



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT**

FOR

BLUETOOTH V2.0 MODULE

MODEL NUMBER: PA3418U-1BTM

FCC ID: CJ6UPA3418BT

REPORT NUMBER: 05U3286-1 REV B

ISSUE DATE: MARCH 18, 2005

Prepared for

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Revision History

<u>Rev.</u>	<u>Revisions</u>	<u>Revised By</u>
B	Change the EUT description from Bluetooth V1.2 Module to Bluetooth V2.0 Module	Danielle Z.

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
2-9 SUEHIRO-CHO, OME
TOKYO, 198-8710, JAPAN

EUT DESCRIPTION: BLUETOOTH V2.0 MODULE

MODEL: PA3418U-1BTM

SERIAL NUMBER: CCS 01505

DATE TESTED: FEBRUARY 22-23, 2005

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: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG
EMC ENGINEERS
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. 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>.

4. CALIBRATION AND UNCERTAINTY

4.1. 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.

4.2. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Toshiba Bluetooth module is a wireless Frequency Hopping Spread Spectrum that operates on the 2400-2483.5 MHz band. It is designed to be installed in the host system. This unit provides a power output of +1.46 dBm (1.40mw).

Optionally the Bluetooth may be collocated with a WLAN transceiver MB51H (FCC ID: CJ6UPA3426WL) installed in the host PC.

5.2. MAXIMUM OUTPUT POWER

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

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	1.46	1.40

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The BT radio utilizes four alternate PIFA antennas. These four antennas are :

1. HTL017 - 4.24 dBi at 2.4GHz without cable loss;
2. HTL004 - 4.18 dBi at 2.4GHz without cable loss;
3. HTL008 - 2.89 dBi at 2.4GHz without cable loss;
4. TIAN01 - 4.02 dBi at 2.4GHz without cable loss.

When Bluetooth module is installed in Laptop or Tablet Computers, it will be co-existed and transmitting simultaneously with WLAN Module (FCC ID:CJ6UPA3426WL)

The WLAN may alternatively use four PIFA type antennas:

1. HTL017 - 4.24 dBi at 2.4GHz without cable loss;
2. HTL004 - 4.18 dBi at 2.4GHz without cable loss;
3. HTL008 - 2.89 dBi at 2.4GHz without cable loss;
4. TIAN01 - 4.02 dBi at 2.4GHz without cable loss.

Therefore, the co-location testing was conducted with the Bluetooth PA3418U-1BTM co-located with HTL017, which represents the worst-case scenario.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the Toshiba Laptop equipment during testing was CSR-BC01
The test utility software used during testing was Bluetest rev. 1.20.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2441 MHz. Among the x, y and z positions of the portable configuration, the worst-case position was determined and tested.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Toshiba	PPM20U-AAAA3	93070085JU	DoC
AC Adapter	Toshiba	PA3083U-1ACA	0904433G	NA

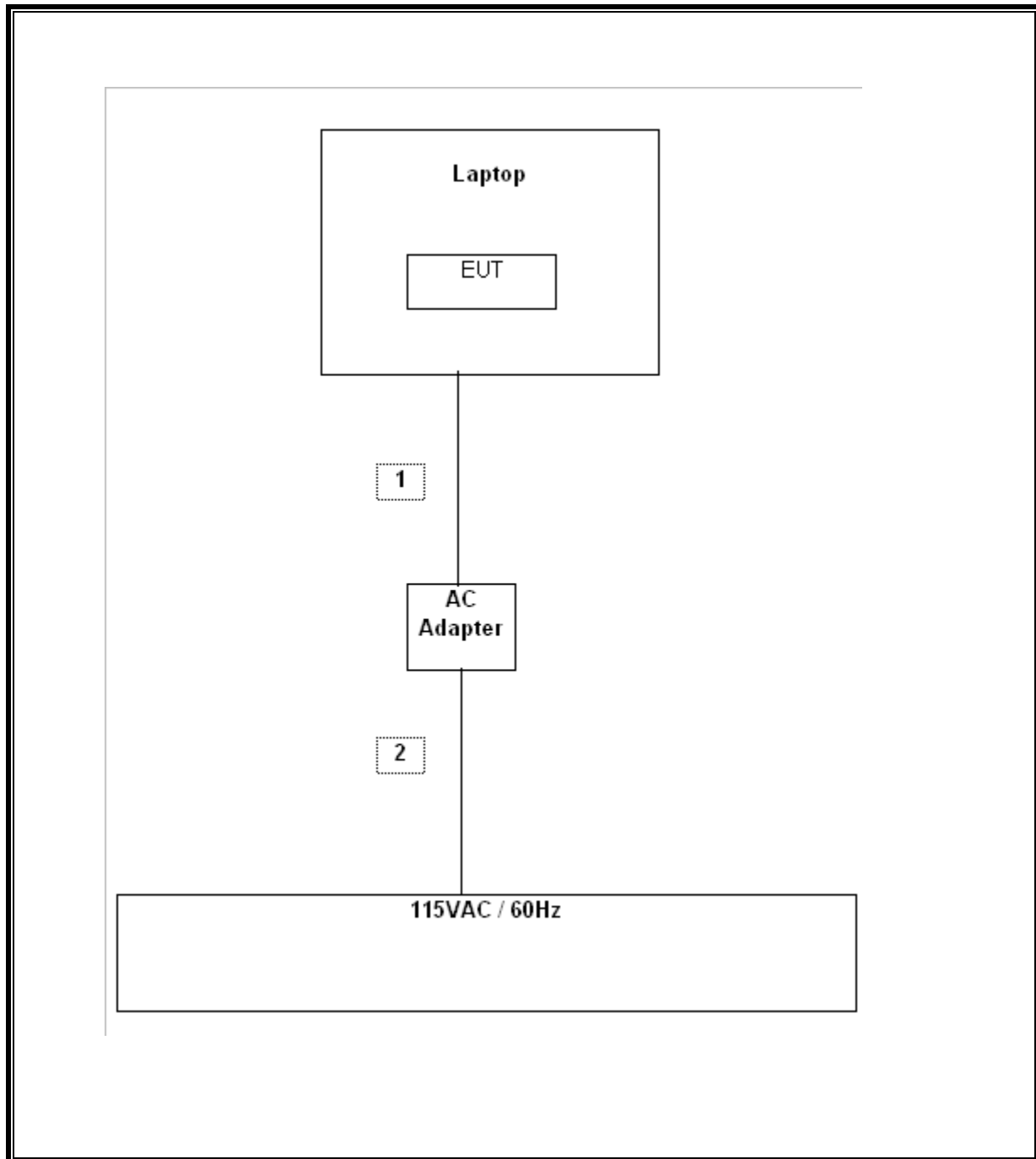
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	No
2	DC	1	DC	Un-shielded	1.5m	No

TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Spectrum Analyzer	Agilent	E4446A	MY43360112	1/13/2006
Quasi-Peak Adaptor	HP	85650A	2811A01155	5/24/05
SA Display Section 2	HP	85662A	2816A16696	5/24/05
SA RF Section, 1.5 GHz	HP	85680B	2814A04227	5/24/05
Preamplifier, 1300MHz	HP	8447D	2944A06833	8/17/05
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/05
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/05
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	9/12/05
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	8/17/05

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

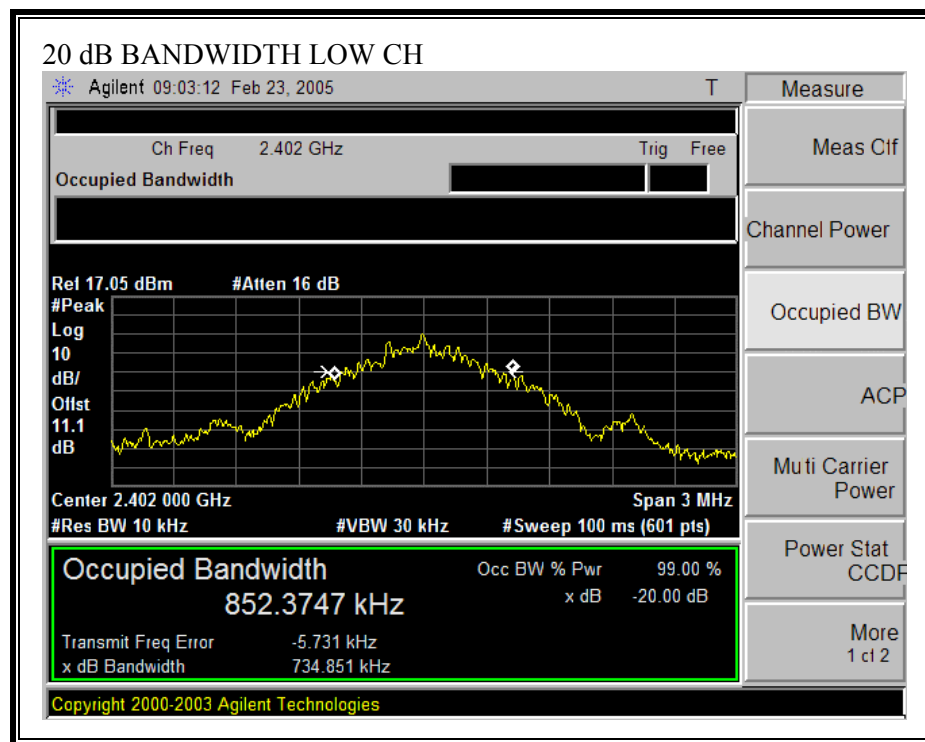
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

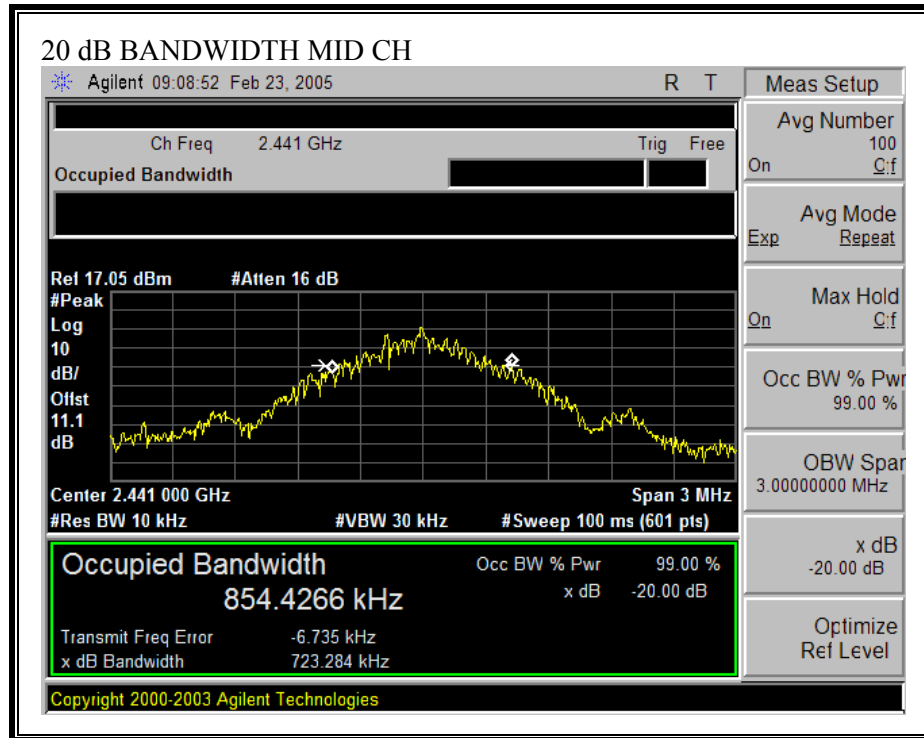
RESULTS

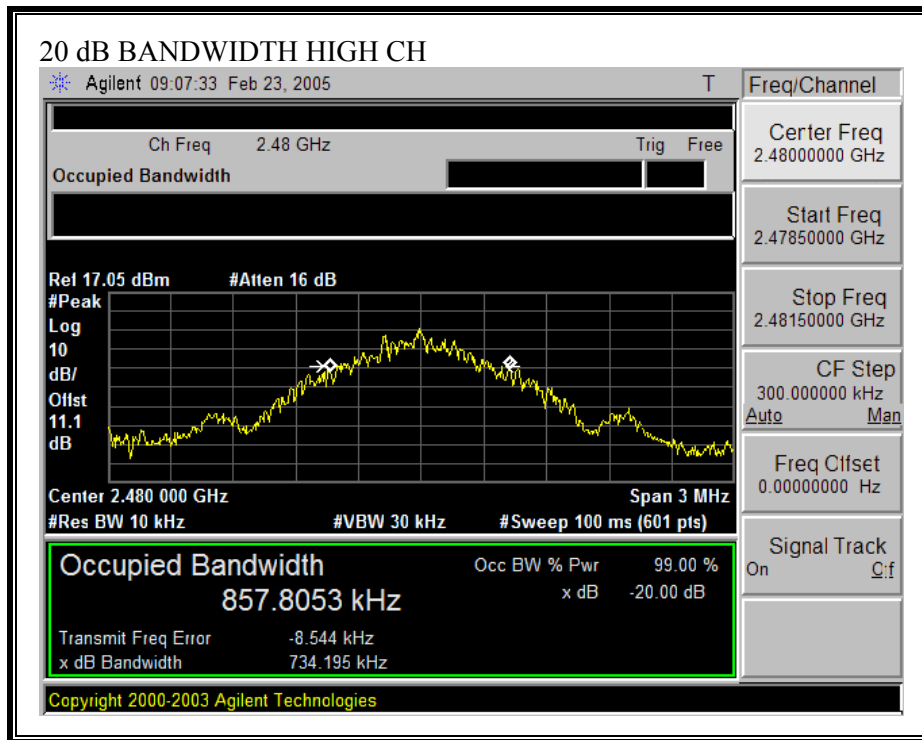
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	734.851
Middle	2441	723.284
High	2480	734.295

20 dB BANDWIDTH







7.1.2. 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.

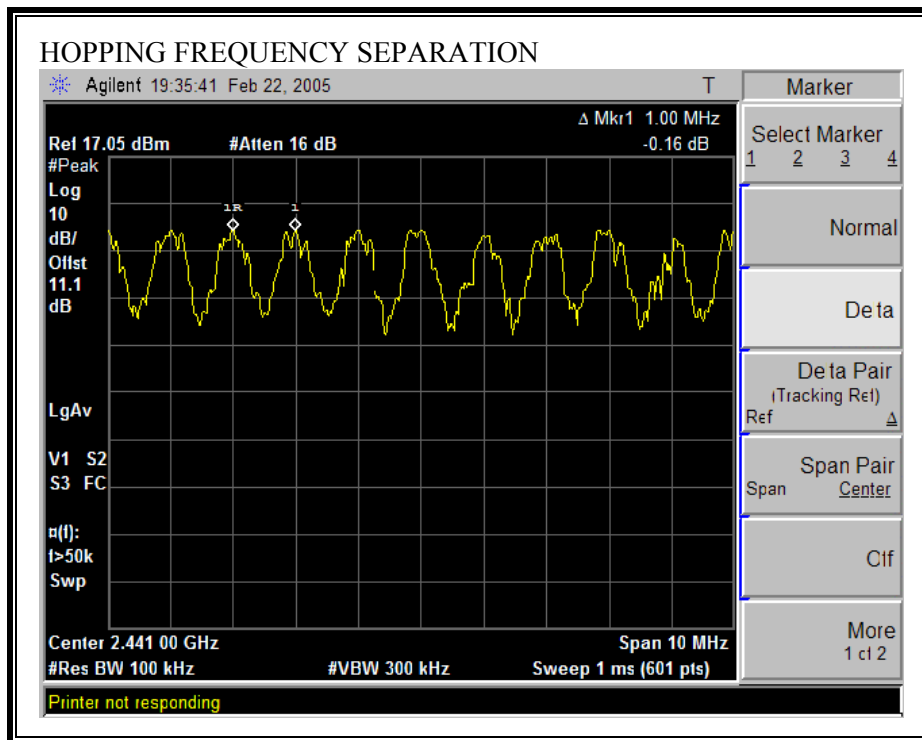
TEST PROCEDURE

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



7.1.3. 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

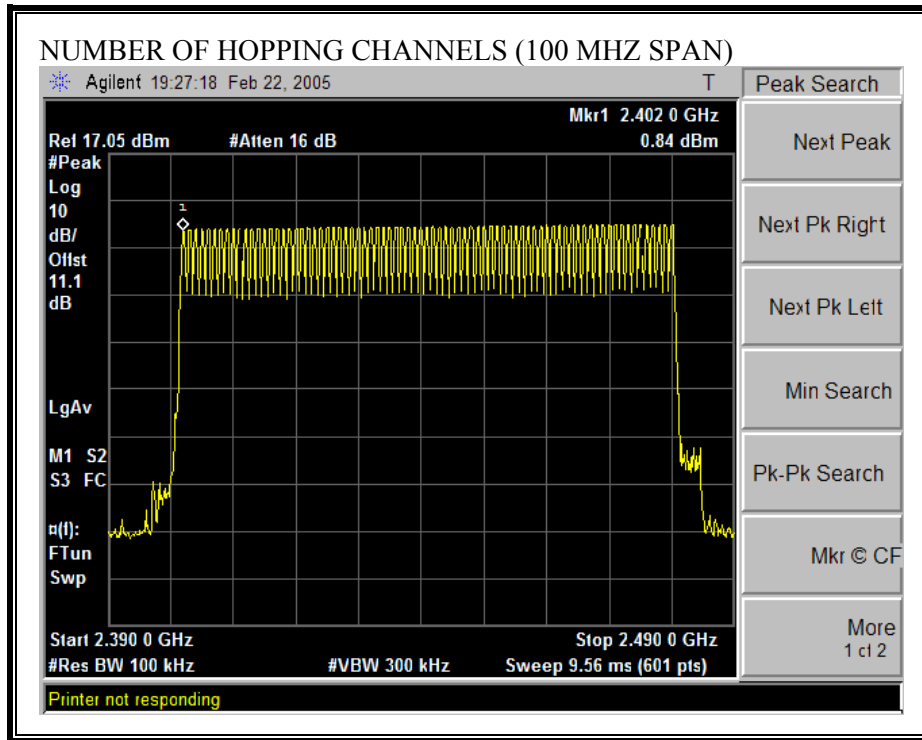
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

