

# Microsoft Corporation

## Wireless Headset – FHSS 2.4GHz, Model: 1481

Report No. MCSO1576.1

Report Prepared By



[www.nwemc.com](http://www.nwemc.com)  
1-888-EMI-CERT

© 2011 Northwest EMC, Inc

**EMC Test Report**

**Certificate of Test**  
**Last Date of Test: July 19, 2011**  
**Microsoft Corporation**  
**Model: 1481**

Emissions			
Test Description	Specification	Test Method	Pass/Fail
Spurious Radiated Emissions	FCC 15.247:2011	ANSI C63.10:2009	Pass
Occupied Bandwidth	FCC 15.247:2011	ANSI C63.10:2009	Pass
Output Power	FCC 15.247:2011	ANSI C63.10:2009	Pass
Band Edge Compliance	FCC 15.247:2011	ANSI C63.10:2009	Pass
Spurious Conducted Emissions	FCC 15.247:2011	ANSI C63.10:2009	Pass
Channel Spacing	FCC 15.247:2011	ANSI C63.10:2009	Pass
Number of Hopping Frequencies	FCC 15.247:2011	ANSI C63.10:2009	Pass
Dwell Time	FCC 15.247:2011	ANSI C63.10:2009	Pass
Powerline Conducted Emissions	FCC 15.207:2011	ANSI C63.10:2009	Pass


**Modifications made to the product**  
**See the Modifications section of this report**

**Test Facility**

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400;  
Hillsboro, OR 97124  
Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-2).

**Approved By:**  
  
Dean Ghizzone, President



NVLAP Lab Code: 200630-0

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.*

*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

Revision Number	Description	Date	Page Number
00	None		

**Barometric Pressure**

The recorded barometric pressure has been normalized to sea level.



# Accreditations and Authorizations

---

## FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

---

## NVLAP

Northwest EMC, Inc. is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

---

## Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1*)

---

## CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

---

## Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

---



# Accreditations and Authorizations

---

## VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (*Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-3265, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634.*)

---

## BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017).

---

## GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

---

## KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175*)

---

## VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

---

## SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>



# Northwest EMC Locations



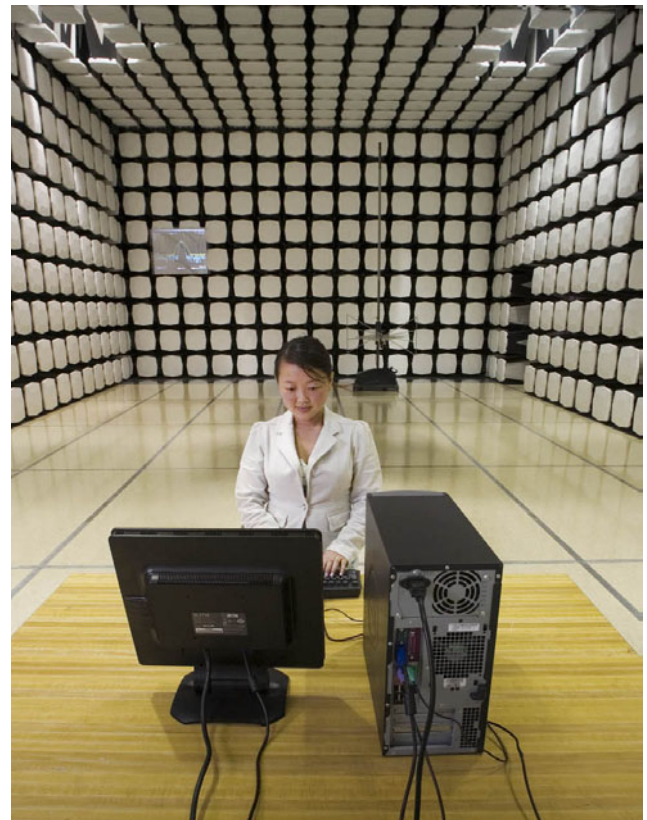
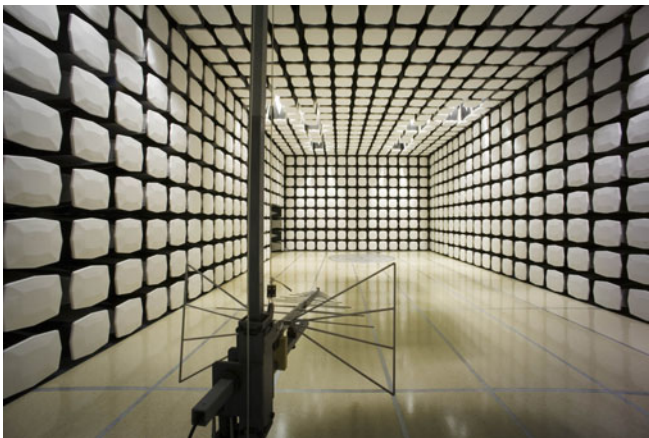
Oregon  
Labs EV01-EV12  
22975 NW Evergreen Pkwy  
Suite 400  
Hillsboro, OR 97124  
(503) 844-4066

California  
Labs OC01-OC13  
41 Tesla  
Irvine, CA 92618  
(949) 861-8918

Minnesota  
Labs MN01-MN08  
9349 W Broadway Ave.  
Brooklyn Park,  
MN 55445  
(763) 425-2281

Washington  
Labs SU01-SU07  
14128 339<sup>th</sup> Ave. SE  
Sultan, WA 98294  
(360) 793-8675

New York  
Labs WA01-WA04  
4939 Jordan Rd.  
Elbridge, NY 13060  
(315) 685-0796



**Party Requesting the Test**

<b>Company Name:</b>	Microsoft Corporation
<b>Address:</b>	One Microsoft Way
<b>City, State, Zip:</b>	Redmond, WA 98052-6399
<b>Test Requested By:</b>	Kitty Tam
<b>Model:</b>	1481
<b>First Date of Test:</b>	7/11/2011
<b>Last Date of Test:</b>	7/19/2011
<b>Receipt Date of Samples:</b>	7/11/2011
<b>Equipment Design Stage:</b>	Prototype
<b>Equipment Condition:</b>	No Damage

**Information Provided by the Party Requesting the Test****Functional Description of the EUT (Equipment Under Test):**

2.4 GHz FHSS radio

**Testing Objective:**

To demonstrate compliance to FCC 15.247 requirements.

**CONFIGURATION 1 MCSO1576****Software/Firmware Running during test**

Description	Version
TestCommandTool040	unknown
WirelessDevice	TestV124

**EUT**

Description	Manufacturer	Model/Part Number	Serial Number
Headset - Direct Connect FHSS	Microsoft Corporation	1481	5

**Remote Equipment Outside of Test Setup Boundary**

Description	Manufacturer	Model/Part Number	Serial Number
Computer	Dell	D600	7SLS71
Front Panel Module	Microsoft Corporation	X821258-004	X821258-004-EV2C-IC065

**Cables**

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB	Yes	1.8m	No	Headset	Computer
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

**CONFIGURATION 6 MCSO1576****Software/Firmware Running during test**

Description	Version
TestCommandTool040	unknown
WirelessDevice	TestV124

**EUT**

Description	Manufacturer	Model/Part Number	Serial Number
Headset - FHSS	Microsoft Corporation	1481	C13

**Remote Equipment Outside of Test Setup Boundary**

Description	Manufacturer	Model/Part Number	Serial Number
Computer	Dell	D600	7SLS71
Front Panel Module	Microsoft Corporation	X821258-004	X821258-004-EV2C-IC065

**Cables**

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB	Yes	1.8m	No	Headset	Computer
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					



**CONFIGURATION 8 MCSO1576****Software/Firmware Running during test**

Description	Version
WirelessDevice	TestV124

**EUT**

Description	Manufacturer	Model/Part Number	Serial Number
Headset - FHSS	Microsoft Corporation	1481	C13

**Peripherals in test setup boundary**

Description	Manufacturer	Model/Part Number	Serial Number
Computer	Dell	D600	7SLS71
Cradle	Microsoft Corporation	1502	EV2 B 01
Power Adapter	Dell	PS-1900-0202	CN0U7809-71615-SAO-1A18

**Cables**

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB	Yes	1.8m	No	Computer	Cradle
DC Power	No	1.8m	PA	Computer	Power Adapter
AC Power	No	1.8m	No	Power Adapter	AC Mains

**PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.**

<b>Equipment modifications</b>					
Item	Date	Test	Modification	Note	Disposition of EUT
1	7/11/2011	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	7/12/2011	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	7/12/2011	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	7/12/2011	Channel Spacing	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	7/12/2011	Dwell Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	7/12/2011	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	7/12/2011	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
8	7/15/2011	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
9	7/15/2011	Receiver Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
10	7/19/2011	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

Per 15.247(a)(1): frequency hopping systems operating in the 2400 – 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

This frequency hopping transmitter has output power less than 125 mW (1.94 mW) with 20 dB Bandwidth of 1.43 MHz. 2/3 of 20 dB bandwidth is equal to 0.95 MHz. Channel separation is measured with 2 MHz separation thus is greater than 2/3 of 20 dB bandwidth

**EMC**

**Channel Spacing**

<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> 5	<b>Date:</b> 07/12/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 24°C
<b>Attendees:</b> None	<b>Humidity:</b> 48%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.92 in
<b>Tested by:</b> Rod Peloquin	<b>Power:</b> USB
	<b>Job Site:</b> EV06

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

**COMMENTS**  
 Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2 .466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

**DEVIATIONS FROM TEST STANDARD**

<b>Configuration #</b>	1	<i>Rod Peloquin</i> Signature
------------------------	---	----------------------------------

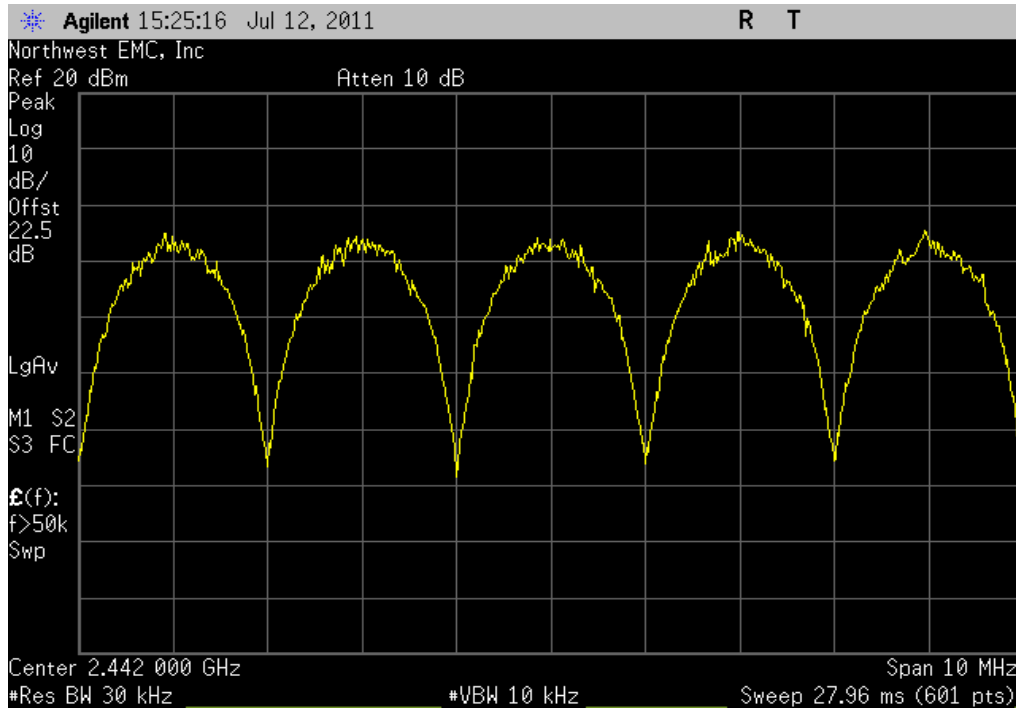
	Value	Limit	Results
Channel Spacing	2 MHz	≥ 1 MHz	Pass

## Channel Spacing

**Result:** Pass

**Value:** 2 MHz

**Limit:**  $\geq 1$  MHz



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT					
Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled.

The EUT uses a total of 41 hopping channels. The total allowable dwell time is 400 ms in a period of  $.4 \times 41 = 16.4$  s

The pulse width of the transmission is .466 ms. The highest dwell time found was during a 250 ms sweep with 10 pulses

There are 65.6 250 ms periods in 16.4 s for a total of 656 pulses of .459 ms for a total dwell time of .306 ms.

