



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

**FOR**

**XBOX 360 RF MODULE**

**MODEL NUMBER: RF01**

**FCC ID: C3K-RF01**

**REPORT NUMBER: 06U10262-1**

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** MICROSOFT CORPORATION  
ONE MICROSOFT WAY  
REDMOND, WA 98052-6399

**EUT DESCRIPTION:** XBOX 360 RF MODULE

**MODEL:** RF01

**SERIAL NUMBER:** CS01727/05260092973543; 05260023604543

**DATE TESTED:** APPRL 23-24, 2006

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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THANH NGUYEN  
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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 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 EUT is a frequency hopping transceiver module. This RF module will always be installed in Xbox 360 or Xbox 360 XDK console by the manufacturer. RF module is not an optional accessory to be installed by the end user. RF module utilizes a proprietary communication protocol to interact with Xbox 360 game pads.

The two host system models: Xbox 360 and Xbox 360 XDK belong to the same product type and series, and are identical in regard to technical specification and RF performance.

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	3.90	2.45

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a directional patch antenna, with a maximum peak gain of 6.38 dBi @2.45 GHz.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Argon FW 107.

The EUT driver software installed in the host support equipment (XBOX 360) during testing was ArgonDevelopmentTest.EXE

The test utility software used during testing was XBOX 360 FREEDOM, V.0.74

### 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. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Monitor	SAMSUNG	TX-P1430	A00134AYB01475Z	N/A
Console	MICROSOFT	XBOX 360	508480354705	DoC
Controller	MICROSOFT	X803238-007	4060060247536	DoC
AC Adapter	MICROSOFT	DPSW-16CBA Rev 0	99026779545538	N/A

#### I/O CABLES (CONFIGURATION 1)

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	No
2	DC	1	DC Plug	Un-shielded	1m	No
3	Video	1	Parrallel	Shielded	2m	Yes
4	Game	1	USB	Shielded	2m	Yes

**I/O CABLES (CONFIGURATION 2)**

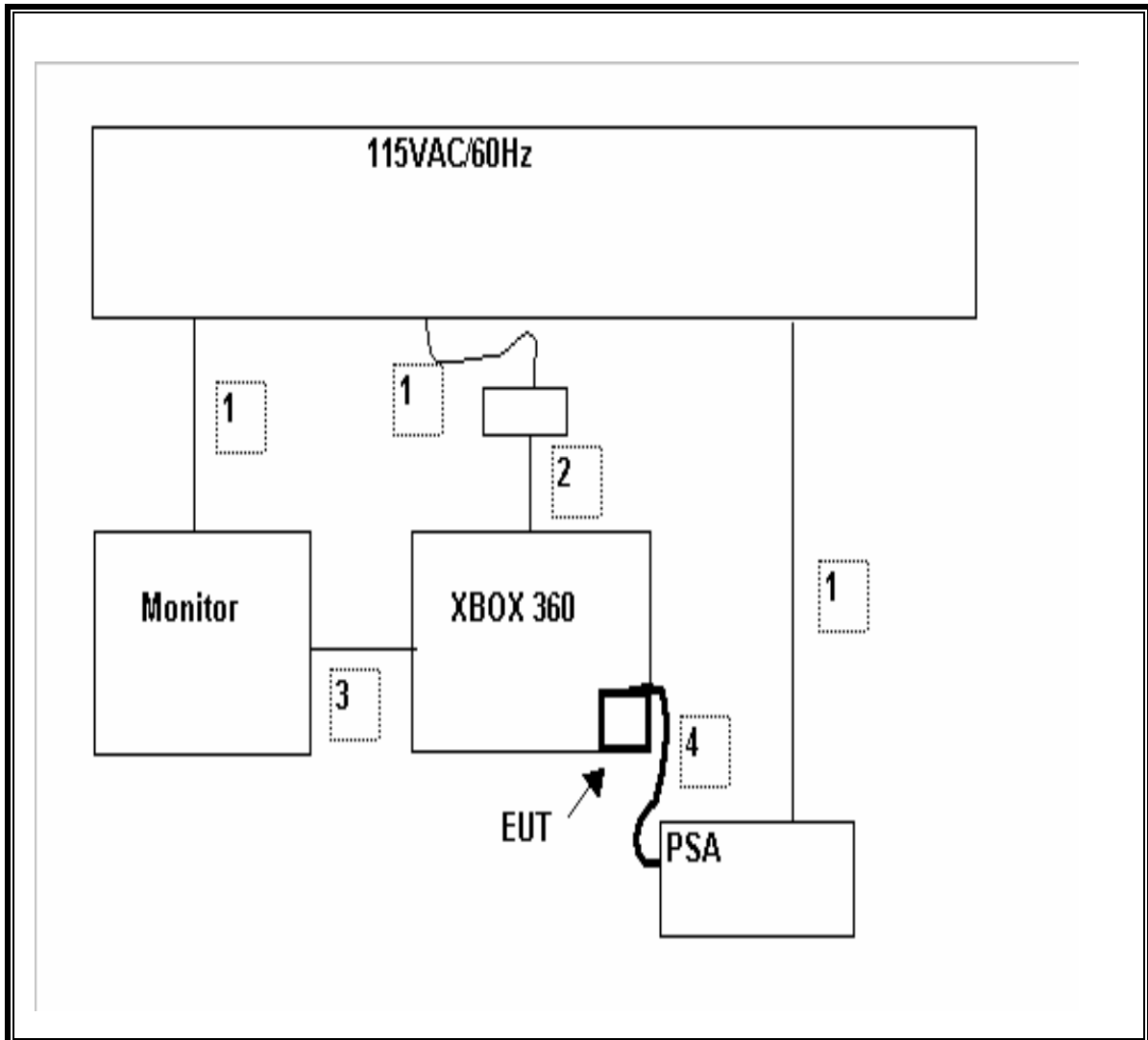
TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	AC	2	US 115V	Un-shielded	2m	No	No	N/A
2	DC	3	DC	26G	1m	No	No	N/A
3	USB	1	USB	26G	.5m	Yes	No	N/A
4	USB	1	USB	Shielded	1m	Yes	No	N/A
5	USB	1	USB	Shielded	1.5m	Yes	Yes	N/A
6	USB	1	USB	Shielded	1.5m	Yes	No	N/A
7	Serial	1	DB9	26G	.5m	Yes	No	N/A
8	USB	1	USB	Shielded	.5m	Yes	No	N/A
9	USB	1	USB	Shielded	.5m	Yes	Yes	N/A
10	Serial	1	DB9	Shielded	.5m	Yes	No	UART

**TEST SETUP**

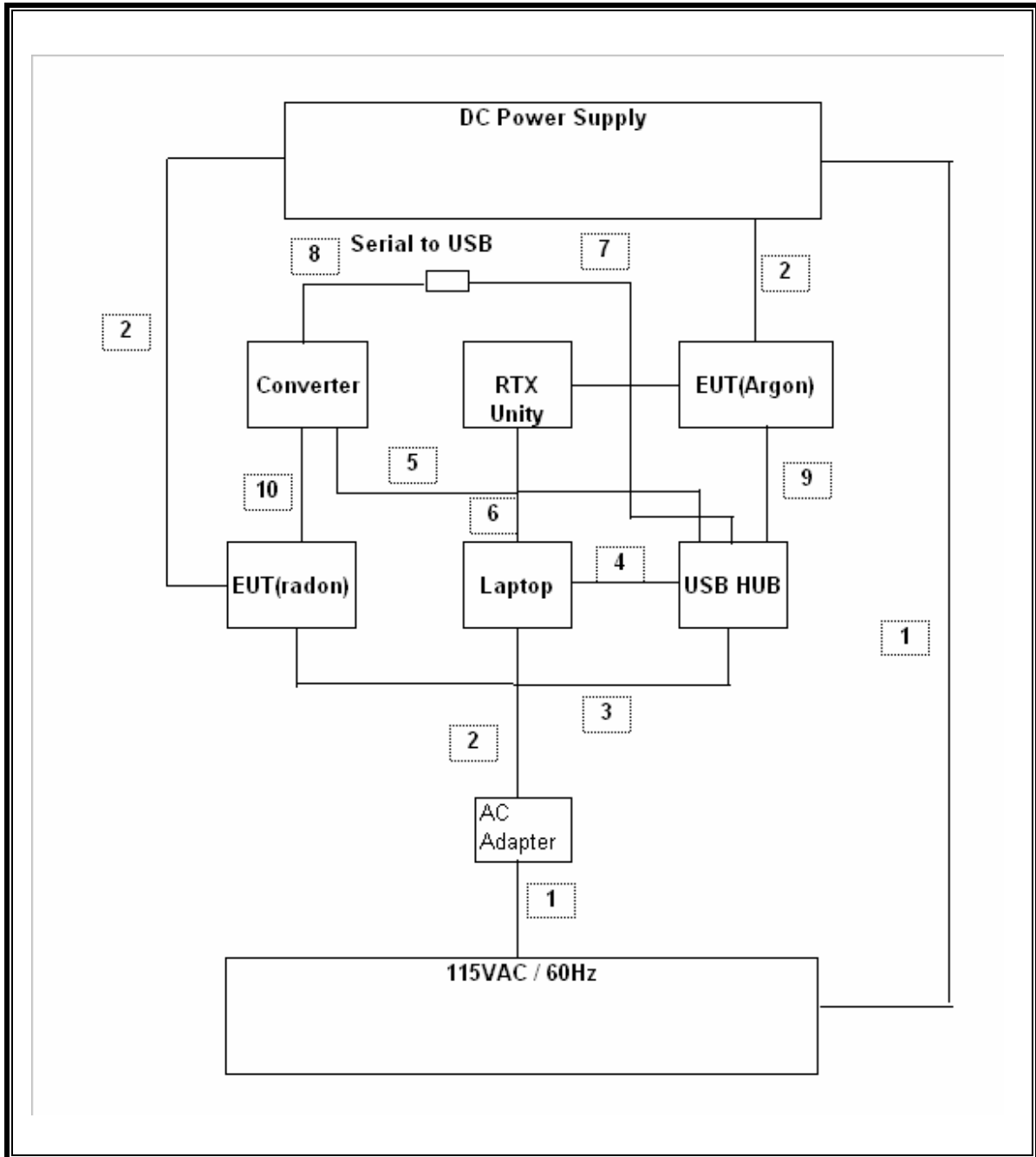
The EUT is initially connected to the RTX unit, was tested in a standalone configuration once setup for testing with Software controlled.



**SETUP DIAGRAM FOR TESTS, CONFIGURATION 1**



**SETUP DIAGRAM FOR TESTS, CONFIGURATION 2**



## 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	US42510266	10/19/06
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/07
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/06
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/06
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	8/30/06
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/06
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/07
Preamplifier, 1 ~ 26 GHz	Agilent / HP	8449B	3008A00931	6/24/06

## 7. LIMITS AND RESULTS

### 7.1. ANTENNA PORT CHANNEL TESTS

#### 7.1.1. 20 dB BANDWIDTH

##### LIMIT

None; for reporting purposes only.

##### TEST PROCEDURE

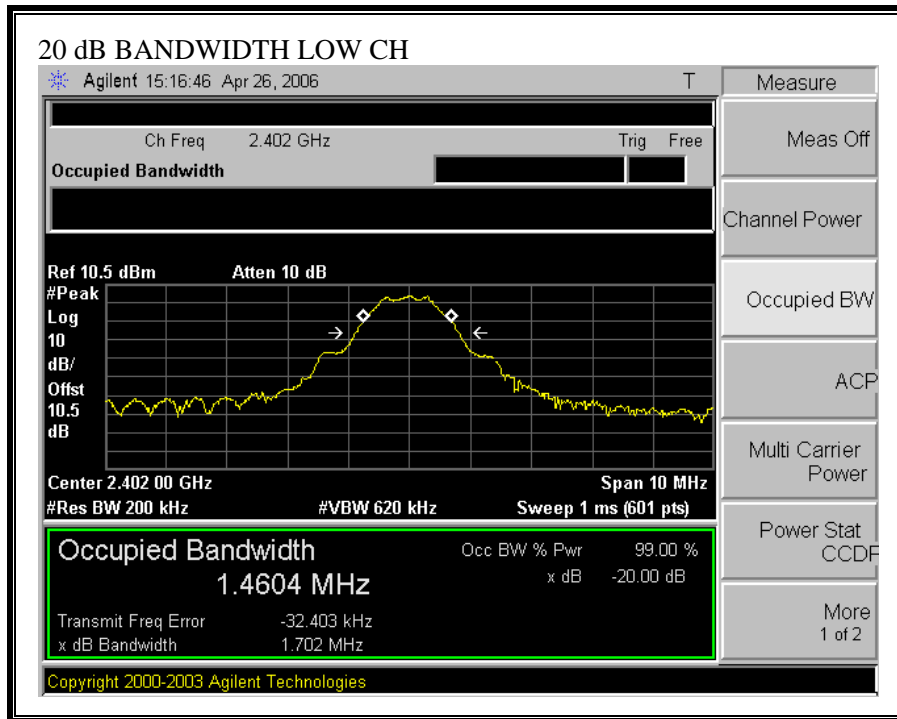
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

