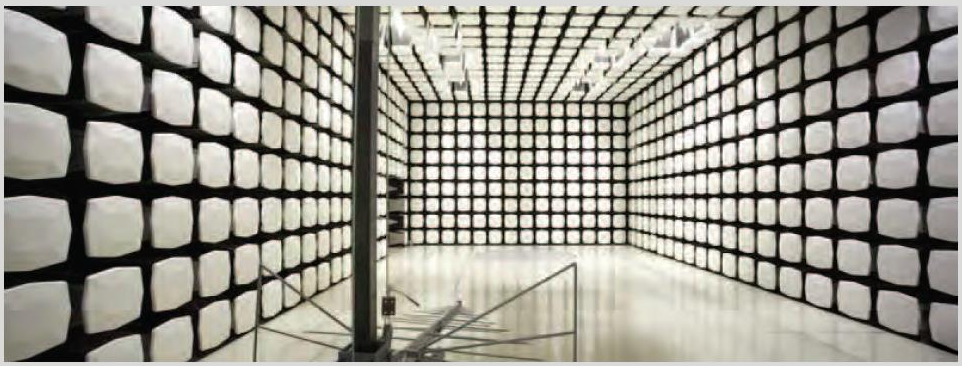
Masimo Corporation

AIR01 Technology Board

FCC 15.247:2018

Bluetooth Low Energy (DTS) Radio

Report # MASI0520.2 Rev. 1



NVLAP LAB CODE: 200676-0

CERTIFICATE OF TEST

Last Date of Test: November 30, 2018
Masimo Corporation
Model: AIR01 Technology Board

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2018	ANSI C63.10:2013

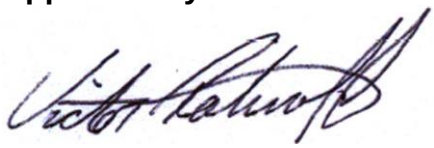
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
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	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated 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
01	Spurious Radiated Emissions: - reformatted so test description is not cut off - duty cycle correction factor needs to be applied to the average measurements that are temporally related to the fundamental. The duty cycle measurement indicates that the EUT operated at a 93% duty cycle.	2019-11-24	23 and 24
	Added output power module based upon the EIRP values. The reported antenna gain for the radio is 1 dBi.	2019-11-24	43-47
	Added output power to certificate of test and modifications pages	2019-11-24	2 and 10

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). Certification chambers and Open Area Test Sites are filed with ISED.

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

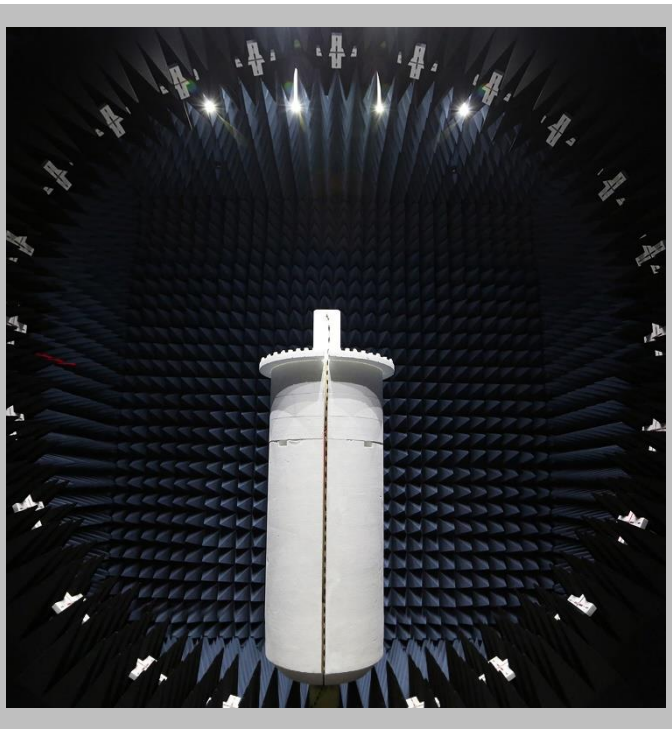
MIC – Recognized by MIC as a CAB for the acceptance of test data.

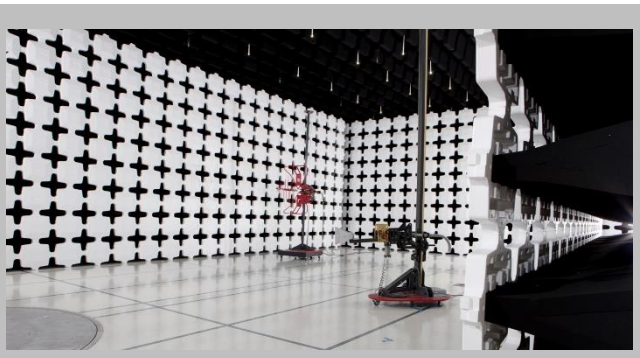
SCOPE

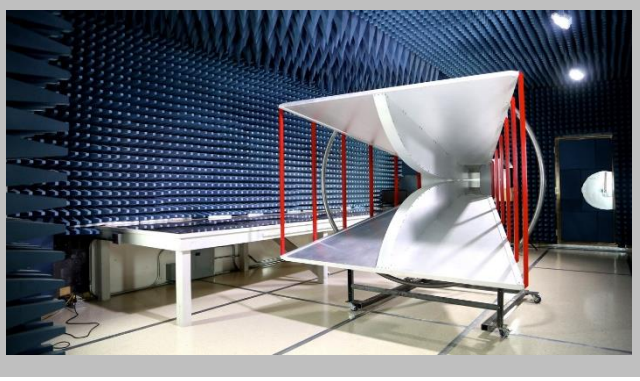
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	New York	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 NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	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: 200761-0	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	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







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.

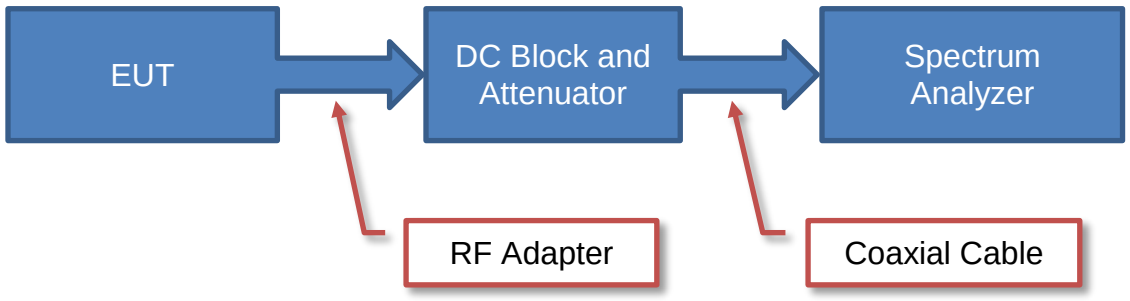
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

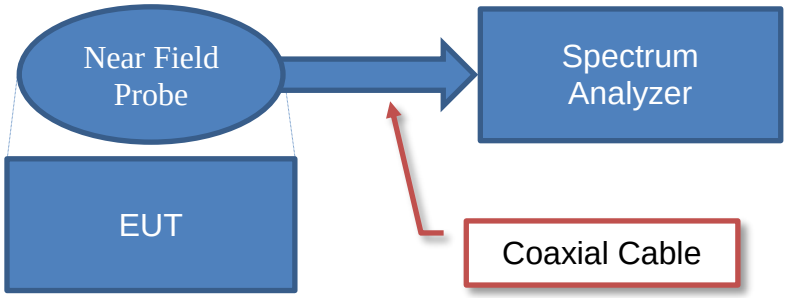
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

