



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

FOR

XBOX 360 WIRELESS RACING WHEEL WITH FORCE FEEDBACK

MODEL NUMBER: WRW02

FCC ID: C3KWRW02

REPORT NUMBER: 07U11053-1, REVISION B

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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
---	07/06/07	Initial Issue	T. Chan
B	07/12/07	Revised power supply information and modify section 5.6	S. Radecki

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION
1065 LA AVENIDA
MOUNTAIN VIEW, CA. 94043

EUT DESCRIPTION: XBOX 360 WIRELESS RACING WHEEL WITH FORCE FEEDBACK

MODEL: WRW02

SERIAL NUMBER: 05480000382715

DATE TESTED: MAY 7 - 12, 2007

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 most of the requirements set forth in the above standards. Testing the average time of occupancy is not feasible, therefore the demonstration of compliance with this requirement is based on the theory of operation as documented in this report. The test results show that the equipment tested is capable of demonstrating compliance with the remaining 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:




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EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

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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 47173 Benicia Street, Fremont, 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
Radiated Emission, Above 2000 MHz	+/- 4.3 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 EUT is a frequency hopping transceiver.

During the final tests, a special design test accessory (RTX Unity) was used to control the frequency channel and enable continuous transmission.

Proprietary communication protocol is detailed in the theory of operation.

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 - 2482	3.14	2.06

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a directional patch antenna, with a maximum peak gain of -2.1 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was BAT-menu-V0107.

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 2402 MHz.

5.6. MODIFICATIONS

1. Add FFB motor ferrite. Steward/ PN 28B0355-000 or equivalent.
2. Removed R122, R123, R124, and R125
3. Replaced R118, R119, R120, and R121 with 330 Ohm 0402 resistors
4. Replaced 100 Ohm (0402) resistors with 200 Ohm (0402) resistors on R115, R140, and R141
5. Replaced suppressors with 3.9V zener diodes on VR22, VR23, and VR24

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	Inspiron 1200	0043-658-488-585	DoC
RTX Unity	MS	Xbox MS	76	N/A
Converter	MS	Xbox MS	209358	N/A
Converter	KEYSPAN	USA-19113	N/A	DoC
Steering Wheel	Microsoft	DVX809211-001	608000011	NA
AC Adapter	Phihong	PSC24W-240(MS)	N/A	DoC

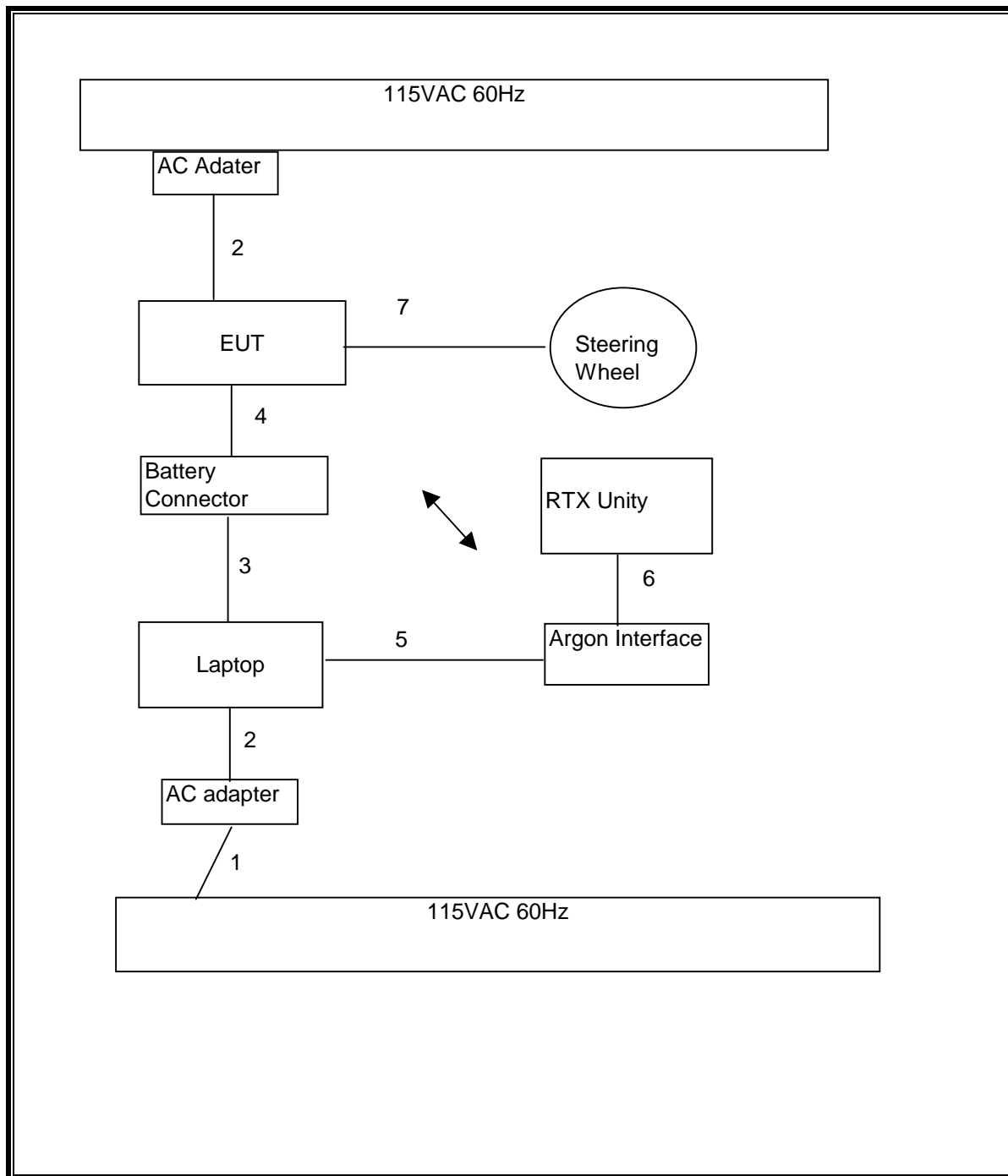
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	2m	N/A
2	DC	2	DC	Un-shielded	2m	Ferrite on one end
3	USB	1	USB	Un-shielded	2m	N/A
4	J5	1	8 pins Connector	Shielded	1m	N/A
5	USB	1	Argon Interface	Un-shielded	2m	Two Ferrites on laptop's end
6	Serial	1	Argon Interface	Un-shielded	0.2m	To Argon Interface Card
7	J6, 6 Pins Connector	1	Steering Wheel	Un-shielded	0.2m	N/A

TEST SETUP

The EUT was tested in a standalone configuration once it was setup for testing with the laptop.

SETUP DIAGRAM FOR EMISSIONS TESTS



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 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY45300064	03/18/08
SA Display Section 2	Agilent / HP	85662A	2816A16696	04/07/08
Quasi-Peak Adaptor	Agilent / HP	85650A	3145A01654	01/21/08
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	01/07/08
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/02/07
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/02/07
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00369	08/01/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	04/15/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	1937A02062	01/23/08
EMI Test Receiver	R & S	ESHS 20	827129/006	01/27/08
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	09/15/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	08/13/07

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

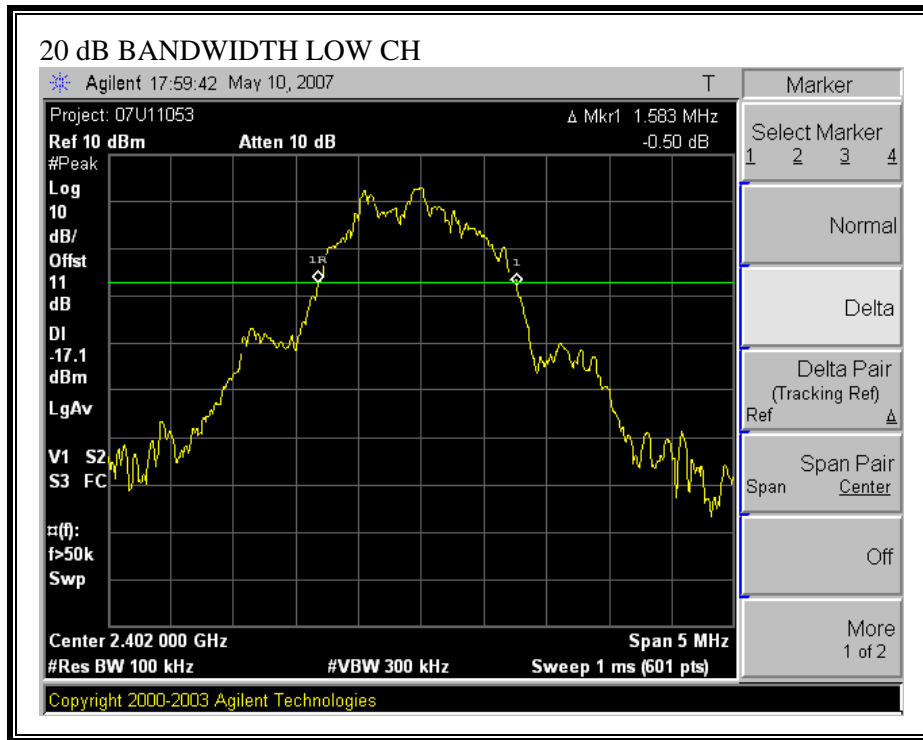
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to \geq the RBW. The sweep time is coupled.

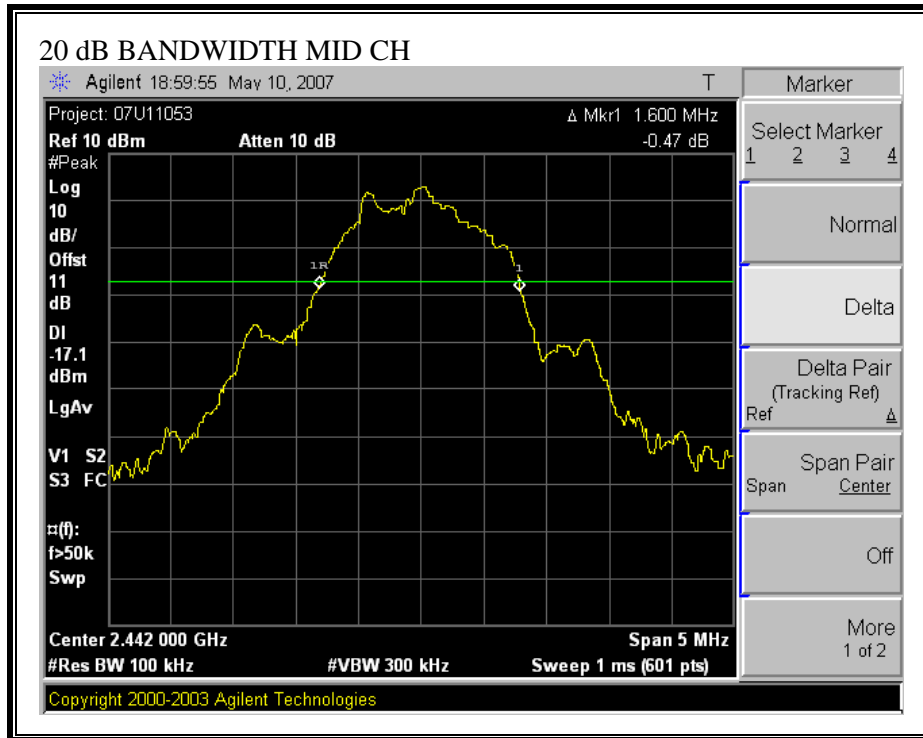
RESULTS

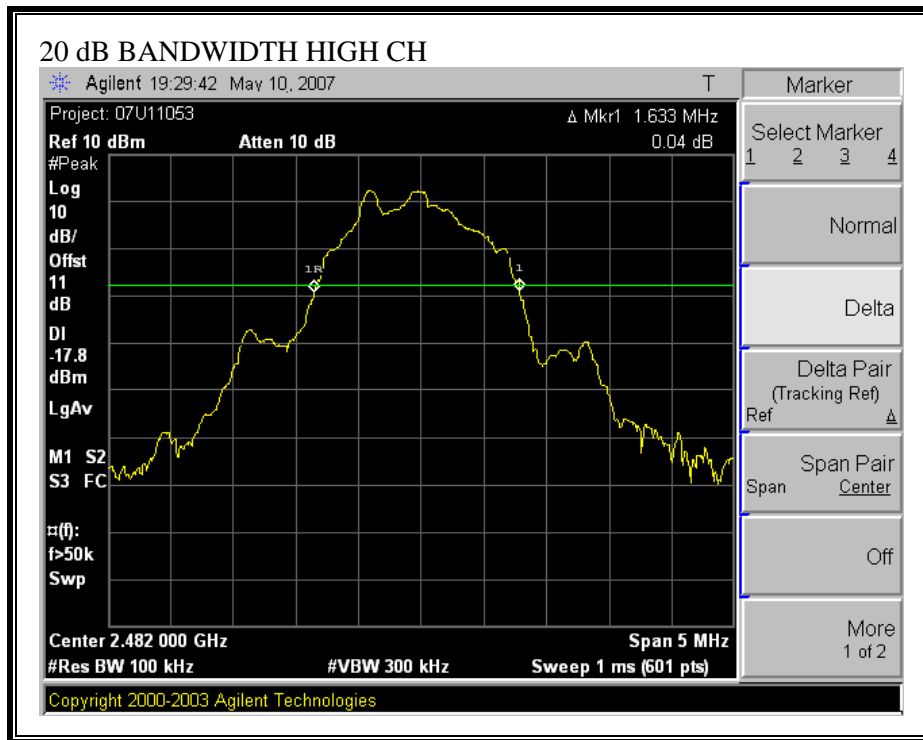
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1583
Middle	2442	1600
High	2482	1633