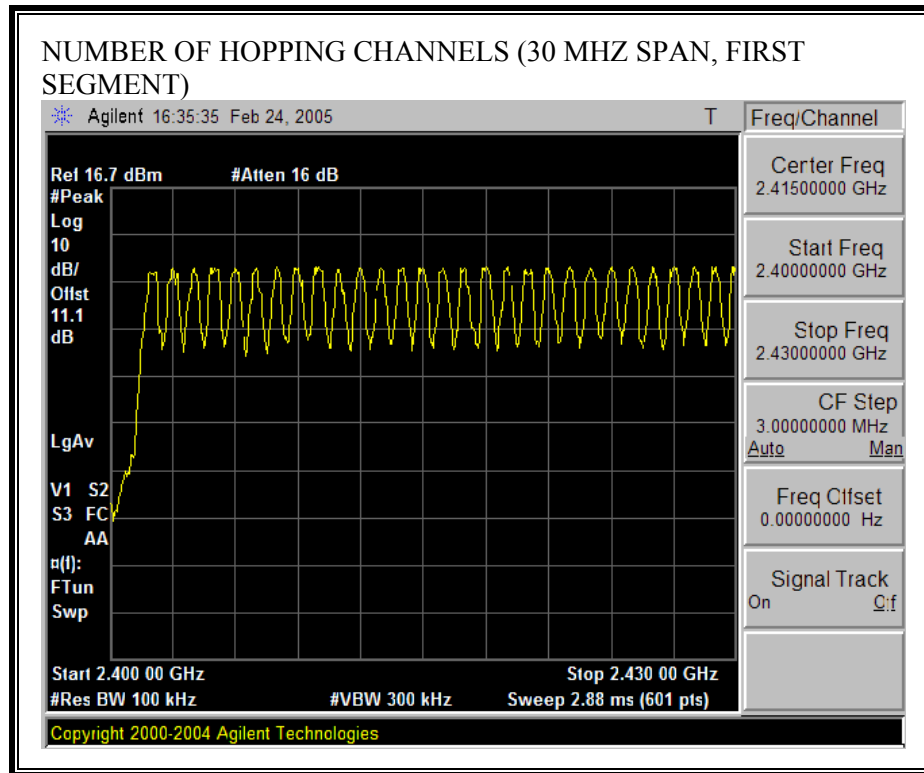
RESULTS

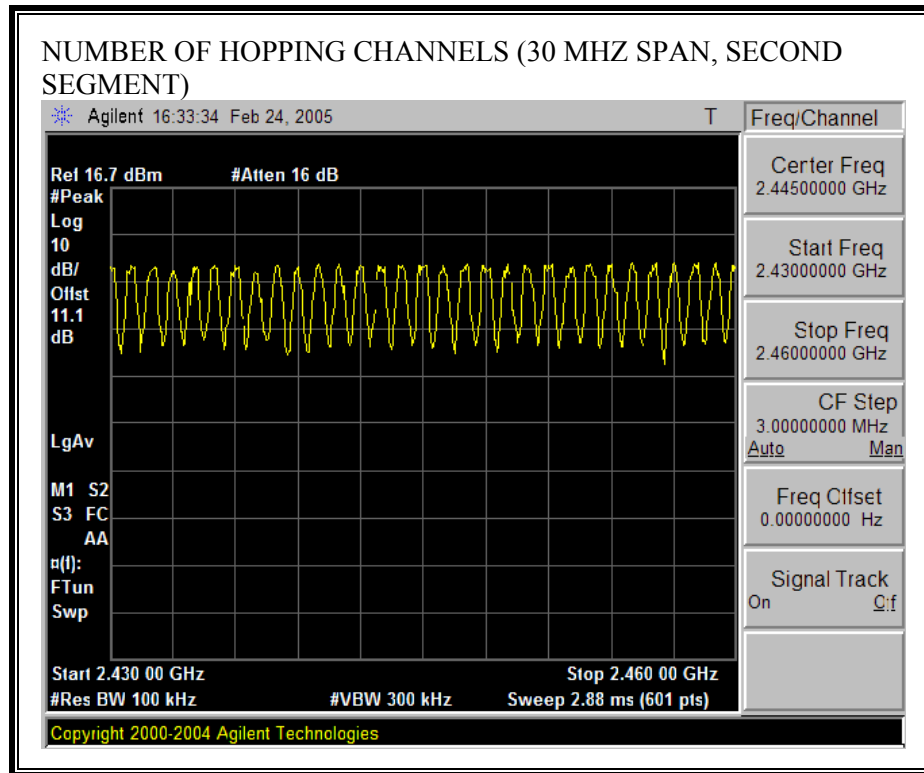
No non-compliance noted:

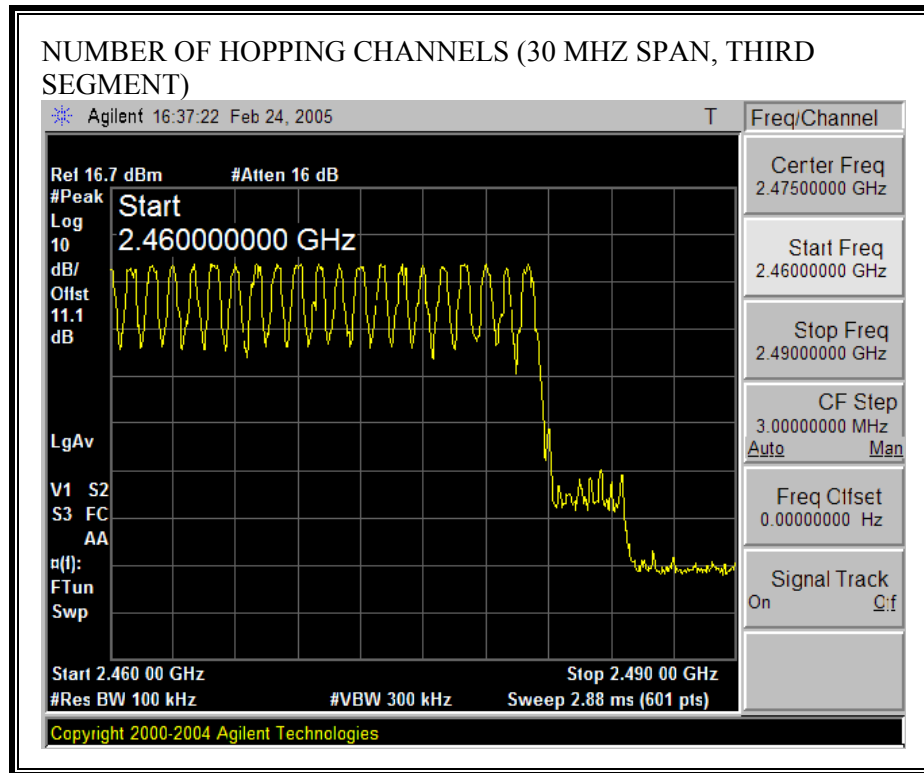
79 Channels observed.

NUMBER OF HOPPING CHANNELS









7.1.4. 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

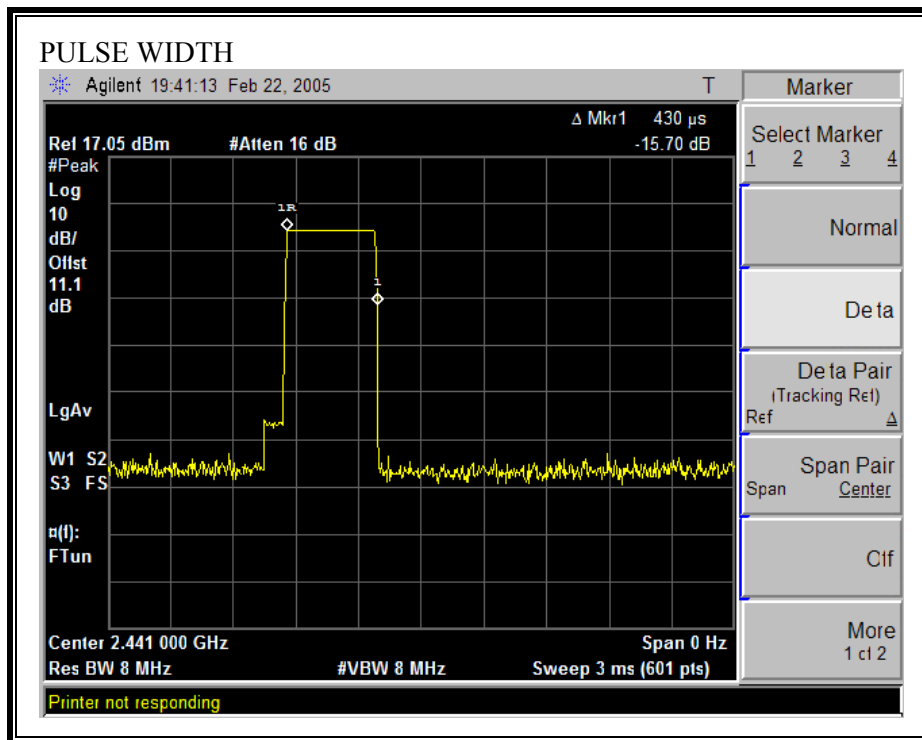
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

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.

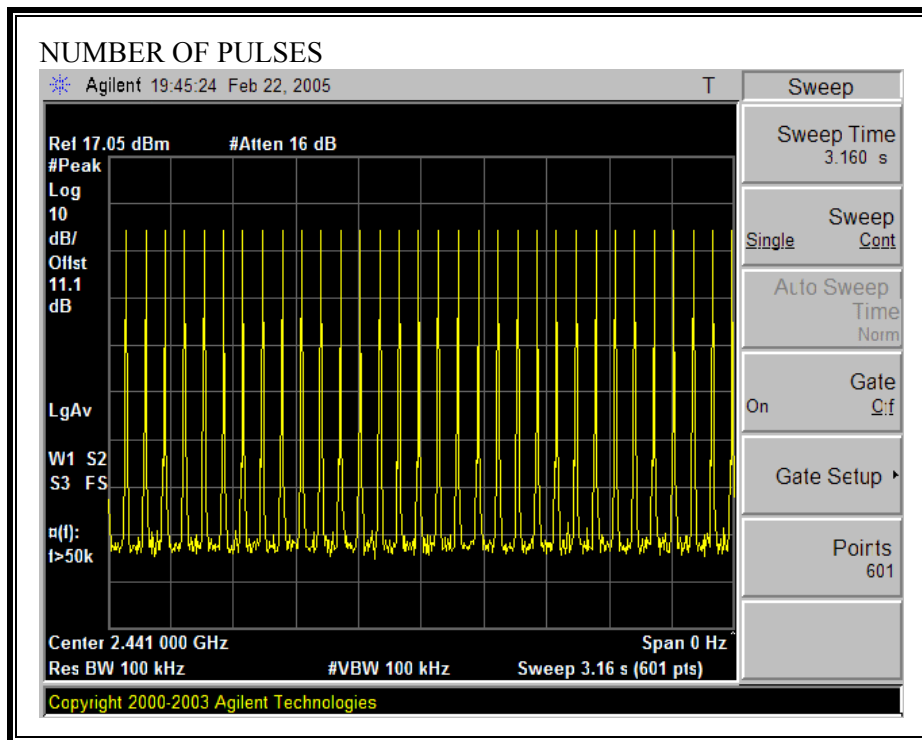
RESULTS

No non-compliance noted:

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.1.5. 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.

1

The maximum antenna gain is 4.18dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

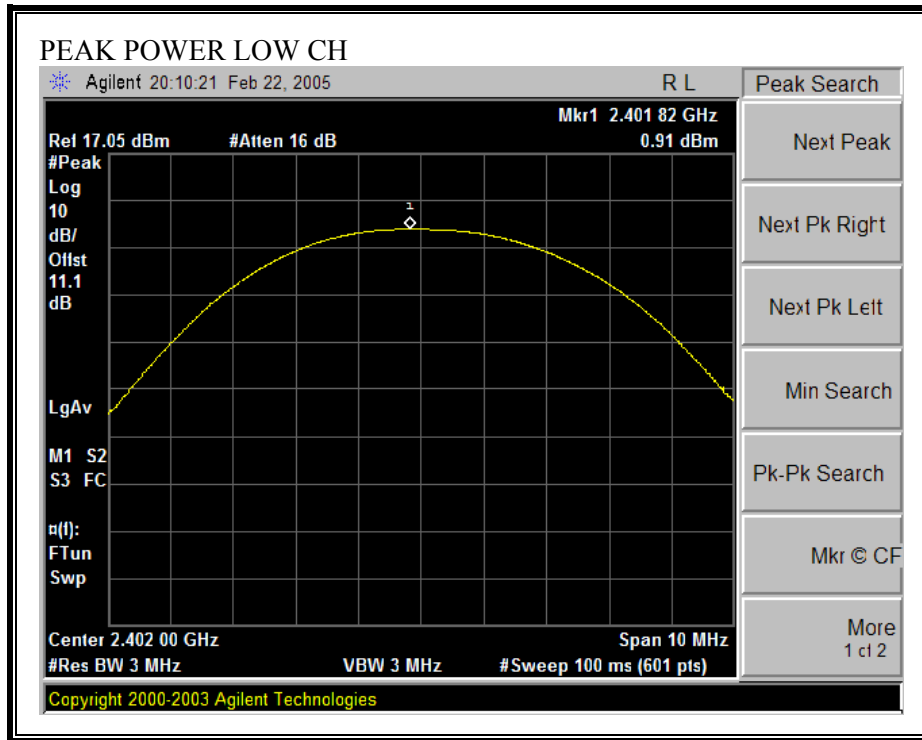
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

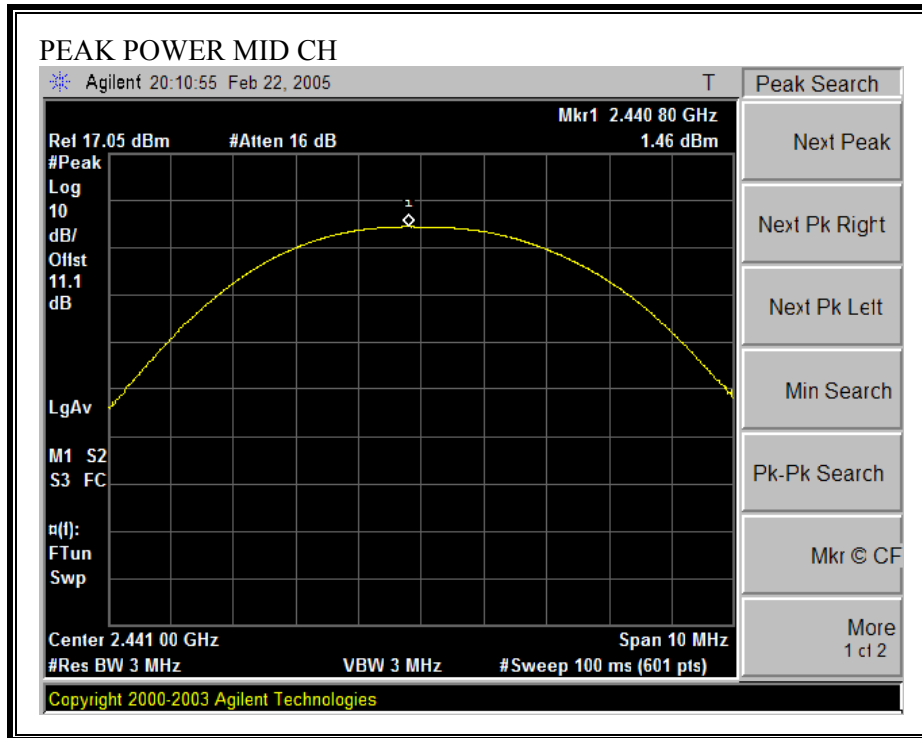
RESULTS

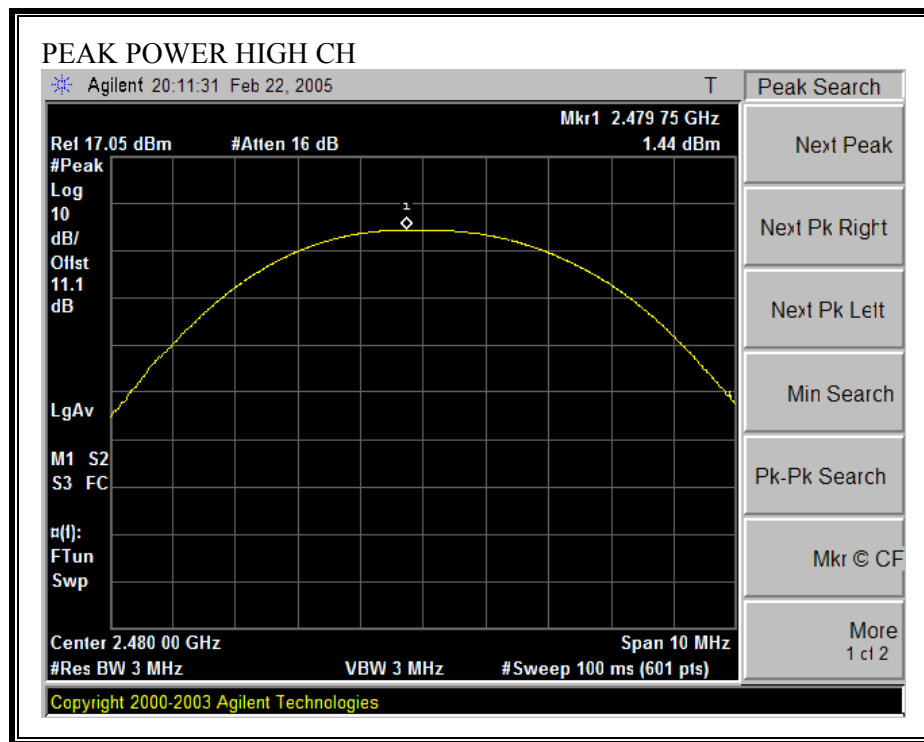
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.91	30	-29.09
Middle	2441	1.46	30	-28.54
High	2480	1.44	30	-28.56

OUTPUT POWER







7.1.6. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

* = Plane-wave equivalent power density

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

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

CALCULATIONS

Given

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

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

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

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

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

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

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

yields

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

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

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

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/cm²

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

LIMITS

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

RESULTS

No non-compliance noted:

Power Density Limit (mW/cm²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
1.0	1.46	4.18	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.

