



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 7  
CLASS II PERMISSIVE CHANGE**

**CERTIFICATION TEST REPORT**

**FOR**

**XBox 360 Wireless Controller**

**MODEL NUMBER: 1403**

**FCC ID: C3K1403**

**IC: 3048A-1403**

**REPORT NUMBER: 12U14305-1, Revision C**

**ISSUE DATE: JULY 23, 2012**

*Prepared for*

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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>
--	3/21/12	Initial Issue	T. LEE
A	6/26/12	Revised Radiated Test Results	T. LEE
B	07/09/12	Updated report with Correction Factor	A. Zaffar
C	07/23/12	Revert back to Radiated Emission Test Data of Initial Issue since manufacturer no longer implementing changes in Rev. A	T. LEE

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** MICROSOFT CORPORATION  
ONE MICROSOFT  
REDMOND, WA 98052, U.S.A.

**EUT DESCRIPTION:** XBox 360 Wireless Controller

**MODEL:** 1403

**SERIAL NUMBER:** ES2-EMC1 and DV1, S/N 58804125223 (CONDUCTED), EVI-EMC1 (RADIATED)

**DATE TESTED:** FEBRUARY 24- JULY 23, 2012

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	PASS
INDUSTRY CANADA RSS-GEN Issue 2	PASS

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:



TIMOTHY K. LEE  
STAFF ENGINEER  
UL CCS

STEVE AGUILAR  
EMC TECHNICIAN  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 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 Xbox 360 Wireless controller. EUT is using the proprietary communication protocol to interact with Xbox 360 console. Proprietary communication protocol is detailed in the theory of operation.

The EUT is manufactured by Microsoft, Model 1403.

### **5.2. MAXIMUM OUTPUT POWER**

The measured average power values were within  $\pm 0.5$  dB of the original values. Refer to original report number "09U12392-1A FCC IC FHSS REPORT\_FINAL" for exact output power values and for all antenna port results.

### **5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE**

The change filed under this application has the following changes.

New PCBA layout  
Replacing radio ROM chip to RAM Master chip,  
Addition of memory flash and FW to support RAM

### **5.4. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes an inverted-F antenna, which is soldered to the printed circuit board. This antenna has a maximum gain of -0.2 dBi

### **5.5. SOFTWARE AND FIRMWARE**

The test utility software used during testing was Wireless Device Test Ver. 113 and XboxACCUartTestTool Ver. 1-21-2012. Product firmware version: 4.10 and 4.27.

## 5.6. 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 2482 MHz.

The EUT is a portable device that has two orientations; therefore X and Y orientations have been investigated. The worst case was found to be Y orientation.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	LENOVO	L420	LR-78PNB	DoC
AC Adaptor	LENOVO	42T4418	11S42T14418ZiZGwg13PA94	DoC
USB Controller Cable	MICROSOFT	N/A	EV3C-0007	N/A
Front Panel Module	MICROSOFT	1410	EV2C-IB039	C3K1410
Front Panel Module	MICROSOFT	1409	4104G003394213(FW 6.80)	C3K1409

### I/O CABLES

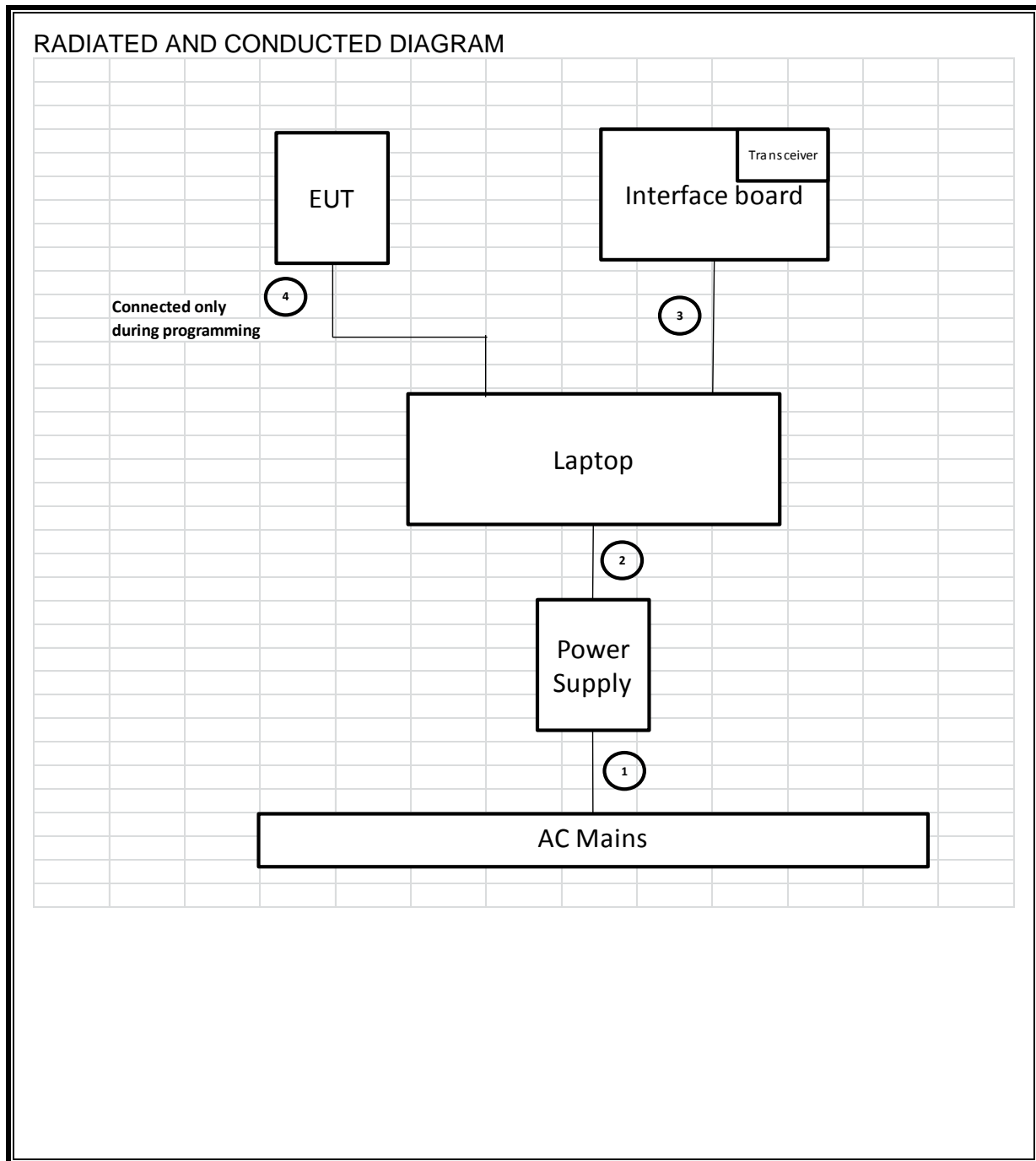
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	0.9m	none
2	DC	1	DC	Shielded	1.8m	Ferrite
3	USB	1	I/O	Shielded	0.5m	none
4	USB	1	I/O	Shielded	2.8m	Ferrite

### TEST SETUP

The EUT is tested as stand-alone unit.



