

低功率射頻電機試驗報告	
產品名稱	BROADCOM USB BLUETOOTH MODULE
申請廠商	新加坡商博通亞洲股份有限公司台灣分公司 台北市信義區信義路五段106號5樓
製造廠商	BROADCOM CORPORATION / USA
廠牌	BROADCOM
型號	BCM92045NMD
該產品樣品試驗 依據之試驗標準	低功率射頻電機技術規範 (93.9.20 低功率 0002 (LP0002) 版本)
報告編號	05U3354-1
試驗結果	合格
康萊士標準測試技術有限公司 美國加州摩根山市蒙特利路561 F 受理日期 2005年4月01日 完成日期 2005年4月22日	 Thu Chan

附註:

1. 未經本實驗室書面許可，不得部份複製本報告內容。
2. 本報告僅對檢送樣品負責，且分離使用無效。
3. 本報告需加本所負責人簽名始生效。

低功率射頻電機技術規範3.10節 (DTS)

項次	測試項目	適用規範	測試結果	備註
1.	場強輻射	低功率射頻電機技術規範 3.10.1節(5)	請參閱 7.1.8. 7.2.8 and 7.3 節	
2.	電源線傳導干擾	低功率射頻電機技術規範 2.3節	請參閱 7.4 & 7.5 節	
3.	天線增益之要求	低功率發射機，依據交通部低功率射頻電機技術規範3.10.1節(3)(3.1)之規定，若發射天線之方向性增益超過6dB時，除符合下列二種情形外，應依其所超過之dB數降低峰值輸出功率。 依據交通部低功率射頻電機技術規範3.10.1節(3)(3.1)之規定，2400-2483.5MHz僅用於固定式點對點操作，每超過3dB應降低1dB之峰值輸出功率。	請參閱 Page 6 (D) 節	
4.	發射頻寬	對使用跳頻系統技術之低功率發射機，依據交通部低功率射頻電機技術規範3.10.1節之(6.1.1)規定，跳頻系統之載波頻率頻道間隔應至少25 千赫(kHz)或跳頻頻道之20dB 頻寬，兩者取較寬者。	請參閱 7.1.1 and 7.2.1 節	
5.	輸出峰值功率	依據交通部低功率射頻電機技術規範3.10.1節(2.1)(2.3)之規定，對使用展頻技術之低功率發射機，其峰值輸出功率不得大於1 Watt。	請參閱 7.1.5 and 7.2.5 節	
6.	頻帶邊緣之發射	依據交通部低功率射頻電機技術規範3.10.1節(5)之規定，使用頻帶範圍外之任意100kHz內，發射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之100kHz內的射頻功率，須衰減20分貝(dB)，以射頻傳導或輻射方式測量。此外，落於第2.7節禁用頻段之輻射發射，應符合第2.8節之規定。	請參閱 7.3.1 , 7.3.2 and 7.3.3 節	
7.	功率密度	依據交通部低功率射頻電機技術規範3.10.1節之(6.2.2)條規定，在使用頻率範圍之任意3kHz 頻寬內，由發射機傳導至天線之峰值發射電功率密度在任意期間內，皆不得大於8dBm。	請參閱 7.1.7 and 7.2.7節	

項次	測試項目	適用規範	測試結果	備註
8.	載波頻率間隔	依據交通部低功率射頻電機技術規範 3.10.1節(6.1)跳頻系統之規定	請參閱 7.1.2 and 7.2.2節	
9.	載波頻率之佔用週期	(6.1.1.)本系統之載波頻率頻道間隔應至少 25kHz 或跳頻頻道之 20dB 頻寬，兩者取較寬者。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射的信號同步偏移接收頻率。 (6.1.2.)需使用至少15個無重疊的頻道，在0.4秒乘以跳頻頻道數之週期內，任一頻率佔用之平均時間不得超過0.4秒。	請參閱7.1.4 and 7.2.4節	
10.	跳頻頻道數	依據交通部低功率射頻電機技術規範 3.10.1節(6.1)跳頻系統之規定 至少須使用75個以上跳頻頻道 (hopping channel)。	請參閱7.1.3 and 7.2.3節	

A. 測試實驗室資料

實驗室認可登錄： 中華民國九十年元月十二日 (NVLAP: 200065-0: June 30, 2004 – June 30, 2005)
交通部電信總局
低功率射頻電機檢驗實驗室認可登錄
證書編號 DGT-WAV003
(91.12.9 函 電信工字第0910509731-0號
認可頻率範圍變更為9KHz - 40GHz)

測試場地： 二號傳導測試室 & 電波暗室
實驗室名稱： 康萊士標準測試技術有限公司
實驗室地址： 美國加州摩根山市蒙特利路561 F
電話： (408) 463 0885
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公司名稱： 康萊士標準測試技術有限公司
公司地址： 美國加州摩根山市蒙特利路561 F

B. 試驗室之測試不確定度

測試項目	頻率範圍	不確定度 (dB)
輻射干擾電壓量測 (測試距離: 3m)	30 – 200 MHz	± 3.3dB
	200 – 1000 MHz	+4.5dB / -2.9dB
	> 1000 MHz	+3.5dB / -2.2dB
傳導干擾場強量測	150 kHz – 30 MHz	± 2.9dB

注: 不確定度(Uncertainty) 公式: $U=ku(y)$; Figures are valid to a confidence level of 95%.

C. 一般資料**待測物資料**

器材名稱 : BROADCOM USB BLUETOOTH MODULE

廠牌 : BROADCOM

產品型號 : BCM92045NMD

申請者(或公司) : 新加坡商博通亞洲股份有限公司台灣分公司

地址 : 台北市信義區信義路五段106號5樓

製造廠 : BROADCOM CORPORATION / USA

使用頻率 : Bluetooth: 2402 ~ 2480MHz

使用頻道 :

頻道	對應頻率(MHz)
0	2402
§	§
78	2480

頻道間隔 : 1 MHz

輸出功率 : 2.16 dBm with 8PSK Modulation
1.25 dBm with GFSK Modulation

調變方式 : QDPSK \ GFSK \ 8PSK

D. 天線增益之要求

適用標準

低功率發射機，依據交通部低功率射頻電機技術規範3.10.1節(3)之規，用於固定式點對點操作時，應符合下列情現之一：

依據交通部低功率射頻電機技術規範3.10.1節(3)(3.1)之規定，操作於2400-2483.5MHz者，其發射天線之方向性增益超過6dBi，應於每超過3dB降低1dB之峰值輸出功率。

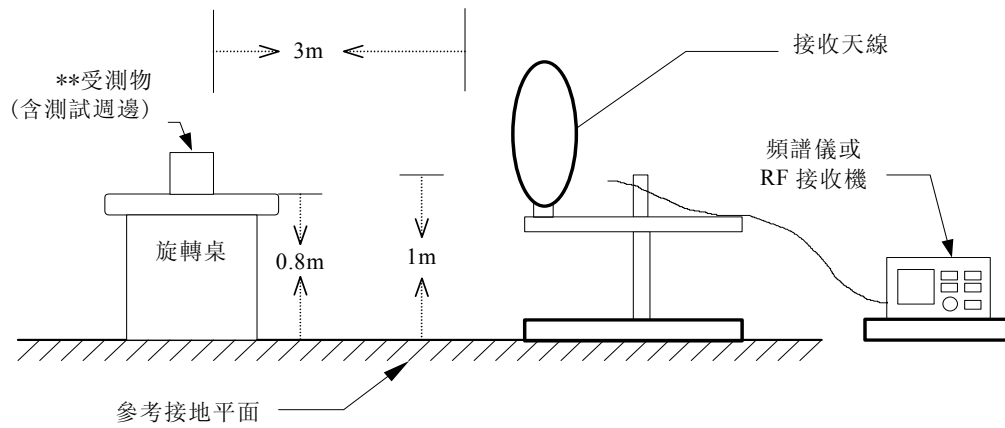
天線增益

The radio utilizes an Ethertronics (PCB antenna) with a maximum gain of 2.2 dBi.

**詳細天線資料請參閱天線規格

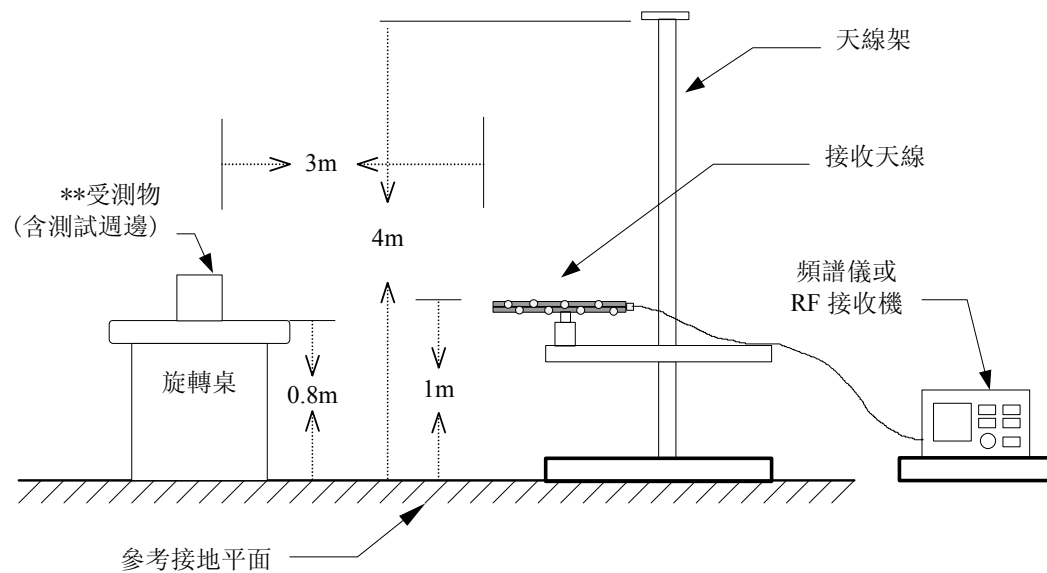
E. 輻射之測試配置

圖 1 :量測頻率9kHz ~ 30MHz之測試配置



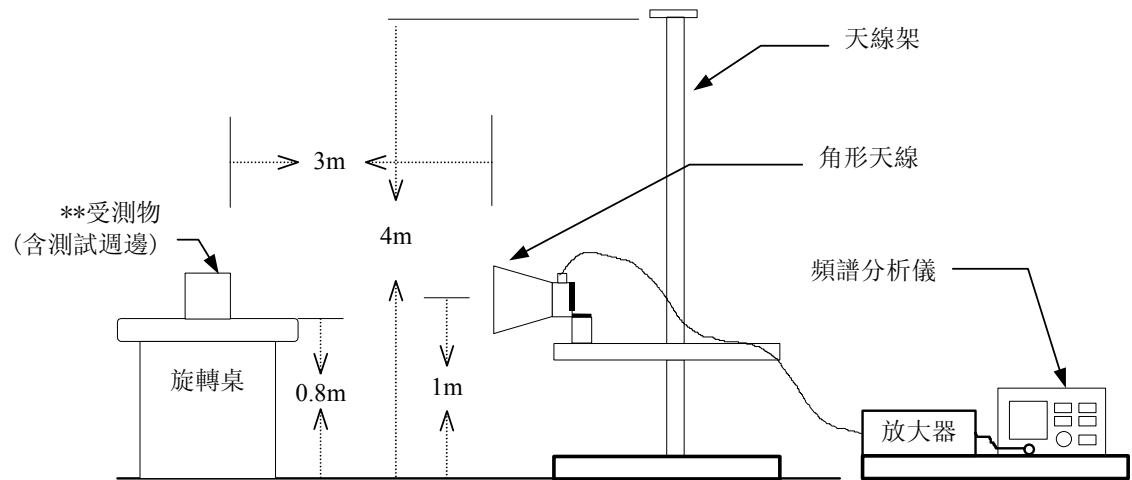
註: **請參照3.2節

圖 2 :量測頻率30MHz ~ 1GHz之測試配置



註: **請參照3.2節

圖 3：量測頻率1GHz以上之測試配置



註: **請參照3.2節

F. 場強度之計算

場強之計算公式如

結果值 = 讀值 + 校正因子

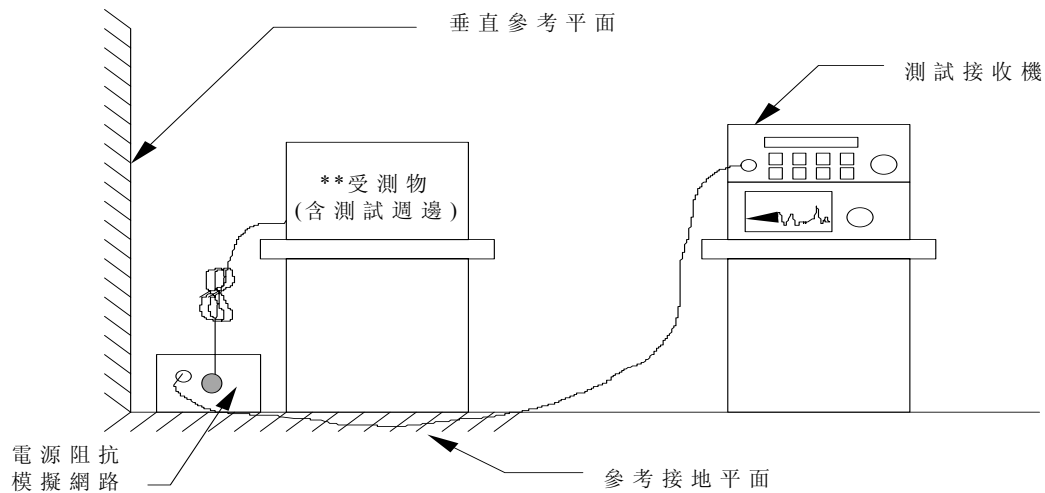
其中校正因子為：

天線因子 + 饋線損失 + 濾波器損失 (若有使用) - 放大器增益 (若有使用)。

G. 量測場強輻射之儀器

Refer to FCC report Section 5.3 on pages 8 and 9 for details.

H. 傳導干擾之測試配置



註: **請參照 3.2 節

I. 傳導干擾之干擾值之計算

電源傳導干擾電壓之計算公式如下

$$\text{結果值} = \text{儀器讀值(QP)} + \text{校正因子}$$

其中校正因子為：

$$\text{饋線損失} + \text{電源阻抗模擬網路損失}$$

J. 傳導干擾之量測儀器

Refer to FCC report Section 5.3 on page 9 for details.

FCC REPORT



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION**

TEST REPORT

FOR

BROADCOM USB BLUETOOTH MODULE

MODEL NUMBER: BCM92045NMD

FCC ID: QDS-BRCM1018

REPORT NUMBER: 05U3354-1

ISSUE DATE: APRIL 20, 2005

Prepared for
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Prepared by
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NVLAP[®]
LAB CODE:200065-0

Revision History

<u>Rev.</u>	<u>Revisions</u>	<u>Revised By</u>
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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY.....	6
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i>	<i>6</i>
4.2. <i>MEASUREMENT UNCERTAINTY.....</i>	<i>6</i>
5. EQUIPMENT UNDER TEST.....	7
5.1. <i>DESCRIPTION OF EUT</i>	<i>7</i>
5.2. <i>MAXIMUM OUTPUT POWER</i>	<i>7</i>
5.3. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i>	<i>8</i>
5.4. <i>SOFTWARE AND FIRMWARE</i>	<i>8</i>
5.5. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	<i>8</i>
5.6. <i>DESCRIPTION OF TEST SETUP</i>	<i>9</i>
6. TEST AND MEASUREMENT EQUIPMENT	11
7. LIMITS AND RESULTS	12
7.1. <i>ANTENNA PORT CHANNEL TESTS FOR EUT WITH GFSK MODULATION.....</i>	<i>12</i>
7.1.1. <i>20 dB BANDWIDTH</i>	<i>12</i>
7.1.2. <i>HOPPING FREQUENCY SEPARATION.....</i>	<i>16</i>
7.1.3. <i>NUMBER OF HOPPING CHANNELS</i>	<i>18</i>
7.1.4. <i>AVERAGE TIME OF OCCUPANCY</i>	<i>22</i>
7.1.5. <i>PEAK OUTPUT POWER</i>	<i>29</i>
7.1.6. <i>AVERAGE POWER.....</i>	<i>33</i>
7.1.7. <i>PEAK POWER SPECTRAL DENSITY</i>	<i>34</i>
7.1.8. <i>CONDUCTED SPURIOUS EMISSIONS.....</i>	<i>38</i>
7.2. <i>ANTENNA PORT CHANNEL TESTS FOR EUT WITH 8PSK MODULATION</i>	<i>47</i>
7.2.1. <i>20 dB BANDWIDTH</i>	<i>47</i>
7.2.2. <i>HOPPING FREQUENCY SEPARATION.....</i>	<i>51</i>
7.2.3. <i>NUMBER OF HOPPING CHANNELS</i>	<i>53</i>
7.2.4. <i>AVERAGE TIME OF OCCUPANCY</i>	<i>57</i>
7.2.5. <i>PEAK OUTPUT POWER</i>	<i>64</i>
7.2.6. <i>AVERAGE POWER.....</i>	<i>68</i>
7.2.7. <i>PEAK POWER SPECTRAL DENSITY</i>	<i>69</i>
7.2.8. <i>CONDUCTED SPURIOUS EMISSIONS.....</i>	<i>73</i>
7.3. <i>RADIATED EMISSIONS.....</i>	<i>82</i>
7.3.1. <i>TRANSMITTER RADIATED SPURIOUS EMISSIONS</i>	<i>82</i>
7.3.2. <i>TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz WITH GFSK MODULATION</i>	<i>85</i>
7.3.3. <i>TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz WITH 8PSK MODULATION</i>	<i>100</i>

7.3.4. RECEIVER ABOVE 1 GHZ WITH GFSK MODULAION 115
7.3.5. RECEIVER ABOVE 1 GHZ WITH 8PSK MODULAION 118
7.3.6. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH GFSK MODULATION 121
7.3.7. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 8PSK MODULATION 125
7.4. *POWERLINE CONDUCTED EMISSIONS WITH GFSK MODULATION*..... 129
7.5. *POWERLINE CONDUCTED EMISSIONS WITH 8PSK MODULATION*..... 133
8. SETUP PHOTOS **137**

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Broadcom Corp.
190 Mathilda Place
Sunnyvale, CA 94086, USA

EUT DESCRIPTION: Broadcom USB Bluetooth Module

MODEL: BCM92045NMD

SERIAL NUMBER: 002

DATE TESTED: APRIL 11 to 18, 2005

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a USB Bluetooth module operating in the 2400-2483.5 MHz band. The radio utilizes an Ethertronics (PCB antenna) with a maximum gain of 2.2 dBi.

The radio module is manufactured by BROADCOM CORPORATION

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

GFSK 2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	0.98	1.25

8PSK 2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	3.34	2.16

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Ethertronics (PCB antenna) with a maximum gain of 2.2 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Vidcomm_V 4.0.1.400.

The EUT driver software installed in the laptop support equipment during testing was Broadcom Bluetool, rev. 0.8.5.8.

The test utility software used during testing was HCI Control: USBO.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2480 MHz for both GFSK and 8PSK modulations.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	D410	5N793	N/A
AC Adapter	Dell	AA22850	NA	N/A

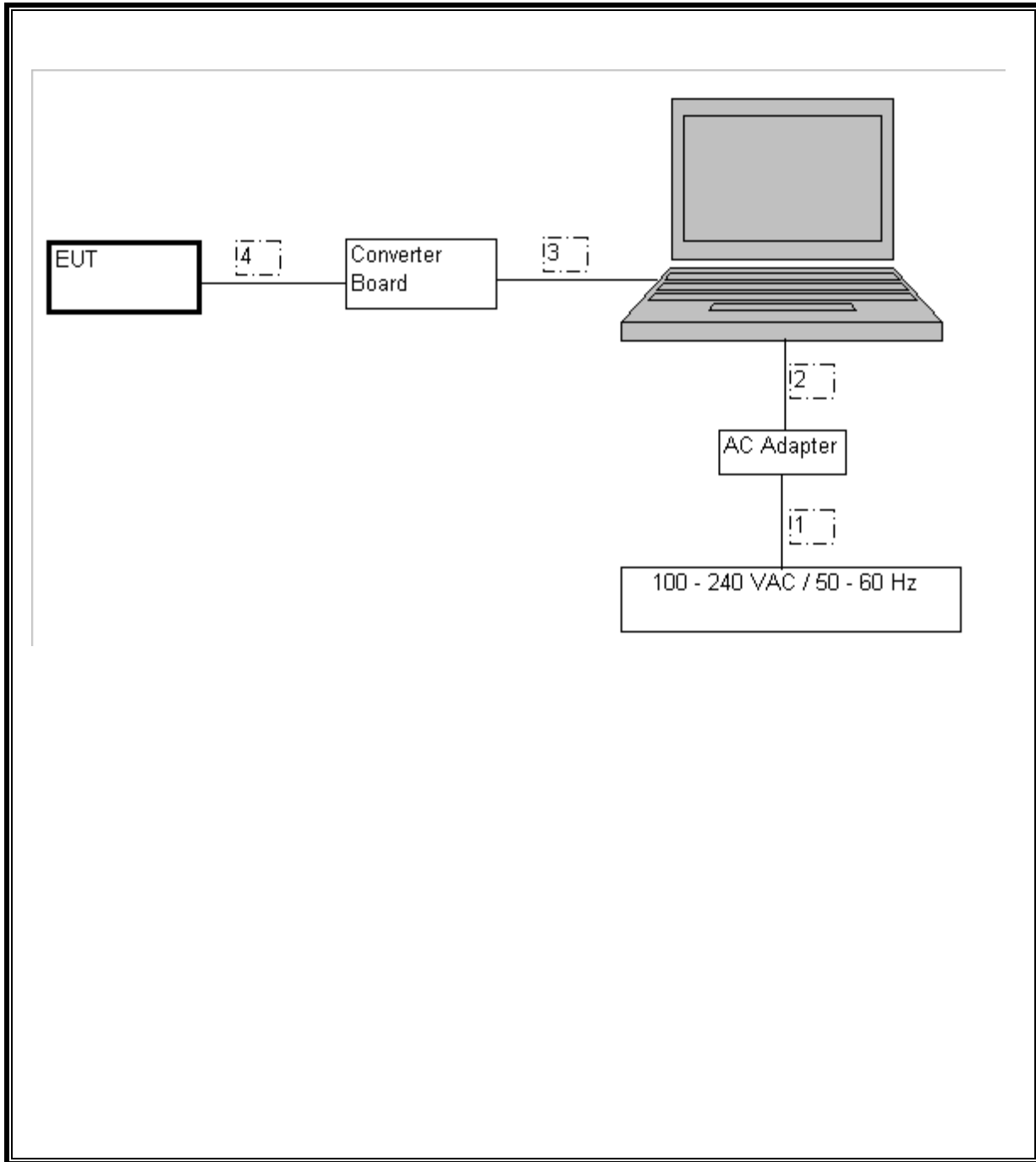
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115	Unshielded	1.5m	
2	DC	1	DC	Unshielded	1.5m	
3	USB	1	USB	Shielded	.2m	
4	USB	1	USB	Shielded	.5m	

TEST SETUP

The EUT was connected to the host laptop via a converter board. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	08/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	01/06/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	09/12/2005
Antenna, Horn 18 ~ 26 GHz	ARA	SWH-28	1007	02/24/2006
Line Filter	Lindgren	LMF-3489	497	N.C.R.
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	08/17/2005
Peak Power Meter	Agilent	E4416A	GB41291160	02/09/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	02/10/2006
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	09/15/2005
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	06/16/2005
2.4-2.5 Band Reject Filter	Micro Tronics	N/A	1	N/A

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS FOR EUT WITH GFSK MODULATION

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

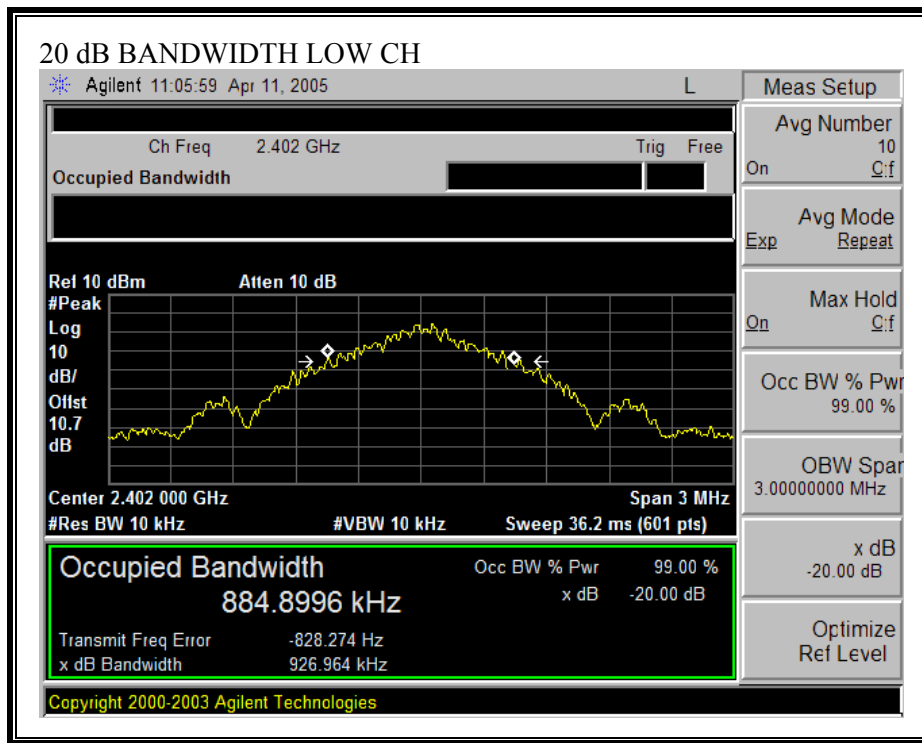
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set equal to the RBW. The sweep time is coupled.

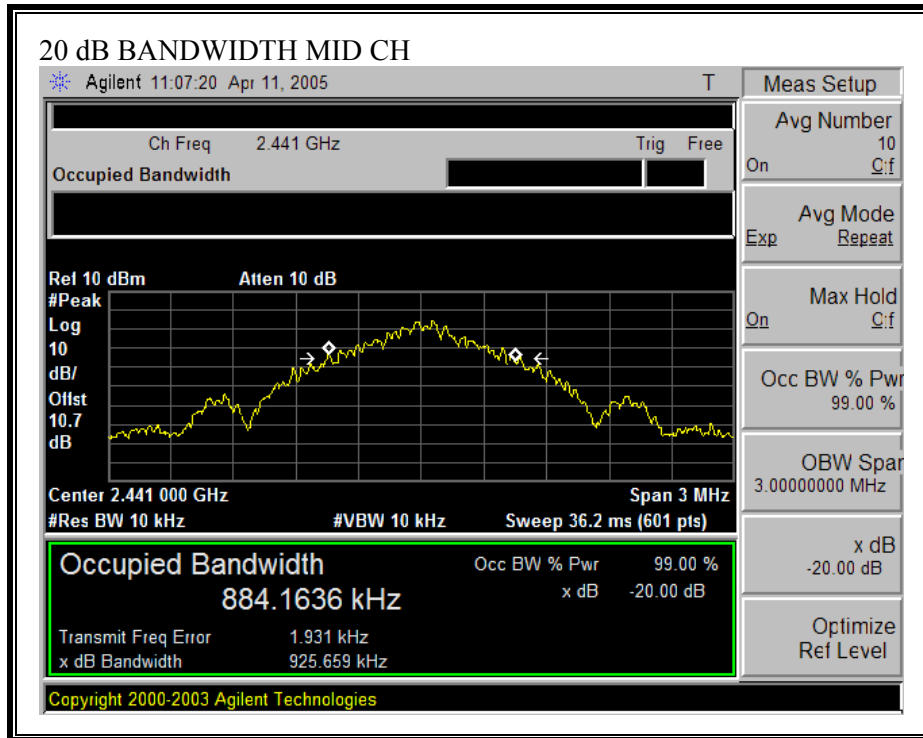
RESULTS

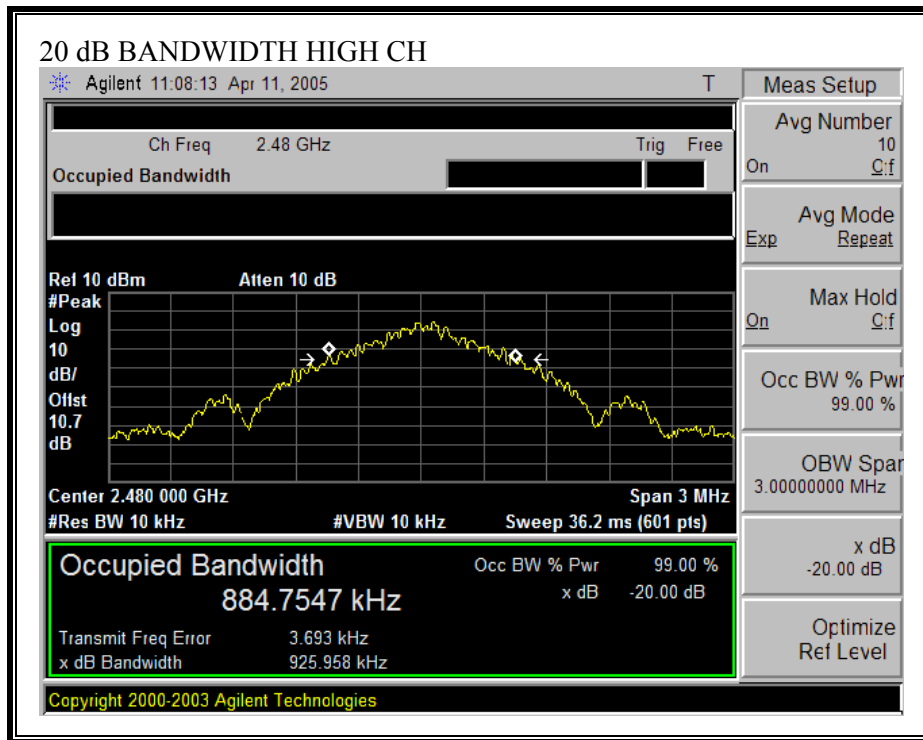
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	926.96
Middle	2441	925.55
High	2480	925.96

20 dB BANDWIDTH







7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

§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.

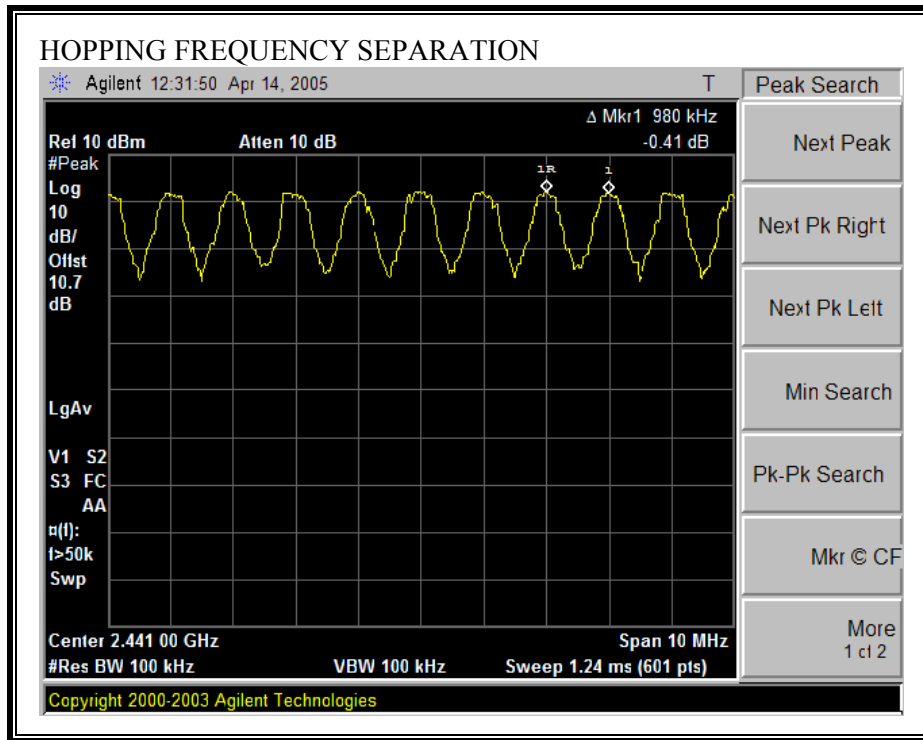
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

HOPPING FREQUENCY SEPARATION



7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

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 PROCEDURE

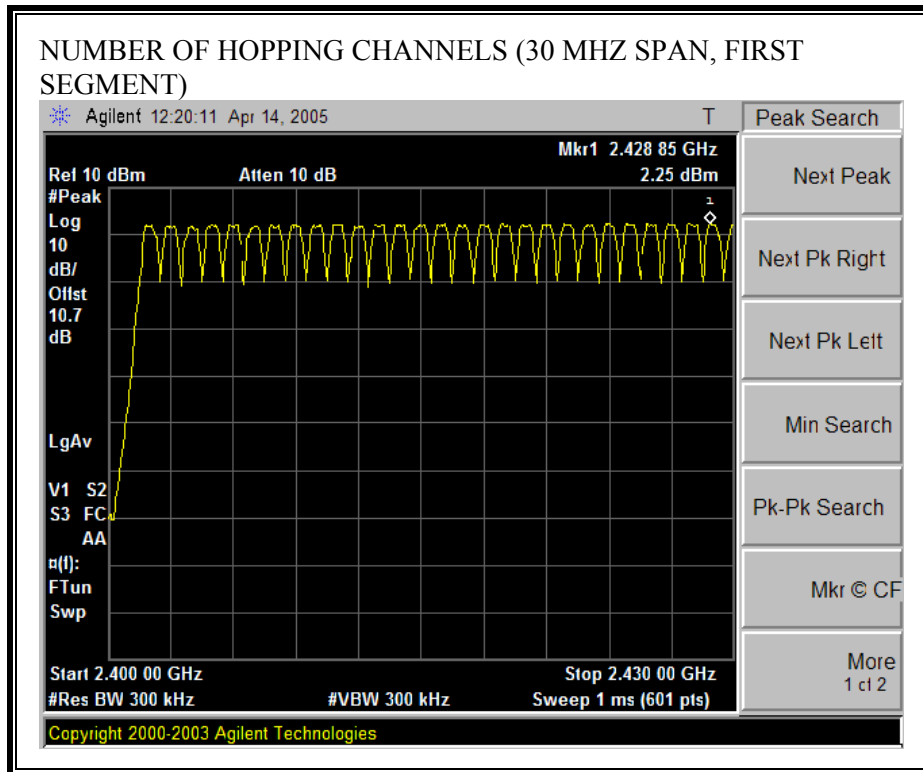
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

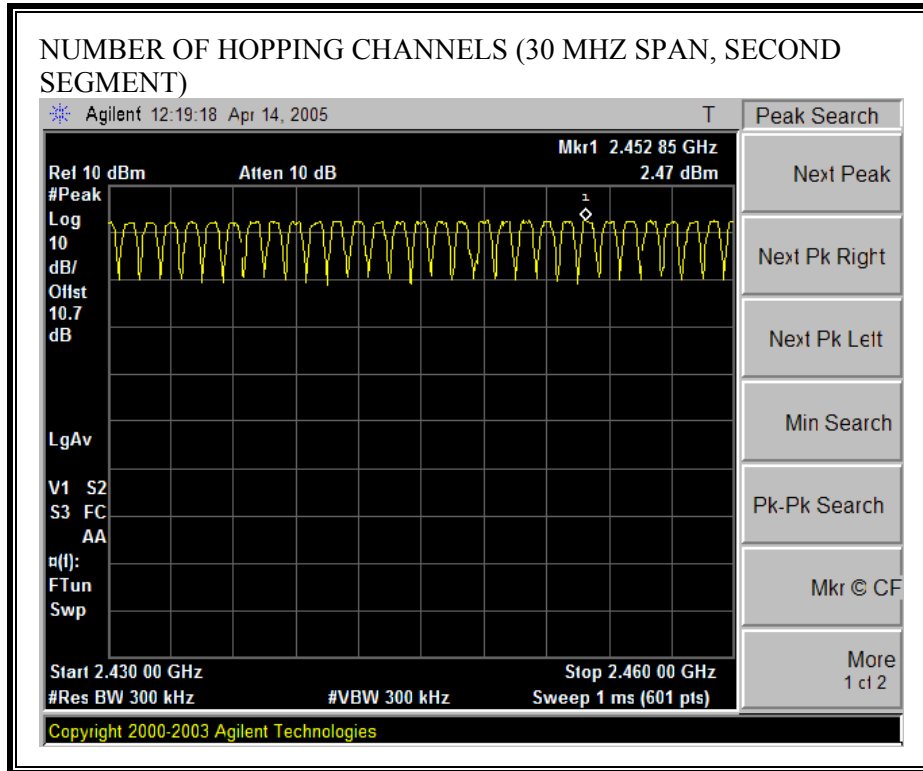
RESULTS

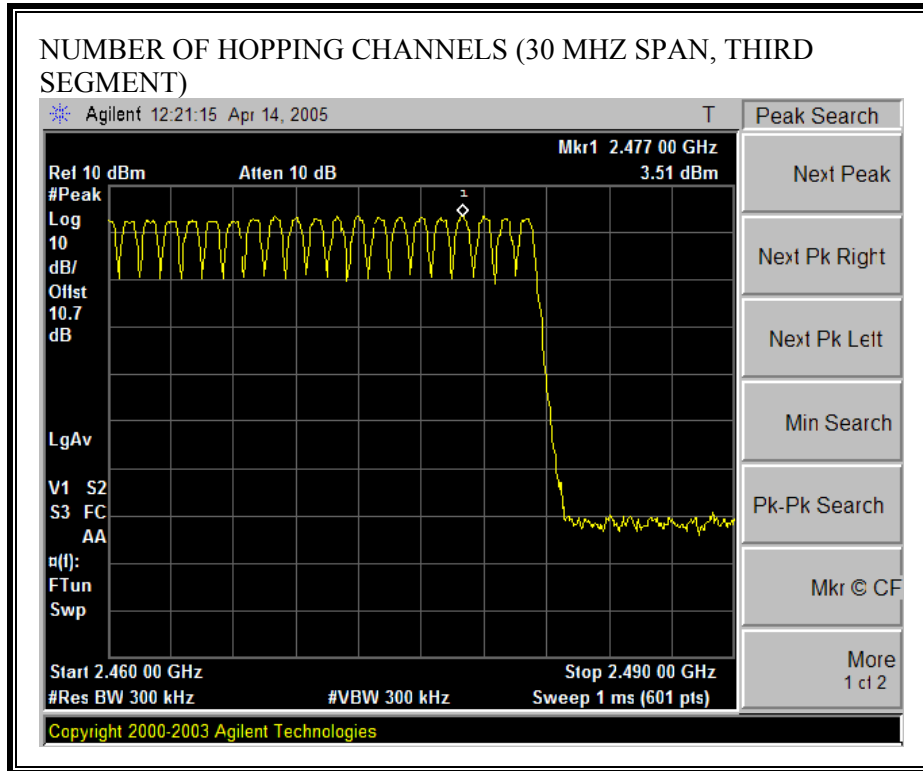
No non-compliance noted:

79 Channels observed.

NUMBER OF HOPPING CHANNELS







7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

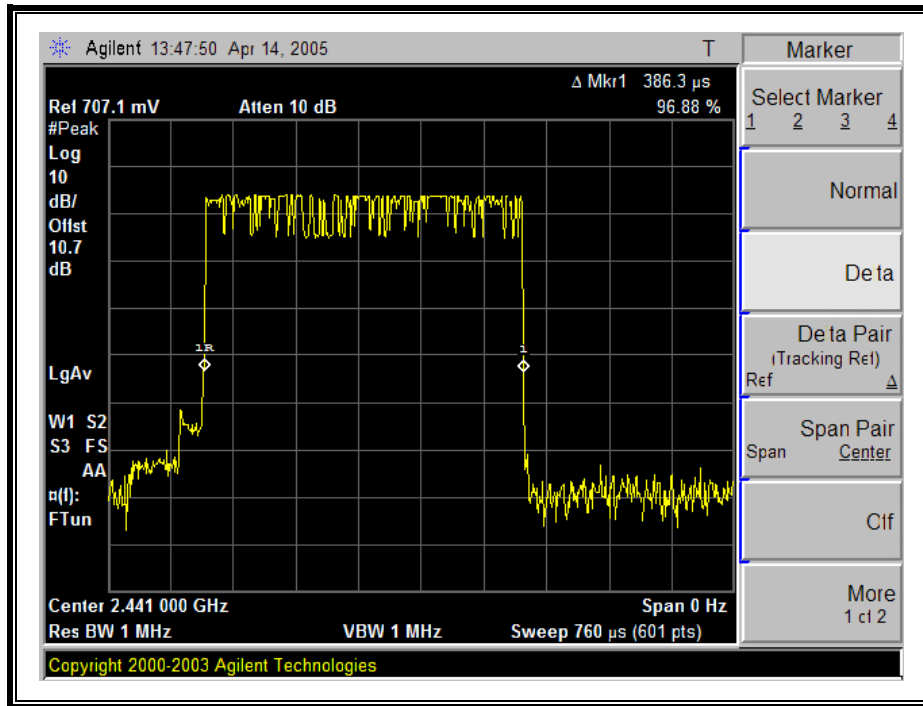
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

