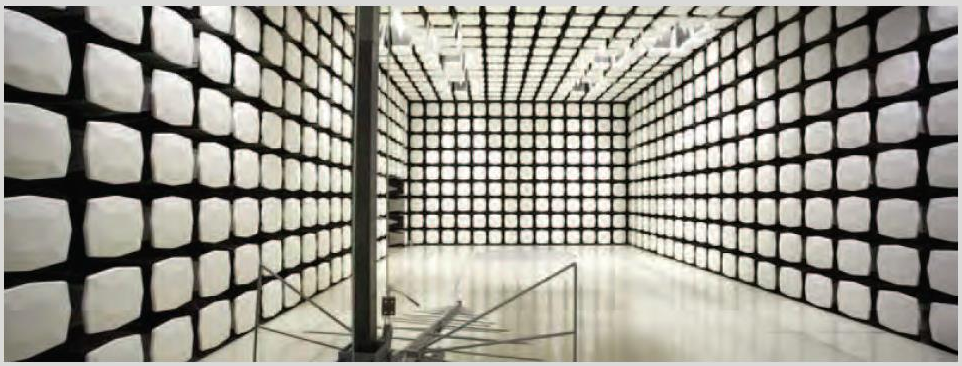
Masimo Corporation

MWMII

FCC 15.247:2019

Bluetooth LE Radio

Report # MASI0553.3



NVLAP LAB CODE: 200676-0

CERTIFICATE OF TEST

Last Date of Test: July 9, 2019
Masimo Corporation
Model: MWMII

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2019	ANSI C63.10:2013
FCC 15.247:2019	ANSI C63.10:2013, KDB 558074

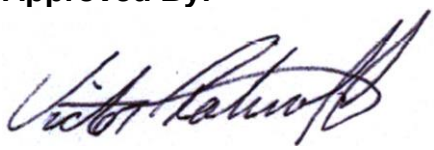
Results

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	
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	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. 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. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

MSIT / 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

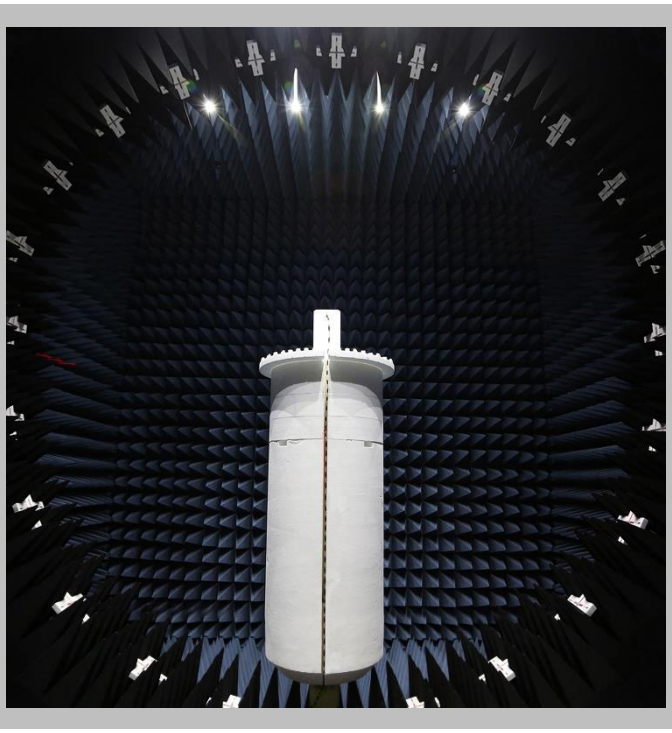
MIC – Recognized by MIC as a CAB for the acceptance of test data.

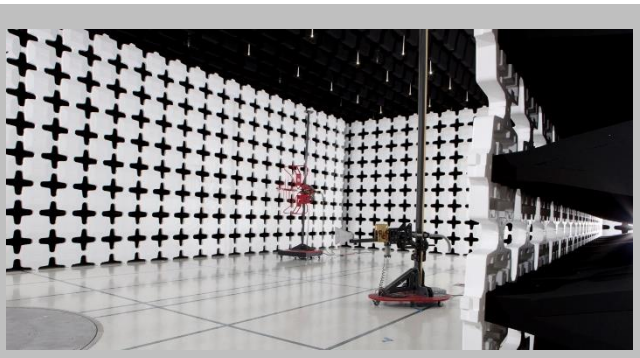
SCOPE

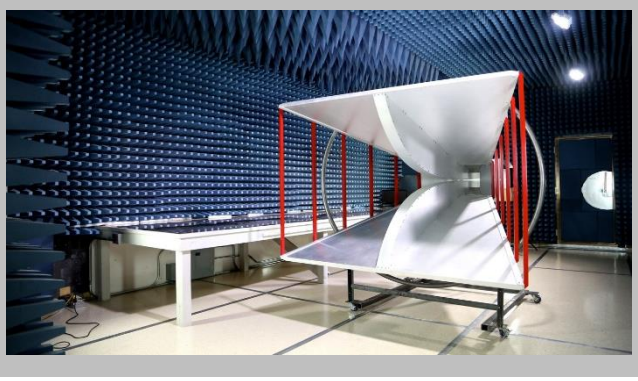
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 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 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
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.

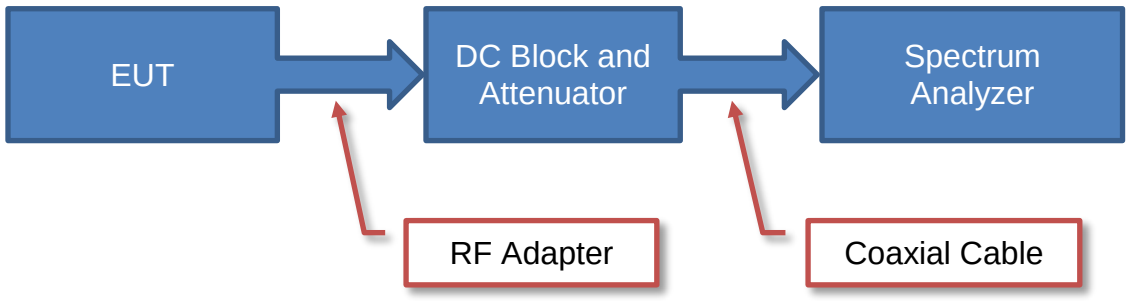
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

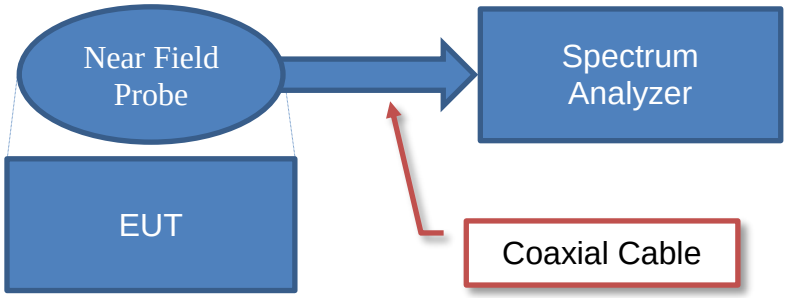
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

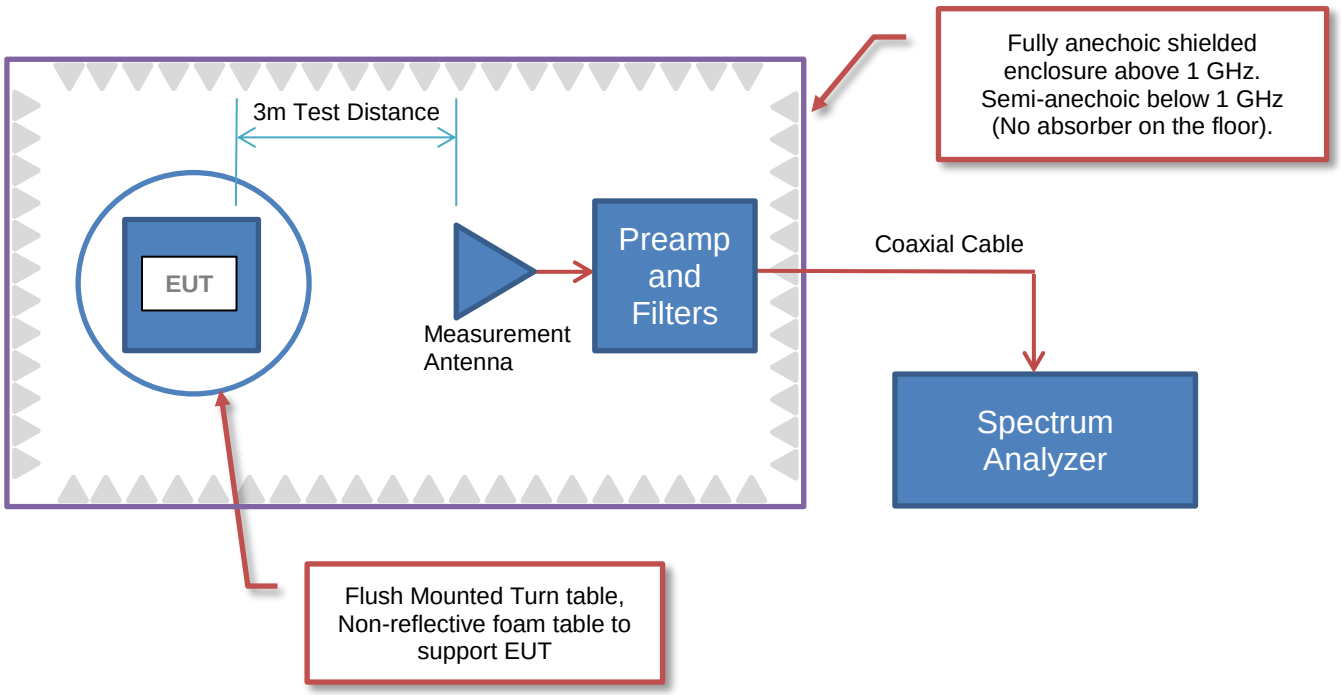
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Masimo Corporation
Address:	52 Discovery
City, State, Zip:	Irvine, CA 92618
Test Requested By:	Anami Joshi
Model:	MWMII
First Date of Test:	July 3, 2019
Last Date of Test:	July 9, 2019
Receipt Date of Samples:	July 1, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The MWMII module (P/N 26269) uses an AzureWave AW-CM256SM radio chipset, which incorporates the Broadcom BCM43455 single chip.

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

CONFIGURATIONS

Configuration MASI0553- 2

Software/Firmware Running during test	
Description	**Version**
Firmware	7.45.100.7-mfgtest

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Masimo Wireless Module II	Masimo	MWMII (P/N: 26269)	ENG-1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Host Laptop	Hewlett-Packard	ProBook	CND638CWSR
Laptop Power Supply	Hewlett-Packard	PPP009H	WBGSU0BL91FXO9
DC Power Supply	TEKPOWER	TP6005E	187890
Hawk Radio Board Debug Tool	Masimo	82403	None
Carrier board	Masimo	26634 Rev. B	1847700024

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
u.Fl Cable	Yes	0.1m	No	Masimo Wireless Module II	SMA Cable
AC Cable	No	1.8m	No	AC Mains	DC Power Supply
USB Cable	Yes	3.0m	No	Host Laptop	USB Hub
AC Cable	No	1.2m	No	AC Mains	Laptop Power Supply
DC Cable	Yes	1.4m	Yes	Laptop Power Supply	Host Laptop
USB Cable	Yes	2.6m	No	Host Laptop	Hawk Radio Board Debug Tool
DC Cable	Yes	1.6m	No	iMx-53 Programmer	AC Adapter (AC Mains)

CONFIGURATIONS

Configuration MASI0553- 5

Software/Firmware Running during test	
Description	**Version**
Firmware	7.45.100.7-mfgtest

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Masimo Wireless Module II	Masimo	MWMII (P/N: 26269)	ENG-1
Antenna (2.4GHz-5.35GHz)	Ethertronics	1000672	N/A

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Hawk Radio Board Debug Tool	Masimo	82403	None
Battery	Masimo	23794	21826002827
Carrier board	Masimo	26634 Rev. B	1847700024

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
RF Cable	Yes	0.1m	No	Masimo Wireless Module II	Antenna

Configuration MASI0553- 7

Software/Firmware Running during test	
Description	**Version**
Firmware	7.45.100.7-mfgtest

