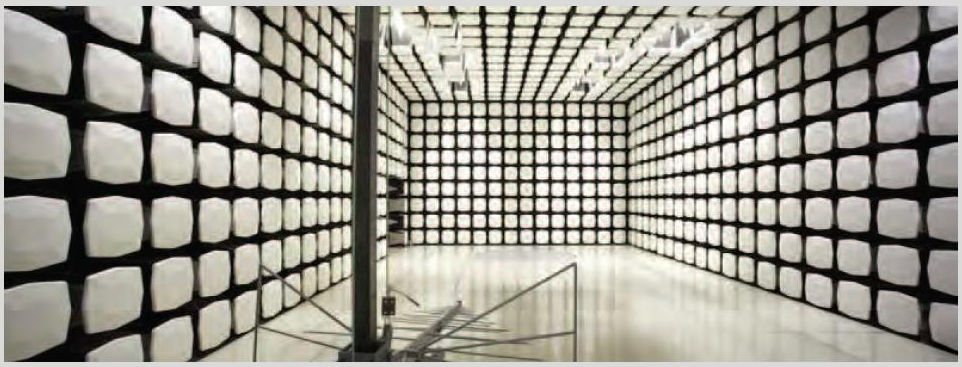
Masimo Corporation

Radius T°

FCC 15.247:2020

Bluetooth LE Radio

Report: MASI0638 Rev. 1, Issue Date: September 29, 2020



NVLAP LAB CODE: 200676-0

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CERTIFICATE OF TEST

Last Date of Test: August 25, 2020
Masimo Corporation
EUT: Radius T°

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2020	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	
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:

Johnny Candelas, Department 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
01	Revised the EIRP module to update Antenna Gain to 1.99dBi instead of 5.67dBi originally noted.	2020-09-29	33-35

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

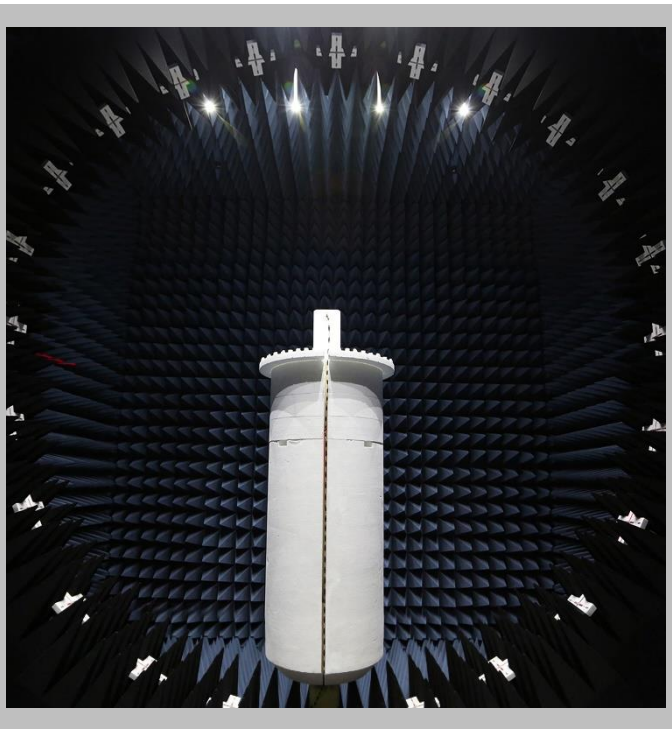
MIC – Recognized by MIC as a CAB for the acceptance of test data.

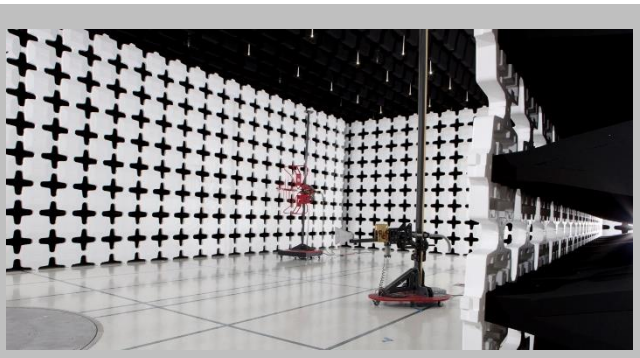
SCOPE

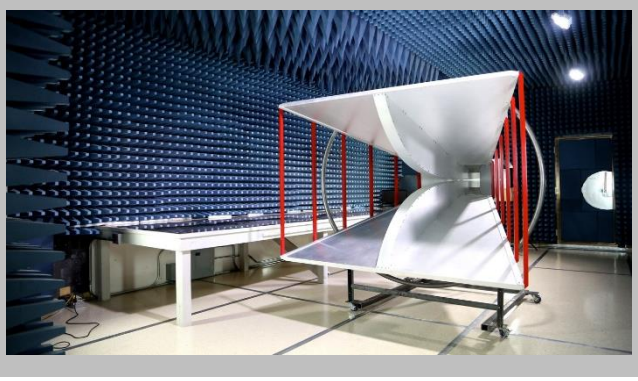
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

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.

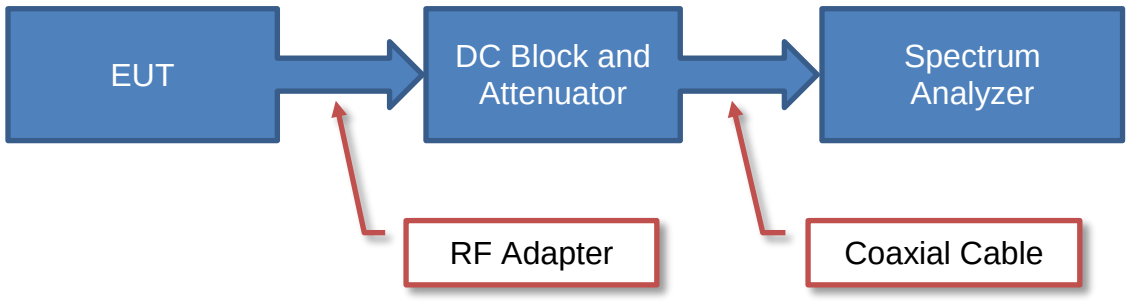
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

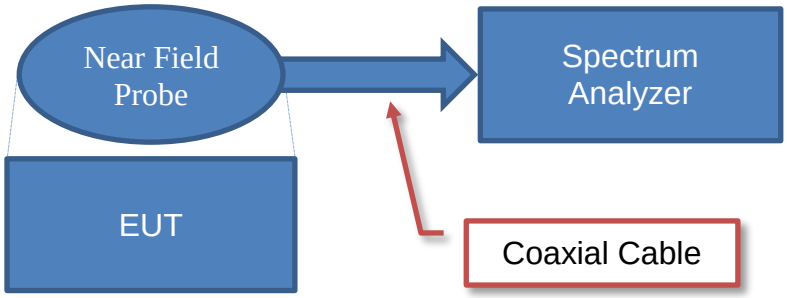
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

Test Setup Block Diagrams

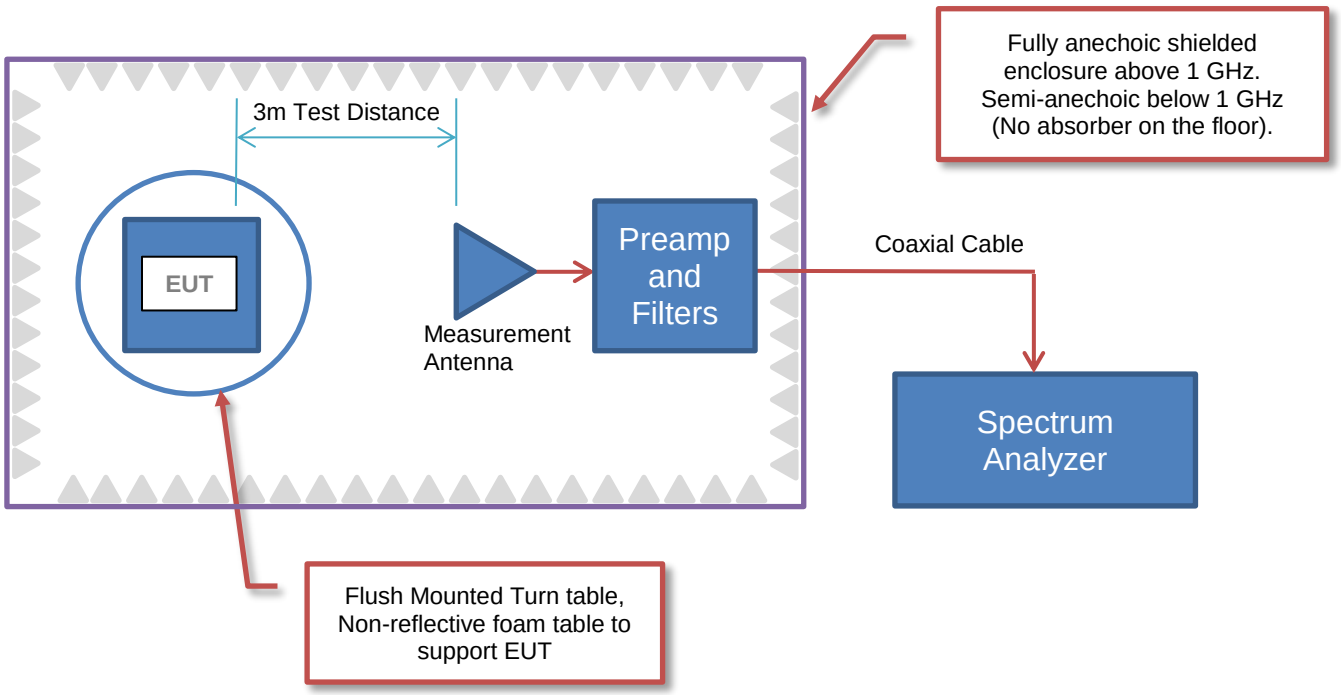
Antenna Port Conducted Measurements



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
EUT:	Radius T°
First Date of Test:	May 26, 2020
Last Date of Test:	August 25, 2020
Receipt Date of Samples:	May 26, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Radius T° sensors are battery powered, disposable sensors that are designed to continuously measure body temperature. The sensors are capable of adhering to patient's and continuously transmitting adjusted temperature measurement via Bluetooth communication protocol to a host device.

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

CONFIGURATIONS

Configuration MASI0638- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radius T°	Masimo Corporation	27869	ENG-1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP Laptop PC	HP	ProBook	5CD5469F1H
HP Laptop Power Adapter	HP	PPP009H	F12921029065683

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8m	No	HP Laptop Power Adapter	AC Mains
DC Cable	No	1.8m	No	HP Laptop Power Adapter	HP Laptop PC
FTDI USB Cable	Yes	1.6m	No	HP Laptop Power Adapter	Radius T°

Configuration MASI0638- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radius T°	Masimo Corporation	27869	ENG-2

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP Laptop PC	HP	ProBook	5CD5469F1H
HP Laptop Power Adapter	HP	PPP009H	F12921029065683

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8m	No	HP Laptop Power Adapter	AC Mains
DC Cable	No	1.8m	No	HP Laptop Power Adapter	HP Laptop PC
FTDI USB Cable	Yes	1.6m	No	HP Laptop Power Adapter	Radius T°

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-05-26	Spurious Radiated 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.
2	2020-05-27	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.
3	2020-05-27	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.
4	2020-05-27	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.
5	2020-05-27	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.
6	2020-05-27	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.
7	2020-05-27	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.
8	2020-05-27	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.
9	2020-08-25	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	4 dBm
		20	Mid Channel	2442	4 dBm
		39	High Channel	2480	4 dBm

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2020.04.03.0

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 2402 MHz, Mid Ch 2442 MHz, High Ch 2480 MHz

POWER SETTINGS INVESTIGATED

3.3 VDC via FTDI USB Cable

CONFIGURATIONS INVESTIGATED

MASI0638 - 1

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	HHX	2019-07-02	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFT	NCR	0 mo
Attenuator	Fairview Microwave	SA18H-20	TKQ	2019-07-02	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	2019-07-02	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2019-07-02	12 mo
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2019-09-09	12 mo
Antenna - Biconilog	EMCO	3142B	AXK	2019-10-30	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	2019-12-13	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	2019-12-13	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	2020-02-27	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	2020-02-27	12 mo
Cable	Northwest EMC	8-18GHz RE Cables	OCO	2020-02-27	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	0 mo
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2020-02-28	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2020-02-28	12 mo
Antenna - Double Ridge	EMCO	3115	AHB	2020-04-08	24 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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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(1/dc).

