



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION**

**TEST REPORT**

**FOR**

**BROADCOM USB BLUETOOTH MODULE**

**MODEL NUMBER: BCM92035NMD**

**FCC ID: QDS-BRCM1009**

**REPORT NUMBER: 03U2091-1**

**ISSUE DATE: SEPTEMBER 29<sup>TH</sup>, 2003**

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## 1. TEST RESULT CERTIFICATION

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

**EUT DESCRIPTION:** BROADCOM USB BLUETOOTH MODULE

**MODEL:** BCM92035NMD

**DATE TESTED:** SETEMBER 22 – 29, 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:

  
THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:

  
NEELESH RAJ  
EMC TECHNICIAN  
COMPLIANCE CERTIFICATION SERVICES

## 2. EUT DESCRIPTION

The EUT is a Bluetooth transceiver operating in the 2400-248.5 MHz band, with 79 channels.

The highest peak conducted output power is as follows:

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	1.52	1.42

The radio utilizes an internal antenna, model: Etenna's EA2400 AccuWave with a maximum gain of 3.0 dBi.

Collocated with WLAN model: BCM94301MPL.

### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

### 4. FACILITIES AND ACCREDITATION

The open area test sites and conducted 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:

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 EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2004
Peak Power Meter	Agilent	E4416A	GB41291160	11/7/2004
Spectrum Analyzer	HP	E4446A	US42510266	7/23/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/2004
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/20/2003
RF Filter Section	HP	85420E	3705A00256	11/20/2003
Antenna, Bicon/Log, 25 ~ 2000 MHz	ARA	LPB-2520/A	1185	3/6/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/2004
Amplifier 1-26GHz	MTTEQ	NSP2600-SP	924341	4/25/2004
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	10/6/2003
Line Filter	Lindgren	LMF-3489	497	CNR
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
10dB Attenuator	Weinschel	56-10	K16148	N/A
2.4-2.5GHZ Reject Filter	Micro-Tronics	BRM50702	1	N/A
Spectrum Analyzer	Agilent	E4440A	MY42510514	8/28/2004

## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

TEST PERIPHERALS				
Device Type	Manufacturer	Model Number	Serial Number	FCC ID
<b>THE FOLLOWING WAS USED FOR ANTENNA PORT, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS</b>				
AC ADAPTER LAPTOP	DELL DELL	AA20031 PP01L	CN-09364U-16291-29F-00KM 37232072533	N/A DoC
<b>THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS</b>				
AC ADAPTER LAPTOP WIRELESS LAN CARD	COMPAQ COMPAQ BROADCOM	PPP009H NX7000 BCM94301MPL	F3-0302011044B N/A N/A	N/A N/A QDS-BRCM1002-H

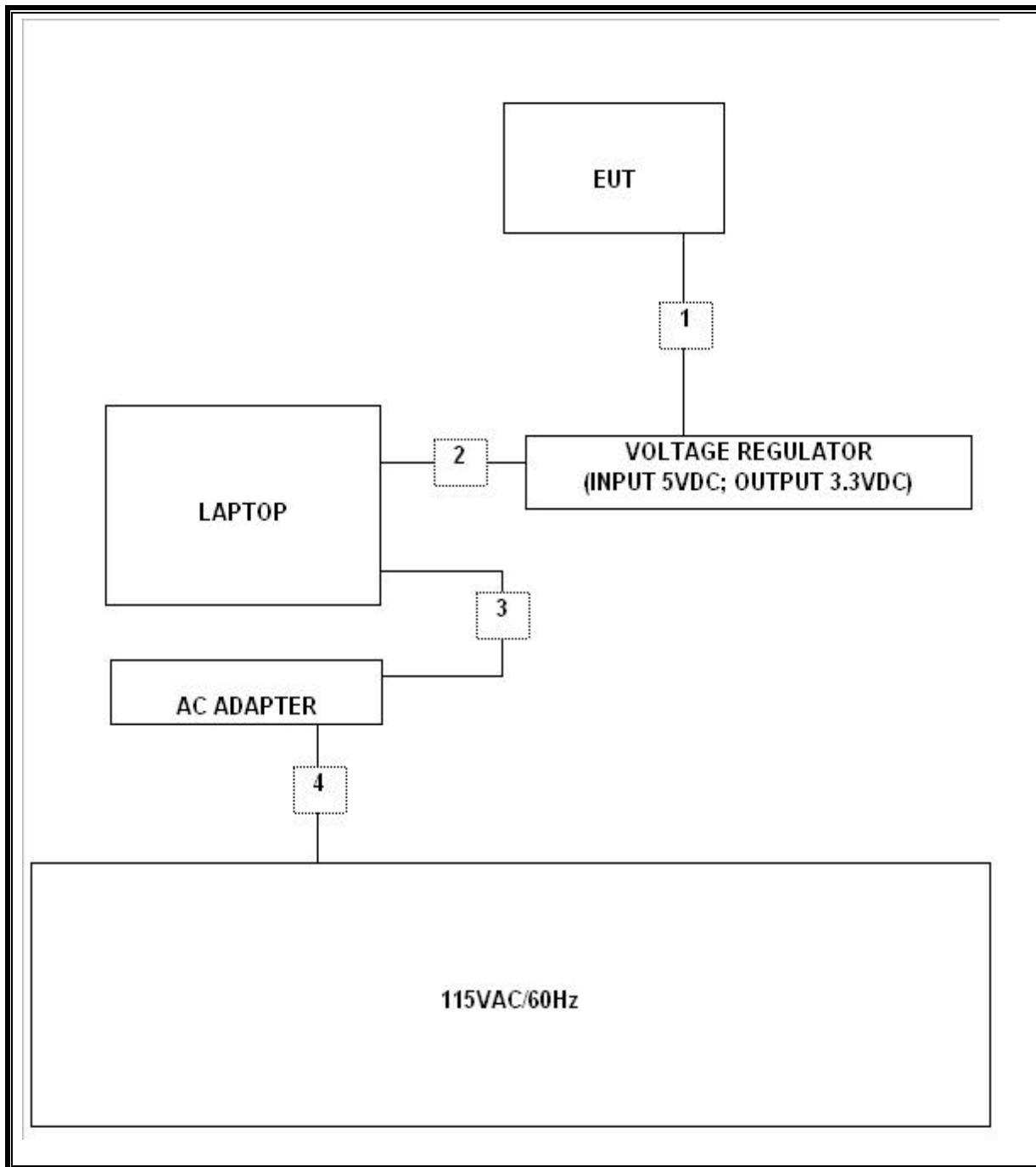
### I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	DC	1	WIRE	UNSHIELDED	.07M	NO	NO	3.3VDC
2	USB	1	USB	UNSHIELDED	1.55M	YES	NO	5VDC
3	DC	1	DC PWR	UNSHIELDED	1.86M	NO	YES	FERRITE EUT END
4	AC	1	AC PWR	UNSHIELDED	1.8M	NO	NO	N/A

### TEST SETUP

During the testing process the EUT was connected to the laptop via a voltage regulator to the USB port. The EUT was tested in the X, Y, and Z positions; the worst case was used for the tests.

**SETUP DIAGRAM FOR TESTS**



### **SETUP FOR DIGITAL DEVICE TESTS**

### **SUPPORT EQUIPMENT**

TEST PERIPHERALS				
Device Type	Manufacturer	Model Number	Serial Number	FCC ID
<b>THE FOLLOWING WAS USED FOR ANTENNA PORT, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS</b>				
AC ADAPTER LAPTOP	DELL DELL	AA20031 PP01L	CN-09364U-16291-29F-00KM 37232072533	N/A DoC
<b>THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS</b>				
AC ADAPTER LAPTOP WIRELESS LAN CARD	COMPAQ COMPAQ BROADCOM	PPP009H NX7000 BCM94301MPL	F3-0302011044B N/A N/A	N/A N/A QDS-BRCM1002-H

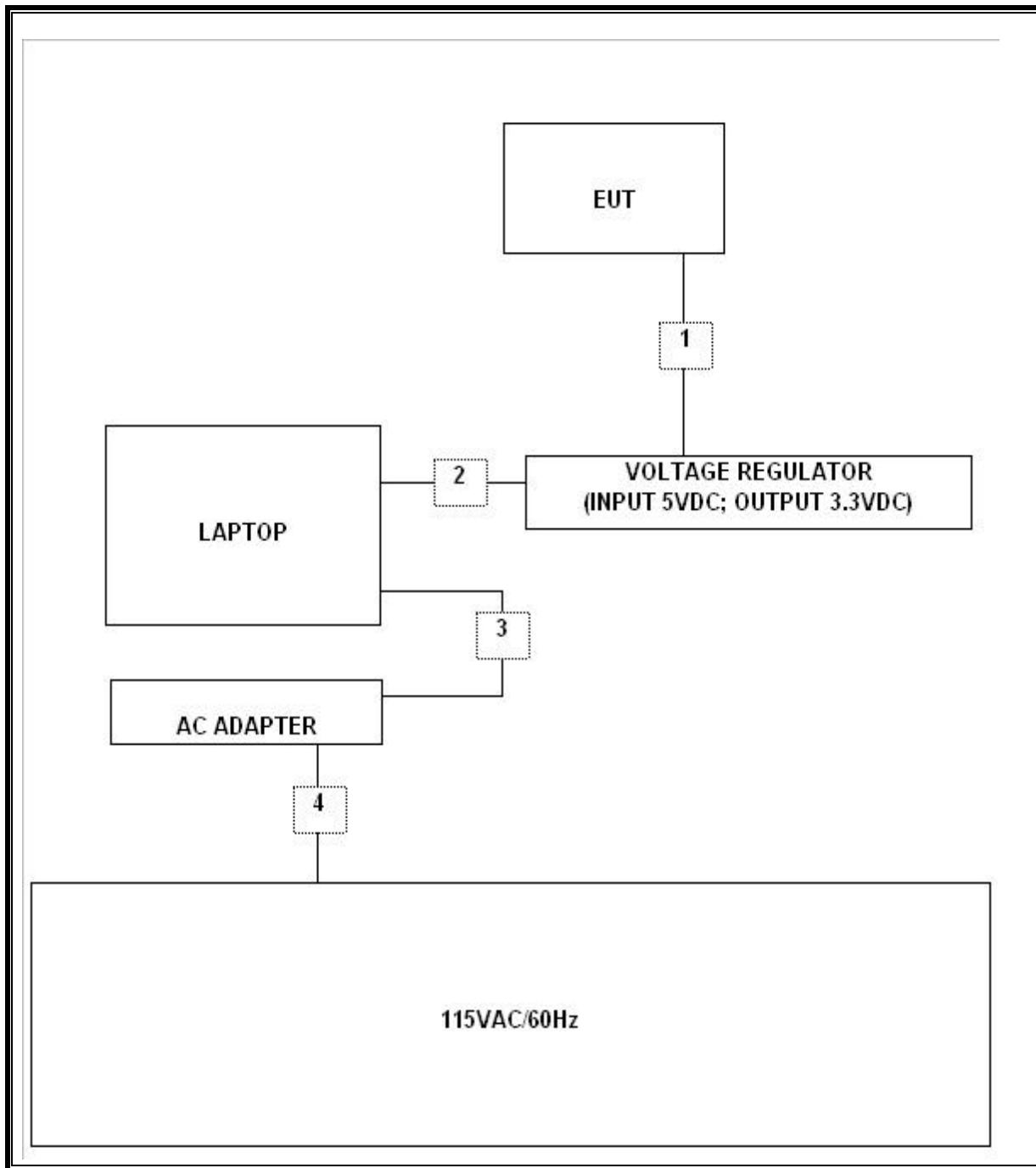
### **I/O CABLES**

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	DC	1	WIRE	UNSHIELDED	.07M	NO	NO	3.3VDC
2	USB	1	USB	UNSHIELDED	1.55M	YES	NO	5VDC
3	DC	1	DC PWR	UNSHIELDED	1.86M	NO	YES	FERRITE EUT END
4	AC	1	AC PWR	UNSHIELDED	1.8M	NO	NO	N/A

### **TEST SETUP**

During the testing process the EUT was connected to the laptop via a voltage regulator to the USB port. The EUT was tested in the X, Y, and Z positions; the worst case was used for the tests.

**SETUP DIAGRAM FOR DIGITAL DEVICE TESTS**



## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. 20 dB BANDWIDTH

#### LIMIT

None; for reporting purposes only.

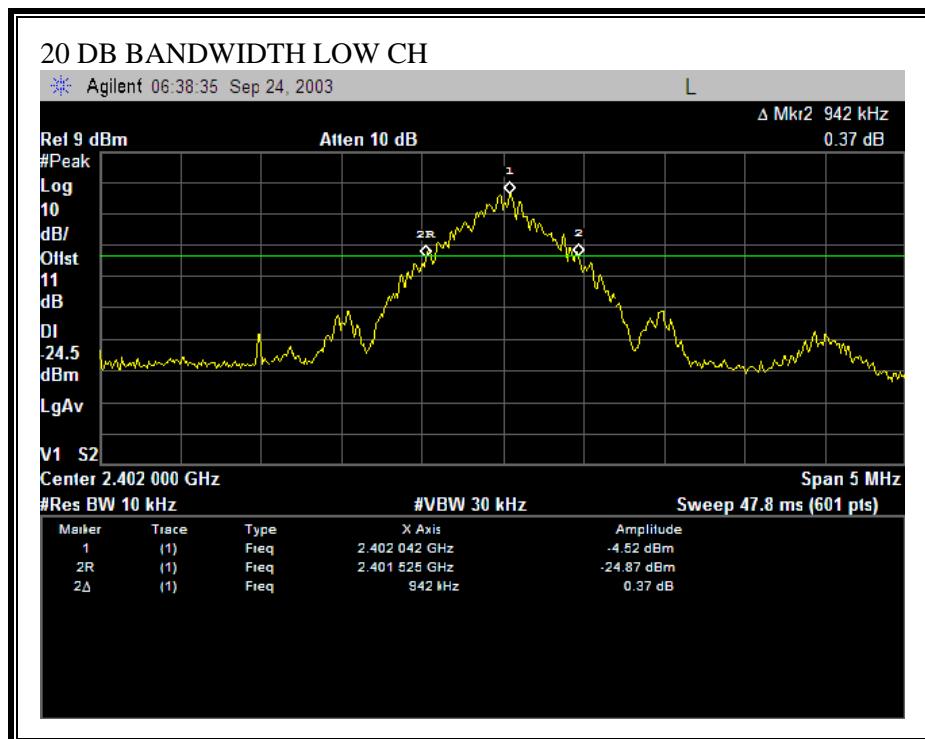
#### TEST PROCEDURE

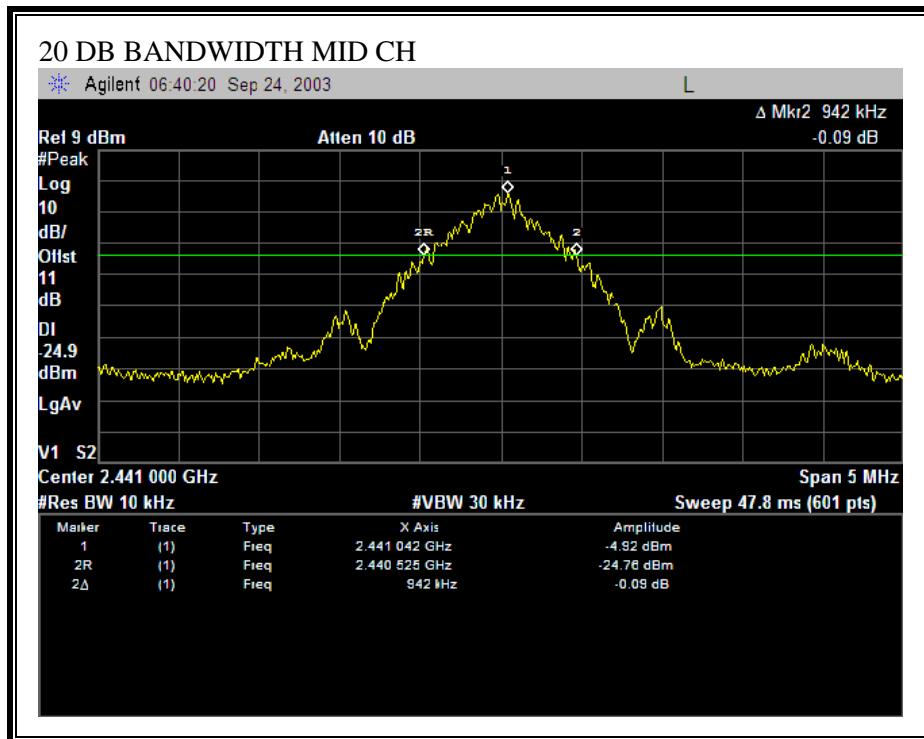
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