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Masimo Wireless Module II	Masimo	MWMII (P/N: 26269)	ENG-1
Antenna (2.4GHz-5.35GHz)	Ethertronics	1000672	N/A

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	TEKPOWER	TP6005E	187890
Hawk Radio Board Debug Tool	Masimo	82403	None
Carrier board	Masimo	26634 Rev. B	1847700024

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	Yes	1.0m	No	DC Power Supply	Hawk Radio Board Debug Tool
RF Cable	Yes	0.1m	No	Masimo Wireless Module II	Antenna

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-07-03	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2019-07-03	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-07-03	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-07-03	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2019-07-03	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-07-03	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2019-07-03	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2019-07-08	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2019-07-09	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS

The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Type	Channel	Position	Frequency (MHz)	Power Setting
BLE	DTS	0	Low Channel	2402	Max
		20	Mid Channel	2442	Max
		39	High Channel	2480	Max

POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

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. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. 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
LISN	Solar Electronics	9252-50-24-BNC	LIA	2019-01-08	2020-01-08
LISN	Solar Electronics	9252-50-24-BNC	LIB	2019-01-08	2020-01-08
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2018-10-05	2019-10-05
Power Supply	Pacific Power	AFX 12KVA	SMT	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2019-07-02	2020-07-02

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MASI0553-7

MODES INVESTIGATED

Transmitting Bluetooth LE Mid Ch 20 (2442 MHz)

POWERLINE CONDUCTED EMISSIONS

EUT:	MWMII	Work Order:	MASI0553
Serial Number:	ENG-1	Date:	2019-07-08
Customer:	Masimo Corporation	Temperature:	21.3°C
Attendees:	Anami Joshi, Nghi Nguyen	Relative Humidity:	50%
Customer Project:	None	Bar. Pressure:	1019 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	3.6 VDC	Configuration:	MASI0553-7

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

Run #:	7	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

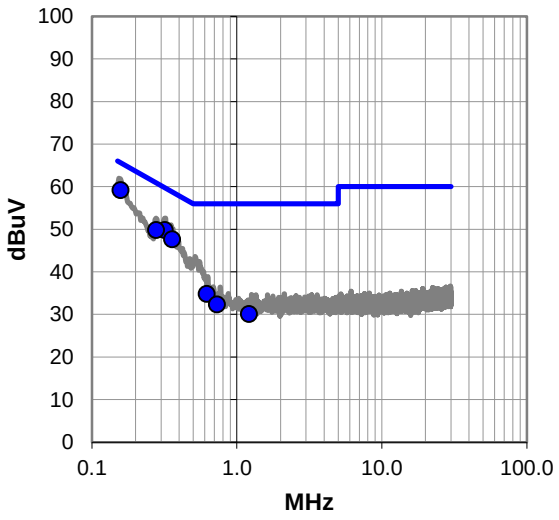
EUT OPERATING MODES

Transmitting Bluetooth LE Mid Ch 20 (2442 MHz)

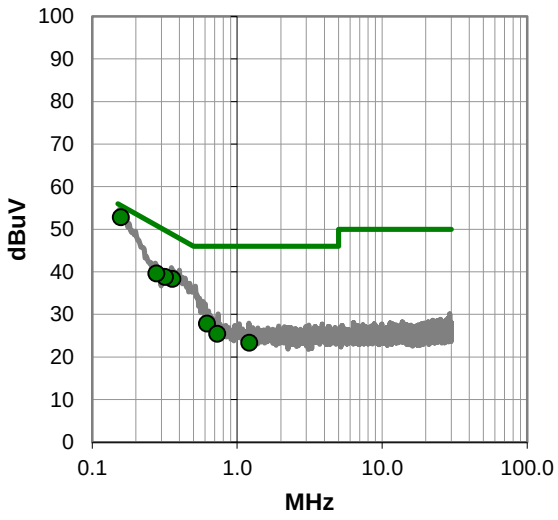
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

RESULTS - Run #7

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.158	38.9	20.3	59.2	65.6	-6.4
0.318	29.7	20.1	49.8	59.8	-10.0
0.278	29.7	20.1	49.8	60.9	-11.1
0.358	27.5	20.1	47.6	58.8	-11.2
0.621	14.8	20.0	34.8	56.0	-21.2
0.730	12.3	20.0	32.3	56.0	-23.7
1.215	10.1	20.0	30.1	56.0	-25.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.158	32.5	20.3	52.8	55.6	-2.8
0.358	18.2	20.1	38.3	48.8	-10.5
0.318	18.7	20.1	38.8	49.8	-11.0
0.278	19.5	20.1	39.6	50.9	-11.3
0.621	7.8	20.0	27.8	46.0	-18.2
0.730	5.4	20.0	25.4	46.0	-20.6
1.215	3.3	20.0	23.3	46.0	-22.7

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MWMII	Work Order:	MASI0553
Serial Number:	ENG-1	Date:	2019-07-08
Customer:	Masimo Corporation	Temperature:	21.3°C
Attendees:	Anami Joshi, Nghi Nguyen	Relative Humidity:	50%
Customer Project:	None	Bar. Pressure:	1019 mb
Tested By:	Nolan De Ramos	Job Site:	OC06
Power:	3.6 VDC	Configuration:	MASI0553-7

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

Run #:	8	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

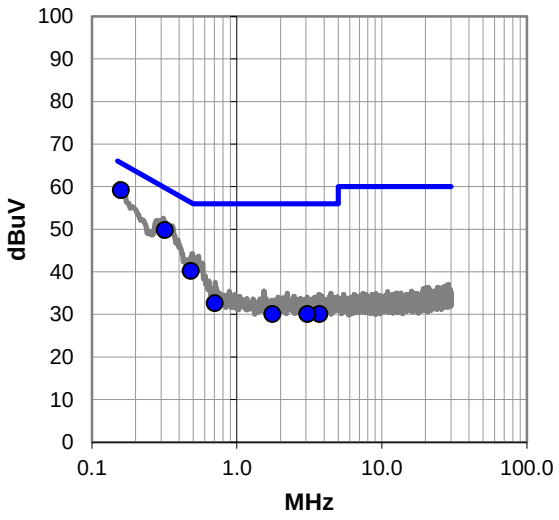
EUT OPERATING MODES

Transmitting Bluetooth LE Mid Ch 20 (2442 MHz)

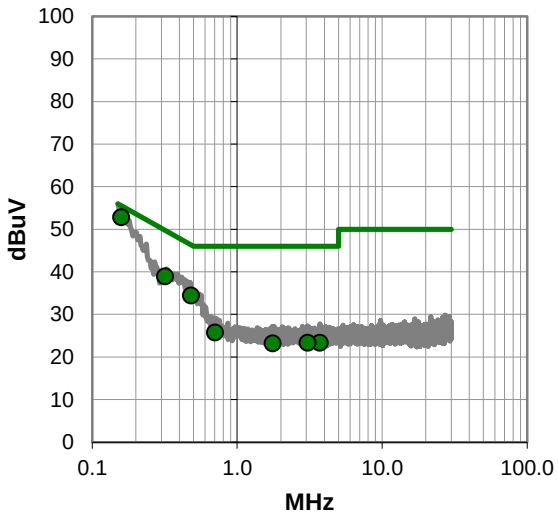
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

RESULTS - Run #8

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.158	38.9	20.3	59.2	65.5	-6.3
0.318	29.7	20.1	49.8	59.8	-10.0
0.480	20.2	20.0	40.2	56.3	-16.1
0.704	12.6	20.0	32.6	56.0	-23.4
3.723	9.8	20.3	30.1	56.0	-25.9
3.061	9.8	20.3	30.1	56.0	-25.9
1.755	10.0	20.1	30.1	56.0	-25.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.158	32.5	20.3	52.8	55.5	-2.7
0.318	18.8	20.1	38.9	49.8	-10.9
0.480	14.4	20.0	34.4	46.3	-11.9
0.704	5.7	20.0	25.7	46.0	-20.3
3.723	3.0	20.3	23.3	46.0	-22.7
3.061	3.0	20.3	23.3	46.0	-22.7
1.755	3.1	20.1	23.2	46.0	-22.8

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2019.05.10

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

MODES OF OPERATION

Transmitting BLE: Low Ch 0 (2402 MHz), Mid Ch 20 (2442 MHz) and High Ch 39 (2480 MHz)
Transmitting BLE: Low Ch 0 (2402 MHz) and High Ch 39 (2480 MHz)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MASI0553 - 5

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - High Pass	Micro-Tronics	HPM50111	HGQ	23-Jan-2019	12 mo
Attenuator	S.M. Electronics	SA6-20	REO	23-Jan-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAN	20-Dec-2018	12 mo
Cable	ESM Cable Corp.	8-18GHz cables	OCY	16-Jan-2019	12 mo
Cable	ESM Cable Corp.	1-8GHz cables	OCX	16-Jan-2019	12 mo
Cable	ESM Cable Corp.	30-1GHz cables	OCW	8-May-2019	12 mo
Cable	D-Coax	None	OC4	20-Dec-2018	12 mo
Antenna - Biconilog	EMCO	3142	AXB	5-Apr-2018	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVP	16-Jan-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVL	16-Jan-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVJ	16-Jan-2019	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIR	28-Jun-2018	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHX	NCR	0 mo
Antenna - Standard Gain	EMCO	3160-08	AHK	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAD	3-Jul-2019	12 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXV	15-May-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	30-Nov-2018	12 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc).

