FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

BROADCOM USB BLUETOOTH DONGLE

MODEL NUMBER: BCM92035BTSD

FCC ID: QDS-BRCM1008

REPORT NUMBER: 03U2092-1

ISSUE DATE: AUGUST 27TH, 2003

Prepared for

BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CALIFORNIA 94086
U.S.A

Prepared by

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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 DONGLE

MODEL: BCM92035BTSD

DATE TESTED: JULY 31 – AUGUST 27, 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:

MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

NEELESH RAJ
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is a USB BLUETOOTH DONGLE operating in the 2400-2483.5 MHz range with 79 channels. The EUT has a peak output power of 2.78 dBm (1.9 mW) with an antenna gain of 2.8 dBi.

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

4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	ELA-171
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	IC2324 A,B,C, and F

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

5.2. MEASUREMENT UNCERTAINTY

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

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

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

5.3. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST

Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	837990	9/6/2003
Line Filter	Lindgren	LMF-3489	497	CNR
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2003
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/2004
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/2004
Power Sensor, 100 kHz ~ 4.2 GHz	HP	8482A	2349A08568	7/15/2004
Power Meter	HP	436A	2709A29209	7/15/2004
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	US42070220	1/13/2004
Antenna, Bicon/Log, 25 ~ 2000 MHz	ARA	LPB-2520/A	1185	3/6/2004
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/20/2003
10dB Attenuator	Weinschel	56-10	k16148	N/A
2.4-2.5 Reject Filter	Micro-Tronics	BRM50702	1	N/A

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
LAPTOP	DELL	PP01L	N/A	DoC
AC ADAPTER	DELL	AA20031	09364U16291-297	N/A

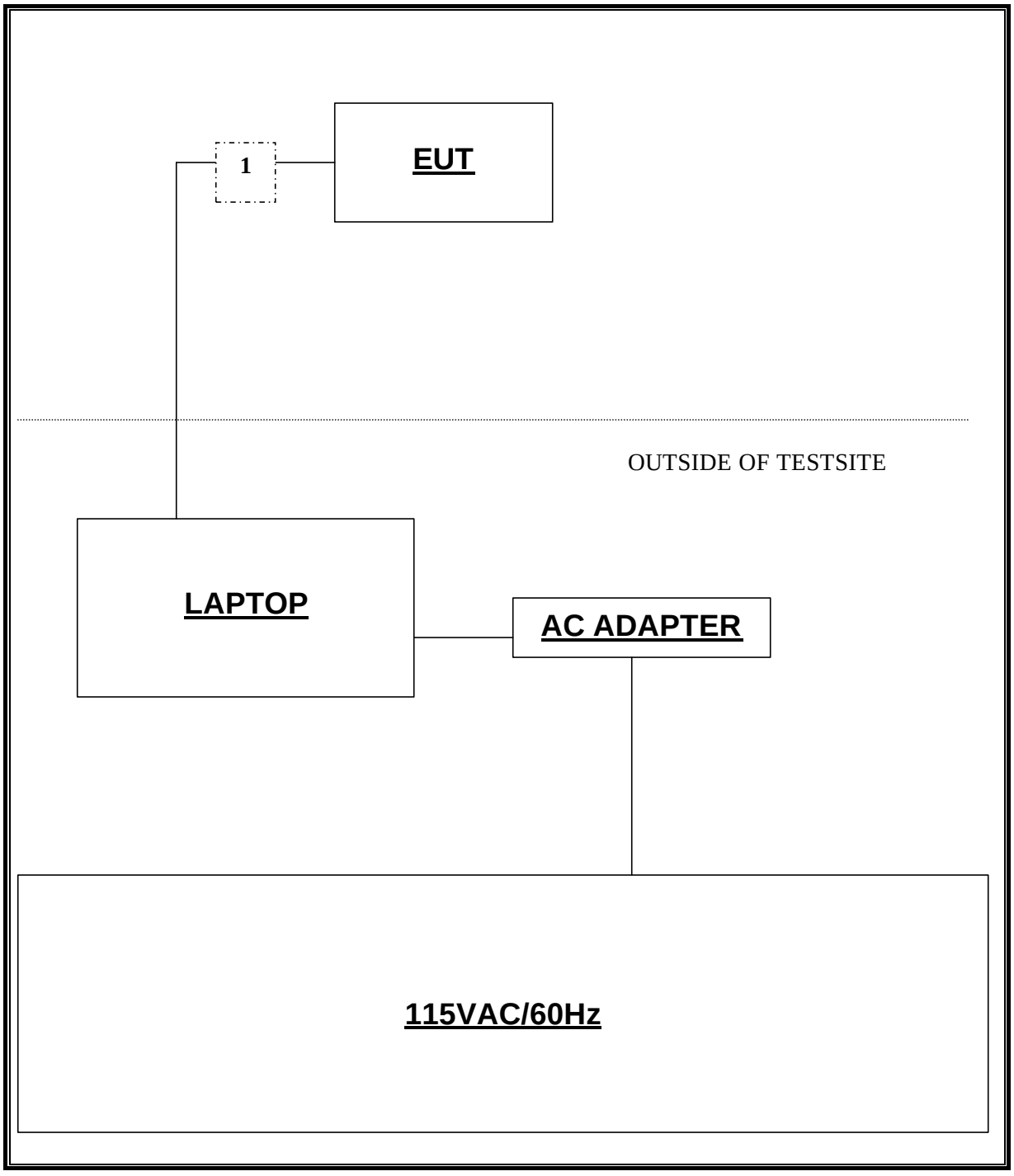
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	USB	1	USB	SHIELDED	1.86M	N/A

TEST SETUP

The EUT was connected to the laptop via its USB port. The EUT was tested at X, Y, and Z positions, Y axis was found to be the worst case. During the testing process the laptop and ac adapter were located under the table.

SETUP DIAGRAM



SETUP FOR DIGITAL DEVICE TESTS

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
LAPTOP	DELL	PP01L	N/A	DoC
AC ADAPTER	DELL	AA20031	09364U16291-297	N/A
MODEM	ACEEX	1414	9013537	IFAXDM1414
PRINTER	HP	N/A	N/A	N/A
AC/DC ADAPTER	ILSUNG ELECTRONICS	ISA-30509	N/A	N/A
AC/DC ADAPTER	N/A	FB13130	N/A	N/A

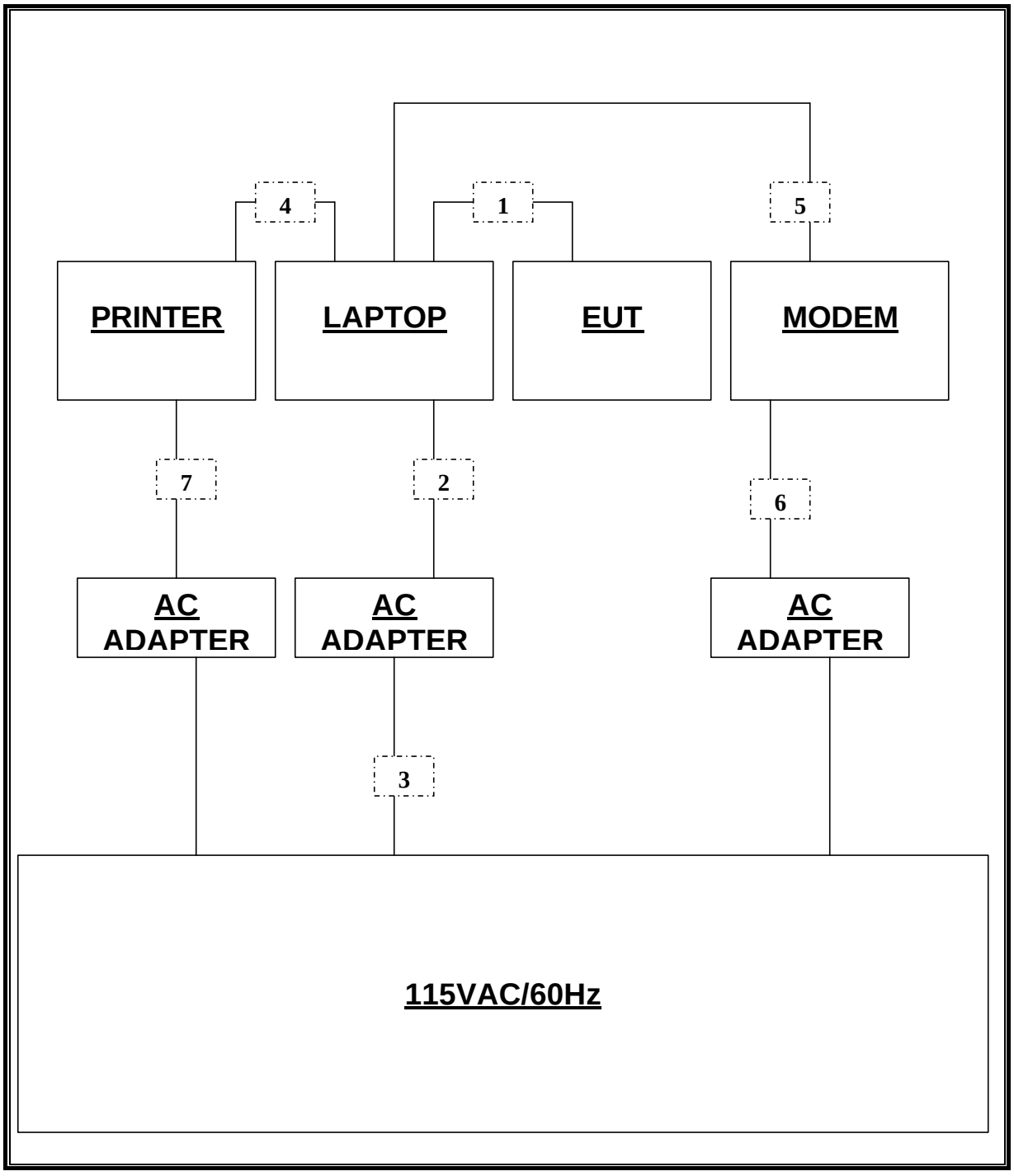
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	USB	1	USB	SHIELDED	1.86M	N/A
2	DC PWR	1	DC PWR	UNSHIELDED	1.86M	FERRITE LAPTOP END
3	AC PWR	1	AC PWR	UNSHIELDED	1.86M	N/A
4	PARALLEL	1	DB-25	SHIELDED	1.86M	FERRITE PRINTER END
5	SERIAL	1	DB-9	UNSHIELDED	1.86M	N/A
6 & 7	DC PWR	1	DC PWR	UNSHIELDED	1.86M	N/A

TEST SETUP

The EUT was connected to the laptop via its USB port. The EUT was tested at X, Y, and Z positions, Y axis was found to be the worst case.

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	935
Middle	2441	940
High	2480	935

20 DB BANDWIDTH

20 DB BANDWIDTH LOW CH

20 DB BANDWIDTH MID CH

20 DB BANDWIDTH HIGH CH

7.2. PEAK OUTPUT POWER

PEAK POWER LIMIT

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

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

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

The maximum antenna gain is 2.8 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

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

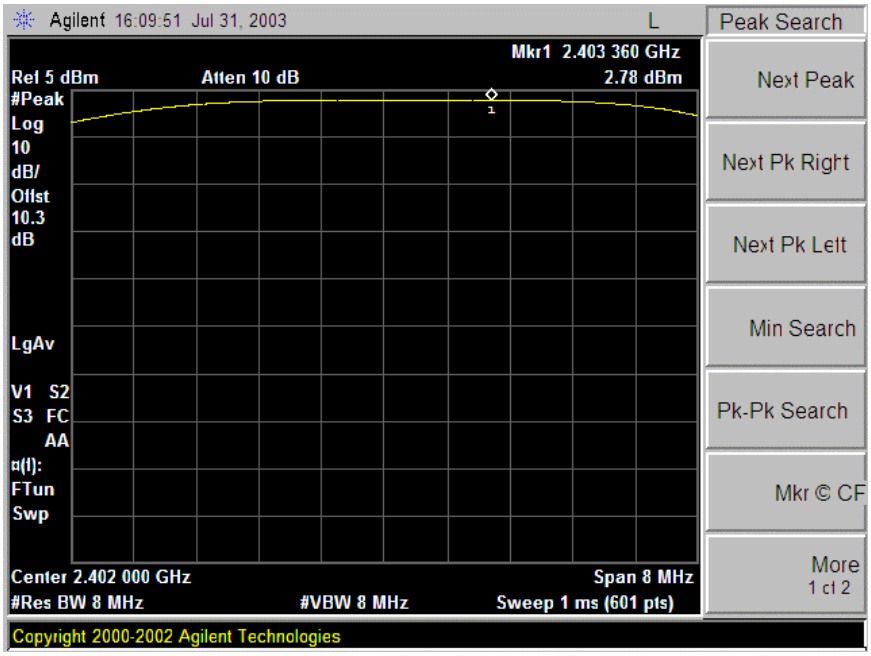
RESULTS

No non-compliance noted:

