



# **FCC RF Test Report**

**Product Name: 3G/4G Dual Mode Wireless Router**

**Model Number: EC5072/PCDH5072HS**

**Report No: SYBH(Z-RF)014032011-2001**

**FCC ID: QISEC5072**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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## Notice

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## Notice 2

Modification Information:

Table 1 Modification Information

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



<b>REGULATION</b>	FCC CFR47 Part 2: Subpart J;
	FCC CFR47 Part 22 : Subpart H;
<b>START OF TEST</b>	Mar.11, 2011
<b>END OF TEST</b>	Mar.15, 2011
<b>Final Judgement:</b>	Pass

Approved By 2011-03-16 Chen Xiaohong Chen Xiaohong  
 Date Name Signature

Reviewed By 2011-03-16 Xu Guangyi Xuguangyi  
 Date Name Signature

Operator 2011-03-16 Jingjinhua Kim jin  
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# 1 Summary

The table below summarizes the measurements and results for the EC5072. Detailed results and descriptions are shown in the following pages.

Table 2 Summary of results

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
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 Terminals	PASS
2.1053	22.917	Radiated Spurious Emissions	PASS
2.1055	22.355	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

QISEC5072 is a WiMAX/EVDO dual mode and WiFi Wireless Mobile Router; it can be used as a WiFi Access Point based on standard of IEEE802.11b/g/n, max to 5 WiFi stations can be associating with EC5072 simultaneously. It also can be used as a USB modem by connecting with PC via USB cable. It supports 3G CDMA and 4G WiMAX wireless internet accessing function and GPS function. About 3G CDMA wireless mode, it supports CDMA2000 1x and 1xEV-DO Rev.0/Rev.A, operating in Band Class 0(800MHz) and Band Class 1(1900M), and the 4G WiMAX supports IEEE802.16e, operating in frequency of 2.5GHz. The WiFi frequency is 2.4GHz.

QISEC5072 supports 1Tx2Rx for 3G CDMA and 4G WiMAX, but there are also two Tx antenna for 4G WiMAX to realize TxD(TX Switching Diversity), WiFi only supports 1Tx1Rx, the GPS is only used for receiver.

#### 2.1.2 Support function and Service

The EC5072 support the function and service as follows:

Table 3 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note (Corresponding coding and transmission rates)
data and SMS	Modulation: QPSK	TM1	
data and SMS	Modulation: HPSK	TM3	
Data(EV-DO)	Default Access Channel MAC	Subtype 0	Modulation: HPSK
data(EV-DO)	Enhanced Access Channel MAC	Subtype 2	The R-Data packet size determines the modulation format, R-Data Packet Size: 128, 256, 512, 768 or 1024 Modulation: BPSK R-Data Packet Size: 1536 , 2048, 3072, 4096, 6144 or 8192 Modulation: QPSK R-Data Packet Size: 12288 Modulation: 8-PSK

Note: \* The test conditions and settings are defined in ANSI/TIA-98-E section 1.3, 3GPP2 c.s0033-0-v2.0 and 3GPP2 C.S0033-A-v1.0.



## 2.2 Modification Information

For original equipment, following table is not application.

Table 4 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

Mar.11, 2011 to Mar.15, 2011

#### 3.2 General Set up Description

EC5072 can Support Cellular Band, and Support the CDMA2000 1x standard and the CDMA2000 1xEV-DO Rev. A standard. During this measurement,EC5072 works in CDMA / EV-DO mode and Cellular Band.

##### CDMA MODE:

**TM1:** Forward Traffic Channel Radio Configuration 1, Reverse Traffic Channel Radio Configuration 1

**TM3:** Forward Traffic Channel Radio Configuration 3, Reverse Traffic Channel Radio Configuration 3

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{Pilot Ec}{I_{or}}$	dB	-7
$\frac{Traffic Ec}{I_{or}}$	dB	-7.4

##### EVDO MODE:

Current Physical Layer Subtype:

**Subtype 0\*** indicates that the protocol subtype assigned to the Access Channel MAC protocol is Default Access Channel MAC and its Subtype ID number is 0x0000.

**Subtype 2\*** indicates that the protocol subtype assigned to the Access Channel MAC protocol is Enhanced Access Channel MAC and its Subtype ID number is 0x0002

Note: \*The test settings are defined in 3GPP2 C.S0033



## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 5 Frequency Range

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

#### 4.1.2 Channel Spacing / Separation

Table 6 Channel Spacing / Separation

Channel spacing:	30 KHz
Channel separation:	1.23 MHz

#### 4.1.3 Type of Emission

Table 7 Type of Emission

Emission Designation:	<b>1M25F9W</b>
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According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

#### 4.1.4 Environmental Requirements

Table 8 Environmental Requirements

Minimum temperature:	0 °C
Maximum temperature:	+ 35 °C
Relative Humidity:	5% ~ 95%RH

#### 4.1.5 Power Source

Table 9 Power Source

Charger voltage range:	~ 100-240 V, 50/60Hz
Charger current maximal:	0.2 A Max
Battery Rated capacity:	2200mAh
Battery Nominal Voltage:	≡ 3.7V

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033 (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 (8)

The voltage and current in the final RF stage is:

Table 10 Applied DC Voltages and Currents

Voltage:	≡ +3.7V
Current:	2200mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)



## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 11 Board Information

3G/4G Dual Mode Wireless Router		
EC5072/PCDH5072HS		
Board and Module		
Equipment Designation / Description	Equipment Designation / Description	Equipment Designation / Description
EC5072	CE1EC5072M	Main board
	CE1EC5072S	Slave board

### 4.2.2 Adapter Technical Data

Name	Qty.	Manufacture	Serials number	Description
Adapter	1	HUAWEI	NA	Adapter Model: HW-050100U1W Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage:  5.0V 1.0A

### 4.2.3 Battery Technical Data

Name	Qty.	Manufacture	Serials number	Description
Li-ion Battery	1	Huawei	NA	Battery Model: BTR5072B Rated capacity: 2200mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V

### 4.2.4 FCC Identification

Grantee Code: QIS  
 Product Code: EC5072  
 FCC Identification: QISEC5072



## 5 Main Test Instruments

Table 12 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14.2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24.2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.24,2011
Signal Analyzer	R&S	FSQ40	100025	Oct.09,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal Generator	R&S	SMR40	100325	May.12,2012
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Spectrum Analyzer	R&S	FSU26	EG26725	Mar.07,2012
Test receiver	R&S	ESIB26	100318	May.04.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13.2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13.2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2012
Horn Antenna	R & S	HF906	359287/006	April.27, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20.2011



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Horn Antenna	ETS-LINDGREN	3160	60006	Oct.27.2011
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## 6 Transmitter Measurements

### 6.1 Effective Radiated Power of Transmitter (ERP)

#### 6.1.1 Test Conditions

Table 13 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	CDMA TM1 and TM3 at frequency B,M,T EVDO Mode Subtype 0 and Subtype 2 at frequency B,M,T

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 6.1.2.2 Supporting Standards

Table 14 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum

##### 6.1.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of EC5072 transmitter exceed 7 W. The calculated longitude ERP by following formula:  $ERP(dBm) = 10 * \log(ERP_{in\ mwatts})$ .

Table 15 Limits

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

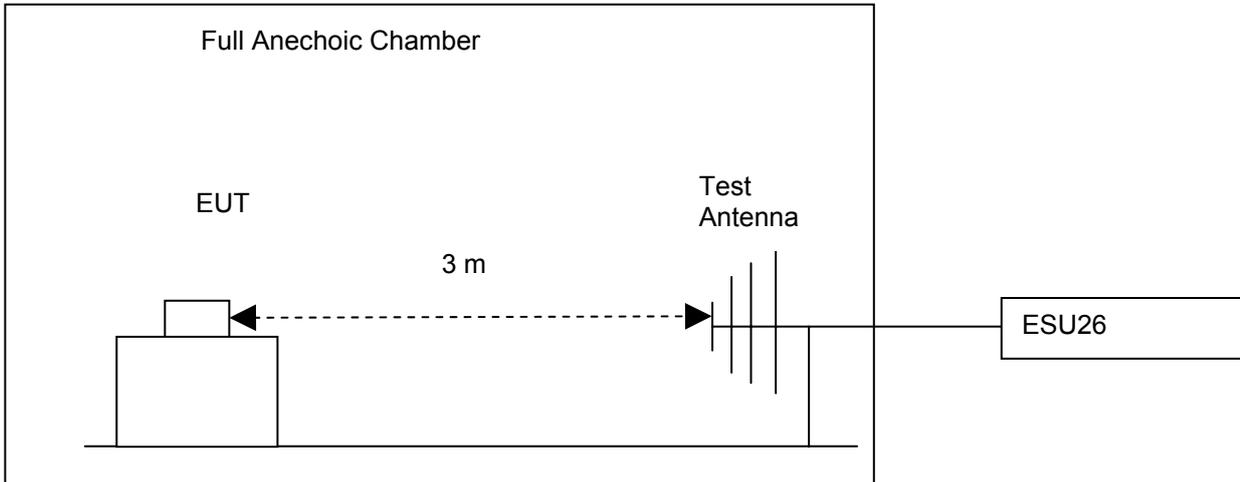
#### 6.1.3 Test Method and Setup

- (a) 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 EC5072 to the wireless communication tester CMU200 the air interface. The band class is set as US Cellular.
- (b) Test the Radiated maximum output power by the CMU200 received from test antenna.
- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a 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**

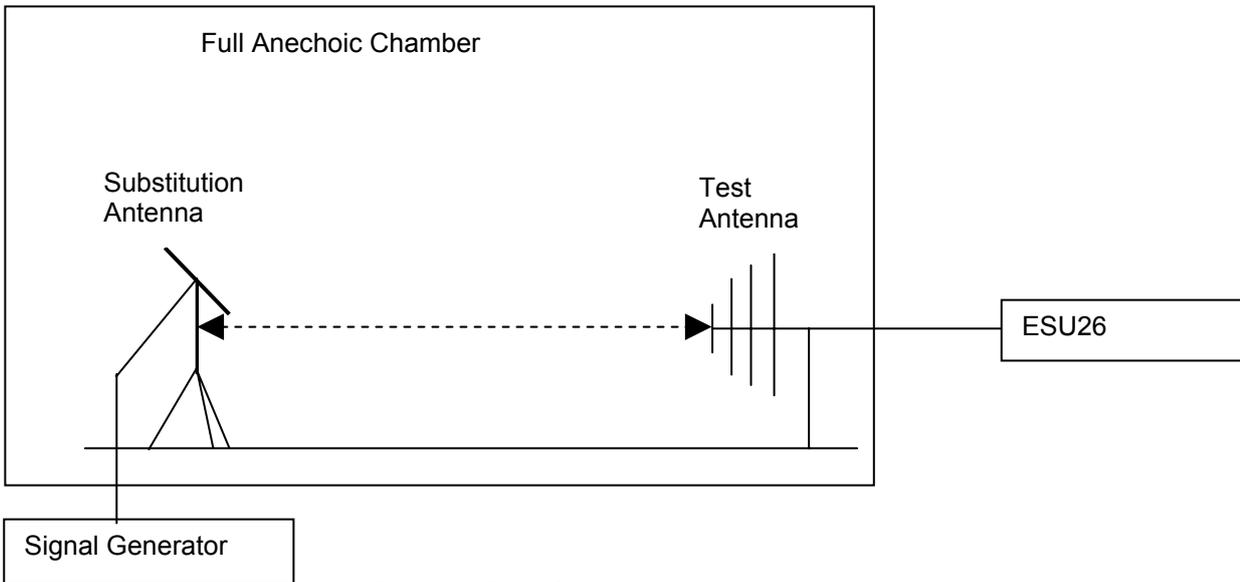


Figure 1. Test Set-up

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

**6.1.4 Measurement Results**

Table 16 Measurement Results

TEST CONDITIONS	RF Output Power(ERP)		
	Channel1013(B) 824.7MHz	Channel384(M) 833.49Mhz	Channel777(T) 848.31MHz



		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	24.82	38.5	24.27	38.5	24.45	38.5
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	24.81	38.5	24.32	38.5	24.49	38.5
Subtype 0	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	24.51	38.5	24.08	38.5	24.38	38.5
Subtype 2	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	24.48	38.5	24.38	38.5	24.43	38.5

### 6.1.4.1 Substitution Results

Table 17 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	Limit [dBm]	Result
TM1	824.7	24.82	Dipole Ant.	28.07	-2.95	0.6	24.52	38.5	Pass
TM1	833.49	24.27	Dipole Ant.	27.93	-3.02	0.6	24.31	38.5	Pass
TM1	848.31	24.45	Dipole Ant.	28.12	-3.11	0.6	24.41	38.5	Pass
TM3	824.7	24.81	Dipole Ant.	27.91	-2.95	0.6	24.36	38.5	Pass
TM3	833.49	24.32	Dipole Ant.	28.44	-3.02	0.6	24.82	38.5	Pass
TM3	848.31	24.49	Dipole Ant.	27.85	-3.11	0.6	24.14	38.5	Pass
Subtype	824.7	24.51	Dipole Ant.	27.89	-2.95	0.6	24.34	38.5	Pass
Subtype	833.49	24.08	Dipole Ant.	27.99	-3.02	0.6	24.37	38.5	Pass
Subtype	848.31	24.38	Dipole Ant.	27.88	-3.11	0.6	24.17	38.5	Pass
Subtype	824.7	24.48	Dipole Ant.	27.9	-2.95	0.6	24.35	38.5	Pass
Subtype	833.49	24.1	Dipole Ant.	28.18	-3.02	0.6	24.56	38.5	Pass
Subtype	848.31	24.43	Dipole Ant.	28.44	-3.11	0.6	24.73	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, A CDMA EVDO signal with bandwidth of 1.23MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 1.23MHz.



## 6.1.5 Conclusion

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

## 6.2 Conducted output power

### 6.2.1 Test Conditions

Table 18 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	CDMA TM1 and TM3 at frequency B,M ,T EVDO Subtype 0 and Subtype 2 at frequency B,M ,T

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

#### 6.2.2.2 Supporting Standards

Table 19 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations

#### 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:

$$ERP(\text{dBm}) = 10 * \log(ERP_{\text{in mwatts}}).$$

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

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

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

Table 20 Limits

Maximum Output Power (Watts)	< 7 Watts
Antenna Gain(dBd):	1
Maximum Conducted Output Power (dBm)	< 37.5dBm

### 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 Mobile Station 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**

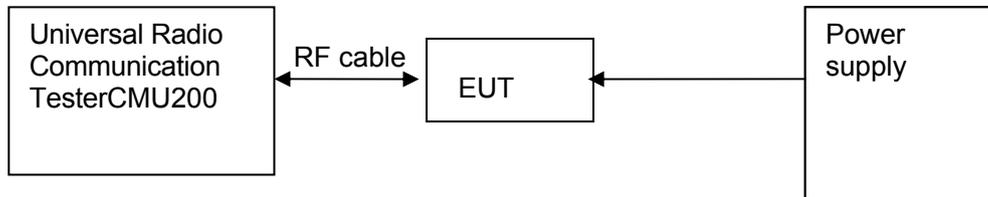


Figure 2. Test Set-up

**6.2.4 Measurement Results**

Table 21 Measurement Results

TEST CONDITIONS		RF Output Power(ERP)					
		Channel1013(B) 824.7MHz		Channel384(M) 833.49Mhz		Channel777(T) 848.31MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	23.82	37.5	23.27	37.5	23.45	37.5
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	23.81	37.5	23.32	37.5	23.49	37.5
Subtype 0	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	23.51	37.5	23.08	37.5	23.38	37.5
Subtype 2	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (3.7V)	23.48	37.5	23.10	37.5	23.43	37.5

**6.2.5 Conclusion**

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

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 22 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	47 %
Test Configurations:	CDMA mode TM1 and TM3 at frequency M EVDO mode Subtype 0 and Subtype 2 at frequency M

### 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 23 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum.

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

Table 24 Limits

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

### 6.3.3 Test Method and Setup

Connect the EC5072 Wireless Module to Universal Radio Communication Tester CMU200 via the antenna connector. The band class is set as US Cellular; the EC5072 output is matched with 50 Ω loads, test method was according to ANSI/TIA-98-E. The waveform quality and constellation of the HUAWEI EC5072 Wireless Module were tested.

#### Test setup

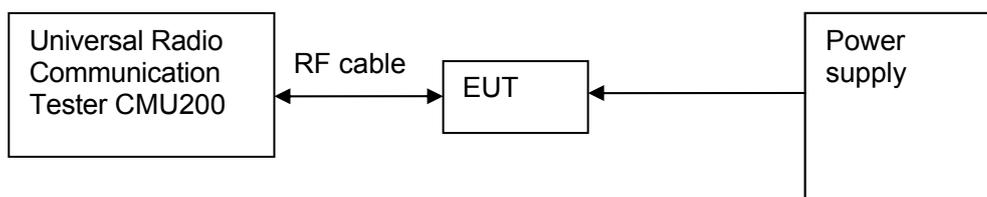


Figure 3. Test Set-up



### 6.3.4 Measurement Results

Table 25 Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel 384(M) 833.49MHz	
		Measured	
		CDMA Mode TM1 & TM3	EVDO Mode Subtype 0 & Subtype 2
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (3.7V)	Refer to Appendix A	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 26 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency B,M ,T EVDO Mode Subtype 0 and Subtype 2 at frequency B,M ,T

### 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 27 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum

#### 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 28 Limits

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

### 6.4.3 Test Method and Setup

EC5072 was connected to the wireless signal analyzer FSQ31 via the one RF connector. The band class is set as US Cellular; EC5072 was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EC5072 by the FSQ31.

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

Refer to 47CFR part 2.1049 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.

Measurement bandwidth (RBW): 30 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 300 kHz

### Test Set-up

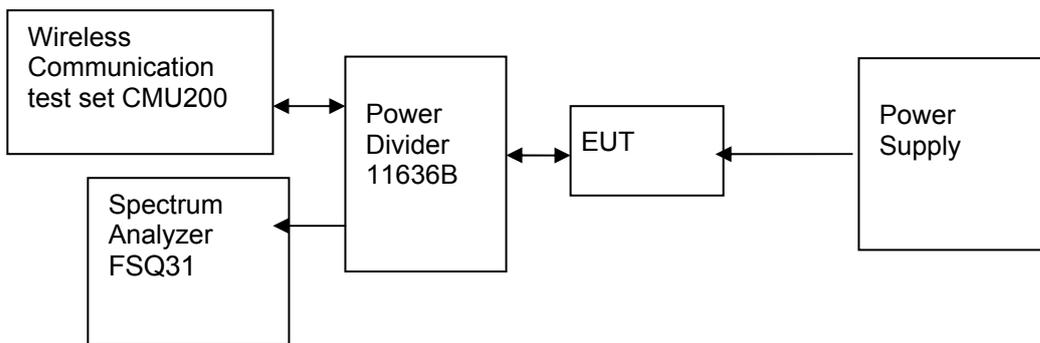


Figure 4. Test Set-up

### 6.4.4 Measurement Results

Table 29 Measurement Results

TEST CONDITIONS		Occupied Bandwidth												
		Channel1013 (B) 824.70MHz				Channel384 (M) 833.49Mhz				Channel777(T) 848.31MHz				
		Measured (MHz)				Measured (MHz)				Measured (MHz)				
		CDMA		EVDO		CDMA		EVDO		CDMA		EVDO		
		TM1	TM3	Subtype 0	Subtype 2	TM1	TM3	Subtype 0	Subtype 2	TM1	TM3	Subtype 0	Subtype 2	
Tnom (25 °C)	Vnom (3.7V)	1.28	1.28	1.28	1.28	1.29	1.28	1.29	1.29	1.29	1.29	128	1.28	1.29

### 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 30 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency B,T EVDO Mode Subtype 0 and Subtype 2 at frequency B,T

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.5.2.2 Supporting Standards

Table 31 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum

#### 6.5.2.3 Limits

Compliance with 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 in Watt).

Table 32 Limits

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

### 6.5.3 Test Method and Setup

EC5072 was connected to the wireless signal analyzer FSQ31 via the one RF connector, the band class is set as US Cellular. EC5072 was controlled to transmit maximum power. Measure and record Band edge compliance of the EC5072 by the FSQ31.

Measurement bandwidth (RBW): 13 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 130 kHz

#### Test Set-up

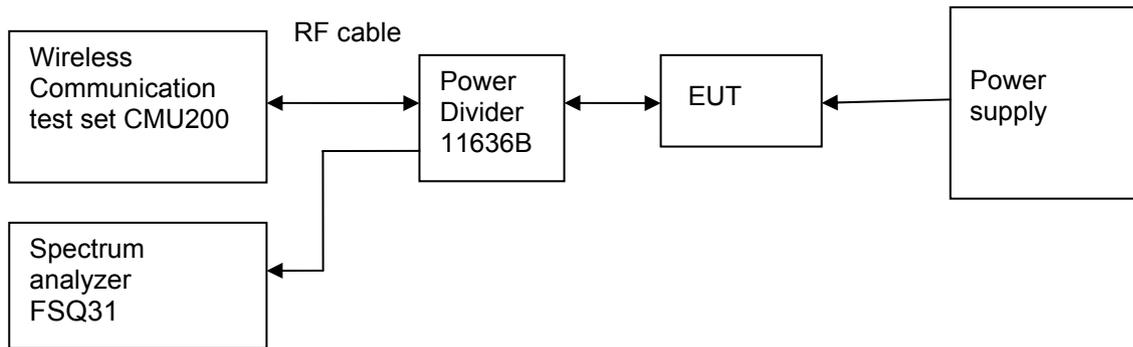


Figure 5. Test Set-up

### 6.5.4 Measurement Results

Table 33 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
US Cellular	$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (3.7\text{V})$						
	824	1013 (B)	TM1 & TM3	24	<-13(See appendix C)	- 13 dBm	Pass
	849	777 (T)	TM1 & TM3	24	<-13(See appendix C)	- 13 dBm	Pass
US Cellular	$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (3.7\text{V})$						
	824	1013 (B)	Subtype 0 & Subtype 2	24	<-13(See appendix C)	- 13 dBm	Pass
	849	777 (T)	Subtype 0 & Subtype 2	24	<-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 34 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency B,M,T EVDO Mode Subtype 0 and Subtype 2 at frequency B,M,T

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.6.2.2 Supporting Standards

Table 35 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum.

#### 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 in Watt).

Table 36 Limits

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

### 6.6.3 Test Method and Setup

EC5072 was connected to the wireless signal analyzer FSQ31 via the one RF connector, the band class is set as US Cellular. EC5072 was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EC5072 by the FSQ31.

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

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

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;  
Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 1MHz;

**Test Set-up**

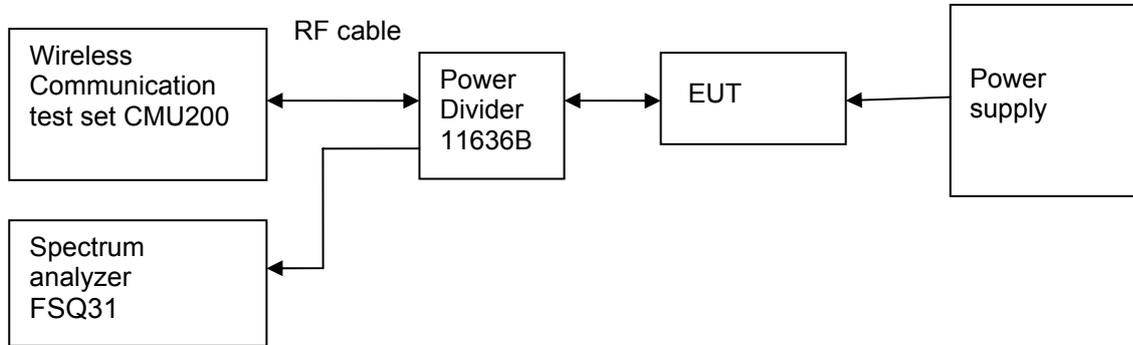


Figure 6. Test Set-up

**6.6.4 Measurement Results**

Table 37 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1013(B)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 384 (M)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 777 (T)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass



	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	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 38 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	55 % at 25 °C
Test Configurations:	CDMA TM1 and TM3 at frequency M EVDO Mode Subtype 0 and Subtype 2 at frequency M

### 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 39 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum

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

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

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

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter

keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

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

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

### Test Set up

Connect the HUAWEI C8600/HUAWEI M860 cdma2000 Digital Mobile Phone to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The HUAWEI C8600/HUAWEI M860 cdma2000 Digital Mobile Phone's output is matched with a 50 Ω loads.

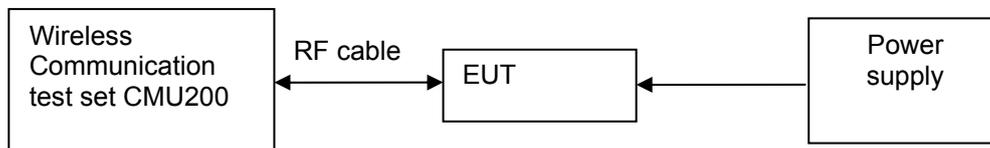


Figure 7. Test Set up

### 6.7.4 Measurement Results

#### 6.7.4.1 Measurement Results vs. Variation of Temperature

- TM1, 5.0V DC Channel No.384(833.49MHz)

Table 40 Measurement Results vs. Variation of Temperature—TM1

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	833.49	-10	Pass
-20 °C	24	833.49	-8	Pass
-10 °C	24	833.49	2	Pass
0 °C	24	833.49	9	Pass
+10 °C	24	833.49	-5	Pass
+20 °C	24	833.49	6	Pass
+30 °C	24	833.49	-7	Pass
+40 °C	24	833.49	-1	Pass
+50 °C	24	833.49	4	Pass

- TM3, 5.0V DC Channel No.384(833.49MHz)

Table 41 Measurement Results vs. Variation of Temperature—TM3

Temperature	Power	Nominal	Measured	Result
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	(dBm)	Frequency (MHz)	Frequency Error(Hz)	
-30 °C	24	833.49	-2	Pass
-20 °C	24	833.49	3	Pass
-10 °C	24	833.49	12	Pass
0 °C	24	833.49	-8	Pass
+10 °C	24	833.49	-3	Pass
+20 °C	24	833.49	6	Pass
+30 °C	24	833.49	13	Pass
+40 °C	24	833.49	4	Pass
+50 °C	24	833.49	-6	Pass

● Subtype 0, 5.0V DC Channel No.**384(833.49MHz)**

Table 42 Measurement Results vs. Variation of Temperature – EVDO

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	833.49	10	Pass
-20 °C	24	833.49	14	Pass
-10 °C	24	833.49	-5	Pass
0 °C	24	833.49	-13	Pass
+10 °C	24	833.49	1	Pass
+20 °C	24	833.49	7	Pass
+30 °C	24	833.49	9	Pass
+40 °C	24	833.49	-8	Pass
+50 °C	24	833.49	-4	Pass

● Subtype 2, 5.0V DC Channel No.**384(833.49MHz)**

Table 43 Measurement Results vs. Variation of Temperature – EVDO

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	24	833.49	13	Pass
-20 °C	24	833.49	7	Pass
-10 °C	24	833.49	2	Pass
0 °C	24	833.49	-10	Pass
+10 °C	24	833.49	-8	Pass
+20 °C	24	833.49	5	Pass

+30 °C	24	833.49	11	Pass
+40 °C	24	833.49	14	Pass
+50 °C	24	833.49	-2	Pass

#### 6.7.4.2 Measurement Results vs. Variation of Voltage

- TM1, 25 °C ,Channel No. **384(833.49MHz)**

Table 44 Measurement Results vs. Variation of Voltage—TM1

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
5.25	24	833.49	7	Pass
5.0	24	833.49	-12	Pass
4.75	24	833.49	-4	Pass

- TM3, 25 °C ,Channel No. **384(833.49MHz)**

Table 45 Measurement Results vs. Variation of Voltage—TM3

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
5.25	24	833.49	-12	Pass
5.0	24	833.49	8	Pass
4.75	24	833.49	-3	Pass

- Subtype 0 , 25 °C ,Channel No. **384(833.49MHz)**

Table 46 Measurement Results vs. Variation of Voltage—EVDO

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
5.25	24	833.49	13	Pass
5.0	24	833.49	-10	Pass
4.75	24	833.49	1	Pass

- Subtype 2 , 25 °C ,Channel No. **384(833.49MHz)**

Table 47 Measurement Results vs. Variation of Voltage—EVDO

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
5.25	24	833.49	10	Pass
5.0	24	833.49	-5	Pass



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4.75	24	833.49	-13	Pass
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### 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 48 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	ERP(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
Field Strength of Spurious Radiation	ERP(dBm)	U=2.2dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2



## 8 Appendixes

Appendix A	Measurement Results Modulation Characteristics	7 pages
Appendix B	Measurement Results Occupied Bandwidth	13 pages
Appendix C	Measurement Results Band Edges	13 pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	73 pages