SPURIOUS RADIATED EMISSIONS

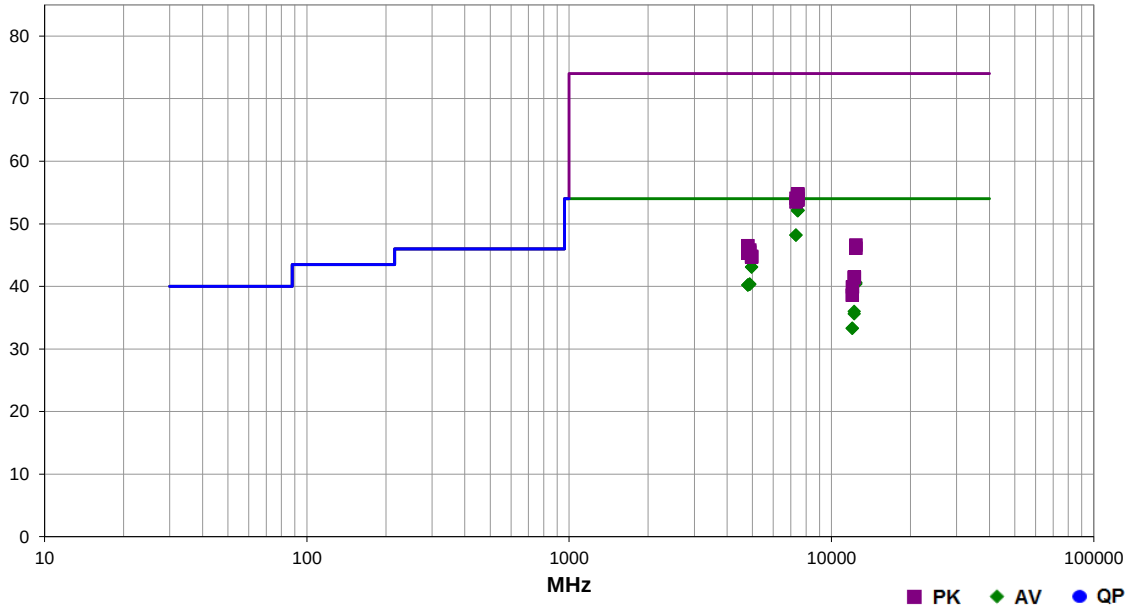
element

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	MASI0553	**Date:**	9-Jul-2019		
Project:	None	**Temperature:**	24.4 °C		
Job Site:	OC07	**Humidity:**	47.2% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1018 mbar	**Tested by:**	Luis Flores & Mark Baytan
EUT:	MWMII				
Configuration:	5				
Customer:	Masimo Corporation				
Attendees:	Mike Tran				
EUT Power:	3.6 VDC				
Operating Mode:	Transmitting BLE: Low Ch 0 (2402 MHz), Mid Ch 20 (2442 MHz) and High Ch 39 (2480 MHz)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	48	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7442.300	31.7	12.1	1.8	326.0	8.4	0.0	Horz	AV	0.0	52.2	54.0	-1.8	High Ch 39, BLE, EUT on Side
7440.033	31.7	12.1	1.3	144.0	8.4	0.0	Vert	AV	0.0	52.2	54.0	-1.8	High Ch 39, BLE, EUT on Side
7442.142	31.6	12.1	3.2	12.0	8.4	0.0	Horz	AV	0.0	52.1	54.0	-1.9	High Ch 39, BLE, EUT Vert
7441.850	31.6	12.1	1.5	112.0	8.4	0.0	Vert	AV	0.0	52.1	54.0	-1.9	High Ch 39, BLE, EUT Vert
7442.392	31.6	12.1	1.5	353.0	8.4	0.0	Horz	AV	0.0	52.1	54.0	-1.9	High Ch 39, BLE, EUT Horz
7441.717	31.6	12.1	2.3	233.0	8.4	0.0	Vert	AV	0.0	52.1	54.0	-1.9	High Ch 39, BLE, EUT Horz
7325.192	28.7	11.1	1.3	144.0	8.4	0.0	Vert	AV	0.0	48.2	54.0	-5.8	Mid Ch 20, BLE, EUT on side
7325.517	28.7	11.1	1.8	326.0	8.4	0.0	Horz	AV	0.0	48.2	54.0	-5.8	Mid Ch 20, BLE, EUT on side
4961.450	30.6	4.1	1.8	326.0	8.4	0.0	Horz	AV	0.0	43.1	54.0	-10.9	High Ch 39, BLE, EUT on Side
4958.683	30.6	4.1	1.3	144.0	8.4	0.0	Vert	AV	0.0	43.1	54.0	-10.9	High Ch 39, BLE, EUT on Side
12400.030	26.2	6.0	1.8	326.0	8.4	0.0	Horz	AV	0.0	40.6	54.0	-13.4	High Ch 39, BLE, EUT on Side
12400.150	26.0	6.0	1.3	144.0	8.4	0.0	Vert	AV	0.0	40.4	54.0	-13.6	High Ch 39, BLE, EUT on Side
4881.525	28.0	4.0	1.8	326.0	8.4	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch 20, BLE, EUT on side
4881.692	27.9	4.0	1.3	144.0	8.4	0.0	Vert	AV	0.0	40.3	54.0	-13.7	Mid Ch 20, BLE, EUT on side
4801.992	28.1	3.7	1.8	326.0	8.4	0.0	Horz	AV	0.0	40.2	54.0	-13.8	Low Ch 0, BLE, EUT on side
4801.792	28.1	3.7	1.3	144.0	8.4	0.0	Vert	AV	0.0	40.2	54.0	-13.8	Low Ch 0, BLE, EUT on side
12209.060	31.0	-3.4	1.8	326.0	8.4	0.0	Horz	AV	0.0	36.0	54.0	-18.0	Mid Ch 20, BLE, EUT on side
12209.100	30.6	-3.4	1.3	144.0	8.4	0.0	Vert	AV	0.0	35.6	54.0	-18.4	Mid Ch 20, BLE, EUT on side
7439.850	42.7	12.1	1.5	353.0	0.0	0.0	Horz	PK	0.0	54.8	74.0	-19.2	High Ch 39, BLE, EUT Horz
7438.217	42.6	12.1	1.5	112.0	0.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	High Ch 39, BLE, EUT Vert
7440.292	42.5	12.1	2.3	233.0	0.0	0.0	Vert	PK	0.0	54.6	74.0	-19.4	High Ch 39, BLE, EUT Horz
7325.275	43.0	11.1	1.3	144.0	0.0	0.0	Vert	PK	0.0	54.1	74.0	-19.9	Mid Ch 20, BLE, EUT on side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7439.692	41.9	12.1	3.2	12.0	0.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	High Ch 39, BLE, EUT Vert
7438.033	41.8	12.1	1.3	144.0	0.0	0.0	Vert	PK	0.0	53.9	74.0	-20.1	High Ch 39, BLE, EUT on Side
7442.258	41.7	12.1	1.8	326.0	0.0	0.0	Horz	PK	0.0	53.8	74.0	-20.2	High Ch 39, BLE, EUT on Side
7327.367	42.4	11.1	1.8	326.0	0.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	Mid Ch 20, BLE, EUT on side
12012.020	30.6	-5.7	1.3	144.0	8.4	0.0	Vert	AV	0.0	33.3	54.0	-20.7	Low Ch 0, BLE, EUT on side
12009.280	30.6	-5.7	1.8	326.0	8.4	0.0	Horz	AV	0.0	33.3	54.0	-20.7	Low Ch 0, BLE, EUT on side
12400.920	40.6	6.0	1.8	326.0	0.0	0.0	Horz	PK	0.0	46.6	74.0	-27.4	High Ch 39, BLE, EUT on Side
4806.483	42.8	3.7	1.8	326.0	0.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	Low Ch 0, BLE, EUT on side
12401.460	40.1	6.0	1.3	144.0	0.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	High Ch 39, BLE, EUT on Side
4882.992	41.8	4.0	1.3	144.0	0.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	Mid Ch 20, BLE, EUT on side
4881.658	41.5	4.0	1.8	326.0	0.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	Mid Ch 20, BLE, EUT on side
4803.392	41.6	3.7	1.3	144.0	0.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	Low Ch 0, BLE, EUT on side
4962.358	40.7	4.1	1.8	326.0	0.0	0.0	Horz	PK	0.0	44.8	74.0	-29.2	High Ch 39, BLE, EUT on Side
4962.492	40.6	4.1	1.3	144.0	0.0	0.0	Vert	PK	0.0	44.7	74.0	-29.3	High Ch 39, BLE, EUT on Side
12208.850	44.9	-3.4	1.8	326.0	0.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	Mid Ch 20, BLE, EUT on side
12211.030	44.8	-3.4	1.3	144.0	0.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	Mid Ch 20, BLE, EUT on side
12012.230	45.6	-5.7	1.3	144.0	0.0	0.0	Vert	PK	0.0	39.9	74.0	-34.1	Low Ch 0, BLE, EUT on side
12009.130	44.3	-5.7	1.8	326.0	0.0	0.0	Horz	PK	0.0	38.6	74.0	-35.4	Low Ch 0, BLE, EUT on side

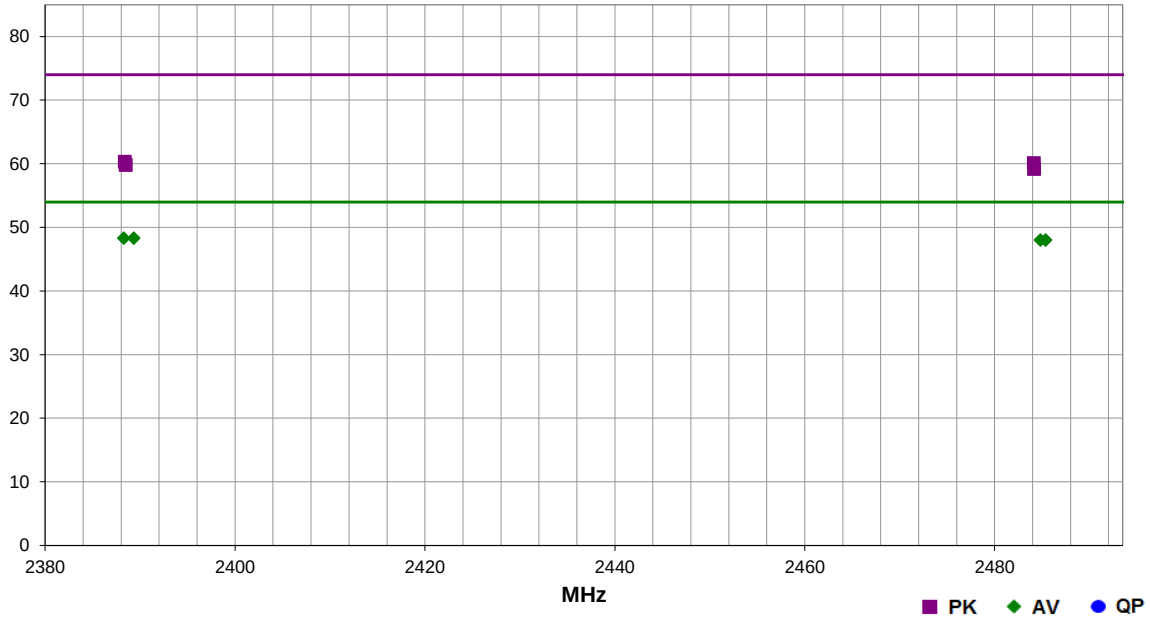
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.05.20 PSA-ESCI 2019.05.10

Work Order:	MASI0553	**Date:**	9-Jul-2019		
Project:	None	**Temperature:**	21.6 °C		
Job Site:	OC07	**Humidity:**	46.8% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1019 mbar	**Tested by:**	Nolan De Ramos & Mark Baytan
EUT:	MWMII				
Configuration:	5				
Customer:	Masimo Corporation				
Attendees:	Mike Tran				
EUT Power:	3.6 VDC				
Operating Mode:	Transmitting BLE: Low Ch 0 (2402 MHz) and High Ch 39 (2480 MHz)				
Deviations:	None				
Comments:	Band Edge				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	39	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2389.343	24.3	-4.4	1.5	123.0	8.4	20.0	Vert	AV	0.0	48.3	54.0	-5.7	Low Ch, BLE, EUT on Side
2388.290	24.3	-4.4	3.1	0.0	8.4	20.0	Horz	AV	0.0	48.3	54.0	-5.7	Low Ch, BLE, EUT on Side
2485.390	23.7	-4.1	1.0	225.0	8.4	20.0	Vert	AV	0.0	48.0	54.0	-6.0	High Ch, BLE, EUT On Side
2484.840	23.7	-4.1	1.3	52.0	8.4	20.0	Horz	AV	0.0	48.0	54.0	-6.0	High Ch, BLE, EUT On Side
2388.390	44.7	-4.4	3.1	0.0	0.0	20.0	Horz	PK	0.0	60.3	74.0	-13.7	Low Ch, BLE, EUT on Side
2484.130	44.2	-4.1	1.0	225.0	0.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9	High Ch, BLE, EUT On Side
2388.487	44.2	-4.4	1.5	123.0	0.0	20.0	Vert	PK	0.0	59.8	74.0	-14.2	Low Ch, BLE, EUT on Side
2484.157	43.3	-4.1	1.3	52.0	0.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	High Ch, BLE, EUT On Side

DUTY CYCLE

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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.

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

element

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	MWMII			**Work Order:**	MASI0553
Serial Number:	ENG-1			**Date:**	3-Jul-19
Customer:	Masimo Corporation			**Temperature:**	26.4 °C
Attendees:	Anami Joshi			**Humidity:**	41.6% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Luis Flores and Mark Baytan	**Power:**	3.6VDC	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

