



FCC RF Test Report

Product Name: HSDPA Module

Model Number: MU509-c

Report No: SYBHZ(R)E005112010EB-2

FCC ID: QISMU509C

IC ID: 6369A-MU509C

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-1.
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.



Notice 2

Modification Information:

Modification Information

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



REGULATION	FCC CFR47 Part 2: Subpart J;
	FCC CFR47 Part 22 : Subpart H;
	RSS-Gen Issue 2 June 2007
	RSS-132 Issue 2 September 2005
START OF TEST	Nov.15, 2010
END OF TEST	Nov.18, 2010
Final Judgement:	Pass

Approved By

Nov.18, 2010
Date

Liuchunlin
Name

Signature

Reviewed By

Nov.18, 2010
Date

Chenxiaohong
Name

Signature

Operator

Nov.18, 2010
Date

Zhangting
Name

Signature



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 RADIATED POWER OF TRANSMITTER (ERP).....	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	FREQUENCY STABILITY	30
7	<u>System Measurement Uncertainty</u>	34
8	<u>Appendices</u>	35

1 Summary

The table below summarizes the measurements and results for the HUAWEI MU509-c Module. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	22.913	Effective Radiated Power of Transmitter	PASS
2.1046	22.913	Conducted Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	22.917	Band Edges compliance	PASS
2.1051	22.917	Spurious Emission at Antenna Terminal	PASS
2.1055	22.355	Frequency Stability	PASS
2.1053	22.917	Radiated Spurious Emissions	PASS

Section in CFR 47	Section in RSS-132	Description	Result
22.913	4.4	Effective Radiated Power of Transmitter	PASS
2.1046	4.4	Conducted RF output power	PASS
2.1049	4.5	Occupied Bandwidth	PASS
22.917	4.5	Band Edges compliance	PASS
2.1051, 22.917	4.5	Spurious Emission at Antenna Terminal	PASS
2.1053, 22.917	4.5	Radiated Spurious Emission	PASS
2.1055	4.3	Frequency Stability	PASS

Note: The Radiated Spurious Emissions' test results are shown in the EMC report.



2 Product Description

2.1 Production Information

2.1.1 General Description

MU509-c Module is subscriber equipment in the GSM/UMTS system. The frequency band of this report is 850M. The MU509-c implements such functions as RF signal receiving / Transmitting, HSDPA/WCDMA/EDGE/GPRS/GSM protocol processing and data service etc. Externally it provides LGA interface. It has not an internal antenna. MU509-c uses Qualcomm QSC6270 chipset and Zero-IF technologies.

2.1.2 Support function and Service

The HUAWEI MU509-c Module 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: 8PSK	TM2	EDGE
Data	Modulation: QPSK	TM3	WCDMA
Data	Modulation: QPSK	TM4	HSDPA

Note: * The specified GPRS test conditions & settings are defined in 3GPP TS51.010 V5.4.0 and the EDGE 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.

Table 3 Modification Information

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



3 Test Site Description

The test site of:

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

3.1 Testing Period

The test have been performed during the period of

Nov.15, 2010 – Nov.18, 2010

3.2 General Set up Description

HUAWEI MU509-c Module can support GSM/GPRS/EDGE/WCDMA/HSDPA mode and 850M Band in this report. During this measurement, the HUAWEI MU509-c Module just works in GSM/GPRS/EDGE/WCDMA/HSDPA mode and 850M Band.

- TM1:** GSM/GPRS Mode with GMSK Modulation
- TM2:** EDGE Mode with 8PSK Modulation
- TM3:** WCDMA Mode with QPSK Modulation
- TM4:** HSDPA Mode with QPSK Modulation

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

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

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

	EDGE/GPRS/GSM	WCDMA/HSDPA
Channel Raster	200k Hz	200k Hz
Channel spacing:	200k Hz	5MHz

4.1.3 Type of Emission

Table 6 Type of Emission

	EDGE/GPRS/GSM	WCDMA/HSDPA
Emission Designation:	300KG7W / 300KGXW	5M00F9W

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



4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 20 °C
Maximum temperature:	+ 70 °C
Relative Humidity:	5%-95%RH

4.1.5 Power Source

Table 8 Power Source

DC voltage nominal:	 3.8V; Supplied by LGA interface
DC voltage range	 3.3-4.2V
DC 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:

Table 9 Applied RF Module DC 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 10 Board Information

HSDPA Module		
MU509-c		
Board and Module		
Model name	Serial Number	Remarks
MU509-c	4CA2A110A1900056	QSC6270

4.2.2 Adapter Technical Data

No Applicable.

4.2.3 Battery Technical Data

No Applicable.

4.2.4 FCC Identification

FCC Identification: QISMU509C
IC Identification: 6369A-MU509C

5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
EMI Test receiver	R&S	ESIB 26	100318	05.04.2011
Broadband Antenna	Schaffner	CBL 6112B	2941	04.17, 2011
Horn Antenna	R & S	HF906	359287/006	06.15.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	11.20.2010
Signal Generator	R&S	SMR 40	100325	05.12, 2011
Vector Signal Generator	R&S	SMU200A	3605064030	05.20.2011
Power Supply	Agilent	66311B	MY43006371	03.26.2011
Climate Chamber	WEISS	WK11-600/70	5922602844001 0	09.26.2011
Universal Radio Communication Tester	R&S	CMU200	113164	05.21.2011
Spectrum Analyzer	R&S	FSU26	200002	03.07.2011

6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (ERP)

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	TM1/TM2/TM3/TM4 at Channel Bottom, Middle, Top

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22 subpart H

6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3GPP TS51.010 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 22.913, mobile/portable stations are limited to 7 watts ERP peak power.
 $W \text{ (dBm)} = 10 \cdot \log(W_{\text{in mW}})$.

Table 14 Limits

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

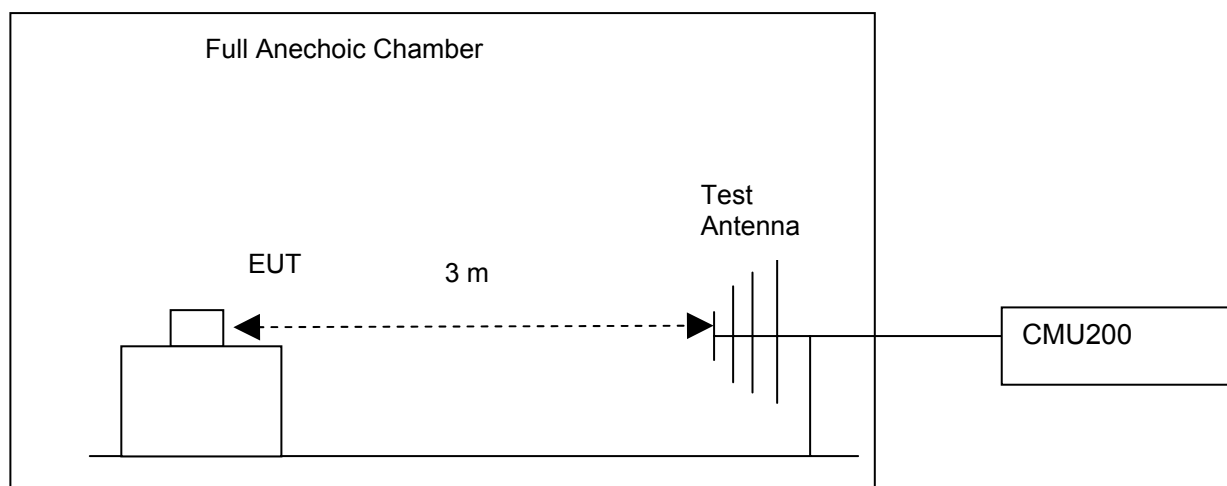
6.1.3 Test Method and Setup

- For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI MU509-c Module to the wireless communication tester CMU200 via the air interface. The band is set as 850M.
- Test the Radiated maximum output power by the CMU200 received from test antenna.

- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on 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 ERP

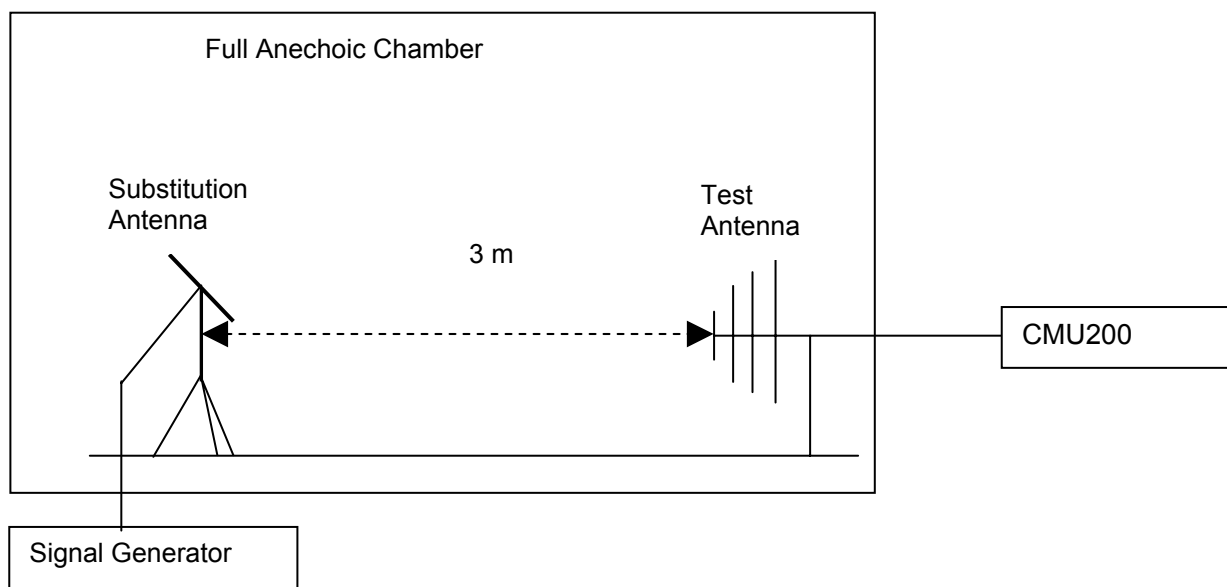


Figure 1. Test Set-up

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

ERP was measured using 1 host.

BenQ Joy book S72

6.1.4 Measurement Results

6.1.4.1 Pre-test Results

Table 15 Measurement Results

TEST CONDITIONS	RF Output Power (ERP)					
	Channel128(B) 824.2MHz		Channel192(M) 837.0MHz		Channel251(T) 848.8MHz	
	dBm		dBm		dBm	
Tnom (25 °C)/ Vnom (3.8V)	Measured	Limit	Measured	Limit	Measured	Limit
TM1	33.90	38.5	33.94	38.5	33.68	38.5
TM2	28.52	38.5	28.49	38.5	28.29	38.5
TEST CONDITIONS	Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
	dBm		dBm		dBm	
	Measured	Limit	Measured	Limit	Measured	Limit
TM3	23.49	38.5	24.05	38.5	23.85	38.5

6.1.4.2 Substitution Results

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	FCC limit [dBm]	Result
TM1	824.2	33.90	Dipole Ant.	37.06	-2.75	0.6	33.71	38.5	Pass
TM1	837.0	33.94	Dipole Ant.	37.26	-2.87	0.6	33.79	38.5	Pass
TM1	848.8	33.68	Dipole Ant.	36.97	-2.85	0.6	33.52	38.5	Pass
TM2	824.2	28.52	Dipole Ant.	31.78	-2.75	0.6	28.43	38.5	Pass
TM2	837.0	28.49	Dipole Ant.	31.87	-2.87	0.6	28.40	38.5	Pass
TM2	848.8	28.29	Dipole Ant.	31.53	-2.85	0.6	28.08	38.5	Pass
TM3	826.4	23.49	Dipole Ant.	26.82	-2.75	0.6	23.47	38.5	Pass
TM3	836.4	24.05	Dipole Ant.	27.31	-2.87	0.6	23.84	38.5	Pass
TM3	846.6	23.85	Dipole Ant.	27.08	-2.85	0.6	23.63	38.5	Pass



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

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

NOTE: SGP- Signal Generator Level

b, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 200kHz for TM1 and TM2 and 5M for TM3 and TM4.

6.1.5 Conclusion

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

6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3/TM4 at Channel Bottom, Middle, Top

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

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

6.2.2.2 Supporting Standards

Table 18 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 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

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

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

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

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

Table 19 Limits

Maximum Output Power (Watts)	< 7 Watts(38.5dBm)
Antenna Gain(dBi):	4.28

Antenna Gain(dBd):	2.13
Maximum Conducted Output Power (dBm)	< 36.37

For HSDPA test mode, there are 4 sub-tests for different configuration.

HSDPA conducted max power pre-scan

Sub-test	c	d	d (SF)	c/d	HS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0	0
2	12/15	15/15	64	12/15	24/15	1	0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

6.2.3 Test Method and Setup

(a)For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the HUAWEI MU509-c Module to the wireless communication tester CMU200 via the antenna connector. The band class is set as US Cellular.

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

Test setup

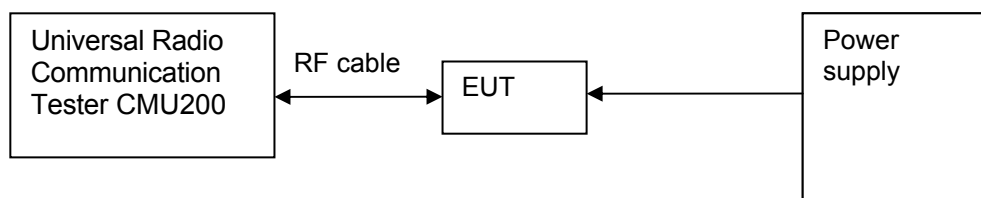


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 20 Measurement Results

TEST CONDITIONS	RF Output Power (Conducted)		
	Channel128(B)	Channel192(M)	Channel251(T)



		824.2MHz		837.0MHz		848.8MHz	
		dBm		dBm		dBm	
Tnom (25 °C)/ Vnom (3.8V)		Measured	Limit	Measured	Limit	Measured	Limit
TM1		31.77	36.37	31.81	36.37	31.55	36.37
TM2		26.39	36.37	26.36	36.37	26.16	36.37
TEST CONDITIONS		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
		dBm		dBm		dBm	
Tnom (25 °C)/ Vnom (3.8V)		Measured	Limit	Measured	Limit	Measured	Limit
TM3		21.36	36.37	21.92	36.37	21.72	36.37
TM4	Case1	20.88	36.37	21.41	36.37	21.20	36.37
	Case2	20.69	36.37	21.20	36.37	21.01	36.37
	Case3	20.04	36.37	20.63	36.37	20.44	36.37
	Case4	19.06	36.37	19.61	36.37	19.43	36.37

6.2.5 Conclusion

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

6.3 Modulation Characteristics

6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	52 %
Test Configurations:	TM1/TM2/TM3 at frequency Middle

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

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

6.3.2.2 Supporting Standards

Table 22 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 22 subpart H.

Table 23 Limits

Limits	Not applicable
--------	----------------

6.3.3 Test Method and Setup

Connect the HUAWEI MU509-c Module to Universal Radio Communication Tester CMU200 via the antenna connector. The frequency band is set as 850M; the HUAWEI MU509-c Module'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 HUAWEI MU509-c Module was tested.

Test setup

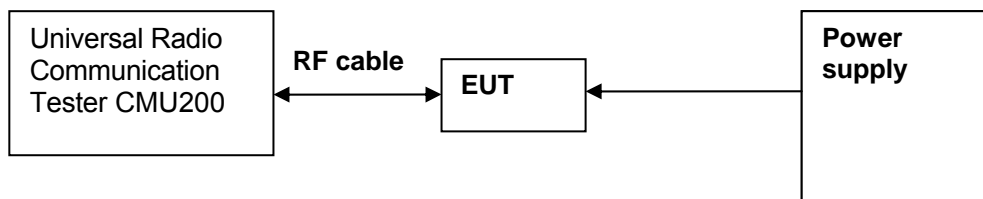


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

		Modulation Characteristic	
TEST CONDITIONS		Channel Middle	
		Measured	
		TM1	TM2
T _{nom} (25 °C)	V _{nom} (3.8V)	Refer to Appendix A	Refer to Appendix A
		Modulation Characteristic	
TEST CONDITIONS		Channel4182(M) 836.4MHz	
		Measured	
		TM3	
T _{nom} (25 °C)	V _{nom} (3.8V)	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

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 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 22 subpart H.

6.4.2.2 Supporting Standards

Table 26 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 22 subpart H, 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.

Table 27 Limits

Upper /lower frequency limits	0.5% of the mean power
-------------------------------	------------------------

6.4.3 Test Method and Setup

HUAWEI MU509-c Module was connected to the wireless signal analyzer R&S FSU26 via the one RF connector. The band class is set as 850M; HUAWEI MU509-c Module was controlled to transmit maximum power. Measure and record the occupied bandwidth of the HUAWEI MU509-c Module by the R&S FSU26.

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

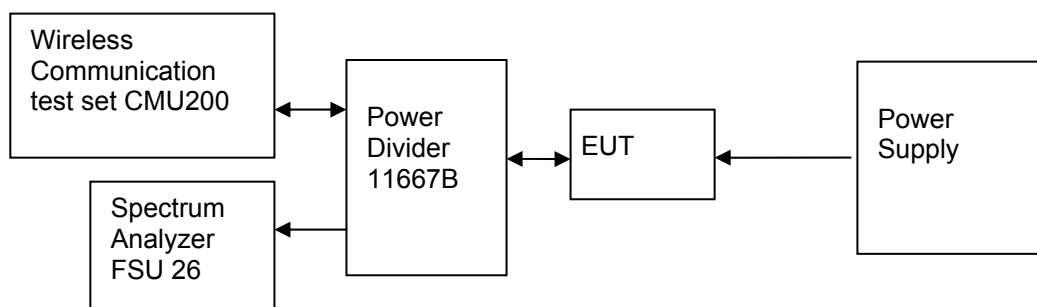


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth					
Center Frequency		Channel128(B) 824.2MHz		Channel192(M) 837.0MHz		Channel251(T) 848.8MHz	
		Measured (kHz)		Measured (kHz)		Measured (kHz)	
		TM1	TM2	TM1	TM2	TM1	TM2
Tnom (25 °C)	99%	243.59	248.40	246.79	245.19	245.19	245.19
Vnom (3.8V)							
Center Frequency		Channel4132(B) 826.4MHz		Channel4182(M) 836.4MHz		Channel4233(T) 846.6MHz	
		Measured (MHz)		Measured (MHz)		Measured (MHz)	



		TM3	TM3	TM3
Tnom (25 °C) Vnom (3.8V)	99%	4.20	4.20	4.20

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

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Top

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22 subpart H

6.5.2.2 Supporting Standards

Table 30 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 22.917, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$ (W) . (Whereas P is the rated power of the EUT).

Table 31 Limits

	TM1	TM2	TM3
Rated Power:	33 dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log(2) = 46$, 33 dBm - 46 dB	$43 + 10 \log(0.5) = 40$, 27 dBm - 40 dB	$43 + 10 \log(0.25) = 37$, 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

6.5.3 Test Method and Setup

HUAWEI MU509-c Module was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as 850M. HUAWEI MU509-c Module was controlled to transmit

maximum power. Measure and record band edges compliance of the HUAWEI MU509-c Module by the R&S FSU26.

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): 200 kHz

Test Set-up

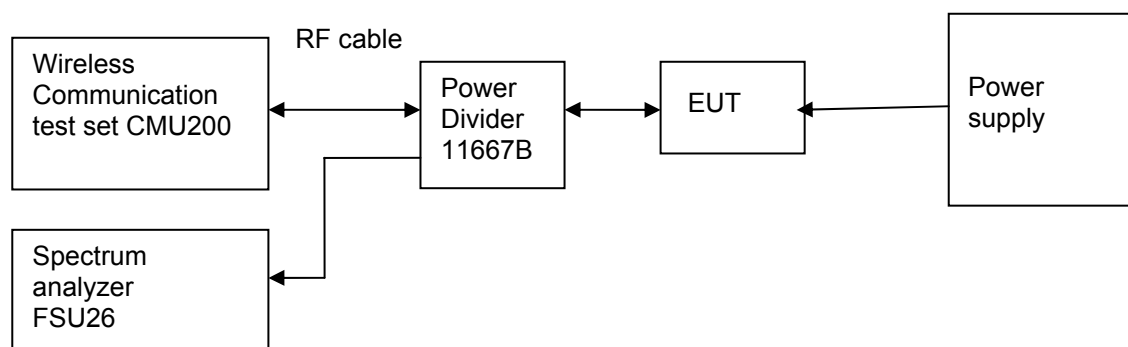


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Spurious Level measured [dBm]	FCC limit	Result
Cellular	T_{nom} (25 °C), V_{nom} (3.8V)					
	824.2	128	TM1	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM1	<-13(See appendix C)	- 13 dBm	Pass
	824.2	128	TM2	<-13(See appendix C)	- 13 dBm	Pass
	848.8	251	TM2	<-13(See appendix C)	- 13 dBm	Pass
	826.4	4132	TM3	<-13(See appendix C)	- 13 dBm	Pass
	846.6	4233	TM3	<-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

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	50 %
Test Configurations:	TM1/TM2/TM3 at frequency Bottom, Middle, Top

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22 subpart H

6.6.2.2 Supporting Standards

Table 34 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 22.917, 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 35 Limits

	TM1	TM2	TM3
Rated Power:	33dBm	27 dBm	24 dBm
Required attenuation:	$43 + 10 \log (2) = 46$, 33 dBm - 46 dB	$43 + 10 \log (0.5) = 40$, 27 dBm - 40 dB	$43 + 10 \log (0.25) = 37$, 24 dBm - 37 dB
Absolute level	- 13 dBm	- 13 dBm	- 13 dBm

6.6.3 Test Method and Setup

HUAWEI MU509-c Module was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as 850M. HUAWEI MU509-c Module was controlled to transmit

maximum power. Measure and record the Conducted Spurious Emission of the HUAWEI MU509-c Module by the R&S FSU26.

