



**FCC 47 CFR PART 15 SUBPART C**

**TEST REPORT**

**For**

**Bluetooth Module**

**Model: BTC04R**

**Trade Name: Getac**

*Issued to*

**Getac Technology Corp.**  
**No.1,R&D Road 2 , Hsinchu Science Based Industrial Park ,**  
**Hsinchu , Taiwan**

*Issued by*

**Compliance Certification Services Inc.**  
**No. 11, Wu-Gong 6<sup>th</sup> Rd., Wugu Industrial Park,**  
**Taipei Hsien 248, Taiwan (R.O.C.)**  
**<http://www.ccsrf.com>**  
**[service@ccsrf.com](mailto:service@ccsrf.com)**





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## 1. TEST RESULT CERTIFICATION

**Applicant:** Getac Technology Corp.  
No.1,R&D Road 2 , Hsinchu Science Based Industrial  
Park ,Hsinchu , Taiwan

**Equipment Under Test:** Bluetooth Module

**Trade Name:** Getac

**Model:** BTC04R

**Date of Test:** July 27 ~ September 10, 2010

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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Rex Lai  
Section Manager  
Compliance Certification Services Inc.

*Reviewed by:*

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Gina Lo  
Section Manager  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

<b>Product</b>	Bluetooth Module
<b>Trade Name</b>	Getac
<b>Model Number</b>	BTC04R
<b>Model Discrepancy</b>	N/A
<b>Power Supply</b>	Powered from host device
<b>Frequency Range</b>	2402 ~ 2480 MHz
<b>Transmit Power</b>	2.55 dBm
<b>Modulation Technique</b>	GFSK for 1Mbps; $\pi/4$ -DQPSK for 2Mbps; 8DPSK for 3Mbps
<b>Number of Channels</b>	79 Channels
<b>Antenna Specification</b>	Gain: 4 dBi
<b>Antenna Designation</b>	PIFA Antenna
<b>Notes</b>	Add portable category for the platform. The platform information is list as below. Since the module and the antenna are the same. We assess the conducted output power and the radiated emission to meet the standard. According to conducted output power, then to test the radiated emission for model V100-X, V200-X. After verification, the worst case is V100-2X. Product name: Notebook Computer Model: V100-2X, V100-X, V200-X All the specification and layout are identical except they come with different model numbers and panel size for marketing purposes.

**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: MAU041 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 and FCC CFR 47 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 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.

**3.4FCC 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:

<b>MHz</b>	<b>MHz</b>	<b>MHz</b>	<b>GHz</b>
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: BTC04R) had been tested under operating condition.

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

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

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

During the preliminary test, GFSK,  $\pi/4$ -QPSK & 8DPSK with DH1 were pre-tested and found that 8DPSK emits the highest output power. Then the tests were carried on with DH1 compare to DH3 & DH5 and found that 8DPSK with DH5 emit the highest output power, and therefore had been tested under operating condition.

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

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



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING 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.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/03/2011
Power Meter	Agilent	E4416A	GB41291611	06/27/2011
Power Sensor	Agilent	E9327A	US40441097	06/27/2011

3M Semi Anechoic Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	10/26/2010
EMI Test Receiver	R&S	ESCI	100064	02/04/2011
Pre-Amplifier	Mini-Circuits	ZFL-1000LN	SF350700823	01/13/2011
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/20/2010
Bilog Antenna	Sunol Sciences	JB3	A030105	09/11/2010
Horn Antenna	EMCO	3117	00055165	12/07/2010
Loop Antenna	EMCO	6502	8905/2356	06/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/31/2010
Test S/W	EZ-EMC (CCS-3A1RE)			



<b>Powerline Conducted Emissions Test Site</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-465	08/12/2011
L.I.S.N	SCHWARZBECK	NSLK 8127	8127-473	03/22/2011
EMI Test Receiver	ROHDE & SCHWARZ	ESHS 30	838550/003	01/28/2011
Pulse Limit	ROHDE & SCHWARZ	ESH3-Z2	100117	09/17/2010
N Type Coaxial Cable	BELDEN	8268 M17/164	003	07/09/2011
I.S.N.	SCHAFFNER	T800	24313	05/04/2011
Ferrite Clamp	SCHAFFNER	KEMA801	15937	05/04/2011
Current Probe	SCHAFFNER	SMZ11	14802	N.C.R.



### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.7468
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0606
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9979
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5790
3M Semi Anechoic Chamber / 8G~18G	+/- 2.5928
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7212
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9520

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



## **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.989-1, Wenshan Rd., Qionglin Township, Hsinchu County 307, Taiwan (R.O.C.)

Tel: +886-3-5921698

**Remark:** The powerline conducted emissions items was tested at Compliance Certification Services Inc. (Hsinchu Lab.) The test equipments were listed in page 9 and the test data, please refer page 67-68.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 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	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	 Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

*\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

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

### 6.2 SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	GPS Simulator	HWajeat	GPS-101	EN001	---
2	8960 Series 10 Wireless Communication test set	Agilent	E5515C	GB44051665	---
3	ADVANCED HYBRID SYSTEM	Panasonic	KX-TA308	---	---
4	Notebook PC	Lenovo ideaPad	S10e_4068-RZ1	L3CEV2D	HFS-FL
5	Notebook PC	HP	nx6130	CNU543274R	CNTWM3B2200BGA
6	Bluetooth Headset	Motorola	H17	SJYN029A	IHDP6KE1
7	Modem	ZyXEL	Omni 56K	S1Z4107727	1880MNI56K
8	LED Monitor	ViewSonic	VS12085	R18082200389	DoC
9	Headset/Microphone	ERGOTECH	ET-E203	4719405008042	---
10	E-SATA External hard	VANTEC	NexStar CX	---	---
11	Flash disk	Transcend	CompactFlash512MB	1561433338	---
12	Flash disk	Sayho	PR1014(256M)	104720	---
13	SD Crad	SanDisk	---	---	---
14	Smart Card	HOME RUN CARD	---	---	---
15	PCMCIA Card (CF Adapter)	Billonton	1211004-0040	00082900065	---
16	CF Card	iEi	ICF1000	ICF-10001-128MB	---

#### **Remark:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



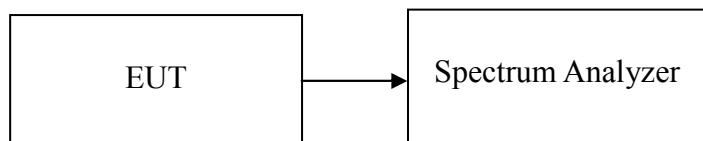
## 7. FCC PART 15.247 REQUIREMENTS

### 7.120 DB 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 = 1.5MHz, 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.*

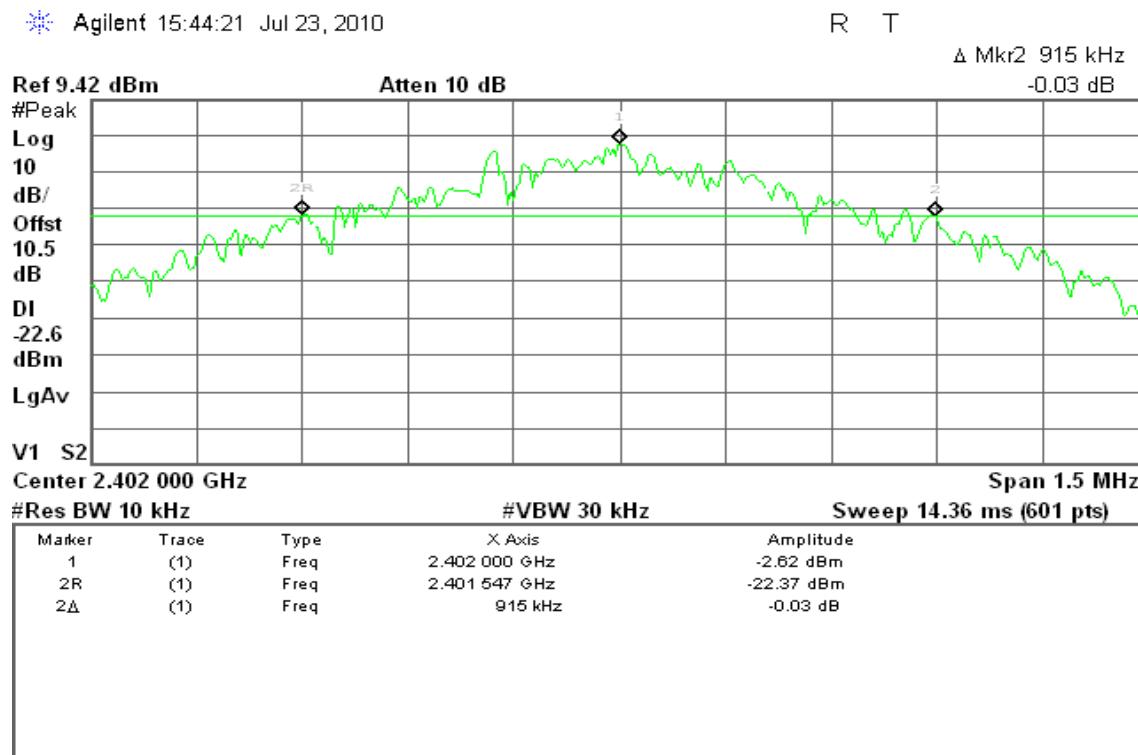
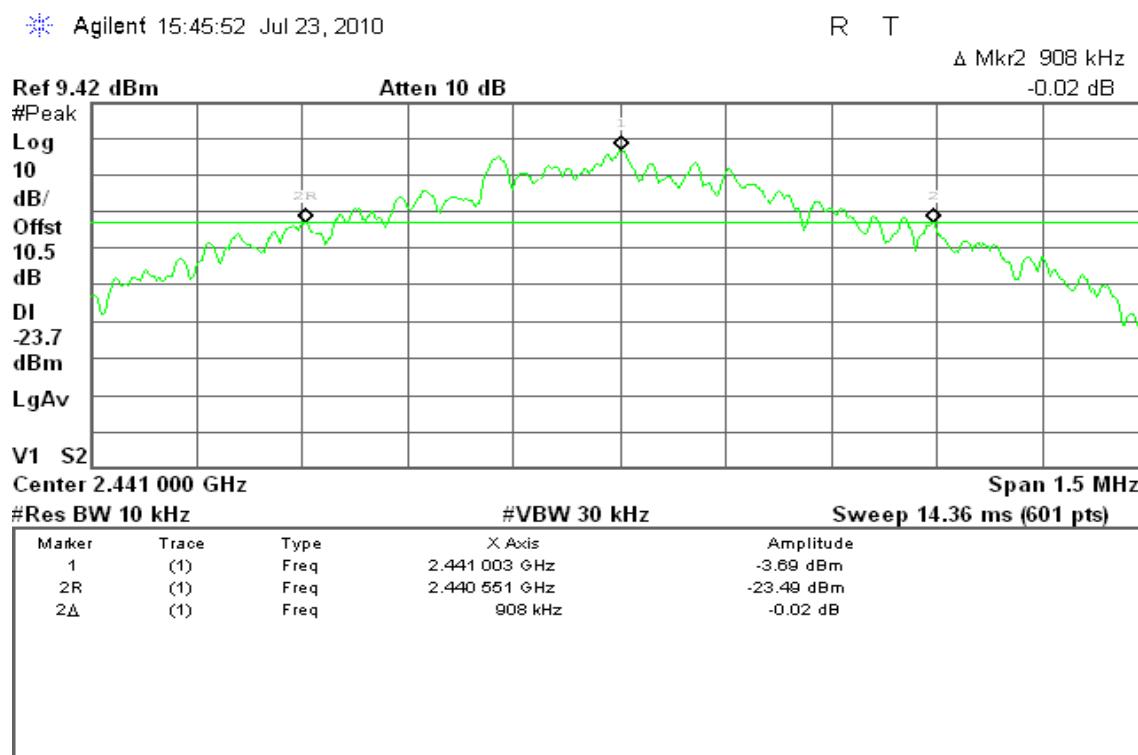
#### Test Data

##### **For GFSK / DH5**

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	0.915
Mid	2441	0.908
High	2480	0.919

##### **For 8DPSK / DH5**

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	1.243
Mid	2441	1.240
High	2480	1.263

**Test Plot****For GFSK / DH5****20dB Bandwidth (CH Low)****20dB Bandwidth (CH Mid)**

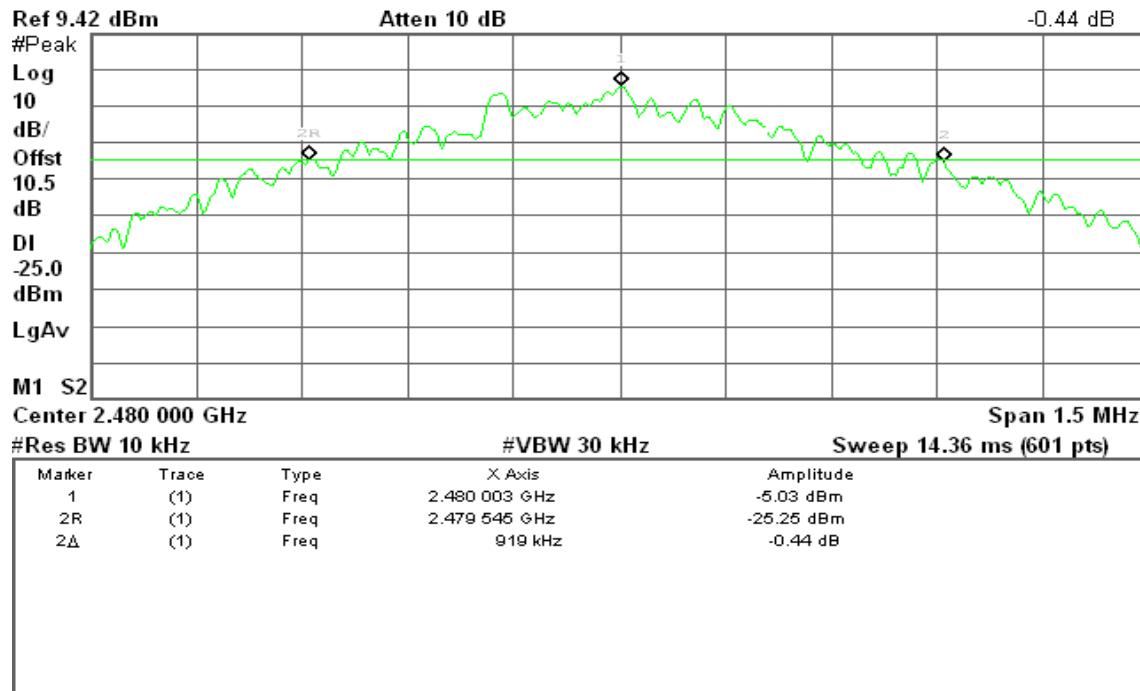
**20dB Bandwidth (CH High)**

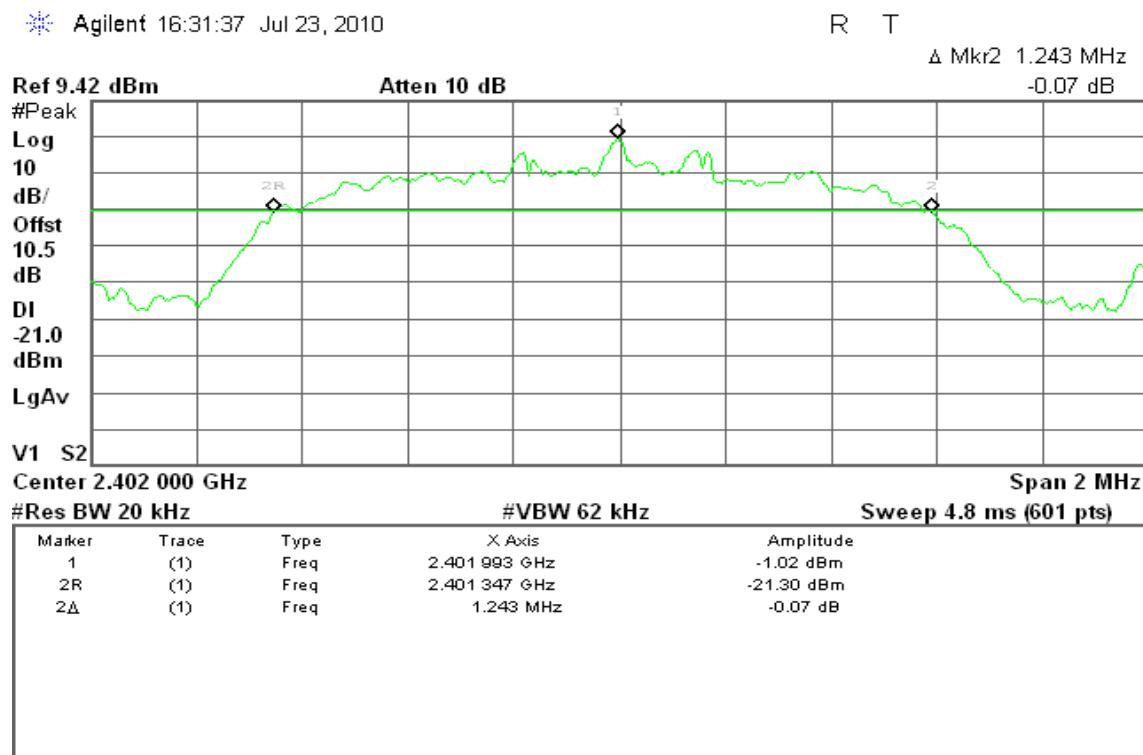
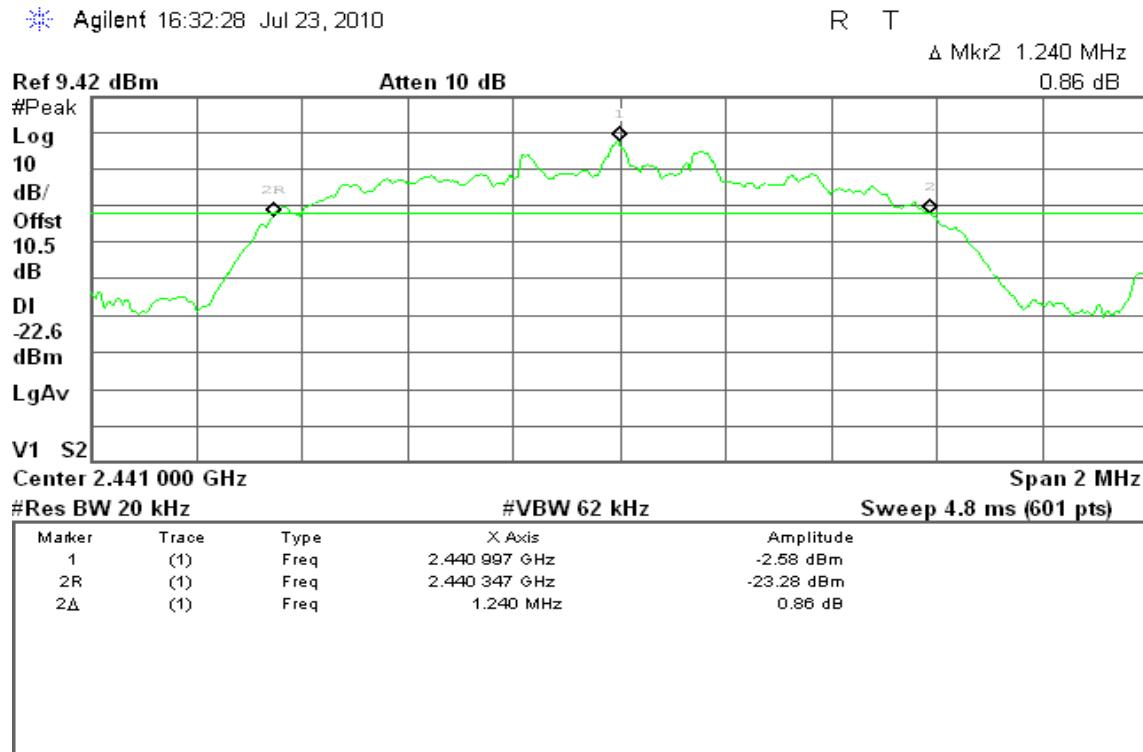
Agilent 15:56:43 Jul 23, 2010

R T

Δ Mkr2 919 kHz

-0.44 dB



**For 8DPSK / DH5****20dB Bandwidth (CH Low)****20dB Bandwidth (CH Mid)**

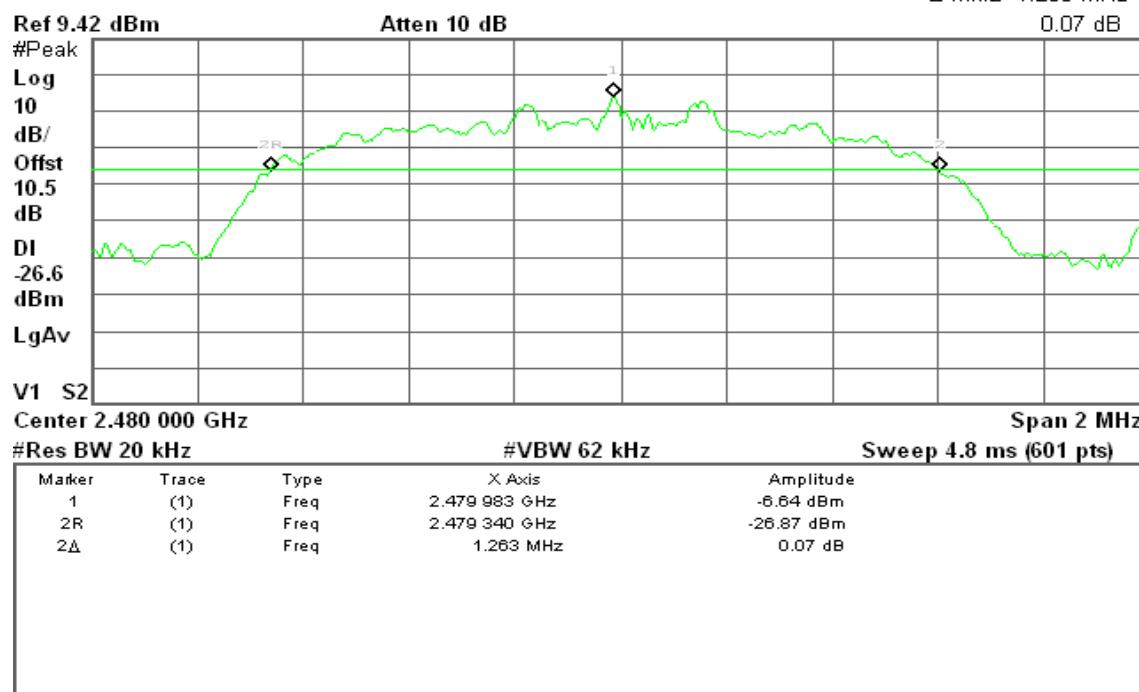
**20dB Bandwidth (CH High)**

Agilent 16:33:17 Jul 23, 2010

R T

Δ Mkr2 1.263 MHz

0.07 dB





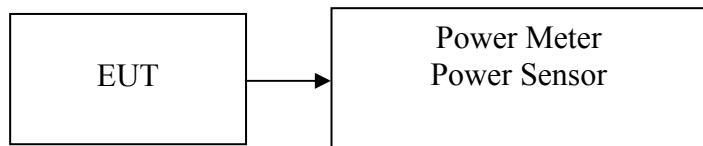
## **7.2PEAK POWER**

### **LIMIT**

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 Power Meter. The Power Meter is set to the peak power detection.

