FCC
RF Test Report

Product Name: Vodafone Mobile Wi-Fi

Model Number: Number: R208

Report No: SYBH(Z-RF)001082012-2002
FCC ID：QISR208

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Tel: +86 755 28780808 Fax: +86 755 89652518

Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
3. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-2.
4. The test report is invalid if not marked with "exclusive stamp for the test report".
5. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
6. The test report is invalid if there is any evidence of erasure and/or falsification.
7. If there is any dissidence for the test report, please file objection to the test centre within 15 days from the date of receiving the test report.
8. Normally, the test report is only responsible for the samples that have undergone the test.
9. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the laboratory.

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Date of Receipt Test Item:	Jul., 31, 2012
Start Date of Test:	Aug., 01, 2012
End Date of Test:	Aug., 07, 2012
Test Result:	Pass

Approved By Senior Engineer	Sep., 05, 2012	Dai Linjun	
	Date	Name	Signature
Reviewed By	Sep., 05, 2012	Cousy Xu	
	Date	Name	Signature
Operated By	Sep., 05, 2012	Huang Qiuliang	
	Date	Name	Signature

Contents

1 General Information

1.1 Applied Standard	
Applied Rules:	47 CFR FCC Part 2:2011, Subpart J 47 CFR FCC Part 24:2011, Subpart E ANSI/TIA 603C:2004
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
1.3 Test Environmental Condition	
Ambient Temperature:	20 – 25 °C
Ambient Relative Humidity:	45 – 55 %
Atmospheric Pressure:	101 kPa

2 Summary

Table 1 Summary of results

Test Case	FCC Part No.	Requirements	Result
PCS Band			
Transmitter Output Power	2.1046 & 24.232	Peak EIRP not exceed 2 W Peak-to-average ratio not exceed 13 dB	Pass
Modulation Characteristics	2.104	Digital modulation	Pass
Occupied Bandwidth	2.104	(Not specified)	Pass
Band Edges Compliance	2.1051 &24.238	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 24.238	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 10th harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 24.238	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 24.235	Stay within the authorized frequency block	Pass

3 Product Description

3.1 Product Information

3.1.1 General Description

R208 DC-HSDPA/2100M/900M/850M/EDGE Quad Band is subscriber equipment in the UMTS/GSM system. R208 implement such functions as RF signal receiving/ transmitting, DC-HSDPA/WCDMA protocol processing, data service etc, and it can act as a Wi-Fi hotspot for user accessing to internet. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. R208 has 3 internal antennas as default Wi-Fi , diversity, and main antenna.

3.1.2 Board Information

Table 2 Board Information

Vodafone Mobile Wi-Fi		
R208		
Board and Module		
Equipment Designation / Description	Hardware version	S/N
Main Board	CH1E5756SM	--

3.1.3 Adapter Technical Data

Name	Manufacture	Description
Adapter	HUAWEI	Adapter,-10degC-45degC,100V, 240V, 5.0V/2.0A,CE 2PIN/DC USB 2.0,ERP V, GHOST/CE, HUAWEI LOGO,White,Terminal Dedicated

3.1.4 Battery Technical Data

Name	Manufacture	Description
Li-ion Battery	Huawei Technologies Co., Ltd.	Battery Model: HB5P1H Rated capacity: 3000mAh Nominal Voltage: ⎓ +3.7V Charging Voltage: ⎓ +4.2V

4 Test Description

4.1 Supported Frequency Range

Characteristics	Description
Downlink	1930 to 1990 MHz
Uplink	1850 to 1910 MHz

4.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	GSM
TX Output Power (per Antenna Port)	GSM system: Power class 1
Channel Spacing(s) / Bandwidth(s)	GSM system: 200 kHz
Designation of Emissions	GSM system: 252KGXW (GMSK modulation), 259KG7W (8PSK modulation)

4.3 Antenna Gain

Antenna Gain(dBi)	1.66

4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal: ⎓ +3.7 V DC Voltage Range: ⎓ +3.6 V to +4.2 V
Input to EUT (AC power)	AC Voltage Nominal: ~ 120 V (50/60 Hz) AC Voltage Range: ~ 100 V to 240 V

5 General Test Conditions / Configurations

5.1 RF Channels under Test

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
TM1/TM2	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0MHz	1909.8MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz

5.2 Test Modes

Test Mode	Test Modes Description
TM1	GSM/GPRS, GMSK modulation
TM2	EDGE, 8PSK modulation

5.3 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.6V
	VN	3.7V
	VH	4.2V

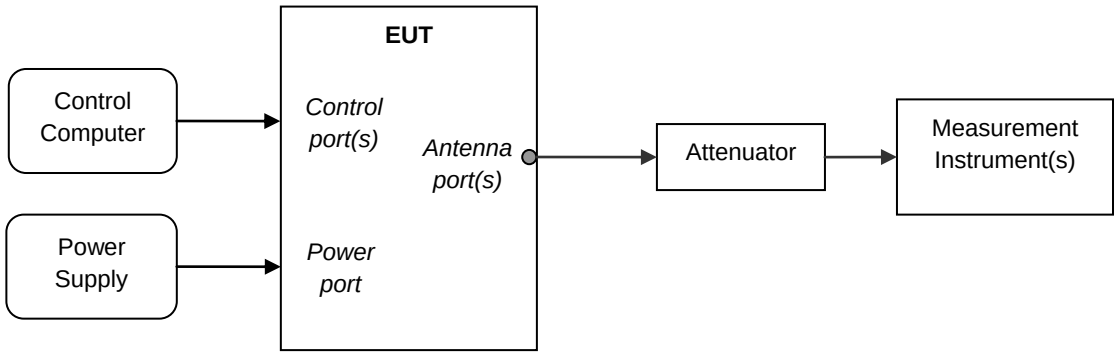
NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

5.4 Test Setup

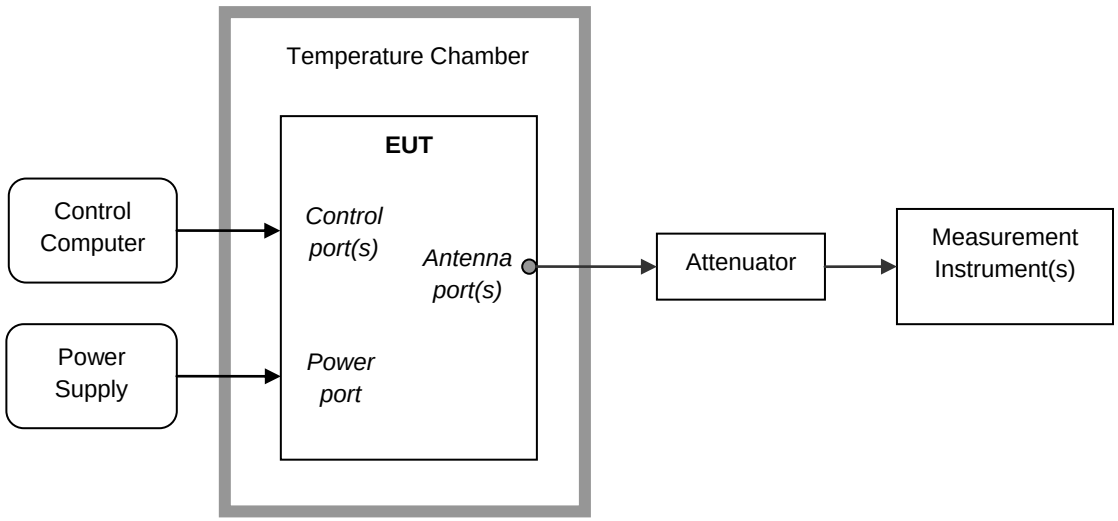
5.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

5.4.2 Test Setup 1



5.4.3 Test Setup 2



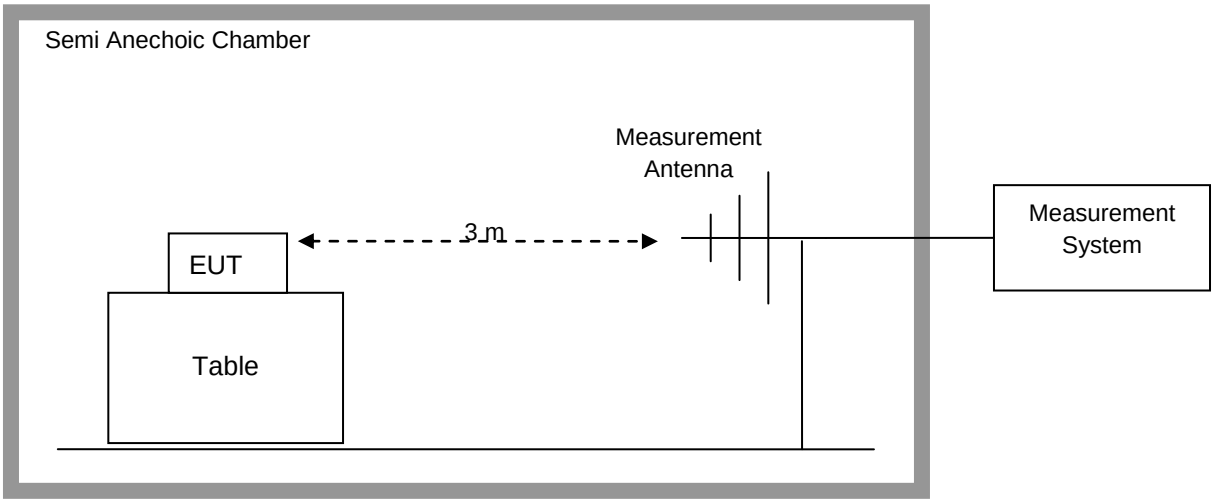
5.4.4 Test Setup 3

NOTE1: Effective radiated power (ERP) or Effective Isotropic radiated power (EIRP) refers to the EUT radiation power output, assuming all emissions are radiated from half-wave dipole antennas or horn antennas.

NOTE2: The EUT was set on insulator 80cm above the Ground Plane. The setup and test methods were according to ANSI-TIA-603C 2004.The measurements were carried through with a Rohde and Schwarz Test Receiver and control software.

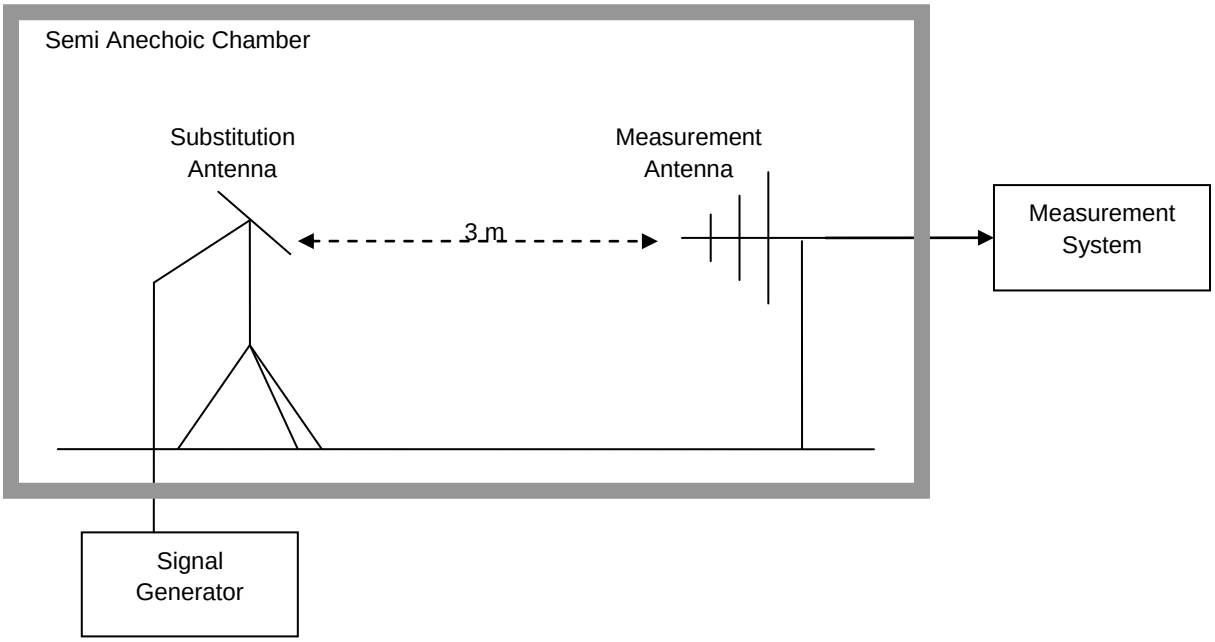
Step 1: Pre-test to find the Maximum ERP or EIRP

1. Connect the test system according to the following figure. EUT is running for 30 minutes before test, and measurement instruments are warming-up for 30 minutes.
2. Set up communication link between Universal radio communication tester and EUT, set EUT working frequency, and control EUT to transmit at maximum power.
3. Set the center frequency of the signal analyzer or receiver to the EUT's operating frequency, the RBW is equal to the emission bandwidth of the signal. Set RMS detector for the test, and the span is equal to 2 times of emission bandwidth, the other settings should remain automatic. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0°to 360°. The receiver antenna has two polarizations V and H. A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.
4. Changing EUT working frequency and measuring the RF power at channel L, M, H respectively. Complete the test data.


Semi Anechoic Chamber
Measurement
Antenna
3 m
EUT
Table
Measurement
System

Step 2: Substitution method to verify the maximum ERP or EIRP

1. Measurement setup is according to the following figure. EUT was substituted by antenna, and the polarization is identical with the test antenna; the signal generator was connected to the substitution antenna.
2. The radiated output power, measured by signal analyzer set, is the same as recorded in above. Then this power level is matched by a signal from a calibrated signal generator which is substituted for EUT. The power supplied by the generator is then equal to the ERP or EIRP after corrected by the antenna gain and cable loss.



5.5 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1 & Test Setup 3
	Detector	RMS
	RF Channels (TX)	L, M, H
	Test Mode	TM1/TM2
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	L, M, H
	Test Mode	TM1/TM2
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	L, H
	Test Mode	TM1/TM2
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	L, M,H
	Test Mode	TM1/TM2
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	PK
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Temperature.
	Test Setup	Test Setup 2
	RF Channels (TX)	M

Test Case	Test Conditions	
	Test Mode	TM1/TM2

6 Main Test Instruments

Table 3 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sept., 27, 2012
Universal Radio Communication Tester	R&S	CMU200	105822	Oct., 24, 2012
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec., 14, 2012
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug., 31, 2013
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr., 20, 2013
Signal Analyzer	R&S	FSQ31	200021	Sept., 27, 2012
Temperature Chamber	WEISS	WKL64	24600294	Jan., 03, 2013
Signal generator	Agilent	E8257D	MY49281095	Jul., 09, 2013
Vector Signal Generator	R&S	SMU200A	104162	Sept., 07, 2012
Test receiver	R&S	ESU26	100150	May., 24, 2013
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec., 13, 2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec., 13, 2012
Horn Antenna	R & S	HF906	100683	May., 16, 2013
Horn Antenna	R & S	HF906	100684	May., 16, 2013
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	Sep.,15, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	Sep., 15, 2012

NOTE: All the test equipment are calibrated once a year.

7 Test Results

No.	Test Item	Test Result
1	Transmitter Output Power	Appendix A
2	Modulation Characteristics	Appendix B
3	Occupied Bandwidth	Appendix C
4	Band Edges Compliance	Appendix D
5	Spurious Emission at Antenna Terminals	Appendix E
6	Radiated Spurious Emissions	Appendix F
7	Frequency Stability	Appendix G
8	Photos of Radiated Spurious Emissions	Appendix H

NOTE: There is no test data in Appendix H, only Photos of Test Setup for Field Strength of Spurious Radiation.

