



## FCC 47 CFR PART 15 SUBPART C

### TEST REPORT

For

**Navigation Device**

**Model: Magellan<sup>®</sup> Maestro 4700**

**Trade Name: MAGELLAN**

*Issued to*

**MITAC International Corp.  
6th Floor, No. 187, Tiding Blvd. Sec. 2, Nei-Hu,  
Taipei, Taiwan 114**

*Issued by*

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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
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# 1. TEST RESULT CERTIFICATION

**Applicant:** MITAC International Corp.  
6th Floor, No. 187, Tiding Blvd. Sec. 2, Nei-Hu,  
Taipei, Taiwan 114

**Equipment Under Test:** Navigation Device

**Trade Name:** MAGELLAN

**Model:** Magellan® Maestro 4700

**Date of Test:** May 11~12, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

**Approved by:**

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Ethan Huang  
Section Manager

**Reviewed by:**

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Julia Wei  
Senior Specialist



## 2. EUT DESCRIPTION

<b>Product</b>	Navigation Device		
<b>Trade Name</b>	MAGELLAN		
<b>Model Number</b>	Magellan® Maestro 4700		
<b>Model Discrepancy</b>	N/A		
<b>EUT Power Rating</b>	5VDC, 1A		
<b>Power Adapter</b>	TPT	<b>Model</b>	MII050100
<b>Power Adapter Power Rating</b>	I/P: 100-240VAC, 13~17VA, 50-60Hz, 0.5A O/P: 5VDC, 1A		
<b>Operating Frequency Range</b>	2402 ~ 2480 MHz		
<b>Transmit Power</b>	3.22dBm		
<b>Modulation Technique</b>	GFSK for 1Mbps; $\pi/4$ -DQPSK for 2Mbps; 8DPSK for 3Mbps		
<b>Transmit Data Rate</b>	1Mbps		
<b>Number of Channels</b>	79 Channels		
<b>Antenna Specification</b>	PIFA Antenna / Gain: 0.357dBi		

**Remark:**

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **P4Q-2009MIN4700** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4: 2003 and FCC CFR 47 Part 2, Part 15.207, 15.209 and 15.247.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2003.



### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



### 3.5 DESCRIPTION OF TEST MODES

The EUT (model: Magellan<sup>®</sup> Maestro 4700) had been tested under operating condition and had been reported as worst case on this test report.

Test program used to control the EUT for staying in continuous transmitting mode was programmed.

Following channels were selected for the for radiated emission testing only as listed below:

Tested Channel	Modulation Type	Packet Type	Date Rate
Low, Mid, High	GFSK	DH 5	1
Low, Mid, High	8DPSK	DH 5	3

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

Channel Low (2402MHz), Mid (2441MHz) and High (2480MHz) were chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.





### 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

#### 4.1 MEASUREMENT EQUIPMENT USED

##### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year.+*

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEB	825829/011	10/29/2009
Spectrum Analyzer	Agilnet	E4446A	MY48250064	10/28/2009

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSP30	100112	10/16/2009
Spectrum Analyzer	R&S	FSEB	825829/011	10/29/2009
Loop Antenna	EMCO	6502	2356	05/28/2010
Pre-Amplifier	Anritsu	MH648A	M89145	07/25/2009
Pre-Amplifier	Agilent	8449B	3008A01738	03/28/2010
Bilog Antenna	FRANKONIA	BTA-M	030003M	04/03/2010
Horn Antenna	EMCO	3115	00022250	05/08/2010
Antenna Tower	HD	AS620E	N/A	N.C.R
Controller	HD	HD100	N/A	N.C.R
Turn Table	HD	DT-K312	N/A	N.C.R
Test S/W	LabVIEW 6.1 (Wugu Chamber EMI Teat V1_4.5.3)			

Powerline Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	845552/030	04/08/2010
LISN	R&S	ENV216	100074	12/09/2009
LISN	FCC	FCC-LISN-50/ 250-16-2-07	06013	10/12/2009
Test S/W	LabVIEW 6.1 (CCS Conduction Test SW Version_01)			



### 4.2 MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	±1.7806
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	±3.8856
3M Semi Anechoic Chamber / Above 1GHz	±3.8721

*Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

### 4.3 MEASUREMENT UNCERTAINTY

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028-1 [2] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 6 is based on such expansion factors.

**Table 6: Maximum measurement uncertainty**

Parameter	Uncertainty
RF frequency	+/- 1 * 10 <sup>-5</sup>
Total RF power conducted	+/- 1,5 dB
RF power density, conducted	+/- 3 dB
Spurious emissions, conducted	+/- 3 dB
All emissions, radiated	+/- 6 dB
Humidity	+/- 5 %
Temperature	+/- 1°C
DC and low frequency voltages	+/- 3%



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

No. 81-1, Lane 210, Pa-De 2nd Rd., Luchu Hsiang, Taoyuan Shien, (338) Taiwan, R.O.C.

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7: 1992, ANSI C63.4: 2003 and CISPR Publication 22.

### **5.2 EQUIPMENT**





Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	 ACCREDITED No. 0824-01
USA	FCC MRA	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	<b>VCCI</b> R-2882/2541/2798/725/1868 C-402/747/912 T-321/325
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	 IAC-MRA <b>TAF</b> Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	 <b>Canada</b> IC 2324C-3 IC 2324C-5

**Note:** No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**\*\*No any support equipment during the test.**

*Remark: Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



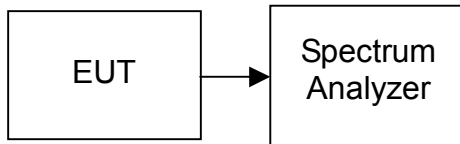
## **7. FCC PART 15.247 REQUIREMENTS**

### **7.1 20dB BANDWIDTH**

#### **LIMIT**

None; for reporting purposes only.

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10kHz, VBW = 30kHz, Span = 2.5MHz, Sweep = auto.
4. Mark the peak frequency and 20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### **TEST RESULTS**

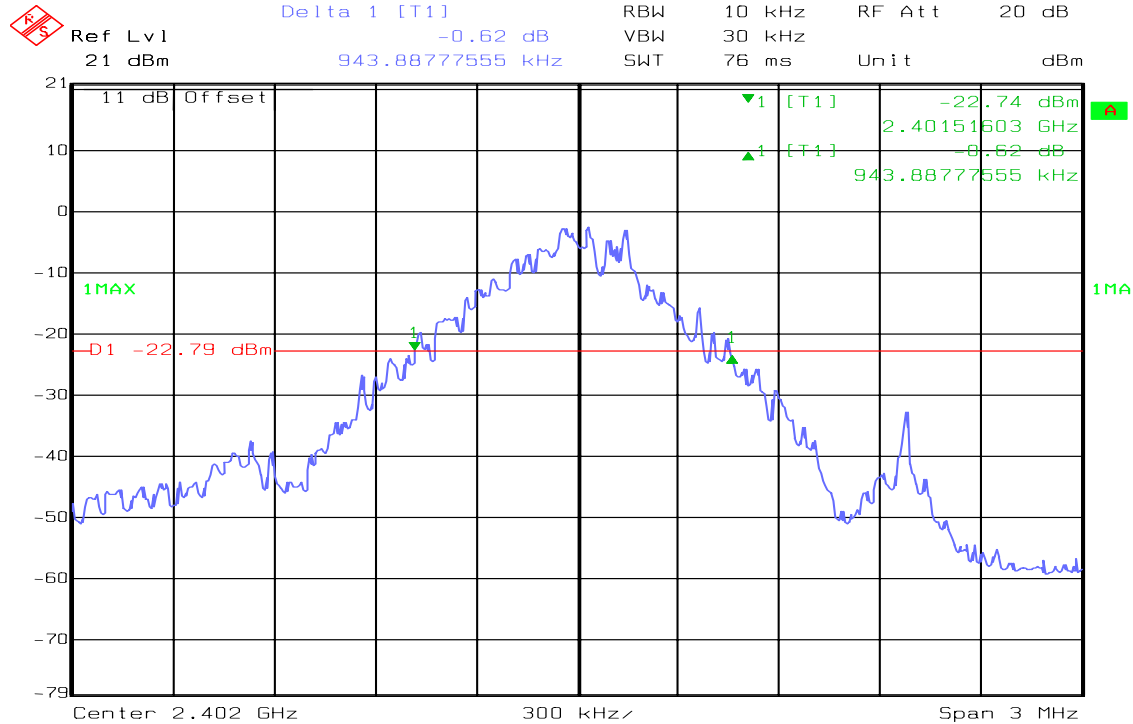
*No non-compliance noted*



Test Plot

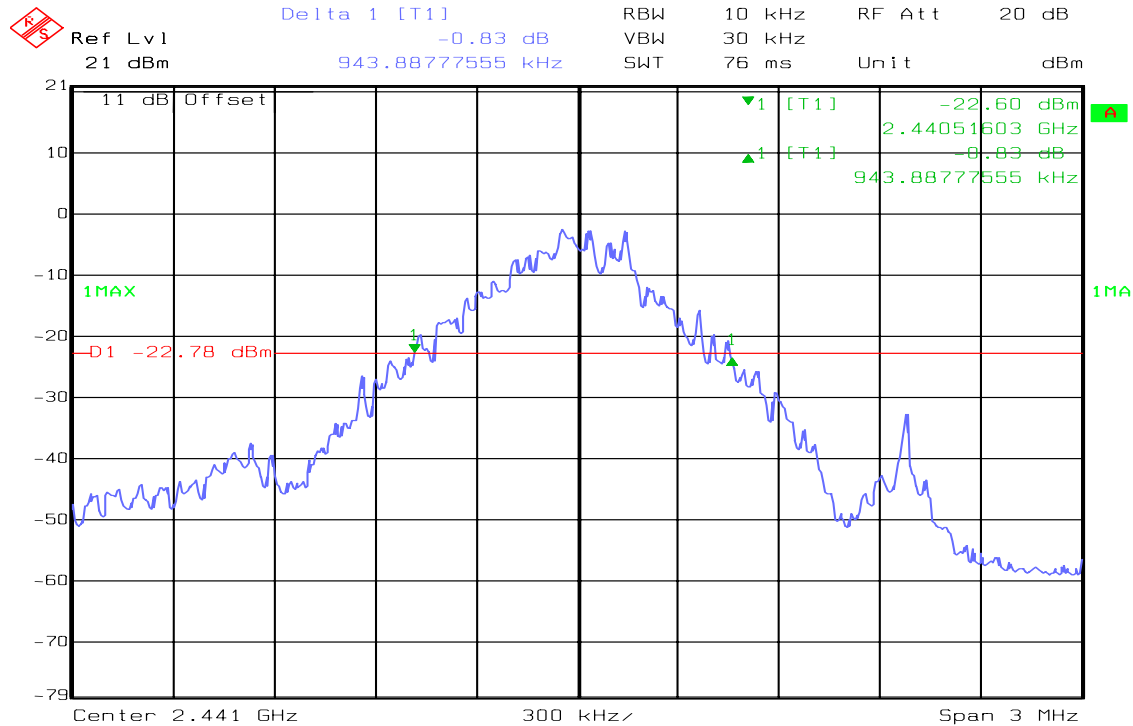
GFSK

20dB Bandwidth (CH Low)



Date: 12.MAY 2009 09:46:21

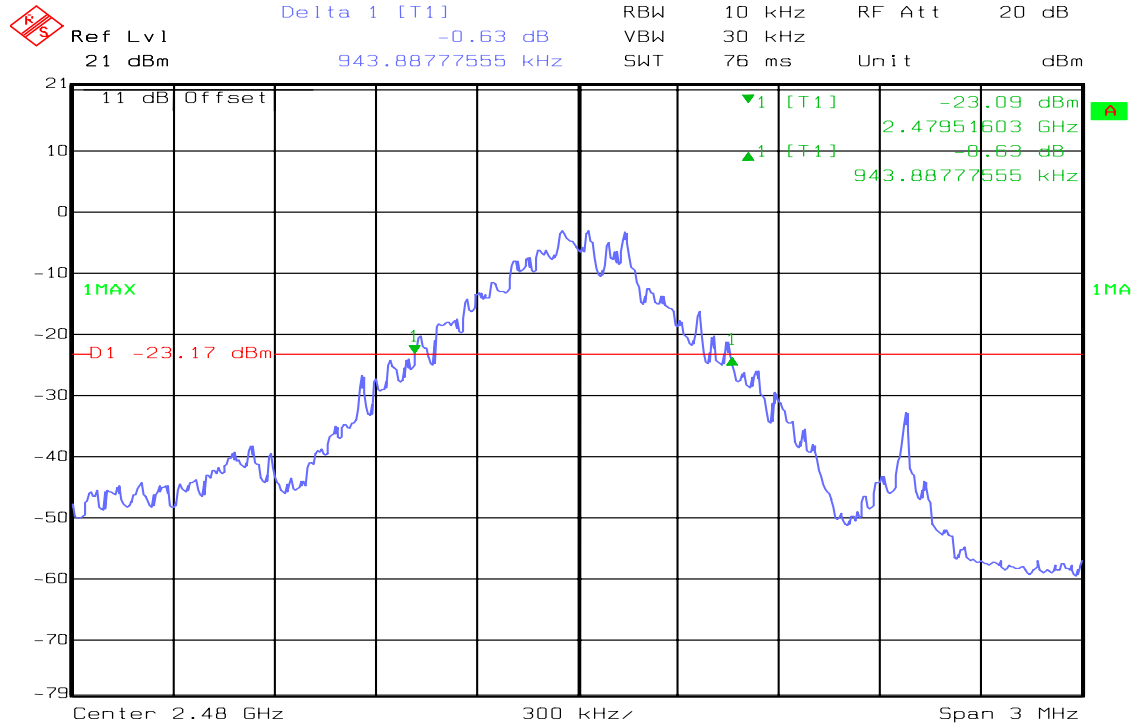
20dB Bandwidth (CH Mid)



Date: 12.MAY 2009 09:38:12



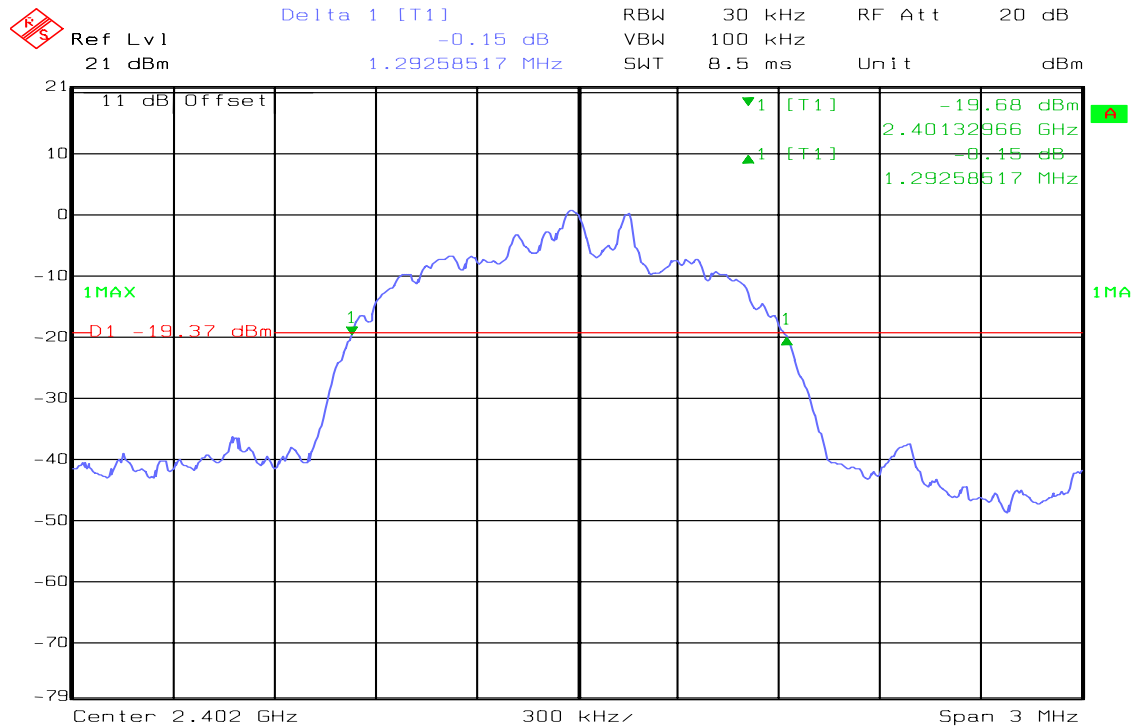
### 20dB Bandwidth (CH High)



Date: 12.MAY 2009 09:31:54

### 8DPSK

### 20dB Bandwidth (CH Low)

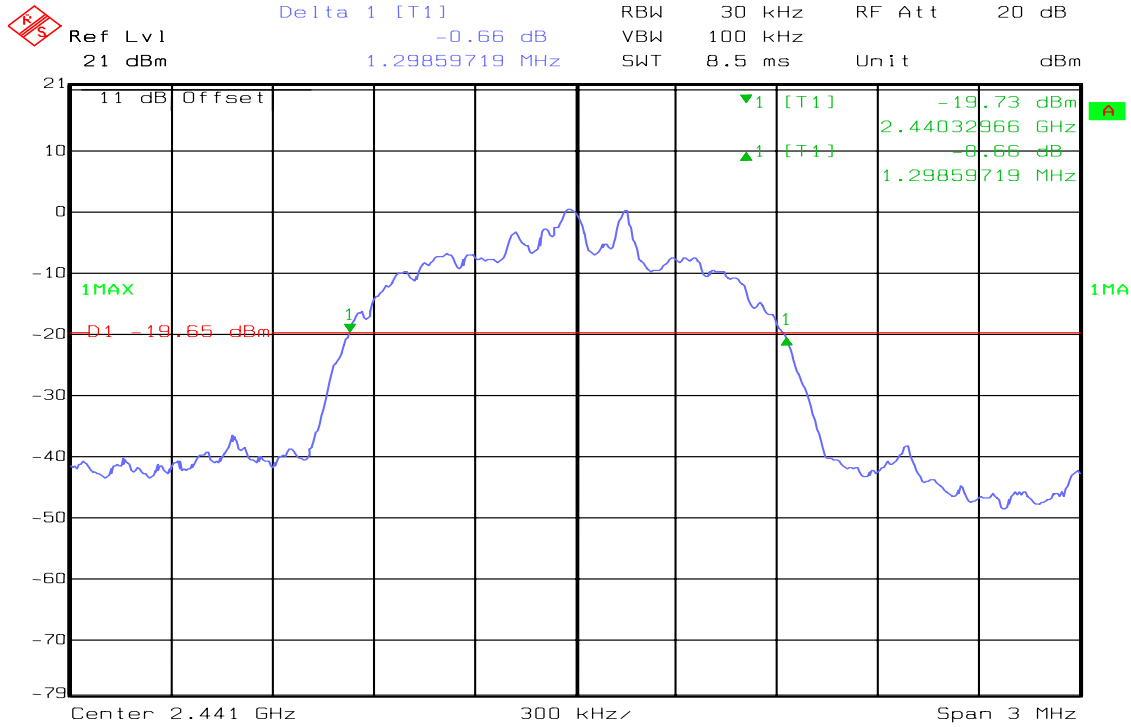


Date: 12.MAY 2009 09:41:51



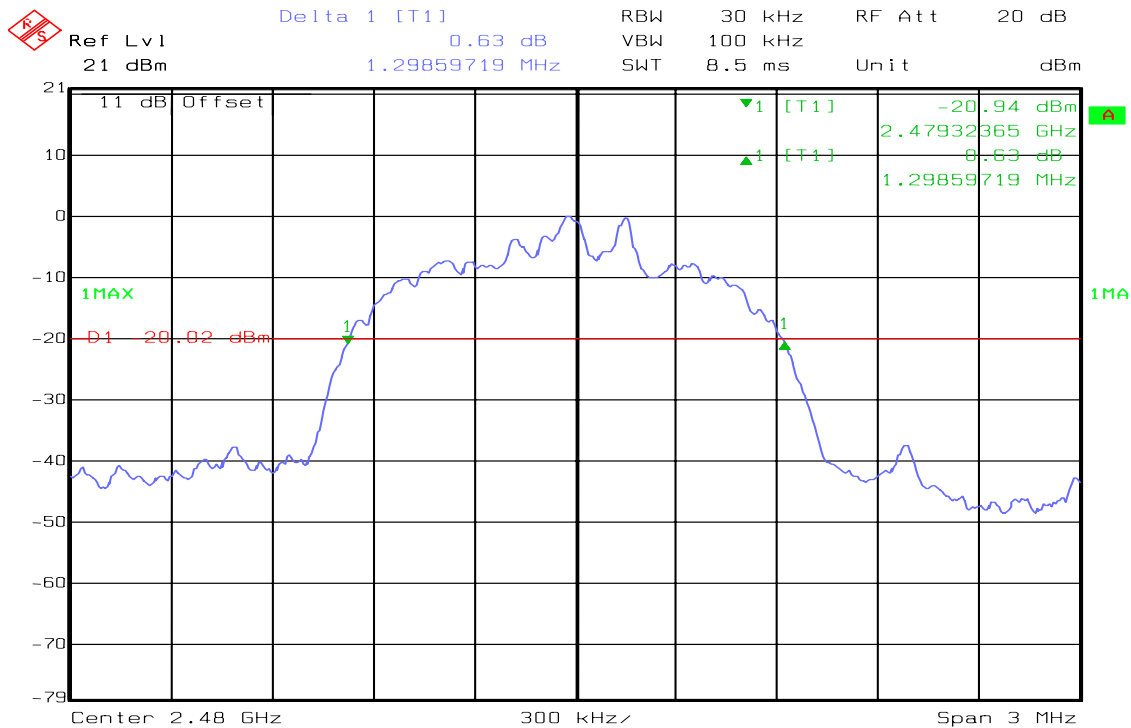


### 20dB Bandwidth (CH Mid)



Date: 12.MAY 2009 09:39:53

### 20dB Bandwidth (CH High)



Date: 12.MAY 2009 09:29:15



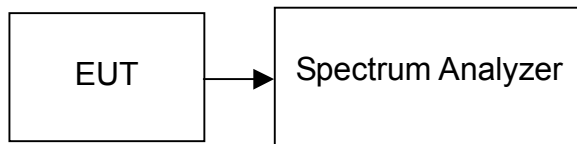
## **7.2 PEAK POWER**

### **LIMIT**

According to §15.247, the maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
2. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
3. According to §15.247(b) (4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the peak power detection.