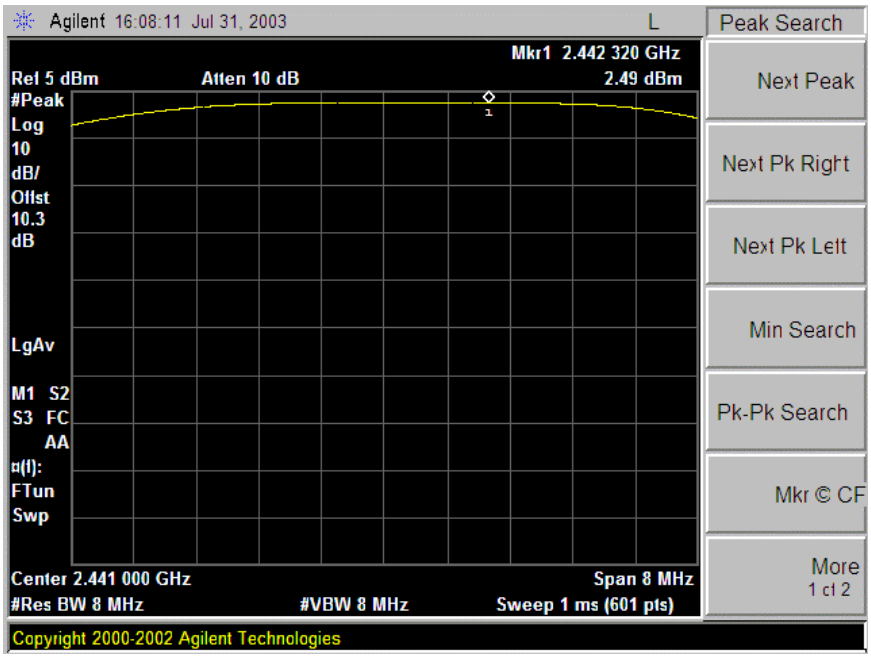
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.78	30	-27.22
Middle	2441	2.49	30	-27.51
High	2480	2.03	30	-27.97

OUTPUT POWER

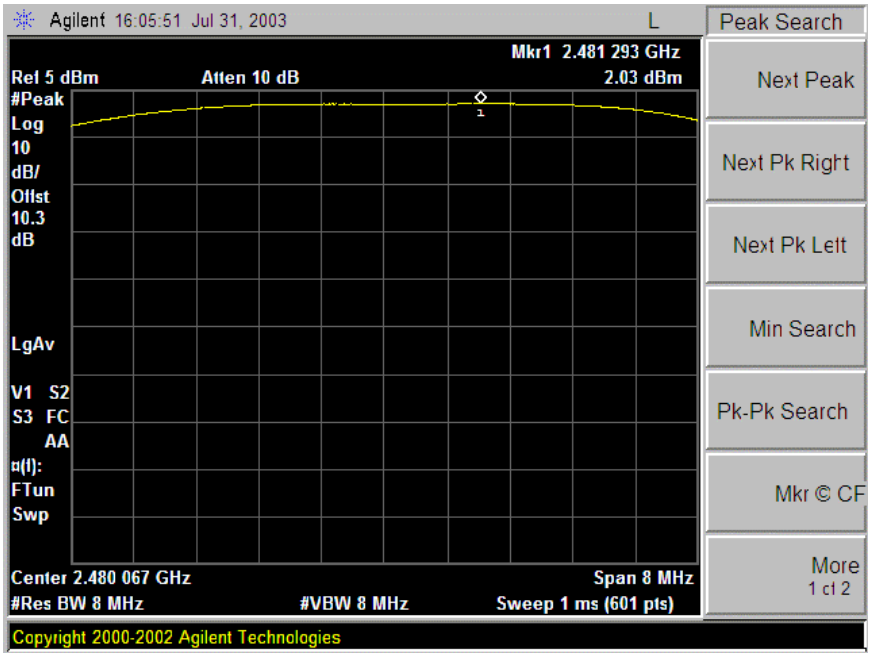
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.3. 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

$S = E \wedge 2 / 3770$

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 (mW) = P (W) / 1000 and
d (cm) =100 * d (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^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and

G (numeric) = 10 ^ (G (dBi) / 10)

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW / cm^2

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

LIMITS

S = 1.0 mW / cm^2 from 1.1310 Table 1

RESULTS

No non-compliance noted:

Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1.0	2.78	2.80	0.54

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.

7.4. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.38
Middle	2441	2.18
High	2480	1.83

7.5. 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.

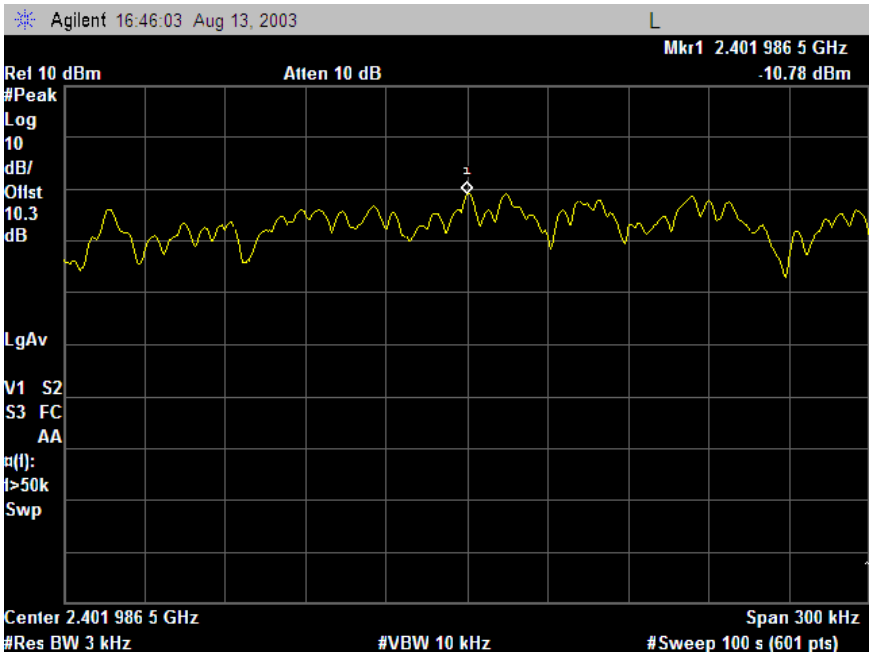
RESULTS

No non-compliance noted:

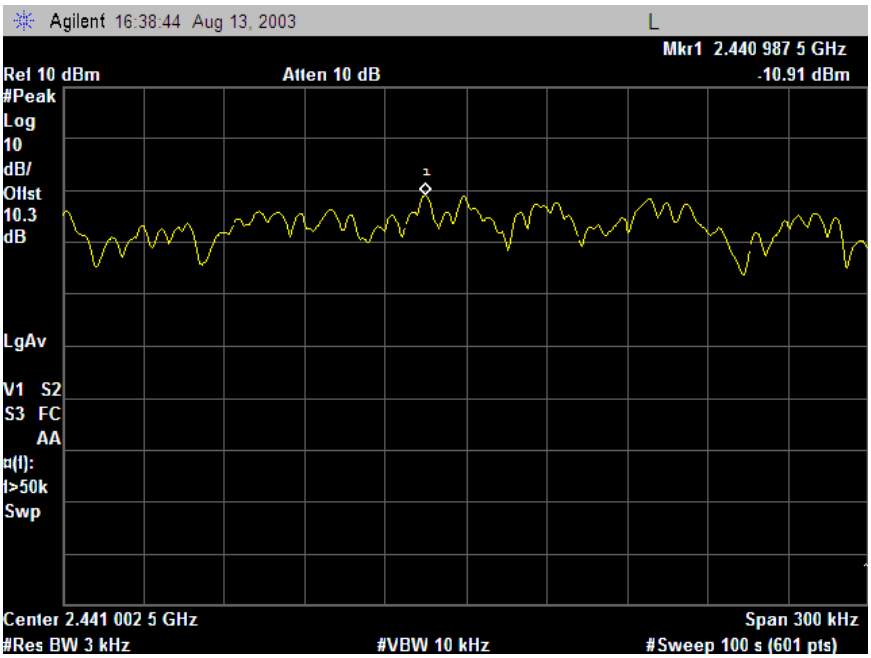
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.78	8	-18.78
Middle	2441	-10.91	8	-18.91
High	2480	-11.07	8	-19.07

PEAK POWER SPECTRAL DENSITY

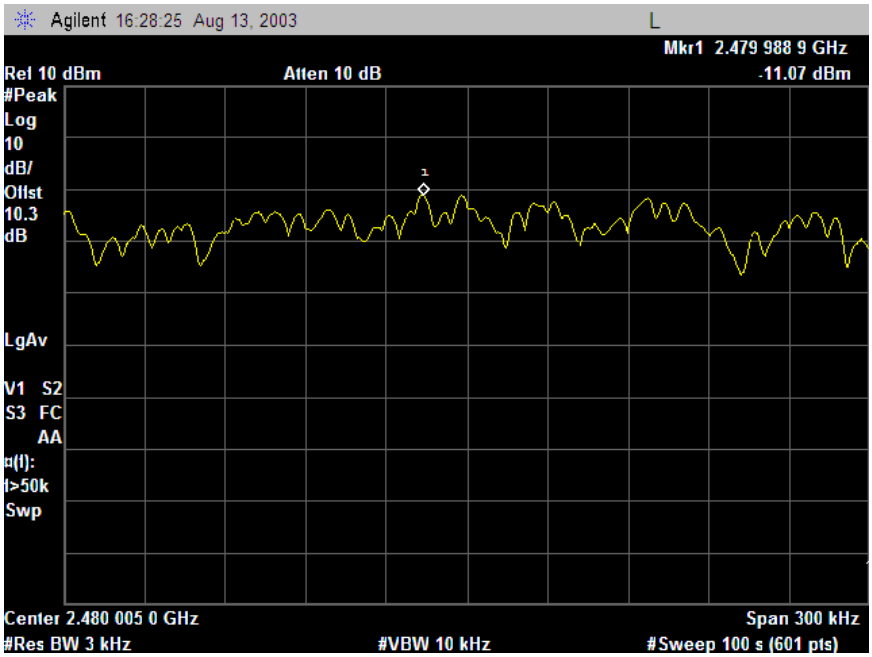
PPSD LOW CH



PPSD MID CH



PPSD HIGH CH



7.6. 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.

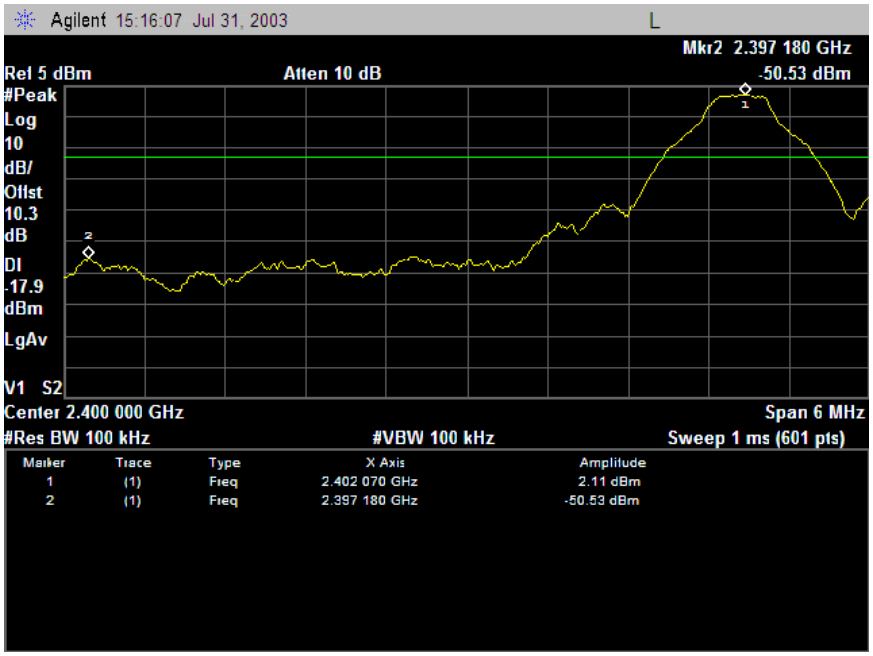
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