## **TEST RESULTS**

*No non-compliance noted.*

**Test Data****For V-100-2X****For GFSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	2.55	0.0018	0.125	PASS
Mid	2441	1.22	0.0013		PASS
High	2480	-0.21	0.0010		PASS

**For 8DPSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	0.75	0.0012	0.125	PASS
Mid	2441	-0.78	0.0008		PASS
High	2480	-2.35	0.0006		PASS

**For V-100-X****For GFSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	2.60	0.0018	0.125	PASS
Mid	2441	1.36	0.0014		PASS
High	2480	-0.29	0.0009		PASS

**For 8DPSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	0.71	0.0012	0.125	PASS
Mid	2441	-0.85	0.0008		PASS
High	2480	-2.49	0.0006		PASS

**For V-200-X****For GFSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	2.51	0.0018	0.125	PASS
Mid	2441	1.19	0.0013		PASS
High	2480	-0.29	0.0009		PASS

**For 8DPSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2402	0.82	0.0012	0.125	PASS
Mid	2441	-0.69	0.0009		PASS
High	2480	-2.46	0.0006		PASS

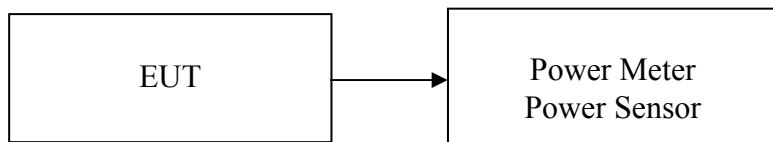


## 7.3 AVERAGE POWER

### LIMIT

None; for reporting purposes only.

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted.*

#### Test Data

##### **For GFSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	1.43	0.0014
Mid	2441	0.07	0.0010
High	2480	-1.37	0.0007

##### **For 8DPSK / DH5**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	-2.74	0.0005
Mid	2441	-4.40	0.0004
High	2480	-6.07	0.0002

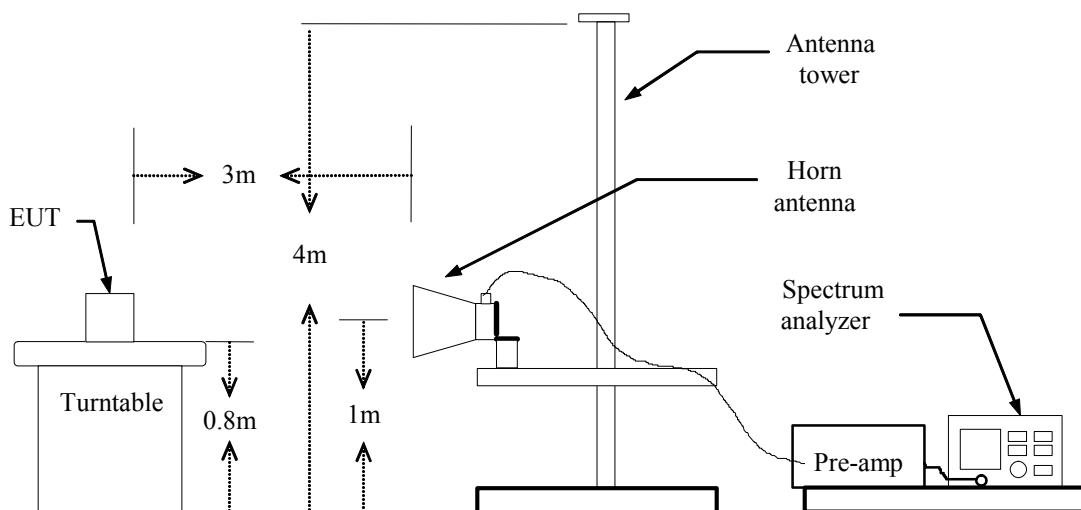


## 7.4BAND EDGES MEASUREMENT

### LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### Test Configuration

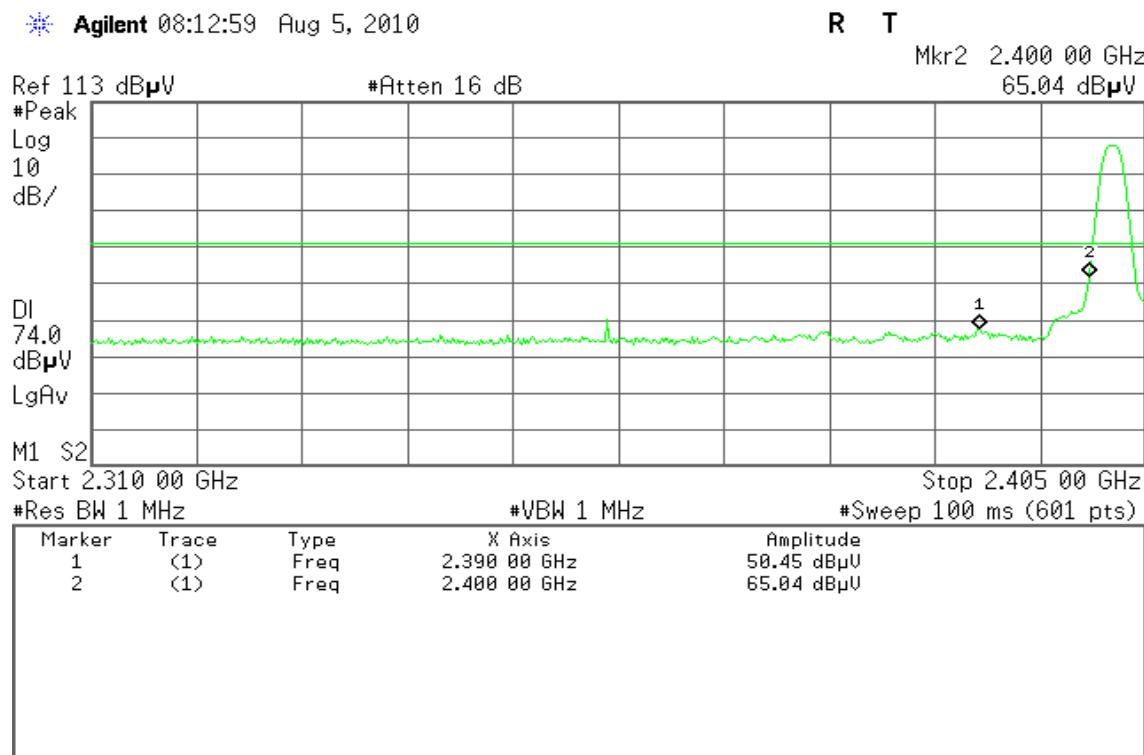
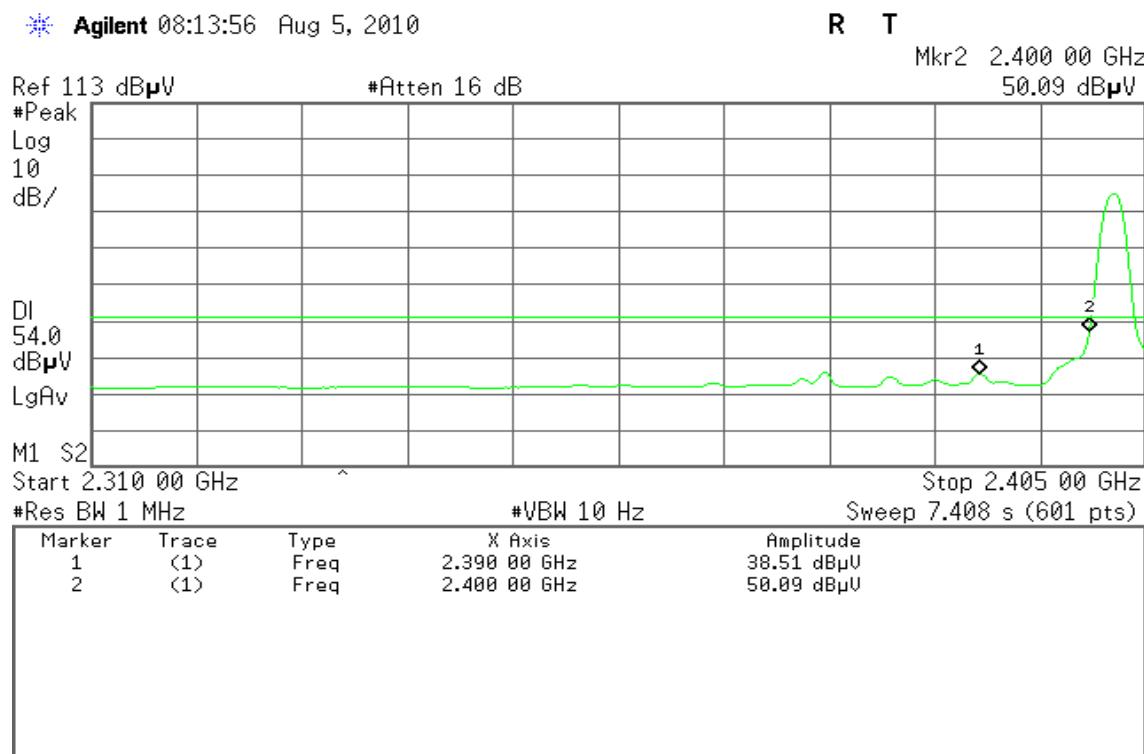


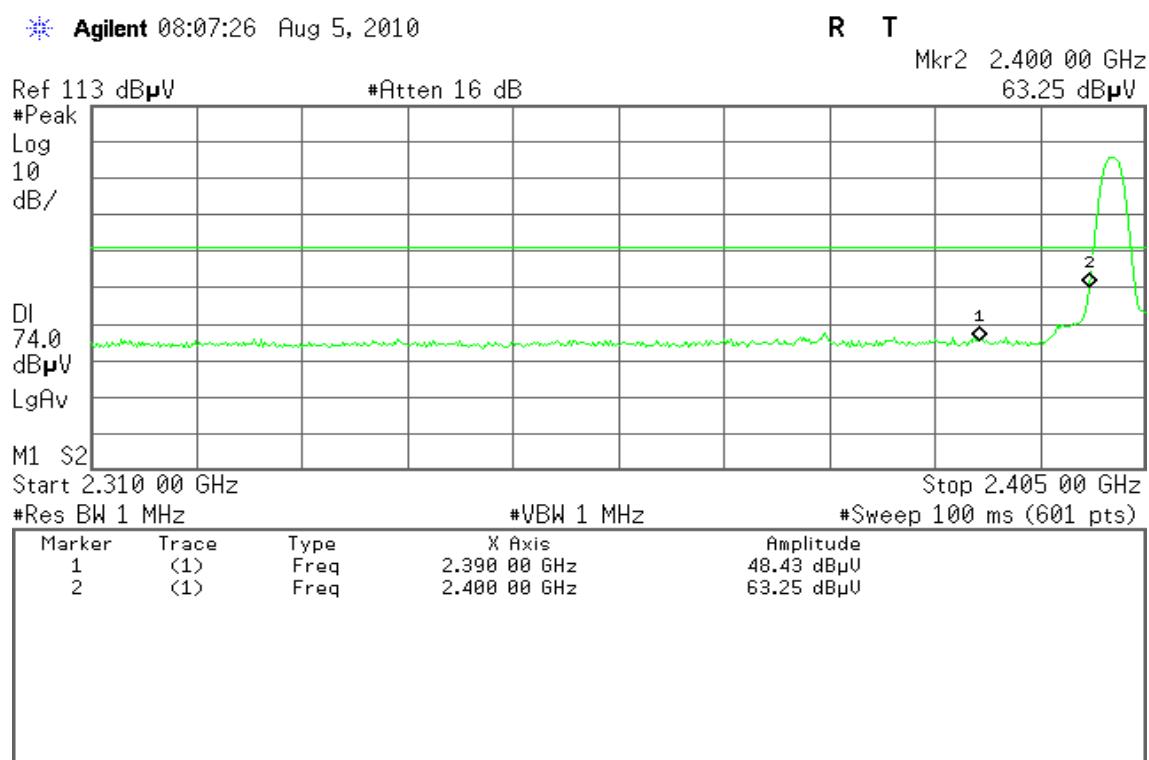
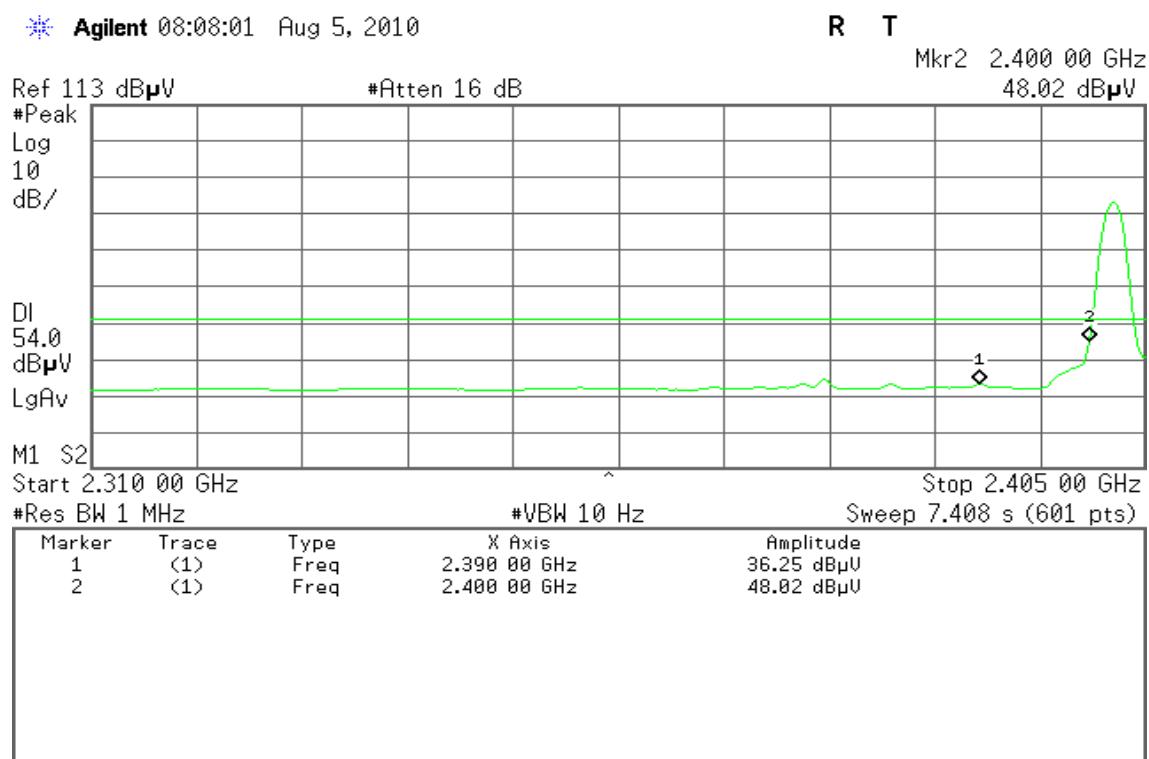
### TEST PROCEDURE

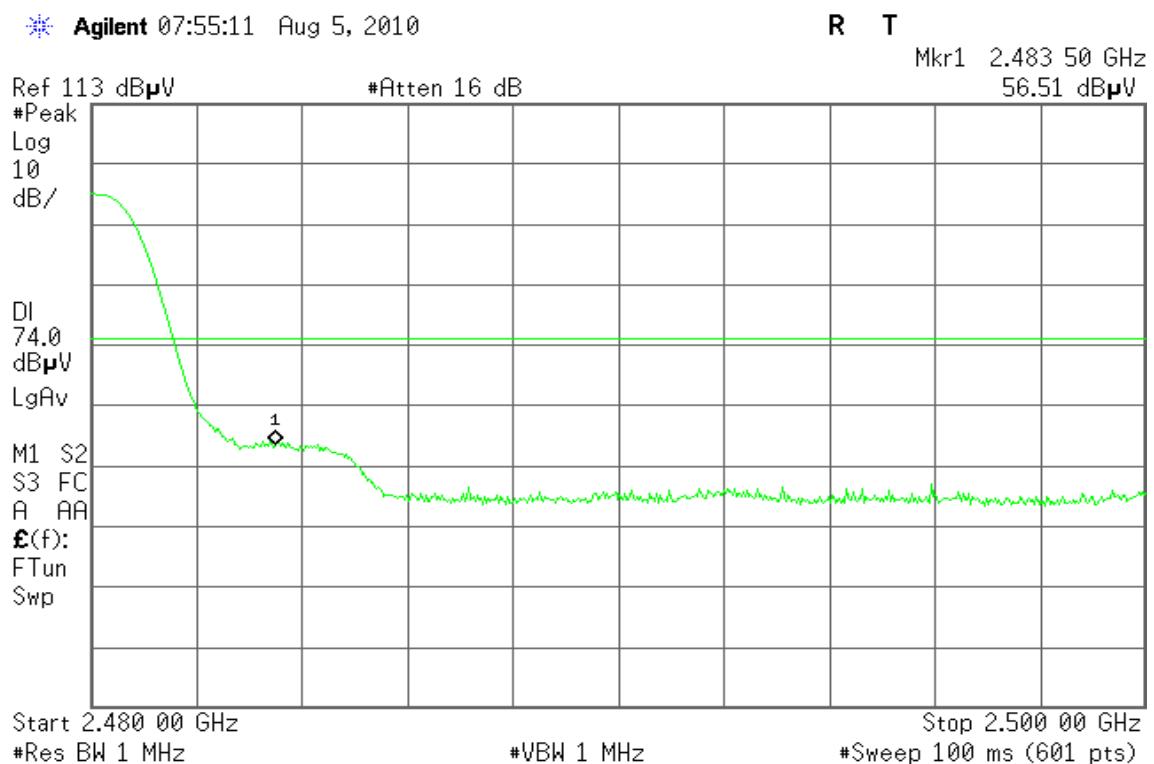
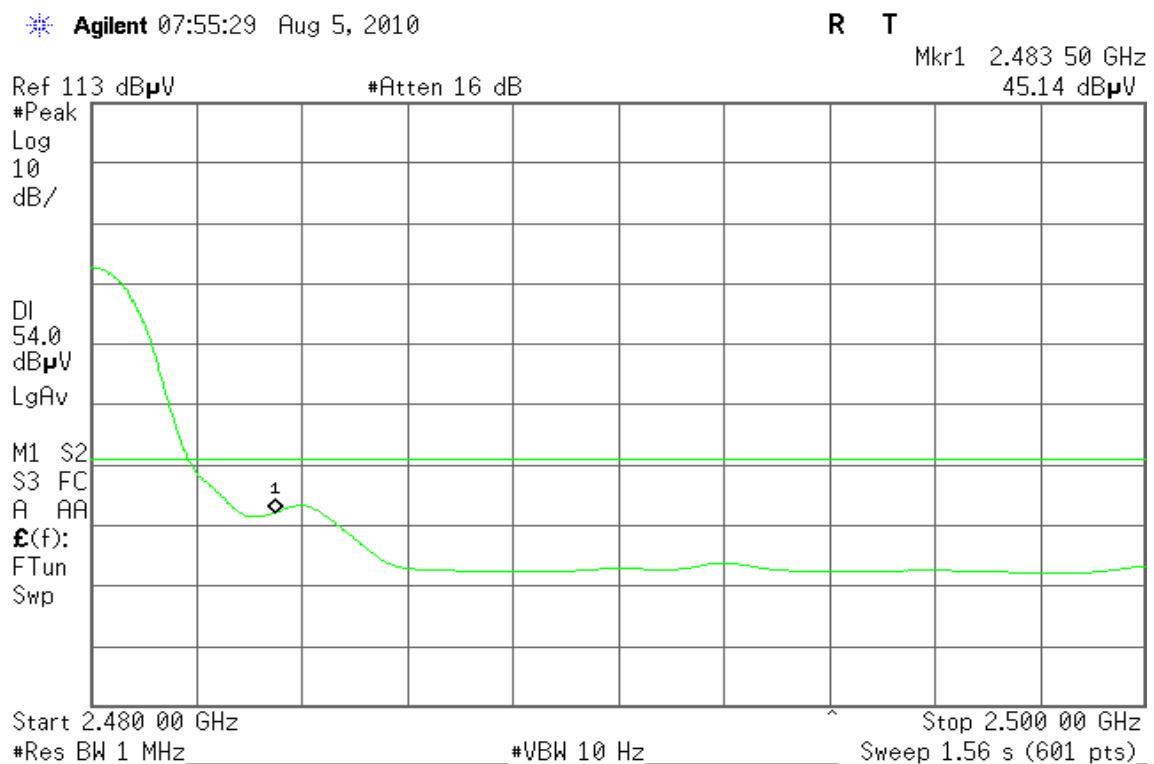
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the 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.