DEVIATIONS FROM TEST STANDARD

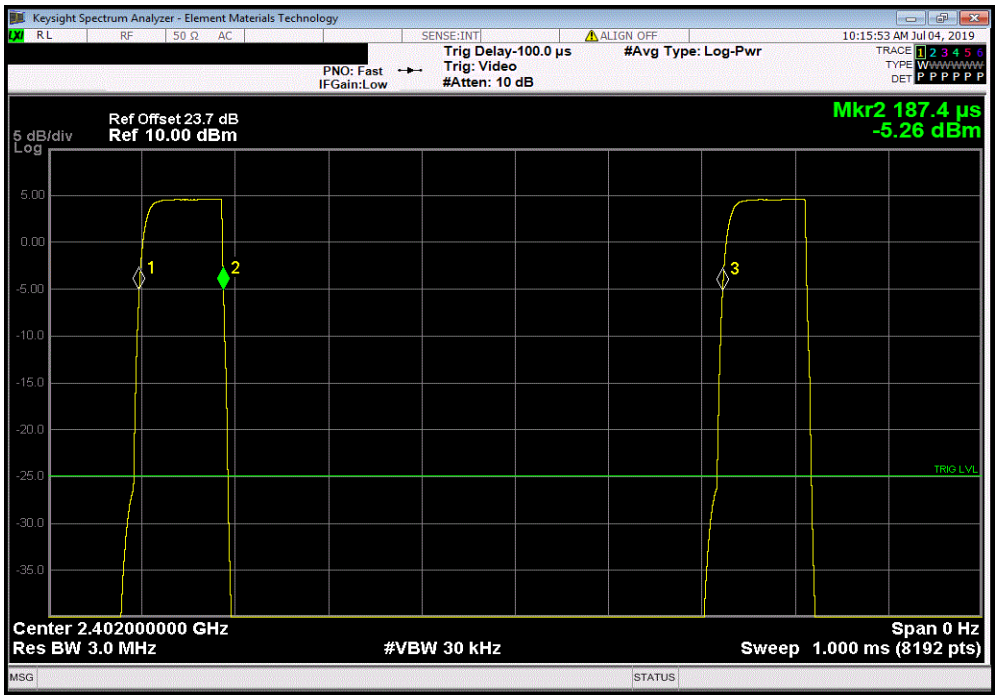
None

Configuration #	2	Signature

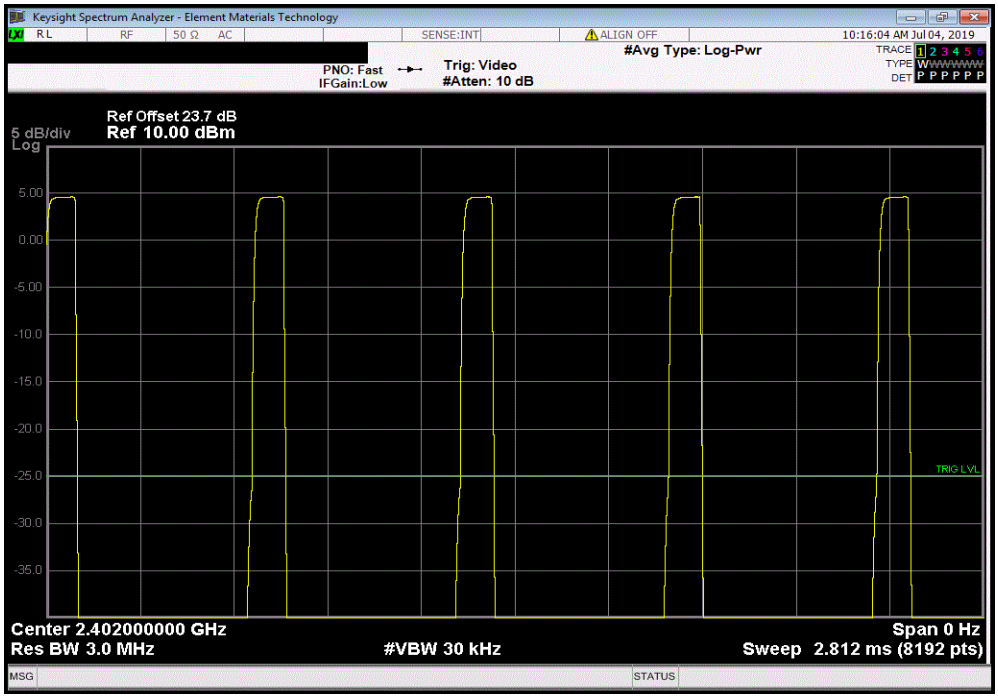
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	90.268 us	624.9 us	1	14.4	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	90.48 us	625 us	1	14.5	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	90.236 us	625 us	1	14.4	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	90.268 us	624.9 us	1	14.4	N/A	N/A

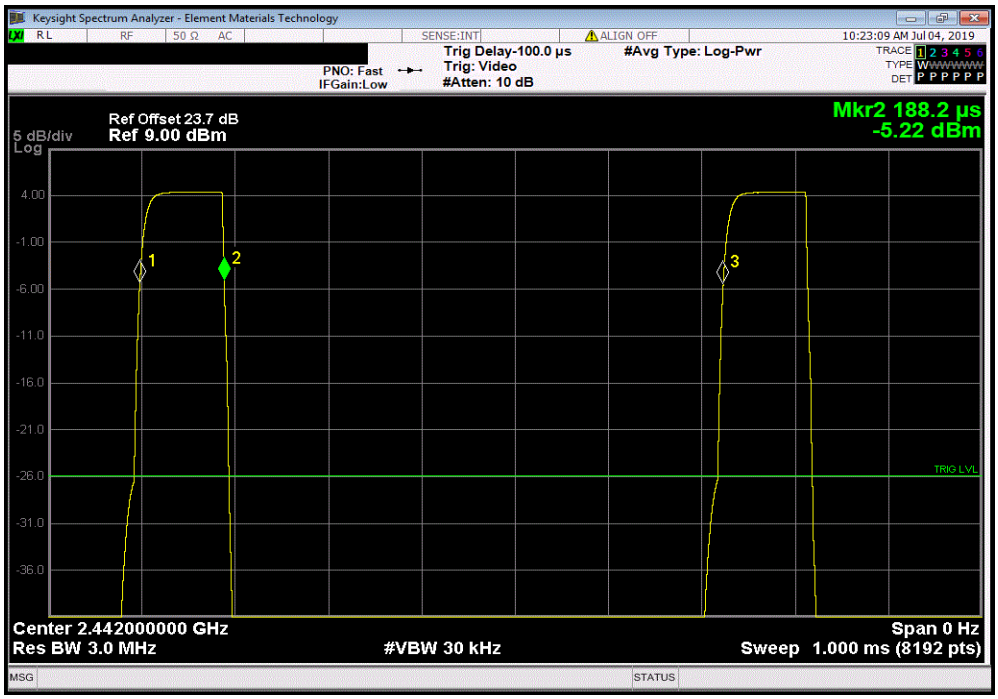


BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



DUTY CYCLE

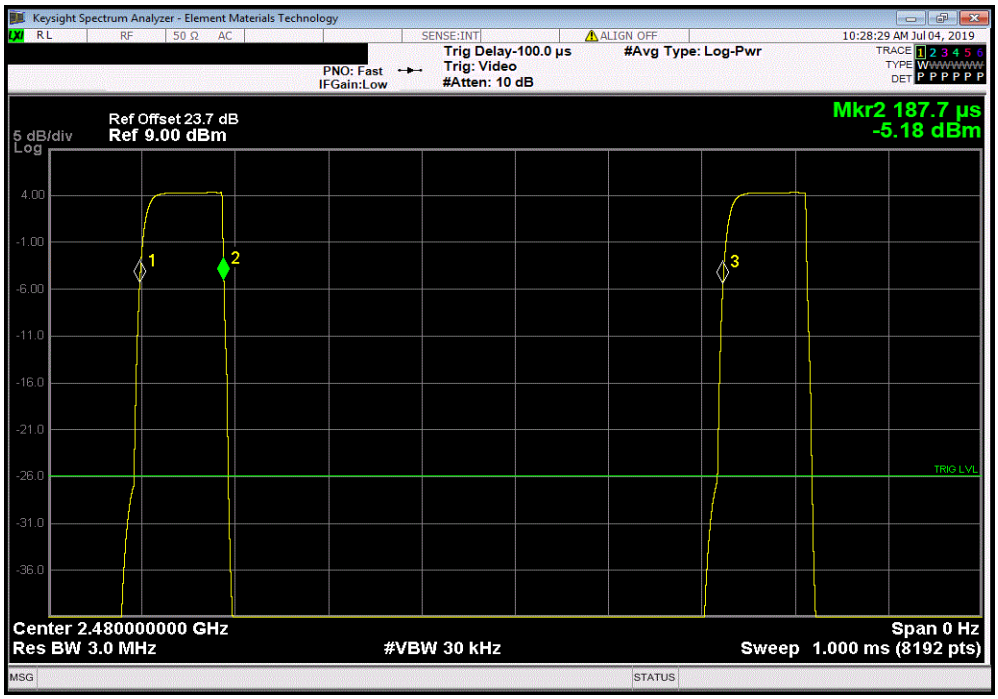
BLE/GFSK Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	90.48 us	625 us	1	14.5	N/A	N/A



BLE/GFSK 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

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	90.236 us	625 us	1	14.4	N/A	N/A



BLE/GFSK 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 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

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

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	**MWMII**			**Work Order:**	**MASI0553**
Serial Number:	**ENG-1**			**Date:**	**3-Jul-19**
Customer:	**Masimo Corporation**			**Temperature:**	**26.4 °C**
Attendees:	**Anami Joshi**			**Humidity:**	**41.6% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Luis Flores and Mark Baytan**	**Power:**	**3.6VDC**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

DEVIATIONS FROM TEST STANDARD

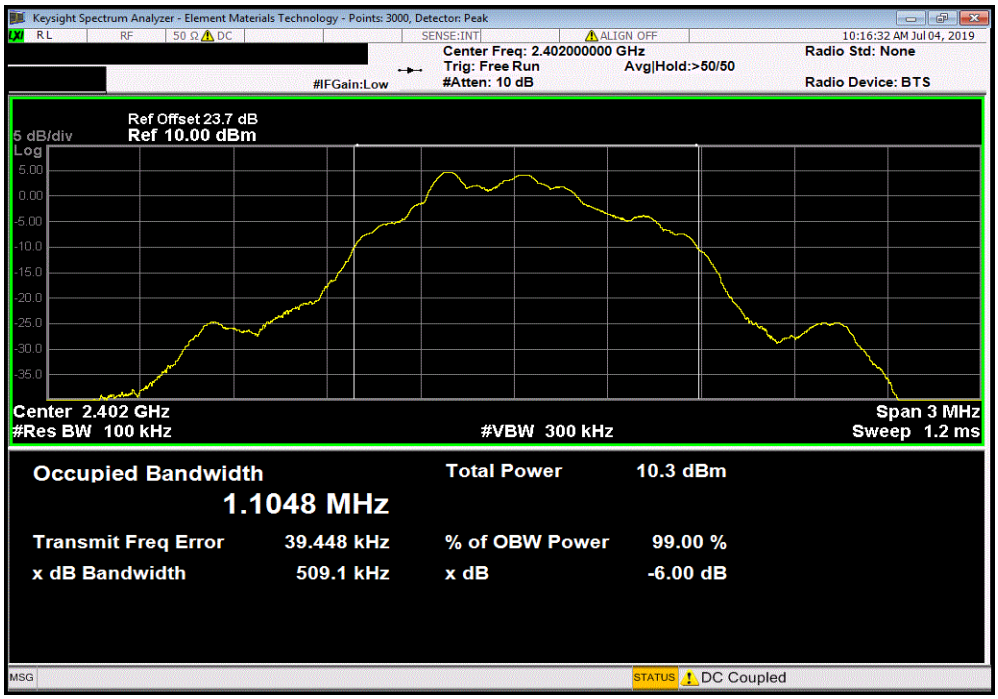
None

Configuration #	**2**	*Signature*

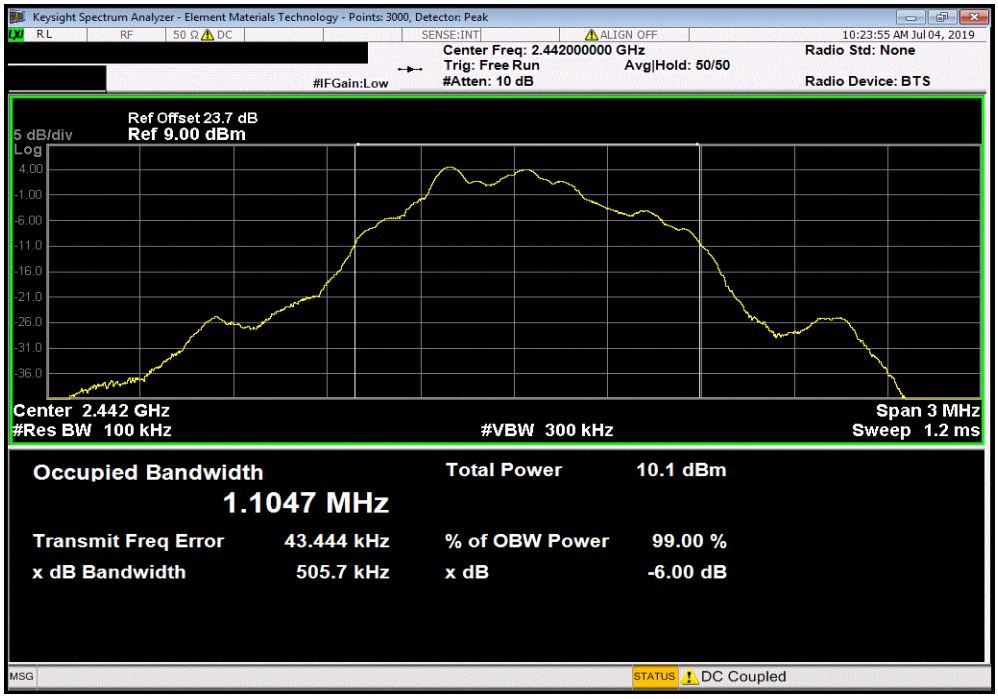
	Value	Limit (≥)	Result
BLE/GFSK Low Channel, 2402 MHz	509.074 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	505.742 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	506.728 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				509.074 kHz	500 kHz	Pass