### **TEST RESULTS**

*No non-compliance noted*



**TEST DATA**

**GFSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	3.22	0.00210	0.125	PASS
Mid	2441	3.15	0.00207		PASS
High	2480	2.27	0.00169		PASS

**8DPSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	2.23	0.00167	0.125	PASS
Mid	2441	2.14	0.00163		PASS
High	2480	1.72	0.00148		PASS

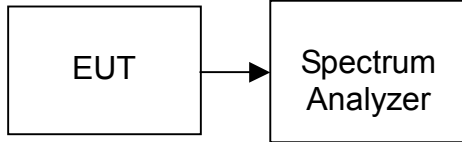


### 7.3 AVERAGE POWER

#### LIMIT

None; for reporting purposes only.

#### TEST CONFIGURATION



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the average power detection.

#### TEST RESULTS

*No non-compliance noted*

#### TEST DATA

##### **GFSK**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	1.81	0.00152
Mid	2441	1.73	0.00149
High	2480	1.03	0.00127

##### **8DPSK**

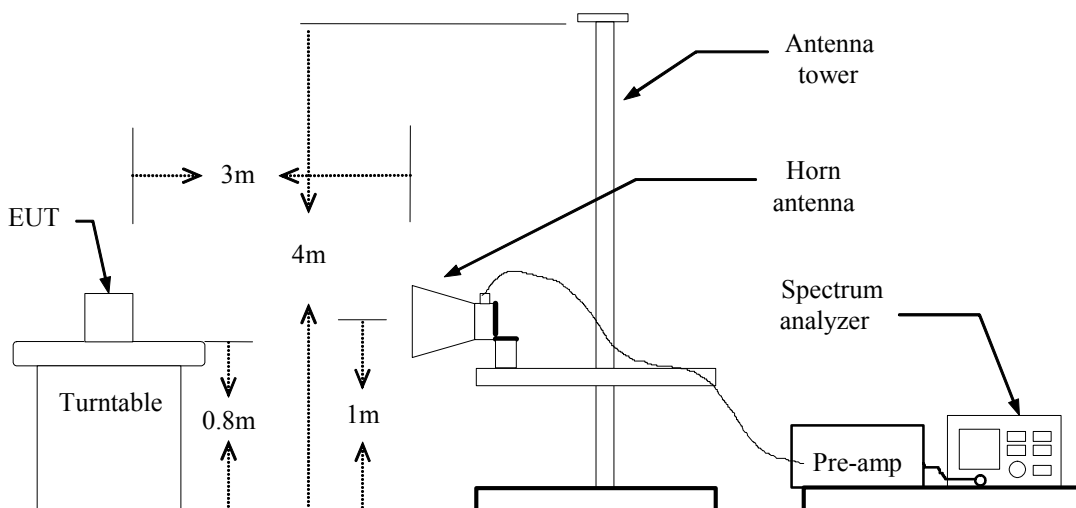
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	-0.79	0.00083
Mid	2441	-0.95	0.00080
High	2480	-1.33	0.00074

## 7.4 BAND EDGES MEASUREMENT

### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### TEST RESULTS

*No non-compliance noted*



### TEST DATA

Refer to attach spectrum analyzer data chart.

#### Band Edges (Bluetooth GFSK / CH Low)

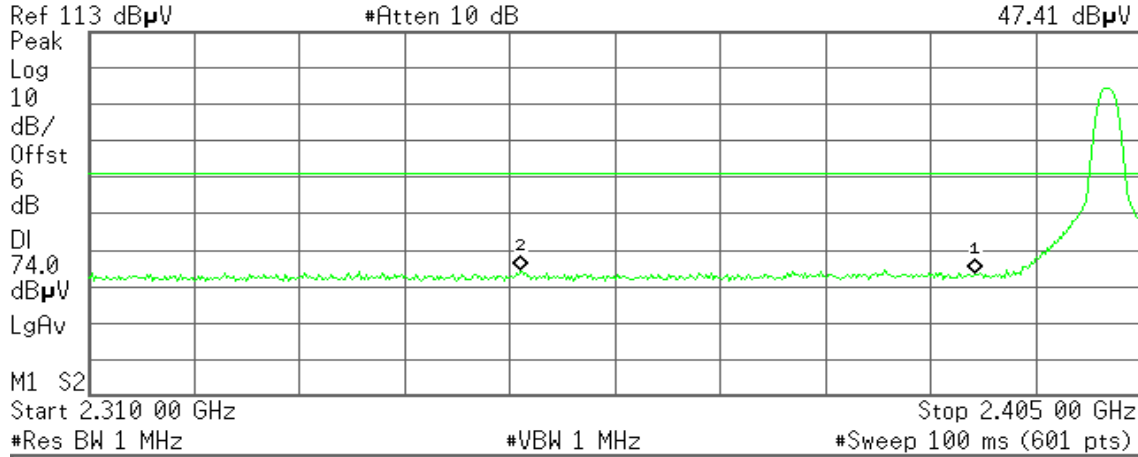
Detector mode: Peak

Polarity: Vertical

Agilent 14:20:38 May 11, 2009

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Mkr2 2.348 95 GHz  
47.41 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.398 00 GHz	46.94 dBµU
2	(1)	Freq	2.348 95 GHz	47.41 dBµU

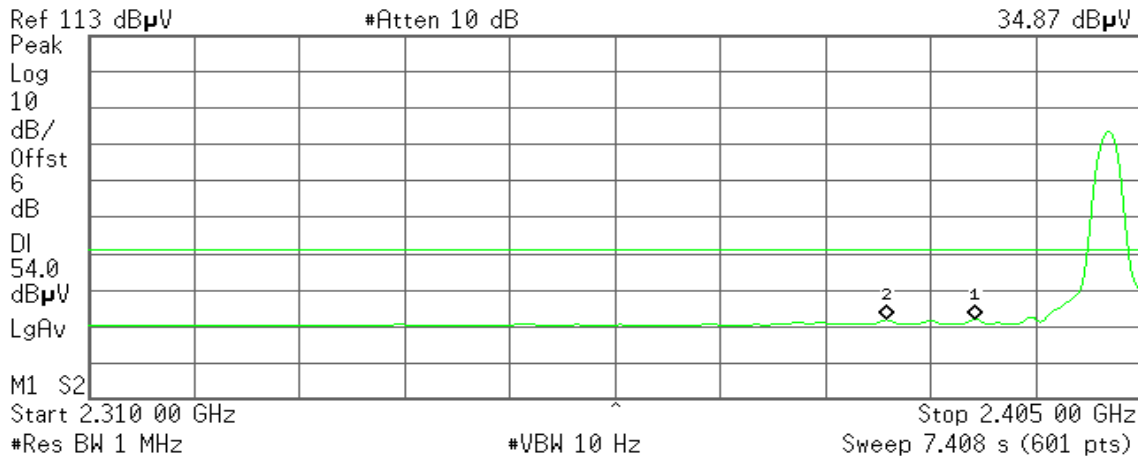
Detector mode: Average

Polarity: Vertical

Agilent 14:21:44 May 11, 2009

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Mkr2 2.382 04 GHz  
34.87 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.398 00 GHz	35.04 dBµU
2	(1)	Freq	2.382 04 GHz	34.87 dBµU



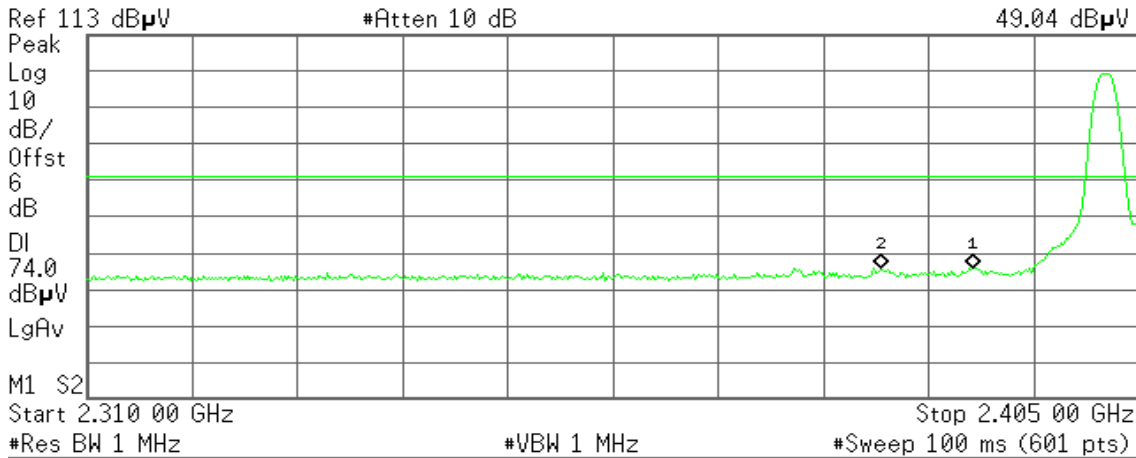
Detector mode: Peak

Polarity: Horizontal

Agilent 14:15:15 May 11, 2009

R T

Mkr2 2.381 72 GHz  
49.04 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	48.82 dBµU
2	(1)	Freq	2.381 72 GHz	49.04 dBµU

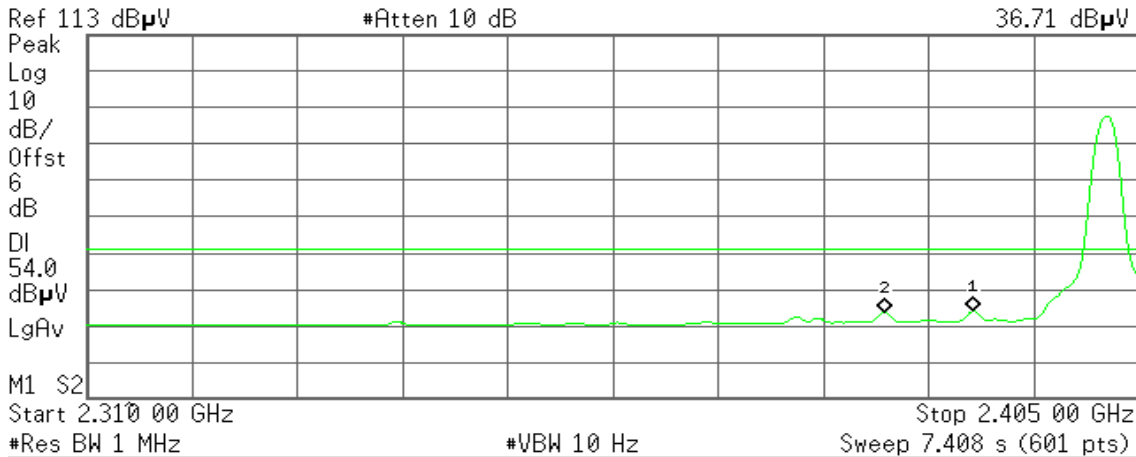
Detector mode: Average

Polarity: Horizontal

Agilent 14:16:42 May 11, 2009

R T

Mkr2 2.382 04 GHz  
36.71 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	37.04 dBµU
2	(1)	Freq	2.382 04 GHz	36.71 dBµU



### Band Edges (Bluetooth GFSK / CH High)

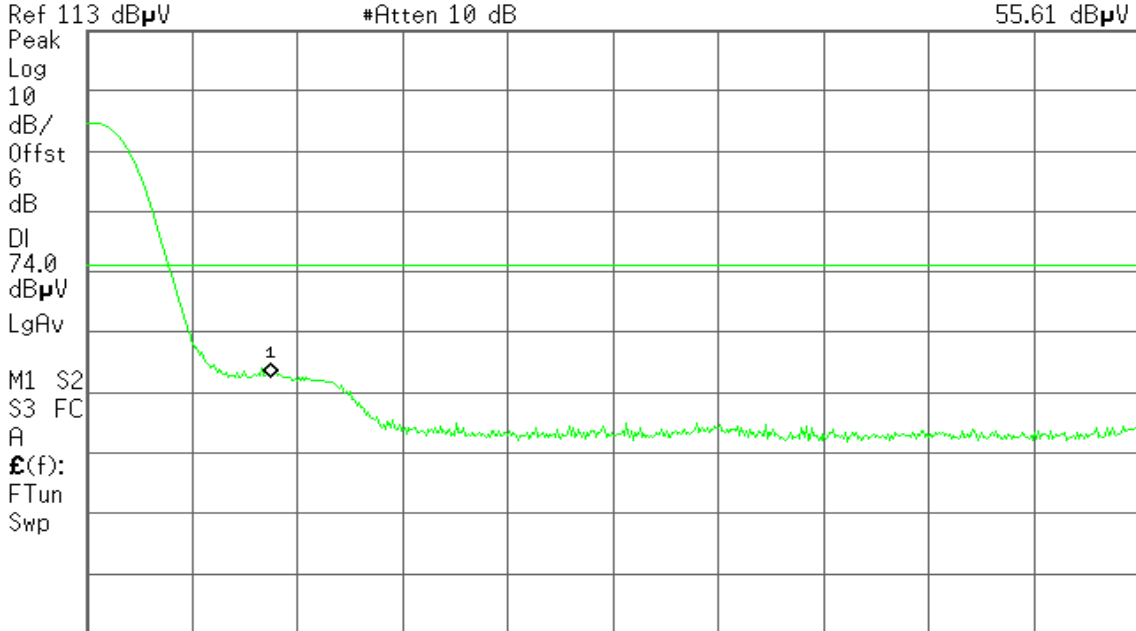
Detector mode: Peak

Polarity: Vertical

Agilent 14:57:45 May 11, 2009

R T

Mkr1 2.483 50 GHz  
55.61 dBμV



Start 2.480 00 GHz #Res BW 1 MHz #Atten 10 dB #VBW 1 MHz Stop 2.500 00 GHz #Sweep 100 ms (601 pts)

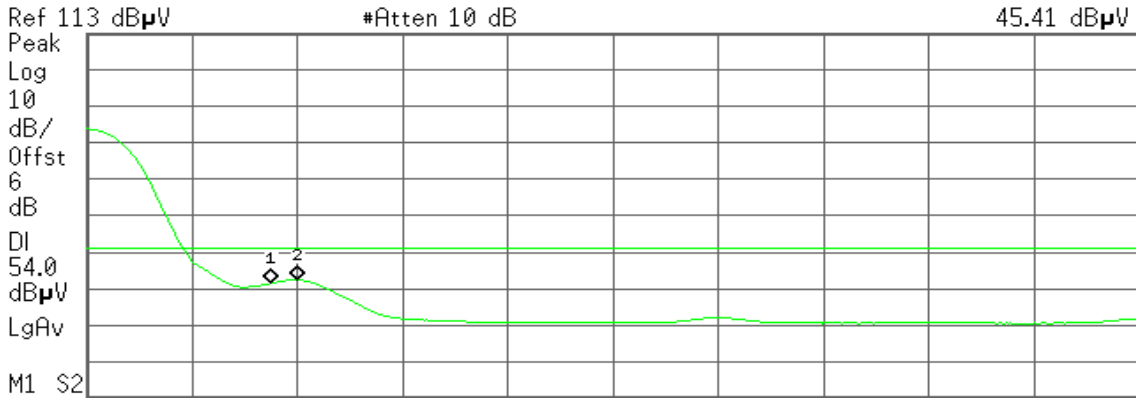
Detector mode: Average

Polarity: Vertical

Agilent 15:01:21 May 11, 2009

R T

Mkr2 2.484 00 GHz  
45.41 dBμV



Start 2.480 00 GHz #Res BW 1 MHz #Atten 10 dB #VBW 10 Hz Stop 2.500 00 GHz Sweep 1.56 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.483 50 GHz	44.42 dBμU
2	(1)	Freq	2.484 00 GHz	45.41 dBμU





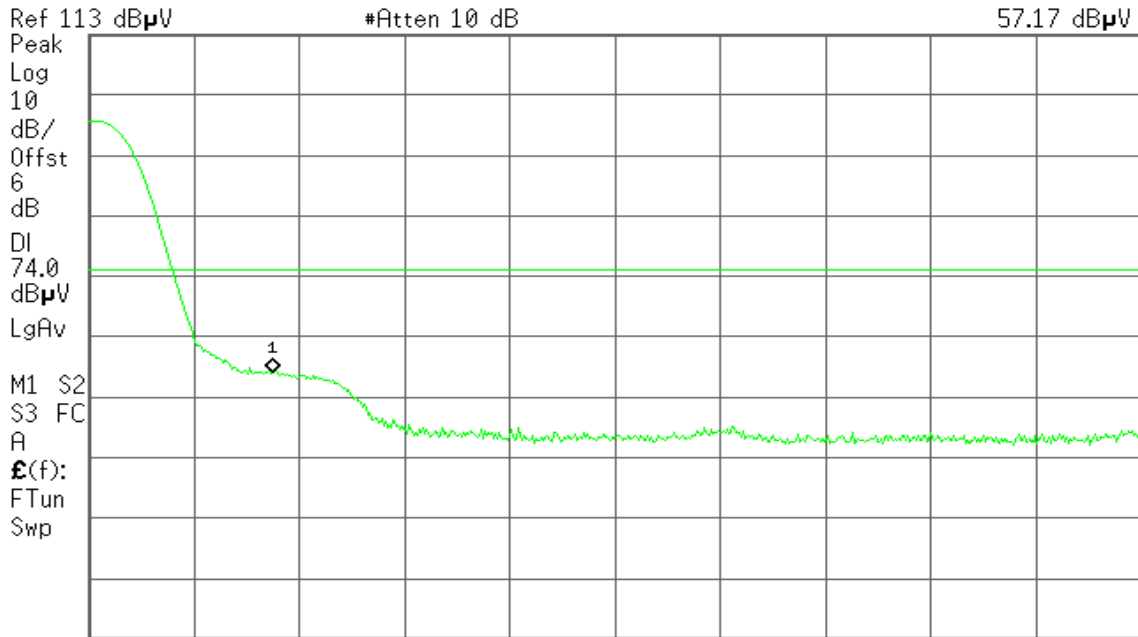
Detector mode: Peak

Polarity: Horizontal

Agilent 15:03:08 May 11, 2009

R T

Mkr1 2.483 50 GHz  
57.17 dBµV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

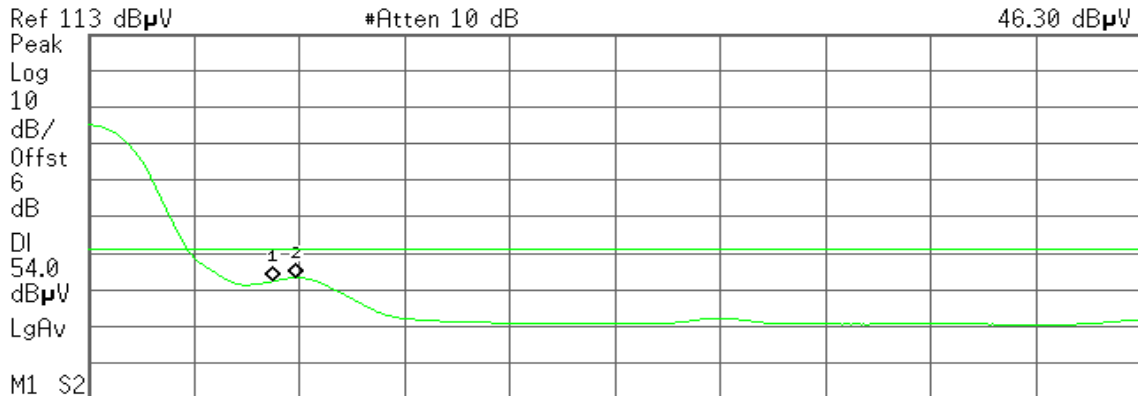
Detector mode: Average

Polarity: Horizontal

Agilent 15:04:18 May 11, 2009

R T

Mkr2 2.483 93 GHz  
46.30 dBµV



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 1.56 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.483 50 GHz	45.31 dBµU
2	(1)	Freq	2.483 93 GHz	46.30 dBµU