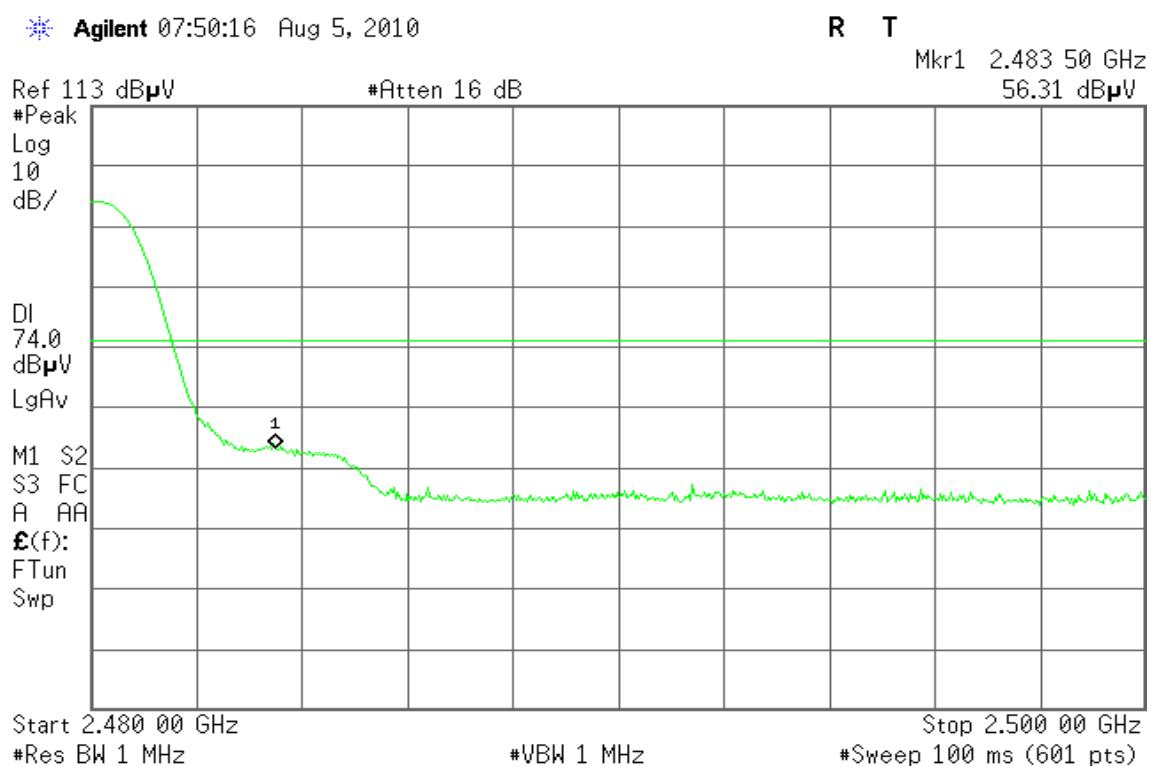
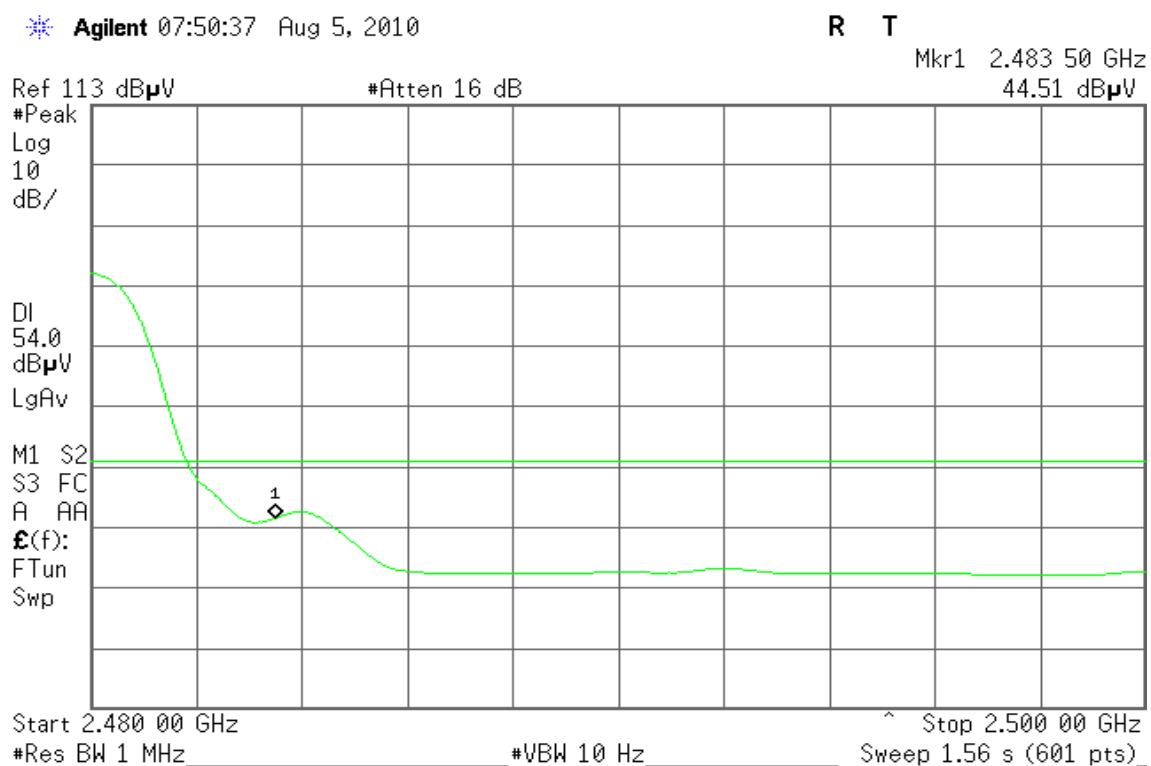
### TEST RESULTS

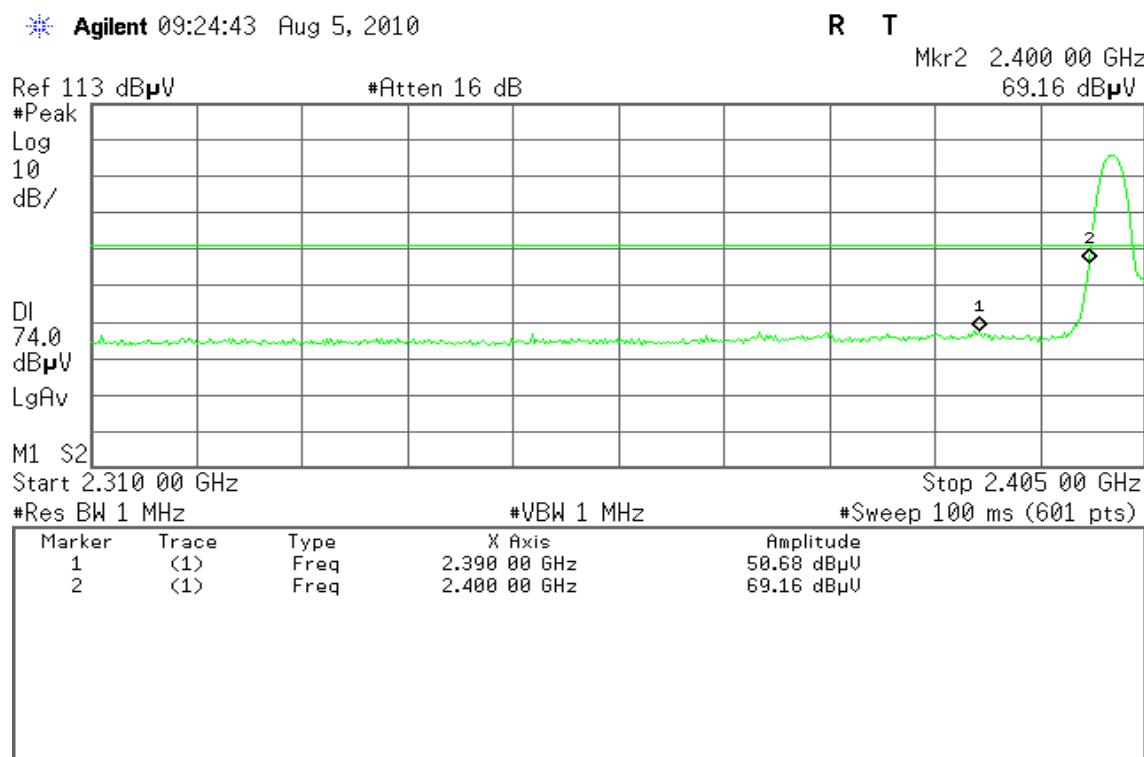
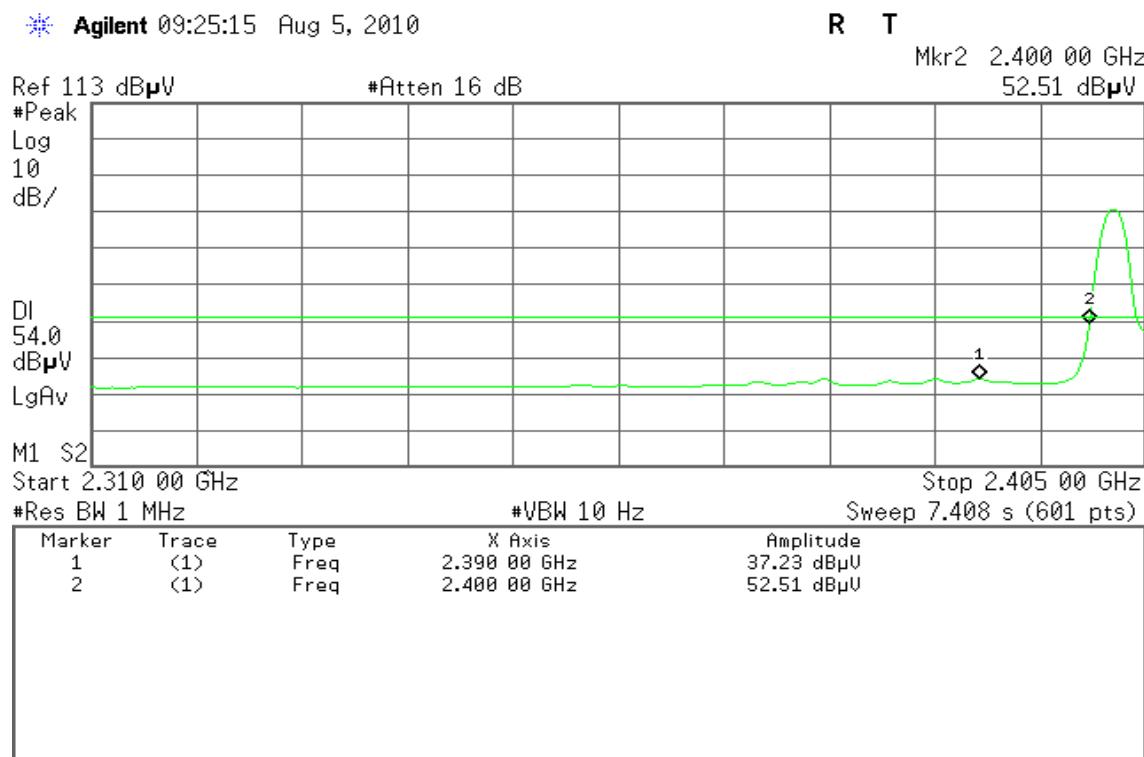
Refer to attach spectrum analyzer data chart.

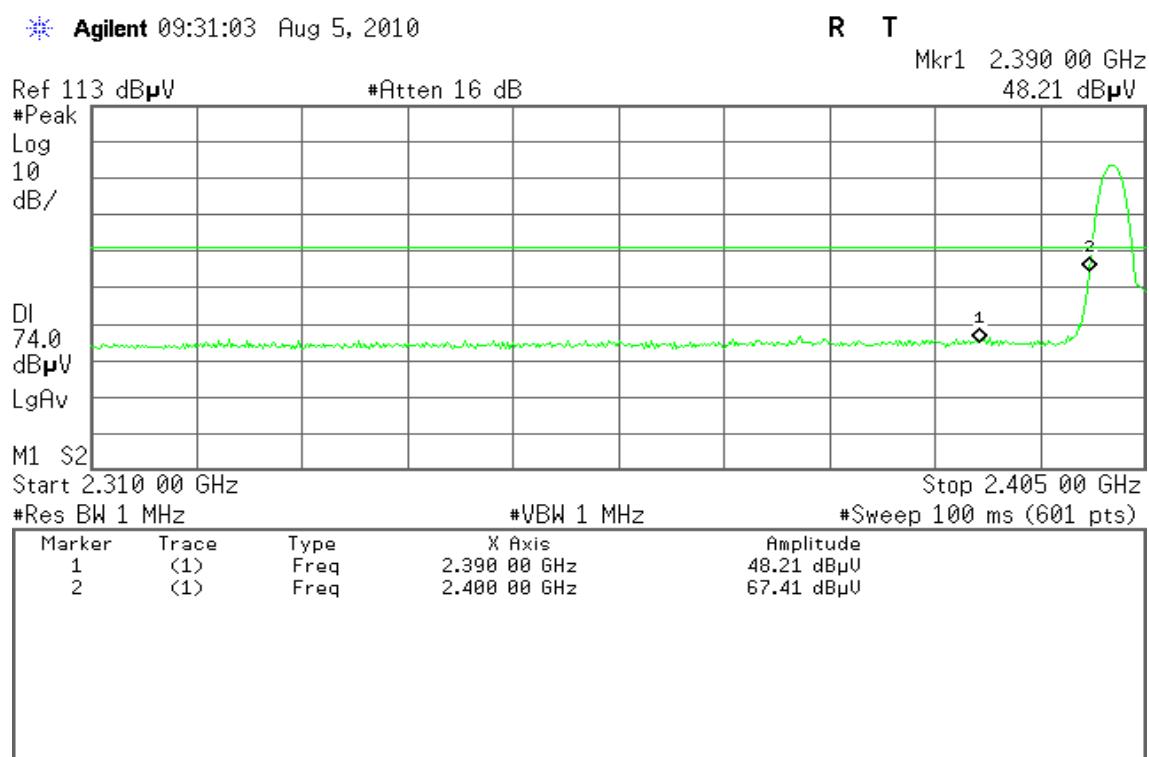
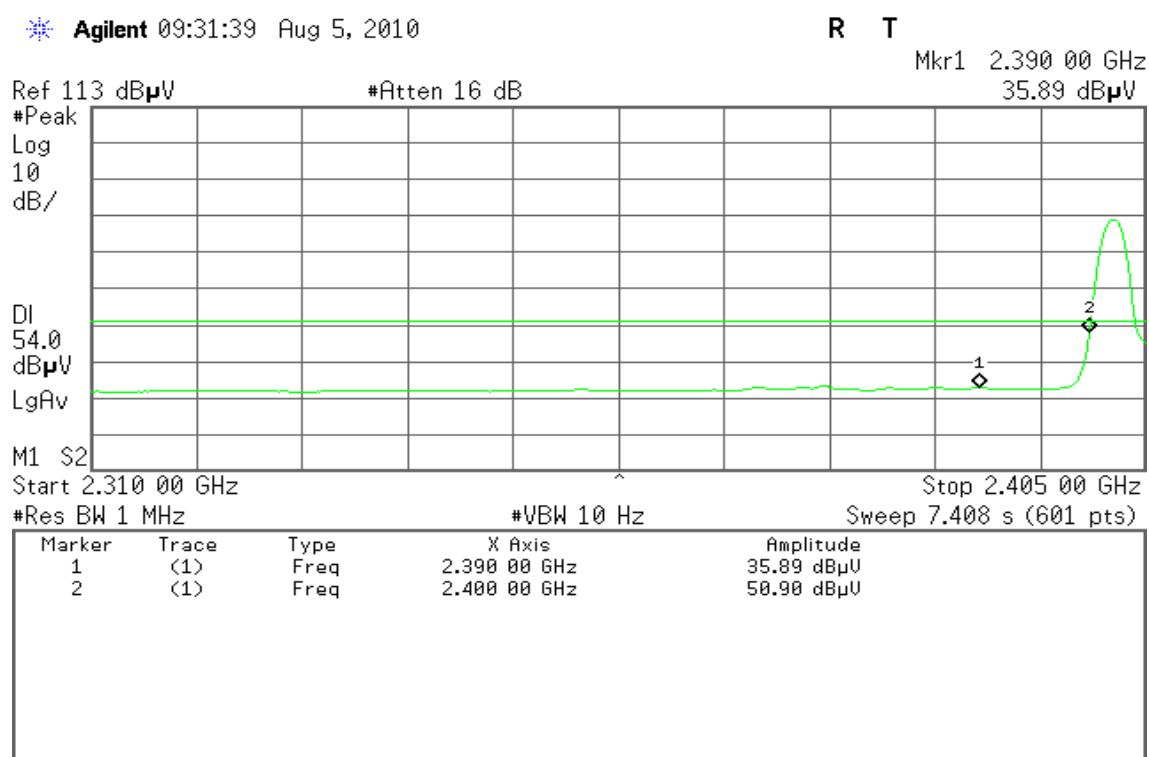
**For GFSK / DH5****Band Edges (CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

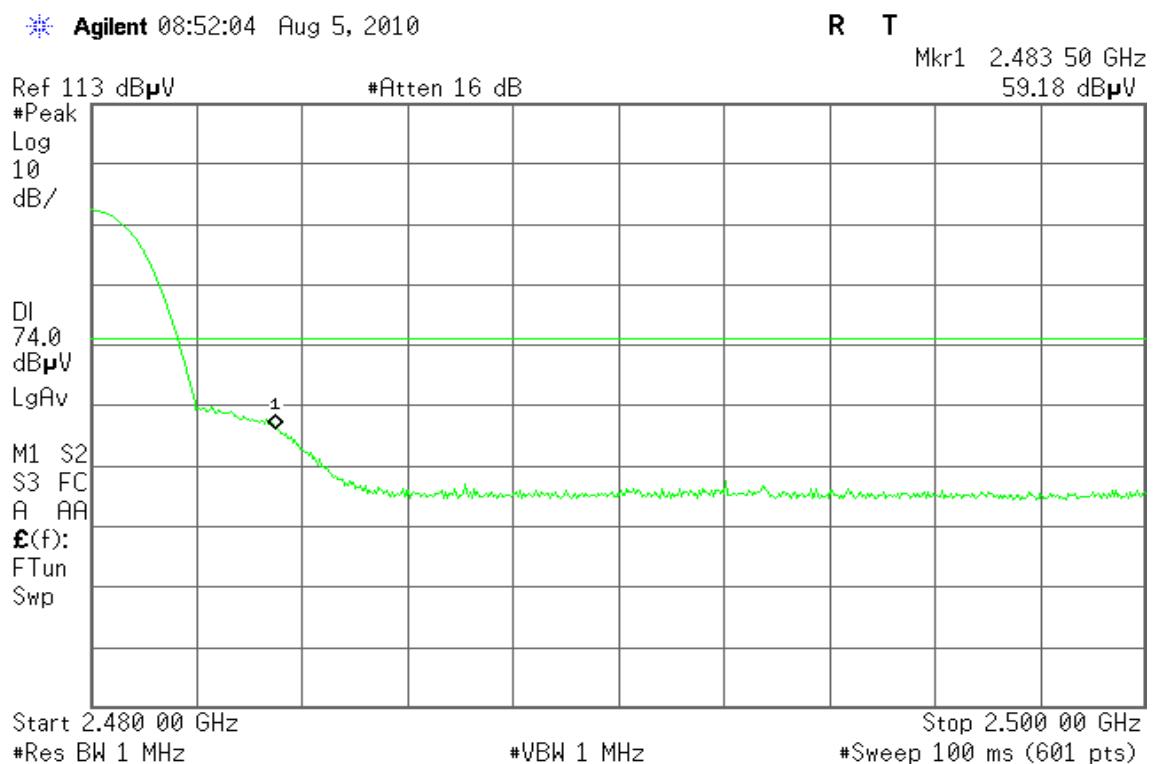
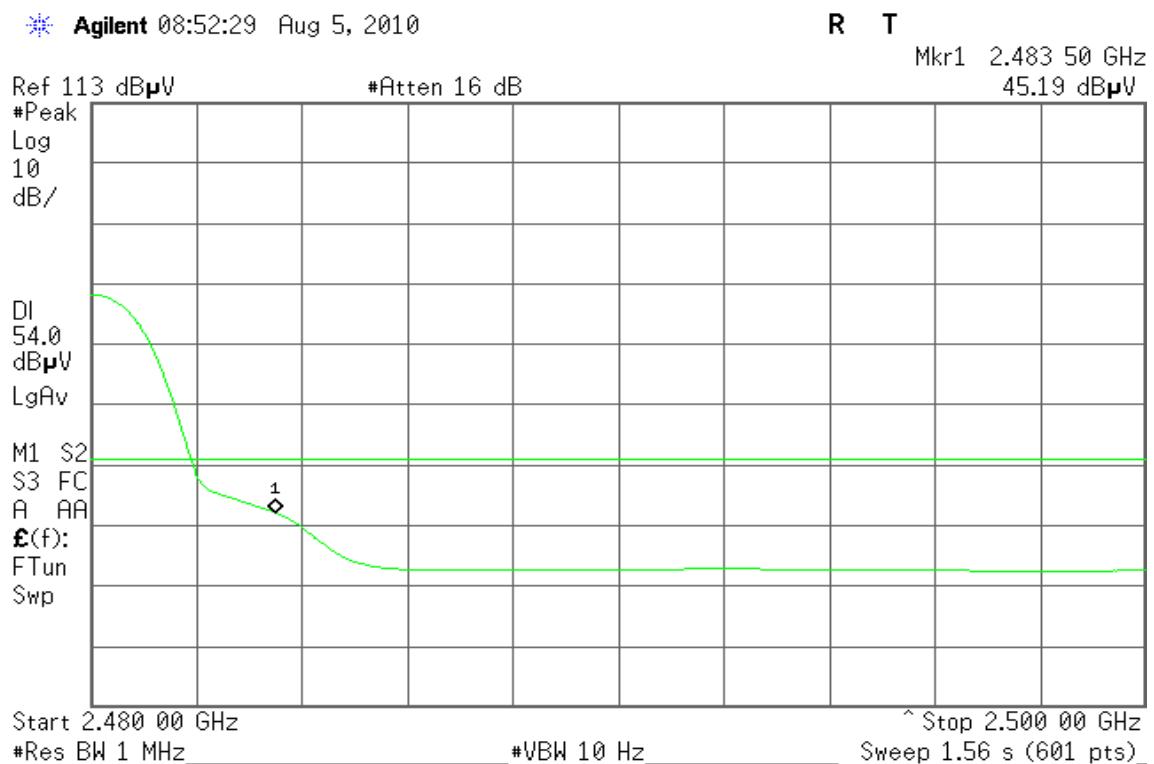
**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

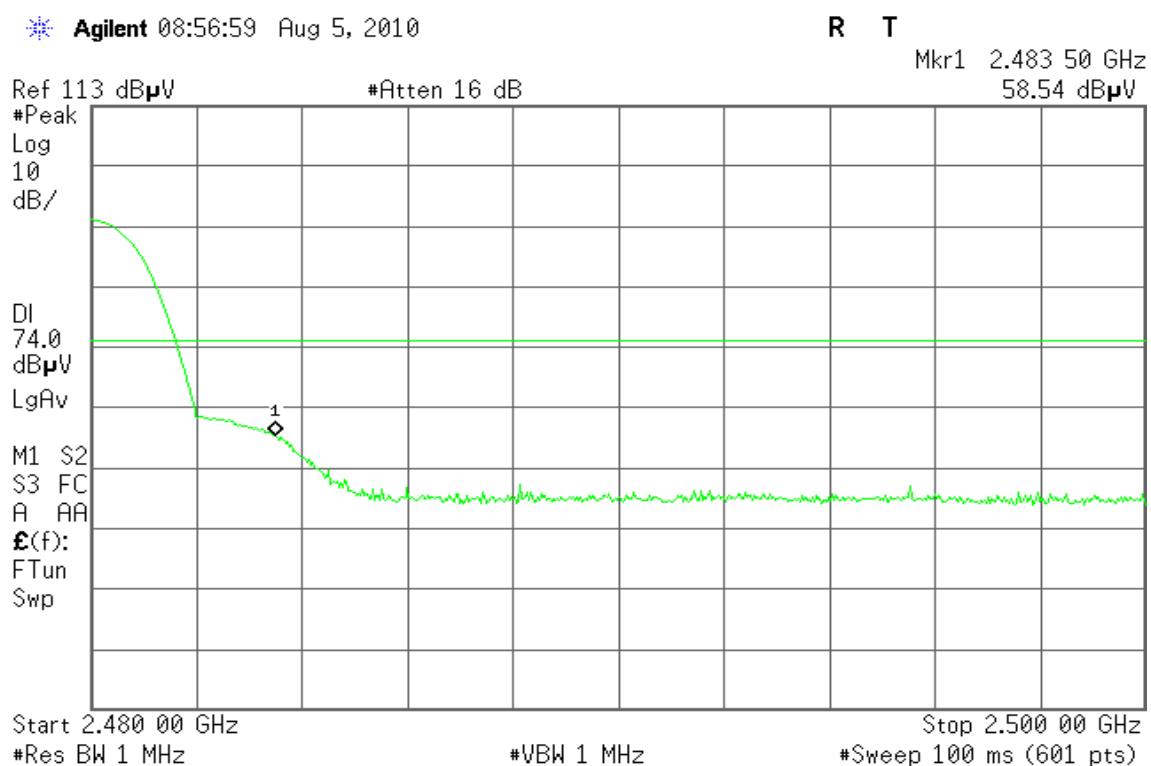
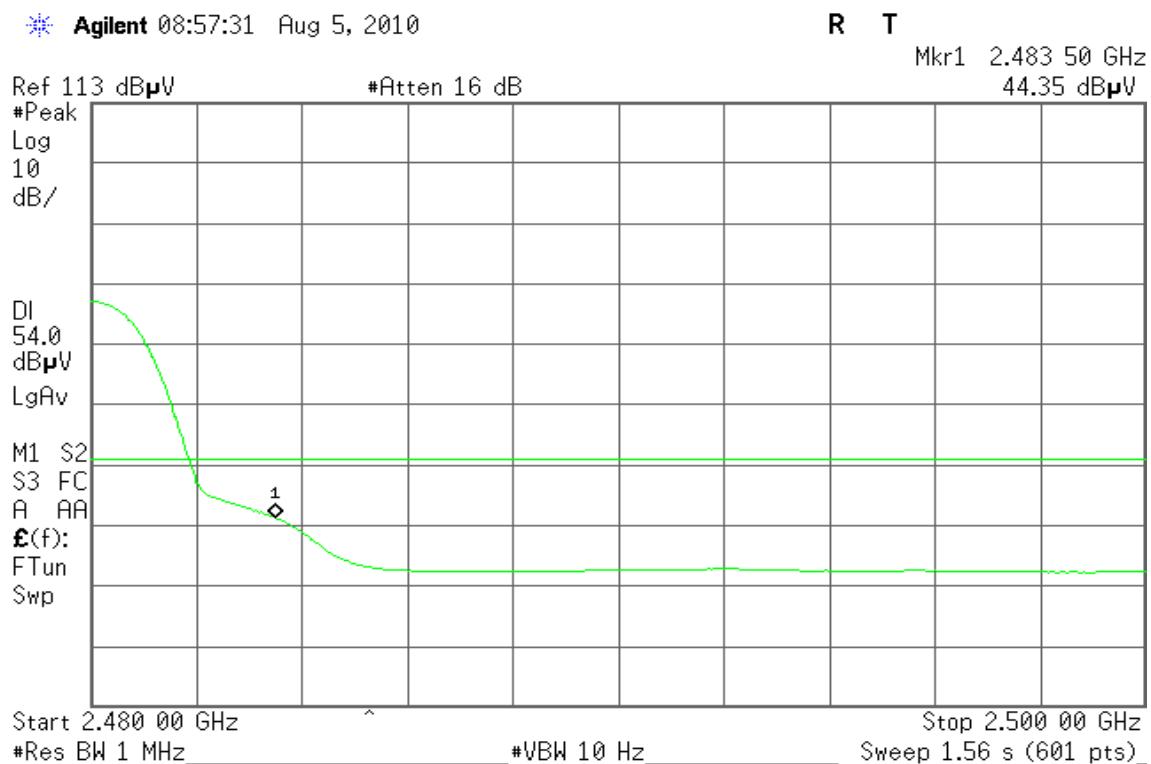
**Band Edges (CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