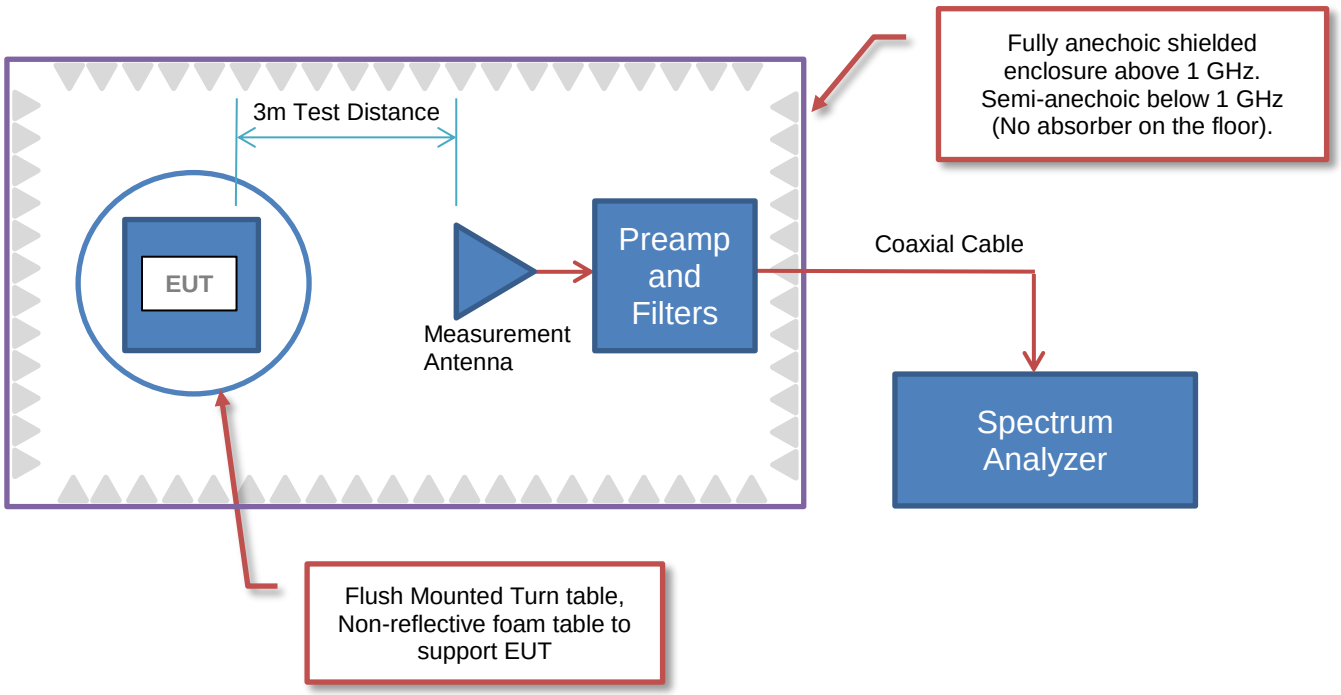
Antenna Port Conducted Measurements



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:	AIR01 Technology Board
First Date of Test:	November 29, 2018
Last Date of Test:	November 30, 2018
Receipt Date of Samples:	November 29, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
AIR01 Technology Board snaps on to sensor (no cable). This assembly of AIR01 Technology Board and sensor is battery powered. This assembly connects to AIR01 Receiver over Bluetooth LE. AIR01 Receiver has a cable (less than 0.3 m) that connects to the patient port of Rad-97.

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

Channels	Power Setting	Data Rate	Modulation
Low	+8 dBm	1 Mbps	GFSK
Middle	+8 dBm	1 Mbps	GFSK
High	+8 dBm	1 Mbps	GFSK

CONFIGURATIONS

Configuration MASI0520- 1

Software/Firmware Running during test	
Description	**Version**
AIR01 Technology Board	V0001

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AIR01 Technology Board	Masimo Corporation	P/N 26842 Rev. A	ENG-R-1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop (HP)	HP	X3U21AV	5CG8271JH4
Power supply	HP	TPN-CA06	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	No	2m	No	AIR01 Technology Board	Laptop (HP)
AC cable	No	.5m	No	AC Mains	Power supply
DC Cable	No	2m	No	Power supply	Laptop (HP)

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-11-29	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	2018-11-29	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	2018-11-29	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.
4	2018-11-30	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	2018-11-30	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	2018-11-30	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	2018-11-30	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	2018-11-30	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE

XMit 2017.12.13

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
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-18	6-Sep-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-18	6-Sep-19
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-18	28-Mar-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	13-Jun-18	13-Jun-19

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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 2018.09.13 XMit 2017.12.13

EUT:	**AIR01 Technology Board**			**Work Order:**	**MASI0520**
Serial Number:	**ENG-R-1**			**Date:**	**29-Nov-18**
Customer:	**Masimo Corporation**			**Temperature:**	**20.3 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**56.4% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**OC10**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Total offset accounts for Antenna Gain, Cable Loss, 20dB Attenuator, and Pre-Amp Gain. Low Ch - 22.9dB, Mid Ch - 22.9dB, & High Ch - 23.1dB
EUT Worst Case Orientation = Horizontal

