



FCC RF Test Report

Product Name: Vodafone Mobile Wi-Fi

Model Number: R210

**Report No: SYBH(Z-RF)018032012-2002
FCC ID: QISR210**

Reliability Laboratory of Huawei Technologies Co., Ltd.

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

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.

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1 General Information

1.1 Applied Standard	
Applied Rules:	47 CFR FCC Part 2:2010, Subpart J 47 CFR FCC Part 24:2010, Subpart E ANSI/TIA 603C:2004
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China
1.3 Test Environment 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 10 th 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 Production Information

3.1.1 General Description

R210 is a LTE/DC-HSPA+/HSPA/UMTS/GSM triple mode and WiFi Wireless mobile Router; it can be used as a WiFi Access Point based on standard of IEEE802.11b/g/n. It supports 3G WCDMA and 4G LTE wireless internet accessing function. About 3G WCDMA wireless mode, it supports WCDMA and HSDPA/HSUPA/HSPA+, operating in Band1 (2100MHz) and Band 8(900M), and the 4G LTE, operating in Band3, Band7 and Band20 and GSM 4 bands. But only PCS 1900 test data included in this report .The WiFi frequency is 2.4GHz.

R210 supports 1Tx2Rx for 3G WCDMA and 4G LTE, WiFi only supports 1Tx1Rx.

3.1.2 Board Information

Table 2 Board Information

Vodafone Mobile Wi-Fi		
R210		
Board and Module		
Hardware Version	Software Version	Serial Number
CL1E589M22	11.433.11.01.11	X6U2C11151500558

3.1.3 Adapter Technical Data

Name	Manufacture	Description
Adapter	HUAWEI	Adapter Model: HW-050200U3W Input Voltage : 100-240V ¹ ~50/60Hz, 0.5A MAX Output Voltage: === 5.0V 2.0A

3.1.4 Battery Technical Data

Name	Manufacture	Description
Li-ion Battery	HUAWEI	Battery Model: HB5P1H Rated capacity: 3000mAh Nominal Voltage: === +3.7V Charging Voltage:



		+4.2V
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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: 30dBm; ;
Channel Spacing(s) / Bandwidth(s)	GSM system: 200 kHz
Designation of Emissions	GSM system: 246KGXW (GMSK modulation), 243KG7W (8PSK modulation)

4.3 Antenna Gain

Antenna Gain(dBi)	2
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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: ~ 230 V (50/60 Hz) AC Voltage Range: ~100-240V

5 General Test Conditions / Configurations

5.1 RF Channels under Test

Test Mode	TX / RX	RF Channel		
		Bottom (B)	Middle (M)	Top (T)
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 Environments

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

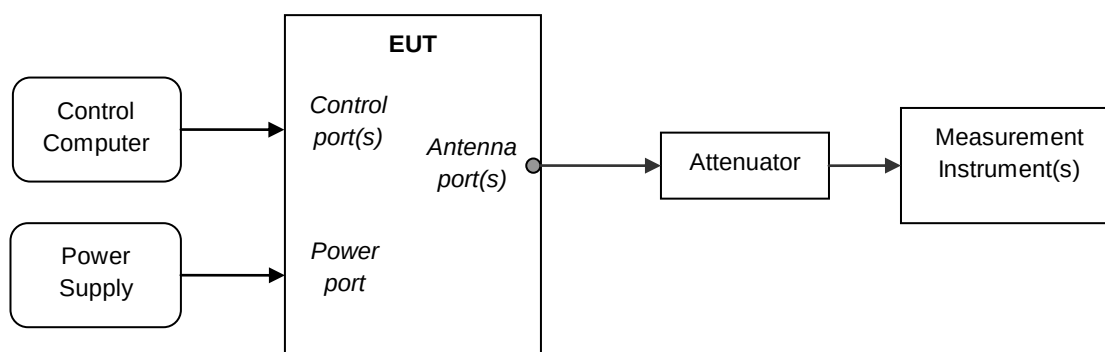
NOTE: VL= lower extreme test voltages
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

5.4 Test Setups

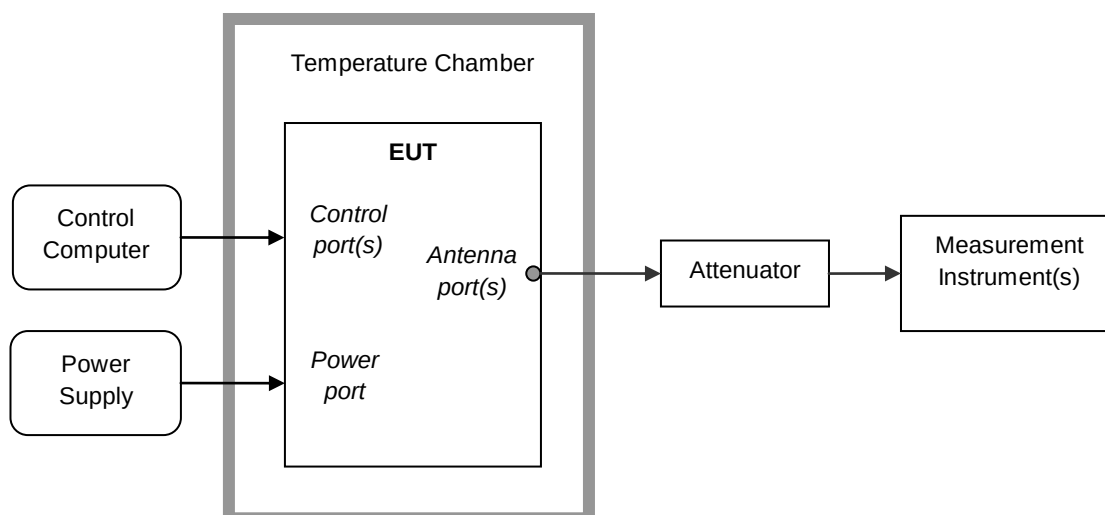
5.4.1 General Test Setup Configurations

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



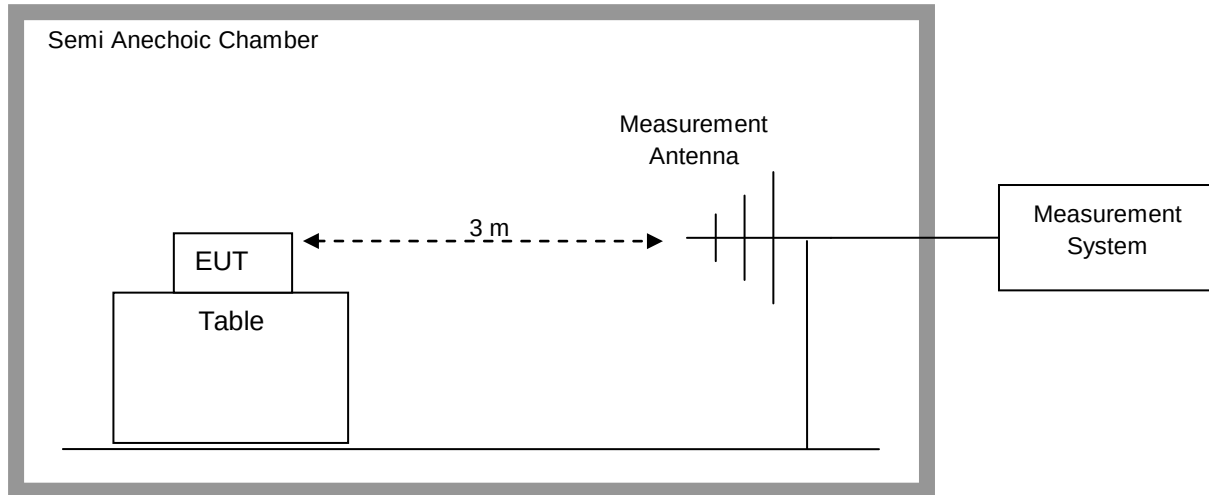
5.4.3 Test Setup 2



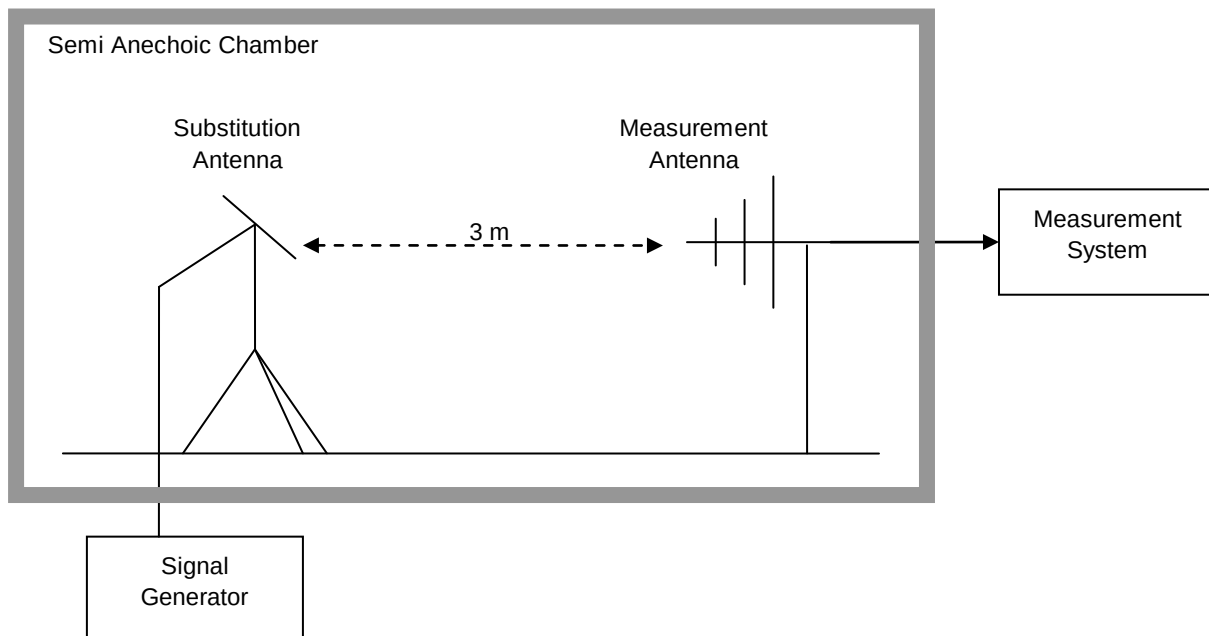
5.4.4 Test Setup 3

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

Step 1: Pre-test



Step 2: Substitution method to verify the maximum EIRP



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)	B, M, T
	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)	B, M, T
	Test Mode	TM1/TM2
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, T
	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)	B, M,T
	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



Test Case	Test Conditions	
	RF Channels (TX)	M
	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	Sep.27,2012
Universal Radio Communication Tester	R&S	CMU200	117341	Jan.12.2013
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.31,2012
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.20,2012
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2012
Temperature Chamber	WEISS	WKL64	24600294	Feb.13,2013
Signal generator	Agilent	E8257D	MY49281095	Jul.09.2012
Test receiver	R&S	ESU26	100150	May.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Jan.29.2013
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Jan.29.2013
Horn Antenna	R & S	HF906	100683	May.15, 2012
Horn Antenna	R & S	HF906	100684	Jul.01, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	May.15, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	May.15, 2012

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	Field Strength of Spurious Radiation	Appendix F
7	Frequency Stability	Appendix G
8	Photos of Field Strength of Spurious Radiation	Appendix H

NOTE: The Appendix H only photos of Field Strength of Spurious Radiation, no test data.

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

Table 1 Measurement Results

	RF Output Power (Conducted)					
TEST CONDITIONS	Channel512(B)		Channel661(M)		Channel810(T)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dBm		dBm		dBm	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	29.41	33	29.30	33	29.16	33
TM2	25.64	33	25.57	33	25.51	33



Effective Isotropic Radiated Power of Transmitter (EIRP)

Table 2 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP)	FCC limit [dBm]	Result
				[dBm]			[dBm]		
TM1	1850.2	31.41	Horn Ant.	27.95	4.5	1	31.45	33	Pass
TM1	1880.0	31.30	Horn Ant.	27.82	4.5	1	31.32	33	Pass
TM1	1909.8	31.16	Horn Ant.	27.31	4.8	1	31.11	33	Pass
TM2	1850.2	27.64	Horn Ant.	24.17	4.5	1	27.67	33	Pass
TM2	1880.0	27.57	Horn Ant.	24.04	4.5	1	27.54	33	Pass
TM2	1909.8	27.51	Horn Ant.	23.75	4.8	1	27.55	33	Pass

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

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

b, SGP=Signal Generator Level

The END



Appendix B

Modulation Characteristics

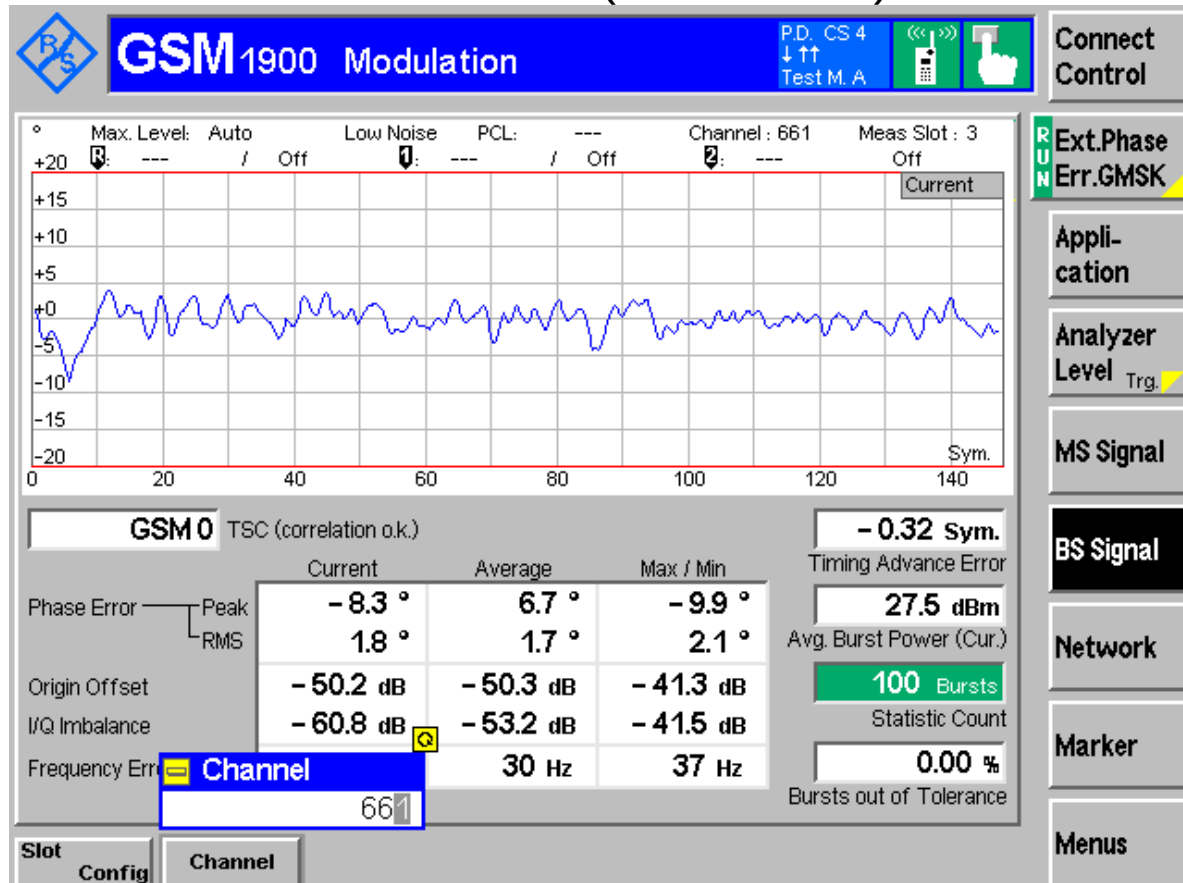
According to FCC Part 2.1047 & Part24 Subpart E