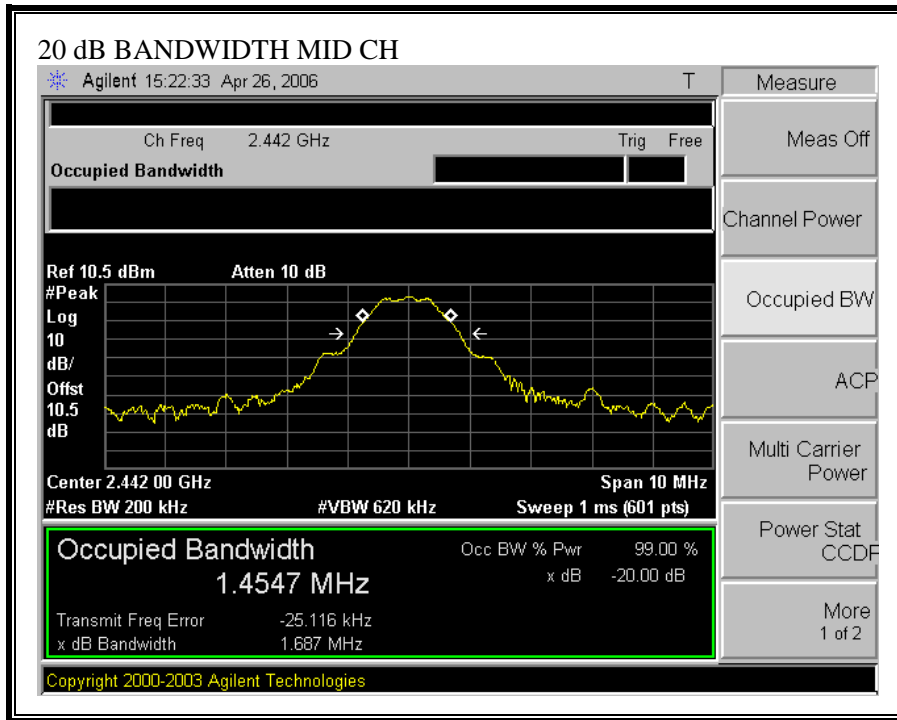
##### RESULTS

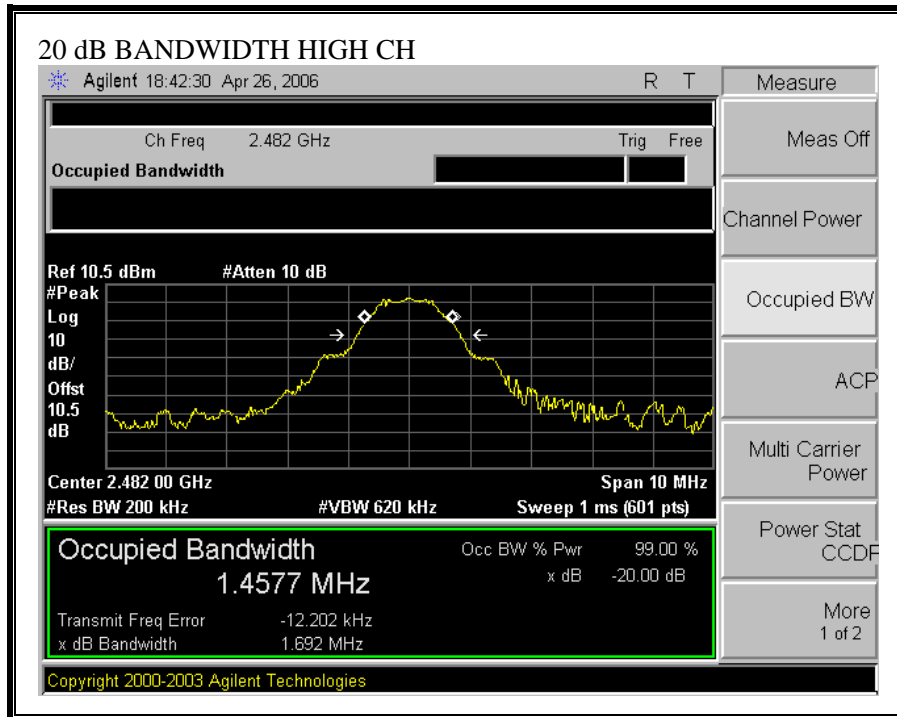
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1702
Middle	2442	1687
High	2482	1692

**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

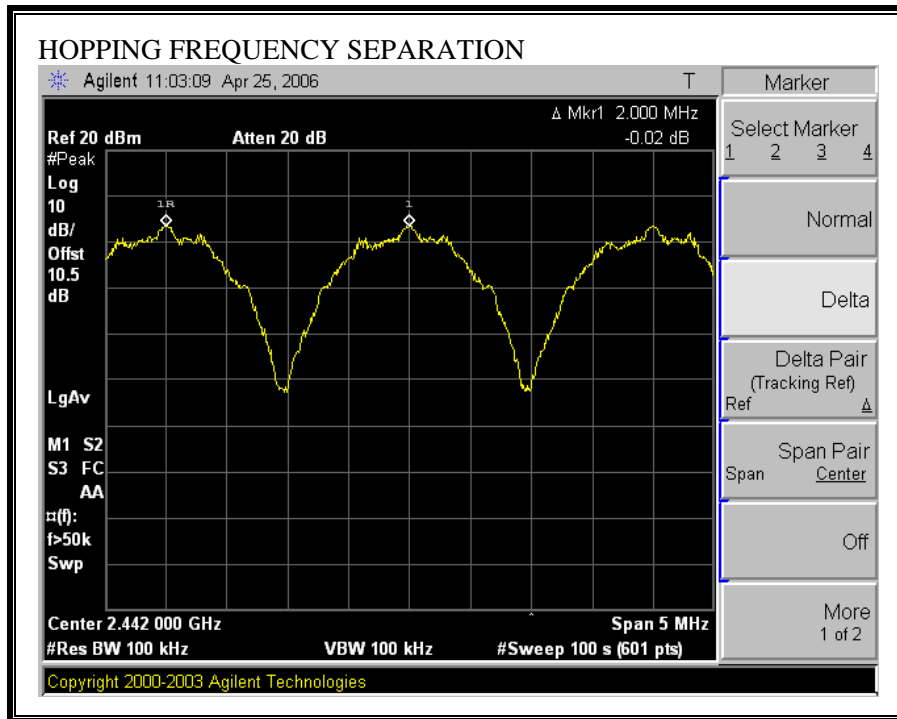
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

### RESULTS

No non-compliance noted:



**HOPPING FREQUENCY SEPARATION**



Channel Separation	20 dB Bandwidth	Margin
2 MHz	1.684 MHz	316kHz

### **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**

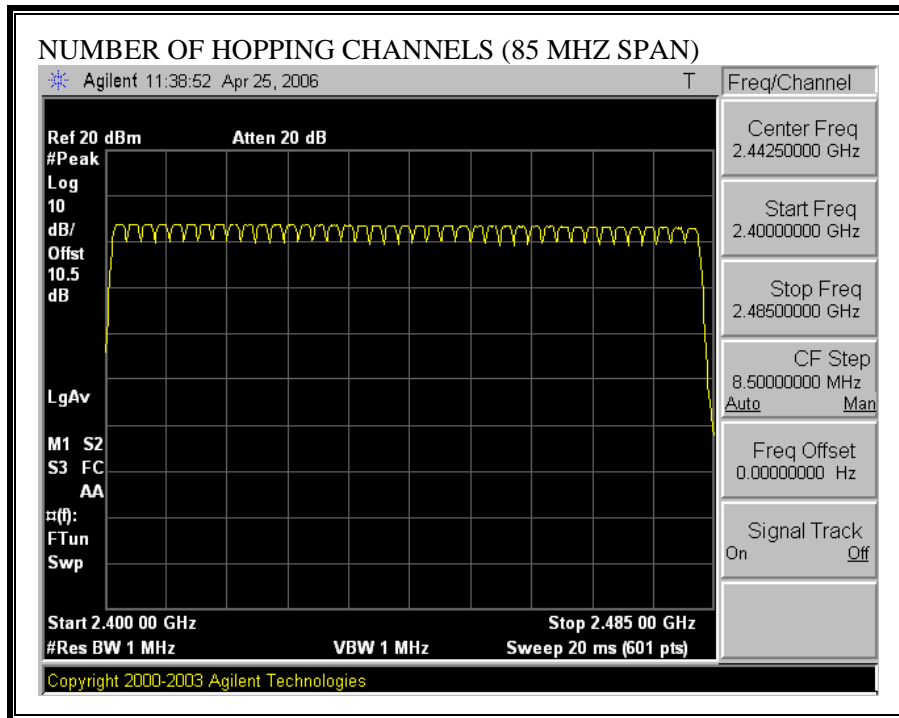
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

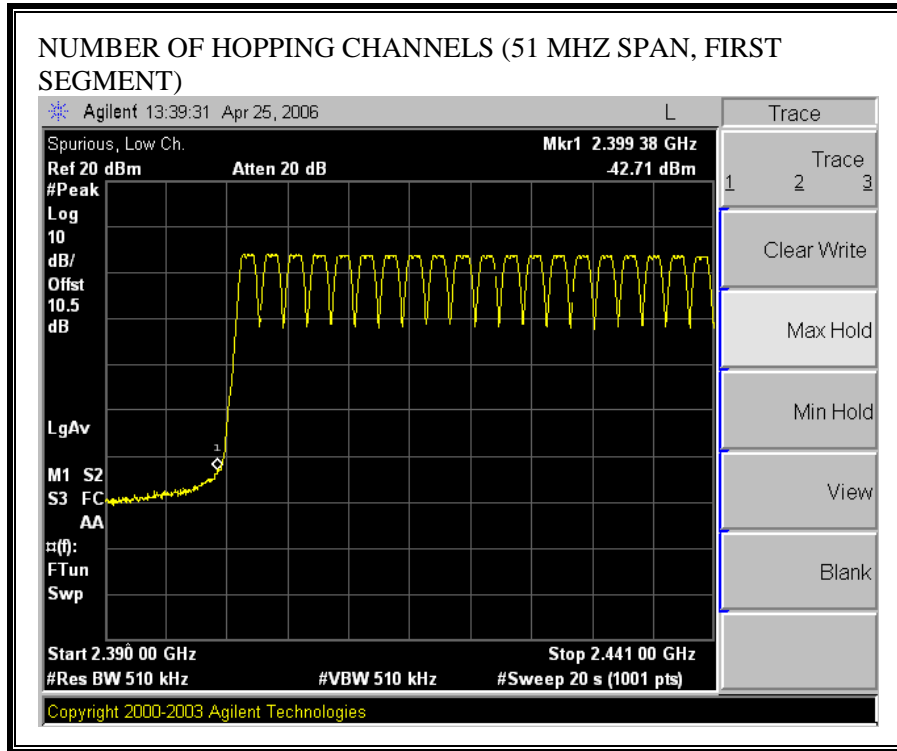
#### **RESULTS**

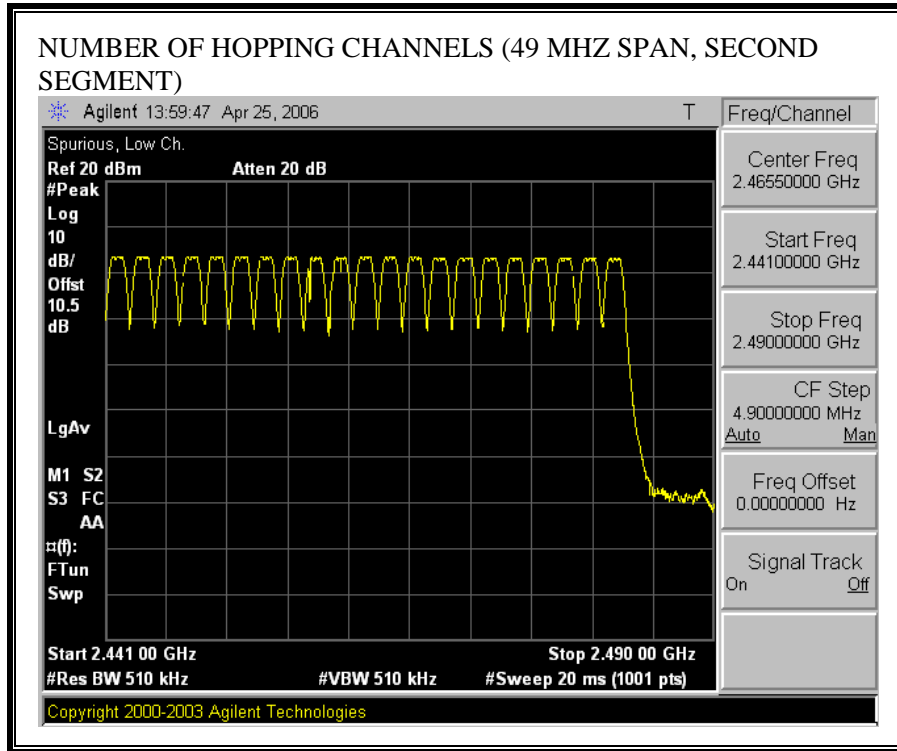
No non-compliance noted:

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.

The window period is 0.4 seconds times 41 channels = 16.4 seconds

### TEST PROCEDURE

The hopping sequence is 524,287 frequencies long before it repeats therefore testing for this parameter is not feasible. Compliance is demonstrated by the manufacturers declaration of the theory of operation as stated below.

### RESULTS

#### MANUFACTURERS DECLARATION

Adaptive frequency hopping is used by the host firmware in the baseband chip to continuously assess channel performance and mark channels as bad if performance is not acceptable. When marked as bad, channels will be deleted from the hopping table for a minimum of 5 seconds. No less than 20 channels will be used no matter how bad the interference, to comply with ETSI 300 328 V1.6.1 rules. There are 4 frequencies used in every 8 mS frame of the protocol, for an average hopping rate of about 500 hops/sec.

The worst-case, longest dwell time per channel is 3147 us in every 8ms when you have 2 or more wireless game pads and wireless voice devices. This includes both receiving and transmitting. The worst-case, longest transmitting dwell time per channel for the Xbox RF module is 568 us in every 8 ms under these same conditions.

For host, the longest dwell time is  $(981+758)*750ns = 1304.24$  us in 8 ms this is only for TX from devices to host. The longest dwell time for channel for RX is  $1229*2*750ns = 1843us$ .