**EMC**

**Dwell Time**

<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> 5	<b>Date:</b> 07/12/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 24°C
<b>Attendees:</b> None	<b>Humidity:</b> 48%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.92 in
<b>Tested by:</b> Rod Peloquin	<b>Power:</b> USB
	<b>Job Site:</b> EV06

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

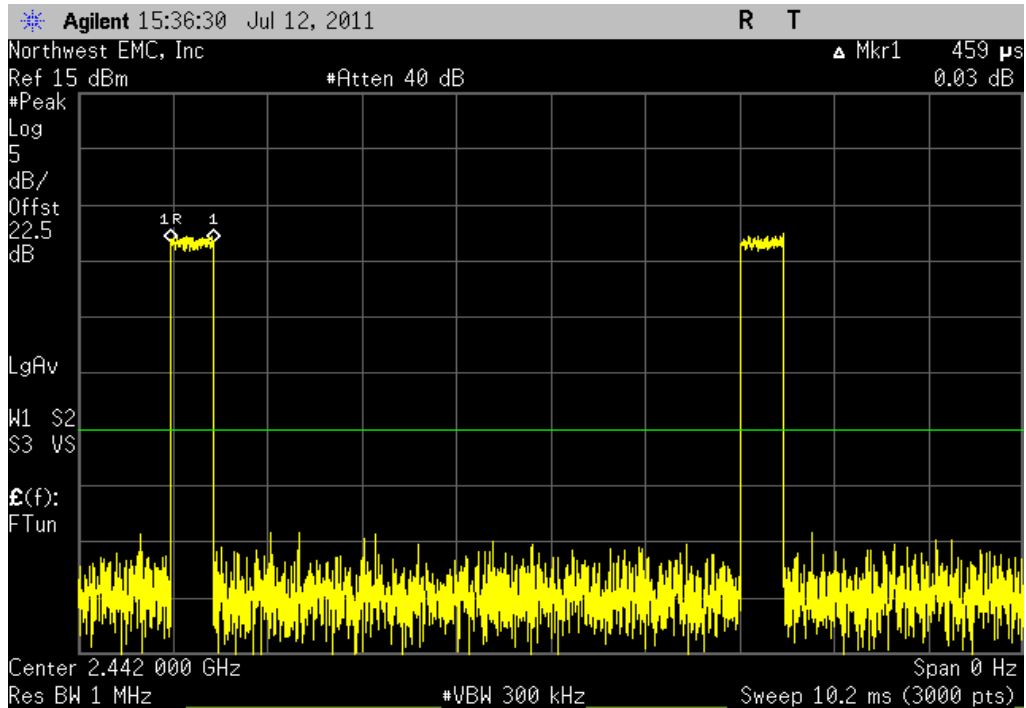
**COMMENTS**  
 Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2 .466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

**DEVIATIONS FROM TEST STANDARD**

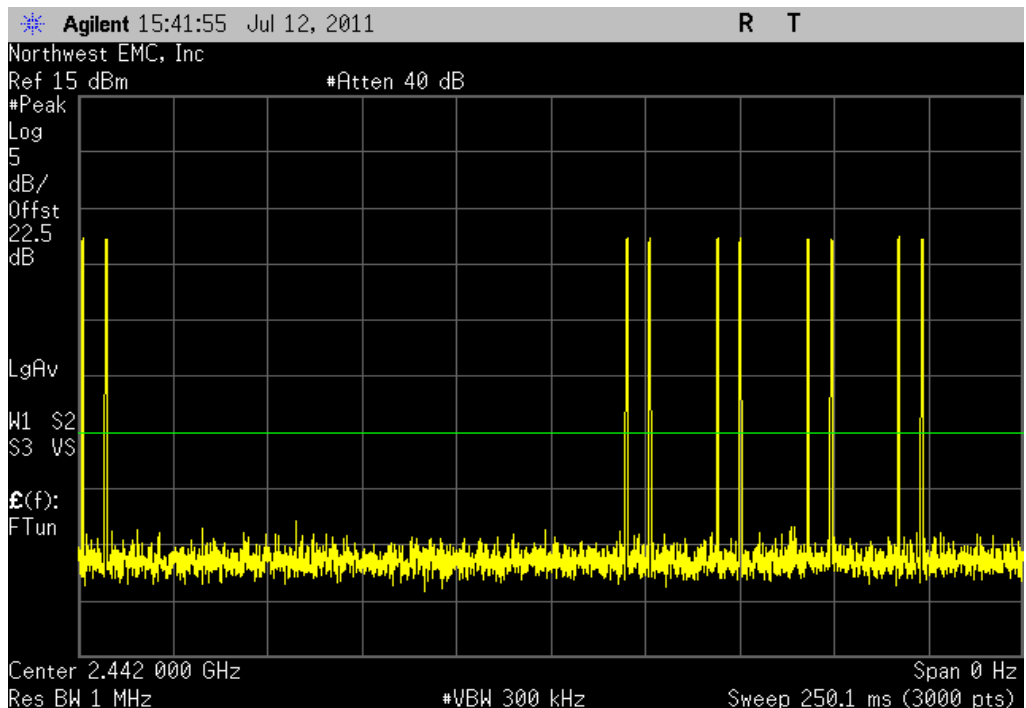
<b>Configuration #</b>	1	<i>Rod Peloquin</i> Signature
------------------------	---	----------------------------------

	Value	Limit	Results
Pulse Width	0.459 ms	400 ms in 16.4 s	Pass
250 ms sweep	259 ms in 16.4 s	400 ms in 16.4 s	Pass

Pulse Width		
<b>Result:</b> Pass	<b>Value:</b> 0.459 ms	<b>Limit:</b> 400 ms in 16.4 s



250 ms sweep		
<b>Result:</b> Pass	<b>Value:</b> 259 ms in 16.4 s	<b>Limit:</b> 400 ms in 16.4 s





Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT					
Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The number of hopping frequencies was measured across the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled.

**EMC**

**Number Of Hopping Frequencies**

<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> 5	<b>Date:</b> 07/12/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 24°C
<b>Attendees:</b> None	<b>Humidity:</b> 48%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.92 in
<b>Tested by:</b> Rod Peloquin	<b>Power:</b> USB
	<b>Job Site:</b> EV06

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

**COMMENTS**  
 Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2 .466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable

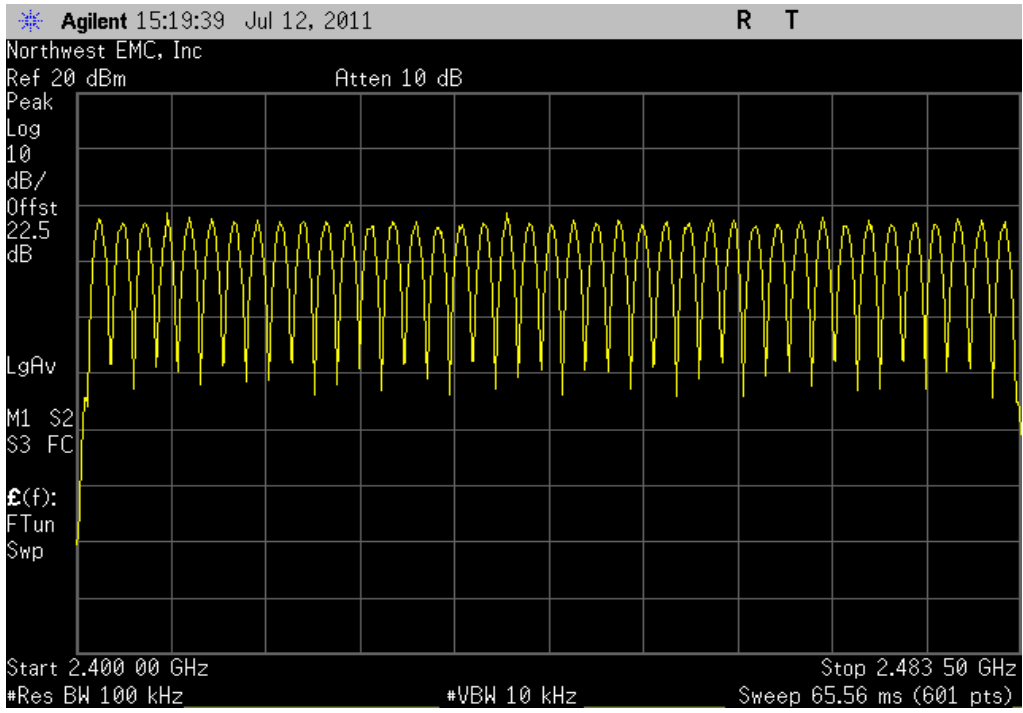
**DEVIATIONS FROM TEST STANDARD**

<b>Configuration #</b>	1	<i>Rod Peloquin</i> Signature
------------------------	---	----------------------------------

	Value	Limit	Results
Number Of Hopping Frequencies	41	>15	Pass

# Number Of Hopping Frequencies

Number Of Hopping Frequencies			
<b>Result:</b> Pass	<b>Value:</b> 41	<b>Limit:</b> >15	



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

**EMC**

**Occupied Bandwidth**

EUT: Model: 1481	Work Order: MCSO1576
Serial Number: 5	Date: 07/12/11
Customer: Microsoft Corporation	Temperature: 24°C
Attendees: None	Humidity: 48%
Project: None	Barometric Pres.: 29.92 in
Tested by: Rod Peloquin	Power: USB
	Job Site: EV06

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

**COMMENTS**  
Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2 .466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

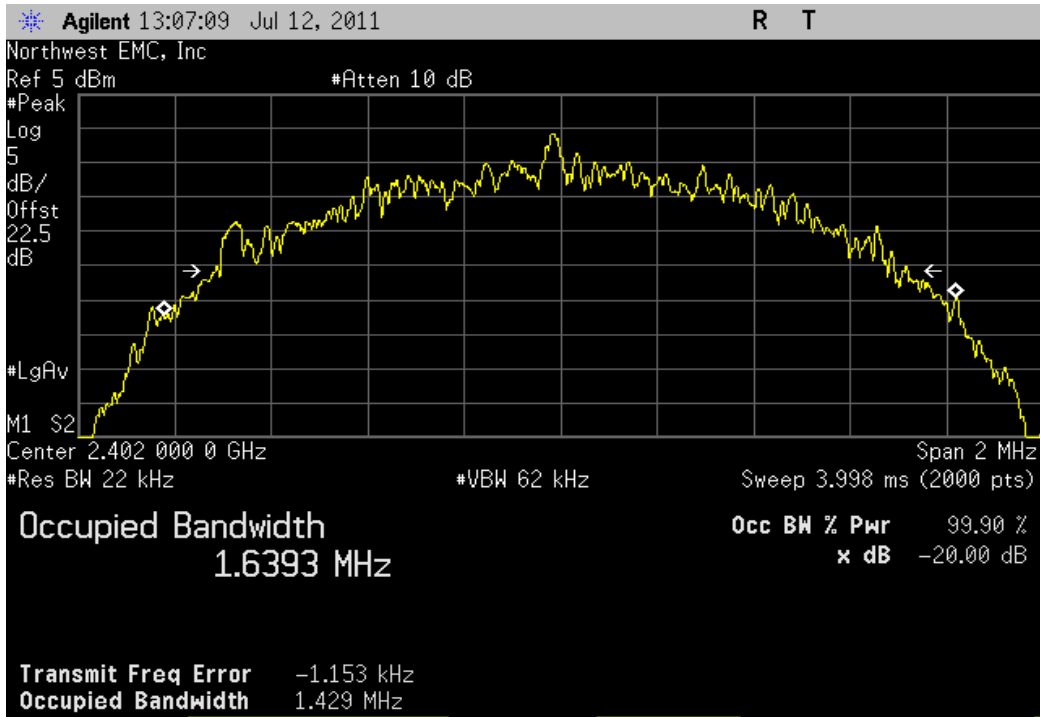
**DEVIATIONS FROM TEST STANDARD**

Configuration #	1	<i>Rodry Le Pelings</i> Signature
-----------------	---	--------------------------------------

	Value	Limit	Result
Low Channel	1.429 MHz	< 1.5 MHz	Pass
Mid Channel	1.43 MHz	< 1.5 MHz	Pass
High Channel	1.42 MHz	< 1.5 MHz	Pass