### Band Edges (Bluetooth 8DPSK / CH Low)

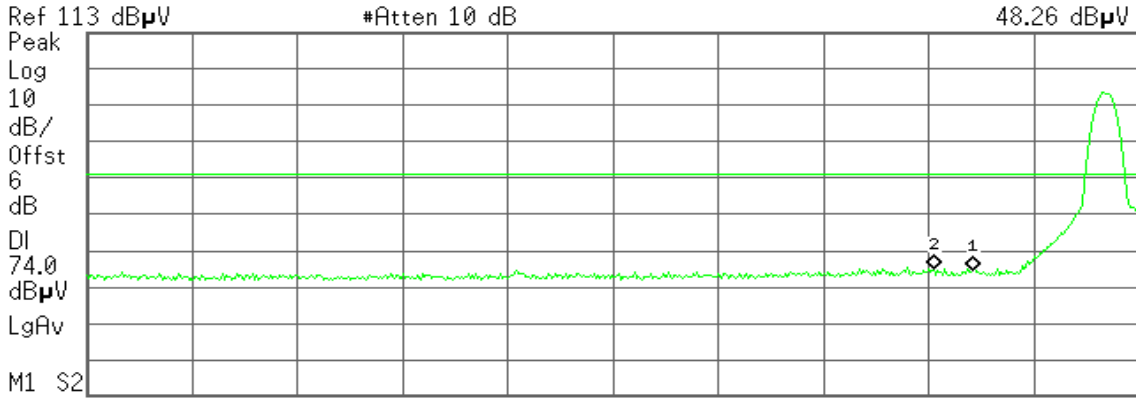
Detector mode: Peak

Polarity: Vertical

Agilent 14:25:22 May 11, 2009

R T

Mkr2 2.386 48 GHz  
48.26 dBμV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	47.43 dBμV
2	(1)	Freq	2.386 48 GHz	48.26 dBμV

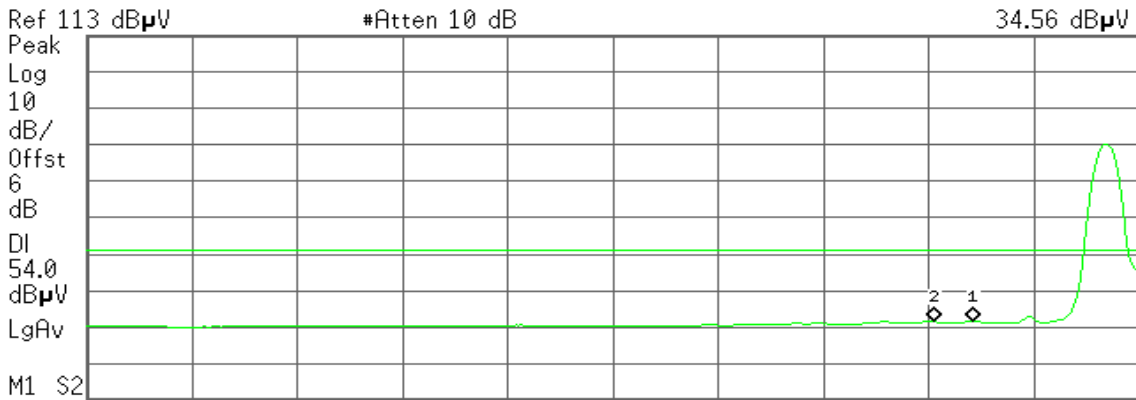
Detector mode: Average

Polarity: Vertical

Agilent 14:26:03 May 11, 2009

R T

Mkr2 2.386 48 GHz  
34.56 dBμV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	34.71 dBμV
2	(1)	Freq	2.386 48 GHz	34.56 dBμV



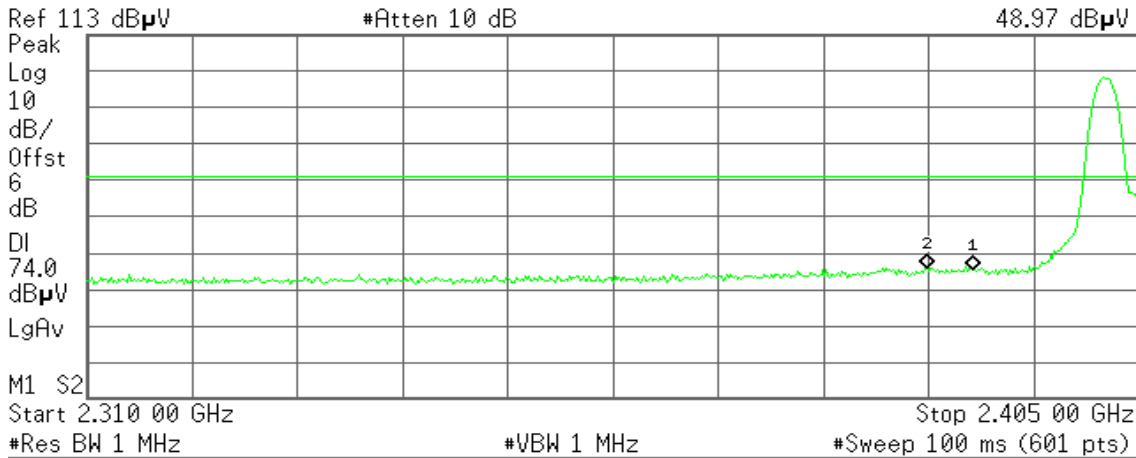
Detector mode: Peak

Polarity: Horizontal

Agilent 14:28:21 May 11, 2009

R T

Mkr2 2.385 84 GHz  
48.97 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	48.48 dBµU
2	(1)	Freq	2.385 84 GHz	48.97 dBµU

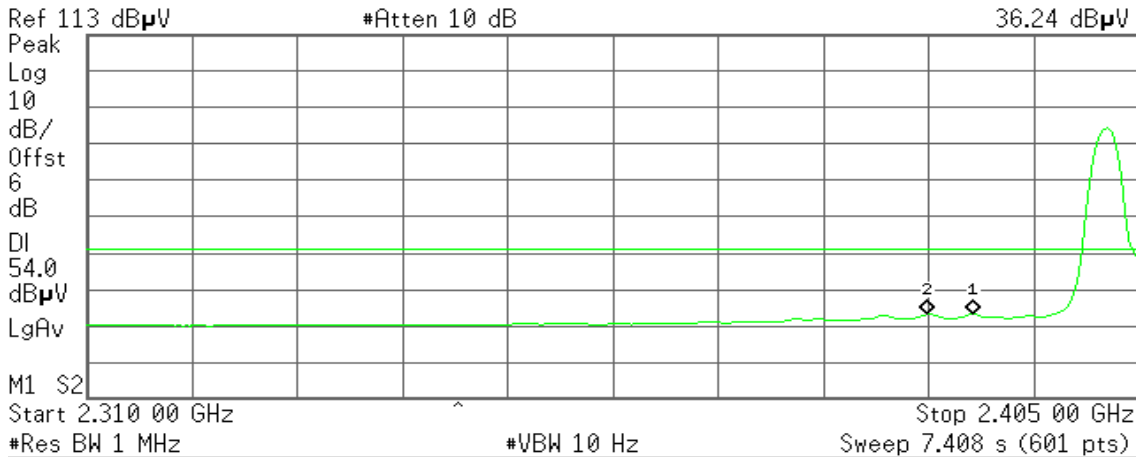
Detector mode: Average

Polarity: Horizontal

Agilent 14:29:39 May 11, 2009

R T

Mkr2 2.385 84 GHz  
36.24 dBµV



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.390 00 GHz	36.37 dBµU
2	(1)	Freq	2.385 84 GHz	36.24 dBµU



### Band Edges (Bluetooth 8DPSK / CH High)

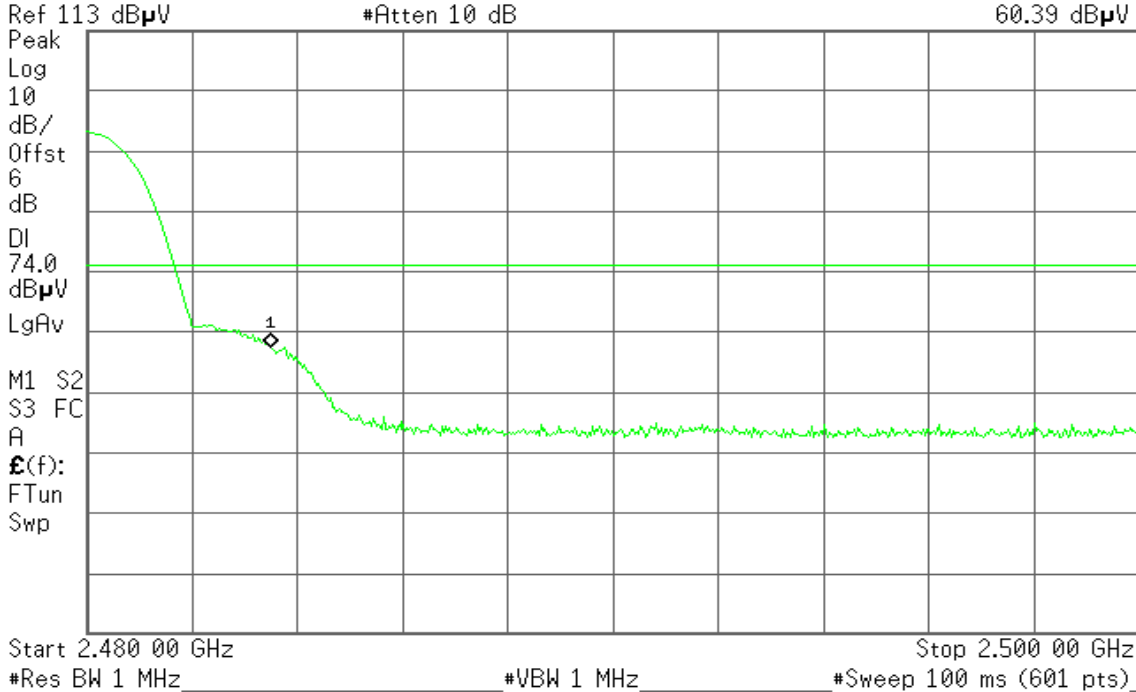
Detector mode: Peak

Polarity: Vertical

Agilent 14:54:09 May 11, 2009

R T

Mkr1 2.483 50 GHz  
60.39 dB $\mu$ V



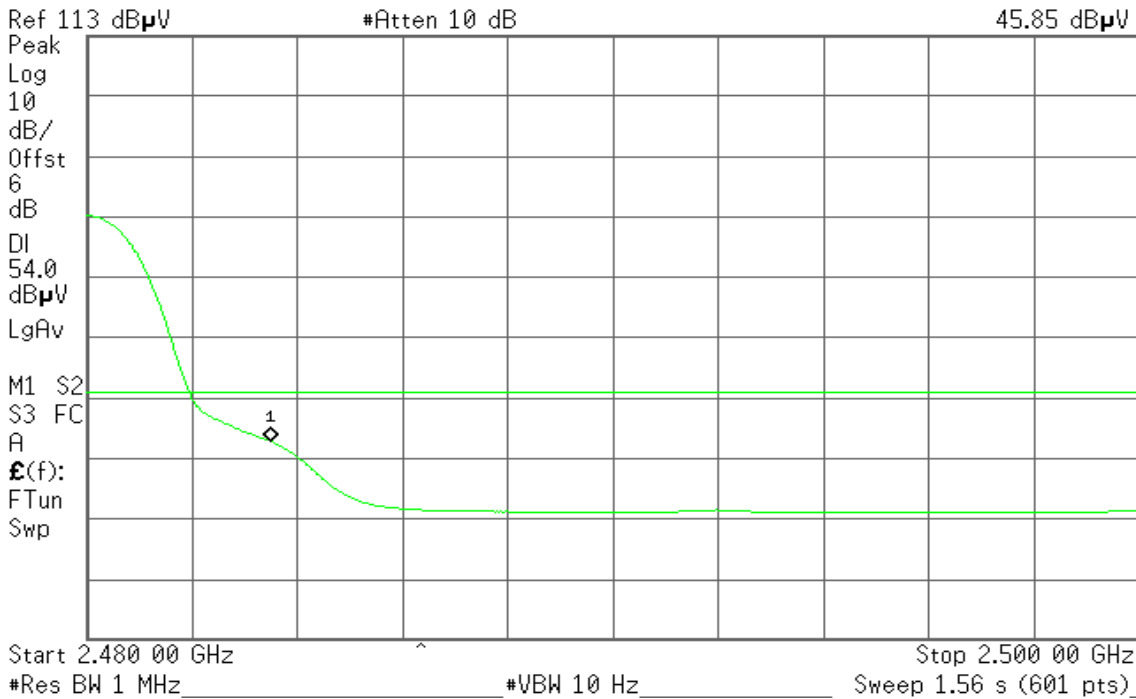
Detector mode: Average

Polarity: Vertical

Agilent 14:54:53 May 11, 2009

R T

Mkr1 2.483 50 GHz  
45.85 dB $\mu$ V





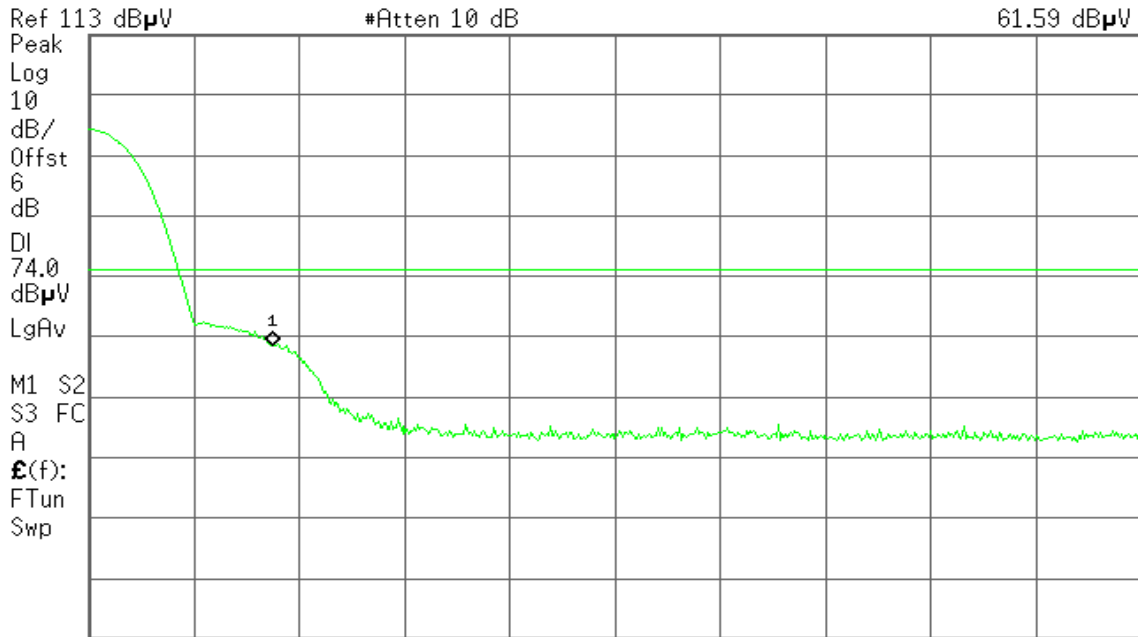
**Detector mode: Peak**

**Polarity: Horizontal**

Agilent 14:49:19 May 11, 2009

R T

Mkr1 2.483 50 GHz  
61.59 dB $\mu$ V



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

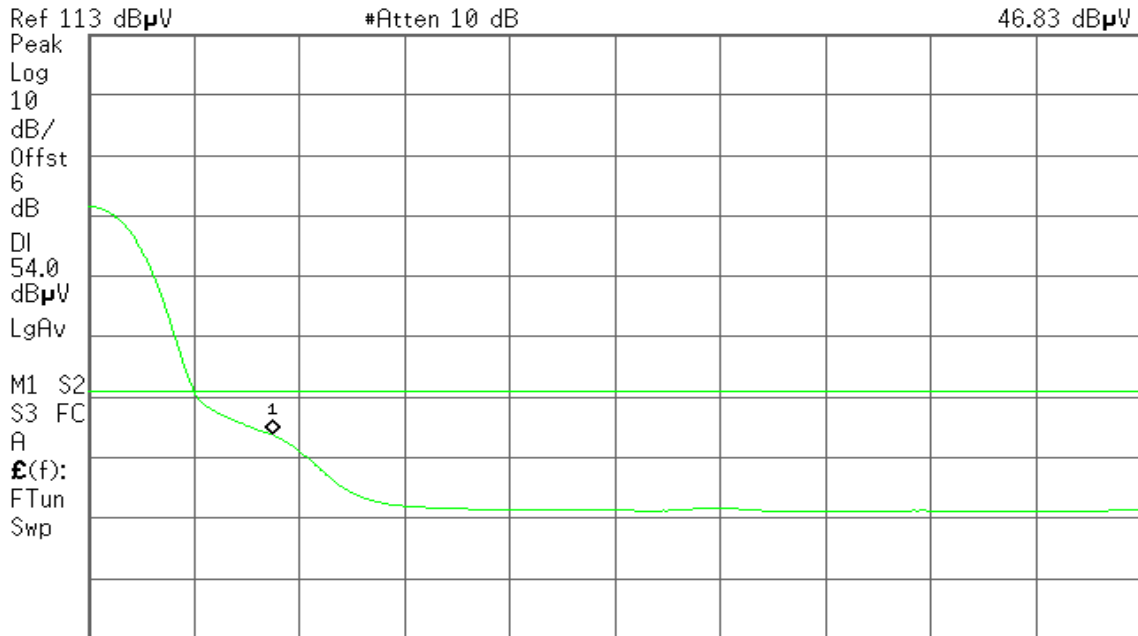
**Detector mode: Average**

**Polarity: Horizontal**

Agilent 14:49:55 May 11, 2009

R T

Mkr1 2.483 50 GHz  
46.83 dB $\mu$ V



Start 2.480 00 GHz Stop 2.500 00 GHz  
#Res BW 1 MHz #VBW 10 Hz Sweep 1.56 s (601 pts)

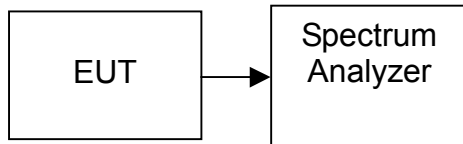


## 7.5 FREQUENCY SEPARATION

### LIMIT

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW = 30kHz, VBW = 100kHz, Span = 3MHz, Sweep = auto.
5. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency.

### TEST RESULTS

*No non-compliance noted*

### TEST DATA

#### GFSK

Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	629.26	> 20dB Bandwidth or two-thirds of the 20 dB bandwidth	Pass

#### 8DPSK

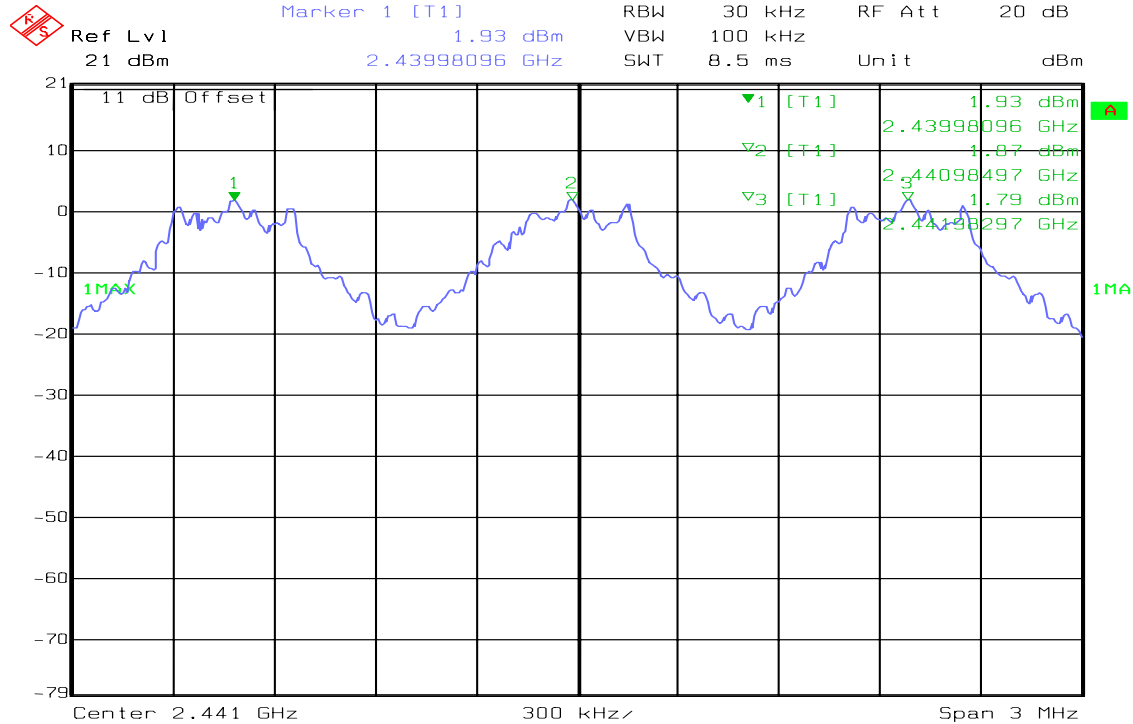
Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	865.73	> 20dB Bandwidth or two-thirds of the 20 dB bandwidth	Pass



Test Plot

GFSK

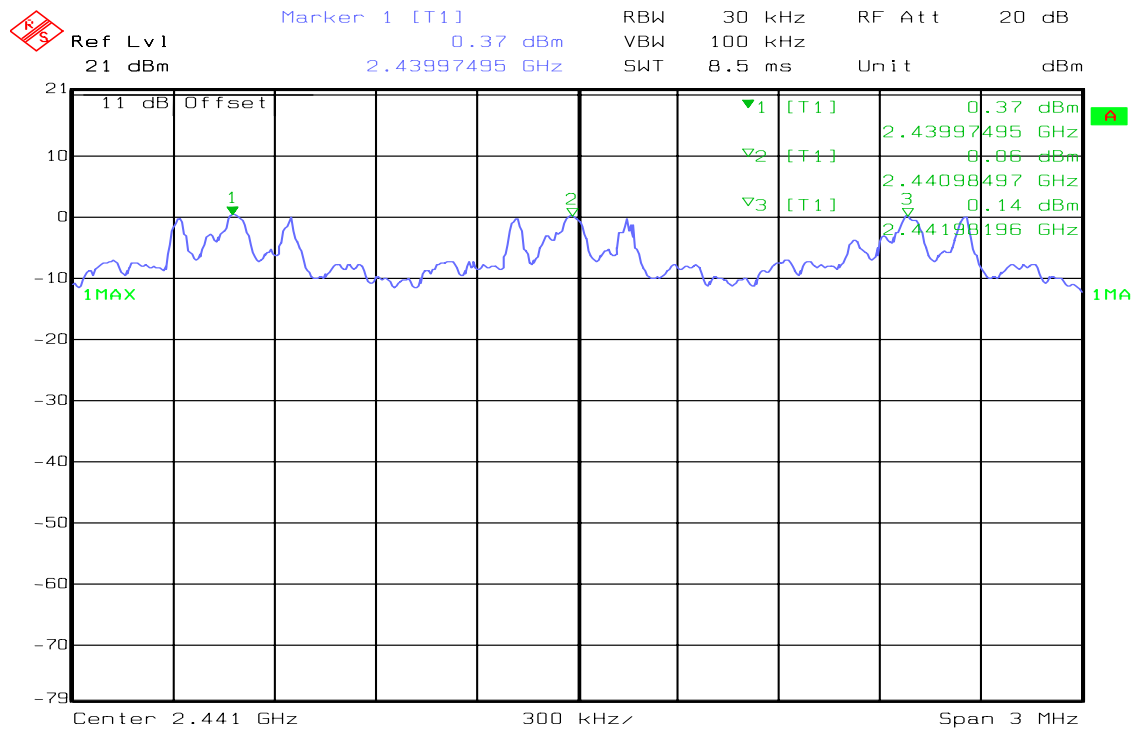
Measurement of Channel Separation



Date: 12.MAY 2009 11:00:25

8DPSK

Measurement of Channel Separation



Date: 12.MAY 2009 10:58:24

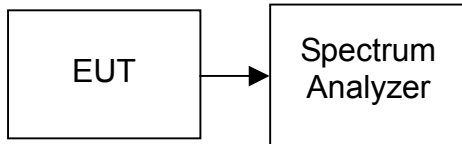


## 7.6 NUMBER OF HOPPING FREQUENCY

### LIMIT

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2441.5MHz, Sweep = auto and Start=2441.5MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW, VBW=500kHz.
5. Max hold, view and count how many channel in the band.