According to part 22.917, the defined measurement bandwidth as following:

22.917 (b) Measurement procedure: Compliance with these provisions 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 30 MHz up to 1 GHz: 100 kHz;
Measurement bandwidth (RBW) for 1 GHz up to 12.75 GHz: 1 MHz;

Test Set-up

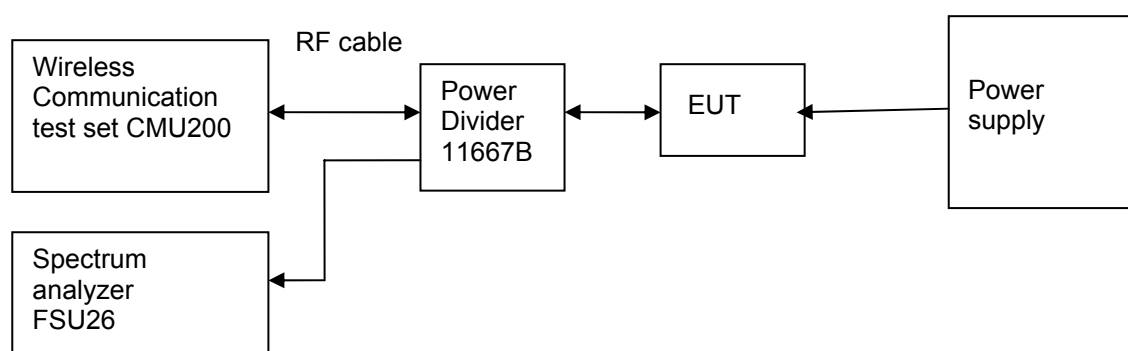


Figure 6. Test Set-up

6.6.4 Measurement Results

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 128(B)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4132(B)	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 192(M)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4182(M)	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass

Channel 251(T)	TM1	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM2	9 kHz ~12.75GHz	27	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 4233(T)	TM3	9 kHz ~12.75GHz	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 Frequency Stability

6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	TM1/TM2/TM3 at frequency Middle

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

6.7.2.2 Supporting Standards

Table 38 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

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

6.7.3 Test Method and Setup

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

- (1) From -30 ° to +70 ° 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 95 to 105 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 3.3V and 4.2V, so here the EUT is tested in the 3.3V and 4.2V.

Test Set up

Connect the HUAWEI MU509-c Module 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.

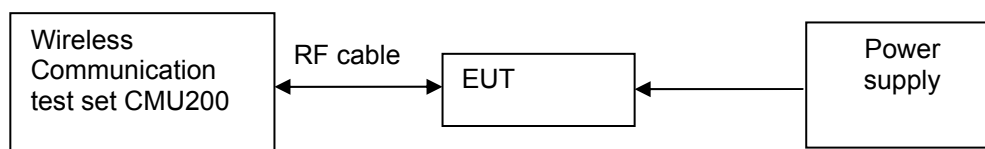


Figure 7. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

● TM1, 3.8V DC Channel No.192(837.0MHz)

Table 39 Measurement Results vs. Variation of Temperature—TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	837.0	33	Pass
-20 °C	837.0	-23	Pass
-10 °C	837.0	-13	Pass
0 °C	837.0	11	Pass
+10 °C	837.0	-4	Pass
+20 °C	837.0	-9	Pass
+30 °C	837.0	-10	Pass
+40 °C	837.0	-7	Pass
+50 °C	837.0	18	Pass
+60 °C	837.0	-9	Pass
+70 °C	837.0	8	Pass

● **TM2, 3.8V DC Channel No.192(837.0MHz)**

Table 40 Measurement Results vs. Variation of Temperature—TM2

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	837.0	31	Pass
-20 °C	837.0	-25	Pass
-10 °C	837.0	-10	Pass
0 °C	837.0	6	Pass
+10 °C	837.0	10	Pass
+20 °C	837.0	1	Pass
+30 °C	837.0	6	Pass
+40 °C	837.0	-13	Pass
+50 °C	837.0	14	Pass
+60 °C	837.0	7	Pass
+70 °C	837.0	-8	Pass

● **TM3, 3.8V DC Channel No.4182(836.4MHz)**

Table 41 Measurement Results vs. Variation of Temperature—TM3

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	836.4	27	Pass
-20 °C	836.4	23	Pass
-10 °C	836.4	-14	Pass
0 °C	836.4	-8	Pass
+10 °C	836.4	4	Pass
+20 °C	836.4	7	Pass
+30 °C	836.4	-6	Pass
+40 °C	836.4	-7	Pass
+50 °C	836.4	13	Pass
+60 °C	836.4	6	Pass
+70 °C	836.4	8	Pass

6.7.4.2 Measurement Results vs. Variation of Voltage

● **TM1, 25 °C ,Channel No. 192(837.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage—TM1

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	837.0	-16	Pass
3.8 V	837.0	-21	Pass
3.3 V	837.0	-24	Pass

● **TM2, 25 °C ,Channel No. 192(837.0MHz)**

Table 43 Measurement Results vs. Variation of Voltage—TM2

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	837.0	-31	Pass
3.8 V	837.0	-34	Pass
3.3 V	837.0	-36	Pass

● **TM3, 25 °C ,Channel No. 4182(836.4MHz)**

Table 44 Measurement Results vs. Variation of Voltage—TM3

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.2 V	836.4	-19	Pass
3.8 V	836.4	-6	Pass
3.3 V	836.4	-1	Pass

6.7.5 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:

Table 45 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=3dB; k=2
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2



8 Appendices

Appendix A	Measurement Results Modulation Characteristics	4 Pages
Appendix B	Measurement Results Occupied Bandwidth	10 Pages
Appendix C	Measurement Results Band Edges	7 Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	37 Pages



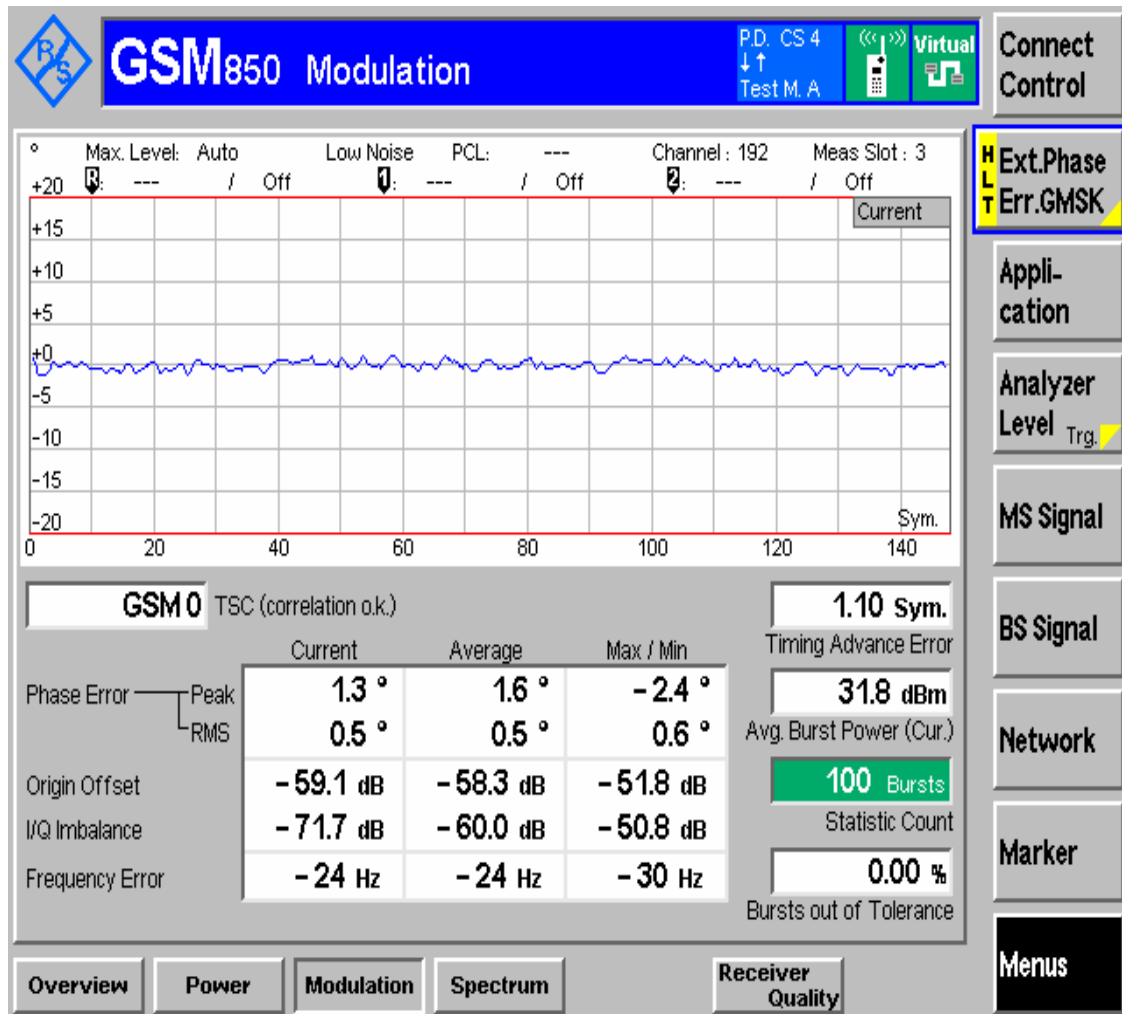
Appendix A

Modulation Characteristics

According to FCC Part 2.1047 & Part22 Subpart H

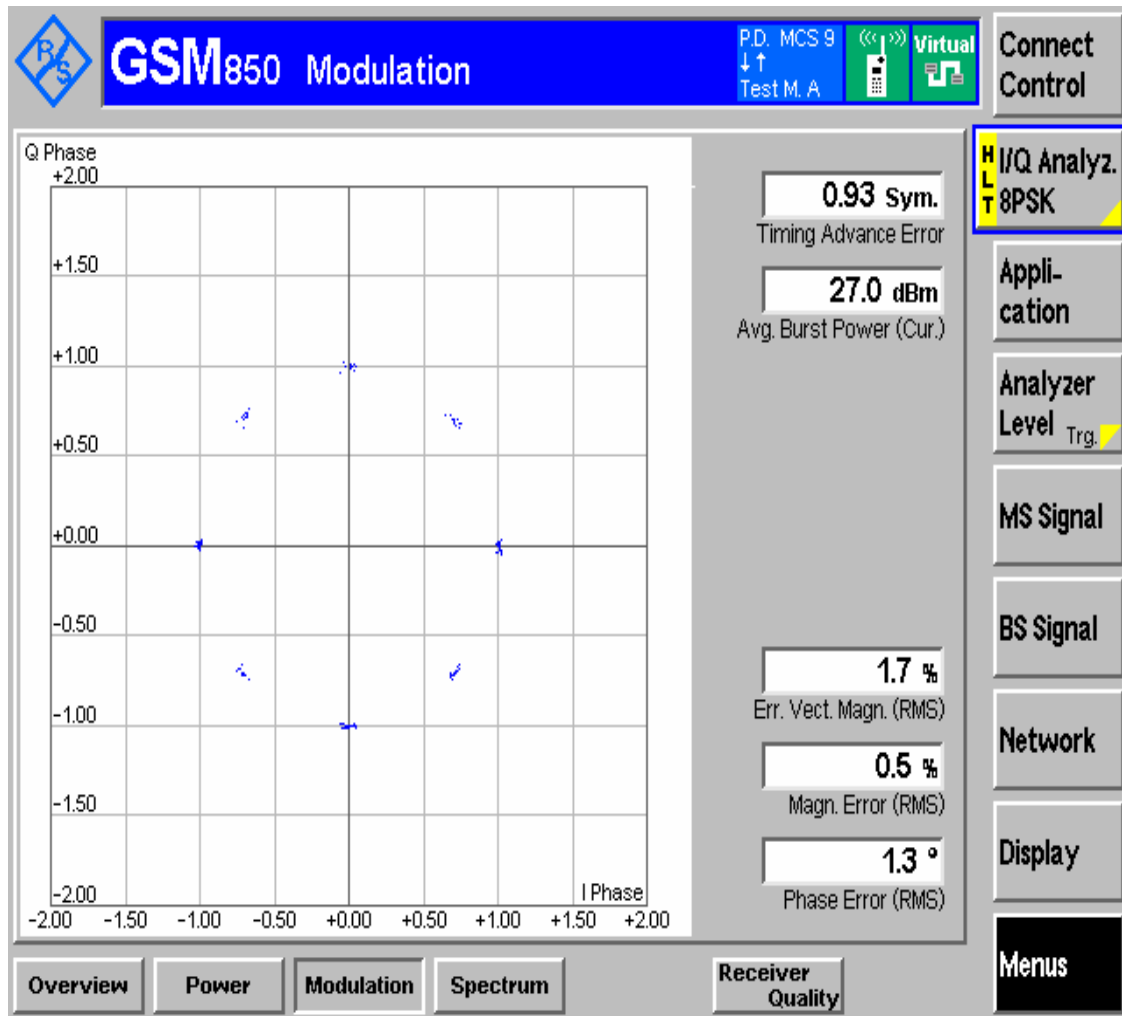


Channel 192 (TM1:GPRS/GSM)



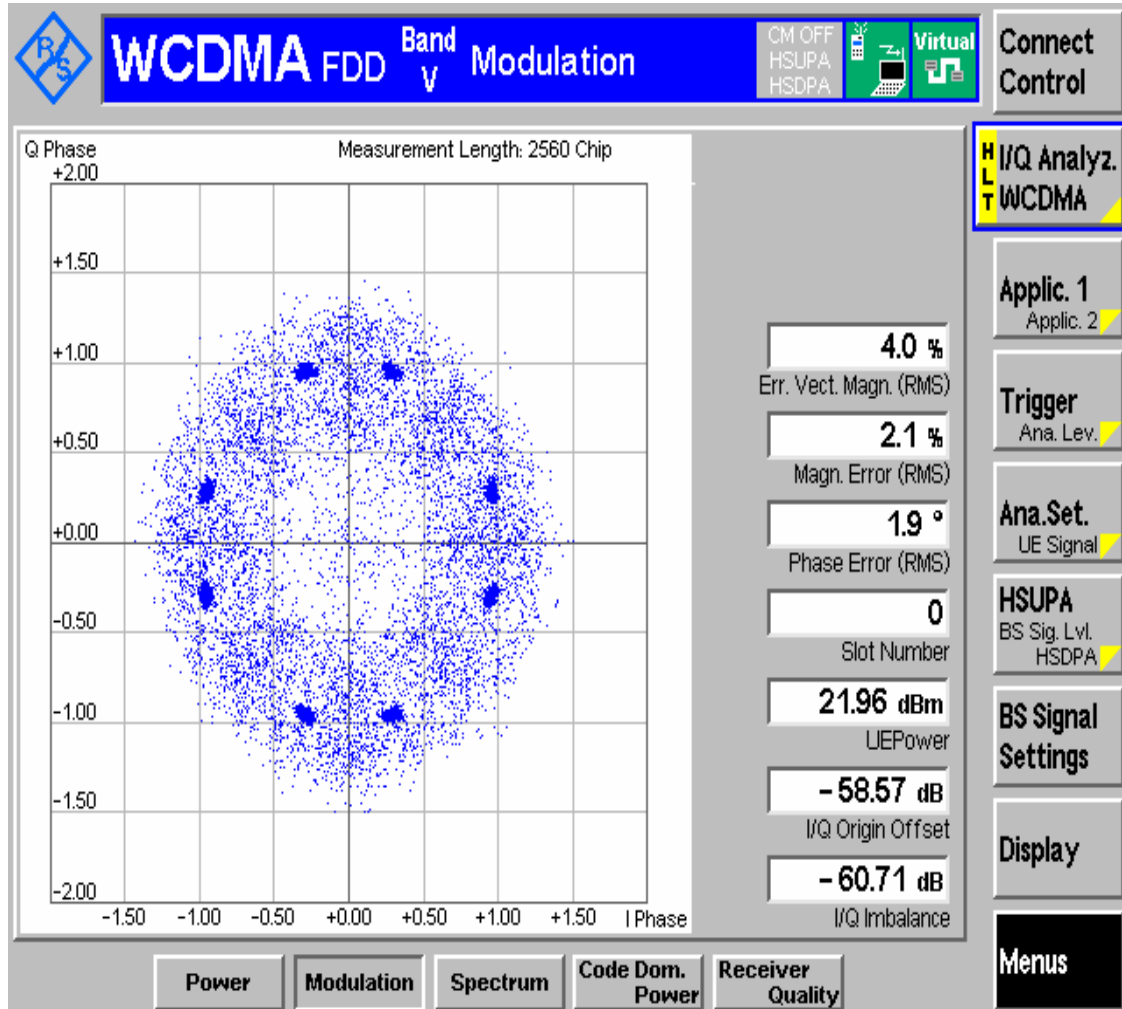


Channel 192 (TM2:EDGE)





Channel 4182 (TM3: WCDMA)





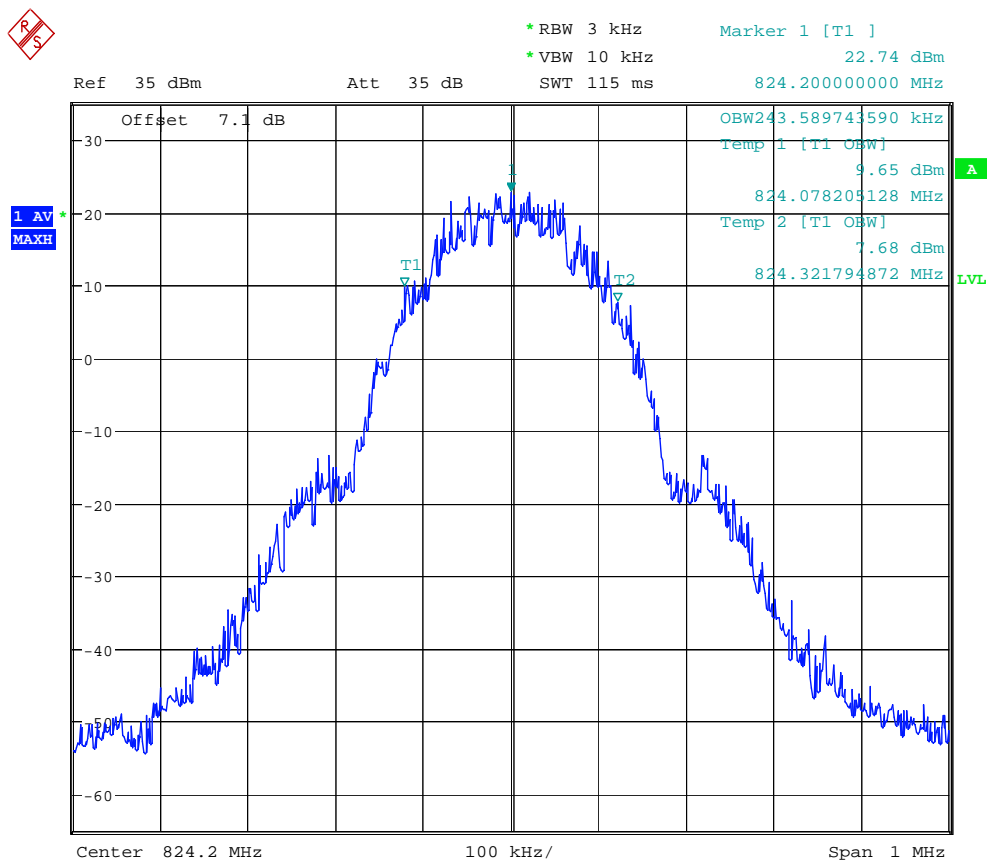
Appendix B

Occupied Bandwidth

According to FCC Part 2.1049 & Part 22 Subpart H
& RSS-132



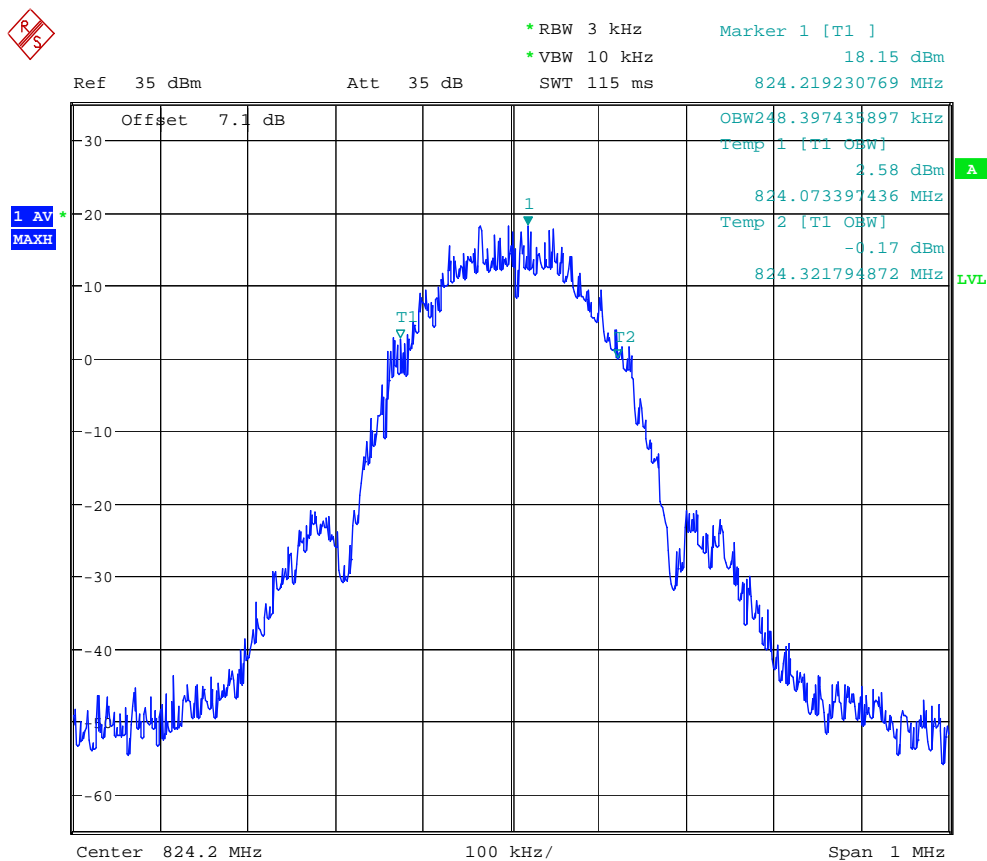
Channel 128 (TM1:GPRS/GSM)