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

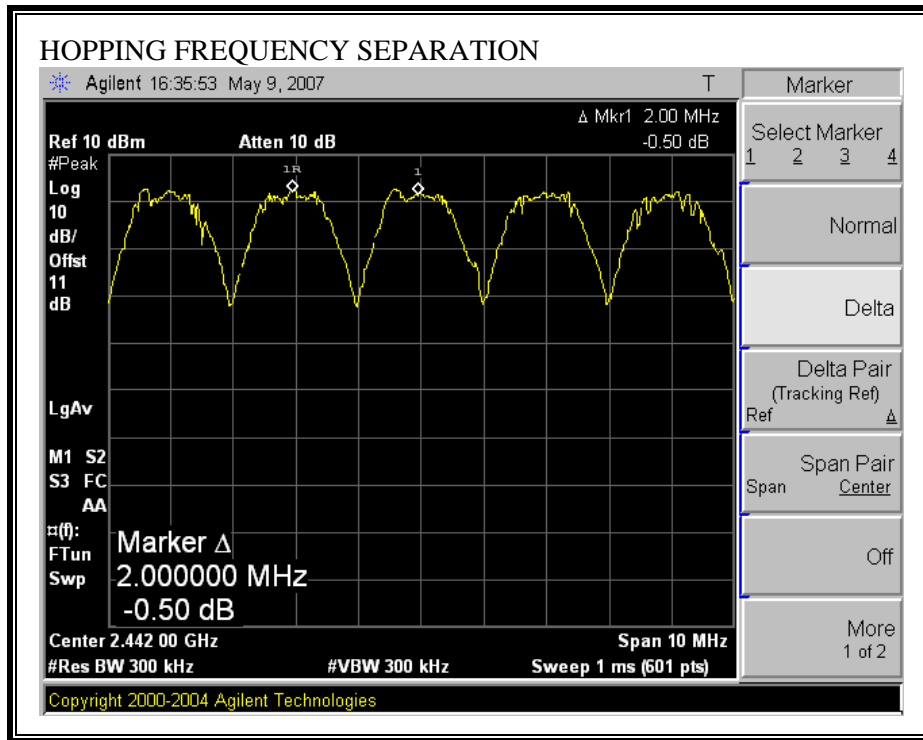
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

Channel Separation	20 dB Bandwidth	Margin
2 MHz	1.633 MHz	367KHz

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

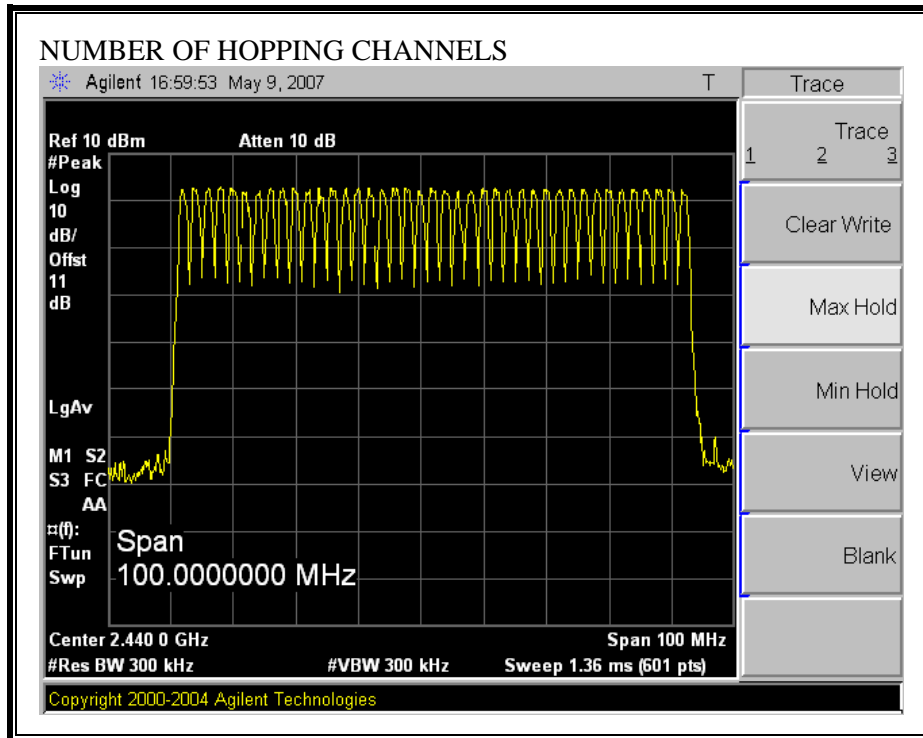
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

RESULTS

No non-compliance noted:

41 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.

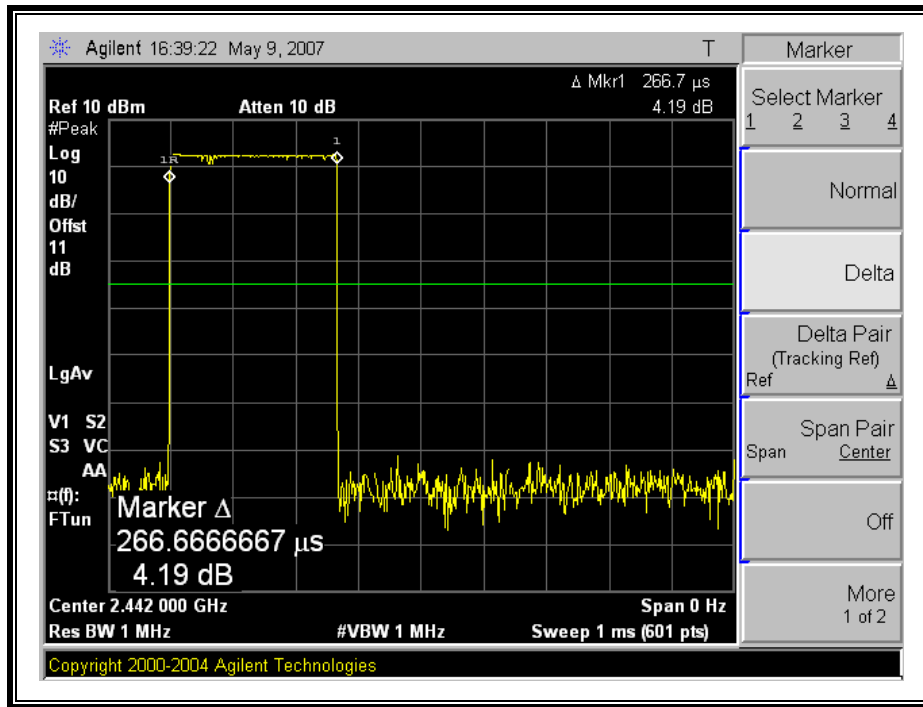
RESULTS

No non-compliance noted:

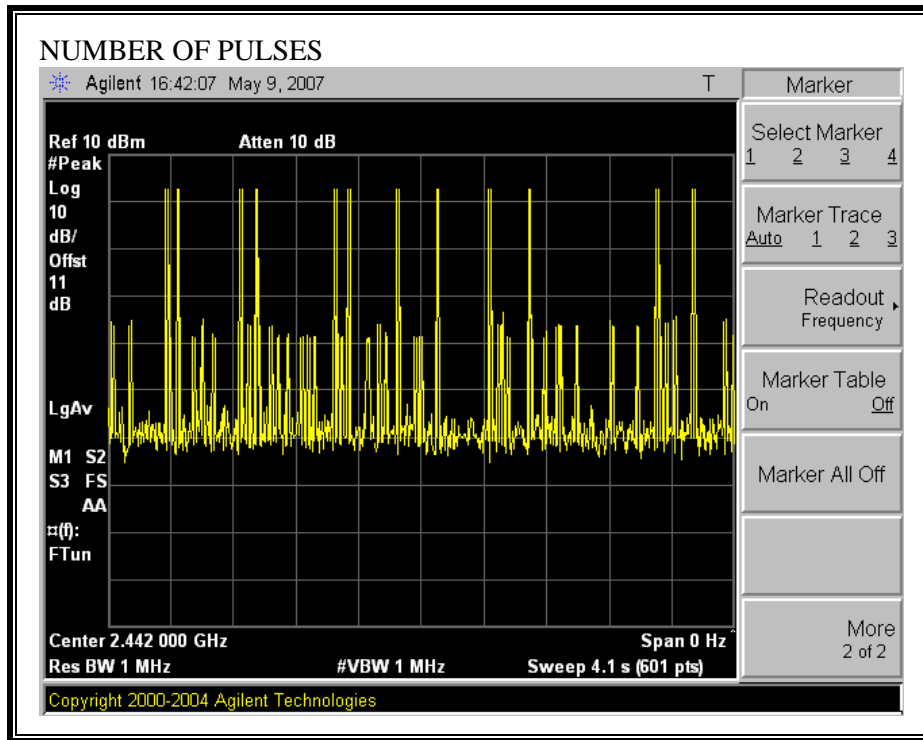
Time of Occupancy = 10 * 12 pulses * 0.2667 msec = 32 msec

Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
0.2667	12	0.032	0.4	0.368

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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

§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 -2.1 dBi; therefore the limit is 21 dBm.