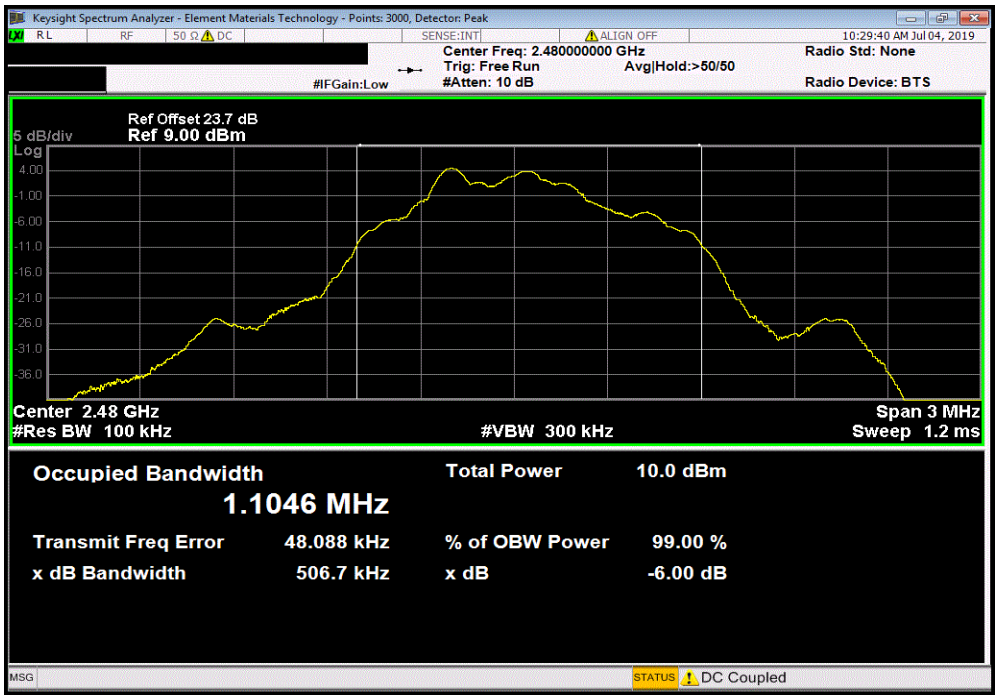


BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				505.742 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				506.728 kHz	500 kHz	Pass



OUTPUT POWER

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

OUTPUT POWER

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	**MWMII**			**Work Order:**	**MASI0553**
Serial Number:	**ENG-1**			**Date:**	**3-Jul-19**
Customer:	**Masimo Corporation**			**Temperature:**	**26.4 °C**
Attendees:	**Anami Joshi**			**Humidity:**	**41.6% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Luis Flores and Mark Baytan**	**Power:**	**3.6VDC**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

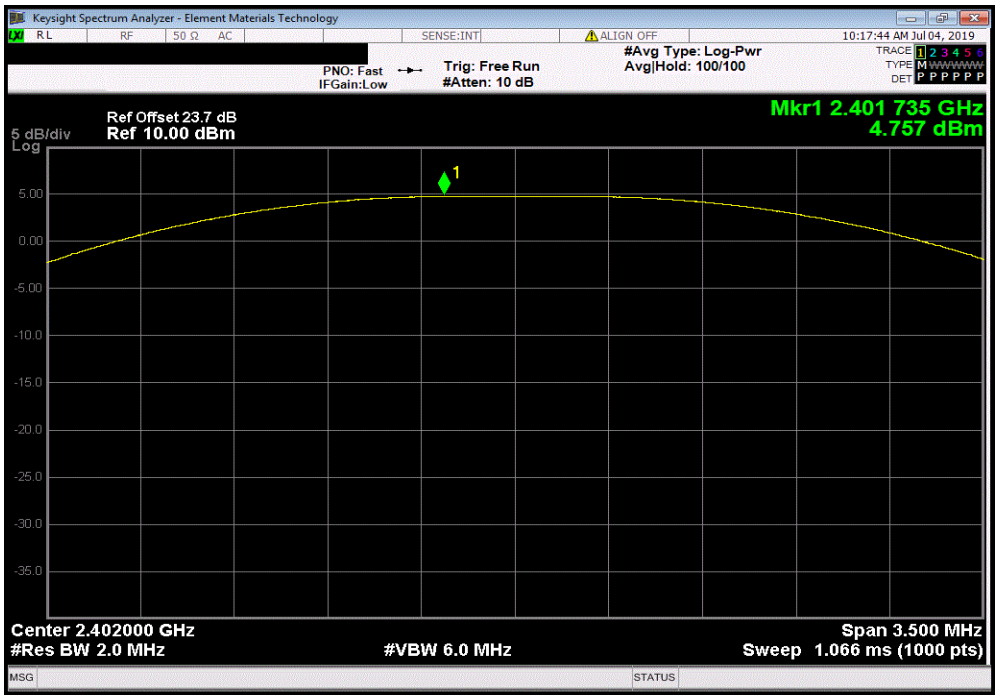
DEVIATIONS FROM TEST STANDARD

None

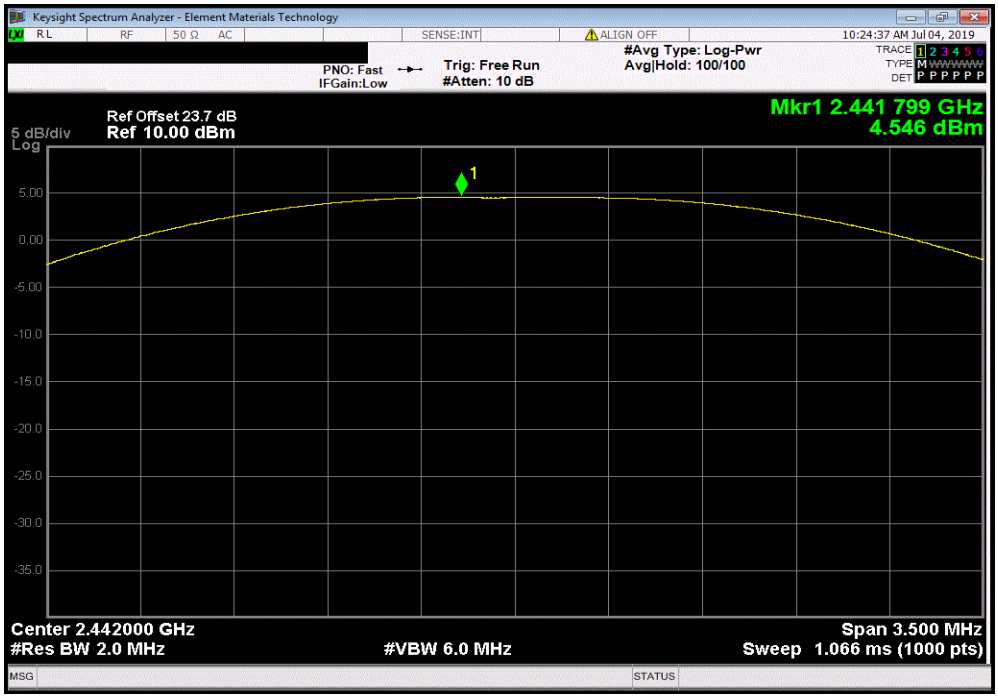
Configuration #	**2**	*Signature*

	Out Pwr (dBm)	**Limit (dBm)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	4.757	30	Pass
BLE/GFSK Mid Channel, 2442 MHz	4.546	30	Pass
BLE/GFSK High Channel, 2480 MHz	4.466	30	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.757	30	Pass

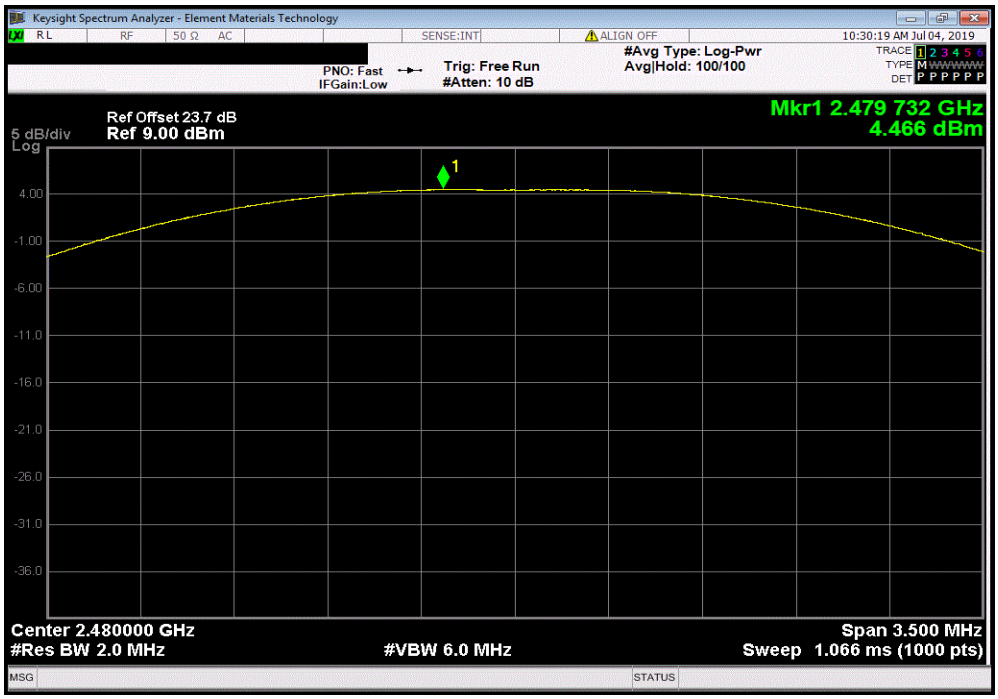


BLE/GFSK Mid Channel, 2442 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.546	30	Pass



OUTPUT POWER

BLE/GFSK High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.466	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	**MWMII**			**Work Order:**	**MASI0553**
Serial Number:	**ENG-1**			**Date:**	**3-Jul-19**
Customer:	**Masimo Corporation**			**Temperature:**	**26.4 °C**
Attendees:	**Anami Joshi**			**Humidity:**	**41.6% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Luis Flores and Mark Baytan**	**Power:**	**3.6VDC**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

