Microsoft Corporation

1631

DTS

FCC 15.207:2014

FCC 15.247:2014

Report #: MCSO1702.1

Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

WTD 12.5.23

Last Date of Test: March 10, 2014
Microsoft Corporation
Model: 1631

Emissions

Test Description	Specification	Test Method	Pass/Fail
Duty Cycle	FCC 15.247:2014	ANSI C63.10:2009	Pass
Occupied Bandwidth	FCC 15.247:2014	ANSI C63.10:2009	Pass
Output Power	FCC 15.247:2014	ANSI C63.10:2009	Pass
Power Spectral Density	FCC 15.247:2014	ANSI C63.10:2009	Pass
Band Edge Compliance	FCC 15.247:2014	ANSI C63.10:2009	Pass
Spurious Conducted Emissions	FCC 15.247:2014	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.247:2014	ANSI C63.10:2009	Pass
AC Powerline Conducted Emissions	FCC 15.207:2014	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:

Rod Munro, Operations Manager

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.

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 HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

ACCREDITATIONS AND AUTHORIZATIONS

REV 2012.05.24

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 Guide 65 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

KCC / 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.

Hong Kong

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

Vietnam

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

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

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 listed below. 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 16-4-1 as applicable), and are available upon request.

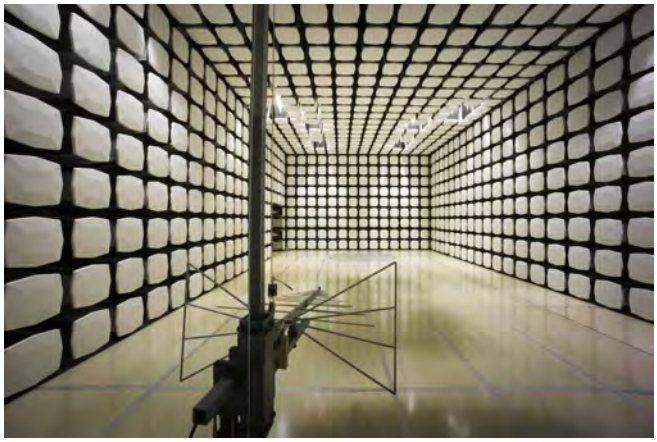
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94

FACILITIES

REV 2013.06.28

Oregon	**California**	**New York**	**Minnesota**	**Washington**
Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Labs NC01-05,SU02,SU07 19201 120th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0



PRODUCT DESCRIPTION

WTD 12.5.23

Client and Equipment Under Test (EUT) Information

Company Name:	Microsoft Corporation
Address:	One Microsoft Way
City, State, Zip:	Redmond, WA 98052-6399
Test Requested By:	Mike Boucher
Model:	1631
First Date of Test:	March 06, 2012
Last Date of Test:	March 10, 2014
Receipt Date of Samples:	March 06, 2012
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Handheld computing device with Bluetooth radio module with 1 antenna(s).

Testing Objective:
To demonstrate compliance to FCC 15.247 requirements for BLE.

CONFIGURATIONS

Configuration MCSO1702- 1

Software/Firmware Running during test	
Description	**Version**
Wi-Fi Tool	V2.3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Handheld Computing Device	Microsoft Corporation	1631	041152140753

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Lenovo	ThinkPad 4174BB4	R9-PMLAF
USB Ethernet Adapter	Cisco	Linksys USB300M	CU906M715225
Detachable Keyboard	Microsoft Corporation	X889242-BBH	000596140354
AC Adapter (1)	Microsoft Corporation	X891182-003	0D130C1VPC42
AC Adapter (2)	Lenovo	42T4430	36200147

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet	No	1.5m	No	USB Ethernet Adapter	Laptop Computer
AC Power	No	0.5m	No	AC Mains	AC Adapter (1)
DC Power	No	1.8m	No	AC Adapter (1)	Handheld Computing Device
AC Power	No	0.85m	No	AC Mains	AC Adapter (2)
DC Power	No	1.8m	No	AC Adapter (2)	Laptop Computer
USB	Yes	0.1m	No	Handheld Computing Device	USB Ethernet Adapter
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration MCSO1702- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Handheld Computing Device	Microsoft Corporation	1631	041152140753

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB Ethernet Adapter	Cisco	Linksys USB300M	CU906M715225
Detachable Keyboard	Microsoft Corporation	X889242-BBH	000596140354
AC Adapter (1)	Microsoft Corporation	X891182-003	0D130C1VPC42
Headphones	Unknown	None	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	0.5m	No	AC Mains	AC Adapter (1)
DC Power	No	1.8m	No	AC Adapter (1)	Handheld Computing Device
Audio Cable	No	1.1m	No	Handheld Computing Device	Headphones
Display Port	Yes	1.8m	No	Handheld Computing Device	Unterminated
USB	Yes	0.1m	No	Handheld Computing Device	USB Ethernet Adapter
Ethernet	No	1.5m	No	USB Ethernet Adapter	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/6/2014	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.
2	3/6/2014	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.
3	3/6/2014	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.
4	3/6/2014	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.
5	3/6/2014	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.
6	3/6/2014	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.
7	3/7/2014	AC 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	3/10/2014	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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:	1631	Work Order:	MCSO1702
Serial Number:	041152140753	Date:	03/06/14
Customer:	Microsoft Corporation	Temperature:	23°C
Attendees:	None	Humidity:	40%
Project:	None	Barometric Pres.:	1001
Tested by:	Richard Mellroth	Power: 110 VAC / 60Hz	Job Site: NC06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

DEVIATIONS FROM TEST STANDARD

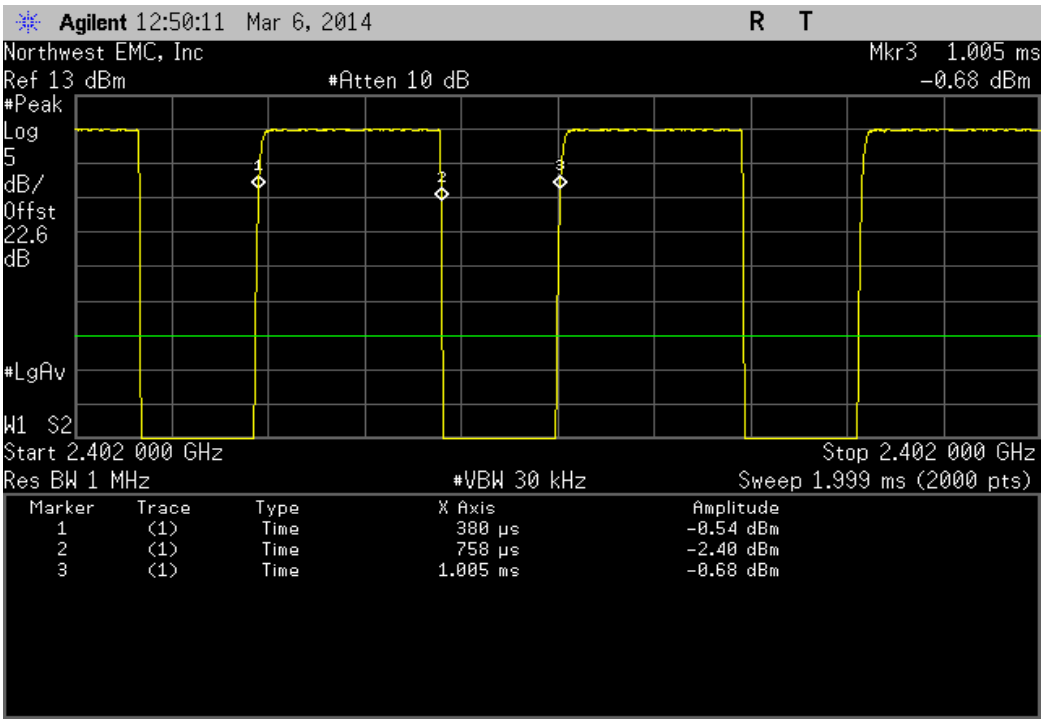
None

Configuration #	1	Signature

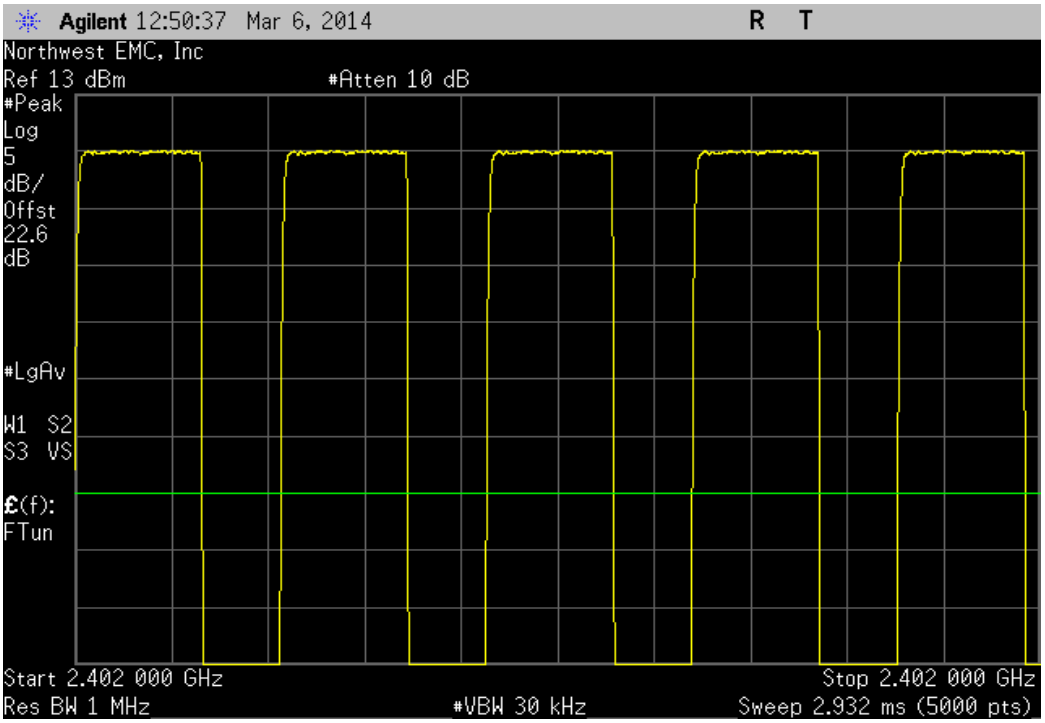
		Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
BLE ADV							
	Low Channel 0, 2402 MHz	378 uS	625 uS	1	60.5	N/A	N/A
	Low Channel 0, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel 12, 2426 MHz	379 uS	625 uS	1	60.6	N/A	N/A
	Mid Channel 12, 2426 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel 39, 2480 MHz	379 uS	626 uS	1	60.5	N/A	N/A
	High Channel 39, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE DATA							
	Low Channel 1, 2404 MHz	379 uS	625 uS	1	60.6	N/A	N/A
	Low Channel 1, 2404 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel 19, 2440 MHz	379 uS	625 uS	1	60.6	N/A	N/A
	Mid Channel 19, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel 38, 2478 MHz	379 uS	625 uS	1	60.6	N/A	N/A
	High Channel 38, 2478 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

BLE ADV, Low Channel 0, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	378 uS	625 uS	1	60.5	N/A	N/A

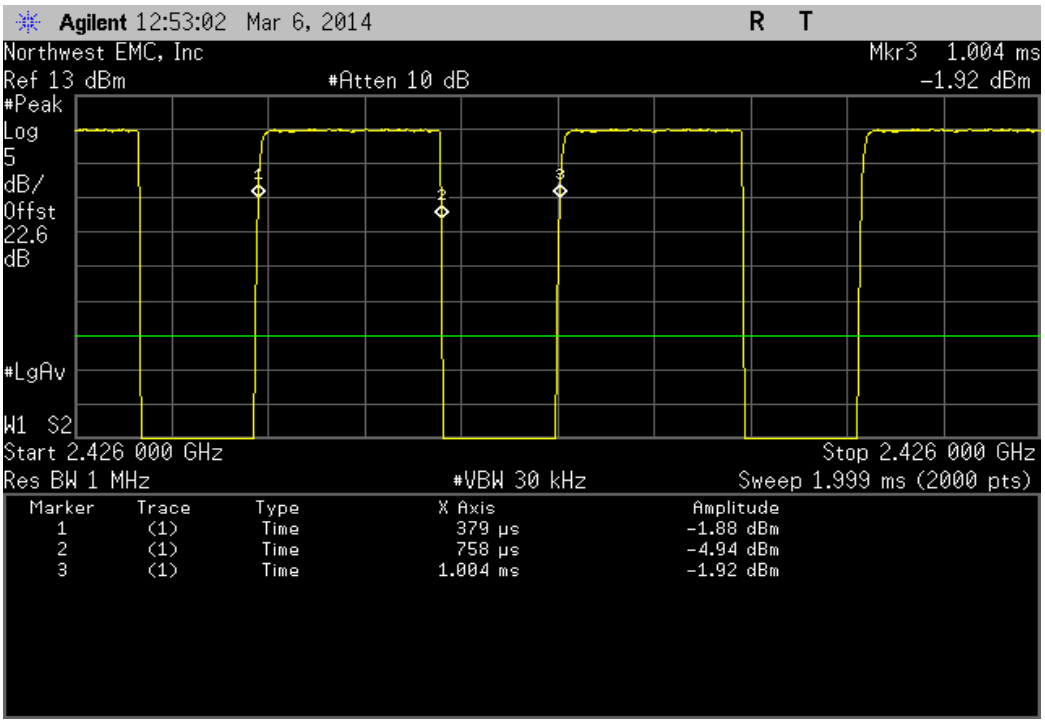


BLE ADV, Low Channel 0, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A

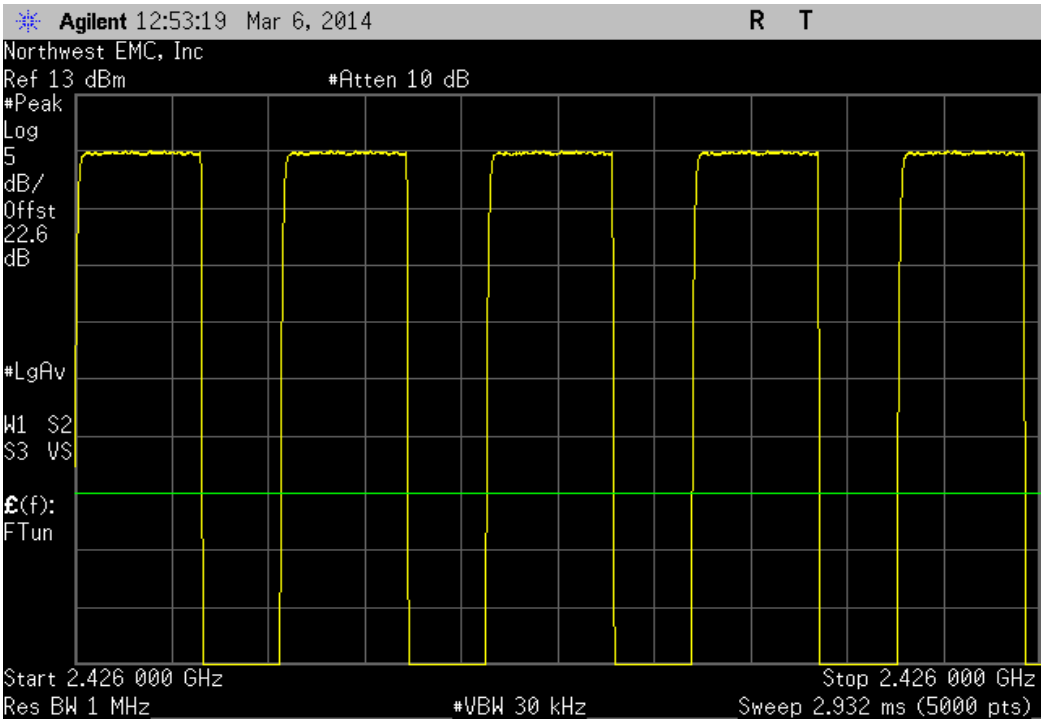


DUTY CYCLE

BLE ADV, Mid Channel 12, 2426 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	379 uS	625 uS	1	60.6	N/A	N/A

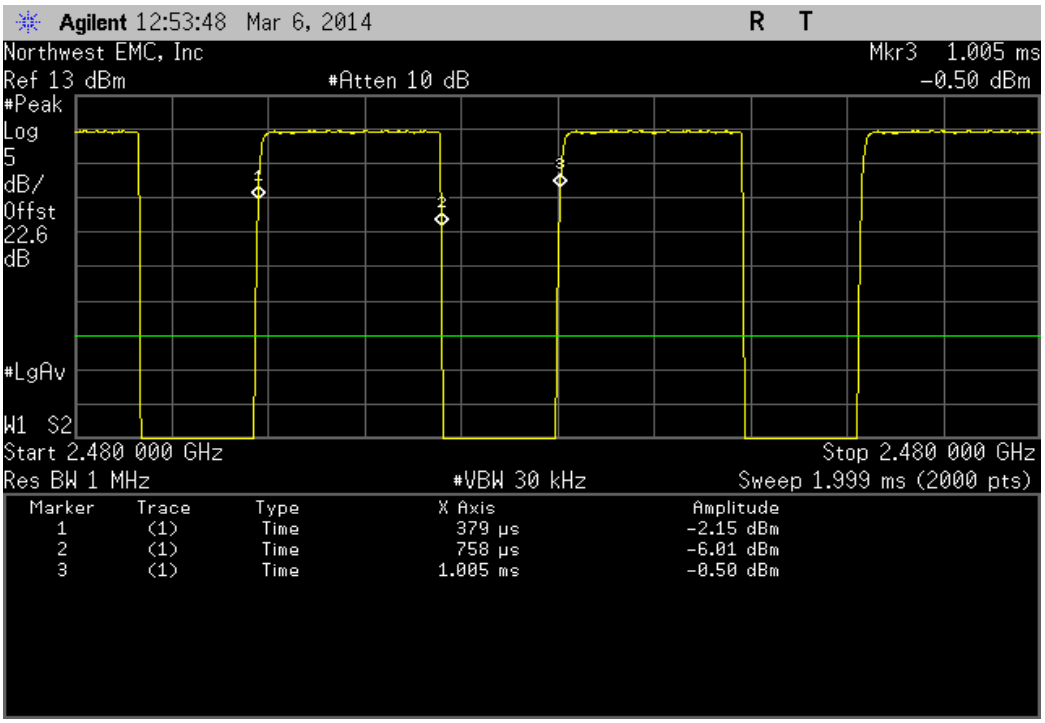


BLE ADV, Mid Channel 12, 2426 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A

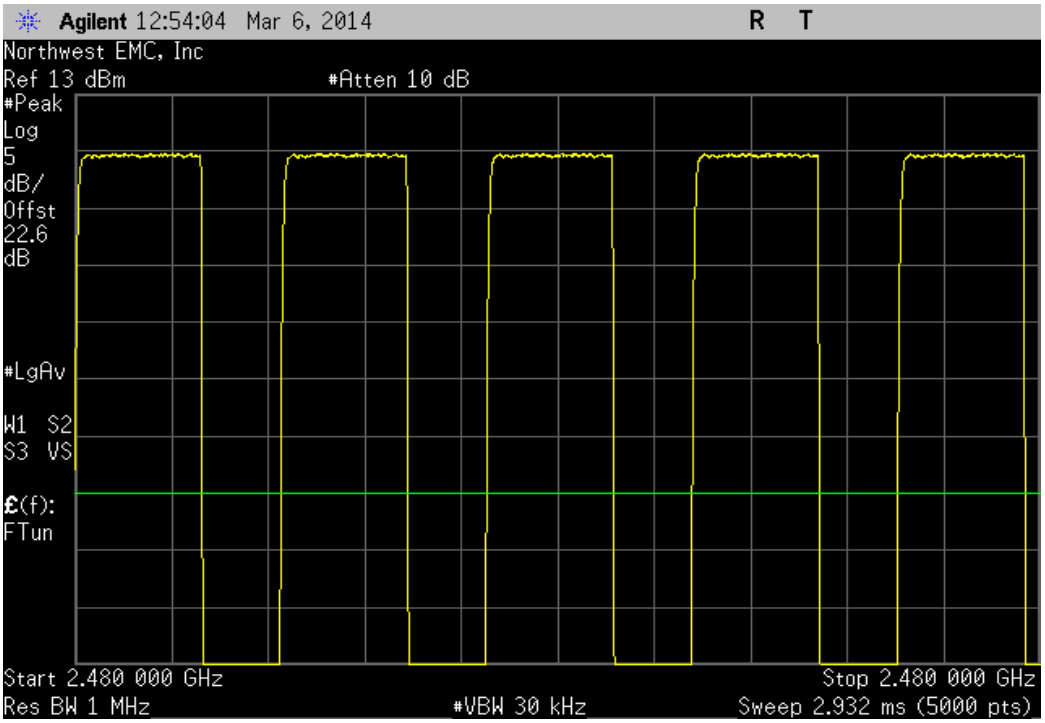


DUTY CYCLE

BLE ADV, High Channel 39, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	379 uS	626 uS	1	60.5	N/A	N/A