TEST PROCEDURE

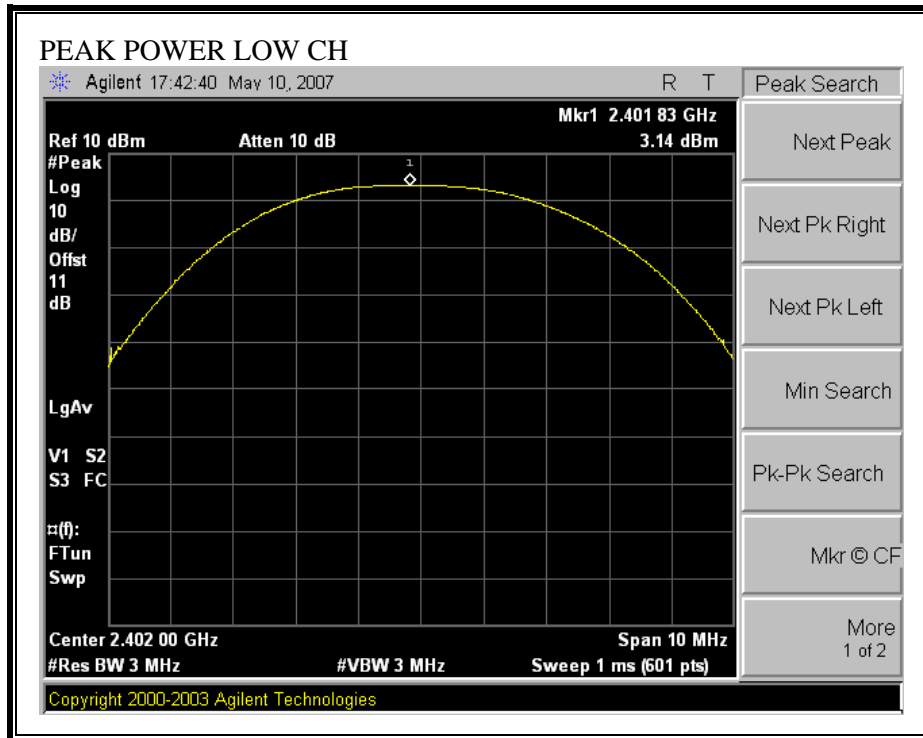
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

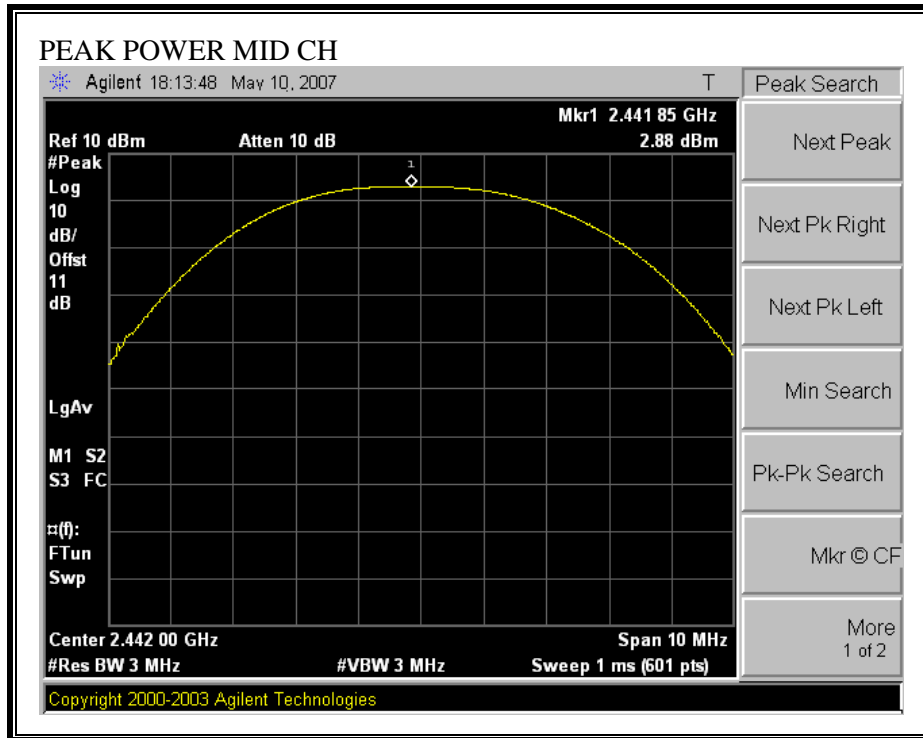
RESULTS

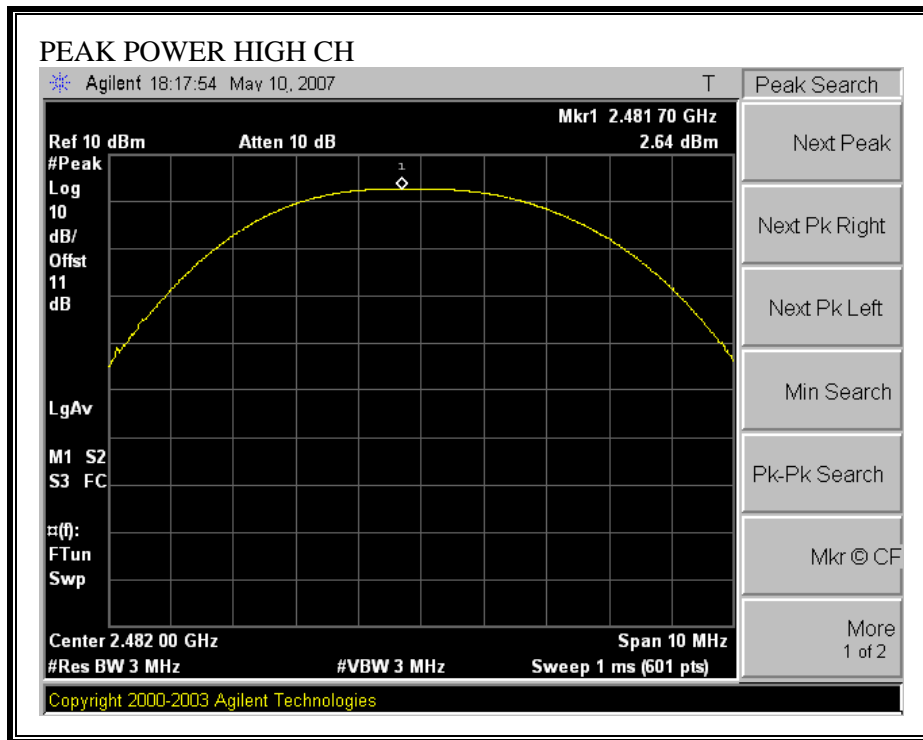
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.14	21.00	-17.86
Middle	2442	2.88	21.00	-18.12
High	2482	2.64	21.00	-18.36

OUTPUT POWER







7.1.6. 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 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-7.26
Middle	2442	-7.47
High	2482	-8.17

7.1.7. 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

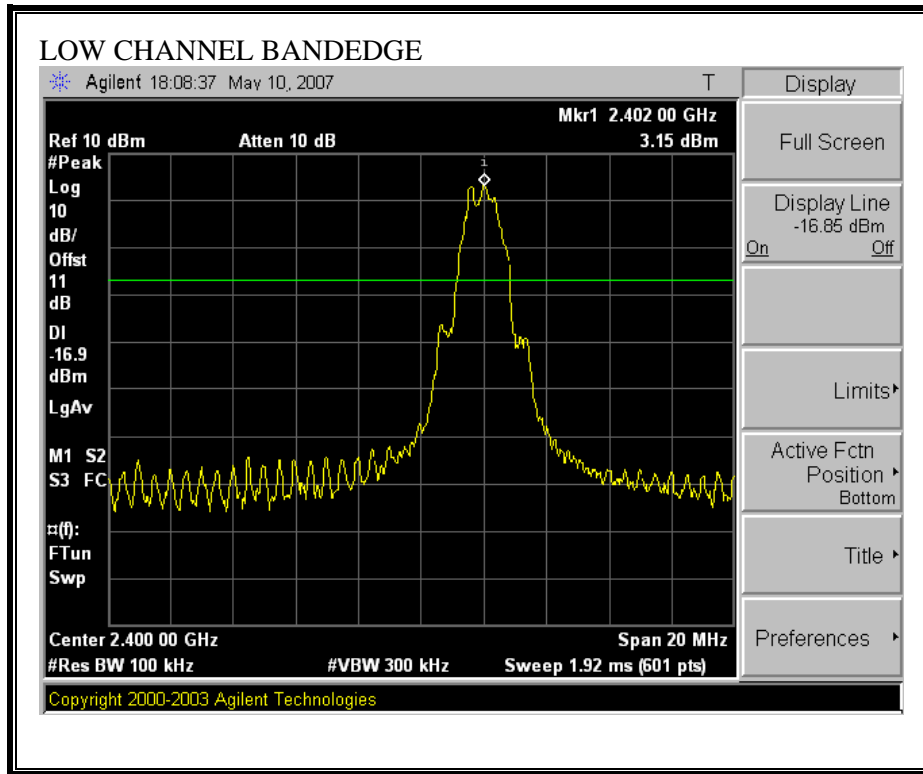
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

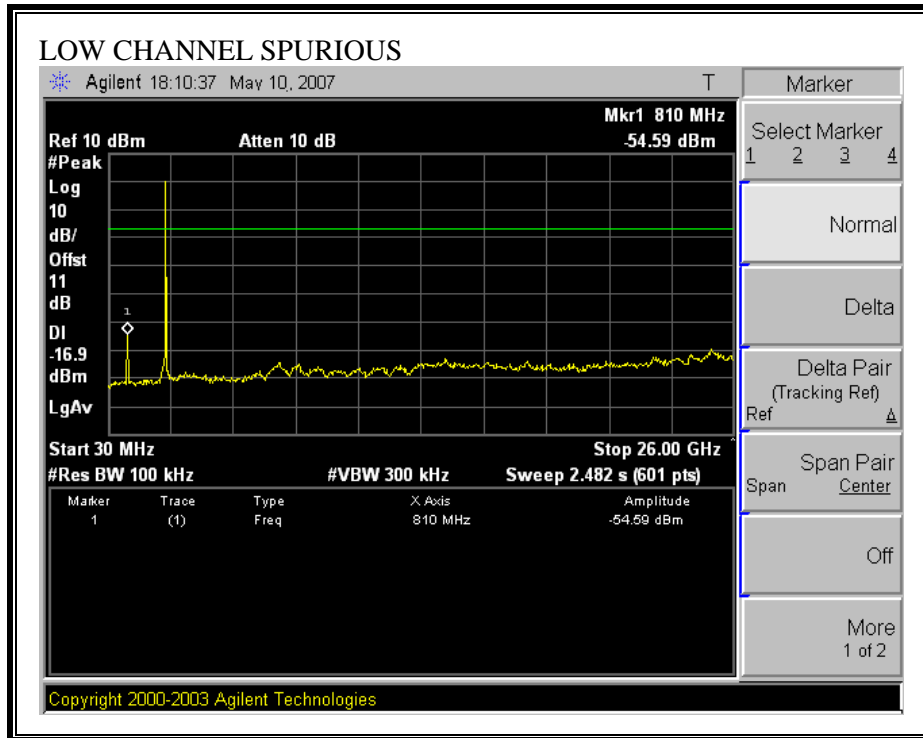
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

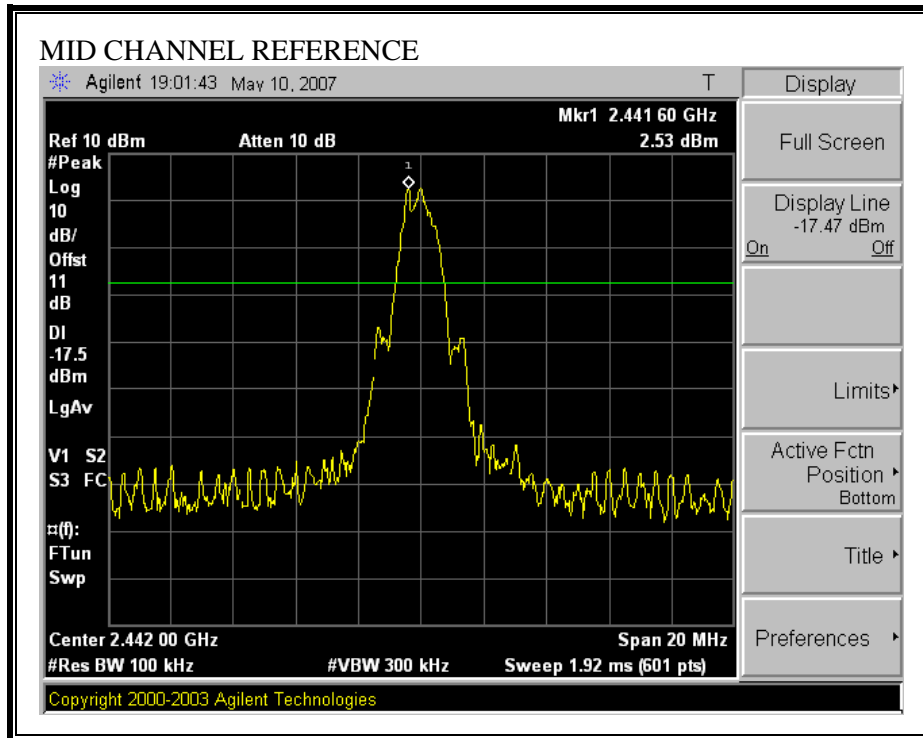
No non-compliance noted:

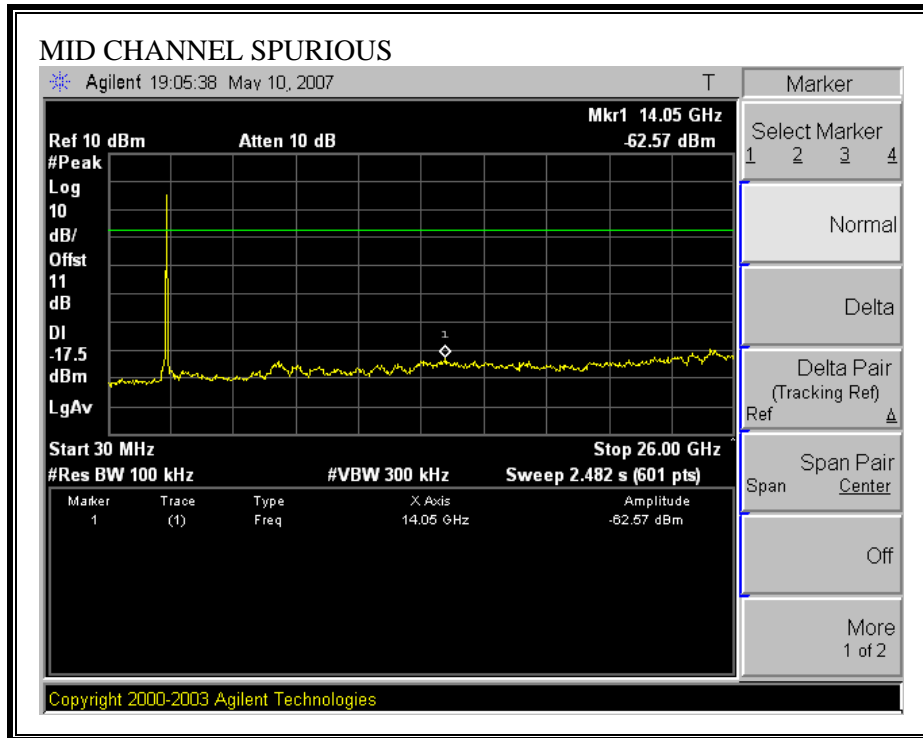
SPURIOUS EMISSIONS, LOW CHANNEL



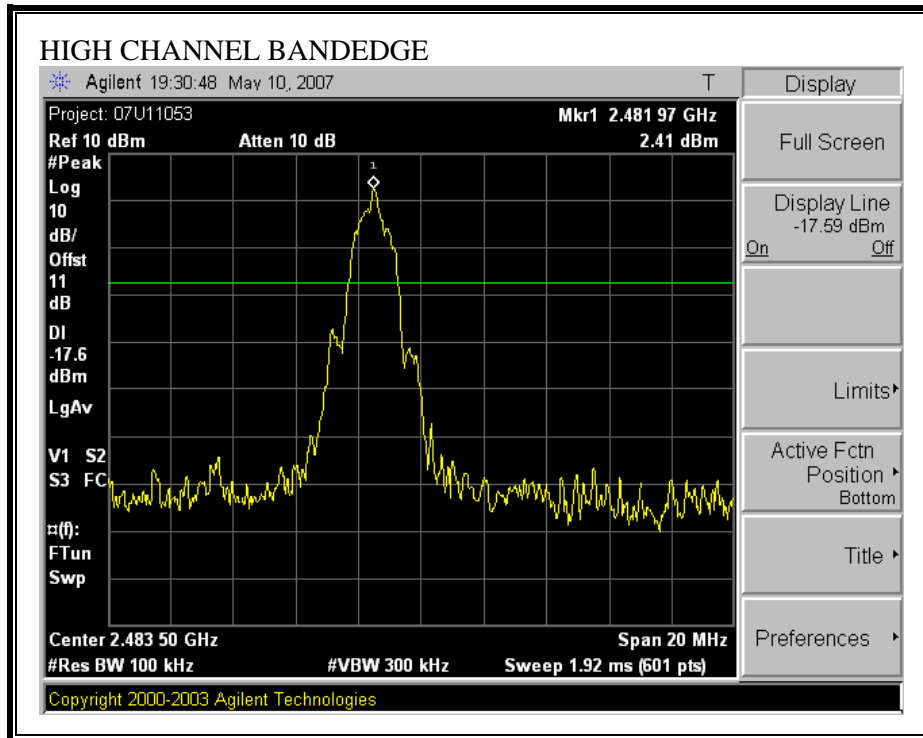


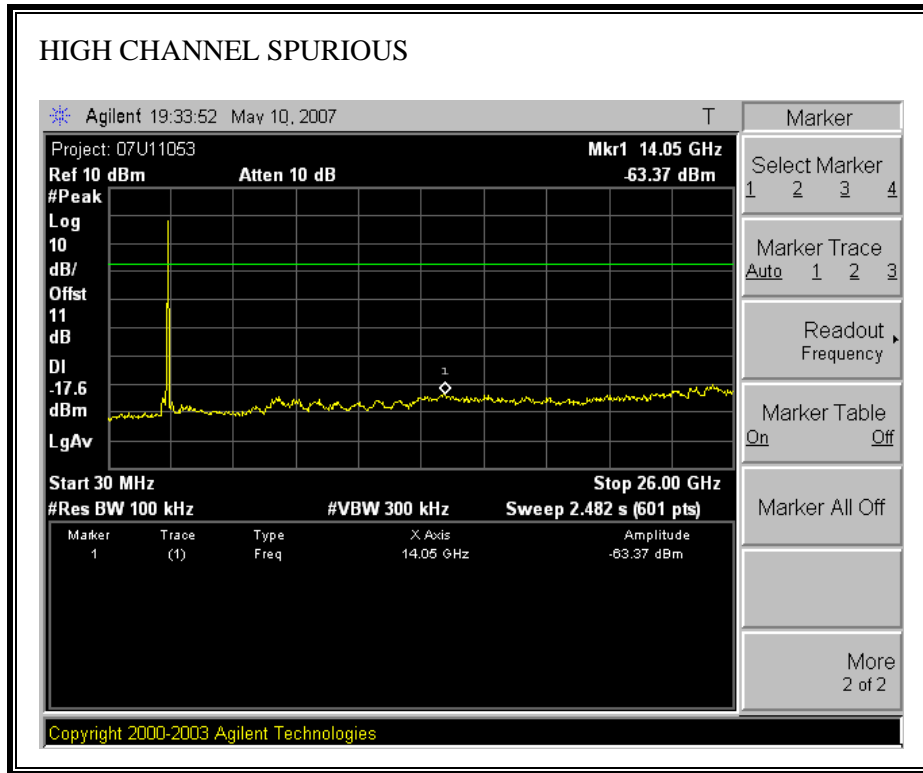
SPURIOUS EMISSIONS, MID CHANNEL



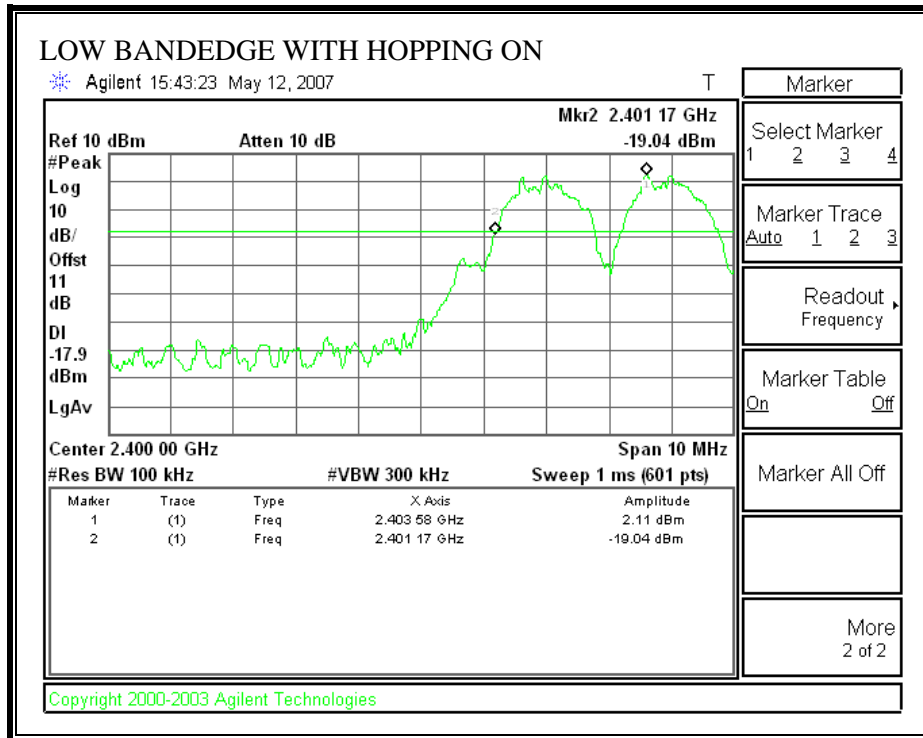


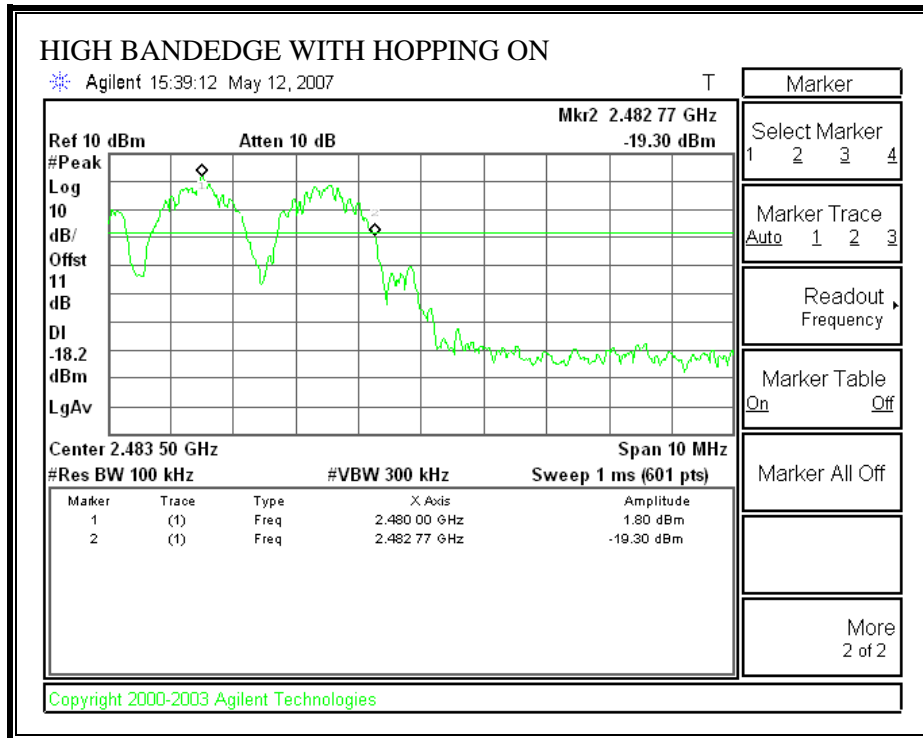
SPURIOUS EMISSIONS, HIGH CHANNEL





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.

The EUT was tested inside the host system and in stand-alone configuration.

The data reported represents the worse case.

