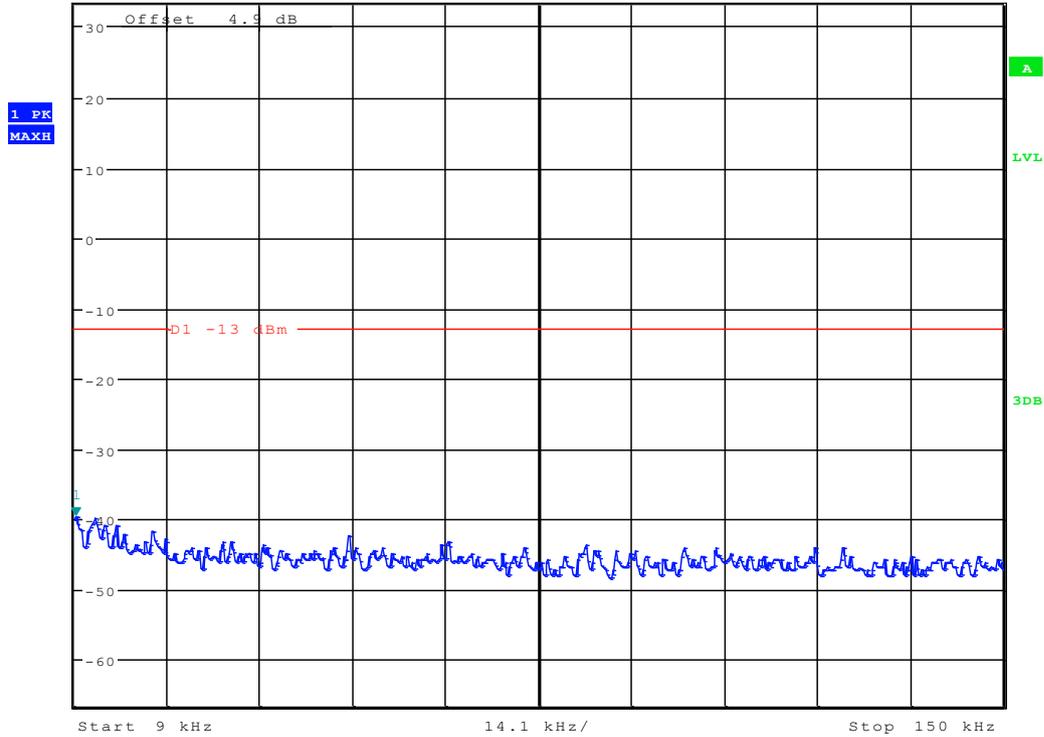
Date: 24.JUN.2011 10:31:30



Channel 9400



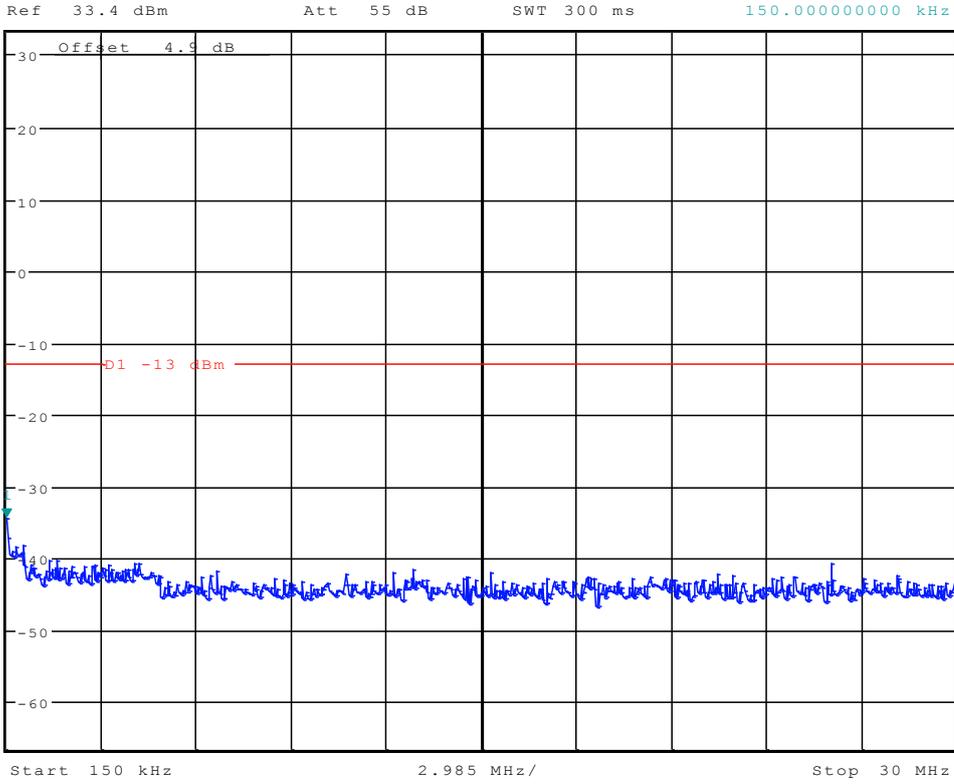
Ref 33.4 dBm Att 55 dB * RBW 1 kHz * VBW 10 kHz SWT 145 ms Marker 1 [T1] -39.67 dBm 9.225961538 kHz