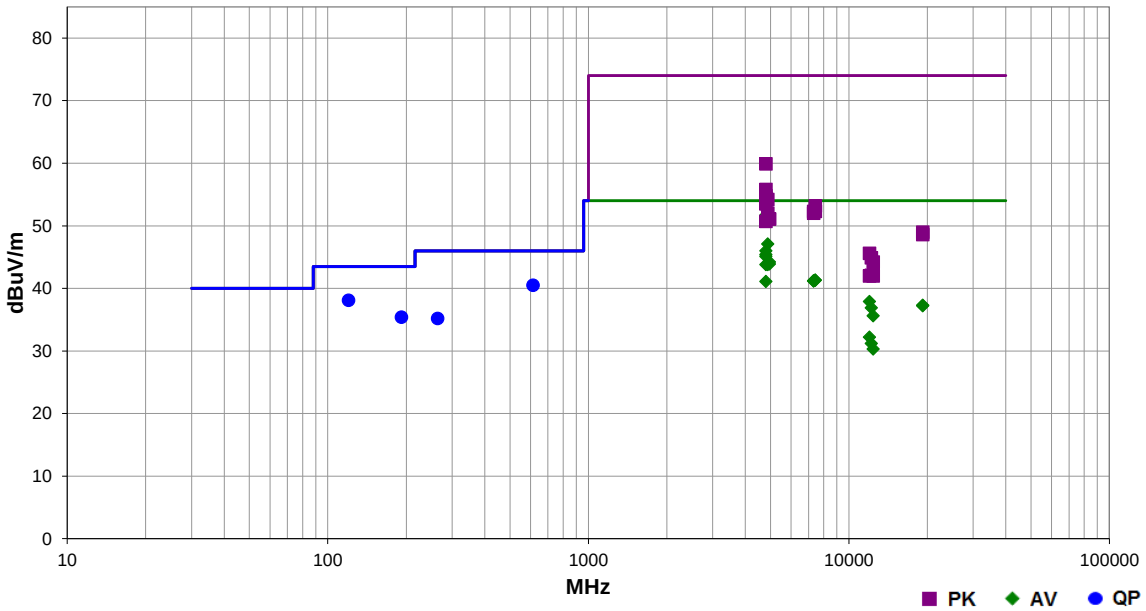
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2020.04.03.0

Work Order:	MASI0638	**Date:**	2020-05-26		
Project:	None	**Temperature:**	21.7 °C		
Job Site:	OC10	**Humidity:**	49.4% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1004 mbar	**Tested by:**	Nolan De Ramos
EUT:	Radius T°				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	3.3 VDC via FTDI USB Cable				
Operating Mode:	Transmitting BLE. Low Ch 2402 MHz, Mid Ch 2442 MHz, High Ch 2480 MHz				
Deviations:	None				
Comments:	The EUT operates at 93.8% duty cycle. A duty cycle correction factor was added to the AVG measurements, this factor was calculated using 10*log(1/0.938) = 0.3 dB. Partial Enclosure.				

Test Specifications	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

Run #	15	**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
4804.100	55.8	-4.4	3.3	157.0	0.3	0.0	Horz	AV	0.0	51.7	54.0	-2.3	Low Ch, BLE, EUT On Side
120.024	40.9	-2.8	1.5	102.0	0.0	0.0	Horz	QP	0.0	38.1	43.5	-5.4	BLE, Low Ch, EUT On Side
613.020	27.6	12.9	2.8	233.0	0.0	0.0	Horz	QP	0.0	40.5	46.0	-5.5	BLE, Low Ch, EUT On Side
4884.008	50.7	-3.9	1.6	149.0	0.3	0.0	Horz	AV	0.0	47.1	54.0	-6.9	Mid Ch, BLE, EUT On Side
4804.083	50.1	-4.4	1.5	341.0	0.3	0.0	Vert	AV	0.0	46.0	54.0	-8.0	Low Ch, BLE, EUT Vert
191.755	34.9	0.5	2.8	235.0	0.0	0.0	Horz	QP	0.0	35.4	43.5	-8.1	BLE, Low Ch, EUT On Side
4804.075	49.5	-4.4	1.4	52.0	0.3	0.0	Vert	AV	0.0	45.4	54.0	-8.6	Low Ch, BLE, EUT On Side
4804.150	49.2	-4.4	1.5	331.0	0.3	0.0	Horz	AV	0.0	45.1	54.0	-8.9	Low Ch, BLE, EUT Horz
4960.000	47.6	-3.7	1.5	343.0	0.3	0.0	Vert	AV	0.0	44.2	54.0	-9.8	High Ch, BLE, EUT Vert
4960.083	47.3	-3.7	1.5	334.0	0.3	0.0	Horz	AV	0.0	43.9	54.0	-10.1	High Ch, BLE, EUT On Side
4803.958	47.9	-4.4	1.5	153.0	0.3	0.0	Horz	AV	0.0	43.8	54.0	-10.2	Low Ch, BLE, EUT Vert
4884.000	47.4	-3.9	1.5	360.0	0.3	0.0	Vert	AV	0.0	43.8	54.0	-10.2	Mid Ch, BLE, EUT Vert
263.949	31.8	3.4	1.0	47.0	0.0	0.0	Horz	QP	0.0	35.2	46.0	-10.8	BLE, Low Ch, EUT On Side
7440.317	35.2	5.8	1.5	215.0	0.3	0.0	Vert	AV	0.0	41.3	54.0	-12.7	High Ch, BLE, EUT Vert
7439.083	35.2	5.8	1.5	158.0	0.3	0.0	Horz	AV	0.0	41.3	54.0	-12.7	High Ch, BLE, EUT On Side
7326.933	35.4	5.5	1.5	42.0	0.3	0.0	Horz	AV	0.0	41.2	54.0	-12.8	Mid Ch, BLE, EUT On Side
7326.950	35.4	5.5	1.5	196.0	0.3	0.0	Vert	AV	0.0	41.2	54.0	-12.8	Mid Ch, BLE, EUT Vert
4804.033	45.2	-4.4	1.8	246.0	0.3	0.0	Vert	AV	0.0	41.1	54.0	-12.9	Low Ch, BLE, EUT Horz
4804.000	64.3	-4.4	3.3	157.0	0.0	0.0	Horz	PK	0.0	59.9	74.0	-14.1	Low Ch, BLE, EUT On Side
12008.930	41.6	-4.0	3.1	196.0	0.3	0.0	Horz	AV	0.0	37.9	54.0	-16.1	BLE, Low Ch, EUT On Side
19217.590	39.4	-2.4	1.3	342.0	0.3	0.0	Vert	AV	0.0	37.3	54.0	-16.7	BLE, Low Ch, EUT Vert
19218.230	39.3	-2.4	1.3	225.0	0.3	0.0	Horz	AV	0.0	37.2	54.0	-16.8	BLE, Low Ch, 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
12209.010	39.5	-2.9	3.7	202.0	0.3	0.0	Horz	AV	0.0	36.9	54.0	-17.1	BLE, Mid Ch, EUT On Side
4804.242	60.2	-4.4	1.4	52.0	0.0	0.0	Vert	PK	0.0	55.8	74.0	-18.2	Low Ch, BLE, EUT On Side
12398.950	38.5	-3.2	4.0	208.0	0.3	0.0	Horz	AV	0.0	35.6	54.0	-18.4	BLE, High Ch, EUT On Side
4804.075	59.2	-4.4	1.5	331.0	0.0	0.0	Horz	PK	0.0	54.8	74.0	-19.2	Low Ch, BLE, EUT Horz
4804.208	58.8	-4.4	1.5	341.0	0.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	Low Ch, BLE, EUT Vert
4883.842	58.1	-3.9	1.6	149.0	0.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	Mid Ch, BLE, EUT On Side
4804.200	57.9	-4.4	1.5	153.0	0.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	Low Ch, BLE, EUT Vert
7441.142	47.4	5.8	1.5	215.0	0.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	High Ch, BLE, EUT Vert
7327.958	46.8	5.5	1.5	196.0	0.0	0.0	Vert	PK	0.0	52.3	74.0	-21.7	Mid Ch, BLE, EUT Vert
7437.875	46.5	5.8	1.5	158.0	0.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	High Ch, BLE, EUT On Side
12009.000	35.9	-4.0	1.3	26.0	0.3	0.0	Vert	AV	0.0	32.2	54.0	-21.8	BLE, Low Ch, EUT Vert
7325.967	46.5	5.5	1.5	42.0	0.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	Mid Ch, BLE, EUT On Side
4883.792	55.9	-3.9	1.5	360.0	0.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Mid Ch, BLE, EUT Vert
12211.300	33.8	-2.9	3.9	335.0	0.3	0.0	Vert	AV	0.0	31.2	54.0	-22.8	BLE, Mid Ch, EUT Vert
4960.083	54.8	-3.7	1.5	343.0	0.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9	High Ch, BLE, EUT Vert
4959.850	54.8	-3.7	1.5	334.0	0.0	0.0	Horz	PK	0.0	51.1	74.0	-22.9	High Ch, BLE, EUT On Side
4804.083	55.1	-4.4	1.8	246.0	0.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3	Low Ch, BLE, EUT Horz
12398.880	33.2	-3.2	1.0	303.0	0.3	0.0	Vert	AV	0.0	30.3	54.0	-23.7	BLE, High Ch, EUT Vert
19215.690	51.4	-2.4	1.3	225.0	0.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	BLE, Low Ch, EUT On Side
19215.420	51.0	-2.4	1.3	342.0	0.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	BLE, Low Ch, EUT Vert
12011.070	49.7	-4.1	3.1	196.0	0.0	0.0	Horz	PK	0.0	45.6	74.0	-28.4	BLE, Low Ch, EUT On Side
12211.580	47.8	-2.9	3.7	202.0	0.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1	BLE, Mid Ch, EUT On Side
12399.010	47.4	-3.2	4.0	208.0	0.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8	BLE, High Ch, EUT On Side
12211.580	45.0	-2.9	3.9	335.0	0.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9	BLE, Mid Ch, EUT Vert
12398.910	45.2	-3.2	1.0	303.0	0.0	0.0	Vert	PK	0.0	42.0	74.0	-32.0	BLE, High Ch, EUT Vert
12008.890	46.0	-4.0	1.3	26.0	0.0	0.0	Vert	PK	0.0	42.0	74.0	-32.0	BLE, Low Ch, EUT Vert

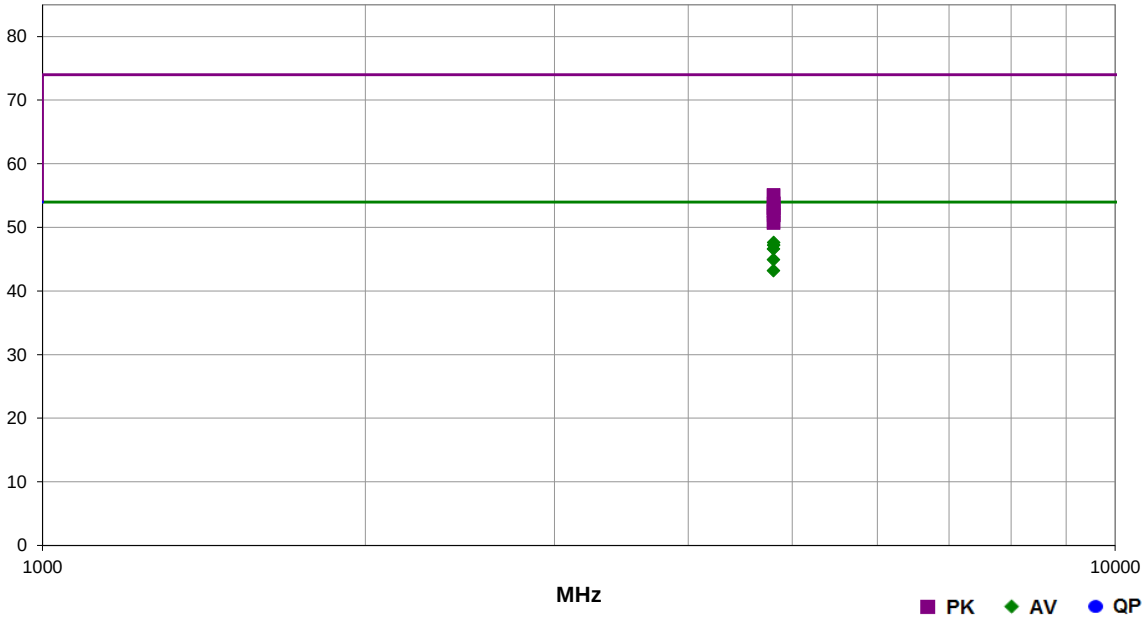
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2020.04.03.0

Work Order:	MASI0638	**Date:**	2020-08-25		
Project:	None	**Temperature:**	26.2 °C		
Job Site:	OC10	**Humidity:**	44.8% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1010 mbar	**Tested by:**	Mark Baytan
EUT:	Radius T°				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	3.3 VDC via FTDI USB Cable				
Operating Mode:	Transmitting BLE. Low Ch 2402 MHz				
Deviations:	None				
Comments:	The EUT operates at 93.8% duty cycle. A duty cycle correction factor was added to the AVG measurements, this factor was calculated using 10*log(1/0.938) = 0.3 dB. Full enclosure installed.				