### TEST RESULTS

*No non-compliance noted*

### TEST DATA

Result (No. of CH)	Limit (No. of CH)	Result
79	>15	PASS



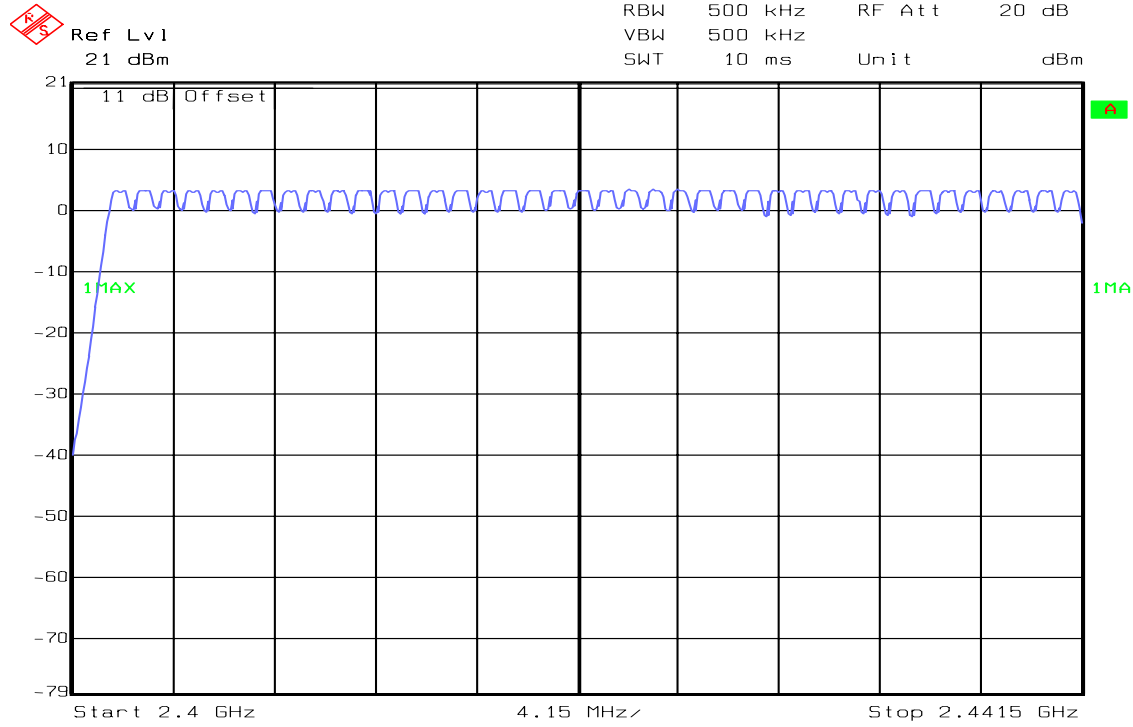


**Test Plot**

**GFSK**

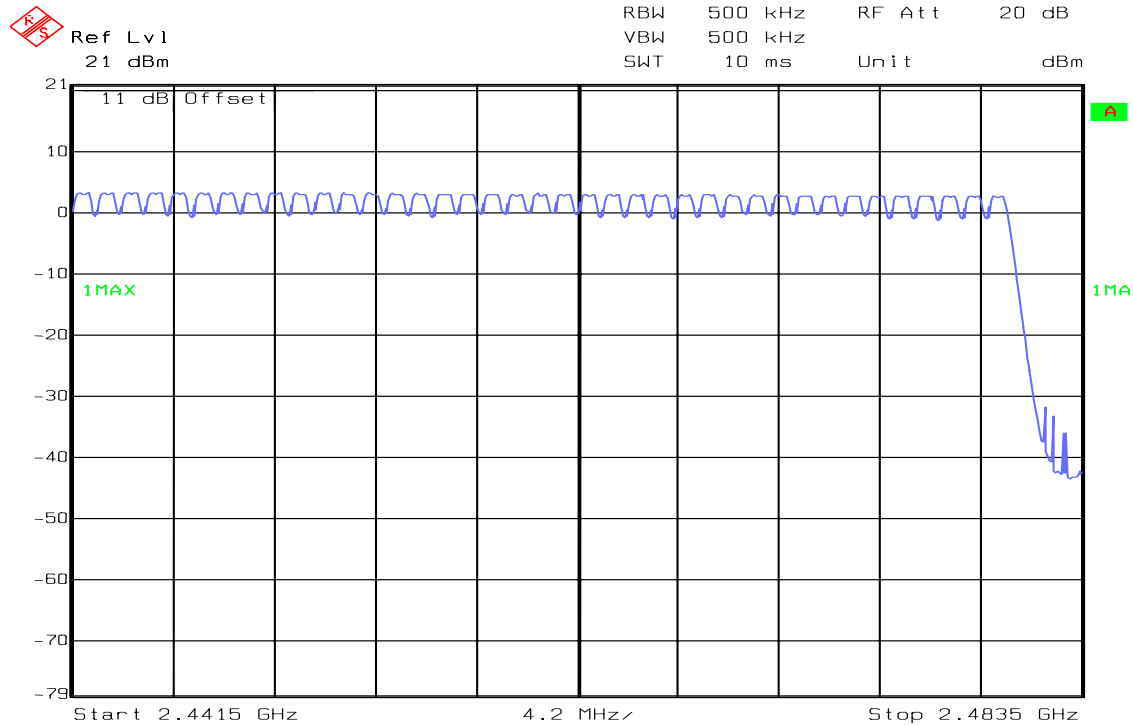
**Channel Number**

**2.4 GHz – 2.4415 GHz**



Date: 12.MAY 2009 10:23:16

**2.4415 GHz – 2.4835 GHz**



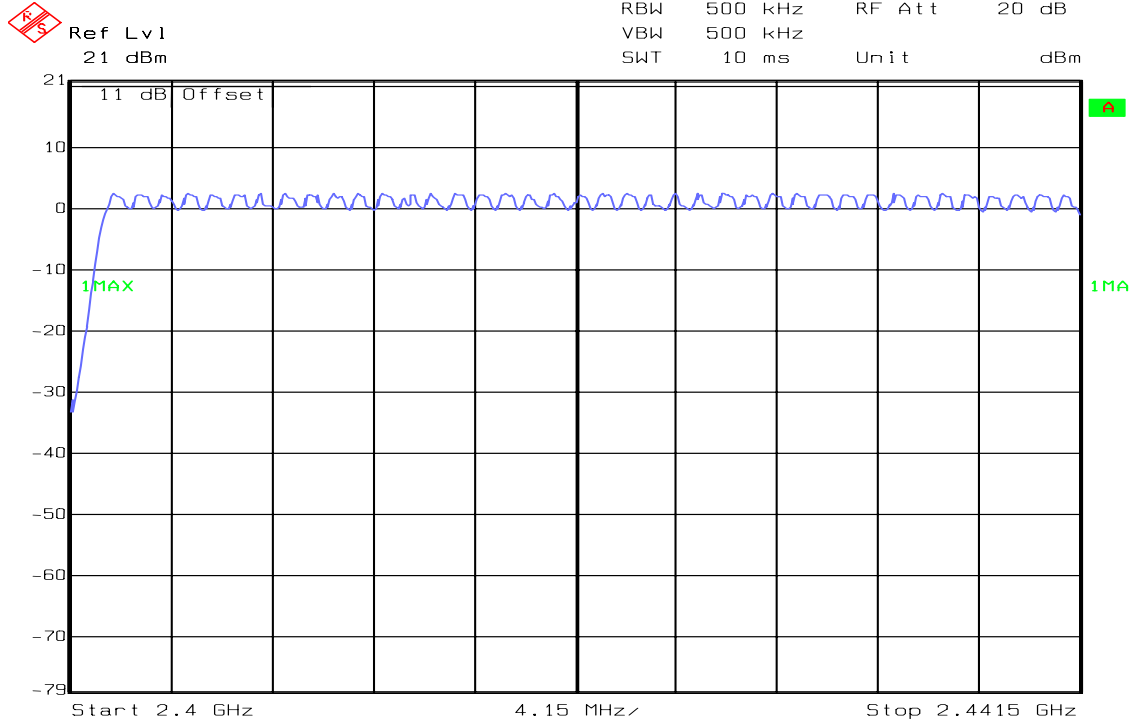
Date: 12.MAY 2009 10:22:26



**8DPSK**

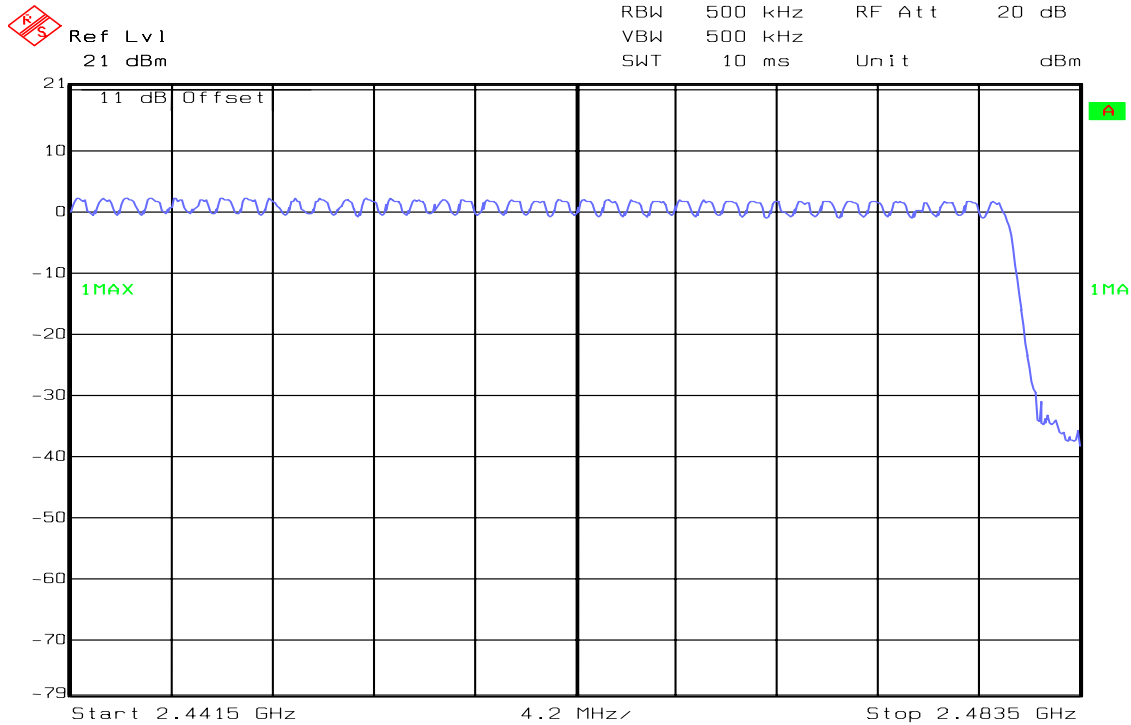
**Channel Number**

**2.4 GHz – 2.4415 GHz**



Date: 12.MAY 2009 10:16:07

**2.4415 GHz – 2.4835 GHz**



Date: 12.MAY 2009 10:20:48

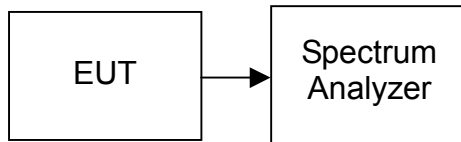


## **7.7 TIME OF OCCUPANCY (DWELL TIME)**

### **LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

### **TEST CONFIGURATION**



### **TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
5. Repeat above procedures until all frequency measured were complete.

### **TEST RESULTS**

*No non-compliance noted*



**TEST DATA**

**GFSK**

**DH 1**

CH Low:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH Mid:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH High:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.888	284.16	31.60	400.00	PASS
Mid	0.888	284.16	31.60		PASS
High	0.888	284.16	31.60		PASS

**DH 3**

CH Low:  $2.15 * (1600/4)/79 * 31.6 = 344$  (ms)

CH Mid:  $2.15 * (1600/4)/79 * 31.6 = 344$  (ms)

CH High:  $2.15 * (1600/4)/79 * 31.6 = 344$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.15	344	31.60	400.00	PASS
Mid	2.15	344	31.60		PASS
High	2.15	344	31.60		PASS

**DH 5**

CH Low:  $3.39 * (1600/6)/79 * 31.6 = 361.6$  (ms)

CH Mid:  $3.35 * (1600/6)/79 * 31.6 = 357.3$  (ms)

CH High:  $3.39 * (1600/6)/79 * 31.6 = 361.6$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	3.39	361.6	31.60	400.00	PASS
Mid	3.35	357.3	31.60		PASS
High	3.39	361.6	31.60		PASS



**8DPSK**

**DH 1**

CH Low:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH Mid:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH High:  $0.888 * (1600/2)/79 * 31.6 = 284.16$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.888	284.16	31.60	400.00	PASS
Mid	0.888	284.16	31.60		PASS
High	0.888	284.16	31.60		PASS

**DH 3**

CH Low:  $2.13 * (1600/4)/79 * 31.6 = 340.8$  (ms)

CH Mid:  $2.15 * (1600/4)/79 * 31.6 = 344.0$  (ms)

CH High:  $2.15 * (1600/4)/79 * 31.6 = 344.0$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.13	340.8	31.60	400.00	PASS
Mid	2.15	344.0	31.60		PASS
High	2.15	344.0	31.60		PASS

**DH 5**

CH Low:  $3.41 * (1600/6)/79 * 31.6 = 363.73$  (ms)

CH Mid:  $3.39 * (1600/6)/79 * 31.6 = 361.60$  (ms)

CH High:  $3.37 * (1600/6)/79 * 31.6 = 359.47$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	3.41	363.73	31.60	400.00	PASS
Mid	3.39	361.60	31.60		PASS
High	3.37	359.47	31.60		PASS

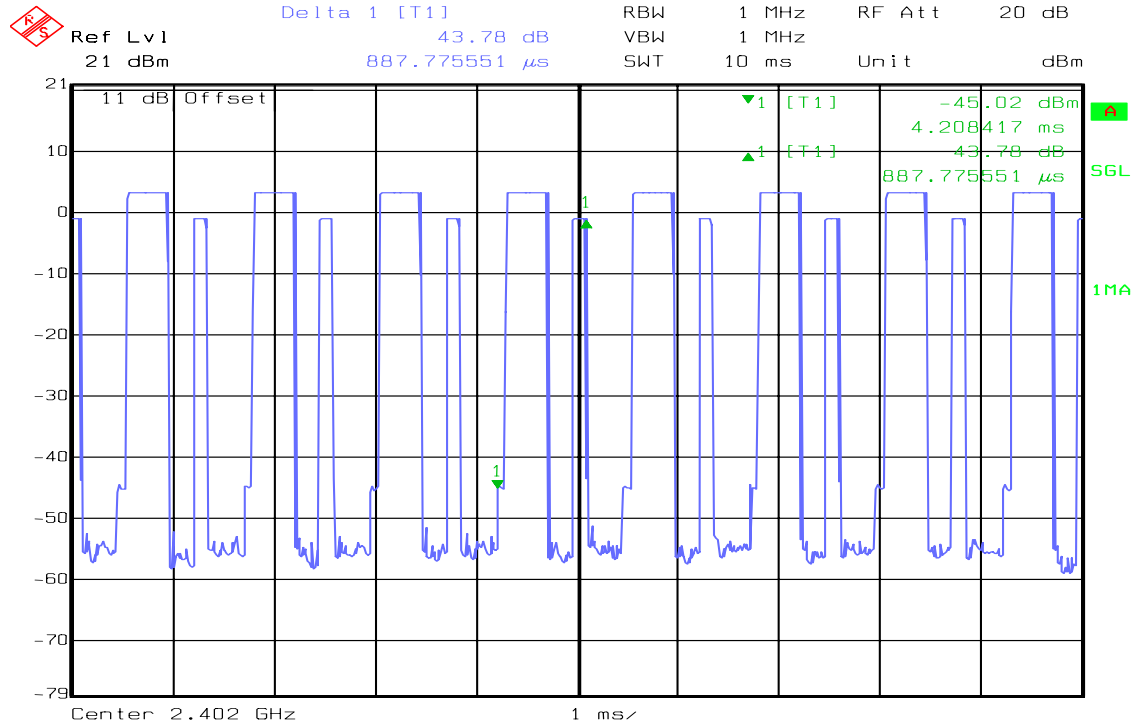


Test Plot

GFSK

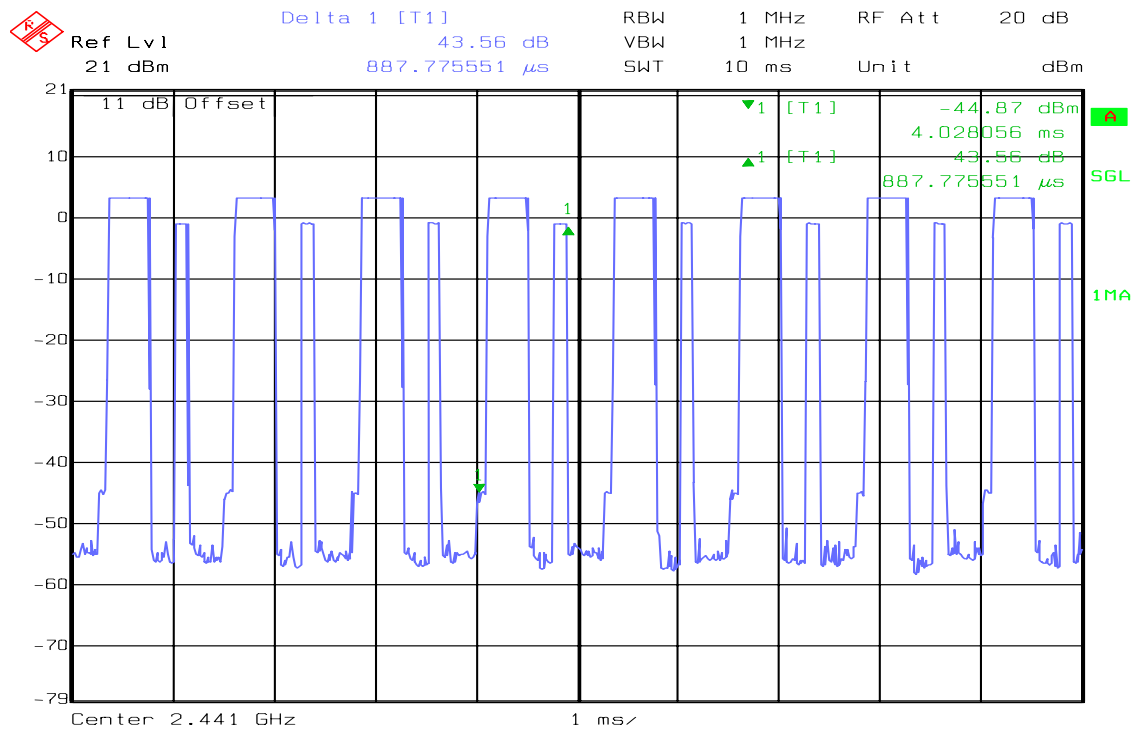
DH 1

(CH Low)



Date: 12.MAY 2009 09:51:12

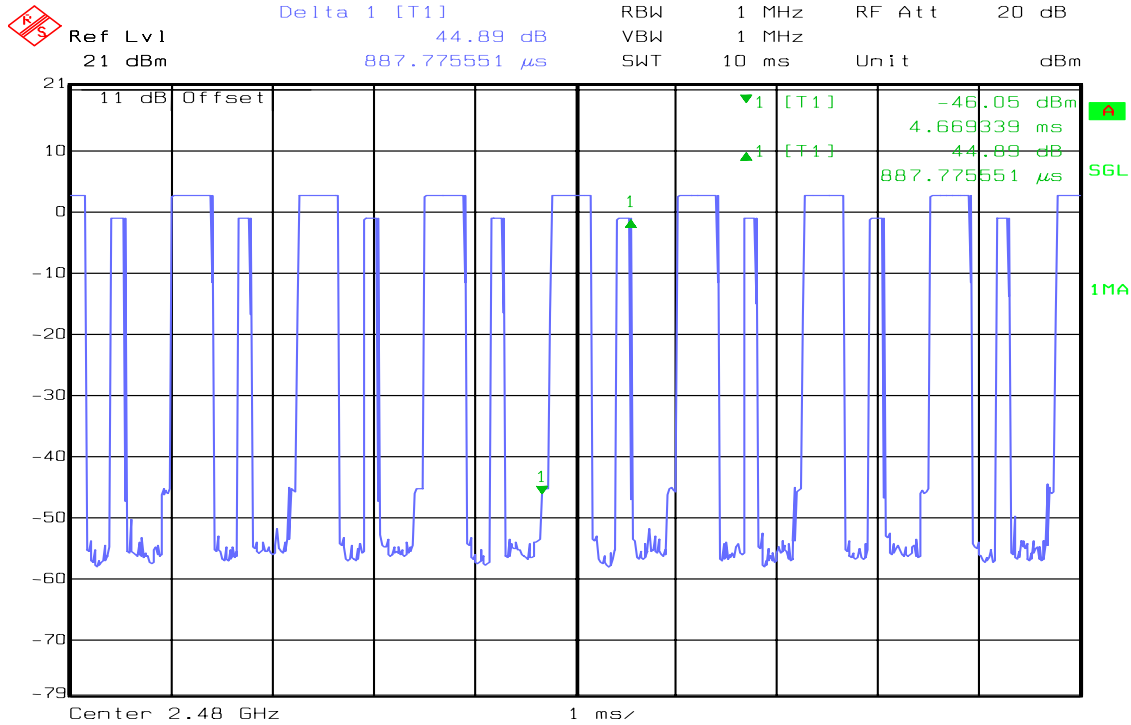
(CH Mid)



