

NORTHWEST EMC

Microsoft Corporation

1721

FCC 15.207:2015

FCC 15.247:2015

Report # MCSO1732.2



NVLAP Lab Code: 200629-0

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. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: July 09, 2015
Microsoft Corporation
Model: 1721

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2015	ANSI C63.10:2009
FCC 15.247:2015	ANSI C63.10:2009

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	

Deviations From Test Standards

None

Approved By:



Rod Munro, Operations Manager

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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

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

<http://www.nwemc.com/accreditations/>
<http://gsi.nist.gov/global/docs/cabs/designations.html>

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

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 (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

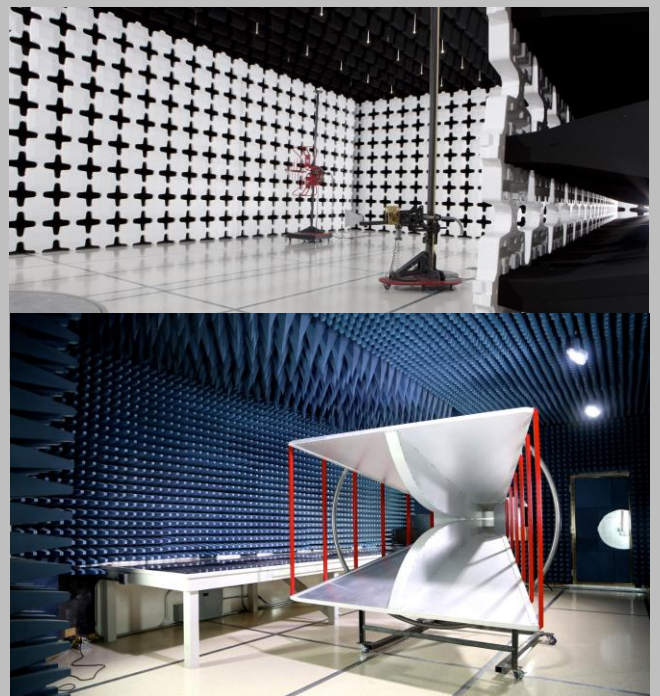
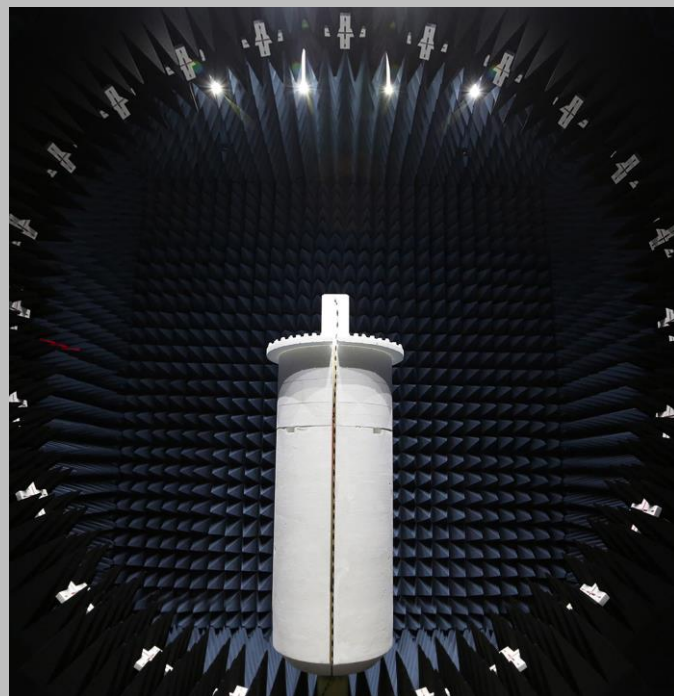
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.0 dB	-5.0 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052
Test Requested By:	Kitty Tam
Model:	Model 1721
First Date of Test:	June 26, 2015
Last Date of Test:	July 09, 2015
Receipt Date of Samples:	June 26, 2015
Equipment Design Stage:	Pre-Production EV2
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Bluetooth Radio Device
Testing Objective:
To demonstrate compliance of the Bluetooth radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration MCSO1732- 1

Software/Firmware Running during test	
Description	Version
N Bluetooth Compliance Tool	v2.13.1750.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Radio Device	Microsoft Corporation	1721	2937901005079752549
USB Cable	Microsoft Corporation	PN: X914502	N/A

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	ThinkPad E440	None
AC/DC Power Supply	Lenovo	ADLX65NLC2A	11SA45N0259Z1AS974CG6XA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1m	No	Bluetooth Radio Device	Laptop PC
AC Power	No	0.9m	No	AC Mains	AC/DC Power Supply
DC Power	No	1.75m	Yes	AC/DC Power Supply	Laptop PC

Configuration MCSO1732- 2

Software/Firmware Running during test	
Description	Version
N Bluetooth Compliance Tool	v2.13.1750.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Radio Device (Hardware Configuration 2)	Microsoft Corporation	1721	2937901003818152549
USB Cable	Microsoft Corporation	PN: X914502	N/A

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC/USB Power Supply	Microsoft Corporation	1623	0D130B0AKCE44

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1m	No	Bluetooth Radio Device	AC/USB Power Supply

CONFIGURATIONS

Configuration MCSO1732- 3

Software/Firmware Running during test	
Description	Version
N Bluetooth Compliance Tool	v2.13.1750.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Radio Device (Hardware Configuration 1)	Microsoft Corporation	1721	2937902003021152649
USB Cable	Microsoft Corporation	PN: X914502	N/A

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	ThinkPad E440	None
AC/DC Power Supply	Lenovo	ADLX65NLC2A	11SA45N0259Z1AS974CG6XA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1m	No	Bluetooth Radio Device	Laptop PC
AC Power	No	0.9m	No	AC Mains	AC/DC Power Supply
DC Power	No	1.75m	Yes	AC/DC Power Supply	Laptop PC

Configuration MCSO1732- 4

Software/Firmware Running during test	
Description	Version
N Bluetooth Compliance Tool	v2.13.1750.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Radio Device (Hardware Configuration 2)	Microsoft Corporation	1721	2937901003818152549
USB Cable	Microsoft Corporation	PN: X914502	N/A

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	ThinkPad E440	None
AC/DC Power Supply	Lenovo	ADLX65NLC2A	11SA45N0259Z1AS974CG6XA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1m	No	Bluetooth Radio Device	Laptop PC
AC Power	No	0.9m	No	AC Mains	AC/DC Power Supply
DC Power	No	1.75m	Yes	AC/DC Power Supply	Laptop PC

CONFIGURATIONS

Configuration MCSO1732- 5

Software/Firmware Running during test					
Description				Version	
N Bluetooth Compliance Tool				v2.13.1750.0	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Radio Device (Hardware Configuration 3)	Microsoft Corporation	1721	2937900007466552649
USB Cable	Microsoft Corporation	PN: X914502	N/A

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop PC	Lenovo	ThinkPad E440	None
AC/DC Power Supply	Lenovo	ADLX65NLC2A	11SA45N0259Z1AS974CG6XA

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1m	No	Bluetooth Radio Device	Laptop PC
AC Power	No	0.9m	No	AC Mains	AC/DC Power Supply
DC Power	No	1.75m	Yes	AC/DC Power Supply	Laptop PC

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/26/2015	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.
2	6/26/2015	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	6/26/2015	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.
4	6/26/2015	Duty Cycle	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	6/26/2015	Power Spectral Density	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	6/26/2015	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.
7	6/29/2015	Powerline 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	7/9/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

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 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50 Ω .

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-R-24-BNC	LIM	12/9/2014	12/09/2015
Cable	Northwest EMC	Conducted / NF Probe Cable	NC4	2/11/2015	02/11/2016
Attenuator	Fairview Microwave	SA03B-20	RKD	10/14/2014	10/14/2015
High Pass Filter	TTE	H97-100K-50-720B	HHF	12/8/2014	12/08/2015
Receiver	Rohde & Schwarz	ESCI	ARE	6/6/2014	12/06/2015

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MCSO1732-2

MODES INVESTIGATED

Transmitting BTLE, Low Channel 0, 2402 MHz
Transmitting BTLE, Mid Channel 20, 2442 MHz
Transmitting BTLE, High Channel 39, 2480 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

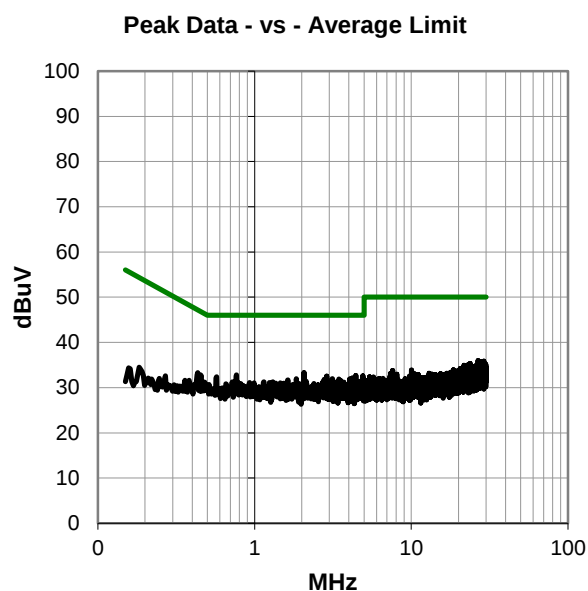
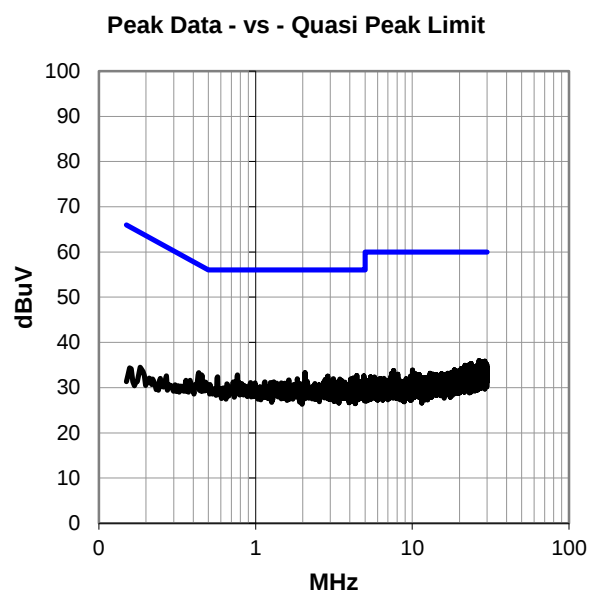
None

EUT OPERATING MODES

Transmitting BTLE, Low Channel 0, 2402 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #1

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.068	12.9	20.4	33.3	56.0	-22.7
0.766	12.5	20.3	32.8	56.0	-23.2
4.429	12.1	20.6	32.7	56.0	-23.3
4.918	12.0	20.6	32.6	56.0	-23.4
2.888	12.1	20.4	32.5	56.0	-23.5
0.572	12.1	20.3	32.4	56.0	-23.6
0.434	13.0	20.3	33.3	57.2	-23.9
4.209	11.5	20.6	32.1	56.0	-23.9
1.851	11.6	20.4	32.0	56.0	-24.0
26.732	12.6	23.4	36.0	60.0	-24.0
0.452	12.5	20.3	32.8	56.8	-24.0
3.138	11.5	20.5	32.0	56.0	-24.0
3.444	11.4	20.5	31.9	56.0	-24.1
4.049	11.3	20.6	31.9	56.0	-24.1
2.784	11.4	20.4	31.8	56.0	-24.2
29.019	12.0	23.8	35.8	60.0	-24.2
27.489	12.3	23.5	35.8	60.0	-24.2
28.187	12.1	23.6	35.7	60.0	-24.3
28.493	12.0	23.7	35.7	60.0	-24.3
1.627	11.3	20.4	31.7	56.0	-24.3
3.541	11.1	20.5	31.6	56.0	-24.4
2.135	11.0	20.4	31.4	56.0	-24.6
2.056	11.0	20.4	31.4	56.0	-24.6
4.720	10.8	20.6	31.4	56.0	-24.6
4.832	10.8	20.6	31.4	56.0	-24.6
23.706	12.5	22.9	35.4	60.0	-24.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.068	12.9	20.4	33.3	46.0	-12.7
0.766	12.5	20.3	32.8	46.0	-13.2
4.429	12.1	20.6	32.7	46.0	-13.3
4.918	12.0	20.6	32.6	46.0	-13.4
2.888	12.1	20.4	32.5	46.0	-13.5
0.572	12.1	20.3	32.4	46.0	-13.6
0.434	13.0	20.3	33.3	47.2	-13.9
4.209	11.5	20.6	32.1	46.0	-13.9
1.851	11.6	20.4	32.0	46.0	-14.0
26.732	12.6	23.4	36.0	50.0	-14.0
0.452	12.5	20.3	32.8	46.8	-14.0
3.138	11.5	20.5	32.0	46.0	-14.0
3.444	11.4	20.5	31.9	46.0	-14.1
4.049	11.3	20.6	31.9	46.0	-14.1
2.784	11.4	20.4	31.8	46.0	-14.2
29.019	12.0	23.8	35.8	50.0	-14.2
27.489	12.3	23.5	35.8	50.0	-14.2
28.187	12.1	23.6	35.7	50.0	-14.3
28.493	12.0	23.7	35.7	50.0	-14.3
1.627	11.3	20.4	31.7	46.0	-14.3
3.541	11.1	20.5	31.6	46.0	-14.4
2.135	11.0	20.4	31.4	46.0	-14.6
2.056	11.0	20.4	31.4	46.0	-14.6
4.720	10.8	20.6	31.4	46.0	-14.6
4.832	10.8	20.6	31.4	46.0	-14.6
23.706	12.5	22.9	35.4	50.0	-14.6

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	2	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

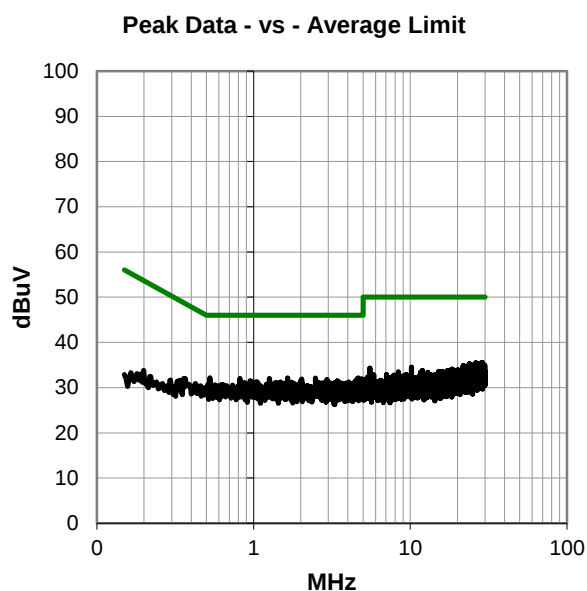
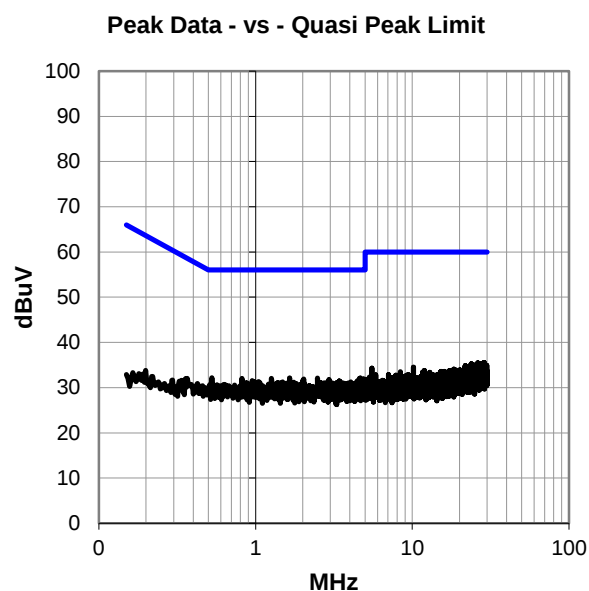
None

EUT OPERATING MODES

Transmitting BTLE, Low Channel 0, 2402 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #2

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.527	11.9	20.3	32.2	56.0	-23.8
2.489	11.7	20.4	32.1	56.0	-23.9
4.672	11.5	20.6	32.1	56.0	-23.9
1.654	11.7	20.4	32.1	56.0	-23.9
1.262	11.7	20.3	32.0	56.0	-24.0
0.818	11.7	20.3	32.0	56.0	-24.0
4.608	11.4	20.6	32.0	56.0	-24.0
4.896	11.3	20.6	31.9	56.0	-24.1
2.027	11.5	20.4	31.9	56.0	-24.1
2.941	11.3	20.4	31.7	56.0	-24.3
28.769	11.8	23.8	35.6	60.0	-24.4
0.952	11.2	20.3	31.5	56.0	-24.5
3.418	11.0	20.5	31.5	56.0	-24.5
2.000	11.1	20.4	31.5	56.0	-24.5
4.440	10.9	20.6	31.5	56.0	-24.5
26.221	12.2	23.3	35.5	60.0	-24.5
28.556	11.7	23.7	35.4	60.0	-24.6
28.504	11.7	23.7	35.4	60.0	-24.6
27.982	11.8	23.6	35.4	60.0	-24.6
1.045	11.0	20.3	31.3	56.0	-24.7
0.982	11.0	20.3	31.3	56.0	-24.7
3.474	10.8	20.5	31.3	56.0	-24.7
27.526	11.8	23.5	35.3	60.0	-24.7
4.045	10.7	20.6	31.3	56.0	-24.7
28.825	11.5	23.8	35.3	60.0	-24.7
23.818	12.4	22.9	35.3	60.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.527	11.9	20.3	32.2	46.0	-13.8
2.489	11.7	20.4	32.1	46.0	-13.9
4.672	11.5	20.6	32.1	46.0	-13.9
1.654	11.7	20.4	32.1	46.0	-13.9
1.262	11.7	20.3	32.0	46.0	-14.0
0.818	11.7	20.3	32.0	46.0	-14.0
4.608	11.4	20.6	32.0	46.0	-14.0
4.896	11.3	20.6	31.9	46.0	-14.1
2.027	11.5	20.4	31.9	46.0	-14.1
2.941	11.3	20.4	31.7	46.0	-14.3
28.769	11.8	23.8	35.6	50.0	-14.4
0.952	11.2	20.3	31.5	46.0	-14.5
3.418	11.0	20.5	31.5	46.0	-14.5
2.000	11.1	20.4	31.5	46.0	-14.5
4.440	10.9	20.6	31.5	46.0	-14.5
26.221	12.2	23.3	35.5	50.0	-14.5
28.556	11.7	23.7	35.4	50.0	-14.6
28.504	11.7	23.7	35.4	50.0	-14.6
27.982	11.8	23.6	35.4	50.0	-14.6
1.045	11.0	20.3	31.3	46.0	-14.7
0.982	11.0	20.3	31.3	46.0	-14.7
3.474	10.8	20.5	31.3	46.0	-14.7
27.526	11.8	23.5	35.3	50.0	-14.7
4.045	10.7	20.6	31.3	46.0	-14.7
28.825	11.5	23.8	35.3	50.0	-14.7
23.818	12.4	22.9	35.3	50.0	-14.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

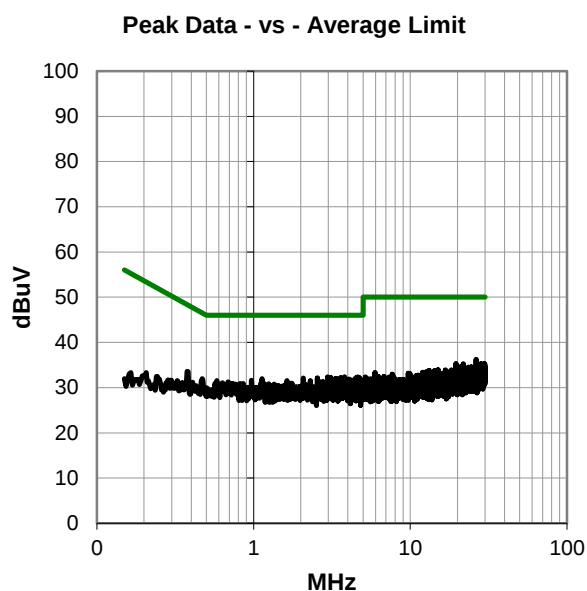
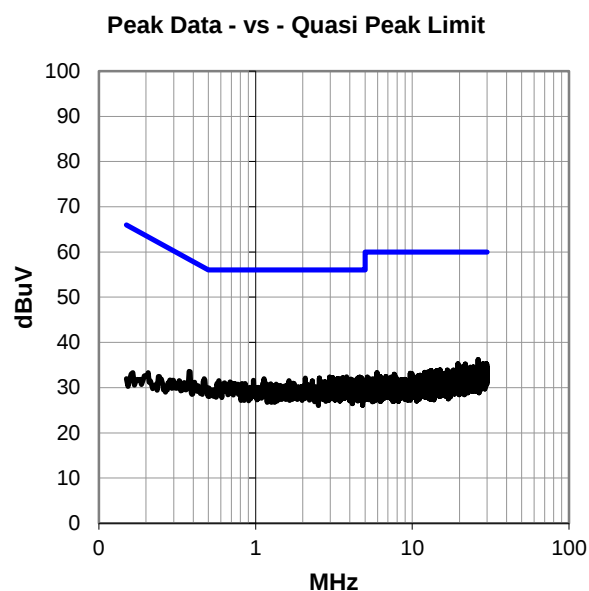
None

EUT OPERATING MODES

Transmitting BTLE, Mid Channel 20, 2442 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #3

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.802	11.8	20.6	32.4	56.0	-23.6
2.970	11.9	20.4	32.3	56.0	-23.7
4.623	11.7	20.6	32.3	56.0	-23.7
3.097	11.8	20.5	32.3	56.0	-23.7
4.735	11.6	20.6	32.2	56.0	-23.8
26.280	12.9	23.3	36.2	60.0	-23.8
3.601	11.6	20.6	32.2	56.0	-23.8
2.556	11.7	20.4	32.1	56.0	-23.9
2.079	11.7	20.4	32.1	56.0	-23.9
4.496	11.5	20.6	32.1	56.0	-23.9
3.676	11.5	20.6	32.1	56.0	-23.9
3.396	11.5	20.5	32.0	56.0	-24.0
3.329	11.5	20.5	32.0	56.0	-24.0
1.131	11.6	20.3	31.9	56.0	-24.1
4.060	11.3	20.6	31.9	56.0	-24.1
4.198	11.1	20.6	31.7	56.0	-24.3
3.940	11.1	20.6	31.7	56.0	-24.3
3.079	11.2	20.5	31.7	56.0	-24.3
26.583	12.3	23.3	35.6	60.0	-24.4
0.971	11.3	20.3	31.6	56.0	-24.4
1.631	11.2	20.4	31.6	56.0	-24.4
0.583	11.2	20.3	31.5	56.0	-24.5
2.303	11.1	20.4	31.5	56.0	-24.5
0.471	11.7	20.3	32.0	56.5	-24.5
3.146	11.0	20.5	31.5	56.0	-24.5
3.963	10.8	20.6	31.4	56.0	-24.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.802	11.8	20.6	32.4	46.0	-13.6
2.970	11.9	20.4	32.3	46.0	-13.7
4.623	11.7	20.6	32.3	46.0	-13.7
3.097	11.8	20.5	32.3	46.0	-13.7
4.735	11.6	20.6	32.2	46.0	-13.8
26.280	12.9	23.3	36.2	50.0	-13.8
3.601	11.6	20.6	32.2	46.0	-13.8
2.556	11.7	20.4	32.1	46.0	-13.9
2.079	11.7	20.4	32.1	46.0	-13.9
4.496	11.5	20.6	32.1	46.0	-13.9
3.676	11.5	20.6	32.1	46.0	-13.9
3.396	11.5	20.5	32.0	46.0	-14.0
3.329	11.5	20.5	32.0	46.0	-14.0
1.131	11.6	20.3	31.9	46.0	-14.1
4.060	11.3	20.6	31.9	46.0	-14.1
4.198	11.1	20.6	31.7	46.0	-14.3
3.940	11.1	20.6	31.7	46.0	-14.3
3.079	11.2	20.5	31.7	46.0	-14.3
26.583	12.3	23.3	35.6	50.0	-14.4
0.971	11.3	20.3	31.6	46.0	-14.4
1.631	11.2	20.4	31.6	46.0	-14.4
0.583	11.2	20.3	31.5	46.0	-14.5
2.303	11.1	20.4	31.5	46.0	-14.5
0.471	11.7	20.3	32.0	46.5	-14.5
3.146	11.0	20.5	31.5	46.0	-14.5
3.963	10.8	20.6	31.4	46.0	-14.6

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

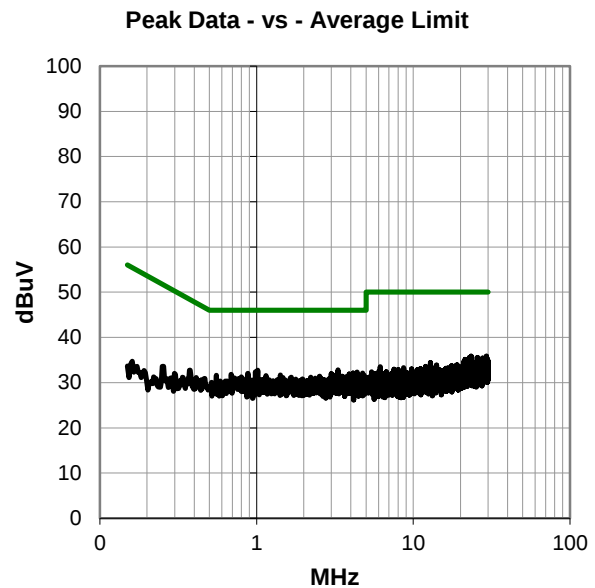
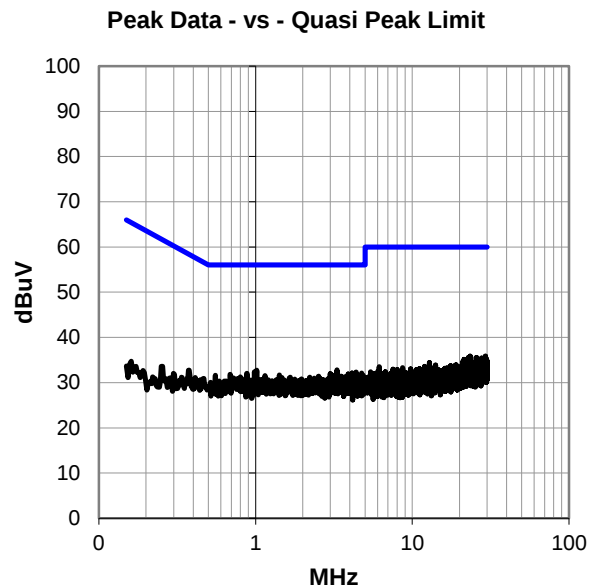
None

EUT OPERATING MODES

Transmitting BTLE, Mid Channel 20, 2442 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.303	12.3	20.5	32.8	56.0	-23.2
1.016	12.4	20.3	32.7	56.0	-23.3
0.986	12.1	20.3	32.4	56.0	-23.6
4.381	11.7	20.6	32.3	56.0	-23.7
4.761	11.5	20.6	32.1	56.0	-23.9
4.131	11.5	20.6	32.1	56.0	-23.9
0.878	11.7	20.3	32.0	56.0	-24.0
2.997	11.5	20.4	31.9	56.0	-24.1
3.903	11.3	20.6	31.9	56.0	-24.1
0.687	11.5	20.3	31.8	56.0	-24.2
23.419	13.0	22.8	35.8	60.0	-24.2
29.403	11.9	23.9	35.8	60.0	-24.2
4.444	11.2	20.6	31.8	56.0	-24.2
3.056	11.3	20.5	31.8	56.0	-24.2
1.418	11.3	20.3	31.6	56.0	-24.4
23.613	12.8	22.8	35.6	60.0	-24.4
0.553	11.3	20.3	31.6	56.0	-24.4
4.858	11.0	20.6	31.6	56.0	-24.4
4.478	11.0	20.6	31.6	56.0	-24.4
25.766	12.4	23.2	35.6	60.0	-24.4
22.904	12.8	22.7	35.5	60.0	-24.5
1.150	11.2	20.3	31.5	56.0	-24.5
4.806	10.9	20.6	31.5	56.0	-24.5
27.720	11.9	23.5	35.4	60.0	-24.6
3.519	10.9	20.5	31.4	56.0	-24.6
2.527	11.0	20.4	31.4	56.0	-24.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.303	12.3	20.5	32.8	46.0	-13.2
1.016	12.4	20.3	32.7	46.0	-13.3
0.986	12.1	20.3	32.4	46.0	-13.6
4.381	11.7	20.6	32.3	46.0	-13.7
4.761	11.5	20.6	32.1	46.0	-13.9
4.131	11.5	20.6	32.1	46.0	-13.9
0.878	11.7	20.3	32.0	46.0	-14.0
2.997	11.5	20.4	31.9	46.0	-14.1
3.903	11.3	20.6	31.9	46.0	-14.1
0.687	11.5	20.3	31.8	46.0	-14.2
23.419	13.0	22.8	35.8	50.0	-14.2
29.403	11.9	23.9	35.8	50.0	-14.2
4.444	11.2	20.6	31.8	46.0	-14.2
3.056	11.3	20.5	31.8	46.0	-14.2
1.418	11.3	20.3	31.6	46.0	-14.4
23.613	12.8	22.8	35.6	50.0	-14.4
0.553	11.3	20.3	31.6	46.0	-14.4
4.858	11.0	20.6	31.6	46.0	-14.4
4.478	11.0	20.6	31.6	46.0	-14.4
25.766	12.4	23.2	35.6	50.0	-14.4
22.904	12.8	22.7	35.5	50.0	-14.5
1.150	11.2	20.3	31.5	46.0	-14.5
4.806	10.9	20.6	31.5	46.0	-14.5
27.720	11.9	23.5	35.4	50.0	-14.6
3.519	10.9	20.5	31.4	46.0	-14.6
2.527	11.0	20.4	31.4	46.0	-14.6

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	5	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

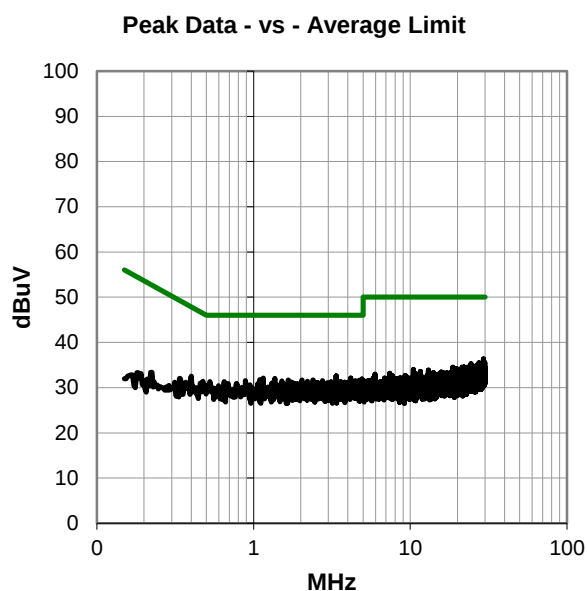
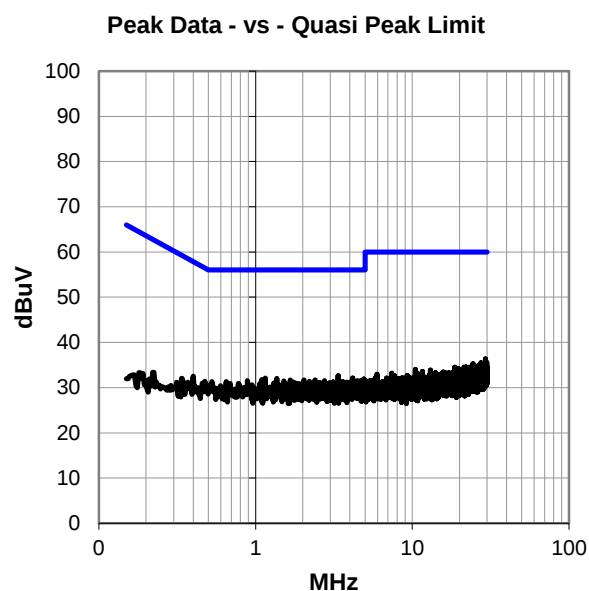
None

EUT OPERATING MODES

Transmitting BTLE, High Channel 39, 2480 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #5

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.370	12.1	20.5	32.6	56.0	-23.4
29.403	12.4	23.9	36.3	60.0	-23.7
1.154	11.8	20.3	32.1	56.0	-23.9
4.172	11.5	20.6	32.1	56.0	-23.9
1.366	11.7	20.3	32.0	56.0	-24.0
4.910	11.3	20.6	31.9	56.0	-24.1
1.101	11.4	20.3	31.7	56.0	-24.3
2.400	11.3	20.4	31.7	56.0	-24.3
2.034	11.3	20.4	31.7	56.0	-24.3
1.665	11.3	20.4	31.7	56.0	-24.3
4.739	11.0	20.6	31.6	56.0	-24.4
0.889	11.2	20.3	31.5	56.0	-24.5
29.903	11.5	24.0	35.5	60.0	-24.5
2.750	11.1	20.4	31.5	56.0	-24.5
4.467	10.9	20.6	31.5	56.0	-24.5
27.429	12.0	23.5	35.5	60.0	-24.5
1.515	11.1	20.4	31.5	56.0	-24.5
3.459	10.9	20.5	31.4	56.0	-24.6
2.206	11.0	20.4	31.4	56.0	-24.6
4.668	10.8	20.6	31.4	56.0	-24.6
27.508	11.9	23.5	35.4	60.0	-24.6
4.317	10.8	20.6	31.4	56.0	-24.6
0.650	11.0	20.3	31.3	56.0	-24.7
29.705	11.3	24.0	35.3	60.0	-24.7
1.736	10.9	20.4	31.3	56.0	-24.7
3.620	10.7	20.6	31.3	56.0	-24.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.370	12.1	20.5	32.6	46.0	-13.4
29.403	12.4	23.9	36.3	50.0	-13.7
1.154	11.8	20.3	32.1	46.0	-13.9
4.172	11.5	20.6	32.1	46.0	-13.9
1.366	11.7	20.3	32.0	46.0	-14.0
4.910	11.3	20.6	31.9	46.0	-14.1
1.101	11.4	20.3	31.7	46.0	-14.3
2.400	11.3	20.4	31.7	46.0	-14.3
2.034	11.3	20.4	31.7	46.0	-14.3
1.665	11.3	20.4	31.7	46.0	-14.3
4.739	11.0	20.6	31.6	46.0	-14.4
0.889	11.2	20.3	31.5	46.0	-14.5
29.903	11.5	24.0	35.5	50.0	-14.5
2.750	11.1	20.4	31.5	46.0	-14.5
4.467	10.9	20.6	31.5	46.0	-14.5
27.429	12.0	23.5	35.5	50.0	-14.5
1.515	11.1	20.4	31.5	46.0	-14.5
3.459	10.9	20.5	31.4	46.0	-14.6
2.206	11.0	20.4	31.4	46.0	-14.6
4.668	10.8	20.6	31.4	46.0	-14.6
27.508	11.9	23.5	35.4	50.0	-14.6
4.317	10.8	20.6	31.4	46.0	-14.6
0.650	11.0	20.3	31.3	46.0	-14.7
29.705	11.3	24.0	35.3	50.0	-14.7
1.736	10.9	20.4	31.3	46.0	-14.7
3.620	10.7	20.6	31.3	46.0	-14.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	1721	Work Order:	MCSO1732
Serial Number:	2937901003818152549	Date:	06/29/2015
Customer:	Microsoft Corporation	Temperature:	24°C
Attendees:	None	Relative Humidity:	52%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	MCSO1732-2

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	6	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

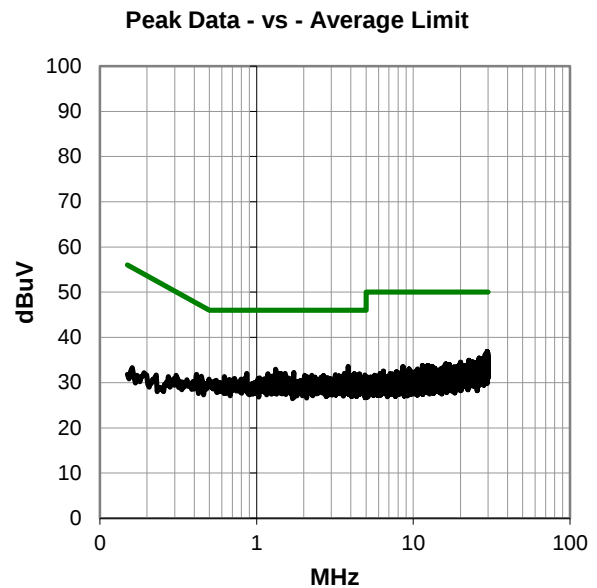
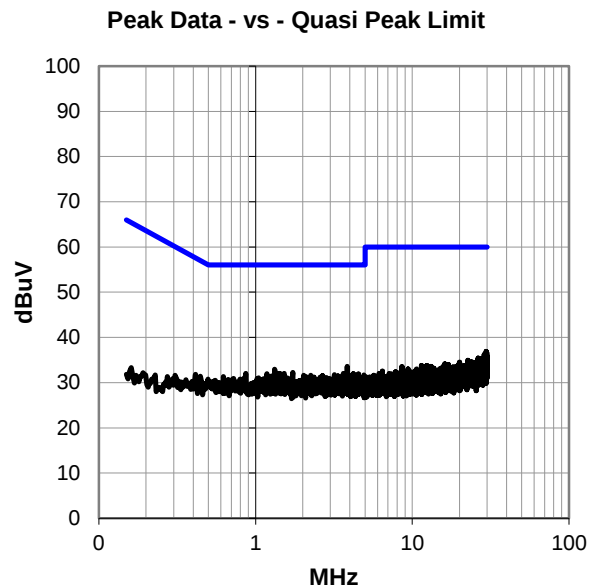
None

EUT OPERATING MODES

Transmitting BTLE, High Channel 39, 2480 MHz
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DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.855	13.0	20.6	33.6	56.0	-22.4
1.325	12.6	20.3	32.9	56.0	-23.1
29.657	12.9	24.0	36.9	60.0	-23.1
29.899	12.6	24.0	36.6	60.0	-23.4
1.728	11.9	20.4	32.3	56.0	-23.7
28.802	12.4	23.8	36.2	60.0	-23.8
3.631	11.5	20.6	32.1	56.0	-23.9
1.523	11.7	20.4	32.1	56.0	-23.9
1.433	11.7	20.3	32.0	56.0	-24.0
1.407	11.7	20.3	32.0	56.0	-24.0
0.866	11.7	20.3	32.0	56.0	-24.0
4.202	11.4	20.6	32.0	56.0	-24.0
1.180	11.6	20.3	31.9	56.0	-24.1
4.530	11.3	20.6	31.9	56.0	-24.1
29.978	11.8	24.0	35.8	60.0	-24.2
3.732	11.2	20.6	31.8	56.0	-24.2
3.183	11.3	20.5	31.8	56.0	-24.2
4.903	11.1	20.6	31.7	56.0	-24.3
3.657	11.1	20.6	31.7	56.0	-24.3
2.250	11.2	20.4	31.6	56.0	-24.4
2.027	11.2	20.4	31.6	56.0	-24.4
4.097	11.0	20.6	31.6	56.0	-24.4
4.060	11.0	20.6	31.6	56.0	-24.4
2.679	11.1	20.4	31.5	56.0	-24.5
3.358	11.0	20.5	31.5	56.0	-24.5
4.120	10.9	20.6	31.5	56.0	-24.5

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.855	13.0	20.6	33.6	46.0	-12.4
1.325	12.6	20.3	32.9	46.0	-13.1
29.657	12.9	24.0	36.9	50.0	-13.1
29.899	12.6	24.0	36.6	50.0	-13.4
1.728	11.9	20.4	32.3	46.0	-13.7
28.802	12.4	23.8	36.2	50.0	-13.8
3.631	11.5	20.6	32.1	46.0	-13.9
1.523	11.7	20.4	32.1	46.0	-13.9
1.433	11.7	20.3	32.0	46.0	-14.0
1.407	11.7	20.3	32.0	46.0	-14.0
0.866	11.7	20.3	32.0	46.0	-14.0
4.202	11.4	20.6	32.0	46.0	-14.0
1.180	11.6	20.3	31.9	46.0	-14.1
4.530	11.3	20.6	31.9	46.0	-14.1
29.978	11.8	24.0	35.8	50.0	-14.2
3.732	11.2	20.6	31.8	46.0	-14.2
3.183	11.3	20.5	31.8	46.0	-14.2
4.903	11.1	20.6	31.7	46.0	-14.3
3.657	11.1	20.6	31.7	46.0	-14.3
2.250	11.2	20.4	31.6	46.0	-14.4
2.027	11.2	20.4	31.6	46.0	-14.4
4.097	11.0	20.6	31.6	46.0	-14.4
4.060	11.0	20.6	31.6	46.0	-14.4
2.679	11.1	20.4	31.5	46.0	-14.5
3.358	11.0	20.5	31.5	46.0	-14.5
4.120	10.9	20.6	31.5	46.0	-14.5

CONCLUSION

Pass



Tested By

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

CHANNELS TESTED

Low Channel 0, 2402 MHz

Mid Channel 20, 2442 MHz

High Channel 39, 2480 MHz

MODES OF OPERATION

Transmitting Bluetooth Low Energy

POWER SETTINGS INVESTIGATED

USB

CONFIGURATIONS INVESTIGATED

MCSO1732 - 3

MCSO1732 - 4

MCSO1732 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 26 GHz

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
Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12 mo
Spectrum Analyzer	Agilent Technologies	N9010A	R104	4/15/2014	24 mo
High Pass Filter, 2.8 - 18 GHz	Micro-Tronics	HPM50111	HHL	12/9/2014	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	10/13/2014	12 mo
Low Pass Filter, 0 - 1000 MHz	Micro-Tronics	LPM50004	LFF	3/6/2015	12 mo
Antenna, Bilog	Teseq	CBL 6144	AYG	3/5/2015	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	9/8/2014	12 mo
NC01 Cables	Northwest EMC	Bilog Cables	NC1	9/8/2014	12 mo
Antenna, Horn	EMCO	3115	AHM	6/3/2014	24 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	9/8/2014	12 mo
NC01 Cables	Northwest EMC	3115 Horn Cable	NC2	6/17/2015	12 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	10/13/2014	12 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AQJ	10/13/2014	12 mo
NC01 Cables	Northwest EMC	Standard Gain Horn Cable	NC3	6/17/2015	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIY	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	6/6/2015	12 mo
18-26GHz Horn Antenna Cable	Northwest EMC	N/A	NC8	6/6/2015	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (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

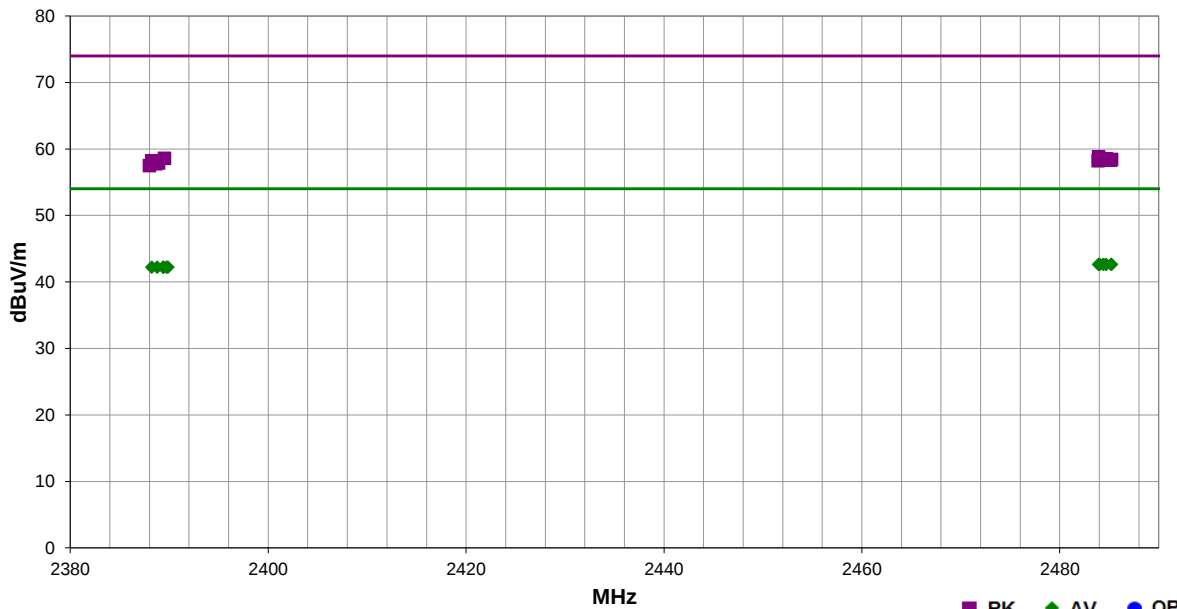
TEST DESCRIPTION

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. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Work Order:	MCSO1732	Date:	07/09/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	50% RH	
Serial Number:	2937900007466552649	Barometric Pres.:	1008 mbar	
EUT:	1721			
Configuration:	5			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 3. 2.4 GHz Band Edge Measurements.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	151	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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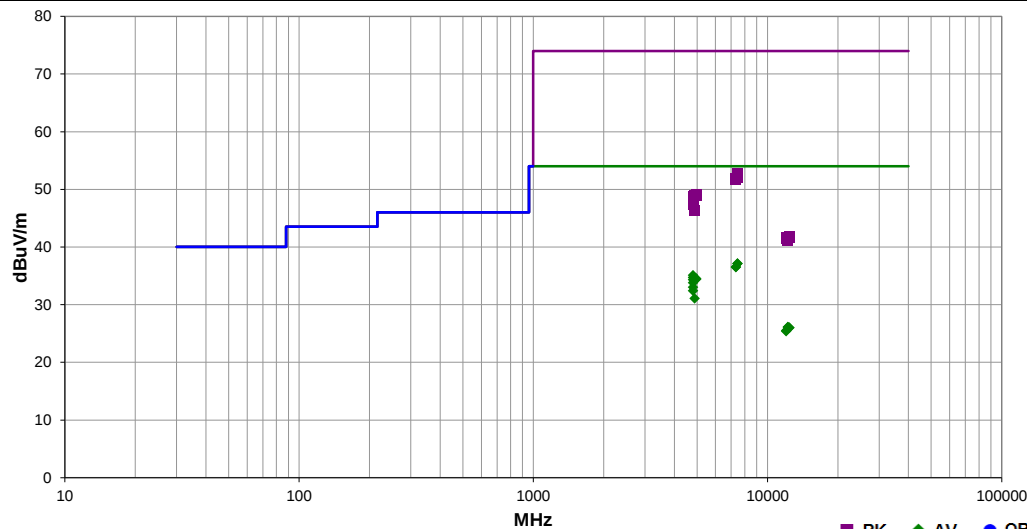


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.220	24.7	-2.1	1.3	66.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Vert
2485.217	24.7	-2.1	1.3	122.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Vert
2484.683	24.7	-2.1	1.3	229.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Disp. Up
2484.413	24.7	-2.1	1.3	202.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Disp. Up
2484.050	24.7	-2.1	1.3	308.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Flat
2483.913	24.7	-2.1	1.3	317.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Flat
2389.870	24.5	-2.3	1.3	203.0	3.0	20.0	Vert	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Vert
2389.740	24.5	-2.3	1.3	83.0	3.0	20.0	Horz	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Flat
2389.443	24.5	-2.3	1.1	249.0	3.0	20.0	Vert	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Flat
2389.383	24.5	-2.3	1.8	185.0	3.0	20.0	Horz	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Disp. Up
2388.783	24.5	-2.3	1.6	289.0	3.0	20.0	Horz	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Vert
2388.237	24.5	-2.3	1.3	248.0	3.0	20.0	Vert	AV	0.0	42.2	54.0	-11.8	Low Ch 0, EUT Disp. Up
2483.923	40.9	-2.1	1.3	202.0	3.0	20.0	Vert	PK	0.0	58.8	74.0	-15.2	High Ch 39, EUT Disp. Up
2389.507	40.9	-2.3	1.8	185.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Low Ch 0, EUT Disp. Up
2484.680	40.6	-2.1	1.3	308.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	High Ch 39, EUT Flat
2484.530	40.6	-2.1	1.3	66.0	3.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	High Ch 39, EUT Vert
2485.243	40.5	-2.1	1.3	229.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	High Ch 39, EUT Disp. Up
2485.083	40.4	-2.1	1.3	317.0	3.0	20.0	Horz	PK	0.0	58.3	74.0	-15.7	High Ch 39, EUT Flat
2483.890	40.3	-2.1	1.3	122.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	High Ch 39, EUT Vert
2388.243	40.5	-2.3	1.3	83.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	Low Ch 0, EUT Flat
2388.233	40.3	-2.3	1.6	289.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	Low Ch 0, EUT Vert
2388.920	40.2	-2.3	1.3	203.0	3.0	20.0	Vert	PK	0.0	57.9	74.0	-16.1	Low Ch 0, EUT Vert
2388.640	40.1	-2.3	1.3	248.0	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	Low Ch 0, EUT Disp. Up
2388.000	39.8	-2.3	1.1	249.0	3.0	20.0	Vert	PK	0.0	57.5	74.0	-16.5	Low Ch 0, EUT Flat

Work Order:	MCSO1732	Date:	07/09/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	50% RH	
Serial Number:	2937900007466552649	Barometric Pres.:	1008 mbar	
EUT:	1721	Tested by:	Richard Mellroth	
Configuration:	5			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 3.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	152-153	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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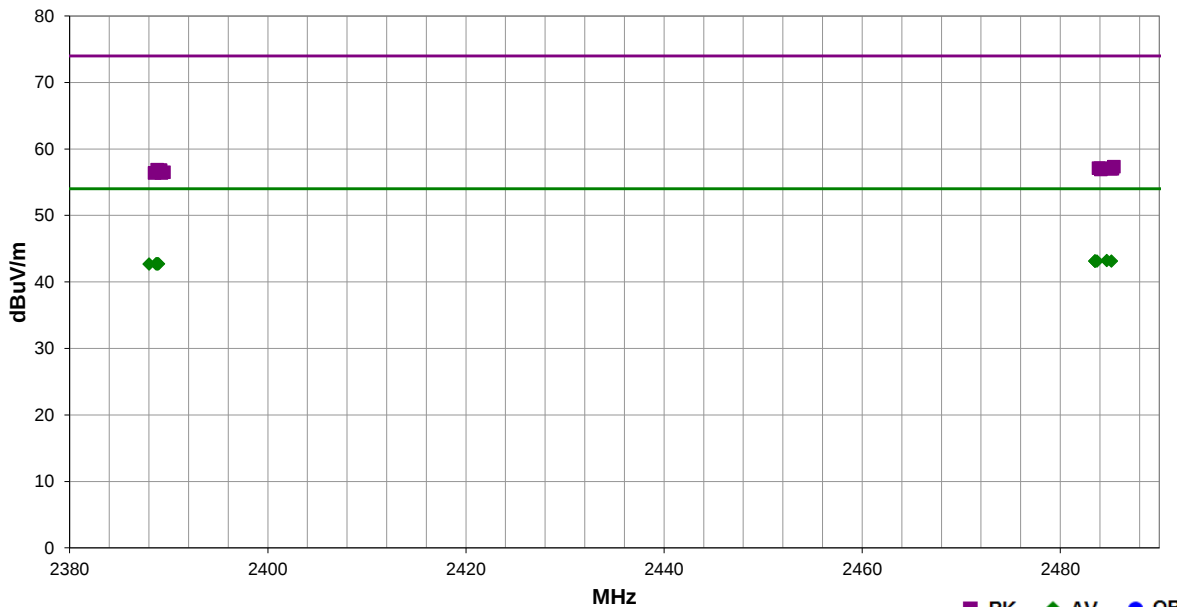


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7438.670	22.9	14.2	1.3	275.0	3.0	0.0	Vert	AV	0.0	37.1	54.0	-16.9	High Ch 39, EUT Flat
7438.860	22.9	14.2	3.4	94.0	3.0	0.0	Horz	AV	0.0	37.1	54.0	-16.9	High Ch 39, EUT Vert
7324.930	23.1	13.4	2.2	281.0	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5	Mid Ch 20, EUT Flat
7324.615	23.1	13.4	3.5	158.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	Mid Ch 20, EUT Vert
4804.525	27.0	8.1	1.3	294.0	3.0	0.0	Horz	AV	0.0	35.1	54.0	-18.9	Low Ch 0, EUT Vert
4804.420	26.6	8.1	1.6	357.0	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	Low Ch 0, EUT Flat
4960.085	26.0	8.5	1.2	348.0	3.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	High Ch 39, EUT Vert
4960.255	25.9	8.5	1.7	346.0	3.0	0.0	Vert	AV	0.0	34.4	54.0	-19.6	High Ch 39, EUT Flat
4884.330	25.8	8.6	1.3	315.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	Mid Ch 20, EUT Vert
4804.480	26.2	8.1	2.1	294.0	3.0	0.0	Horz	AV	0.0	34.3	54.0	-19.7	Low Ch 0, EUT Disp. Up
4804.500	25.7	8.1	1.6	26.0	3.0	0.0	Horz	AV	0.0	33.8	54.0	-20.2	Low Ch 0, EUT Flat
4804.530	24.9	8.1	1.3	204.0	3.0	0.0	Vert	AV	0.0	33.0	54.0	-21.0	Low Ch 0, EUT Vert
7439.310	38.6	14.2	3.4	94.0	3.0	0.0	Horz	PK	0.0	52.8	74.0	-21.2	High Ch 39, EUT Vert
4804.460	24.3	8.1	2.3	242.0	3.0	0.0	Vert	AV	0.0	32.4	54.0	-21.6	Low Ch 0, EUT Disp. Up
7438.590	37.8	14.2	1.3	275.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	High Ch 39, EUT Flat
7326.310	38.4	13.5	2.2	281.0	3.0	0.0	Vert	PK	0.0	51.9	74.0	-22.1	Mid Ch 20, EUT Flat
7327.420	38.3	13.5	3.5	158.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	Mid Ch 20, EUT Vert
4884.175	22.5	8.6	1.3	178.0	3.0	0.0	Vert	AV	0.0	31.1	54.0	-22.9	Mid Ch 20, EUT Flat
4960.215	40.6	8.5	1.7	346.0	3.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	High Ch 39, EUT Flat
4884.275	40.4	8.6	1.3	315.0	3.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	Mid Ch 20, EUT Vert
4960.005	40.4	8.5	1.2	348.0	3.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	High Ch 39, EUT Vert
4804.390	40.7	8.1	1.6	357.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Low Ch 0, EUT Flat
4803.650	40.7	8.1	1.3	294.0	3.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	Low Ch 0, EUT Vert
4804.490	39.7	8.1	2.1	294.0	3.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	Low Ch 0, EUT Disp. Up
4804.765	39.5	8.1	2.3	242.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	Low Ch 0, EUT Disp. Up
4804.345	39.4	8.1	1.3	204.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Low Ch 0, EUT Vert
4804.440	39.3	8.1	1.6	26.0	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	Low Ch 0, EUT Flat
4884.575	37.8	8.6	1.3	178.0	3.0	0.0	Vert	PK	0.0	46.4	74.0	-27.6	Mid Ch 20, EUT Flat
12211.430	26.9	-0.8	1.3	133.0	3.0	0.0	Horz	AV	0.0	26.1	54.0	-27.9	Mid Ch 20, EUT Vert
12210.750	26.9	-0.8	1.3	349.0	3.0	0.0	Vert	AV	0.0	26.1	54.0	-27.9	Mid Ch 20, EUT Flat
12399.930	26.9	-0.9	3.2	0.0	3.0	0.0	Horz	AV	0.0	26.0	54.0	-28.0	High Ch 39, EUT Vert
12400.000	26.9	-0.9	1.3	0.0	3.0	0.0	Vert	AV	0.0	26.0	54.0	-28.0	High Ch 39, EUT Flat
12011.400	27.2	-1.7	2.5	111.0	3.0	0.0	Vert	AV	0.0	25.5	54.0	-28.5	Low Ch 0, EUT Flat
12010.270	27.1	-1.7	1.3	335.0	3.0	0.0	Horz	AV	0.0	25.4	54.0	-28.6	Low Ch 0, EUT Vert
12399.980	42.7	-0.9	3.2	0.0	3.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	High Ch 39, EUT Flat
12399.110	42.6	-0.9	1.3	0.0	3.0	0.0	Vert	PK	0.0	41.7	74.0	-32.3	High Ch 39, EUT Vert
12008.560	43.3	-1.7	2.5	111.0	3.0	0.0	Vert	PK	0.0	41.6	74.0	-32.4	Low Ch 0, EUT Flat
12208.700	42.2	-0.8	1.3	133.0	3.0	0.0	Horz	PK	0.0	41.4	74.0	-32.6	Mid Ch 20, EUT Vert
12011.430	43.1	-1.7	1.3	335.0	3.0	0.0	Horz	PK	0.0	41.4	74.0	-32.6	Low Ch 0, EUT Vert
12209.640	42.0	-0.8	1.3	349.0	3.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	Mid Ch 20, EUT Flat

Work Order:	MCSO1732	Date:	07/02/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	48% RH	
Serial Number:	2937901003818152549	Barometric Pres.:	1017 mbar	Tested by: Richard Mellroth
EUT:	1721			
Configuration:	4			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 2. 2.4 GHz Band Edge Measurements.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

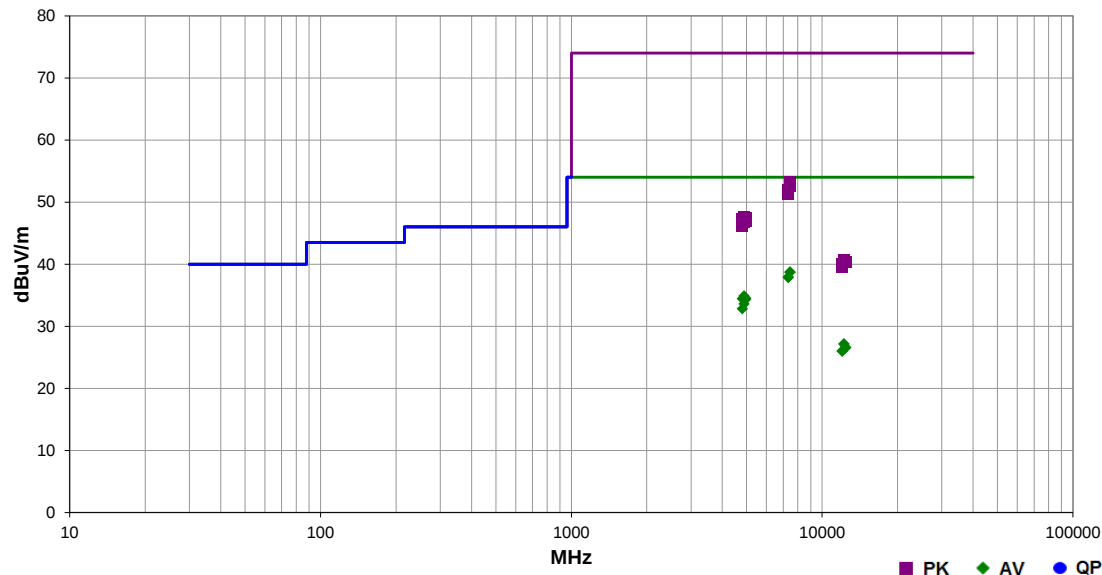
Run #	52	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.700	25.3	-2.1	1.6	246.0	3.0	20.0	Horz	AV	0.0	43.2	54.0	-10.8	High Ch 39, EUT Vert
2485.170	25.2	-2.1	1.3	213.0	3.0	20.0	Vert	AV	0.0	43.1	54.0	-10.9	High Ch 39, EUT Flat
2483.713	25.2	-2.1	1.4	284.0	3.0	20.0	Vert	AV	0.0	43.1	54.0	-10.9	High Ch 39, EUT Disp. Up
2483.523	25.2	-2.1	3.6	211.0	3.0	20.0	Horz	AV	0.0	43.1	54.0	-10.9	High Ch 39, EUT Flat
2483.503	25.2	-2.1	1.3	340.0	3.0	20.0	Vert	AV	0.0	43.1	54.0	-10.9	High Ch 39, EUT Vert
2483.510	25.2	-2.1	1.3	30.0	3.0	20.0	Horz	AV	0.0	43.1	54.0	-10.9	High Ch 39, EUT Disp. Up
2388.970	25.0	-2.3	1.3	137.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Flat
2388.887	25.0	-2.3	1.3	65.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Vert
2388.827	25.0	-2.3	1.4	71.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Disp. Up
2388.817	25.0	-2.3	2.3	245.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Flat
2388.720	25.0	-2.3	1.3	359.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Disp. Up
2388.023	25.0	-2.3	1.3	216.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	Low Ch 0, EUT Vert
2485.413	39.4	-2.1	1.6	246.0	3.0	20.0	Horz	PK	0.0	57.3	74.0	-16.7	High Ch 39, EUT Vert
2484.057	39.2	-2.1	3.6	211.0	3.0	20.0	Horz	PK	0.0	57.1	74.0	-16.9	High Ch 39, EUT Flat
2483.853	39.2	-2.1	1.4	284.0	3.0	20.0	Vert	PK	0.0	57.1	74.0	-16.9	High Ch 39, EUT Disp. Up
2485.103	39.1	-2.1	1.3	340.0	3.0	20.0	Vert	PK	0.0	57.0	74.0	-17.0	High Ch 39, EUT Vert
2485.270	39.1	-2.1	1.3	30.0	3.0	20.0	Horz	PK	0.0	57.0	74.0	-17.0	High Ch 39, EUT Disp. Up
2484.103	39.0	-2.1	1.3	213.0	3.0	20.0	Vert	PK	0.0	56.9	74.0	-17.1	High Ch 39, EUT Flat
2388.833	39.2	-2.3	2.3	245.0	3.0	20.0	Horz	PK	0.0	56.9	74.0	-17.1	Low Ch 0, EUT Flat
2389.180	39.1	-2.3	1.3	216.0	3.0	20.0	Horz	PK	0.0	56.8	74.0	-17.2	Low Ch 0, EUT Vert
2389.127	39.1	-2.3	1.3	137.0	3.0	20.0	Vert	PK	0.0	56.8	74.0	-17.2	Low Ch 0, EUT Flat
2389.527	38.8	-2.3	1.3	65.0	3.0	20.0	Vert	PK	0.0	56.5	74.0	-17.5	Low Ch 0, EUT Vert
2389.250	38.7	-2.3	1.4	71.0	3.0	20.0	Horz	PK	0.0	56.4	74.0	-17.6	Low Ch 0, EUT Disp. Up
2388.573	38.7	-2.3	1.3	359.0	3.0	20.0	Vert	PK	0.0	56.4	74.0	-17.6	Low Ch 0, EUT Disp. Up

Work Order:	MCSO1732	Date:	07/02/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	48% RH	
Serial Number:	2937901003818152549	Barometric Pres.:	1017 mbar	
EUT:	1721	Tested by:	Richard Mellroth	
Configuration:	4			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 2			

Test Specifications					Test Method		
FCC 15.247:2015					ANSI C63.10:2009		
Run #	53-54	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass

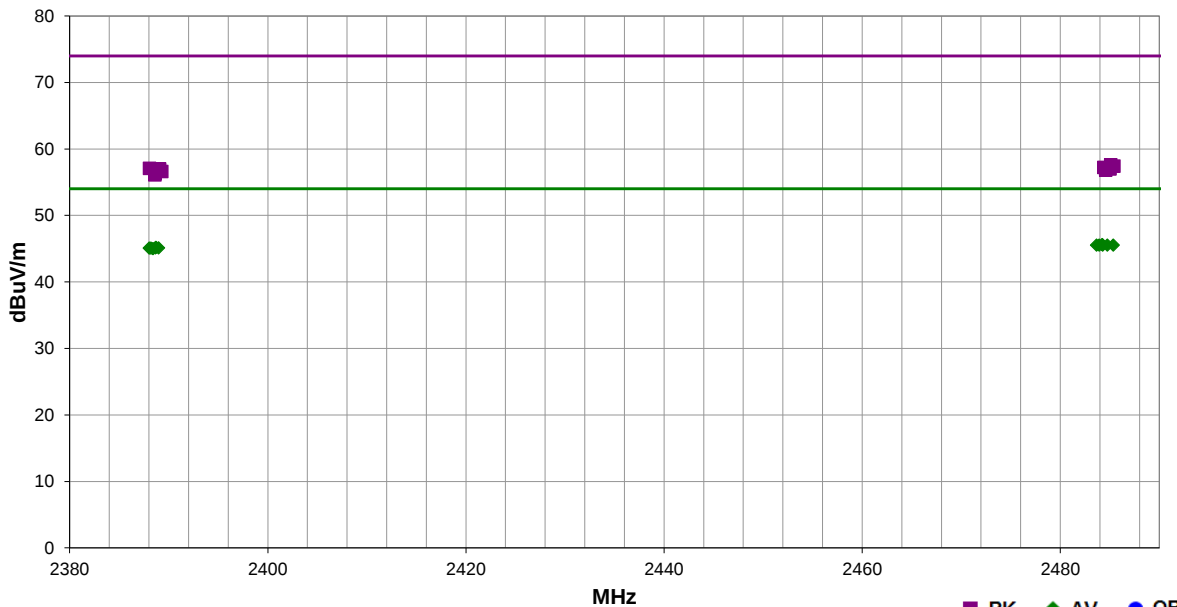


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7440.785	24.5	14.2	2.6	339.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	High Ch 39, EUT Flat
7441.085	24.5	14.2	1.3	122.0	3.0	0.0	Vert	AV	0.0	38.7	54.0	-15.3	High Ch 39, EUT Vert
7325.100	24.5	13.4	3.7	313.0	3.0	0.0	Horz	AV	0.0	37.9	54.0	-16.1	Mid Ch 20, EUT Flat
7324.670	24.4	13.4	1.3	90.0	3.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Mid Ch 20, EUT Vert
4884.495	26.3	8.6	1.3	31.0	3.0	0.0	Horz	AV	0.0	34.9	54.0	-19.1	Mid Ch 20, EUT Flat
4960.510	26.0	8.5	1.3	327.0	3.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	High Ch 39, EUT Flat
4804.505	26.3	8.1	1.3	22.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	Low Ch 0, EUT Flat
4960.475	25.8	8.5	4.0	360.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	High Ch 39, EUT Vert
4884.455	25.0	8.6	1.8	326.0	3.0	0.0	Vert	AV	0.0	33.6	54.0	-20.4	Mid Ch 20, EUT Vert
7439.730	39.0	14.2	2.6	339.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	High Ch 39, EUT Flat
4804.425	24.7	8.1	1.3	227.0	3.0	0.0	Vert	AV	0.0	32.8	54.0	-21.2	Low Ch 0, EUT Vert
7440.390	38.3	14.2	1.3	122.0	3.0	0.0	Vert	PK	0.0	52.5	74.0	-21.5	High Ch 39, EUT Vert
7326.110	38.5	13.5	1.3	90.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Mid Ch 20, EUT Vert
7325.585	37.8	13.5	3.7	313.0	3.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	Mid Ch 20, EUT Vert
4884.680	39.0	8.6	1.3	31.0	3.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	Mid Ch 20, EUT Flat
4959.775	39.0	8.5	4.0	360.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	High Ch 39, EUT Vert
4803.945	39.1	8.1	1.3	22.0	3.0	0.0	Horz	PK	0.0	47.2	74.0	-26.8	Low Ch 0, EUT Flat
12211.140	27.9	-0.8	1.3	207.0	3.0	0.0	Horz	AV	0.0	27.1	54.0	-26.9	Mid Ch 20, EUT Flat
12210.710	27.9	-0.8	1.3	339.0	3.0	0.0	Vert	AV	0.0	27.1	54.0	-26.9	Mid Ch 20, EUT Vert
4960.490	38.4	8.5	1.3	327.0	3.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1	High Ch 39, EUT Flat
4884.365	38.3	8.6	1.8	326.0	3.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1	Mid Ch 20, EUT Vert
12399.860	27.5	-0.9	2.6	17.0	3.0	0.0	Horz	AV	0.0	26.6	54.0	-27.4	High Ch 39, EUT Flat
12400.000	27.4	-0.9	1.3	342.0	3.0	0.0	Vert	AV	0.0	26.5	54.0	-27.5	High Ch 39, EUT Vert
4804.030	38.1	8.1	1.3	227.0	3.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	Low Ch 0, EUT Vert
12009.230	27.7	-1.7	1.3	351.0	3.0	0.0	Vert	AV	0.0	26.0	54.0	-28.0	Low Ch 0, EUT Vert
12008.500	27.7	-1.7	1.3	295.0	3.0	0.0	Horz	AV	0.0	26.0	54.0	-28.0	Low Ch 0, EUT Flat
12211.080	41.4	-0.8	1.3	207.0	3.0	0.0	Horz	PK	0.0	40.6	74.0	-33.4	Mid Ch 20, EUT Flat
12209.520	41.4	-0.8	1.3	339.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	Mid Ch 20, EUT Vert
12398.580	41.2	-0.9	2.6	17.0	3.0	0.0	Horz	PK	0.0	40.3	74.0	-33.7	High Ch 39, EUT Flat
12398.890	41.2	-0.9	1.3	342.0	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	High Ch 39, EUT Vert
12009.310	41.7	-1.7	1.3	295.0	3.0	0.0	Horz	PK	0.0	40.0	74.0	-34.0	Low Ch 0, EUT Flat
12010.260	41.3	-1.7	1.3	351.0	3.0	0.0	Vert	PK	0.0	39.6	74.0	-34.4	Low Ch 0, EUT Vert

Work Order:	MCSO1732	Date:	07/01/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	48% RH	
Serial Number:	2937902003021152649	Barometric Pres.:	1018 mbar	
EUT:	1721			
Configuration:	3			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 1. 2.4 GHz Band Edge Measurements.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	32	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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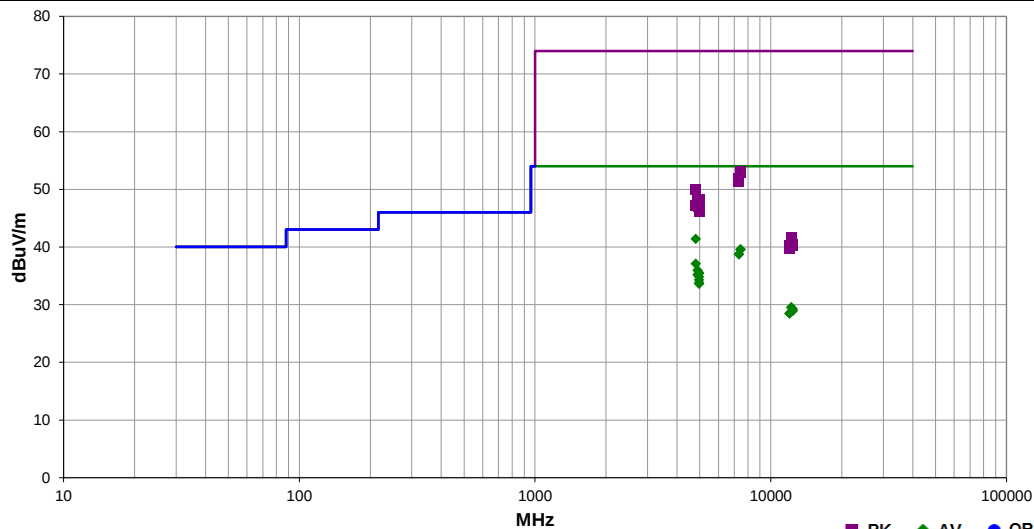


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.227	27.7	-2.1	1.3	255.0	3.0	20.0	Horz	AV	0.0	45.6	54.0	-8.4	High Ch 39, EUT Flat
2485.353	27.6	-2.1	1.3	33.0	3.0	20.0	Horz	AV	0.0	45.5	54.0	-8.5	High Ch 39, EUT Vert
2484.757	27.6	-2.1	1.3	5.0	3.0	20.0	Horz	AV	0.0	45.5	54.0	-8.5	High Ch 39, EUT Disp. Up
2484.283	27.6	-2.1	1.3	101.0	3.0	20.0	Vert	AV	0.0	45.5	54.0	-8.5	High Ch 39, EUT Vert
2483.930	27.6	-2.1	1.3	142.0	3.0	20.0	Vert	AV	0.0	45.5	54.0	-8.5	High Ch 39, EUT Flat
2483.670	27.6	-2.1	1.3	323.0	3.0	20.0	Vert	AV	0.0	45.5	54.0	-8.5	High Ch 39, EUT Disp. Up
2388.710	27.5	-2.3	1.5	58.0	3.0	20.0	Vert	AV	0.0	45.2	54.0	-8.8	Low Ch 0, EUT Disp. Up
2388.977	27.4	-2.3	3.8	171.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Flat
2388.650	27.4	-2.3	1.3	21.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Vert
2388.210	27.4	-2.3	1.3	20.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Vert
2388.037	27.4	-2.3	1.3	323.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Disp. Up
2388.413	27.3	-2.3	1.3	301.0	3.0	20.0	Horz	AV	0.0	45.0	54.0	-9.0	Low Ch 0, EUT Flat
2485.093	39.7	-2.1	1.3	255.0	3.0	20.0	Horz	PK	0.0	57.6	74.0	-16.4	High Ch 39, EUT Flat
2485.403	39.5	-2.1	1.3	33.0	3.0	20.0	Horz	PK	0.0	57.4	74.0	-16.6	High Ch 39, EUT Vert
2484.403	39.3	-2.1	1.3	323.0	3.0	20.0	Vert	PK	0.0	57.2	74.0	-16.8	High Ch 39, EUT Disp. Up
2388.053	39.4	-2.3	1.3	20.0	3.0	20.0	Vert	PK	0.0	57.1	74.0	-16.9	Low Ch 0, EUT Vert
2484.990	39.1	-2.1	1.3	142.0	3.0	20.0	Vert	PK	0.0	57.0	74.0	-17.0	High Ch 39, EUT Flat
2485.000	39.1	-2.1	1.3	5.0	3.0	20.0	Horz	PK	0.0	57.0	74.0	-17.0	High Ch 39, EUT Disp. Up
2389.070	39.3	-2.3	1.3	323.0	3.0	20.0	Horz	PK	0.0	57.0	74.0	-17.0	Low Ch 0, EUT Disp. Up
2389.060	39.2	-2.3	1.5	58.0	3.0	20.0	Vert	PK	0.0	56.9	74.0	-17.1	Low Ch 0, EUT Disp. Up
2484.587	38.9	-2.1	1.3	101.0	3.0	20.0	Vert	PK	0.0	56.8	74.0	-17.2	High Ch 39, EUT Vert
2389.297	38.9	-2.3	1.3	301.0	3.0	20.0	Horz	PK	0.0	56.6	74.0	-17.4	Low Ch 0, EUT Flat
2388.613	38.6	-2.3	3.8	171.0	3.0	20.0	Vert	PK	0.0	56.3	74.0	-17.7	Low Ch 0, EUT Flat
2388.610	38.4	-2.3	1.3	21.0	3.0	20.0	Horz	PK	0.0	56.1	74.0	-17.9	Low Ch 0, EUT Vert

Work Order:	MCSO1732	Date:	07/01/15	
Project:	None	Temperature:	23 °C	
Job Site:	NC01	Humidity:	48% RH	
Serial Number:	2937902003021152649	Barometric Pres.:	1018 mbar	
EUT:	1721	Tested by:	Richard Mellroth	
Configuration:	3			
Customer:	Microsoft Corporation			
Attendees:	None			
EUT Power:	USB			
Operating Mode:	Transmitting BT LE. See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	Hardware Configuration 1.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	33-34	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4804.465	33.3	8.1	1.3	26.0	3.0	0.0	Horz	AV	0.0	41.4	54.0	-12.6	Low Ch 0, EUT Flat
7439.925	25.4	14.2	1.3	0.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	High Ch 39, EUT Vert
7440.100	25.3	14.2	1.2	351.0	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5	High Ch 39, EUT Flat
7324.610	25.3	13.4	1.3	360.0	3.0	0.0	Vert	AV	0.0	38.7	54.0	-15.3	Mid Ch 20, EUT Vert
7324.500	25.3	13.4	1.3	295.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	Mid Ch 20, EUT Flat
4804.465	29.0	8.1	1.3	193.0	3.0	0.0	Vert	AV	0.0	37.1	54.0	-16.9	Low Ch 0, EUT Vert
4884.105	27.4	8.6	1.3	41.0	3.0	0.0	Horz	AV	0.0	36.0	54.0	-18.0	Mid Ch 20, EUT Flat
4960.105	27.0	8.5	1.3	55.0	3.0	0.0	Horz	AV	0.0	35.5	54.0	-18.5	High Ch 39, EUT Vert
4960.105	26.9	8.5	1.3	31.0	3.0	0.0	Horz	AV	0.0	35.4	54.0	-18.6	High Ch 39, EUT Flat
4884.105	26.6	8.6	3.4	322.0	3.0	0.0	Vert	AV	0.0	35.2	54.0	-18.8	Mid Ch 20, EUT Vert
4960.105	26.3	8.5	4.0	4.0	3.0	0.0	Vert	AV	0.0	34.8	54.0	-19.2	High Ch 39, EUT Vert
4960.105	25.8	8.5	1.3	324.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	High Ch 39, EUT Flat
4960.105	25.3	8.5	1.3	29.0	3.0	0.0	Horz	AV	0.0	33.8	54.0	-20.2	High Ch 39, EUT Disp. Up
4960.145	25.1	8.5	1.3	133.0	3.0	0.0	Vert	AV	0.0	33.6	54.0	-20.4	High Ch 39, EUT Disp. Up
7439.110	38.8	14.2	1.3	0.0	3.0	0.0	Vert	PK	0.0	53.0	74.0	-21.0	High Ch 39, EUT Vert
7440.050	38.7	14.2	1.2	351.0	3.0	0.0	Horz	PK	0.0	52.9	74.0	-21.1	High Ch 39, EUT Flat
7326.110	38.4	13.5	1.3	295.0	3.0	0.0	Horz	PK	0.0	51.9	74.0	-22.1	Mid Ch 20, EUT Flat
7327.405	37.9	13.5	1.3	360.0	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	Mid Ch 20, EUT Vert
4804.390	41.8	8.1	1.3	26.0	3.0	0.0	Horz	PK	0.0	49.9	74.0	-24.1	Low Ch 0, EUT Flat
12210.460	30.3	-0.8	1.3	235.0	3.0	0.0	Horz	AV	0.0	29.5	54.0	-24.5	Mid Ch 20, EUT Flat
12210.310	30.3	-0.8	1.3	281.0	3.0	0.0	Vert	AV	0.0	29.5	54.0	-24.5	Mid Ch 20, EUT Vert
12399.380	30.1	-0.9	3.9	44.0	3.0	0.0	Horz	AV	0.0	29.2	54.0	-24.8	High Ch 39, EUT Flat
12399.230	29.8	-0.9	1.3	296.0	3.0	0.0	Vert	AV	0.0	28.9	54.0	-25.1	High Ch 39, EUT Vert
12009.350	30.2	-1.7	1.3	267.0	3.0	0.0	Horz	AV	0.0	28.5	54.0	-25.5	Low Ch 0, EUT Flat
12008.860	30.2	-1.7	1.9	246.0	3.0	0.0	Vert	AV	0.0	28.5	54.0	-25.5	Low Ch 0, EUT Vert
4960.690	39.8	8.5	1.3	31.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	High Ch 39, EUT Flat
4884.520	39.7	8.6	1.3	41.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	Mid Ch 20, EUT Flat
4884.405	39.0	8.6	3.4	322.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	Mid Ch 20, EUT Vert
4960.355	38.9	8.5	1.3	55.0	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	High Ch 39, EUT Vert
4804.680	39.1	8.1	1.3	193.0	3.0	0.0	Vert	PK	0.0	47.2	74.0	-26.8	Low Ch 0, EUT Flat
4959.495	38.5	8.5	1.3	29.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	High Ch 39, EUT Disp. Up
4960.250	38.4	8.5	4.0	4.0	3.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1	High Ch 39, EUT Vert
4960.545	38.2	8.5	1.3	324.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	High Ch 39, EUT Flat
4960.205	37.6	8.5	1.3	133.0	3.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	High Ch 39, EUT Disp. Up
12208.890	42.4	-0.8	1.3	235.0	3.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	Mid Ch 20, EUT Flat
12210.900	42.2	-0.8	1.3	281.0	3.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	Mid Ch 20, EUT Vert
12399.870	41.4	-0.9	1.3	296.0	3.0	0.0	Vert	PK	0.0	40.5	74.0	-33.5	High Ch 39, EUT Vert
12399.630	41.1	-0.9	3.9	44.0	3.0	0.0	Horz	PK	0.0	40.2	74.0	-33.8	High Ch 39, EUT Flat
12010.500	41.9	-1.7	1.3	267.0	3.0	0.0	Horz	PK	0.0	40.2	74.0	-33.8	Low Ch 0, EUT Flat
12010.510	41.4	-1.7	1.9	246.0	3.0	0.0	Vert	PK	0.0	39.7	74.0	-34.3	Low Ch 0, EUT Vert

BAND EDGE COMPLIANCE

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

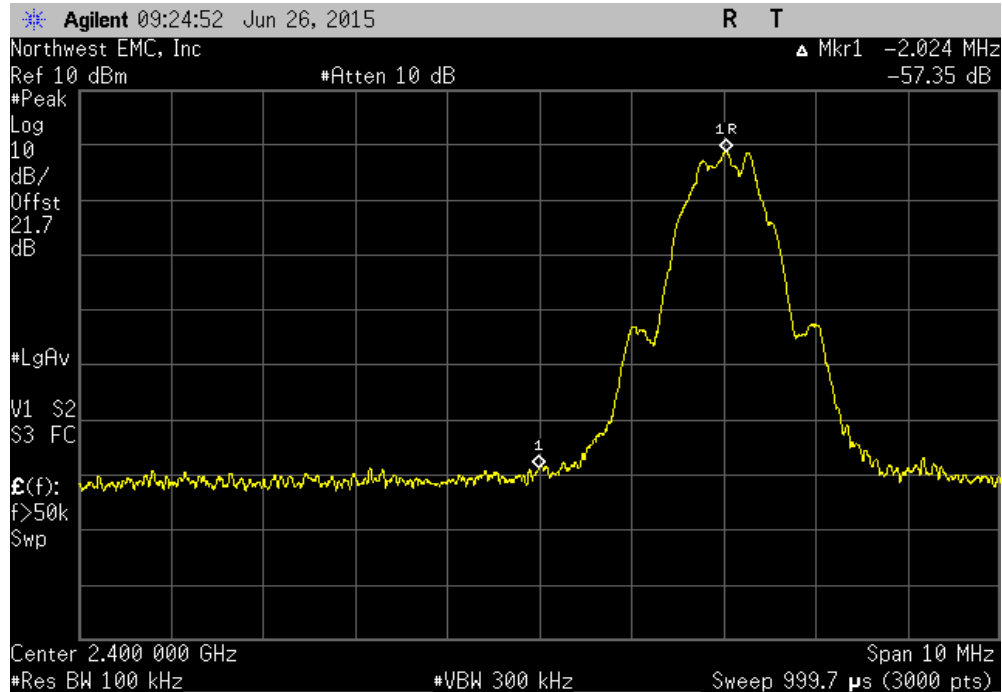
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

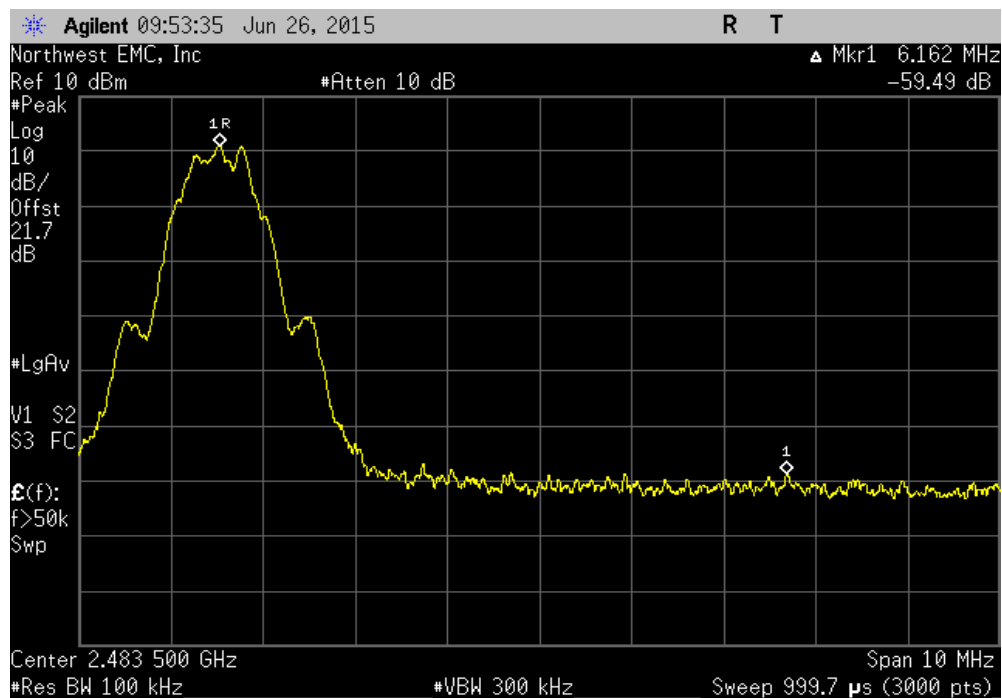
EUT: 1721		Work Order: MCSO1732	
Serial Number: 2937901005079752549		Date: 06/26/15	
Customer: Microsoft Corporation		Temperature: 24°C	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Richard Mellroth	Power: USB	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Bluetooth Low Energy			
Low Channel, 2402 MHz		-57.36	-20 Pass
High Channel, 2480 MHz		-59.49	-20 Pass

BAND EDGE COMPLIANCE

Bluetooth Low Energy, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-57.36	-20	Pass



Bluetooth Low Energy, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-59.49	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

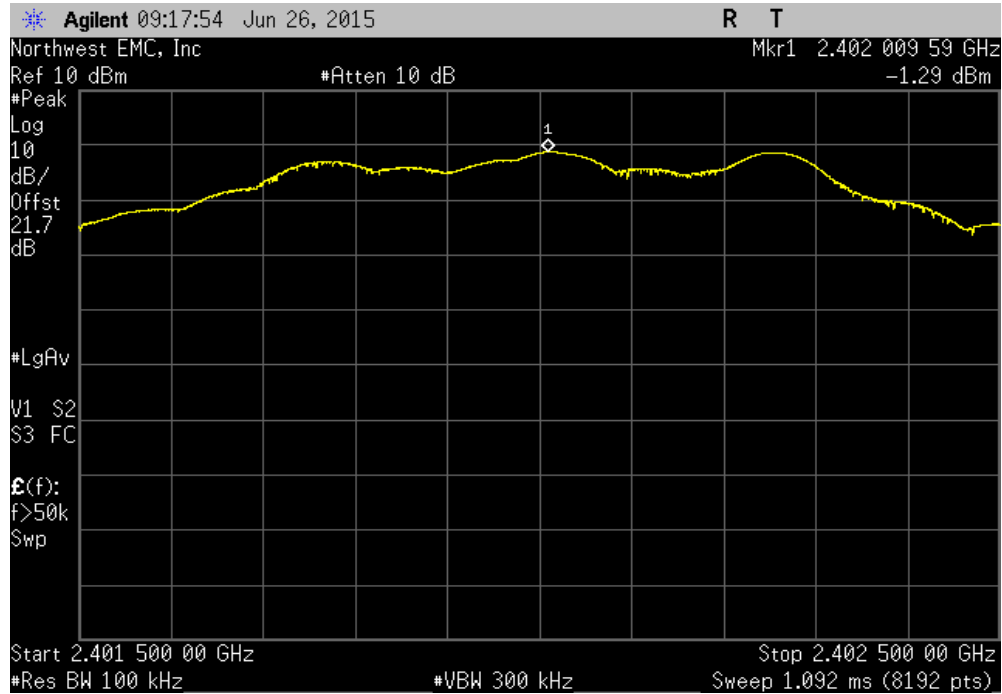
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

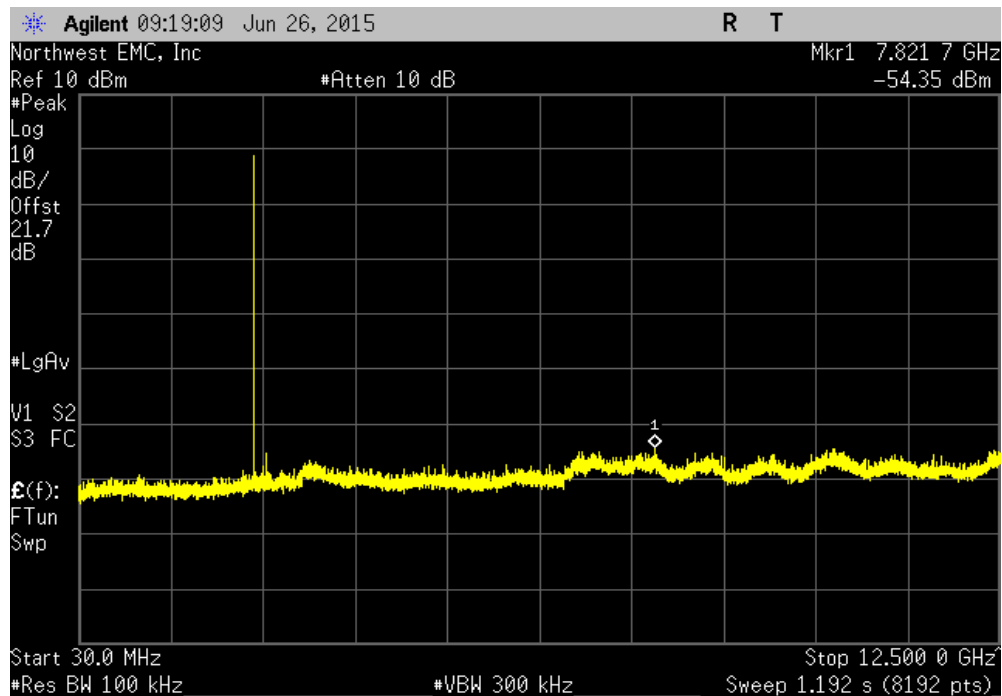
EUT: 1721		Work Order: MCSO1732	
Serial Number: 2937901005079752549		Date: 06/26/15	
Customer: Microsoft Corporation		Temperature: 24°C	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Richard Mellroth		Power: USB	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Frequency Range	Value (dBc)
			Limit ≤ (dBc)
			Result
Bluetooth Low Energy			
	Low Channel, 2402 MHz	Fundamental	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-53.06
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-48.08
	Mid Channel, 2442 MHz	Fundamental	N/A
	Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	-53.65
	Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	-48.95
	High Channel, 2480 MHz	Fundamental	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-54.24
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-50.37

SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

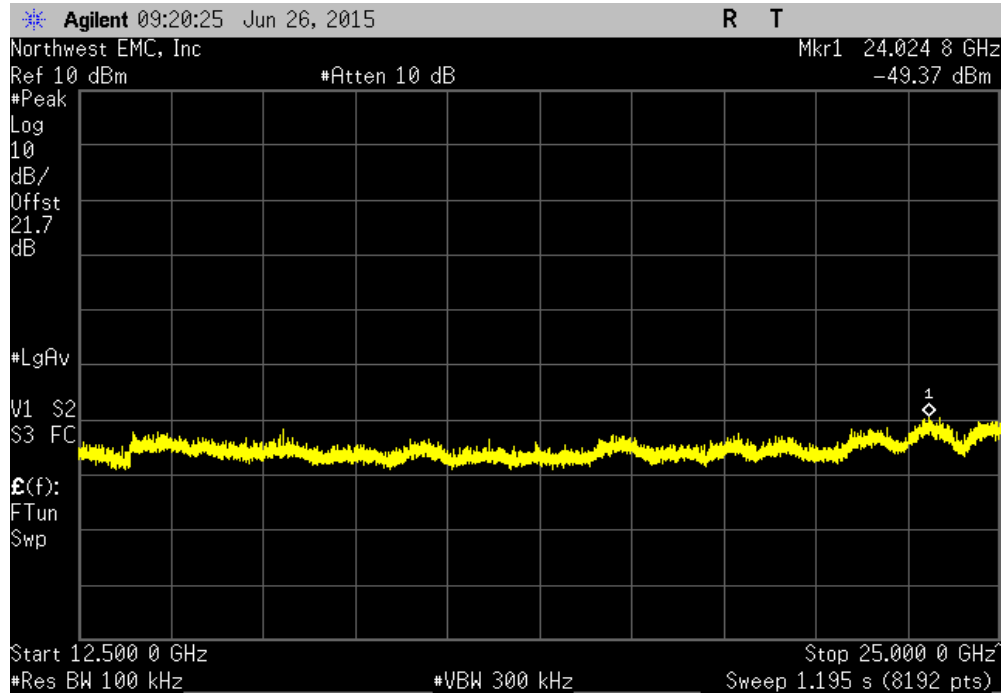


Bluetooth Low Energy, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-53.06	-20	Pass		

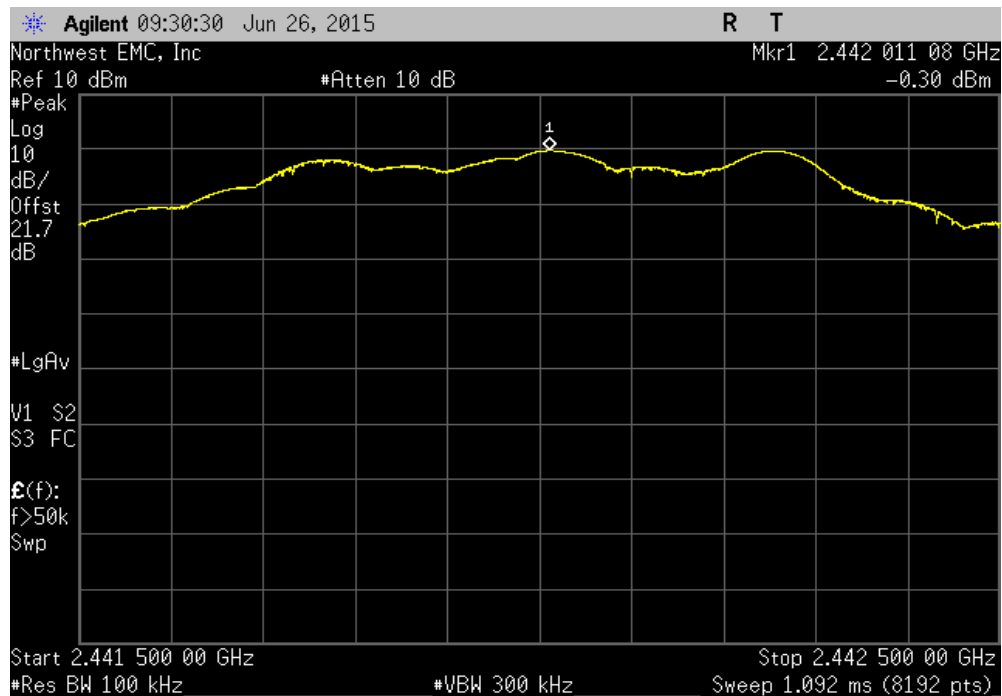


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Low Channel, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-48.08	-20	Pass	

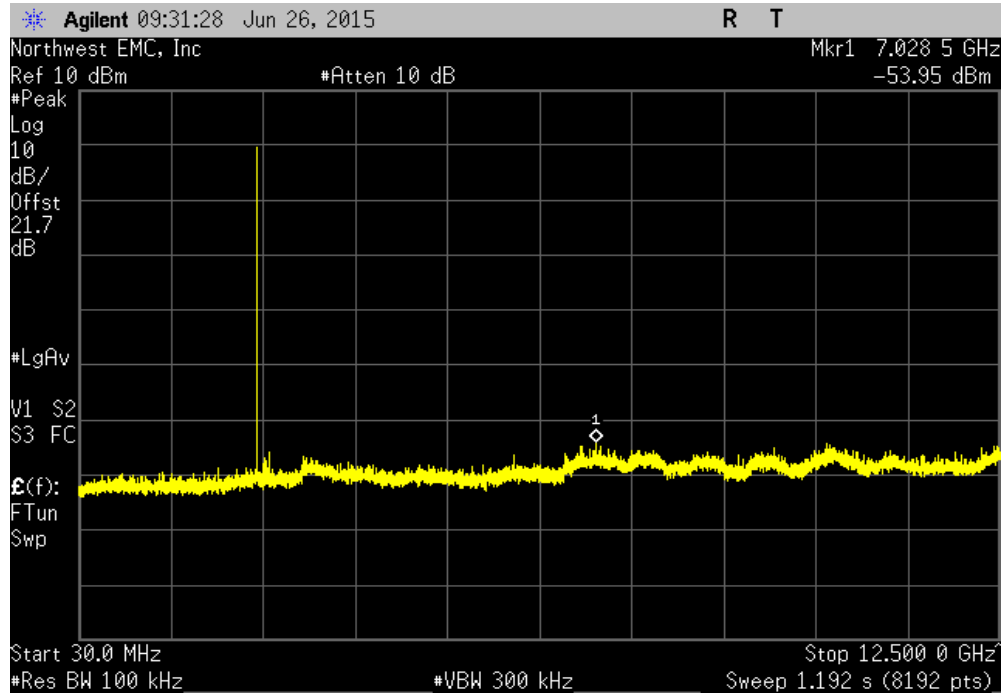


Bluetooth Low Energy, Mid Channel, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

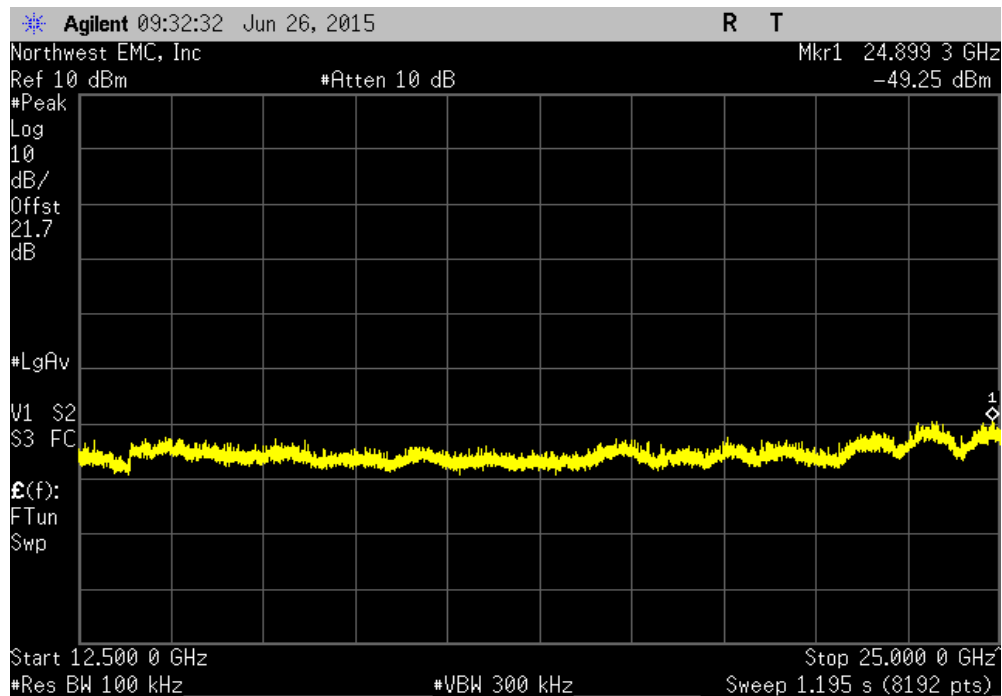


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Mid Channel, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-53.65	-20	Pass	

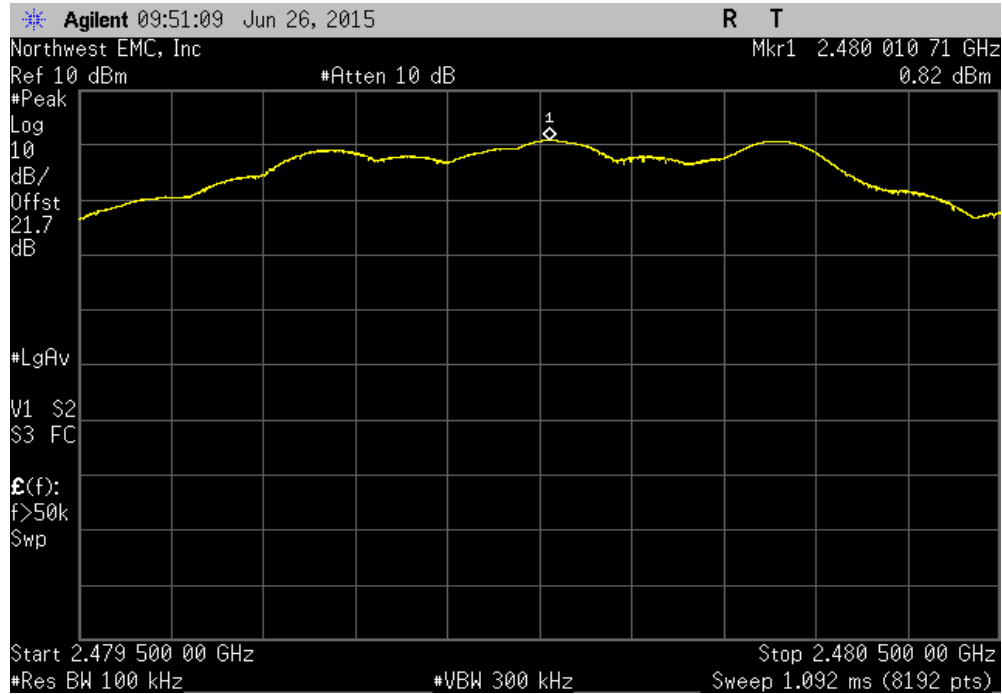


Bluetooth Low Energy, Mid Channel, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-48.95	-20	Pass	

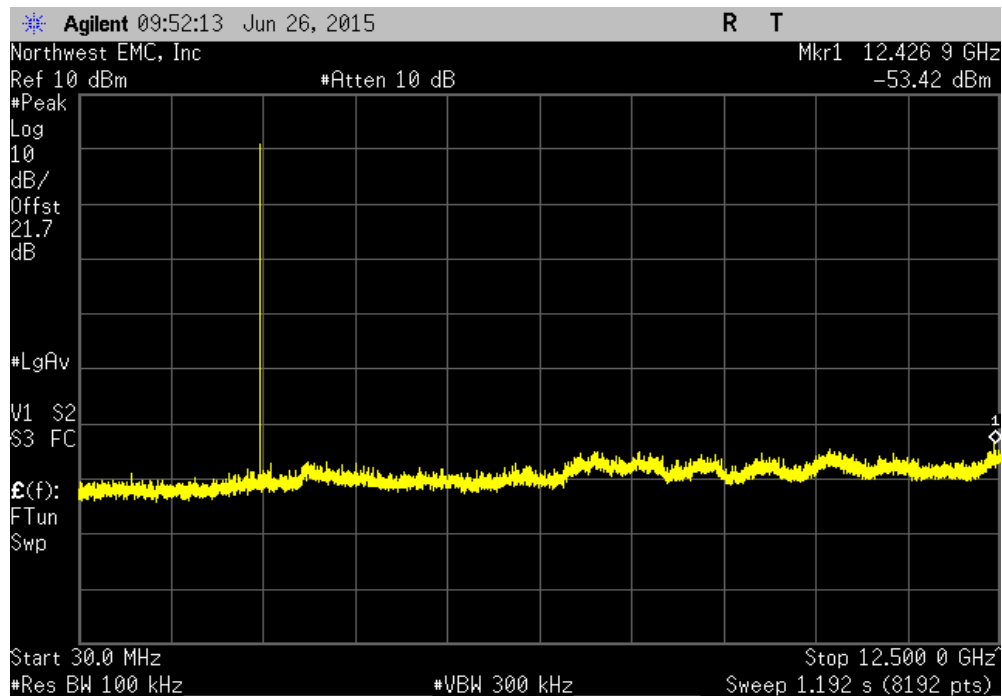


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, High Channel, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

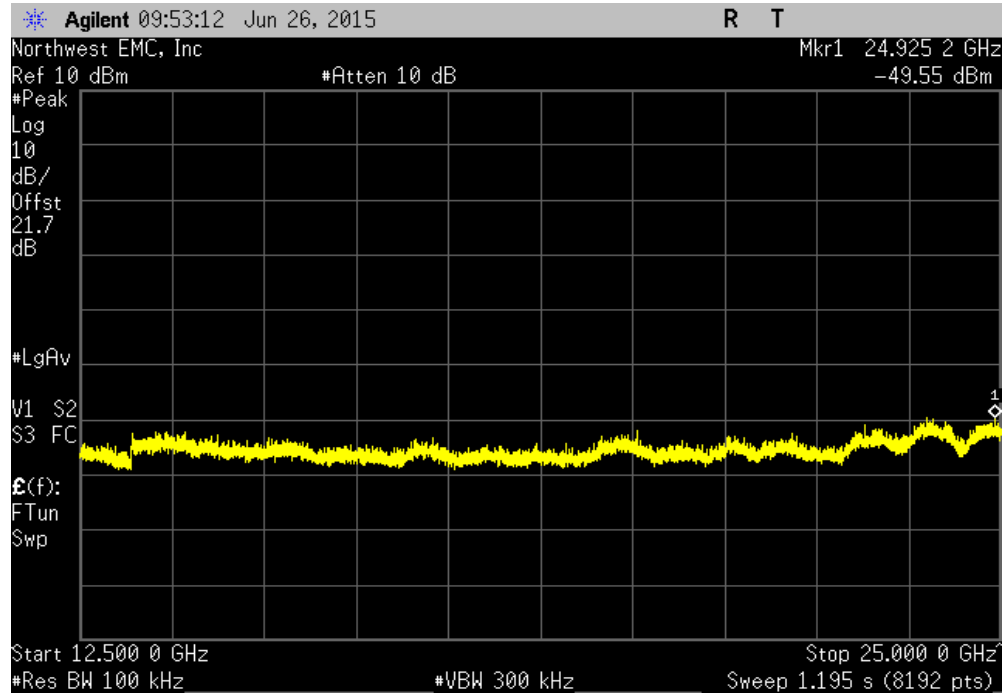


Bluetooth Low Energy, High Channel, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-54.24	-20	Pass		



SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-50.37	-20	Pass	



OCCUPIED BANDWIDTH

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

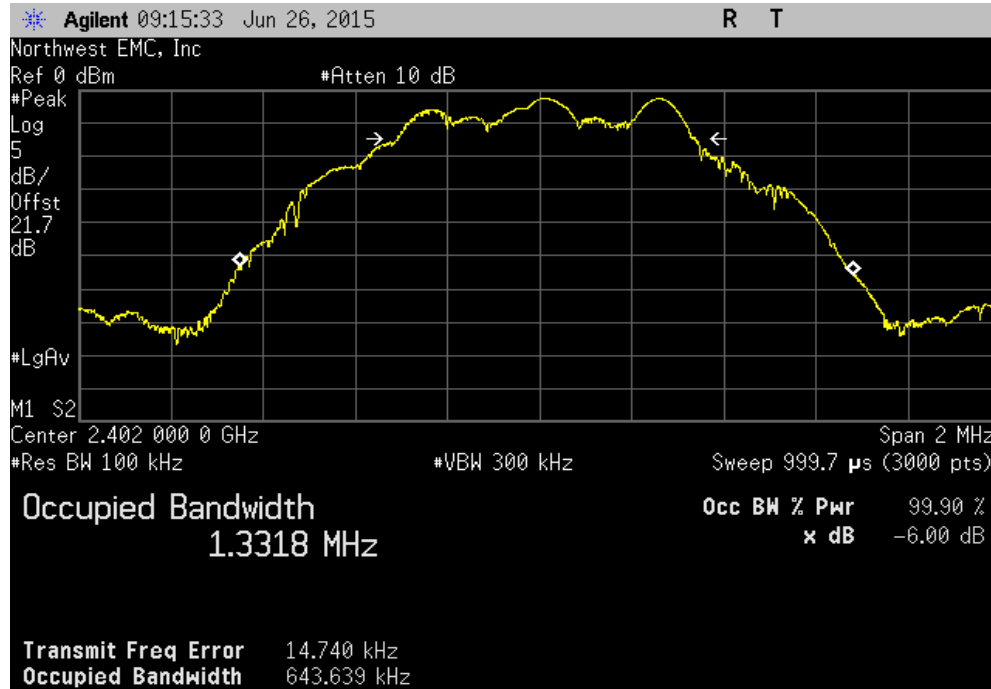
The EUT was set to the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer.

OCCUPIED BANDWIDTH

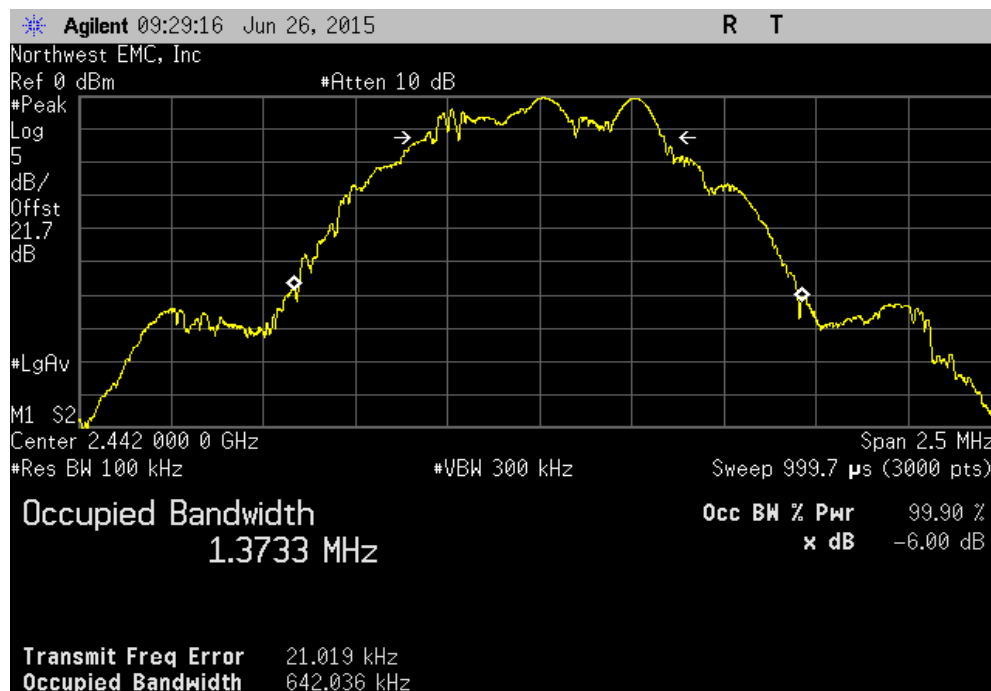
EUT: 1721		Work Order: MCSO1732	
Serial Number: 2937901005079752549		Date: 06/26/15	
Customer: Microsoft Corporation		Temperature: 24°C	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Richard Mellroth		Power: USB	Job Site: NC02
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (±) Result
Bluetooth Low Energy			
Low Channel, 2402 MHz		643.639 kHz	500 kHz Pass
Mid Channel, 2442 MHz		642.036 kHz	500 kHz Pass
High Channel, 2480 MHz		634.77 kHz	500 kHz Pass
			3

OCCUPIED BANDWIDTH

Bluetooth Low Energy, Low Channel, 2402 MHz						
Value				Limit (≥)	Result	
643.639 kHz				500 kHz	Pass	

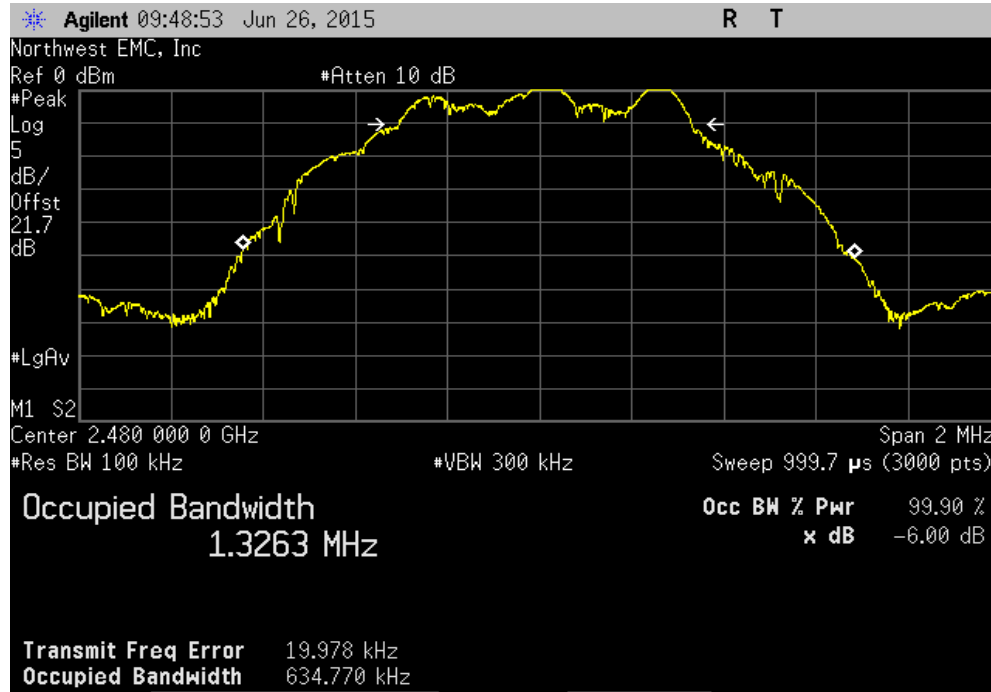


Bluetooth Low Energy, Mid Channel, 2442 MHz						
Value				Limit (≥)	Result	
642.036 kHz				500 kHz	Pass	



OCCUPIED BANDWIDTH

Bluetooth Low Energy, High Channel, 2480 MHz						
Value				Limit (≥)	Result	
634.77 kHz				500 kHz	Pass	



OUTPUT POWER

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Prior to measuring peak transmit power the DTS bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method found in KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

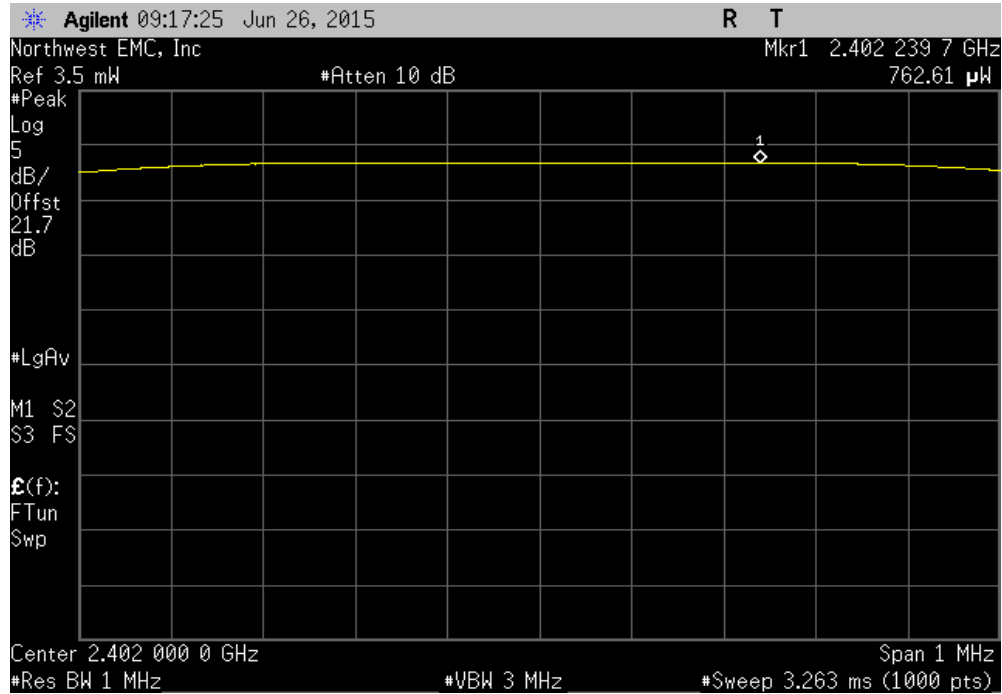
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

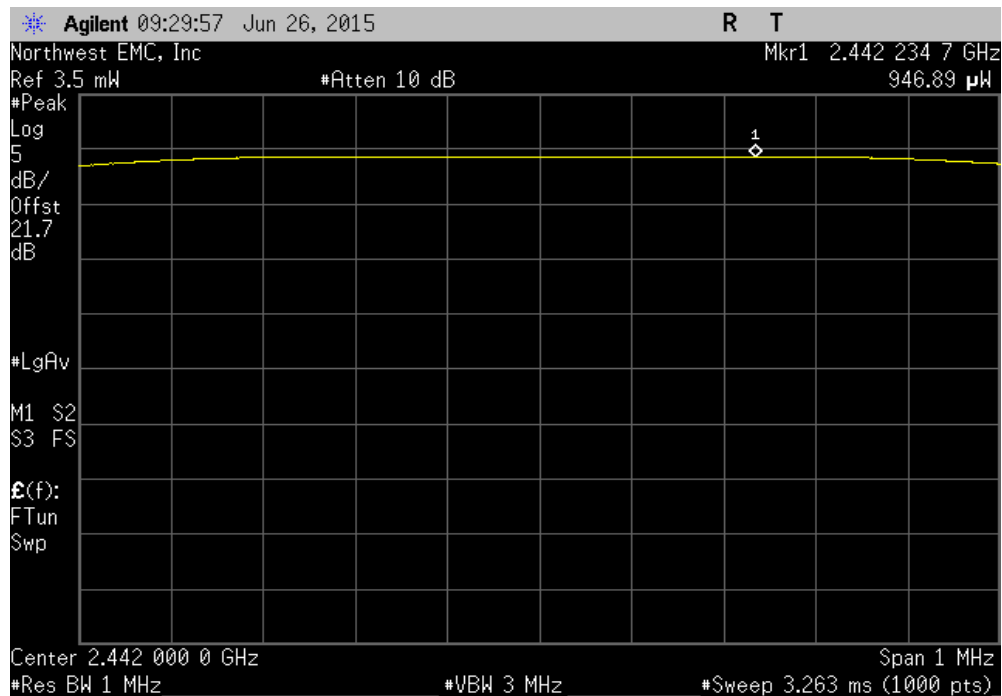
EUT: 1721		Work Order: MCSO1732	
Serial Number: 2937901005079752549		Date: 06/26/15	
Customer: Microsoft Corporation		Temperature: 24°C	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Richard Mellroth		Power: USB	Job Site: NC02
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
Bluetooth Low Energy			
Low Channel, 2402 MHz		762.606 uW	1 W Pass
Mid Channel, 2442 MHz		946.891 uW	1 W Pass
High Channel, 2480 MHz		1.214 mW	1 W Pass

OUTPUT POWER

Bluetooth Low Energy, Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				762.606 uW	1 W	Pass

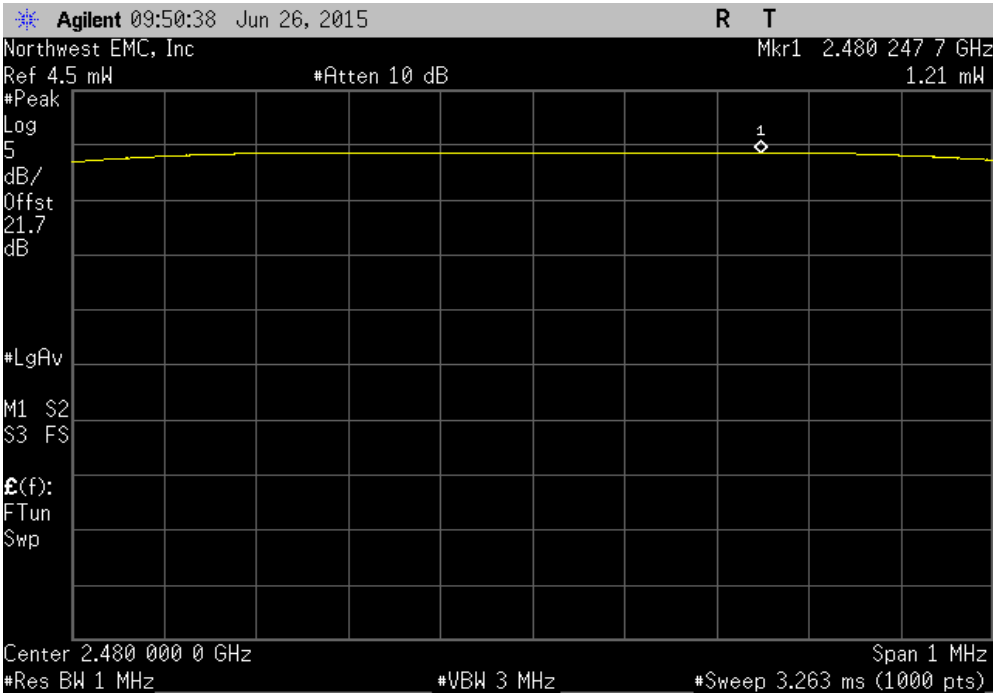


Bluetooth Low Energy, Mid Channel, 2442 MHz						
				Value	Limit (<)	Result
				946.891 uW	1 W	Pass



OUTPUT POWER

Bluetooth Low Energy, High Channel, 2480 MHz						
Value				Limit	Result	
				(<)		
1.214 mW				1 W	Pass	



POWER SPECTRAL DENSITY

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

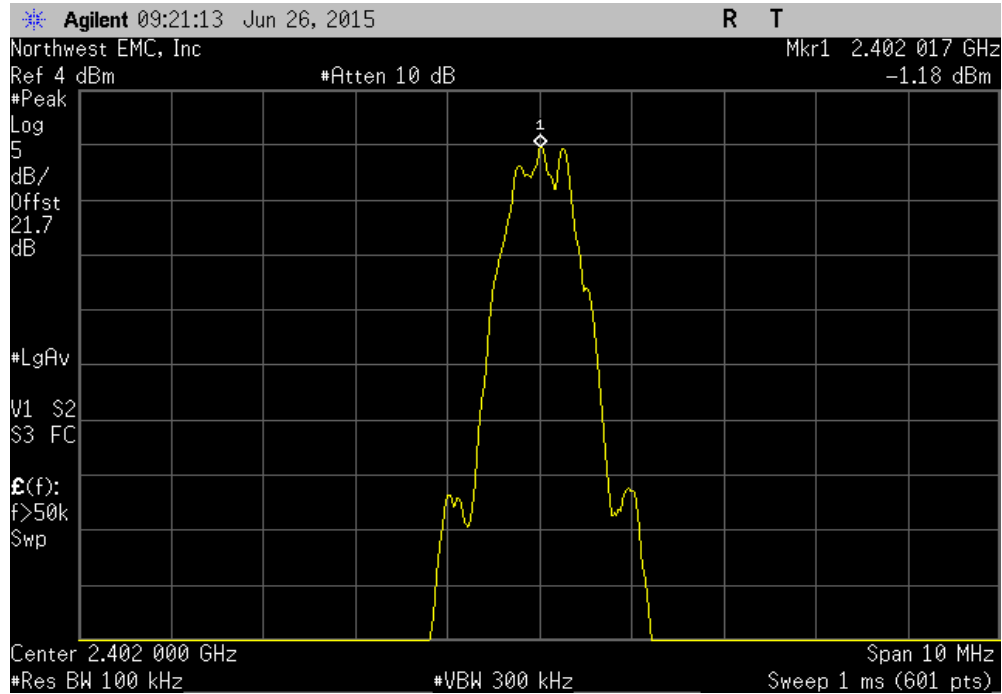
$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

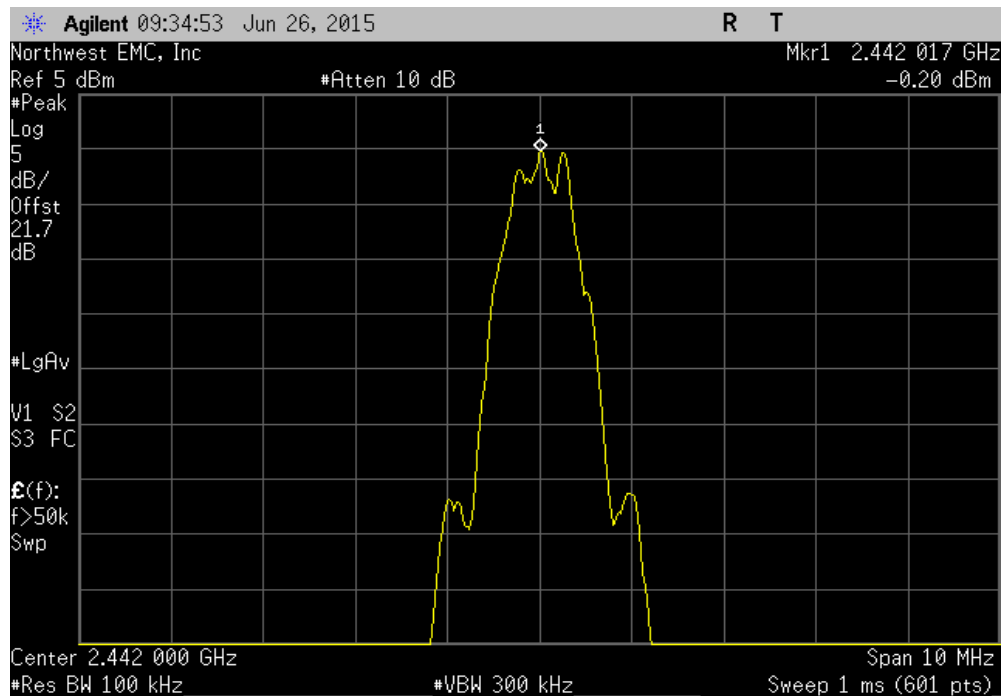
EUT: 1721		Work Order: MCSO1732	
Serial Number: 2937901005079752549		Date: 06/26/15	
Customer: Microsoft Corporation		Temperature: 24°C	
Attendees: None		Humidity: 45%	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Richard Mellroth		Power: USB	
Job Site: NC02			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
Bluetooth Low Energy			
	Low Channel, 2402 MHz	-1.181	-15.2
	Mid Channel, 2442 MHz	-0.203	-15.2
	High Channel, 2480 MHz	0.923	-15.2
		-16.381	8
		-15.403	8
		-14.277	8
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

Bluetooth Low Energy, Low Channel, 2402 MHz					
Value	dBm/100kHz	Value	Limit	Results	
dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
-1.181	-15.2	-16.381	8	Pass	

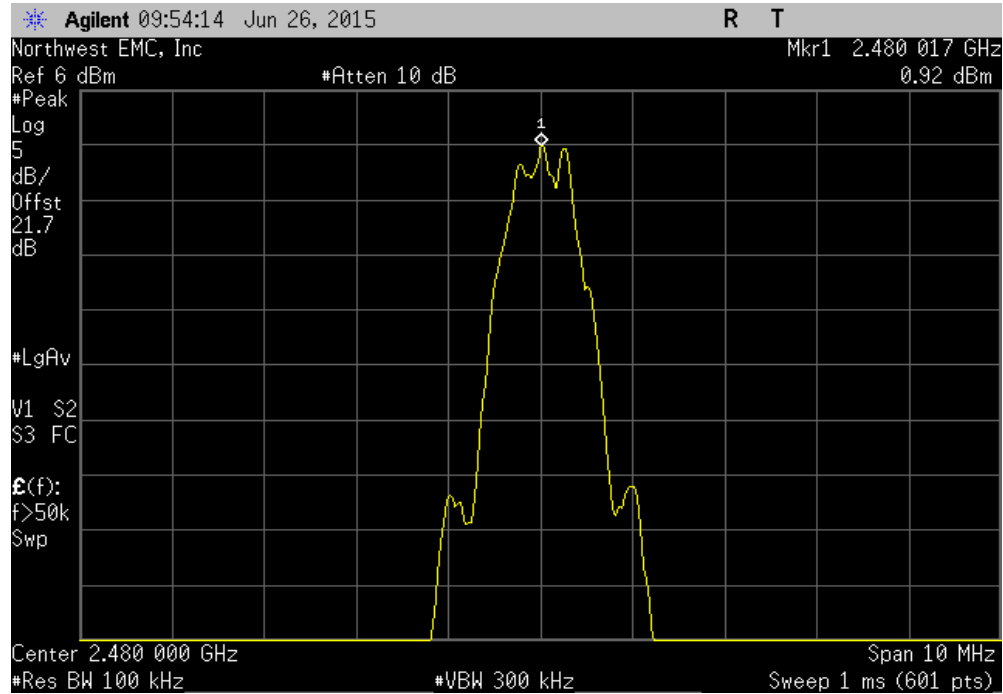


Bluetooth Low Energy, Mid Channel, 2442 MHz					
Value	dBm/100kHz	Value	Limit	Results	
dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
-0.203	-15.2	-15.403	8	Pass	



POWER SPECTRAL DENSITY

Bluetooth Low Energy, High Channel, 2480 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	0.923	-15.2	-14.277	8	Pass	



DUTY CYCLE

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 (mos)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMJ	6/6/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/6/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

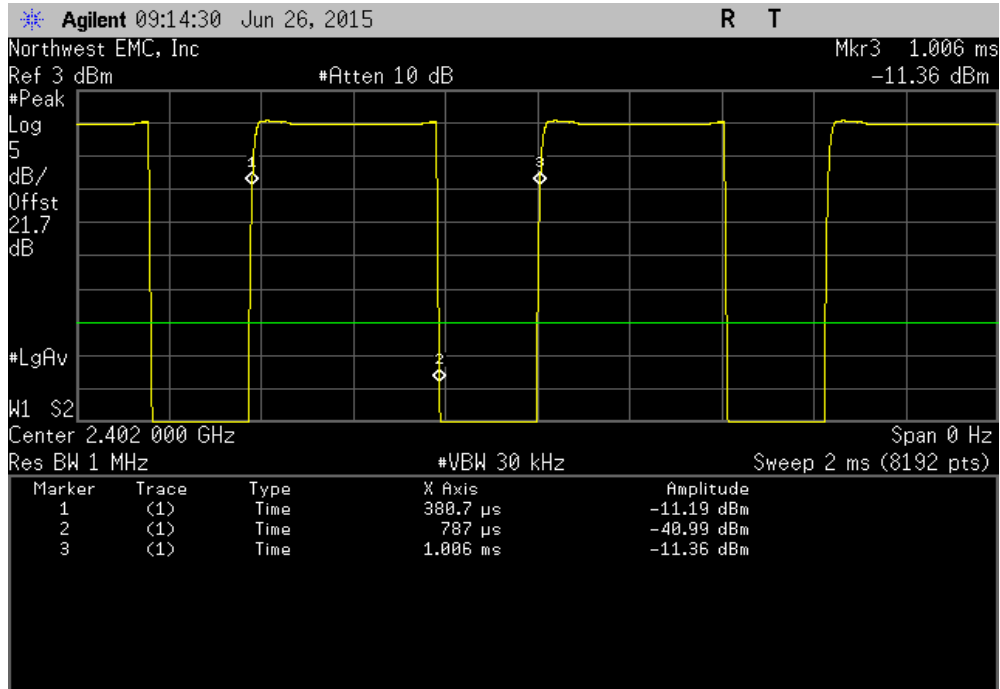
If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.

DUTY CYCLE

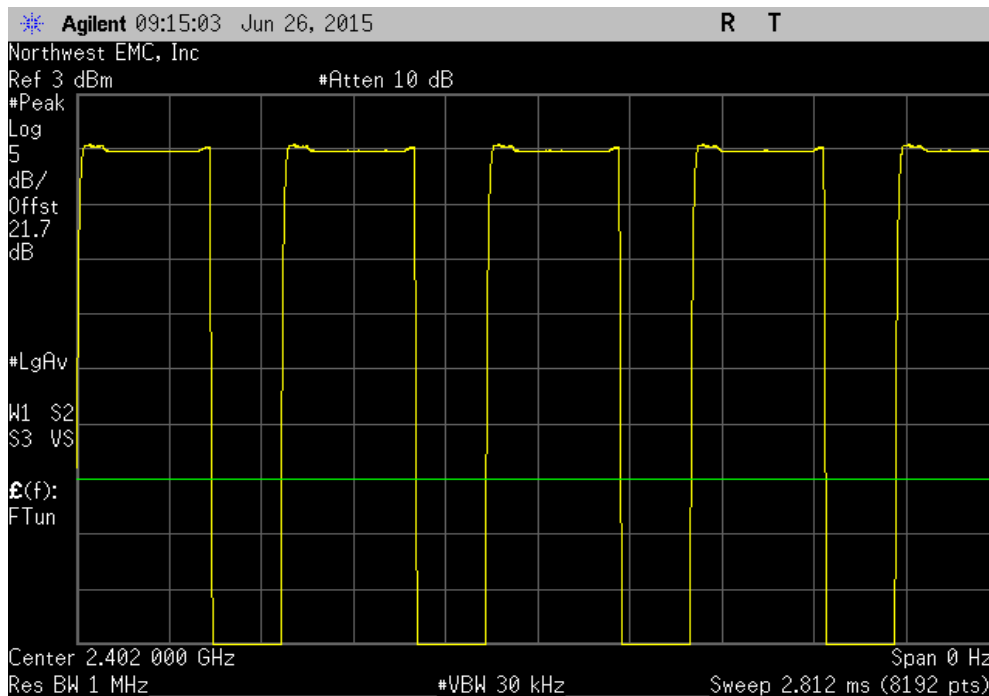
EUT: 1721		Work Order: MCSO1732				
Serial Number: 2937901005079752549		Date: 06/26/15				
Customer: Microsoft Corporation		Temperature: 24°C				
Attendees: None		Humidity: 45%				
Project: None		Barometric Pres.: 1020 mbar				
Tested by: Richard Mellroth		Power: USB	Job Site: NC02			
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2015		ANSI C63.10:2009				
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature 				
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Bluetooth Low Energy						
Low Channel, 2402 MHz	406.3 us	625 us	1	65	N/A	N/A
Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2442 MHz	406.3 us	625 us	1	65	N/A	N/A
Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2480 MHz	406.1 us	624.8 us	1	65	N/A	N/A
High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

Bluetooth Low Energy, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.3 us	625 us	1	65	N/A	N/A

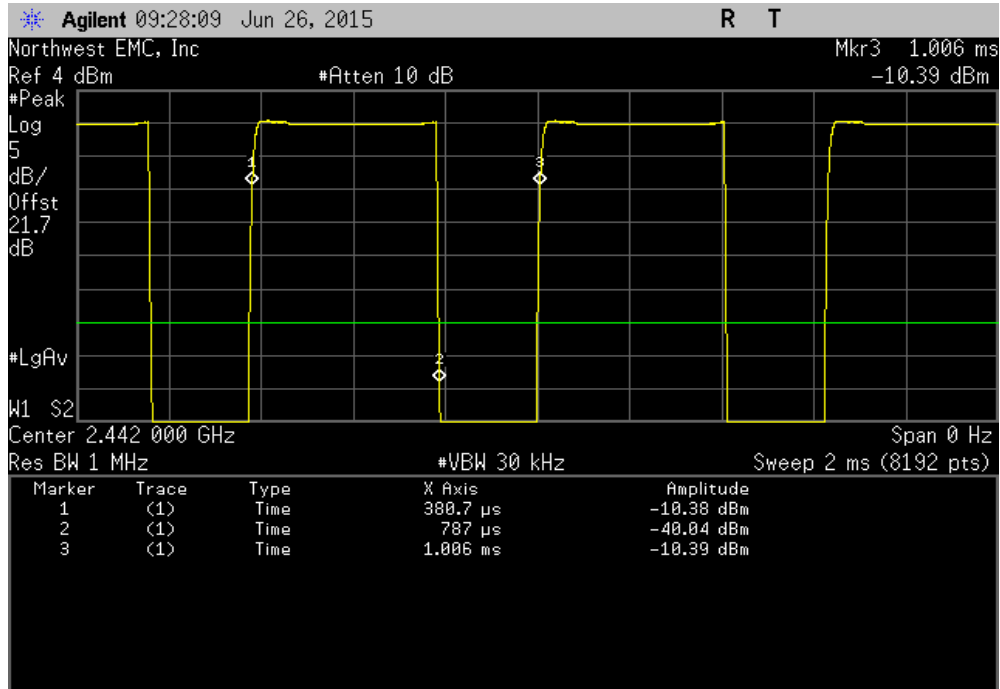


Bluetooth Low Energy, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

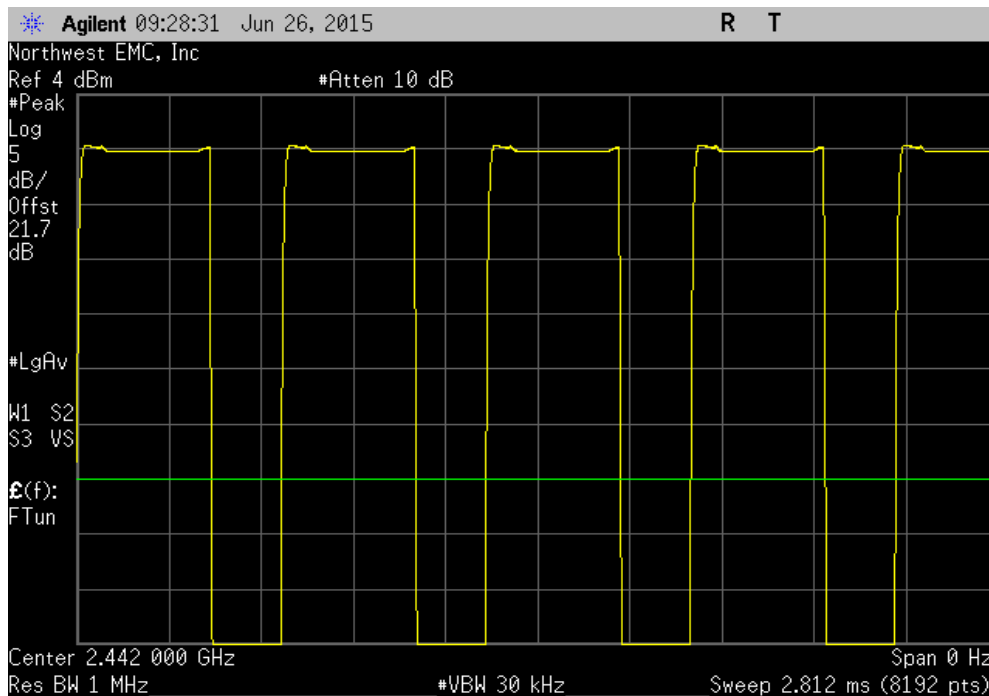


DUTY CYCLE

Bluetooth Low Energy, Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.3 us	625 us	1	65	N/A	N/A

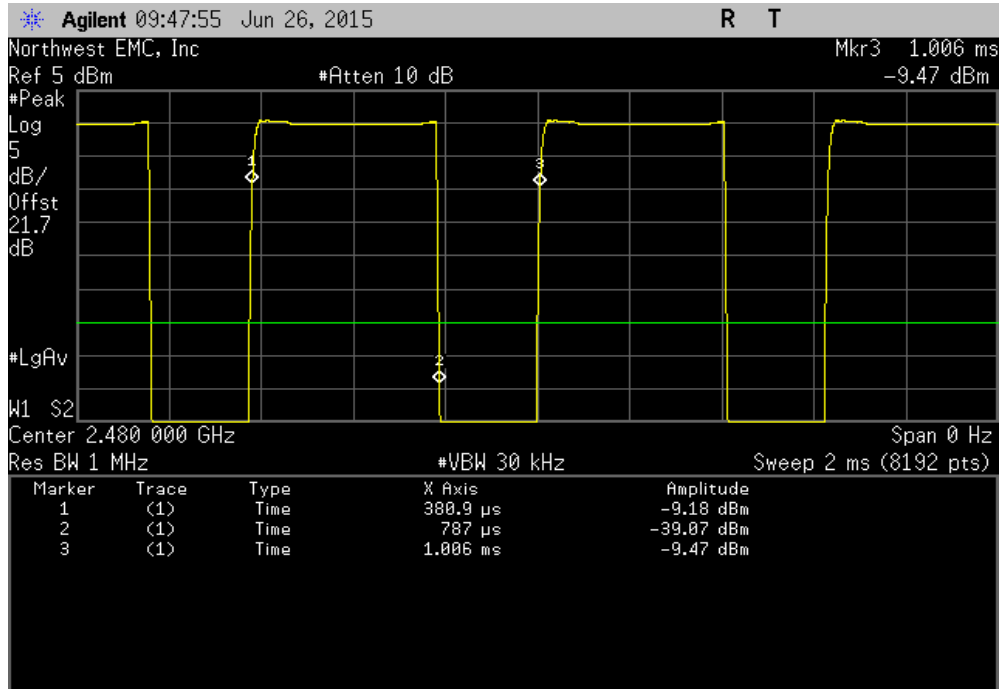


Bluetooth Low Energy, Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



DUTY CYCLE

Bluetooth Low Energy, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.1 us	624.8 us	1	65	N/A	N/A



Bluetooth Low Energy, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