Test Specifications	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

Run #	26	**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)
4803.967	55.7	-4.7	1.4	351.0	0.3	0.0	Vert	AV	0.0	51.3	54.0	-2.7
4804.000	52.0	-4.7	2.7	346.0	0.3	0.0	Horz	AV	0.0	47.6	54.0	-6.4
4804.075	51.6	-4.7	3.7	223.0	0.3	0.0	Vert	AV	0.0	47.2	54.0	-6.8
4803.875	51.0	-4.7	1.5	17.0	0.3	0.0	Horz	AV	0.0	46.6	54.0	-7.4
4803.925	49.3	-4.7	1.7	137.0	0.3	0.0	Vert	AV	0.0	44.9	54.0	-9.1
4803.875	47.6	-4.7	1.5	204.0	0.3	0.0	Horz	AV	0.0	43.2	54.0	-10.8
4803.717	59.8	-4.7	1.4	351.0	0.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9
4804.525	58.5	-4.7	1.5	204.0	0.0	0.0	Horz	PK	0.0	53.8	74.0	-20.2
4803.517	57.7	-4.7	2.7	346.0	0.0	0.0	Horz	PK	0.0	53.0	74.0	-21.0
4803.692	57.3	-4.7	3.7	223.0	0.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4
4804.642	56.6	-4.7	1.5	17.0	0.0	0.0	Horz	PK	0.0	51.9	74.0	-22.1
4803.458	55.4	-4.7	1.7	137.0	0.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3

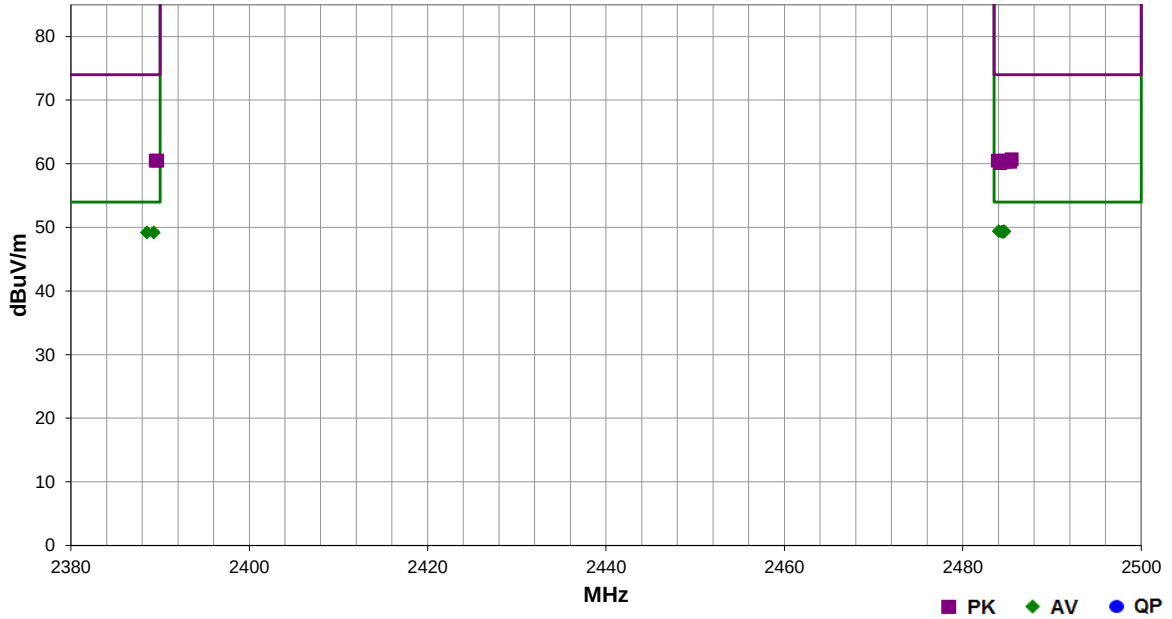
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2020.04.03.0

Work Order:	MASI0638	**Date:**	2020-05-26		
Project:	None	**Temperature:**	21.7 °C		
Job Site:	OC10	**Humidity:**	49.4% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1004 mbar	**Tested by:**	Nolan De Ramos
EUT:	Radius T°				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	3.3 VDC via FTDI USB Cable				
Operating Mode:	Transmitting BLE. Low Ch 2402 MHz, High Ch 2480 MHz				
Deviations:	None				
Comments:	The EUT operates at 93.8% duty cycle. A duty cycle correction factor was added to the AVG measurements, this factor was calculated using 10*log(1/0.938) = 0.3 dB. Band Edge. Partial Enclosure.				

Test Specifications	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

Run #	17	**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
2484.047	40.6	-11.5	1.7	219.0	0.3	20.0	Horz	AV	0.0	49.4	54.0	-4.6	BLE, High Ch, EUT Vert
2484.640	40.6	-11.5	1.5	351.0	0.3	20.0	Vert	AV	0.0	49.4	54.0	-4.6	BLE, High Ch, EUT Vert
2484.357	40.5	-11.5	1.5	94.0	0.3	20.0	Horz	AV	0.0	49.3	54.0	-4.7	BLE, High Ch, EUT On Side
2484.457	40.5	-11.5	3.5	282.0	0.3	20.0	Vert	AV	0.0	49.3	54.0	-4.7	BLE, High Ch, EUT On Side
2484.643	40.5	-11.5	1.5	47.0	0.3	20.0	Horz	AV	0.0	49.3	54.0	-4.7	BLE, High Ch, EUT Horz
2484.577	40.5	-11.5	3.5	11.0	0.3	20.0	Vert	AV	0.0	49.3	54.0	-4.7	BLE, High Ch, EUT Horz
2389.300	40.6	-11.7	1.5	123.0	0.3	20.0	Horz	AV	0.0	49.2	54.0	-4.8	EUT, Low Ch, EUT Vert
2388.543	40.6	-11.7	1.5	209.0	0.3	20.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT, Low Ch, EUT Vert
2485.487	52.2	-11.5	1.7	219.0	0.0	20.0	Horz	PK	0.0	60.7	74.0	-13.3	BLE, High Ch, EUT Vert
2483.923	52.0	-11.5	3.5	282.0	0.0	20.0	Vert	PK	0.0	60.5	74.0	-13.5	BLE, High Ch, EUT On Side
2484.643	52.0	-11.5	1.5	47.0	0.0	20.0	Horz	PK	0.0	60.5	74.0	-13.5	BLE, High Ch, EUT Horz
2389.667	52.2	-11.7	1.5	123.0	0.0	20.0	Horz	PK	0.0	60.5	74.0	-13.5	EUT, Low Ch, EUT Vert
2389.497	52.2	-11.7	1.5	209.0	0.0	20.0	Vert	PK	0.0	60.5	74.0	-13.5	EUT, Low Ch, EUT Vert
2484.820	51.8	-11.5	1.5	351.0	0.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	BLE, High Ch, EUT Vert
2485.303	51.8	-11.5	1.5	94.0	0.0	20.0	Horz	PK	0.0	60.3	74.0	-13.7	BLE, High Ch, EUT On Side
2484.220	51.6	-11.5	3.5	11.0	0.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9	BLE, High Ch, EUT Horz

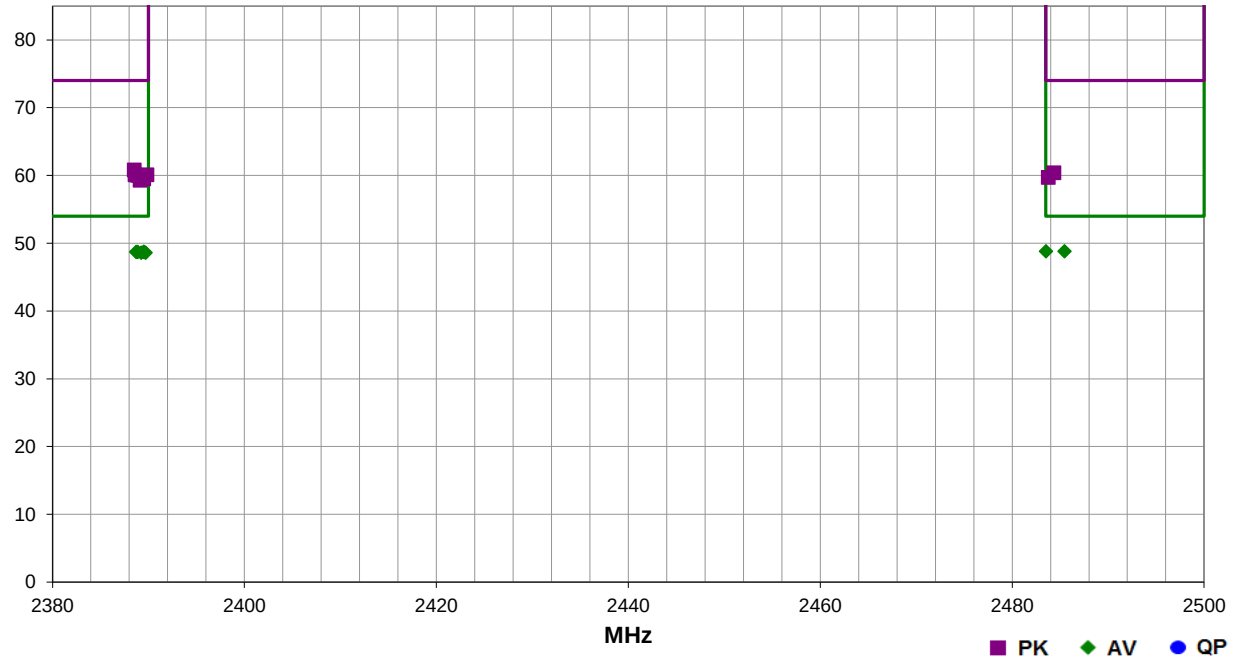
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.15.1 PSA-ESCI 2020.04.03.0

Work Order:	MASI0638	**Date:**	2020-08-25		
Project:	None	**Temperature:**	26.2 °C		
Job Site:	OC10	**Humidity:**	44.8% RH		
Serial Number:	ENG-1	**Barometric Pres.:**	1010 mbar	**Tested by:**	Mark Baytan
EUT:	Radius T°				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	3.3 VDC via FTDI USB Cable				
Operating Mode:	Transmitting BLE. Low Ch 2402 MHz				
Deviations:	None				
Comments:	The EUT operates at 93.8% duty cycle. A duty cycle correction factor was added to the AVG measurements, this factor was calculated using 10*log(1/0.938) = 0.3 dB. Band edge. Full enclosure installed.				

Test Specifications	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

Run #	27	**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)
2483.530	40.3	-11.8	1.5	211.0	0.3	20.0	Horz	AV	0.0	48.8	54.0	-5.2
2485.463	40.3	-11.8	1.5	262.0	0.3	20.0	Vert	AV	0.0	48.8	54.0	-5.2
2388.730	40.4	-12.0	1.5	237.0	0.3	20.0	Vert	AV	0.0	48.7	54.0	-5.3
2388.887	40.4	-12.0	1.5	227.0	0.3	20.0	Horz	AV	0.0	48.7	54.0	-5.3
2389.510	40.4	-12.0	1.5	326.0	0.3	20.0	Vert	AV	0.0	48.7	54.0	-5.3
2389.547	40.4	-12.0	1.4	266.0	0.3	20.0	Vert	AV	0.0	48.7	54.0	-5.3
2389.253	40.3	-12.0	1.5	198.0	0.3	20.0	Horz	AV	0.0	48.6	54.0	-5.4
2389.707	40.3	-12.0	1.5	337.0	0.3	20.0	Horz	AV	0.0	48.6	54.0	-5.4
2388.523	52.8	-12.0	1.5	198.0	0.0	20.0	Horz	PK	0.0	60.8	74.0	-13.2
2484.357	52.2	-11.8	1.5	262.0	0.0	20.0	Vert	PK	0.0	60.4	74.0	-13.6
2388.603	52.1	-12.0	1.5	327.0	0.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9
2389.847	52.1	-12.0	1.4	266.0	0.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9
2388.883	52.0	-12.0	1.5	237.0	0.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0
2483.770	51.5	-11.8	1.5	211.0	0.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3

DUTY CYCLE

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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