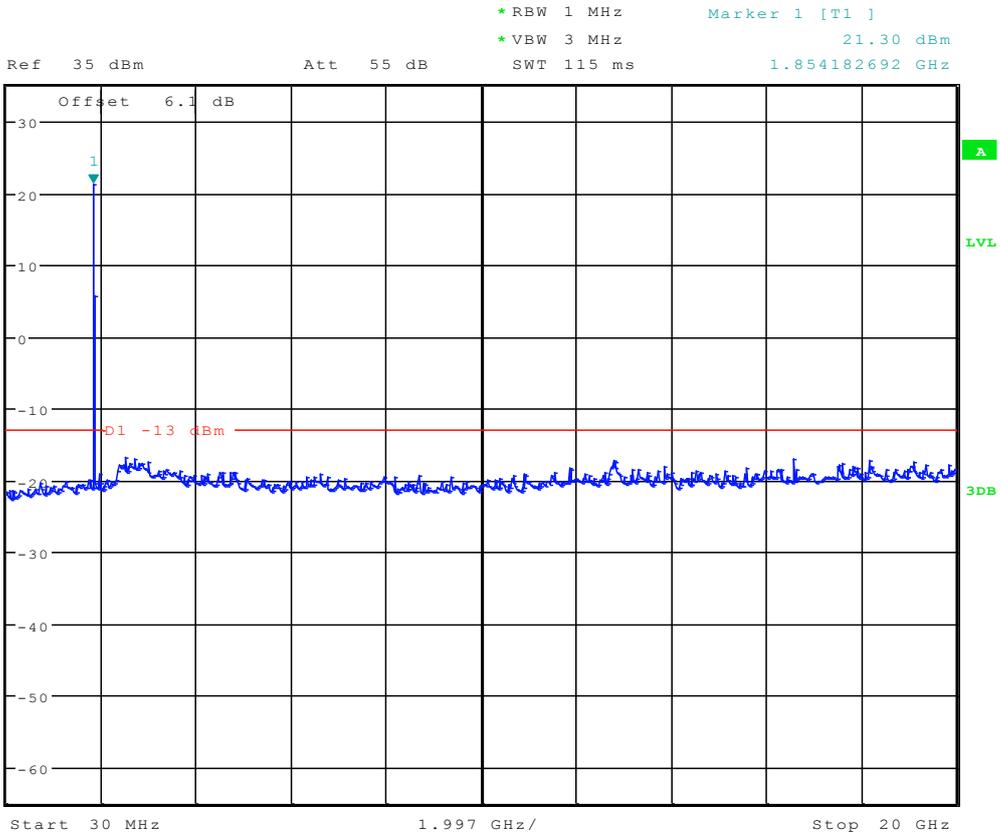
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*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -34.32 dBm
SWT 300 ms 150.000000000 kHz



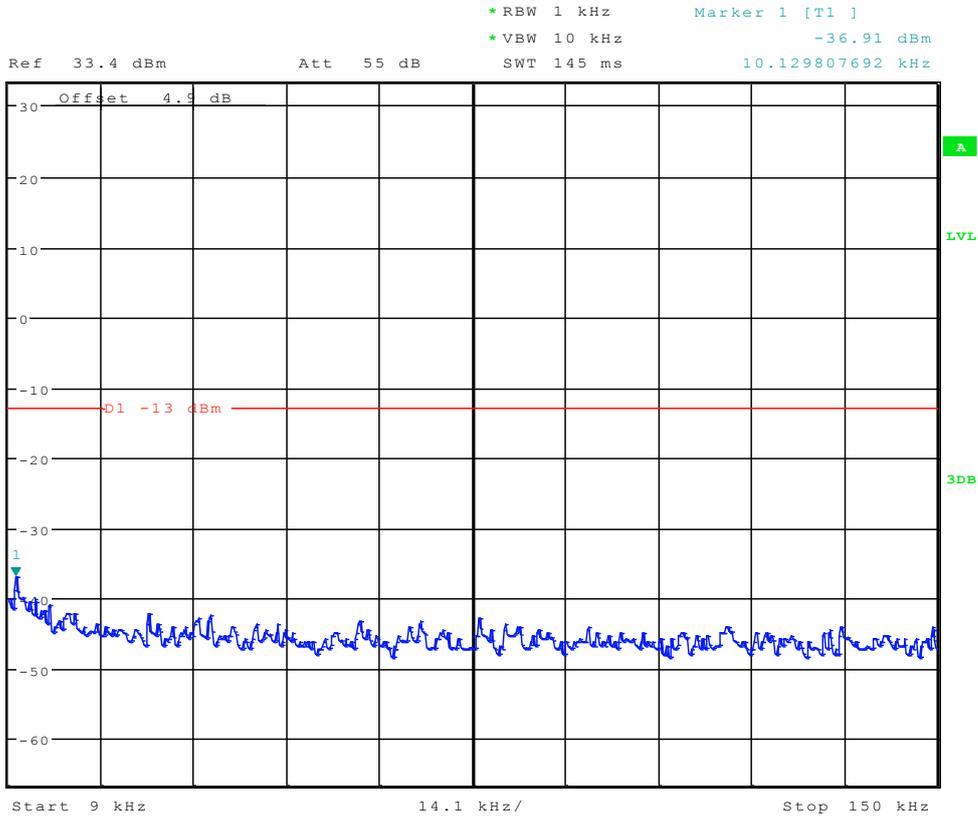
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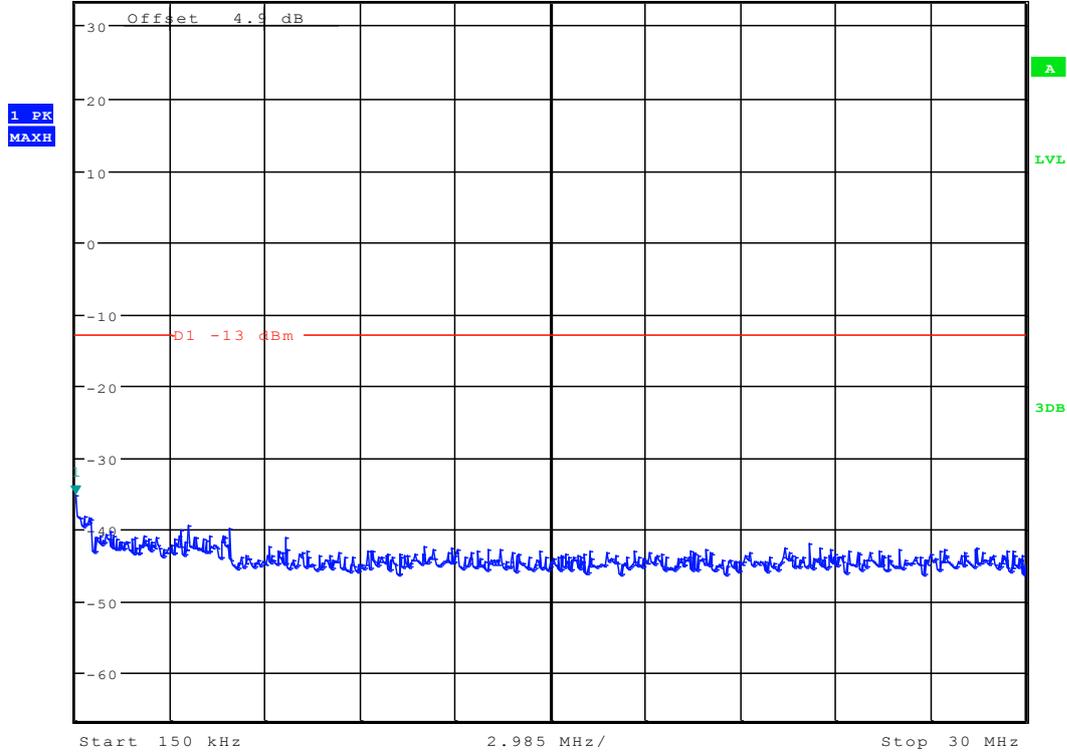
Channel 9538