DEVIATIONS FROM TEST STANDARD

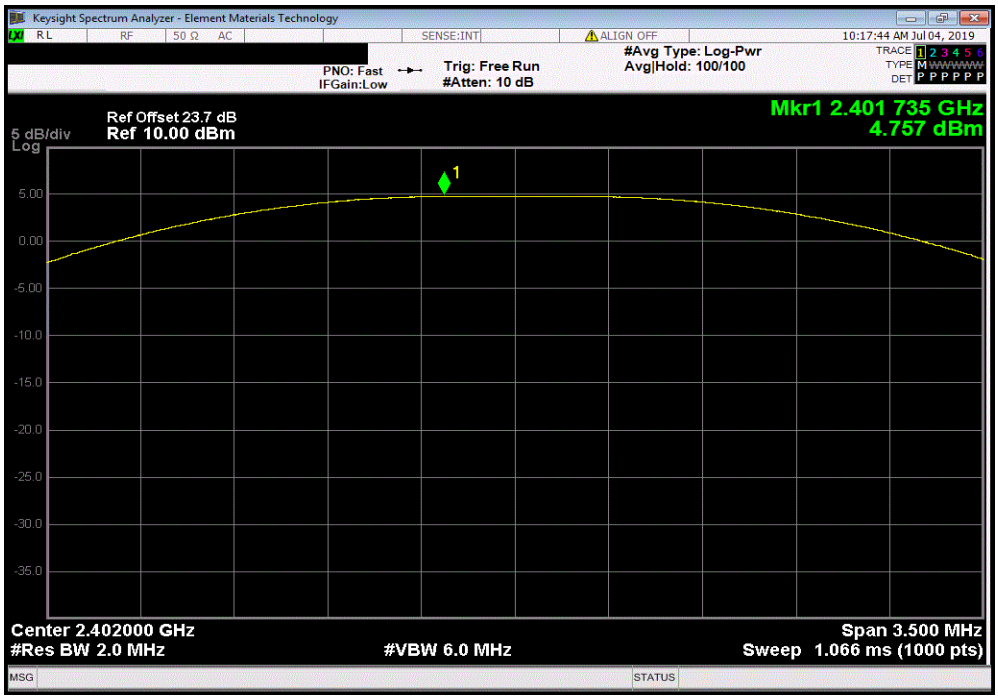
None

Configuration #	**2**	*Signature*

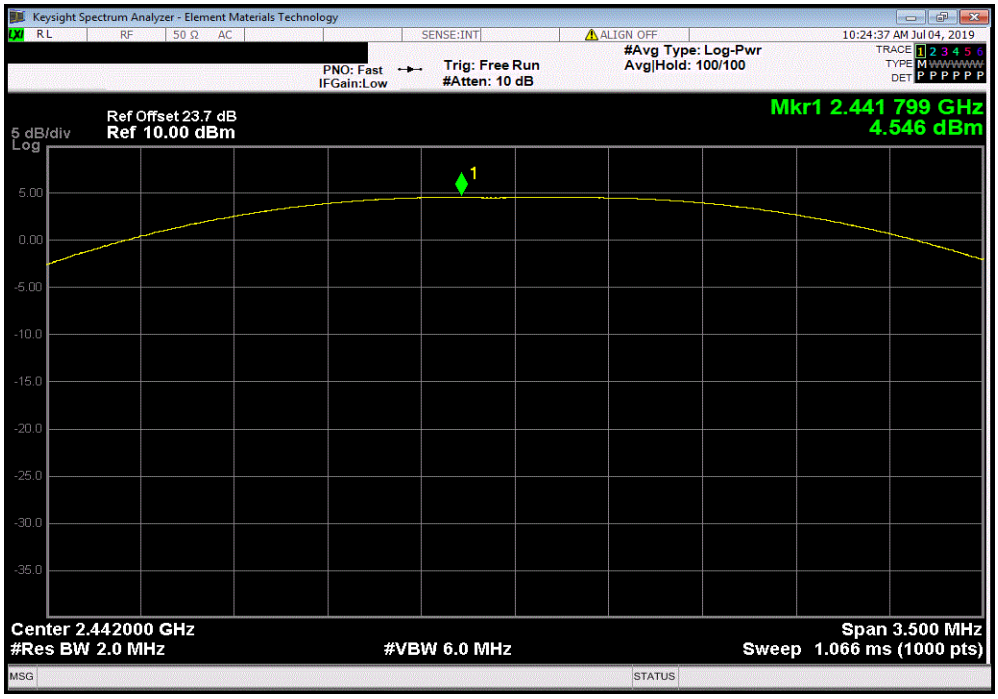
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK Low Channel, 2402 MHz	4.757	2.5	7.3	36	Pass
BLE/GFSK Mid Channel, 2442 MHz	4.546	2.5	7.0	36	Pass
BLE/GFSK High Channel, 2480 MHz	4.466	2.5	7.0	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		4.757	2.5	7.3	36	Pass

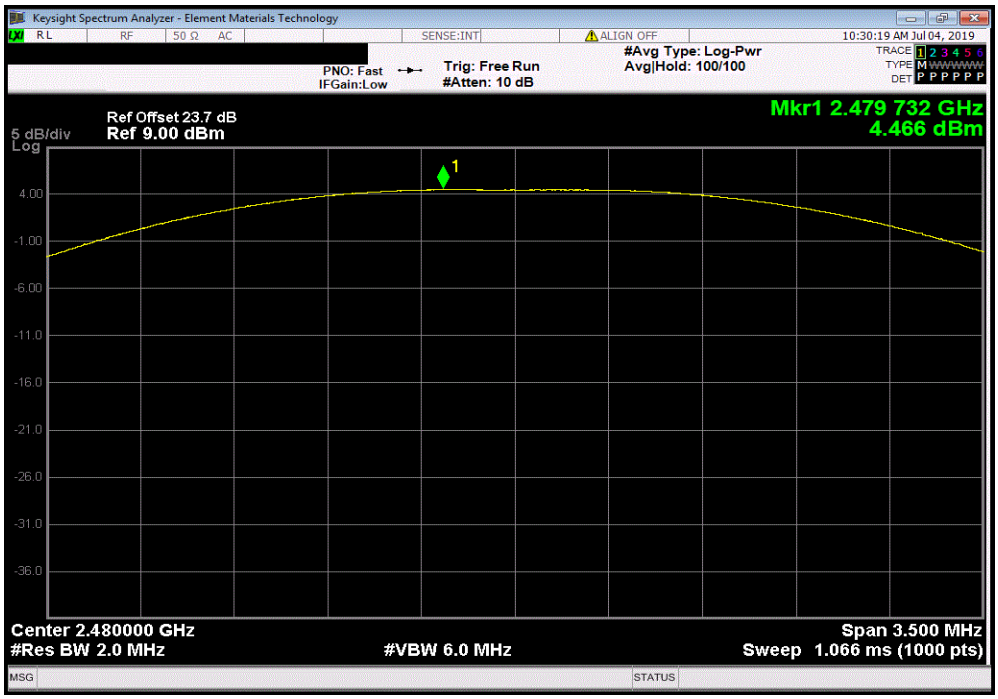


BLE/GFSK Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		4.546	2.5	7.0	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		4.466	2.5	7.0	36	Pass



0.0

POWER SPECTRAL DENSITY

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

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

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

POWER SPECTRAL DENSITY

element

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	**MWMII**			**Work Order:**	**MASI0553**
Serial Number:	**ENG-1**			**Date:**	**3-Jul-19**
Customer:	**Masimo Corporation**			**Temperature:**	**26.4 °C**
Attendees:	**Anami Joshi**			**Humidity:**	**41.6% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Luis Flores and Mark Baytan**	**Power:**	**3.6VDC**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

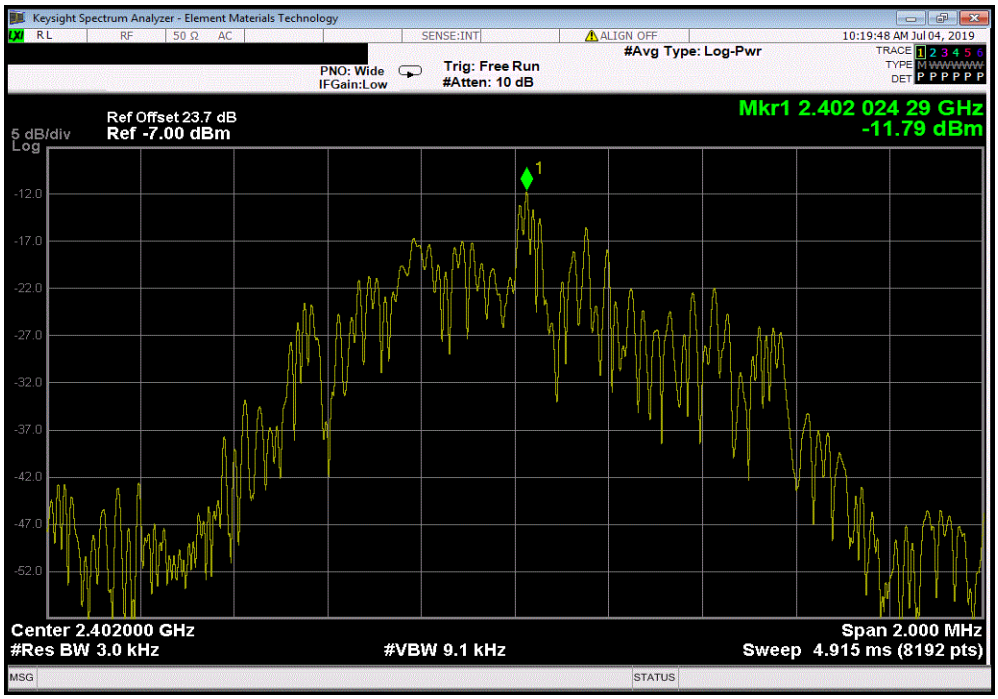
DEVIATIONS FROM TEST STANDARD

None

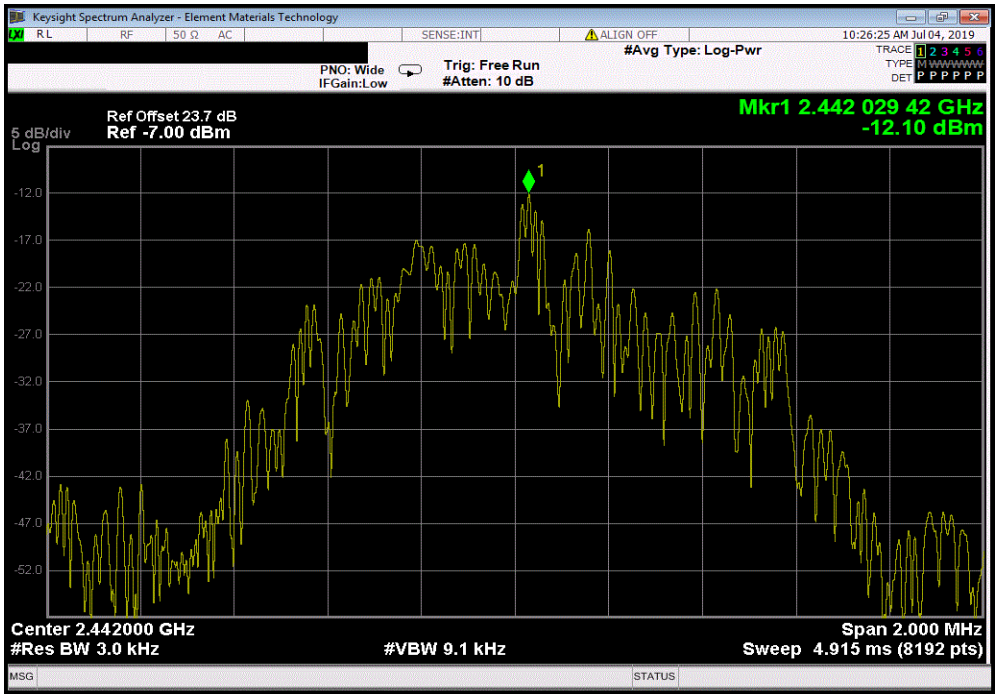
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
BLE/GFSK Low Channel, 2402 MHz	-11.789	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-12.105	8	Pass
BLE/GFSK High Channel, 2480 MHz	-12.185	8	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.789	8	Pass

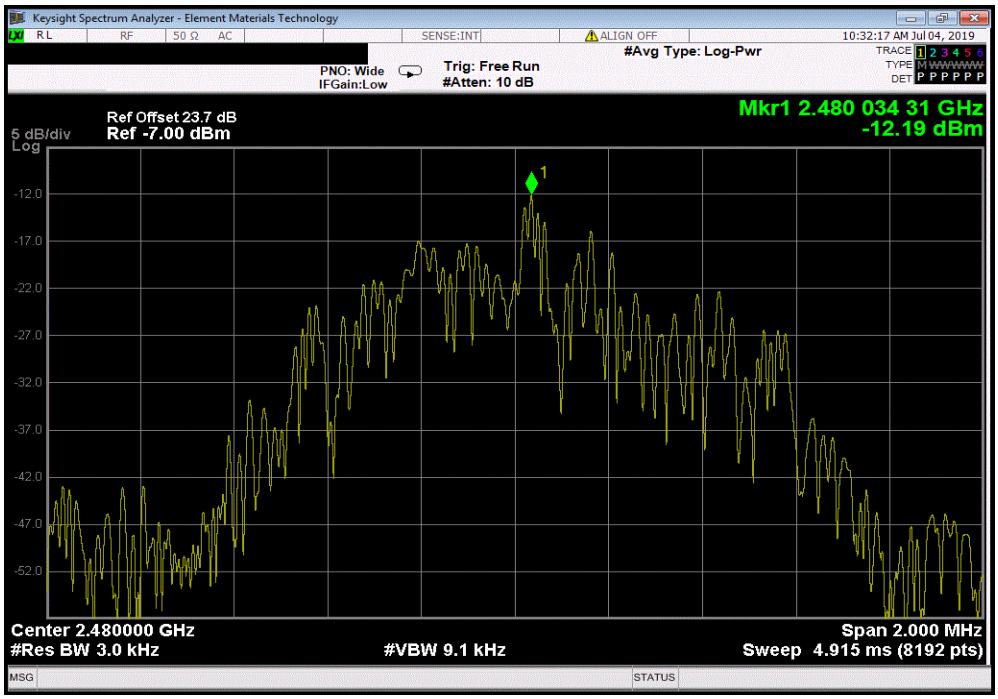


BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.105	8	Pass



POWER SPECTRAL DENSITY

BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.185	8	Pass



BAND EDGE COMPLIANCE

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

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 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