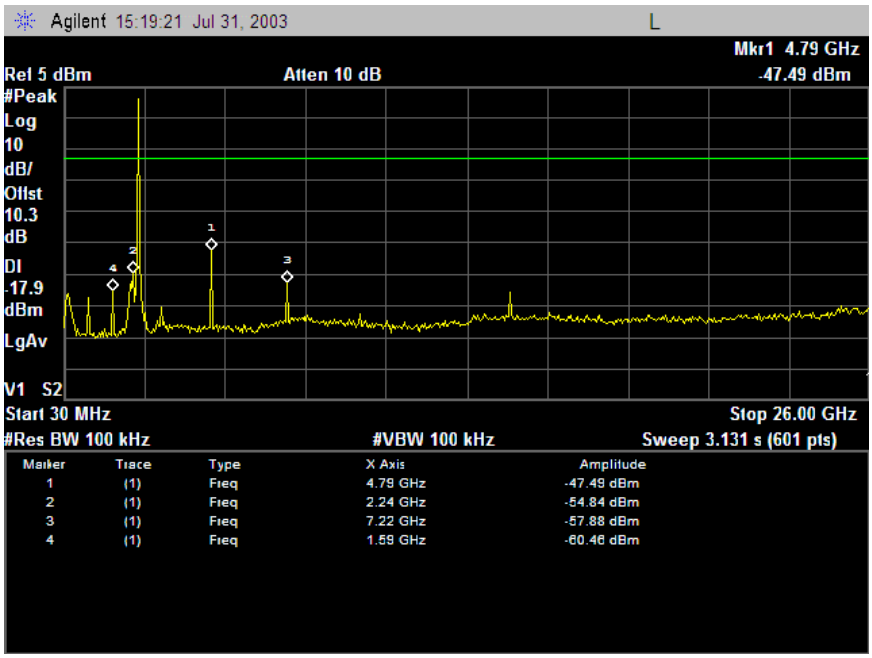
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

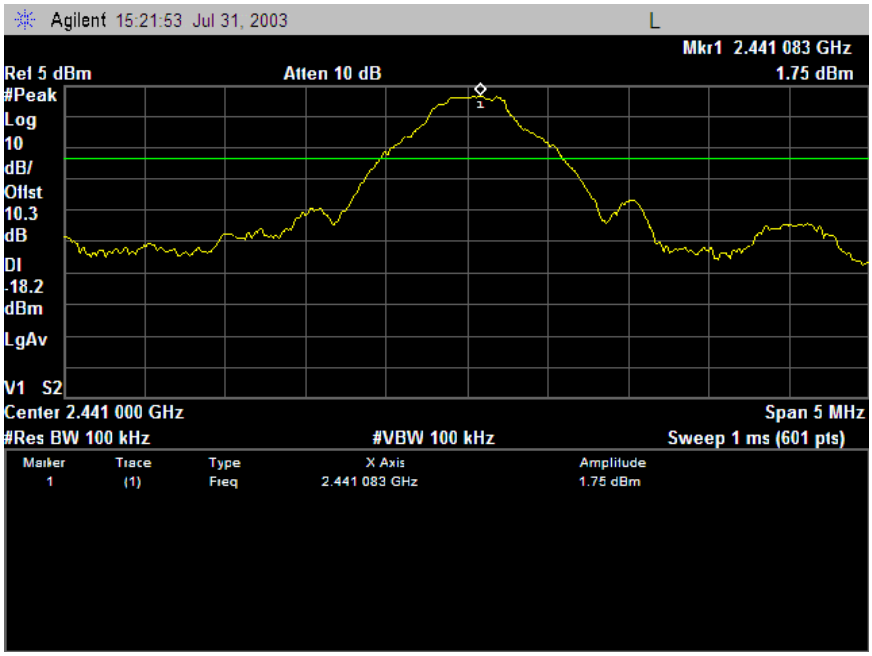


LOW CHANNEL SPURIOUS

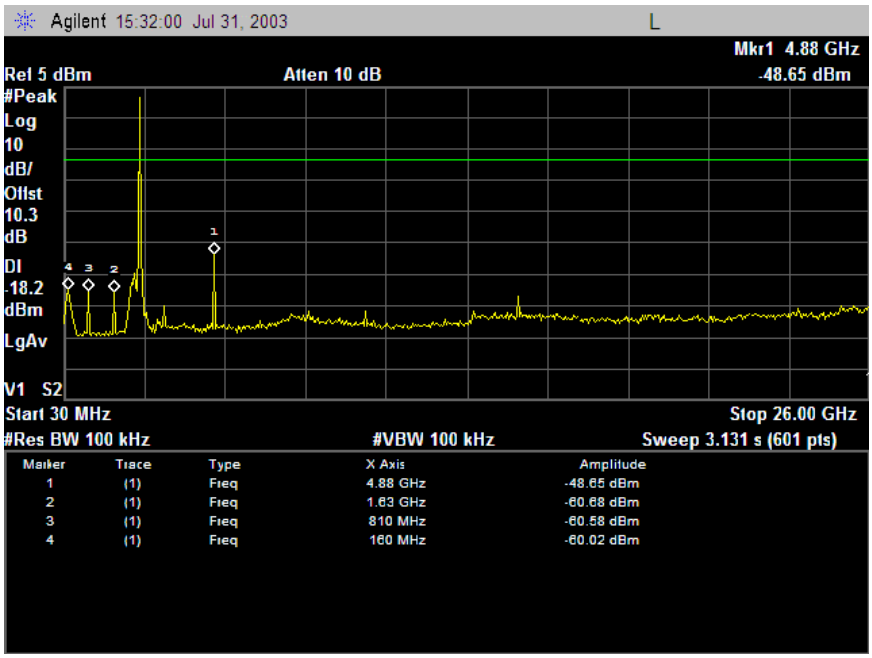


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

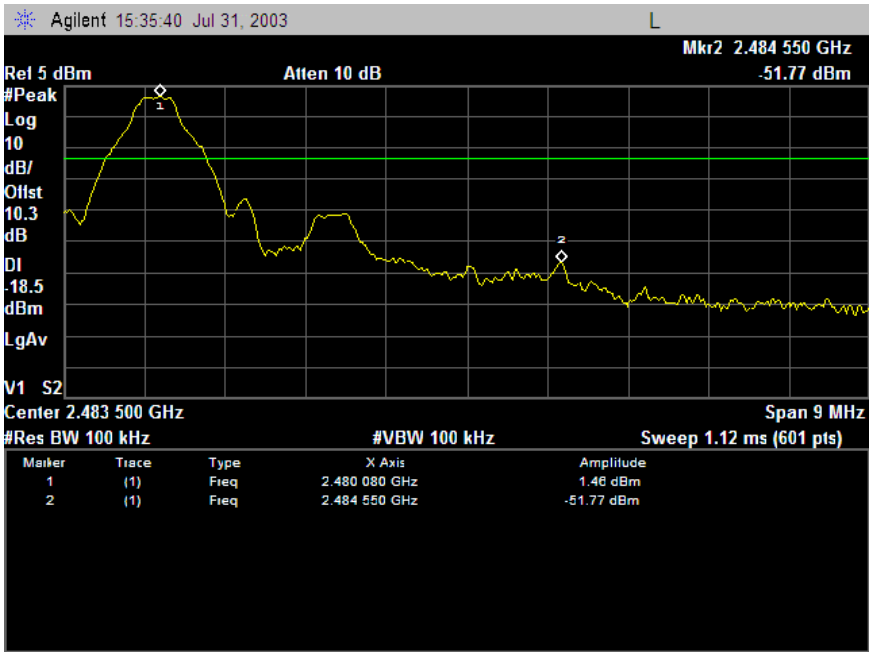


MID CHANNEL SPURIOUS

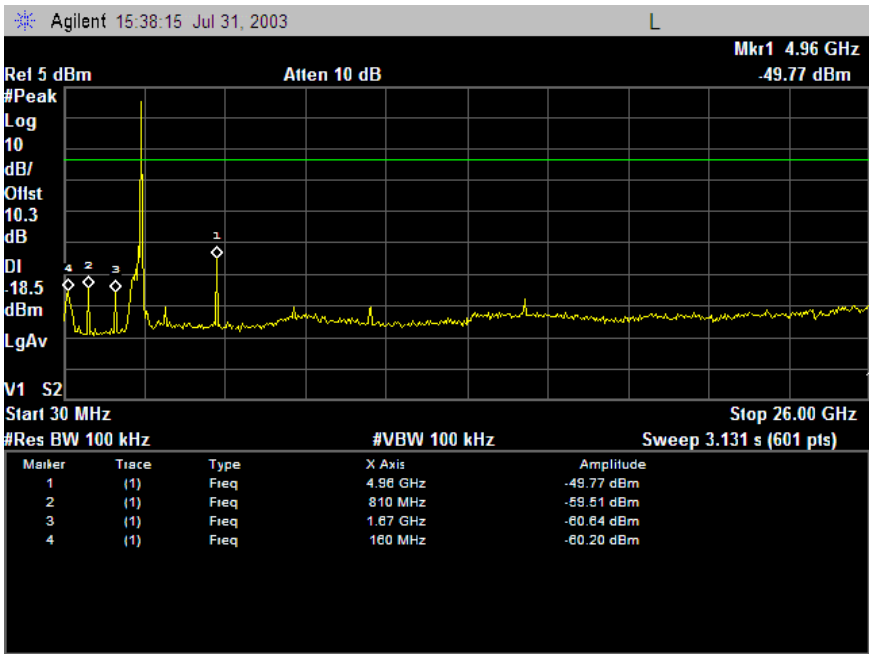


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

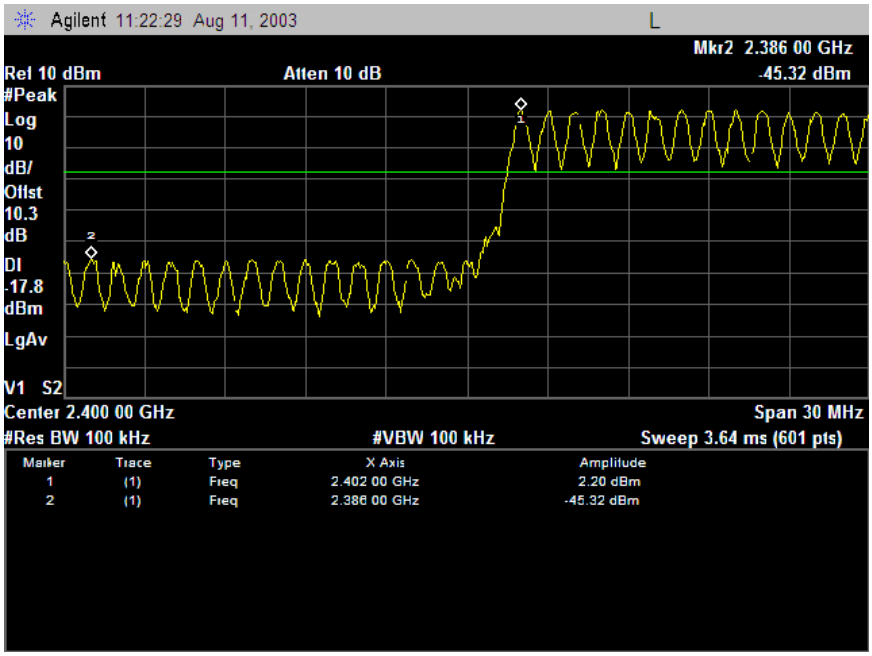


HIGH CHANNEL SPURIOUS

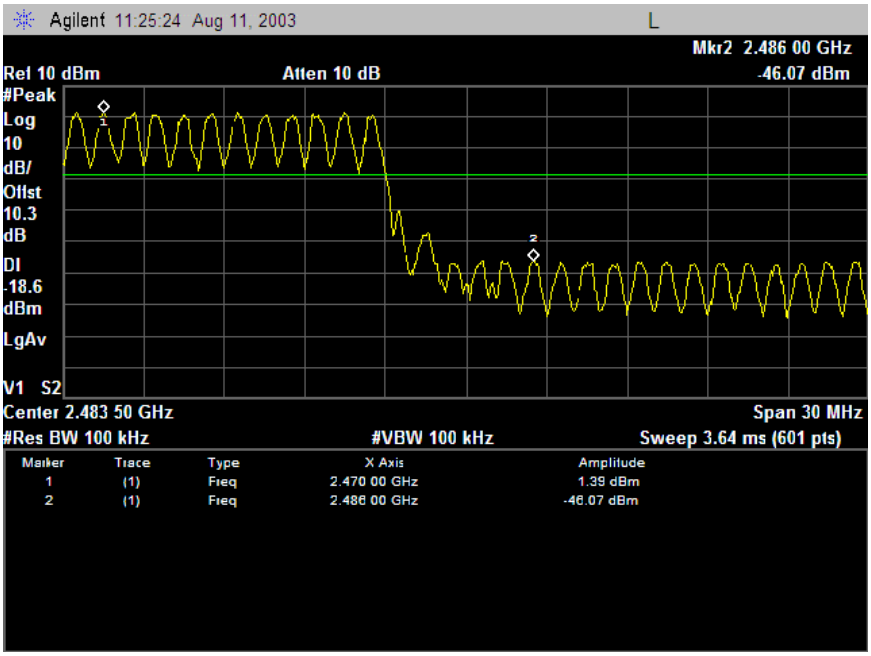


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.7. 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.