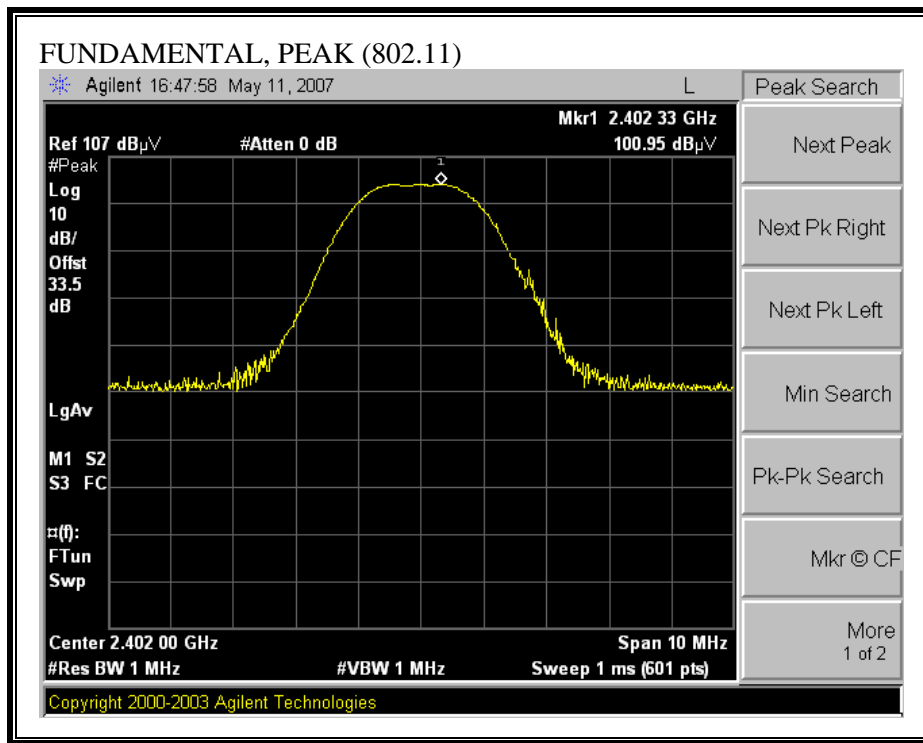
7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ**DELTA METHOD RESULTS****EUT WITHOUT SHIELD**

		Fundamental (dBuV/m)		Reading (dBuV/m)		Limit (dBuV/m)		Margin (dBuV/m)	
CHANNEL	Delta (dBc)	Peak	Average	Peak	Average	Peak	Average	Peak	Average
2402	60.37	100.4	67.78	40.03	7.41	74	54	-33.97	-46.59
2482	35.43	100.4	68.3	64.97	32.87	74	54	-9.03	-21.13

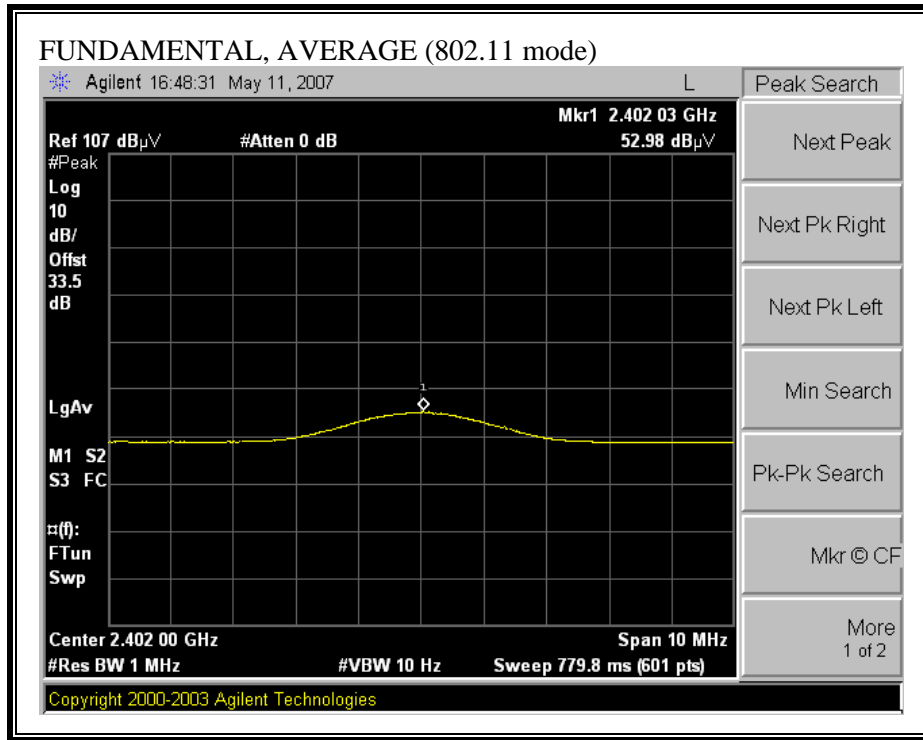
EUT WITH SHIELD

		Fundamental (dBuV/m)		Reading (dBuV/m)		Limit (dBuV/m)		Margin (dBuV/m)	
CHANNEL	Delta (dBc)	Peak	Average	Peak	Average	Peak	Average	Peak	Average
2402	60.37	100.95	52.98	40.58	-7.39	74	54	-33.42	-61.39
2482	35.43	100.68	54.25	65.25	18.82	74	54	-8.75	-35.18

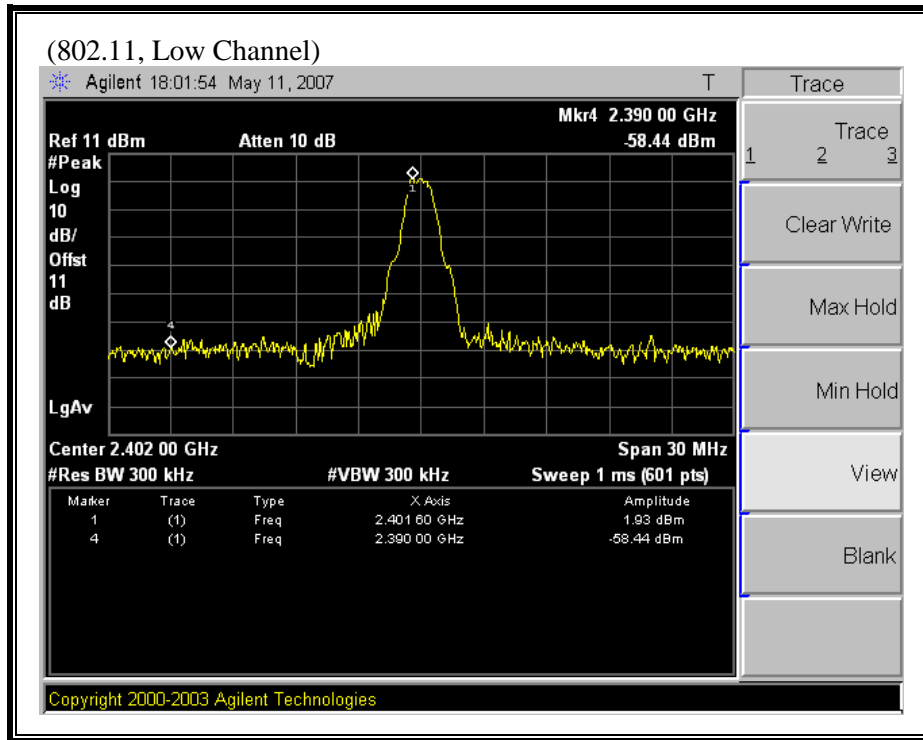
FUNDAMENTAL (b MODE, LOW CHANNEL, PEAK)



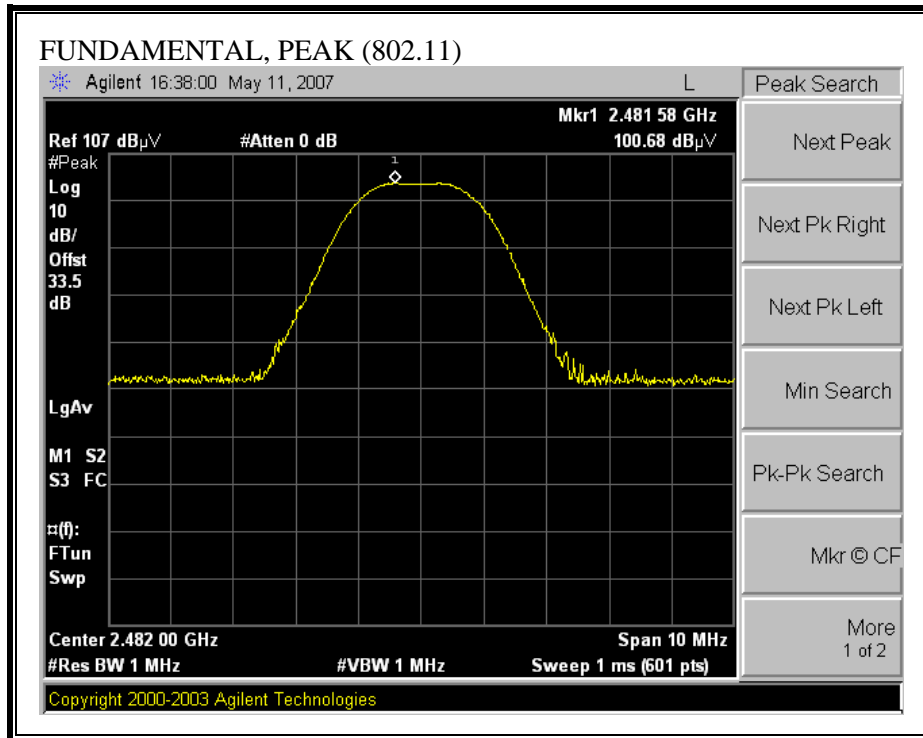
FUNDAMENTAL (LOW CHANNEL, AVERAGE)



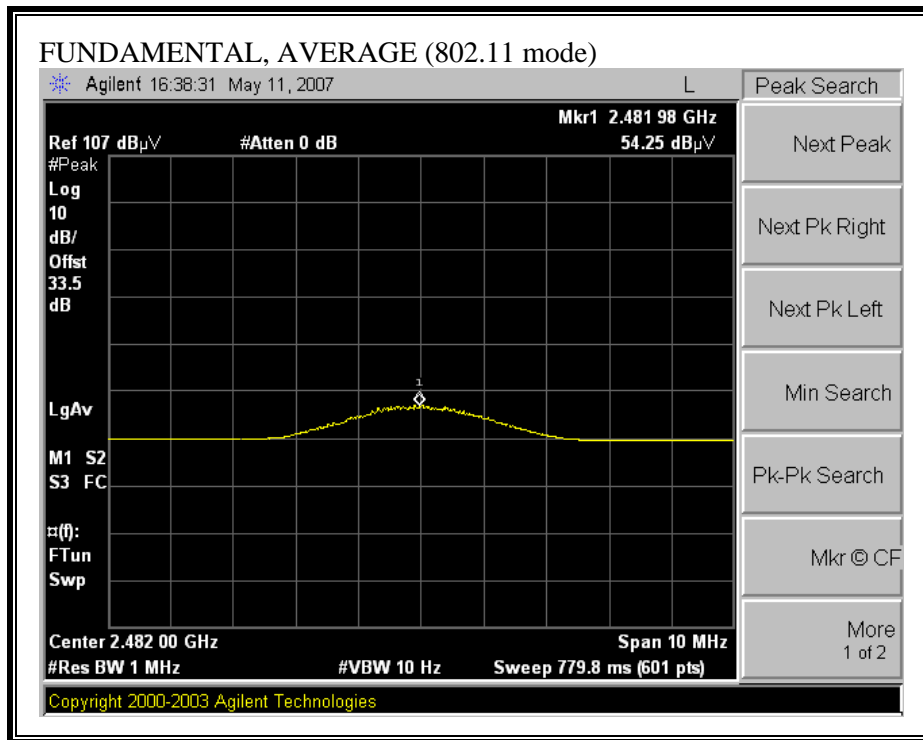
DELTA CONDUCTED BANEDGE (LOW CHANNEL)



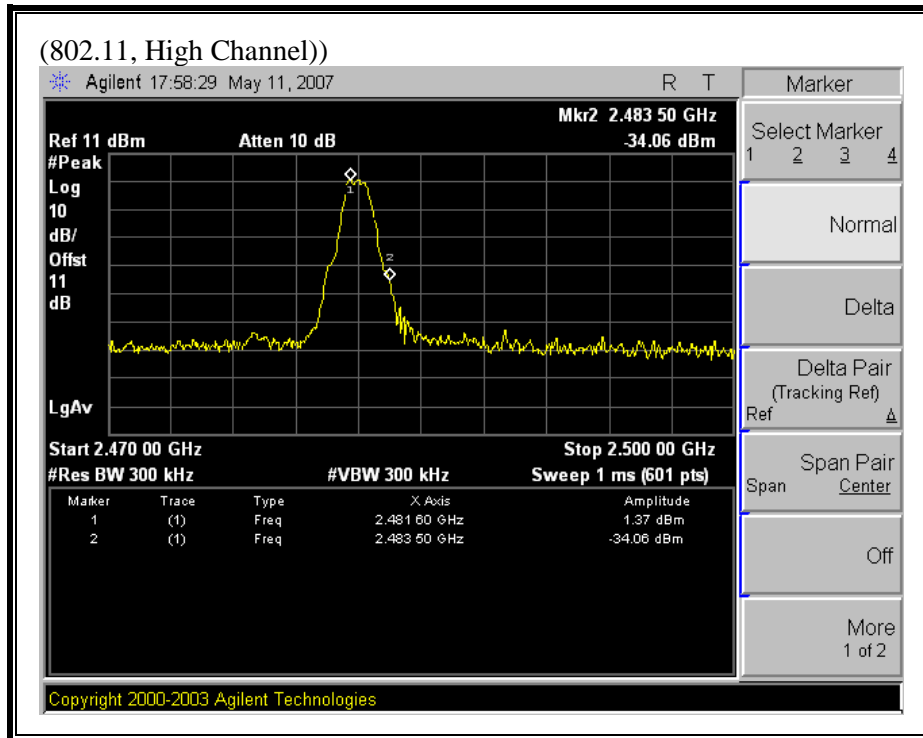
FUNDAMENTAL (HIGH CHANNEL, PEAK)