The worst-case, longest dwell time per channel for the game controller is 1657 us in every 8 ms. This includes both receiving and transmitting. The worst-case, longest transmitting dwell time per channel for Xbox RF module is 922 us in every 8 ms.

Per controller, the longest TX dwell time is  $1229*750ns = 921.75us$  in 8ms. The longest RX dwell time is  $981*750ns = 735us$  in 8 ms.

If AFH is used, the longest dwell time is 168 ms in every 328 ms period. This can occur when we have only 20 channels left and the 21 removed channels are consecutive in the hopping sequence.

27,594 unique frequency hopping polynomials are used by the console. The hopping sequence is 524,287 frequencies long before it repeats.

The polynomials are selected such that on average no hopping frequency channel is occupied for more than 0.4 seconds within any 16.4 second window.

### 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 6.38 dBi, therefore the limit is 20.59 dBm.

#### TEST PROCEDURE

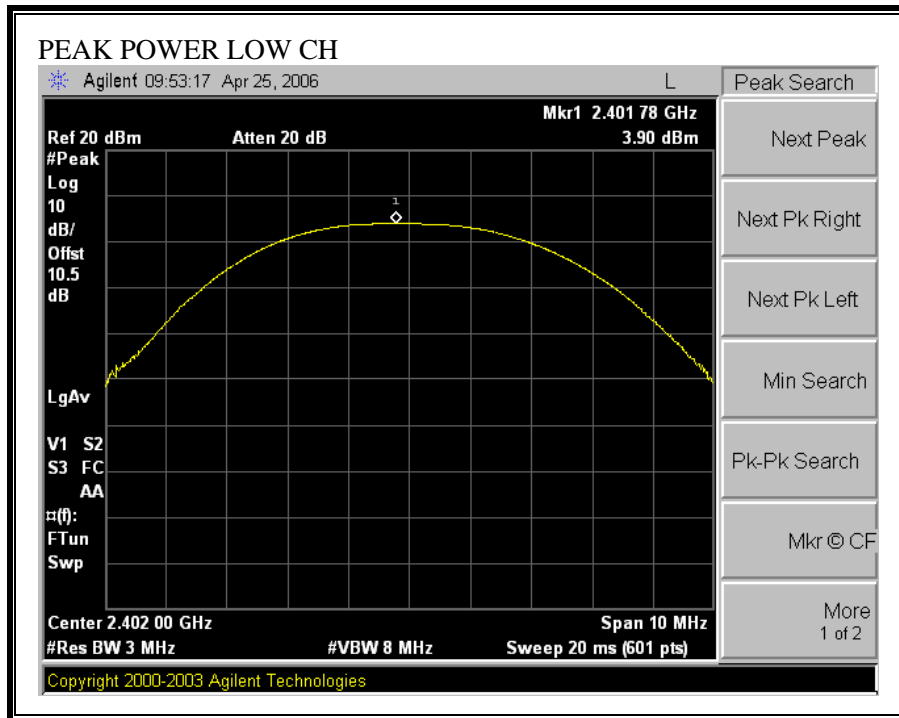
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

#### RESULTS

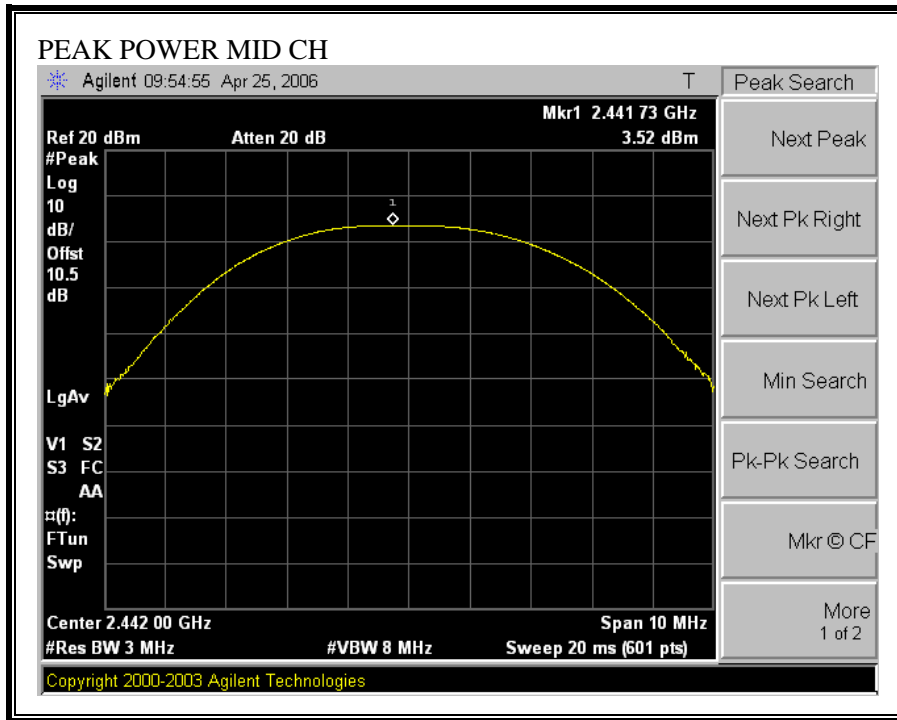
No non-compliance noted:

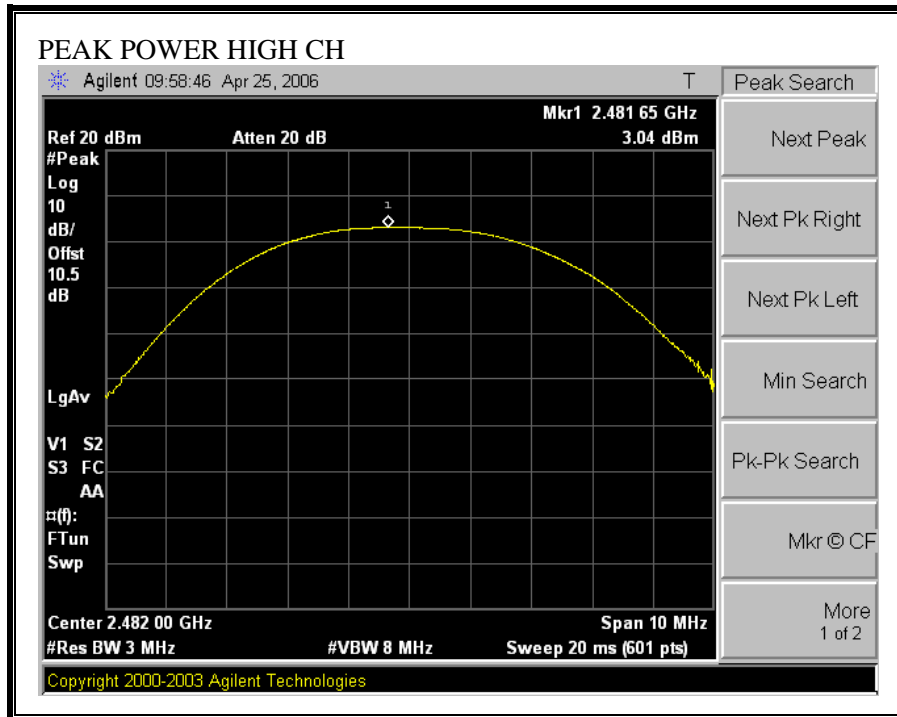
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.90	20.59	-16.69
Middle	2442	3.52	20.59	-17.07
High	2482	3.04	20.59	-17.55

**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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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/cm<sup>2</sup>

Substituting the logarithmic form of power and gain using:

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

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Rearranging terms to calculate the power density at a specific distance yields

$$S = .0795 * 10^{((P + G) / 10)} / (d^2) \quad \text{Equation (1)}$$

**LIMITS**

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

**RESULTS**

No non-compliance noted:

<b>Mode</b>	<b>MPE Distance (cm)</b>	<b>Output Power (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>
FHSS	20.0	3.90	6.38	0.002

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 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	-6.99
Middle	2442	-6.74
High	2482	-7.20

## **7.1.8. 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**

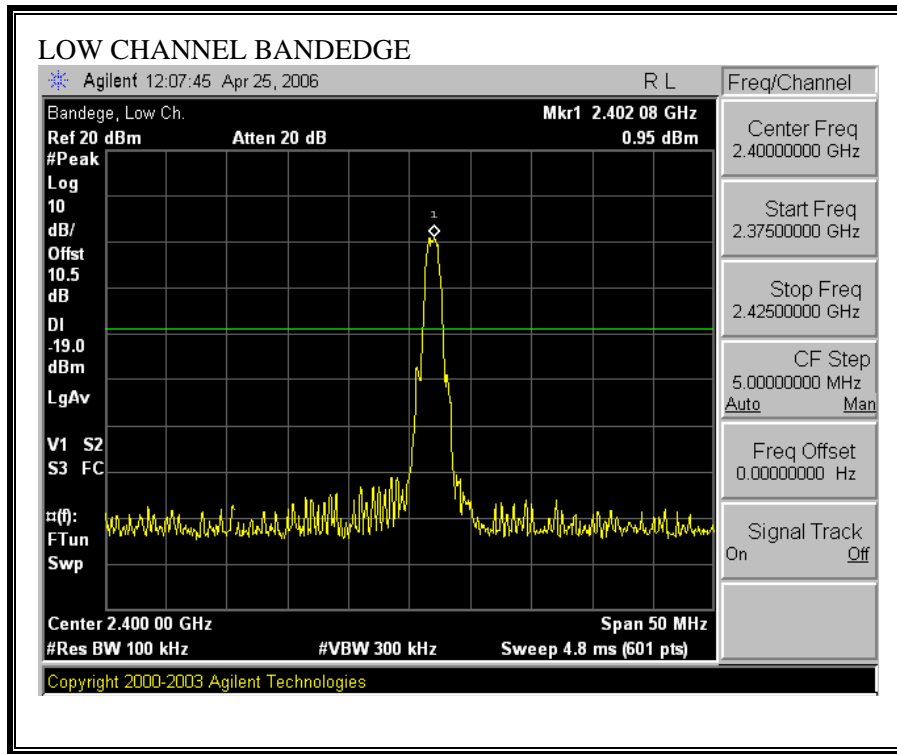
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

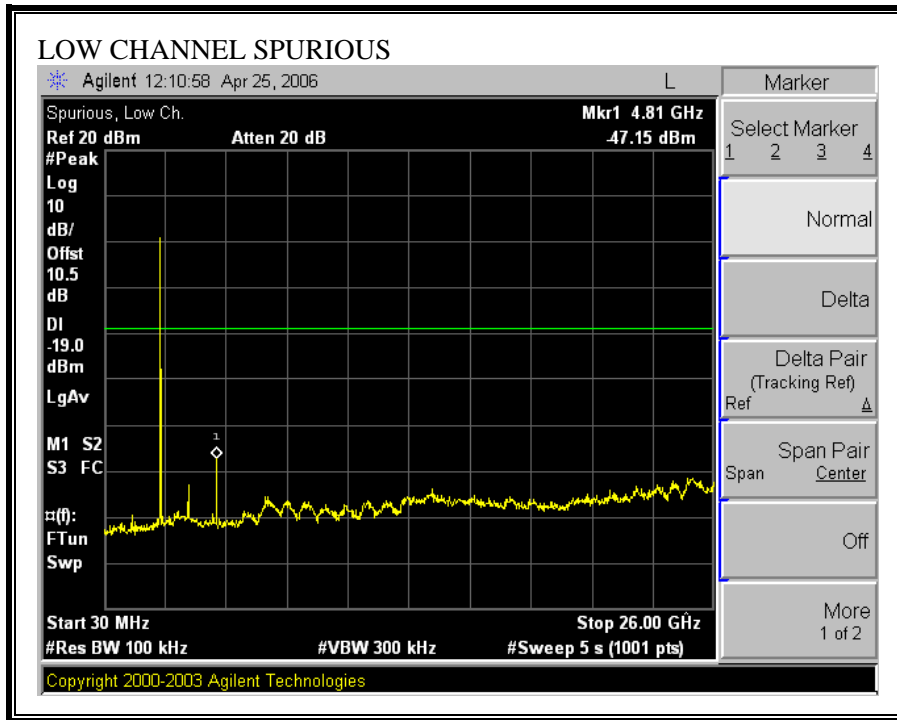
### **RESULTS**

No non-compliance noted:

