



**FCC CFR47 PART 15 SUBPART C**

**CLASS II PERMISSIVE CHANGE  
TEST REPORT**

**FOR**

**BROADCOM USB BLUETOOTH MODULE**

**MODEL NUMBER: BCM92035NMD**

**FCC ID: QDS-BRCM1009**

**REPORT NUMBER: 03U2340-1**

**ISSUE DATE: DECEMBER 12, 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, OCTOBER 29-30, AND DECEMBER 10, 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  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

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.

### 2.1. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The class II permissive change is the EUT was collocated with 2 WLAN models: BCM94036MP and BCM94036MPSG.

### 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 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:

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:

*FOR TESTS DONE FROM SEPTEMBER 22-29, 2003*

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	MITEQ	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

*FOR TESTS DONE FROM OCTOBER 29-30, 2003*

TEST EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Peak Power Meter	Agilent	E4416A	GB41291160	11/7/2004
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/2004
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	4/25/2004
Spectrum Analyzer	Agilent	E4440A	US41421507	5/8/2004
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
2.4-2.5 GHz Reject Filter	Micro-Tronics	BRM50702	1	N/A

FOR TESTS DONE ON DECEMBER 10, 2003

<b>TEST EQUIPMENT LIST</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Due Date</b>
Peak Power Meter	Agilent	E4416A	GB41291160	11/7/2004
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/2004
Spectrum Analyzer	Agilent	E4440A	US41421507	5/8/2004
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004
RF Filter Section	HP	85420E	3705A00256	11/21/2004
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



## 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 CONDUCTED, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS</b>				
AC ADAPTER	DELL	AA20031	CN-09364U-16291-29F-00KM	N/A
LAPTOP	DELL	PP01L	37232072533	DoC
<b>THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS</b>				
AC ADAPTER	COMPAQ	PPP009H	F3-0302011044B	N/A
LAPTOP	COMPAQ	NX7000	N/A	N/A
WIRELESS LAN CARD	BROADCOM	BCM94306MP	N/A	QDS-BRCM1005-H
WIRELESS LAN CARD	BROADCOM	BCM94306MP5G	N/A	QDS-BRCM1005-H

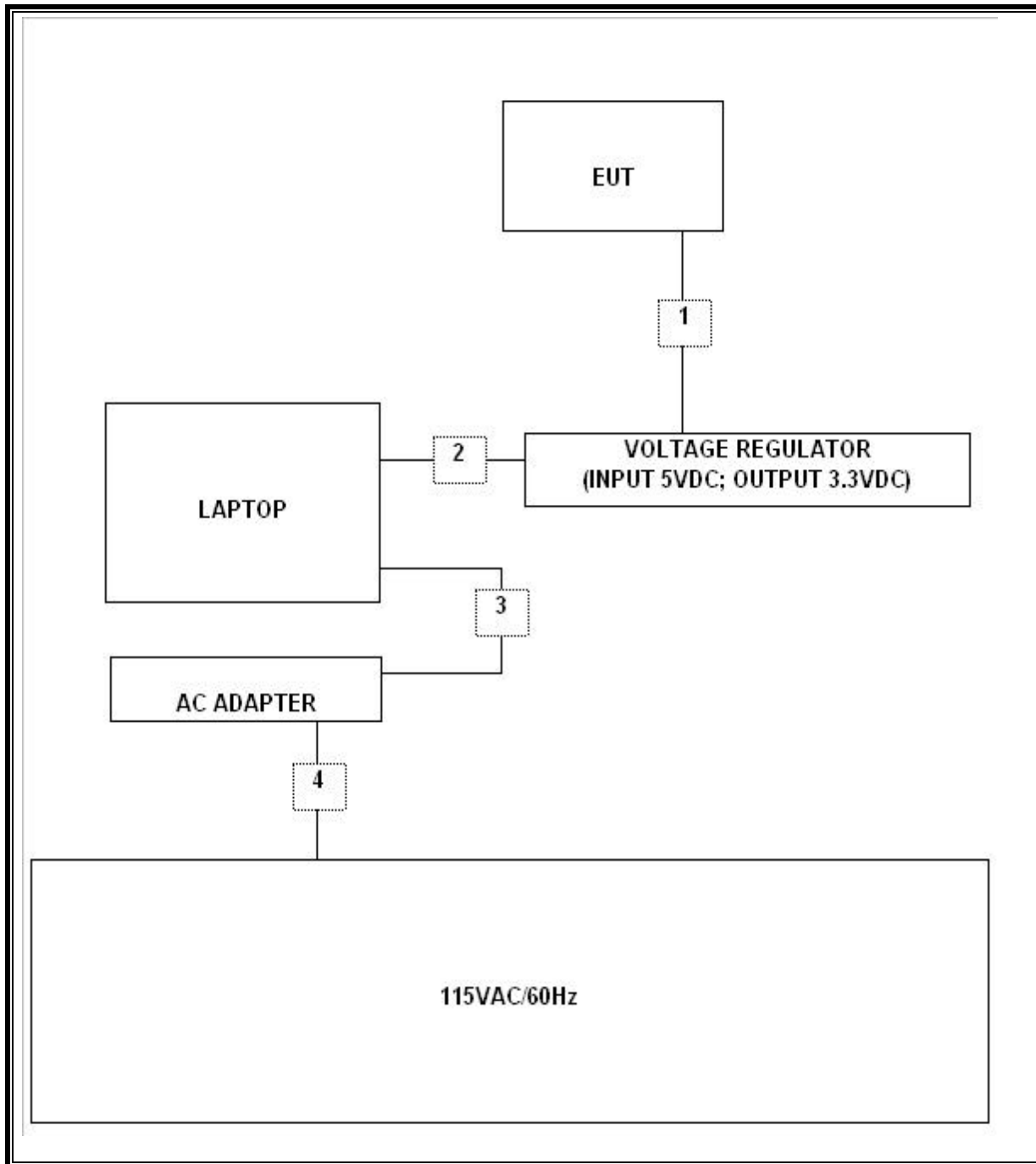
### I/O CABLES

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 CONDUCTED, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS</b>				
AC ADAPTER	DELL	AA20031	CN-09364U-16291-29F-00KM	N/A
LAPTOP	DELL	PP01L	37232072533	DoC
<b>THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS</b>				
AC ADAPTER	COMPAQ	PPP009H	F3-0302011044B	N/A
LAPTOP	COMPAQ	NX7000	N/A	N/A
WIRELESS LAN CARD	BROADCOM	BCM94306MP	N/A	QDS-BRCM1005-H
WIRELESS LAN CARD	BROADCOM	BCM94306MP5G	N/A	QDS-BRCM1005-H

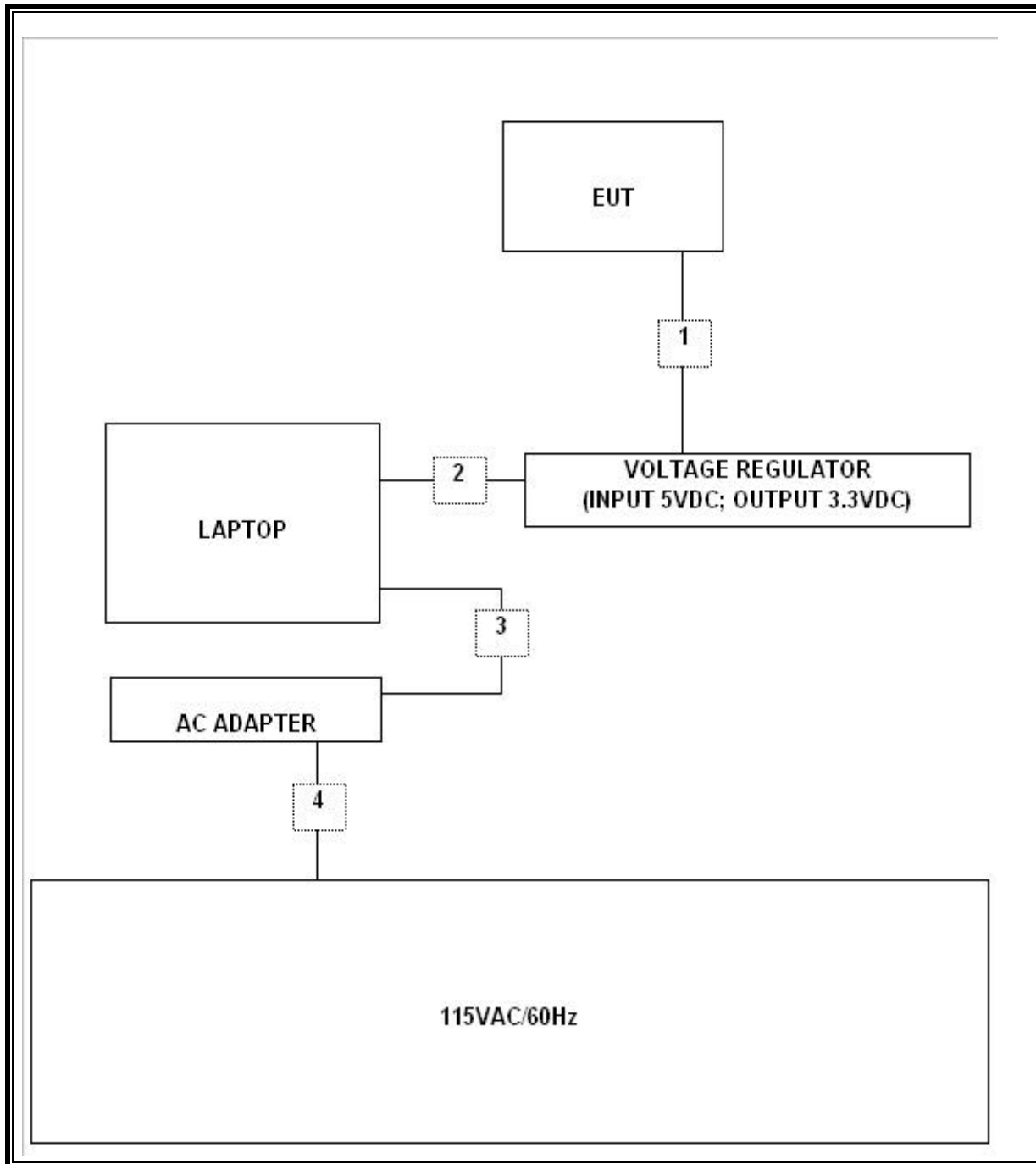
**I/O CABLES**

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

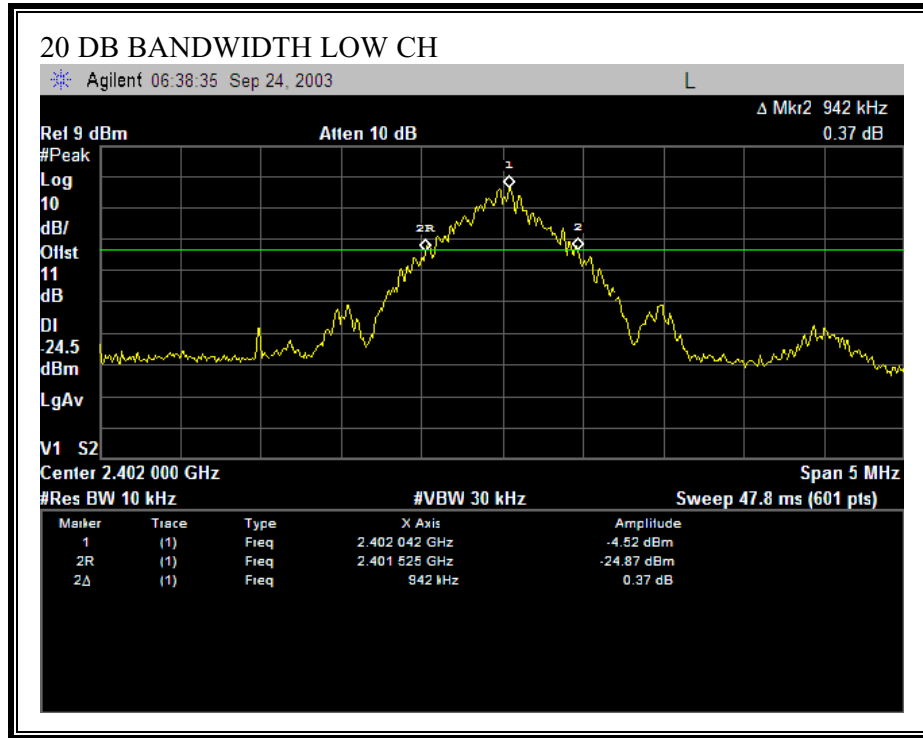
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

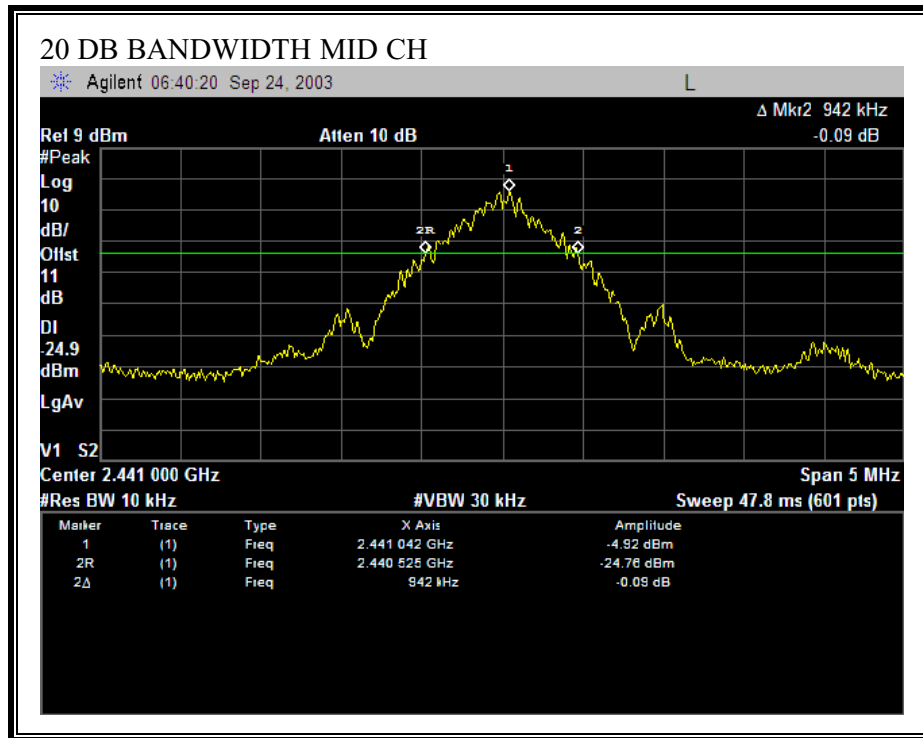
#### RESULTS

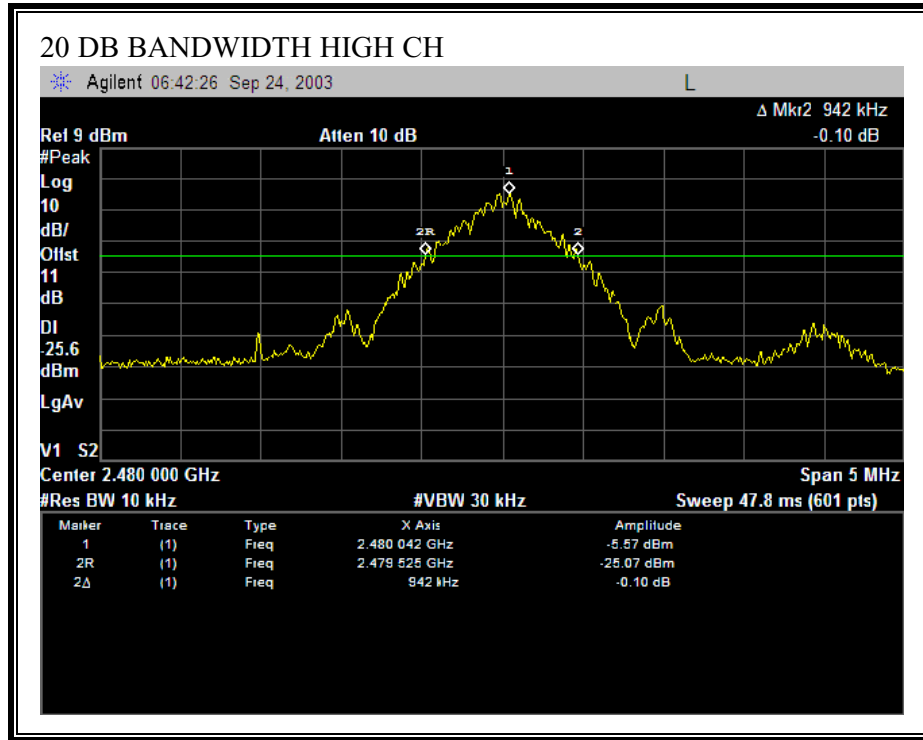
No non-compliance noted:

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 hopping channel, whichever is greater.

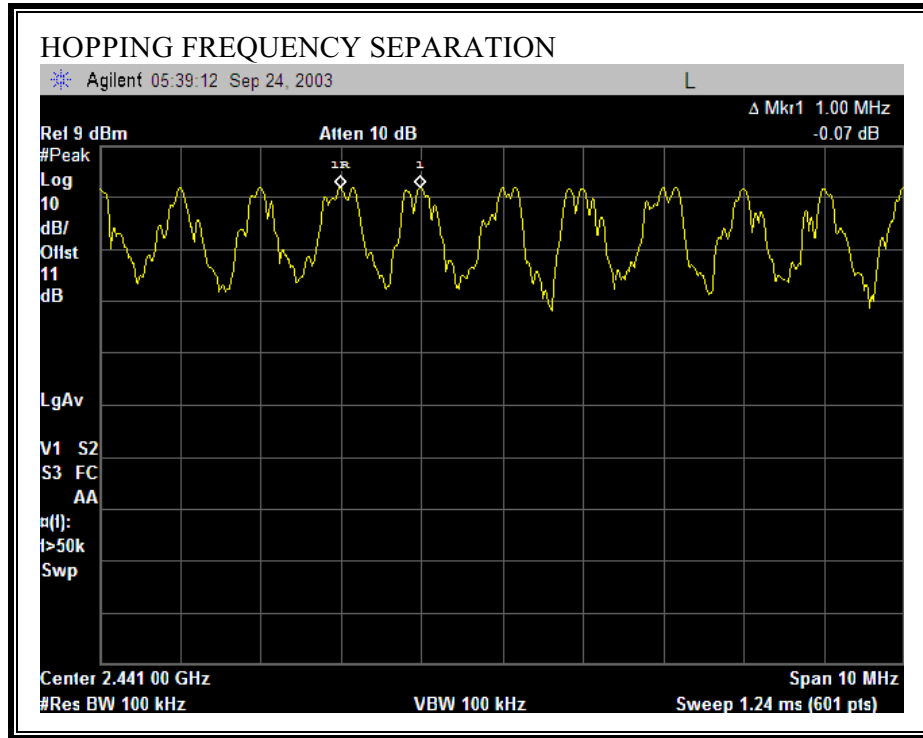
### TEST PROCEDURE

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

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

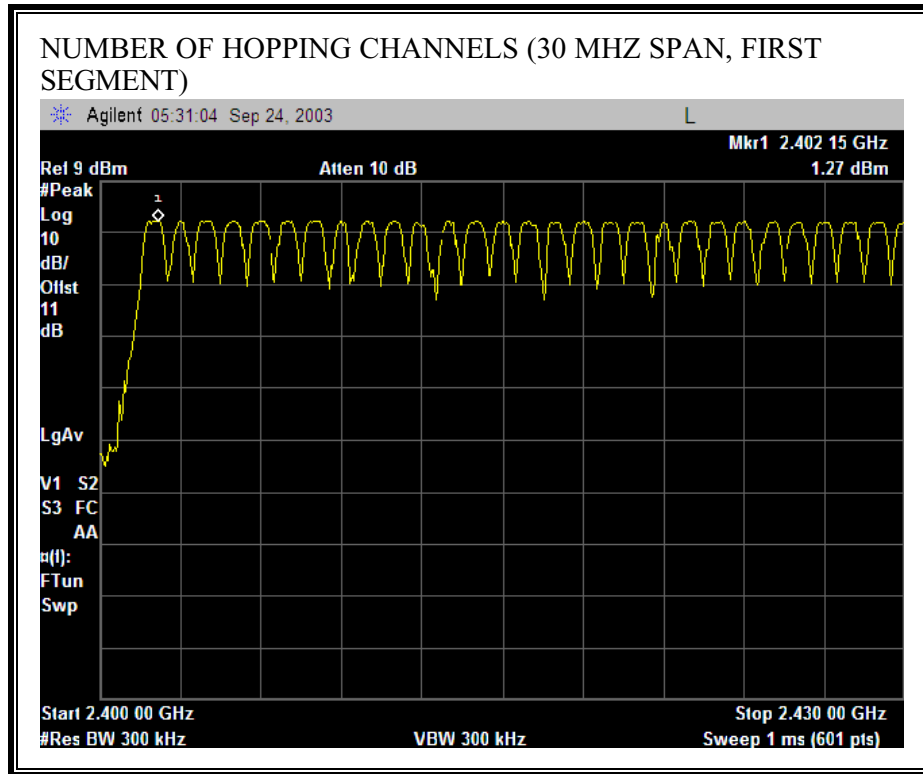
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

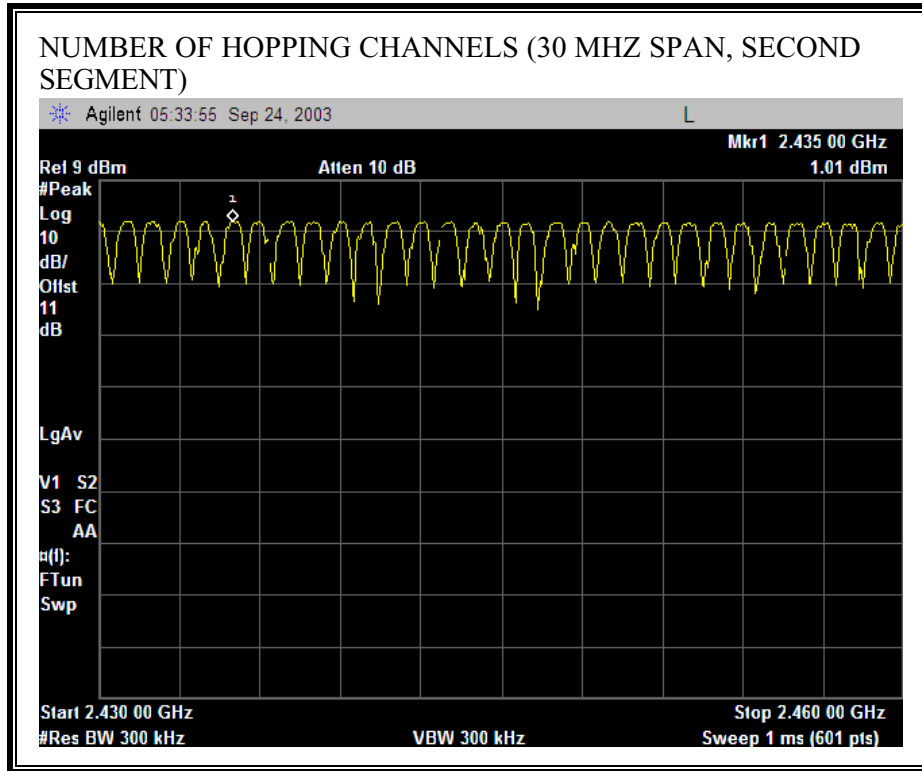
#### RESULTS

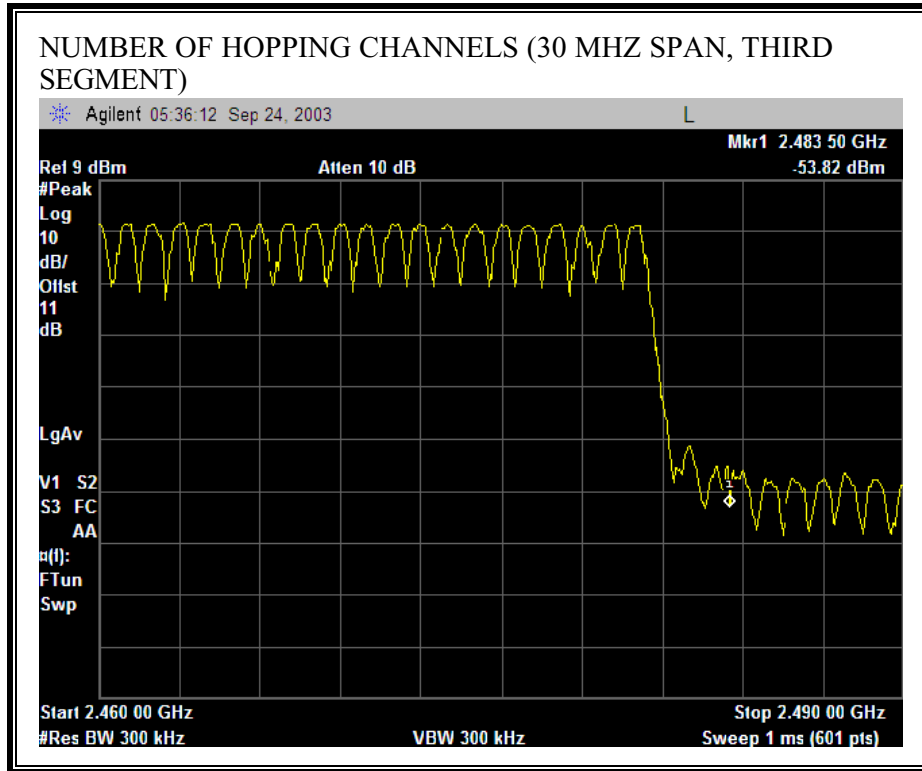
No non-compliance noted:

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)

<b>OCCURANCE</b>
<b>3.16 sec</b>
8

**OCCURANCE IN 31.6 SECONDS (79 CHANNELS x 0.4 SEC)**  
 8 x 10 = 80 (PULSES IN 31.6 SECONDS)

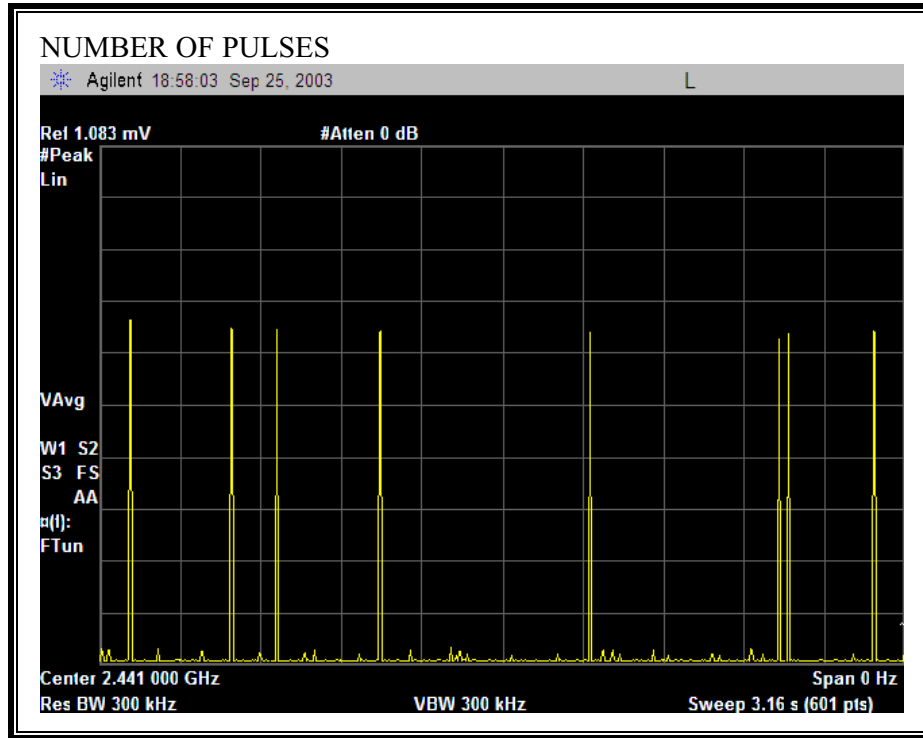
<b>PULSE WIDTH</b>	<b>PULSES IN</b>	<b>TIME OF</b>	<b>LIMIT</b>	<b>MARGIN</b>
<b>(mS)</b>	<b>31.6 SECONDS</b>	<b>OCCUPANCY</b>	<b>(sec)</b>	<b>(sec)</b>
		<b>(sec)</b>		
2.939	80	.235	0.400	0.165

**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

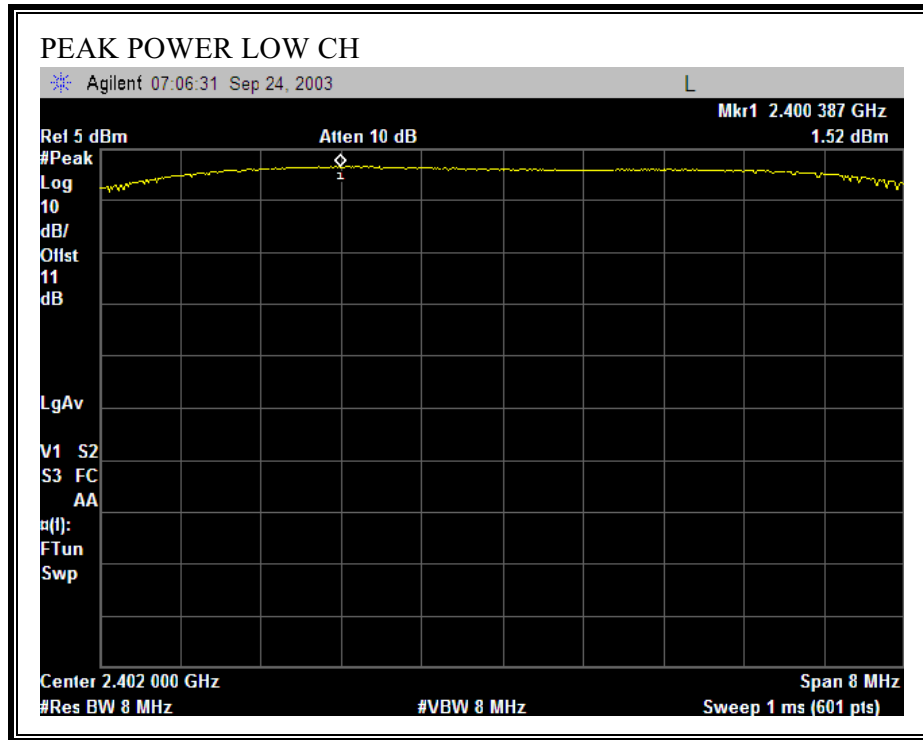
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

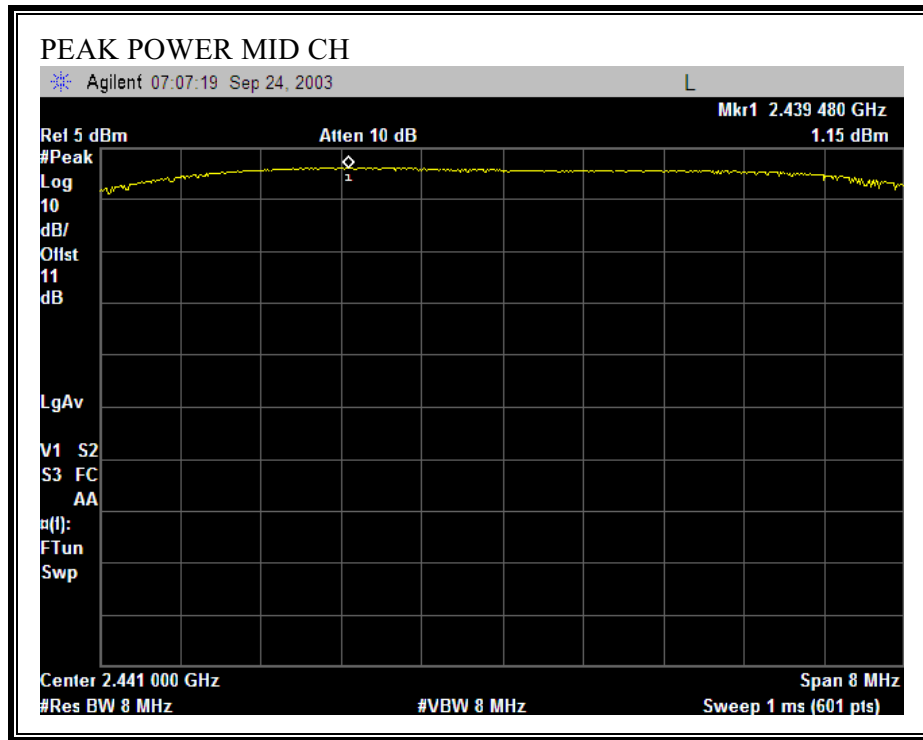
### RESULTS

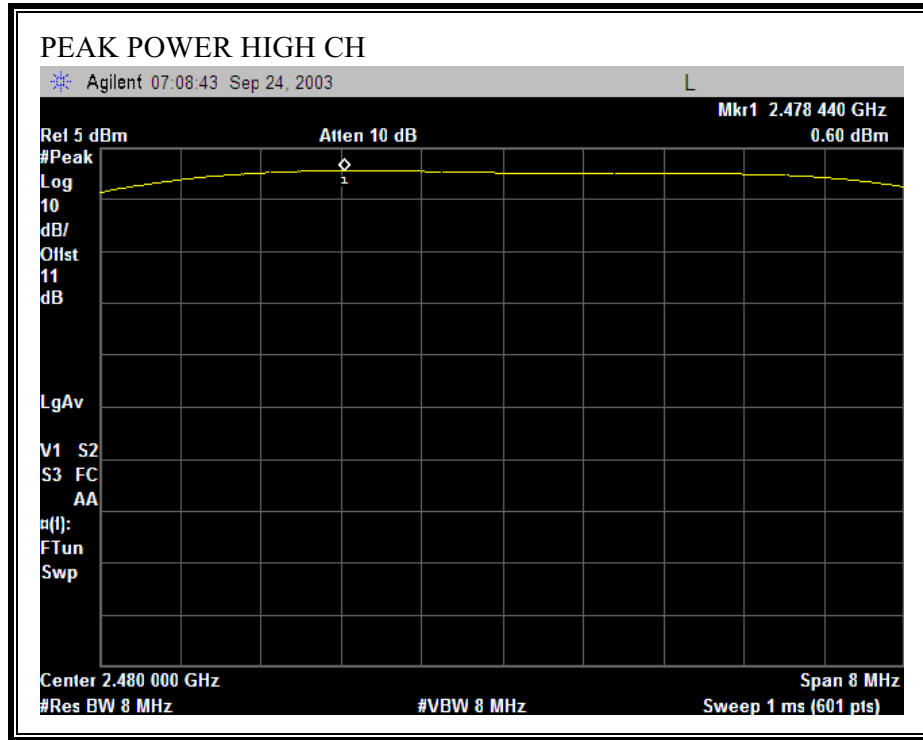
No non-compliance noted:

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:

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

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**

S = 1.0 mW / cm<sup>2</sup> 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

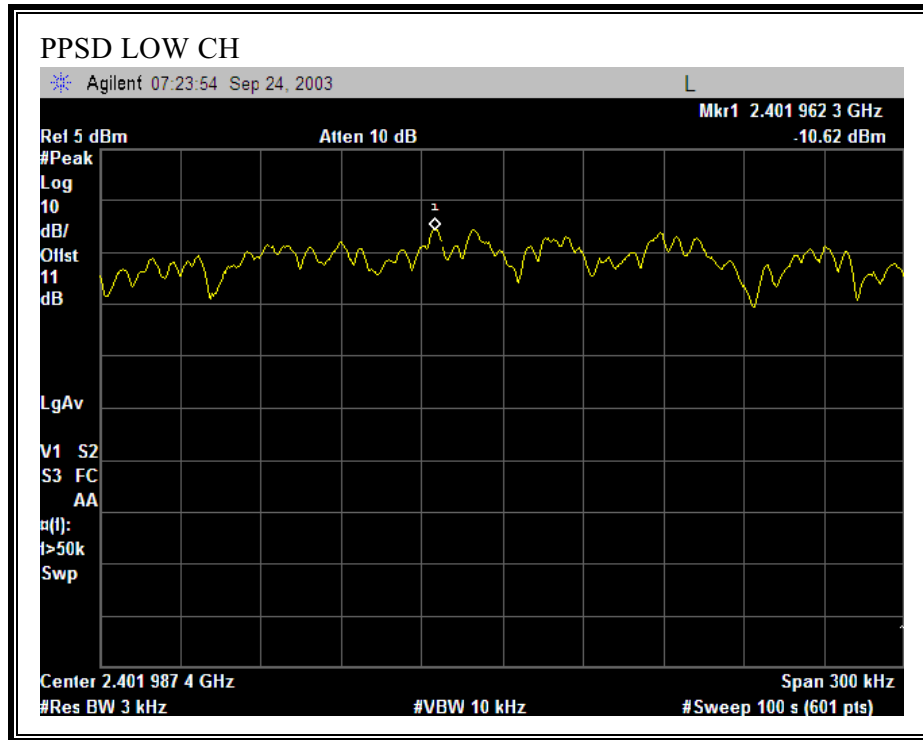
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz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

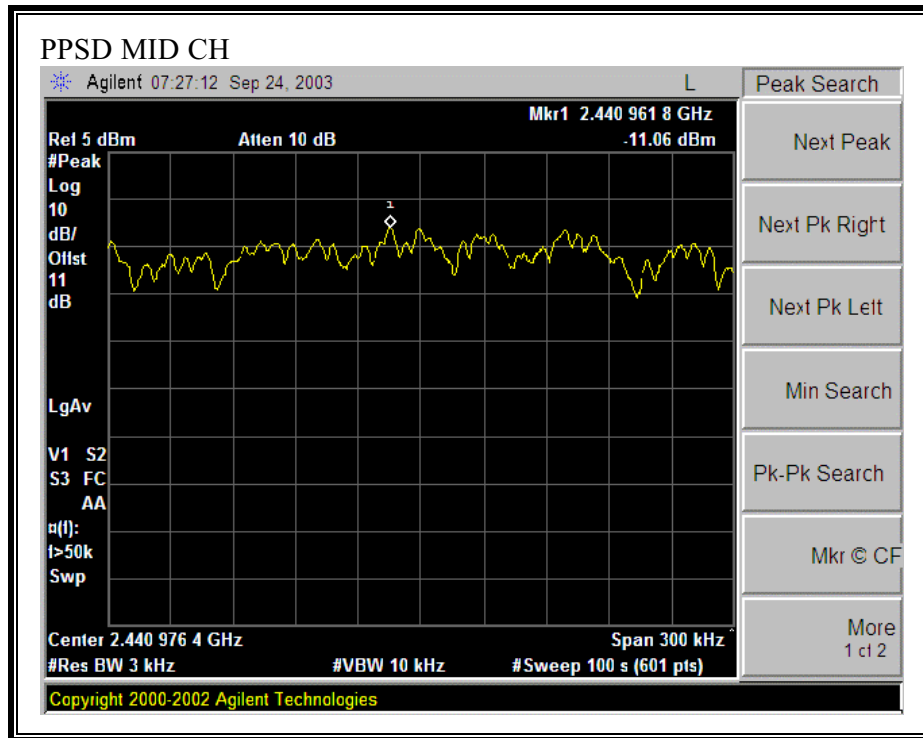
### RESULTS

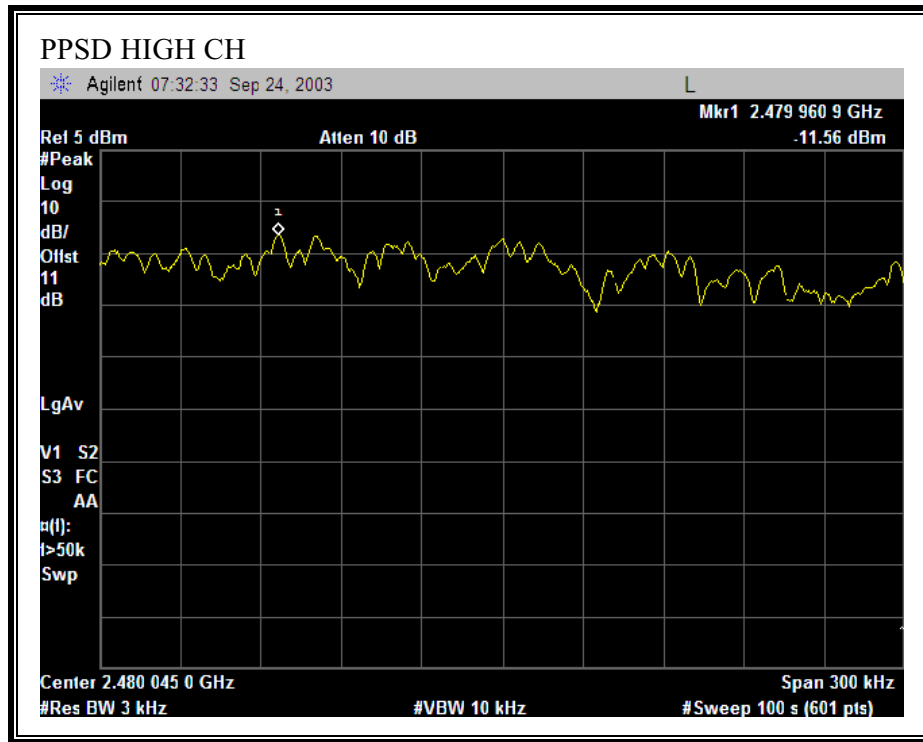
No non-compliance noted:

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

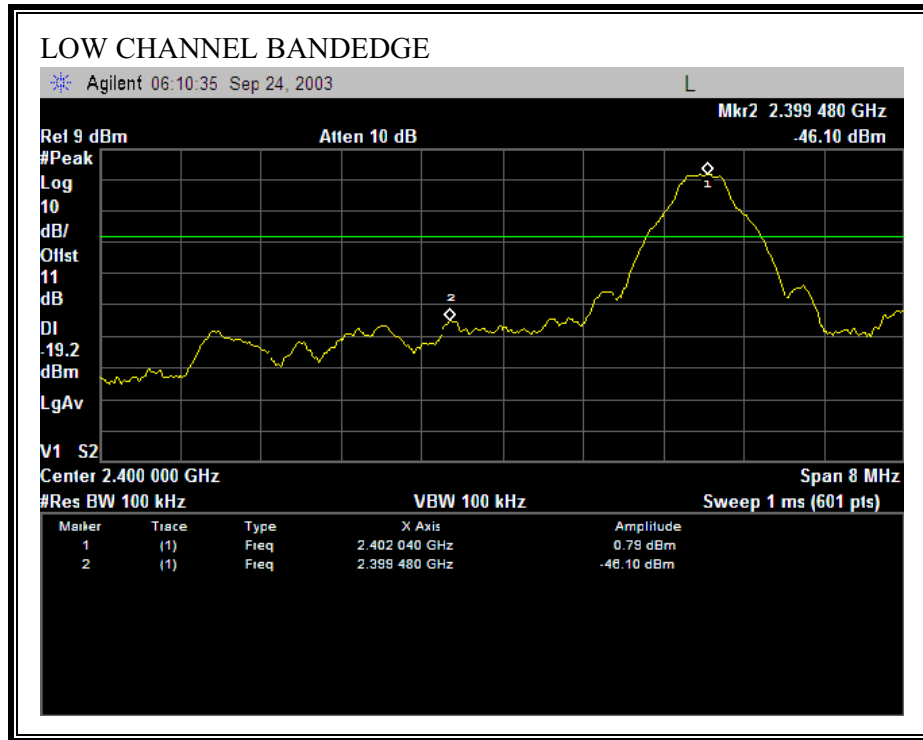
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

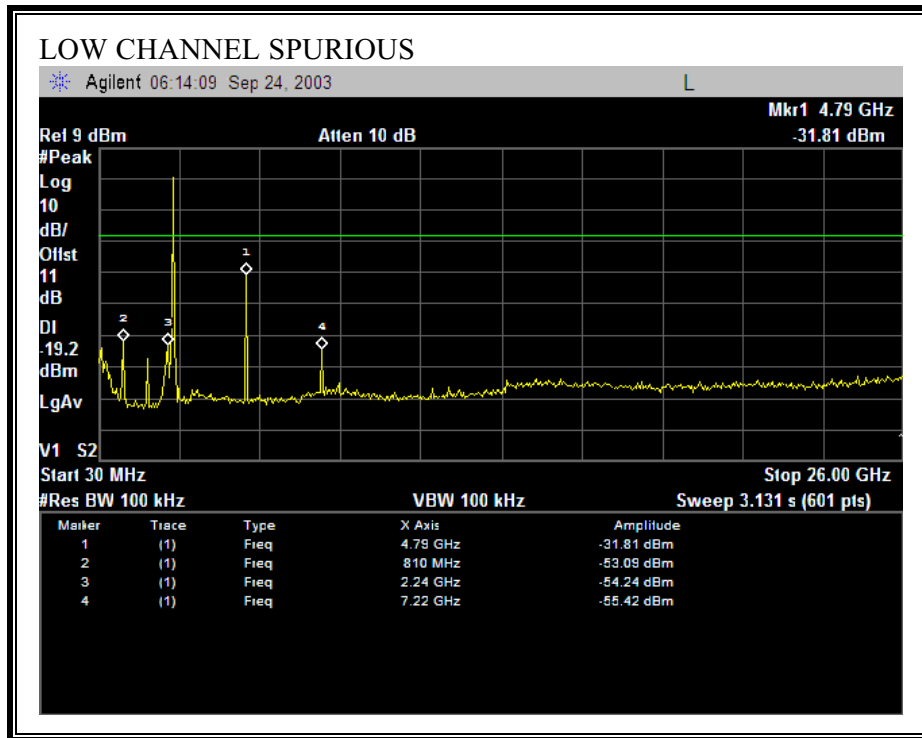
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### RESULTS

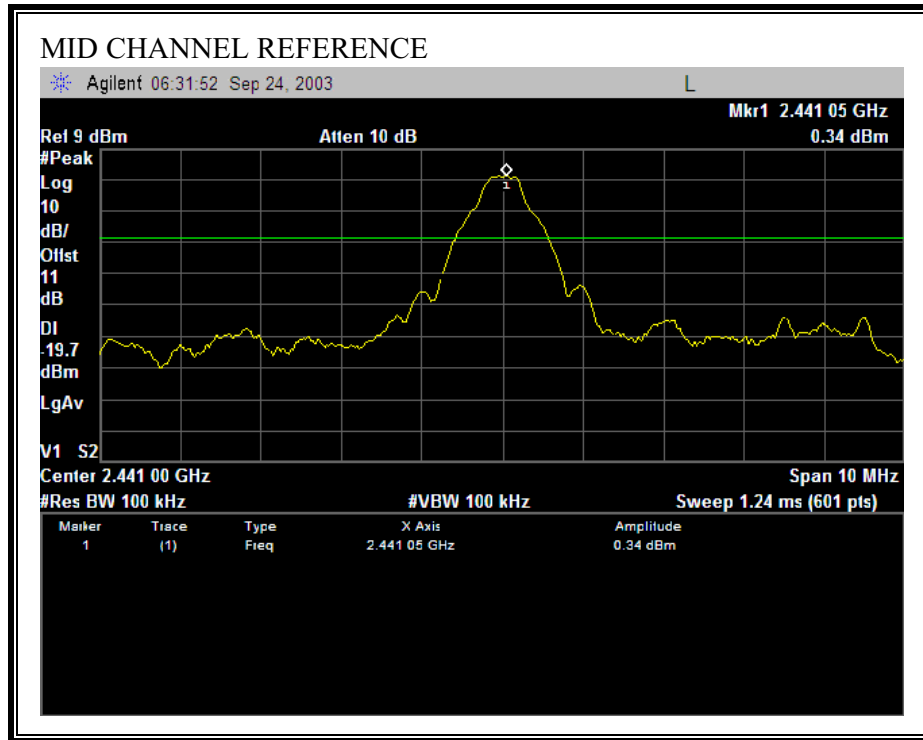
No non-compliance noted:

**SPURIOUS EMISSIONS, LOW CHANNEL**

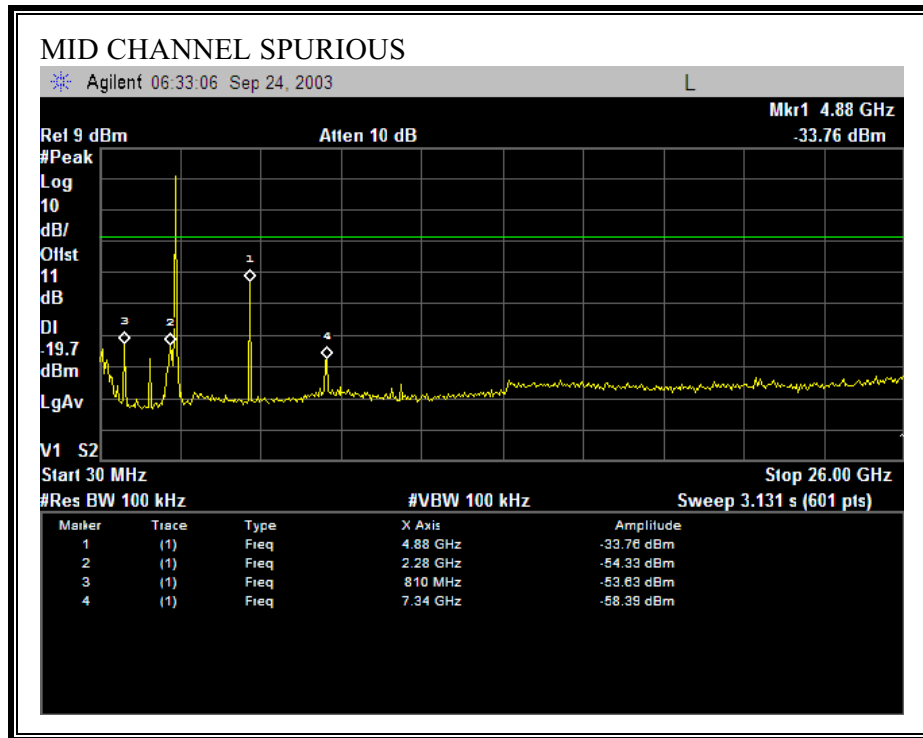




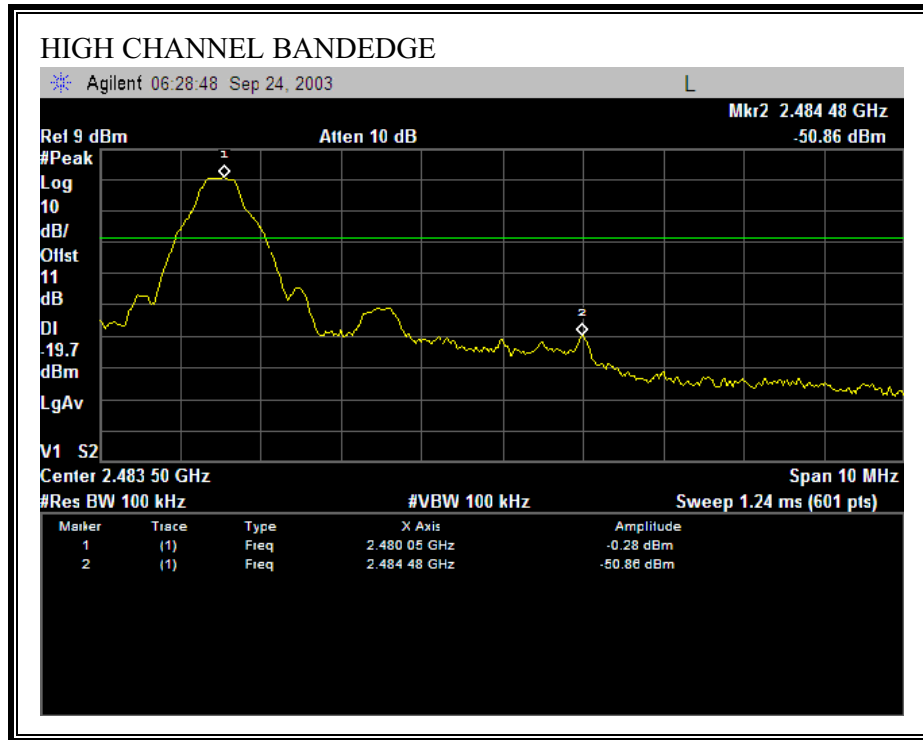
**SPURIOUS EMISSIONS, MID CHANNEL**

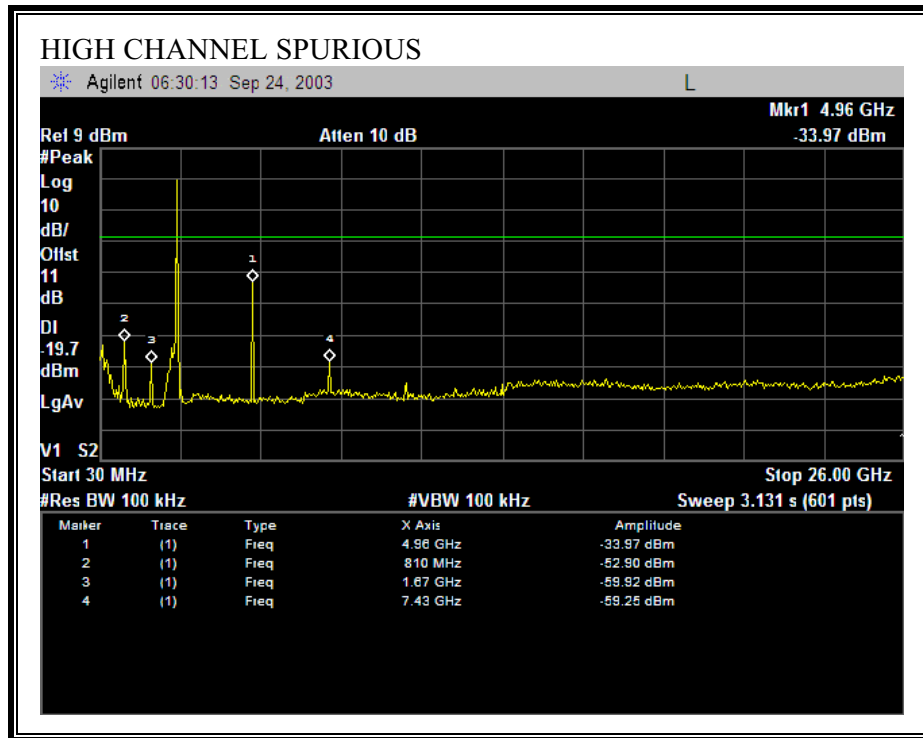




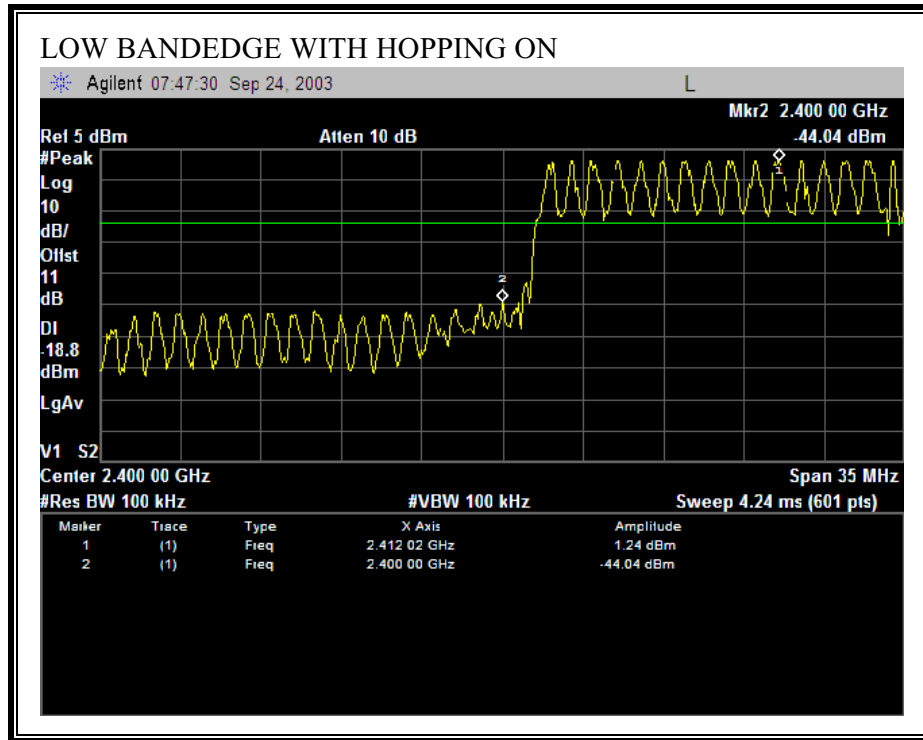


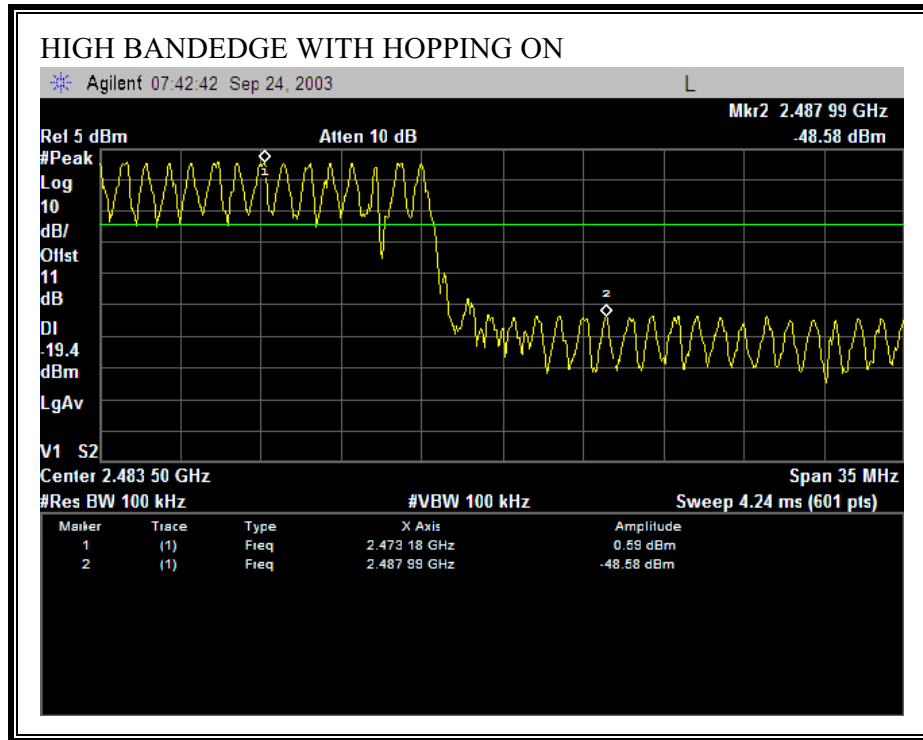
**SPURIOUS EMISSIONS, HIGH CHANNEL**





**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.

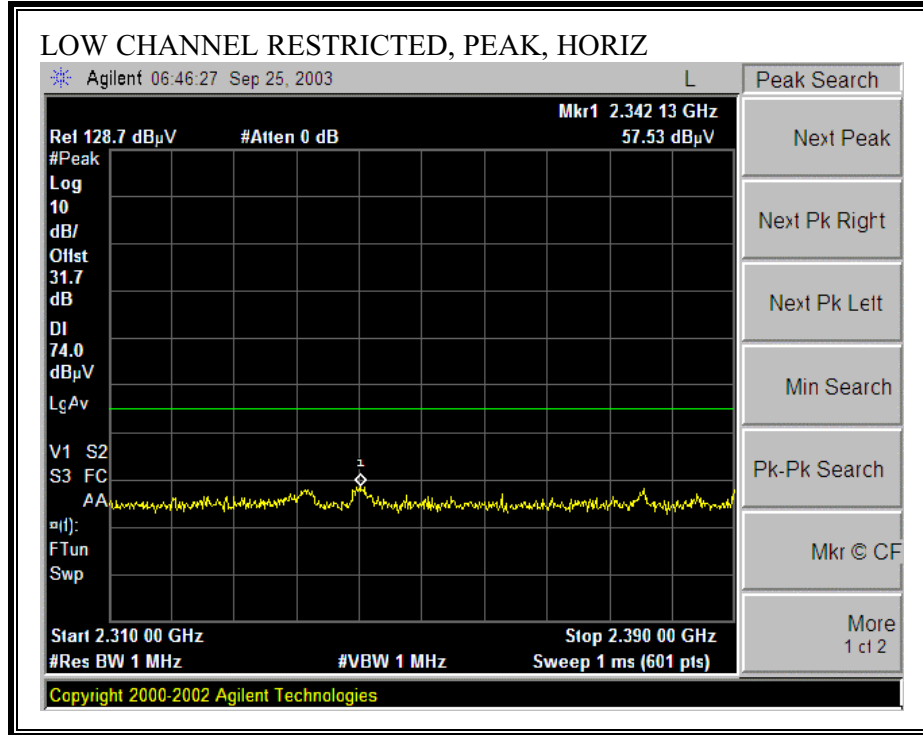
## **RESULTS**

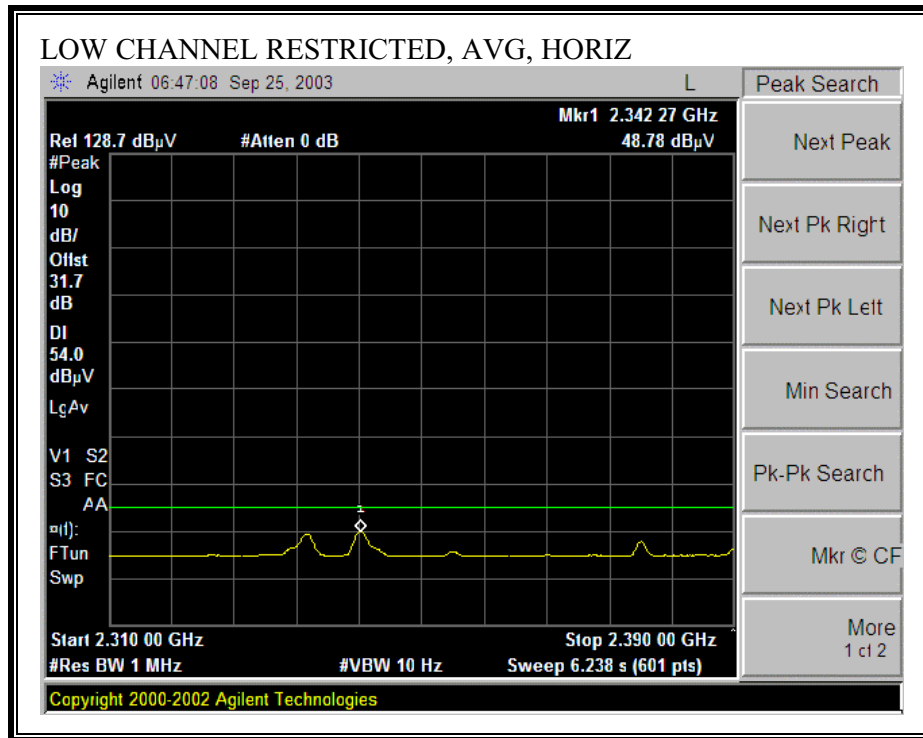
No non-compliance noted:



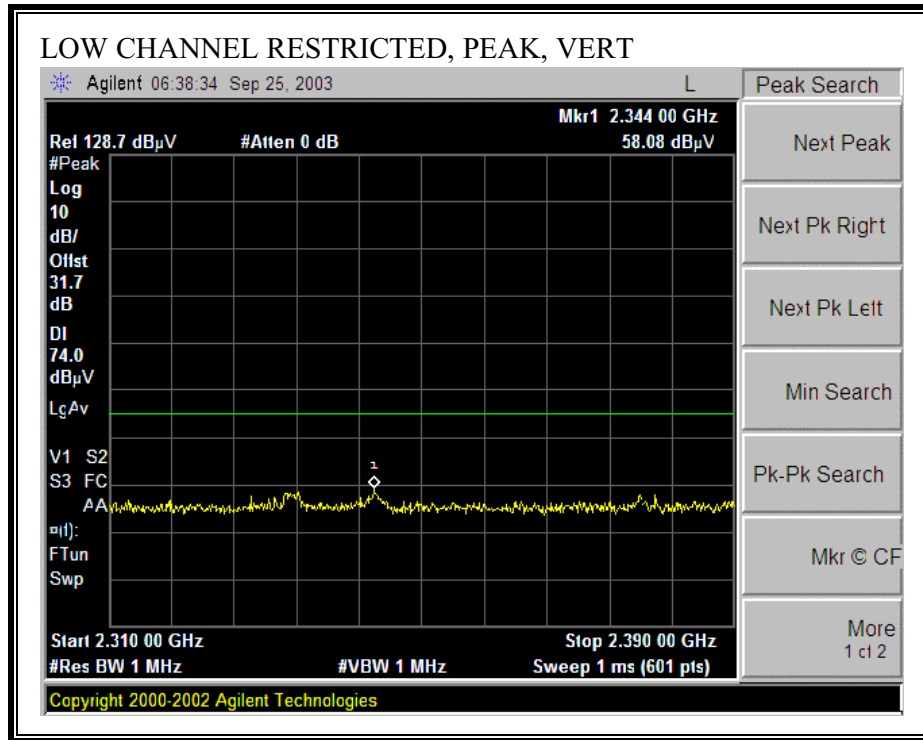
### 7.10.1. RADIATED EMISSIONS ABOVE 1 GHZ

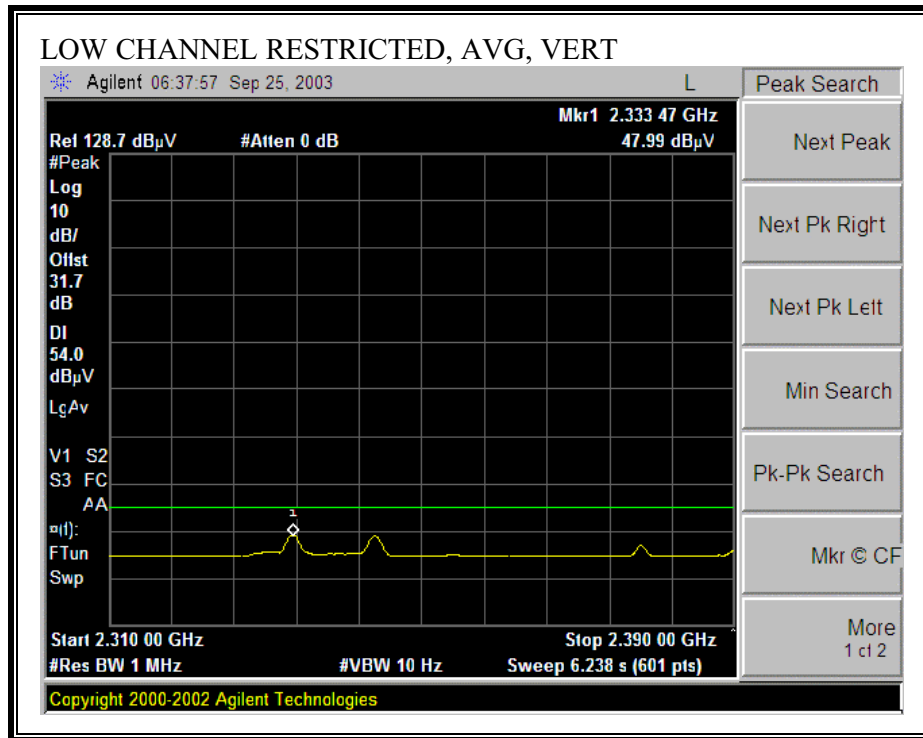
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



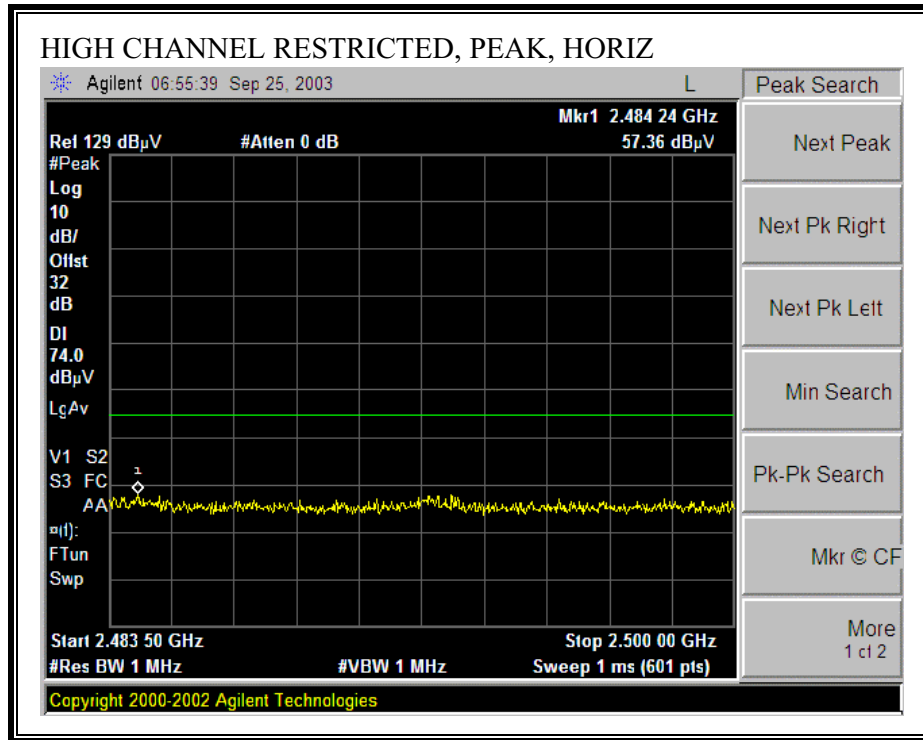


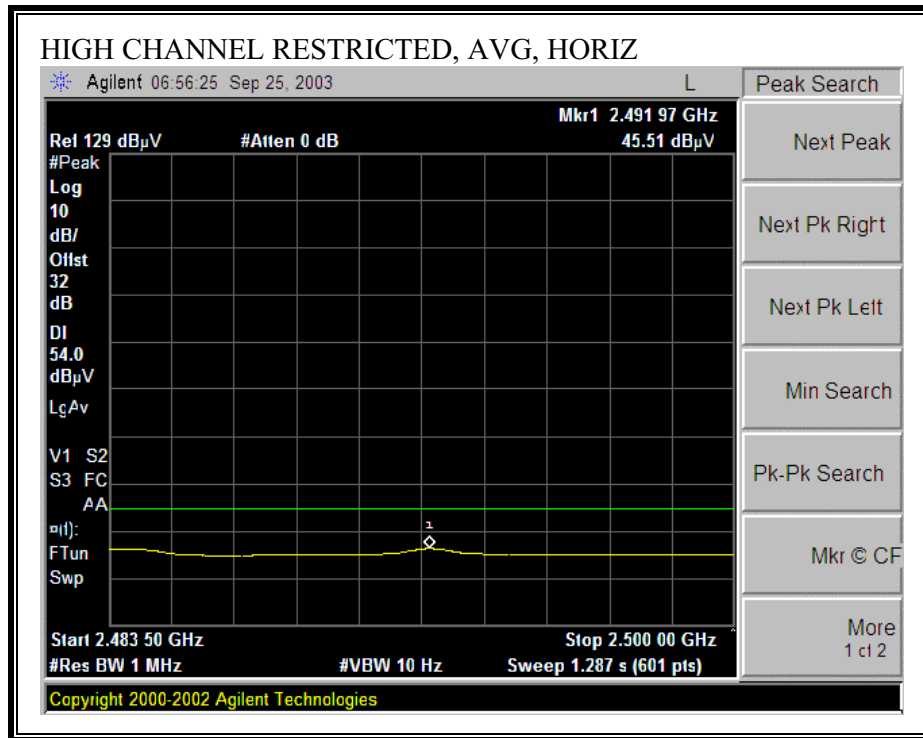
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



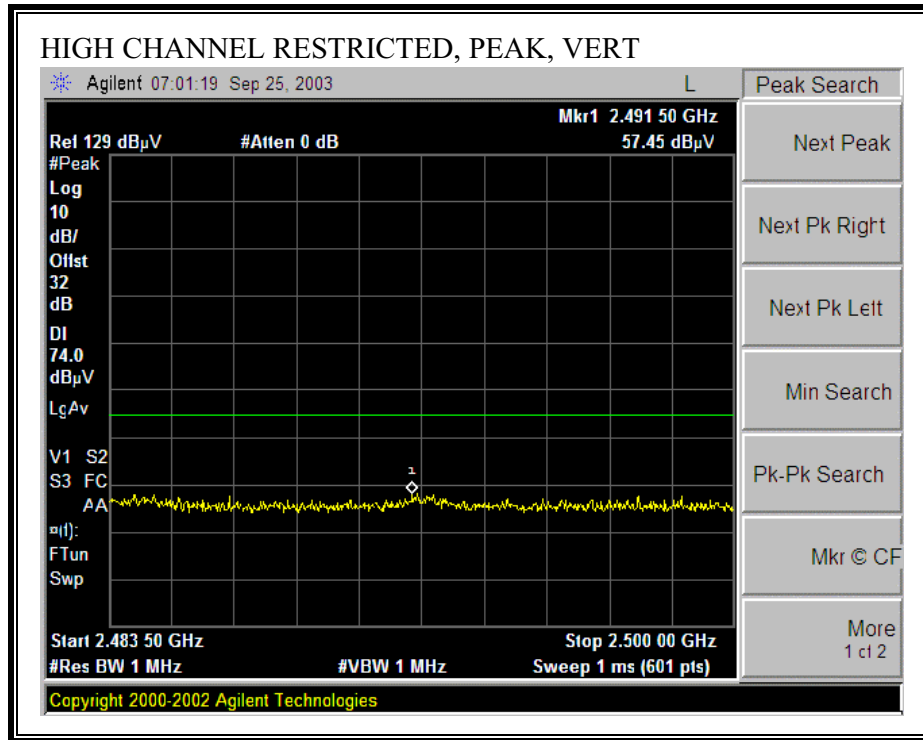


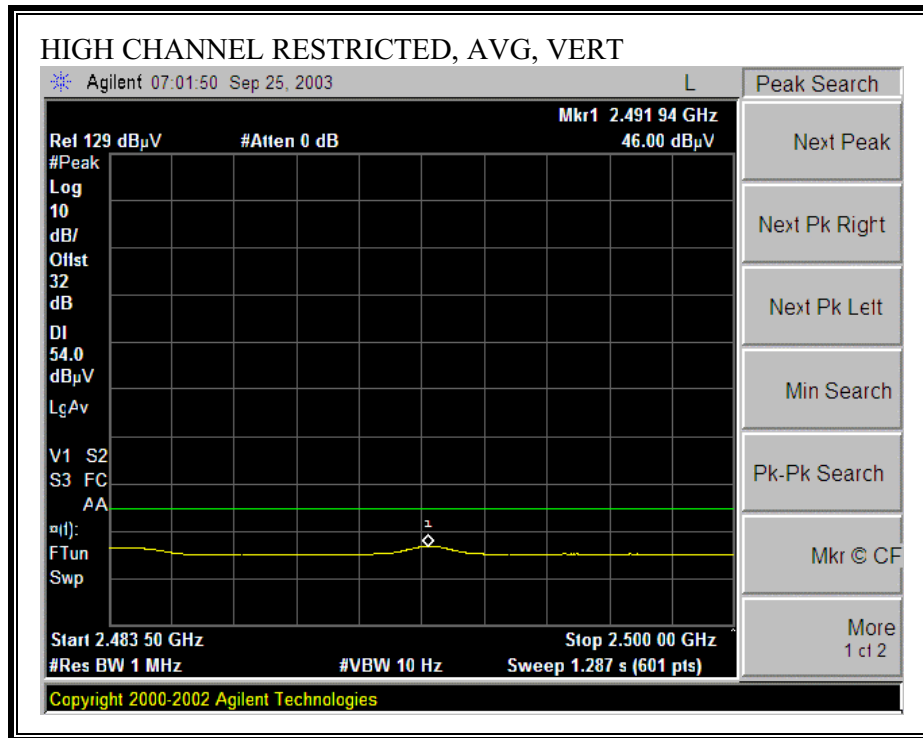
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





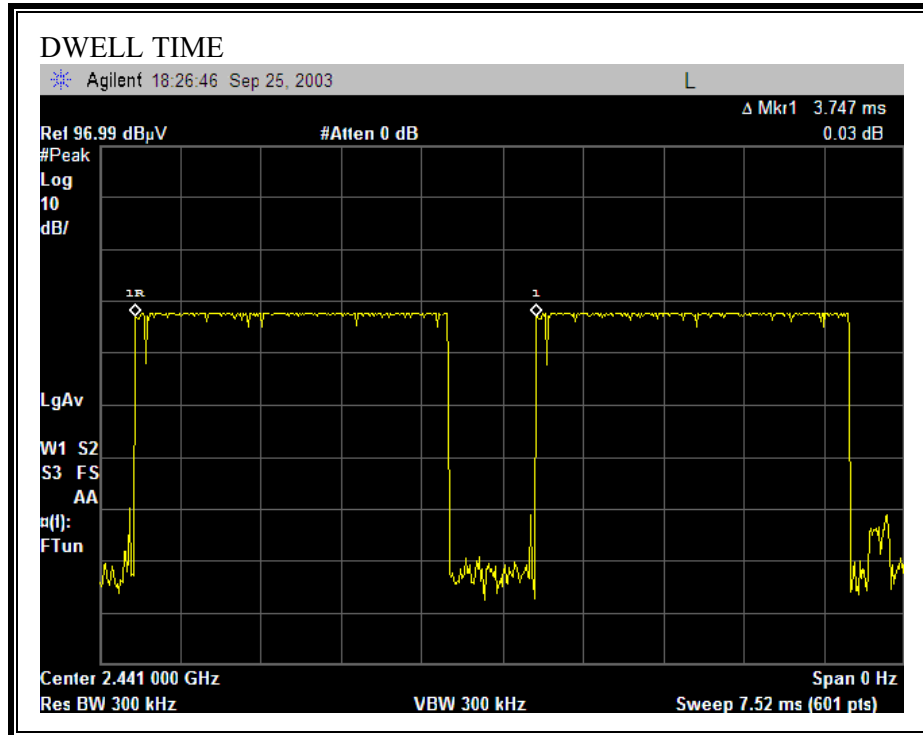
**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**







**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)**

09/24/03 High Frequency Measurement  
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: NEELESH RAJ  
 Project #: 03U2091  
 Company: BROADCOM CORP.  
 EUT Descrip.: BROADCOM USB BLUETOOTH MODULE  
 EUT M/N: BCM9102SNMD  
 Test Target: FCC  
 Mode Oper: TX

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m  
 Pre-amplifier 1-26GHz: T63 Miniq 646456  
 Spectrum Analyzer: Agilent E4446A Analyzer  
 Horn > 18GHz: [Blank]  
 Limit: FCC 15.205

RF Frequency Cables:  (2 ft)  (2 ~ 3 ft)  (4 ~ 6 ft)  (12 ft)

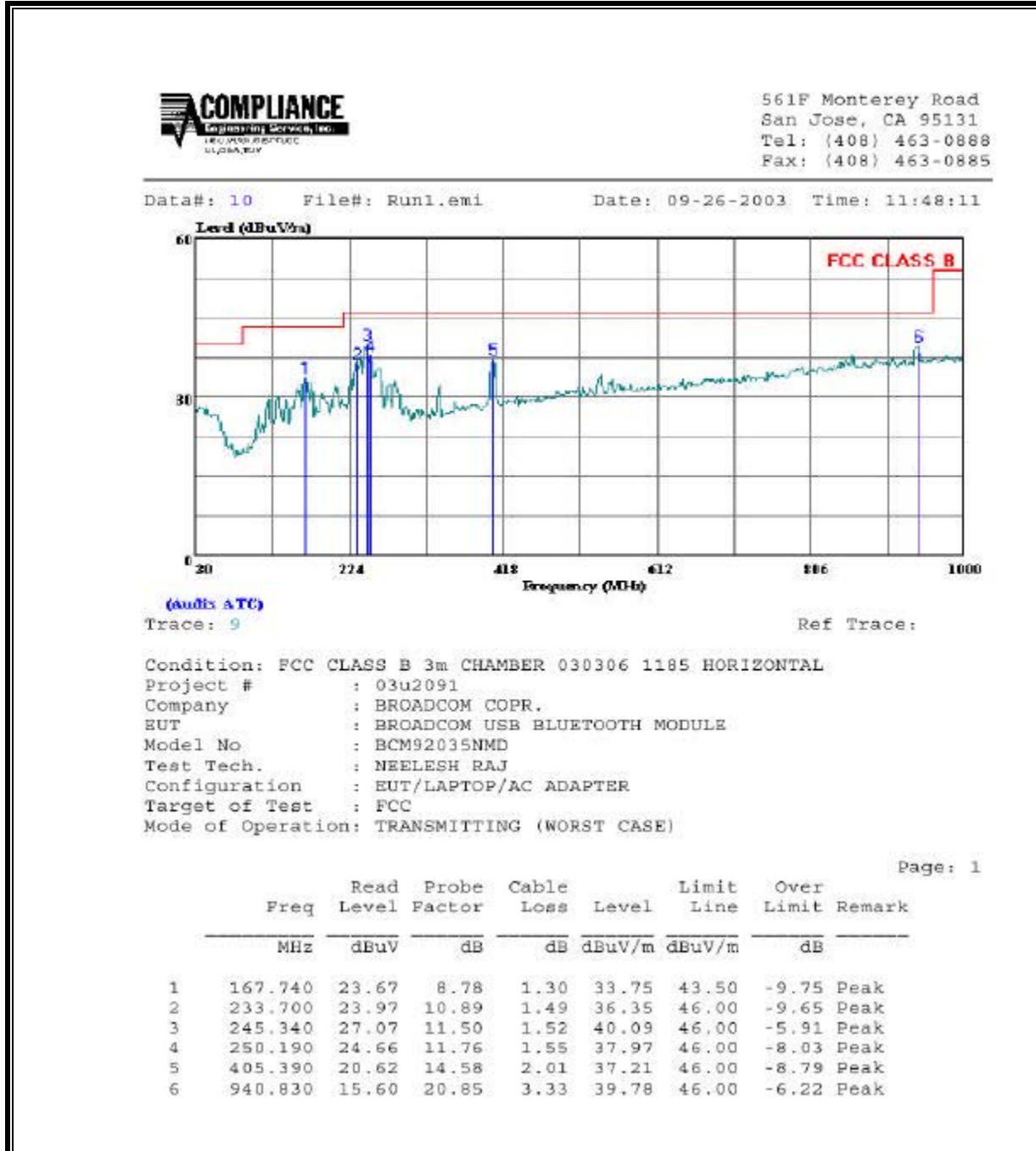
Peak Measurements: 1 MHz Resolution Bandwidth, 10MHz Video Bandwidth  
 Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

f GHz	Dist feet	Raw Pk 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 2402MHz															
4.804	9.8	60.9	56.7	33.4	2.9	-35.3	0.0	1.0	62.8	30.1	74.0	54.0	-11.2	-23.9	Y
4.804	9.8	53.3	50.2	33.4	2.9	-35.3	0.0	1.0	55.2	23.6	74.0	54.0	-18.8	-30.4	H
12.010	9.8	41.8	30.4	39.2	5.1	-34.9	0.0	1.0	52.2	12.3	74.0	54.0	-21.8	-41.7	Y
12.010	9.8	40.3	30.3	39.2	5.1	-34.9	0.0	1.0	50.7	12.2	74.0	54.0	-23.3	-41.8	H
MIDDLE CHANNEL 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	Y
4.882	9.8	48.7	42.3	33.4	3.0	-35.3	0.0	1.0	50.7	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	Y
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	30.9	39.2	5.2	-35.1	0.0	1.0	52.2	12.6	74.0	54.0	-21.8	-41.4	Y
12.205	9.8	43.3	30.2	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	Y
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	Y
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	30.8	39.2	5.2	-35.4	0.0	1.0	51.9	12.3	74.0	54.0	-22.1	-41.7	Y
12.400	9.8	41.7	30.6	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 DETECTED WITHIN THE RESTRICTED BANDS ABOVE -20dB OF THE LIMIT															
NOTE: AVERAGE FIELD STRENGTH INCLUDES DUTY CYCLE CORRECTION FACTOR OF -28.5dB															

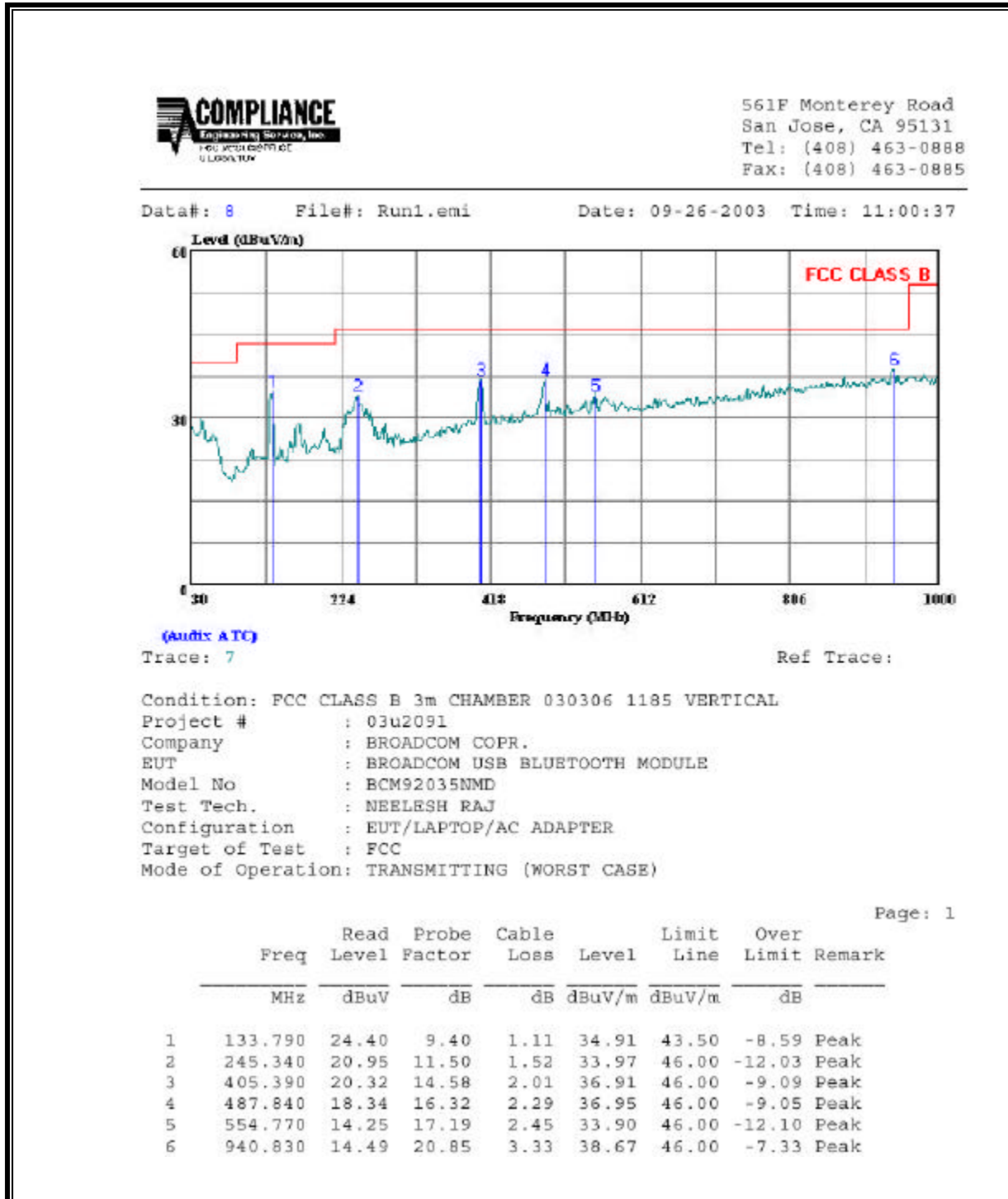
f Measurement Frequency      Amp Preamp Gain      Avg Lim Average Field Strength Limit  
 Dist Distance to Antenna      D Corr Distance Correct to 3 meters      Pk Lim Peak Field Strength Limit  
 Read Analyzer Reading      Avg Average Field Strength @ 3 m      Avg Mar Margin vs. Average Limit  
 AF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

**7.10.2. 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)**



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



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

(Audit ATC)

Trace: 7

Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 VERTICAL  
 Project # : 03u2091  
 Company : BROADCOM COPR.  
 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

	Read Freq	Probe Level	Probe Factor	Cable Loss	Level	Limit	Over	Remark
	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

### 7.11.1. CO-LOCATED RADIATED EMISSIONS WITH *BCM94036MP*SG

#### 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.

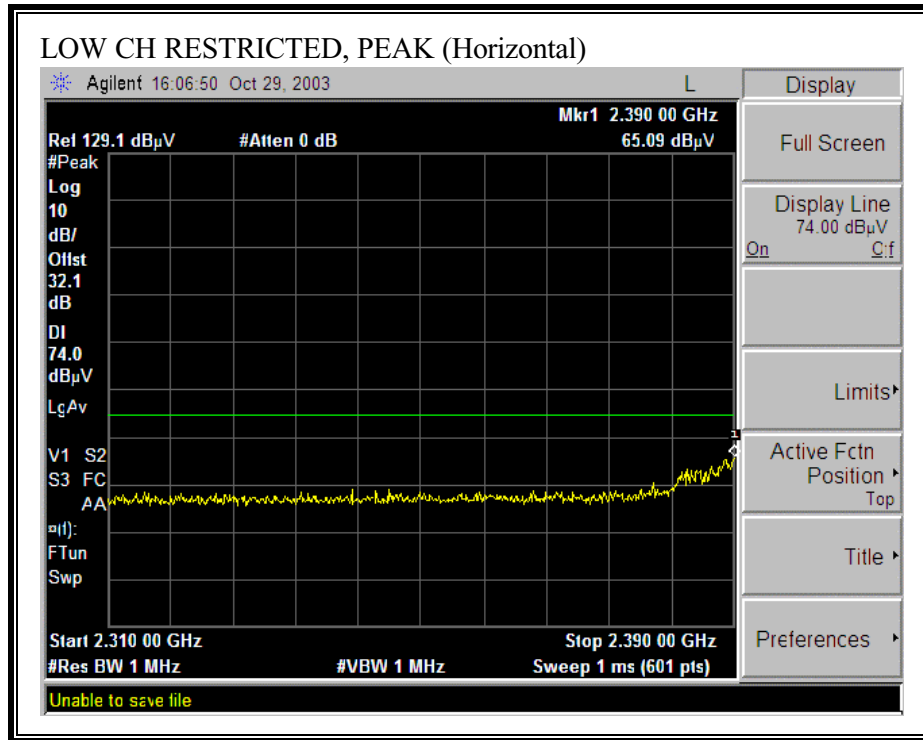
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

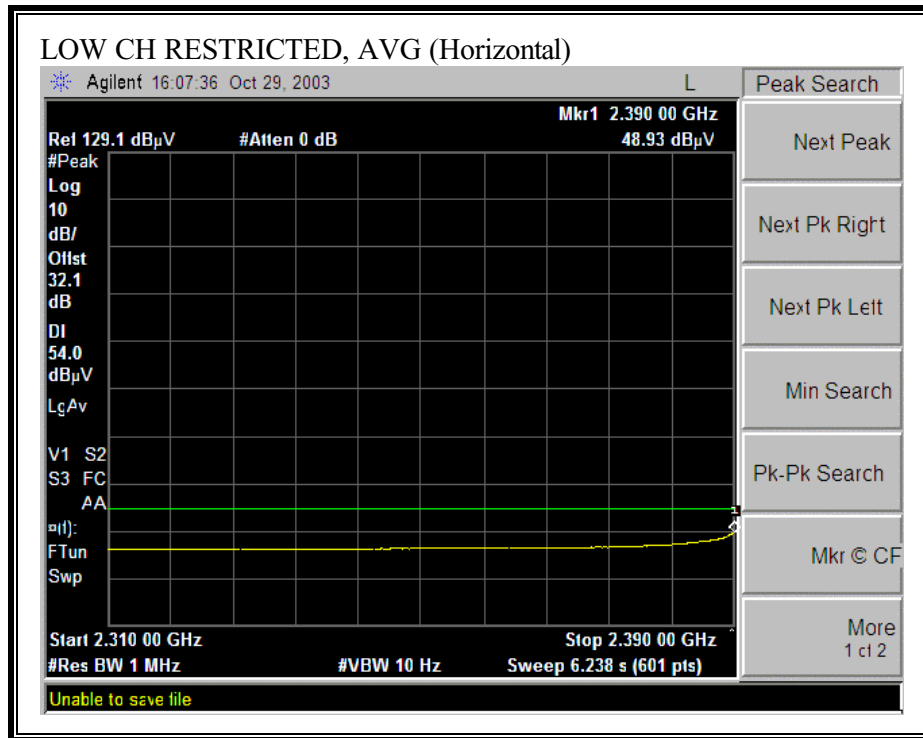
#### RESULTS

No non-compliance noted:

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

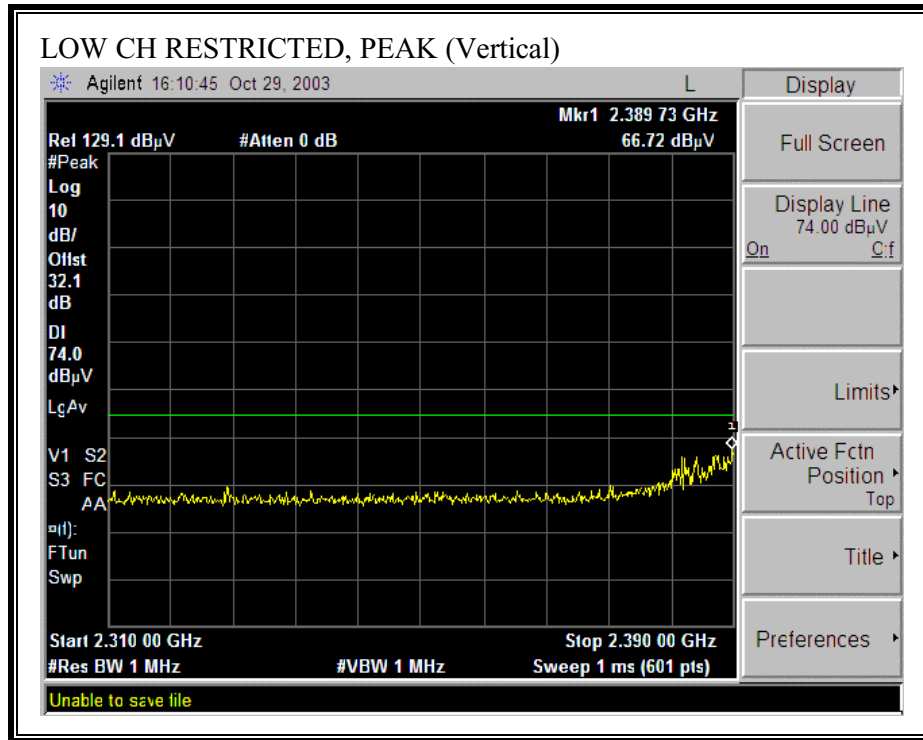
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



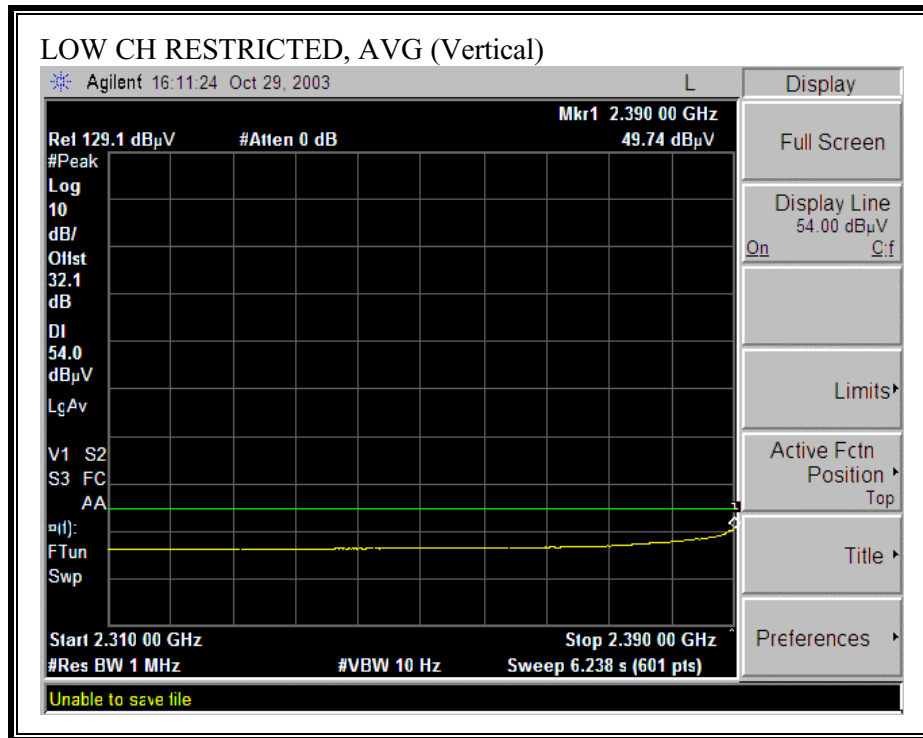




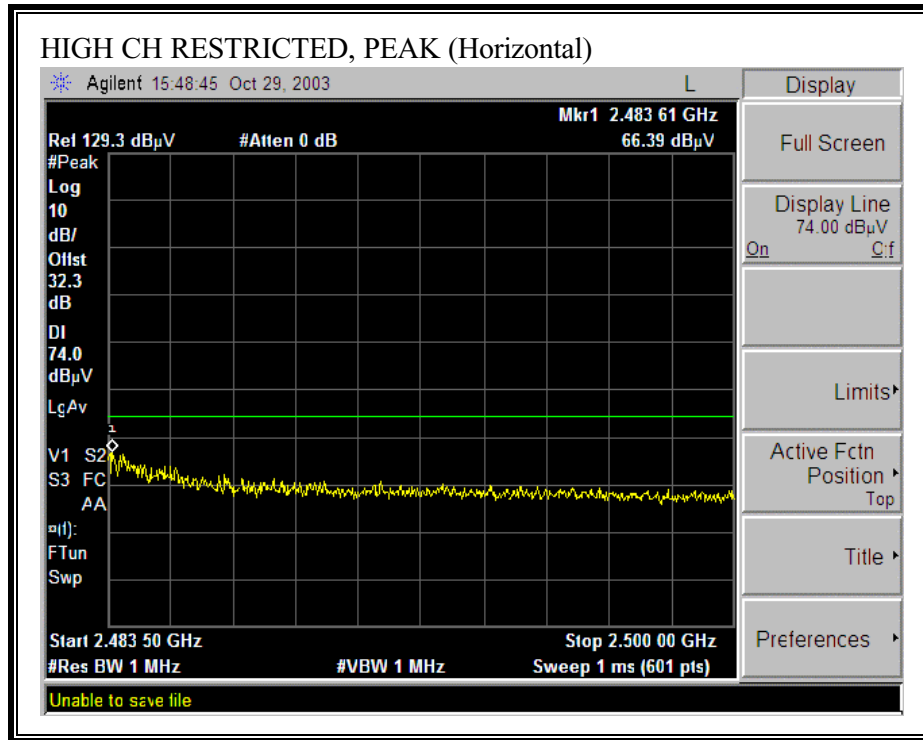
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

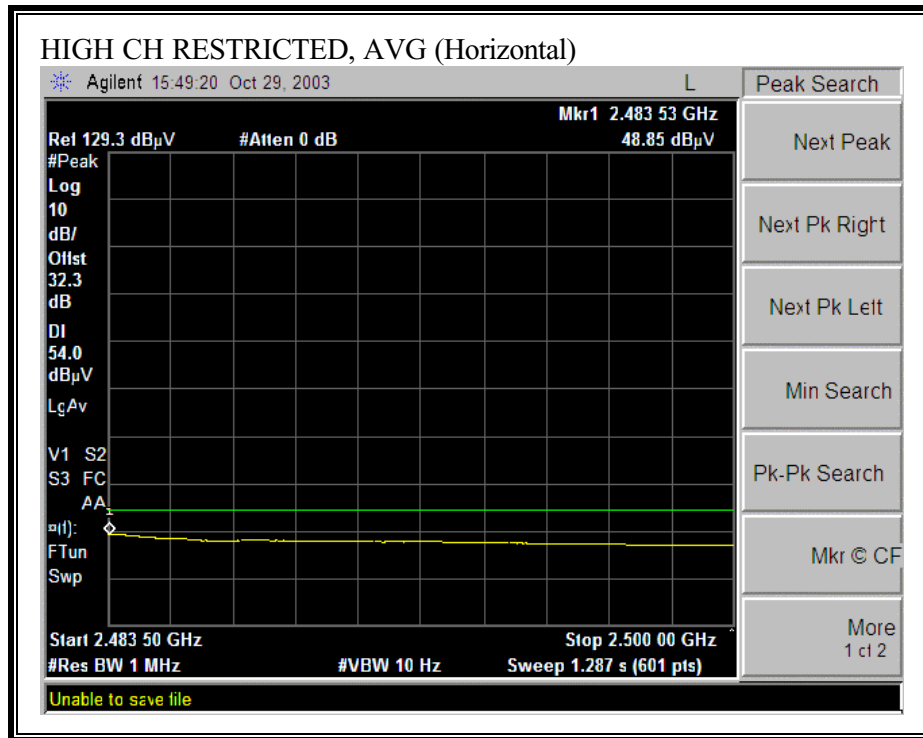




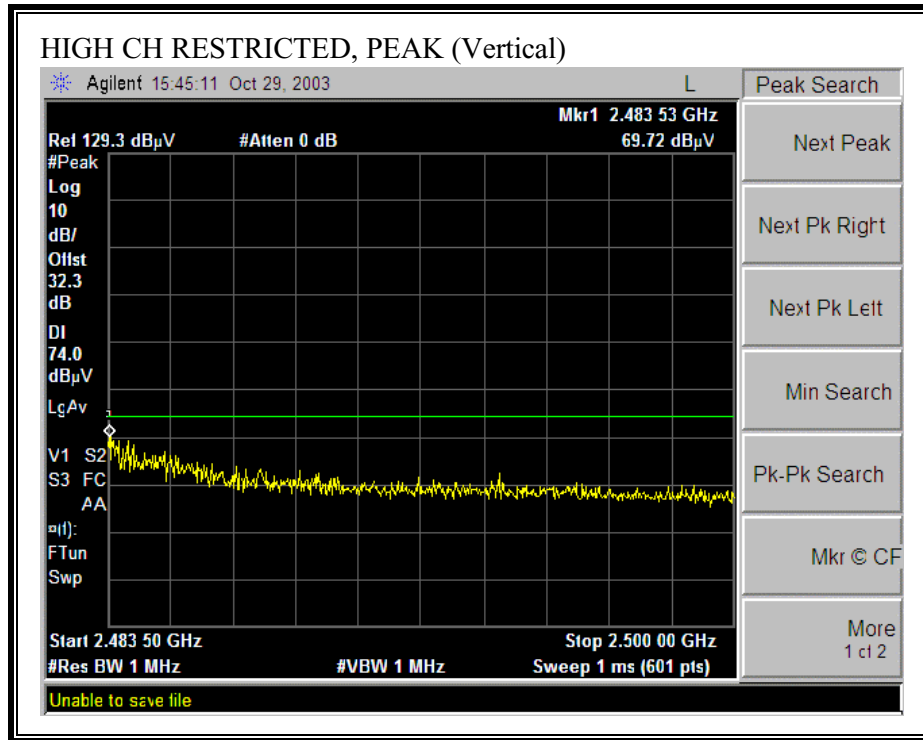


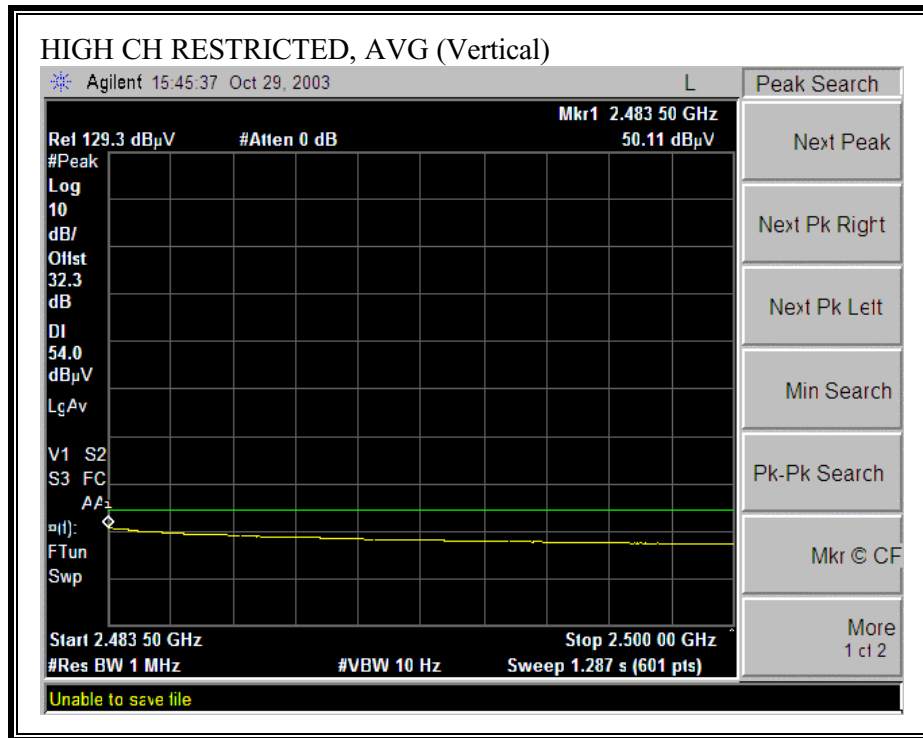
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





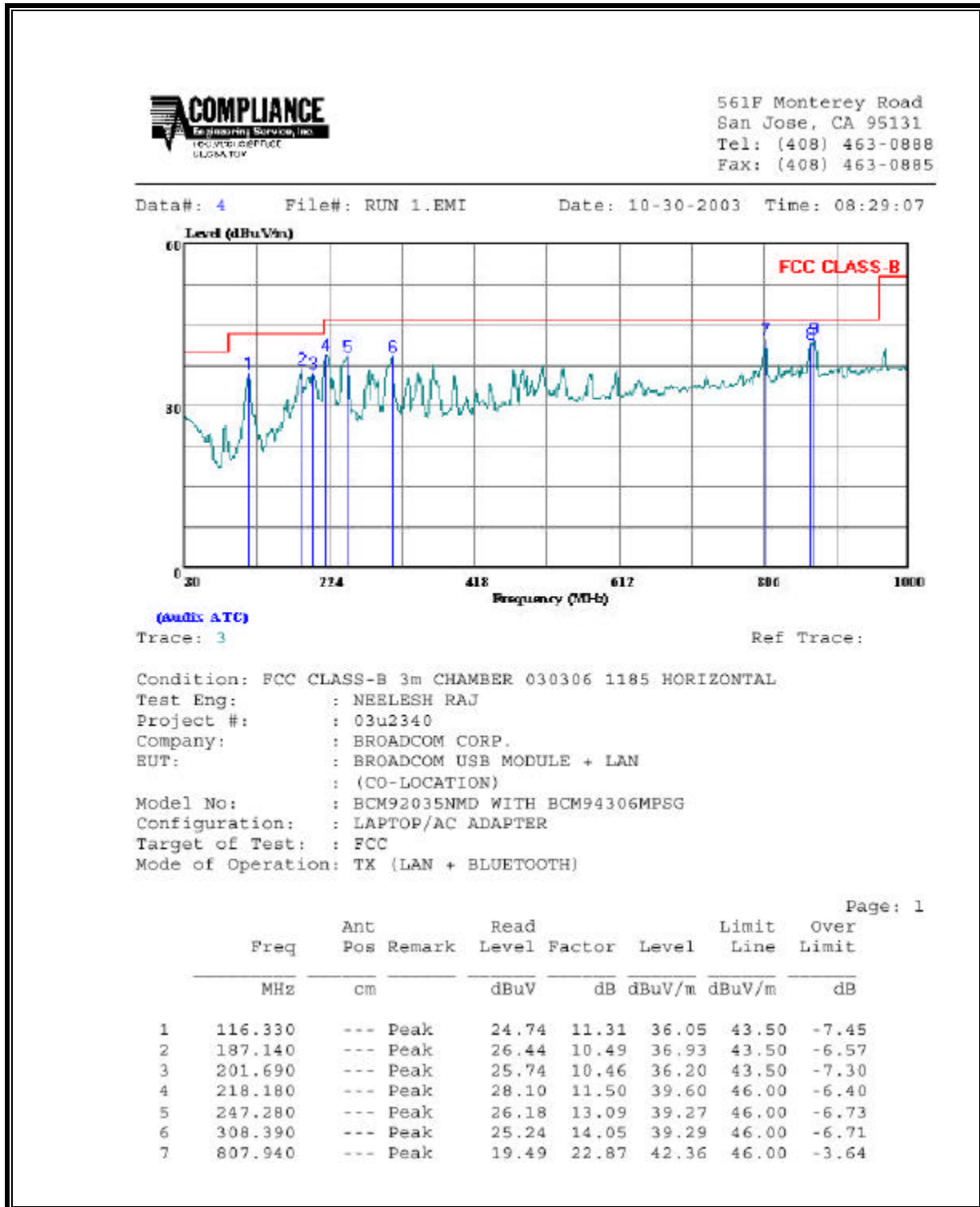
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**







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

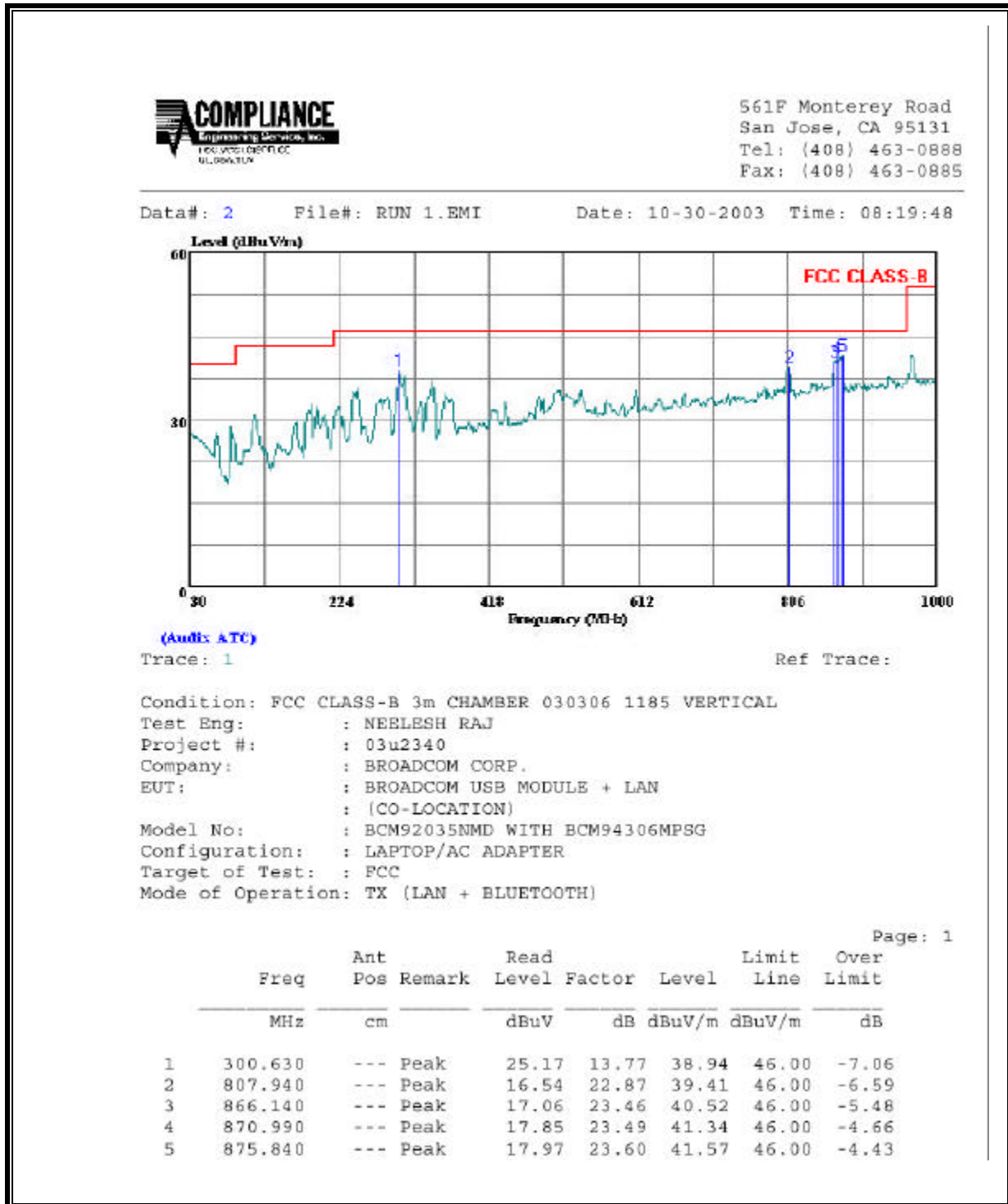


Data#: 4      File#: RUN 1.EMI      Date: 10-30-2003      Time: 08:29:07  
Page: 2

	Freq	Ant Pos	Remark	Read Level	Factor	Level	Limit Line	Over Limit
	MHz	cm		dBuV	dB	dBuV/m	dBuV/m	dB
8	868.080	---	Peak	18.20	23.46	41.66	46.00	-4.34
9	872.930	---	Peak	19.17	23.53	42.70	46.00	-3.30



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



Data#: 2 File#: RUN 1.EMI Date: 10-30-2003 Time: 08:19:48



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

(Auxiliary ATC)  
 Trace: 1

Ref Trace:

Condition: FCC CLASS-B 3m CHAMBER 030306 1185 VERTICAL  
 Test Eng: : NERLESH RAJ  
 Project #: : 03u2340  
 Company: : BROADCOM CORP.  
 EUT: : BROADCOM USB MODULE + LAN  
 : (CO-LOCATION)  
 Model No: : BCM92035NMD WITH BCM94306MPSG  
 Configuration: : LAPTOP/AC ADAPTER  
 Target of Test: : FCC  
 Mode of Operation: TX (LAN + BLUETOOTH)

Page: 1

Freq	Ant	Read	Limit	Over
MHz	Pos	Level	Line	Limit
MHz	cm	dBuV	dBuV/m	dB
300.630	---	25.17	46.00	-7.06
807.940	---	16.54	46.00	-6.59
866.140	---	17.06	46.00	-5.48
870.990	---	17.85	46.00	-4.66
875.840	---	17.97	46.00	-4.43

## 7.11.2. CO-LOCATED RADIATED EMISSIONS WITH *BCM94036MP*

### 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.

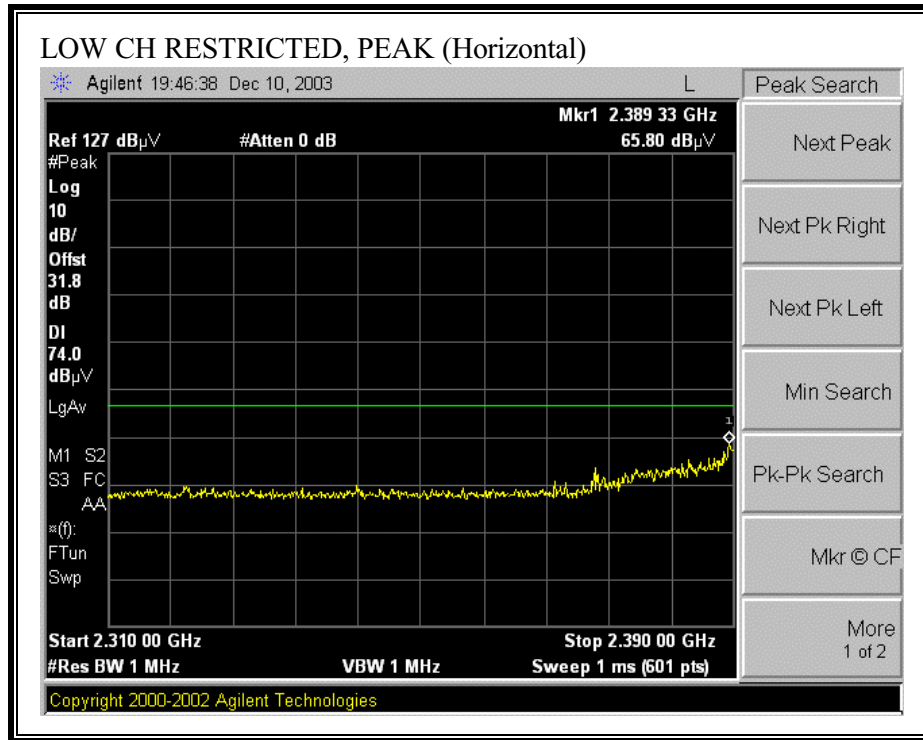
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

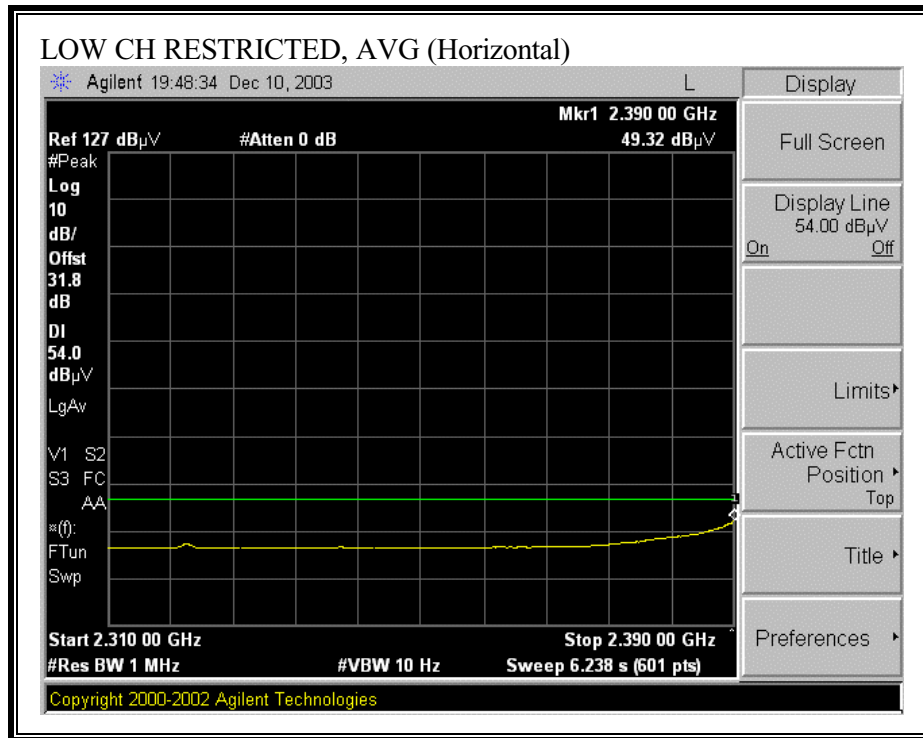
### RESULTS

No non-compliance noted:

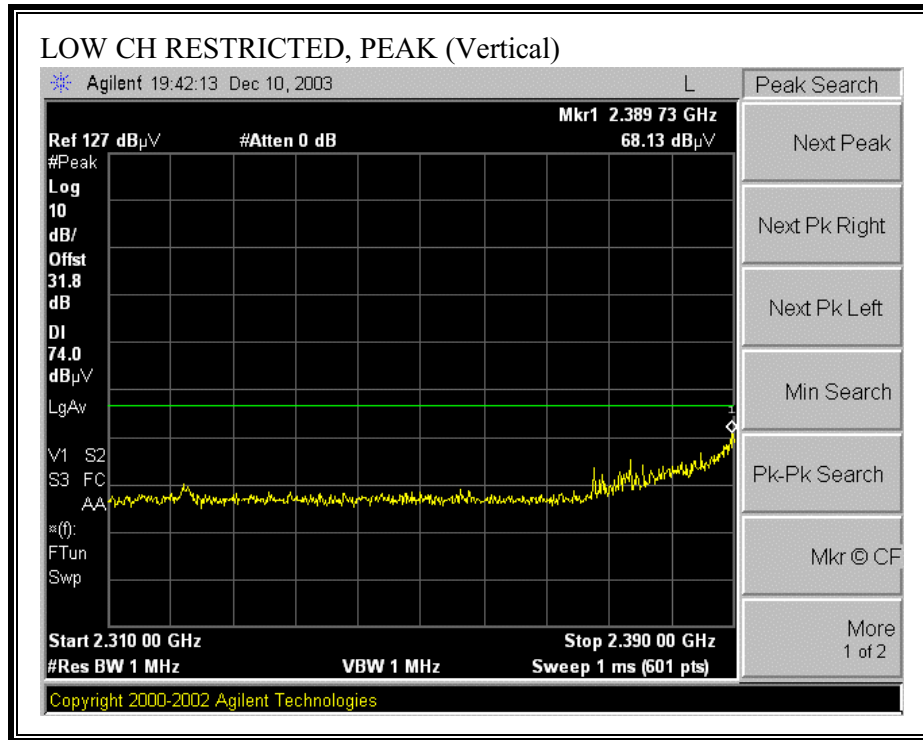
Dominant LAN is transmitted at high channel with non-dominant Bluetooth at high channel is investigated.

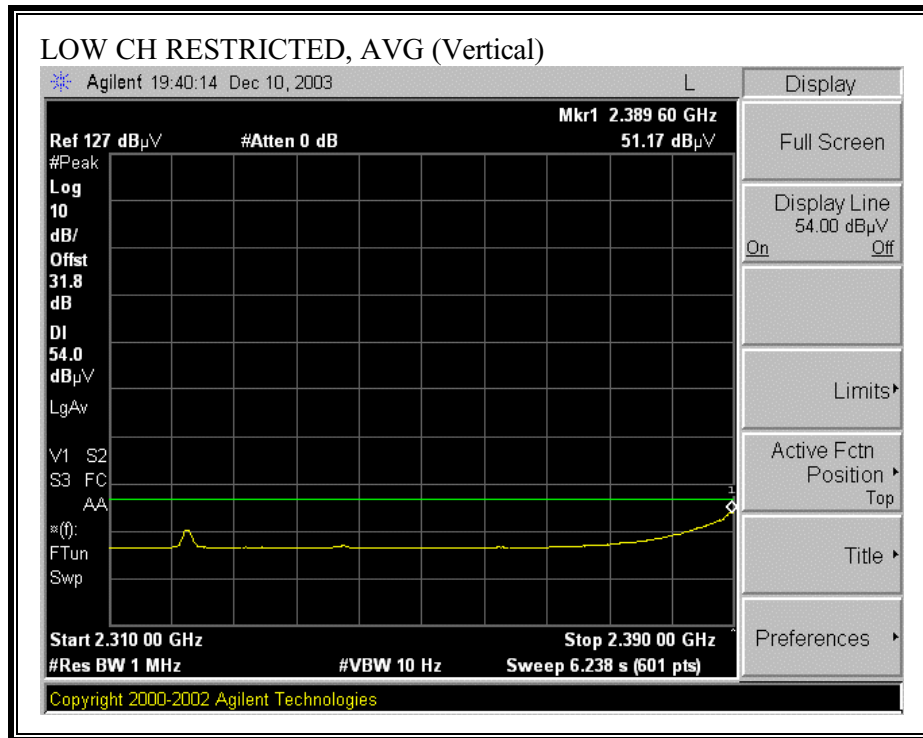
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



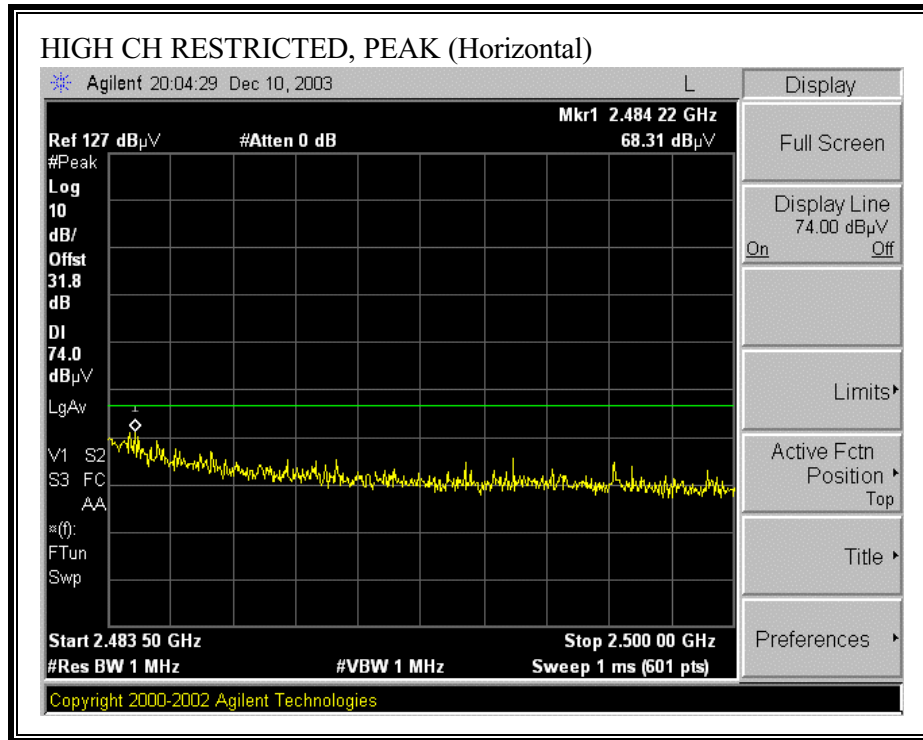


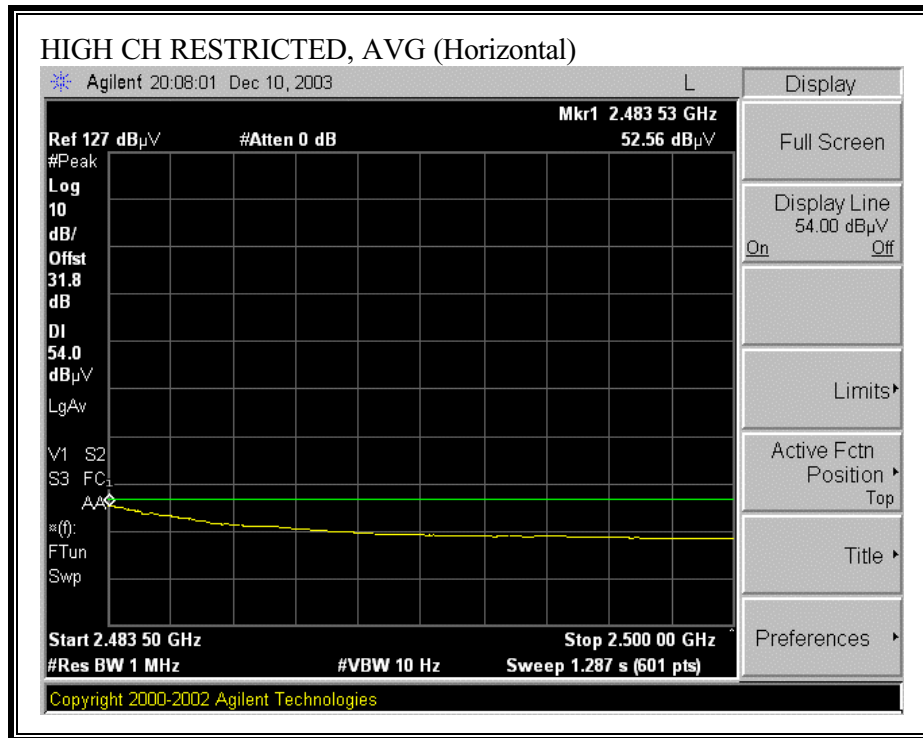
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





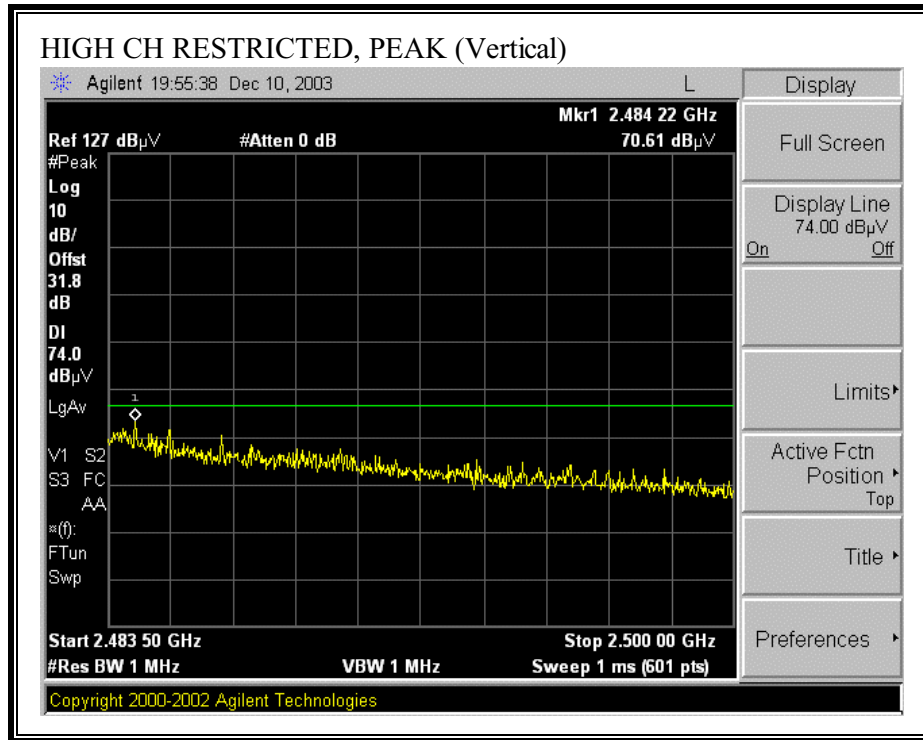
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

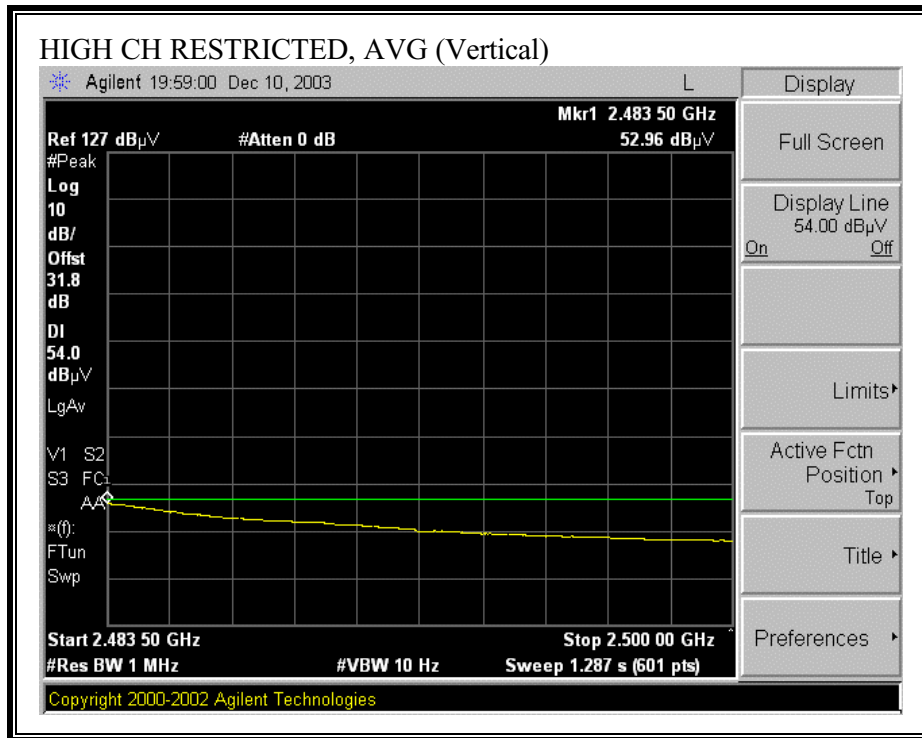






**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





**WORST-CASE HARMONICS AND SPURIOUS EMISSIONS (ABOVE 1 GHz)**

12/10/03 High Frequency Measurement  
 Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen  
 Project #:  
 Company: BROADCOM  
 EUT Descrip.: Broadcomp USB Bluetooth Module.  
 EUT M/N: BCM92035  
 Test Target: FCC  
 Mode Oper: Transmitting LAN+Bluetooth.

Test Equipment:

EMCO Horn 1-18GHz T73; S/N: 6717 @3m	Pre-amplifier 1-26GHz T63 Miteq 646456	Spectrum Analyzer Agilent E4440A Analyzer	Horn > 18GHz T87; ARA 18-26GHz; S/N:1049	Limit FCC 15.205
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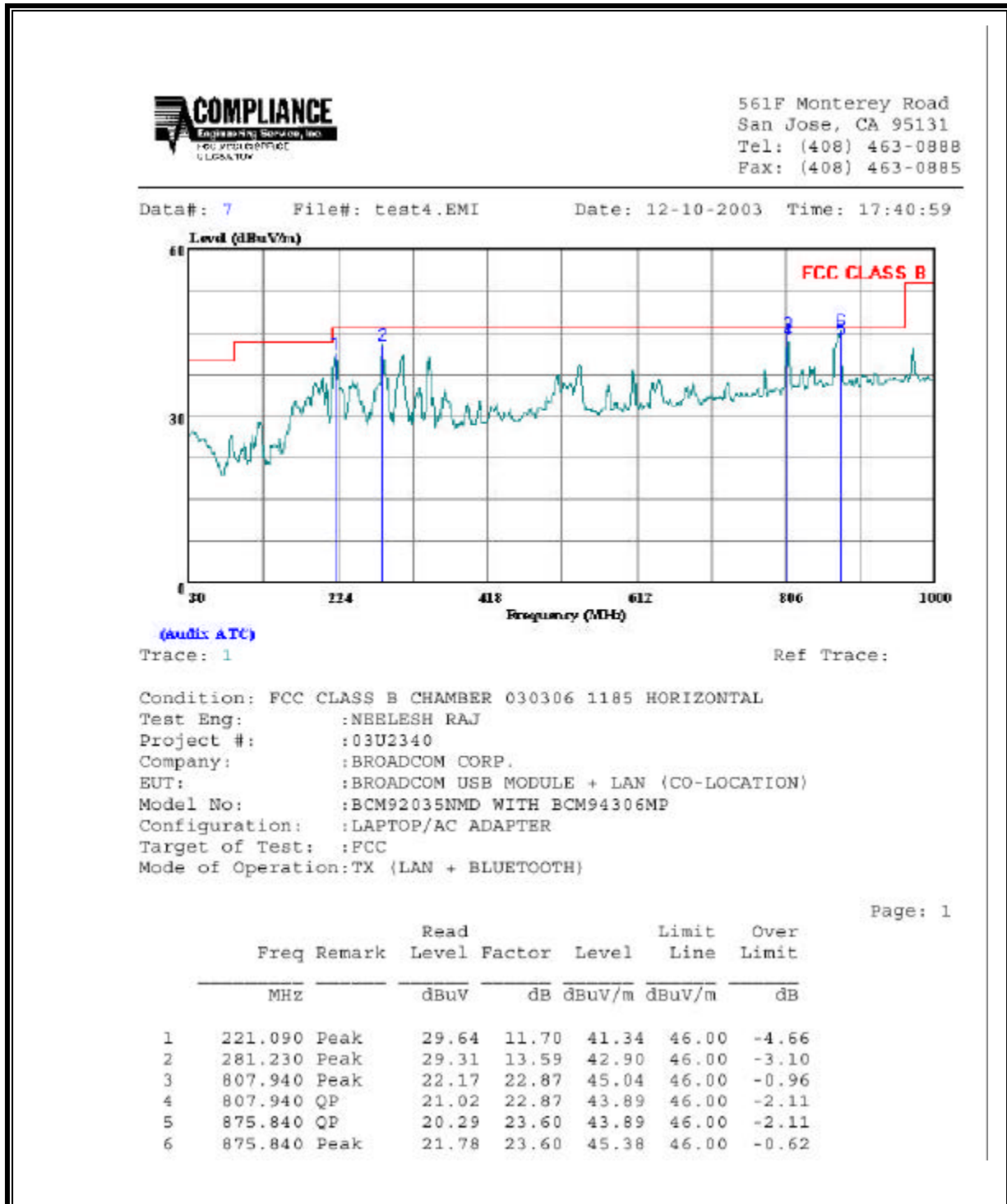
Hi Frequency Cables  
 (2 ft)  (2 ~ 3 ft)  (4 ~ 6 ft)  (12 ft)

Peak Measurements: 1 MHz Resolution Bandwidth  
 1MHz Video Bandwidth

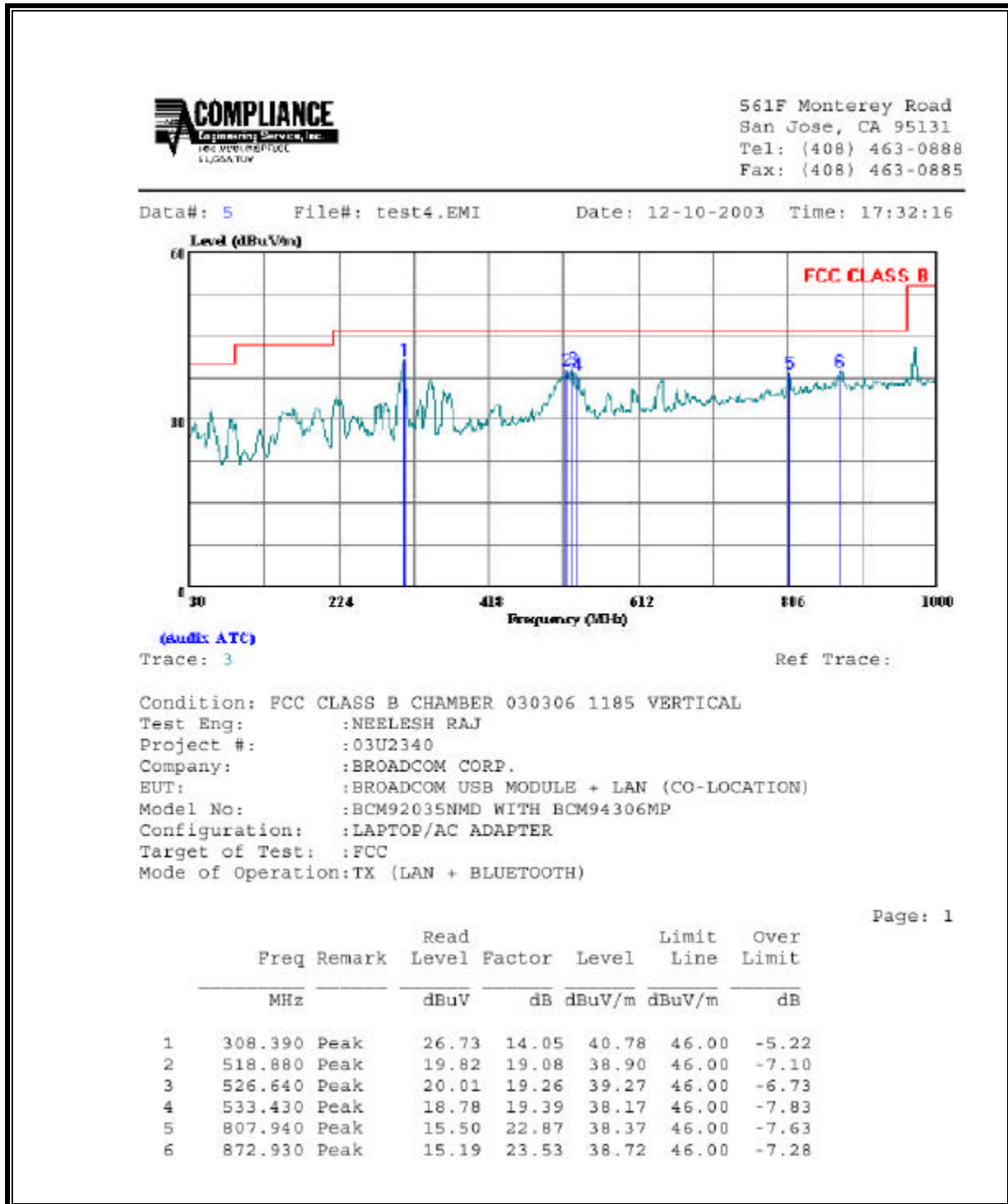
Average Measurements: 1 MHz Resolution Bandwidth  
 10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read 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
BLUETOOTH-HIGH CHANNEL AND LAN-HIGH CHANNEL															
4924	9.8	49.4	38.9	33.5	3.3	-35.3	0.0	0.0	50.8	40.4	74.0	54.0	-23.2	-13.6	V (Noise floor)
4924	9.8	48.6	39.2	33.5	3.3	-35.3	0.0	0.0	50.0	40.6	74.0	54.0	-24.0	-13.4	H (Noise floor)
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								

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



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



## 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*	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

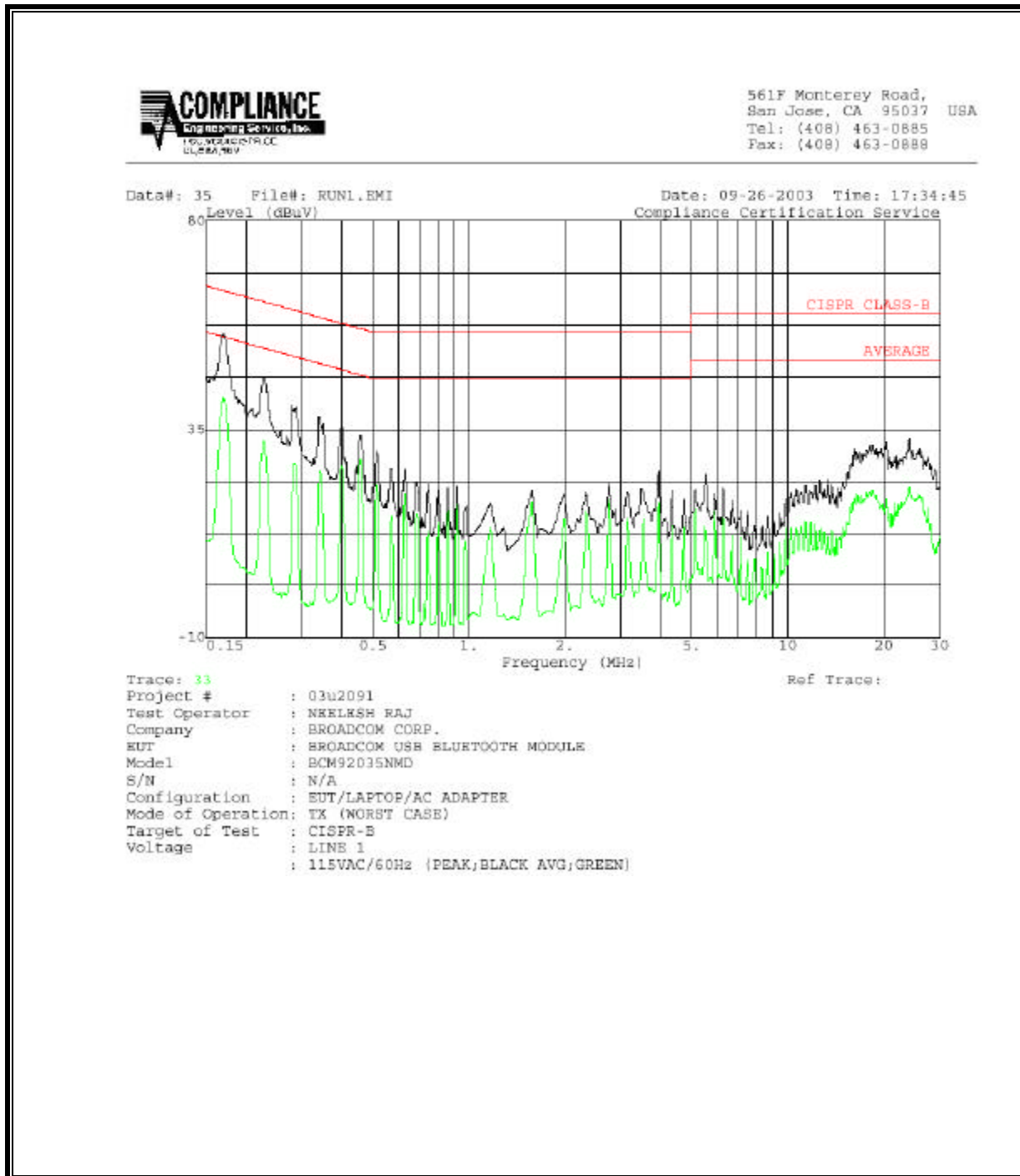
No non-compliance noted:

**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	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										

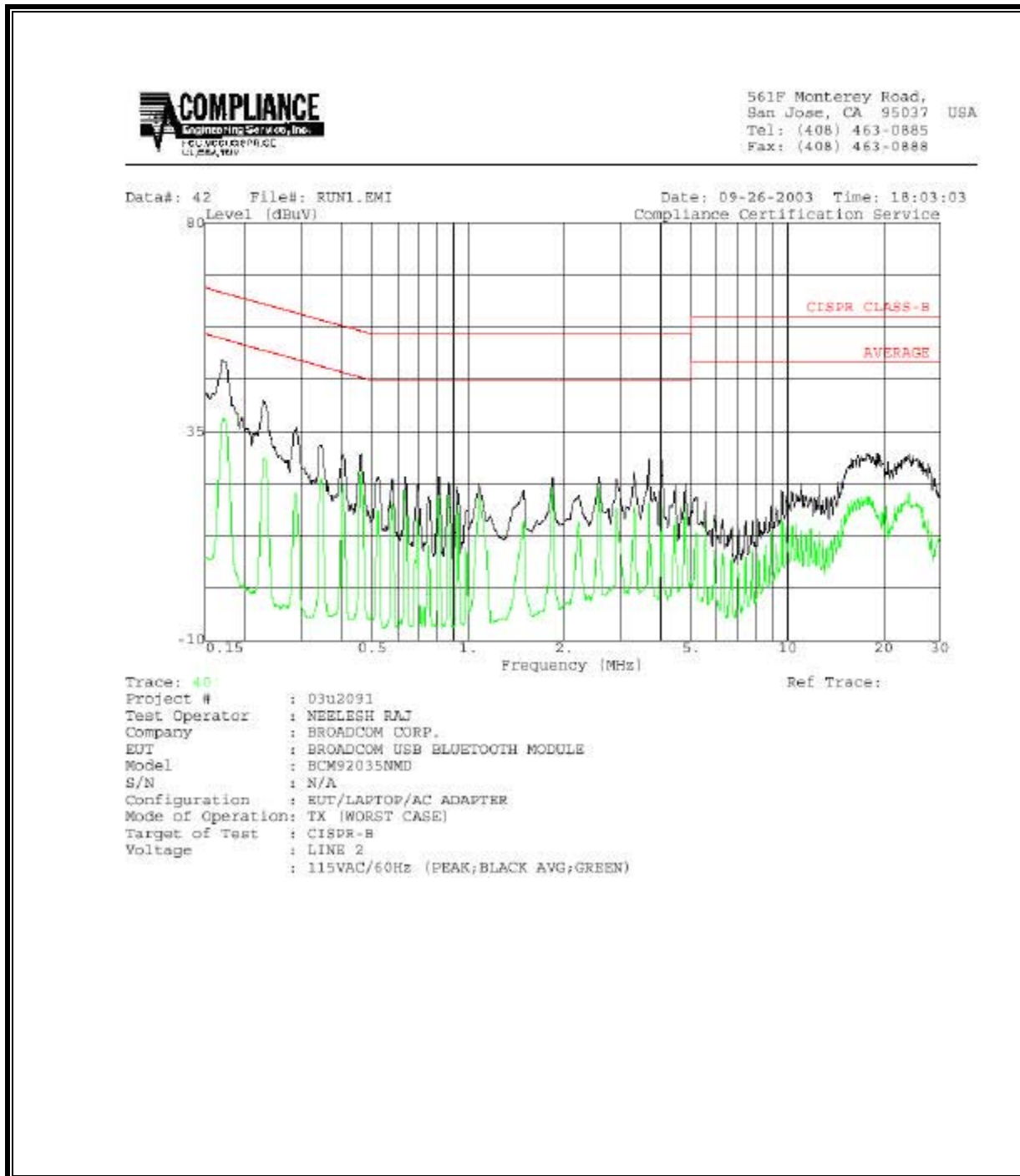


**LINE 1 RESULTS**



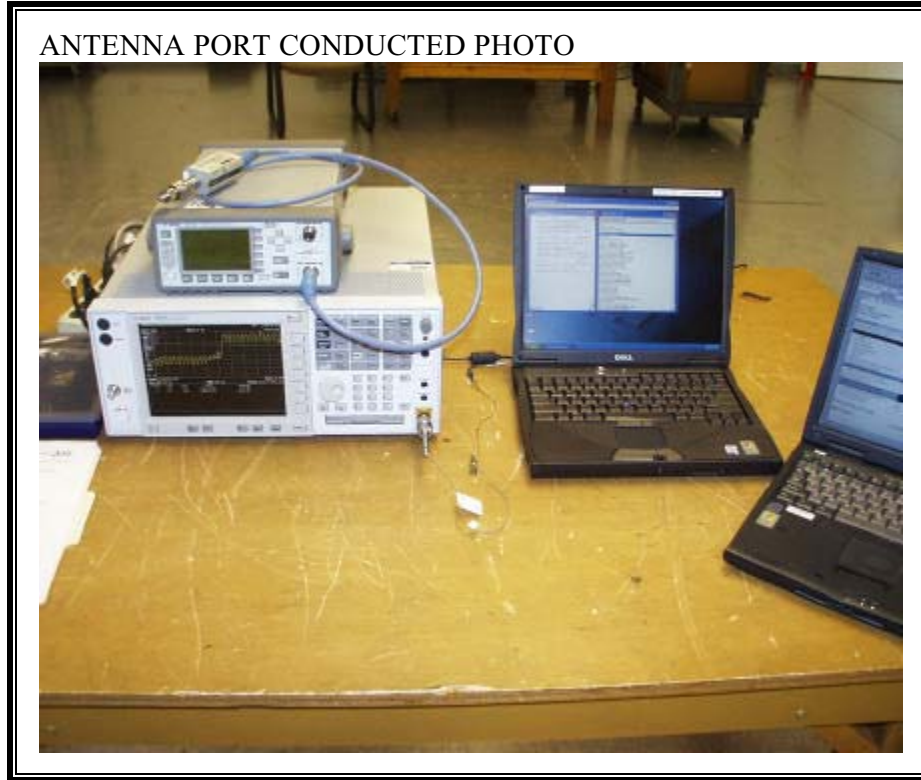


**LINE 2 RESULTS**

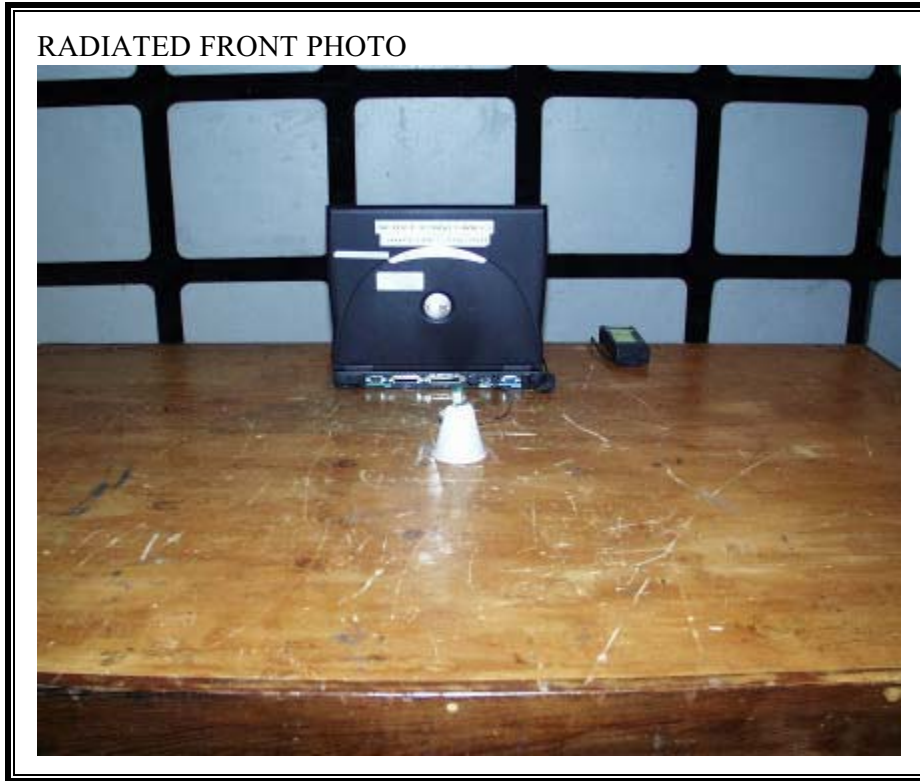


## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

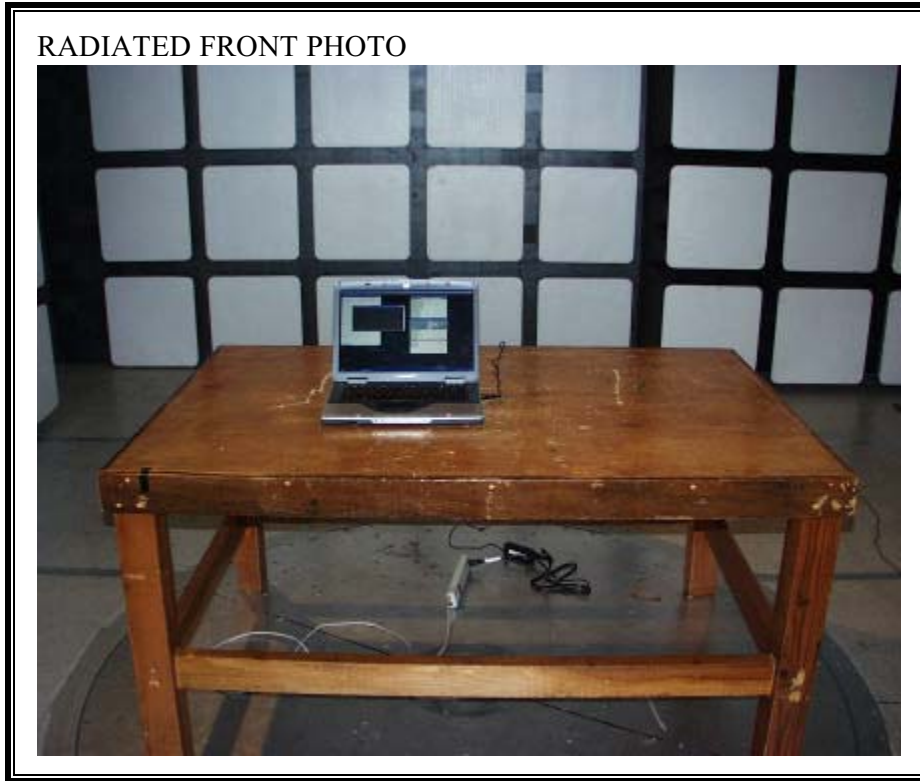


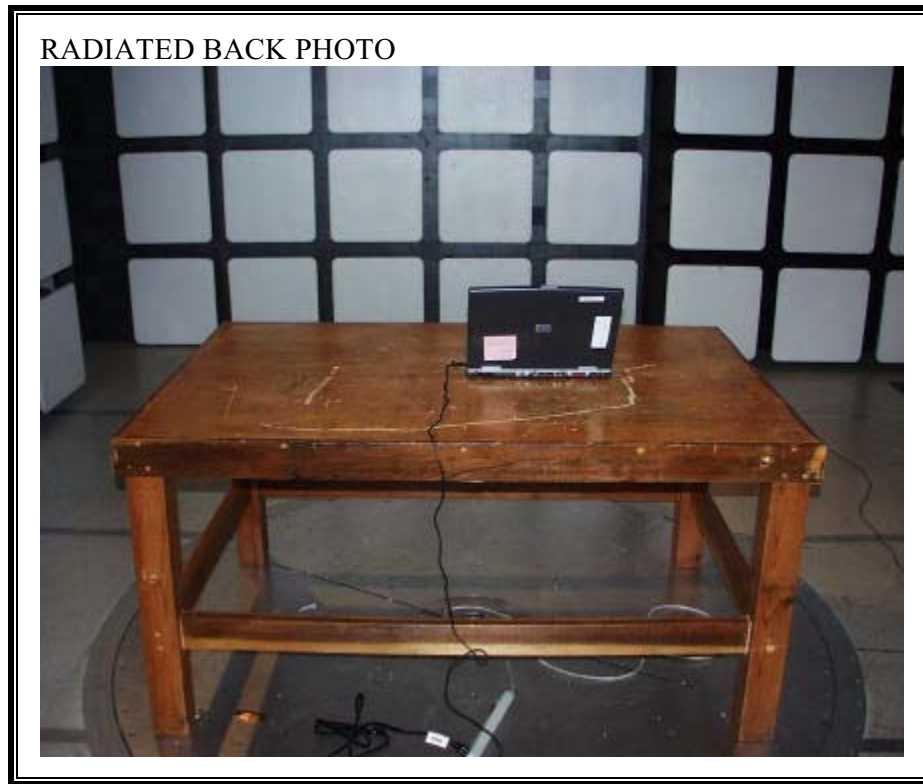
**RADIATED RF MEASUREMENT SETUP**





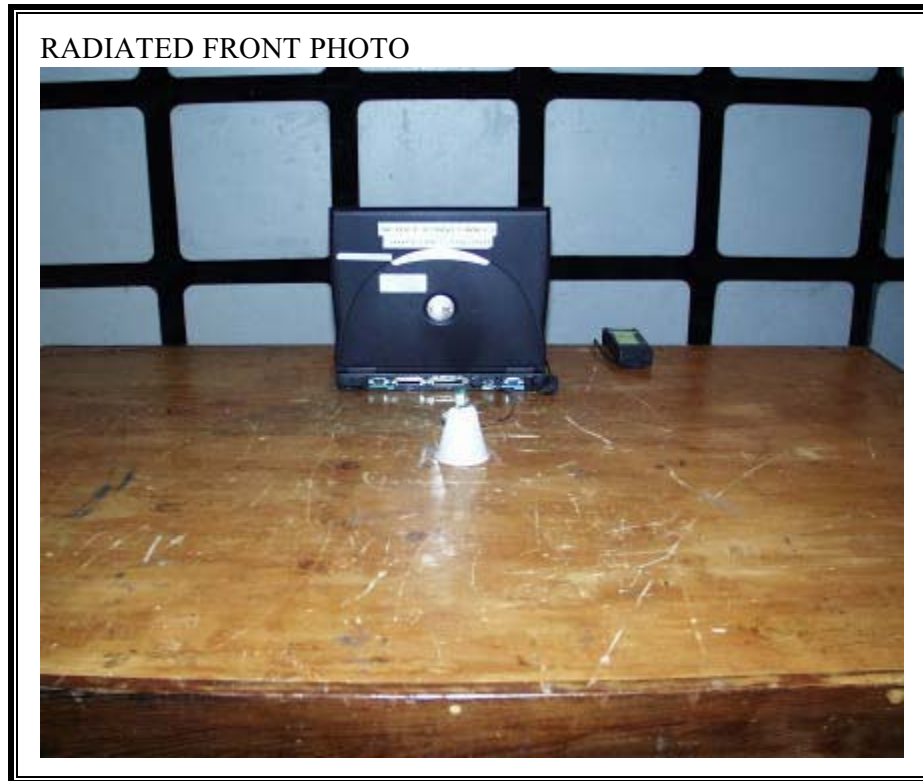
**CO-LOCATION RF MEASUREMENT SETUP**

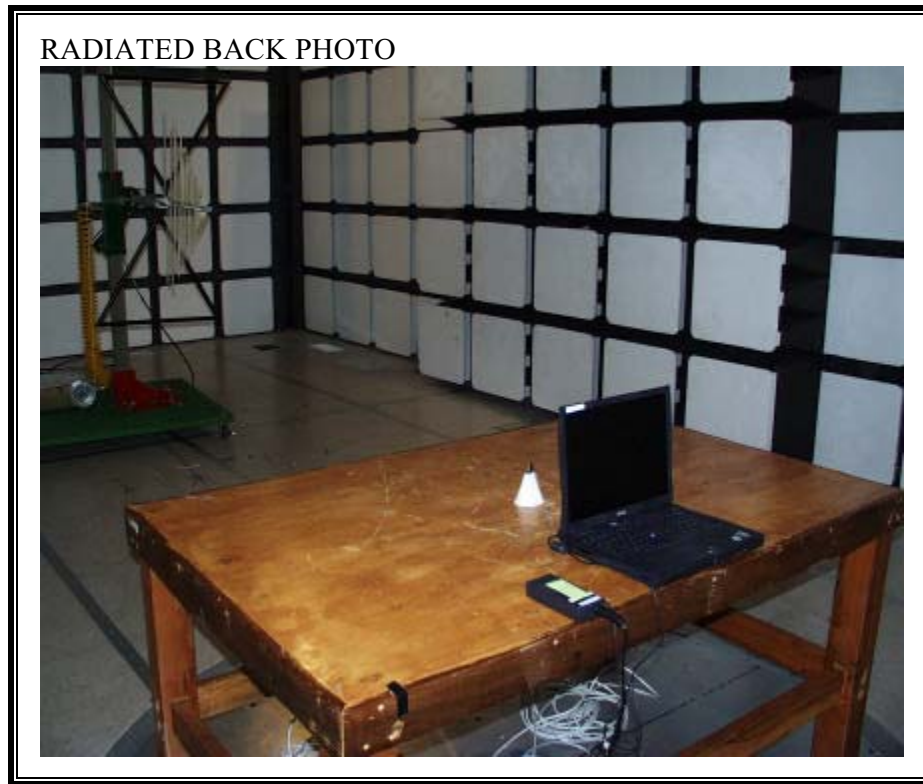






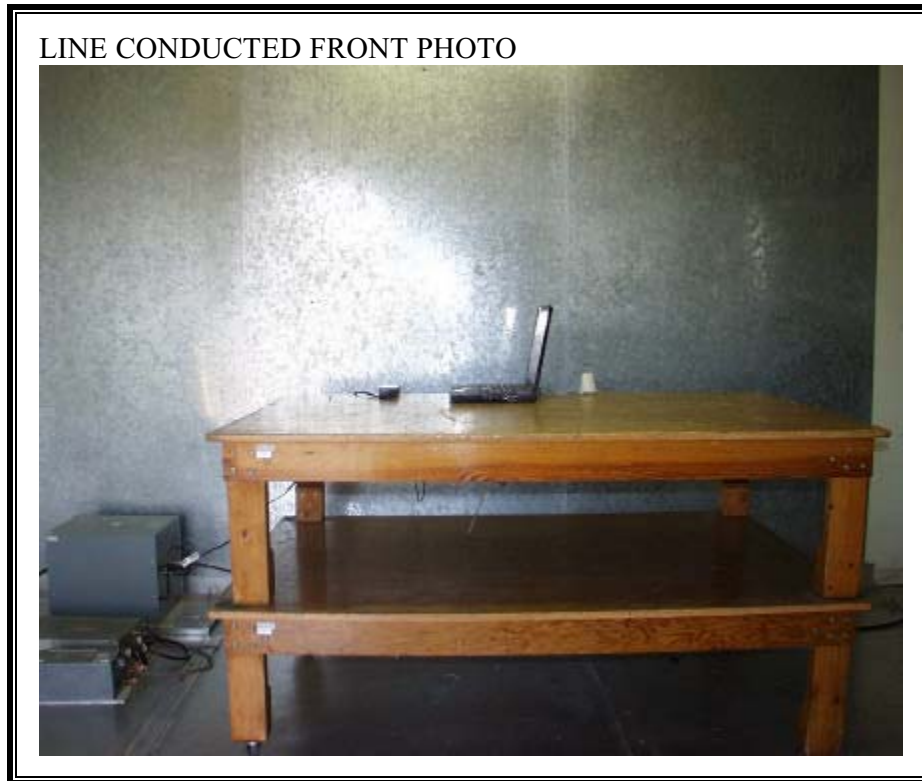
**RADIATED EMISSIONS SETUP**

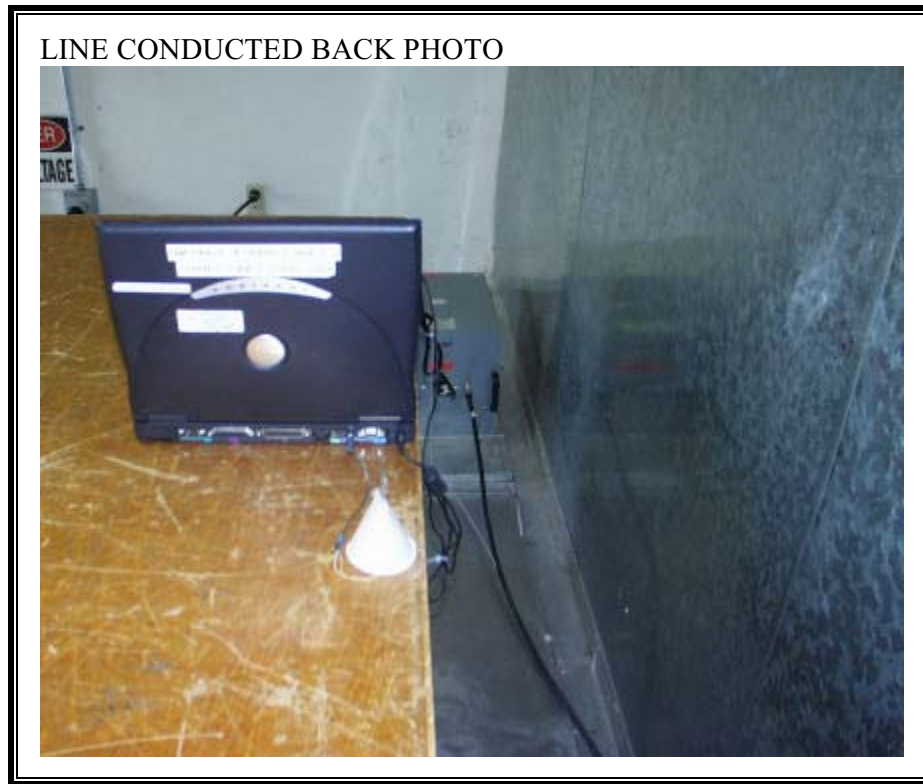






**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**





**END OF REPORT**