**SETUP DIAGRAM FOR 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	Asset	Cal Date	Cal Due
Power Meter	Agilent / HP	437B	N02778	8/11/2010	8/11/2012
Power Sensor, 18 GHz	Agilent / HP	8481A	N02782	7/29/2011	7/29/2013
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01161	12/16/2011	12/16/2012
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	9/2/2011	9/2/2012
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	7/18/2011	7/18/2012
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	11/11/2011	11/11/2012
Antenna, Horn, 18 GHz	EMCO	3115	C00872	9/20/2011	9/20/2012
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	7/28/2011	7/28/2012
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	1/26/2012	1/26/2013

## 7. ANTENNA PORT TEST RESULTS

### 7.1.1. CONDUCTED SPURIOUS EMISSIONS

#### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

#### TEST PROCEDURE

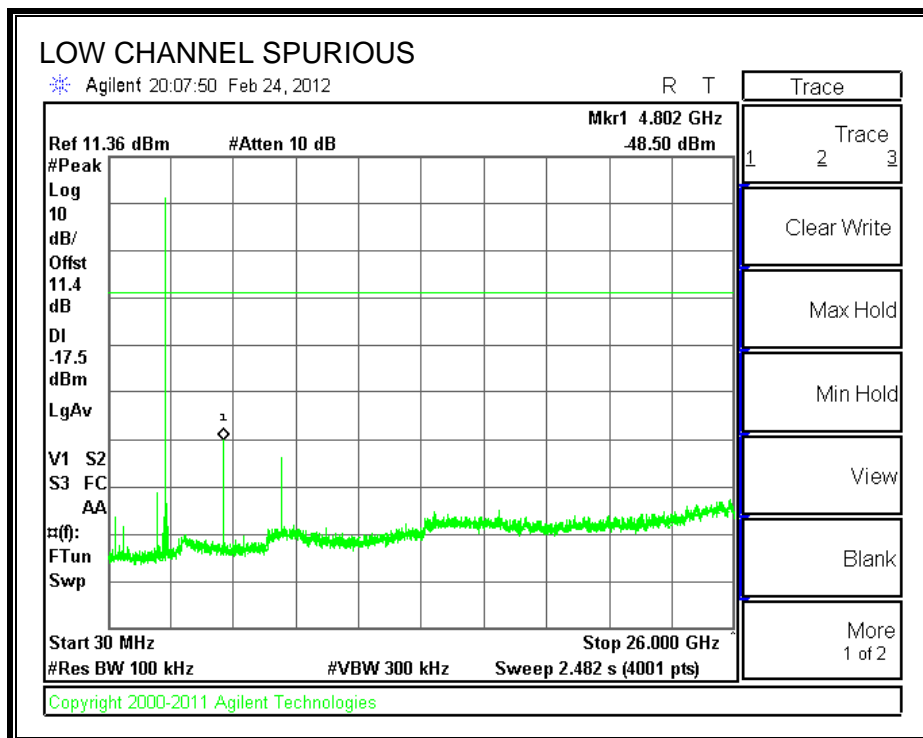
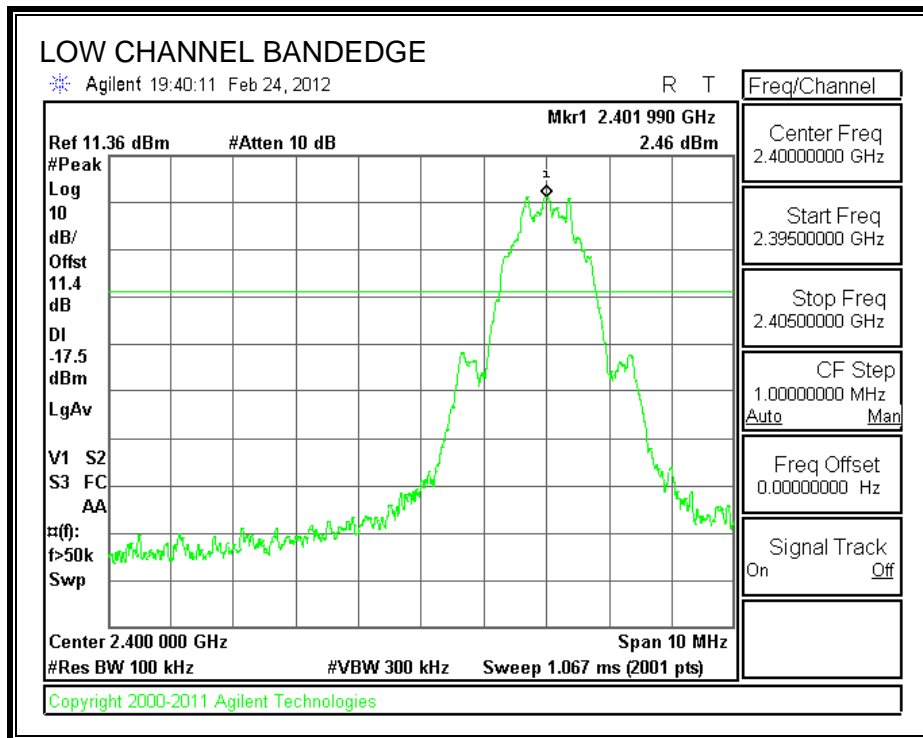
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