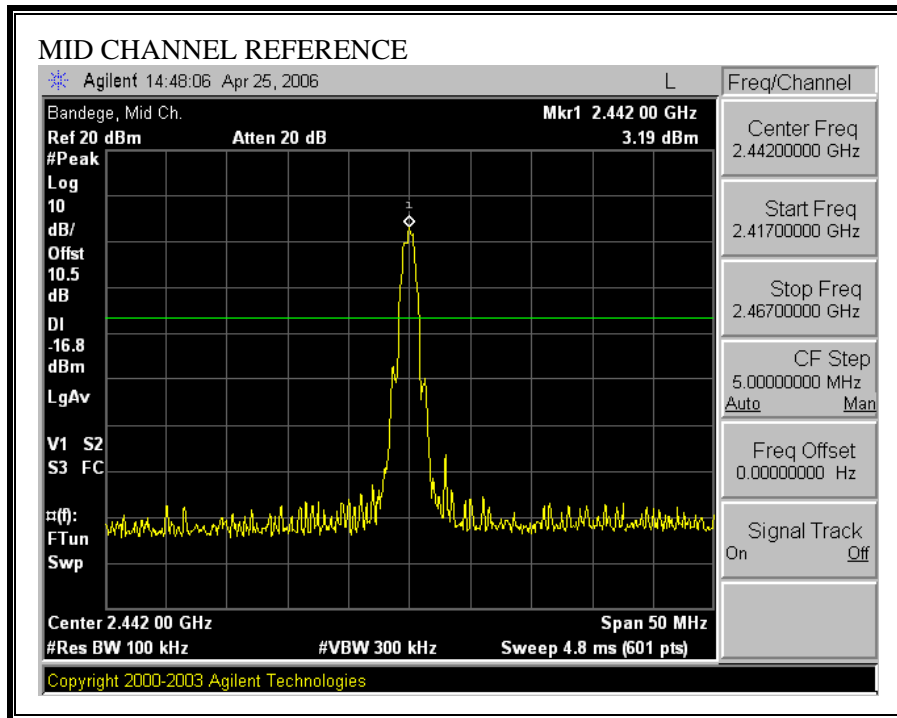
**SPURIOUS EMISSIONS, LOW CHANNEL**

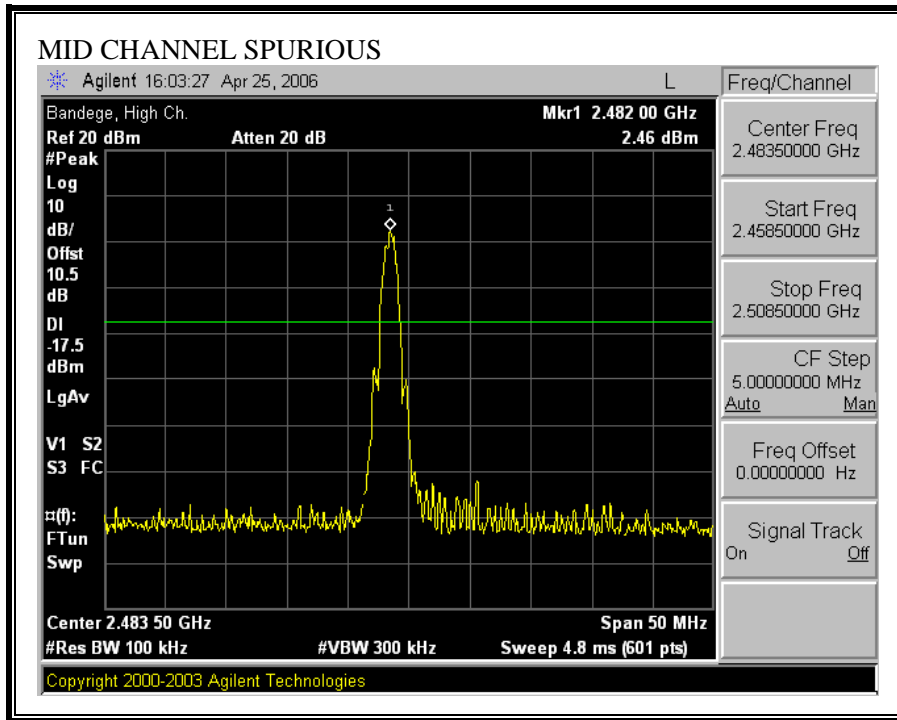




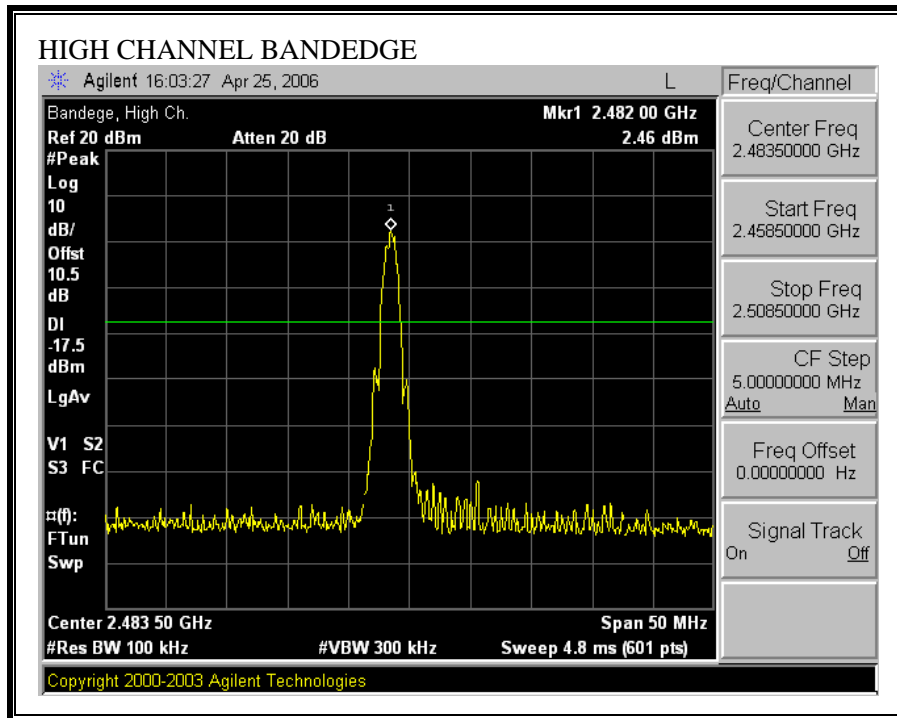


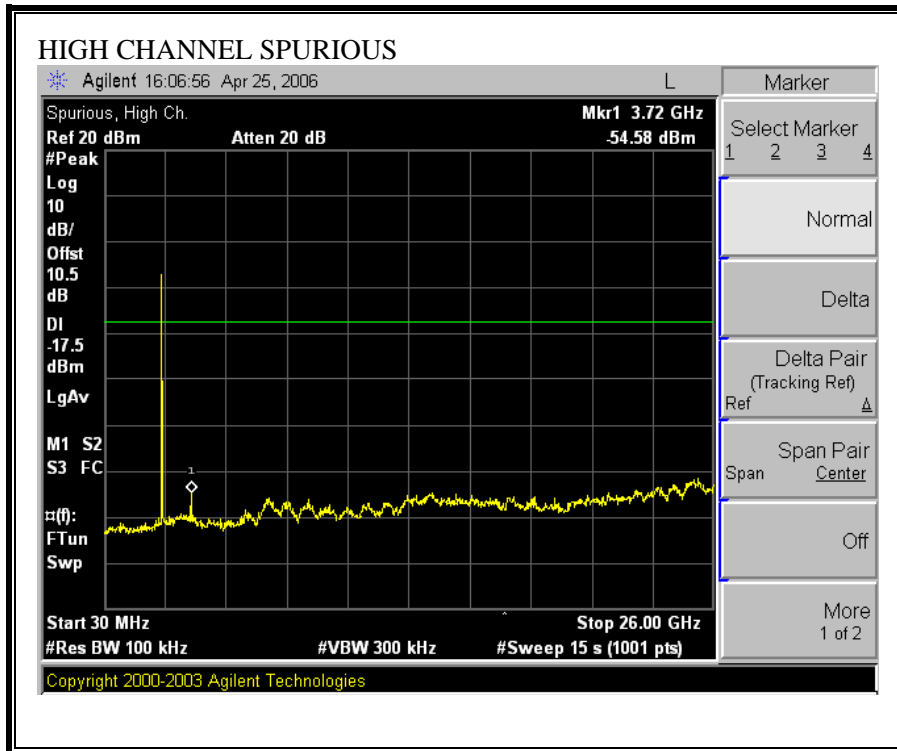
**SPURIOUS EMISSIONS, MID CHANNEL**



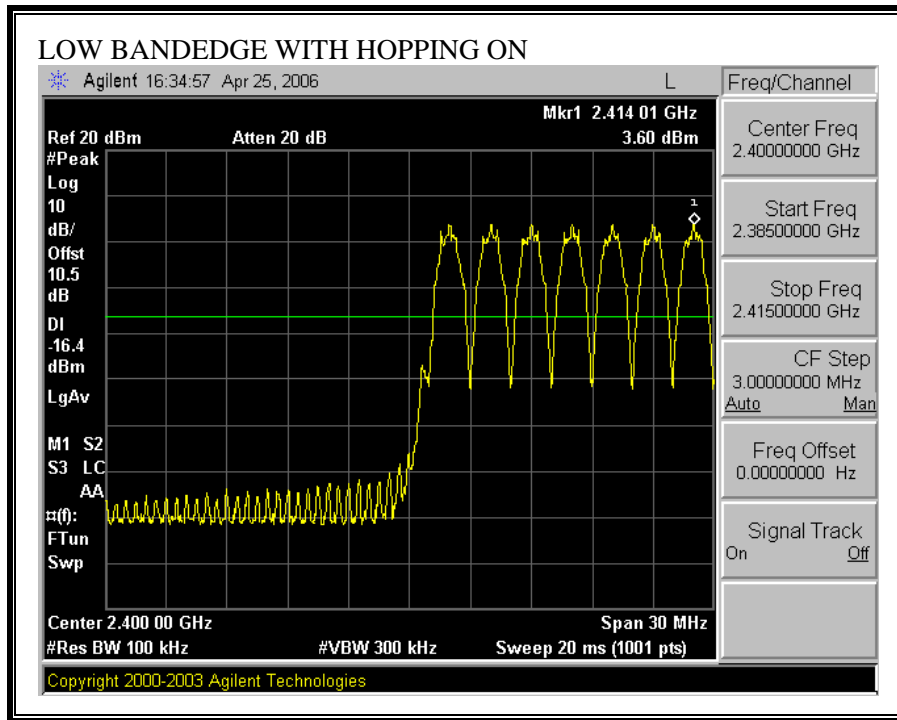


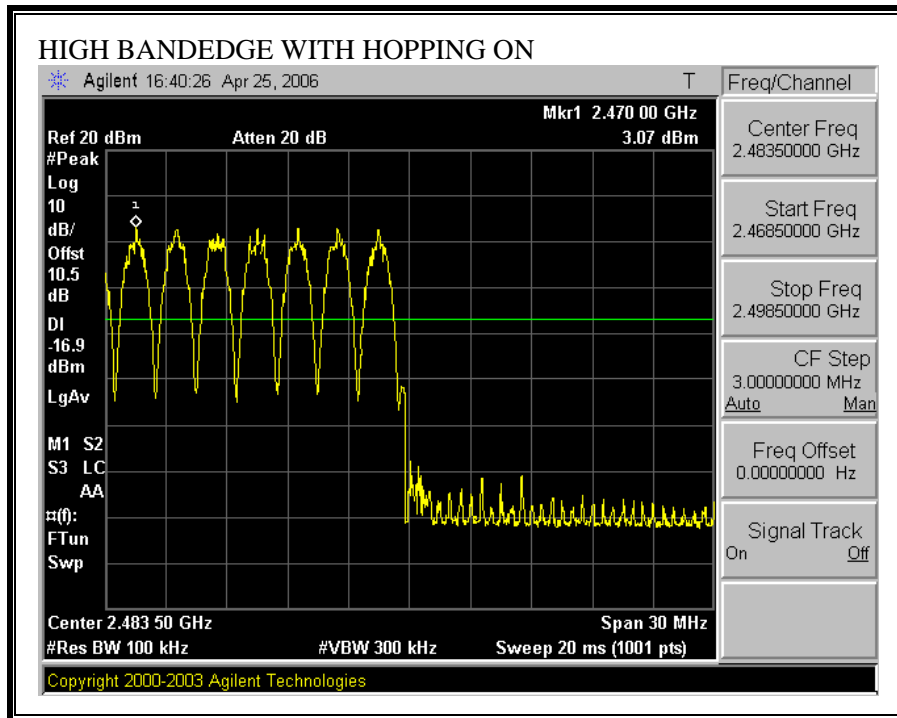
**SPURIOUS EMISSIONS, HIGH CHANNEL**





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

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

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



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

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

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

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

## **TEST PROCEDURE**

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

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

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

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

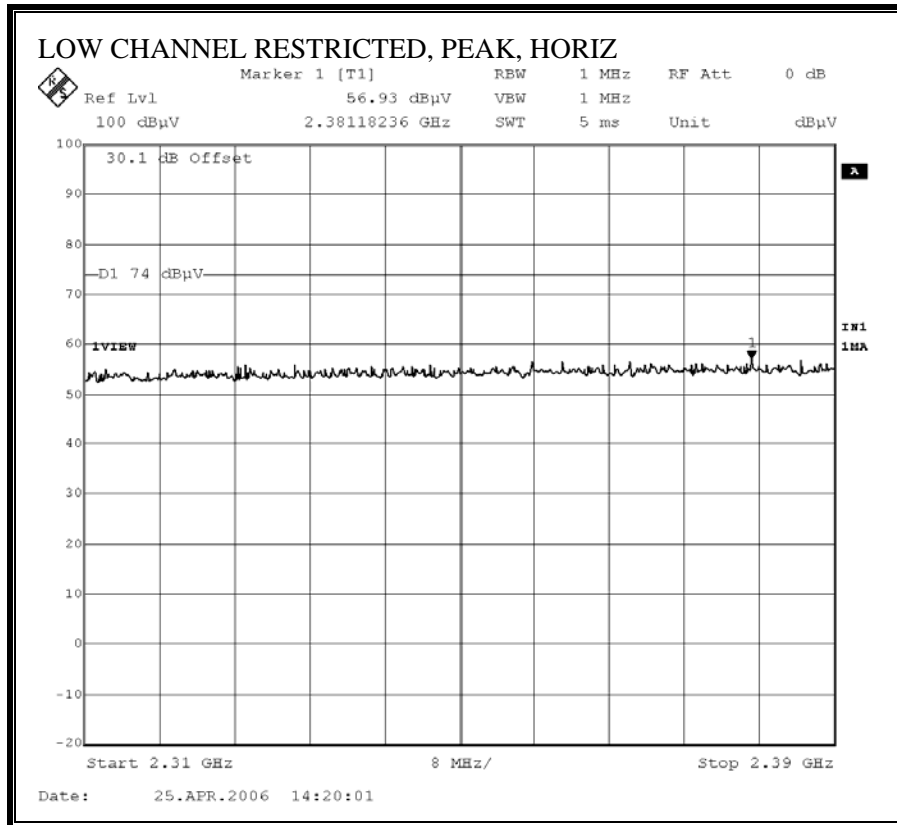
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