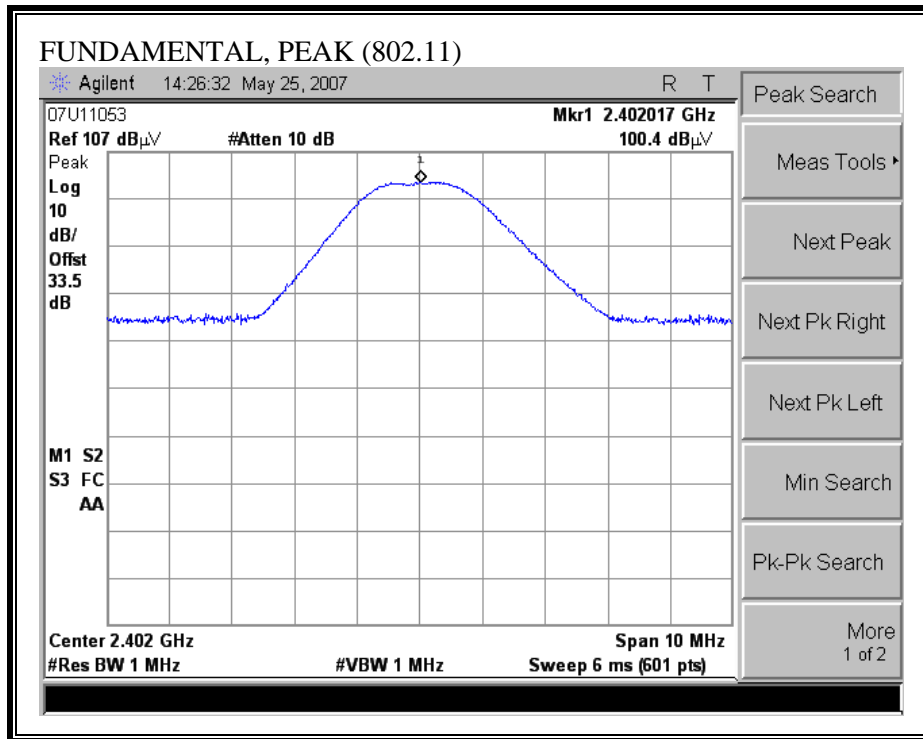
FUNDAMENTAL (HIGH CHANNEL, AVERAGE)



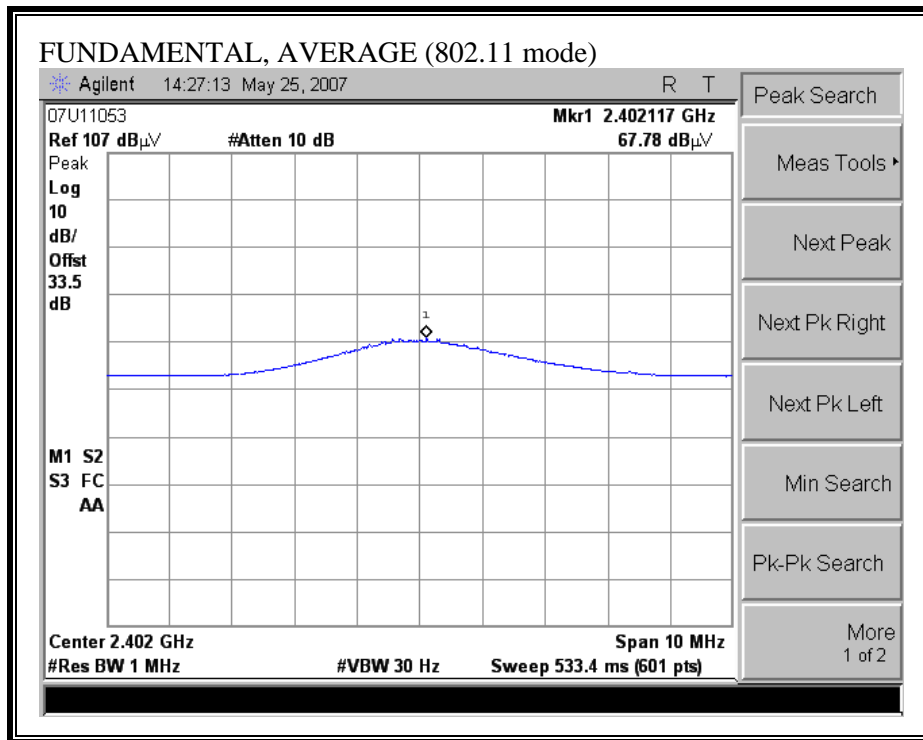
DELTA CONDUCTED BANDEDGE (HIGH CHANNEL)



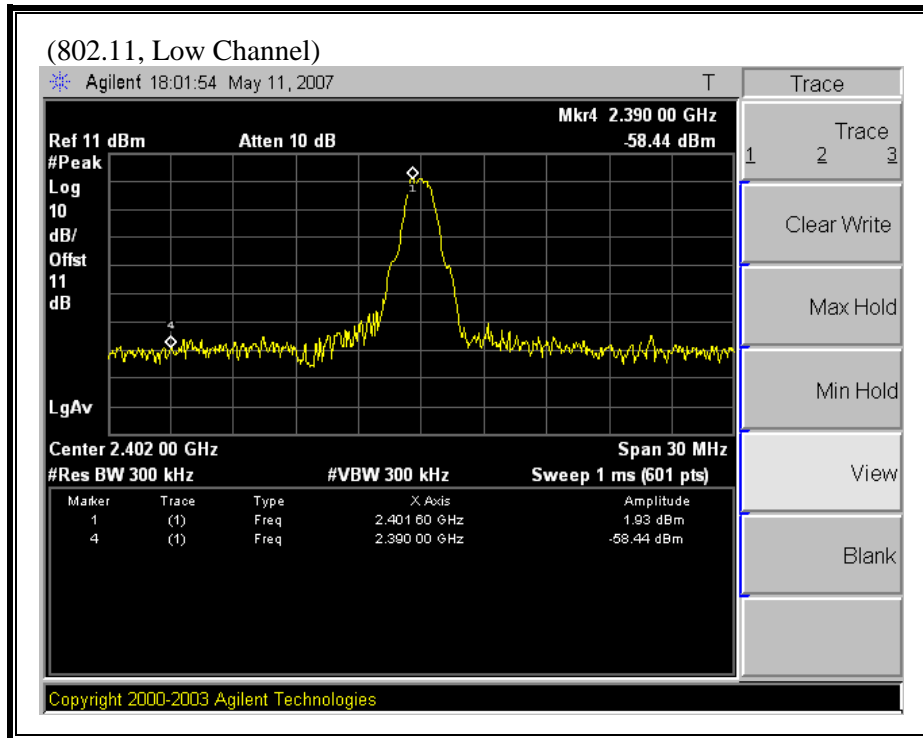
EUT WIH RF SHIELD



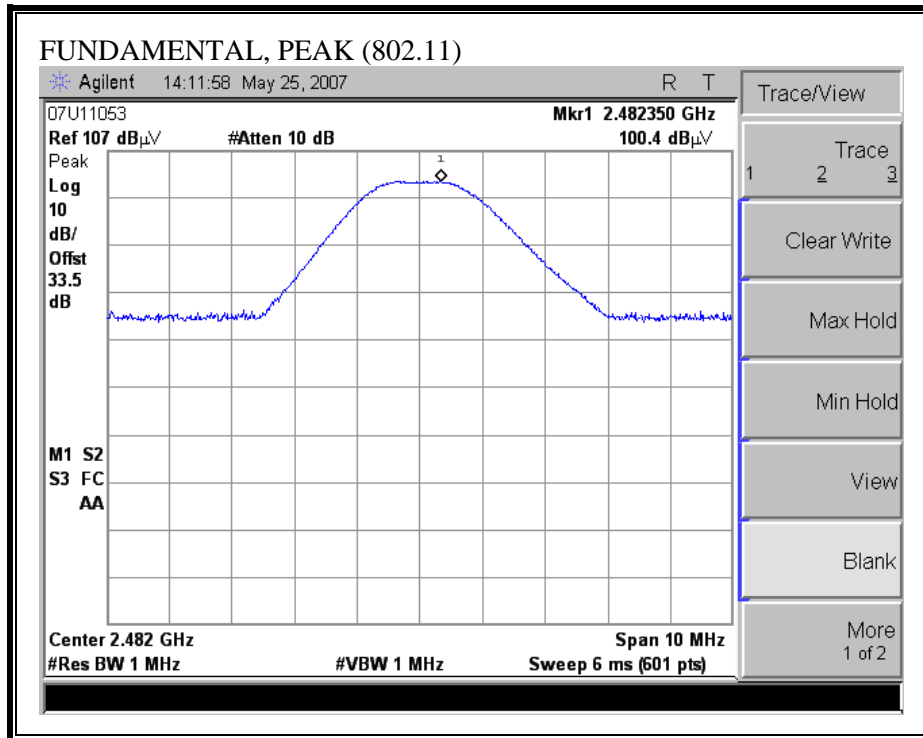
FUNDAMENTAL (LOW CHANNEL, AVERAGE)



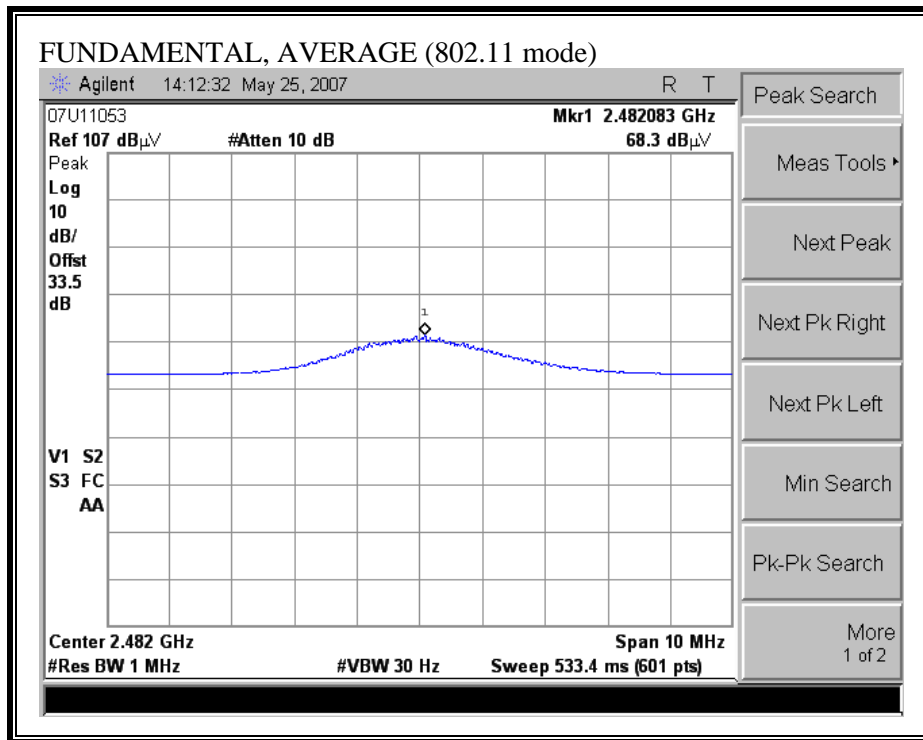
DELTA CONDUCTED BANDEDGE (LOW CHANNEL)