**For 8DPSK / DH5****Band Edges (CH Low)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

**Band Edges (CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

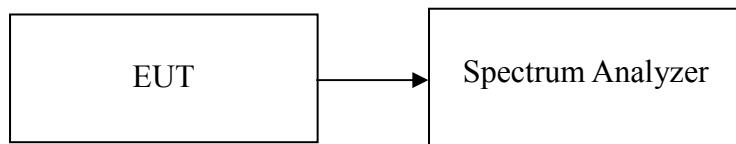


## 7.5 FREQUENCY SEPARATION

### LIMIT

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

#### For GFSK / DH5

Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	612	>two-thirds of the 20 dB bandwidth	Pass

#### For 8DPSK / DH5

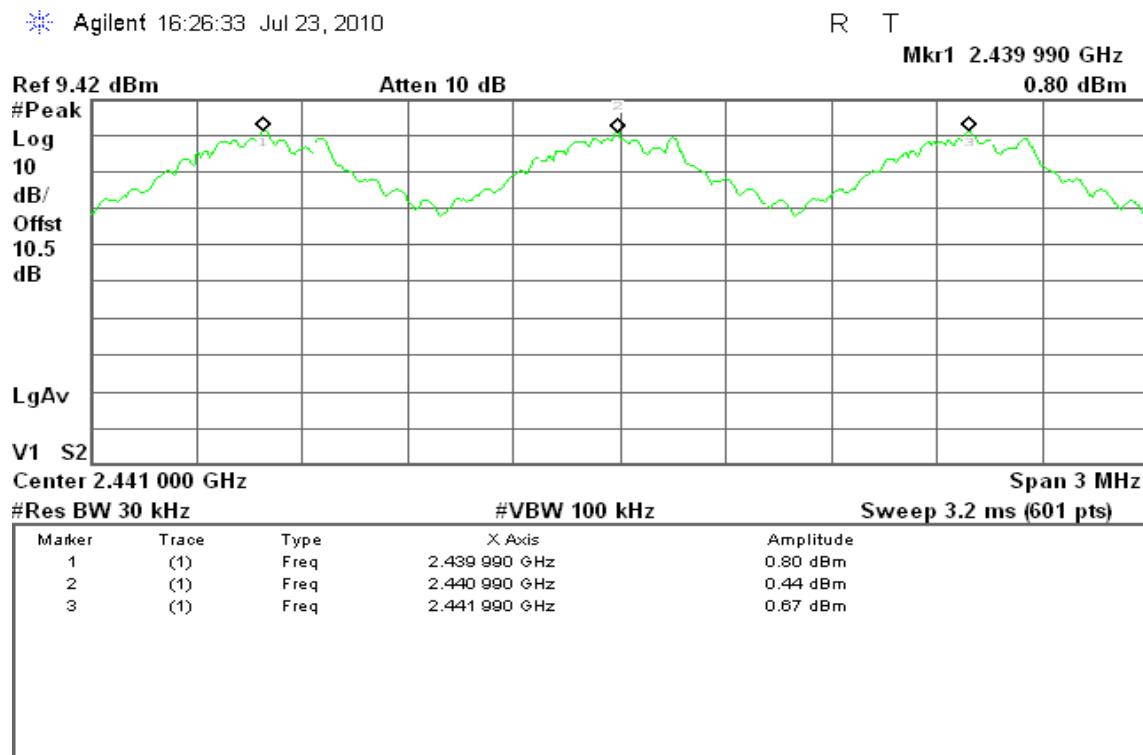
Channel Separation (MHz)	two-thirds of the 20 dB bandwidth (kHz)	Channel Separation Limit	Result
1.00	842	>two-thirds of the 20 dB bandwidth	Pass



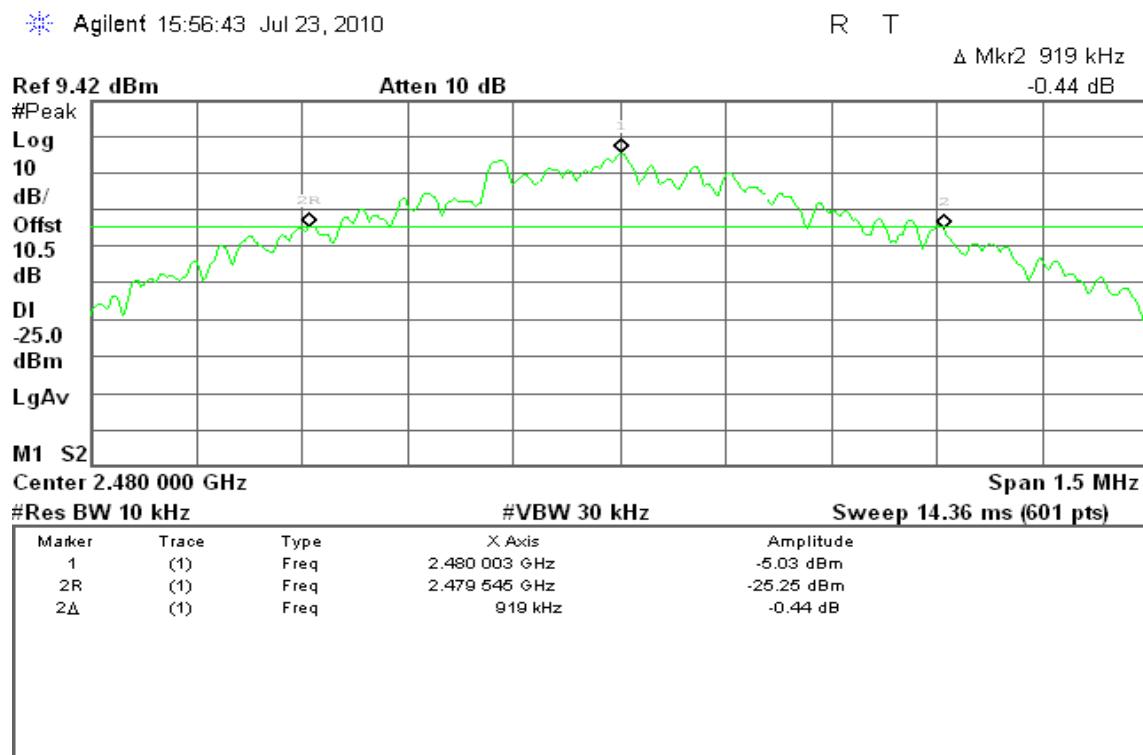
## Test Plot

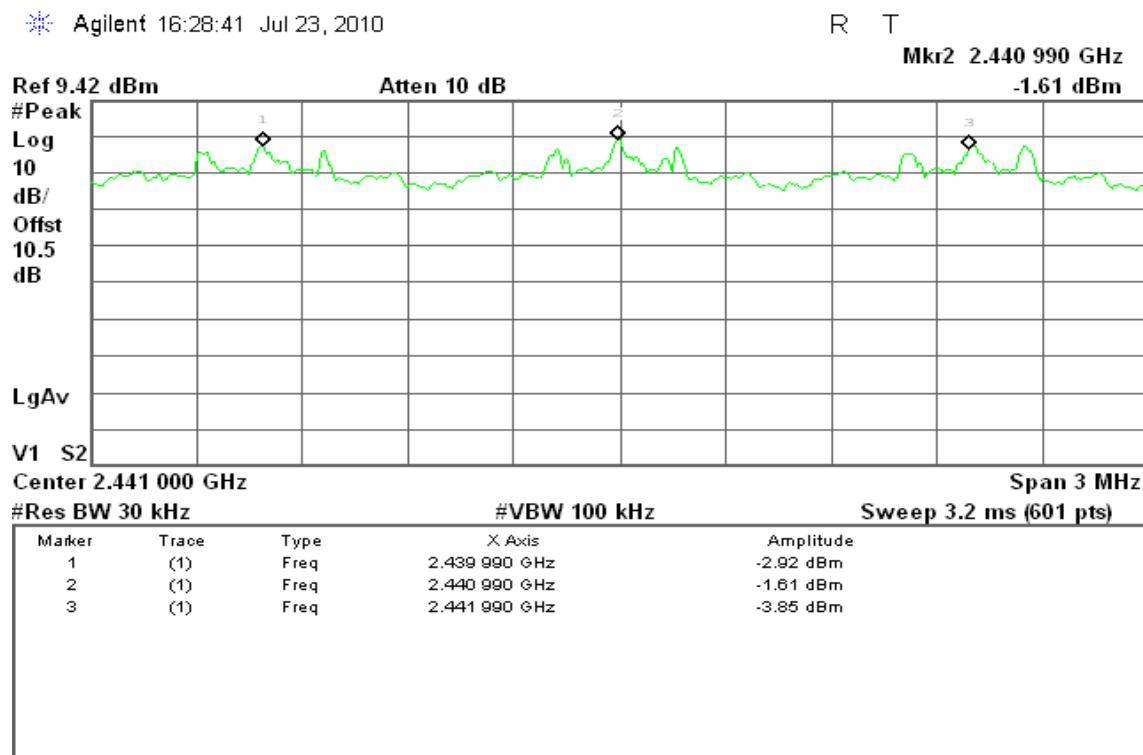
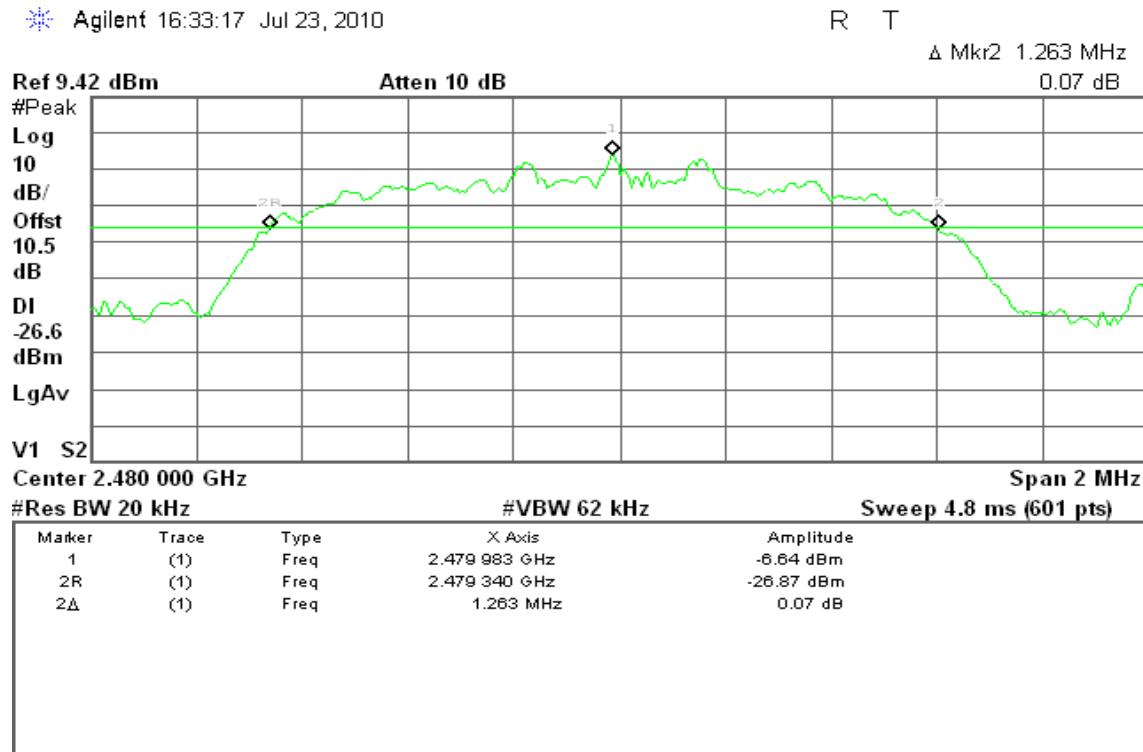
### For GFSK / DH5

#### Measurement of Channel Separation



#### Measurement of 20dB Bandwidth



**For 8DPSK / DH5****Measurement of Channel Separation****Measurement of 20dB Bandwidth**

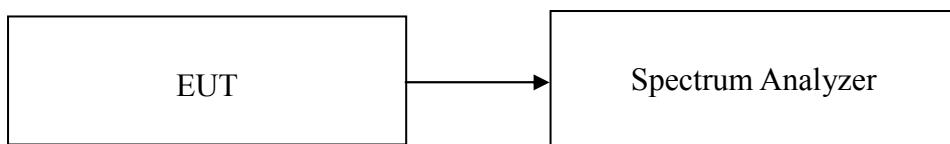


## 7.6 NUMBER OF HOPPING FREQUENCY

### LIMIT

According to §15.247(a)(1)(iii), 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=510kHz.
5. Max hold, view and count how many channel in the band.

