



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION**

**TEST REPORT**

**FOR**

**BROADCOM BLUETOOTH HID MODULE**

**MODEL NUMBER: BCM92040LMF-M**

**FCC ID: QDS-BRCM1010**

**REPORT NUMBER: 03U2374-1**

**ISSUE DATE: FEBRUARY 06, 2004**

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# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** BROADCOM CORP.  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, U.S.A

**EUT DESCRIPTION:** BROADCOM BLUETOOTH HID MODULE

**MODEL:** BCM92040LMF-M

**DATE TESTED:** NOVEMBER 18, 2003 TO FEBRUARY 06, 2003

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:** This document reports conditions under which testing was conducted and results of tests performed. 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.

Approved & Released For CCS By:

Tested By:



THU CHAN  
CHIEF EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

NEELESH RAJ  
EMC TECHNICIAN  
COMPLIANCE CERTIFICATION SERVICES

## 2. EUT DESCRIPTION

The EUT is a Bluetooth transceiver module operating in the 2400-2483.5 MHz band.

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

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	2.52	1.79

The radio utilizes an Integral PCB antenna with a maximum gain of 1.87 dBi.

### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

### 4. 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>.



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

## 5. CALIBRATION AND UNCERTAINTY

### 5.1. 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.

### 5.2. 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%.

### 5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004
RF Filter Section	HP	85420E	3705A00256	11/21/2004
Bilog Antenna 30MHz~ 2GHz	Sunol Sciences	JB1 Antenna	A121003	12/22/2004
Spectrum Analyzer 20Hz ~ 44GHz	Agilent	E4446A	MY43360112	1/33/2005
Communication Tester	R & S	CMU 200	838114/032	12/1/2004
EMI Test Receiver 20Hz ~ 40GHz	R & S	ESIB40	100192	11/21/2004
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2004
Peak Power Meter	Agilent	E4416A	GB41291160	11/7/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/2004
Preamplifier 1-26GHz	MITEQ	NSP2600-SP	924341	4/25/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	2/4/2004
Spectrum Analyzer 3Hz ~ 26.5GHz	Agilent	E4440A	US41421507	5/8/2004
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-1826/B	1013	2/2/2004
Antenna, Bicon/log, 25-2000 MHz	ARA	LPB-2520/A	1185	3/6/2004
2.4-2.5GHz Reject filter	Micro-Tronics	BRM50702	1	N/A
10dB Attenuator	Weinschel	56-10	k16148	N/A

## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
BROADCOM BLUETOOTH HID MODULE	BROADCOM CORP	BCM92040LMF-M	N/A	QDS-BRCM1010
*ADAPTER BOARD / TEST JIG	BROADCOM CORP	N/A	N/A	N/A
*AC ADAPTER	CUI, INC.	CEPA-151DA-05	N/A	N/A

\*USED ONLY FOR TESTING PURPOSES

### I/O CABLES

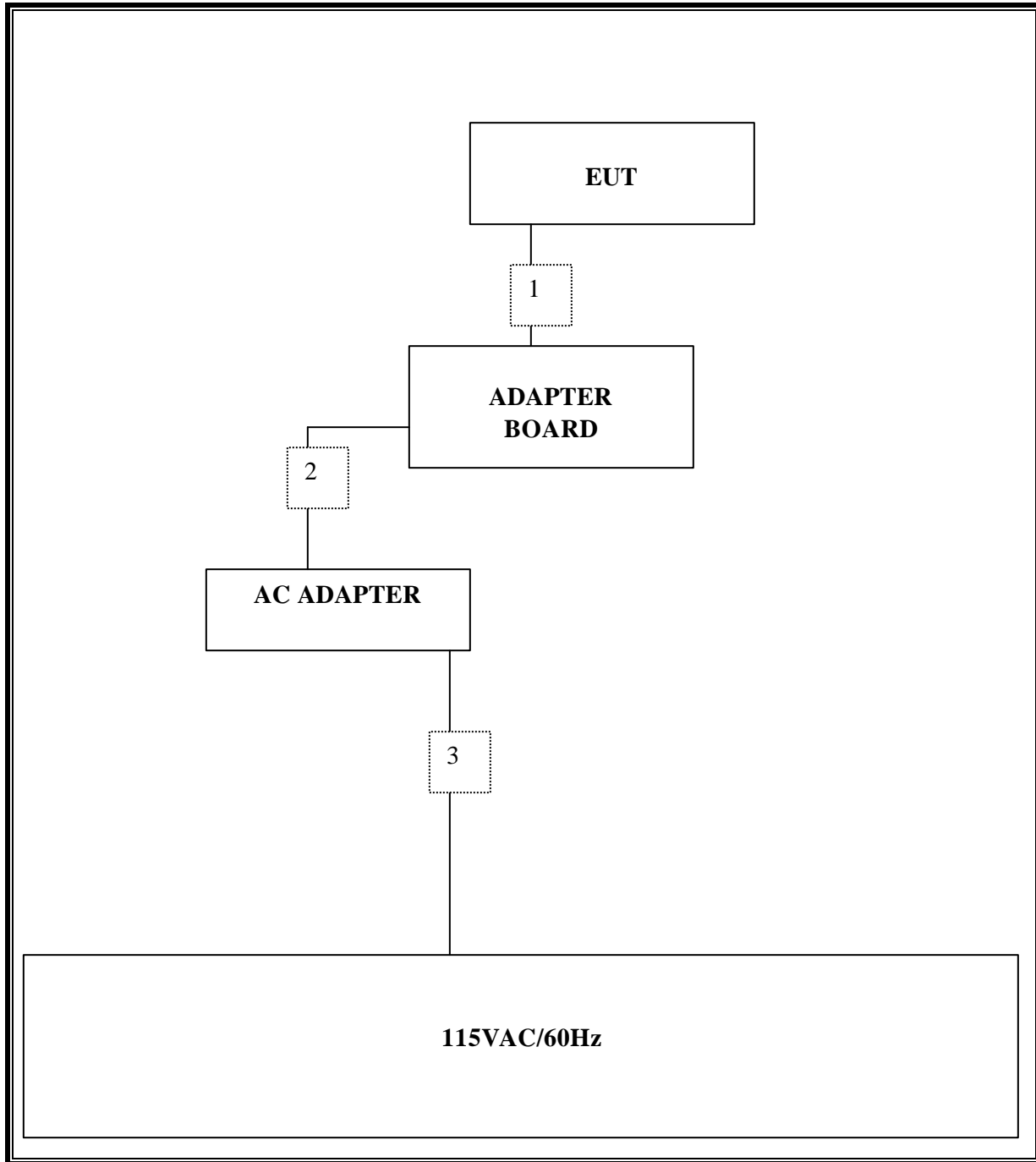
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	CTRL/PWR	1	HARDWIRED	UNSHIELDED	0.2M	USED ONLY FOR TESTING PURPOSES
2	DC POWER	1	DC PWR	UNSHIELDED	1.86M	USED ONLY FOR TESTING PURPOSES
3	AC PWR	1	AC PWR	UNSHIELDED	1.86M	USED ONLY FOR TESTING PURPOSES

### TEST SETUP

During the testing process, positions X, Y, and Z were tested "Y" position was found to be worst case because it yielded the highest radiated power. The EUT was set in continues transmit mode and tested in PRBS9 mode for all non-hopping tests.



**SETUP DIAGRAM FOR TESTS**



## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. 20 dB BANDWIDTH

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

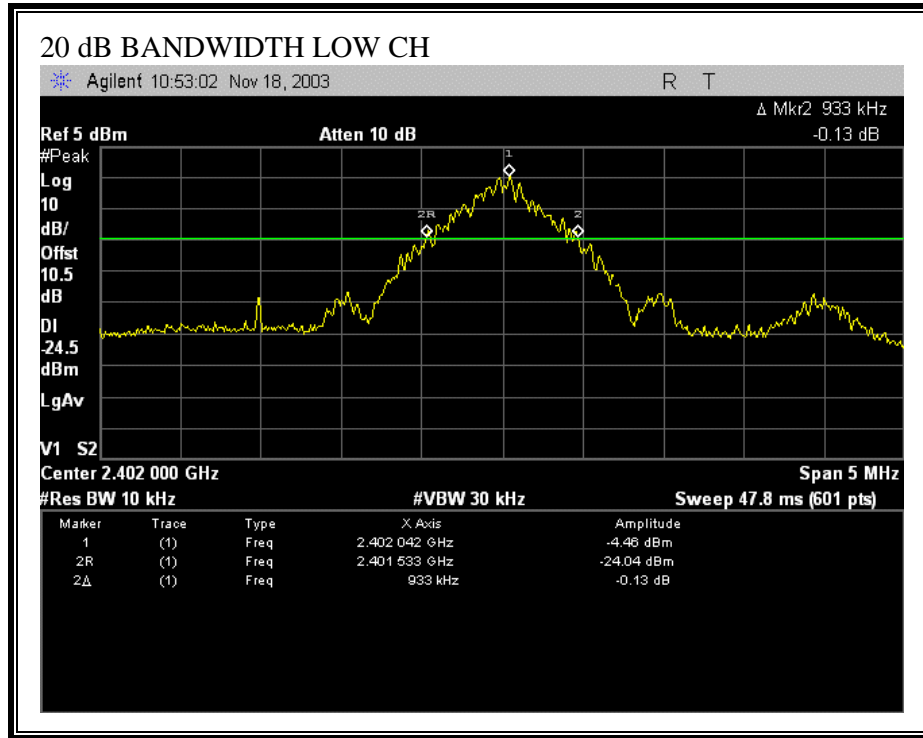
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

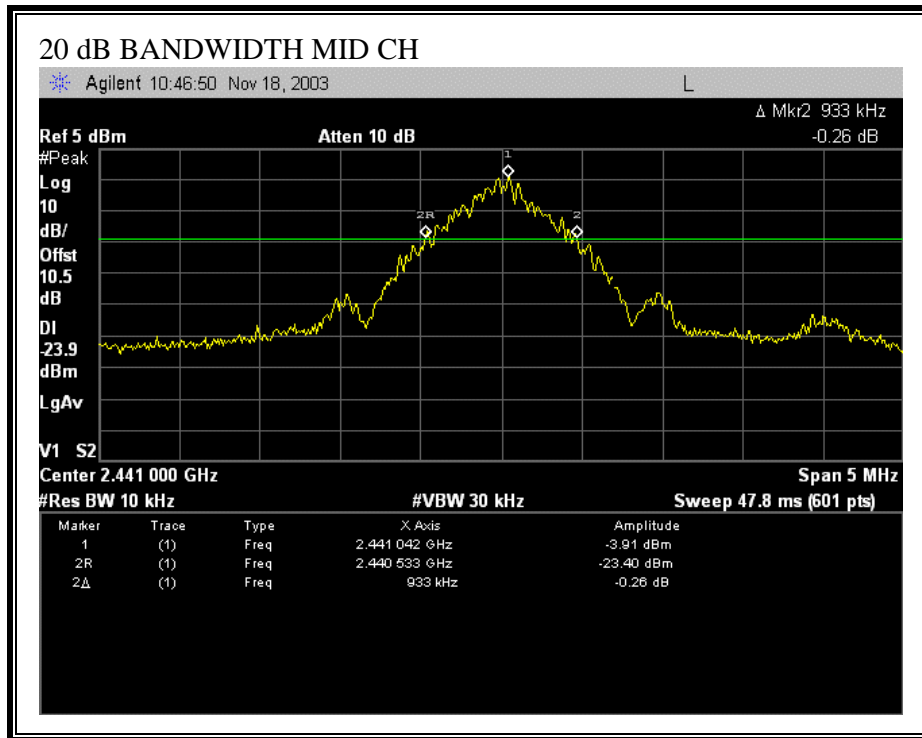
#### RESULTS

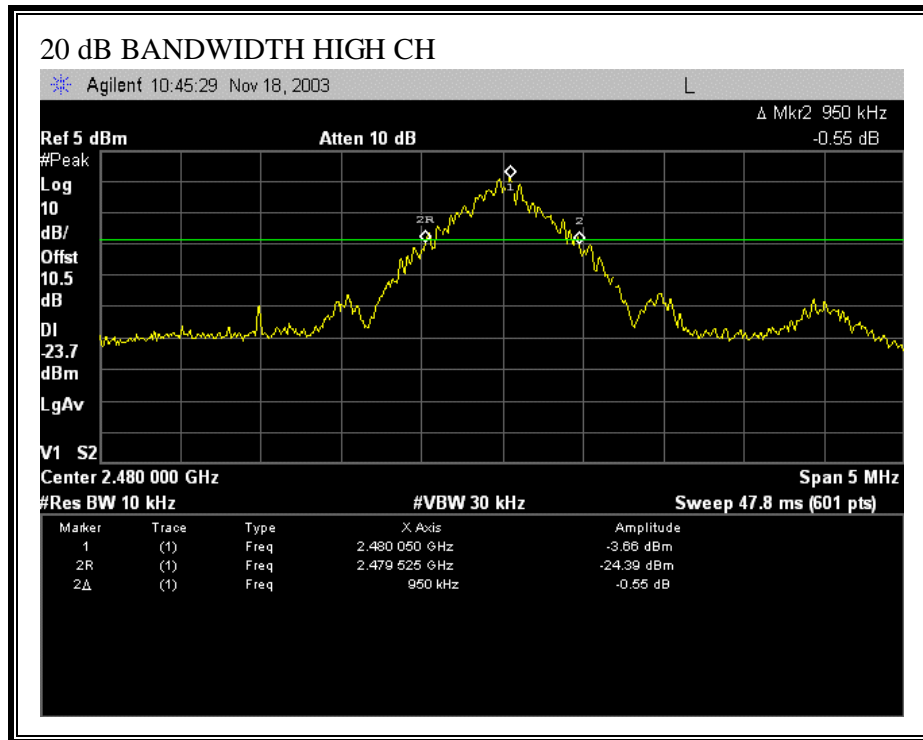
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	933
Middle	2441	933
High	2480	950