1 Test Plot

1.1 Test Mode = TM 1

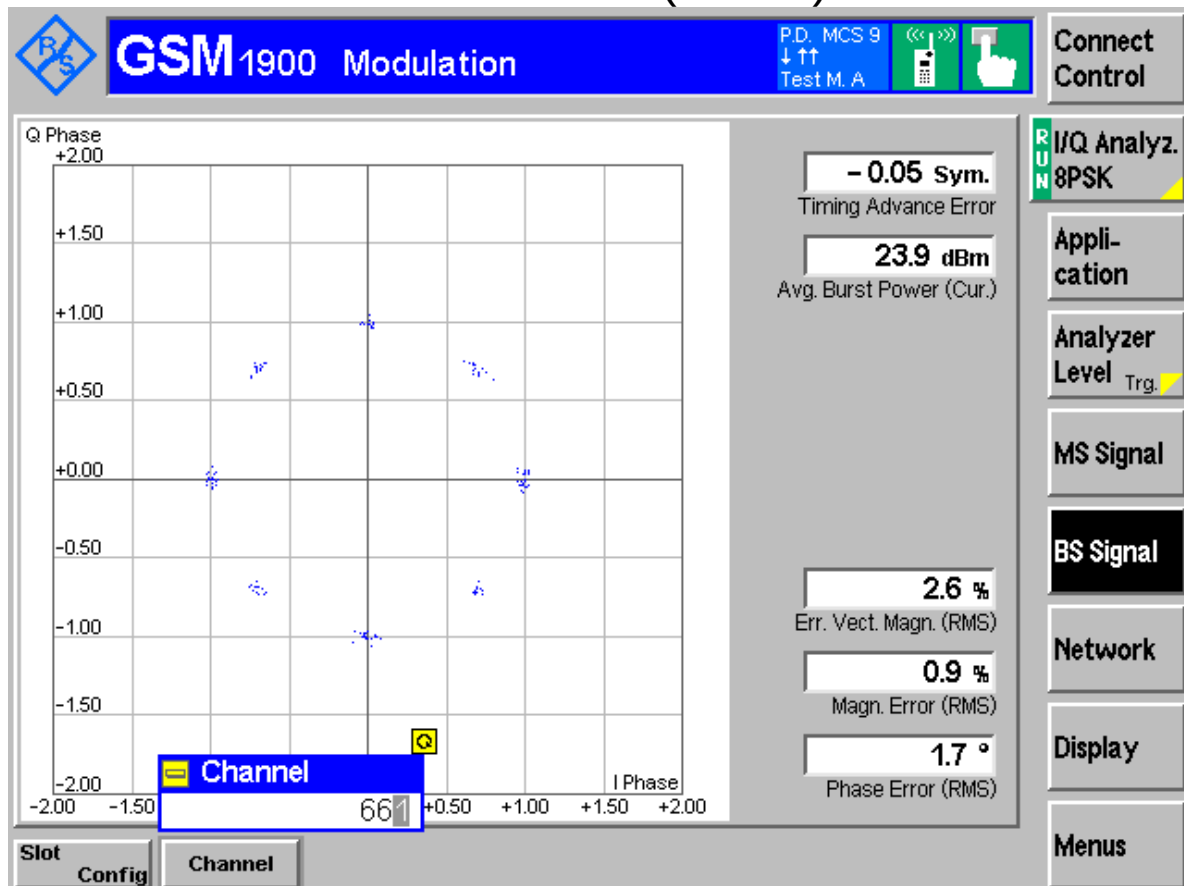
Channel 661 (GPRS/GSM)





1.2 Test Mode = TM 2

Channel 661 (EDGE)



The END



Appendix C

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



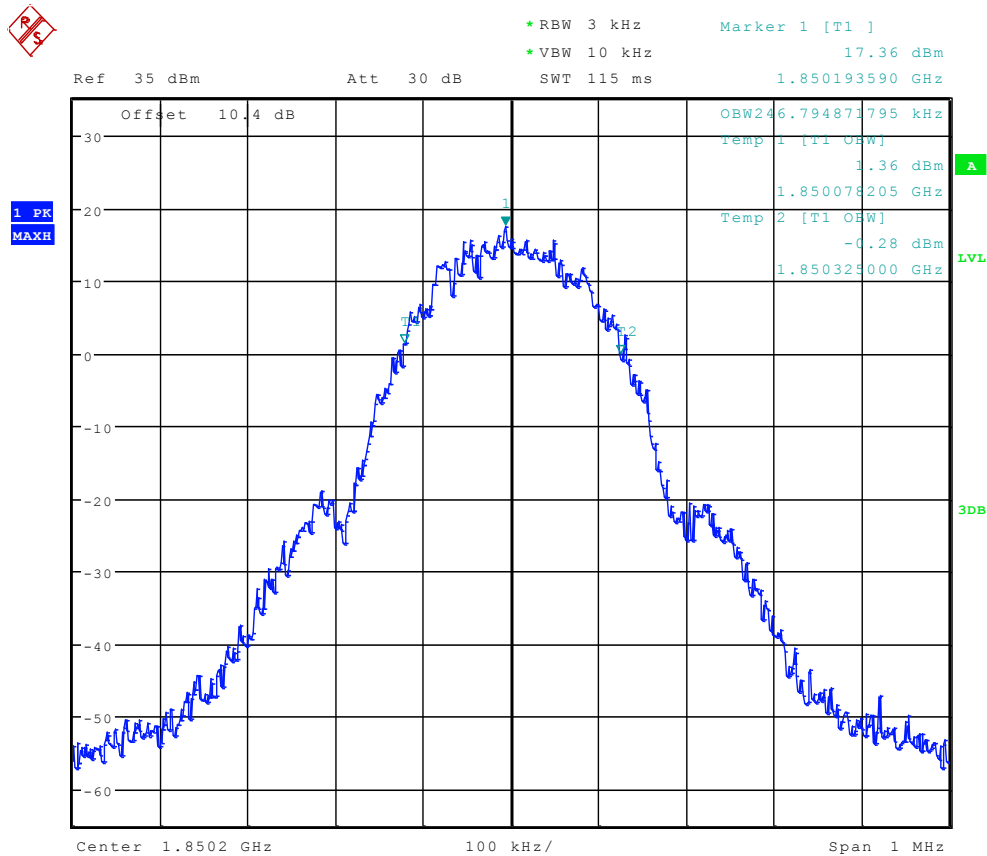
Result Table

Table 1 Measurement Results

Test Mode	RF Channel	Occupied Bandwidth [kHz]	Verdict
TM1	512	246.8	Pass
	661	243.6	Pass
	810	243.6	Pass
TM2	512	242.0	Pass
	661	243.6	Pass
	810	238.8	Pass



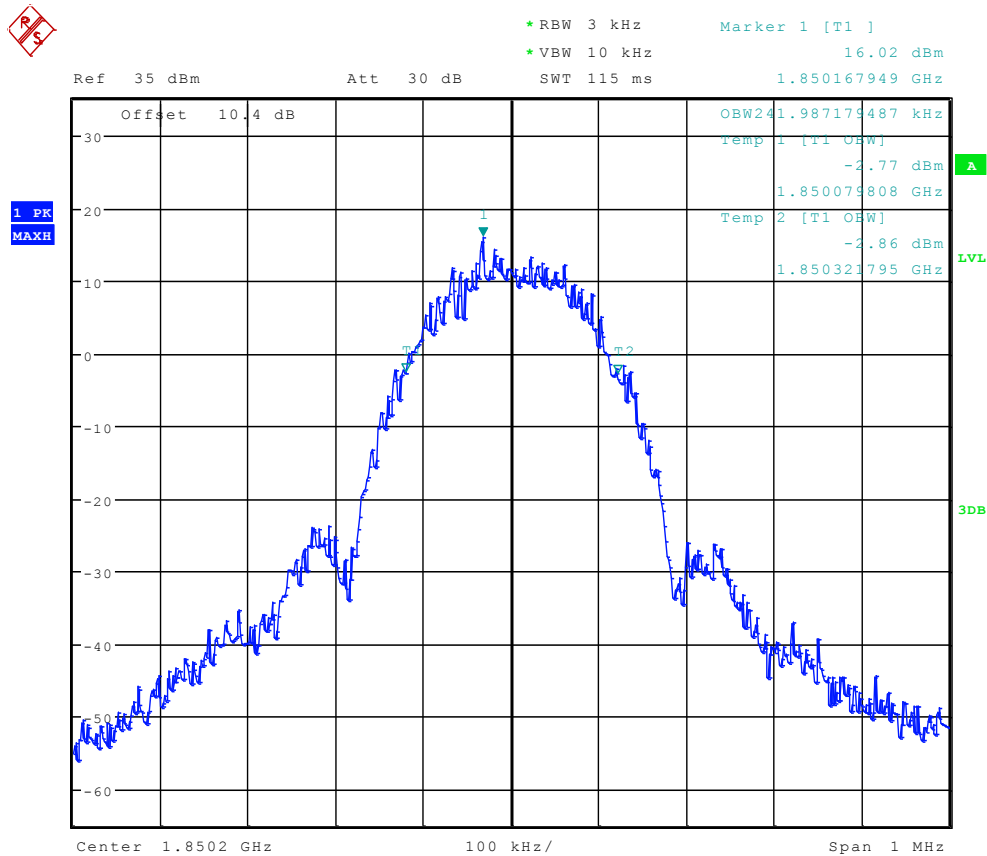
TM1:GPRS/GSM Channel 512



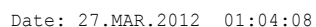
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TM2:EDGE Channel 512

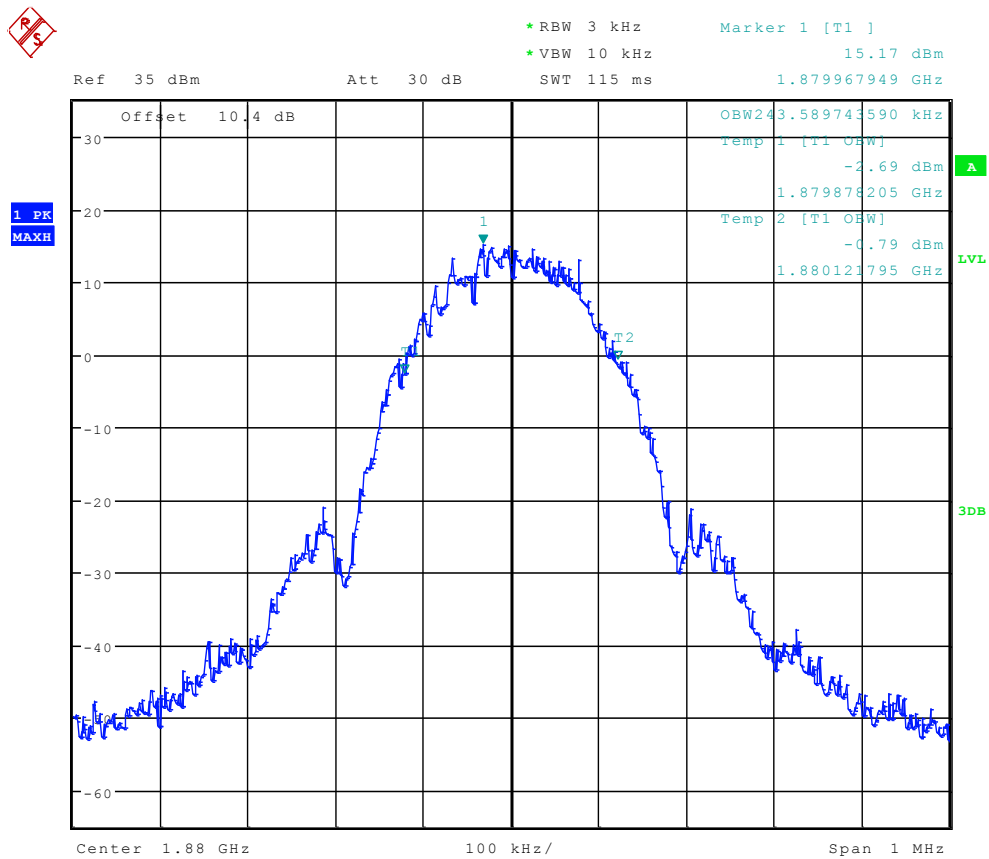


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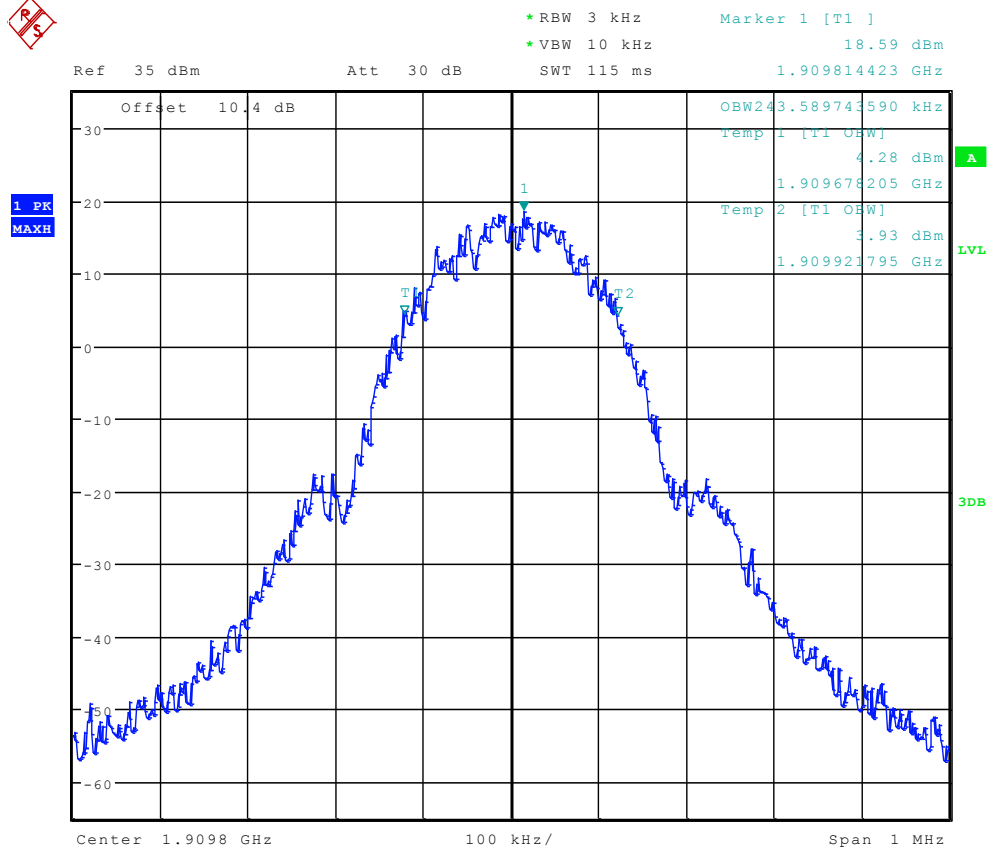
TM2:EDGE Channel 661