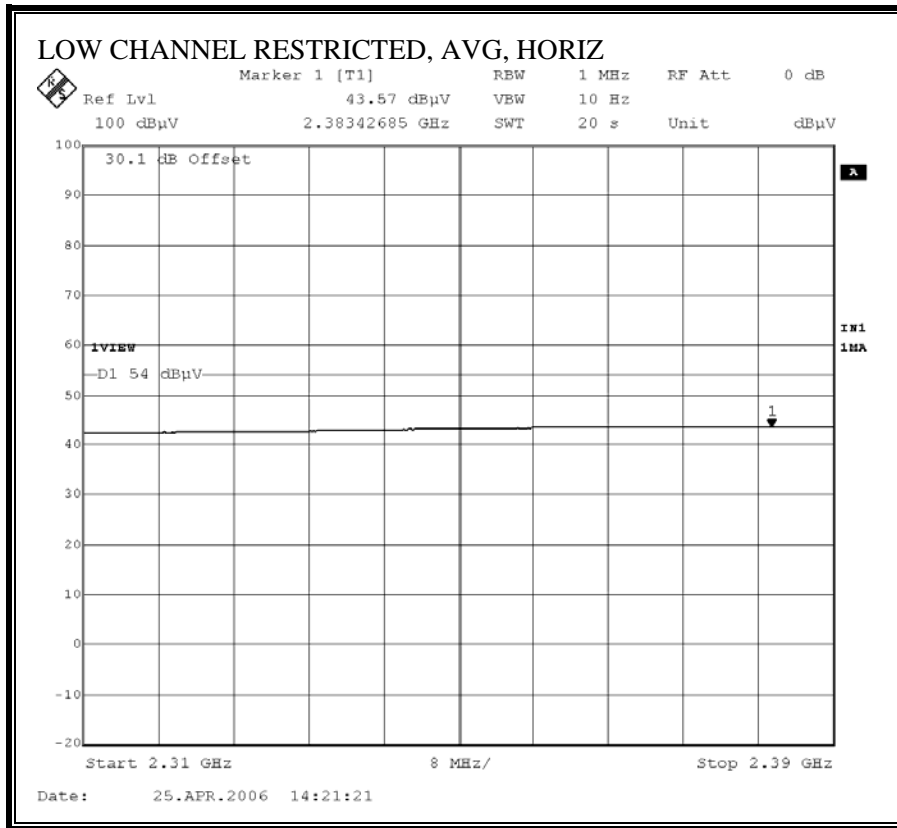
The EUT was tested inside the host system and in stand-alone configuration.

The data reported represents the worse case.

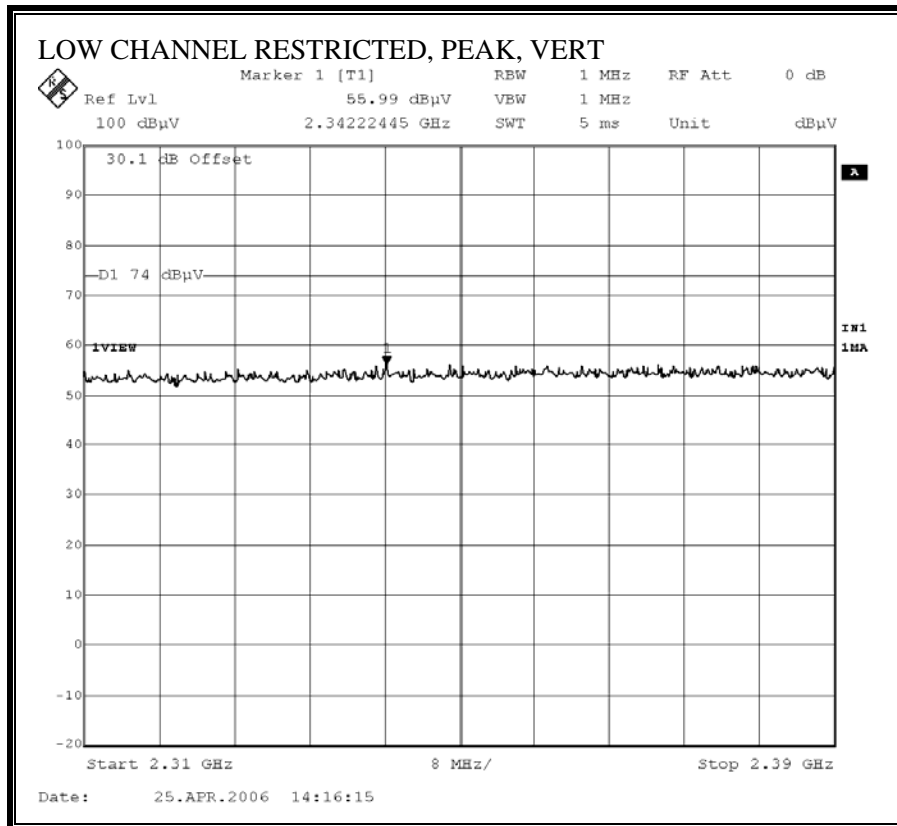
### 7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

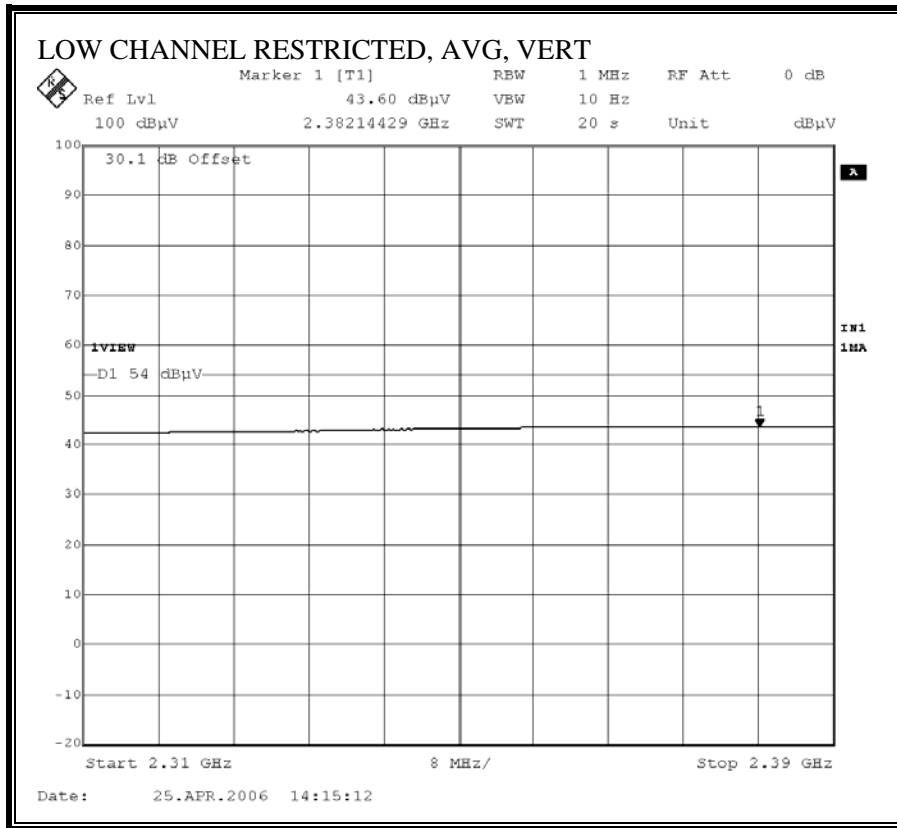
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



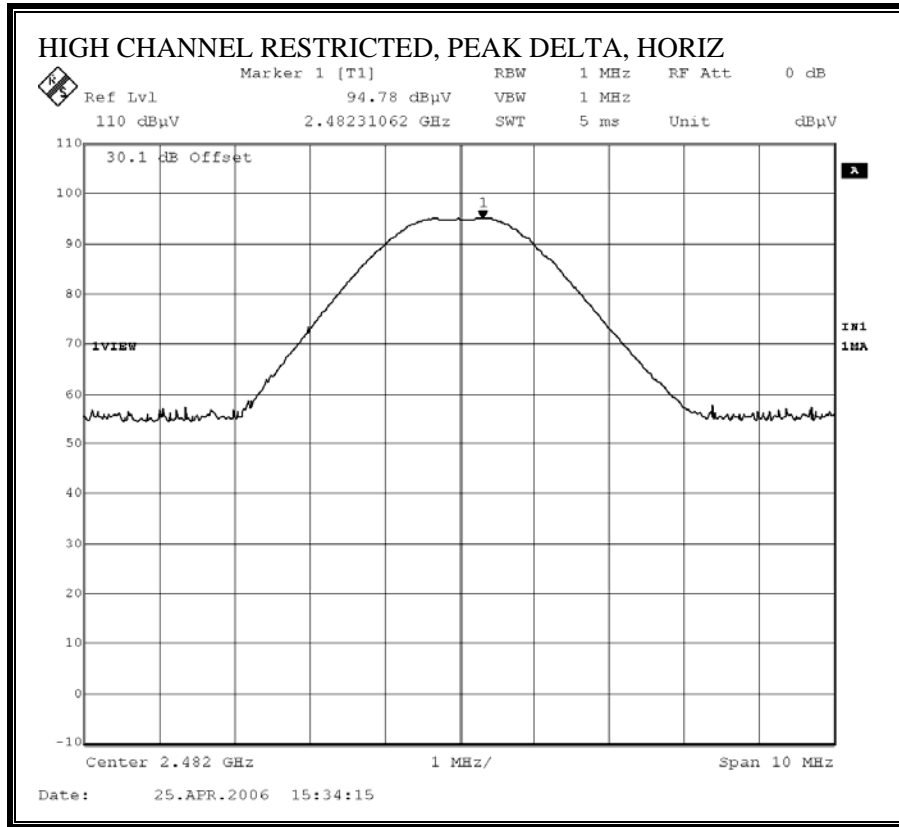


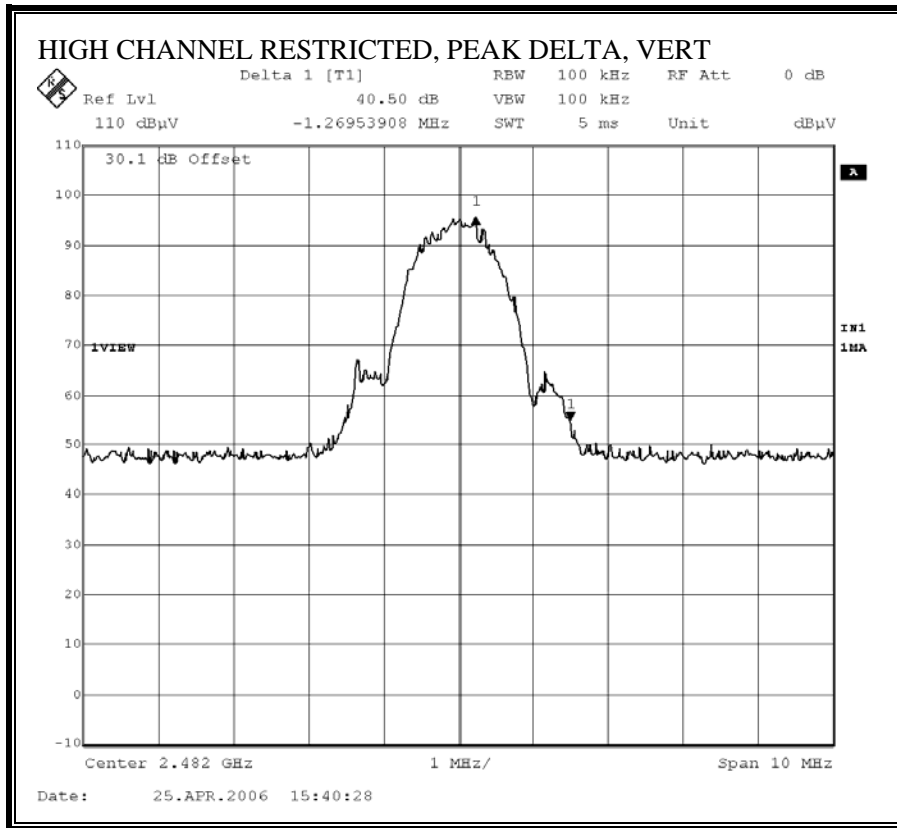
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