Date: 15.NOV.2010 18:24:56



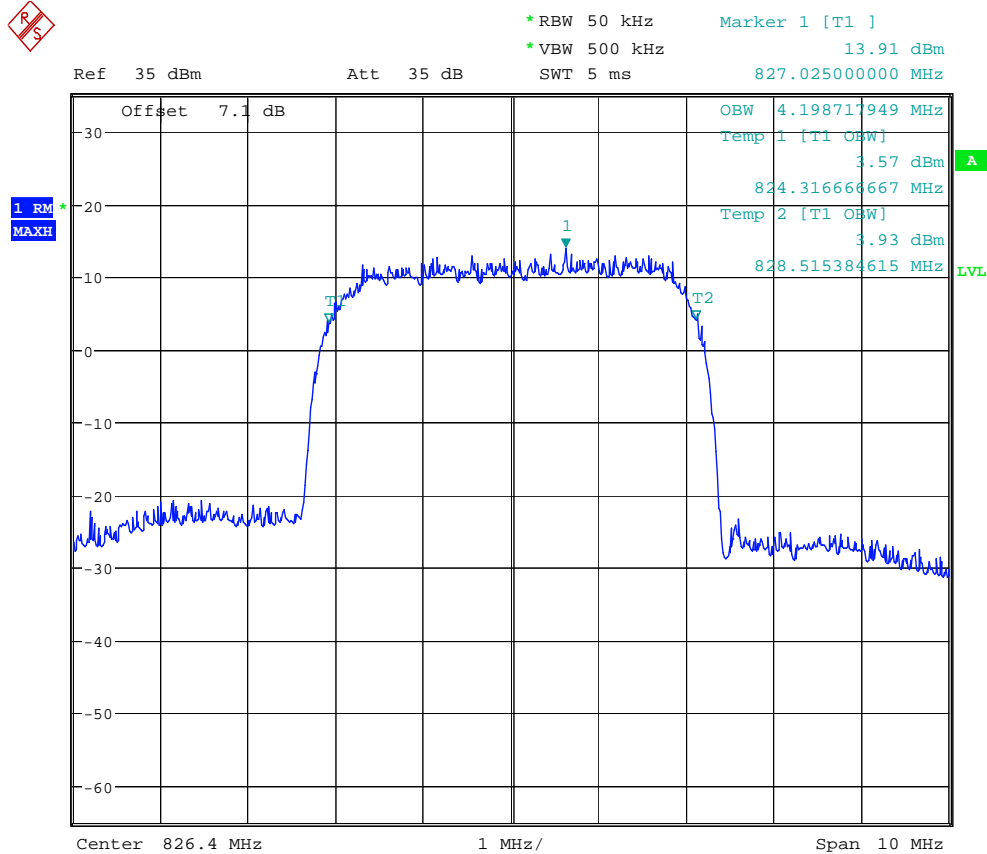
Channel 128 (TM2:EDGE)



Date: 15.NOV.2010 18:37:23



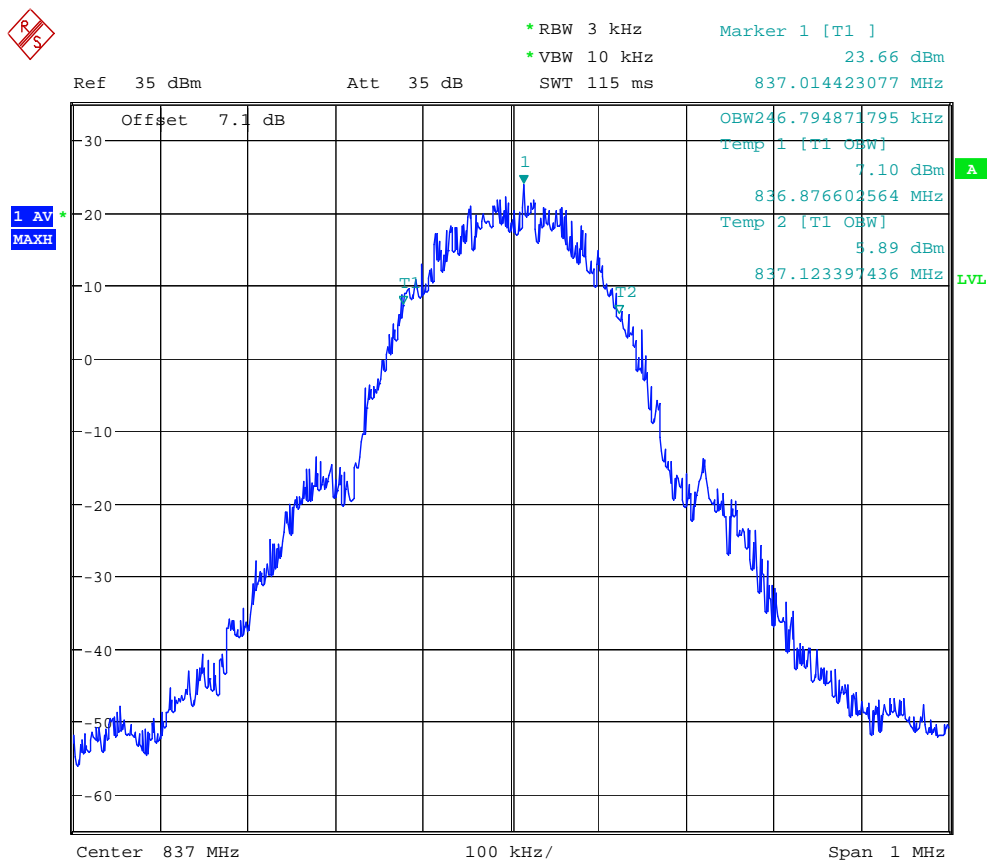
Channel 4132 (TM3: WCDMA)



Date: 15.NOV.2010 18:42:17



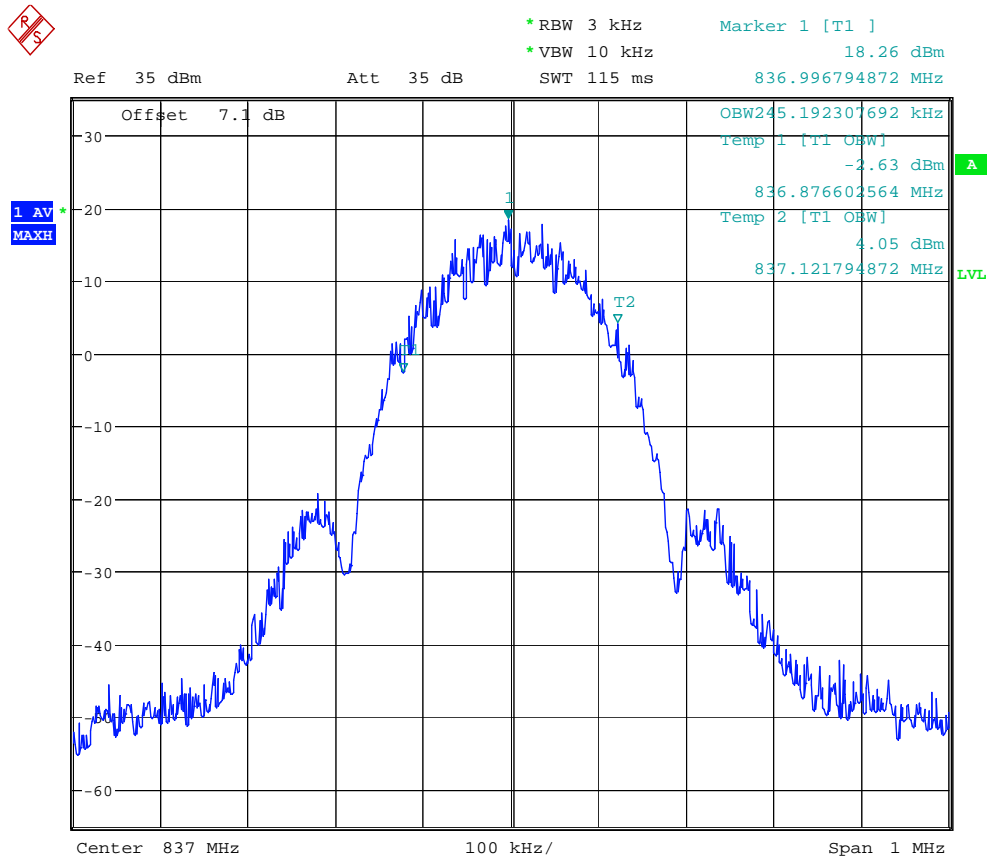
Channel 192 (TM1:GPRS/GSM)



Date: 15.NOV.2010 18:25:10



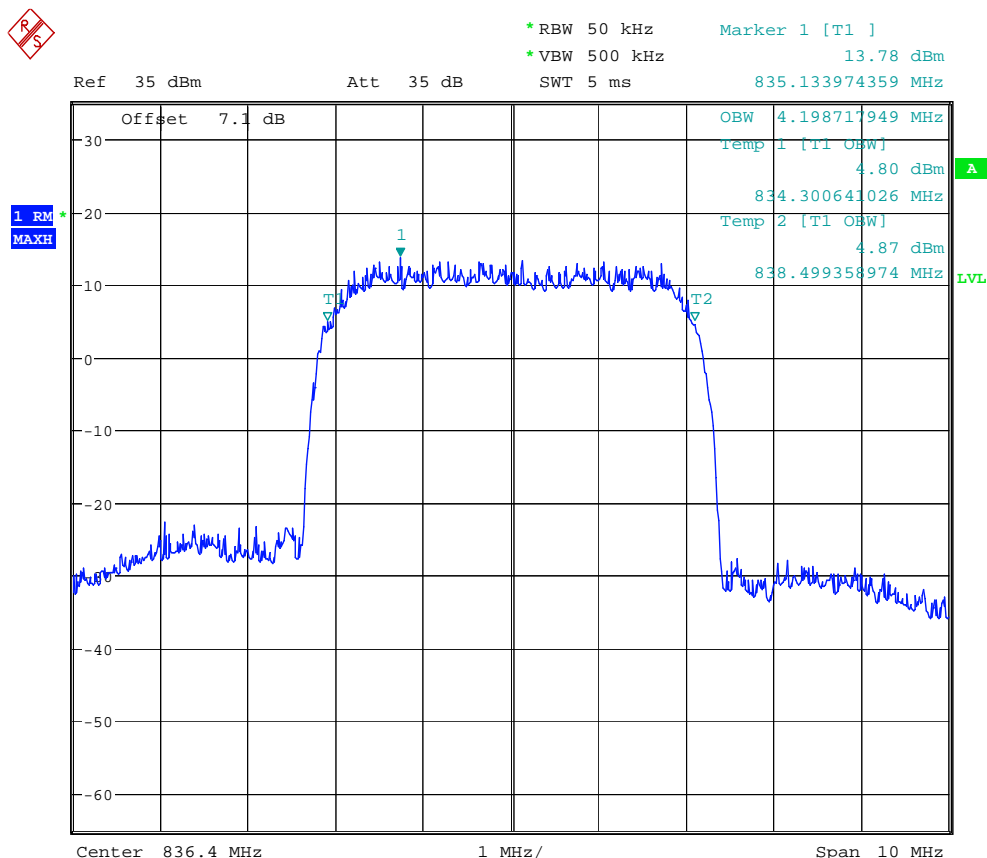
Channel 192 (TM2:EDGE)



Date: 15.NOV.2010 18:37:37



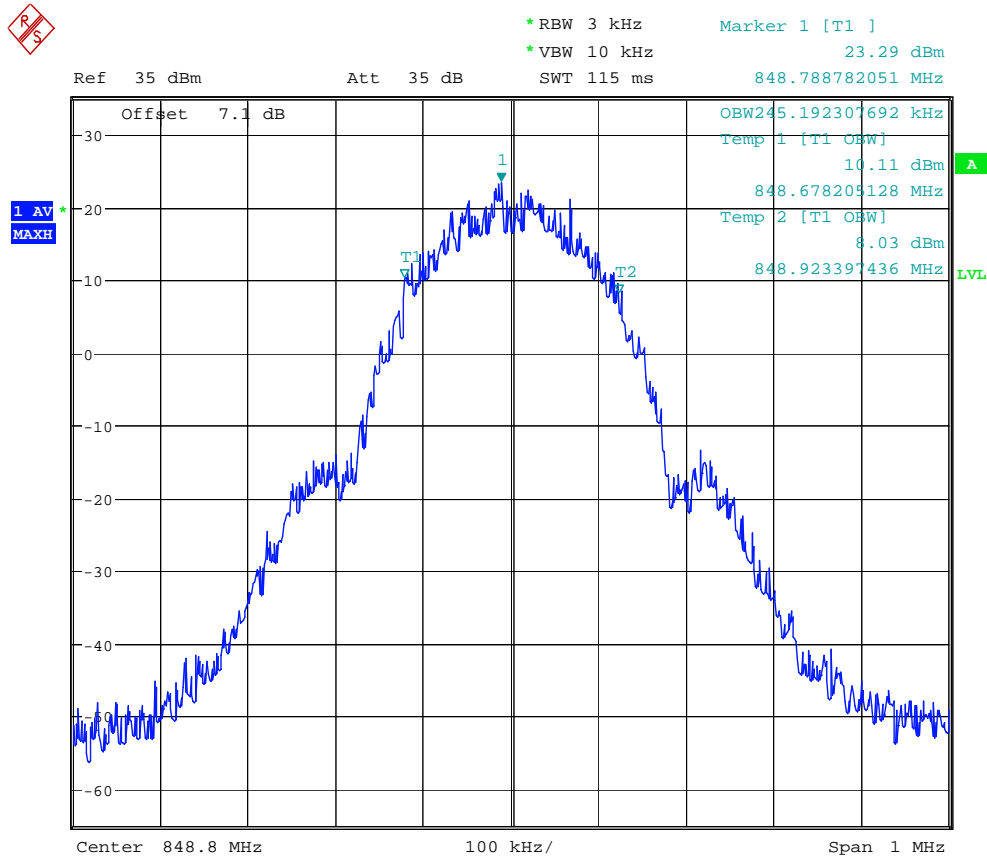
Channel 4182 (TM3: WCDMA)



Date: 15.NOV.2010 18:42:31



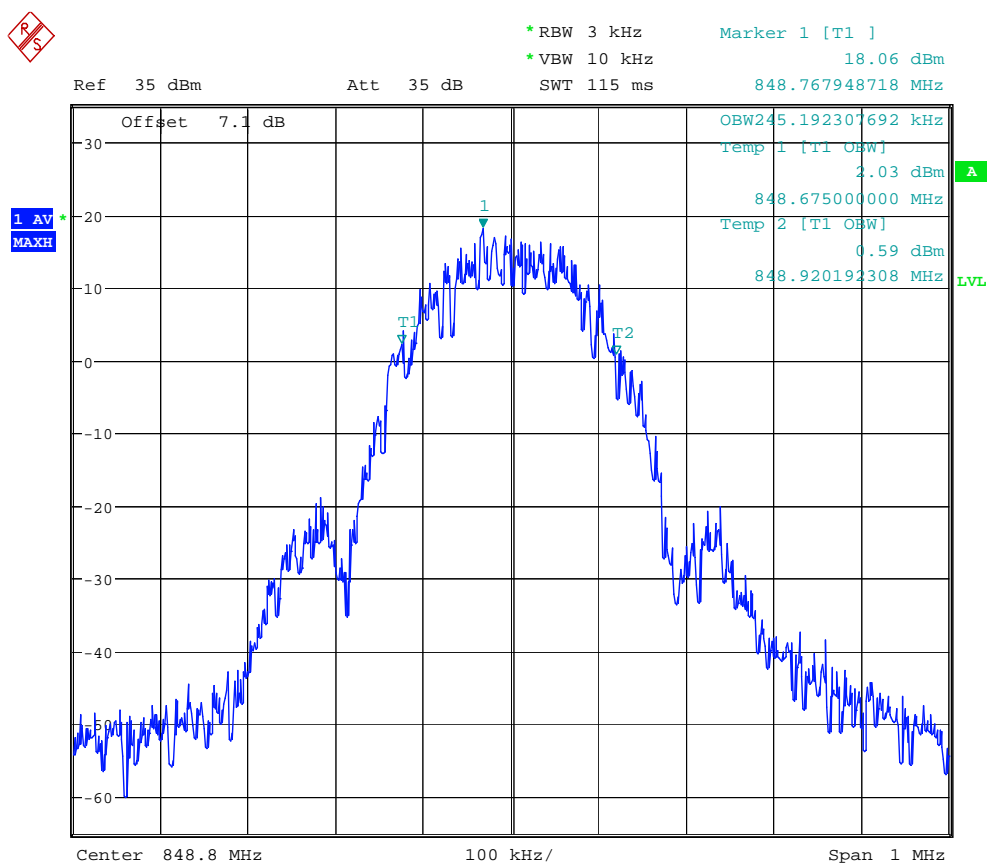
Channel 251 (TM1:GPRS/GSM)



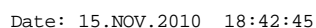
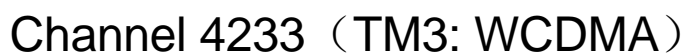
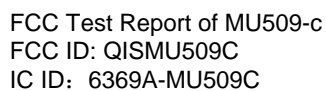
Date: 15.NOV.2010 18:25:23



Channel 251 (TM2:EDGE)



Date: 15.NOV.2010 18:37:51





FCC Test Report of MU509-c
FCC ID: QISMU509C
IC ID: 6369A-MU509C



Appendix C

Band Edges Compliance

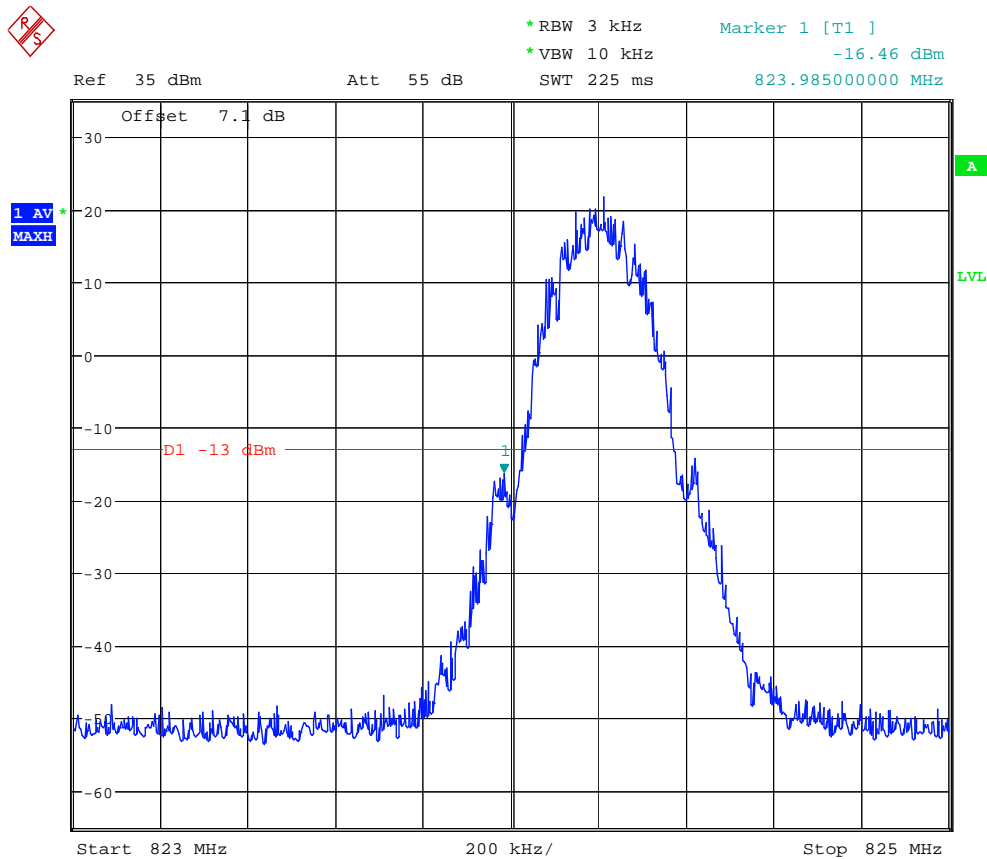
According to FCC Part 2.1051 & Part 22 Subpart H
& RSS-132