----- END OF REPORT -----



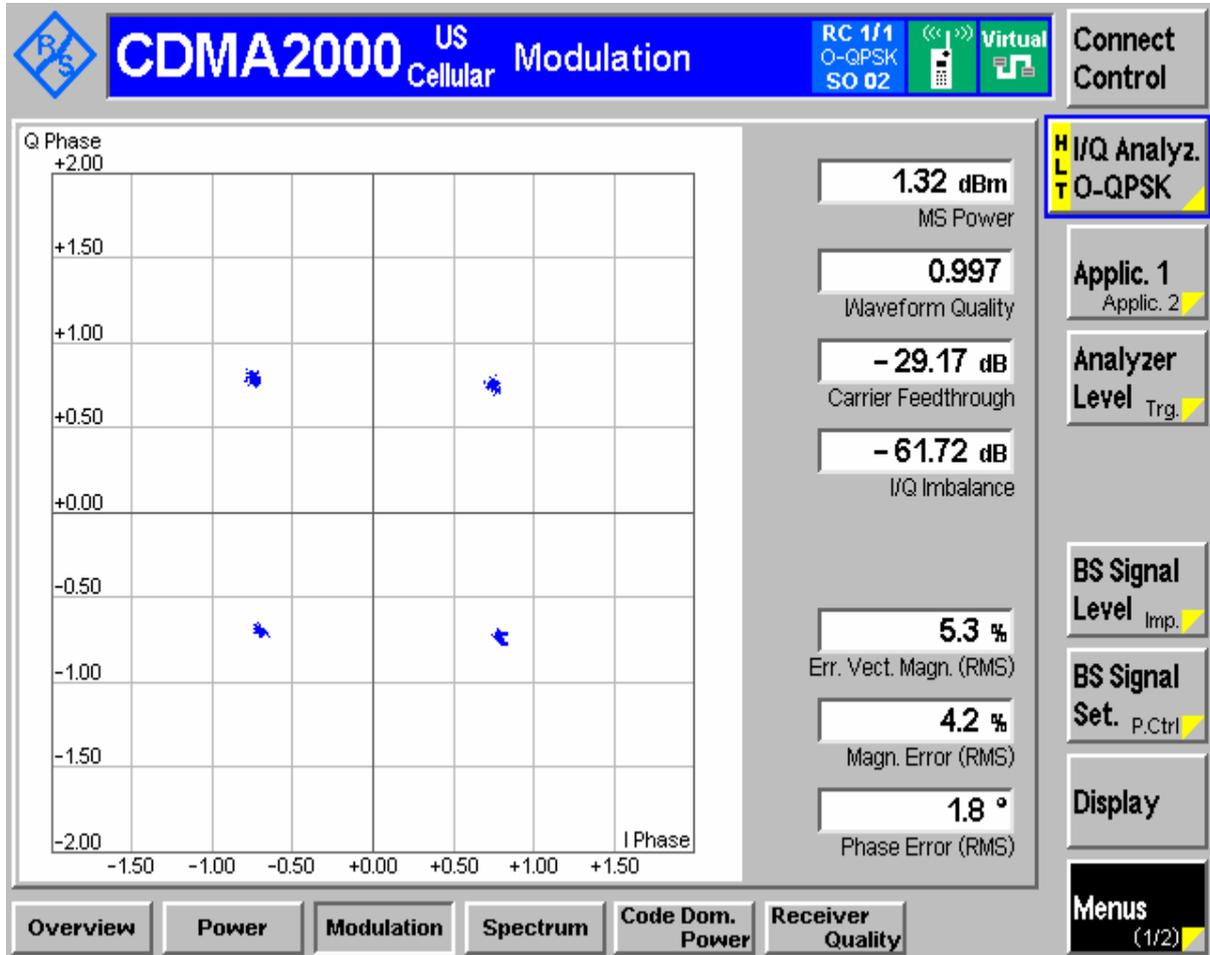
# Appendix A

## Modulation Characteristics

According to FCC Part 2.1047 & Part 22 Subpart H

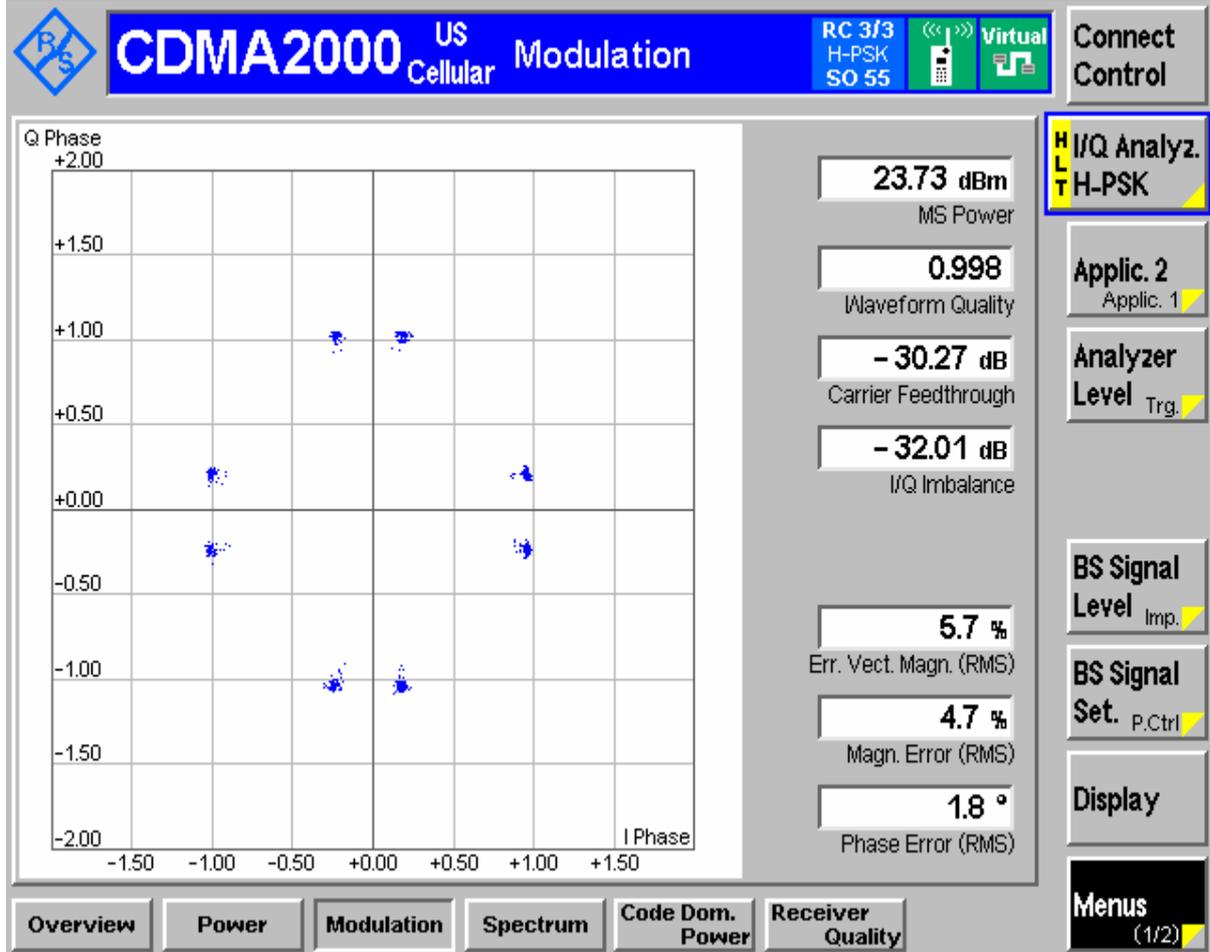


### Channel 384 (TM1)



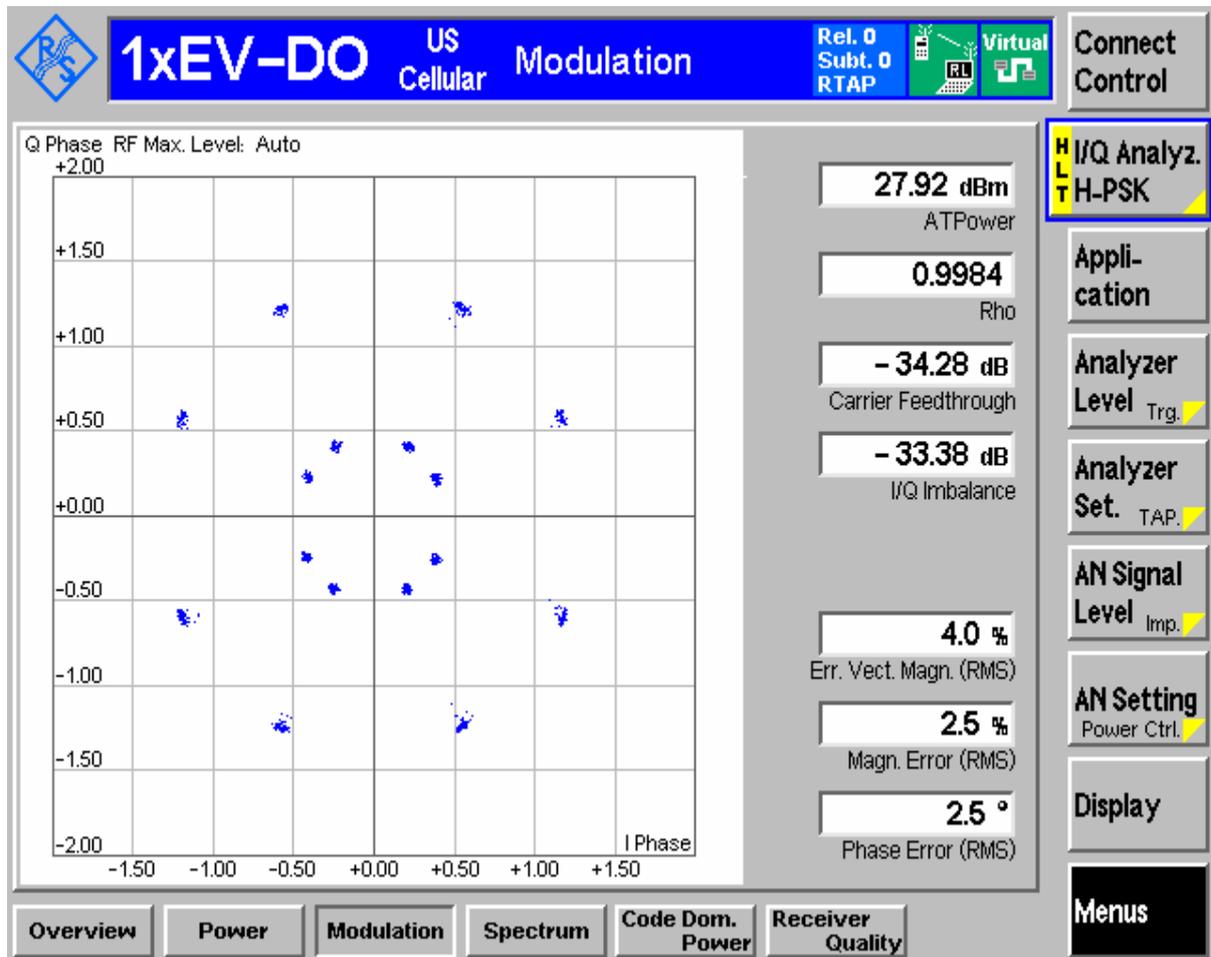


### Channel 384 (TM3)





## Channel 384 (Subtype 0) (HPSK)

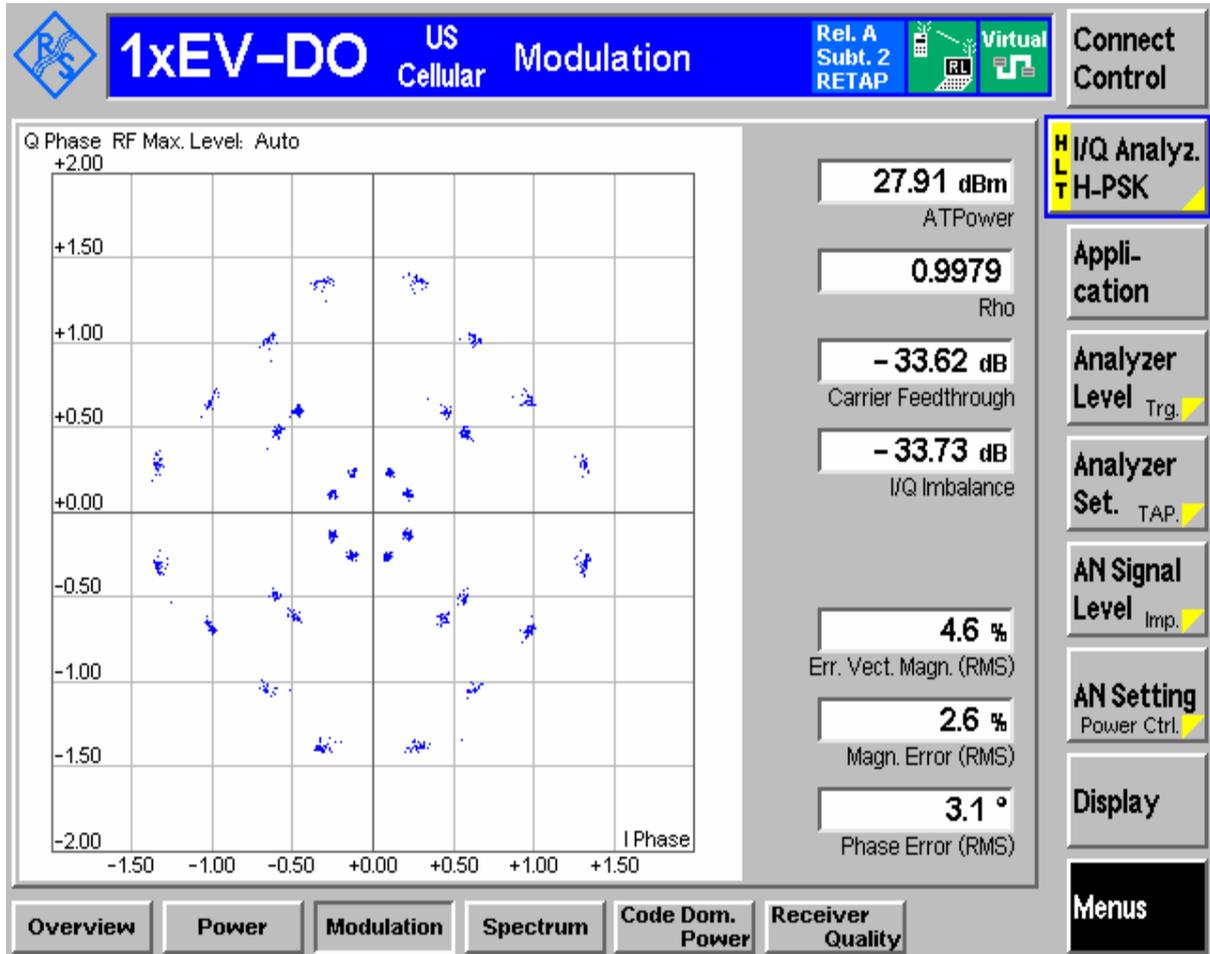




## Channel 384 (Subtype 2)

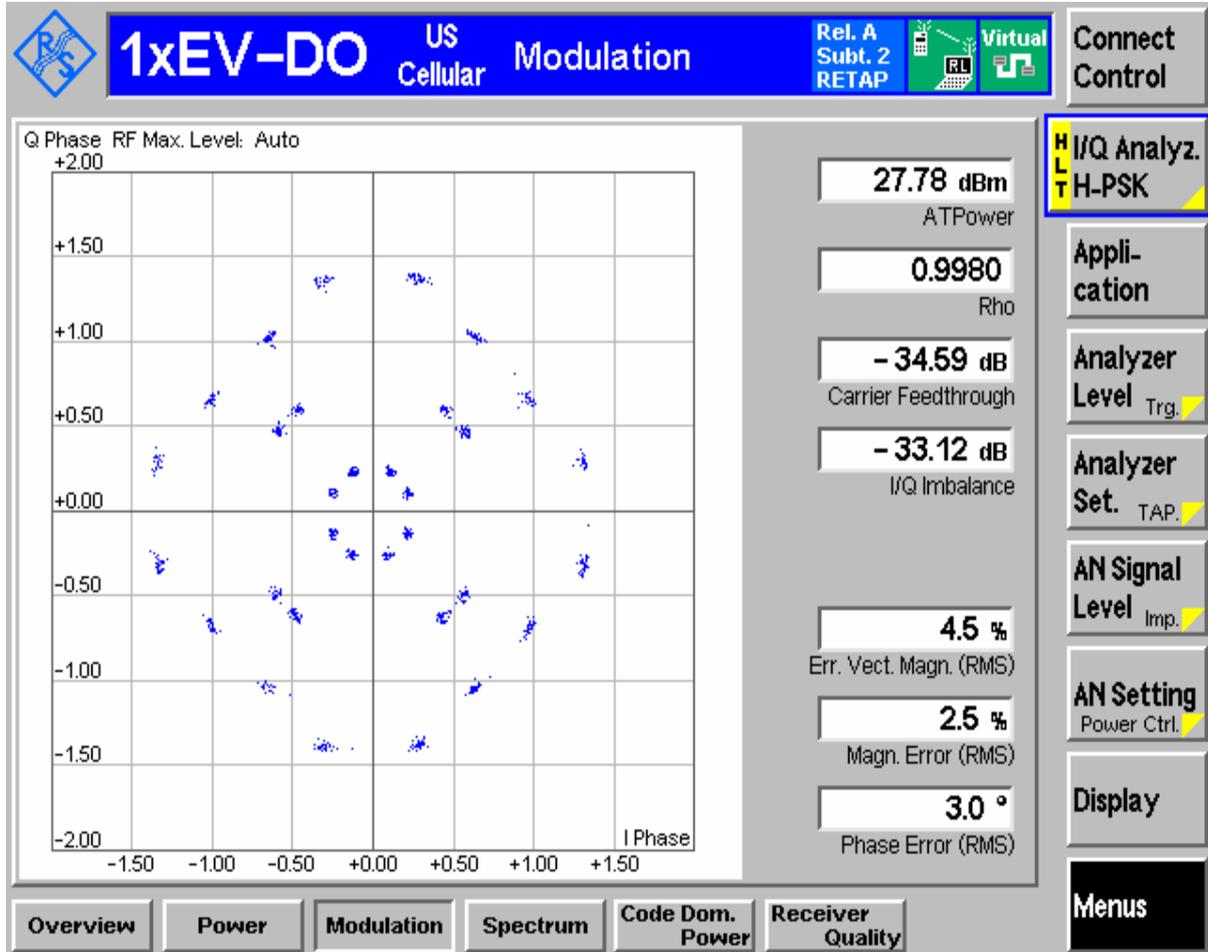
The R-Data packet size determines the modulation format:

R-Data Pkt Size (256 bits) (BPSK)



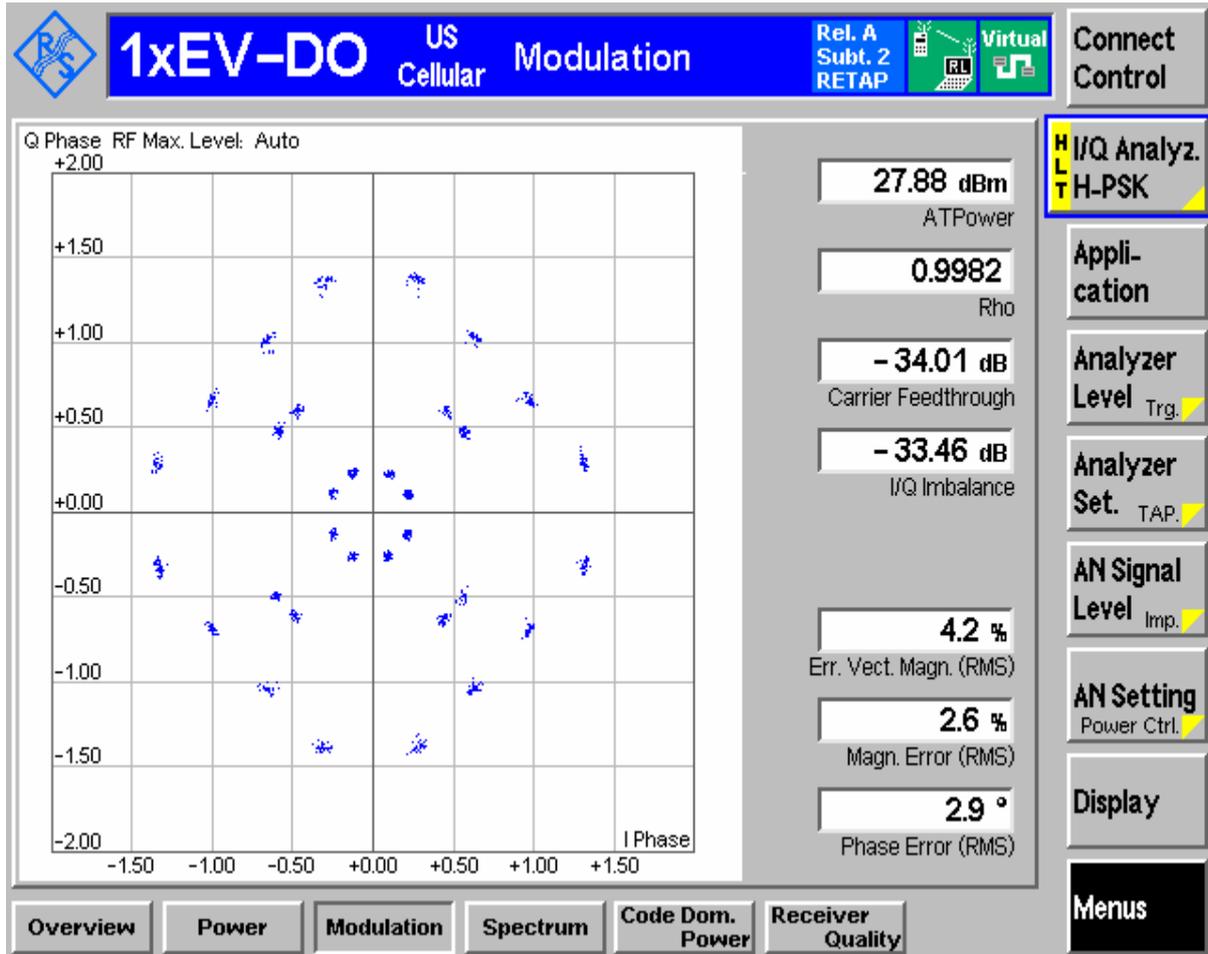


R-Data Pkt Size (4096 bits) (QPSK)





R-Data Pkt Size (12288 bits) (8PSK)





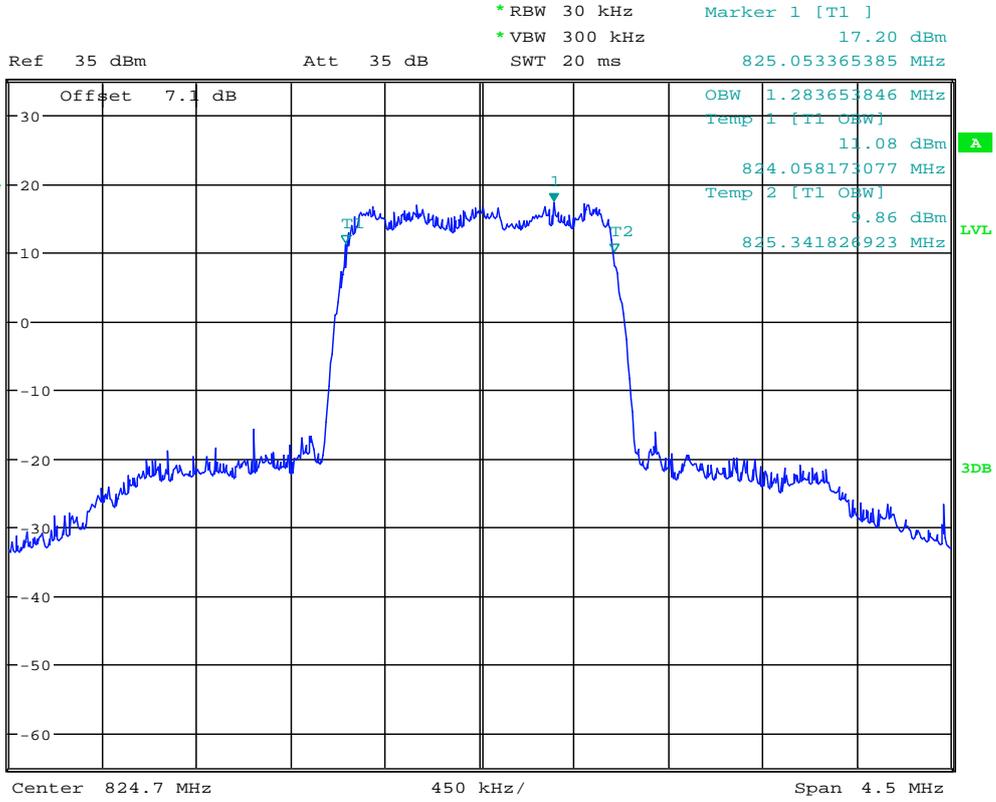
## Appendix B

# Occupied Bandwidth

According to FCC Part 2.1049 & Part 22 Subpart H



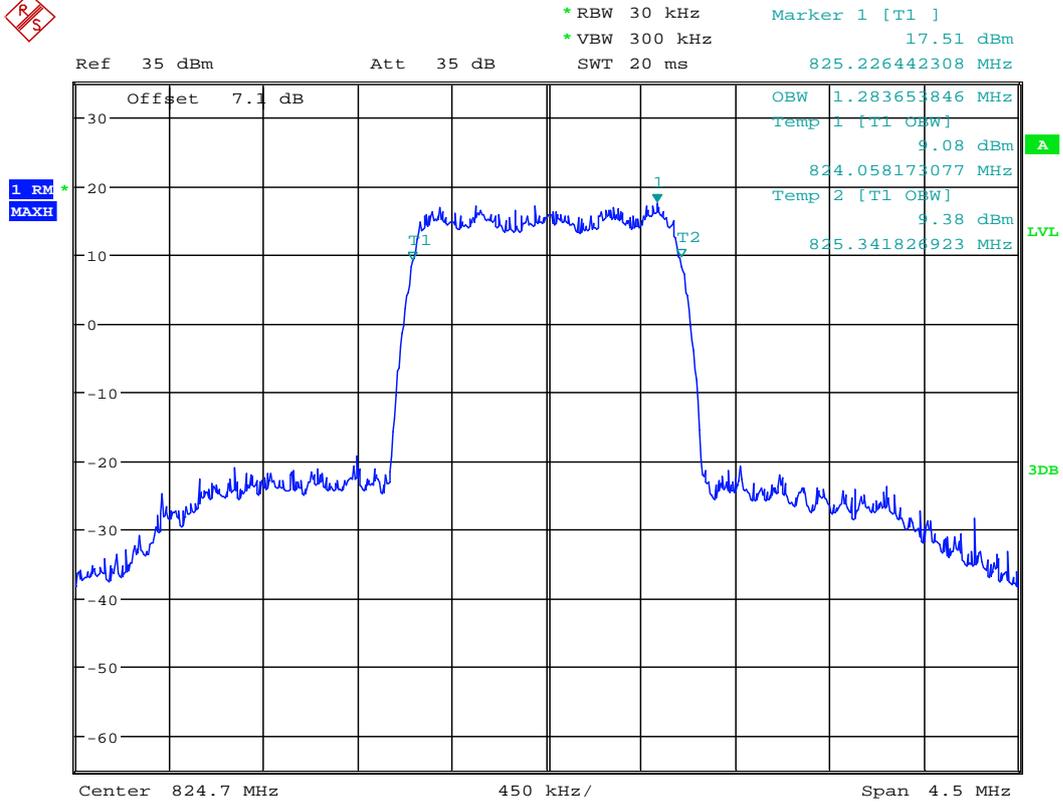
# Channel 1013 (TM1)



Date: 7.MAR.2011 00:14:39



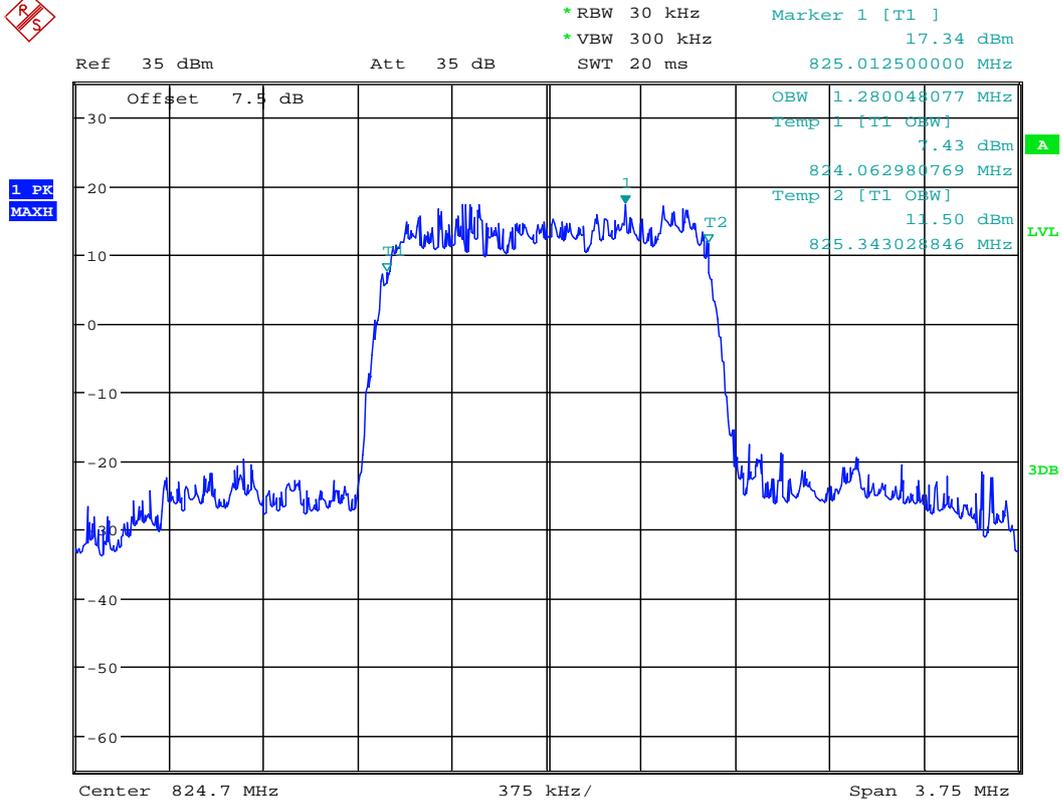
## Channel 1013 (TM3)



Date: 7.MAR.2011 00:15:22



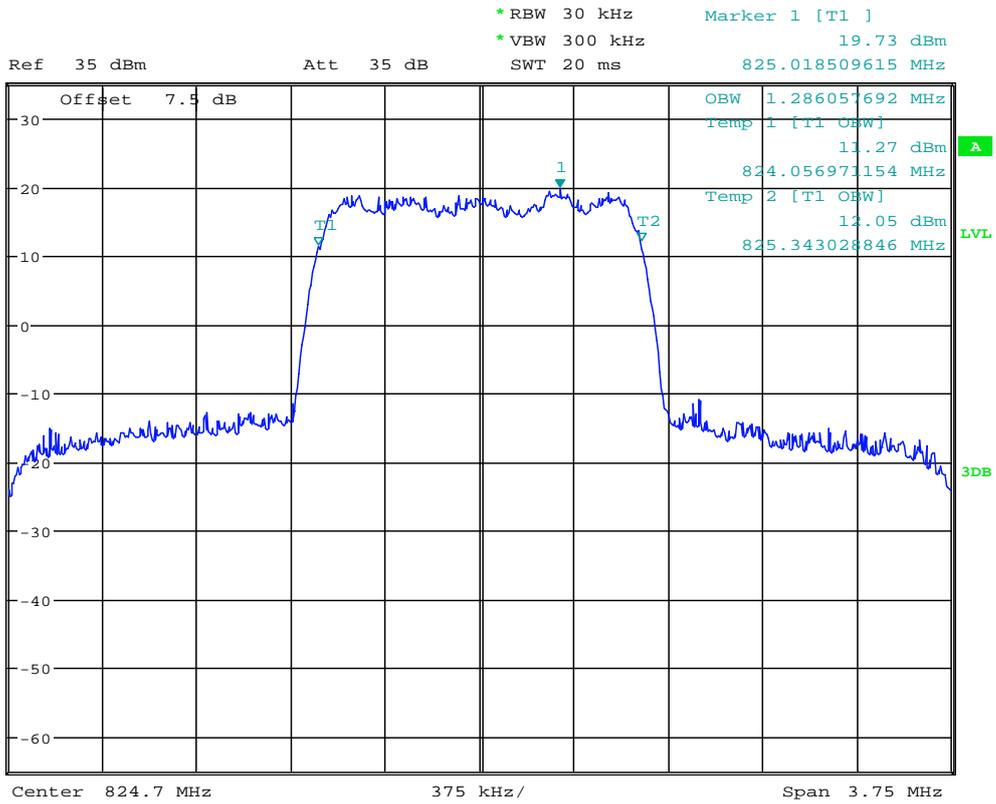
## Channel 1013 (EVDO subtype 0)



Date: 8.MAR.2011 19:45:48



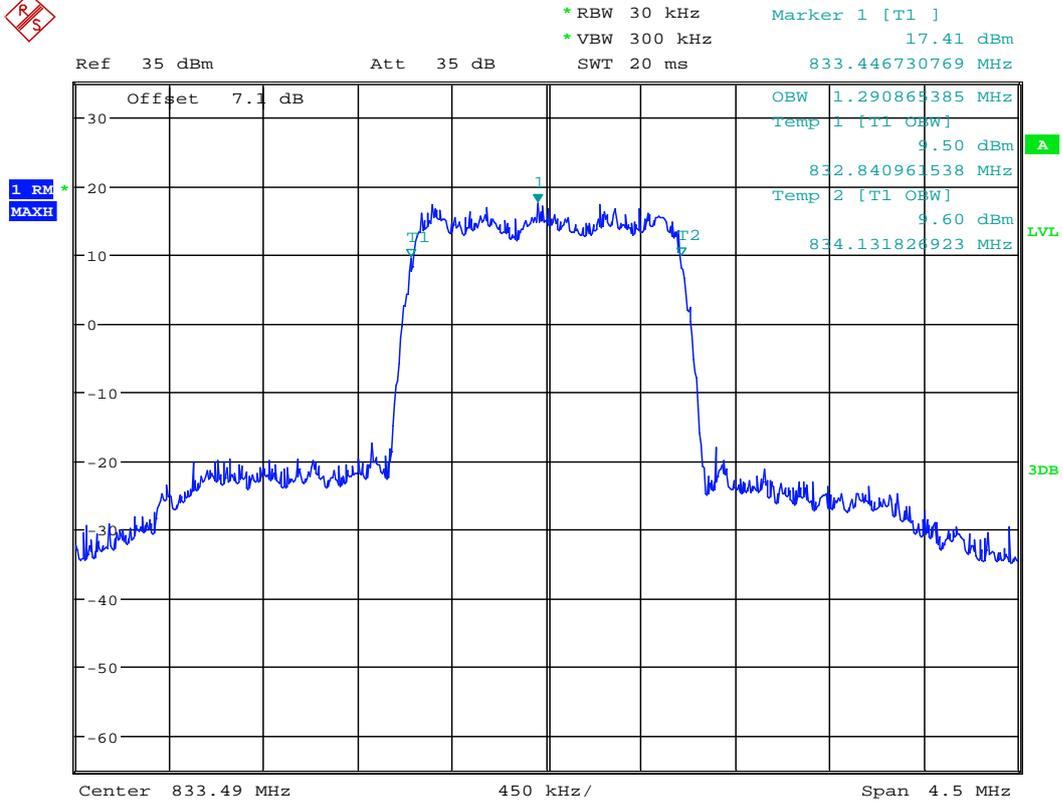
## Channel 1013 (EVDO subtype 2)



Date: 8.MAR.2011 17:59:14



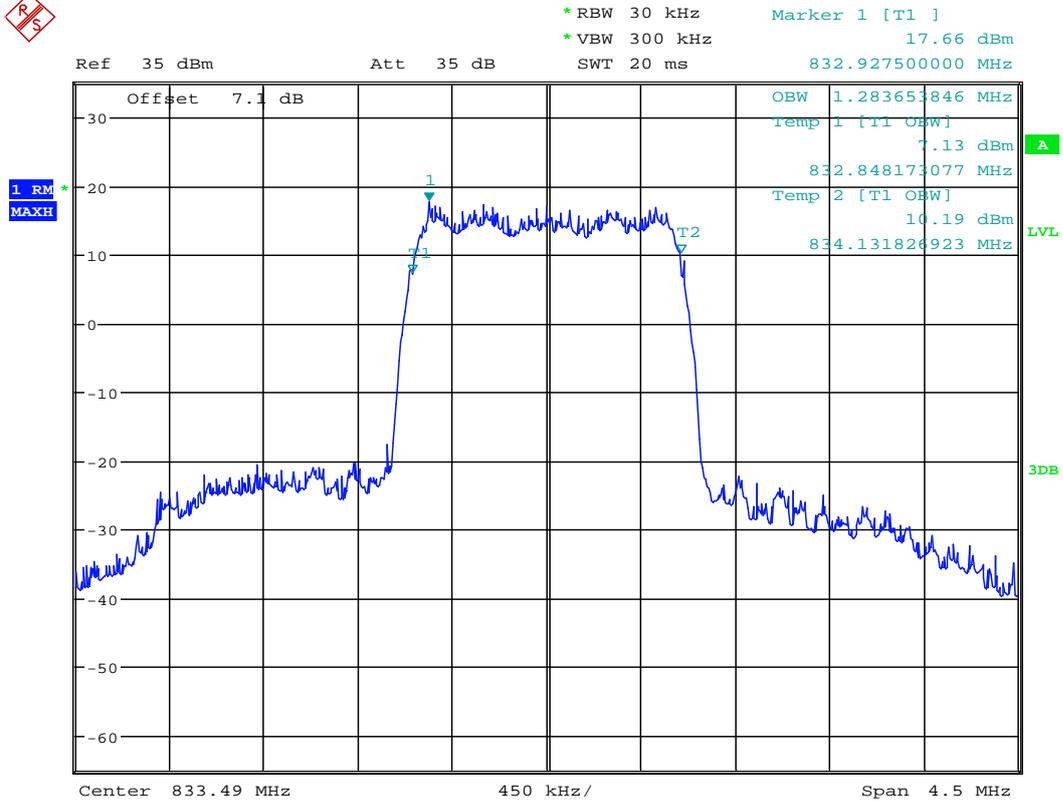
## Channel 384 (TM1)



Date: 7.MAR.2011 00:14:53



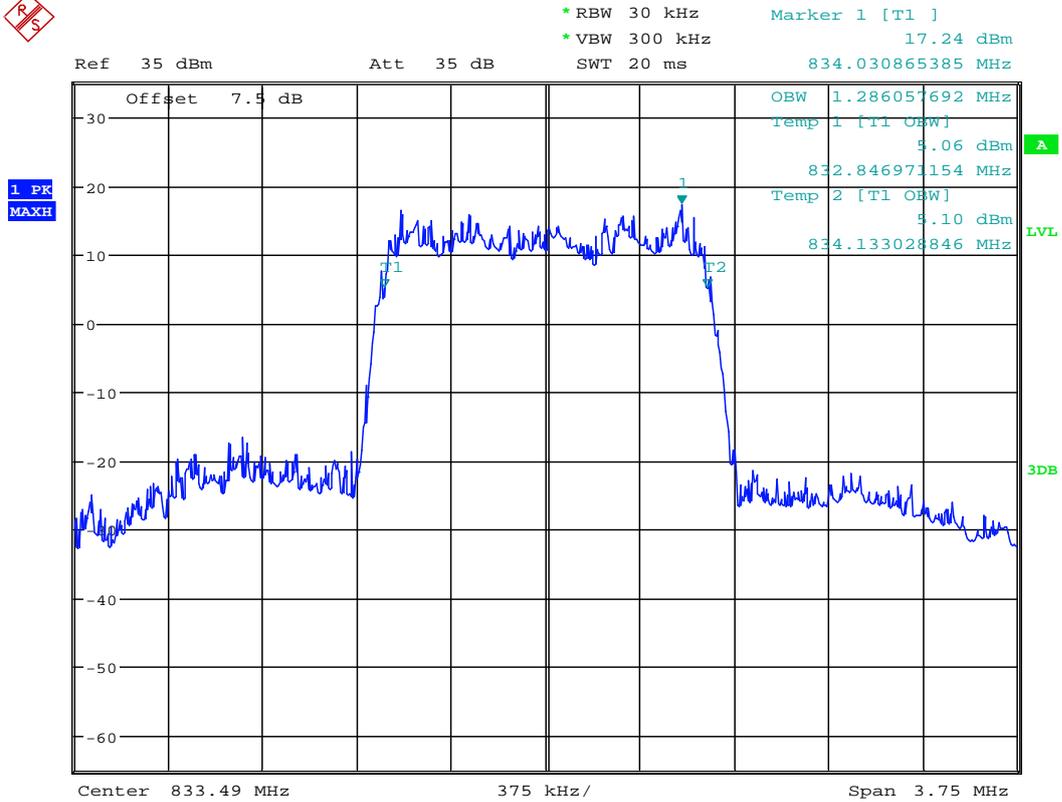
## Channel 384 (TM3)



Date: 7.MAR.2011 00:15:36



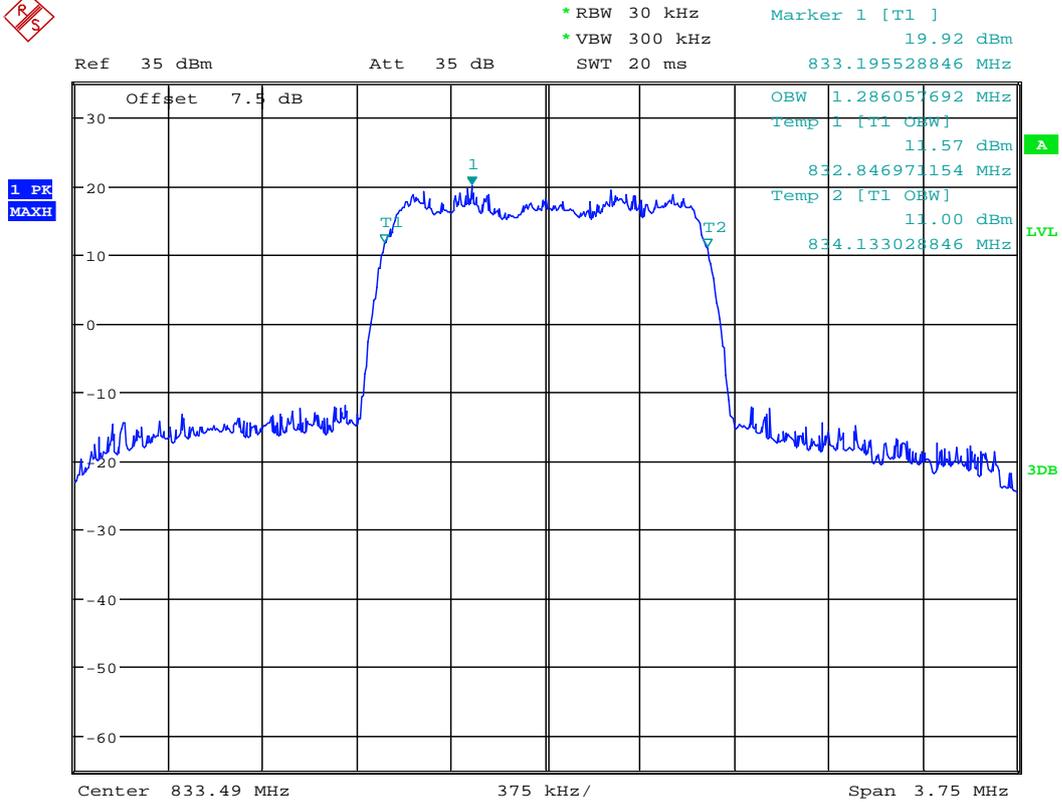
## Channel 384 (EVDO subtype 0)



Date: 8.MAR.2011 19:46:02



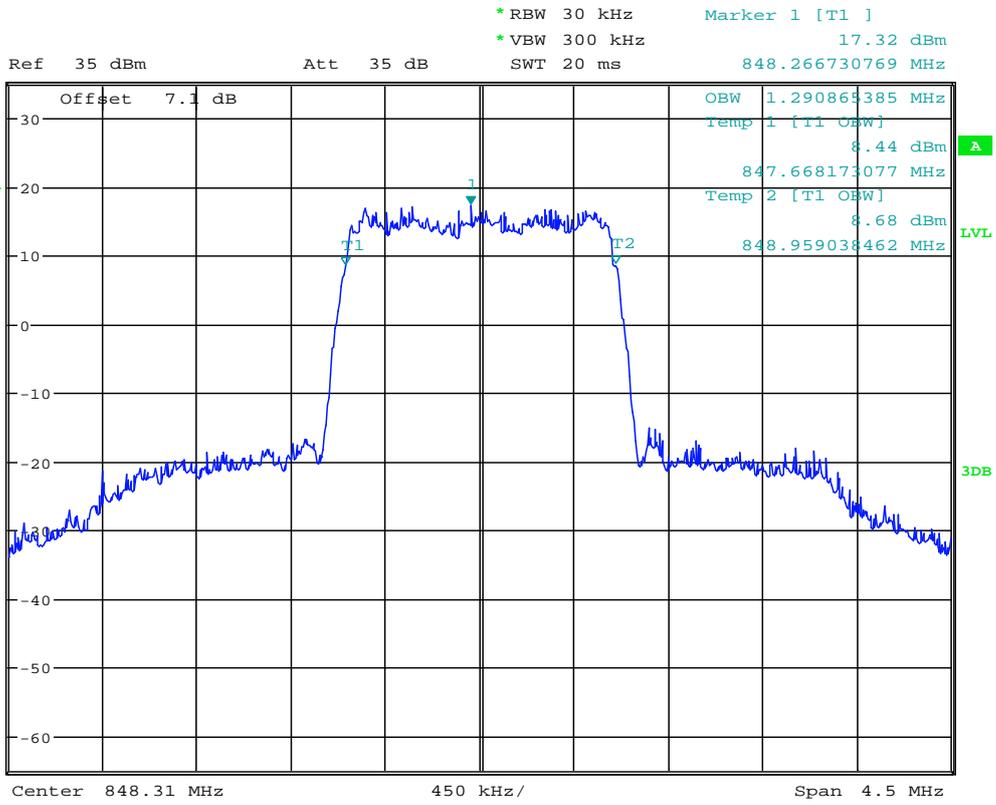
## Channel 384 (EVDO Subtype 2)