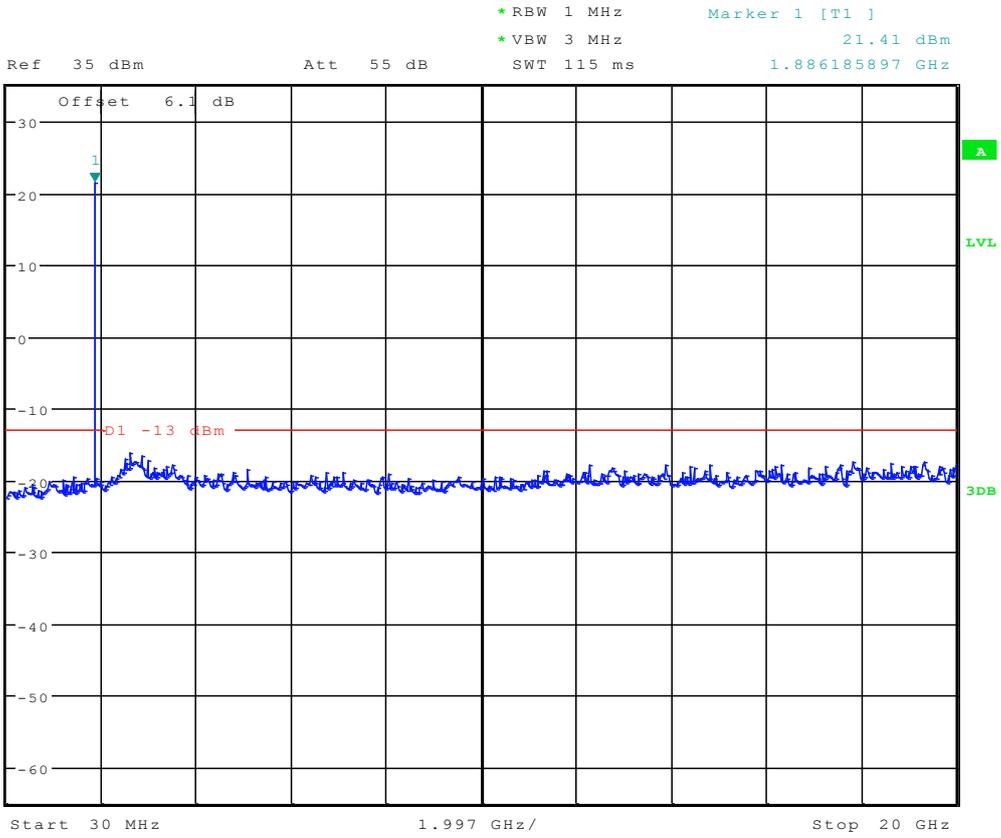
Date: 24.JUN.2011 10:30:32



*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -35.22 dBm
Ref 33.4 dBm Att 55 dB SWT 300 ms 150.000000000 kHz



Date: 24.JUN.2011 10:31:15



Date: 24.JUN.2011 10:31:59



Appendix E

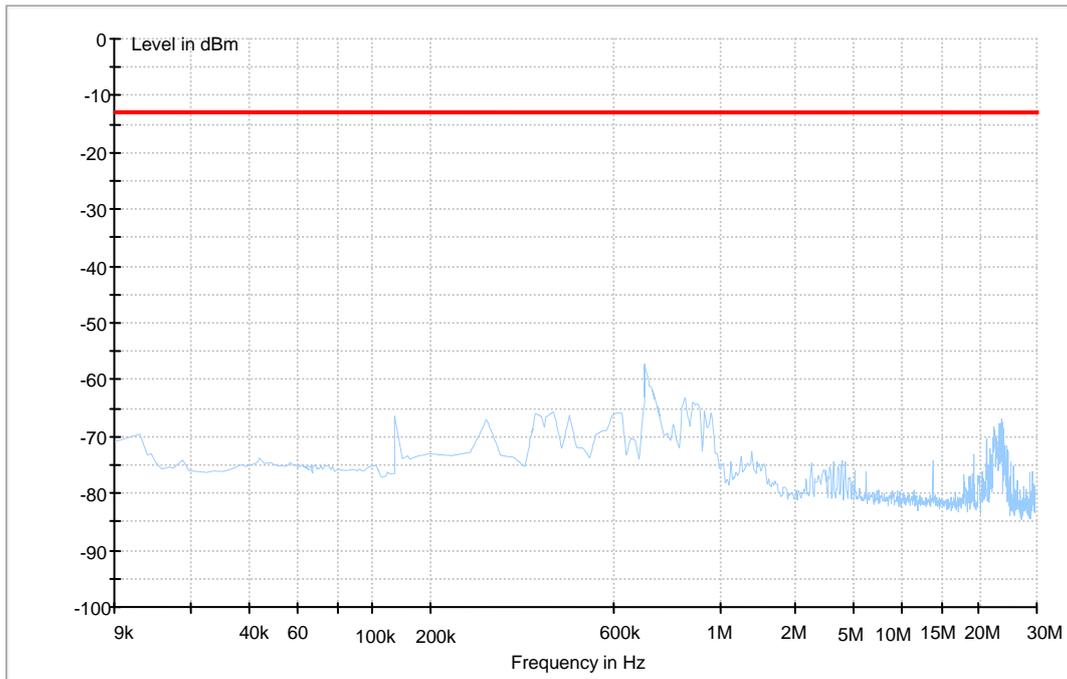
Radiated spurious emission

According to FCC Part 2.1053& Part 24.238



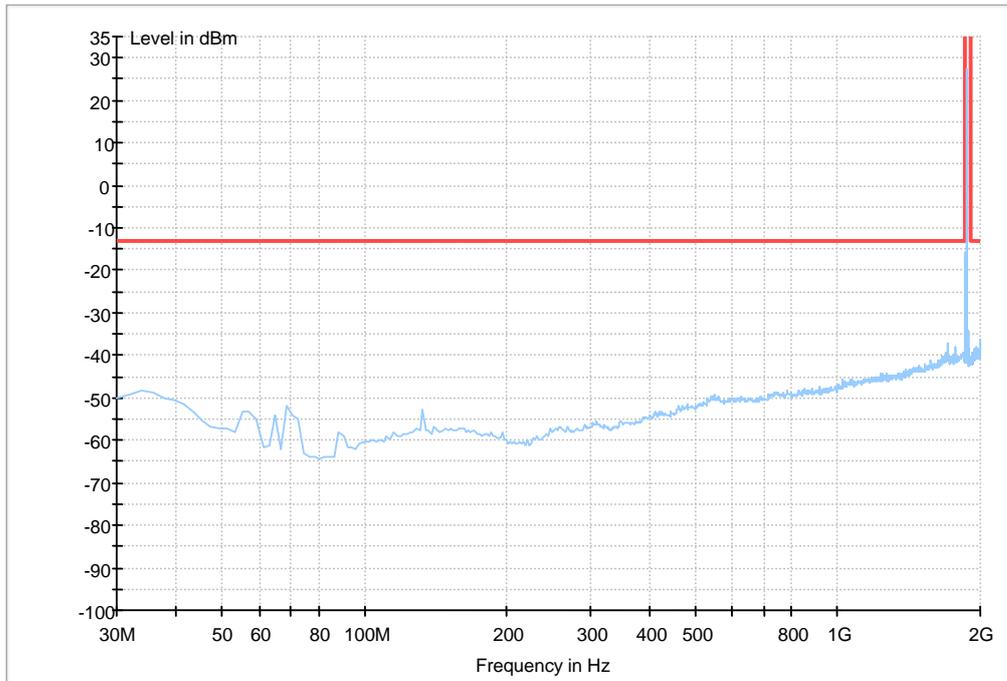
GSM1900

(9kHz-30MHz)



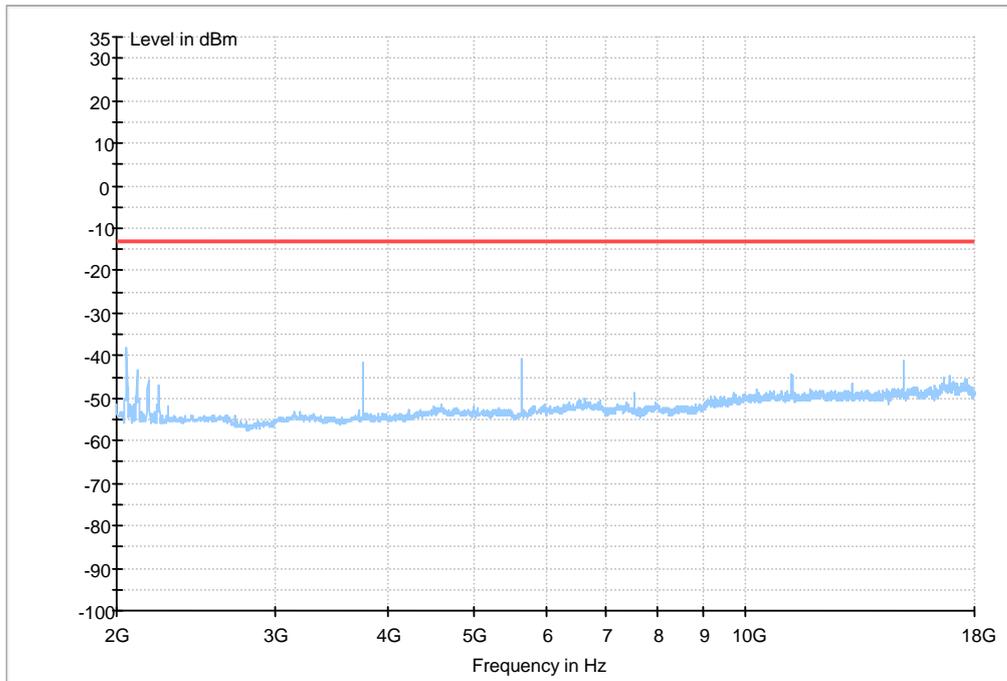


(30MHz~2GHz)