TM1:GPRS/GSM

Left Edge

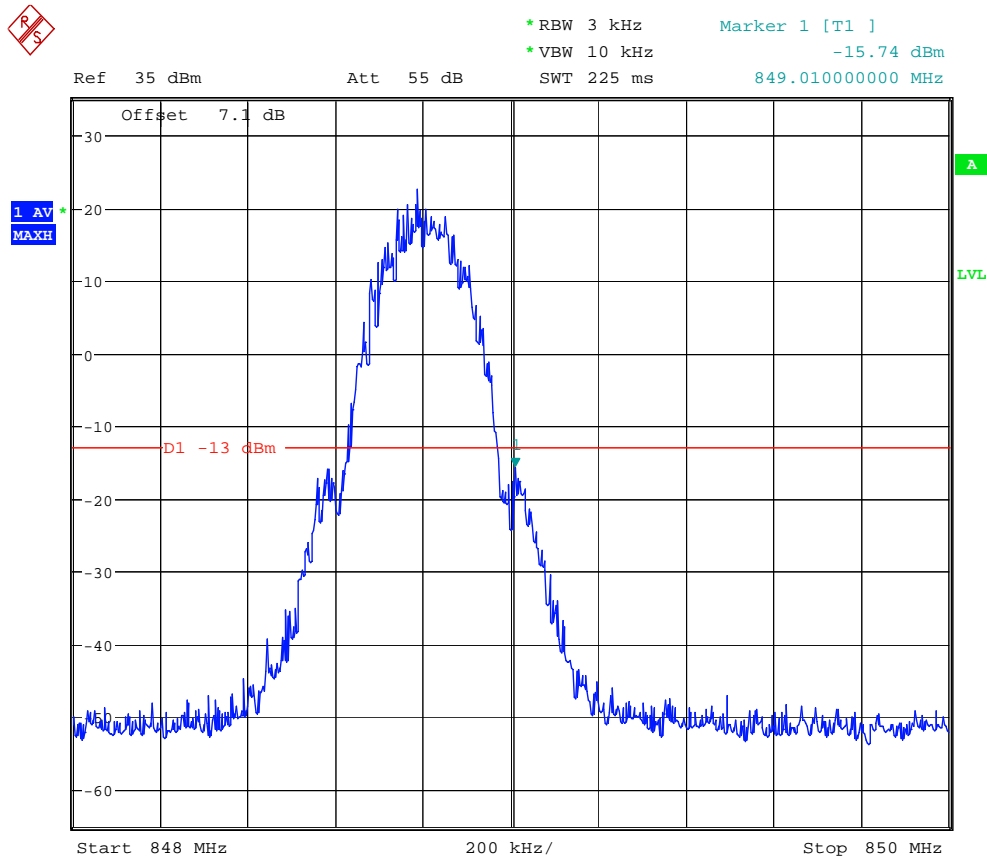
Channel 128



Date: 15.NOV.2010 18:35:25



Right Edge Channel 251



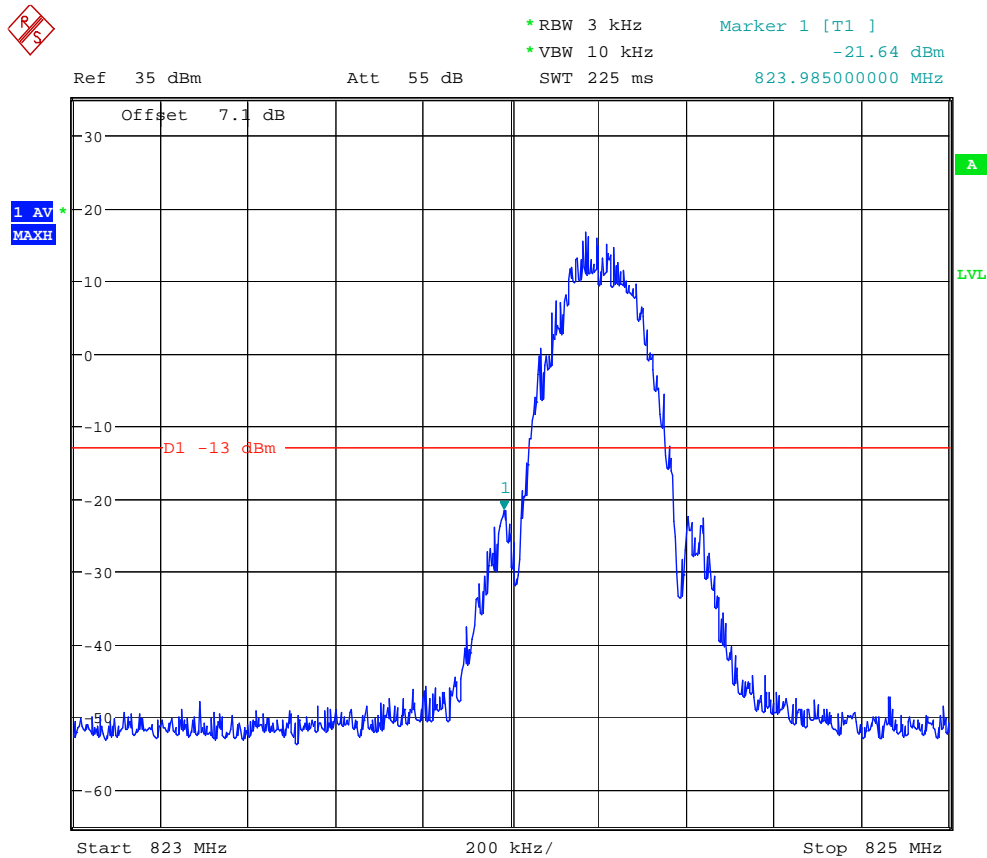
Date: 15.NOV.2010 18:35:39



TM2:EDGE

Left Edge

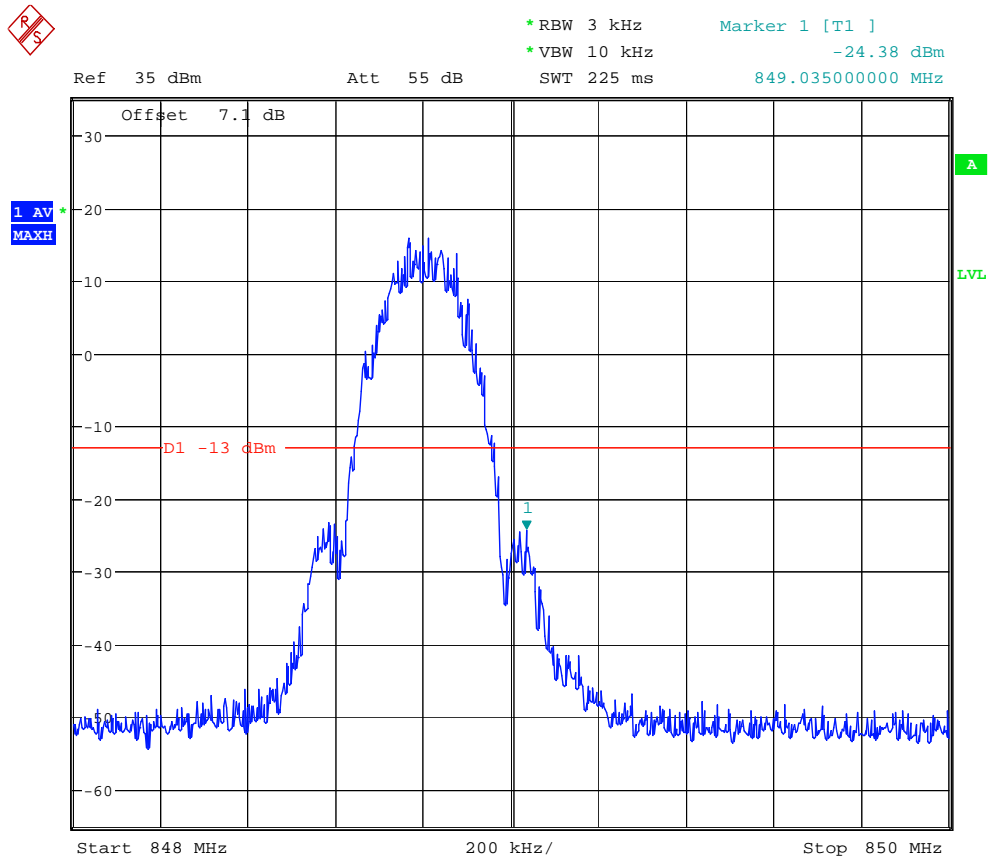
Channel 128



Date: 15.NOV.2010 18:36:54



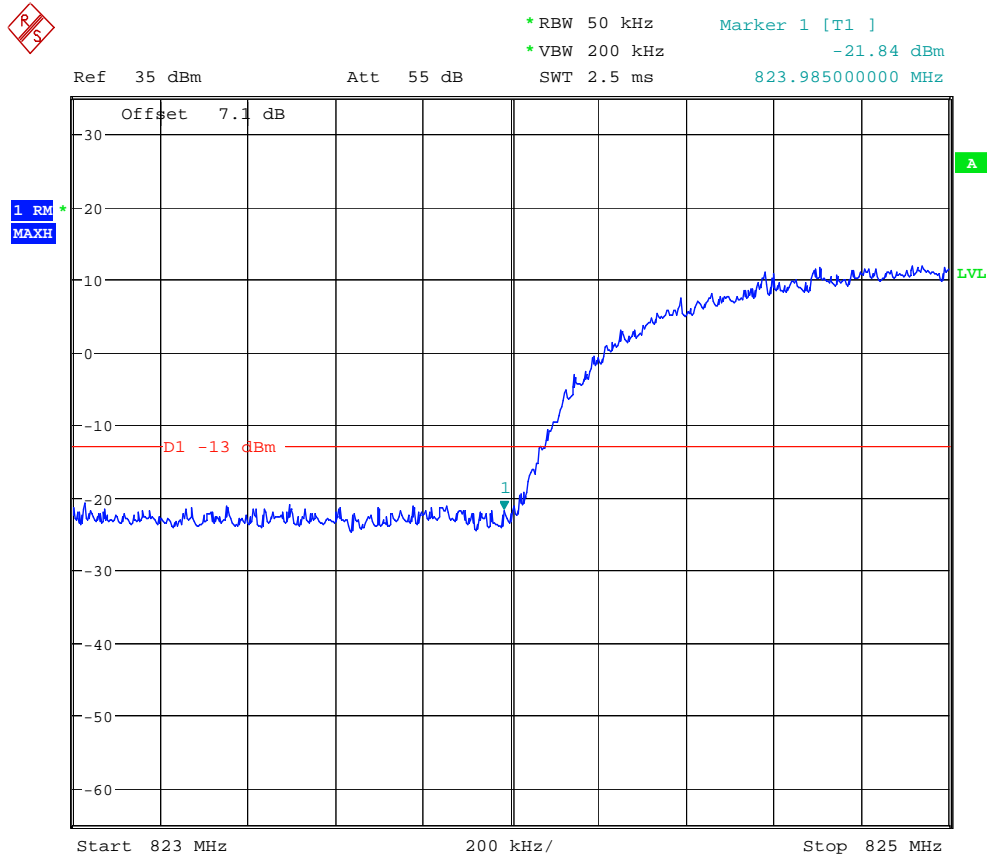
Right Edge Channel 251



Date: 15.NOV.2010 18:37:08



TM3: WCDMA Left Edge Channel 4132



Date: 15.NOV.2010 18:43:00

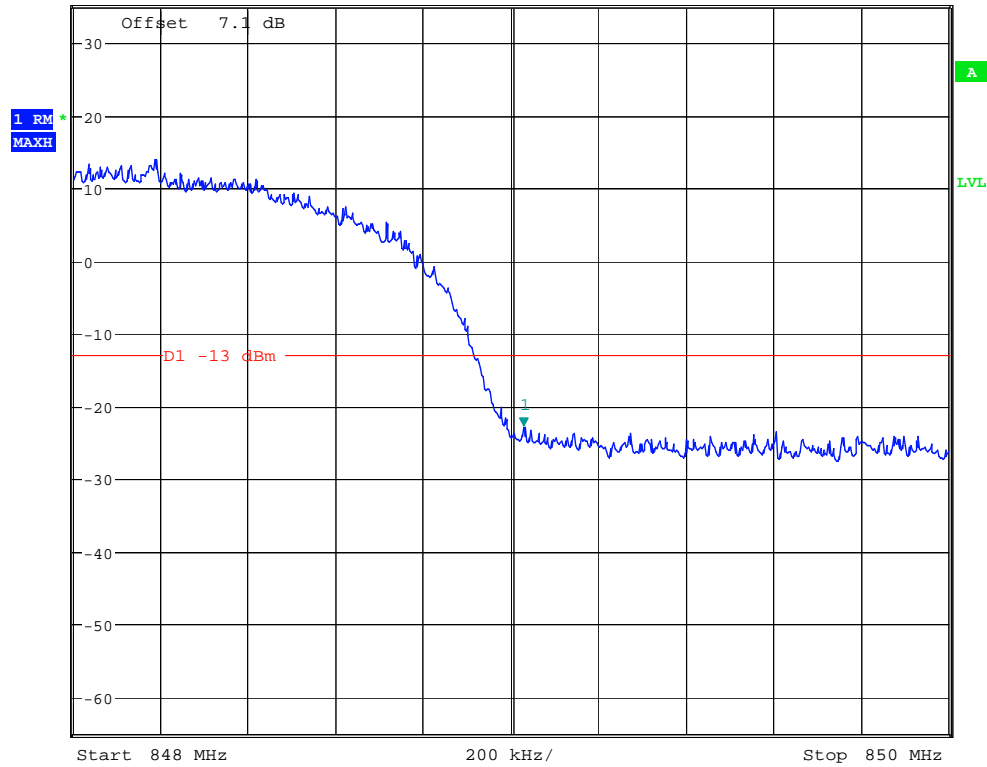
Right Edge



Channel 4233



Ref 35 dBm Att 55 dB SWT 2.5 ms
*RBW 50 kHz *VBW 200 kHz
Marker 1 [T1] -22.96 dBm
849.03000000 MHz



Date: 15.NOV.2010 18:43:14



Appendix D

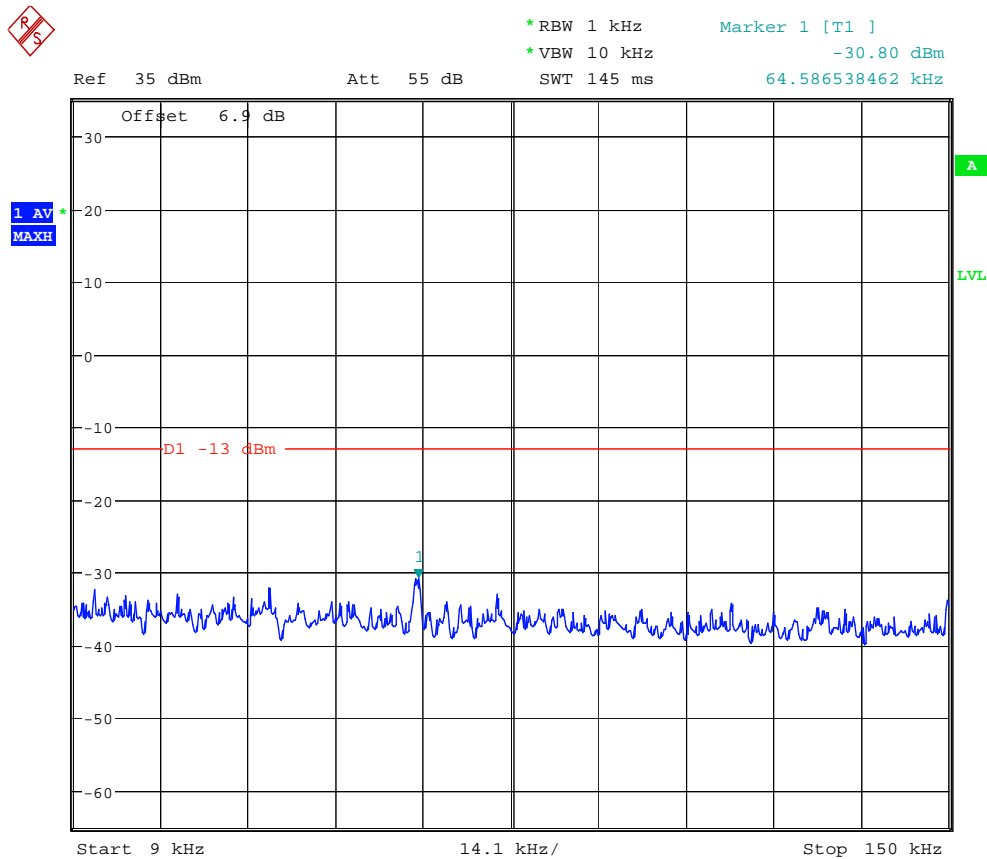
Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & Part 22 Subpart H
& RSS-132