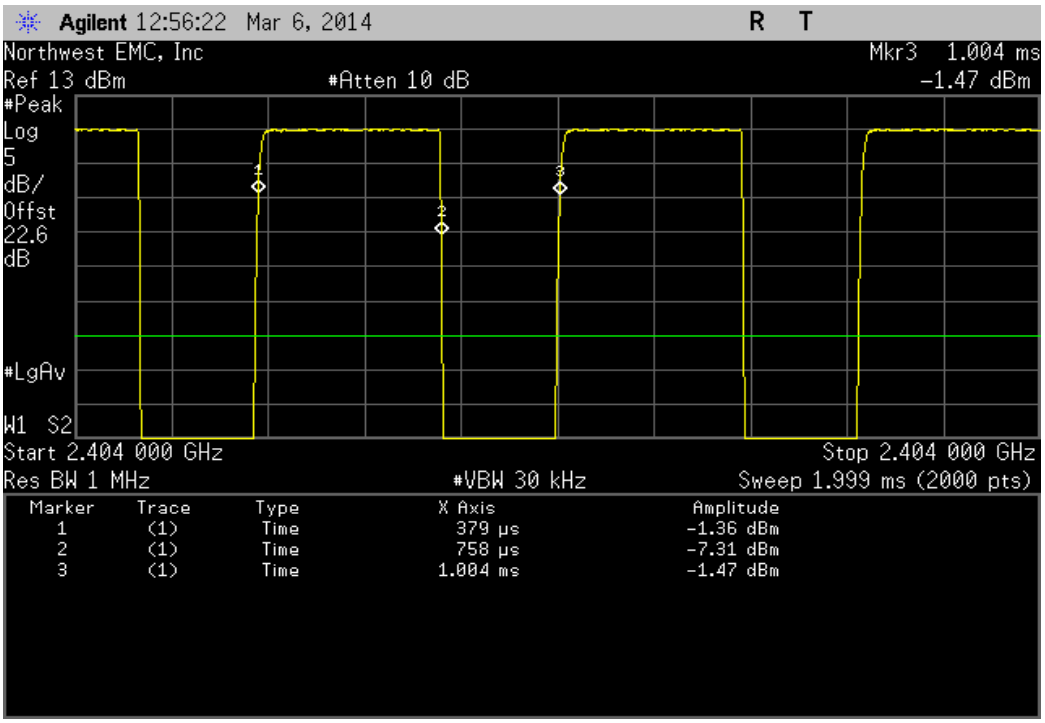


BLE ADV, High Channel 39, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A

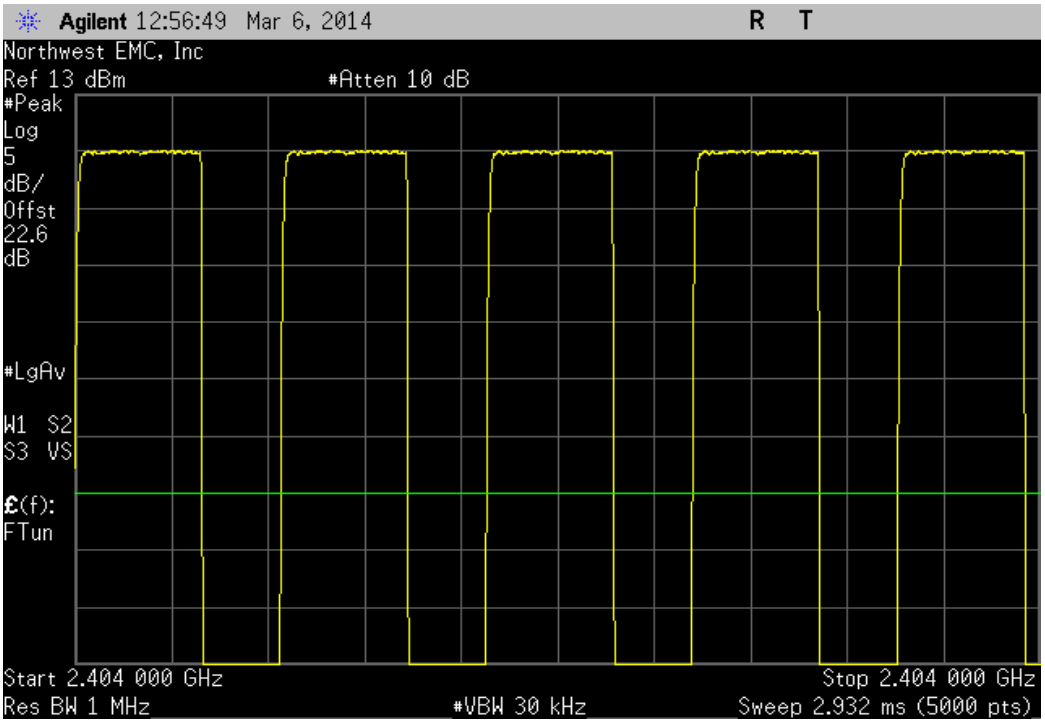


DUTY CYCLE

BLE DATA, Low Channel 1, 2404 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	379 uS	625 uS	1	60.6	N/A	N/A

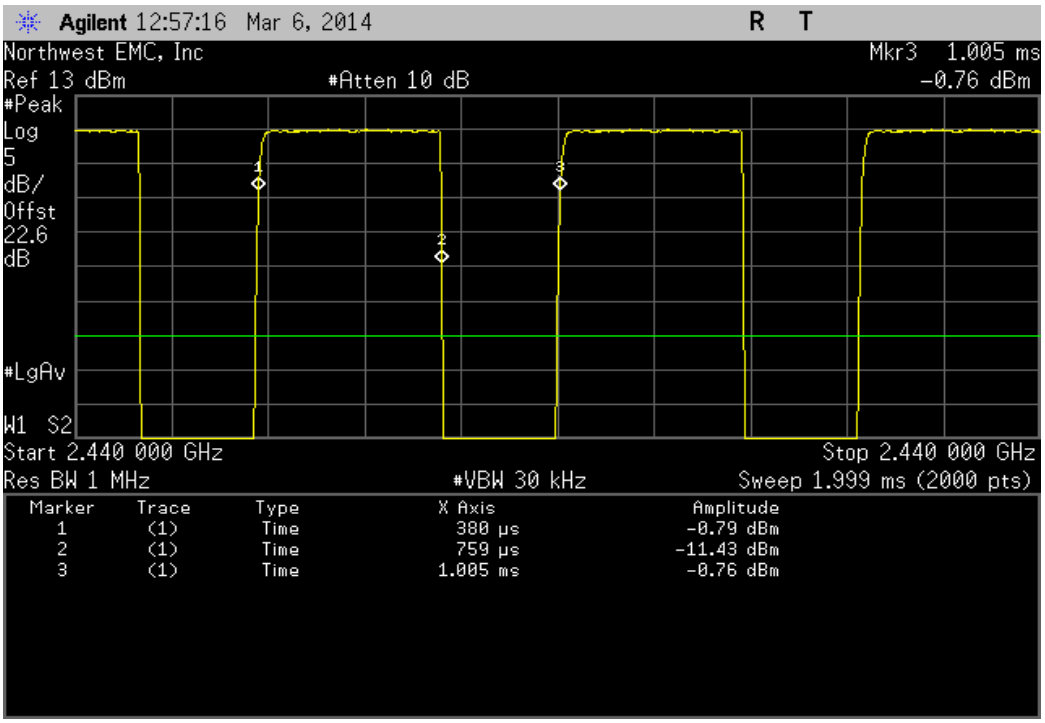


BLE DATA, Low Channel 1, 2404 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A

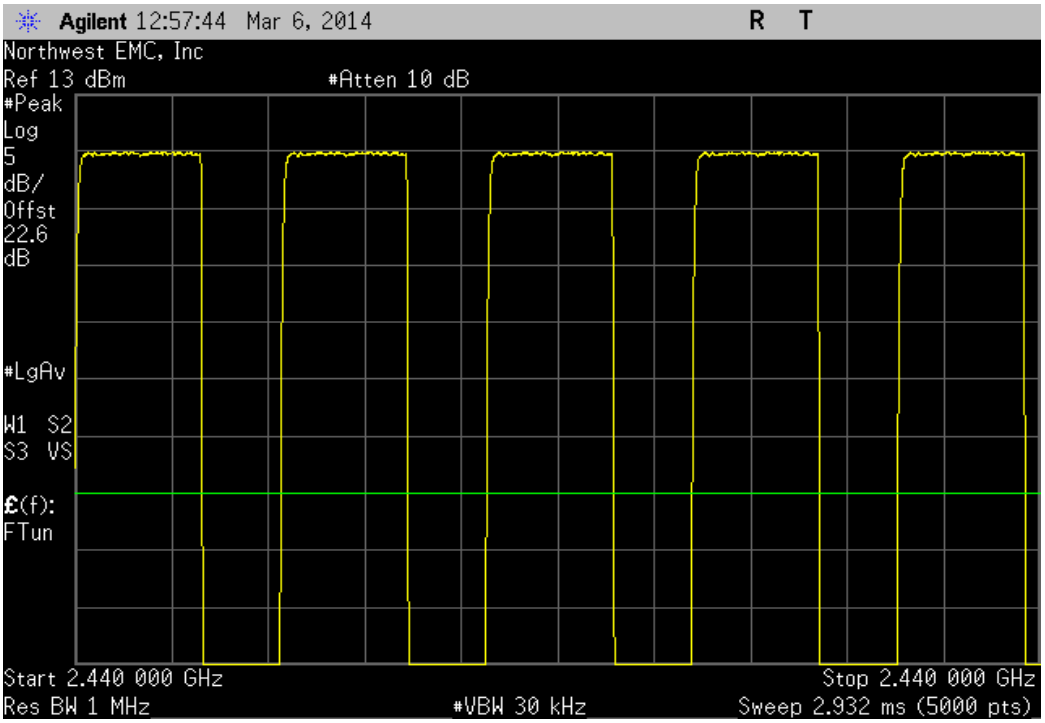


DUTY CYCLE

BLE DATA, Mid Channel 19, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	379 uS	625 uS	1	60.6	N/A	N/A

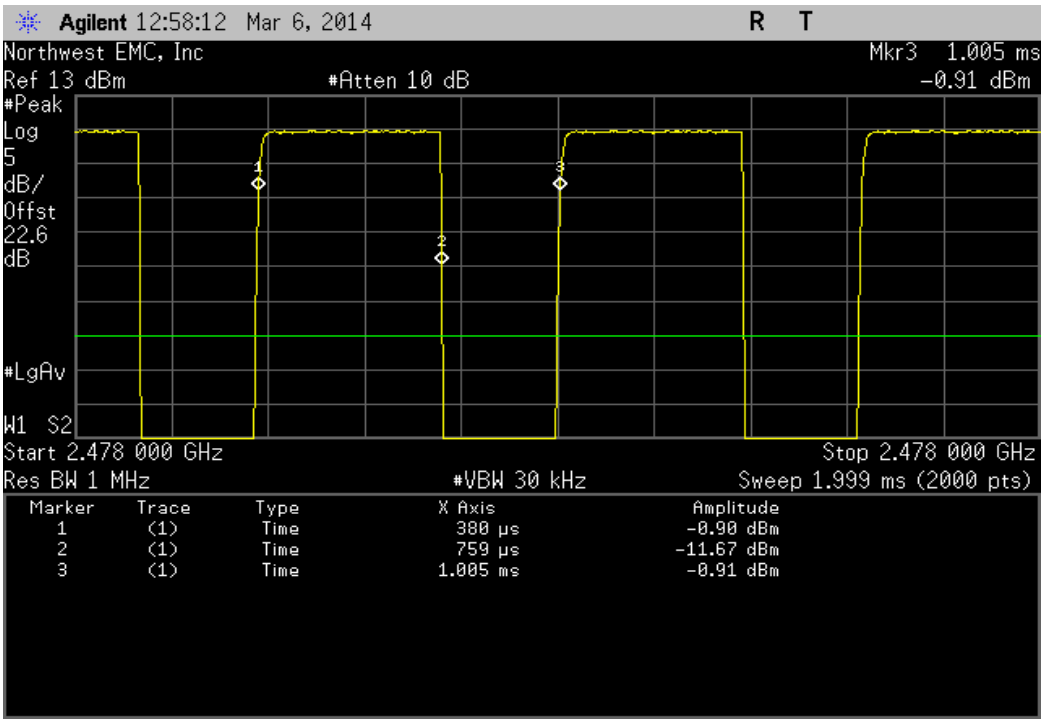


BLE DATA, Mid Channel 19, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A

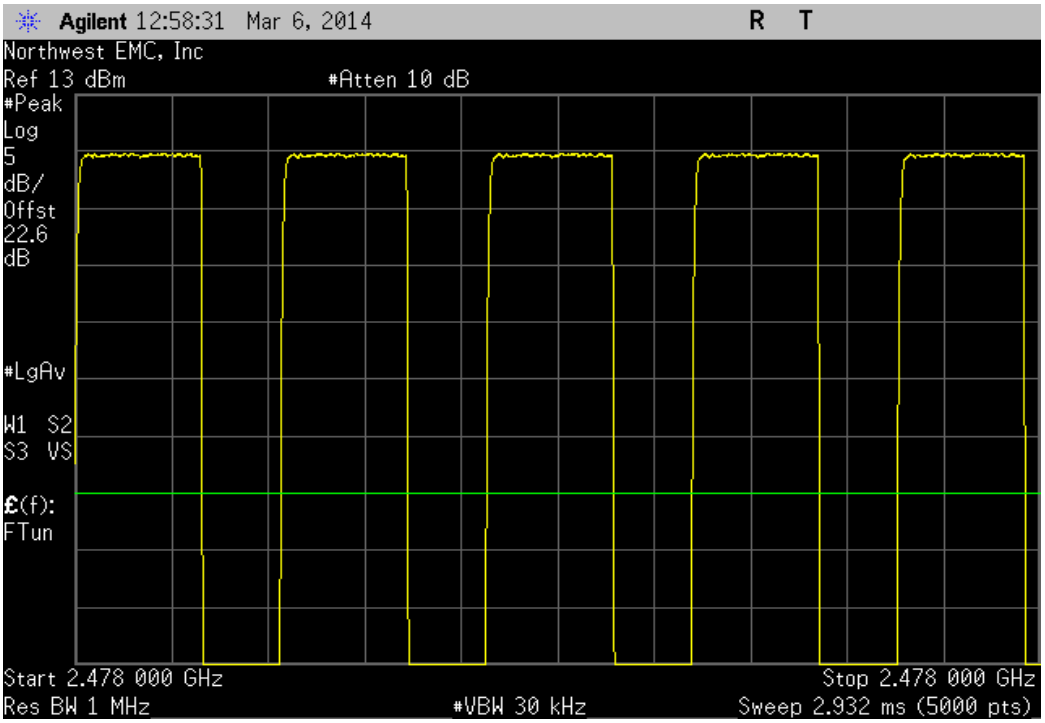


DUTY CYCLE

BLE DATA, High Channel 38, 2478 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	379 uS	625 uS	1	60.6	N/A	N/A



BLE DATA, High Channel 38, 2478 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	N/A	N/A	5	N/A	N/A	N/A



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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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 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 the data rate(s) listed in the datasheet.

OCCUPIED BANDWIDTH

EUT:	1631			**Work Order:**	MCSO1702
Serial Number:	041152140753			**Date:**	03/06/14
Customer:	Microsoft Corporation			**Temperature:**	23°C
Attendees:	None			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1001
Tested by:	Richard Mellroth	**Power:**	110 VAC / 60Hz	**Job Site:**	NC06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

DEVIATIONS FROM TEST STANDARD

None

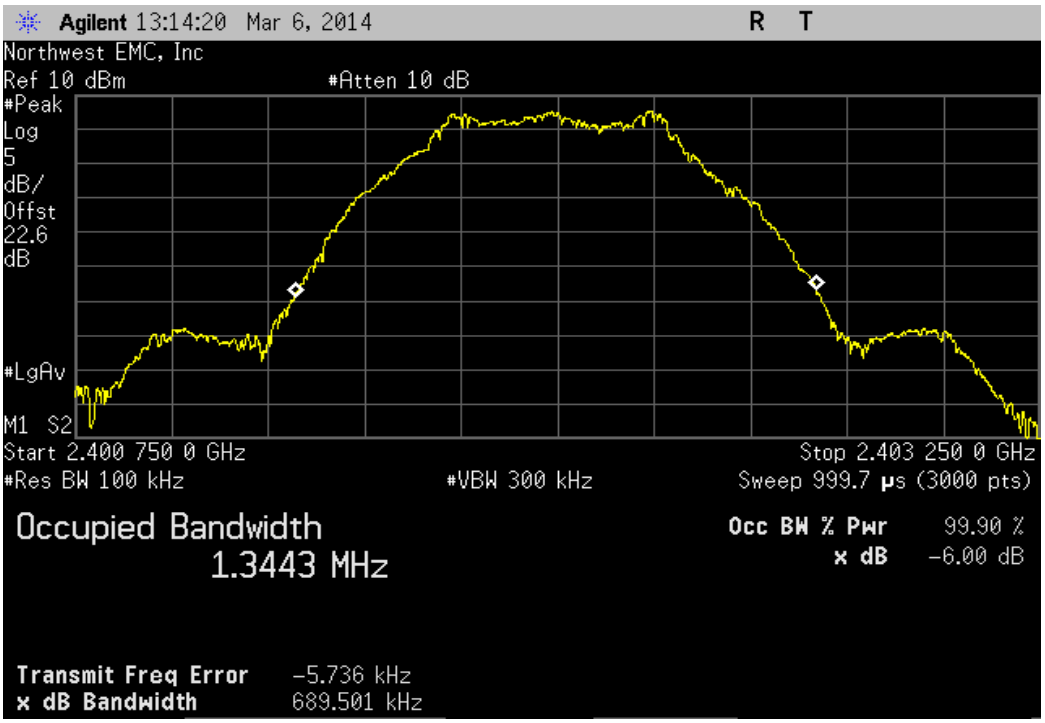
Configuration #	1	Signature

	Value	Limit	Result
BLE ADV			
Low Channel 0, 2402 MHz	689.501 kHz	> 500 kHz	Pass
Mid Channel 12, 2426 MHz	697.034 kHz	> 500 kHz	Pass
High Channel 39, 2480 MHz	701.831 kHz	> 500 kHz	Pass
BLE DATA			
Low Channel 1, 2404 MHz	689.668 kHz	> 500 kHz	Pass
Mid Channel 19, 2440 MHz	709.573 kHz	> 500 kHz	Pass
High Channel 38, 2478 MHz	711.389 kHz	> 500 kHz	Pass

OCCUPIED BANDWIDTH

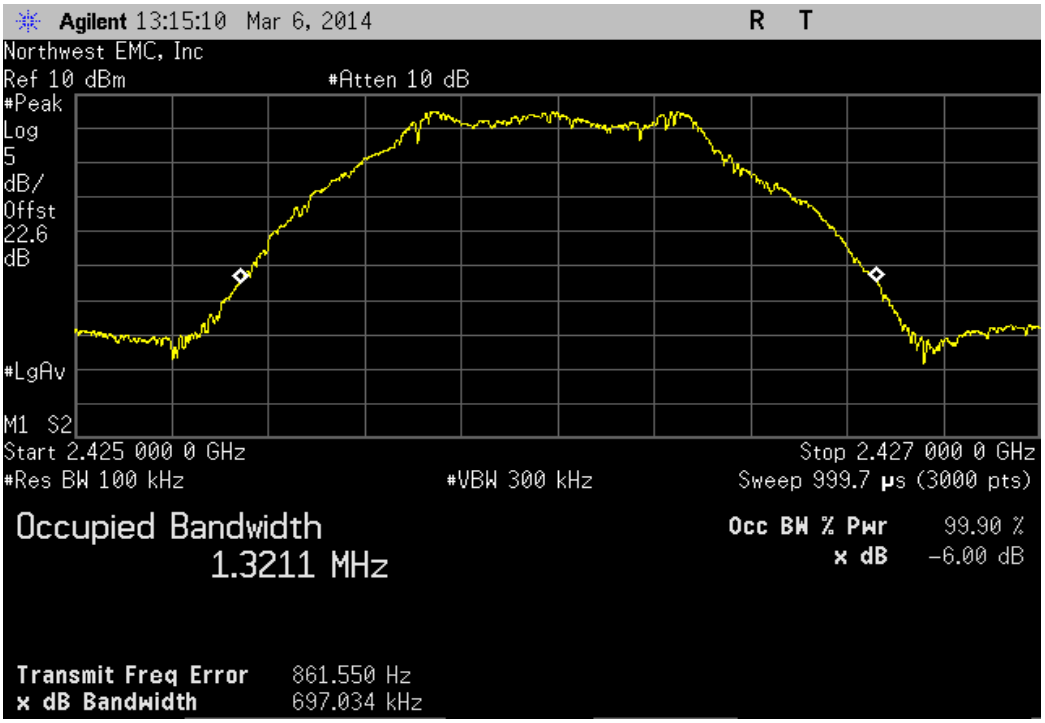
BLE ADV, Low Channel 0, 2402 MHz

				Value	Limit	Result
				689.501 kHz	> 500 kHz	Pass



BLE ADV, Mid Channel 12, 2426 MHz

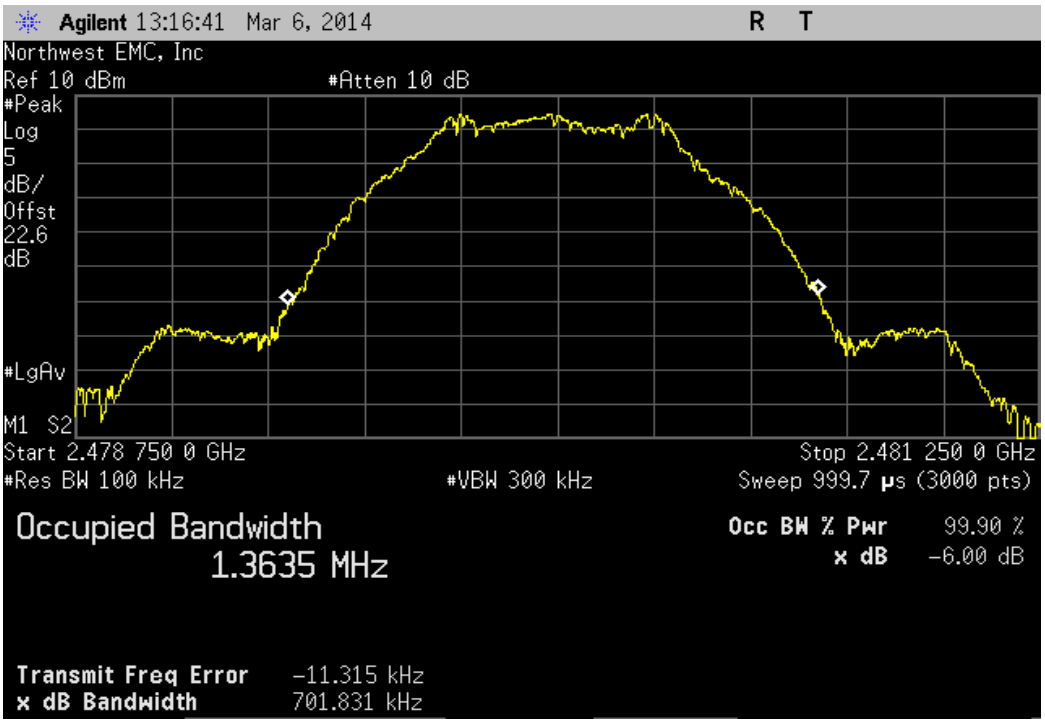
				Value	Limit	Result
				697.034 kHz	> 500 kHz	Pass