Date: 12.MAY 2009 09:55:57



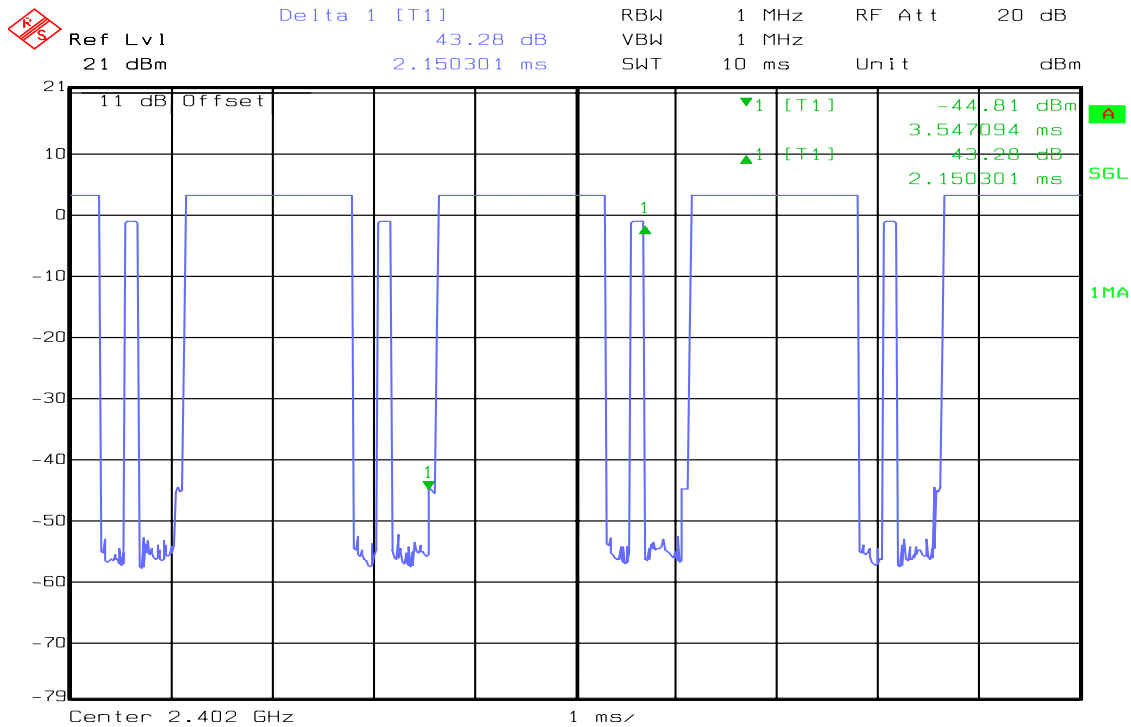
**(CH High)**



Date: 12.MAY 2009 10:02:50

**DH 3**

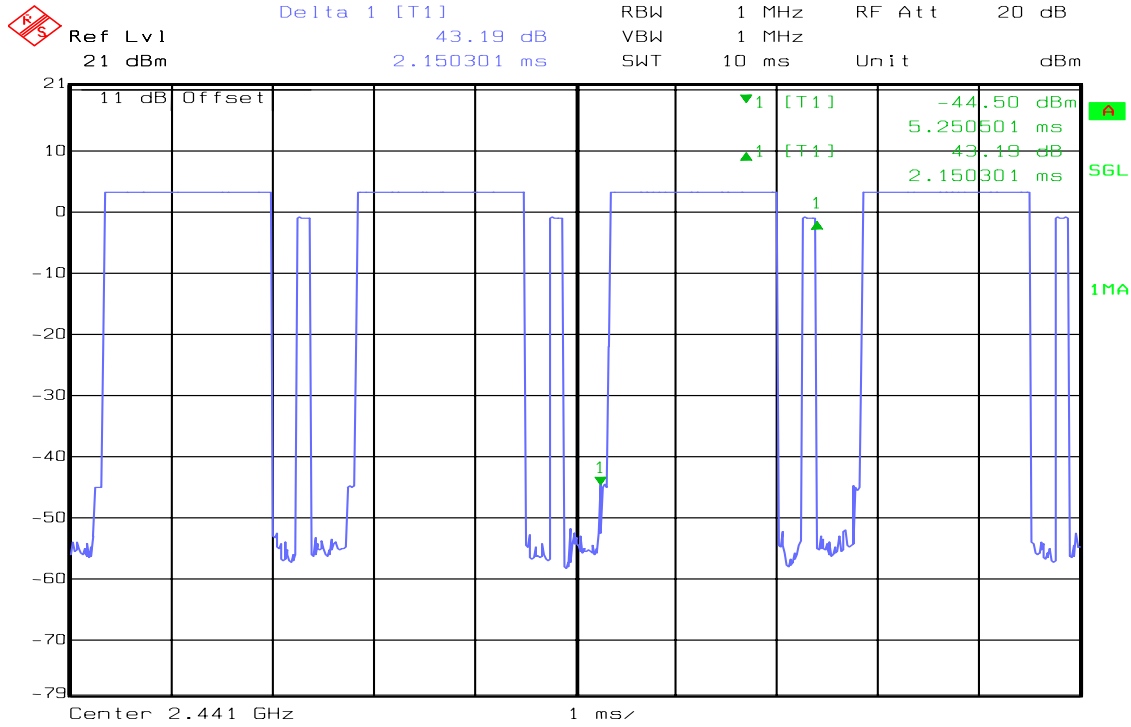
**(CH Low)**



Date: 12.MAY 2009 09:52:04

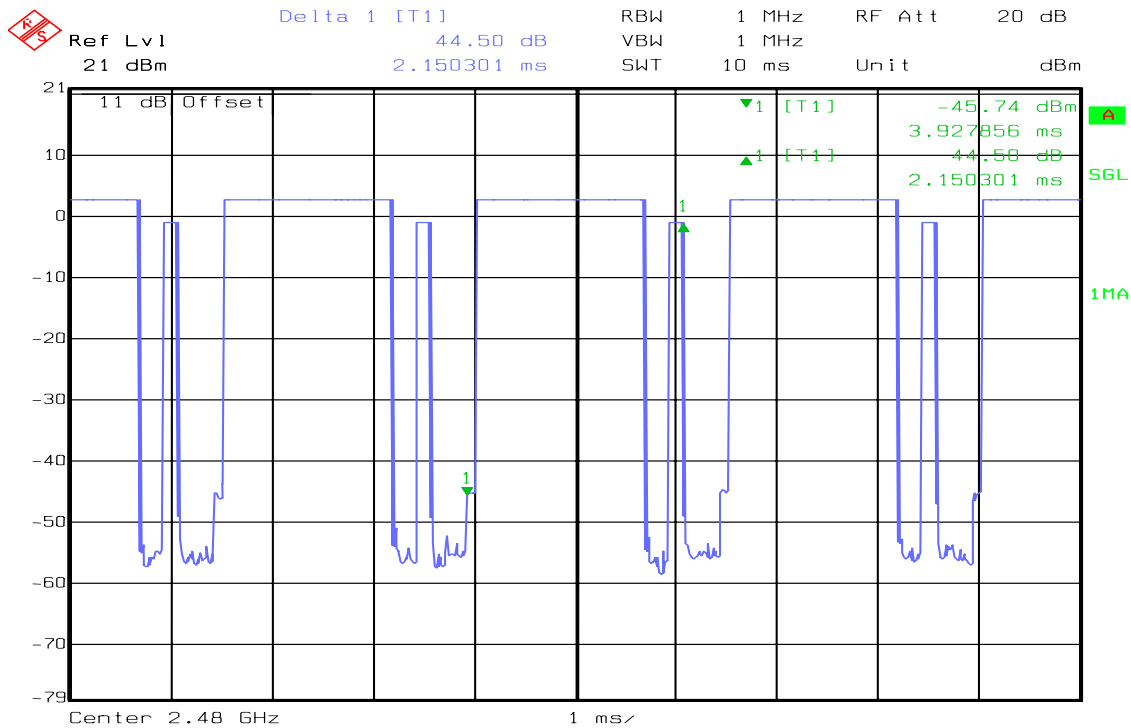


**(CH Mid)**



Date: 12.MAY 2009 09:57:01

**(CH High)**



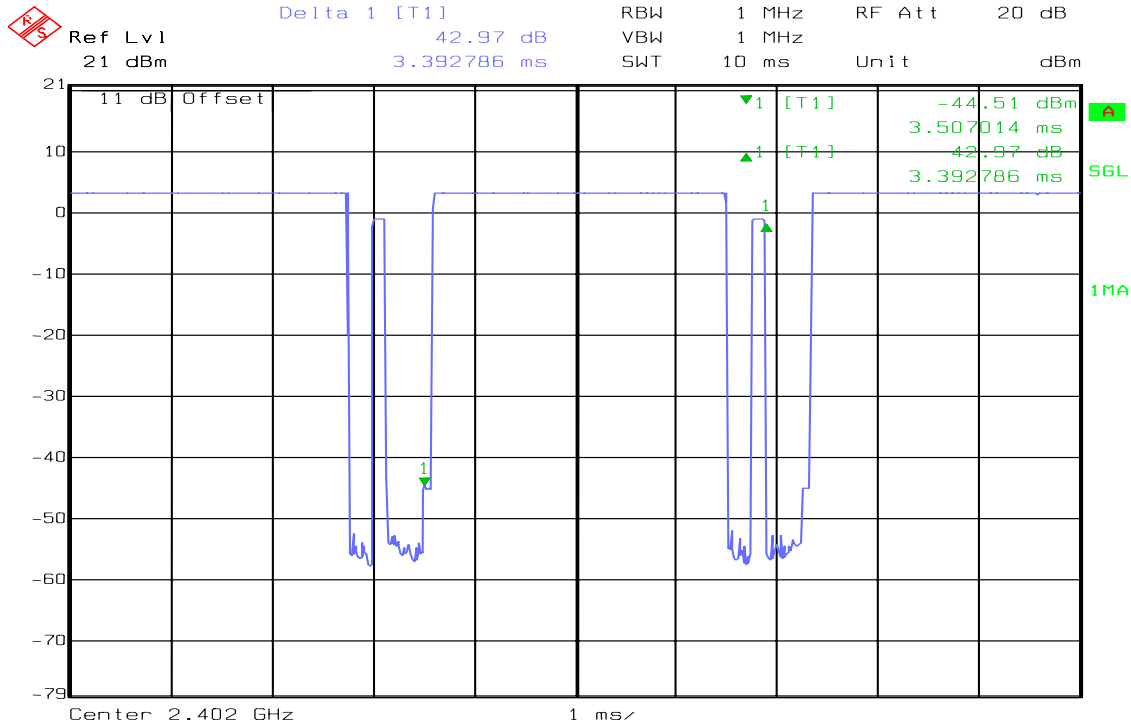
Date: 12.MAY 2009 10:04:03





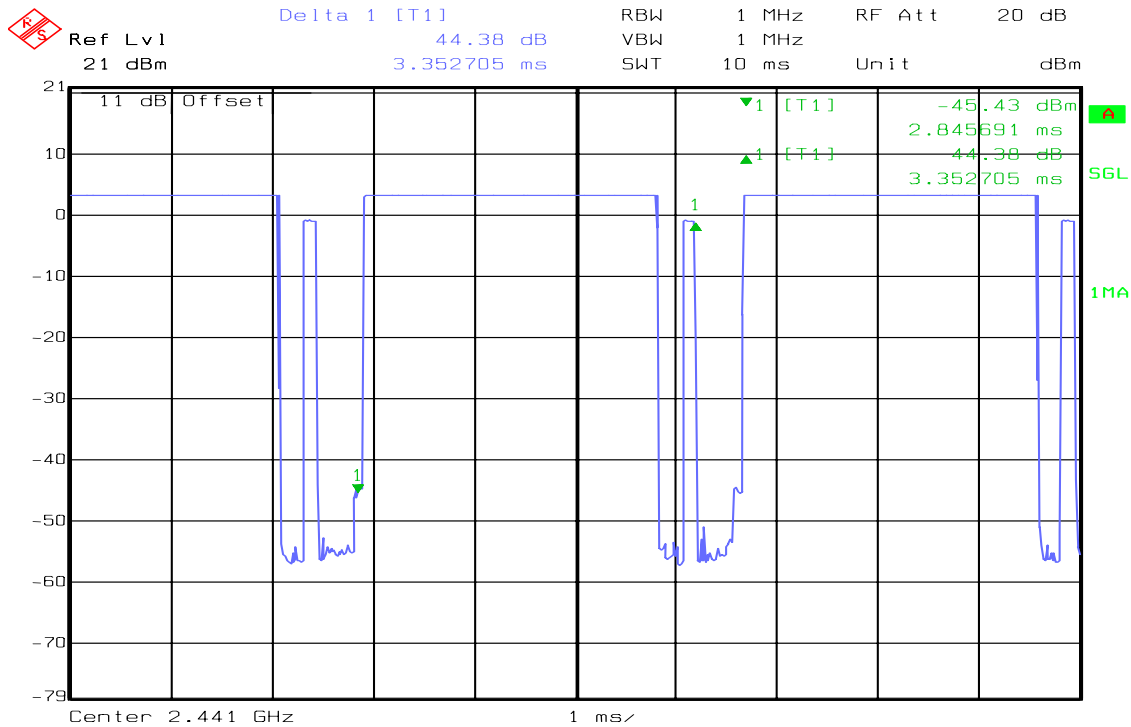
**DH 5**

**(CH Low)**



Date: 12.MAY 2009 09:50:13

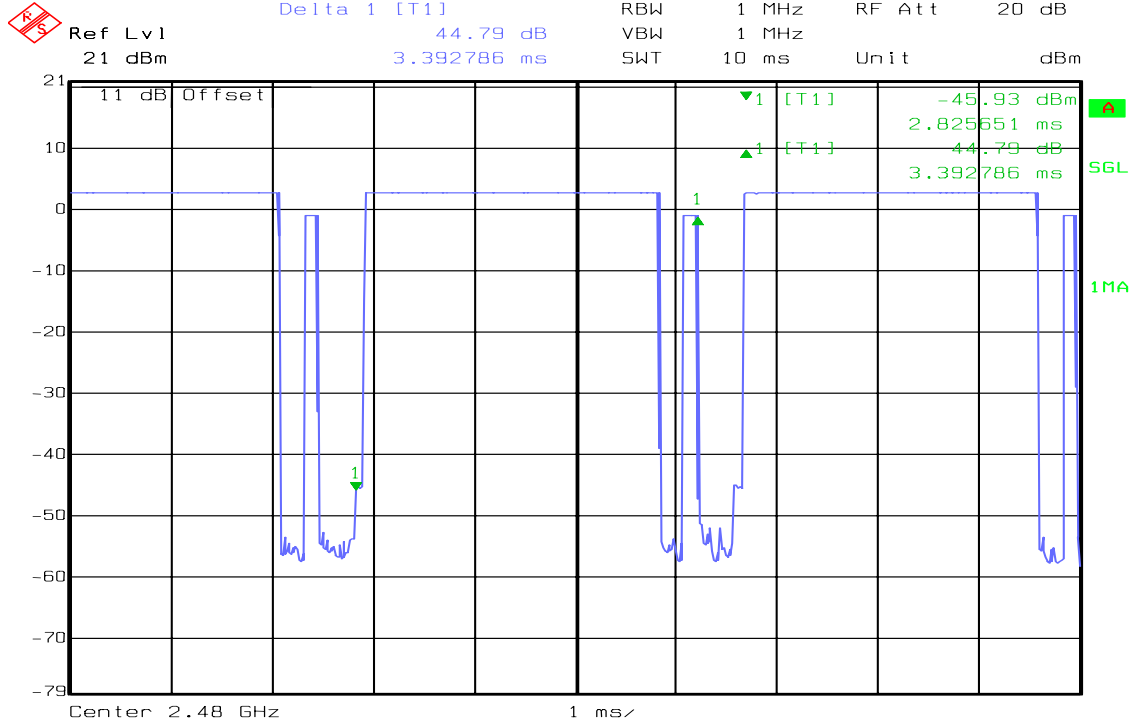
**(CH Mid)**



Date: 12.MAY 2009 09:57:54



**(CH High)**



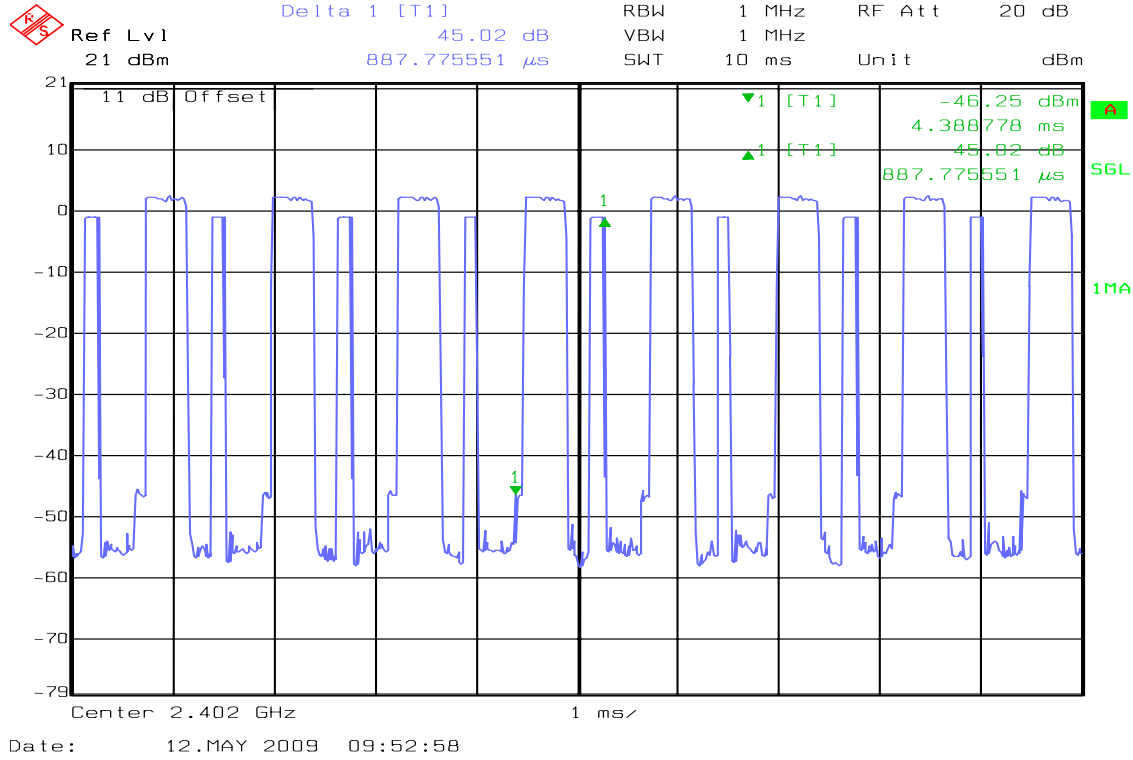
Date: 12.MAY 2009 10:05:01



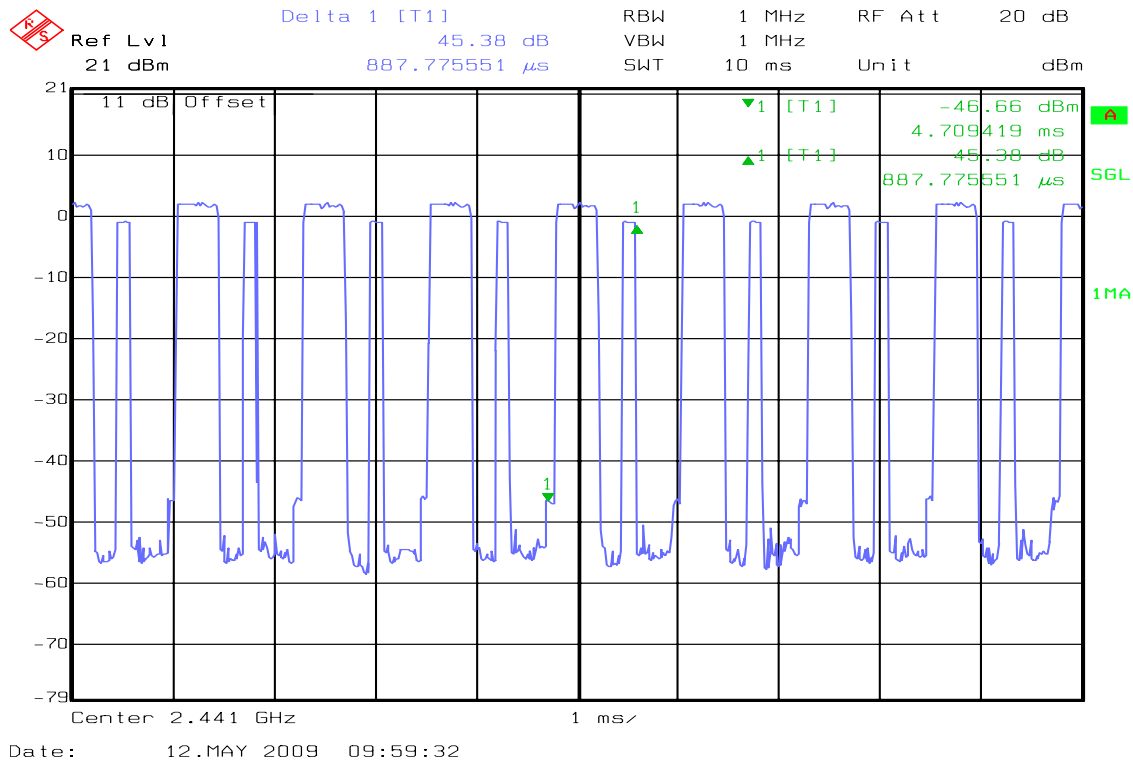
### 8DPSK

### DH 1

### (CH Low)

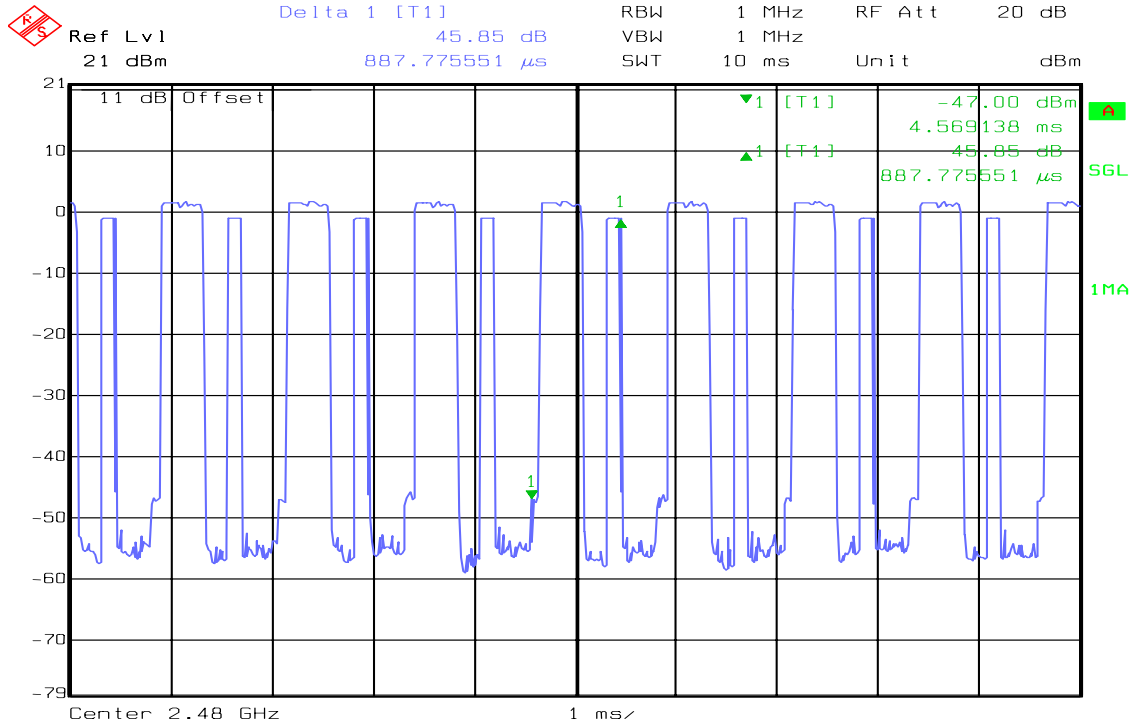


### (CH Mid)





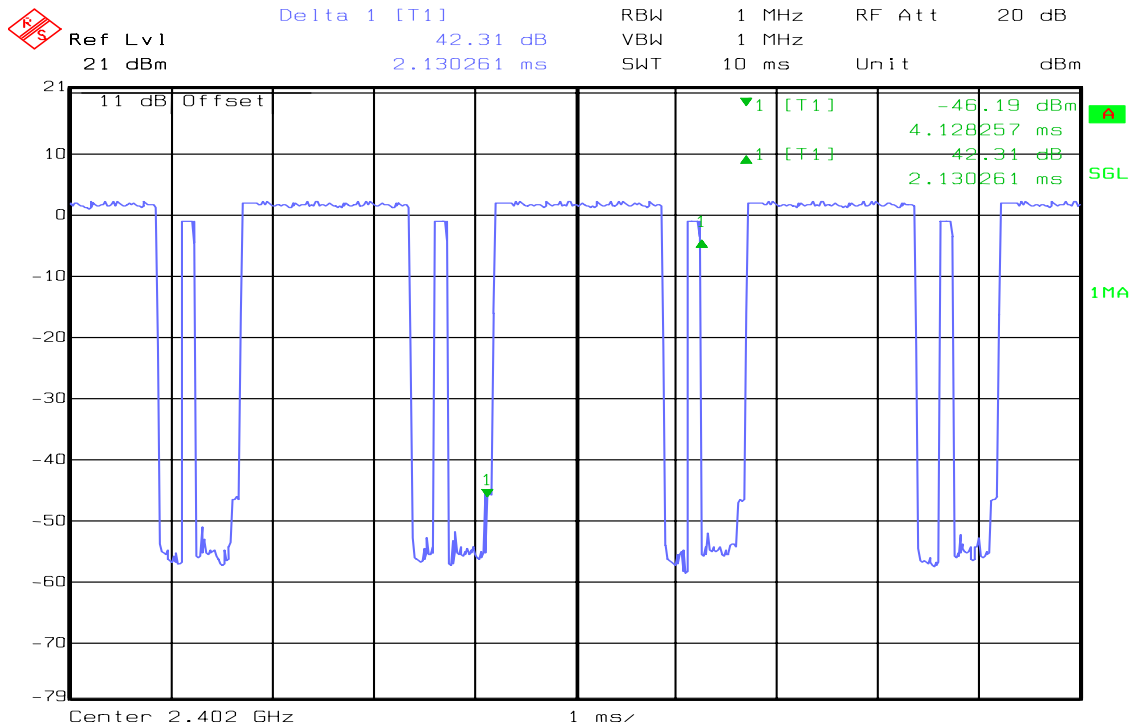
**(CH High)**



Date: 12.MAY 2009 10:05:57

**DH 3**

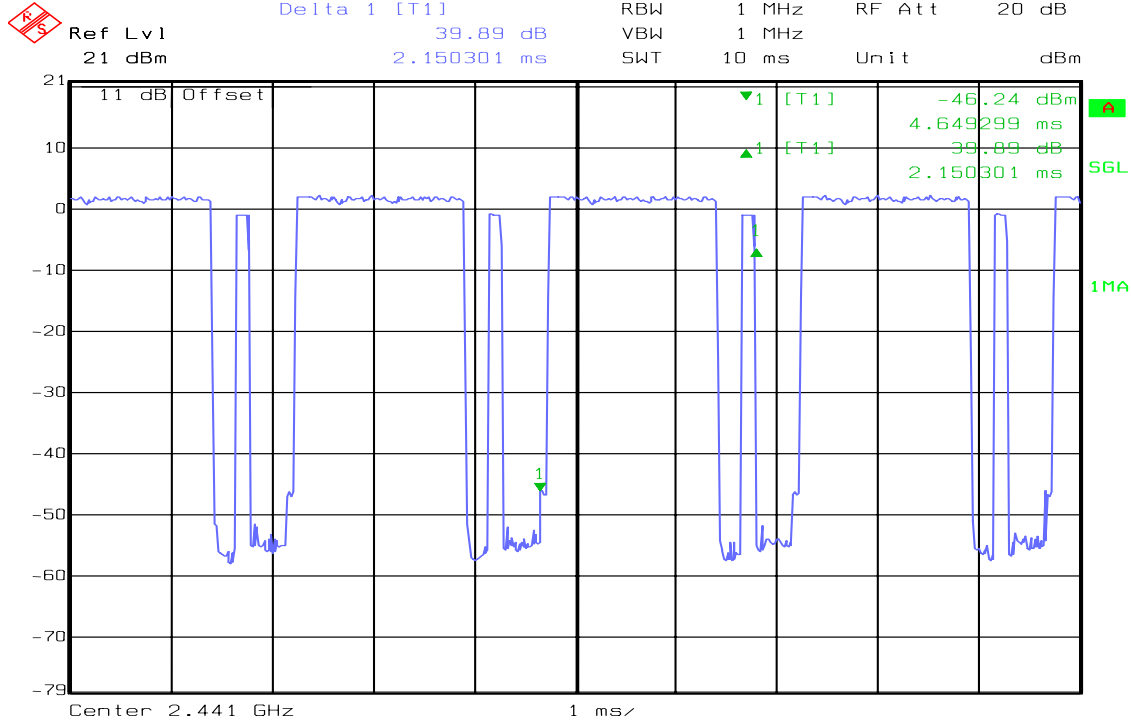
**(CH Low)**



Date: 12.MAY 2009 09:53:48

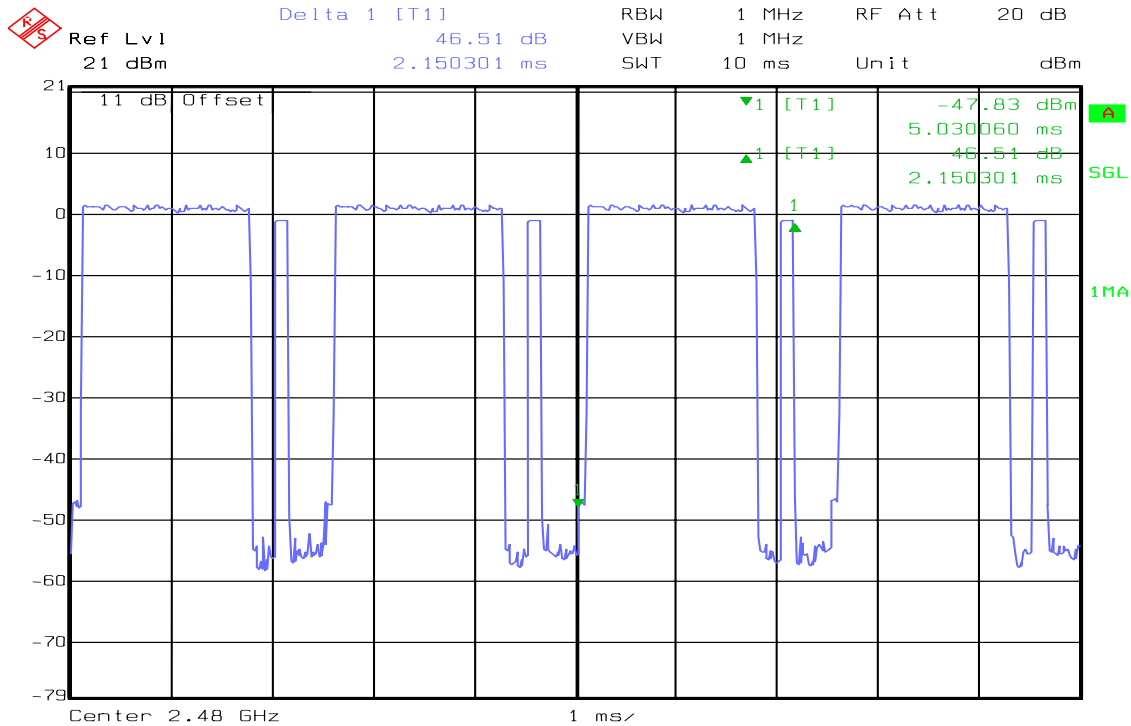


**(CH Mid)**



Date: 12.MAY 2009 10:00:19

**(CH High)**

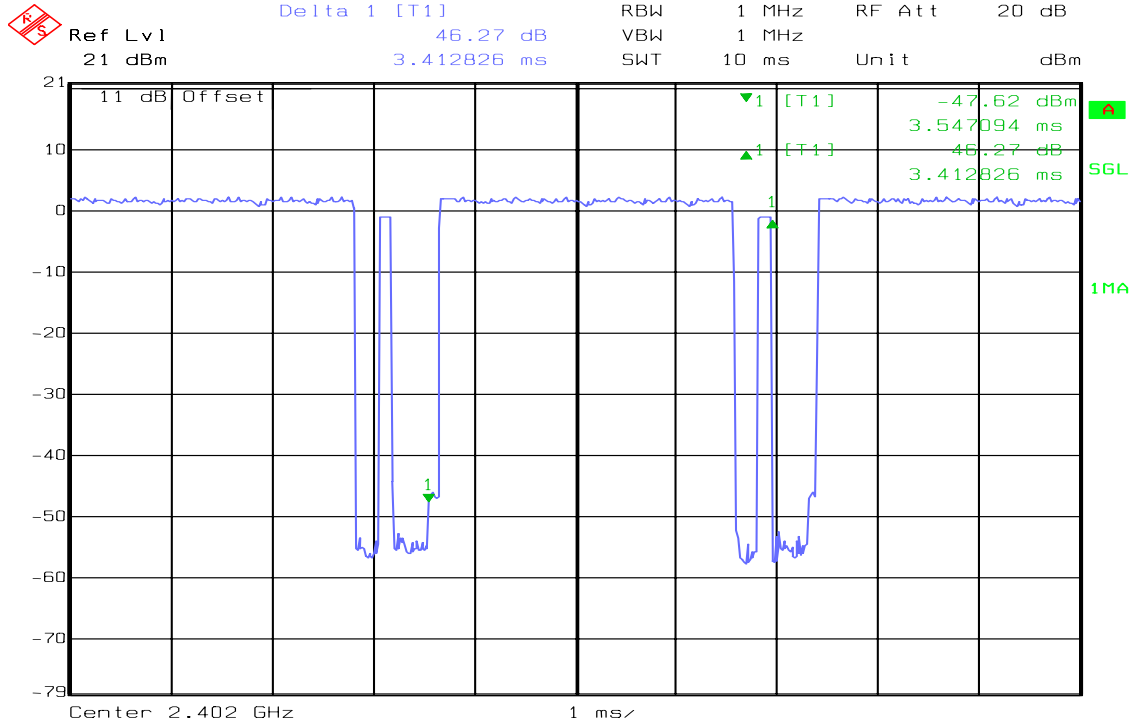


Date: 12.MAY 2009 10:10:30

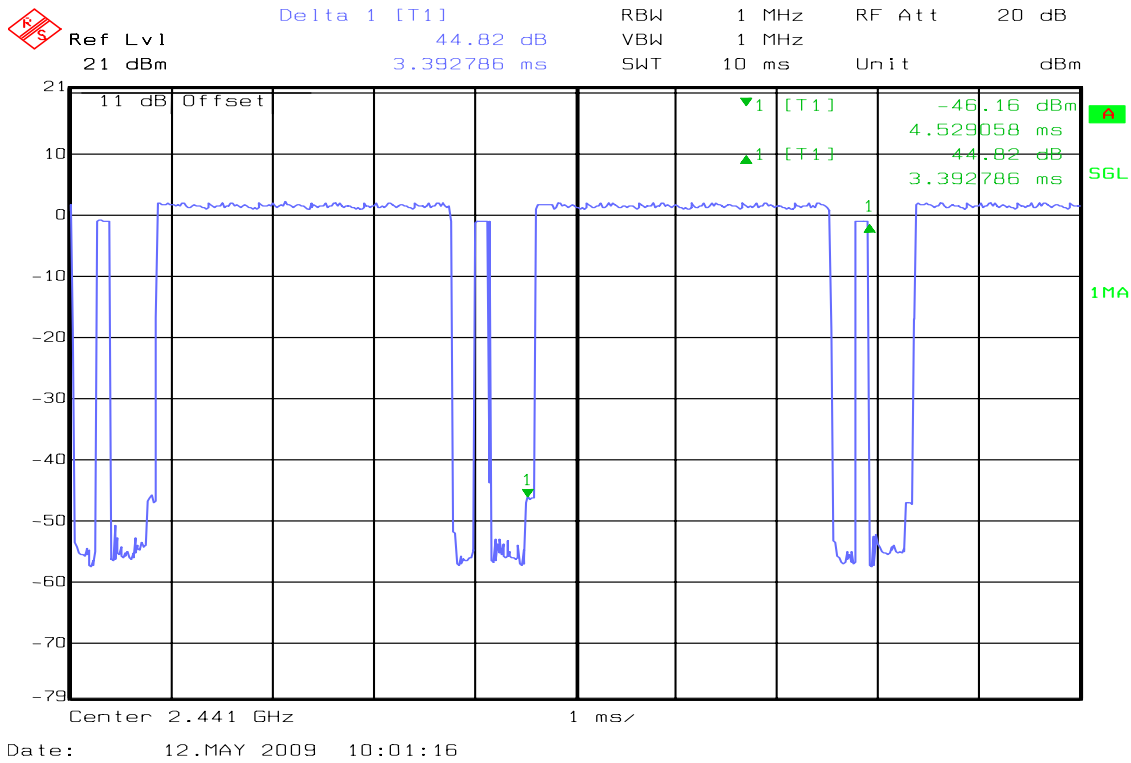


DH 5

(CH Low)

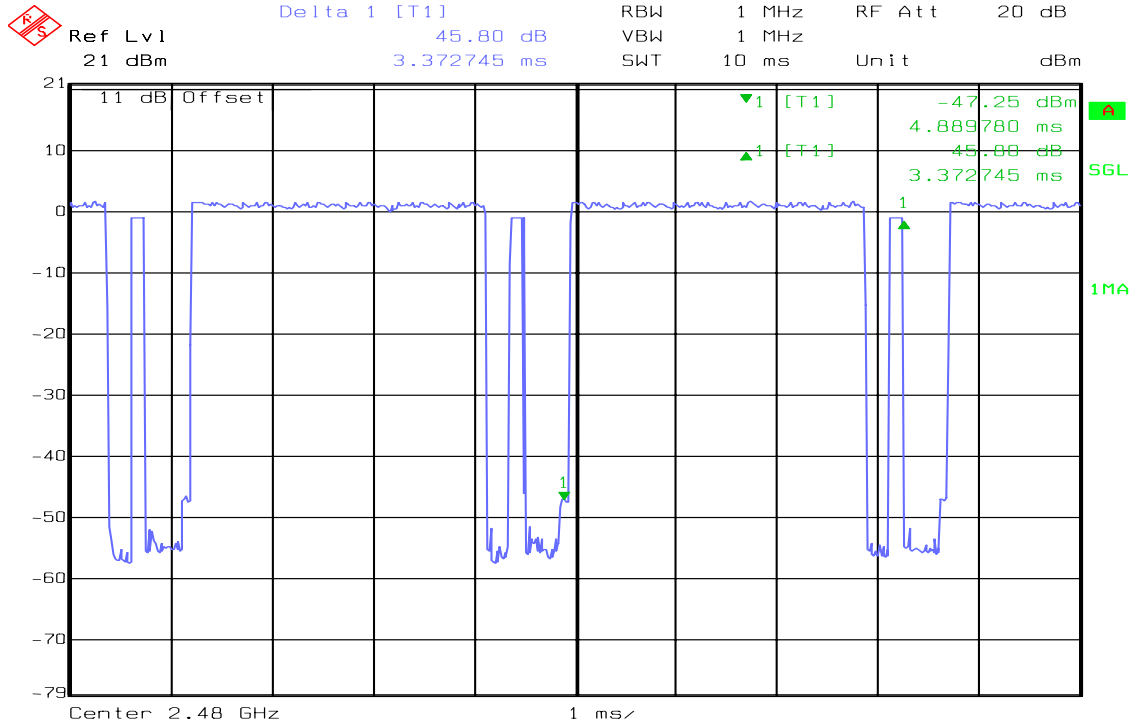


(CH Mid)





(CH High)



Date: 12.MAY 2009 10:09:36



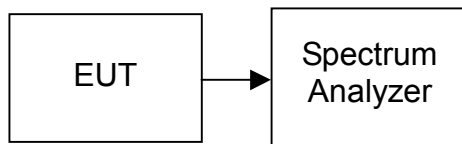
## 7.8 SPURIOUS EMISSIONS

### 7.8.1 Conducted Measurement

#### LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### TEST CONFIGURATION



#### TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels.

#### TEST RESULTS

*No non-compliance noted*

#### TEST DATA

Refer to attach spectrum analyzer data chart.