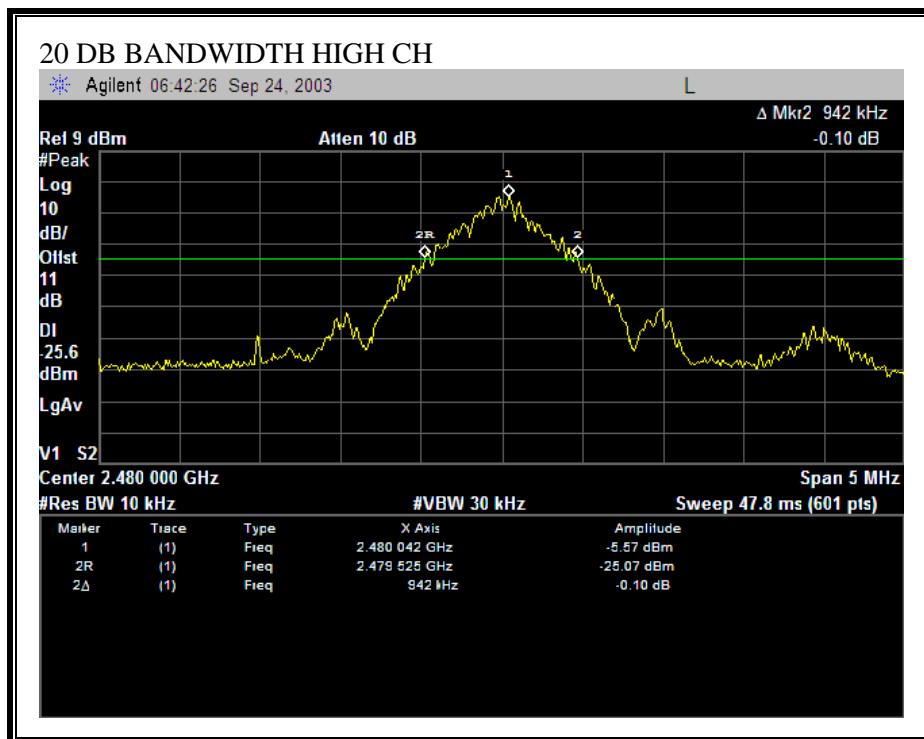
#### RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	942
Middle	2441	942
High	2480	942

**20 DB BANDWIDTH**





## 7.2. HOPPING FREQUENCY SEPARATION

### LIMIT

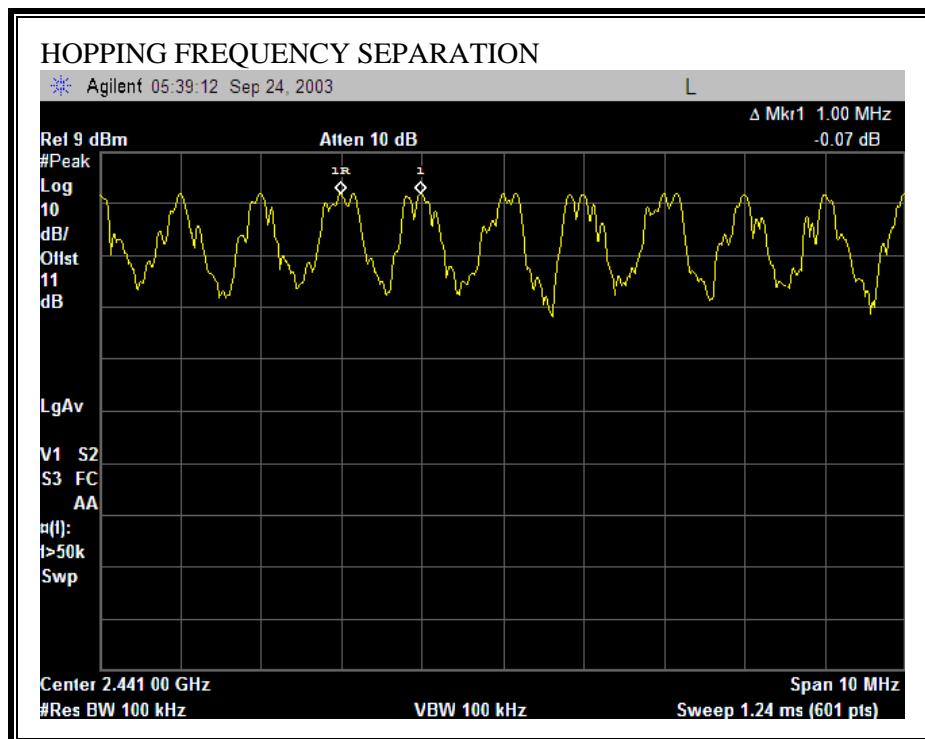
§15.247 (a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

### 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

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.

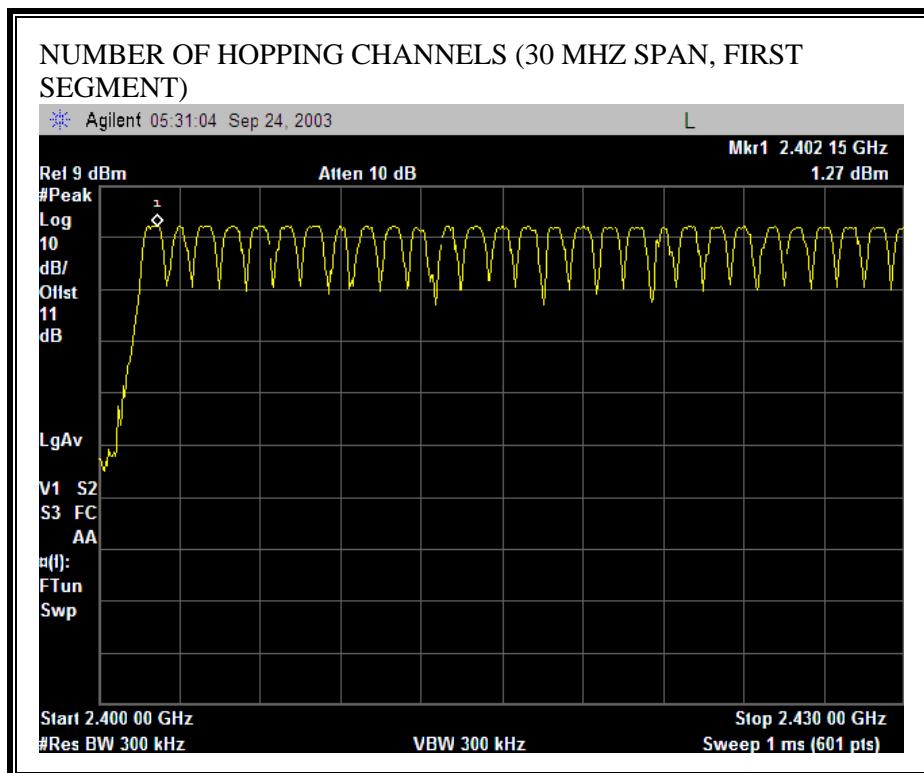
#### TEST PROCEDURE

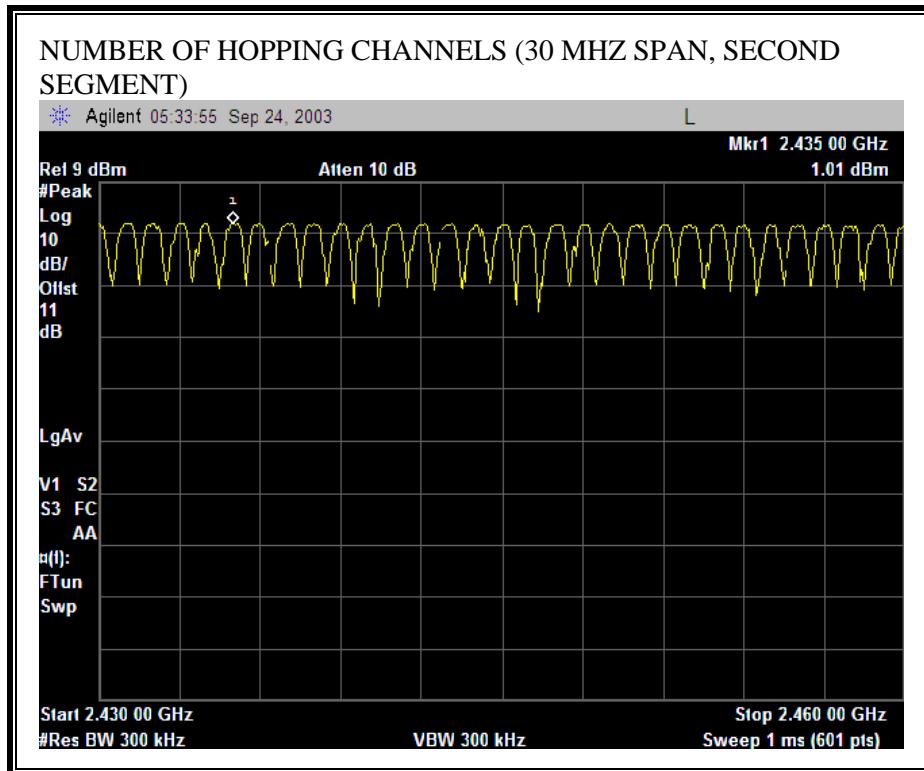
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

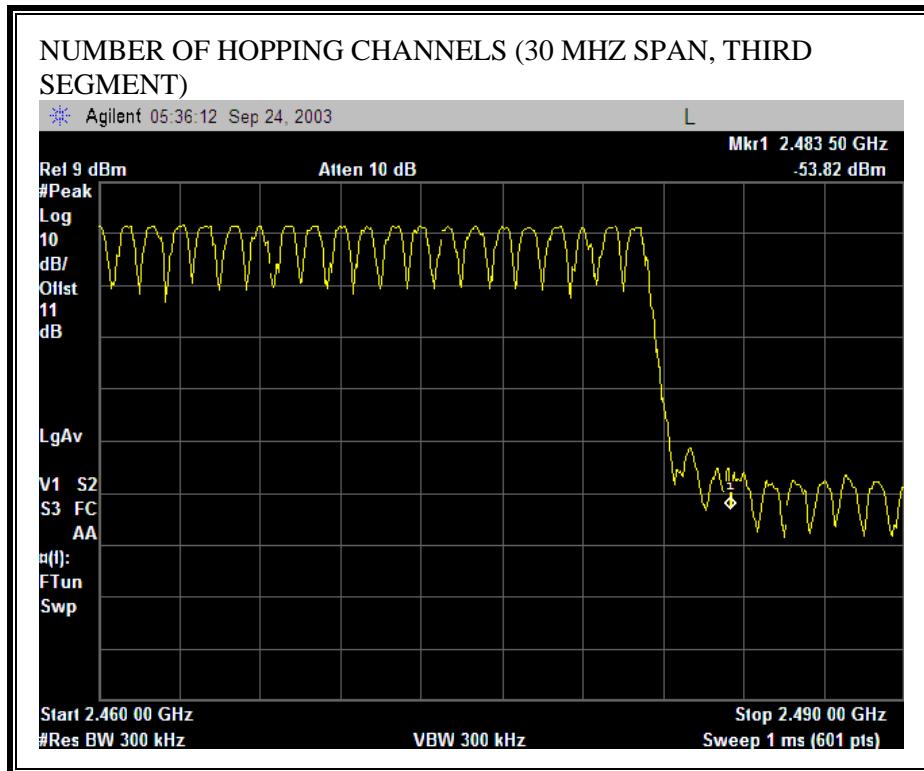
#### RESULTS

No non-compliance noted:

79 Channels observed.

**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:

DH5 (5+1)

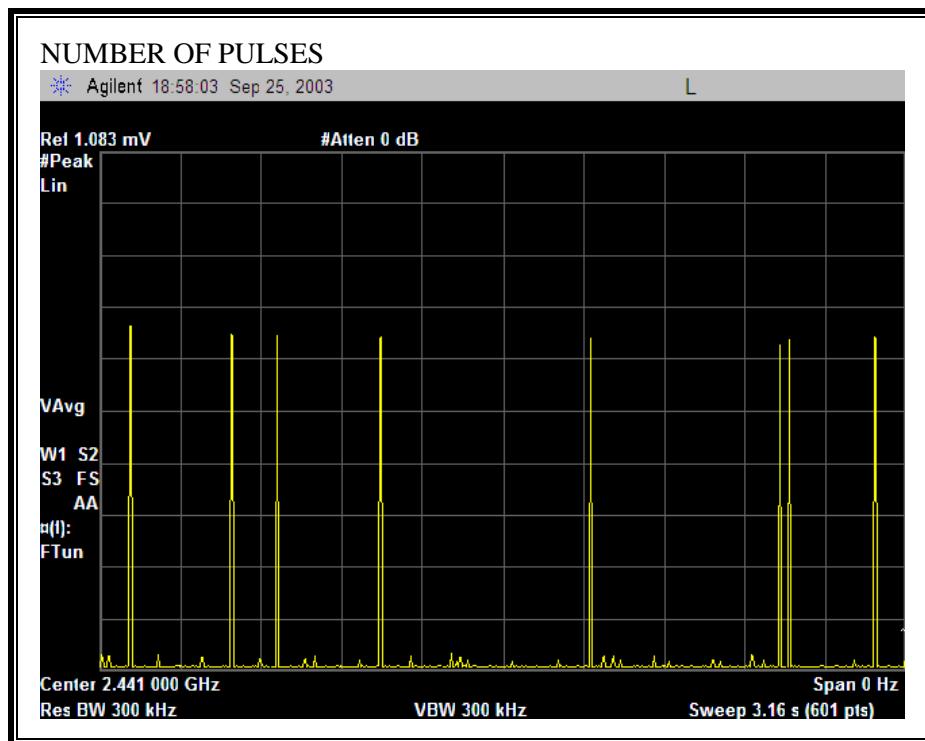
OCCURANCE
3.16 sec
8

#### OCCURANCE IN 31.6 SECONDS (79 CHANNELS x 0.4 SEC)

8 x 10 = 80 (PULSES IN 31.6 SECONDS)

