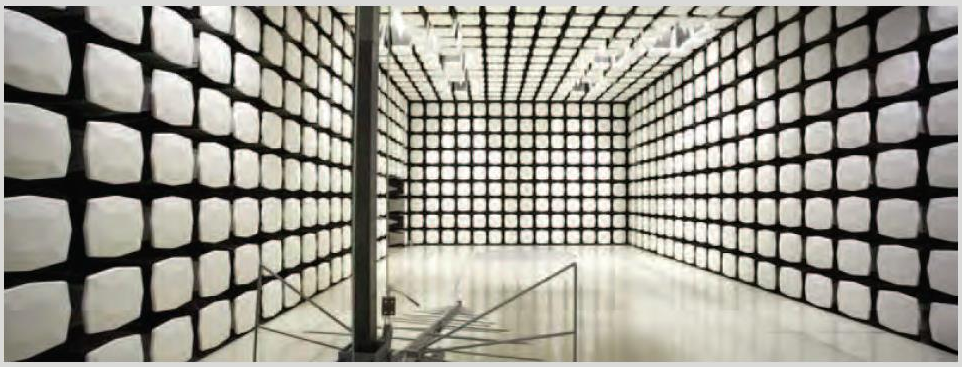
NORTHWEST EMC

Motus Global

M2

FCC 15.207:2015
FCC 15.247:2015

Report # PROU0041.2



NVLAP Lab Code: 200629-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: November 11, 2015
Motus Global
Model: M2

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2015	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
6.10.4	Band Edge Compliance	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9	Output Power	Yes	Pass	
11.10	Power Spectral Density	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

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

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2015.2.19

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

TMU.2015.07.10

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.

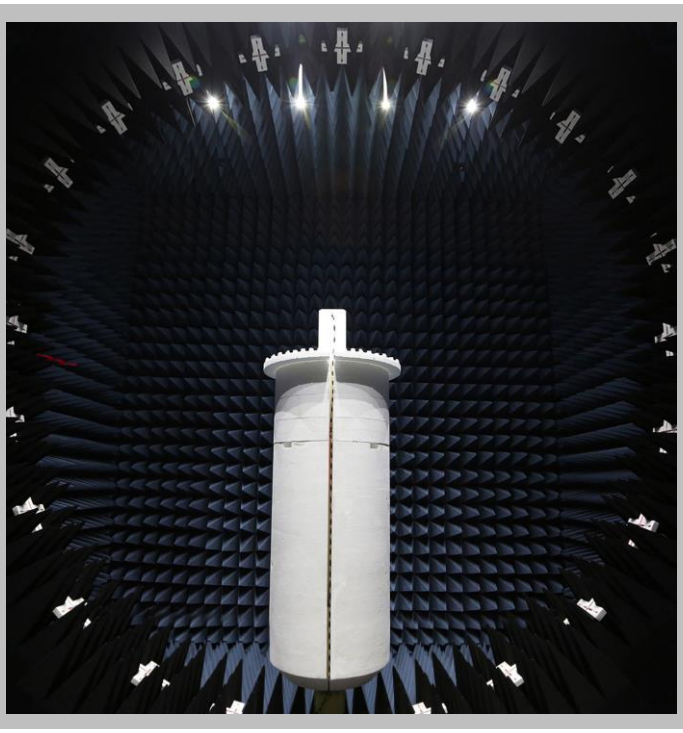
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

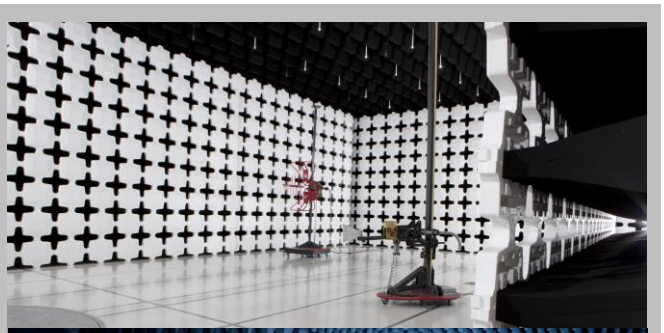
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

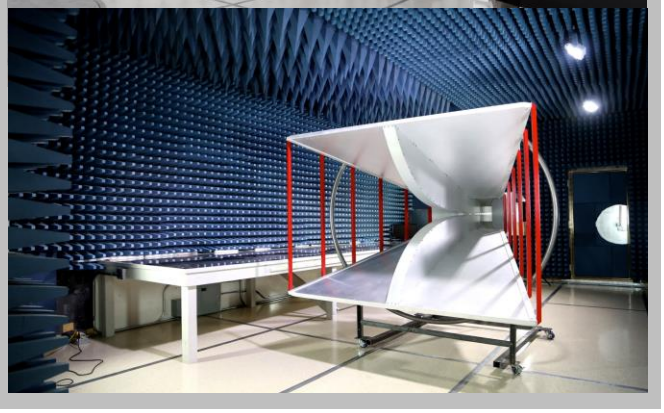
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th 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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







PRODUCT DESCRIPTION

2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Motus Global
Address:	5394 Merrick Road Floor 2
City, State, Zip:	Massapequa, NY 11758
Test Requested By:	Benjamin Hansen
Model:	M2
First Date of Test:	November 10, 2015
Last Date of Test:	November 11, 2015
Receipt Date of Samples:	November 10, 2015
Equipment Design Stage:	Preproduction
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
BLE connectable, battery powered sports device. Device contains IMU functionality and an MCU to report IMU readings to an external device over BLE. Lithium ion battery is charged via USB connection and charge control IC.

Testing Objective:
To demonstrate compliance of the Bluetooth radio to FCC 15.247 requirements.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration PROU0041- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
M2	Motus Global	None	E002

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Debug Fixture	Product Creation Studio	PCBA00673	None

Configuration PROU0041- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
M2	Motus Global	None	E003

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	Apple	A1265	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	4m	No	Power Supply	M2

Configuration PROU0041- 4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
M2	Motus Global	None	E004

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	Apple	A1265	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	0.5m	No	Power Supply	M2

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	11/10/2015	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	11/10/2015	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.
3	11/10/2015	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	11/10/2015	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.
5	11/10/2015	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.
6	11/10/2015	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	11/11/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
8	11/11/2015	Powerline Conducted 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

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

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 50Ω.
The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARE	8/5/2015	8/5/2016
Cable - Conducted Cable Assembly	Northwest EMC	NC4, HHF, RKD	NC4A	2/11/2015	2/11/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIM	11/3/2015	11/3/2016

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

PROU0041-4

MODES INVESTIGATED

Charging. Transmitting BLE at Maximum Duty Cycle on Low Channel, 2402 MHz.
Charging. Transmitting BLE at Maximum Duty Cycle on Mid Channel, 2442 MHz.
Charging. Transmitting BLE at Maximum Duty Cycle on High Channel, 2480 MHz.

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

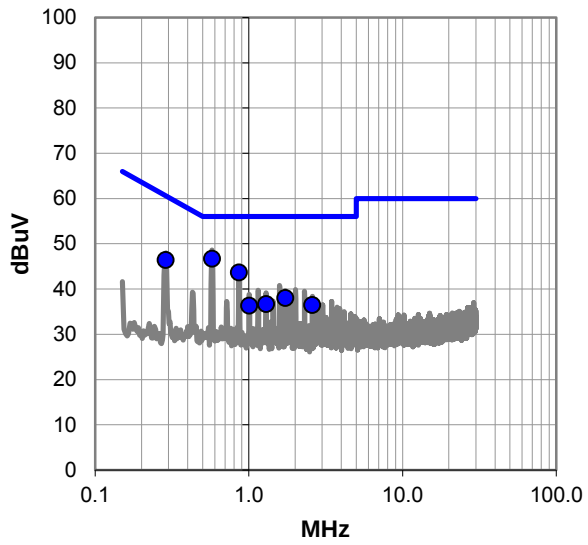
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on Low Channel, 2402 MHz.

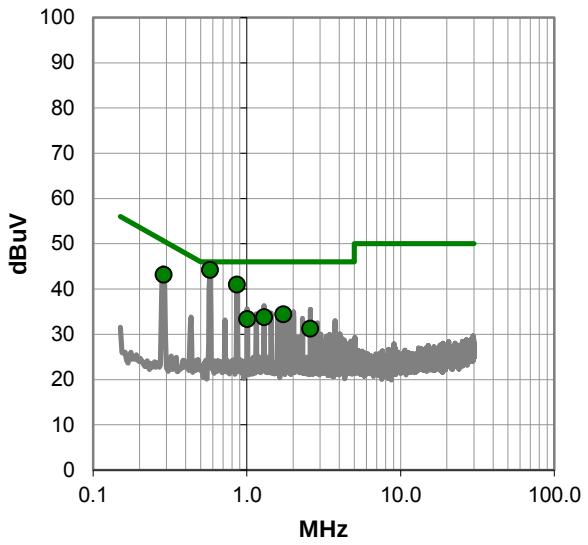
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #1

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	26.3	20.4	46.7	56.0	-9.3
0.864	23.2	20.4	43.6	56.0	-12.4
0.288	26.0	20.4	46.4	60.6	-14.2
1.728	17.5	20.5	38.0	56.0	-18.0
1.296	16.2	20.4	36.6	56.0	-19.4
2.592	15.9	20.5	36.4	56.0	-19.6
1.008	15.9	20.4	36.3	56.0	-19.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	23.8	20.4	44.2	46.0	-1.8
0.864	20.5	20.4	40.9	46.0	-5.1
0.288	22.7	20.4	43.1	50.6	-7.5
1.728	13.9	20.5	34.4	46.0	-11.6
1.296	13.3	20.4	33.7	46.0	-12.3
1.008	12.9	20.4	33.3	46.0	-12.7
2.592	10.7	20.5	31.2	46.0	-14.8

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

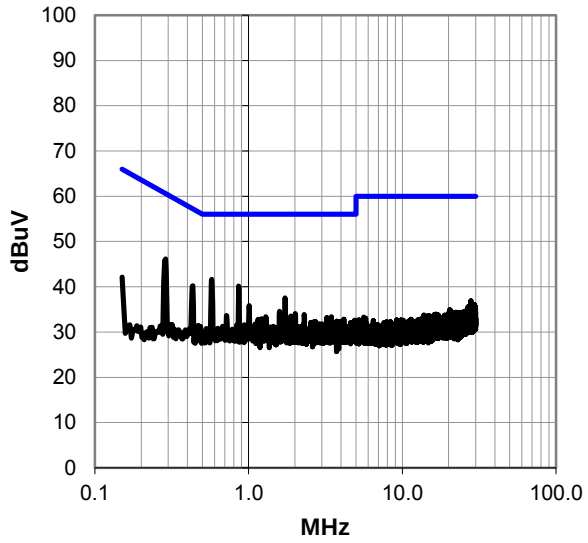
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on Low Channel, 2402 MHz.

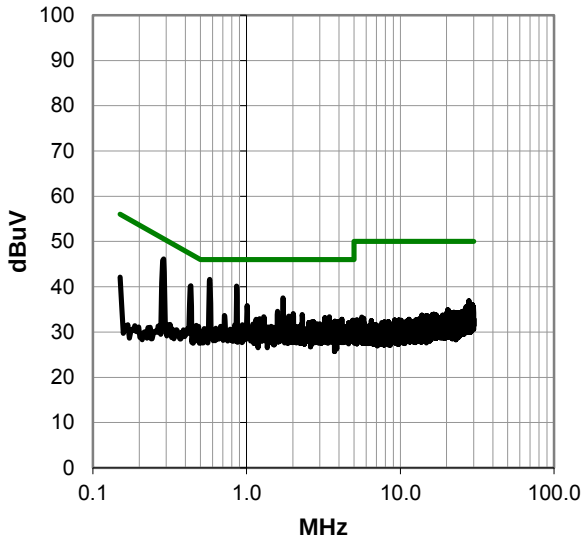
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #2

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	21.2	20.4	41.6	56.0	-14.4
0.288	25.7	20.4	46.1	60.6	-14.5
0.863	19.7	20.4	40.1	56.0	-15.9
0.434	19.8	20.4	40.2	57.2	-17.0
1.728	17.1	20.5	37.6	56.0	-18.4
1.008	15.4	20.4	35.8	56.0	-20.2
1.586	14.1	20.5	34.6	56.0	-21.4
2.015	13.6	20.5	34.1	56.0	-21.9
2.303	13.4	20.5	33.9	56.0	-22.1
0.717	13.2	20.4	33.6	56.0	-22.4
1.877	13.0	20.5	33.5	56.0	-22.5
3.463	12.8	20.6	33.4	56.0	-22.6
1.295	12.9	20.4	33.3	56.0	-22.7
3.235	12.6	20.6	33.2	56.0	-22.8
1.217	12.5	20.4	32.9	56.0	-23.1
27.982	13.2	23.7	36.9	60.0	-23.1
1.154	12.4	20.4	32.8	56.0	-23.2
4.168	12.1	20.7	32.8	56.0	-23.2
4.903	11.9	20.7	32.6	56.0	-23.4
3.750	11.8	20.6	32.4	56.0	-23.6
3.896	11.7	20.6	32.3	56.0	-23.7
2.665	11.8	20.5	32.3	56.0	-23.7
2.735	11.7	20.5	32.2	56.0	-23.8
3.840	11.6	20.6	32.2	56.0	-23.8
1.795	11.7	20.5	32.2	56.0	-23.8
0.150	21.6	20.6	42.2	66.0	-23.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	21.2	20.4	41.6	46.0	-4.4
0.288	25.7	20.4	46.1	50.6	-4.5
0.863	19.7	20.4	40.1	46.0	-5.9
0.434	19.8	20.4	40.2	47.2	-7.0
1.728	17.1	20.5	37.6	46.0	-8.4
1.008	15.4	20.4	35.8	46.0	-10.2
1.586	14.1	20.5	34.6	46.0	-11.4
2.015	13.6	20.5	34.1	46.0	-11.9
2.303	13.4	20.5	33.9	46.0	-12.1
0.717	13.2	20.4	33.6	46.0	-12.4
1.877	13.0	20.5	33.5	46.0	-12.5
3.463	12.8	20.6	33.4	46.0	-12.6
1.295	12.9	20.4	33.3	46.0	-12.7
3.235	12.6	20.6	33.2	46.0	-12.8
1.217	12.5	20.4	32.9	46.0	-13.1
27.982	13.2	23.7	36.9	50.0	-13.1
1.154	12.4	20.4	32.8	46.0	-13.2
4.168	12.1	20.7	32.8	46.0	-13.2
4.903	11.9	20.7	32.6	46.0	-13.4
3.750	11.8	20.6	32.4	46.0	-13.6
3.896	11.7	20.6	32.3	46.0	-13.7
2.665	11.8	20.5	32.3	46.0	-13.7
2.735	11.7	20.5	32.2	46.0	-13.8
3.840	11.6	20.6	32.2	46.0	-13.8
1.795	11.7	20.5	32.2	46.0	-13.8
0.150	21.6	20.6	42.2	56.0	-13.9

CONCLUSION

Pass

Matthew W Burr

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

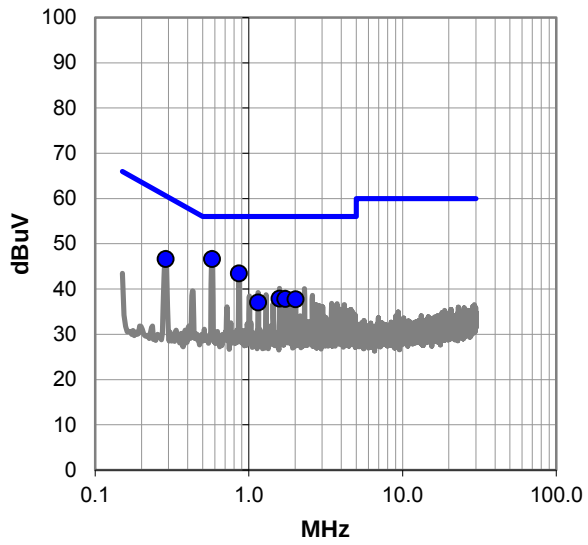
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on Mid Channel, 2442 MHz.

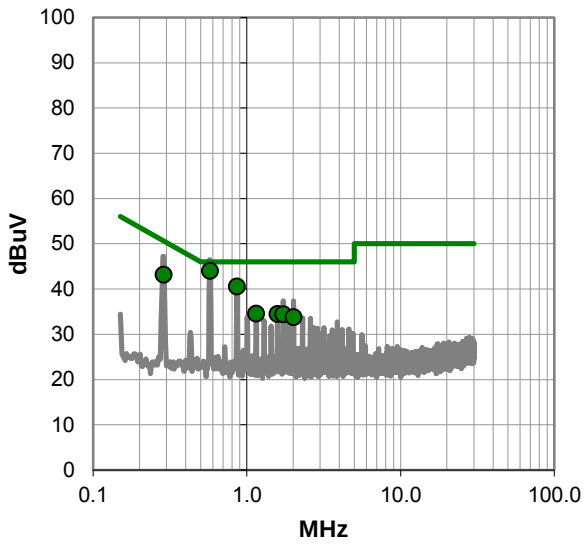
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	26.2	20.4	46.6	56.0	-9.4
0.863	23.0	20.4	43.4	56.0	-12.6
0.288	26.2	20.4	46.6	60.6	-14.0
1.583	17.4	20.5	37.9	56.0	-18.1
1.727	17.3	20.5	37.8	56.0	-18.2
2.015	17.2	20.5	37.7	56.0	-18.3
1.151	16.6	20.4	37.0	56.0	-19.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	23.6	20.4	44.0	46.0	-2.0
0.863	20.1	20.4	40.5	46.0	-5.5
0.288	22.7	20.4	43.1	50.6	-7.5
1.151	14.1	20.4	34.5	46.0	-11.5
1.583	14.0	20.5	34.5	46.0	-11.5
1.727	13.9	20.5	34.4	46.0	-11.6
2.015	13.3	20.5	33.8	46.0	-12.2

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

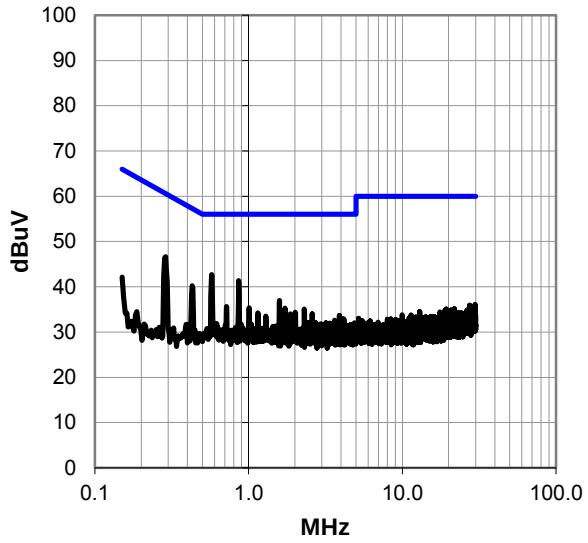
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on Mid Channel, 2442 MHz.

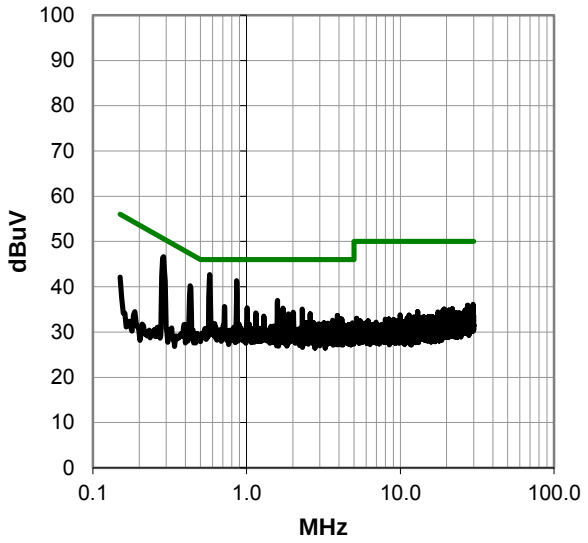
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	22.3	20.4	42.7	56.0	-13.3
0.288	26.2	20.4	46.6	60.6	-14.0
0.863	20.9	20.4	41.3	56.0	-14.7
0.430	19.8	20.4	40.2	57.3	-17.1
1.586	16.5	20.5	37.0	56.0	-19.0
0.717	15.2	20.4	35.6	56.0	-20.4
1.008	14.9	20.4	35.3	56.0	-20.7
1.728	14.8	20.5	35.3	56.0	-20.7
2.303	14.6	20.5	35.1	56.0	-20.9
2.015	13.9	20.5	34.4	56.0	-21.6
1.150	13.8	20.4	34.2	56.0	-21.8
2.594	13.5	20.5	34.0	56.0	-22.0
1.874	13.5	20.5	34.0	56.0	-22.0
3.896	13.0	20.6	33.6	56.0	-22.4
1.295	13.1	20.4	33.5	56.0	-22.5
4.045	12.3	20.7	33.0	56.0	-23.0
4.161	12.2	20.7	32.9	56.0	-23.1
3.635	12.0	20.6	32.6	56.0	-23.4
0.150	21.6	20.6	42.2	66.0	-23.9
29.817	12.1	24.0	36.1	60.0	-23.9
3.183	11.5	20.6	32.1	56.0	-23.9
2.735	11.5	20.5	32.0	56.0	-24.0
2.448	11.5	20.5	32.0	56.0	-24.0
4.892	11.3	20.7	32.0	56.0	-24.0
3.370	11.4	20.6	32.0	56.0	-24.0
27.471	12.3	23.6	35.9	60.0	-24.1

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	22.3	20.4	42.7	46.0	-3.3
0.288	26.2	20.4	46.6	50.6	-4.0
0.863	20.9	20.4	41.3	46.0	-4.7
0.430	19.8	20.4	40.2	47.3	-7.1
1.586	16.5	20.5	37.0	46.0	-9.0
0.717	15.2	20.4	35.6	46.0	-10.4
1.008	14.9	20.4	35.3	46.0	-10.7
1.728	14.8	20.5	35.3	46.0	-10.7
2.303	14.6	20.5	35.1	46.0	-10.9
2.015	13.9	20.5	34.4	46.0	-11.6
1.150	13.8	20.4	34.2	46.0	-11.8
2.594	13.5	20.5	34.0	46.0	-12.0
1.874	13.5	20.5	34.0	46.0	-12.0
3.896	13.0	20.6	33.6	46.0	-12.4
1.295	13.1	20.4	33.5	46.0	-12.5
4.045	12.3	20.7	33.0	46.0	-13.0
4.161	12.2	20.7	32.9	46.0	-13.1
3.635	12.0	20.6	32.6	46.0	-13.4
0.150	21.6	20.6	42.2	56.0	-13.9
29.817	12.1	24.0	36.1	50.0	-13.9
3.183	11.5	20.6	32.1	46.0	-13.9
2.735	11.5	20.5	32.0	46.0	-14.0
2.448	11.5	20.5	32.0	46.0	-14.0
4.892	11.3	20.7	32.0	46.0	-14.0
3.370	11.4	20.6	32.0	46.0	-14.0
27.471	12.3	23.6	35.9	50.0	-14.1

CONCLUSION

Pass

Matthew W Burr

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

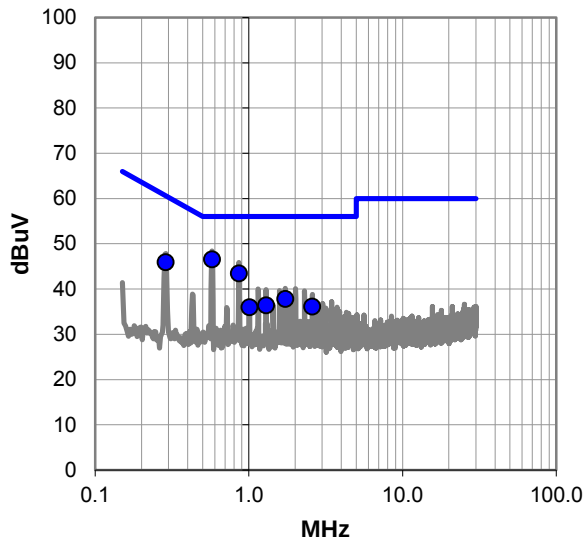
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on High Channel, 2480 MHz.

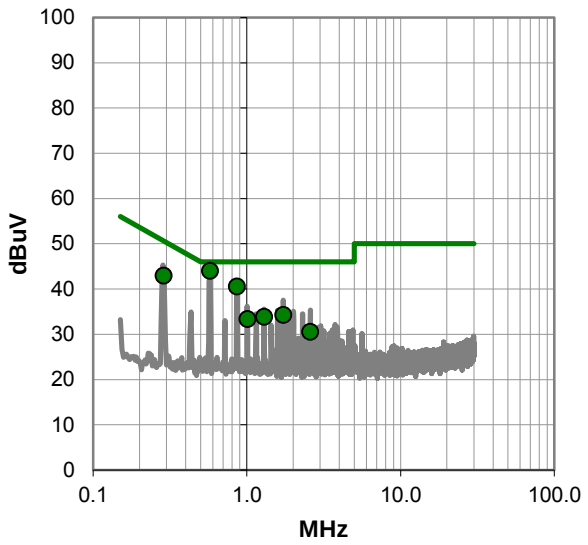
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	26.1	20.4	46.5	56.0	-9.5
0.864	23.0	20.4	43.4	56.0	-12.6
0.288	25.5	20.4	45.9	60.6	-14.7
1.728	17.3	20.5	37.8	56.0	-18.2
1.297	15.9	20.4	36.3	56.0	-19.7
2.591	15.6	20.5	36.1	56.0	-19.9
1.009	15.5	20.4	35.9	56.0	-20.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.576	23.6	20.4	44.0	46.0	-2.0
0.864	20.1	20.4	40.5	46.0	-5.5
0.288	22.5	20.4	42.9	50.6	-7.7
1.728	13.8	20.5	34.3	46.0	-11.7
1.297	13.4	20.4	33.8	46.0	-12.2
1.009	12.9	20.4	33.3	46.0	-12.7
2.591	10.0	20.5	30.5	46.0	-15.5

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

EUT:	M2	Work Order:	PROU0041
Serial Number:	E004	Date:	11/11/2015
Customer:	Motus Global	Temperature:	22.6°C
Attendees:	Zach Eveland, Amanda Woodcock	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure:	1025.2 mb
Tested By:	Matthew Barnes	Job Site:	NC05
Power:	110VAC/60Hz	Configuration:	PROU0041-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

None

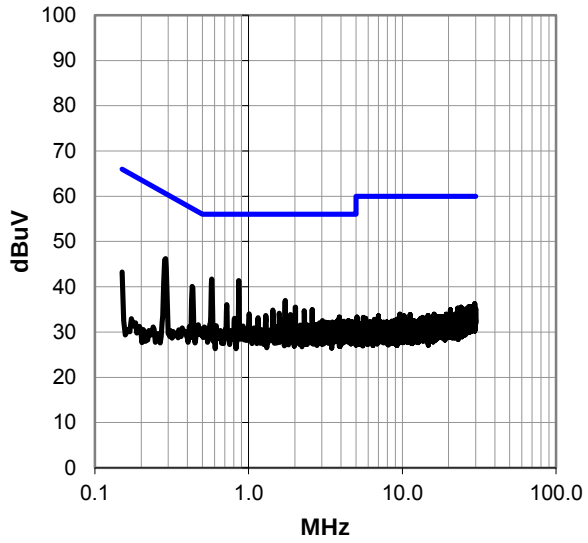
EUT OPERATING MODES

Charging. Transmitting BLE at Maximum Duty Cycle on High Channel, 2480 MHz.

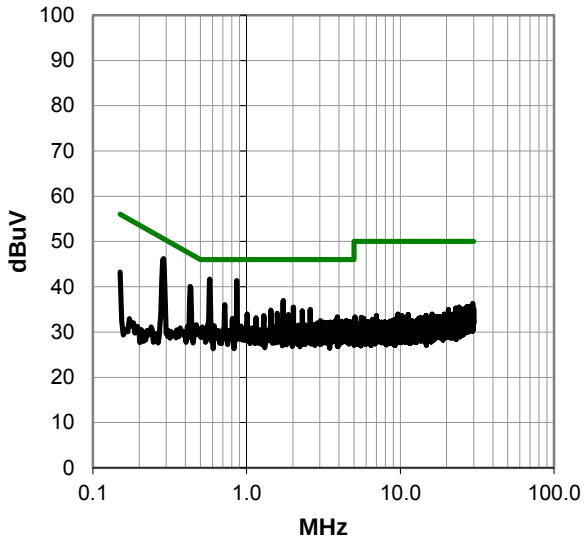
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.10.28
PSA-ESCI 2015.07.01, EmiR5 2015.11.03

RESULTS - Run #6

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	21.3	20.4	41.7	56.0	-14.3
0.288	25.8	20.4	46.2	60.6	-14.4
0.863	20.9	20.4	41.3	56.0	-14.7
0.430	19.7	20.4	40.1	57.3	-17.2
1.732	16.5	20.5	37.0	56.0	-19.0
0.721	15.6	20.4	36.0	56.0	-20.0
2.019	15.0	20.5	35.5	56.0	-20.5
2.594	14.4	20.5	34.9	56.0	-21.1
1.441	14.4	20.4	34.8	56.0	-21.2
2.303	14.2	20.5	34.7	56.0	-21.3
1.583	13.7	20.5	34.2	56.0	-21.8
1.008	13.6	20.4	34.0	56.0	-22.0
1.874	13.4	20.5	33.9	56.0	-22.1
1.295	13.2	20.4	33.6	56.0	-22.4
3.896	12.7	20.6	33.3	56.0	-22.7
0.150	22.7	20.6	43.3	66.0	-22.8
1.154	12.7	20.4	33.1	56.0	-22.9
0.810	12.6	20.4	33.0	56.0	-23.0
3.836	12.1	20.6	32.7	56.0	-23.3
3.026	12.0	20.5	32.5	56.0	-23.5
4.463	11.8	20.7	32.5	56.0	-23.5
4.176	11.7	20.7	32.4	56.0	-23.6
4.037	11.7	20.7	32.4	56.0	-23.6
4.698	11.6	20.7	32.3	56.0	-23.7
3.750	11.7	20.6	32.3	56.0	-23.7
29.649	12.3	24.0	36.3	60.0	-23.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.575	21.3	20.4	41.7	46.0	-4.3
0.288	25.8	20.4	46.2	50.6	-4.4
0.863	20.9	20.4	41.3	46.0	-4.7
0.430	19.7	20.4	40.1	47.3	-7.2
1.732	16.5	20.5	37.0	46.0	-9.0
0.721	15.6	20.4	36.0	46.0	-10.0
2.019	15.0	20.5	35.5	46.0	-10.5
2.594	14.4	20.5	34.9	46.0	-11.1
1.441	14.4	20.4	34.8	46.0	-11.2
2.303	14.2	20.5	34.7	46.0	-11.3
1.583	13.7	20.5	34.2	46.0	-11.8
1.008	13.6	20.4	34.0	46.0	-12.0
1.874	13.4	20.5	33.9	46.0	-12.1
1.295	13.2	20.4	33.6	46.0	-12.4
3.896	12.7	20.6	33.3	46.0	-12.7
0.150	22.7	20.6	43.3	56.0	-12.8
1.154	12.7	20.4	33.1	46.0	-12.9
0.810	12.6	20.4	33.0	46.0	-13.0
3.836	12.1	20.6	32.7	46.0	-13.3
3.026	12.0	20.5	32.5	46.0	-13.5
4.463	11.8	20.7	32.5	46.0	-13.5
4.176	11.7	20.7	32.4	46.0	-13.6
4.037	11.7	20.7	32.4	46.0	-13.6
4.698	11.6	20.7	32.3	46.0	-13.7
3.750	11.7	20.6	32.3	46.0	-13.7
29.649	12.3	24.0	36.3	50.0	-13.7

CONCLUSION

Pass

Tested By

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

Charging. Transmitting BLE at Maximum Duty Cycle

CHANNELS TESTED

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

POWER SETTINGS INVESTIGATED

USB

CONFIGURATIONS INVESTIGATED

PROU0041 - 3

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
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	6/23/2015	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	9/28/2015	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFF	3/6/2015	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHI	10/30/2015	12 mo
Cable	Northwest EMC	Bilog Cables	NC1	8/27/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAB	7/31/2015	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYL	7/30/2015	24 mo
Cable	Northwest EMC	3115 Horn Cable	NC2	6/17/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	7/31/2015	12 mo
Antenna - Double Ridge	EMCO	3115	AHM	6/3/2014	24 mo
Cable	Northwest EMC	Standard Gain Horn Cable	NC3	6/17/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	9/21/2015	12 mo
Antenna - Standard Gain	EMCO	3160-07	AHP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	9/21/2015	12 mo
Antenna - Standard Gain	EMCO	3160-08	AHO	NCR	0 mo
Cable	Northwest EMC	N/A	NC8	6/6/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	6/6/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIY	NCR	0 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

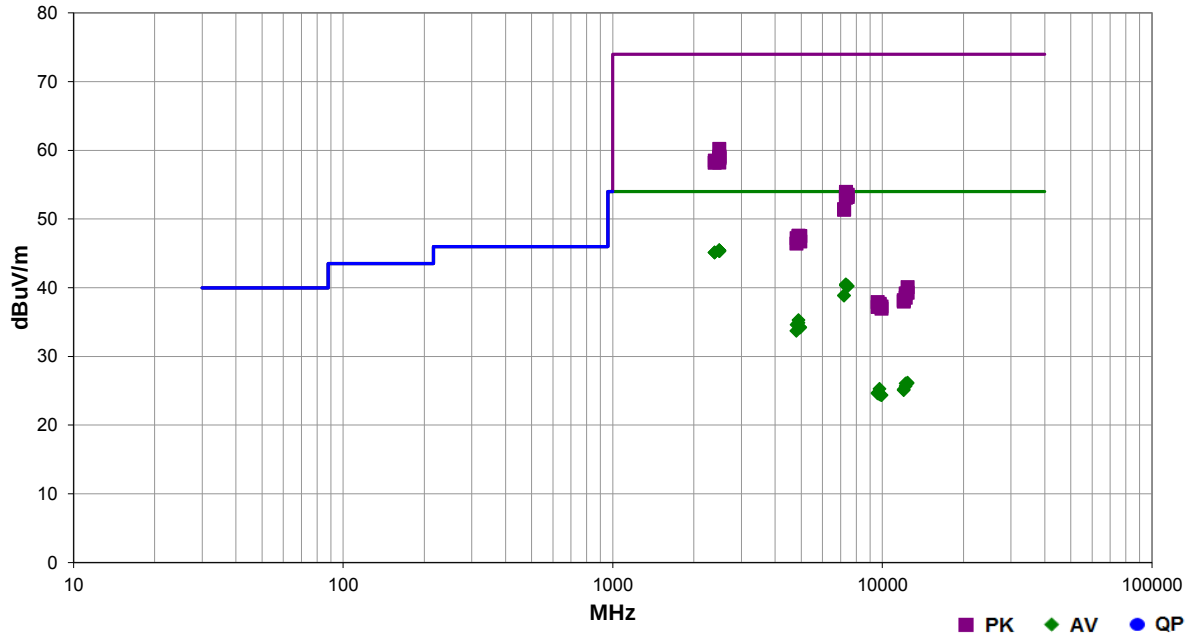
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify 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:	PROU0041	**Date:**	11/11/15		
Project:	None	**Temperature:**	23 °C		
Job Site:	NC01	**Humidity:**	40% RH		
Serial Number:	E003	**Barometric Pres.:**	1022 mbar	**Tested by:**	Richard Mellroth
EUT:	M2				
Configuration:	3				
Customer:	Motus Global				
Attendees:	Zach Eveland, Amanda Woodcock				
EUT Power:	USB				
Operating Mode:	Charging. Transmitting BLE at Maximum Duty Cycle. See comments next to data points for EUT channel and orientation.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2015	ANSI C63.10:2013

Run #	16-18	**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
2485.367	26.2	-0.8	1.5	280.0	3.0	20.0	Horz	AV	0.0	45.4	54.0	-8.6	High Ch 39, EUT Vertical
2485.037	26.2	-0.8	1.5	330.0	3.0	20.0	Horz	AV	0.0	45.4	54.0	-8.6	High Ch 39, EUT Flat
2484.760	26.2	-0.8	3.3	353.0	3.0	20.0	Vert	AV	0.0	45.4	54.0	-8.6	High Ch 39, EUT Flat
2484.623	26.2	-0.8	3.4	353.0	3.0	20.0	Vert	AV	0.0	45.4	54.0	-8.6	High Ch 39, EUT Vertical
2485.463	26.1	-0.8	1.5	163.0	3.0	20.0	Horz	AV	0.0	45.3	54.0	-8.7	High Ch 39, EUT on Side
2485.100	26.1	-0.8	1.5	216.0	3.0	20.0	Vert	AV	0.0	45.3	54.0	-8.7	High Ch 39, EUT on Side
2388.520	26.1	-1.0	2.0	322.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Flat
2388.240	26.1	-1.0	1.5	248.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	Low Ch 0, EUT Flat
7325.220	24.8	15.6	1.5	44.0	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch 20, EUT on Side
7325.105	24.8	15.6	1.5	315.0	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch 20, EUT Vertical
7324.645	24.8	15.6	1.5	95.0	3.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch 20, EUT Flat
7324.520	24.8	15.6	1.5	74.0	3.0	0.0	Vert	AV	0.0	40.4	54.0	-13.6	Mid Ch 20, EUT Flat
7325.145	24.7	15.6	1.5	142.0	3.0	0.0	Vert	AV	0.0	40.3	54.0	-13.7	Mid Ch 20, EUT on Side
7324.550	24.7	15.6	1.5	268.0	3.0	0.0	Vert	AV	0.0	40.3	54.0	-13.7	Mid Ch 20, EUT Vertical
7438.610	23.9	16.3	1.5	208.0	3.0	0.0	Horz	AV	0.0	40.2	54.0	-13.8	High Ch 39, EUT Flat
7438.675	23.9	16.3	3.0	163.0	3.0	0.0	Vert	AV	0.0	40.2	54.0	-13.8	High Ch 39, EUT Flat
2484.427	41.0	-0.8	1.5	330.0	3.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	High Ch 39, EUT Flat
2484.980	39.9	-0.8	3.4	353.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	High Ch 39, EUT Vertical
2484.110	39.7	-0.8	3.3	353.0	3.0	20.0	Vert	PK	0.0	58.9	74.0	-15.1	High Ch 39, EUT Flat
2483.540	39.7	-0.8	1.5	163.0	3.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	High Ch 39, EUT on Side
7207.190	24.5	14.4	1.5	142.0	3.0	0.0	Horz	AV	0.0	38.9	54.0	-15.1	Low Ch 0, EUT Flat
7207.115	24.5	14.4	1.5	163.0	3.0	0.0	Vert	AV	0.0	38.9	54.0	-15.1	Low Ch 0, EUT Flat

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
2483.933	39.6	-0.8	1.5	280.0	3.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	High Ch 39, EUT Vertical
2389.127	39.5	-1.0	2.0	322.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	Low Ch 0, EUT Flat
2484.167	39.0	-0.8	1.5	216.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	High Ch 39, EUT on Side
2388.197	39.2	-1.0	1.5	248.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	Low Ch 0, EUT Flat
4883.700	25.0	10.3	1.5	28.0	3.0	0.0	Vert	AV	0.0	35.3	54.0	-18.7	Mid Ch 20, EUT Flat
4883.575	24.6	10.3	1.5	16.0	3.0	0.0	Horz	AV	0.0	34.9	54.0	-19.1	Mid Ch 20, EUT Flat
4803.665	24.8	9.8	3.0	348.0	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4	Low Ch 0, EUT Flat
4959.445	23.9	10.3	1.5	103.0	3.0	0.0	Horz	AV	0.0	34.2	54.0	-19.8	High Ch 39, EUT Flat
4959.810	23.9	10.3	1.5	172.0	3.0	0.0	Vert	AV	0.0	34.2	54.0	-19.8	High Ch 39, EUT Flat
7326.930	38.3	15.7	1.5	95.0	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	Mid Ch 20, EUT Flat
7324.945	38.1	15.6	1.5	315.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Mid Ch 20, EUT Vertical
4802.530	23.9	9.8	1.5	184.0	3.0	0.0	Vert	AV	0.0	33.7	54.0	-20.3	Low Ch 0, EUT Flat
7439.130	37.2	16.3	3.0	163.0	3.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	High Ch 39, EUT Flat
7327.050	37.6	15.7	1.5	142.0	3.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	Mid Ch 20, EUT on Side
7324.955	37.6	15.6	1.5	44.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	Mid Ch 20, EUT on Side
7439.410	36.9	16.3	1.5	208.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	High Ch 39, EUT Flat
7325.875	37.5	15.6	1.5	74.0	3.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	Mid Ch 20, EUT Flat
7324.510	37.5	15.6	1.5	268.0	3.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	Mid Ch 20, EUT Vertical
7205.225	37.1	14.3	1.5	163.0	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	Low Ch 0, EUT Flat
7205.640	37.0	14.3	1.5	142.0	3.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	Low Ch 0, EUT Flat
4883.470	37.3	10.3	1.5	16.0	3.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	Mid Ch 20, EUT Flat
4960.185	37.2	10.3	1.5	103.0	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	High Ch 39, EUT Flat
4884.990	37.2	10.3	1.5	28.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Mid Ch 20, EUT Flat
4804.535	37.4	9.8	3.0	348.0	3.0	0.0	Horz	PK	0.0	47.2	74.0	-26.8	Low Ch 0, EUT Flat
4960.185	36.4	10.3	1.5	172.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	High Ch 39, EUT Flat
4803.470	36.6	9.8	1.5	184.0	3.0	0.0	Vert	PK	0.0	46.4	74.0	-27.6	Low Ch 0, EUT Flat
12398.840	28.5	-2.3	3.8	186.0	3.0	0.0	Vert	AV	0.0	26.2	54.0	-27.8	High Ch 39, EUT Flat
12398.700	28.4	-2.3	3.5	194.0	3.0	0.0	Horz	AV	0.0	26.1	54.0	-27.9	High Ch 39, EUT Flat
12208.600	28.6	-2.5	3.2	322.0	3.0	0.0	Vert	AV	0.0	26.1	54.0	-27.9	Mid Ch 20, EUT Flat
12208.730	28.2	-2.5	1.5	260.0	3.0	0.0	Horz	AV	0.0	25.7	54.0	-28.3	Mid Ch 20, EUT Flat
9766.570	28.7	-3.4	3.8	358.0	3.0	0.0	Vert	AV	0.0	25.3	54.0	-28.7	Mid Ch 20, EUT Flat
12008.620	28.2	-3.0	1.5	146.0	3.0	0.0	Horz	AV	0.0	25.2	54.0	-28.8	Low Ch 0, EUT Flat
12008.550	28.1	-3.0	1.5	33.0	3.0	0.0	Vert	AV	0.0	25.1	54.0	-28.9	Low Ch 0, EUT Flat
9607.315	28.5	-3.8	3.1	115.0	3.0	0.0	Vert	AV	0.0	24.7	54.0	-29.3	Low Ch 0, EUT Flat
9606.585	28.4	-3.8	3.1	178.0	3.0	0.0	Horz	AV	0.0	24.6	54.0	-29.4	Low Ch 0, EUT Flat
9766.500	27.9	-3.4	1.5	351.0	3.0	0.0	Horz	AV	0.0	24.5	54.0	-29.5	Mid Ch 20, EUT Flat
9918.740	27.7	-3.3	1.5	352.0	3.0	0.0	Vert	AV	0.0	24.4	54.0	-29.6	High Ch 39, EUT Flat
9918.650	27.7	-3.3	1.5	226.0	3.0	0.0	Horz	AV	0.0	24.4	54.0	-29.6	High Ch 39, EUT Flat
12398.530	42.4	-2.3	3.8	186.0	3.0	0.0	Vert	PK	0.0	40.1	74.0	-33.9	High Ch 39, EUT Flat
12399.060	41.6	-2.3	3.5	194.0	3.0	0.0	Horz	PK	0.0	39.3	74.0	-34.7	High Ch 39, EUT Flat
12208.590	41.7	-2.5	3.2	322.0	3.0	0.0	Vert	PK	0.0	39.2	74.0	-34.8	Mid Ch 20, EUT Flat
12208.610	41.1	-2.5	1.5	260.0	3.0	0.0	Horz	PK	0.0	38.6	74.0	-35.4	Mid Ch 20, EUT Flat
12008.830	41.2	-3.0	1.5	33.0	3.0	0.0	Vert	PK	0.0	38.2	74.0	-35.8	Low Ch 0, EUT Flat
12009.980	41.0	-3.0	1.5	146.0	3.0	0.0	Horz	PK	0.0	38.0	74.0	-36.0	Low Ch 0, EUT Flat
9608.255	41.7	-3.8	3.1	115.0	3.0	0.0	Vert	PK	0.0	37.9	74.0	-36.1	Low Ch 0, EUT Flat
9767.350	41.1	-3.4	3.8	358.0	3.0	0.0	Vert	PK	0.0	37.7	74.0	-36.3	Mid Ch 20, EUT Flat
9769.365	41.0	-3.4	1.5	351.0	3.0	0.0	Horz	PK	0.0	37.6	74.0	-36.4	Mid Ch 20, EUT Flat
9919.930	40.6	-3.3	1.5	352.0	3.0	0.0	Vert	PK	0.0	37.3	74.0	-36.7	High Ch 39, EUT Flat
9609.100	41.0	-3.8	3.1	178.0	3.0	0.0	Horz	PK	0.0	37.2	74.0	-36.8	Low Ch 0, EUT Flat
9919.730	40.3	-3.3	1.5	226.0	3.0	0.0	Horz	PK	0.0	37.0	74.0	-37.0	High Ch 39, EUT Flat

BAND EDGE COMPLIANCE

XMit 2015.01.14

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)
Cable	Northwest EMC	None	NC9	3/13/2015	12
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12

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

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

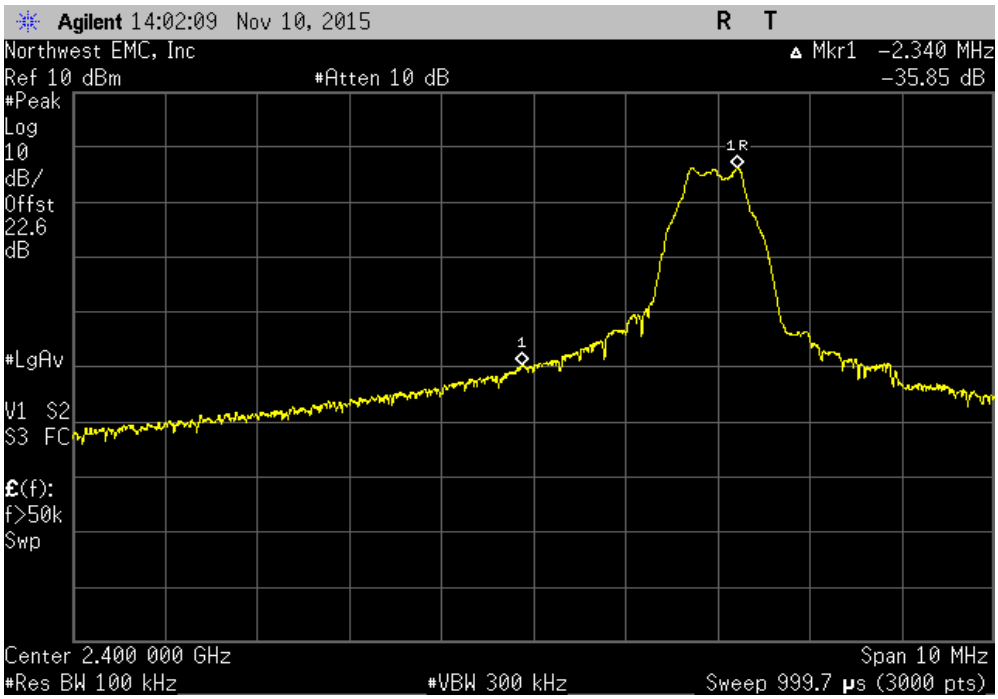
DEVIATIONS FROM TEST STANDARD

None

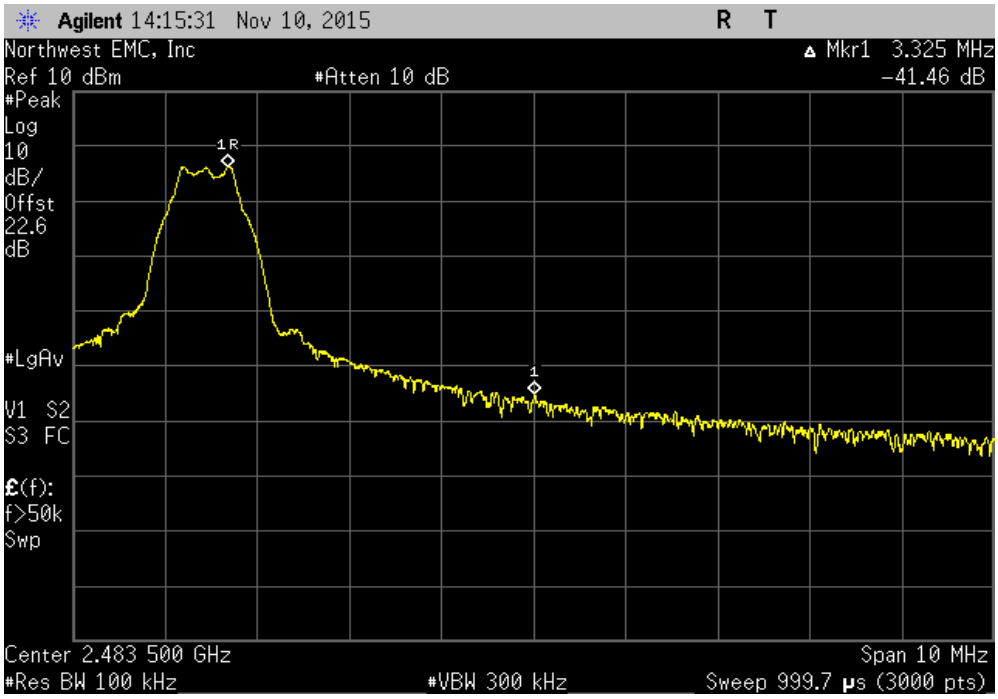
Configuration #	2	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2402 MHz	-35.85	-20	Pass
High Channel, 2480 MHz	-41.46	-20	Pass

Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-35.85	-20	Pass



High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-41.46	-20	Pass



DUTY CYCLE

XMit 2015.01.14

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Cable	Northwest EMC	None	NC9	3/13/2015	12
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12

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.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

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 may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

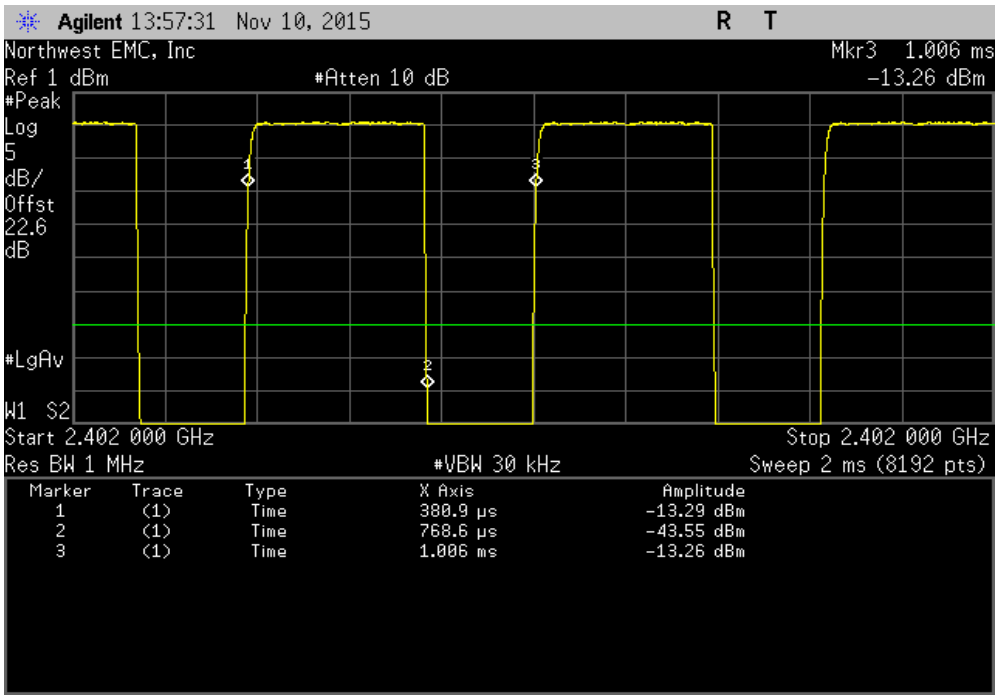
Configuration #	2	Signature	Matthew W Barnes

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Low Channel, 2402 MHz	387.7 us	625.1 us	1	62	N/A	N/A
Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2442 MHz	387.7 us	624.8 us	1	62.1	N/A	N/A
Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2480 MHz	387.7 us	624.8 us	1	62.1	N/A	N/A
High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

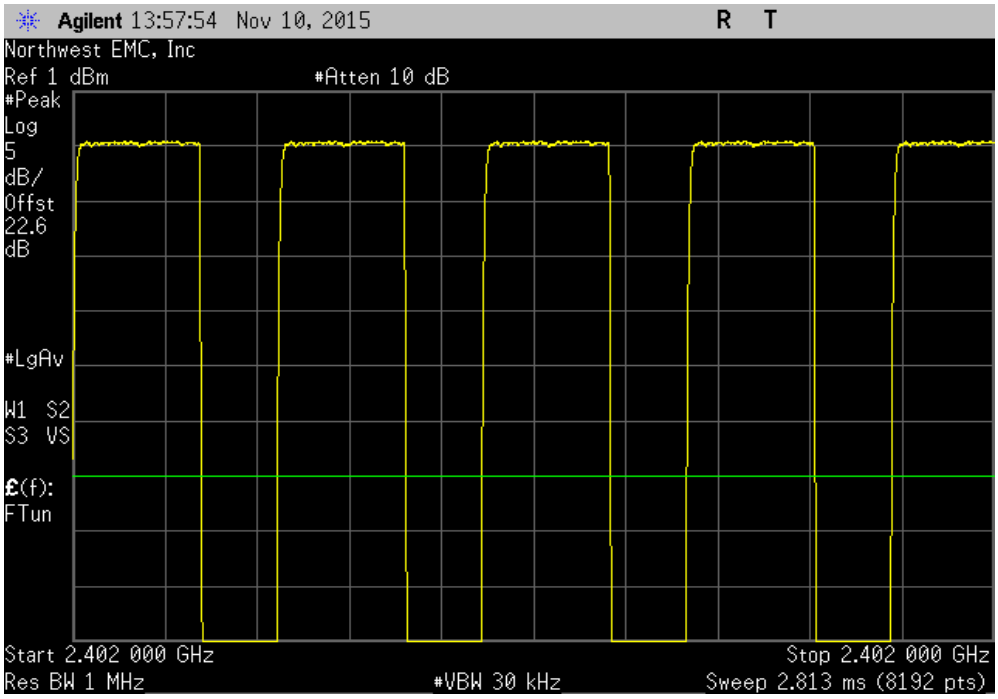
DUTY CYCLE

XMit 2015.01.14

Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	387.7 us	625.1 us	1	62	N/A	N/A



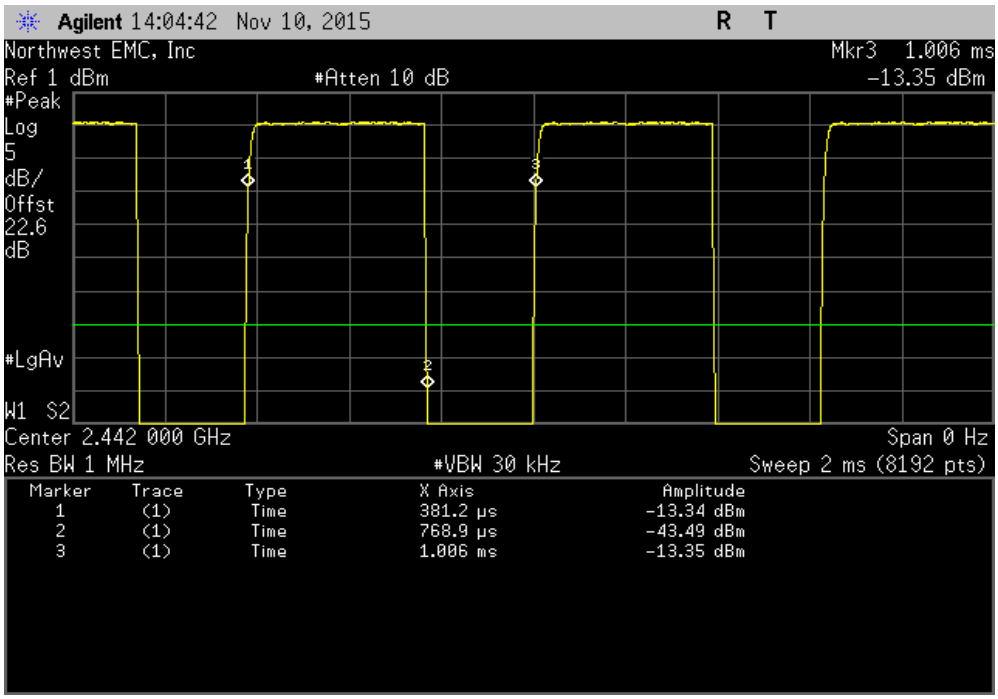
Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



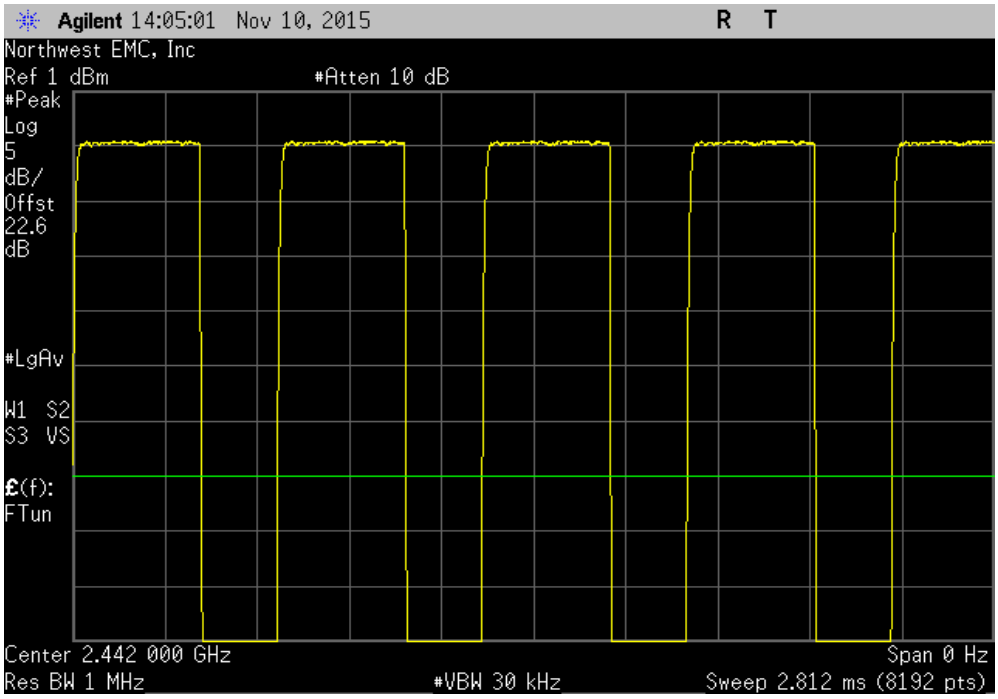
DUTY CYCLE

XMit 2015.01.14

Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	387.7 us	624.8 us	1	62.1	N/A	N/A



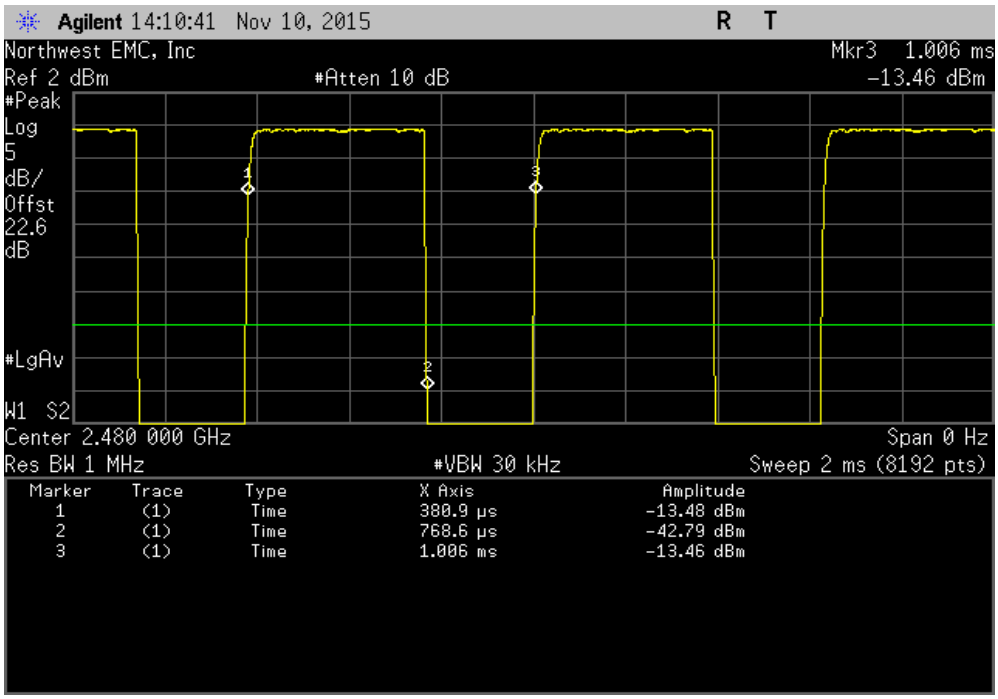
Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



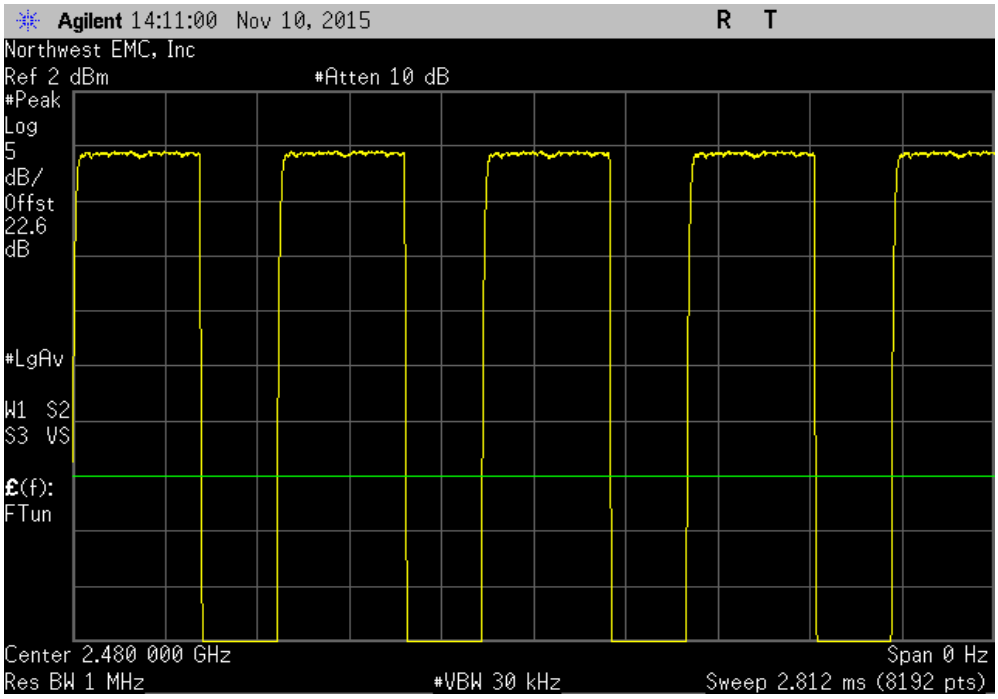
DUTY CYCLE

XMit 2015.01.14

High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	387.7 us	624.8 us	1	62.1	N/A	N/A



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



OCCUPIED BANDWIDTH

XMit 2015.01.14

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mos)
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Cable	Northwest EMC	None	NC9	3/13/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12

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

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

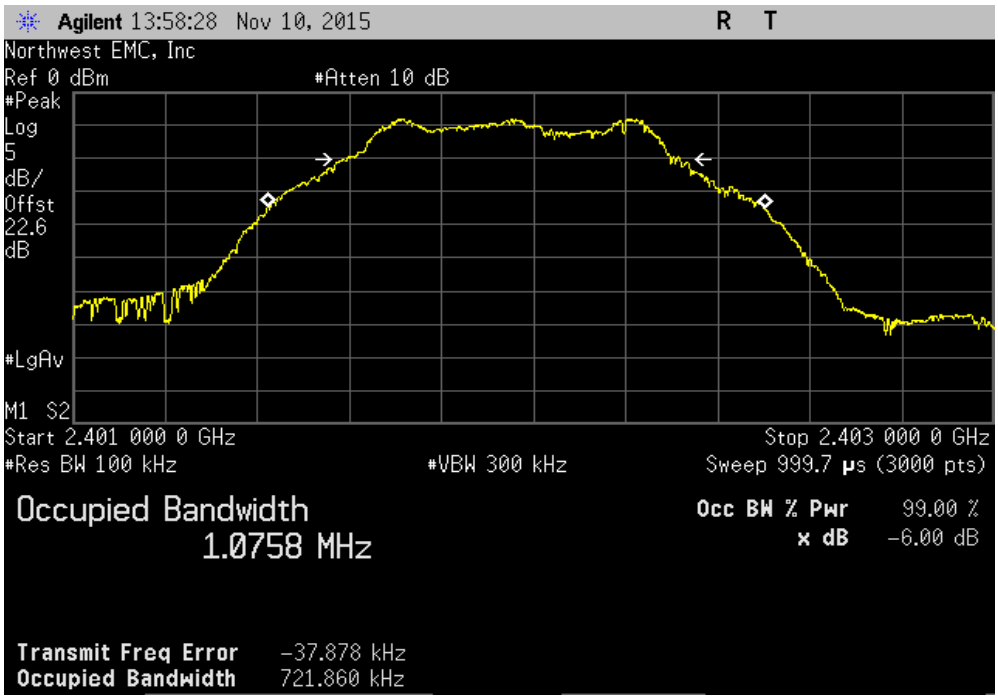
DEVIATIONS FROM TEST STANDARD

None

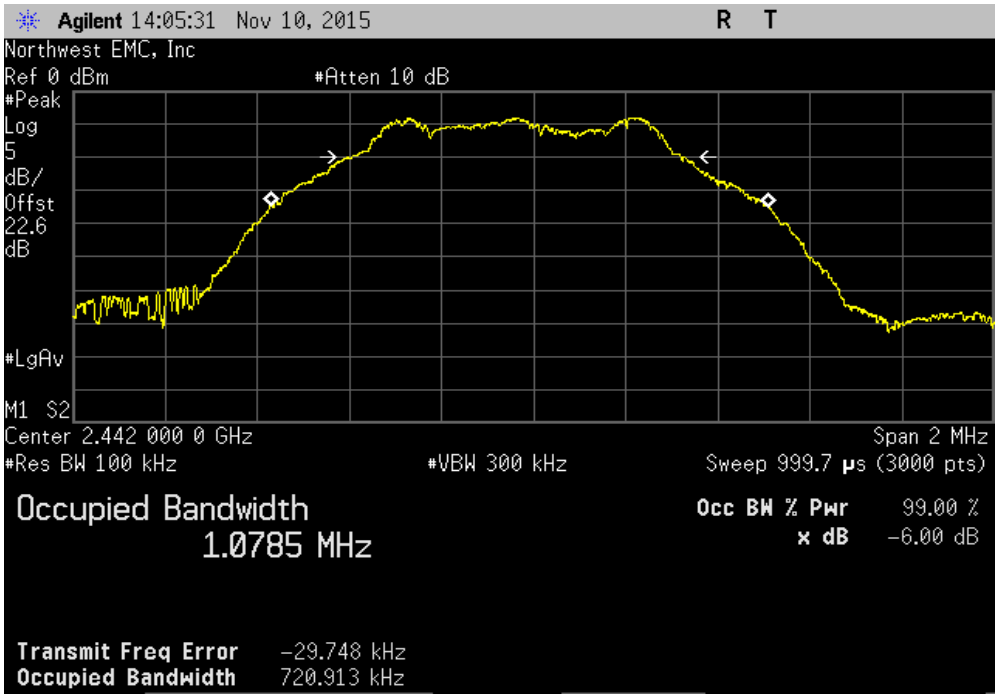
Configuration #	2	Signature

	Value	Limit (≥)	Result
Low Channel, 2402 MHz	721.86 kHz	500 kHz	Pass
Mid Channel, 2442 MHz	720.913 kHz	500 kHz	Pass
High Channel, 2480 MHz	707.744 kHz	500 kHz	Pass

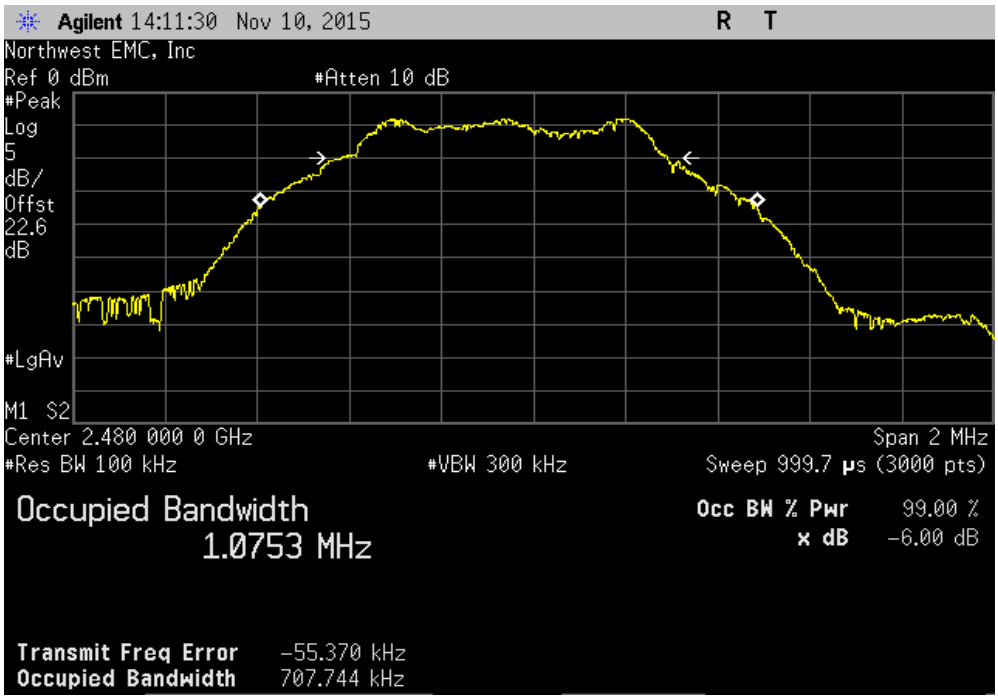
Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				721.86 kHz	500 kHz	Pass



Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				720.913 kHz	500 kHz	Pass



High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				707.744 kHz	500 kHz	Pass



OUTPUT POWER

XMit 2015.01.14

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)
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12
Cable	Northwest EMC	None	NC9	3/13/2015	12
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12

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 ANSI C63.10:2013 Section 11.10.2 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

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

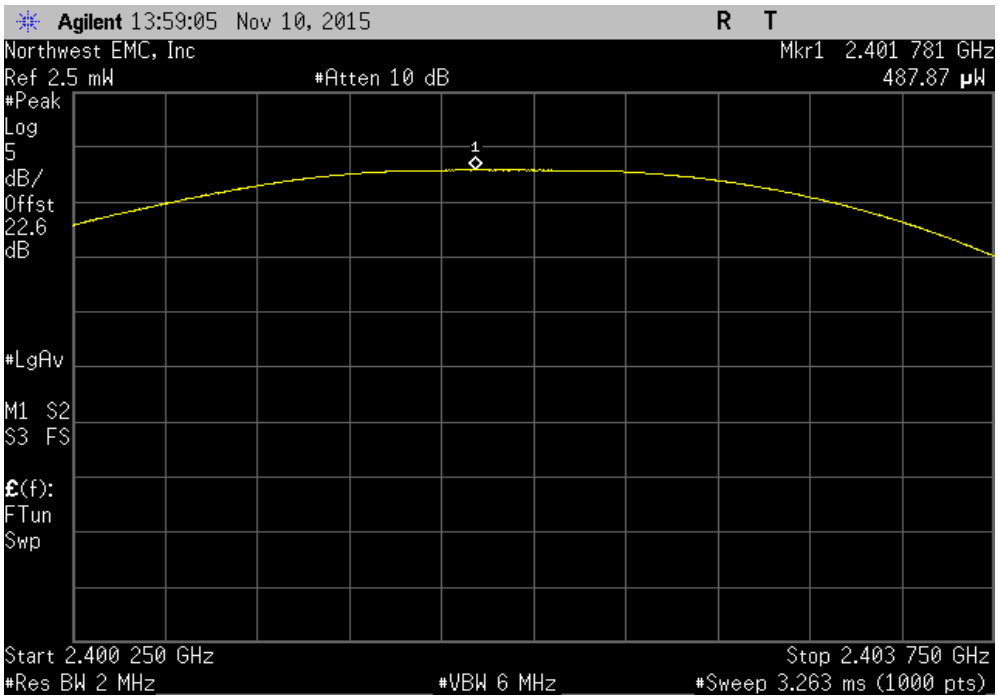
DEVIATIONS FROM TEST STANDARD

None

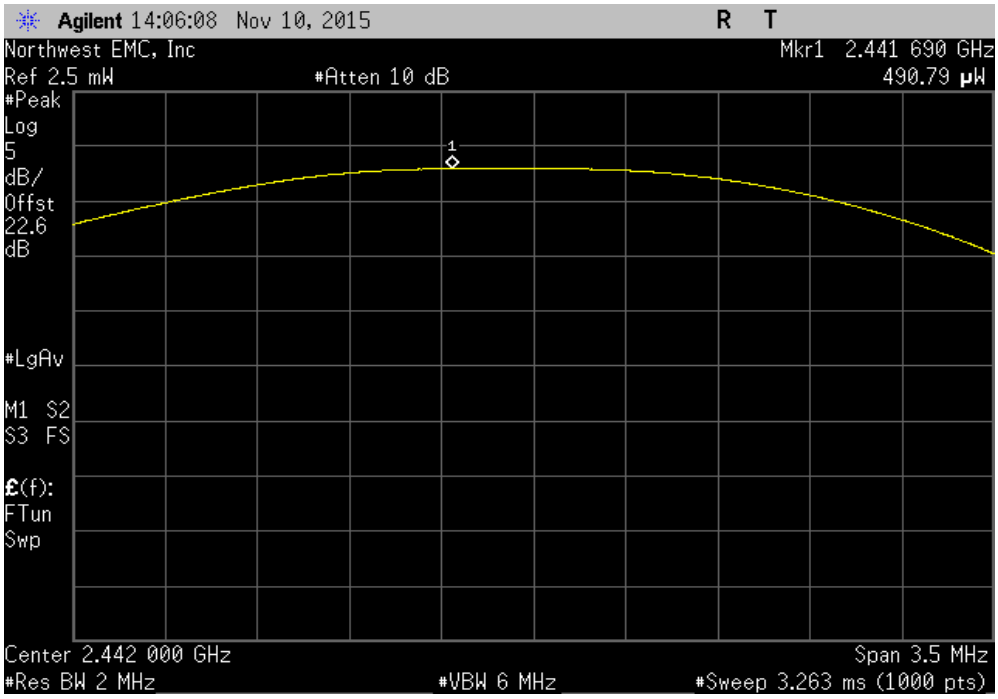
Configuration #	2	Signature	Matthew W Barnes

	Value	Limit (<)	Result
Low Channel, 2402 MHz	487.865 uW	1 W	Pass
Mid Channel, 2442 MHz	490.795 uW	1 W	Pass
High Channel, 2480 MHz	494.766 uW	1 W	Pass

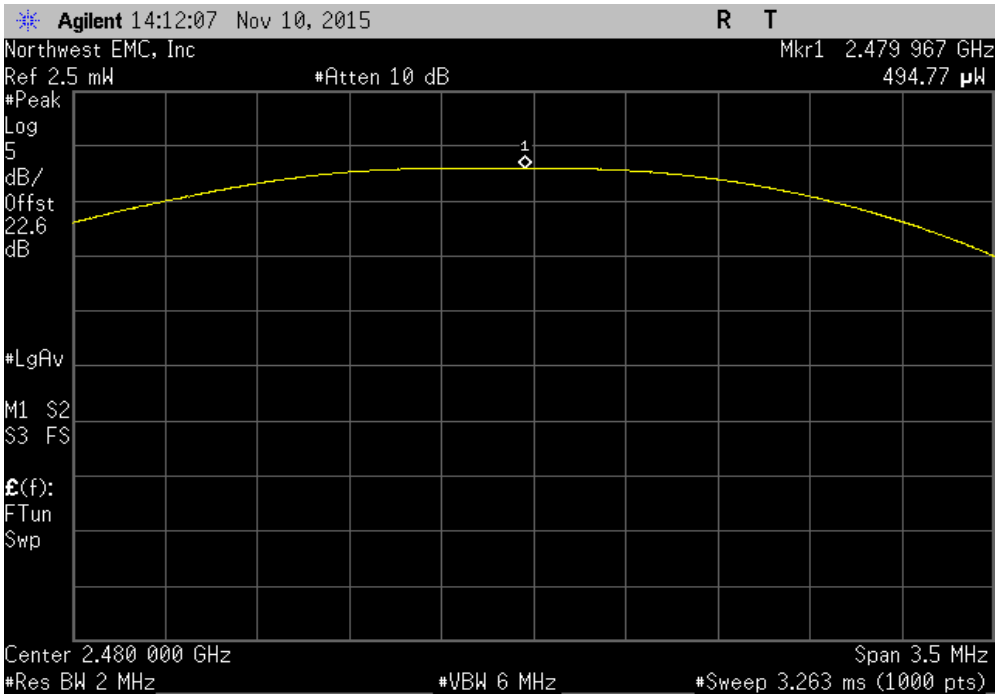
Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				487.865 uW	1 W	Pass



Mid Channel, 2442 MHz						
				Value	Limit (<)	Result
				490.795 uW	1 W	Pass



High Channel, 2480 MHz							
					Value	Limit (<)	Result
					494.766 uW	1 W	Pass



POWER SPECTRAL DENSITY

XMit 2015.01.14

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)
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12
Cable	Northwest EMC	None	NC9	3/13/2015	12
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12

TEST DESCRIPTION

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

A direct connection was made between the RF output of the EUT and a spectrum analyzer. External 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.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

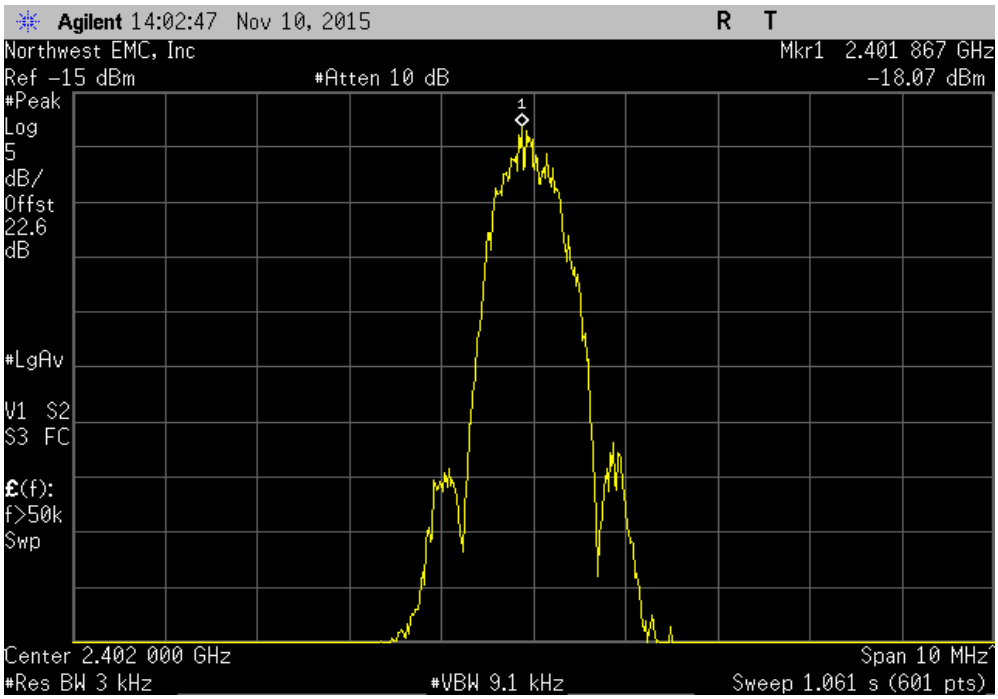
DEVIATIONS FROM TEST STANDARD

None

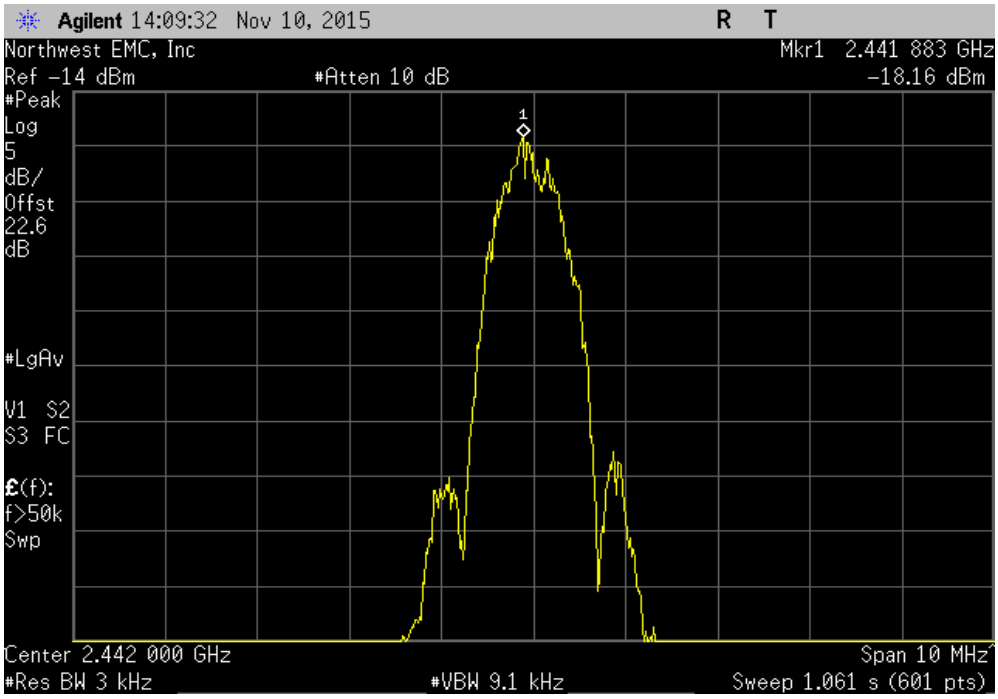
Configuration #	2	Signature	Matthew W Barnes

	Value dBm/3kHz	Limit < dBm/3kHz	Results
Low Channel, 2402 MHz	-18.069	8	Pass
Mid Channel, 2442 MHz	-18.155	8	Pass
High Channel, 2480 MHz	-18.301	8	Pass

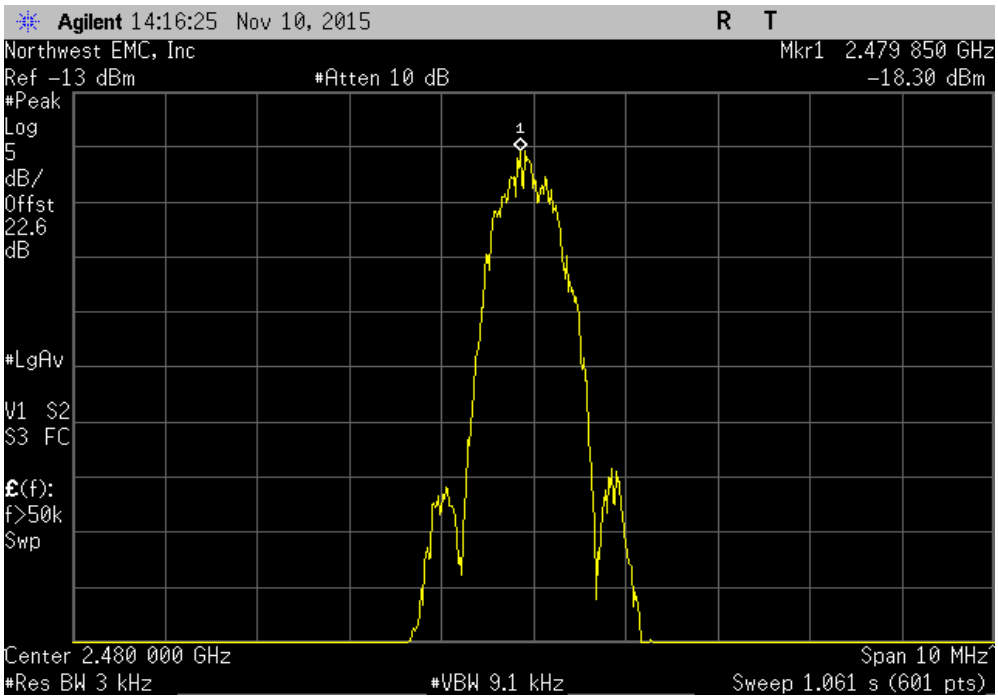
Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-18.069	8	Pass



Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-18.155	8	Pass



High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-18.301	8	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2015.01.14

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)
Cable	Northwest EMC	None	NC9	3/13/2015	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
Generator - Signal	Agilent	N5183A	TIA	4/7/2014	24
Block - DC	Fairview Microwave	SD3379	AMJ	6/6/2015	12
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	6/22/2015	12

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

NORTHWEST EMC

XMit 2015.01.14

EUT:	M2			**Work Order:**	PROU0041
Serial Number:	E002			**Date:**	11/10/15
Customer:	Motus Global			**Temperature:**	23°C
Attendees:	Zach Eveland, Guy Corral			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1024.6
Tested by:	Matthew Barnes	**Power:**	3.7VDC	**Job Site:**	NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2013

COMMENTS

None

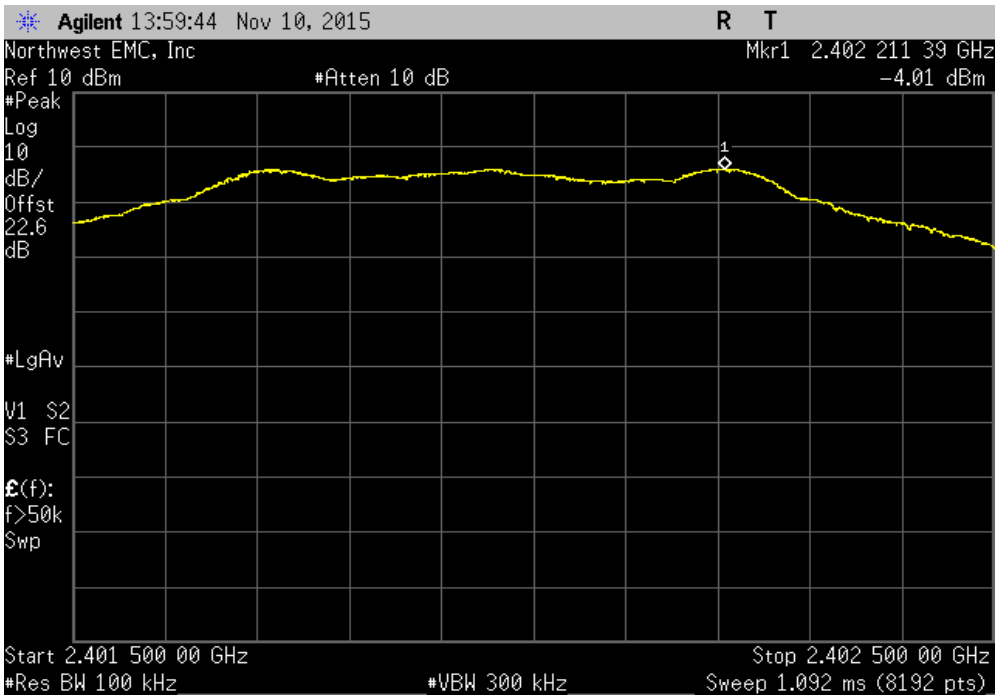
DEVIATIONS FROM TEST STANDARD

None

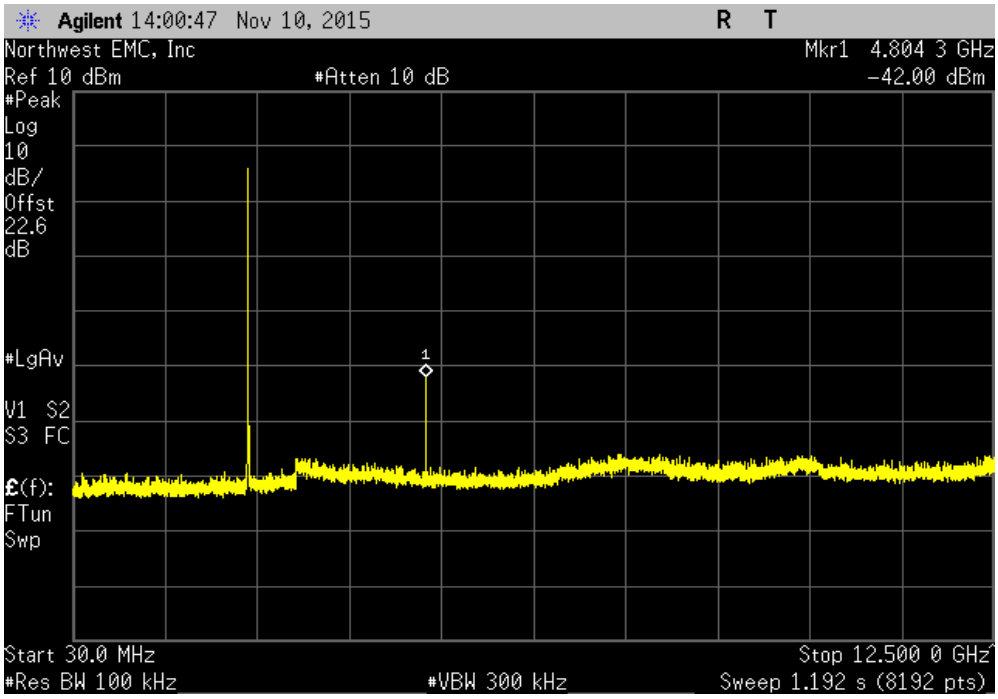
Configuration #	2	Signature	Matthew W Barnes

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-37.99	-20	Pass
Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-47.9	-20	Pass
Mid Channel, 2442 MHz	Fundamental	N/A	N/A	N/A
Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	-38.99	-20	Pass
Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	-48.12	-20	Pass
High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	-38.85	-20	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	-47.72	-20	Pass

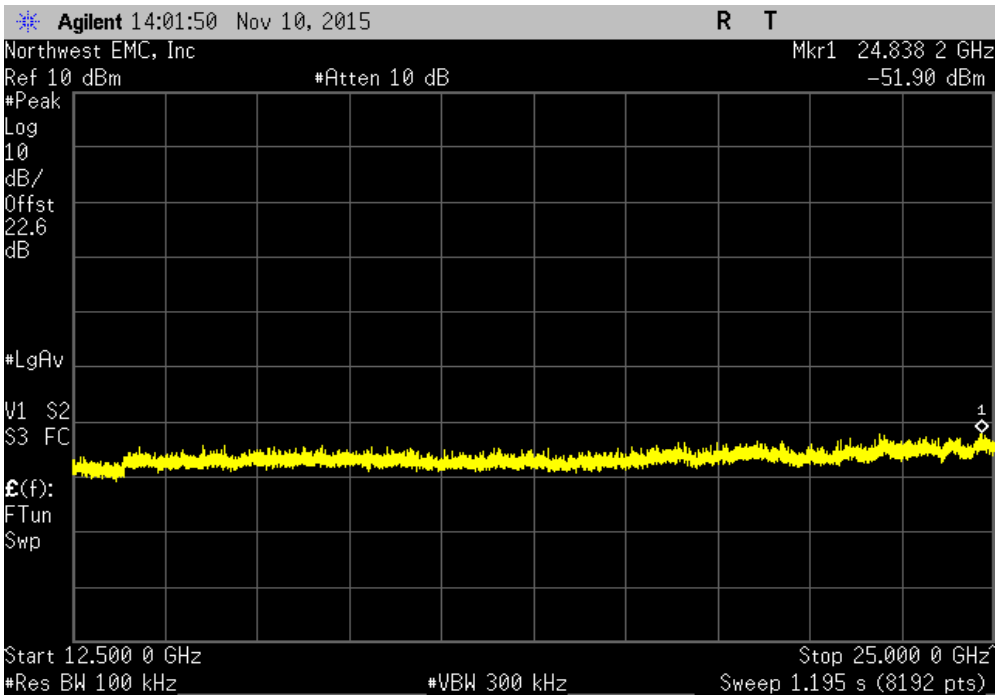
Low Channel, 2402 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



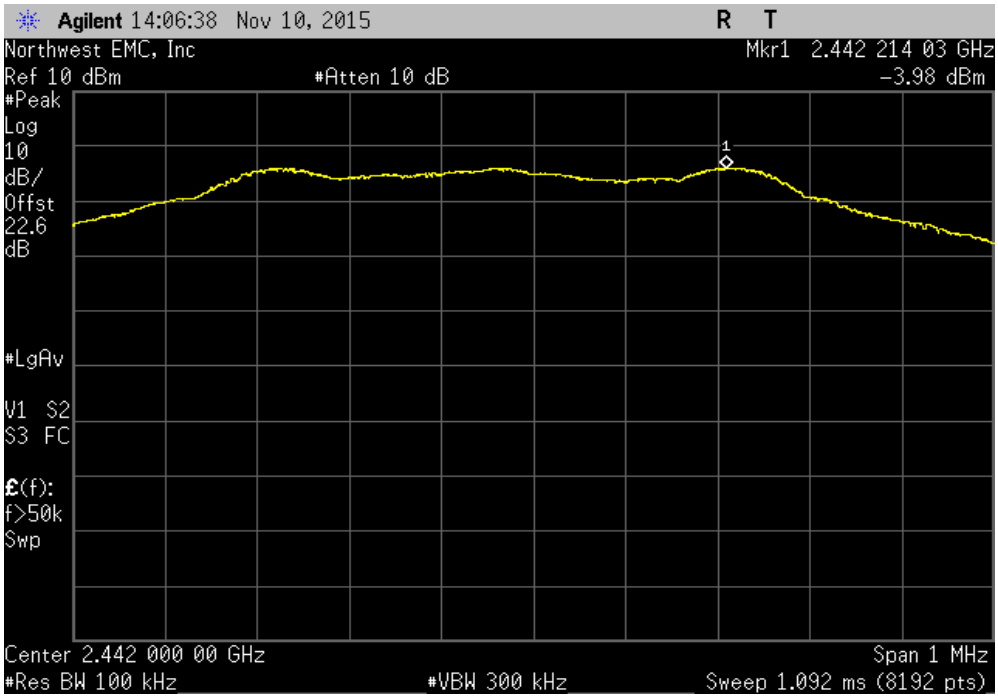
Low Channel, 2402 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-37.99	-20	Pass



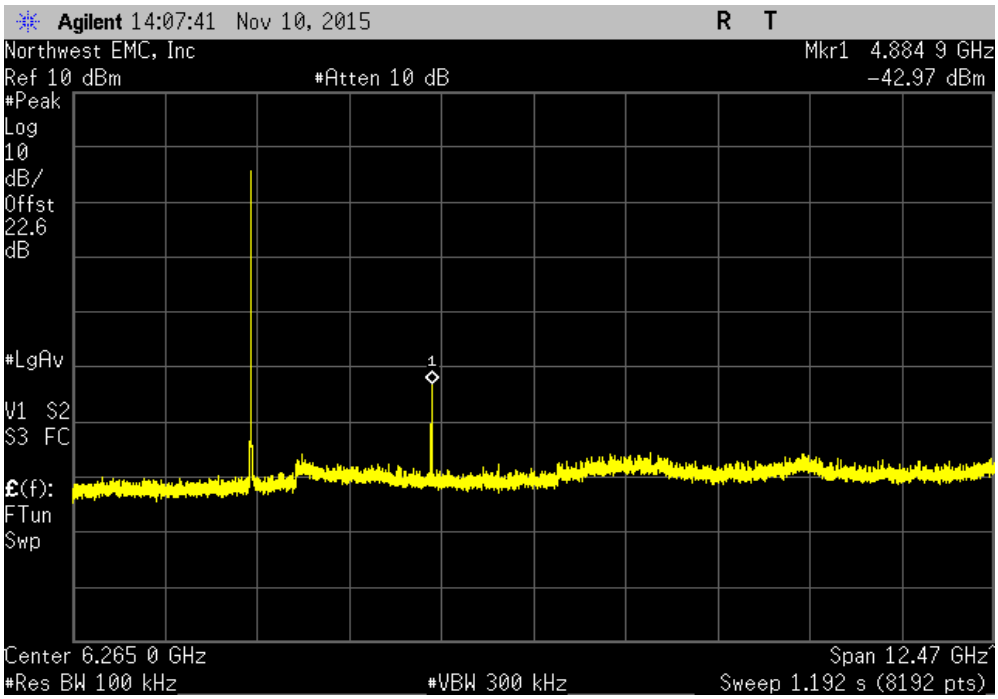
Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-47.9	-20	Pass



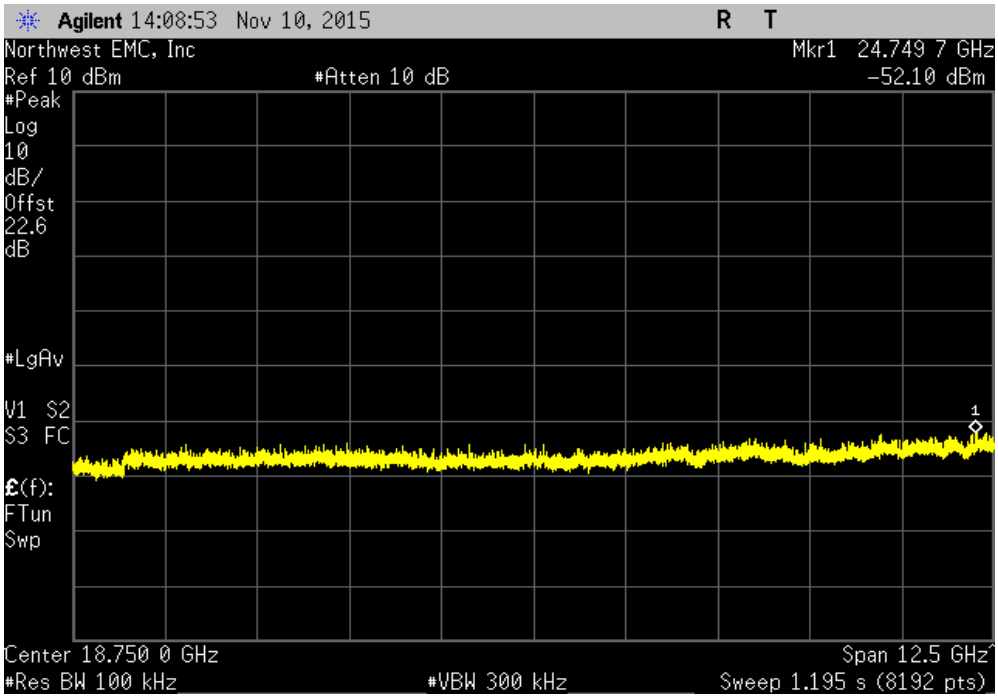
Mid Channel, 2442 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



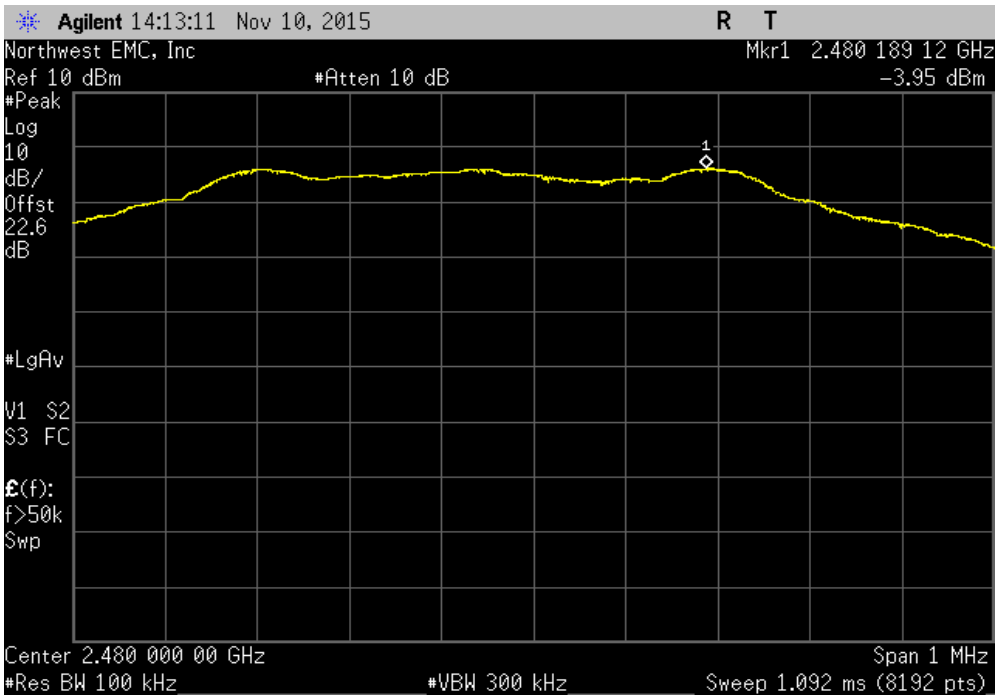
Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-38.99	-20	Pass



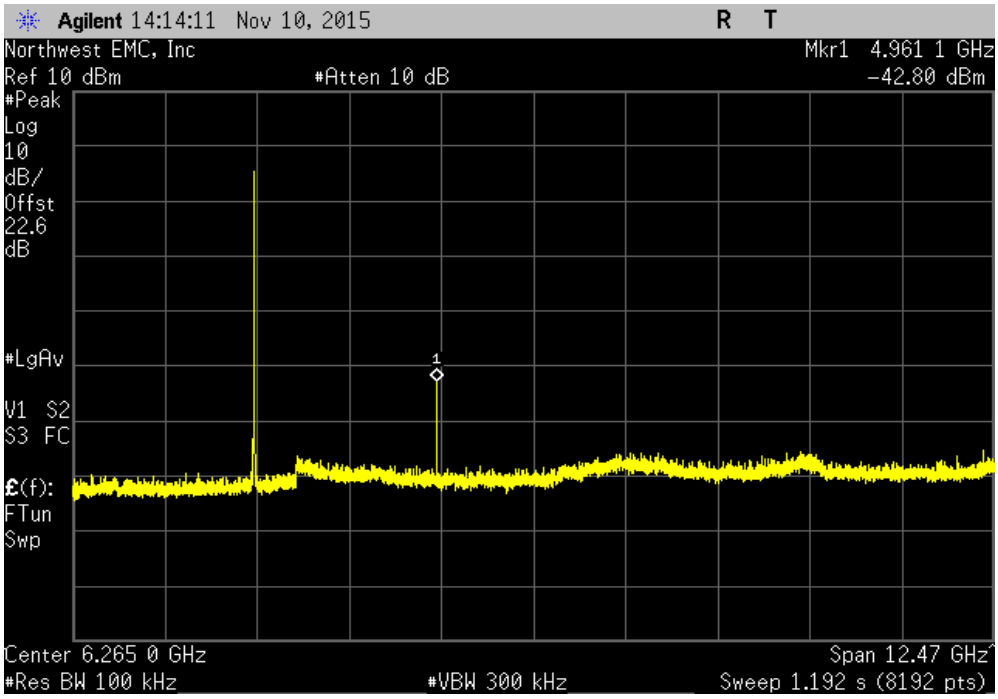
Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-48.12	-20	Pass



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



High Channel, 2480 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-38.85	-20	Pass



High Channel, 2480 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-47.72	-20	Pass