Date: 8.MAR.2011 17:59:26



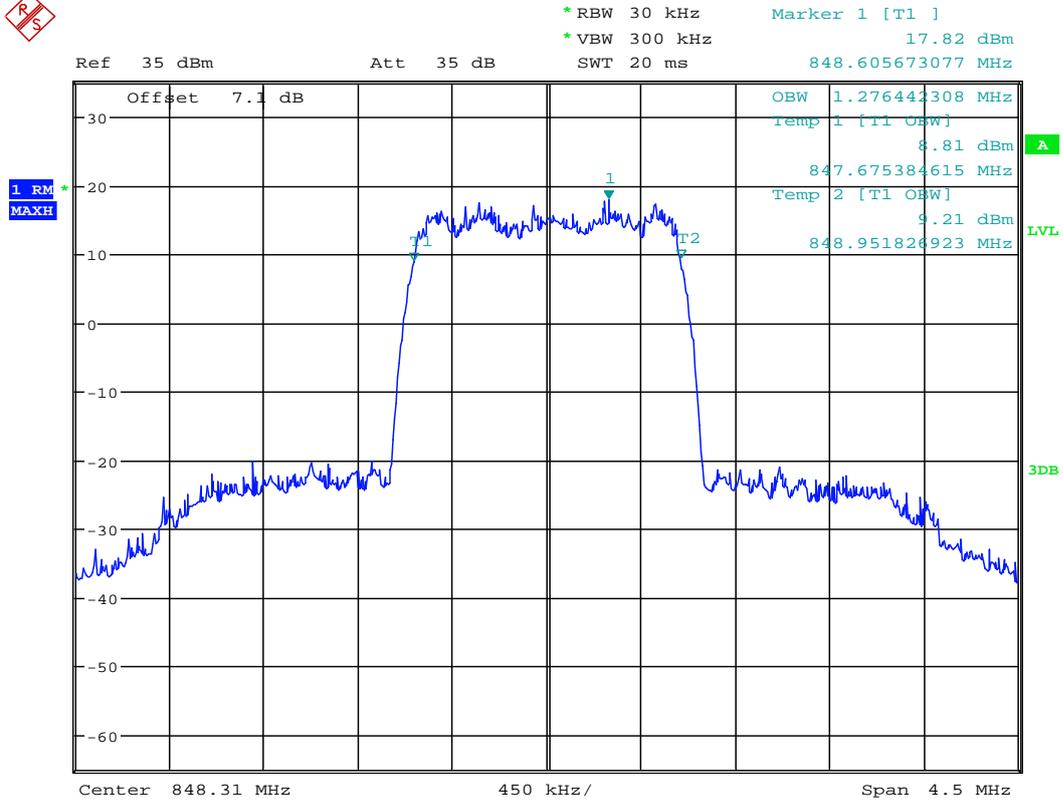
# Channel 777 (TM1)



Date: 7.MAR.2011 00:15:07



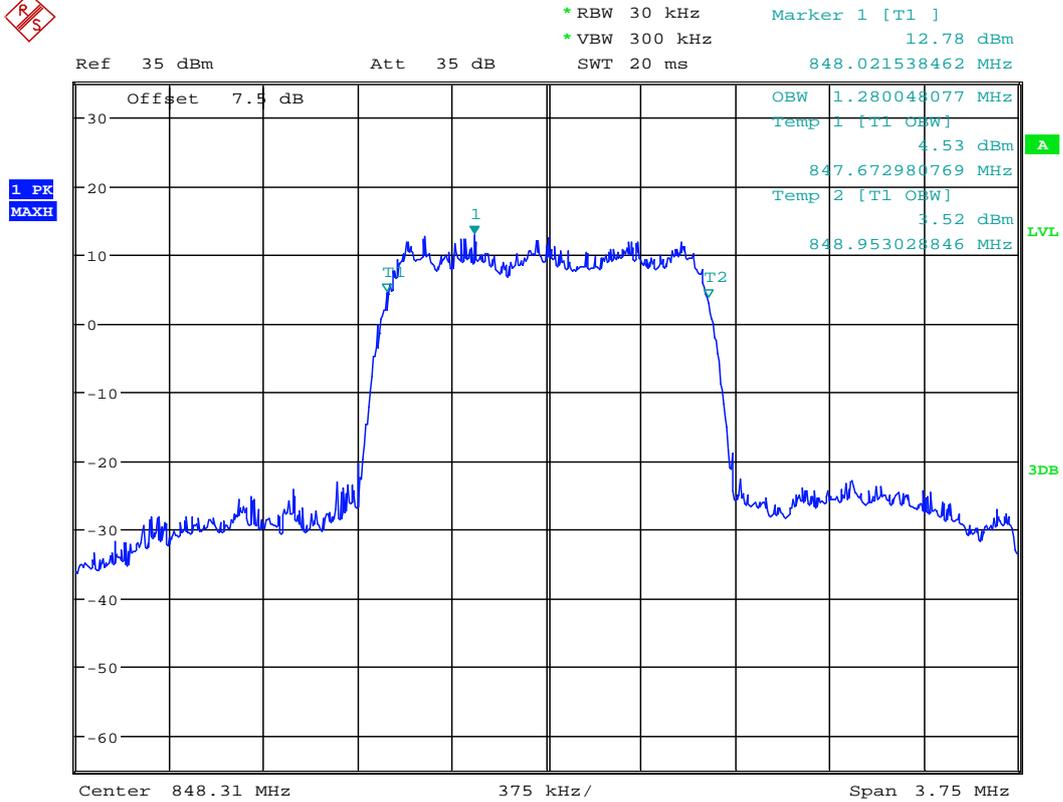
## Channel 777 (TM3)



Date: 7.MAR.2011 00:15:50



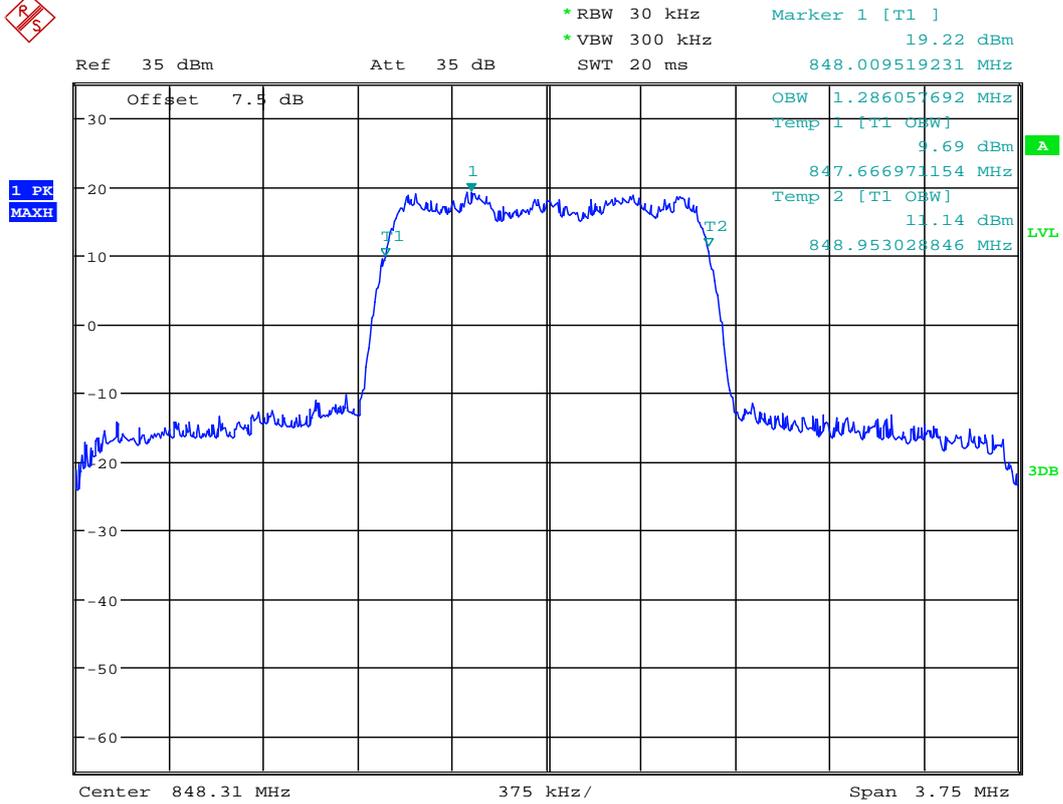
## Channel 777 (EVDO subtype 0)



Date: 8.MAR.2011 19:46:16



## Channel 777 (EVDO Subtype 2)



Date: 8.MAR.2011 17:59:37



## **Appendix C**

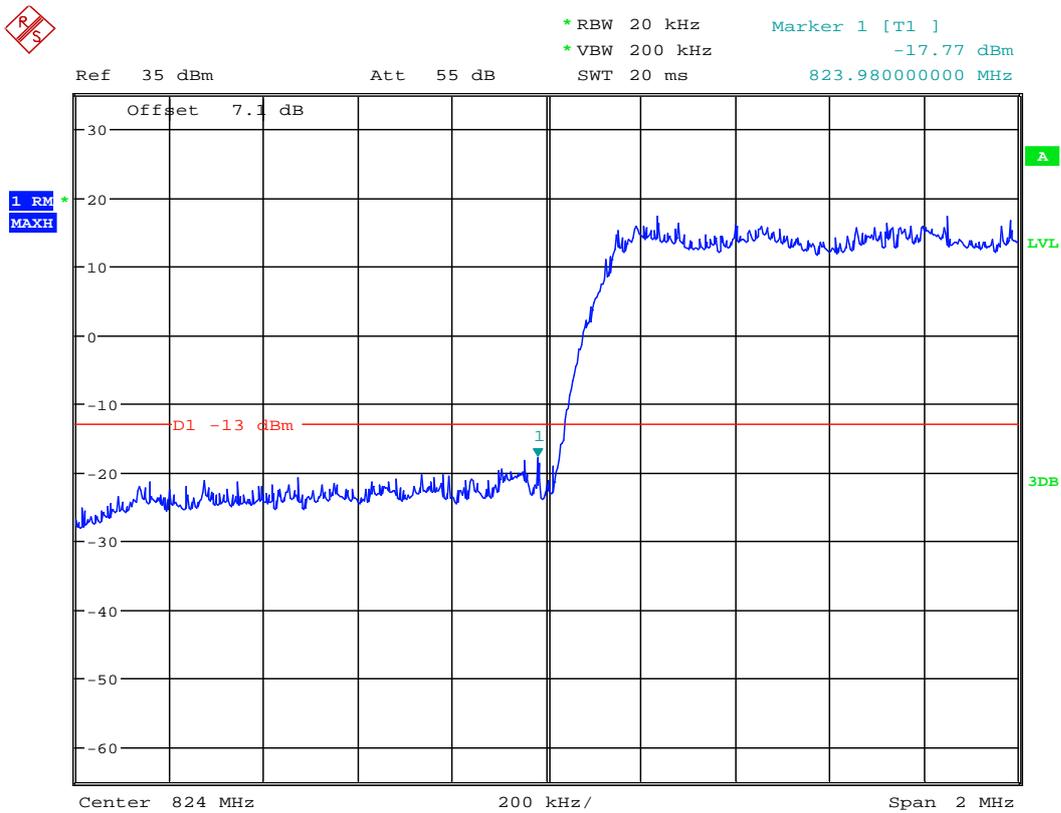
# **Band Edges Compliance**

According to FCC Part 2.1051 & 22.917



# TM1

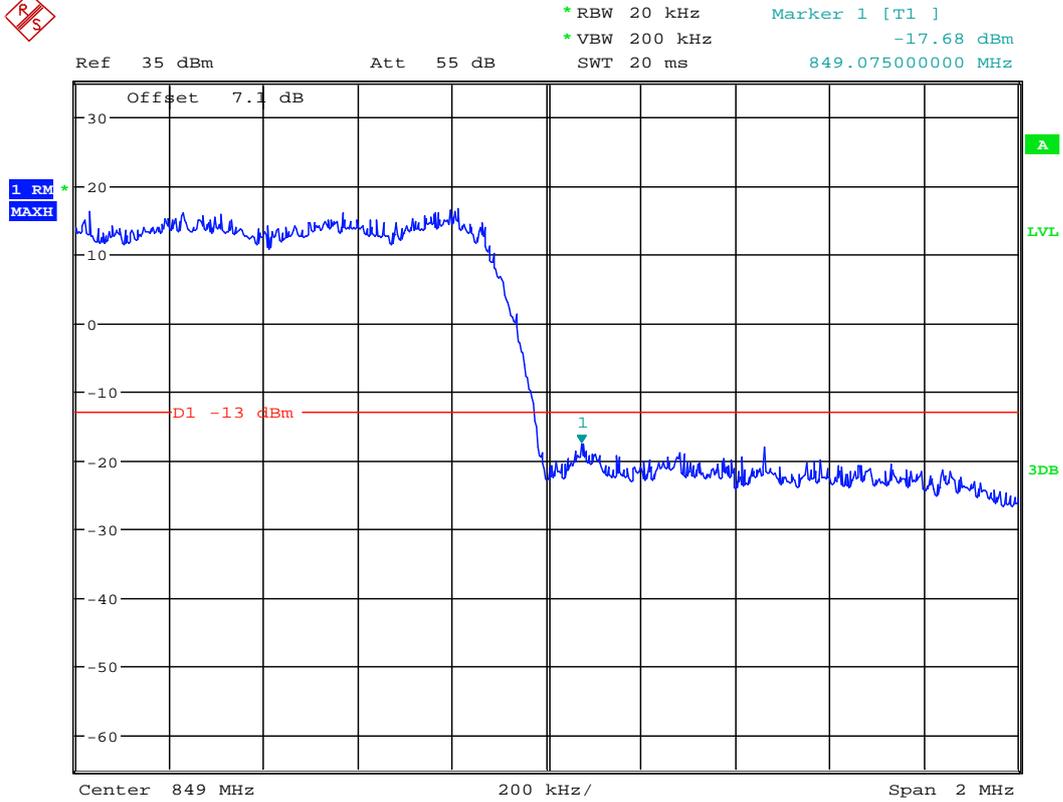
## Left Edge (824 MHz) Channel 1013



Date: 7.MAR.2011 00:11:45



### Right Edge (849MHz) Channel 777

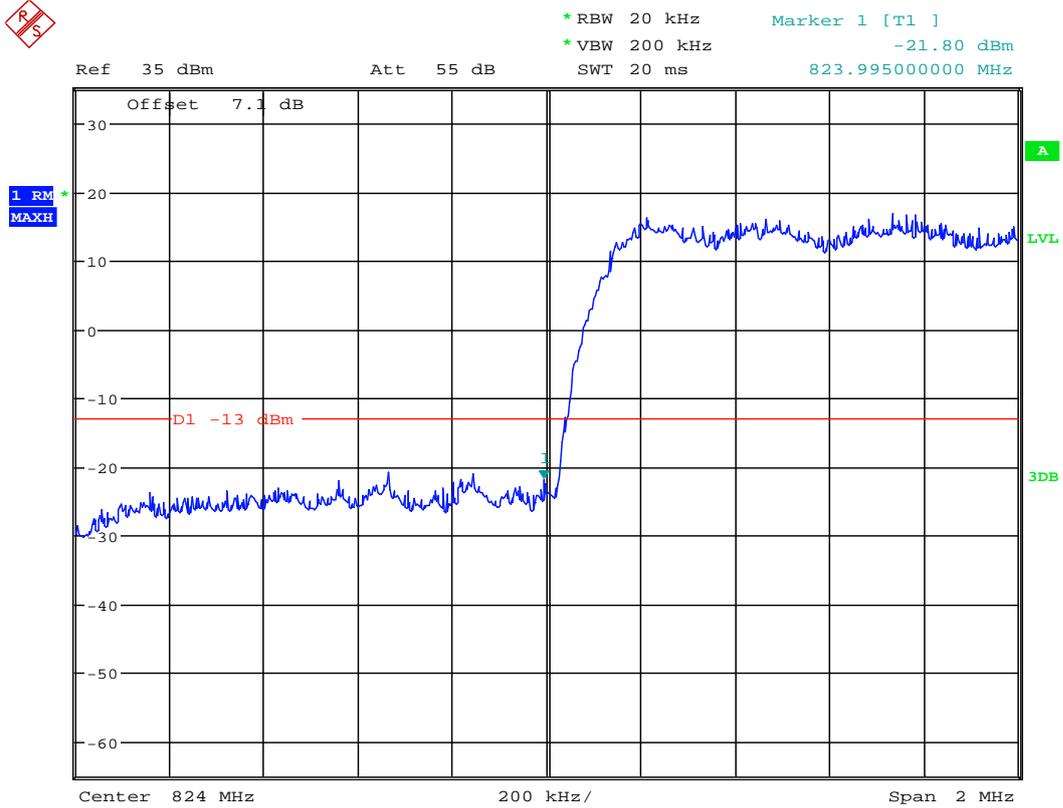


Date: 7.MAR.2011 00:11:59



### TM3

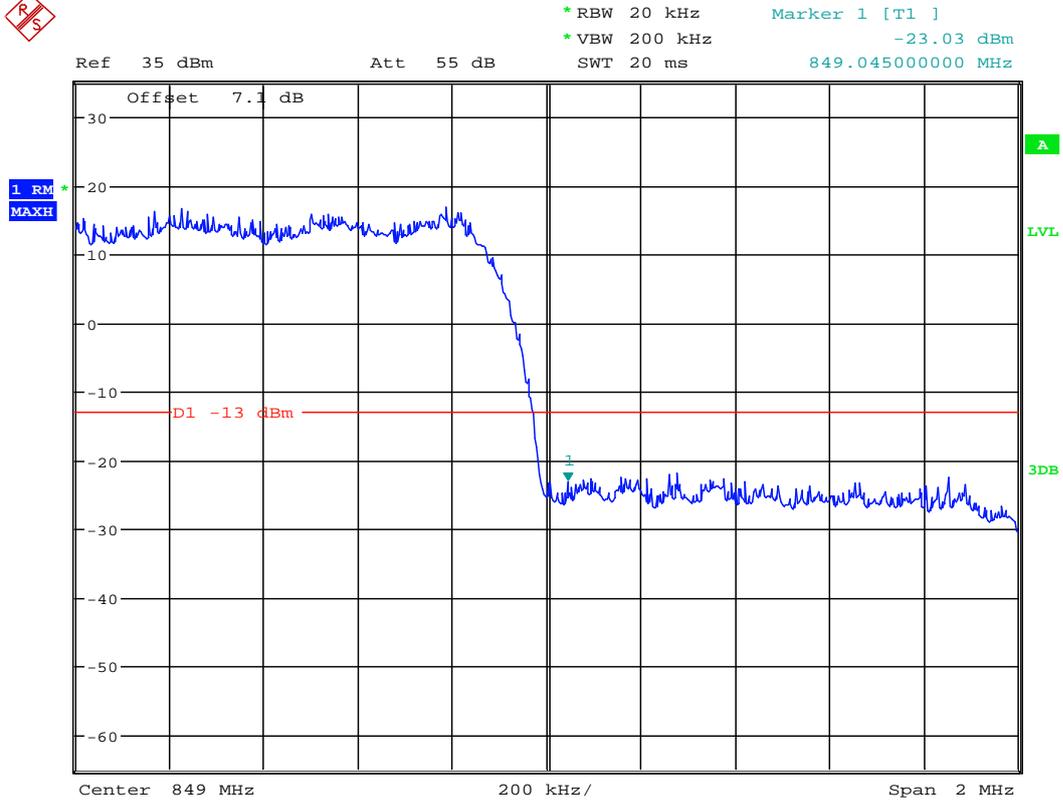
### Left Edge (824 MHz) Channel 1013



Date: 7.MAR.2011 00:12:15



### Right Edge (849MHz) Channel 777

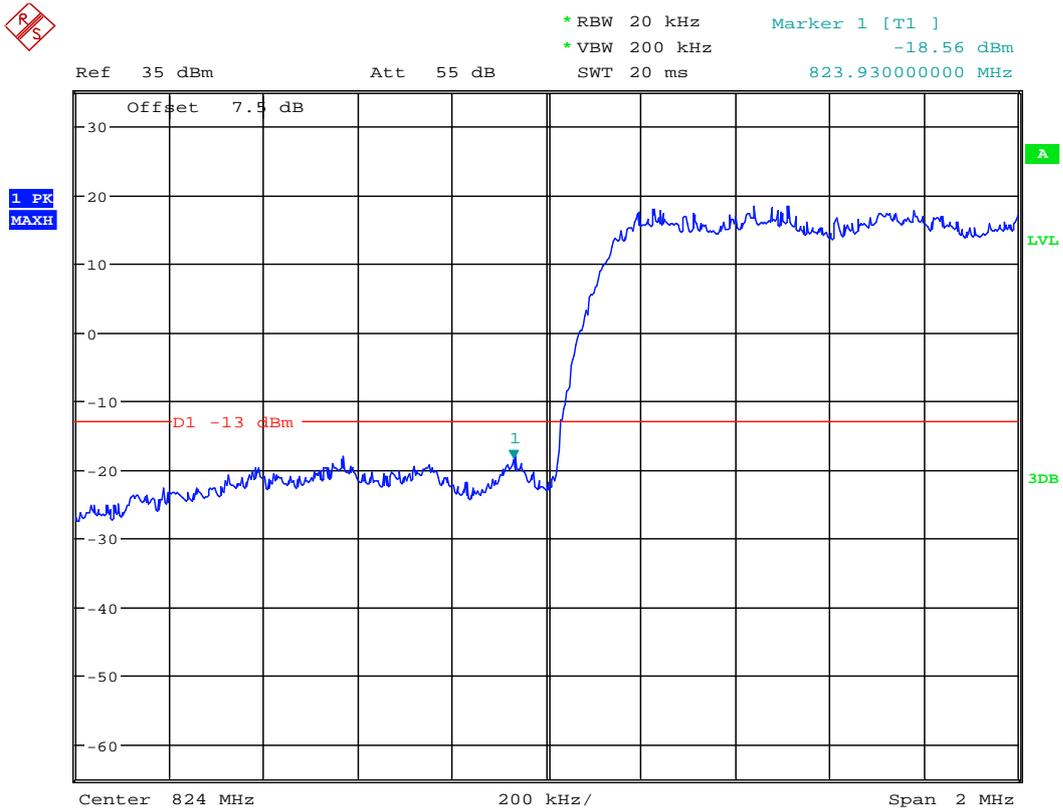


Date: 7.MAR.2011 00:12:29



# EVDO Subtype 0

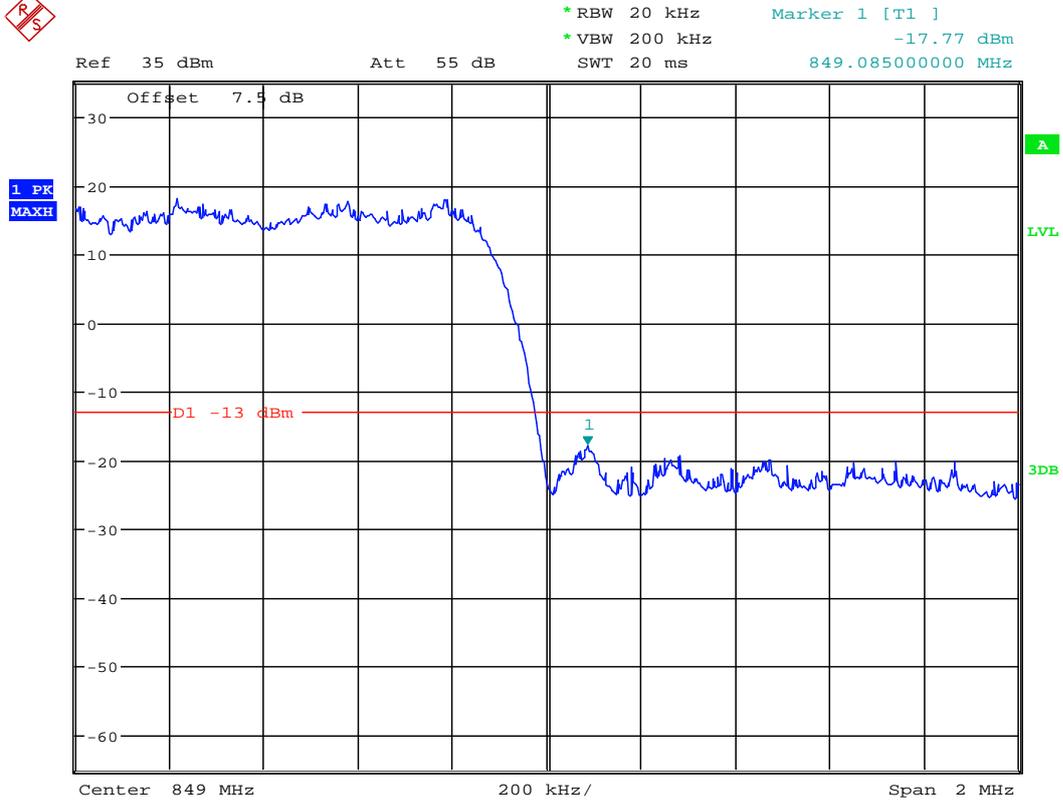
## Left Edge (824 MHz) Channel 1013



Date: 8.MAR.2011 19:45:09



### Right Edge (849MHz) Channel 777

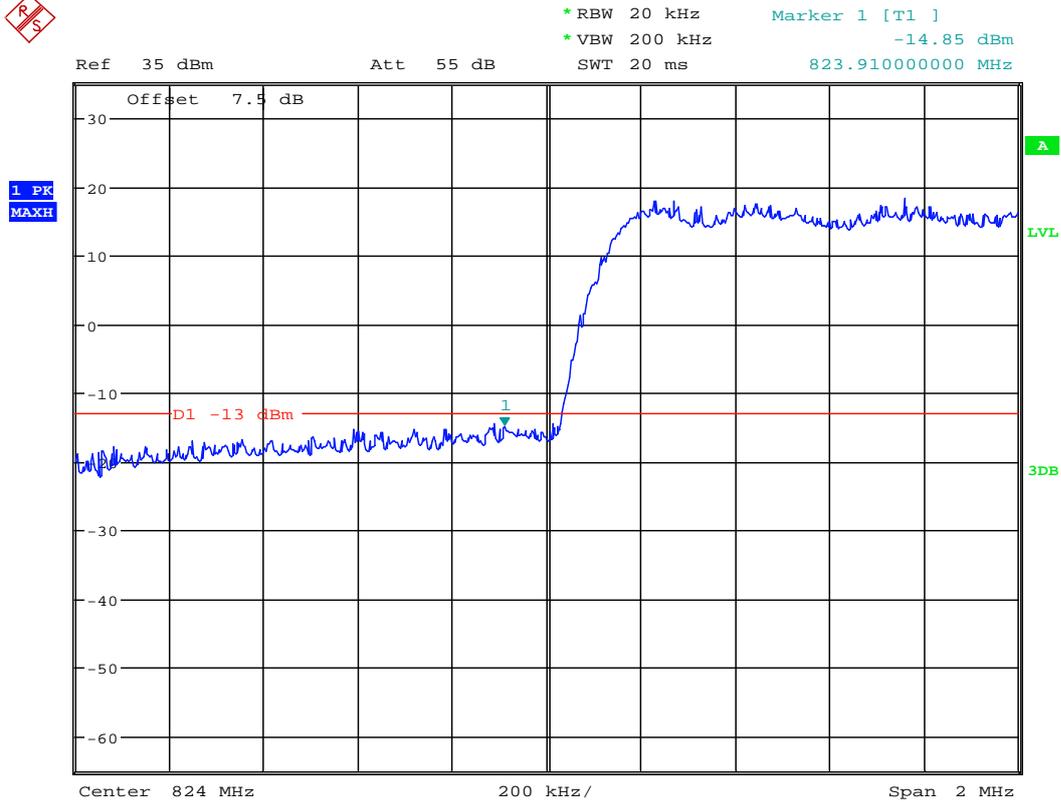


Date: 8.MAR.2011 19:45:23



# EVDO Subtype 2

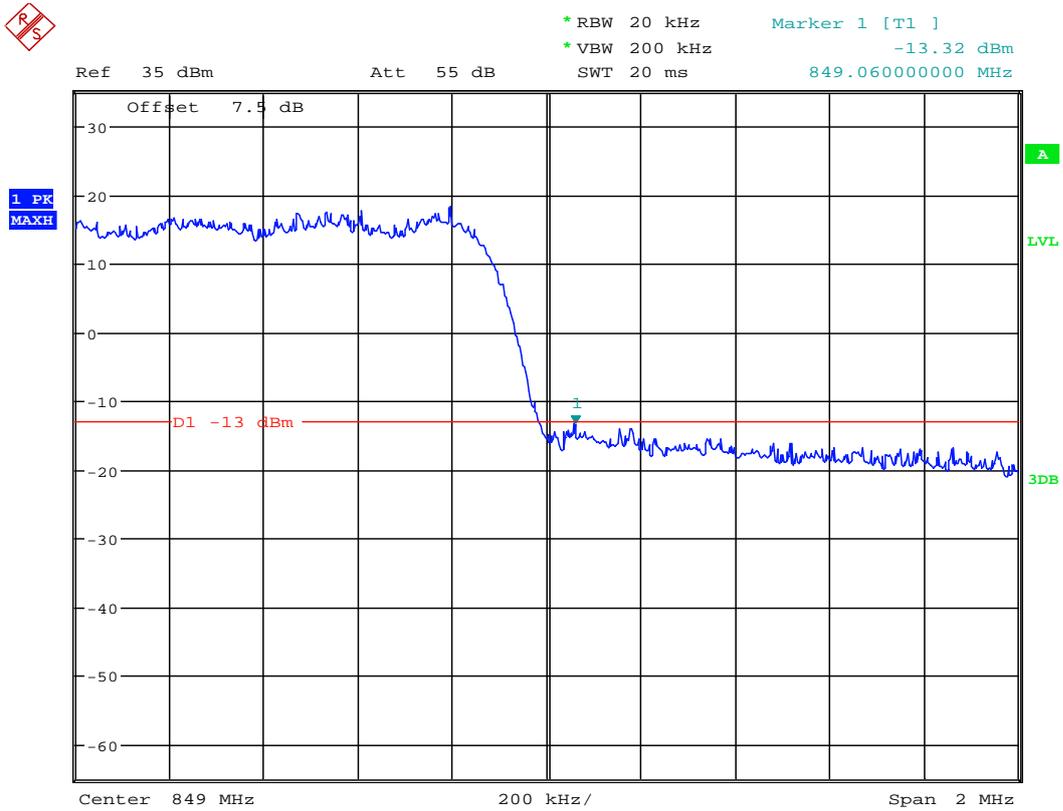
**Modulation: BPSK**  
**Left Edge (824 MHz)**  
**Channel 1013**



Date: 8.MAR.2011 17:57:46



### Right Edge (849MHz) Channel 777

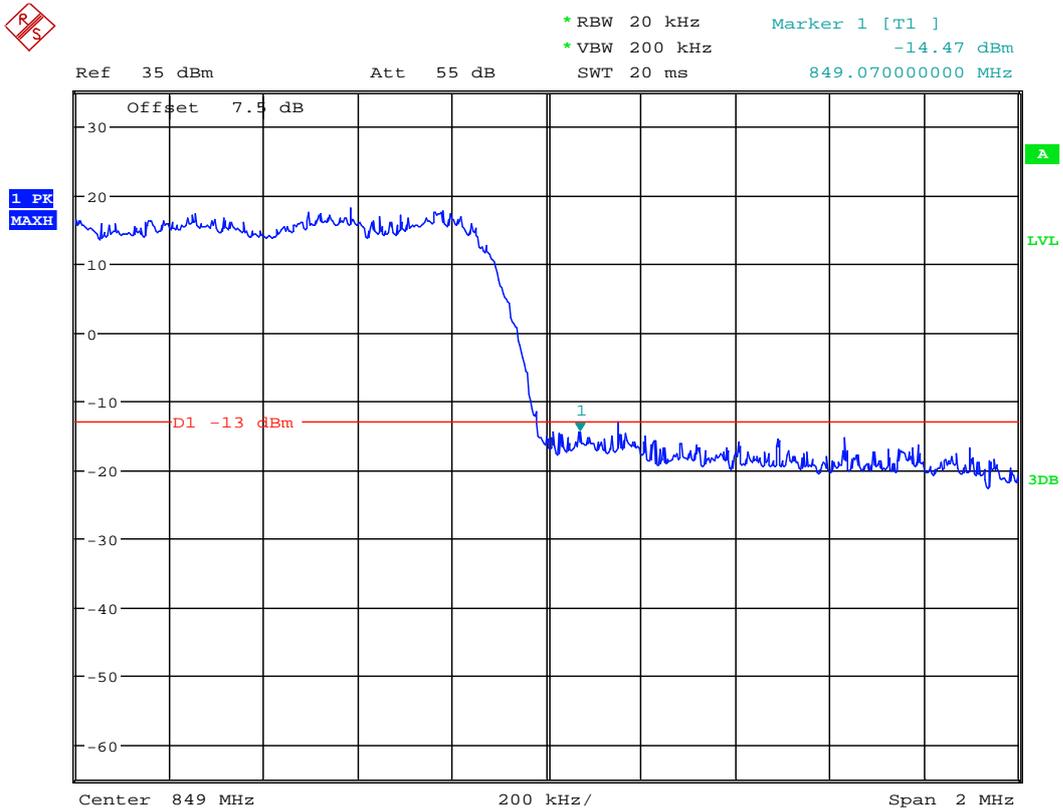


Date: 8.MAR.2011 17:58:00





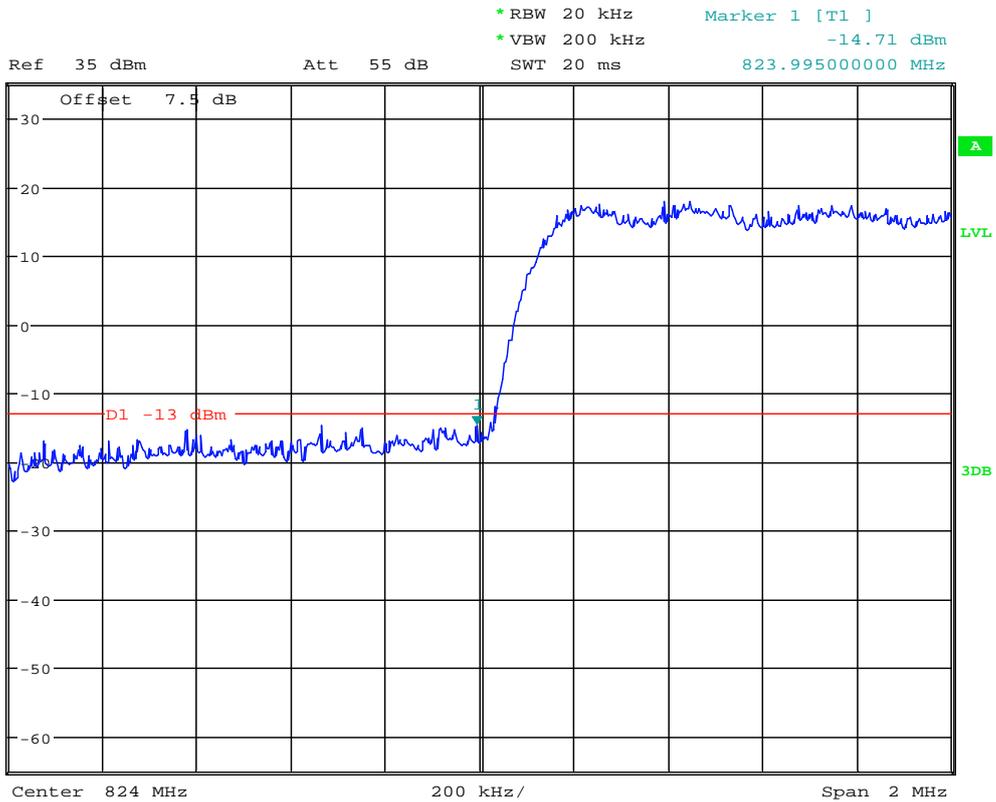
### Right Edge (849MHz) Channel 777



Date: 8.MAR.2011 17:58:28



**Modulation: 8PSK**  
**Left Edge (824 MHz)**  
**Channel 1013**



Date: 8.MAR.2011 17:58:42





## Appendix D

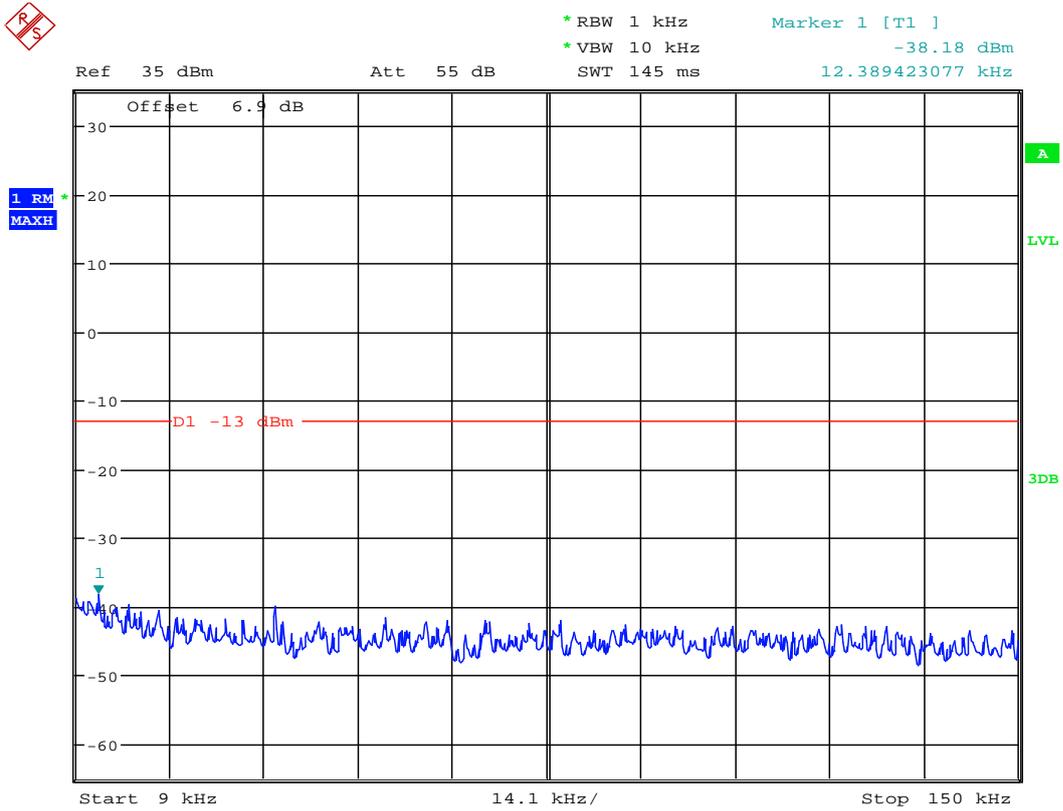
# Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & 22.917