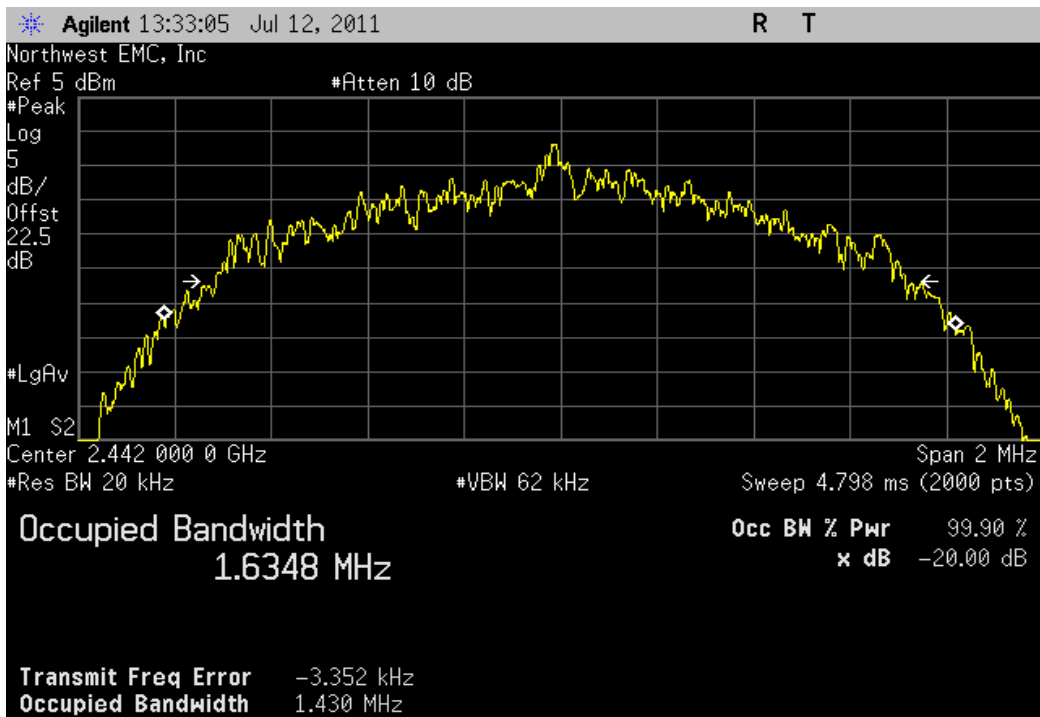
Low Channel

				Value	Limit	Result
				1.429 MHz	< 1.5 MHz	Pass



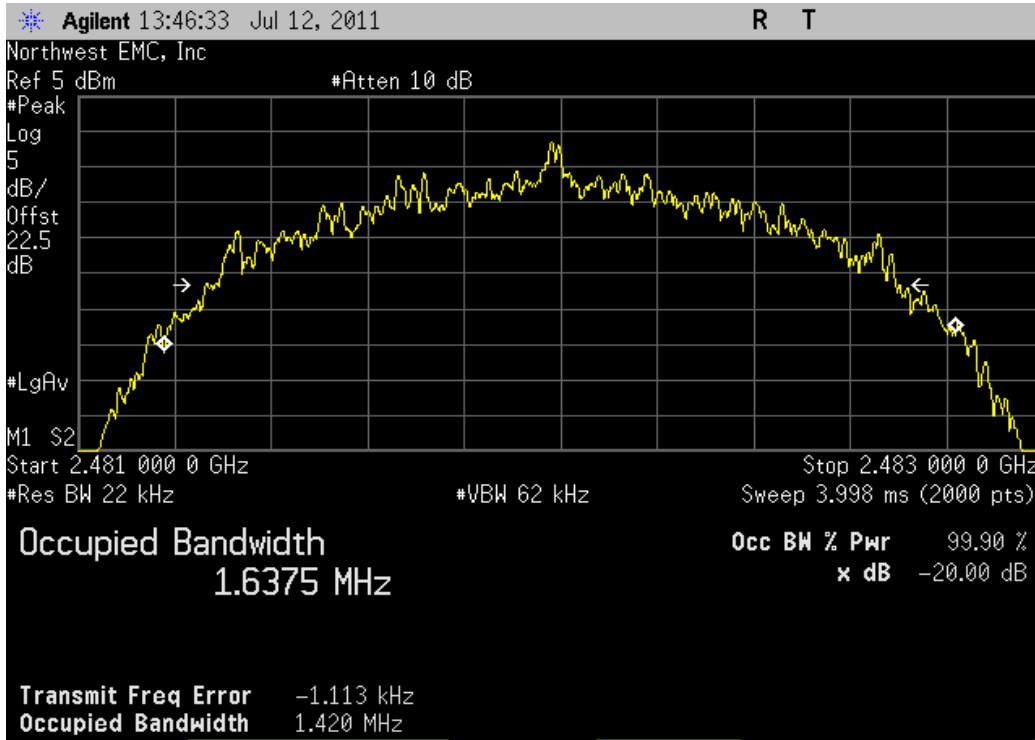
Mid Channel

				Value	Limit	Result
				1.43 MHz	< 1.5 MHz	Pass



## High Channel

	Value	Limit	Result
	1.42 MHz	< 1.5 MHz	Pass



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

**De Facto EIRP Limit:** Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.



EUT: Model: 1481	Work Order: MCSO1576
Serial Number: 5	Date: 07/11/11
Customer: Microsoft Corporation	Temperature: 24°C
Attendees: None	Humidity: 42%
Project: None	Barometric Pres.: 29.98 in
Tested by: Rod Peloquin	Power: USB
	Job Site: EV06

TEST SPECIFICATIONS	TEST METHOD
FCC 15.247:2011	ANSI C63.10:2009

**COMMENTS**  
Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2.466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

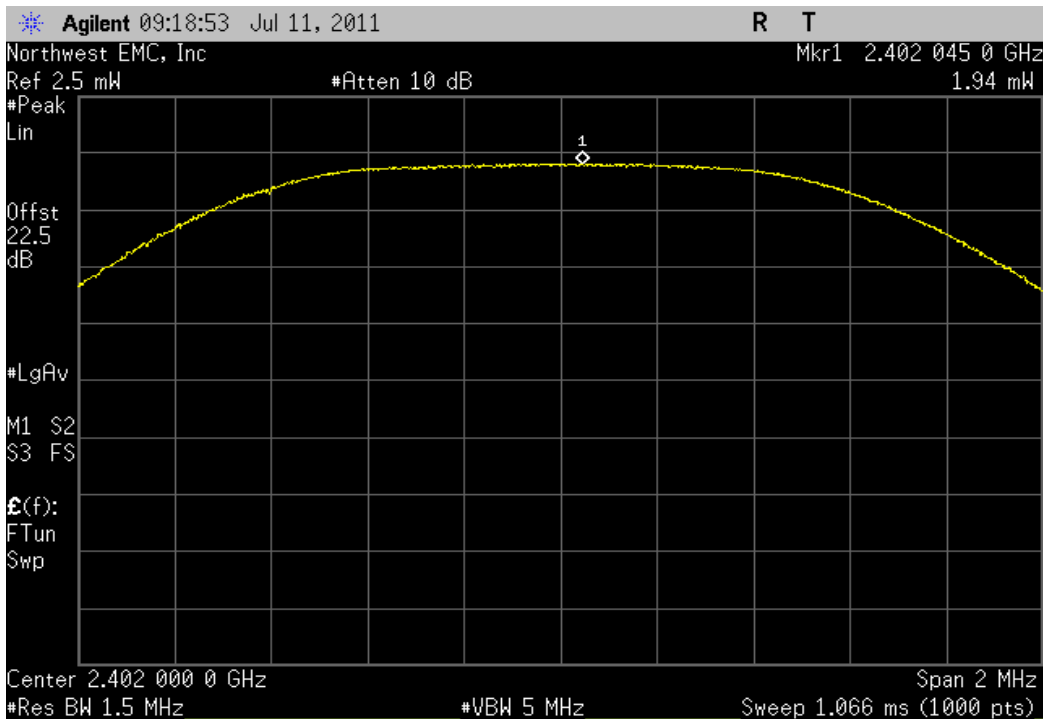
**DEVIATIONS FROM TEST STANDARD**

Configuration #	1	<i>Rodry le Pelings</i> Signature
-----------------	---	--------------------------------------

	Value	Limit	Result
Low Channel	1.94 mW	< 125 mW	Pass
Mid Channel	1.797 mW	< 125 mW	Pass
High Channel	1.697 mW	< 125 mW	Pass

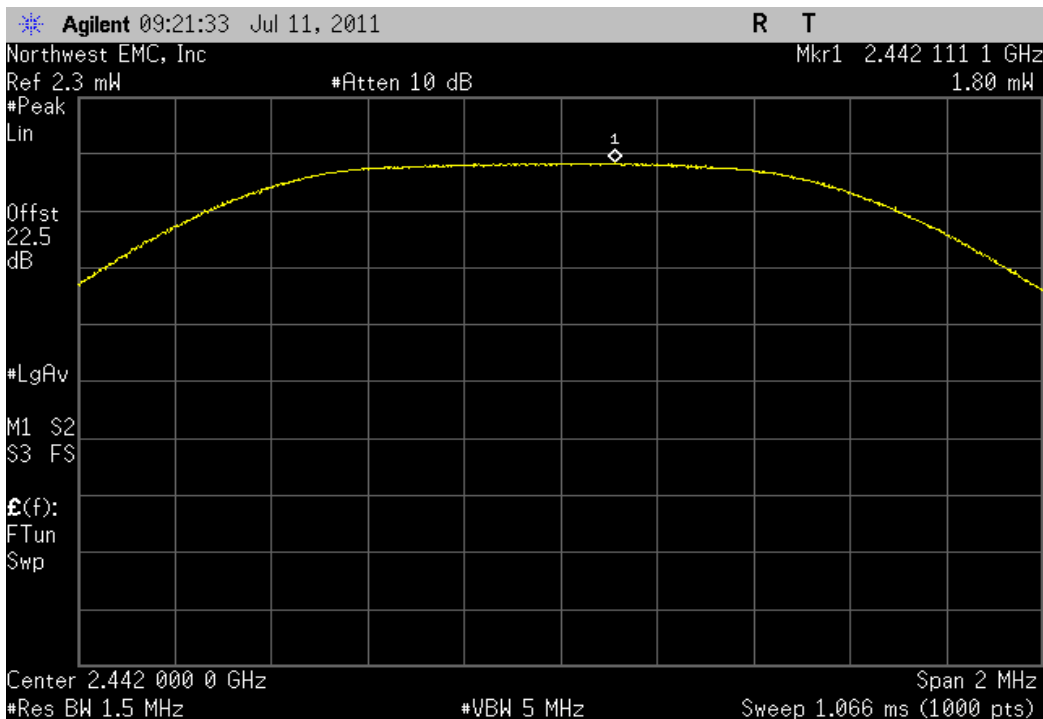
Low Channel

				Value	Limit	Result
				1.94 mW	< 125 mW	Pass



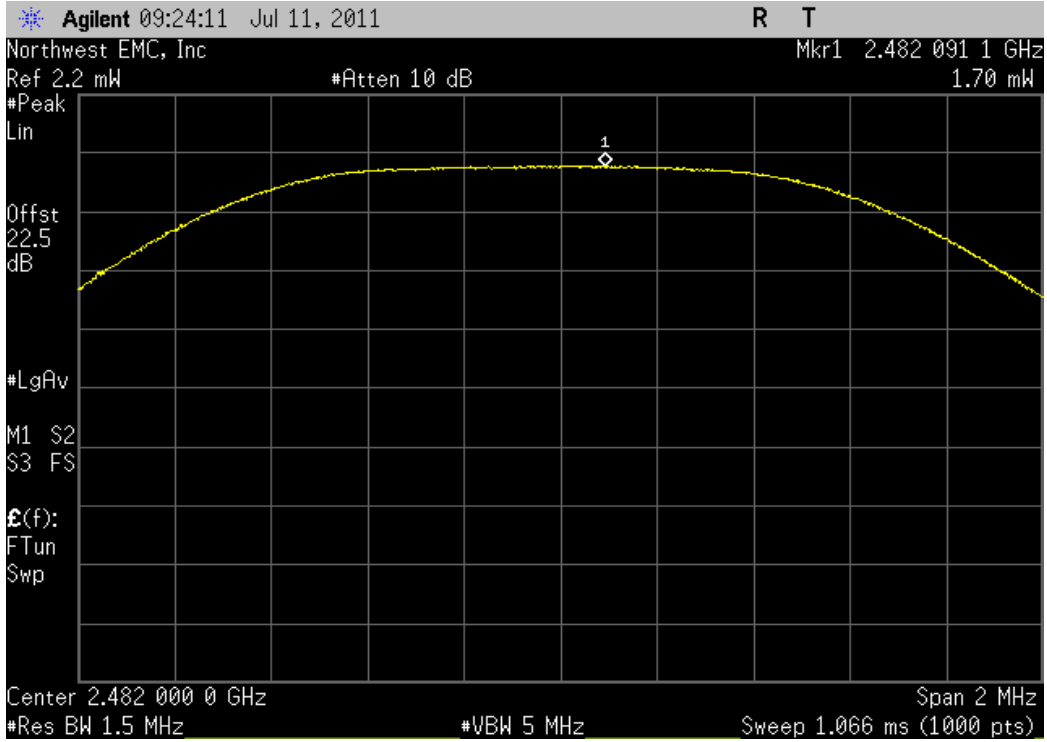
Mid Channel

				Value	Limit	Result
				1.797 mW	< 125 mW	Pass



## High Channel

Value	Limit	Result
1.697 mW	< 125 mW	Pass



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate in both a no hop mode and with hopping enabled. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 5 MHz below the band edge to 5 MHz above the band edge.

