



**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<br>(MHz) | Output Power<br>(dBm) | Output Power<br>(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 BCM94036MPSPG.

### 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

| 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        | 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         |
| THE FOLLOWING WAS USED FOR ANTENNA PORT CONDUCTED, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS |              |              |                          |                |
| AC ADAPTER                                                                                       | DELL         | AA20031      | CN-09364U-16291-29F-00KM | N/A            |
| LAPTOP                                                                                           | DELL         | PP01L        | 37232072533              | DoC            |
| THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS                                           |              |              |                          |                |
| 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 |

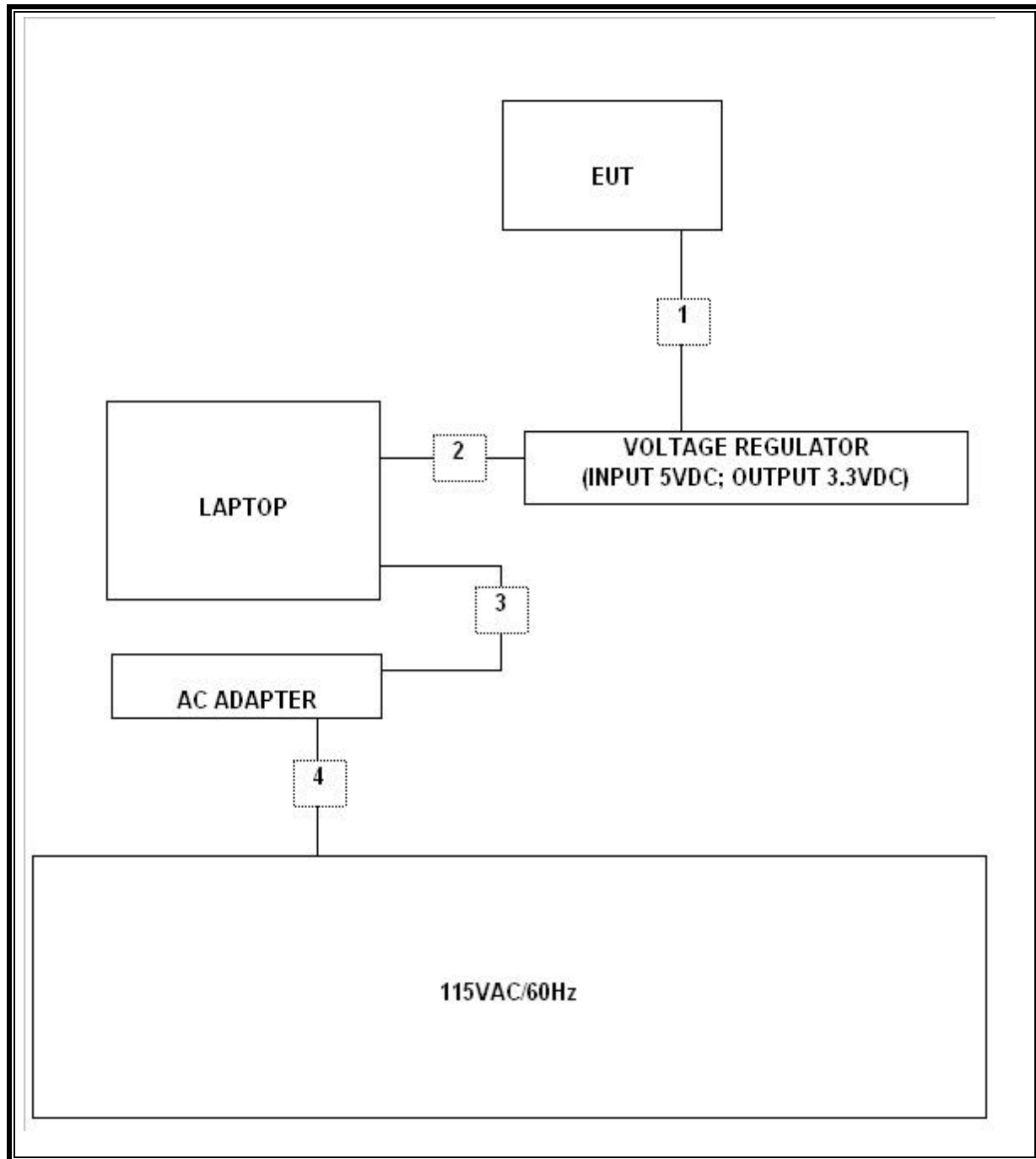
### I/O CABLES

| 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         |
| THE FOLLOWING WAS USED FOR ANTENNA PORT CONDUCTED, RADIATED, AND LINE CONDUCTION EMISSIONS TESTS |              |               |                          |                |
| AC ADAPTER                                                                                       | DELL         | AA20031       | CN-09364U-16291-29F-00KM | N/A            |
| LAPTOP                                                                                           | DELL         | PP01L         | 37232072533              | DoC            |
| THE FOLLOWING WAS USED FOR CO-LOCATION EMISSIONS TESTS                                           |              |               |                          |                |
| 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     | BCM94306MP SG | N/A                      | QDS-BRCM1005-H |

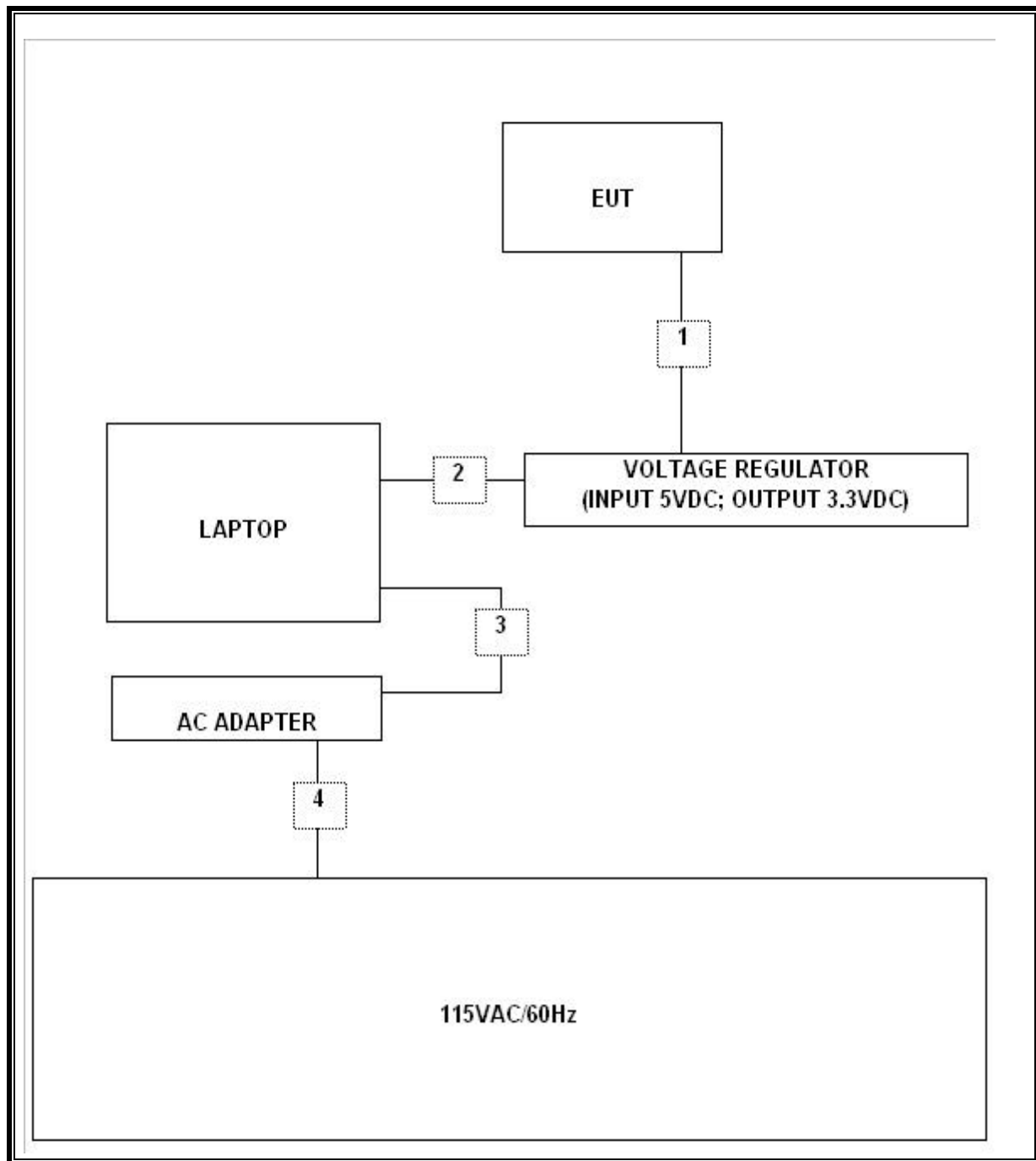
### I/O CABLES

| 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

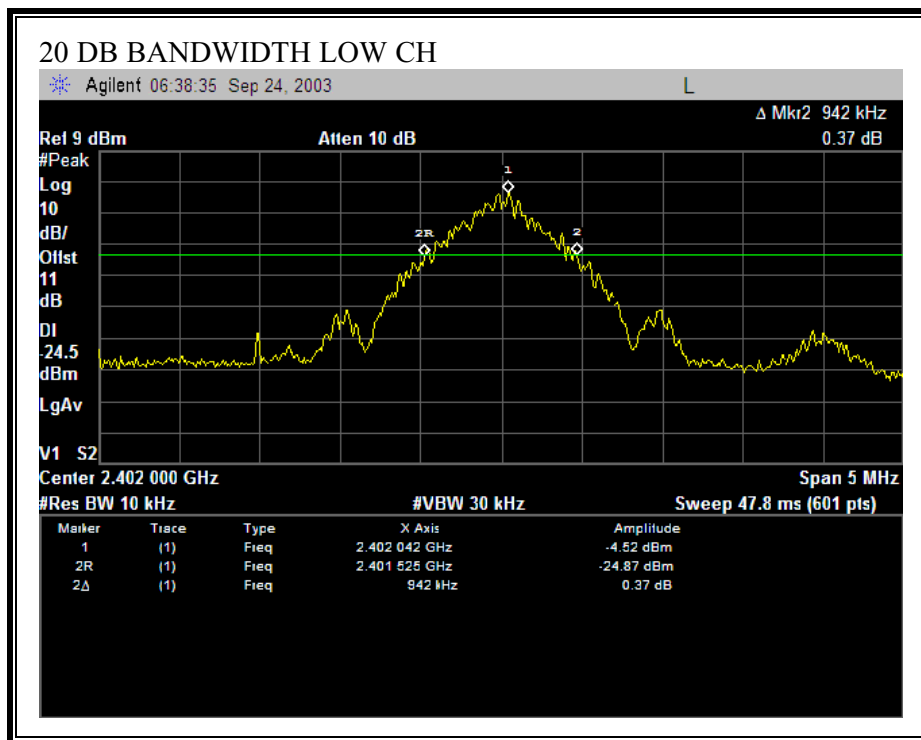
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

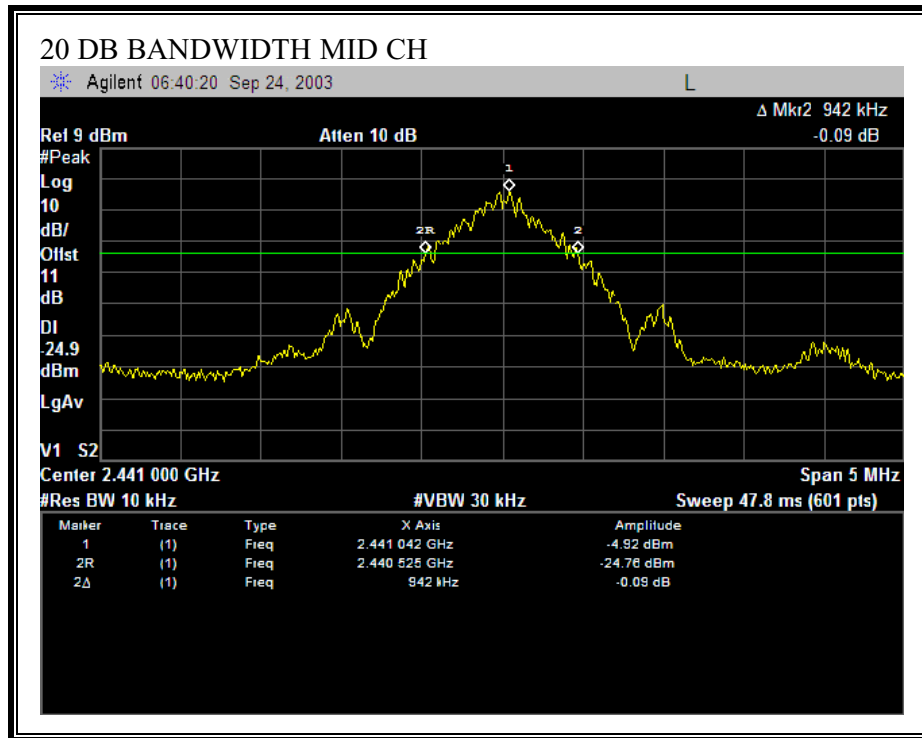
#### RESULTS

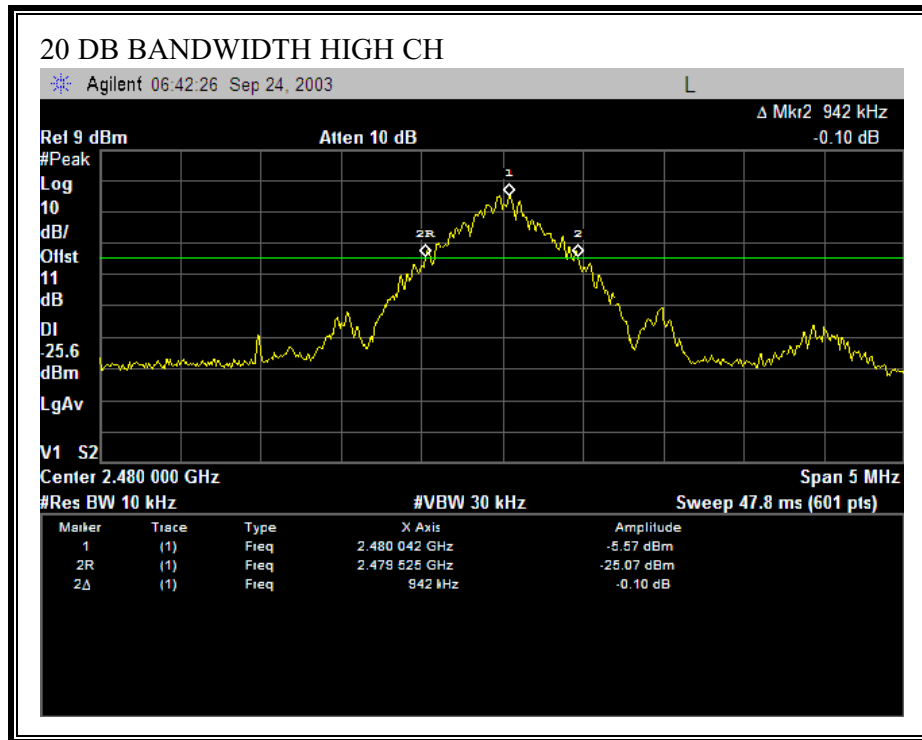
No non-compliance noted:

| Channel | Frequency<br>(MHz) | 20 dB Bandwidth<br>(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.

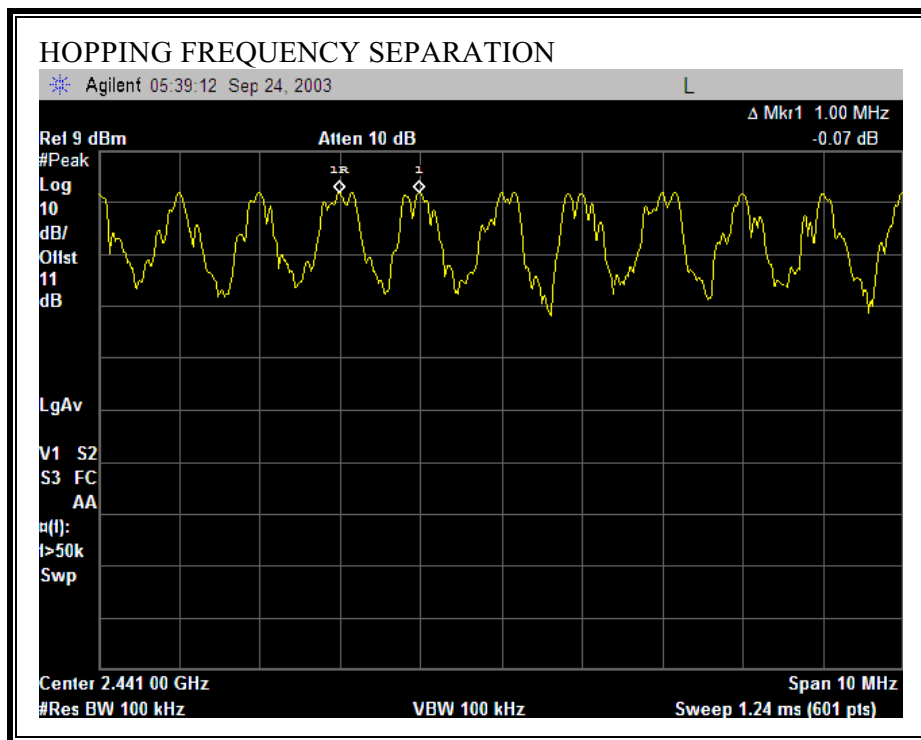
### **TEST PROCEDURE**

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**

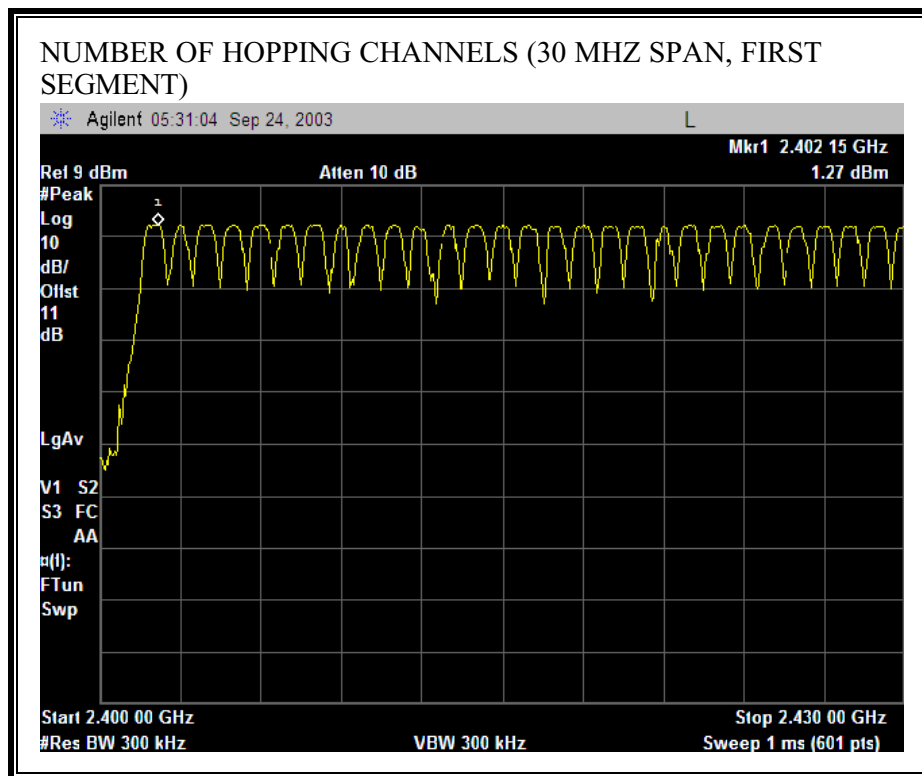
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