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

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

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

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

DEVIATIONS FROM TEST STANDARD

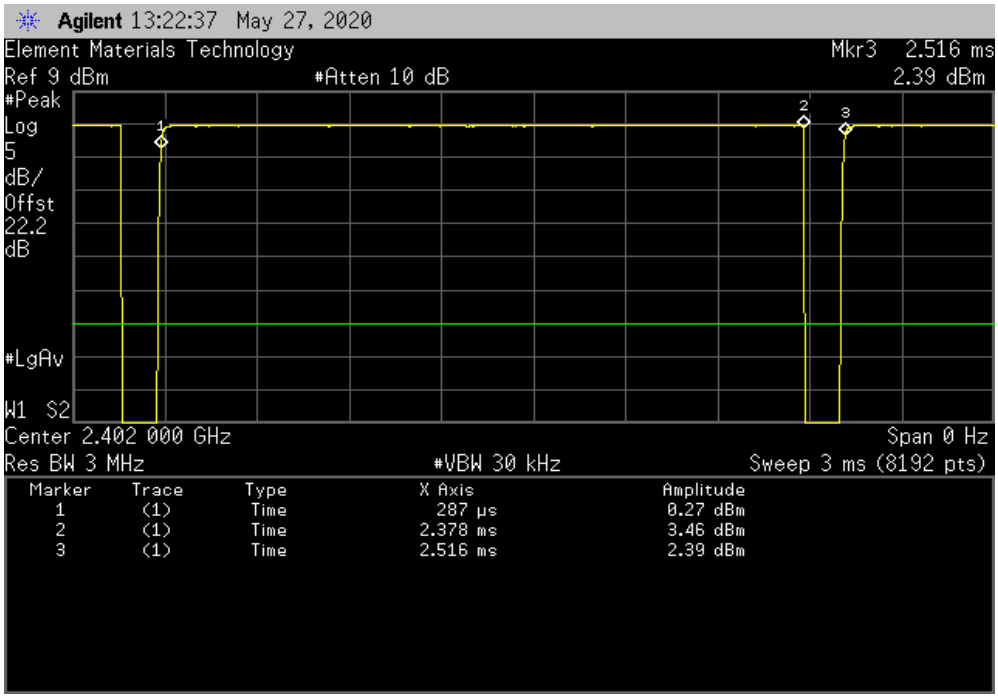
None

Configuration #	**2**	*Signature*

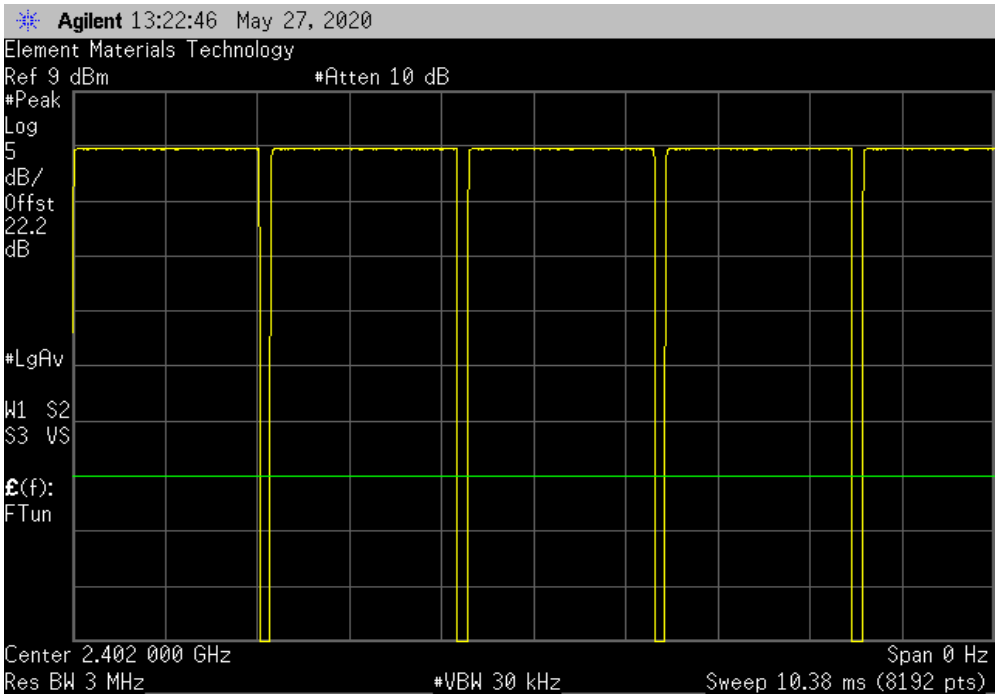
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	2.091 ms	2.229 ms	1	93.8	N/A	N/A
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	2.087 ms	2.225 ms	1	93.8	N/A	N/A
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK 1 Mbps High Channel, 2480 MHz	2.084 ms	2.223 ms	1	93.8	N/A	N/A
BLE/GFSK 1 Mbps High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.091 ms	2.229 ms	1	93.8	N/A	N/A

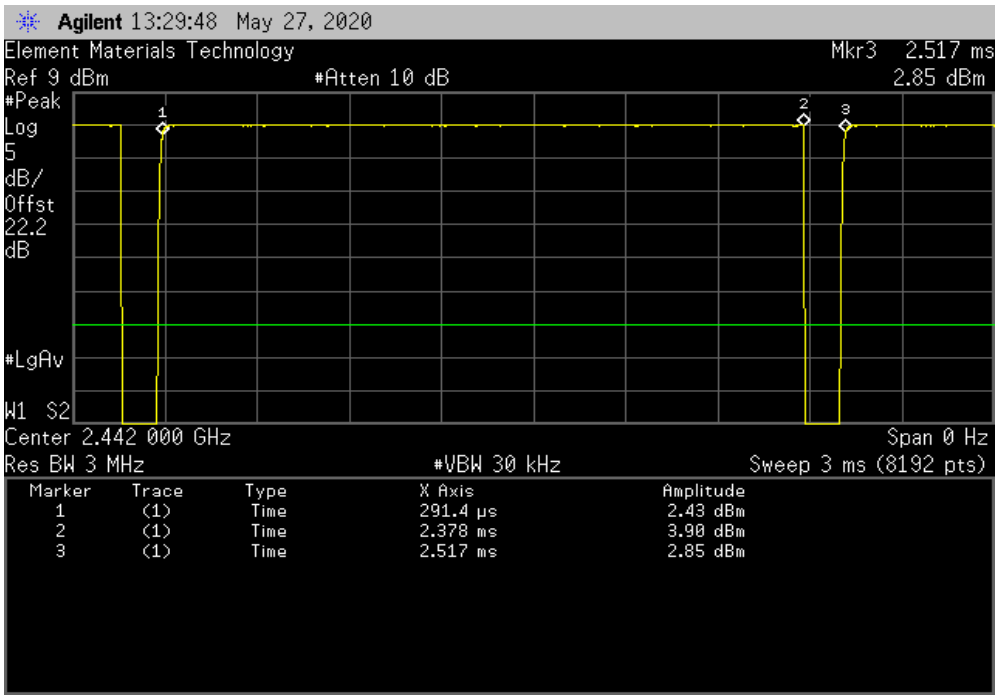


BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

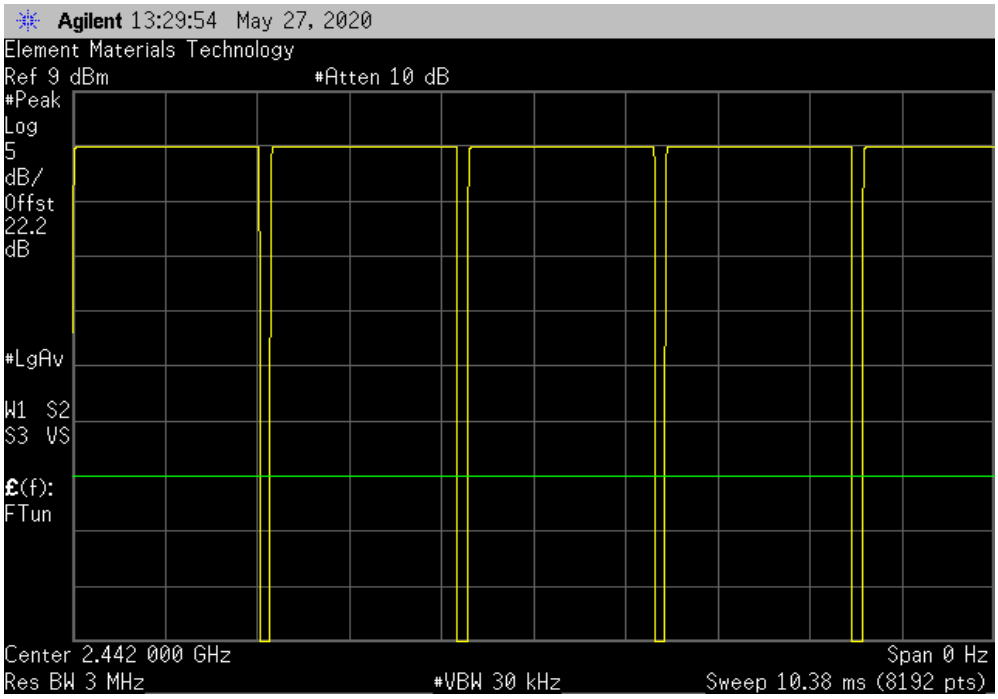


DUTY CYCLE

BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.087 ms	2.225 ms	1	93.8	N/A	N/A

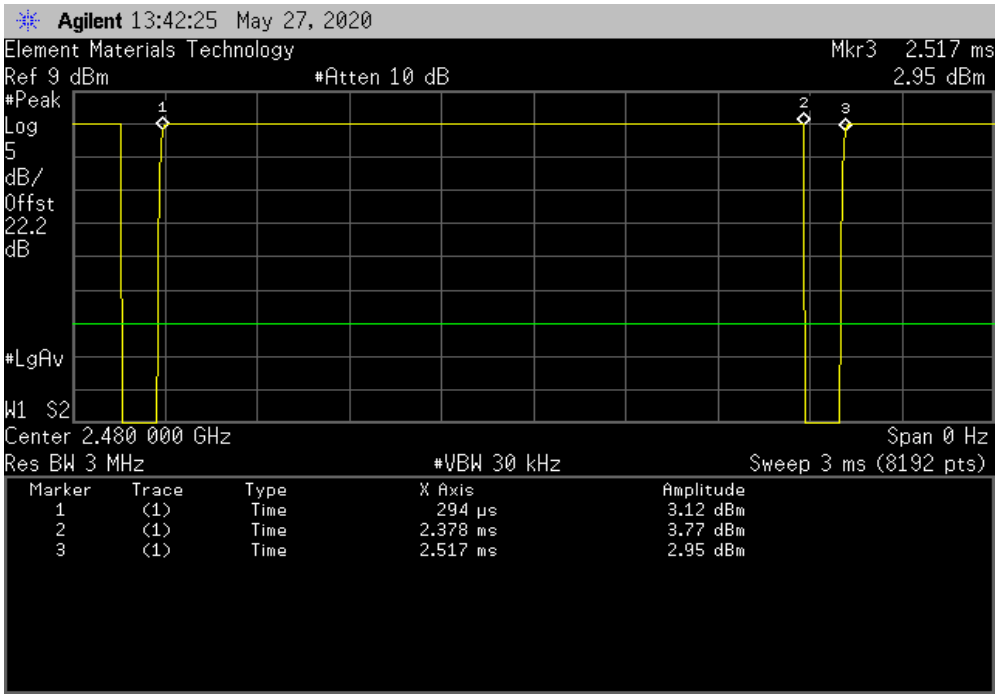


BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

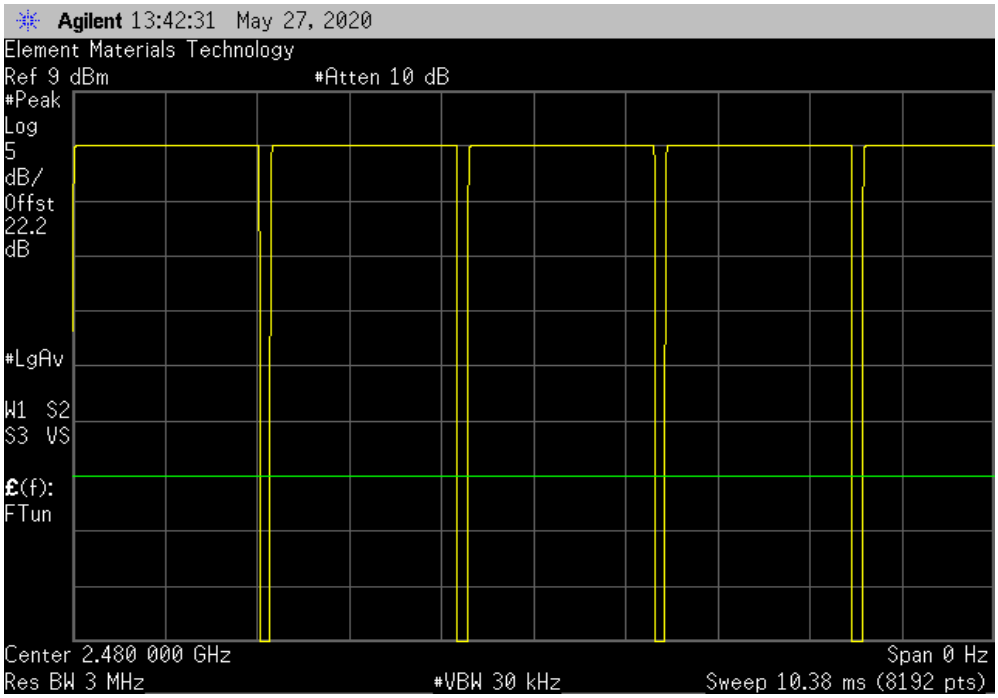


DUTY CYCLE

BLE/GFSK 1 Mbps High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.084 ms	2.223 ms	1	93.8	N/A	N/A



BLE/GFSK 1 Mbps 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 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