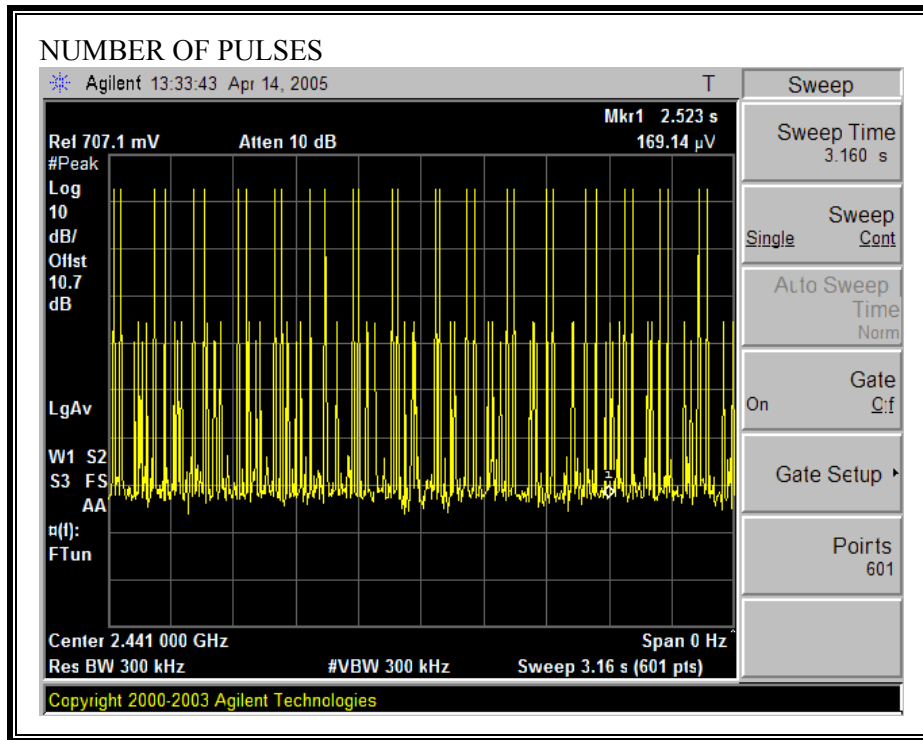
No non-compliance noted:

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
1	0.3863	32	0.124	0.4	0.276
3	1.645	20	0.329	0.4	0.071
5	2.892	13	0.376	0.4	0.024

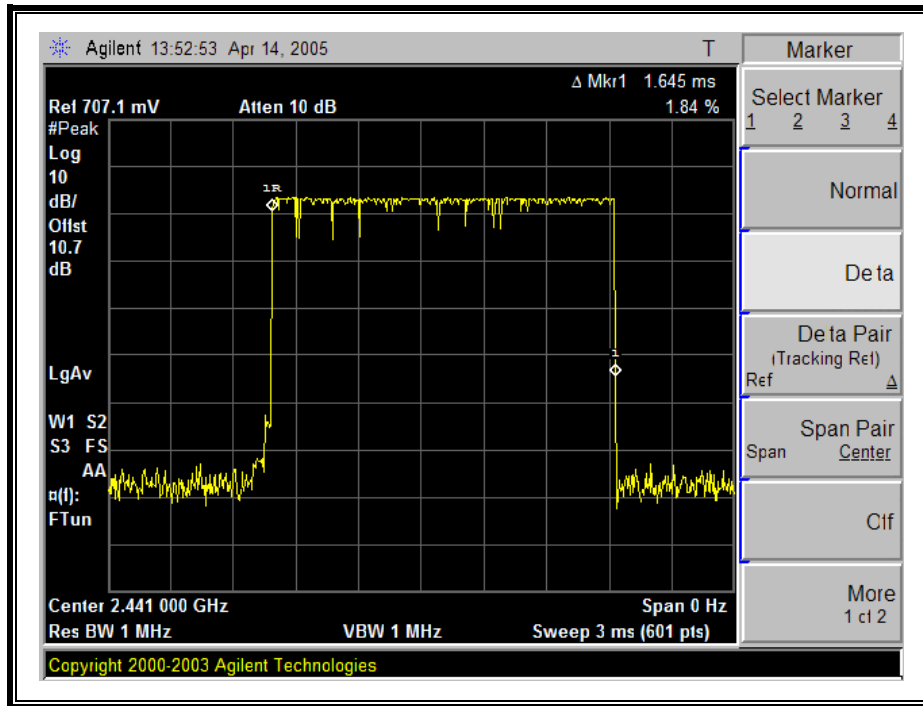
PULSE WIDTH (DH1 PACKET TYPE)



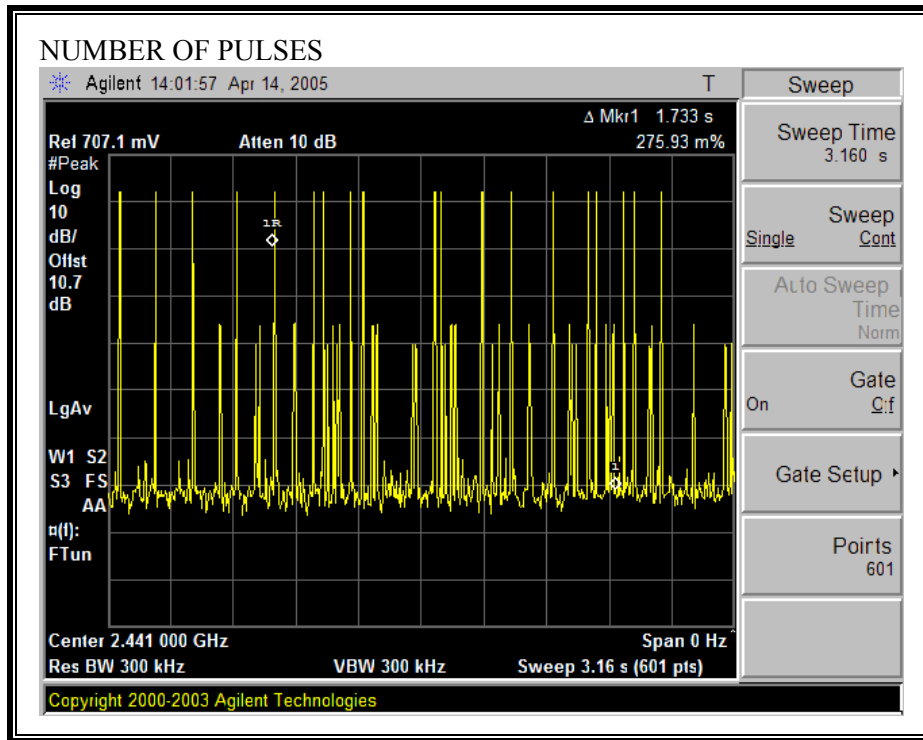
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



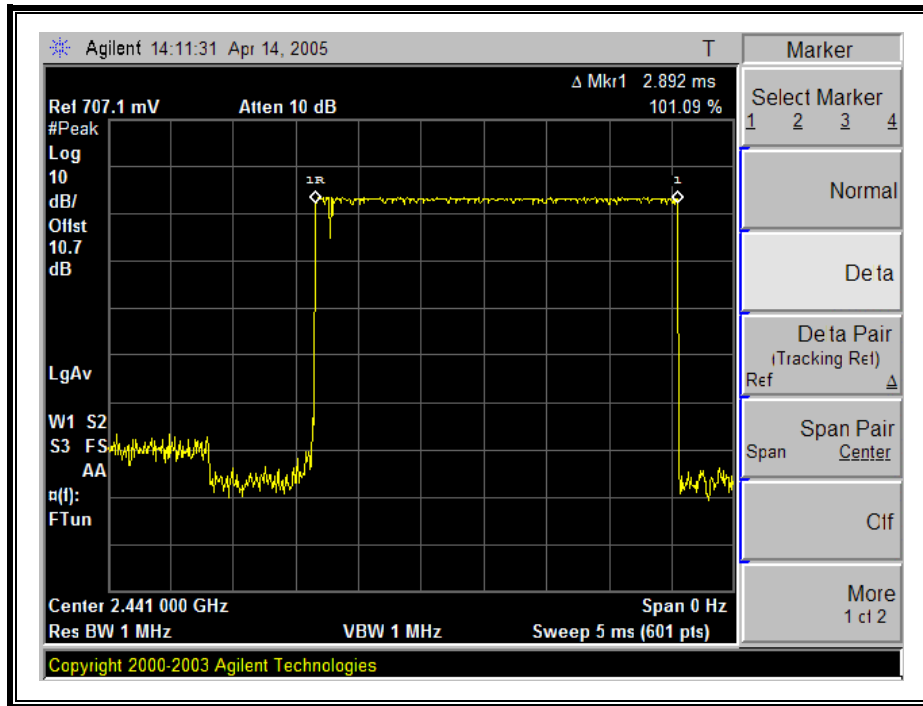
PULSE WIDTH (DH3 PACKET TYPE)



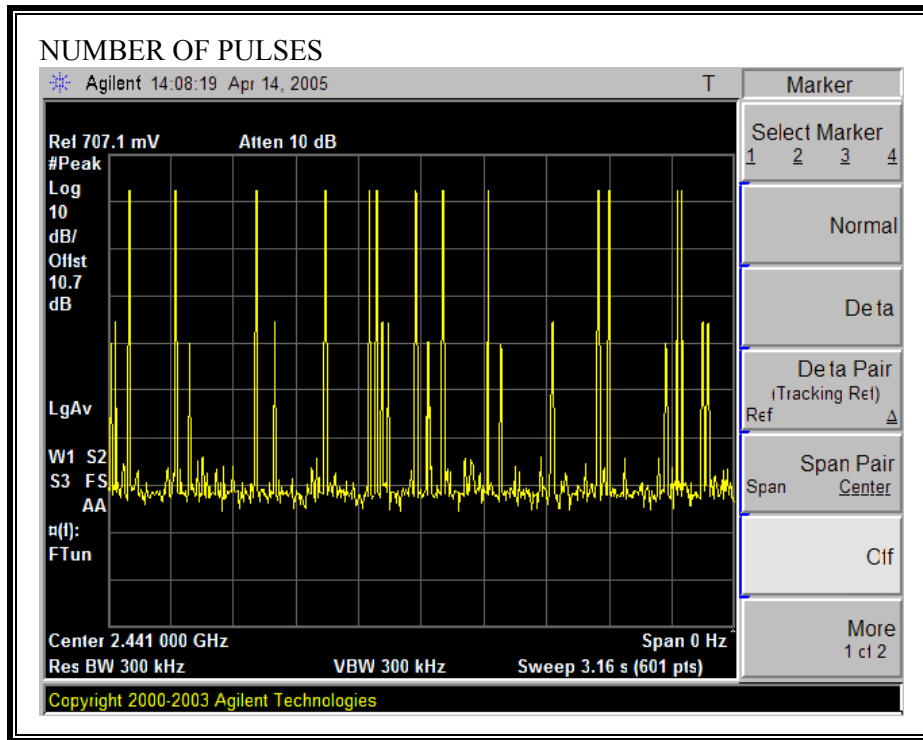
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



PULSE WIDTH (DH5 PACKET TYPE)



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.1.5. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 2.2 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

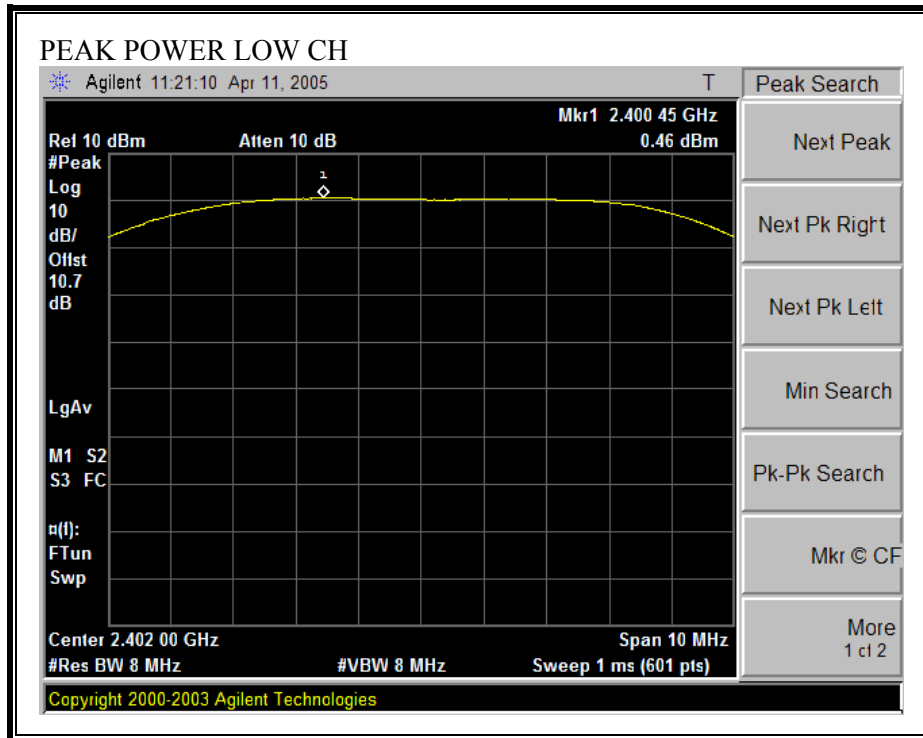
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

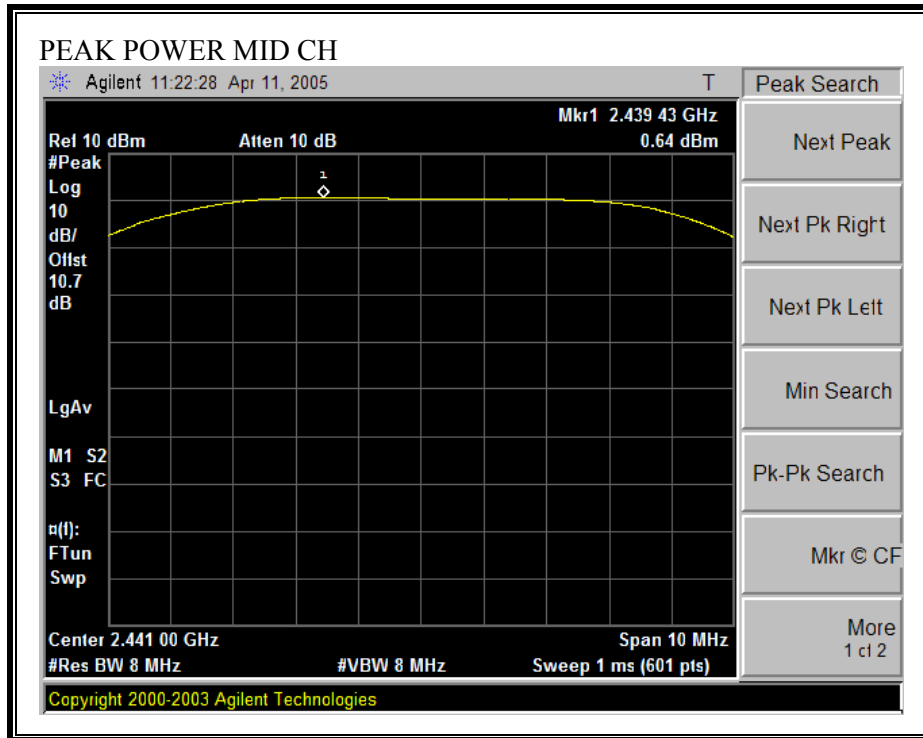
RESULTS

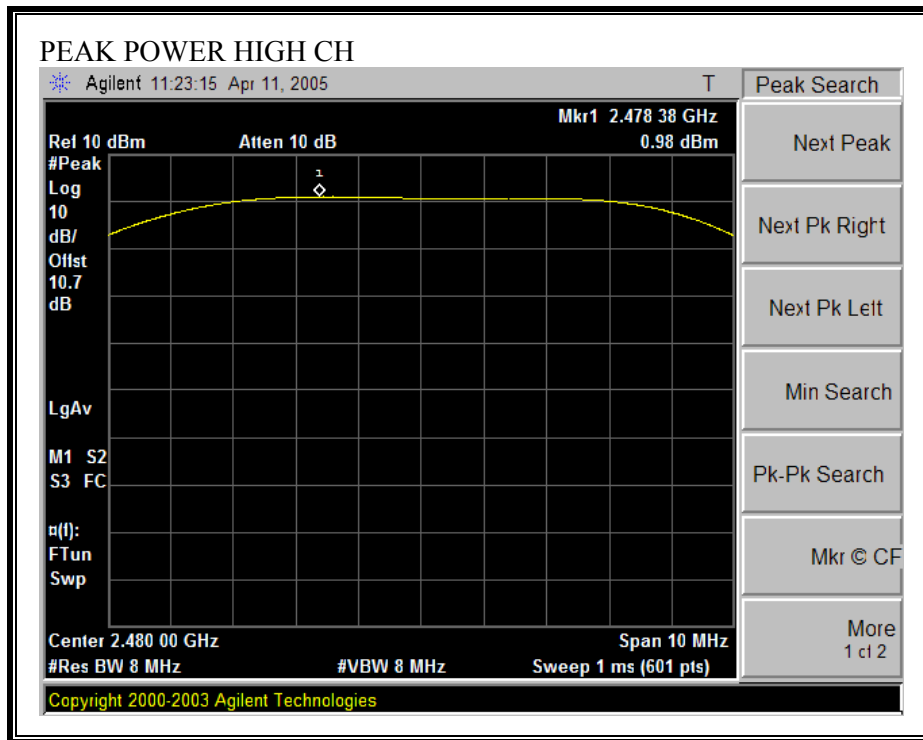
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.46	30	-29.54
Middle	2441	0.64	30	-29.36
High	2480	0.98	30	-29.02

OUTPUT POWER







7.1.6. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.10
Middle	2441	2.22
High	2480	2.55

7.1.7. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST PROCEDURE

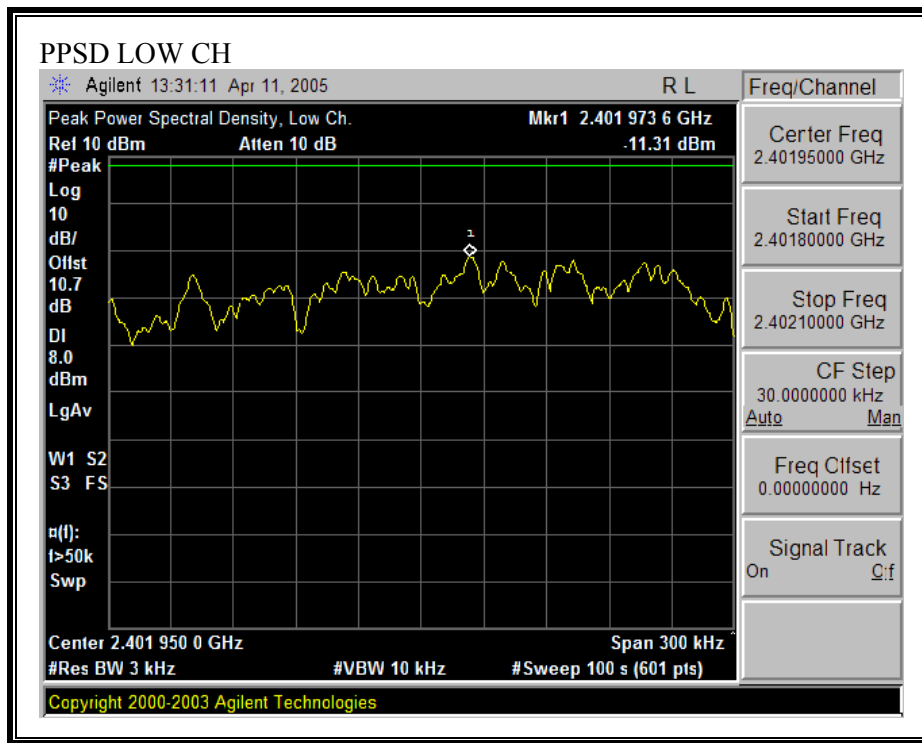
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

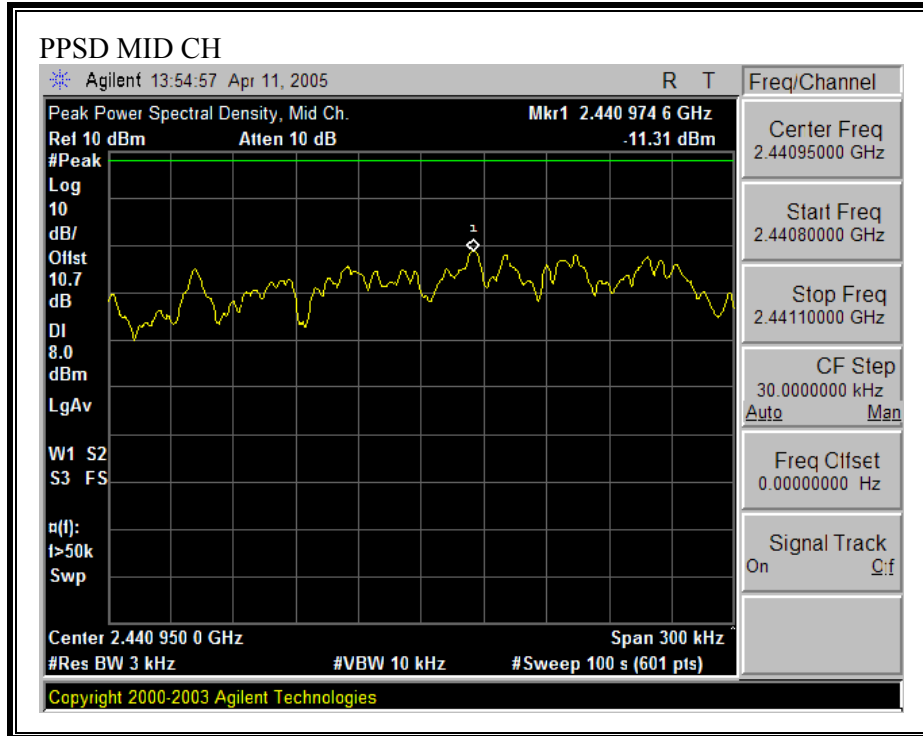
RESULTS

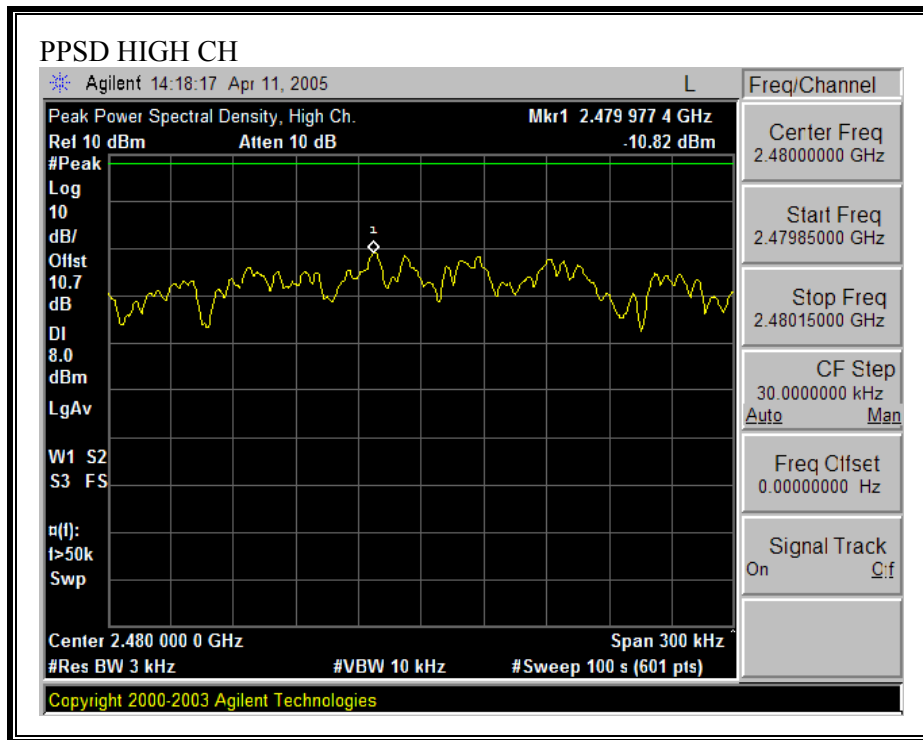
No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-11.31	8	-19.31
Middle	2441	-11.31	8	-19.31
High	2480	-10.82	8	-18.82

PEAK POWER SPECTRAL DENSITY







7.1.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band 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. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c)).

TEST PROCEDURE

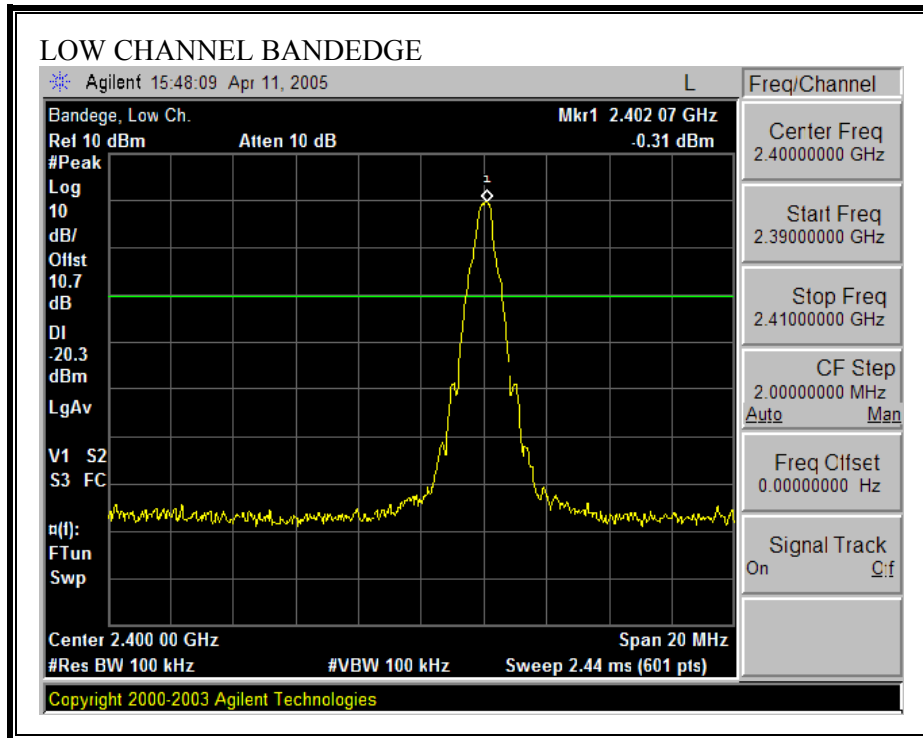
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

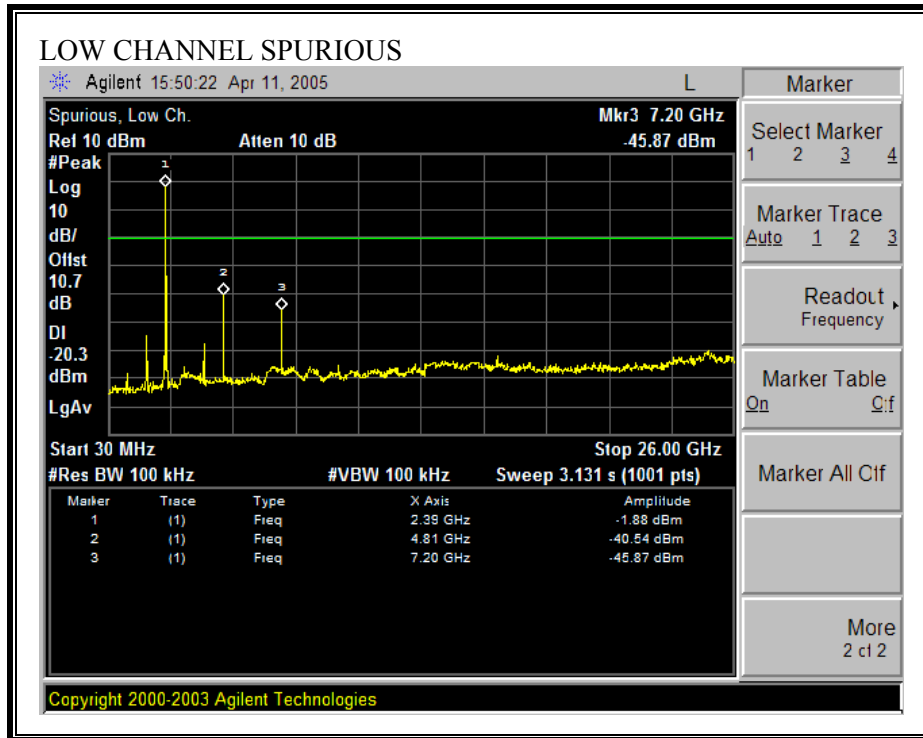
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

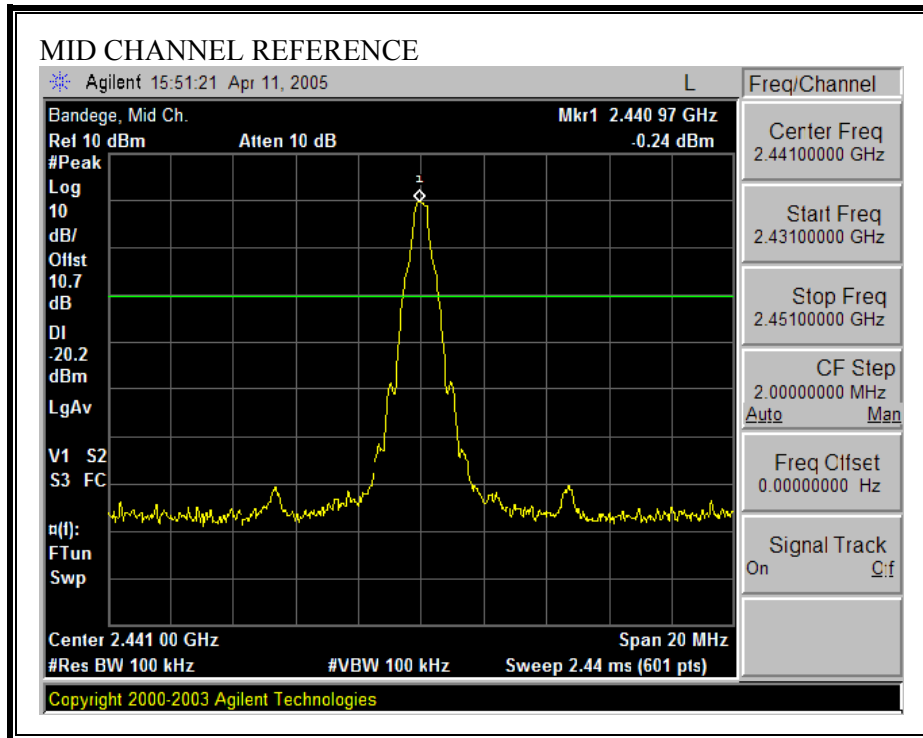
No non-compliance noted:

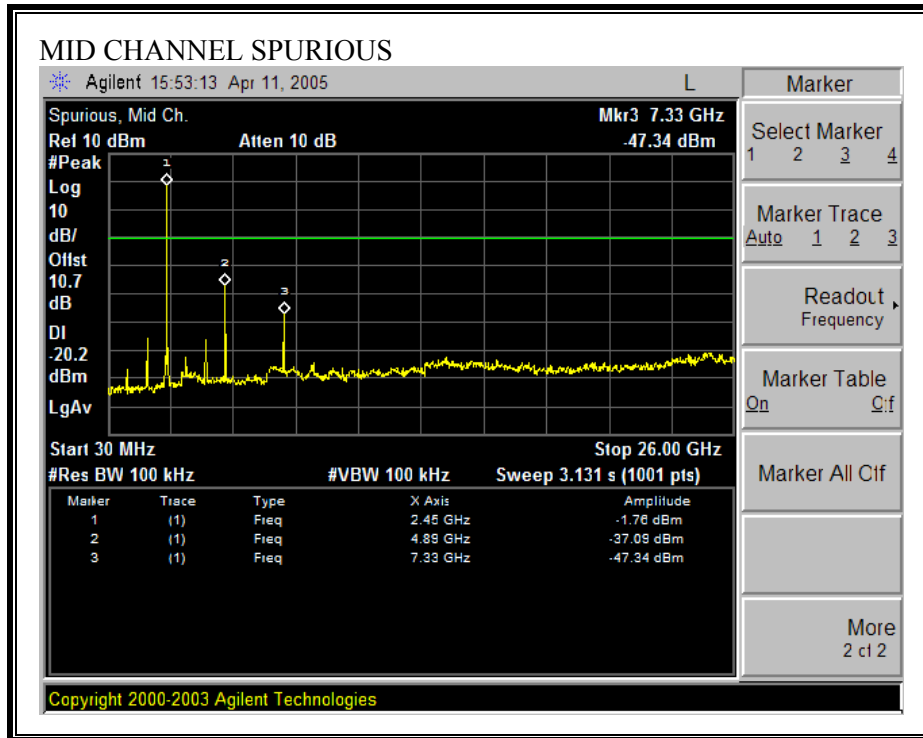
SPURIOUS EMISSIONS, LOW CHANNEL



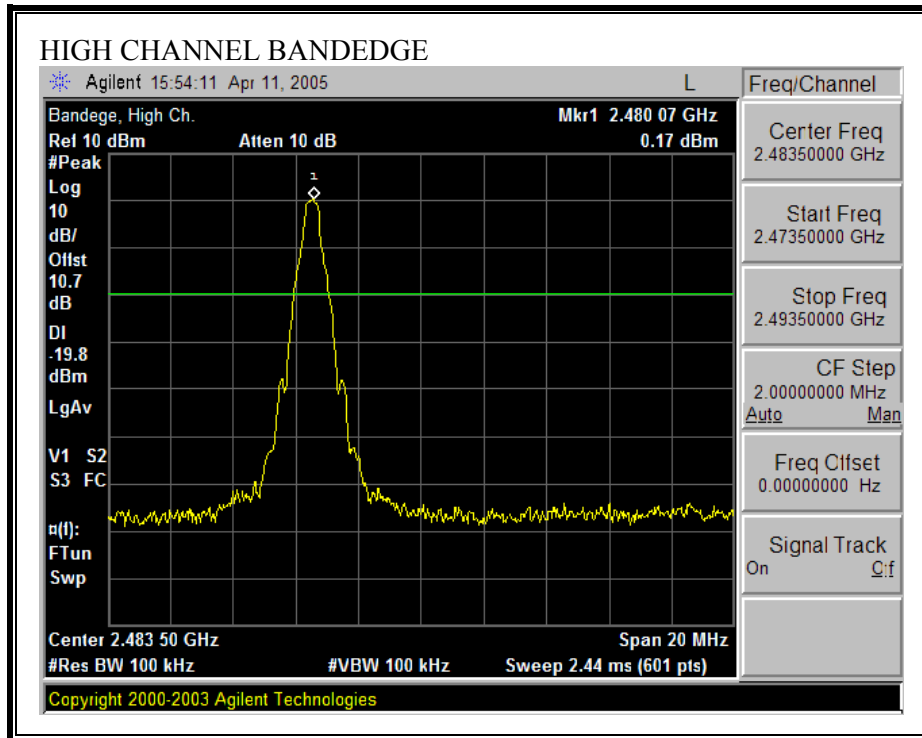


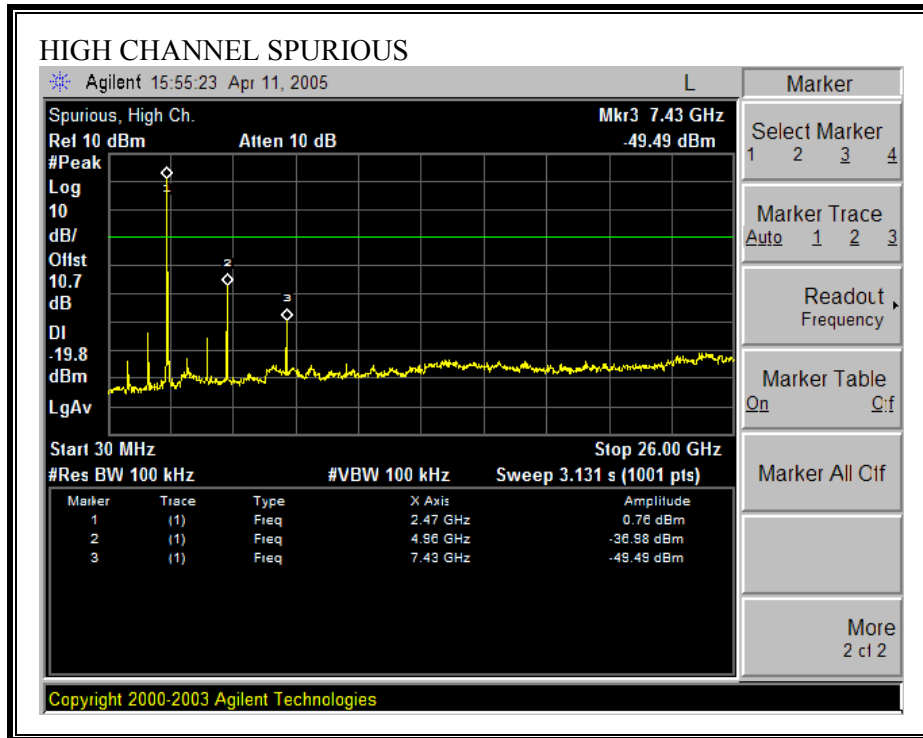
SPURIOUS EMISSIONS, MID CHANNEL



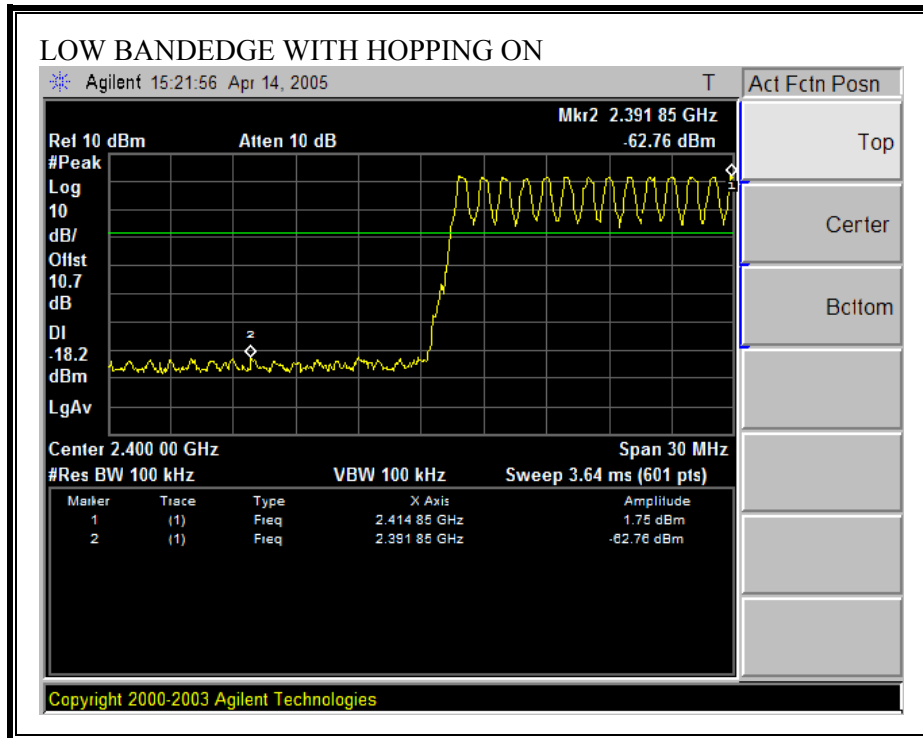


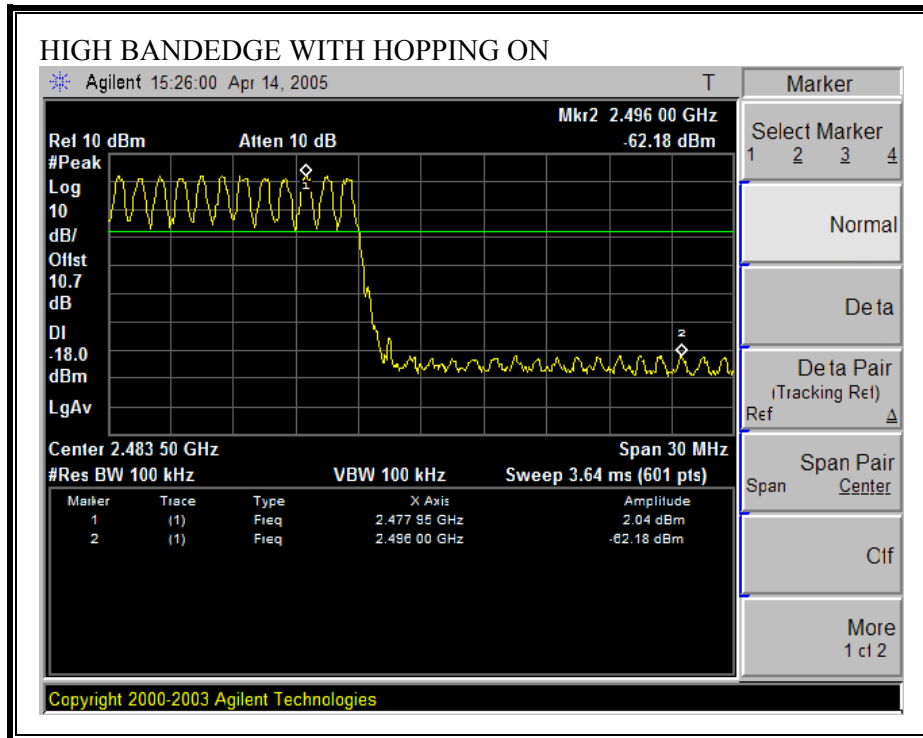
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.2. ANTENNA PORT CHANNEL TESTS FOR EUT WITH 8PSK MODULATION

7.2.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

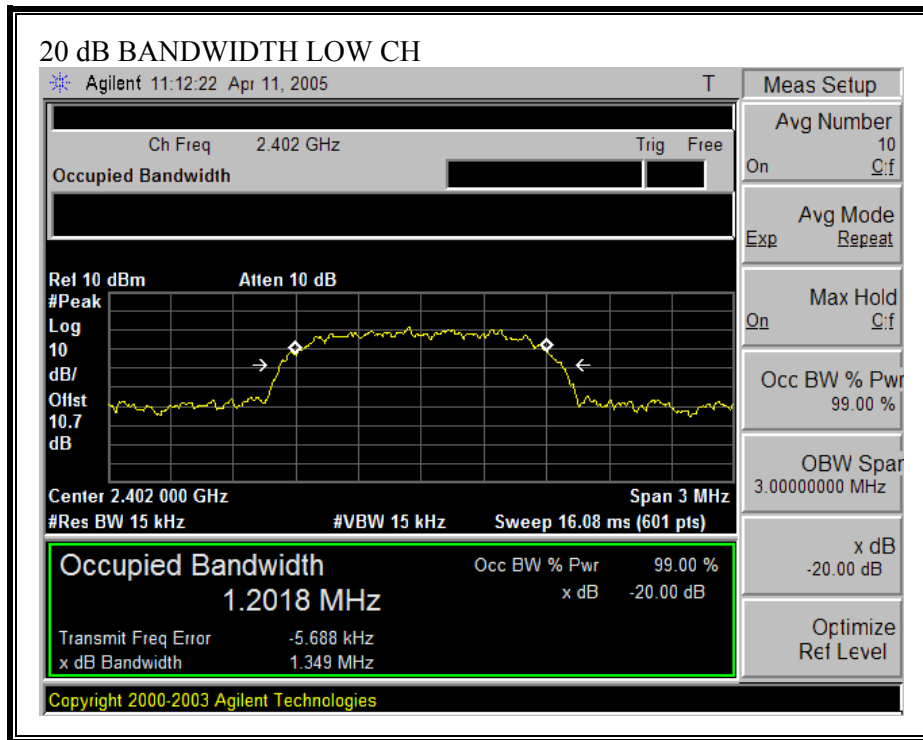
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set equal to the RBW. The sweep time is coupled.