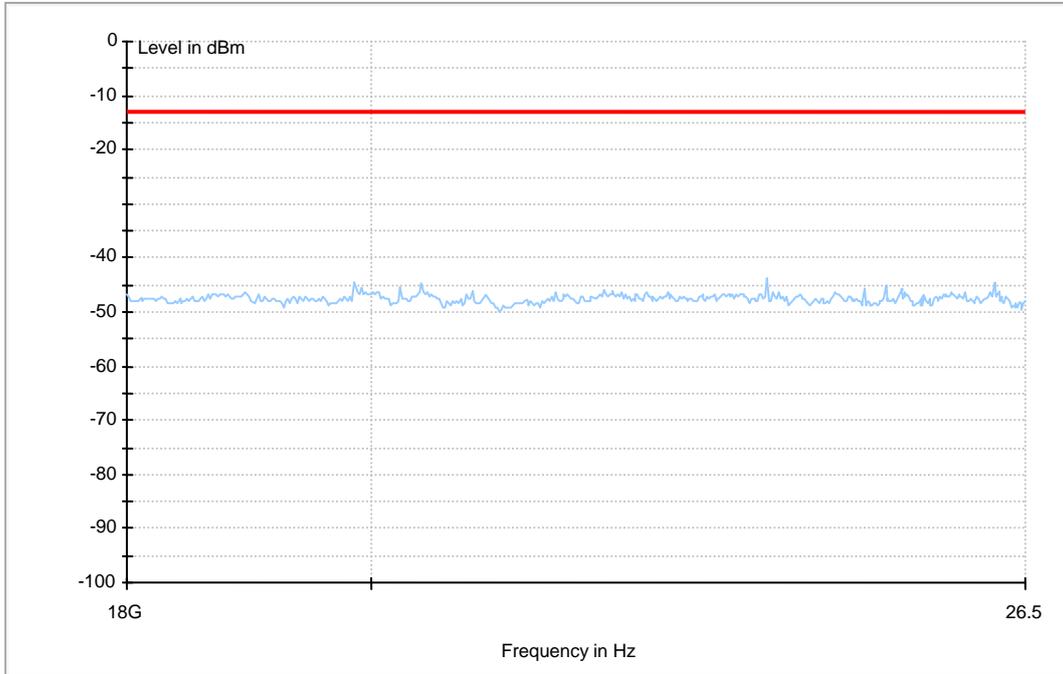


(2GHz~18GHz)





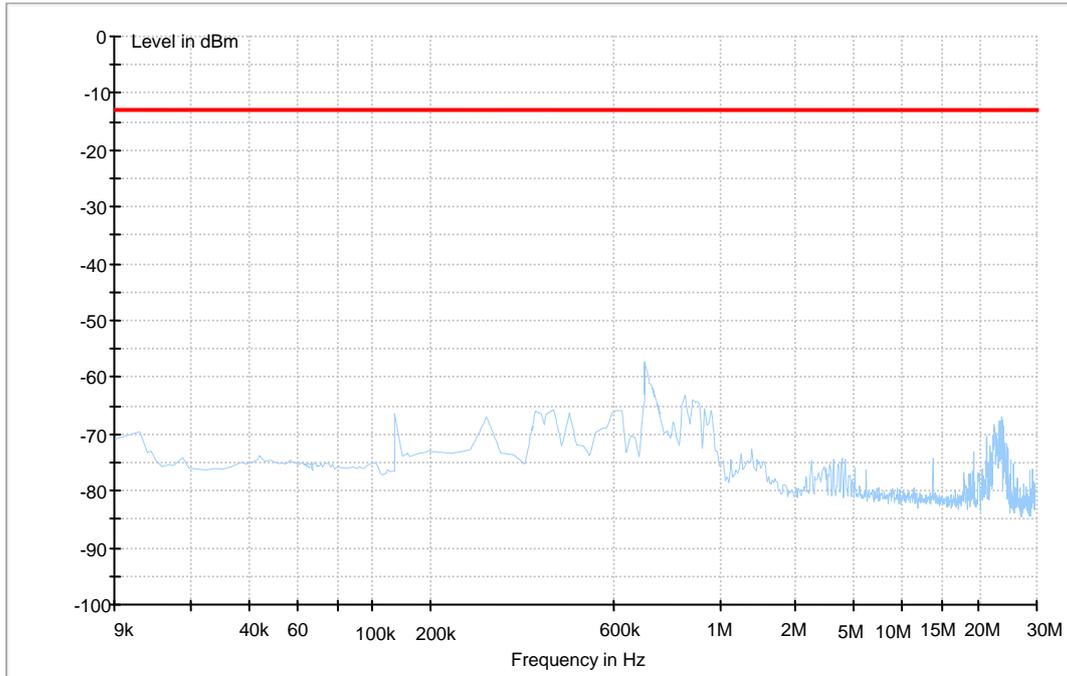
(18GHz-26.5GHz)





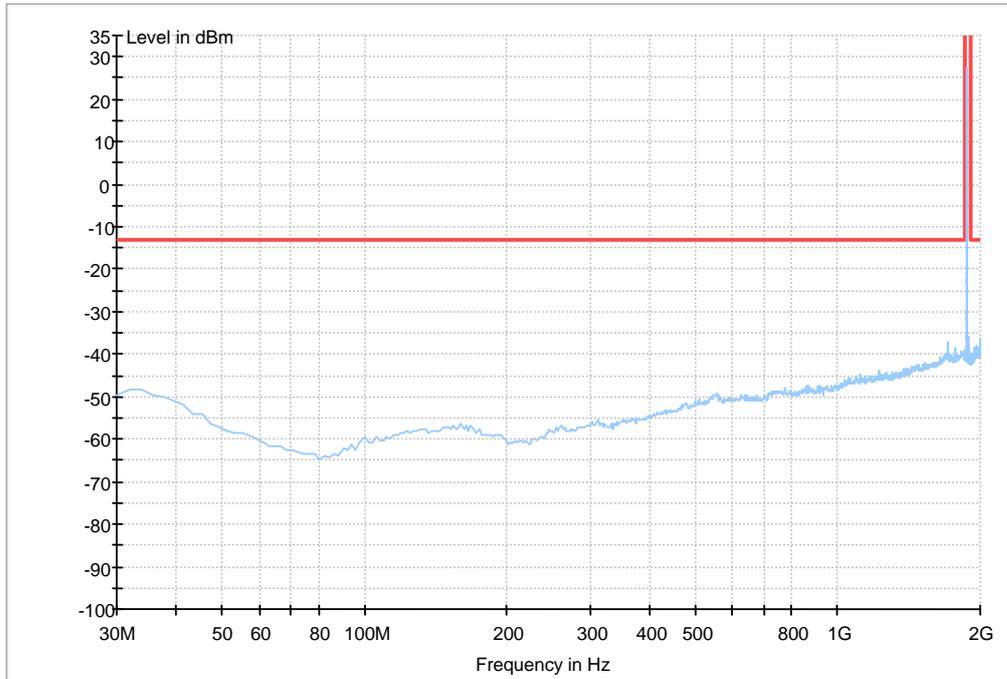
GPRS1900

(9kHz-30MHz)