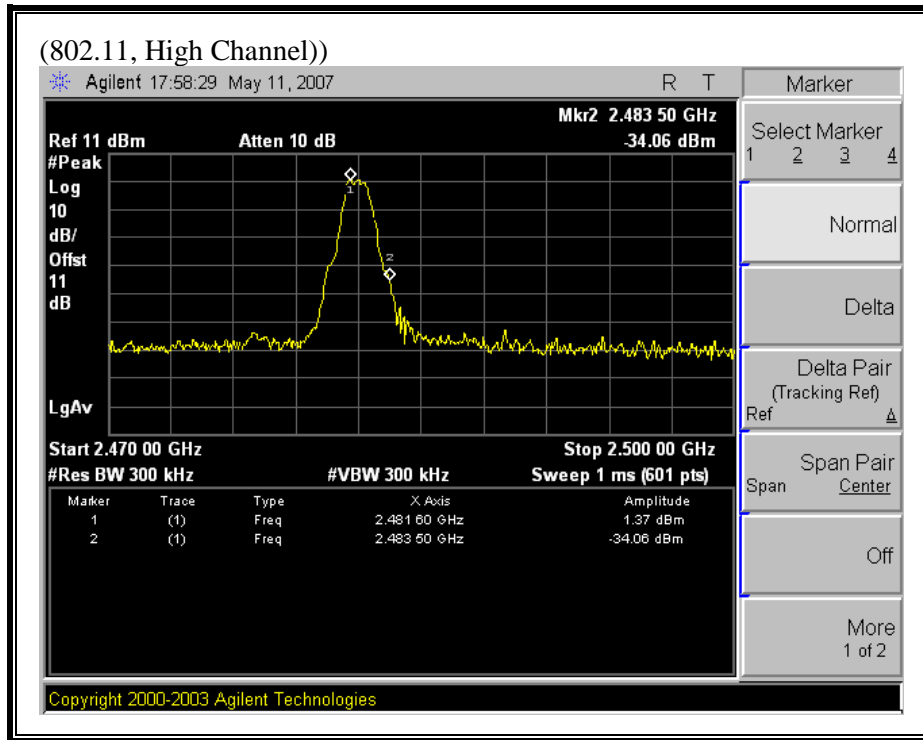
FUNDAMENTAL (HIGH CHANNEL, PEAK)



FUNDAMENTAL (HIGH CHANNEL, AVERAGE)



DELTA CONDUCTED BANDEDGE (HIGH CHANNEL)



HARMONICS AND SPURIOUS EMISSIONS (Un-shielded)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Microsoft
Project #: 07U11053
Date: 05/10/07
Test Engineer: Frank Ibrahim
Configuration: EUT with peripherals
Mode: TX ON
S/N: CS01955

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T34 HP 8449B		T89; ARA 18-26GHz; S/N:1049	FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
		A-5m Chamber		R_001	Average Measurements RBW=1MHz; VBW=10Hz

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)
Low Channel (2402 MHz)															
1.200	3.0	59.60	39.34	28.6	3.3	-38.0	0.0	0.0	53.48	33.22	74	54	-20.52	-20.78	V
4.804	3.0	43.31	25.48	33.7	6.9	-34.8	0.0	0.0	49.02	31.19	74	54	-24.98	-22.81	V
1.200	3.0	58.56	43.36	28.6	3.3	-38.0	0.0	0.0	52.44	37.24	74	54	-21.56	-16.76	H
4.804	3.0	43.82	24.84	33.7	6.9	-34.8	0.0	0.0	49.53	30.55	74	54	-24.47	-23.45	H
Mid Channel (2442 MHz)															
4.884	3.0	45.24	26.01	33.8	6.9	-34.8	0.0	0.0	51.11	31.88	74	54	-22.89	-22.12	V
4.884	3.0	43.02	25.75	33.8	6.9	-34.8	0.0	0.0	48.89	31.62	74	54	-25.11	-22.38	H
High Channel (2482 MHz)															
4.964	3.0	41.63	26.02	33.8	7.0	-34.8	0.0	0.0	47.66	32.05	74	54	-26.34	-21.95	V
4.964	3.0	40.97	25.67	33.8	7.0	-34.8	0.0	0.0	47.00	31.70	74	54	-27.00	-22.30	H

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		

Note: EUT was scanned from 1 GHz to 18 GHz, no other signals were detected from EUT above the system noise floor.

HARMONICS AND SPURIOUS EMISSIONS (With-RF shield)

High Frequency Measurement

Compliance Certification Services, Fremont B-5m Chamber

Company: Microsoft
 Project #: 07U11053
 Date: 5/25/2007
 Test Engineer: Chun Pang
 Configuration: EUT/Support peripherals. (EUT with RF Shield)
 Mode: TX

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
		Gordon 203134001		R_001	

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr 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															
4.804	3.0	47.7	36.8	33.0	6.9	-36.5	0.0	0.0	51.1	40.2	74	54	-22.9	-13.8	V
4.804	3.0	46.6	36.4	33.0	6.9	-36.5	0.0	0.0	50.0	39.8	74	54	-24.0	-14.2	H
Mid Ch															
4.884	3.0	47.2	36.5	33.1	6.9	-36.5	0.0	0.0	50.7	40.0	74	54	-23.3	-14.0	V
4.884	3.0	46.2	36.0	33.1	6.9	-36.5	0.0	0.0	49.7	39.5	74	54	-24.3	-14.5	H
High Ch															
4.964	3.0	47.5	36.1	33.1	7.0	-36.5	0.0	0.0	51.2	39.8	74	54	-22.8	-14.2	V
4.964	3.0	46.0	35.8	33.1	7.0	-36.5	0.0	0.0	49.7	39.5	74	54	-24.3	-14.5	H

Rev. 5.1.6

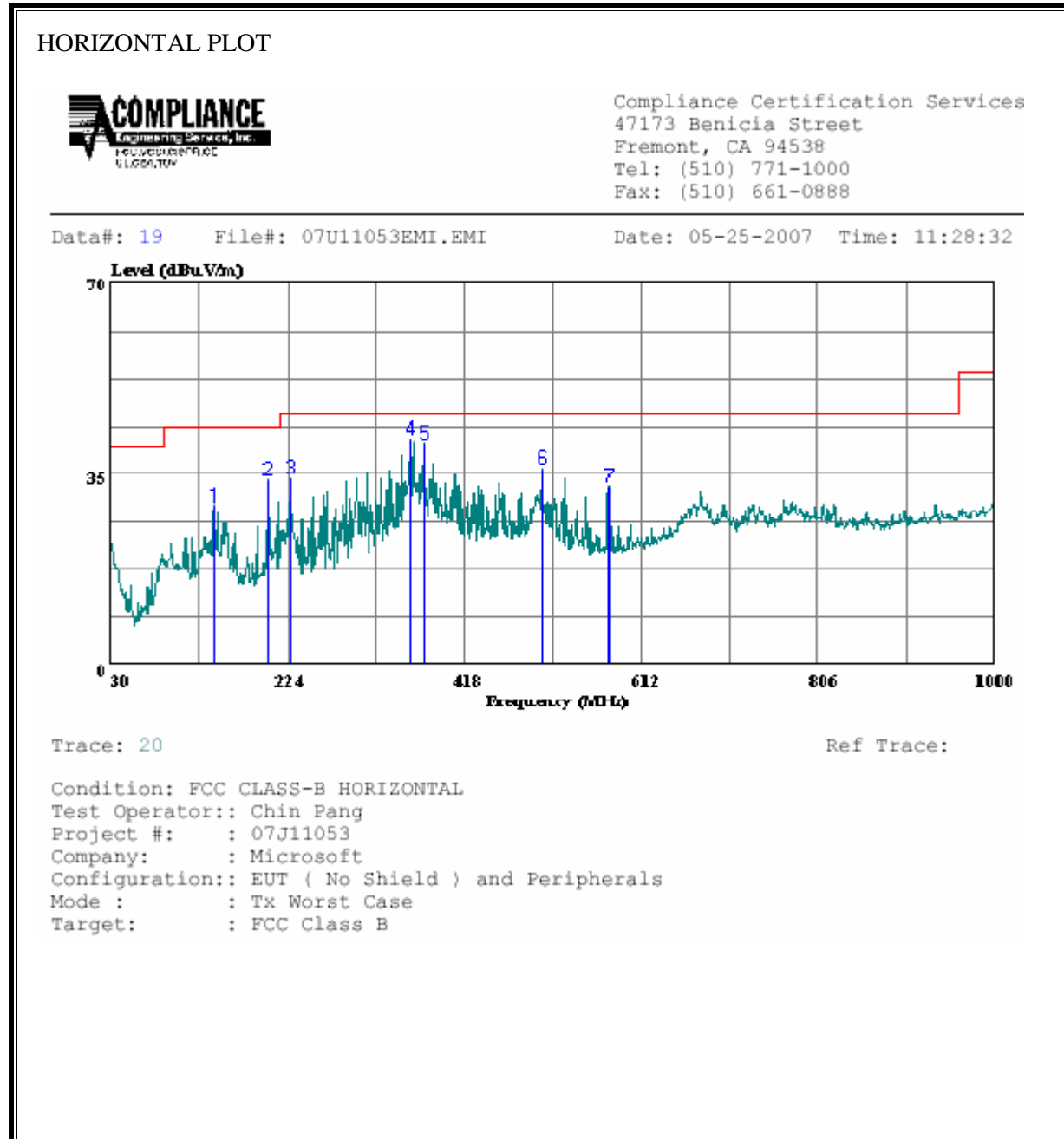
Note: No other emissions were detected above the system noise floor.

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

EUT WITHOUT SHIELD

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	142.520	46.10	-16.90	29.20	43.50	-14.30	Peak
2	202.660	51.40	-17.32	34.09	43.50	-9.41	Peak
3	226.910	52.80	-18.52	34.28	46.00	-11.72	Peak
4	359.800	56.00	-14.42	41.58	46.00	-4.42	Peak
5	373.380	54.80	-14.06	40.74	46.00	-5.26	Peak
6	503.360	47.40	-11.31	36.09	46.00	-9.91	Peak
7	576.110	43.00	-10.17	32.83	46.00	-13.17	Peak

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

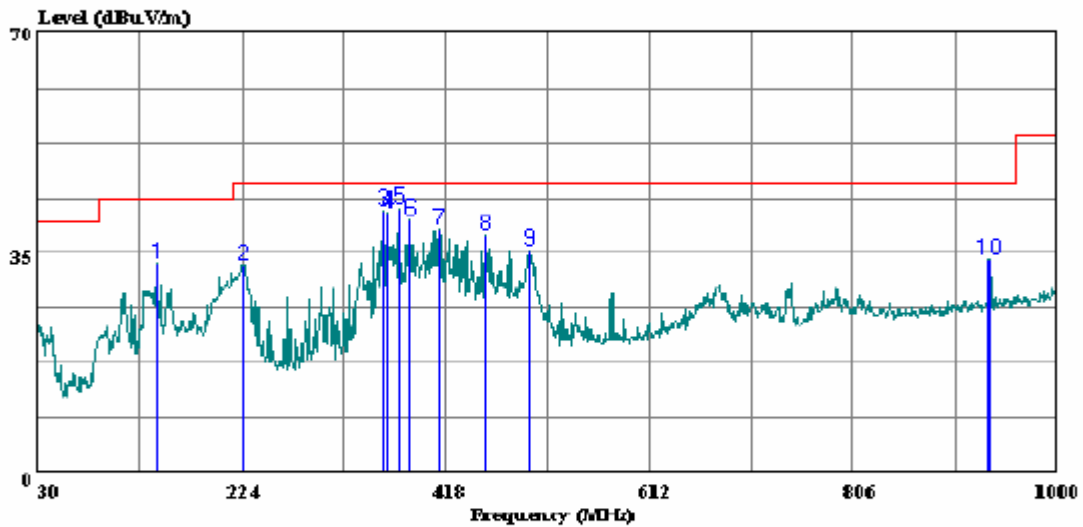
VERTICAL PLOT



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 22 File#: 07U11053EMI.EMI

Date: 05-25-2007 Time: 11:53:20



Trace: 21

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Chin Pang
Project #: : 07J11053
Company: : Microsoft
Configuration:: EUT (No Shield) and Peripherals
Mode : : Tx Worst Case
Target: : FCC Class B