7.1.7. 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 11.1 dB (including 10 dB pad and 1.1dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	0.32
Middle	2441	0.88
High	2480	1.02

7.1.8. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST PROCEDURE

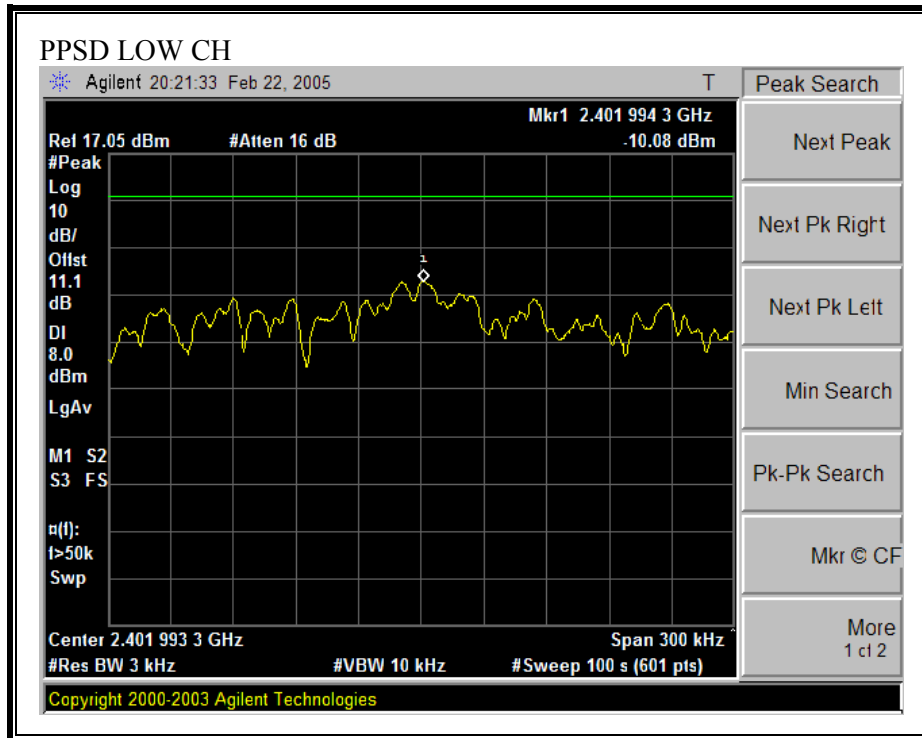
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz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

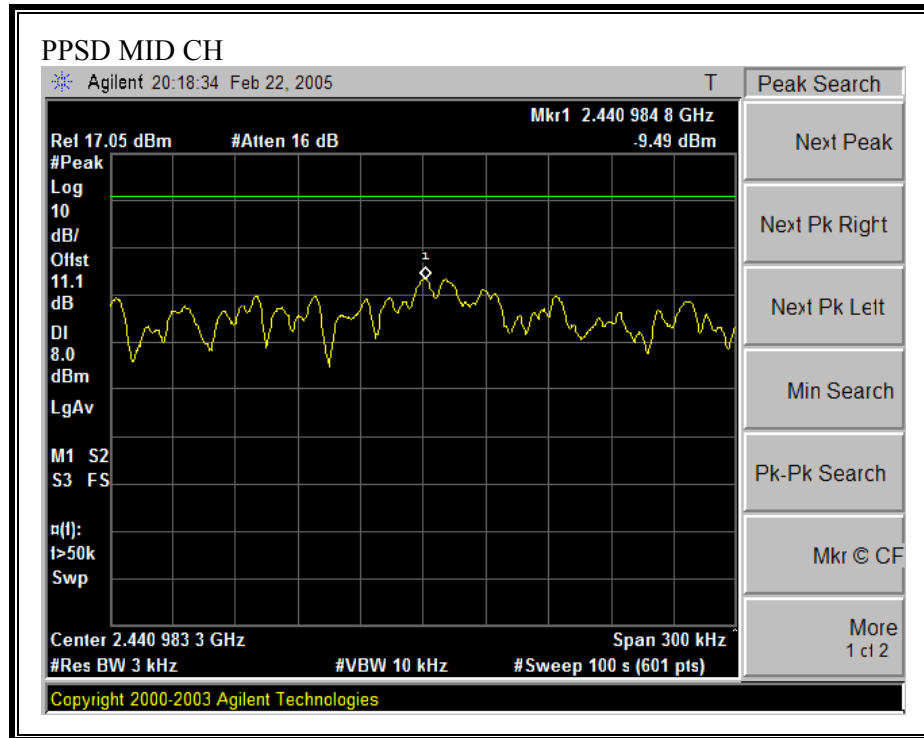
RESULTS

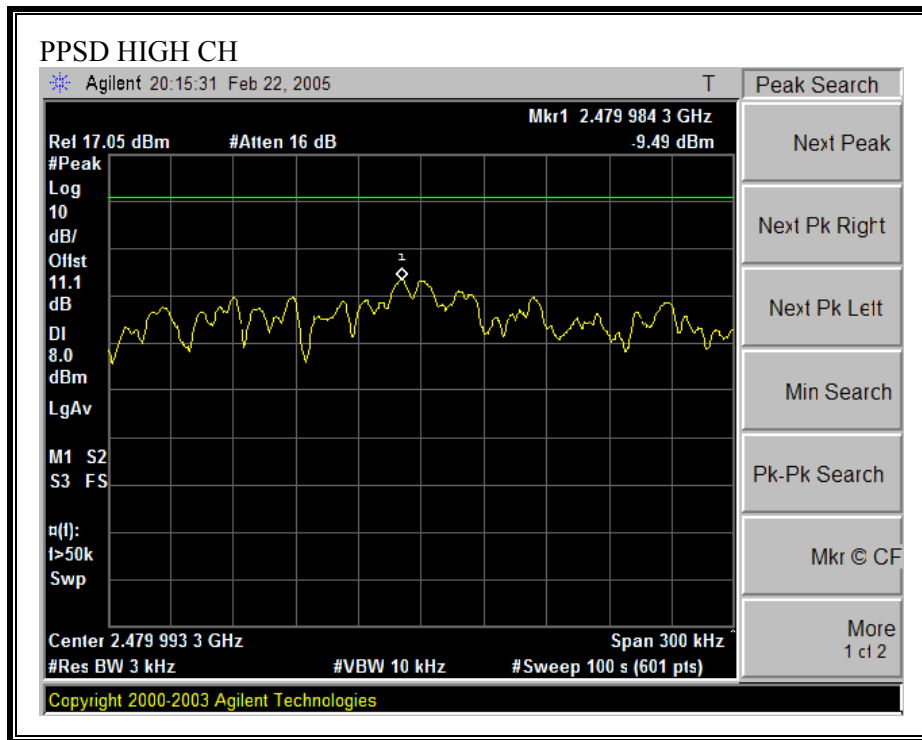
No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-10.08	8	-18.08
Middle	2441	-9.49	8	-17.49
High	2480	-9.49	8	-17.49

PEAK POWER SPECTRAL DENSITY







7.1.9. 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

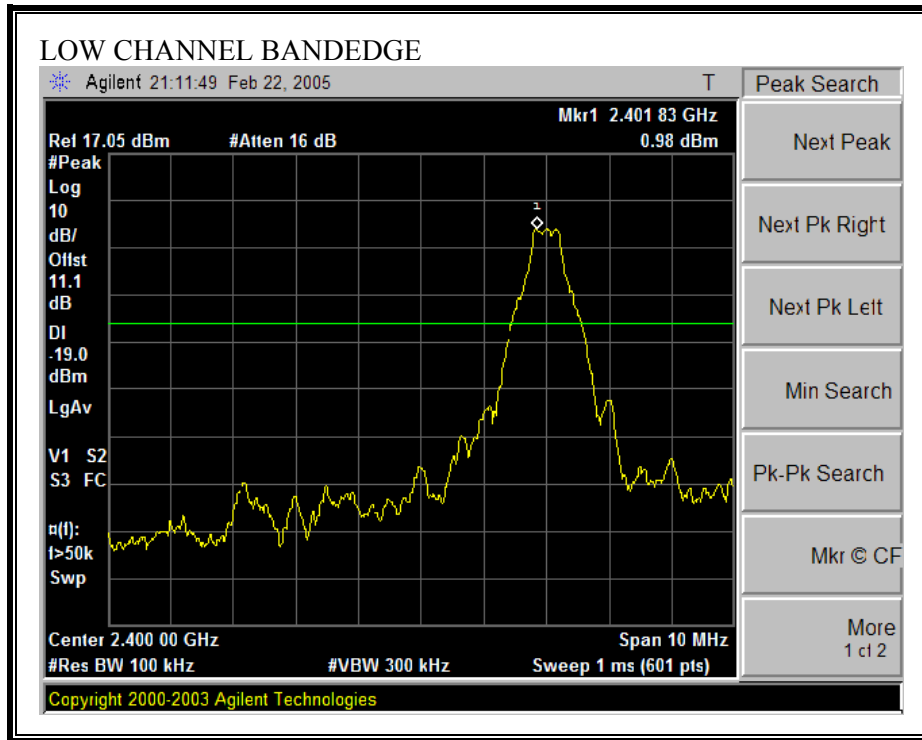
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

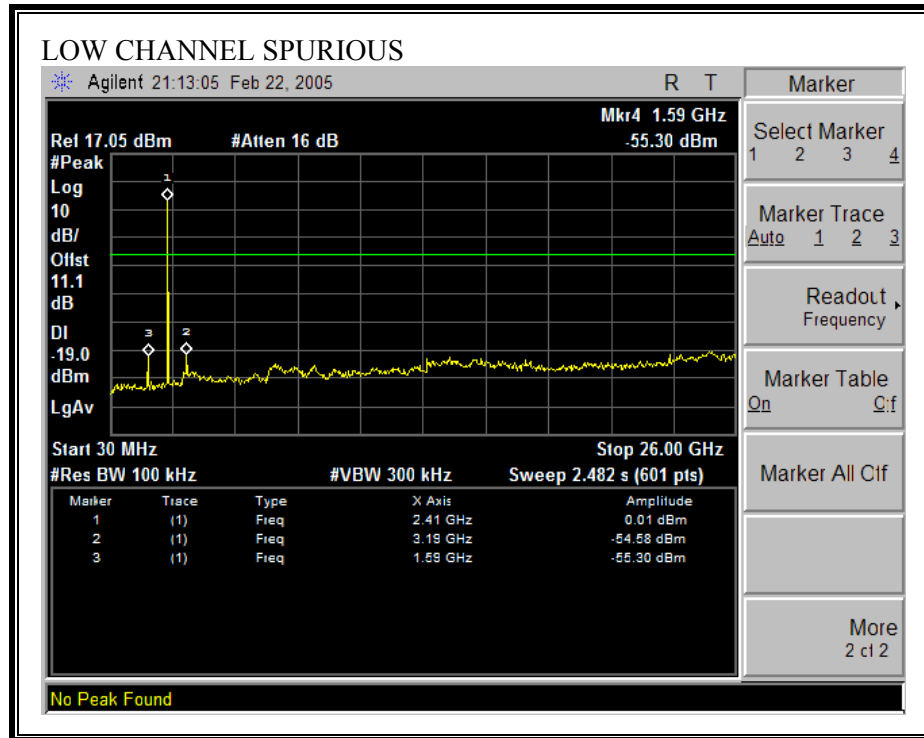
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

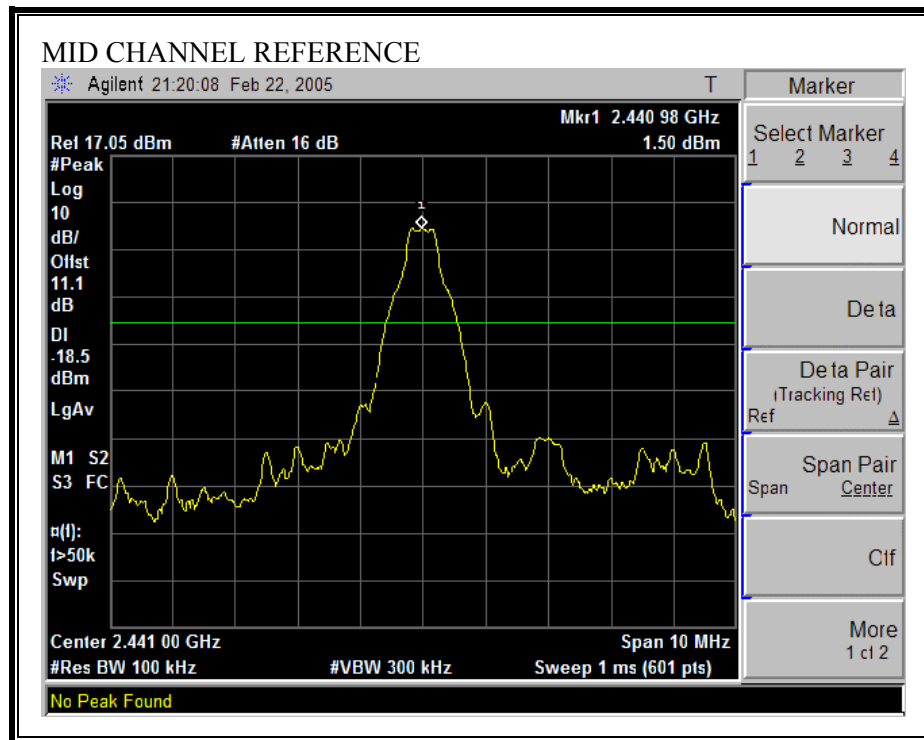
No non-compliance noted:

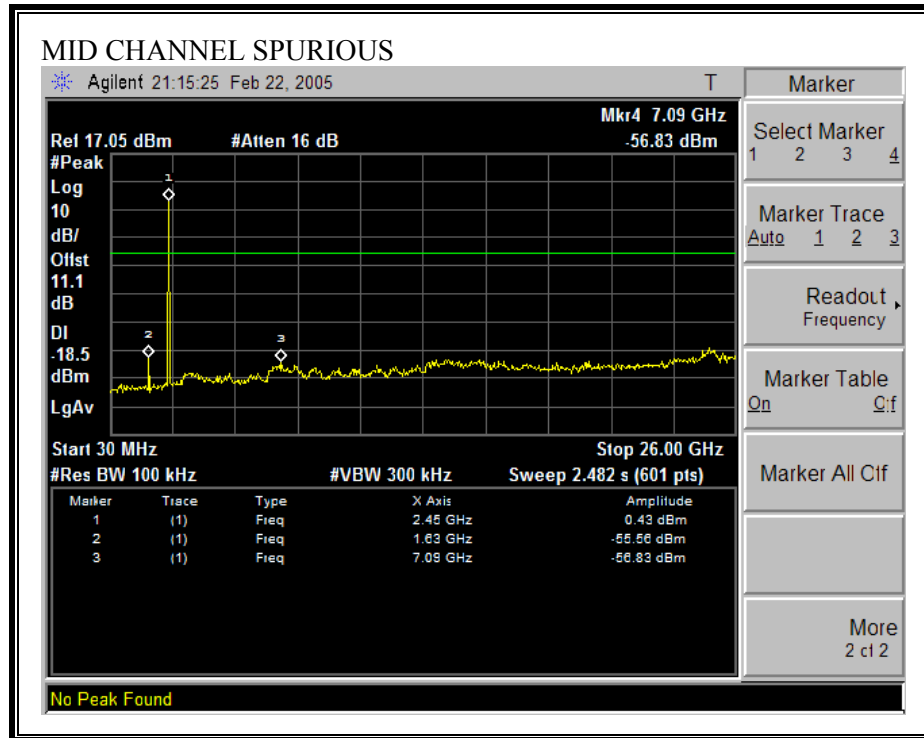
SPURIOUS EMISSIONS, LOW CHANNEL



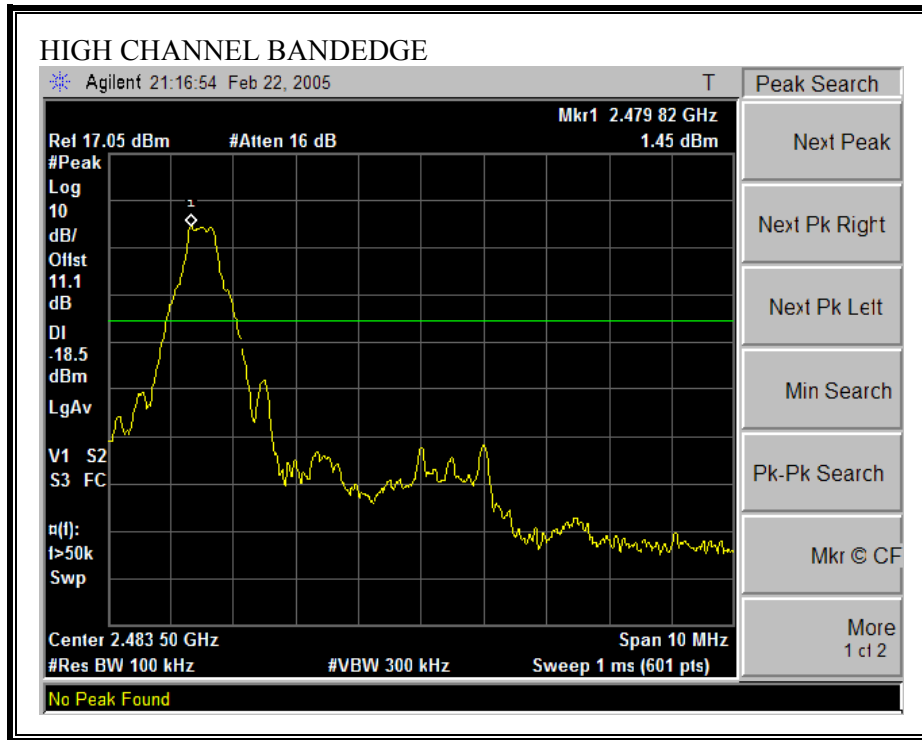


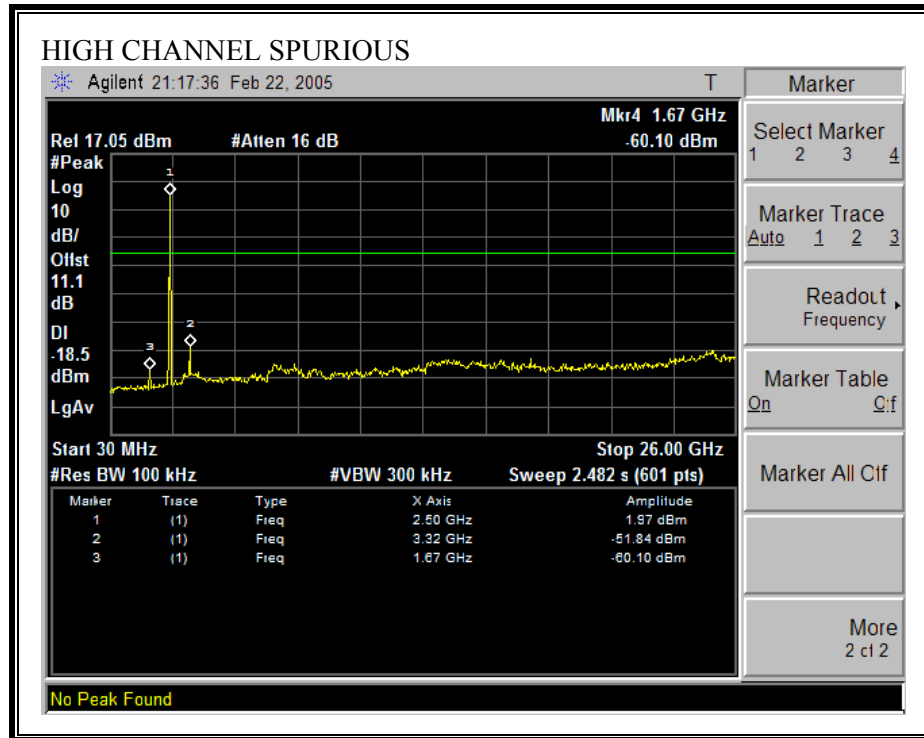
SPURIOUS EMISSIONS, MID CHANNEL



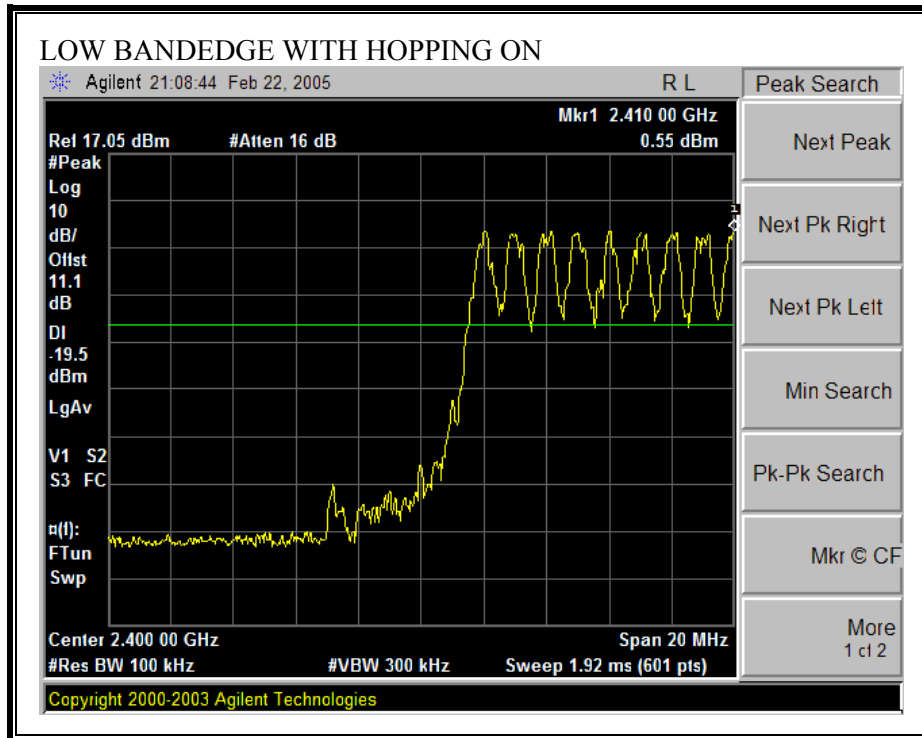


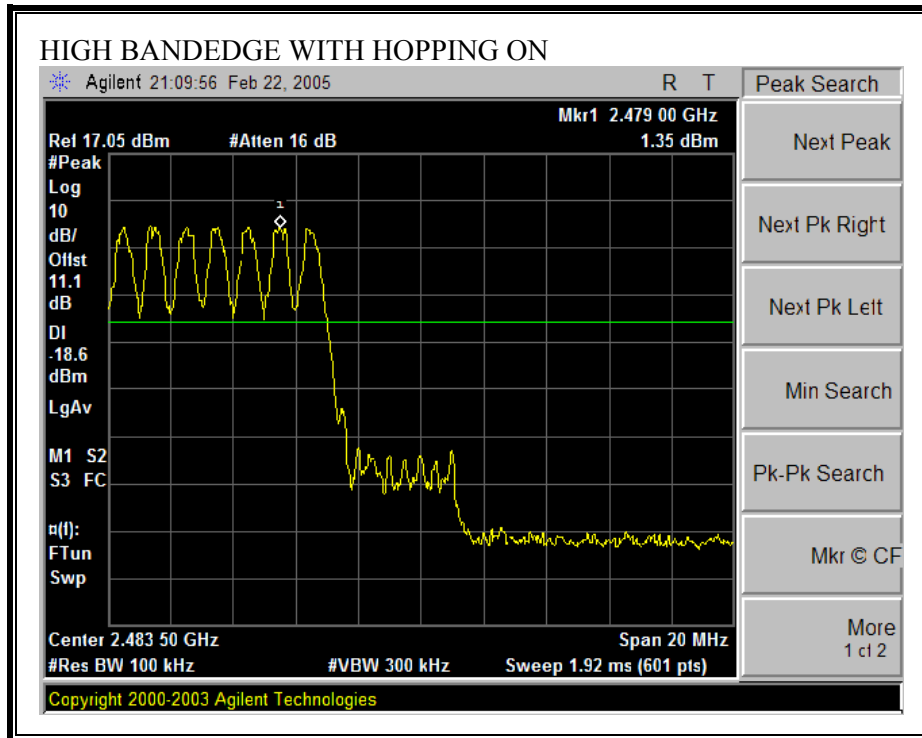
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
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 in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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.