PULSE WIDTH (mS)	PULSES IN 31.6 SECONDS	TIME OF OCCUPANCY (sec)	LIMIT (sec)	MARGIN (sec)
2.939	80	.235	0.400	0.165

**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 3.0 dBi, therefore the limit is 30 dBm.

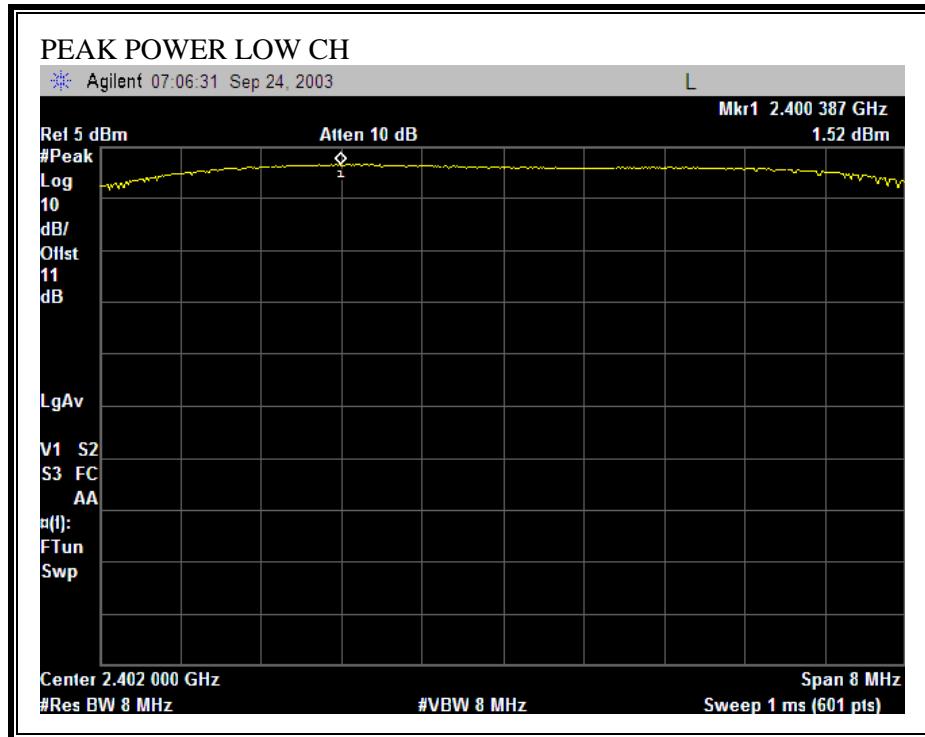
### TEST PROCEDURE

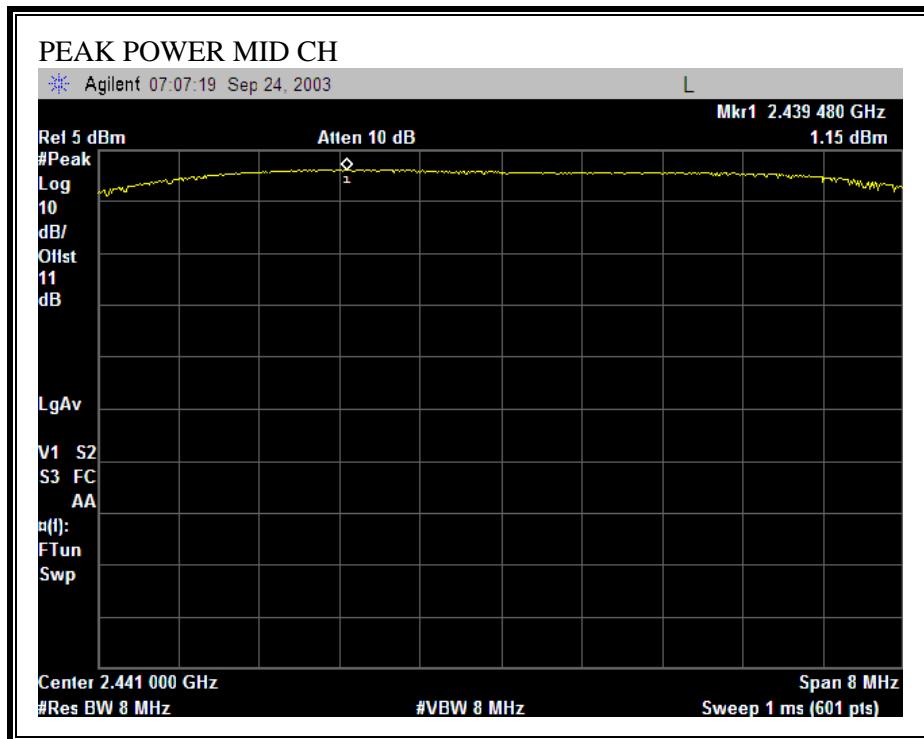
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

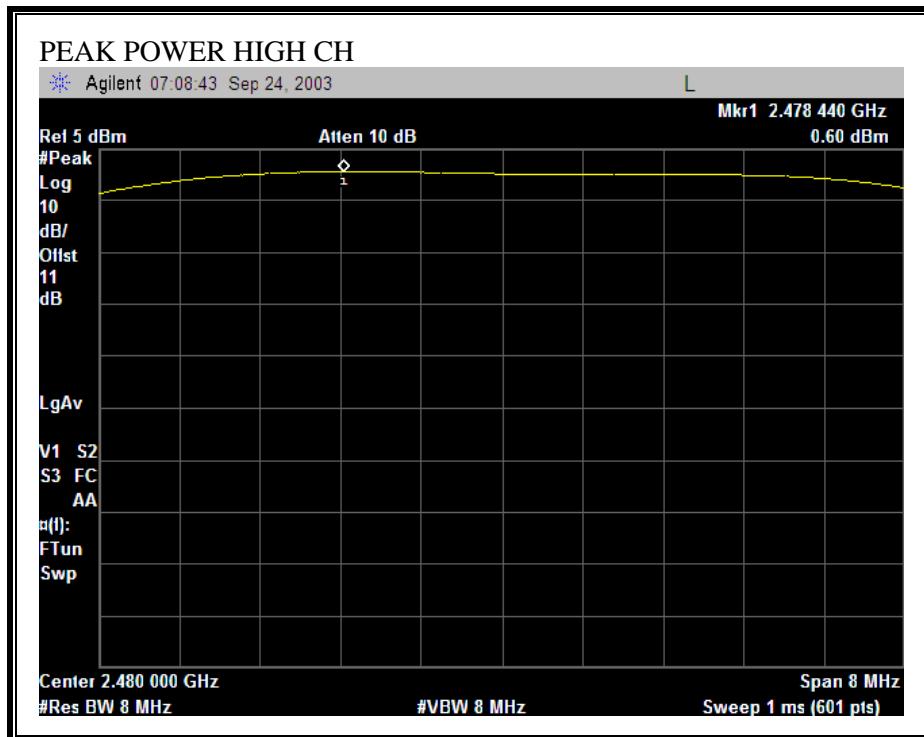
### RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.52	30	-28.48
Middle	2441	1.15	30	-28.85
High	2480	0.60	30	-29.40

**OUTPUT POWER**





## 7.6. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

§15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

### 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 mW and 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:

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

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

yields

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

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

$S = 1.0 \text{ mW / cm}^2$  from 1.1310 Table 1

## RESULTS

No non-compliance noted:

Power Density Limit (mW/cm <sup>2</sup> )	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1.0	1.52	3.00	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 11 dB (including 10 dB pad and 1.0 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	0.93
Middle	2441	0.51
High	2480	-0.07

## 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.

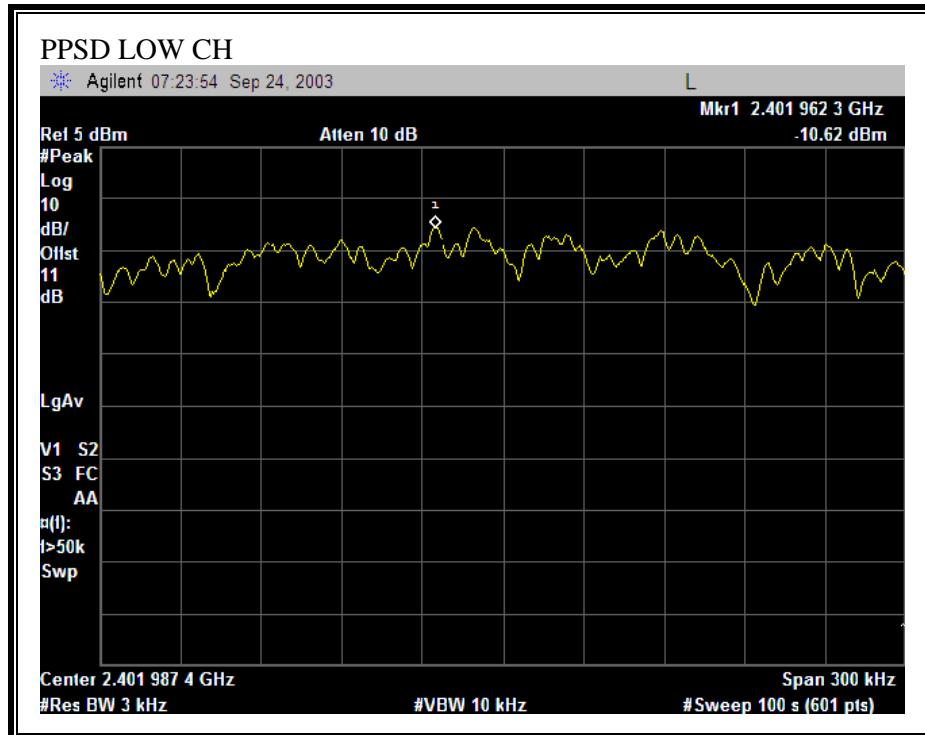
### TEST PROCEDURE

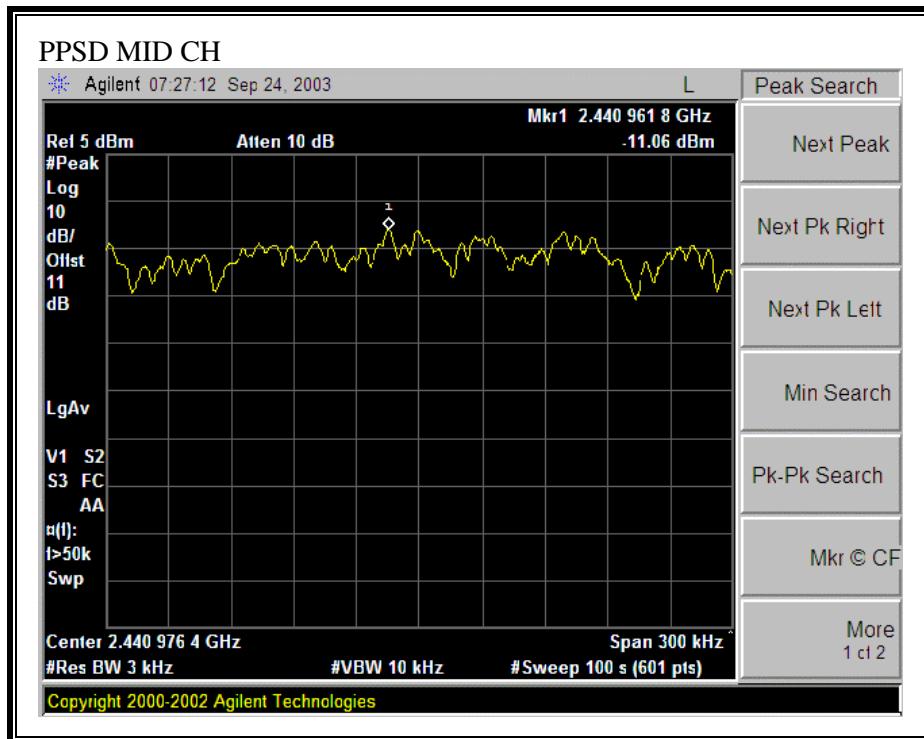
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz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

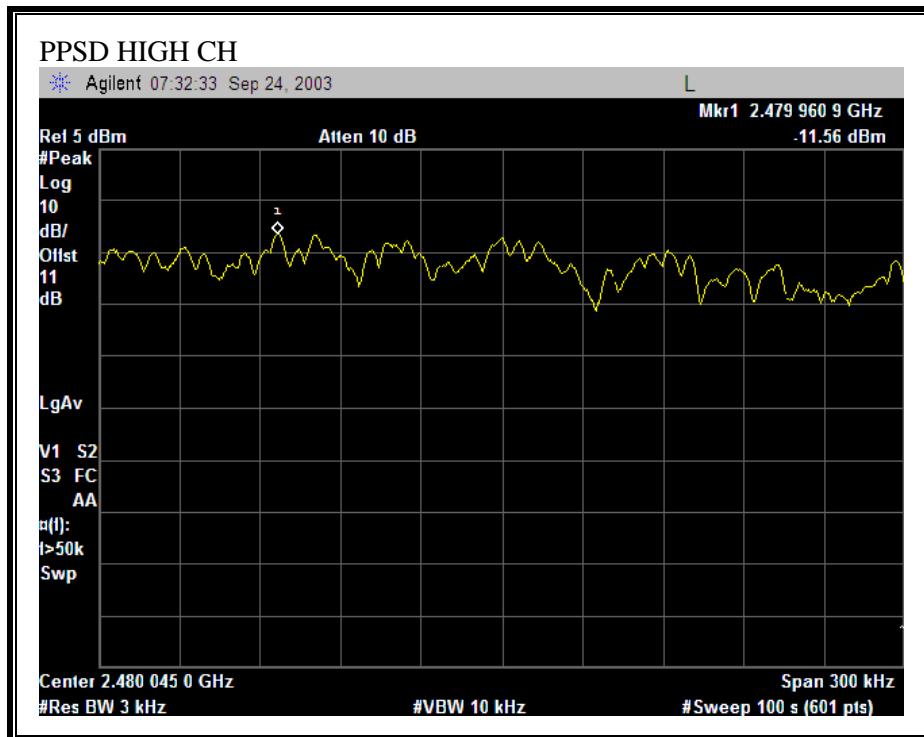
### RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.62	8	-18.62
Middle	2441	-11.06	8	-19.06
High	2480	-11.56	8	-19.56

**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)).

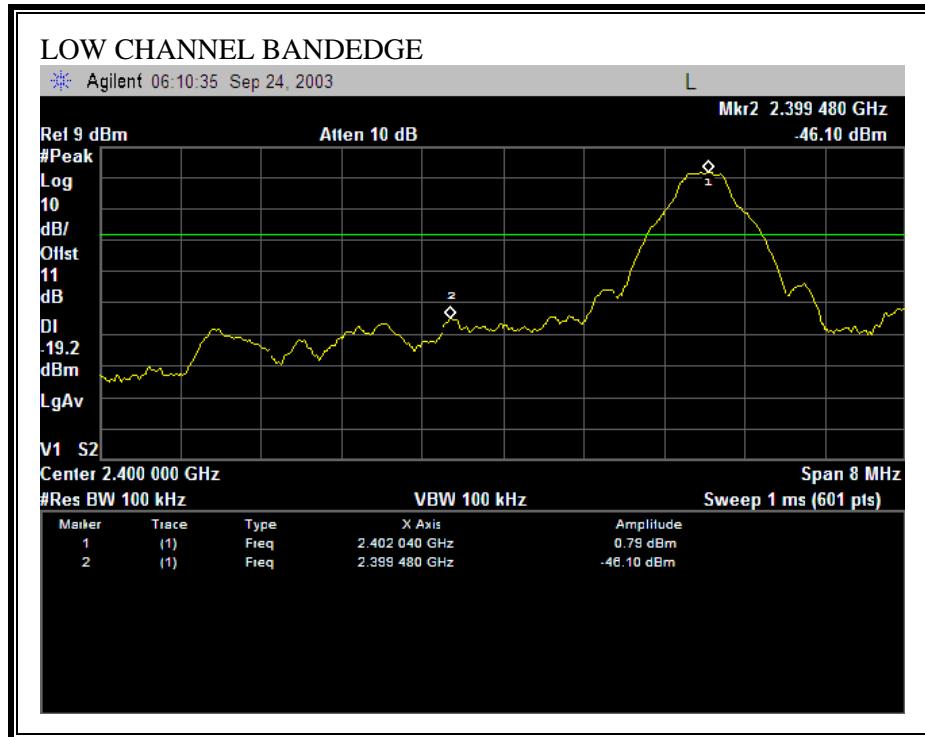
### TEST PROCEDURE

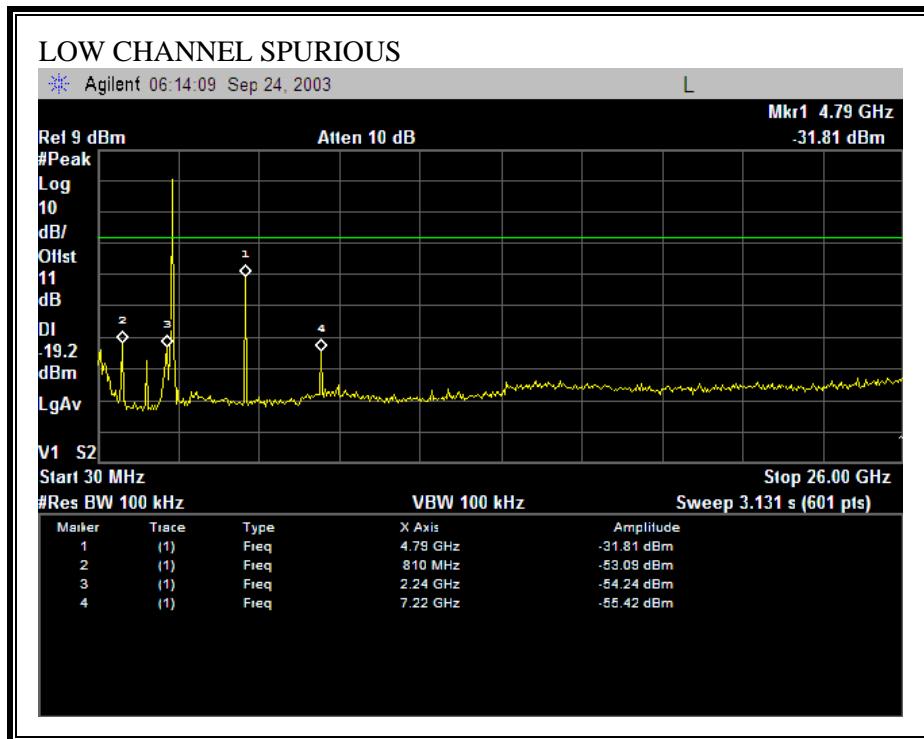
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