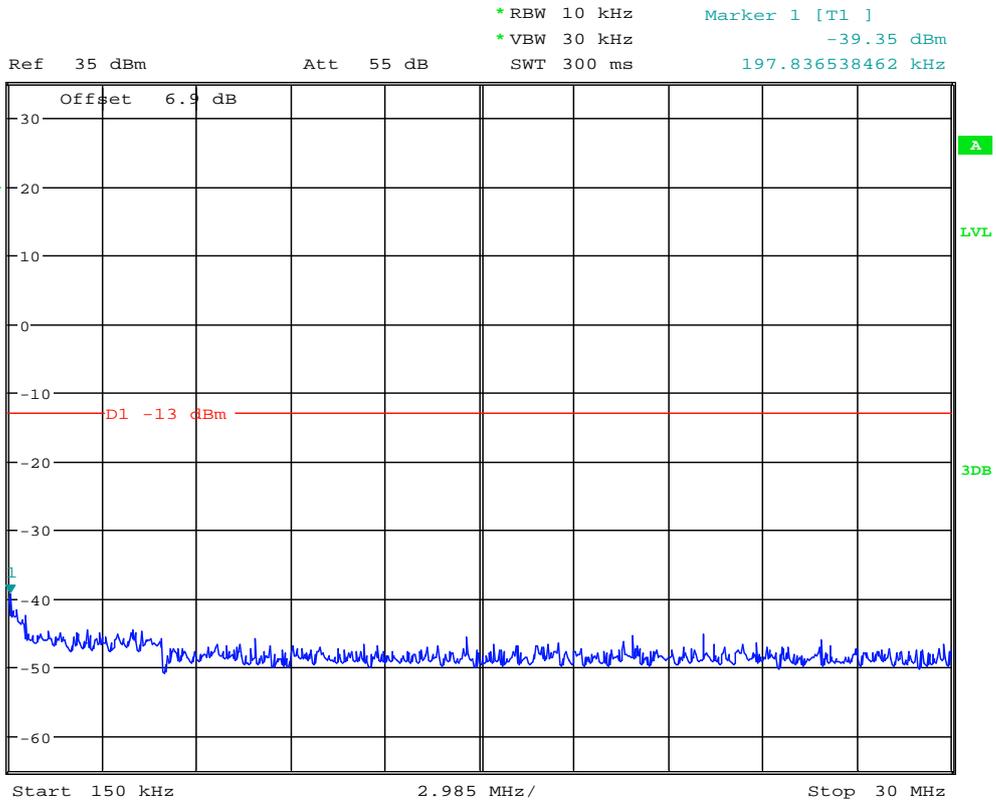


# TM1

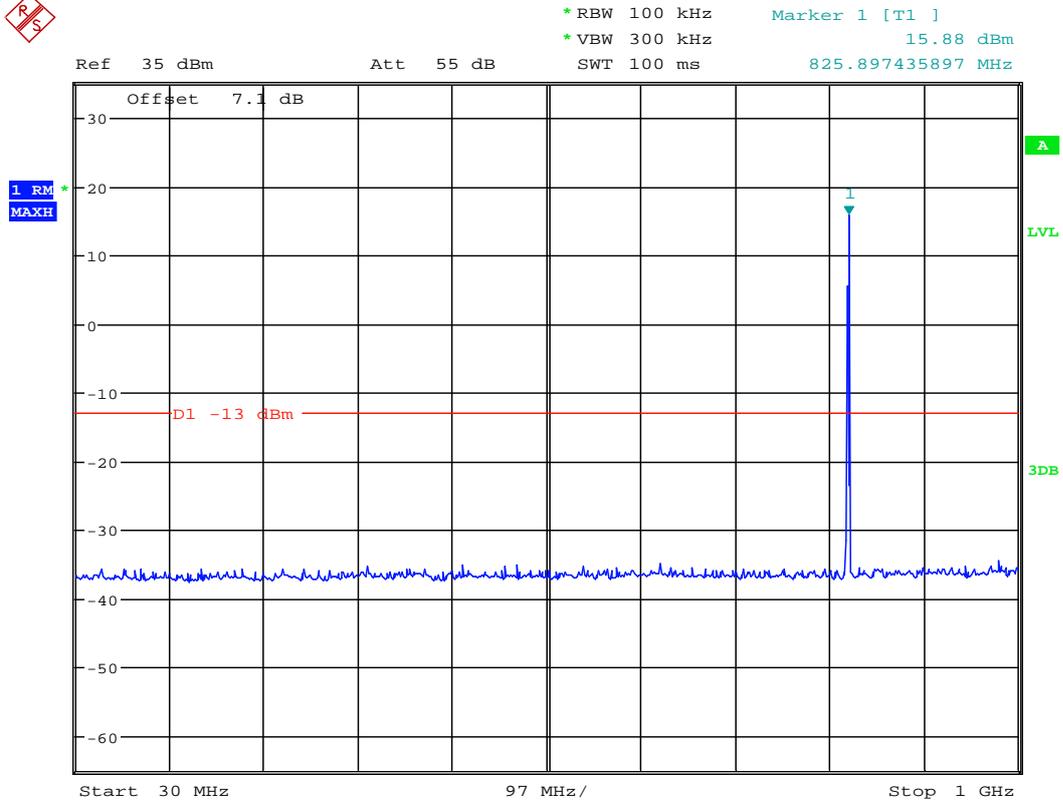
## Channel 1013



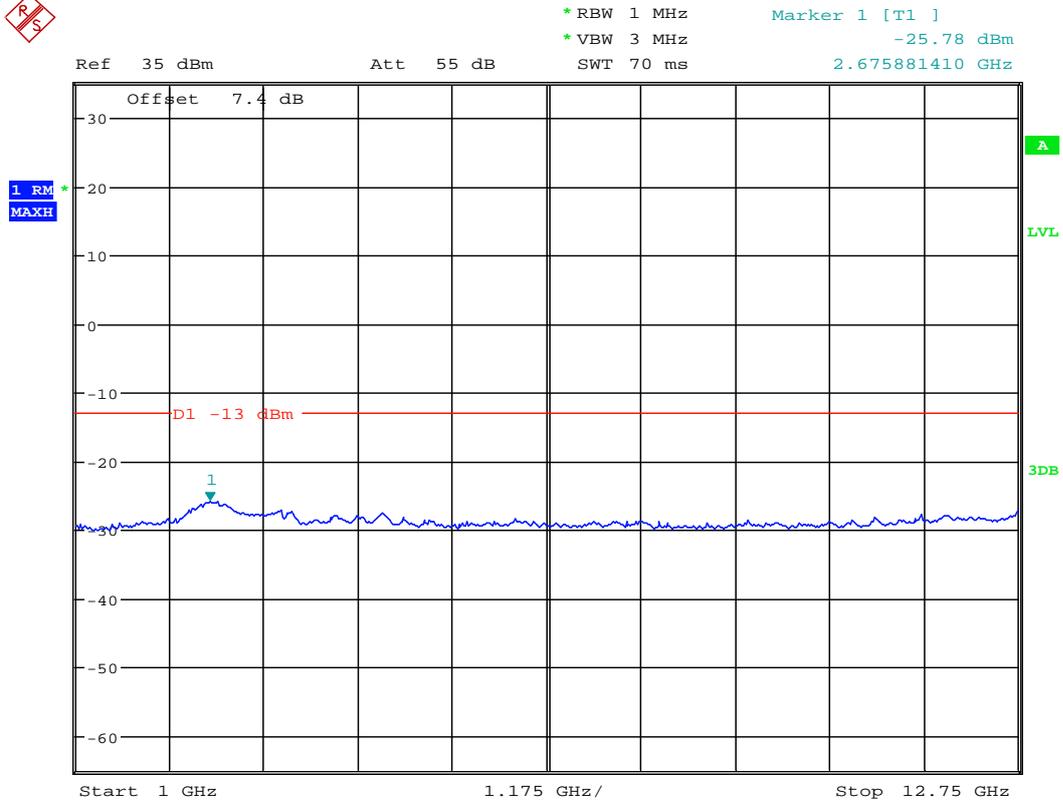
Date: 7.MAR.2011 00:16:01



Date: 7.MAR.2011 00:16:26



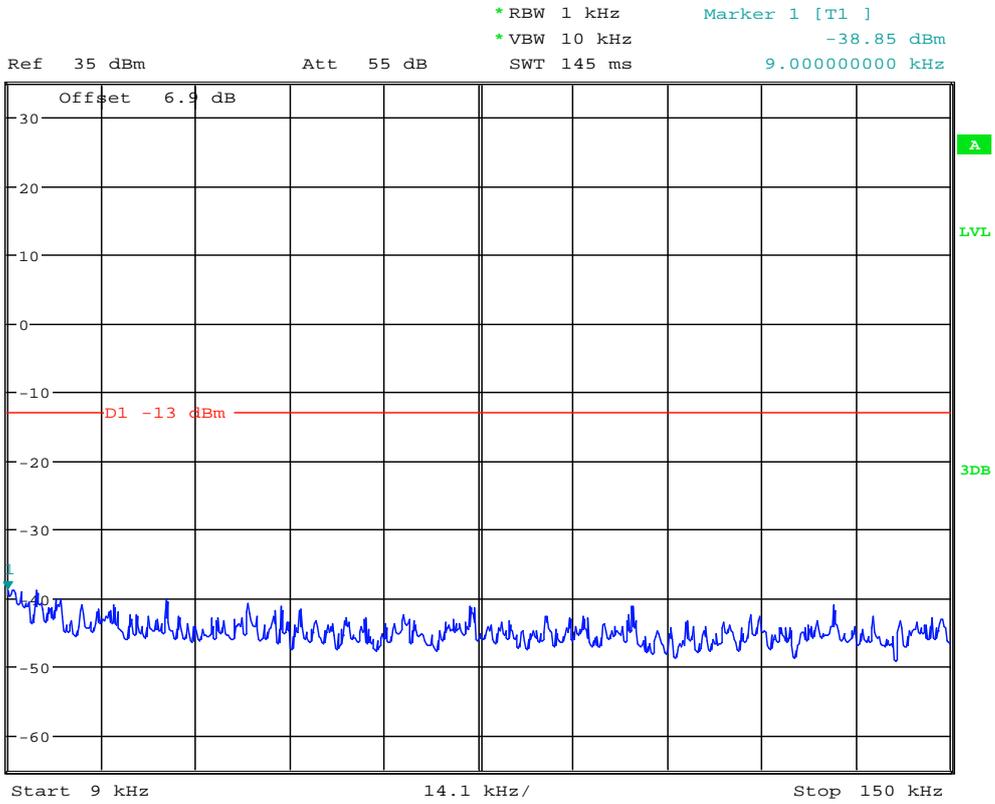
Date: 7.MAR.2011 00:16:52



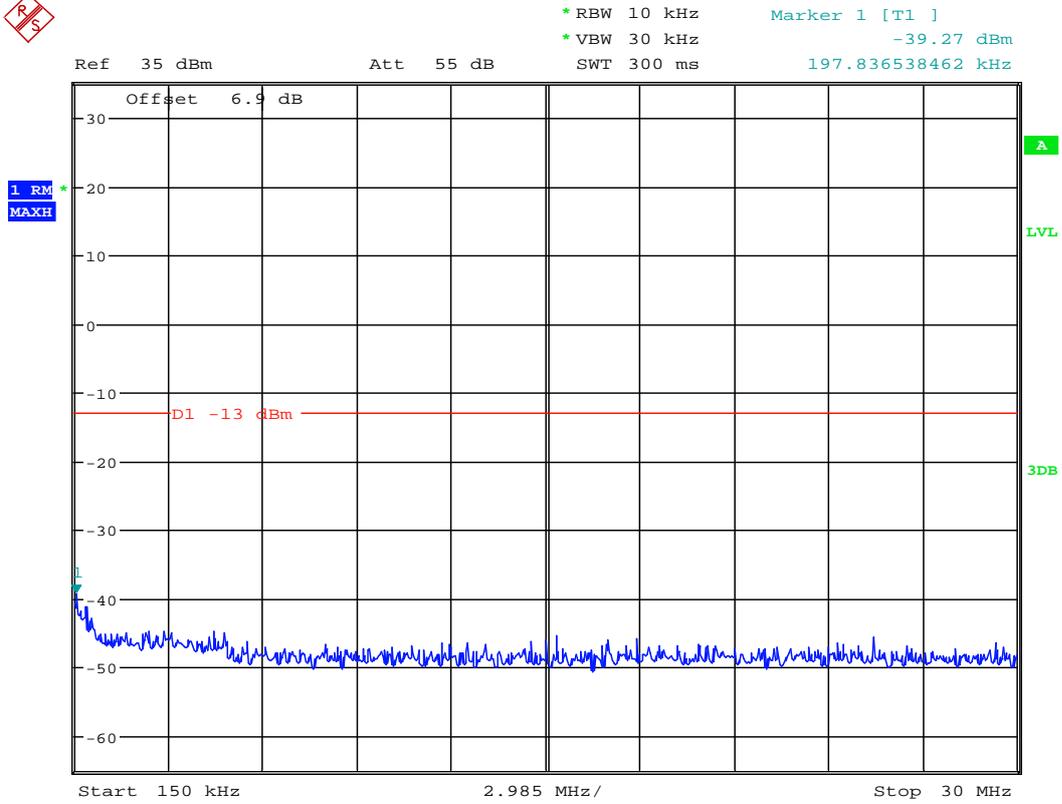
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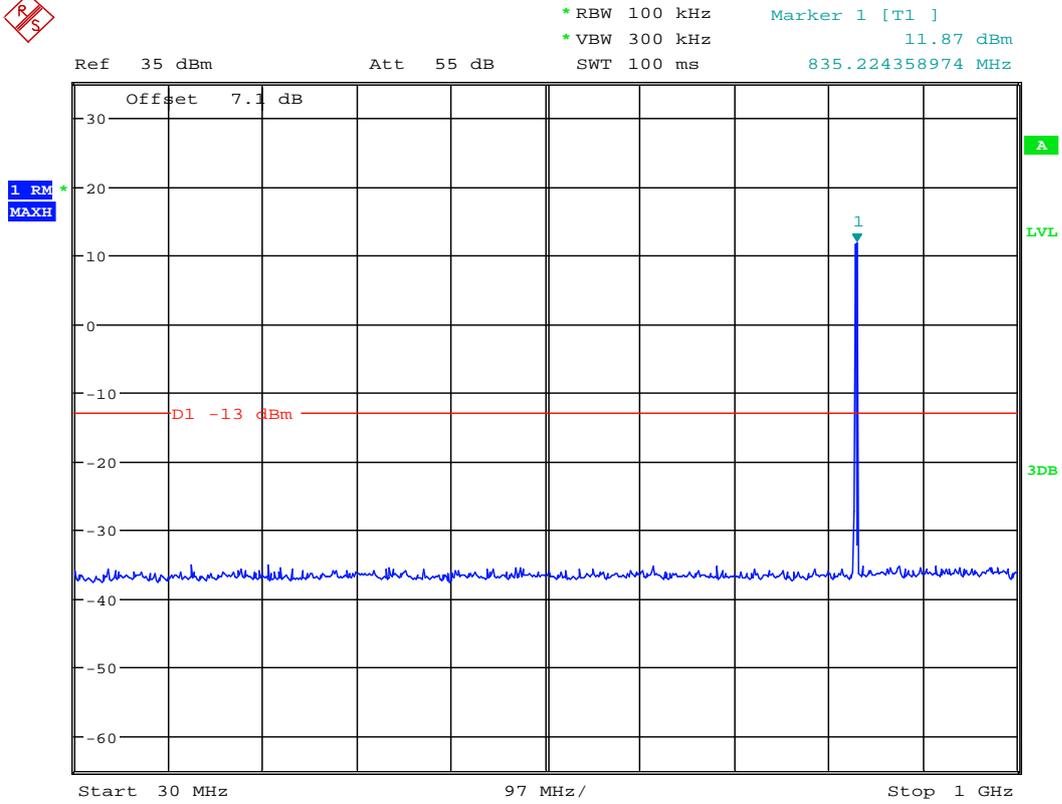
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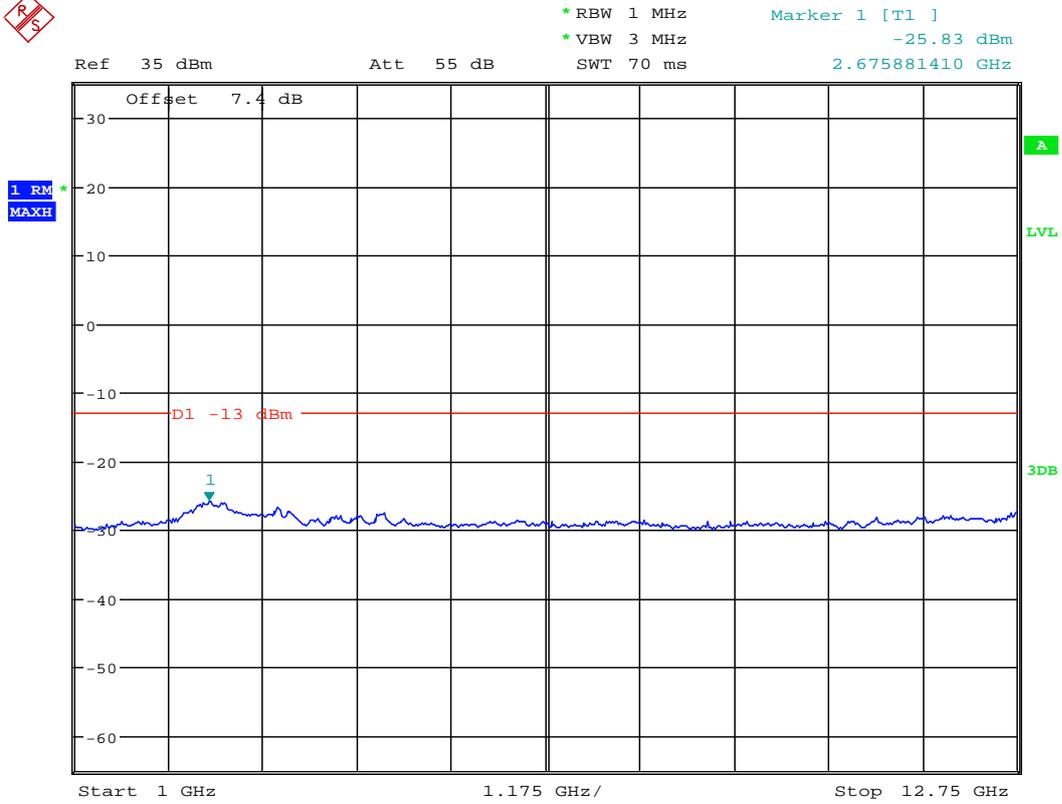
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Date: 7.MAR.2011 00:16:35



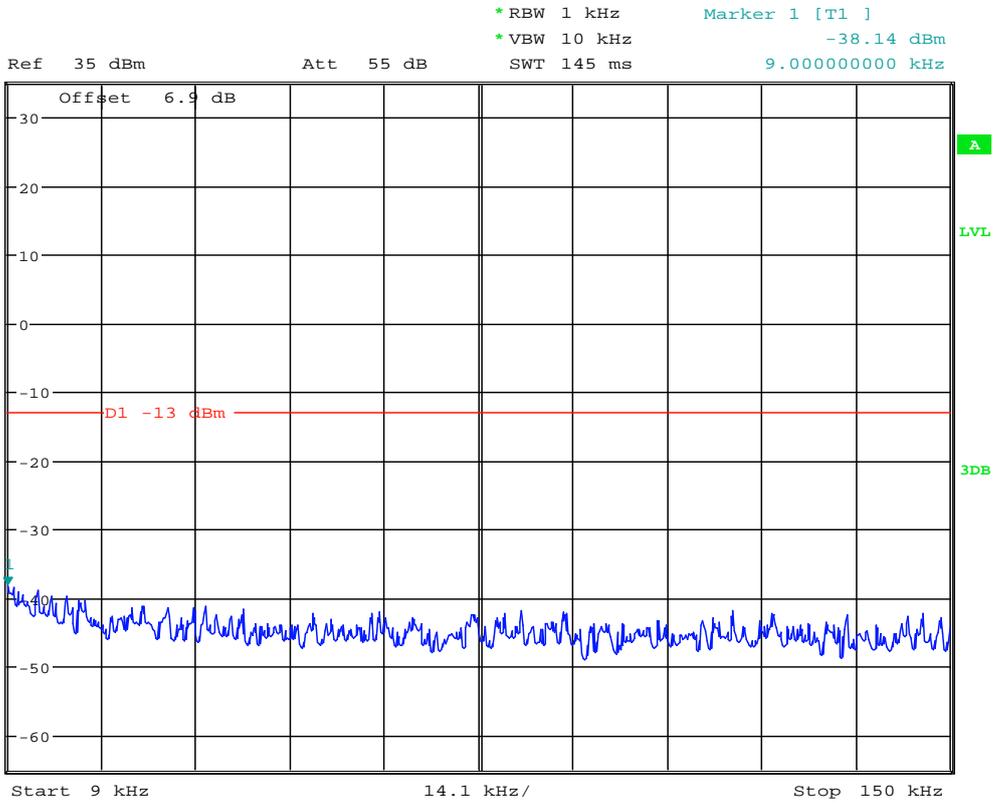
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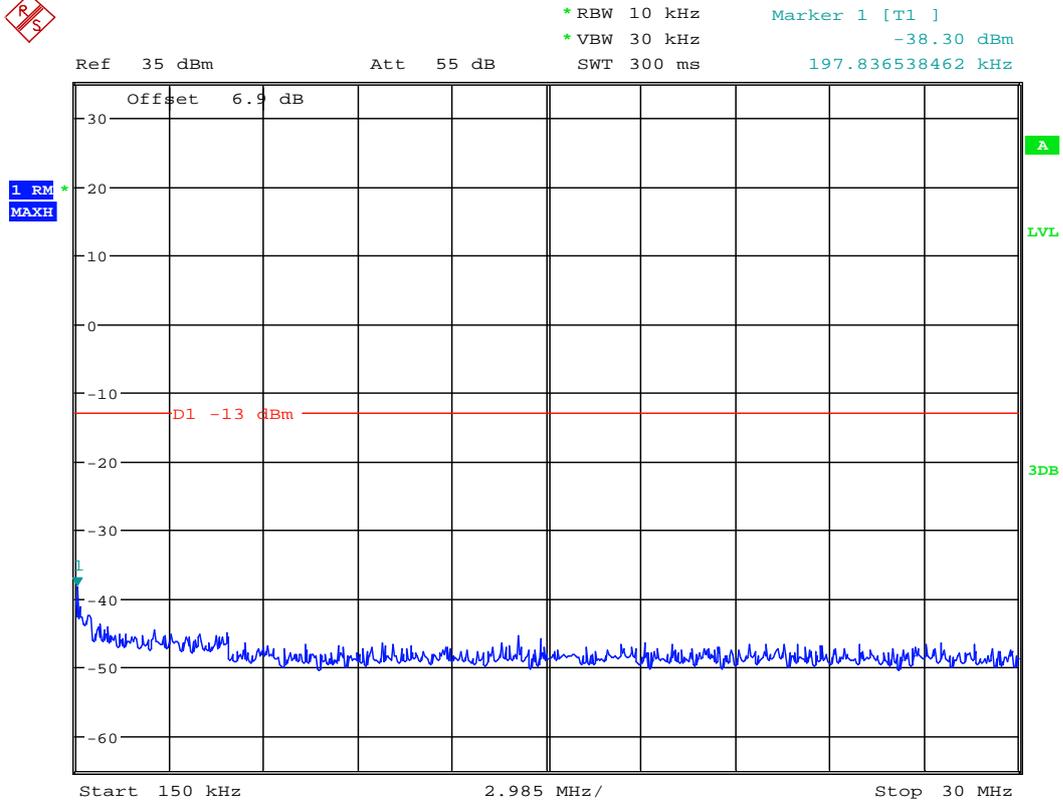
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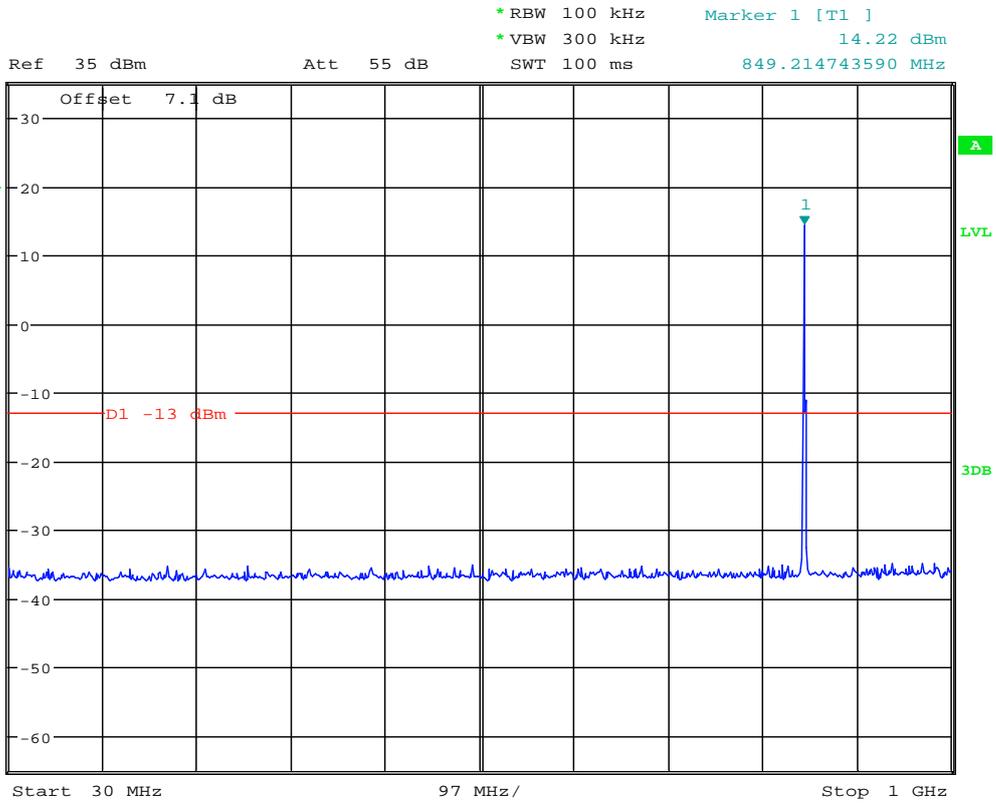
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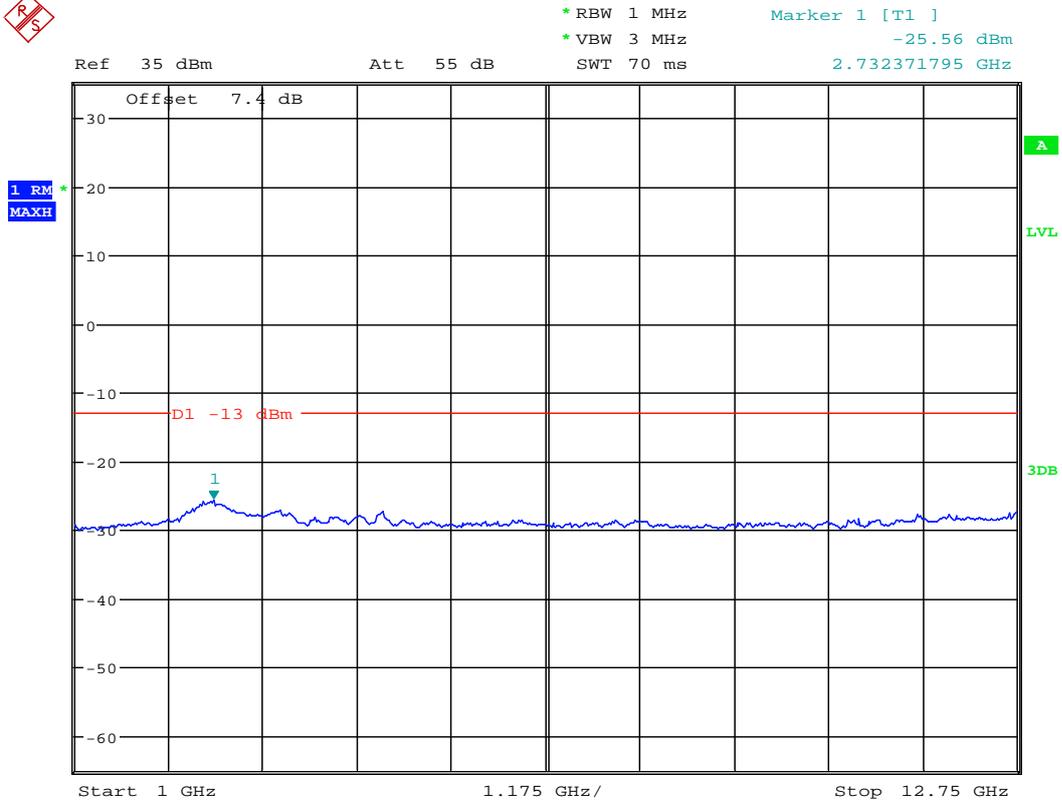
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Date: 7.MAR.2011 00:16:43



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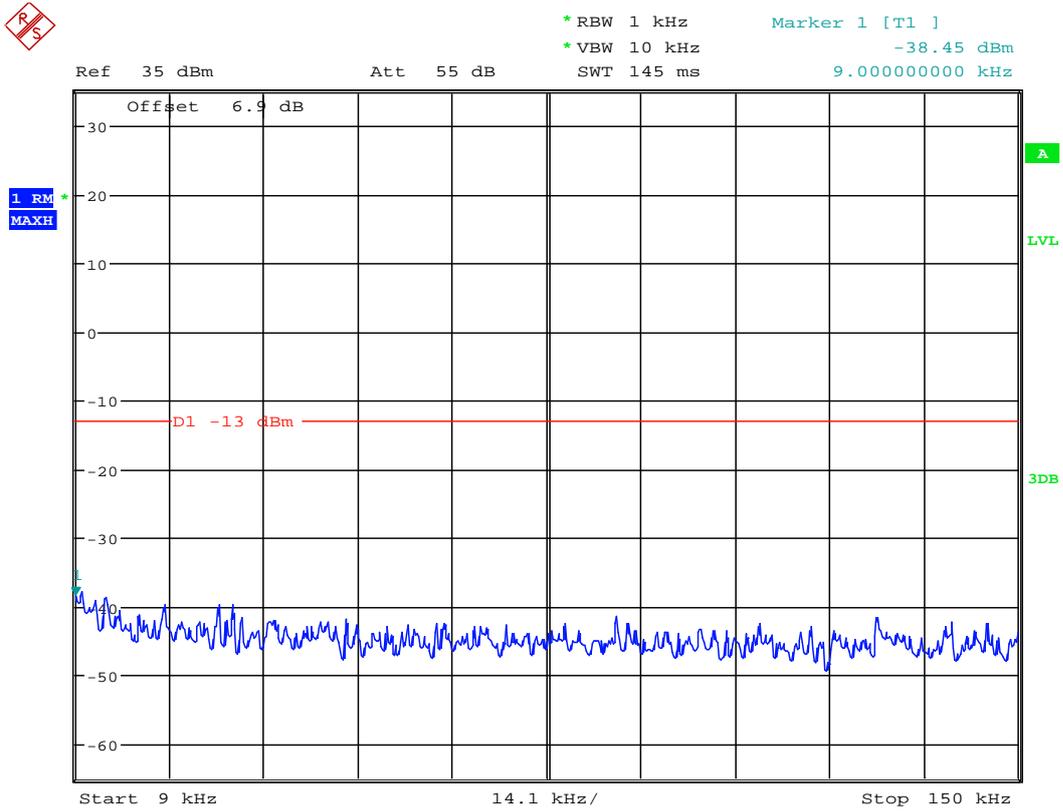


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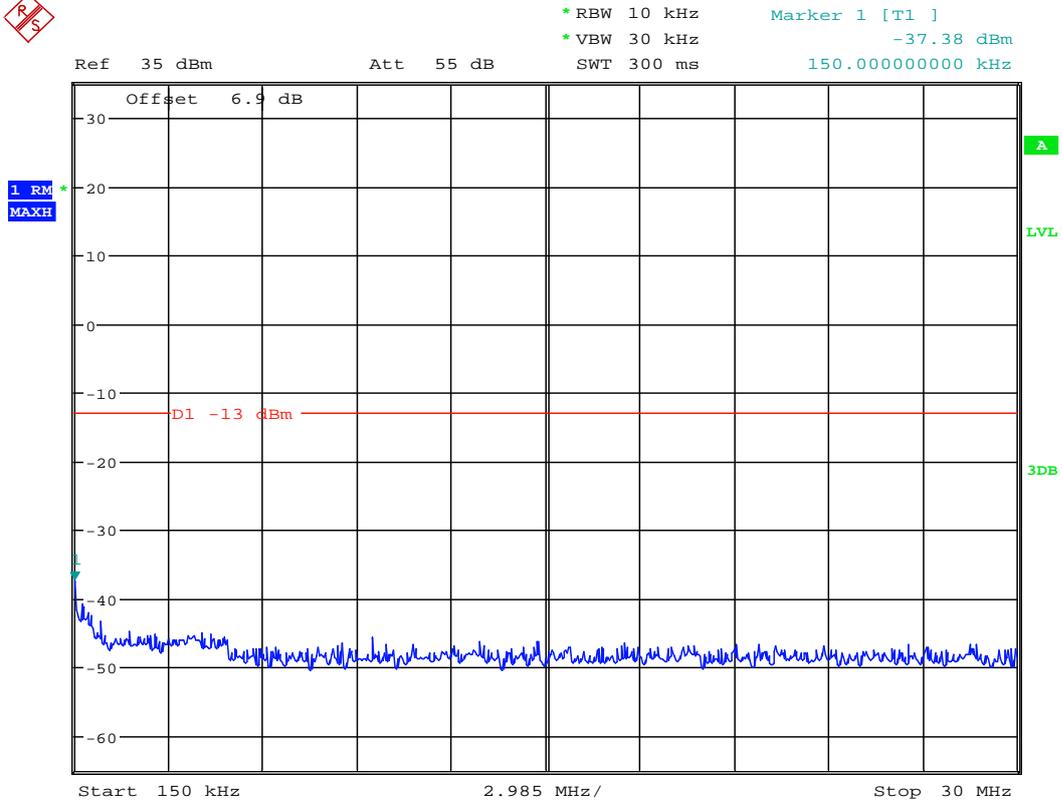