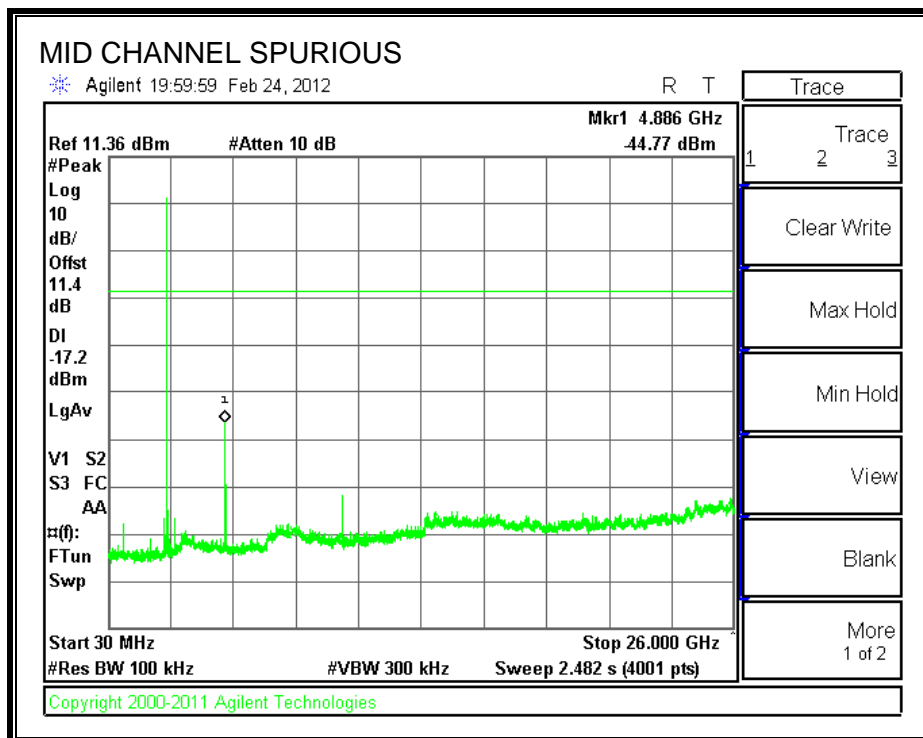
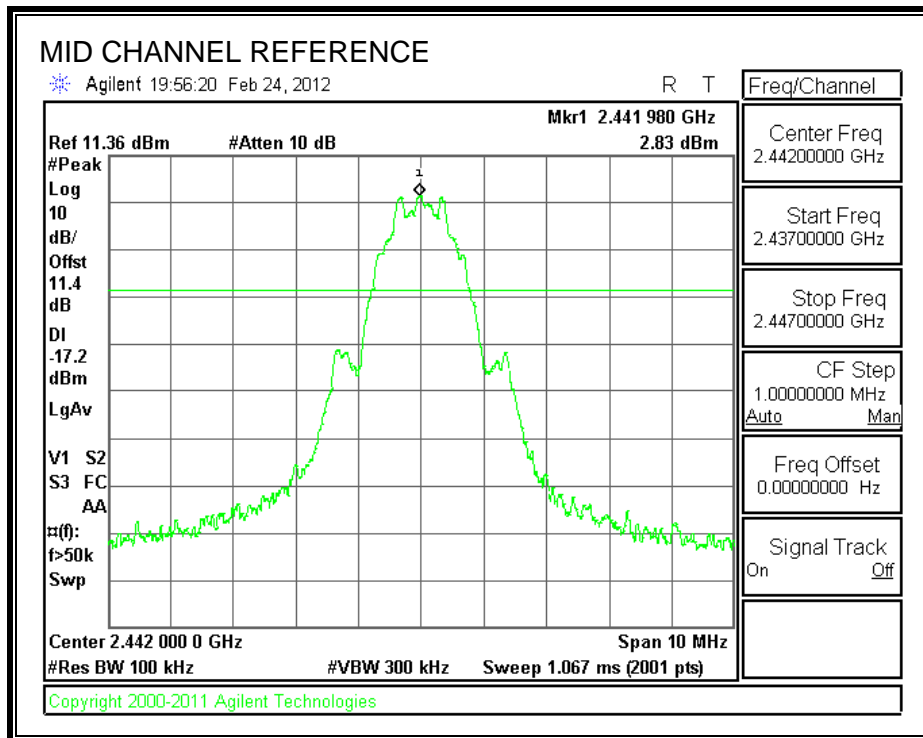
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

#### RESULTS

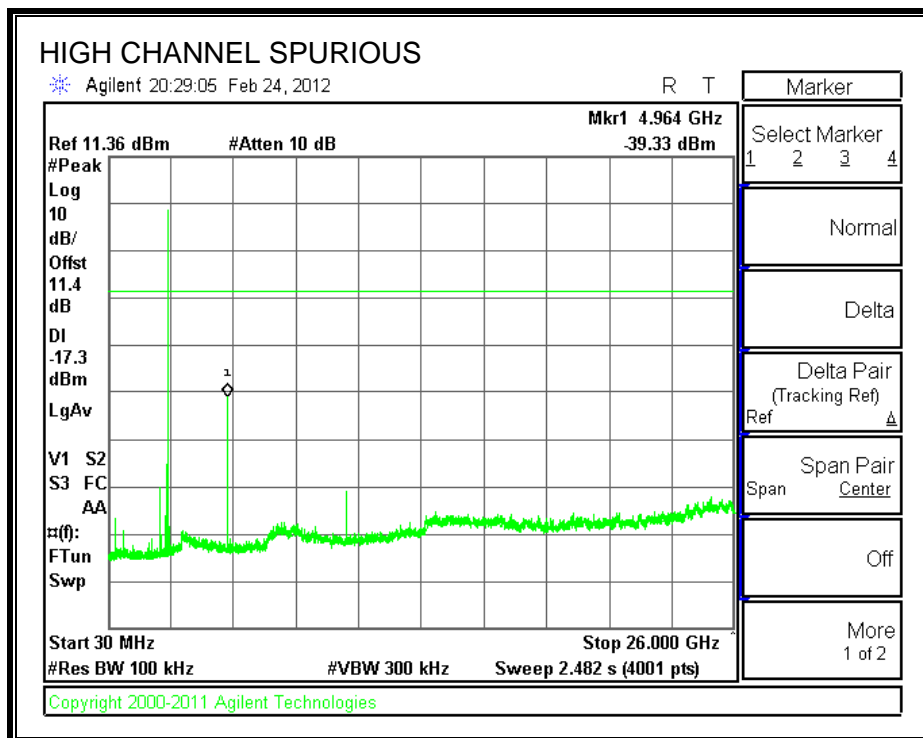
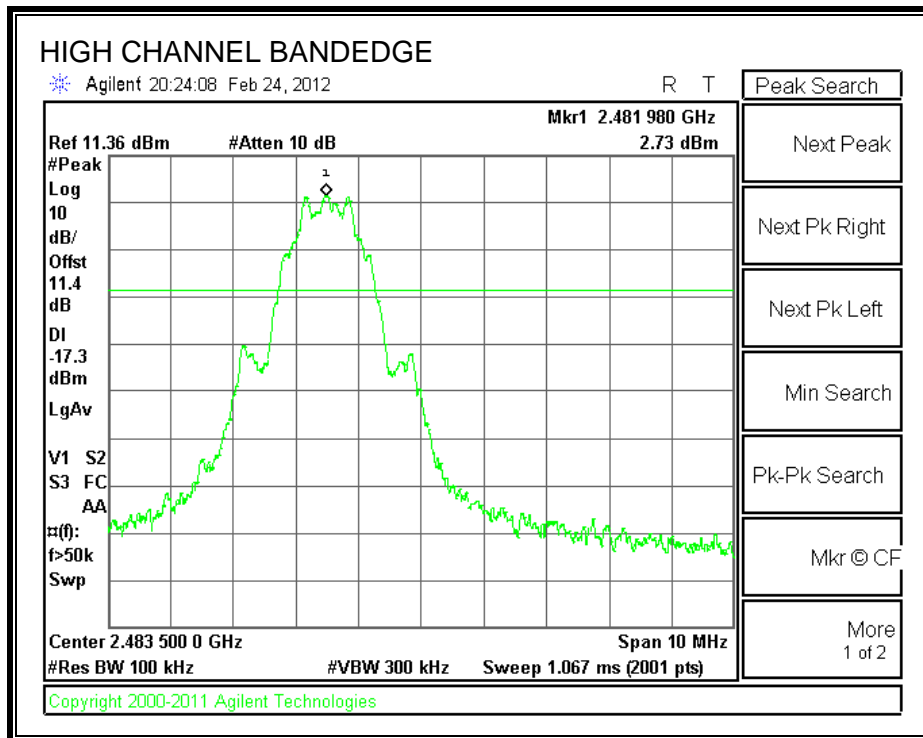
**SPURIOUS EMISSIONS, LOW CHANNEL**