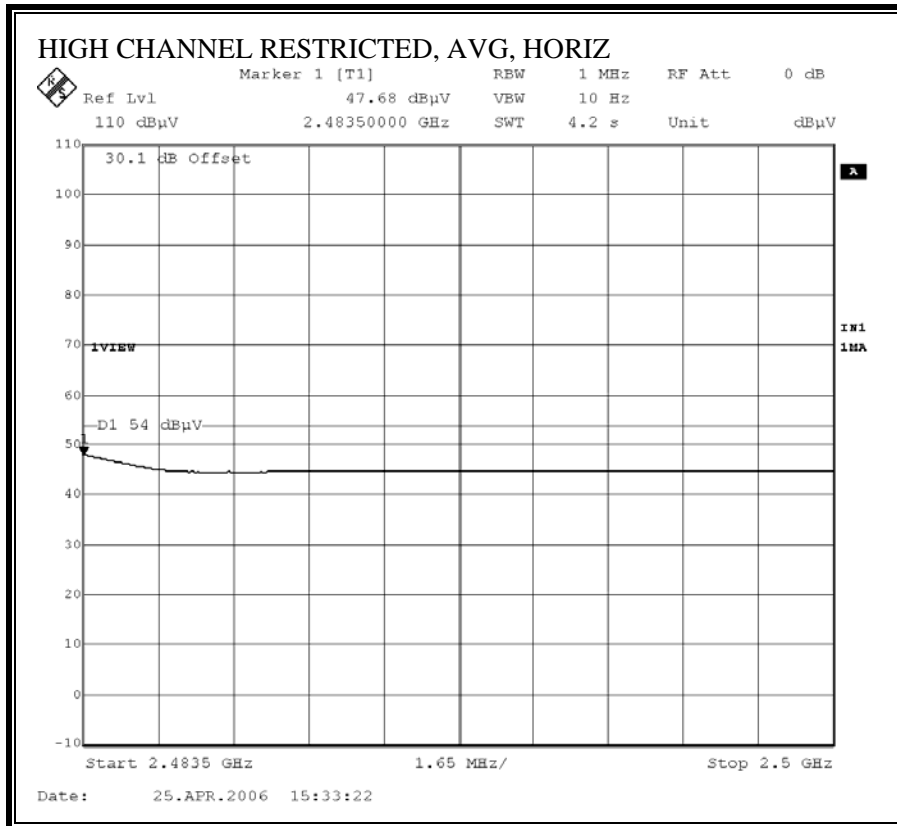
**RESTRICTED BANDEDGE (HIGH CHANNEL, DELTA METHOD, HORIZONTAL)**



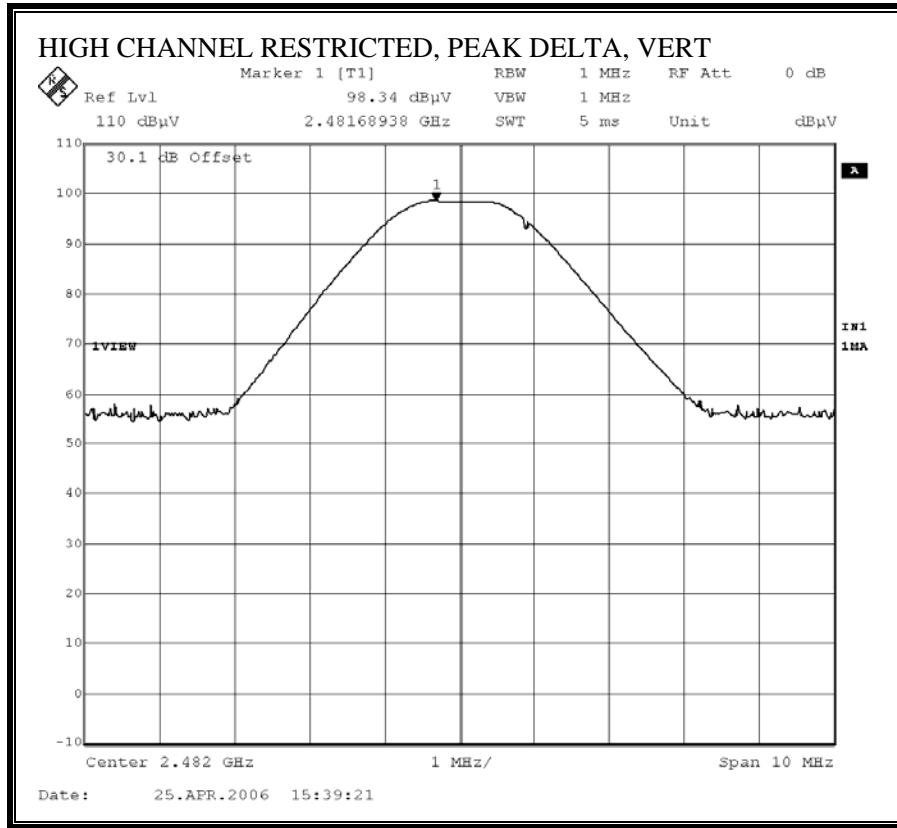


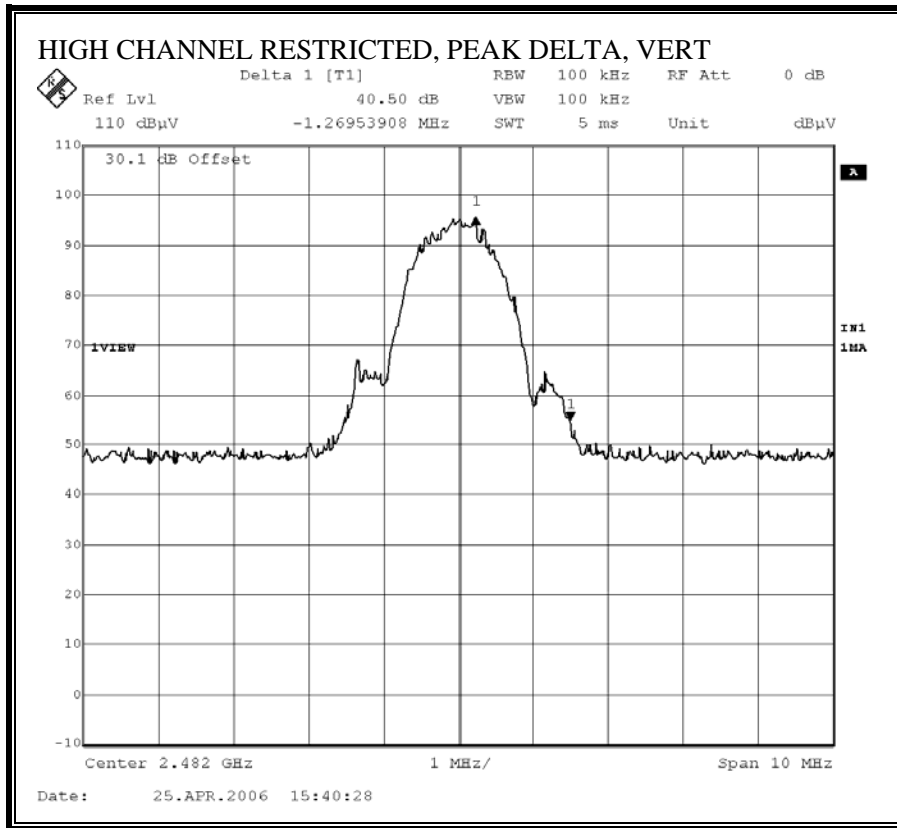


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

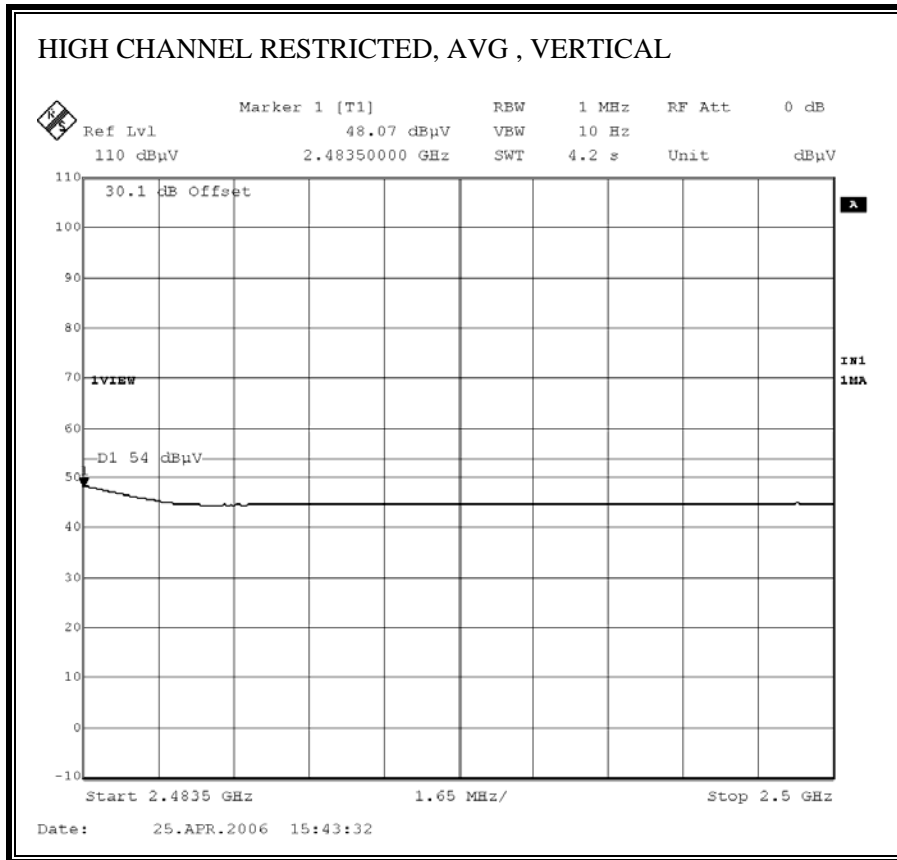


**RESTRICTED BANDEDGE (HIGH CHANNEL, DELTA METHOD, VERTICAL)**





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

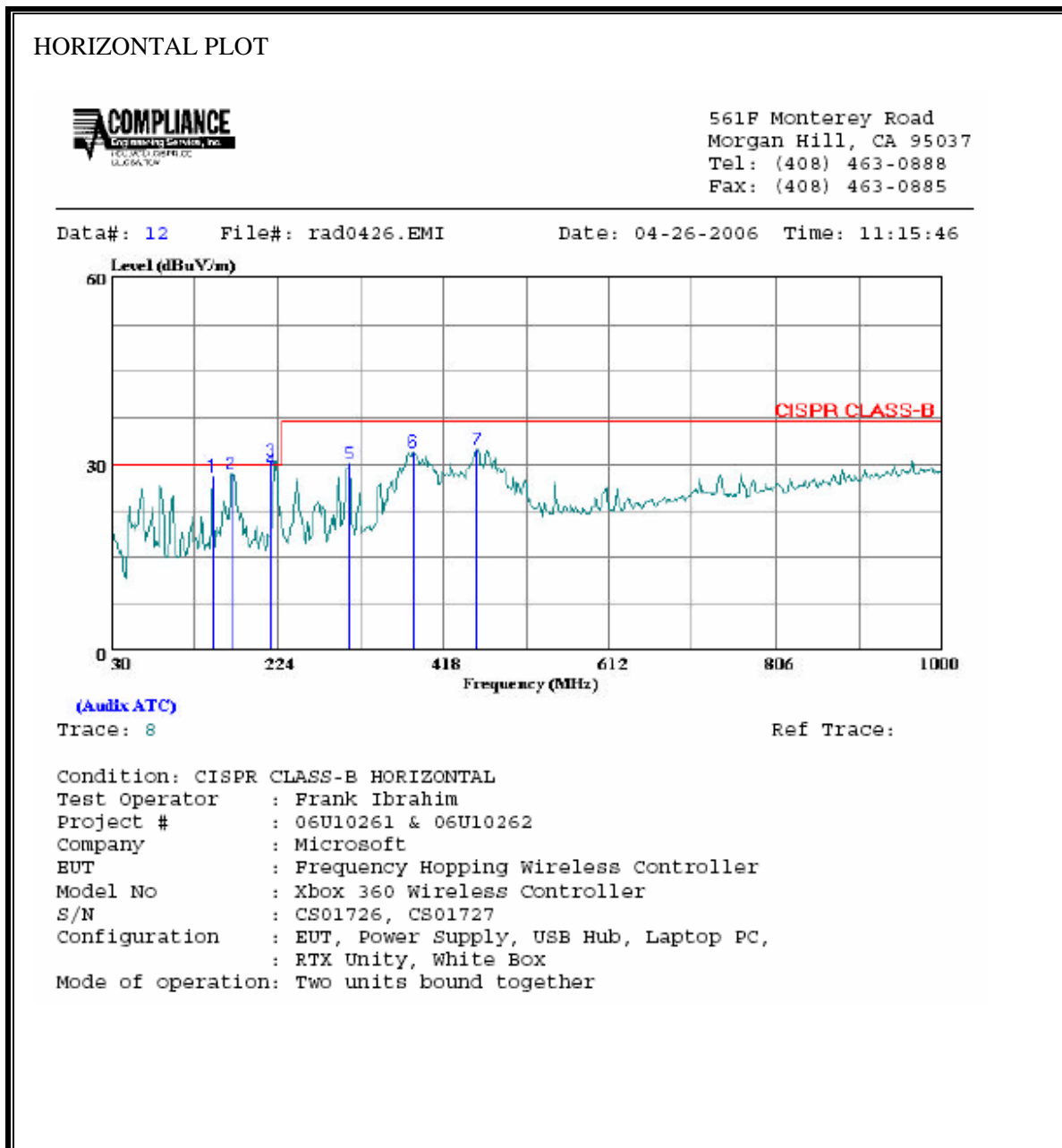


**HARMONICS AND SPURIOUS EMISSIONS**

04/25/06 <b>High Frequency Measurement</b> Compliance Certification Services, Morgan Hill Open Field Site																	
<b>Test Engr:</b> David Garcia <b>Project #:</b> 06U10262 <b>Company:</b> Microsoft <b>EUT Descrip.:</b> RF Module <b>EUT M/N:</b> XBOX 360 Rf Module <b>Test Target:</b> 802.11 FHSS <b>Mode Oper:</b> Transmit mode																	
<b>Test Equipment:</b>																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz					
T60; S/N: 2238 @3m				T144 Miteq 3008A00931													
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 187207002								Joseph 208946001				52.1					
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)		
<b>2402 Channel</b>																	
4.804	3.0	52.1	31.9	33.6	3.3	-36.5	0.0	0.6	53.1	32.9	74	54	-20.9	-21.1	V		
4.804	3.0	57.8	32.8	33.6	3.3	-36.5	0.0	0.6	58.8	33.8	74	54	-15.2	-20.2	H		
<b>2442 Channel</b>																	
4.884	3.0	48.9	31.4	33.7	3.3	-36.5	0.0	0.6	50.0	32.5	74	54	-24.0	-21.5	V		
7.326	3.0	45.1	31.1	36.2	3.4	-36.2	0.0	0.6	49.1	35.1	74	54	-24.9	-18.9	V		
4.884	3.0	49.9	32.0	33.7	3.3	-36.5	0.0	0.6	51.0	33.1	74	54	-23.0	-20.9	H		
<b>2482 Channel</b>																	
4.964	3.0	49.2	31.2	33.8	3.3	-36.5	0.0	0.6	50.4	32.4	74	54	-23.6	-21.6	V		
7.446	3.0	46.4	31.4	36.3	3.4	-36.2	0.0	0.6	50.5	35.5	74	54	-23.5	-18.5	V		
4.964	3.0	53.6	31.9	33.8	3.3	-36.5	0.0	0.6	54.8	33.1	74	54	-19.2	-20.9	H		
7.446	3.0	46.3	31.5	36.3	3.4	-36.2	0.0	0.6	50.4	35.6	74	54	-23.6	-18.4	H		
No further emissions were detected above the noise floor of the receiver.																	
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										