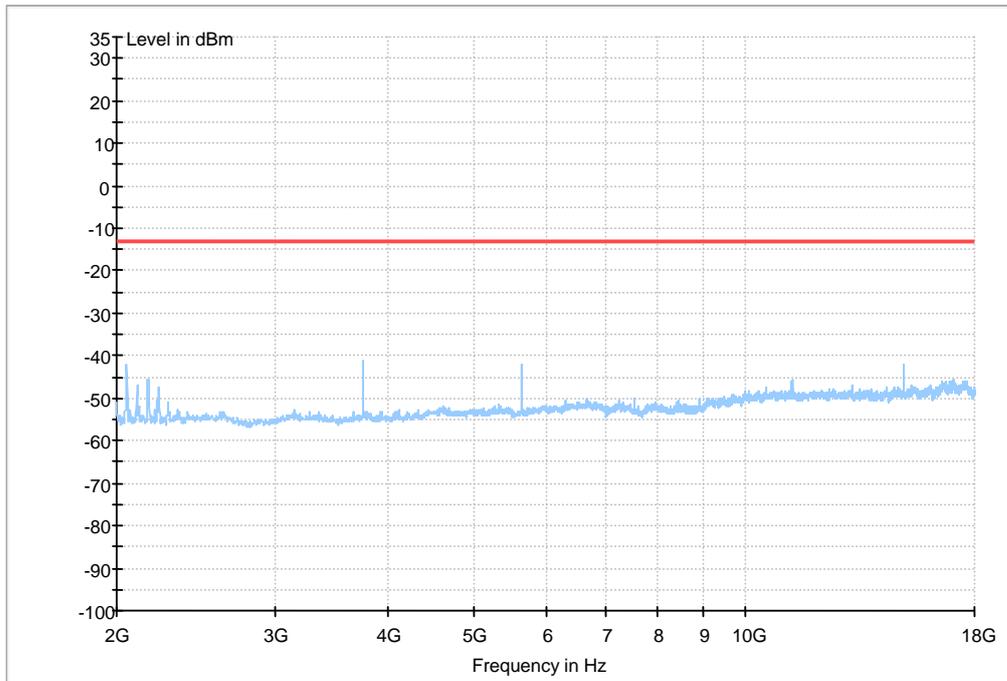


(30MHz~2GHz)



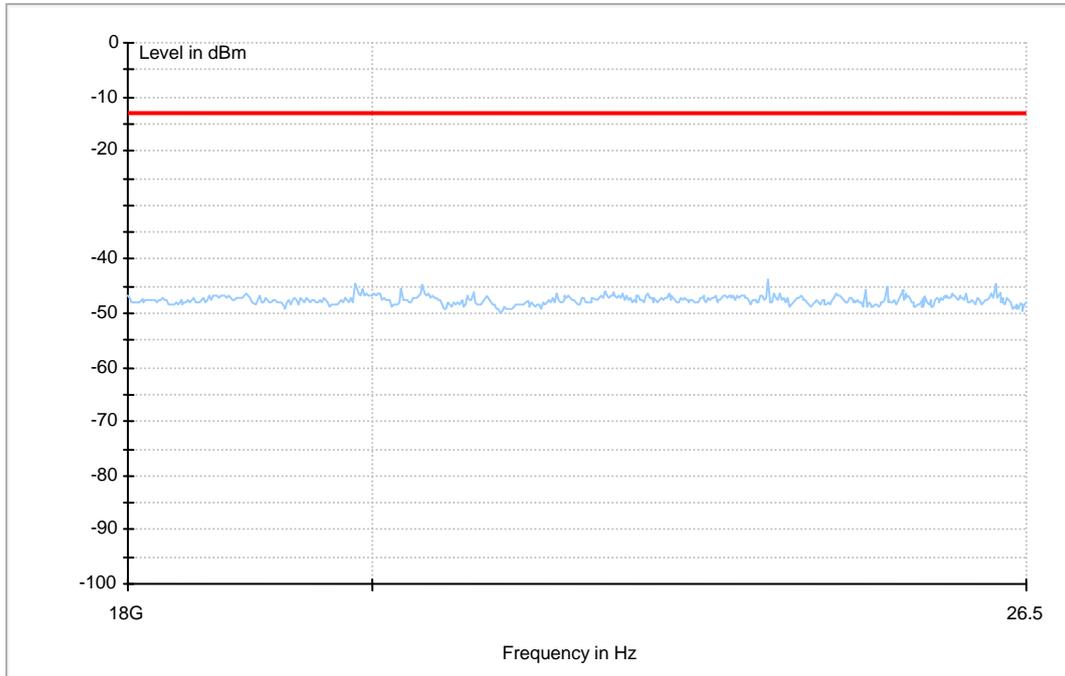


(2GHz~18GHz)





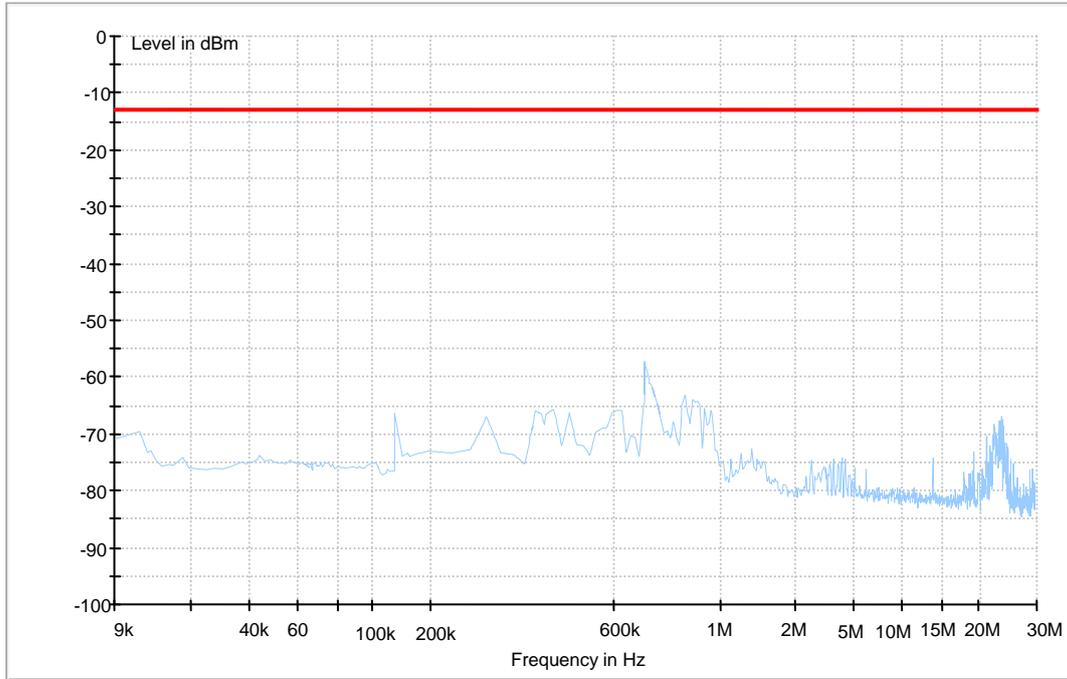
(18GHz-26.5GHz)