**20 dB BANDWIDTH**







## 7.2. 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.

### TEST PROCEDURE

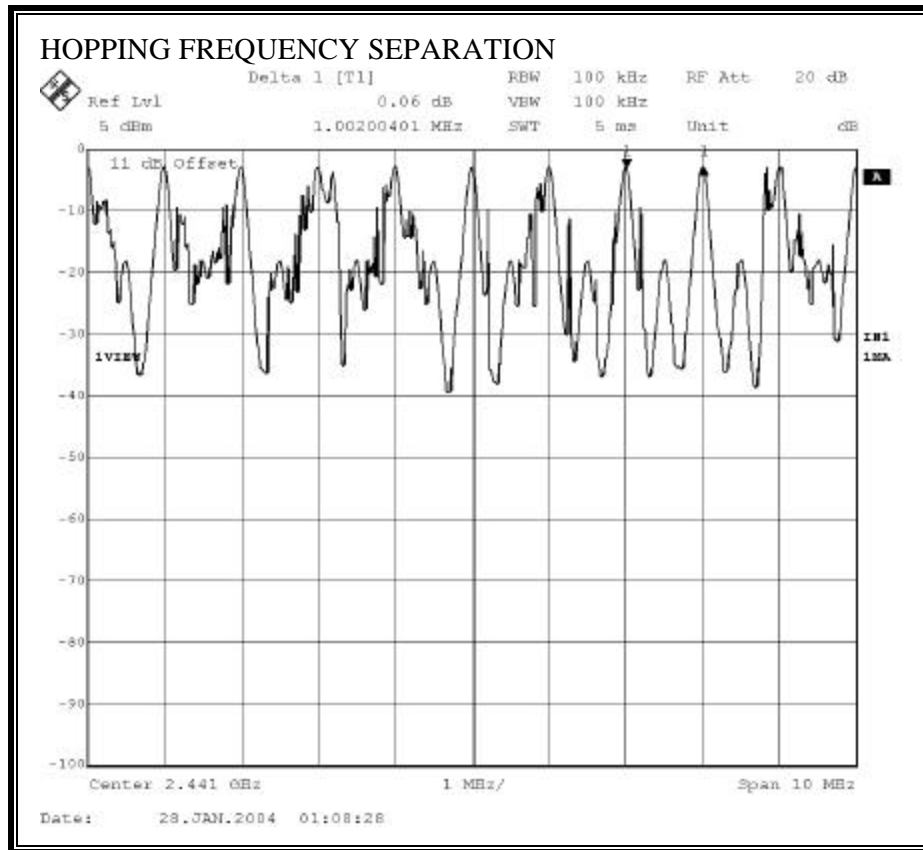
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

### RESULTS

Channel Separation (kHz)	20 dB Bandwidth (kHz)	Margin (kHz)
1002	950	52

No non-compliance noted:

**HOPPING FREQUENCY SEPARATION**



### 7.3. 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.

#### 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.

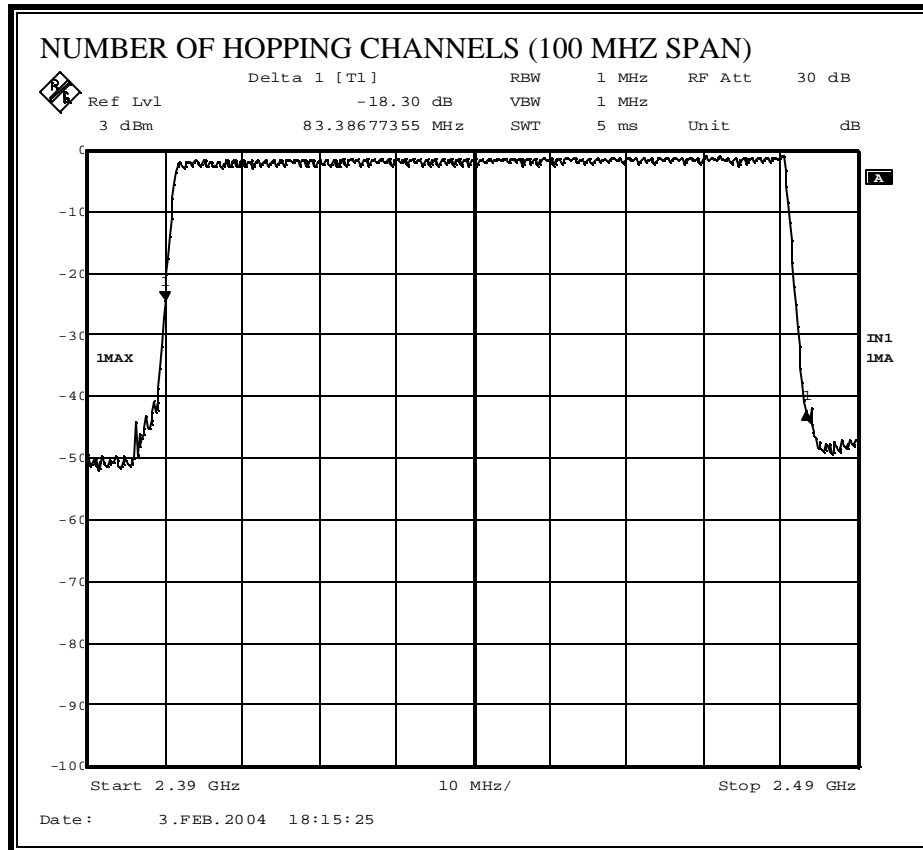
#### RESULTS

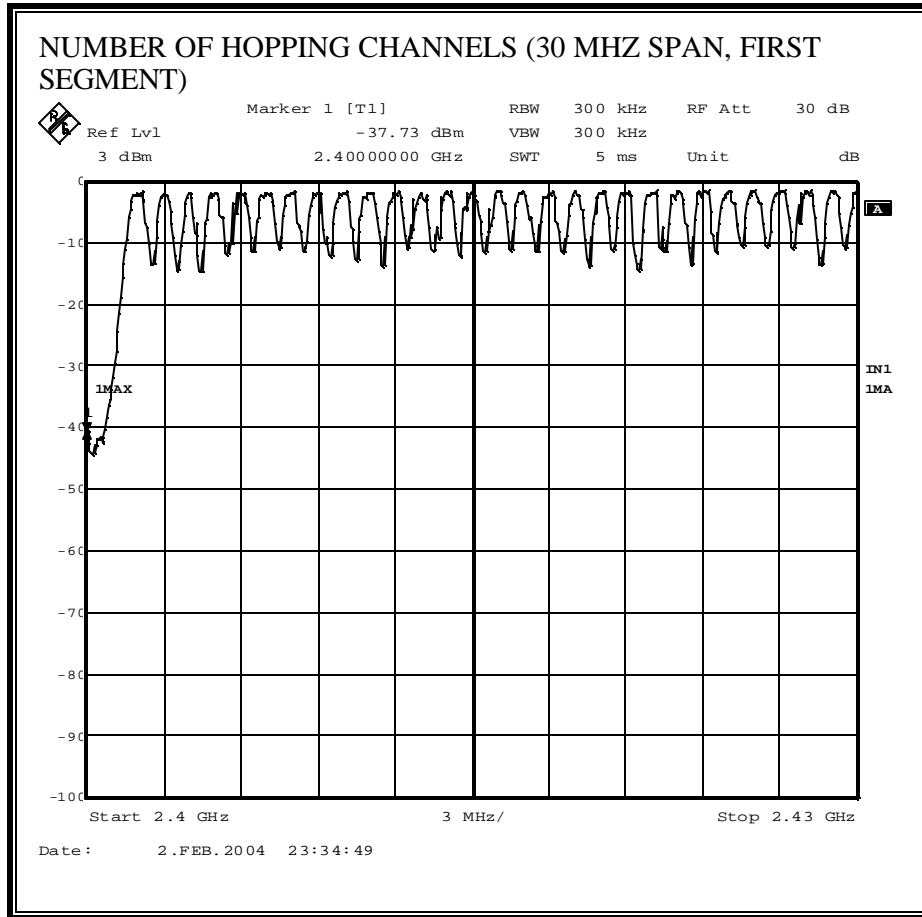
Channels Observed
79

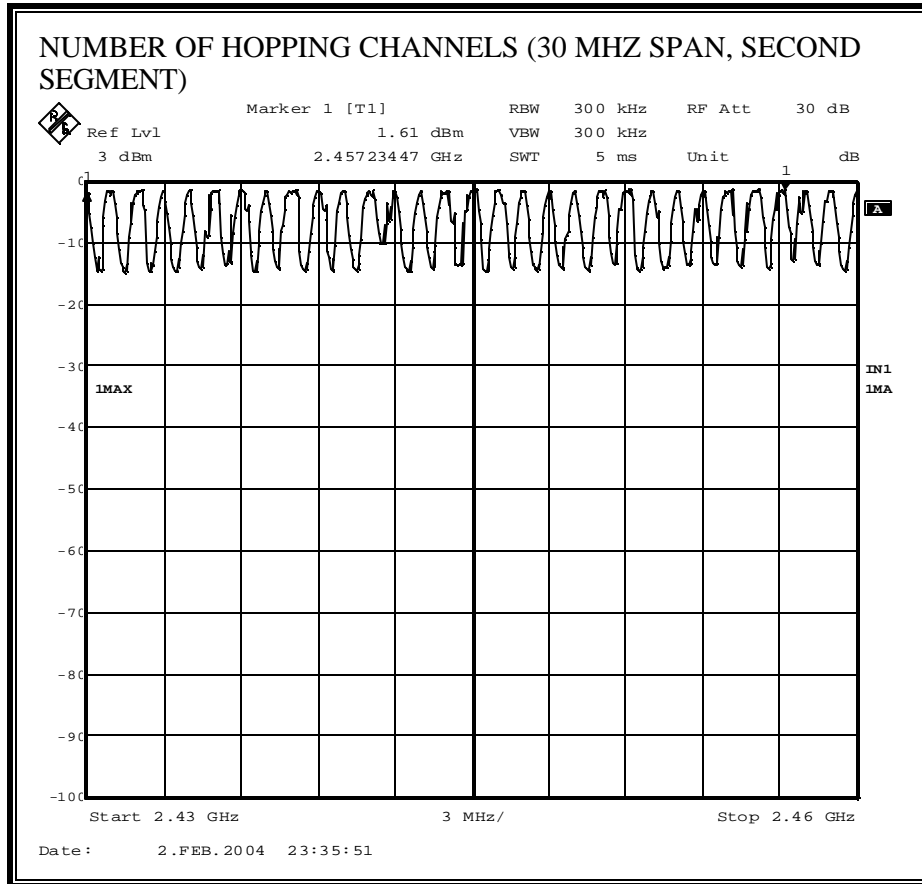
No non-compliance noted:

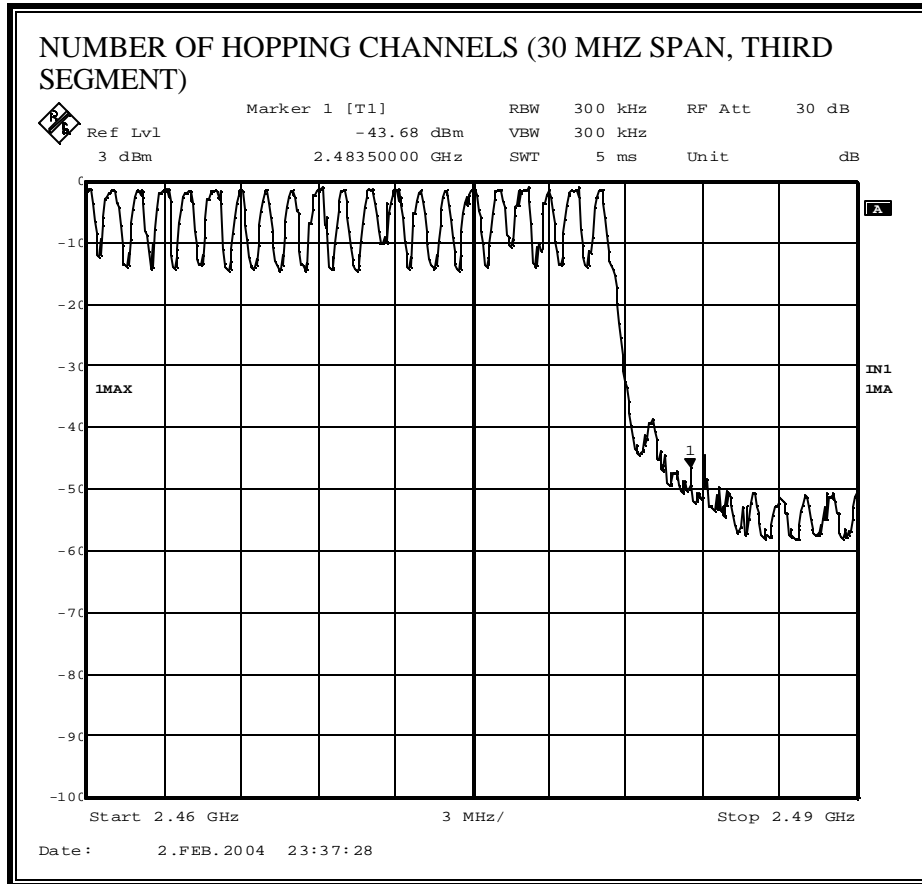


**NUMBER OF HOPPING CHANNELS**









## 7.4. 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:

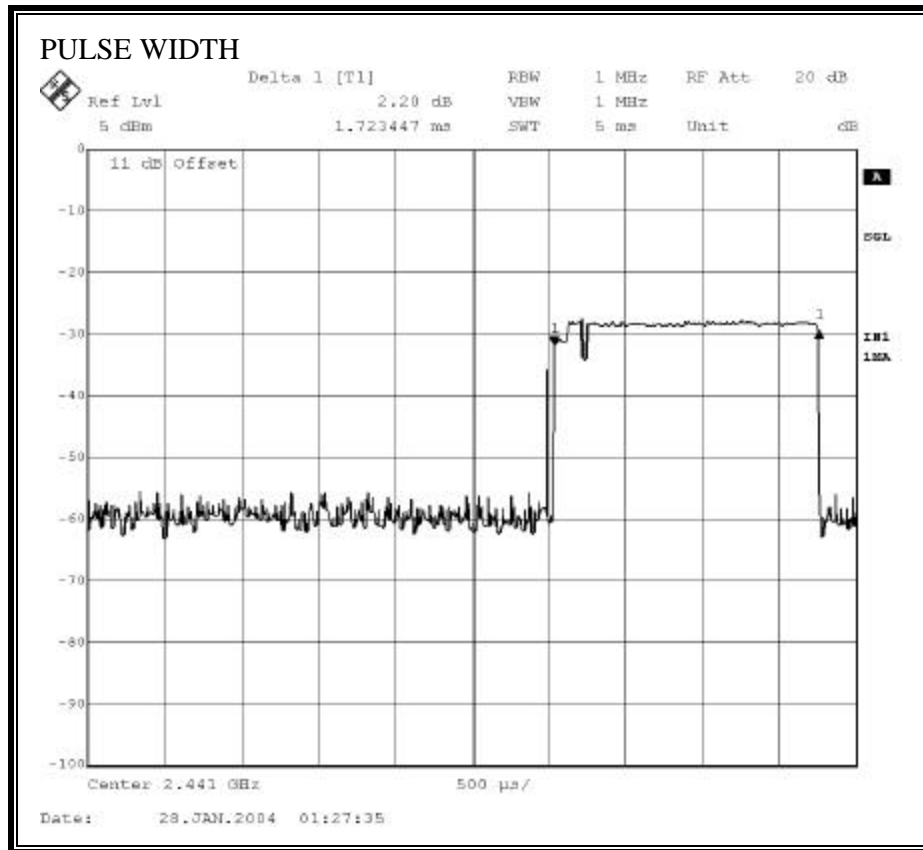
# of Occurrence/Pulses in 3.16 sec
14

14 (occurrence/pulse in 3.16 seconds) x 10 = 140 (pulses in 31.6 seconds)