Date: 27.MAR.2012 01:11:33



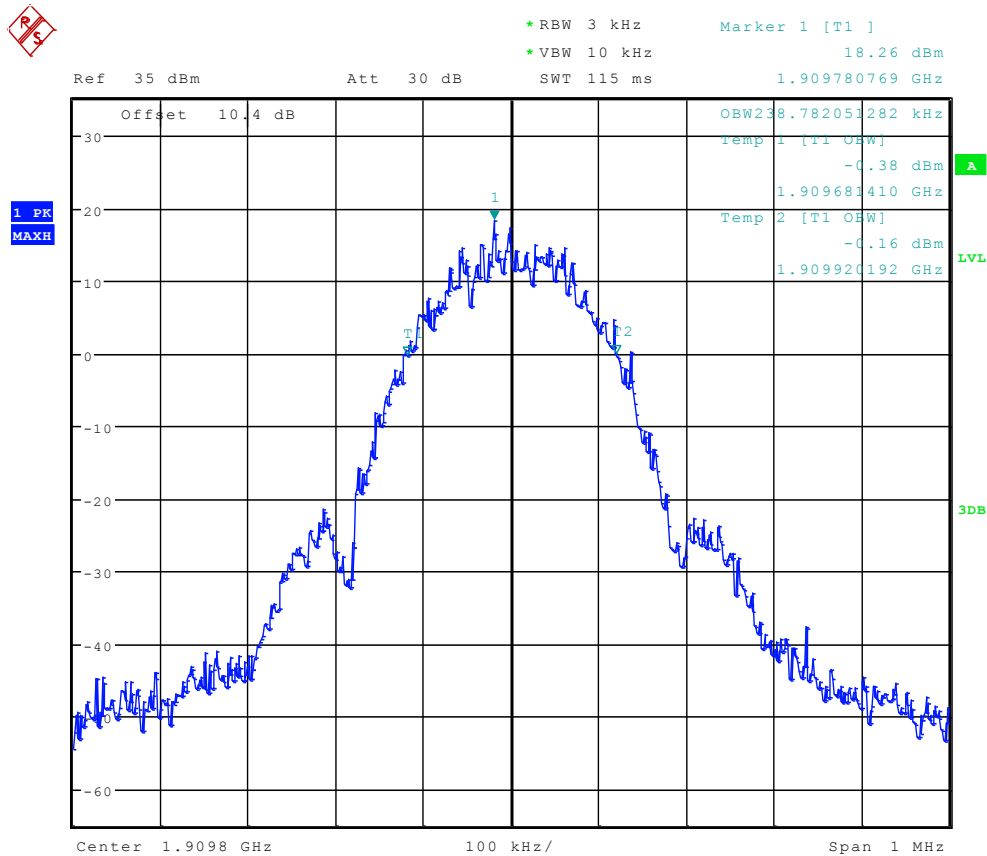
TM1:GPRS/GSM Channel 810



Date: 27.MAR.2012 01:04:22



TM2:EDGE Channel 810



Date: 27.MAR.2012 01:11:47

The END

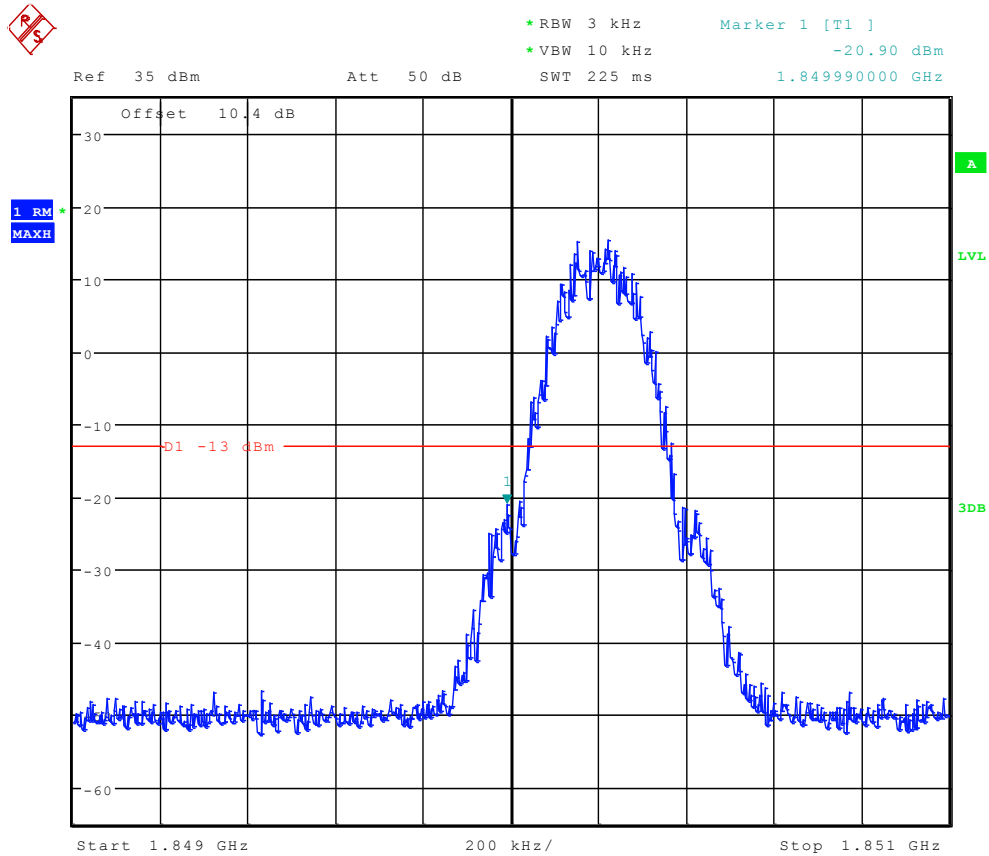


Appendix D

Band Edges Compliance According to FCC Part 2.1051 & 24.238



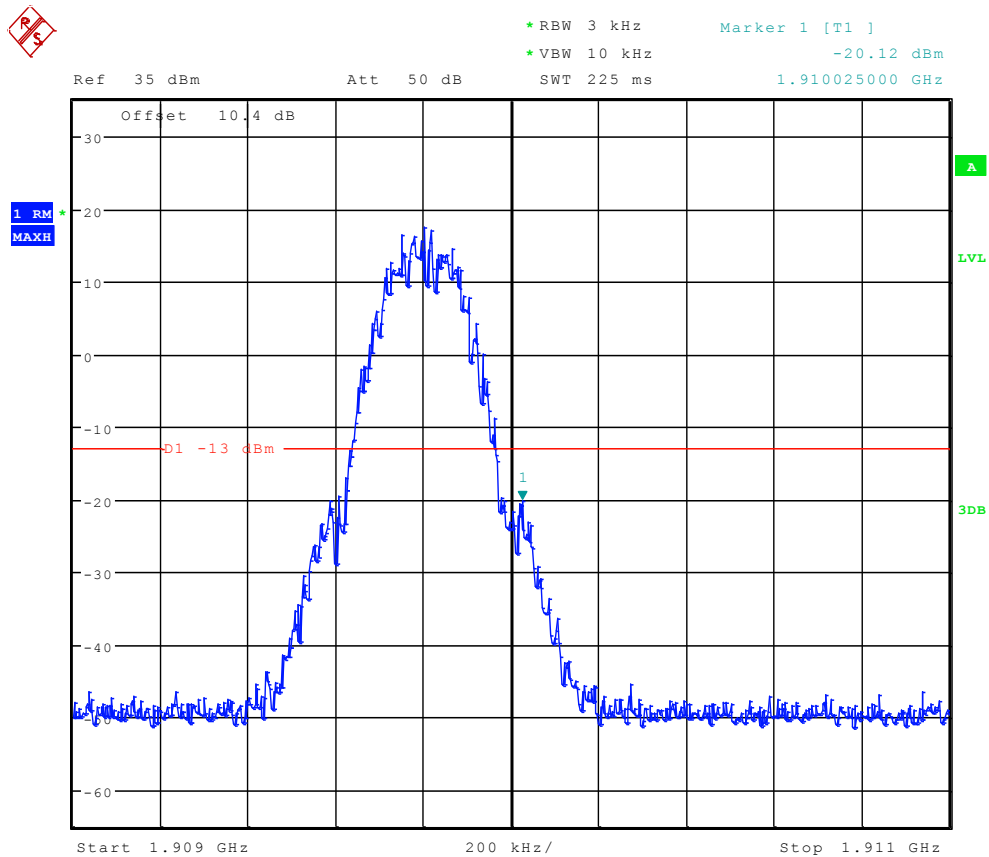
TM1:GPRS/GSM Left Edge Channel 512



Date: 27.MAR.2012 01:21:04



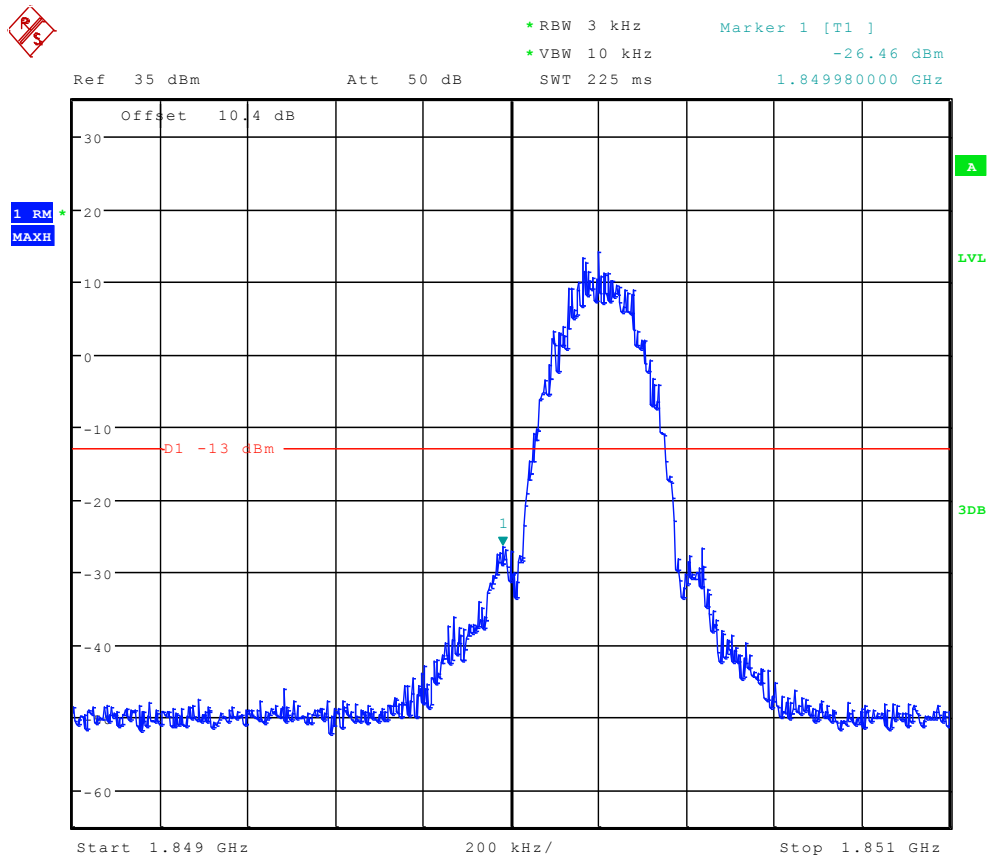
Right Edge Channel 810



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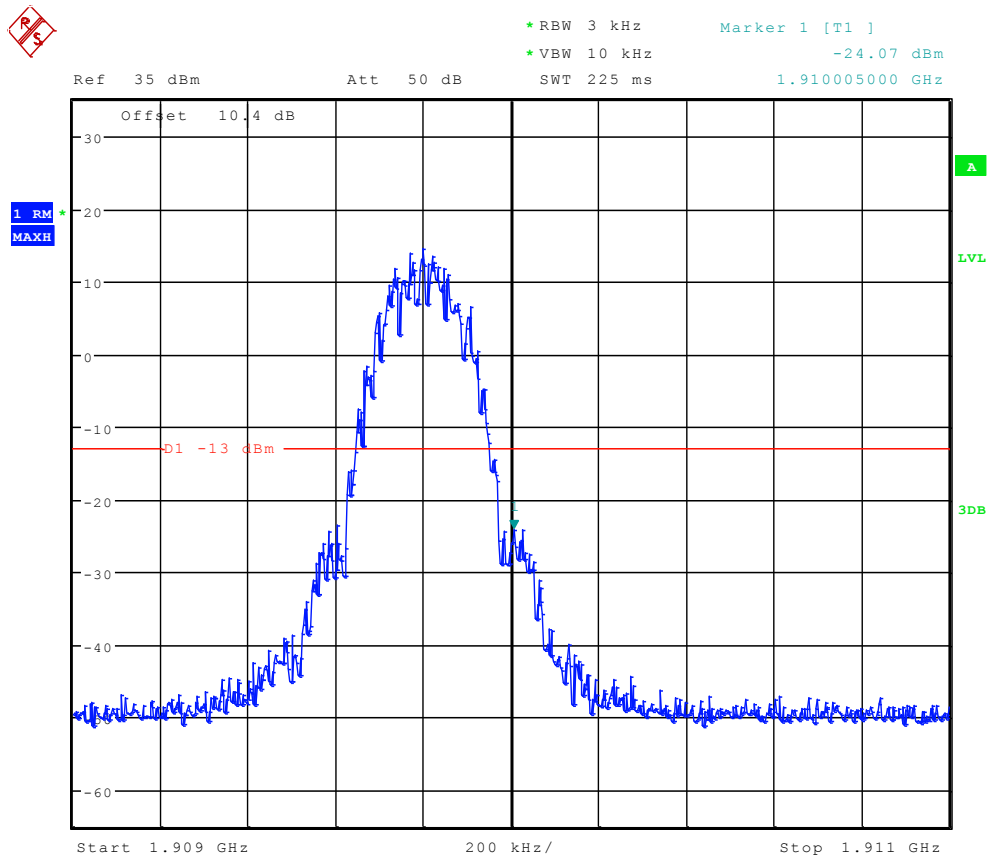
EDGE Left Edge Channel 512