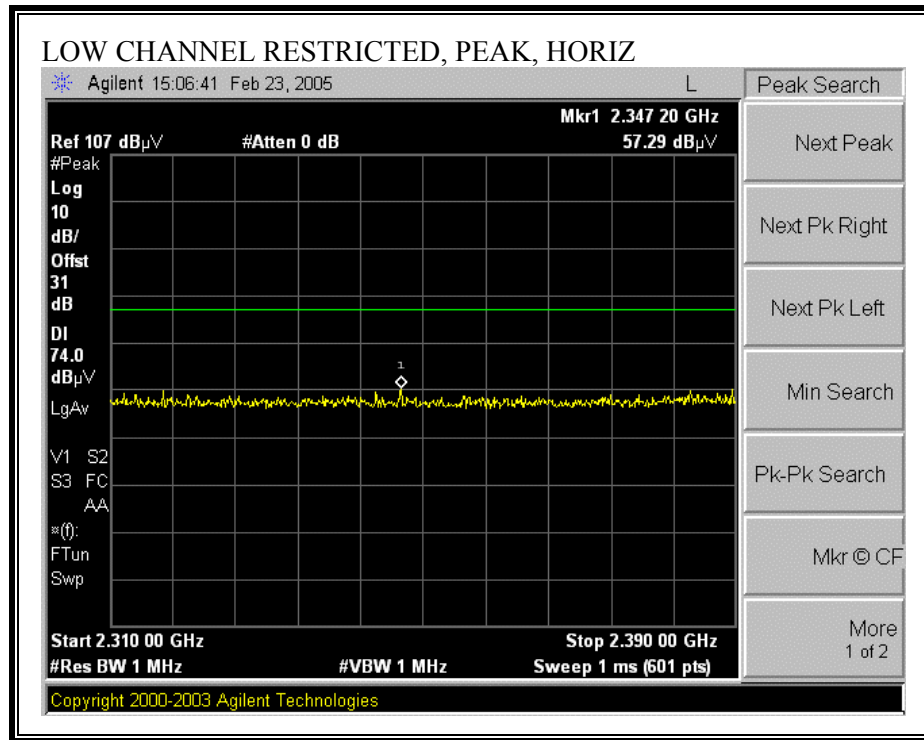
SUPPLEMENTAL TEST PROCEDURE FOR CO-LOCATED TRANSMITTERS

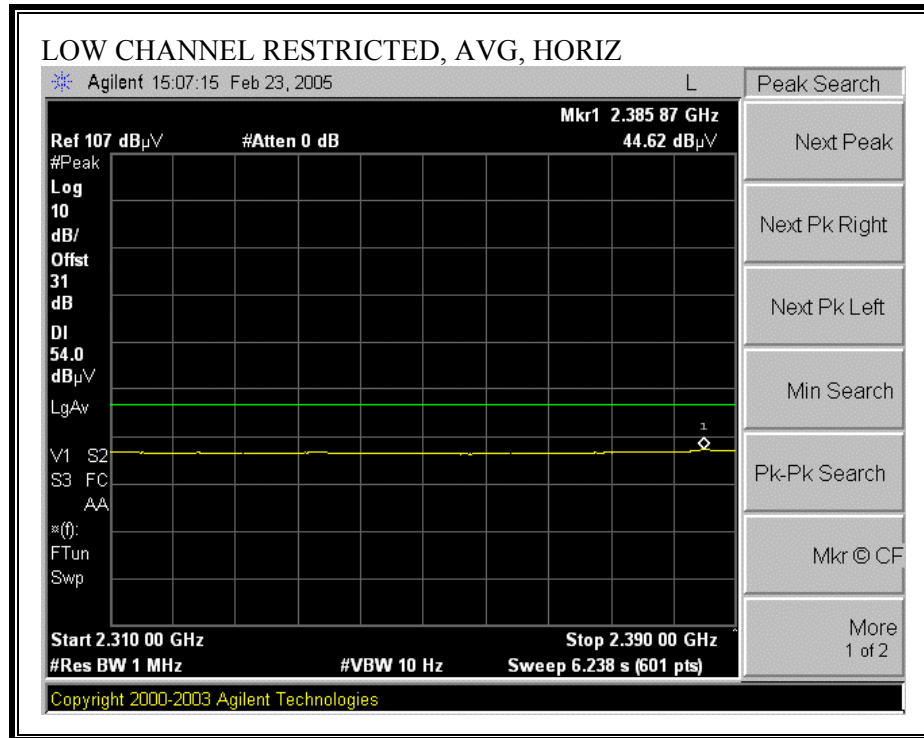
The dominant transmitter is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter are varied. The spectrum is searched for intermodulation products. Worst-case results are reported

7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

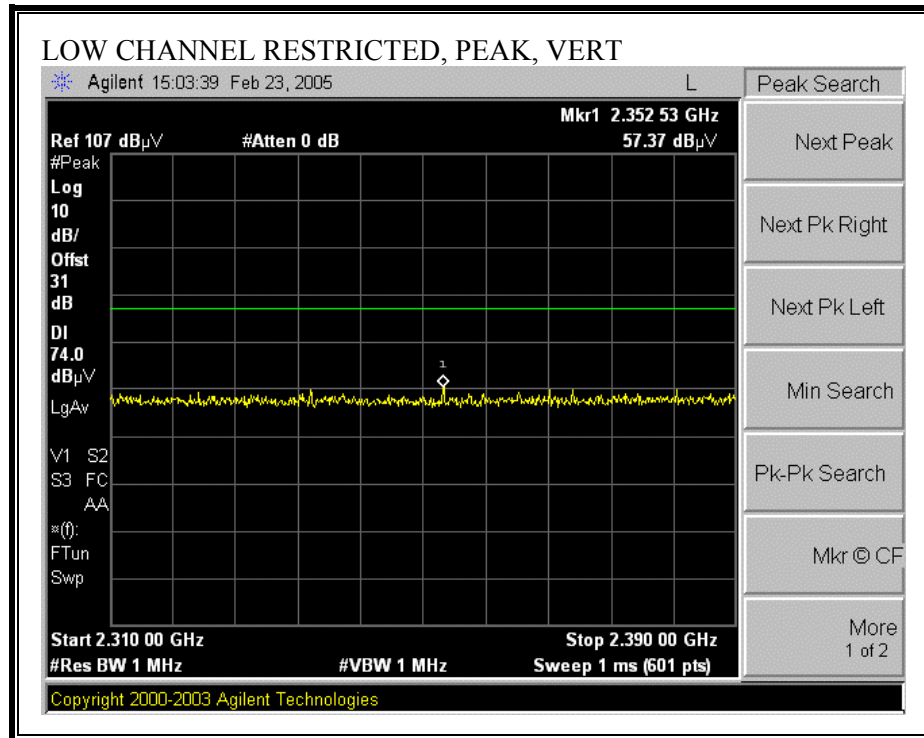
7.2.2.1. LAPTOP CONFIGURATION

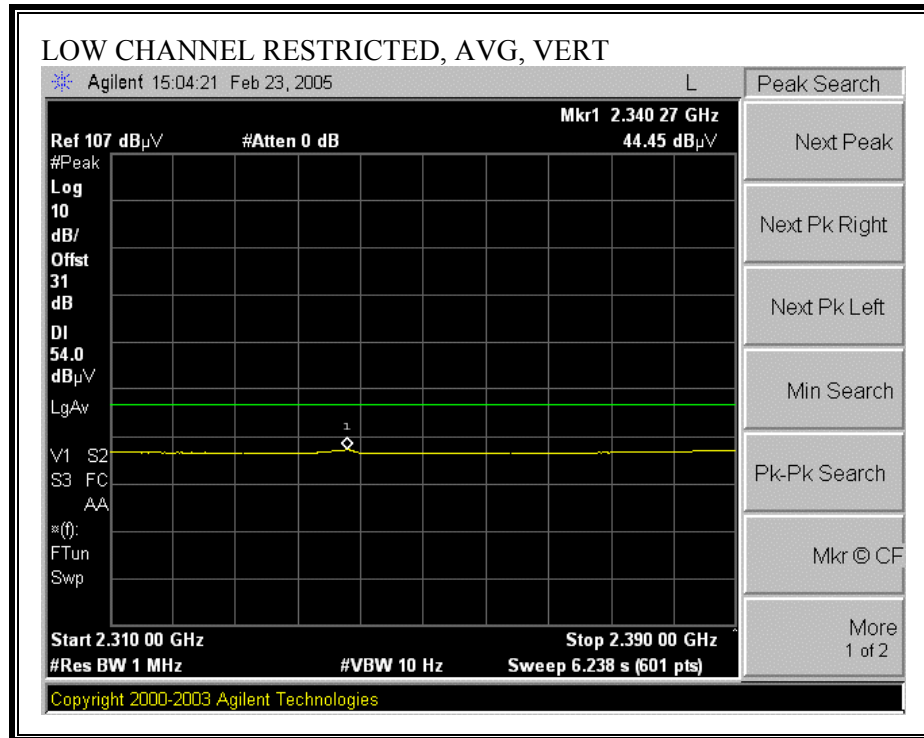
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



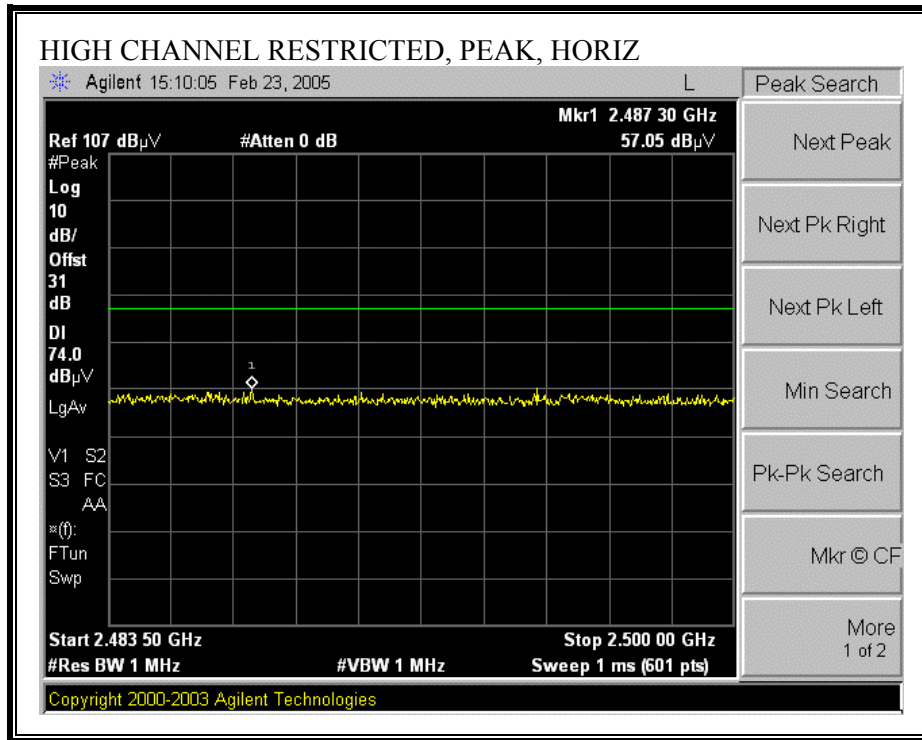


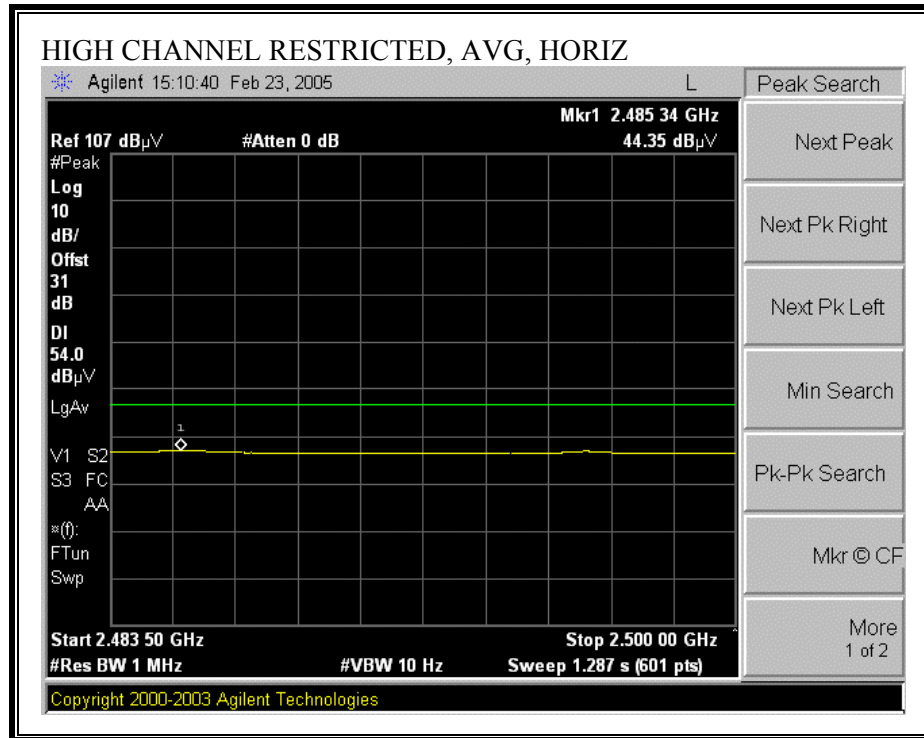
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



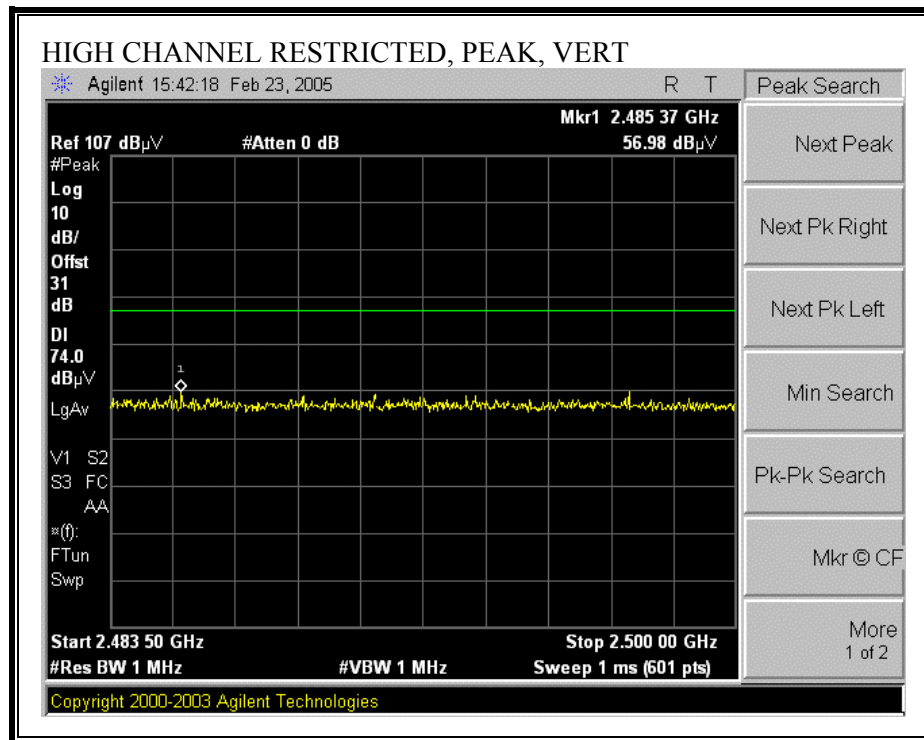


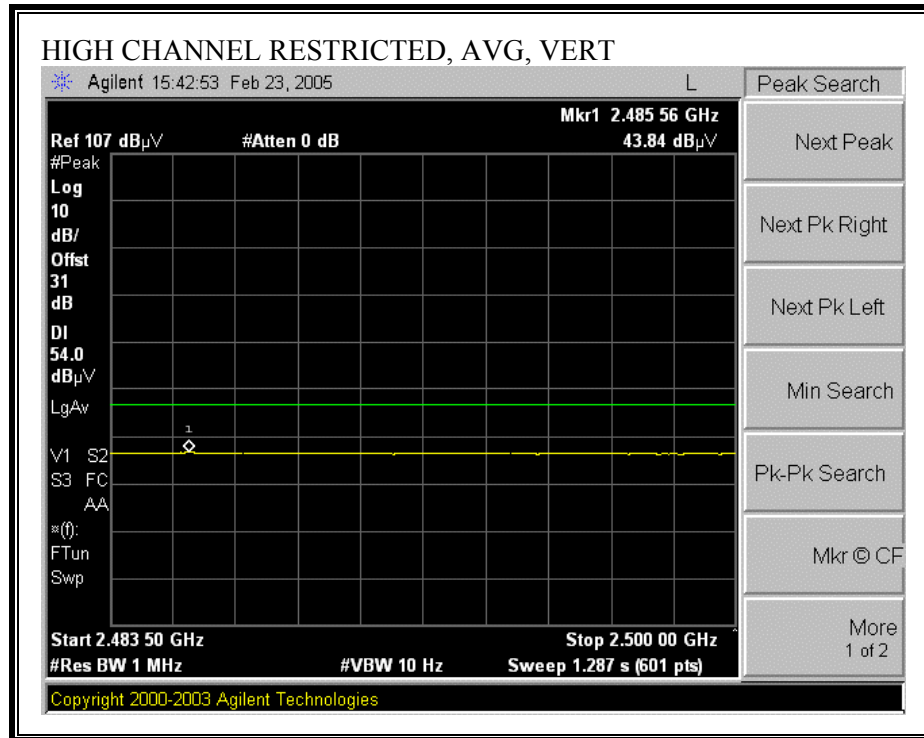
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