8 Measurement Uncertainty

For a 95% confidence level (k=2), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	U =0.39 dB
Occupied Bandwidth	Magnitude (%)	U=0.2%
Band Edge Compliance	Disturbance Power (dBm)	U=2.0 dB
Conducted Spurious Emissions	Disturbance Power (dBm)	U=2.0 dB
Field Strength of Spurious Radiation	ERP (dBm)	U=4.6 dB (30 MHz – 1GHz) U=3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	U=0.21 ppm

----------The END----------

Appendix A

Transmitter Output Power

According to FCC Part 2.1046 & Part24.232

Conducted Power of Transmitter

	RF Output Power (Conducted)					
TEST CONDITIONS	Channel512(L)		Channel661(M)		Channel810(H)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dBm		dBm		dBm	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	30.35	33	30.18	33	30.08	33
TM2	25.11	33	25.05	33	24.81	33

Peak-to-Average Ratio

	Peak-to-Average Ratio					
TEST CONDITIONS	Channel512(L)		Channel661(M)		Channel810(H)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dB		dB		dB	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	0.3	13	0.2	13	0.3	13
TM2	3.4	13	3.2	13	3.3	13

Effective Isotropic Radiated Power of Transmitter (EIRP)

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	32.01	Horn Ant.	28.55	4.5	1	32.05	33	Pass
TM1	1880.0	31.84	Horn Ant.	28.39	4.5	1	31.89	33	Pass
TM1	1909.8	31.74	Horn Ant.	27.95	4.8	1	31.75	33	Pass
TM2	1850.2	26.77	Horn Ant.	23.28	4.5	1	26.78	33	Pass
TM2	1880.0	26.71	Horn Ant.	23.22	4.5	1	26.72	33	Pass
TM2	1909.8	26.47	Horn Ant.	22.68	4.8	1	26.48	33	Pass

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

EIRP [dBm] = SGP [dBm] – Cable Loss [dB] + Gain [dBi]

b, SGP=Signal Generator Level

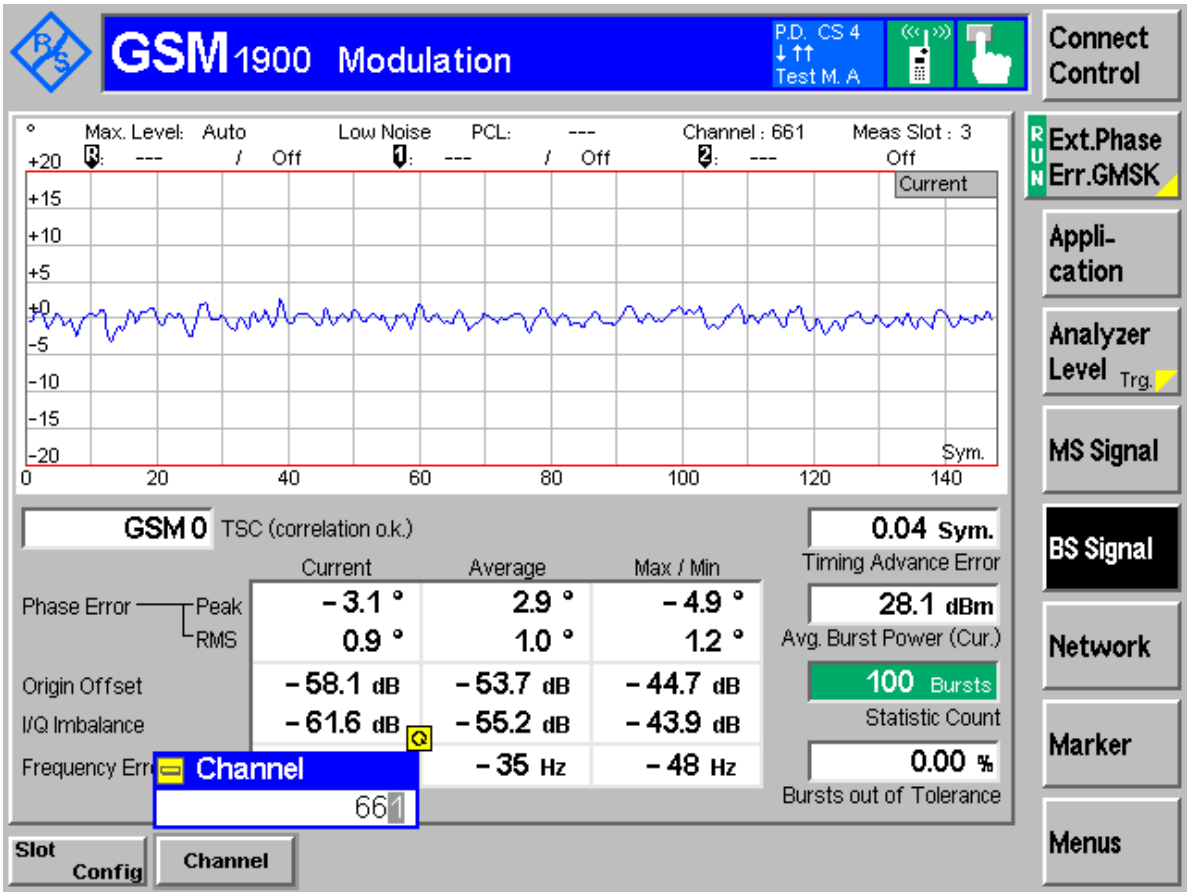
----------The END----------

Appendix B

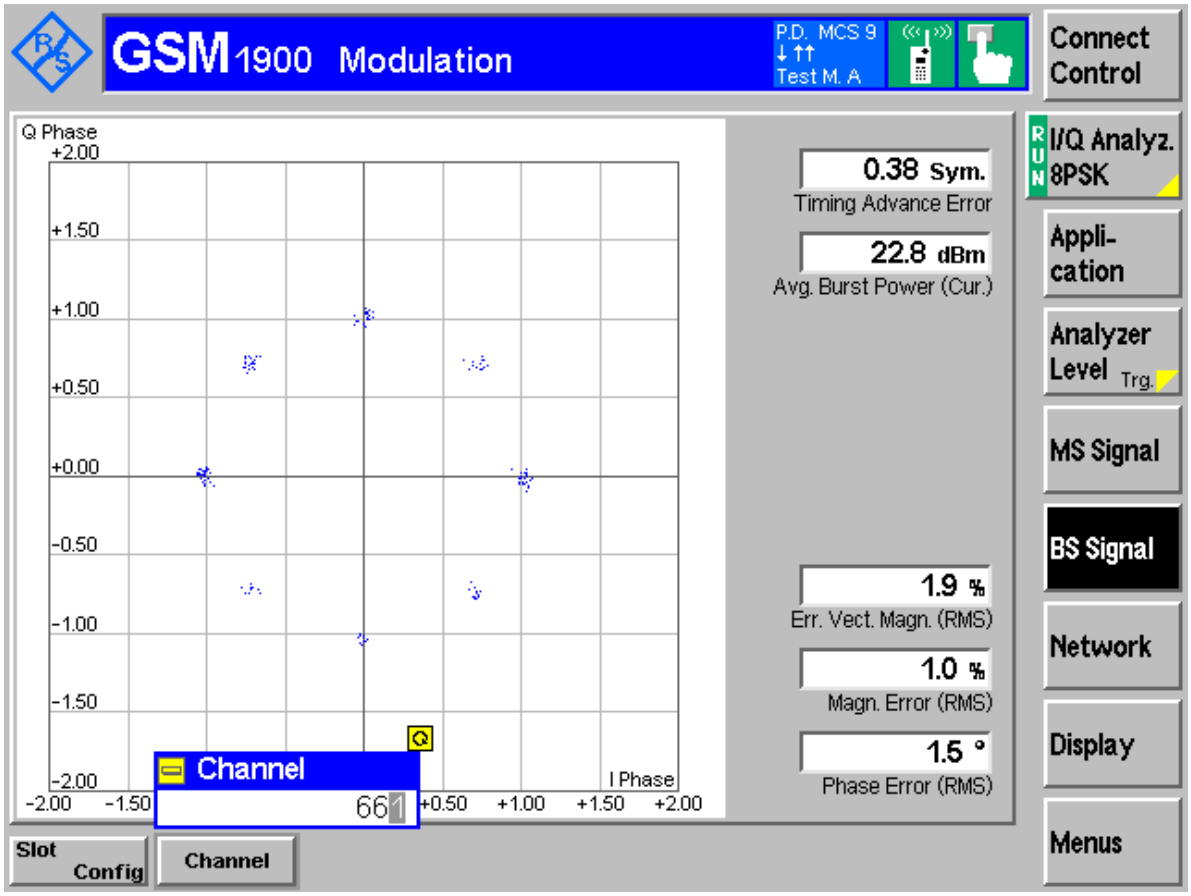
Modulation Characteristics

According to FCC Part 2.1047 & Part24 Subpart E

TM1:GPRS/GSM
Channel 661



TM2:EDGE
Channel 661



----------The END----------

Appendix C

Occupied Bandwidth

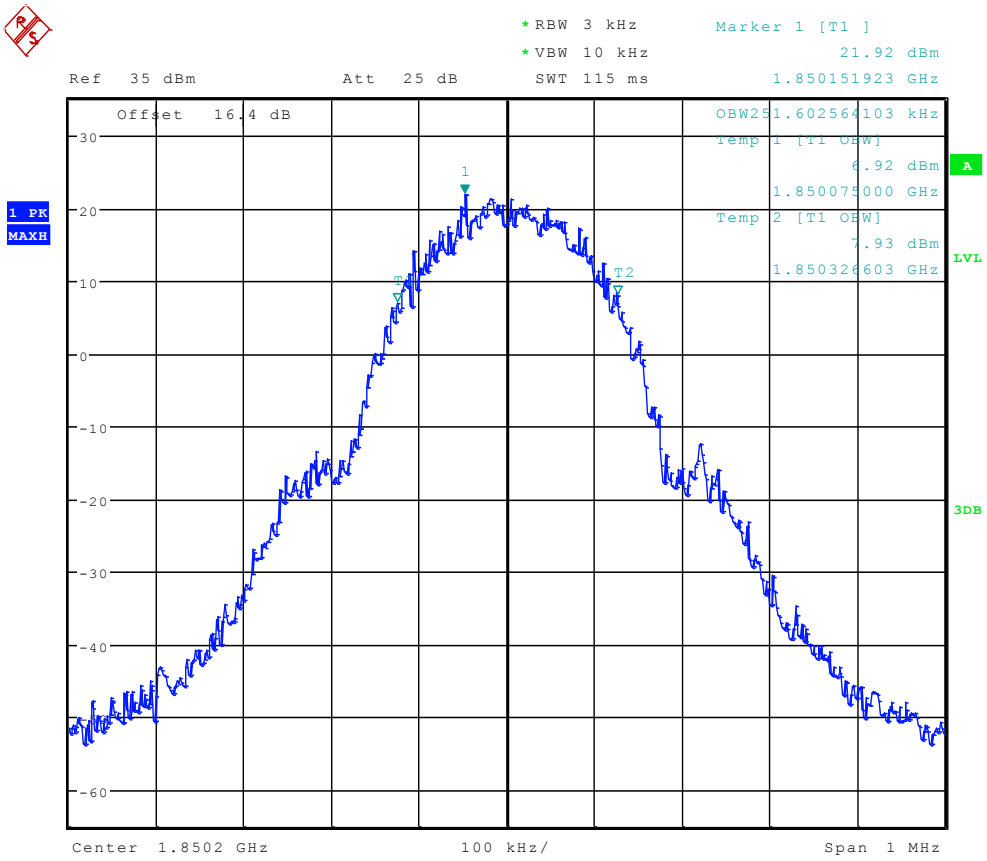
According to FCC Part 2.1049 & Part24 Subpart E

Result Table

Table 1 Measurement Results

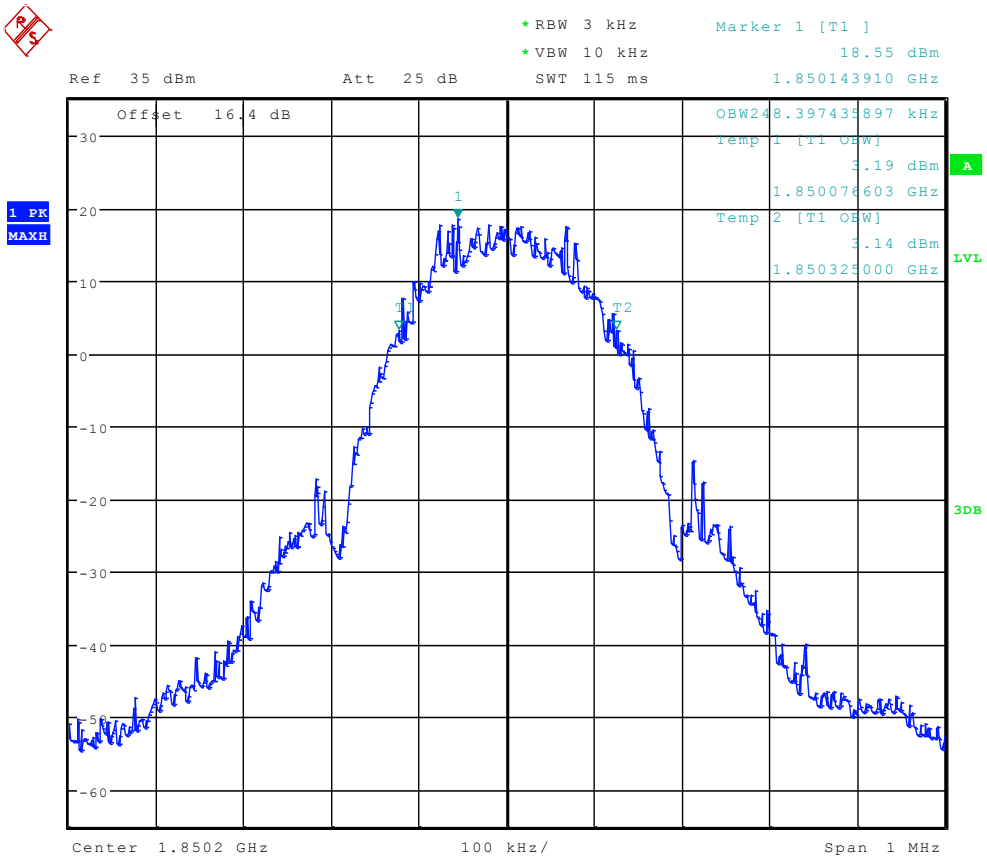
Test Mode	RF Channel	Occupied Bandwidth [kHz]	Verdict
TM1	512	251.60	Pass
	661	246.79	Pass
	810	250.00	Pass
TM2	512	248.10	Pass
	661	253.21	Pass
	810	258.01	Pass