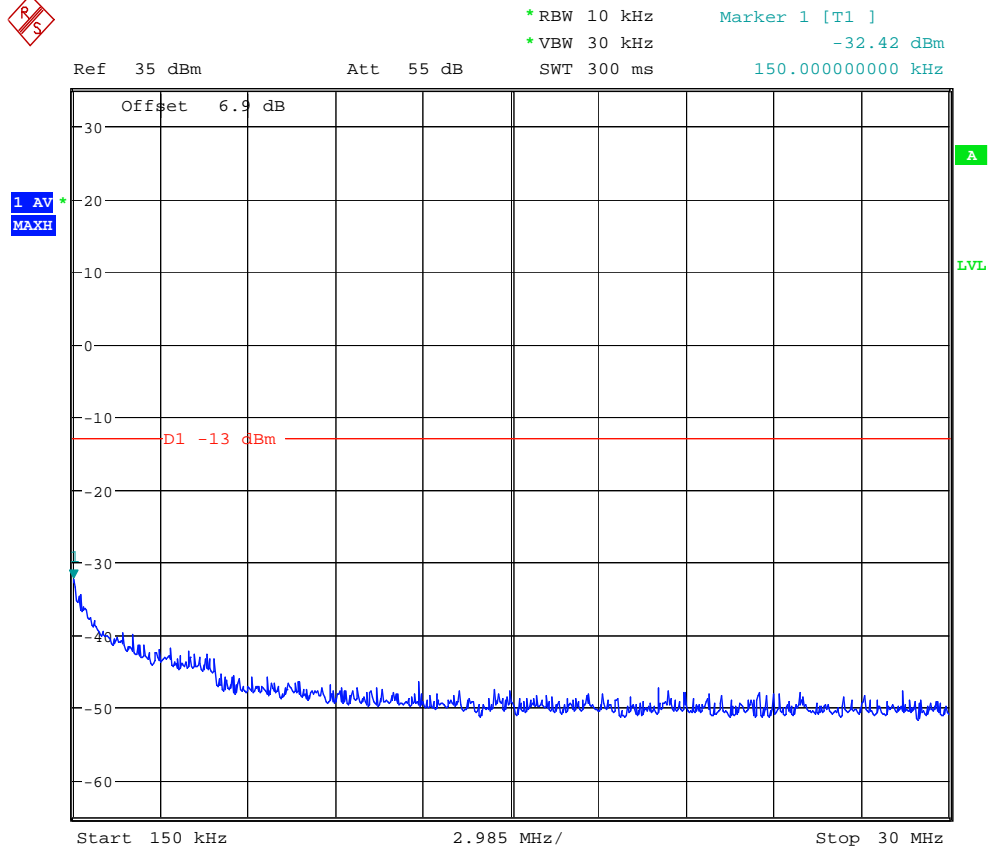


TM1: GPRS/GSM

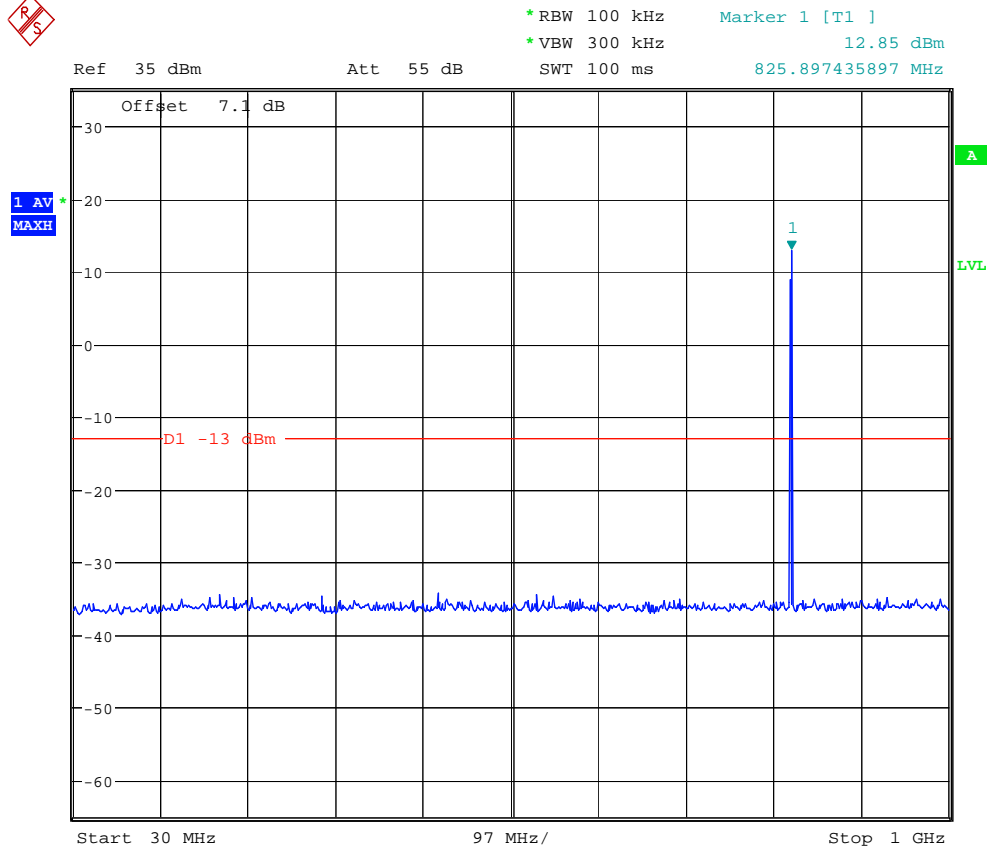
Channel 128



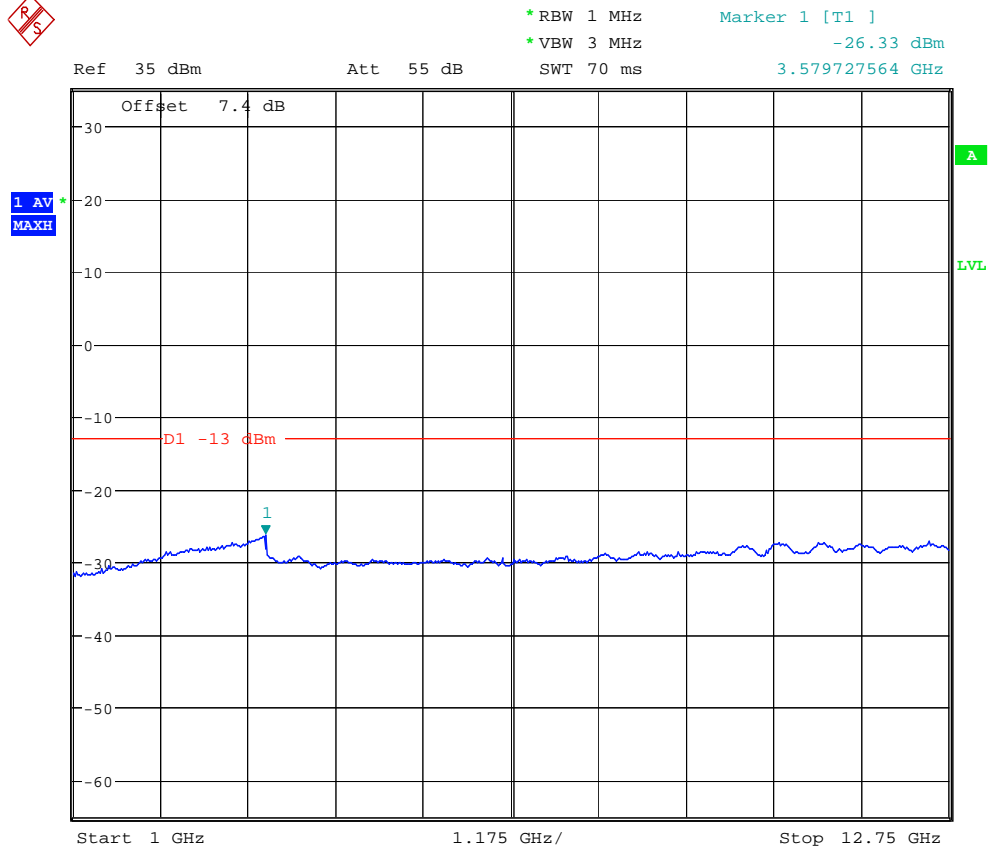
Date: 15.NOV.2010 18:25:38



Date: 15.NOV.2010 18:26:22



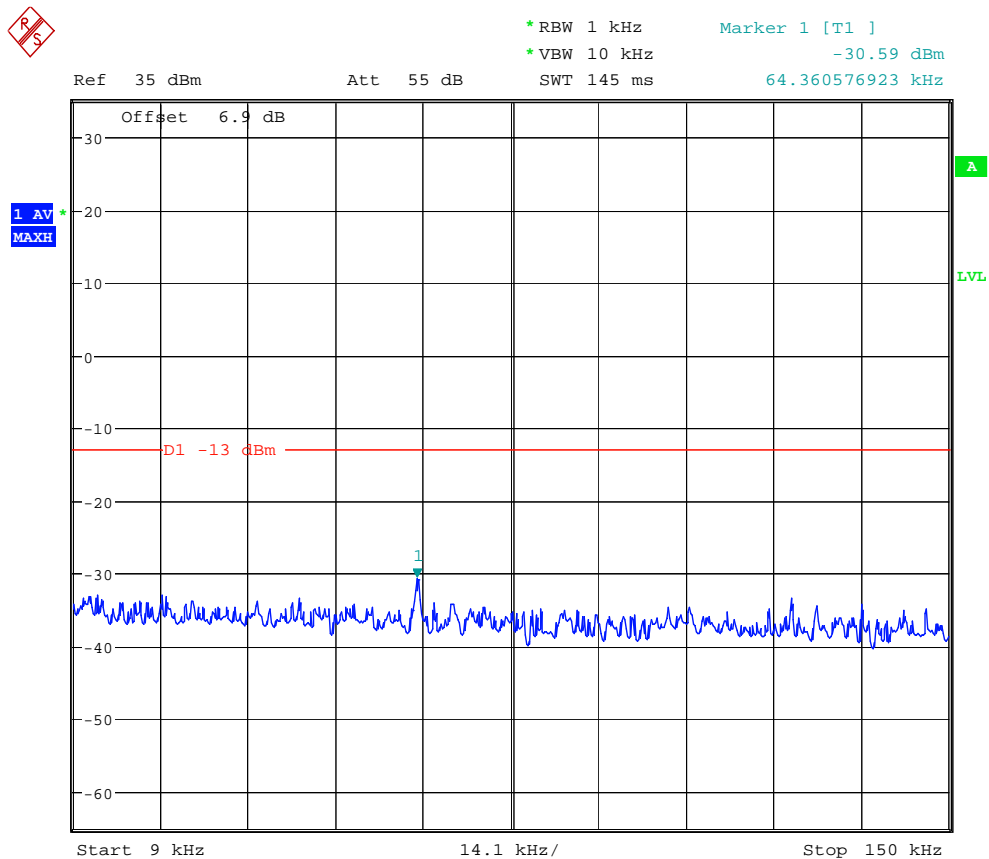
Date: 15.NOV.2010 18:27:06



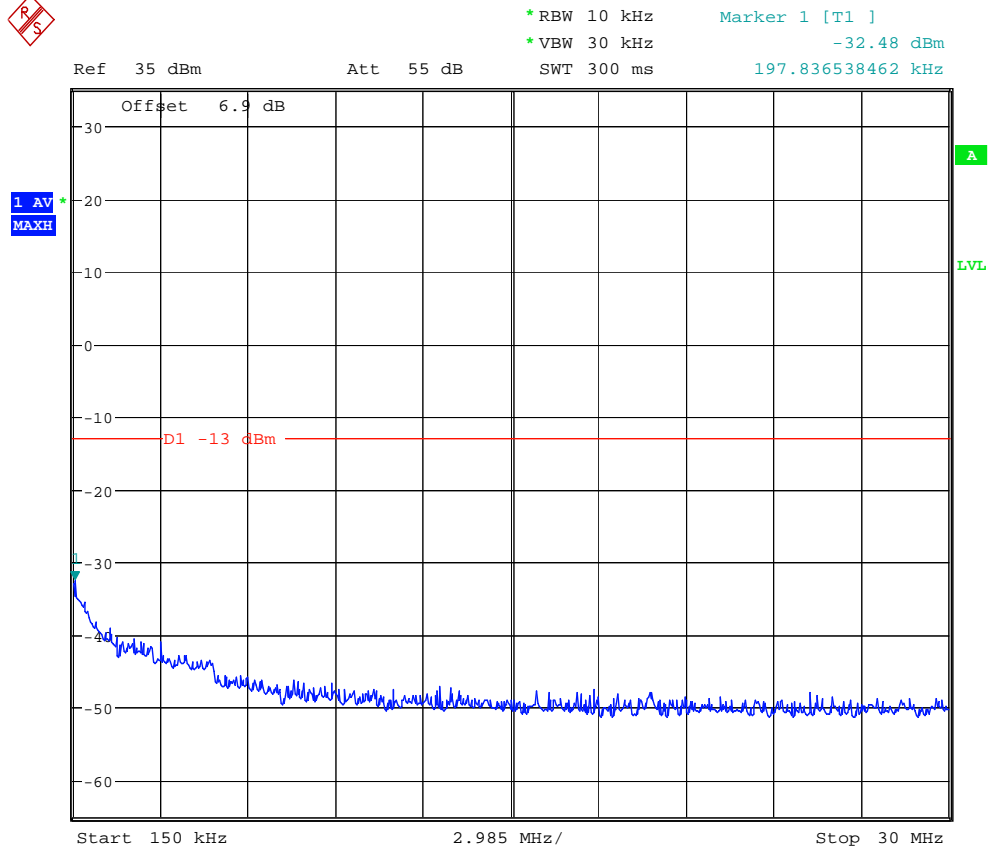
Date: 15.NOV.2010 18:27:49



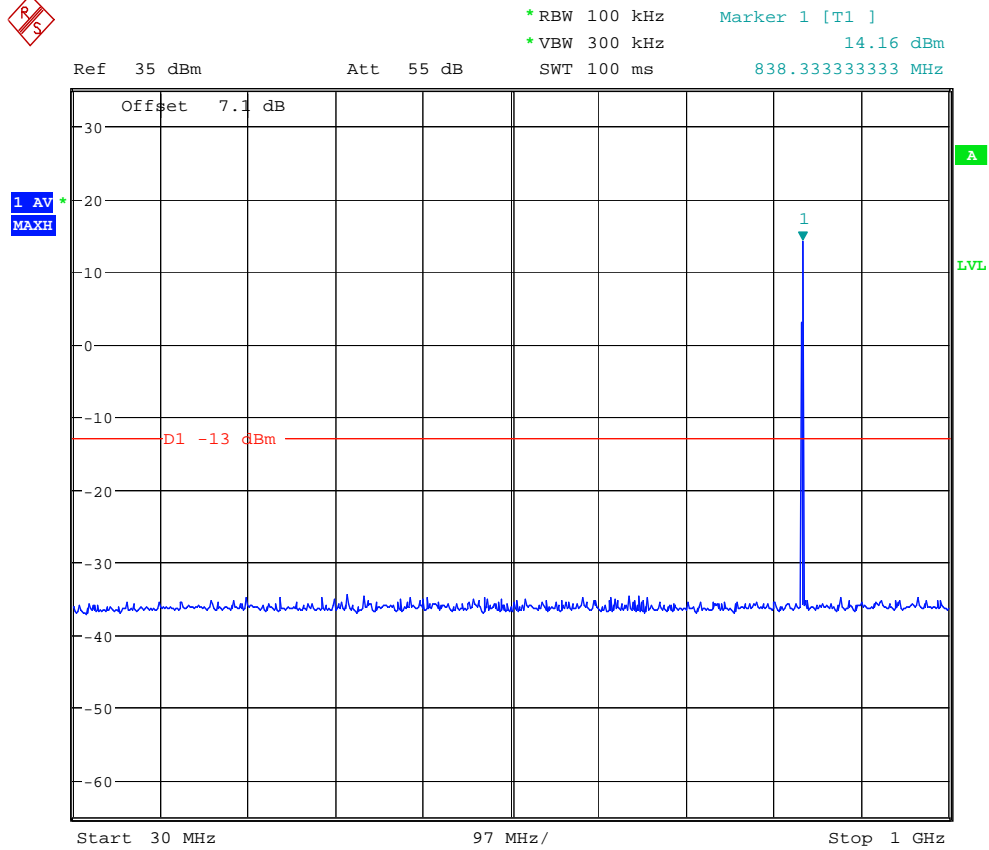
Channel 192



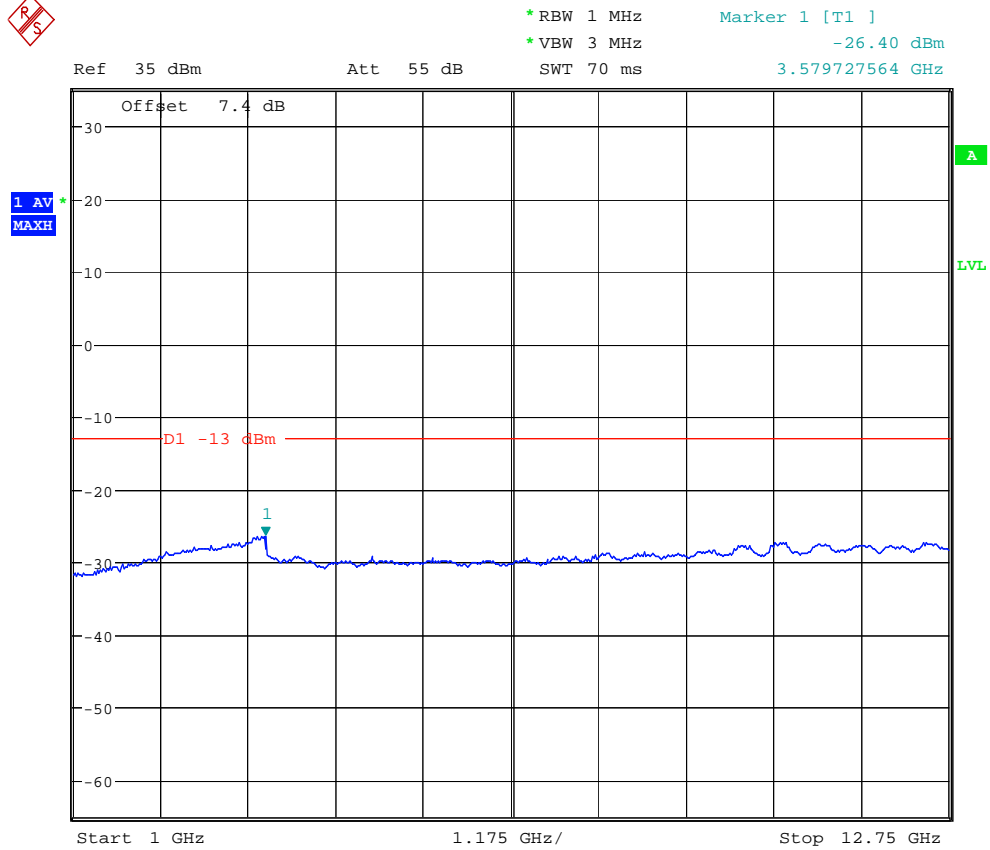
Date: 15.NOV.2010 18:25:53



Date: 15.NOV.2010 18:26:36



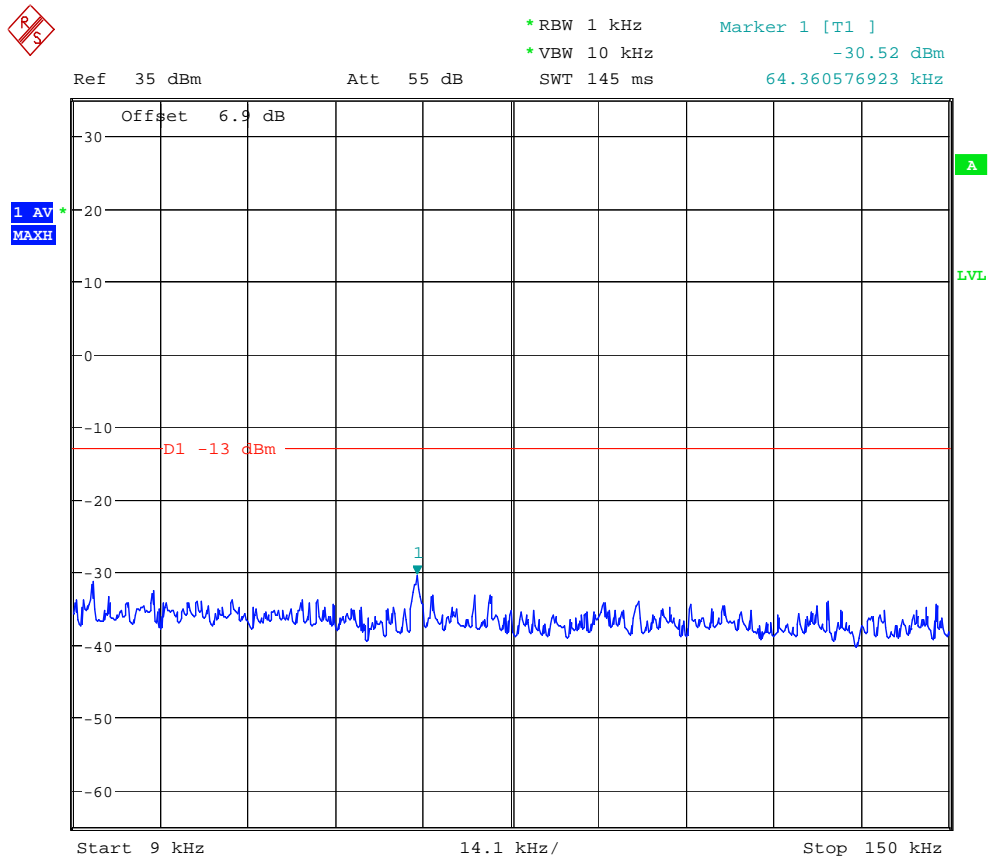
Date: 15.NOV.2010 18:27:20



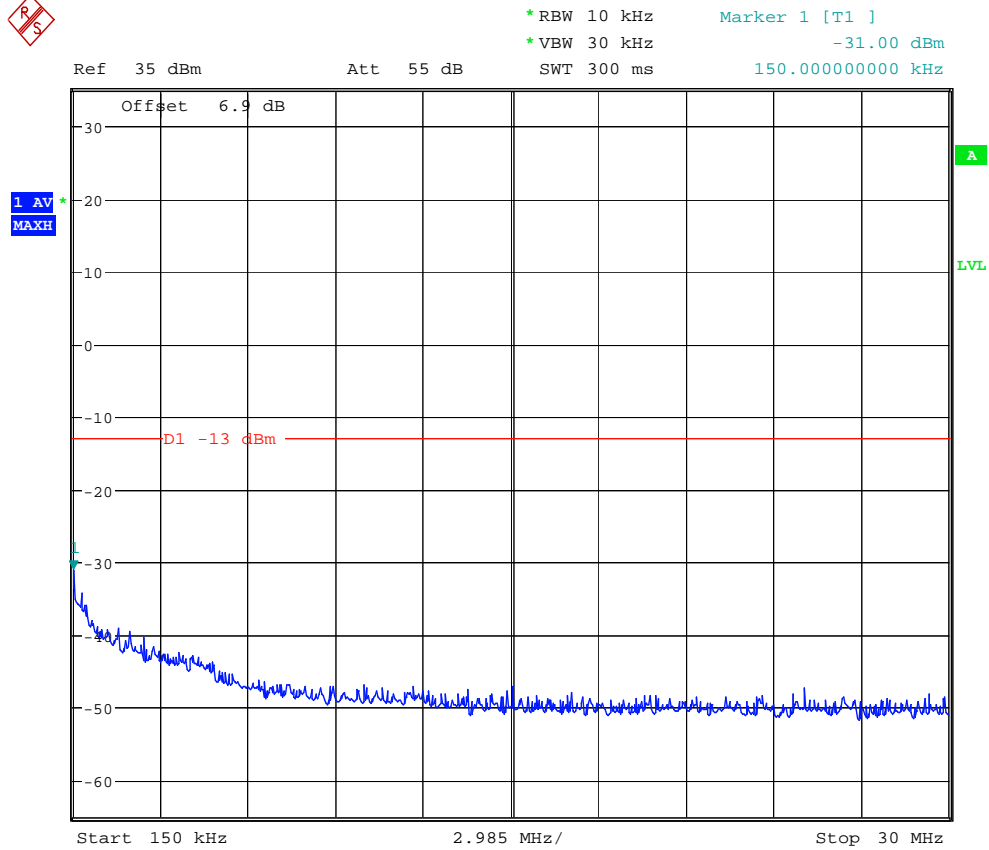
Date: 15.NOV.2010 18:28:04