DEVIATIONS FROM TEST STANDARD

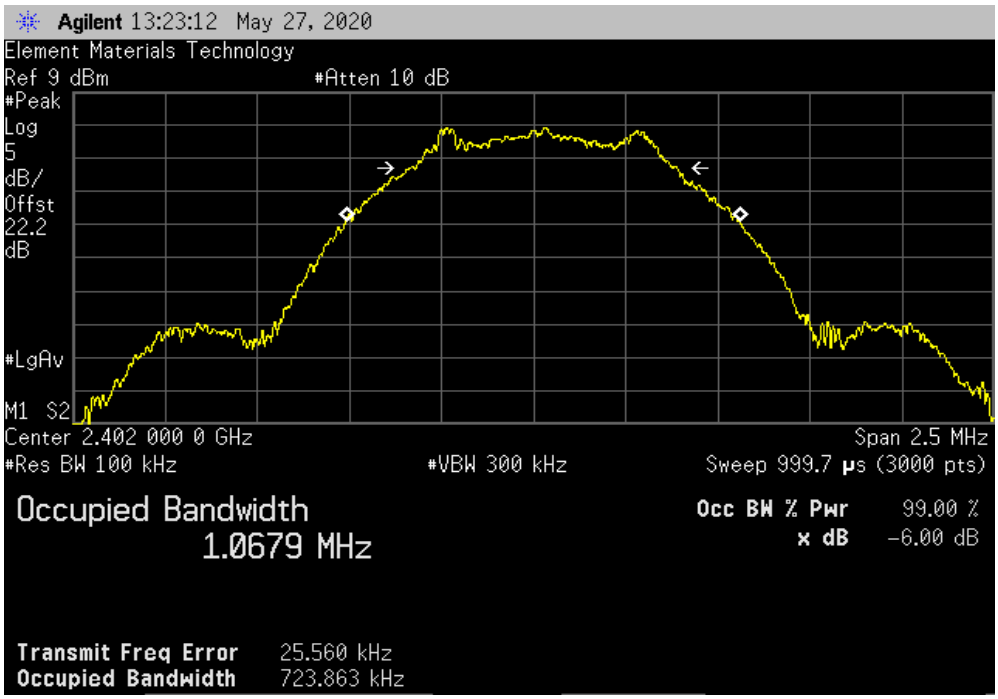
None

Configuration #	**2**	*Signature*

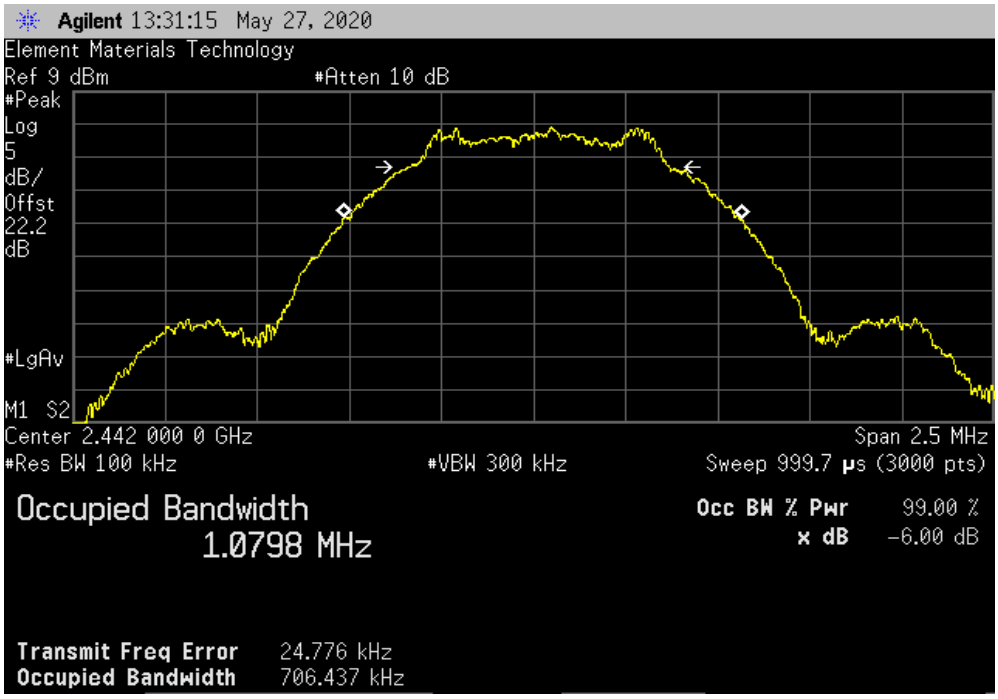
	Value	**Limit (≥)**	**Result**
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	723.863 kHz	500 kHz	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	706.437 kHz	500 kHz	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	721.085 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				723.863 kHz	500 kHz	Pass

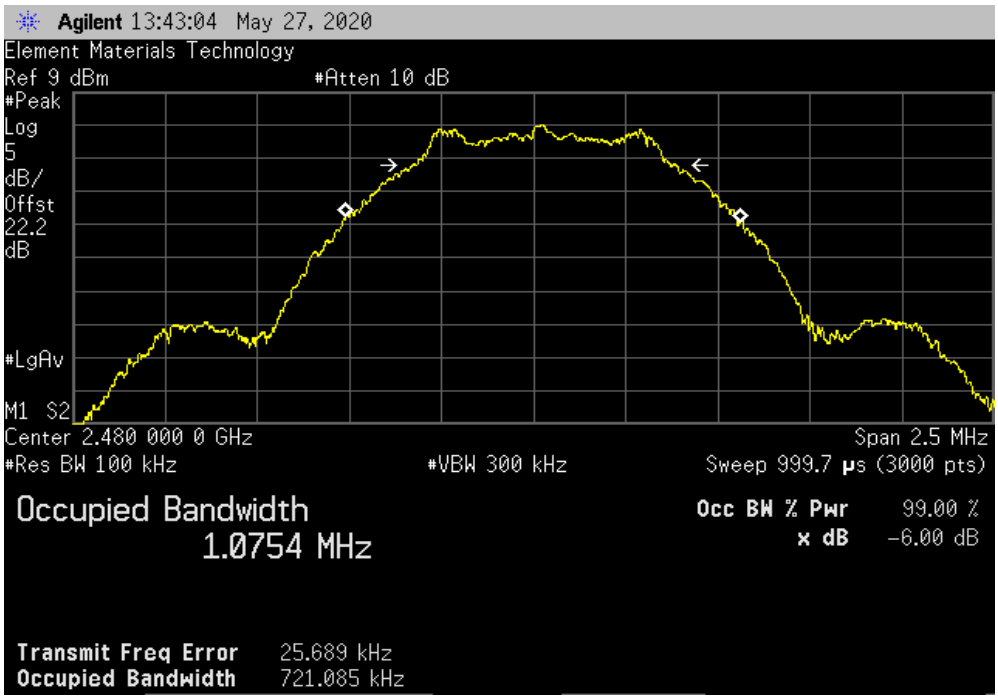


BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				706.437 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

BLE/GFSK 1 Mbps High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				721.085 kHz	500 kHz	Pass



OUTPUT POWER

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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

element

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

DEVIATIONS FROM TEST STANDARD

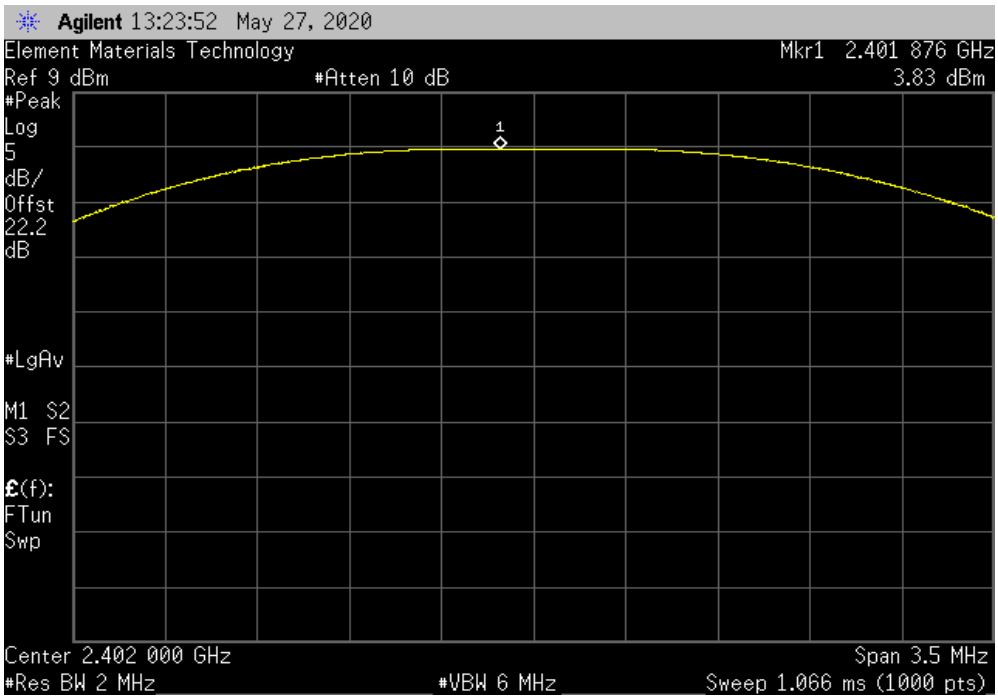
None

Configuration #	**2**	*Signature*

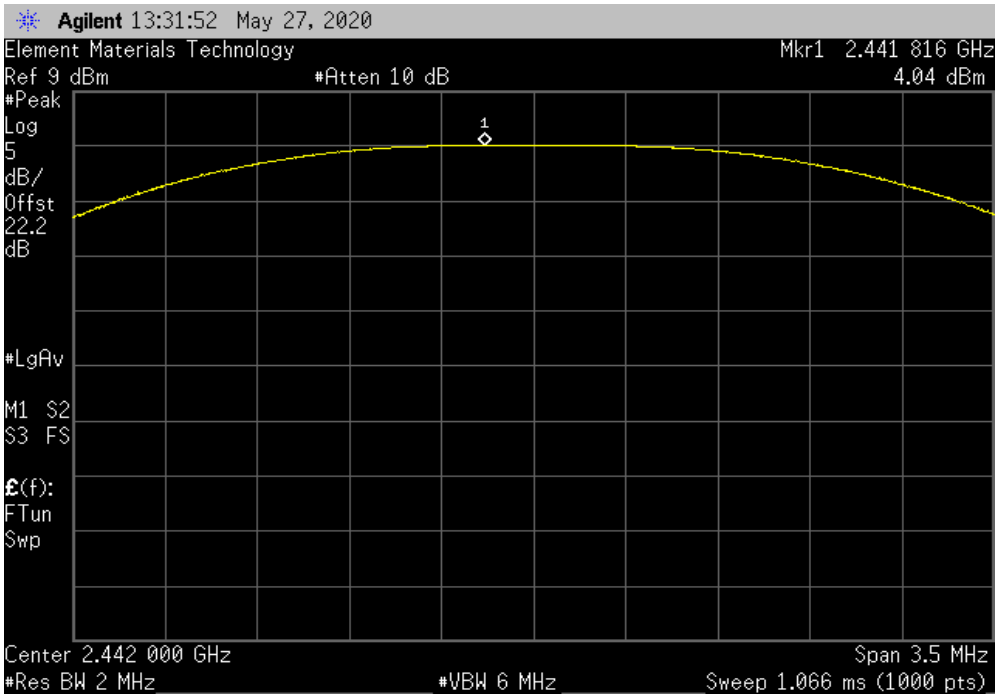
	Out Pwr (dBm)	**Limit (dBm)**	**Result**
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	3.833	30	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	4.041	30	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	4.144	30	Pass

OUTPUT POWER

BLE/GFSK 1 Mbps Low Channel, 2402 MHz							
					Out Pwr (dBm)	Limit (dBm)	Result
					3.833	30	Pass

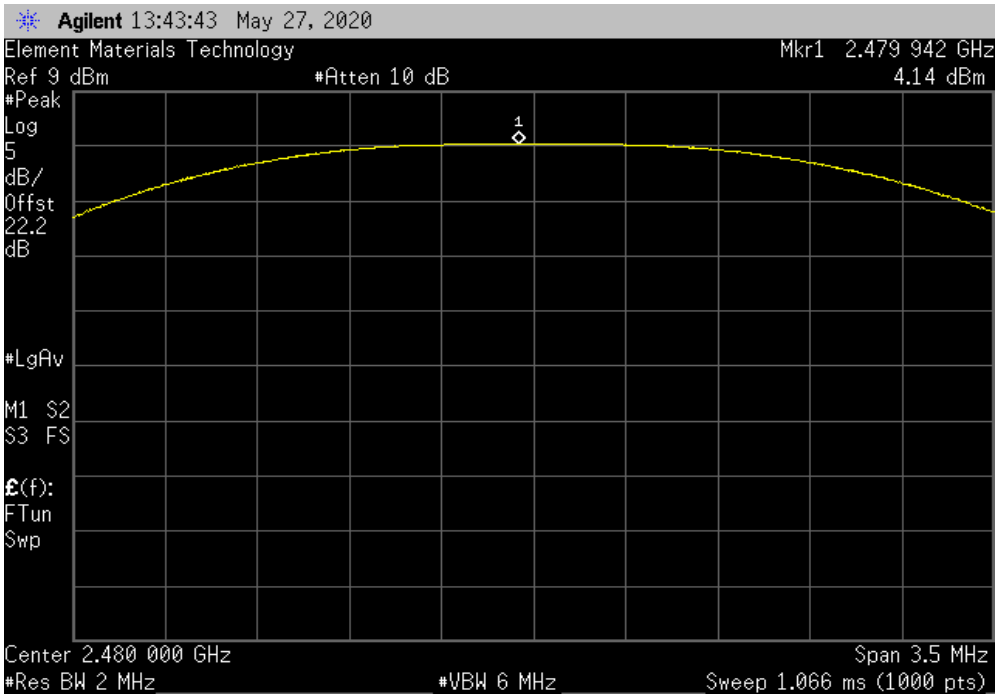


BLE/GFSK 1 Mbps Mid Channel, 2442 MHz							
					Out Pwr (dBm)	Limit (dBm)	Result
					4.041	30	Pass



OUTPUT POWER

BLE/GFSK 1 Mbps High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.144	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB. Antenna gain provided by the client (determined under MASI0640).