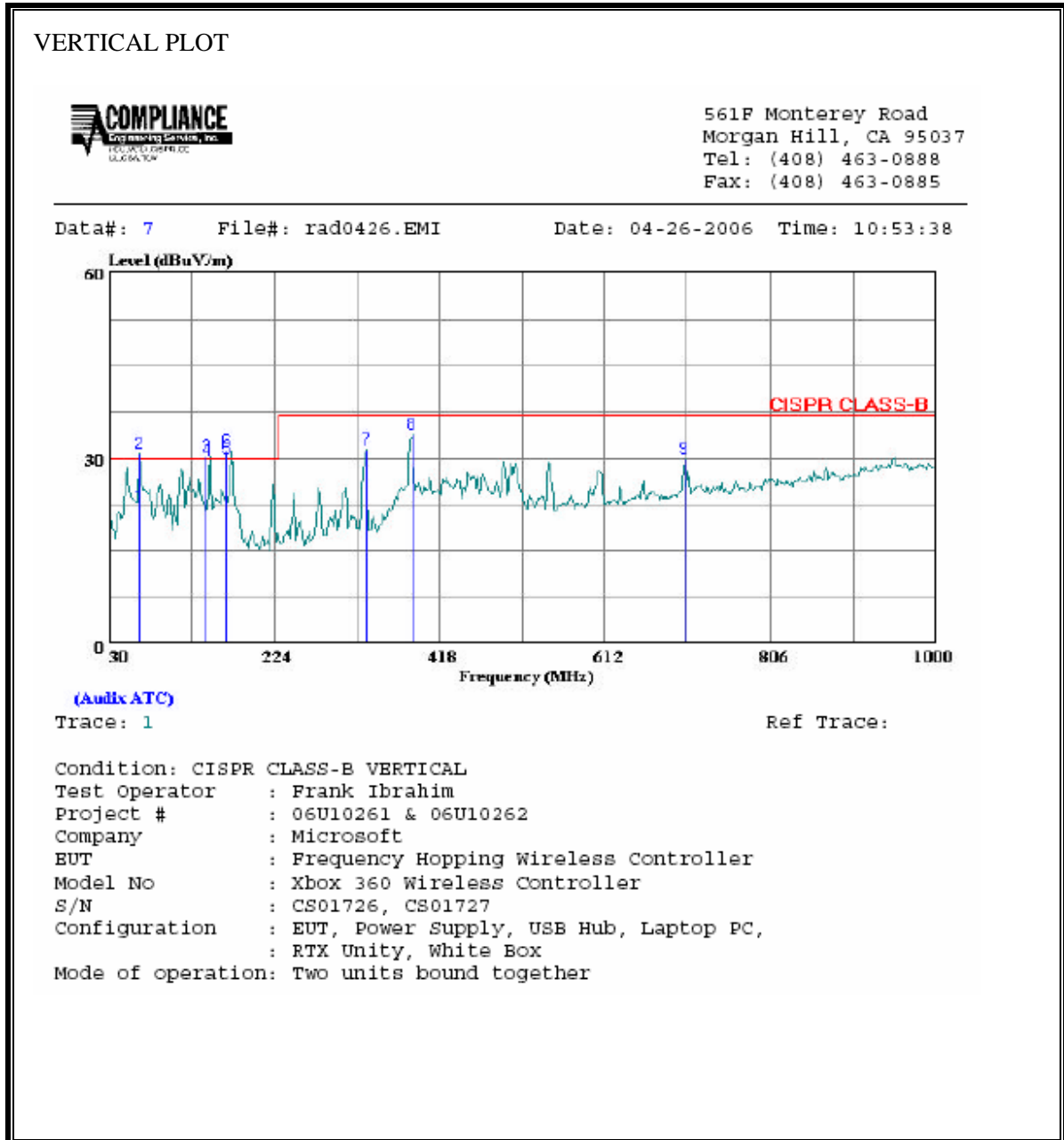
### 7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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



HORIZONTAL DATA							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	148.340	13.62	14.33	27.94	30.00	-2.06	Peak
2	170.650	15.10	13.38	28.48	30.00	-1.52	Peak
3 *	216.010	19.20	12.41	31.61	30.00	1.61	Peak
4	216.010	16.70	12.41	29.11	30.00	-0.89	QP
5	308.390	14.26	15.87	30.13	37.00	-6.87	Peak
6	383.080	14.39	17.69	32.08	37.00	-4.92	Peak
7	457.770	12.94	19.38	32.32	37.00	-4.68	Peak

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





VERTICAL DATA							
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	65.890	13.10	9.09	22.19	30.00	-7.81	QP
2 *	65.890	21.69	9.09	30.78	30.00	0.78	Peak
3 *	144.010	16.00	14.63	30.62	30.00	0.62	Peak
4	144.010	15.18	14.63	29.80	30.00	-0.20	QP
5	168.008	16.40	13.51	29.91	30.00	-0.09	QP
6 *	168.008	17.89	13.51	31.40	30.00	1.40	Peak
7	332.640	14.96	16.47	31.43	37.00	-5.57	Peak
8	385.990	16.13	17.73	33.86	37.00	-3.14	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  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

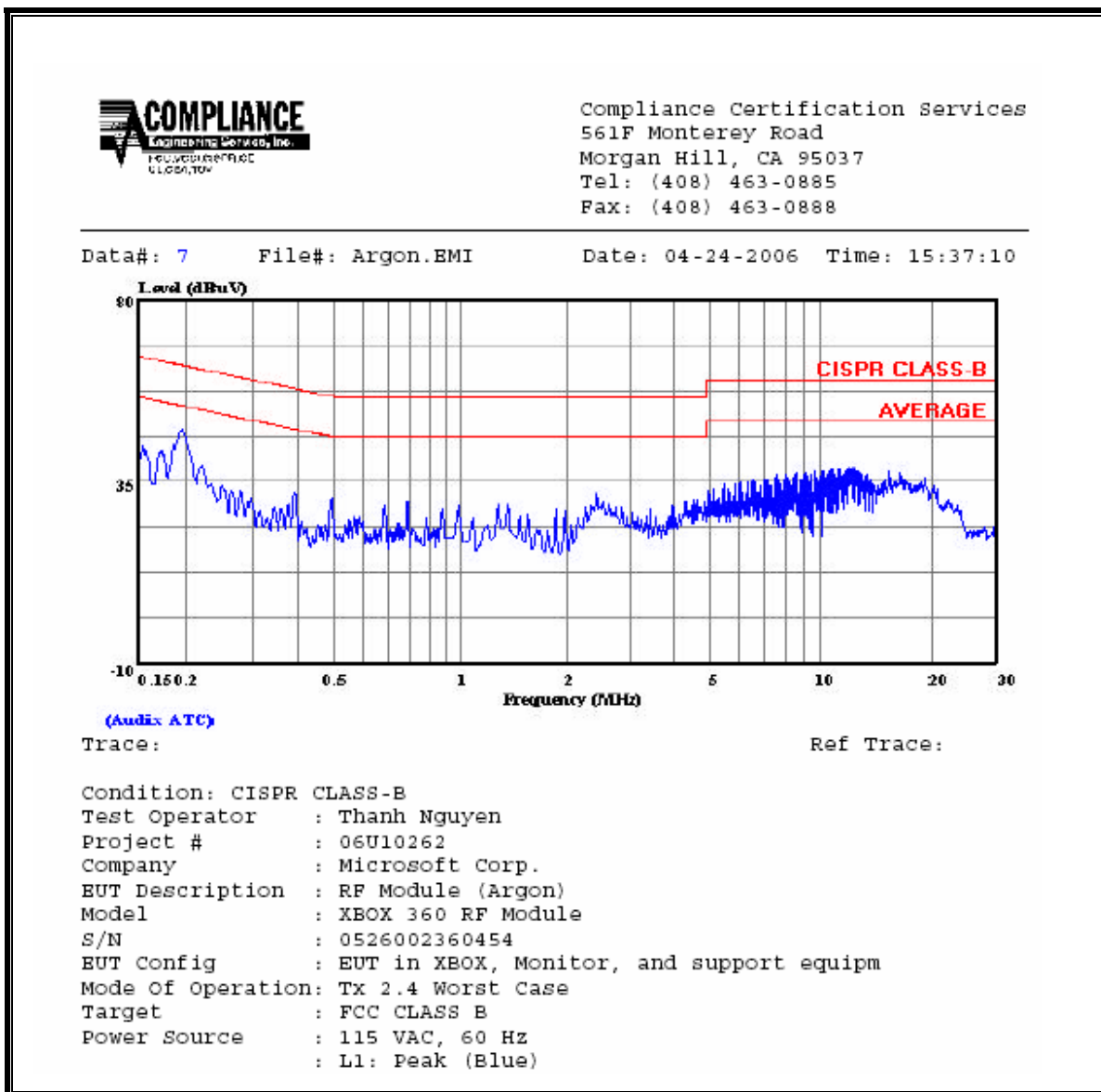
#### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS**

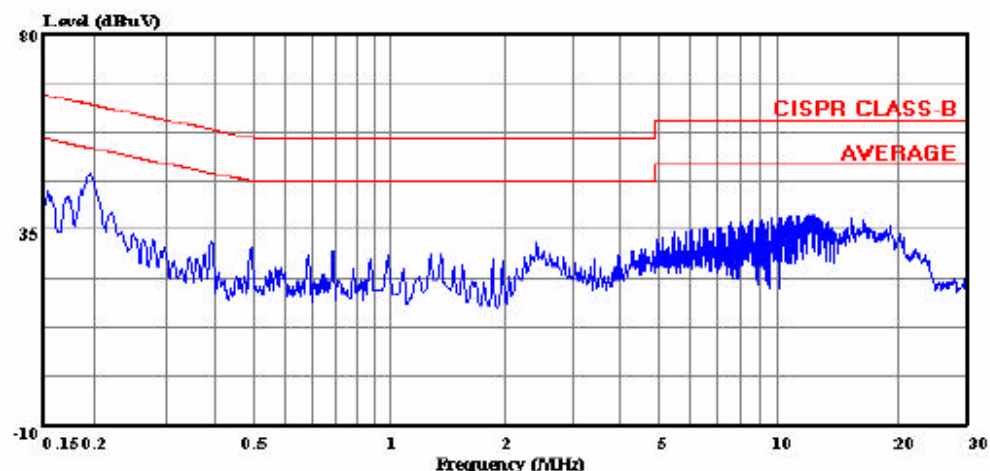
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.19	48.04	--	--	0.00	63.86	53.86	-15.82	-5.82	L1
2.54	32.16	--	--	0.00	56.00	46.00	-23.84	-13.84	L1
12.38	38.28	--	--	0.00	60.00	50.00	-21.72	-11.72	L1
0.16	45.64	--	--	0.00	65.67	55.67	-20.03	-10.03	L2
2.54	33.48	--	--	0.00	56.00	46.00	-22.52	-12.52	L2
10.62	38.72	--	--	0.00	60.00	50.00	-21.28	-11.28	L2
6 Worst Data									