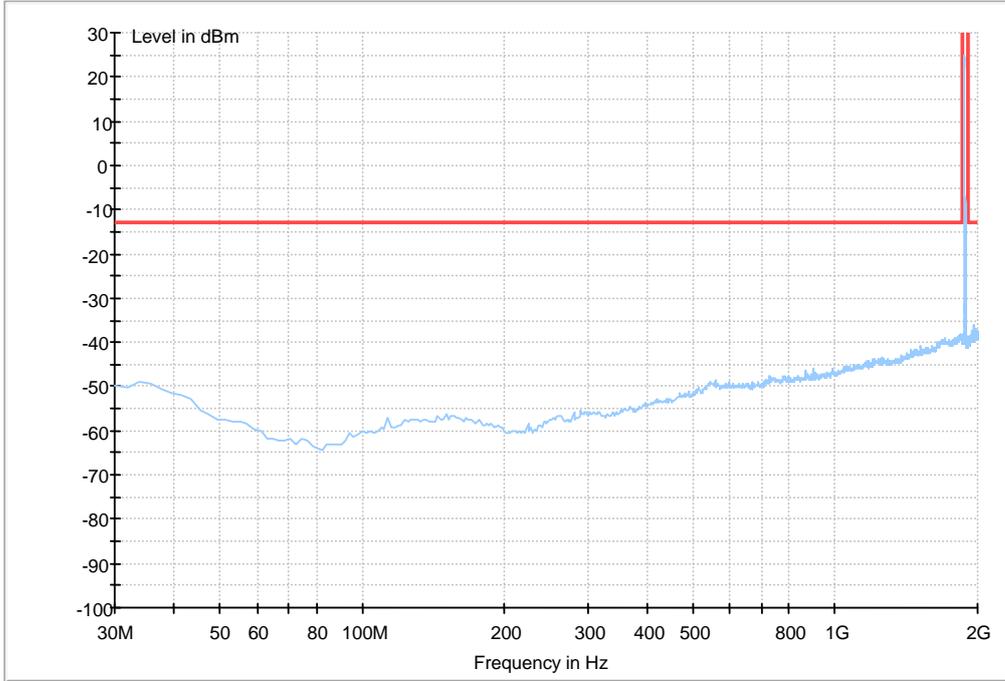
WCDMA BAND II

(9KHz~30MHz)



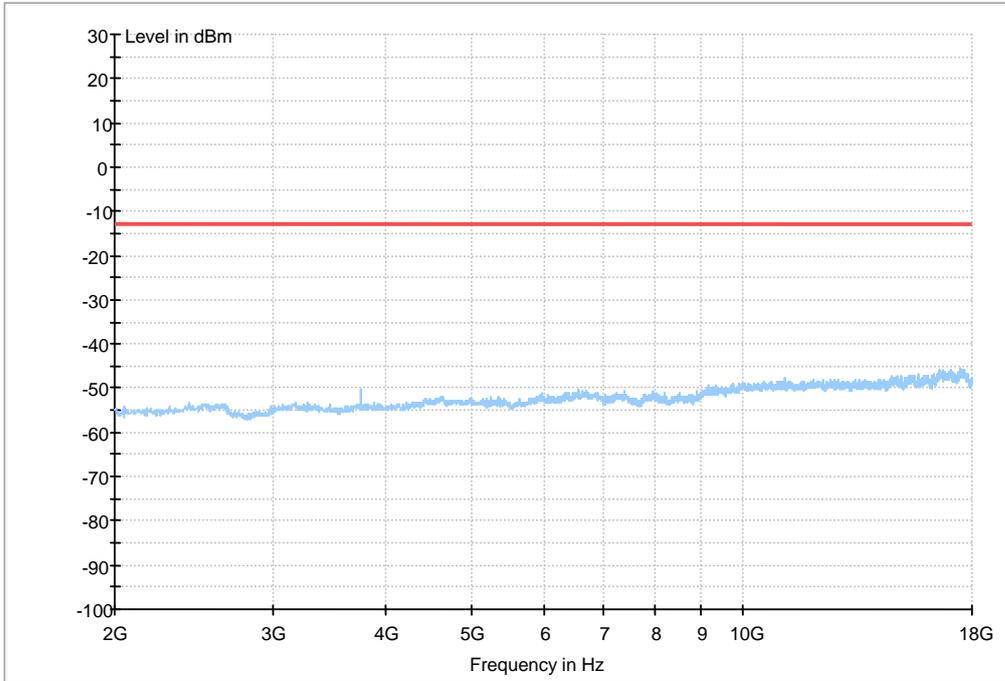


(30MHz~2GHz)