DEVIATIONS FROM TEST STANDARD

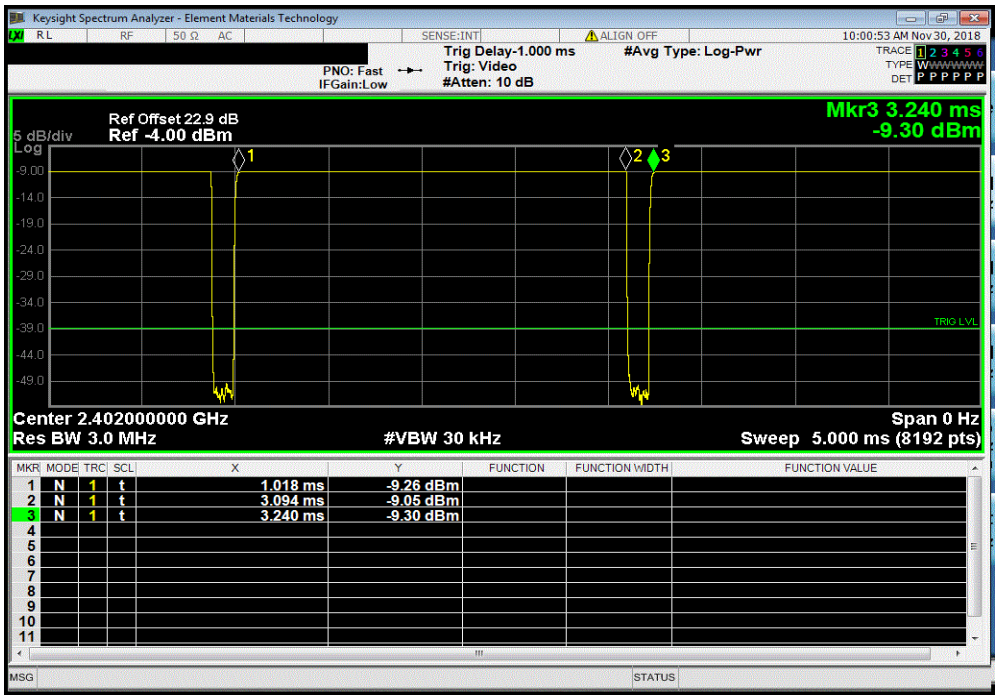
None

Configuration #	**1**	*Signature*

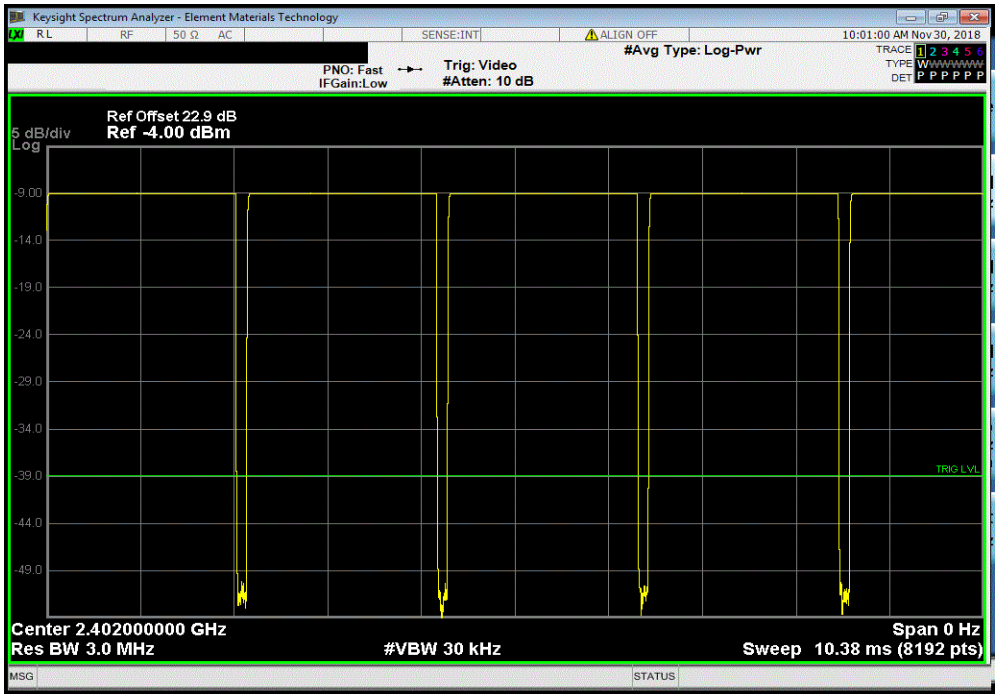
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	2.076 ms	2.222 ms	1	93.4	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	2.078 ms	2.224 ms	1	93.4	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	2.080 ms	2.234 ms	1	93.1	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
	2.076 ms	2.222 ms	1	93.4	N/A	N/A

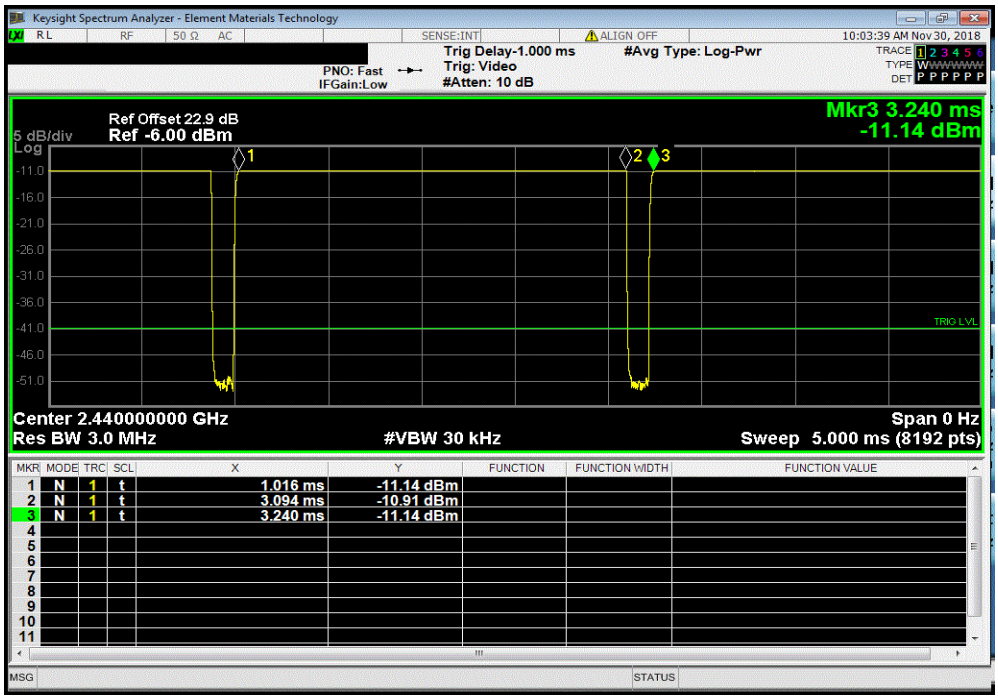


BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

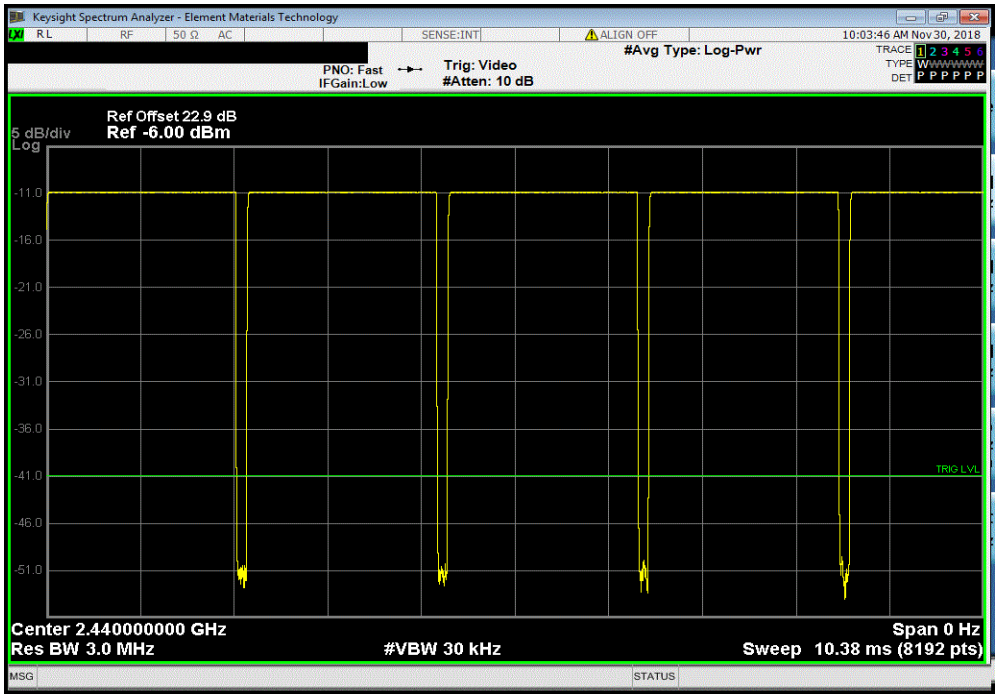


DUTY CYCLE

BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.078 ms	2.224 ms	1	93.4	N/A	N/A