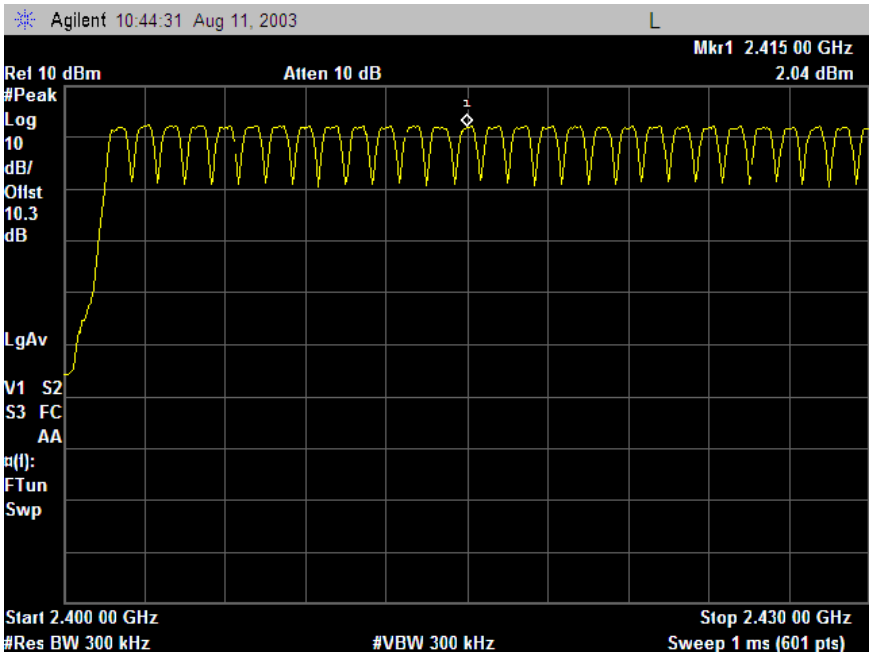
RESULTS

No non-compliance noted:

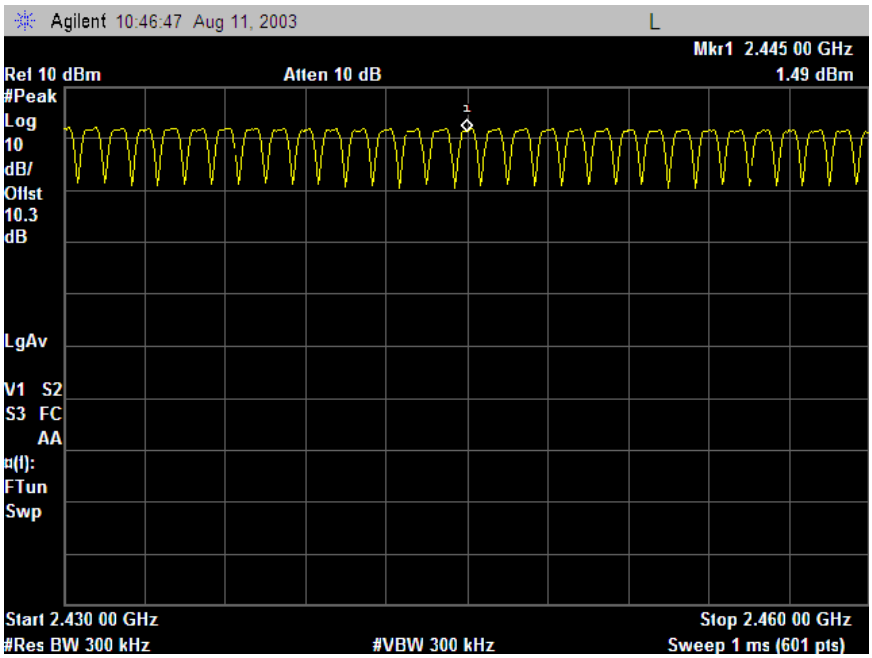
79 Channels observed.

NUMBER OF HOPPING CHANNELS

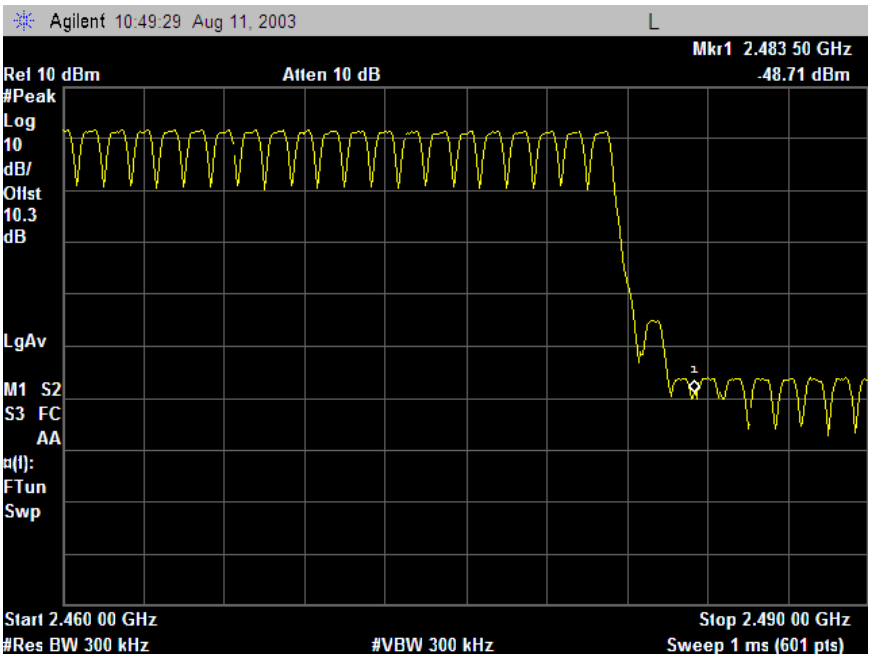
NUMBER OF HOPPING CHANNELS



NUMBER OF HOPPING CHANNELS



NUMBER OF HOPPING CHANNELS



7.8. HOPPING FREQUENCY SEPARATION

LIMIT

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

TEST PROCEDURE

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

RESULTS

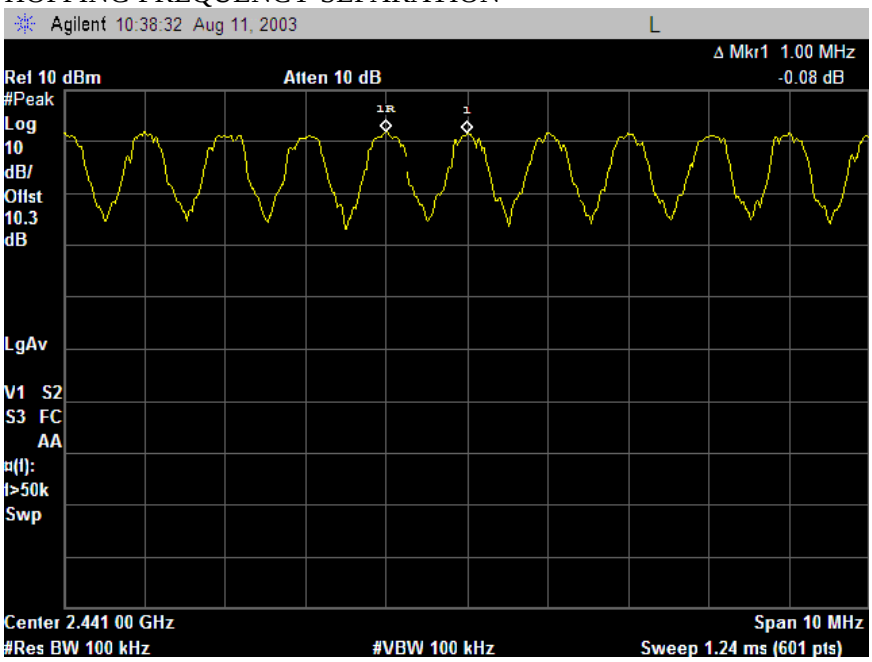
No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Channel Separation (kHz)	20dB Bandwidth (kHz)	Margin (kHz)
Middle	2441	1000	940	60

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



7.9. 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 slow scan.

RESULTS

No non-compliance noted:

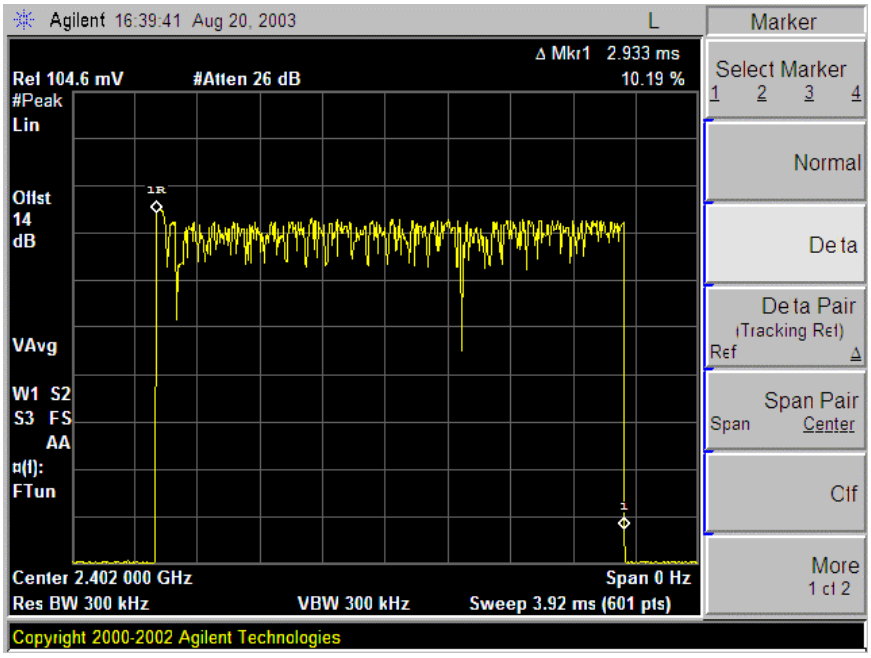
OCCURANCE 3.16 sec
8

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

PULSE WIDTH (mS)	PULSES IN 31.6 SECONDS	TIME OF OCCUPANCY (sec)	LIMIT (sec)	MARGIN (sec)
2.933	80	0.234	0.400	0.166

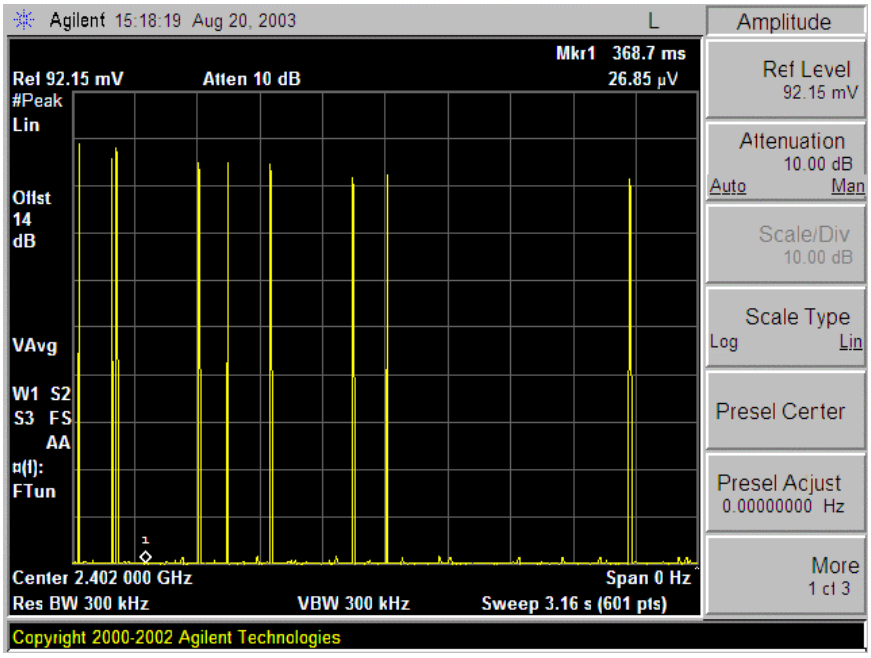
PULSE WIDTH

PULSE WIDTH



NUMBER OF PULSES

NUMBER OF PULSES IN 3.16 SEC.