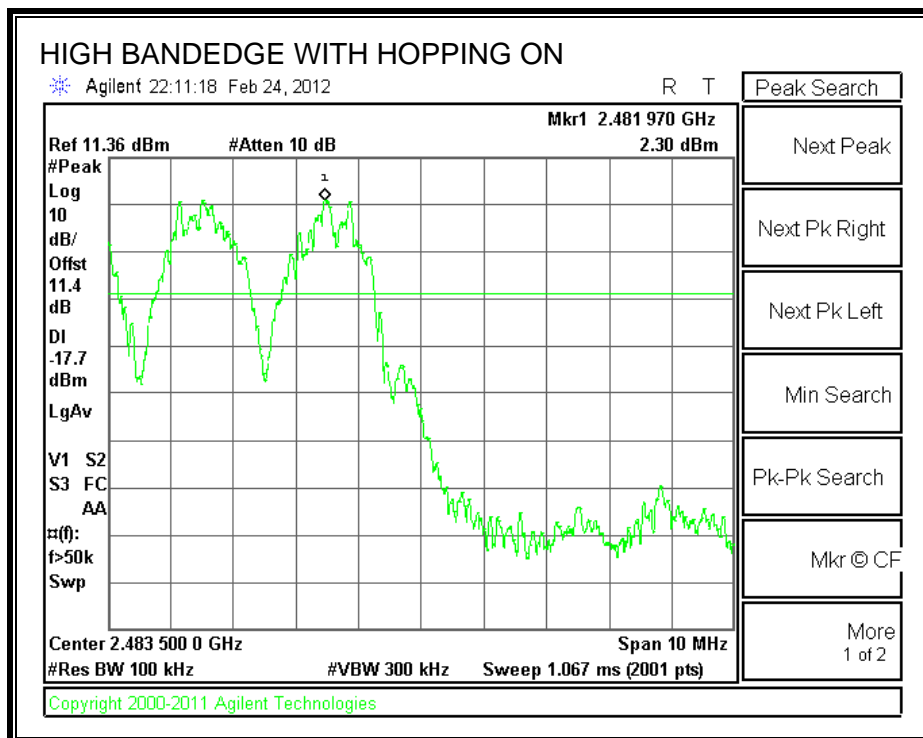
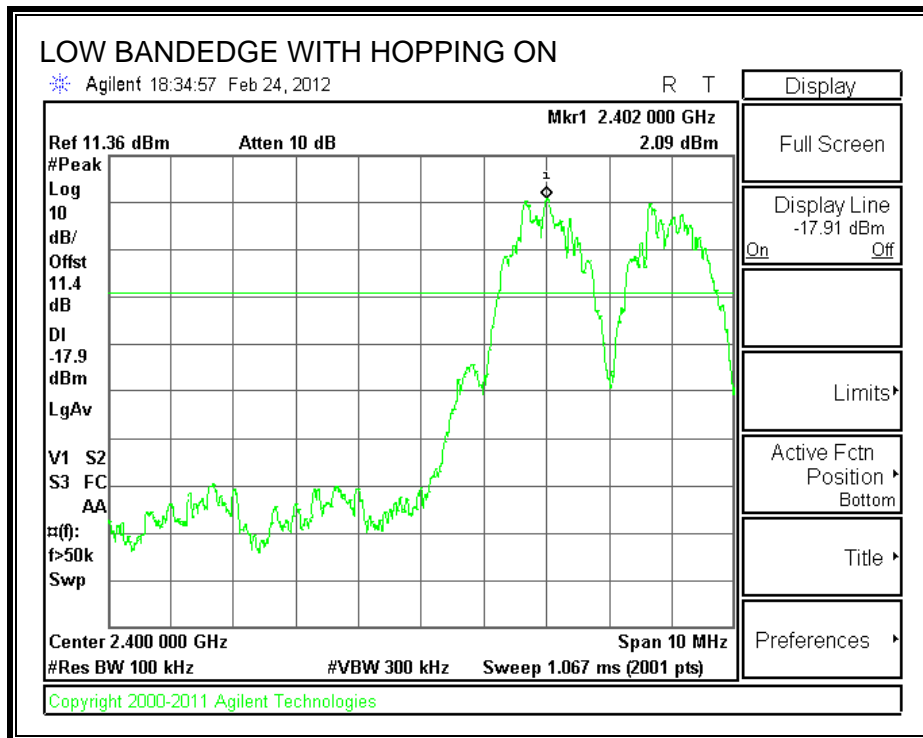
**SPURIOUS EMISSIONS, MID CHANNEL**



**SPURIOUS EMISSIONS, HIGH CHANNEL**



**SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON**



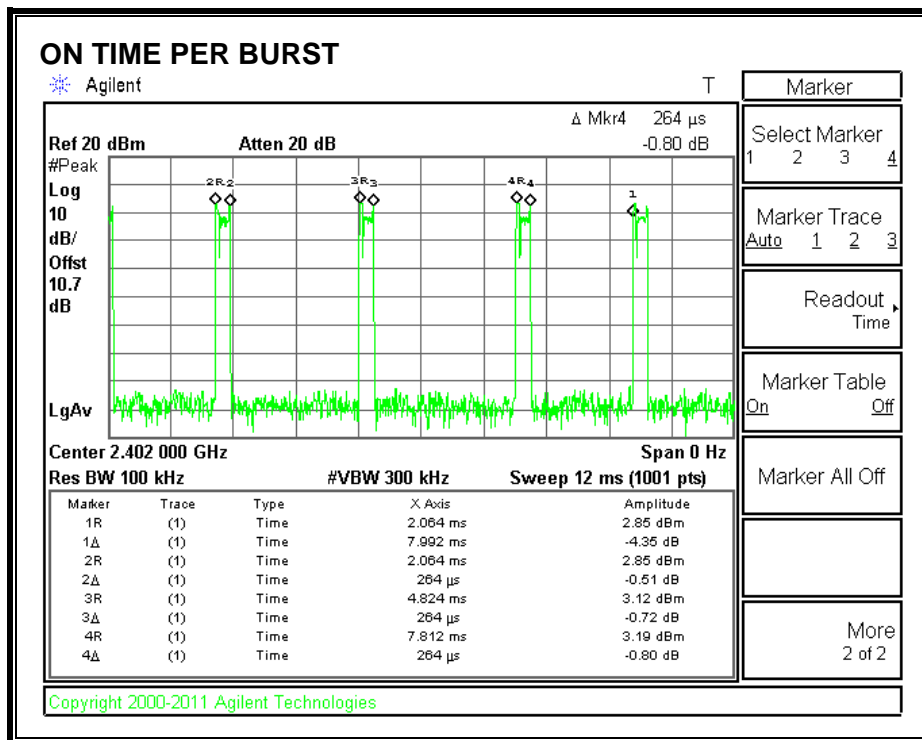
### 7.1.2. DUTY CYCLE CORRECTION FACTOR

**LIMITS**

None; for reporting purposes only.