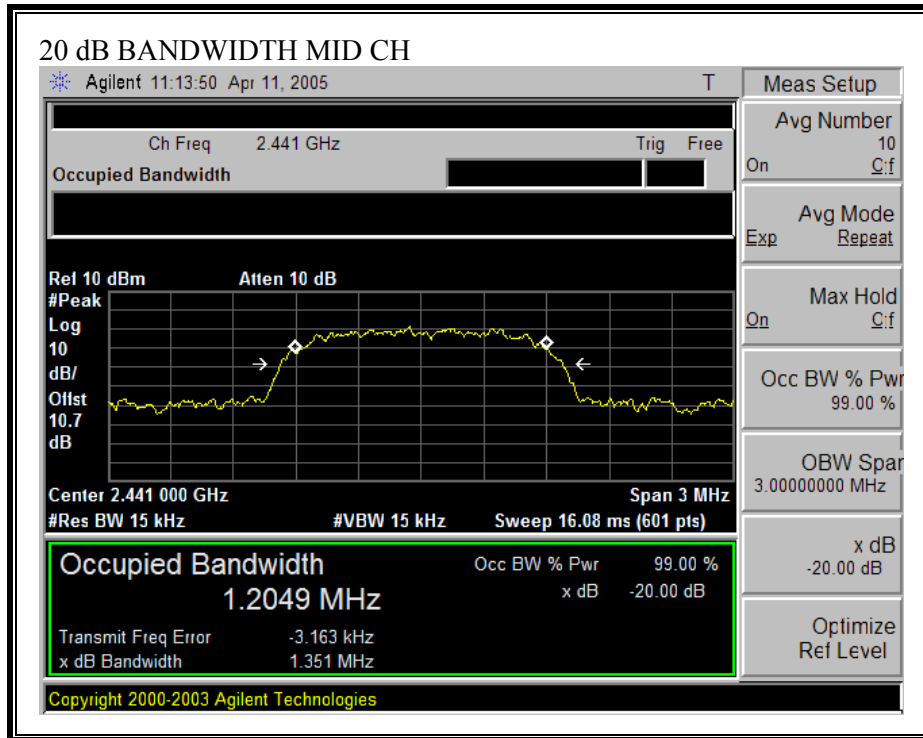
RESULTS

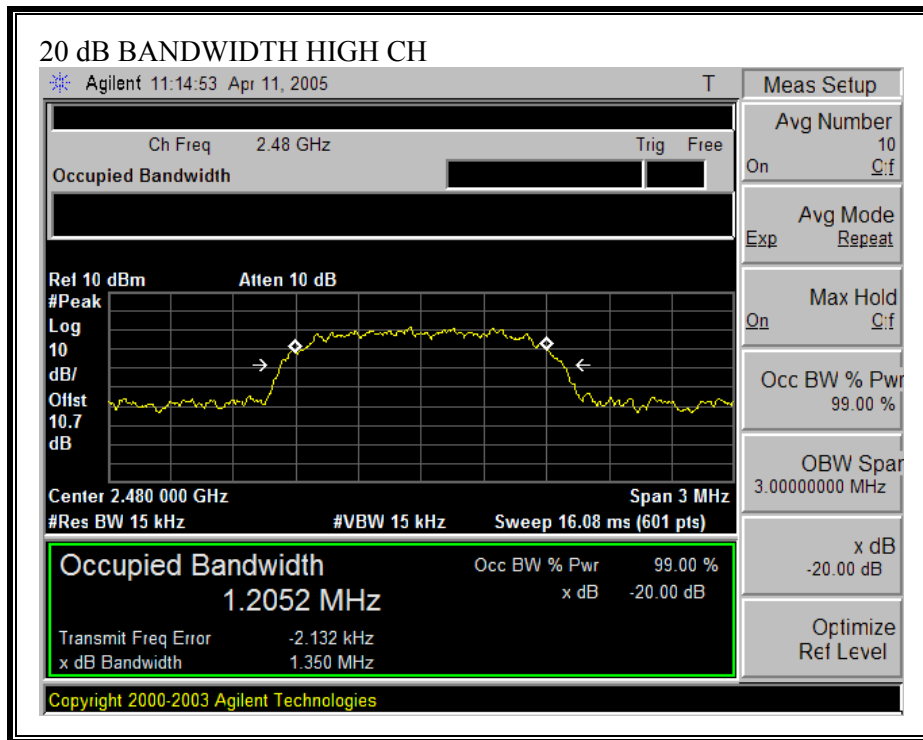
No non-compliance noted:

8PSK

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1349
Middle	2441	1351
High	2480	1350







7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

§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.

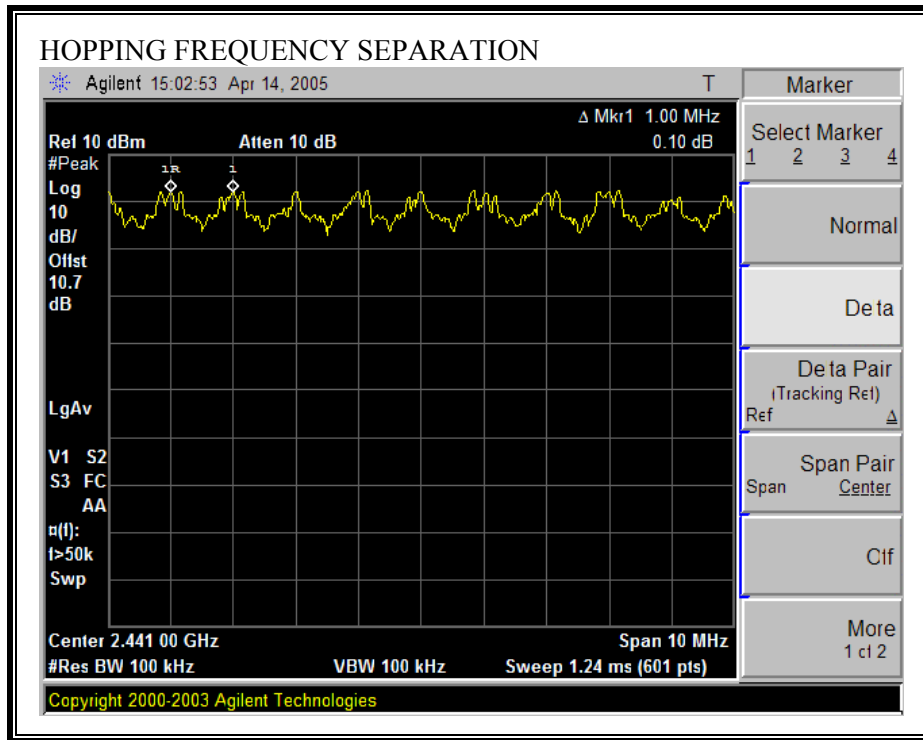
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

HOPPING FREQUENCY SEPARATION



7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

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 PROCEDURE

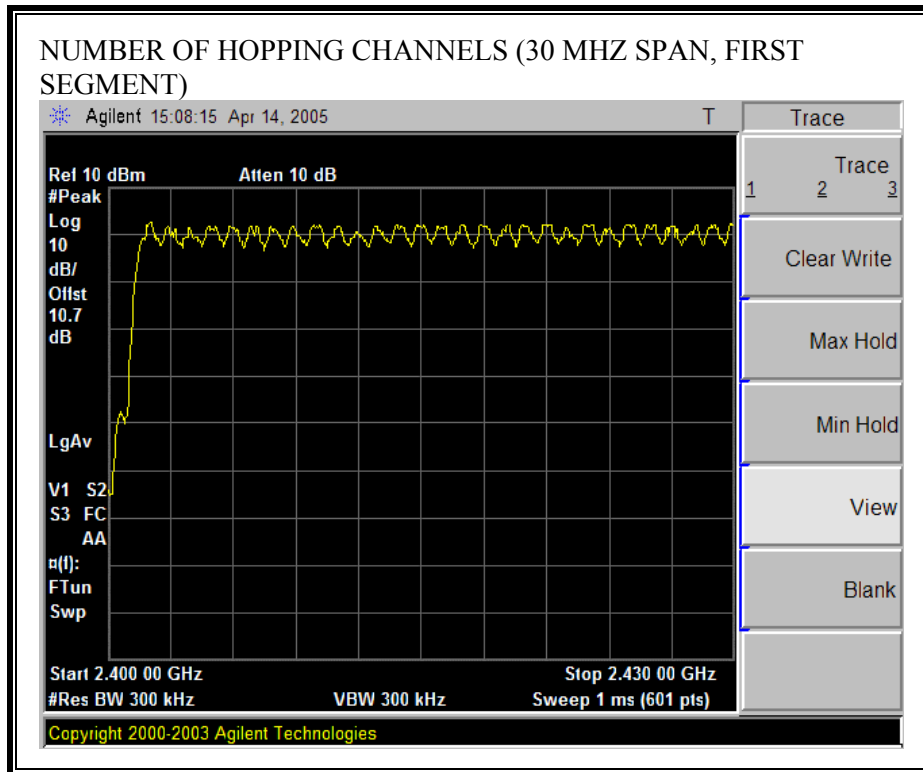
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

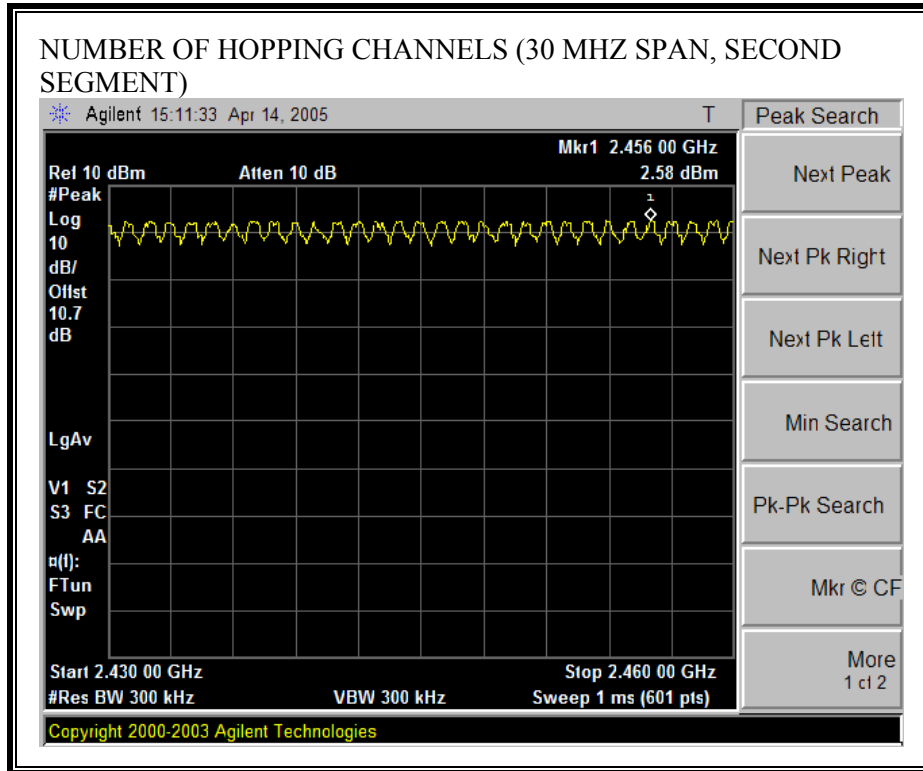
RESULTS

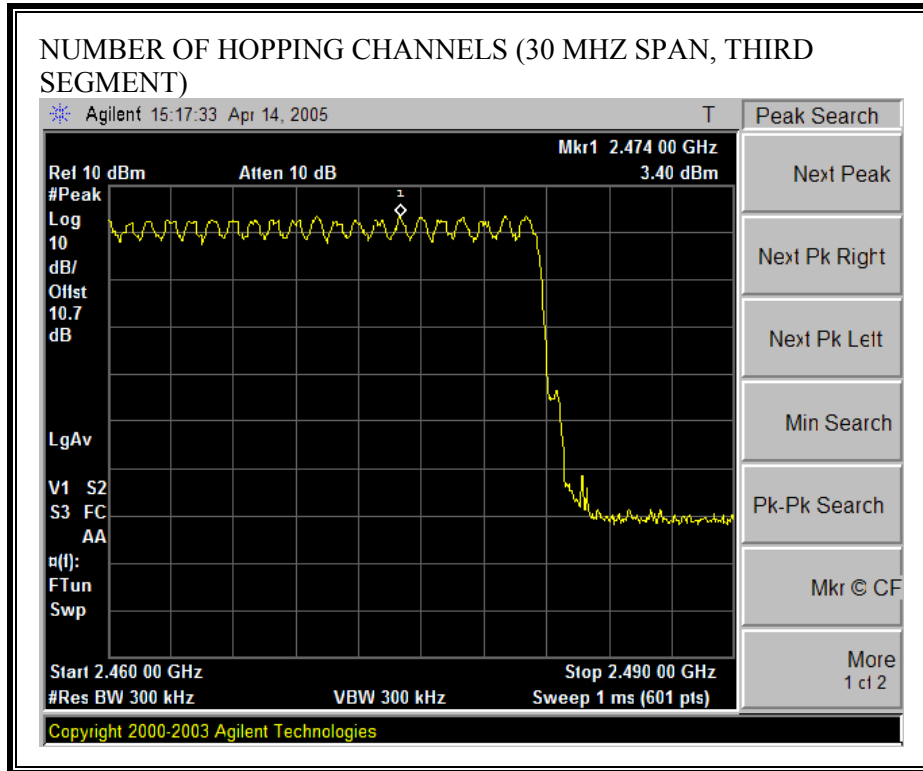
No non-compliance noted:

79 Channels observed.

NUMBER OF HOPPING CHANNELS







7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

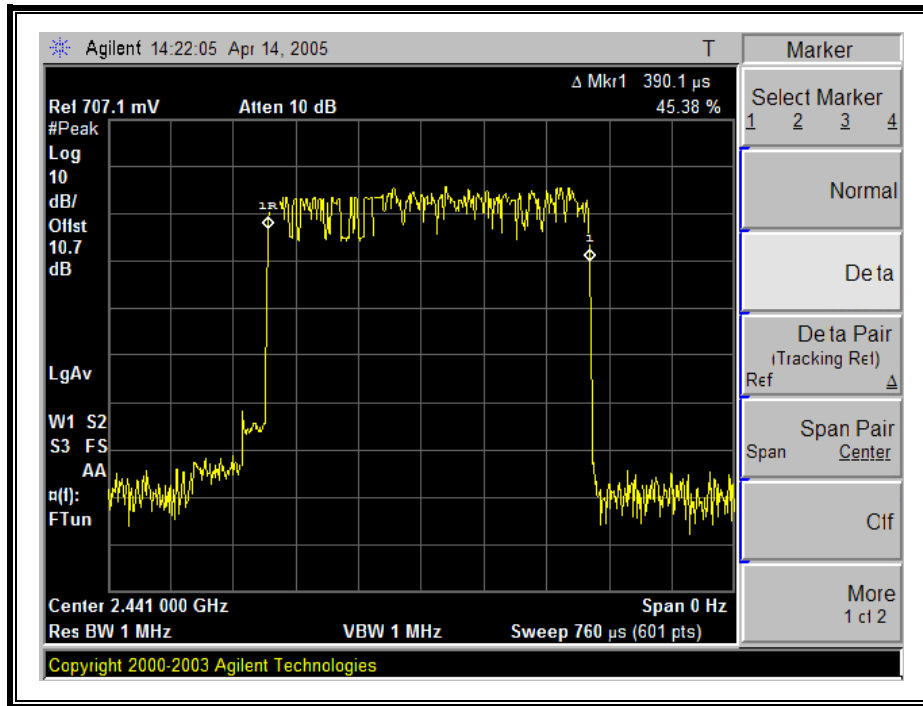
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

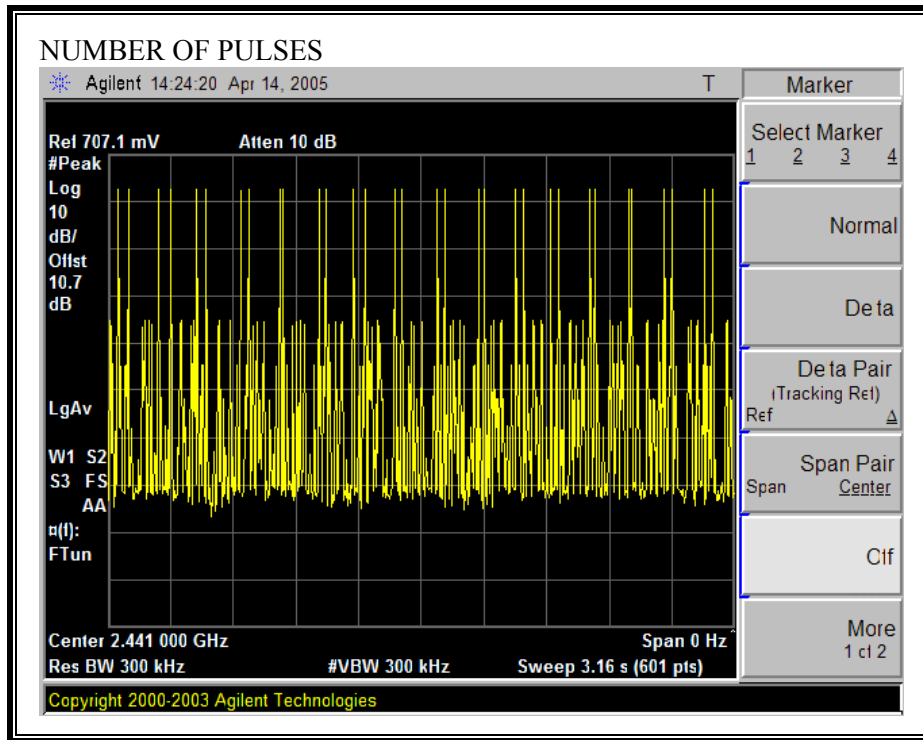
No non-compliance noted:

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
1	0.39	32	0.125	0.4	0.275
3	1.645	17	0.280	0.4	0.120
5	2.892	13	0.376	0.4	0.024

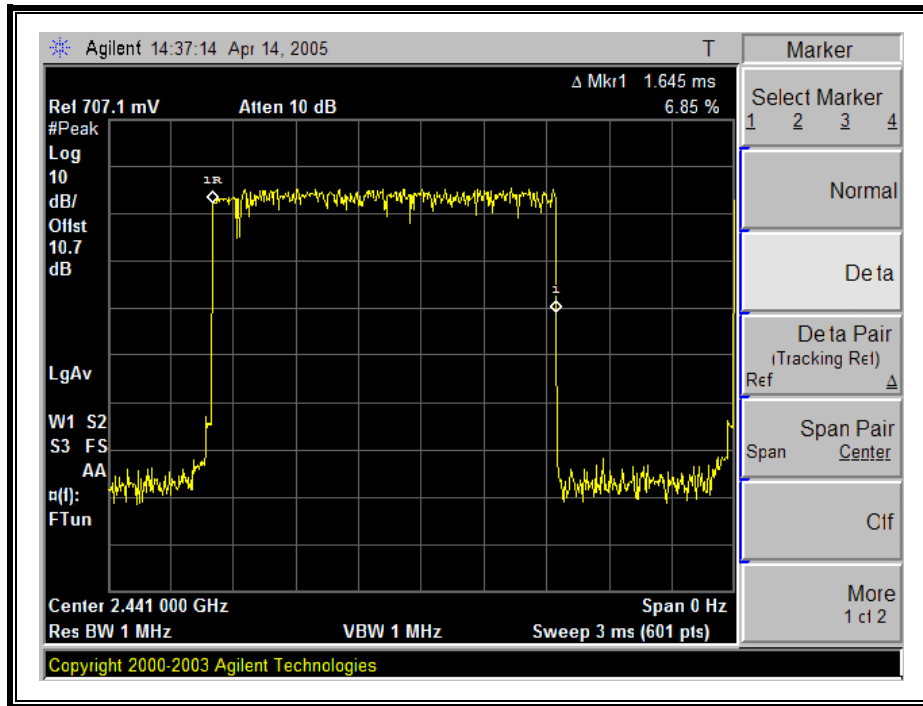
PULSE WIDTH (DH1 PACKET TYPE)



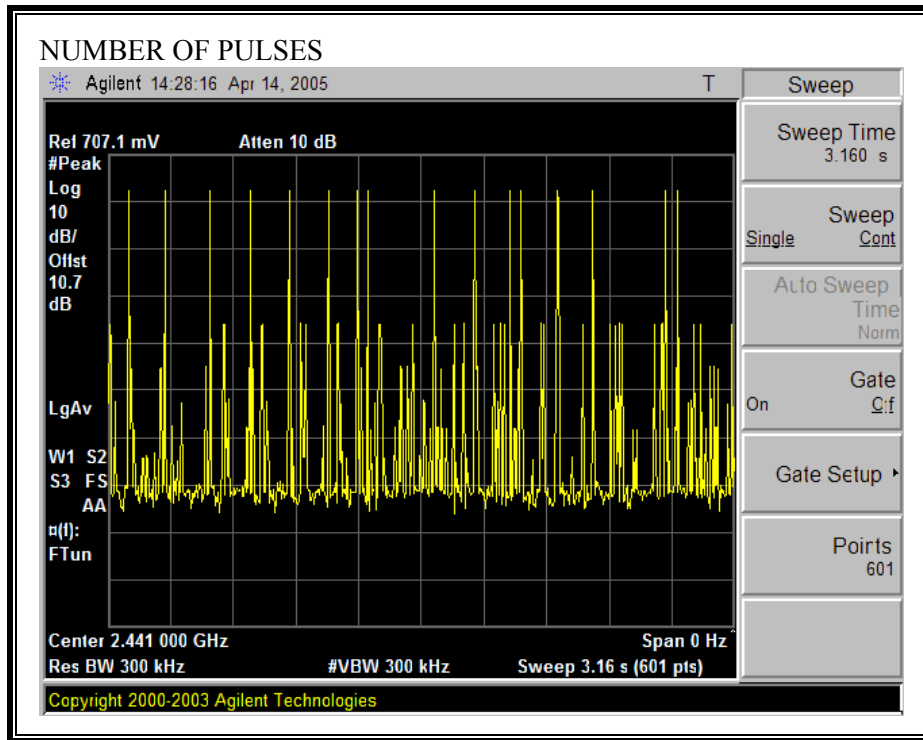
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



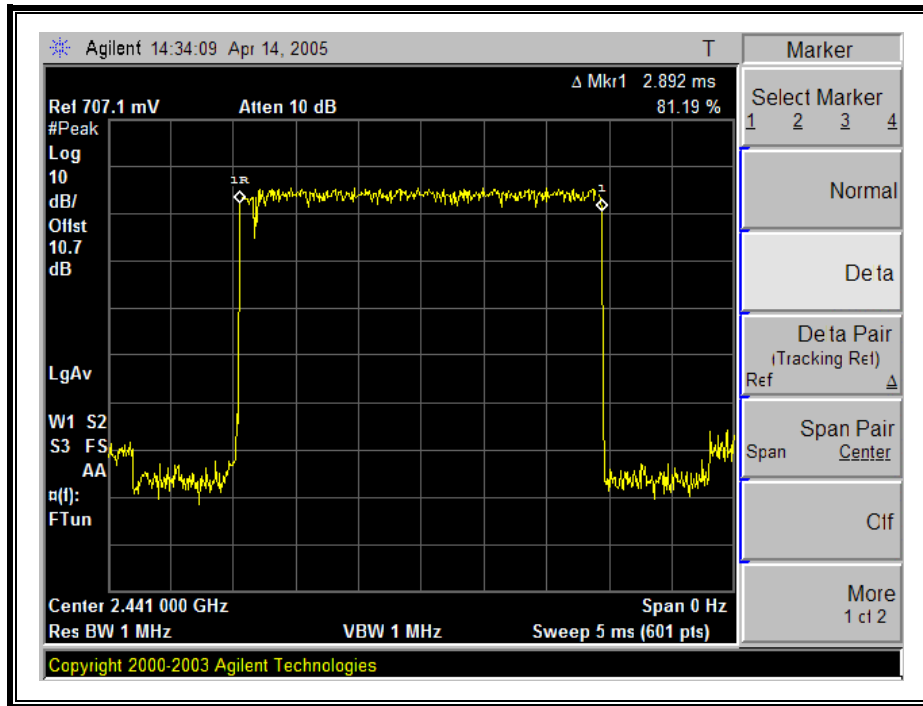
PULSE WIDTH (DH3 PACKET TYPE)



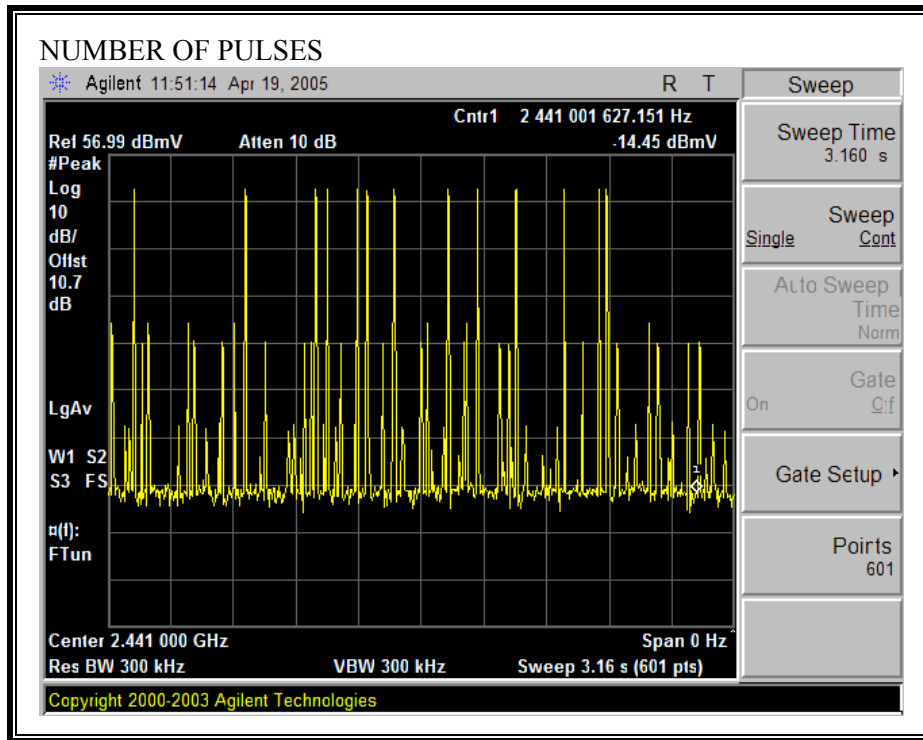
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



PULSE WIDTH (DH5 PACKET TYPE)



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.2.5. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 2.2 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

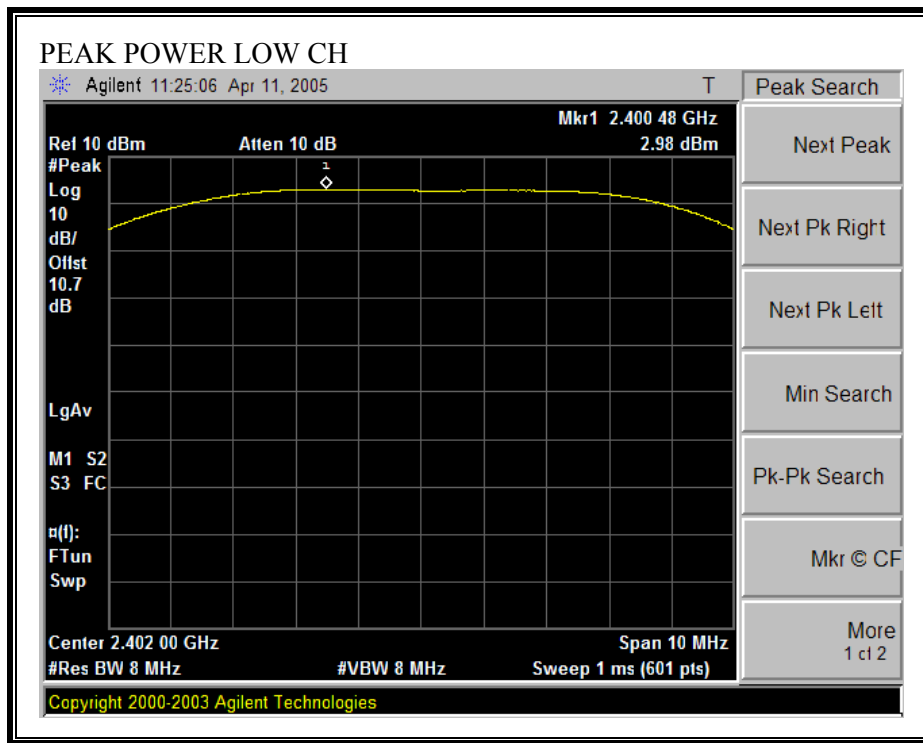
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

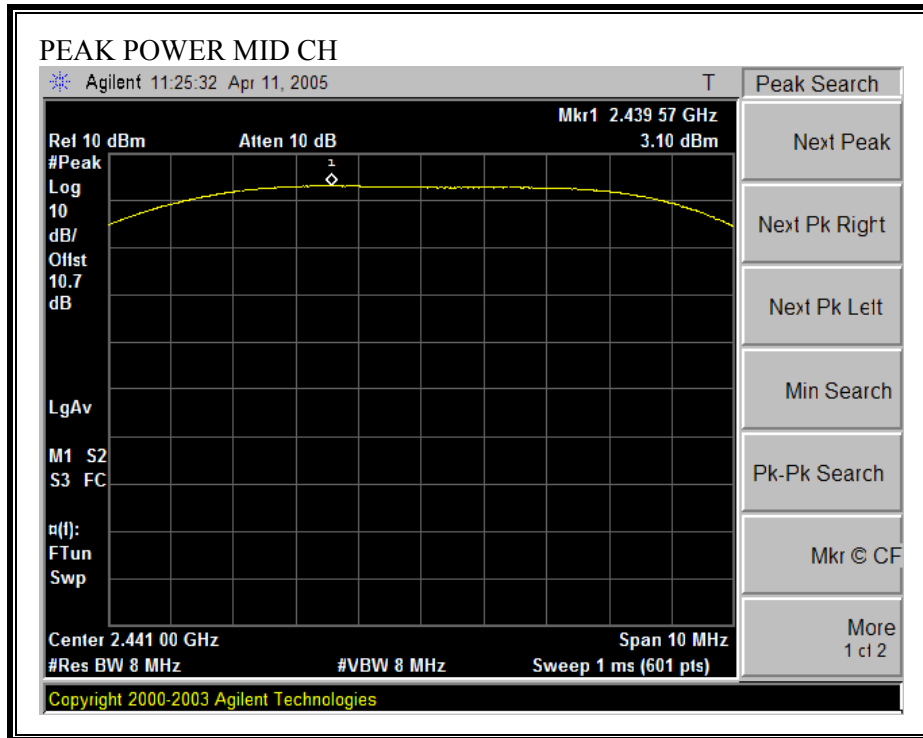
RESULTS

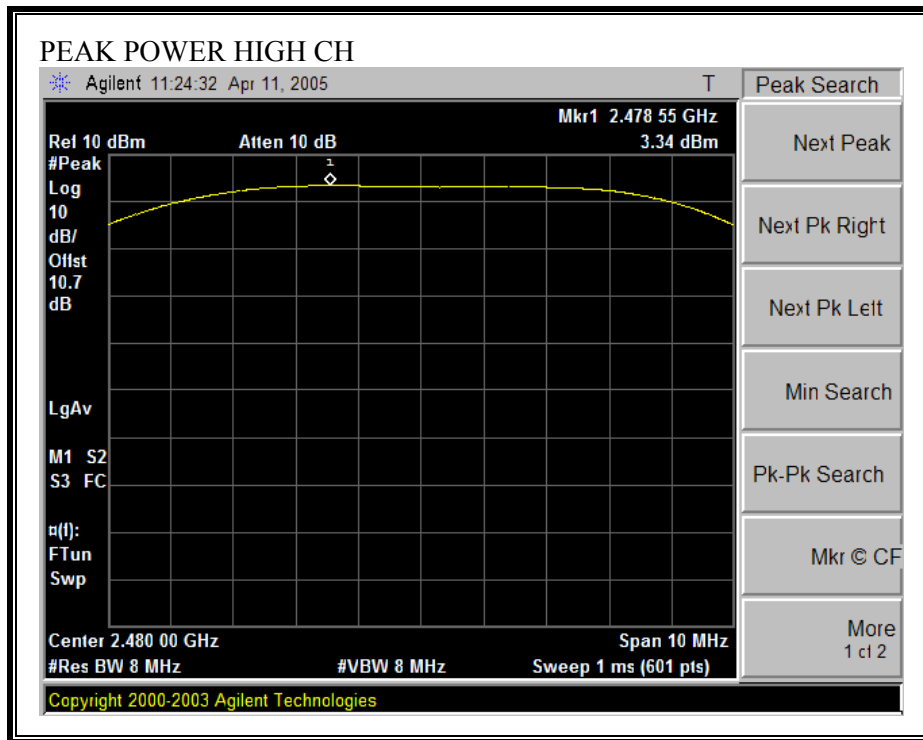
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.98	30	-27.02
Middle	2441	3.10	30	-26.90
High	2480	3.34	30	-26.66

OUTPUT POWER







7.2.6. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-0.13
Middle	2441	0.20
High	2480	0.50

7.2.7. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

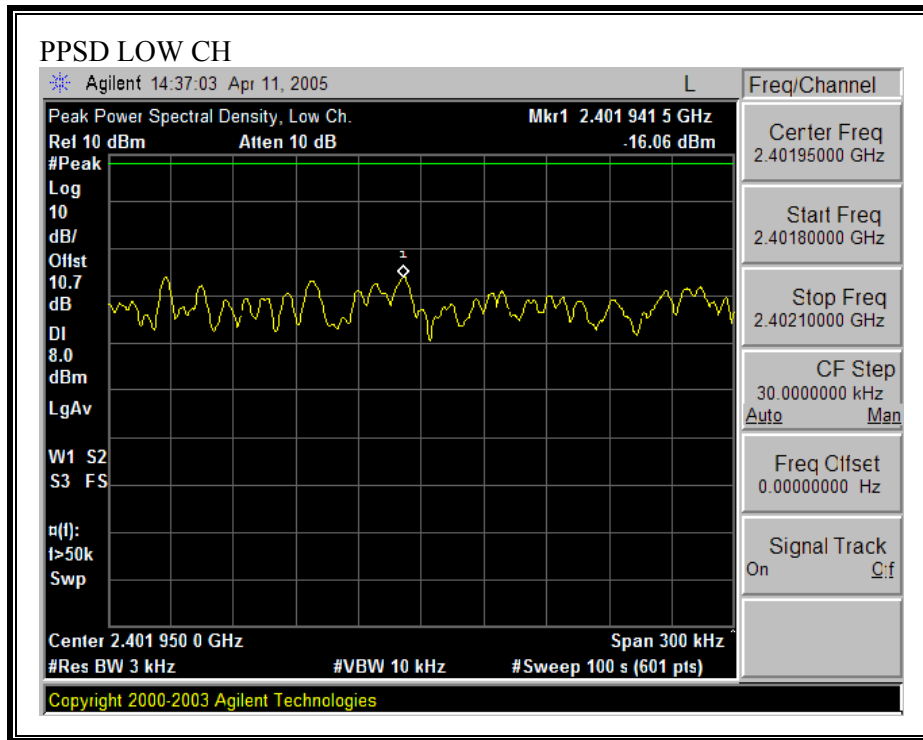
TEST PROCEDURE

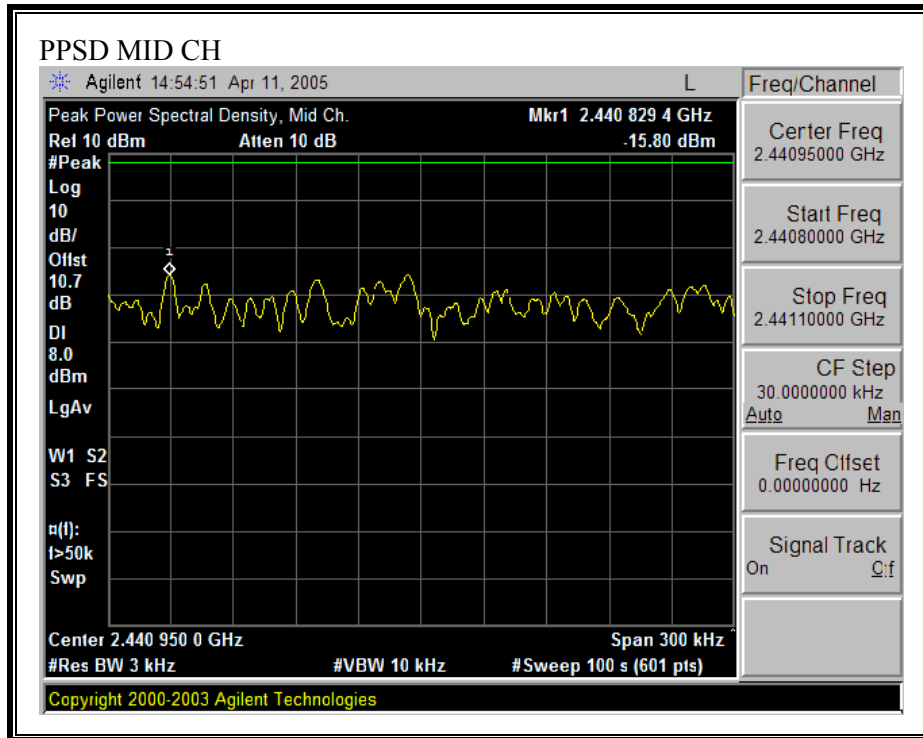
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

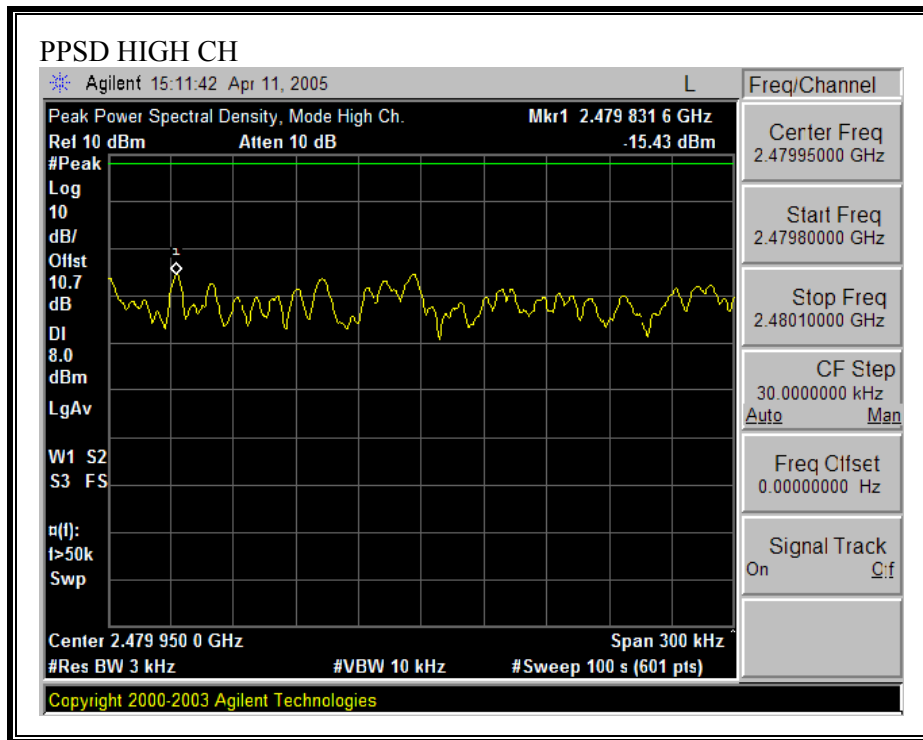
RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-16.06	8	-24.06
Middle	2441	-15.80	8	-23.80
High	2480	-15.43	8	-23.43







7.2.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band 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. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c)).

TEST PROCEDURE

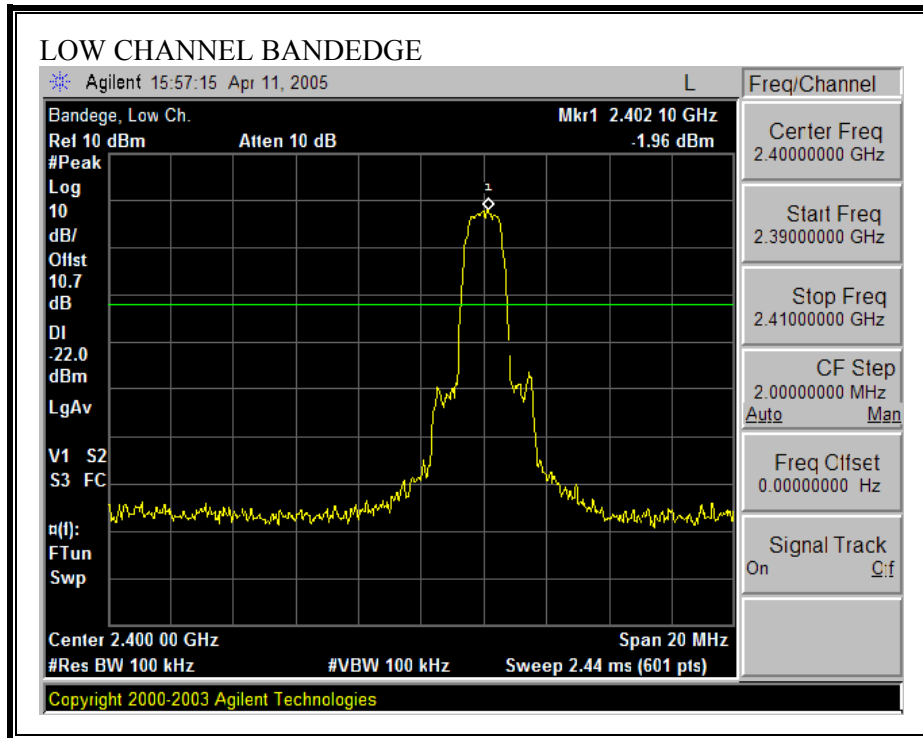
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

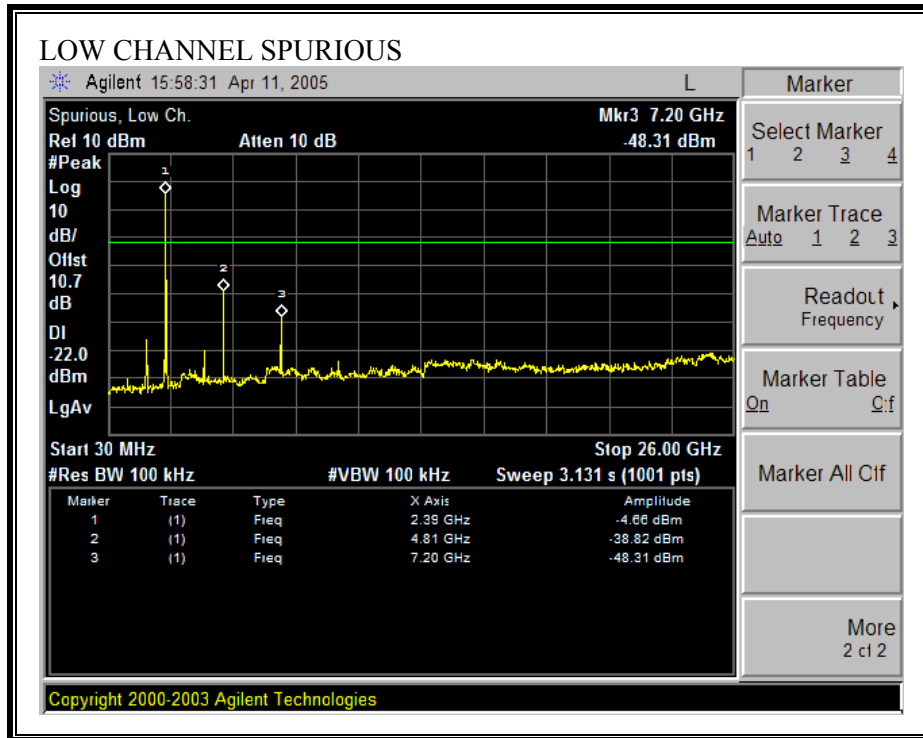
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

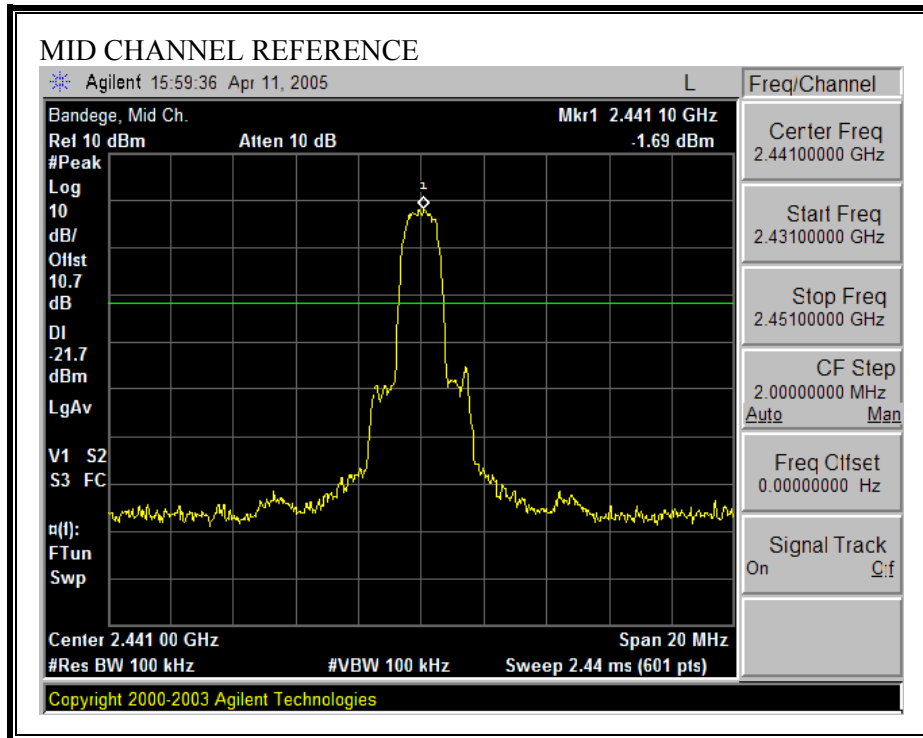
No non-compliance noted:

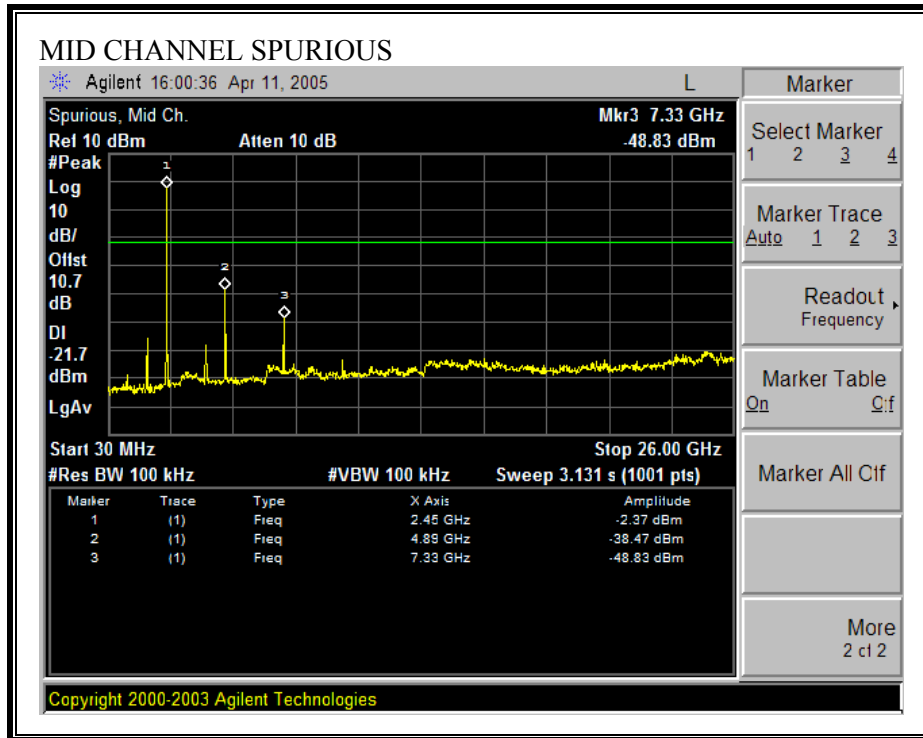
SPURIOUS EMISSIONS, LOW CHANNEL



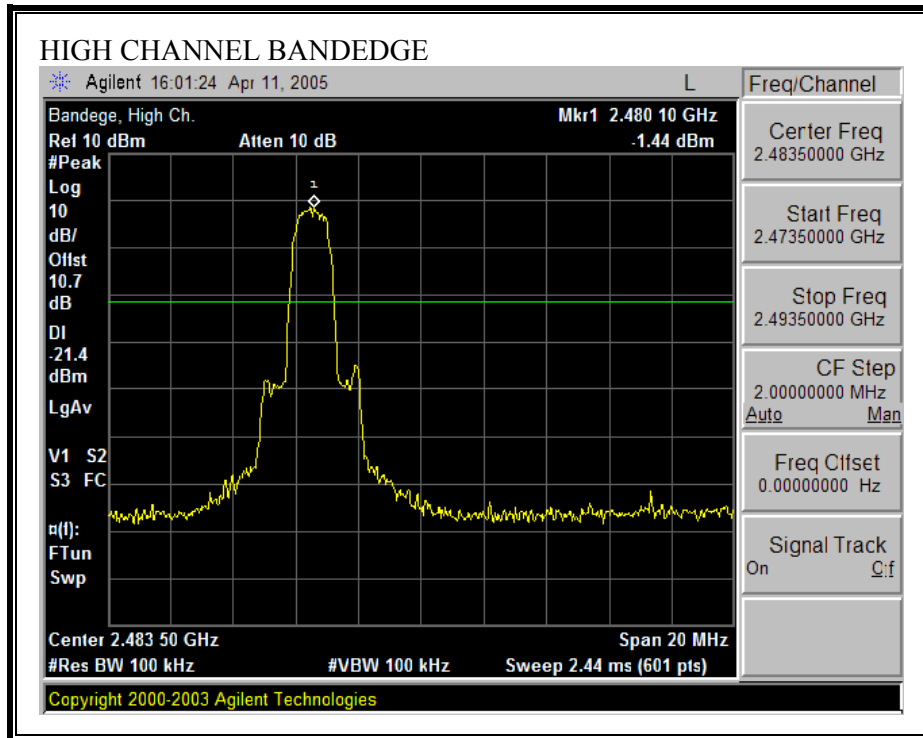


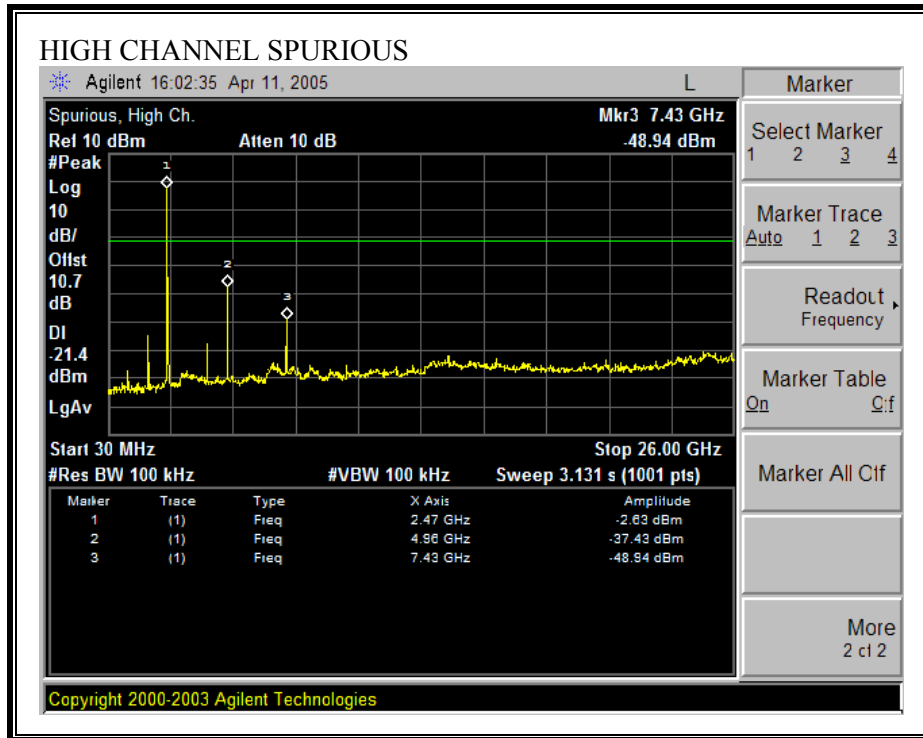
SPURIOUS EMISSIONS, MID CHANNEL



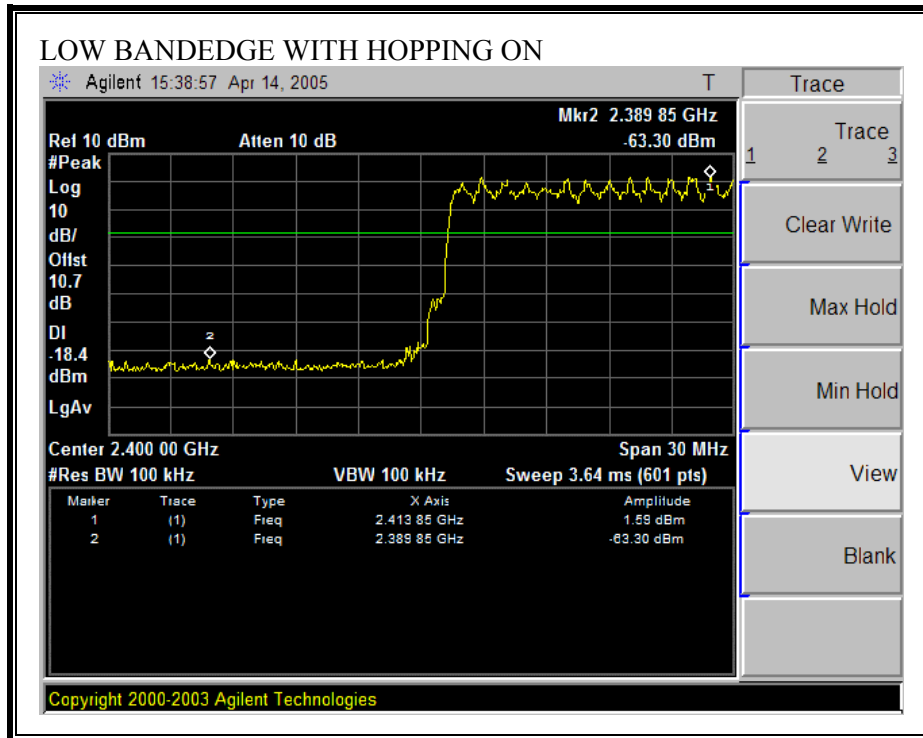


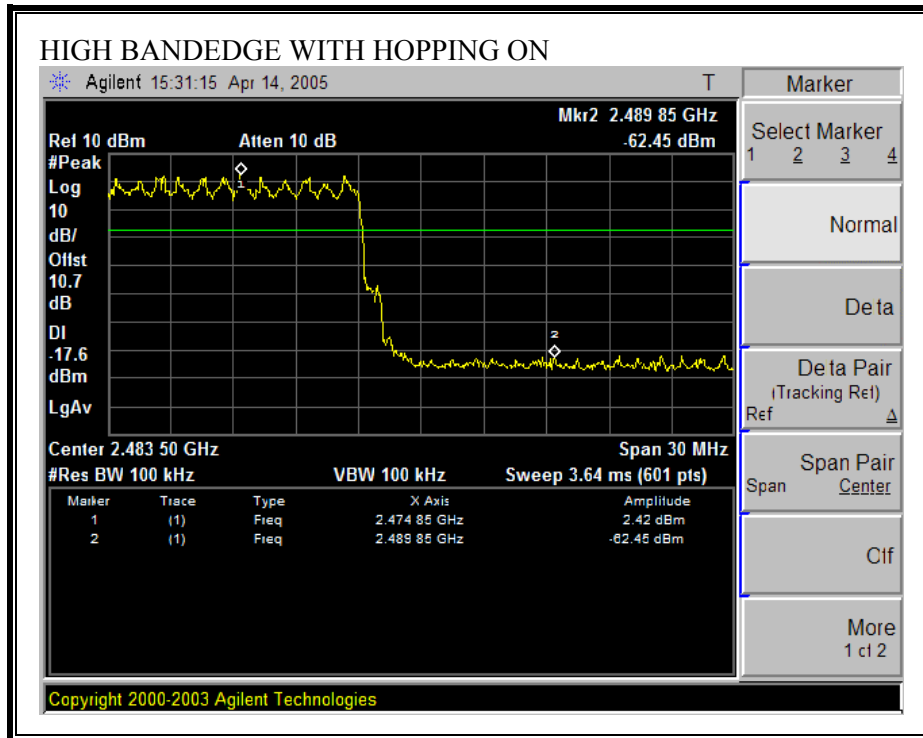
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.3. RADIATED EMISSIONS

7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (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*
¹ 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

*: 4.5 – 5.25 per Standard LP0002.

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (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.

§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 (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** 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.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

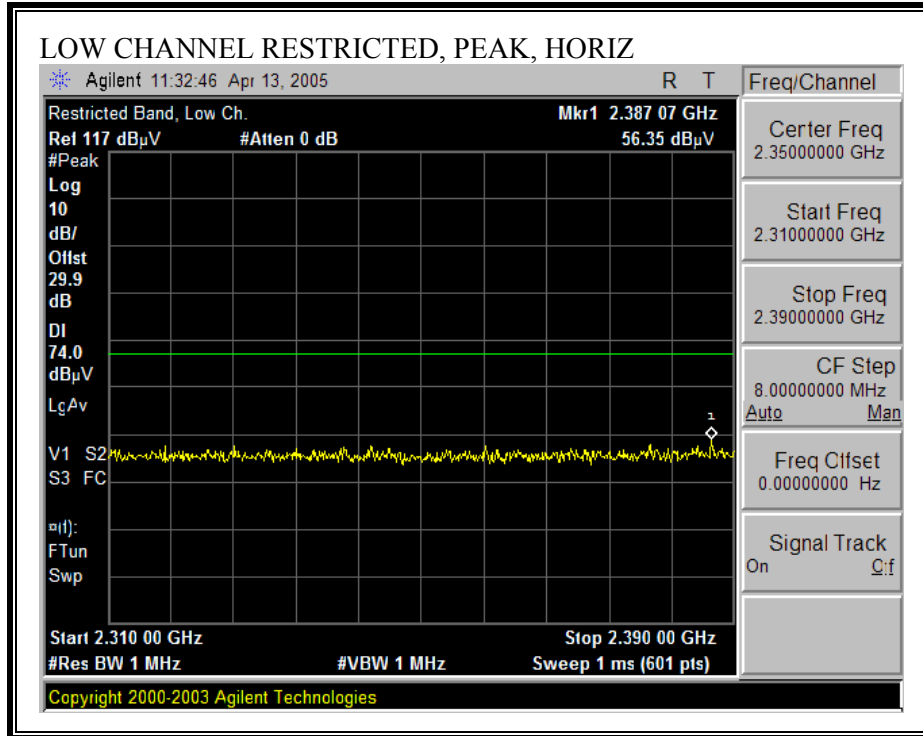
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

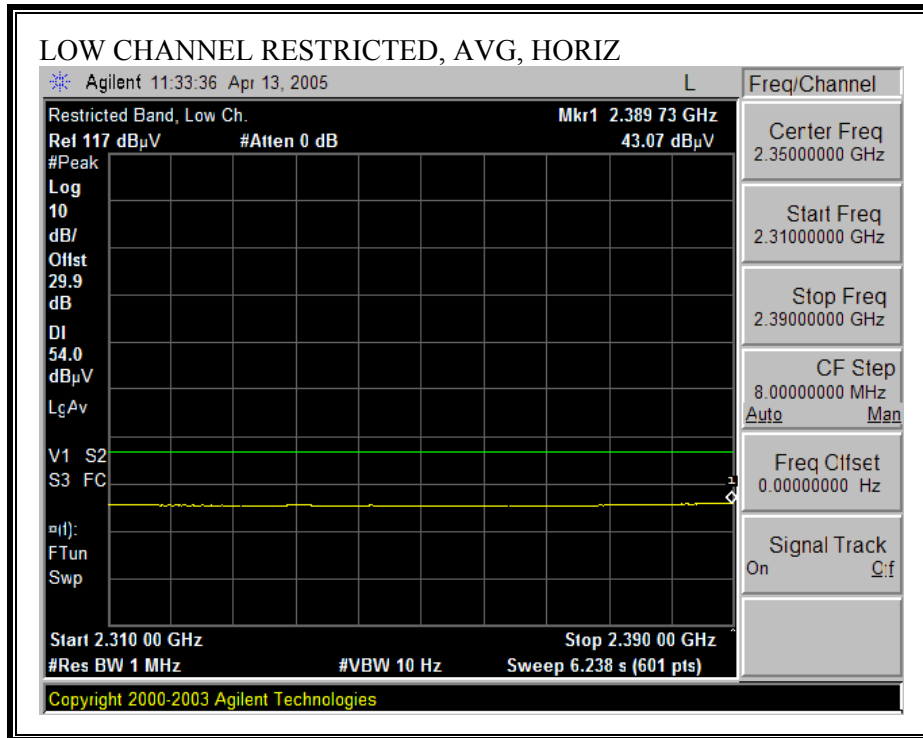
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

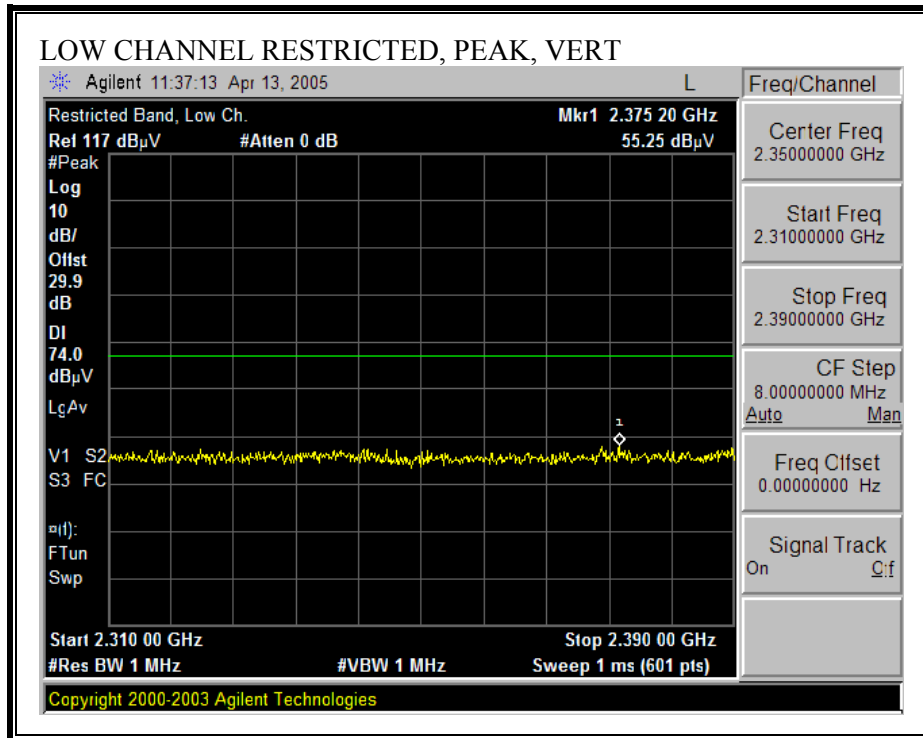
7.3.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz WITH GFSK MODULATION

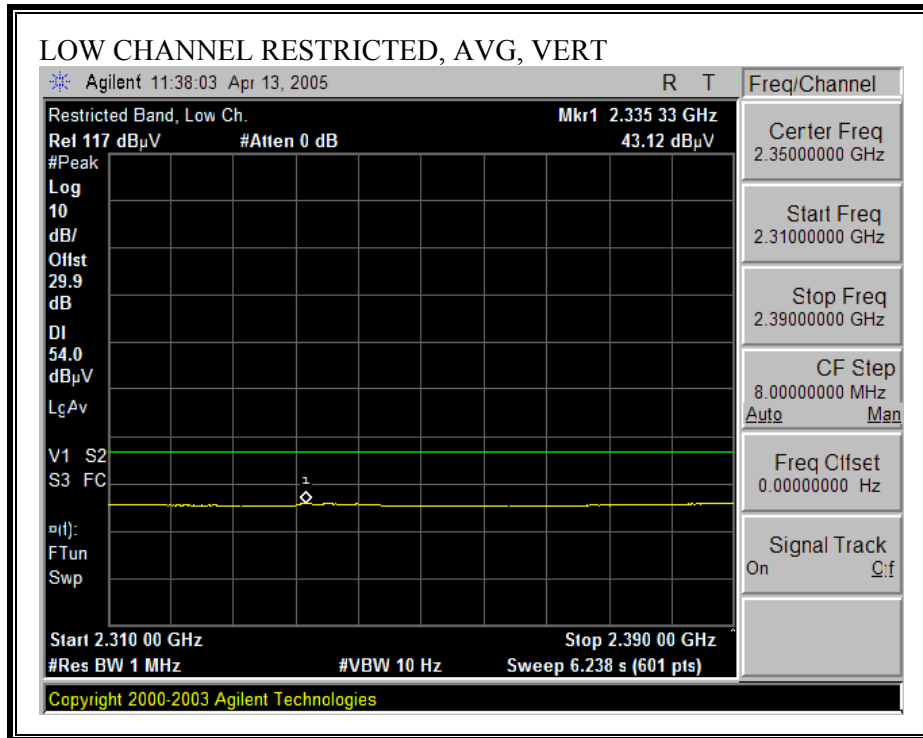
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



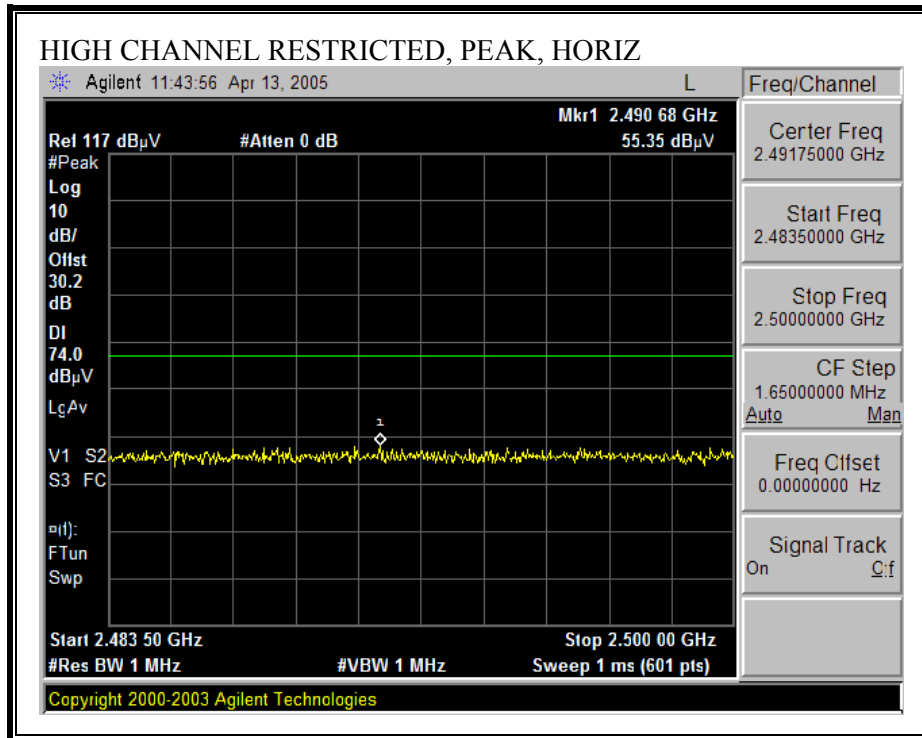


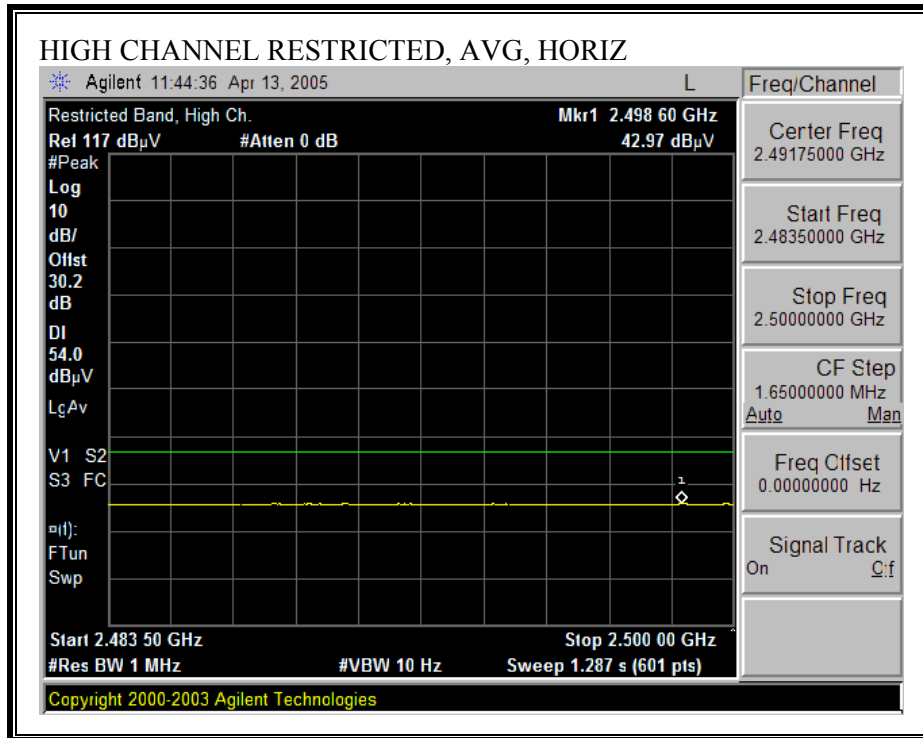
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



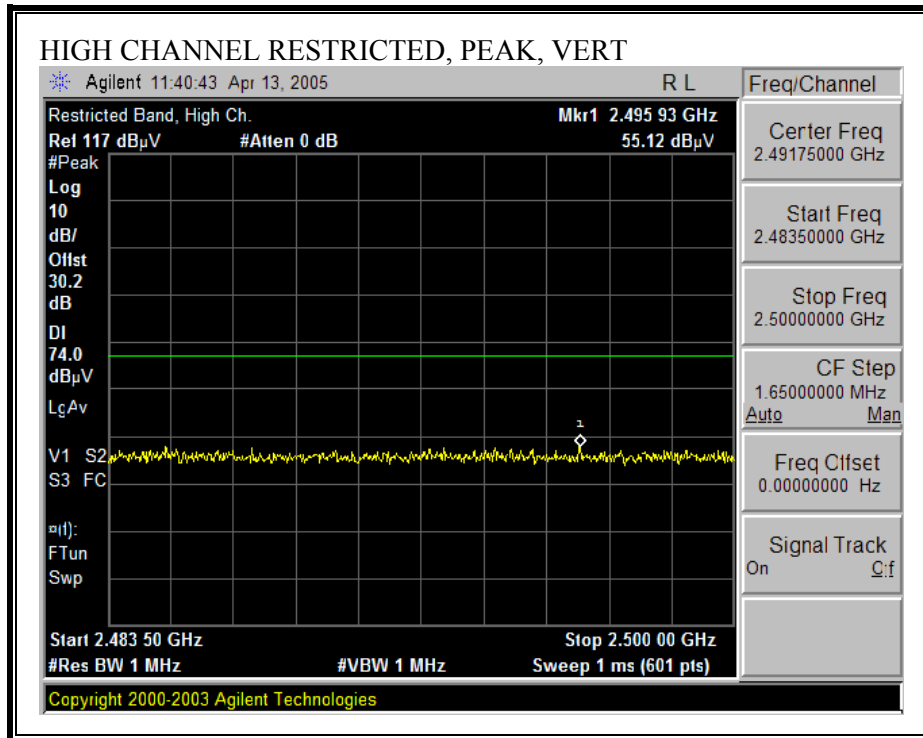


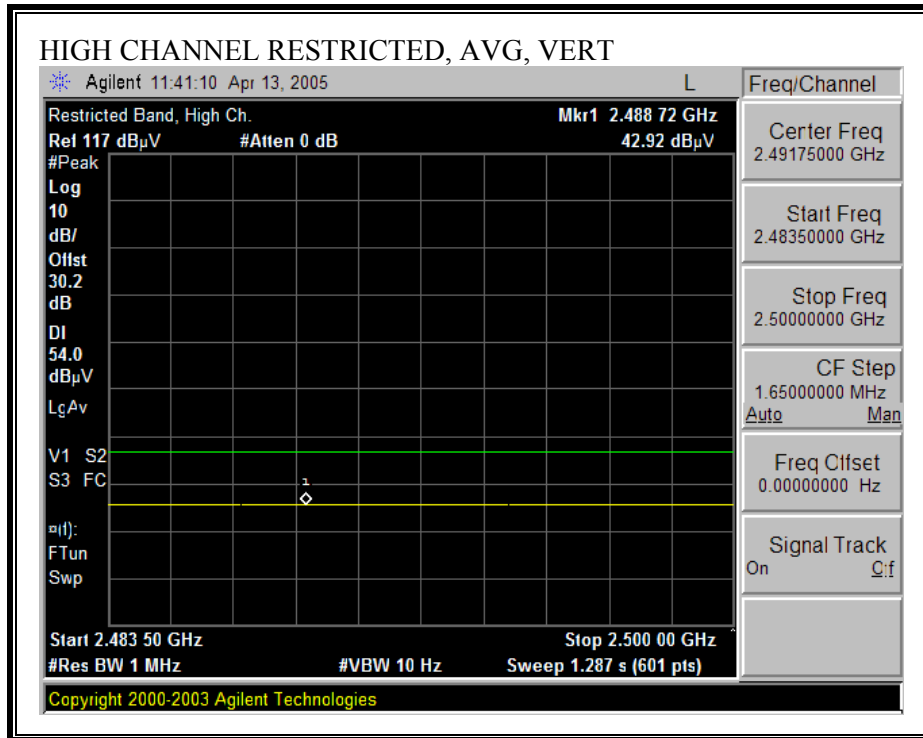
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

4/13/2005 **High Frequency Measurement**
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Vien Tran
 Project #: 05U3354-1
 Company: Broadcom
 EUT Descrip.: USB Bluetooth EDR Module
 EUT M/N: BCM92045NMD
 Test Target: FCC Class B
 Mode Oper: Tx_GFSK_Low / Mid / Hi channels_Harmonic & Spur

Test Equipment:

EMCO Horn 1-18GHz
 T73; S/N: 6717 @3m

Pre-amplifier 1-26GHz
 T34 HP 8449B

Pre-amplifier 26-40GHz

Horn > 18GHz

Hi Frequency Cables
 2 foot cable
 3 foot cable
 4 foot cable
 12 foot cable

4_Vien
 12_Vien

HPF
 HPF_4.6GHz

Reject Filter

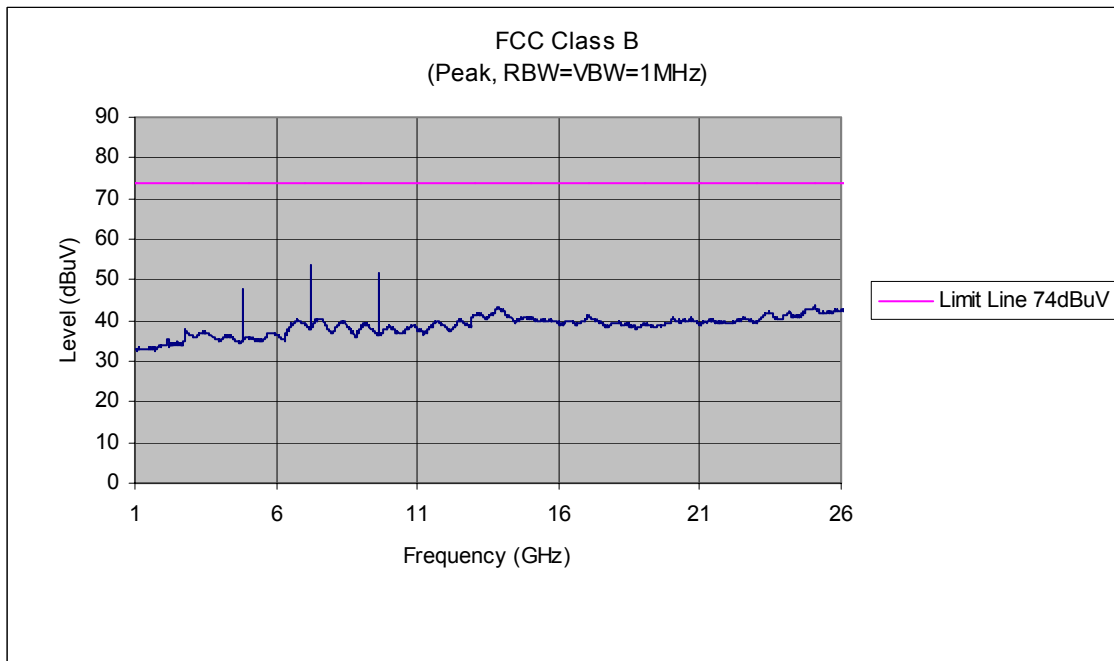
Peak Measurements
 RBW=VBW=1MHz

Average Measurements
 RBW=1MHz ; VBW=10Hz

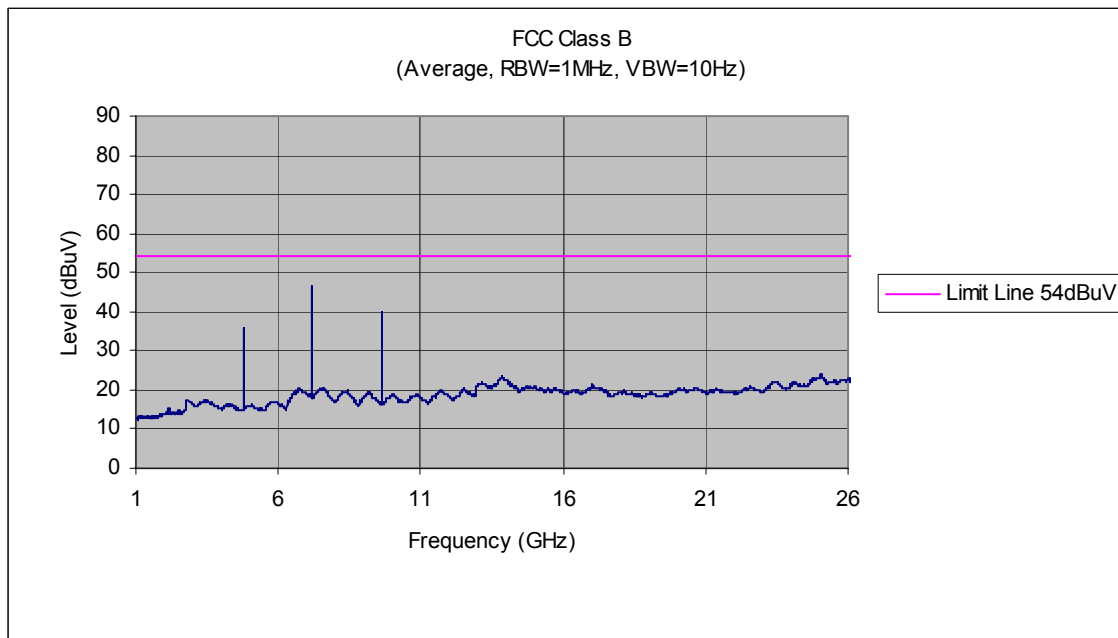
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL															
4.804	3.0	42.7	30.8	32.9	3.4	-33.6	0.0	2.4	47.8	35.9	74	54	-26.2	-18.1	H
7.206	3.0	46.0	38.6	35.7	3.9	-33.3	0.0	1.4	53.7	46.3	74	54	-20.3	-7.7	H
9.608	3.0	42.7	31.0	37.5	4.4	-33.9	0.0	0.9	51.6	39.9	74	54	-22.4	-14.1	H, Noise floor
4.804	3.0	42.0	30.5	32.9	3.4	-33.6	0.0	2.4	47.1	35.6	74	54	-26.9	-18.4	V
7.206	3.0	44.0	35.8	35.7	3.9	-33.3	0.0	1.4	51.7	43.5	74	54	-22.3	-10.5	V
9.608	3.0	42.0	32.1	37.5	4.4	-33.9	0.0	0.9	50.9	41.0	74	54	-23.1	-13.0	V, Noise floor
MID CHANNEL															
4.882	3.0	45.1	35.4	32.9	3.4	-33.5	0.0	2.5	50.4	40.7	74	54	-23.6	-13.3	H
7.323	3.0	47.0	38.7	35.9	3.9	-33.3	0.0	1.4	54.9	46.6	74	54	-19.1	-7.4	H
9.764	3.0	42.4	30.9	37.6	4.6	-34.0	0.0	0.9	51.4	39.9	74	54	-22.6	-14.1	H, Noise floor
4.882	3.0	43.6	33.9	32.9	3.4	-33.5	0.0	2.5	48.9	39.2	74	54	-25.1	-14.8	V
7.323	3.0	45.0	35.3	35.9	3.9	-33.3	0.0	1.4	52.9	43.2	74	54	-21.1	-10.8	V
9.764	3.0	43.2	30.8	37.6	4.6	-34.0	0.0	0.9	52.2	39.8	74	54	-21.8	-14.2	V, Noise floor
HI CHANNEL															
4.960	3.0	46.3	39.9	33.0	3.5	-33.5	0.0	2.5	51.8	45.4	74	54	-22.2	-8.6	H
7.440	3.0	45.0	36.9	36.1	3.9	-33.3	0.0	1.4	53.1	45.0	74	54	-20.9	-9.0	H
9.920	3.0	42.0	31.6	37.6	4.7	-34.0	0.0	0.9	51.1	40.7	74	54	-22.9	-13.3	H, Noise floor
4.960	3.0	44.7	37.0	33.0	3.5	-33.5	0.0	2.5	50.2	42.5	74	54	-23.8	-11.5	V
7.440	3.0	45.0	34.8	36.1	3.9	-33.3	0.0	1.4	53.1	42.9	74	54	-20.9	-11.1	V
9.920	3.0	41.8	31.0	37.6	4.7	-34.0	0.0	0.9	50.9	40.1	74	54	-23.1	-13.9	V, Noise floor
NO OTHER EMISSIONS WERE DETECTED ABOVE SYSTEM NOISE FLOOR															

f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit
 Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit
 AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit
 CL Cable Loss HPF High Pass Filter

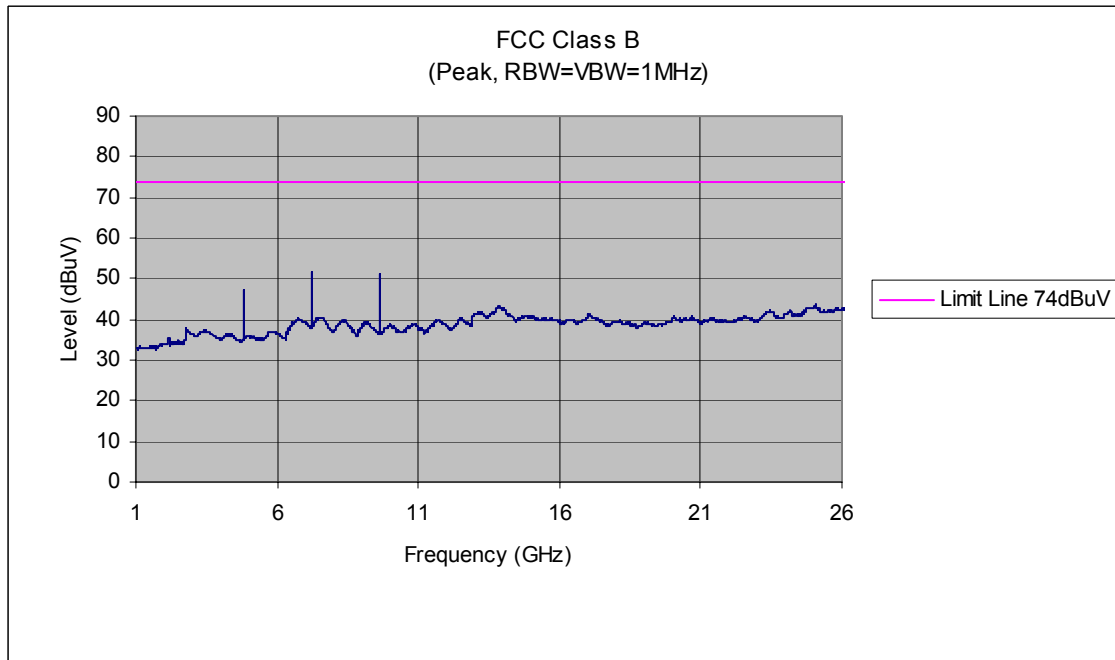
Low Channel, Peak, Horizontal



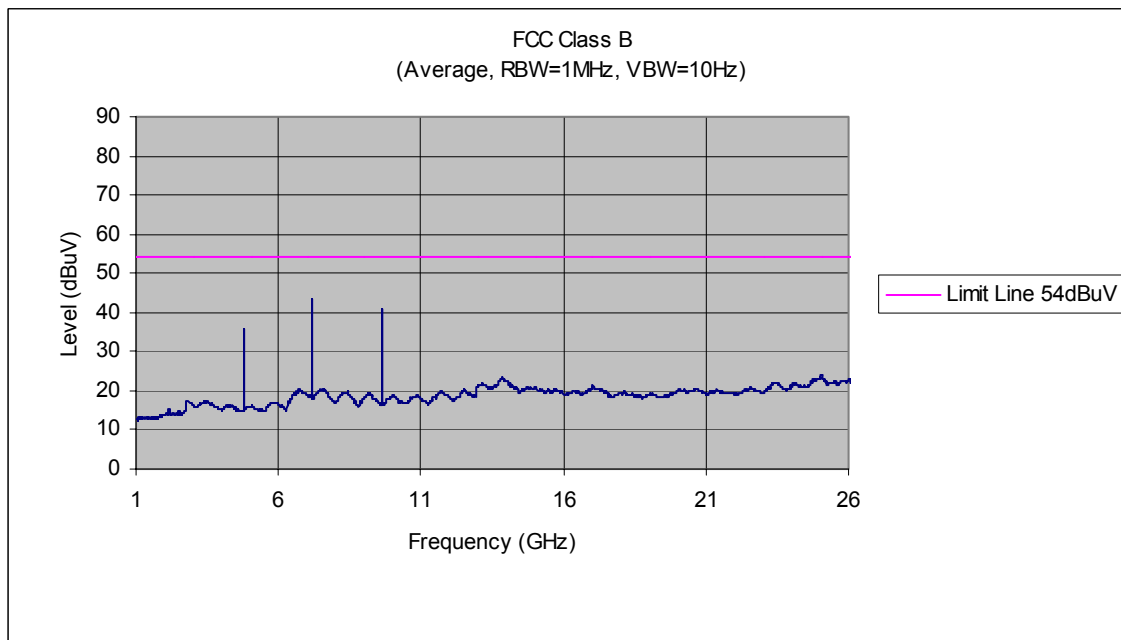
Low Channel, Average, Horizontal



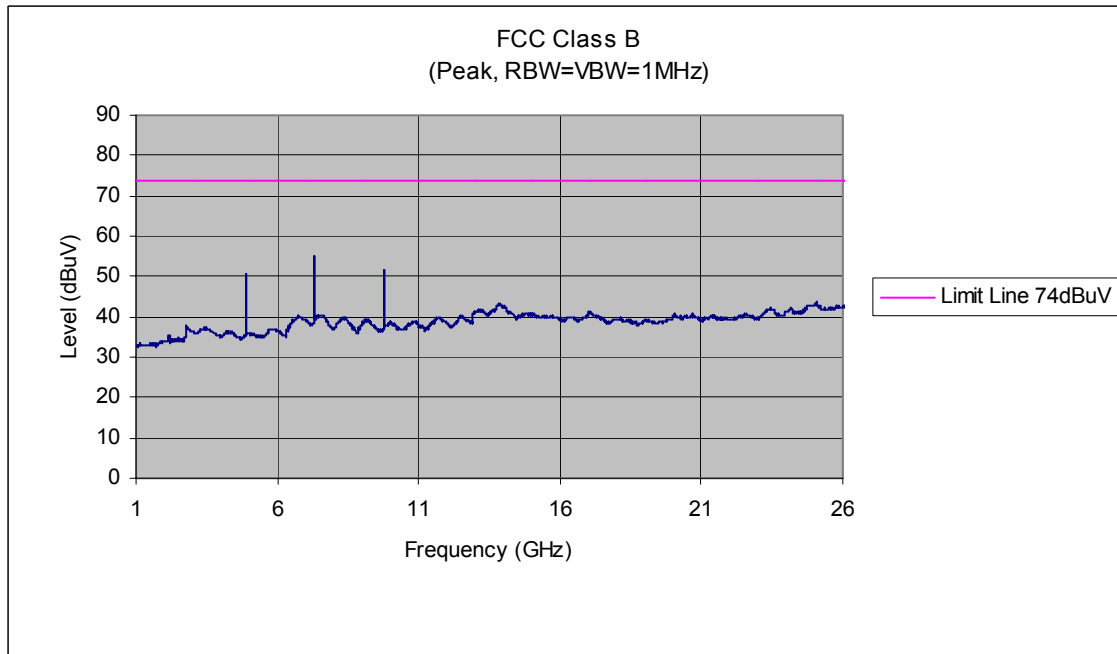
Low Channel, Peak, Vertical



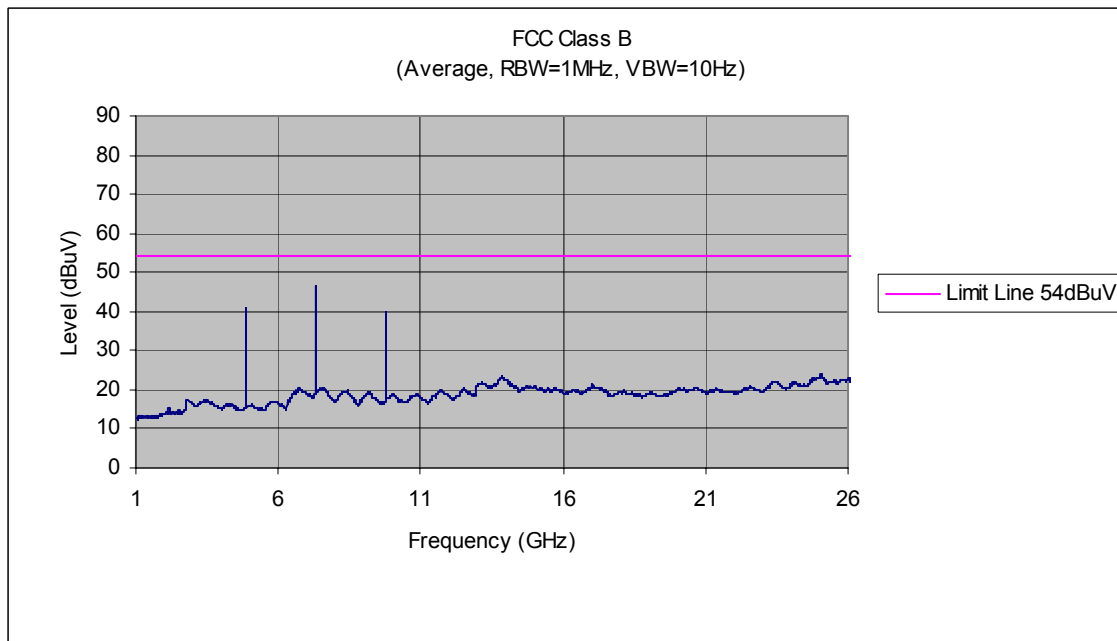
Low Channel, Average, Vertical



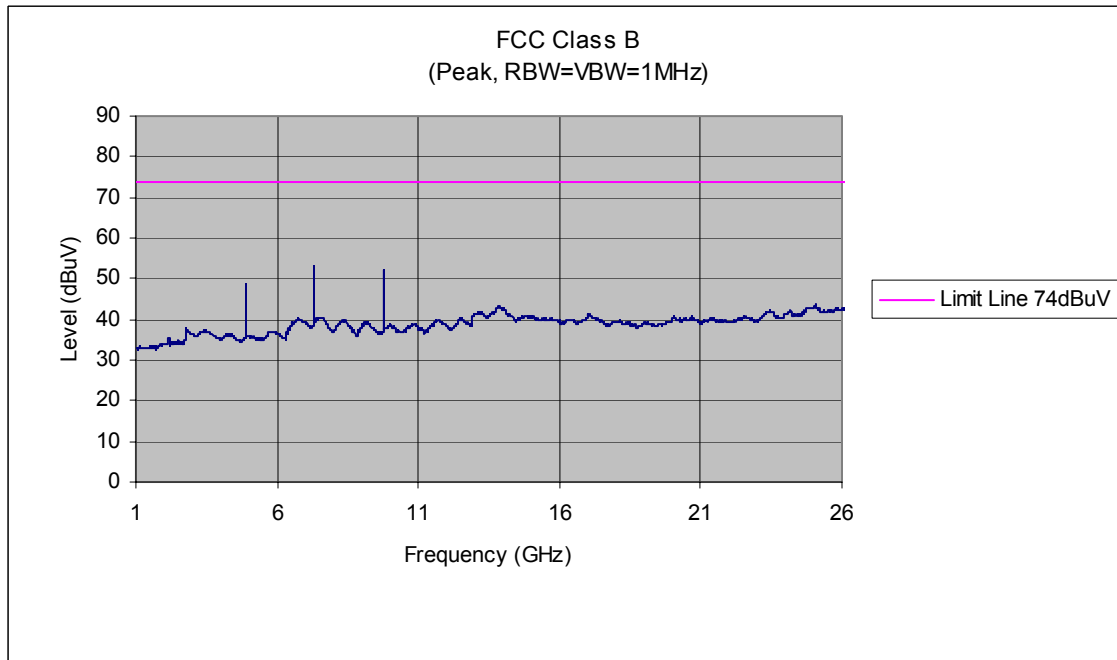
Mid Channel, Peak, Horizontal



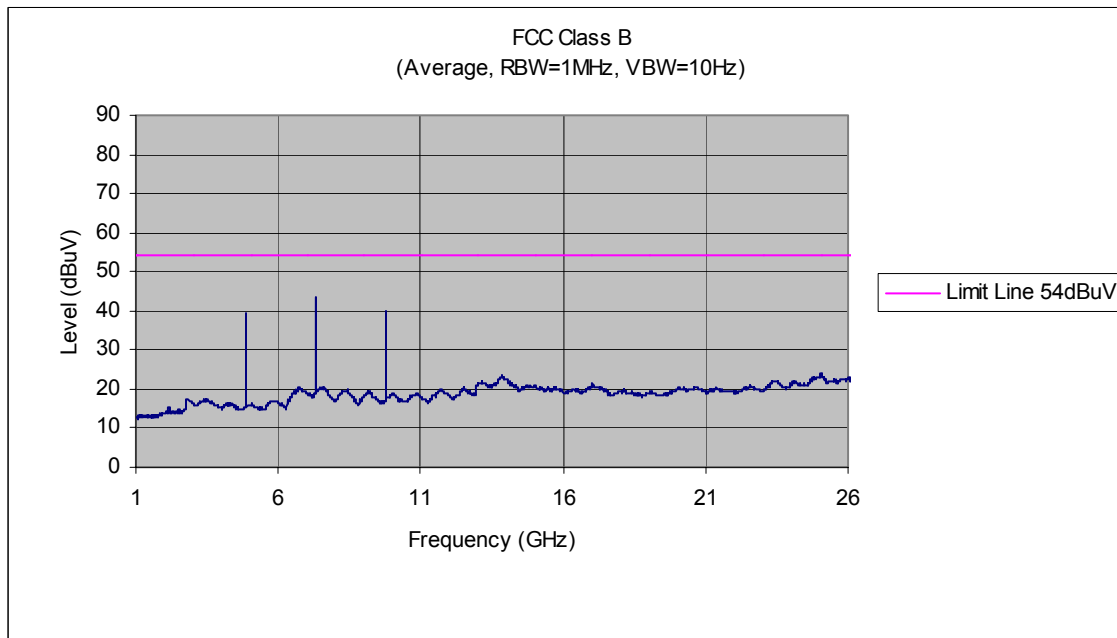
Mid Channel, Average, Horizontal



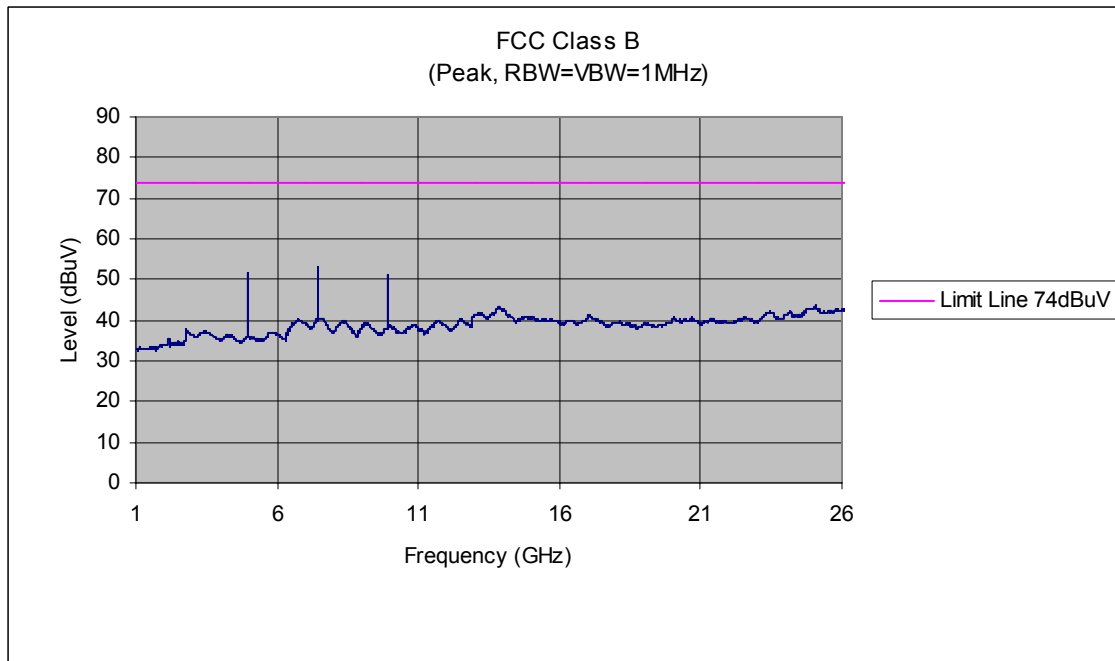
Mid Channel, Peak, Vertical



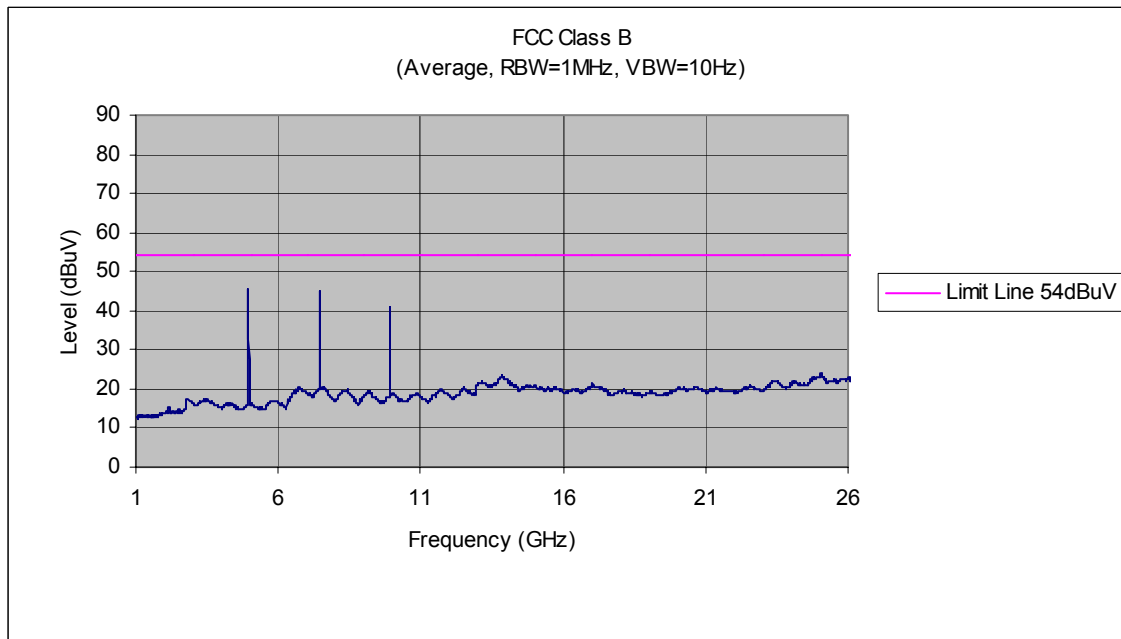
Mid Channel, Average, Vertical



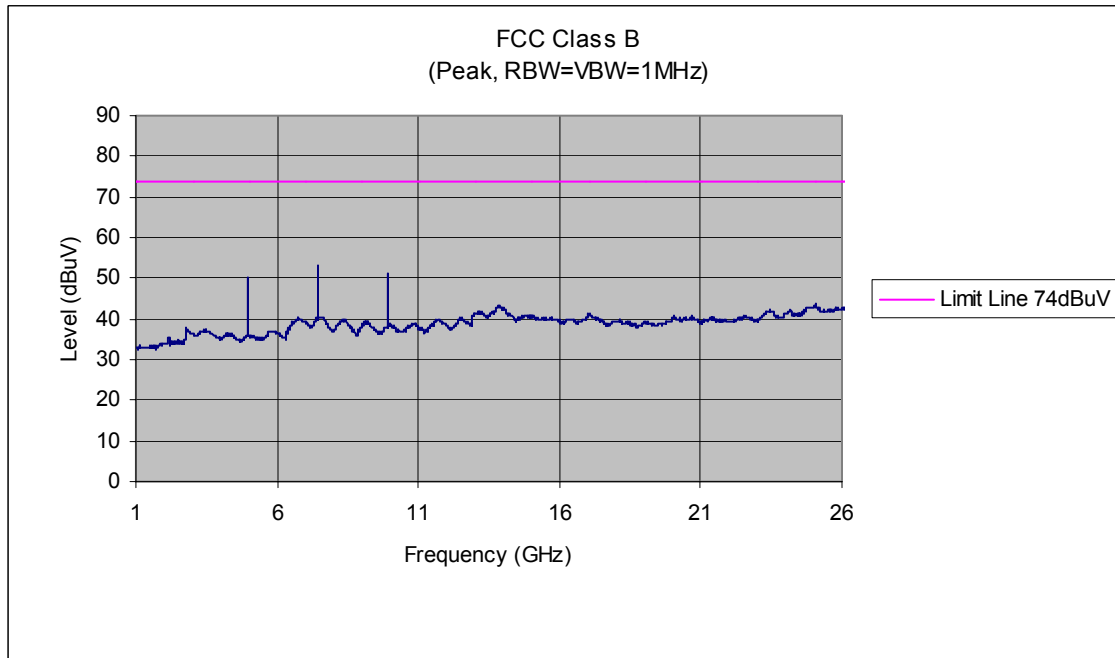
High Channel, Peak, Horizontal



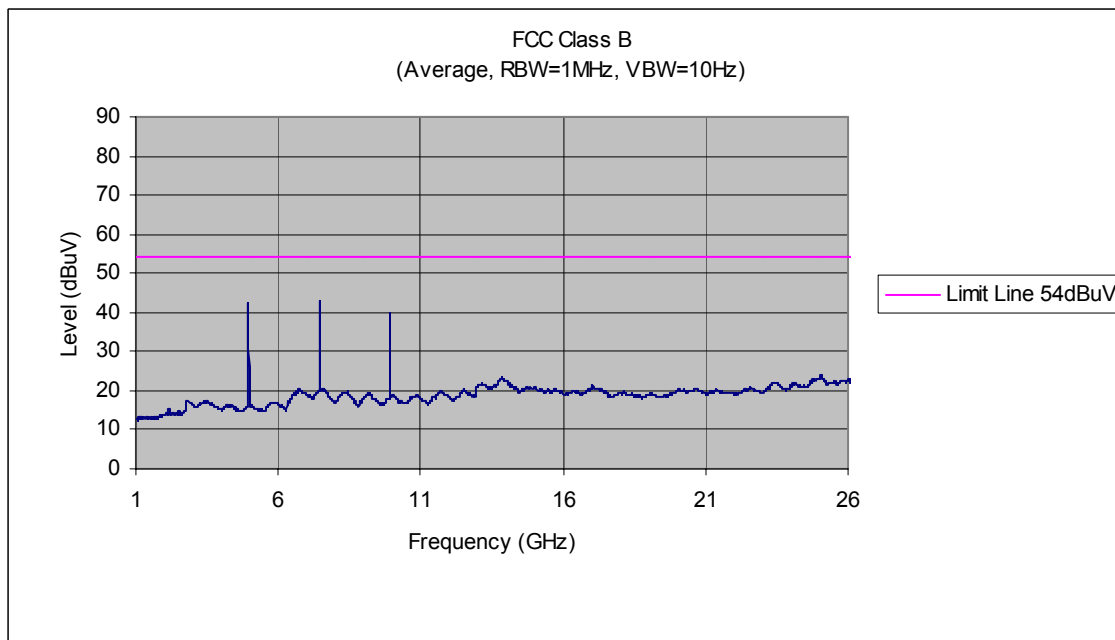
High Channel, Average, Horizontal



High Channel, Peak, Vertical

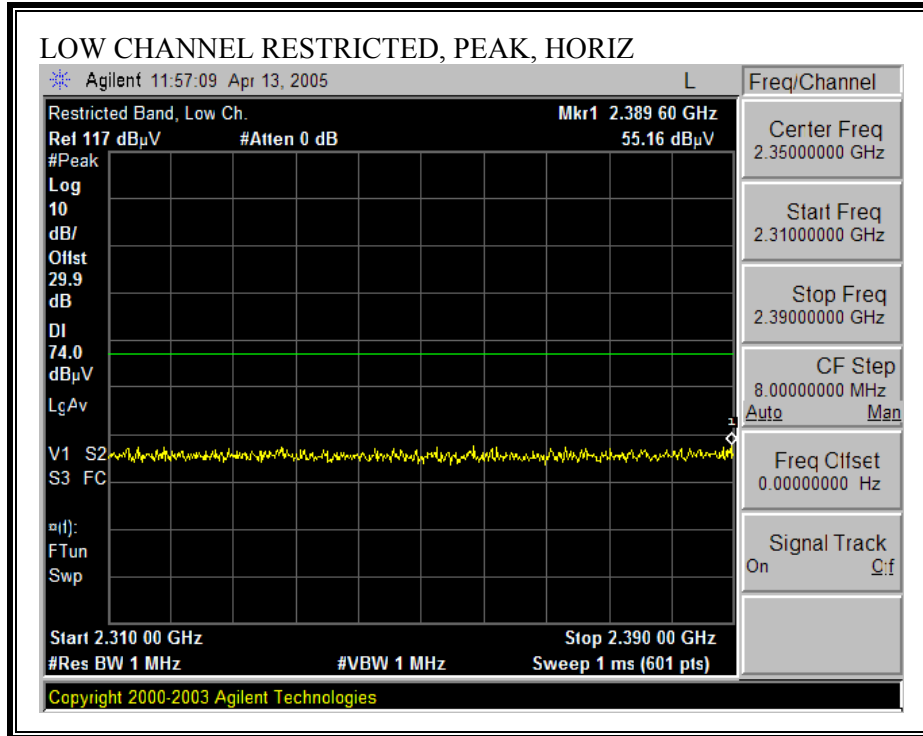


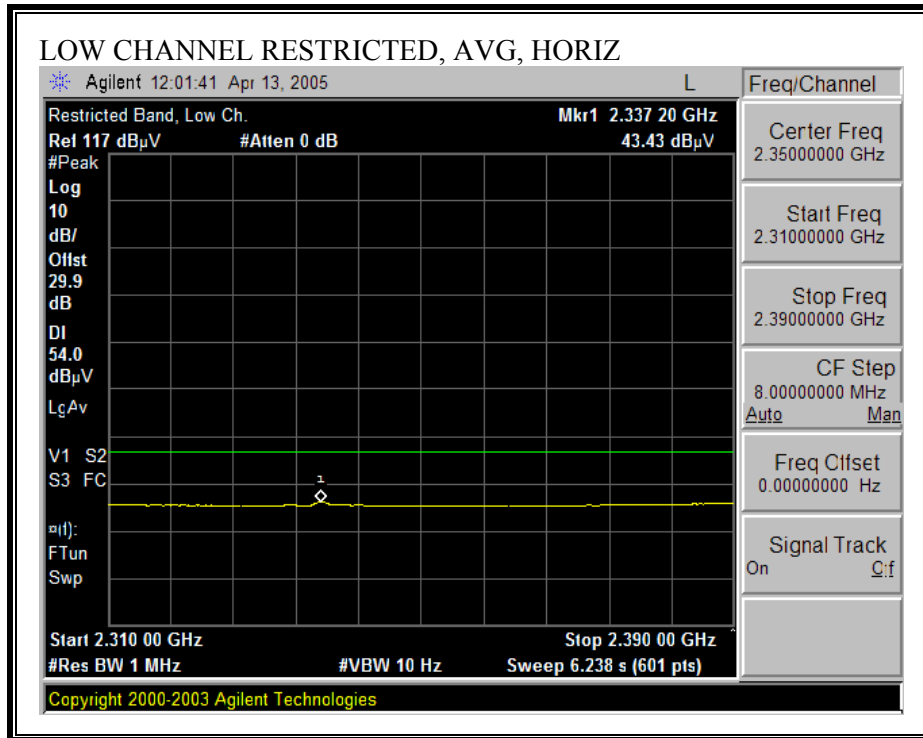
High Channel, Average, Vertical



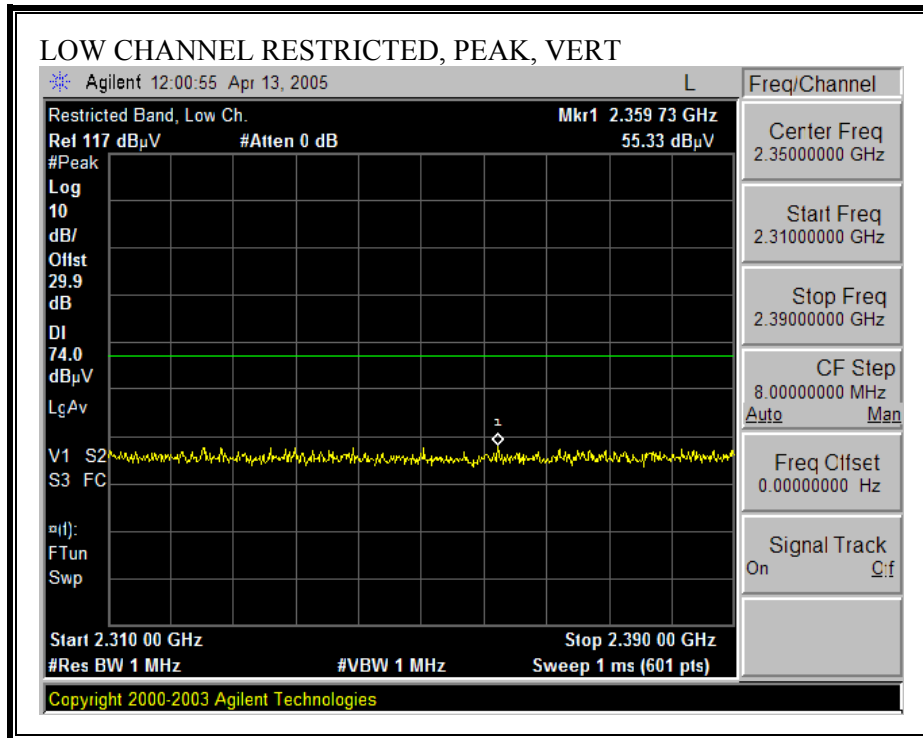
7.3.3. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz WITH 8PSK MODULATION

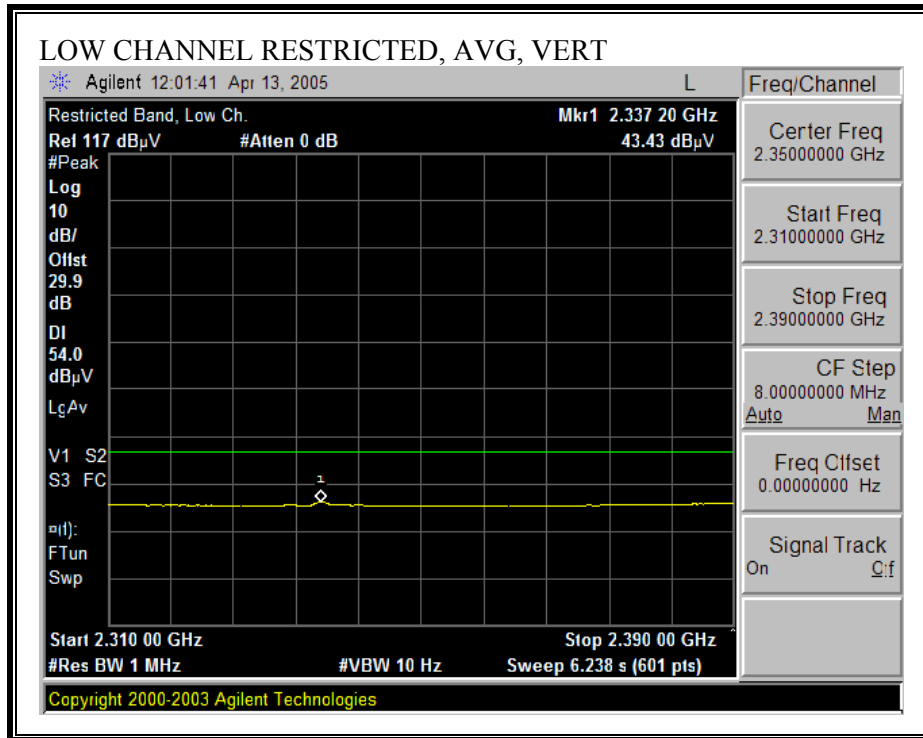
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