Date: 27.MAR.2012 01:17:04



Right Edge Channel 810



Date: 27.MAR.2012 01:17:34

The END



Appendix E

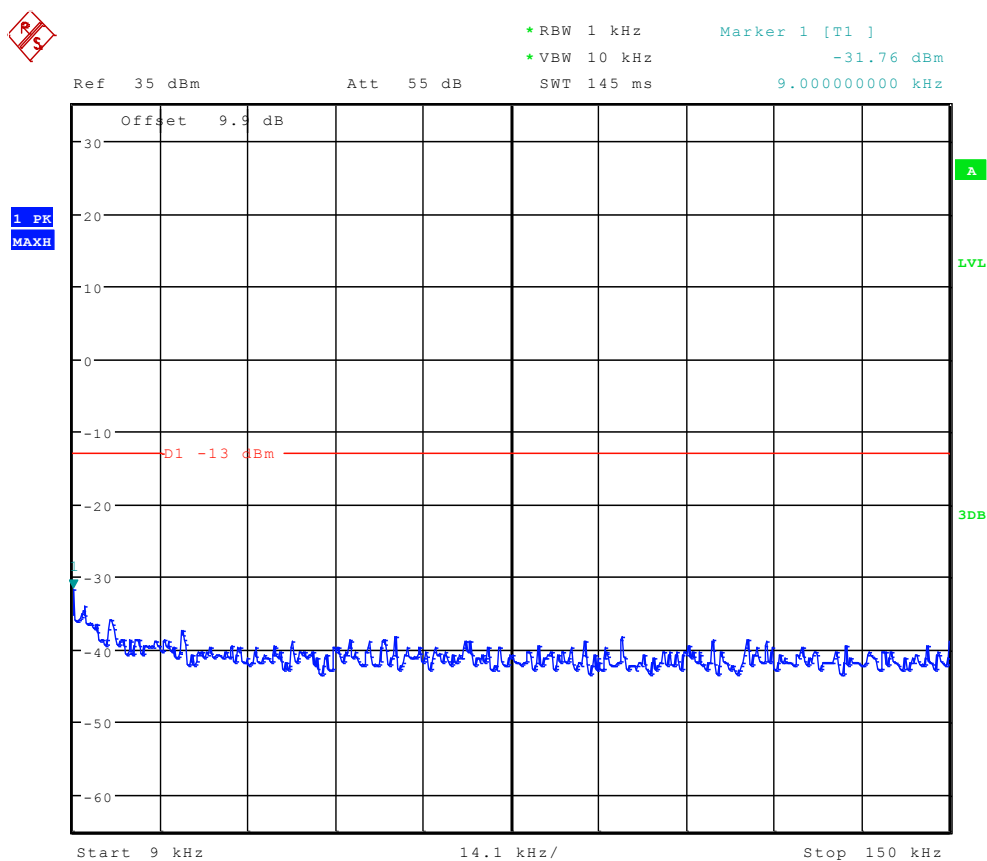
Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & 24.238

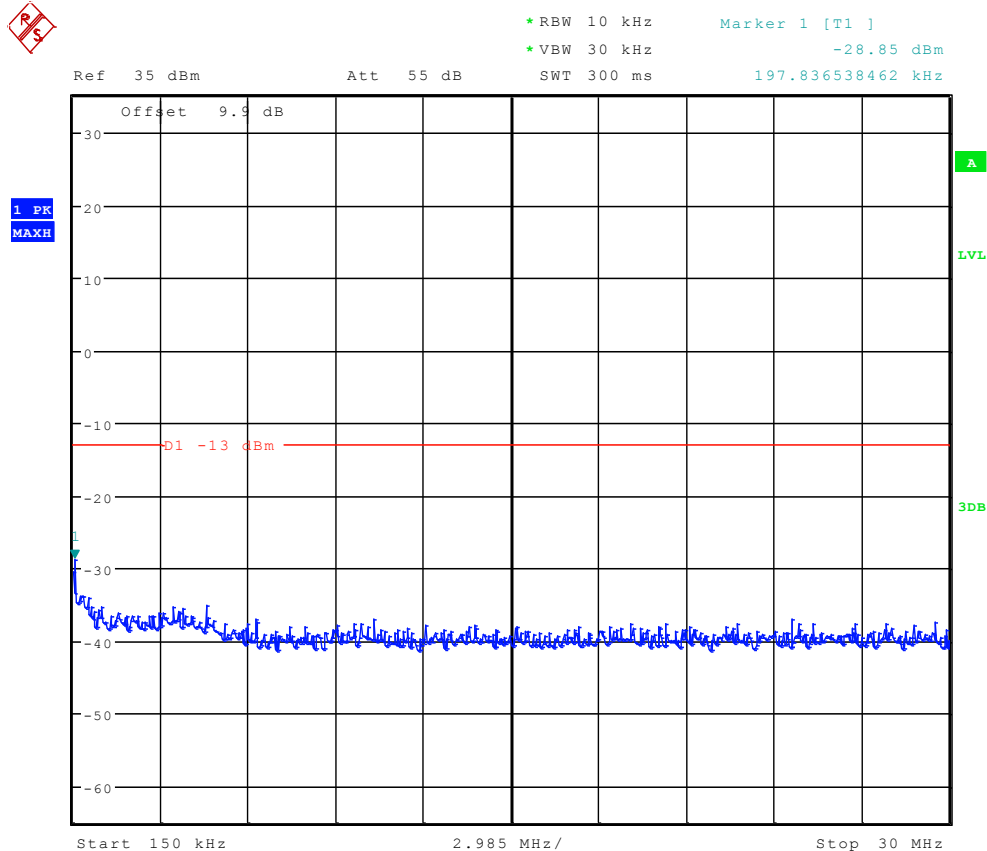


TM1:GPRS/GSM

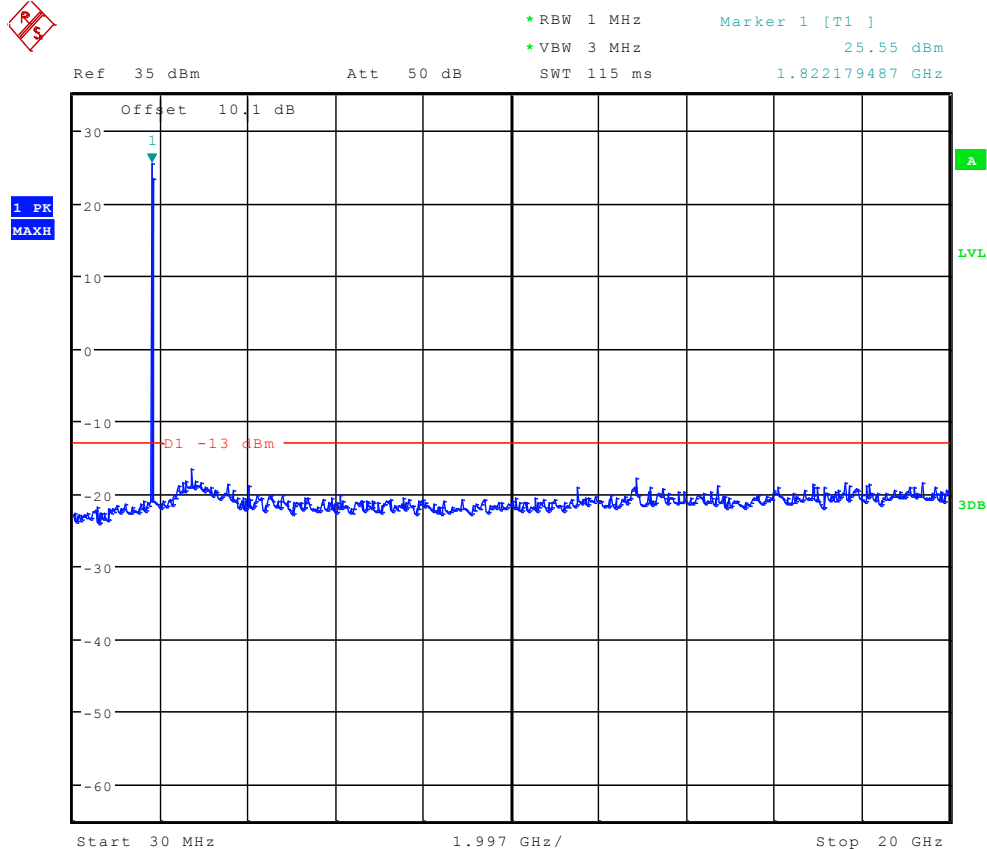
Channel 512



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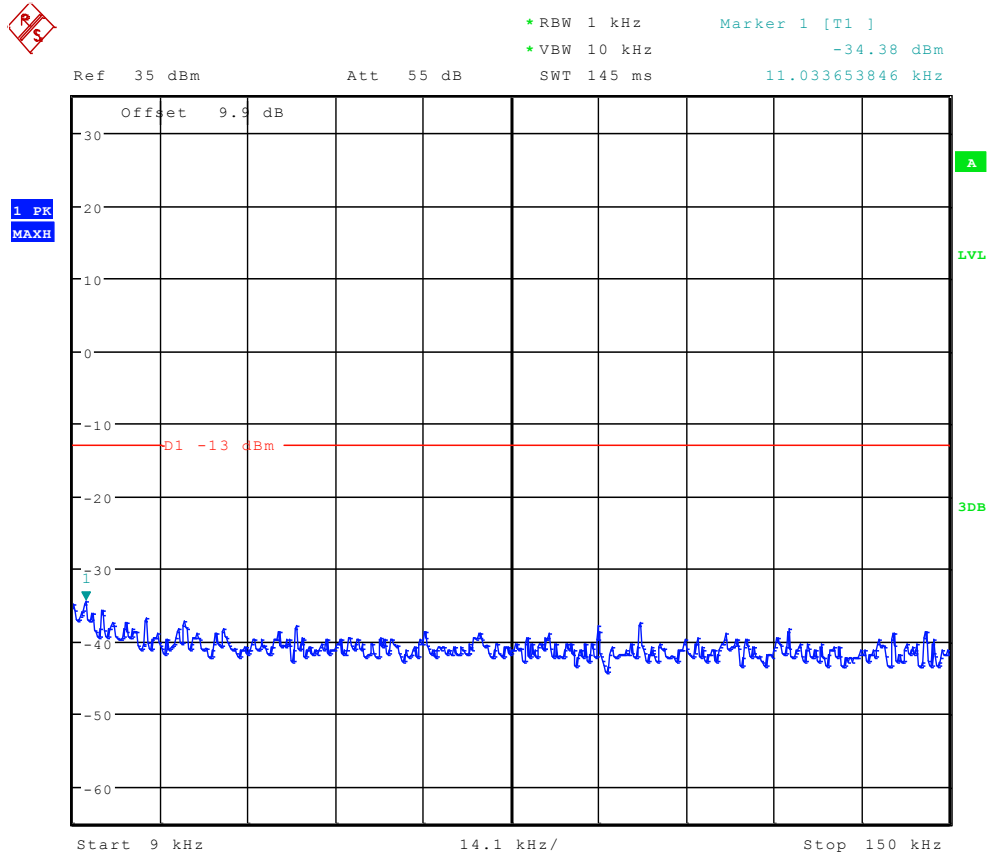
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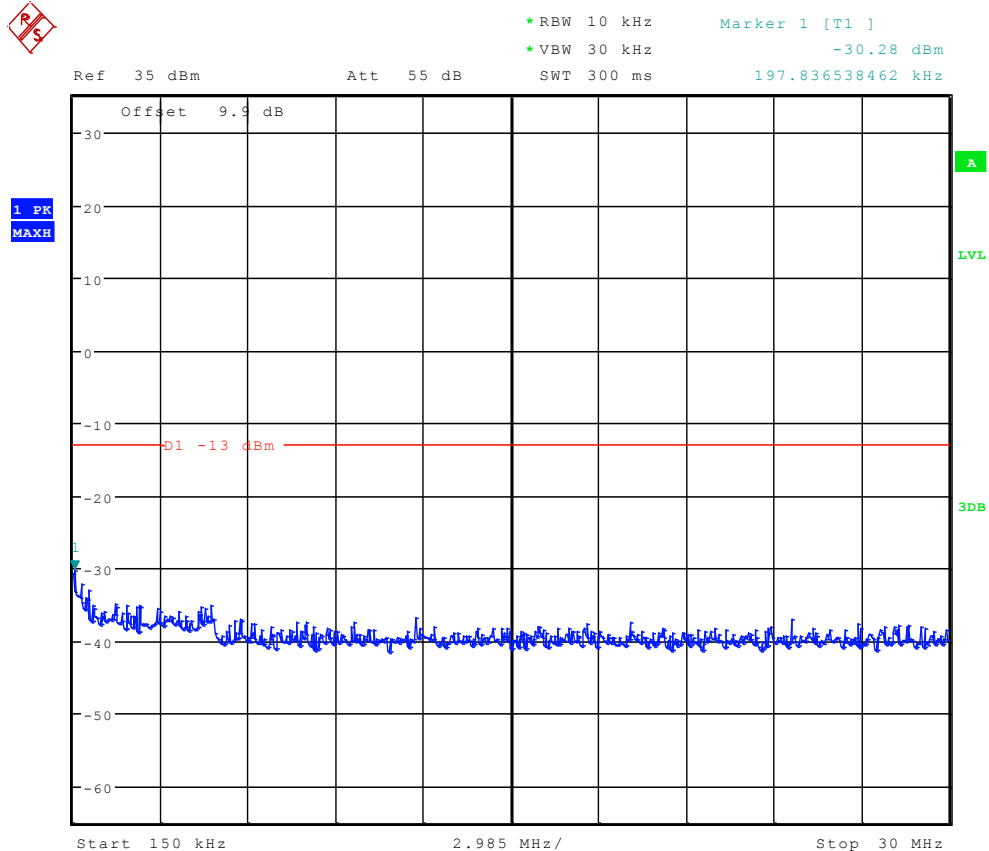
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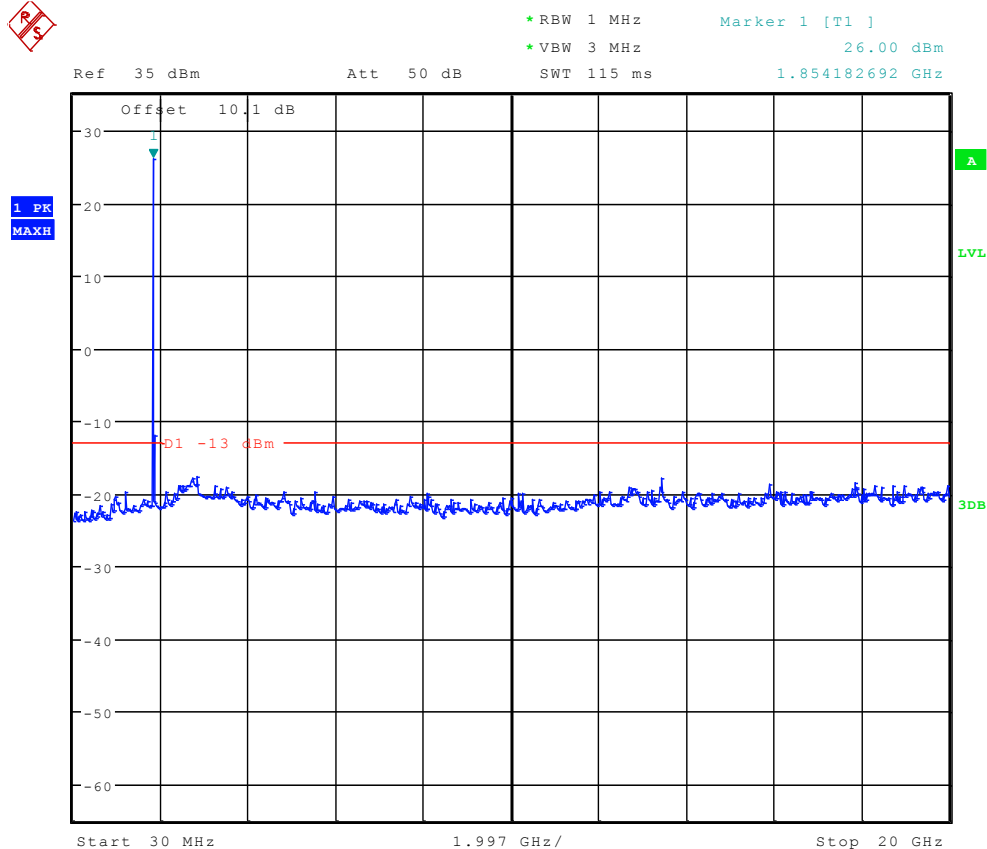
Channel 661