TM1:GPRS/GSM
Channel 512



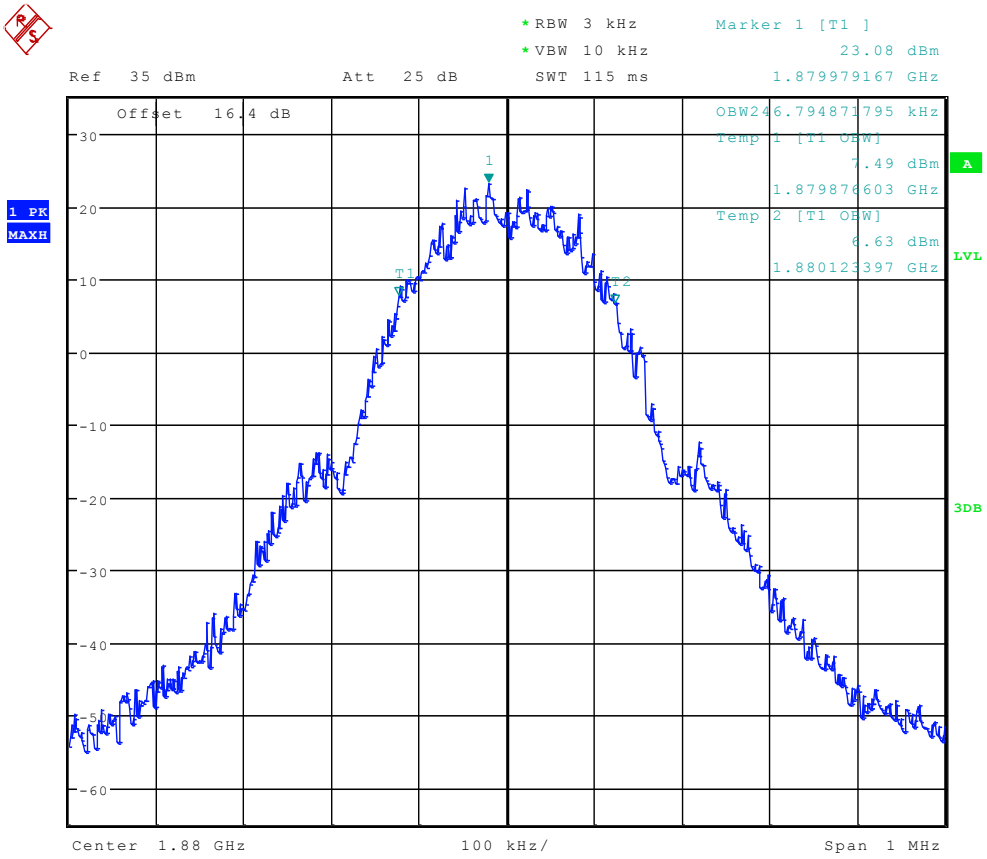
Date: 2.AUG.2012 14:25:17

TM2:EDGE
Channel 512



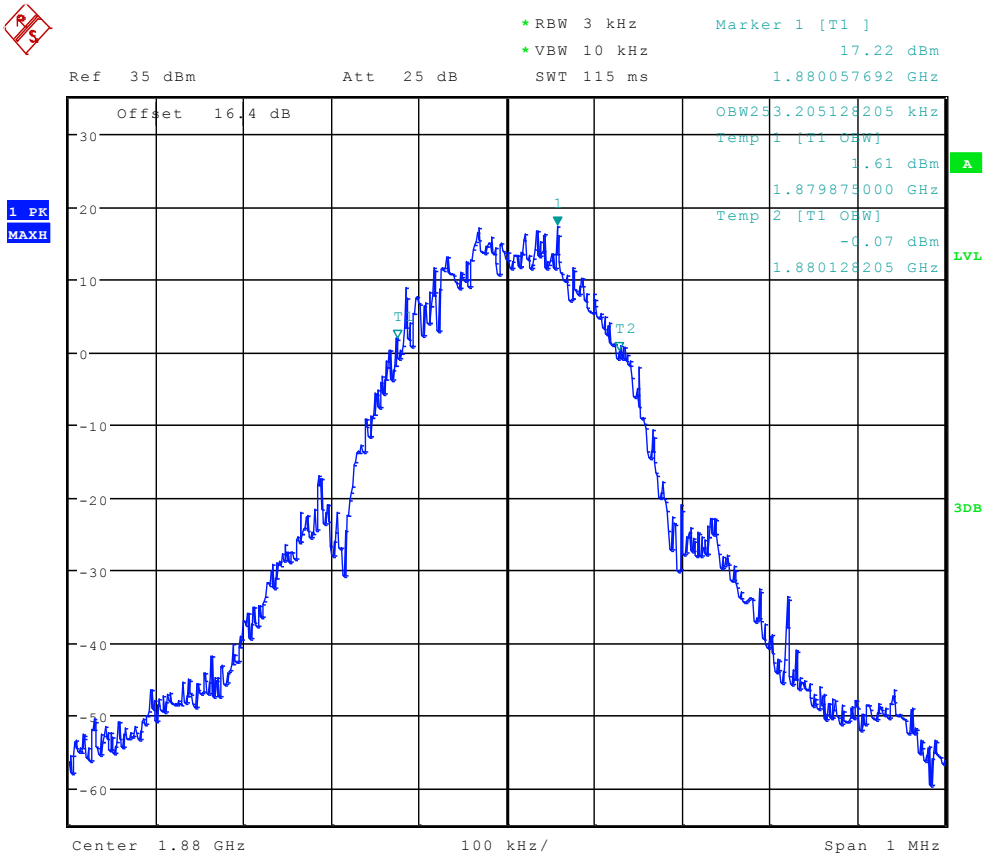
Date: 2.AUG.2012 14:34:14

TM1:GPRS/GSM
Channel 661



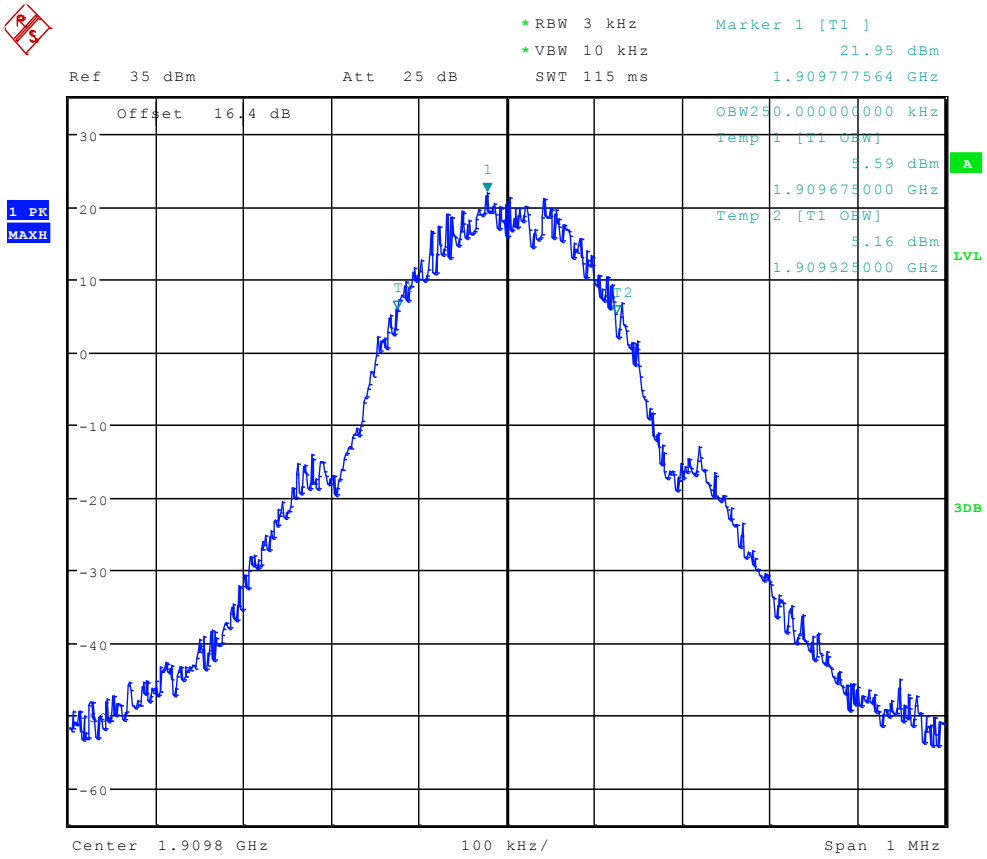
Date: 2.AUG.2012 14:25:30

TM2:EDGE
Channel 661



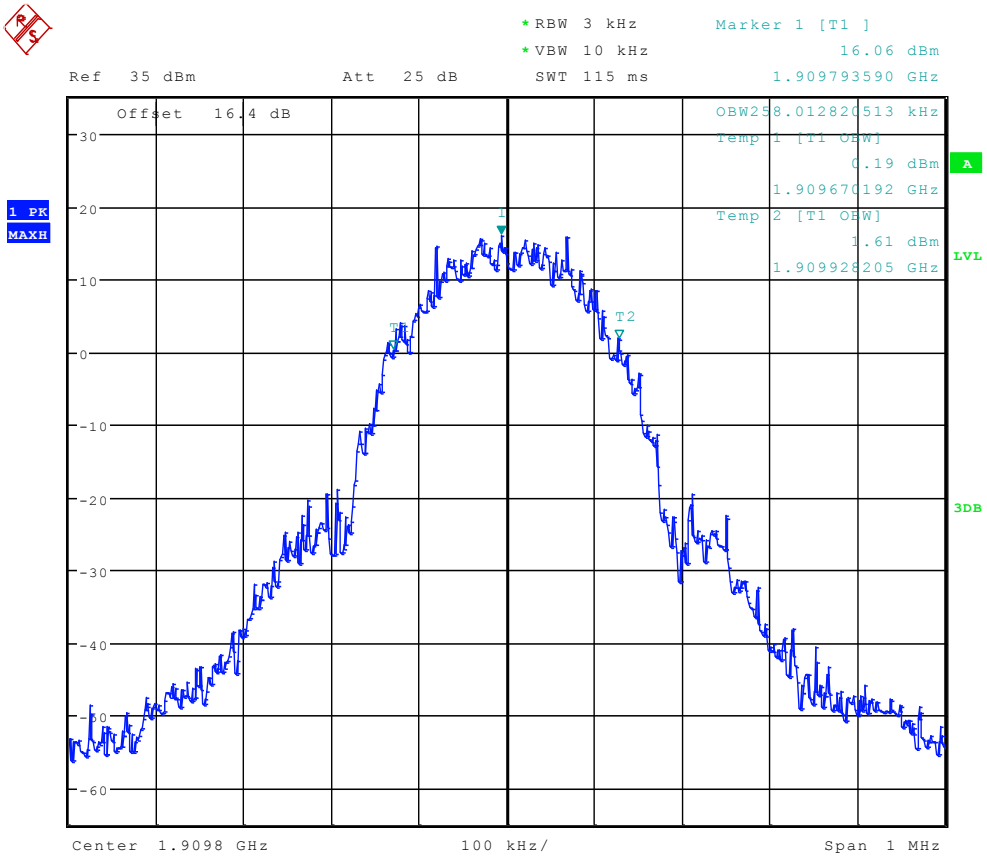
Date: 2.AUG.2012 14:34:28

TM1:GPRS/GSM
Channel 810



Date: 2.AUG.2012 14:25:44

TM2:EDGE
Channel 810



Date: 2.AUG.2012 14:34:42

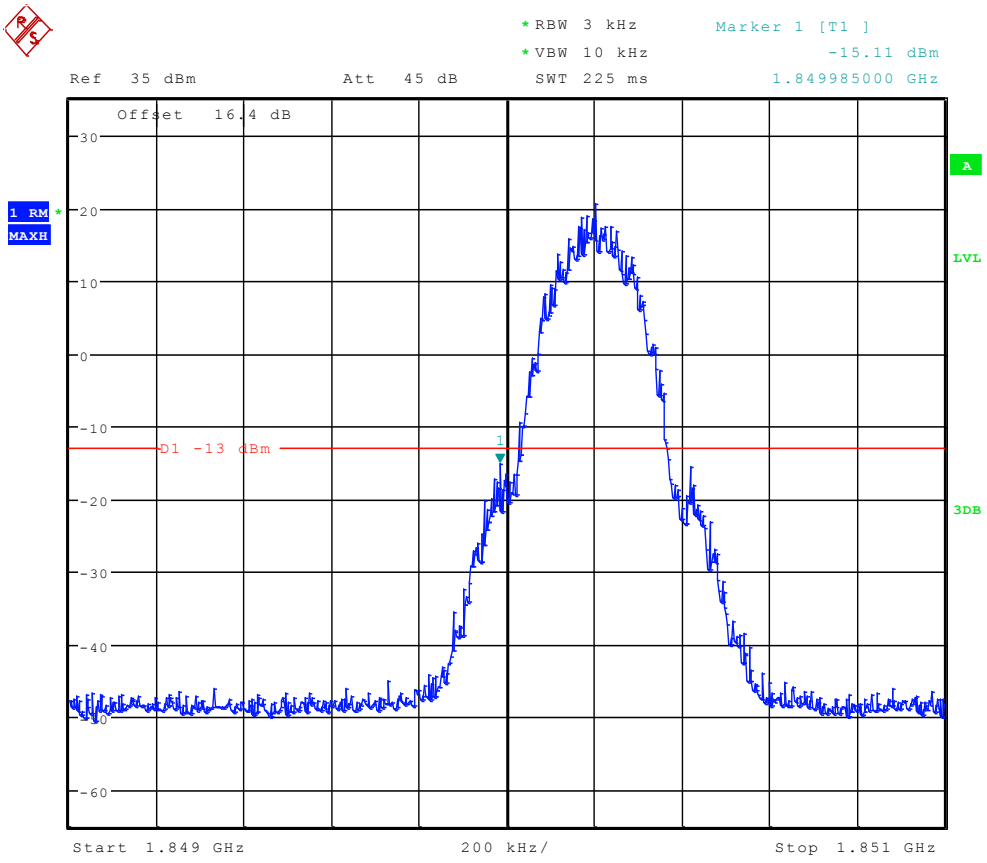
The END

Appendix D

Band Edges Compliance

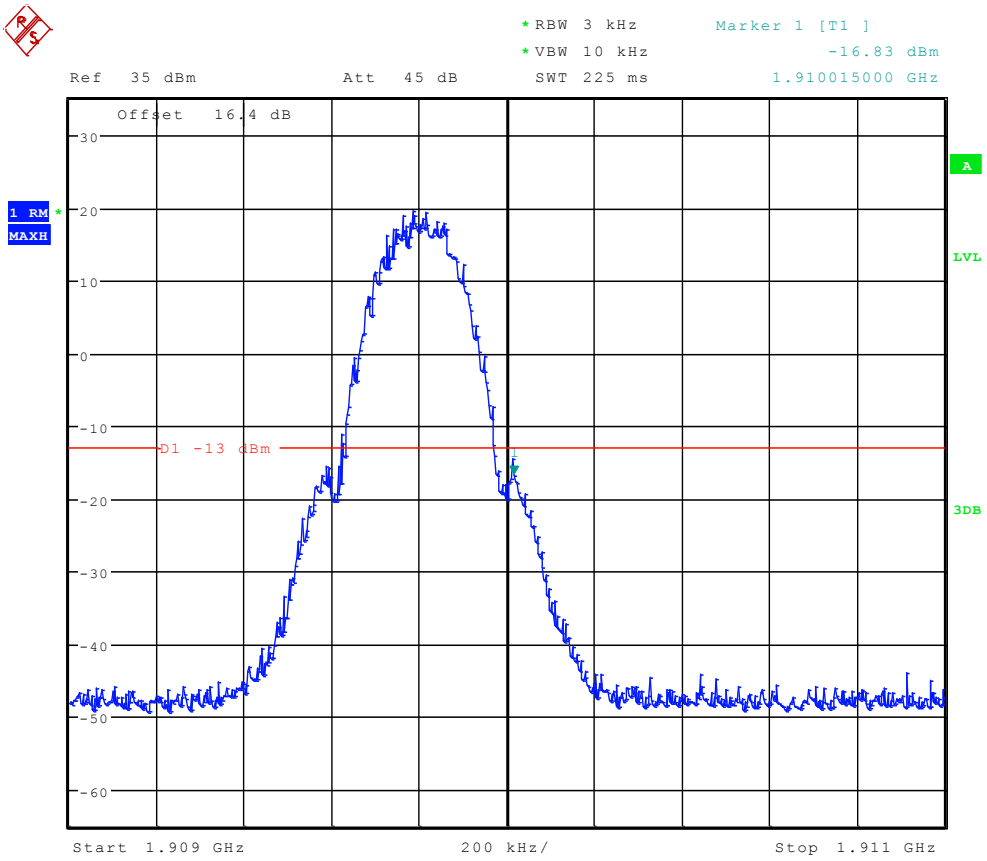
According to FCC Part 2.1051 & Part24 Subpart E