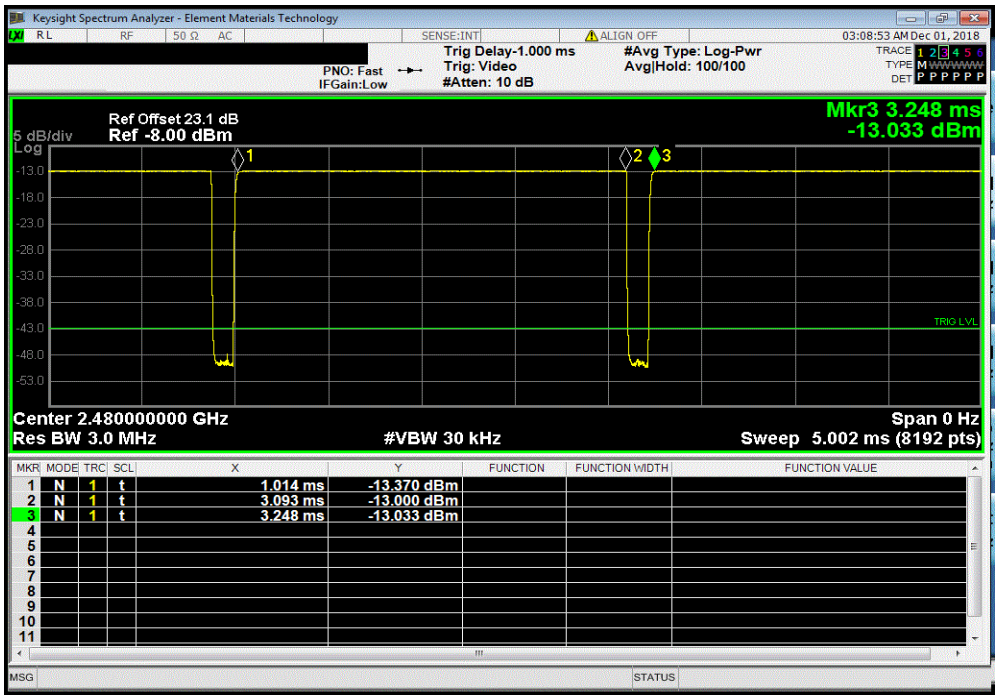


BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

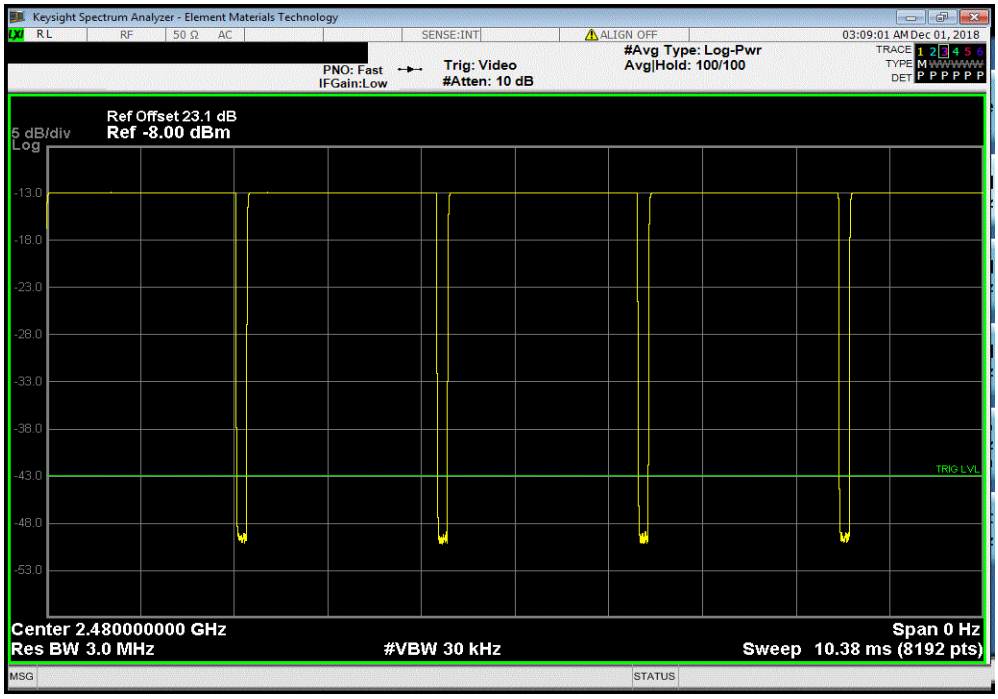


DUTY CYCLE

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.080 ms	2.234 ms	1	93.1	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 2017.12.13

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
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-18	6-Sep-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-18	6-Sep-19
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-18	28-Mar-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	13-Jun-18	13-Jun-19

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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 2017.12.13

EUT:	**AIR01 Technology Board**			**Work Order:**	**MASI0520**
Serial Number:	**ENG-R-1**			**Date:**	**29-Nov-18**
Customer:	**Masimo Corporation**			**Temperature:**	**20.3 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**56.4% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**OC10**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Total offset accounts for Antenna Gain, Cable Loss, 20dB Attenuator, and Pre-Amp Gain. Low Ch - 22.9dB, Mid Ch - 22.9dB, & High Ch - 23.1dB
EUT Worst Case Orientation = Horizontal

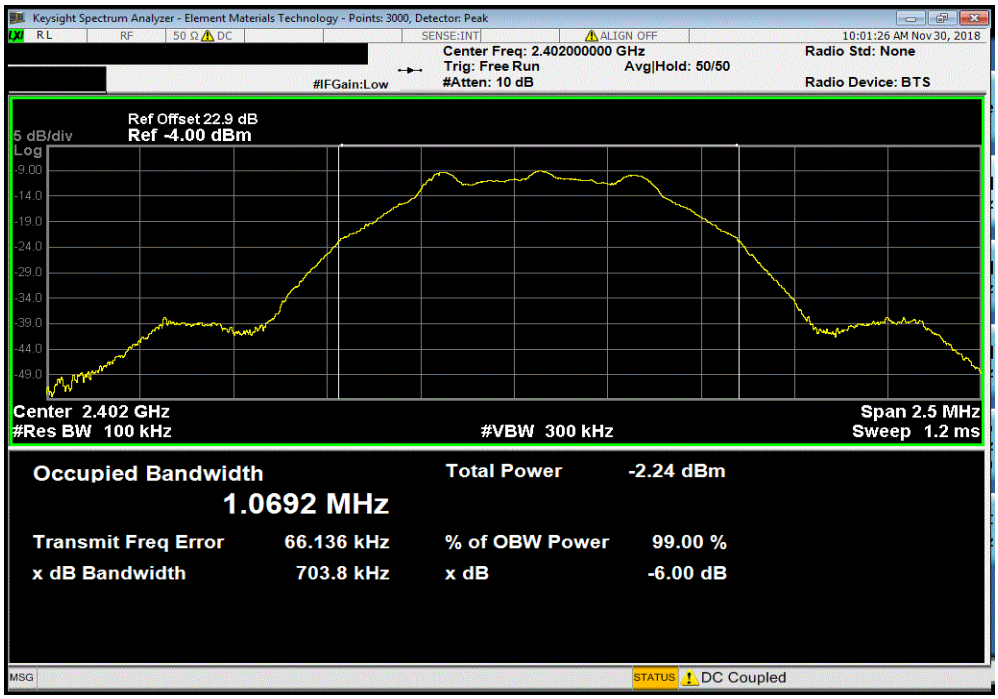
DEVIATIONS FROM TEST STANDARD

None

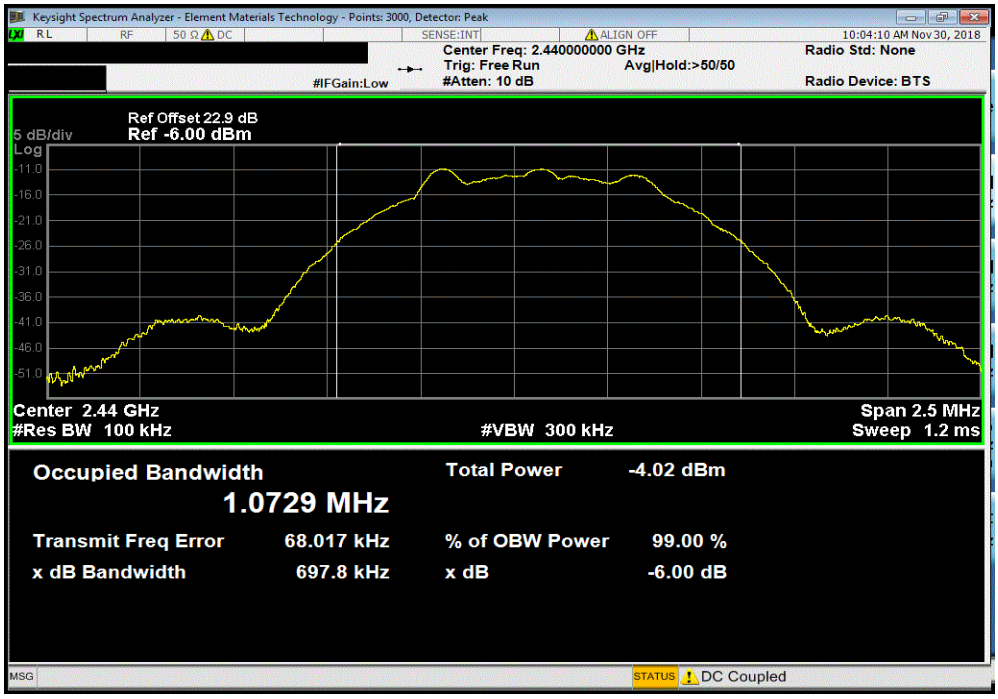
Configuration #	**1**	*Signature*

	Value	**Limit (≥)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	703.808 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2440 MHz	697.815 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	715.389 kHz	500 kHz	Pass