**LINE 1 RESULTS**



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

Data#: 7 File#: Argon.EMI Date: 04-24-2006 Time: 15:37:10



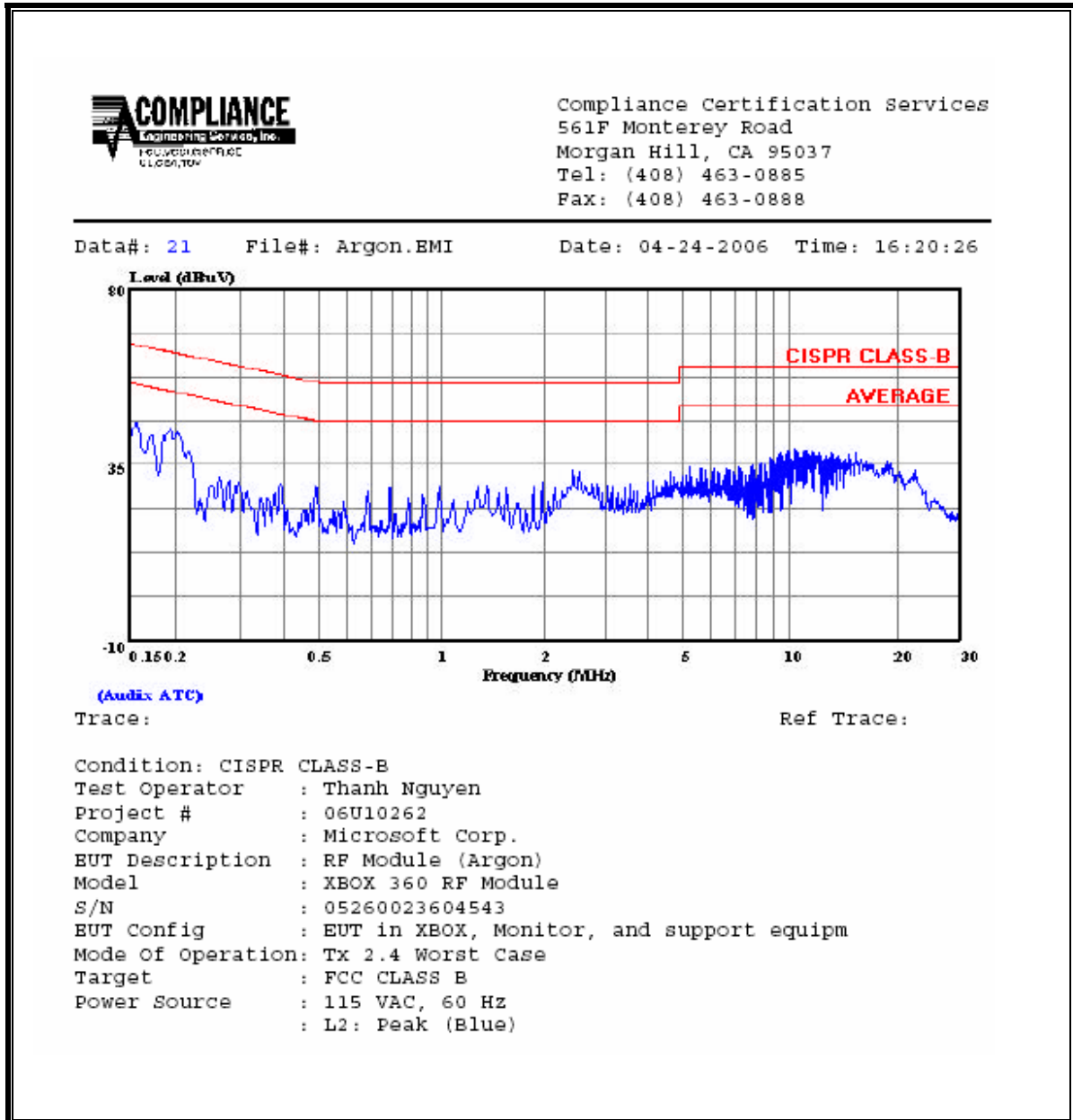
(Auxiliary ATC)

Trace:

Ref Trace:

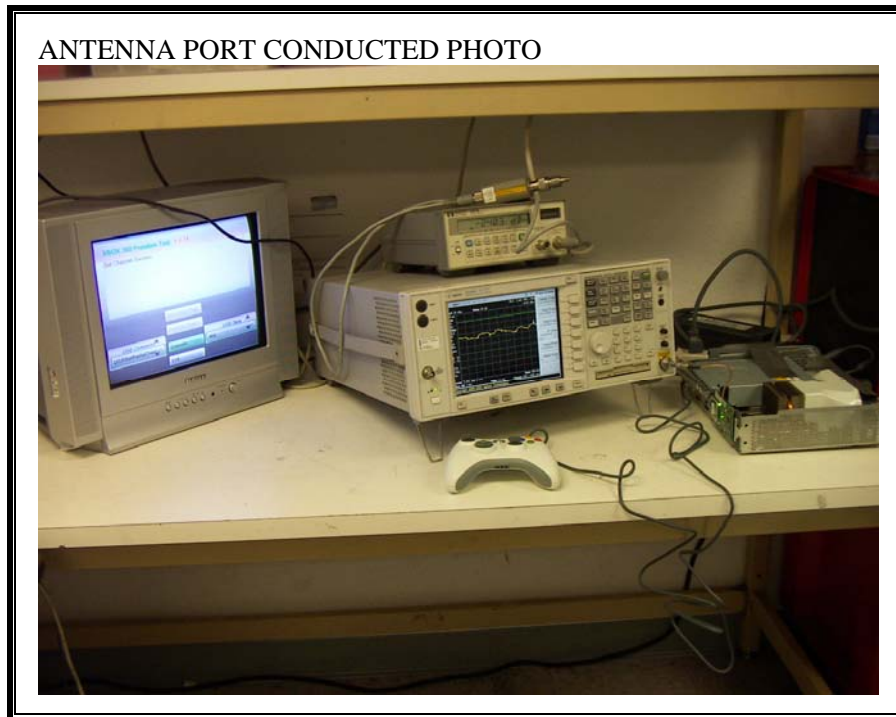
Condition: CISPR CLASS-B  
Test Operator : Thanh Nguyen  
Project # : 06U10262  
Company : Microsoft Corp.  
EUT Description : RF Module (Argon)  
Model : XBOX 360 RF Module  
S/N : 0526002360454  
EUT Config : EUT in XBOX, Monitor, and support equipm  
Mode Of Operation: Tx 2.4 Worst Case  
Target : FCC CLASS B  
Power Source : 115 VAC, 60 Hz  
: L1: Peak (Blue)

**LINE 2 RESULTS**

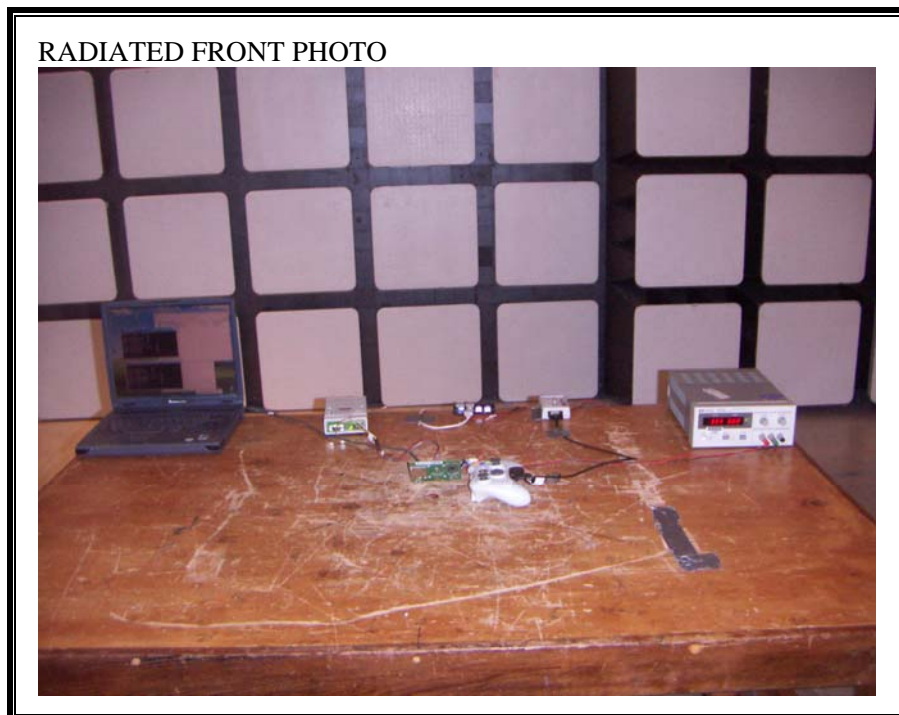


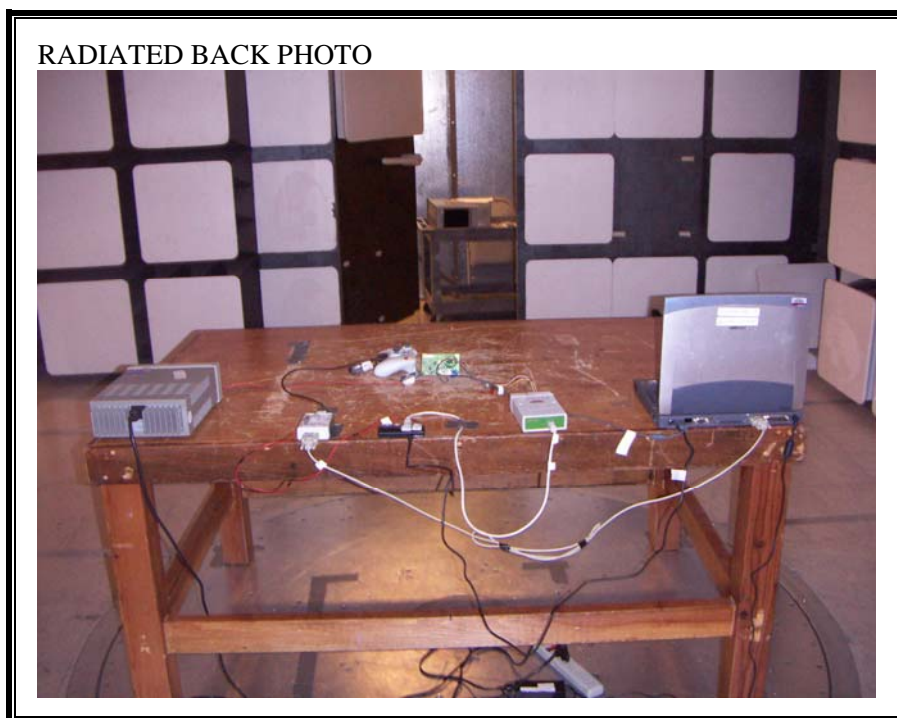
## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



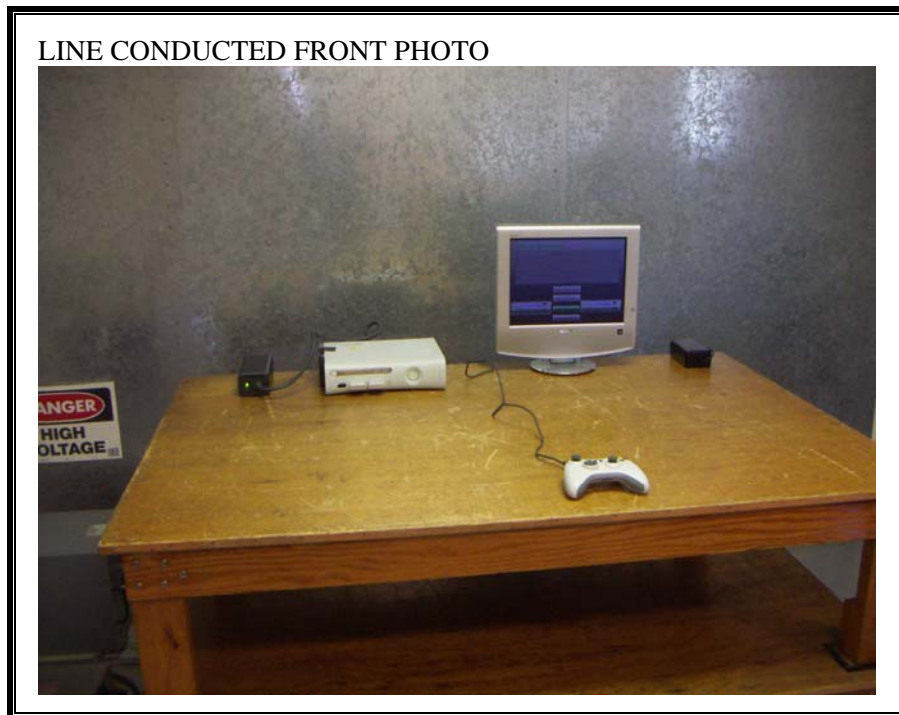
**RADIATED RF MEASUREMENT SETUP**

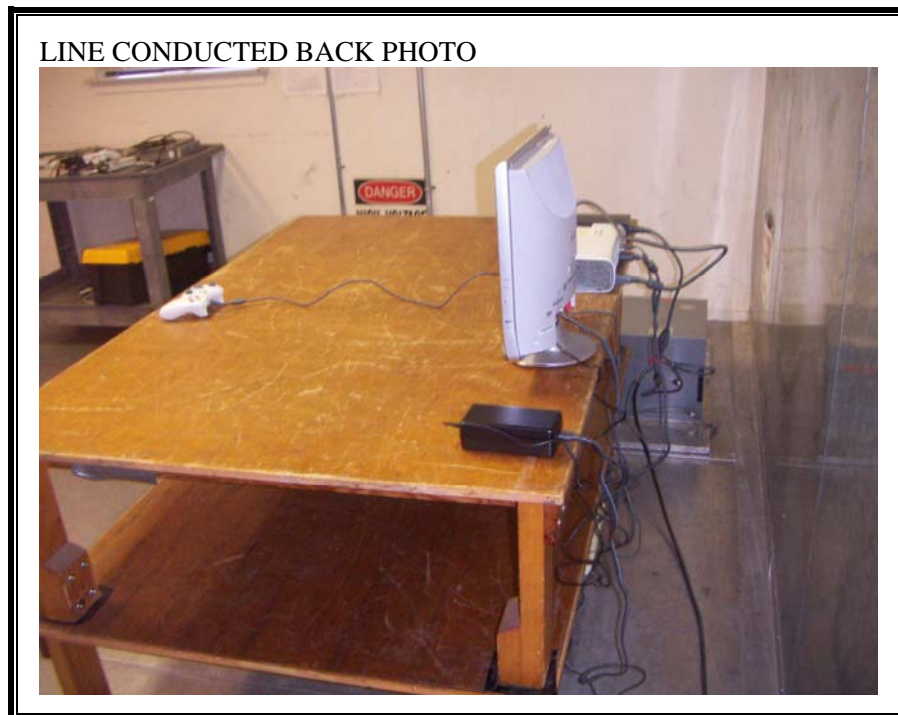






**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**





**END OF REPORT**