TM1:GPRS/GSM
Left Edge
Channel 512



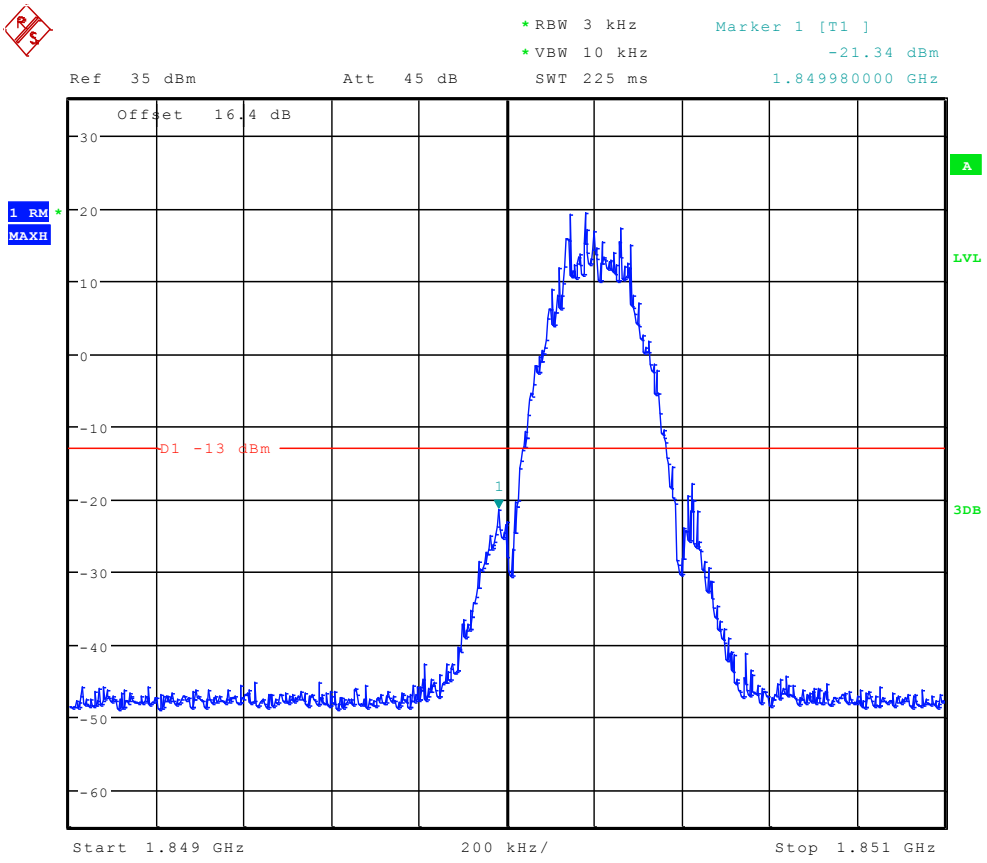
Date: 2.AUG.2012 14:28:40

Right Edge
Channel 810



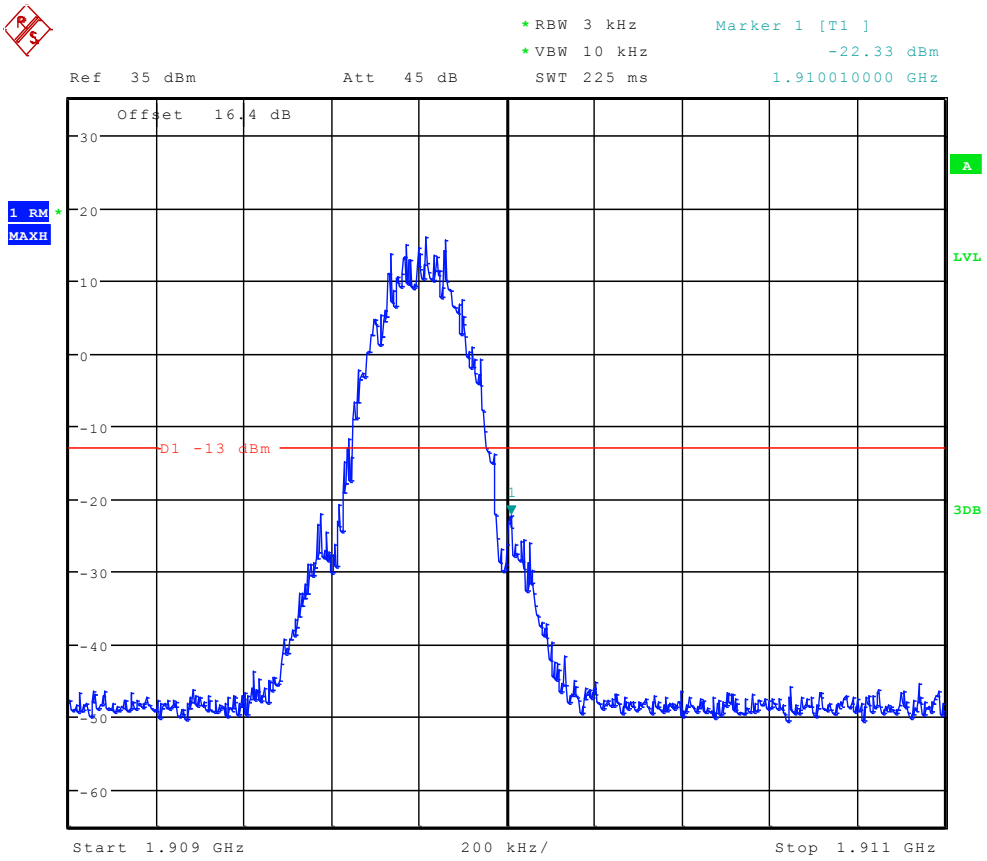
Date: 2.AUG.2012 14:29:37

TM2:EDGE
Left Edge
Channel 512



Date: 2.AUG.2012 14:33:07

Right Edge
Channel 810



Date: 2.AUG.2012 14:33:32

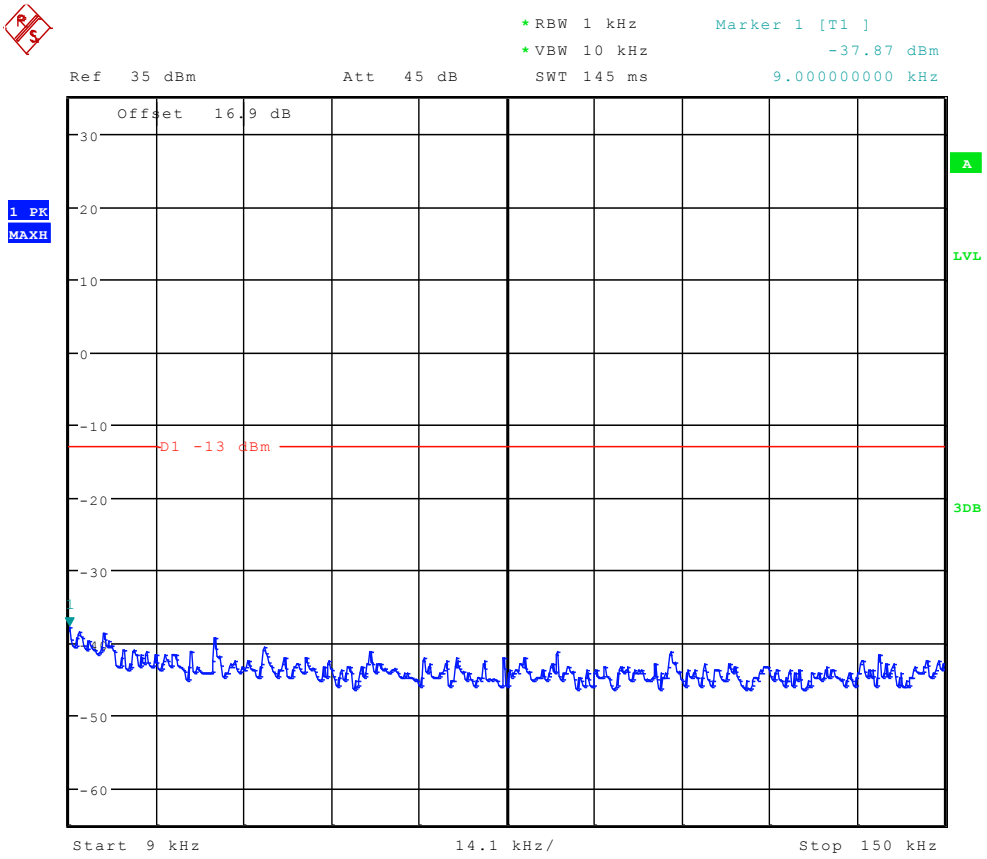
The END

Appendix E

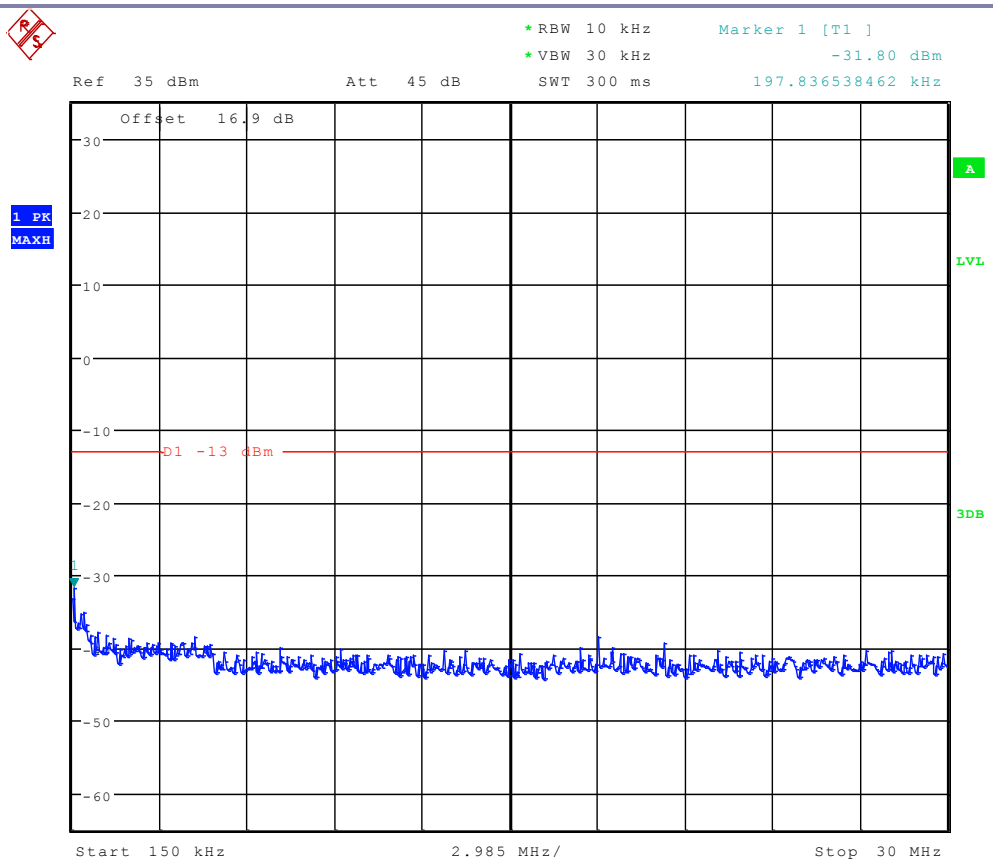
Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & Part24 Subpart E