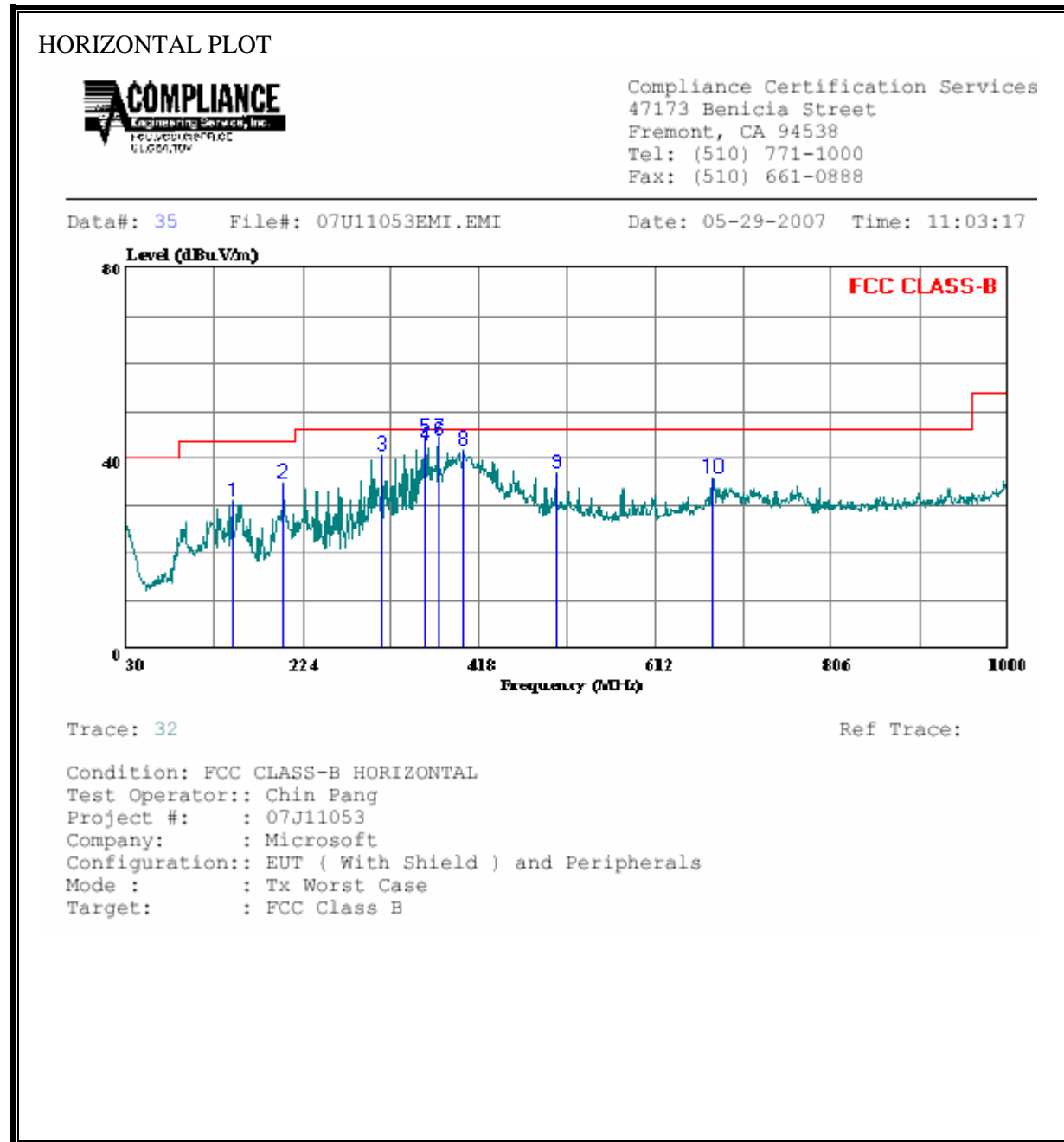
VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	142.520	50.20	-16.90	33.30	43.50	-10.20	Peak
2	224.000	51.50	-18.57	32.93	46.00	-13.07	Peak
3	359.800	56.20	-14.42	41.78	46.00	-4.22	Peak
4	362.710	55.60	-14.21	41.39	46.00	-4.61	Peak
5	373.380	56.30	-14.06	42.24	46.00	-3.76	Peak
6	383.080	54.10	-13.70	40.40	46.00	-5.60	Peak
7	411.210	51.80	-13.16	38.64	46.00	-7.36	Peak
8	454.860	50.10	-12.18	37.92	46.00	-8.08	Peak
9	496.570	46.90	-11.39	35.51	46.00	-10.49	Peak
10	935.980	38.20	-4.30	33.90	46.00	-12.10	Peak

EUT WITH RF SHIELD

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	146.400	45.00	-13.67	31.33	43.50	-12.17	Peak
2	202.660	48.60	-13.73	34.87	43.50	-8.63	Peak
3	311.300	52.70	-11.98	40.72	46.00	-5.28	Peak
4	359.800	53.80	-10.77	43.03	46.00	-2.97	QP
5	359.800	55.50	-10.77	44.73	46.00	-1.27	Peak
6	373.380	54.52	-10.49	44.03	46.00	-1.97	QP
7	373.380	55.30	-10.49	44.81	46.00	-1.19	Peak
8	401.510	51.80	-9.87	41.93	46.00	-4.07	Peak
9	503.360	44.30	-7.32	36.98	46.00	-9.02	Peak
10	675.050	39.80	-3.93	35.87	46.00	-10.13	Peak

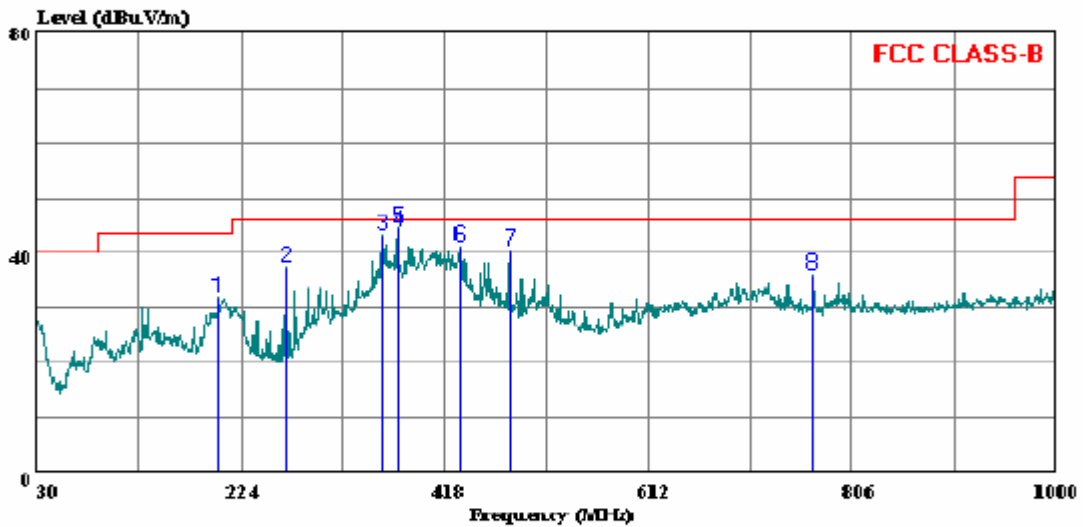
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 39 File#: 07U11053EMI.EMI Date: 05-29-2007 Time: 11:10:51



Trace: 36

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Chin Pang
Project #: : 07J11053
Company: : Microsoft
Configuration:: EUT (With Shield Can) and Peripherals
Mode : : Tx Worst Case
Target: : FCC Class B

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	202.660	45.70	-13.73	31.97	43.50	-11.53	Peak
2	266.680	50.94	-13.55	37.39	46.00	-8.61	Peak
3	359.800	54.10	-10.77	43.33	46.00	-2.67	Peak
4	373.380	54.60	-10.49	44.11	46.00	-1.89	QP
5	373.380	55.30	-10.49	44.81	46.00	-1.19	Peak
6	431.580	50.30	-9.06	41.24	46.00	-4.76	Peak
7	480.080	48.40	-7.81	40.59	46.00	-5.41	Peak
8	768.170	38.40	-2.48	35.92	46.00	-10.08	Peak

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

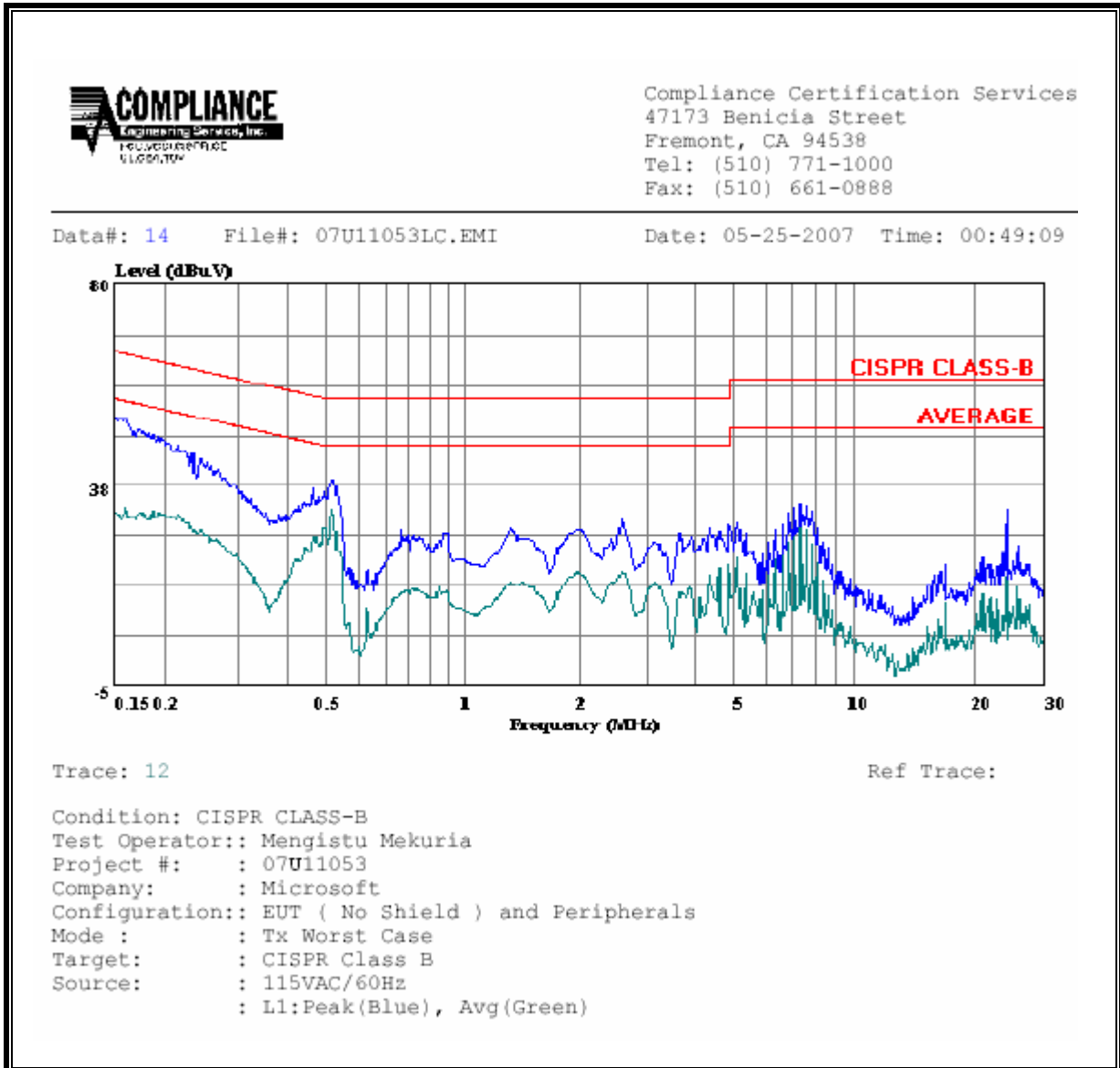
No non-compliance noted:

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
0.15	52.07	--	--	0.00	66.00	56.00	-13.93	-3.93	L1
0.52	38.91	--	--	0.00	56.00	46.00	-17.09	-7.09	L1
7.45	33.62	--	--	0.00	60.00	50.00	-26.38	-16.38	L1
0.15	51.31	--	--	0.00	65.89	55.89	-14.58	-4.58	L2
0.51	41.30	--	--	0.00	56.00	46.00	-14.70	-4.70	L2
24.01	35.24	--	--	0.00	60.00	50.00	-24.76	-14.76	L2
6 Worst Data									

EUT WITHOUT SHIELD

LINE 1 RESULTS



LINE 1 RESULTS