**RESULTS**

Mode	Tx on (msec)	Tx on + Tx off (msec)	Duty Cycle Correction Factor (dB)
FHSS	0.792	7.992	-20.08



On time = First Peak on time + Second Peak on time + Third Peak on time  
 = 0.264ms + 0.264ms + 0.264ms  
 = 0.792 ms



## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### 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.

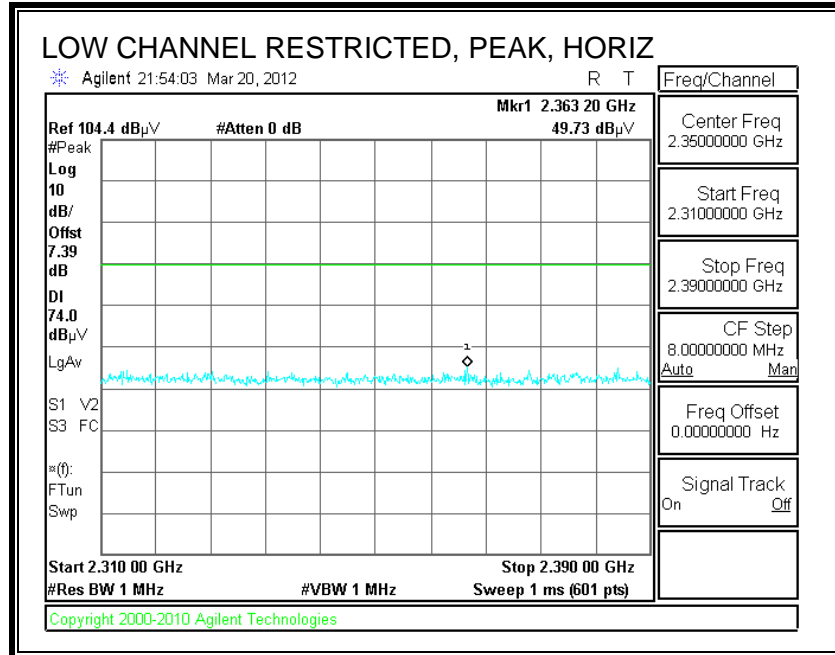
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

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 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.

## 8.2. TRANSMITTER ABOVE 1 GHz

### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

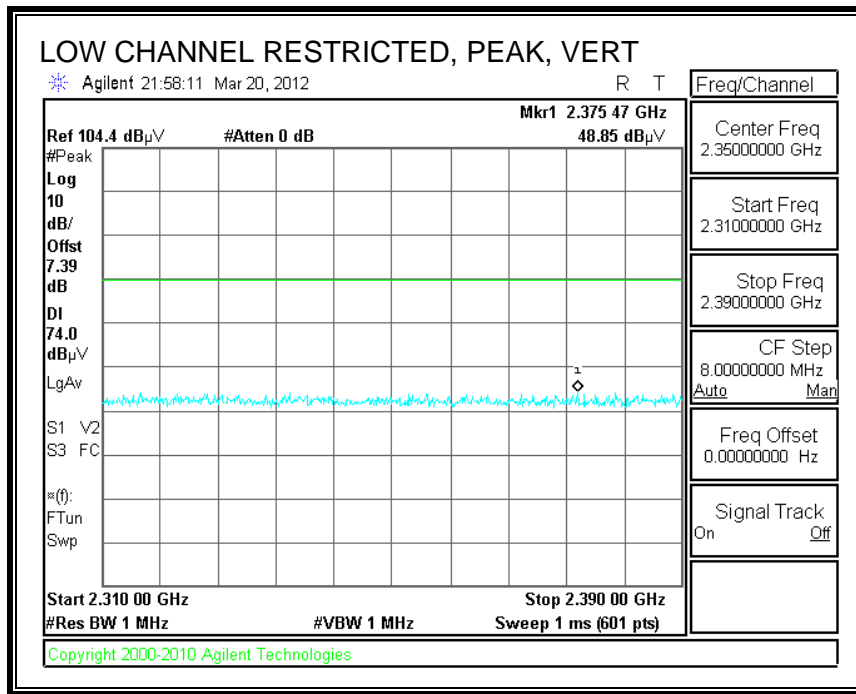


### AVERAGE FIELD STRENGTH CALCULATION:

$$\begin{aligned} \text{AVG Field Strength} &= \text{Peak Reading} - \text{Duty Cycle Correction Factor} \\ &= 49.73 \text{ dBuV} - 20.08 \text{ dBuV} \\ &= 29.65 \text{ dBuV} \end{aligned}$$

$$\begin{aligned} \text{AVG Margin} &= \text{AVE Reading} - \text{AVE Power Limit} \\ &= 29.65 \text{ dBuV} - 54 \text{ dBuV} \\ &= -24.35 \text{ dBuV} \end{aligned}$$