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
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

TEST PROCEDURE

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

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

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

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

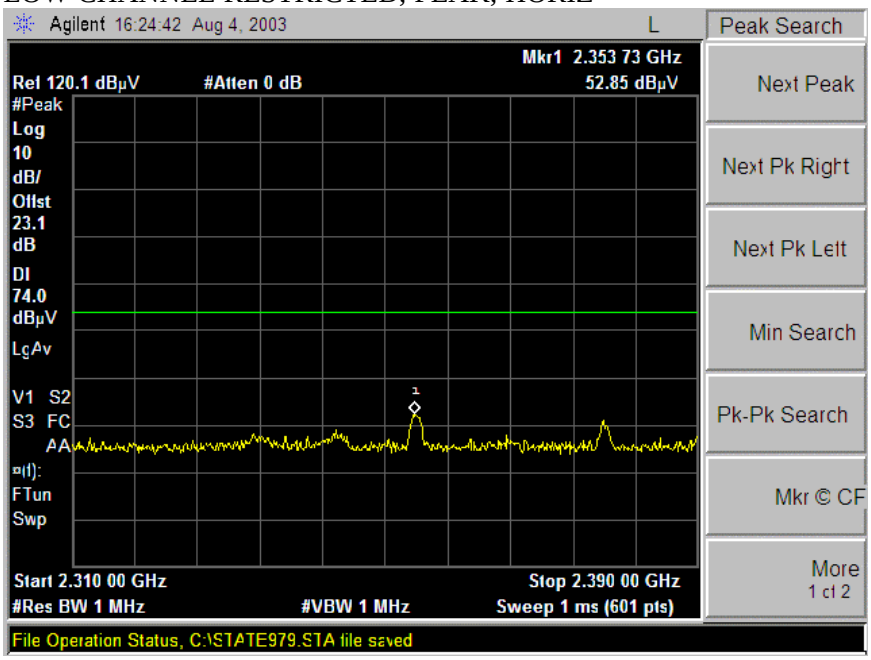
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

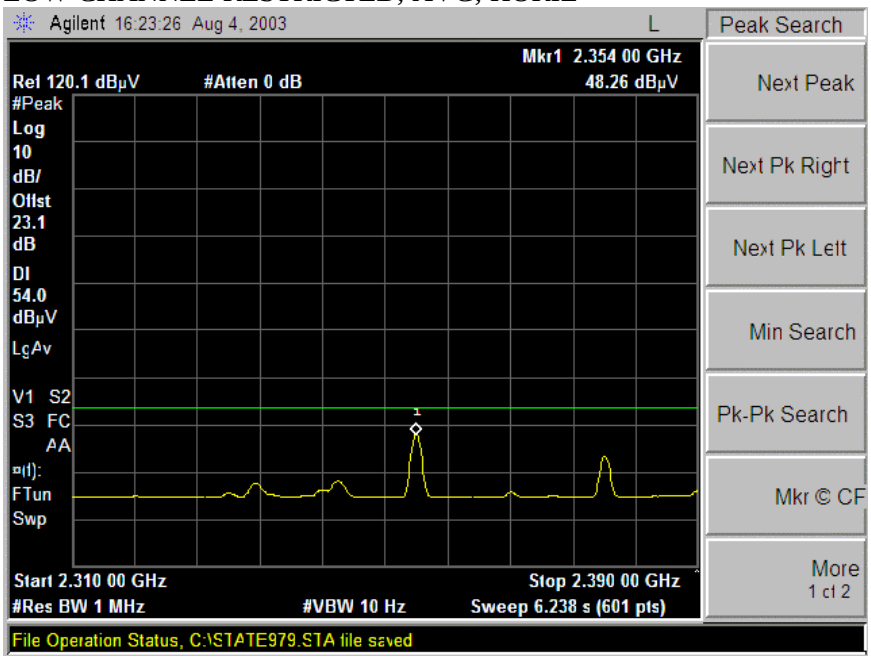
No non-compliance noted:

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ

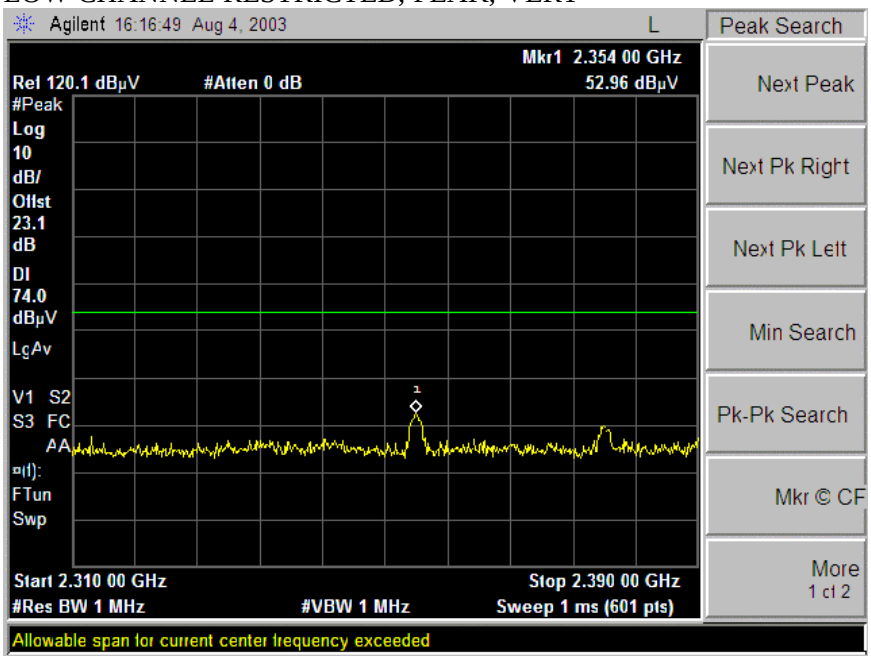


LOW CHANNEL RESTRICTED, AVG, HORIZ

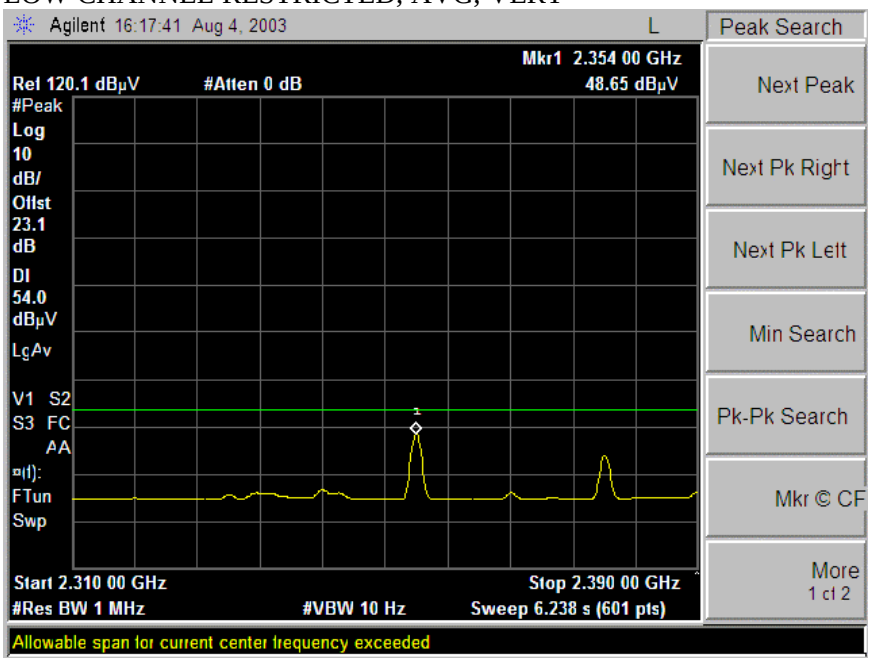


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

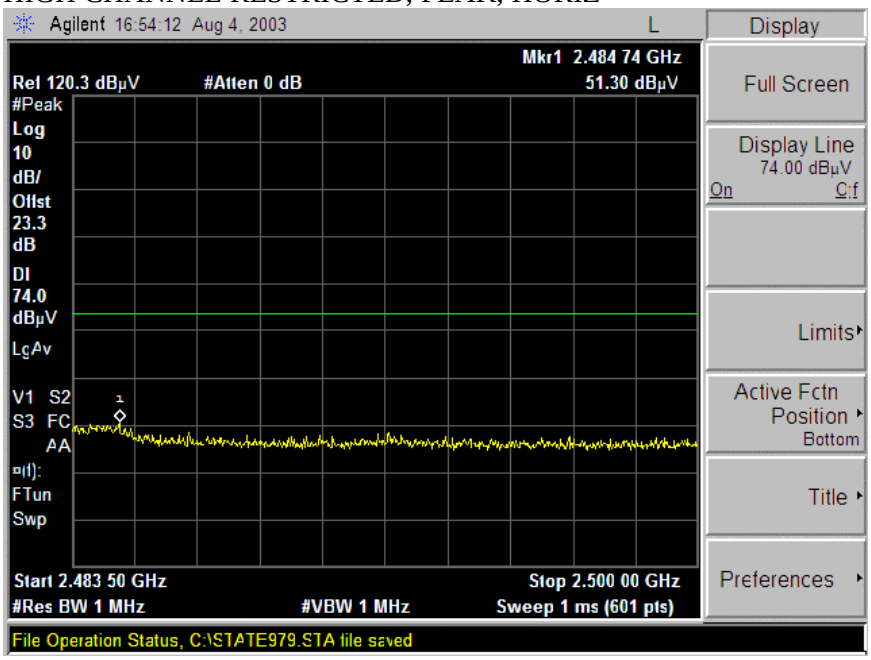


LOW CHANNEL RESTRICTED, AVG, VERT

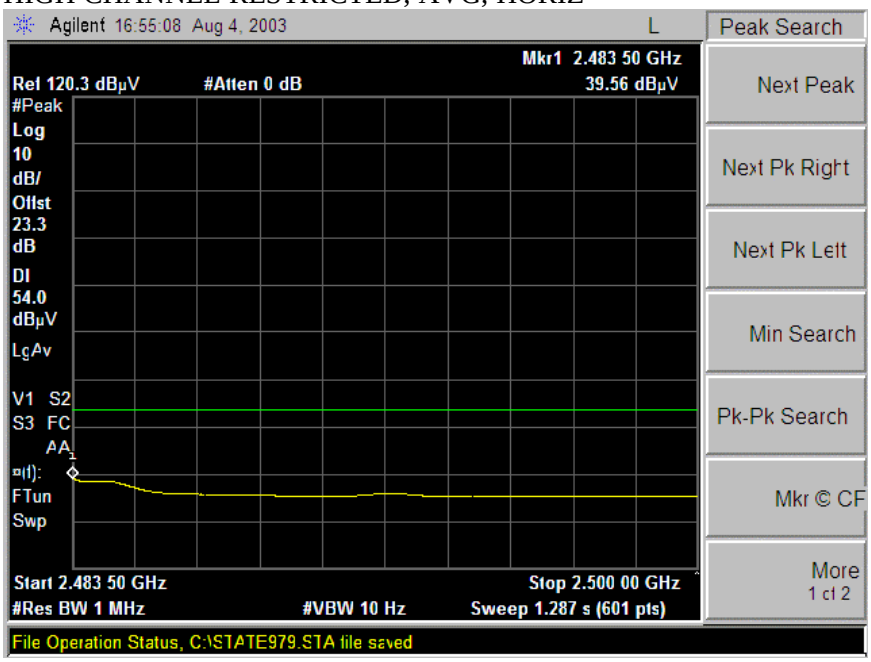


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

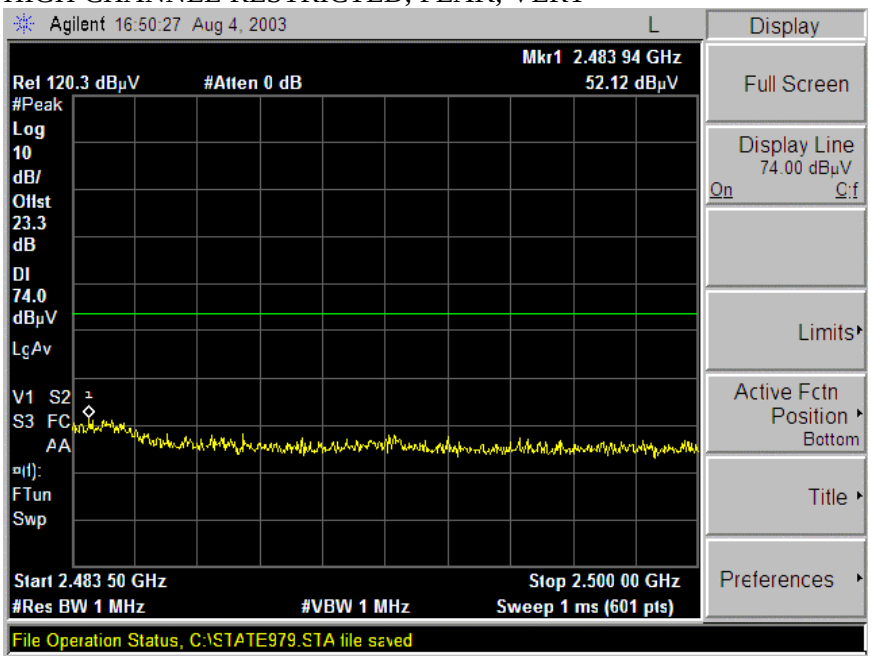


HIGH CHANNEL RESTRICTED, AVG, HORIZ

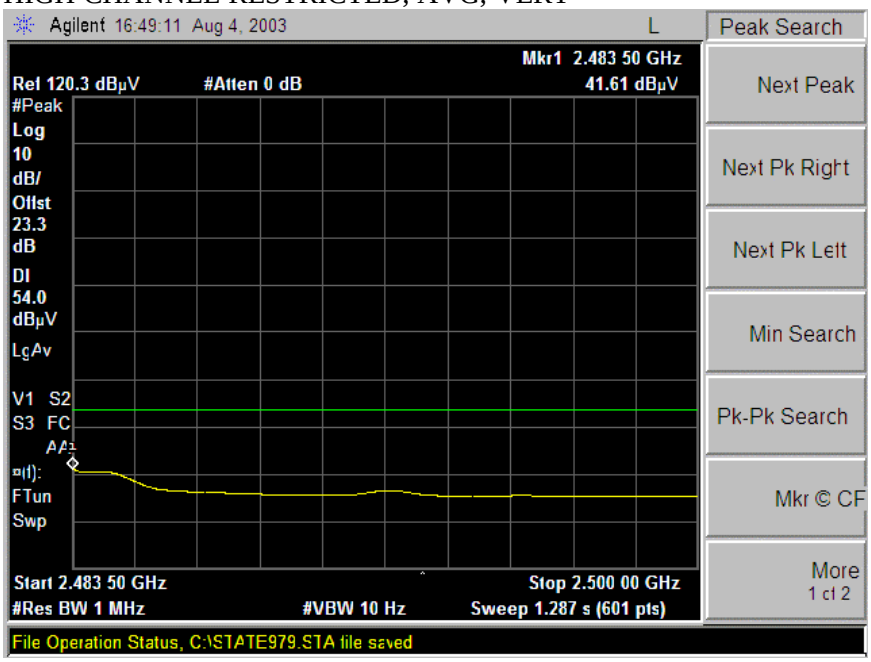


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT

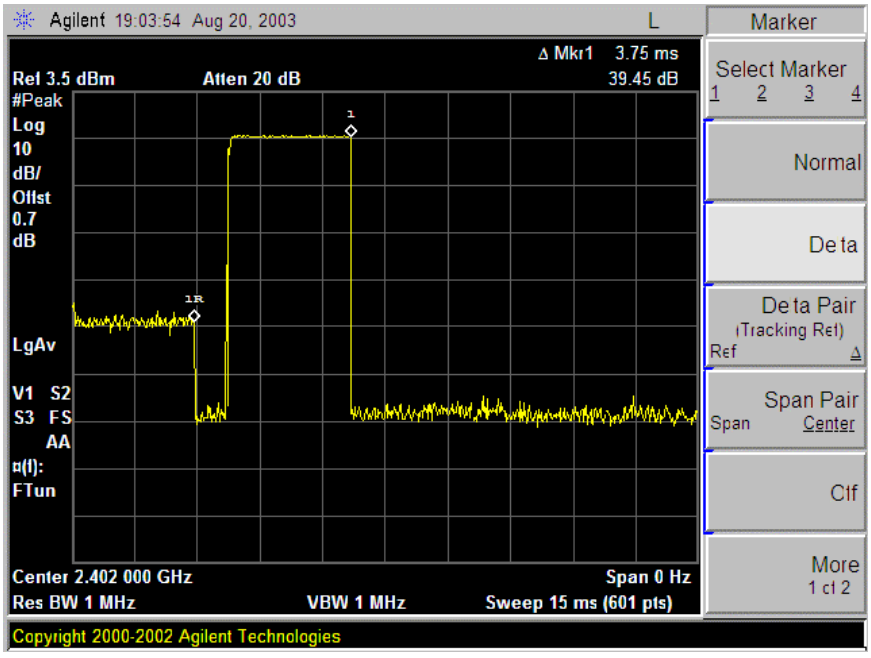


HIGH CHANNEL RESTRICTED, AVG, VERT



DUTY CYCLE CORRECTION FACTOR

DWELL TIME



*IN ACCORDANCE WITH FCC PUBLIC NOTICE DA-00-705, THE “DUTY CYCLE CORRECTION FACTOR” FOR SPURIOUS RADIATED EMISSIONS IS; 20 log * (3.75 ms / 100 ms) = -28.5 dB, WHICH WAS USED TO CORRECT THE AVERAGE SPURIOUS READING.

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

080403 High Frequency Measurement

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: NEELESH RAJ
Project #: 03U2091-1
Company: BROADCOM CORP
EUT Descrip.: BLUETOOTH DONGLE
EUT M/N: BCM92035BTSD
Test Target: FCC
Mode Oper: TX (power @ +2dBm all channels)

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifier 1-26GHz	Spectrum Analyzer	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T63 Miteq 646456	psa	T87; ARA 18-26GHz; S/N:1049	FCC 15.205

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

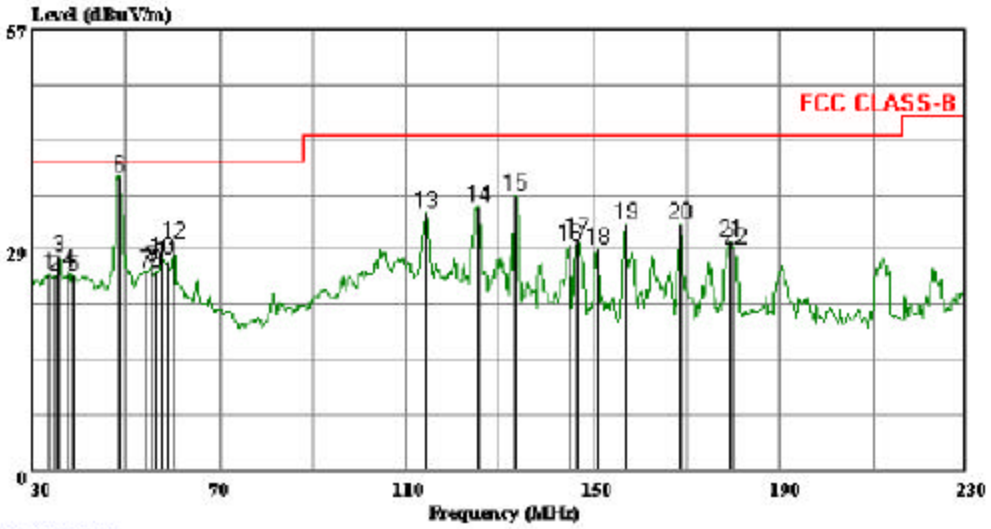
f GHz	Dist feet	Raw Pk dBuV	Raw Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
HIGH CHANNEL															
4.960	9.8	54.4	51.9	33.2	3.0	-35.3	0.0	1.0	56.2	25.2	74.0	54.0	-17.8	-28.8	V
4.960	9.8	50.6	48.9	33.2	3.0	-35.3	0.0	1.0	52.5	22.3	74.0	54.0	-21.5	-31.7	H
7.439	9.8	45.3	41.5	36.4	3.8	-34.5	0.0	1.0	52.0	19.7	74.0	54.0	-22.0	-34.3	V
7.439	9.8	44.3	40.5	36.4	3.8	-34.5	0.0	1.0	51.0	18.7	74.0	54.0	-23.0	-35.3	H
MIDDLE CHANNEL															
4.882	9.8	53.9	51.8	33.2	3.0	-35.3	0.0	1.0	55.7	25.1	74.0	54.0	-18.3	-28.9	V
4.882	9.8	50.7	49.2	33.2	3.0	-35.3	0.0	1.0	52.5	22.5	74.0	54.0	-21.5	-31.5	H
7.323	9.8	44.3	40.2	36.2	3.8	-34.6	0.0	1.0	50.7	18.1	74.0	54.0	-23.3	-35.9	V
7.323	9.8	45.7	41.3	36.2	3.8	-34.6	0.0	1.0	52.1	19.2	74.0	54.0	-21.9	-34.8	H
LOW CHANNEL															
4.802	9.8	54.2	51.8	33.1	2.9	-35.3	0.0	1.0	55.9	25.0	74.0	54.0	-18.1	-29.0	V
4.802	9.8	50.8	49.0	33.1	2.9	-35.3	0.0	1.0	52.5	22.2	74.0	54.0	-21.5	-31.8	H
12.010	9.8	43.7	34.0	39.3	5.1	-34.9	0.0	1.0	54.2	16.0	74.0	54.0	-19.8	-38.0	V
12.010	9.8	44.0	34.1	39.3	5.1	-34.9	0.0	1.0	54.5	16.1	74.0	54.0	-19.5	-37.9	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 -28.54dB															

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		

SPURIOUS EMISSIONS 30 TO 230 MHz (WORST-CASE CONFIGURATION; VERTICAL)

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037, U.S.A.
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 8 File#: RUN1.EMI Date: 08-01-2003 Time: 17:21:51



(Audix ATC)

Trace: 7 Ref Trace:

Condition: FCC CLASS-B 3m CHAMBER 030306 1185 VERTICAL
Company : BROADCOM CORP.
EUT Description : BLUETOOTH
Model Number :
Test Configurtion: EUT/MODEM/PRINTER/LAPTOP/AC ADAPTER
Tester : NEELESH RAJ
Test Target : FCC-B
Mode of Operation: TX (WORST CASE)
Project No : 03U2091-1

Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	33.400	7.78	16.96	0.60	0.00	25.32	40.00	-14.68	Peak
2	34.800	7.60	16.92	0.59	0.00	25.11	40.00	-14.89	Peak
3	35.800	10.09	16.86	0.58	0.00	27.54	40.00	-12.46	Peak
4	37.800	8.41	16.68	0.58	0.00	25.67	40.00	-14.33	Peak
5	38.800	7.88	16.60	0.59	0.00	25.07	40.00	-14.93	Peak
6	48.400	22.28	15.11	0.66	0.00	38.05	40.00	-1.95	Peak
7	54.400	11.92	13.09	0.71	0.00	25.72	40.00	-14.28	Peak
8	55.400	12.92	12.75	0.71	0.00	26.38	40.00	-13.62	Peak
9	56.400	12.65	12.41	0.73	0.00	25.78	40.00	-14.22	Peak
10	57.800	14.64	11.93	0.76	0.00	27.33	40.00	-12.67	Peak
11	58.800	14.45	11.59	0.75	0.00	26.79	40.00	-13.21	Peak
12	60.400	17.51	11.02	0.72	0.00	29.26	40.00	-10.74	Peak
13	114.400	22.02	10.15	1.03	0.00	33.20	43.50	-10.31	Peak
14	125.400	23.04	10.05	1.06	0.00	34.15	43.50	-9.35	Peak
15	133.400	24.96	9.38	1.11	0.00	35.46	43.50	-8.04	Peak
16	144.800	19.49	8.50	1.15	0.00	29.14	43.50	-14.36	Peak

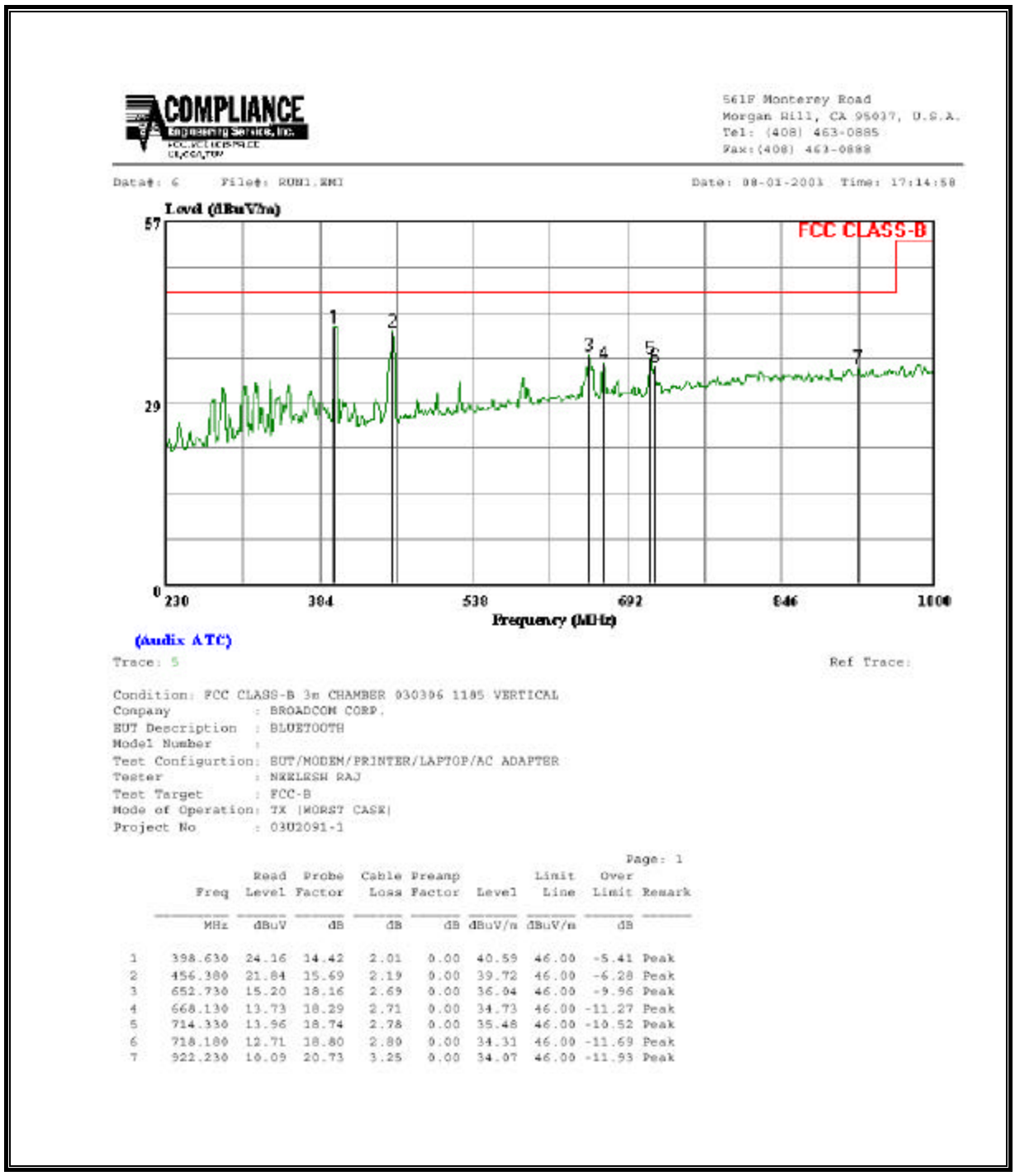
SPURIOUS EMISSIONS 30 TO 230 MHz (WORST-CASE CONFIGURATION; VERTICAL)

