



FCC RF Test Report

Product Name: Vodafone Mobile Wi-Fi

Model Number: R205

Report No: SYBH(Z-RF)003122011-2002

FCC ID: QISR205

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, Subpart J
47 CFR FCC Part 24, Subpart E

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 Test Summary

Table 1 Summary of results

PCS Band			
Test Case	FCC Part No.	Requirements	Result
Transmitter Output Power	2.1046 & 24.232	Peak EIRP not exceed 2 W	Pass
Modulation Characteristics	2.1047	Digital modulation	Pass
Occupied Bandwidth	2.1049	(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

R205 HSPA+/2100M/900M/850M/EDGE Quad Band is subscriber equipment in the UMTS/GSM system. R205 implement such functions as RF signal receiving/ transmitting, HSPA/WCDMA protocol processing, data service etc, and it can act as a Wi-Fi hot-point for user accessing to internet. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. R205 has 3 internal antennas as default Wi-Fi ,diversity, and main antenna.

3.1.2 Board

Table 1 Board Information

Vodafone Mobile Wi-Fi		
R205		
Board and Module		
Hardware Version	Software Version	Serial Number
CH1E586M	21.341.00.04.11	A7B01A11B0500443

3.1.3 Sub-Assembly

Sub-Assembly Name	Manufacturer	Description
Adapter	HUAWEI	AC/DC adapter,0degC-45degC,100V-240V,5.0V/1.0A,CE 2PIN/DC USB2.0,CE,HUAWEI LOGO,ERP V

3.1.4 Battery Technical Data

Name	Manufacture	Description
Li-ion Battery	FMT	Rated capacity: 1500mAh Nominal Voltage: === +3.7V Charging Voltage: === +4.2V

3.2 Test Description

3.2.1 Supported Frequency Range

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

3.2.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	GSM
TX Output Power (per Antenna Port)	1 W (= 30 dBm)
Channel Spacing(s) / Bandwidth(s)	GSM system: 200 kHz
Designation of Emissions	GSM system: 248KGXW (GMSK modulation), 253KG7W (8PSK modulation))

3.2.3 Antenna Gain

Antenna Gain(dBi):	2.2
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3.2.4 Power Supply

	Description
Power Supply Type	Directly Connected to DC
Input to EUT (DC power)	DC Voltage Nominal: \equiv +5V DC Voltage Range: \equiv +4.75 V to +5.25V
Input to EUT (AC power)	AC Voltage Nominal: ~ 220V (50/60 Hz) AC Voltage Range: ~ 100V-240V

4 General Test Conditions / Configurations

4.1 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

4.2 Test Modes

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

4.3 Test Environments

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

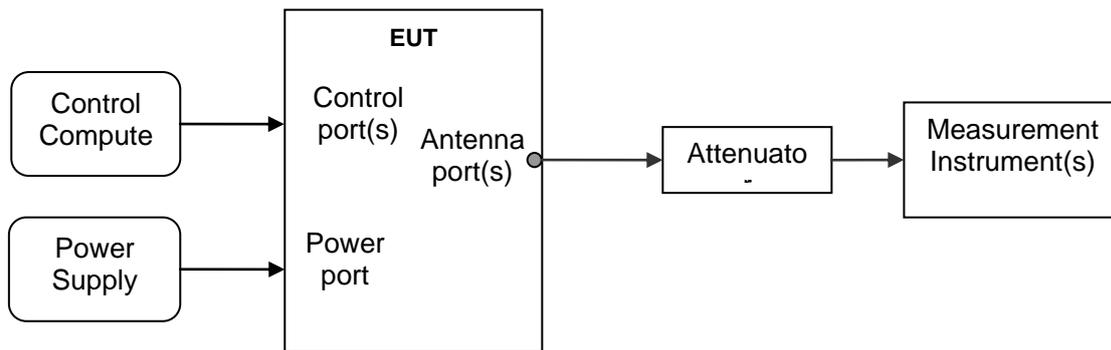
NOTE: VL= lower extreme test voltages
 VN= nominal voltage
 VH= upper extreme test voltage
 TN= nominal temperature

4.4 Test Setups

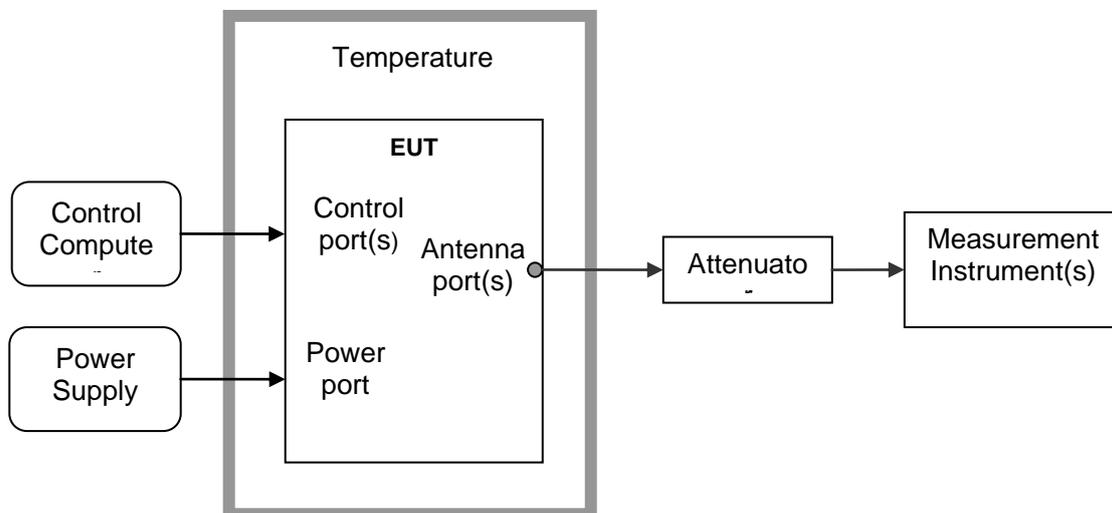
4.4.1 General Test Setup Configurations

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.

4.4.2 Test Setup 1



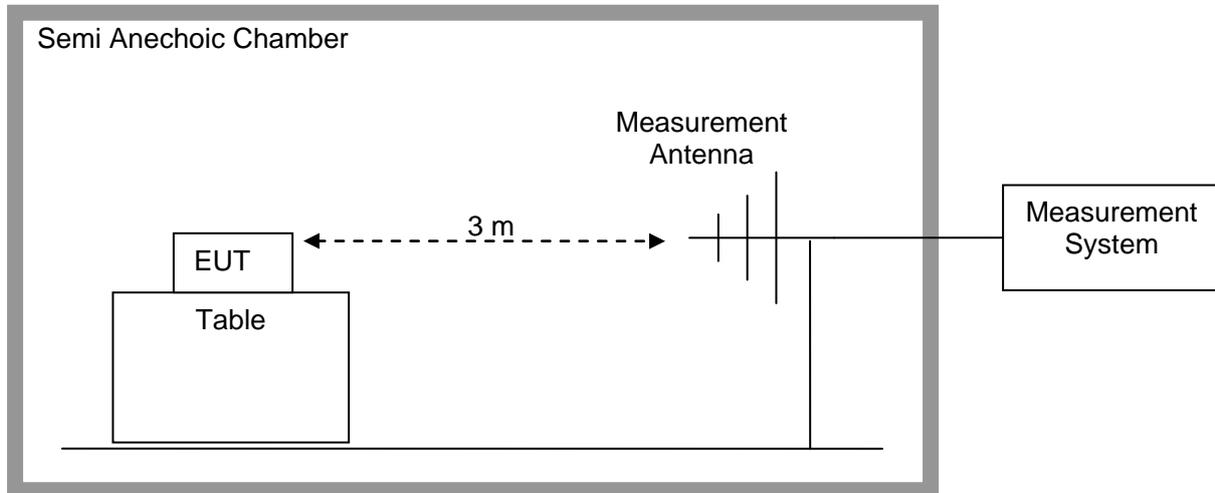
4.4.3 Test Setup 2



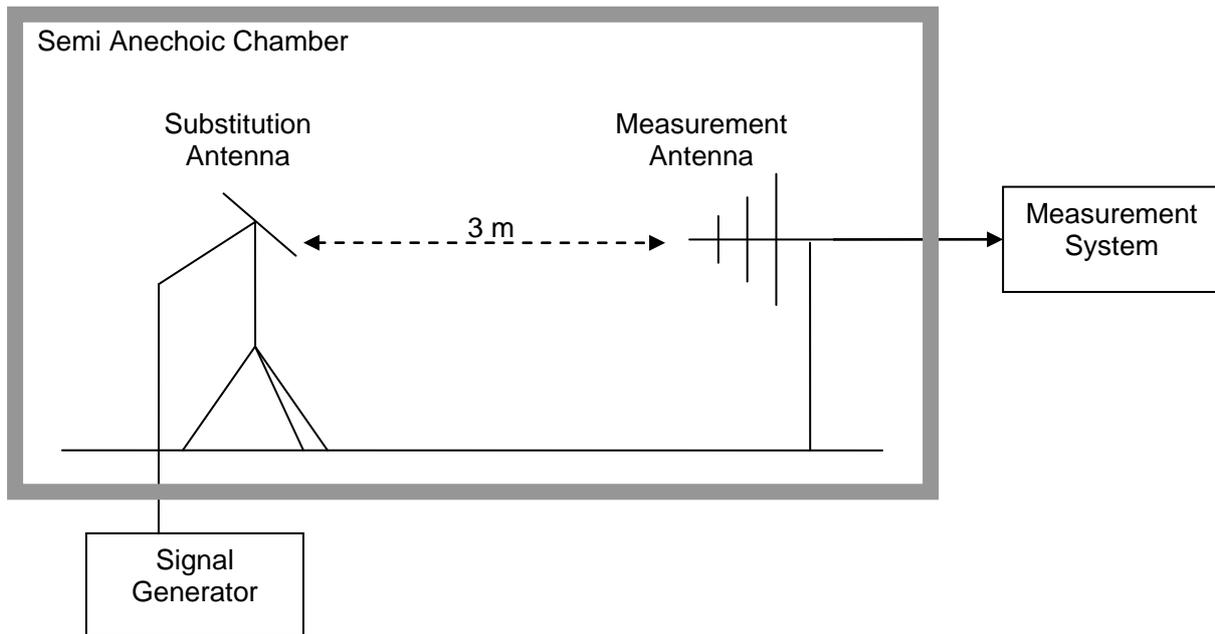
4.4.4 Test Setup 3

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



4.5 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

5 Main Test Instruments

Table 2 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.13.2012
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	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2012
Test receiver	R&S	ESU26	100150	May.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Jan.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Jan.29.2012
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

6 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 Radiated Spurious Emissions	Appendix H

NOTE: The Appendix H only photos of Radiated Spurious Emissions, no test data.



7 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



FCC Test Report of R205
FCC ID: QISR205



Appendix A

Transmitter Output Power According to FCC Part 2.1046 & Part 24.235



Conducted Power of Transmitter

TEST CONDITIONS	RF Output Power (Conducted)					
	Channel512(B)		Channel661(M)		Channel810(T)	
	1850.2MHz		1880MHz		1909.8MHz	
	dBm		dBm		dBm	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	29.63	30.8	29.57	30.8	29.35	30.8
TM2	24.87	30.8	24.75	30.8	24.55	30.8



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	31.83	Horn Ant.	28.38	4.5	1	31.88	33	Pass
TM1	1880	31.77	Horn Ant.	28.25	4.5	1	31.75	33	Pass
TM1	1909.8	31.55	Horn Ant.	27.71	4.8	1	31.51	33	Pass
TM2	1850.2	27.07	Horn Ant.	23.52	4.5	1	27.02	33	Pass
TM2	1880	26.95	Horn Ant.	23.43	4.5	1	26.93	33	Pass
TM2	1909.8	26.75	Horn Ant.	22.98	4.8	1	26.78	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