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

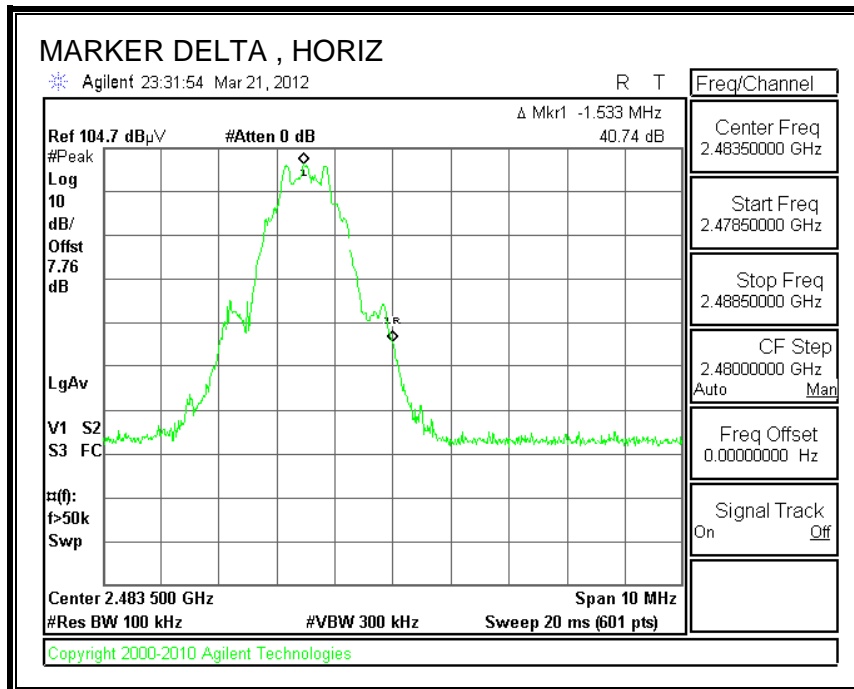
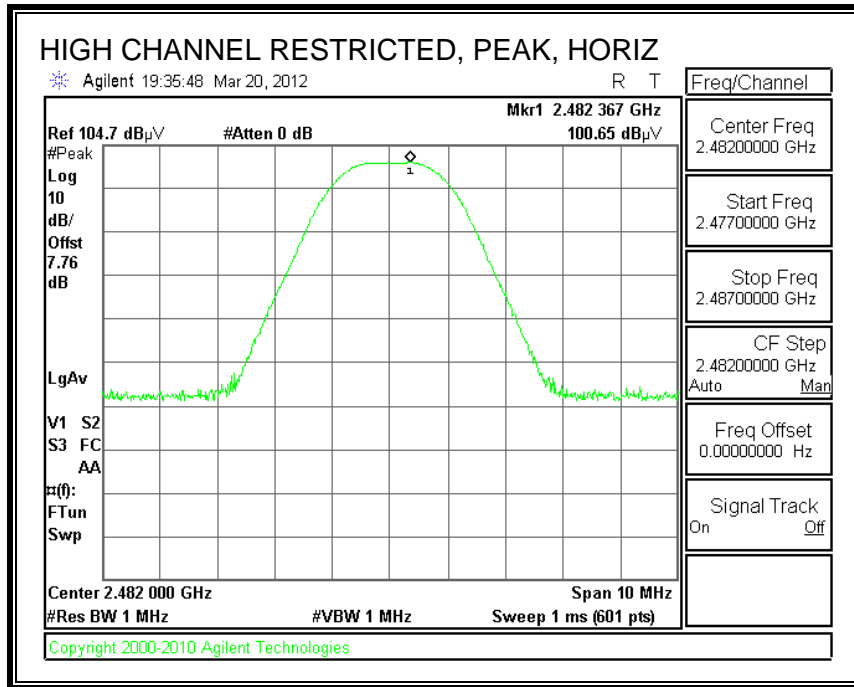


**AVERAGE FIELD STRENGTH CALCULATION:**

AVG Field Strength = Peak Reading – Duty Cycle Correction Factor  
 = 48.85 dBuV – 20.08 dBuV/m  
 = 28.77 dBuV/m

AVG Margin = AVE Reading – AVE Power Limit  
 = 28.77 dBuV – 54 dBuV  
 = -25.23 dBuV

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



**MARKER DELTA CALCULATION:**

\_ Peak Reading = Fundamental Peak Field Strength - Delta

\_Peak Margin = Peak Reading - 74

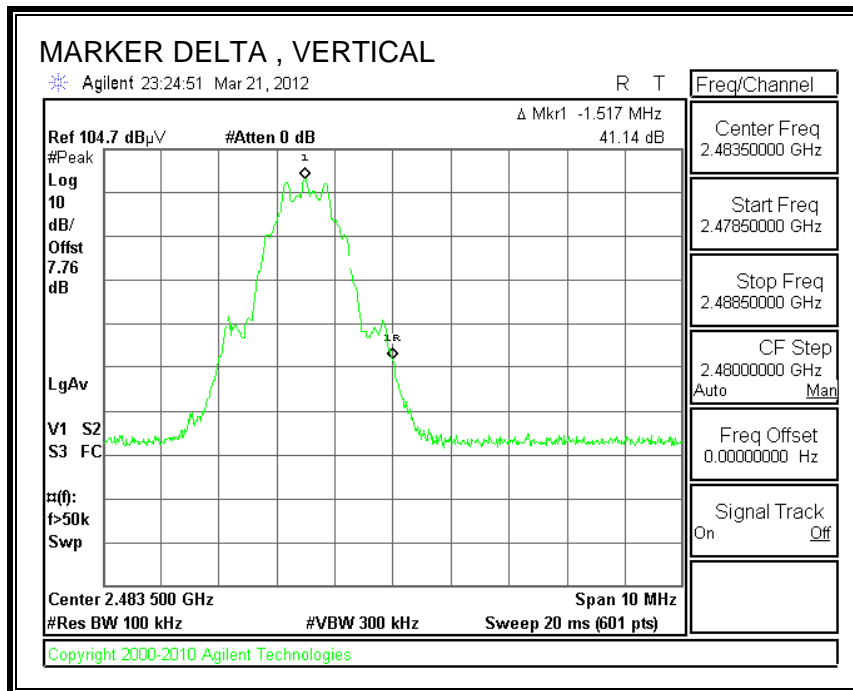
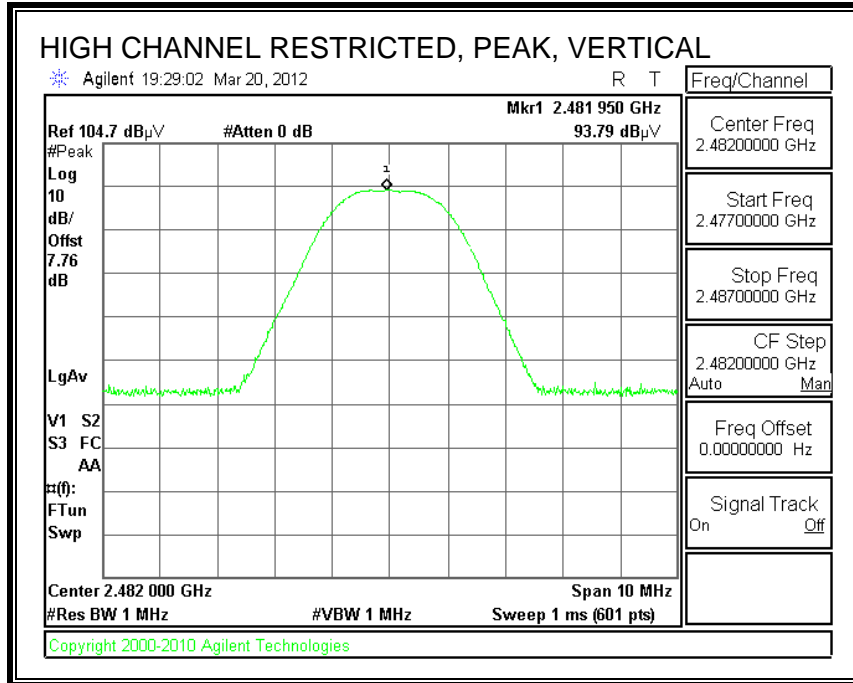
			Fundamental (dBuV/m)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
	Delta (dB)	Horn Antenna	Peak	Peak	Peak	Peak
High Ch, 2482MHz	40.74	Horizontal	100.65	59.91	74	-14.09

**AVERAGE FIELD STRENGTH CALCULATION:**

AVG Field Strength = Peak Reading – Duty Cycle Correction Factor  
 = 59.91 dBuV – 20.08 dBuV  
 = 39.83 dBuV

AVG Margin = AVE Reading – AVE Power Limit  
 = 39.83 dBuV – 54 dBuV  
 = -14.17 dBuV