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



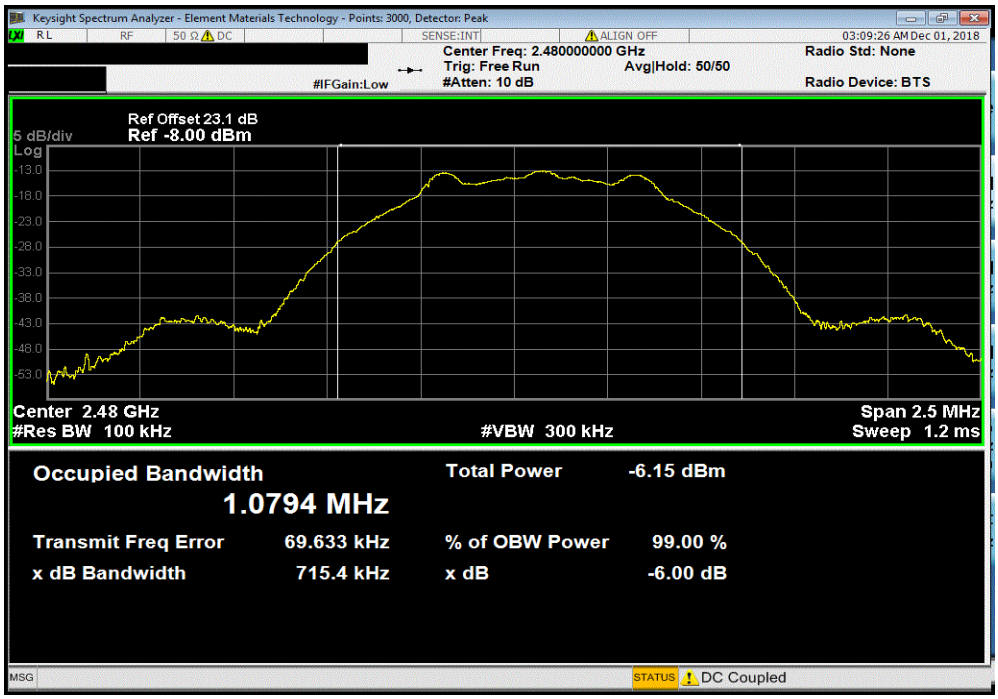
BLE/GFSK Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				697.815 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2018.09.13 XMit 2017.12.13

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



EQUIVALENT ISOTROPIC RADIATED POWER

PSA-ESCI 2018.07.27

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 at 2402 MHz, 2440 MHz, & 2480 MHz

POWER SETTINGS INVESTIGATED

USB via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MASI0520 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	2400 MHz	Stop Frequency	2483.5 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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	20-Nov-2018	12 mo
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-2018	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-2018	12 mo
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-2018	24 mo

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. A field strength measurement was made of the fundamental with the carrier fully maximized for its highest radiated power.

The final data was converted from field strength to a radiated power value using equations found in ANSI C63.10:2013 Annex G.2

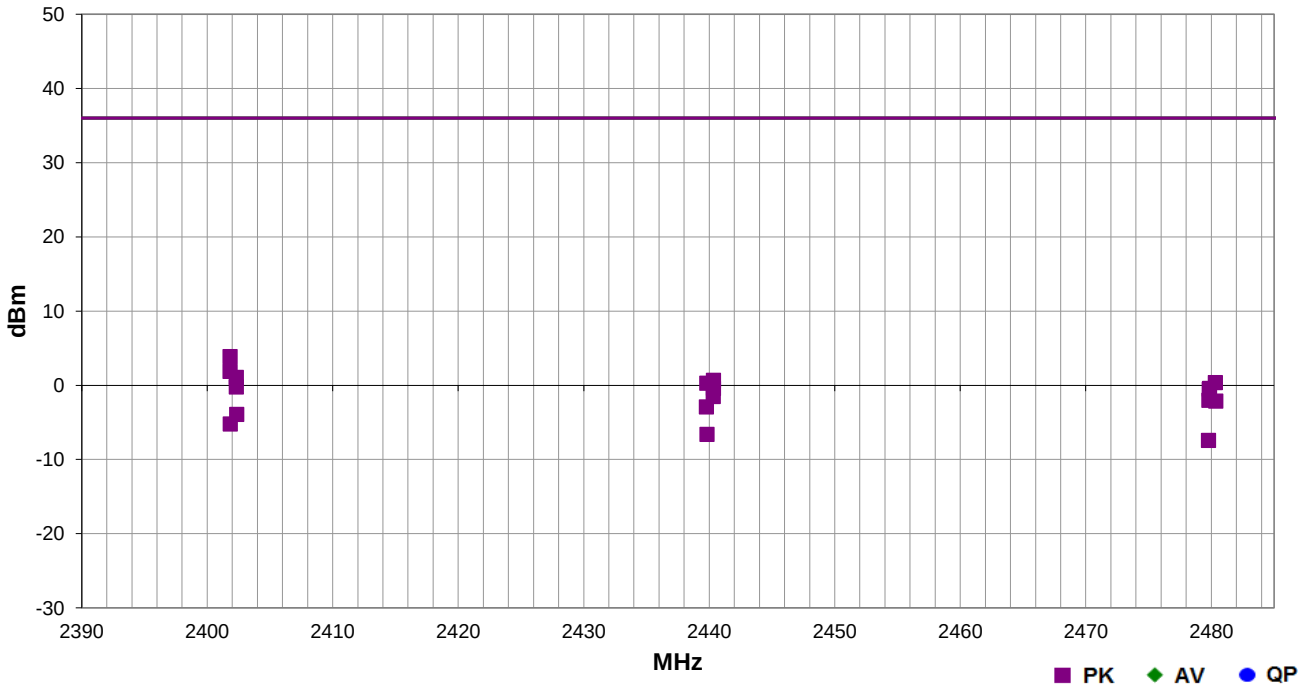
EQUIVALENT ISOTROPIC RADIATED POWER

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	MASI0520	**Date:**	30-Nov-2018		
Project:	None	**Temperature:**	20.3 °C		
Job Site:	OC10	**Humidity:**	54% RH		
Serial Number:	ENG-R-1	**Barometric Pres.:**	1013 mbar	**Tested by:**	Salvador Solorzano
EUT:	AIR01 Technology Board				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	USB via 110VAC/60Hz				
Operating Mode:	Transmitting at 2402 MHz, 2440 MHz, & 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

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



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	2401.817	1.5	255.0	Horz	PK	2.44E-03	3.9	36.0	-32.1	Low Ch, EUT Horz
	2401.817	1.5	189.0	Vert	PK	1.54E-03	1.9	36.0	-34.1	Low CH, EUT Vert
	2402.317	1.5	174.0	Horz	PK	1.28E-03	1.1	36.0	-34.9	Low Ch, EUT on Side
	2440.333	1.5	75.0	Vert	PK	1.17E-03	0.7	36.0	-35.3	Mid Ch, EUT on Side
	2480.333	1.5	317.0	Vert	PK	1.09E-03	0.4	36.0	-35.6	High Ch, EUT Vert
	2439.808	1.5	267.0	Horz	PK	1.06E-03	0.3	36.0	-35.7	Mid Ch, EUT Horz
	2402.317	1.5	288.0	Vert	PK	9.49E-04	-0.2	36.0	-36.2	Low Ch, EUT on Side
	2440.333	1.5	104.0	Vert	PK	9.06E-04	-0.4	36.0	-36.4	Mid Ch, EUT Vert
	2479.858	1.5	266.0	Horz	PK	9.06E-04	-0.4	36.0	-36.4	High Ch, EUT Horz
	2479.842	1.5	116.0	Vert	PK	8.85E-04	-0.5	36.0	-36.5	High CH, EUT on Side
	2440.325	1.5	135.0	Horz	PK	7.03E-04	-1.5	36.0	-37.5	Mid Ch, EUT on Side