### TM3

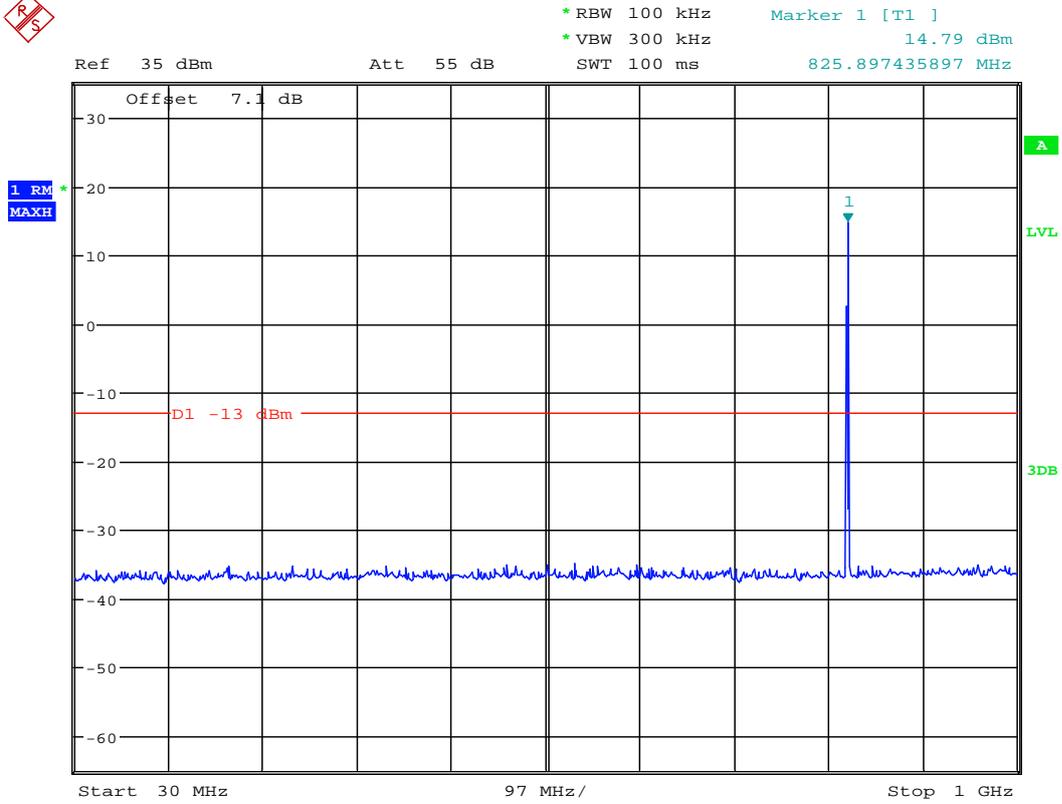
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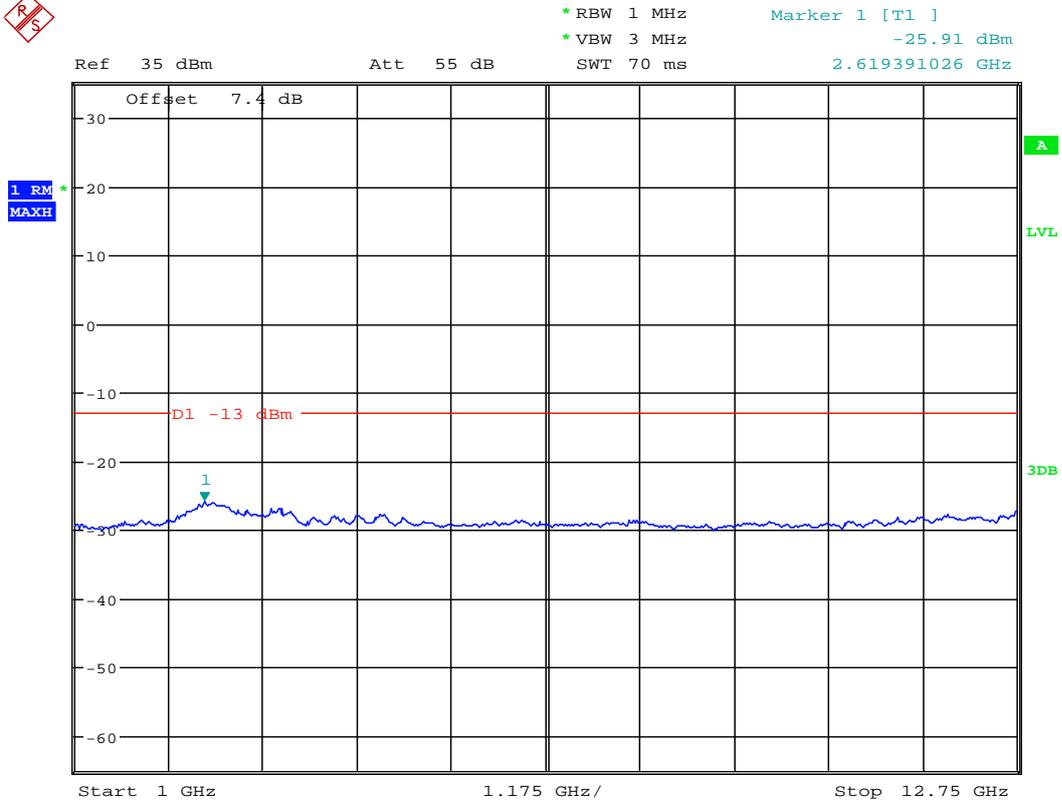
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Date: 7.MAR.2011 00:18:11



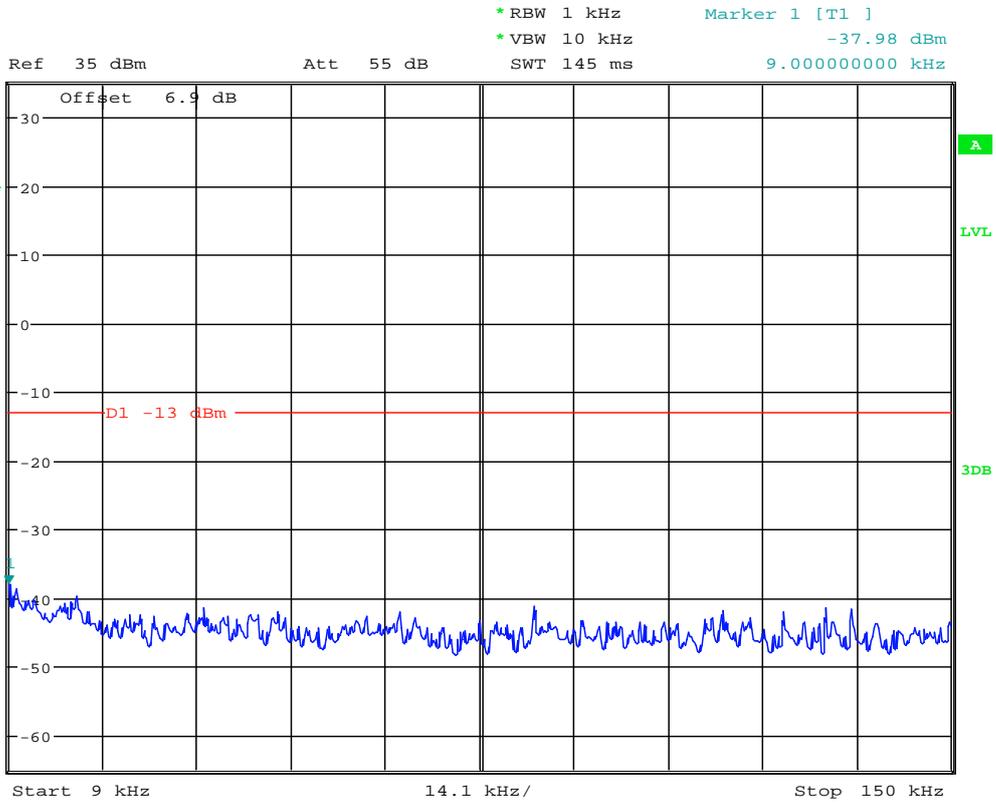
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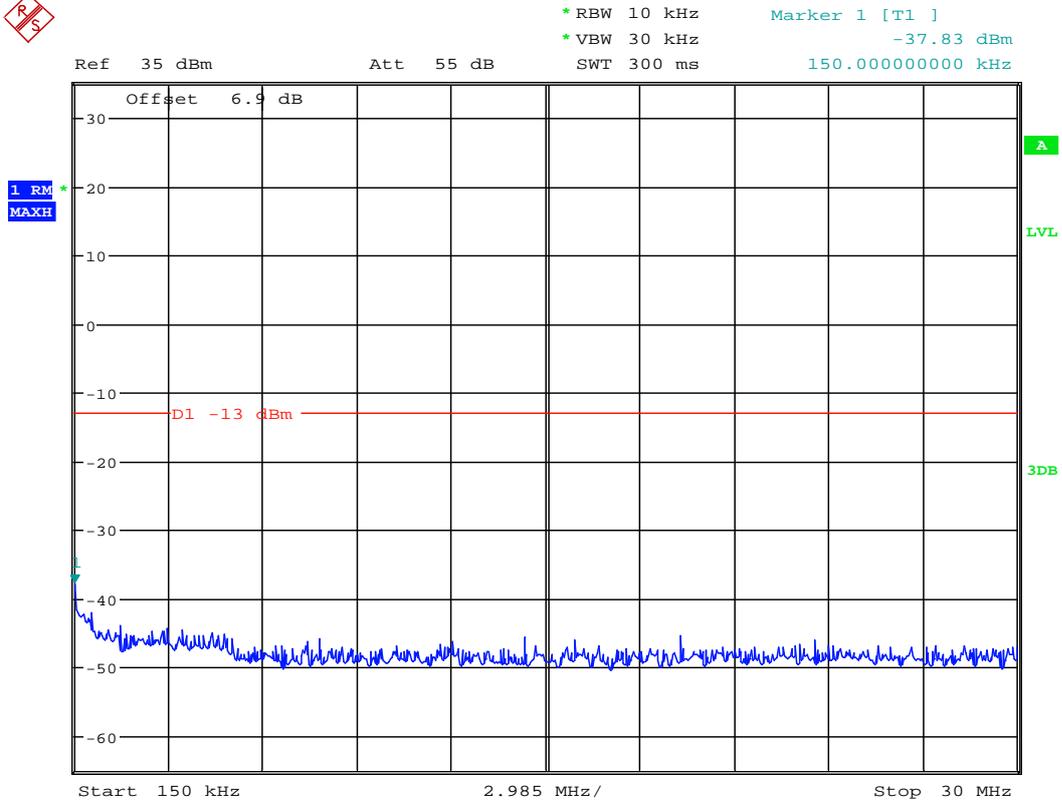
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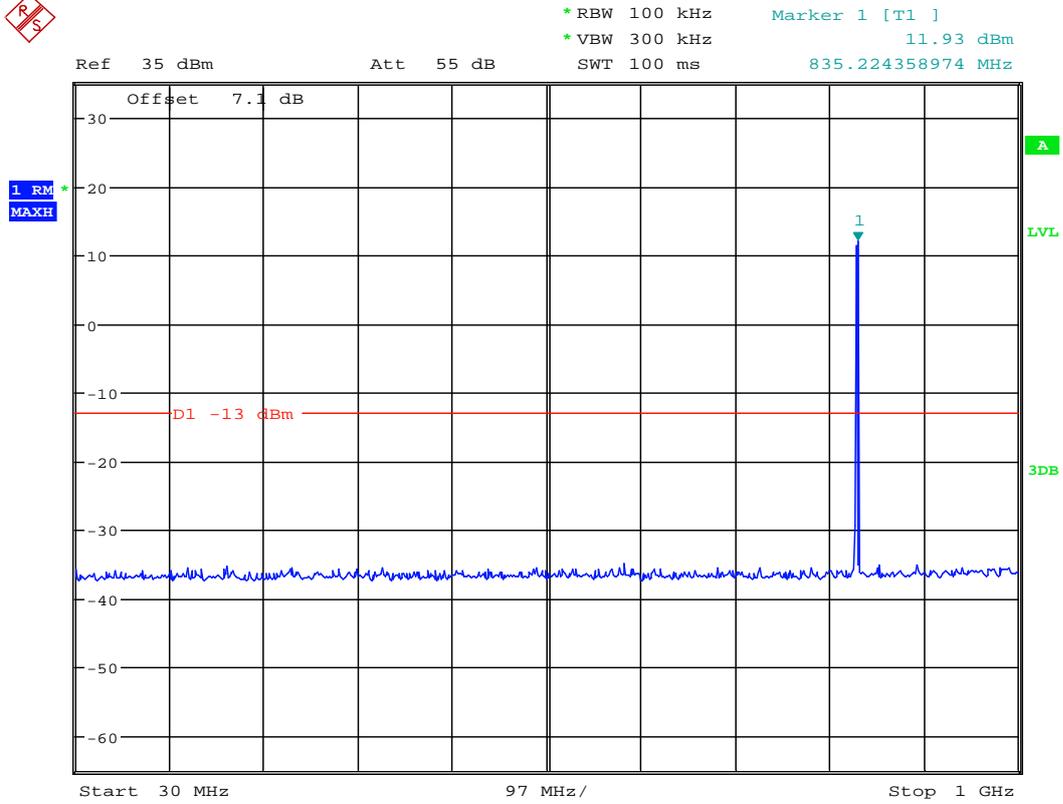
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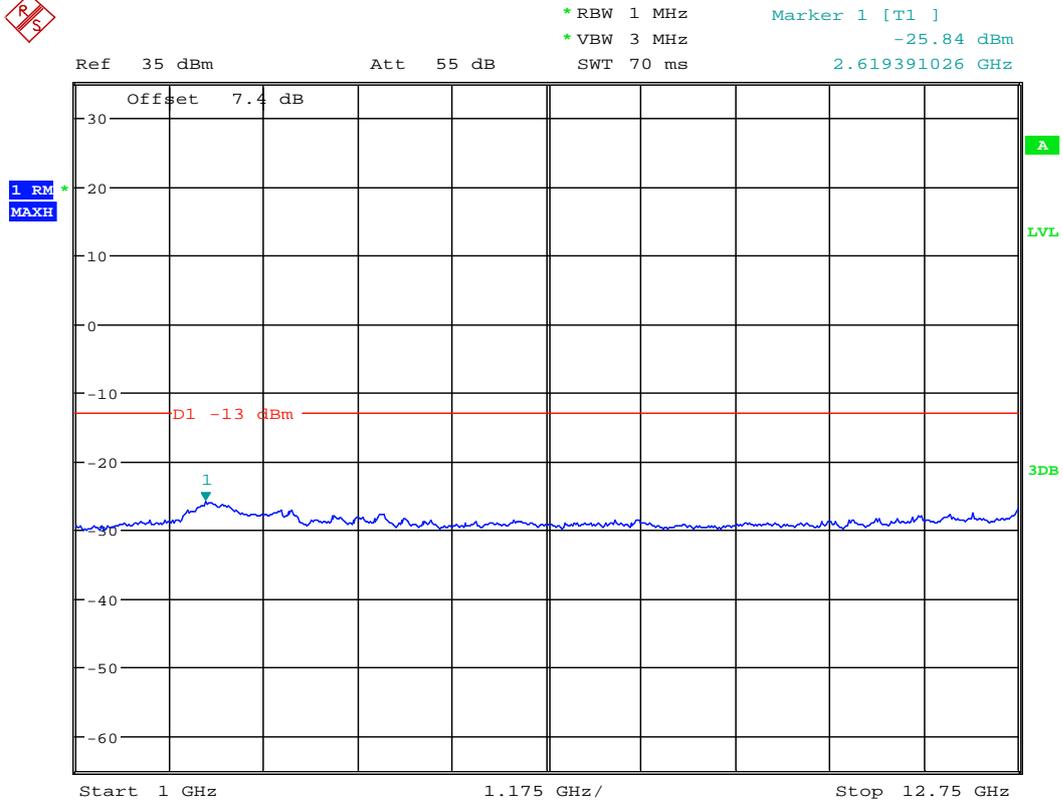
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Date: 7.MAR.2011 00:18:20



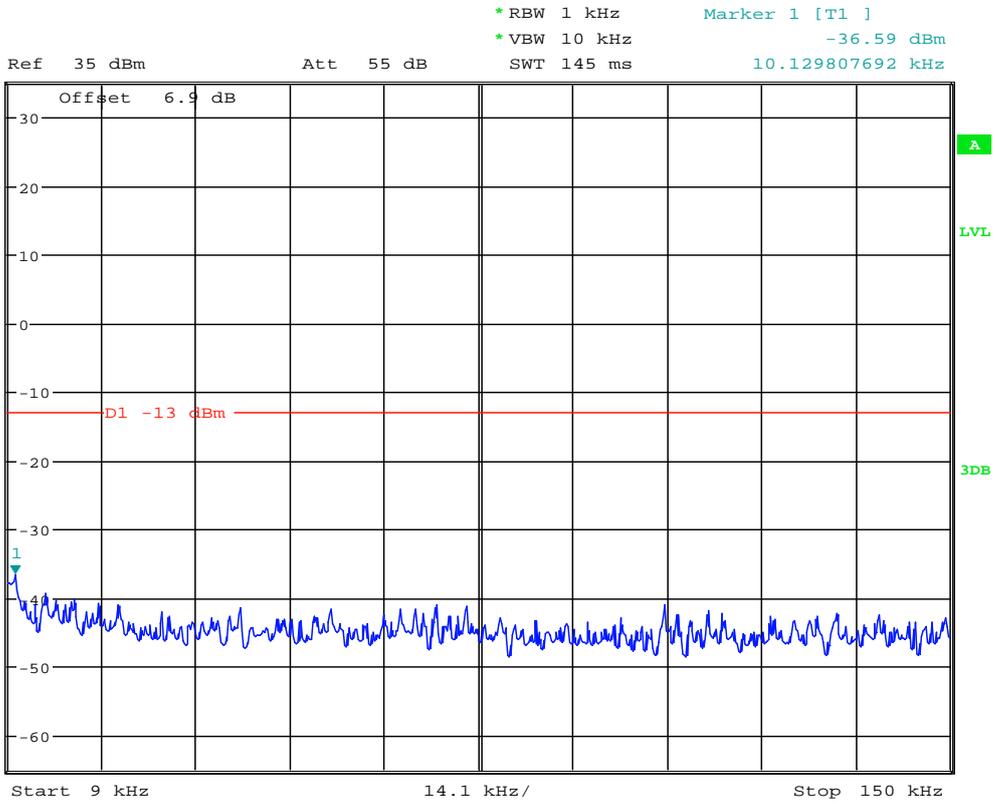
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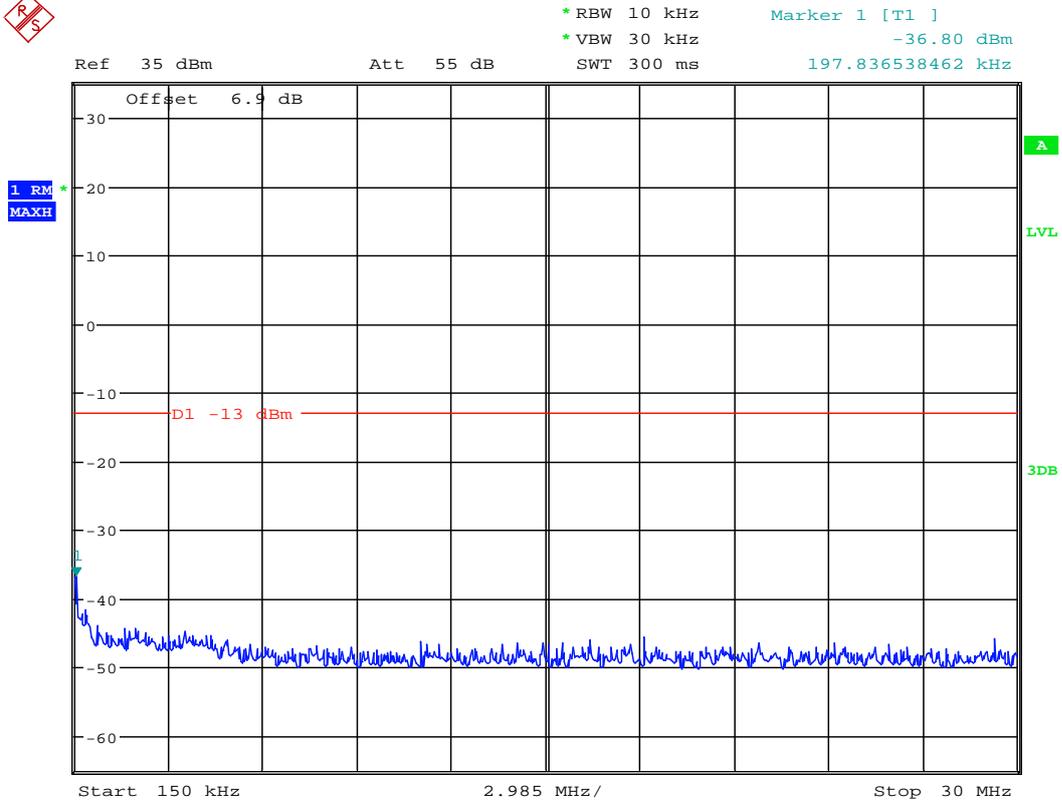
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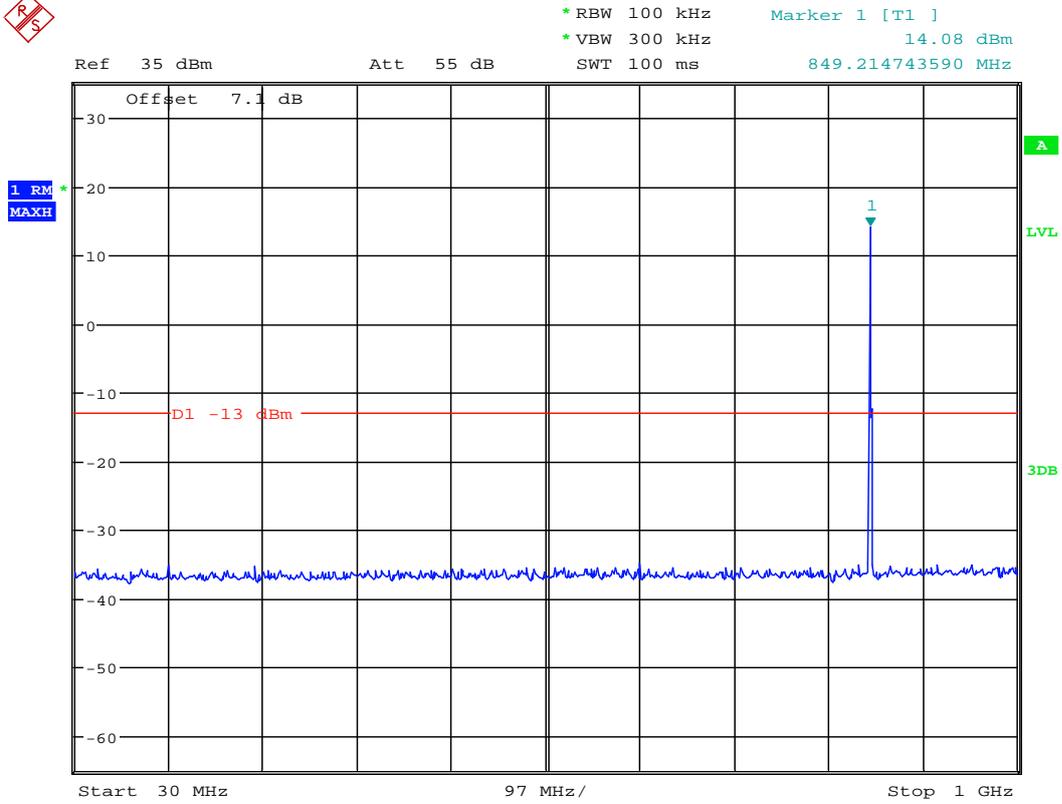
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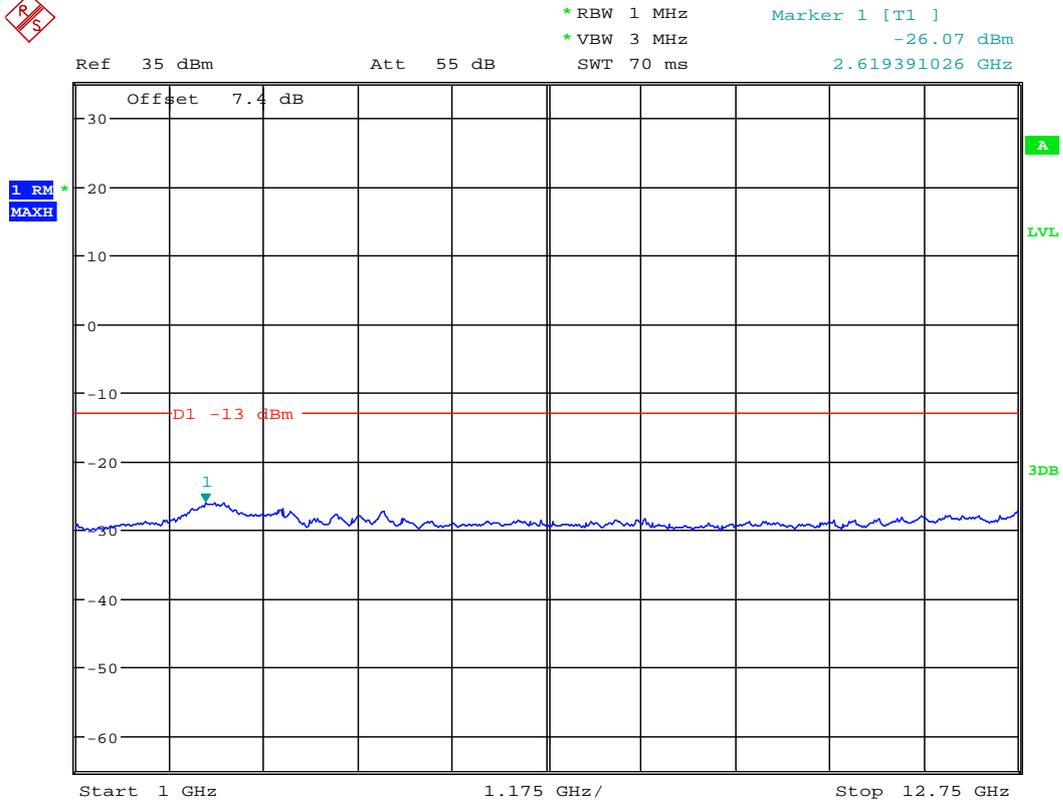
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Date: 7.MAR.2011 00:18:28



Date: 7.MAR.2011 00:18:54

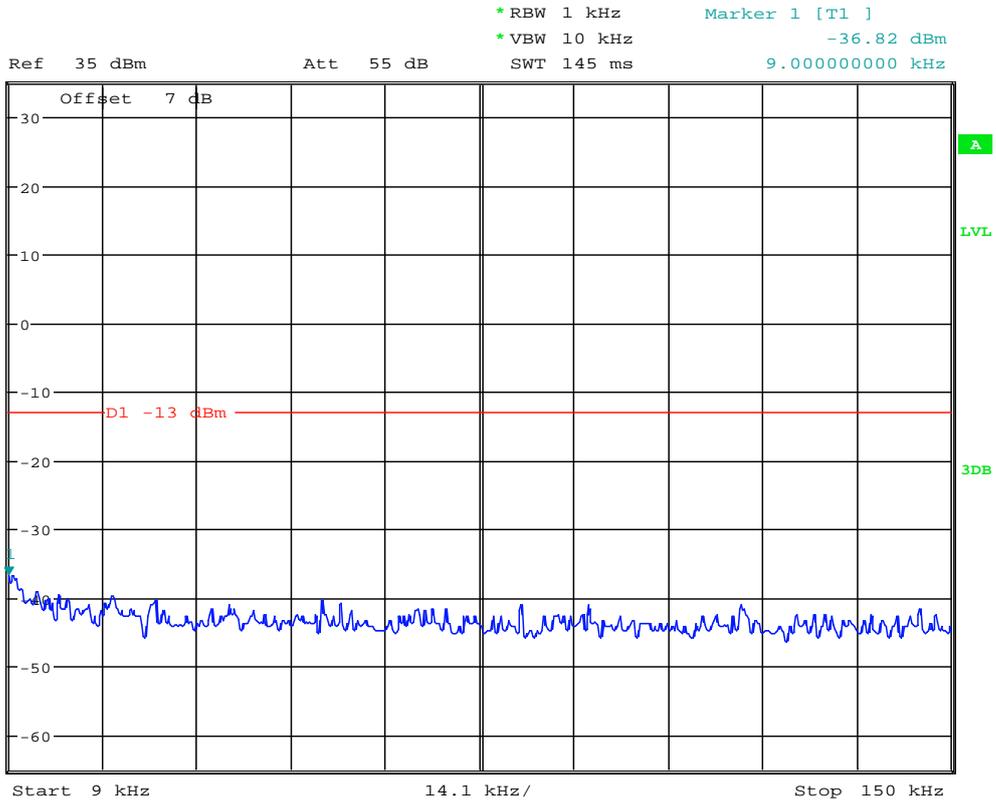


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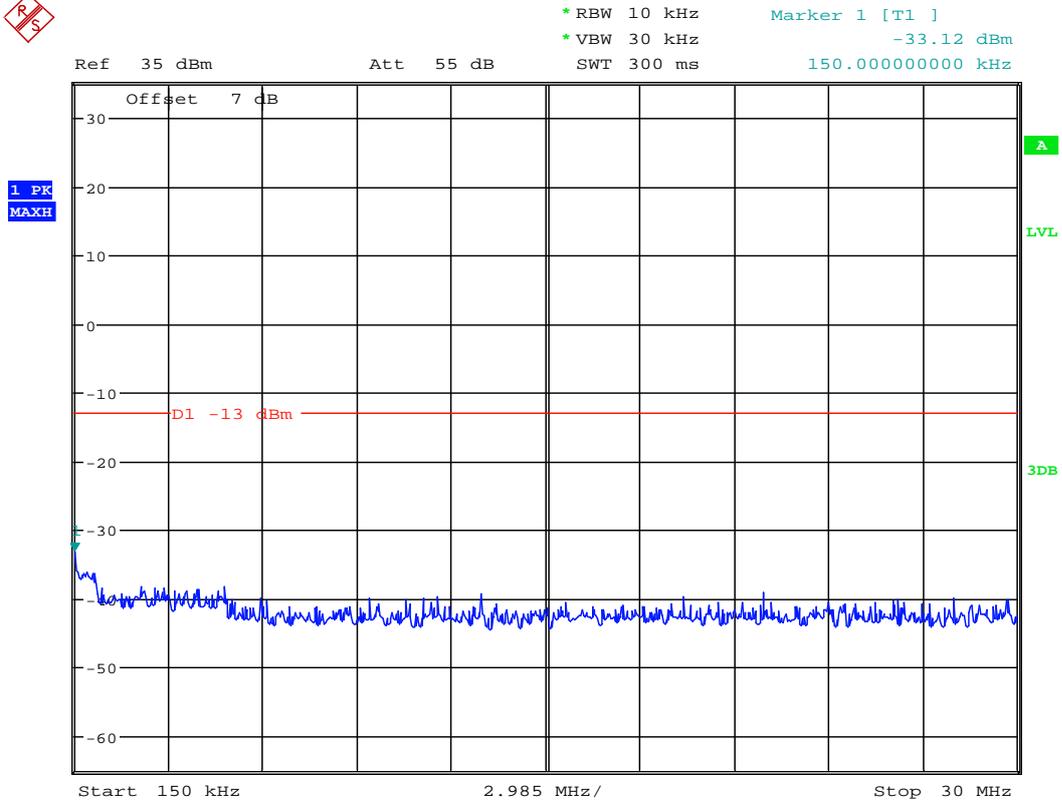


# EVDO subtype 0

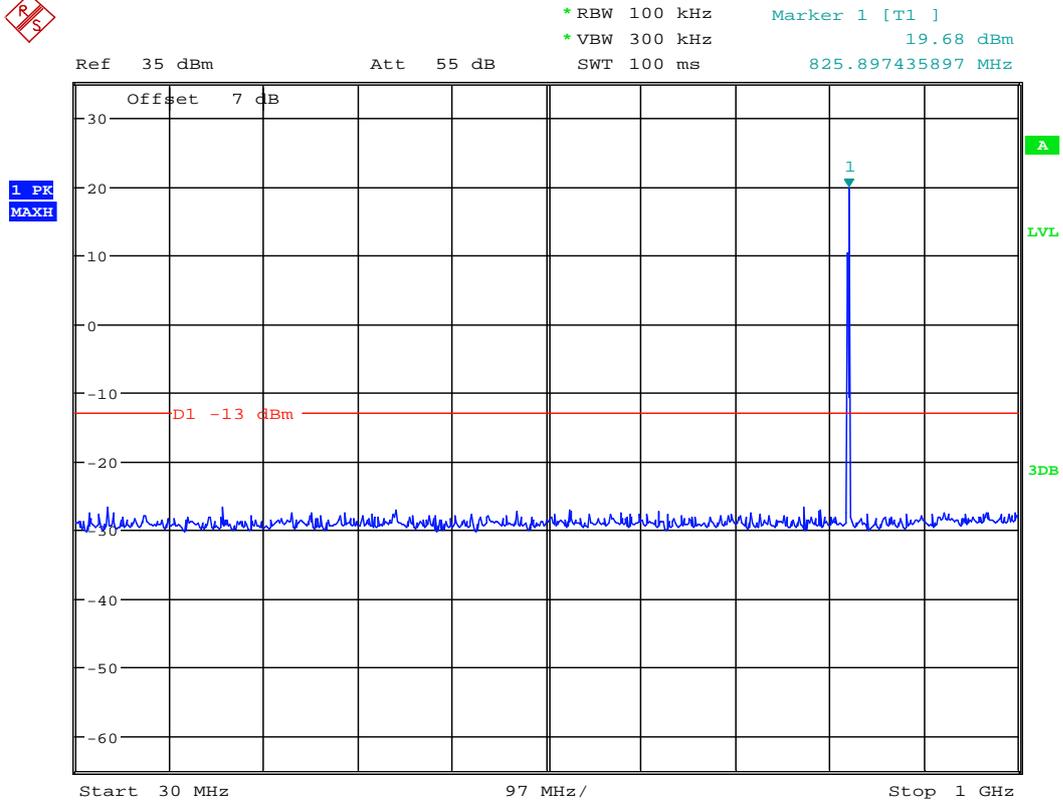
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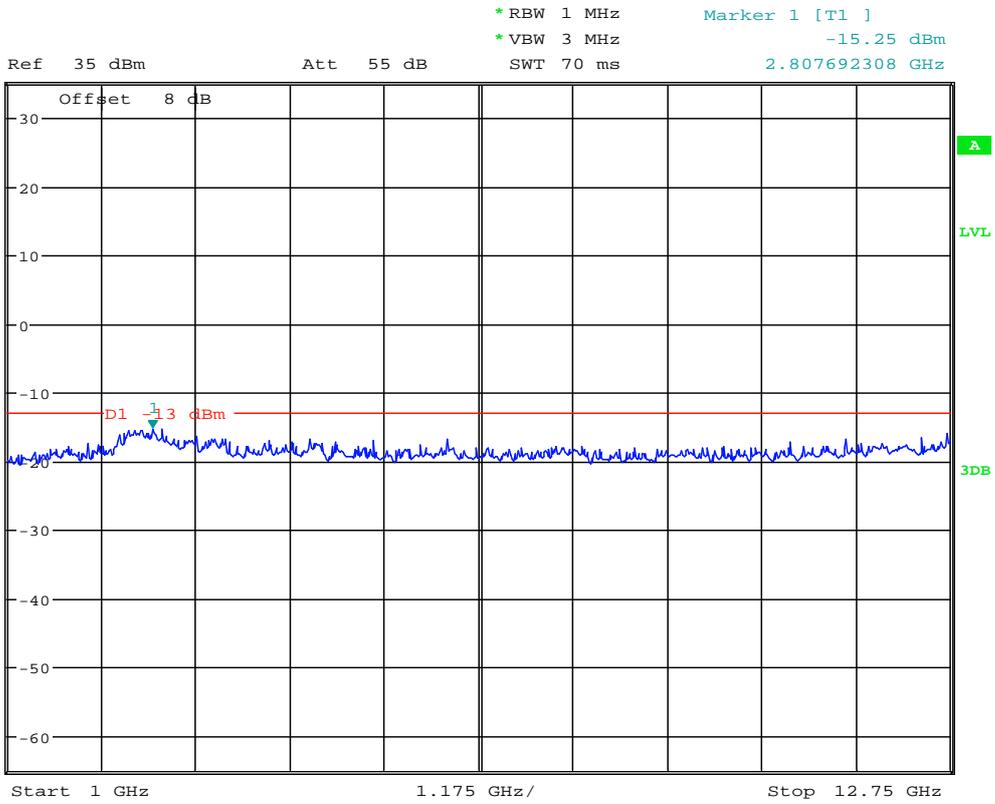
Date: 8.MAR.2011 19:46:33