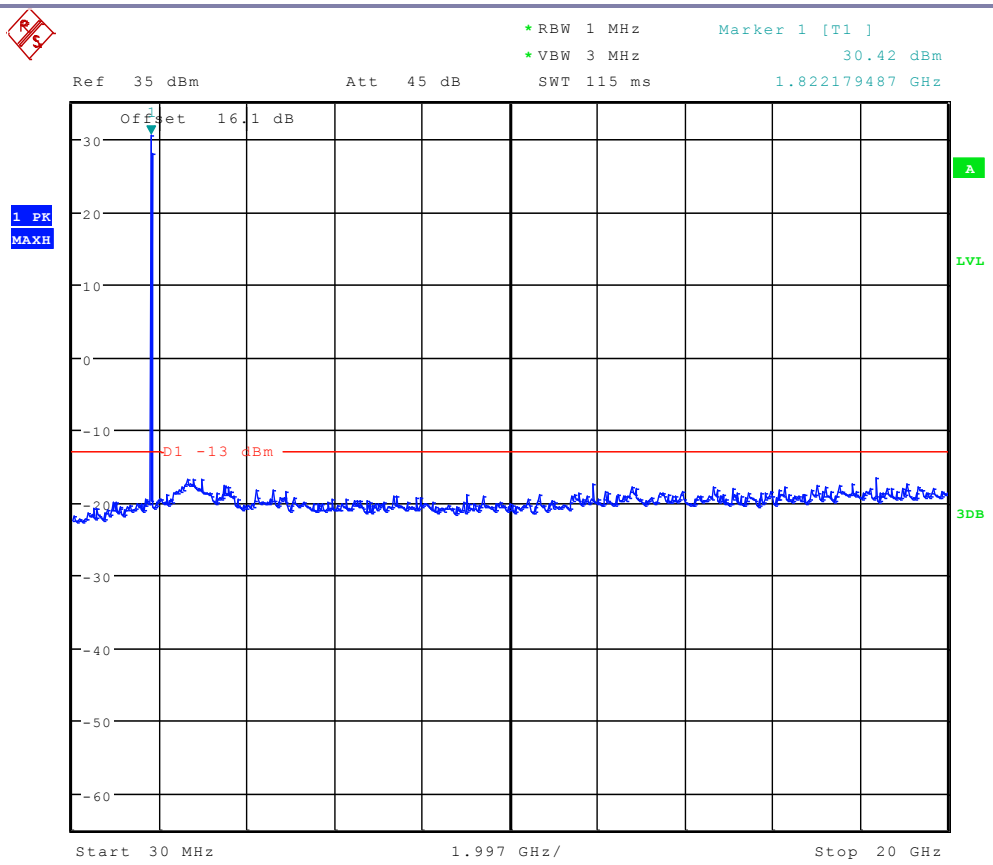
TM1:GPRS/GSM
Channel 512



Date: 2.AUG.2012 14:25:59

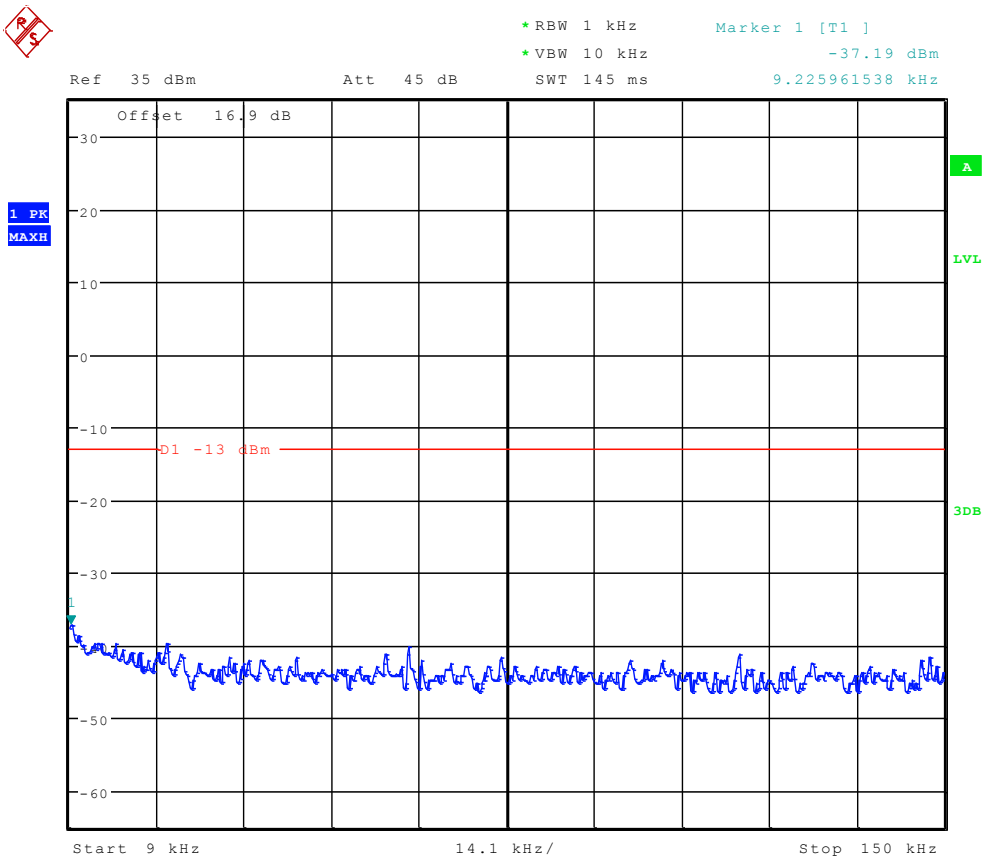


Date: 2.AUG.2012 14:26:43

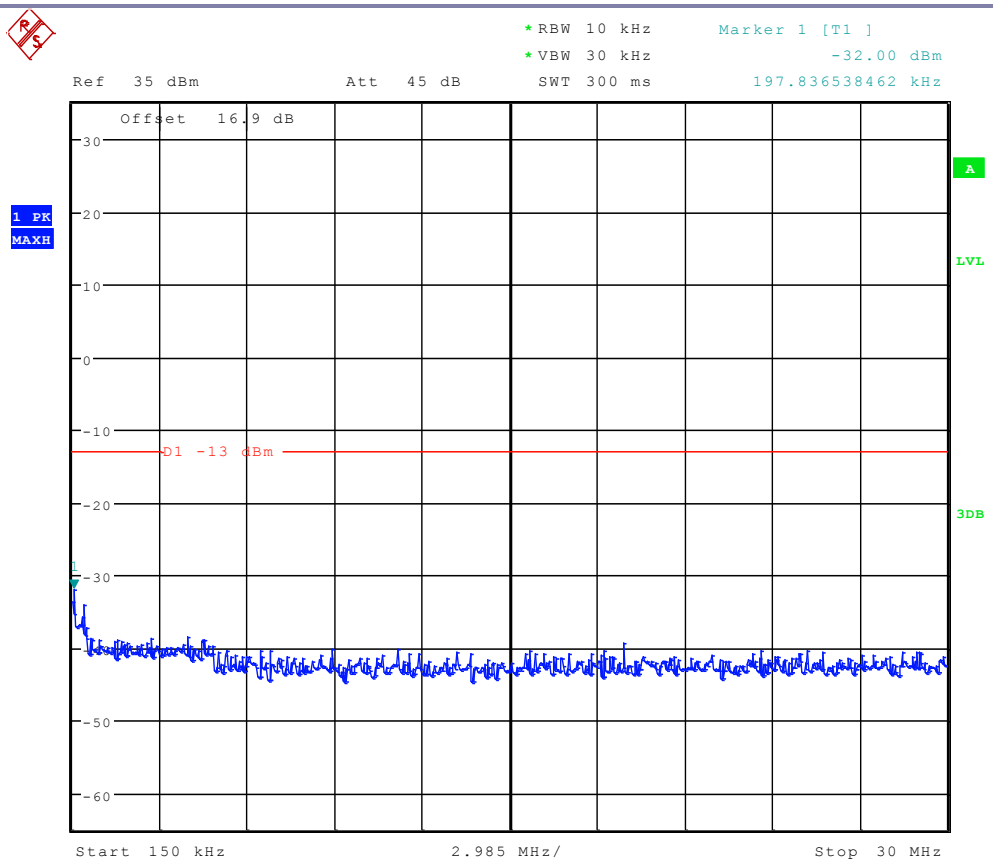


Date: 2.AUG.2012 14:27:32

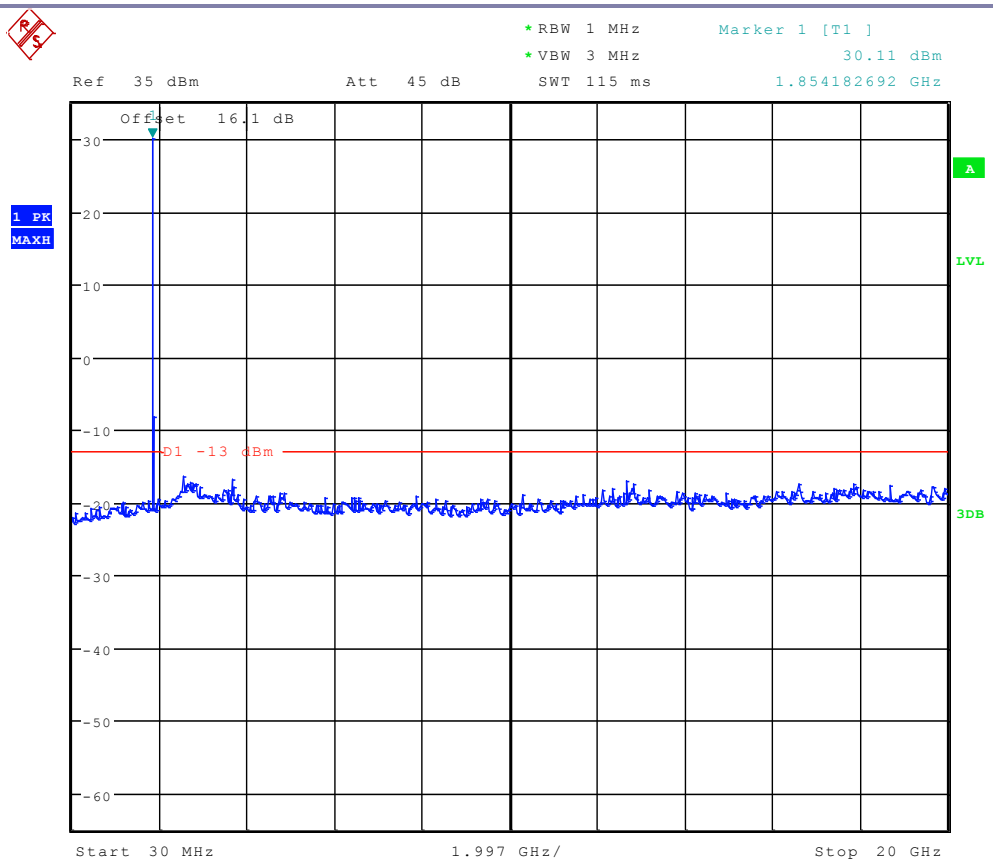
Channel 661



Date: 2.AUG.2012 14:26:13

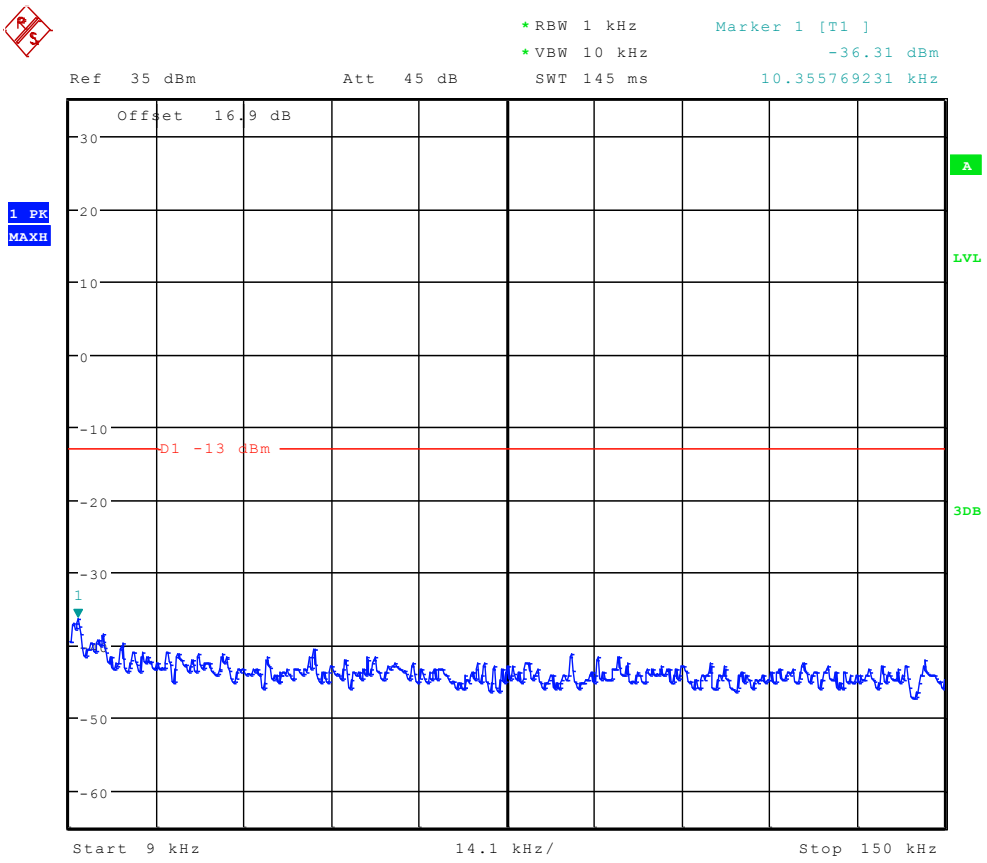


Date: 2.AUG.2012 14:26:57

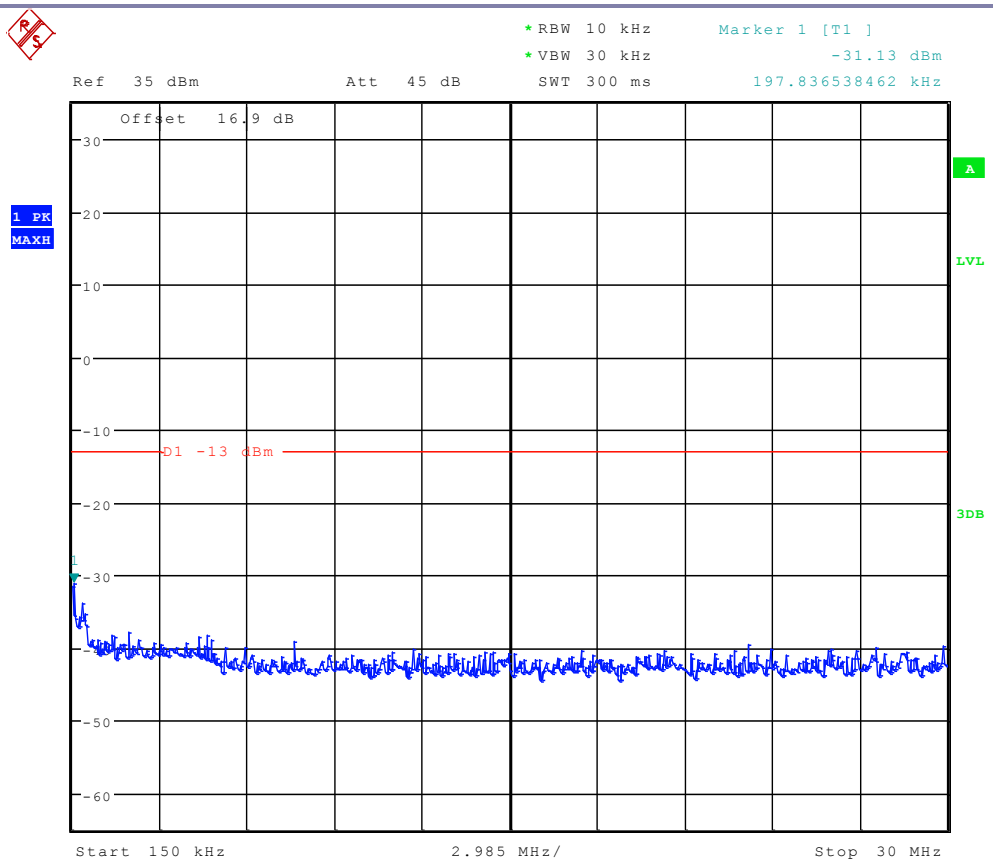


Date: 2.AUG.2012 14:27:47

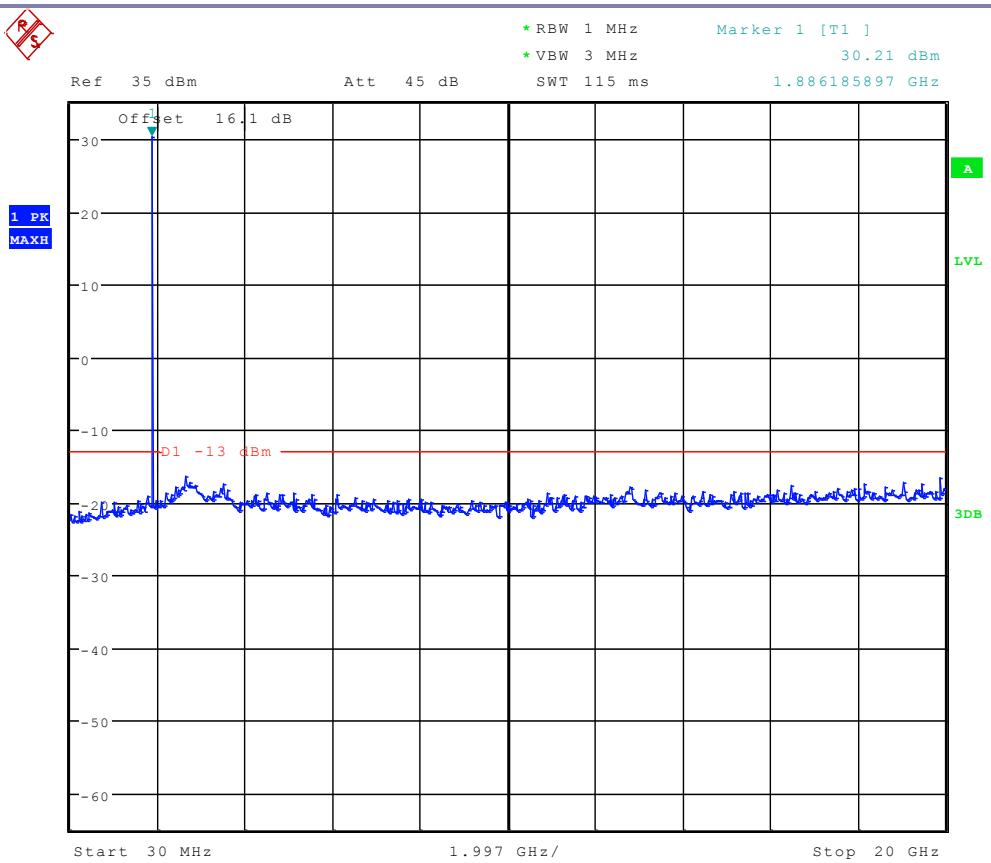
Channel 810