### TEST RESULTS

*No non-compliance noted*

### Test Data

#### For GFSK / 8DPSK

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

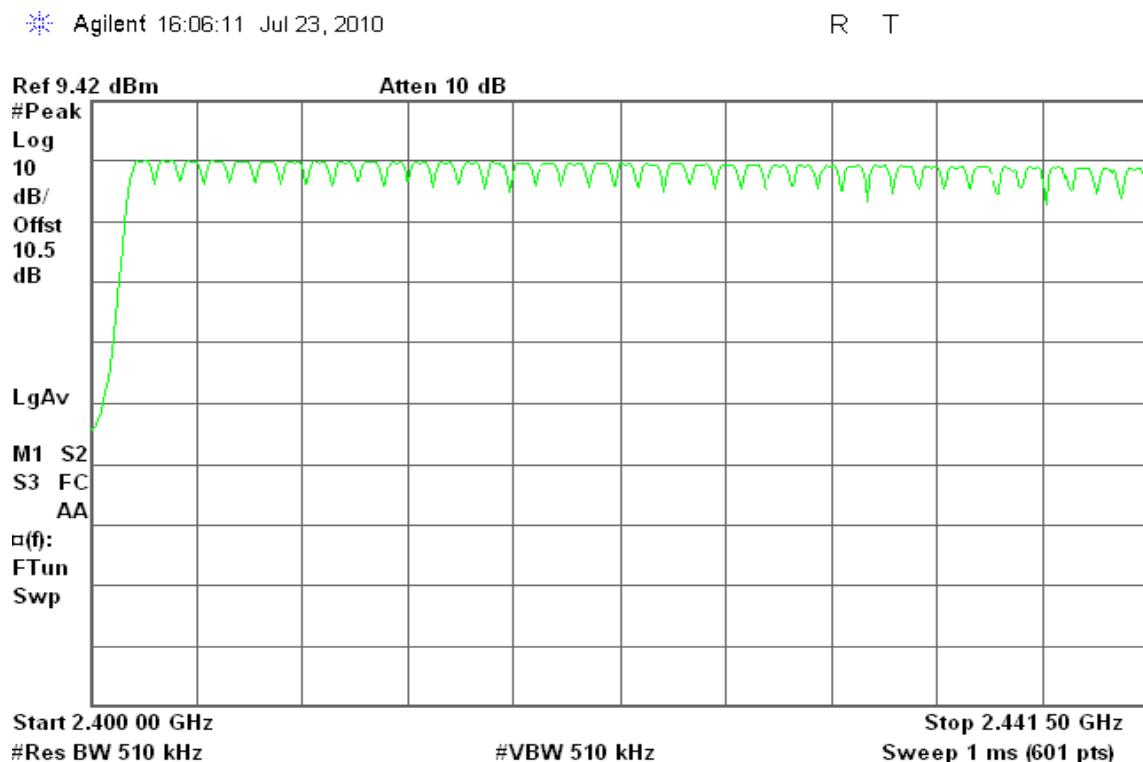


## Test Plot

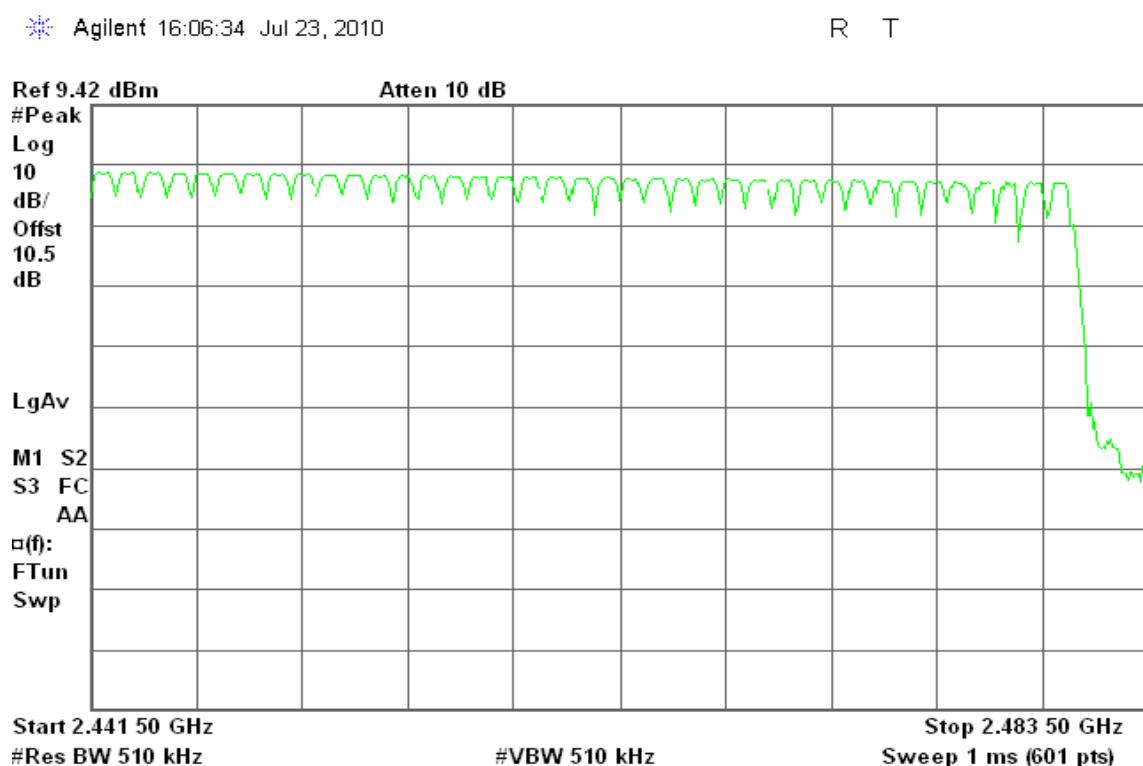
For GFSK

Channel Number

2.4 GHz – 2.4415 GHz



2.4415 GHz – 2.4835 GHz

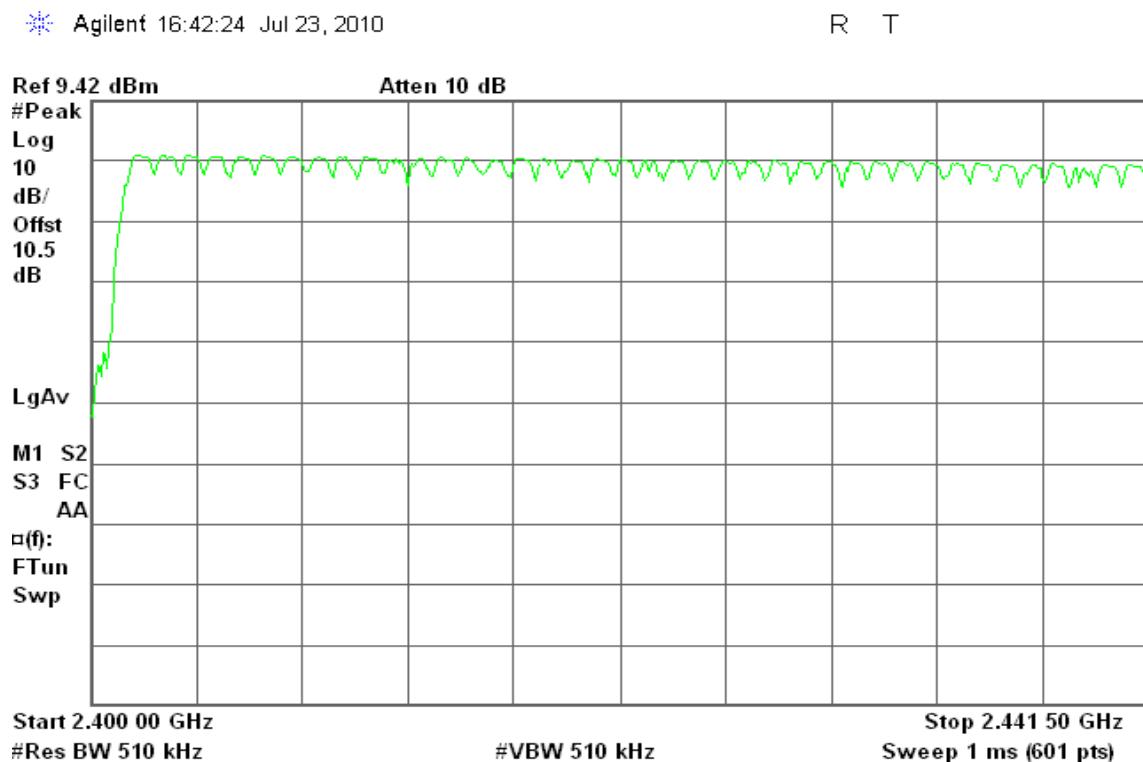




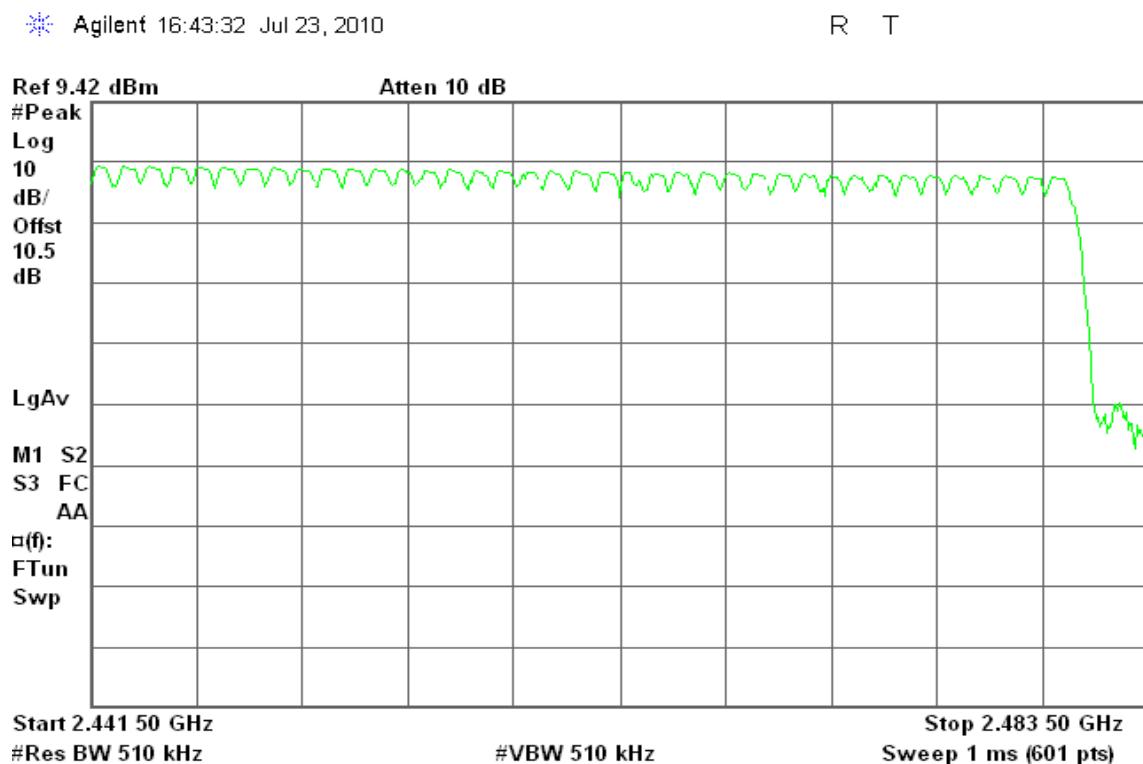
For 8DPSK

Channel Number

2.4 GHz – 2.4415 GHz



2.4415 GHz – 2.4835 GHz



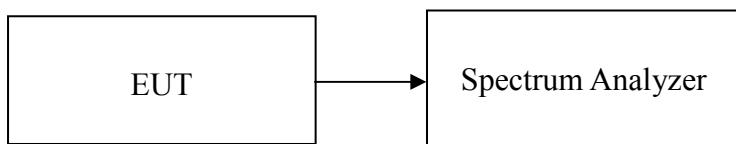


## **7.7 TIME OF OCCUPANCY (DWELL TIME)**

### **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=1MHz, VBW=1MHz, Span = 0Hz, Sweep = auto.
5. Repeat above procedures until all frequency measured were complete.

**Test Data****For GFSK****DH 1**CH Low:  $0.4000 * (1600/2)/79 * 31.6 = 128.0$  (ms)CH Mid:  $0.4000 * (1600/2)/79 * 31.6 = 128.0$  (ms)CH High:  $0.3833 * (1600/2)/79 * 31.6 = 122.7$  (ms)

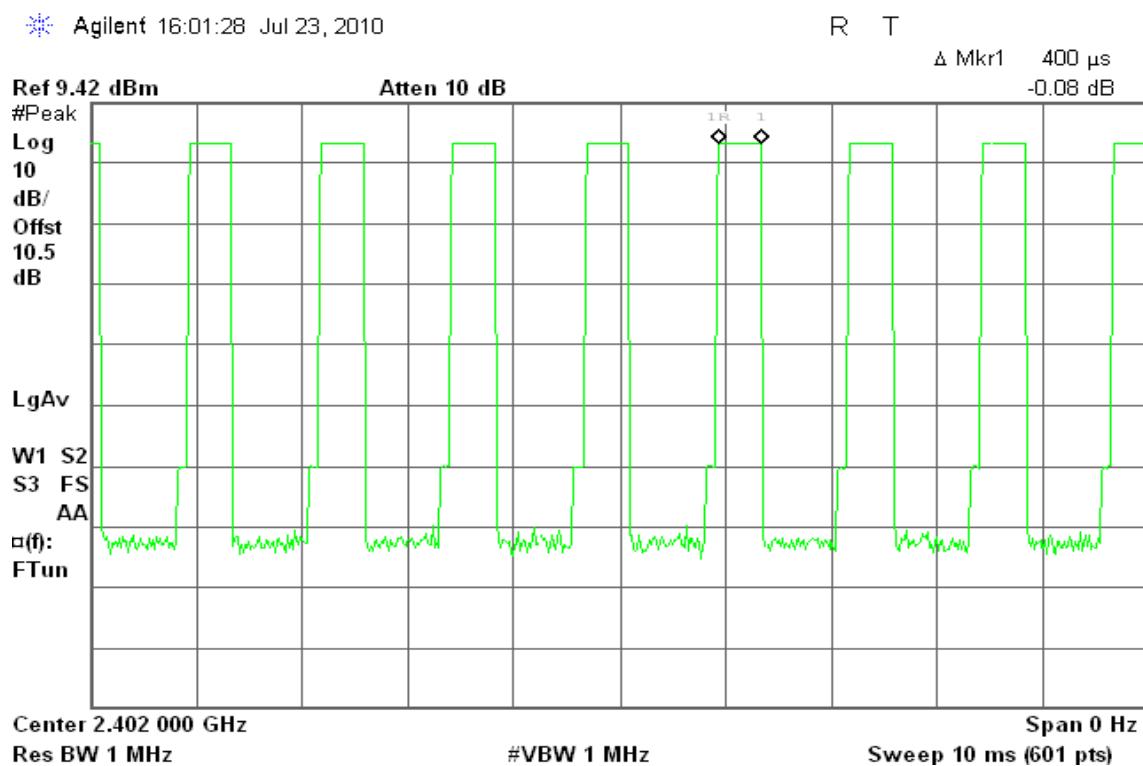
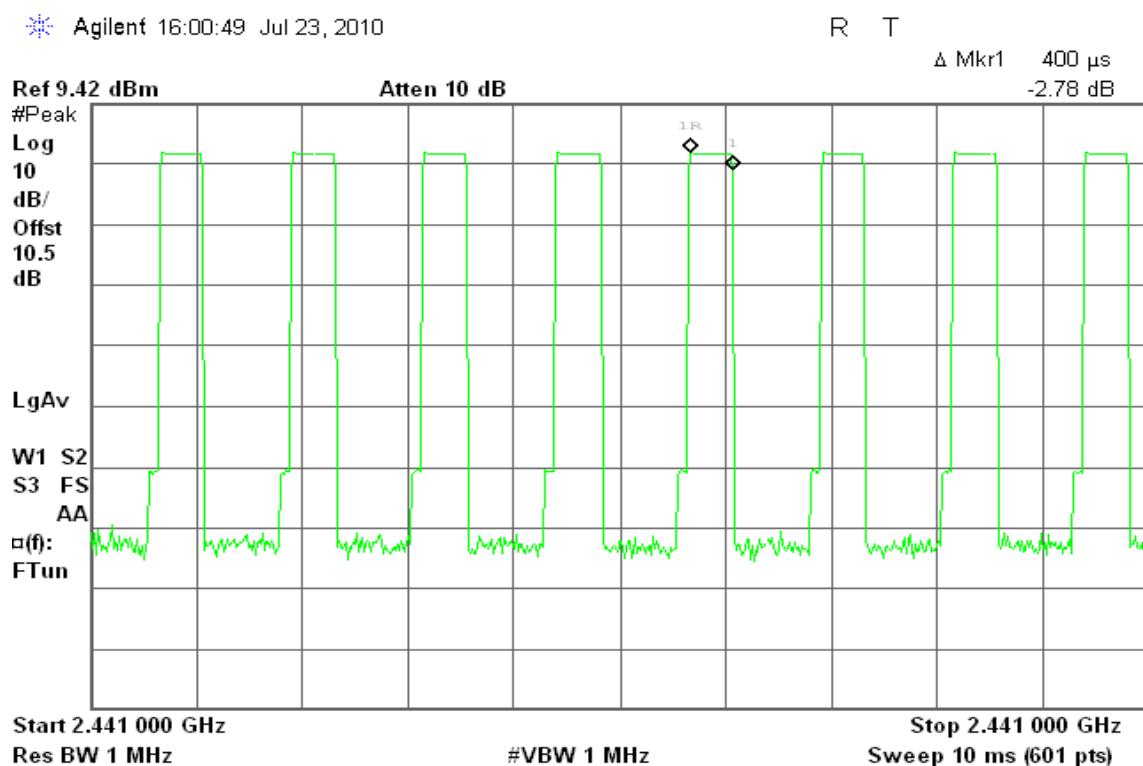
CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4000	128.0	31.60	400.00	PASS
Mid	0.4000	128.0	31.60		PASS
High	0.3833	122.7	31.60		PASS

**DH 3**CH Low:  $1.650 * (1600/4)/79 * 31.6 = 264.0$  (ms)CH Mid:  $1.650 * (1600/4)/79 * 31.6 = 264.0$  (ms)CH High:  $1.650 * (1600/4)/79 * 31.6 = 264.0$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.6500	264.0	31.60	400.00	PASS
Mid	1.6500	264.0	31.60		PASS
High	1.6500	264.0	31.60		PASS

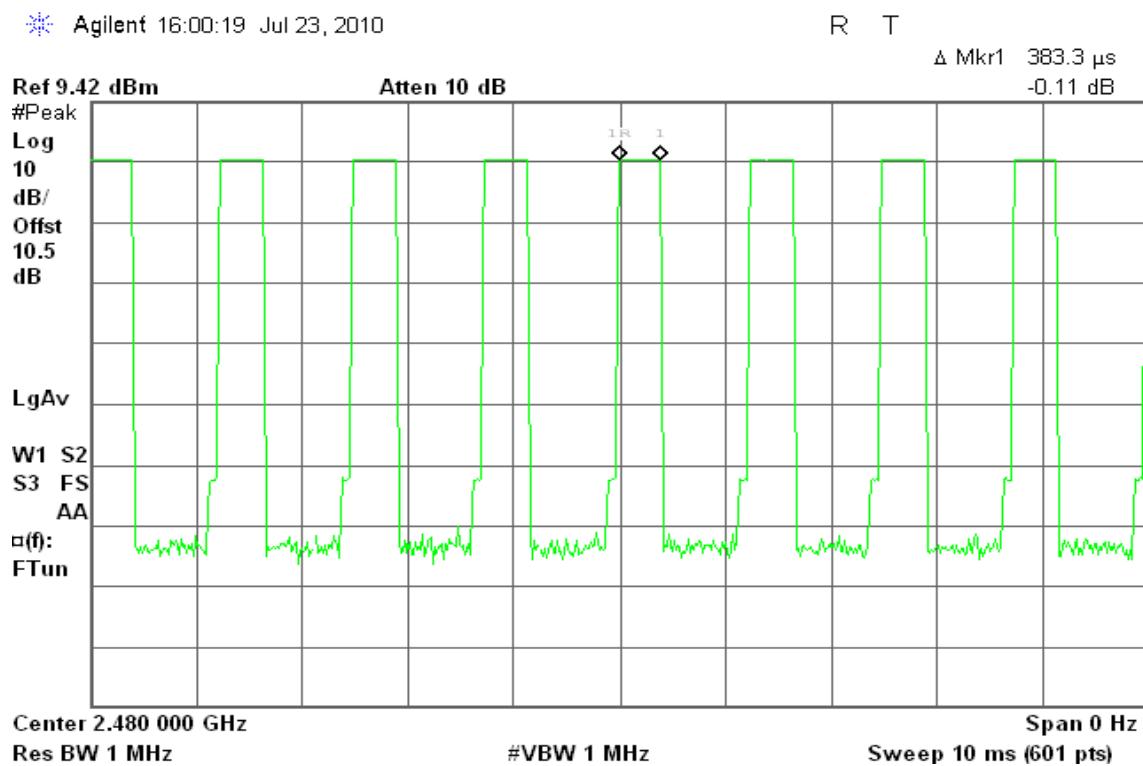
**DH 5**CH Low:  $2.9170 * (1600/6)/79 * 31.6 = 311.1$  (ms)CH Mid:  $2.9000 * (1600/6)/79 * 31.6 = 309.3$  (ms)CH High:  $2.9170 * (1600/6)/79 * 31.6 = 311.1$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.9170	311.1	31.60	400.00	PASS
Mid	2.9000	309.3	31.60		PASS
High	2.9170	311.1	31.60		PASS