	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	2479.808	1.5	163.0	Horz	PK	6.27E-04	-2.0	36.0	-38.0	High CH, EUT on Side
	2480.350	1.5	164.0	Horz	PK	6.13E-04	-2.1	36.0	-38.1	High Ch, EUT Vert
	2439.767	1.5	164.0	Horz	PK	5.09E-04	-2.9	36.0	-38.9	Mid Ch, EUT Vert
	2402.350	1.5	162.0	Horz	PK	4.05E-04	-3.9	36.0	-39.9	Low CH, EUT Vert
	2401.833	1.5	157.0	Vert	PK	3.00E-04	-5.2	36.0	-41.2	Low Ch, EUT Horz
	2439.817	1.5	162.0	Vert	PK	2.17E-04	-6.6	36.0	-42.6	Mid Ch, EUT Horz
	2479.775	1.5	270.0	Vert	PK	1.81E-04	-7.4	36.0	-43.4	High Ch, EUT Horz

OUTPUT POWER

PSA-ESCI 2018.07.27

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 at 2402 MHz, 2440 MHz, & 2480 MHz

POWER SETTINGS INVESTIGATED

USB via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MASI0520 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	2400 MHz	Stop Frequency	2483.5 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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	20-Nov-2018	12 mo
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-2018	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-2018	12 mo
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-2018	24 mo

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium and high transmit frequencies. A field strength measurement was made of the fundamental with the carrier fully maximized for its highest radiated power.

The final data was converted from field strength to a radiated power value using equations found in ANSI C63.10:2013 Annex G.2

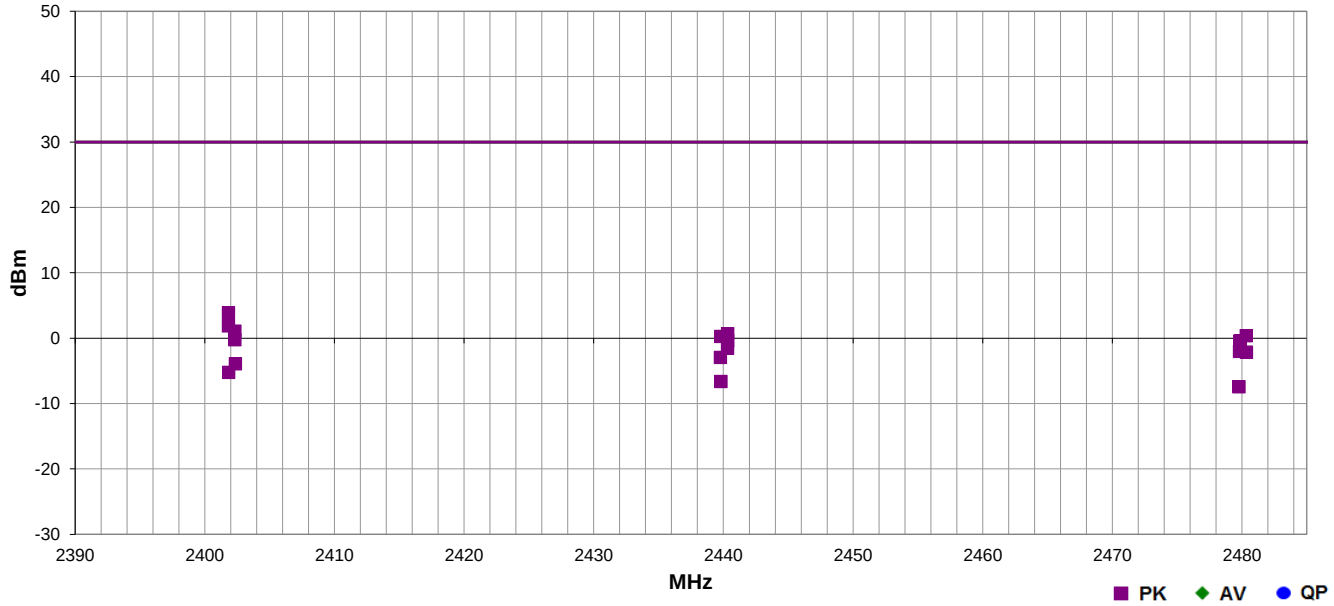
OUTPUT POWER

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	MASI0520	**Date:**	30-Nov-2018		
Project:	None	**Temperature:**	20.3 °C		
Job Site:	OC10	**Humidity:**	54% RH		
Serial Number:	ENG-R-1	**Barometric Pres.:**	1013 mbar	**Tested by:**	Salvadore Solorzano
EUT:	AIR01 Technology Board				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	USB via 110VAC/60Hz				
Operating Mode:	Transmitting at 2402 MHz, 2440 MHz, & 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

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



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Antenna Gain (dB - subtracted)	Output Power (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	2401.817	1.5	255.0	Horz	PK	2.44E-03	3.9	1.0	2.9	30.0	-27.1	Low Ch, EUT Horz
	2401.817	1.5	189.0	Vert	PK	1.54E-03	1.9	1.0	0.9	30.0	-29.1	Low CH, EUT Vert
	2402.317	1.5	174.0	Horz	PK	1.28E-03	1.1	1.0	0.1	30.0	-29.9	Low Ch, EUT on Side
	2440.333	1.5	75.0	Vert	PK	1.17E-03	0.7	1.0	-0.3	30.0	-30.3	Mid Ch, EUT on Side
	2480.333	1.5	317.0	Vert	PK	1.09E-03	0.4	1.0	-0.6	30.0	-30.6	High Ch, EUT Vert
	2439.808	1.5	267.0	Horz	PK	1.06E-03	0.3	1.0	-0.7	30.0	-30.7	Mid Ch, EUT Horz
	2402.317	1.5	288.0	Vert	PK	9.49E-04	-0.2	1.0	-1.2	30.0	-31.2	Low Ch, EUT on Side
	2440.333	1.5	104.0	Vert	PK	9.06E-04	-0.4	1.0	-1.4	30.0	-31.4	Mid Ch, EUT Vert
	2479.858	1.5	266.0	Horz	PK	9.06E-04	-0.4	1.0	-1.4	30.0	-31.4	High Ch, EUT Horz
	2479.842	1.5	116.0	Vert	PK	8.85E-04	-0.5	1.0	-1.5	30.0	-31.5	High CH, EUT on Side
	2440.325	1.5	135.0	Horz	PK	7.03E-04	-1.5	1.0	-2.5	30.0	-32.5	Mid Ch, EUT on Side
	2479.808	1.5	163.0	Horz	PK	6.27E-04	-2.0	1.0	-3.0	30.0	-33.0	High CH, EUT on Side
	2480.350	1.5	164.0	Horz	PK	6.13E-04	-2.1	1.0	-3.1	30.0	-33.1	High Ch, EUT Vert
	2439.767	1.5	164.0	Horz	PK	5.09E-04	-2.9	1.0	-3.9	30.0	-33.9	Mid Ch, EUT Vert
	2402.350	1.5	162.0	Horz	PK	4.05E-04	-3.9	1.0	-4.9	30.0	-34.9	Low CH, EUT Vert
	2401.833	1.5	157.0	Vert	PK	3.00E-04	-5.2	1.0	-6.2	30.0	-36.2	Low Ch, EUT Horz
	2439.817	1.5	162.0	Vert	PK	2.17E-04	-6.6	1.0	-7.6	30.0	-37.6	Mid Ch, EUT Horz
	2479.775	1.5	270.0	Vert	PK	1.81E-04	-7.4	1.0	-8.4	30.0	-38.4	High Ch, EUT Horz

POWER SPECTRAL DENSITY

XMit 2017.12.13

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
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-18	6-Sep-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-18	6-Sep-19
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-18	28-Mar-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	20-Nov-18	20-Nov-19

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

The final data was converted from a field strength to a radiated power value. The equations in section 9.5 of ANSI C63.10:2013, were used to derive this conversion formula:

dBm/m (field strength) + 11.77 = dBm EIRP

Per the procedure outlined in ANSI C63.10:2013 Section 11.10.2, the peak power spectral density was measured.