Data#: 8 File#: RUN1.EMI Date: 08-01-2003 Time: 17:21:51

Page: 2

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
17	146.800	20.25	8.37	1.19	0.00	29.80	43.50	-13.70	Peak
18	150.800	19.35	8.19	1.19	0.00	28.73	43.50	-14.77	Peak
19	156.800	22.01	8.48	1.24	0.00	31.73	43.50	-11.77	Peak
20	168.800	21.85	8.80	1.28	0.00	31.94	43.50	-11.56	Peak
21	179.400	19.78	8.58	1.31	0.00	29.67	43.50	-13.83	Peak
22	180.400	18.75	8.60	1.32	0.00	28.67	43.50	-14.83	Peak

SPURIOUS EMISSIONS 230-1000 MHz (WORST-CASE CONFIGURATION; VERTICAL)

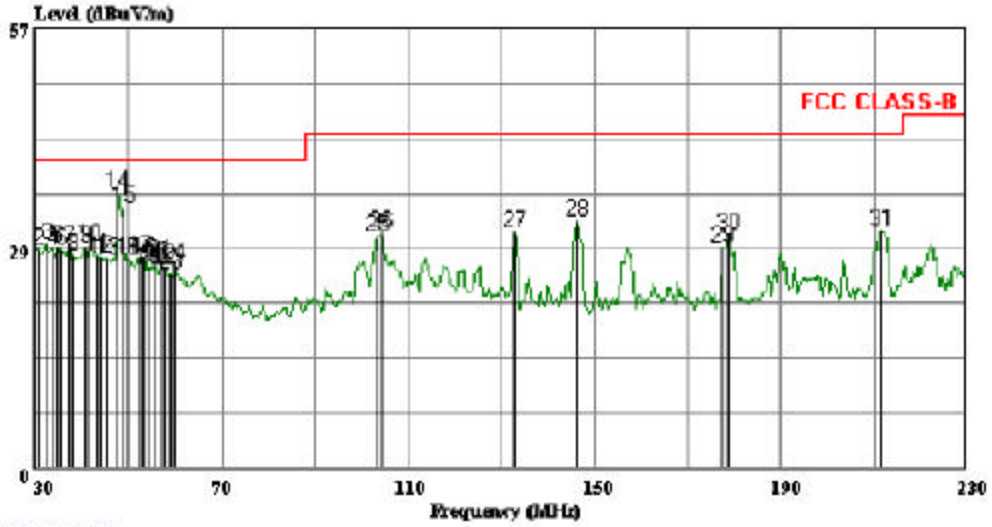


	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	398.630	24.16	14.42	2.01	0.00	40.59	46.00	-5.41	Peak
2	456.380	21.84	15.69	2.19	0.00	39.72	46.00	-6.28	Peak
3	652.730	15.20	18.16	2.69	0.00	36.04	46.00	-9.96	Peak
4	668.130	13.73	18.29	2.71	0.00	34.73	46.00	-11.27	Peak
5	714.330	13.96	18.74	2.78	0.00	35.48	46.00	-10.52	Peak
6	718.180	12.71	18.80	2.80	0.00	34.31	46.00	-11.69	Peak
7	922.230	16.09	20.73	3.25	0.00	34.07	46.00	-11.93	Peak

SPURIOUS EMISSIONS 30 TO 230 MHz (WORST-CASE CONFIGURATION; HORIZONTAL)

561F Monterey Road
Morgan Hill, CA 95037, U.S.A.
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 2 File#: RUN1.EMI Date: 08-01-2003 Time: 16:53:13



(Audix ATC)

Trace: 1 Ref Trace:

Condition: FCC CLASS-B 3m CHAMBER 030306 1185 HORIZONTAL
Company : BROADCOM CORP.
EUT Description : BLUETOOTH
Model Number :
Test Configurtion: EUT/MODEM/PRINTER/LAPTOP/AC ADAPTER
Tester : NEELESH RAJ
Test Target : FCC-B
Mode of Operation: TX (WORST CASE)
Project No : 03U2091-1

Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	30.000	10.91	16.99	0.55	0.00	28.45	40.00	-11.55	Peak
2	30.800	10.82	16.98	0.56	0.00	28.35	40.00	-11.65	Peak
3	32.400	11.64	16.95	0.58	0.00	29.17	40.00	-10.83	Peak
4	33.800	10.96	16.93	0.60	0.00	28.49	40.00	-11.51	Peak
5	34.800	11.04	16.92	0.59	0.00	28.55	40.00	-11.45	Peak
6	35.800	10.84	16.86	0.58	0.00	28.29	40.00	-11.71	Peak
7	37.400	11.34	16.70	0.58	0.00	28.62	40.00	-11.38	Peak
8	38.400	10.35	16.61	0.59	0.00	27.55	40.00	-12.45	Peak
9	40.800	11.68	16.40	0.63	0.00	28.71	40.00	-11.29	Peak
10	41.800	11.95	16.28	0.64	0.00	28.87	40.00	-11.13	Peak
11	43.400	10.91	16.07	0.64	0.00	27.62	40.00	-12.38	Peak
12	44.400	10.79	15.95	0.65	0.00	27.39	40.00	-12.61	Peak
13	45.400	10.62	15.80	0.65	0.00	27.08	40.00	-12.92	Peak
14	47.800	20.01	15.22	0.66	0.00	35.89	40.00	-4.11	Peak
15	48.800	18.09	14.99	0.67	0.00	33.75	40.00	-6.25	Peak
16	49.800	11.59	14.80	0.67	0.00	27.06	40.00	-12.94	Peak

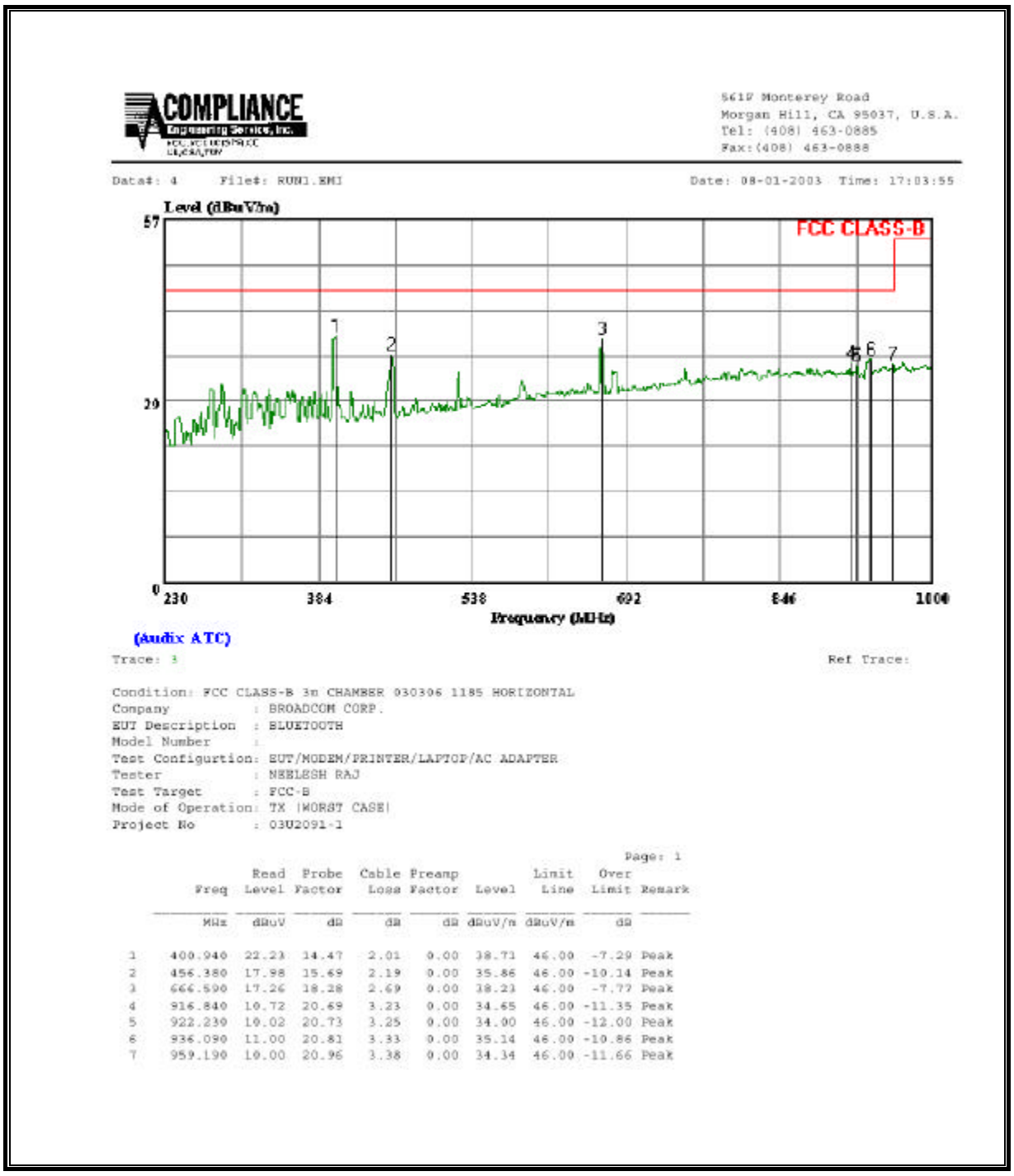
SPURIOUS EMISSIONS 30 TO 230 MHz (WORST-CASE CONFIGURATION; HORIZONTAL)

Data#: 2 File#: RUN1.EMI Date: 08-01-2003 Time: 16:53:13

Page: 2

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
17	52.400	12.87	13.84	0.70	0.00	27.41	40.00	-12.59	Peak
18	53.400	12.94	13.49	0.71	0.00	27.14	40.00	-12.86	Peak
19	54.400	12.17	13.09	0.71	0.00	25.97	40.00	-14.03	Peak
20	55.400	12.99	12.75	0.71	0.00	26.45	40.00	-13.55	Peak
21	56.800	13.87	12.27	0.74	0.00	26.87	40.00	-13.13	Peak
22	57.800	13.21	11.93	0.76	0.00	25.90	40.00	-14.10	Peak
23	58.800	12.81	11.59	0.75	0.00	25.15	40.00	-14.85	Peak
24	59.800	14.39	11.25	0.73	0.00	26.37	40.00	-13.63	Peak
25	103.400	19.99	9.17	0.98	0.00	30.15	43.50	-13.35	Peak
26	104.400	20.24	9.28	1.01	0.00	30.53	43.50	-12.98	Peak
27	132.800	19.99	9.42	1.10	0.00	30.51	43.50	-12.99	Peak
28	146.400	22.64	8.40	1.17	0.00	32.12	43.50	-11.38	Peak
29	177.400	18.57	8.73	1.30	0.00	28.60	43.50	-14.90	Peak
30	178.800	20.36	8.63	1.30	0.00	30.29	43.50	-13.21	Peak
31	211.400	19.68	9.69	1.42	0.00	30.80	43.50	-12.70	Peak

SPURIOUS EMISSIONS 230-1000 MHz (WORST-CASE CONFIGURATION; HORIZONTAL)



	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	400.940	22.23	14.47	2.01	0.00	38.71	46.00	-7.29	Peak
2	456.380	17.98	15.69	2.19	0.00	35.86	46.00	-10.14	Peak
3	666.590	17.26	18.28	2.69	0.00	38.23	46.00	-7.77	Peak
4	916.840	10.72	20.69	3.23	0.00	34.65	46.00	-11.35	Peak
5	922.230	10.02	20.73	3.25	0.00	34.00	46.00	-12.00	Peak
6	936.090	11.00	20.81	3.33	0.00	35.14	46.00	-10.86	Peak
7	959.190	10.00	20.96	3.38	0.00	34.34	46.00	-11.66	Peak

7.11. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/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.