Date: 2.AUG.2012 14:26:28

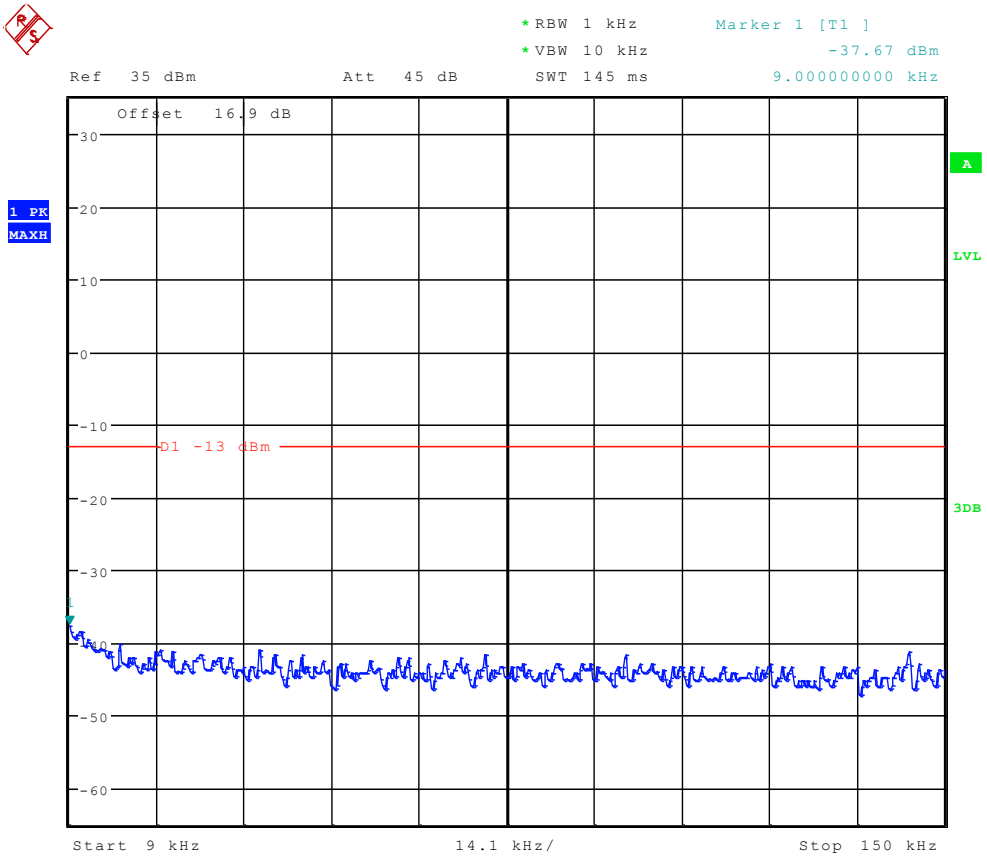


Date: 2.AUG.2012 14:27:11

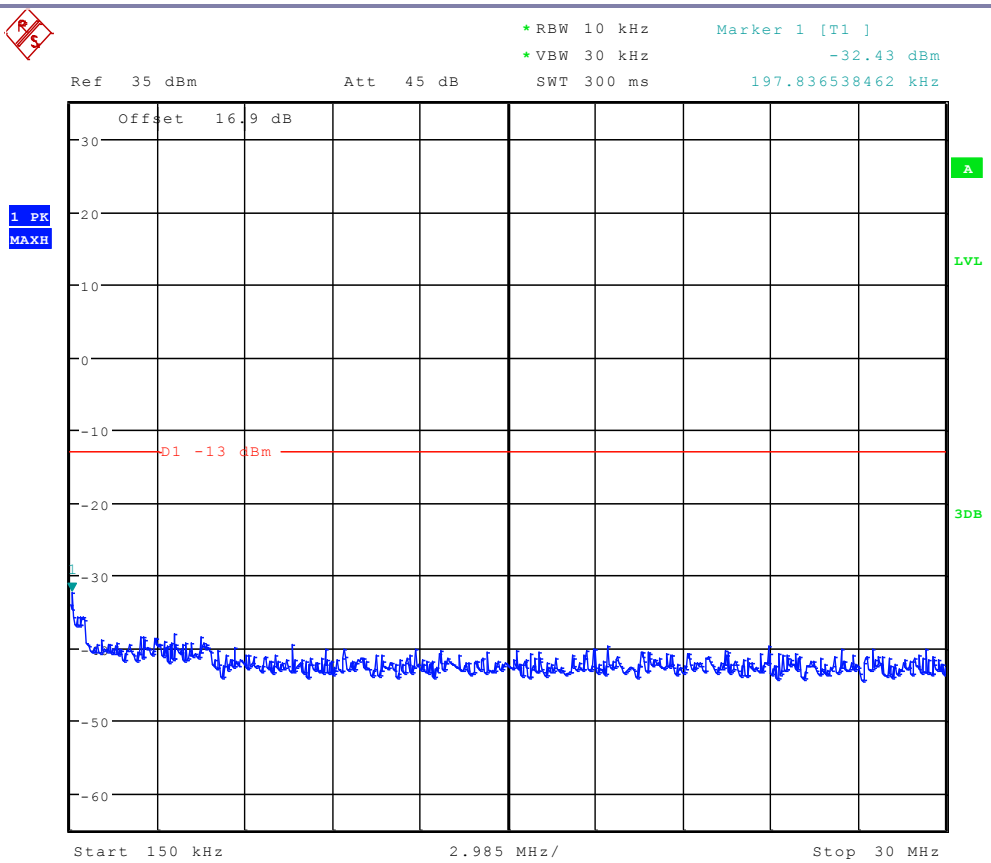


Date: 2.AUG.2012 14:28:01

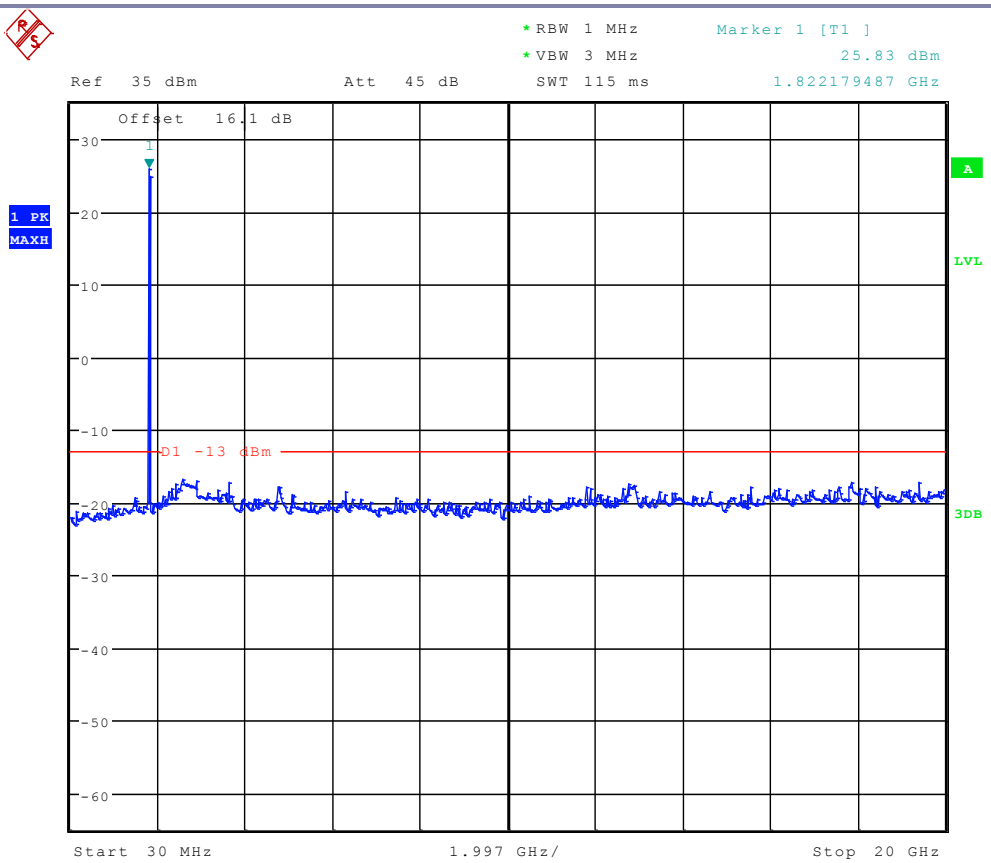
TM2:EDGE
Channel 512



Date: 2.AUG.2012 14:34:57

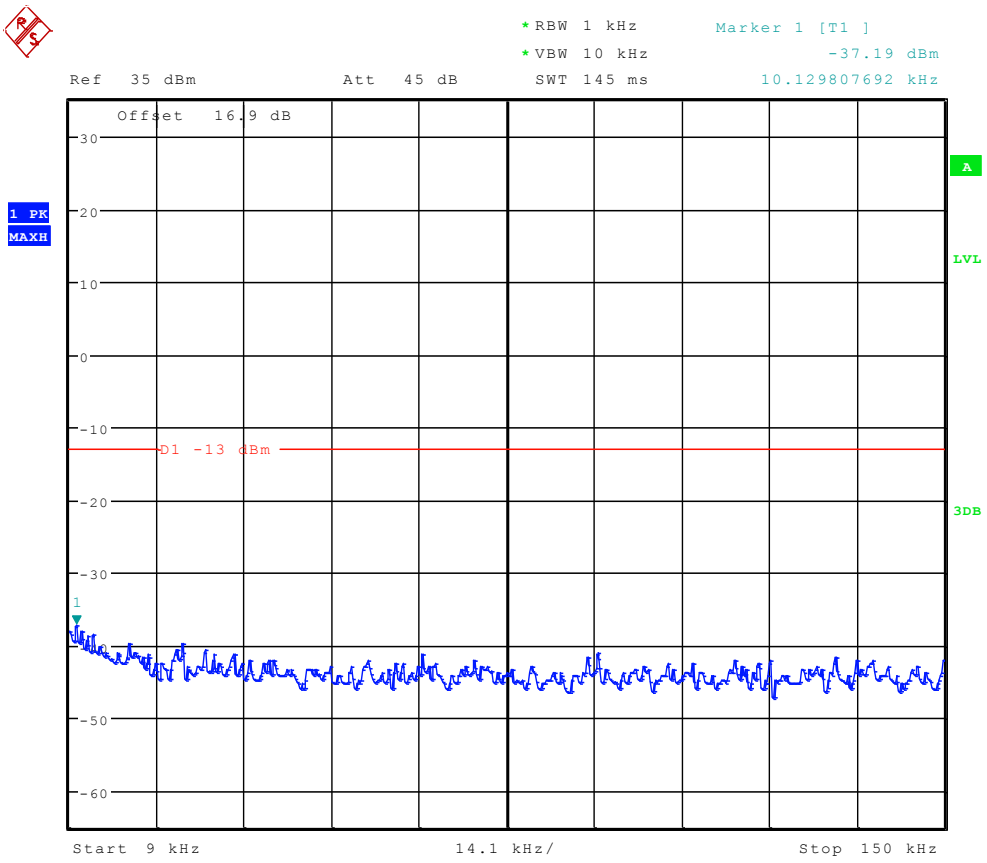


Date: 2.AUG.2012 14:35:40

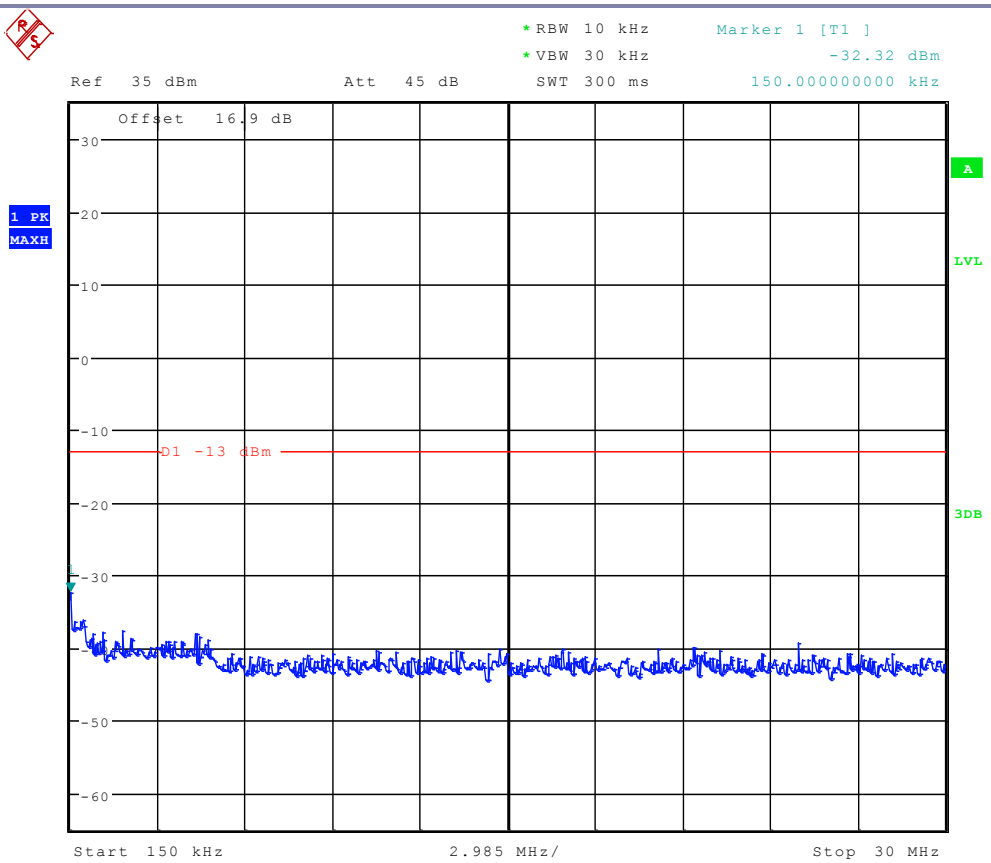


Date: 2.AUG.2012 14:36:24

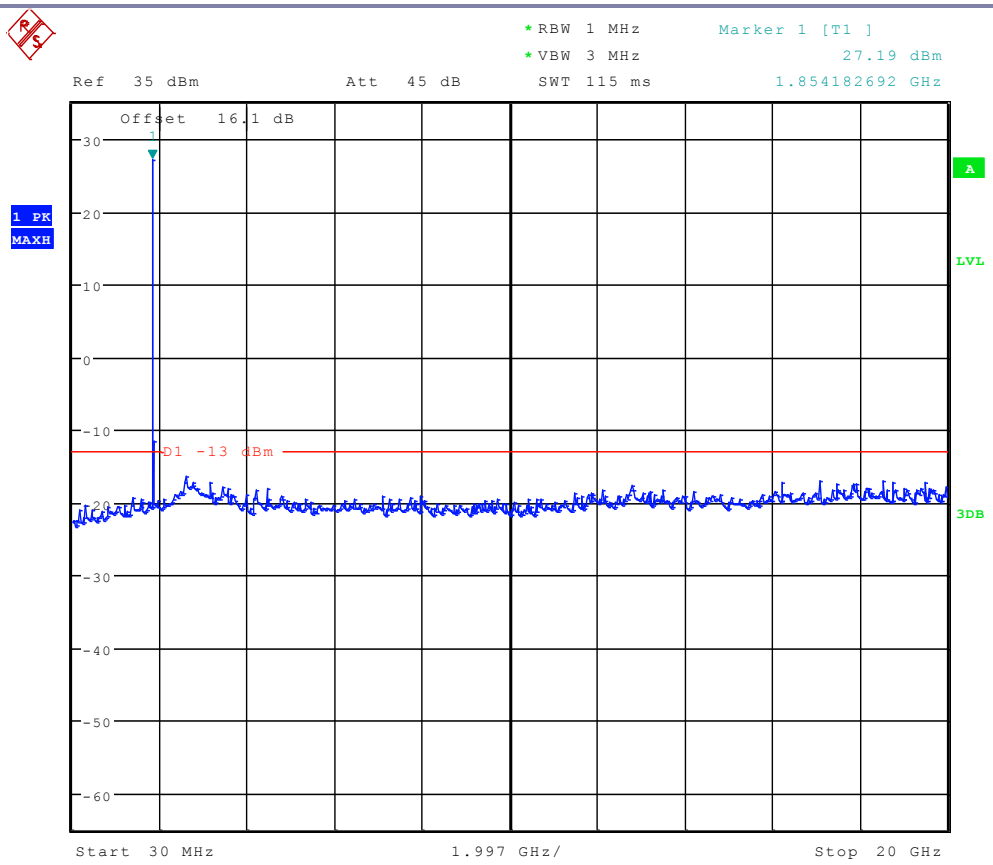
Channel 661



Date: 2.AUG.2012 14:35:11

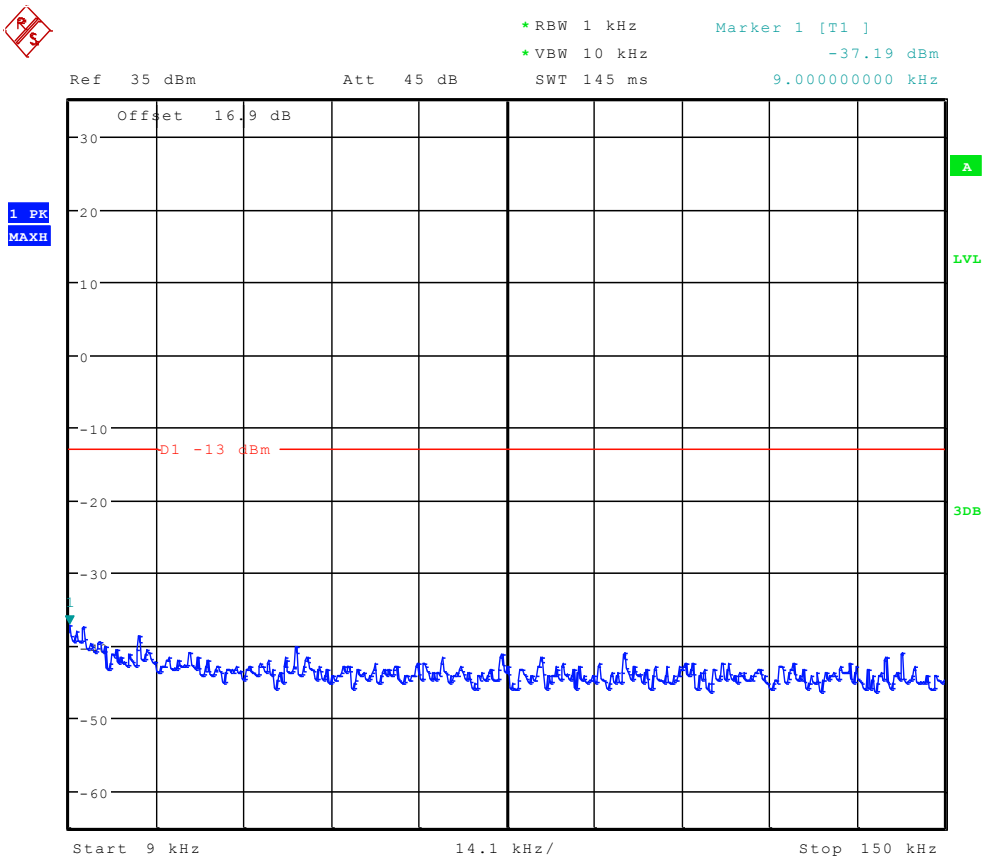