# EMC Band Edge Compliance

## EMC

EUT: Model: 1481	Work Order: MCSO1576
Serial Number: 5	Date: 07/12/11
Customer: Microsoft Corporation	Temperature: 24°C
Attendees: None	Humidity: 48%
Project: None	Barometric Pres.: 29.92 in
Tested by: Rod Peloquin	Power: USB
	Job Site: EV06
<b>TEST SPECIFICATIONS</b>	<b>Band Edge Compliance</b>
FCC 15.247:2011	ANSI C63.10:2009

### COMMENTS

Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2 .466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

### DEVIATIONS FROM TEST STANDARD

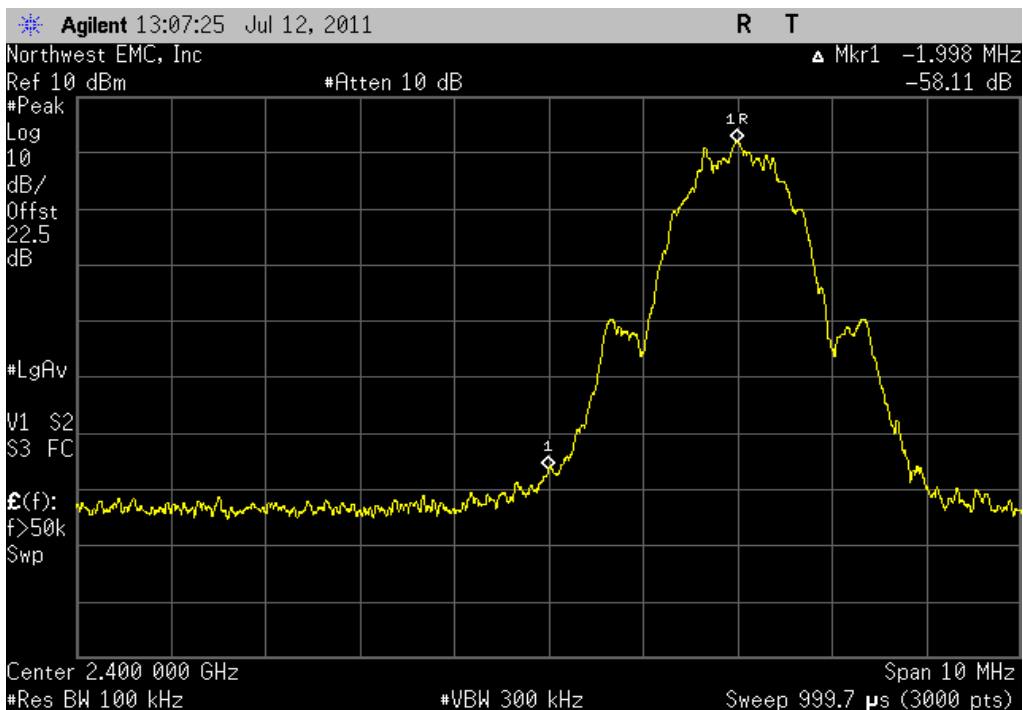
Configuration #	1	<i>Rod Peloquin</i> Signature
-----------------	---	----------------------------------

		Value	Limit	Results
Single Channel	Lower Band Edge	-58.1 dBc	≥ -20 dBc	Pass
	Upper Band Edge	-41.8 dBc	≥ -20 dBc	Pass
Frequency Hopping	Lower Band Edge	-57.5 dBc	≥ -20 dBc	Pass
	Upper Band Edge	-44.0 dBc	≥ -20 dBc	Pass

# Band Edge Compliance

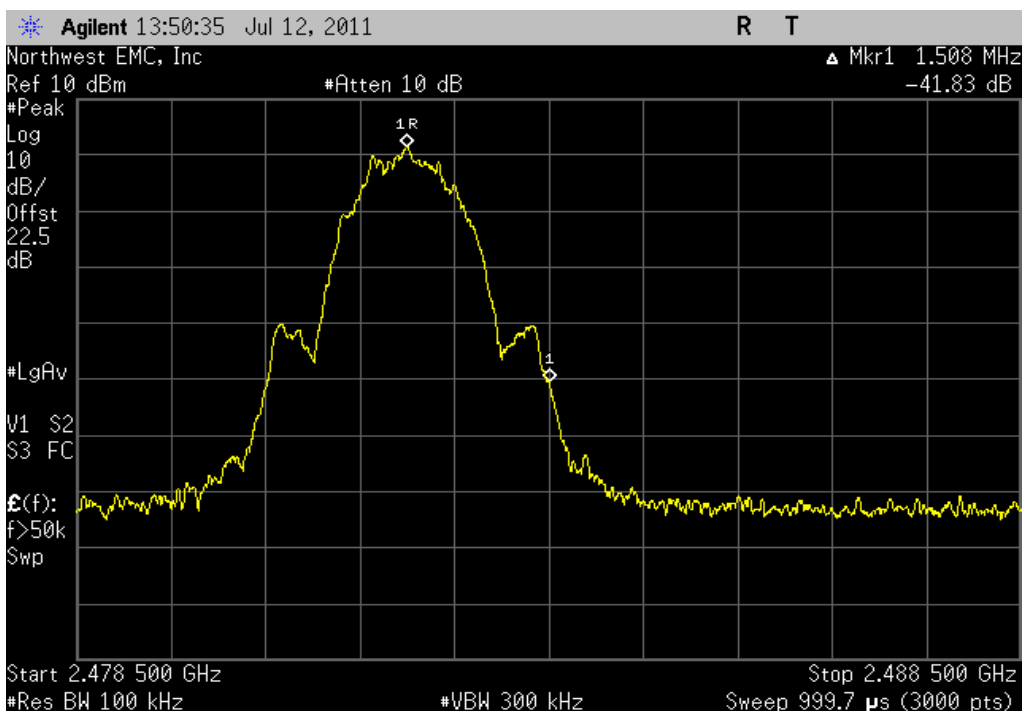
## Single Channel, Lower Band Edge

**Result:** Pass      **Value:** -58.1 dBc      **Limit:** ≥ -20 dBc



## Single Channel, Upper Band Edge

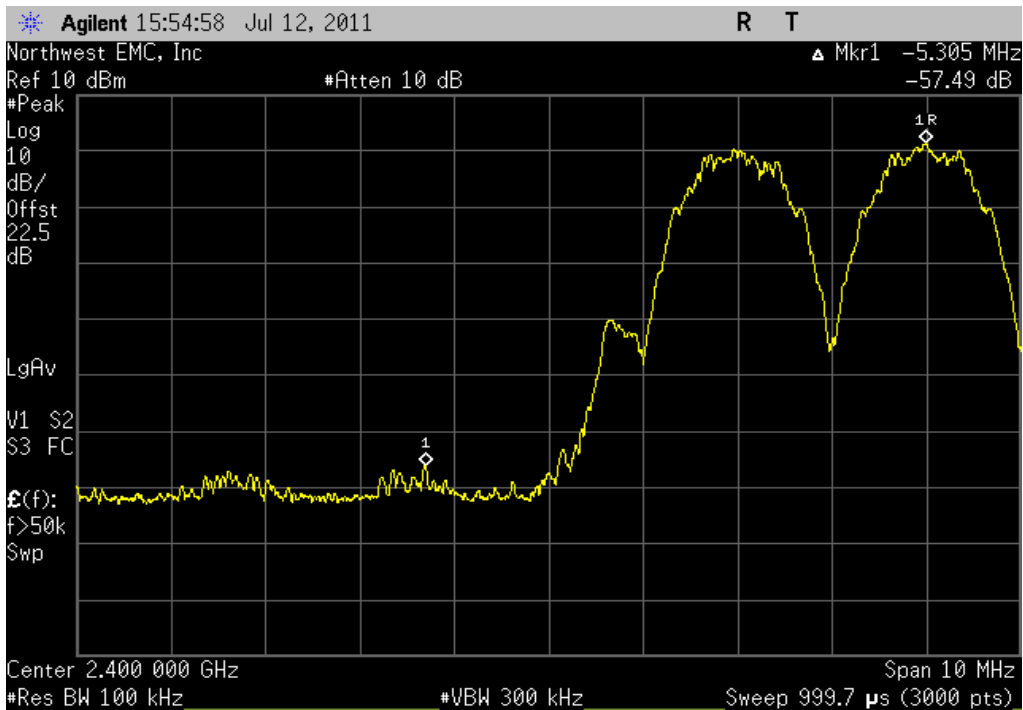
**Result:** Pass      **Value:** -41.8 dBc      **Limit:** ≥ -20 dBc



# Band Edge Compliance

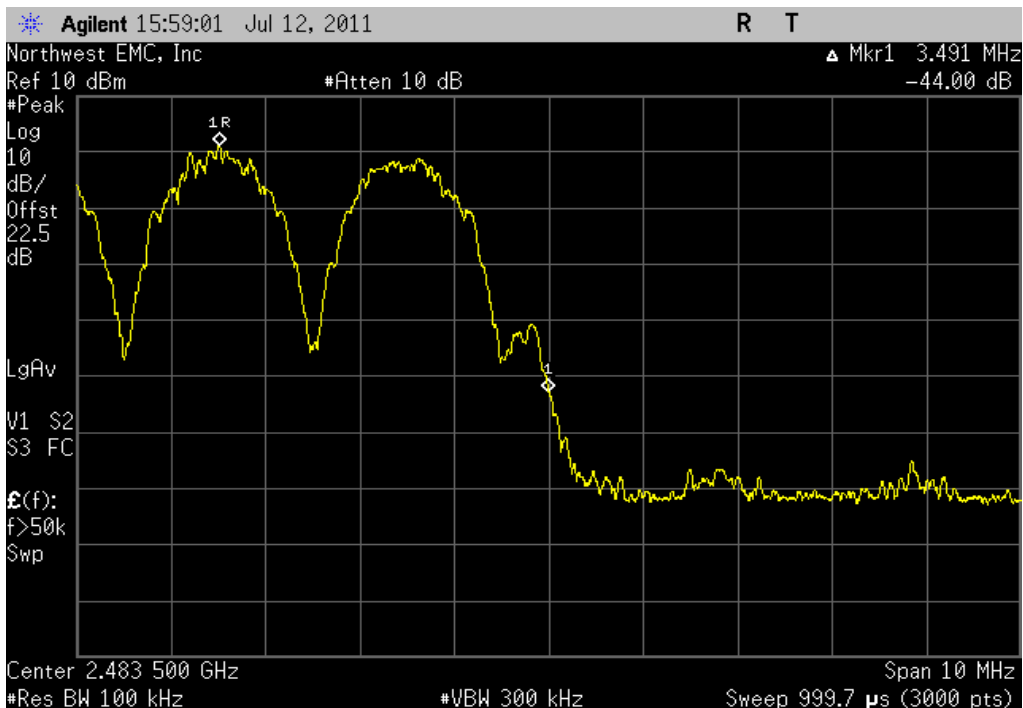
**Frequency Hopping, Lower Band Edge**

<b>Result:</b> Pass	<b>Value:</b> -57.5 dBc	<b>Limit:</b> ≥ -20 dBc
---------------------	-------------------------	-------------------------



**Frequency Hopping, Upper Band Edge**

<b>Result:</b> Pass	<b>Value:</b> -44.0 dBc	<b>Limit:</b> ≥ -20 dBc
---------------------	-------------------------	-------------------------



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT					
Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency.



# Spurious Conducted Emissions

EUT: Model: 1481	Work Order: MCSO1576
Serial Number: 5	Date: 07/12/11
Customer: Microsoft Corporation	Temperature: 24°C
Attendees: None	Humidity: 48%
Project: None	Barometric Pres.: 29.92 in
Tested by: Rod Peloquin	Power: USB
	Job Site: EV06

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

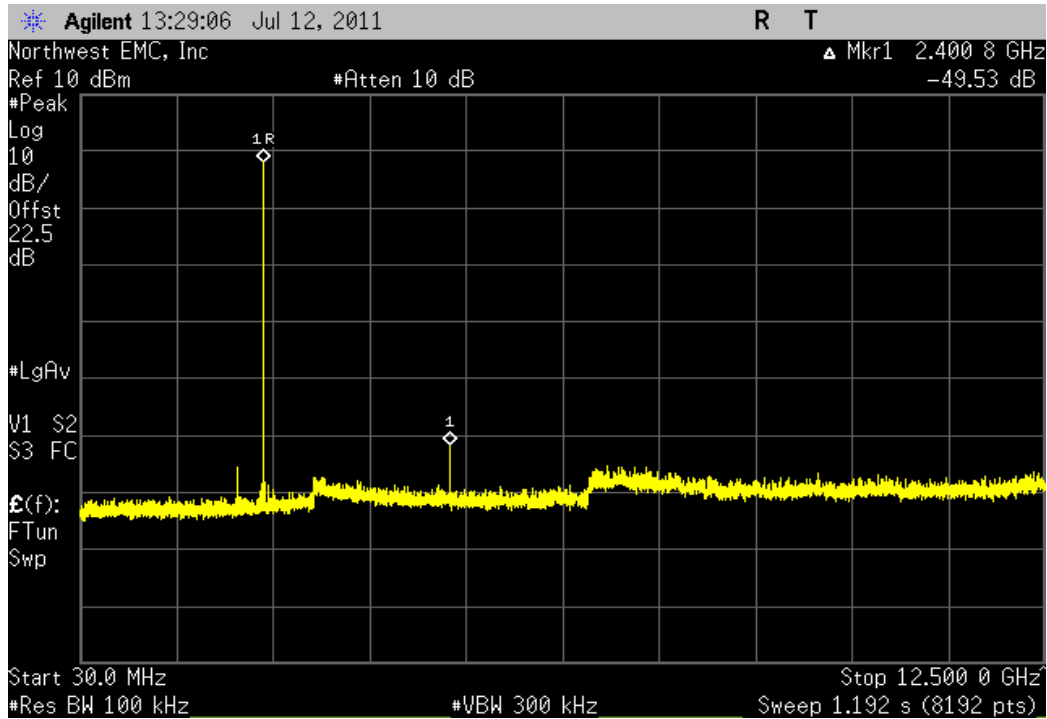
**COMMENTS**  
Transmitting on 2.4 GHz FHSS radio with 11.7 % duty cycle of 2.466 ms packets in 8 ms period. Bound to Front Panel Controller radio. 0.5 dB added for adapter cable.

**DEVIATIONS FROM TEST STANDARD**

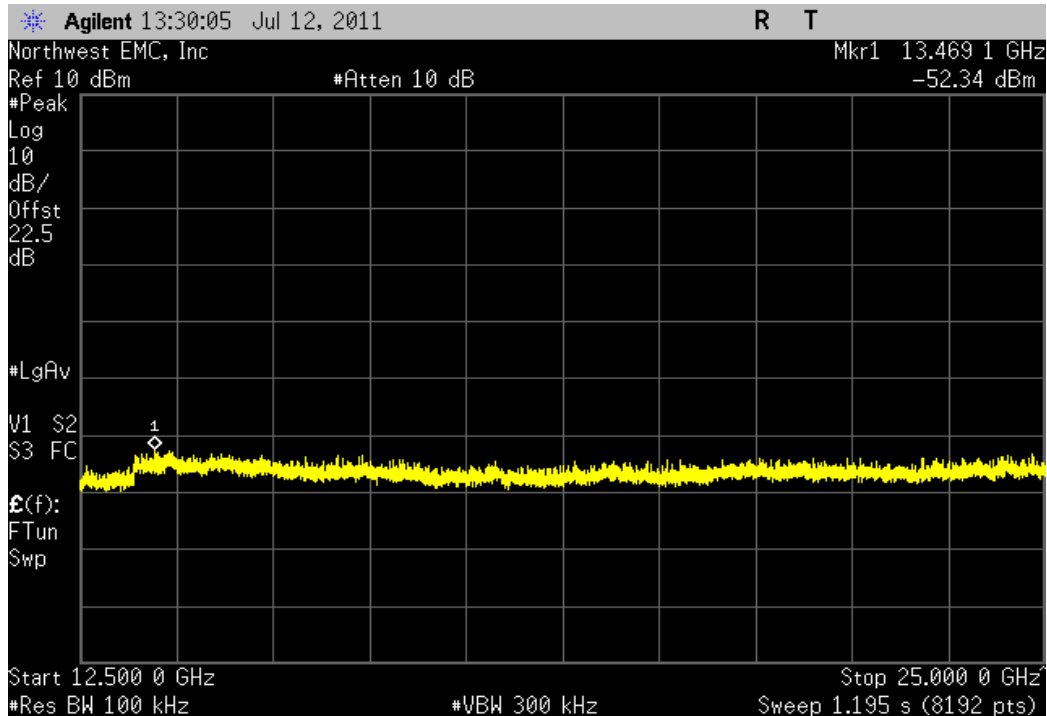
Configuration #	1	<i>Rod Peloquin</i> Signature
-----------------	---	----------------------------------

	Frequency Range	Value	Limit	Result
Low Channel	30 MHz - 12.5 GHz	-49.53 dBc	≤ -20 dBc	Pass
Low Channel	12.5 GHz - 25 GHz	-50.33 dBc	≤ -20 dBc	Pass
Mid Channel	30 MHz - 12.5 GHz	-51.14 dBc	≤ -20 dBc	Pass
Mid Channel	12.5 GHz - 25 GHz	-50.64 dBc	≤ -20 dBc	Pass
High Channel	30 MHz - 12.5 GHz	-53.18 dBc	≤ -20 dBc	Pass
High Channel	12.5 GHz - 25 GHz	-52.09 dBc	≤ -20 dBc	Pass

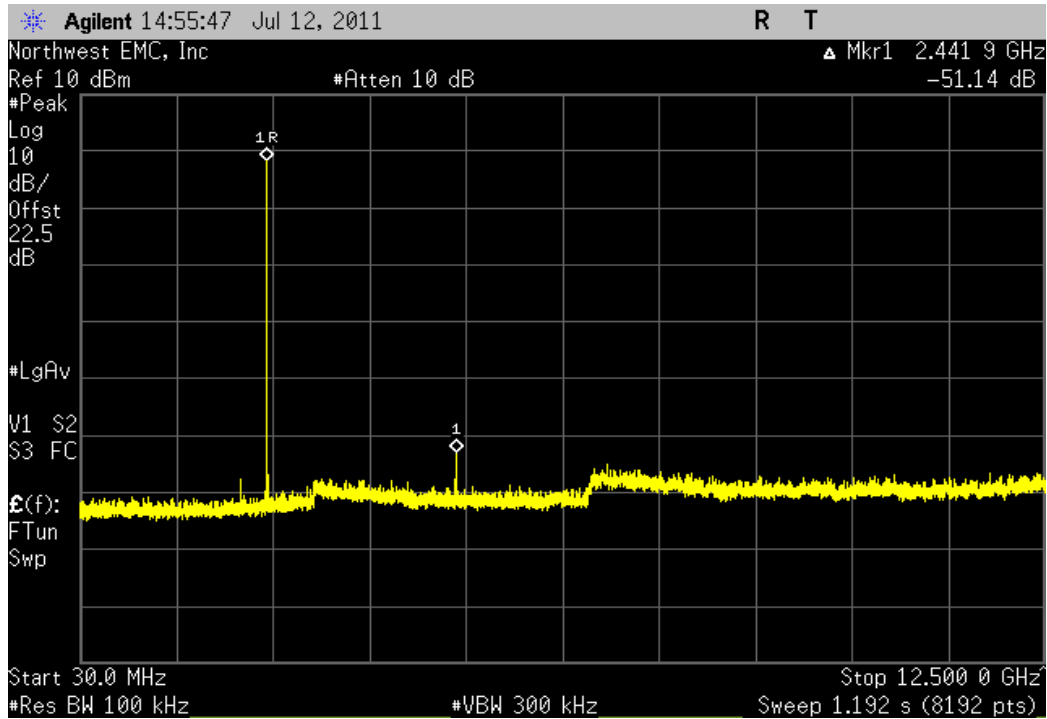
Low Channel				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-49.53 dBc	≤ -20 dBc	Pass	



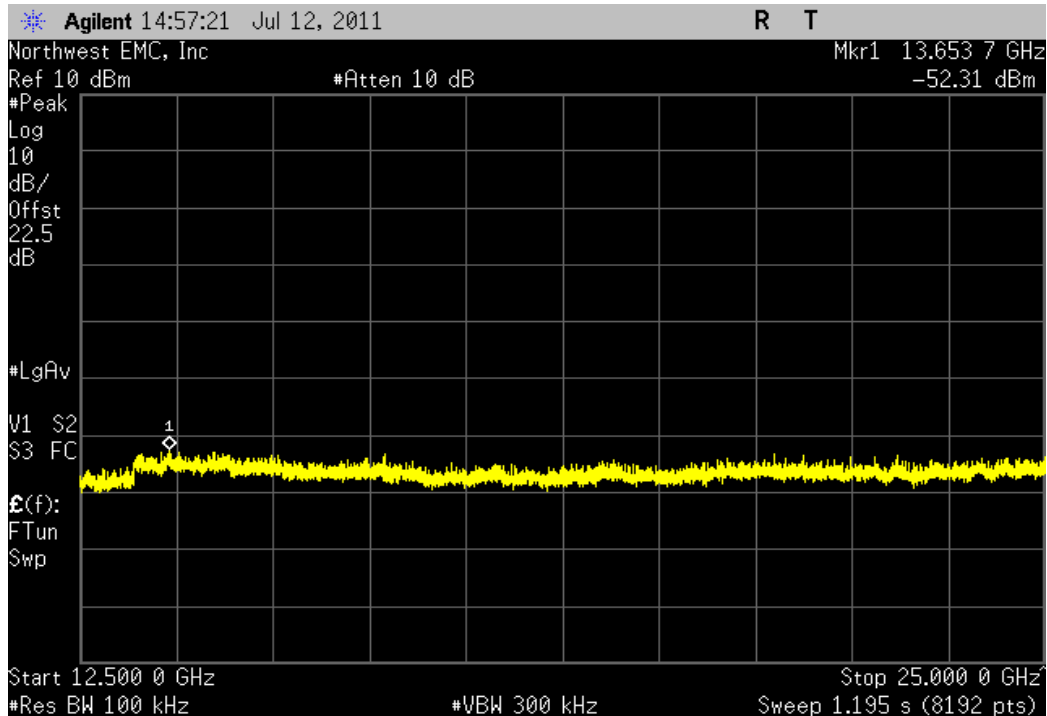
Low Channel				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-50.33 dBc	≤ -20 dBc	Pass	



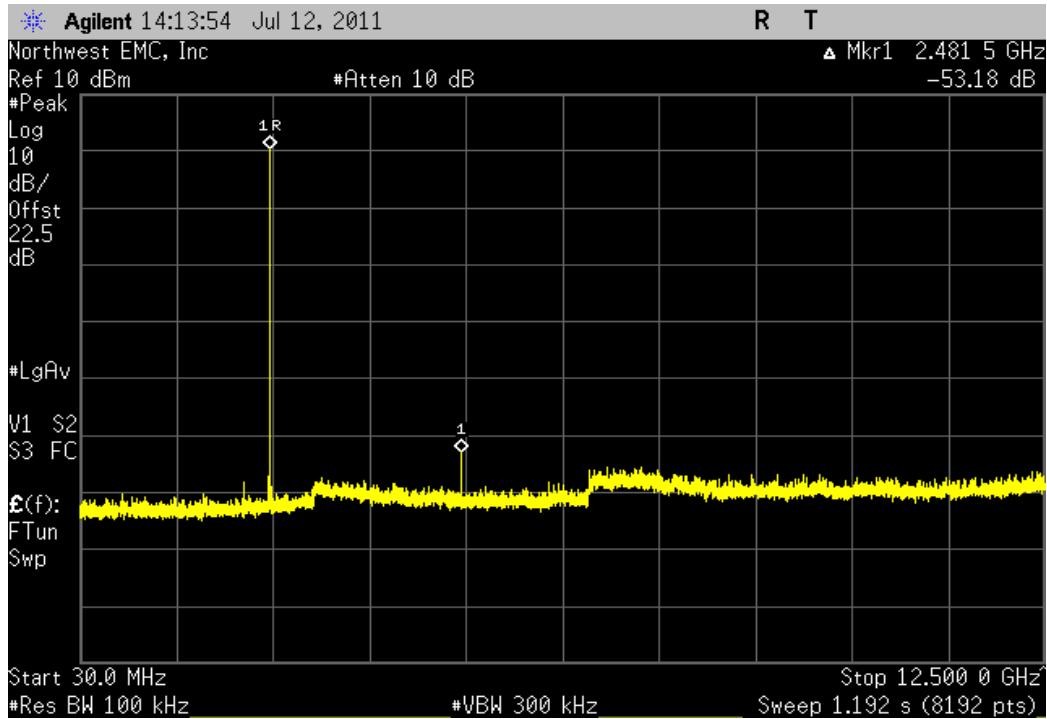
Mid Channel				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-51.14 dBc	≤ -20 dBc	Pass	



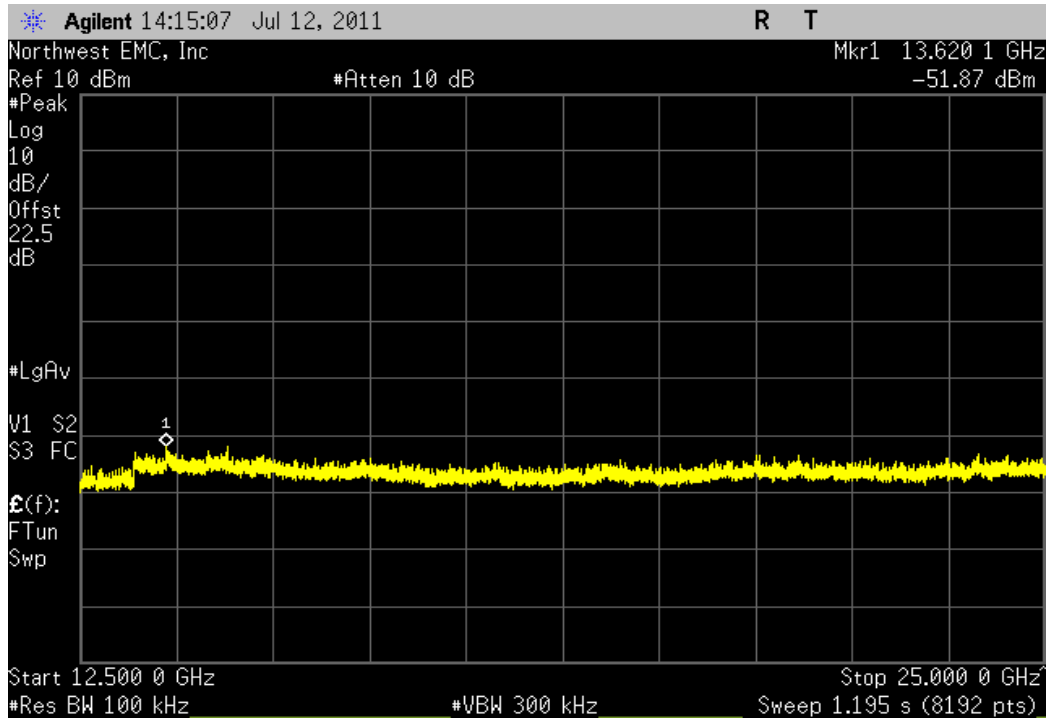
Mid Channel				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-50.64 dBc	≤ -20 dBc	Pass	



High Channel				
Frequency Range	Value	Limit	Result	
30 MHz - 12.5 GHz	-53.18 dBc	≤ -20 dBc	Pass	



High Channel				
Frequency Range	Value	Limit	Result	
12.5 GHz - 25 GHz	-52.09 dBc	≤ -20 dBc	Pass	



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### MODES OF OPERATION

Tx, 2.4GHz FHSS radio

#### POWER SETTINGS INVESTIGATED

USB

#### FREQUENCY RANGE INVESTIGATED

Start Frequency	30MHz	Stop Frequency	26.5GHz
-----------------	-------	----------------	---------

#### SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
High Pass Filter	Micro-Tronics	50111	HGE	7/14/2010	24
Cable	ESM Cable Corp.	KMKM-72	EVY	9/15/2010	12
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	9/15/2010	12
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVI	7/5/2011	12
Antenna, Horn	ETS	3160-08	AIA	NCR	0
EV12 Cables	N/A	Standard Gain Horn Cables	EVU	6/20/2011	12
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVH	6/20/2011	12
Antenna, Horn	ETS	3160.07	AHZ	9/8/2010	24
EV12 Cables	N/A	Double Ridge Horn Cables	EVT	11/22/2010	12
Pre-Amplifier	Miteq	AMF-3D00100800-32-13P	AVF	6/20/2011	12
Antenna, Horn	ETS	3115	AIB	9/8/2010	24
EV12 Cables	N/A	Bilog Cables	EVS	6/1/5403	12
Pre-Amplifier	Miteq	AM-1616-1000	AVM	6/20/2011	12
Antenna, Biconilog	EMCO	3141	AXG	3/15/2010	24
Spectrum Analyzer	Agilent	E4440A	AAW	4/19/2011	12

#### MEASUREMENT BANDWIDTHS

	Frequency Range	Peak Data	Quasi-Peak Data	Average Data
	(MHz)	(kHz)	(kHz)	(kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

#### MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

#### TEST DESCRIPTION

Marker Delta method was performed per FCC Public Notice DA 00-705 released March 30, 2000 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

EUT: Model: 1481	Work Order: MCSO1576
Serial Number: C13	Date: 7/15/2011 & 7/18/11
Customer: Microsoft Corporation	Temperature: 23
Attendees: None	Humidity: 45%
Project: None	Barometric Pres.: 29.9
Tested by: Jennifer Herrett	Power: USB
	Job Site: EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

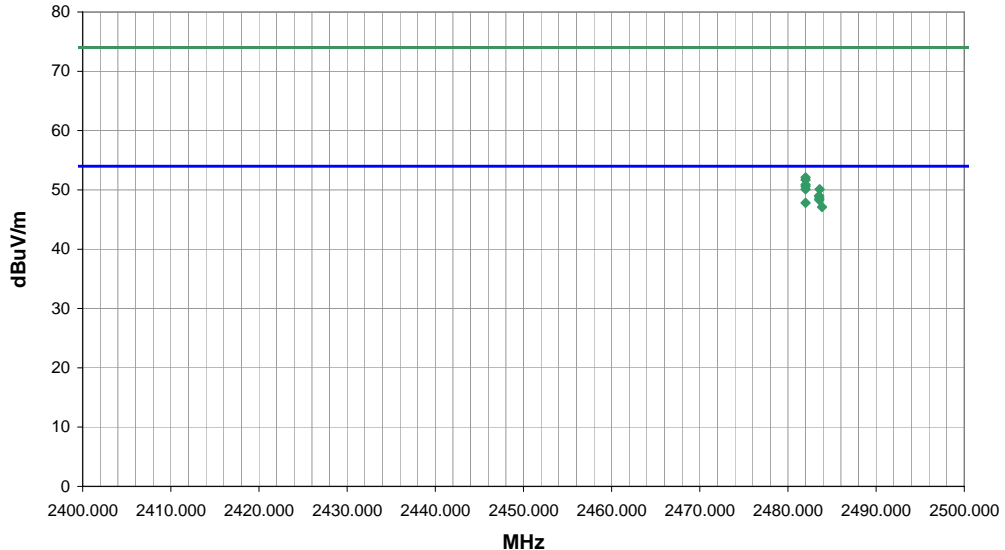
<b>TEST PARAMETERS</b>
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS  
None

EUT OPERATING MODES  
Tx, 2.4GHz FHSS radio, High Ch

DEVIATIONS FROM TEST STANDARD  
No deviations.

Run #	5	 Signature
Configuration #	6	
Results	Pass	



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2482.000	79.6	-1.2	172.0	1.0	3.0	20.0	H-Horn	PK	0.0	98.4			Fundamental. EUT on side. Marker Delta Method: Fundamental 98.4 dBuV/m + -46.3 dBc = 52.1 dBuV/m
2482.000	76.2	-1.2	149.0	1.0	3.0	20.0	H-Horn	PK	0.0	95.0	74.0	-21.9	Fundamental. EUT vertical. Marker Delta Method: Fundamental 95.0 dBuV/m + -44.1 dBc = 50.9 dBuV/m
2482.000	76.5	-1.2	161.0	1.0	3.0	20.0	H-Horn	PK	0.0	95.3	74.0	-23.1	Fundamental. EUT horizontal. Marker Delta Method: Fundamental 95.3 dBuV/m + -44.7 dBc = 50.6 dBuV/m
2482.000	74.0	-1.2	134.0	1.0	3.0	20.0	V-Horn	PK	0.0	92.8	74.0	-23.4	Fundamental. EUT vertical. Marker Delta Method: Fundamental 92.8 dBuV/m + -45.0 dBc = 47.8 dBuV/m
2482.000	75.2	-1.2	199.0	1.0	3.0	20.0	V-Horn	PK	0.0	94.0	74.0	-26.2	Fundamental. EUT horizontal. Marker Delta Method: Fundamental 94.0 dBuV/m + -43.9 dBc = 50.1 dBuV/m
2482.000	77.0	-1.2	130.0	1.0	3.0	20.0	V-Horn	PK	0.0	95.8	74.0	-23.9	Fundamental. EUT on side. Marker Delta Method: Fundamental 95.8 dBuV/m + -44.1 dBc = 51.7 dBuV/m
2483.598	31.2	-1.2	134.0	1.0	3.0	20.0	V-Horn	AV	0.0	50.1	54.0	-3.9	EUT vertical.
2483.517	30.2	-1.2	172.0	1.0	3.0	20.0	H-Horn	AV	0.0	49.0	54.0	-5.0	EUT on side.
2483.557	30.1	-1.2	149.0	1.0	3.0	20.0	H-Horn	AV	0.0	48.9	54.0	-5.1	EUT vertical.
2483.552	29.7	-1.2	130.0	1.0	3.0	20.0	V-Horn	AV	0.0	48.5	54.0	-5.5	EUT on side.
2483.558	29.5	-1.2	199.0	1.0	3.0	20.0	V-Horn	AV	0.0	48.3	54.0	-5.7	EUT horizontal.
2483.870	28.3	-1.2	161.0	1.0	3.0	20.0	H-Horn	AV	0.0	47.1	54.0	-6.9	EUT horizontal.

# Spurious Radiated Emissions

## EMC

EUT: Model: 1481	Work Order: MCSO1576
Serial Number: C13	Date: 07/18/11
Customer: Microsoft Corporation	Temperature: 23
Attendees: None	Humidity: 45%
Project: None	Barometric Pres.: 29.9
Tested by: Jennifer Herrett	Power: USB
	Job Site: EV12

TEST SPECIFICATIONS	TEST METHOD
FCC 15.247:2011	ANSI C63.10:2009

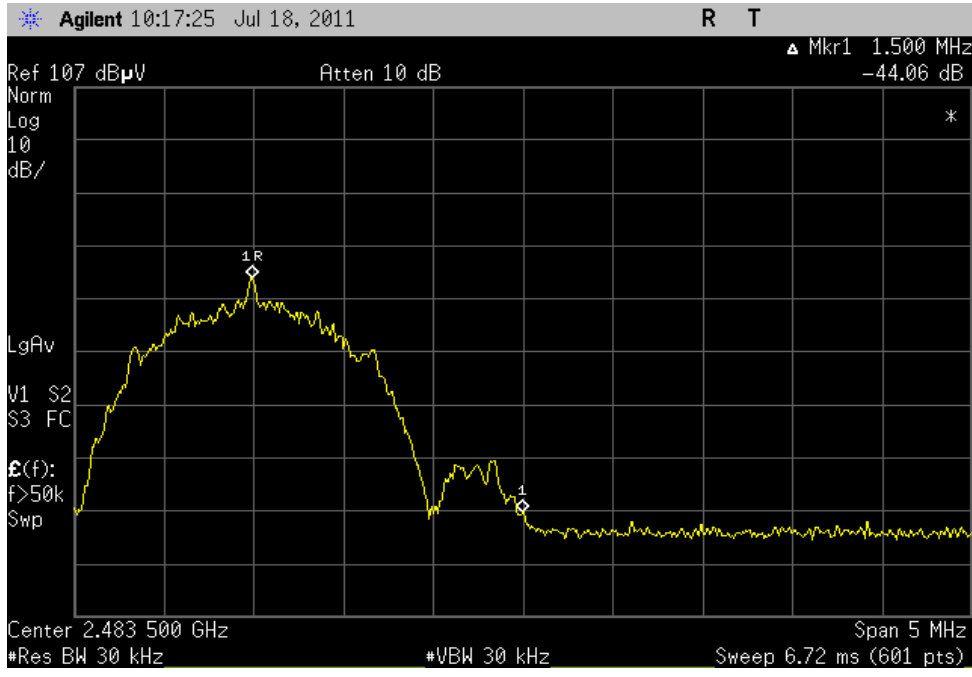
TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	5	EUT on side, Vertical receive
Configuration #	6	
Results	NA	



<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> C13	<b>Date:</b> 07/18/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 23
<b>Attendees:</b> None	<b>Humidity:</b> 45%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.9
<b>Tested by:</b> Jennifer Herrett	<b>Power:</b> USB
	<b>Job Site:</b> EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

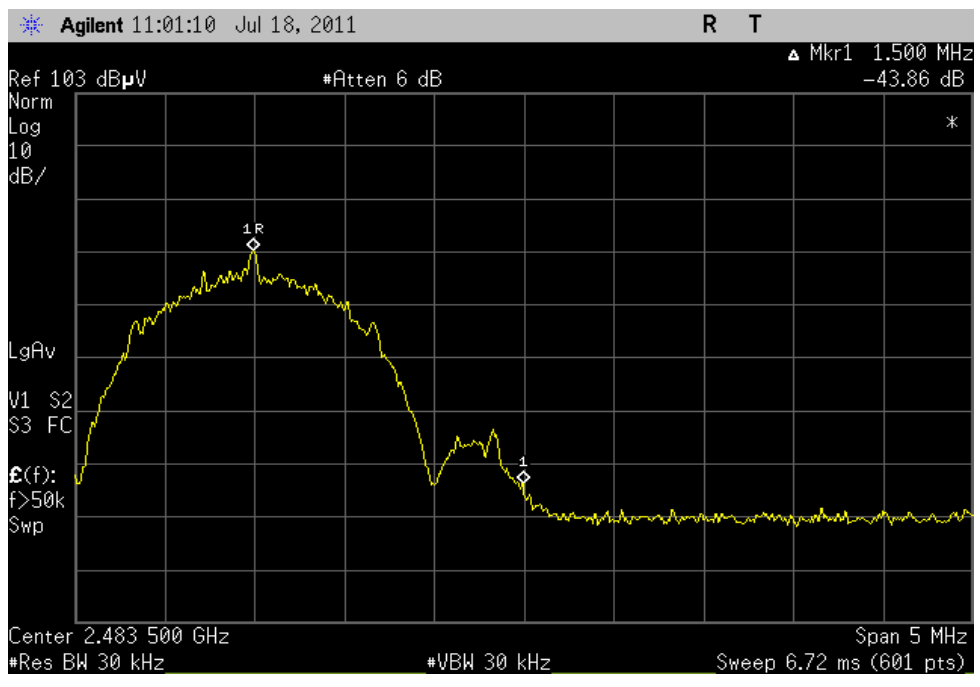
<b>TEST PARAMETERS</b>
<b>Antenna Height(s) (m)</b>   1 - 4   <b>Test Distance (m)</b>   3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

<b>Run #</b>	5	EUT horizontal, Vertical receive
<b>Configuration #</b>	6	
<b>Results</b>	NA	





<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> C13	<b>Date:</b> 07/18/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 23
<b>Attendees:</b> None	<b>Humidity:</b> 45%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.9
<b>Tested by:</b> Jennifer Herrett	<b>Power:</b> USB
	<b>Job Site:</b> EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

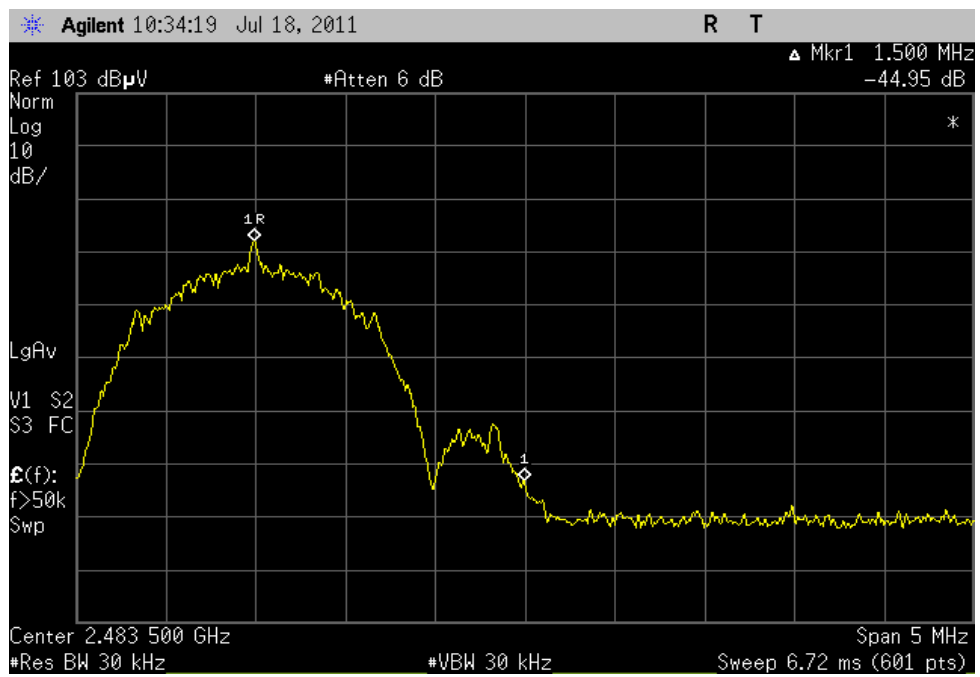
<b>TEST PARAMETERS</b>
<b>Antenna Height(s) (m)</b>   1 - 4   <b>Test Distance (m)</b>   3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

<b>Run #</b>	5	EUT vertical, Vertical receive
<b>Configuration #</b>	6	
<b>Results</b>	NA	



<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> C13	<b>Date:</b> 07/18/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 23
<b>Attendees:</b> None	<b>Humidity:</b> 45%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.9
<b>Tested by:</b> Jennifer Herrett	<b>Power:</b> USB
	<b>Job Site:</b> EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

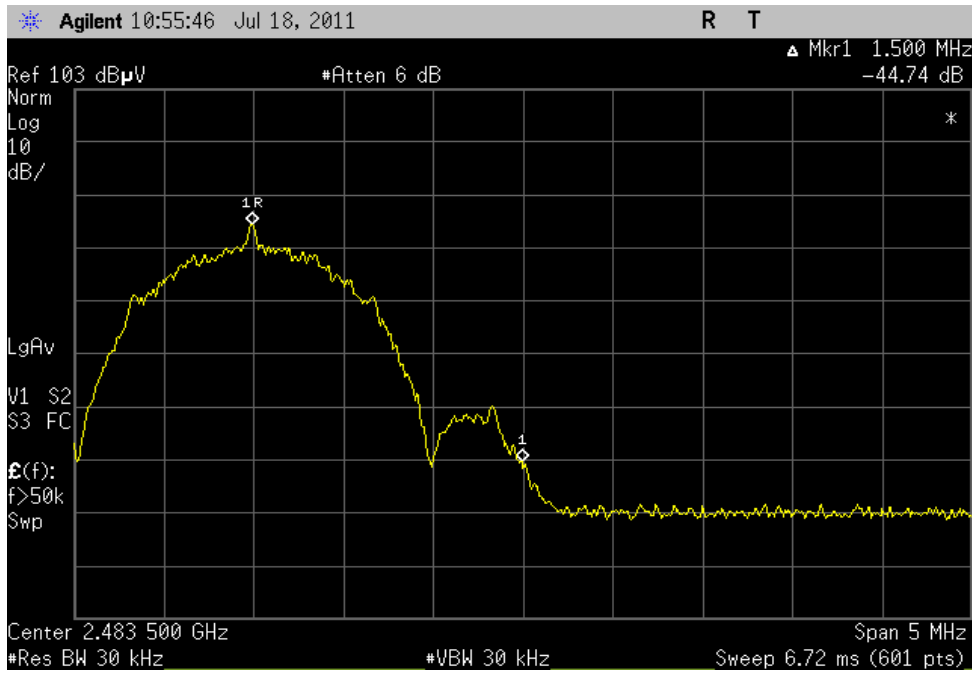
<b>TEST PARAMETERS</b>	
<b>Antenna Height(s) (m)</b>	1 - 4
<b>Test Distance (m)</b>	3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

<b>Run #</b>	5	EUT horizontal, Horizontal receive
<b>Configuration #</b>	6	
<b>Results</b>	NA	



<b>EUT:</b> Model: 1481	<b>Work Order:</b> MCSO1576
<b>Serial Number:</b> C13	<b>Date:</b> 07/18/11
<b>Customer:</b> Microsoft Corporation	<b>Temperature:</b> 23
<b>Attendees:</b> None	<b>Humidity:</b> 45%
<b>Project:</b> None	<b>Barometric Pres.:</b> 29.9
<b>Tested by:</b> Jennifer Herrett	<b>Power:</b> USB
	<b>Job Site:</b> EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

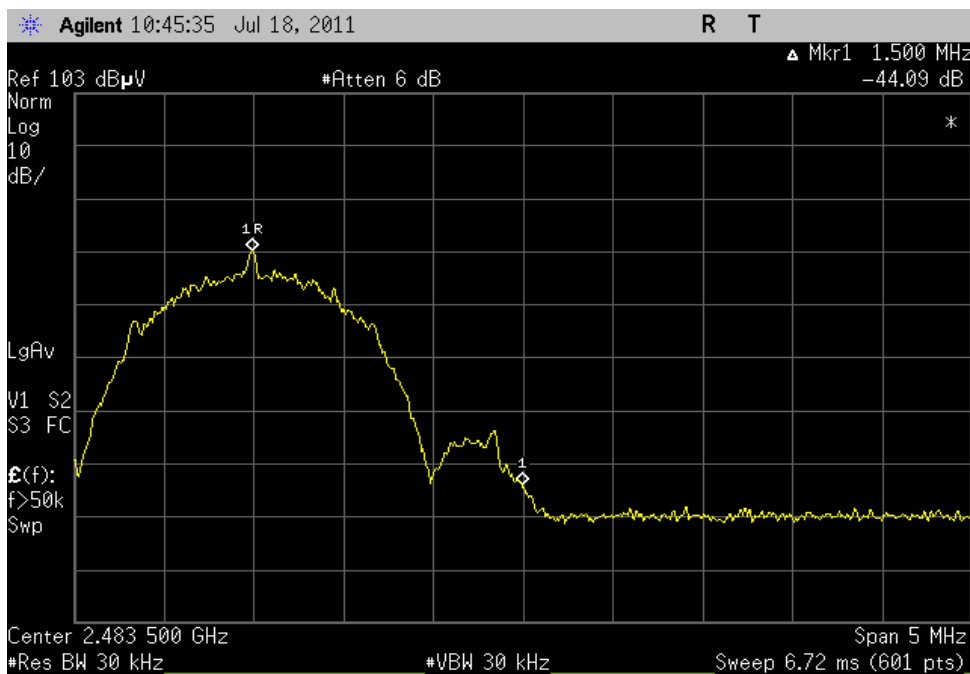
<b>TEST PARAMETERS</b>
<b>Antenna Height(s) (m)</b>   1 - 4   <b>Test Distance (m)</b>   3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

<b>Run #</b>	5	EUT vertical, Horizontal receive
<b>Configuration #</b>	6	
<b>Results</b>	NA	



EUT: Model: 1481	Work Order: MCSO1576
Serial Number: C13	Date: 07/18/11
Customer: Microsoft Corporation	Temperature: 23
Attendees: None	Humidity: 45%
Project: None	Barometric Pres.: 29.9
Tested by: Jennifer Herrett	Power: USB
	Job Site: EV12

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

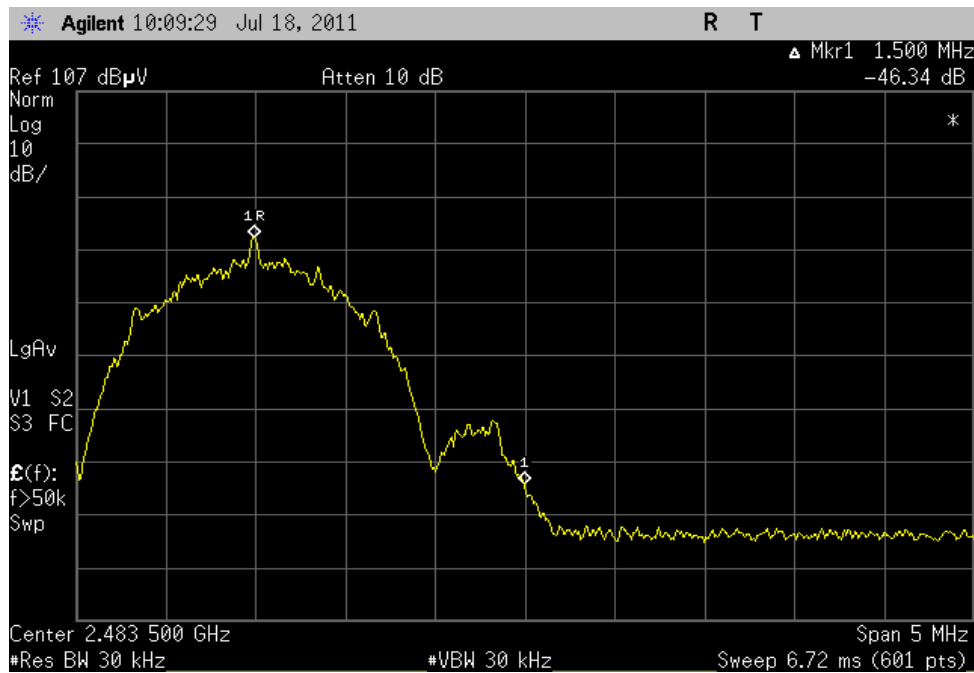
<b>TEST PARAMETERS</b>	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Tx, 2.4GHz FHSS radio, High Ch

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	5	EUT on side, Horizontal receive
Configuration #	6	
Results	NA	



# Spurious Radiated Emissions

## EMC

EUT: Model: 1481		Work Order: MCSO1576	
Serial Number: C13		Date: 07/15/11	
Customer: Microsoft Corporation		Temperature: 23	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 29.9	
Tested by: Jennifer Herrett		Power: USB	
		Job Site: EV12	

<b>TEST SPECIFICATIONS</b>	<b>TEST METHOD</b>
FCC 15.247:2011	ANSI C63.10:2009

<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

<b>COMMENTS</b>
None

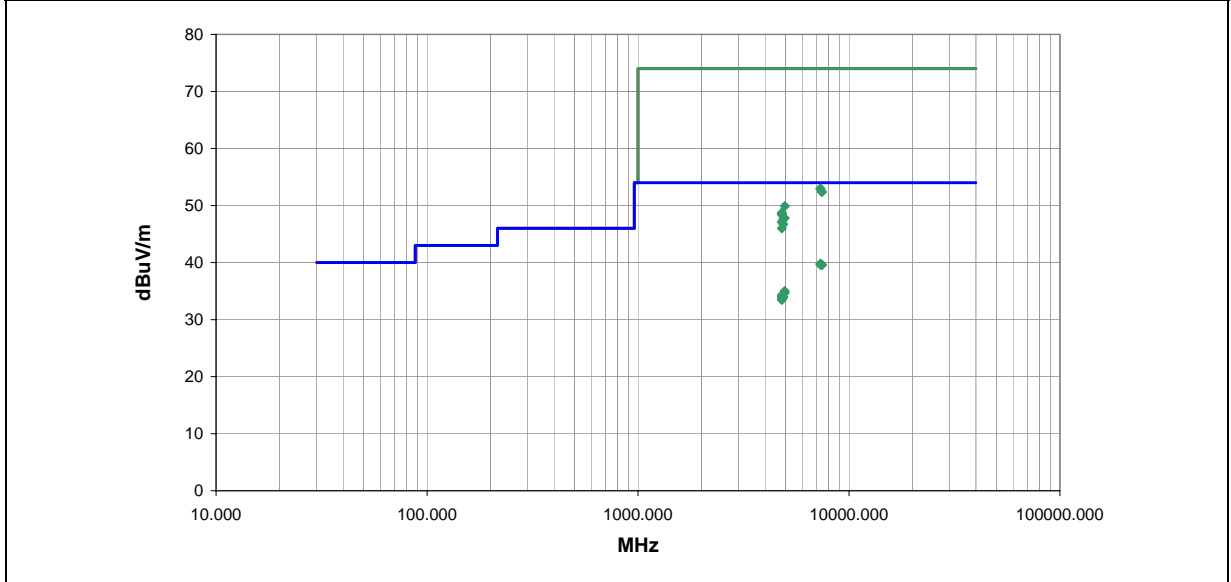
**EUT OPERATING MODES**

Tx, 2.4GHz FHSS radio

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	6	 Signature
Configuration #	6	
Results	Pass	



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7326.833	24.4	15.4	54.0	1.0	3.0	0.0	V-Horn	AV	0.0	39.8	54.0	-14.2	Mid Channel. EUT on side.
7445.653	23.8	15.8	137.0	1.0	3.0	0.0	V-Horn	AV	0.0	39.6	54.0	-14.4	High Channel. EUT on side.
7448.620	23.8	15.8	67.0	1.2	3.0	0.0	H-Horn	AV	0.0	39.6	54.0	-14.4	High Channel. EUT horizontal.
7328.213	24.3	15.3	58.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.6	54.0	-14.4	Mid Channel. EUT horizontal.
4964.167	25.2	9.8	127.0	1.7	3.0	0.0	V-Horn	AV	0.0	35.0	54.0	-19.0	High Channel. EUT on side.
4964.080	24.9	9.8	173.0	1.0	3.0	0.0	H-Horn	AV	0.0	34.7	54.0	-19.3	High Channel. EUT horizontal.
4803.987	25.1	9.2	155.0	1.9	3.0	0.0	H-Horn	AV	0.0	34.3	54.0	-19.7	Low Channel. EUT horizontal.
4803.987	24.9	9.2	356.0	1.0	3.0	0.0	V-Horn	AV	0.0	34.1	54.0	-19.9	Low Channel. EUT on side.
4803.947	24.7	9.2	245.0	1.8	3.0	0.0	V-Horn	AV	0.0	33.9	54.0	-20.1	Low Channel. EUT vertical.
4804.087	24.7	9.2	138.0	2.0	3.0	0.0	H-Horn	AV	0.0	33.9	54.0	-20.1	Low Channel. EUT vertical.
4881.647	24.3	9.6	171.0	3.5	3.0	0.0	H-Horn	AV	0.0	33.9	54.0	-20.1	Mid Channel. EUT horizontal.
4881.780	24.3	9.6	82.0	1.0	3.0	0.0	V-Horn	AV	0.0	33.9	54.0	-20.1	Mid Channel. EUT on side.
4803.740	24.4	9.1	261.0	1.9	3.0	0.0	V-Horn	AV	0.0	33.5	54.0	-20.5	Low Channel. EUT horizontal.
4804.093	24.3	9.2	317.0	1.0	3.0	0.0	H-Horn	AV	0.0	33.5	54.0	-20.5	Low Channel. EUT on side.
7324.653	37.7	15.3	58.0	1.0	3.0	0.0	H-Horn	PK	0.0	53.0	74.0	-21.0	Mid Channel. EUT horizontal.
7326.680	37.6	15.3	54.0	1.0	3.0	0.0	V-Horn	PK	0.0	52.9	74.0	-21.1	Mid Channel. EUT on side.
7444.247	36.6	15.8	67.0	1.2	3.0	0.0	H-Horn	PK	0.0	52.4	74.0	-21.6	High Channel. EUT horizontal.
7446.533	36.6	15.8	137.0	1.0	3.0	0.0	V-Horn	PK	0.0	52.4	74.0	-21.6	High Channel. EUT on side.
4965.407	40.1	9.8	127.0	1.7	3.0	0.0	V-Horn	PK	0.0	49.9	74.0	-24.1	High Channel. EUT on side.
4803.733	39.5	9.2	155.0	1.9	3.0	0.0	H-Horn	PK	0.0	48.7	74.0	-25.3	Low Channel. EUT horizontal.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

**MODES OF OPERATION**

Charging with cradle

**POWER SETTINGS INVESTIGATED**

USB

**CONFIGURATIONS INVESTIGATED**

MCSO1576 - 8

**SAMPLE CALCULATIONS**

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

**TEST EQUIPMENT**

Description	Manufacturer	Model	ID	Last Cal.	Interval
High Pass Filter	TTE	H97-100K-50-720B	HFX	2/9/2011	24 mo
Attenuator	Coaxicom	66702 2910-20	ATO	8/6/2010	12 mo
Receiver	Rohde & Schwarz	ESCI	ARH	3/30/2011	12 mo
EV07 Cables	N/A	Conducted Cables	EVG	6/17/2011	12 mo
LISN	Solar	9252-50-R-24-BNC	LIR	2/17/2011	12 mo

**MEASUREMENT BANDWIDTHS**

	Frequency Range	Peak Data	Quasi-Peak Data	Average Data
	(MHz)	(kHz)	(kHz)	(kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

**MEASUREMENT UNCERTAINTY**


A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

**TEST DESCRIPTION**

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm.

# EMC

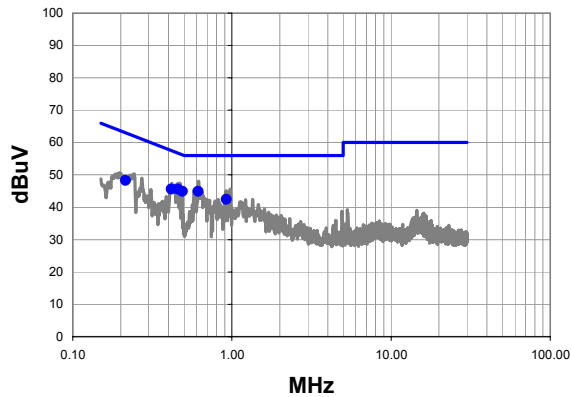
# Powerline Conducted Emissions

<b>Work Order:</b>	MCSO1576	<b>Date:</b>	07/19/11	
<b>Project:</b>	None	<b>Temperature:</b>	23	
<b>Job Site:</b>	EV07	<b>Humidity:</b>	45	
<b>Serial Number:</b>	C13	<b>Barometric Pres.:</b>	29.9	
<b>Tested by:</b>	Ethan Schoonover			
<b>EUT:</b>	Model: 1481			
<b>Configuration:</b>	8			
<b>Customer:</b>	Microsoft Corporation			
<b>Attendees:</b>	None			
<b>EUT Power:</b>	USB			
<b>Operating Mode:</b>	Charging with cradle			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

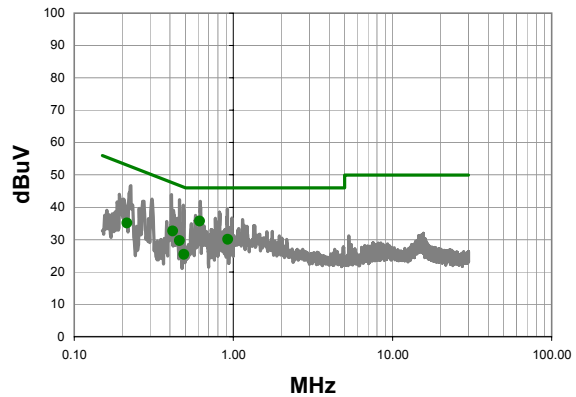
<b>Test Specifications</b> FCC 15.207:2011	<b>Class B</b>	<b>Test Method</b> ANSI C63.10:2009
---	----------------	--

<b>Run #</b>	1	<b>Line:</b>	High Line	<b>Ext. Attenuation:</b>	20	<b>Results</b>	Pass
--------------	---	--------------	-----------	--------------------------	----	----------------	------

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.615	24.8	20.1	44.9	56.0	-11.1
0.458	25.5	20.1	45.6	56.7	-11.1
0.489	24.8	20.1	44.9	56.2	-11.3
0.416	25.5	20.1	45.6	57.5	-11.9
0.923	22.3	20.1	42.4	56.0	-13.6
0.215	28.2	20.1	48.3	63.0	-14.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.615	15.6	20.1	35.7	46.0	-10.3
0.416	12.5	20.1	32.6	47.5	-14.9
0.923	10.0	20.1	30.1	46.0	-15.9
0.458	9.6	20.1	29.7	46.7	-17.0
0.215	15.0	20.1	35.1	53.0	-17.9
0.489	5.3	20.1	25.4	46.2	-20.8

# EMC

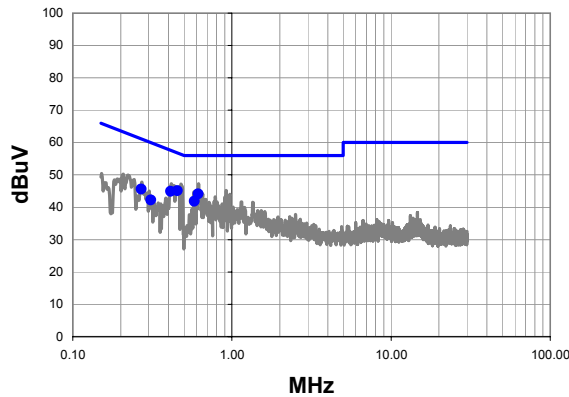
# Powerline Conducted Emissions

<b>Work Order:</b>	MCSO1576	<b>Date:</b>	07/19/11	 <b>Tested by:</b> Ethan Schoonover
<b>Project:</b>	None	<b>Temperature:</b>	23	
<b>Job Site:</b>	EV07	<b>Humidity:</b>	45	
<b>Serial Number:</b>	C13	<b>Barometric Pres.:</b>	29.9	
<b>EUT:</b>	Model: 1481			
<b>Configuration:</b>	8			
<b>Customer:</b>	Microsoft Corporation			
<b>Attendees:</b>	None			
<b>EUT Power:</b>	USB			
<b>Operating Mode:</b>	Charging with cradle			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

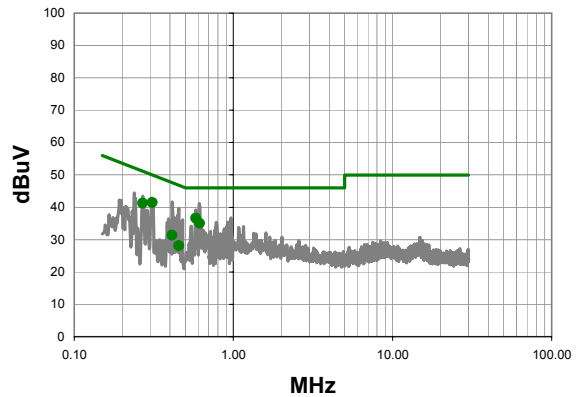
<b>Test Specifications</b> FCC 15.207:2011	<b>Class B</b>	<b>Test Method</b> ANSI C63.10:2009
---	----------------	--

<b>Run #</b>	2	<b>Line:</b>	Neutral	<b>Ext. Attenuation:</b>	20	<b>Results</b>	Pass
--------------	---	--------------	---------	--------------------------	----	----------------	------

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.454	25.0	20.1	45.1	56.8	-11.7
0.615	24.0	20.1	44.1	56.0	-11.9
0.412	24.8	20.1	44.9	57.6	-12.7
0.580	21.7	20.1	41.8	56.0	-14.2
0.269	25.5	20.1	45.6	61.1	-15.5
0.310	22.1	20.1	42.2	60.0	-17.8

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.310	21.3	20.1	41.4	50.0	-8.6
0.580	16.5	20.1	36.6	46.0	-9.4
0.269	21.1	20.1	41.2	51.1	-9.9
0.615	14.9	20.1	35.0	46.0	-11.0
0.412	11.3	20.1	31.4	47.6	-16.2
0.454	8.0	20.1	28.1	46.8	-18.7