POWER SPECTRAL DENSITY

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**AIR01 Technology Board**			**Work Order:**	**MASI0520**
Serial Number:	**ENG-R-1**			**Date:**	**30-Nov-18**
Customer:	**Masimo Corporation**			**Temperature:**	**20.3 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**56.4% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**OC10**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Total offset accounts for Antenna Gain, Cable Loss, 20dB Attenuator, and Pre-Amp Gain. Low Ch - 22.9dB, Mid Ch - 22.9dB, & High Ch - 23.1dB
EUT Worst Case Orientation = Horizontal

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature*

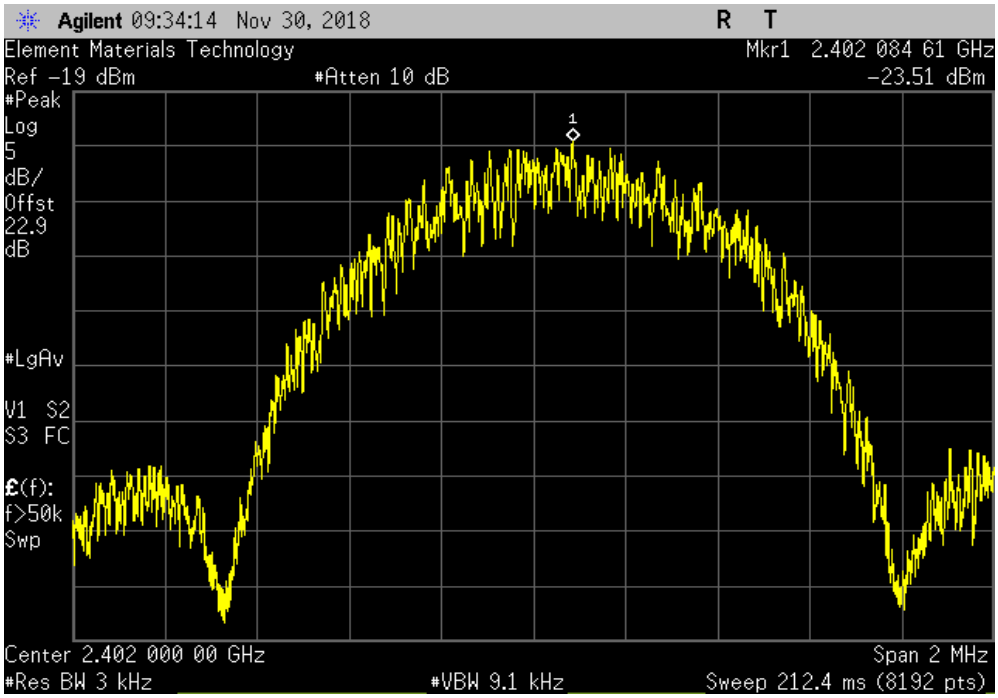
	Measured Value (dBm/3kHz)	**Conversion Factor (dB)**	**Total EIRP (dBm/3kHz)**	**Limit < dBm/3kHz**	**Results**
BLE/GFSK Low Channel, 2402 MHz	-23.507	11.77	-11.737	8	Pass
BLE/GFSK Mid Channel, 2440 MHz	-23.488	11.77	-11.718	8	Pass
BLE/GFSK High Channel, 2480 MHz	-26.247	11.77	-14.477	8	Pass

POWER SPECTRAL DENSITY

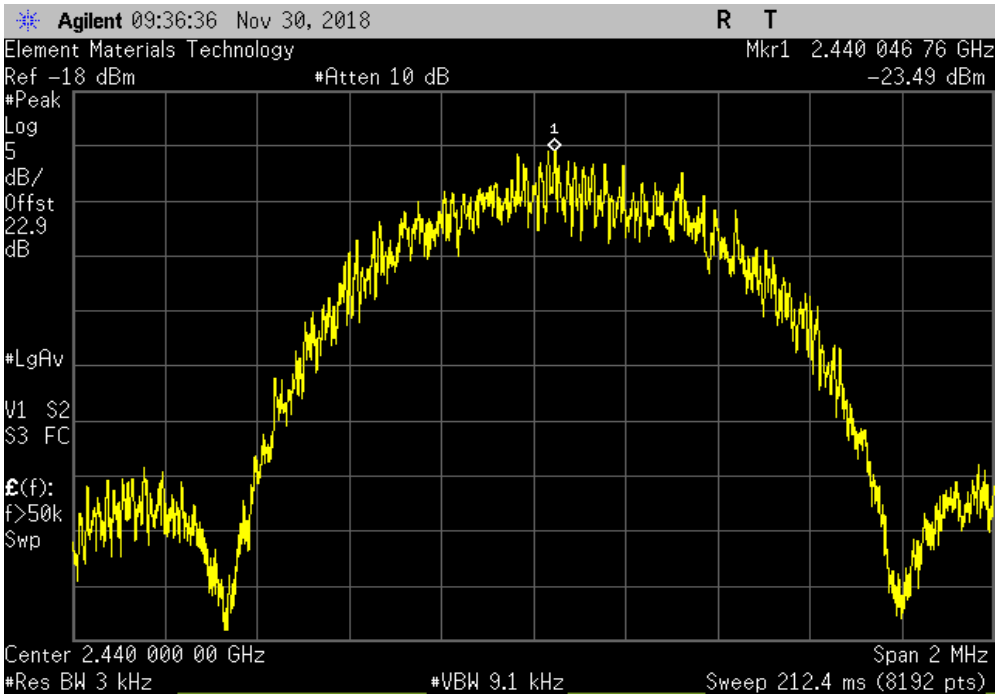
element

TbtTx 2018.09.13 XMit 2017.12.13

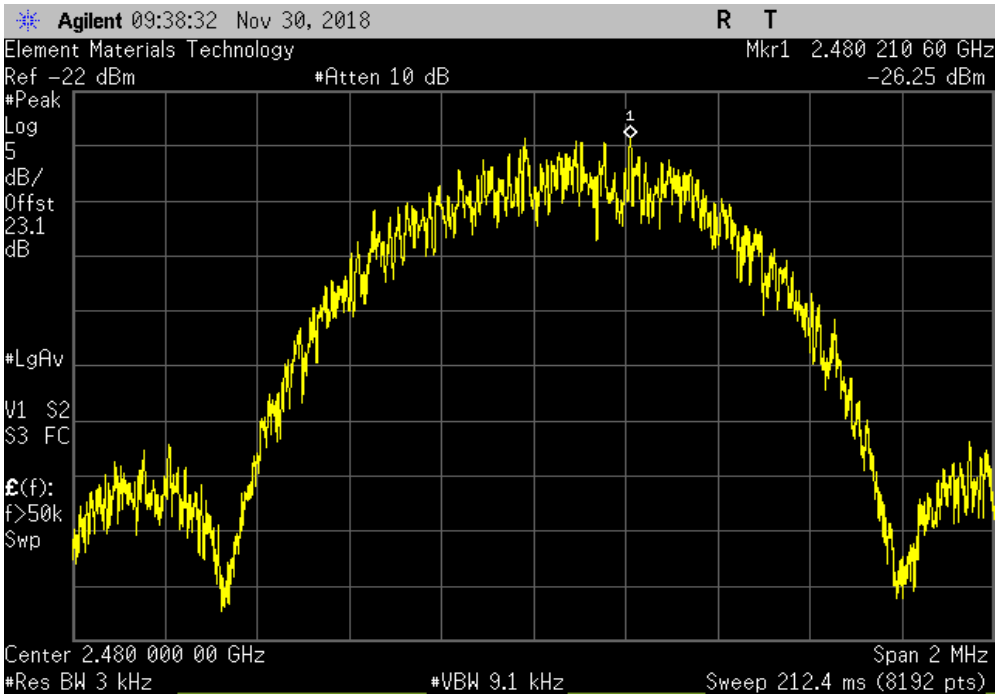
BLE/GFSK Low Channel, 2402 MHz						
		Measured Value (dBm/3kHz)	Conversion Factor (dB)	Total EIRP (dBm/3kHz)	Limit < dBm/3kHz	Results
		-23.507	11.77	-11.737	8	Pass