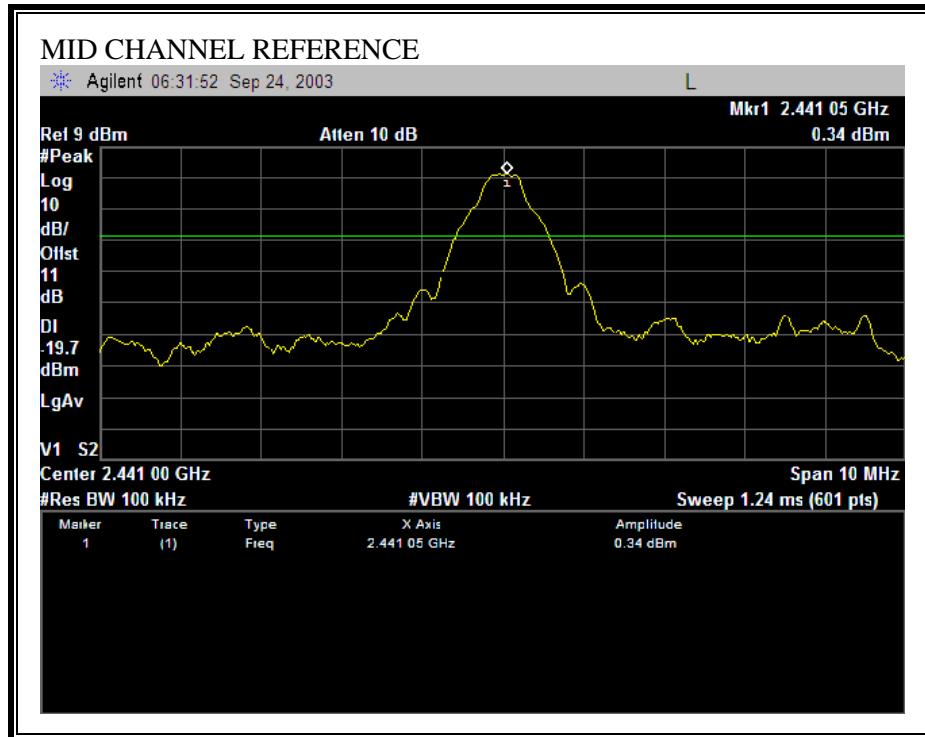
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

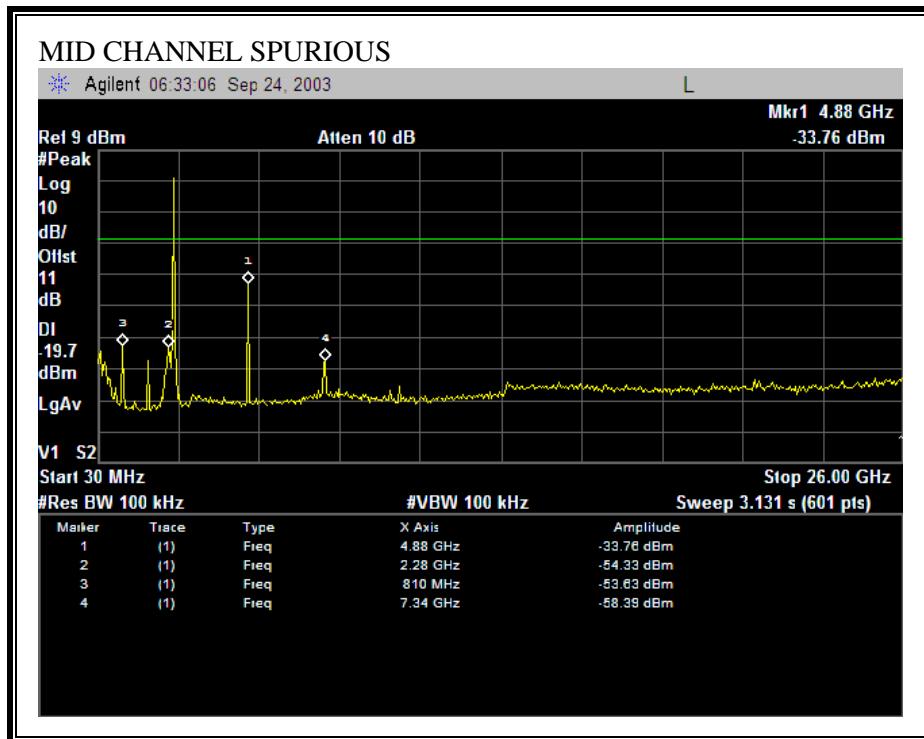
### RESULTS

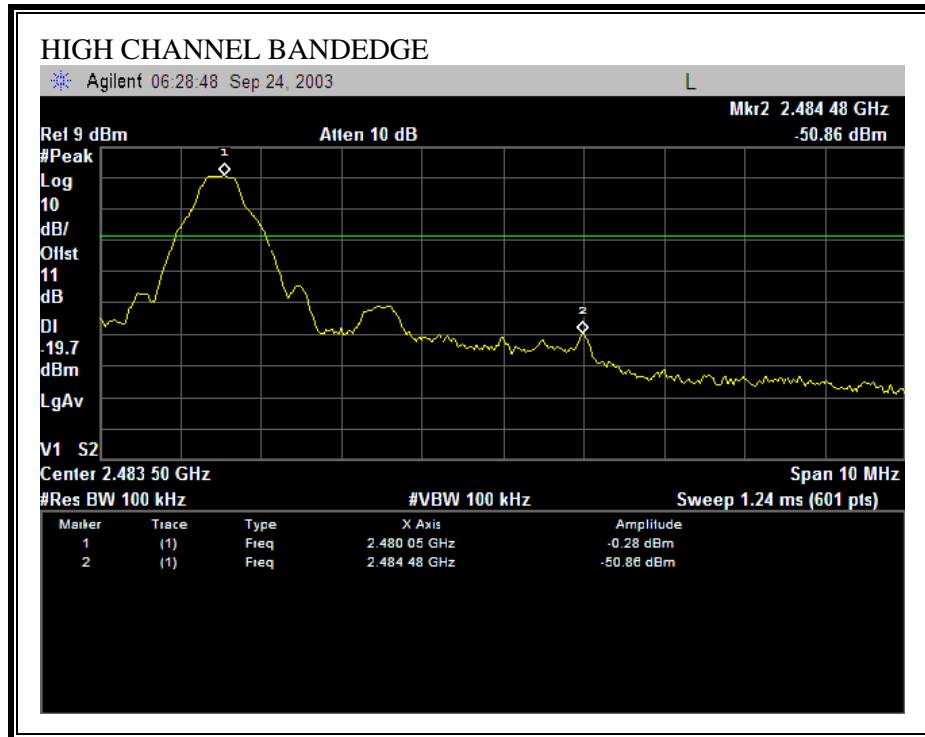
No non-compliance noted:

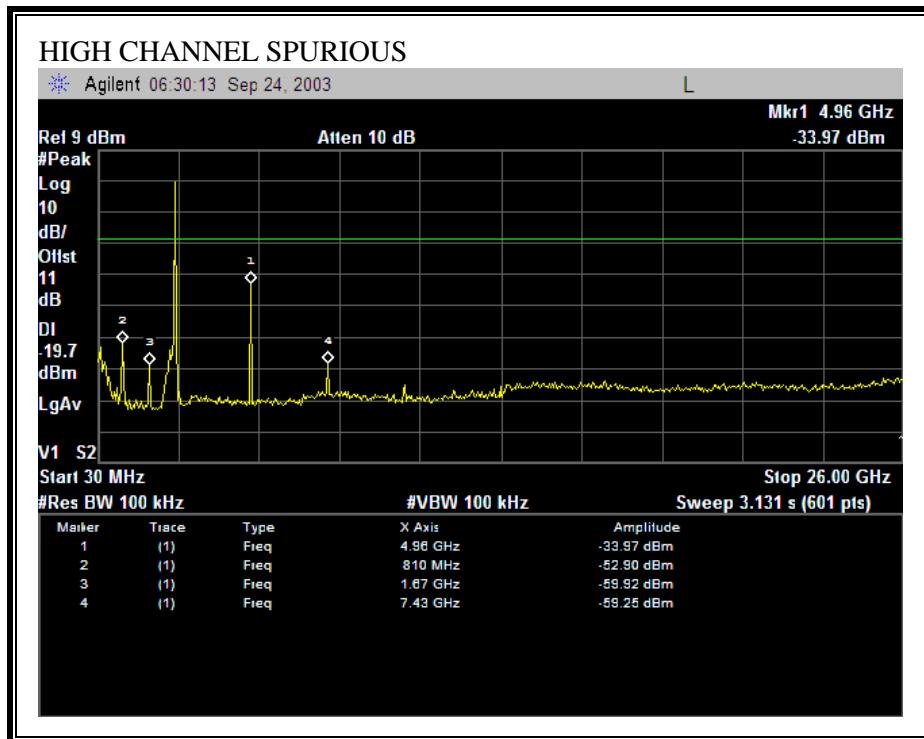
**SPURIOUS EMISSIONS, LOW CHANNEL**

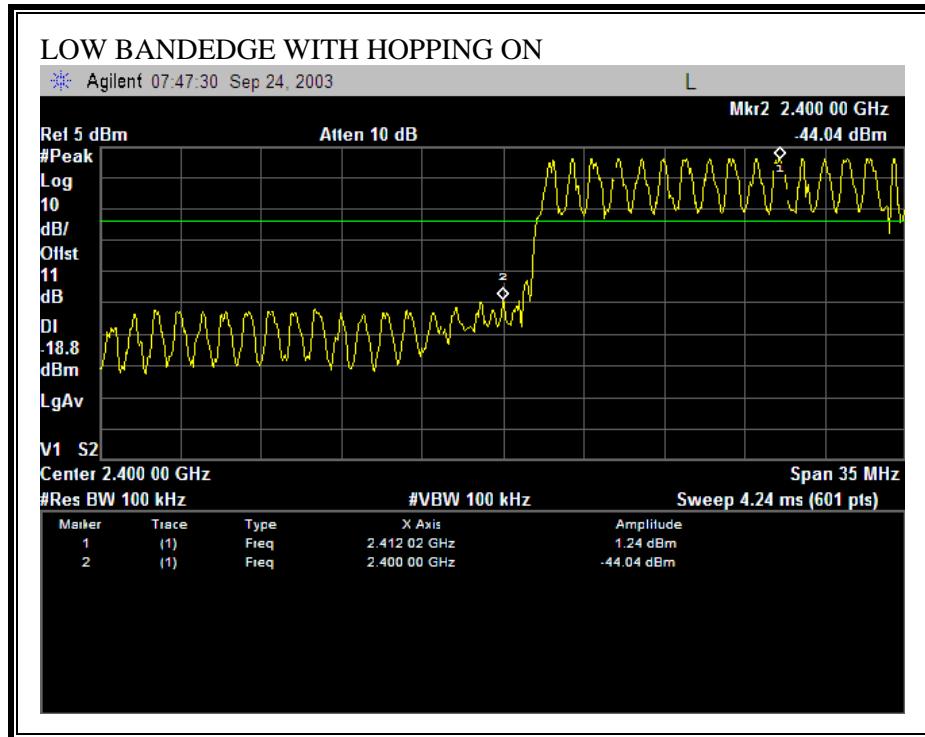


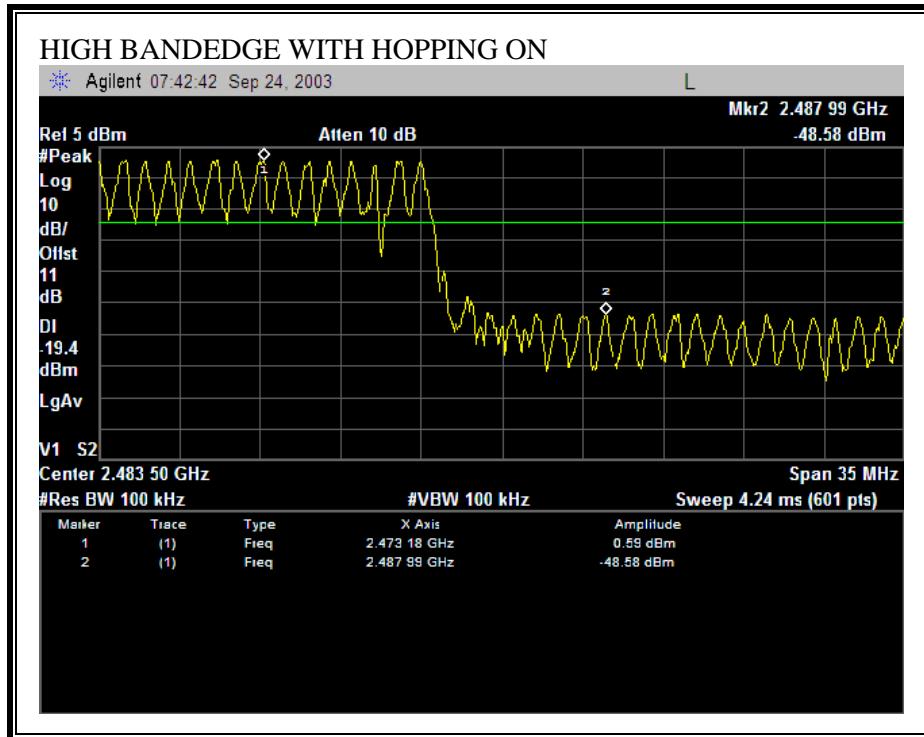
**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



## 7.10. RADIATED EMISSIONS

### 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.

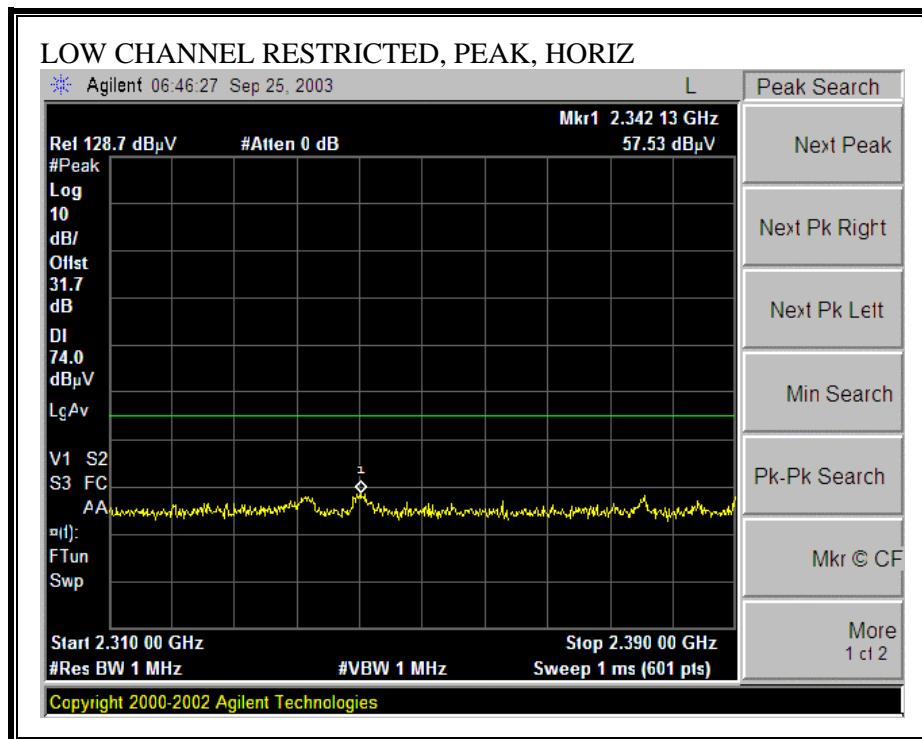
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