**Test Plot****For GFSK****DH 1****CH Low****CH Mid**

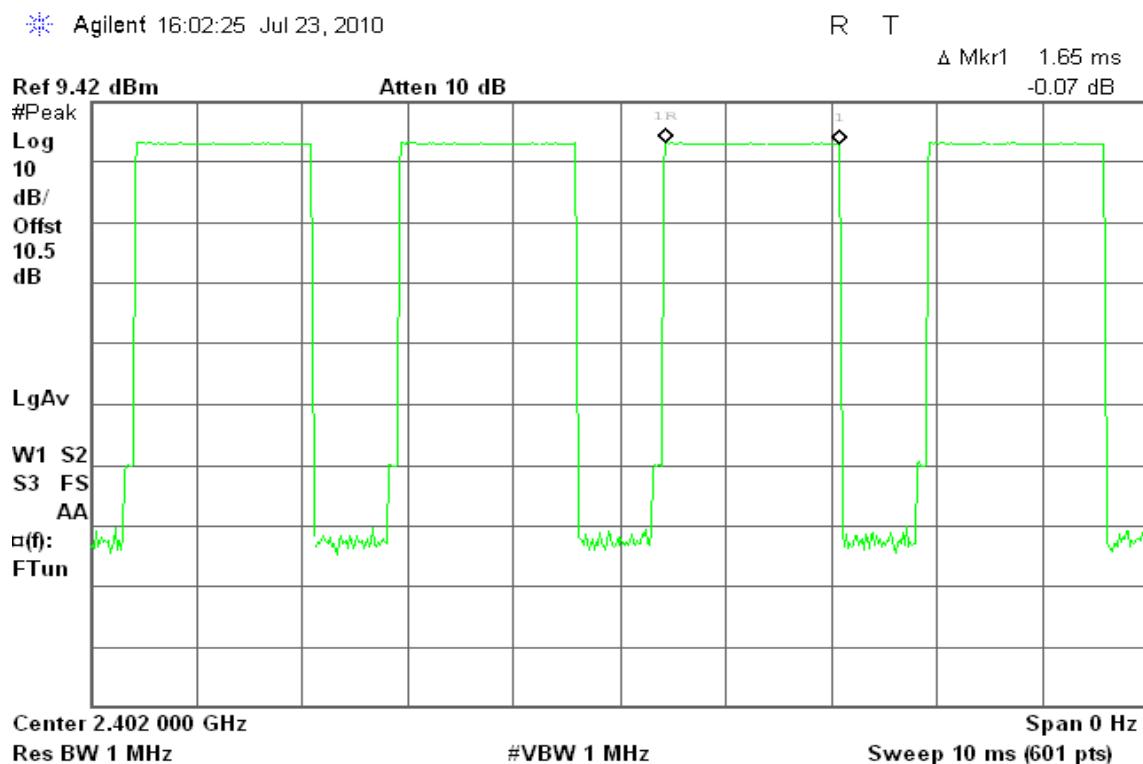


## CH High



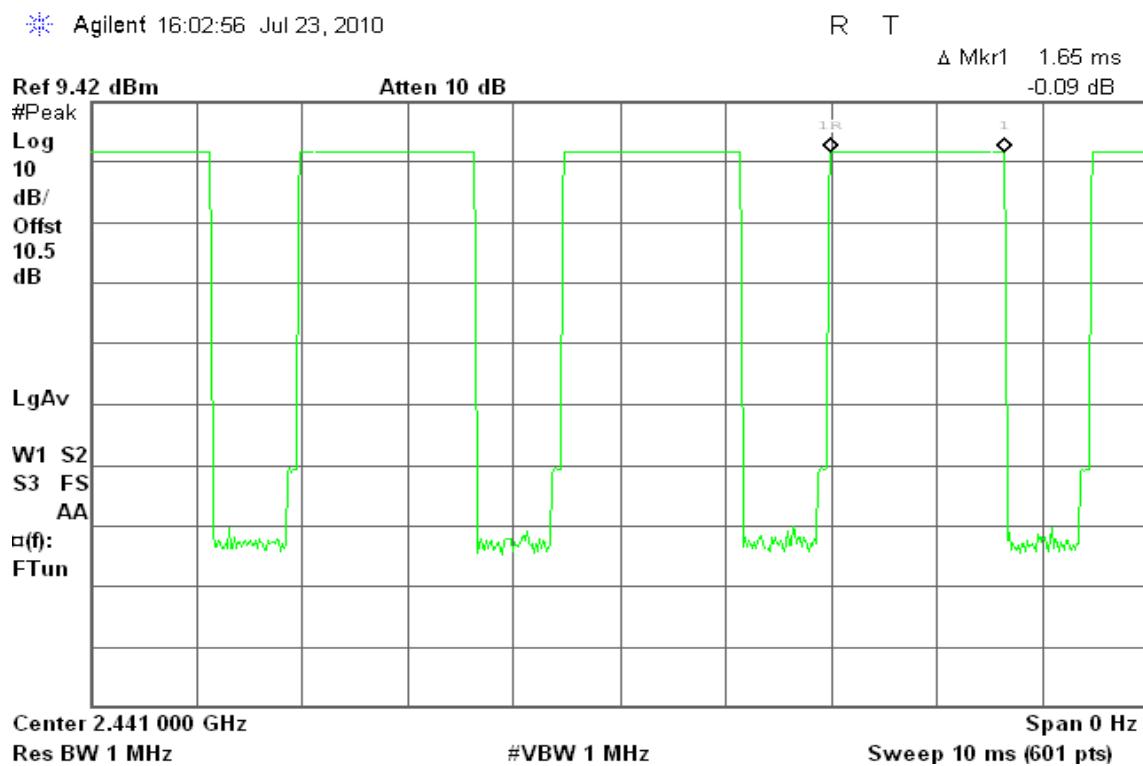
## DH 3

### CH Low

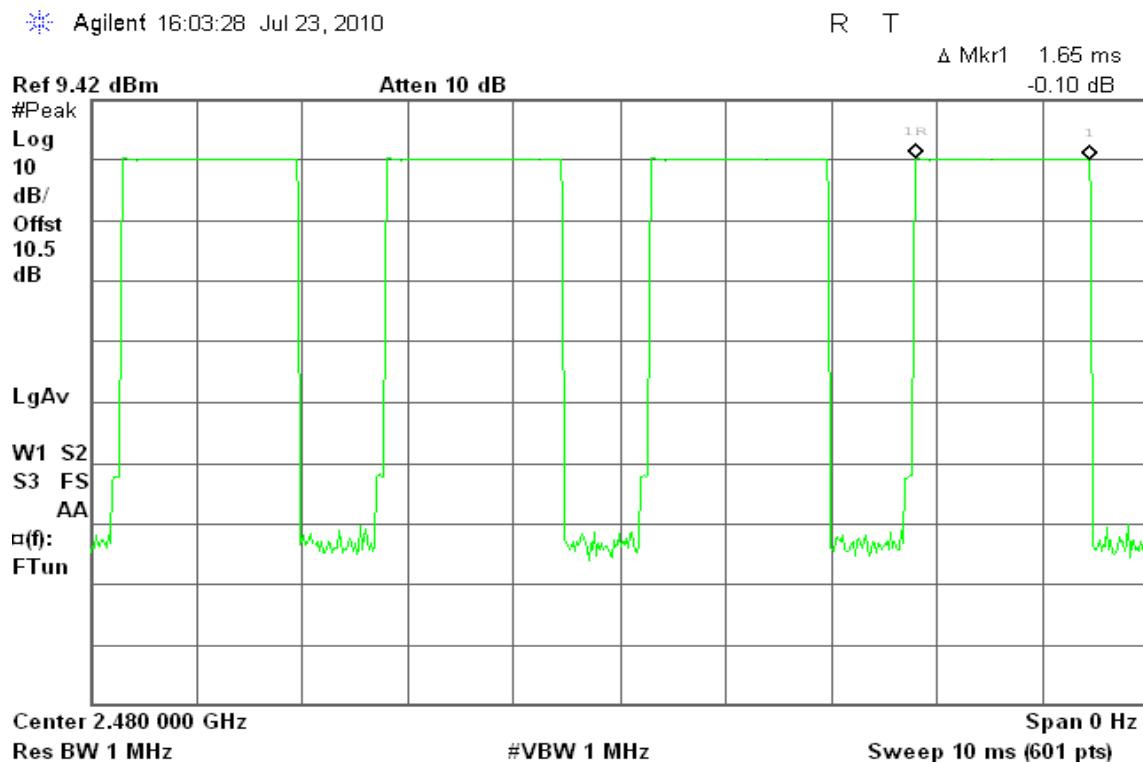




## CH Mid



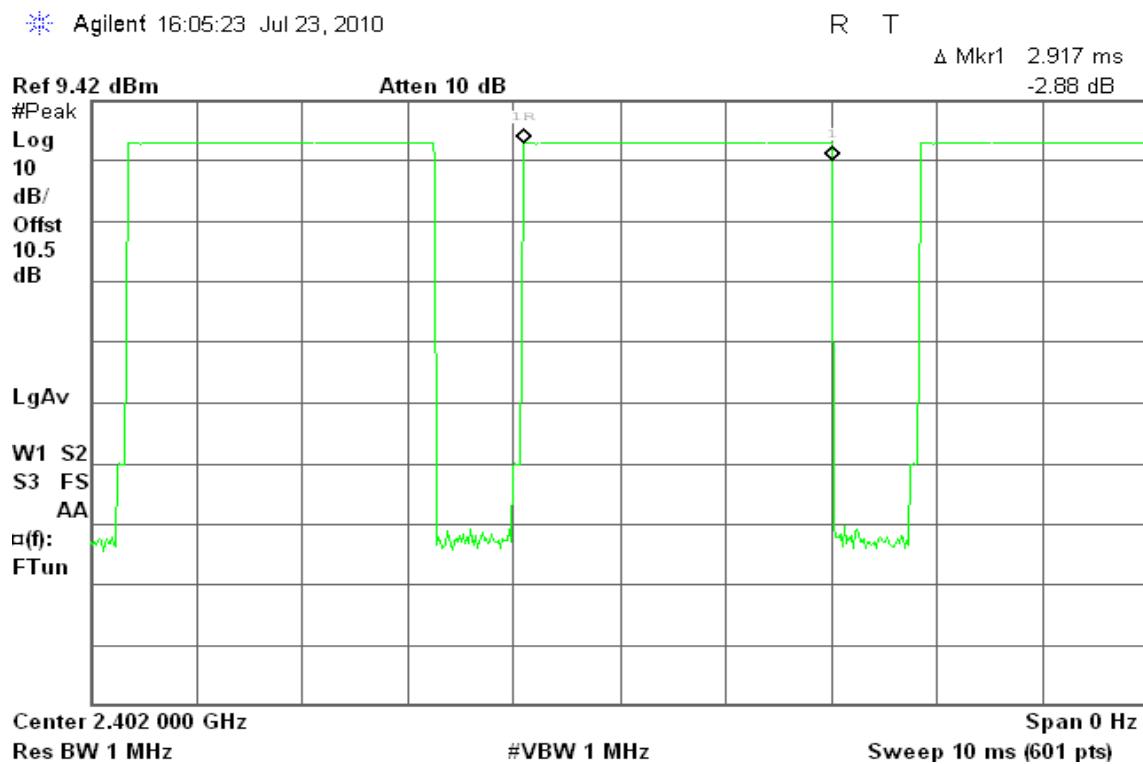
## CH High



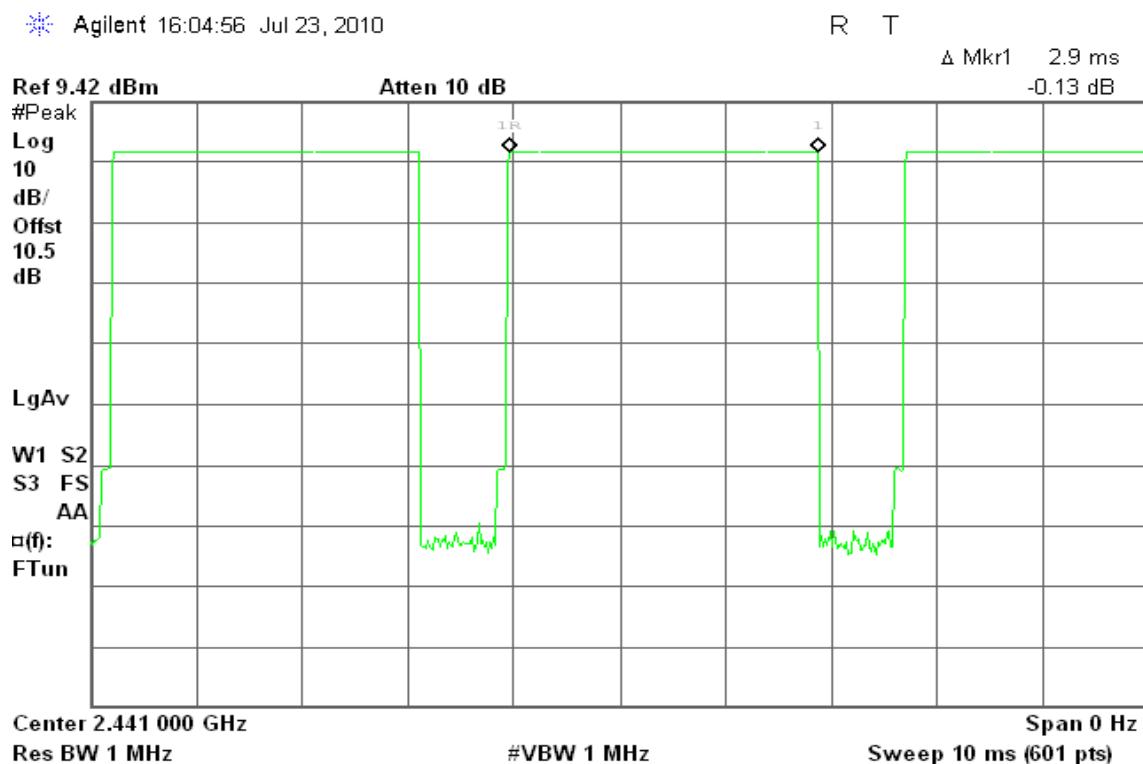


## DH 5

### CH Low



### CH Mid





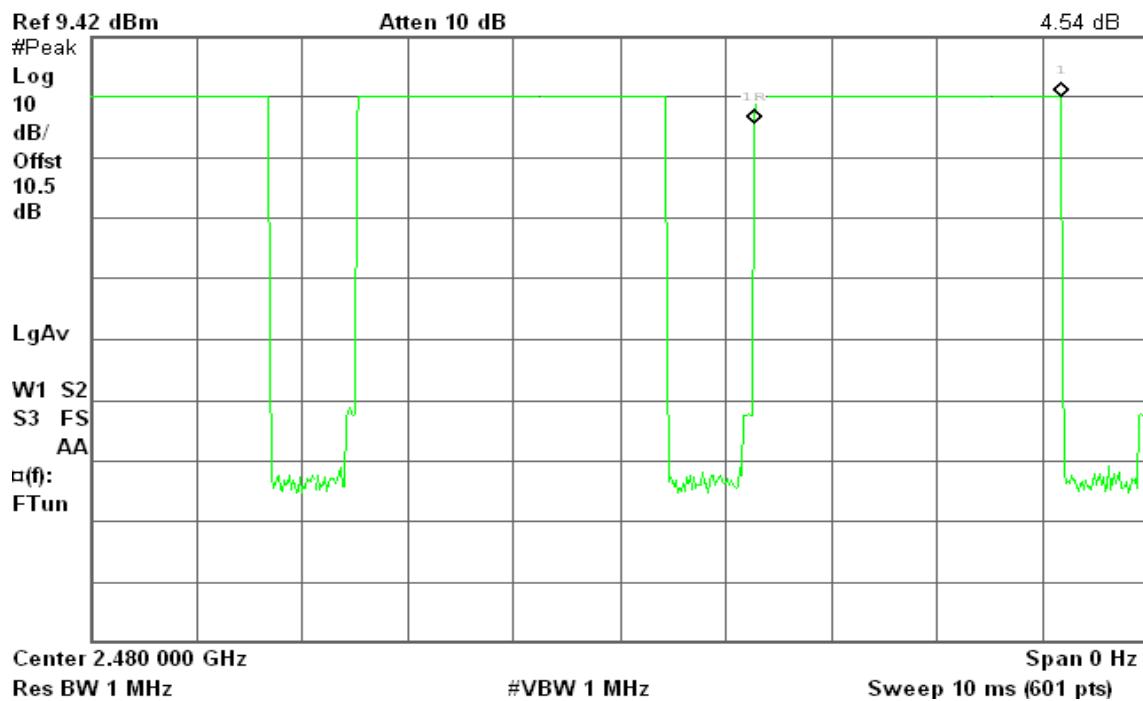
**CH High**

Agilent 16:04:13 Jul 23, 2010

R T

Δ Mkr1 2.917 ms

4.54 dB



**Test Data****For 8DPSK****DH 1**CH Low:  $0.4000 * (1600/2)/79 * 31.6 = 128.0$  (ms)CH Mid:  $0.4167 * (1600/2)/79 * 31.6 = 133.3$  (ms)CH High:  $0.4000 * (1600/2)/79 * 31.6 = 128.0$  (ms)

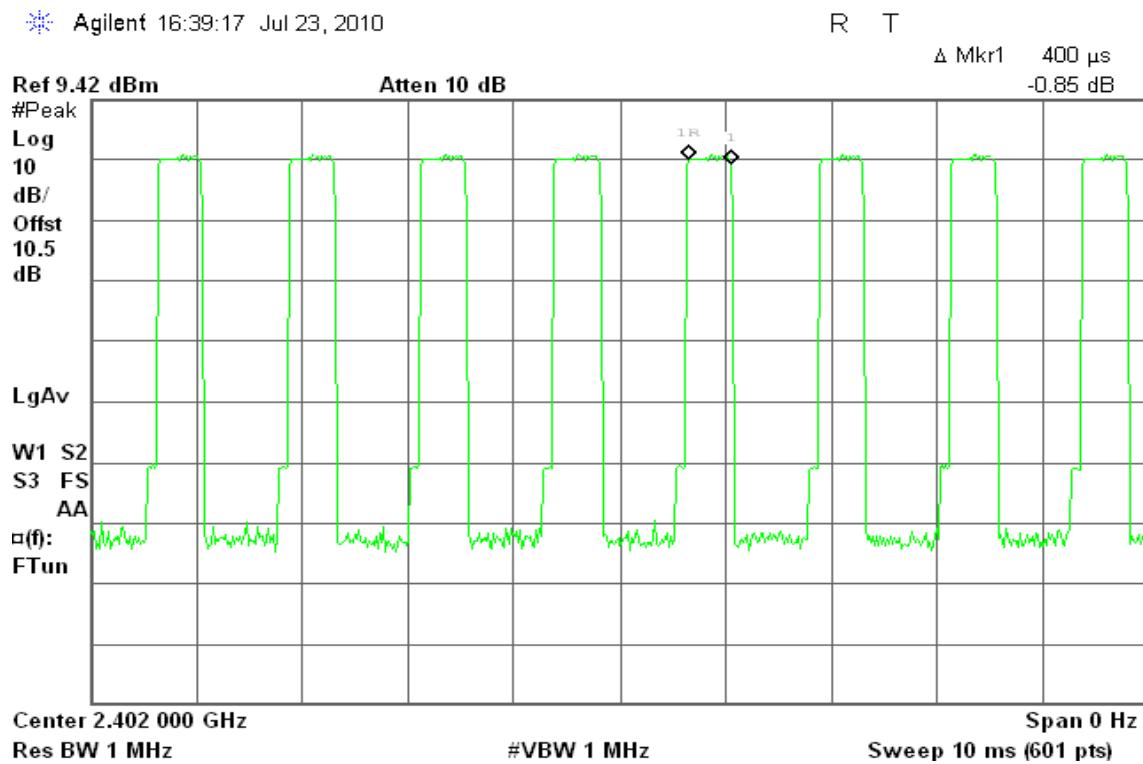
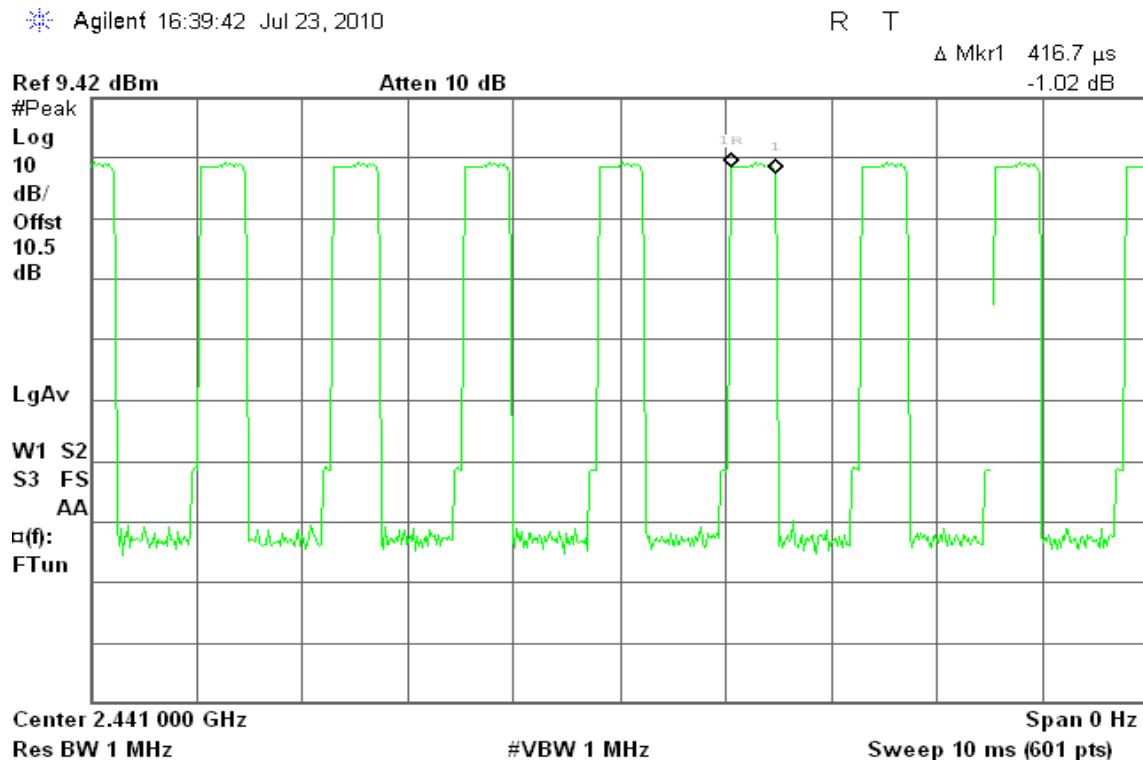
CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.4000	128.0	31.60	400.00	PASS
Mid	0.4167	133.3	31.60		PASS
High	0.4000	128.0	31.60		PASS

**DH 3**CH Low:  $1.6670 * (1600/4)/79 * 31.6 = 266.7$  (ms)CH Mid:  $1.6500 * (1600/4)/79 * 31.6 = 264.0$  (ms)CH High:  $1.6500 * (1600/4)/79 * 31.6 = 264.0$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.6670	266.7	31.60	400.00	PASS
Mid	1.6500	264.0	31.60		PASS
High	1.6500	264.0	31.60		PASS

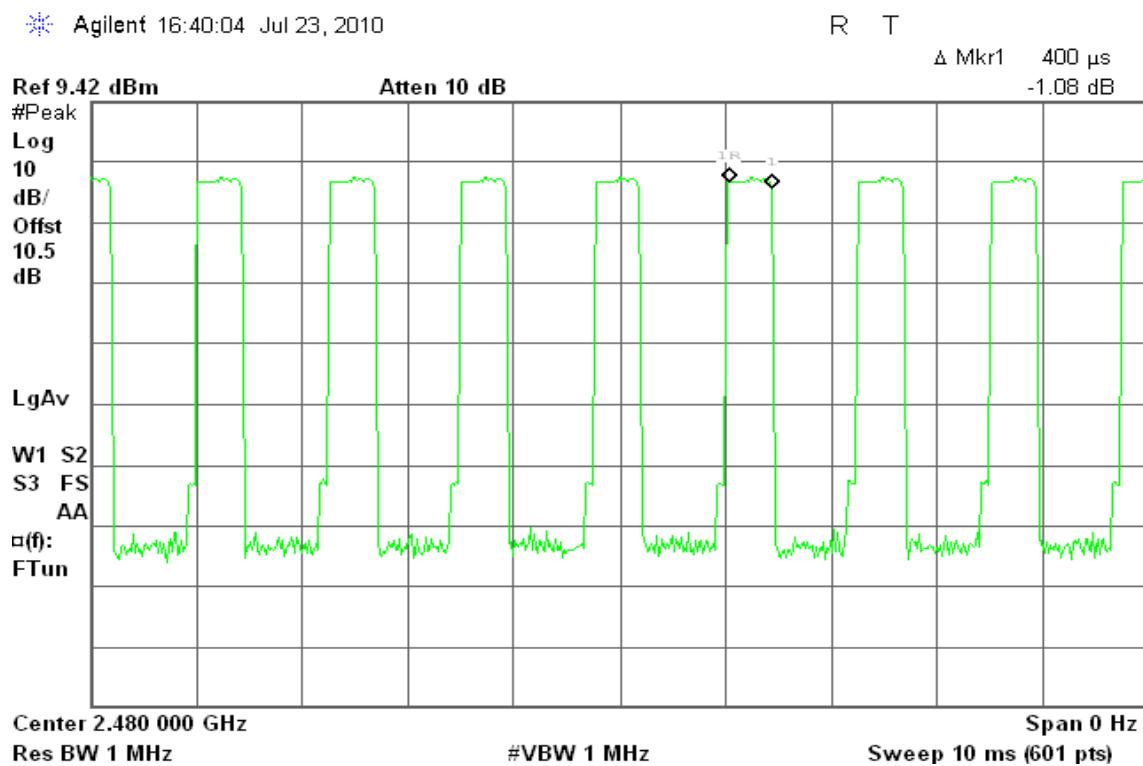
**DH 5**CH Low:  $2.9000 * (1600/6)/79 * 31.6 = 309.3$  (ms)CH Mid:  $2.9170 * (1600/6)/79 * 31.6 = 311.1$  (ms)CH High:  $2.9000 * (1600/6)/79 * 31.6 = 309.3$  (ms)

CH	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.9000	309.3	31.60	400.00	PASS
Mid	2.9170	311.1	31.60		PASS
High	2.9000	309.3	31.60		PASS

**For 8DPSK****DH 1****CH Low****CH Mid**

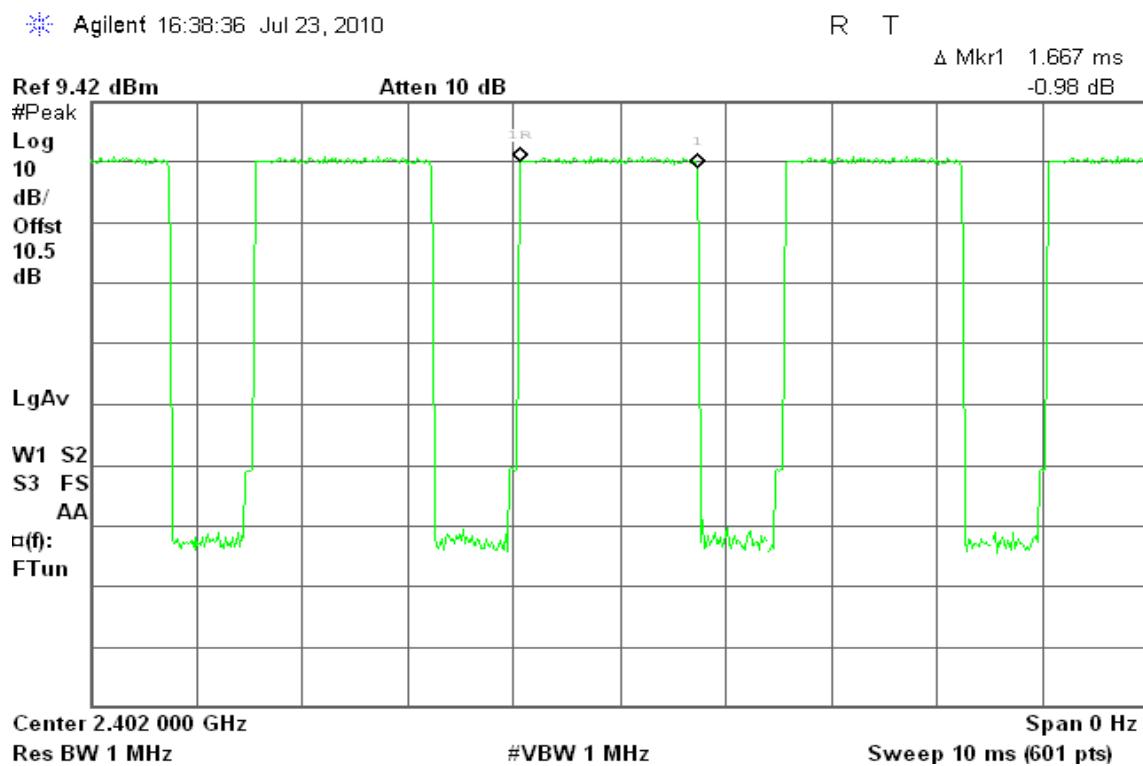


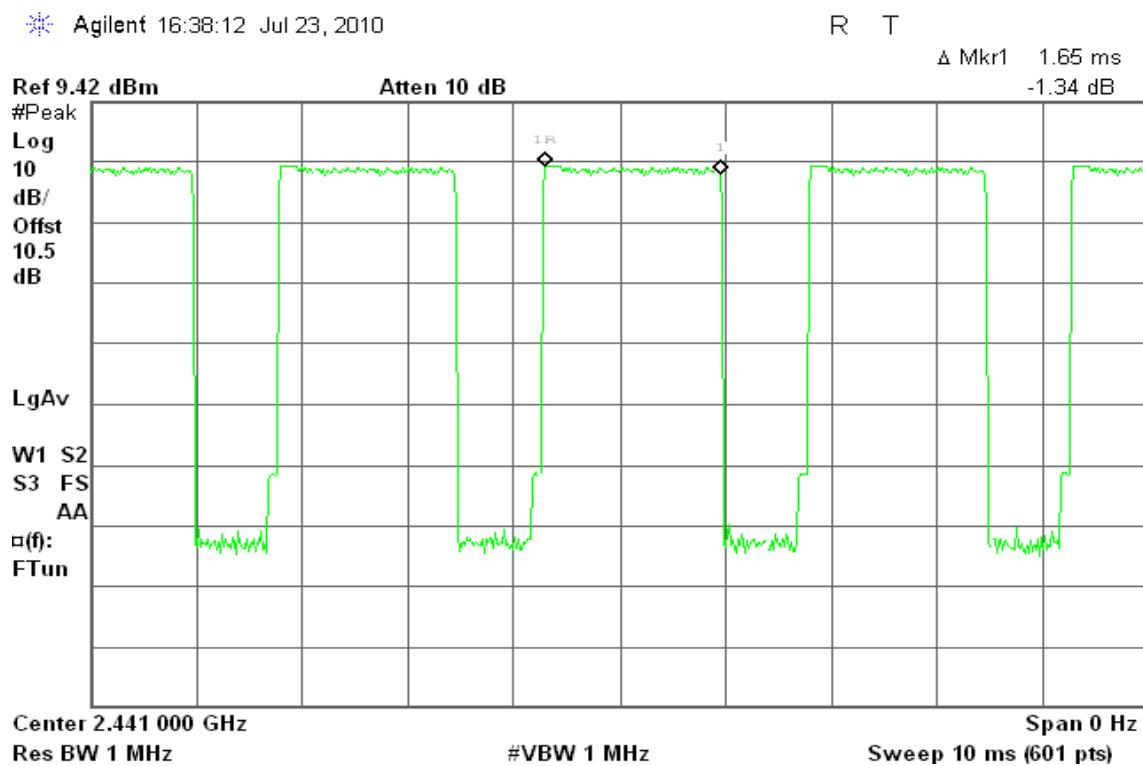
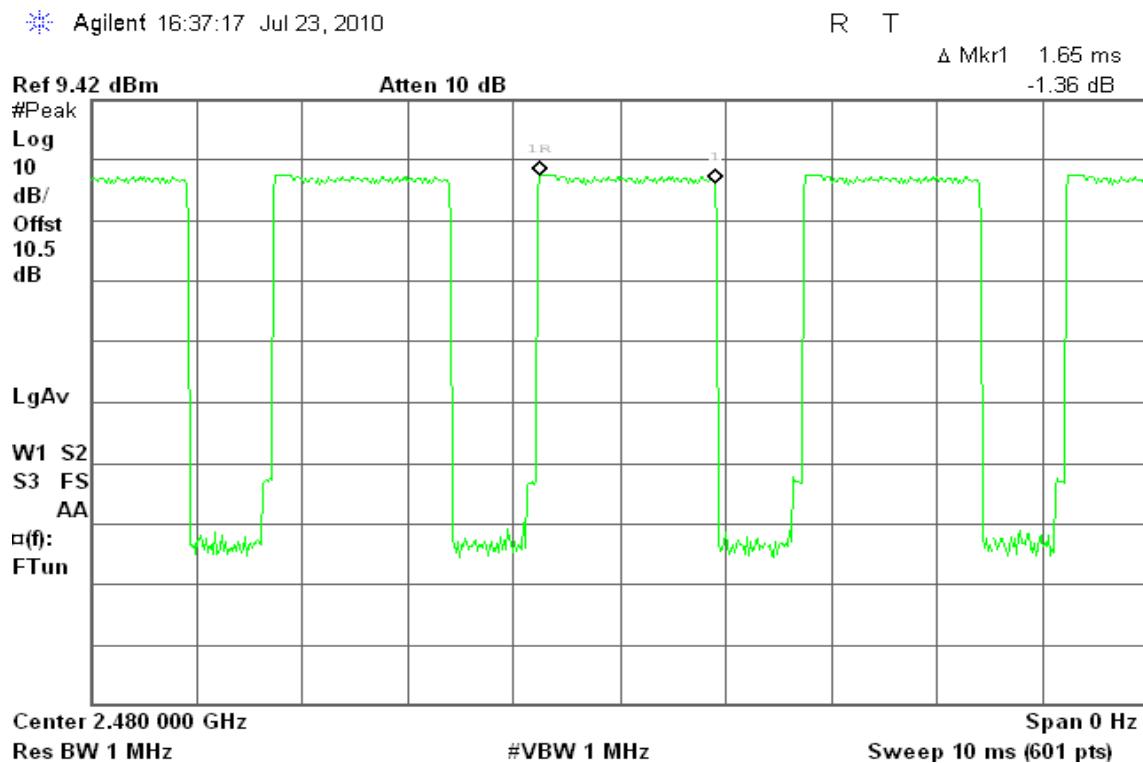
## CH High