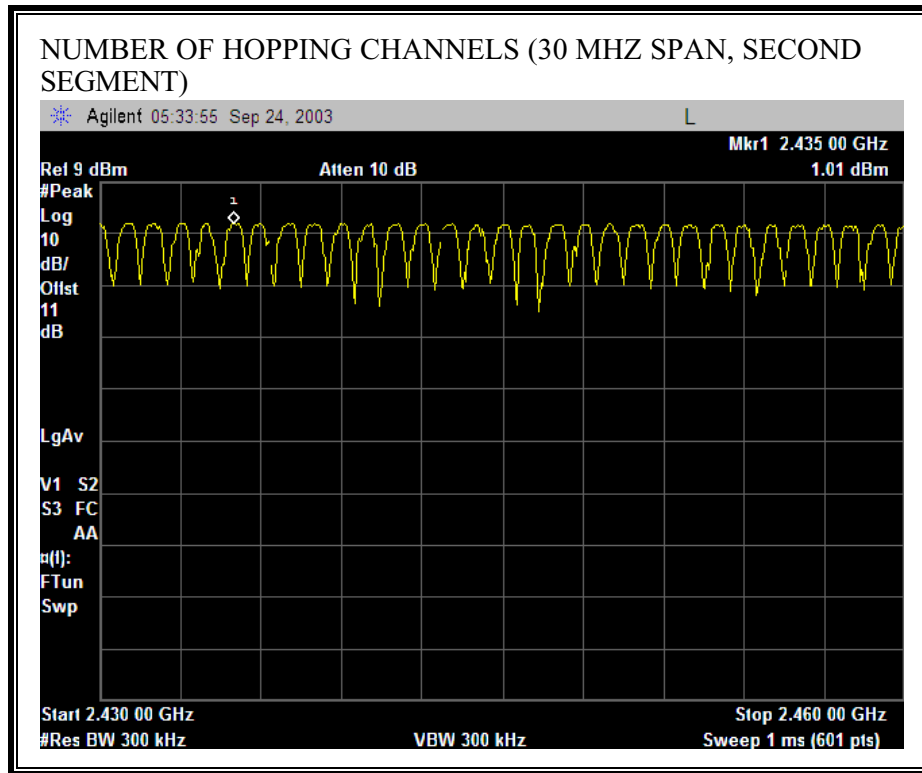
#### **RESULTS**

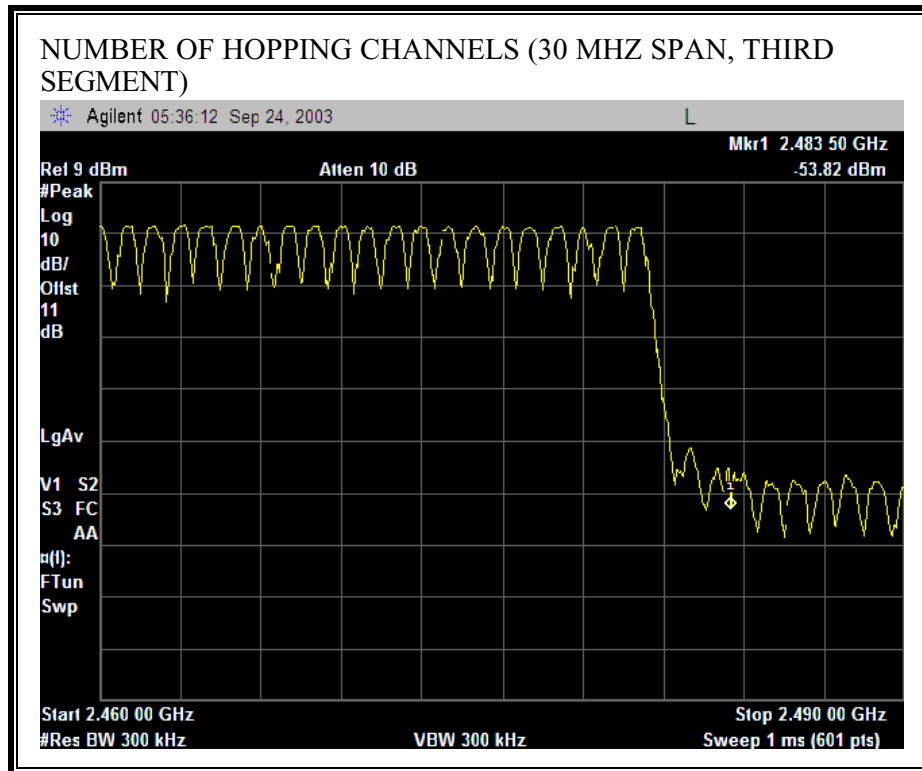
No non-compliance noted:

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)

| OCCURANCE |
|-----------|
| 3.16 sec  |
| 8         |

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

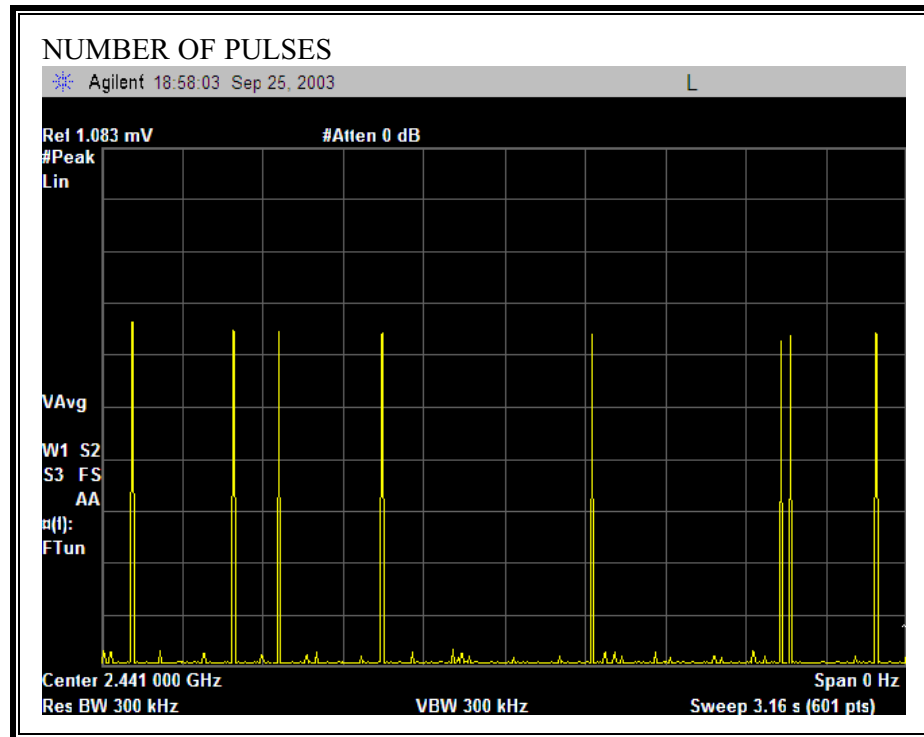
8 x 10 = 80 (PULSES IN 31.6 SECONDS)

| PULSE WIDTH | PULSES IN    | TIME OF   | LIMIT | MARGIN |
|-------------|--------------|-----------|-------|--------|
| (mS)        | 31.6 SECONDS | OCCUPANCY | (sec) | (sec)  |
| (sec)       |              | (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

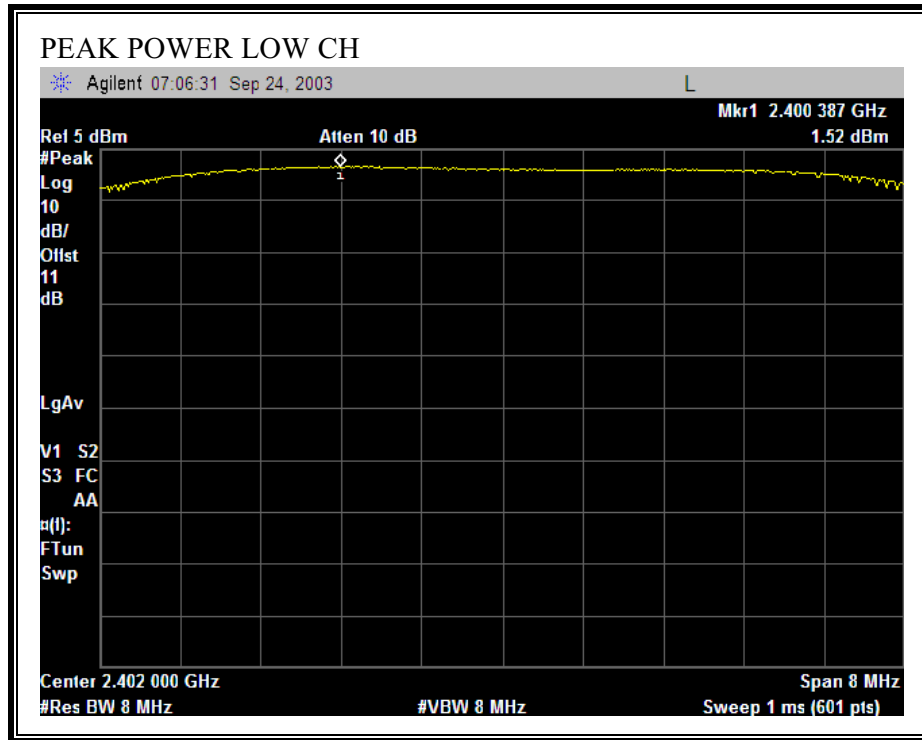
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

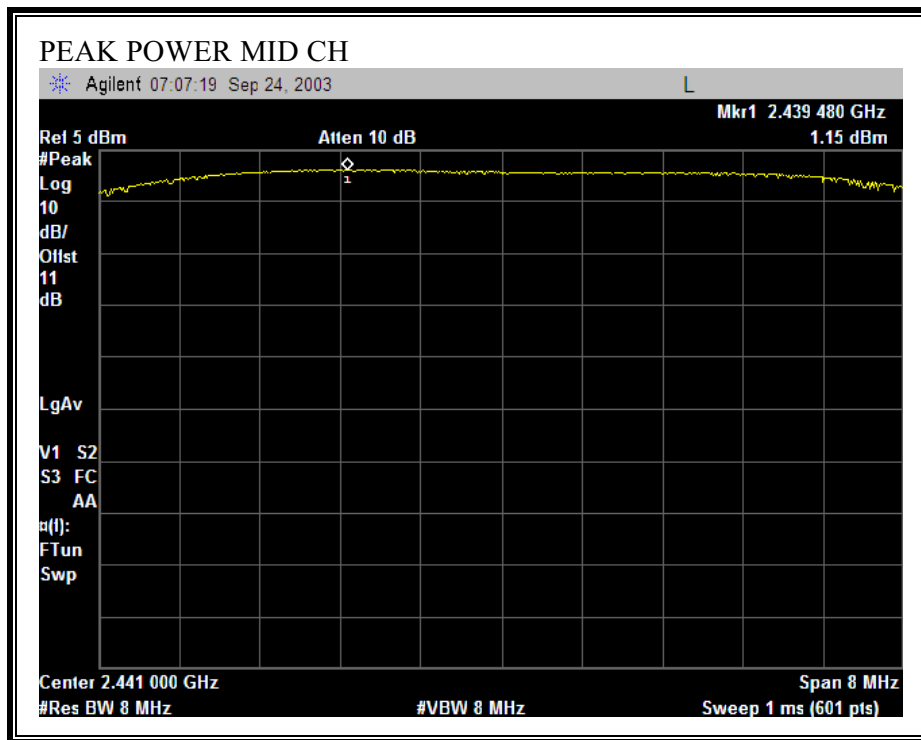
### RESULTS

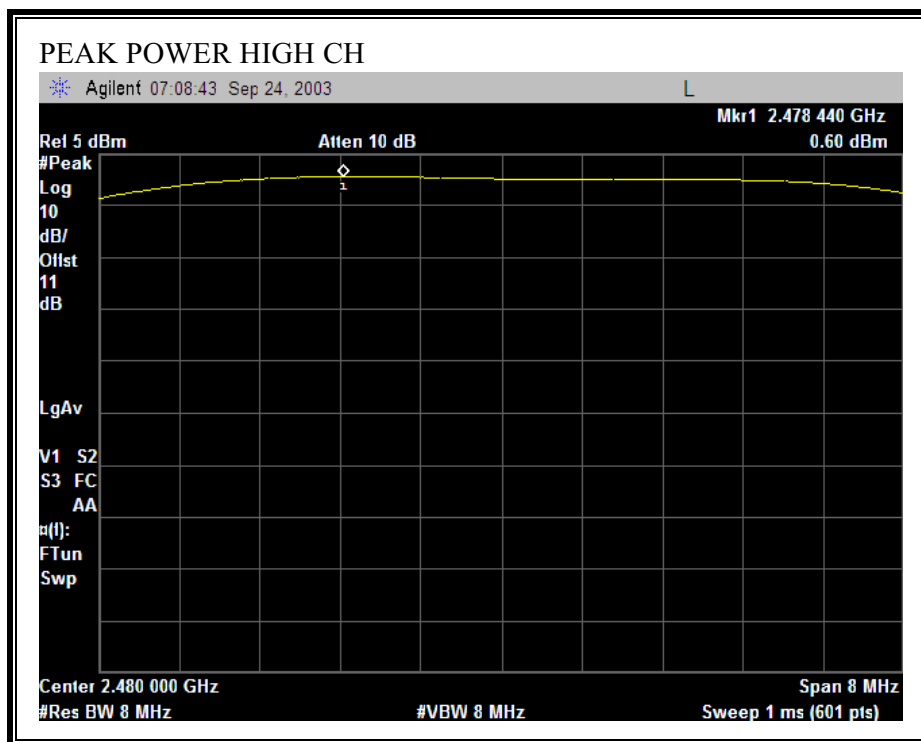
No non-compliance noted:

| Channel | Frequency<br>(MHz) | Peak Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(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<br>(mW/cm <sup>2</sup> ) | Output Power<br>(dBm) | Antenna Gain<br>(dBi) | MPE Distance<br>(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<br>(MHz) | Average Power<br>(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

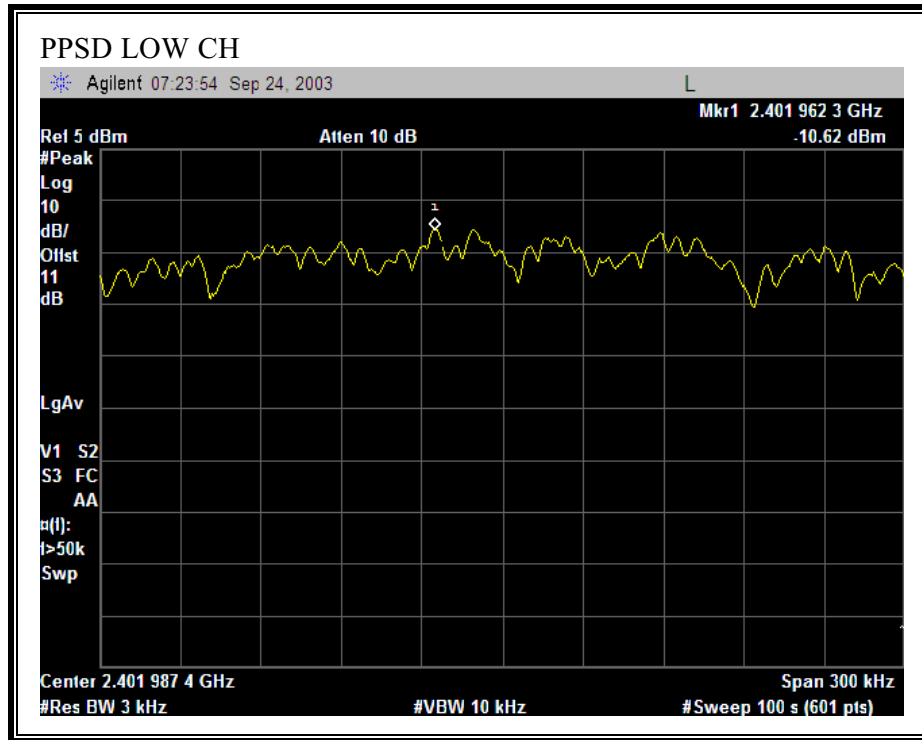
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz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

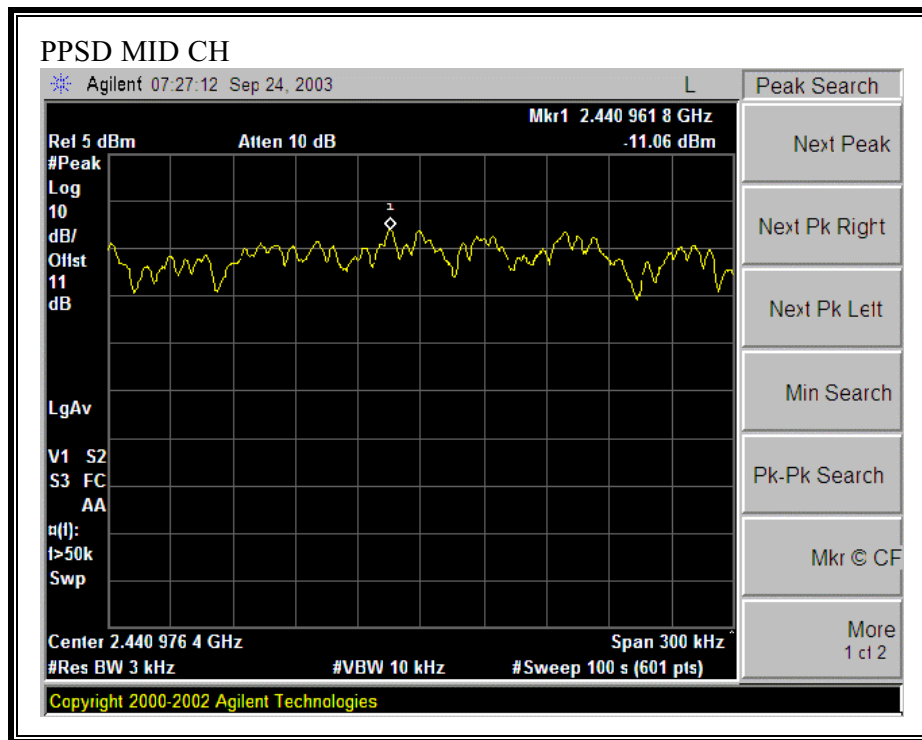
### RESULTS

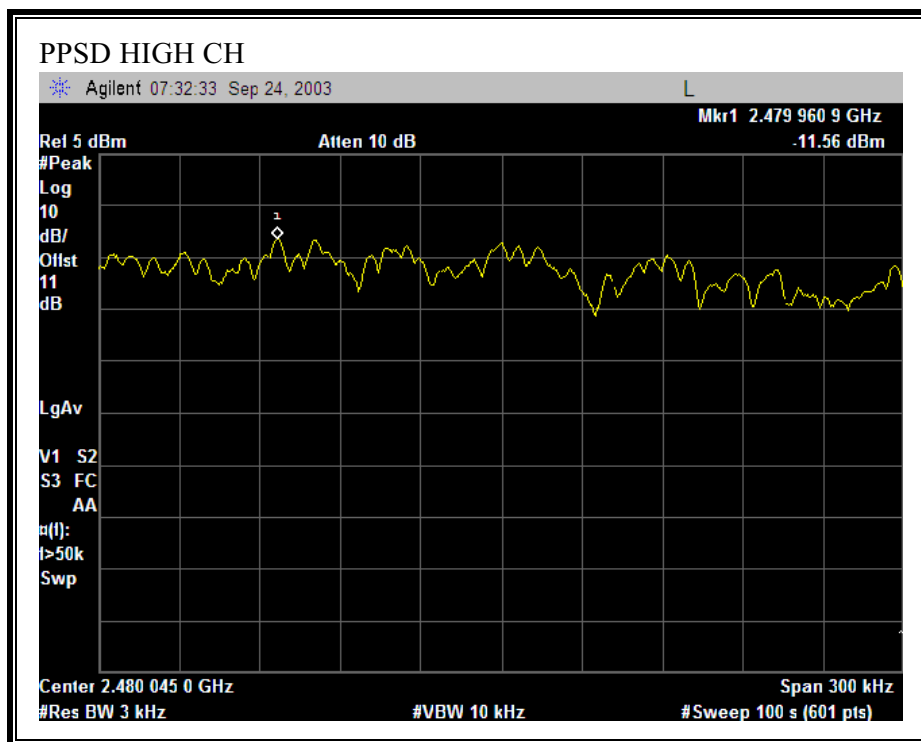
No non-compliance noted:

| Channel | Frequency<br>(MHz) | PPSD<br>(dBm) | Limit<br>(dBm) | Margin<br>(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**