Date: 2.AUG.2012 14:35:55

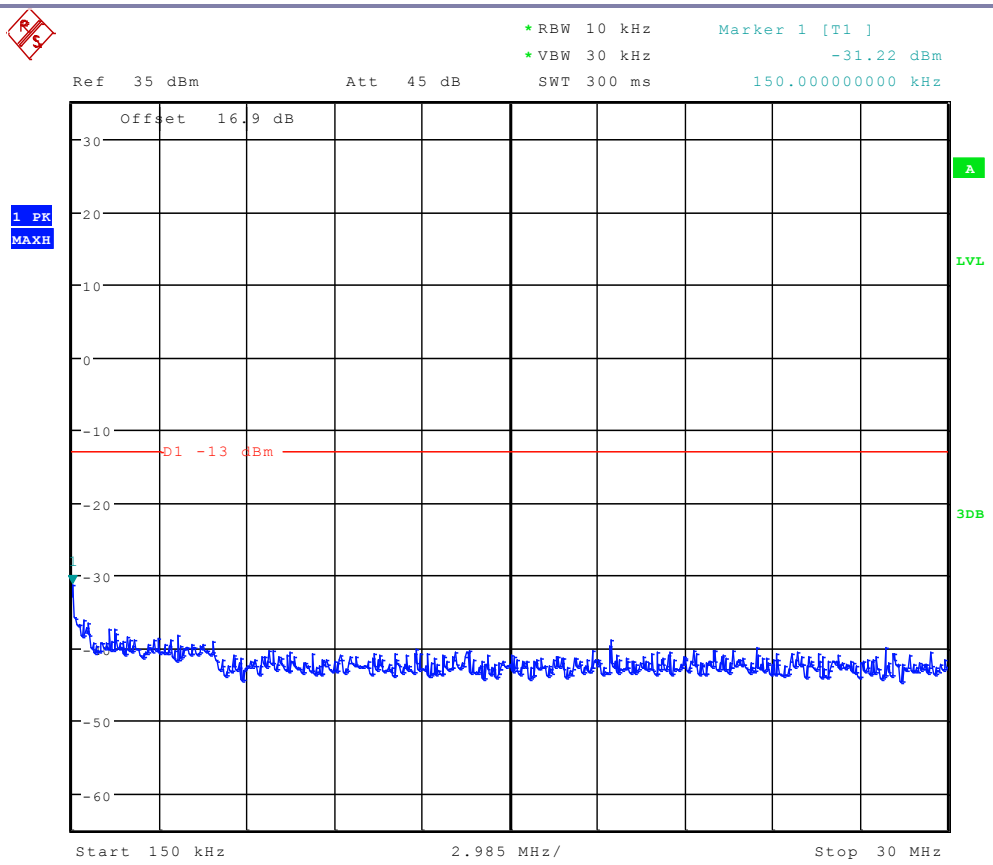


Date: 2.AUG.2012 14:36:39

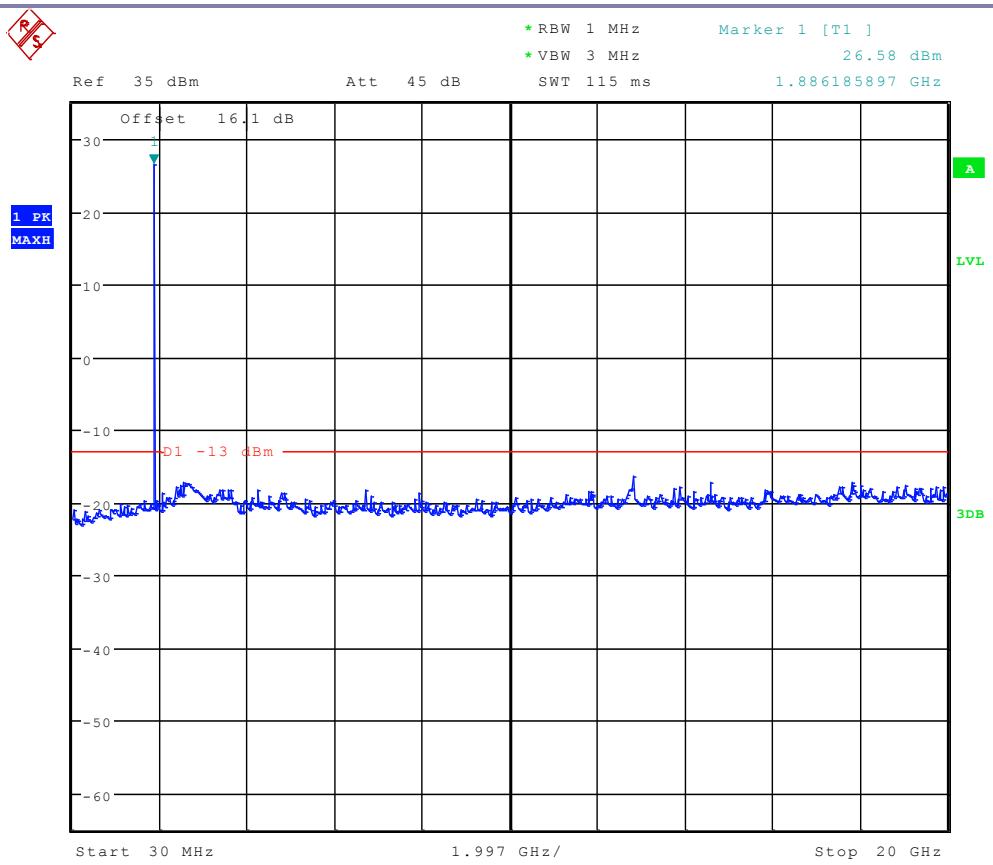
Channel 810



Date: 2.AUG.2012 14:35:26



Date: 2.AUG.2012 14:36:09



Date: 2.AUG.2012 14:36:53

The END

Appendix F

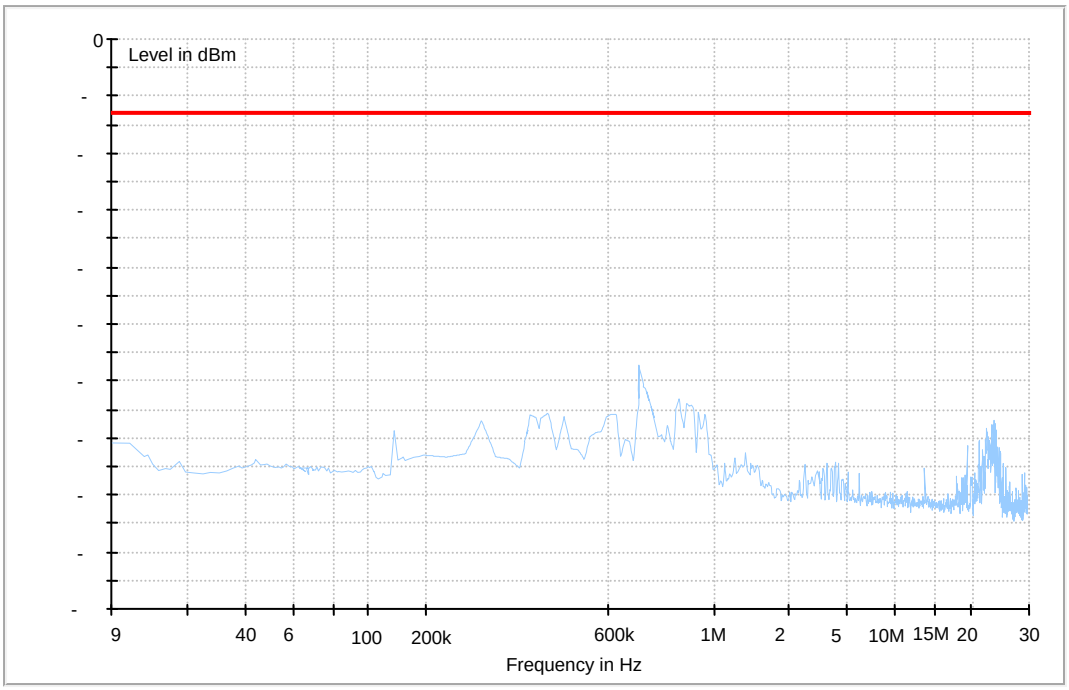
Radiated spurious emission

According to FCC Part 2.1053 & Part24.238

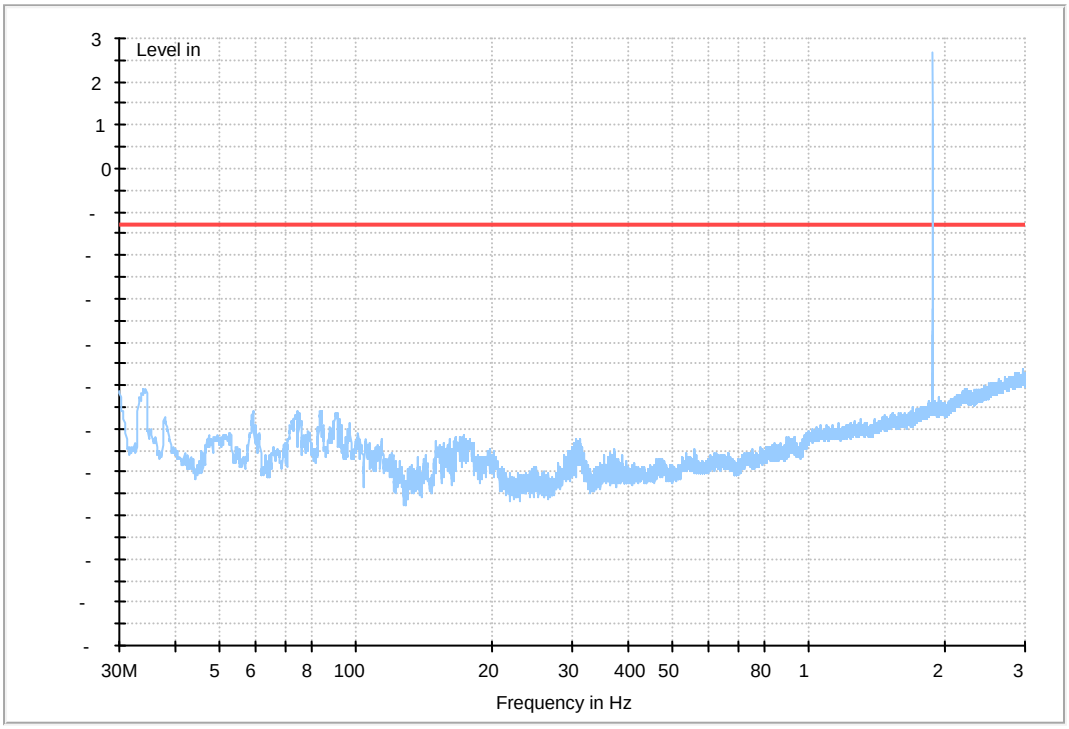
Note: 1. Simultaneous transmission was investigated and no new emissions were found.
2. RBW ≥ 1MHz, VBW > 3 x RBW.