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	MWMII			Work Order:	MASI0553
Serial Number:	ENG-1			Date:	3-Jul-19
Customer:	Masimo Corporation			Temperature:	26.4 °C
Attendees:	Anami Joshi			Humidity:	41.6% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Luis Flores and Mark Baytan	Power:	3.6VDC	Job Site:	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

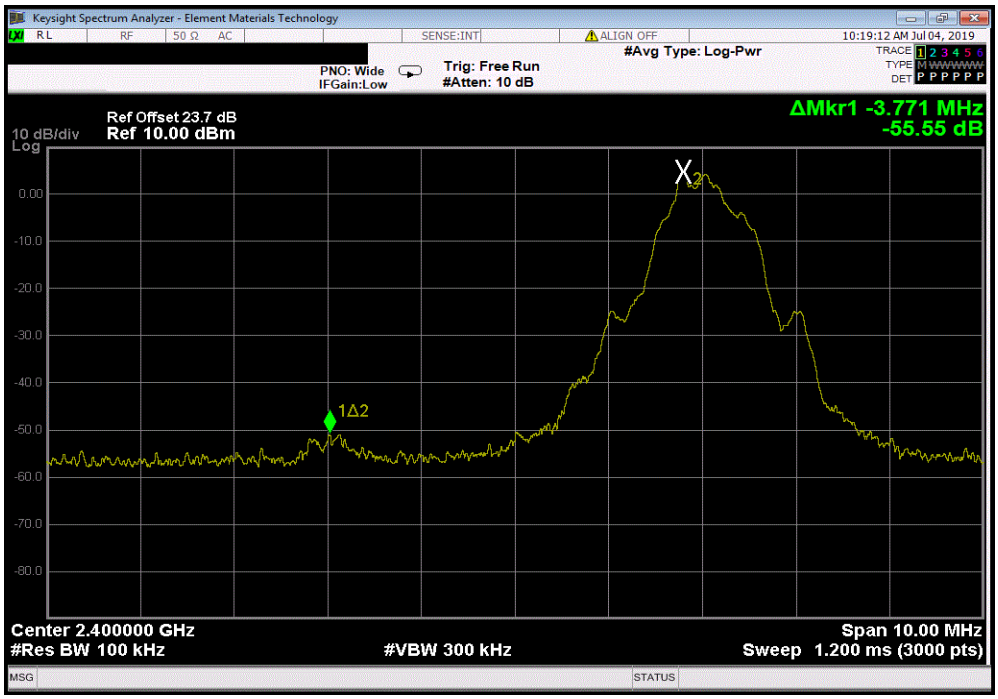
DEVIATIONS FROM TEST STANDARD

None

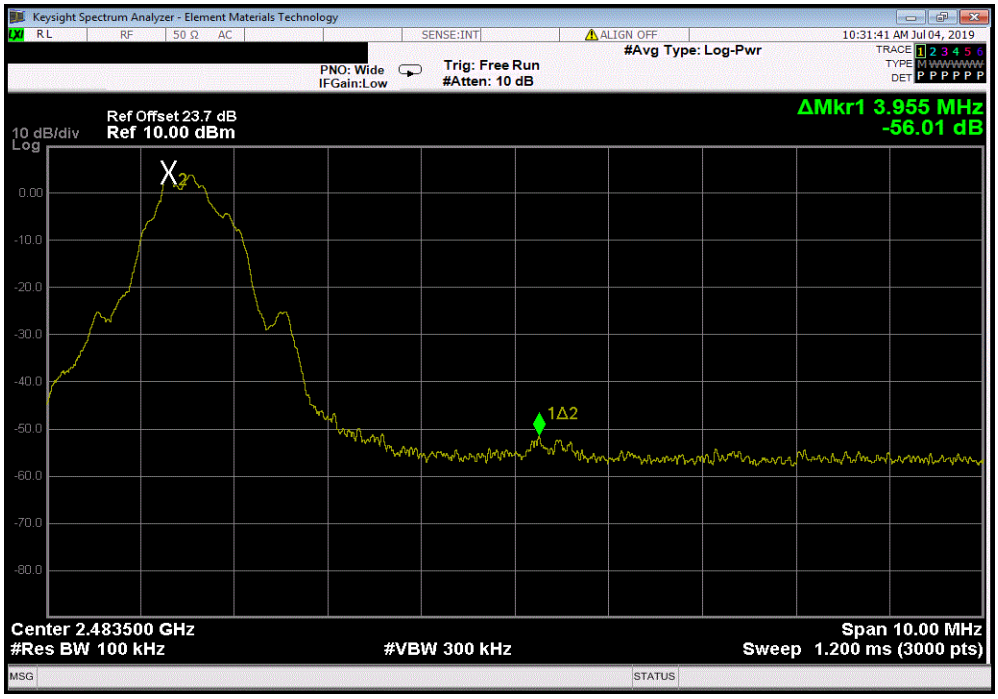
Configuration #	2	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	-55.55	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-56.01	-20	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-55.55	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.01	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2019.06.11

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.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	20-Dec-18	20-Dec-19
Block - DC	Fairview Microwave	SD3379	AMV	3-Jan-19	3-Jan-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2-Jul-19	2-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. 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

TbtTx 2018.09.13 XMit 2019.06.11

EUT:	**MWMII**			**Work Order:**	**MASI0553**
Serial Number:	**ENG-1**			**Date:**	**3-Jul-19**
Customer:	**Masimo Corporation**			**Temperature:**	**26.4 °C**
Attendees:	**Anami Joshi**			**Humidity:**	**41.6% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Luis Flores and Mark Baytan**	**Power:**	**3.6VDC**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

Reference level offset: DC block + 20dB attenuator + coax cable + client provided patch cable = 23.7dB Total Offset

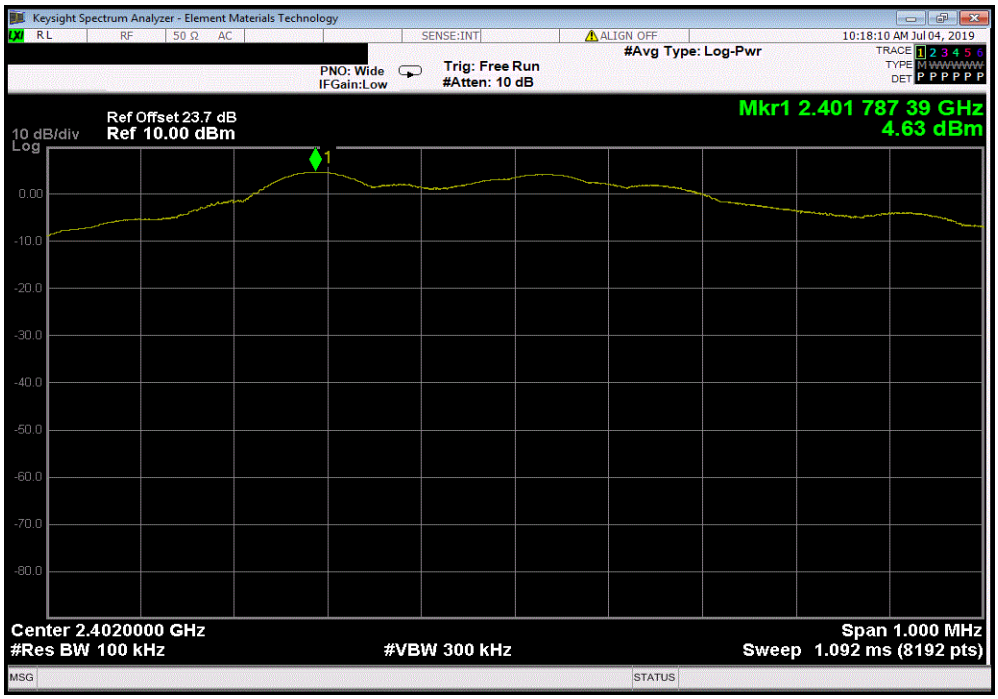
DEVIATIONS FROM TEST STANDARD

None

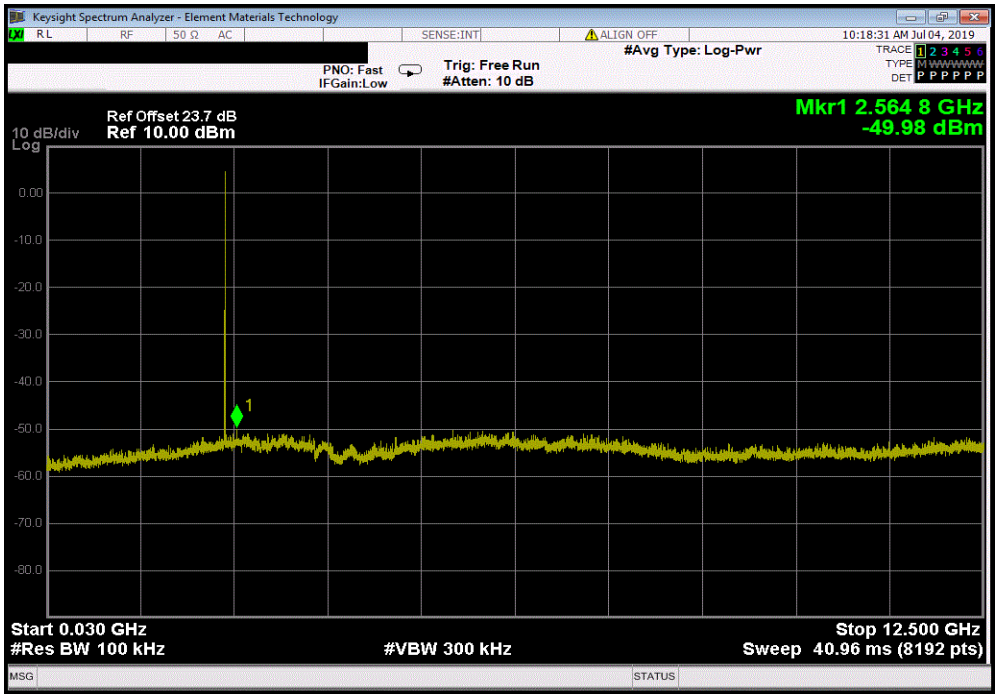
Configuration #	**2**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	2401.79	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	2564.8	-54.61	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24949.64	-39.83	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	2441.79	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	6143.97	-53.98	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24949.64	-41.43	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	2479.79	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	5874.5	-54.4	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	24888.6	-41.07	-20	Pass

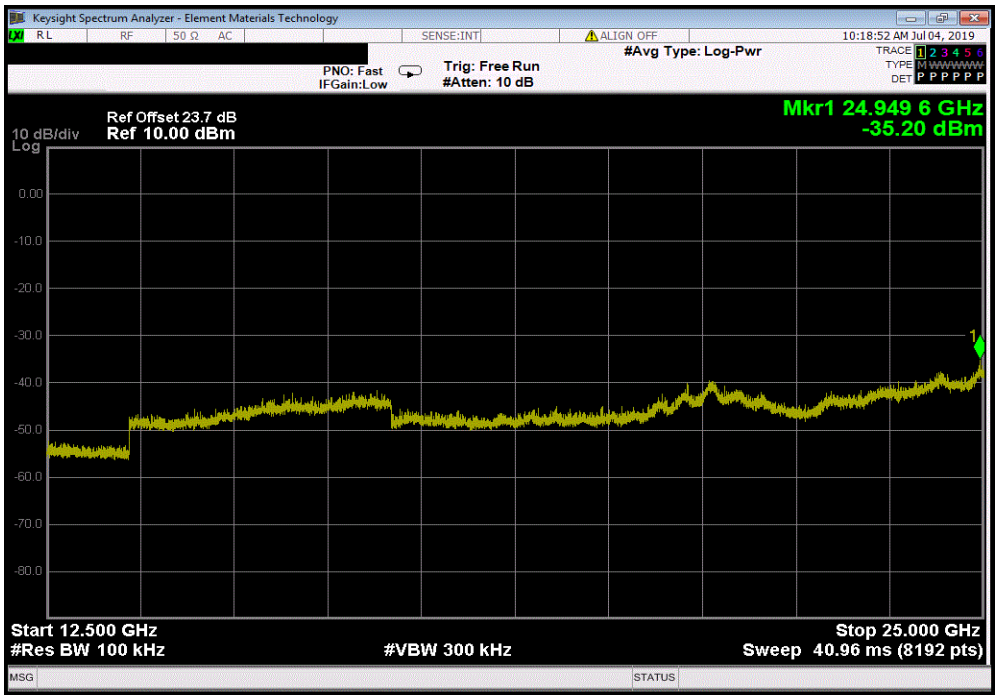
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2401.79	N/A	N/A	N/A