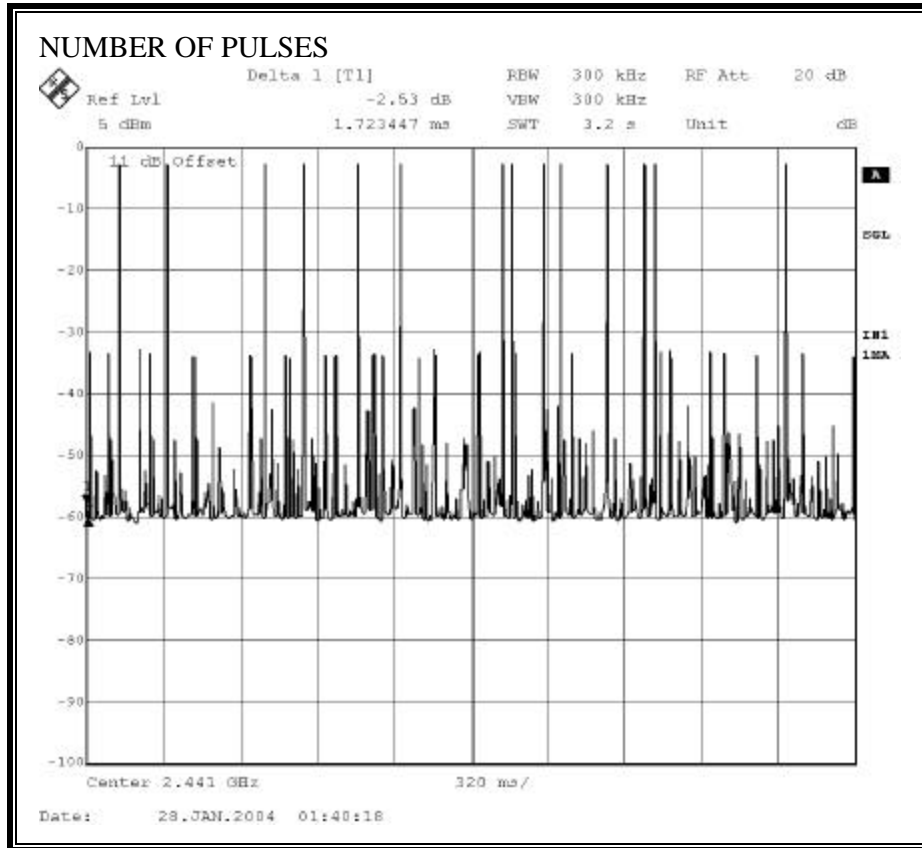
Pulse Width (ms)	# of Occurrence/Pulses in 31.6 sec	Time of Occupancy (sec)	Limit (sec)	Margin (sec)
1.723	140	0.241	0.400	0.159

Note: DH3 packets were found to be worst case and were used for testing purposes. The EUT uses DH1 and DH3 packets only.

**PULSE WIDTH**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**



## 7.5. 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 1.87 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.

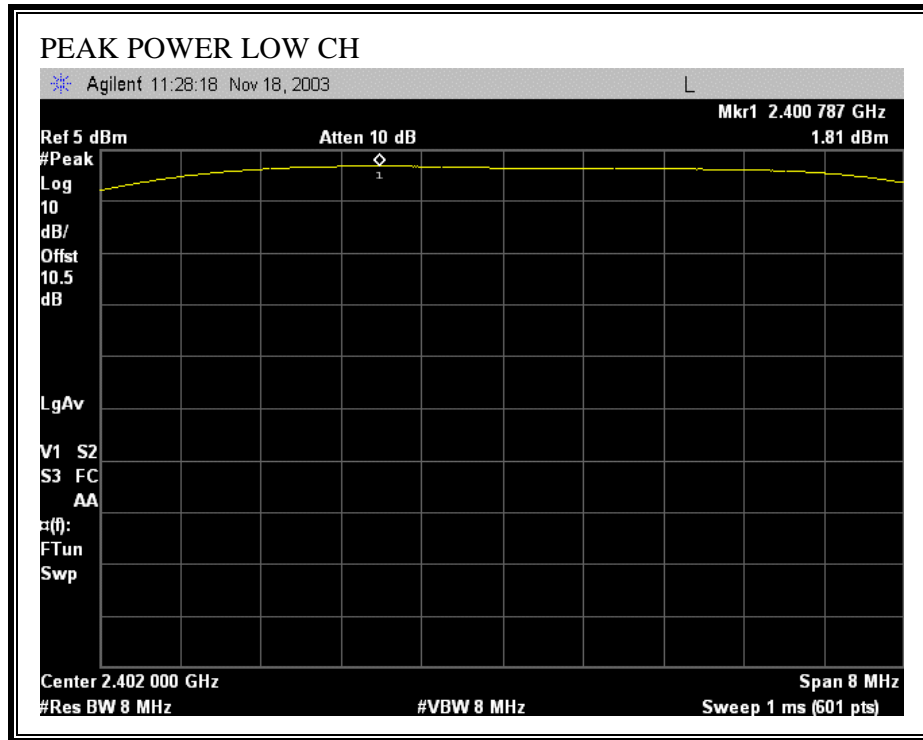
### RESULTS

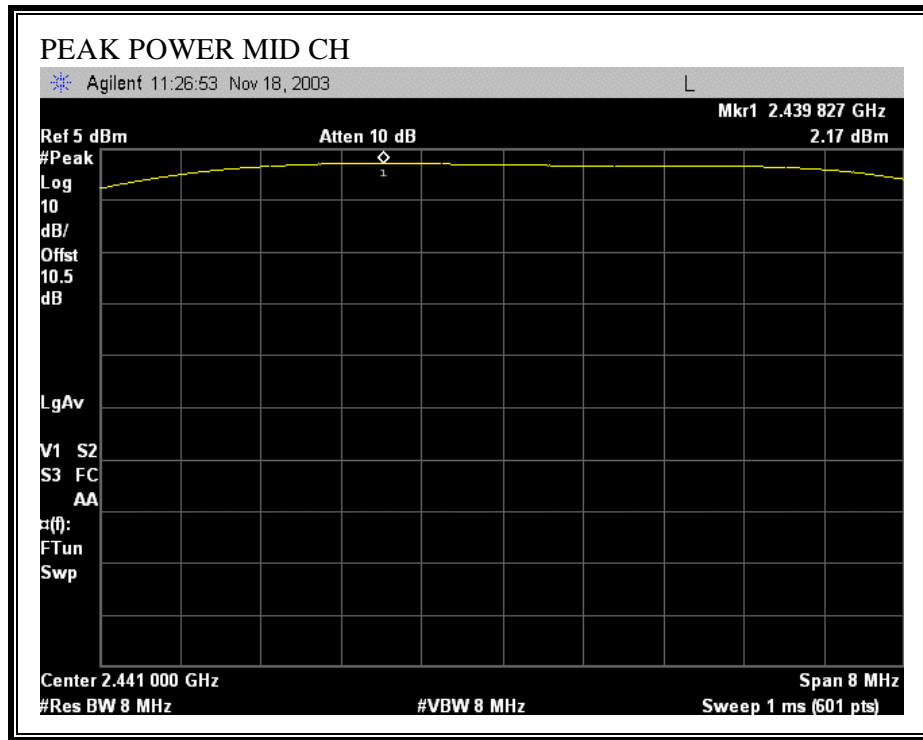
No non-compliance noted:

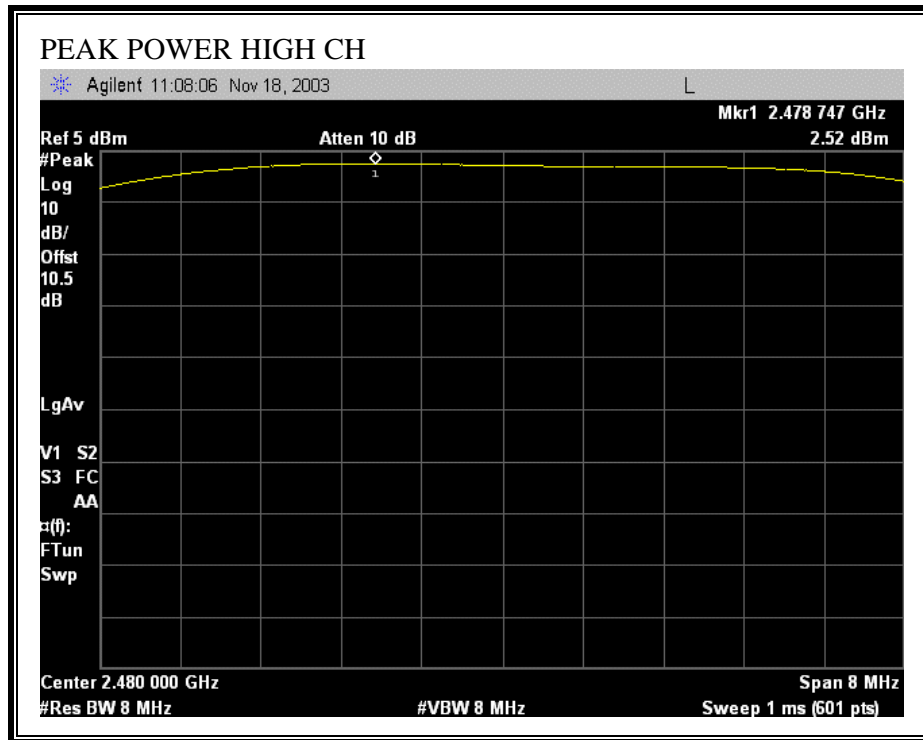
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.81	30	-28.19
Middle	2441	2.17	30	-27.83
High	2480	2.52	30	-27.48



**OUTPUT POWER**







## 7.6. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**CALCULATIONS**

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of Power to mW and Distance to cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm<sup>2</sup>

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S} \quad \text{Equation (1)}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Equation (1) and the measured peak power is used to calculate the MPE distance.

**LIMITS**

From §1.1310 Table 1 (B),  $S = 1.0 \text{ mW/cm}^2$

**RESULTS**

No non-compliance noted:

<b>Power Density Limit (mW/cm<sup>2</sup>)</b>	<b>Output Power (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>MPE Distance (cm)</b>
1.0	2.52	1.87	0.47

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

## 7.7. 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 10.5 dB (including 10 dB pad and 0.5 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	1.07
Middle	2441	1.67
High	2480	1.89

## 7.8. 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.

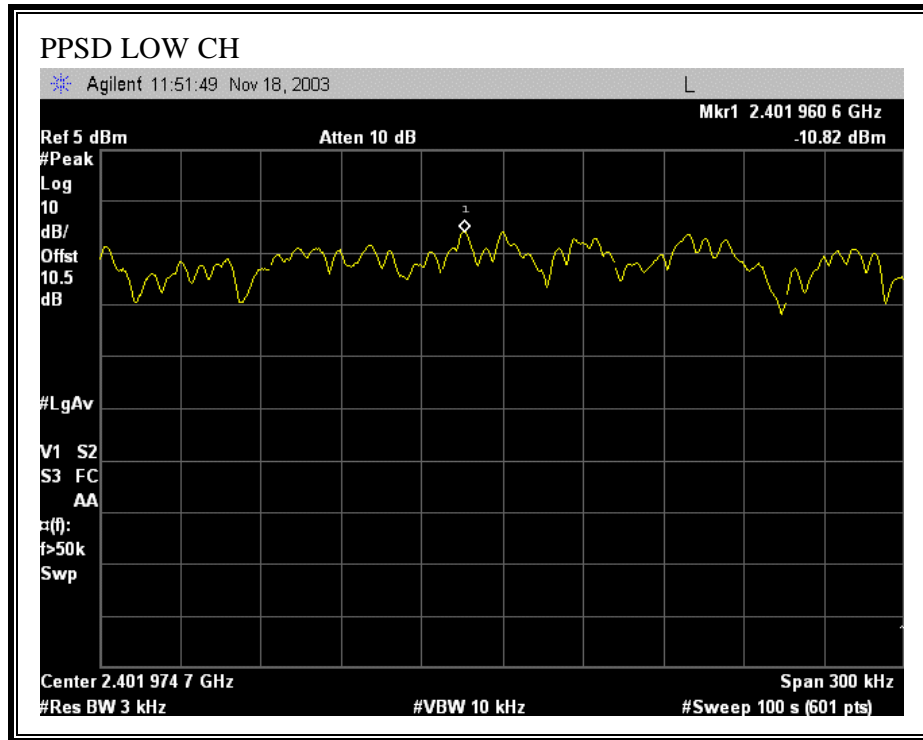
### RESULTS

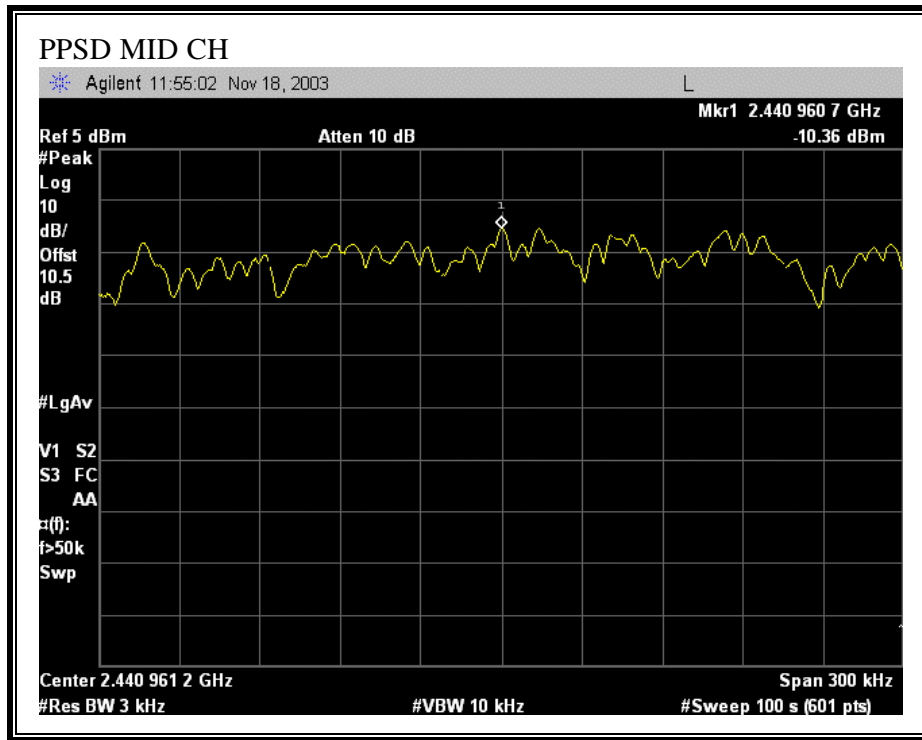
No non-compliance noted:

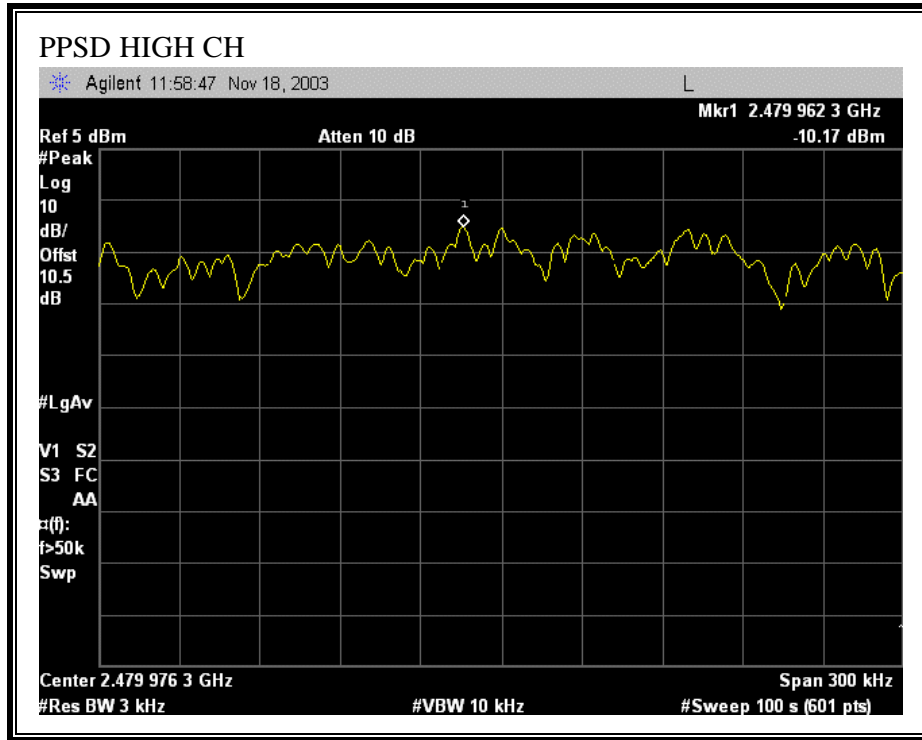
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.82	8	-18.82
Middle	2441	-10.36	8	-18.36
High	2480	-10.17	8	-18.17



**PEAK POWER SPECTRAL DENSITY**







## 7.9. 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

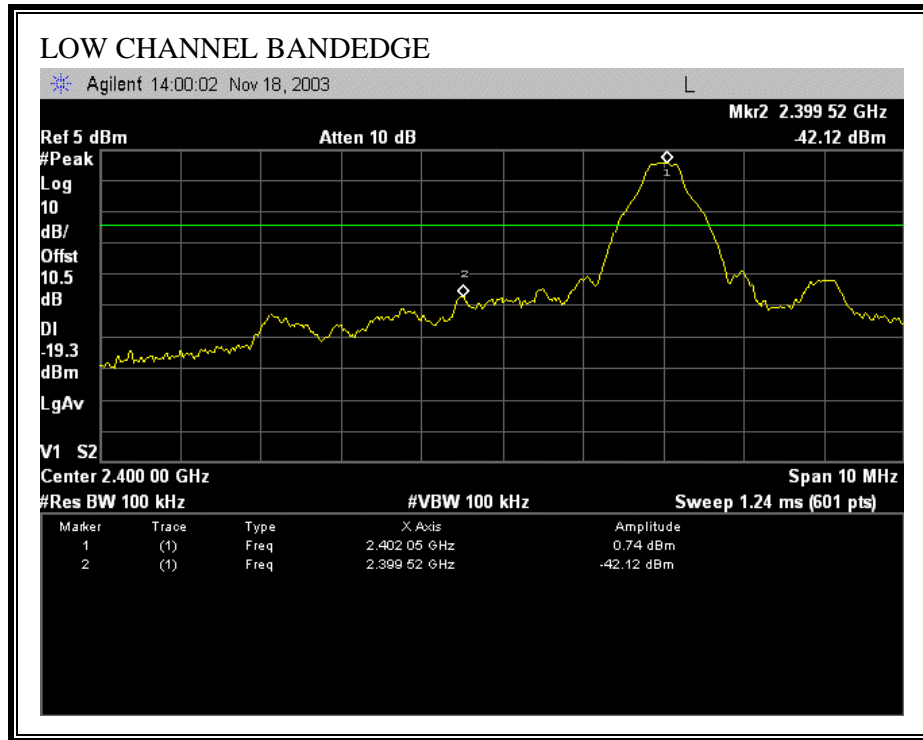
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

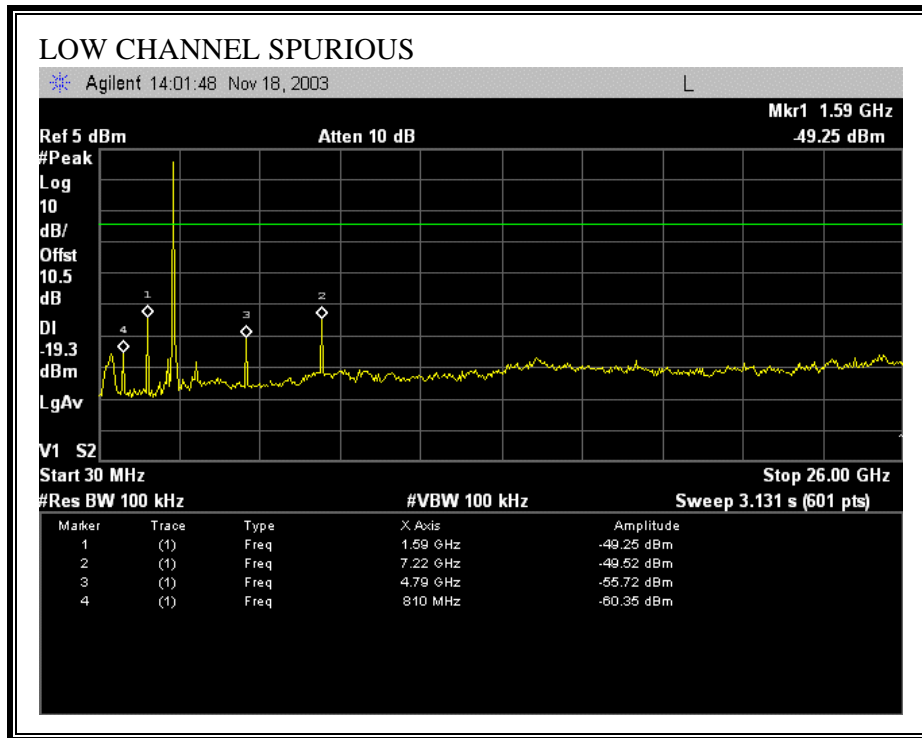
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### RESULTS

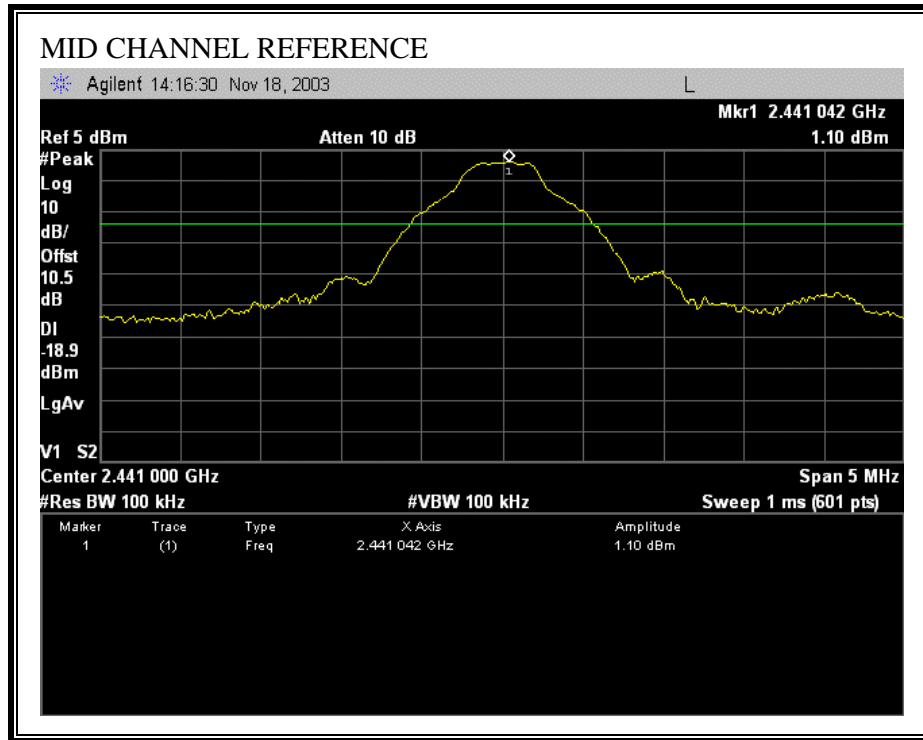
No non-compliance noted:

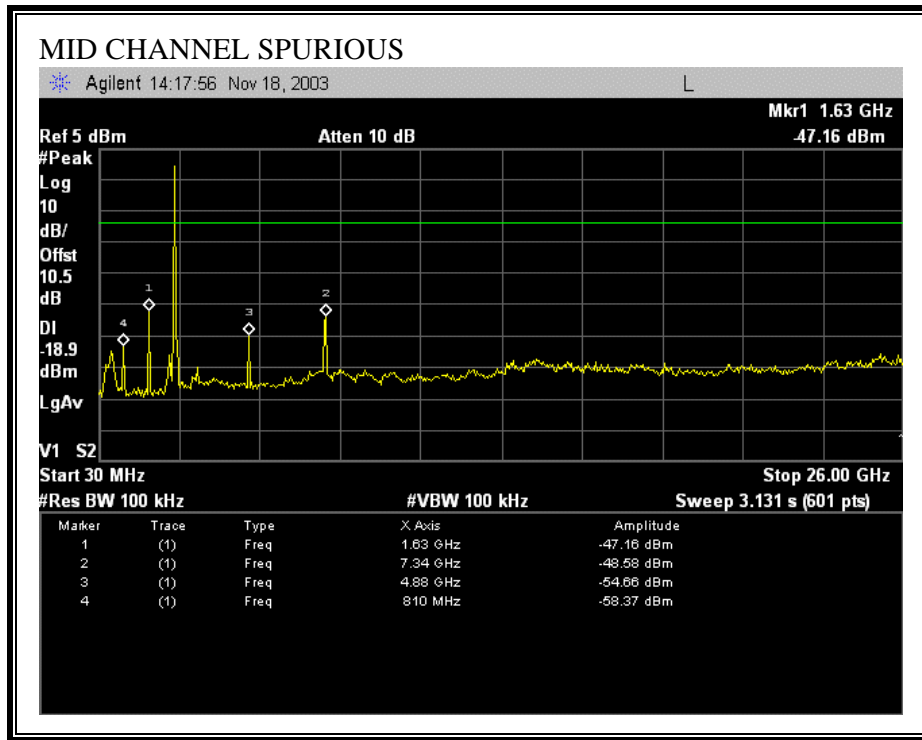
**SPURIOUS EMISSIONS, LOW CHANNEL**





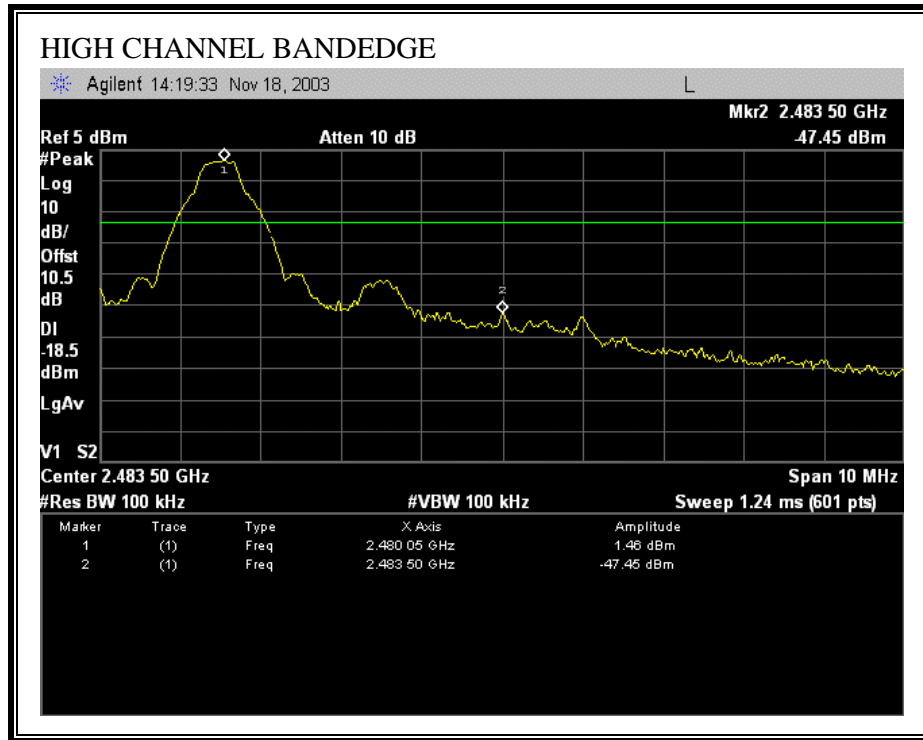
**SPURIOUS EMISSIONS, MID CHANNEL**

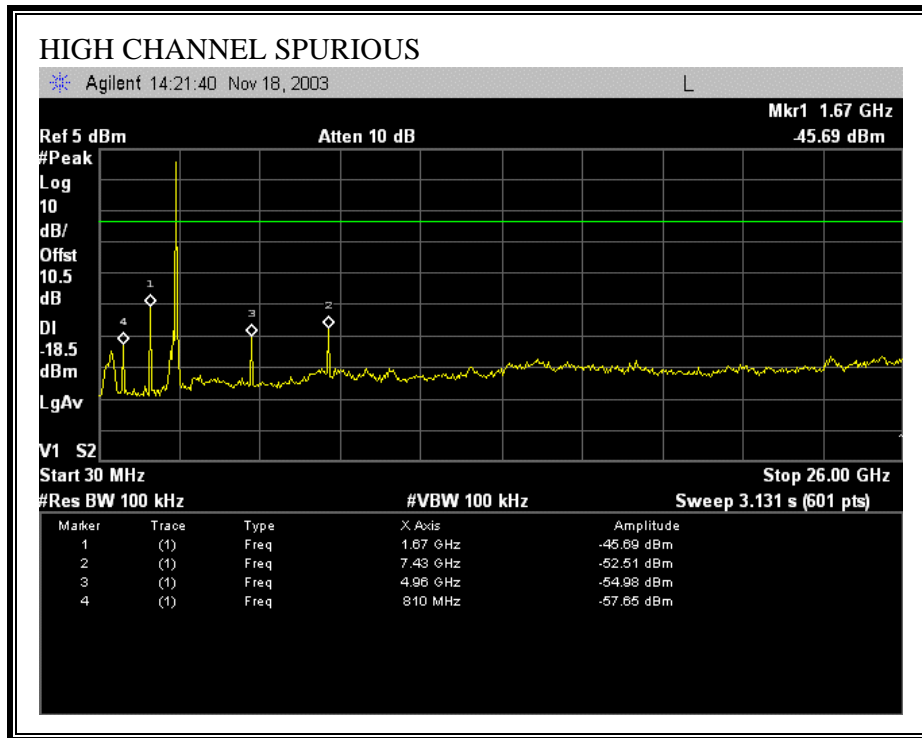




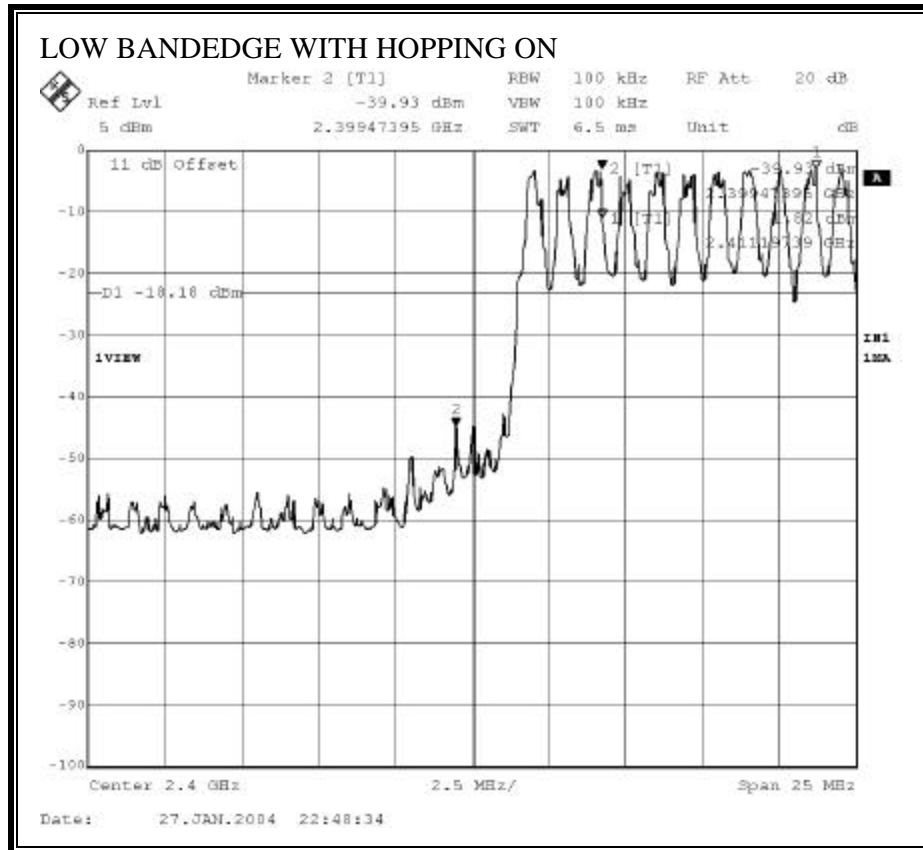


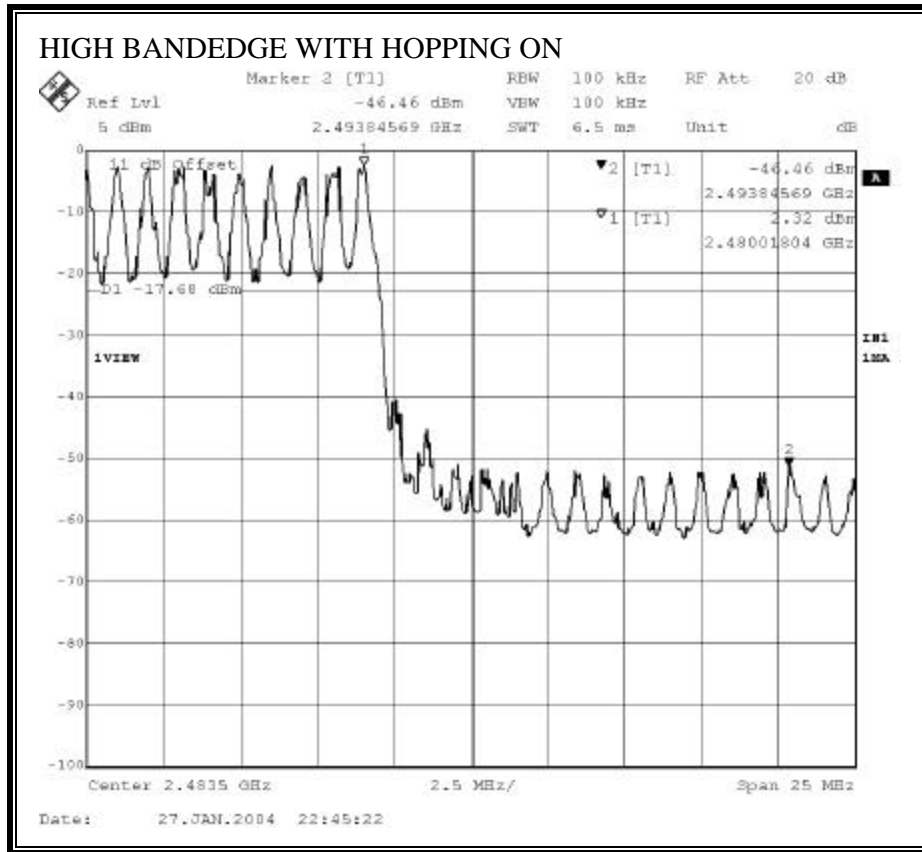
**SPURIOUS EMISSIONS, HIGH CHANNEL**





**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





## 7.10. RADIATED EMISSIONS

### 7.10.1. 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
<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 - 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	( <sup>2</sup> )
13.36 - 13.41			

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

<sup>2</sup> 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.

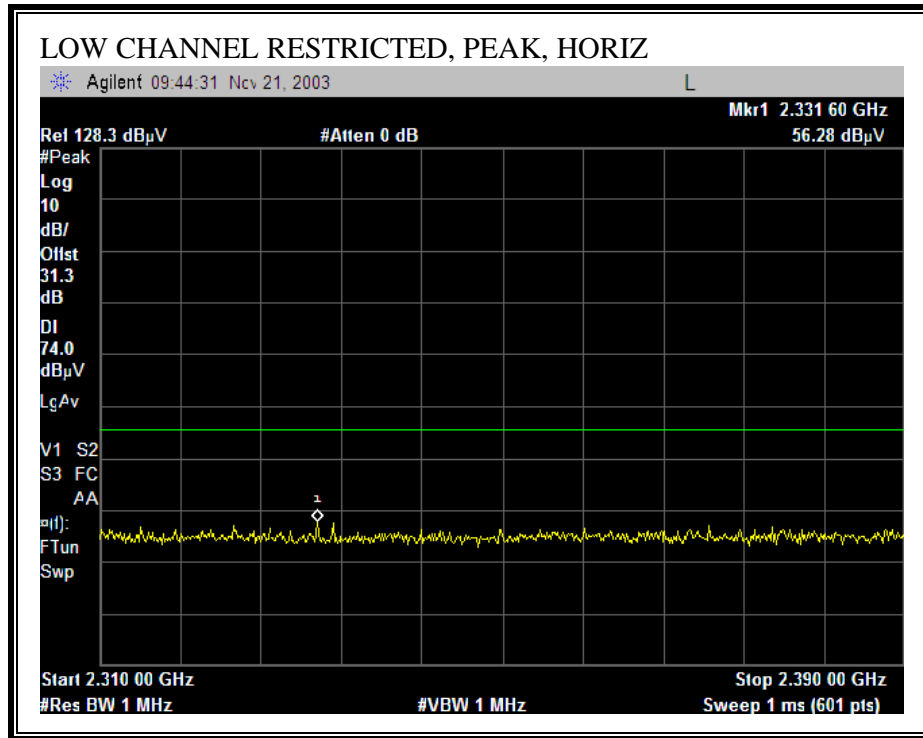
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## **RESULTS**

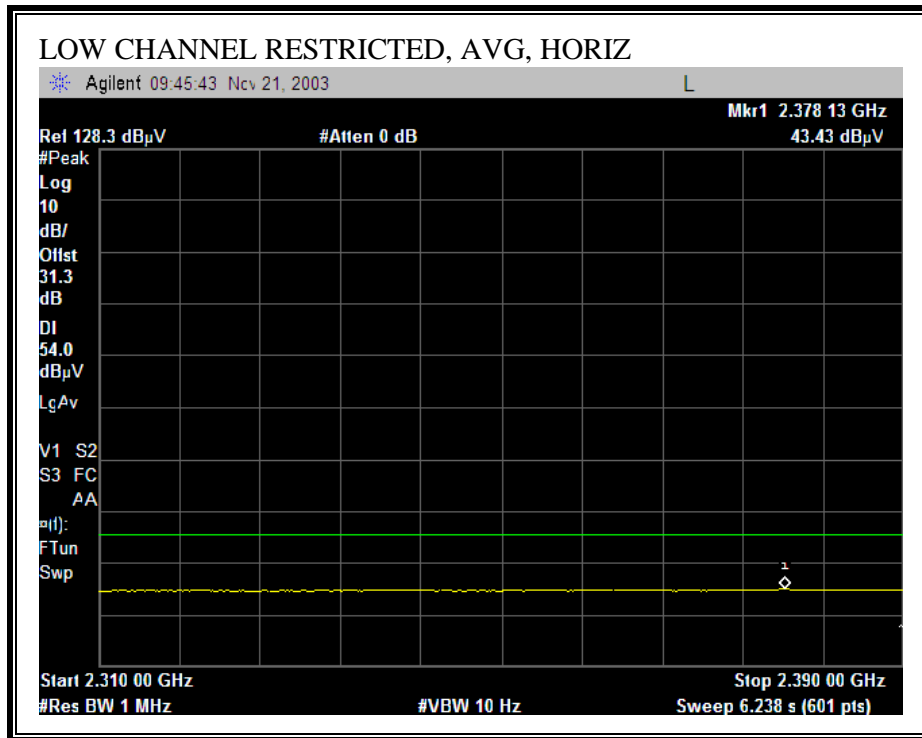
No non-compliance noted:

### 7.10.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

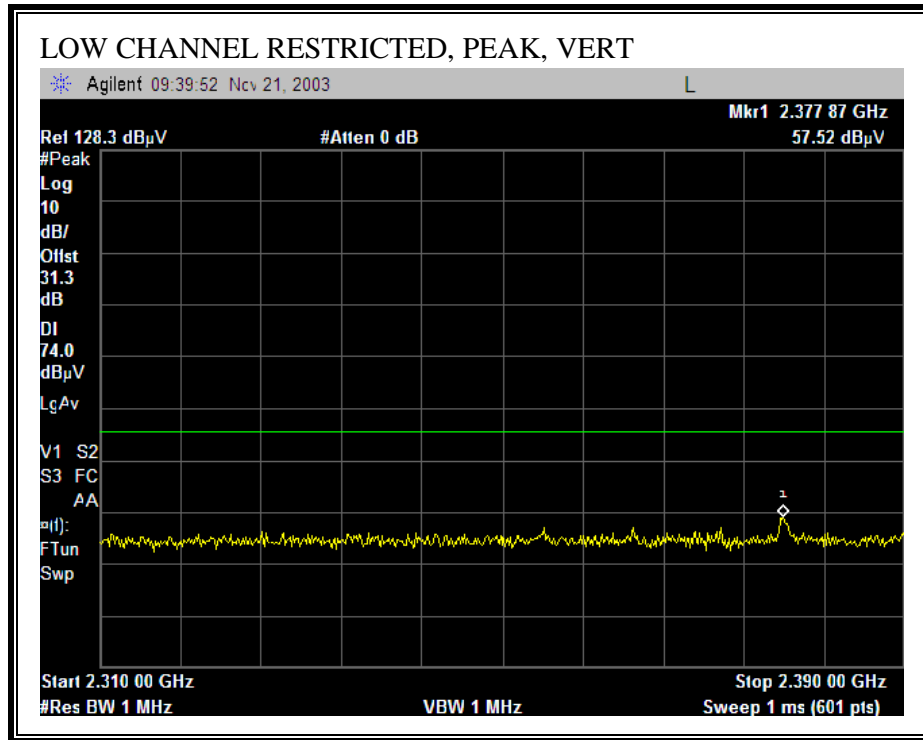
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

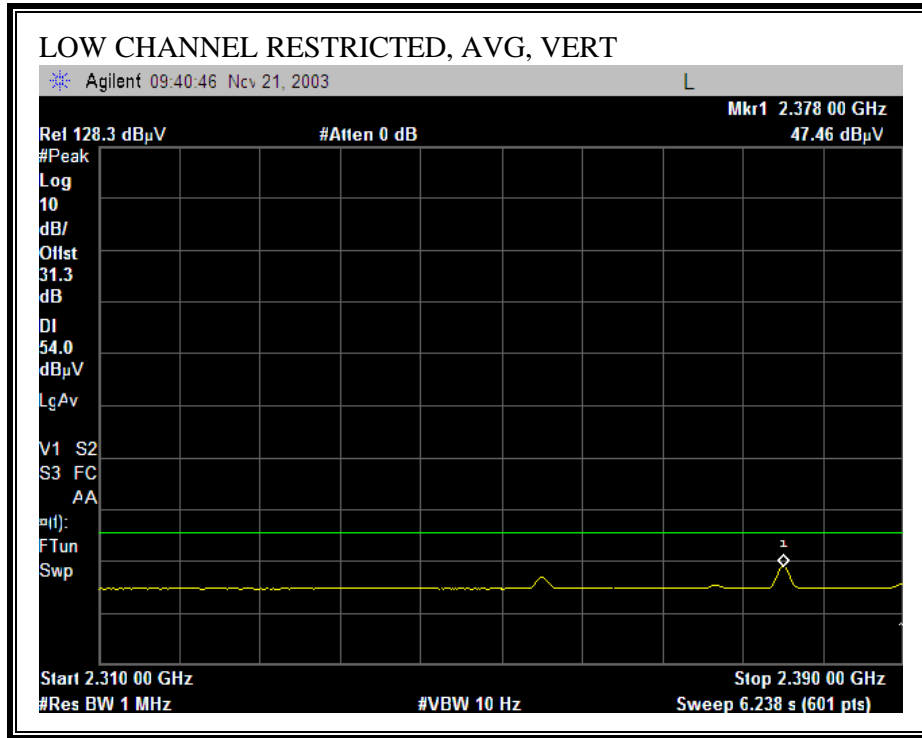




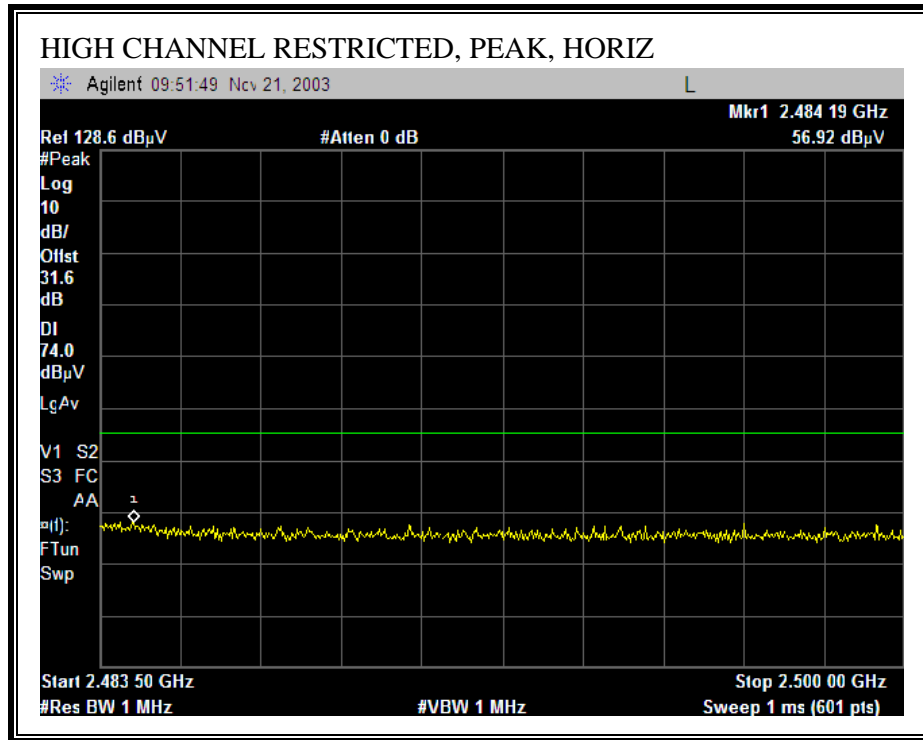


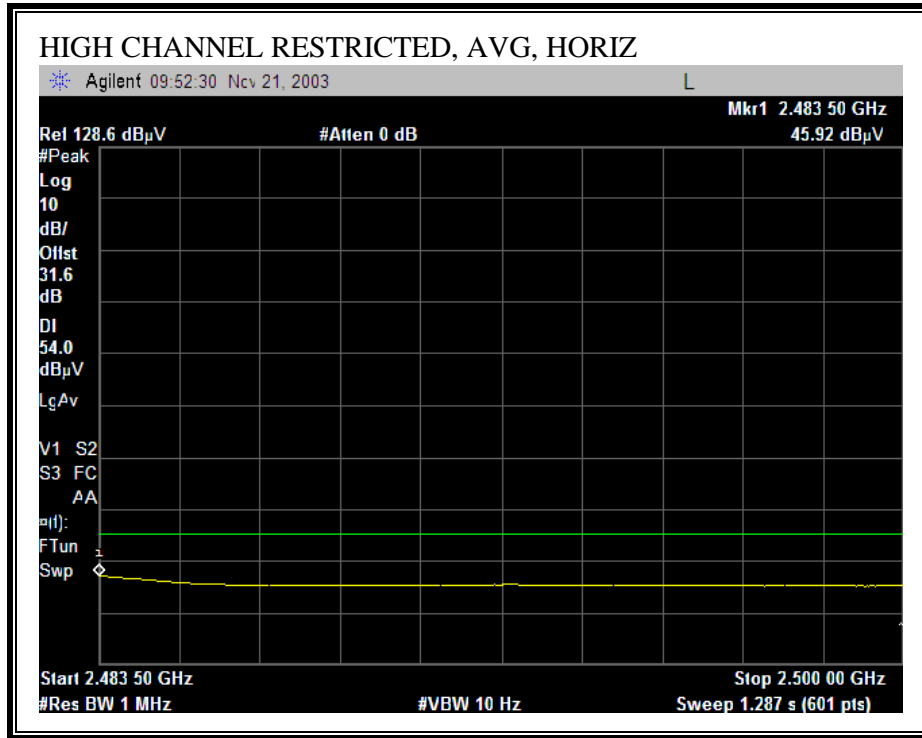
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



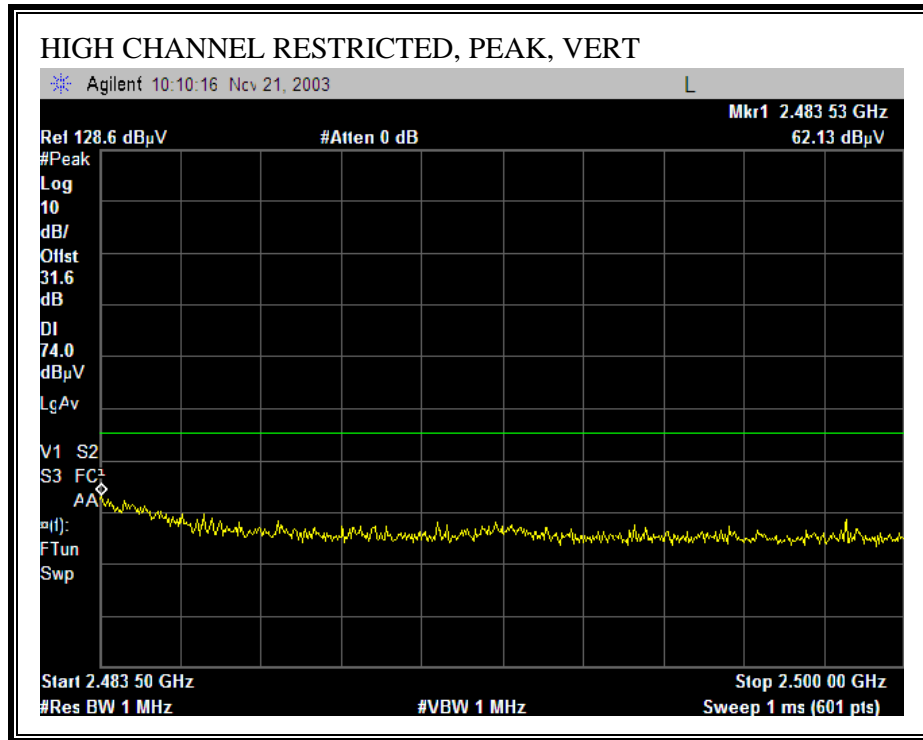


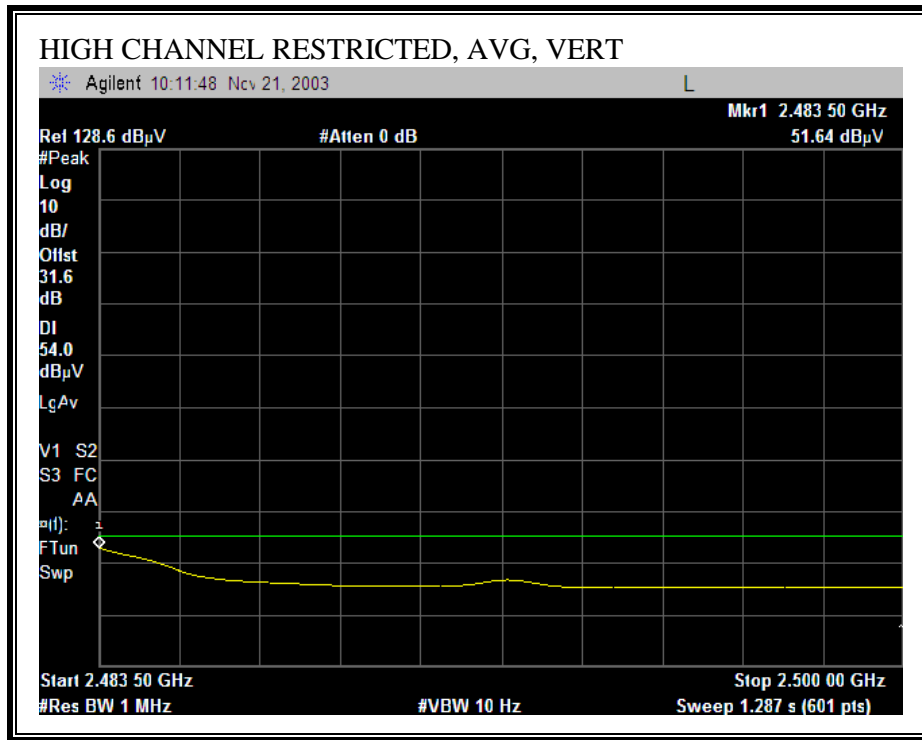
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



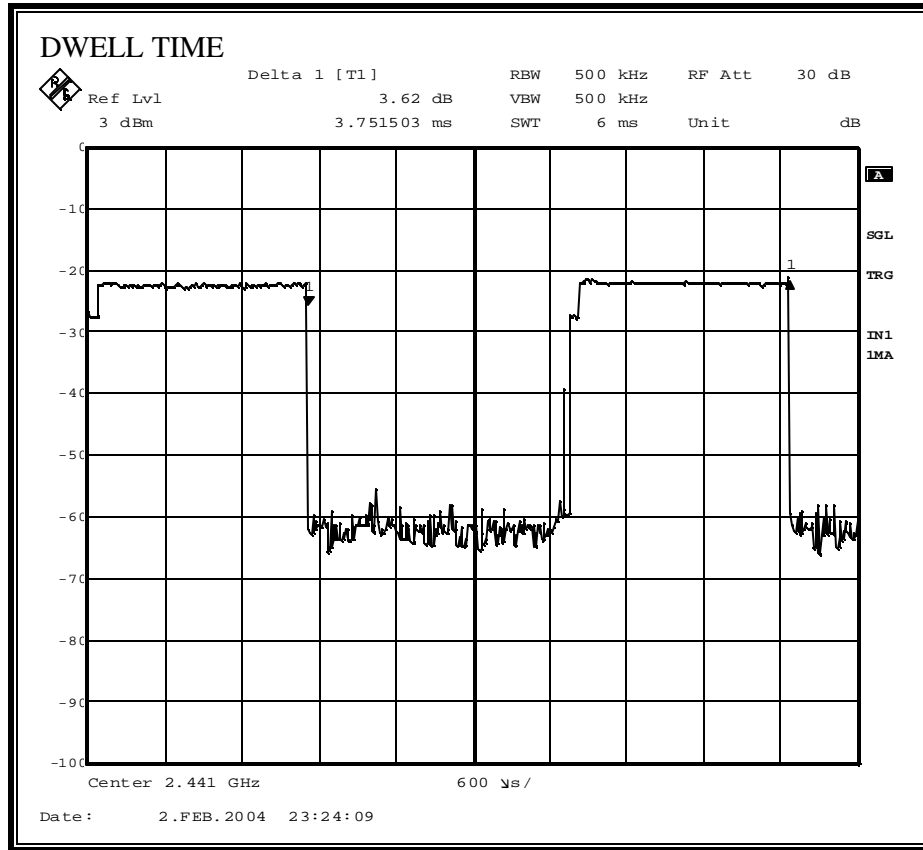


**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





**DUTY CYCLE CORRECTION FACTOR**



\*IN ACCORDANCE WITH FCC PUBLIC NOTICE DA-00-705, THE “DUTY CYCLE CORRECTION FACTOR” FOR SPURIOUS RADIATED EMISSIONS IS;  $20 \log * (3.752 \text{ ms} / 100 \text{ ms}) = -28.5 \text{ dB}$ , WHICH WAS USED TO CORRECT THE AVERAGE SPURIOUS READING.



**HARMONICS AND SPURIOUS EMISSIONS**

11/21/03 High Frequency Measurement  
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: NEELESH RAJ  
 Project #: 03U2374  
 Company: BROADCOM CORP  
 EUT Descr: BLUETOOTH HID MODULE  
 EUT M/N: BCM91940LMP-M  
 Test Target: FCC  
 Mode Oper: TX

Test Equipment:

EMCO Horn 1-18GHz Pre-amplifier 1-26GHz Spectrum Analyzer Horn > 18GHz Limit  
 T73; S/D: 6717 @1m T87 Miniq 924342 FCC 15.205

Hi Frequency Cables  
 (2 ft)  (2 - 3 ft)  (4 - 6 ft)  (12 ft)

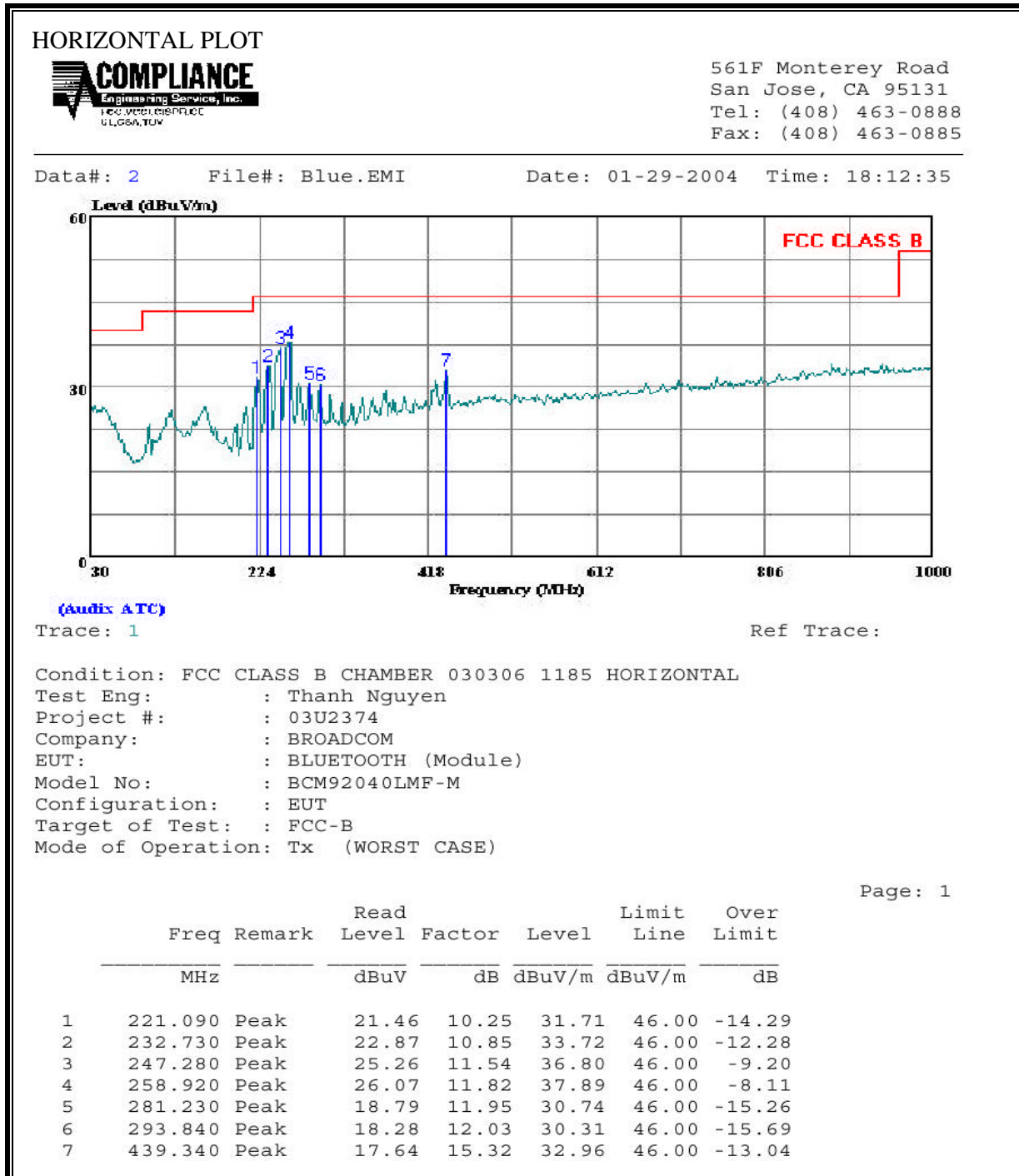
Peak Measurements: 1 MHz Resolution Bandwidth 1 MHz Video Bandwidth  
 Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth

f GHz	Dist feet	Raw Fk dBuV	Raw Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
LOW CHANNEL HARMONICS															
4.804	9.8	65.0	63.7	33.9	2.9	-44.7	0.0	1.0	58.2	28.4	74.0	54.0	-15.8	-25.6	Y
4.804	9.8	60.1	56.3	33.9	2.9	-44.7	0.0	1.0	53.2	21.0	74.0	54.0	-20.8	-33.0	H
12.101	9.8	47.0	38.9	39.5	5.1	-42.3	0.0	1.0	50.3	13.7	74.0	54.0	-23.7	-40.3	Y
12.101	9.8	46.8	38.0	39.5	5.1	-42.3	0.0	1.0	50.1	12.8	74.0	54.0	-23.9	-41.2	H
LOW CHANNEL SPURIOUS															
1.602	9.8	60.7	57.9	26.8	1.4	-43.3	0.0	1.0	46.4	15.2	74.0	54.0	-27.6	-38.8	Y
1.602	9.8	56.0	53.4	26.8	1.4	-43.3	0.0	1.0	41.8	10.7	74.0	54.0	-32.2	-43.3	H
MIDDLE CHANNEL HARMONICS															
4.882	9.8	64.9	62.1	34.0	3.0	-44.7	0.0	1.0	58.0	26.7	74.0	54.0	-16.0	-27.3	Y
4.882	9.8	58.6	55.0	34.0	3.0	-44.7	0.0	1.0	51.7	19.7	74.0	54.0	-22.3	-34.3	H
7.323	9.8	64.1	59.1	36.8	3.8	-44.5	0.0	1.0	61.2	27.7	74.0	54.0	-12.8	-26.3	Y
7.323	9.8	58.5	53.1	36.8	3.8	-44.5	0.0	1.0	55.6	21.6	74.0	54.0	-18.4	-32.4	H
12.205	9.8	48.4	39.2	39.6	5.2	-42.4	0.0	1.0	51.7	14.0	74.0	54.0	-22.3	-40.0	Y
12.205	9.8	48.3	39.1	39.6	5.2	-42.4	0.0	1.0	51.6	13.9	74.0	54.0	-22.4	-40.1	H
HIGH CHANNEL HARMONICS															
4.960	9.8	64.8	62.6	34.0	3.0	-44.8	0.0	1.0	58.0	27.2	74.0	54.0	-16.0	-26.8	Y
4.960	9.8	59.1	57.0	34.0	3.0	-44.8	0.0	1.0	52.3	21.7	74.0	54.0	-21.7	-32.3	H
7.440	9.8	52.6	42.3	37.0	3.8	-44.4	0.0	1.0	50.0	11.2	74.0	54.0	-24.0	-42.8	Y
7.440	9.8	51.3	41.6	37.0	3.8	-44.4	0.0	1.0	48.7	10.5	74.0	54.0	-25.3	-43.5	H
12.399	9.8	51.4	39.2	39.8	5.2	-42.6	0.0	1.0	54.7	14.0	74.0	54.0	-19.3	-40.0	Y
12.399	9.8	51.5	38.2	39.8	5.2	-42.6	0.0	1.0	54.8	13.0	74.0	54.0	-19.2	-41.0	H
NO OTHER HARMONICS OR SPURIOUS EMISSIONS DETECTED IN THE REST. BAND ABOVE THE SYSTEM FLOOR NOISE ABOVE -20 dB TO THE LIMIT															
NOTE: AVERAGE FIELD STRENGTH INCLUDES DUTY CYCLE CORRECTION FACTOR OF -28.5 dB															

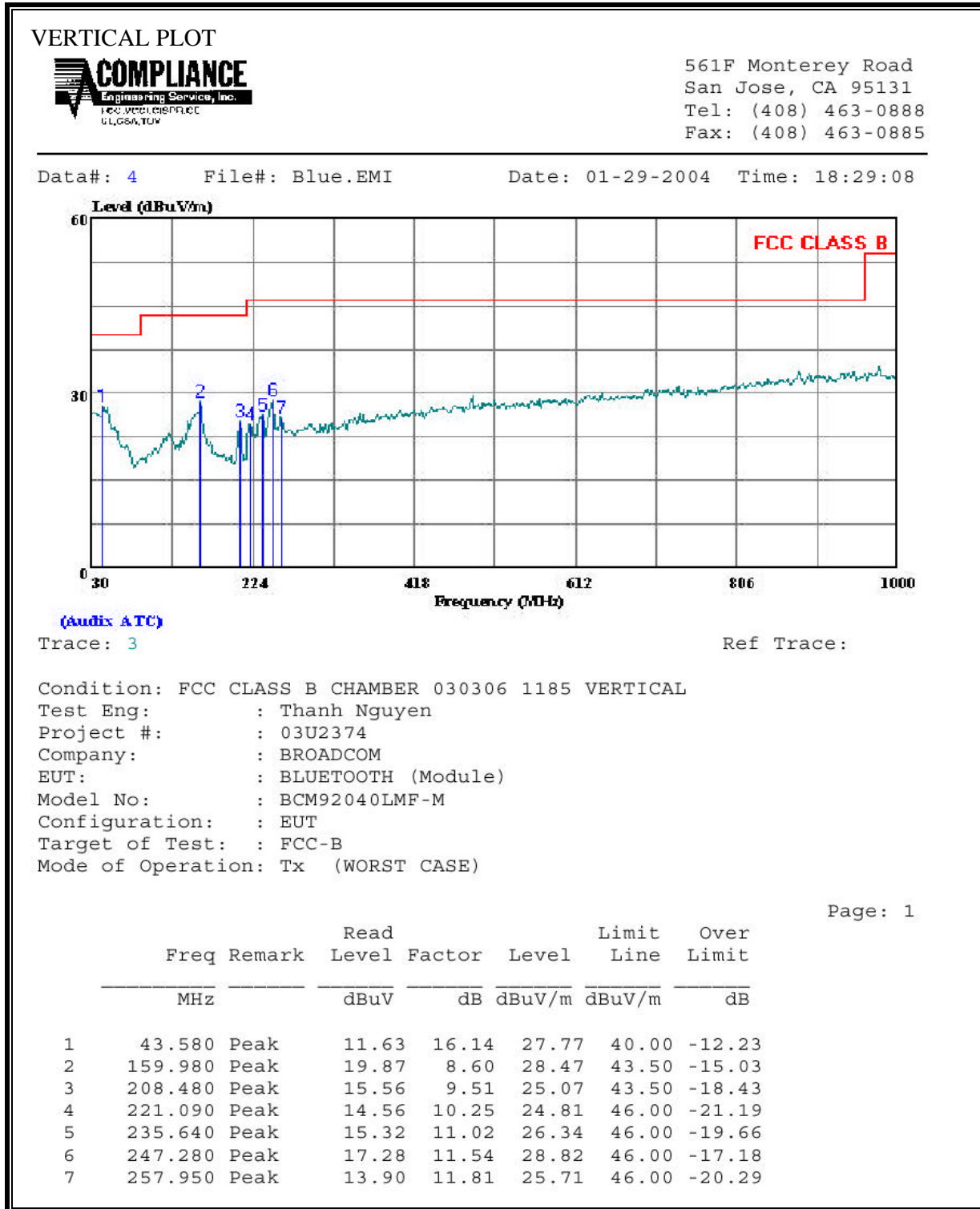
f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit  
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit  
 Read Analyzer Reading Avg Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit  
 AF Antenna Factor Peak Calculated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

**7.10.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz**

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



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



## 7.11. POWERLINE CONDUCTED EMISSIONS

### 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  $\mu$ 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 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.

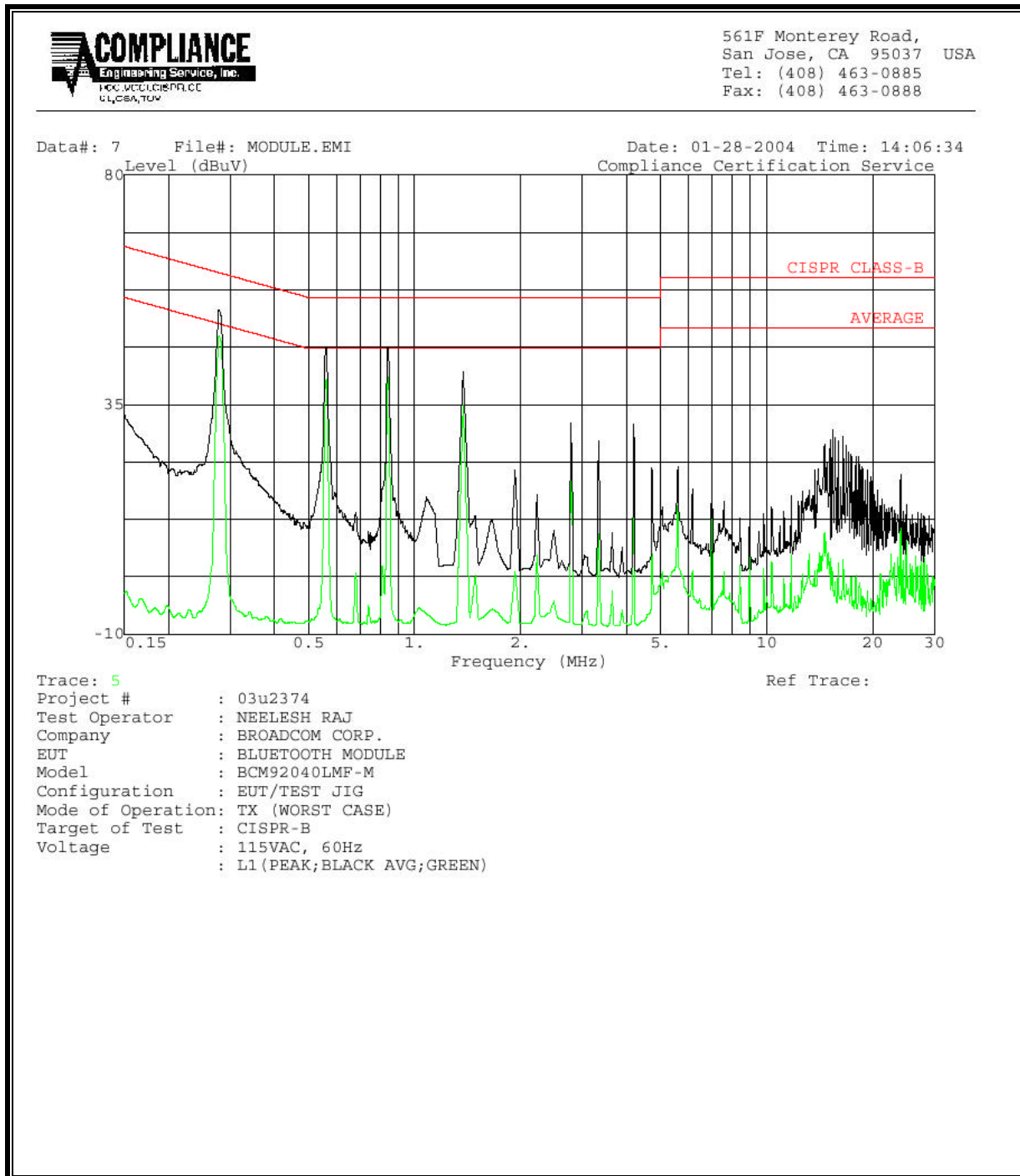
### RESULTS

No non-compliance noted:

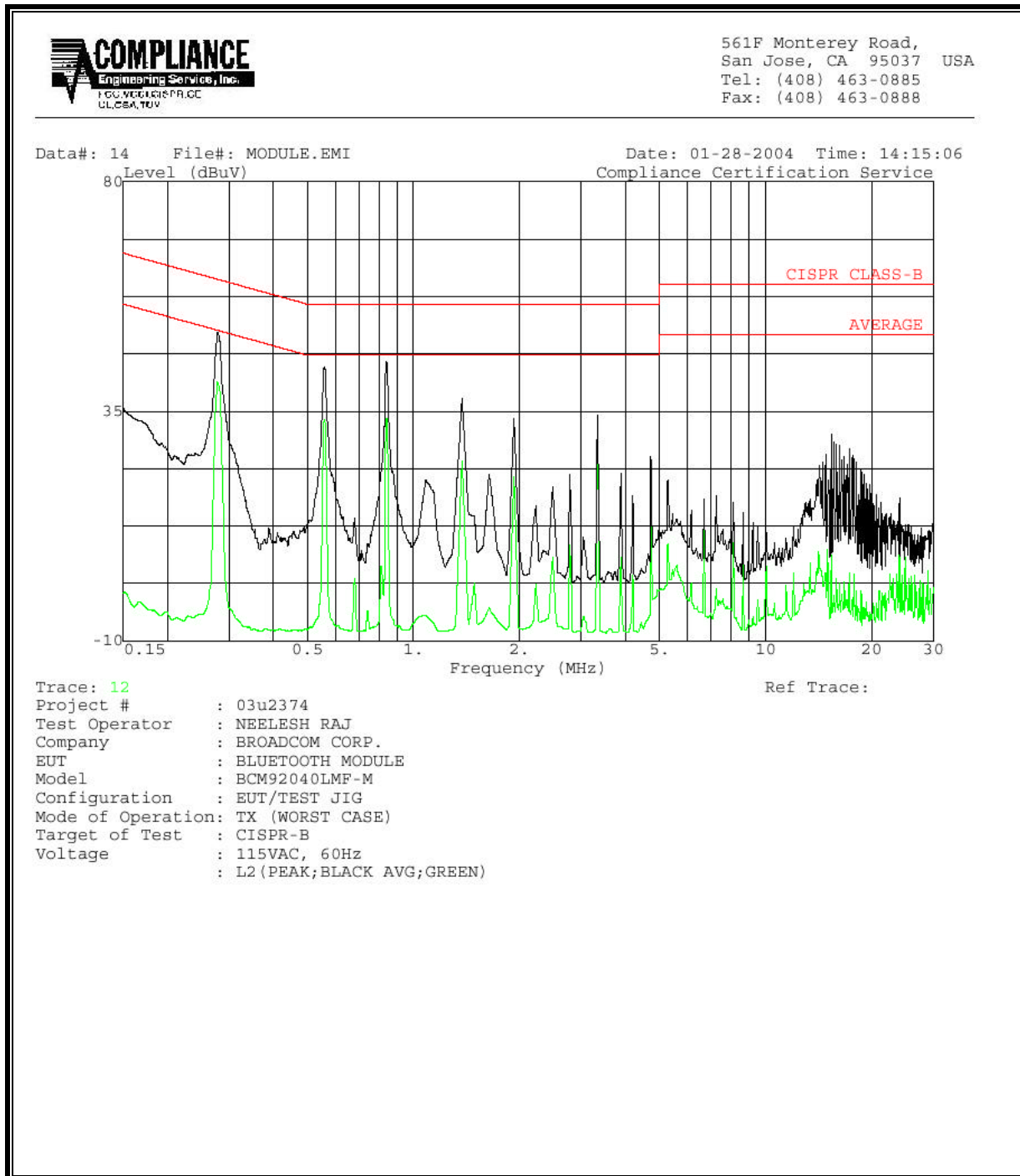
**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Cross	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.28	53.54	--	48.45	0.00	62.29	52.29	-8.75	-3.84	L1
0.56	46.02	--	39.83	0.00	56.00	46.00	-9.98	-6.17	L1
0.84	46.36	--	40.43	0.00	56.00	46.00	-9.64	-5.57	L1
2.77	50.48	--	40.80	0.00	56.00	46.00	-5.52	-5.20	L2
0.84	44.76	--	33.63	0.00	56.00	46.00	-11.24	-12.37	L2
0.56	43.74	--	33.40	0.00	56.00	46.00	-12.26	-12.60	L2
6 Worst Data									

**LINE 1 RESULTS**

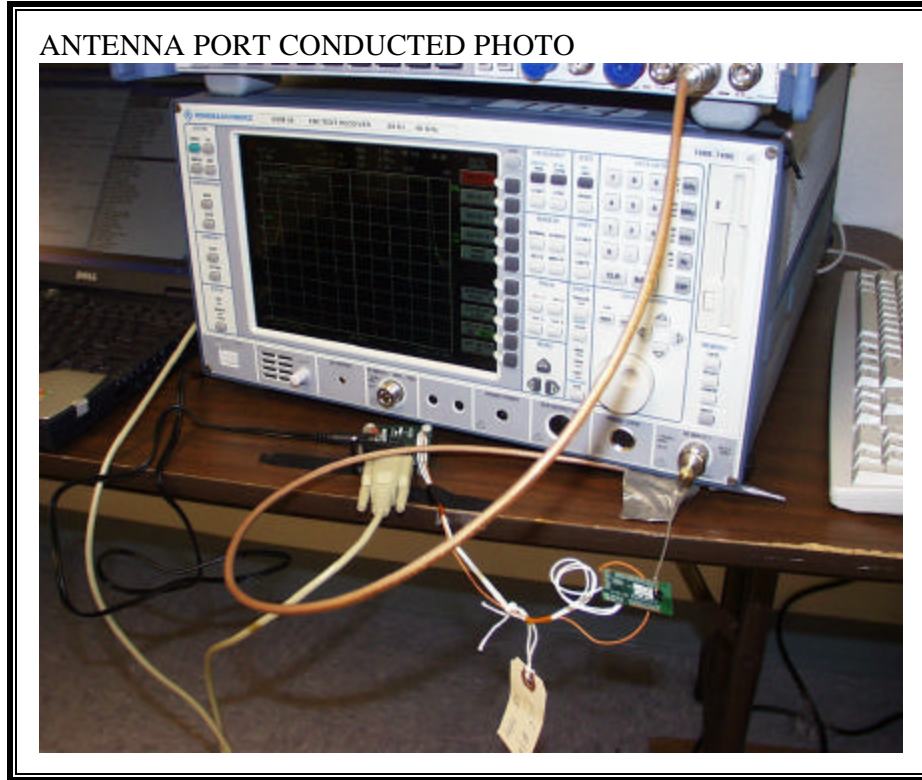


**LINE 2 RESULTS**



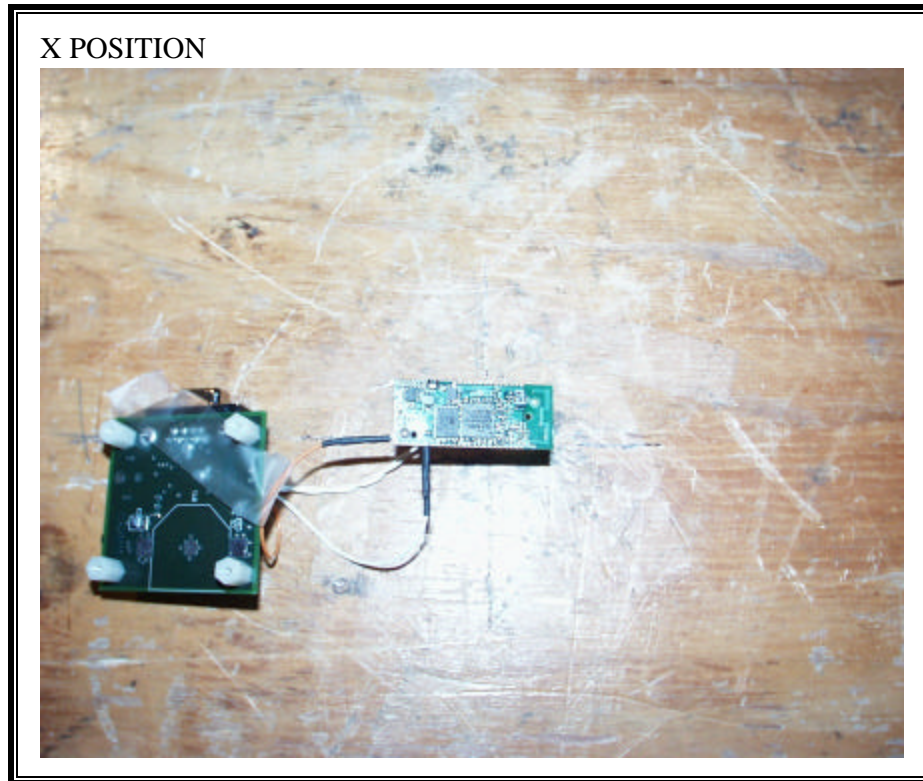
## 8. SETUP PHOTOS

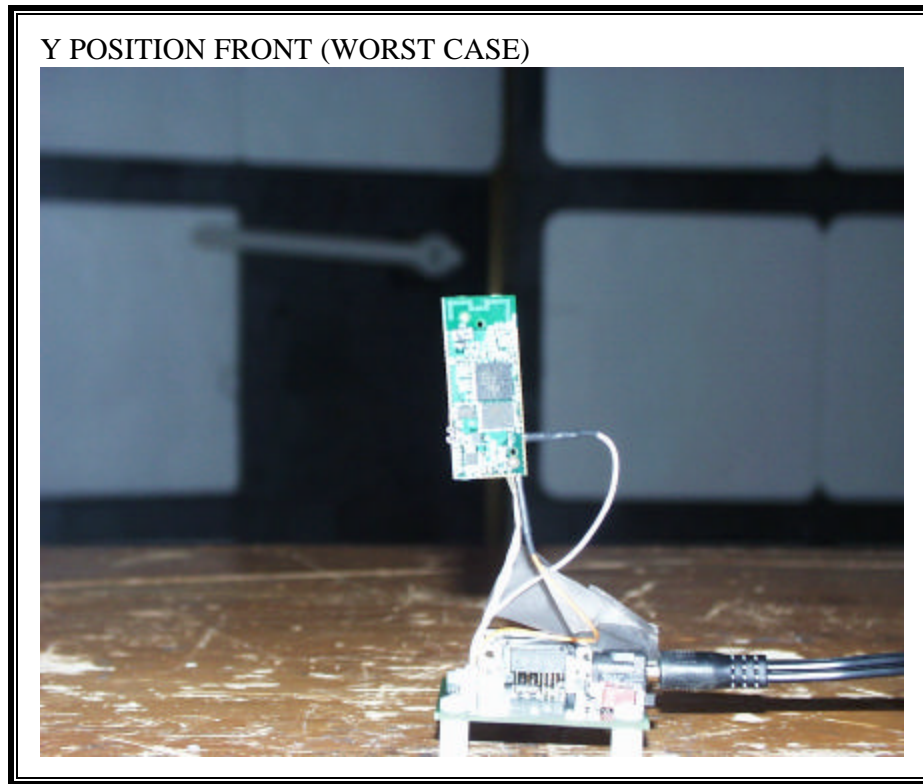
### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

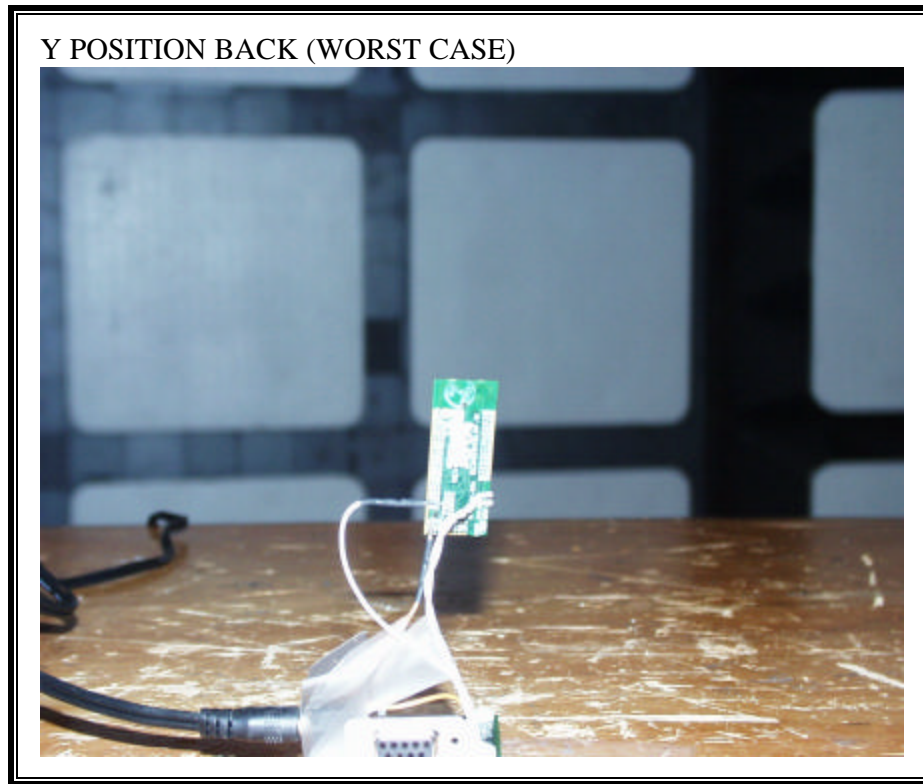


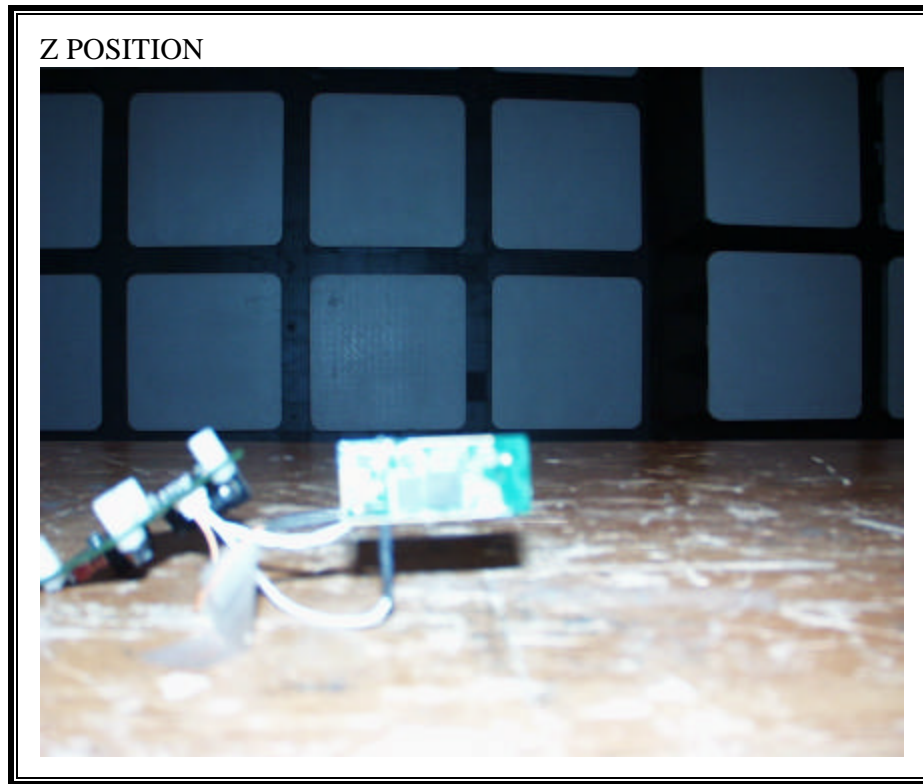


**RADIATED RF MEASUREMENT SETUP**









**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**





**END OF REPORT**