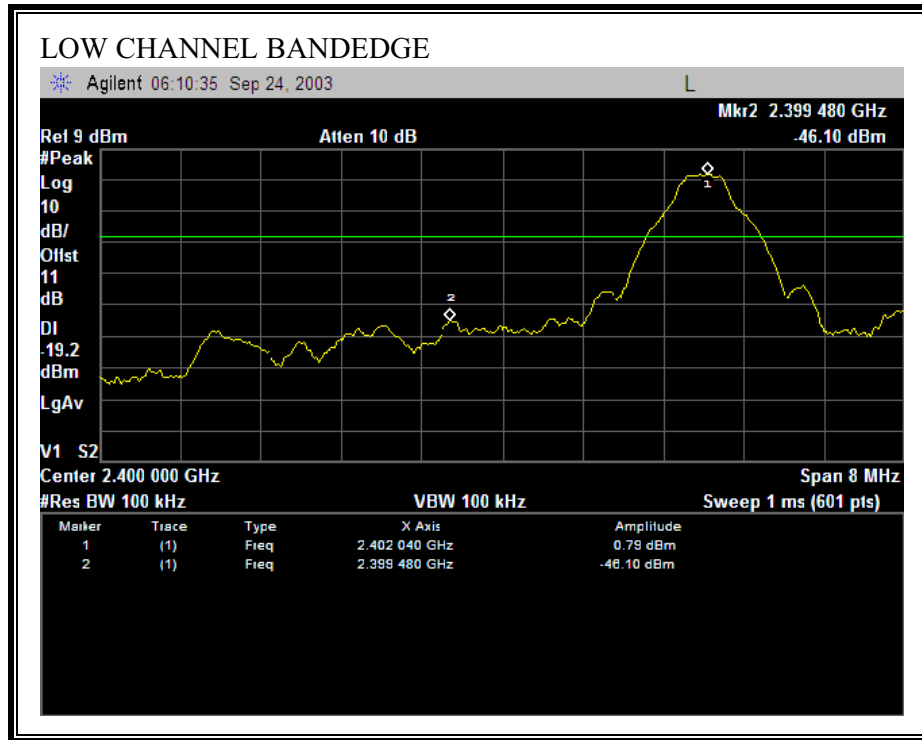
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

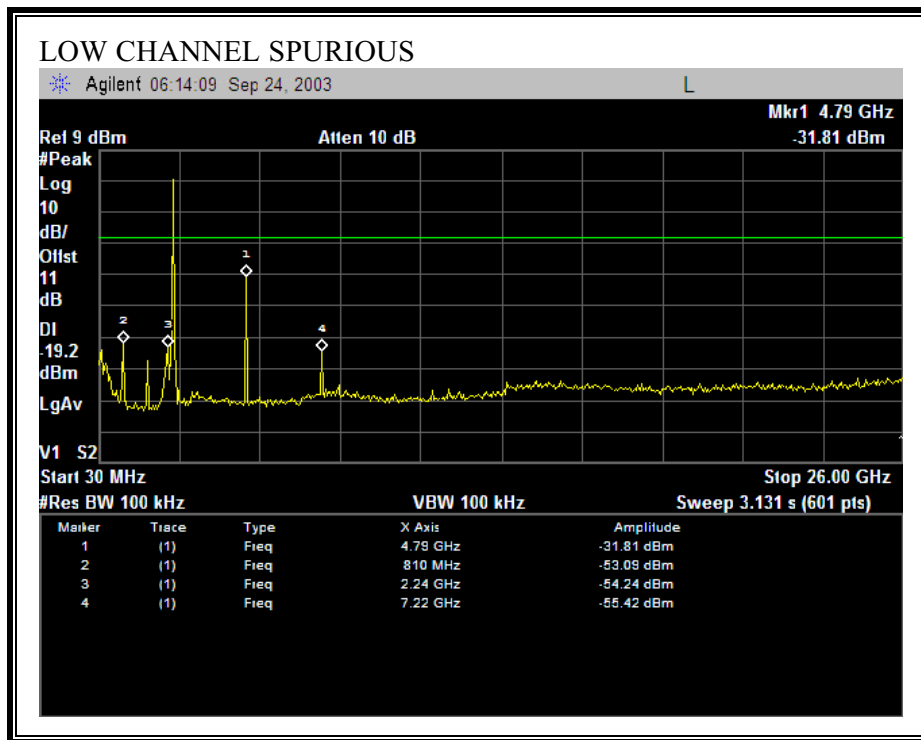
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### **RESULTS**

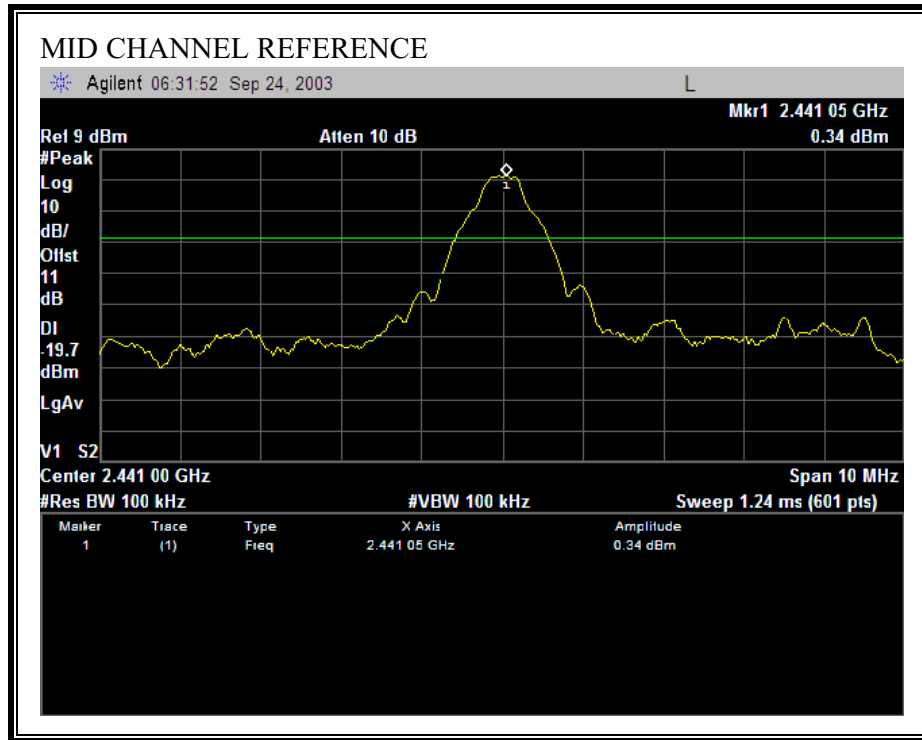
No non-compliance noted:

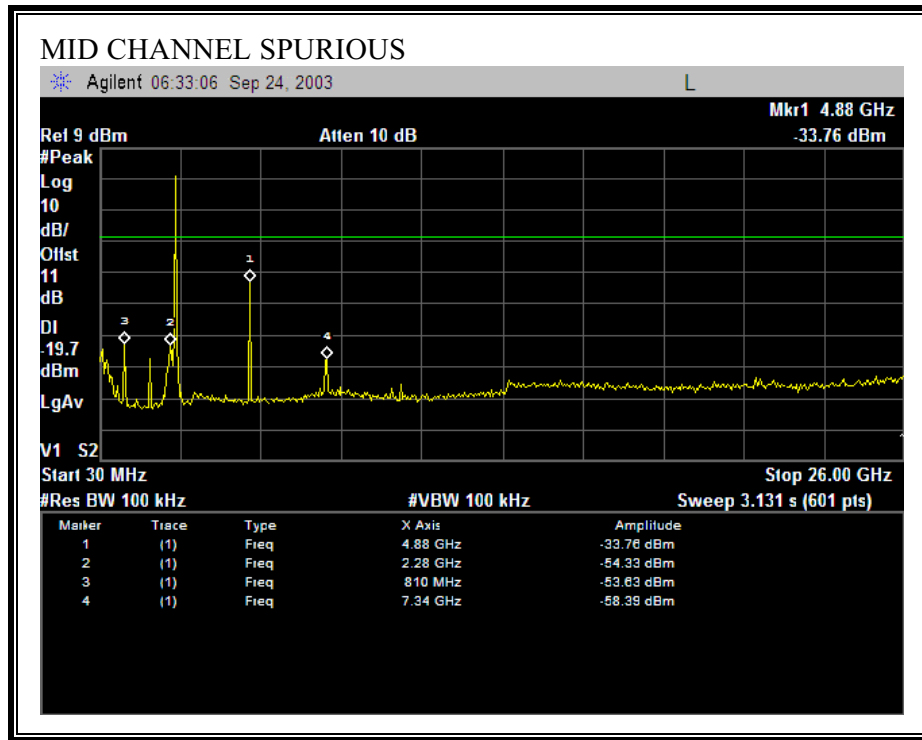
**SPURIOUS EMISSIONS, LOW CHANNEL**



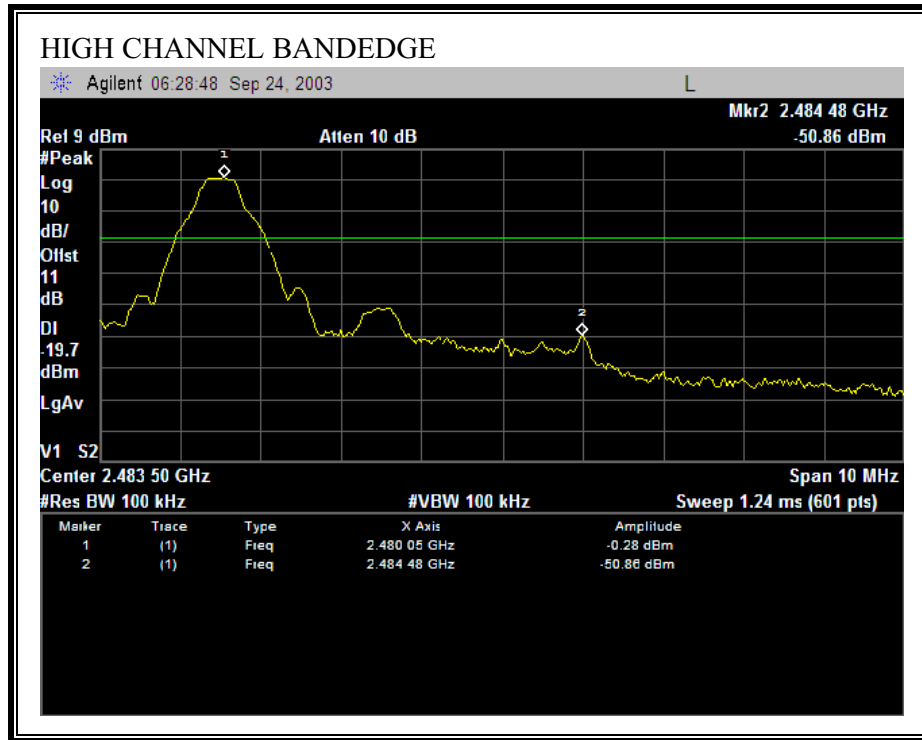


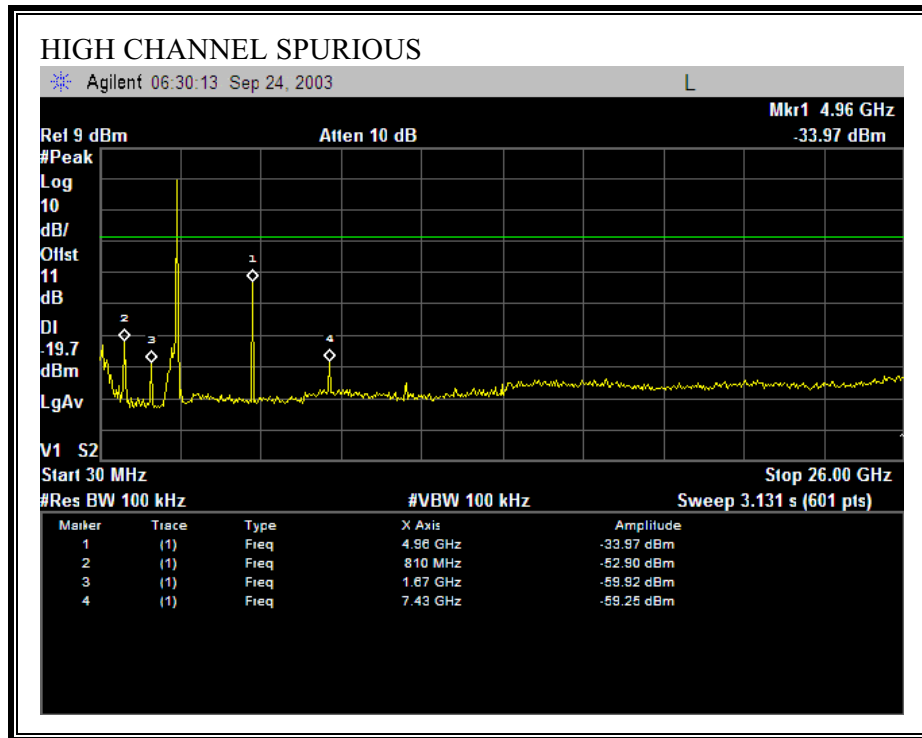
**SPURIOUS EMISSIONS, MID CHANNEL**



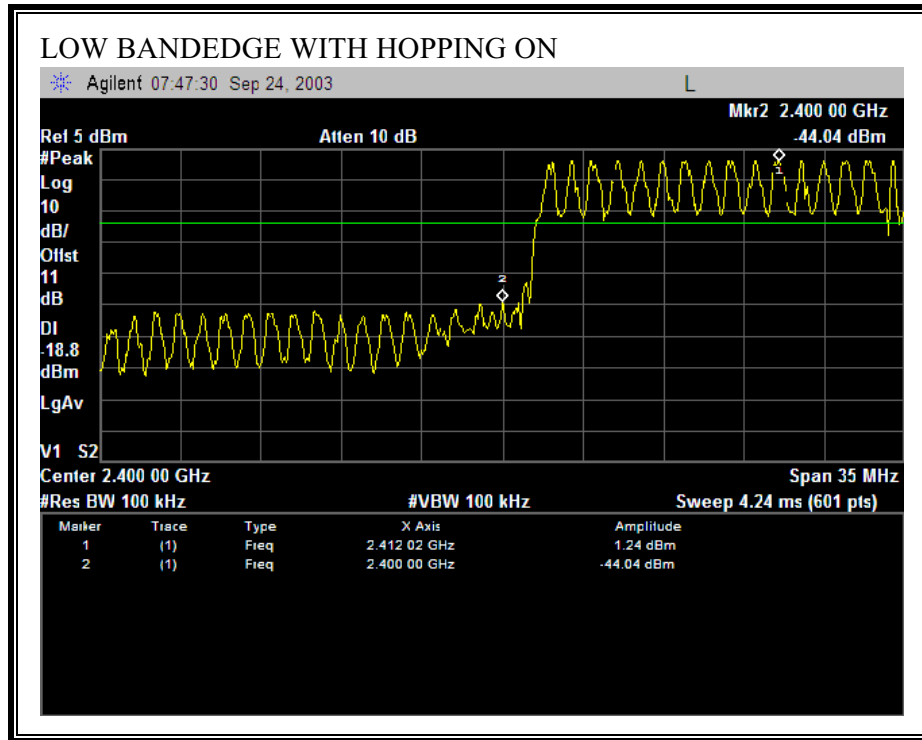


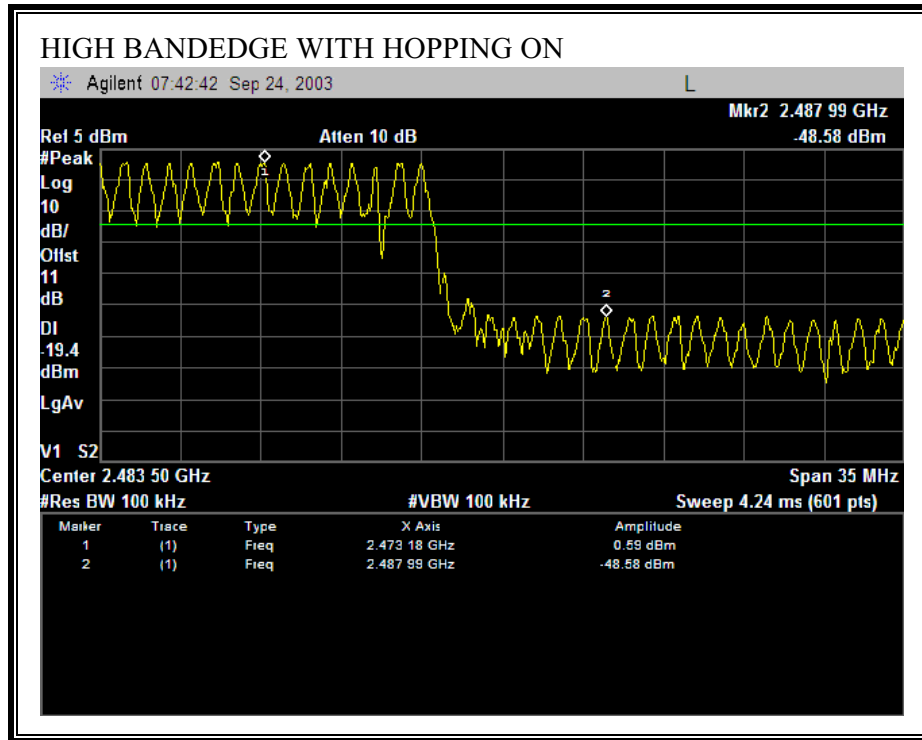
**SPURIOUS EMISSIONS, HIGH CHANNEL**





**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<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(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.