Date: 8.MAR.2011 19:47:17



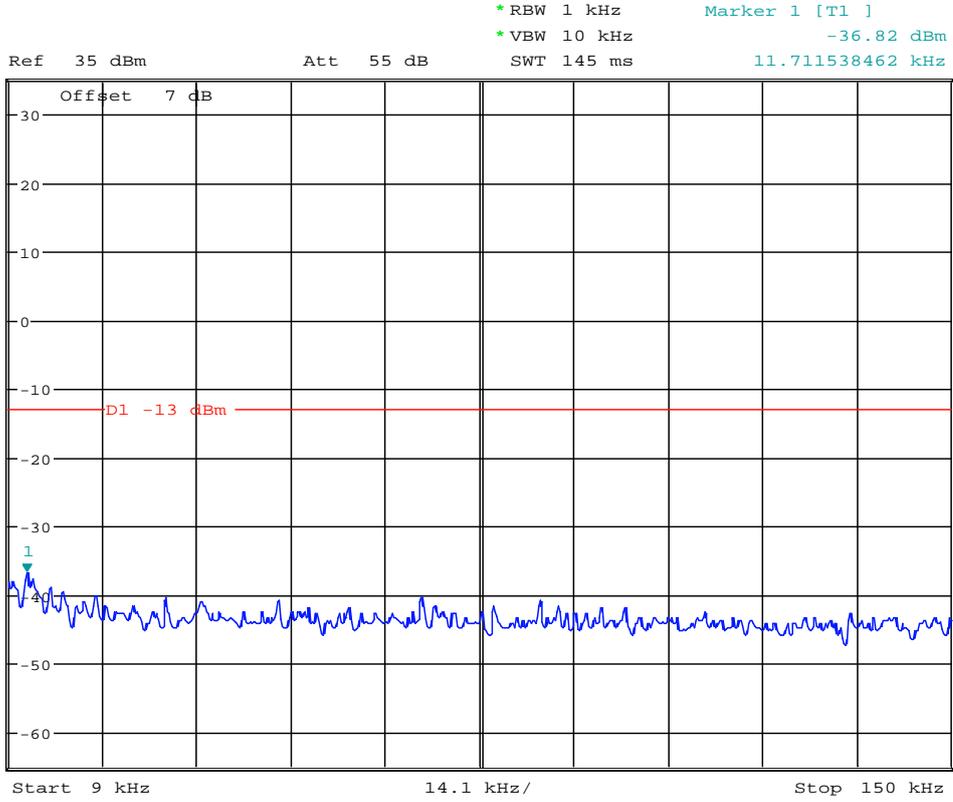
Date: 8.MAR.2011 19:48:01



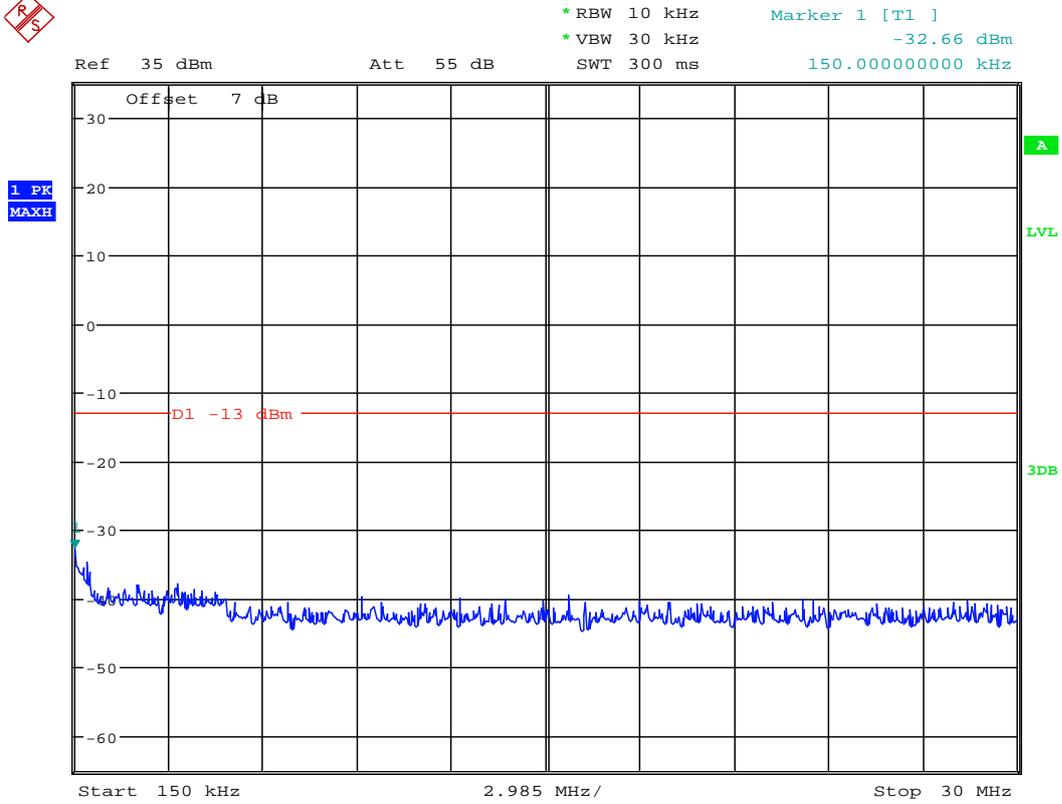
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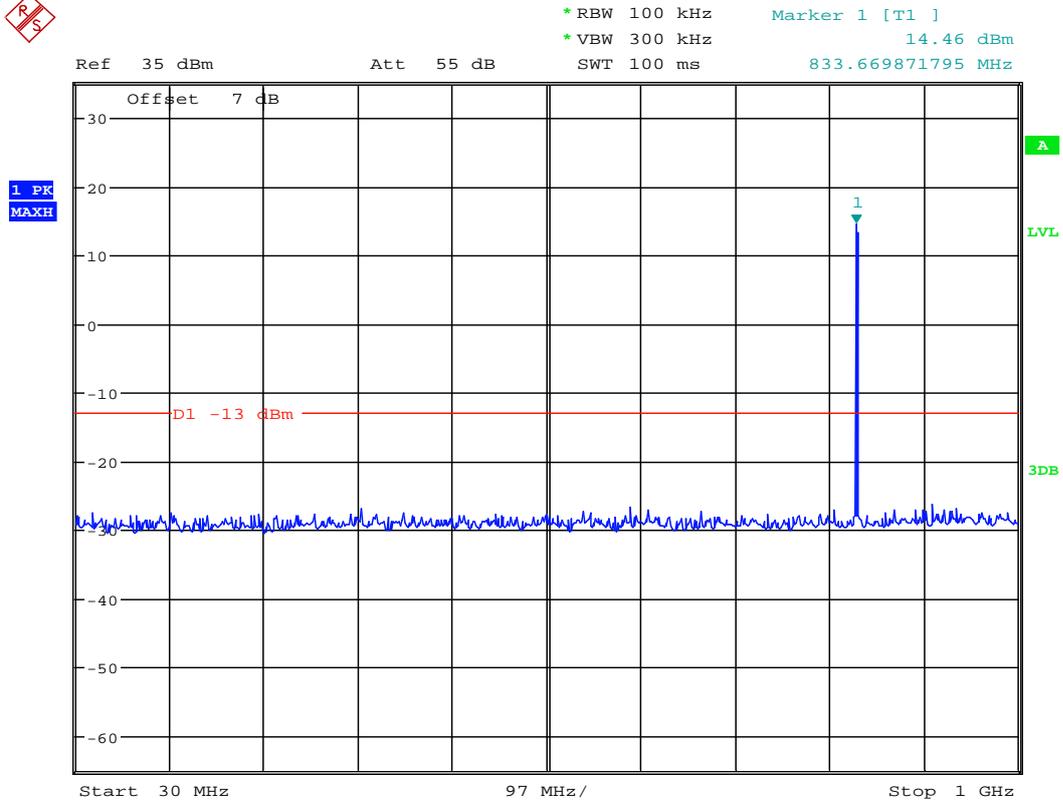
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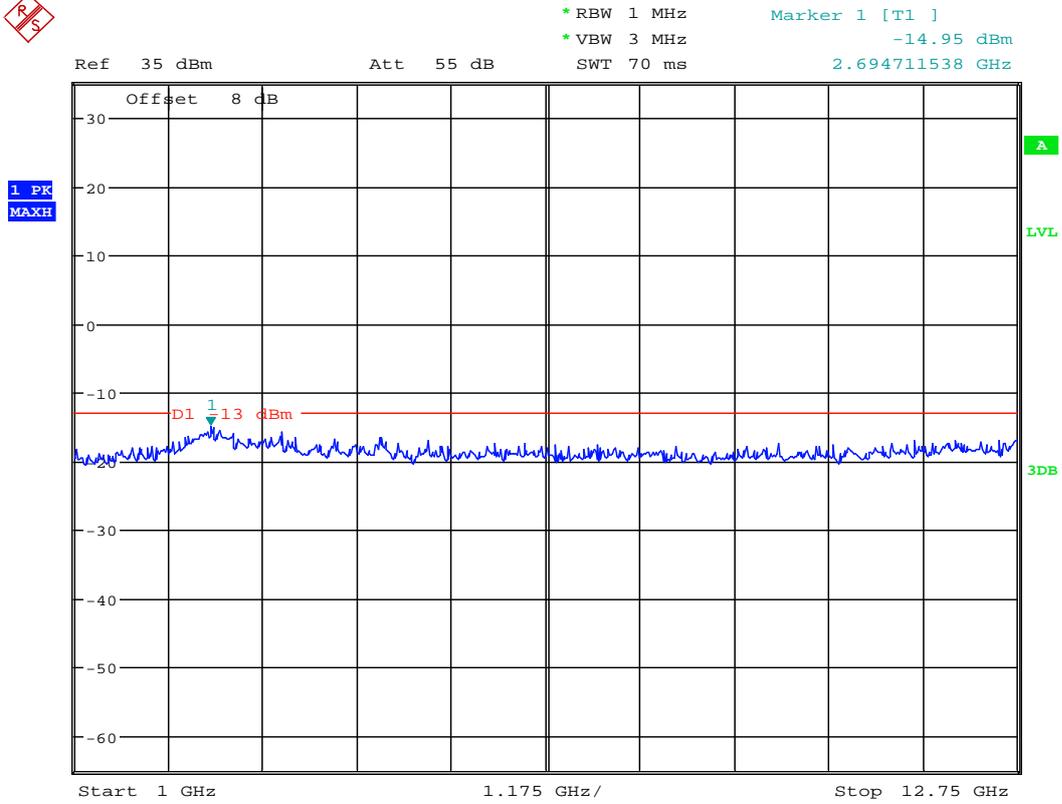
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Date: 8.MAR.2011 19:47:32



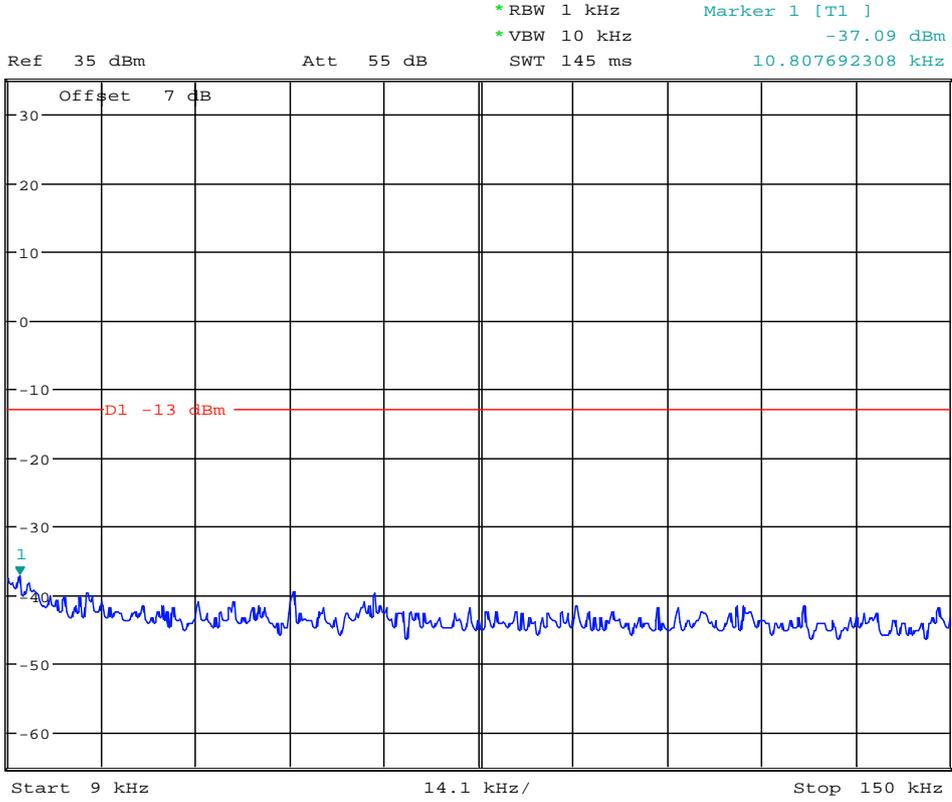
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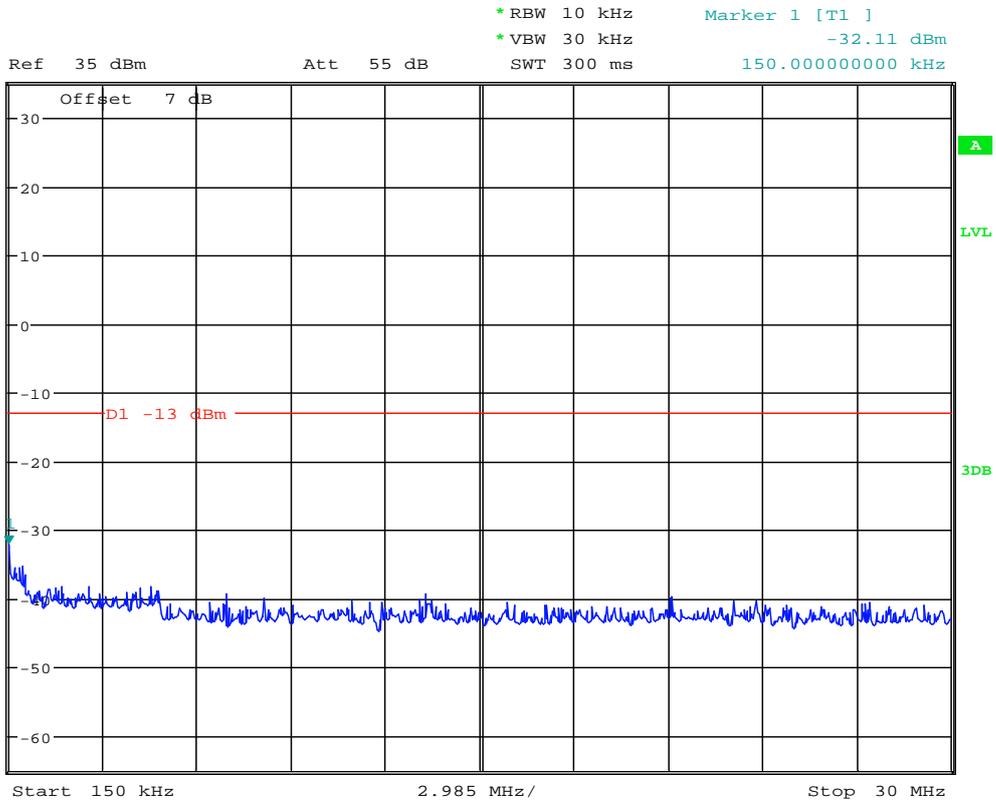
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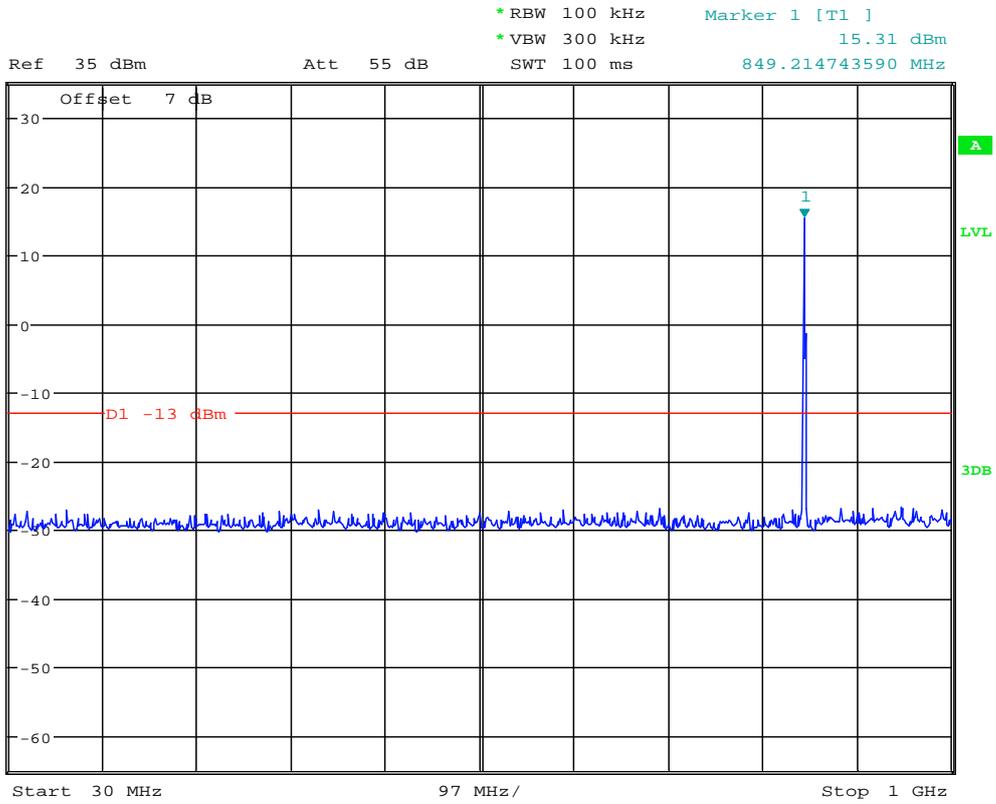
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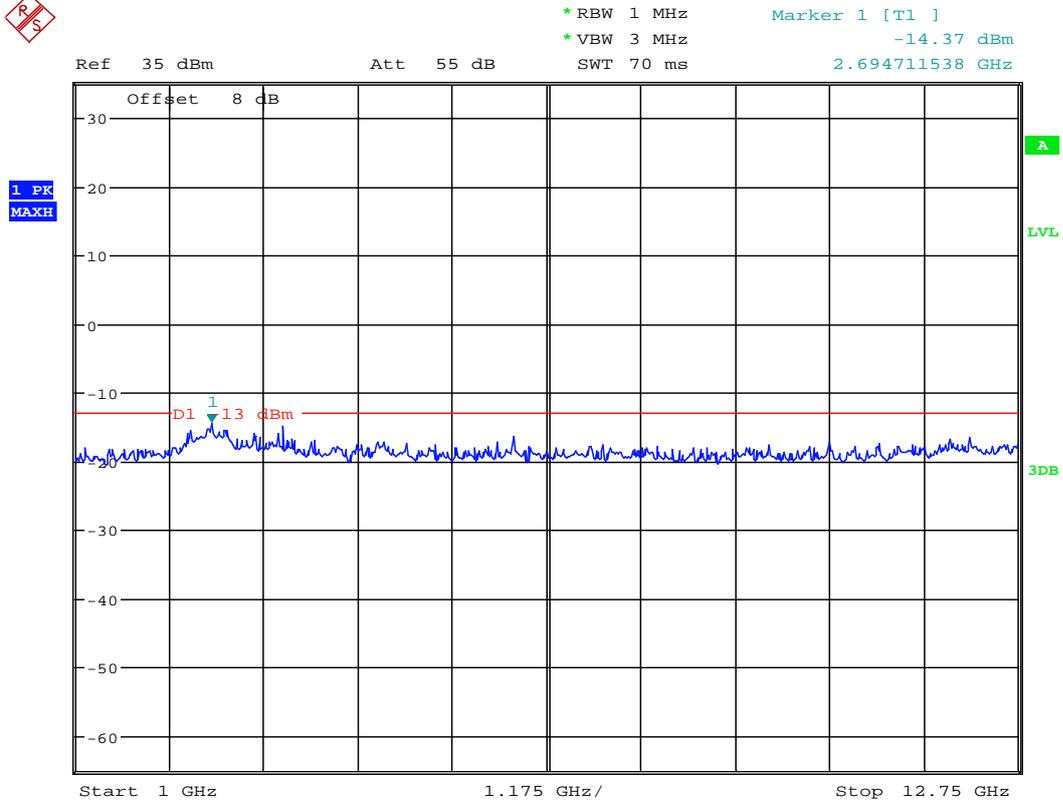
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Date: 8.MAR.2011 19:47:46



Date: 8.MAR.2011 19:48:30



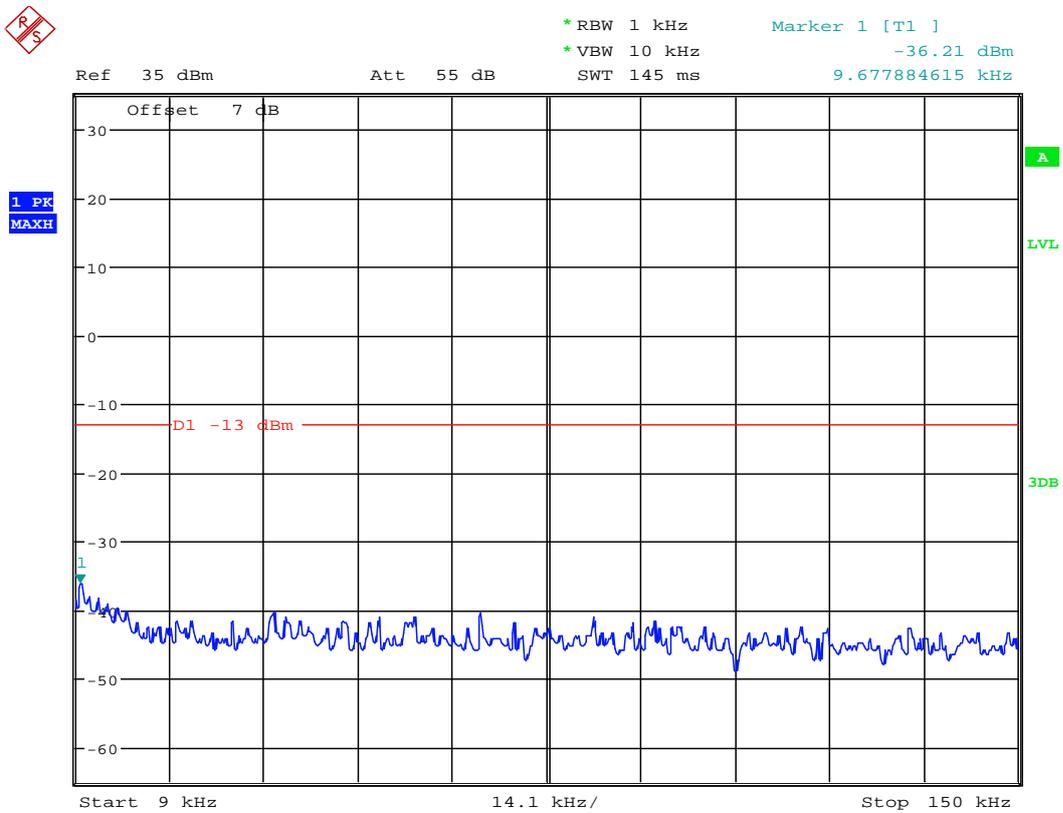
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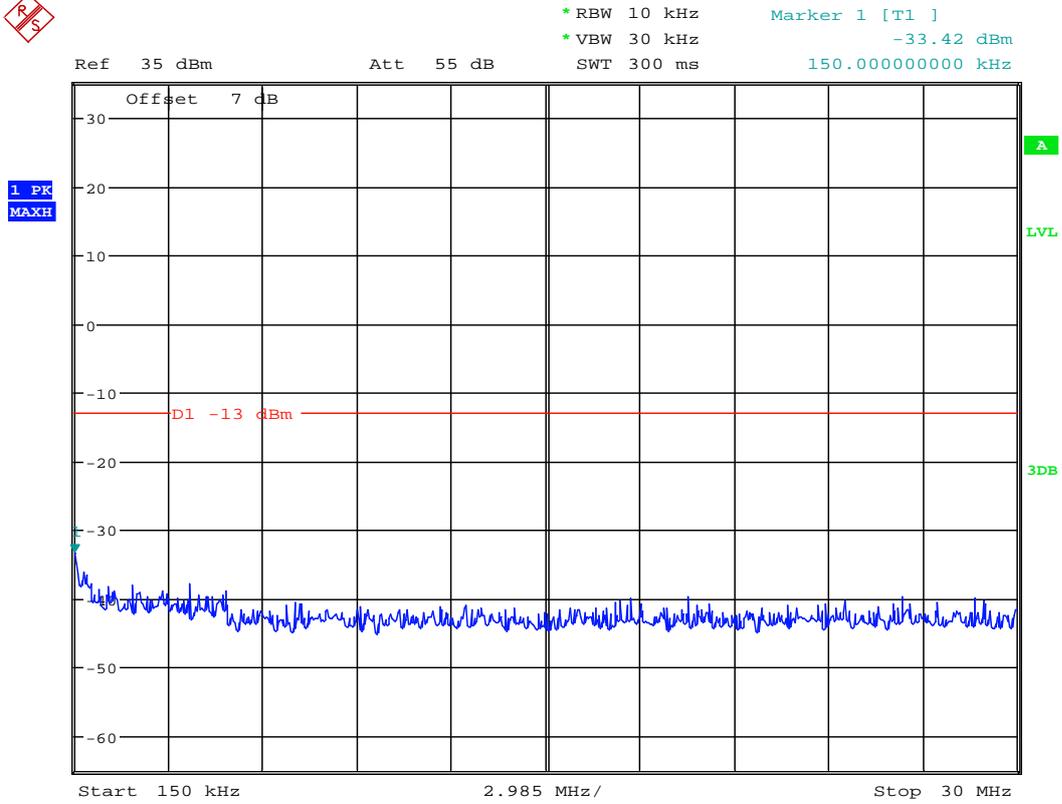
# EVDO subtype 2

Modulation: BPSK

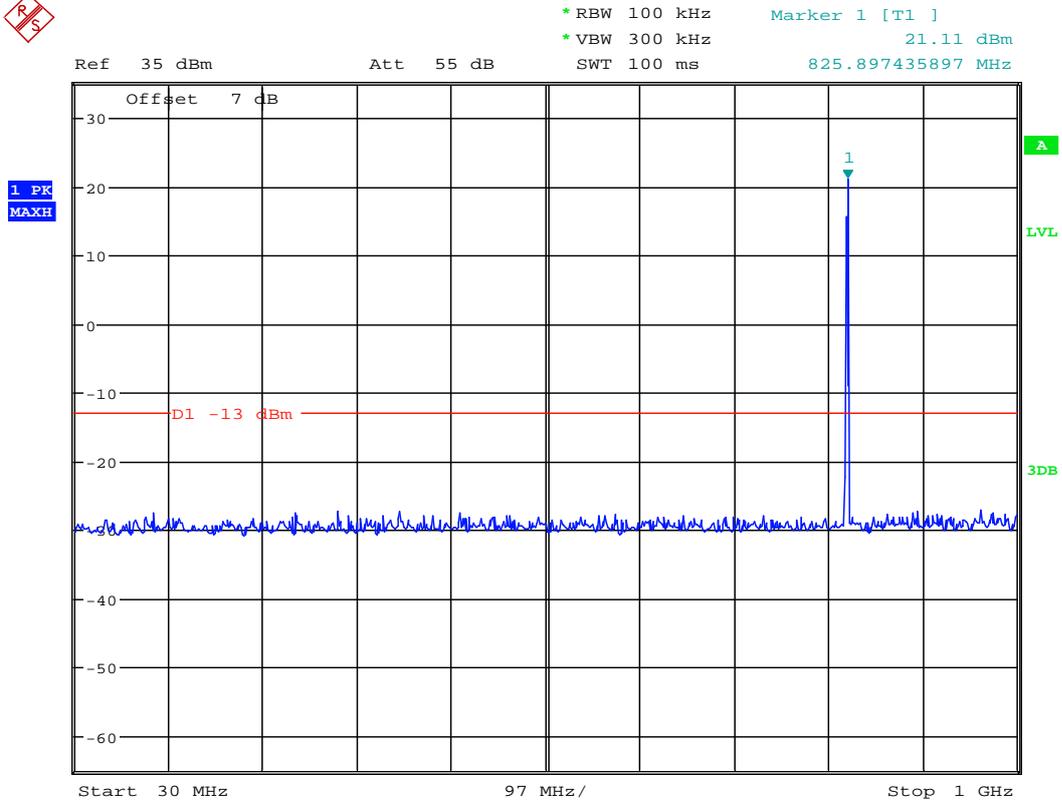
Channel 1013



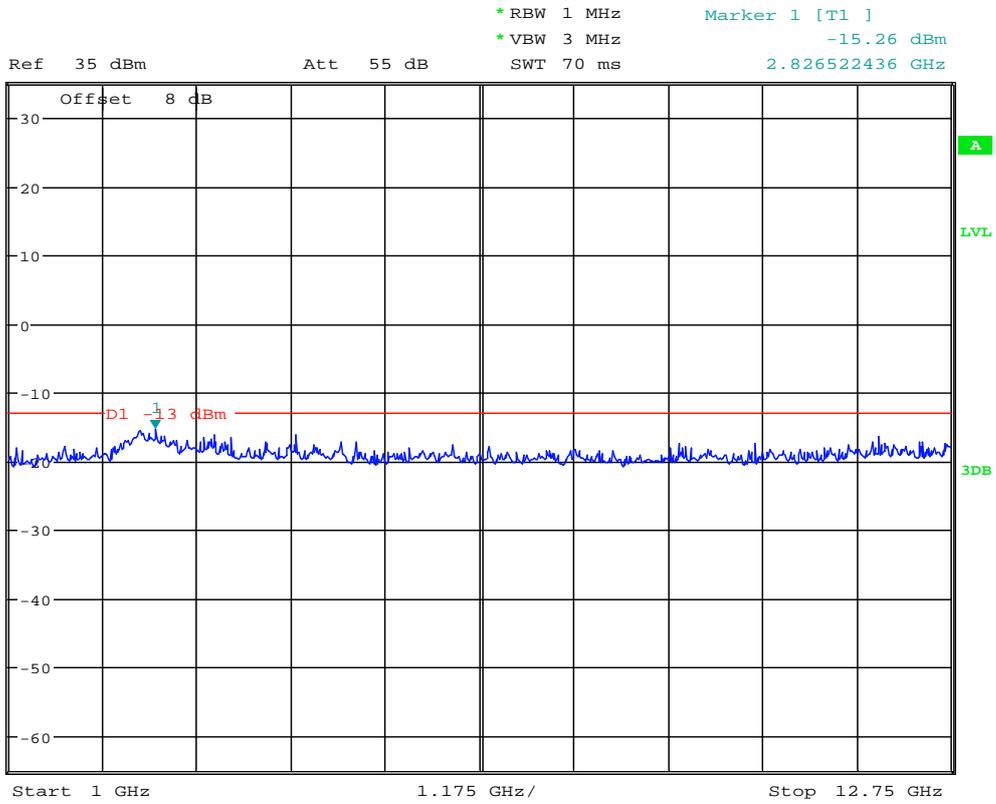
Date: 8.MAR.2011 18:00:59



Date: 8.MAR.2011 18:01:24



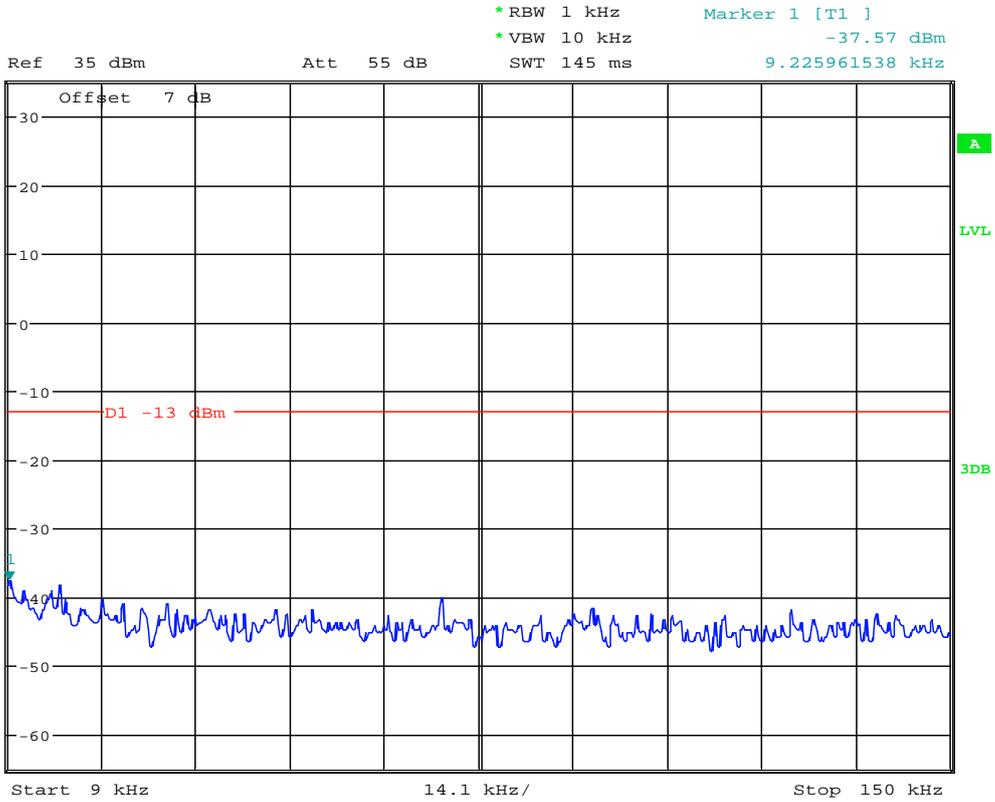
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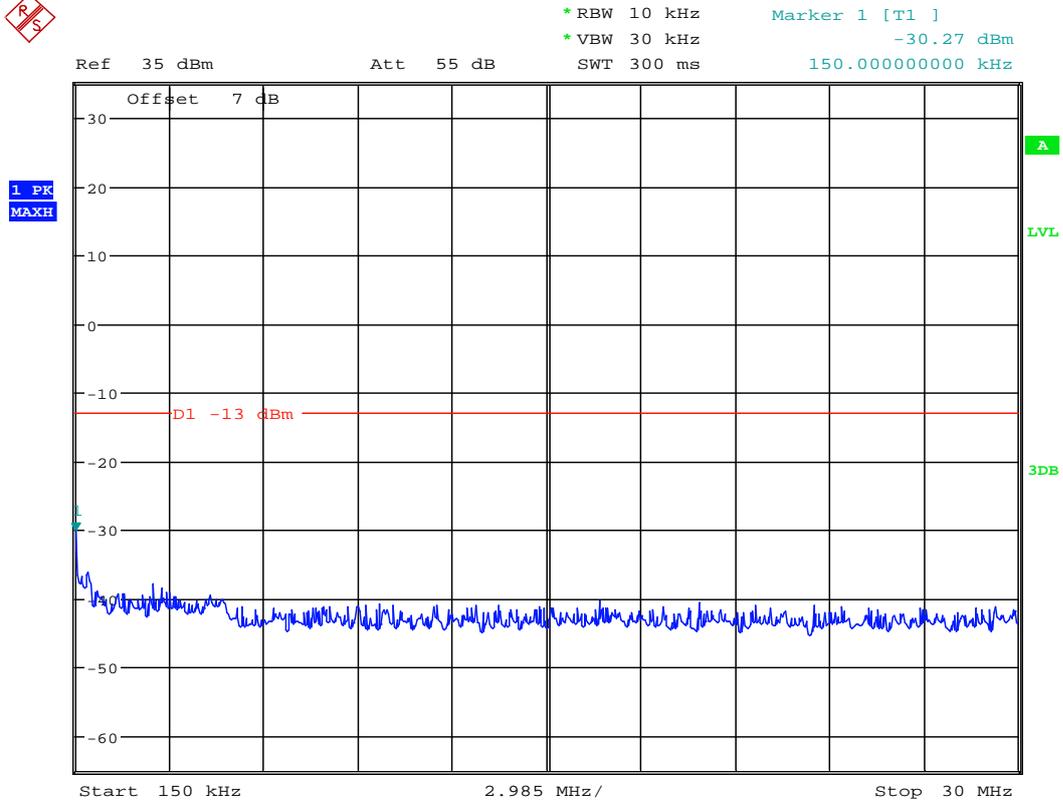
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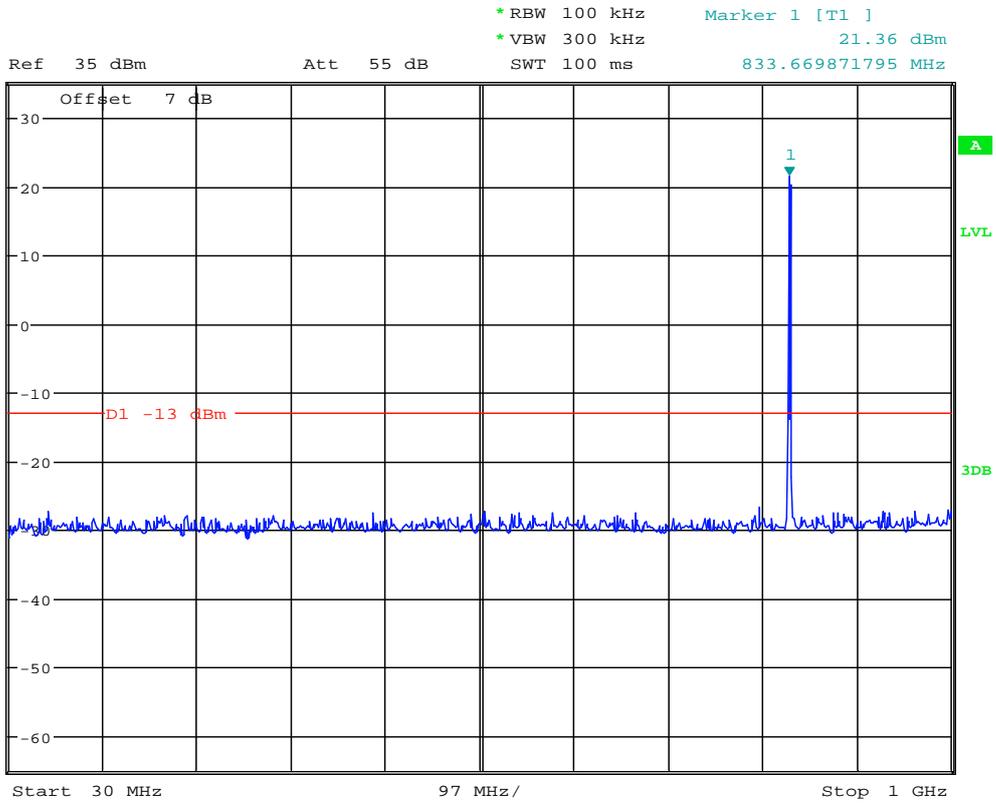
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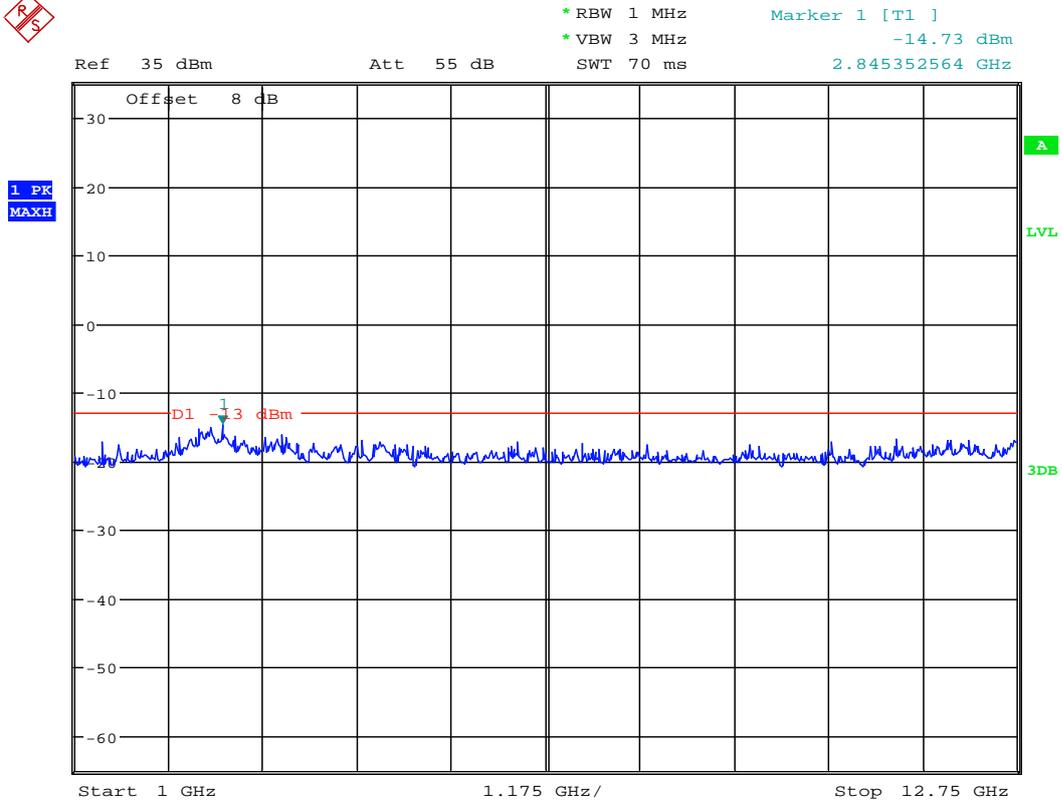
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Date: 8.MAR.2011 18:01:33