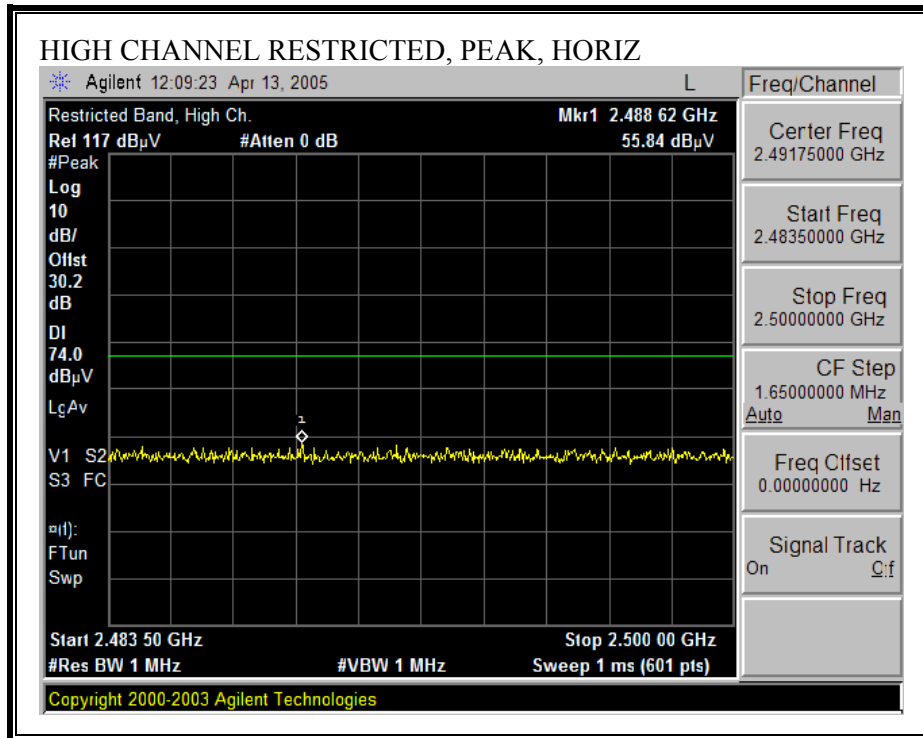


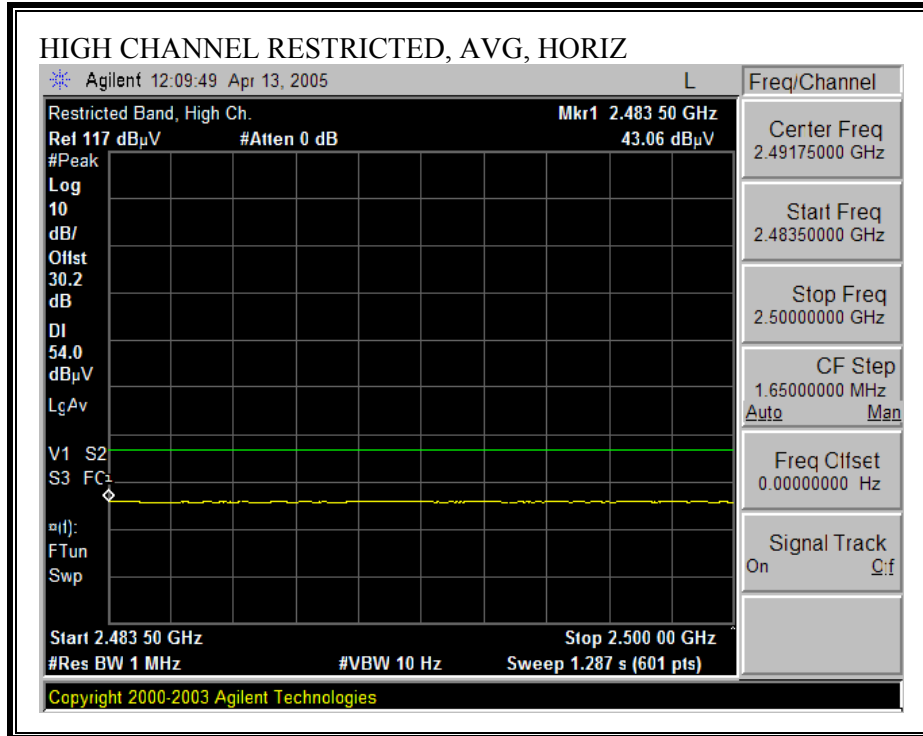
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



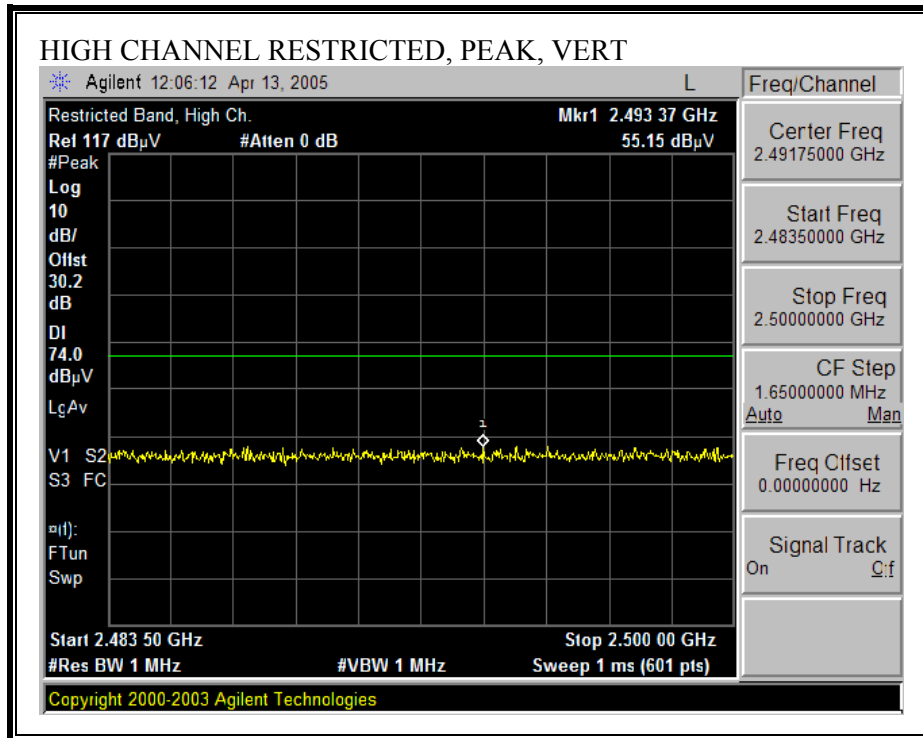


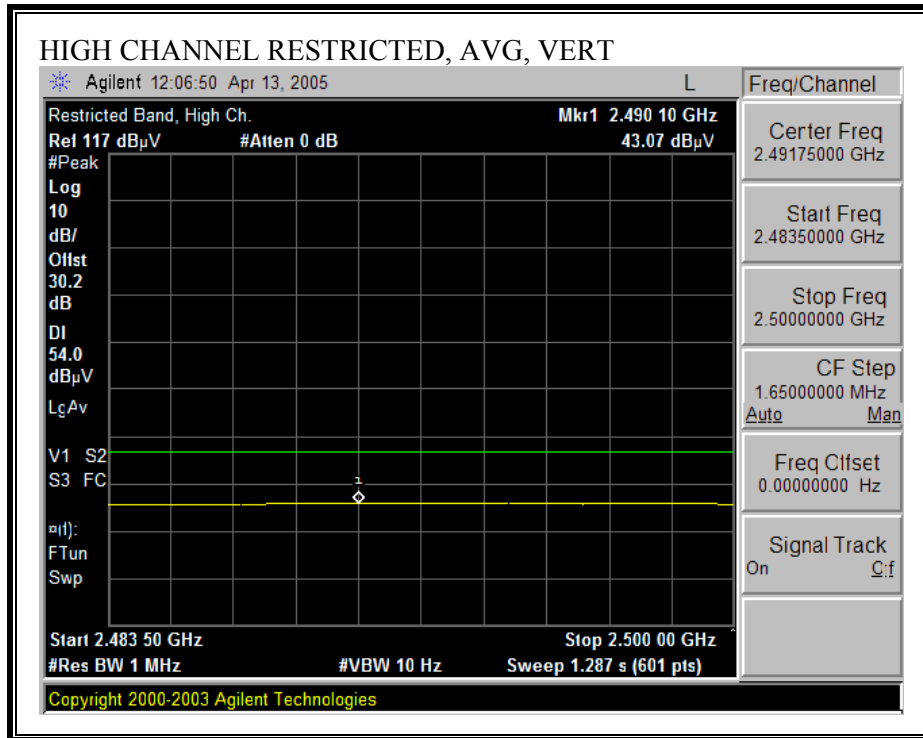
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

4/13/2005 **High Frequency Measurement**
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Vien Tran
 Project #: 05U3354-1
 Company: Broadcom
 EUT Descrip.: USB Bluetooth EDR Module
 EUT M/N: BCM92045NMD
 Test Target: FCC Class B
 Mode Oper: Tx_8PSK_Low / Mid / Hi channels_Harmonic & Spur

Test Equipment:

EMCO Horn 1-18GHz
 T73; S/N: 6717 @3m

Pre-amplifier 1-26GHz
 T34 HP 8449B

Pre-amplifier 26-40GHz

Horn > 18GHz

Hi Frequency Cables
 2 foot cable
 3 foot cable
 4 foot cable
 12 foot cable

4_Vien
 12_Vien

HPF
 HPF_4.6GHz

Reject Filter

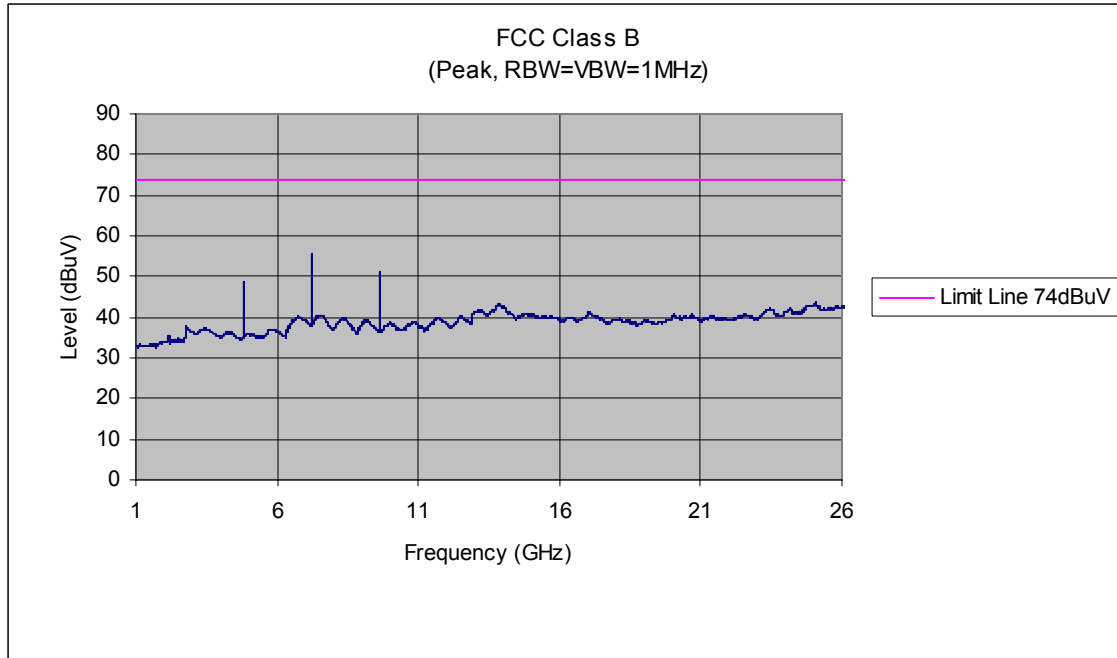
Peak Measurements
 RBW=VBW=1MHz

Average Measurements
 RBW=1MHz ; VBW=10Hz

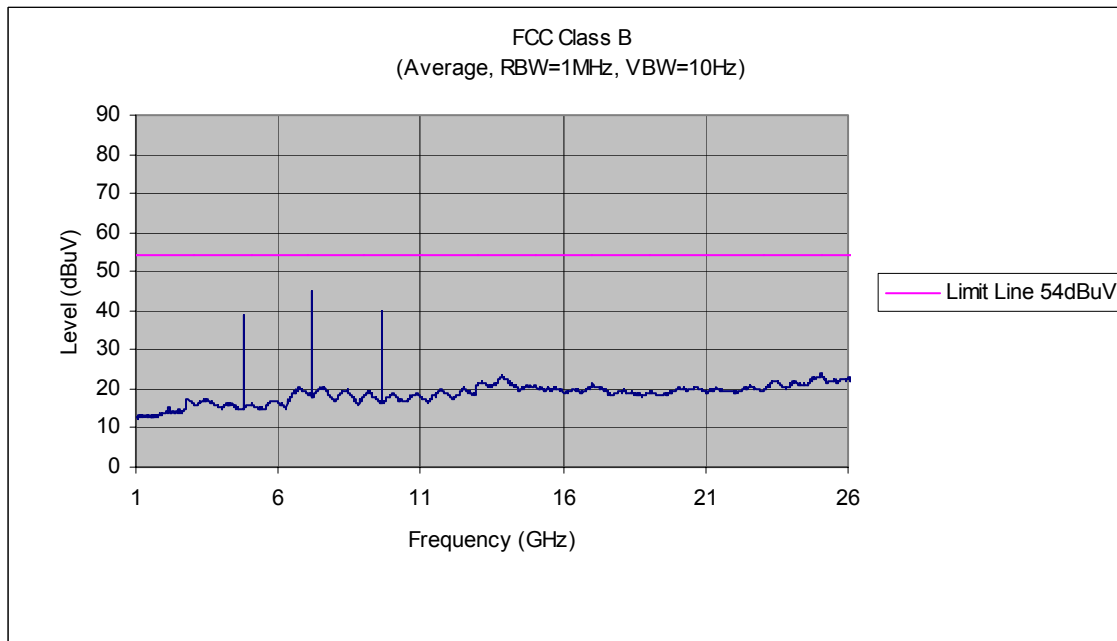
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL															
4.804	3.0	43.6	34.0	32.9	3.4	-33.6	0.0	2.4	48.7	39.1	74	54	-25.3	-14.9	H
7.206	3.0	47.9	37.5	35.7	3.9	-33.3	0.0	1.4	55.6	45.2	74	54	-18.4	-8.8	H
9.608	3.0	42.4	30.9	37.5	4.4	-33.9	0.0	0.9	51.3	39.8	74	54	-22.7	-14.2	H, Noise floor
4.804	3.0	43.0	33.0	32.9	3.4	-33.6	0.0	2.4	48.1	38.1	74	54	-25.9	-15.9	V
7.206	3.0	46.3	35.5	35.7	3.9	-33.3	0.0	1.4	54.0	43.2	74	54	-20.0	-10.8	V
9.608	3.0	42.3	31.0	37.5	4.4	-33.9	0.0	0.9	51.2	39.9	74	54	-22.8	-14.1	V, Noise floor
MID CHANNEL															
4.882	3.0	44.3	34.7	32.9	3.4	-33.5	0.0	2.5	49.6	40.0	74	54	-24.4	-14.0	H
7.323	3.0	48.0	37.4	35.9	3.9	-33.3	0.0	1.4	55.9	45.3	74	54	-18.1	-8.7	H
9.764	3.0	42.4	30.9	37.6	4.6	-34.0	0.0	0.9	51.4	39.9	74	54	-22.6	-14.1	H, Noise floor
4.882	3.0	43.8	32.9	32.9	3.4	-33.5	0.0	2.5	49.1	38.2	74	54	-24.9	-15.8	V
7.323	3.0	45.7	35.5	35.9	3.9	-33.3	0.0	1.4	53.6	43.4	74	54	-20.4	-10.6	V
9.764	3.0	42.4	31.0	37.6	4.6	-34.0	0.0	0.9	51.4	40.0	74	54	-22.6	-14.0	V, Noise floor
HI CHANNEL															
4.960	3.0	45.6	36.9	33.0	3.5	-33.5	0.0	2.5	51.1	42.4	74	54	-22.9	-11.6	H
7.440	3.0	47.3	36.3	36.1	3.9	-33.3	0.0	1.4	55.4	44.4	74	54	-18.6	-9.6	H
9.920	3.0	43.0	31.2	37.6	4.7	-34.0	0.0	0.9	52.1	40.3	74	54	-21.9	-13.7	H, Noise floor
4.960	3.0	44.5	36.5	33.0	3.5	-33.5	0.0	2.5	50.0	42.0	74	54	-24.0	-12.0	V
7.440	3.0	45.0	33.8	36.1	3.9	-33.3	0.0	1.4	53.1	41.9	74	54	-20.9	-12.1	V
9.920	3.0	42.0	31.3	37.6	4.7	-34.0	0.0	0.9	51.1	40.4	74	54	-22.9	-13.6	V, Noise floor
NO OTHER EMISSIONS WERE DETECTED ABOVE SYSTEM NOISE FLOOR															

f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit
 Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit
 AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit
 CL Cable Loss HPF High Pass Filter

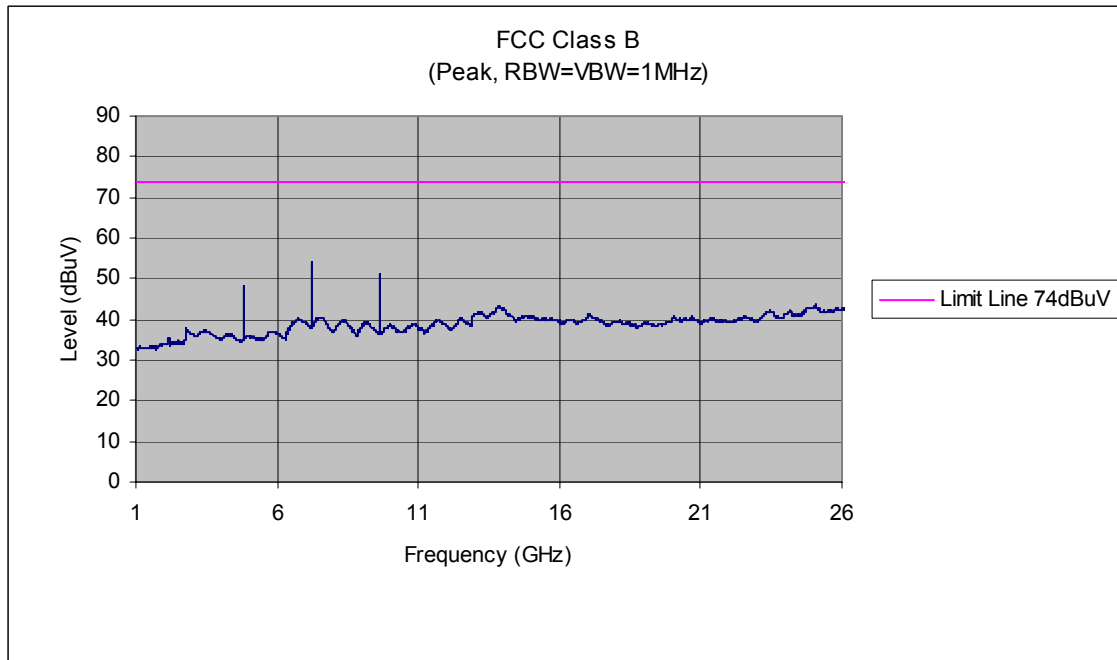
Low Channel, Peak, Horizontal



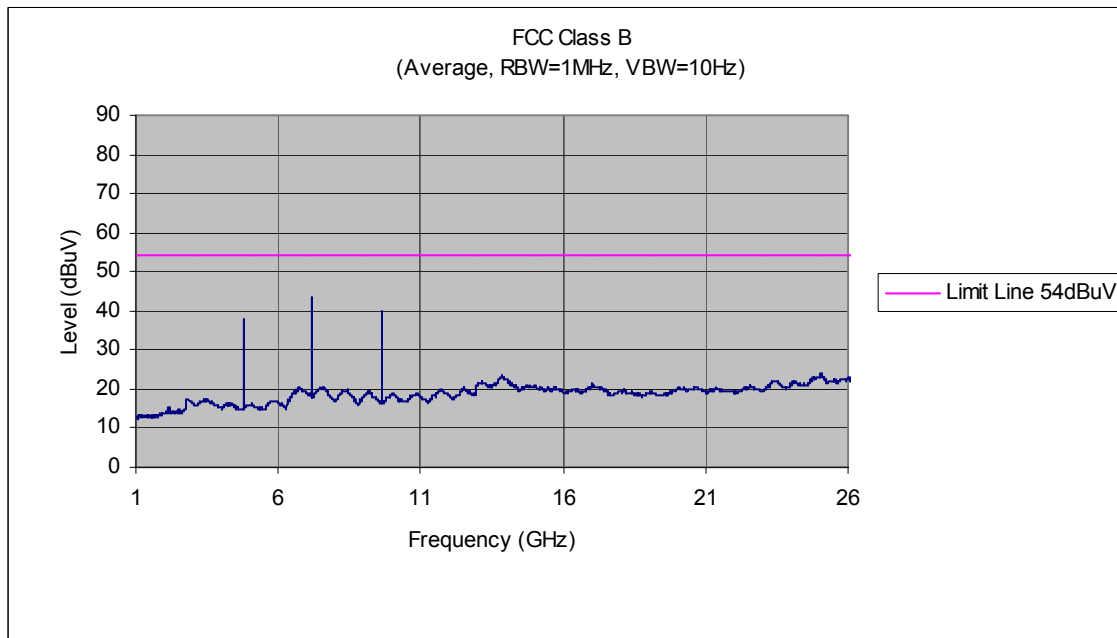
Low Channel, Average, Horizontal



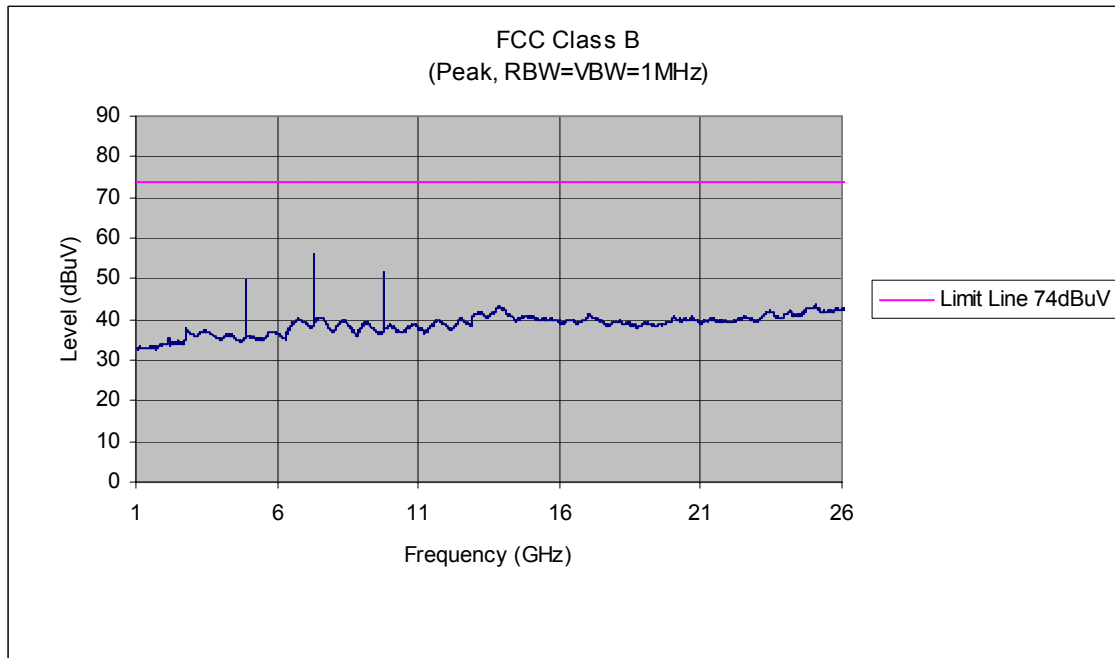
Low Channel, Peak, Vertical



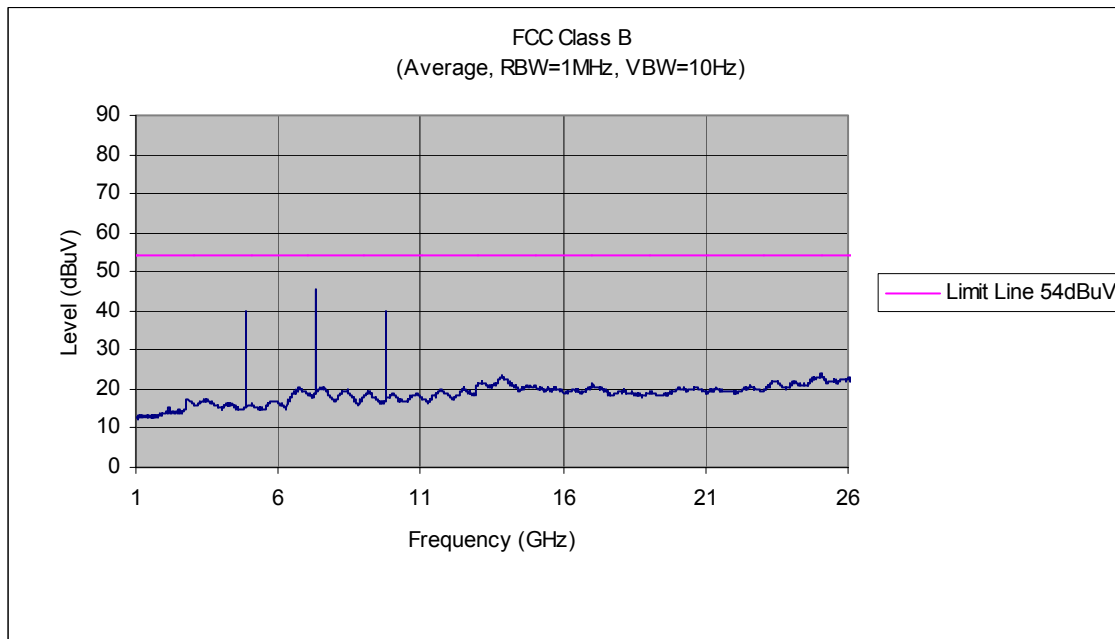
Low Channel, Average, Vertical



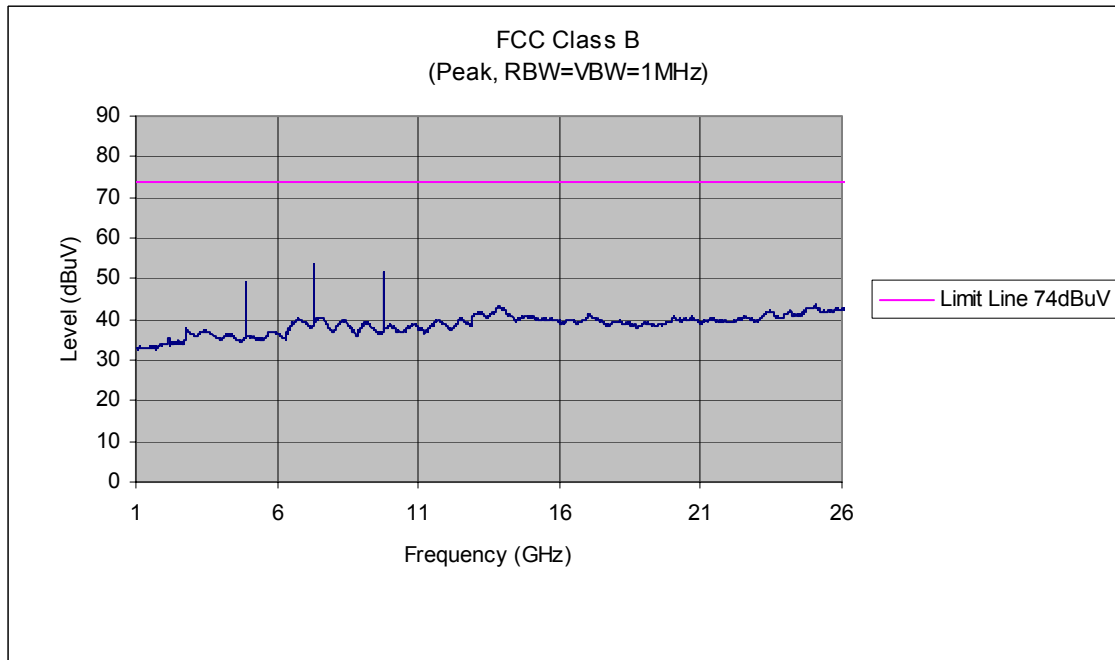
Mid Channel, Peak, Horizontal



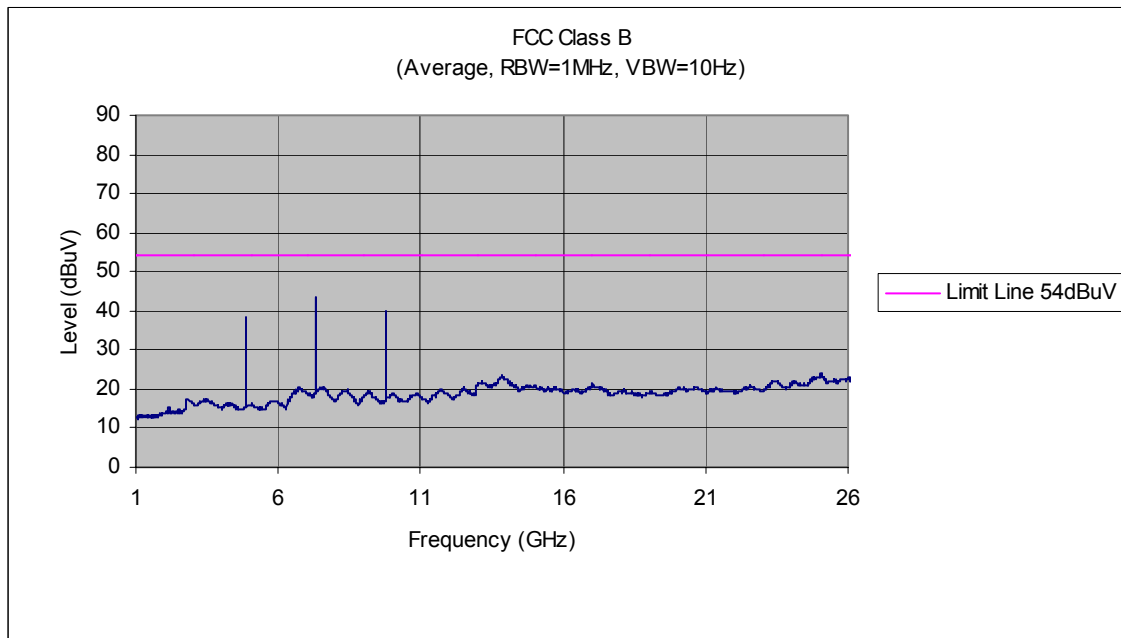
Mid Channel, Average, Horizontal



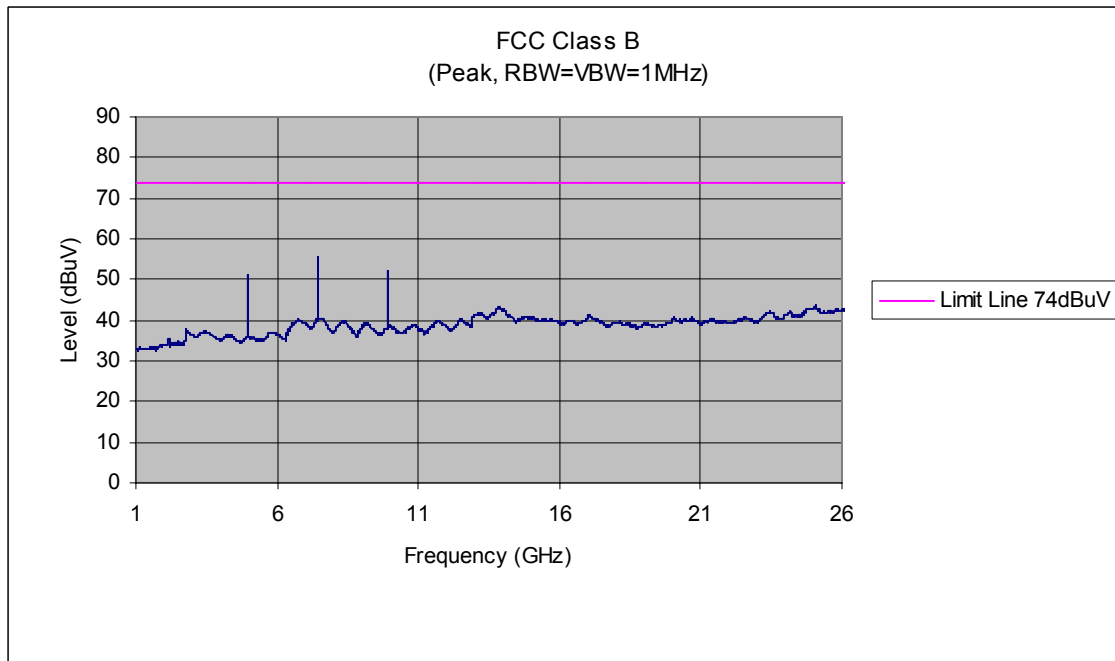
Mid Channel, Peak, Vertical



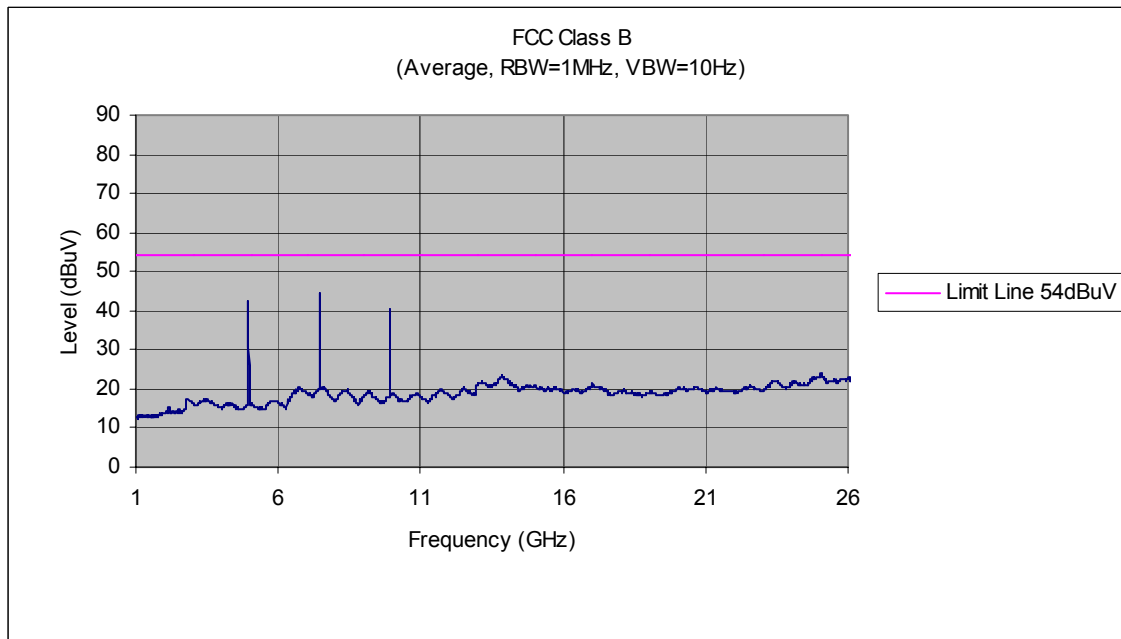
Mid Channel, Average, Vertical



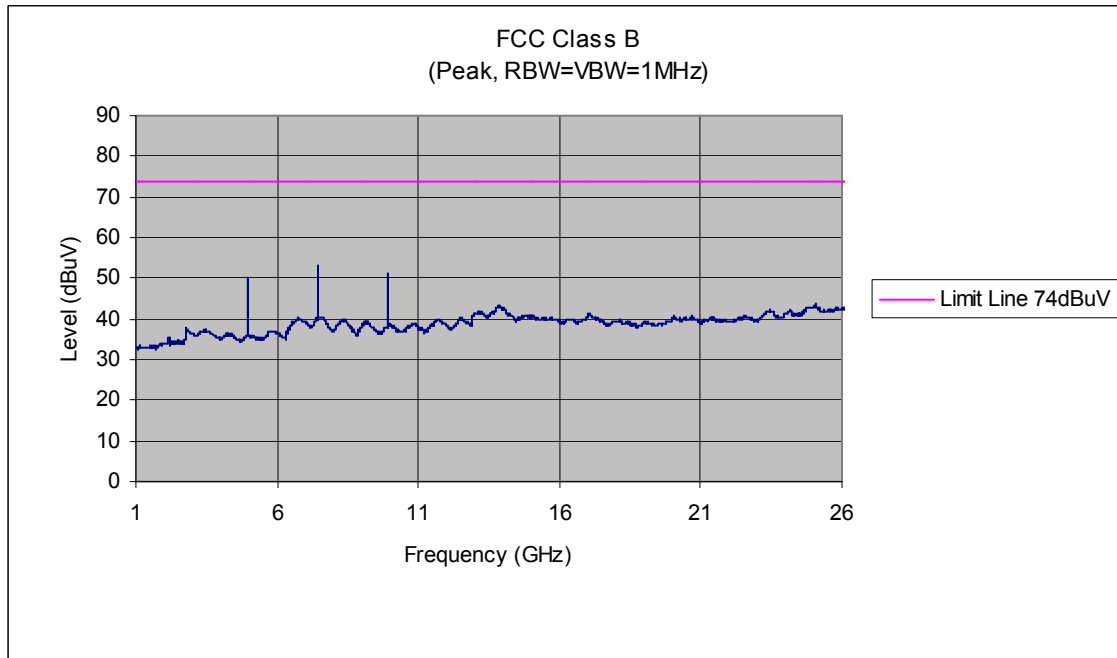
High Channel, Peak, Horizontal



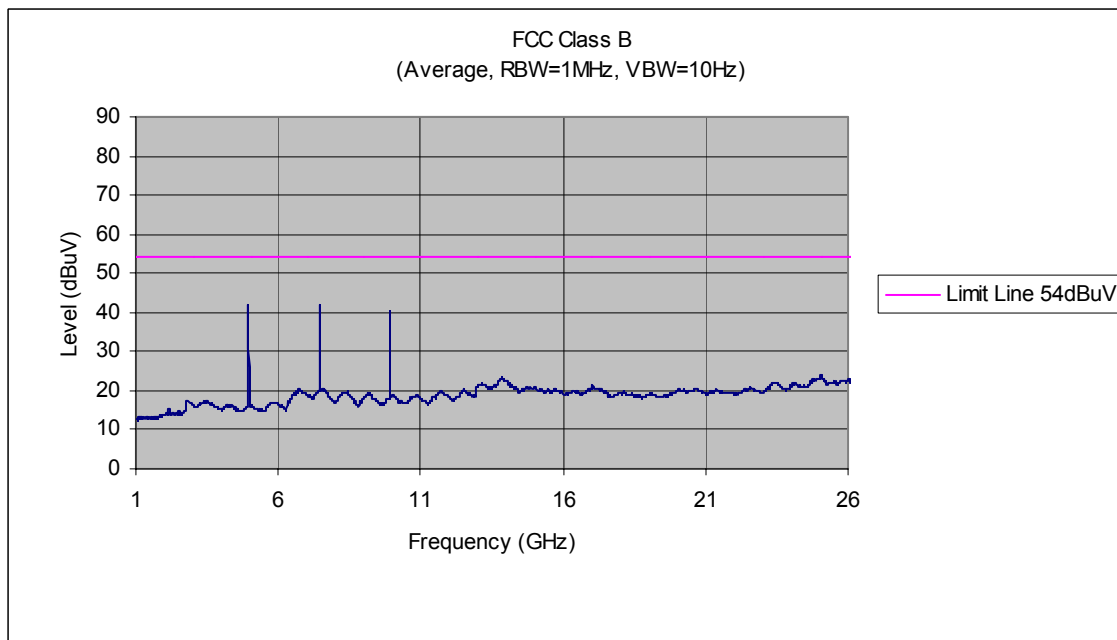
High Channel, Average, Horizontal



High Channel, Peak, Vertical



High Channel, Average, Vertical



7.3.4. RECEIVER ABOVE 1 GHZ WITH GFSK MODULAION

RESULTS

No non-compliance noted:

4/12/2005 High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Vien Tran
 Project #: 05u3354-1
 Company: Broadcom
 EUT Descip.: USB Bluetooth EDR module
 EUT M/N: BCM92045NMD
 Test Target: FCC class B
 Mode Oper: Rx Worst Case_Above 1 GHz_ GFSK

Test Equipment:

EMCO Horn 1-18GHz 173; S/N: 6717 @3m	Pre-amplifier 1-26GHz T34 HP 8449B	Pre-amplifier 26-40GHz	Horn > 18GHz
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Hi Frequency Cables

2 foot cable	3 foot cable	4 foot cable 4_Vien	12 foot cable 12_Vien
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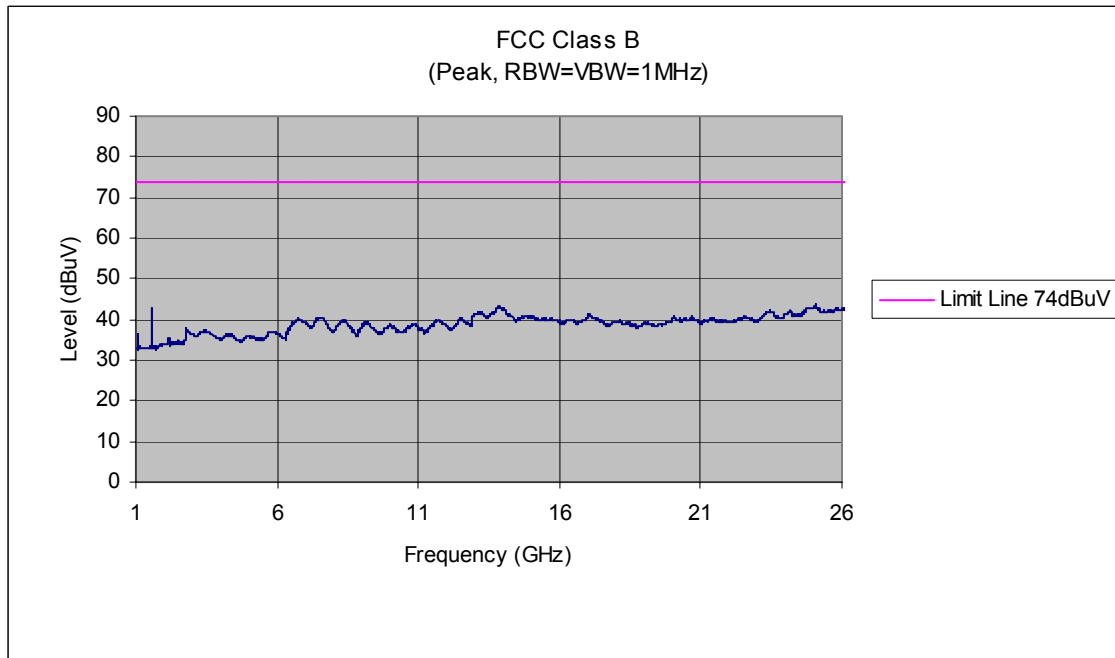
Peak Measurements
 RBW=VBW=1MHz

Average Measurements
 RBW=1MHz ; VBW=10Hz

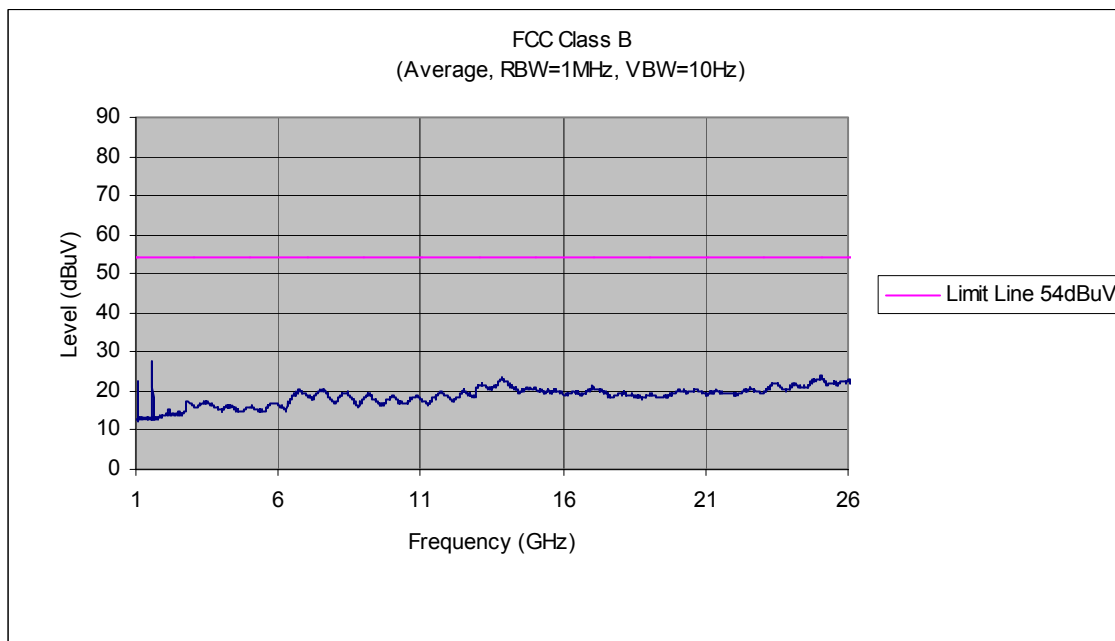
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	49.2	35.2	23.8	1.5	-37.9	0.0	0.0	36.6	22.6	74	54	-37.4	-31.4	H
1.593	3.0	52.1	36.9	25.7	1.8	-36.9	0.0	0.0	42.7	27.5	74	54	-31.3	-26.5	H
1.063	3.0	49.0	35.3	23.8	1.5	-37.9	0.0	0.0	36.4	22.7	74	54	-37.6	-31.3	V
1.593	3.0	53.8	37.6	25.7	1.8	-36.9	0.0	0.0	44.4	28.2	74	54	-29.6	-25.8	V
NO OTHER EMISSIONS WERE DETECTED ABOVE SYSTEM NOISE FLOOR IN RECEIVER MODE															

f Measurement Frequency	Amp Preamp Gain	Avg Lim Average Field Strength Limit
Dist Distance to Antenna	D Corr Distance Correct to 3 meters	Pk Lim Peak Field Strength Limit
Read Analyzer Reading	Avg Average Field Strength @ 3 m	Avg Mar Margin vs. Average Limit
AF Antenna Factor	Peak Calculated Peak Field Strength	Pk Mar Margin vs. Peak Limit
CL Cable Loss	HPF High Pass Filter	

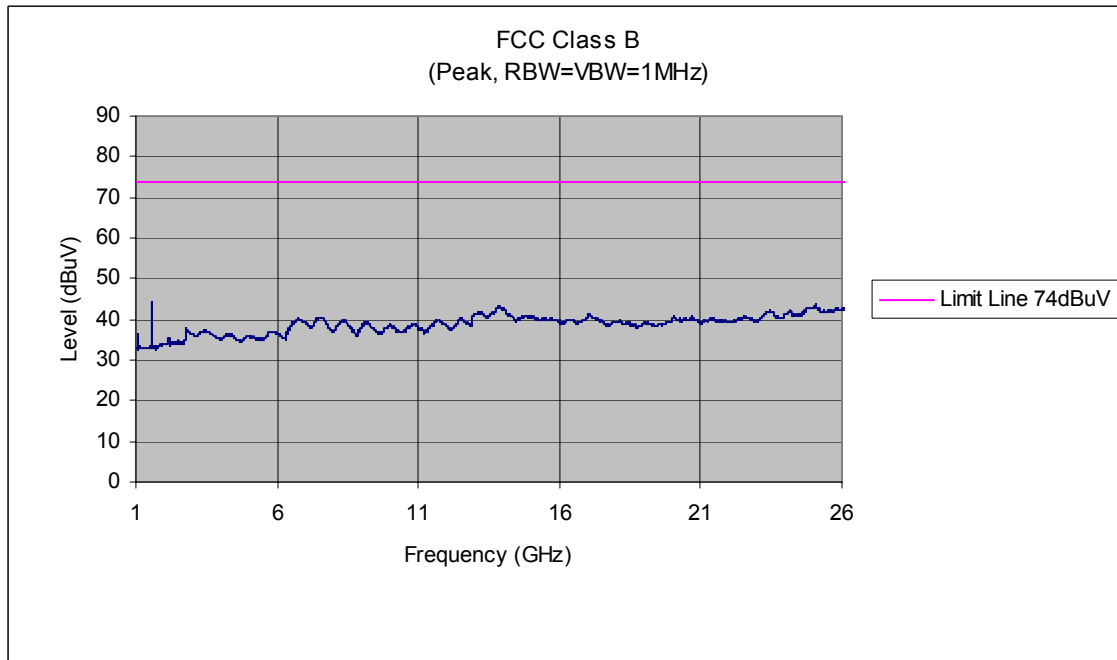
Worst-case Channel, Peak, Horizontal



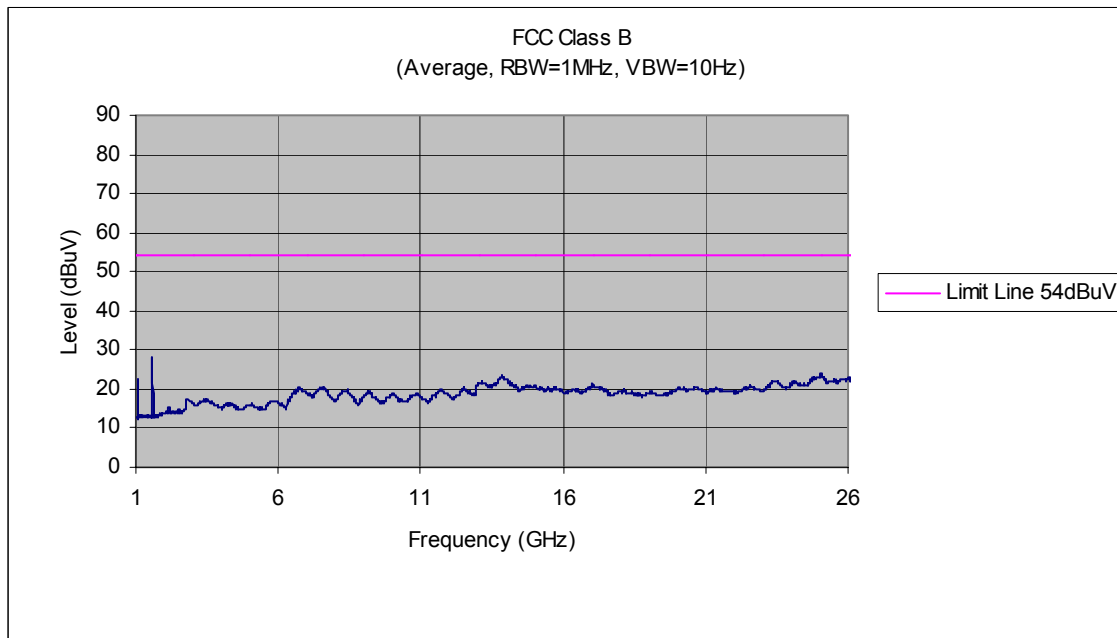
Worst-case Channel, Average, Horizontal



Worst-case Channel, Peak, Vertical



Worst-case Channel, Average, Vertical



7.3.5. RECEIVER ABOVE 1 GHZ WITH 8PSK MODULAION

RESULTS

No non-compliance noted:

4/12/2005 High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Vien Tran
 Project #: 05u3354-1
 Company: Broadcom
 EUT Descip.: USB Bluetooth EDR module
 EUT M/N: BCM92045NMD
 Test Target: FCC class B
 Mode Oper: Rx Worst Case_Above 1 GHz_ 8PSK

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
 Pre-amplifier 1-26GHz: T34 HP 8449B
 Pre-amplifier 26-40GHz:
 Horn > 18GHz:
 Hi Frequency Cables: 2 foot cable, 3 foot cable, 4 foot cable, 12 foot cable
 HPF: 4_Vien
 Reject Filter: 12_Vien

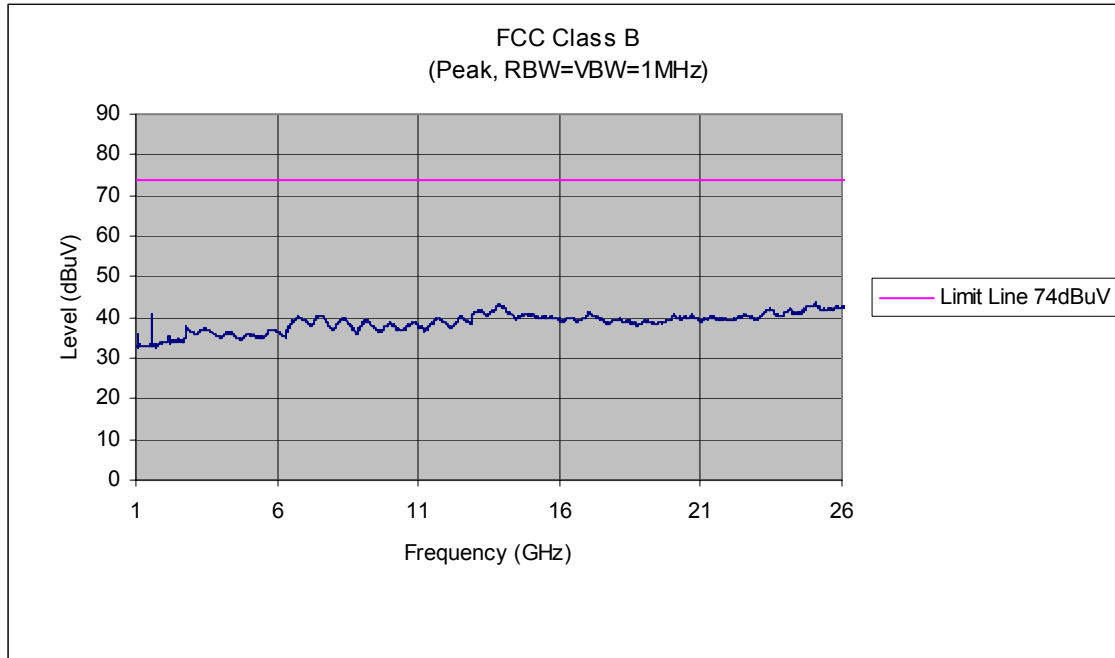
Peak Measurements
 RBW=VBW=1MHz

Average Measurements
 RBW=1MHz ; VBW=10Hz

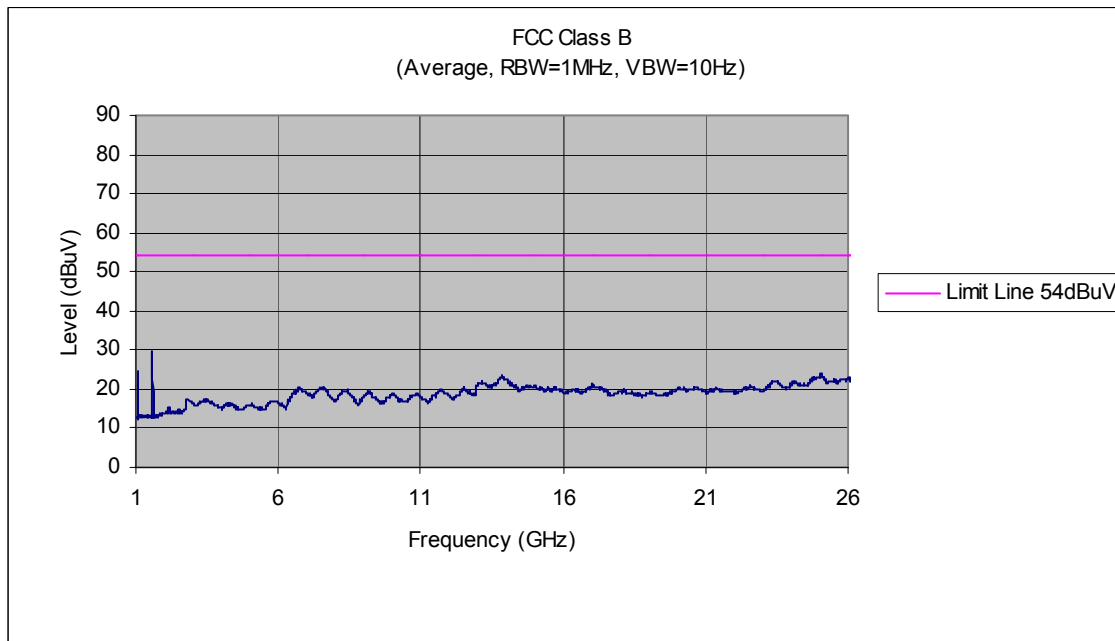
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.063	3.0	48.3	35.9	23.8	1.5	-37.9	0.0	0.0	35.7	23.3	74	54	-38.3	-30.7	H
1.593	3.0	50.5	37.1	25.7	1.8	-36.9	0.0	0.0	41.0	27.7	74	54	-33.0	-26.3	H
1.063	3.0	50.6	37.2	23.8	1.5	-37.9	0.0	0.0	37.9	24.6	74	54	-36.1	-29.4	V
1.593	3.0	54.3	38.9	25.7	1.8	-36.9	0.0	0.0	44.9	29.5	74	54	-29.1	-24.5	V
NO OTHER EMISSIONS WERE DETECTED ABOVE SYSTEM NOISE FLOOR IN RECEIVER MODE															

f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit
 Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit
 AF Antenna Factor Peak Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit
 CL Cable Loss HPF High Pass Filter

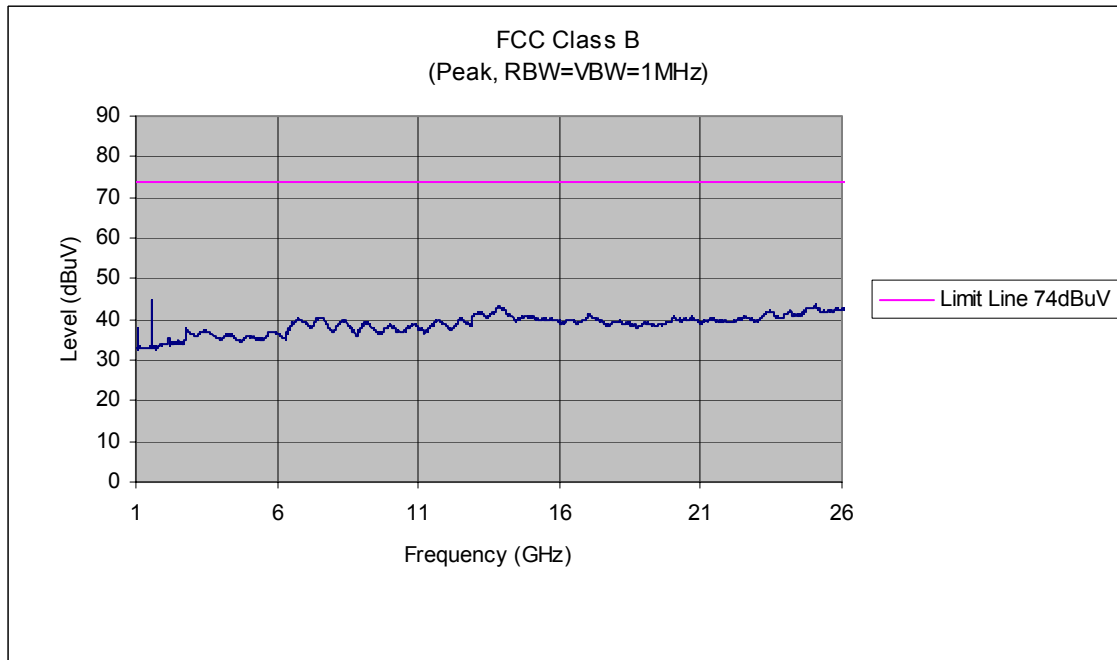
Worst-case Channel, Peak, Horizontal



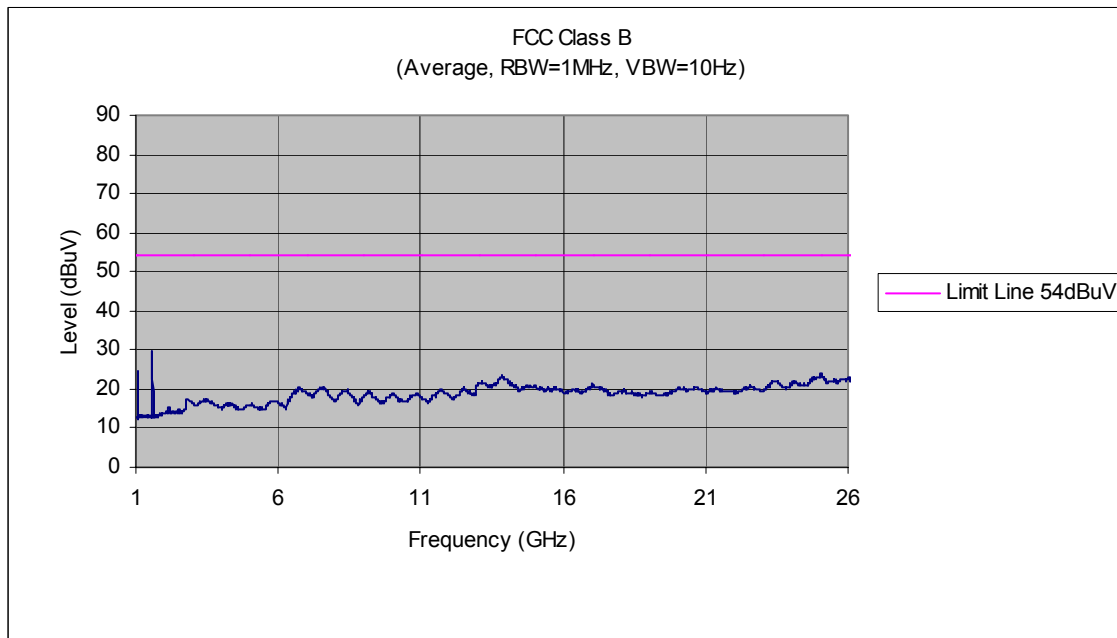
Worst-case Channel, Average, Horizontal



Worst-case Channel, Peak, Vertical

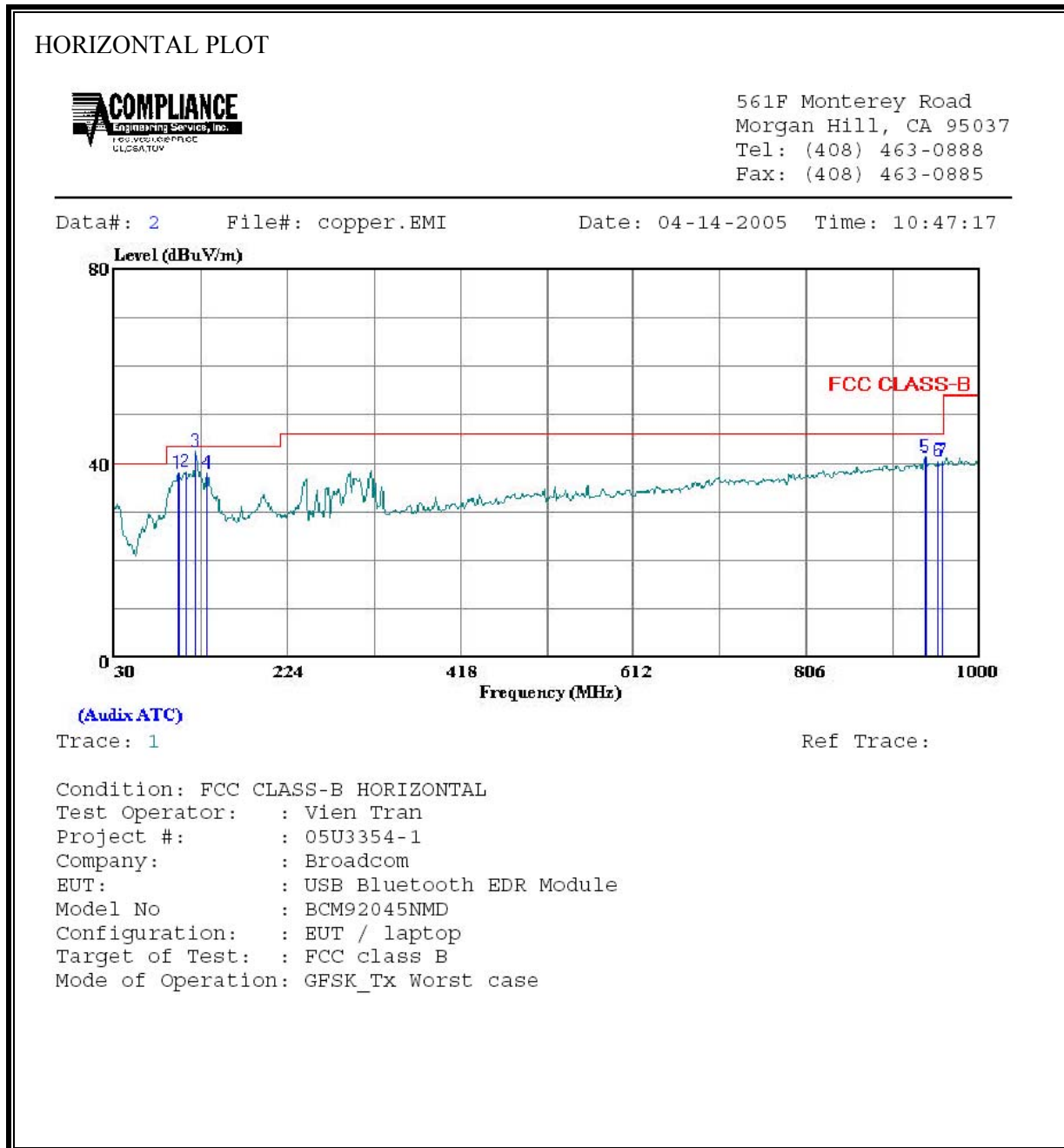


Worst-case Channel, Average, Vertical



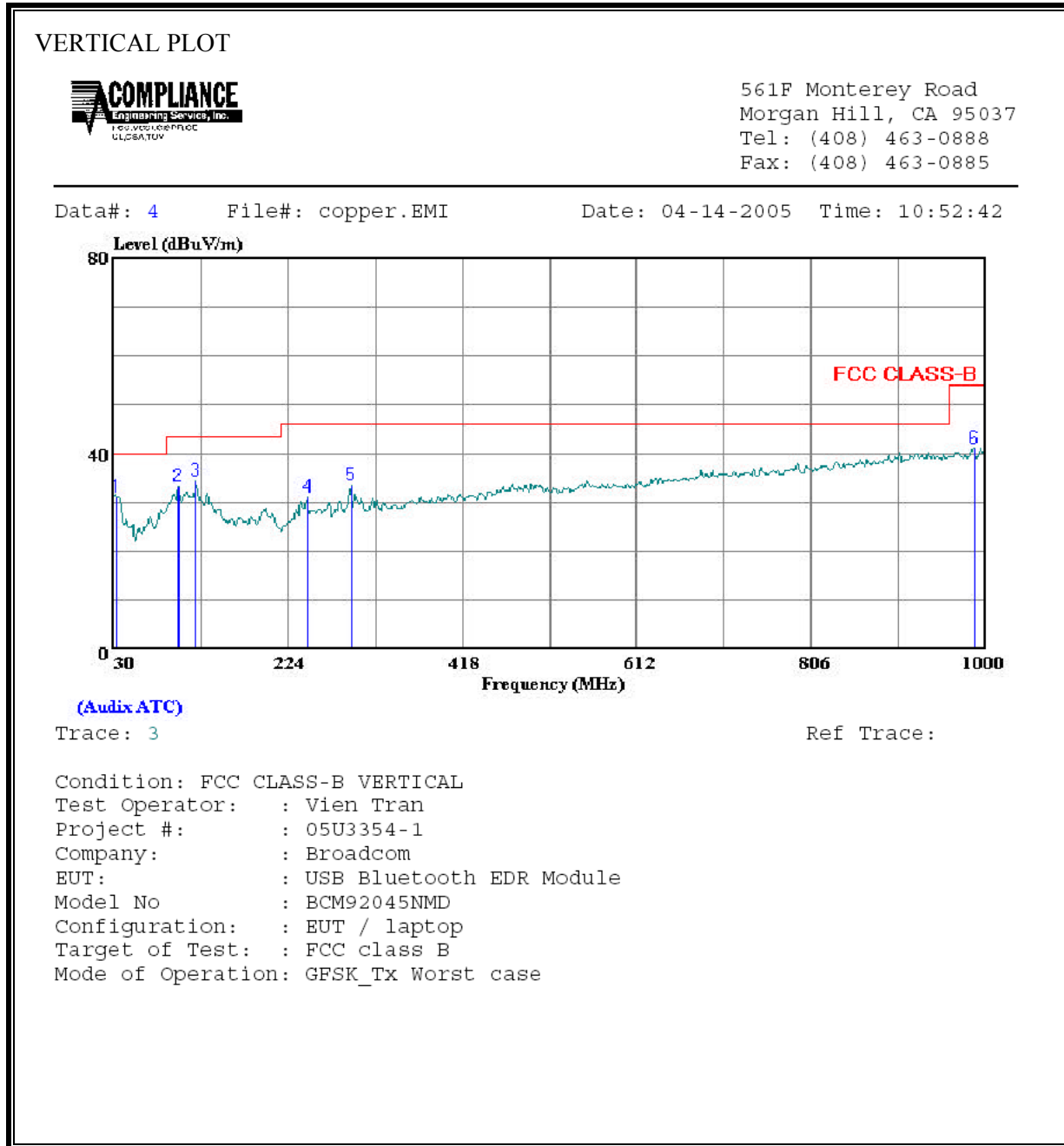
7.3.6. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH GFSK MODULATION

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	101.780	26.14	11.77	37.91	43.50	-5.59	Peak
2	109.540	24.86	13.44	38.30	43.50	-5.20	Peak
3	121.180	27.13	15.16	42.29	43.50	-1.21	Peak
4	133.790	22.81	15.02	37.83	43.50	-5.67	Peak
5	938.890	14.84	26.43	41.27	46.00	-4.73	Peak
6	953.440	13.99	26.50	40.49	46.00	-5.51	Peak
7	958.290	13.81	26.50	40.31	46.00	-5.69	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

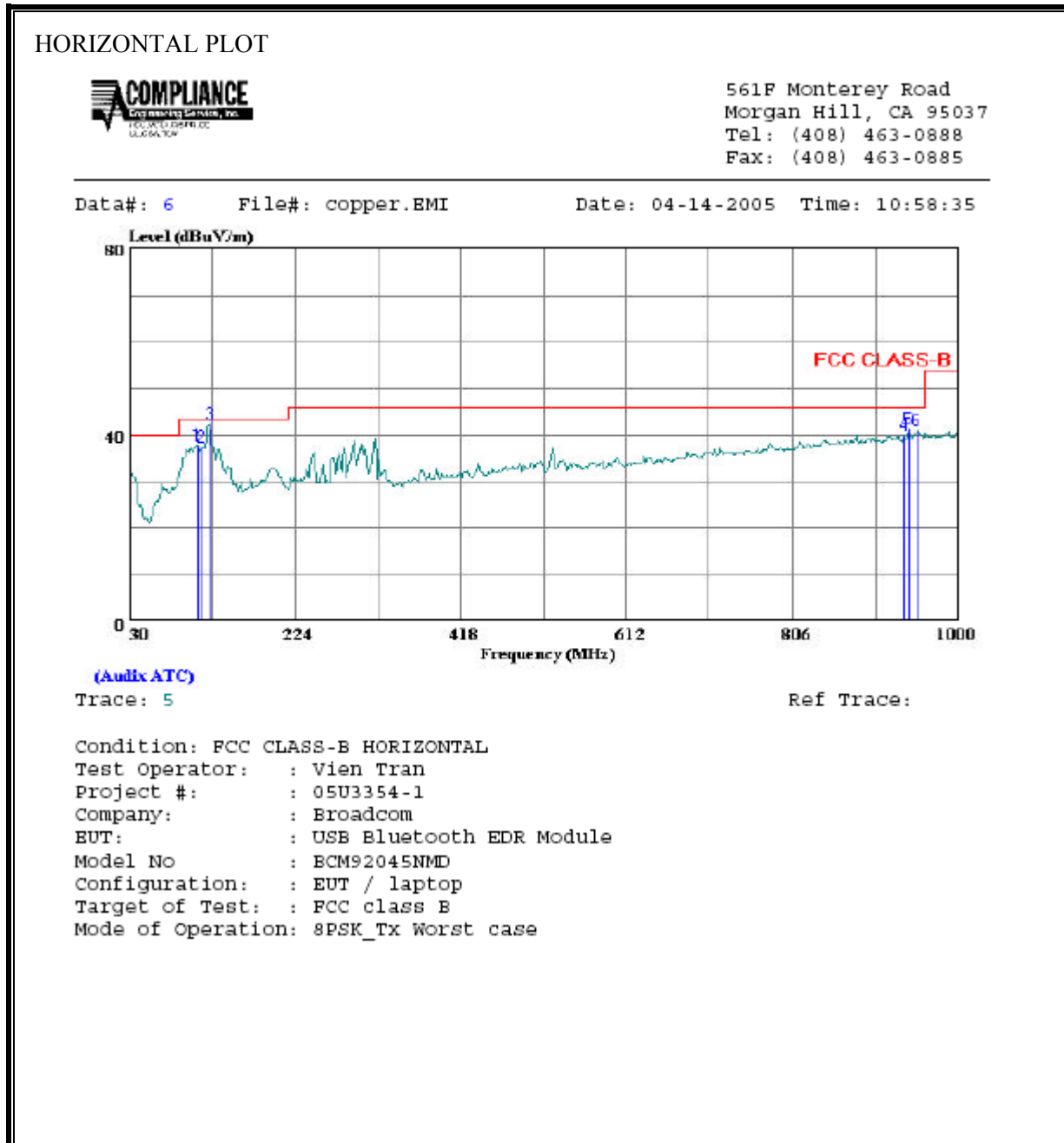


VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	32.910	11.17	19.94	31.11	40.00	-8.89	Peak
2	101.780	21.50	11.77	33.27	43.50	-10.23	Peak
3	121.180	19.18	15.16	34.34	43.50	-9.16	Peak
4	245.340	17.30	13.72	31.02	46.00	-14.98	Peak
5	293.840	17.96	15.42	33.38	46.00	-12.62	Peak
6	987.390	14.29	26.80	41.09	54.00	-12.91	Peak

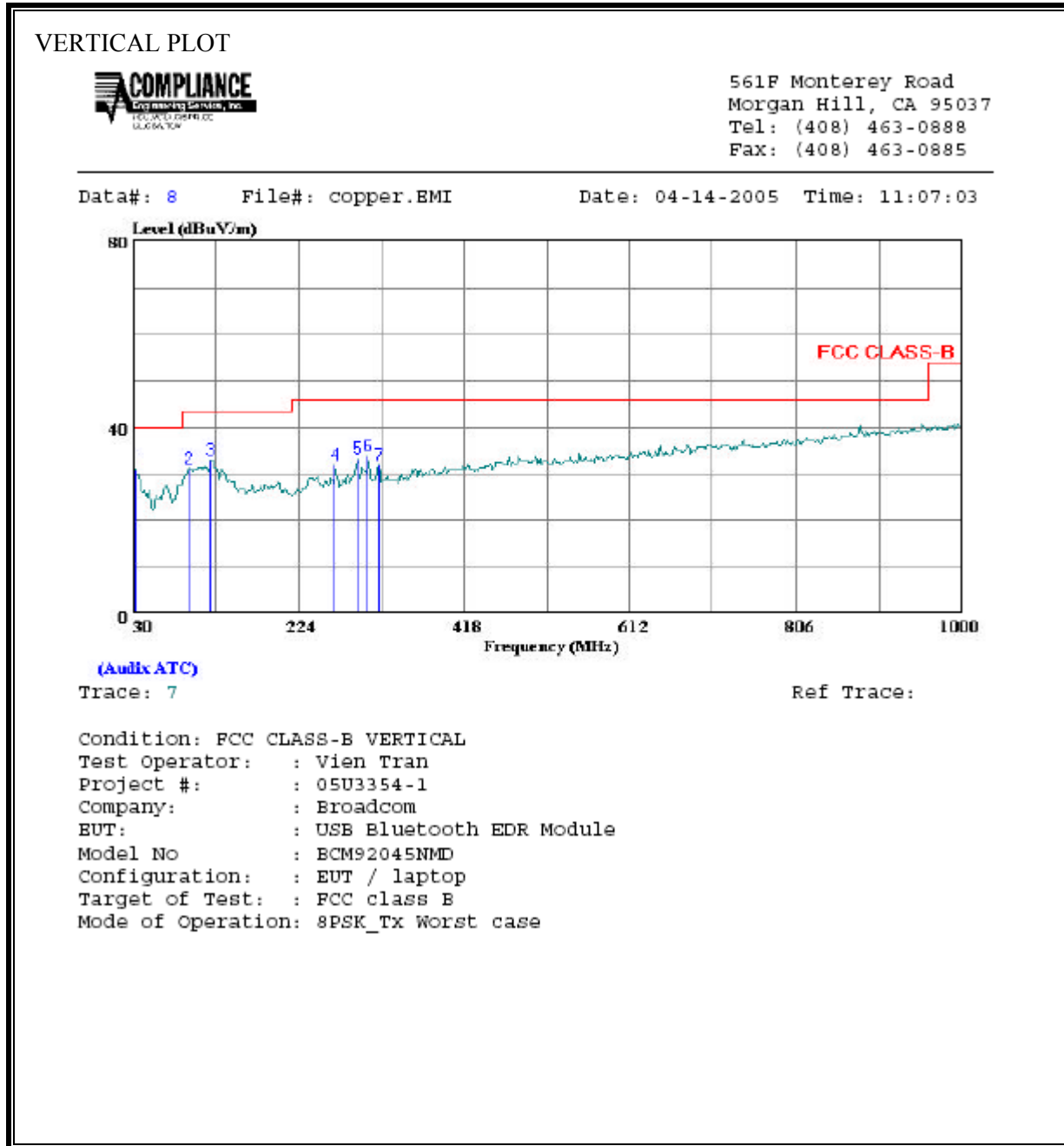
7.3.7. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 8PSK MODULATION

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	109.540	24.32	13.44	37.76	43.50	-5.74	Peak
2	114.390	23.00	14.46	37.46	43.50	-6.04	Peak
3	124.090	27.07	15.23	42.30	43.50	-1.20	Peak
4	935.980	13.51	26.33	39.84	46.00	-6.16	Peak
5	940.830	14.88	26.44	41.32	46.00	-4.68	Peak
6	950.530	14.48	26.48	40.96	46.00	-5.04	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)



VERTICAL DATA							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	32.910	10.70	19.94	30.63	40.00	-9.37	Peak
2	96.930	20.32	10.58	30.90	43.50	-12.60	Peak
3	121.180	17.92	15.16	33.08	43.50	-10.42	Peak
4	266.680	17.28	14.45	31.73	46.00	-14.27	Peak
5	293.840	17.74	15.42	33.16	46.00	-12.84	Peak
6	305.480	17.85	15.80	33.65	46.00	-12.35	Peak
7	318.090	15.72	16.11	31.83	46.00	-14.17	Peak

7.4. POWERLINE CONDUCTED EMISSIONS WITH GFSK MODULATION

LIMIT

§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 μ 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 of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

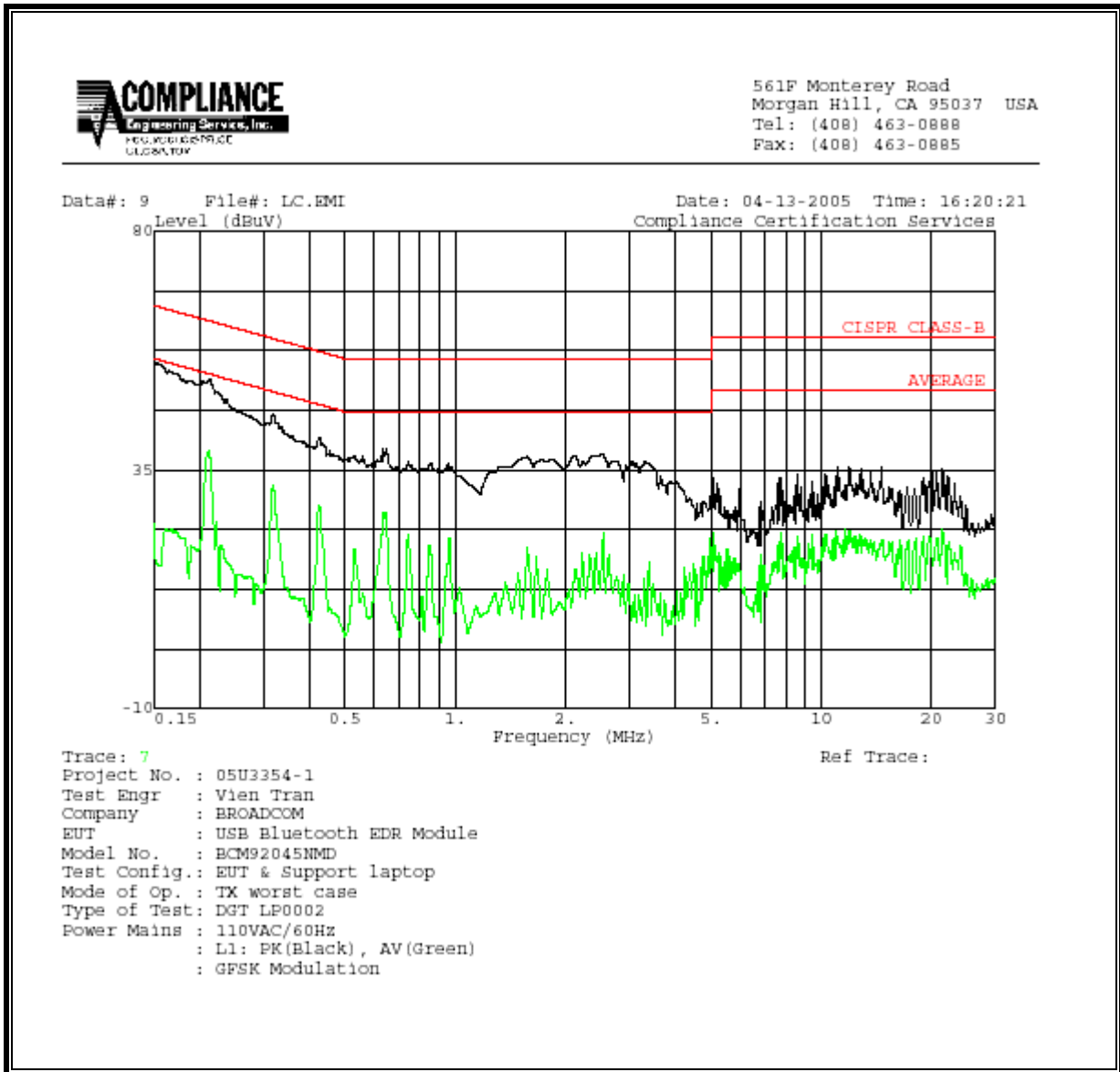
RESULTS

No non-compliance noted:

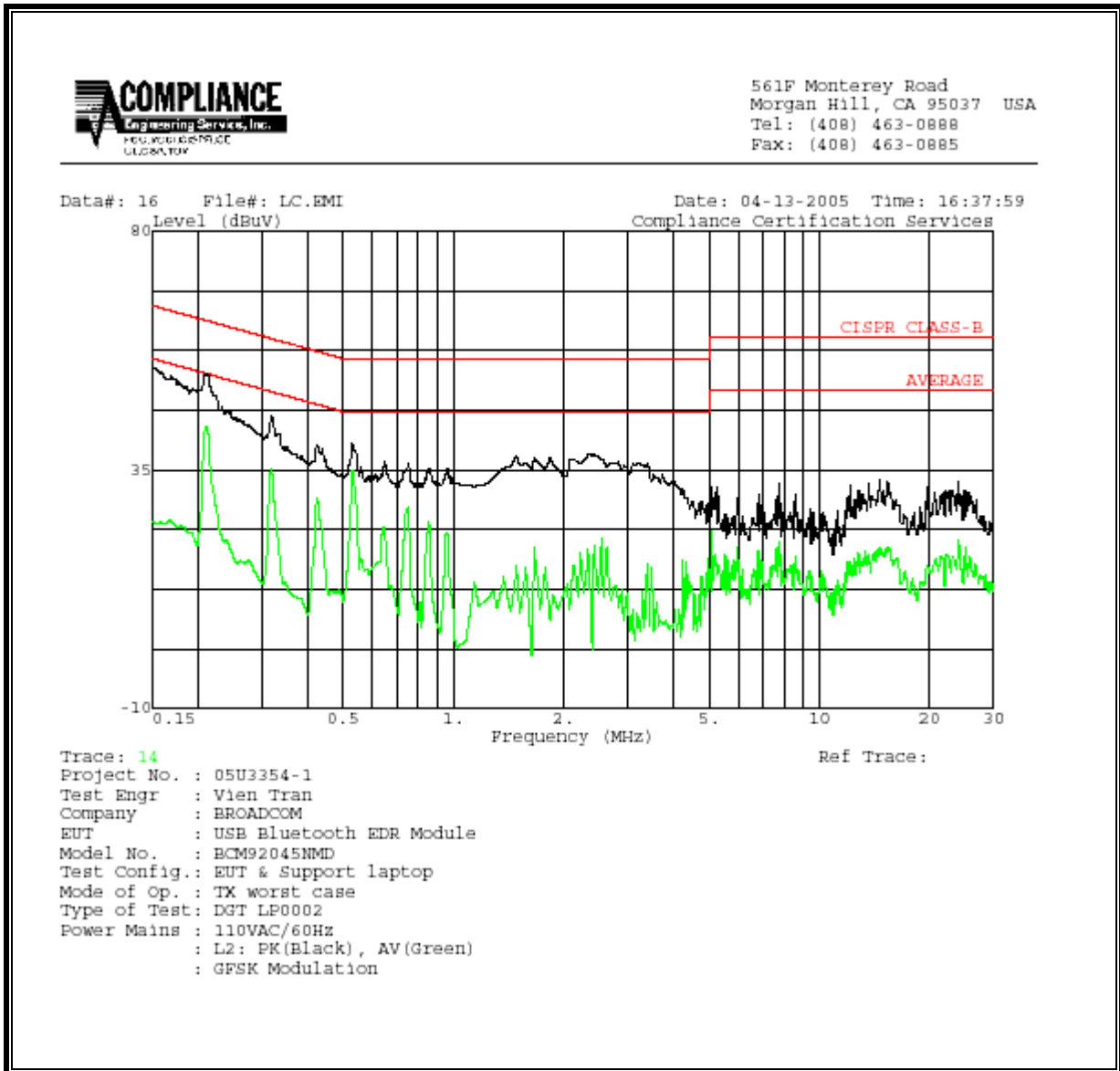
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (110VAC 60Hz)										
Freq. (MHz)	Reading			Class (dB)	Limit QP	FCC B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	QP (dB)	AV (dB)		
0.15	54.70	--	24.95	0.00	66.00	56.00	-11.30	-31.05	L1	
0.21	51.96	--	38.00	0.00	63.21	53.21	-11.25	-15.21	L1	
0.64	39.10	--	26.78	0.00	56.00	46.00	-16.90	-19.22	L1	
2.54	37.78	--	23.32	0.00	56.00	46.00	-18.22	-22.68	L1	
11.93	35.52	--	23.54	0.00	60.00	50.00	-24.48	-26.46	L1	
24.00	36.20	--	23.75	0.00	60.00	50.00	-23.80	-26.25	L1	
0.15	54.23	--	25.36	0.00	66.00	56.00	-11.77	-30.64	L2	
0.21	53.02	--	43.17	0.00	63.21	53.21	-10.19	-10.04	L2	
0.54	39.71	--	34.93	0.00	56.00	46.00	-16.29	-11.07	L2	
2.54	37.89	--	28.00	0.00	56.00	46.00	-18.11	-18.00	L2	
14.59	33.00	--	23.38	0.00	60.00	50.00	-27.00	-26.62	L2	
24.00	32.68	--	21.75	0.00	60.00	50.00	-27.32	-28.25	L2	
12 Worst Data										

LINE 1 RESULTS



LINE 2 RESULTS



7.5. POWERLINE CONDUCTED EMISSIONS WITH 8PSK MODULATION

LIMIT

§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 μ 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 of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

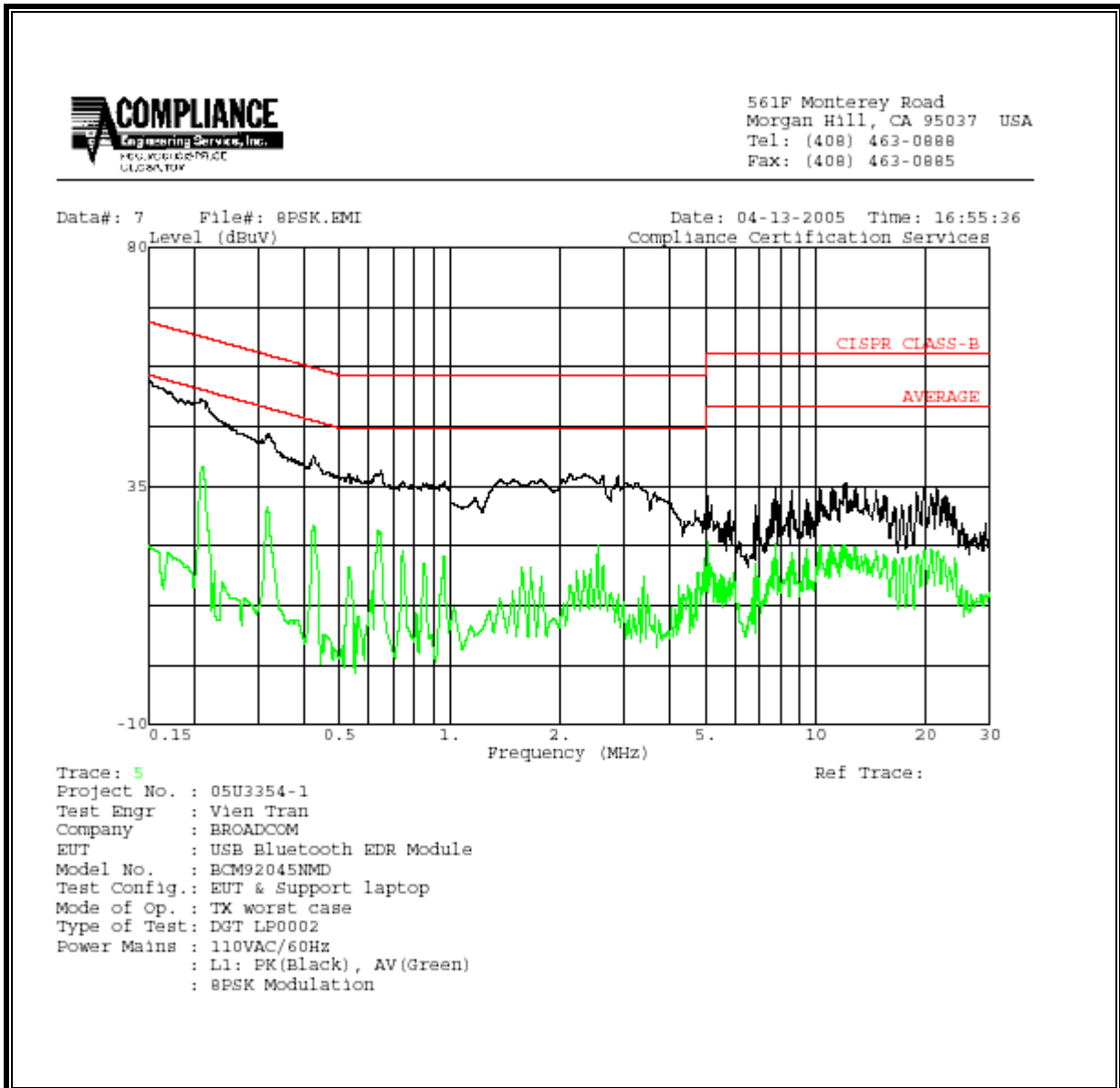
RESULTS

No non-compliance noted:

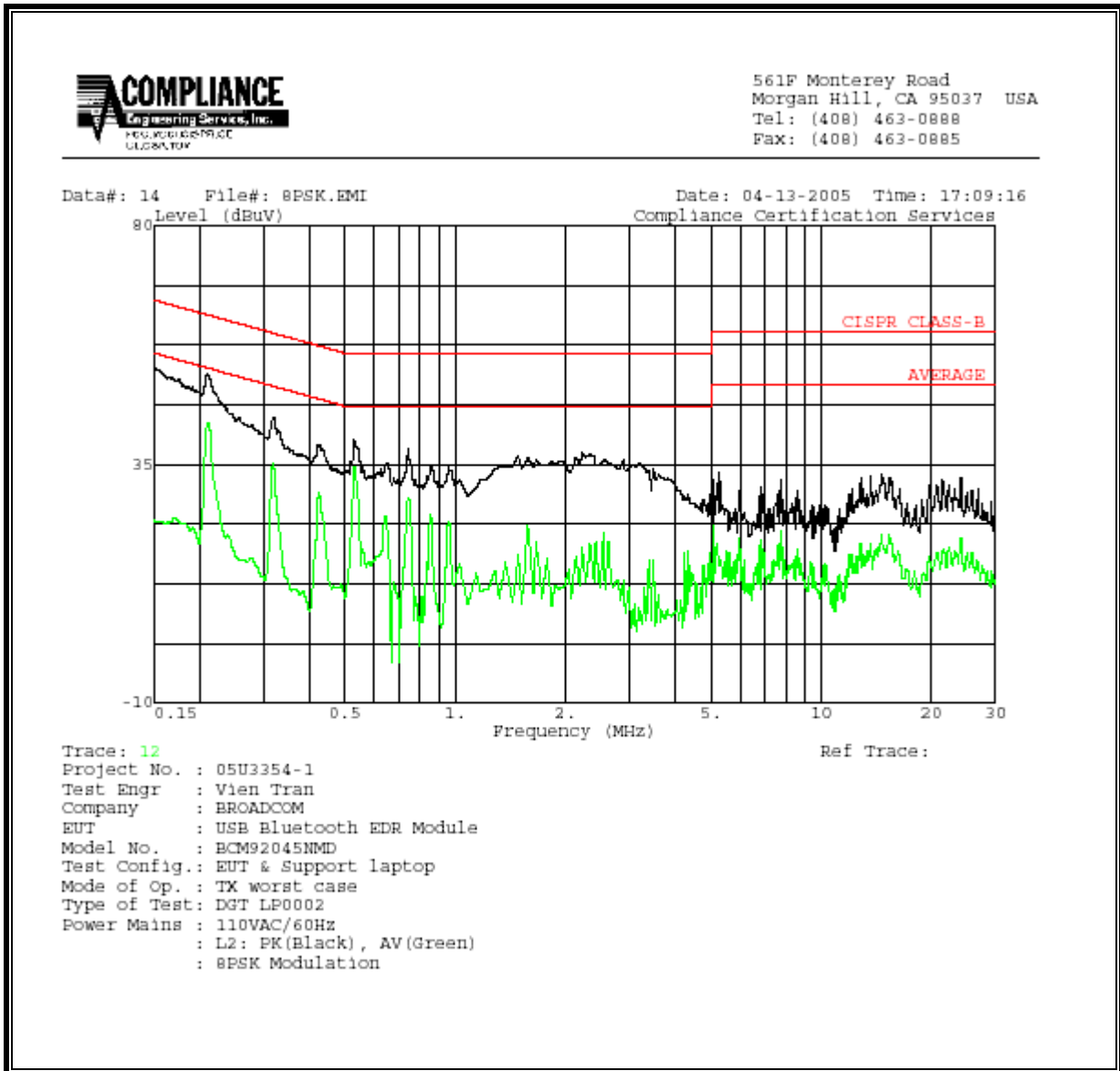
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (110VAC 60Hz)										
Freq. (MHz)	Reading			Class (dB)	Limit QP	FCC_B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	QP (dB)	AV (dB)		
0.15	54.96	--	23.96	0.00	66.00	56.00	-11.04	-32.04	L1	
0.21	51.16	--	38.48	0.00	63.21	53.21	-12.05	-14.73	L1	
0.65	37.94	--	26.57	0.00	56.00	46.00	-18.06	-19.43	L1	
2.35	37.18	--	23.87	0.00	56.00	46.00	-18.82	-22.13	L1	
7.77	35.06	--	24.39	0.00	60.00	50.00	-24.94	-25.61	L1	
12.00	35.44	--	23.67	0.00	60.00	50.00	-24.56	-26.33	L1	
0.15	53.38	--	24.50	0.00	66.00	56.00	-12.62	-31.50	L2	
0.21	51.81	--	42.89	0.00	63.21	53.21	-11.40	-10.32	L2	
0.65	39.39	--	34.63	0.00	56.00	46.00	-16.61	-11.37	L2	
2.35	36.85	--	28.26	0.00	56.00	46.00	-19.15	-17.74	L2	
7.77	33.70	--	24.10	0.00	60.00	50.00	-26.30	-25.90	L2	
12.00	33.00	--	22.67	0.00	60.00	50.00	-27.00	-27.33	L2	
12 Worst Data										

LINE 1 RESULTS

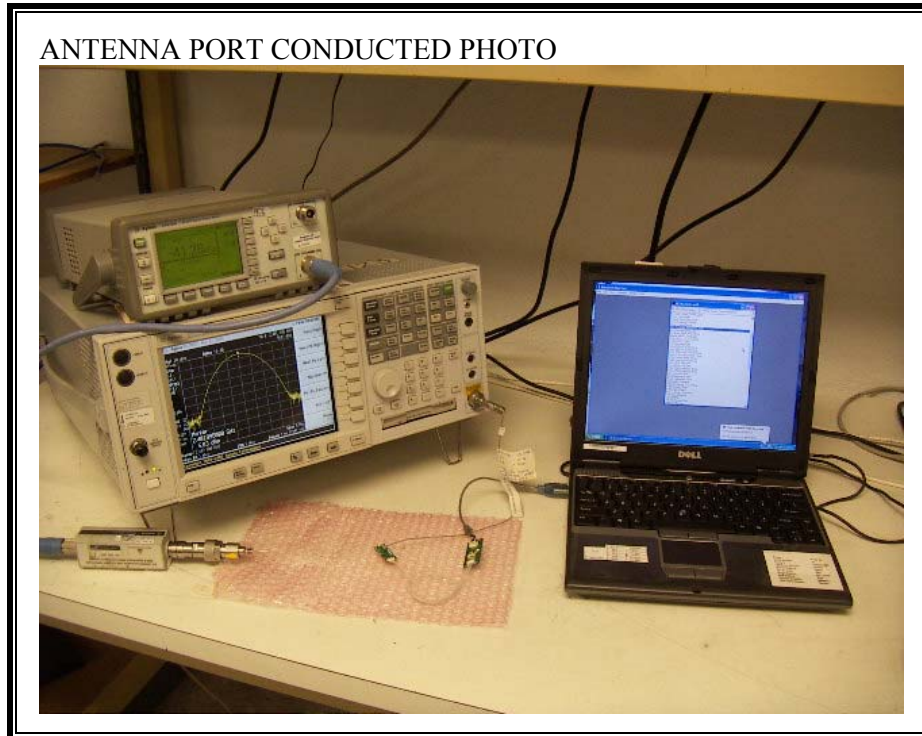


LINE 2 RESULTS

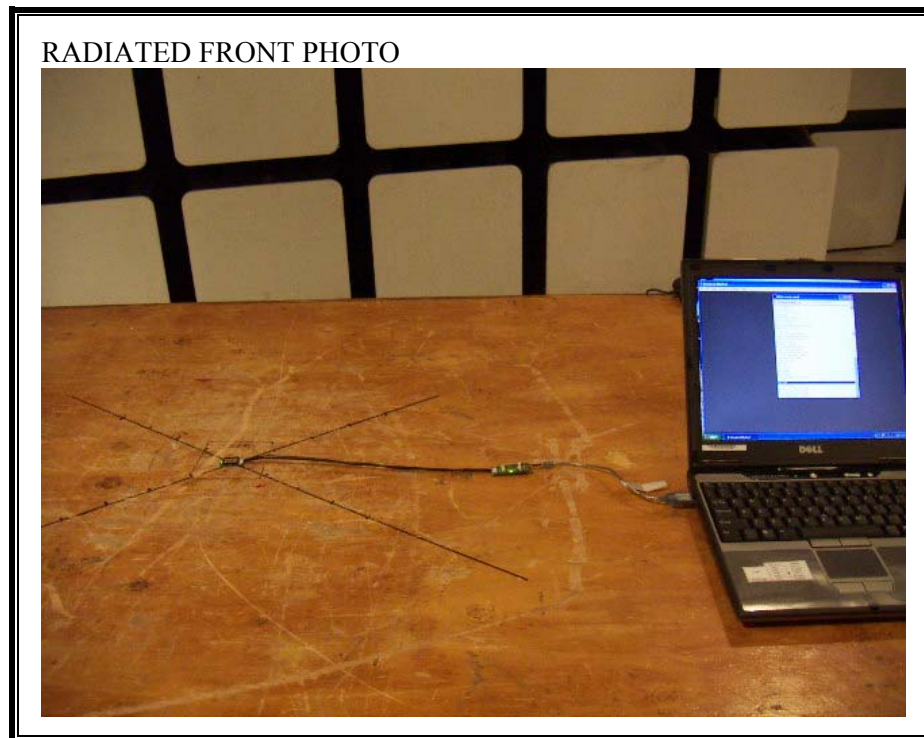


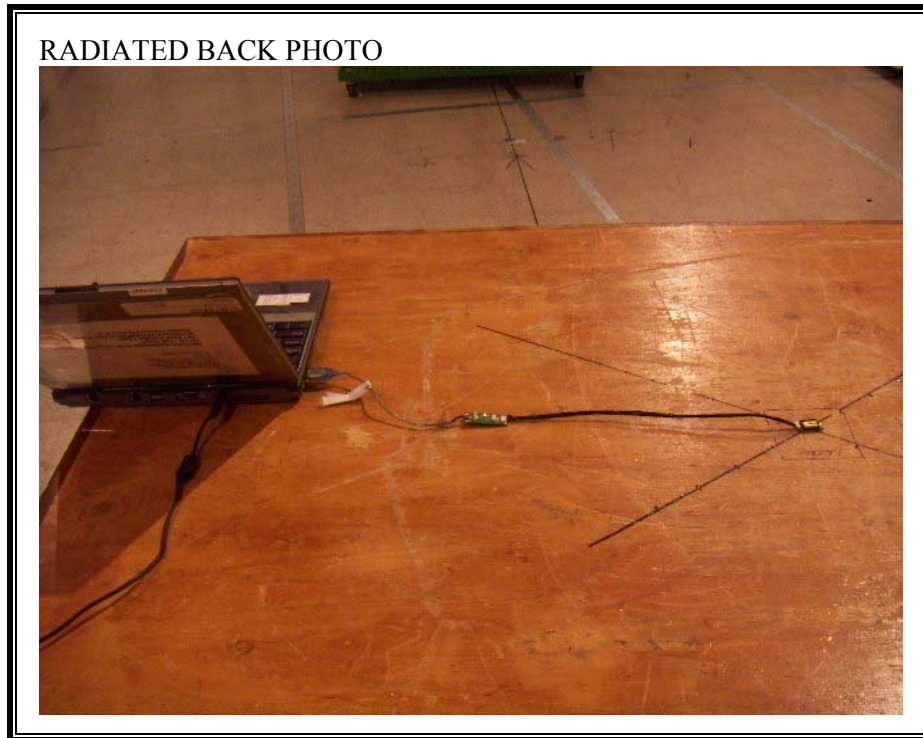
8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



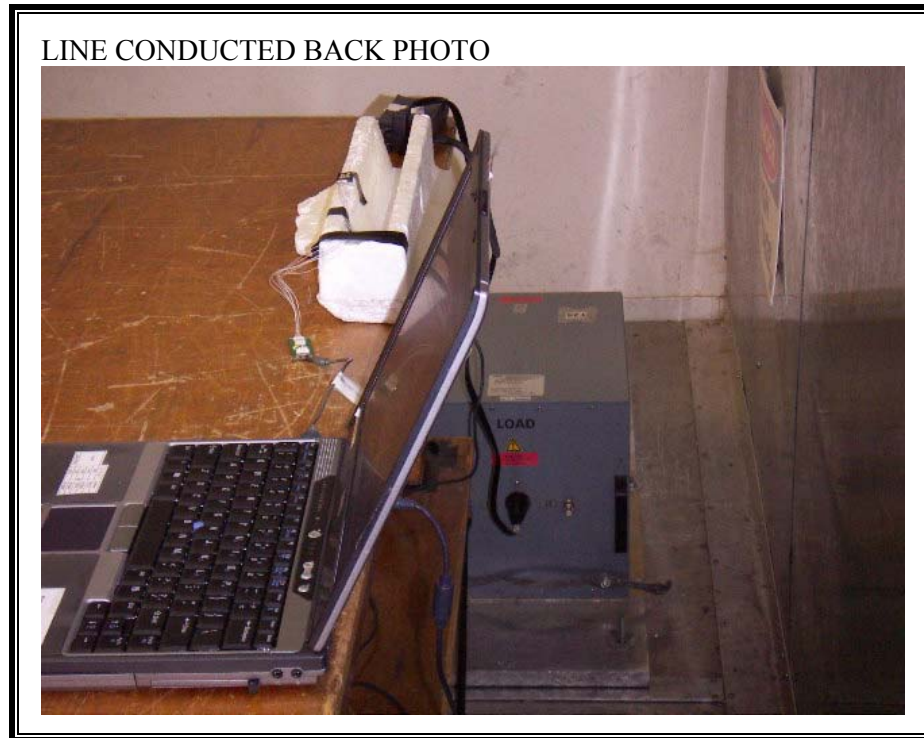
RADIATED RF MEASUREMENT SETUP





POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

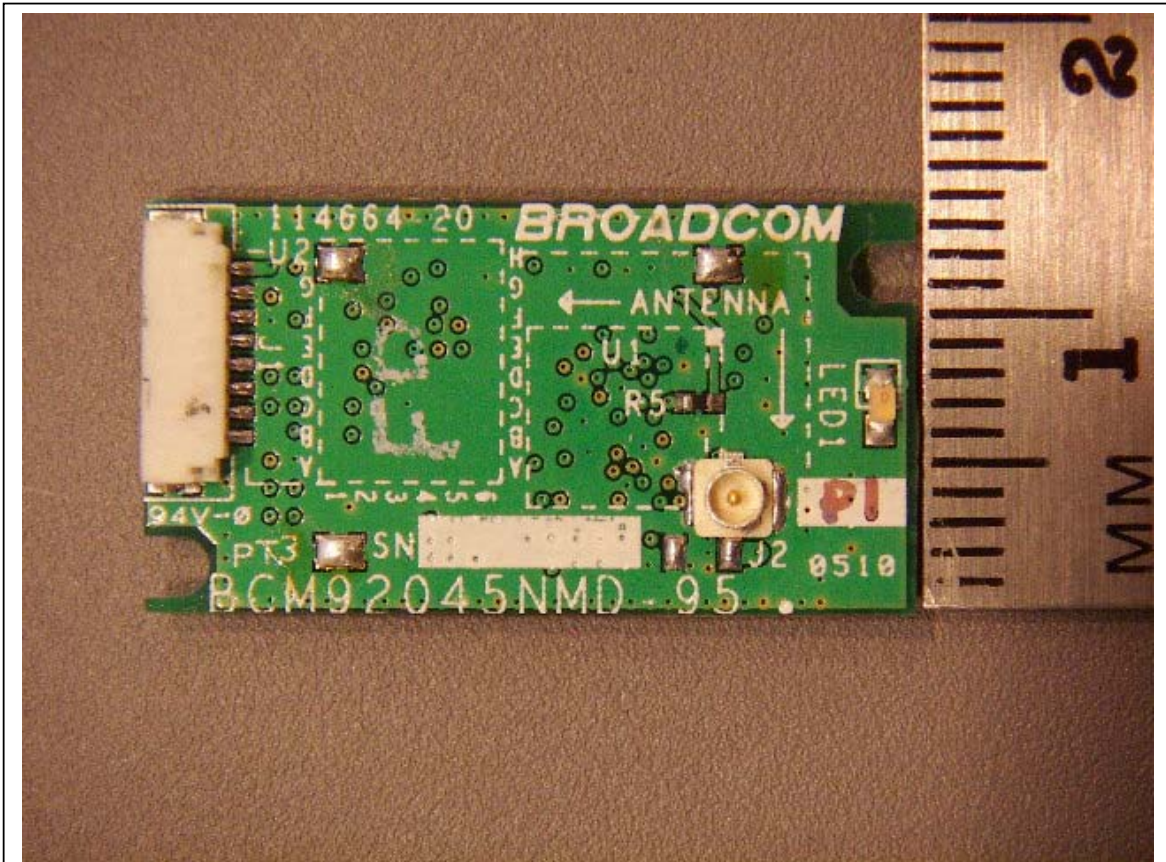




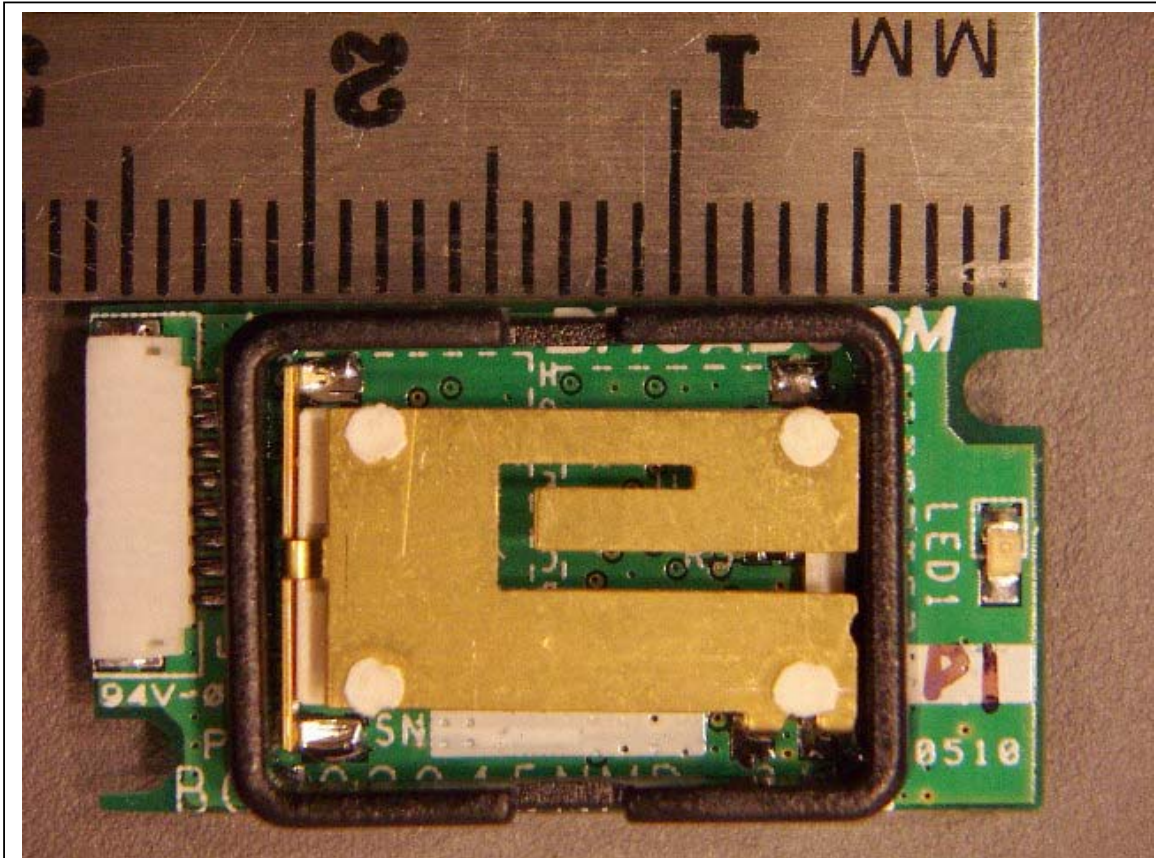
END OF REPORT

APPENDIX

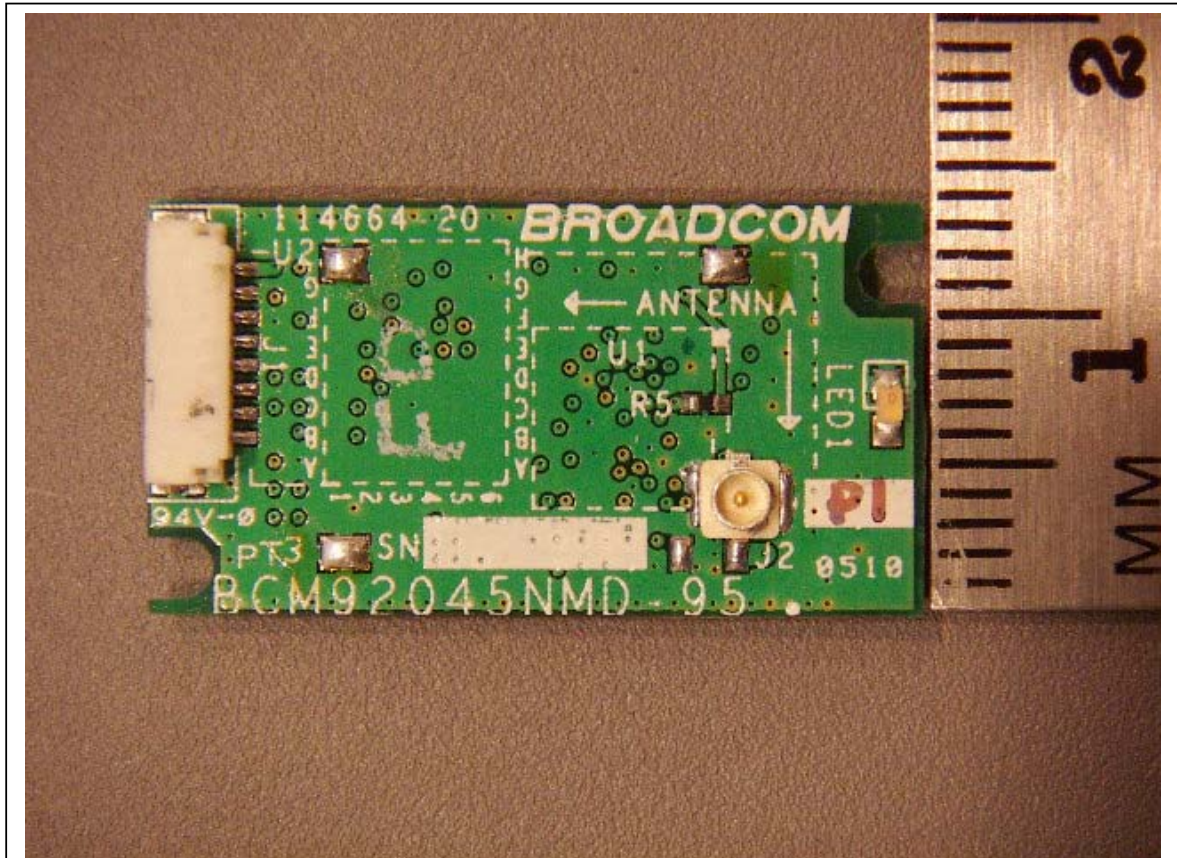
產品照片



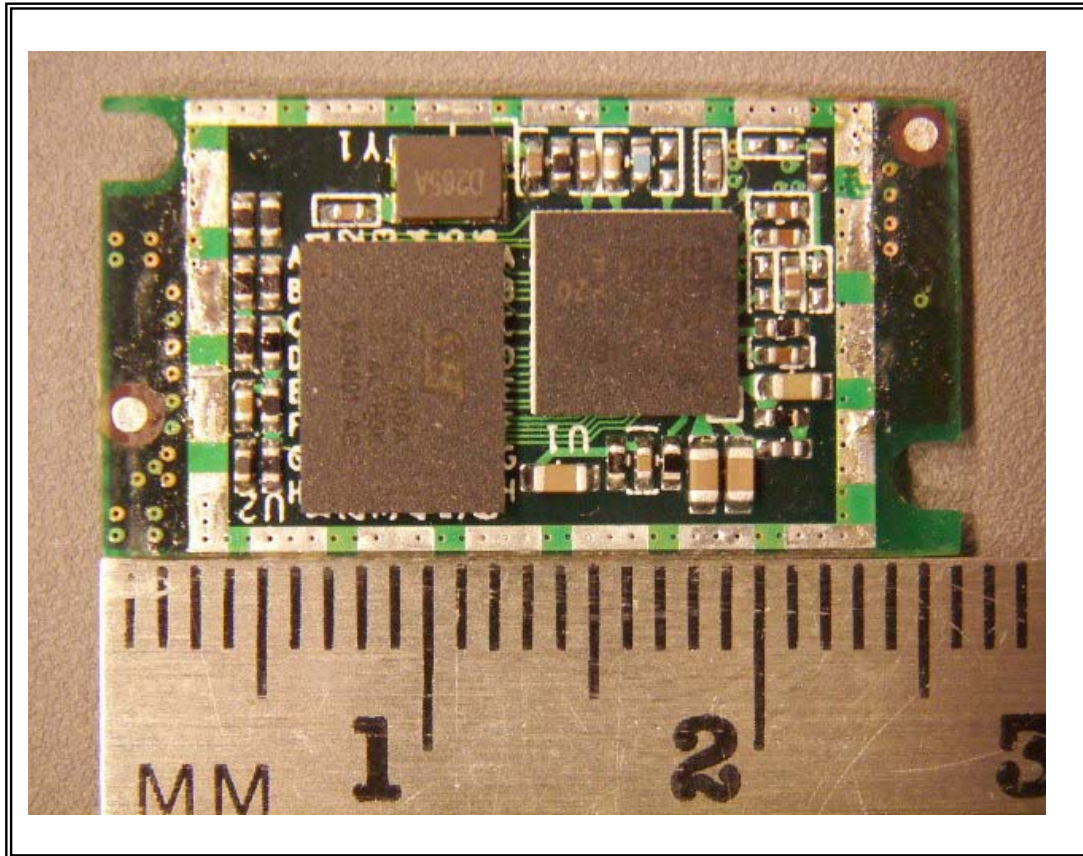
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Model: BCM92045NMD
Brand: BROADCOM
Project No.: 05U3354-1



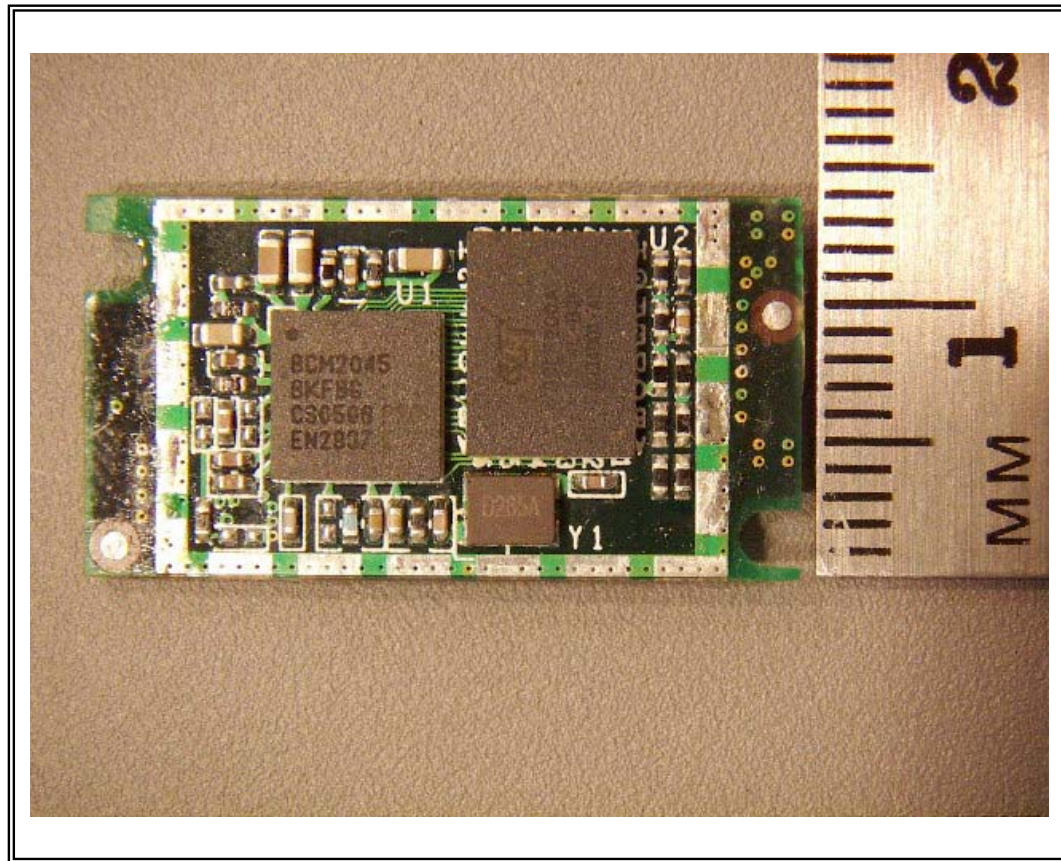
EUT Name: BROADCOM USB BLUETOOTH MODULE
Model: BCM92045NMD
Brand: BROADCOM
Project No.: 05U3354-1



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END OF REPORT