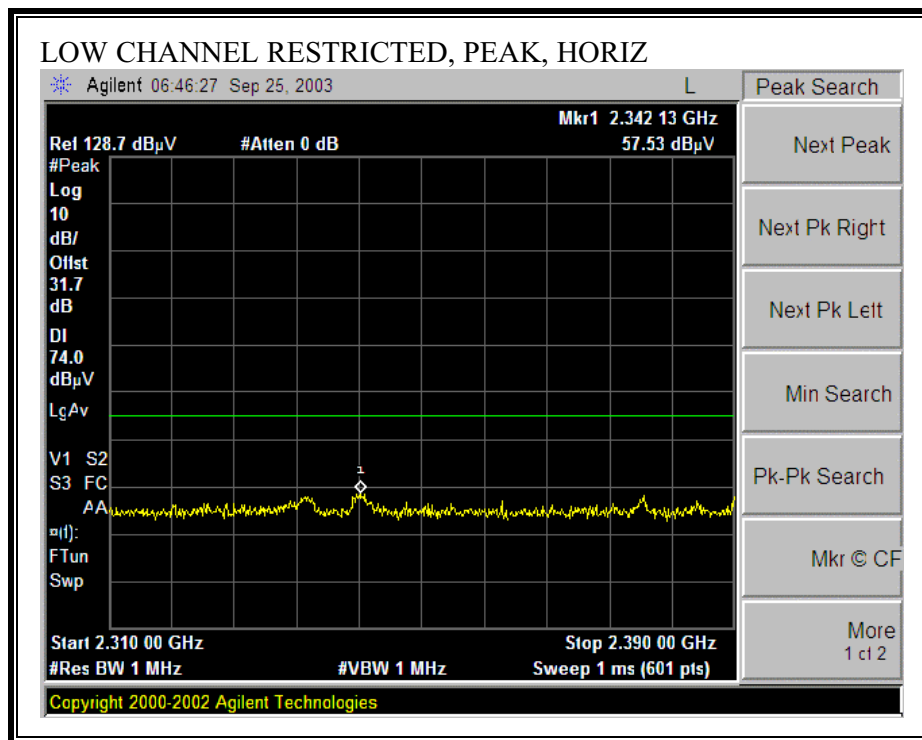
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

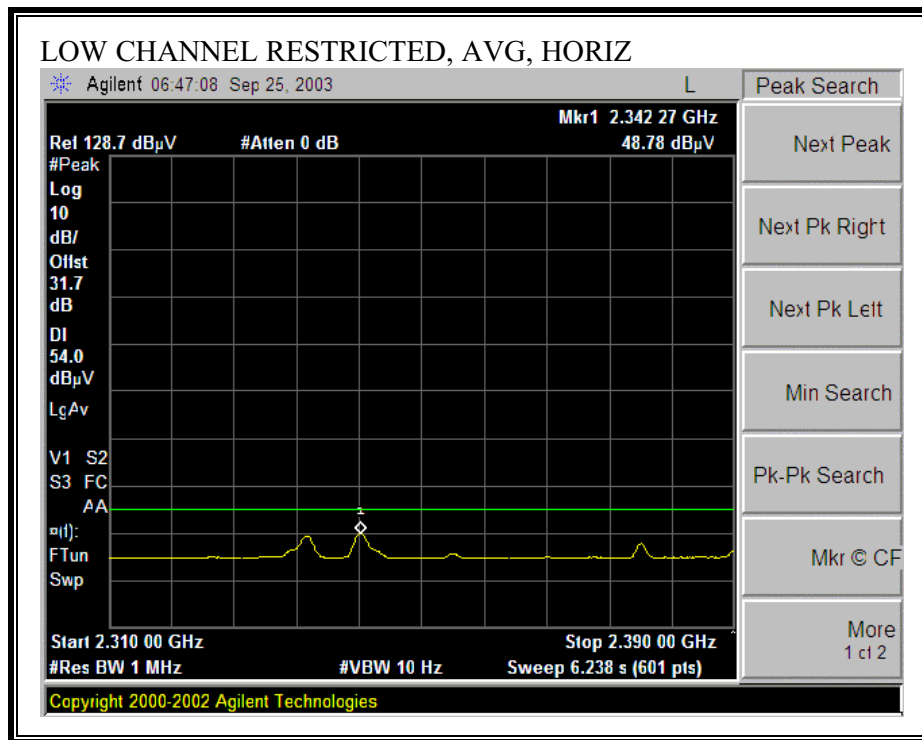
## **RESULTS**

No non-compliance noted:

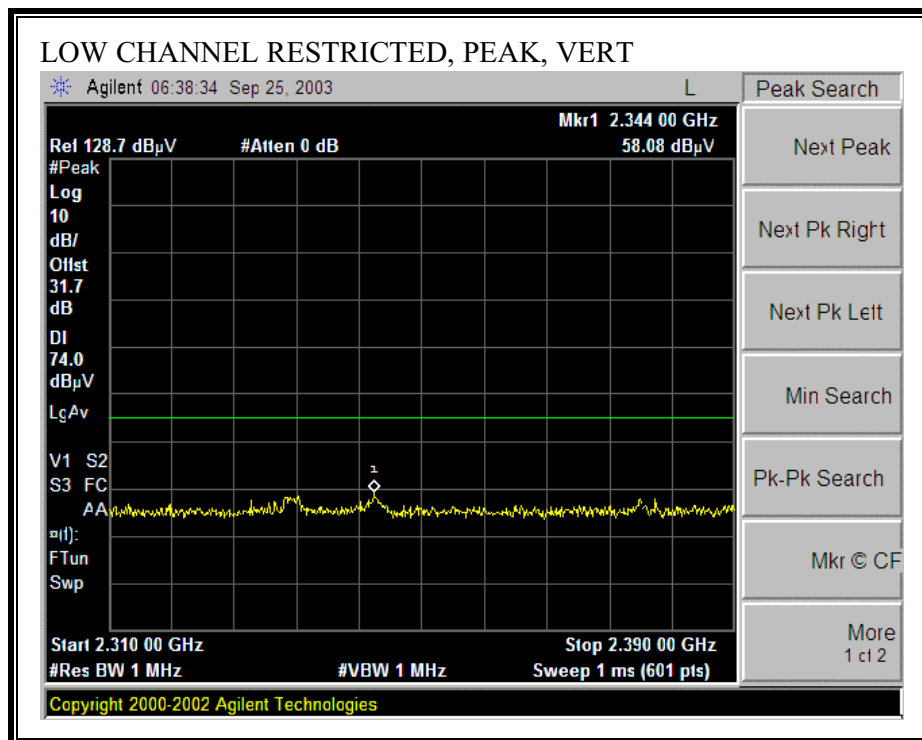
## 7.10.1. RADIATED EMISSIONS ABOVE 1 GHZ

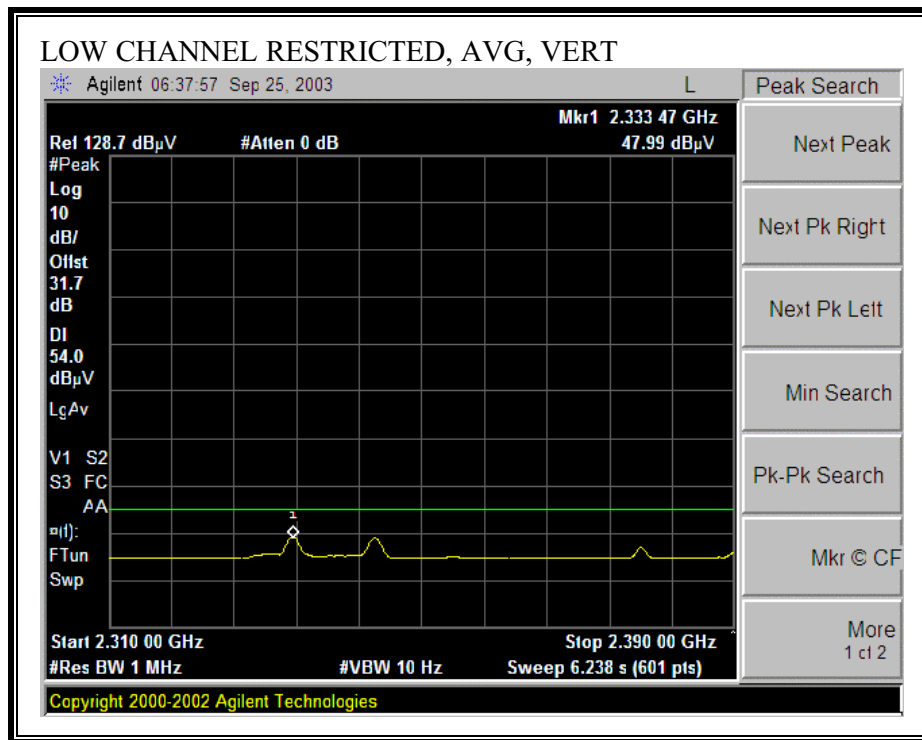
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



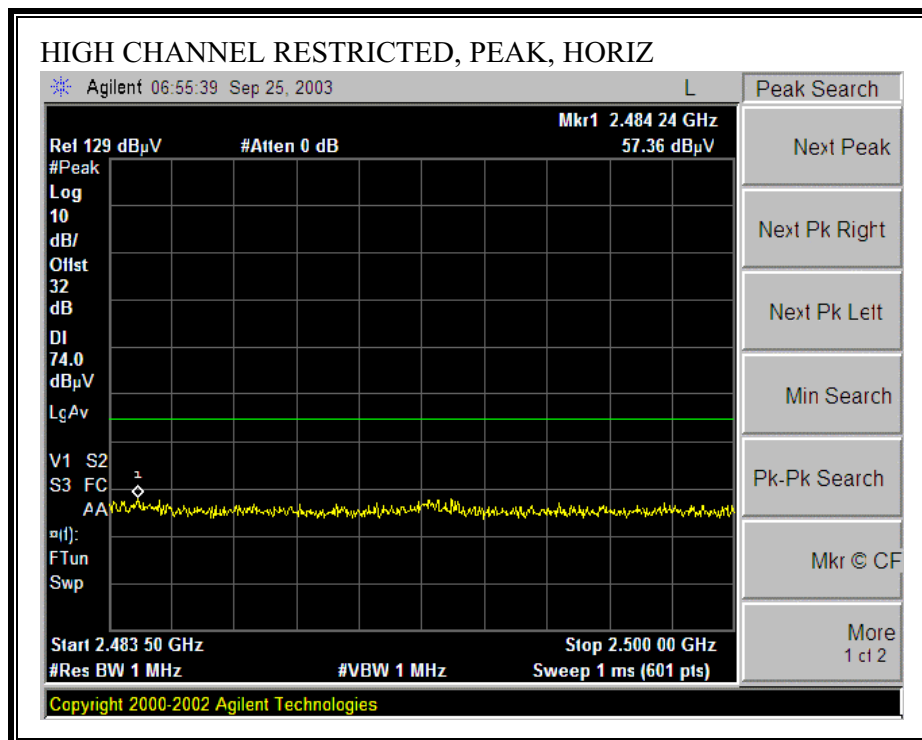


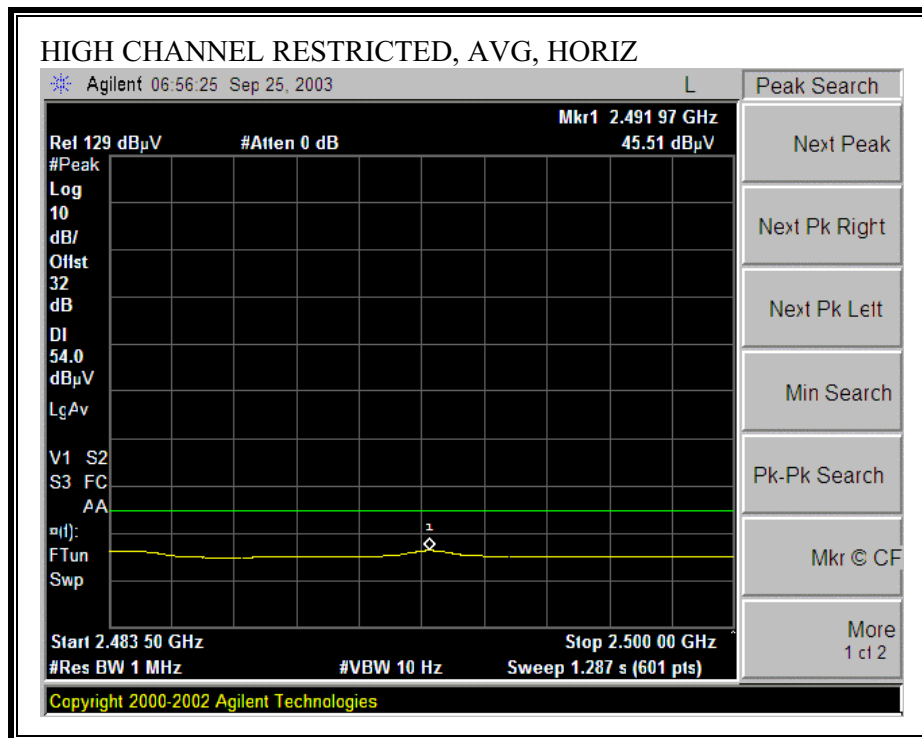
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



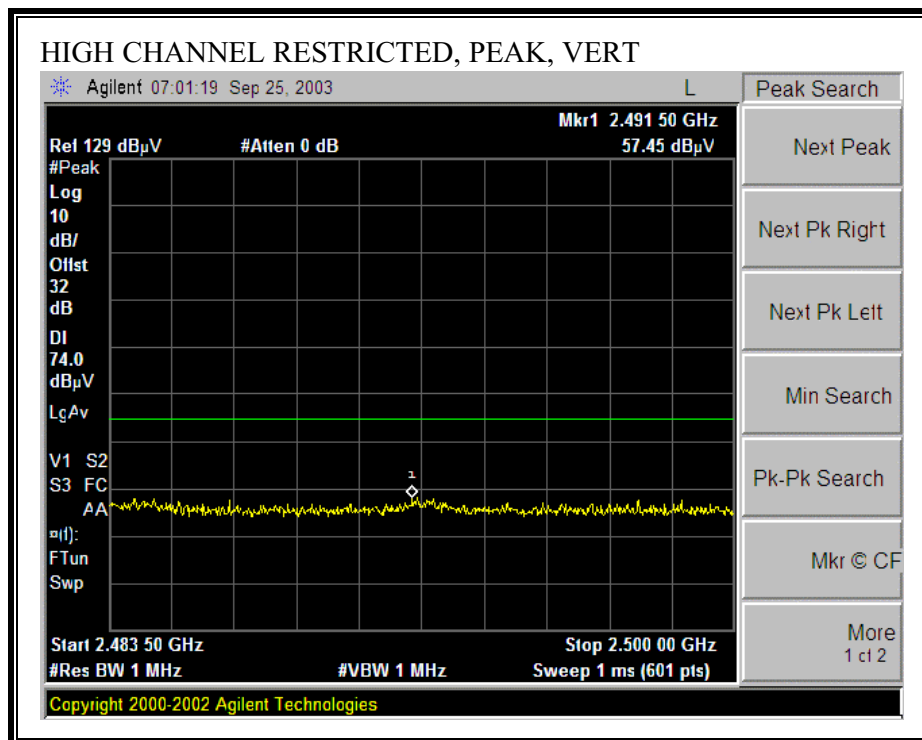


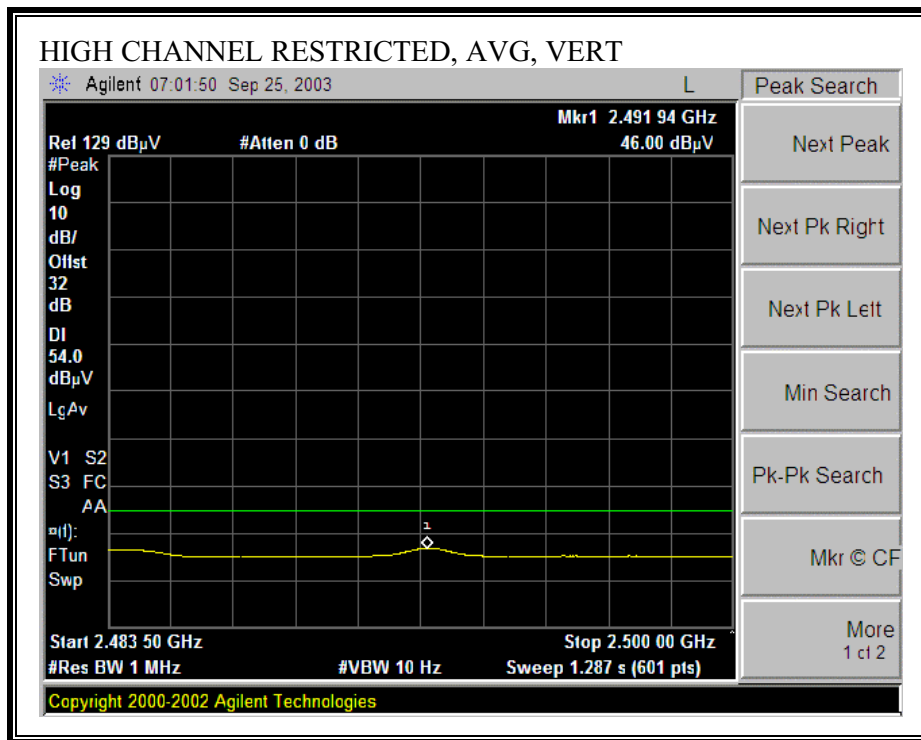
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



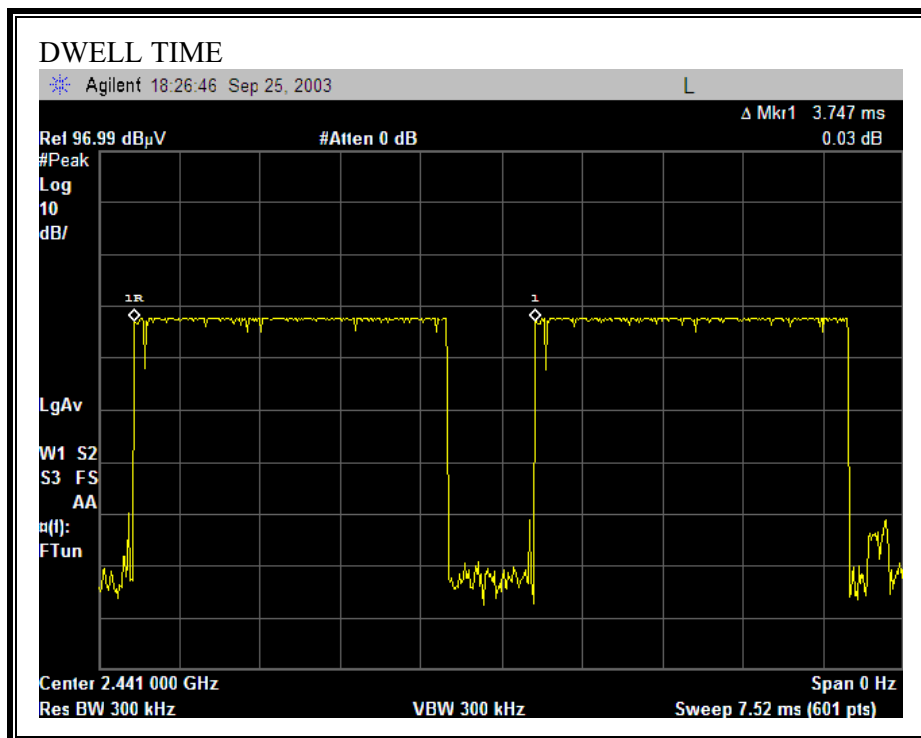


**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





**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)

09/04/03 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: BCM9100SNMD  
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