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



**DELTA MARKER CALCULATION**

\_ Peak Reading = Fundamental Peak Field Strength - Delta

\_Peak Margin = Peak Reading - 74

			Fundamental (dBuV/m)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)
	Delta (dB)	Horn Antenna	Peak	Peak	Peak	Peak
High Ch, 2482MHz	41.14	Horizontal	93.79	52.65	74	-21.43

**AVERAGE FIELD STRENGTH CALCULATION:**

AVG Field Strength = Peak Reading – Duty Cycle Correction Factor  
 = 52.65 dBuV – 20.08 dBuV/m  
 = 32.57 dBuV/m

AVG Margin = AVE Reading – AVE Power Limit  
 = 32.57 dBuV – 54 dBuV  
 = -21.43 dBuV

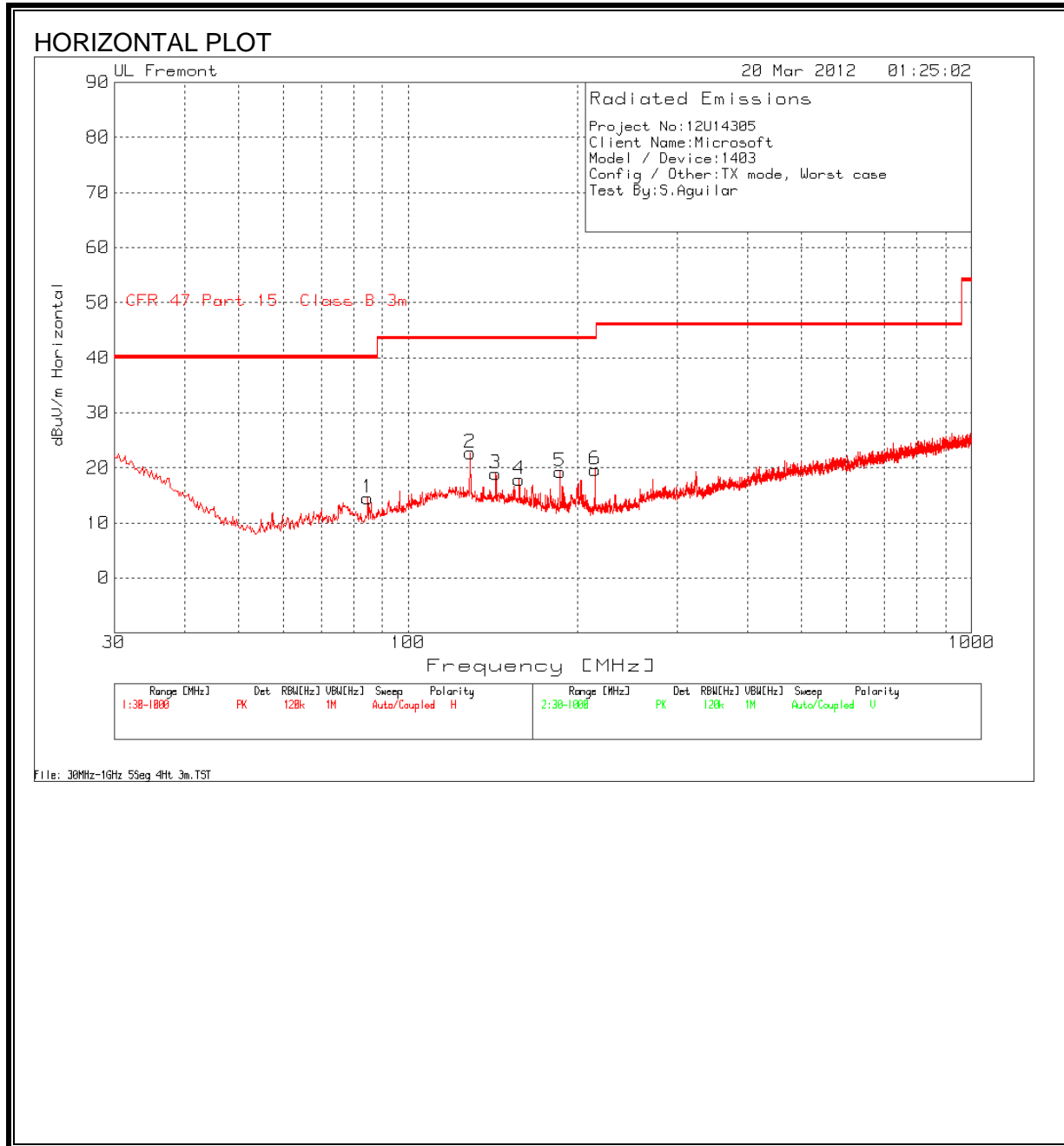
**HARMONICS AND SPURIOUS EMISSIONS**

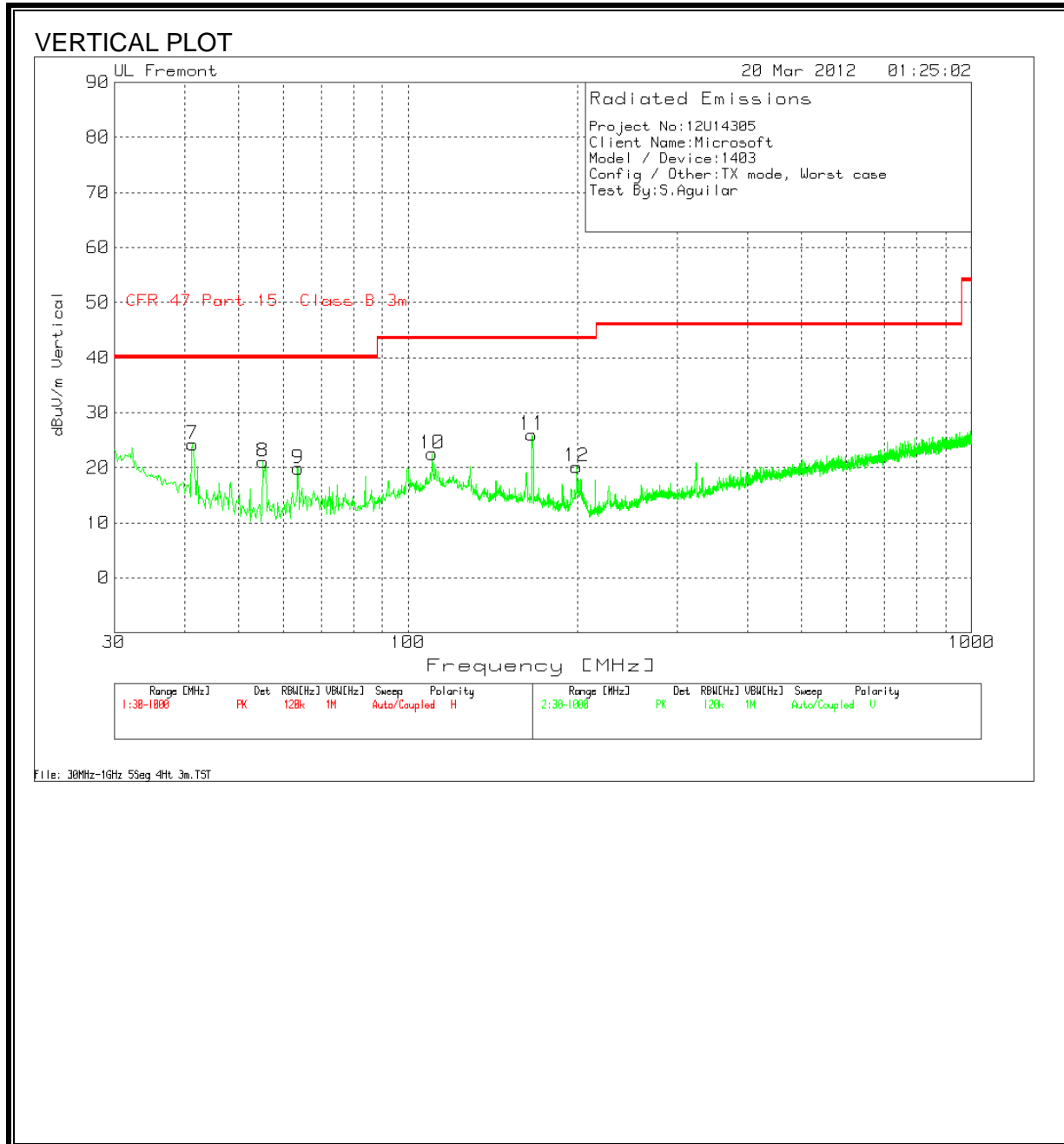
High Frequency Measurement																	
Compliance Certification Services, Fremont 3m Chamber																	
Company:		Microsoft															
Project #:		12U14305, Model 1403															
Date:		3/20/2012															
Test Engineer:		Steve Aguilar															
Configuration:		Worst case															
Mode:		TX Mode															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T60; S/N: 2238 @3m			T34 HP 8449B						T89; ARA 18-26GHz; S/N:1049			FCC 15.205					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz; VBW=10Hz				
3' cable 22807700			12' cable 22807600			20' cable 22807500					R_001						
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)																	
4.804	3.0	54.166	-	33.1	6.8	-34.1	0.0	0.0	60.0	-	74	54	-14.0	-	H		
4.804	3.0	-	60.000	0.0	0.0	0.0	-20.1	0.0	-	39.9	74	54	-	-14.1	H		
4.804	3.0	52.599	-	33.1	6.8	-34.1	0.0	0.0	58.4	-	74	54	-15.6	-	V		
4.804	3.0	-	58.400	0.0	0.0	0.0	-20.1	0.0	-	38.3	74	54	-	-15.7	V		
Mid Channel (2442 MHz)																	
4.884	3.0	54.759	-	33.2	6.8	-34.0	0.0	0.0	60.7	-	74	54	-13.3	-	H		
4.884	3.0	-	60.700	0.0	0.0	0.0	-20.1	0.0	-	40.6	74	54	-	-13.4	H		
4.884	3.0	52.812	-	33.2	6.8	-34.0	0.0	0.0	58.8	-	74	54	-15.2	-	V		
4.884	3.0	-	58.800	0.0	0.0	0.0	-20.1	0.0	-	38.7	74	54	-	-15.3	V		
7.326	3.0	40.985	-	36.3	9.1	-33.1	0.0	0.0	53.3	-	74	54	-20.7	-	H		
7.326	3.0	-	53.300	0.0	0.0	0.0	-20.1	0.0	-	33.2	74	54	-	-20.8	H		
7.326	3.0	48.454	-	36.3	9.1	-33.1	0.0	0.0	60.8	-	74	54	-13.2	-	V		