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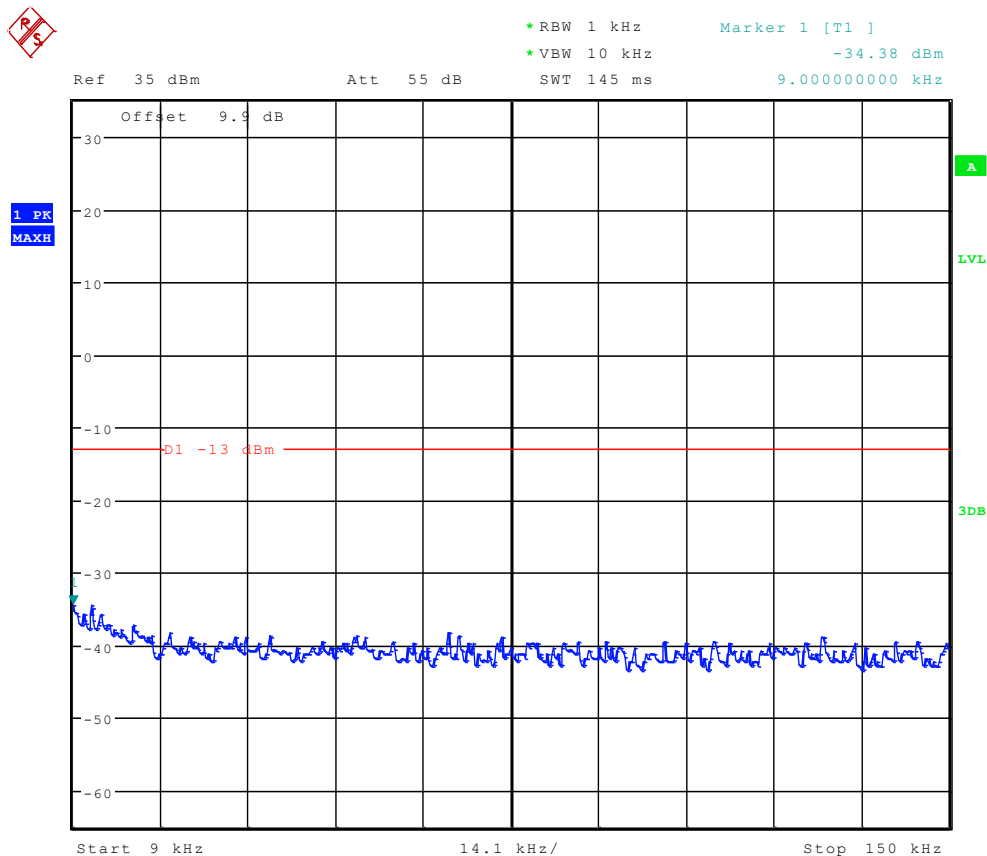
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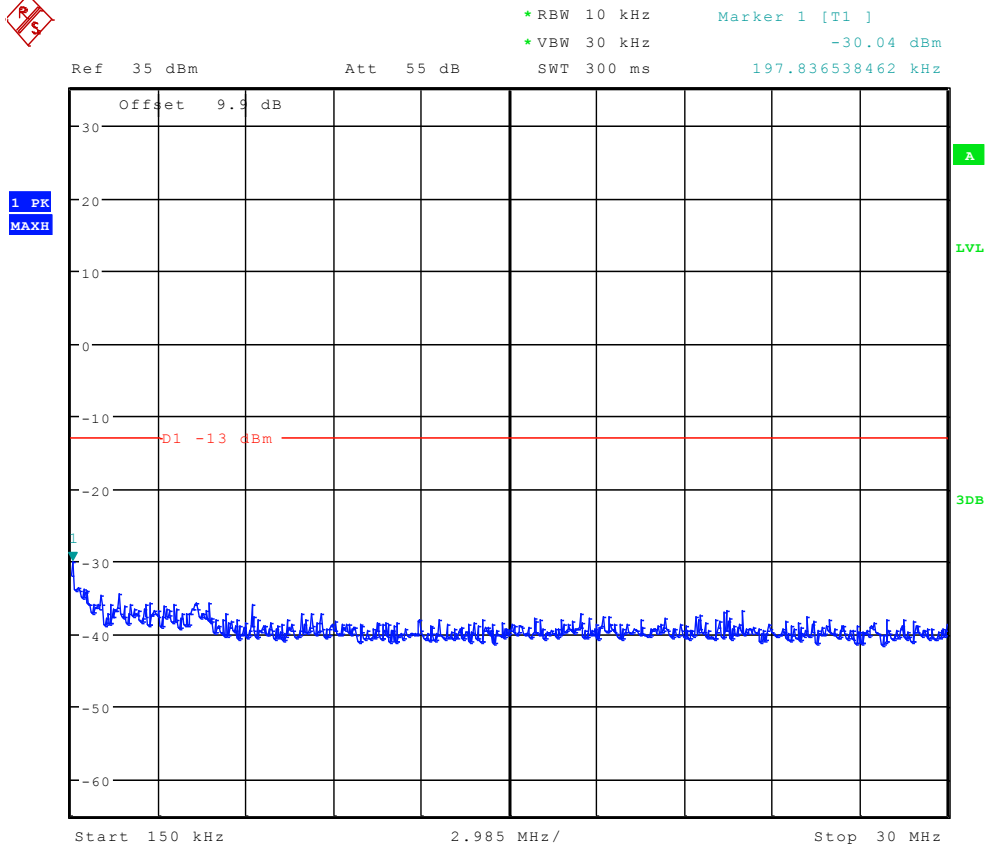
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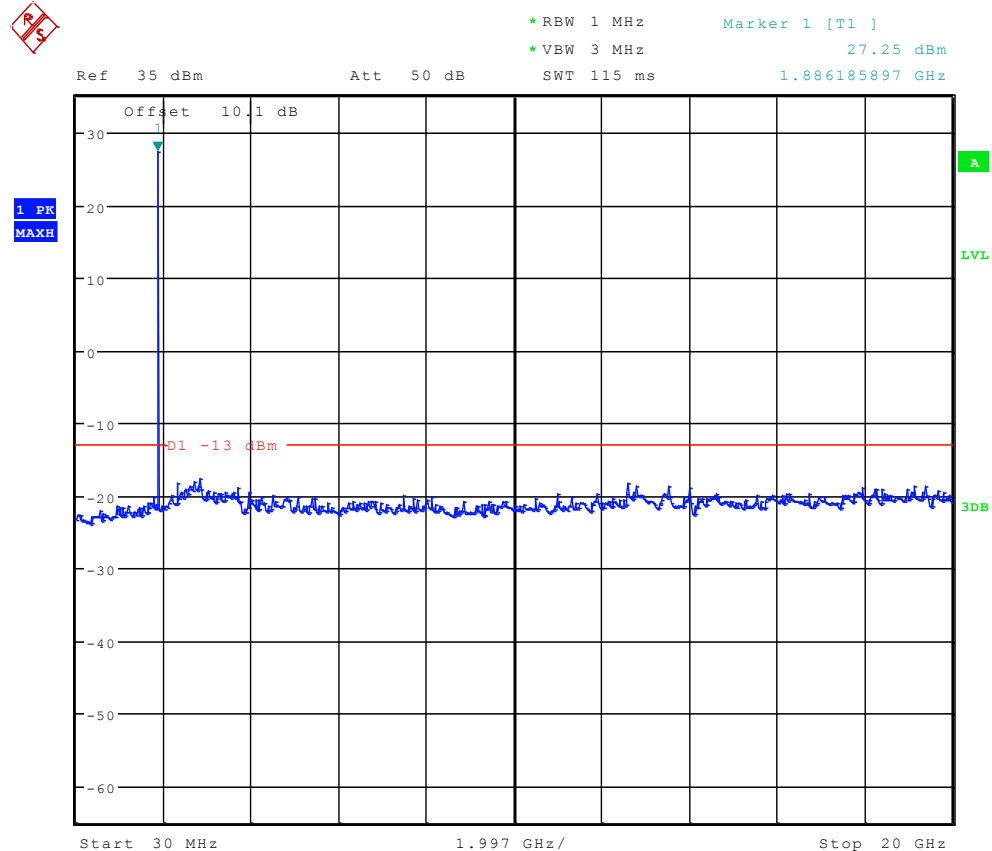
Channel 810