Date: 8.MAR.2011 18:01:59



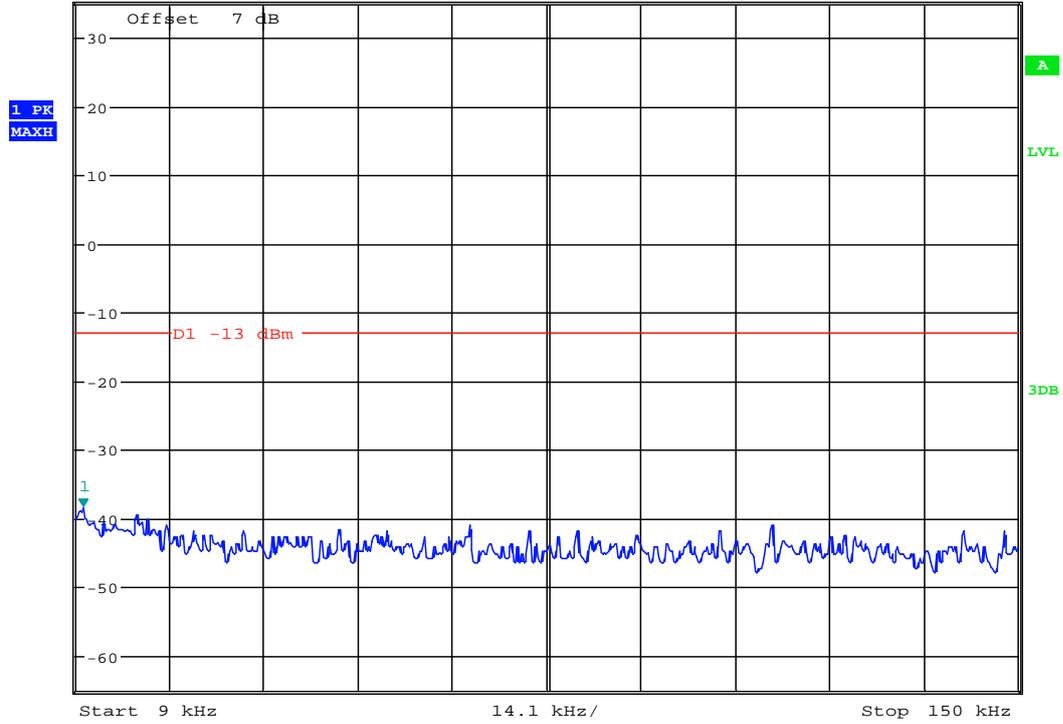
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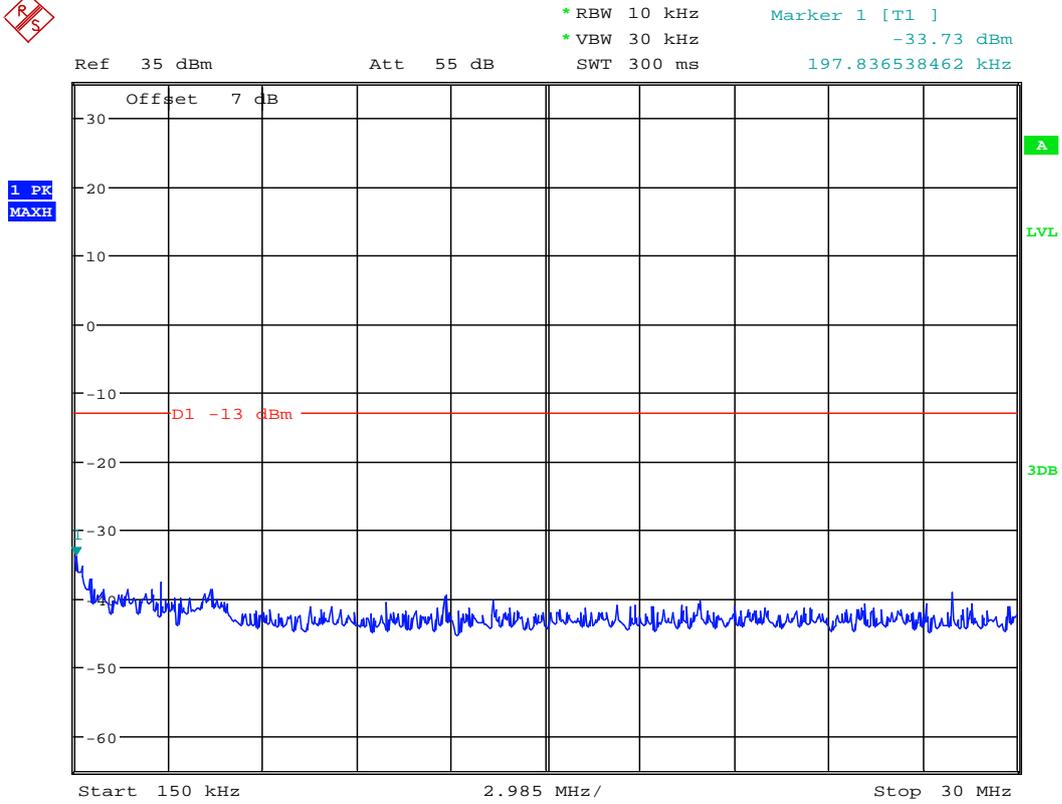
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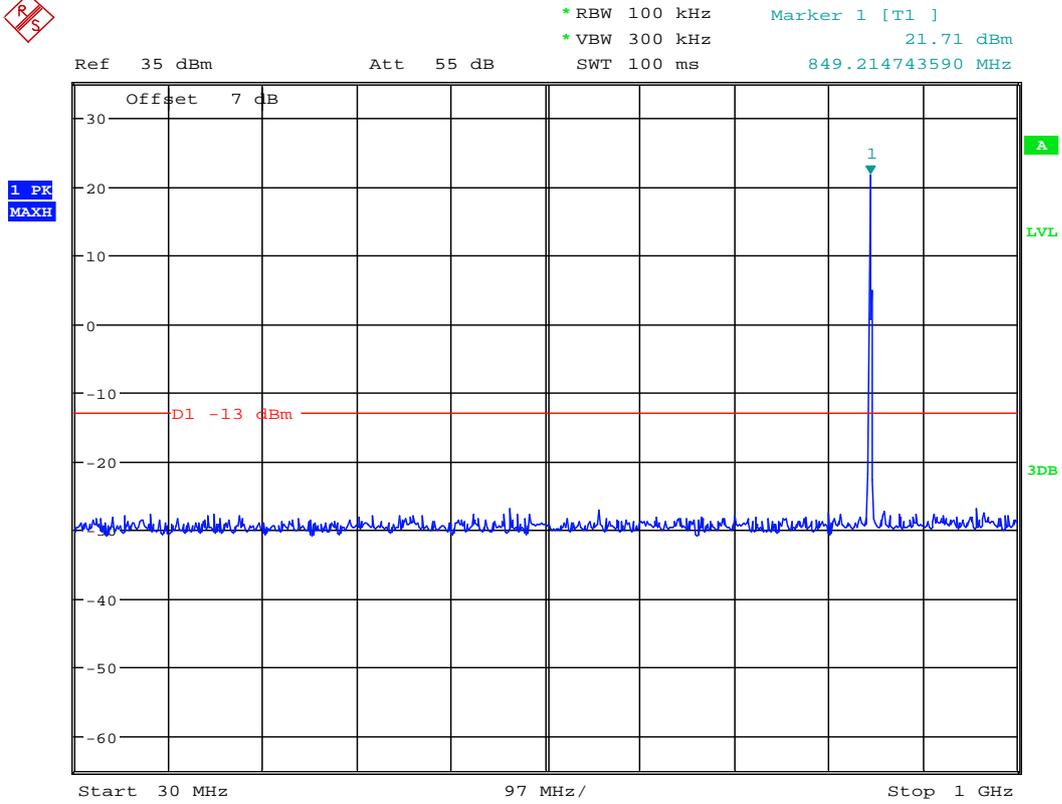
Ref 35 dBm Att 55 dB SWT 145 ms  
\*RBW 1 kHz \*VBW 10 kHz  
Marker 1 [T1] -38.51 dBm  
10.129807692 kHz



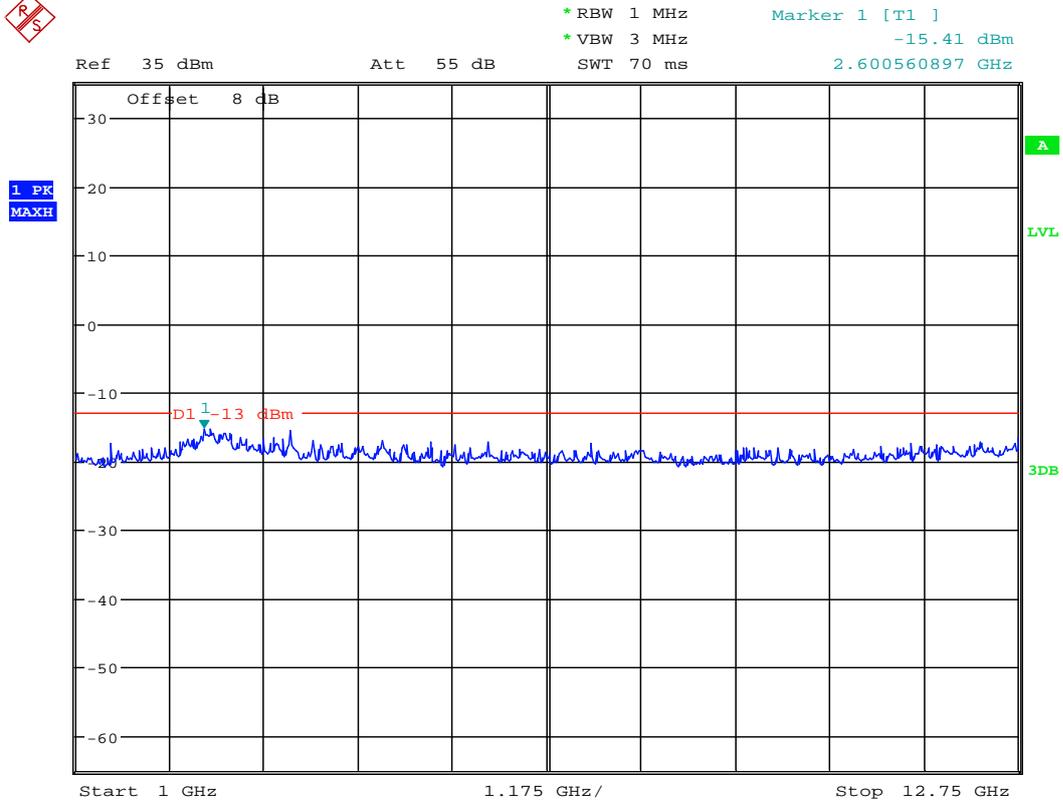
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Date: 8.MAR.2011 18:01:41



Date: 8.MAR.2011 18:02:07

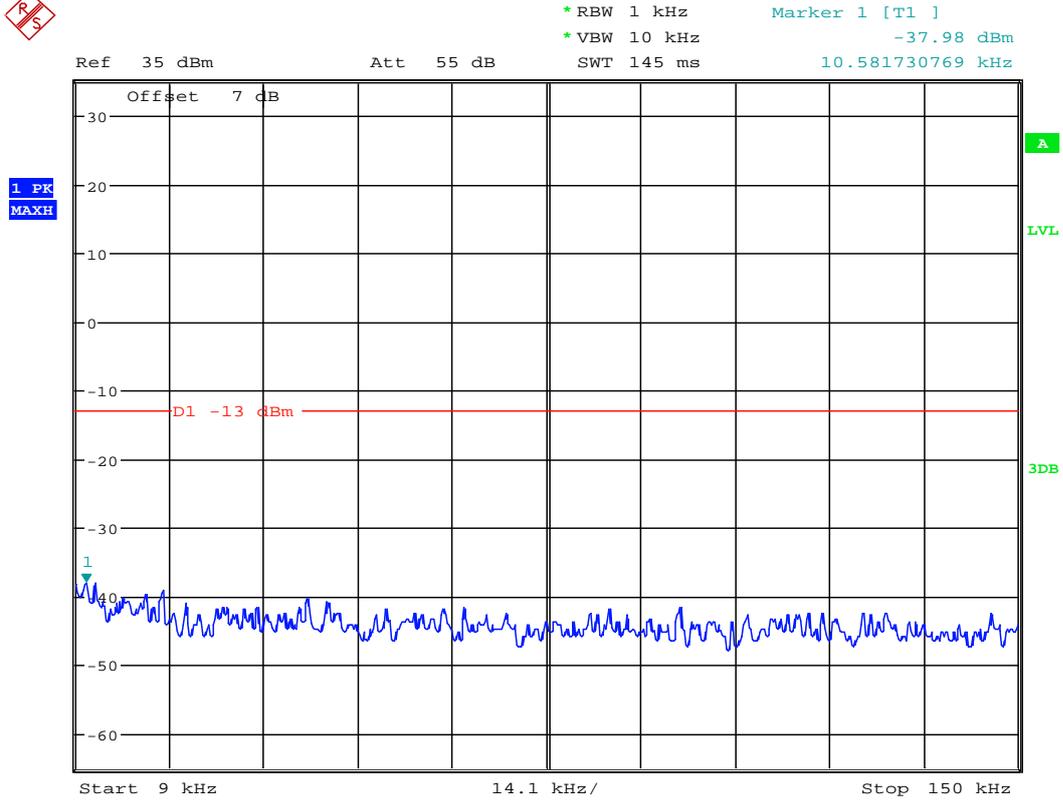


Date: 8.MAR.2011 18:02:33

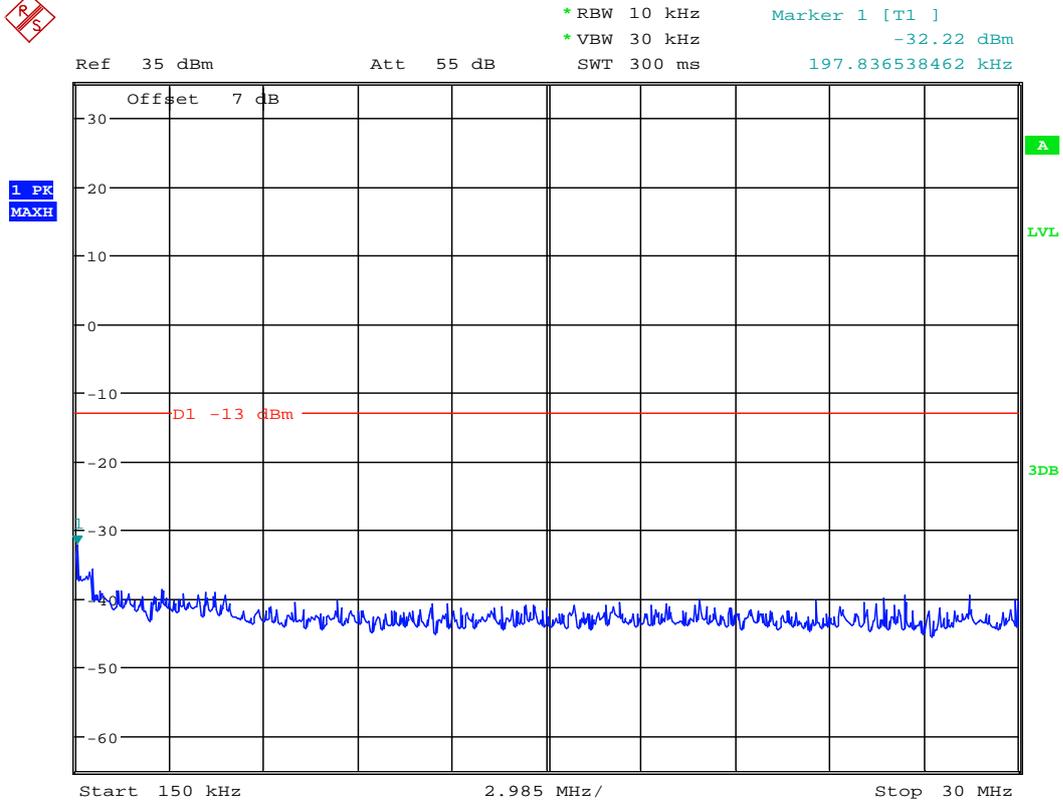


**Modulation: QPSK**

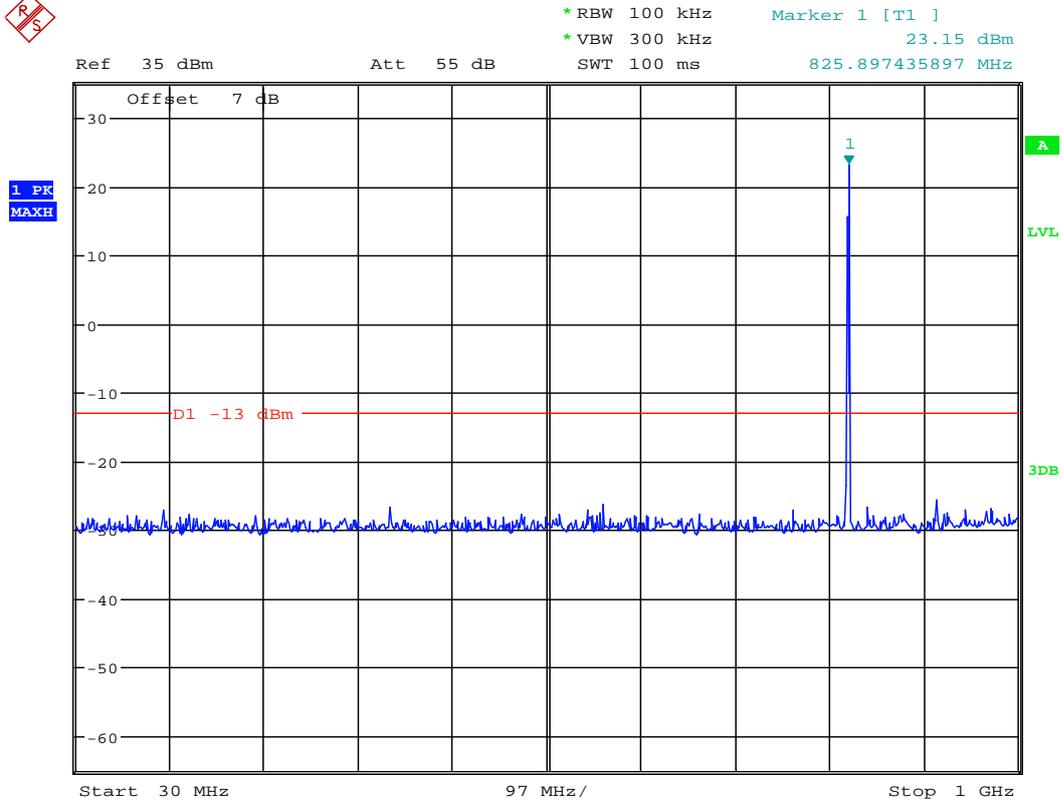
**Channel 1013**



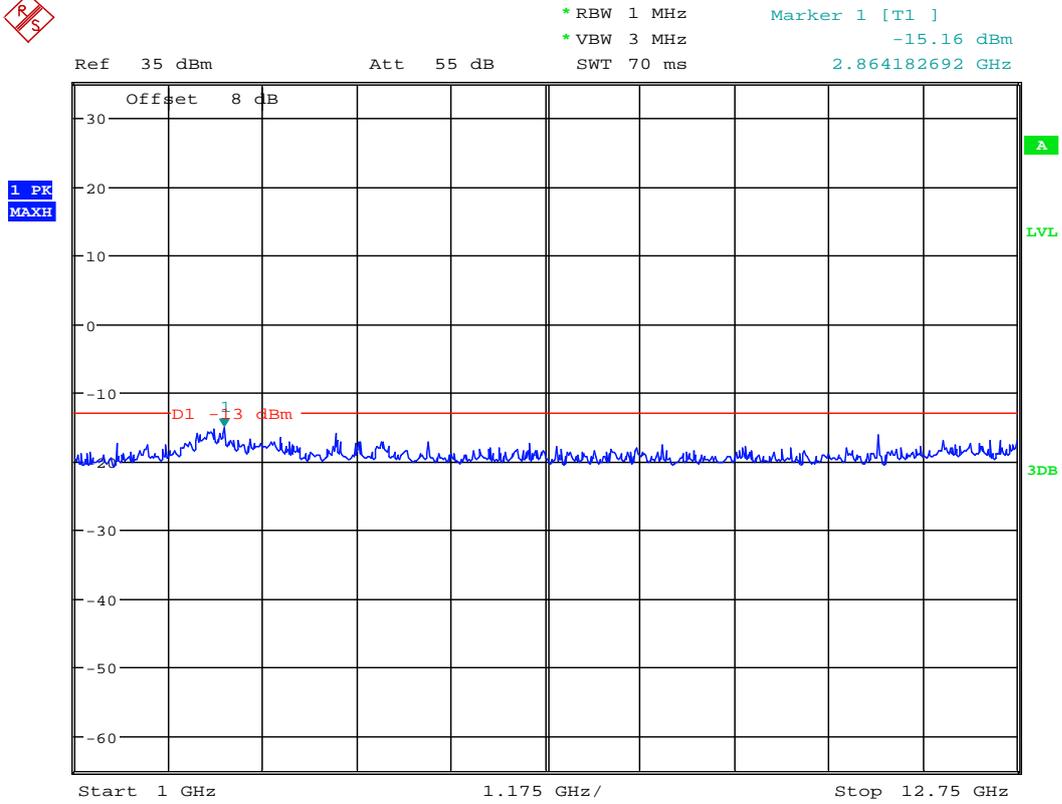
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Date: 8.MAR.2011 18:03:08



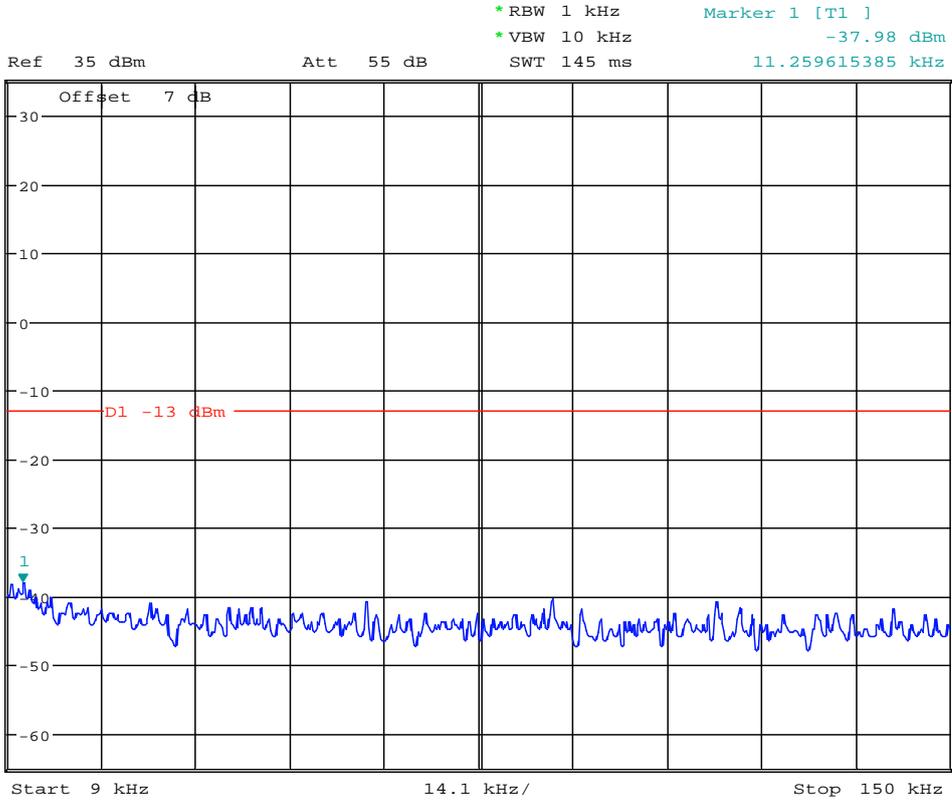
Date: 8.MAR.2011 18:03:34



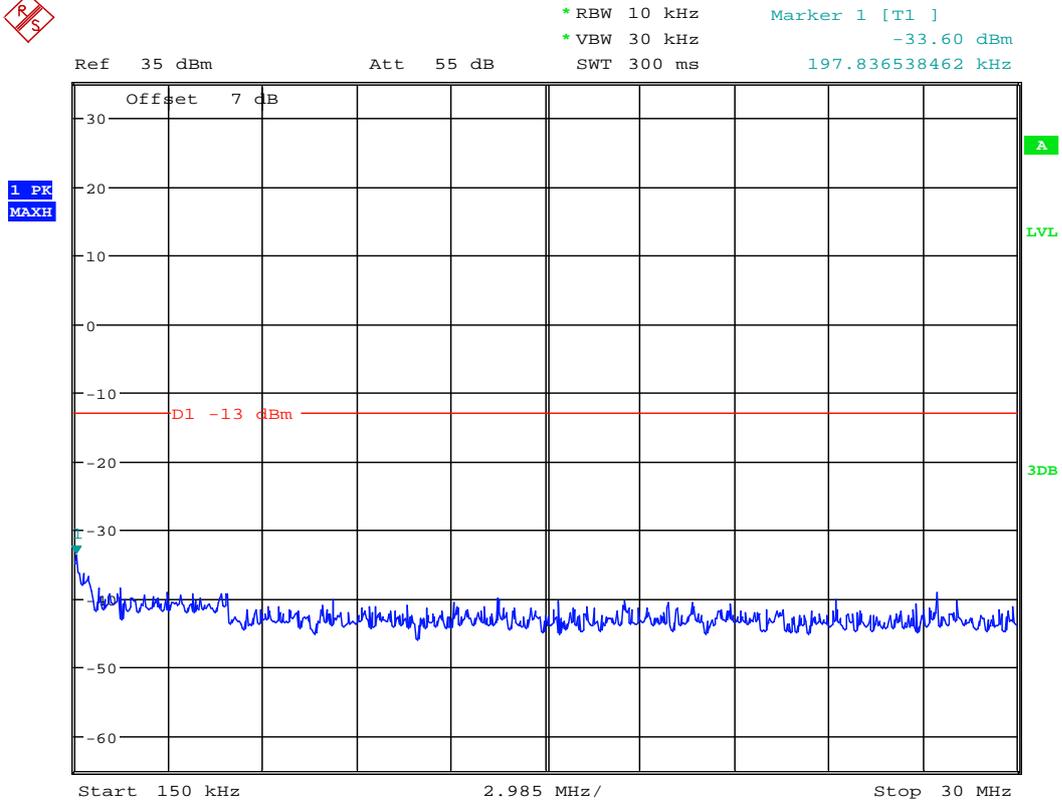
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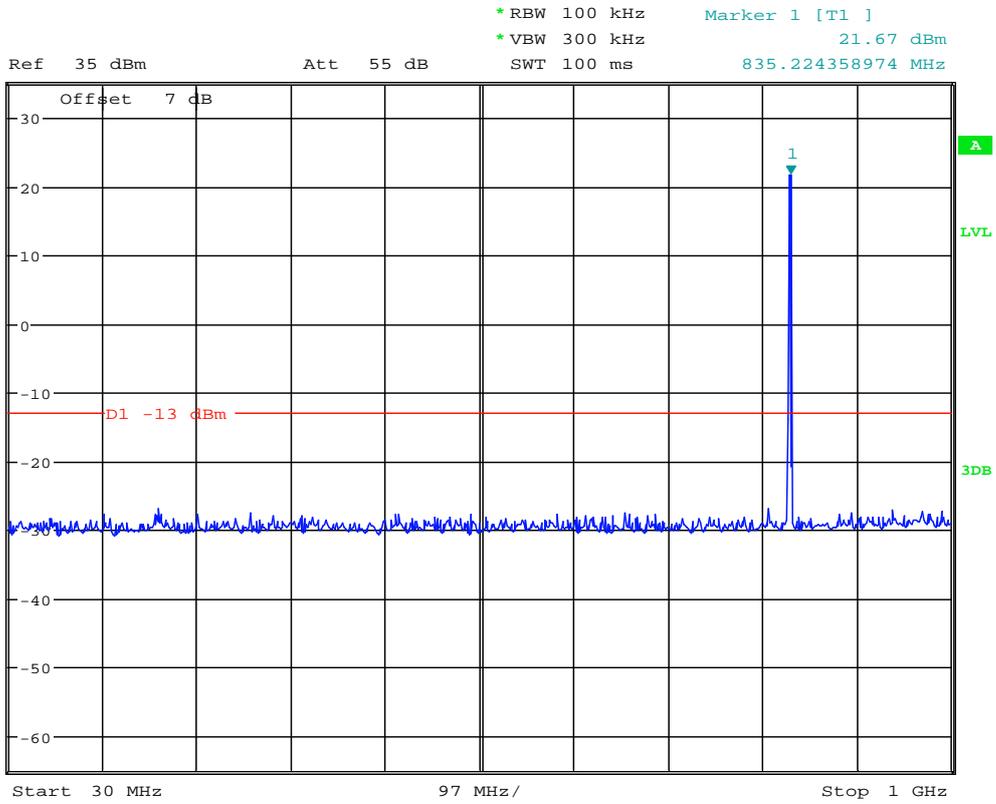
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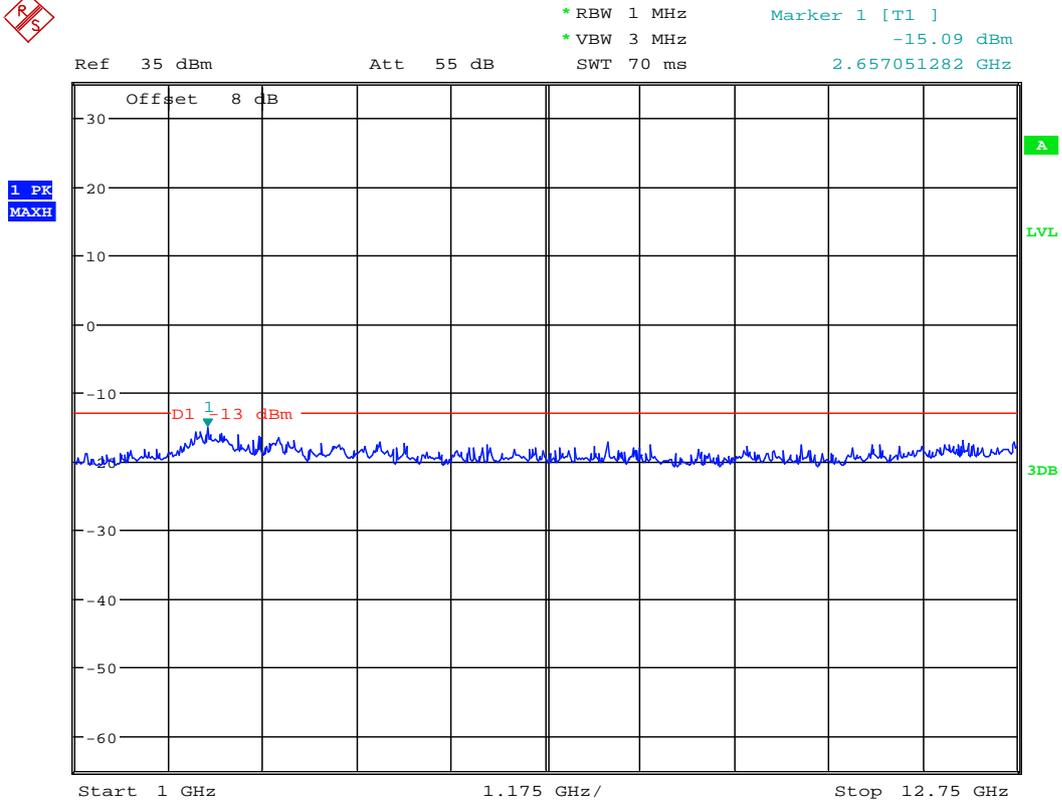
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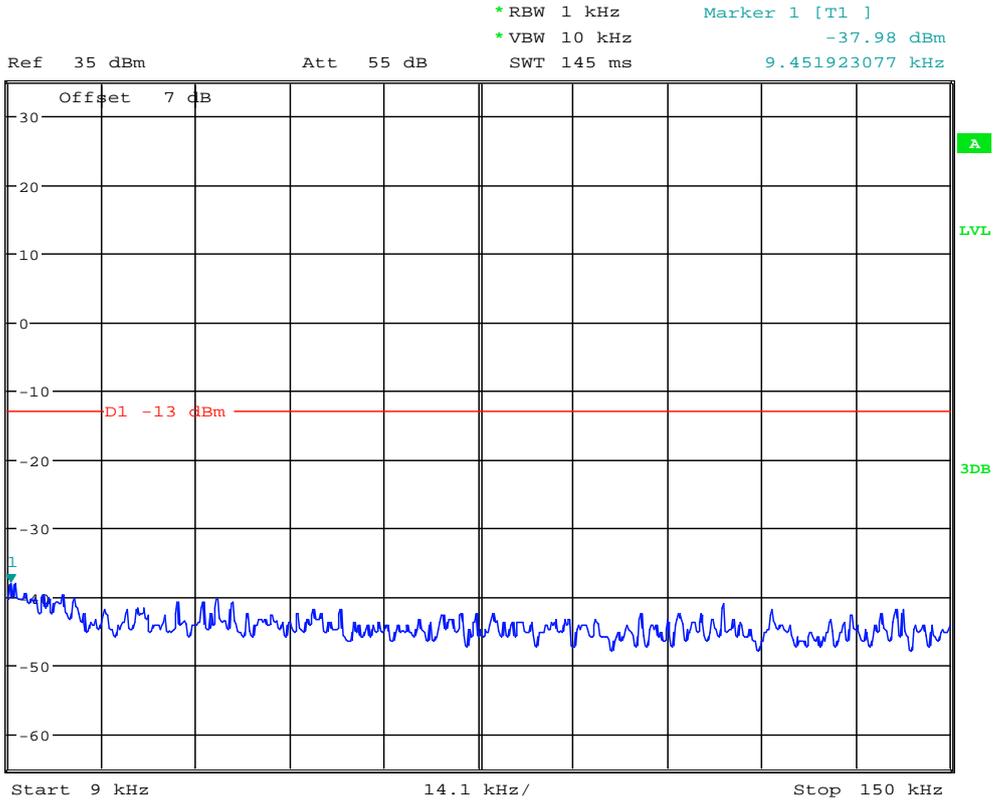
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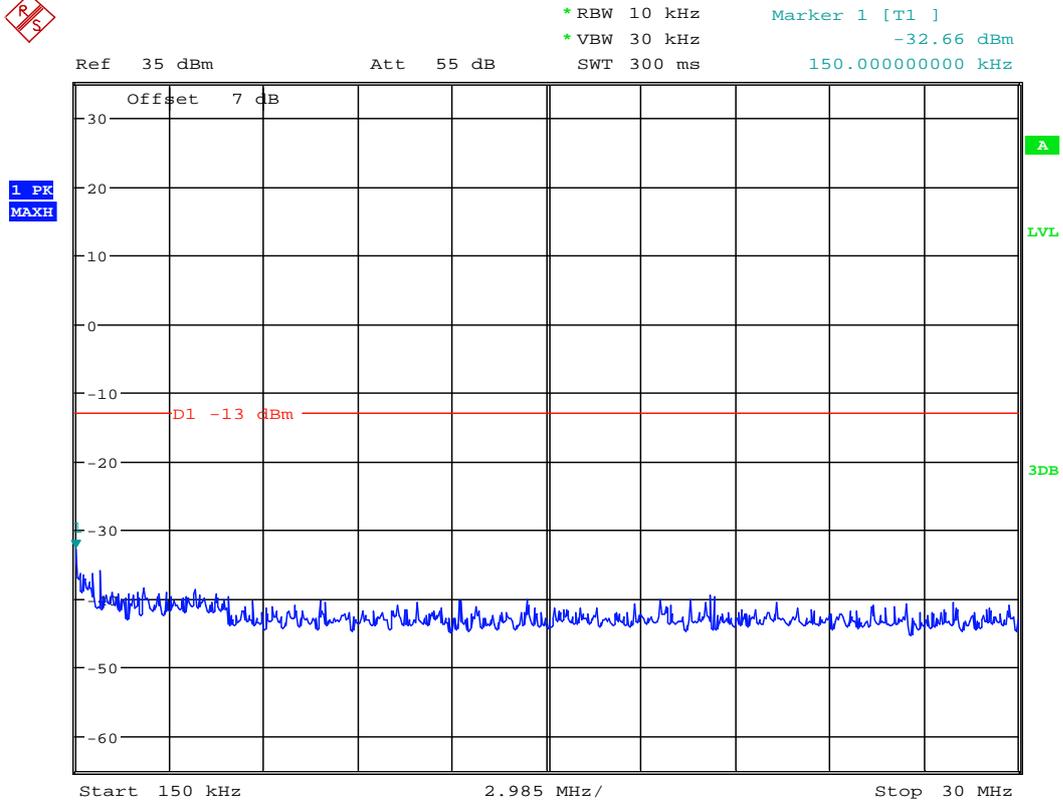
Date: 8.MAR.2011 18:04:08