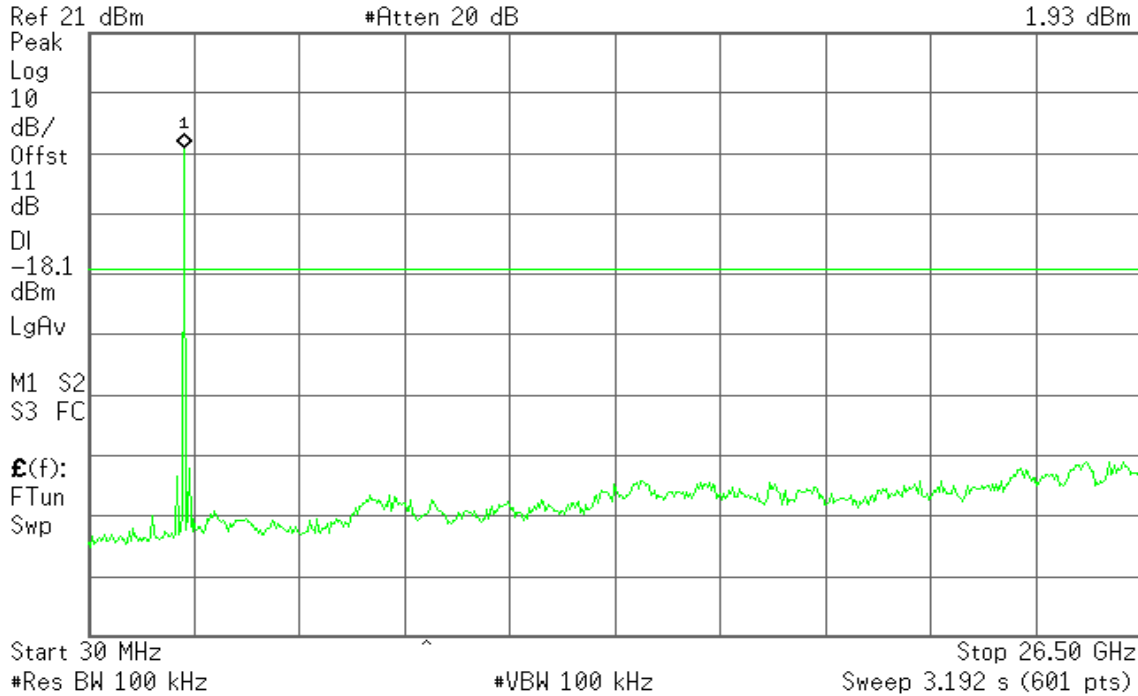
### Test Plot

#### GFSK / CH Low

Agilent 11:13:01 May 12, 2009

R T

Mkr1 2.41 GHz  
1.93 dBm

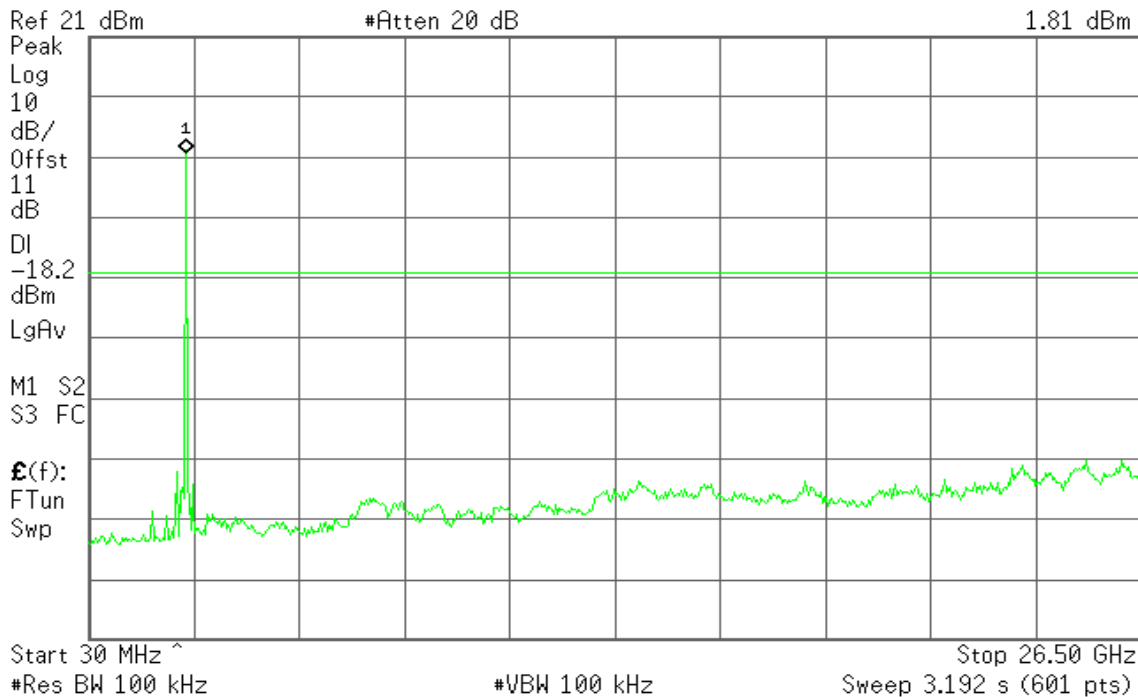


#### GFSK / CH Mid

Agilent 11:16:54 May 12, 2009

R T

Mkr1 2.44 GHz  
1.81 dBm



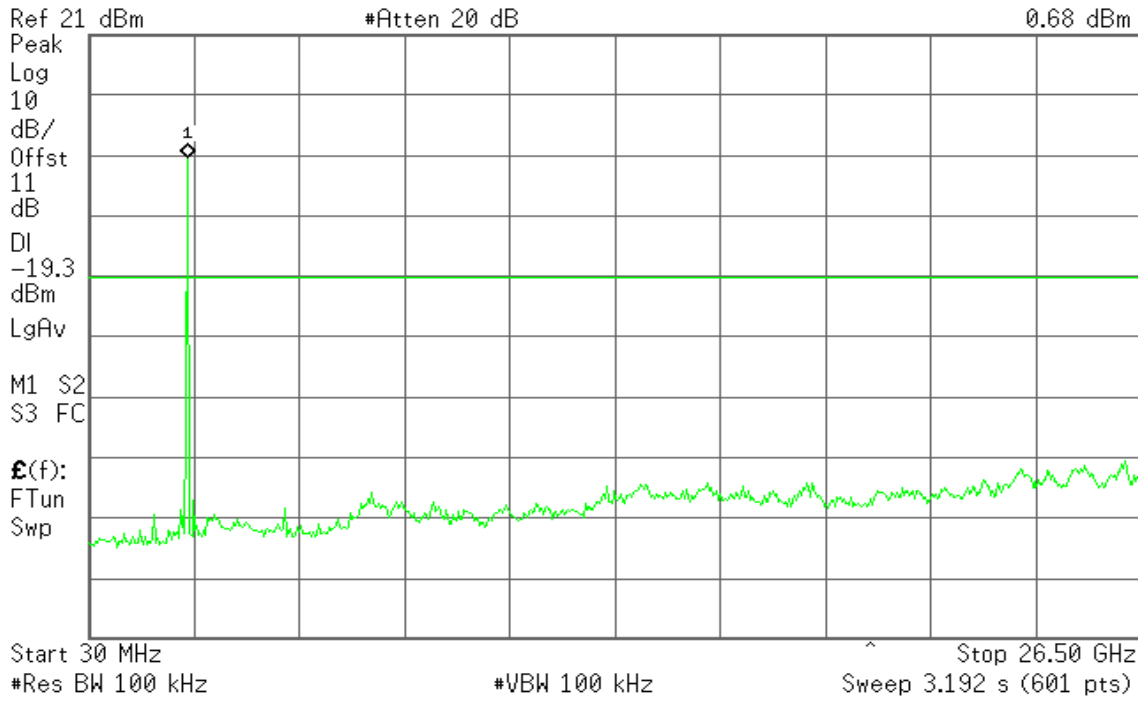


**GFSK / CH High**

Agilent 11:19:32 May 12, 2009

R T

Mkr1 2.48 GHz  
0.68 dBm

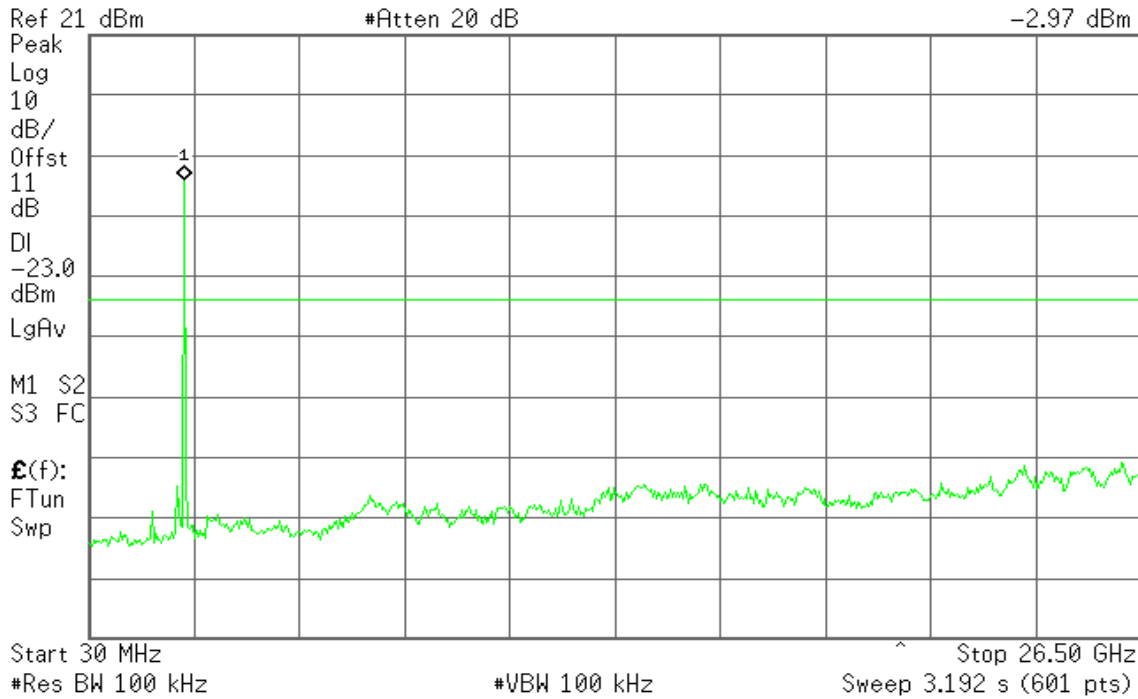


**8DPSK / CH Low**

Agilent 11:14:36 May 12, 2009

R T

Mkr1 2.41 GHz  
-2.97 dBm



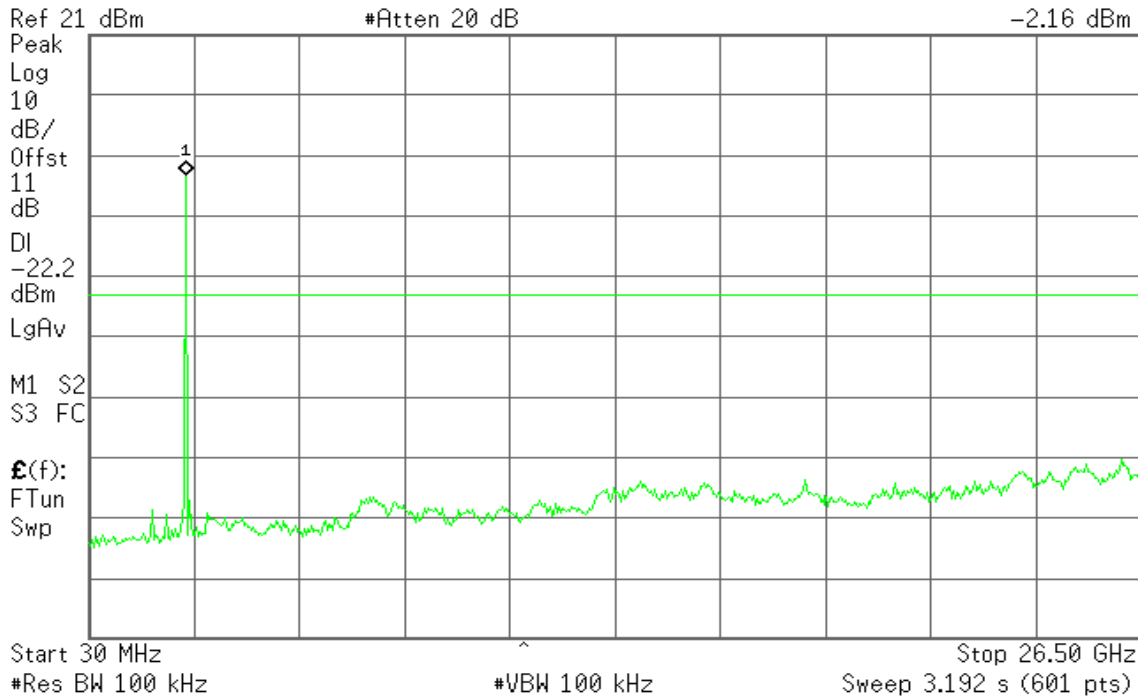


### 8DPSK / CH Mid

Agilent 11:16:05 May 12, 2009

R T

Mkr1 2.44 GHz  
-2.16 dBm

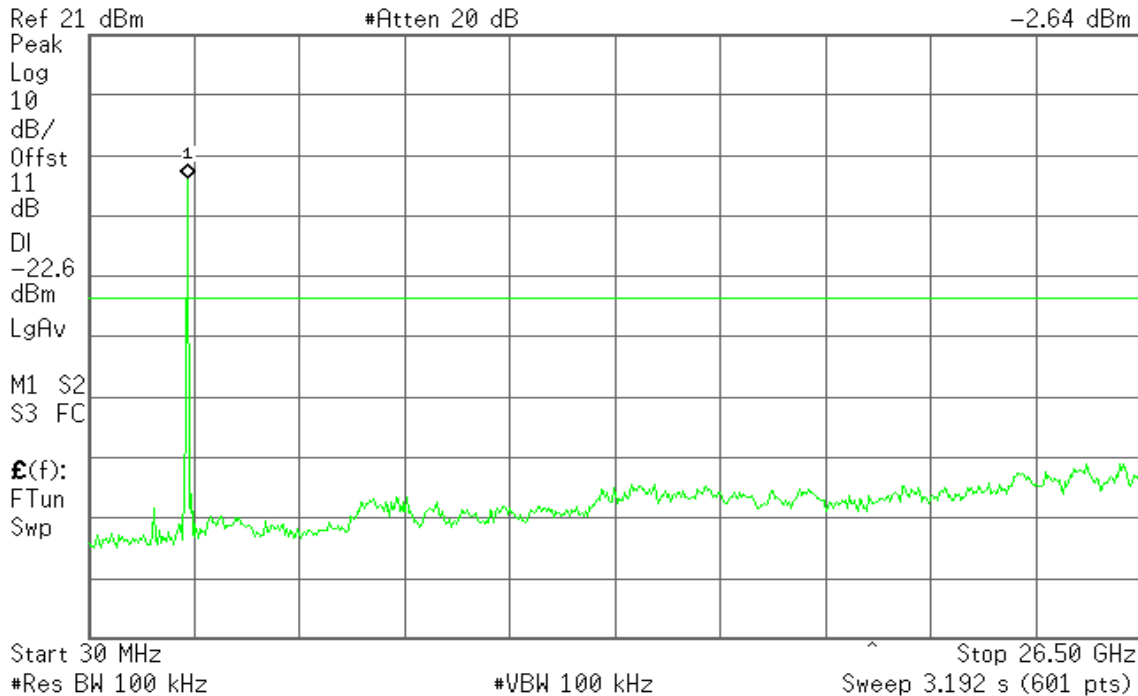


### 8DPSK / CH High

Agilent 11:20:38 May 12, 2009

R T

Mkr1 2.48 GHz  
-2.64 dBm





### 7.8.2 RADIATED EMISSIONS

#### LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

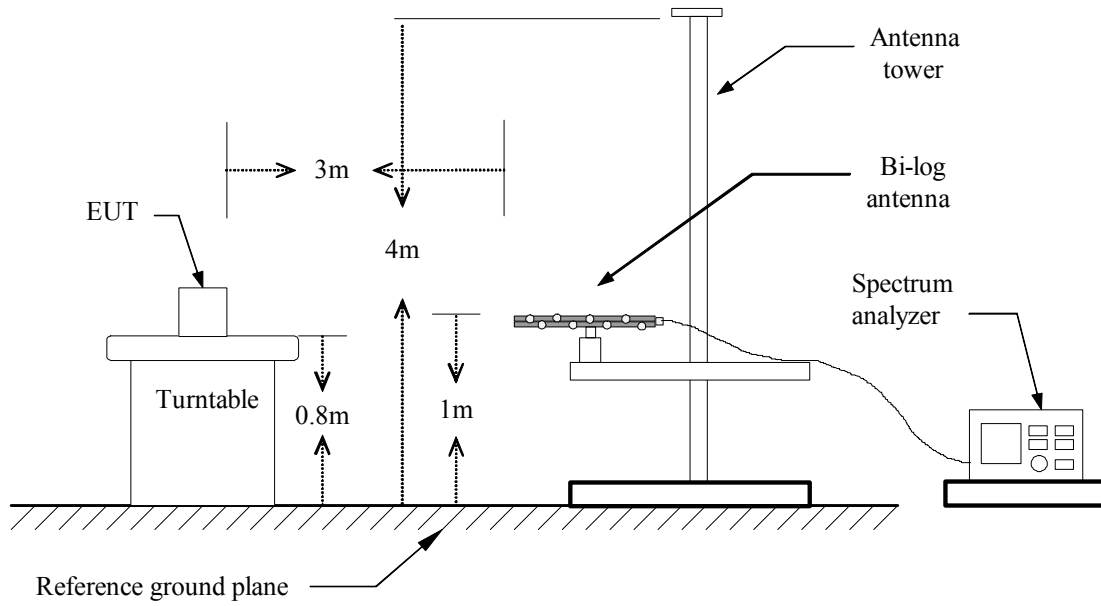
**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

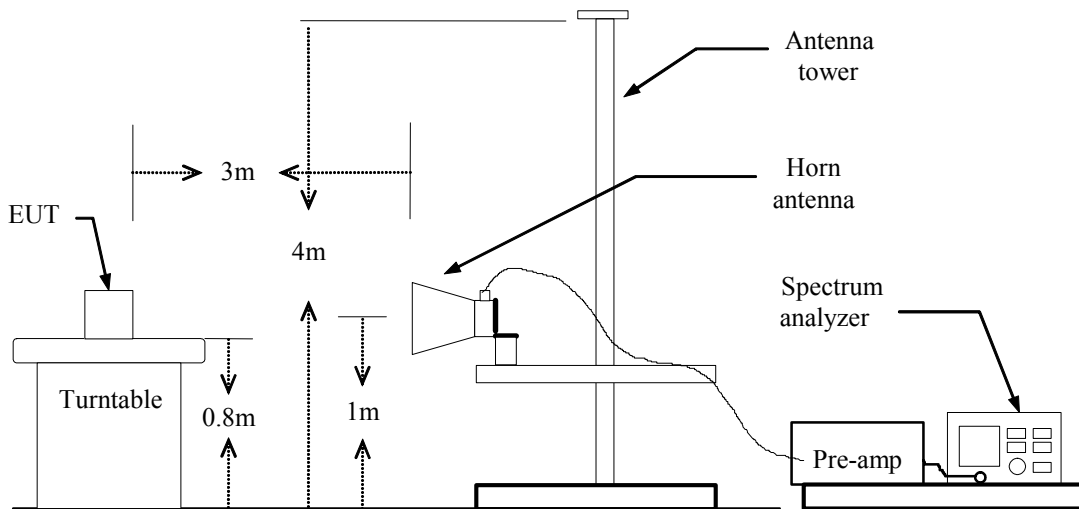
Frequency (Hz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