DEVIATIONS FROM TEST STANDARD

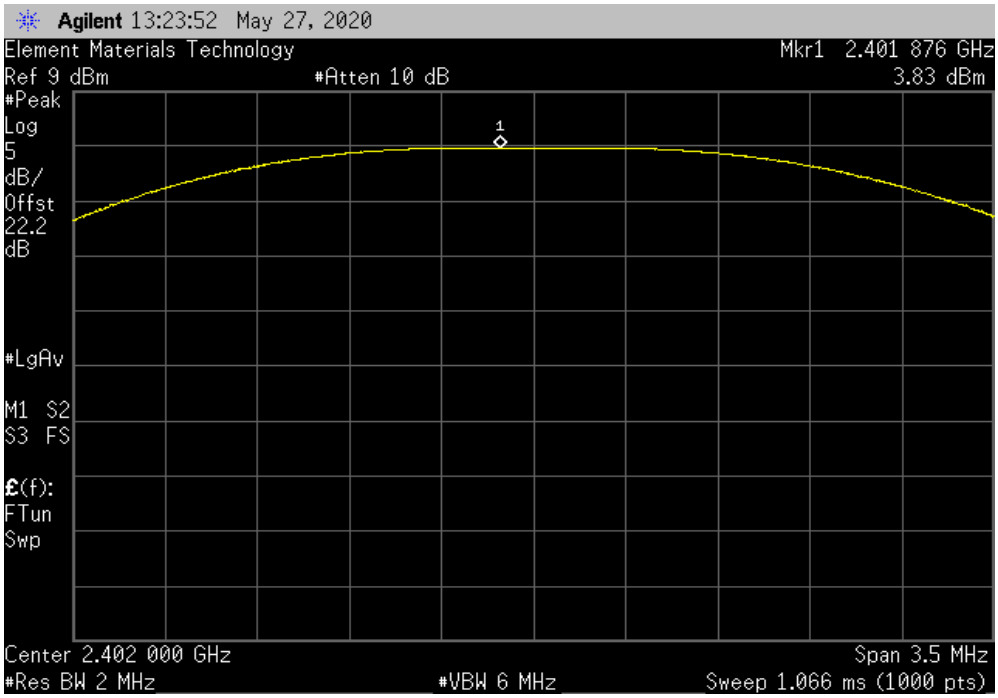
None

Configuration #	**2**	*Signature*

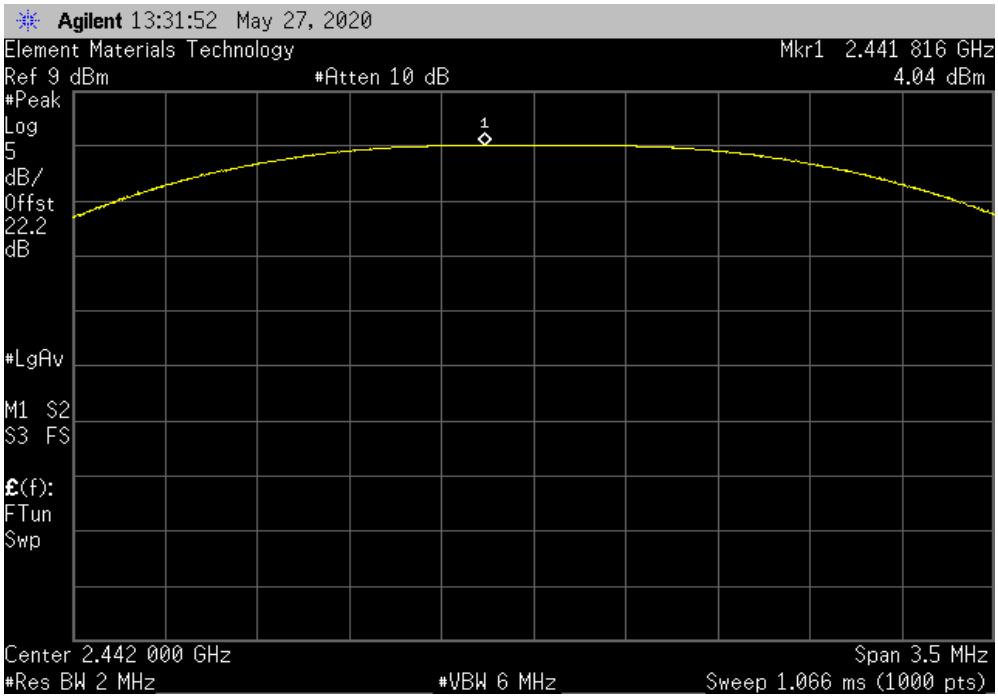
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	3.833	1.99	5.823	36	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	4.041	1.99	6.031	36	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	4.144	1.99	6.134	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		3.833	1.99	5.823	36	Pass



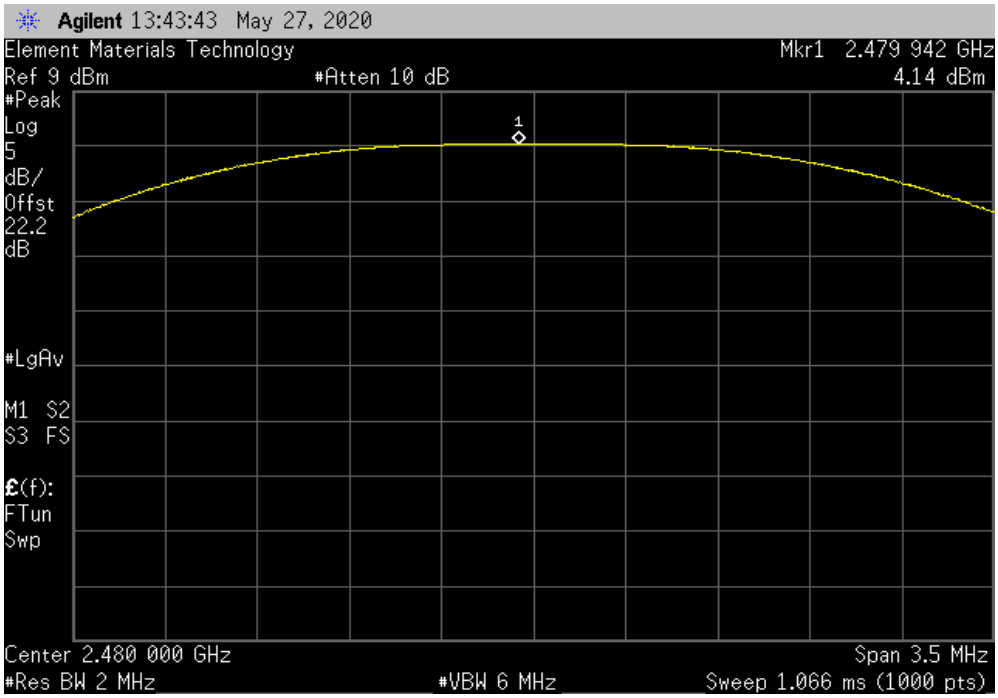
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		4.041	1.99	6.031	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2019.08.30.0 XMit 2020.03.25.0

BLE/GFSK 1 Mbps High Channel, 2480 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		4.144	1.99	6.134	36	Pass



POWER SPECTRAL DENSITY

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-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

TbtTx 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

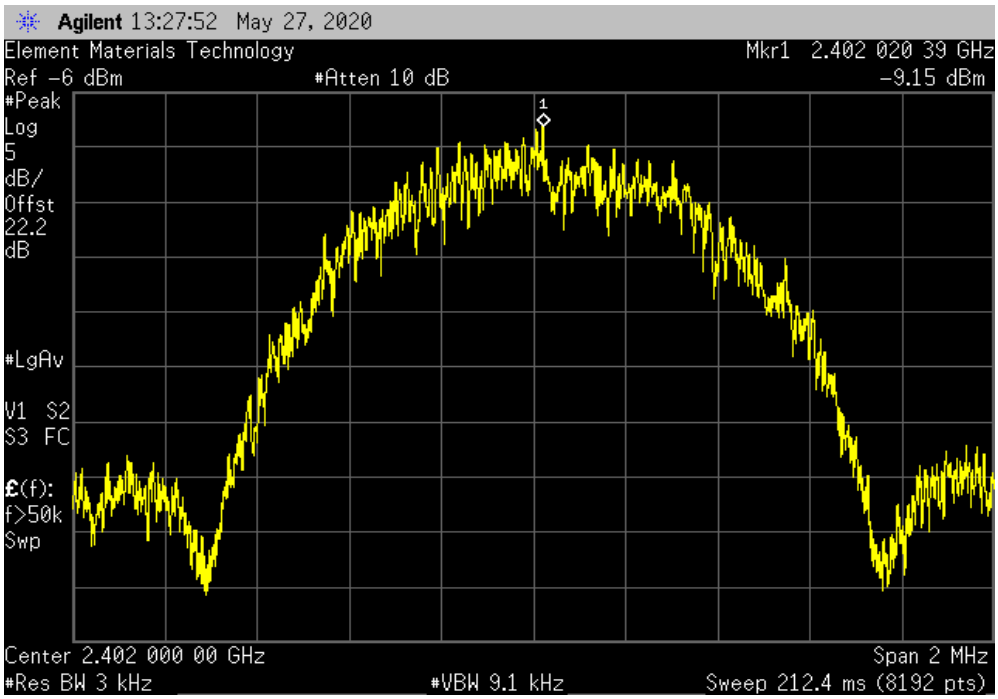
DEVIATIONS FROM TEST STANDARD

None

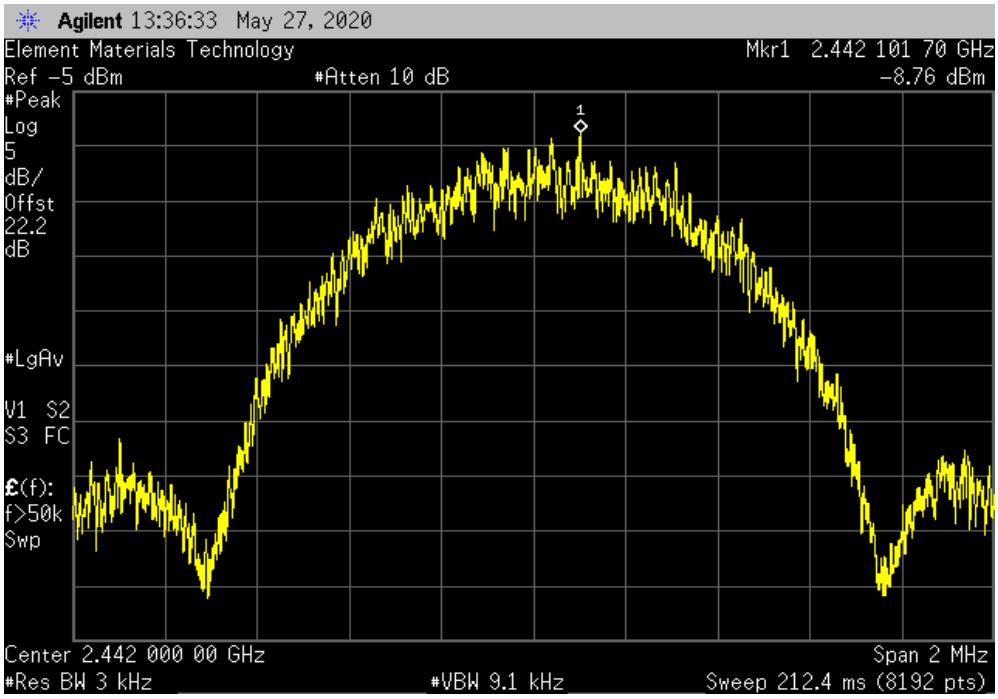
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	-9.151	8	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	-8.761	8	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	-8.059	8	Pass

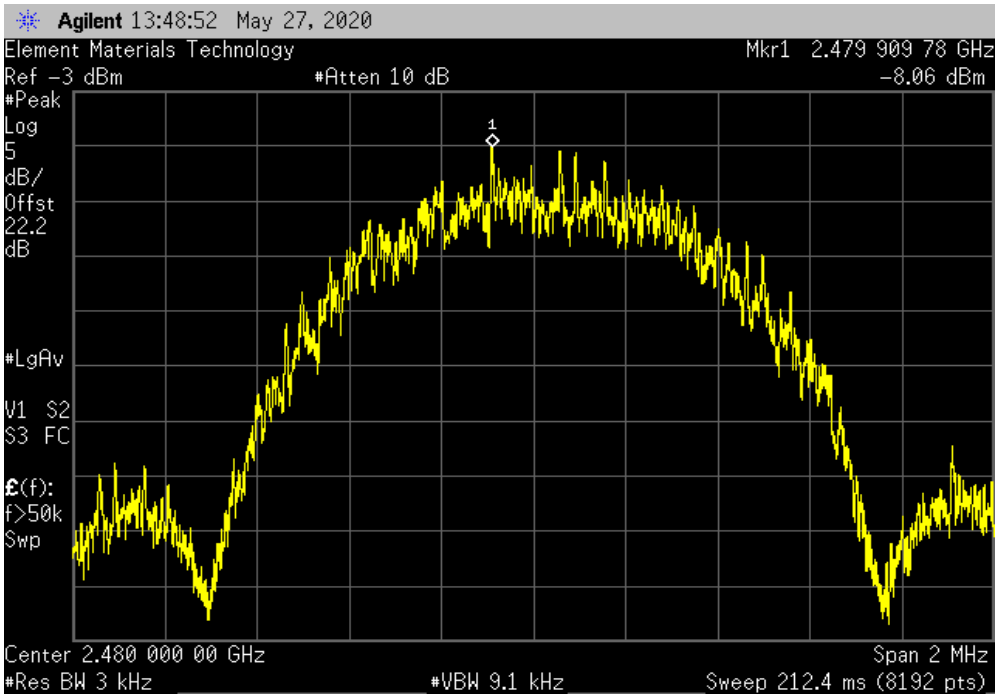
BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-9.151	8	Pass



BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.761	8	Pass



BLE/GFSK 1 Mbps High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.059	8	Pass



BAND EDGE COMPLIANCE

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-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 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