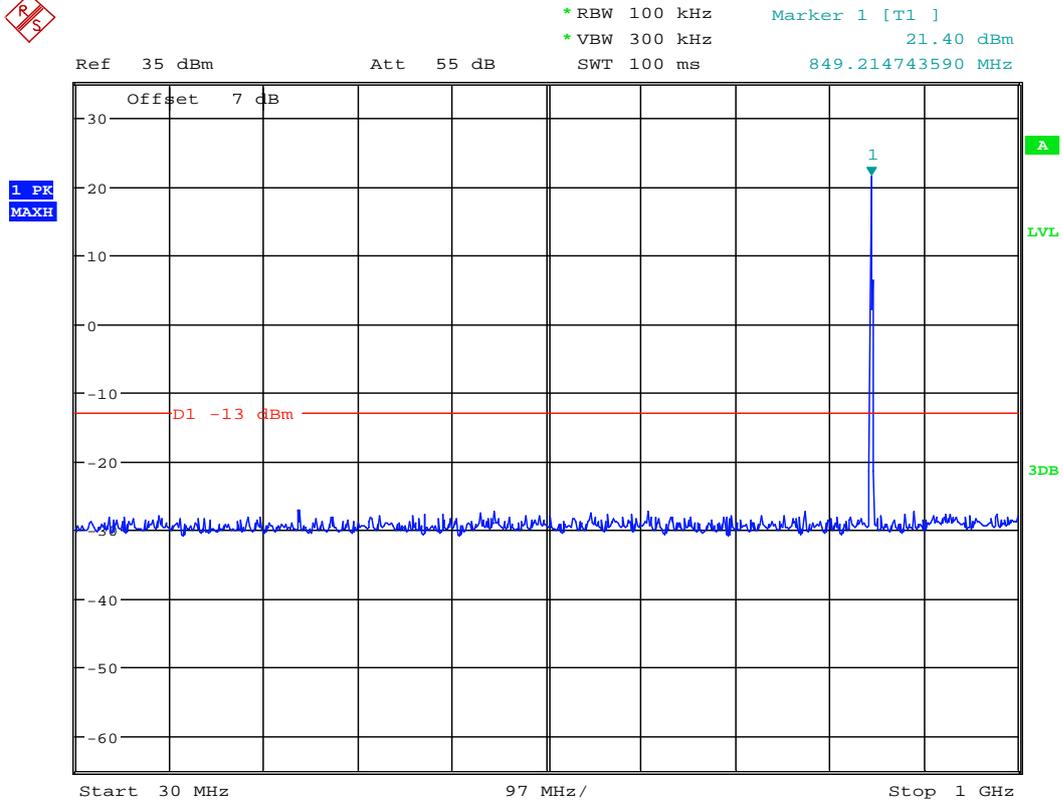
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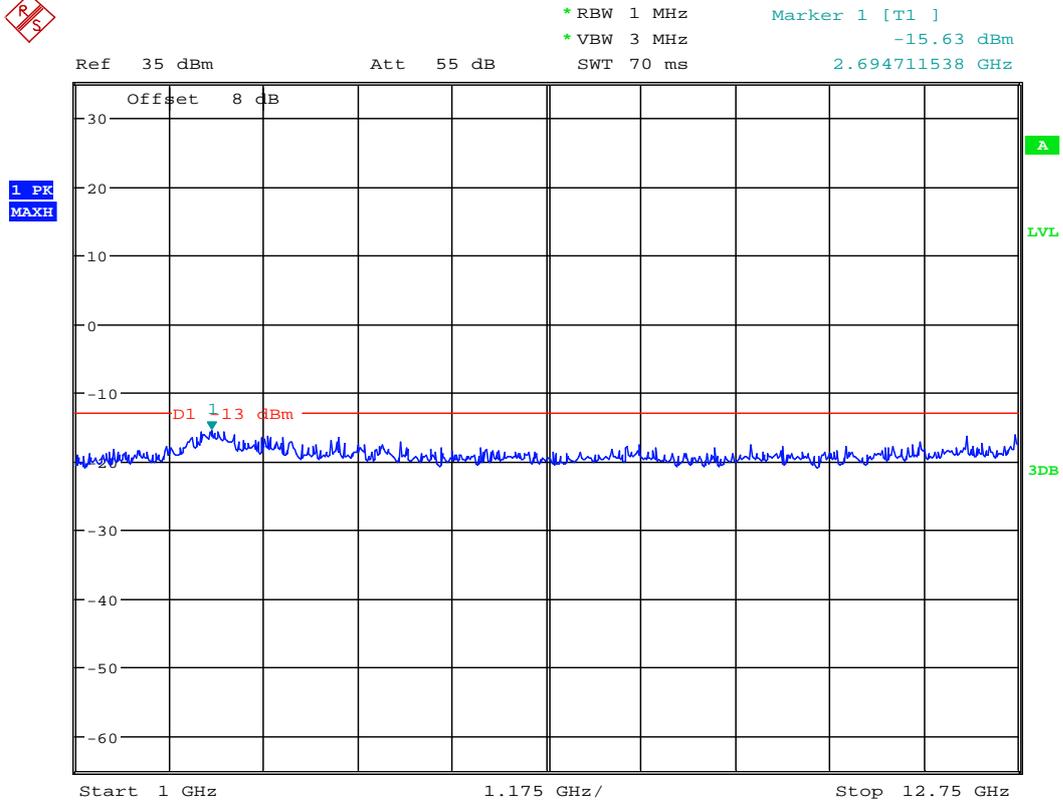
Date: 8.MAR.2011 18:02:59



Date: 8.MAR.2011 18:03:25



Date: 8.MAR.2011 18:03:50

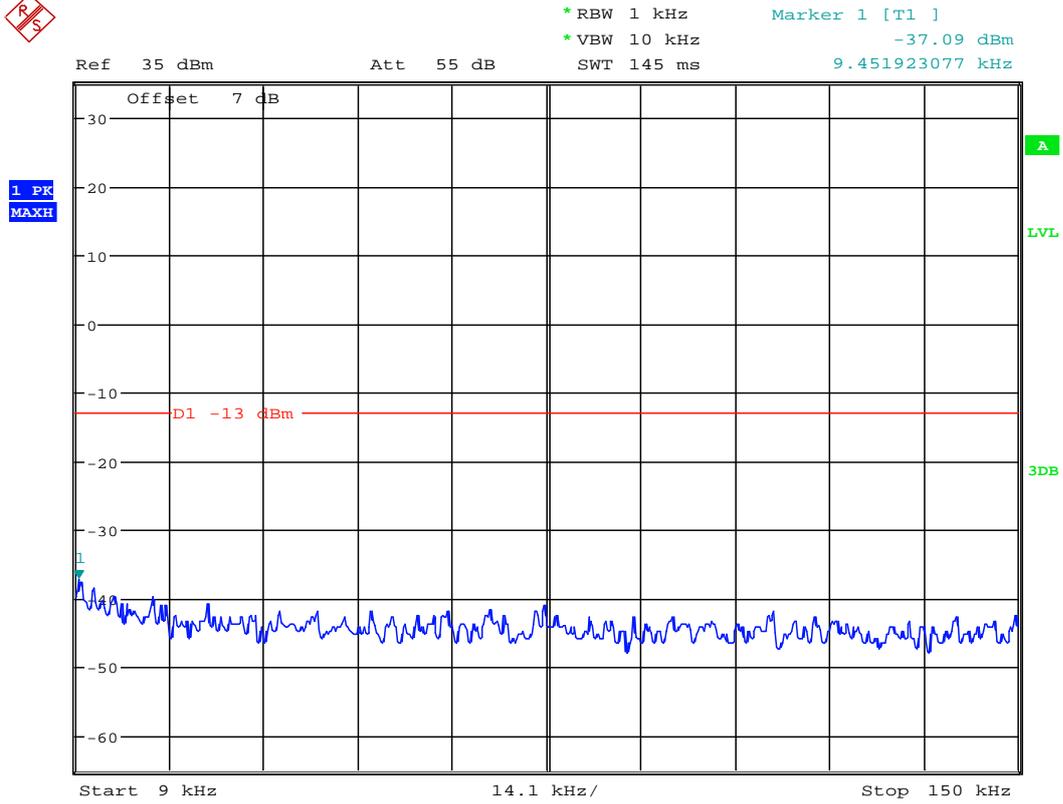


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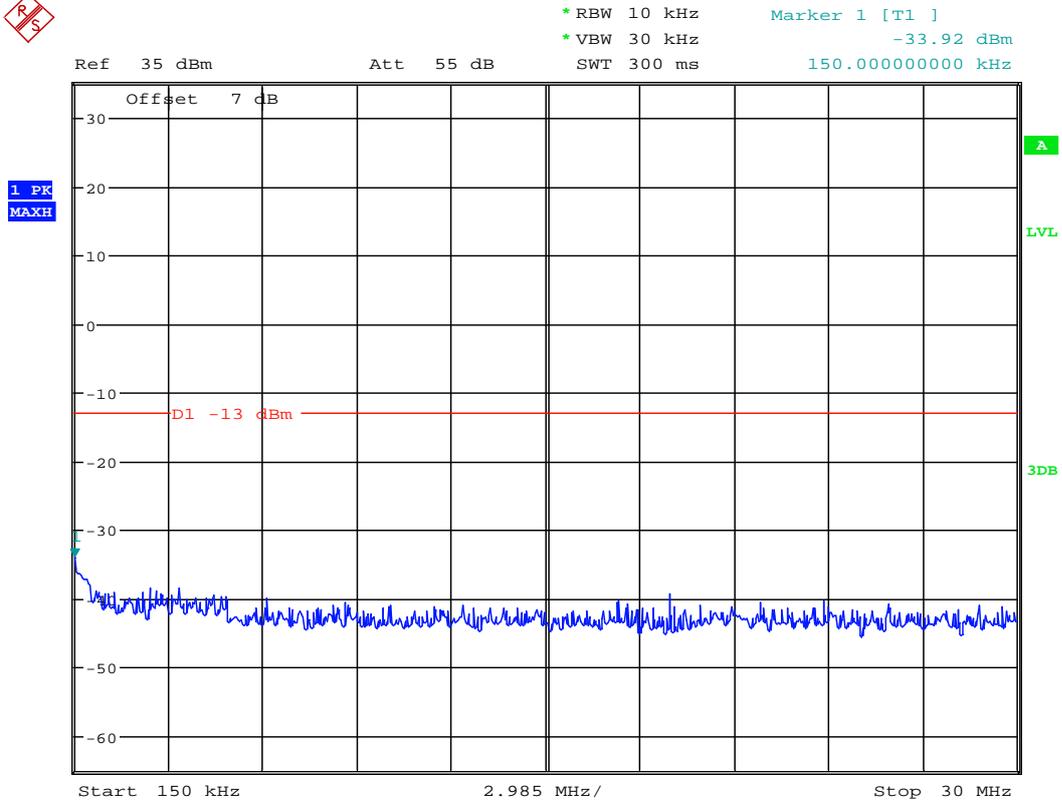


Modulation: 8PSK

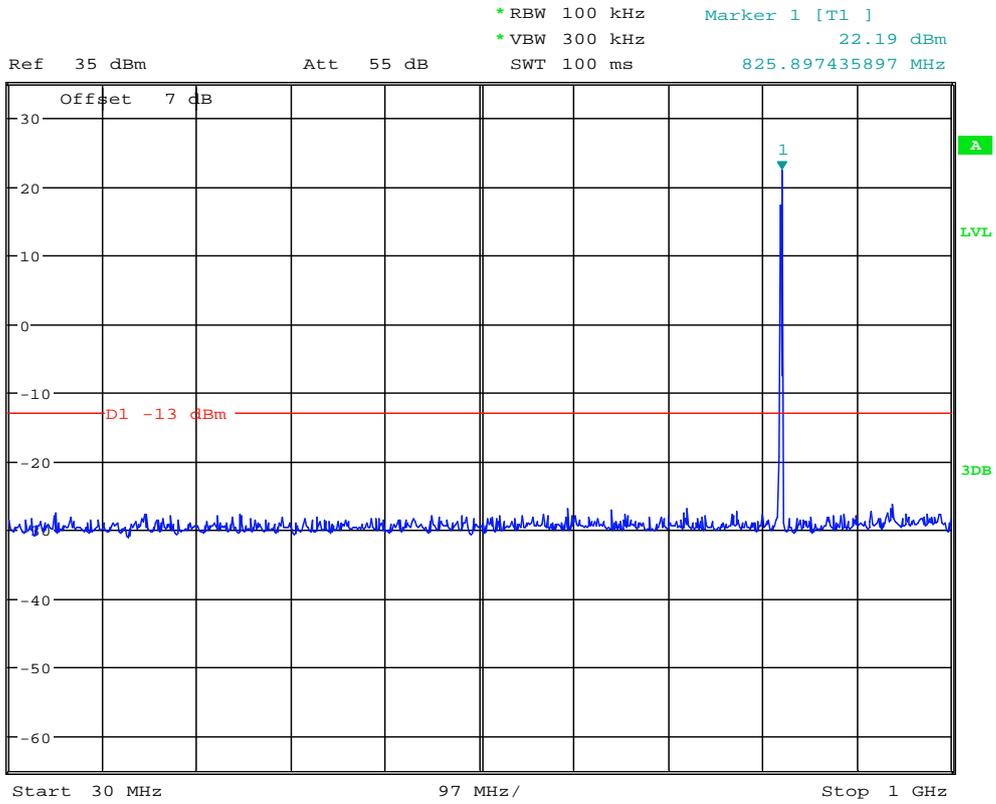
Channel 1013



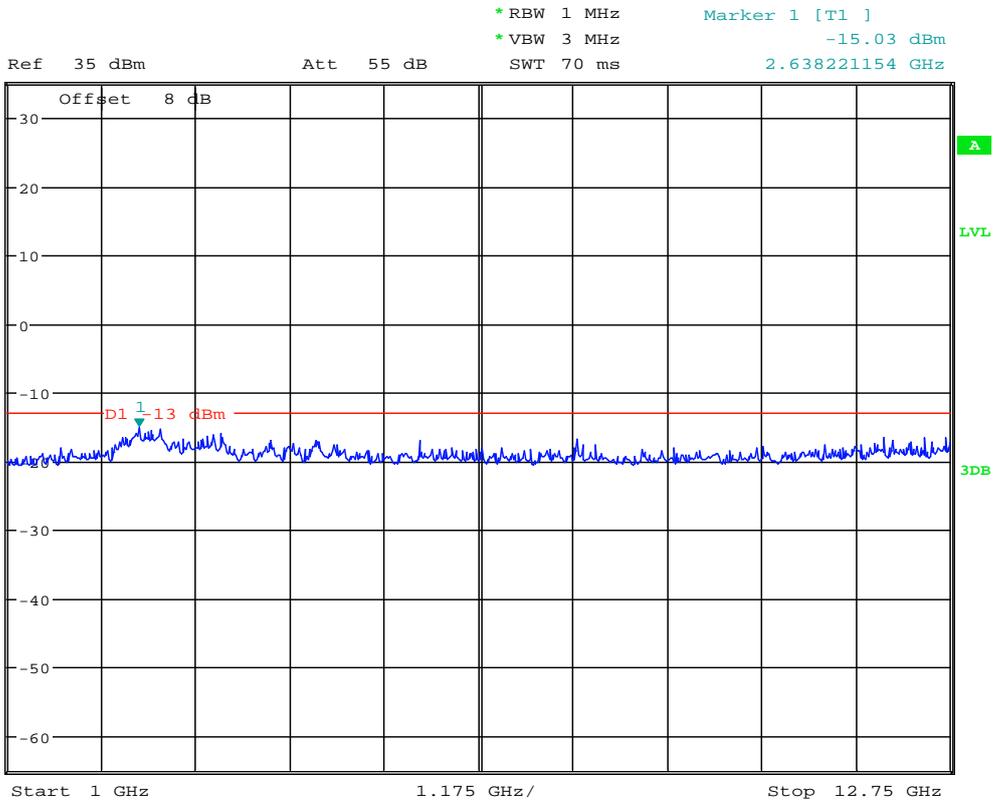
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Date: 8.MAR.2011 18:04:52



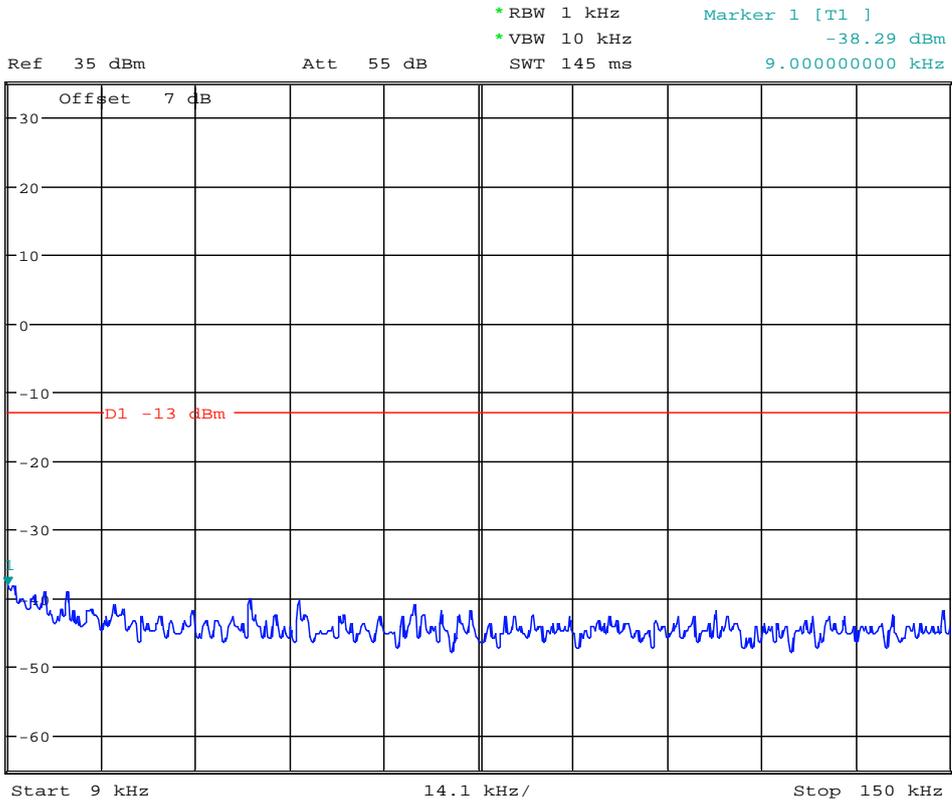
Date: 8.MAR.2011 18:05:17



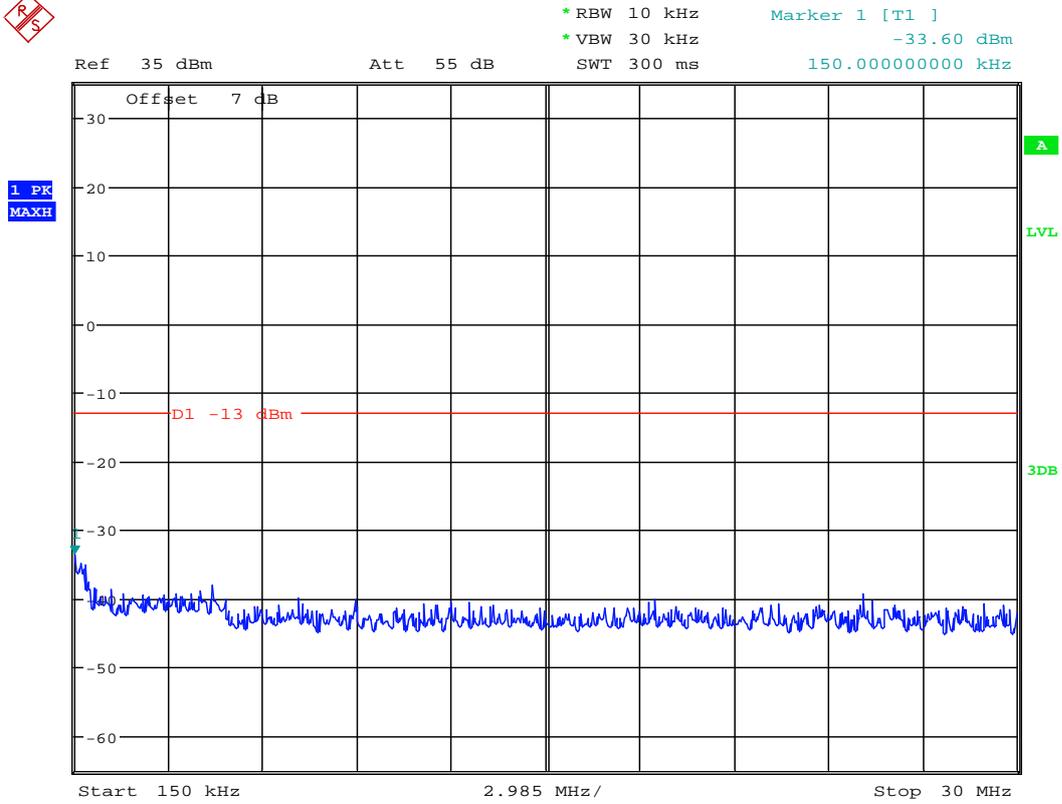
Date: 8.MAR.2011 18:05:43



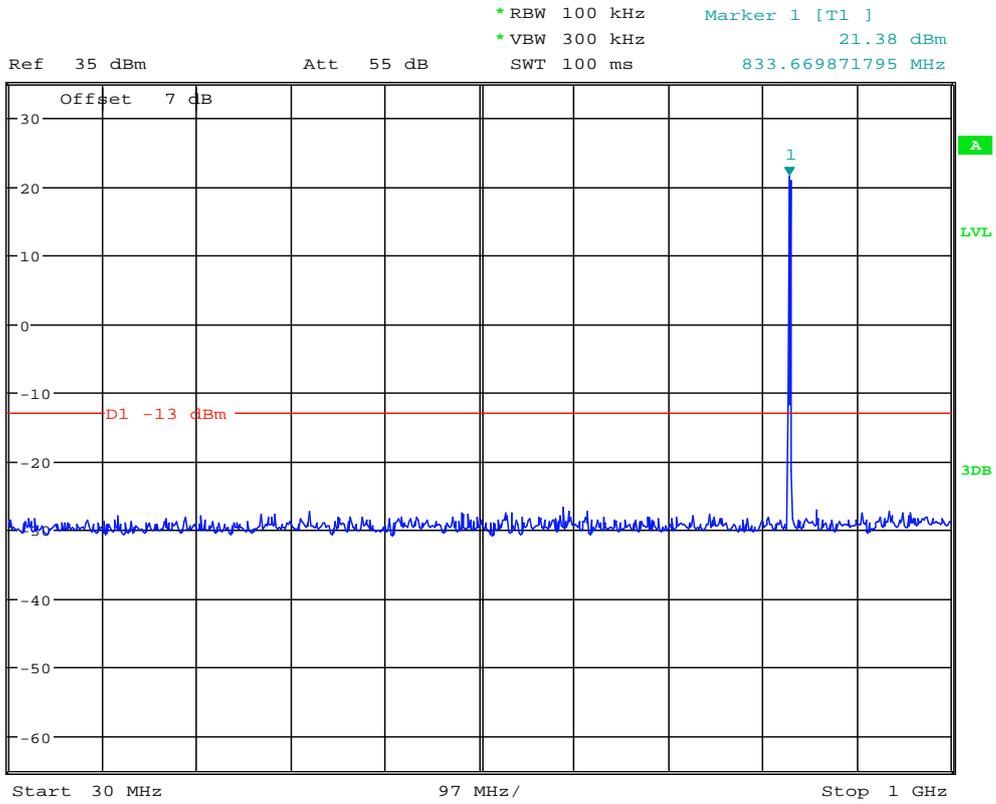
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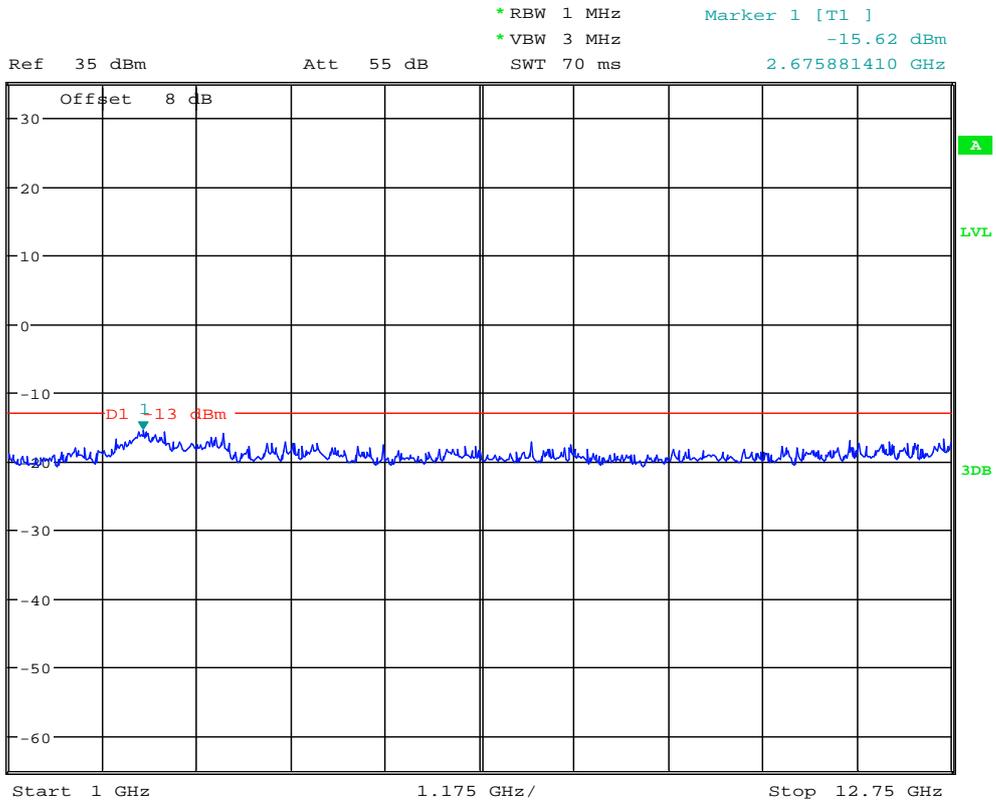
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Date: 8.MAR.2011 18:05:00



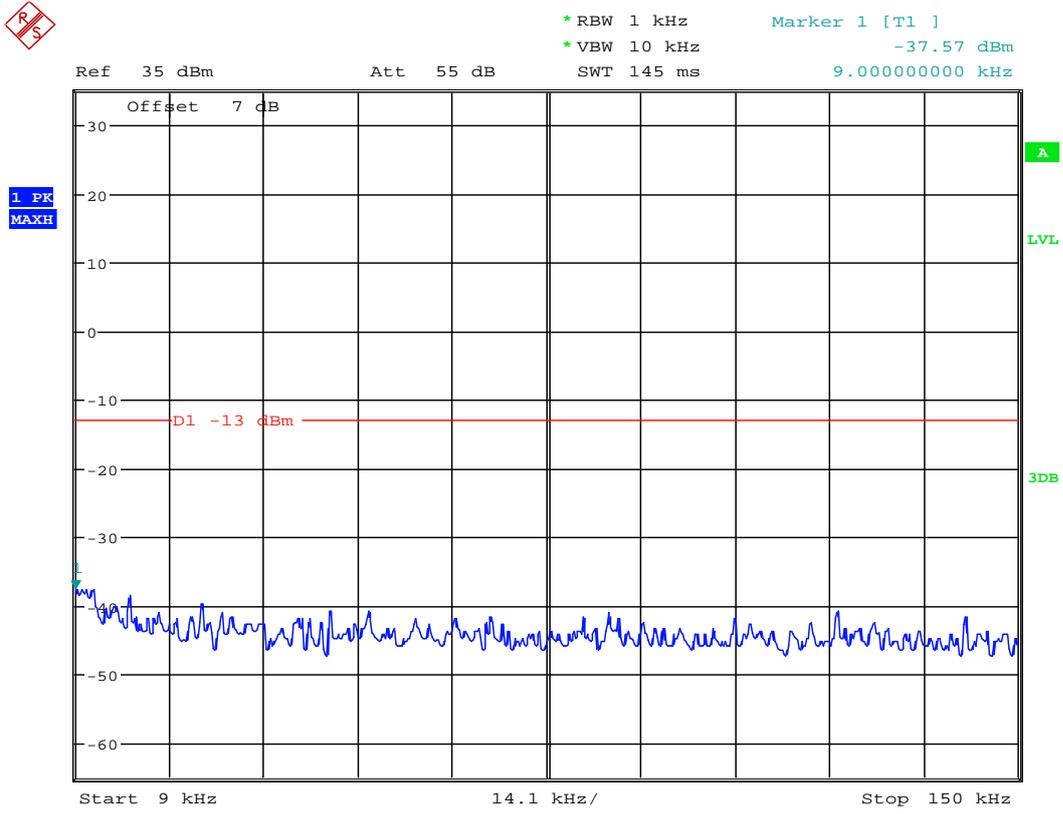
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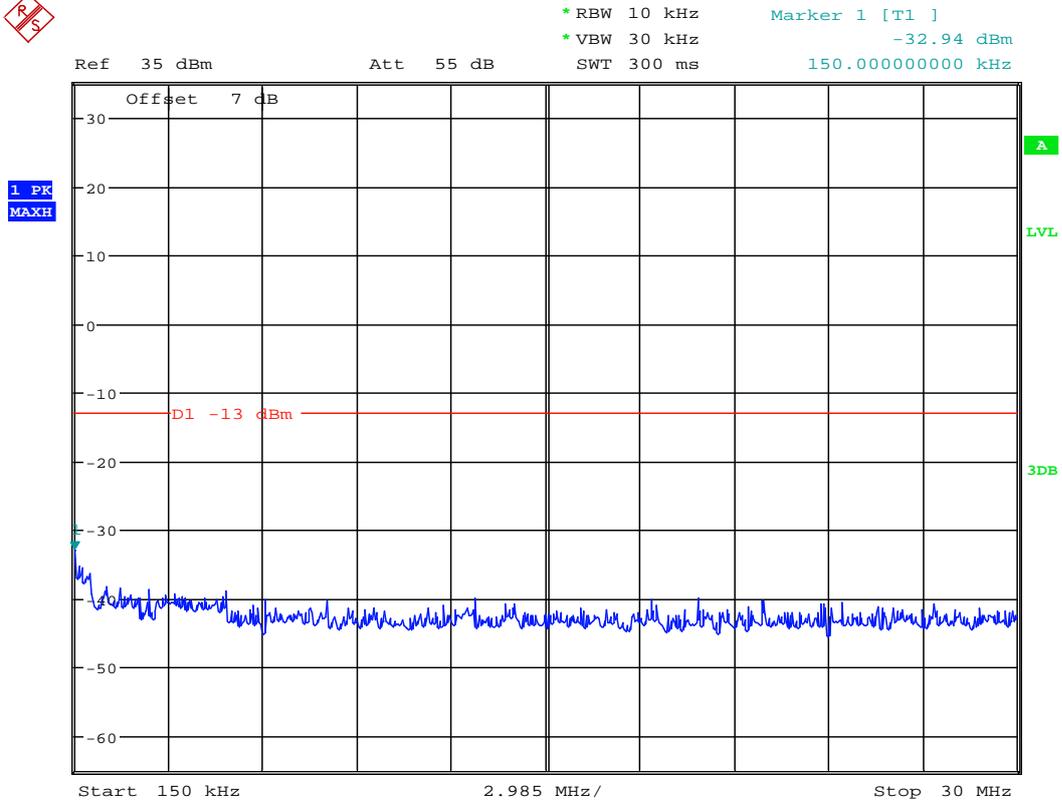
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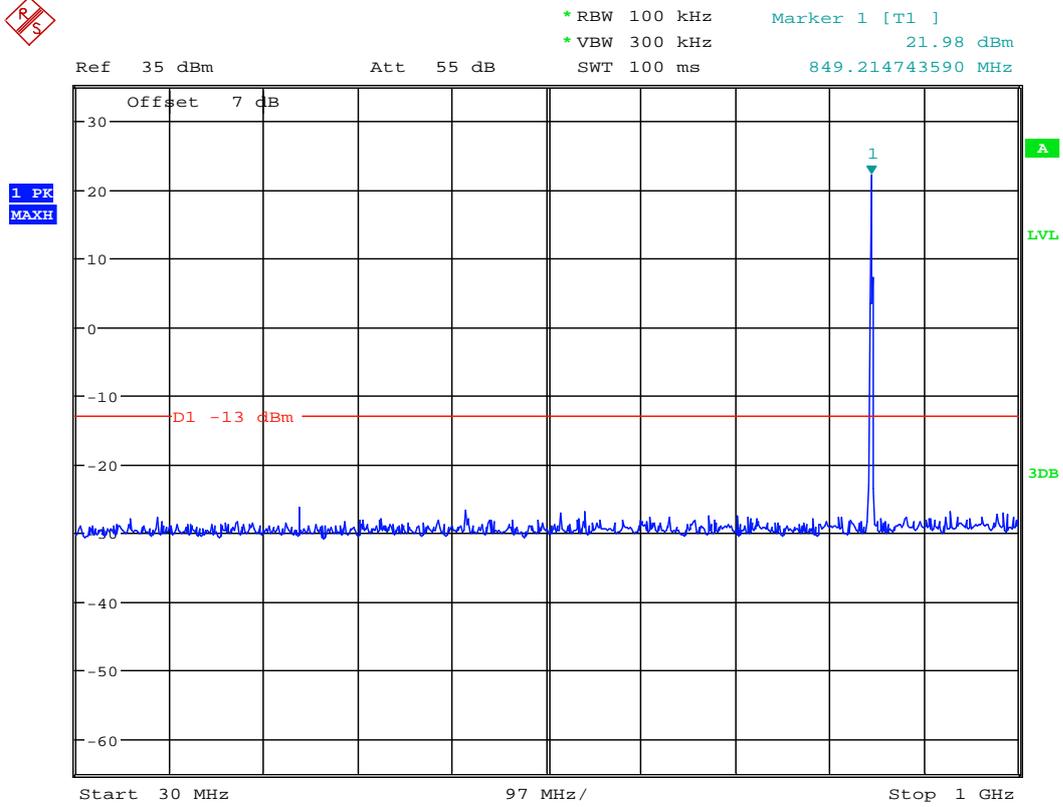
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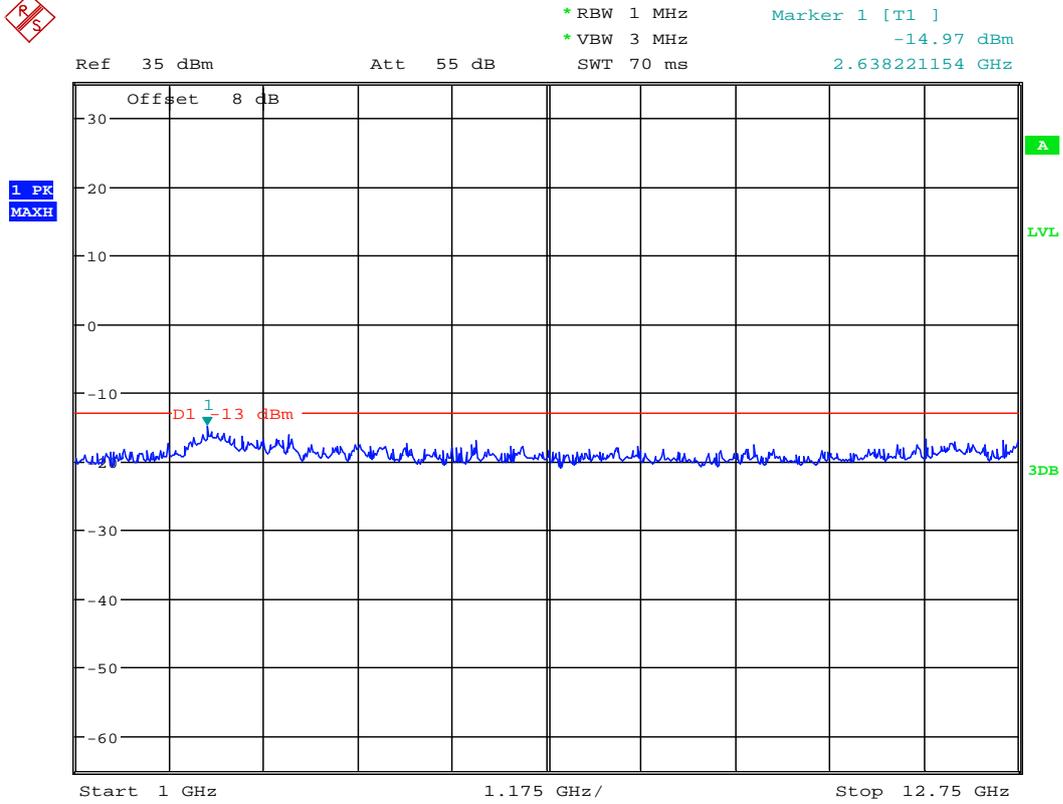
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Date: 8.MAR.2011 18:05:08



Date: 8.MAR.2011 18:05:34



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