OCCUPIED BANDWIDTH

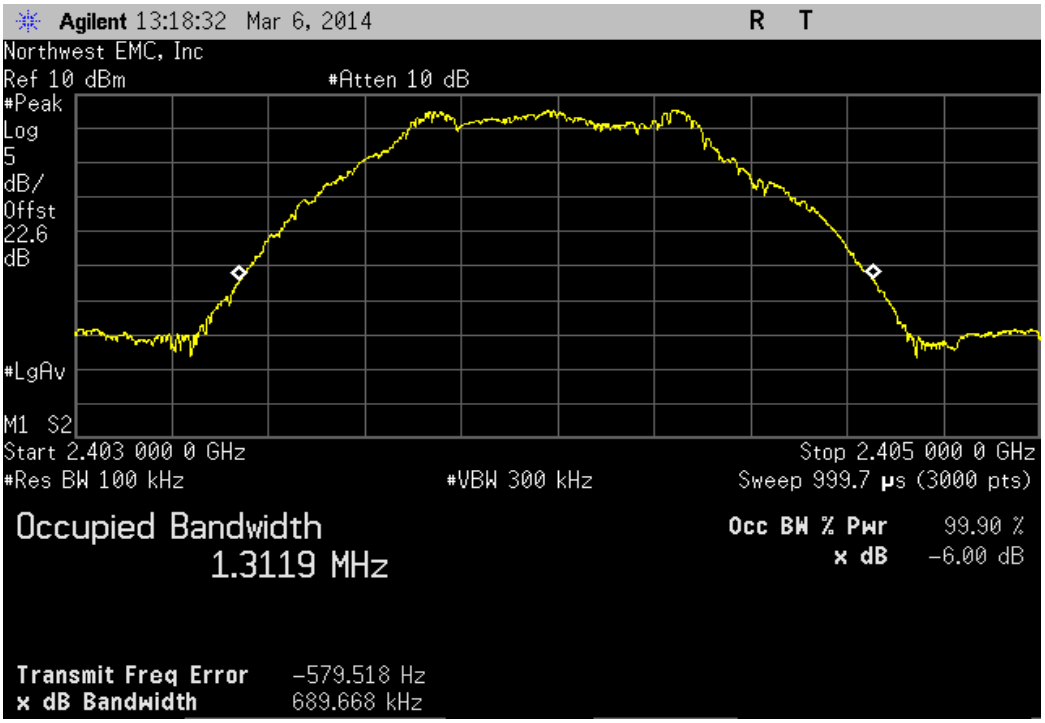
BLE ADV, High Channel 39, 2480 MHz

				Value	Limit	Result
				701.831 kHz	> 500 kHz	Pass



BLE DATA, Low Channel 1, 2404 MHz

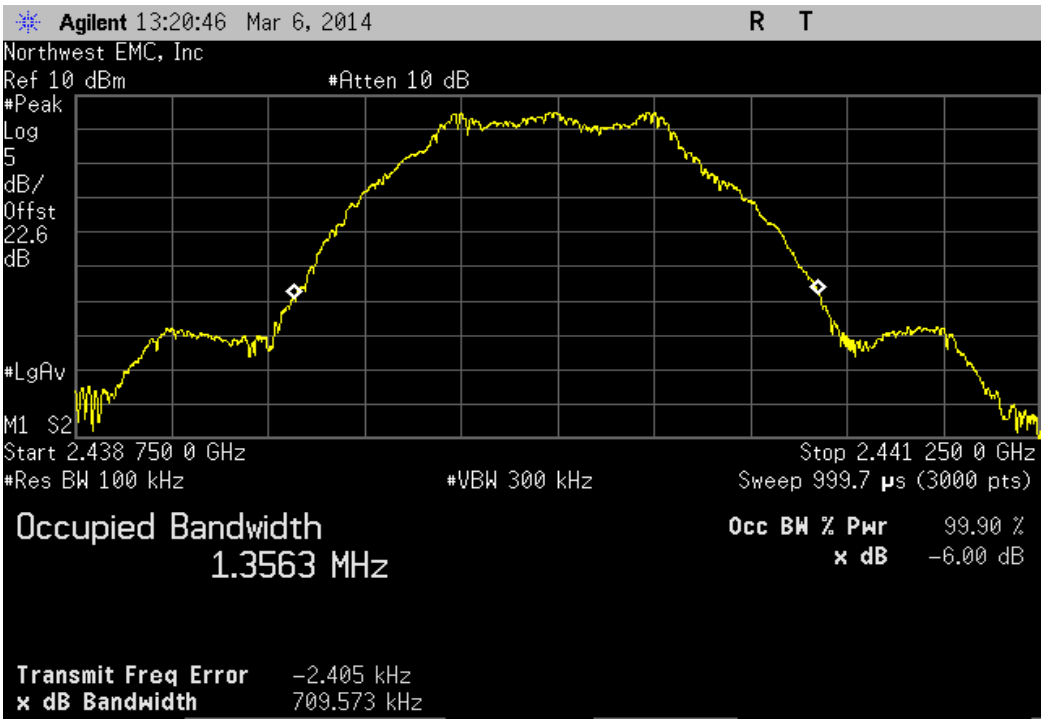
				Value	Limit	Result
				689.668 kHz	> 500 kHz	Pass



OCCUPIED BANDWIDTH

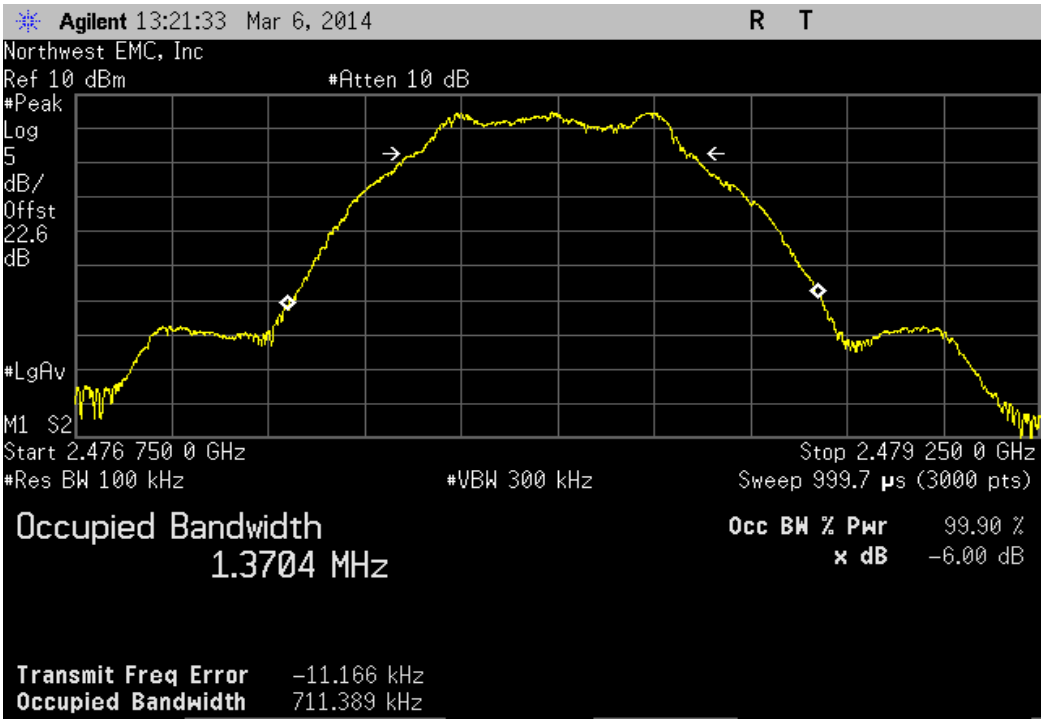
BLE DATA, Mid Channel 19, 2440 MHz

				Value	Limit	Result
				709.573 kHz	> 500 kHz	Pass



BLE DATA, High Channel 38, 2478 MHz

				Value	Limit	Result
				711.389 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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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.

Method Option 1 found in KDB 558074 DTS D01 Measurement Section 8.1.1 was used because the RBW on the analyzer was greater than the Emission 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:	1631	Work Order:	MCSO1702
Serial Number:	041152140753	Date:	03/06/14
Customer:	Microsoft Corporation	Temperature:	23°C
Attendees:	None	Humidity:	40%
Project:	None	Barometric Pres.:	1001
Tested by:	Richard Mellroth	Power: 110 VAC / 60Hz	Job Site: NC06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

DEVIATIONS FROM TEST STANDARD

None

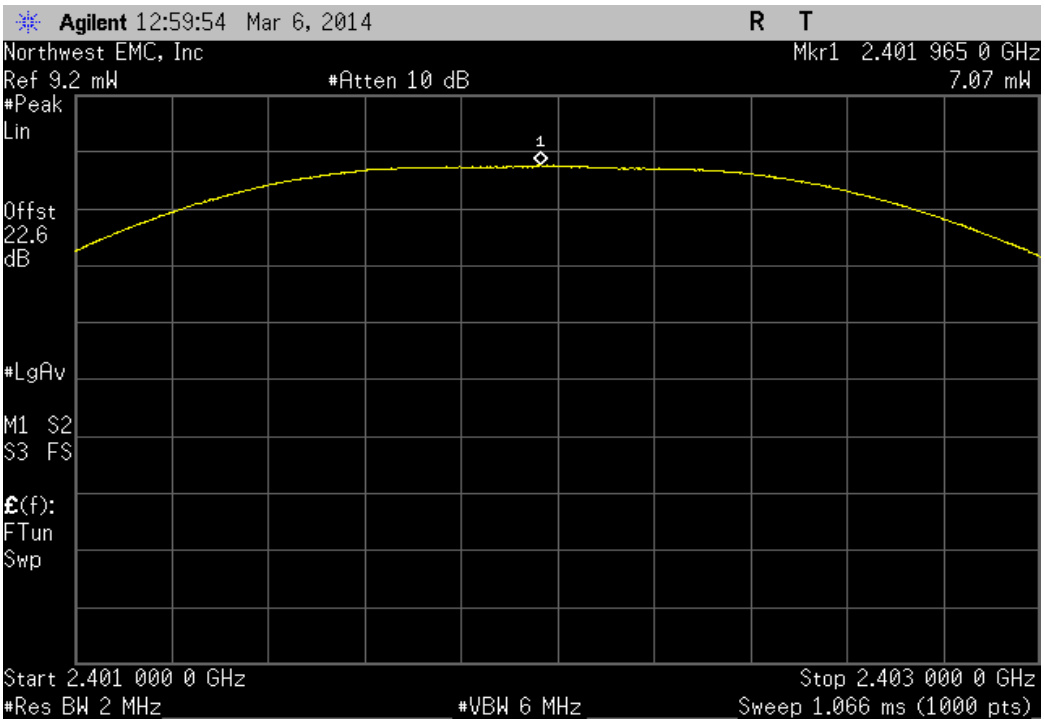
Configuration #	1	Signature

	Value	Limit	Result
BLE ADV			
Low Channel 0, 2402 MHz	7.073 mW	< 1 W	Pass
Mid Channel 12, 2426 MHz	6.942 mW	< 1 W	Pass
High Channel 39, 2480 MHz	6.616 mW	< 1 W	Pass
BLE DATA			
Low Channel 1, 2404 MHz	7.058 mW	< 1 W	Pass
Mid Channel 19, 2440 MHz	6.856 mW	< 1 W	Pass
High Channel 38, 2478 MHz	6.662 mW	< 1 W	Pass

Output Power

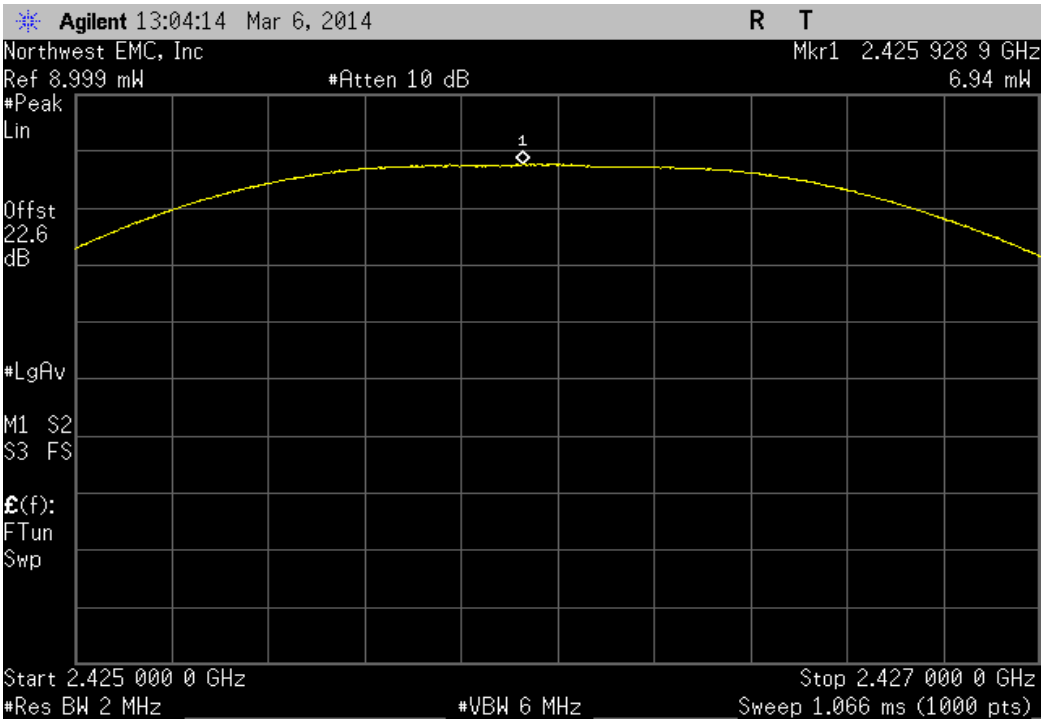
BLE ADV, Low Channel 0, 2402 MHz

				Value	Limit	Result
				7.073 mW	< 1 W	Pass



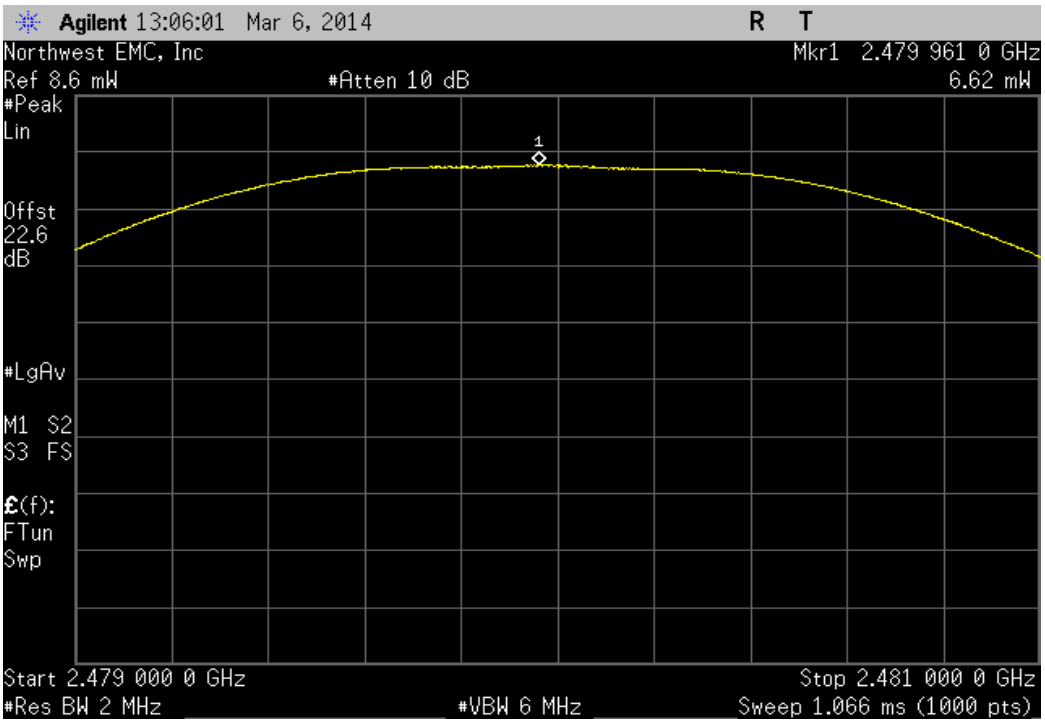
BLE ADV, Mid Channel 12, 2426 MHz

				Value	Limit	Result
				6.942 mW	< 1 W	Pass

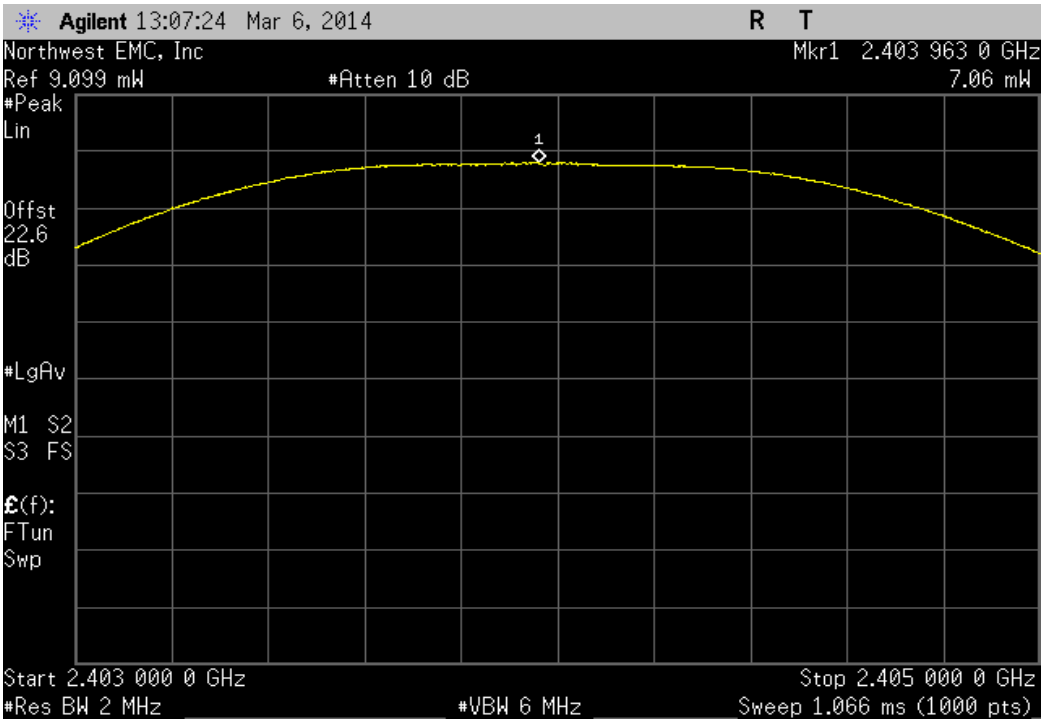


Output Power

BLE ADV, High Channel 39, 2480 MHz						
				Value	Limit	Result
				6.616 mW	< 1 W	Pass



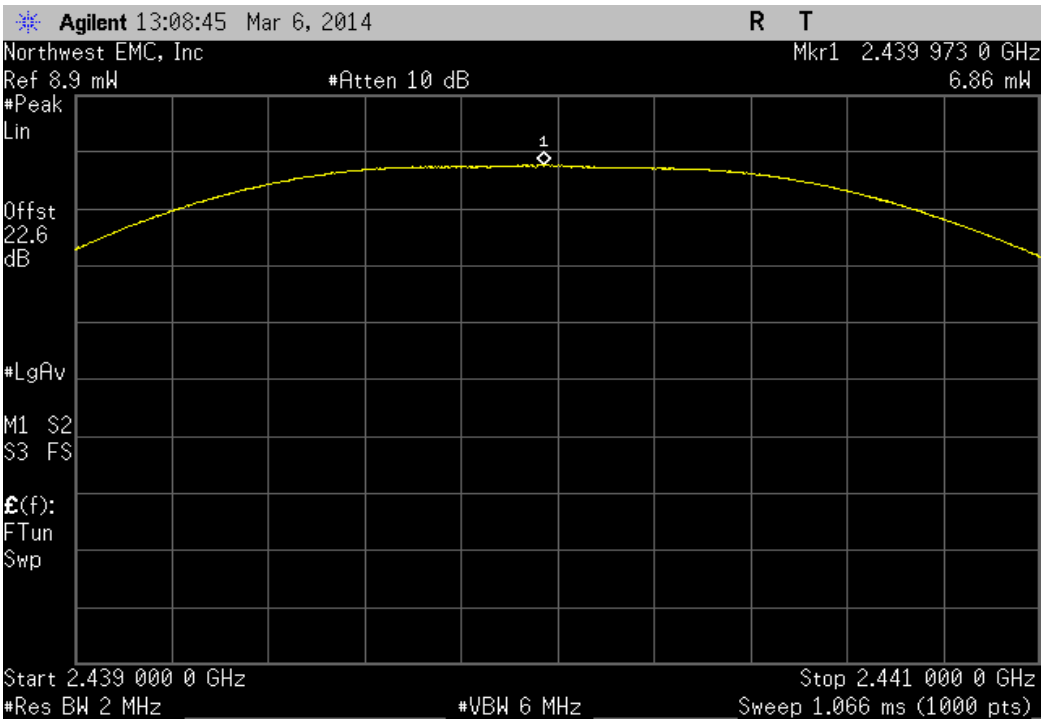
BLE DATA, Low Channel 1, 2404 MHz						
				Value	Limit	Result
				7.058 mW	< 1 W	Pass



Output Power

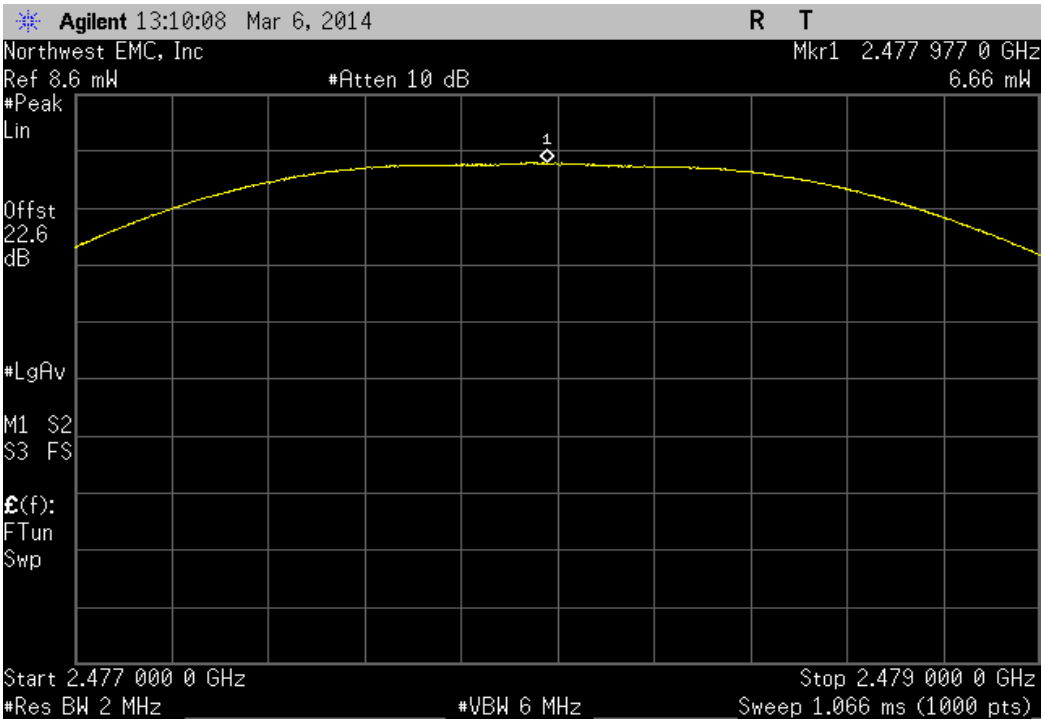
BLE DATA, Mid Channel 19, 2440 MHz

				Value	Limit	Result
				6.856 mW	< 1 W	Pass



BLE DATA, High Channel 38, 2478 MHz

				Value	Limit	Result
				6.662 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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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:

BWCF = 10*LOG (3 kHz / 100 kHz) = -15.2 dB

POWER SPECTRAL DENSITY

EUT:	**1631**			**Work Order:**	**MCSO1702**
Serial Number:	**041152140753**			**Date:**	**03/06/14**
Customer:	**Microsoft Corporation**			**Temperature:**	**23°C**
Attendees:	**None**			**Humidity:**	**40%**
Project:	**None**			**Barometric Pres.:**	**1001**
Tested by:	**Richard Mellroth**	**Power:**	**110 VAC / 60Hz**	**Job Site:**	**NC06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

DEVIATIONS FROM TEST STANDARD

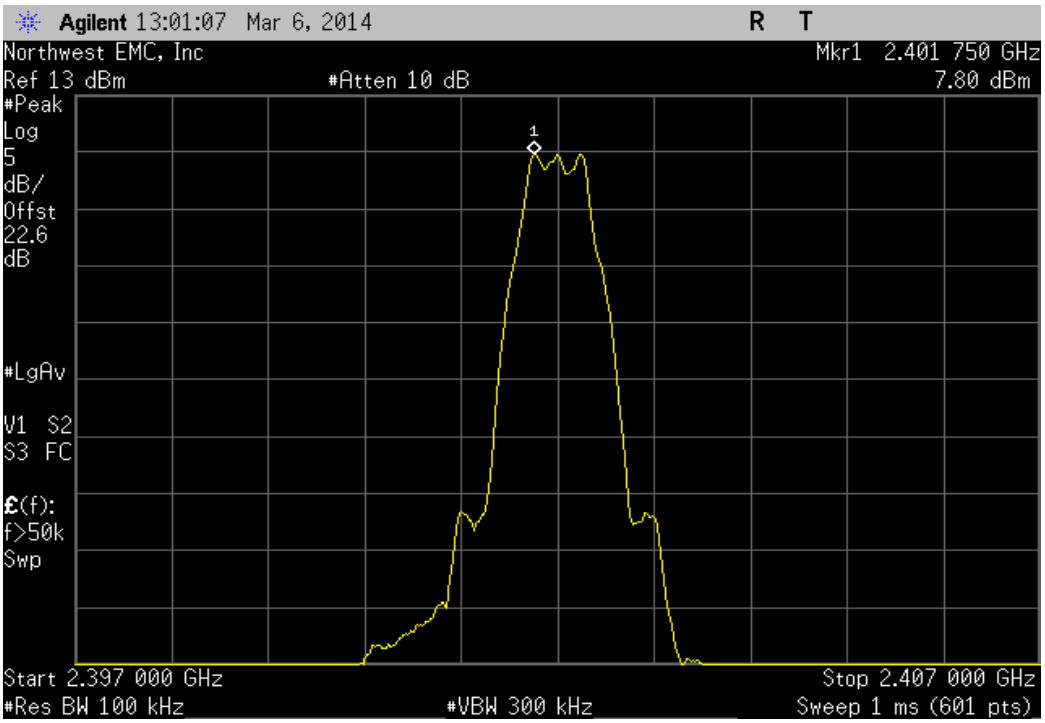
None

Configuration #	**1**	*Signature*

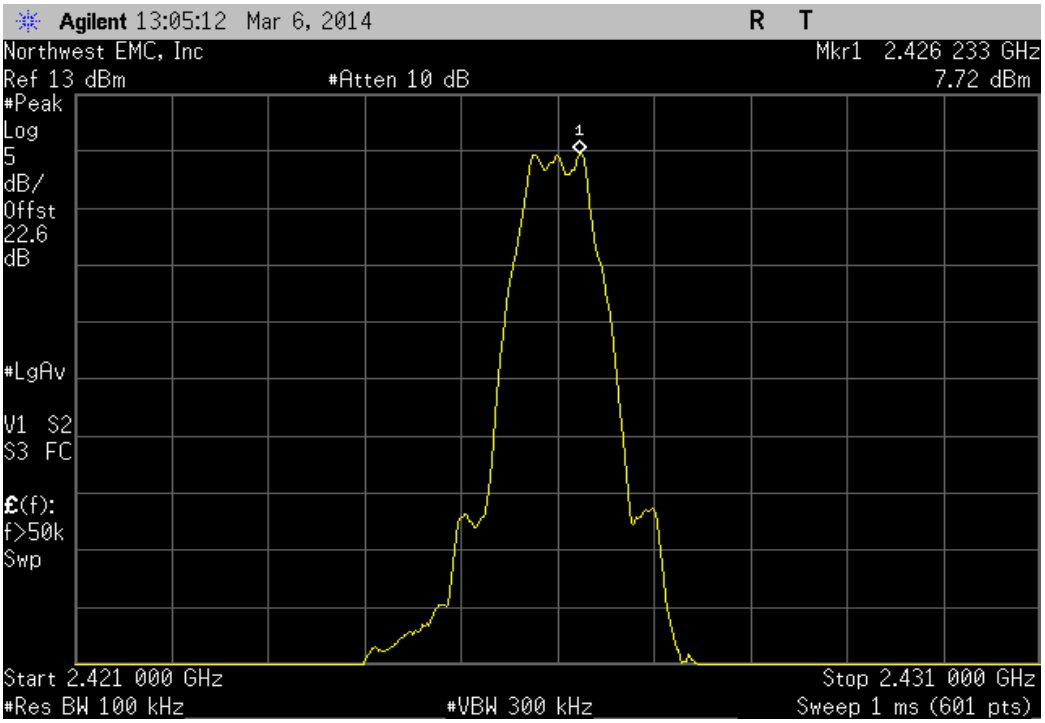
	Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
BLE ADV					
Low Channel 0, 2402 MHz	7.795	-15.2	-7.405	8	Pass
Mid Channel 12, 2426 MHz	7.717	-15.2	-7.483	8	Pass
High Channel 39, 2480 MHz	7.524	-15.2	-7.676	8	Pass
BLE DATA					
Low Channel 1, 2404 MHz	7.81	-15.2	-7.39	8	Pass
Mid Channel 19, 2440 MHz	7.674	-15.2	-7.526	8	Pass
High Channel 38, 2478 MHz	7.531	-15.2	-7.669	8	Pass

POWER SPECTRAL DENSITY

BLE ADV, Low Channel 0, 2402 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.795	-15.2	-7.405	8	Pass

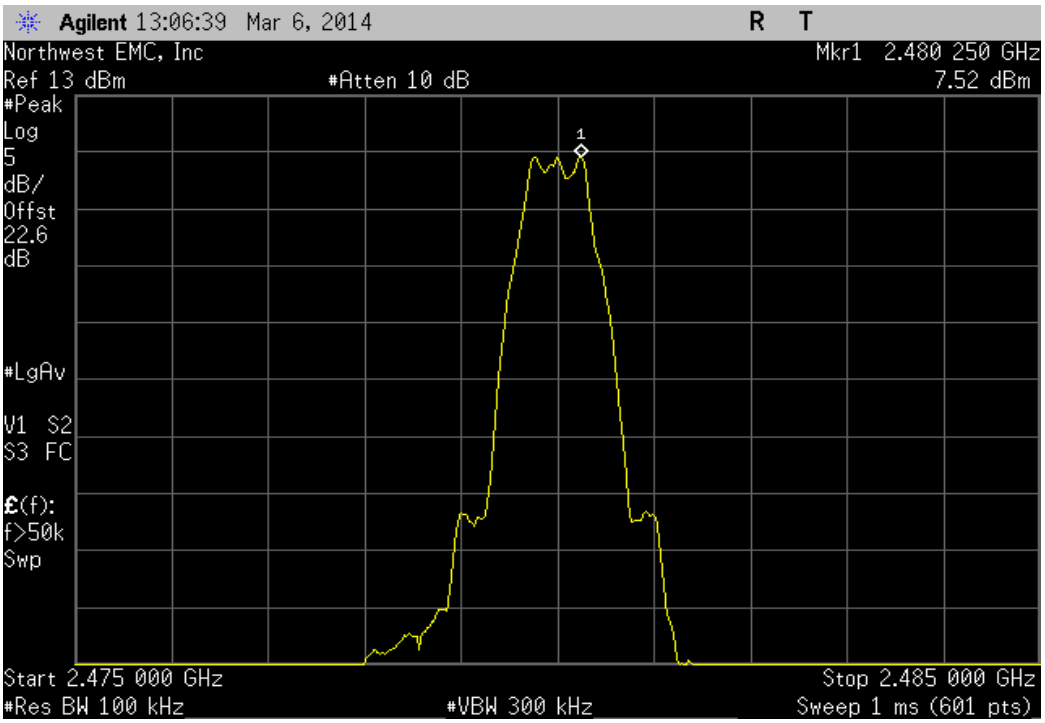


BLE ADV, Mid Channel 12, 2426 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.717	-15.2	-7.483	8	Pass

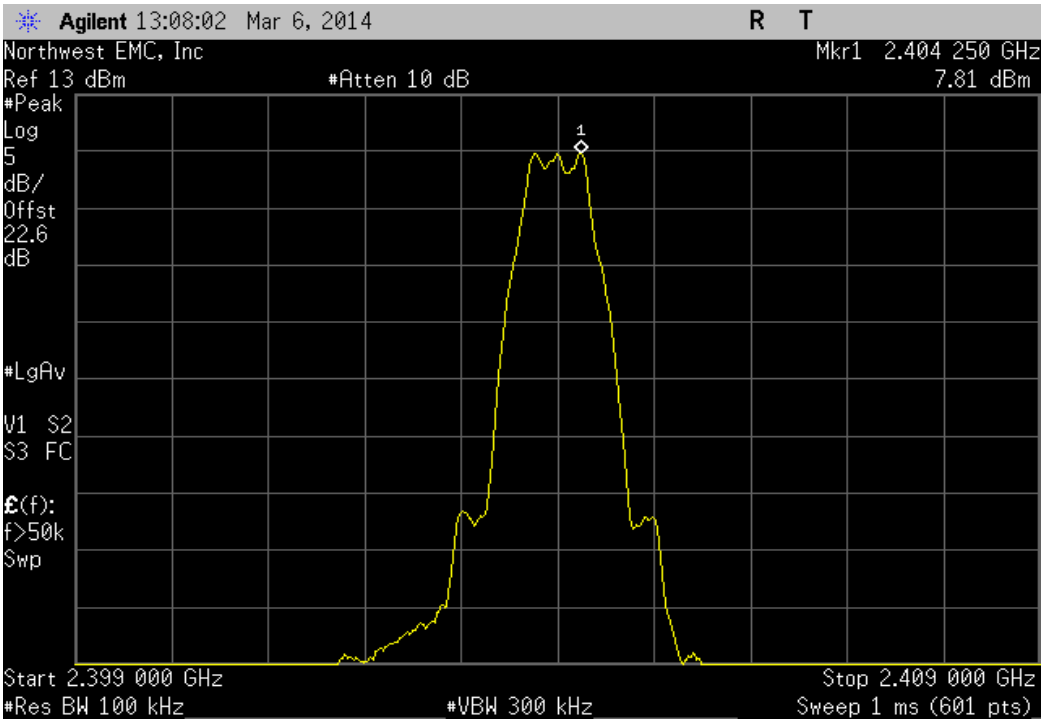


POWER SPECTRAL DENSITY

BLE ADV, High Channel 39, 2480 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.524	-15.2	-7.676	8	Pass

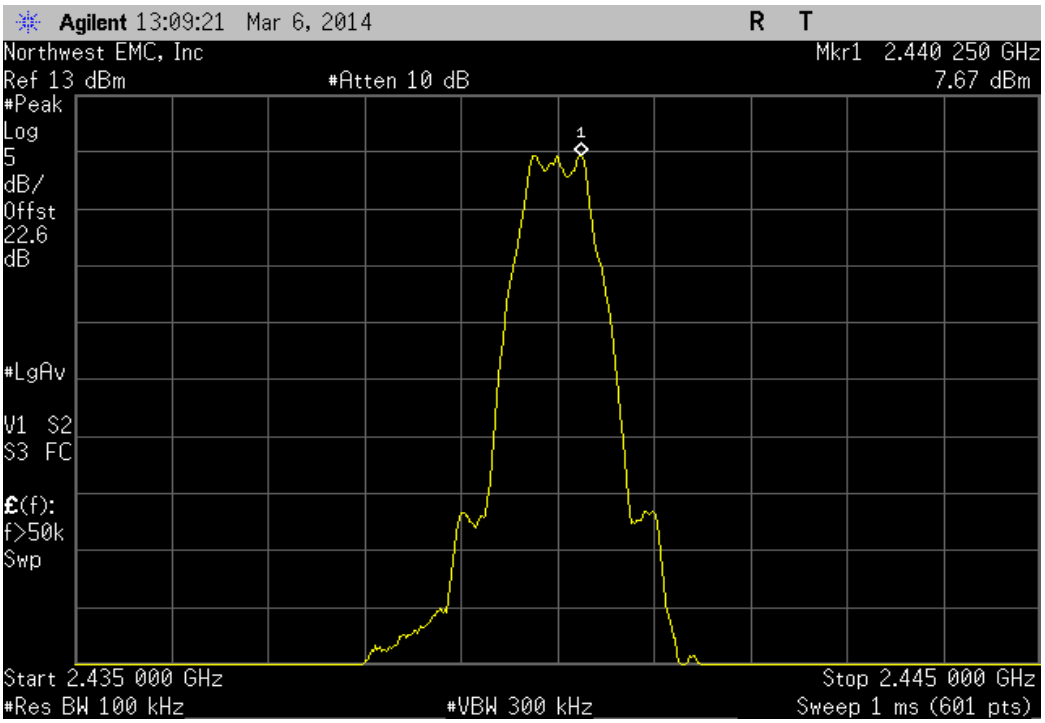


BLE DATA, Low Channel 1, 2404 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.81	-15.2	-7.39	8	Pass

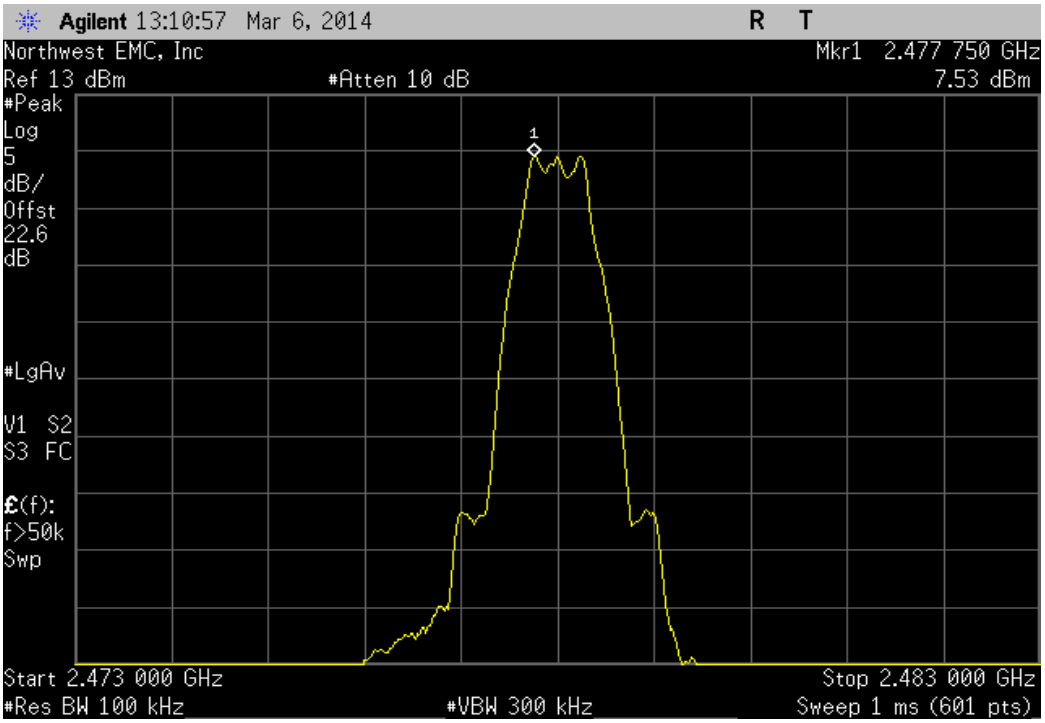


POWER SPECTRAL DENSITY

BLE DATA, Mid Channel 19, 2440 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.674	-15.2	-7.526	8	Pass



BLE DATA, High Channel 38, 2478 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Result
		7.531	-15.2	-7.669	8	Pass



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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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:	1631	Work Order:	MCSO1702
Serial Number:	041152140753	Date:	03/06/14
Customer:	Microsoft Corporation	Temperature:	23°C
Attendees:	None	Humidity:	40%
Project:	None	Barometric Pres.:	1001
Tested by:	Richard Mellroth	Power: 110 VAC / 60Hz	Job Site: NC06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

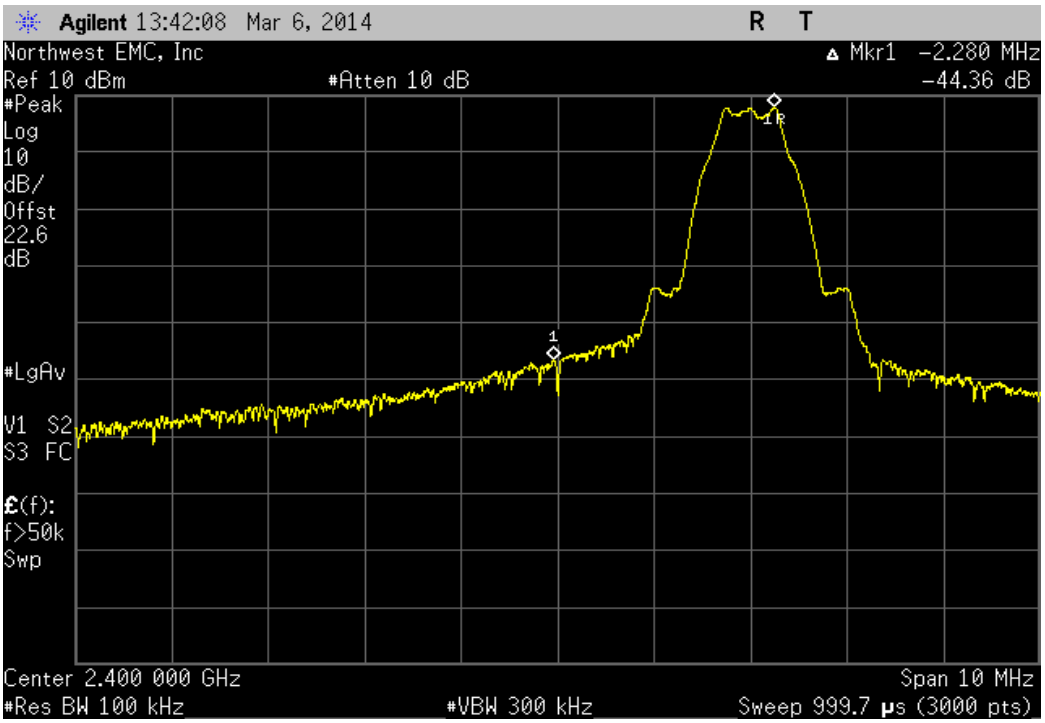
DEVIATIONS FROM TEST STANDARD

None

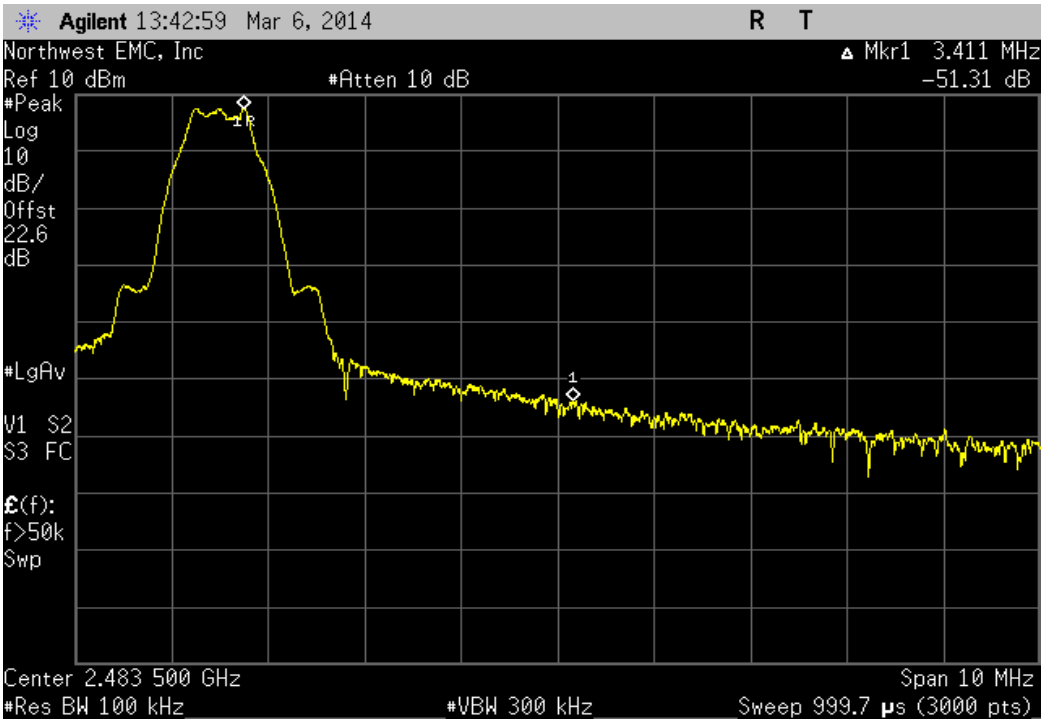
Configuration #	1	Signature

	Value	Limit	Result
BLE ADV			
Low Channel 0, 2402 MHz	-44.36 dBc	≤ -20 dBc	Pass
High Channel 39, 2480 MHz	-51.31 dBc	≤ -20 dBc	Pass
BLE DATA			
Low Channel 1, 2404 MHz	-51.17 dBc	≤ -20 dBc	Pass
High Channel 38, 2478 MHz	-54.49 dBc	≤ -20 dBc	Pass

BLE ADV, Low Channel 0, 2402 MHz						
				Value	Limit	Result
				-44.36 dBc	≤ -20 dBc	Pass



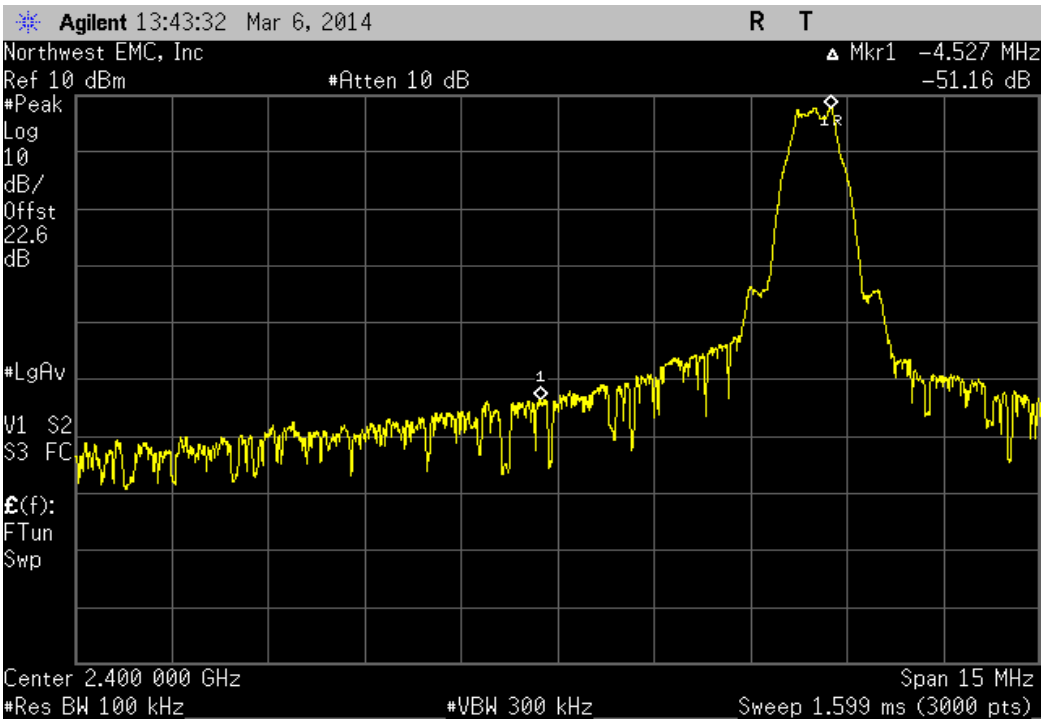
BLE ADV, High Channel 39, 2480 MHz						
				Value	Limit	Result
				-51.31 dBc	≤ -20 dBc	Pass



BAND EDGE COMPLIANCE

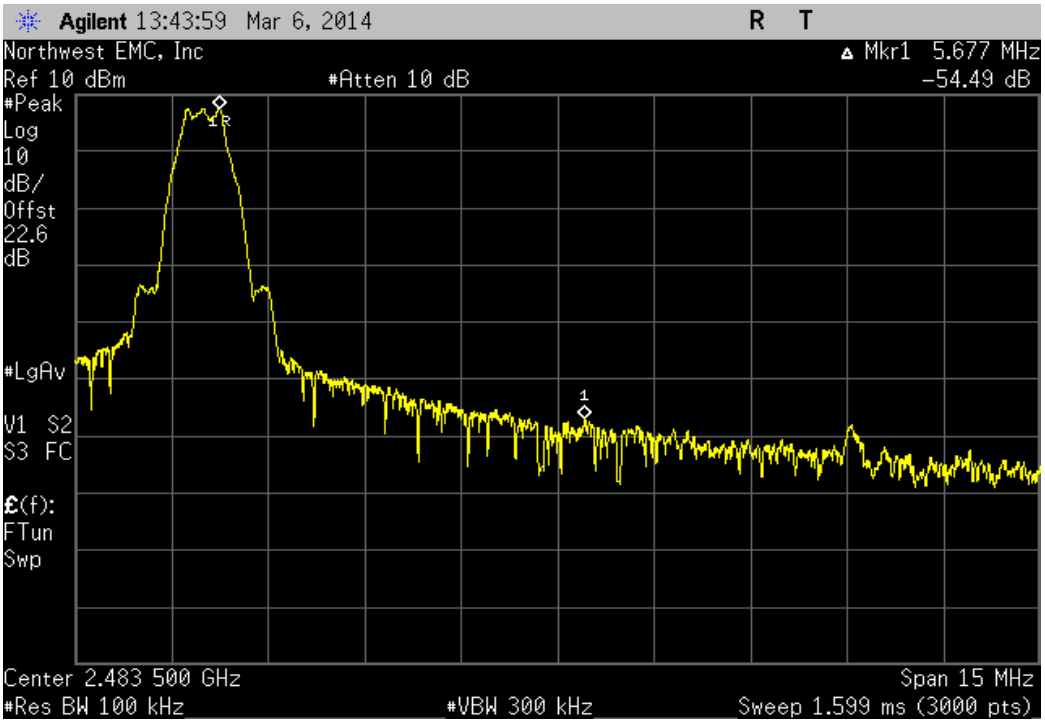
BLE DATA, Low Channel 1, 2404 MHz

				Value	Limit	Result
				-51.17 dBc	≤ -20 dBc	Pass



BLE DATA, High Channel 38, 2478 MHz

				Value	Limit	Result
				-54.49 dBc	≤ -20 dBc	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
Signal Generator	Agilent	N5183A	TIA	1/27/2012	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	7/3/2013	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	7/3/2013	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

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:	1631	**Work Order:**	MCSO1702
Serial Number:	041152140753	**Date:**	03/06/14
Customer:	Microsoft Corporation	**Temperature:**	23°C
Attendees:	None	**Humidity:**	40%
Project:	None	**Barometric Pres.:**	1001
Tested by:	Richard Mellroth	**Power:** 110 VAC / 60Hz	**Job Site:** NC06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2014	ANSI C63.10:2009

COMMENTS

Adapter cable loss of 0.75dB added to analyzer reference level offset.

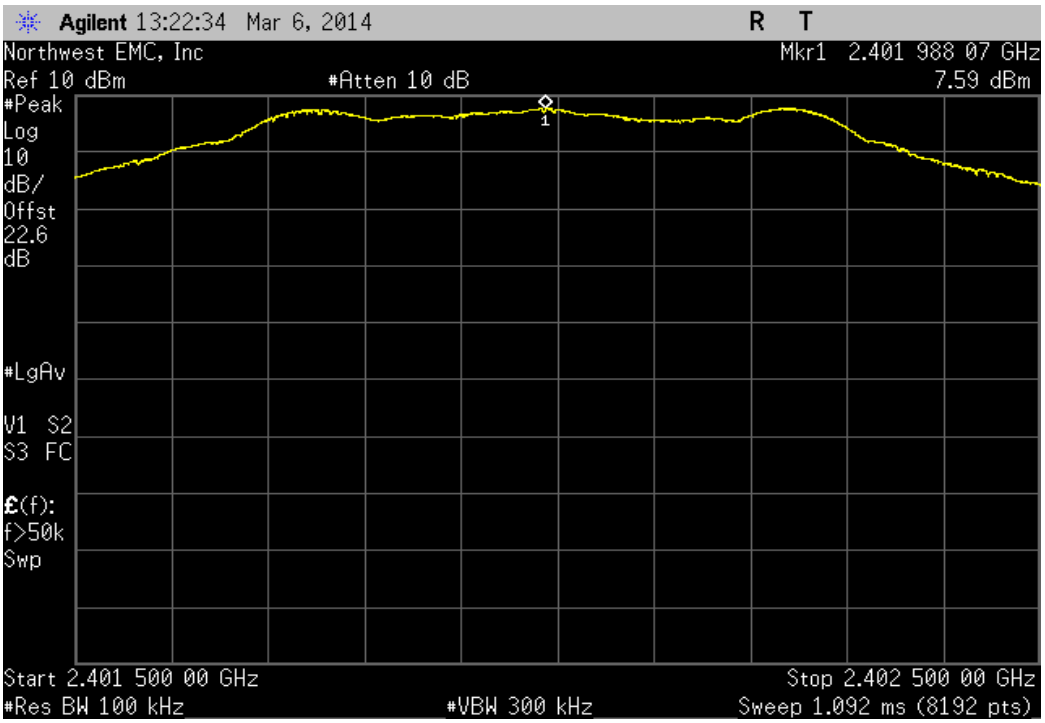
DEVIATIONS FROM TEST STANDARD

None

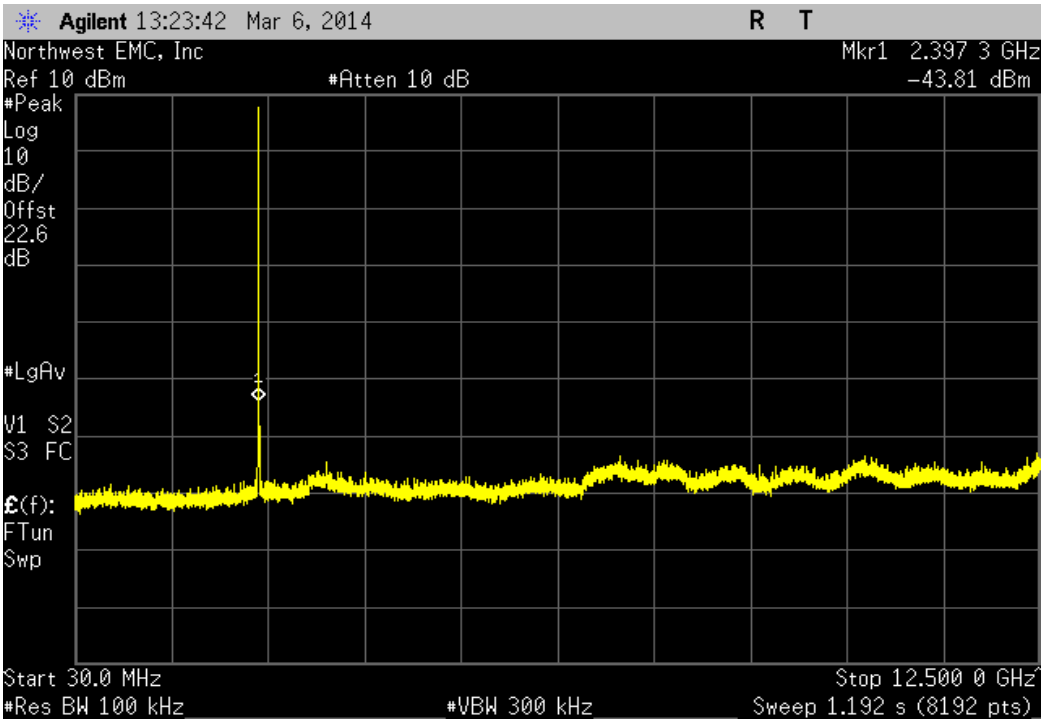
Configuration #	1	Signature

		Frequency Range	Value	Limit	Result
BLE ADV					
	Low Channel 0, 2402 MHz	Fundamental	N/A	N/A	N/A
	Low Channel 0, 2402 MHz	30 MHz - 12.5 GHz	-51.4 dBc	≤ -20 dBc	Pass
	Low Channel 0, 2402 MHz	12.5 GHz - 25 GHz	-55.1 dBc	≤ -20 dBc	Pass
	Mid Channel 12, 2426 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel 12, 2426 MHz	30 MHz - 12.5 GHz	-61.45 dBc	≤ -20 dBc	Pass
	Mid Channel 12, 2426 MHz	12.5 GHz - 25 GHz	-55.45 dBc	≤ -20 dBc	Pass
	High Channel 39, 2480 MHz	Fundamental	N/A	N/A	N/A
	High Channel 39, 2480 MHz	30 MHz - 12.5 GHz	-56.14 dBc	≤ -20 dBc	Pass
	High Channel 39, 2480 MHz	12.5 GHz - 25 GHz	-55.76 dBc	≤ -20 dBc	Pass
BLE DATA					
	Low Channel 1, 2404 MHz	Fundamental	N/A	N/A	N/A
	Low Channel 1, 2404 MHz	30 MHz - 12.5 GHz	-56.82 dBc	≤ -20 dBc	Pass
	Low Channel 1, 2404 MHz	12.5 GHz - 25 GHz	-55.86 dBc	≤ -20 dBc	Pass
	Mid Channel 19, 2440 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel 19, 2440 MHz	30 MHz - 12.5 GHz	-60.9 dBc	≤ -20 dBc	Pass
	Mid Channel 19, 2440 MHz	12.5 GHz - 25 GHz	-55.77 dBc	≤ -20 dBc	Pass
	High Channel 38, 2478 MHz	Fundamental	N/A	N/A	N/A
	High Channel 38, 2478 MHz	30 MHz - 12.5 GHz	-56.04 dBc	≤ -20 dBc	Pass
	High Channel 38, 2478 MHz	12.5 GHz - 25 GHz	-55.11 dBc	≤ -20 dBc	Pass

BLE ADV, Low Channel 0, 2402 MHz					
Frequency Range			Value	Limit	Result
	Fundamental		N/A	N/A	N/A

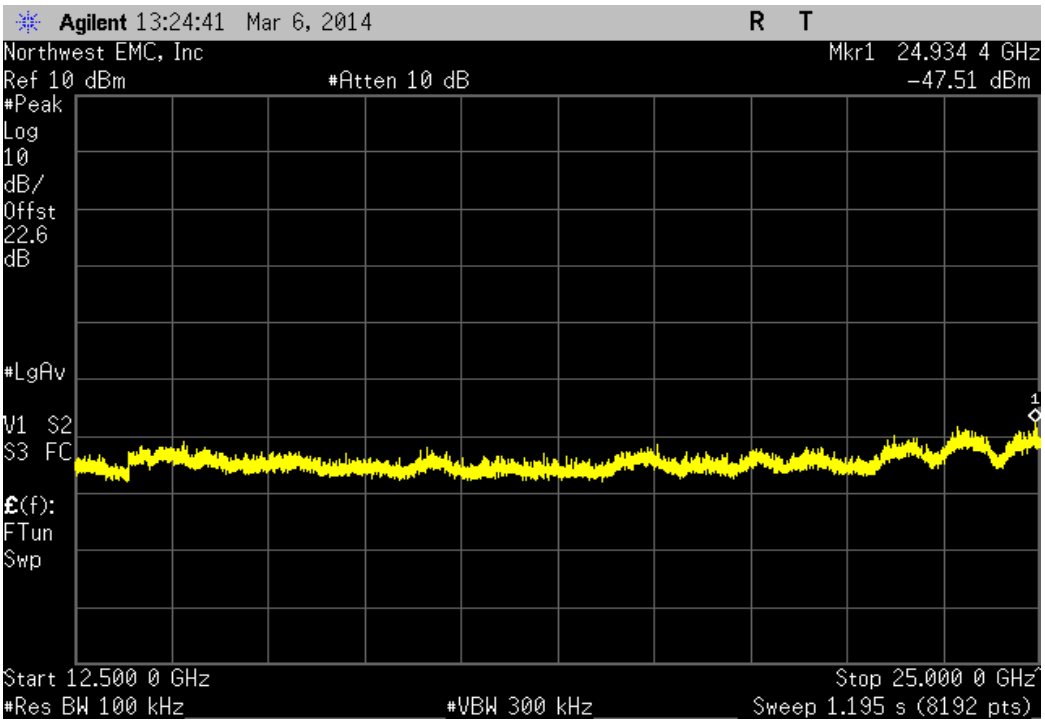


BLE ADV, Low Channel 0, 2402 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-51.4 dBc	≤ -20 dBc	Pass

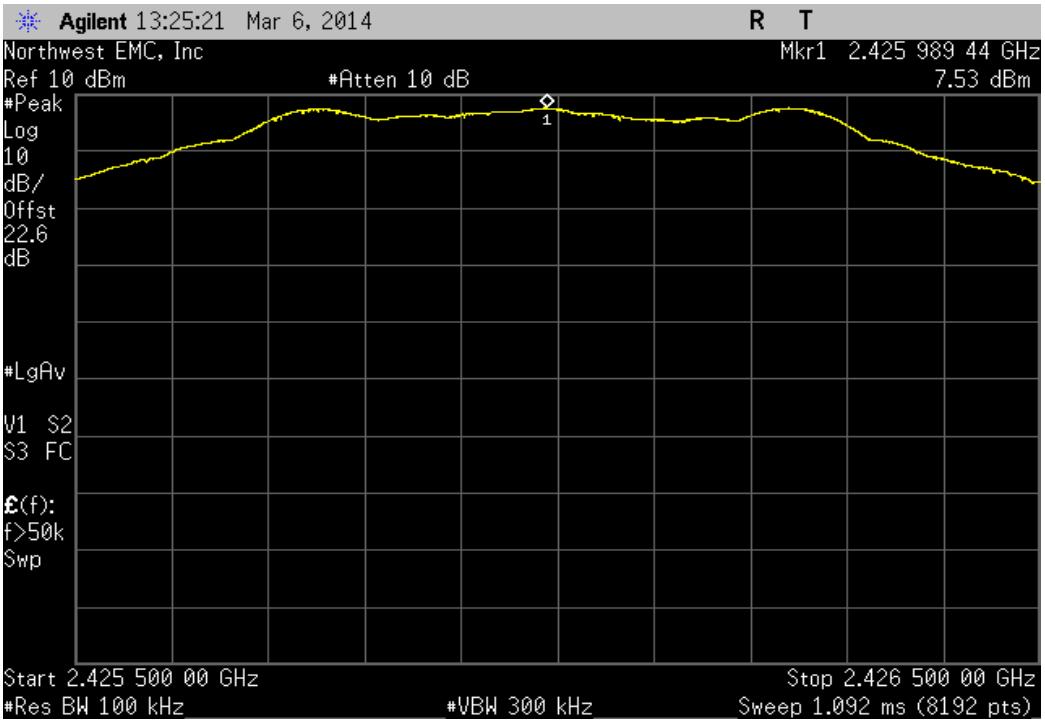


SPURIOUS CONDUCTED EMISSIONS

BLE ADV, Low Channel 0, 2402 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.1 dBc	≤ -20 dBc	Pass

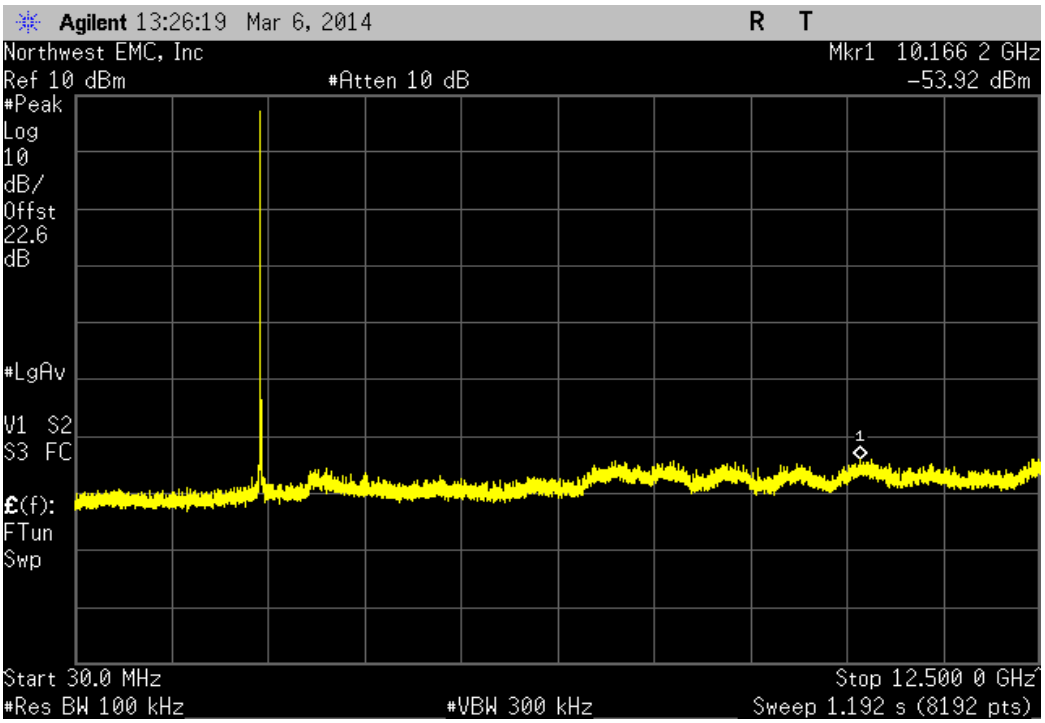


BLE ADV, Mid Channel 12, 2426 MHz				
Frequency Range		Value	Limit	Result
Fundamental		N/A	N/A	N/A

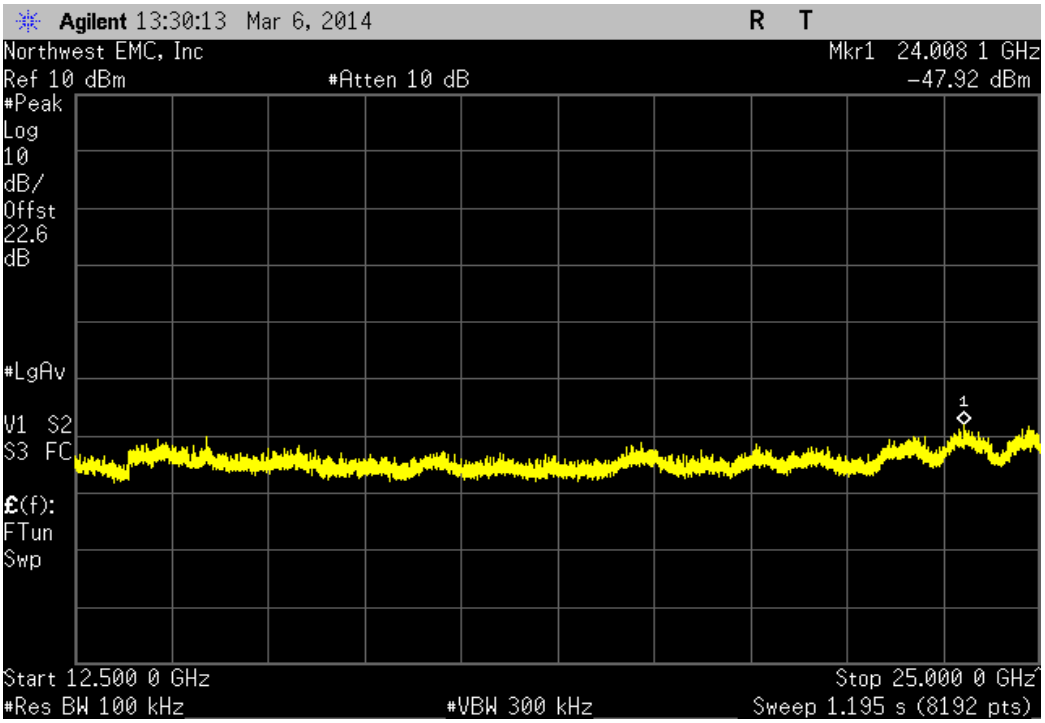


SPURIOUS CONDUCTED EMISSIONS

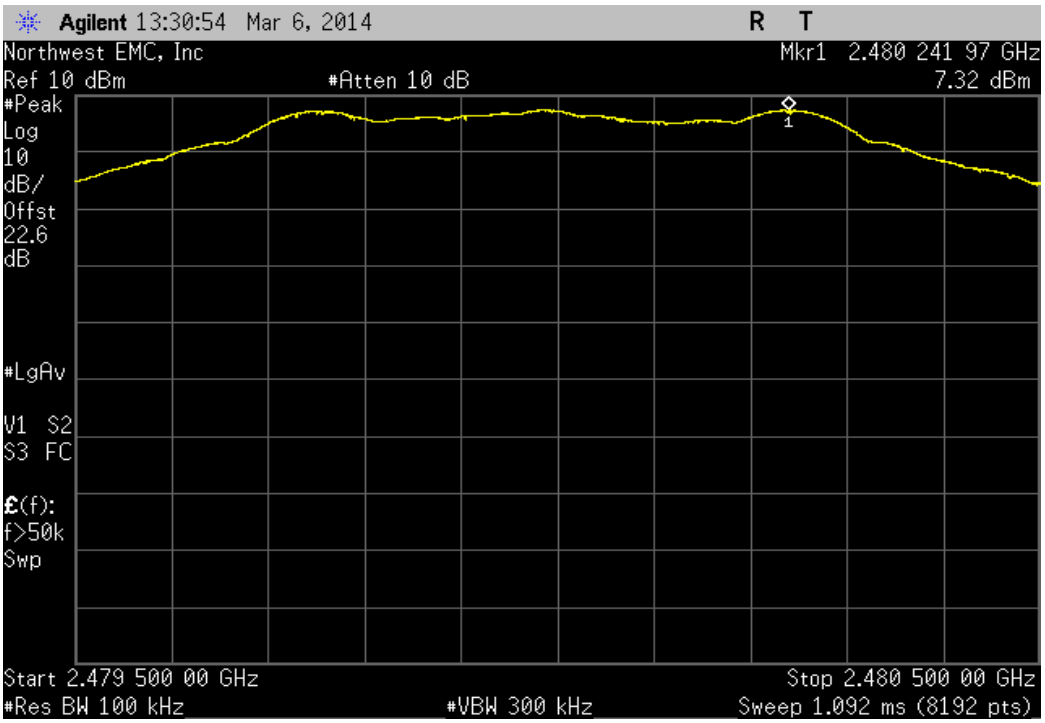
BLE ADV, Mid Channel 12, 2426 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-61.45 dBc	≤ -20 dBc	Pass



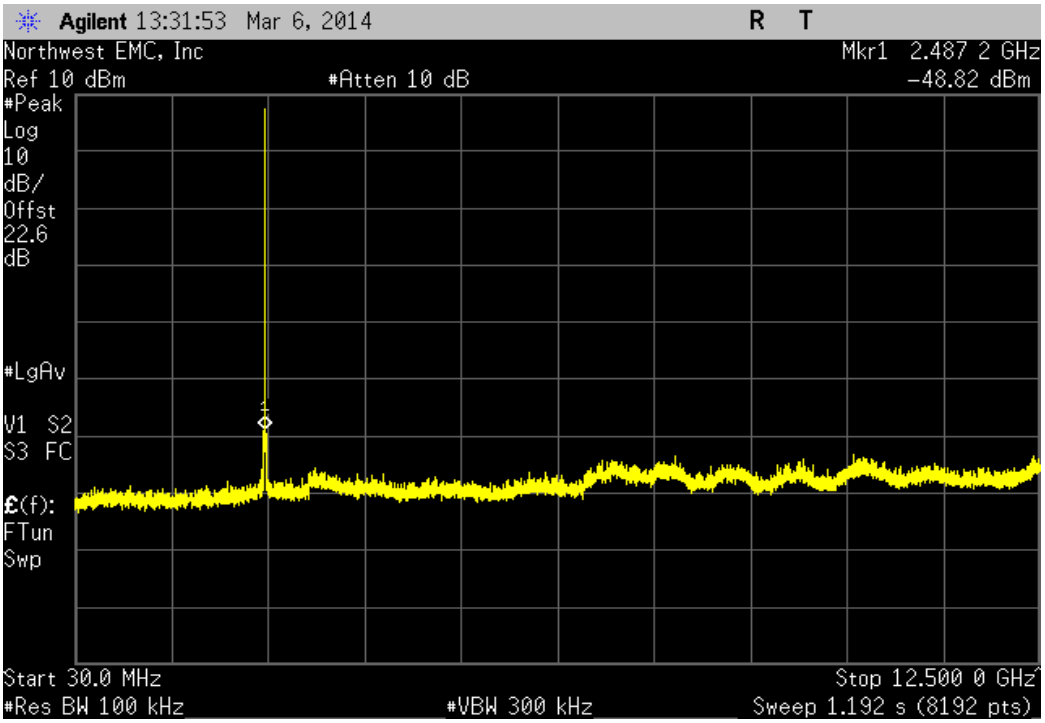
BLE ADV, Mid Channel 12, 2426 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.45 dBc	≤ -20 dBc	Pass



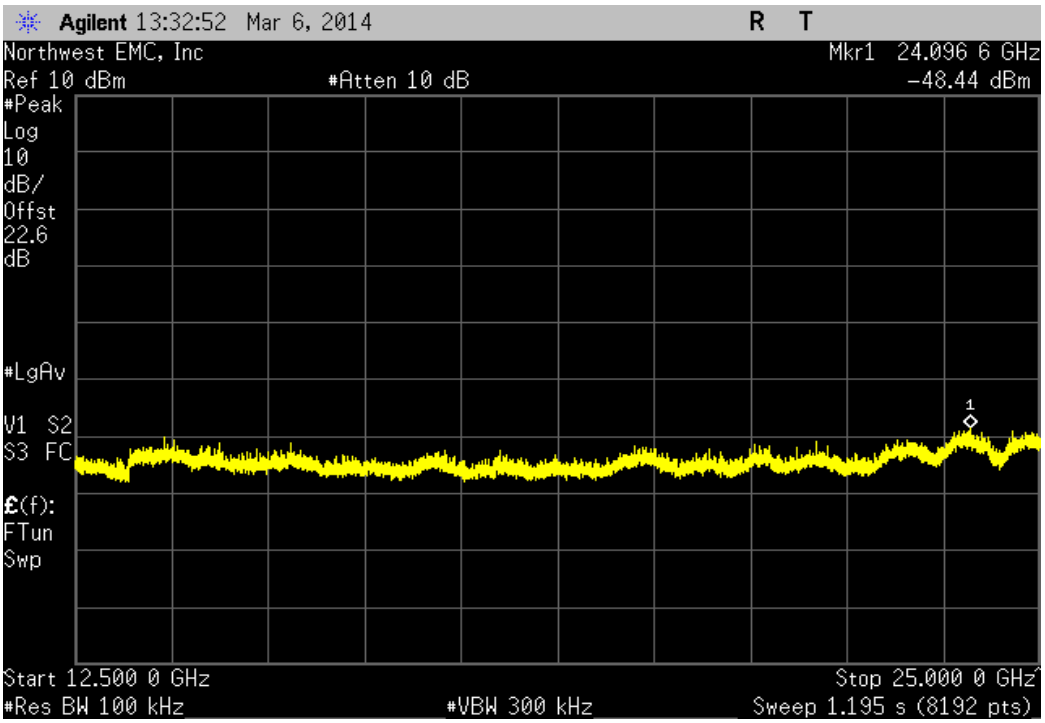
BLE ADV, High Channel 39, 2480 MHz						
	Frequency Range			Value	Limit	Result
	Fundamental			N/A	N/A	N/A



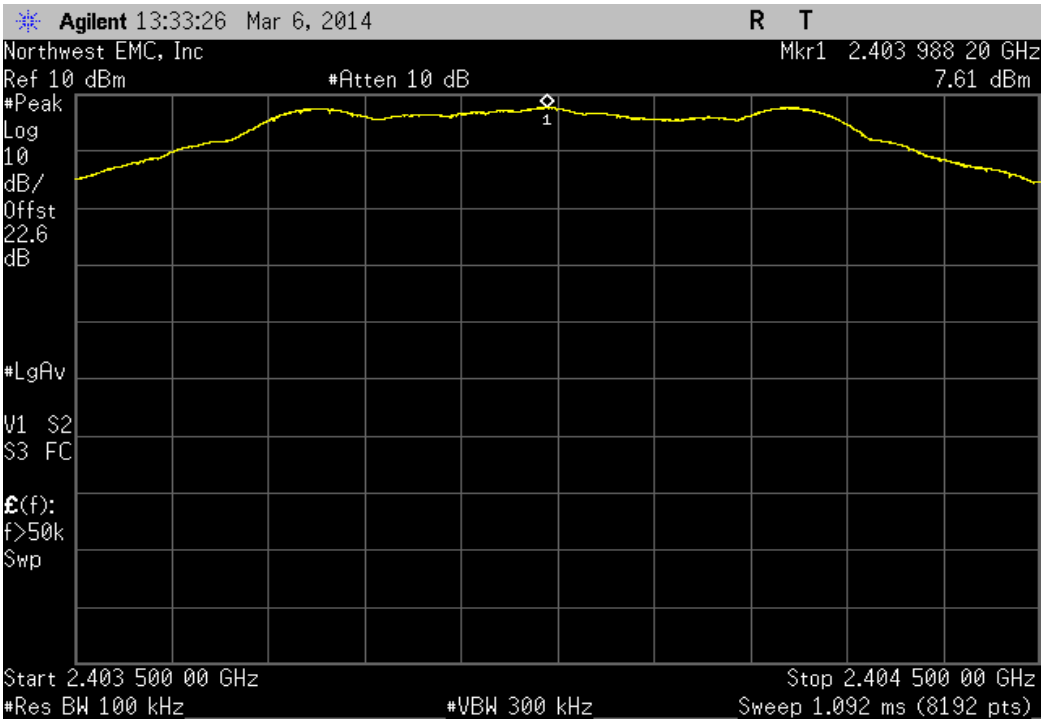
BLE ADV, High Channel 39, 2480 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-56.14 dBc	≤ -20 dBc	Pass



BLE ADV, High Channel 39, 2480 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.76 dBc	≤ -20 dBc	Pass

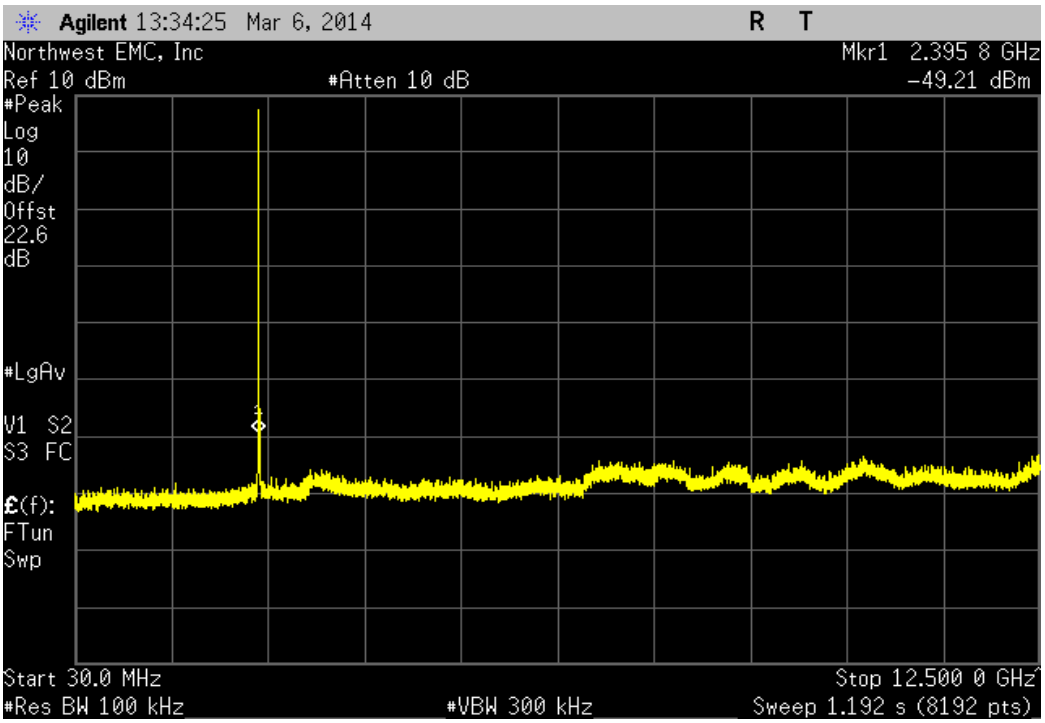


BLE DATA, Low Channel 1, 2404 MHz						
	Frequency Range			Value	Limit	Result
	Fundamental			N/A	N/A	N/A

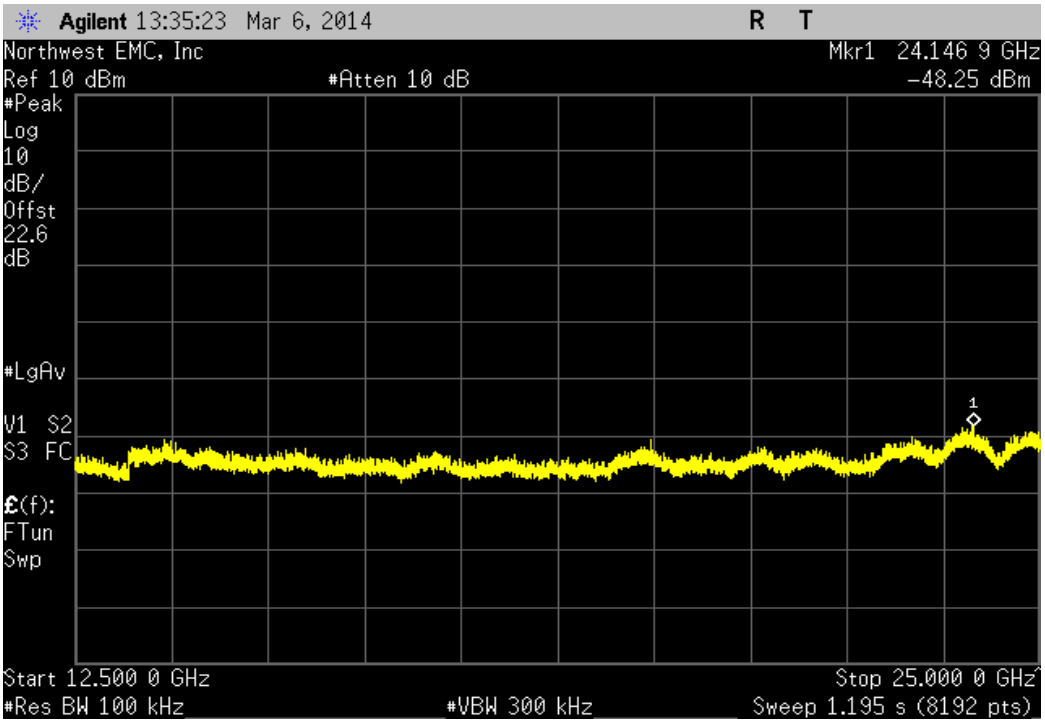


SPURIOUS CONDUCTED EMISSIONS

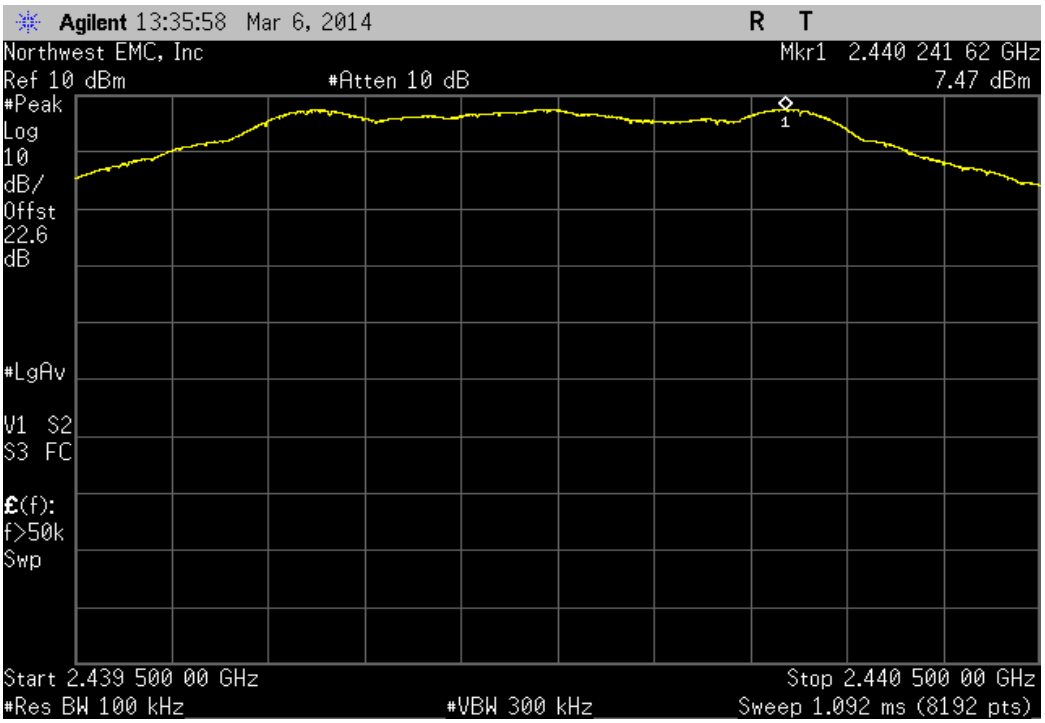
BLE DATA, Low Channel 1, 2404 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-56.82 dBc	≤ -20 dBc	Pass



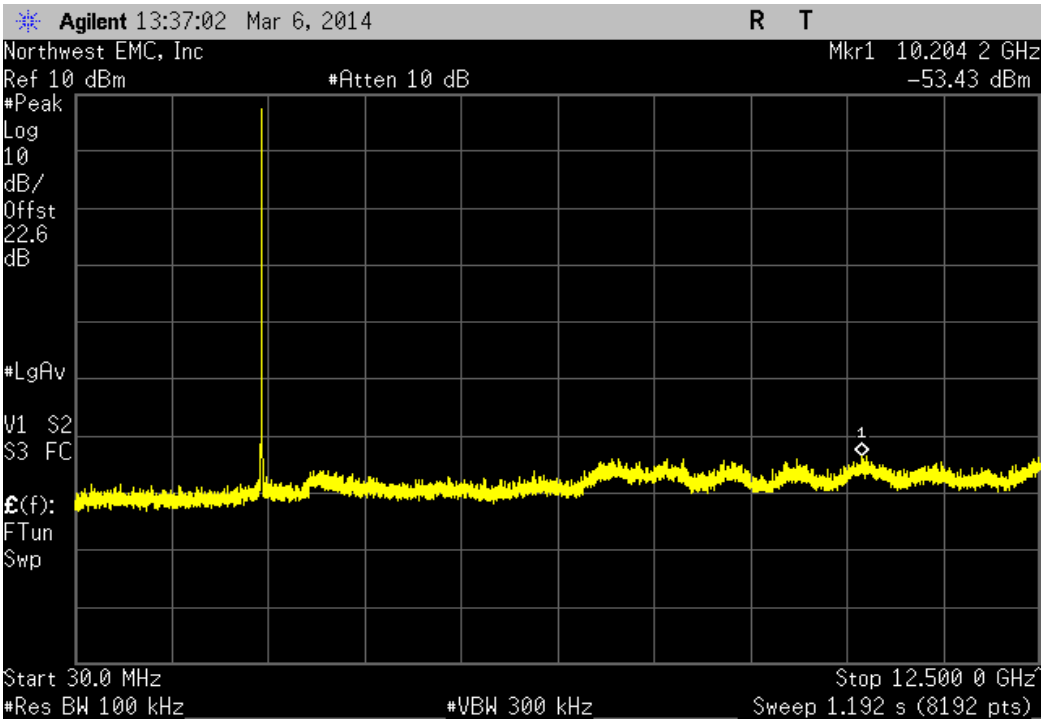
BLE DATA, Low Channel 1, 2404 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.86 dBc	≤ -20 dBc	Pass



BLE DATA, Mid Channel 19, 2440 MHz						
	Frequency Range			Value	Limit	Result
	Fundamental			N/A	N/A	N/A

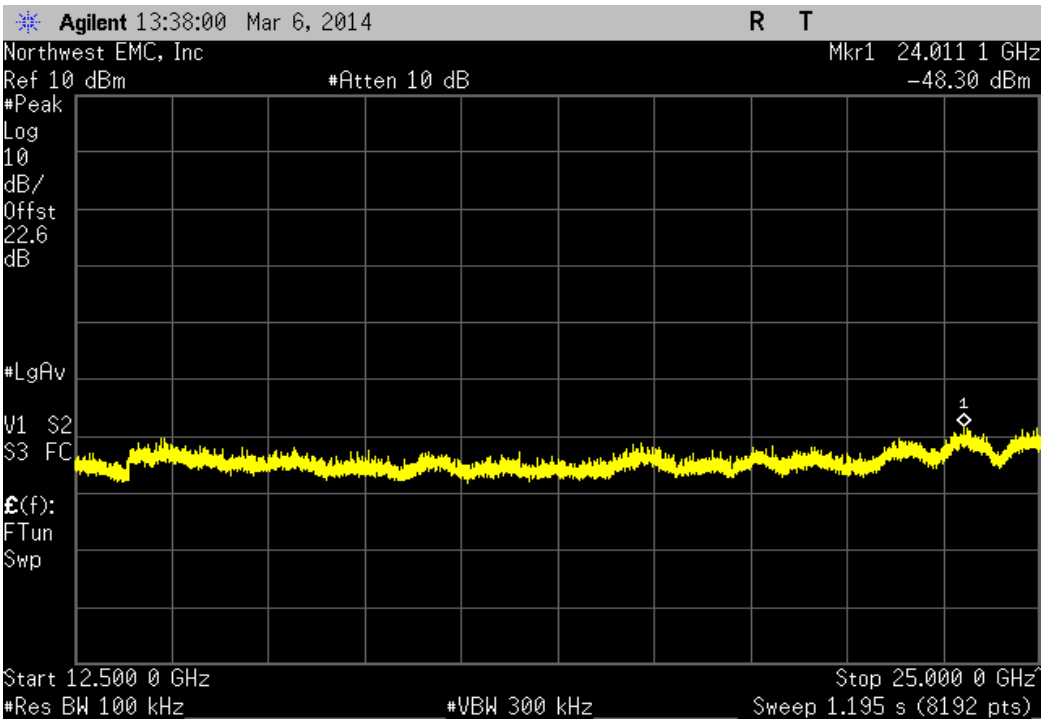


BLE DATA, Mid Channel 19, 2440 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-60.9 dBc	≤ -20 dBc	Pass

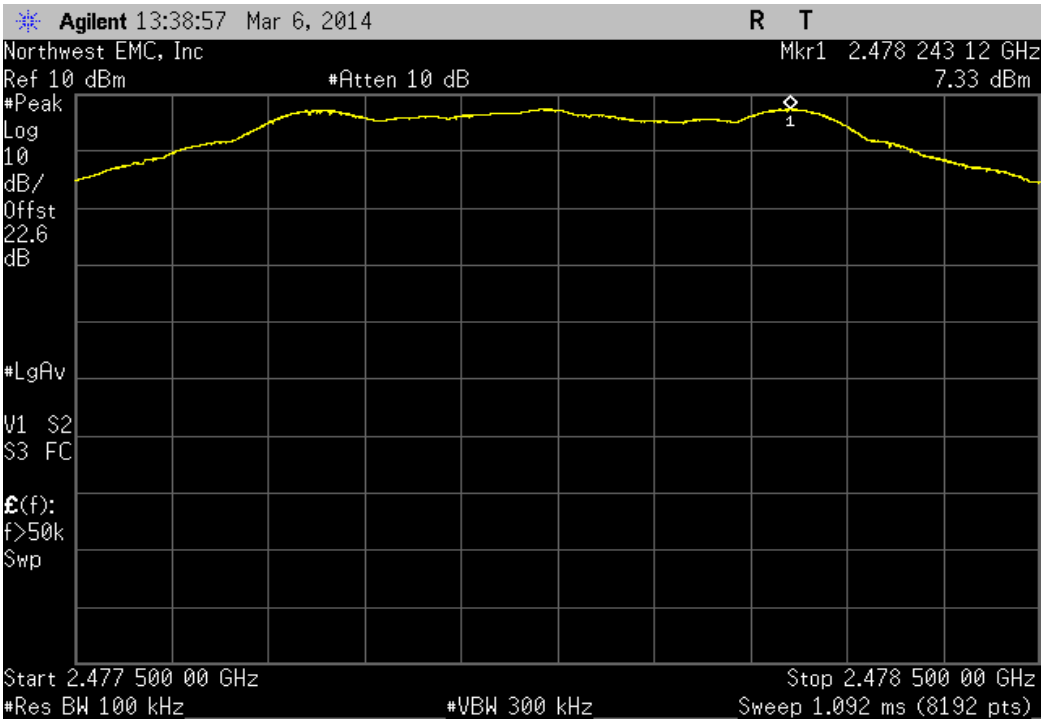


SPURIOUS CONDUCTED EMISSIONS

BLE DATA, Mid Channel 19, 2440 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.77 dBc	≤ -20 dBc	Pass

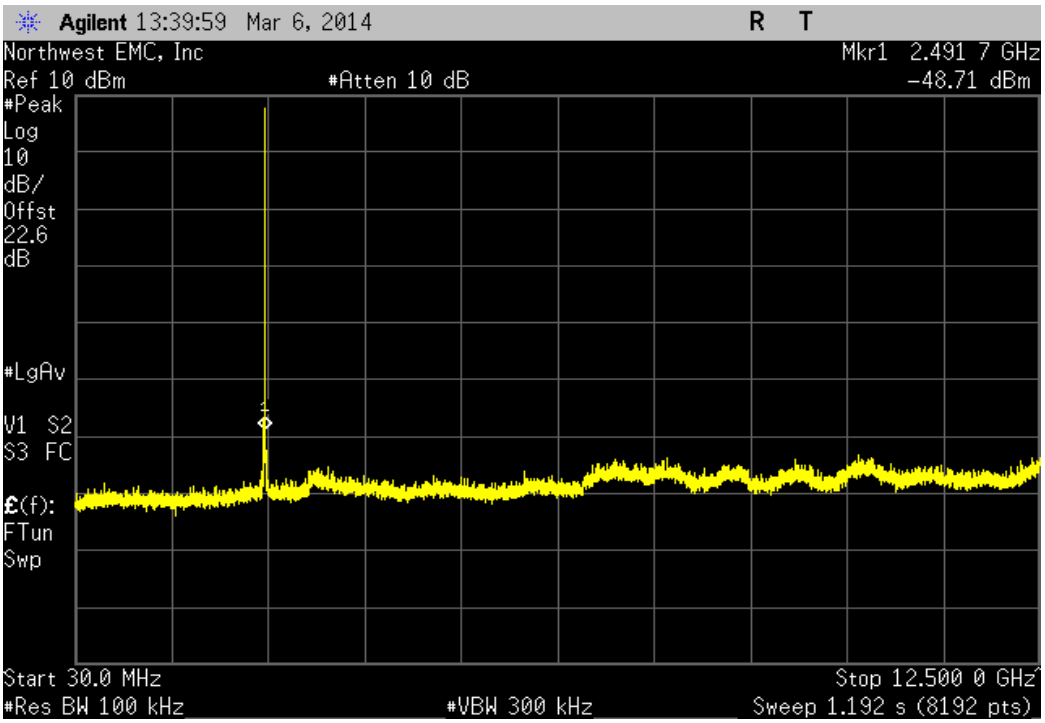


BLE DATA, High Channel 38, 2478 MHz				
Frequency Range		Value	Limit	Result
Fundamental		N/A	N/A	N/A

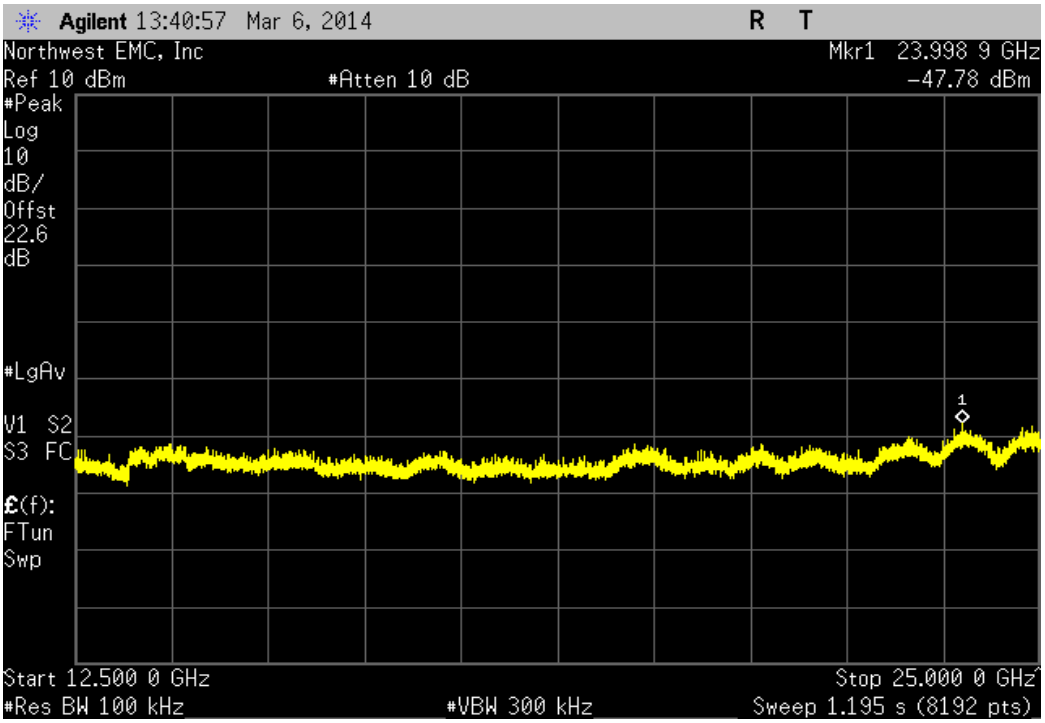


SPURIOUS CONDUCTED EMISSIONS

BLE DATA, High Channel 38, 2478 MHz				
Frequency Range		Value	Limit	Result
30 MHz - 12.5 GHz		-56.04 dBc	≤ -20 dBc	Pass



BLE DATA, High Channel 38, 2478 MHz				
Frequency Range		Value	Limit	Result
12.5 GHz - 25 GHz		-55.11 dBc	≤ -20 dBc	Pass



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

MODES OF OPERATION

Transmitting Bluetooth Low Energy (BLE), Advertising Mode
Transmitting Bluetooth Low Energy (BLE), Data Mode

CHANNELS TESTED

Low Channel 0, 2402 MHz, BLE ADV
Mid Channel 12, 2426 MHz, BLE ADV
High Channel 39, 2480 MHz, BLE ADV
Low Channel 1, 2404 MHz, BLE DATA
Mid Channel 19, 2440 MHz, BLE DATA
High Channel 38, 2478 MHz, BLE DATA

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MCSO1702 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz

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
HP Filter	Micro-Tronics	HPM50111	HHI	1/18/2013	24 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	12/6/2013	12 mo
LP Filter	Micro-Tronics	LPM50004	LFF	11/14/2013	24 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	7/10/2013	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	12/6/2013	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	12/6/2013	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	10/24/2013	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	10/24/2013	12 mo
Antenna, Horn	ETS	3160-09	AIY	NCR	0 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	0 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Antenna, Horn	EMCO	3115	AHM	6/19/2012	24 mo
Antenna, Biconilog	EMCO	3142	AXJ	5/16/2012	36 mo
Cable I	N/A	N/A	SUM	7/10/2013	12 mo
NC01 Cables	N/A	Standard Gain Horn Cable	NC3	12/6/2013	12 mo
NC01 Cables	N/A	3115 Horn Cable	NC2	10/24/2013	12 mo
NC01 Cables	N/A	Bilog Cables	NC1	10/24/2013	12 mo
Spectrum Analyzer	Agilent	E4440A	AAW	2/21/2013	24 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

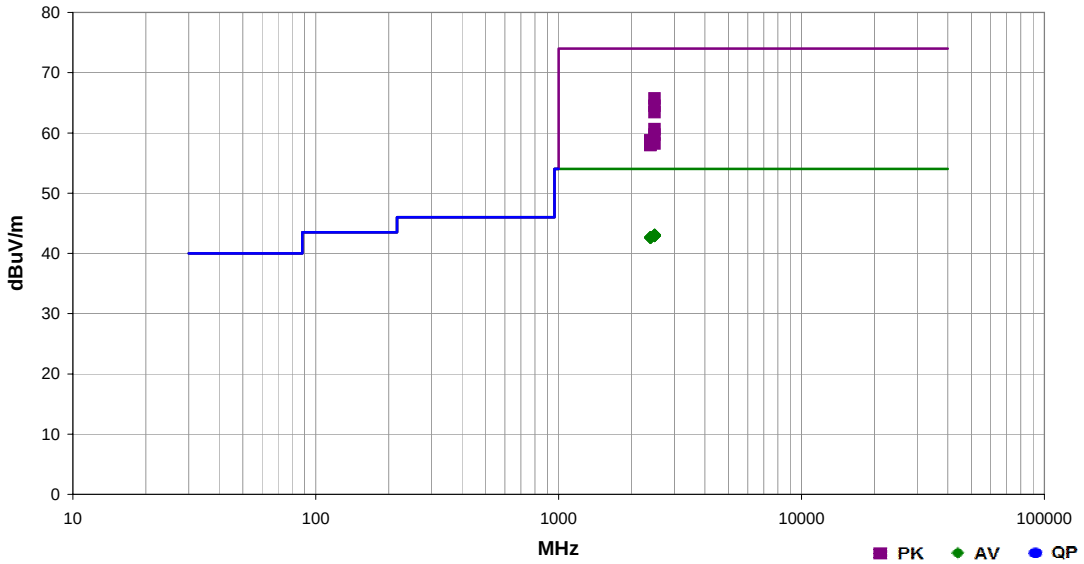
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify 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.

SPURIOUS RADIATED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	23 °C		
Job Site:	NC01	**Humidity:**	37% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, see comments next to data points for channel information.				
Deviations:	None				
Comments:	Measuring emissions at 2483.5 MHz and 2390 MHz restricted band edges.				

Test Specifications	**Test Method**
FCC 15.247:2014	ANSI C63.10:2009

Run #	50	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



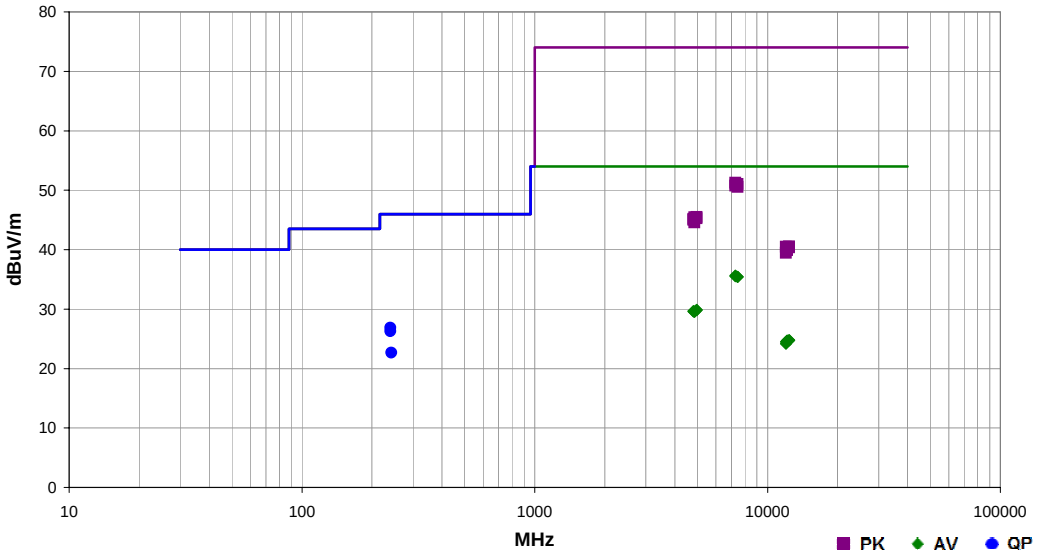
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.597	47.7	-2.0	1.3	309.0	3.0	20.0	Horz	PK	0.0	65.7	74.0	-8.3	High Ch 39, 2480 MHz, ADV, EUT Horz
2483.567	46.5	-2.0	1.1	57.0	3.0	20.0	Horz	PK	0.0	64.5	74.0	-9.5	High Ch 39, 2480 MHz, ADV, EUT Vert
2483.877	45.4	-2.0	1.2	236.0	3.0	20.0	Vert	PK	0.0	63.4	74.0	-10.6	High Ch 39, 2480 MHz, ADV, EUT Vert
2483.677	25.1	-2.0	1.3	309.0	3.0	20.0	Horz	AV	0.0	43.1	54.0	-10.9	High Ch 39, 2480 MHz, ADV, EUT Horz
2484.337	25.0	-2.0	1.2	236.0	3.0	20.0	Vert	AV	0.0	43.0	54.0	-11.0	High Ch 39, 2480 MHz, ADV, EUT Vert
2483.683	25.0	-2.0	1.1	57.0	3.0	20.0	Horz	AV	0.0	43.0	54.0	-11.0	High Ch 39, 2480 MHz, ADV, EUT Vert
2485.497	24.9	-2.0	1.2	162.0	3.0	20.0	Vert	AV	0.0	42.9	54.0	-11.1	High Ch 39, 2480 MHz, ADV, EUT Horz
2485.193	24.9	-2.0	1.2	3.0	3.0	20.0	Vert	AV	0.0	42.9	54.0	-11.1	High Ch 39, 2480 MHz, ADV, EUT Flat
2485.133	24.9	-2.0	1.2	178.0	3.0	20.0	Horz	AV	0.0	42.9	54.0	-11.1	High Ch 39, 2480 MHz, ADV, EUT Flat
2388.680	24.9	-2.2	1.2	344.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	Low Ch 0, 2402 MHz, ADV, EUT Vert
2388.343	24.9	-2.2	3.0	307.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch 0, 2402 MHz, ADV, EUT Vert
2388.087	24.9	-2.2	1.2	179.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch 0, 2402 MHz, ADV, EUT Flat
2388.073	24.9	-2.2	3.6	344.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	Low Ch 0, 2402 MHz, ADV, EUT Flat
2388.143	24.8	-2.2	2.6	4.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	Low Ch 0, 2402 MHz, ADV, EUT Horz
2388.097	24.8	-2.2	1.2	157.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	Low Ch 0, 2402 MHz, ADV, EUT Horz
2485.227	42.6	-2.0	1.2	3.0	3.0	20.0	Vert	PK	0.0	60.6	74.0	-13.4	High Ch 39, 2480 MHz, ADV, EUT Flat
2485.497	41.7	-2.0	1.2	178.0	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	High Ch 39, 2480 MHz, ADV, EUT Flat
2389.963	40.9	-2.2	3.0	307.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	Low Ch 0, 2402 MHz, ADV, EUT Vert
2389.560	40.9	-2.2	1.2	179.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	Low Ch 0, 2402 MHz, ADV, EUT Flat
2388.417	40.9	-2.2	3.6	344.0	3.0	20.0	Horz	PK	0.0	58.7	74.0	-15.3	Low Ch 0, 2402 MHz, ADV, EUT Flat
2483.777	40.2	-2.0	1.2	162.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	High Ch 39, 2480 MHz, ADV, EUT Horz
2388.537	40.3	-2.2	1.2	157.0	3.0	20.0	Horz	PK	0.0	58.1	74.0	-15.9	Low Ch 0, 2402 MHz, ADV, EUT Horz
2389.957	40.2	-2.2	1.2	344.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	Low Ch 0, 2402 MHz, ADV, EUT Vert
2388.570	40.2	-2.2	2.6	4.0	3.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	Low Ch 0, 2402 MHz, ADV, EUT Horz

SPURIOUS RADIATED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/10/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC01	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1017 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, see comments next to data points for channel information.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2014	ANSI C63.10:2009

Run #	52,53,56	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



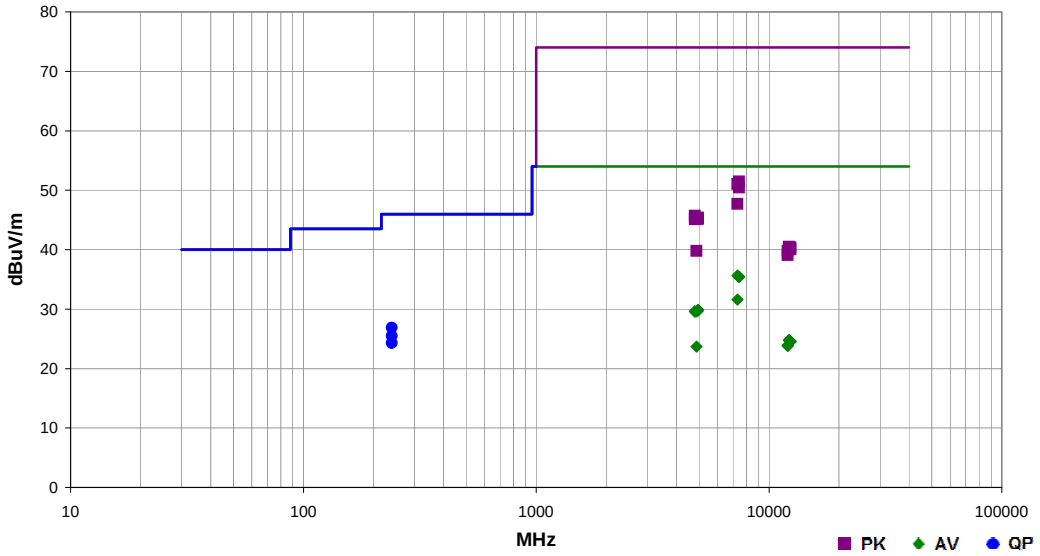
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7278.130	23.7	11.9	1.2	114.0	3.0	0.0	Vert	AV	0.0	35.6	54.0	-18.4	Mid Ch 12, 2426 MHz, ADV, EUT Vert
7278.130	23.6	11.9	2.6	144.0	3.0	0.0	Horz	AV	0.0	35.5	54.0	-18.5	Mid Ch 12, 2426 MHz, ADV, EUT Horz
7439.880	22.7	12.7	2.0	199.0	3.0	0.0	Vert	AV	0.0	35.4	54.0	-18.6	High Ch 39, 2480 MHz, ADV, EUT Vert
7438.535	22.7	12.7	2.8	263.0	3.0	0.0	Horz	AV	0.0	35.4	54.0	-18.6	High Ch 39, 2480 MHz, ADV, EUT Horz
240.011	28.0	-1.1	1.1	297.0	3.0	0.0	Horz	QP	0.0	26.9	46.0	-19.1	Mid Ch 12, 2426 MHz, ADV, EUT Horz
240.016	27.4	-1.1	1.5	227.0	3.0	0.0	Horz	QP	0.0	26.3	46.0	-19.7	High Ch 39, 2480 MHz, ADV, EUT Horz
7278.830	39.3	12.0	2.6	144.0	3.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	Mid Ch 12, 2426 MHz, ADV, EUT Horz
7440.015	38.3	12.7	2.8	263.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	High Ch 39, 2480 MHz, ADV, EUT Horz
7277.560	38.8	11.9	1.2	114.0	3.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3	Mid Ch 12, 2426 MHz, ADV, EUT Vert
242.056	23.7	-1.0	1.0	226.0	3.0	0.0	Horz	QP	0.0	22.7	46.0	-23.3	Low Ch 0, 2402 MHz, ADV, EUT Horz
7440.610	37.8	12.7	2.0	199.0	3.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	High Ch 39, 2480 MHz, ADV, EUT Vert
4958.795	22.4	7.5	1.2	101.0	3.0	0.0	Vert	AV	0.0	29.9	54.0	-24.1	High Ch 39, 2480 MHz, ADV, EUT Vert
4959.670	22.3	7.5	1.2	19.0	3.0	0.0	Horz	AV	0.0	29.8	54.0	-24.2	High Ch 39, 2480 MHz, ADV, EUT Horz
4803.755	22.5	7.2	1.2	41.0	3.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	Low Ch 0, 2402 MHz, ADV, EUT Horz
4803.590	22.4	7.2	2.4	309.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4	Low Ch 0, 2402 MHz, ADV, EUT Vert
4850.930	22.3	7.3	1.2	295.0	3.0	0.0	Horz	AV	0.0	29.6	54.0	-24.4	Mid Ch 12, 2426 MHz, ADV, EUT Horz
4850.610	22.3	7.3	1.2	33.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4	Mid Ch 12, 2426 MHz, ADV, EUT Vert
4959.305	38.0	7.5	1.2	19.0	3.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	High Ch 39, 2480 MHz, ADV, EUT Horz
4851.095	38.2	7.3	1.2	295.0	3.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	Mid Ch 12, 2426 MHz, ADV, EUT Horz
4959.685	37.8	7.5	1.2	101.0	3.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	High Ch 39, 2480 MHz, ADV, EUT Vert
4803.695	38.0	7.2	1.2	41.0	3.0	0.0	Horz	PK	0.0	45.2	74.0	-28.8	Low Ch 0, 2402 MHz, ADV, EUT Horz
4803.305	37.8	7.2	2.4	309.0	3.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	Low Ch 0, 2402 MHz, ADV, EUT Vert
12399.880	26.8	-2.0	1.2	326.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	High Ch 39, 2480 MHz, ADV, EUT Horz
12399.860	26.8	-2.0	1.2	2.0	3.0	0.0	Vert	AV	0.0	24.8	54.0	-29.2	High Ch 39, 2480 MHz, ADV, EUT Vert
12131.180	26.9	-2.2	2.3	275.0	3.0	0.0	Vert	AV	0.0	24.7	54.0	-29.3	Mid Ch 12, 2426 MHz, ADV, EUT Vert
12131.060	26.8	-2.2	1.2	359.0	3.0	0.0	Horz	AV	0.0	24.6	54.0	-29.4	Mid Ch 12, 2426 MHz, ADV, EUT Horz
4852.250	37.3	7.3	1.2	33.0	3.0	0.0	Vert	PK	0.0	44.6	74.0	-29.4	Mid Ch 12, 2426 MHz, ADV, EUT Vert
12010.270	26.7	-2.2	1.2	204.0	3.0	0.0	Horz	AV	0.0	24.5	54.0	-29.5	Low Ch 0, 2402 MHz, ADV, EUT Horz
12011.390	26.4	-2.2	1.9	200.0	3.0	0.0	Vert	AV	0.0	24.2	54.0	-29.8	Low Ch 0, 2402 MHz, ADV, EUT Vert
12398.640	42.6	-2.0	1.2	2.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	High Ch 39, 2480 MHz, ADV, EUT Vert
12010.960	42.7	-2.2	1.2	204.0	3.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	Low Ch 0, 2402 MHz, ADV, EUT Horz
12399.800	42.4	-2.0	1.2	326.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	High Ch 39, 2480 MHz, ADV, EUT Horz
12130.910	42.1	-2.2	2.3	275.0	3.0	0.0	Vert	PK	0.0	39.9	74.0	-34.1	Mid Ch 12, 2426 MHz, ADV, EUT Vert
12130.300	42.1	-2.2	1.2	359.0	3.0	0.0	Horz	PK	0.0	39.9	74.0	-34.1	Mid Ch 12, 2426 MHz, ADV, EUT Horz
12009.040	41.7	-2.2	1.9	200.0	3.0	0.0	Vert	PK	0.0	39.5	74.0	-34.5	Low Ch 0, 2402 MHz, ADV, EUT Vert

SPURIOUS RADIATED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/10/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC01	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1017 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE DATA, see comments next to data points for channel information.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2014	ANSI C63.10:2009

Run #	51,54,55	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**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
7321.440	23.4	12.2	1.2	128.0	3.0	0.0	Horz	AV	0.0	35.6	54.0	-18.4	Mid Ch 19, 2440 MHz, DATA, EUT Horz
7434.990	22.7	12.7	1.2	174.0	3.0	0.0	Horz	AV	0.0	35.4	54.0	-18.6	High Ch 38, 2478 MHz, DATA, EUT Horz
7434.295	22.7	12.7	1.2	1.0	3.0	0.0	Vert	AV	0.0	35.4	54.0	-18.6	High Ch 38, 2478 MHz, DATA, EUT Vert
240.013	28.0	-1.1	1.5	263.0	3.0	0.0	Horz	QP	0.0	26.9	46.0	-19.1	Low Ch 1, 2404 MHz, DATA, EUT Horz
240.016	26.6	-1.1	1.0	220.0	3.0	0.0	Horz	QP	0.0	25.5	46.0	-20.5	Mid Ch 19, 2440 MHz, DATA, EUT Horz
240.011	25.4	-1.1	1.0	209.0	3.0	0.0	Horz	QP	0.0	24.3	46.0	-21.7	High Ch 38, 2478 MHz, DATA, EUT Horz
7318.685	19.4	12.2	1.2	109.0	3.0	0.0	Vert	AV	0.0	31.6	54.0	-22.4	Mid Ch 19, 2440 MHz, DATA, EUT Vert
7435.410	38.7	12.7	1.2	174.0	3.0	0.0	Horz	PK	0.0	51.4	74.0	-22.6	High Ch 38, 2478 MHz, DATA, EUT Horz
7320.100	38.8	12.2	1.2	128.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	Mid Ch 19, 2440 MHz, DATA, EUT Horz
7433.350	37.7	12.7	1.2	1.0	3.0	0.0	Vert	PK	0.0	50.4	74.0	-23.6	High Ch 38, 2478 MHz, DATA, EUT Vert
4955.590	22.4	7.5	1.2	50.0	3.0	0.0	Horz	AV	0.0	29.9	54.0	-24.1	High Ch 38, 2478 MHz, DATA, EUT Horz
4955.475	22.3	7.5	1.2	40.0	3.0	0.0	Vert	AV	0.0	29.8	54.0	-24.2	High Ch 38, 2478 MHz, DATA, EUT Vert
4880.205	22.3	7.3	1.2	349.0	3.0	0.0	Horz	AV	0.0	29.6	54.0	-24.4	Mid Ch 19, 2440 MHz, DATA, EUT Horz
4804.880	22.4	7.2	2.7	282.0	3.0	0.0	Horz	AV	0.0	29.6	54.0	-24.4	Low Ch 1, 2404 MHz, DATA, EUT Horz
4804.165	22.4	7.2	3.4	158.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4	Low Ch 1, 2404 MHz, DATA, EUT Vert
7320.255	35.5	12.2	1.2	109.0	3.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Mid Ch 19, 2440 MHz, DATA, EUT Vert
4803.690	38.5	7.2	3.4	158.0	3.0	0.0	Vert	PK	0.0	45.7	74.0	-28.3	Low Ch 1, 2404 MHz, DATA, EUT Vert
4954.600	37.9	7.5	1.2	50.0	3.0	0.0	Horz	PK	0.0	45.4	74.0	-28.6	High Ch 38, 2478 MHz, DATA, EUT Horz
4955.815	37.7	7.5	1.2	40.0	3.0	0.0	Vert	PK	0.0	45.2	74.0	-28.8	High Ch 38, 2478 MHz, DATA, EUT Vert
4880.110	37.8	7.3	1.2	349.0	3.0	0.0	Horz	PK	0.0	45.1	74.0	-28.9	Mid Ch 19, 2440 MHz, DATA, EUT Horz
4803.905	37.9	7.2	2.7	282.0	3.0	0.0	Horz	PK	0.0	45.1	74.0	-28.9	Low Ch 1, 2404 MHz, DATA, EUT Horz
12201.490	26.9	-2.1	1.2	32.0	3.0	0.0	Vert	AV	0.0	24.8	54.0	-29.2	Mid Ch 19, 2440 MHz, DATA, EUT Vert
12201.150	26.9	-2.1	1.2	46.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	Mid Ch 19, 2440 MHz, DATA, EUT Horz
12391.490	26.6	-2.0	1.2	243.0	3.0	0.0	Horz	AV	0.0	24.6	54.0	-29.4	High Ch 38, 2478 MHz, DATA, EUT Horz
12391.090	26.6	-2.0	1.2	28.0	3.0	0.0	Vert	AV	0.0	24.6	54.0	-29.4	High Ch 38, 2478 MHz, DATA, EUT Vert
12020.720	26.1	-2.2	1.2	165.0	3.0	0.0	Vert	AV	0.0	23.9	54.0	-30.1	Low Ch 1, 2404 MHz, DATA, EUT Vert
12020.790	26.0	-2.2	1.2	360.0	3.0	0.0	Horz	AV	0.0	23.8	54.0	-30.2	Low Ch 1, 2404 MHz, DATA, EUT Horz
4878.500	16.4	7.3	1.2	75.0	3.0	0.0	Vert	AV	0.0	23.7	54.0	-30.3	Mid Ch 19, 2440 MHz, DATA, EUT Vert
12199.110	42.6	-2.1	1.2	46.0	3.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	Mid Ch 19, 2440 MHz, DATA, EUT Horz
12390.150	42.4	-2.0	1.2	28.0	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	High Ch 38, 2478 MHz, DATA, EUT Vert
12200.100	42.2	-2.1	1.2	32.0	3.0	0.0	Vert	PK	0.0	40.1	74.0	-33.9	Mid Ch 19, 2440 MHz, DATA, EUT Vert
12391.220	42.1	-2.0	1.2	243.0	3.0	0.0	Horz	PK	0.0	40.1	74.0	-33.9	High Ch 38, 2478 MHz, DATA, EUT Horz
4879.290	32.5	7.3	1.2	75.0	3.0	0.0	Vert	PK	0.0	39.8	74.0	-34.2	Mid Ch 19, 2440 MHz, DATA, EUT Vert
12021.090	42.0	-2.2	1.2	360.0	3.0	0.0	Horz	PK	0.0	39.8	74.0	-34.2	Low Ch 1, 2404 MHz, DATA, EUT Horz
12018.730	41.3	-2.2	1.2	165.0	3.0	0.0	Vert	PK	0.0	39.1	74.0	-34.9	Low Ch 1, 2404 MHz, DATA, EUT Vert

AC POWERLINE 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.

MODES OF OPERATION

Transmitting BLE ADV

CHANNELS TESTED

High Channel 39, 2480 MHz, BLE
Mid Channel 12, 2426 MHz, BLE
Low Channel 0, 2402 MHz, BLE

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MCSO1702 - 2

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
LISN	Solar	9252-50-R-24-BNC	LIK	1/8/2014	12 mo
NC05 Cables	N/A	Conducted / NF Probe Cable	NC4	12/12/2013	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHF	1/22/2014	12 mo
Attenuator	Fairview Microwave	SA03B-20	RKD	12/12/2013	12 mo
Receiver	Rohde & Schwarz	ESCI	ARE	5/30/2013	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

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

TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

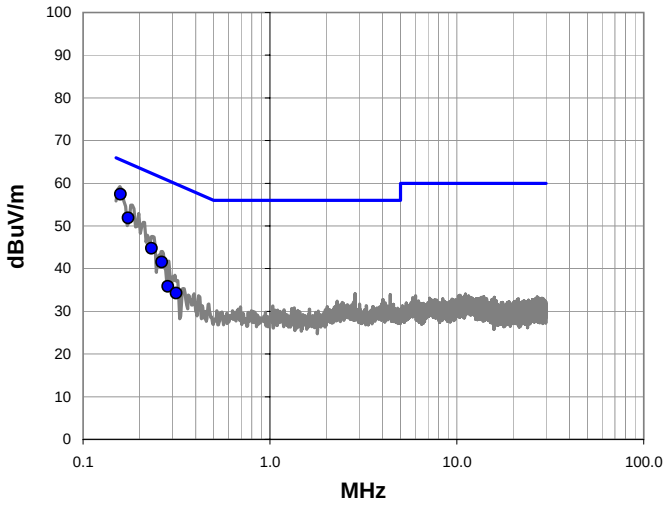
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, Low Channel 0, 2402 MHz				
Deviations:	None				
Comments:	None				

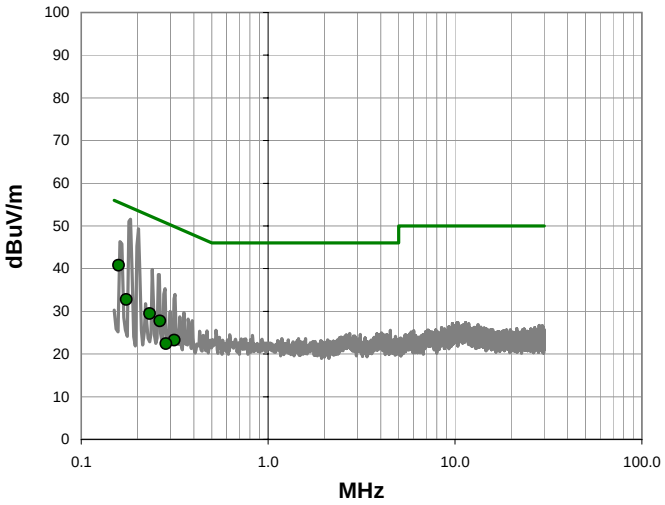
Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	7	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	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/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	37.2	20.2	57.4	65.6	-8.1
0.174	31.6	20.3	51.9	64.7	-12.9
0.233	24.6	20.2	44.8	62.3	-17.6
0.264	21.4	20.1	41.5	61.3	-19.8
0.285	15.7	20.1	35.8	60.7	-24.8
0.315	14.1	20.2	34.3	59.8	-25.6

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	20.6	20.2	40.8	55.6	-14.7
0.174	12.5	20.3	32.8	54.7	-22.0
0.233	9.3	20.2	29.5	52.3	-22.9
0.264	7.6	20.1	27.7	51.3	-23.6
0.315	3.1	20.2	23.3	49.8	-26.6
0.285	2.3	20.1	22.4	50.7	-28.2

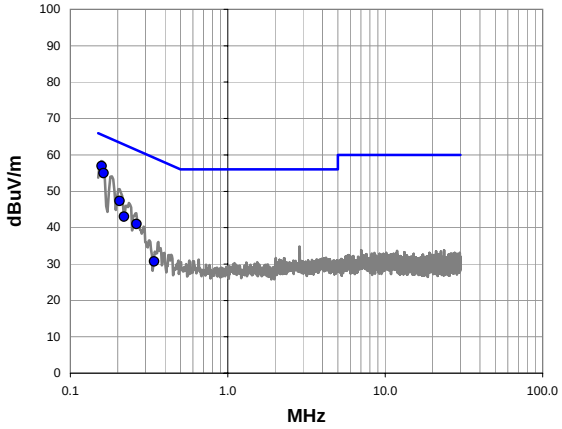
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, Low Channel 0, 2402 MHz				
Deviations:	None				
Comments:	None				

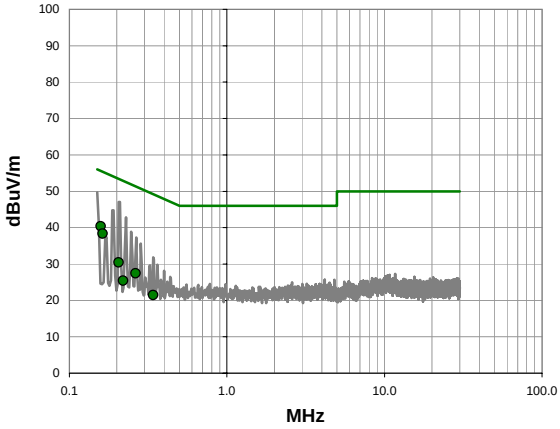
Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	8	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	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/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	36.7	20.2	56.9	65.6	-8.7
0.162	34.7	20.2	54.9	65.3	-10.4
0.205	27.1	20.2	47.3	63.4	-16.1
0.219	22.8	20.2	43.0	62.9	-19.9
0.263	20.9	20.1	41.0	61.3	-20.3
0.341	10.5	20.2	30.7	59.2	-28.5

Average Data - vs - Average Limit

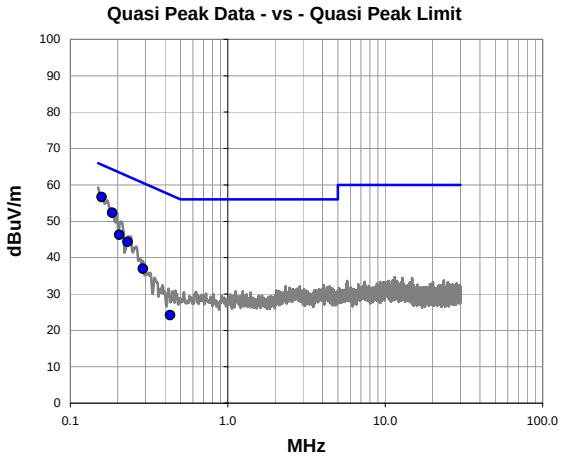
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	20.2	20.2	40.4	55.6	-15.2
0.162	18.1	20.2	38.3	55.3	-17.0
0.205	10.2	20.2	30.4	53.4	-23.0
0.263	7.3	20.1	27.4	51.3	-23.9
0.219	5.2	20.2	25.4	52.9	-27.5
0.341	1.3	20.2	21.5	49.2	-27.7

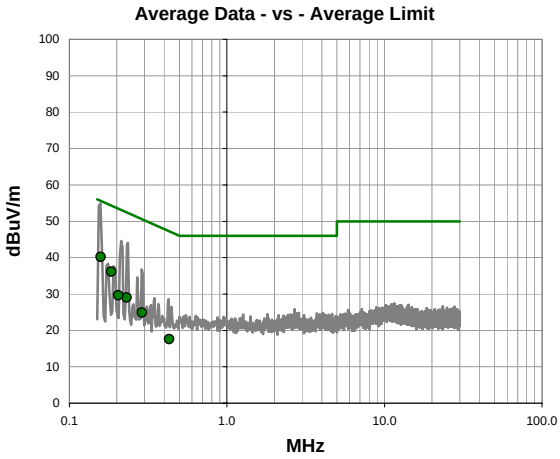
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, Mid Channel 12, 2426 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	9	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass





Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	36.4	20.2	56.6	65.6	-8.9
0.184	32.1	20.3	52.4	64.3	-11.9
0.205	26.0	20.2	46.2	63.4	-17.2
0.231	24.2	20.2	44.4	62.4	-18.0
0.289	16.8	20.1	36.9	60.5	-23.6
0.430	4.0	20.2	24.2	57.3	-33.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	20.0	20.2	40.2	55.6	-15.3
0.184	15.9	20.3	36.2	54.3	-18.1
0.231	8.9	20.2	29.1	52.4	-23.3
0.205	9.4	20.2	29.6	53.4	-23.8
0.289	4.7	20.1	24.8	50.5	-25.7
0.430	-2.6	20.2	17.6	47.3	-29.7

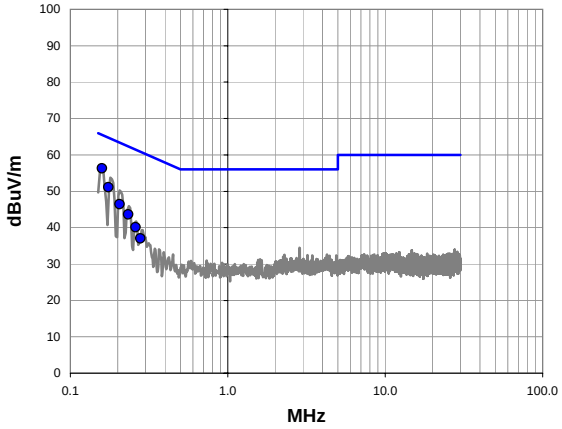
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, Mid Channel 12, 2426 MHz				
Deviations:	None				
Comments:	None				

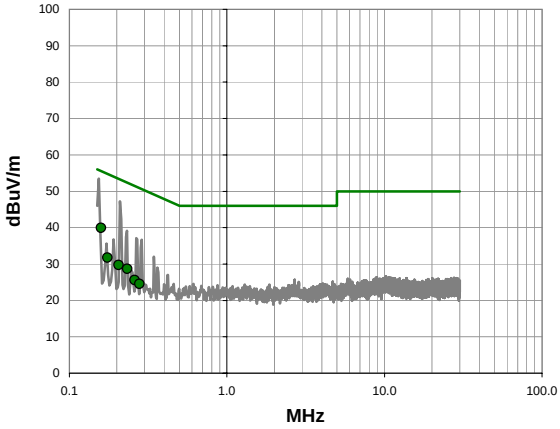
Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	10	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	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/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.159	36.1	20.2	56.3	65.5	-9.2
0.174	30.8	20.3	51.1	64.8	-13.7
0.205	26.2	20.2	46.4	63.4	-17.0
0.233	23.5	20.2	43.7	62.3	-18.7
0.259	20.0	20.1	40.1	61.5	-21.3
0.278	16.9	20.1	37.0	60.9	-23.8

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.159	19.7	20.2	39.9	55.5	-15.6
0.174	11.5	20.3	31.8	54.8	-23.0
0.205	9.5	20.2	29.7	53.4	-23.7
0.233	8.5	20.2	28.7	52.3	-23.7
0.259	5.5	20.1	25.6	51.5	-25.8
0.278	4.4	20.1	24.5	50.9	-26.3

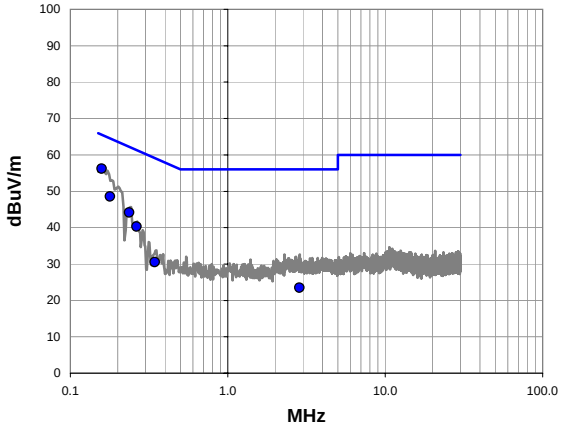
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, High Channel 39, 2480 MHz				
Deviations:	None				
Comments:	None				

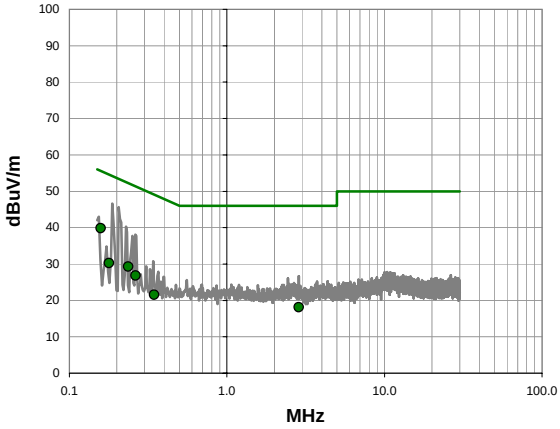
Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	11	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	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/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	36.0	20.2	56.2	65.5	-9.3
0.178	28.3	20.3	48.6	64.6	-16.0
0.236	24.0	20.2	44.2	62.2	-18.1
0.263	20.2	20.1	40.3	61.3	-21.0
0.345	10.3	20.2	30.5	59.1	-28.6
2.856	3.2	20.3	23.5	56.0	-32.5

Average Data - vs - Average Limit

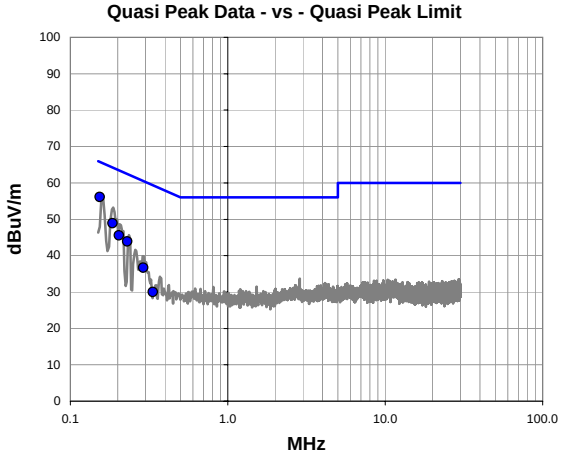
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.158	19.6	20.2	39.8	55.5	-15.7
0.236	9.1	20.2	29.3	52.2	-23.0
0.178	10.0	20.3	30.3	54.6	-24.3
0.263	6.7	20.1	26.8	51.3	-24.5
0.345	1.4	20.2	21.6	49.1	-27.5
2.856	-2.2	20.3	18.1	46.0	-27.9

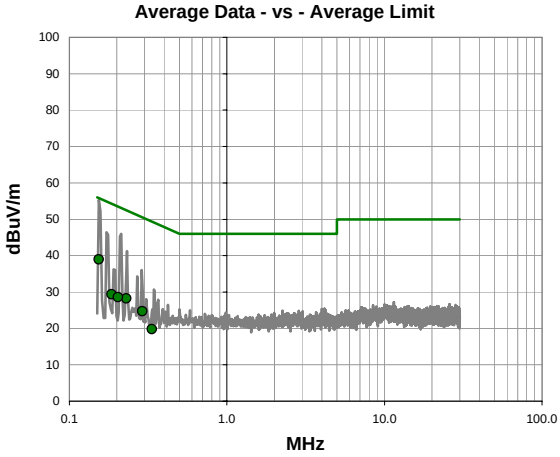
AC POWERLINE CONDUCTED EMISSIONS

Work Order:	MCSO1702	**Date:**	03/07/14		
Project:	None	**Temperature:**	24 °C		
Job Site:	NC05	**Humidity:**	36% RH		
Serial Number:	41152140753	**Barometric Pres.:**	1023 mbar	**Tested by:**	Richard Mellroth
EUT:	1631				
Configuration:	2				
Customer:	Microsoft Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting BLE ADV, High Channel 39, 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.207:2014	ANSI C63.10:2009

Run #	12	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass





Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.154	35.9	20.2	56.1	65.8	-9.7
0.185	28.6	20.3	48.9	64.3	-15.4
0.204	25.3	20.2	45.5	63.4	-17.9
0.230	23.7	20.2	43.9	62.4	-18.6
0.290	16.5	20.2	36.7	60.5	-23.9
0.335	9.8	20.2	30.0	59.3	-29.4

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.154	18.8	20.2	39.0	55.8	-16.8
0.230	8.1	20.2	28.3	52.4	-24.2
0.185	9.1	20.3	29.4	54.3	-24.9
0.204	8.3	20.2	28.5	53.4	-24.9
0.290	4.6	20.2	24.8	50.5	-25.8
0.335	-0.4	20.2	19.8	49.3	-29.6