Limit  
FCC 15.205

H Frequency Cables  
☐ (2 ft) ☒ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☒ (12 ft)

Peak Measurements:  
1 MHz Resolution Bandwidth  
10MHz Video Bandwidth

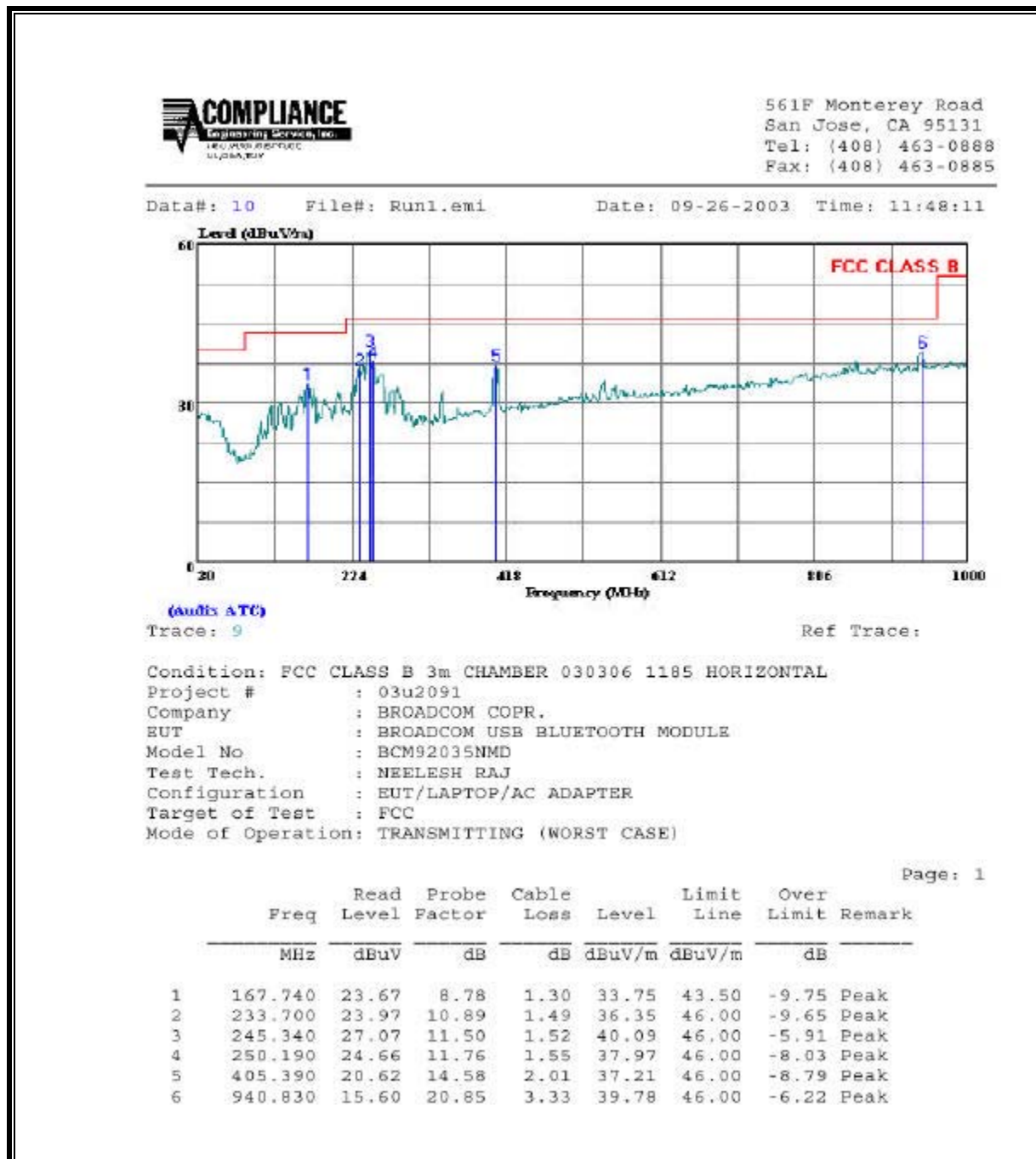
Average Measurements:  
1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                  | Dist<br>feet | Raw Pk<br>dBuV | Raw Avg<br>dBuV | AF<br>dB/m | CL<br>dB | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>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             |              |                |                 |            |          |           |              |     |                |               |                  |                   |              |               |       |

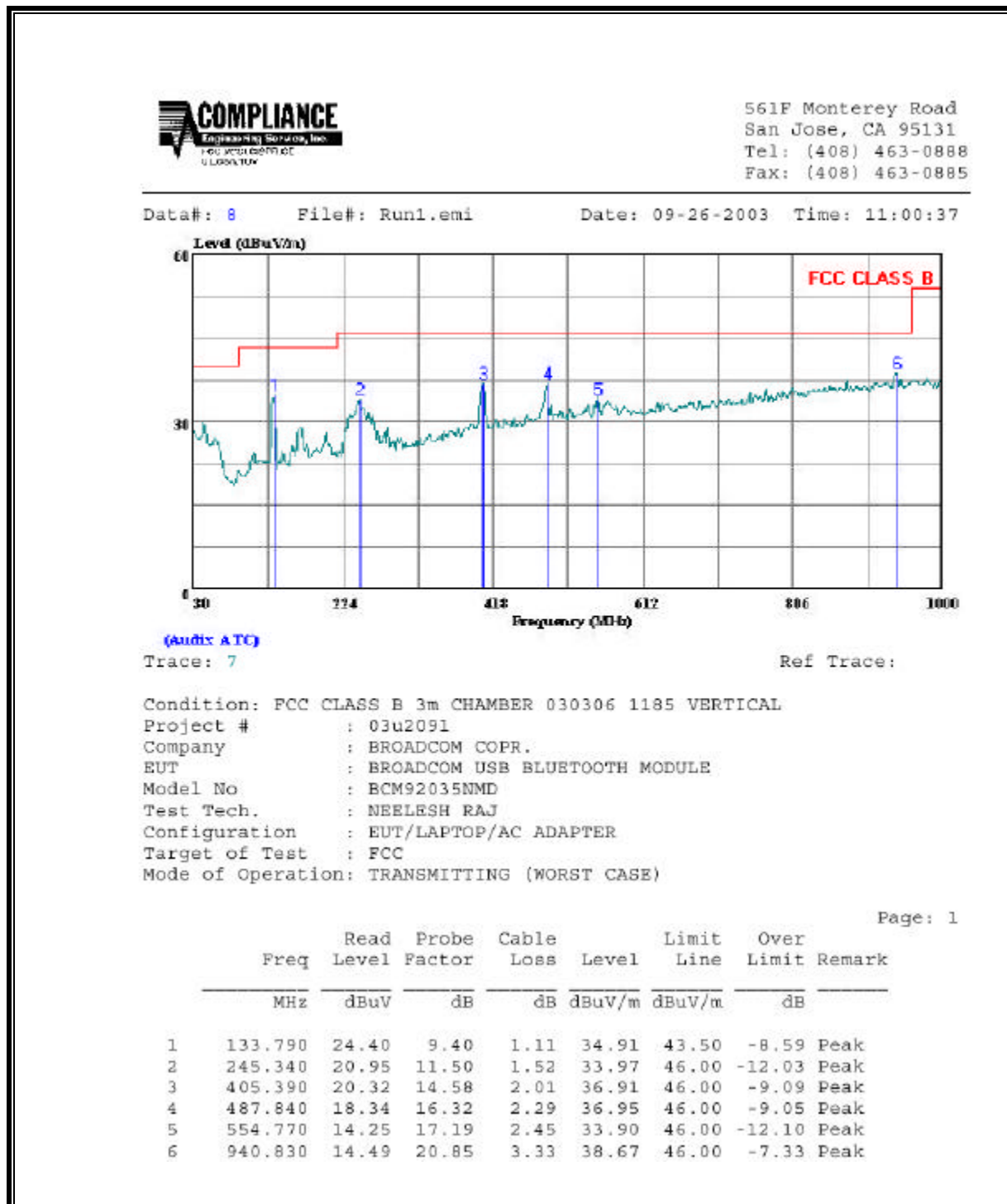
f Measurement Frequency  
Dist Distance to Antenna  
Read Analyzer Reading  
AF Antenna Factor  
CL Cable Loss  
Amp Preamp Gain  
D Corr Distance Correct to 3 meters  
Avg Average Field Strength @ 3 m  
Peak Calculated Peak Field Strength  
HPF High Pass Filter  
Avg Lim Average Field Strength Limit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

## 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)**



## 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.

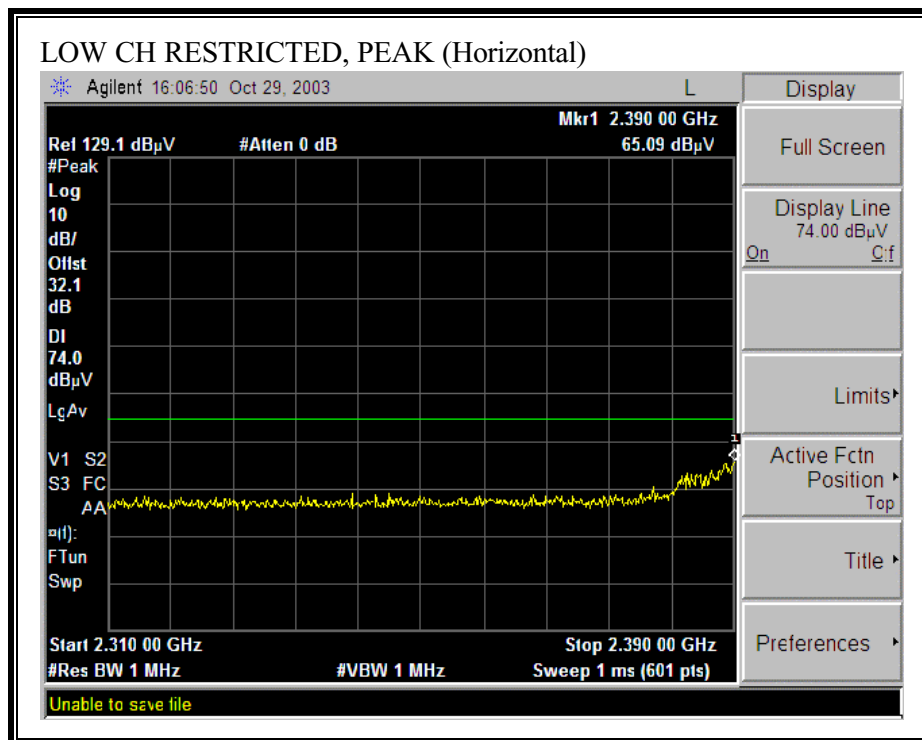
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

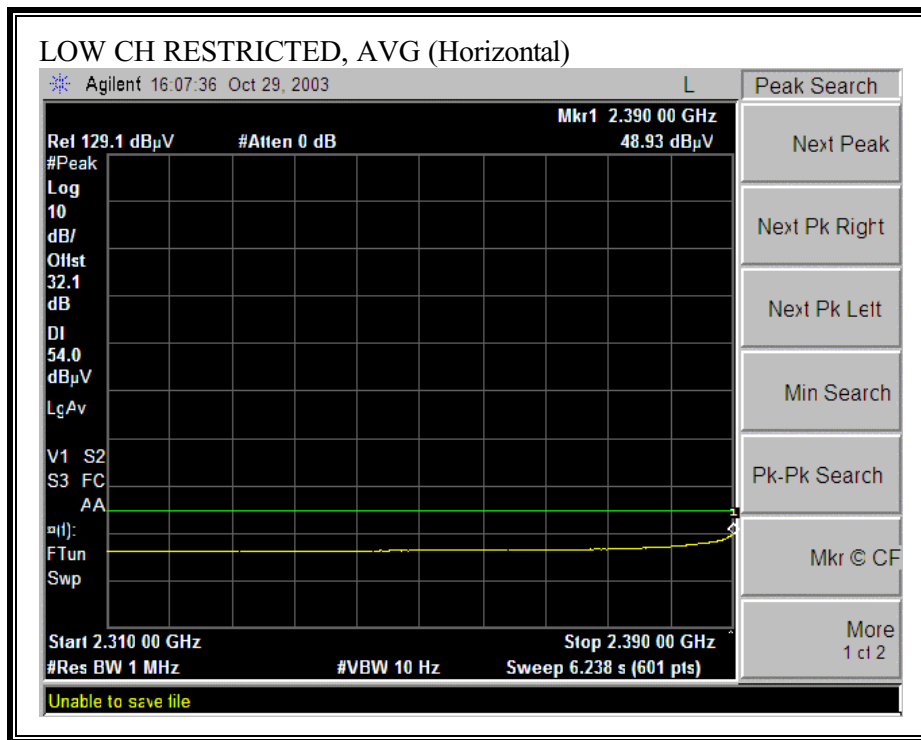
#### RESULTS

No non-compliance noted:

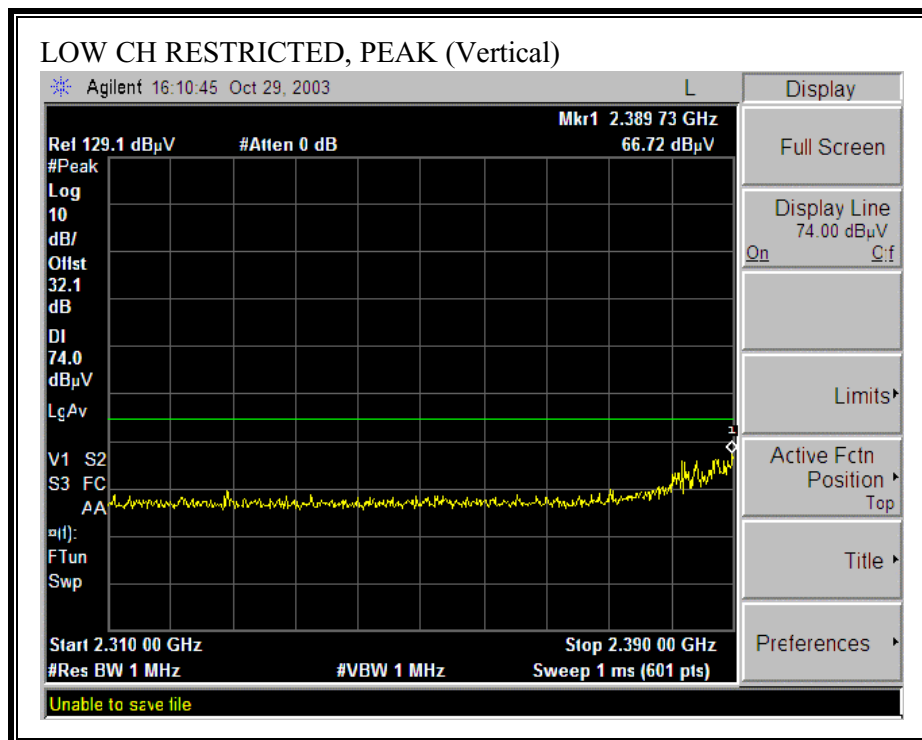
Dominant LAN is transmitted at high channel with non-dominant Bluetooth at high channel as investigated.

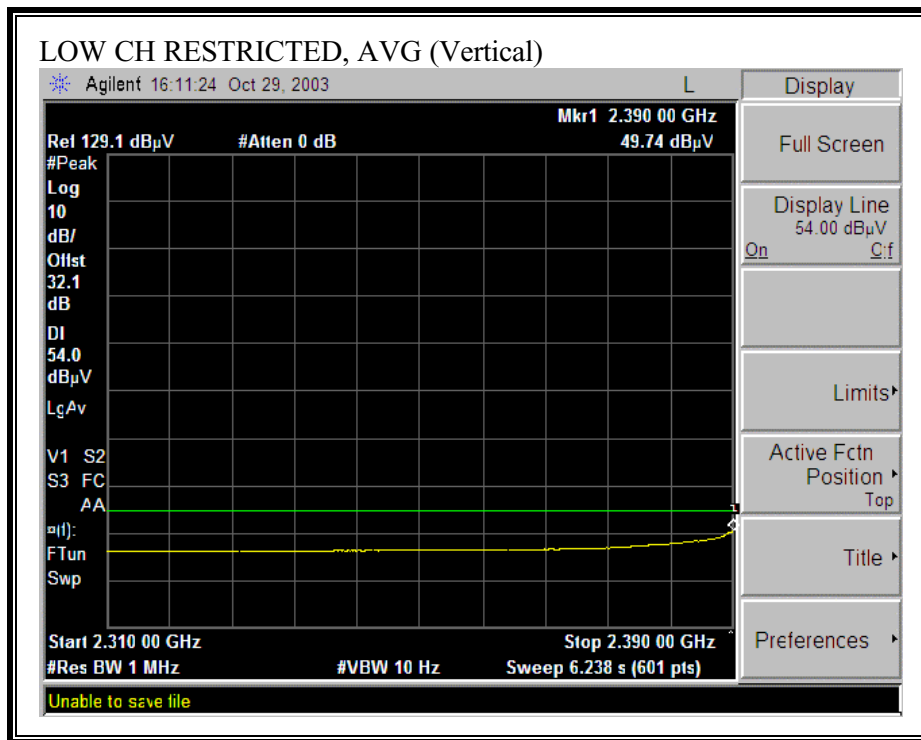
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