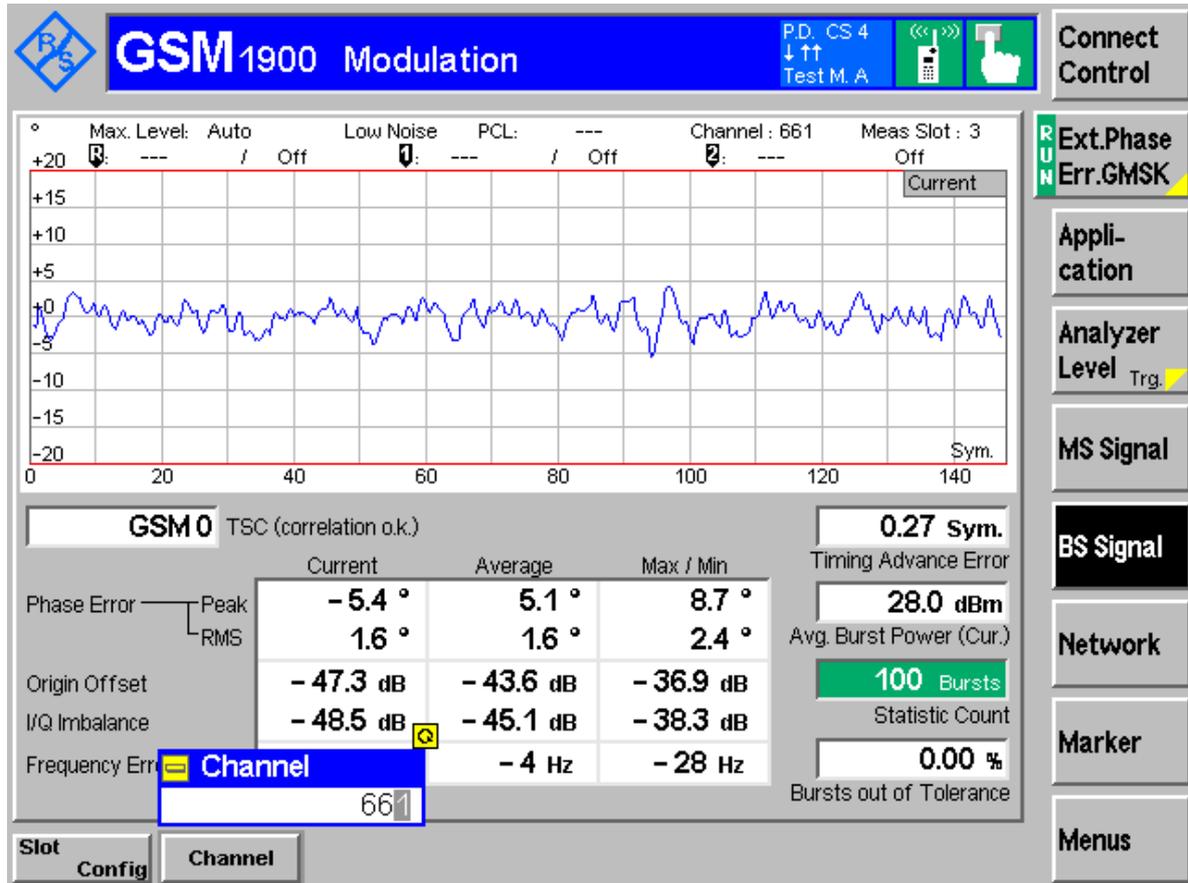
Appendix B

Modulation Characteristics

According to FCC Part 2.1047 & Part24 Subpart E

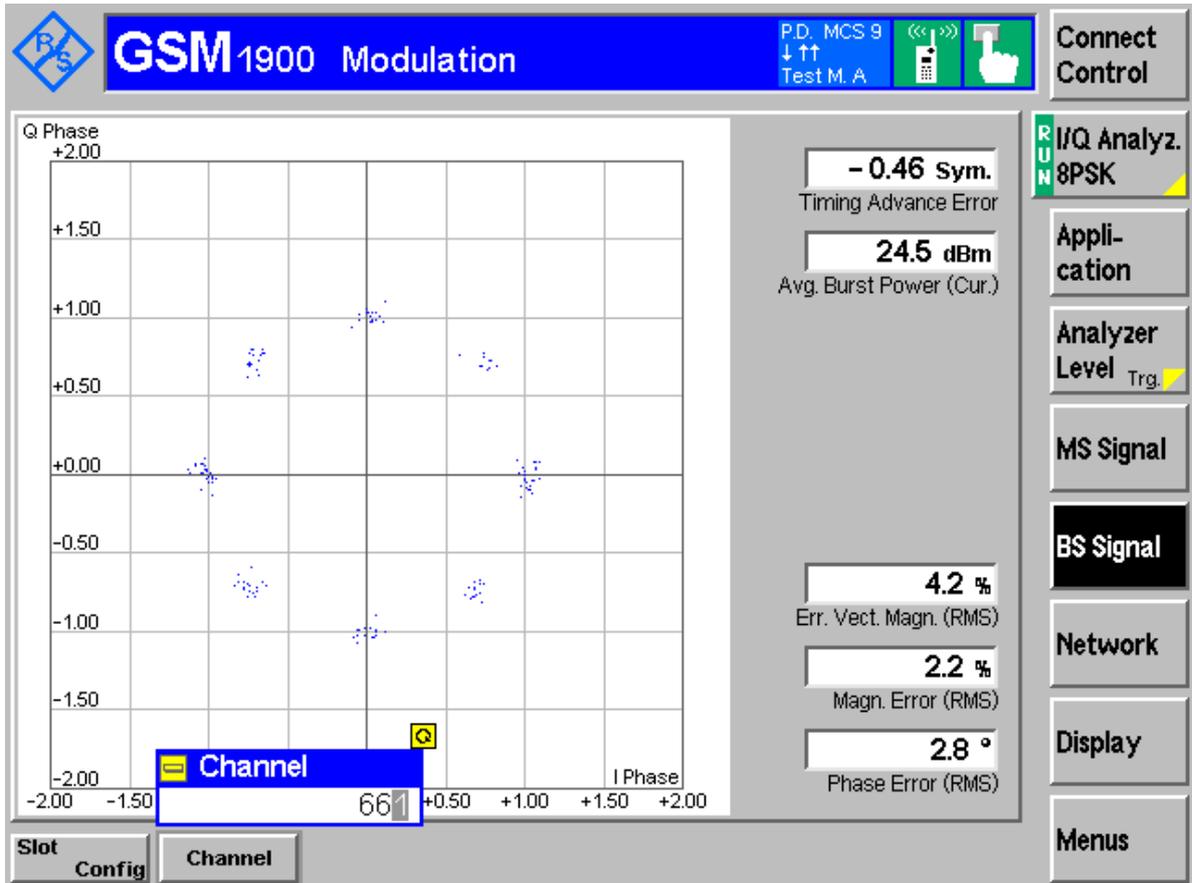


TM1:GPRS/GSM Channel 661





TM2:EDGE Channel 661





Appendix C

Occupied Bandwidth

According to FCC Part 2.1049 & Part 24 Subpart E

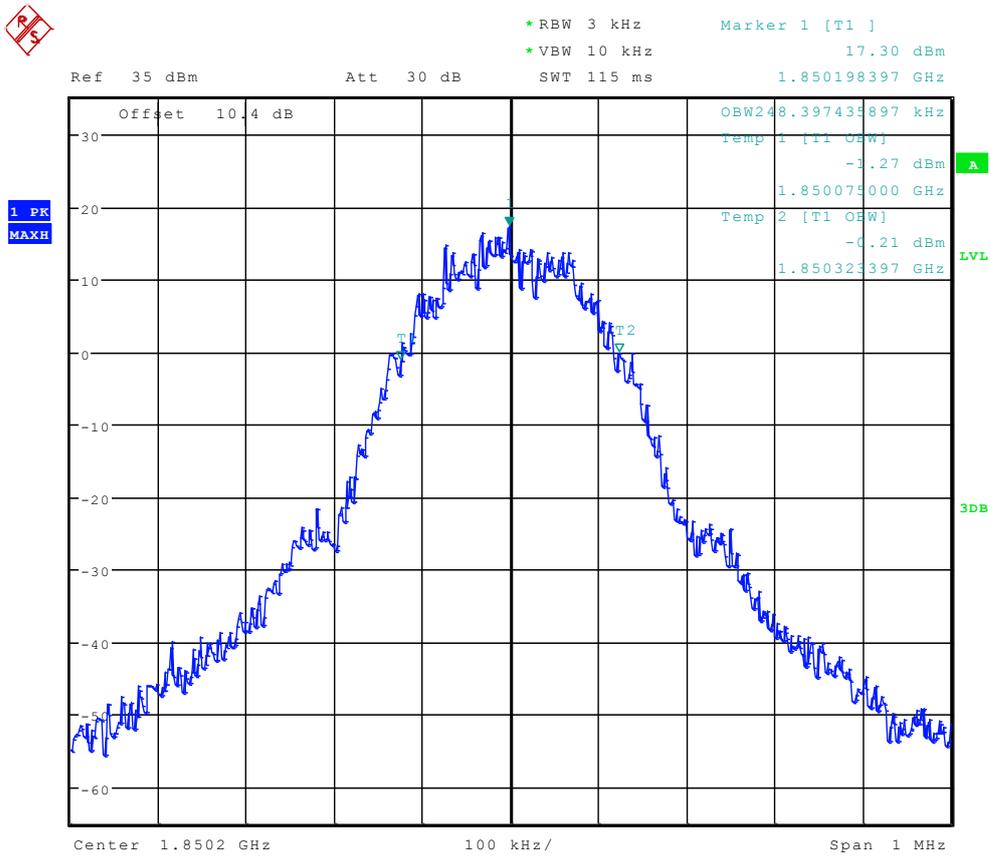


Result Table

Test Mode	RF Ch.	Occupied Bandwidth [KHz]	Verdict
TM 1	B	245.19	Pass
	M	245.19	Pass
	T	248.40	Pass
TM 2	B	248.40	Pass
	M	248.40	Pass
	T	253.21	Pass



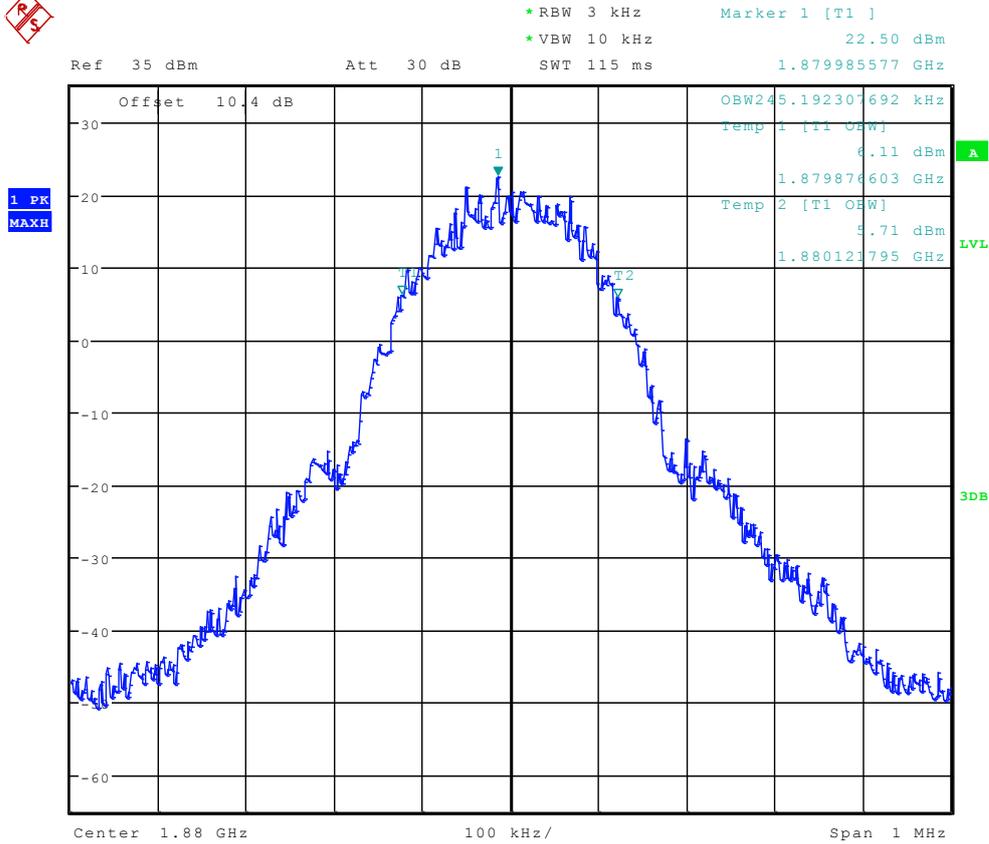
TM2:EDGE Channel 512



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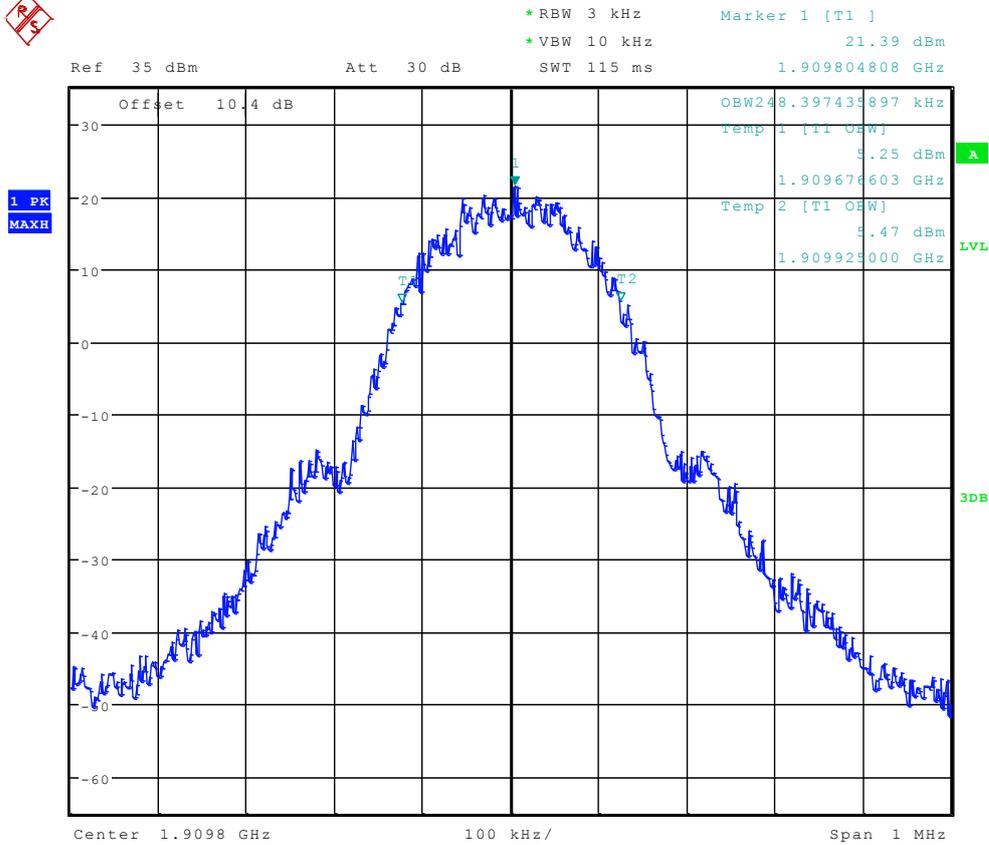
TM1:GPRS/GSM Channel 661