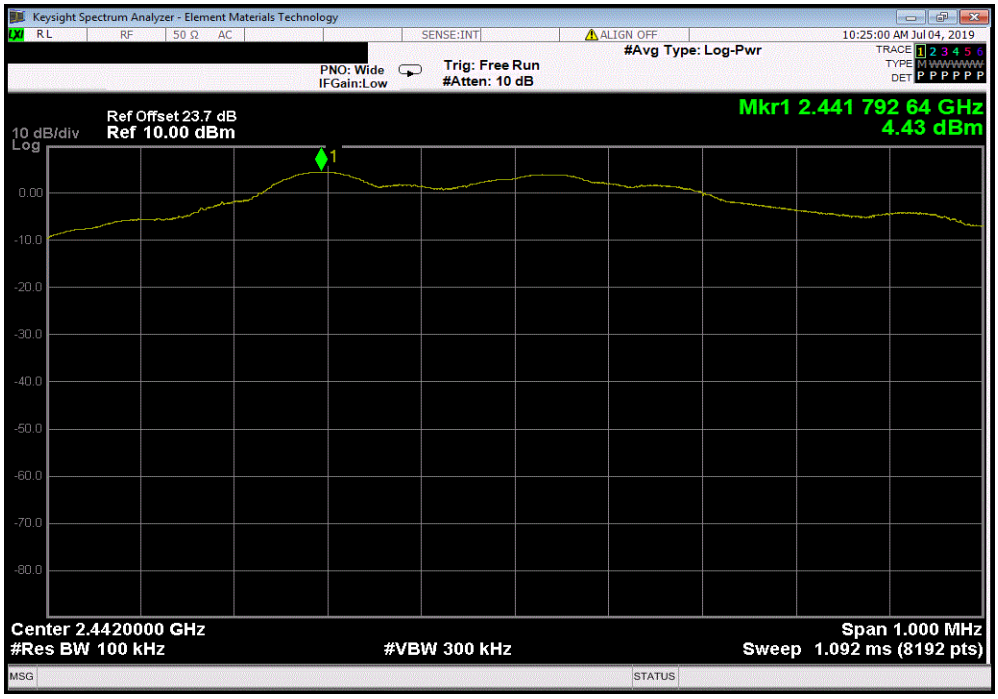
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	2564.8	-54.61	-20	Pass



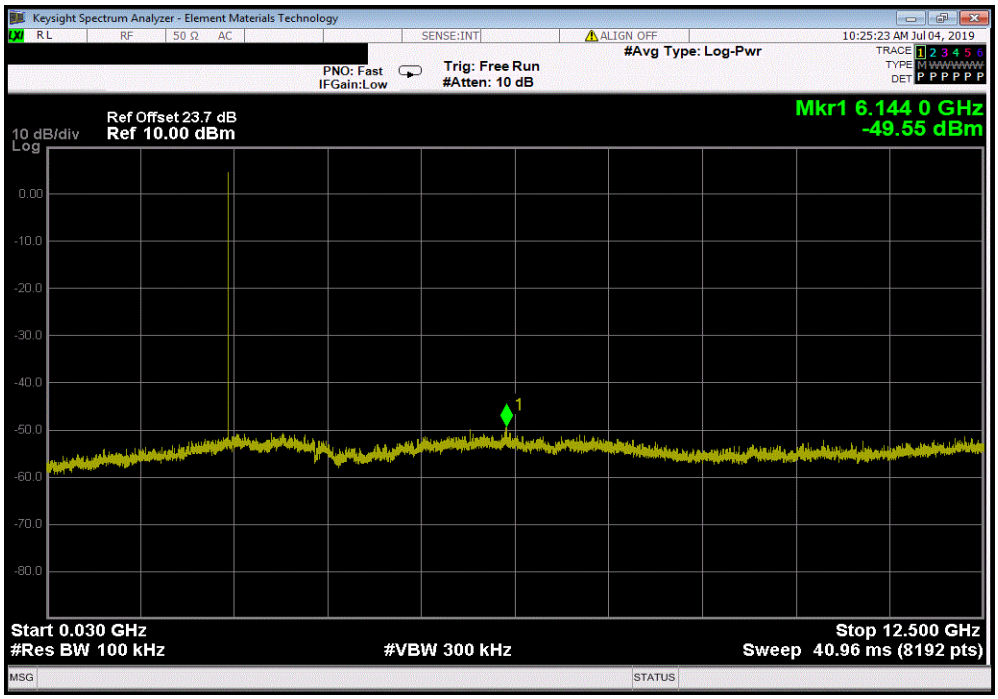
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24949.64	-39.83	-20	Pass



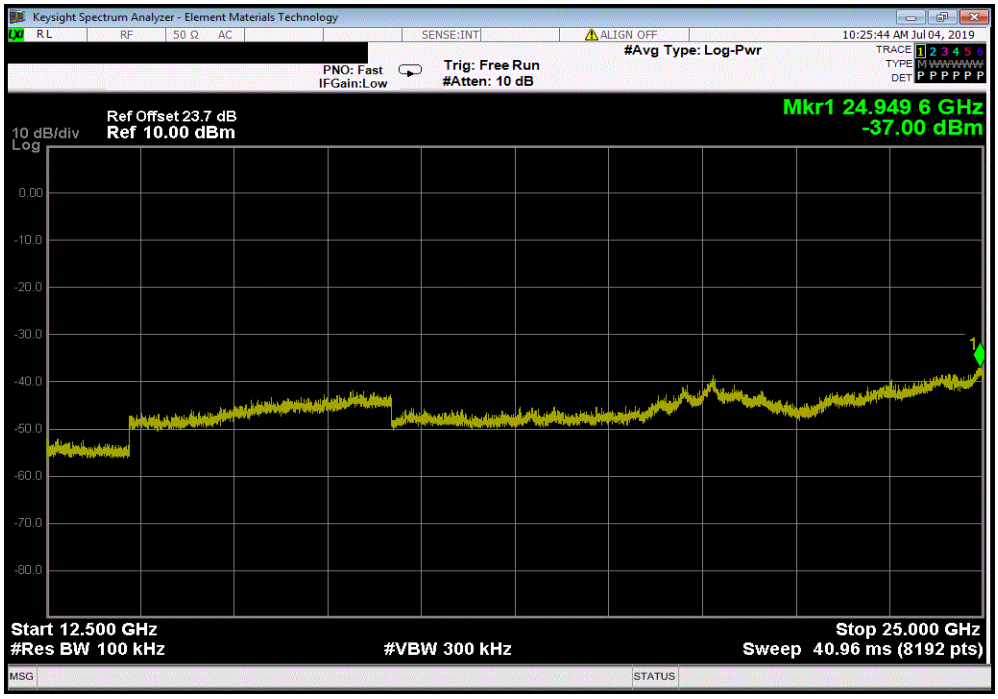
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2441.79	N/A	N/A	N/A



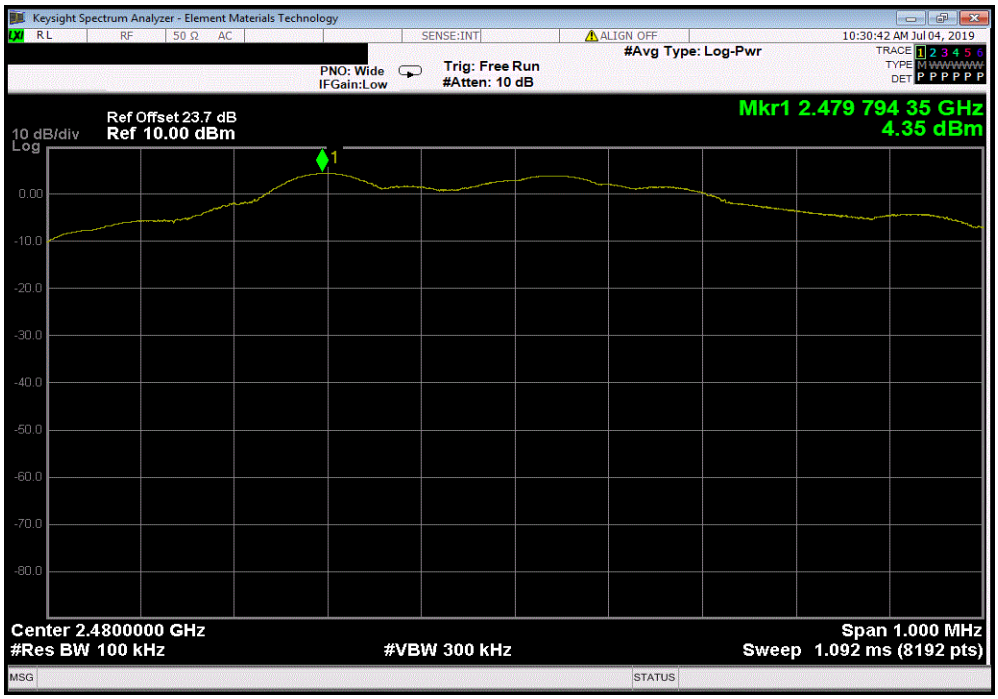
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	6143.97	-53.98	-20	Pass



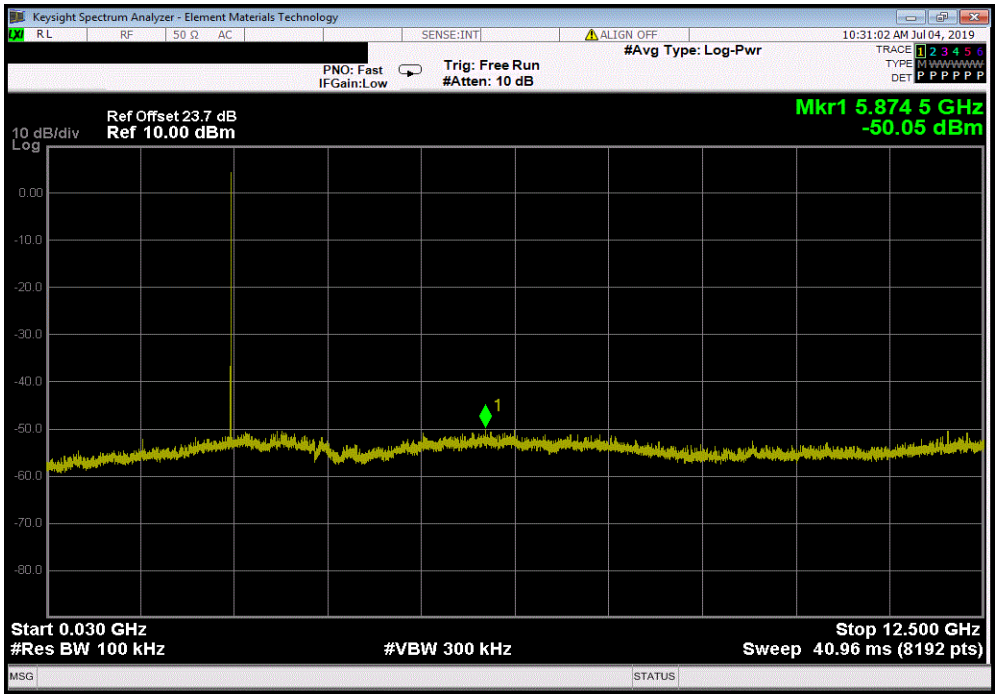
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24949.64	-41.43	-20	Pass



BLE/GFSK High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2479.79	N/A	N/A	N/A



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	5874.5	-54.4	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24888.6	-41.07	-20	Pass