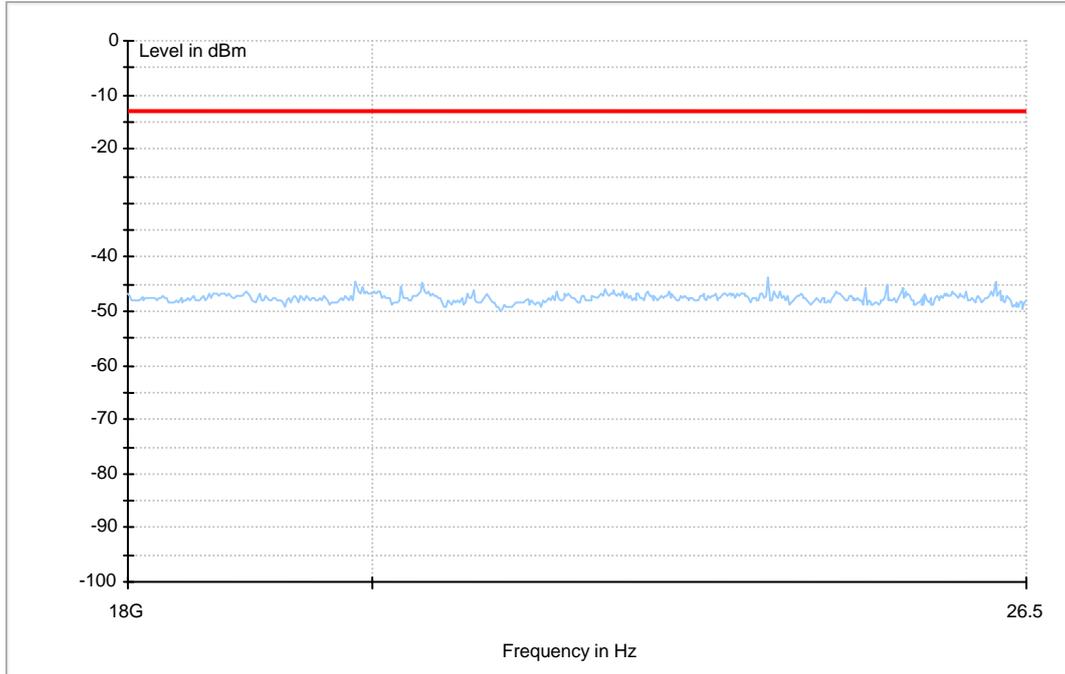


(2GHz~18GHz)





(18GHz~26.5GHz)





Appendix F

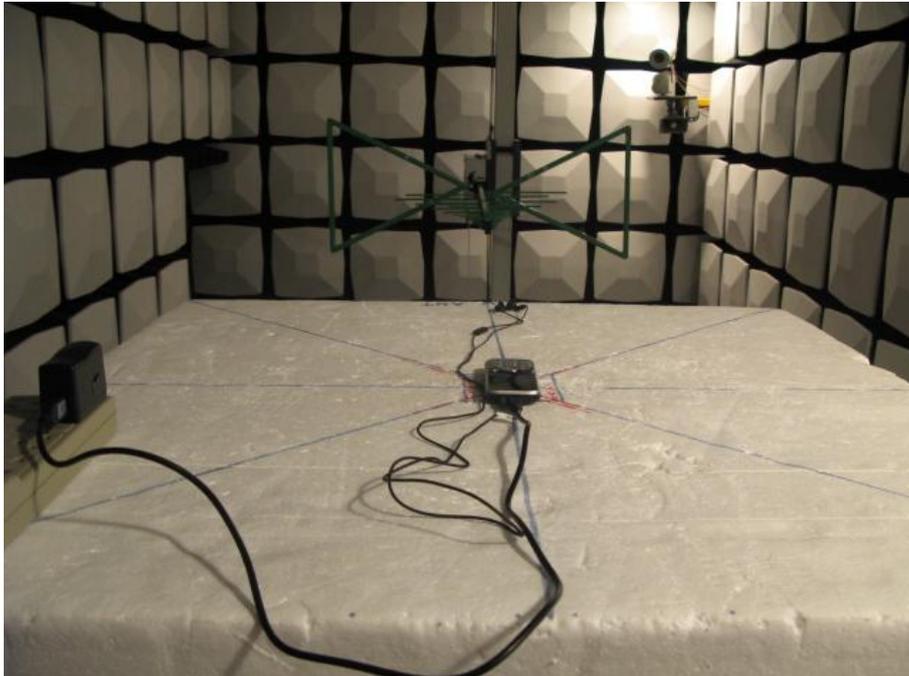
Photos of Radiated Spurious Emissions



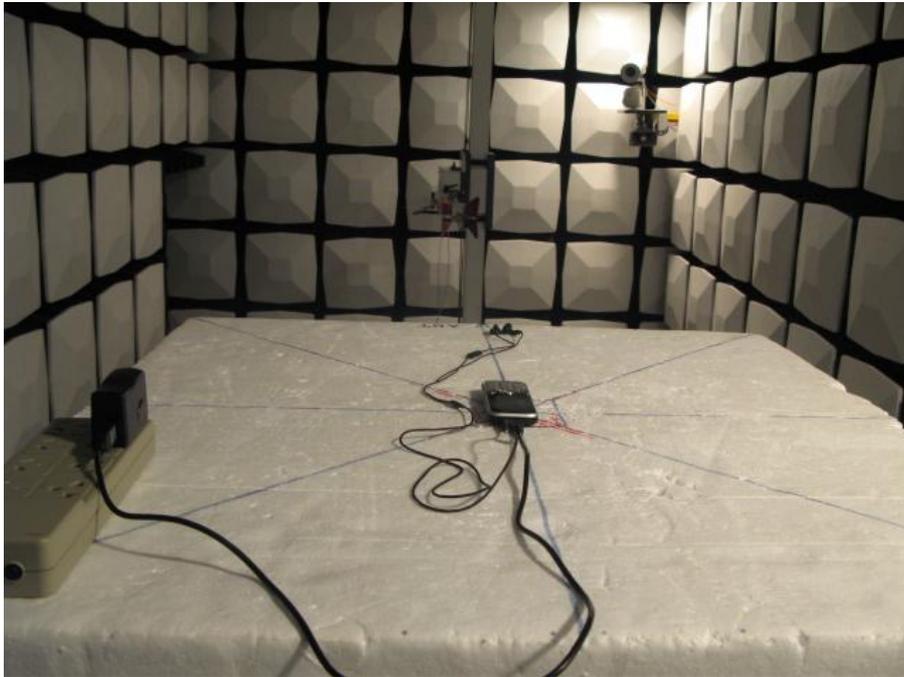
Photos of Test Setup



1 Radiated Spurious Emissions



Radiated Spurious Emission (below 2GHz)



Radiated Spurious Emission (2GHz to18GHz)



Radiated Spurious Emission (18G~26.5GHz)