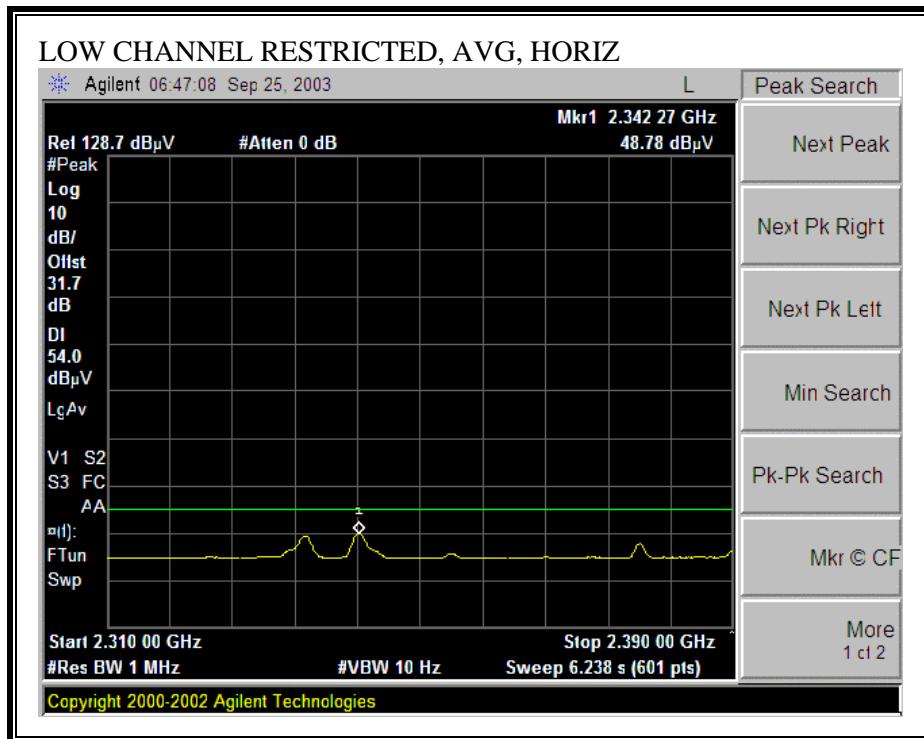
**RESULTS**

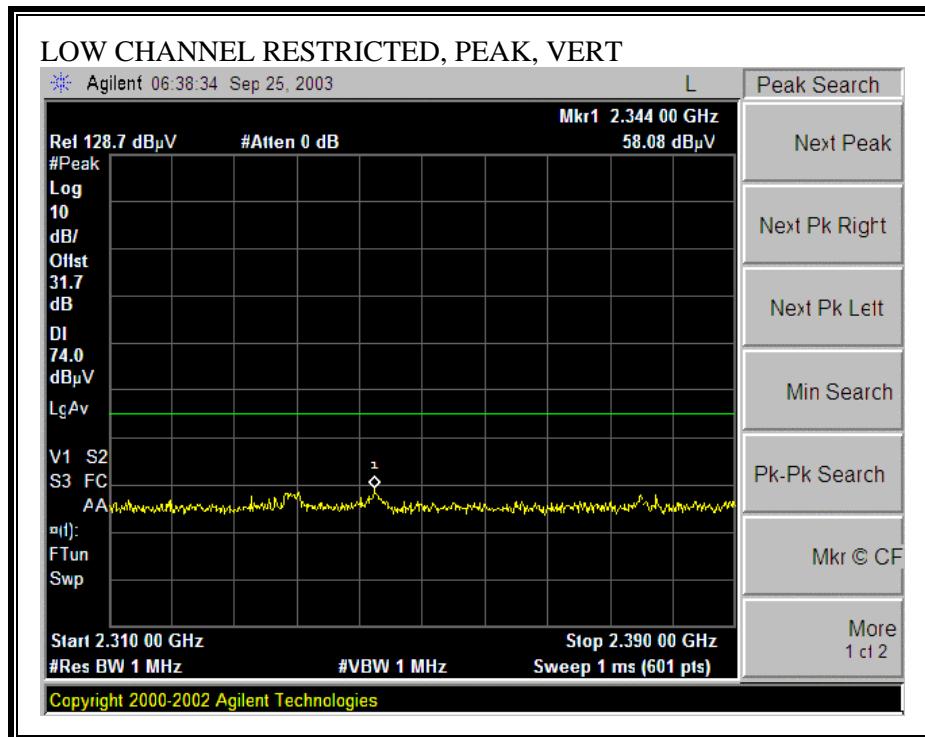
No non-compliance noted:

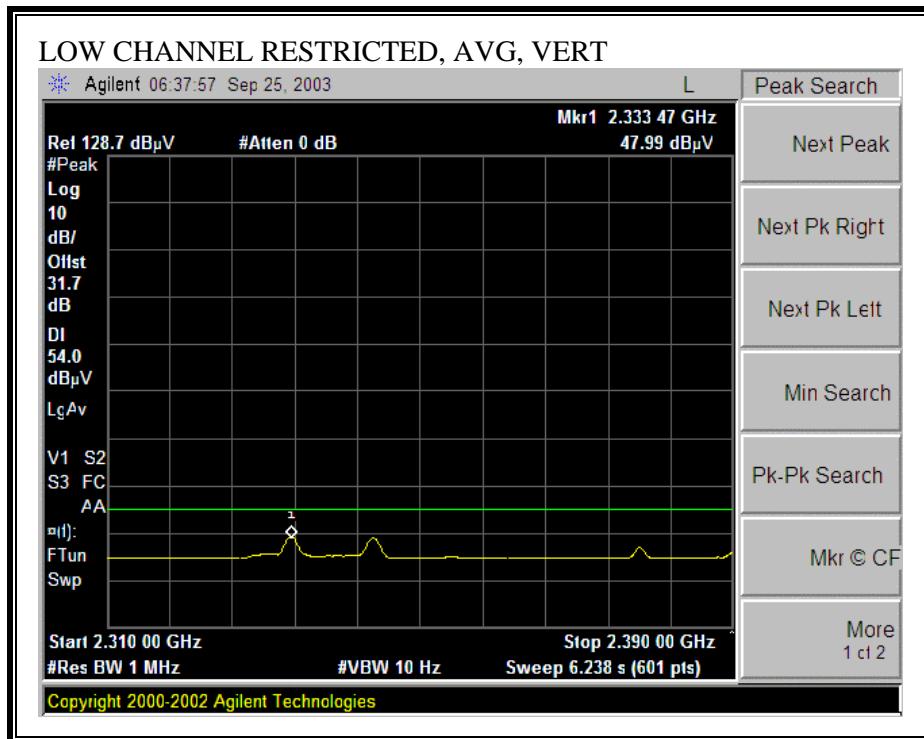
### 7.10.1. RADIATED EMISSIONS ABOVE 1 GHZ

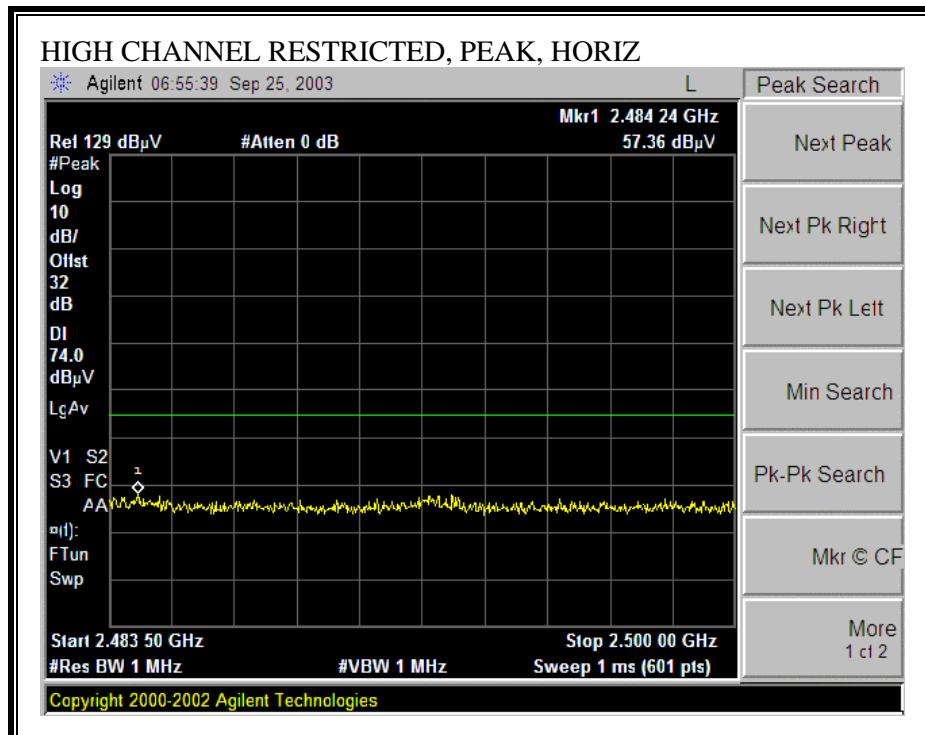
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

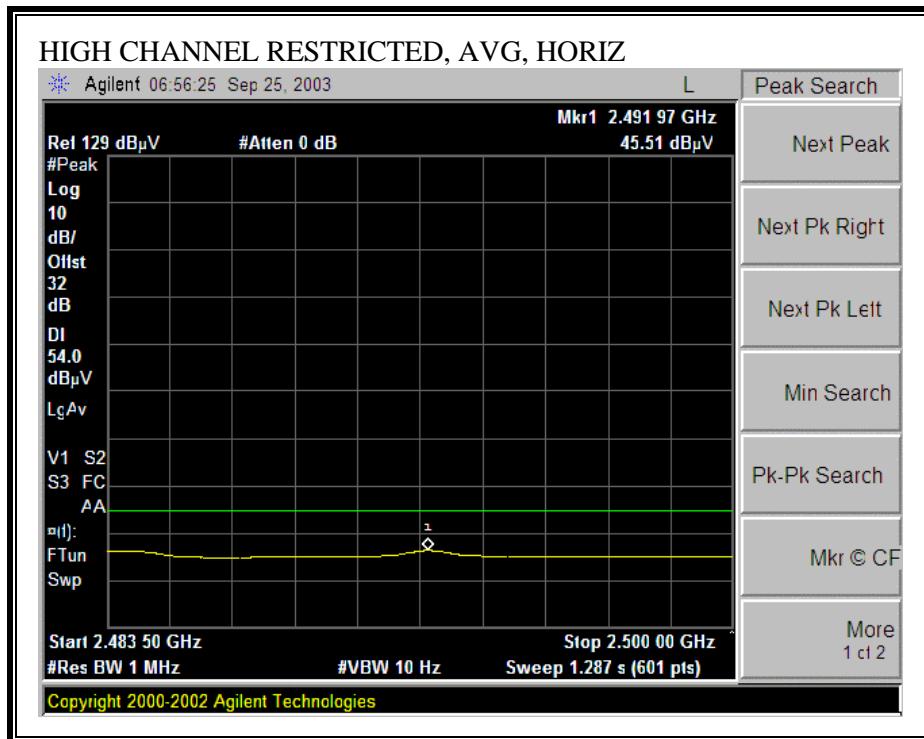


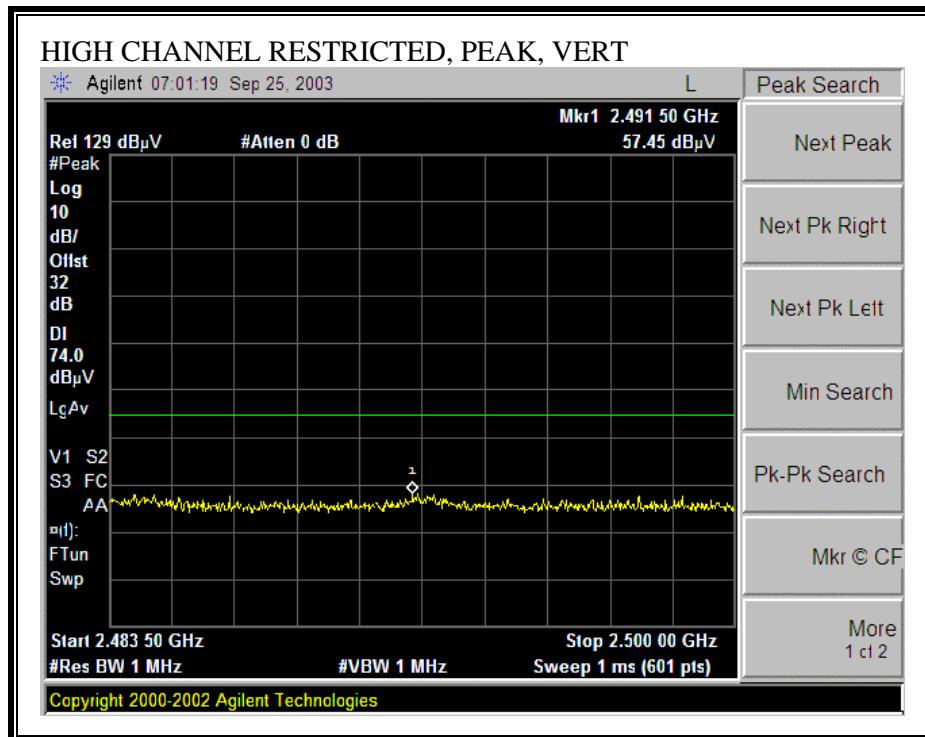


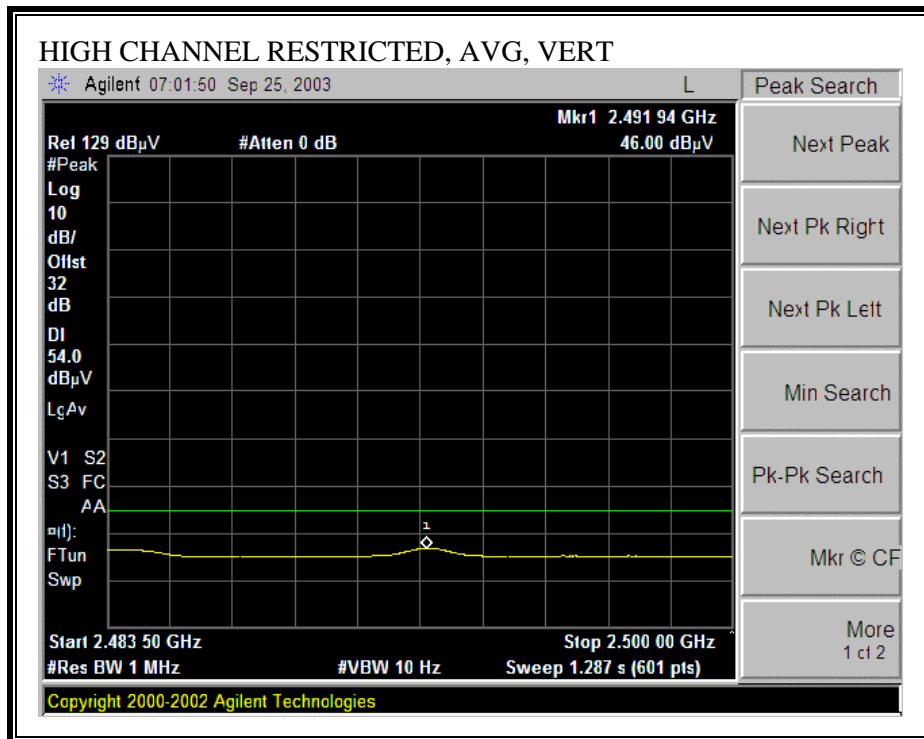
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

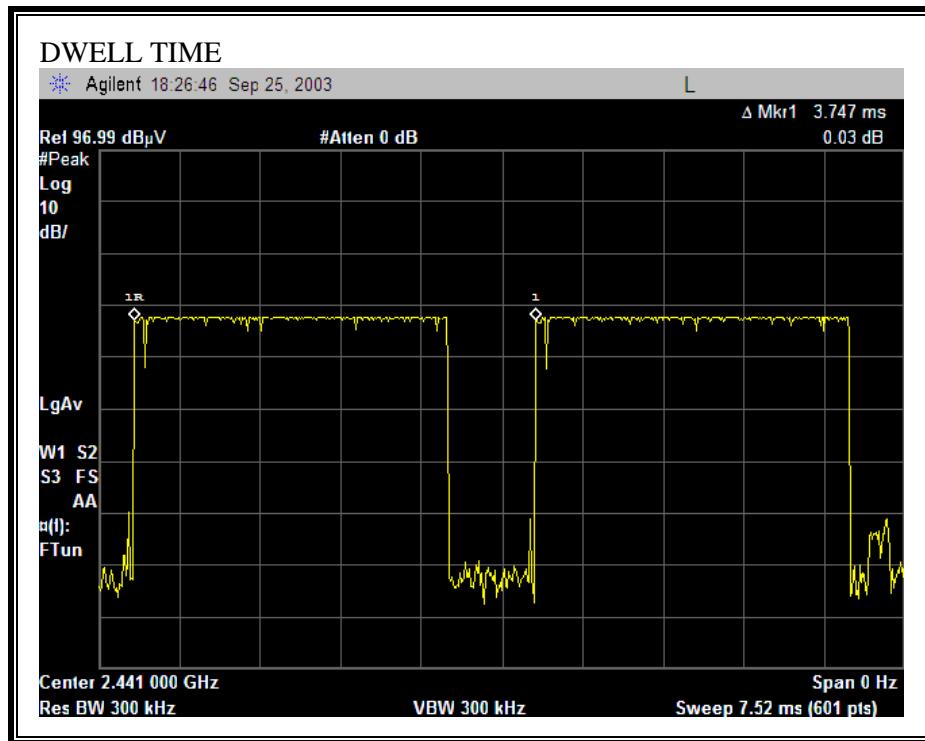


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



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



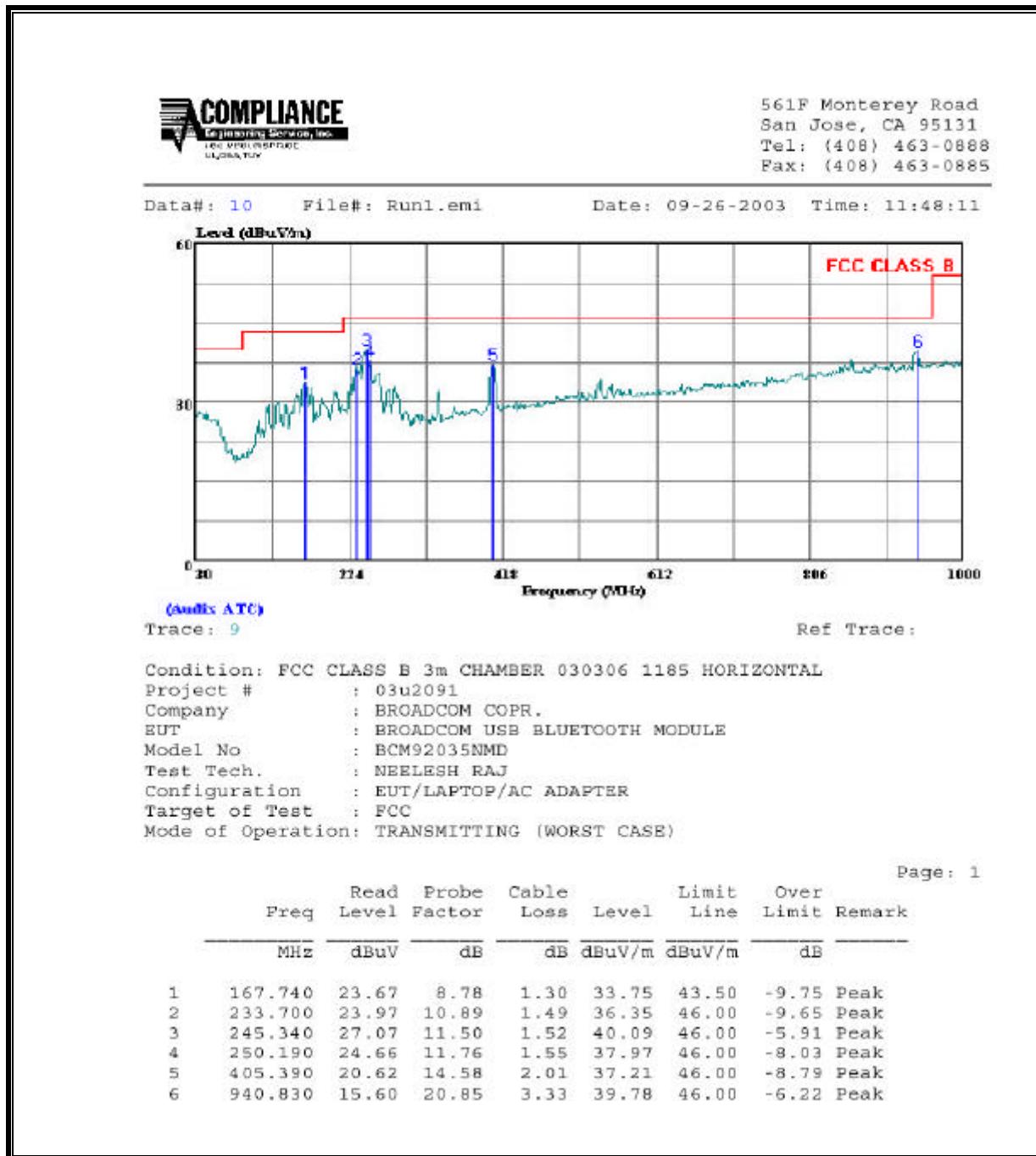
**DUTY CYCLE CORRECTION FACTOR**

\*IN ACCORDANCE WITH FCC PUBLIC NOTICE DA-00-705, THE "DUTY CYCLE CORRECTION FACTOR" FOR SPURIOUS RADIATED EMISSIONS IS;  $20 \log * (3.747 \text{ ms} / 100 \text{ ms}) = -28.5 \text{ dB}$ , WHICH WAS USED TO CORRECT THE AVERAGE SPURIOUS READING.

**HARMONICS AND SPURIOUS EMISSIONS (LOW, MIDDLE, AND HIGH CHANNELS)**

03U2091 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																																																																																																																																																																																																																																																																																																																																																																																																																																									
Test Eng: NEELESH RAJ Project #: 03U2091 Company: BROADCOM CORP. EUT Descrip.: BROADCOM USB BLUETOOTH MODULE EUT M/N: BCM9102NMD Test Target: FCC Mode Oper: TX																																																																																																																																																																																																																																																																																																																																																																																																																																									
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2441MHz																		4.882	9.8	53.2	50.0	33.4	3.0	-35.3	0.0	1.0	55.2	23.5	74.0	54.0	-18.8	-30.5	V	4.882	9.8	42.3	39.4	3.0	-35.3	0.0	1.0	50.2	15.8	74.0	54.0	-23.3	-38.2	H	7.323	9.8	47.8	40.7	35.9	3.8	-34.6	0.0	1.0	53.9	18.2	74.0	54.0	-20.1	-35.8	V	7.323	9.8	46.3	39.6	35.9	3.8	-34.6	0.0	1.0	52.3	17.1	74.0	54.0	-21.7	-36.9	H	12.205	9.8	42.1	39.2	5.2	-35.1	0.0	1.0	52.2	12.6	74.0	54.0	-21.8	-41.4	V	12.205	9.8	43.3	39.2	5.2	-35.1	0.0	1.0	53.5	11.9	74.0	54.0	-20.5	-42.1	H	HIGH CHANNEL 2480MHz																		4.960	9.8	49.5	43.8	33.5	3.0	-35.3	0.0	1.0	51.7	17.5	74.0	54.0	-22.3	-36.5	V	4.960	9.8	44.9	40.7	33.5	3.0	-35.3	0.0	1.0	47.1	14.4	74.0	54.0	-26.9	-39.6	H	7.440	9.8	48.0	39.2	36.1	3.8	-34.5	0.0	1.0	54.3	17.1	74.0	54.0	-19.7	-36.9	V	7.440	9.8	47.1	40.3	36.1	3.8	-34.5	0.0	1.0	53.5	18.2	74.0	54.0	-20.5	-35.8	H	12.400	9.8	41.9	39.2	5.2	-35.4	0.0	1.0	51.9	12.3	74.0	54.0	-22.1	-41.7	V	12.400	9.8	41.7	39.2	5.2	-35.4	0.0	1.0	51.7	12.1	74.0	54.0	-22.3	-41.9	H	NO OTHER SPURIOUS EMISSIONS 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f GHz	Dist feet	Raw Pk dBmV	Raw Avg dBmV	AF	CL	Amp	D Corr	HPF	Peak dBmVm	Avg dBmVm	Pk Lim dBmVm	Avg Lim dBmVm	Pk Mar dB	Avg Mar dB	Notes																																																																																																																																																																																																																																																																																																																																																																																																																										
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12.810	9.8	40.3	39.2	5.1	-34.9	0.0	1.0	50.7	12.2	74.0	54.0	-23.3	-41.8	H																																																																																																																																																																																																																																																																																																																																																																																																																											
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4.882	9.8	53.2	50.0	33.4	3.0	-35.3	0.0	1.0	55.2	23.5	74.0	54.0	-18.8	-30.5	V																																																																																																																																																																																																																																																																																																																																																																																																																										
4.882	9.8	42.3	39.4	3.0	-35.3	0.0	1.0	50.2	15.8	74.0	54.0	-23.3	-38.2	H																																																																																																																																																																																																																																																																																																																																																																																																																											
7.323	9.8	47.8	40.7	35.9	3.8	-34.6	0.0	1.0	53.9	18.2	74.0	54.0	-20.1	-35.8	V																																																																																																																																																																																																																																																																																																																																																																																																																										
7.323	9.8	46.3	39.6	35.9	3.8	-34.6	0.0	1.0	52.3	17.1	74.0	54.0	-21.7	-36.9	H																																																																																																																																																																																																																																																																																																																																																																																																																										
12.205	9.8	42.1	39.2	5.2	-35.1	0.0	1.0	52.2	12.6	74.0	54.0	-21.8	-41.4	V																																																																																																																																																																																																																																																																																																																																																																																																																											
12.205	9.8	43.3	39.2	5.2	-35.1	0.0	1.0	53.5	11.9	74.0	54.0	-20.5	-42.1	H																																																																																																																																																																																																																																																																																																																																																																																																																											
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4.960	9.8	49.5	43.8	33.5	3.0	-35.3	0.0	1.0	51.7	17.5	74.0	54.0	-22.3	-36.5	V																																																																																																																																																																																																																																																																																																																																																																																																																										
4.960	9.8	44.9	40.7	33.5	3.0	-35.3	0.0	1.0	47.1	14.4	74.0	54.0	-26.9	-39.6	H																																																																																																																																																																																																																																																																																																																																																																																																																										
7.440	9.8	48.0	39.2	36.1	3.8	-34.5	0.0	1.0	54.3	17.1	74.0	54.0	-19.7	-36.9	V																																																																																																																																																																																																																																																																																																																																																																																																																										
7.440	9.8	47.1	40.3	36.1	3.8	-34.5	0.0	1.0	53.5	18.2	74.0	54.0	-20.5	-35.8	H																																																																																																																																																																																																																																																																																																																																																																																																																										
12.400	9.8	41.9	39.2	5.2	-35.4	0.0	1.0	51.9	12.3	74.0	54.0	-22.1	-41.7	V																																																																																																																																																																																																																																																																																																																																																																																																																											
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NOTE: AVERAGE FIELD STRENGTH INCLUDES DUTY CYCLE CORRECTION FACTOR OF -28.5dB																																																																																																																																																																																																																																																																																																																																																																																																																																									
<table border="1"> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td></td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td></td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td></td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td></td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> <td></td> </tr> </table>																		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																																																																																																																																																																																																																																																																																																																																																																																								
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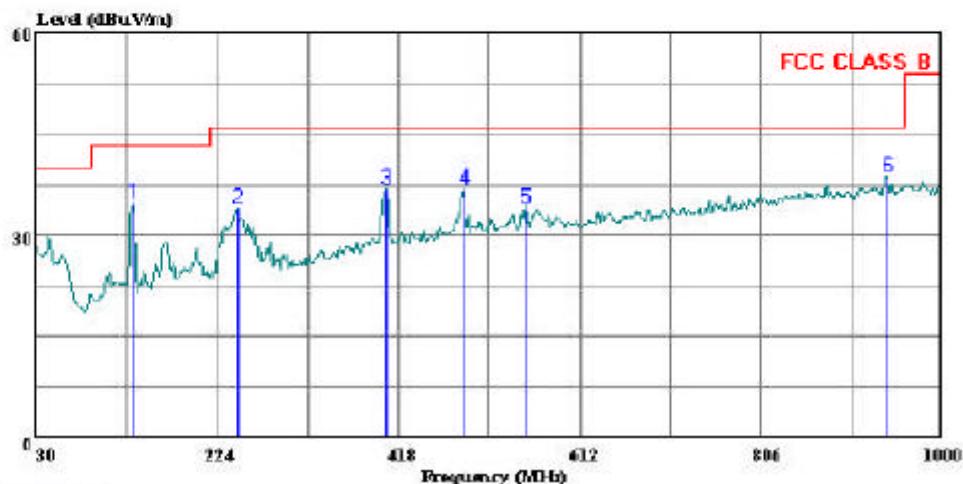
## 7.10.2. RADIATED EMISSIONS BELOW 1 GHZ

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

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

561F Monterey Road  
San Jose, CA 95131  
Tel: (408) 463-0888  
Fax: (408) 463-0885

Data#: 8 File#: Run1.emi Date: 09-26-2003 Time: 11:00:37



(Audit ATC)

Trace: 7

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 VERTICAL

Project #: 03u2091  
Company: BROADCOM CORP.  
EUT: BROADCOM USB BLUETOOTH MODULE  
Model No: BCM92035NMD  
Test Tech.: NEELESH RAJ  
Configuration: EUT/LAPTOP/AC ADAPTER  
Target of Test: FCC  
Mode of Operation: TRANSMITTING (WORST CASE)

Page: 1

Freq	Read	Probe	Cable	Limit	Over	Remark	
	Level	Factor	Cable				
	MHz	dBuV	dB	dB	dBuV/m	dBuV/m	dB
1	133.790	24.40	9.40	1.11	34.91	43.50	-8.59 Peak
2	245.340	20.95	11.50	1.52	33.97	46.00	-12.03 Peak
3	405.390	20.32	14.58	2.01	36.91	46.00	-9.09 Peak
4	487.840	18.34	16.32	2.29	36.95	46.00	-9.05 Peak
5	554.770	14.25	17.19	2.45	33.90	46.00	-12.10 Peak
6	940.830	14.49	20.85	3.33	38.67	46.00	-7.33 Peak

## 7.11. CO-LOCATED RADIATED EMISSIONS

### **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.

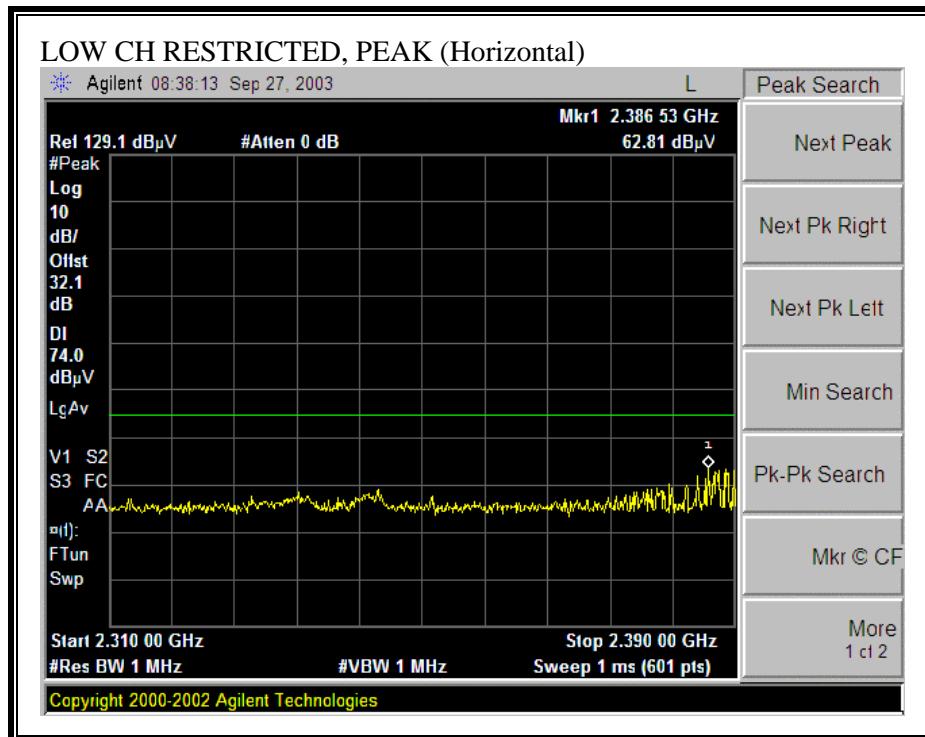
The dominant transmitter is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter are varied. Worst case results are reported.