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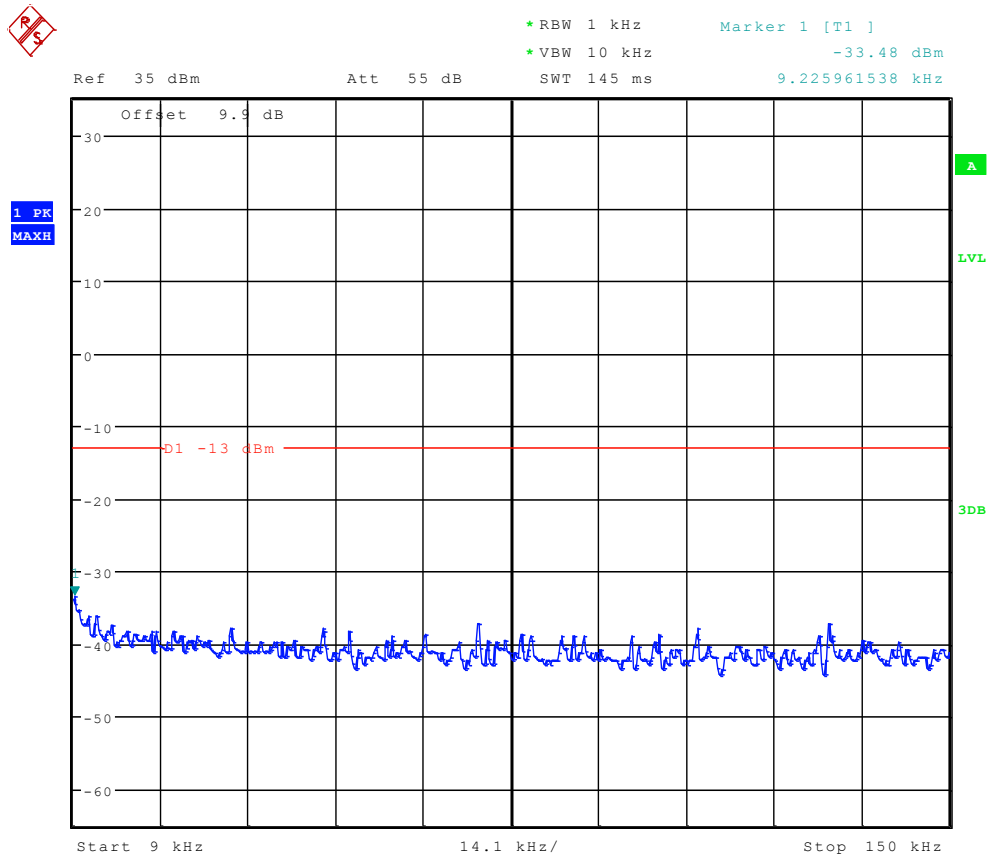
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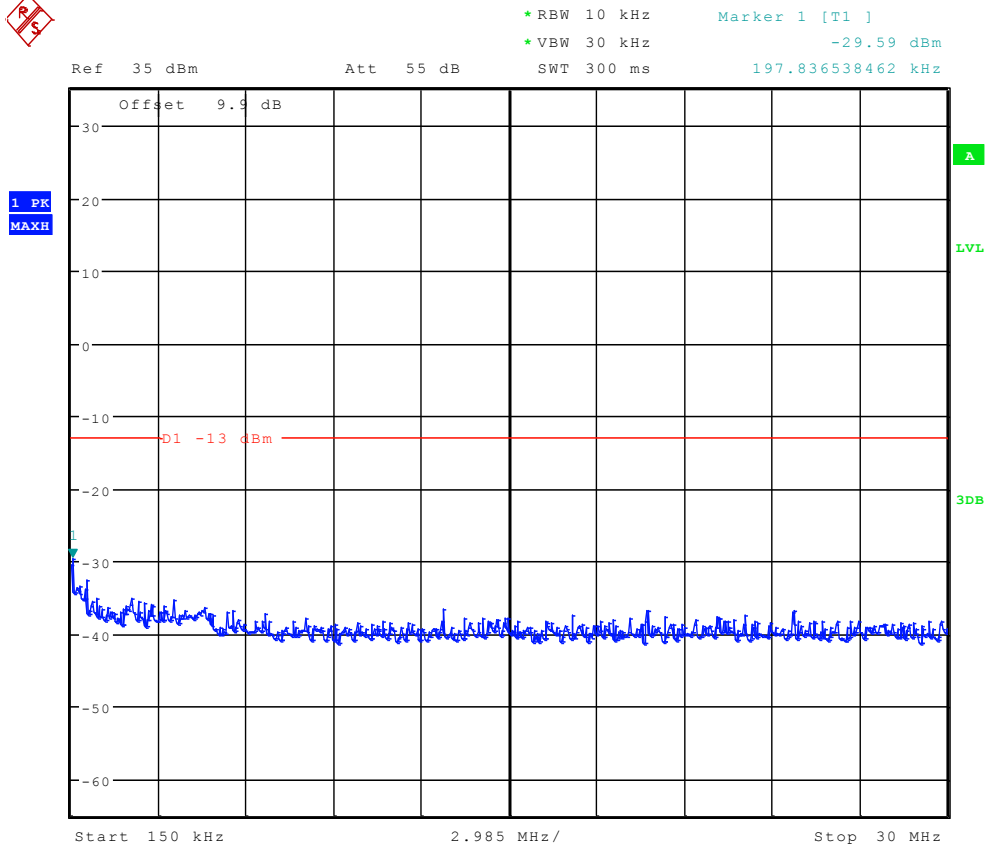
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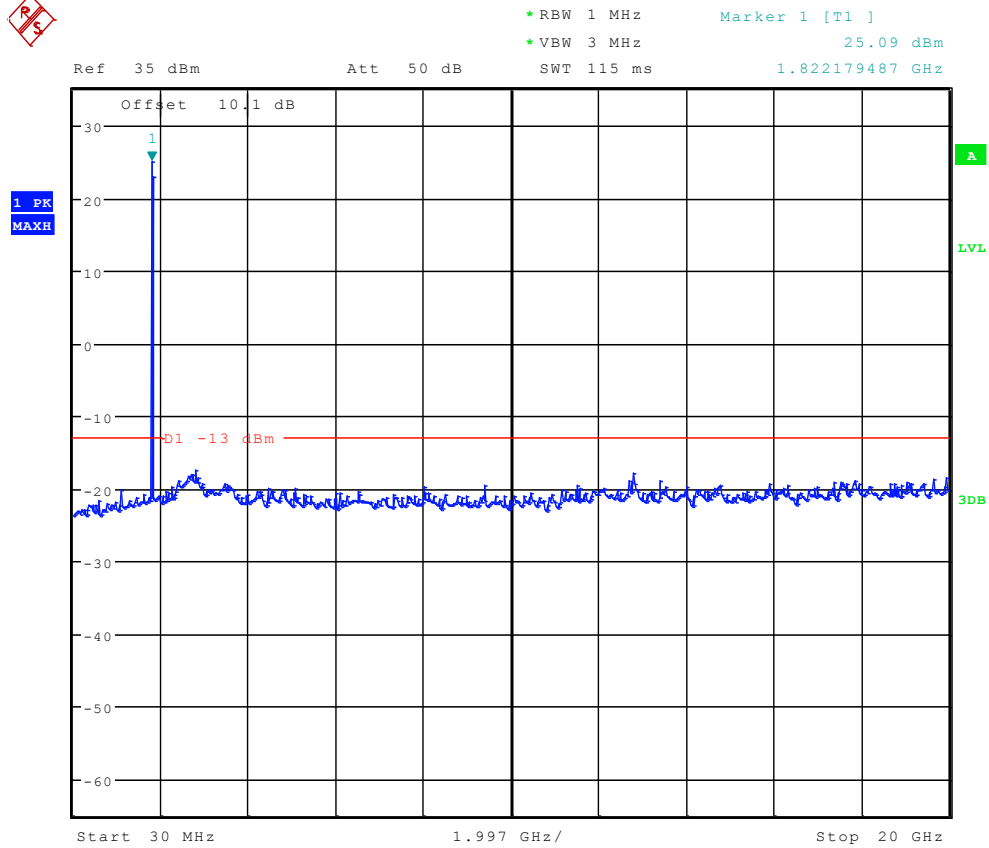
TM2:EDGE Channel 512



Date: 27.MAR.2012 01:12:02



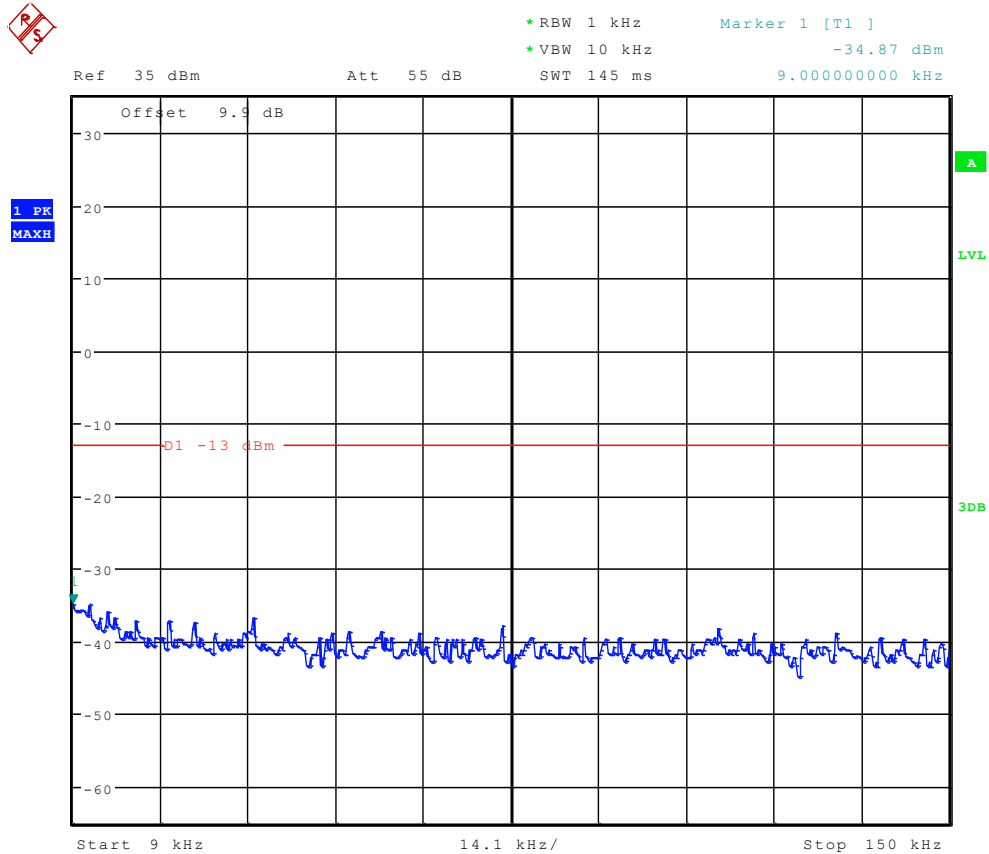
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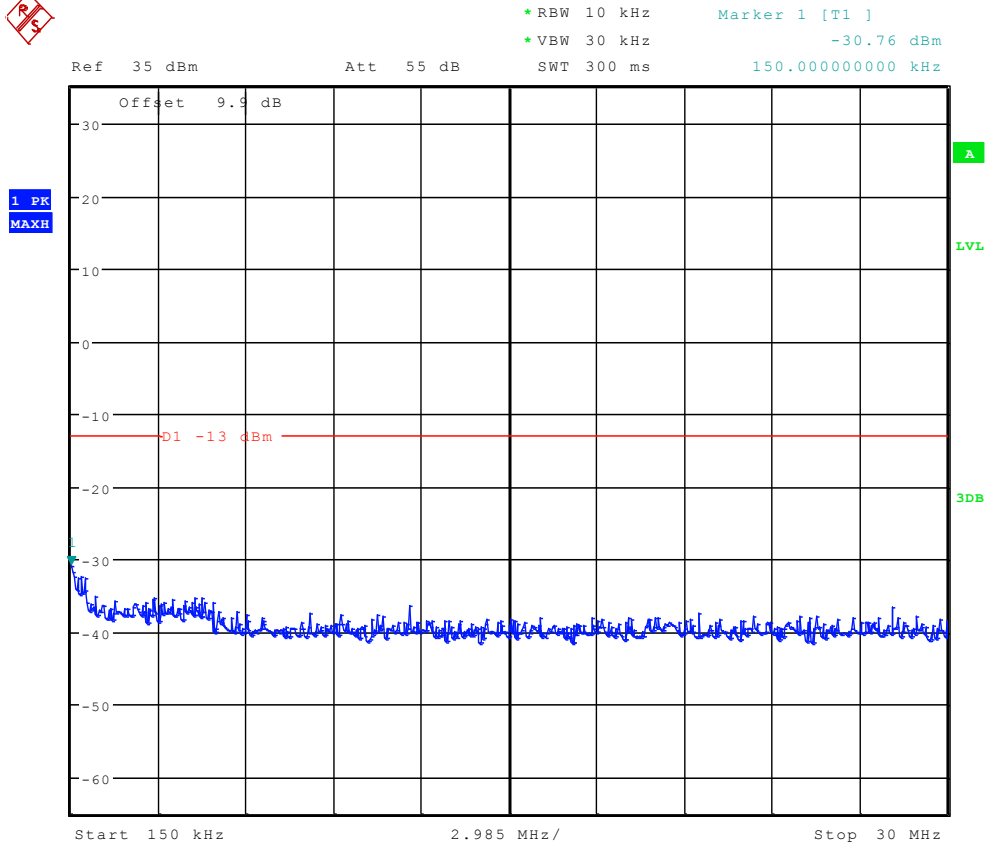
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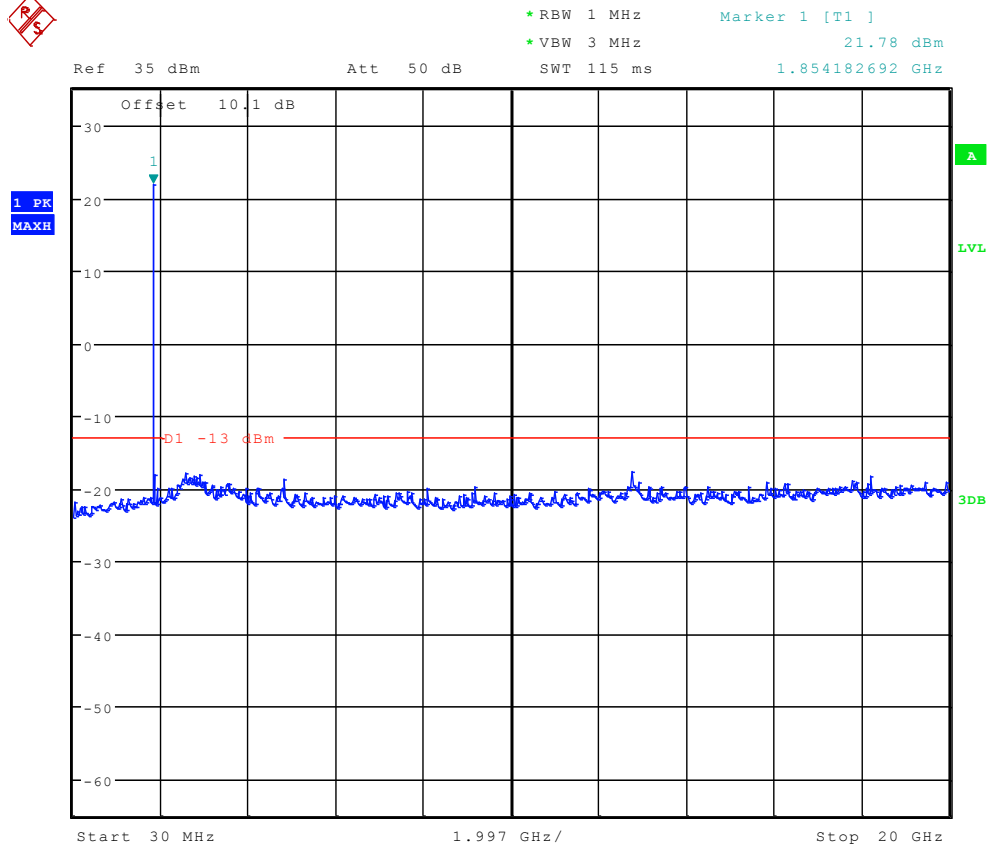
Channel 661