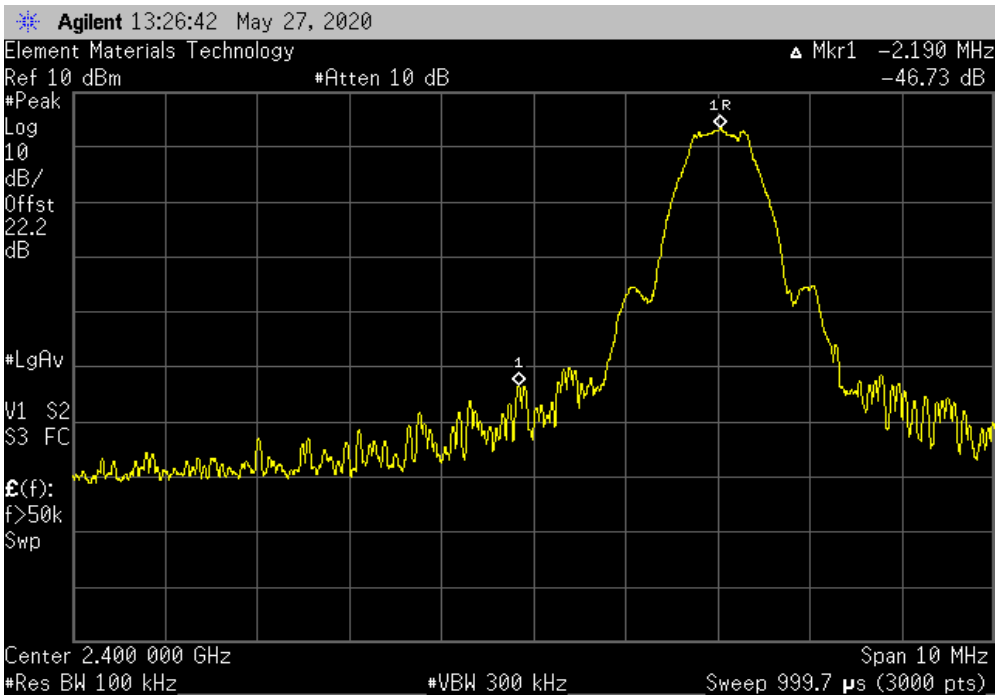
DEVIATIONS FROM TEST STANDARD

None

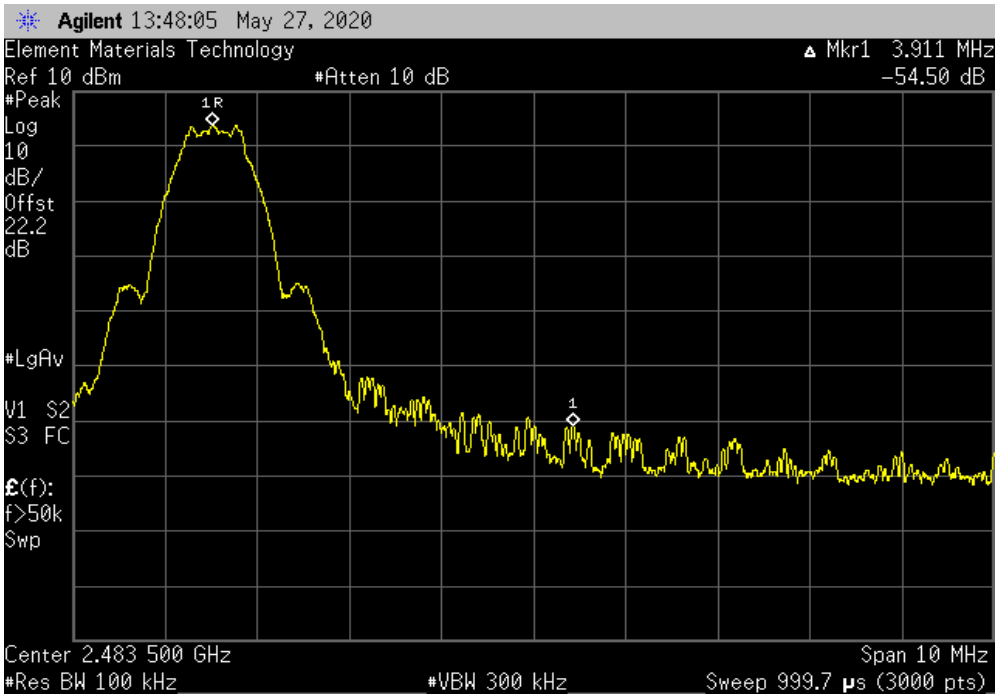
Configuration #	**2**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	-46.73	-20	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	-54.5	-20	Pass

BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.73	-20	Pass



BLE/GFSK 1 Mbps High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-54.5	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.03.25.0

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	Micro-Coax	UFD150A-1-0720-200200	OCA	4-May-20	4-May-21
Attenuator	Fairview Microwave	SA18E-20	TKS	22-Jan-20	22-Jan-21
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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 2019.08.30.0 XMit 2020.03.25.0

EUT:	**Radius T°**			**Work Order:**	**MASI0638**
Serial Number:	**ENG-2**			**Date:**	**27-May-20**
Customer:	**Masimo Corporation**			**Temperature:**	**25.6 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Mark Baytan**	**Power:**	**3.3 VDC via FTDI USB Cable**	**Job Site:**	**OC13**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2020	ANSI C63.10:2013

COMMENTS

Reference level offset: DC Block + 20dB Attenuator + RF Cable = 22.17 dB

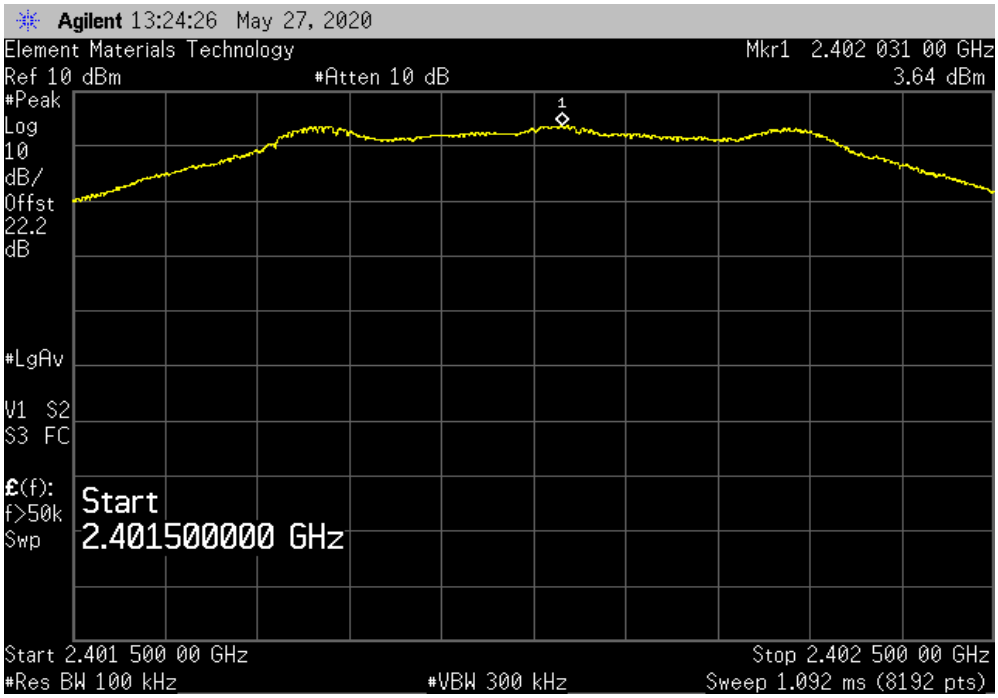
DEVIATIONS FROM TEST STANDARD

None

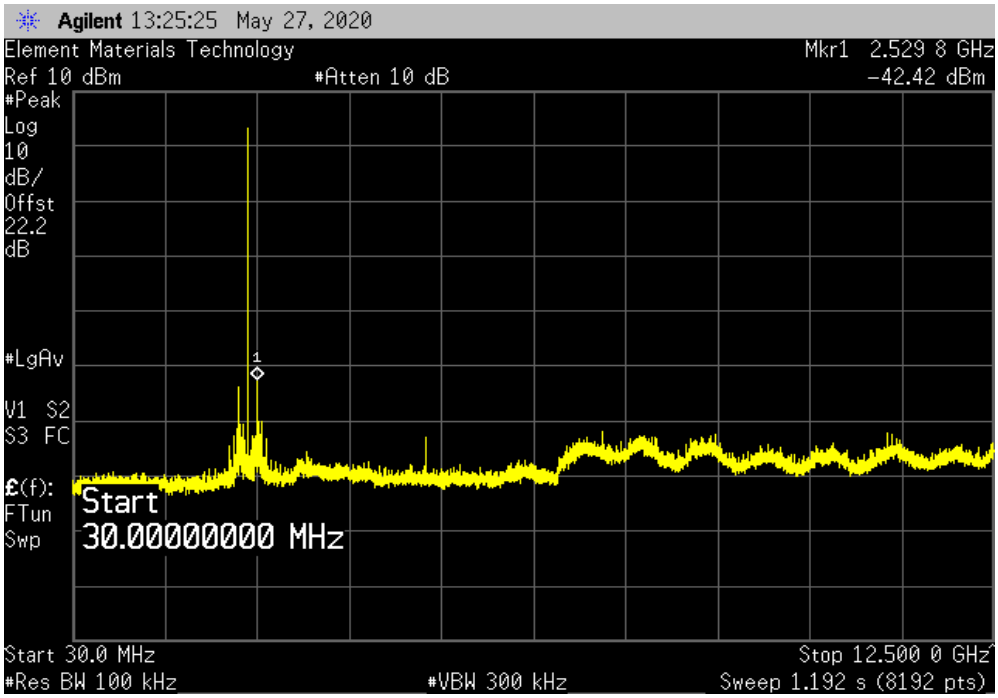
Configuration #	**2**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	Fundamental	2402.03	N/A	N/A	N/A
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	30 MHz - 12.5 GHz	2529.8	-46.06	-20	Pass
BLE/GFSK 1 Mbps Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24664.3	-50.49	-20	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	Fundamental	2442.03	N/A	N/A	N/A
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	2569.4	-45.45	-20	Pass
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	24777.2	-50.91	-20	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	Fundamental	2480.02	N/A	N/A	N/A
BLE/GFSK 1 Mbps High Channel, 2480 MHz	30 MHz - 12.5 GHz	2607.4	-46.1	-20	Pass
BLE/GFSK 1 Mbps High Channel, 2480 MHz	12.5 GHz - 25 GHz	24772.6	-50.94	-20	Pass

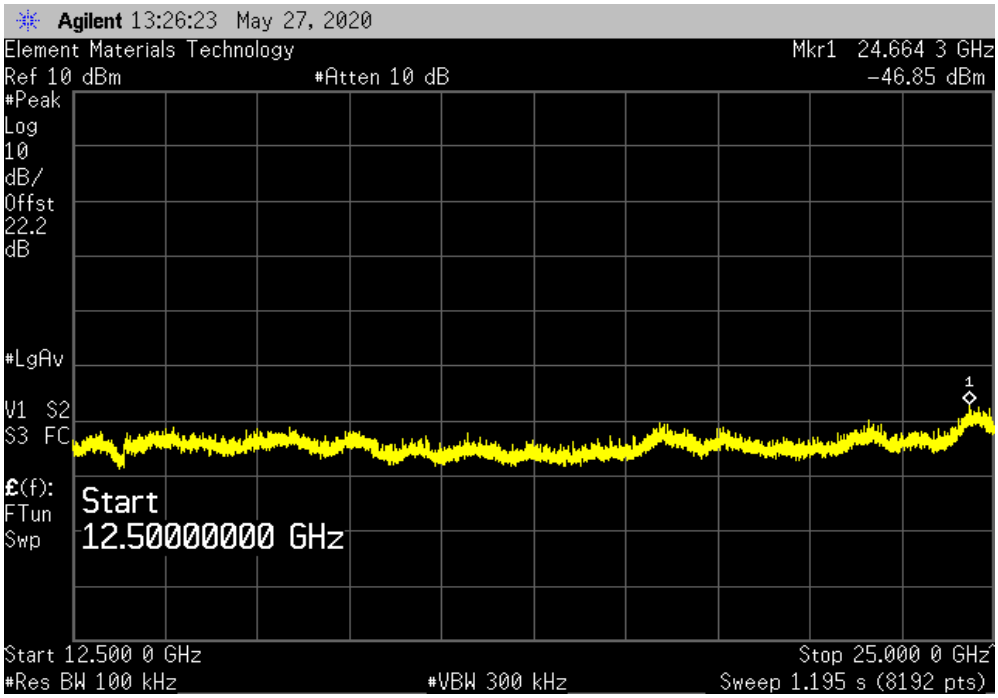
BLE/GFSK 1 Mbps Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2402.03	N/A	N/A	N/A



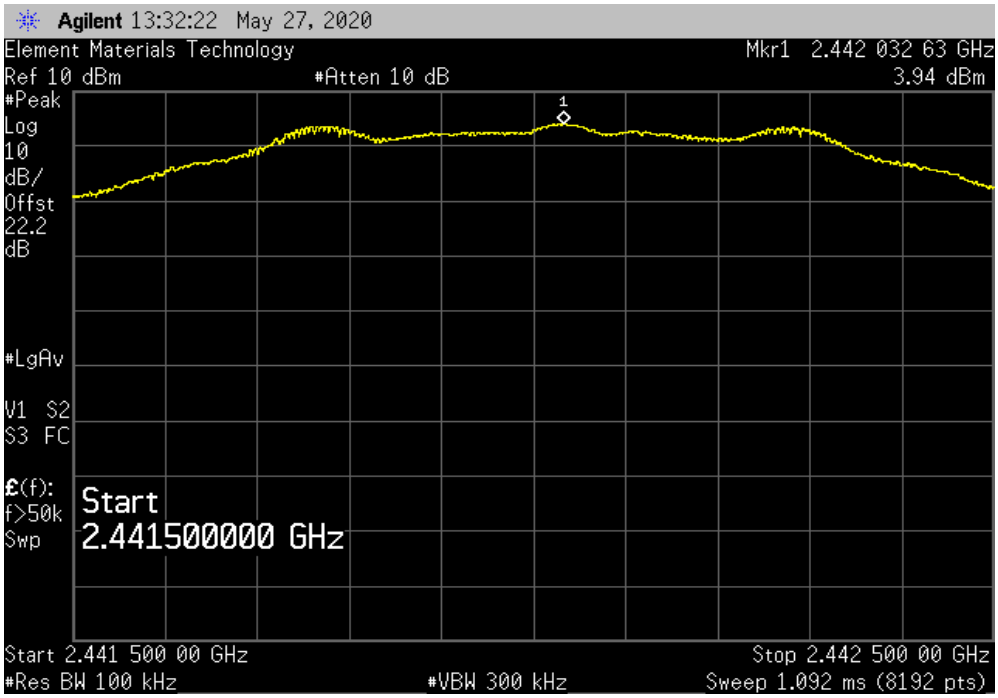
BLE/GFSK 1 Mbps Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	2529.8	-46.06	-20	Pass



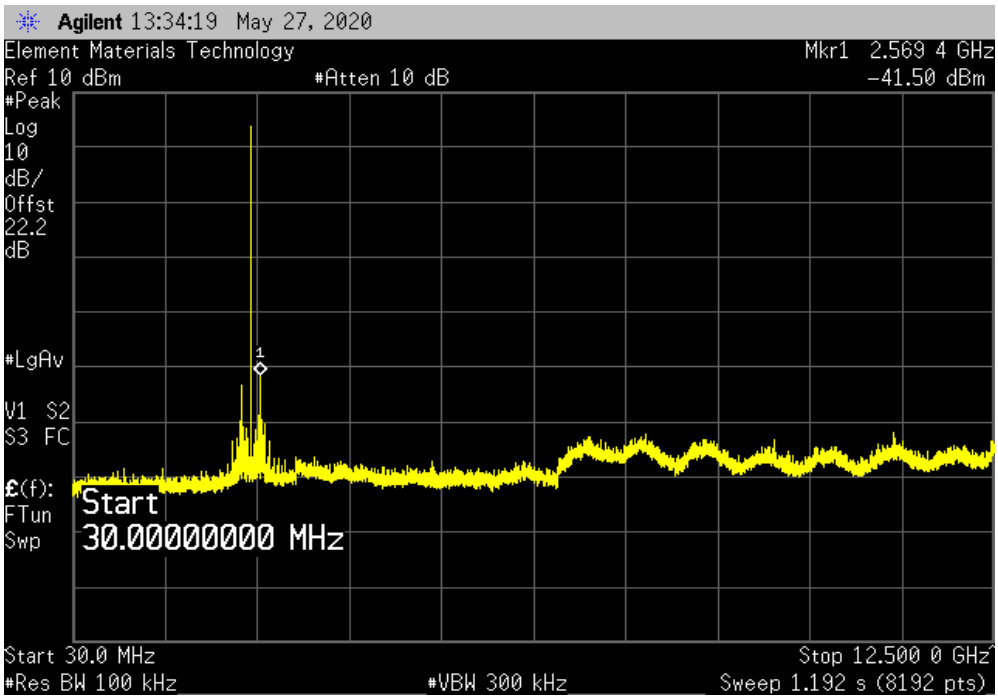
BLE/GFSK 1 Mbps Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24664.3	-50.49	-20	Pass



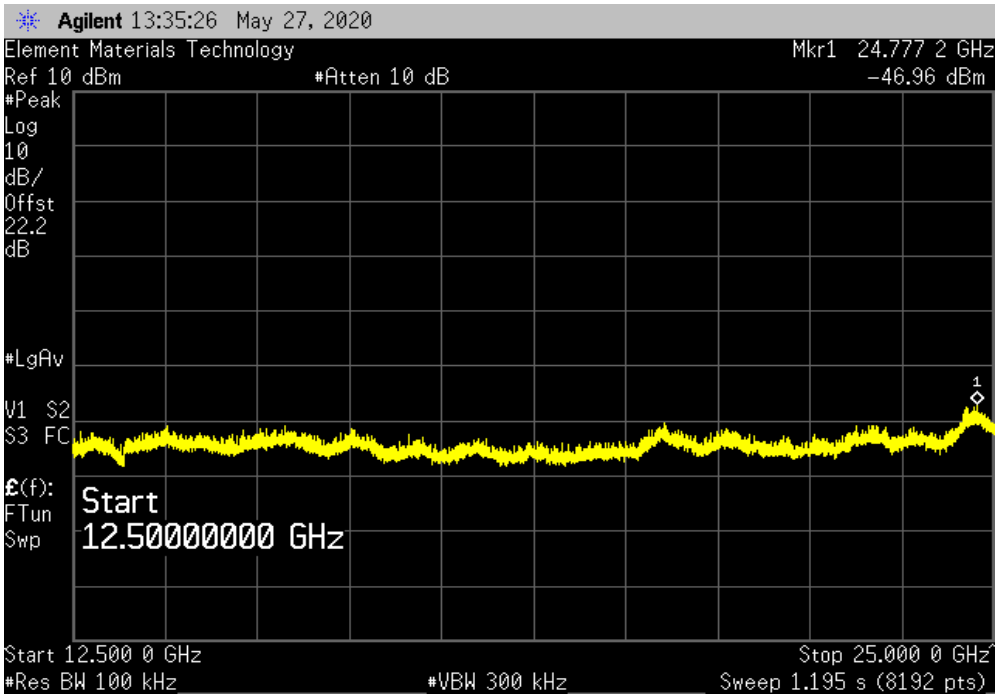
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2442.03	N/A	N/A	N/A



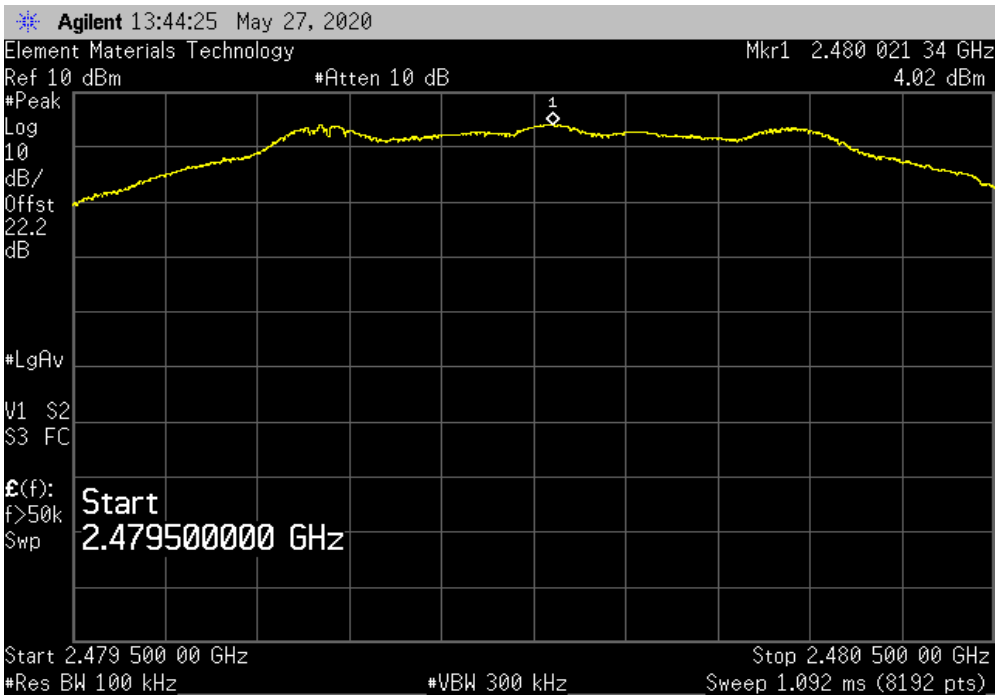
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz	2569.4	-45.45	-20	Pass



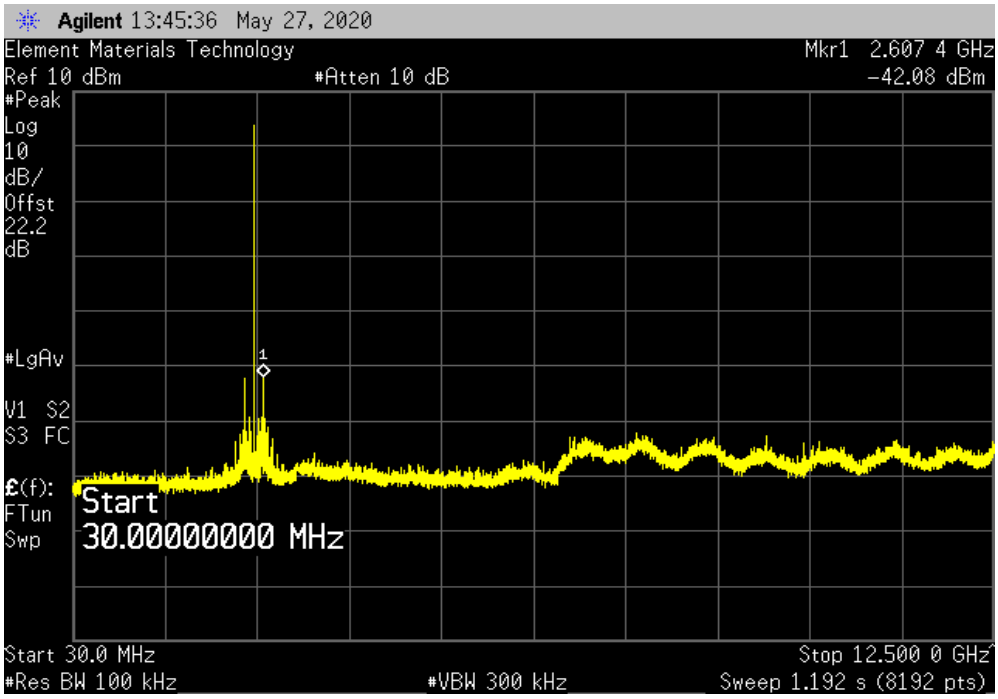
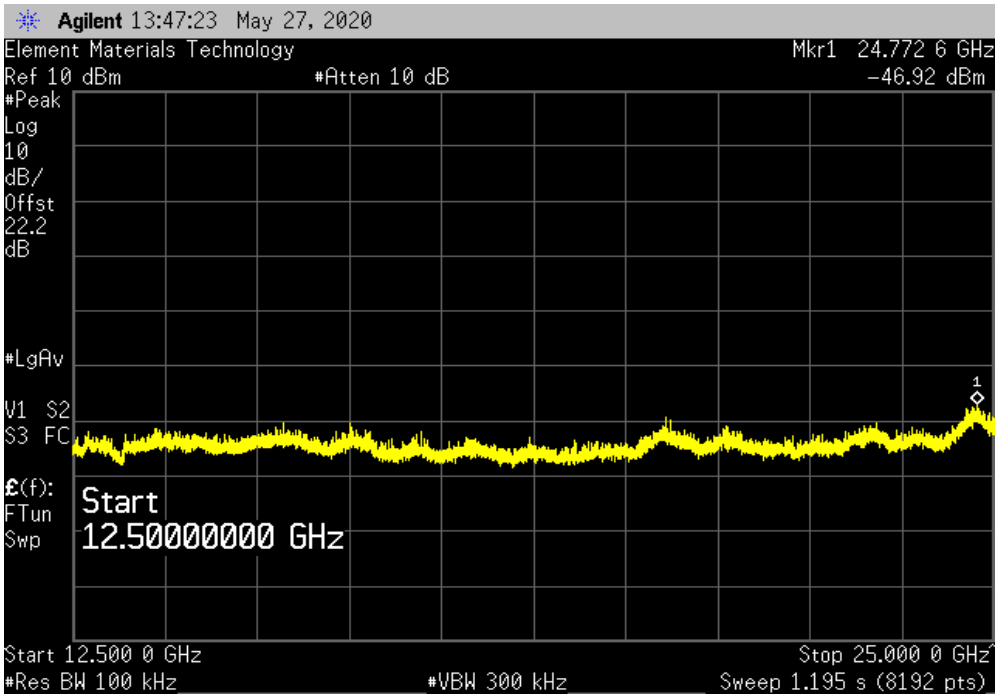
BLE/GFSK 1 Mbps Mid Channel, 2442 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	24777.2	-50.91	-20	Pass



BLE/GFSK 1 Mbps High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.02	N/A	N/A	N/A



BLE/GFSK 1 Mbps High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	2607.4	-46.1	-20	Pass



BLE/GFSK 1 Mbps High Channel, 2480 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	24772.6	-50.94	-20	Pass