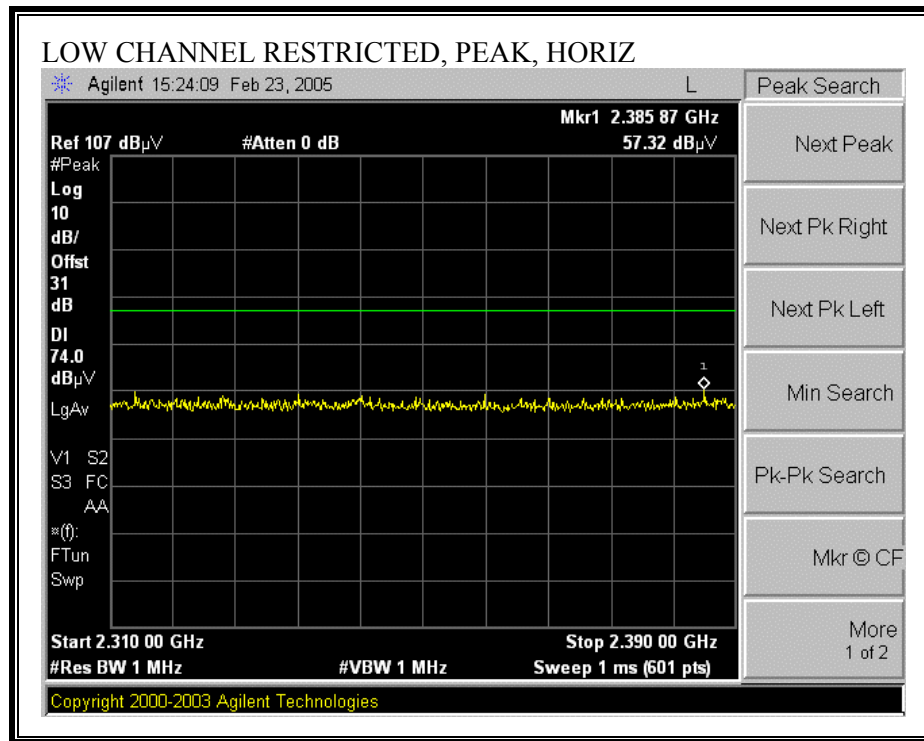


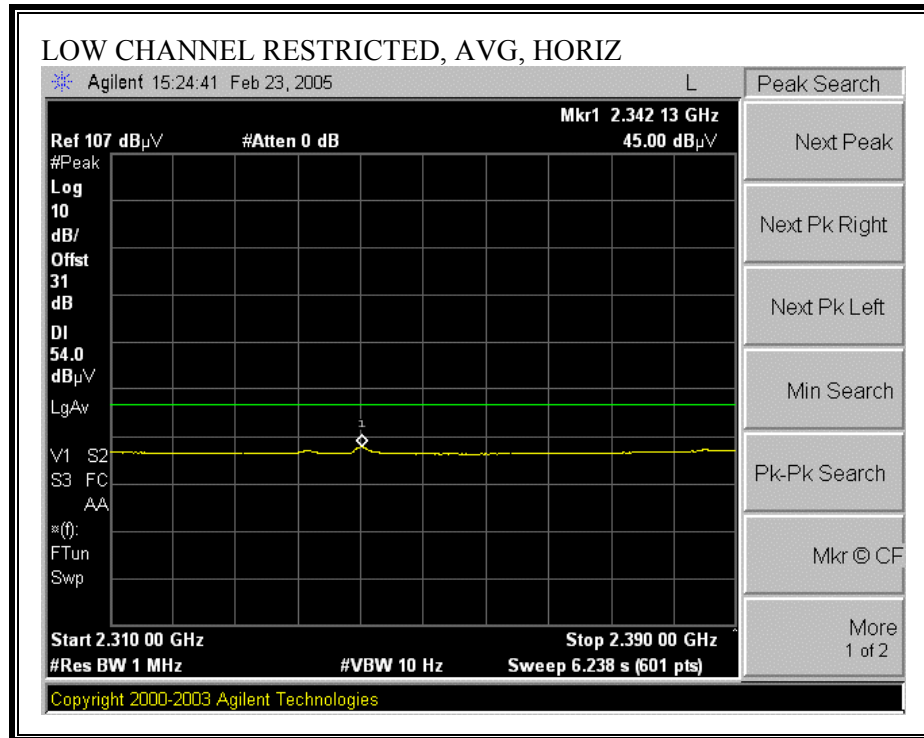
HARMONICS AND SPURIOUS EMISSIONS

02/23/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site Test Engr: Chin Pang Project #: 05U3286-1 Company: Toshiba EUT Descrip.: Bluetooth V2.0 Module EUT M/N: BC04 Test Target: FCC 15.247 Mode Oper: TX, Laptop Configuration																																													
Test Equipment:																																													
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit																																					
T73; S/N: 6717 @3m		T86 Miteq 924341						FCC 15.205																																					
Hi Frequency Cables																																													
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz, VBW=10Hz																																	
3_Chin						12_Neelesh		HPF_2.7GHz																																					
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																														
low ch, 2402MHz																																													
4.804	3.0	53.6	39.8	32.9	3.7	-44.0	0.0	0.5	46.7	32.9	74	54	-27.3	-21.1	V																														
4.804	3.0	52.4	39.7	32.9	3.7	-44.0	0.0	0.5	45.5	32.8	74	54	-28.5	-21.2	H																														
mid ch, 2441MHz																																													
4.882	3.0	52.5	39.6	32.9	3.8	-44.1	0.0	0.5	45.7	32.8	74	54	-28.3	-21.2	V																														
7.323	3.0	52.0	39.0	35.9	4.9	-45.0	0.0	0.5	48.3	35.3	74	54	-25.7	-18.7	V																														
4.882	3.0	52.6	39.4	32.9	3.8	-44.1	0.0	0.5	45.8	32.6	74	54	-28.2	-21.4	H																														
7.323	3.0	51.5	38.7	35.9	4.9	-45.0	0.0	0.5	47.8	35.0	74	54	-26.2	-19.0	H																														
High Ch, 2480MHz																																													
4.960	3.0	52.0	39.5	33.0	3.8	-44.2	0.0	0.5	45.2	32.7	74	54	-28.8	-21.3	V																														
7.440	3.0	50.8	38.5	36.1	5.0	-45.0	0.0	0.5	47.4	35.1	74	54	-26.6	-18.9	V																														
4.960	3.0	51.0	38.6	33.0	3.8	-44.2	0.0	0.5	44.2	31.8	74	54	-29.8	-22.2	H																														
7.440	3.0	50.4	38.2	36.1	5.0	-45.0	0.0	0.5	47.0	34.8	74	54	-27.0	-19.2	H																														
Note: No other emissions were detected above the system noise floor																																													
<table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">f</td> <td style="width: 35%;">Measurement Frequency</td> <td style="width: 15%;">Amp</td> <td style="width: 25%;">Preamp Gain</td> <td style="width: 15%;">Avg Lim</td> <td style="width: 10%;">Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>																f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit	Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit	Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit	AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit	CL	Cable Loss	HPF	High Pass Filter		
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit																																								
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit																																								
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit																																								
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit																																								
CL	Cable Loss	HPF	High Pass Filter																																										

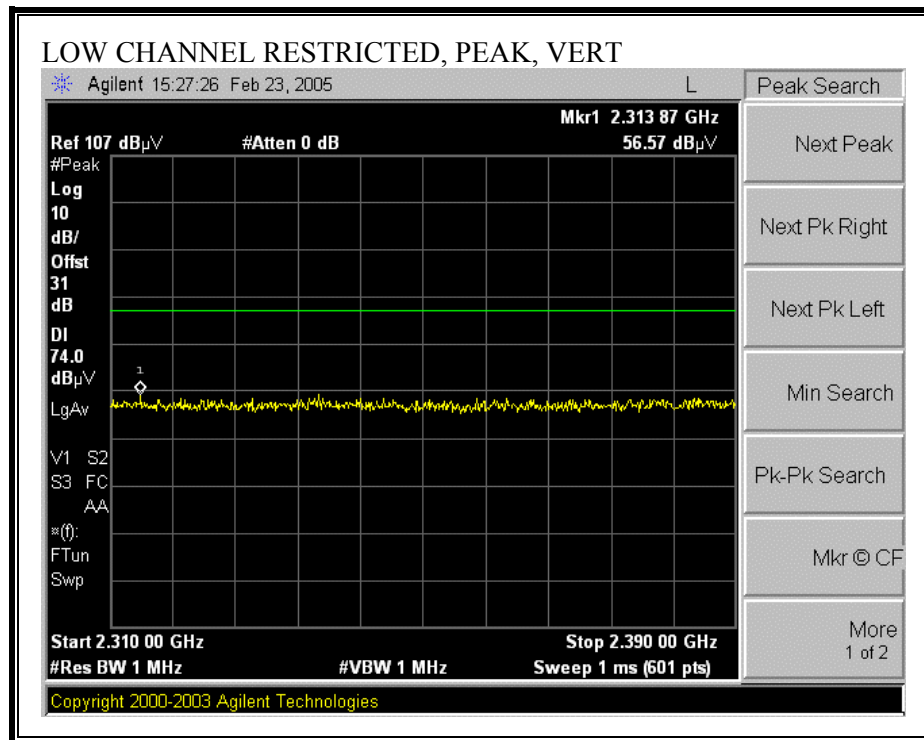
7.2.2.2. PORTABLE CONFIGURATION (WORST CASE)

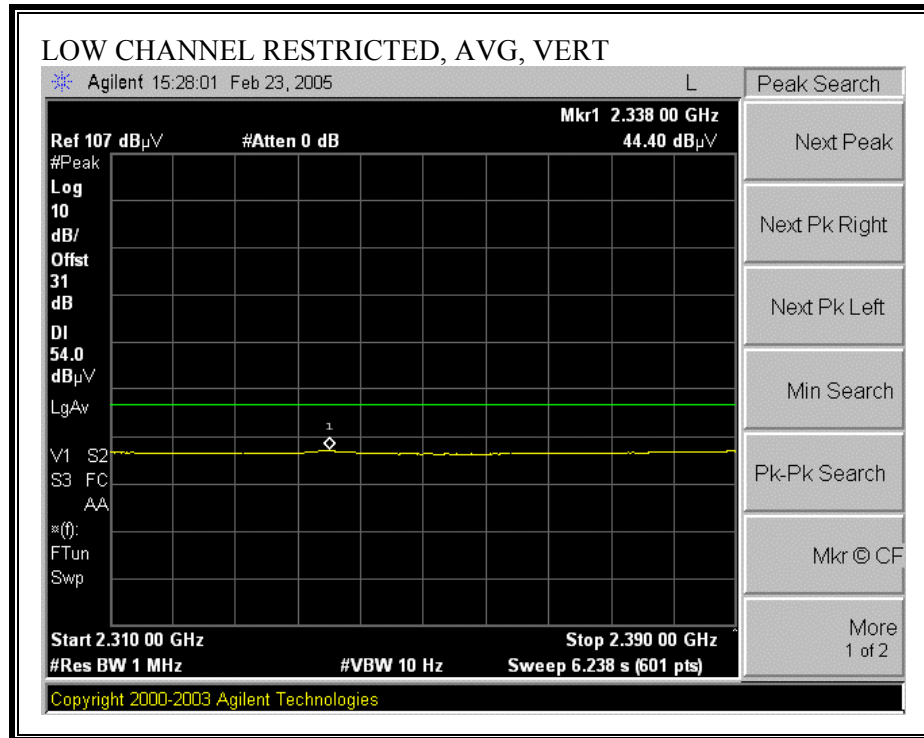
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



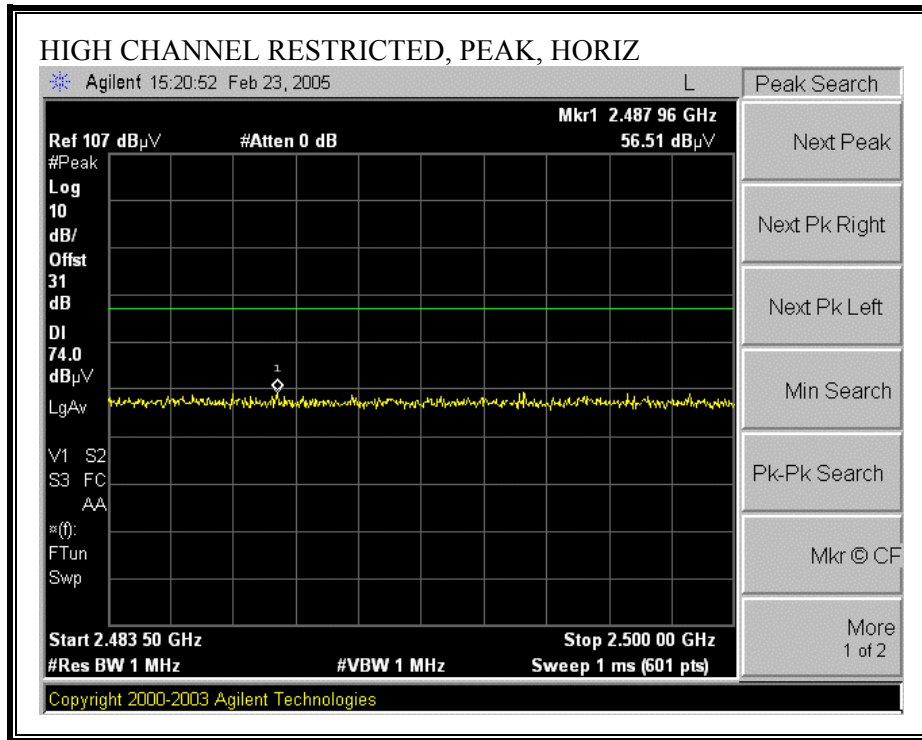


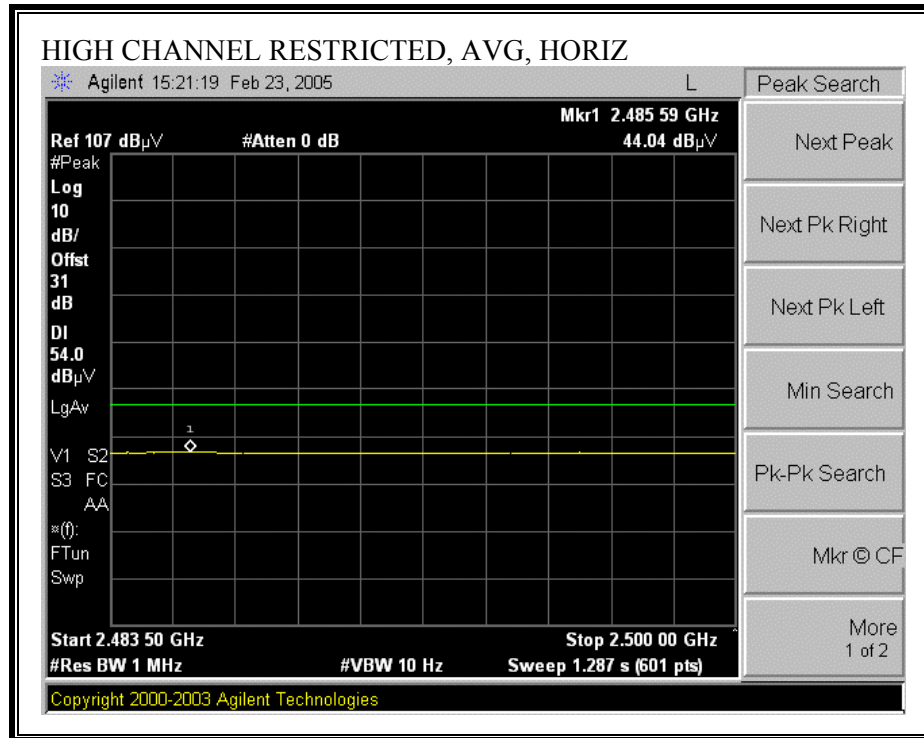
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



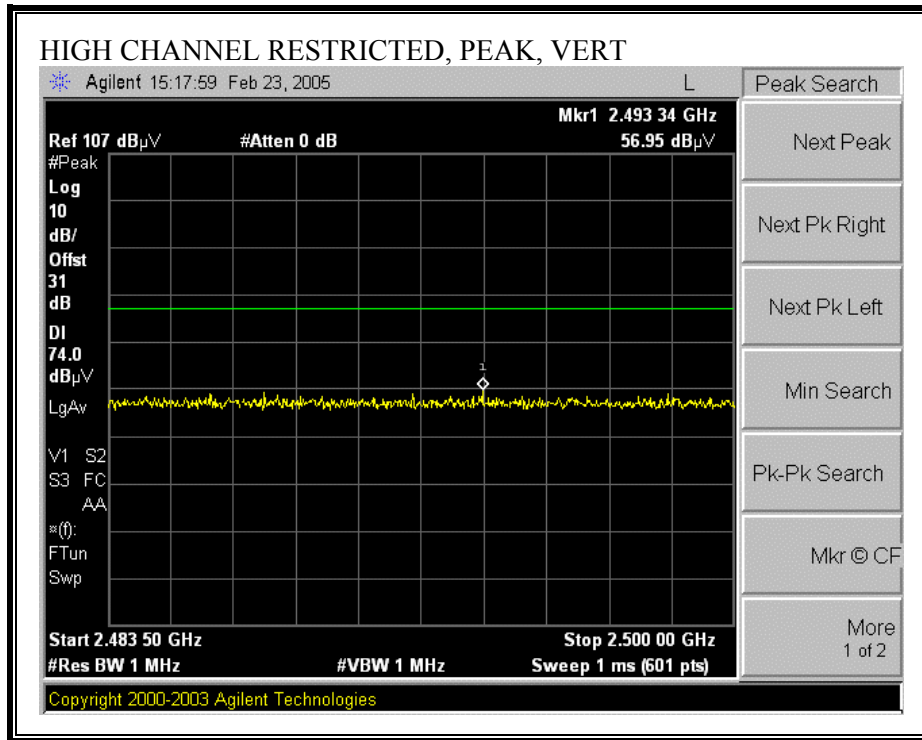


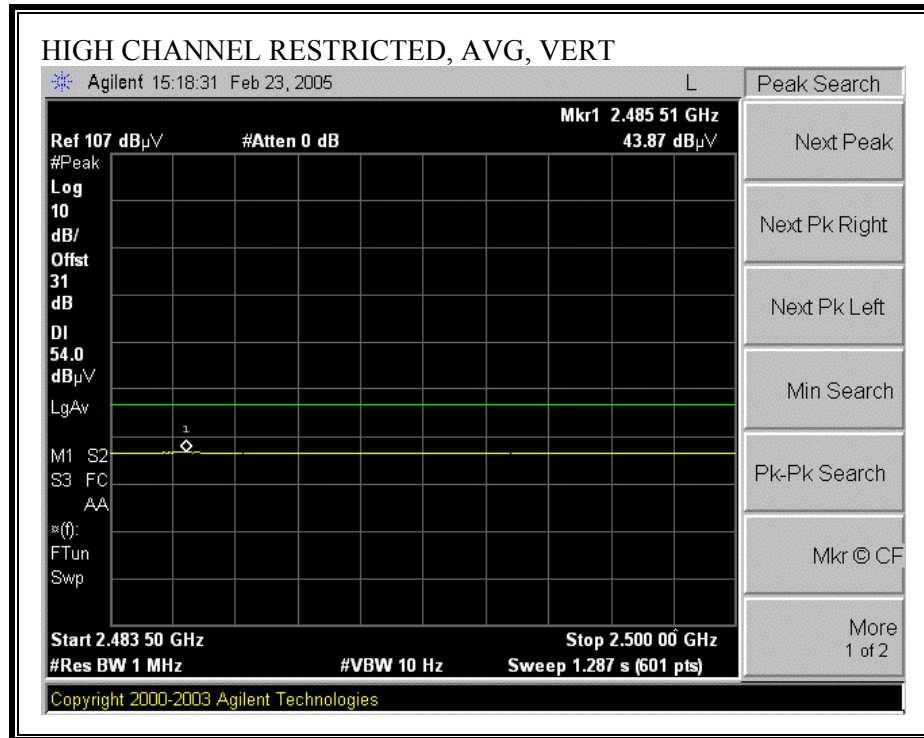
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