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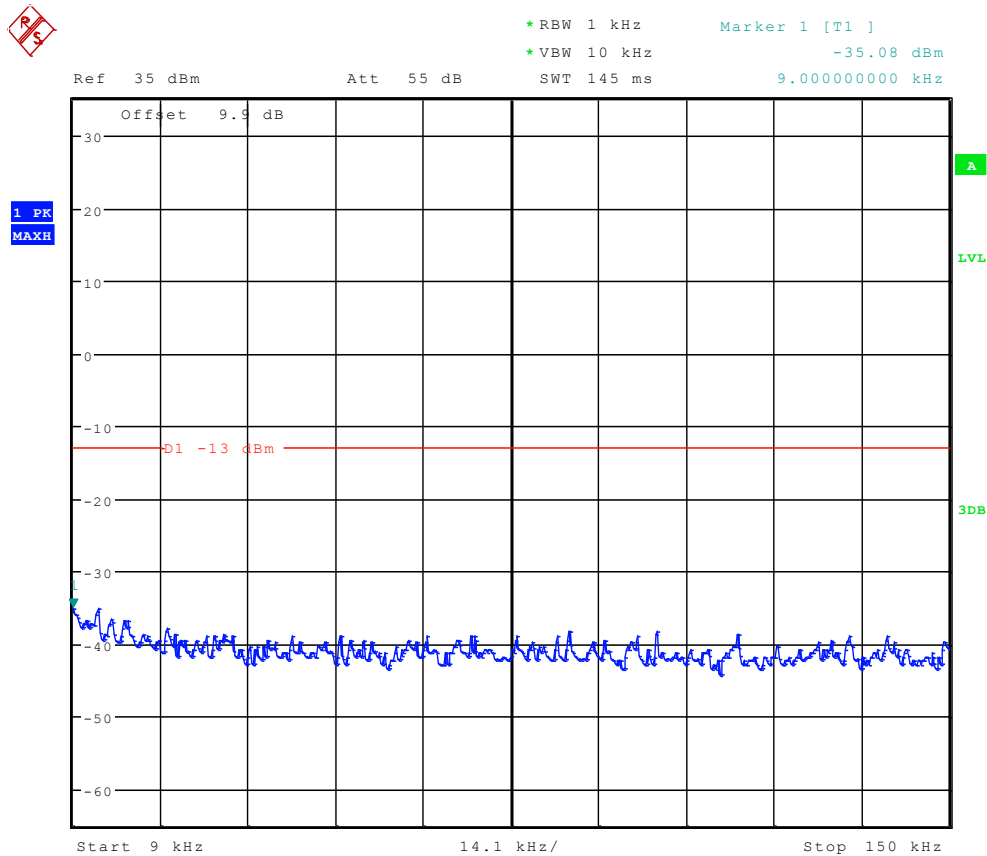
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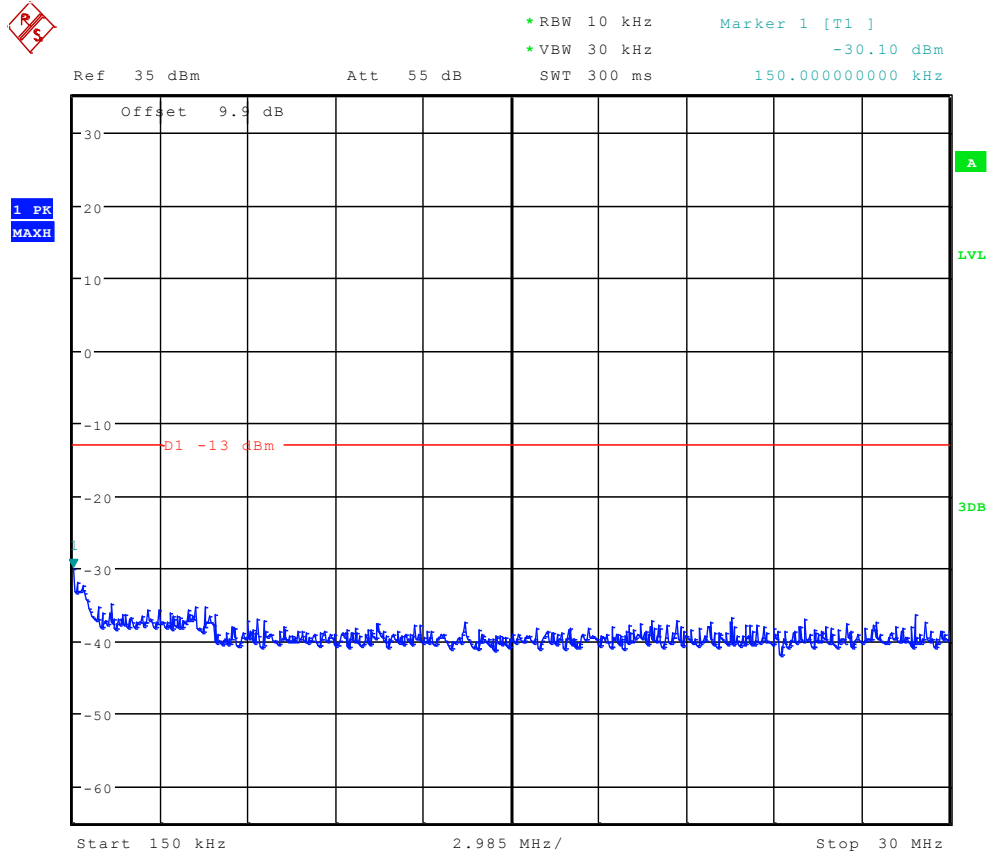
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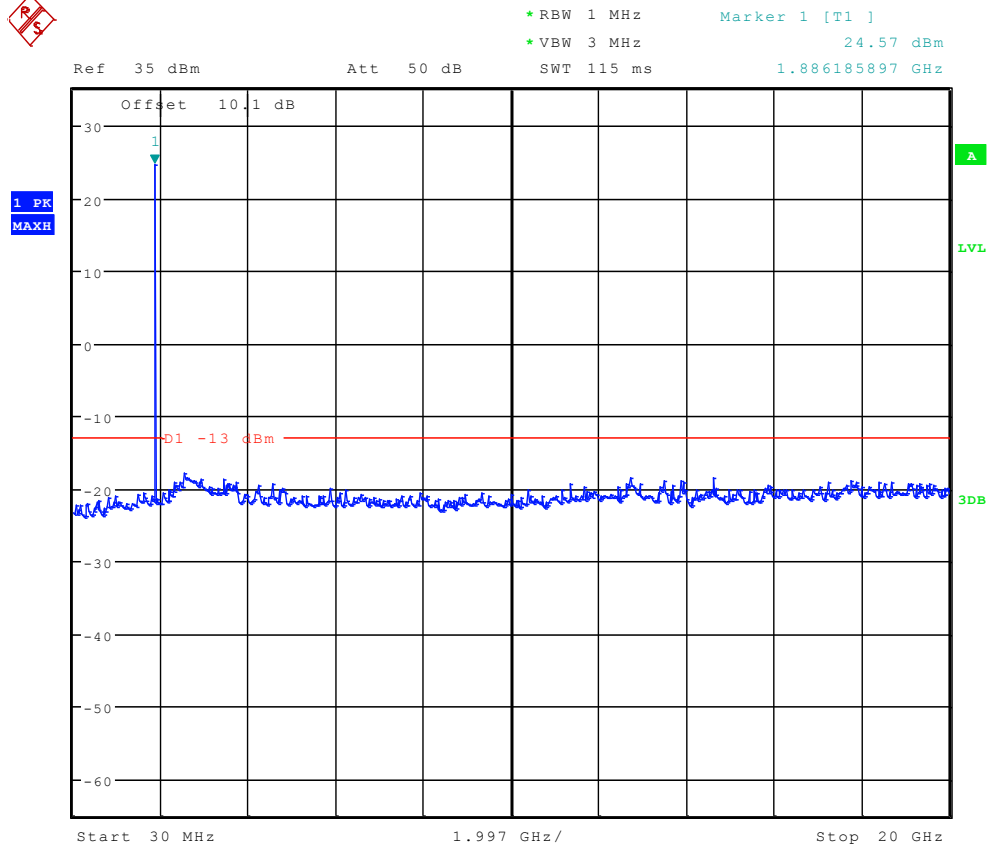
Channel 810



Date: 27.MAR.2012 01:12:30



Date: 27.MAR.2012 01:13:14



Date: 27.MAR.2012 01:13:58

The END



Appendix F

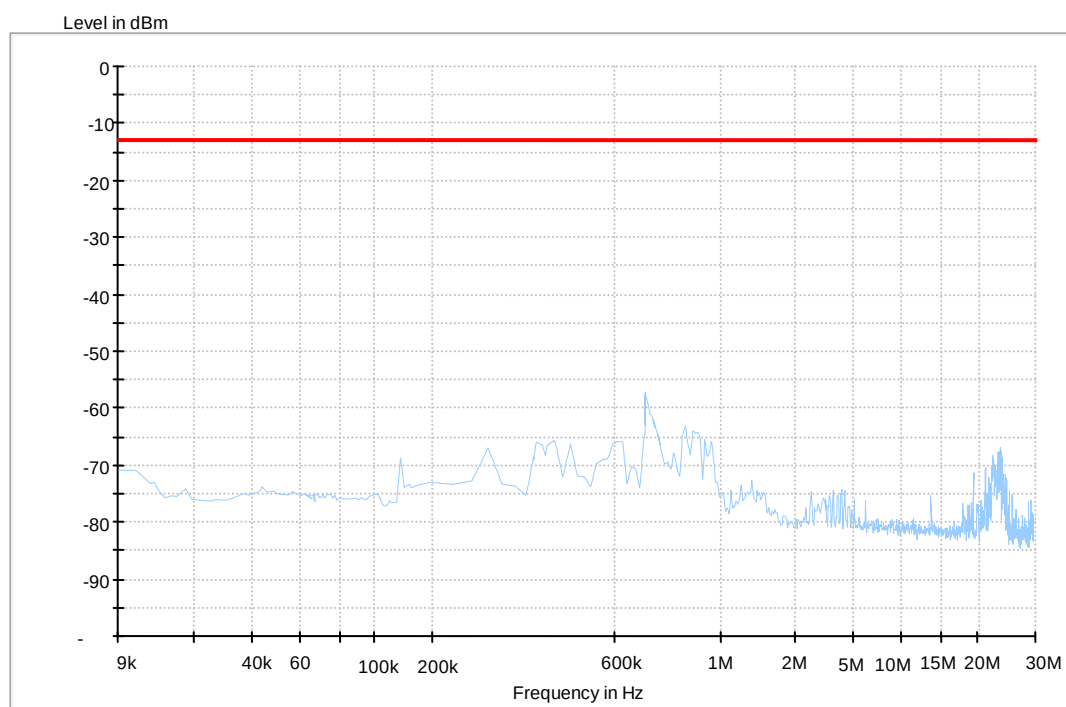
Field Strength of spurious emission

According to FCC Part 24.238



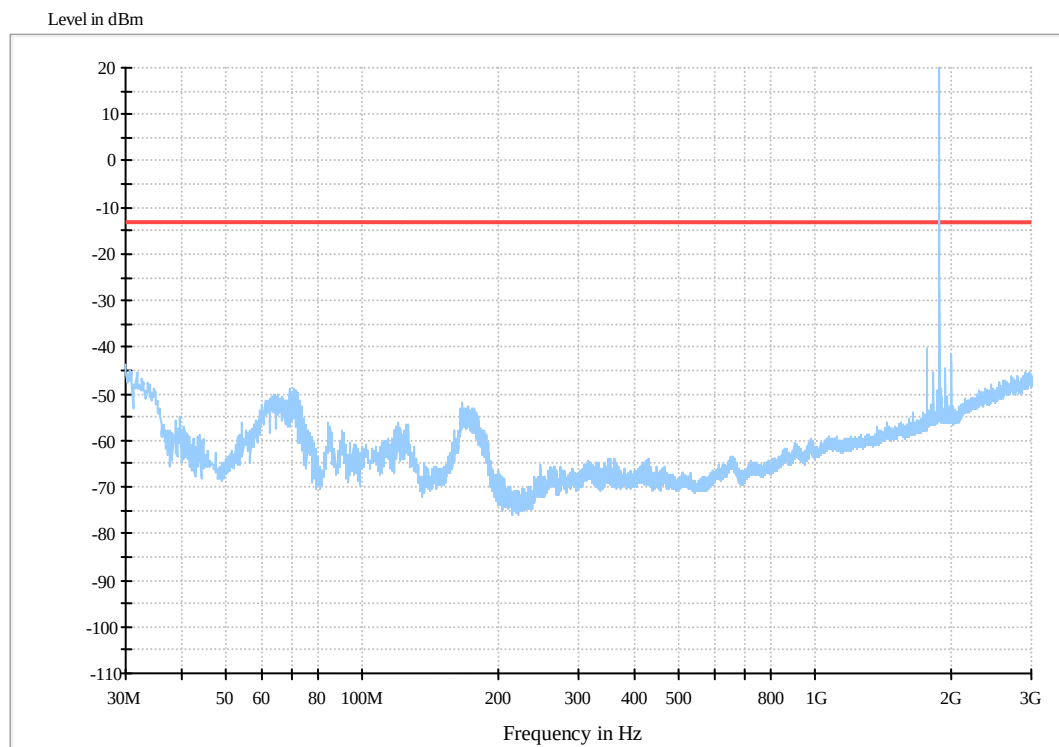
GPRS 1900

Traffic Mode (9kHz-30MHz)



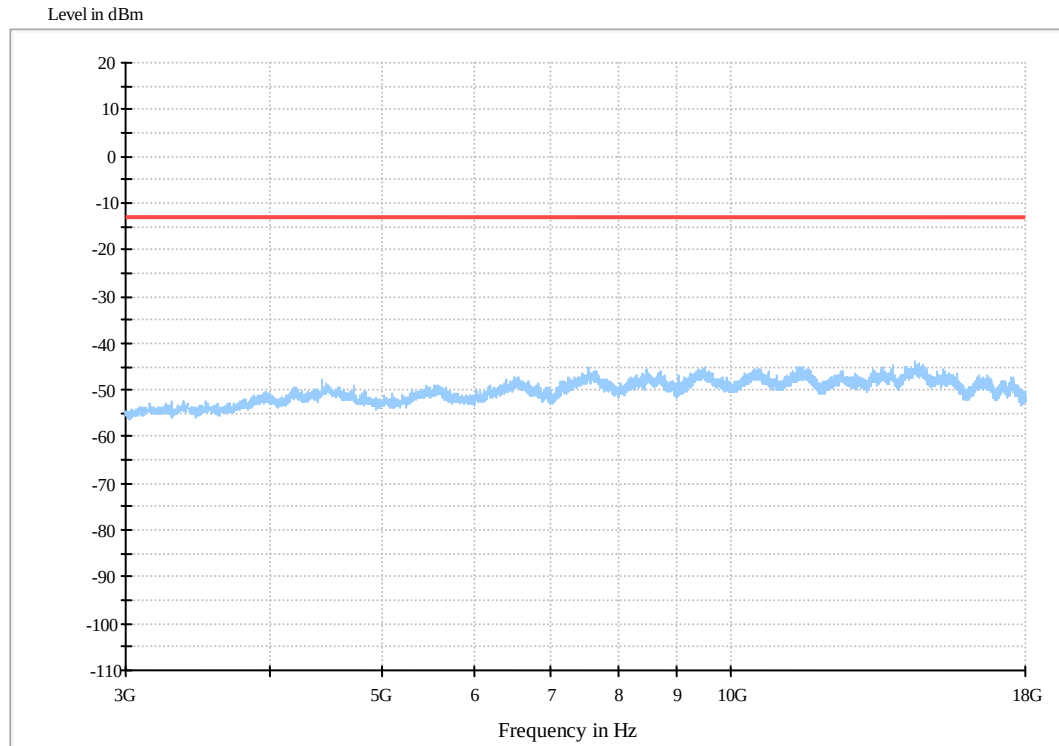


Traffic Mode (30MHz-3GHz)



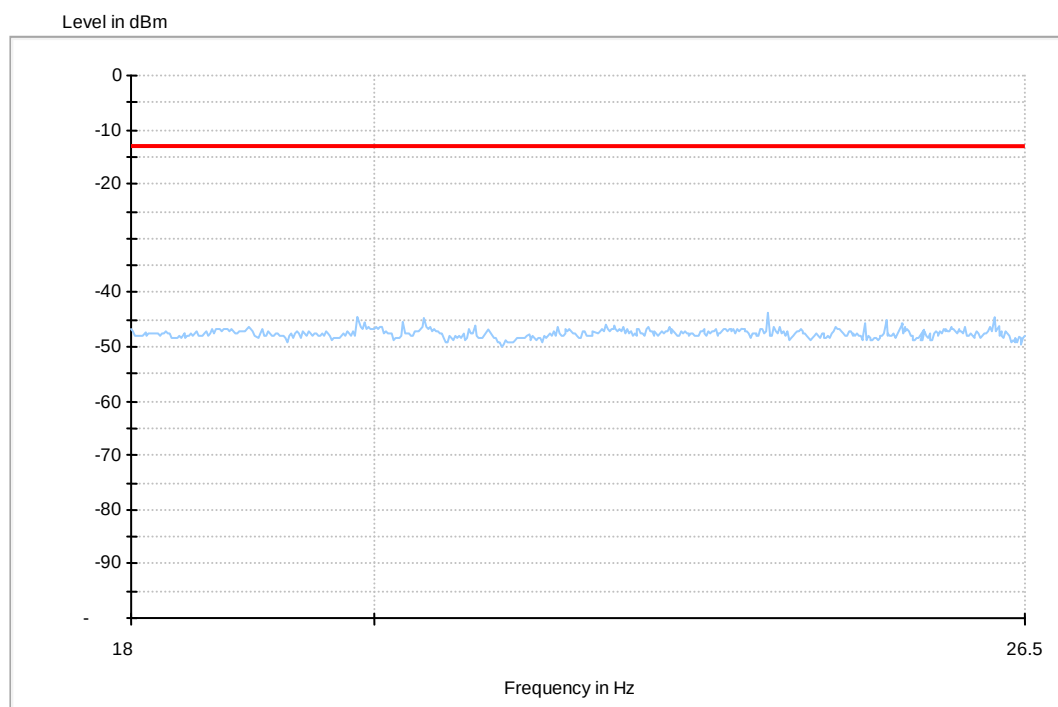


Traffic Mode (3GHz-18GHz)





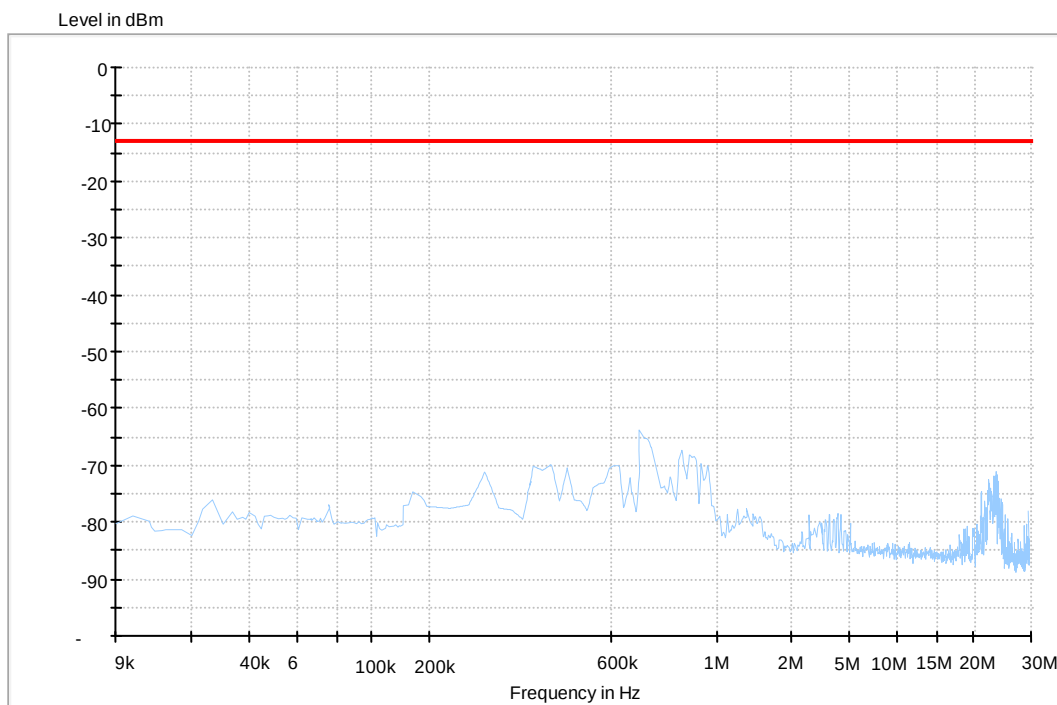
Traffic Mode (18GHz-26.5GHz)





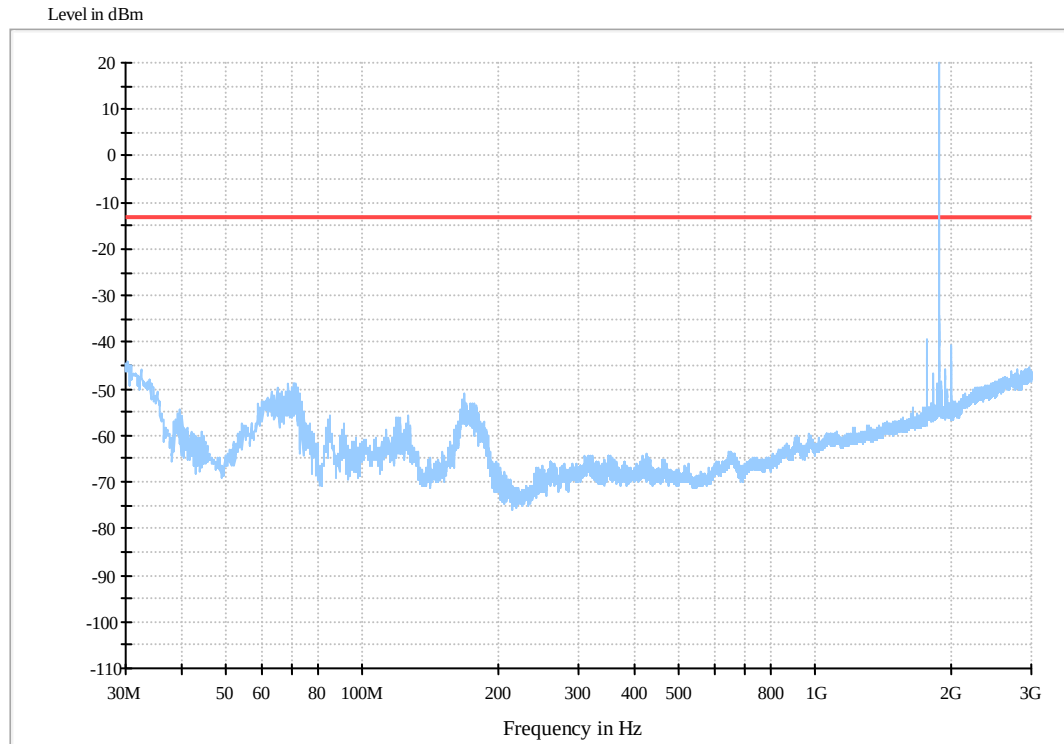
EDGE1900

Traffic Mode (9kHz-30MHz)



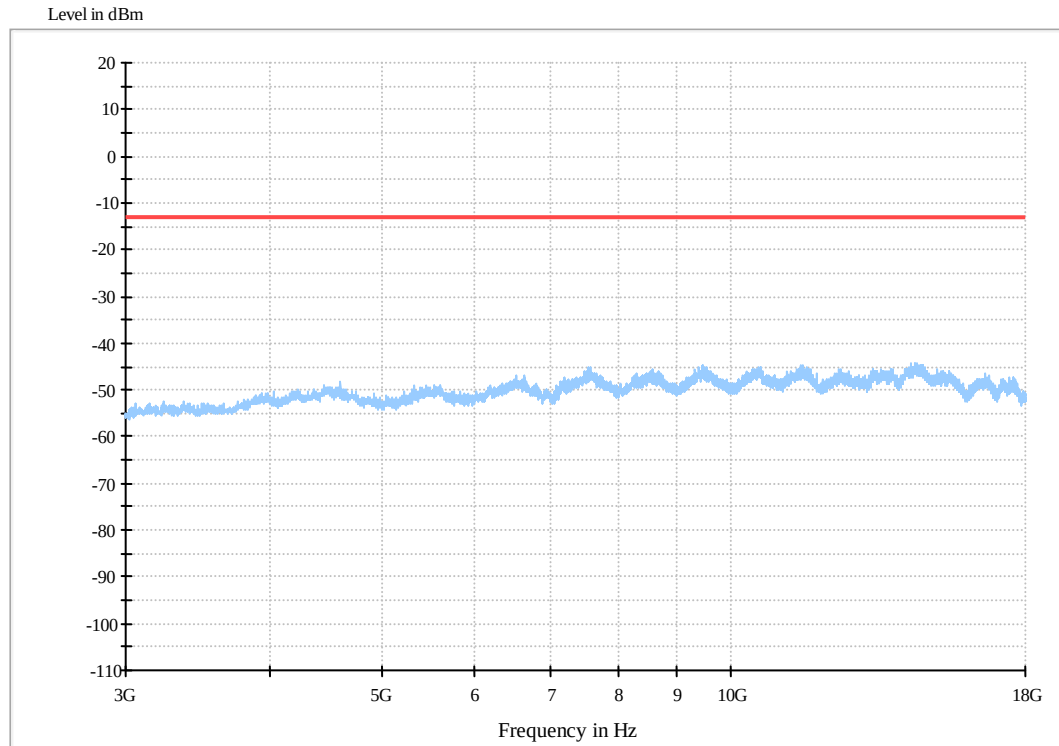


Traffic Mode (30MHz-3GHz)



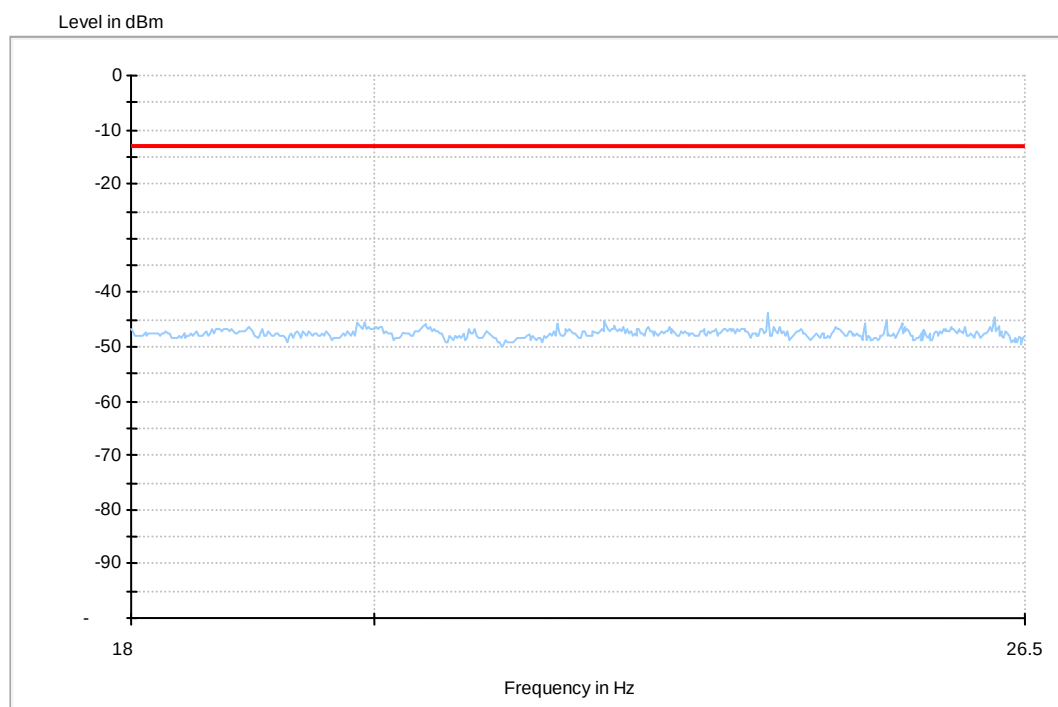


Traffic Mode (3GHz-18GHz)





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	100%	-30 °C	12	0.006383	---	±2.5	Pass
			-20 °C	15	0.007979	---	±2.5	Pass
			-10 °C	-16	-0.00851	---	±2.5	Pass
			0 °C	8	0.004255	---	±2.5	Pass
			10 °C	17	0.009043	---	±2.5	Pass
			20 °C	-13	-0.00691	---	±2.5	Pass
			30 °C	-15	-0.00798	---	±2.5	Pass
			40 °C	10	0.005319	---	±2.5	Pass
			50 °C	-20	-0.01064	---	±2.5	Pass
TM 2	M	100%	-30 °C	10	0.005319	---	±2.5	Pass
			-20 °C	-13	-0.00691	---	±2.5	Pass
			-10 °C	14	0.007447	---	±2.5	Pass
			0 °C	-18	-0.00957	---	±2.5	Pass
			10 °C	11	0.005851	---	±2.5	Pass
			20 °C	13	0.006915	---	±2.5	Pass
			30 °C	-9	-0.00479	---	±2.5	Pass
			40 °C	10	0.005319	---	±2.5	Pass
			50 °C	12	0.006383	---	±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	20 °C	VL	20	0.010638	---	±2.5	Pass
			VN	19	0.010106	---	±2.5	Pass
			VH	12	0.006383	---	±2.5	Pass
TM 2	M	20 °C	VL	-8	-0.00426	---	±2.5	Pass
			VN	-12	-0.00638	---	±2.5	Pass
			VH	13	0.006915	---	±2.5	Pass

The END