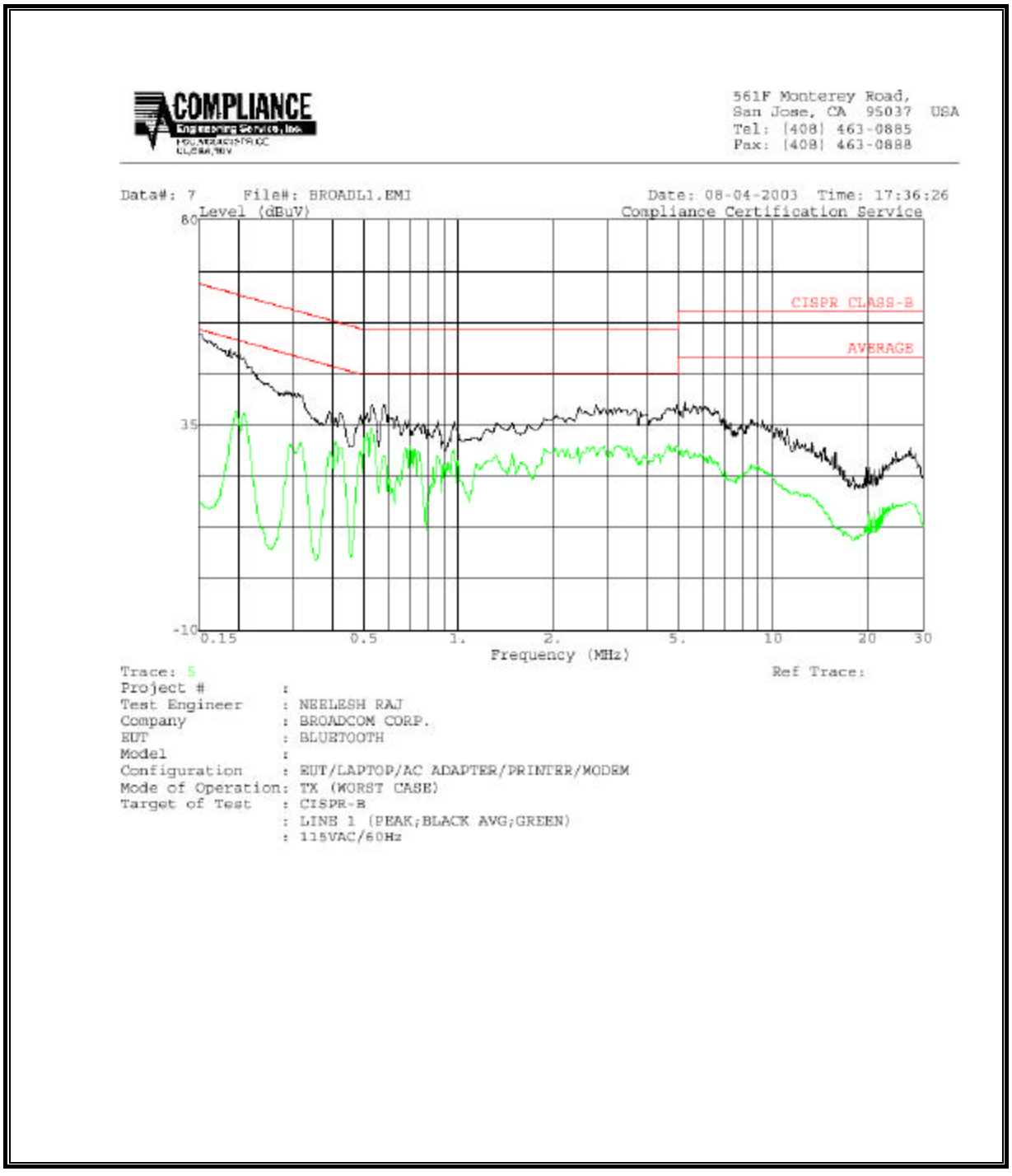
RESULTS

No non-compliance noted:

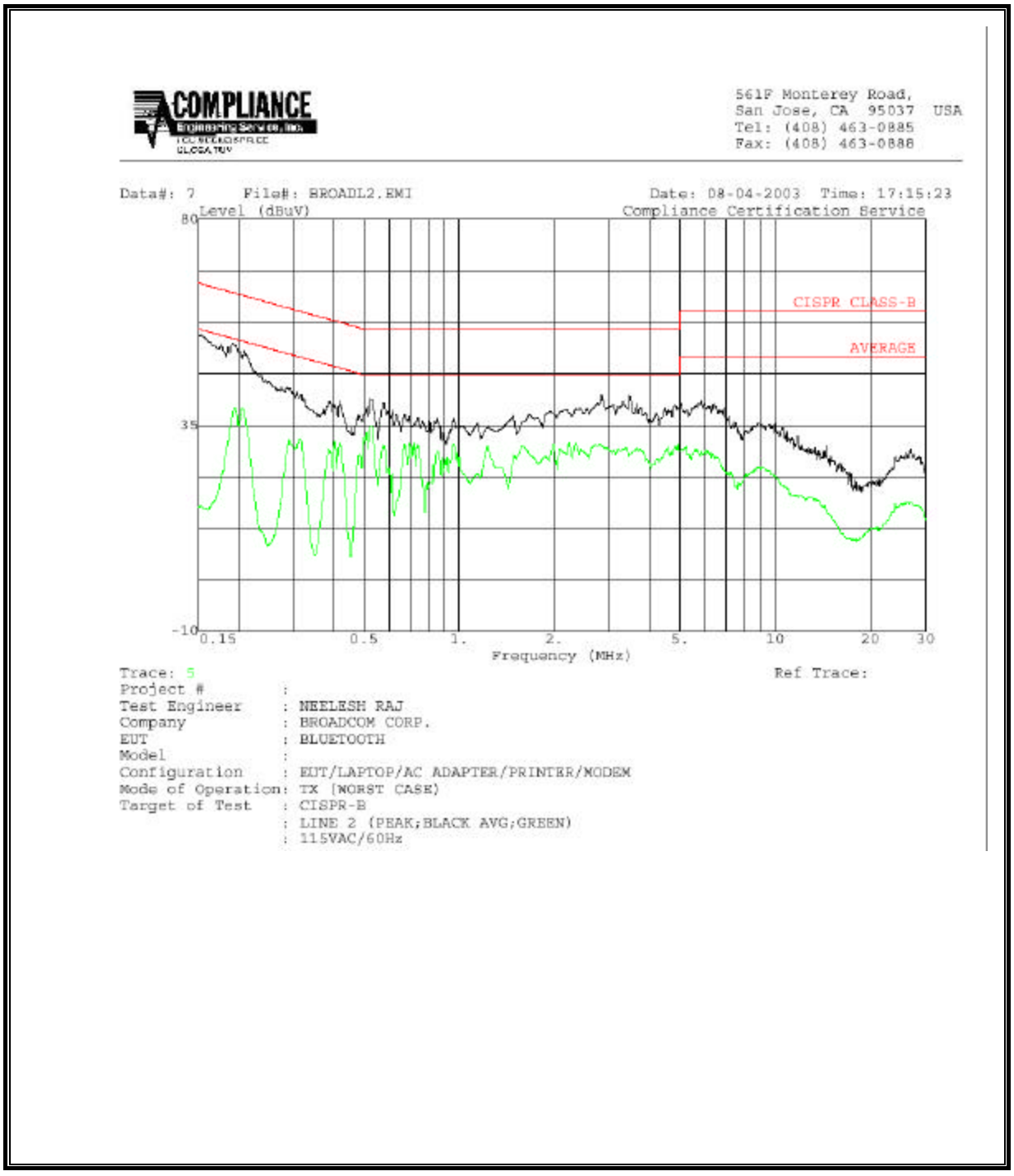
6 WORST EMISSIONS

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
0.15	54.80	--	17.94	0.00	66.00	56.00	-11.20	-38.06	L1
0.19	51.09	--	29.79	0.00	64.97	54.97	-13.88	-25.18	L1
0.21	49.78	--	37.65	0.00	64.34	54.34	-14.56	-16.69	L1
0.15	54.74	--	17.02	0.00	65.94	55.94	-11.20	-38.92	L2
0.19	52.88	--	36.90	0.00	64.83	54.83	-11.95	-17.93	L2
0.21	51.24	--	37.09	0.00	64.31	54.31	-13.07	-17.22	L2
6 Worst Data									

LINE 1 RESULTS



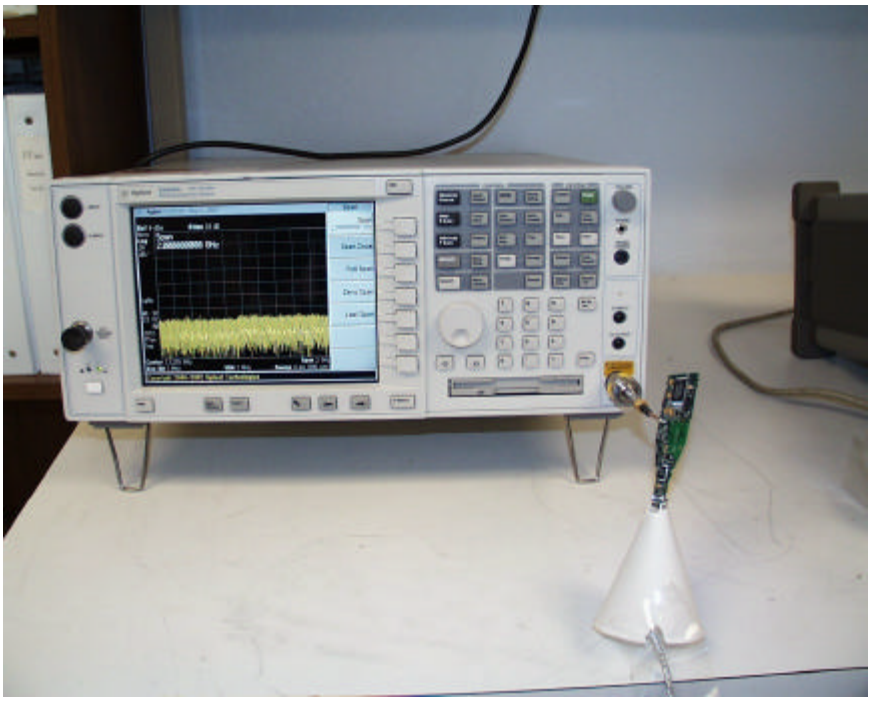
LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



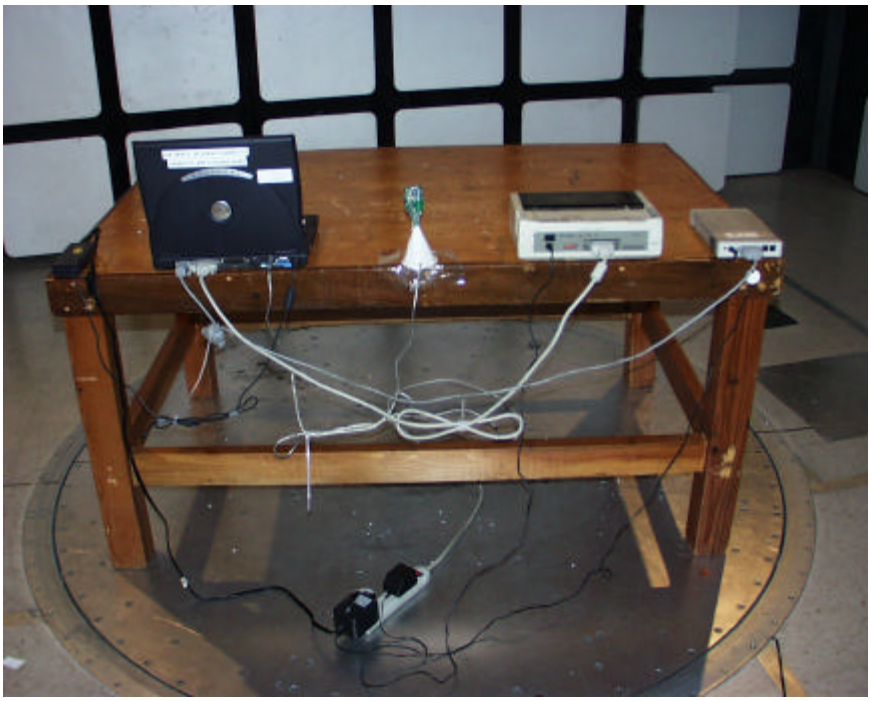
RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

DIGITAL DEVICE RADIATED EMISSIONS SETUP

DIGITAL DEVICE FRONT PHOTO

DIGITAL DEVICE BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT