NORTHWEST EMC

Masimo Corporation

MightySat

FCC 15.247:2014

Report # MASI0245.2

NVLAP Lab Code: 200676-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: December 09, 2014
Masimo Corporation
Model: MightySat

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2014	ANSI C63.10:2009 KDB 558074 V3

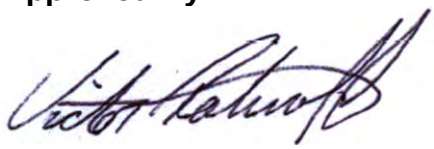
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for battery powered EUT.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Victor Ratinoff, 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.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2014.10.08

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

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

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.

SCOPE

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

MEASUREMENT UNCERTAINTY

TMU.2014.12.03

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.

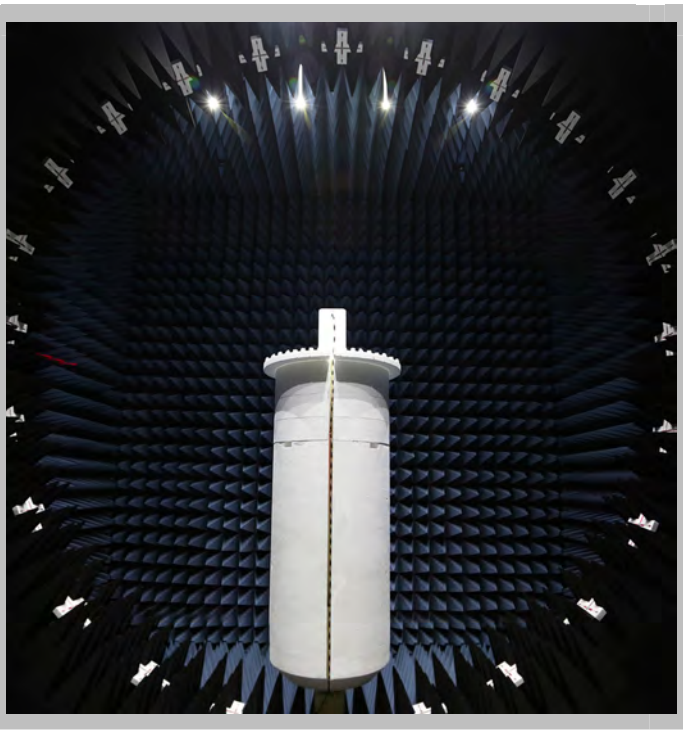
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

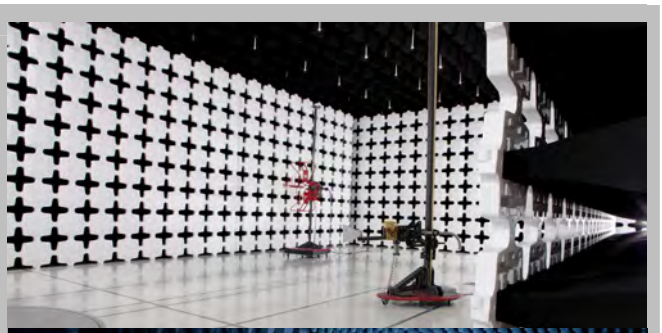
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES

NORTHWEST EMC
REV 2014.10.08

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) 685-0796	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	In Process	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110





PRODUCT DESCRIPTION

NORTHWEST EMC
2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Masimo Corporation
Address:	40 Parker
City, State, Zip:	Irvine, CA 92618
Test Requested By:	Mike Clark
Model:	MightySat
First Date of Test:	November 11, 2014
Last Date of Test:	December 09, 2014
Receipt Date of Samples:	November 11, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
SpO2 finger patient monitor with Bluetooth radio module and one antenna.

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

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration MASI0245- 1

Software/Firmware Running during test	
Description	**Version**
EUT Operating Software	1000-Rx

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Finger Patient Monitor	Masimo Corporation	MightySat	1426682922

Configuration MASI0245- 2

Software/Firmware Running during test	
Description	**Version**
EUT Operating Software	1000-Rx

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Finger Patient Monitor	Masimo Corporation	MightySat	ENG 2

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	11/11/2014	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	11/11/2014	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	11/11/2014	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.
4	11/11/2014	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.
5	11/21/2014	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.
6	11/21/2014	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.
7	12/09/2014	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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

Operating Continuous TX, BT LE - Low Ch (Ch 0, 2402MHz), Mid Ch (Ch 39, 2440MHz), High Ch (Ch 78, 2480MHz)
Operating Continuous TX, BT LE - Low Ch (Ch 0, 2402MHz) & High Ch (Ch 78, 2480MHz)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MASI0245 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 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
Attenuator, 20db, 'SMA'	Weinschel Corp	4H-20	AWB	4/28/2014	12 mo
HP Filter	Micro-Tronics	HPM50111	HGC	11/27/2012	36 mo
Low Pass Filter 0-1000 MHz	Micro-Tronics	LPM50004	LFC	11/14/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	1/10/2014	12 mo
Antenna, Horn	EMCO	3160-09	AHN	NCR	0 mo
OC floating Cable	N/A	18-26GHz RE Cables	OCK	2/6/2014	12 mo
OC07 Cables	ESM Cable Corp.	8-18GHz cables	OCY	3/27/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVP	9/15/2014	12 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVL	9/15/2014	12 mo
Antenna, Horn	ETS	3160-07	AHX	NCR	0 mo
OC07 Cables	ESM Cable Corp.	1-8GHz cables	OCX	3/27/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVJ	9/15/2014	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIR	6/4/2014	24 mo
OC07 Cables	ESM Cable Corp.	30-1GHz cables	OCW	7/15/2014	12 mo
Pre-Amplifier	Miteq	AM-1402	AOZ	7/15/2014	12 mo
Antenna, Biconilog	EMCO	3142	AXA	11/25/2013	24 mo
Spectrum Analyzer	Agilent	E4446A	AAY	10/27/2014	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

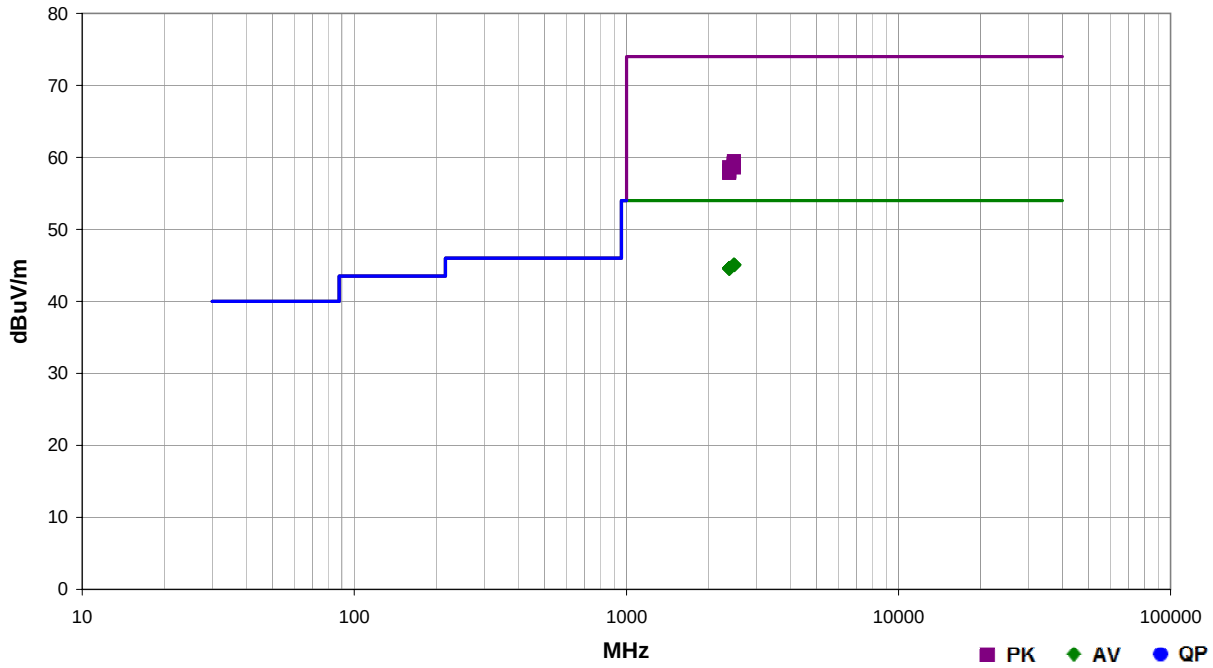
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify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

SPURIOUS RADIATED EMISSIONS

Work Order:	MASI0245	**Date:**	12/09/14		
Project:	None	**Temperature:**	22.5 °C		
Job Site:	OC07	**Humidity:**	48.5% RH		
Serial Number:	ENG 2	**Barometric Pres.:**	1016 mbar	**Tested by:**	Mark Baytan
EUT:	MightySat				
Configuration:	2				
Customer:	Masimo Corporation				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Operating Continuous TX, BT LE - Low Ch (Ch 0, 2402MHz) & High Ch (Ch 78, 2480MHz)				
Deviations:	None				
Comments:	Band Edge				

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

Run #	6	**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
2485.237	30.3	-5.2	2.6	129.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	High Ch, EUT on Side
2485.200	30.3	-5.2	3.7	358.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	High Ch, EUT Horz
2485.053	30.3	-5.2	1.0	355.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	High Ch, EUT Vertical
2484.600	30.3	-5.2	1.0	222.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	High Ch, EUT on Side
2484.493	30.3	-5.2	1.0	210.0	3.0	20.0	Horz	AV	0.0	45.1	54.0	-8.9	High Ch, EUT Horz
2484.370	30.3	-5.2	1.0	93.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	High Ch, EUT Vertical
2388.557	30.4	-5.8	1.0	186.0	3.0	20.0	Horz	AV	0.0	44.6	54.0	-9.4	Low Ch, EUT Horz
2388.210	30.4	-5.8	1.0	14.0	3.0	20.0	Horz	AV	0.0	44.6	54.0	-9.4	Low Ch, EUT on Side
2388.033	30.4	-5.8	1.0	279.0	3.0	20.0	Vert	AV	0.0	44.6	54.0	-9.4	Low Ch, EUT Horz
2388.007	30.4	-5.8	1.0	202.0	3.0	20.0	Vert	AV	0.0	44.6	54.0	-9.4	Low Ch, EUT on Side
2388.760	30.3	-5.8	1.0	250.0	3.0	20.0	Vert	AV	0.0	44.5	54.0	-9.5	Low Ch, EUT Vert
2388.790	30.3	-5.8	1.0	316.0	3.0	20.0	Horz	AV	0.0	44.5	54.0	-9.5	Low Ch, EUT Vert
2484.690	44.7	-5.2	1.0	93.0	3.0	20.0	Vert	PK	0.0	59.5	74.0	-14.5	High Ch, EUT Vertical
2483.563	44.4	-5.2	1.0	355.0	3.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	High Ch, EUT Vertical
2485.323	44.3	-5.2	1.0	210.0	3.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9	High Ch, EUT Horz
2484.767	44.3	-5.2	2.6	129.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	High Ch, EUT on Side
2484.107	44.0	-5.2	3.7	358.0	3.0	20.0	Vert	PK	0.0	58.8	74.0	-15.2	High Ch, EUT Horz
2388.790	44.4	-5.8	1.0	186.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Low Ch, EUT Horz

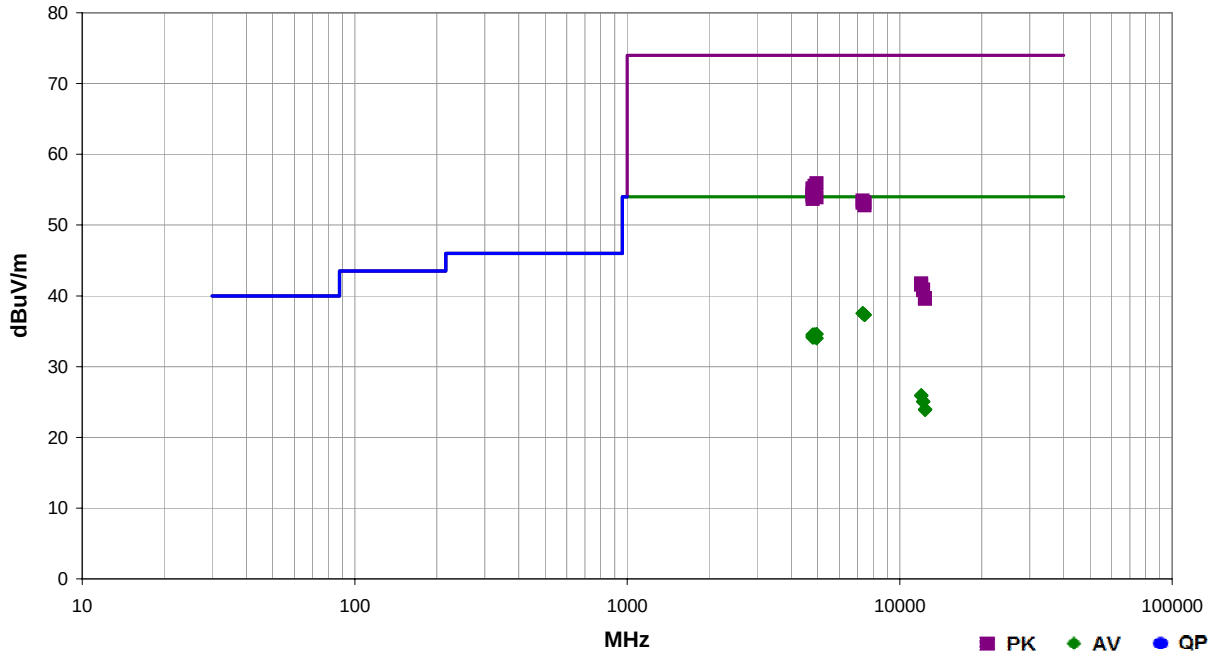
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.877	43.8	-5.2	1.0	222.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	High Ch, EUT on Side
2389.633	43.9	-5.8	1.0	279.0	3.0	20.0	Vert	PK	0.0	58.1	74.0	-15.9	Low Ch, EUT Horz
2389.480	43.8	-5.8	1.0	316.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	Low Ch, EUT Vert
2388.960	43.8	-5.8	1.0	202.0	3.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	Low Ch, EUT on Side
2388.090	43.7	-5.8	1.0	14.0	3.0	20.0	Horz	PK	0.0	57.9	74.0	-16.1	Low Ch, EUT on Side
2388.257	43.6	-5.8	1.0	250.0	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	Low Ch, EUT Vert

SPURIOUS RADIATED EMISSIONS

Work Order:	MASI0245	**Date:**	12/09/14		
Project:	None	**Temperature:**	22.5 °C		
Job Site:	OC07	**Humidity:**	48.5% RH		
Serial Number:	ENG 2	**Barometric Pres.:**	1016 mbar	**Tested by:**	Mark Baytan
EUT:	MightySat				
Configuration:	2				
Customer:	Masimo Corporation				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Operating Continuous TX, BT LE - Low Ch (Ch 0, 2402MHz), Mid Ch (Ch 39, 2440MHz), High Ch (Ch 78, 2480MHz)				
Deviations:	None				
Comments:	None				

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

Run #	9	**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
7318.980	27.1	10.4	1.0	314.0	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	Mid Ch, EUT on Side
7318.830	27.1	10.4	1.0	122.0	3.0	0.0	Horz	AV	0.0	37.5	54.0	-16.5	Mid Ch, EUT Horz
7438.590	26.7	10.6	1.0	193.0	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	High Ch, EUT Horz
7438.500	26.7	10.6	1.0	125.0	3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	High Ch, EUT on Side
4959.590	52.7	3.2	1.0	140.0	3.0	0.0	Horz	PK	0.0	55.9	74.0	-18.1	High Ch, EUT Horz
4880.065	52.5	3.1	1.0	315.0	3.0	0.0	Horz	PK	0.0	55.6	74.0	-18.4	Mid Ch, EUT Horz
4803.645	52.2	3.0	1.0	261.0	3.0	0.0	Horz	PK	0.0	55.2	74.0	-18.8	Low Ch, EUT Horz
4803.940	52.0	3.0	1.0	353.0	3.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	Low Ch, EUT Vertical
4959.885	31.4	3.2	1.0	140.0	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4	High Ch, EUT Horz
4879.940	31.5	3.1	1.0	315.0	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4	Mid Ch, EUT Horz
4879.800	51.5	3.1	1.3	347.0	3.0	0.0	Vert	PK	0.0	54.6	74.0	-19.4	Mid Ch, EUT on Side
4803.935	31.5	3.0	1.0	261.0	3.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	Low Ch, EUT Horz
4803.925	31.5	3.0	1.0	353.0	3.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	Low Ch, EUT Vertical
4804.510	51.4	3.0	1.0	348.0	3.0	0.0	Horz	PK	0.0	54.4	74.0	-19.6	Low Ch, EUT on Side
4803.930	31.4	3.0	1.6	255.0	3.0	0.0	Vert	AV	0.0	34.4	54.0	-19.6	Low Ch, EUT on Side
4803.470	51.4	3.0	1.6	255.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	Low Ch, EUT on Side
4803.915	31.3	3.0	1.0	348.0	3.0	0.0	Horz	AV	0.0	34.3	54.0	-19.7	Low Ch, EUT on Side
4803.920	31.2	3.0	1.1	152.0	3.0	0.0	Vert	AV	0.0	34.2	54.0	-19.8	Low Ch, EUT Horz
4879.910	31.1	3.1	1.3	347.0	3.0	0.0	Vert	AV	0.0	34.2	54.0	-19.8	Mid Ch, EUT on Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4804.170	51.1	3.0	1.1	152.0	3.0	0.0	Vert	PK	0.0	54.1	74.0	-19.9	Low Ch, EUT Horz
4803.925	31.1	3.0	1.0	206.0	3.0	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Low Ch, EUT Vertical
4959.925	30.8	3.2	1.1	200.0	3.0	0.0	Vert	AV	0.0	34.0	54.0	-20.0	High Ch, EUT on Side
4960.460	50.7	3.2	1.1	200.0	3.0	0.0	Vert	PK	0.0	53.9	74.0	-20.1	High Ch, EUT on Side
4804.330	50.7	3.0	1.0	206.0	3.0	0.0	Vert	PK	0.0	53.7	74.0	-20.3	Low Ch, EUT Vertical
7318.840	43.0	10.4	1.0	314.0	3.0	0.0	Vert	PK	0.0	53.4	74.0	-20.6	Mid Ch, EUT on Side
7439.775	42.6	10.6	1.0	125.0	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	High Ch, EUT on Side
7319.005	42.7	10.4	1.0	122.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	Mid Ch, EUT Horz
7440.570	42.2	10.6	1.0	193.0	3.0	0.0	Horz	PK	0.0	52.8	74.0	-21.2	High Ch, EUT Horz
12011.470	33.4	-7.4	1.0	338.0	3.0	0.0	Vert	AV	0.0	26.0	54.0	-28.0	Low Ch, EUT on Side
12011.500	33.3	-7.4	1.0	247.0	3.0	0.0	Horz	AV	0.0	25.9	54.0	-28.1	Low Ch, EUT Horz
12200.610	32.2	-7.1	1.0	7.0	3.0	0.0	Vert	AV	0.0	25.1	54.0	-28.9	Mid Ch, EUT on Side
12199.600	32.2	-7.1	1.0	339.0	3.0	0.0	Horz	AV	0.0	25.1	54.0	-28.9	Mid Ch, EUT Horz
12398.530	30.8	-6.8	1.0	200.0	3.0	0.0	Vert	AV	0.0	24.0	54.0	-30.0	High Ch, EUT on Side
12398.560	30.7	-6.8	1.0	259.0	3.0	0.0	Horz	AV	0.0	23.9	54.0	-30.1	High Ch, EUT Horz
12011.340	49.2	-7.4	1.0	338.0	3.0	0.0	Vert	PK	0.0	41.8	74.0	-32.2	Low Ch, EUT on Side
12011.020	49.0	-7.4	1.0	247.0	3.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	Low Ch, EUT Horz
12200.770	48.0	-7.1	1.0	7.0	3.0	0.0	Vert	PK	0.0	40.9	74.0	-33.1	Mid Ch, EUT on Side
12200.930	47.9	-7.1	1.0	339.0	3.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	Mid Ch, EUT Horz
12398.690	46.5	-6.8	1.0	259.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	High Ch, EUT Horz
12399.450	46.4	-6.8	1.0	200.0	3.0	0.0	Vert	PK	0.0	39.6	74.0	-34.4	High Ch, EUT on Side

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 (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	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

EUT:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/11/14
Customer:	Masimo Corporation			**Temperature:**	22.1°C
Attendees:	Michael Clark			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1014
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

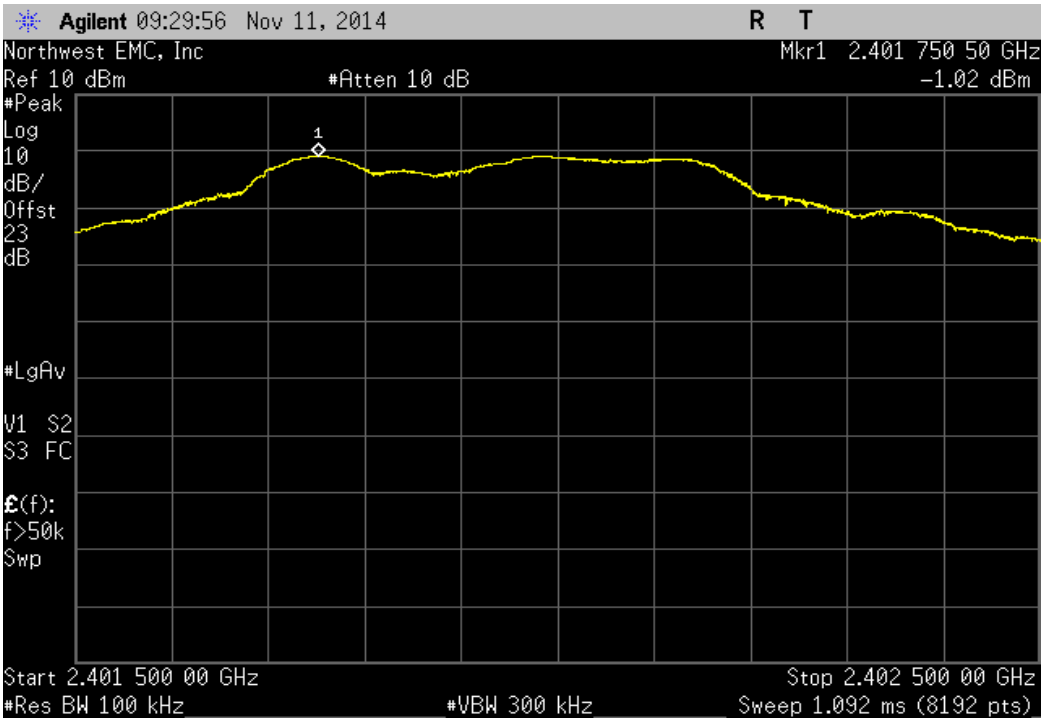
DEVIATIONS FROM TEST STANDARD

None

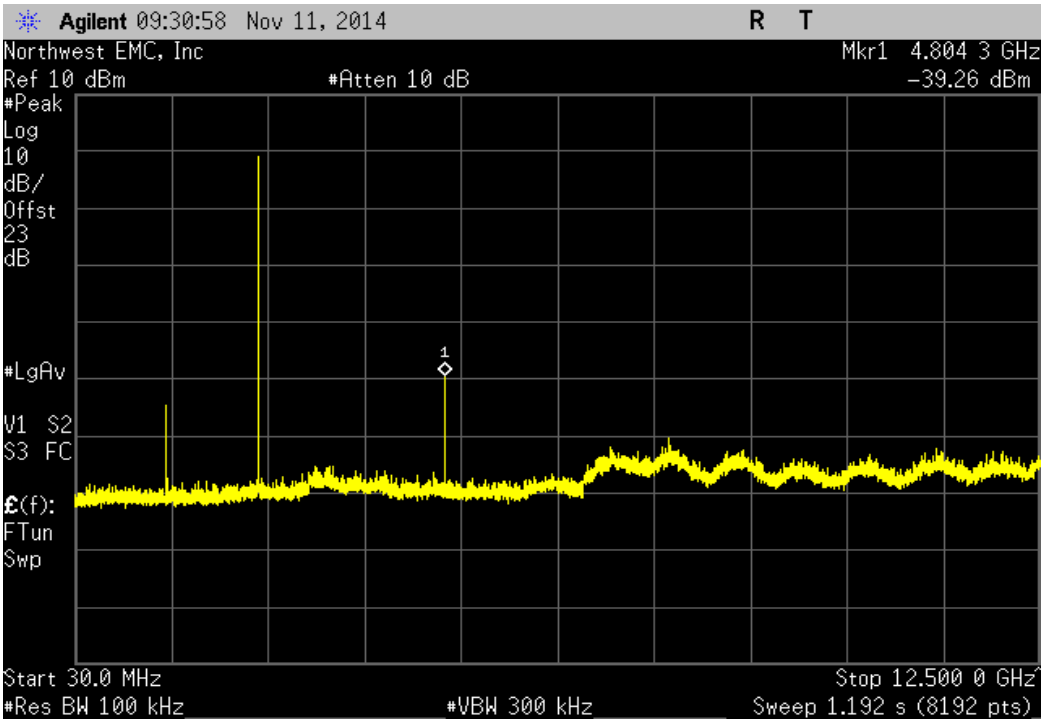
Configuration #	**1**	*Signature*

		Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result
Bluetooth Low Energy					
	Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-38.24	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-45.81	-20	Pass
	Mid Channel, 2440 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	-36.98	-20	Pass
	Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	-44.76	-20	Pass
	High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-36.36	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-44.18	-20	Pass

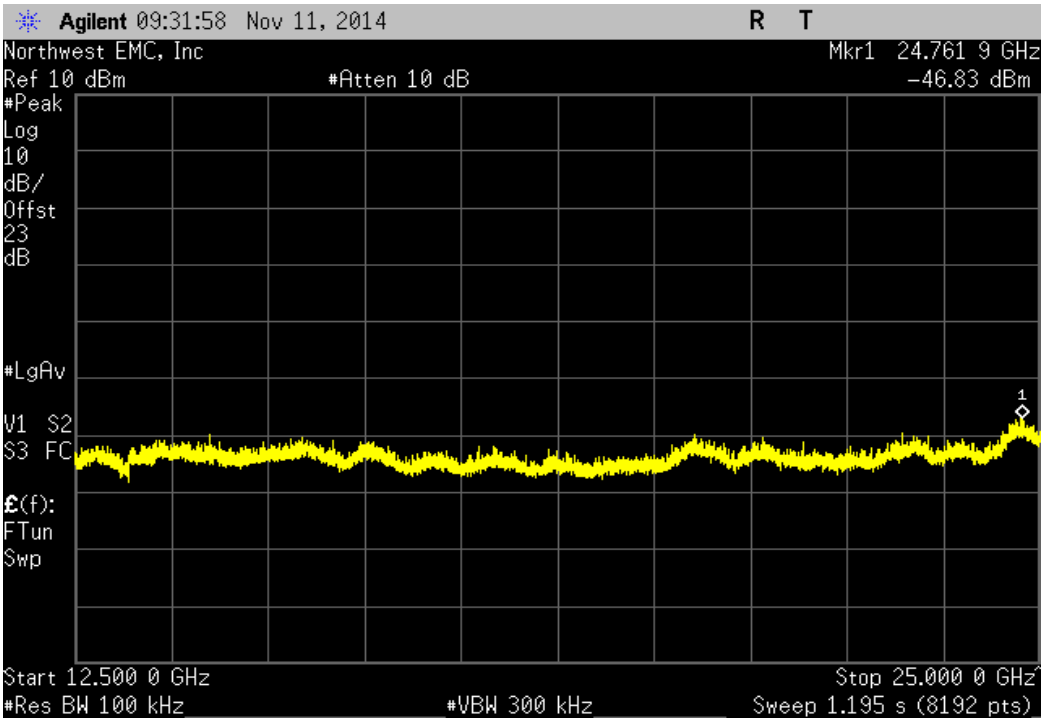
Bluetooth Low Energy, Low Channel, 2402 MHz						
	Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



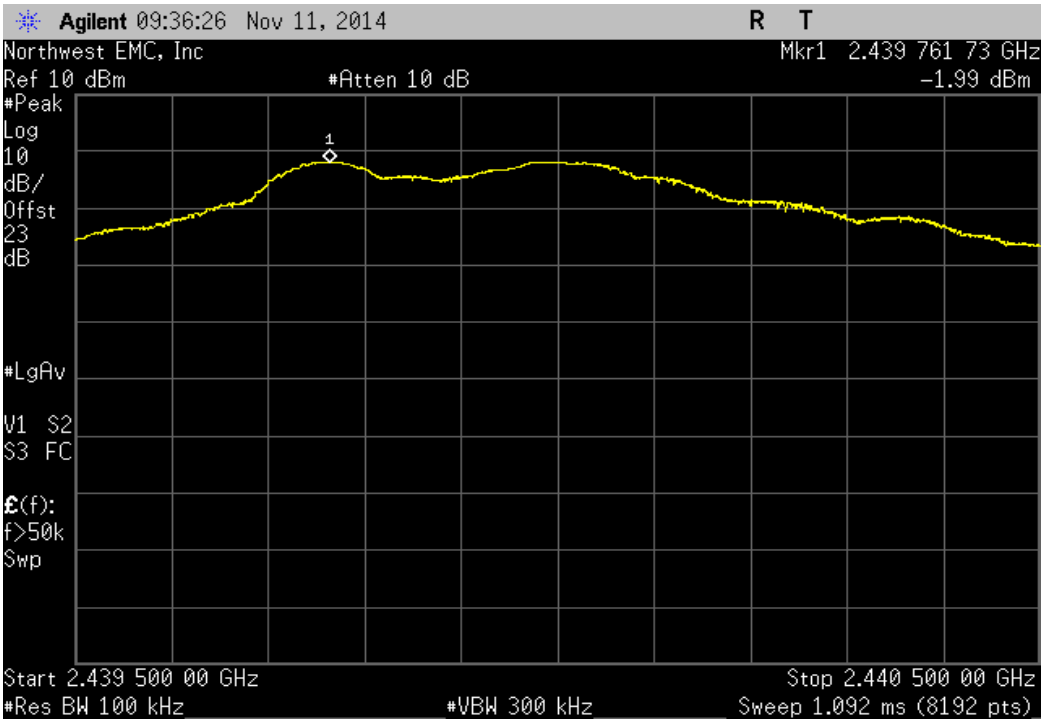
Bluetooth Low Energy, Low Channel, 2402 MHz					
Frequency Range			Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-38.24	-20	Pass



Bluetooth Low Energy, Low Channel, 2402 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-45.81	-20	Pass

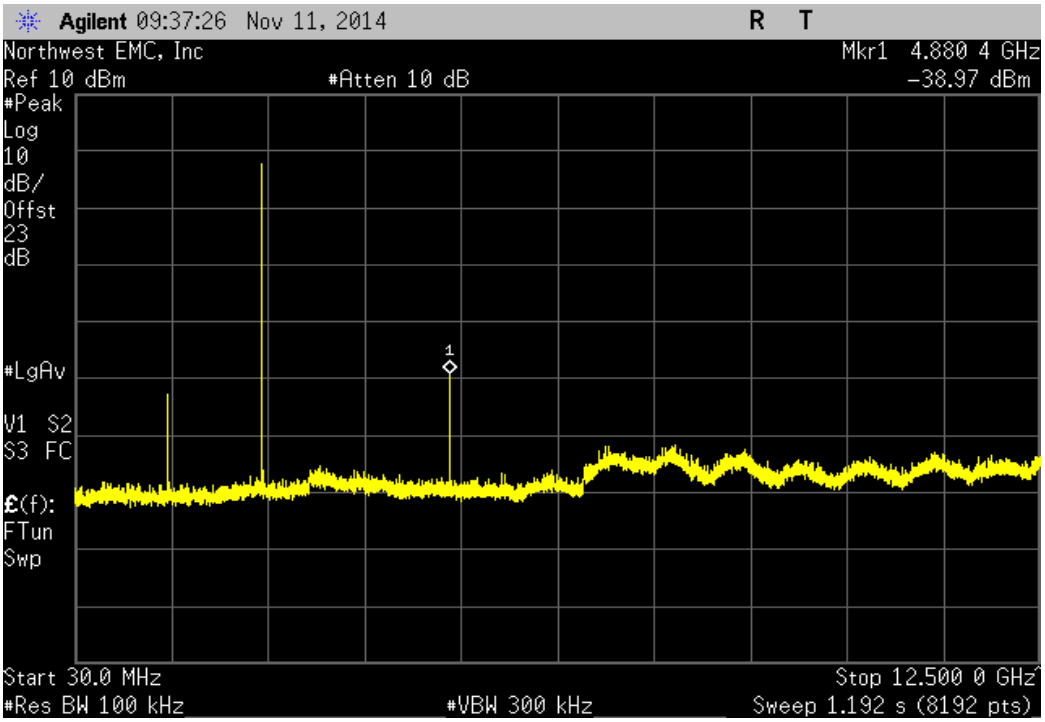


Bluetooth Low Energy, Mid Channel, 2440 MHz					
	Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		N/A	N/A	N/A

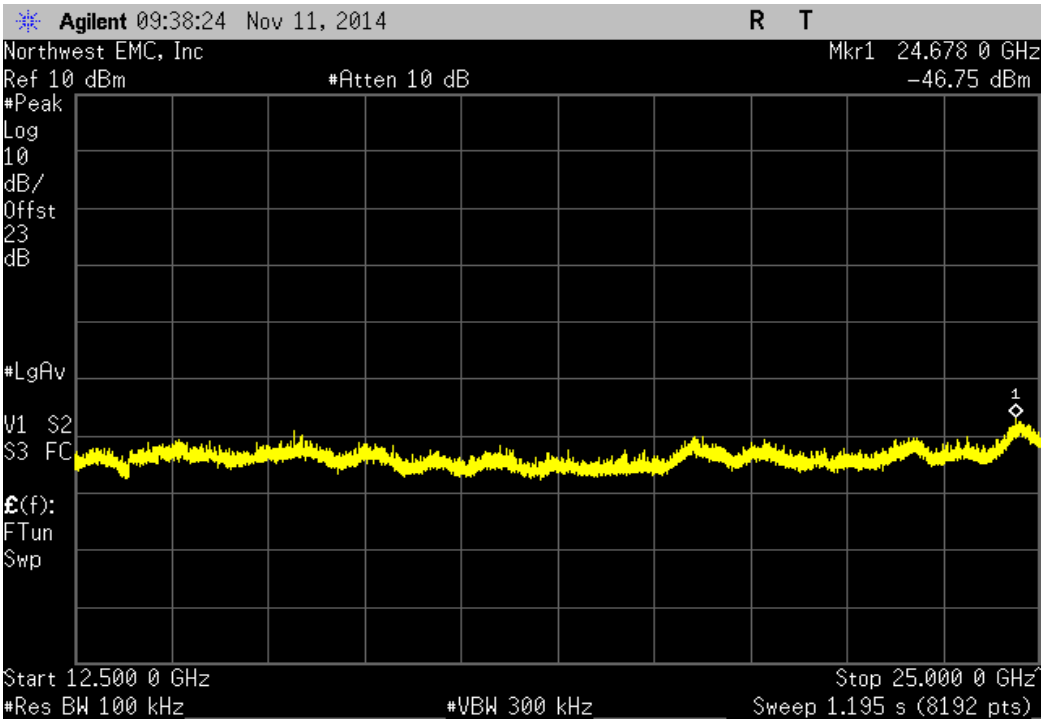


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Mid Channel, 2440 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-36.98	-20	Pass

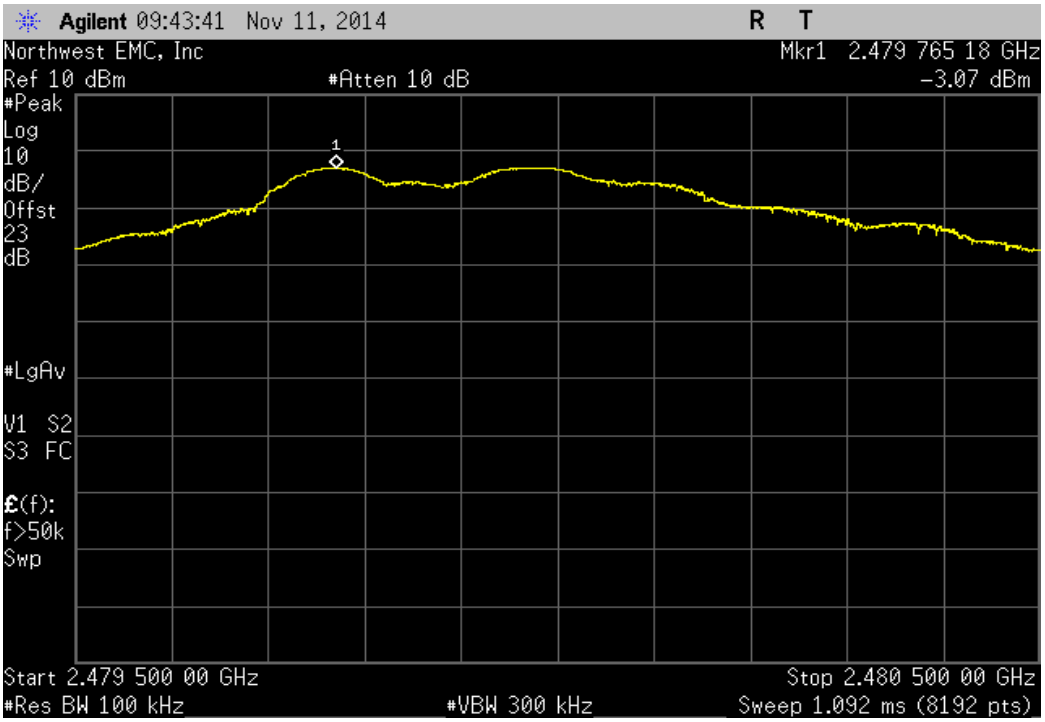


Bluetooth Low Energy, Mid Channel, 2440 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-44.76	-20	Pass

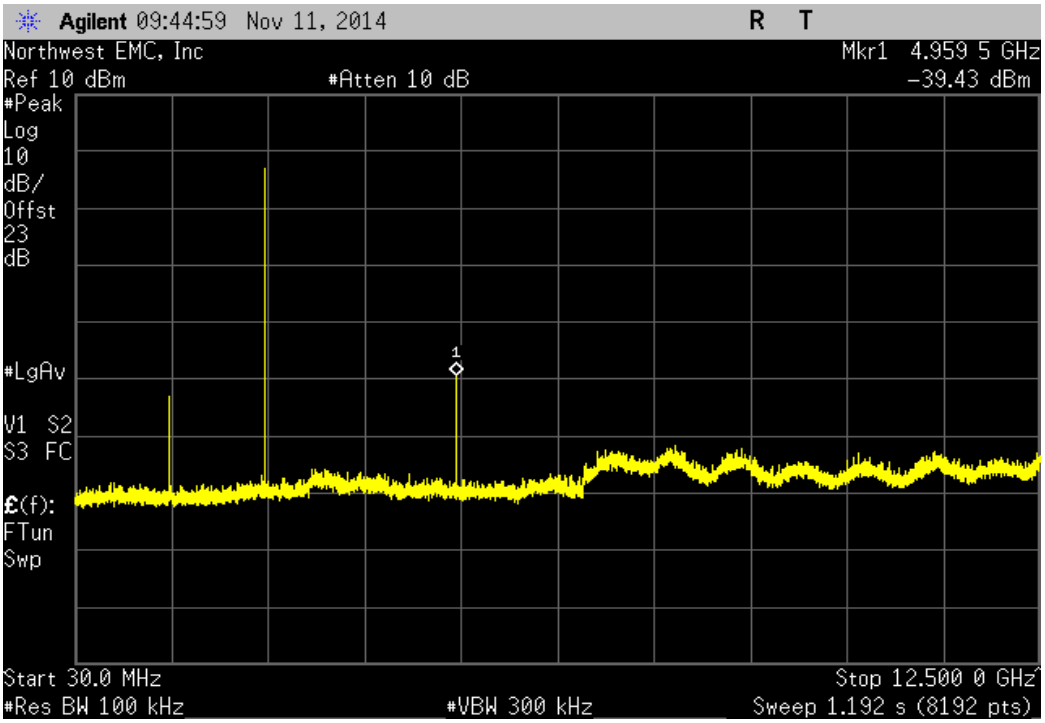


SPURIOUS CONDUCTED EMISSIONS

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

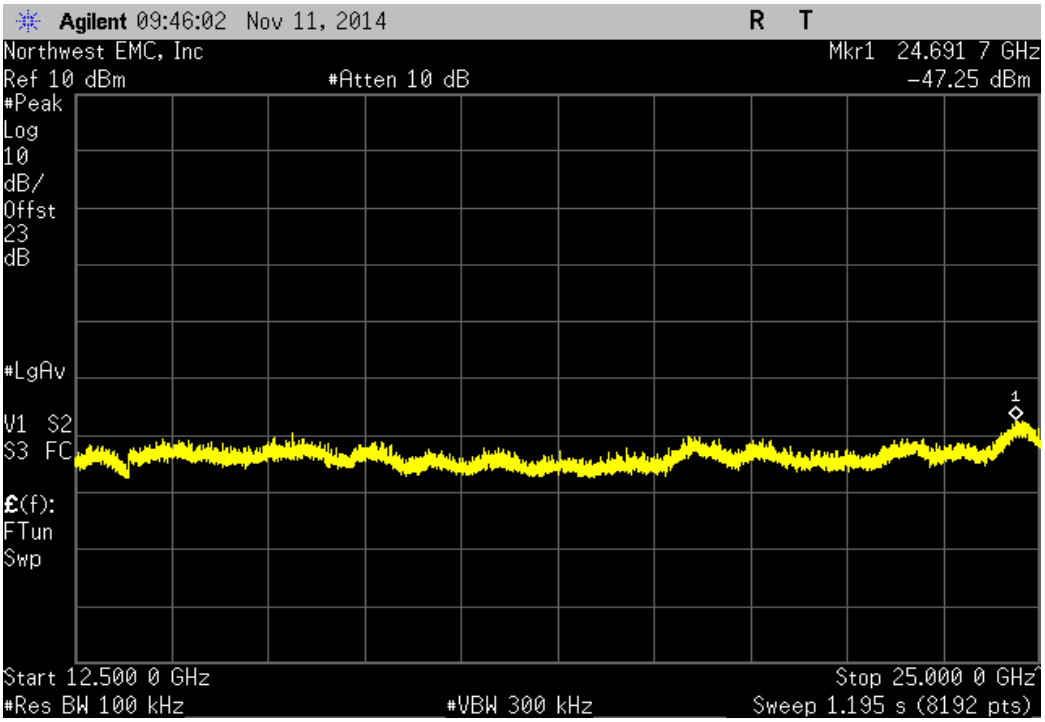


Bluetooth Low Energy, High Channel, 2480 MHz					
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz		-36.36	-20	Pass	



SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, High Channel, 2480 MHz				
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-44.18	-20	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 (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	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

EUT:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/11/14
Customer:	Masimo Corporation			**Temperature:**	22.1°C
Attendees:	Michael Clark			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1014
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

DEVIATIONS FROM TEST STANDARD

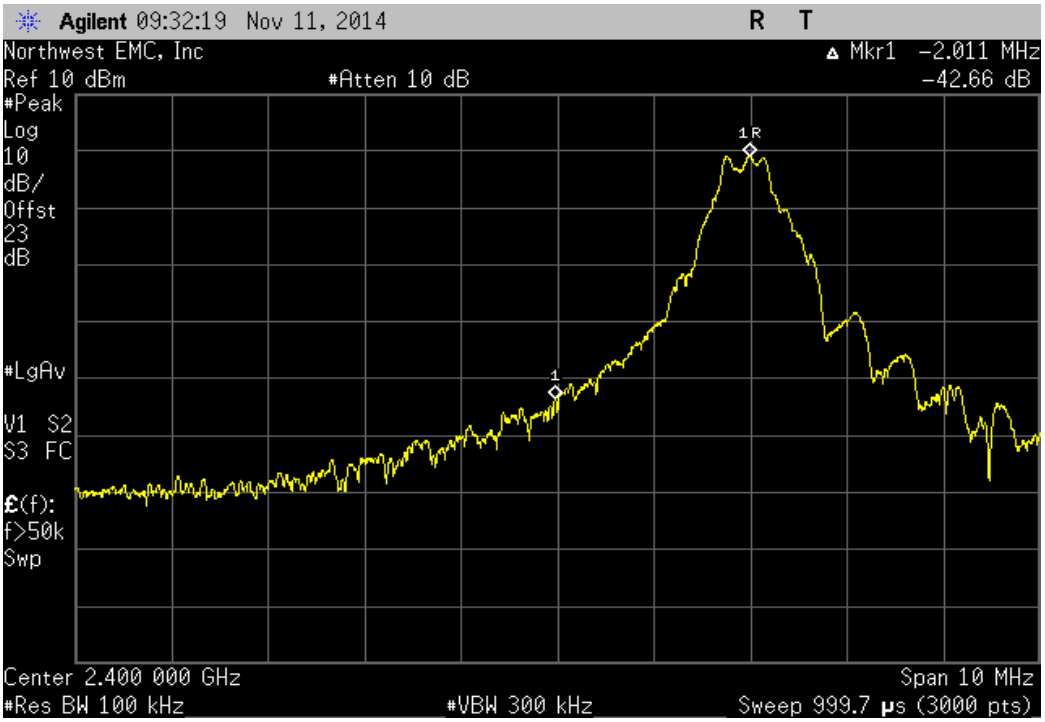
None

Configuration #	**1**	*Signature*

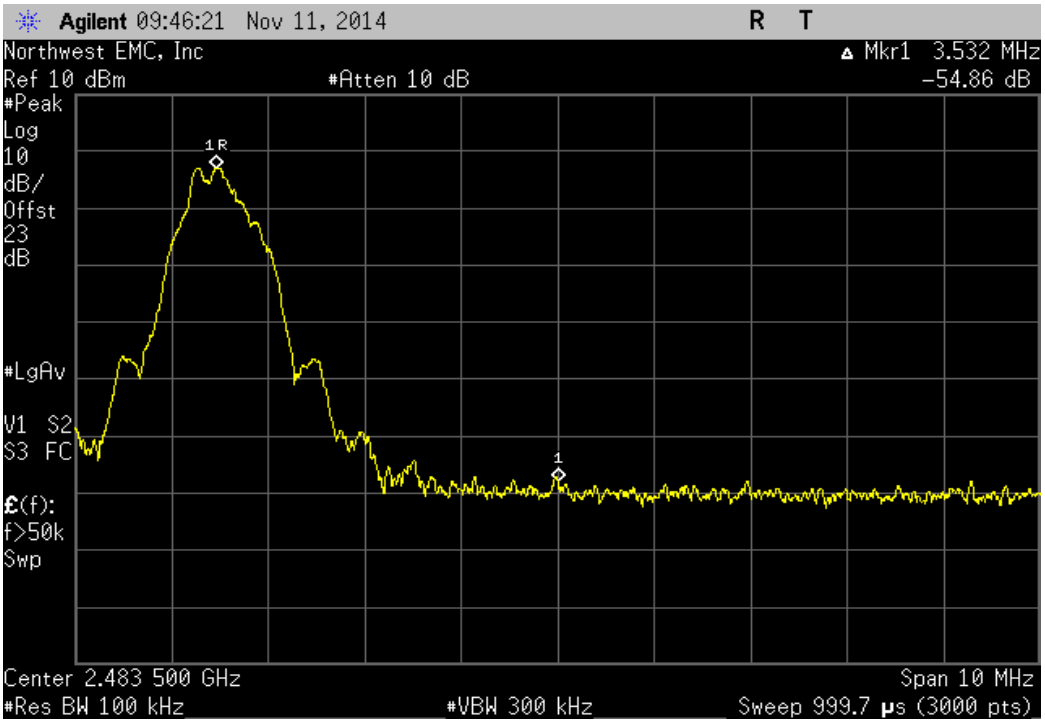
	Value (dBc)	Limit ≤ (dBc)	Result
Bluetooth Low Energy			
Low Channel, 2402 MHz	-42.66	-20	Pass
High Channel, 2480 MHz	-54.86	-20	Pass

BAND EDGE COMPLIANCE

Bluetooth Low Energy, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-42.66	-20	Pass



Bluetooth Low Energy, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-54.86	-20	Pass



OCCUPIED BANDWIDTH

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	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. A 300 second sweep time was used to make sure we measured the entire signal, since unit has 20% duty cycle.

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:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/21/14
Customer:	Masimo Corporation			**Temperature:**	22.7°C
Attendees:	Michael Clark			**Humidity:**	43%
Project:	None			**Barometric Pres.:**	1015
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

DEVIATIONS FROM TEST STANDARD

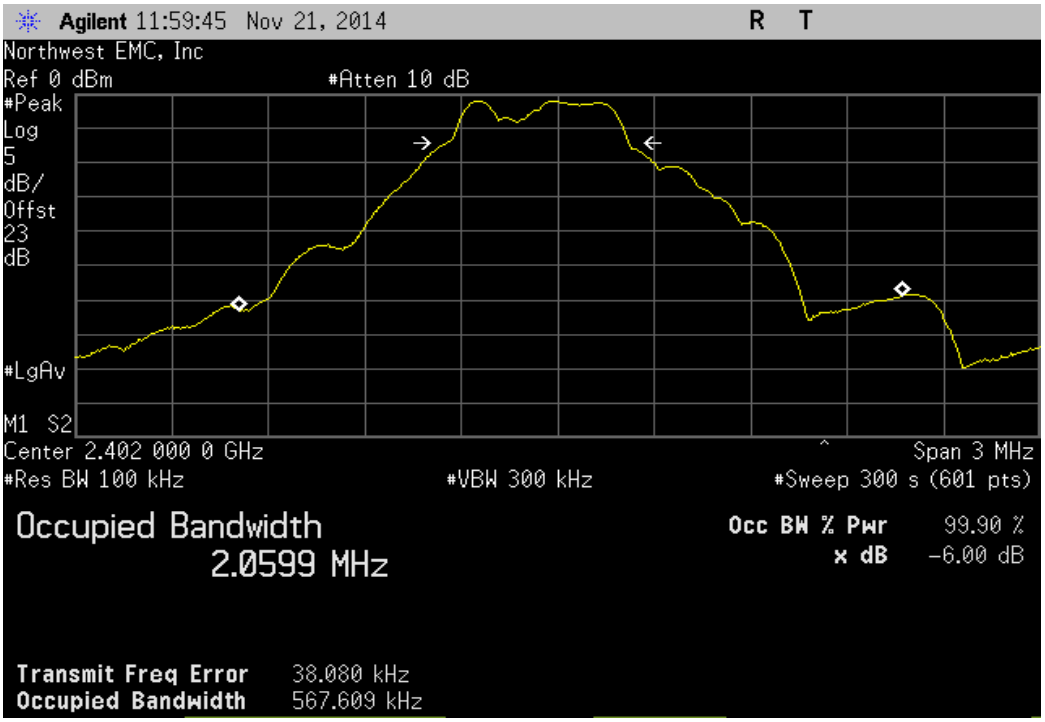
None

Configuration #	**1**	*Signature*

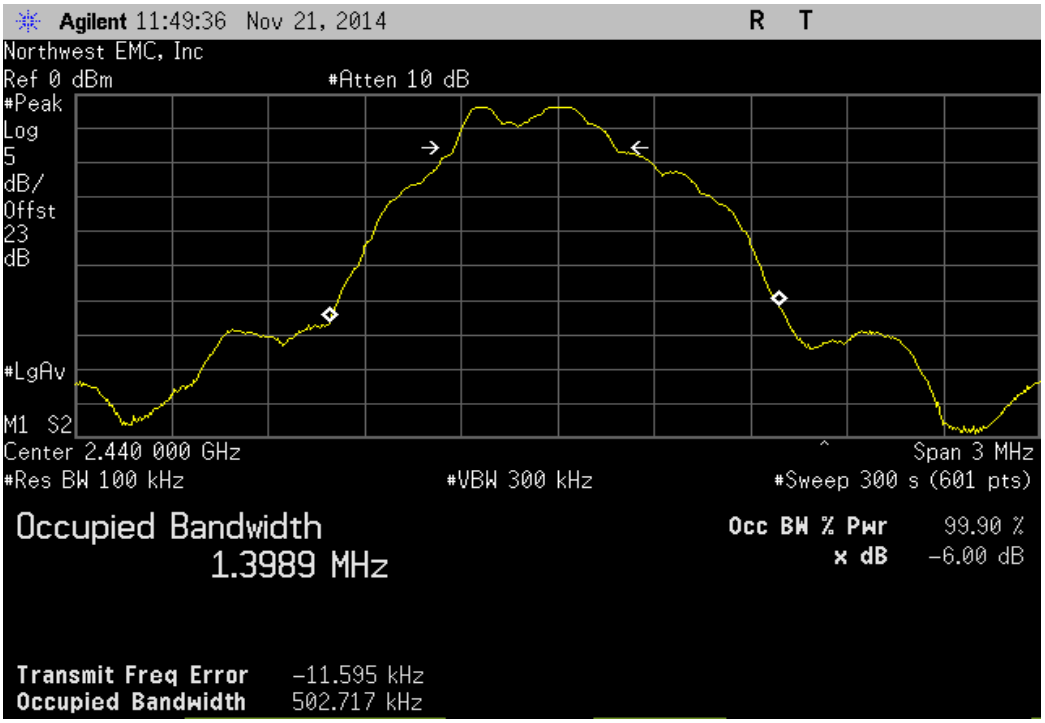
	Value	Limit (≥)	Result
Bluetooth Low Energy			
Low Channel, 2402 MHz	567.609 kHz	500 kHz	Pass
Mid Channel, 2440 MHz	502.717 kHz	500 kHz	Pass
High Channel, 2480 MHz	501.639 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

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

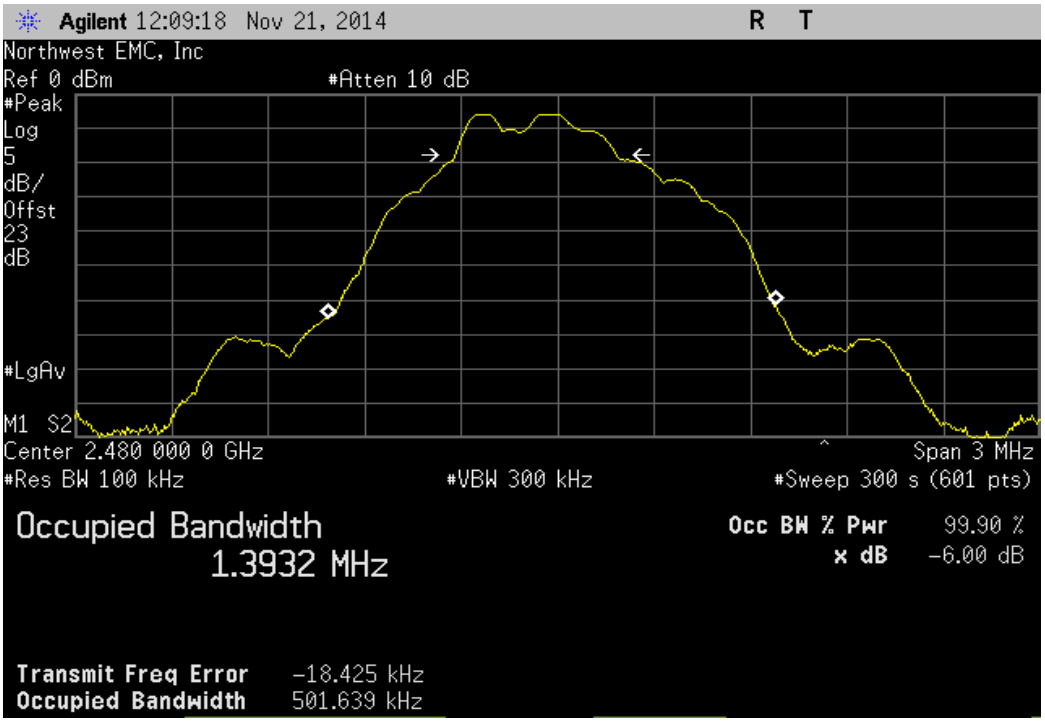


Bluetooth Low Energy, Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				502.717 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

Bluetooth Low Energy, High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				501.639 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 (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	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 KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

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

OUTPUT POWER

EUT:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/21/14
Customer:	Masimo Corporation			**Temperature:**	22.7°C
Attendees:	Michael Clark			**Humidity:**	43%
Project:	None			**Barometric Pres.:**	1015
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

DEVIATIONS FROM TEST STANDARD

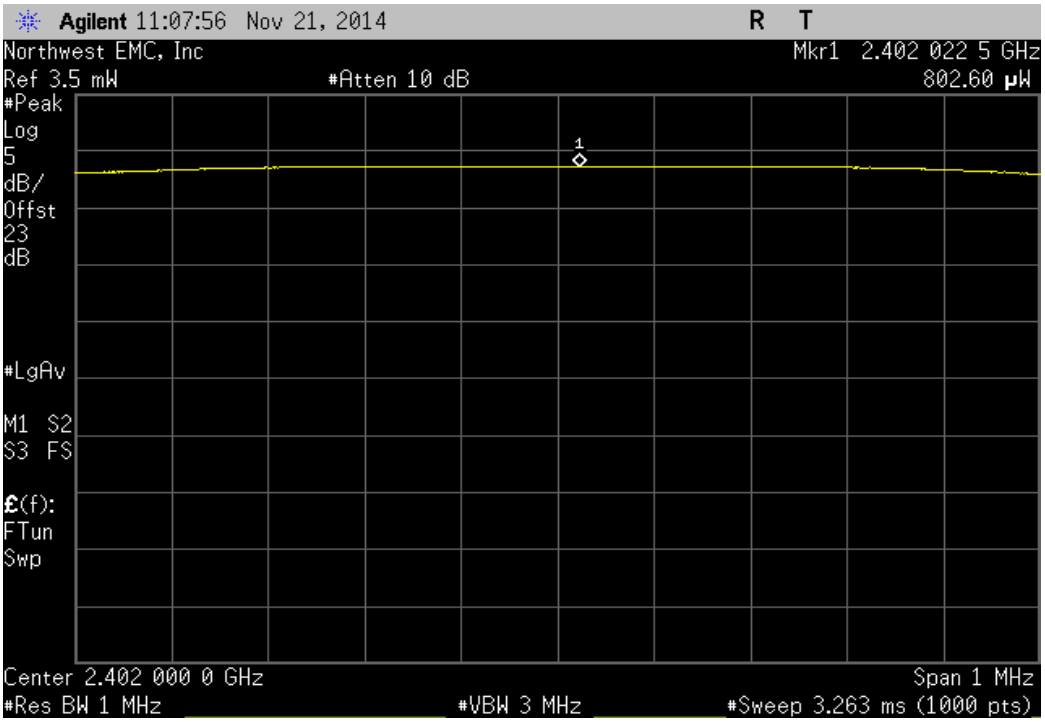
None

Configuration #	**1**	*Signature*

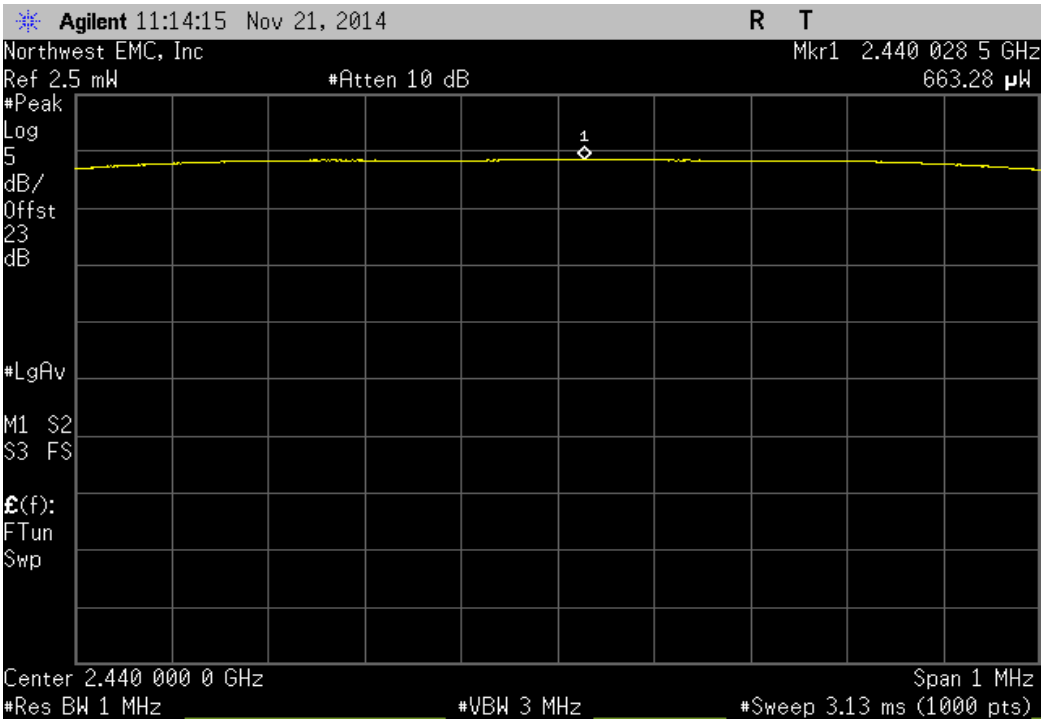
	Value	Limit (<)	Result
Bluetooth Low Energy			
Low Channel, 2402 MHz	802.602 uW	1 W	Pass
Mid Channel, 2440 MHz	663.285 uW	1 W	Pass
High Channel, 2480 MHz	519.876 uW	1 W	Pass

OUTPUT POWER

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

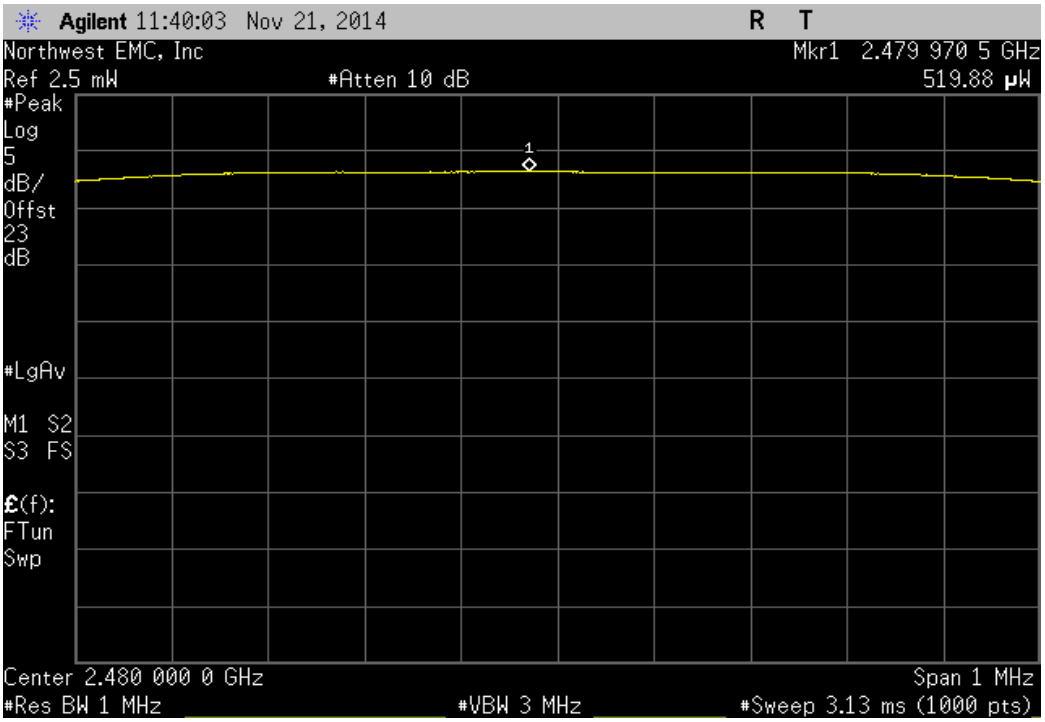


Bluetooth Low Energy, Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				663.285 uW	1 W	Pass



OUTPUT POWER

Bluetooth Low Energy, High Channel, 2480 MHz						
				Value	Limit (<)	Result
				519.876 uW	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 (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	12

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:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/11/14
Customer:	Masimo Corporation			**Temperature:**	22.1°C
Attendees:	Michael Clark			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1014
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

DEVIATIONS FROM TEST STANDARD

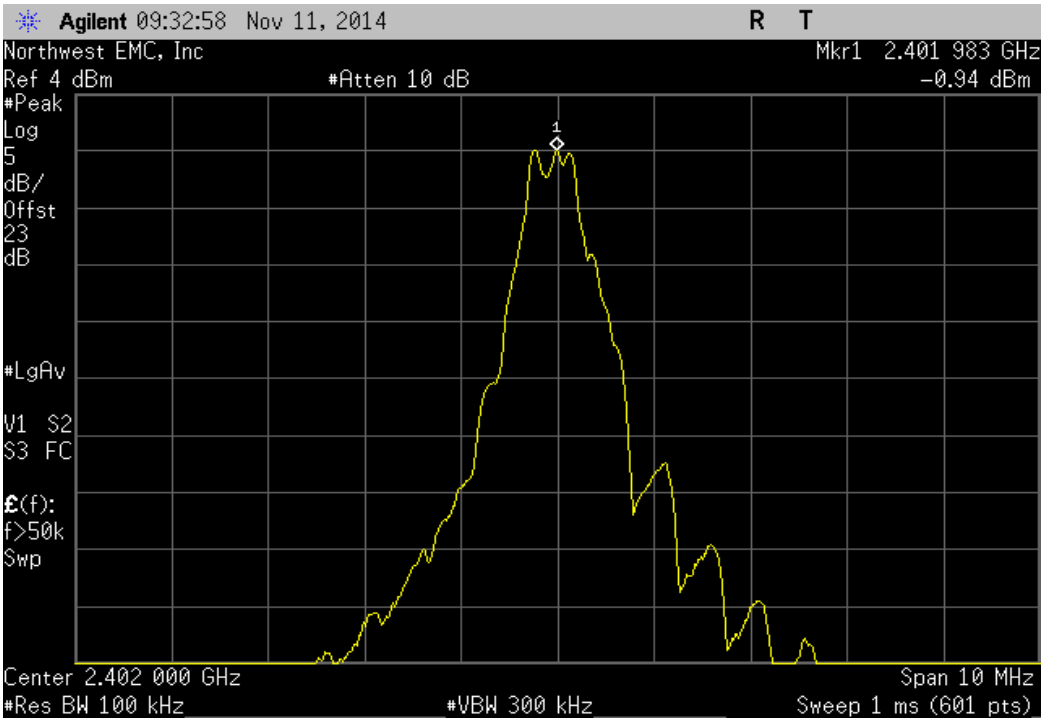
None

Configuration #	1	Signature

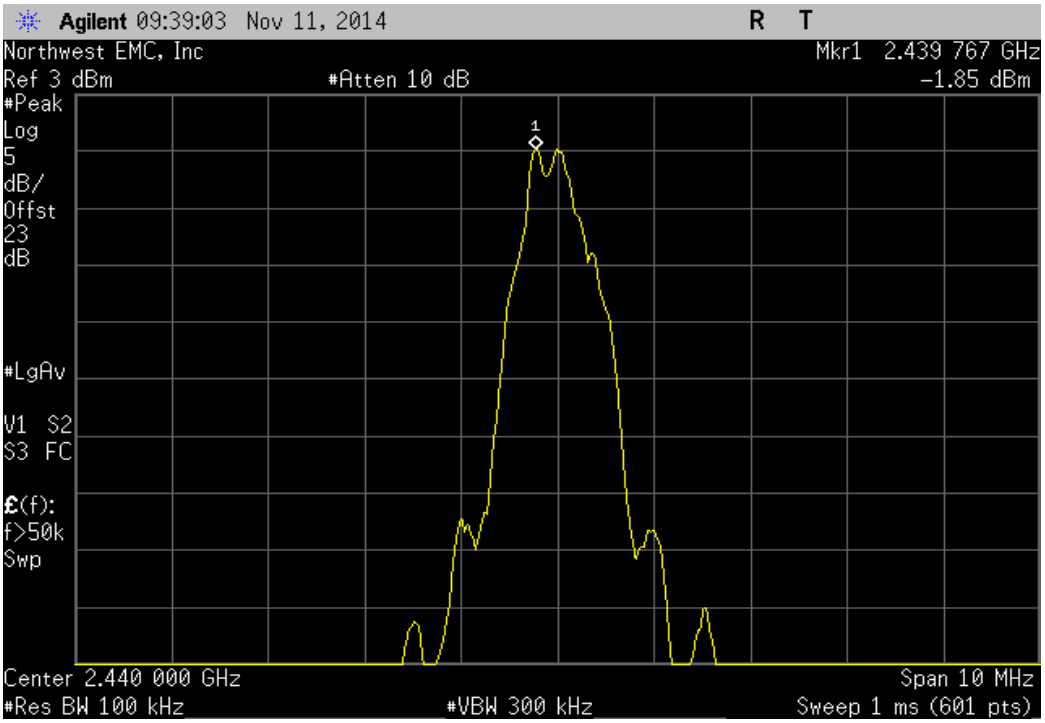
	Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
Bluetooth Low Energy					
Low Channel, 2402 MHz	-0.941	-15.2	-16.141	8	Pass
Mid Channel, 2440 MHz	-1.854	-15.2	-17.054	8	Pass
High Channel, 2480 MHz	-2.779	-15.2	-17.979	8	Pass

POWER SPECTRAL DENSITY

Bluetooth Low Energy, Low Channel, 2402 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-0.941	-15.2	-16.141	8	Pass

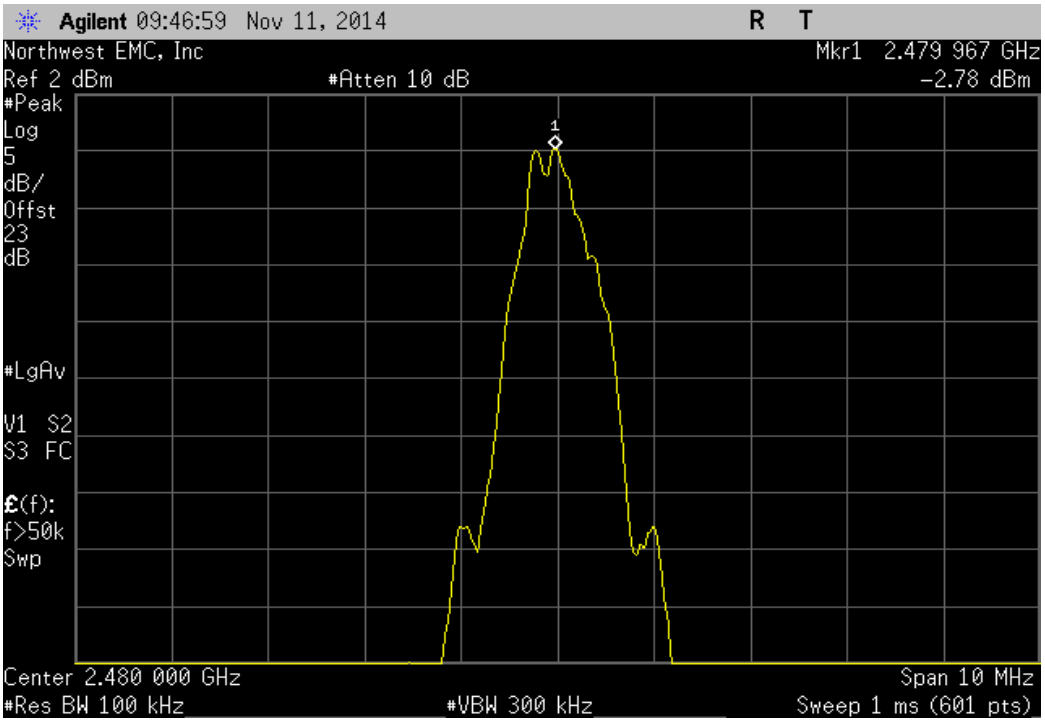


Bluetooth Low Energy, Mid Channel, 2440 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-1.854	-15.2	-17.054	8	Pass



POWER SPECTRAL DENSITY

Bluetooth Low Energy, High Channel, 2480 MHz						
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz	Value dBm/3kHz	Limit dBm/3kHz	Results
		-2.779	-15.2	-17.979	8	Pass



DUTY CYCLE

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	2/3/2014	12
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36
OC13 Cables	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40GHz DC Block	Miteq	DCB4000	AMD	4/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFA	8/28/2014	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.

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:	MightySat			**Work Order:**	MASI0245
Serial Number:	1426682922			**Date:**	11/11/14
Customer:	Masimo Corporation			**Temperature:**	22.1°C
Attendees:	Michael Clark			**Humidity:**	46%
Project:	None			**Barometric Pres.:**	1014
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC13

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

COMMENTS

DC Block/20dB Attenuator + coax cable + patch cable = 22.95dB total offset
Using Max Power Setting

DEVIATIONS FROM TEST STANDARD

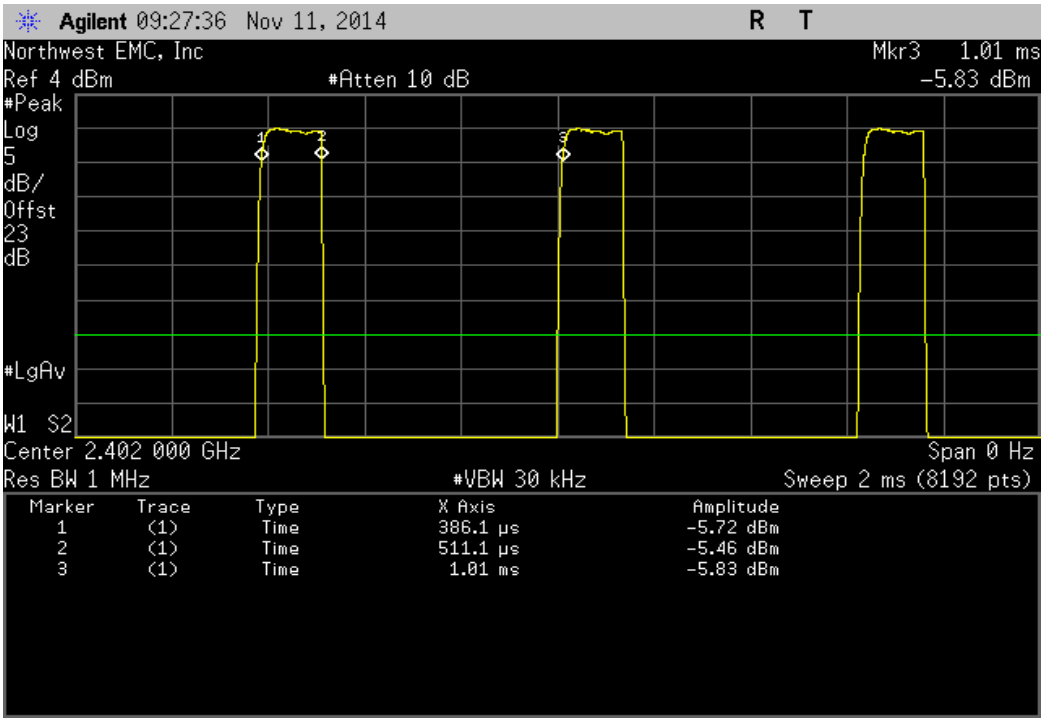
None

Configuration #	**1**	*Signature*

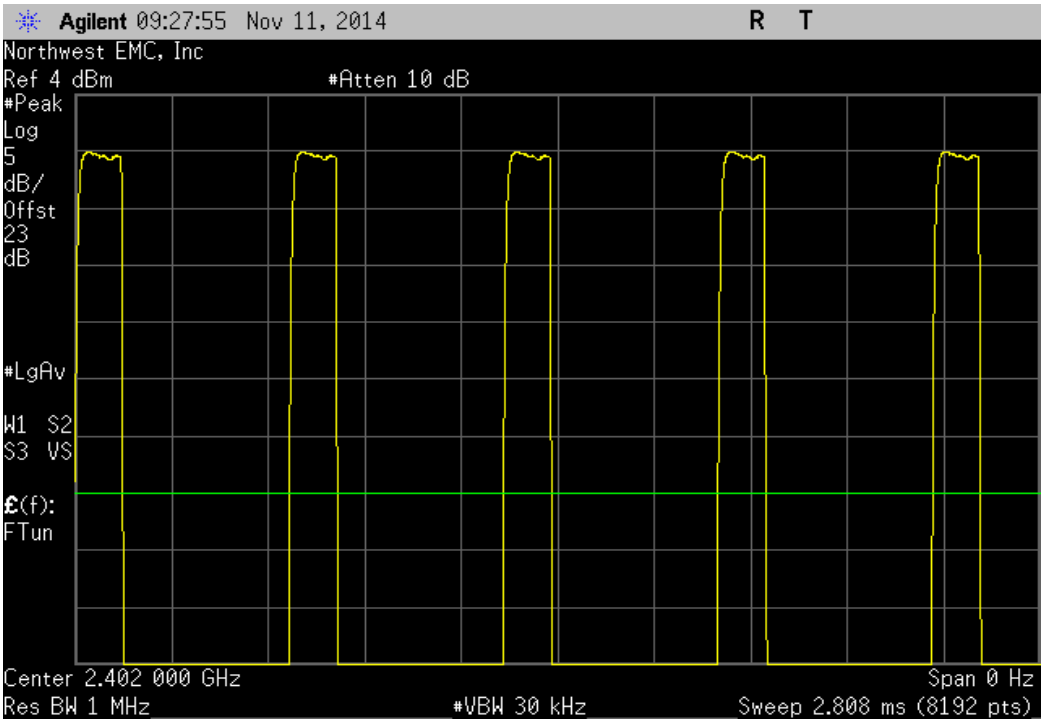
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Bluetooth Low Energy						
Low Channel, 2402 MHz	125.033 uS	624.1 uS	1	20	N/A	N/A
Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2440 MHz	125.477 uS	624.1 uS	1	20.1	N/A	N/A
Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2480 MHz	124.733 uS	622.8 uS	1	20	N/A	N/A
High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

Bluetooth Low Energy, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	125.033 uS	624.1 uS	1	20	N/A	N/A

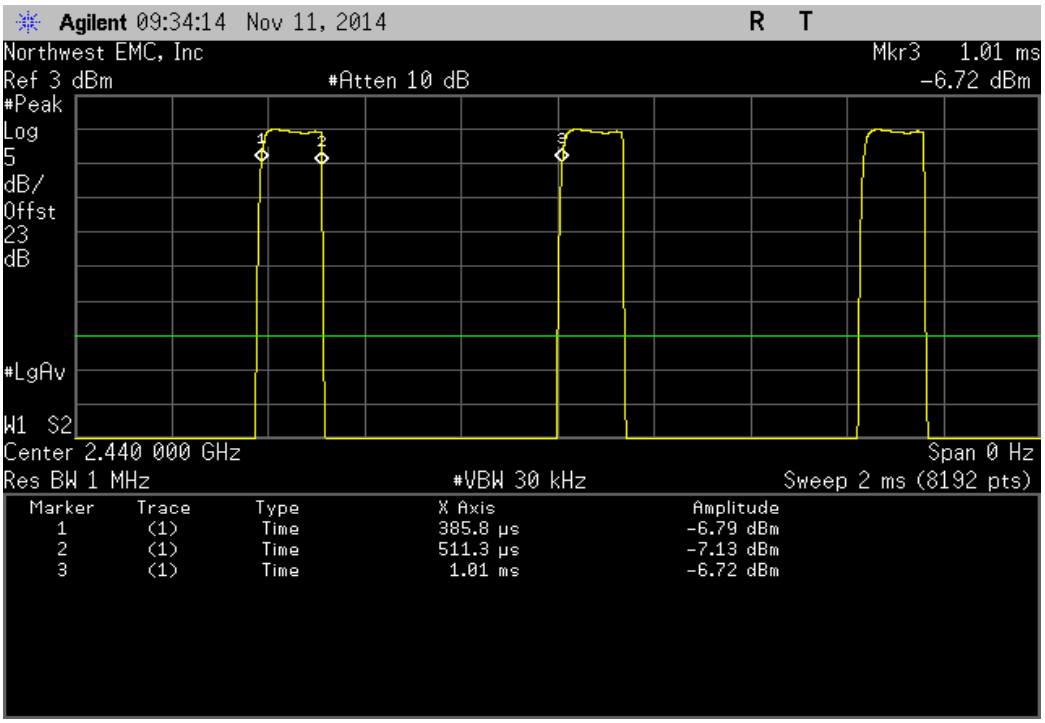


Bluetooth Low Energy, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

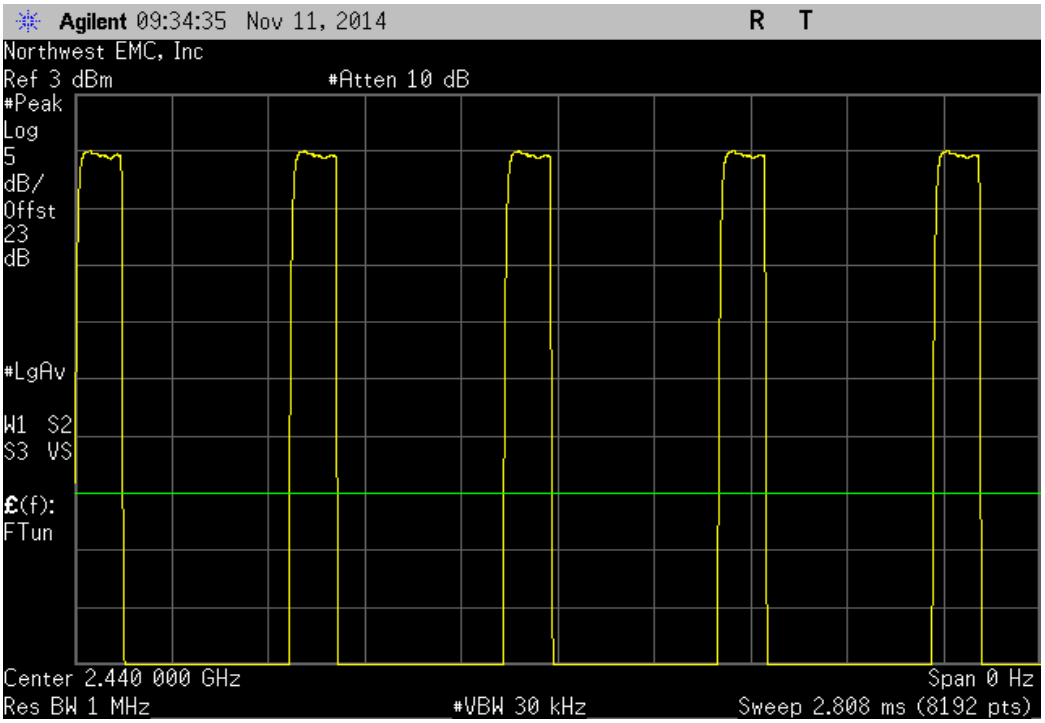


DUTY CYCLE

Bluetooth Low Energy, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	125.477 uS	624.1 uS	1	20.1	N/A	N/A

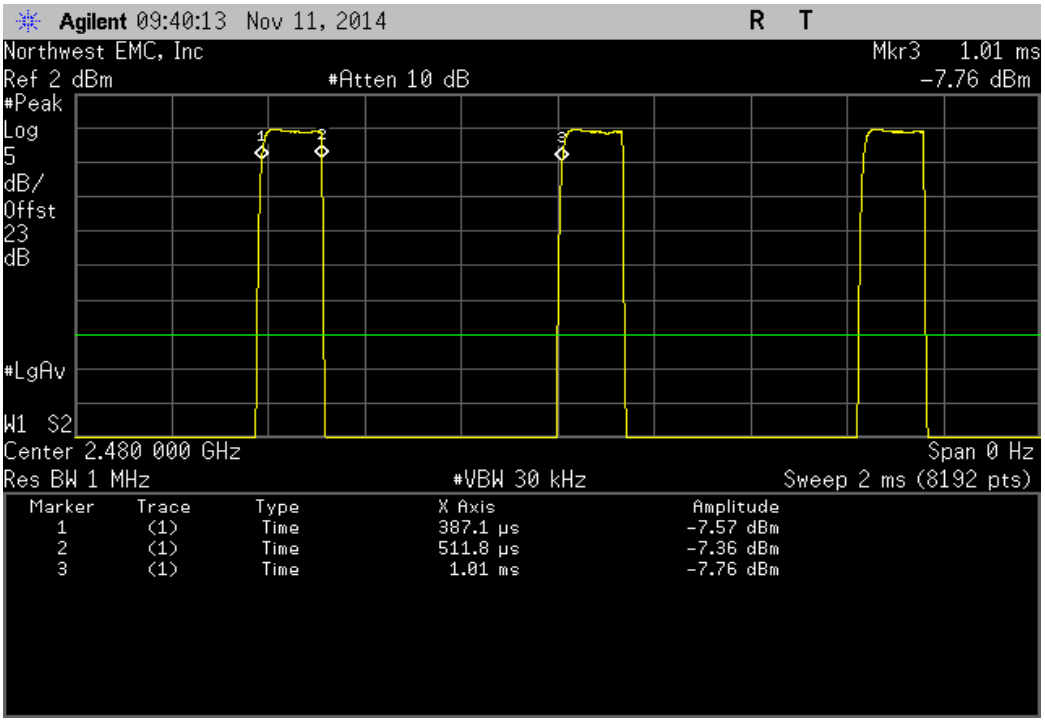


Bluetooth Low Energy, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



DUTY CYCLE

Bluetooth Low Energy, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	124.733 uS	622.8 uS	1	20	N/A	N/A



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