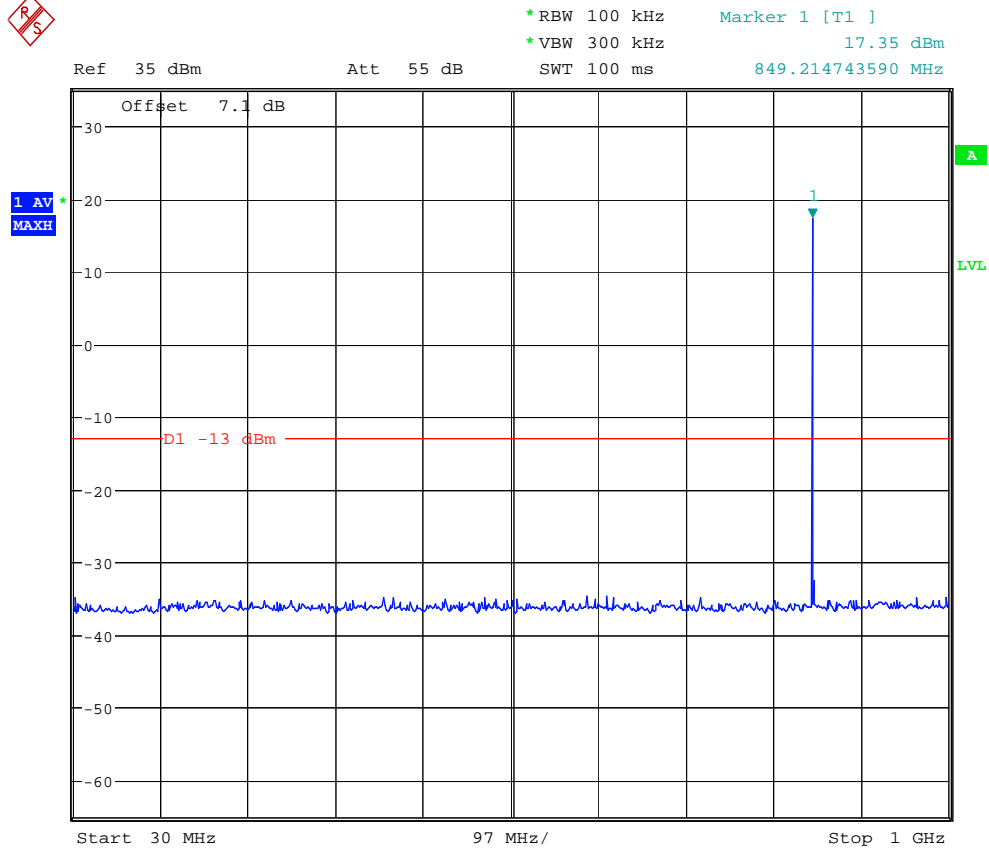
Channel 251



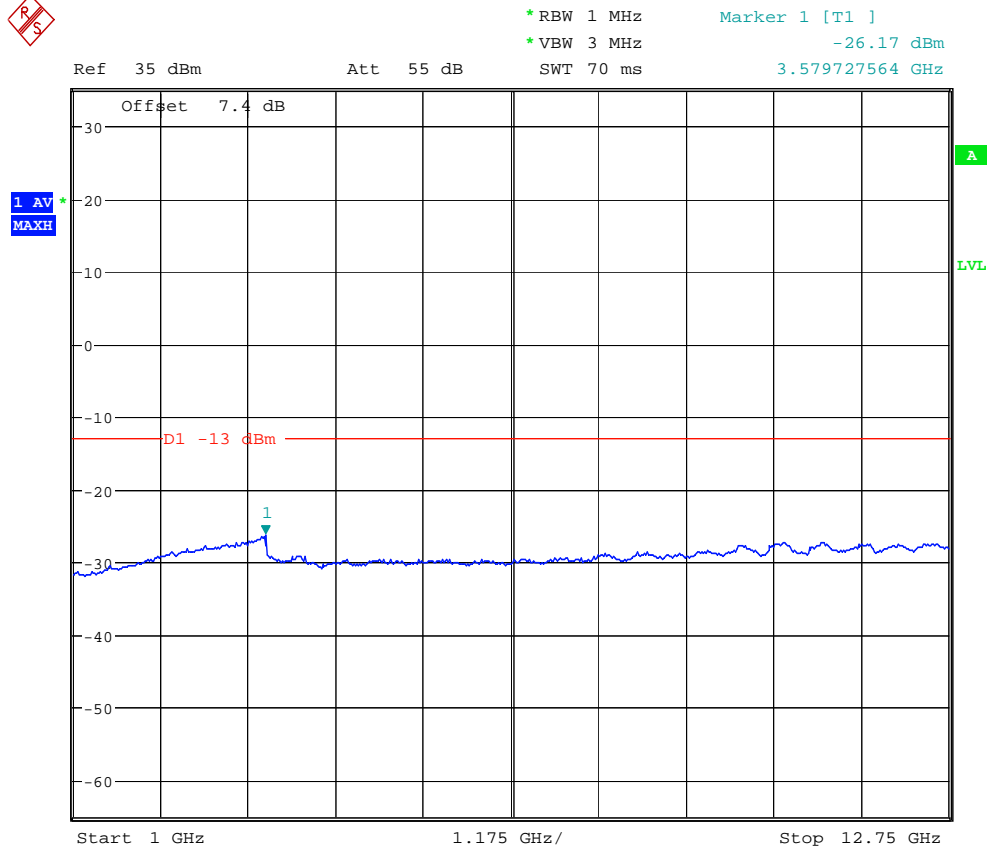
Date: 15.NOV.2010 18:26:07



Date: 15.NOV.2010 18:26:51



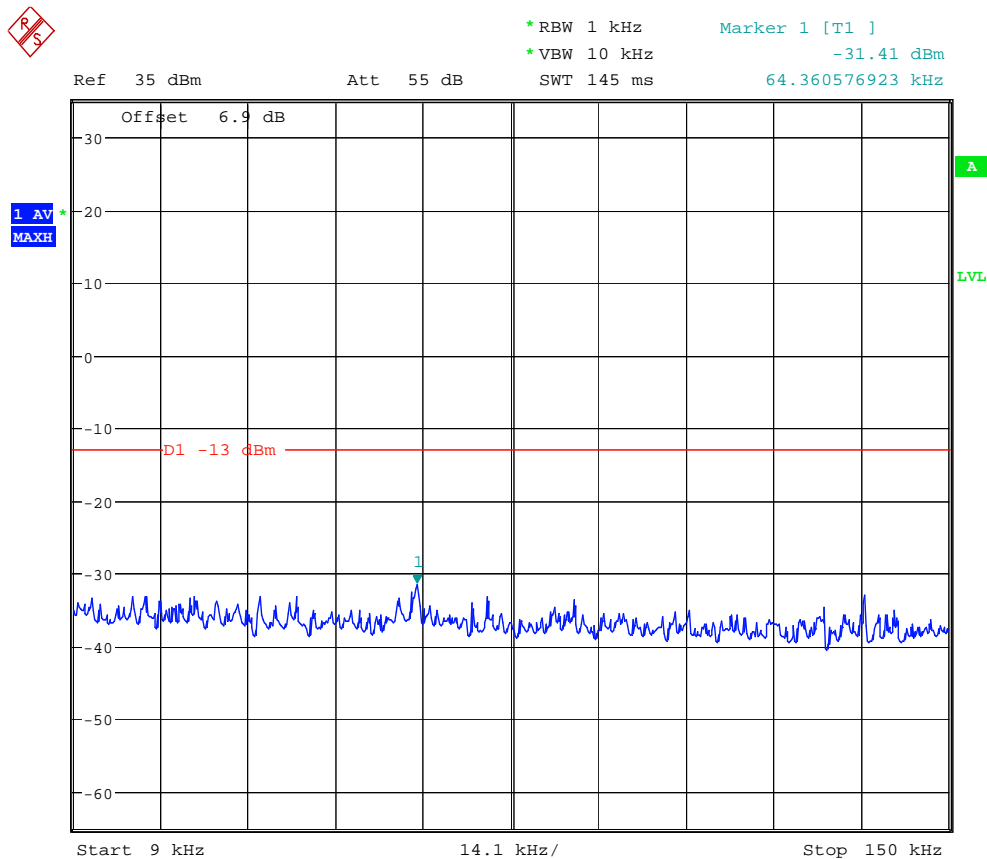
Date: 15.NOV.2010 18:27:35



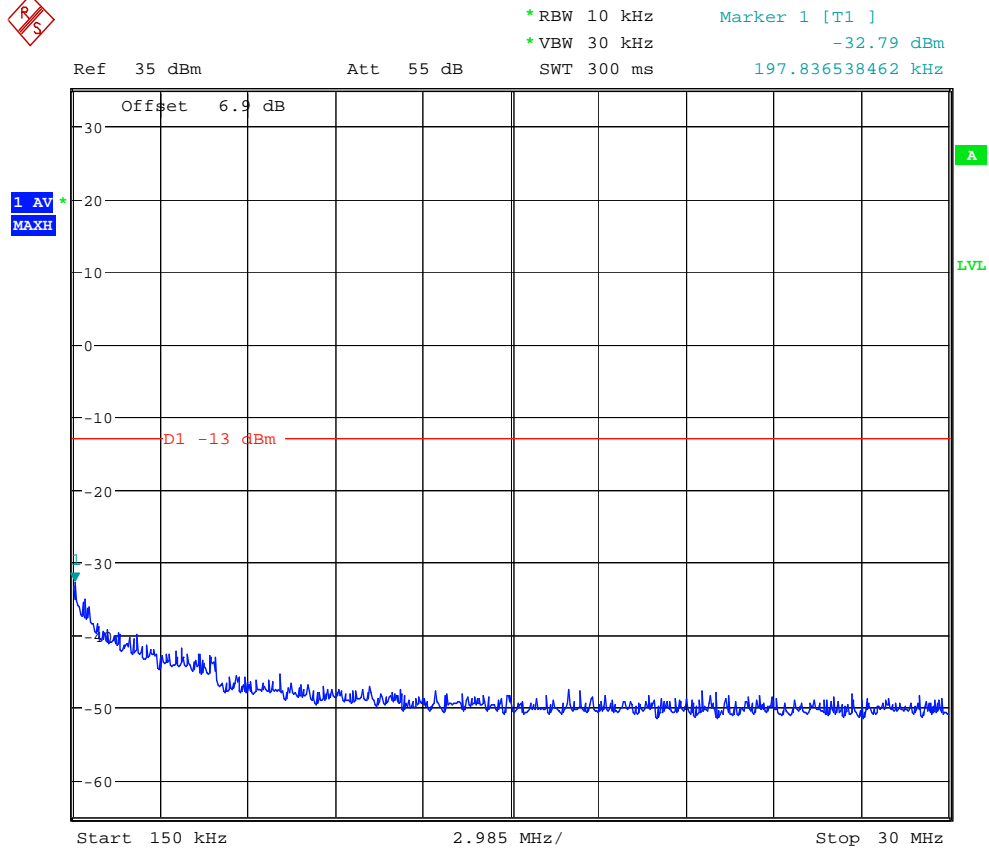
Date: 15.NOV.2010 18:28:18



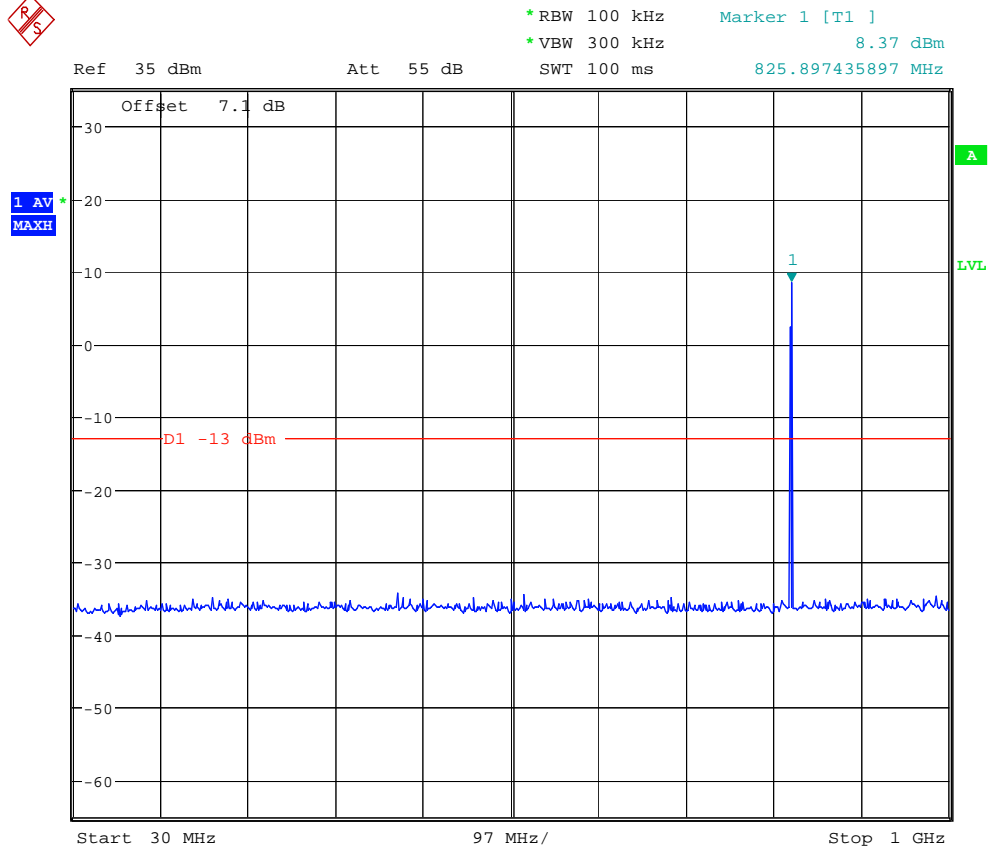
TM2: EDGE Channel 128



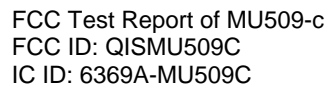
Date: 15.NOV.2010 18:38:07



Date: 15.NOV.2010 18:38:51



Date: 15.NOV.2010 18:39:36

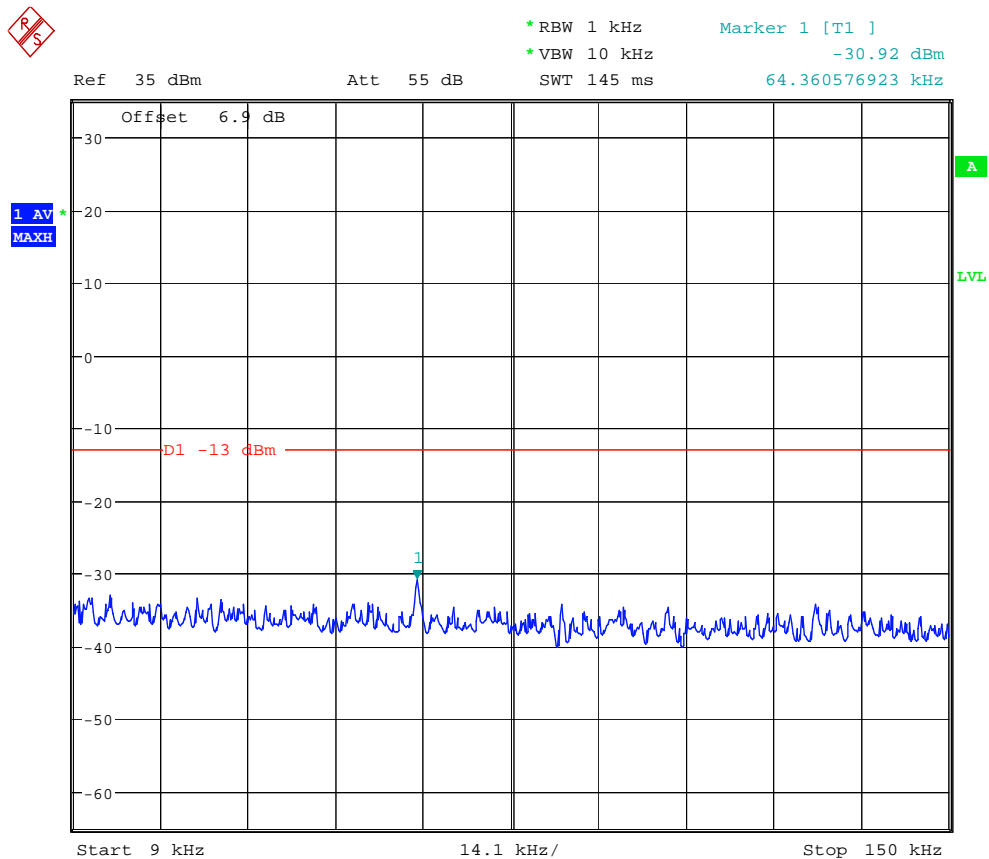


Ref	35 dBm	Att	55 dB	SWT	70 ms	3.579727564 GHz
-----	--------	-----	-------	-----	-------	-----------------