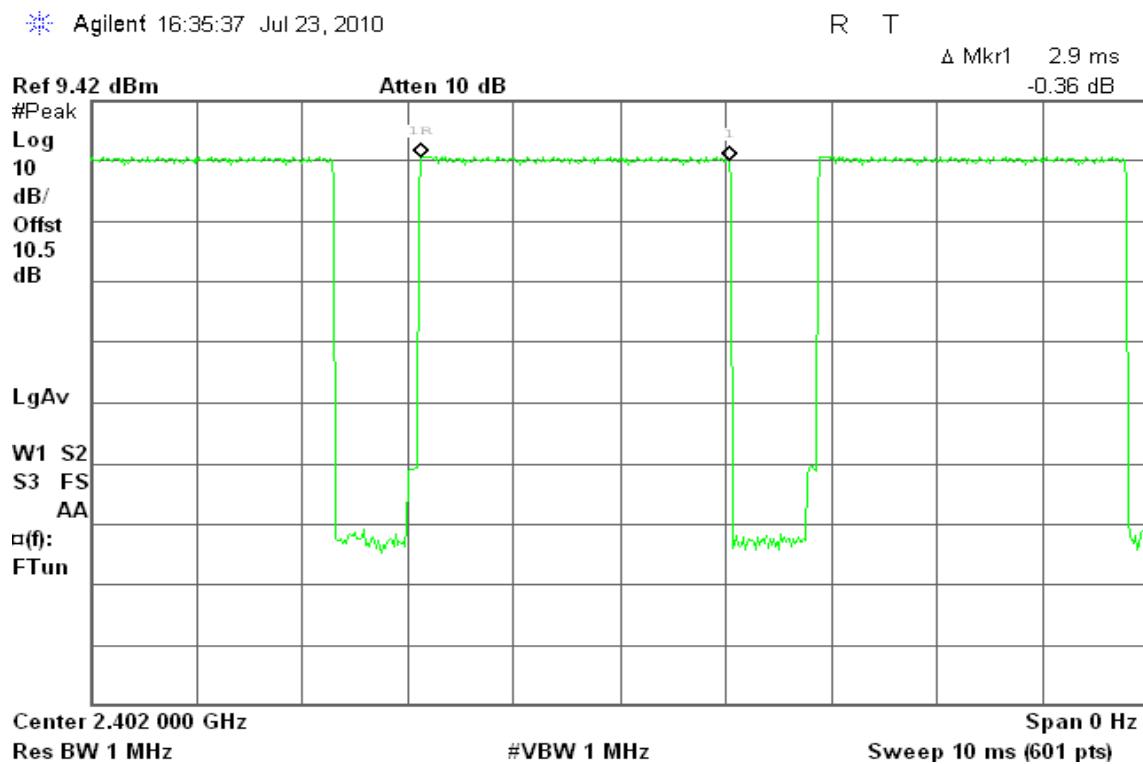
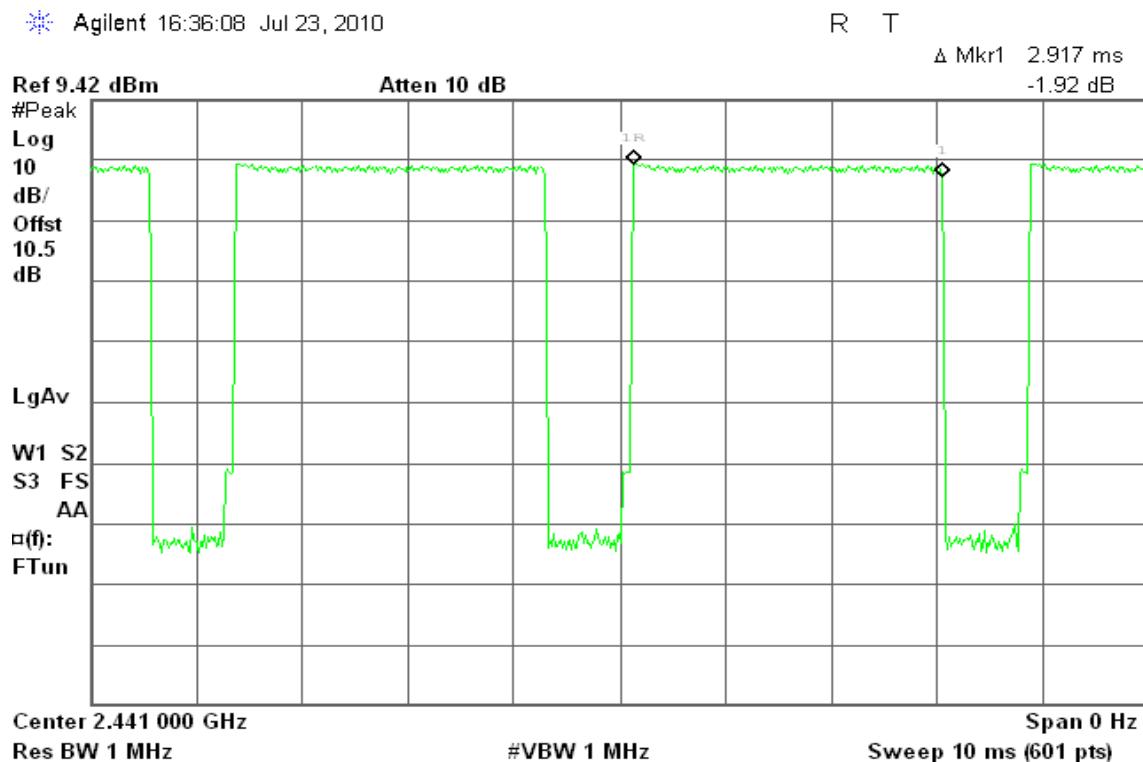


## DH 3

### CH Low



**CH Mid****CH High**

**DH 5****CH Low****CH Mid**

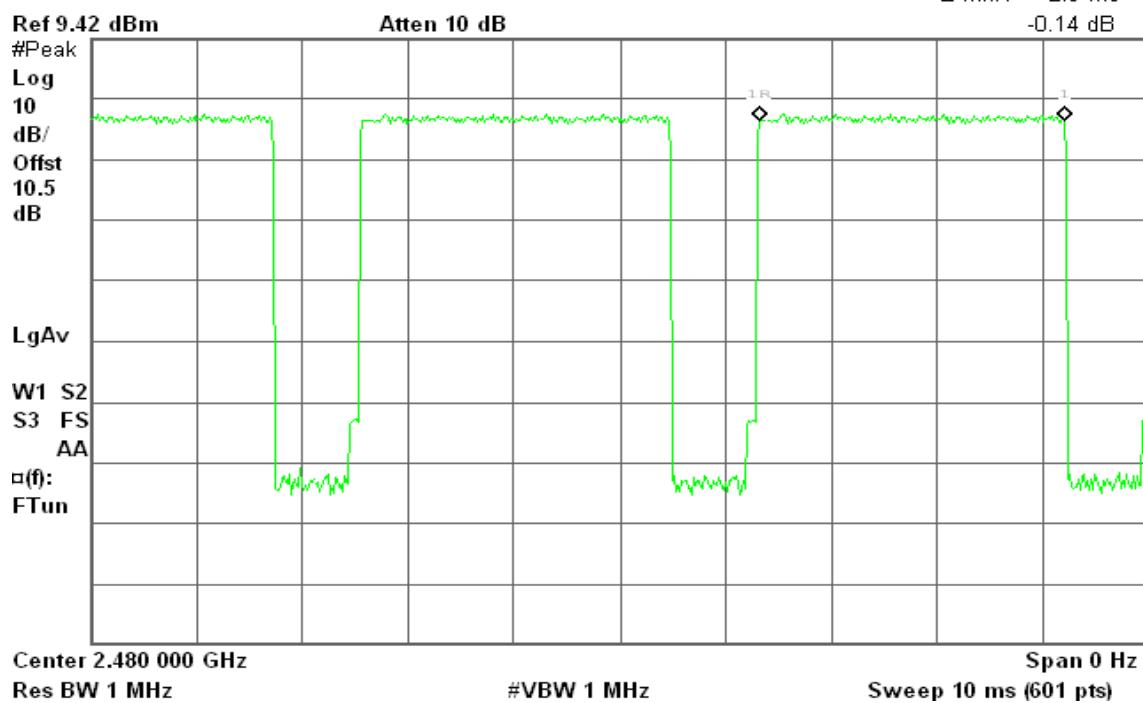


**CH High**

Agilent 16:36:33 Jul 23, 2010

R T

Δ Mkr1 2.9 ms  
-0.14 dB





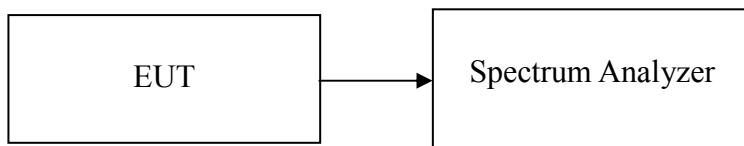
## **7.8SPURIOUS EMISSIONS**

### **7.8.1 Conducted Measurement**

#### **LIMIT**

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

#### **Test Configuration**



## **TEST PROCEDURE**

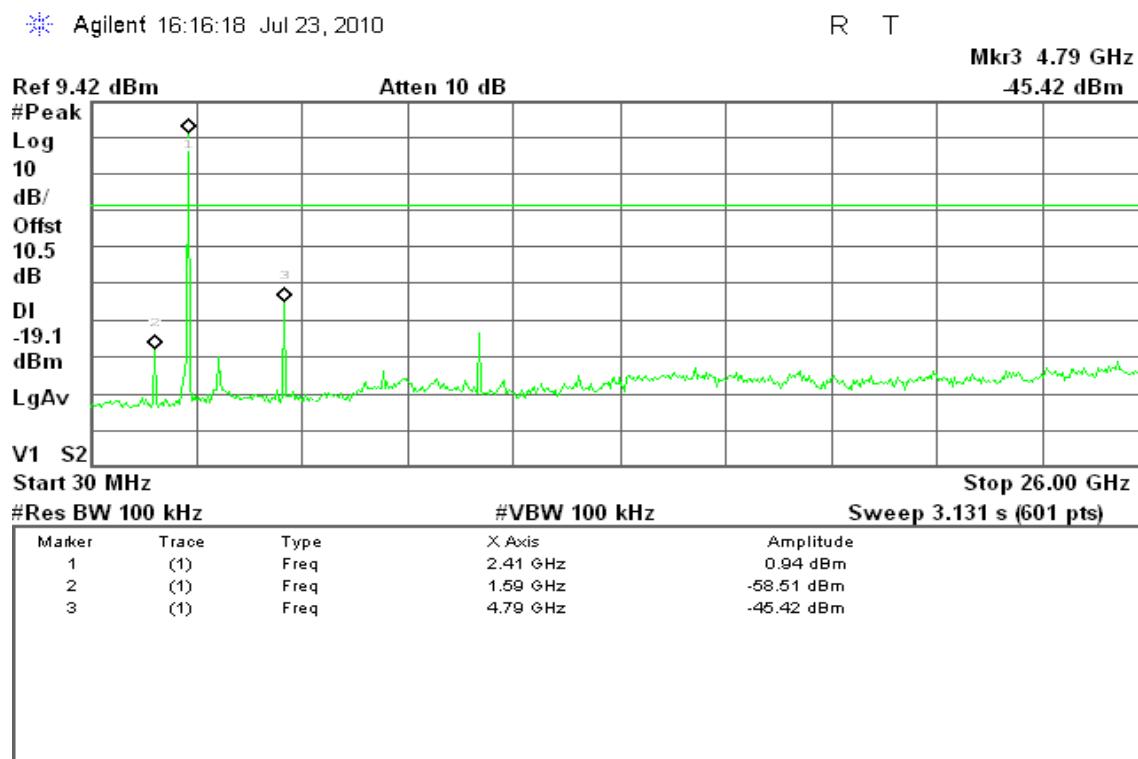
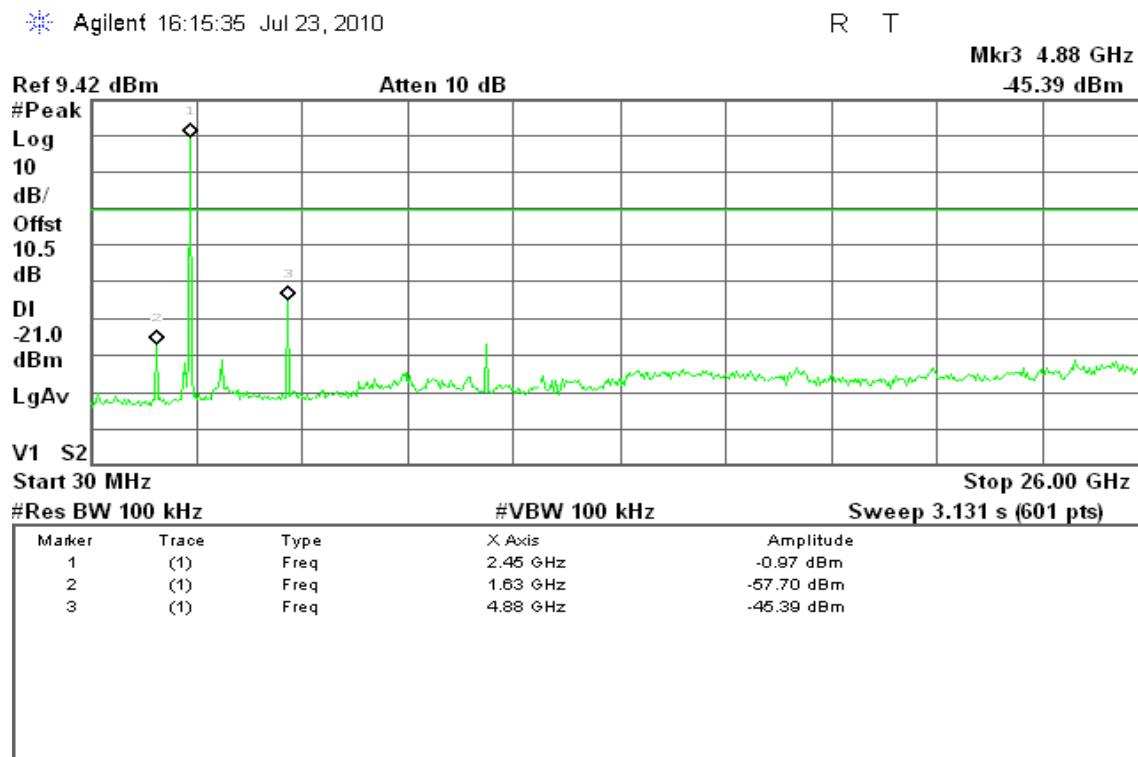
Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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 26GHz range with the transmitter set to the lowest, middle, and highest channels.

## **TEST RESULTS**

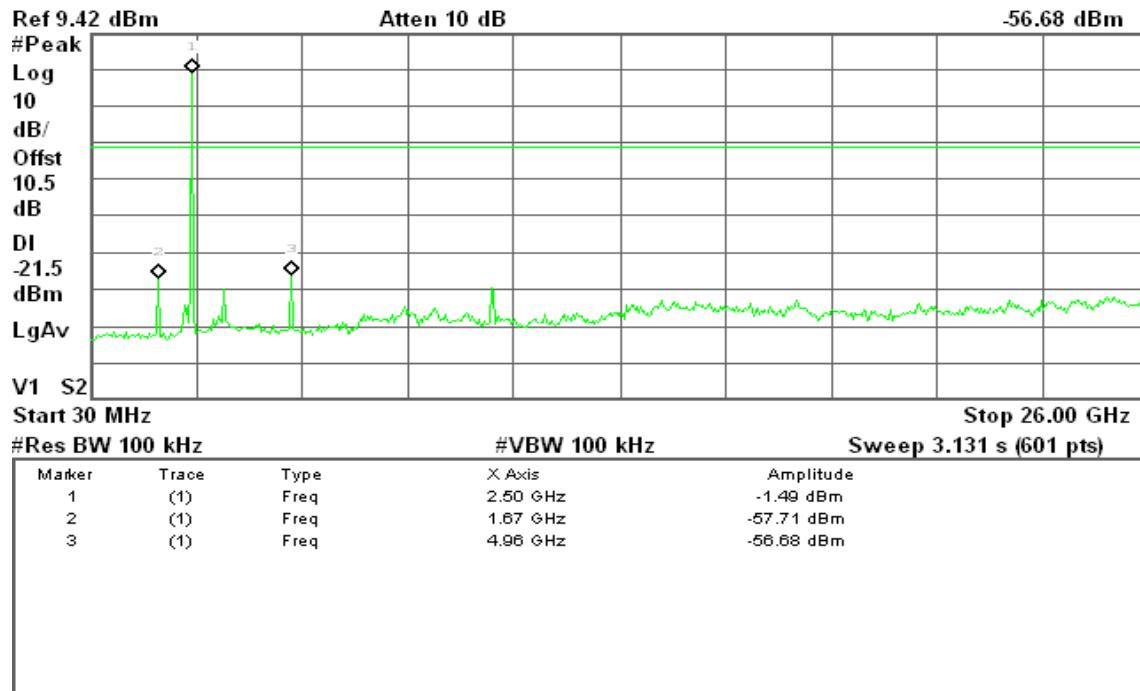
*No non-compliance noted*

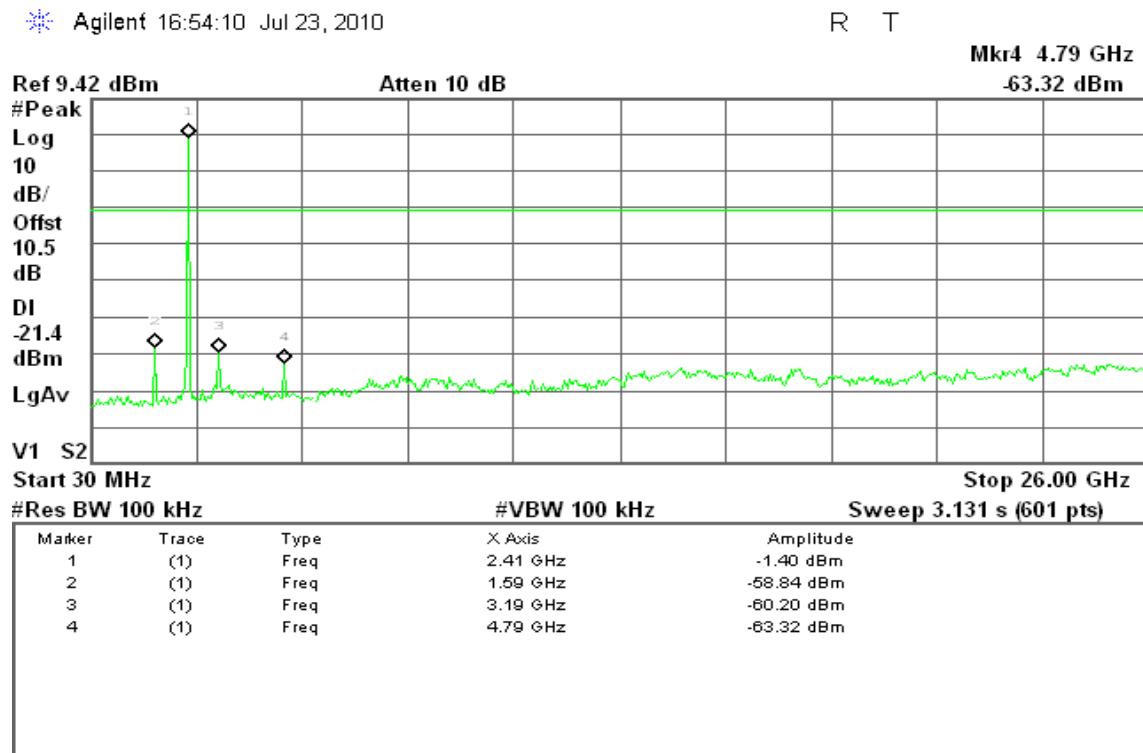
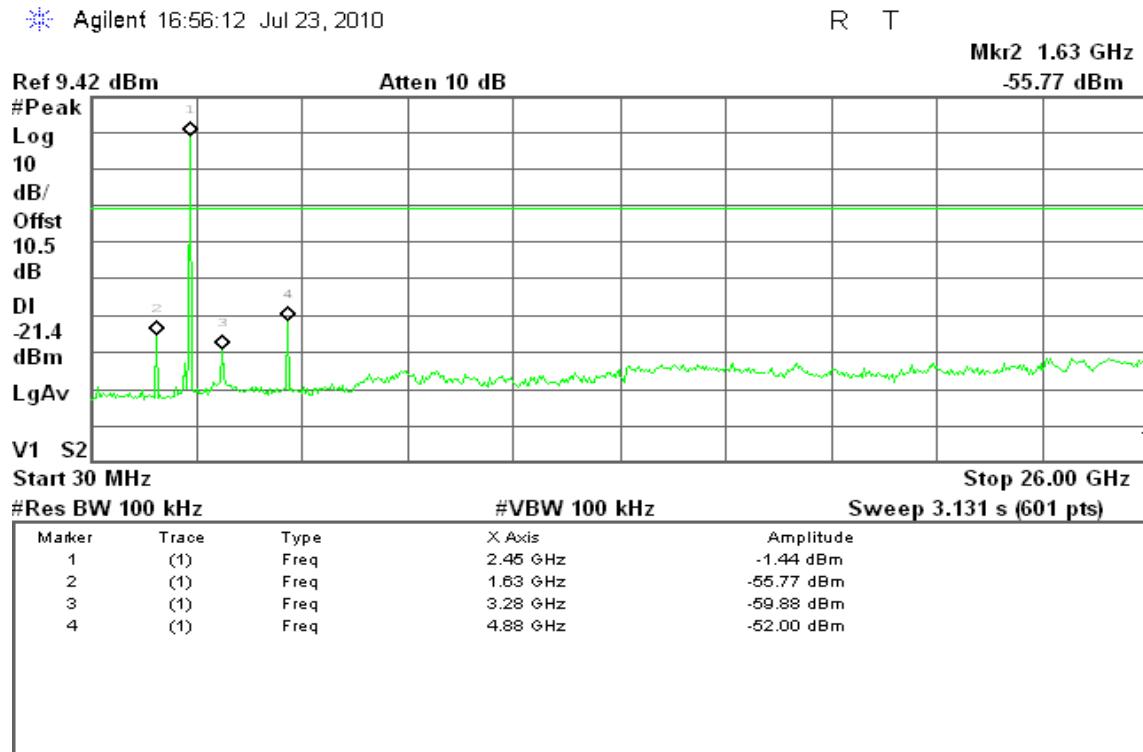
**Test Plot****For GFSK / DH5****CH Low****CH Mid**