GPRS 1900

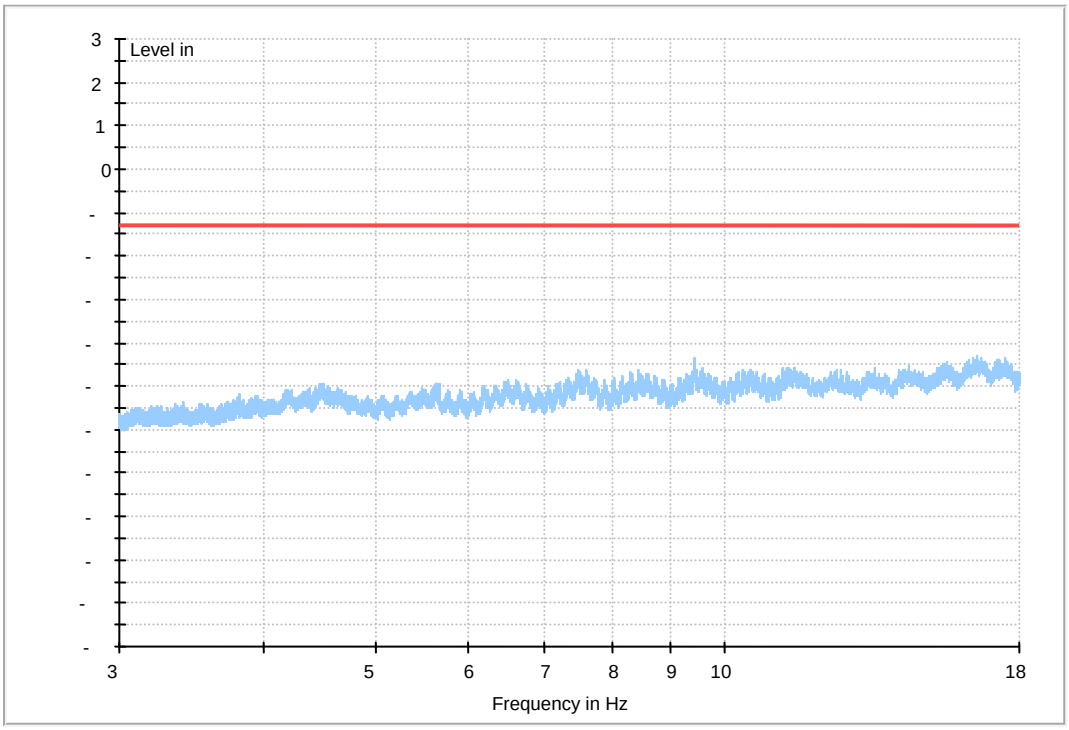
Traffic Mode (9kHz-30MHz)



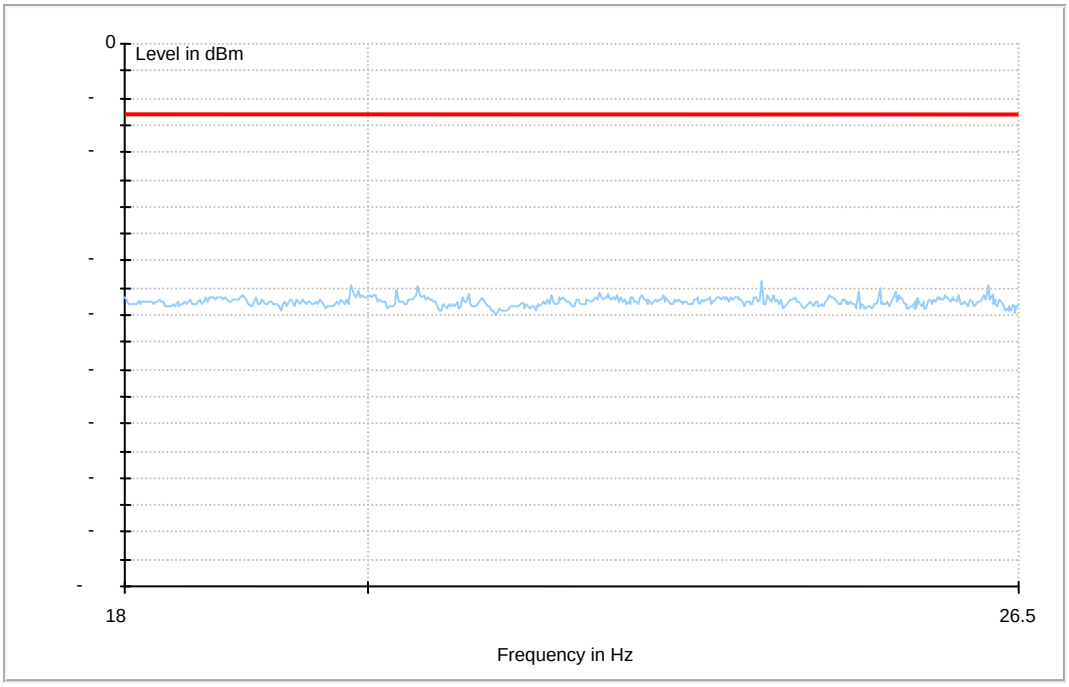
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)

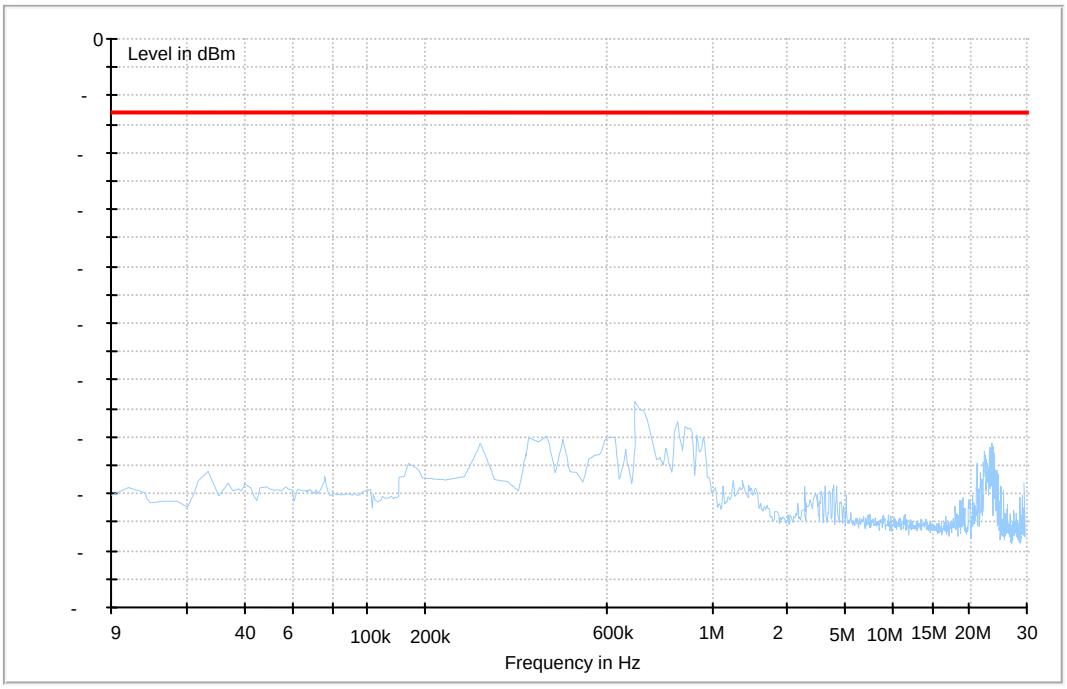


Traffic Mode (18GHz-26.5GHz)

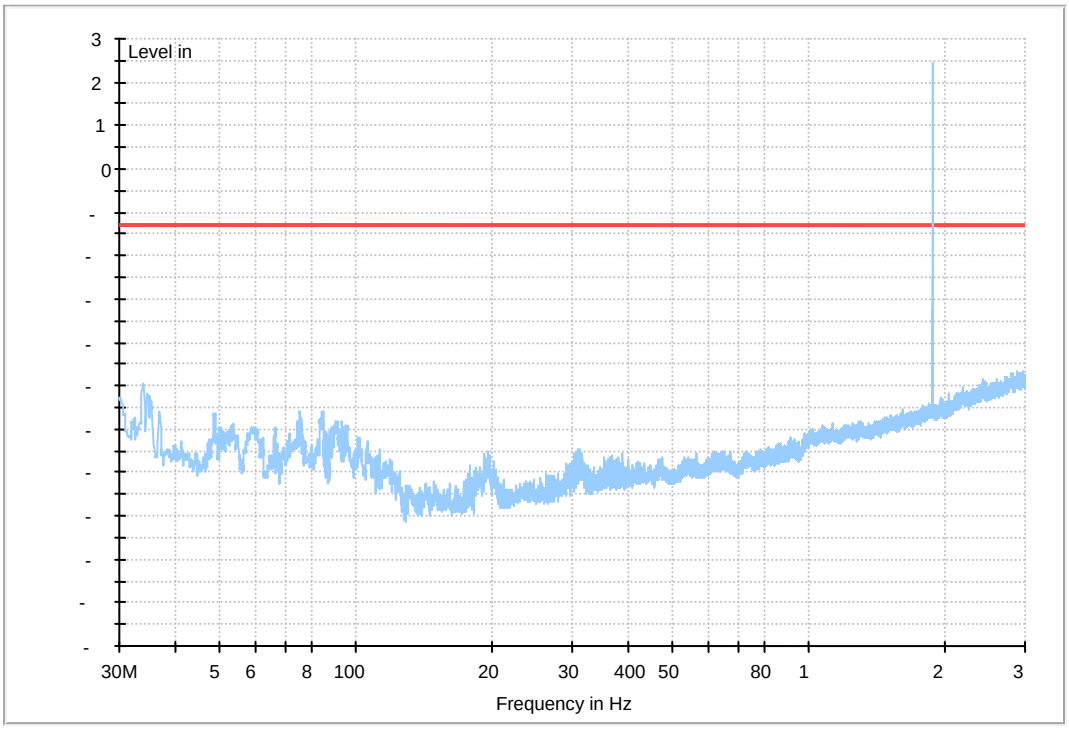


EDGE1900

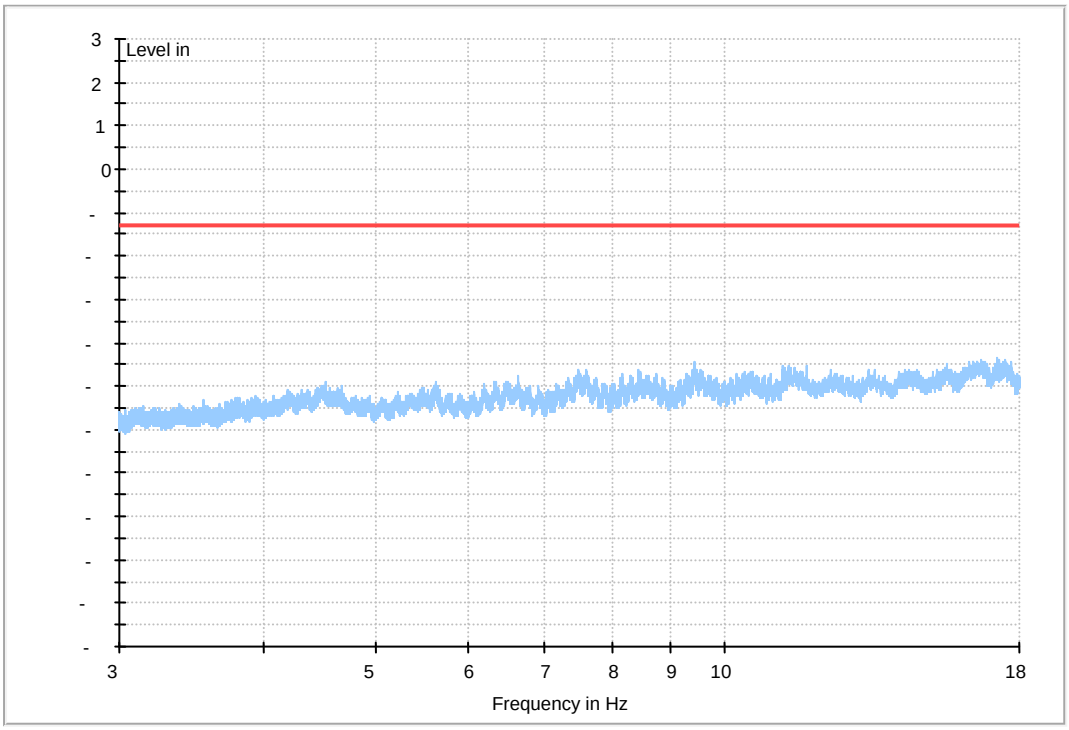
Traffic Mode (9kHz-30MHz)



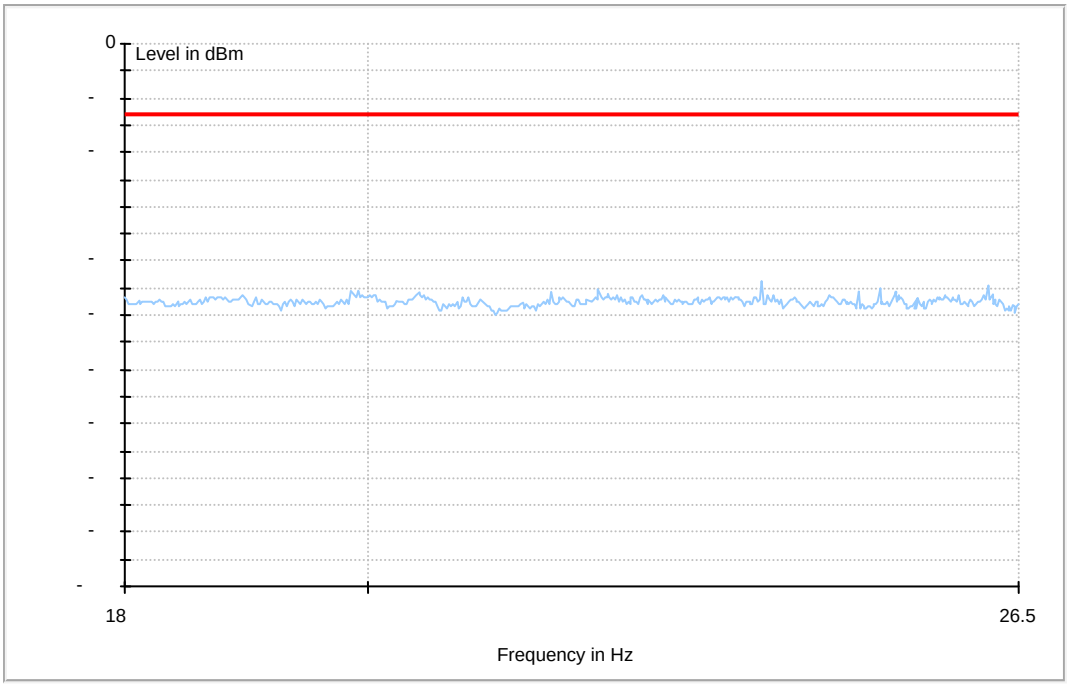
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)



Traffic Mode (18GHz-26.5GHz)



The END

Appendix G

Frequency Stability

According to FCC Part 2.1055& Part 24.235

Frequency Error vs. Temperature:

Test Mode	RF Ch.	Volt.	Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	VN	-30 °C	-13	-0.00691	---	±2.5	Pass
			-20 °C	-13	-0.00691	---	±2.5	Pass
			-10 °C	16	0.00851	---	±2.5	Pass
			0 °C	-8	-0.00426	---	±2.5	Pass
			10 °C	13	0.00691	---	±2.5	Pass
			20 °C	16	0.00851	---	±2.5	Pass
			30 °C	14	0.00745	---	±2.5	Pass
			40 °C	25	0.01330	---	±2.5	Pass
			50 °C	9	0.00479	---	±2.5	Pass
TM 2	M	VN	-30 °C	-13	-0.00691	---	±2.5	Pass
			-20 °C	13	0.00691	---	±2.5	Pass
			-10 °C	13	0.00691	---	±2.5	Pass
			0 °C	10	0.00532	---	±2.5	Pass
			10 °C	-15	-0.00798	---	±2.5	Pass
			20 °C	15	0.00798	---	±2.5	Pass
			30 °C	21	0.01117	---	±2.5	Pass
			40 °C	-11	-0.00585	---	±2.5	Pass
			50 °C	-13	-0.00691	---	±2.5	Pass

Frequency Error vs. Voltage:

Test Mode	RF Ch.	Temp.	Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	TN	VL	-24	-0.01277	---	±2.5	Pass
			VN	-20	-0.01064	---	±2.5	Pass
			VH	19	0.01011	---	±2.5	Pass
TM 2	M	TN	VL	-21	-0.01117	---	±2.5	Pass
			VN	13	0.00691	---	±2.5	Pass
			VH	25	0.01330	---	±2.5	Pass

----------The END----------