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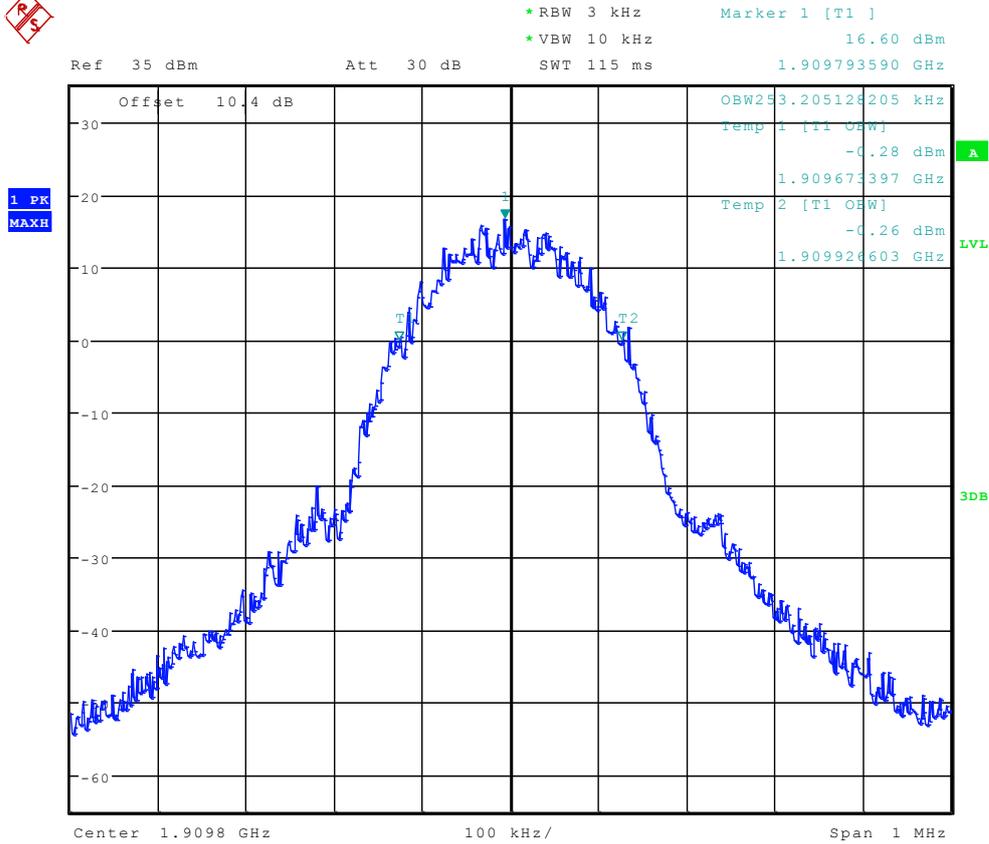
TM1:GPRS/GSM Channel 810



Date: 2.DEC.2011 03:02:31



TM2:EDGE Channel 810



Date: 2.DEC.2011 03:09:32



Appendix D

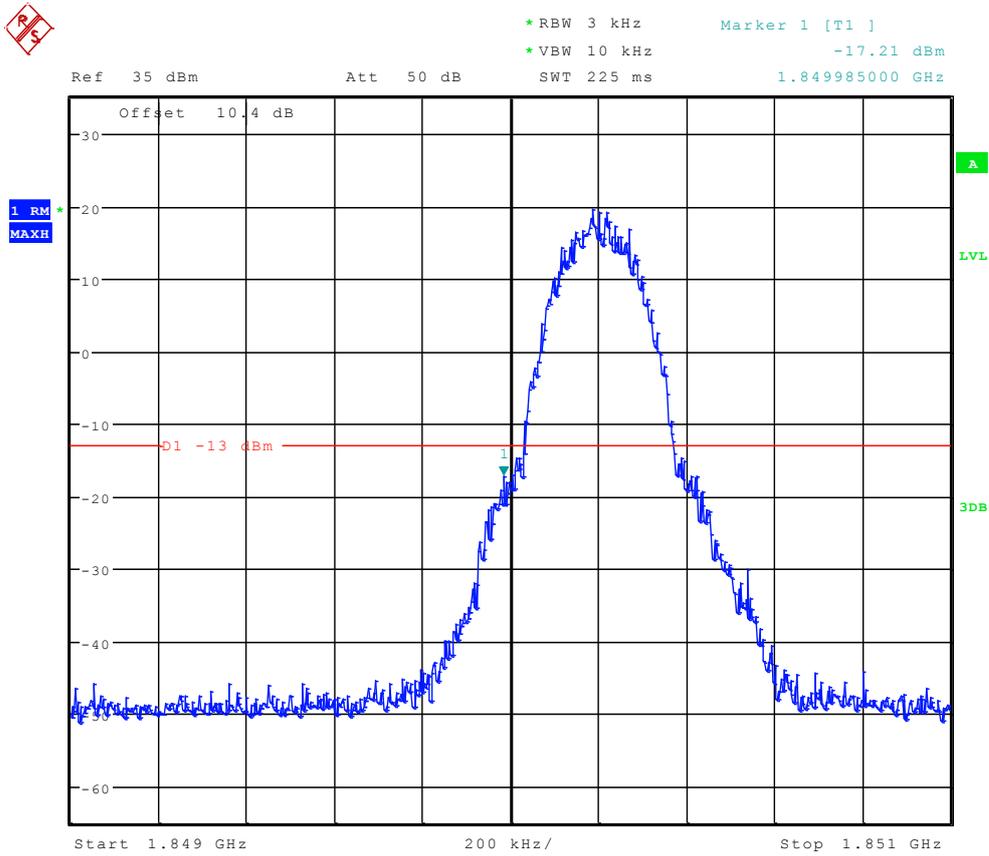
Band Edges Compliance According to FCC Part 2.1051 & 24.238



TM1:GPRS/GSM

Left Edge

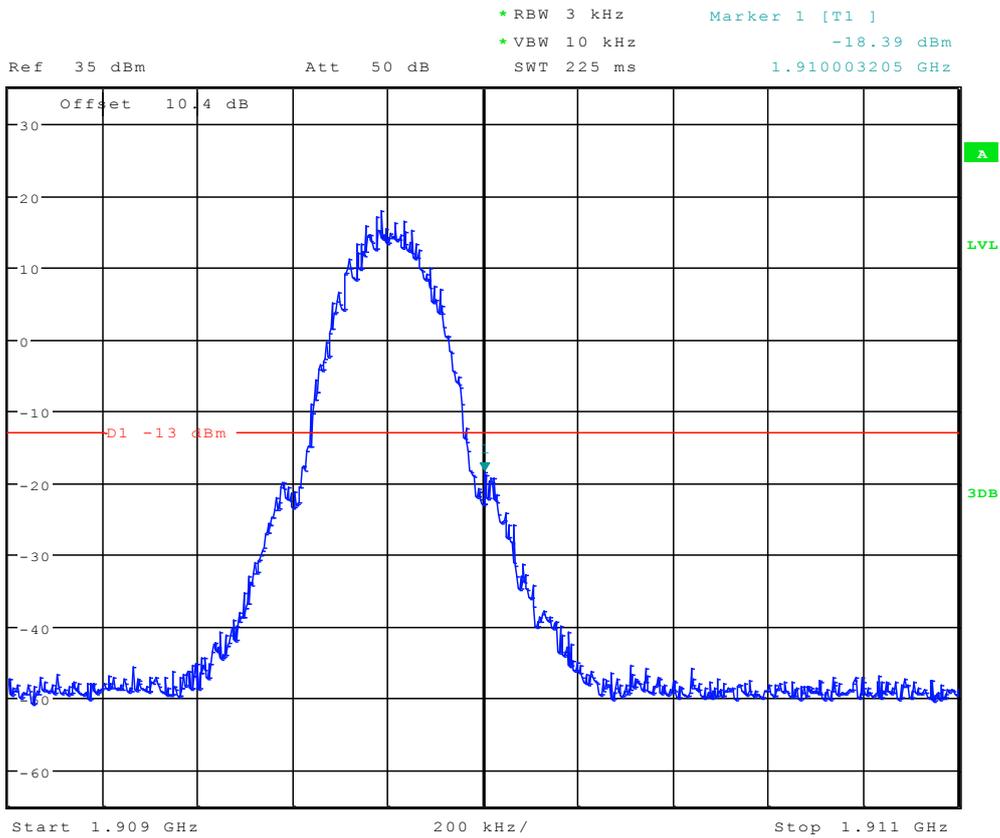
Channel 512



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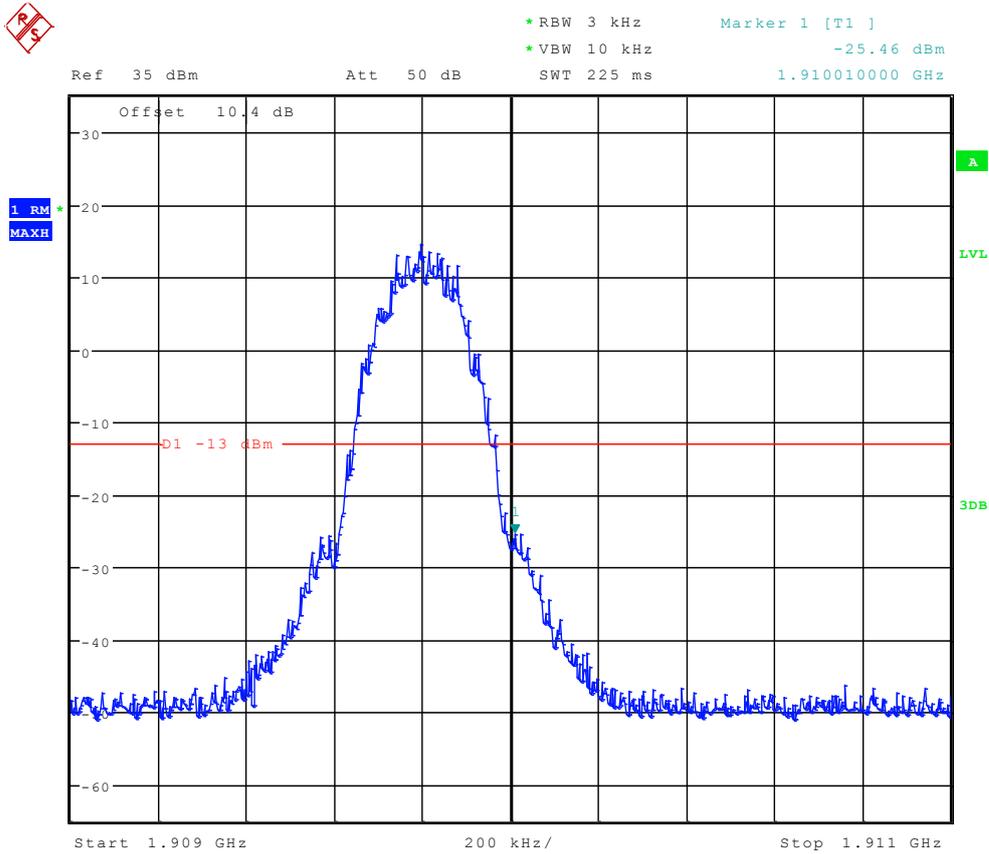
Right Edge Channel 810



Date: 7.DEC.2011 02:41:52



Right Edge Channel 810



Date: 2.DEC.2011 03:08:51



Appendix E

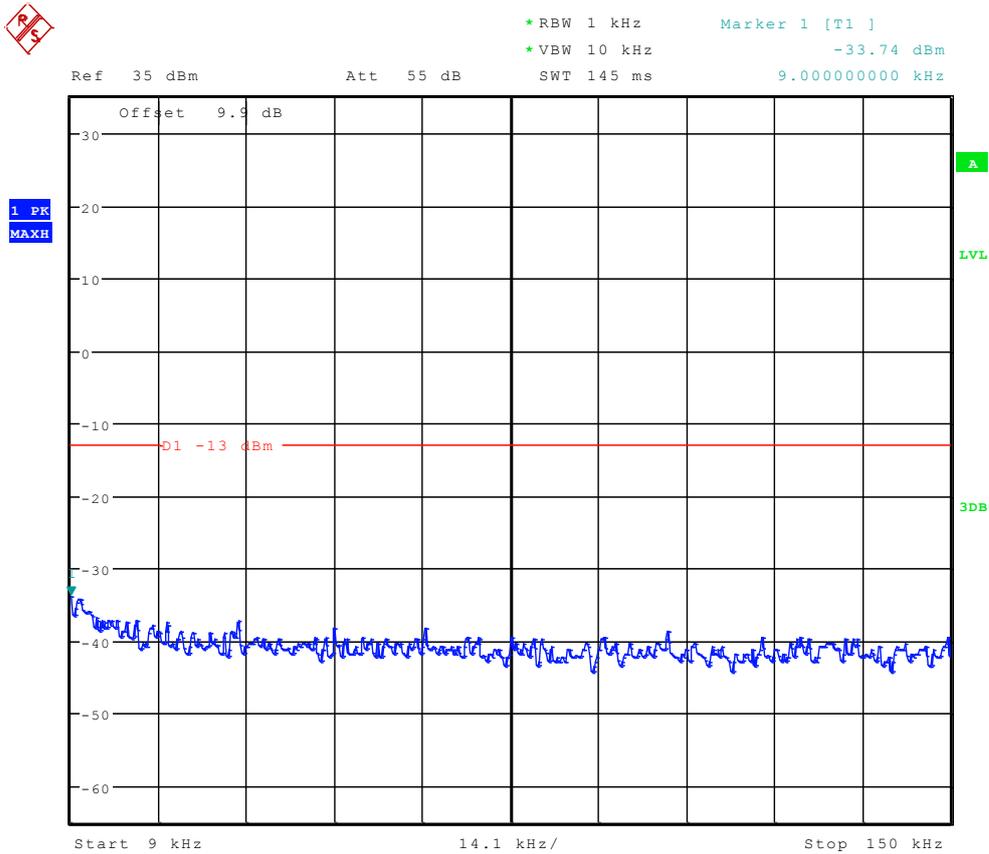
Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & 24.238



TM1:GPRS/GSM

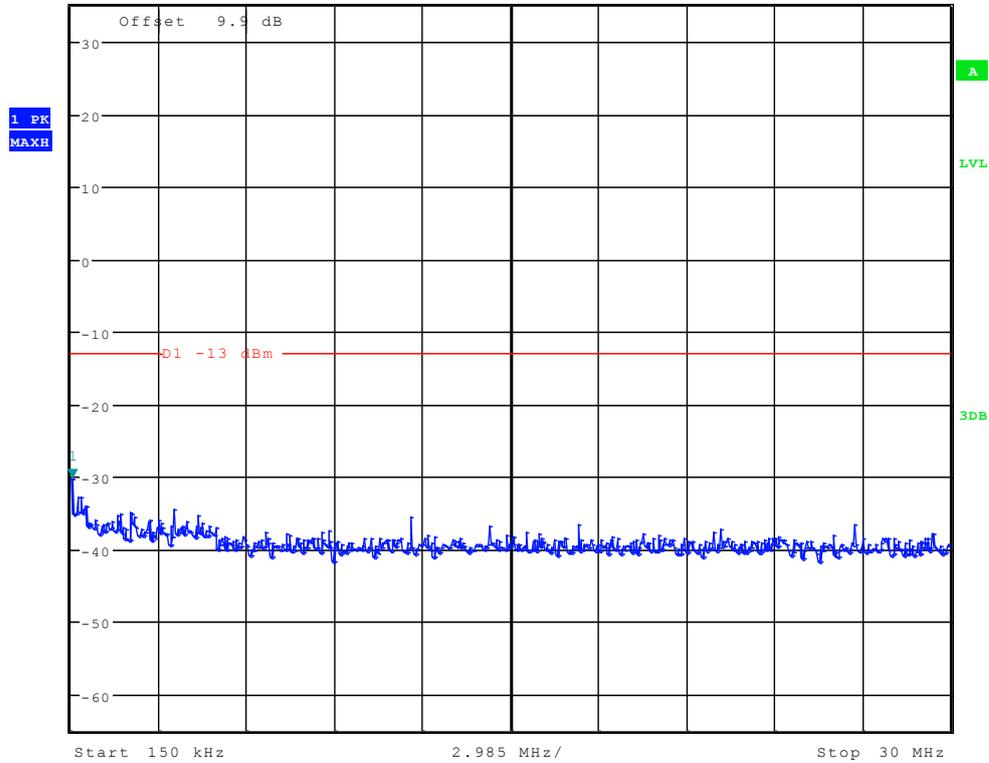
Channel 512



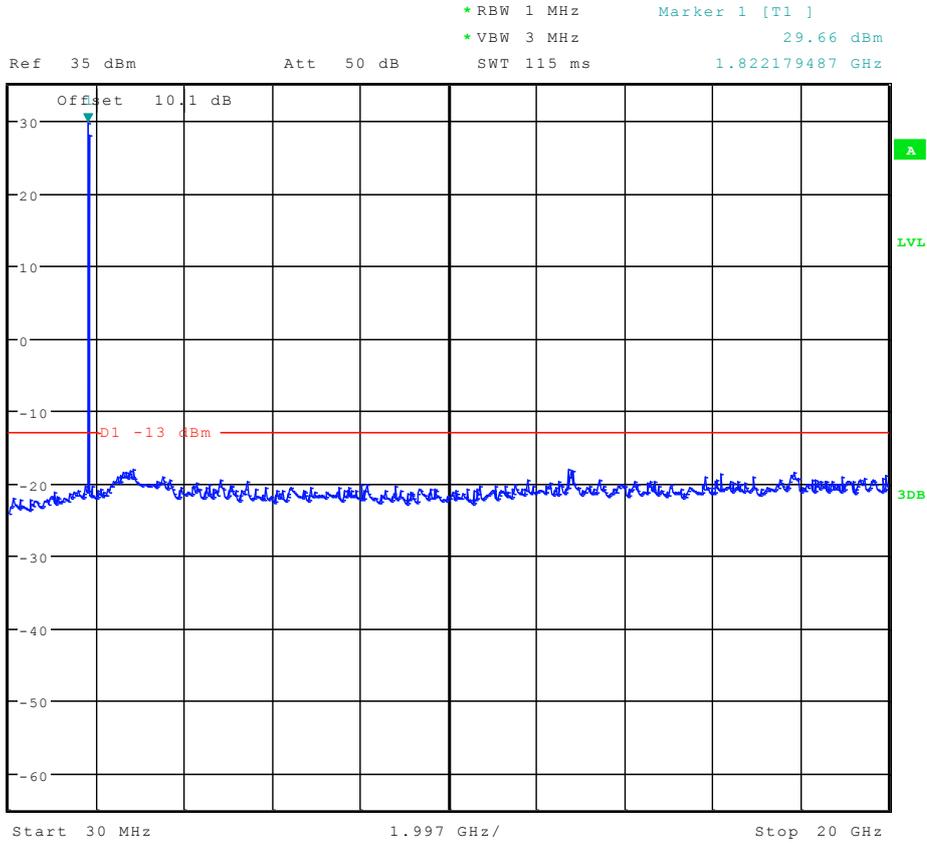
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*RBW 10 kHz Marker 1 [T1] -30.22 dBm
*VBW 30 kHz



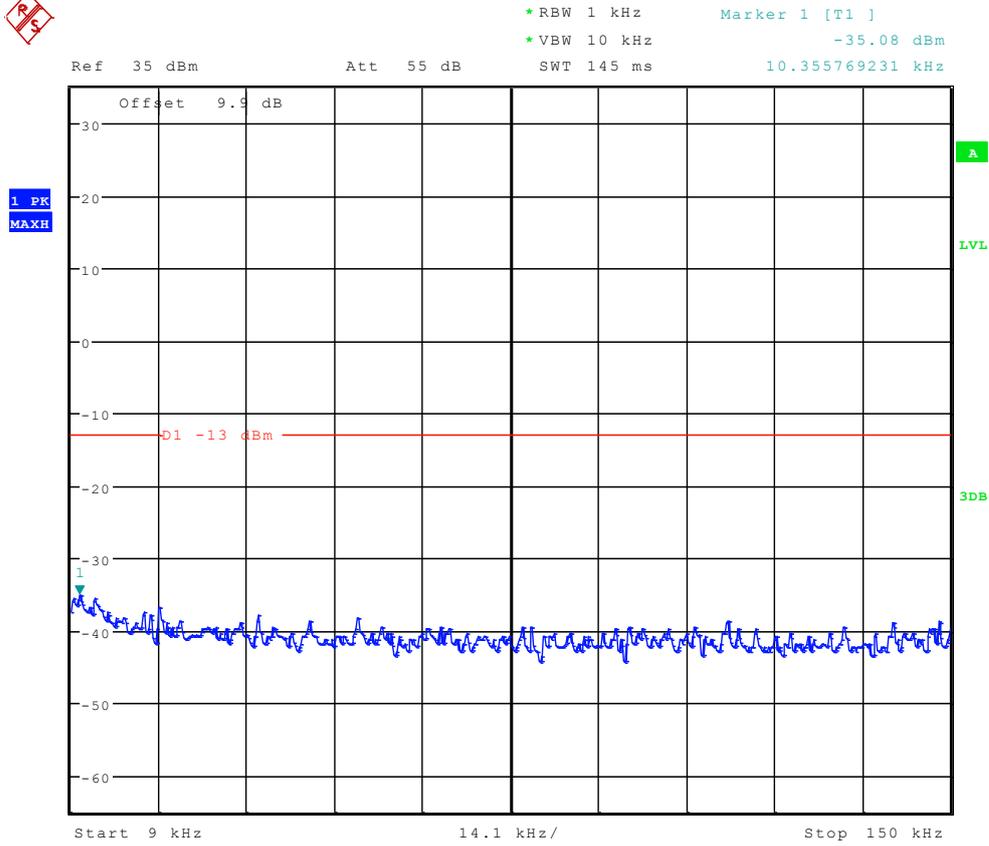
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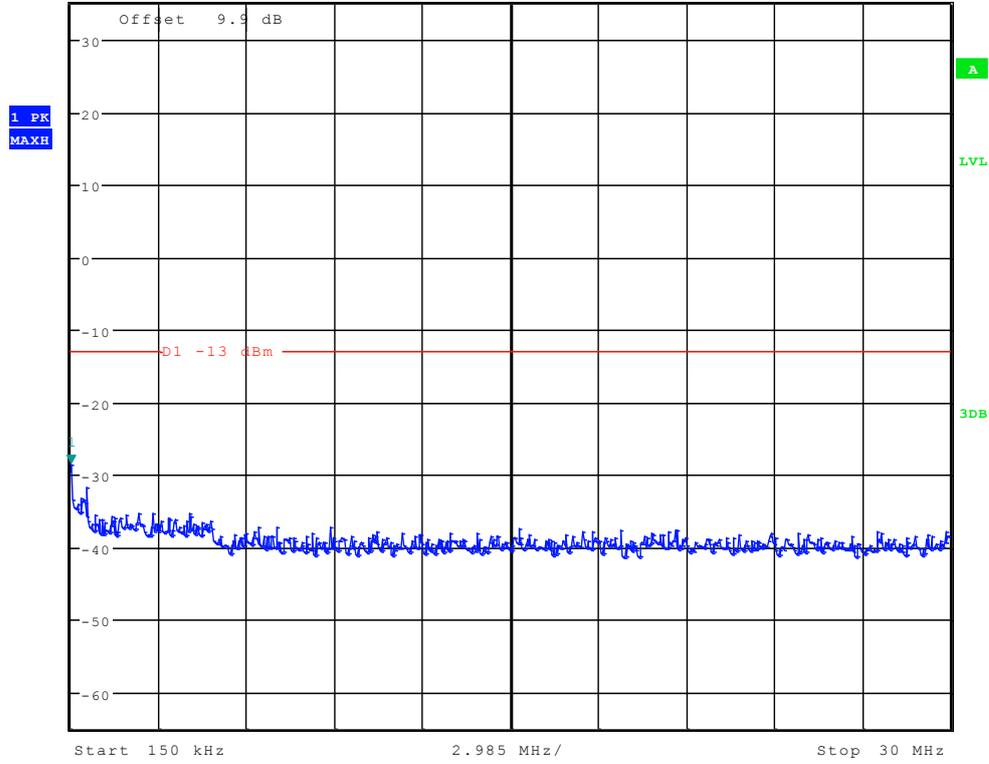
Channel 661



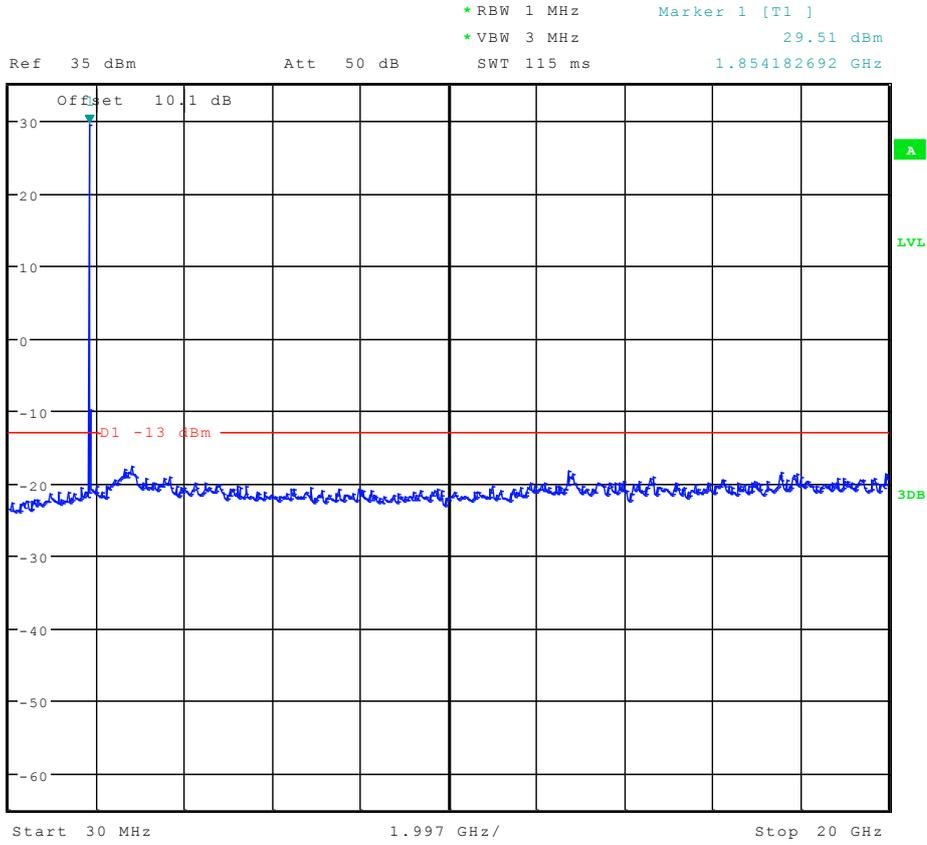
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*VBW 30 kHz -28.60 dBm



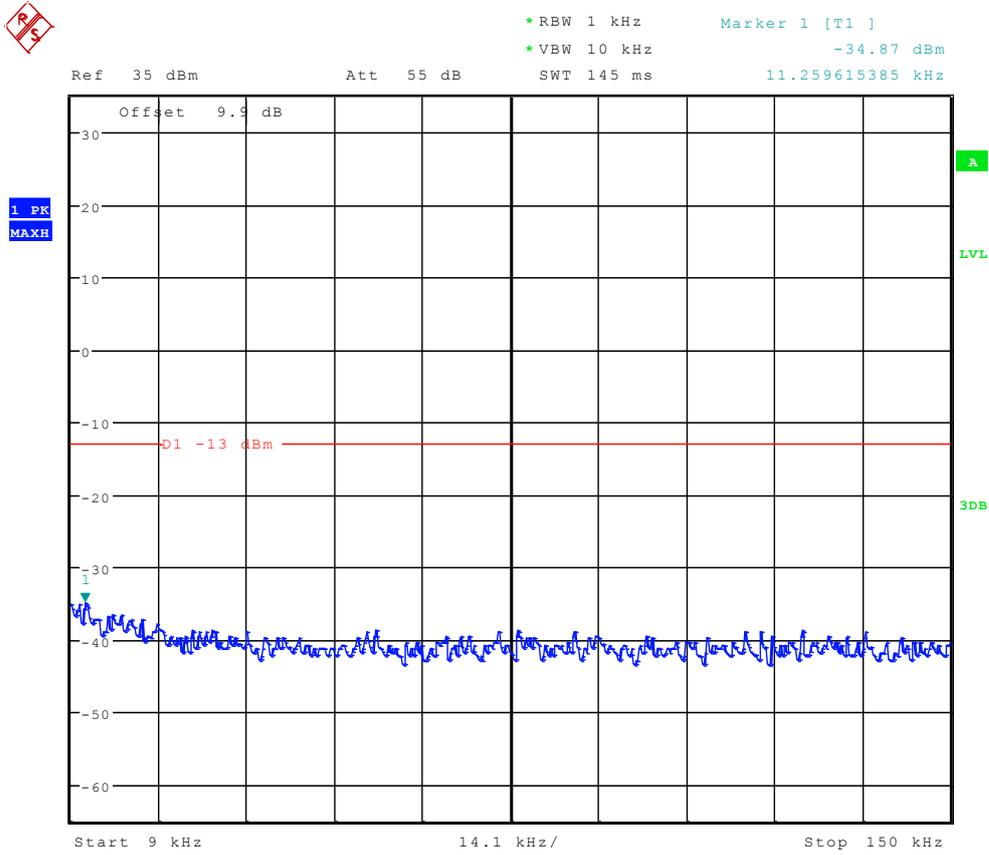
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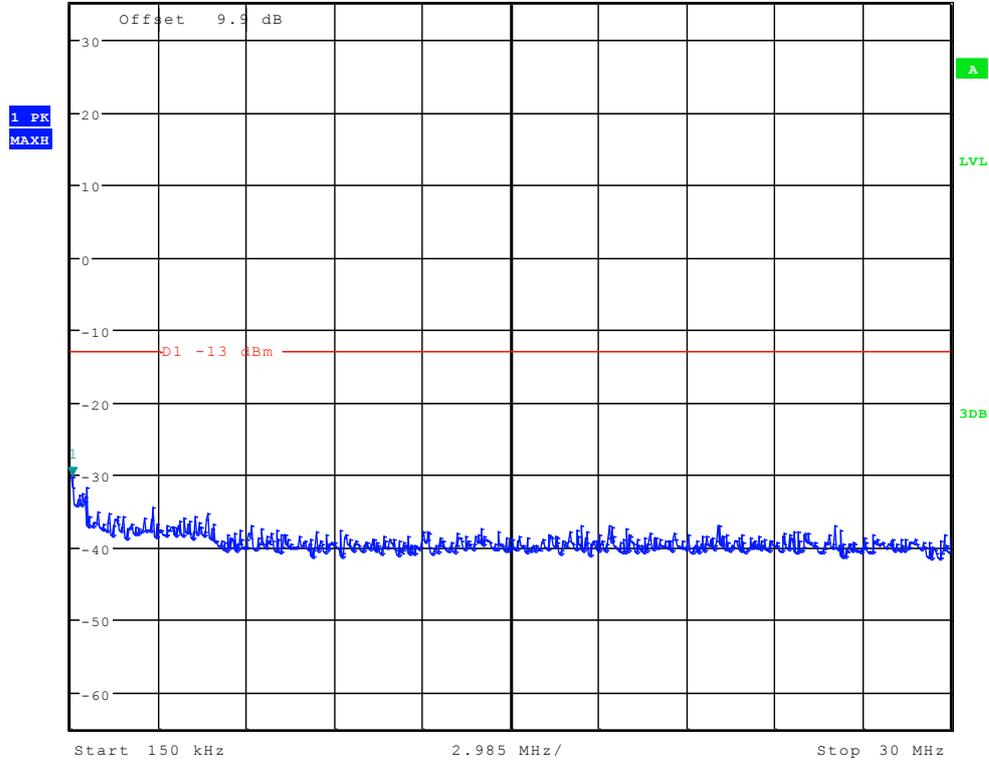
Channel 810



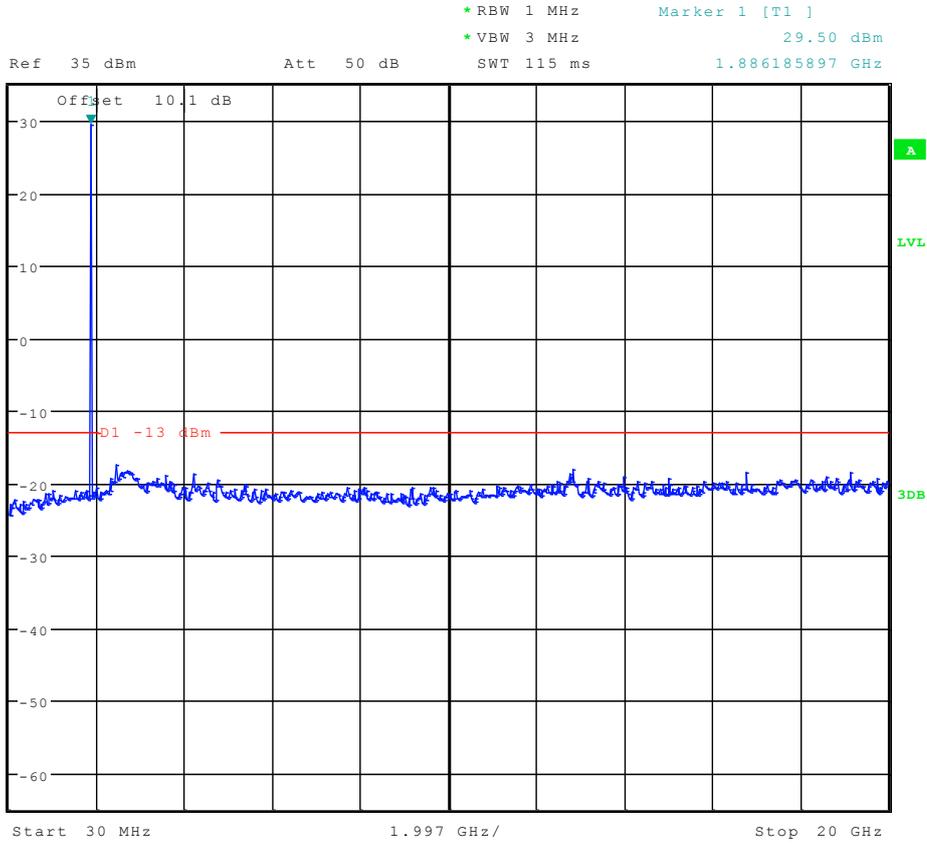
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*VBW 30 kHz -30.22 dBm



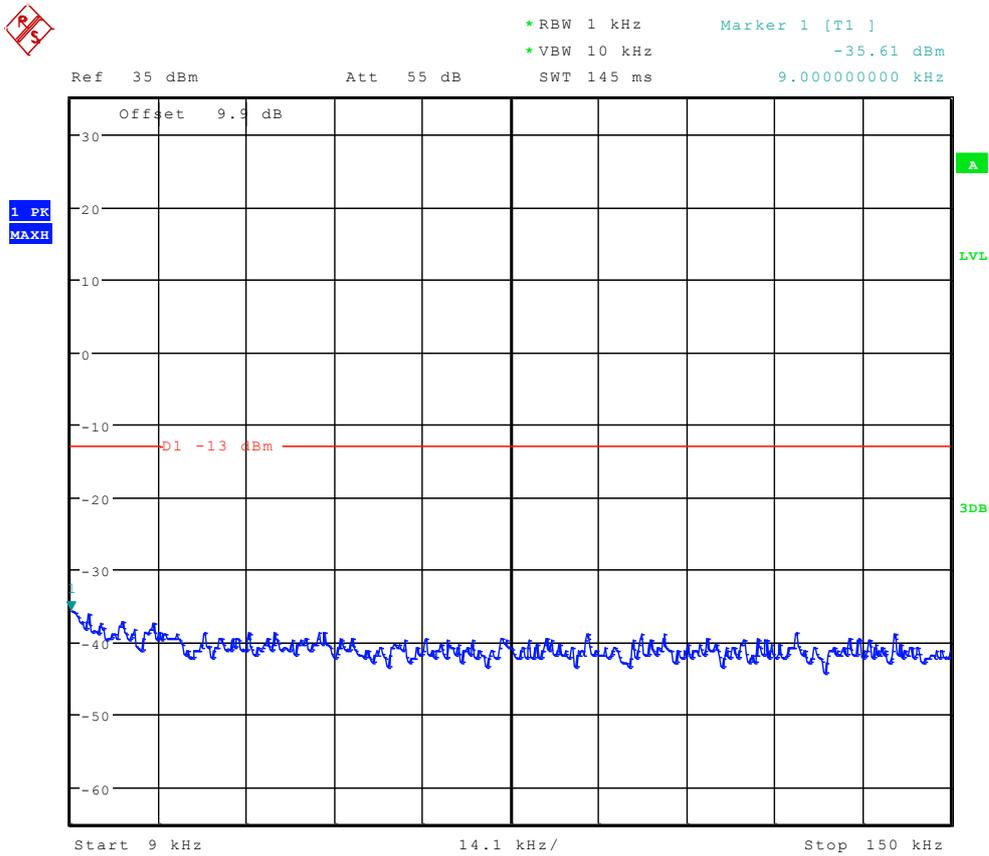
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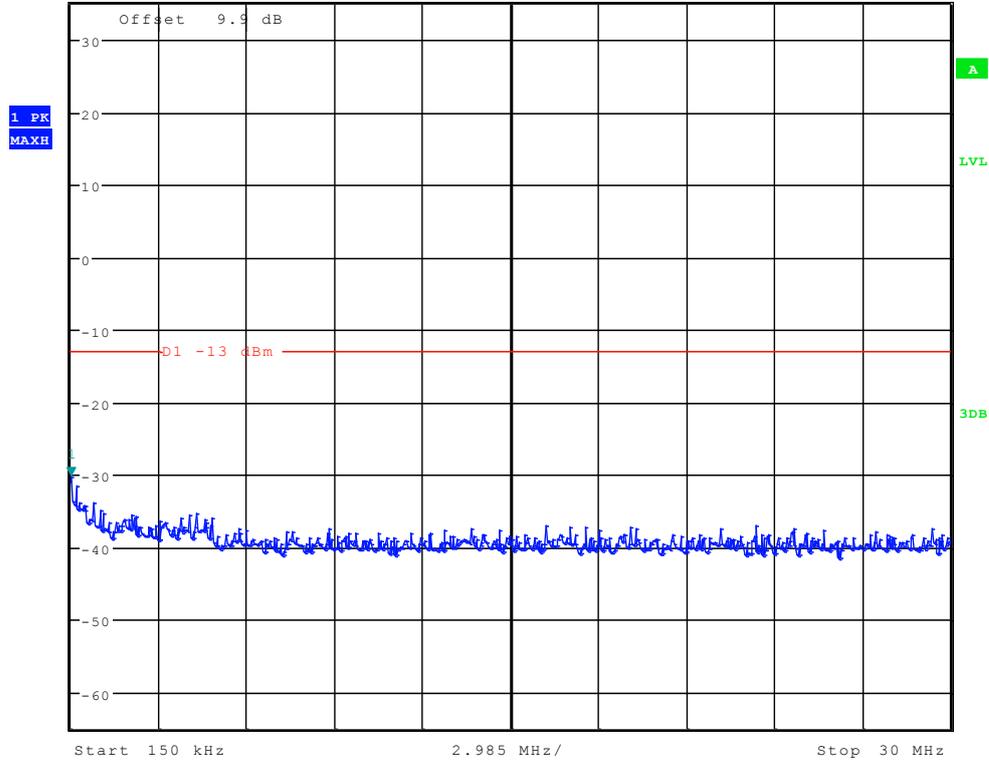
TM2:EDGE Channel 512



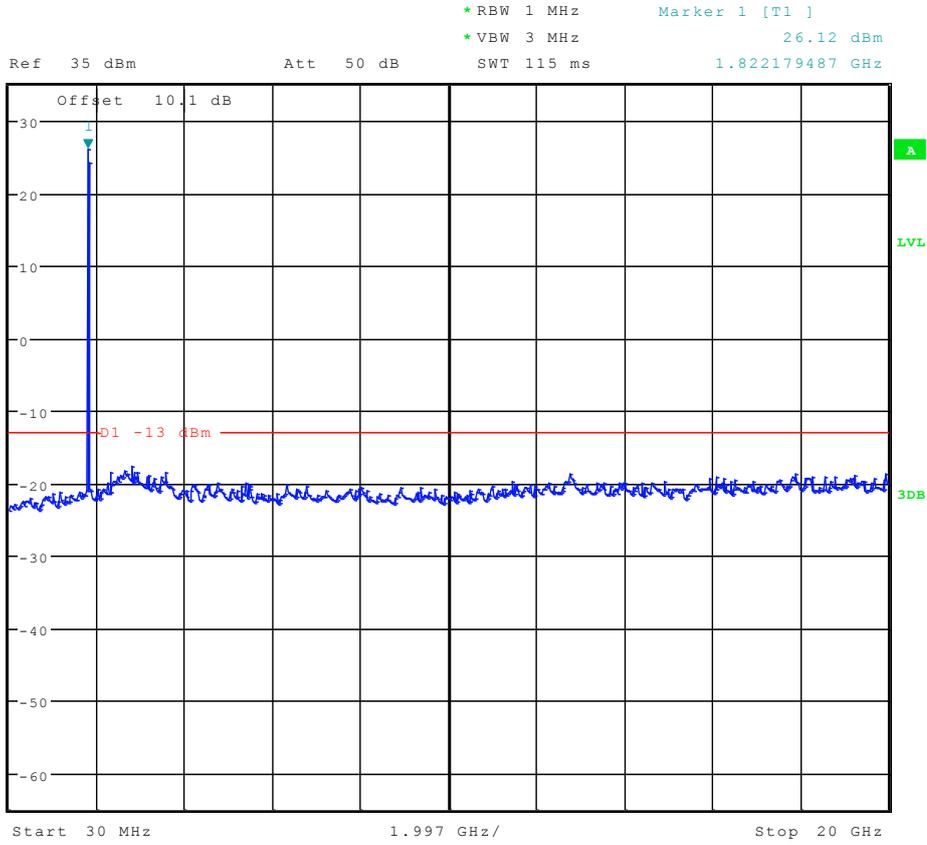
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*VBW 30 kHz -30.22 dBm



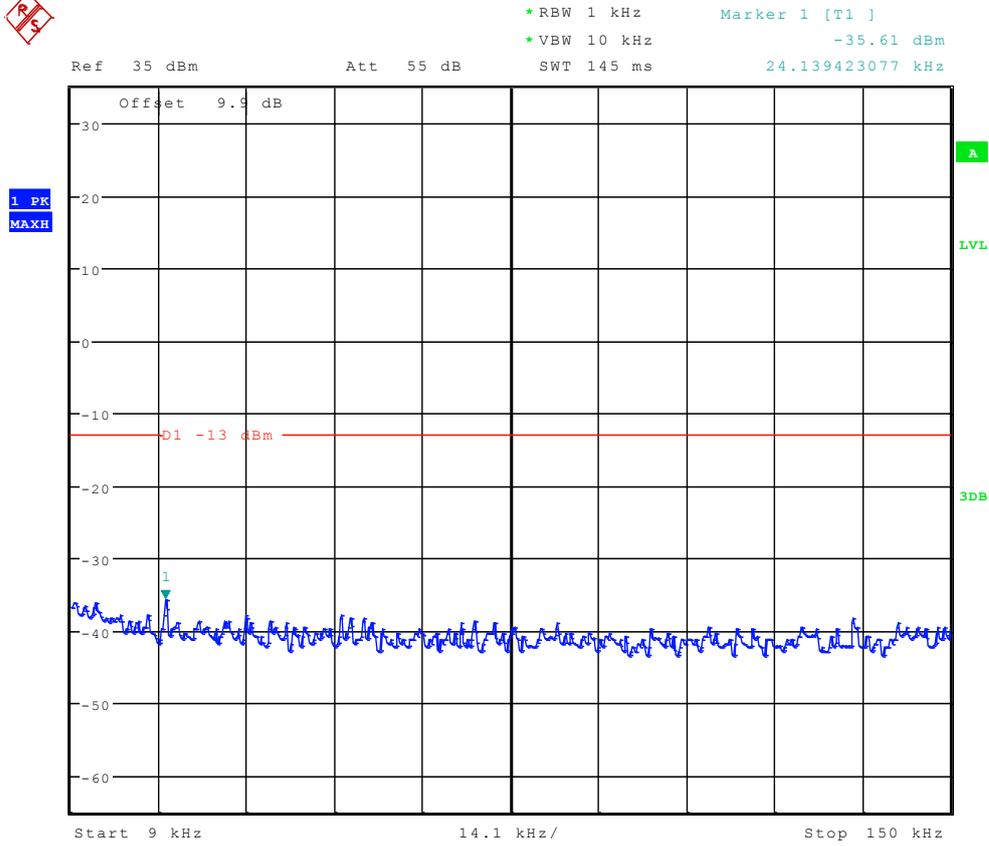
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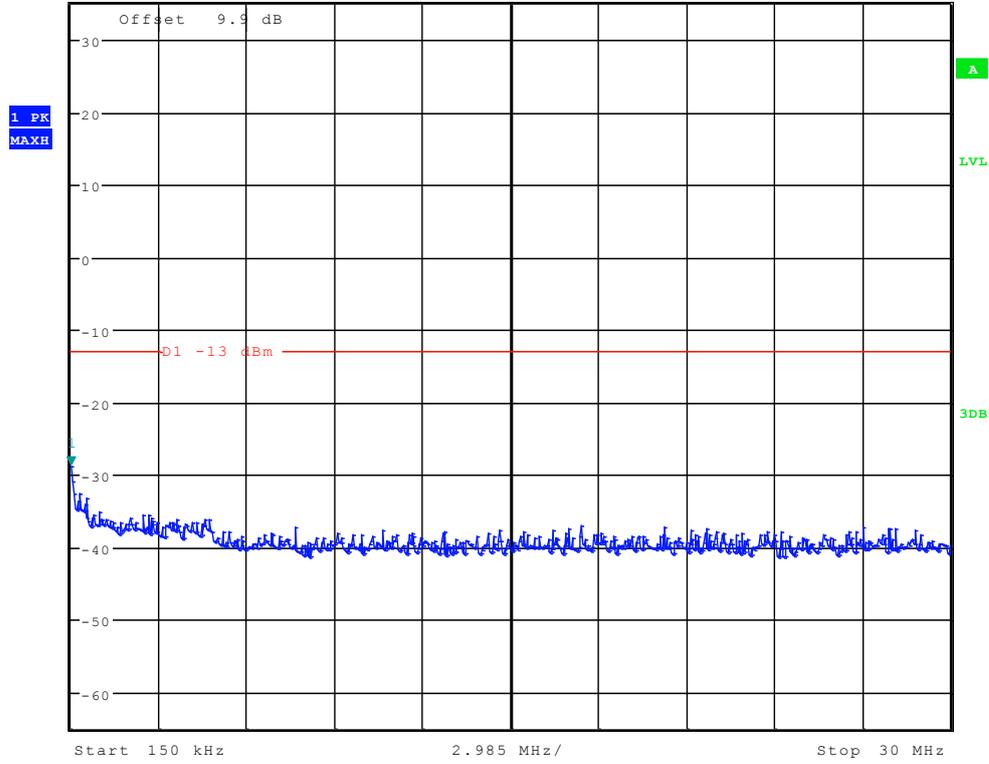
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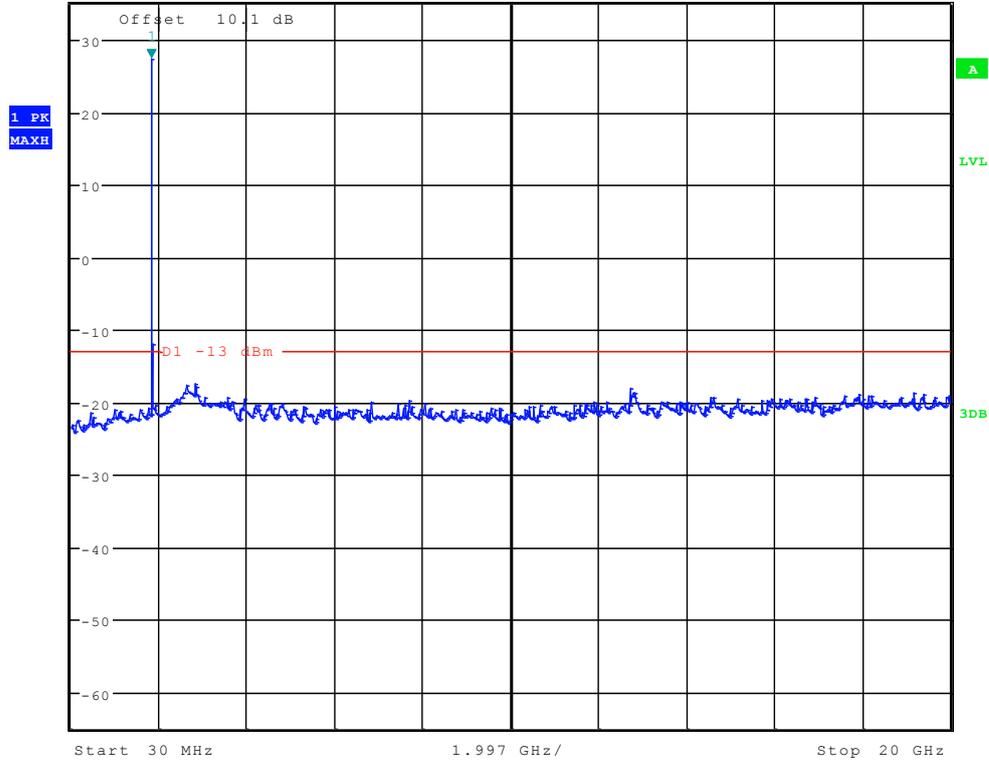
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*VBW 30 kHz -28.75 dBm



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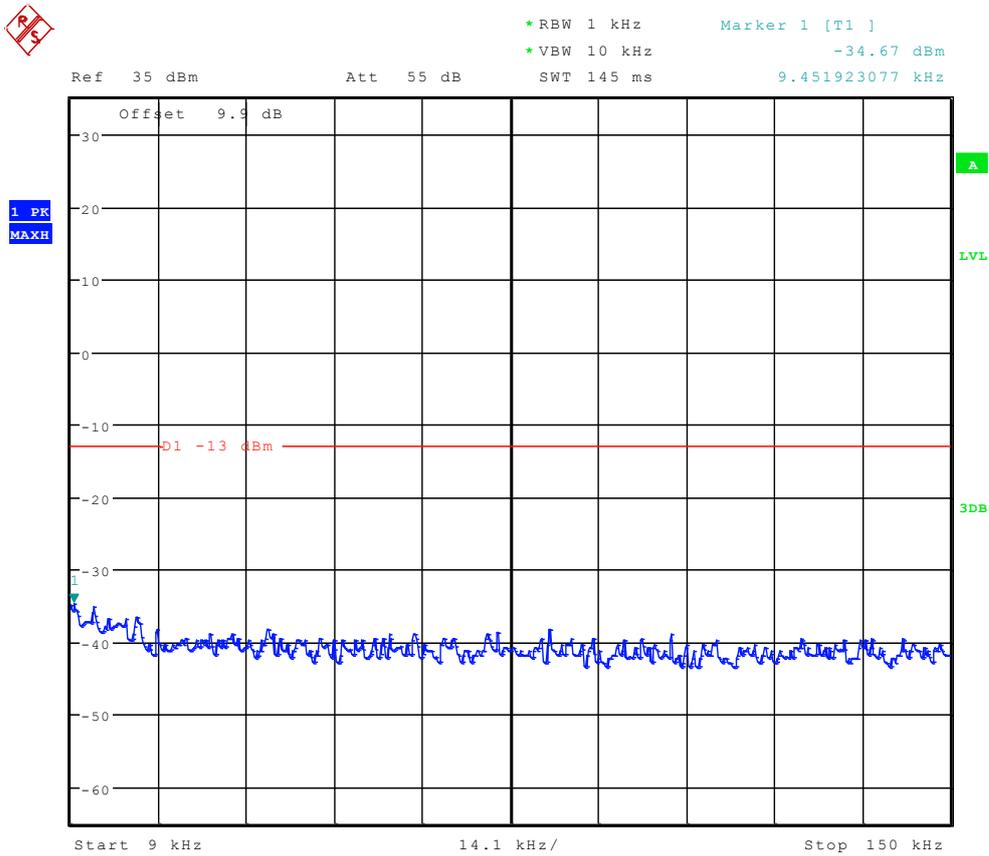
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*RBW 1 MHz Marker 1 [T1] 27.30 dBm
*VBW 3 MHz 1.854182692 GHz



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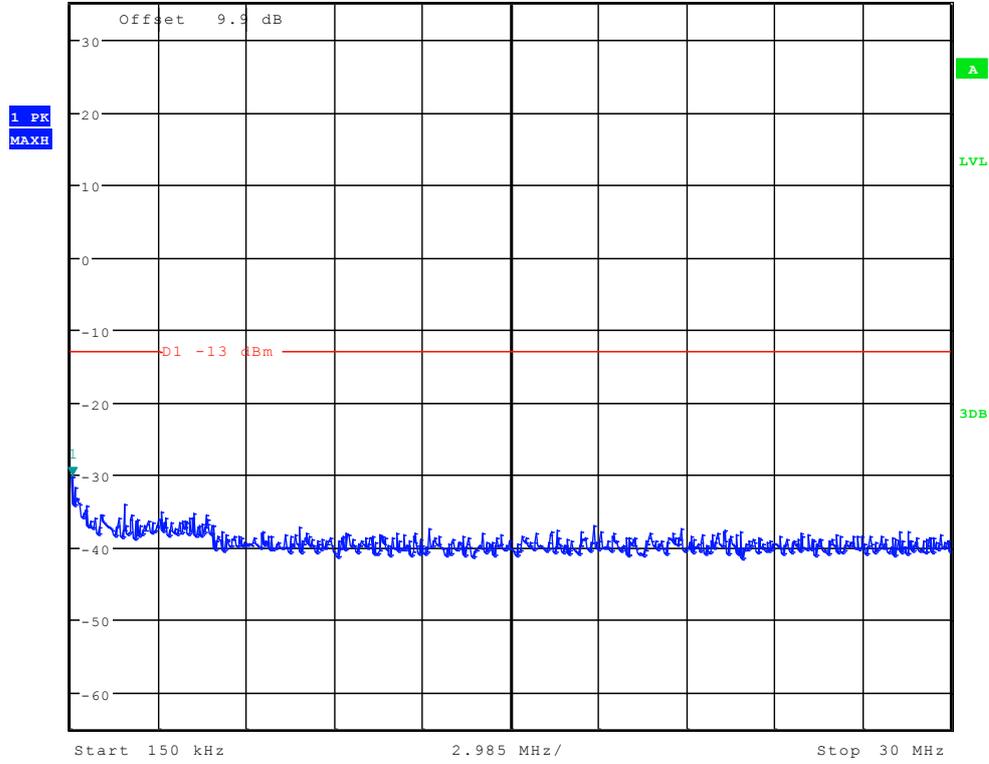
Channel 810



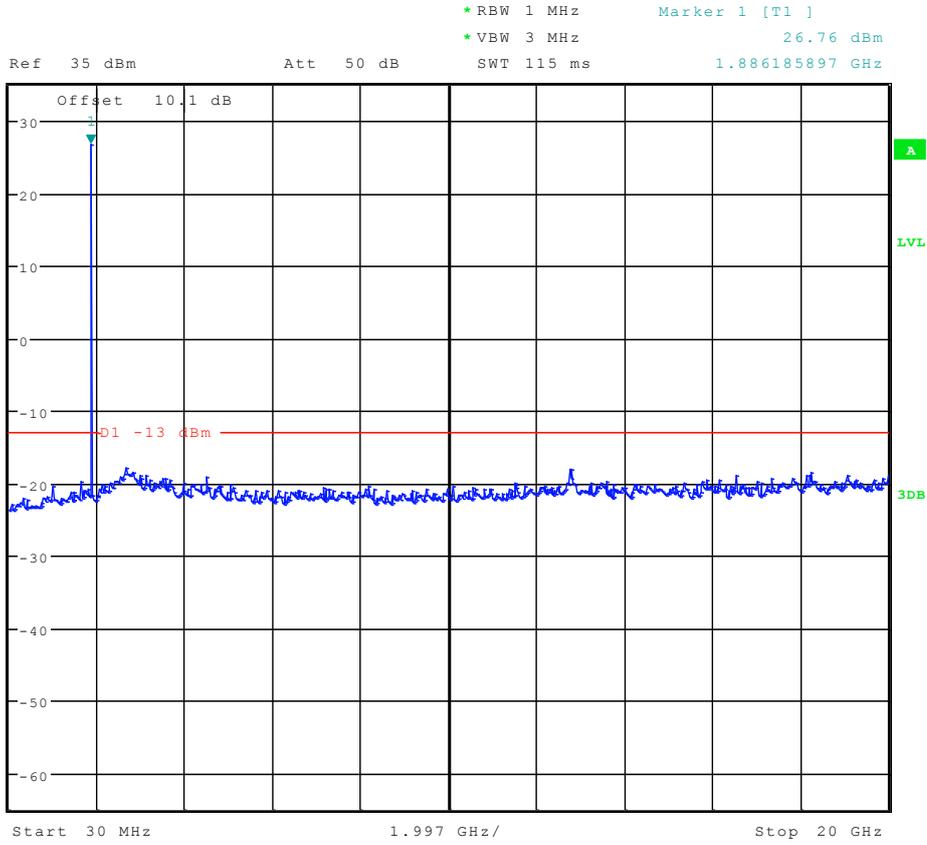
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*VBW 30 kHz -30.22 dBm



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Date: 2.DEC.2011 03:11:44



Appendix E

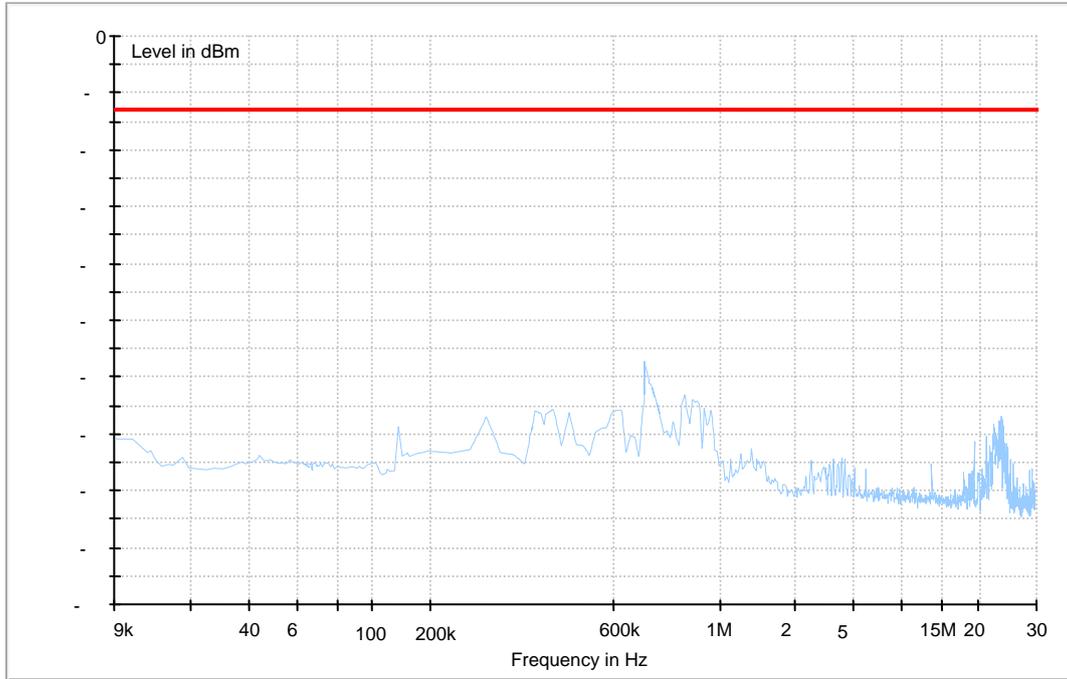
Radiated spurious emission

According to FCC Part 2.1053& Part 24.238



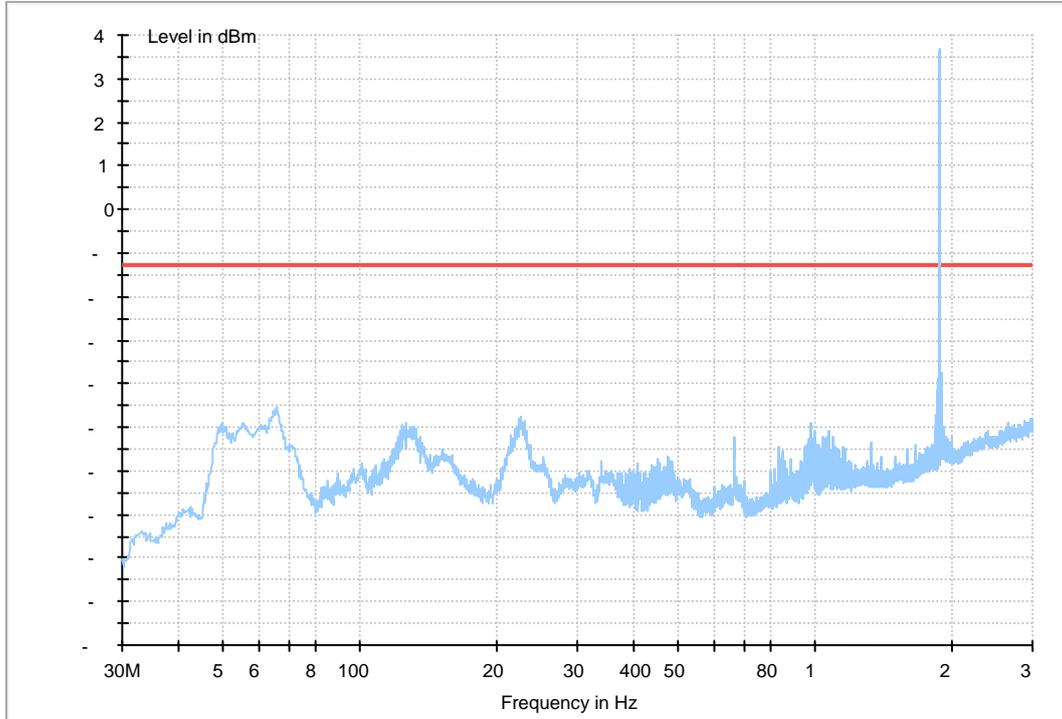
GPRS 1900

Traffic Mode (9kHz-30MHz)



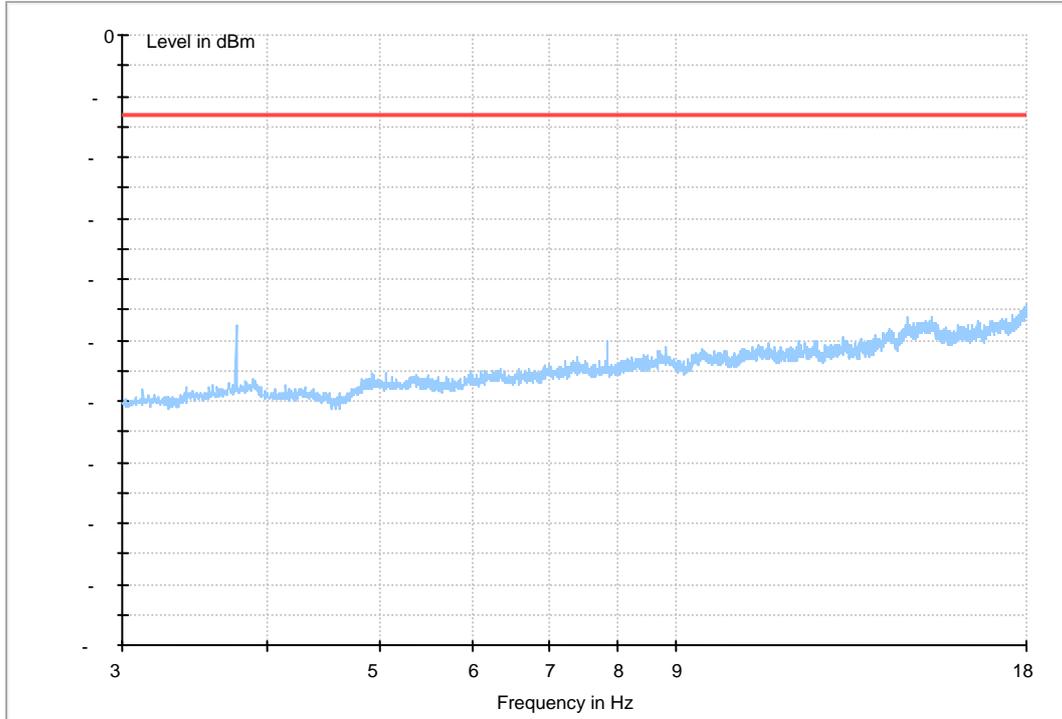


Traffic Mode (30MHz-3GHz)



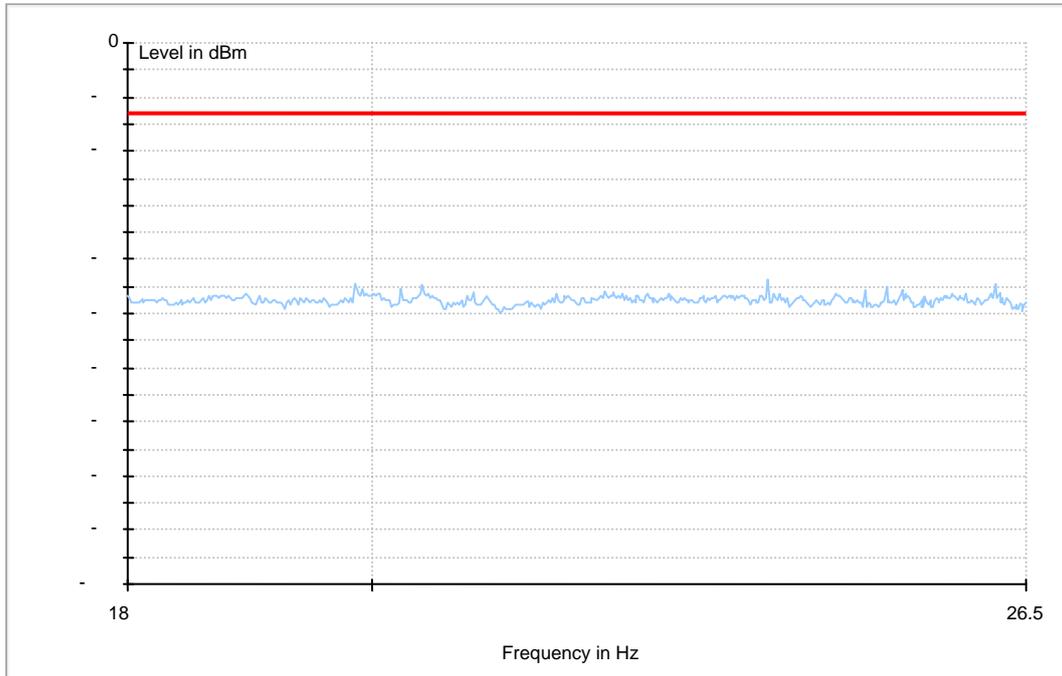


Traffic Mode (3GHz-18GHz)





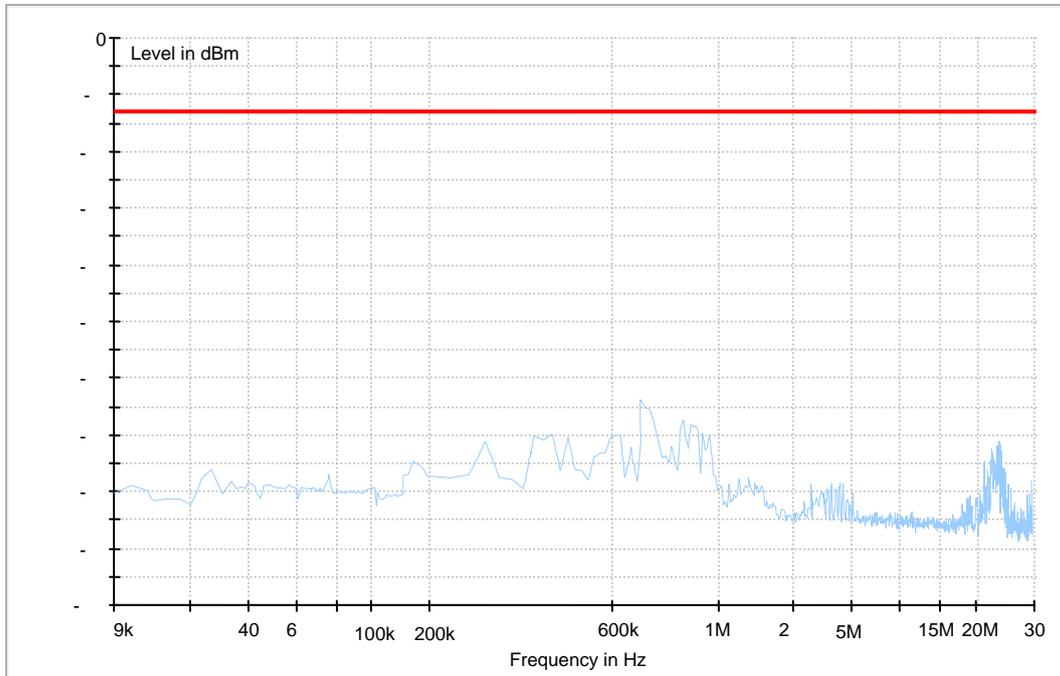
Traffic Mode (18GHz-26.5GHz)





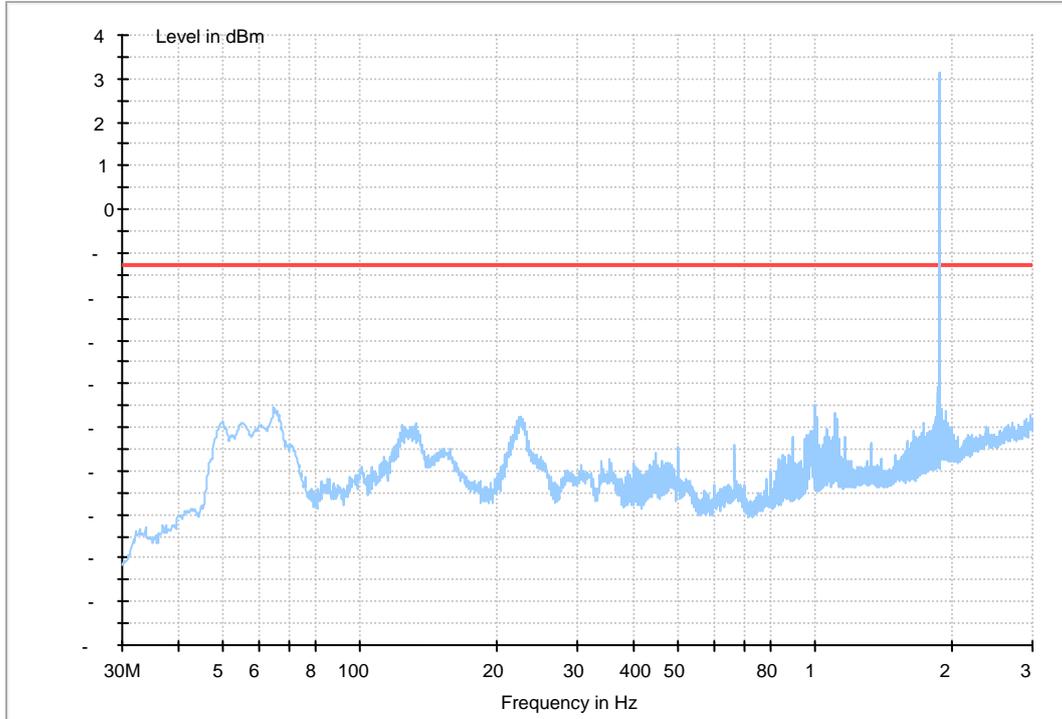
EDGE1900

Traffic Mode (9kHz-30MHz)



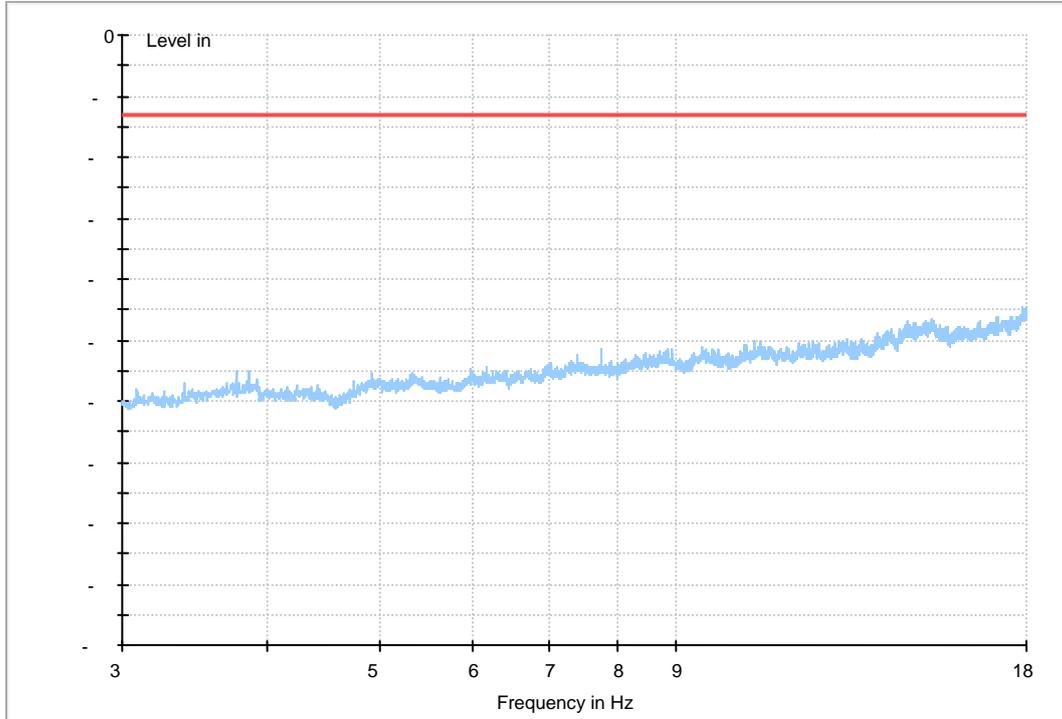


Traffic Mode (30MHz-3GHz)



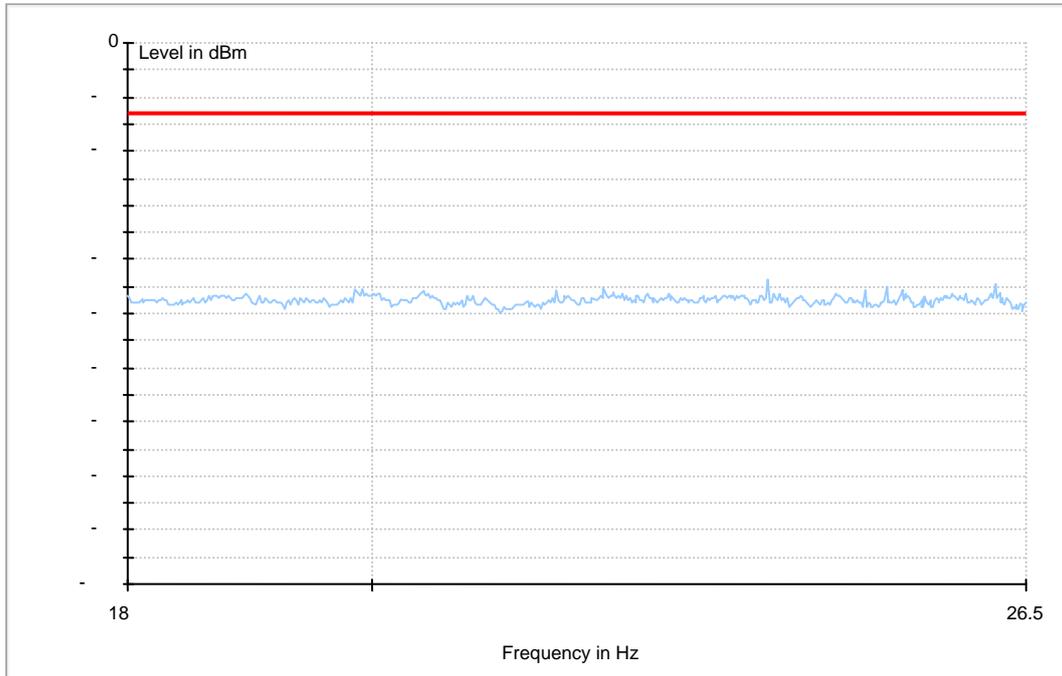


Traffic Mode (3GHz-18GHz)





Traffic Mode (18GHz-26.5GHz)





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	15	0.0080	---	±2.5	Pass
			-20 °C	-14	-0.0074	---	±2.5	Pass
			-10 °C	12	0.0064	---	±2.5	Pass
			0 °C	-14	-0.0074	---	±2.5	Pass
			10 °C	-12	-0.0064	---	±2.5	Pass
			20 °C	9	0.0048	---	±2.5	Pass
			30 °C	14	0.0074	---	±2.5	Pass
			40 °C	-9	-0.0048	---	±2.5	Pass
			50 °C	-18	-0.0096	---	±2.5	Pass
TM 2	M	100%	-30 °C	15	0.0080	---	±2.5	Pass
			-20 °C	-9	-0.0048	---	±2.5	Pass
			-10 °C	-11	-0.0059	---	±2.5	Pass
			0 °C	12	0.0064	---	±2.5	Pass
			10 °C	17	0.0090	---	±2.5	Pass
			20 °C	9	0.0048	---	±2.5	Pass
			30 °C	-18	-0.0096	---	±2.5	Pass
			40 °C	7	0.0037	---	±2.5	Pass
			50 °C	-12	-0.0064	---	±2.5	Pass
			40 °C	14	0.0074	---	±2.5	Pass
			50 °C	-16	-0.0085	---	±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	14	0.0074	---	±2.5	Pass
			VN	15	0.0080	---	±2.5	Pass
			VH	17	0.0090	---	±2.5	Pass
TM 2	M	20 °C	VL	-19	-0.0101	---	±2.5	Pass
			VN	12	0.0064	---	±2.5	Pass
			VH	13	0.0069	---	±2.5	Pass