**CH High**

Agilent 16:14:54 Jul 23, 2010

R T

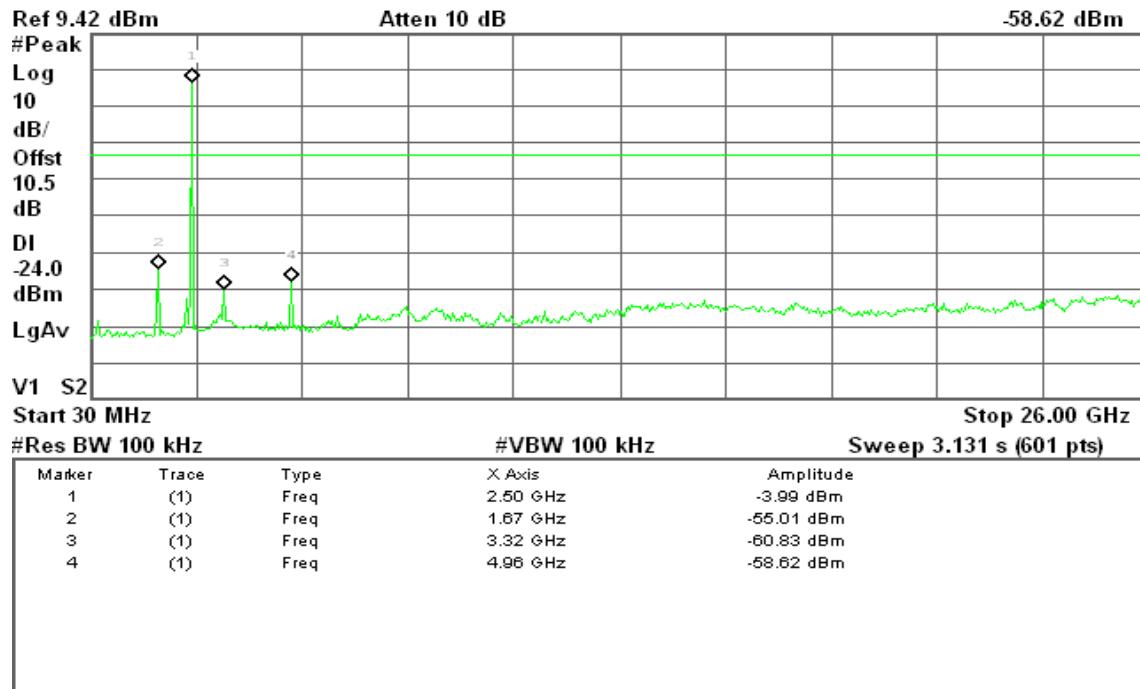
**Mkr3 4.96 GHz****-56.68 dBm**

**For 8DPSK / DH5****CH Low****CH Mid**

**CH High**

Agilent 16:59:23 Jul 23, 2010

R T

**Mkr4 4.96 GHz****-58.62 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 ( $\mu$ V/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

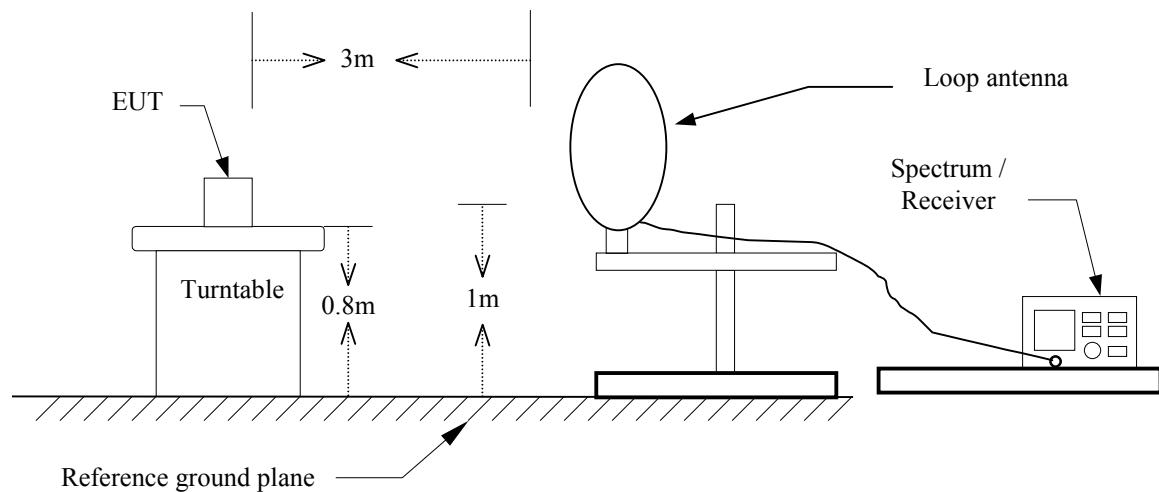
***Remark:*** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections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

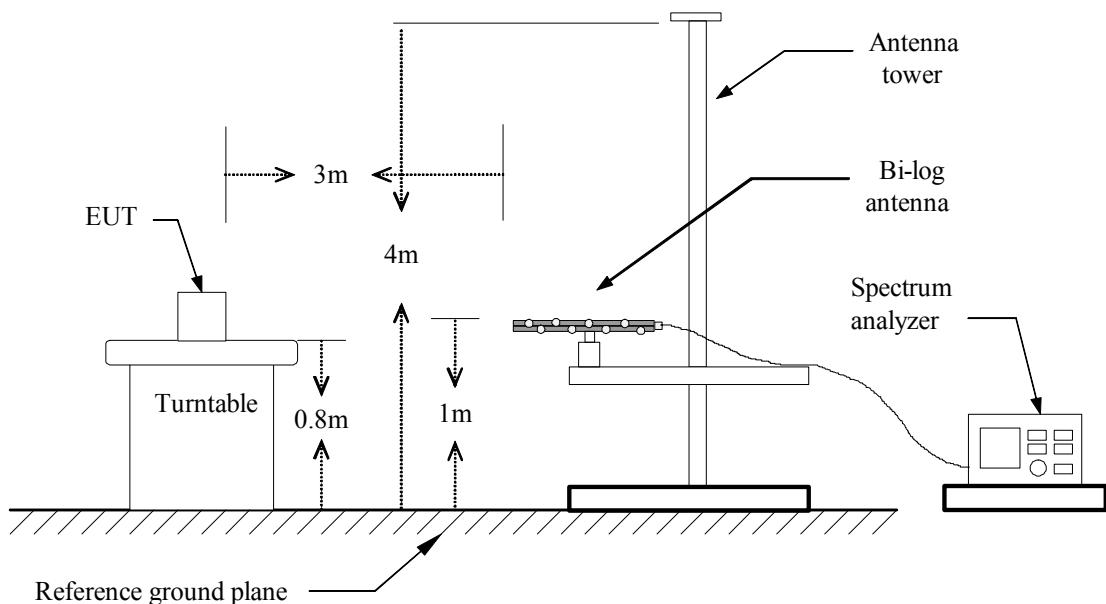
Frequency (MHz)	Field Strength ( $\mu$ V/m at 3-meter)	Field Strength (dB $\mu$ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

## Test Configuration

9kHz ~ 30MHz

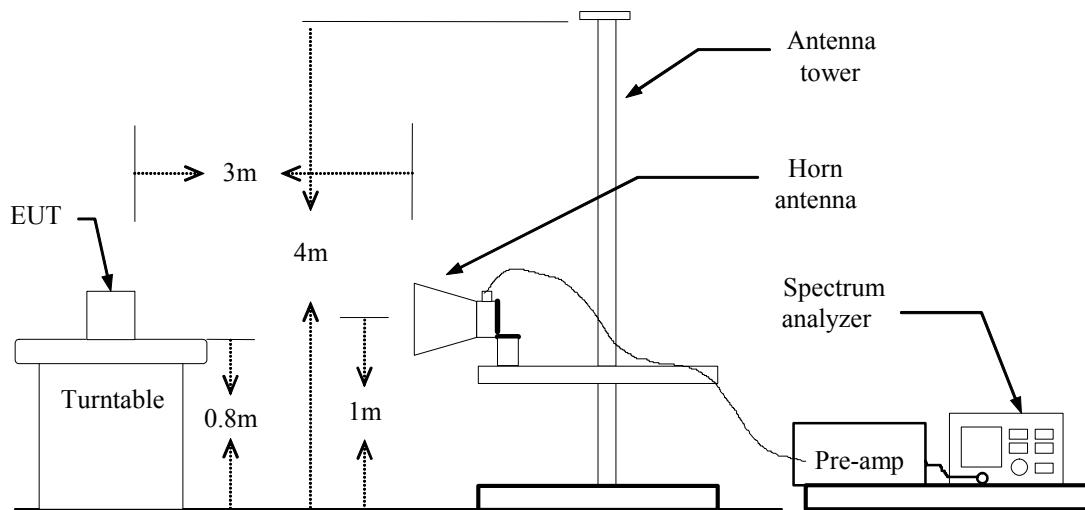


30MHz ~ 1GHz





**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.

**Below 1 GHz****For V-100-2X****Operation Mode:** Normal Link**Test Date:** July 27, 2010**Temperature:** 23°C**Tested by:** Wolf Huang**Humidity:** 51 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
30.00	V	37.71	-1.86	35.85	40.00	-4.15	Peak
135.08	V	35.83	-9.82	26.02	43.50	-17.48	Peak
243.40	V	39.23	-11.03	28.20	46.00	-17.80	Peak
296.75	V	38.54	-9.27	29.26	46.00	-16.74	Peak
647.57	V	33.65	-2.95	30.70	46.00	-15.30	Peak
728.40	V	31.77	-2.13	29.64	46.00	-16.36	Peak
30.00	H	28.12	-1.86	26.26	40.00	-13.74	Peak
178.73	H	39.91	-11.56	28.35	43.50	-15.15	Peak
251.48	H	39.76	-10.80	28.96	46.00	-17.04	Peak
335.55	H	39.47	-8.39	31.07	46.00	-14.93	Peak
451.95	H	31.41	-5.83	25.57	46.00	-20.43	Peak
807.62	H	26.06	-1.26	24.80	46.00	-21.20	Peak

***Remark:***

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *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.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**For V-100-X****Operation Mode:** Normal Link**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
259.57	V	40.70	-10.26	30.44	46.00	-15.56	Peak
299.98	V	42.55	-9.24	33.31	46.00	-12.69	Peak
479.43	V	36.17	-5.44	30.73	46.00	-15.27	Peak
500.45	V	36.20	-5.14	31.06	46.00	-14.94	Peak
584.52	V	34.03	-4.19	29.84	46.00	-16.16	Peak
959.58	V	29.73	0.44	30.17	46.00	-15.83	Peak
240.17	H	41.73	-11.09	30.64	46.00	-15.36	Peak
259.57	H	39.43	-10.26	29.18	46.00	-16.82	Peak
299.98	H	39.88	-9.24	30.64	46.00	-15.36	Peak
500.45	H	35.97	-5.14	30.83	46.00	-15.17	Peak
699.30	H	33.17	-2.54	30.63	46.00	-15.37	Peak
959.58	H	29.62	0.44	30.06	46.00	-15.94	Peak

***Remark:***

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *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.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**For V-200-X****Operation Mode:** Normal Link**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
240.17	V	39.67	-11.09	28.59	46.00	-17.41	Peak
299.98	V	40.56	-9.24	31.32	46.00	-14.68	Peak
500.45	V	35.15	-5.14	30.01	46.00	-15.99	Peak
584.52	V	34.03	-4.19	29.84	46.00	-16.16	Peak
699.30	V	30.45	-2.54	27.91	46.00	-18.09	Peak
959.58	V	28.41	0.44	28.86	46.00	-17.14	Peak
240.17	H	41.17	-11.09	30.08	46.00	-15.92	Peak
299.98	H	38.37	-9.24	29.13	46.00	-16.87	Peak
400.22	H	38.11	-7.08	31.03	46.00	-14.97	Peak
500.45	H	33.69	-5.14	28.54	46.00	-17.46	Peak
699.30	H	32.06	-2.54	29.51	46.00	-16.49	Peak
959.58	H	28.76	0.44	29.20	46.00	-16.80	Peak

***Remark:***

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *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.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**Above 1 GHz****For V-100-2X****Operation Mode:** TX / GFSK / DH5 / CH Low**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2223.33	V	52.52	---	-3.48	49.03	---	74.00	54.00	-4.97	Peak
4808.33	V	58.80	50.63	1.18	59.98	51.81	74.00	54.00	-2.19	AVG
N/A										
2196.67	H	51.48	---	-3.56	47.92	---	74.00	54.00	-6.08	Peak
4800.00	H	56.79	48.27	1.18	57.97	49.45	74.00	54.00	-4.55	AVG
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:** TX / GFSK / DH5 / CH Mid**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2270.00	V	51.94	---	-3.35	48.60	---	74.00	54.00	-5.40	Peak
4883.33	V	56.63	48.28	1.16	57.79	49.44	74.00	54.00	-4.56	AVG
N/A										
2316.67	H	51.60	---	-3.21	48.39	---	74.00	54.00	-5.61	Peak
4883.33	H	50.50	---	1.16	51.66	---	74.00	54.00	-2.34	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:** TX / GFSK / DH5 / CH High**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2216.67	V	51.28	---	-3.50	47.78	---	74.00	54.00	-6.22	Peak
4941.67	V	49.42	---	1.14	50.56	---	74.00	54.00	-3.44	Peak
N/A										
2006.67	H	52.12	---	-4.13	47.99	---	74.00	54.00	-6.01	Peak
4900.00	H	50.70	---	1.15	51.85	---	74.00	54.00	-2.15	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:** TX / 8DPSK / DH5 / CH Low**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1973.33	V	51.45	---	-4.40	47.05	---	74.00	54.00	-6.95	Peak
N/A										
2003.33	H	51.97	---	-4.14	47.83	---	74.00	54.00	-6.17	Peak
4900.00	H	50.21	---	1.15	51.36	---	74.00	54.00	-2.64	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:** TX / 8DPSK / DH5 / CH Mid**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2010.00	V	51.59	---	-4.12	47.47	---	74.00	54.00	-6.53	Peak
4883.33	V	49.43	---	1.16	50.59	---	74.00	54.00	-3.41	Peak
N/A										
1900.00	H	52.01	---	-5.07	46.93	---	74.00	54.00	-7.07	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:** TX / 8DPSK / DH5 / CH High**Test Date:** August 5, 2010**Temperature:** 21°C**Tested by:** Wolf Huang**Humidity:** 48 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2336.67	V	52.43	---	-3.15	49.28	---	74.00	54.00	-4.72	Peak
N/A										
1886.67	H	52.96	---	-5.19	47.76	---	74.00	54.00	-6.24	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).

**For V-100-X****Operation Mode:** TX / GFSK / DH5 / CH Mid**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2316.67	V	53.88	---	-3.21	50.67	---	74.00	54.00	-3.33	Peak
N/A										
2280.00	H	52.24	---	-3.32	48.92	---	74.00	54.00	-5.08	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:** TX / 8DPSK / DH5 / CH Mid**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1743.33	V	54.06	---	-6.52	47.54	---	74.00	54.00	-6.46	Peak
N/A										
1883.33	H	52.70	---	-5.23	47.48	---	74.00	54.00	-6.52	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).

**For V-200-X****Operation Mode:** TX / GFSK / DH5 / CH Mid**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
2250.00	V	51.17	---	-3.41	47.77	---	74.00	54.00	-6.23	Peak
N/A										
2010.00	H	51.42	---	-4.12	47.30	---	74.00	54.00	-6.70	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:** TX / 8DPSK / DH5 / CH Mid**Test Date:** September 10, 2010**Temperature:** 25°C**Tested by:** Mark Yang**Humidity:** 50 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1393.33	V	55.74	---	-8.94	46.80	---	74.00	54.00	-7.20	Peak
N/A										
1760.00	H	54.46	---	-6.36	48.10	---	74.00	54.00	-5.90	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).



## 7.9 POWERLINE CONDUCTED EMISSIONS

### **LIMIT**

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	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

\* Decreases with the logarithm of the frequency.

### **Test Configuration**

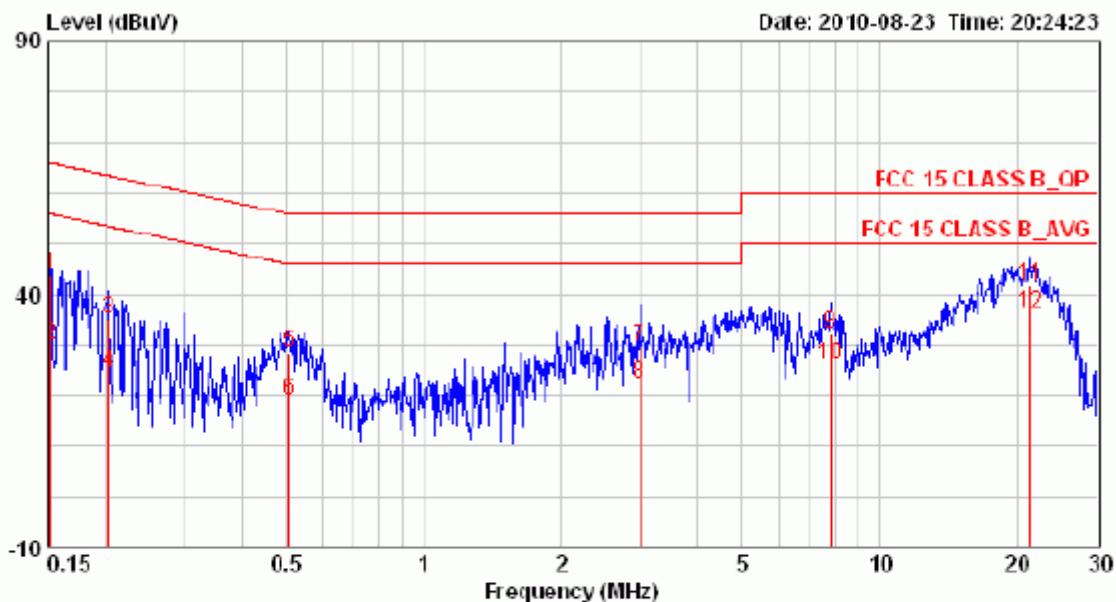
See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

## **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:** Normal Link**Test Date:** August 23, 2010**Temperature:** 19°C**Tested by:** Vic Lin**Humidity:** 66% RH**Line:** L1

Freq. MHz	Corr. Factor dB	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dB	
		Q. P.	Ave.	Q. P.	Ave.	Q. P.	Ave.	Q. P.	Ave.
0.152	0.05	43.04	29.90	43.09	29.95	65.91	55.91	-22.02	-25.96
0.203	0.06	34.96	24.26	35.02	24.32	63.49	53.49	-28.47	-29.17
0.507	0.06	28.34	18.70	28.40	18.76	56.00	46.00	-27.60	-27.24
2.978	0.16	29.54	22.02	29.70	22.18	56.00	46.00	-26.30	-23.82
7.810	0.29	31.83	25.77	32.12	26.06	60.00	50.00	-27.88	-23.94
21.373	0.53	41.18	35.60	41.71	36.13	60.00	50.00	-18.29	-13.87

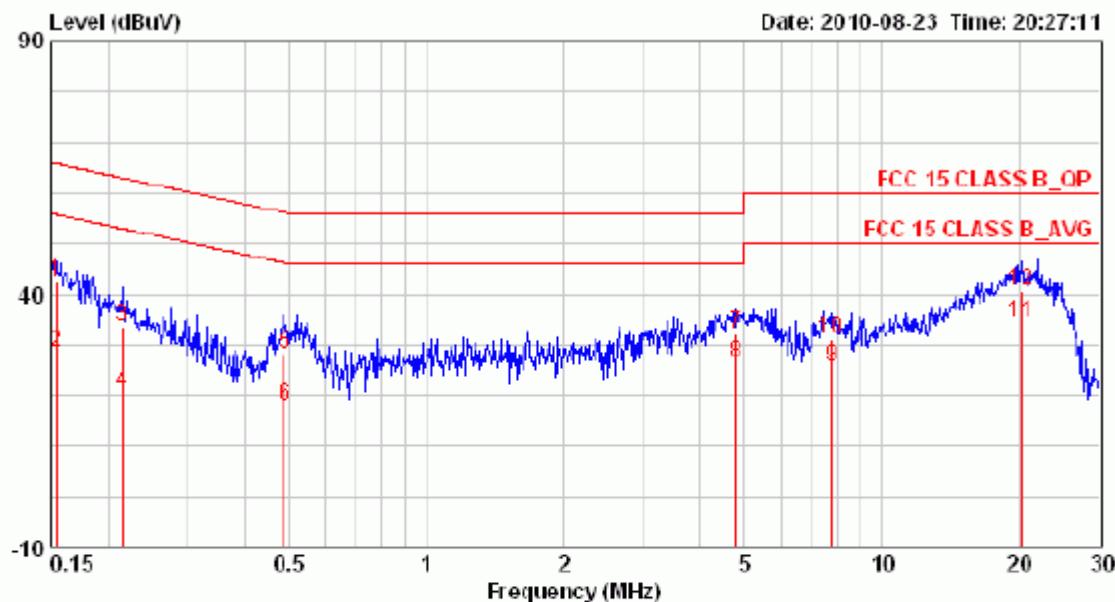
***Remark:***

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. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



**Operation Mode:** Normal Link  
**Temperature:** 19°C  
**Humidity:** 66% RH

**Test Date:** August 23, 2010  
**Tested by:** Vic Lin  
**Line:** L2



Freq. MHz	Corr. Factor dB	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dB	
		Q. P.	Ave.	Q. P.	Ave.	Q. P.	Ave.	Q. P.	Ave.
0.154	0.06	42.16	20.24	42.22	20.30	65.70	55.70	-23.56	-27.40
0.215	0.06	33.36	20.34	33.42	20.40	63.01	53.01	-29.59	-32.61
0.489	0.06	27.90	17.71	27.36	17.77	56.19	46.19	-28.23	-28.42
4.772	0.19	31.81	26.23	32.00	26.42	56.00	46.00	-24.00	-19.58
7.769	0.27	30.78	25.30	31.05	25.57	60.00	50.00	-28.95	-24.43
20.270	0.48	39.96	33.79	40.44	34.27	60.00	50.00	-19.56	-15.73

**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. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)