02/23/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Chin Pang Project #: 05U3286-1 Company: Toshiba EUT Descrip.: Bluetooth V2.0 Module EUT M/N: BC04 Test Target: FCC 15.247 Mode Oper: TX, Pottable Configuration (Worst Case)															
Test Equipment:															
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T86 Miteq 924341		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit FCC 15.205							
Hi Frequency Cables				HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz							
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF 2.7GHz		Reject Filter					
3_Chin		12_Neelesh													
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fldr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
low ch, 2402MHz															
4.804	3.0	54.0	42.3	32.9	3.7	-44.0	0.0	0.5	47.1	35.4	74	54	-26.9	-18.6	V
4.804	3.0	53.2	41.0	32.9	3.7	-44.0	0.0	0.5	46.3	34.1	74	54	-27.7	-19.9	H
mid ch, 2441MHz															
4.882	3.0	54.4	43.0	32.9	3.8	-44.1	0.0	0.5	47.6	36.2	74	54	-26.4	-17.8	V
7.323	3.0	53.0	39.6	35.9	4.9	-45.0	0.0	0.5	49.3	35.9	74	54	-24.7	-18.1	V
4.882	3.0	52.5	40.5	32.9	3.8	-44.1	0.0	0.5	45.7	33.7	74	54	-28.3	-20.3	H
7.323	3.0	51.9	39.3	35.9	4.9	-45.0	0.0	0.5	48.2	35.6	74	54	-25.8	-18.4	H
High Ch, 2480MHz															
4.960	3.0	52.0	39.4	33.0	3.8	-44.2	0.0	0.5	45.2	32.6	74	54	-28.8	-21.4	V
7.440	3.0	50.8	39.0	36.1	5.0	-45.0	0.0	0.5	47.4	35.6	74	54	-26.6	-18.4	V
4.960	3.0	51.6	38.8	33.0	3.8	-44.2	0.0	0.5	44.8	32.0	74	54	-29.2	-22.0	H
7.440	3.0	51.0	38.6	36.1	5.0	-45.0	0.0	0.5	47.6	35.2	74	54	-26.4	-18.8	H
Note: No other emissions were detected above the system noise floor															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

7.2.3.1. LAPTOP CONFIGURATION

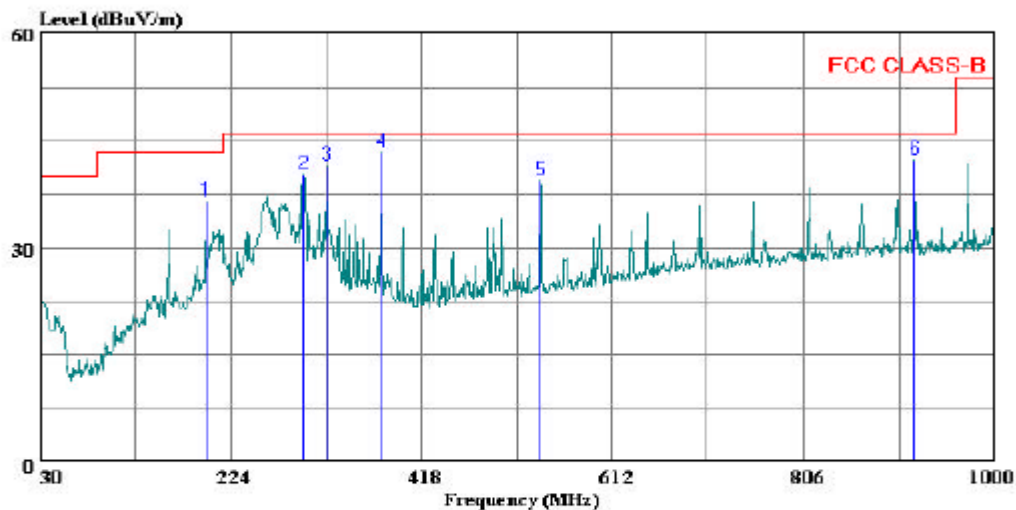
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

Data#: 4 File#: 3286 toshiba.EMI Date: 02-23-2005 Time: 11:02:57



(Auxiliary ATC)

Trace: 3

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Project #: : 05U3286-1
Company: : Toshiba America Information Inc
EUT: : Bluetooth V2.0 Module
Model No : BC04
Configuration: : EUT/Toshiba Laptop
Target of Test: : FCC Class B
Mode of Operation: Transmitting (Worst Case)
: Laptop Configuration

HORIZONTAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	198.780	49.90	-13.27	36.63	43.50	-6.87	Peak
2	298.690	52.20	-11.88	40.32	46.00	-5.68	Peak
3	322.940	52.80	-11.21	41.59	46.00	-4.41	Peak
4	377.260	53.50	-10.01	43.49	46.00	-2.51	Peak
5	539.250	46.10	-6.61	39.49	46.00	-6.51	Peak
6	918.520	43.20	-0.84	42.36	46.00	-3.64	Peak

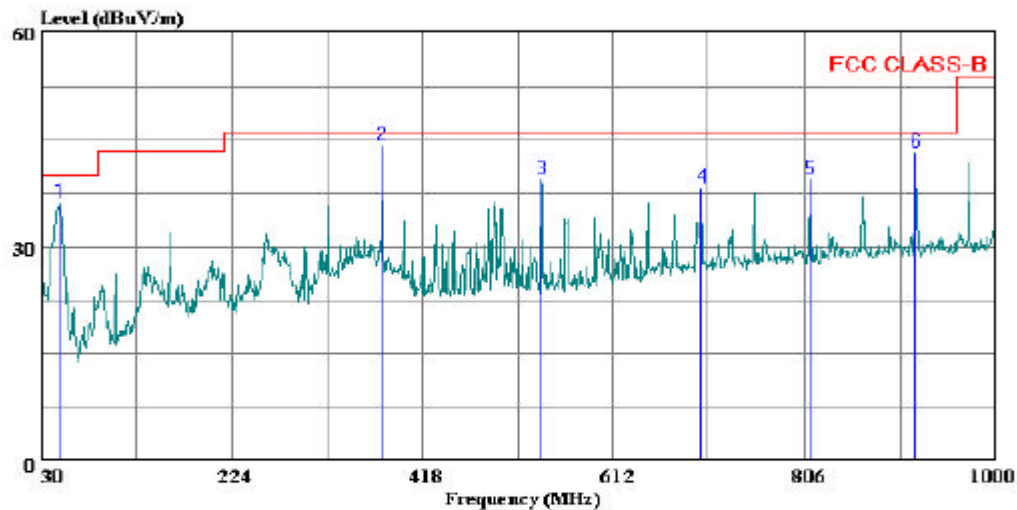
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 2 File#: 3286 toshiba.EMI Date: 02-23-2005 Time: 10:59:41



(Aux1x ATC)

Trace: 1

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Project #: : 05U3286-1
Company: : Toshiba America Information Inc
EUT: : Bluetooth V2.0 Module
Model No : BC04
Configuration: : EUT/Toshiba Laptop
Target of Test: : FCC Class B
Mode of Operation: Trasmitting (Worst Case)
: Laptop Configuration

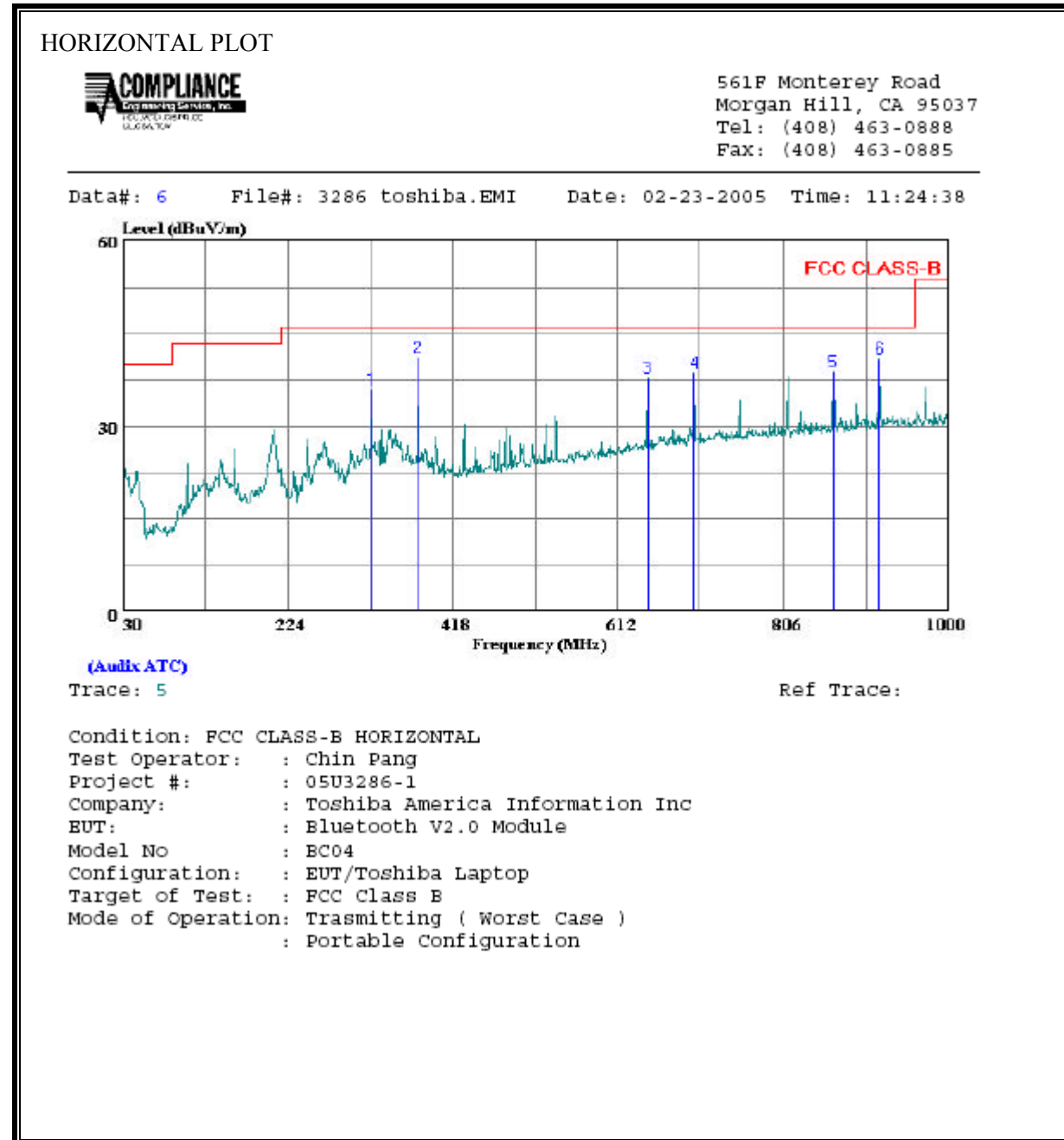
VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	48.430	53.80	-17.60	36.20	40.00	-3.80	Peak
2	377.260	54.30	-10.01	44.29	46.00	-1.71	Peak
3	539.250	46.10	-6.61	39.49	46.00	-6.51	Peak
4	702.210	41.40	-3.23	38.17	46.00	-7.83	Peak
5	810.850	41.20	-1.65	39.55	46.00	-6.45	Peak
6	918.520	44.00	-0.84	43.16	46.00	-2.84	Peak

7.2.3.2. PORTABLE CONFIGURATION

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



HORIZONTAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	322.940	47.10	-11.21	35.89	46.00	-10.11	Peak
2	377.260	51.20	-10.01	41.19	46.00	-4.81	Peak
3	647.890	42.30	-4.41	37.89	46.00	-8.11	Peak
4	702.210	41.90	-3.23	38.67	46.00	-7.33	Peak
5	864.200	40.00	-1.26	38.74	46.00	-7.26	Peak
6	918.520	41.70	-0.84	40.86	46.00	-5.14	Peak

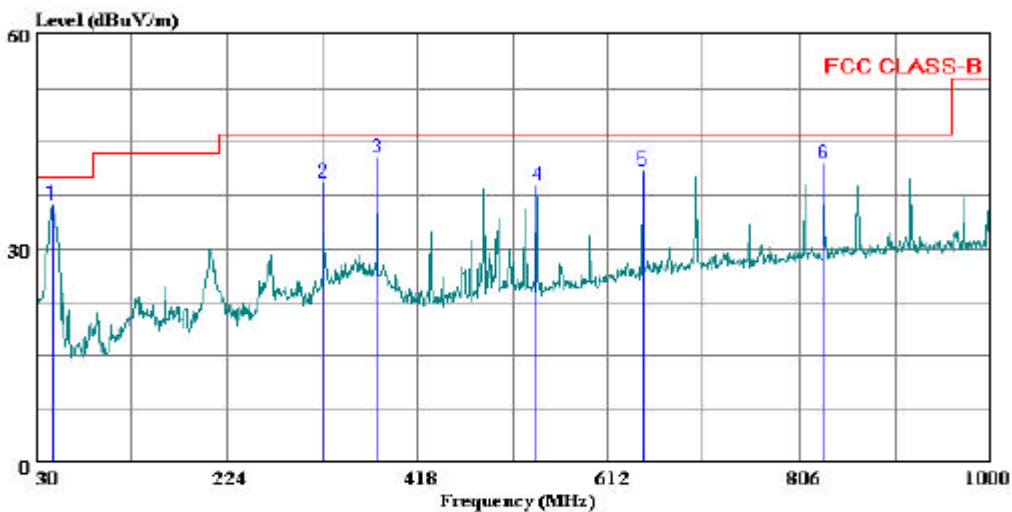
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 8 File#: 3286 toshiba.EMI Date: 02-23-2005 Time: 11:27:38



(Auxiliary ATC)

Trace: 7

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Project #: : 05U3286-1
Company: : Toshiba America Information Inc
EUT: : Bluetooth V2.0 Module
Model No : BC04
Configuration: : EUT/Toshiba Laptop
Target of Test: : FCC Class B
Mode of Operation: Transmitting (Worst Case)
: Portable Configuration

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	46.490	52.29	-16.12	36.17	40.00	-3.83	Peak
2	322.940	50.40	-11.21	39.19	46.00	-6.81	Peak
3	377.260	52.70	-10.01	42.69	46.00	-3.31	Peak
4	539.250	45.40	-6.61	38.79	46.00	-7.21	Peak
5	647.890	45.30	-4.41	40.89	46.00	-5.11	Peak
6	829.280	43.50	-1.66	41.84	46.00	-4.16	Peak

7.2.4. CO-LOCATED TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz

Worst-case configurations are determined as:

Lower bandedge: WLAN in g mode at low channel and Bluetooth at low channel;

Upper bandedge: WLAN in g mode at high channel and Bluetooth at high channel;

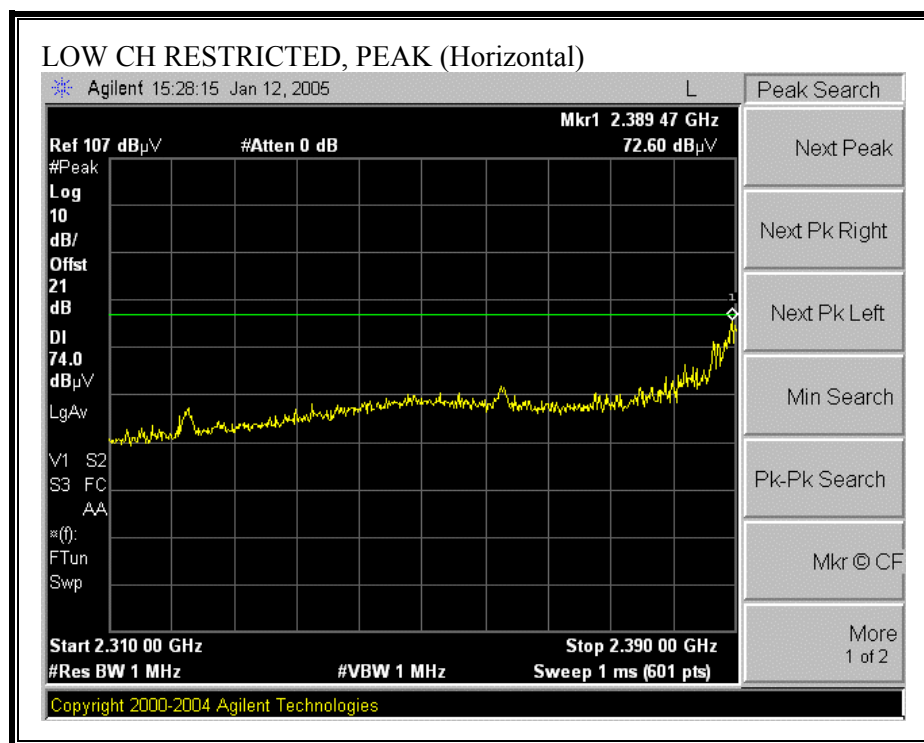
Harmonics and spurious emissions: WLAN in g mode at mid channel and Bluetooth at mid channel.