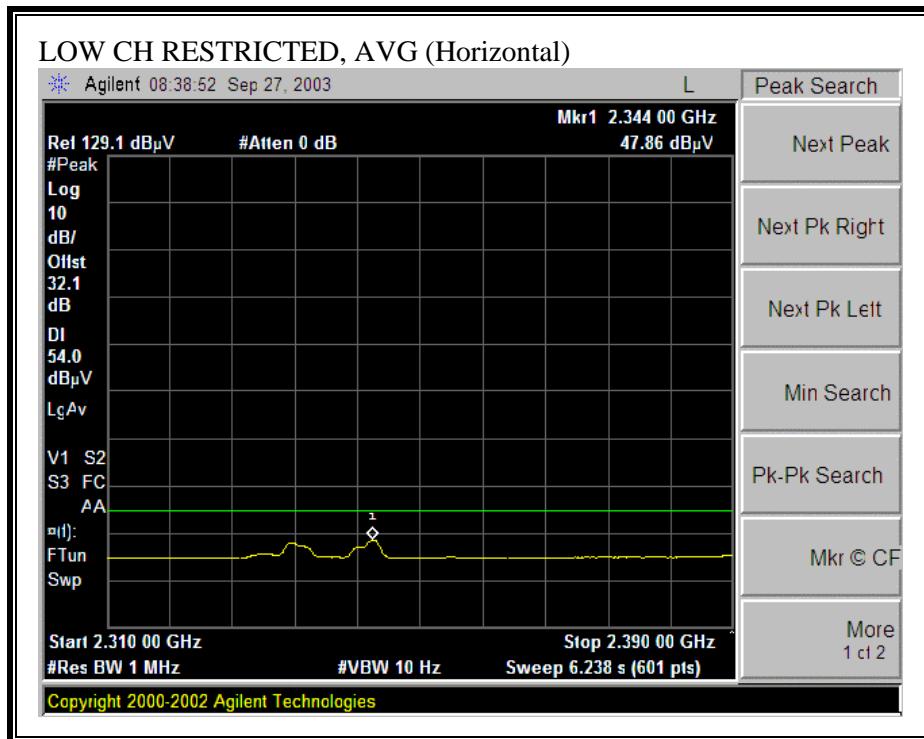
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

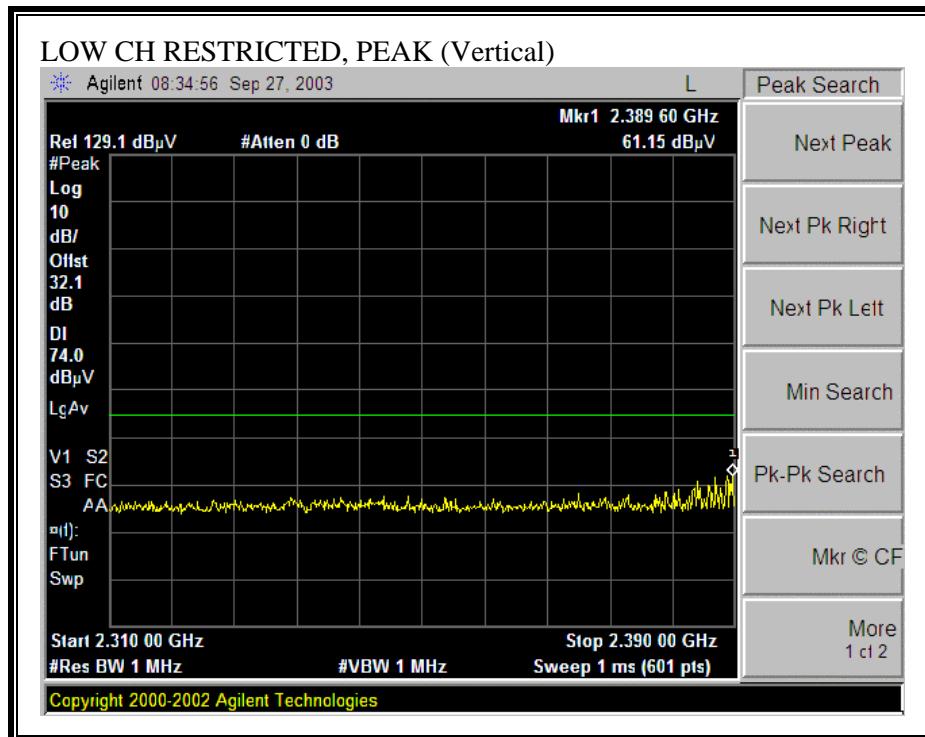
### **RESULTS**

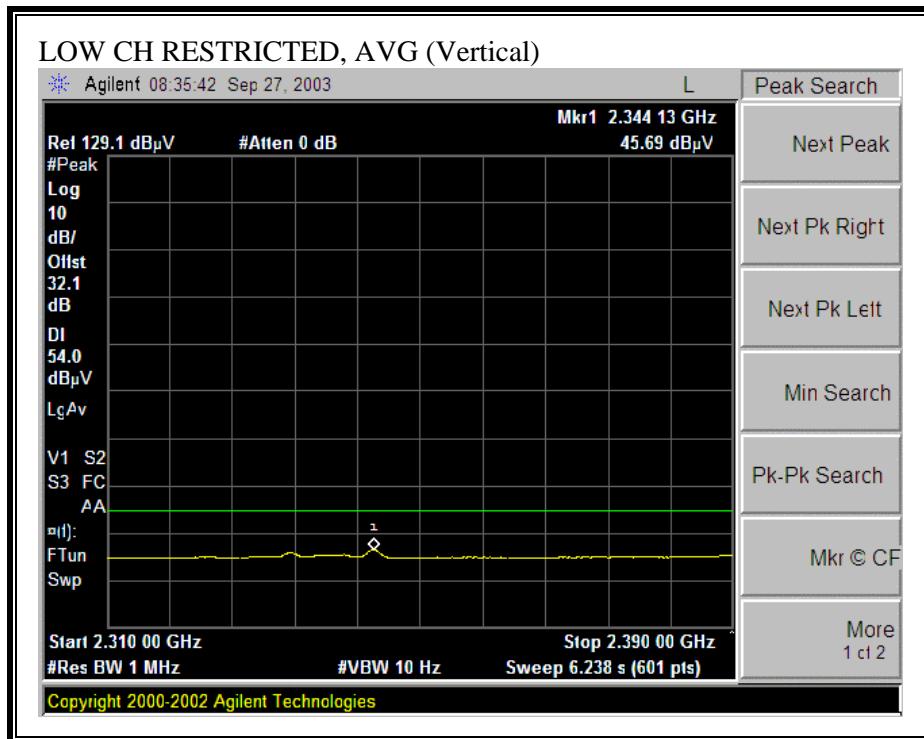
No non-compliance noted:

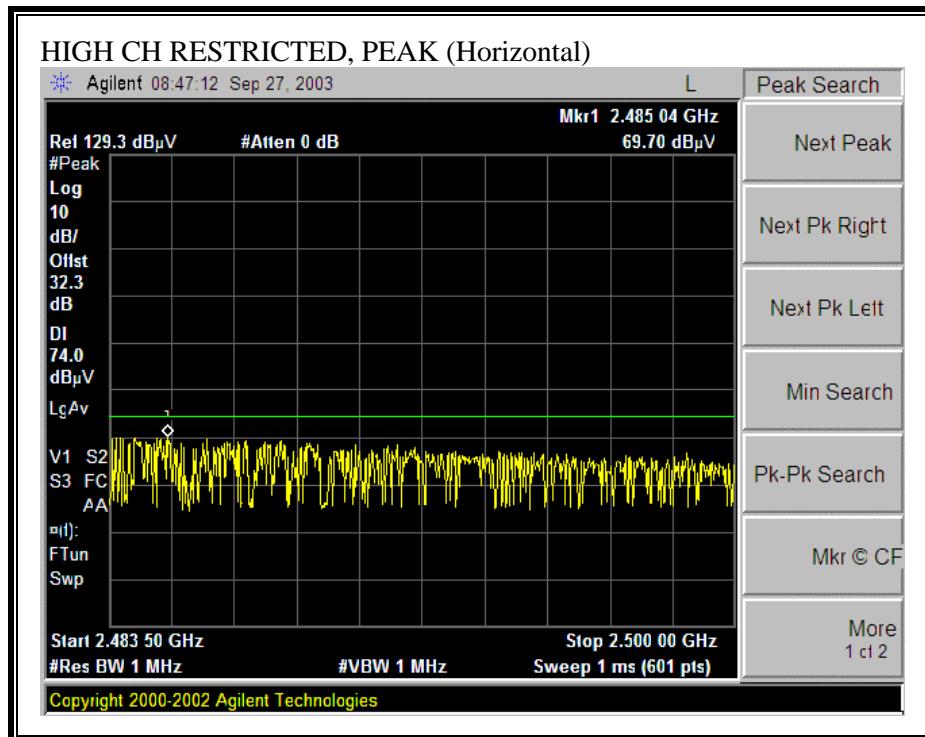
Dominant LAN is transmitted at low channel with non-dominant Bluetooth at low channel as investigated.

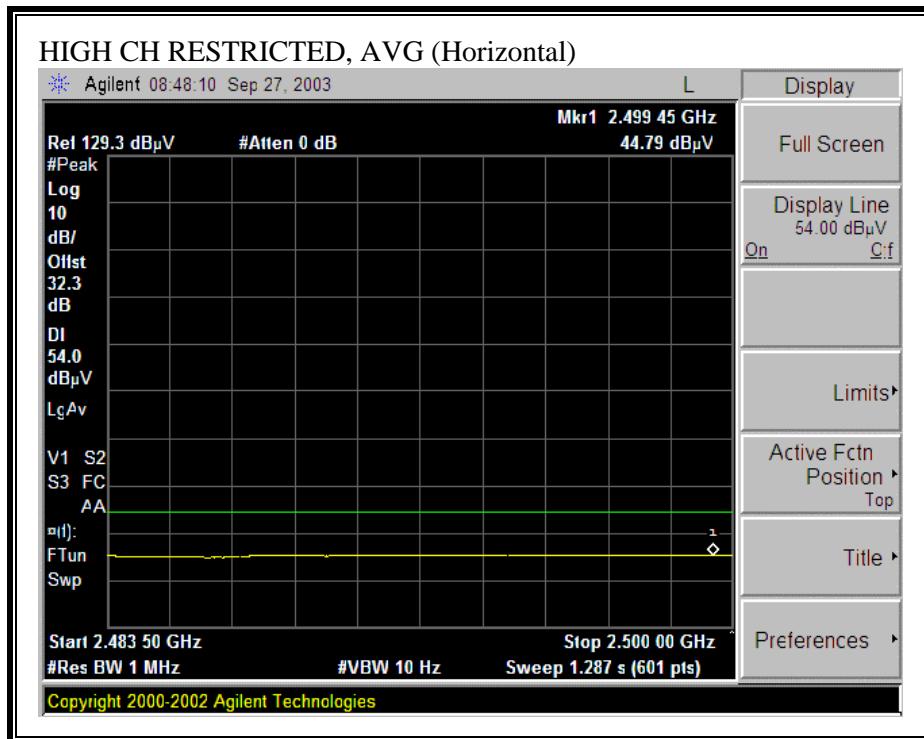
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

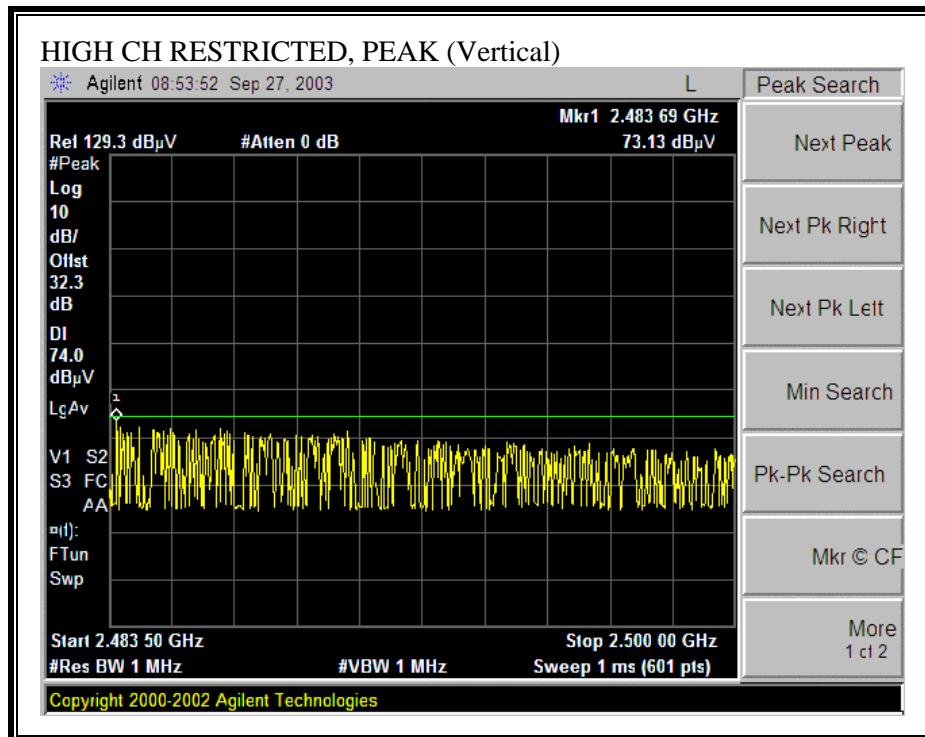


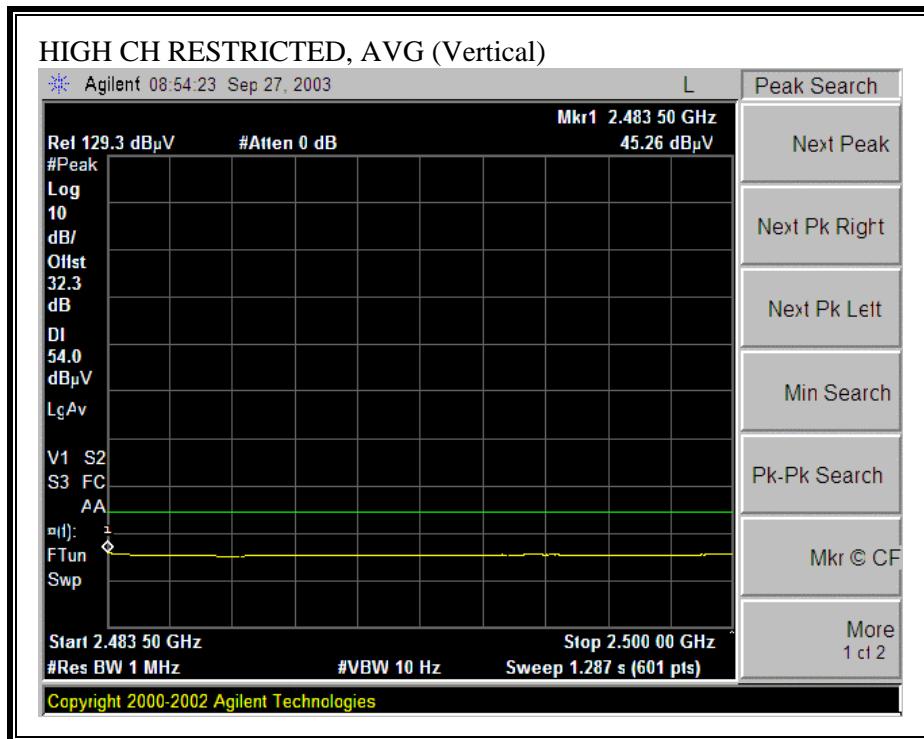
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



## WORST-CASE HARMONICS AND SPURIOUS EMISSIONS

## 7.12. 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 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup> 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.