## TEST CONFIGURATION

### Below 1 GHz



### Above 1 GHz





## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:  
Below 1GHz:  
RBW=100kHz / VBW=300kHz / Sweep=AUTO  
Above 1GHz:  
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

## **TEST RESULTS**

*No non-compliance noted*



**TEST DATA**

**Below 1 GHz**

**Operation Mode:** Normal Link                      **Test Date:** May 11, 2009  
**Temperature:** 21°C                                      **Tested by:** Alonso Lu  
**Humidity:** 48 % RH                                      **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit 3m (dBUV/m)	Safe Margin (dB)
66.3750	V	Peak	44.52	-15.77	28.75	40.00	-11.25
100.3250	V	Peak	45.20	-17.12	28.08	43.50	-15.42
122.1500	V	Peak	45.61	-13.38	32.23	43.50	-11.27
129.4250	V	Peak	44.28	-13.56	30.72	43.50	-12.78
158.5250	V	Peak	44.37	-12.36	32.01	43.50	-11.49
199.7500	V	Peak	48.99	-14.64	34.35	43.50	-9.15
209.4500	V	Peak	47.84	-14.46	33.38	43.50	-10.12
61.5250	H	Peak	37.68	-14.92	22.76	40.00	-17.24
122.1500	H	Peak	34.37	-13.38	20.99	43.50	-22.51
168.2250	H	Peak	41.84	-13.13	28.71	43.50	-14.79
199.7500	H	Peak	47.99	-14.64	33.35	43.50	-10.15
209.4500	H	Peak	52.05	-14.46	37.59	43.50	-5.91
214.3000	H	Peak	50.49	-14.37	36.12	43.50	-7.38
267.6500	H	Peak	37.11	-12.48	24.63	46.00	-21.37
883.6000	H	Peak	33.60	-1.30	32.30	46.00	-13.70

**Remark:**

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 9 kHz to the 1GHz.
3. Radiated emissions measured in the measured frequency range were made with an instrument using peak detector mode.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



**Above 1 GHz**

**Operation Mode:** GFSK / TX / CH Low **Test Date:** May 11, 2009

**Temperature:** 21°C **Tested by:** Alonso Lu

**Humidity:** 48 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1396.67	V	51.86	---	-5.38	46.48	---	74.00	54.00	-7.52	Peak
2093.33	V	51.29	---	-3.19	48.10	---	74.00	54.00	-5.90	Peak
2266.67	V	50.85	---	0.06	50.91	---	74.00	54.00	-3.09	Peak
2486.67	V	49.65	---	1.04	50.68	---	74.00	54.00	-3.32	Peak
4091.67	V	40.05	---	5.81	45.87	---	74.00	54.00	-8.13	Peak
6358.33	V	40.38	---	8.93	49.31	---	74.00	54.00	-4.69	Peak
1716.67	H	50.12	---	-4.29	45.84	---	74.00	54.00	-8.16	Peak
2096.67	H	49.31	---	-1.30	48.01	---	74.00	54.00	-5.99	Peak
2696.67	H	49.28	---	0.05	49.33	---	74.00	54.00	-4.67	Peak
4033.33	H	39.97	---	8.08	48.04	---	74.00	54.00	-5.96	Peak
5291.67	H	39.55	---	8.94	48.49	---	74.00	54.00	-5.51	Peak
5908.33	H	40.65	---	7.93	48.58	---	74.00	54.00	-5.42	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).





**Operation Mode:** GFSK / TX / CH Mid    **Test Date:** May 11, 2009  
**Temperature:** 21°C    **Tested by:** Alonso Lu  
**Humidity:** 48 % RH    **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1683.33	V	50.41	---	-2.42	47.99	---	74.00	54.00	-6.01	Peak
2223.33	V	49.74	---	0.41	50.14	---	74.00	54.00	-3.86	Peak
2743.33	V	49.93	---	-0.68	49.25	---	74.00	54.00	-4.75	Peak
4125.00	V	40.46	---	5.45	45.92	---	74.00	54.00	-8.08	Peak
4883.33	V	39.45	---	7.99	47.45	---	74.00	54.00	-6.55	Peak
6641.67	V	40.19	---	10.80	50.99	---	74.00	54.00	-3.01	Peak
2086.67	H	49.68	---	-1.46	48.21	---	74.00	54.00	-5.79	Peak
2243.33	H	50.71	---	-2.44	48.27	---	74.00	54.00	-5.73	Peak
2706.67	H	49.35	---	0.04	49.39	---	74.00	54.00	-4.61	Peak
4266.67	H	40.24	---	7.71	47.95	---	74.00	54.00	-6.05	Peak
5875.00	H	41.12	---	7.82	48.94	---	74.00	54.00	-5.06	Peak
N/A										

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Operation Mode:** GFSK / TX / CH High **Test Date:** May 11, 2009  
**Temperature:** 21°C **Tested by:** Alonso Lu  
**Humidity:** 48 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1756.67	V	49.91	---	-1.95	47.96	---	74.00	54.00	-6.04	Peak
2210.00	V	50.20	---	0.51	50.71	---	74.00	54.00	-3.29	Peak
2630.00	V	49.92	---	-0.62	49.30	---	74.00	54.00	-4.70	Peak
4075.00	V	40.79	---	5.54	46.33	---	74.00	54.00	-7.67	Peak
4916.67	V	39.27	---	7.96	47.22	---	74.00	54.00	-6.78	Peak
N/A										
1303.33	H	50.89	---	-6.97	43.92	---	74.00	54.00	-10.08	Peak
2080.00	H	50.00	---	-1.57	48.43	---	74.00	54.00	-5.57	Peak
2266.67	H	53.75	---	-2.09	51.66	---	74.00	54.00	-2.34	Peak
2616.67	H	49.50	---	-0.17	49.33	---	74.00	54.00	-4.67	Peak
4008.33	H	40.38	---	8.00	48.38	---	74.00	54.00	-5.62	Peak
5483.33	H	40.62	---	8.70	49.32	---	74.00	54.00	-4.68	Peak
6891.67	H	39.72	---	10.48	50.19	---	74.00	54.00	-3.81	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Operation Mode:** 8DPSK / TX / CH Low **Test Date:** May 11, 2009  
**Temperature:** 21°C **Tested by:** Alonso Lu  
**Humidity:** 48 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1640.00	V	51.43	---	-3.23	48.20	---	74.00	54.00	-5.80	Peak
1743.33	V	50.42	---	-1.99	48.44	---	74.00	54.00	-5.56	Peak
2216.67	V	49.42	---	0.46	49.88	---	74.00	54.00	-4.12	Peak
2560.00	V	50.45	---	0.04	50.49	---	74.00	54.00	-3.51	Peak
4041.67	V	46.83	---	5.00	51.83	---	74.00	54.00	-2.17	Peak
4775.00	V	40.86	---	7.05	47.90	---	74.00	54.00	-6.10	Peak
1673.33	H	51.58	---	-4.65	46.93	---	74.00	54.00	-7.07	Peak
2033.33	H	50.38	---	-2.32	48.06	---	74.00	54.00	-5.94	Peak
2136.67	H	50.42	---	-1.93	48.49	---	74.00	54.00	-5.51	Peak
2633.33	H	49.66	---	-0.13	49.53	---	74.00	54.00	-4.47	Peak
4158.33	H	41.23	---	8.19	49.43	---	74.00	54.00	-4.57	Peak
6275.00	H	41.00	---	8.31	49.31	---	74.00	54.00	-4.69	Peak
6958.33	H	40.30	---	10.65	50.95	---	74.00	54.00	-3.05	Peak
11150.00	H	40.29	---	10.32	50.61	---	74.00	54.00	-3.39	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Operation Mode:** 8DPSK / TX / CH Mid **Test Date:** May 11, 2009  
**Temperature:** 21°C **Tested by:** Alonso Lu  
**Humidity:** 48 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1890.00	V	50.10	---	-2.19	47.91	---	74.00	54.00	-6.09	Peak
2196.67	V	49.29	---	0.46	49.75	---	74.00	54.00	-4.25	Peak
2683.33	V	49.73	---	-0.36	49.37	---	74.00	54.00	-4.63	Peak
3983.33	V	44.59	---	4.30	48.89	---	74.00	54.00	-5.11	Peak
4916.67	V	40.92	---	7.96	48.88	---	74.00	54.00	-5.12	Peak
6600.00	V	38.77	---	11.38	50.15	---	74.00	54.00	-3.85	Peak
1656.67	H	50.72	---	-4.80	45.91	---	74.00	54.00	-8.09	Peak
2096.67	H	49.68	---	-1.30	48.38	---	74.00	54.00	-5.62	Peak
2356.67	H	50.20	---	-1.34	48.86	---	74.00	54.00	-5.14	Peak
2643.33	H	50.29	---	-0.10	50.19	---	74.00	54.00	-3.81	Peak
3983.33	H	47.57	44.56	7.68	55.25	52.24	74.00	54.00	-1.76	AVG
5116.67	H	40.92	---	8.80	49.73	---	74.00	54.00	-4.27	Peak
6900.00	H	40.61	---	10.67	51.28	---	74.00	54.00	-2.72	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Operation Mode:** 8DPSK / TX / CH High **Test Date:** May 11, 2009  
**Temperature:** 21°C **Tested by:** Alonso Lu  
**Humidity:** 48 % RH **Polarity:** Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1436.67	V	50.83	---	-5.51	45.32	---	74.00	54.00	-8.68	Peak
2266.67	V	54.02	36.67	0.06	54.08	36.73	74.00	54.00	-17.27	AVG
2340.00	V	50.49	---	-0.26	50.23	---	74.00	54.00	-3.77	Peak
4066.67	V	39.91	---	5.41	45.32	---	74.00	54.00	-8.68	Peak
5750.00	V	40.86	---	6.27	47.12	---	74.00	54.00	-6.88	Peak
6125.00	V	41.10	---	7.44	48.54	---	74.00	54.00	-5.46	Peak
1823.33	H	50.47	---	-3.78	46.69	---	74.00	54.00	-7.31	Peak
2096.67	H	51.09	---	-1.30	49.78	---	74.00	54.00	-4.22	Peak
2246.67	H	52.10	---	-2.39	49.71	---	74.00	54.00	-4.29	Peak
2266.67	H	53.61	---	-2.09	51.52	---	74.00	54.00	-2.48	Peak
4058.33	H	39.77	---	8.15	47.92	---	74.00	54.00	-6.08	Peak
4625.00	H	40.74	---	7.33	48.07	---	74.00	54.00	-5.93	Peak
6991.67	H	39.39	---	10.64	50.04	---	74.00	54.00	-3.96	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: RX / Mid

Test Date: May 11, 2009

Temperature: 21°C

Tested by: Alonso Lu

Humidity: 48 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)				
1546.67	V	45.73	---	-4.95	40.78	---	74.00	54.00	-13.22	Peak
2400.00	V	48.19	---	-0.36	47.83	---	74.00	54.00	-6.17	Peak
2440.00	V	48.07	---	0.28	48.35	---	74.00	54.00	-5.65	Peak
2473.33	V	47.03	---	0.82	47.85	---	74.00	54.00	-6.15	Peak
4108.33	V	40.96	---	5.78	46.75	---	74.00	54.00	-7.25	Peak
4875.00	V	38.67	---	7.95	46.63	---	74.00	54.00	-7.37	Peak
6616.67	V	39.01	---	11.15	50.16	---	74.00	54.00	-3.84	Peak
1633.33	H	45.59	---	-5.02	40.57	---	74.00	54.00	-13.43	Peak
2400.00	H	47.80	---	-1.15	46.65	---	74.00	54.00	-7.35	Peak
2440.00	H	48.28	---	-0.92	47.35	---	74.00	54.00	-6.65	Peak
2476.67	H	47.78	---	-0.71	47.07	---	74.00	54.00	-6.93	Peak
4016.67	H	40.88	---	8.03	48.91	---	74.00	54.00	-5.09	Peak
6991.67	H	40.19	---	10.64	50.84	---	74.00	54.00	-3.16	Peak

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



## 7.9 POWERLINE CONDUCTED EMISSIONS

### LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.



**TEST DATA**

**Operation Mode:** Charging  
**Temperature:** 25°C  
**Humidity:** 57% RH

**Test Date:** May 12, 2009  
**Tested by:** Stan Lin

Freq. (MHz)	QP Reading	AV Reading	Corr. factor	QP Result	AV Result	QP Limit	AV Limit	QP Margin	AV Margin	Note
0.2008	42.42	34.12	9.68	52.10	43.80	63.58	53.58	-11.48	-9.78	L1
0.2672	36.22	28.82	9.68	45.90	38.50	61.20	51.20	-15.30	-12.70	L1
0.3375	30.92	25.52	9.68	40.60	35.20	59.26	49.26	-18.66	-14.06	L1
3.7672	26.09	17.09	9.71	35.80	26.80	56.00	46.00	-20.20	-19.20	L1
3.9703	28.19	20.09	9.71	37.90	29.80	56.00	46.00	-18.10	-16.20	L1
4.1734	28.67	20.57	9.73	38.40	30.30	56.00	46.00	-17.60	-15.70	L1
0.2008	41.81	33.01	9.69	51.50	42.70	63.58	53.58	-12.08	-10.88	L2
0.2672	34.71	27.21	9.69	44.40	36.90	61.20	51.20	-16.80	-14.30	L2
0.3375	30.21	24.41	9.69	39.90	34.10	59.26	49.26	-19.36	-15.16	L2
4.0484	32.58	25.18	9.72	42.30	34.90	56.00	46.00	-13.70	-11.10	L2
4.2477	29.16	19.96	9.74	38.90	29.70	56.00	46.00	-17.10	-16.30	L2
16.7945	21.39	13.89	10.41	31.80	24.30	60.00	50.00	-28.20	-25.70	L2

**Remark:**

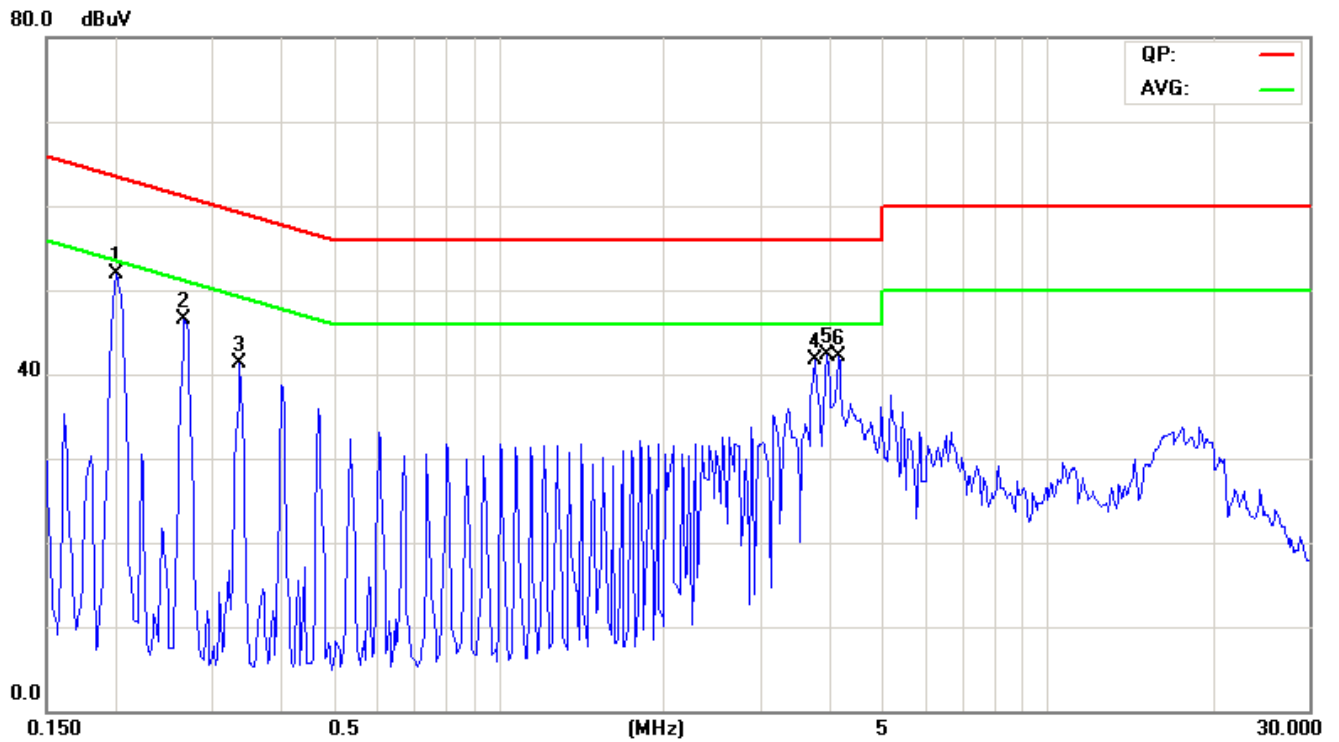
1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit
4. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
5. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



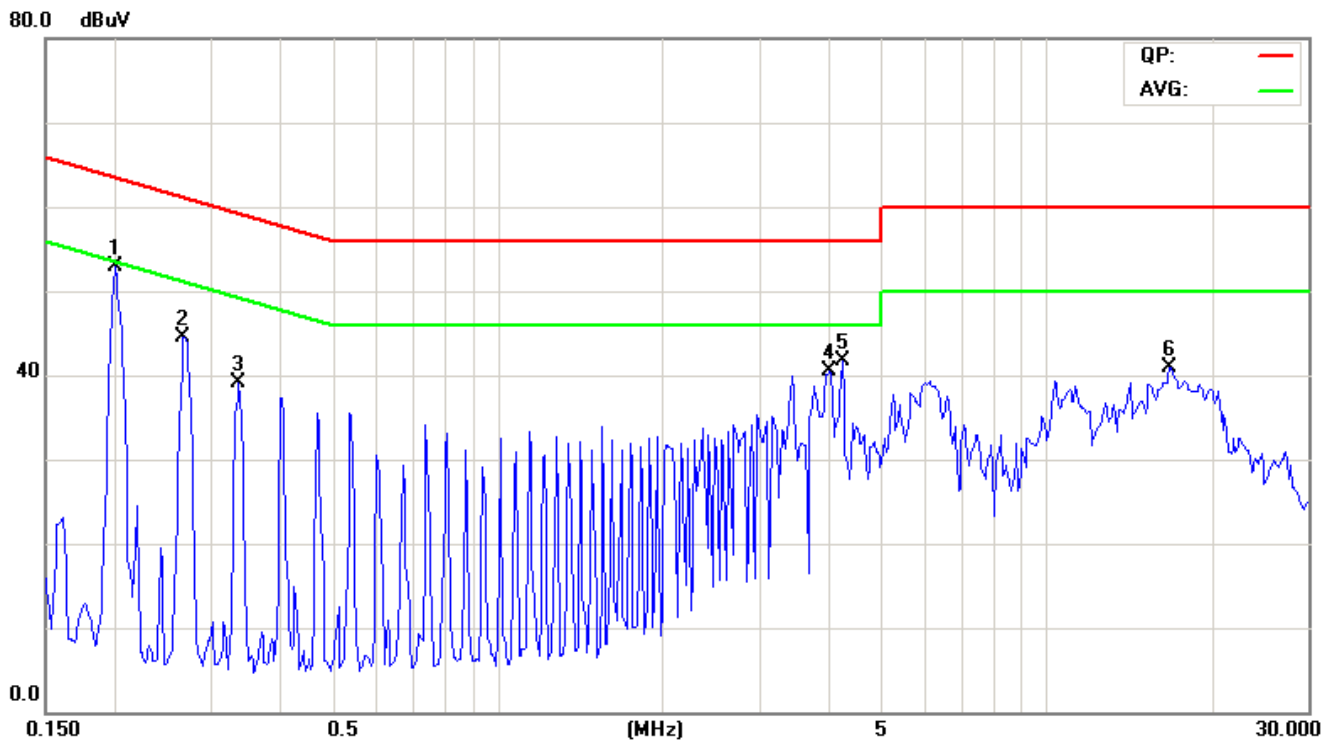


### Test Plots

#### Conducted emissions (Line 1)



#### Conducted emissions (Line 2)





## 8. APPENDIX I RADIO FREQUENCY EXPOSURE

### LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

### EUT SPECIFICATION

<b>EUT</b>	Navigation Device
<b>Frequency band (Operating)</b>	<input type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> Others: <u>Bluetooth: 2.402GHz ~ 2.480GHz</u>
<b>Device category</b>	<input checked="" type="checkbox"/> Portable (<20cm separation) <input type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure ( $S = 5mW/cm^2$ ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S=1mW/cm^2$ )
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <ul style="list-style-type: none"> <li><input type="checkbox"/> Tx diversity</li> <li><input type="checkbox"/> Rx diversity</li> <li><input type="checkbox"/> Tx/Rx diversity</li> </ul>
<b>Max. output power</b>	3.22 dBm (2.09mW)
<b>Antenna gain (Max)</b>	0.357dBi (Numeric gain: 1.09)
<b>Evaluation applied</b>	<input type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input checked="" type="checkbox"/> N/A

**Remark:**

1. The maximum output power is 3.22dBm (2.09mW) at 2402MHz (with 1.09 numeric antenna gain.)

### TEST RESULTS

No non-compliance noted.

(SAR evaluation is not required for the PORTABLE device while its maximum output power is lower than the general population low threshold:  $60/f_{(GHz)}=60/2.441=24.58mW$ )