7.326	3.0	-	60.800	0.0	0.0	0.0	-20.1	0.0	-	40.7	74	54	-	-13.3	V		
High Channel (2482 MHz)																	
4.964	3.0	57.085	-	33.2	6.9	-34.0	0.0	0.0	63.2	-	74	54	-10.8	-	H		
4.964	3.0	-	63.200	0.0	0.0	0.0	-20.1	0.0	-	43.1	74	54	-	-10.9	H		
4.964	3.0	50.383	-	33.2	6.9	-34.0	0.0	0.0	56.5	-	74	54	-17.5	-	V		
4.964	3.0	-	56.500	0.0	0.0	0.0	-20.1	0.0	-	36.4	74	54	-	-17.6	V		
7.446	3.0	40.407	-	36.5	9.1	-33.0	0.0	0.0	53.0	-	74	54	-21.0	-	H		
7.446	3.0	-	53.000	0.0	0.0	0.0	-20.1	0.0	-	32.9	74	54	-	-21.1	H		
7.446	3.0	40.056	-	36.5	9.1	-33.0	0.0	0.0	52.6	-	74	54	-21.4	-	V		
7.446	3.0	-	52.600	0.0	0.0	0.0	-20.1	0.0	-	32.5	74	54	-	-21.5	V		
Rev. 07.08.11																	
No other emissions were detected above the system noise floor.																	
Average Reading is calculated by Peak Reading minus Duty Cycle Correction Factor.																	
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										



### 8.3. WORST-CASE BELOW 1 GHz

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





HORIZONTAL AND VERTICAL DATA

Project:		12U14305								
Client Name:		Microsoft								
Model/Device		1403								
Configuraiton:		TX mode, Worst case								
Tested by:		S.Aguilar								
Test Frequency [MHz]	Meter Reading [dB(μV)]	Detector	Pre Amp Factor [dB]	Antenna Factor [dB/m]	Corrected [dB(μV/m)]	Class B PK limit [dB(μV/m)]	QP Margin [dB]	Height [cm]	Polarity	
Range 1 30 - 1000MHz										
84.6643	34.28	PK	-27.1	7.3	14.48	40	-25.52	300	Horz	
128.8609	35.74	PK	-26.7	13.7	22.74	43.5	-20.76	200	Horz	
143.0116	32.91	PK	-26.6	12.6	18.91	43.5	-24.59	200	Horz	
157.3561	32.35	PK	-26.5	12	17.85	43.5	-25.65	101	Horz	
186.0452	34.47	PK	-26.4	11.2	19.27	43.5	-24.23	101	Horz	
214.5404	35.34	PK	-26.2	10.5	19.64	43.5	-23.86	101	Horz	
Range 2 30 - 1000MHz										
41.4369	38.75	PK	-27.4	12.9	24.25	40	-15.75	300	Vert	
55.1998	41.31	PK	-27.3	7.1	21.11	40	-18.89	100	Vert	
63.729	39.48	PK	-27.2	7.6	19.88	40	-20.12	100	Vert	
110.2518	36.44	PK	-26.7	12.8	22.54	43.5	-20.96	100	Vert	
165.8853	40.69	PK	-26.5	11.8	25.99	43.5	-17.51	100	Vert	
198.9359	34.15	PK	-26.2	12.2	20.15	43.5	-23.35	200	Vert	
PK - Peak detector										
QP - Quasi-peak detector										