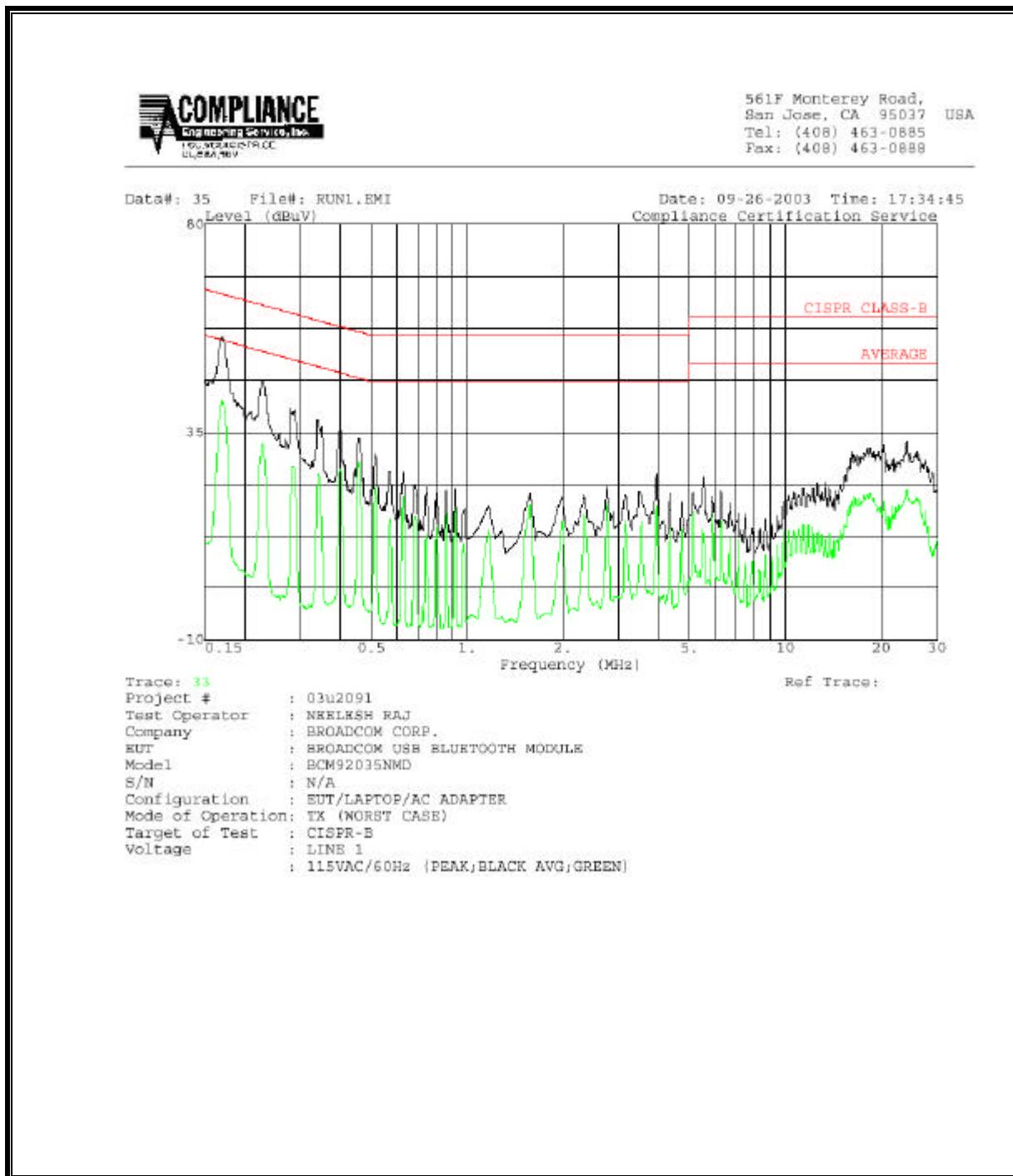
Line conducted data is recorded for both NEUTRAL and HOT lines.

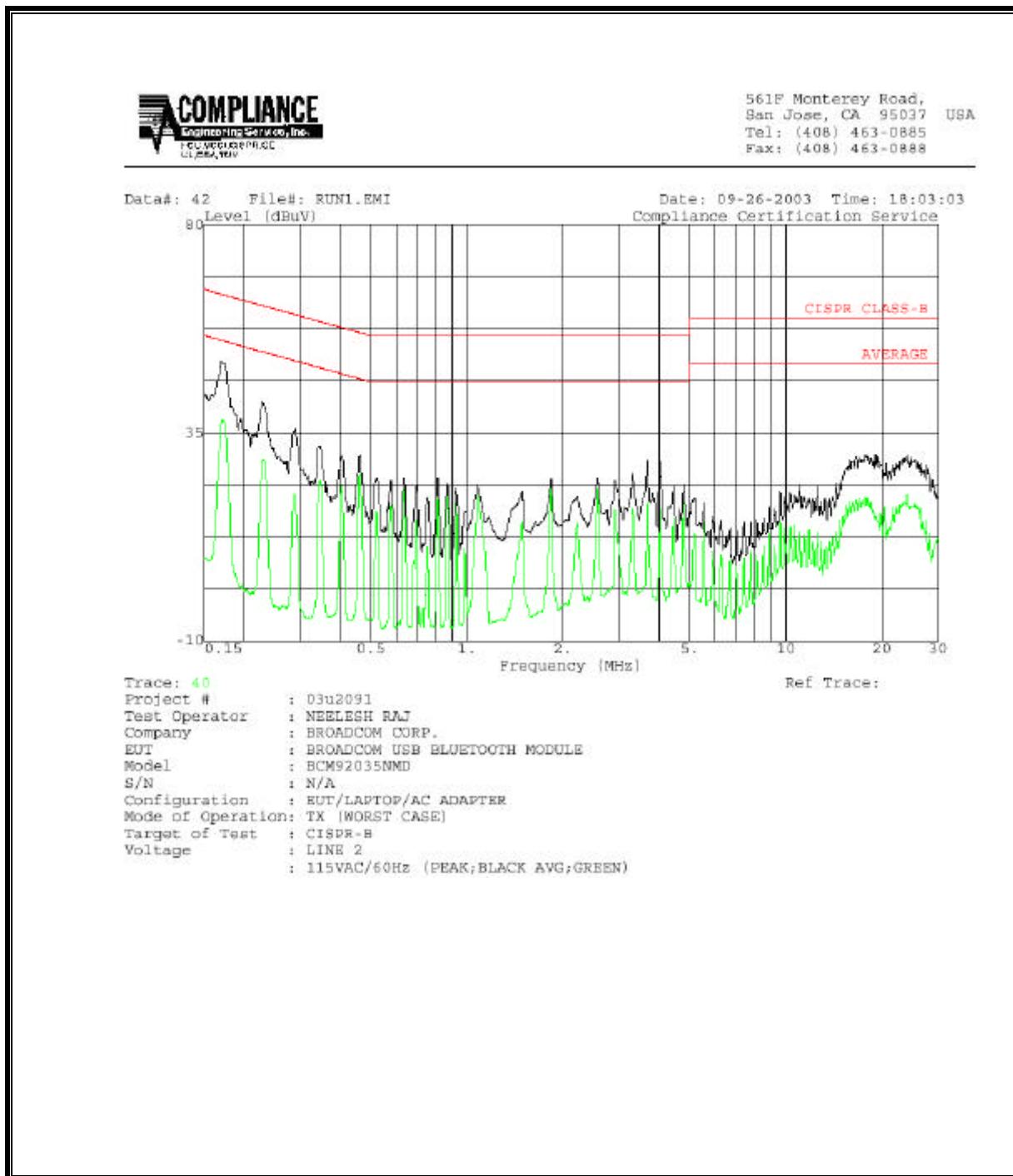
### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS**

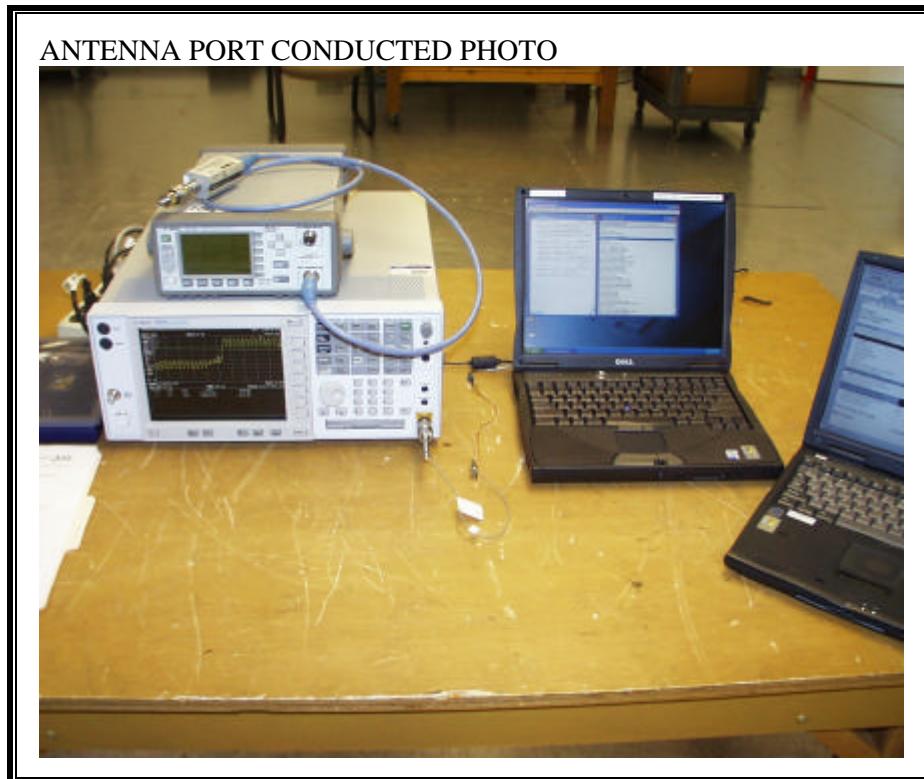
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit QP	EN B AV	Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.17	55.54	--	41.95	0.00	65.46	55.46	-9.92	-13.51	L1
0.23	46.12	--	32.26	0.00	63.77	53.77	-17.65	-21.51	L1
0.28	40.18	--	20.41	0.00	62.31	52.31	-22.13	-31.90	L1
0.17	50.42	--	36.34	0.00	65.46	55.46	-15.04	-19.12	L2
0.23	41.59	--	28.59	0.00	63.77	53.77	-22.18	-25.18	L2
0.29	36.10	--	21.28	0.00	62.03	52.03	-25.93	-30.75	L2
6 Worst Data									

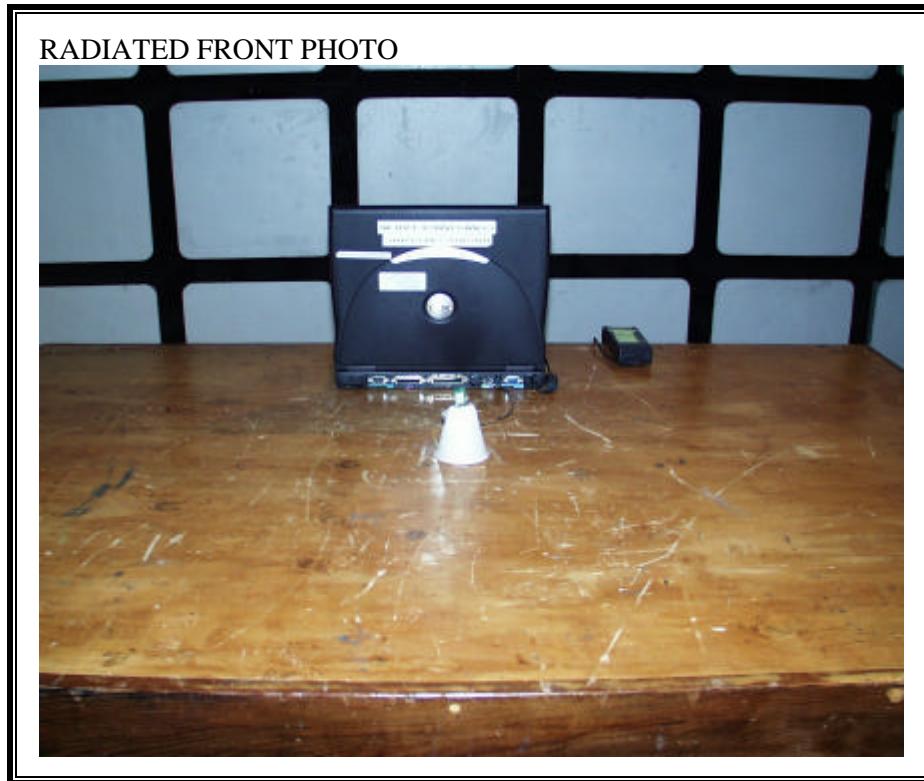
**LINE 1 RESULTS**

**LINE 2 RESULTS**

## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



**RADIATED RF MEASUREMENT SETUP**

RADIATED BACK PHOTO



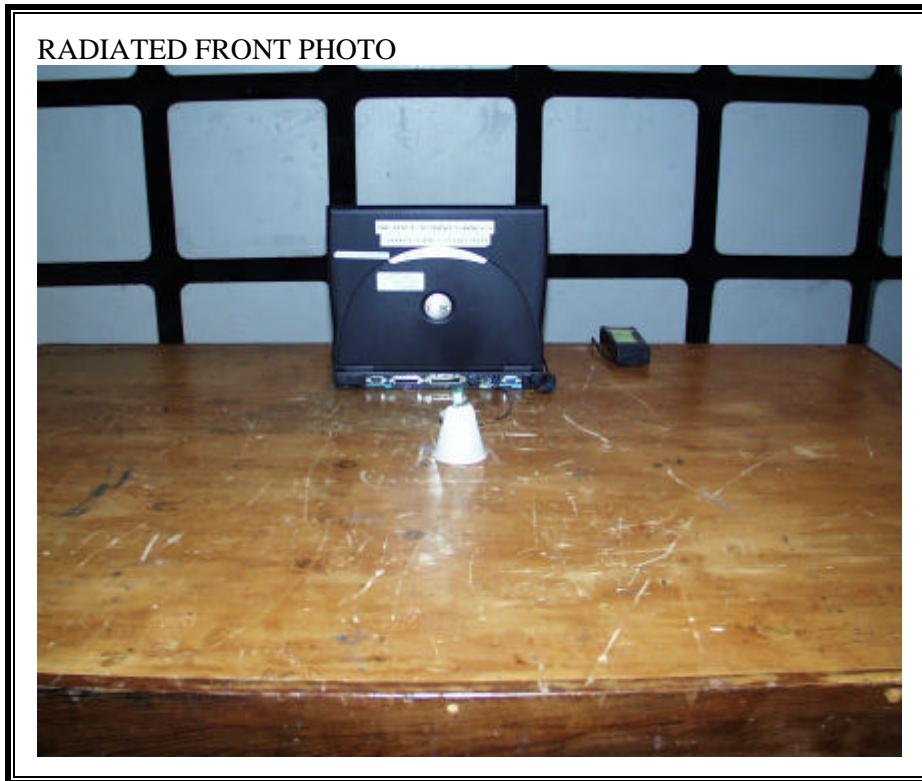
**CO-LOCATION RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO



RADIATED BACK PHOTO



**RADIATED EMISSIONS SETUP**

RADIATED BACK PHOTO

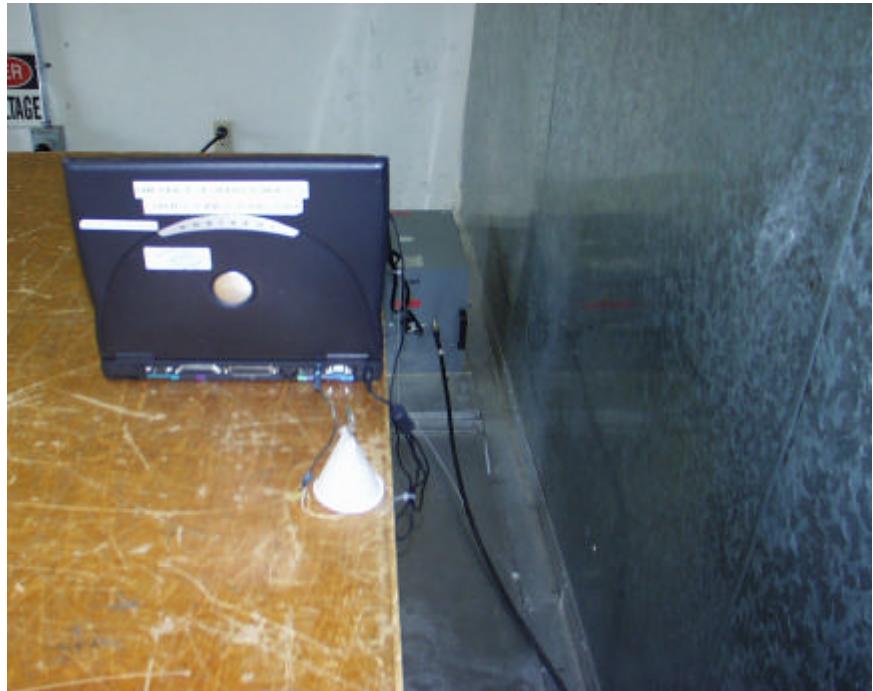


**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO

**END OF REPORT**