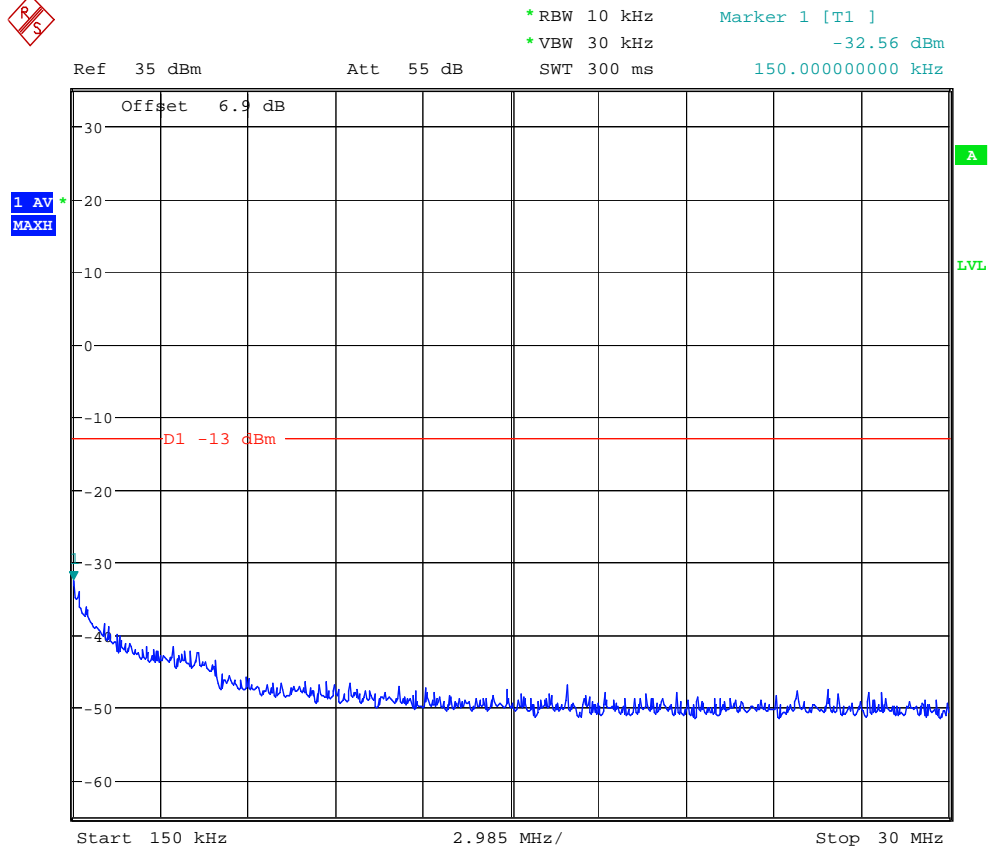
Date: 15.NOV.2010 18:40:20



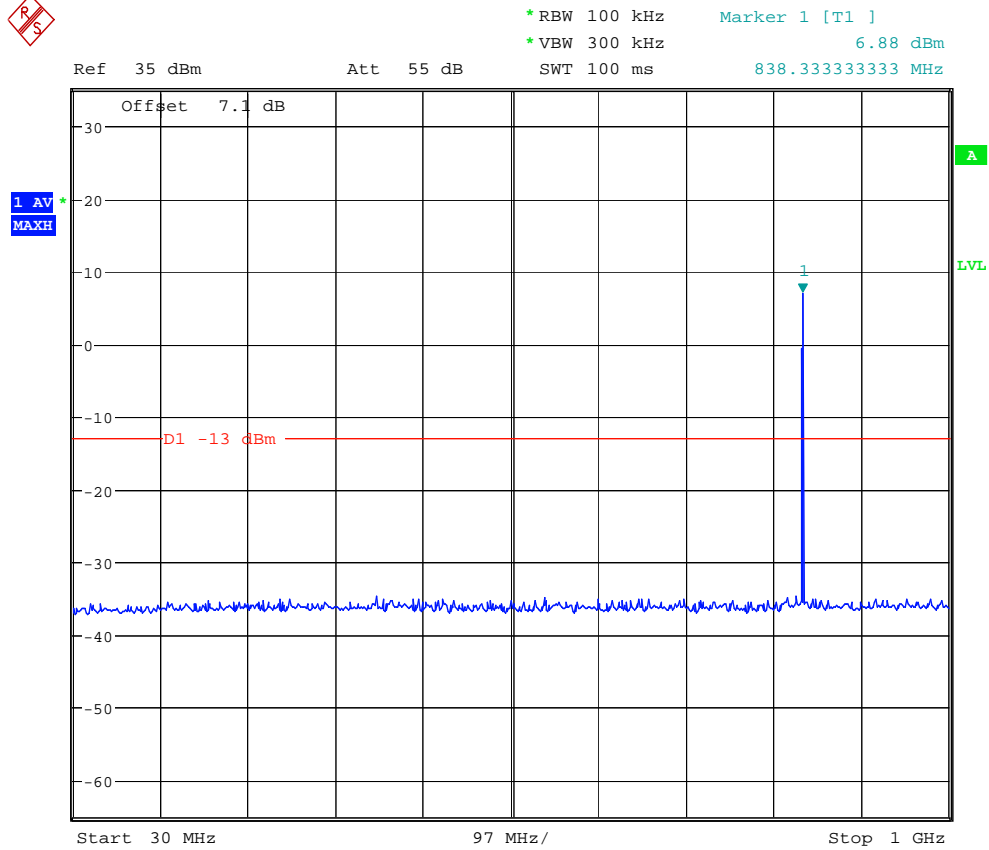
Channel 192



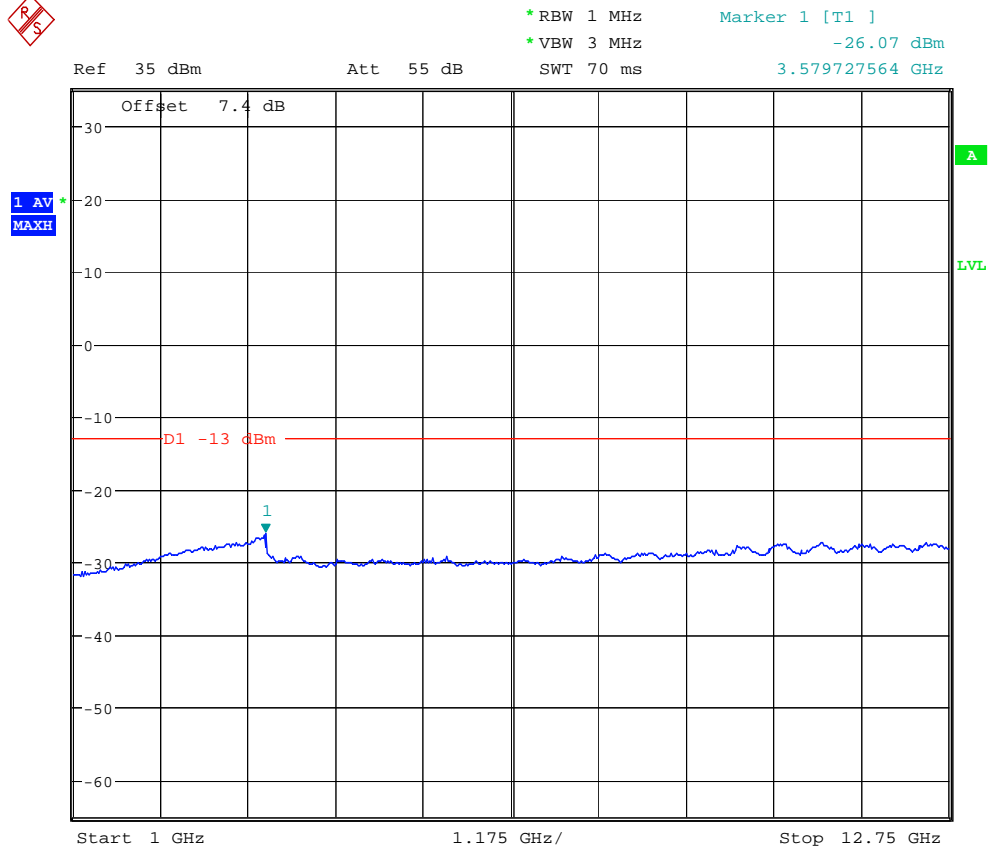
Date: 15.NOV.2010 18:38:21



Date: 15.NOV.2010 18:39:06



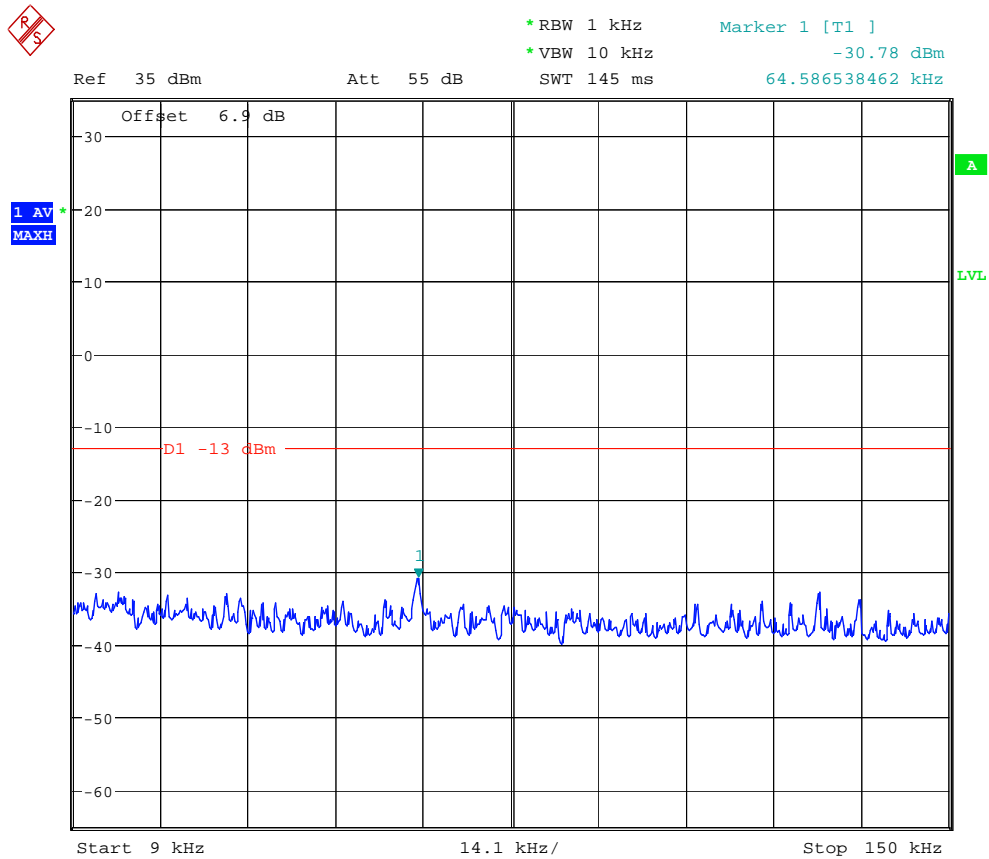
Date: 15.NOV.2010 18:39:50



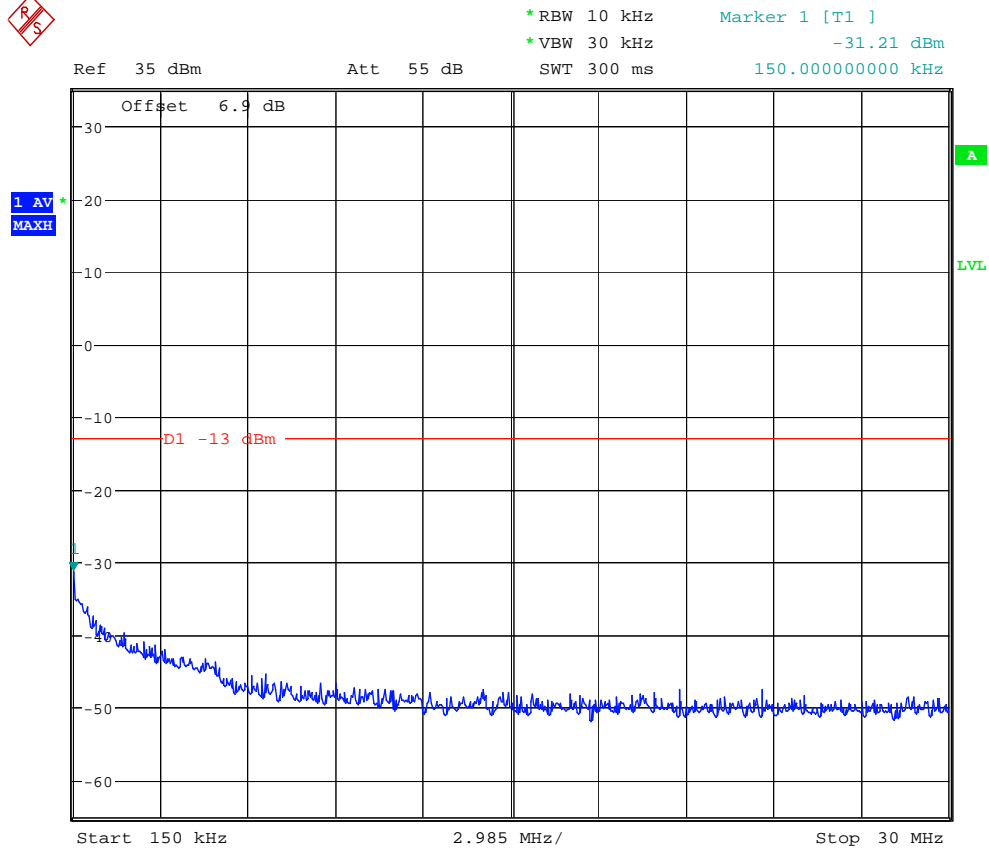
Date: 15.NOV.2010 18:40:35



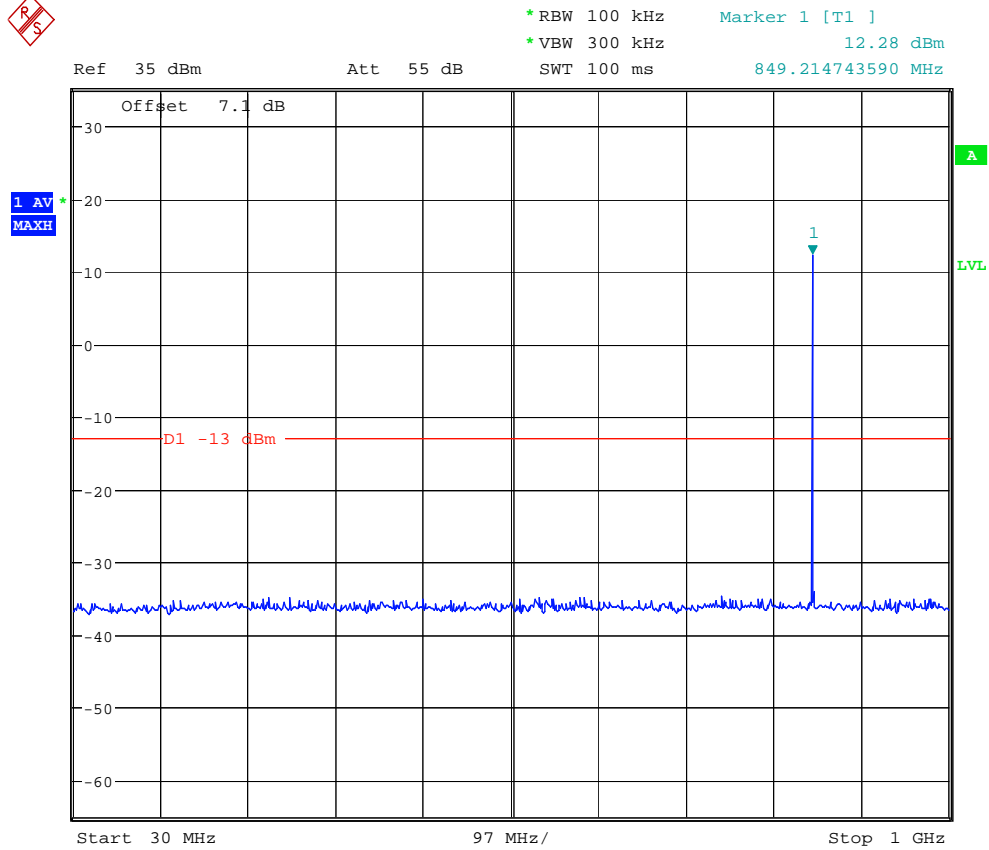
Channel 251



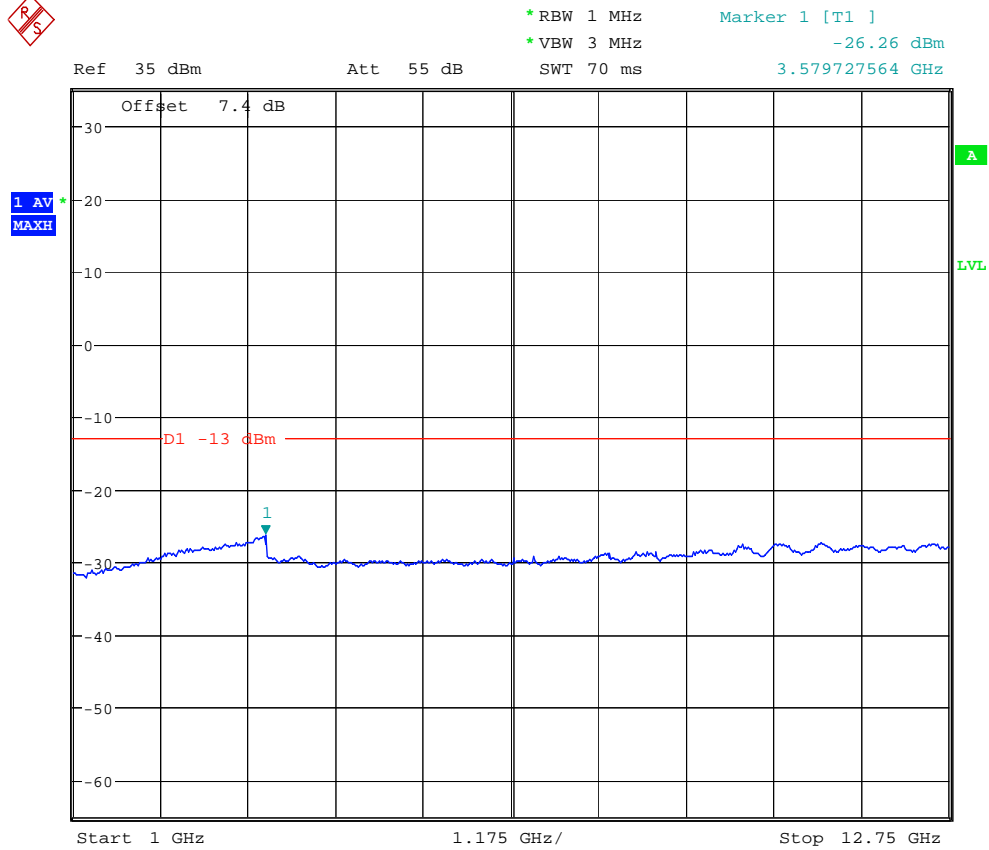
Date: 15.NOV.2010 18:38:36



Date: 15.NOV.2010 18:39:20



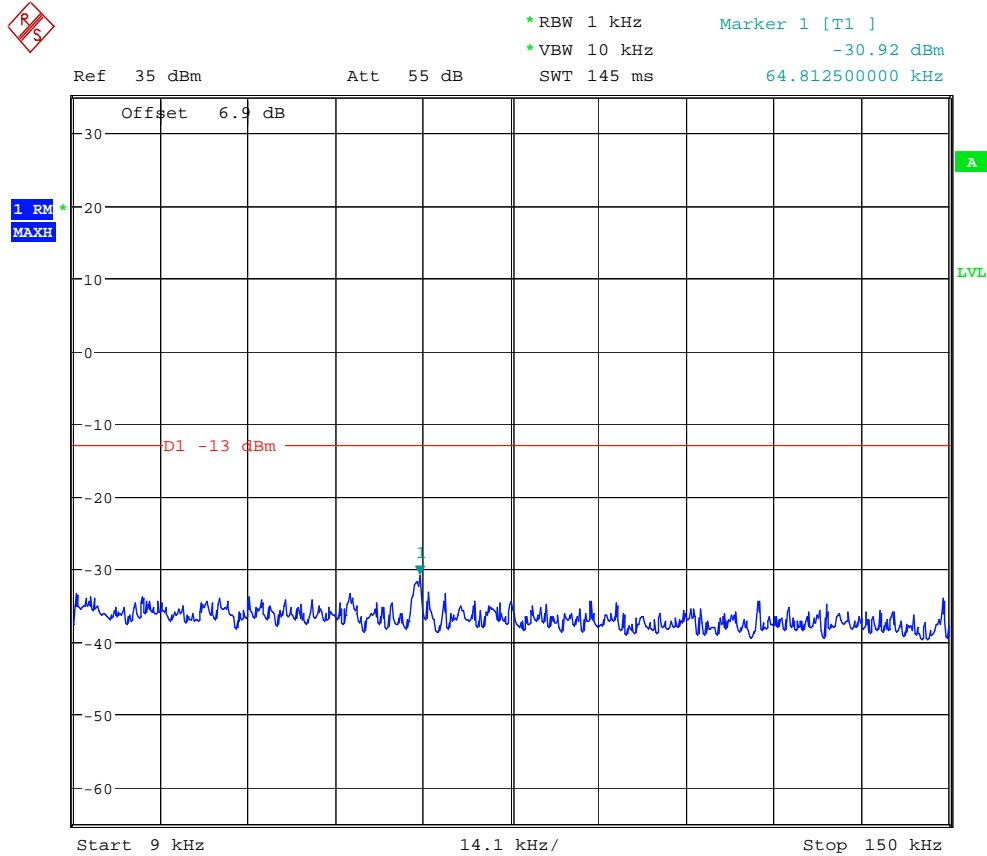
Date: 15.NOV.2010 18:40:05



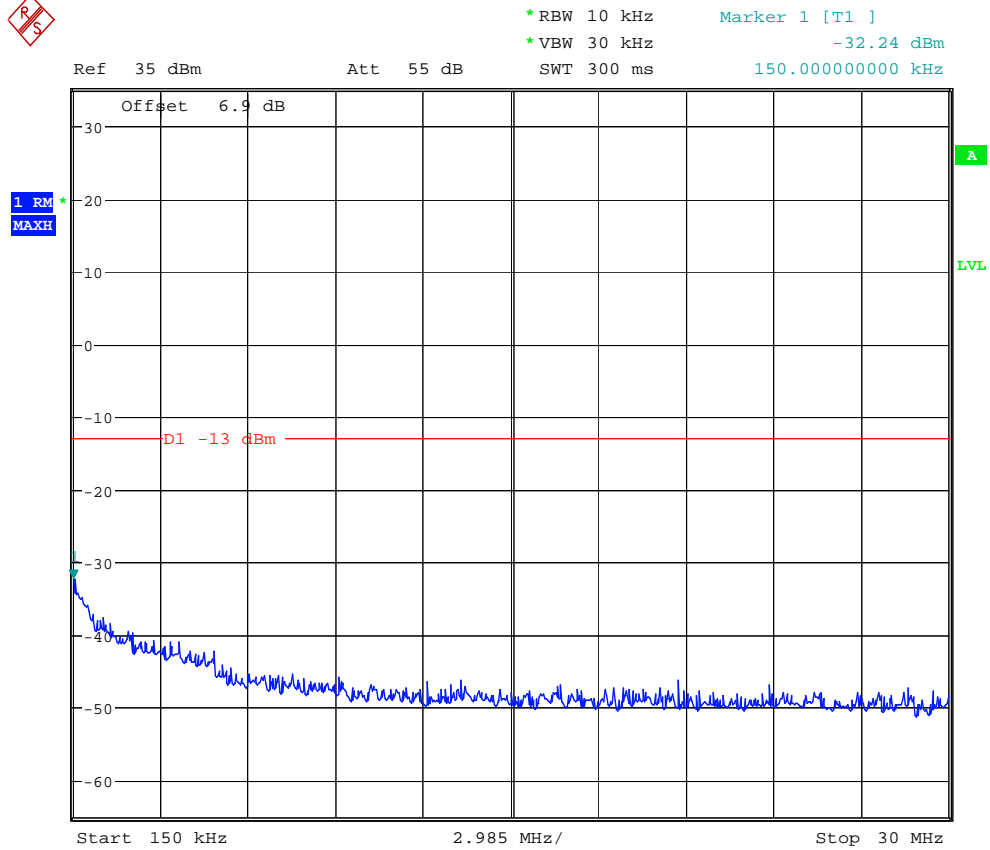
Date: 15.NOV.2010 18:40:50



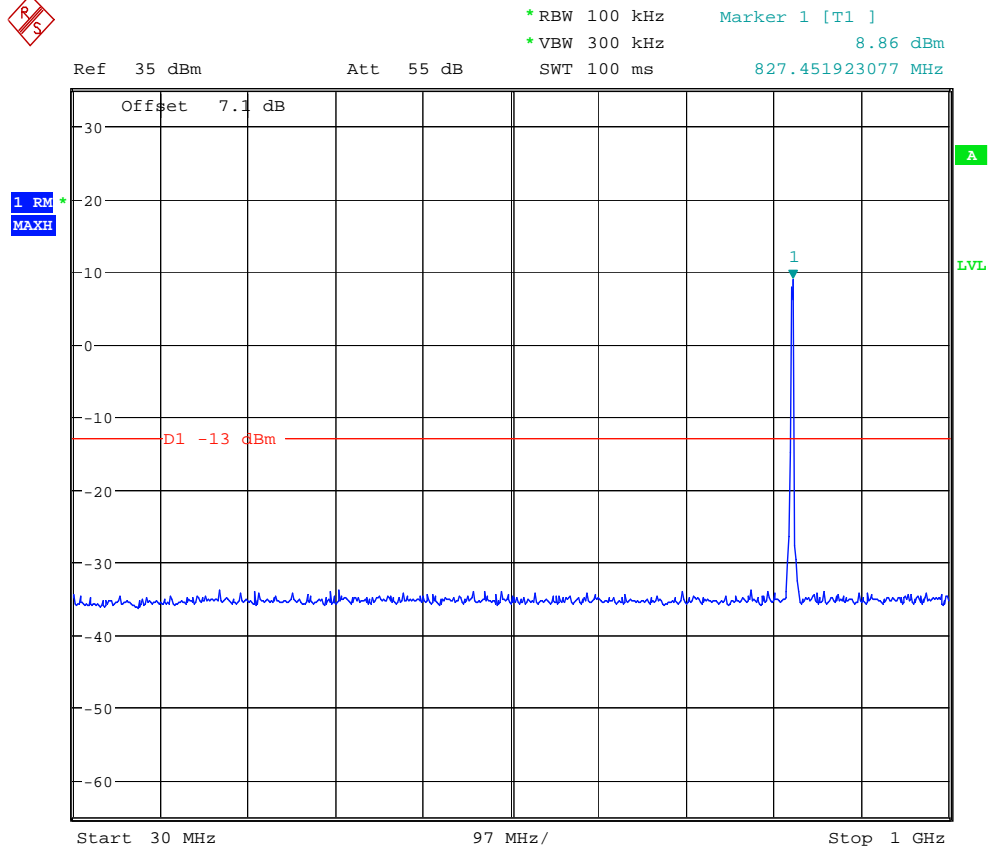
TM3: WCDMA Channel 4132



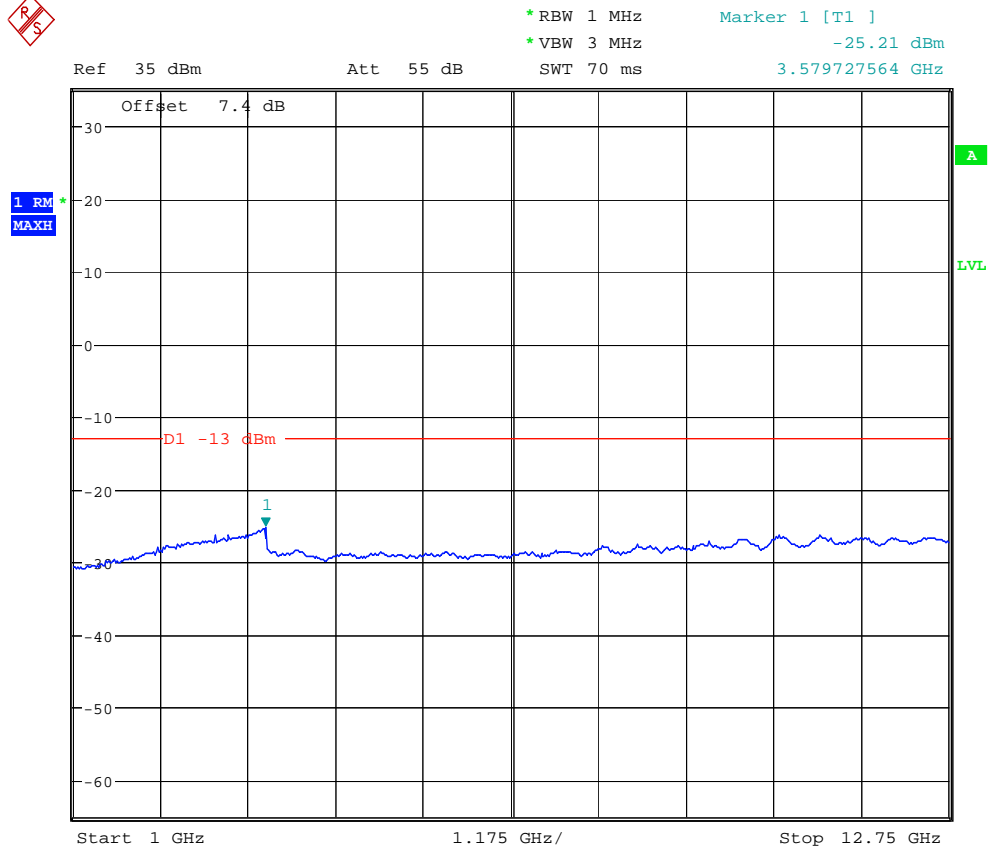
Date: 15.NOV.2010 18:43:30



Date: 15.NOV.2010 18:44:14



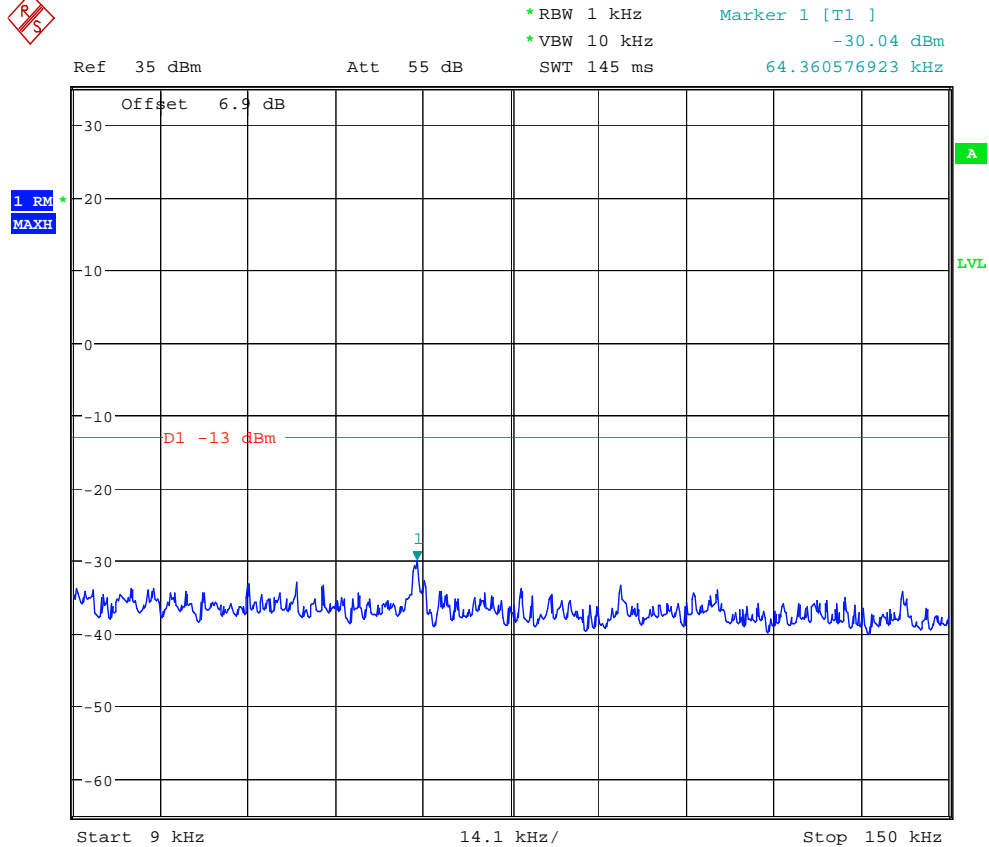
Date: 15.NOV.2010 18:44:59



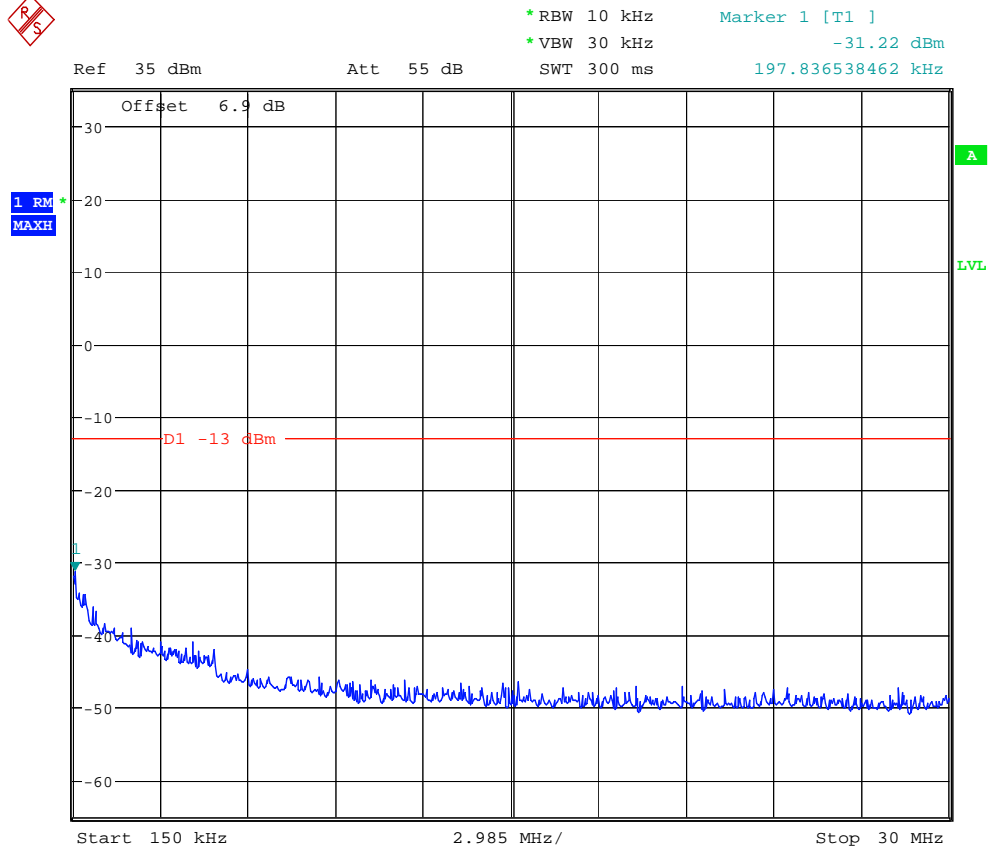
Date: 15.NOV.2010 18:45:44



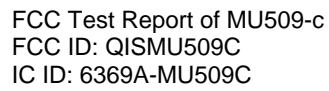
Channel 4182



Date: 15.NOV.2010 18:43:44

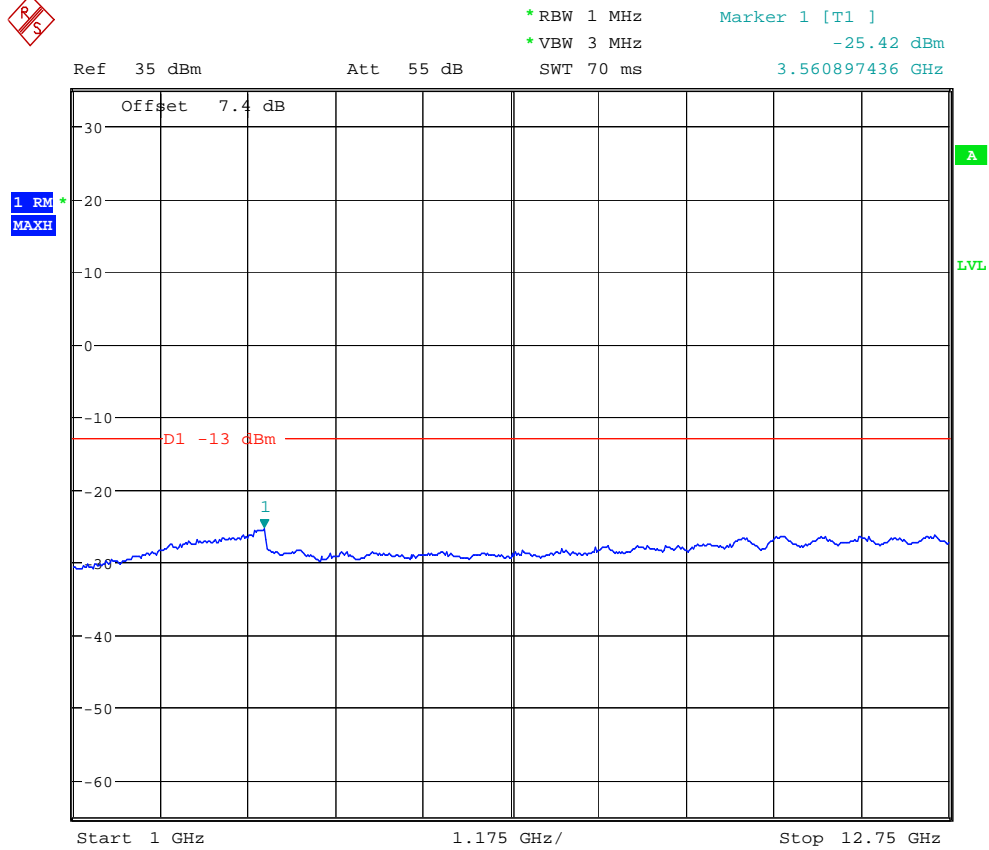


Date: 15.NOV.2010 18:44:29



Ref 35 dBm Att 55 dB SWT 100 ms 838.33333333 MHz

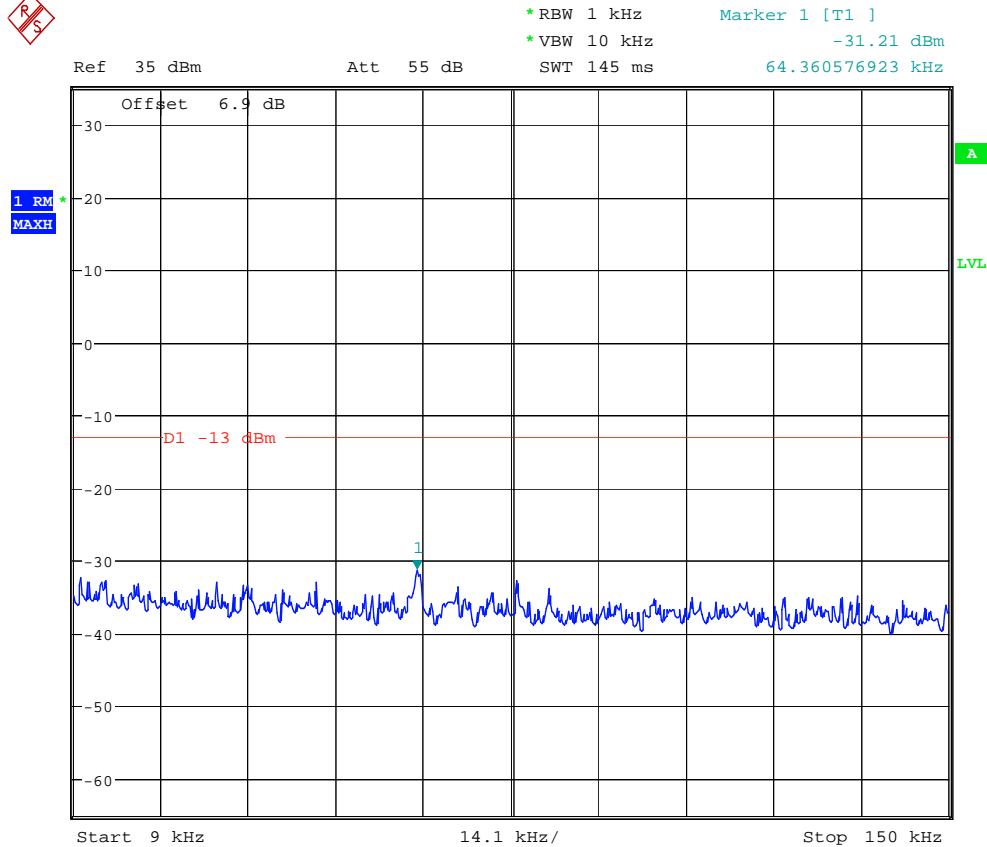
Date: 15.NOV.2010 18:45:14



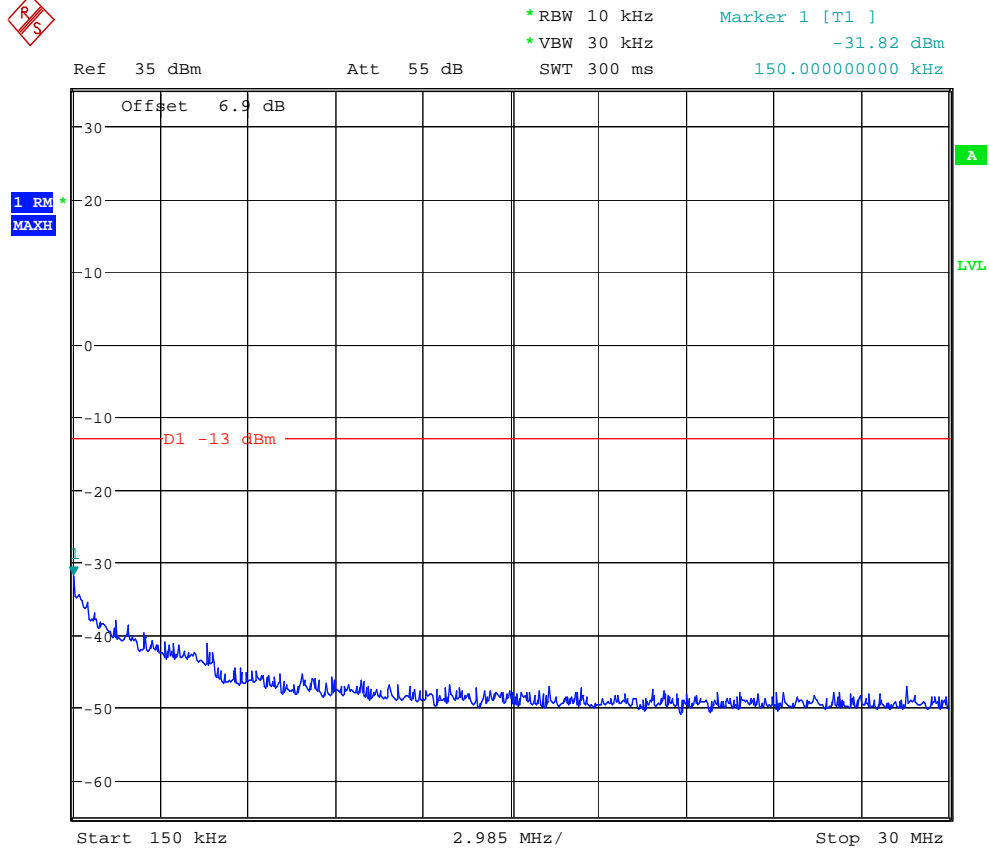
Date: 15.NOV.2010 18:45:58



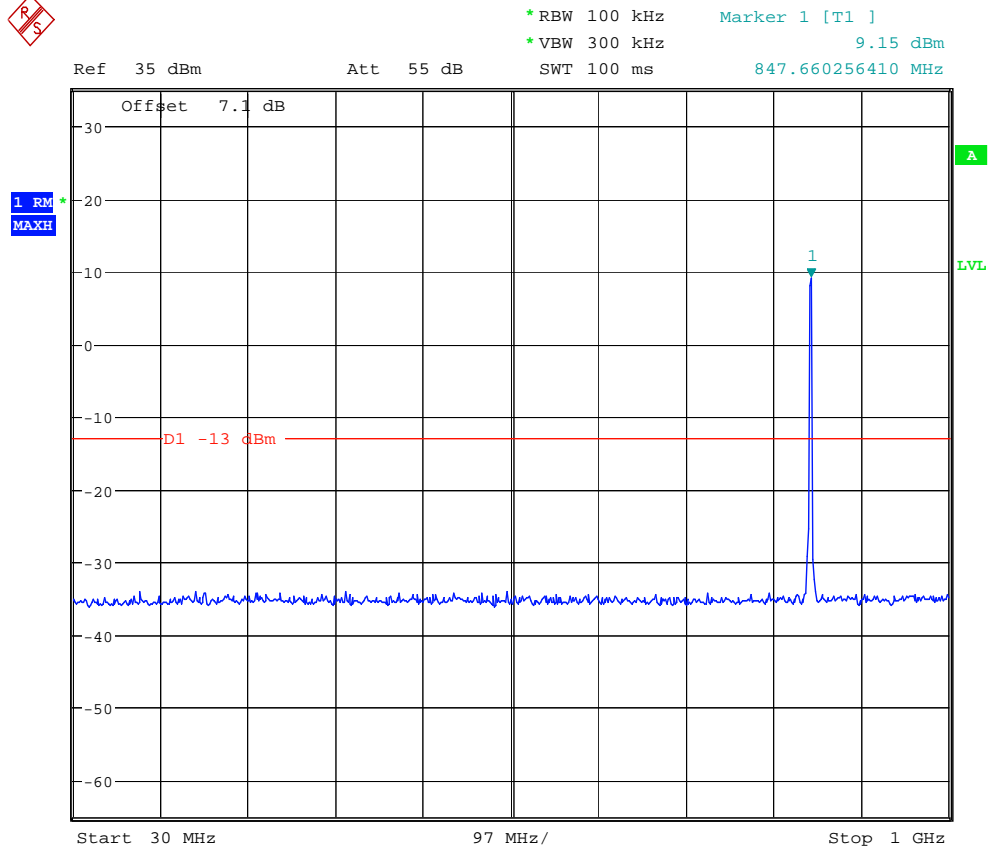
Channel 4233



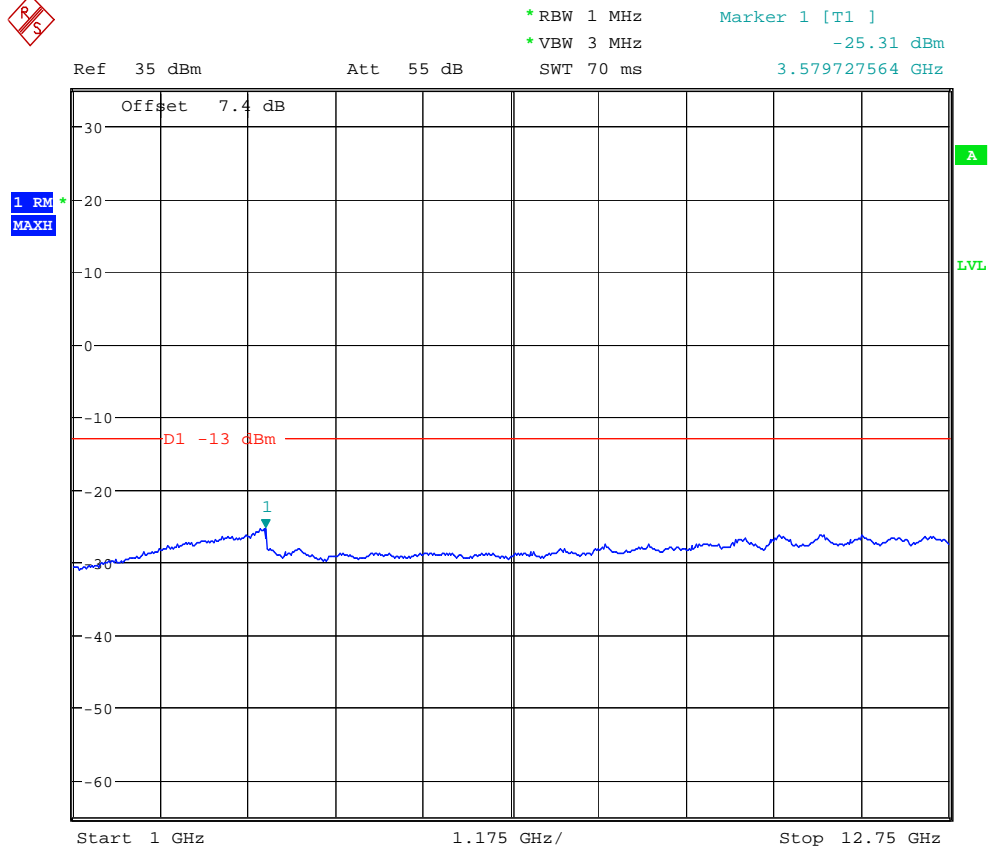
Date: 15.NOV.2010 18:43:59



Date: 15.NOV.2010 18:44:44



Date: 15.NOV.2010 18:45:28



Date: 15.NOV.2010 18:46:13