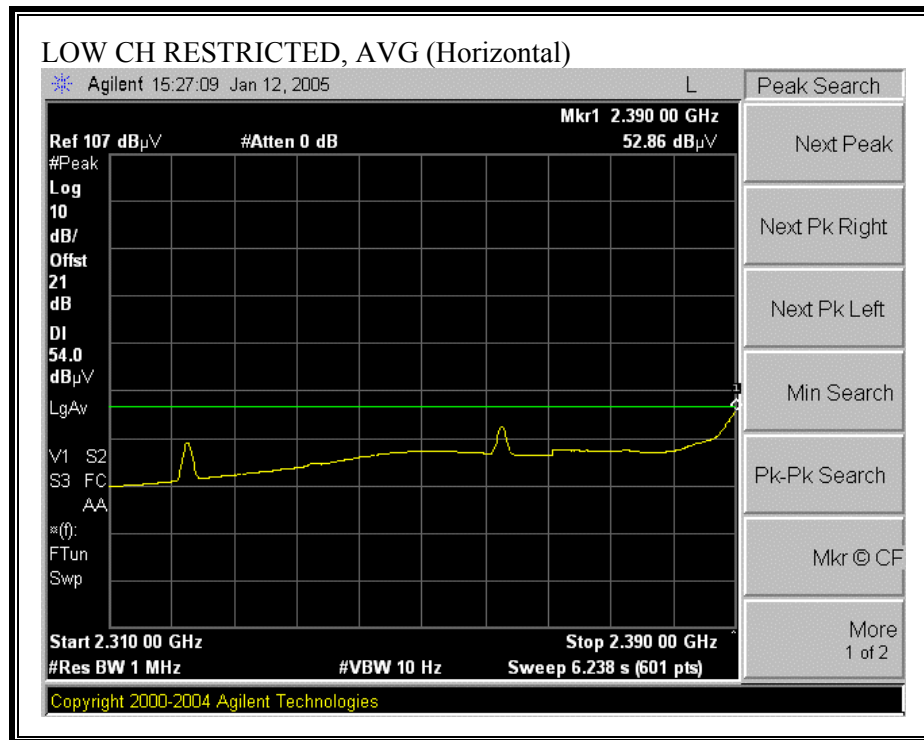
7.2.4.1. MOBILE CONFIGURATION

No non-compliance noted:

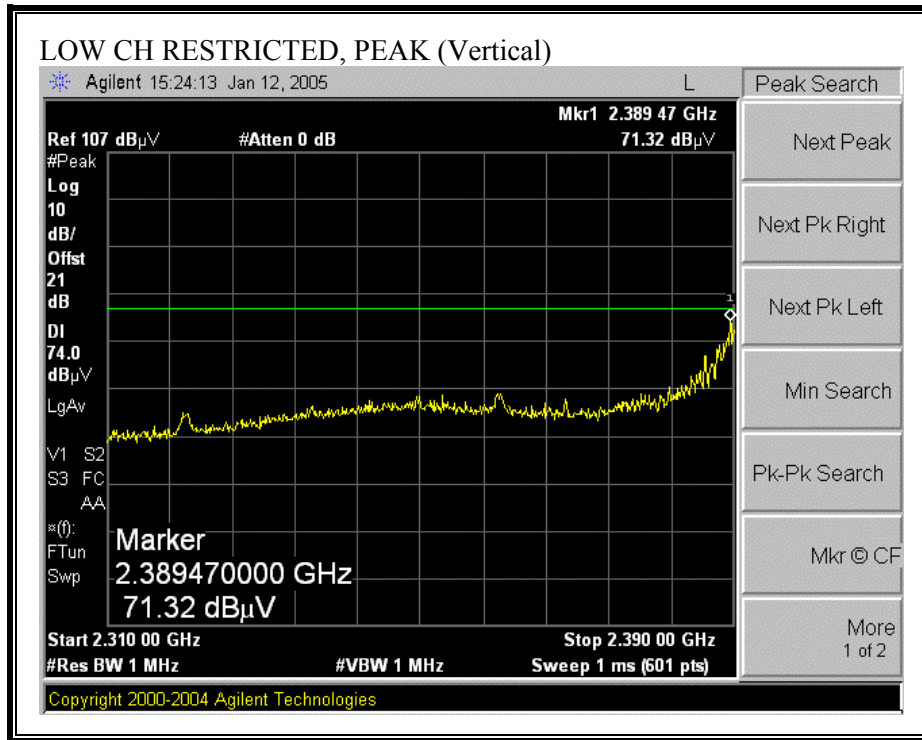
The dominant transmitter is the WLAN and the non-dominant transmitter is the Bluetooth.

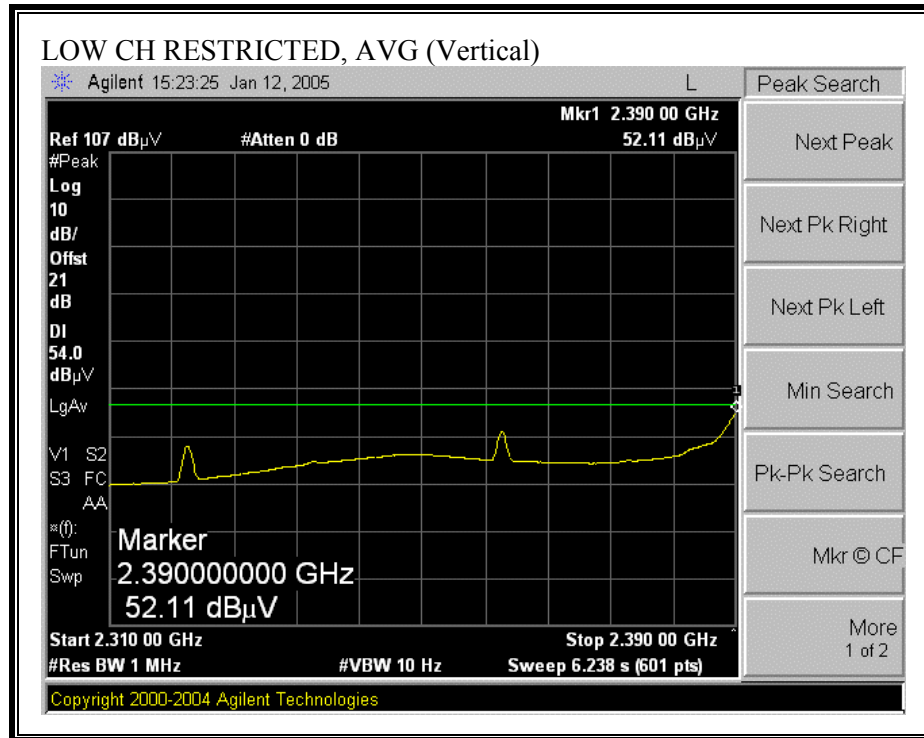
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



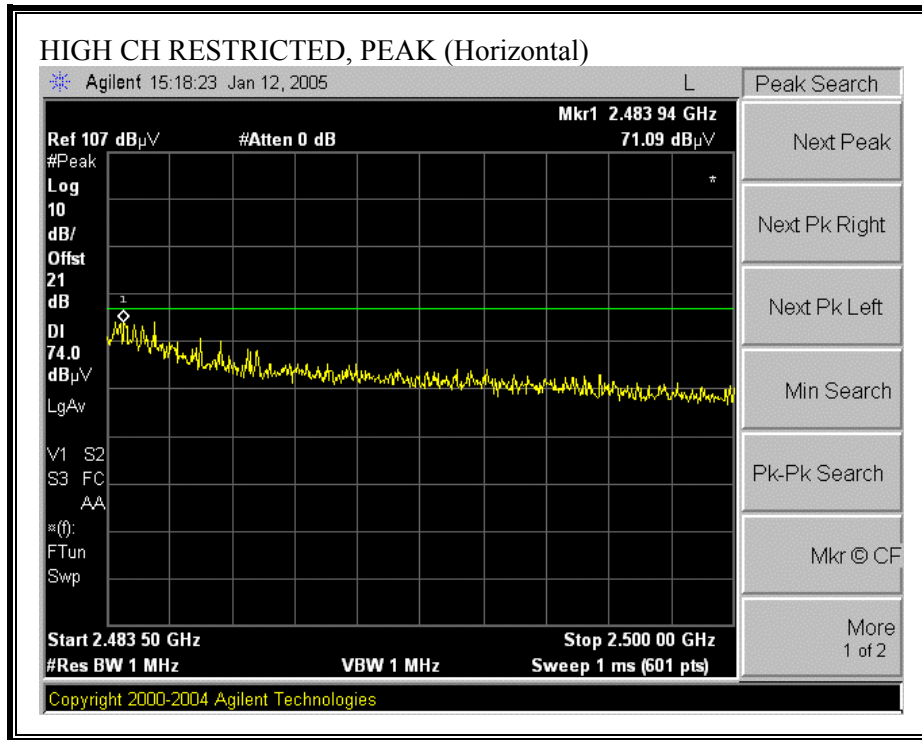


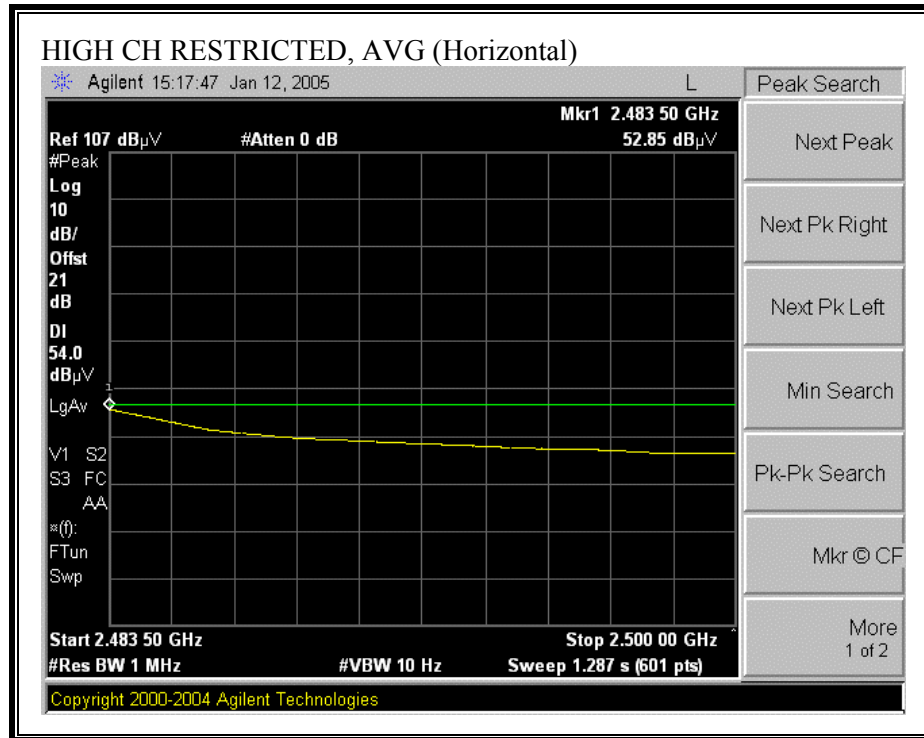
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



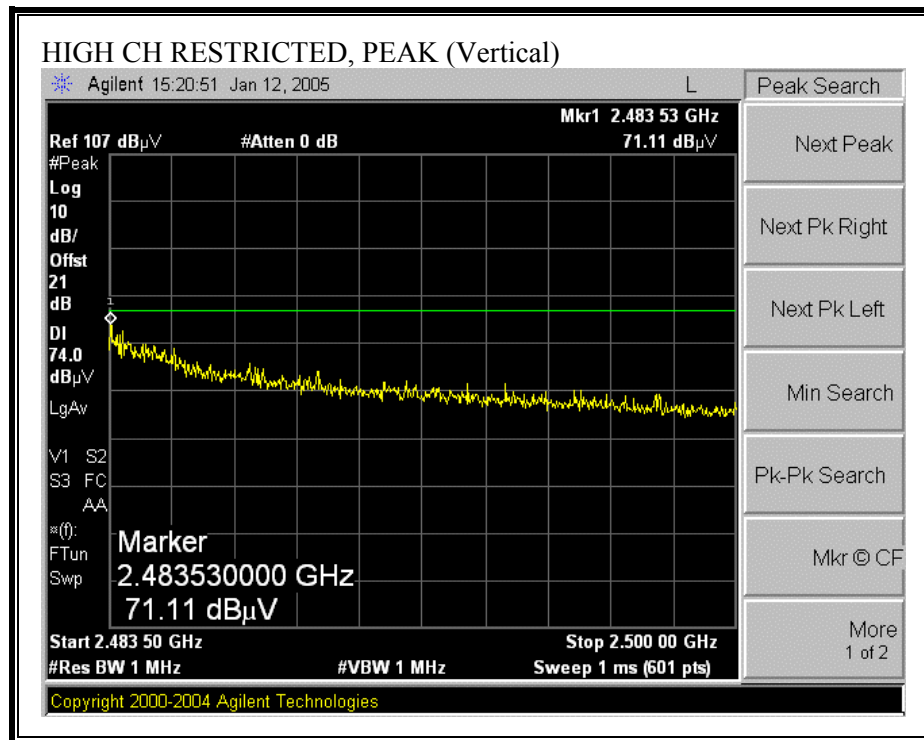


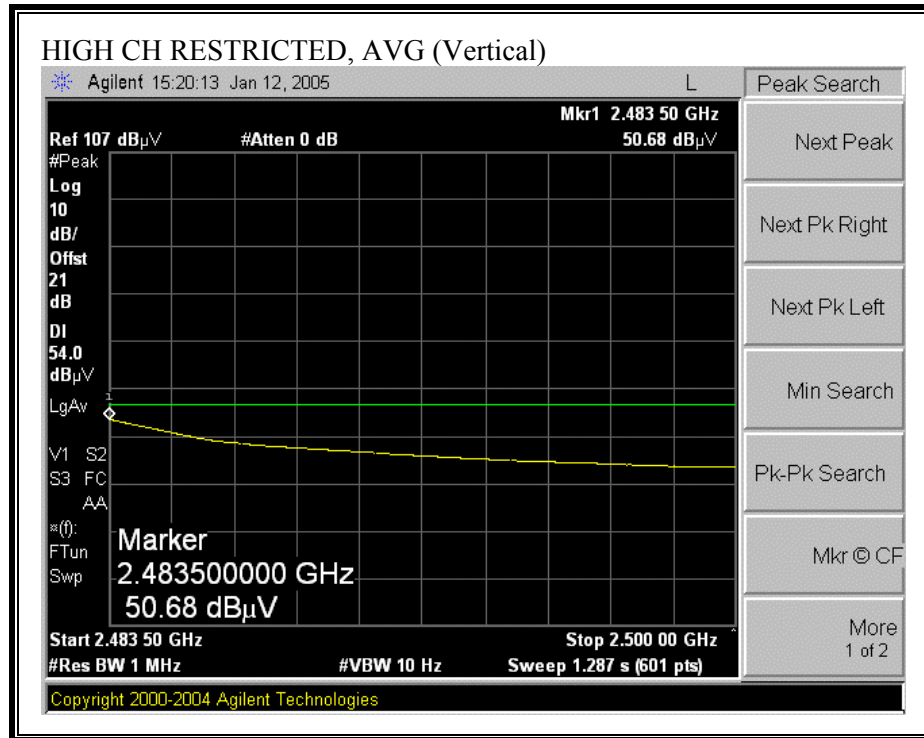
WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





WORST-CASE HARMONICS AND SPURIOUS EMISSIONS

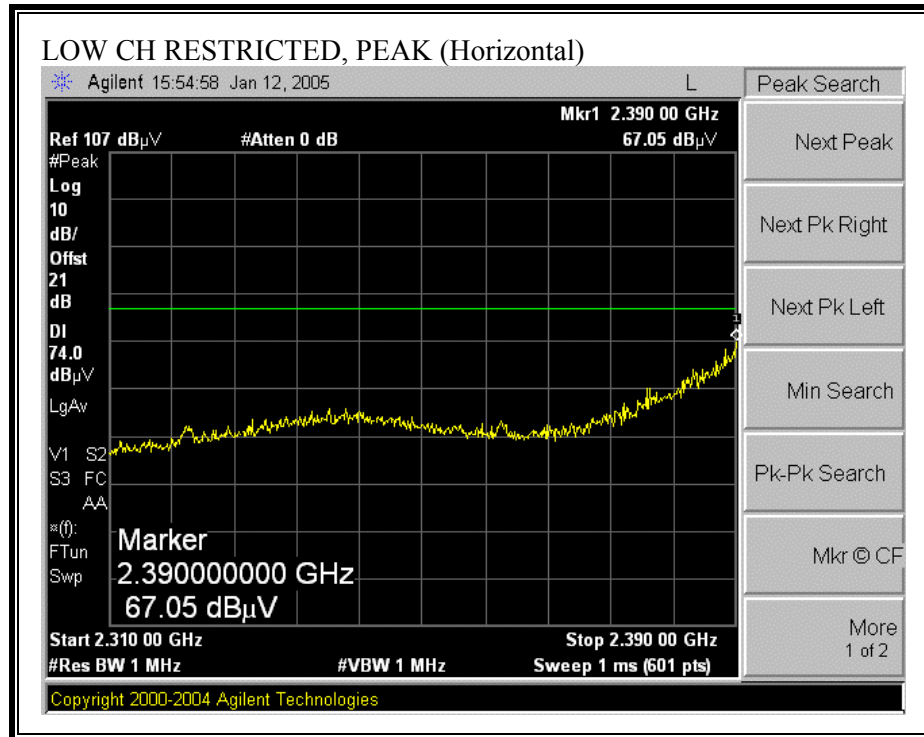
01/05/04 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Chin Pang Project #: 05U3286-1 Company: Toshiba EUT Descrip.: 802.11b/g Half Size Mini-PCI WLAN Module EUT M/N: PA3426U-1MPC Test Target: FCC 15.247 Mode Oper: Tx_worst case mode_WLAN and BT BC04 Co-location, Mobile															
Test Equipment:															
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T87 Miteq 924342		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit FCC 15.205							
Hi Frequency Cables										HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz	
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF_4.0GHz		Reject Filter		Average Measurements RBW=1MHz, VBW=10Hz			
3_Chin						12_Neelsh									
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
mid ch															
4.874	3.0	48.7	40.6	32.9	3.8	-39.6	0.0	0.6	46.4	38.3	74	54	-27.6	-15.7	V
7.311	3.0	50.0	45.2	35.8	4.9	-40.3	0.0	0.6	51.0	46.2	74	54	-23.0	-7.8	V
12.185	3.0	43.5	33.0	38.8	6.6	-39.3	0.0	0.9	50.5	40.0	74	54	-23.5	-14.0	V
4.874	3.0	47.8	40.4	32.9	3.8	-39.6	0.0	0.6	45.5	38.1	74	54	-28.5	-15.9	H
7.311	3.0	49.0	42.0	35.8	4.9	-40.3	0.0	0.6	50.0	43.0	74	54	-24.0	-11.0	H
12.185	3.0	40.8	31.6	38.8	6.6	-39.3	0.0	0.9	47.8	38.6	74	54	-26.2	-15.4	H
Note: No other emissions were detected above the system noise floor.															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

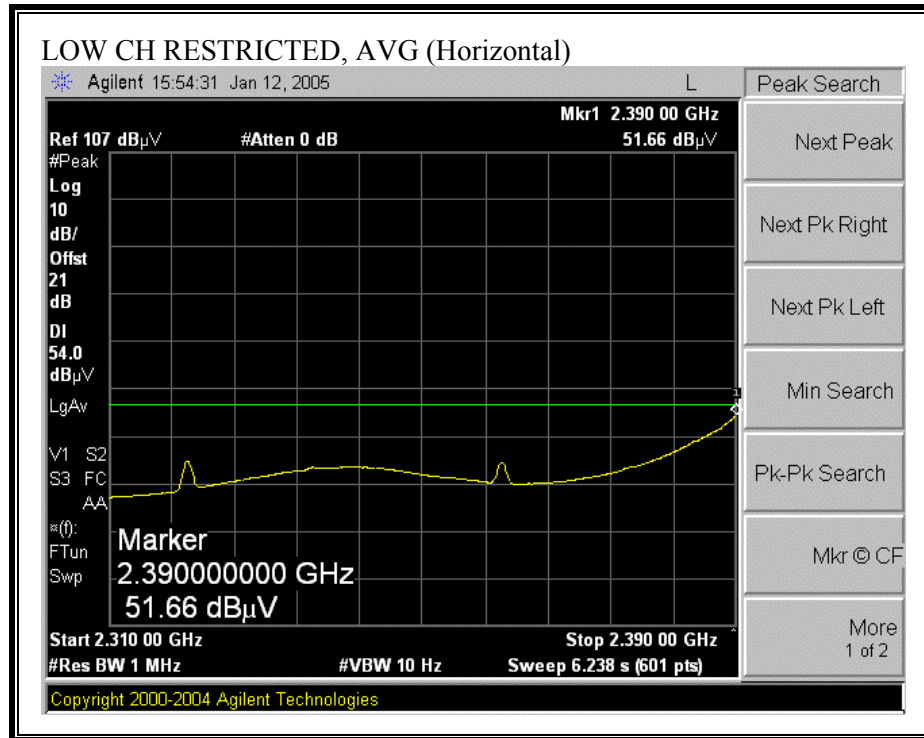
7.2.4.2. PORTABLE CONFIGURATION

No non-compliance noted:

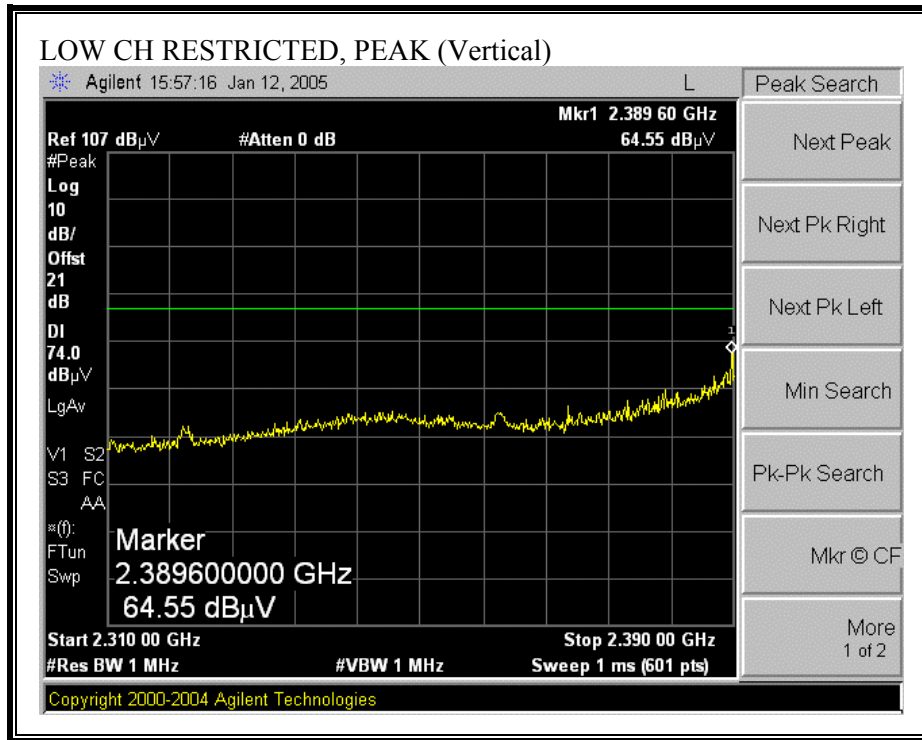
The dominant transmitter is the WLAN and the non-dominant transmitter is the Bluetooth

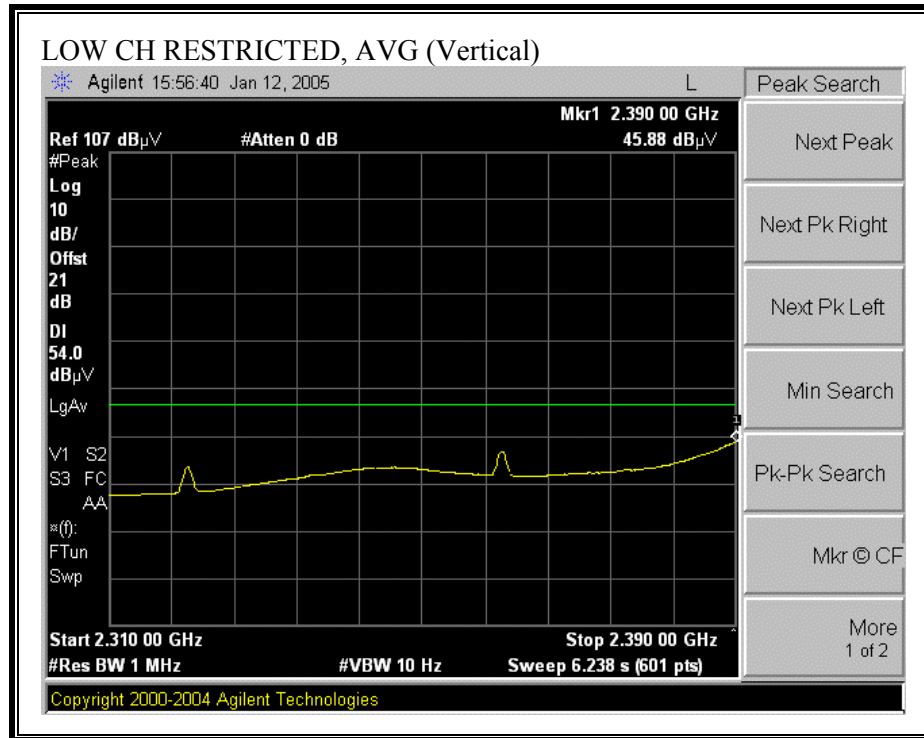
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



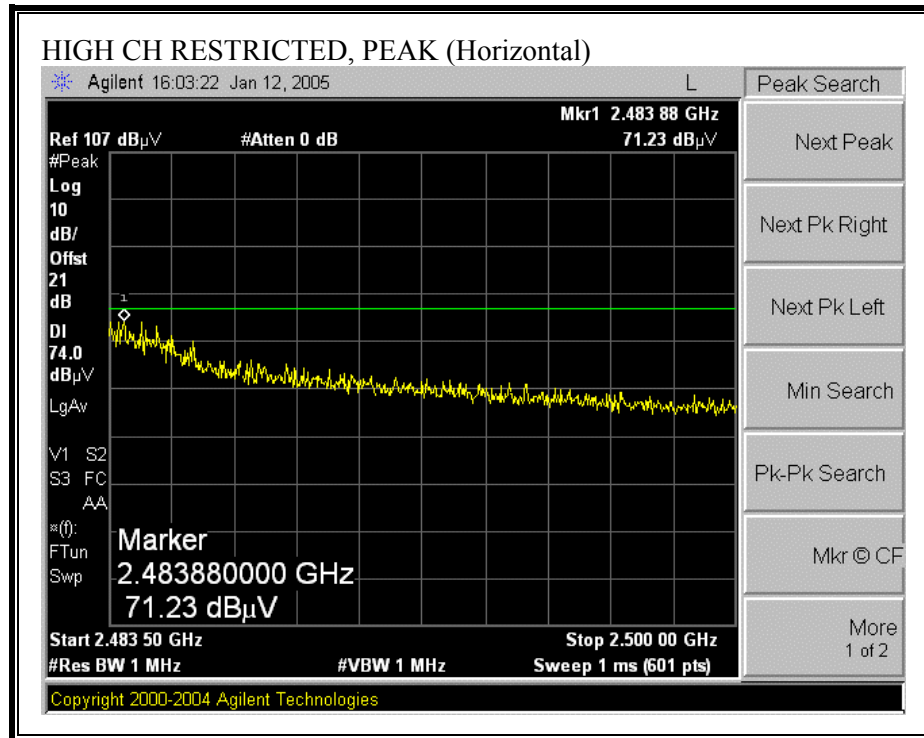


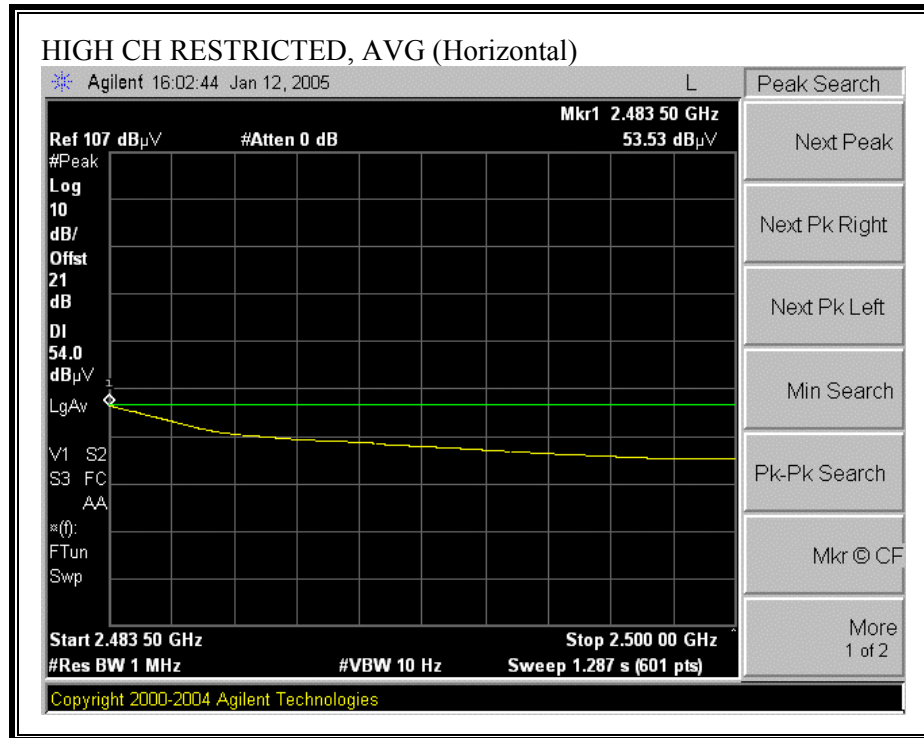
WORST-CASE RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



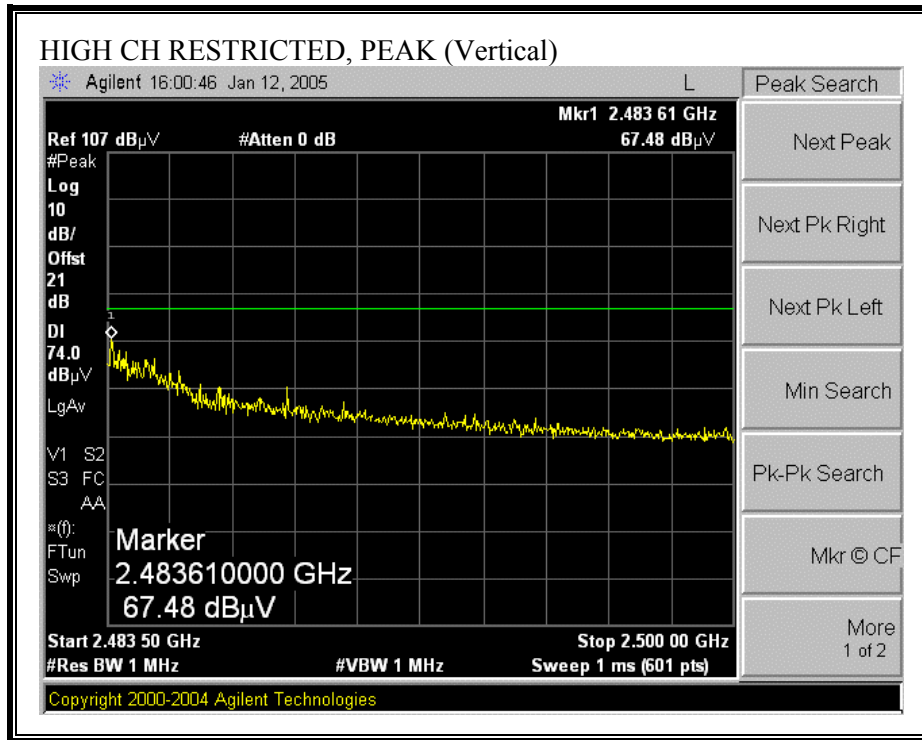


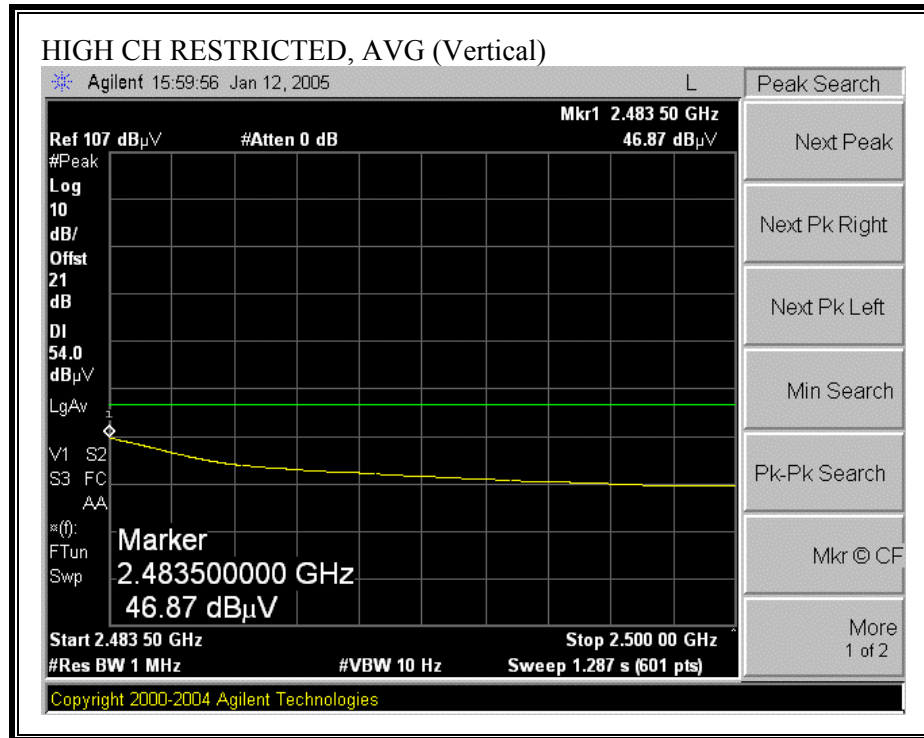
WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





WORST-CASE HARMONICS AND SPURIOUS EMISSIONS

01/05/04 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Chin Pang Project #: 05U3286-1 Company: Toshiba EUT Descrip.: 802.11b/g Half Size Mini-PCI WLAN Module EUT M/N: PA3426U-1MPC Test Target: FCC 15.247 Mode Oper: TX_worst-case mode_WLAN and BT BC04 Co-location, Portable															
Test Equipment:															
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T87 Miteq 924342		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit FCC 15.205							
Hi Frequency Cables										HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz	
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF_4.0GHz		Reject Filter		Average Measurements RBW=1MHz, VBW=10Hz			
3_Chin						12_Neelesh									
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
mid ch															
4.874	3.0	48.4	43.0	32.9	3.8	-39.6	0.0	0.6	46.1	40.7	74	54	-27.9	-13.3	V
7.311	3.0	50.6	43.6	35.8	4.9	-40.3	0.0	0.6	51.6	44.6	74	54	-22.4	-9.4	V
12.185	3.0	43.6	34.0	38.8	6.6	-39.3	0.0	0.9	50.6	41.0	74	54	-23.4	-13.0	V
4.874	3.0	45.3	38.4	32.9	3.8	-39.6	0.0	0.6	43.0	36.1	74	54	-31.0	-17.9	H
7.311	3.0	49.6	42.8	35.8	4.9	-40.3	0.0	0.6	50.6	43.8	74	54	-23.4	-10.2	H
12.185	3.0	42.0	32.0	38.8	6.6	-39.3	0.0	0.9	49.0	39.0	74	54	-25.0	-15.0	H
Note: No other emissions were detected above the system noise floor.															
f	Measurement Frequency			Amp	Preamp Gain			Avg Lim	Average Field Strength Limit						
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit						
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit						
AF	Antenna Factor			Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit						
CL	Cable Loss			HPF	High Pass Filter										

7.3. 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 μ 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.

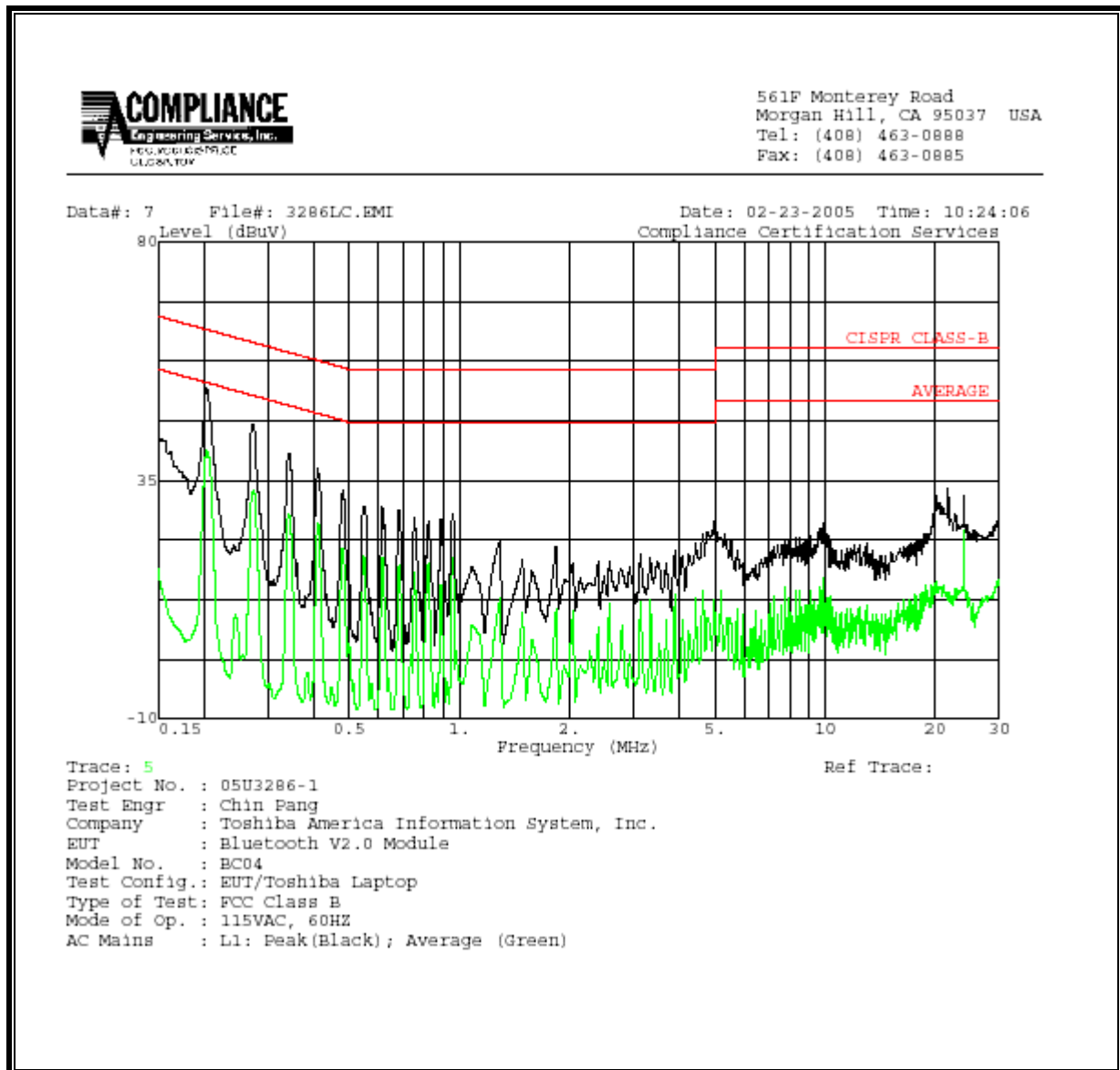
RESULTS

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
0.20	52.36	--	40.57	0.00	63.45	53.45	-11.09	-12.88	L1
0.27	45.33	--	33.01	0.00	61.03	51.03	-15.70	-18.02	L1
0.35	40.08	--	28.72	0.00	59.08	49.08	-19.00	-20.36	L1
0.20	50.02	--	42.08	0.00	63.45	53.45	-63.45	-11.37	L2
0.27	45.11	--	35.17	0.00	61.03	51.03	-15.92	-15.86	L2
0.34	40.70	--	30.04	0.00	59.23	49.23	-18.53	-19.19	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS