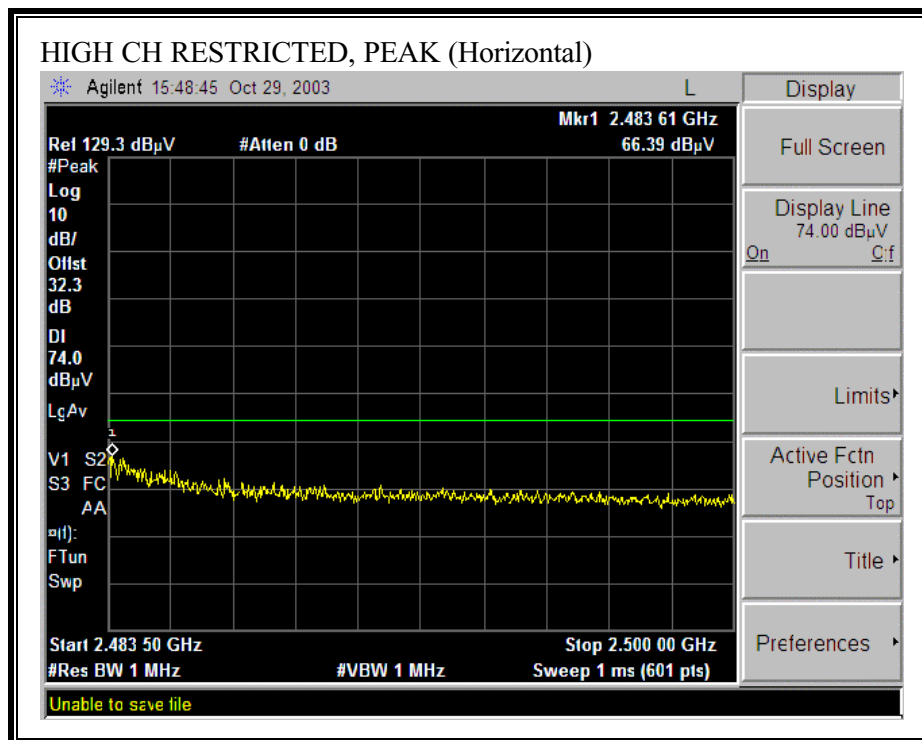


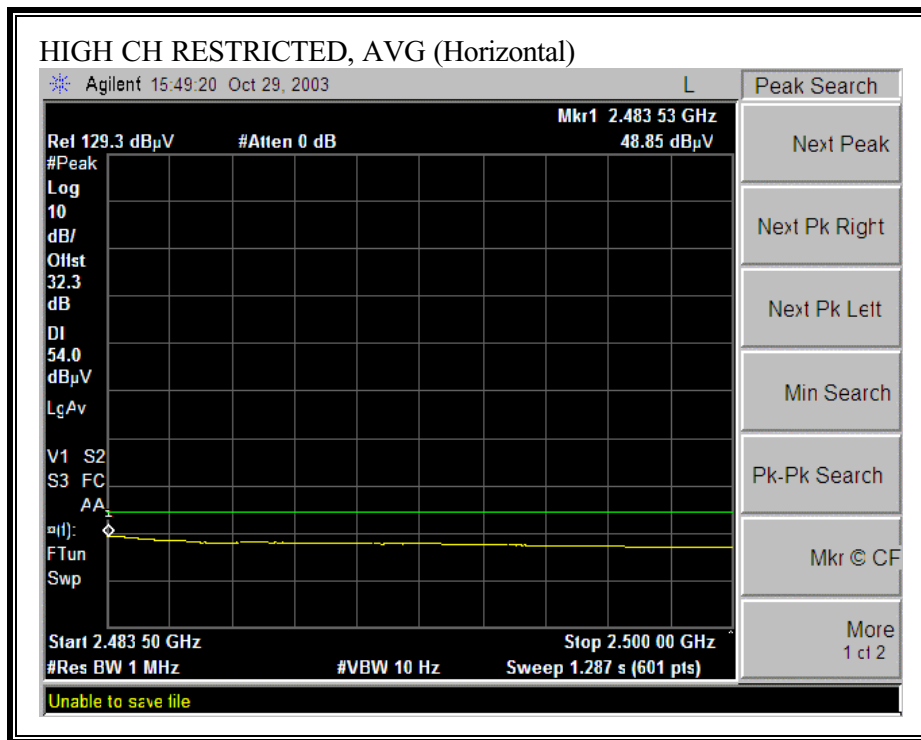
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



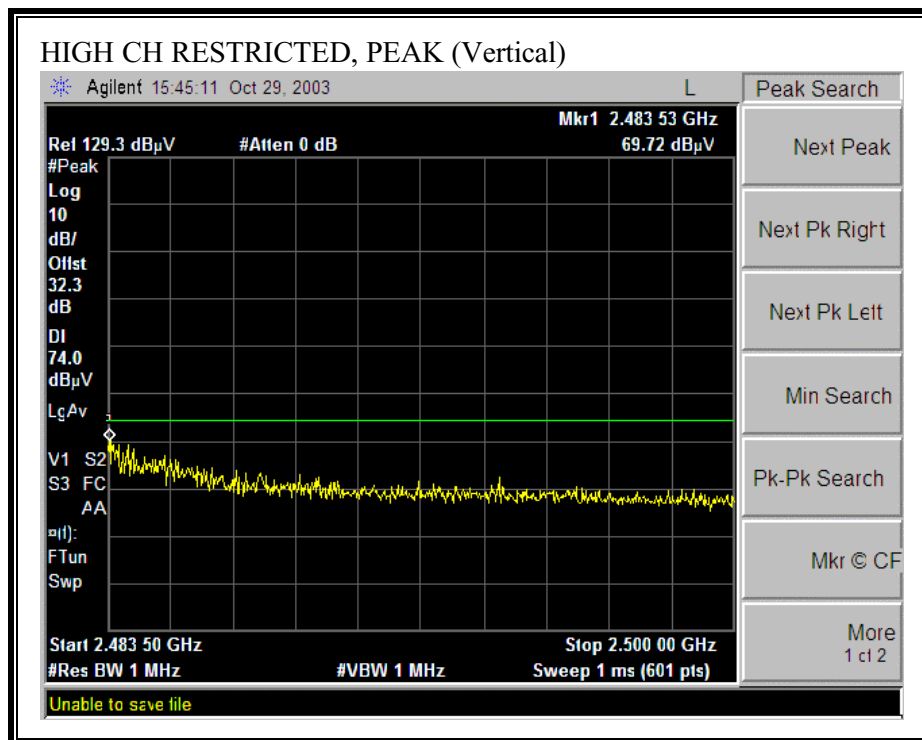


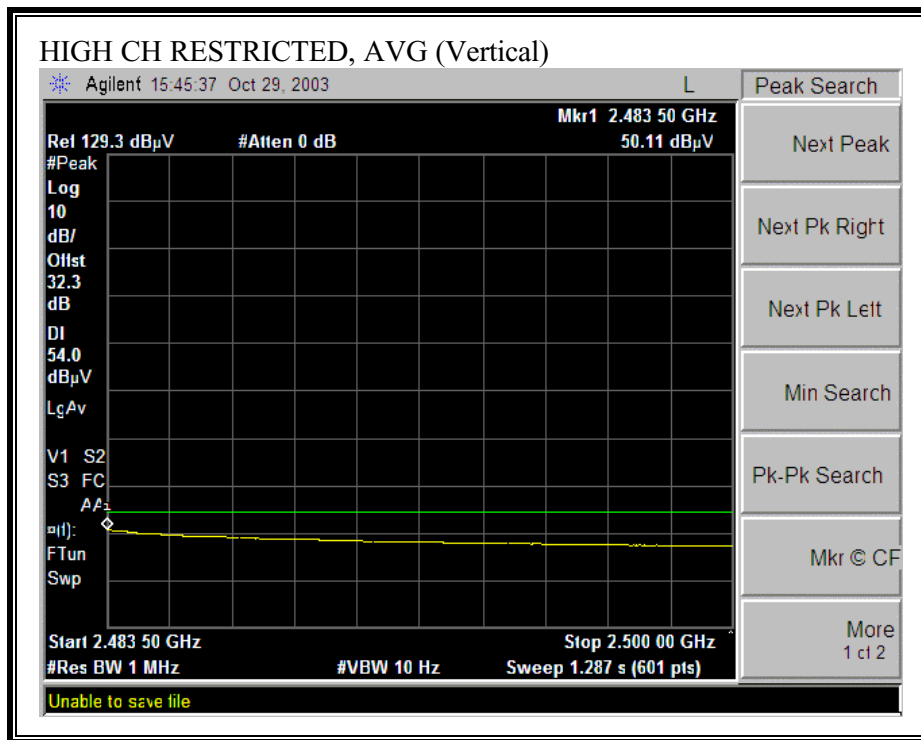
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





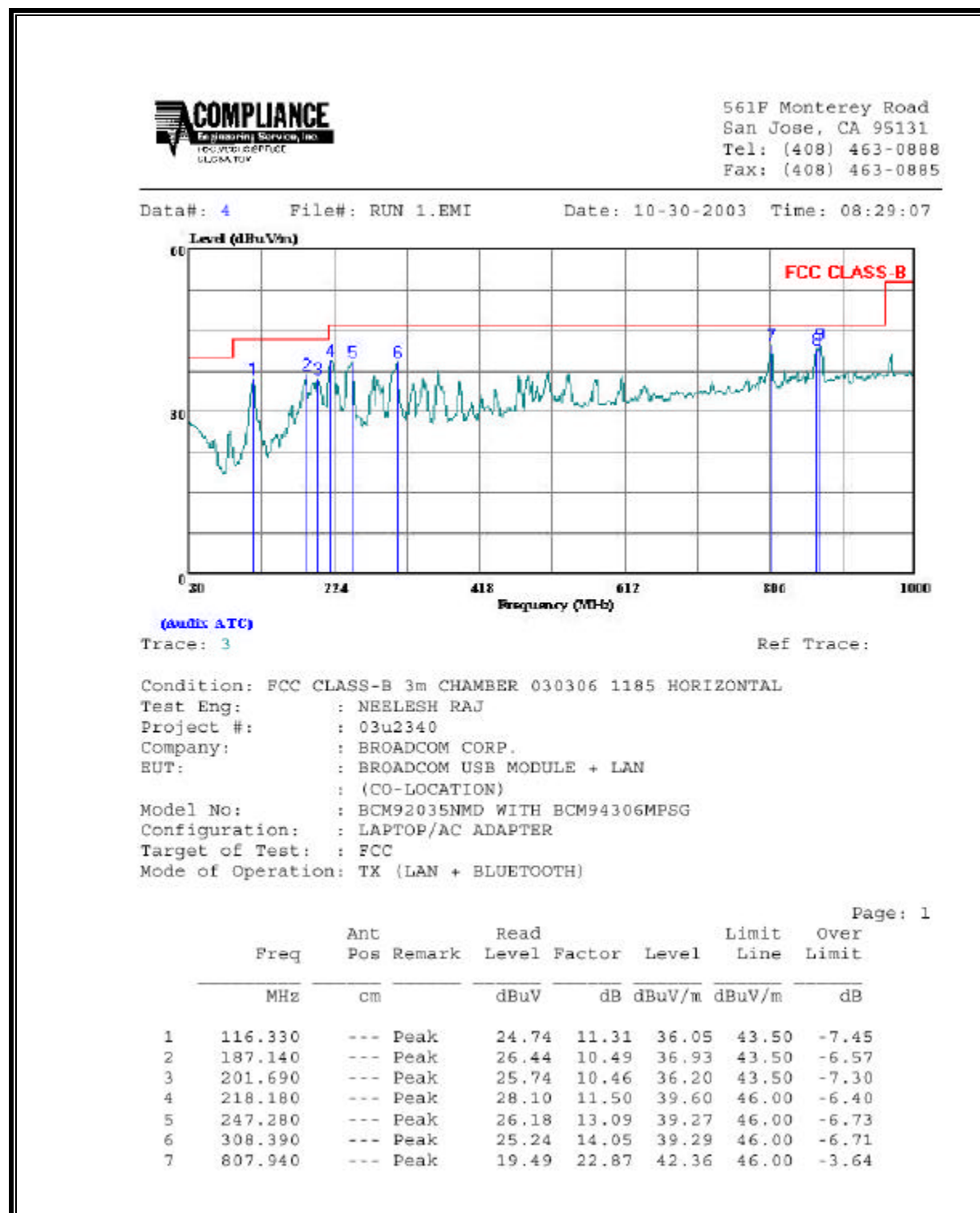
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**





[illegible]

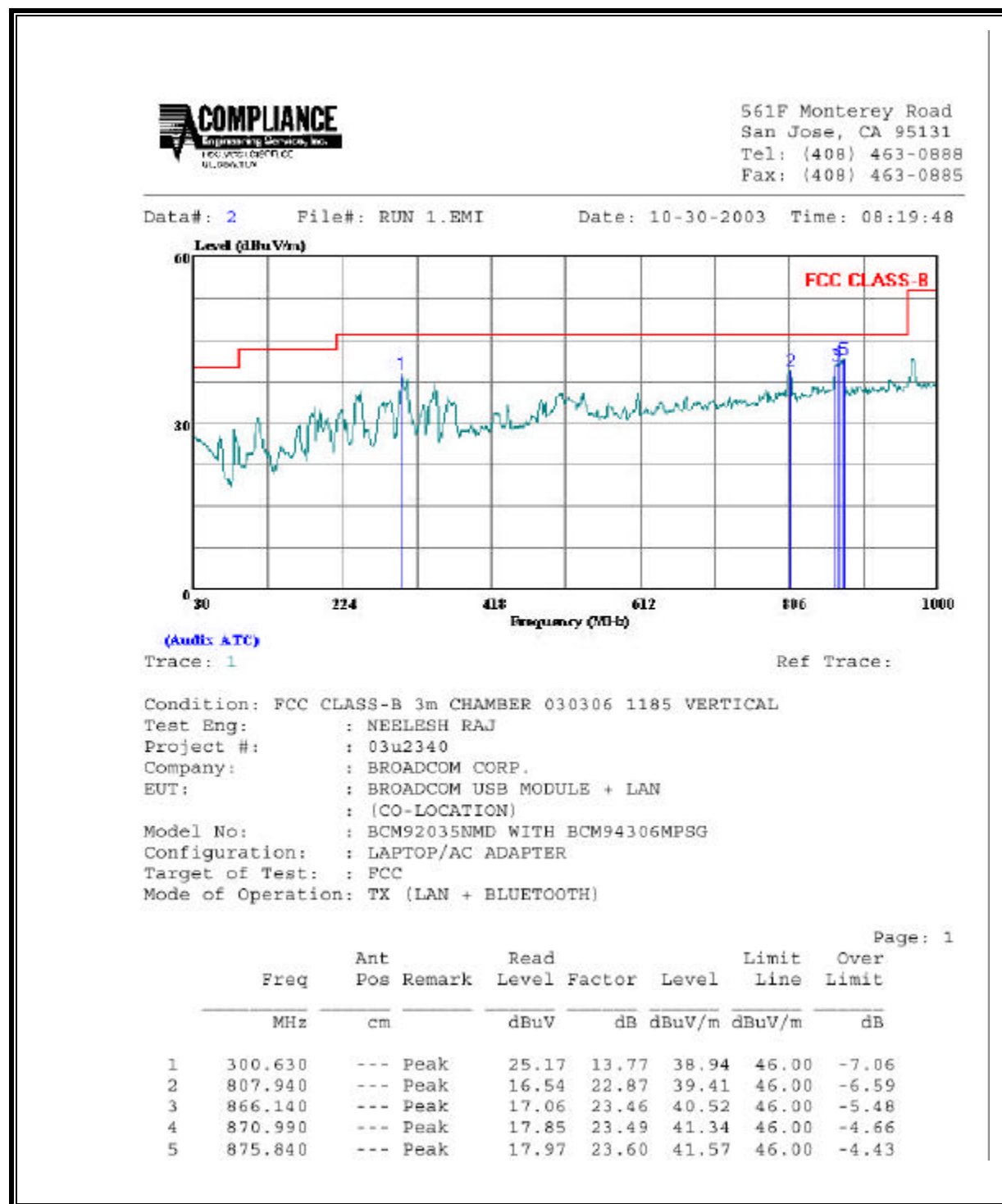
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)**



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

|   | Freq    | Ant<br>Pos | Remark | Read<br>Level | Factor | Level  | Limit<br>Line | Over<br>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)**



## **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.

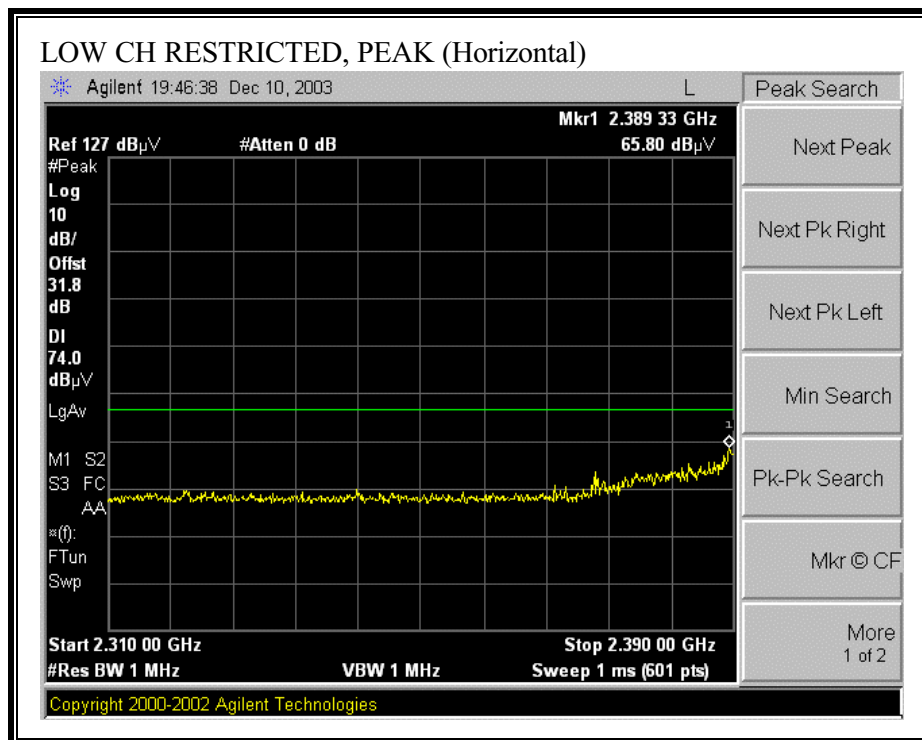
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

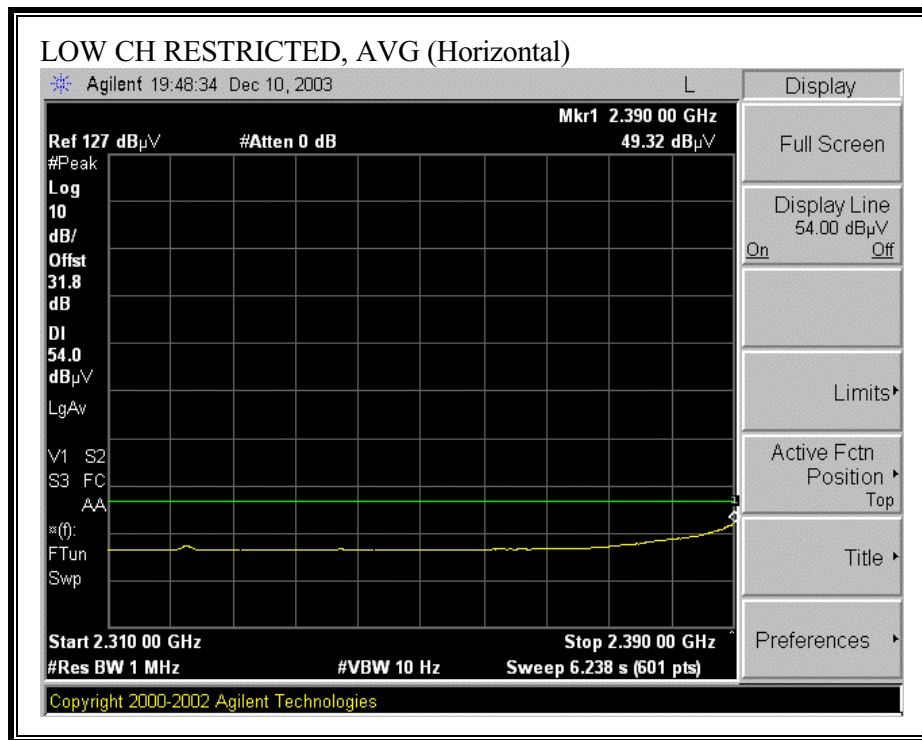
### **RESULTS**

No non-compliance noted:

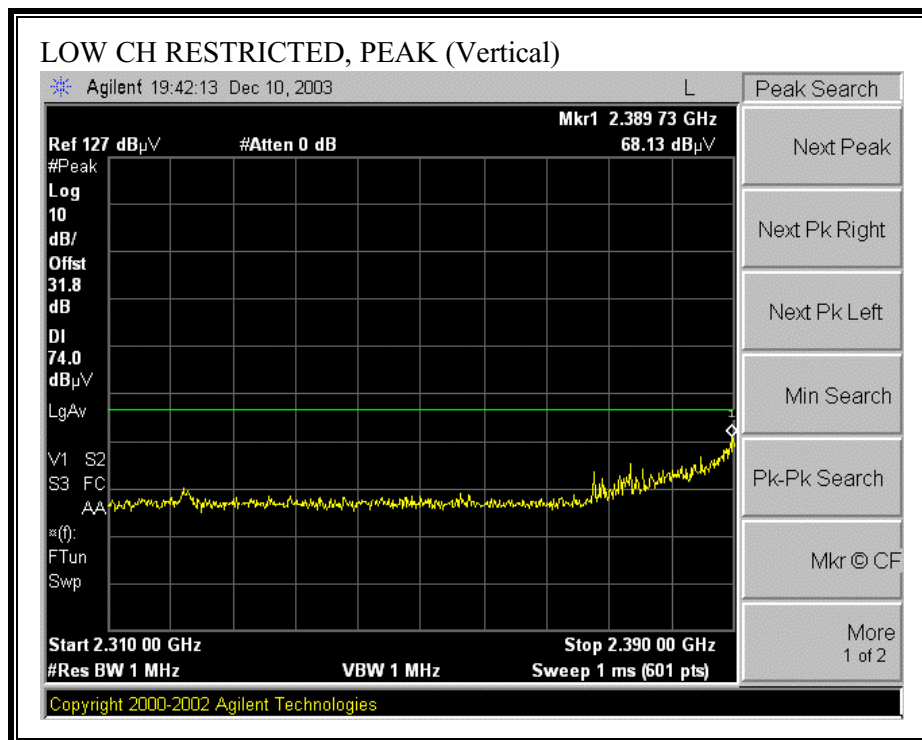
Dominant LAN is transmitted at high channel with non-dominant Bluetooth at high channel is investigated.

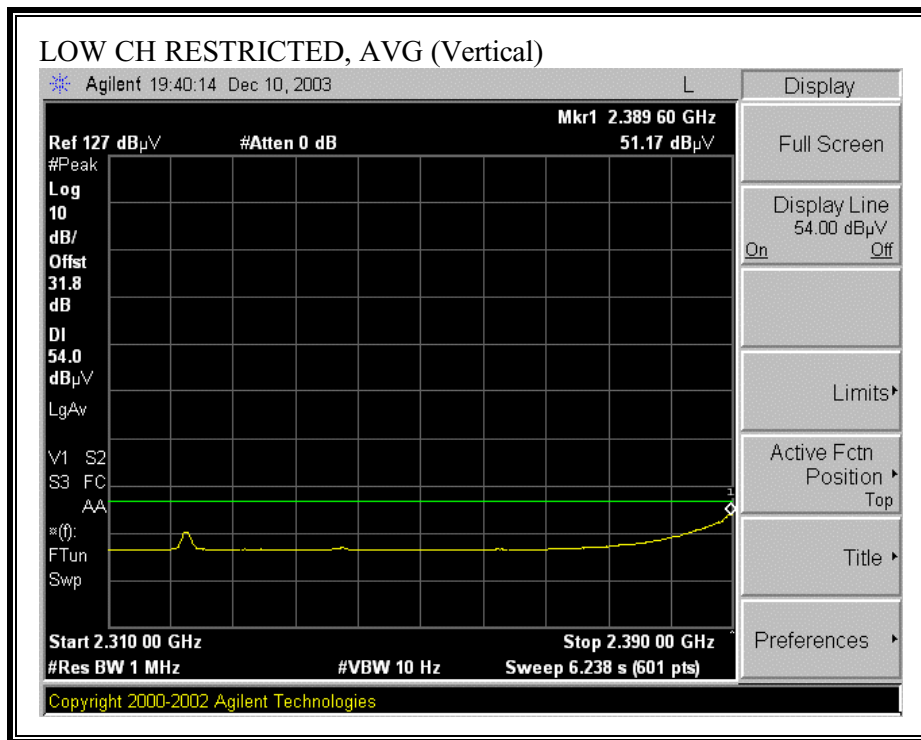
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



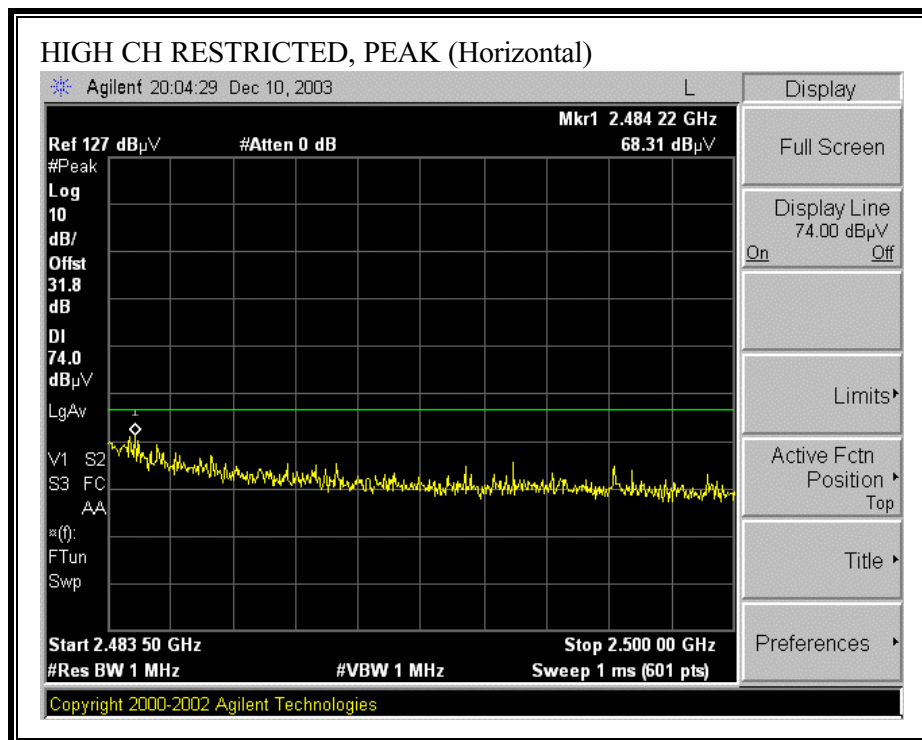


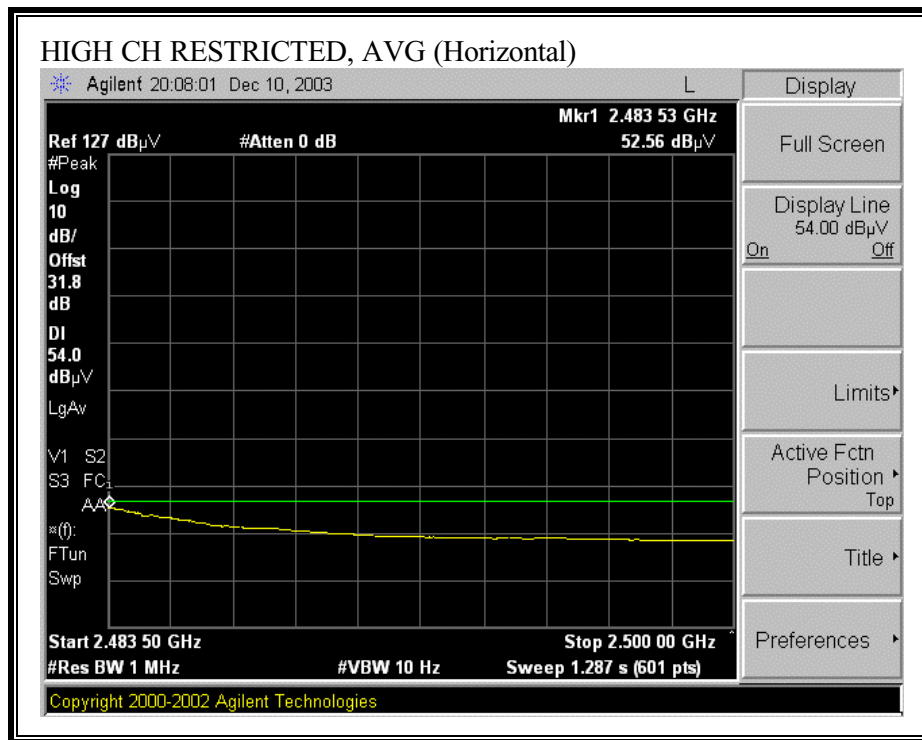
**WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



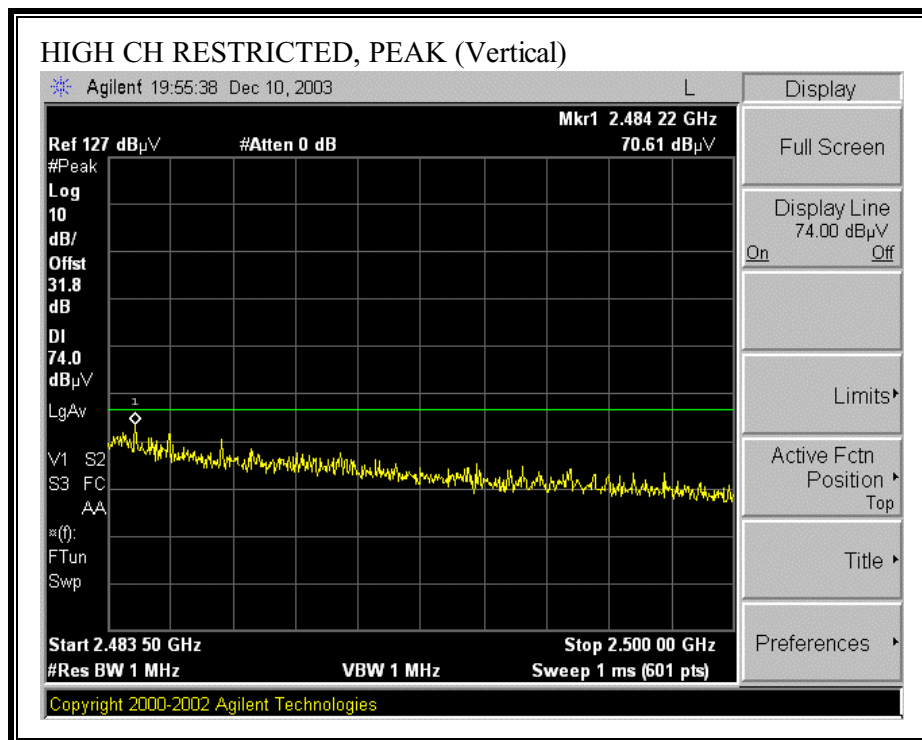


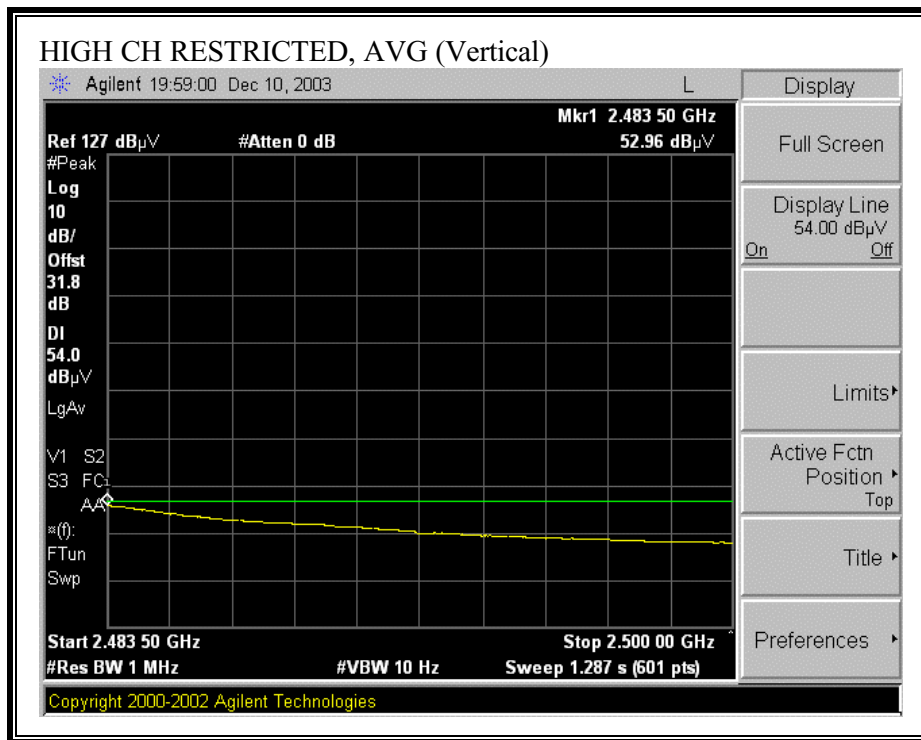
**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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

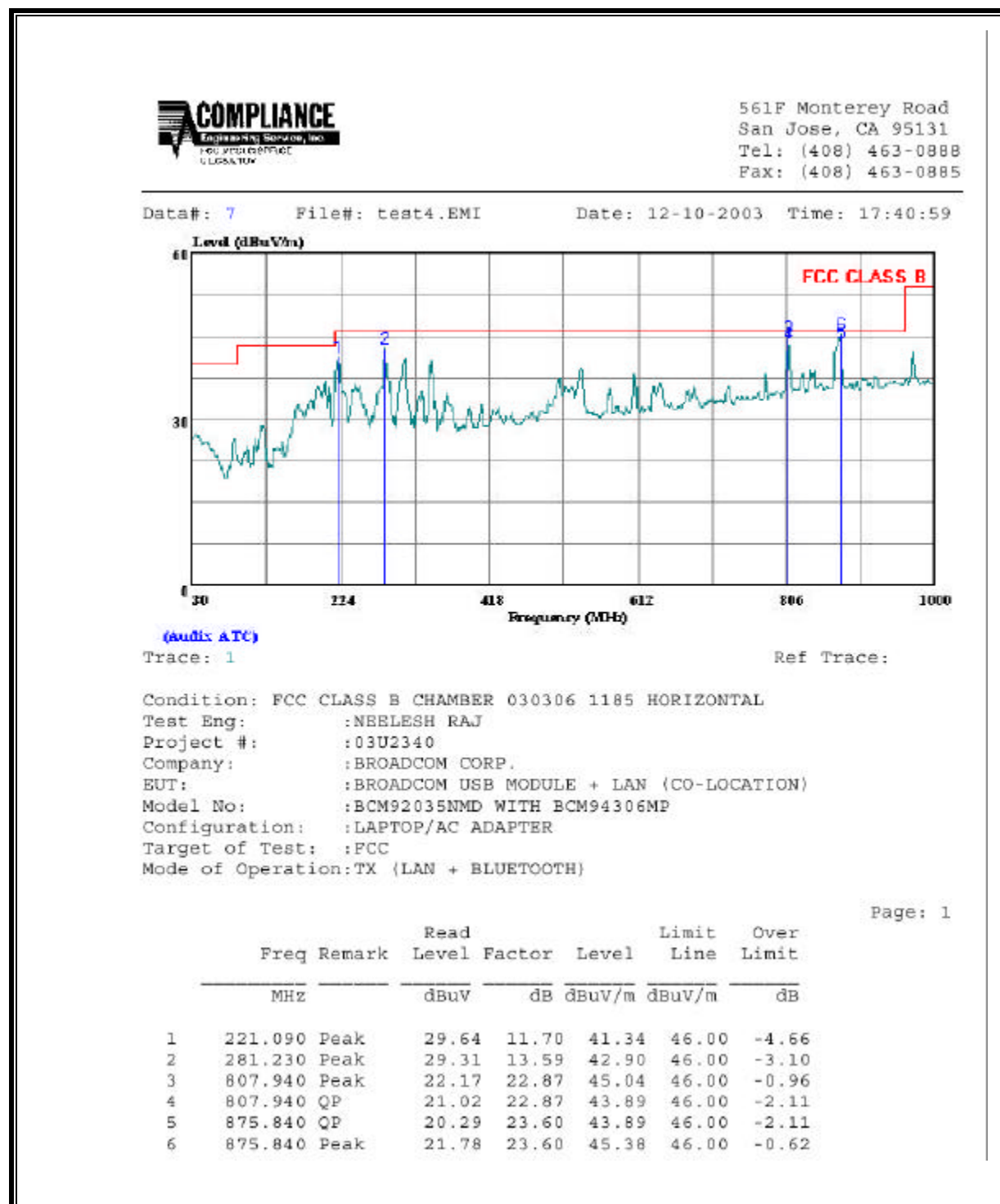




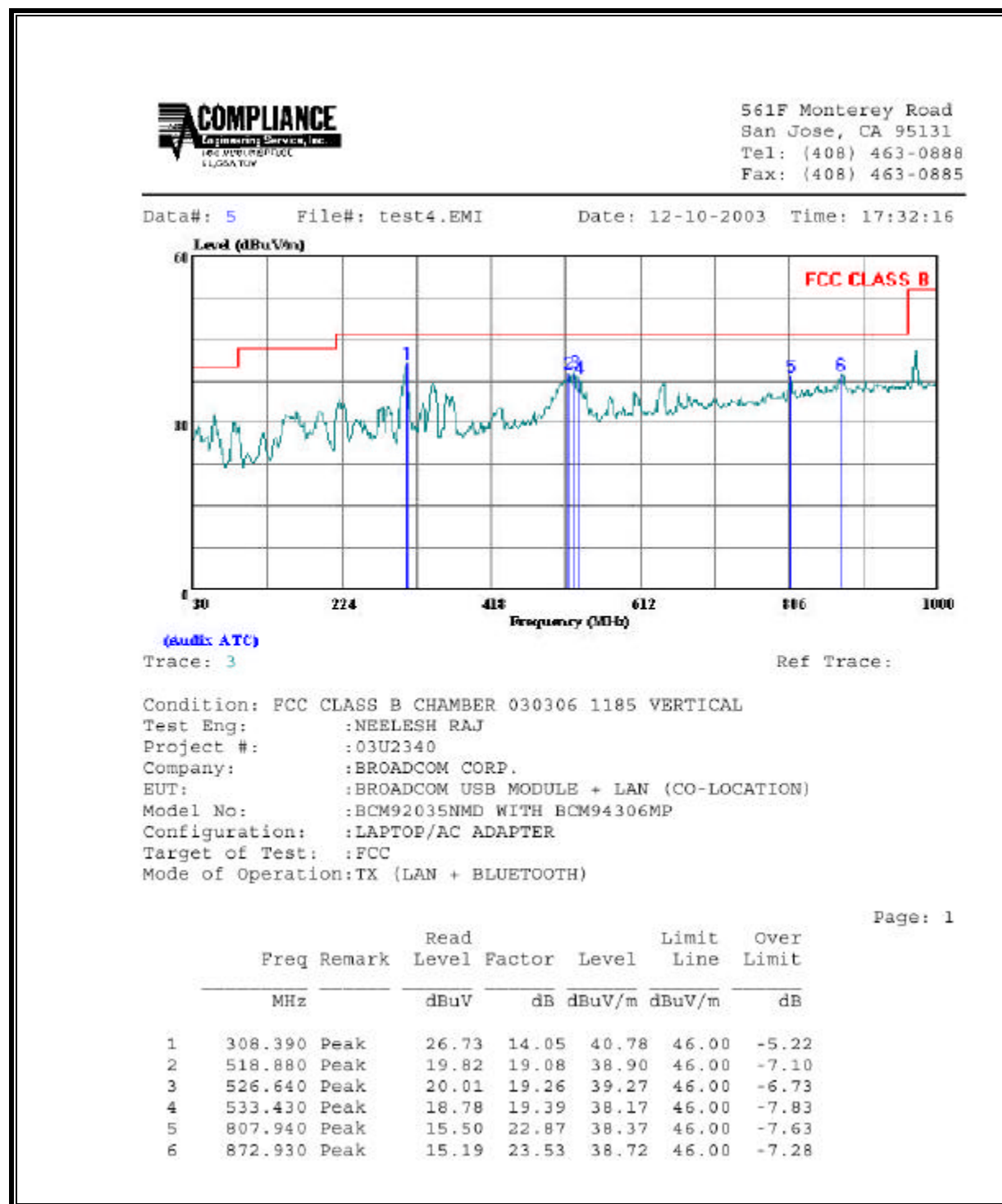
**WORST-CASE HARMONICS AND SPURIOUS EMISSIONS (ABOVE 1 GHz)**

| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |         |          | Pre-amplifier 1-26GHz |     |       |                                | Spectrum Analyzer       |        |        |         | Horn > 18GHz                |        |         |                 | Limit      |
| T73; S/N: 6717 @3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |         |          | T63 Miteq 646456      |     |       |                                | Agilent E4440A Analyzer |        |        |         | T87; ARA 18-26GHz; S/N:1049 |        |         |                 | FCC 15.205 |
| <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 45%;"> <p>Hi Frequency Cables</p> <div style="display: flex; gap: 10px;"> <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft) </div> </div> <div style="width: 50%;"> <p>Peak Measurements:      Average Measurements:</p> <div style="display: flex; justify-content: space-between;"> <div> 1 MHz Resolution Bandwidth<br/> 1 MHz Video Bandwidth </div> <div> 1 MHz Resolution Bandwidth<br/> 10 Hz Video Bandwidth </div> </div> </div> </div> |                  |         |          |                       |     |       |                                |                         |        |        |         |                             |        |         |                 |            |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Dist             | Read Pk | Read Avg | AF                    | CL  | Amp   | D Corr                         | HPF                     | Peak   | Avg    | Pk Lim  | Avg Lim                     | Pk Mar | Avg Mar | Notes           |            |
| GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | feet             | dBuV    | dBuV     | dB/m                  | dB  | dB    | dB                             |                         | dBuV/m | dBuV/m | dBuV/m  | dBuV/m                      | dB     | dB      |                 |            |
| BLUETOOTH-HIGH CHANNEL AND LAN-HIGH CHANNEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |         |          |                       |     |       |                                |                         |        |        |         |                             |        |         |                 |            |
| 4.924                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 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) |            |
| 4.924                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 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.

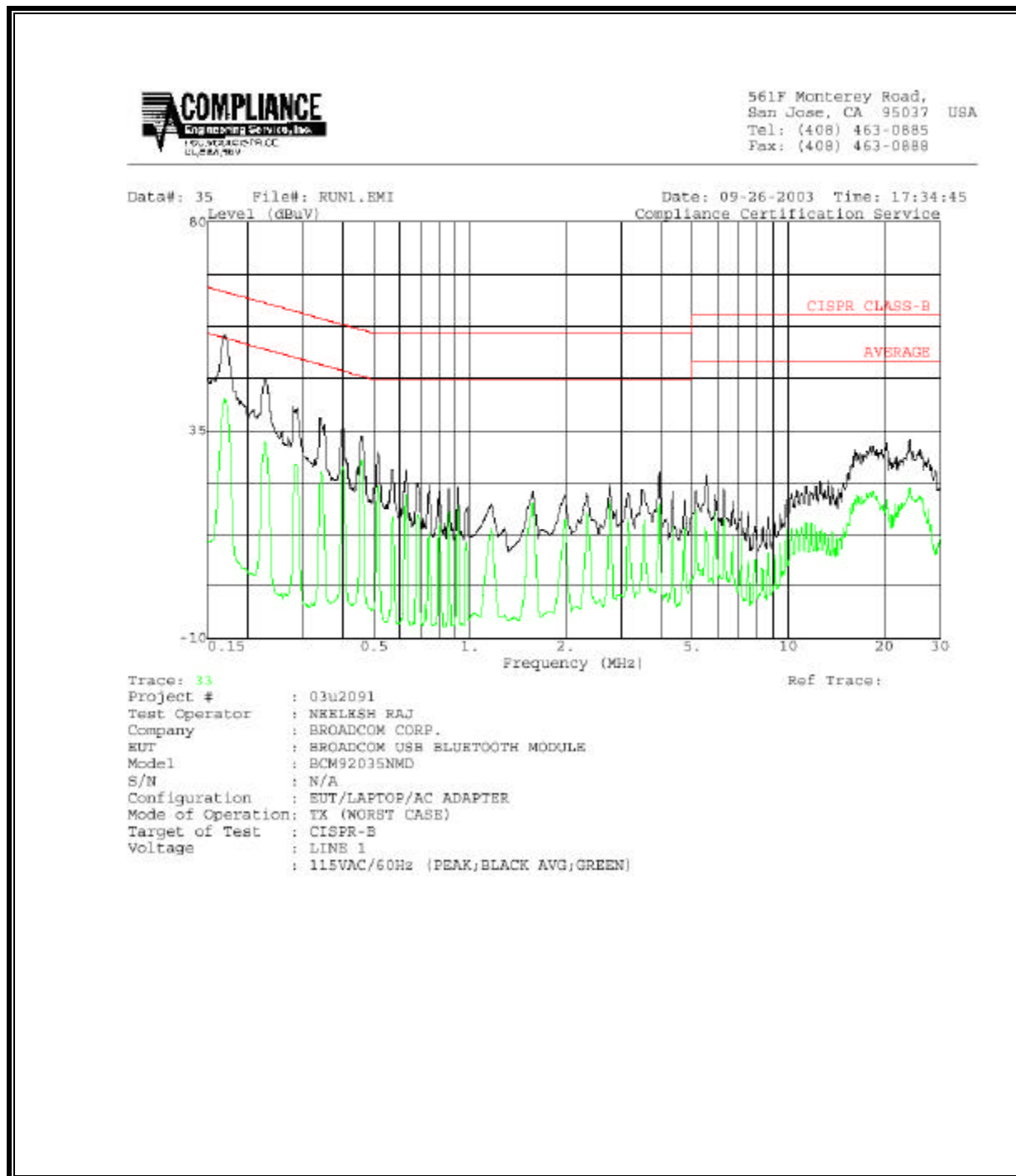
### RESULTS

No non-compliance noted:

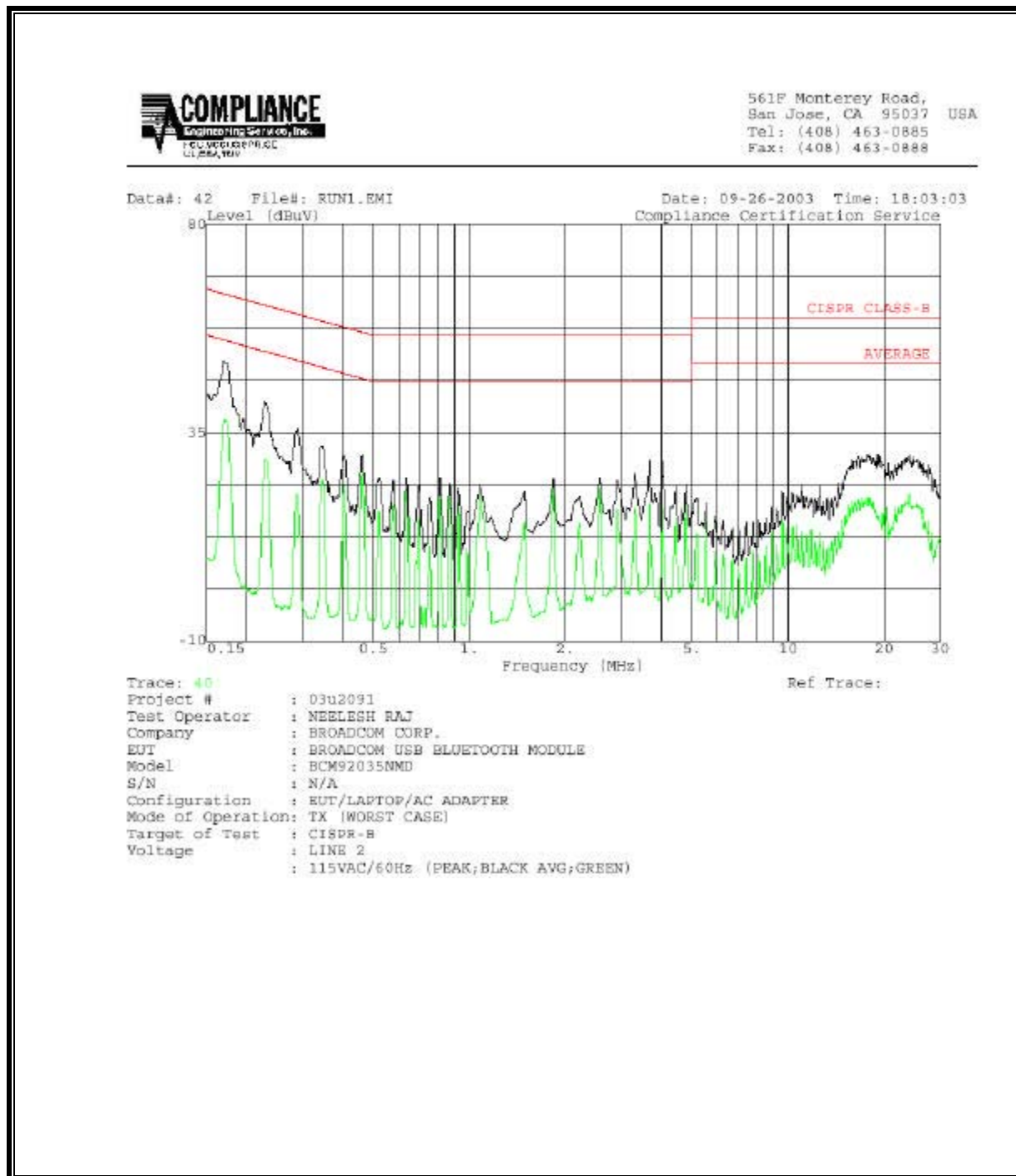
## 6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) |           |           |           |       |       |       |         |         |         |
|----------------------------------------|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq.                                  | Reading   |           |           | Closs | Limit | EN_B  | Margin  |         | Remark  |
| (MHz)                                  | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB)  | QP    | AV    | QP (dB) | AV (dB) | L1 / L2 |
| 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**

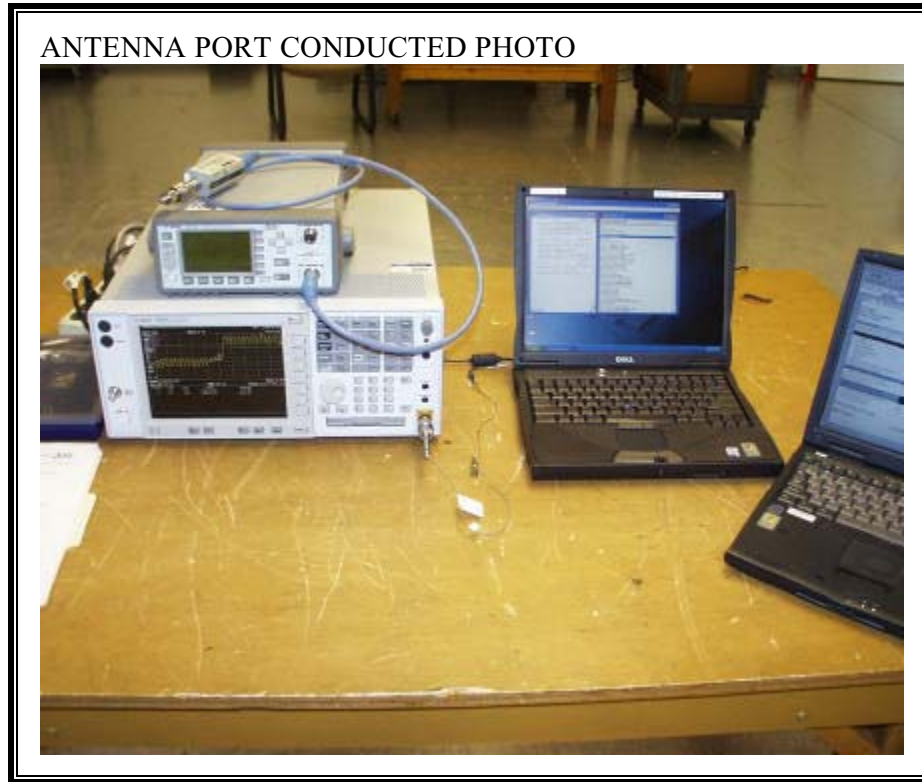


**LINE 2 RESULTS**

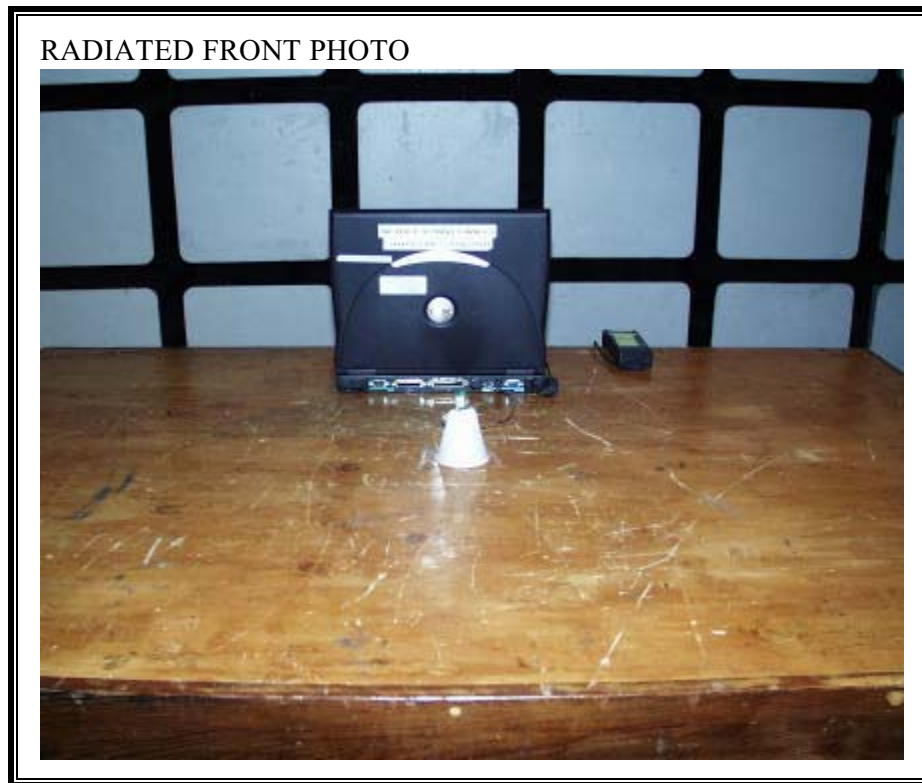


## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



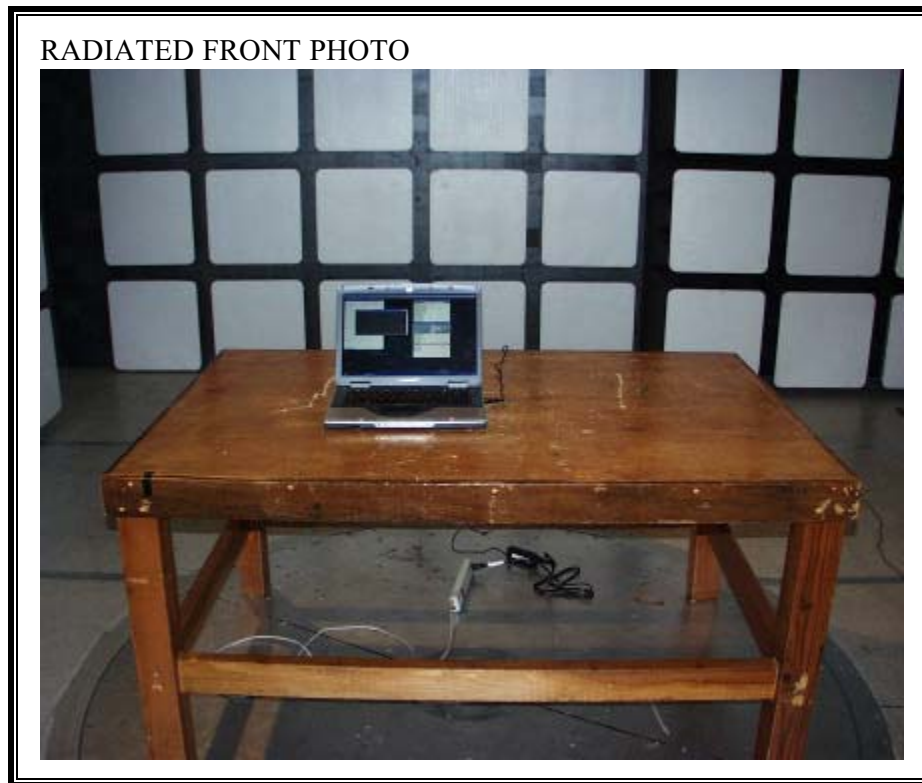
**RADIATED RF MEASUREMENT SETUP**



RADIATED BACK PHOTO



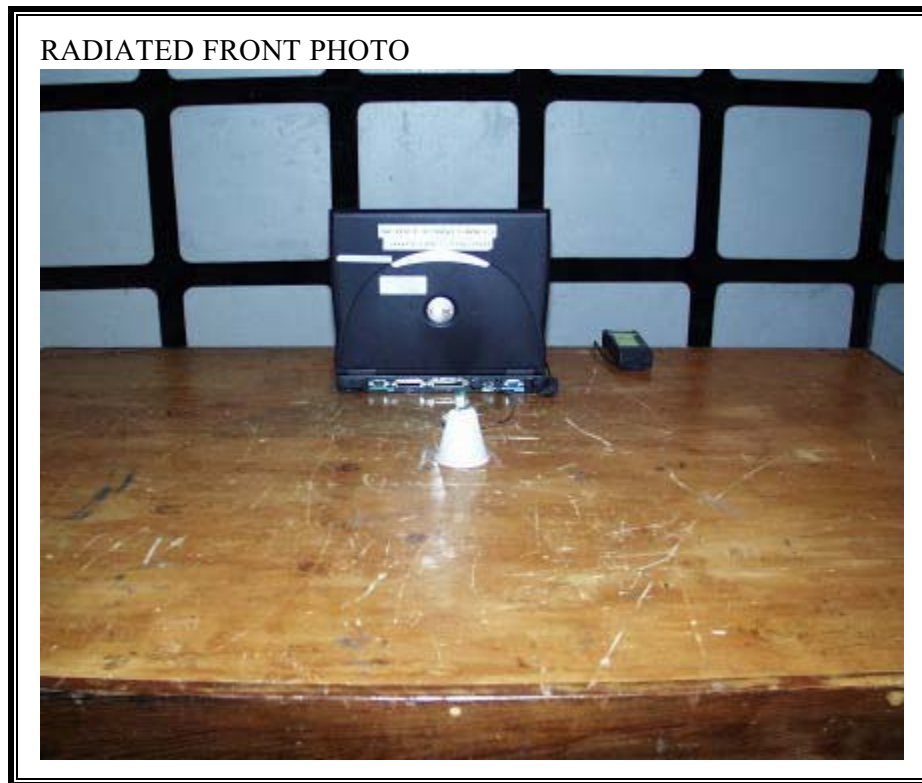
**CO-LOCATION RF MEASUREMENT SETUP**



RADIATED BACK PHOTO



**RADIATED EMISSIONS SETUP**



RADIATED BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



**END OF REPORT**