BLE/GFSK Mid Channel, 2440 MHz						
		Measured Value (dBm/3kHz)	Conversion Factor (dB)	Total EIRP (dBm/3kHz)	Limit < dBm/3kHz	Results
		-23.488	11.77	-11.718	8	Pass



BLE/GFSK High Channel, 2480 MHz						
		Measured Value (dBm/3kHz)	Conversion Factor (dB)	Total EIRP (dBm/3kHz)	Limit < dBm/3kHz	Results
		-26.247	11.77	-14.477	8	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-18	6-Sep-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-18	6-Sep-19
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-18	28-Mar-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	13-Jun-18	13-Jun-19

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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 2017.12.13

EUT:	**AIR01 Technology Board**			**Work Order:**	**MASI0520**
Serial Number:	**ENG-R-1**			**Date:**	**30-Nov-18**
Customer:	**Masimo Corporation**			**Temperature:**	**20.3 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**56.4% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**OC10**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Total offset accounts for Antenna Gain, Cable Loss, 20dB Attenuator, and Pre-Amp Gain. Low Ch - 22.9dB, Mid Ch - 22.9dB, & High Ch - 23.1dB
EUT Worst Case Orientation = Horizontal

DEVIATIONS FROM TEST STANDARD

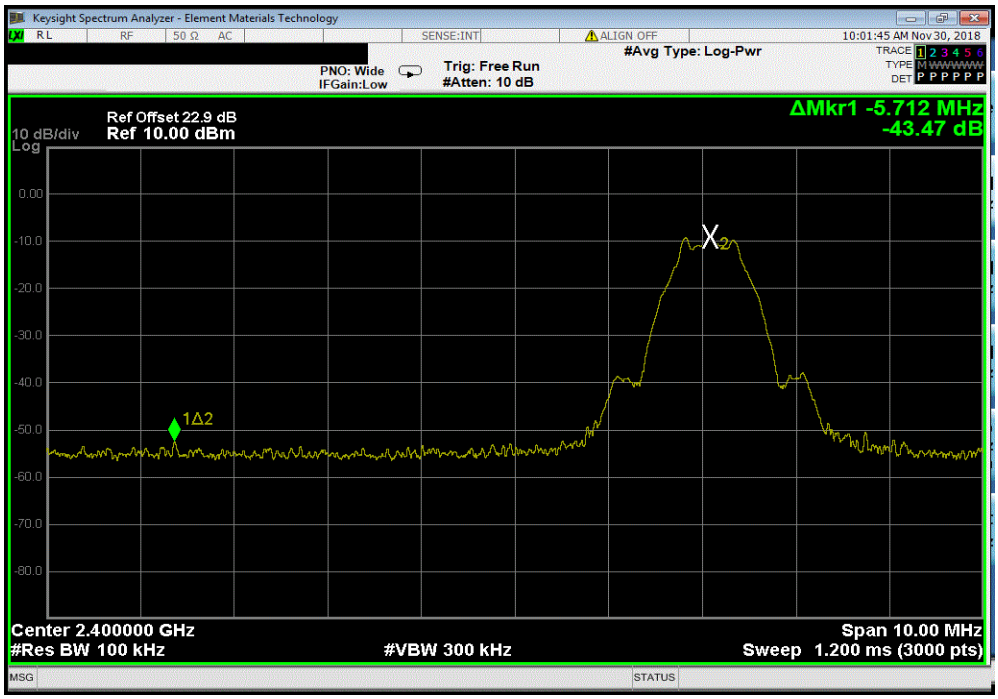
None

Configuration #	**1**	*Signature*

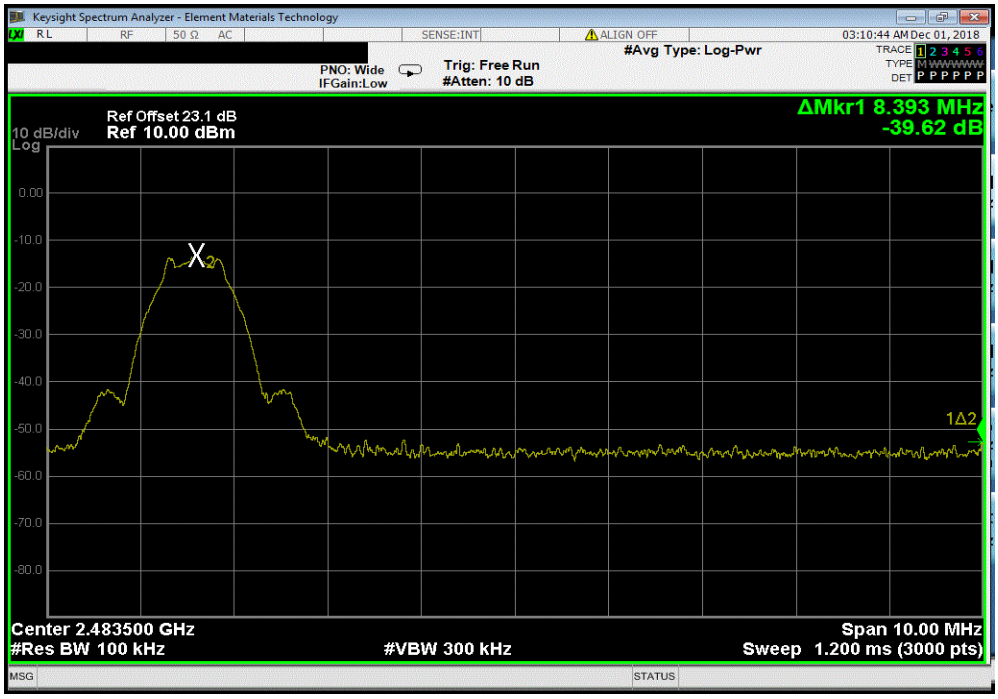
	Value (dBc)	**Limit ≤ (dBc)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	-43.47	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-39.62	-20	Pass

BAND EDGE COMPLIANCE

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-43.47	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-39.62	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	27-Dec-17	27-Dec-18
Cable	Northwest EMC	18-26GHz RE Cables	OCK	27-Dec-17	27-Dec-18
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	7-Sep-18	7-Sep-19
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	7-Sep-18	7-Sep-19
Cable	Northwest EMC	8-18GHz RE Cables	OCO	6-Sep-18	6-Sep-19
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-18	6-Sep-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-18	6-Sep-19
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-18	28-Mar-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	20-Nov-18	20-Nov-19

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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 2017.12.13

EUT:	**AIR01 Technology Board**			**Work Order:**	**MASI0520**
Serial Number:	**ENG-R-1**			**Date:**	**30-Nov-18**
Customer:	**Masimo Corporation**			**Temperature:**	**20.3 °C**
Attendees:	**Nghi Nguyen**			**Humidity:**	**56.4% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Salvador Solorzano**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**OC10**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Total offset accounts for Antenna Gain, Cable Loss, 20dB Attenuator, and Pre-Amp Gain. Low Ch - 22.9dB, Mid Ch - 22.9dB, & High Ch - 23.1dB
EUT Worst Case Orientation = Horizontal

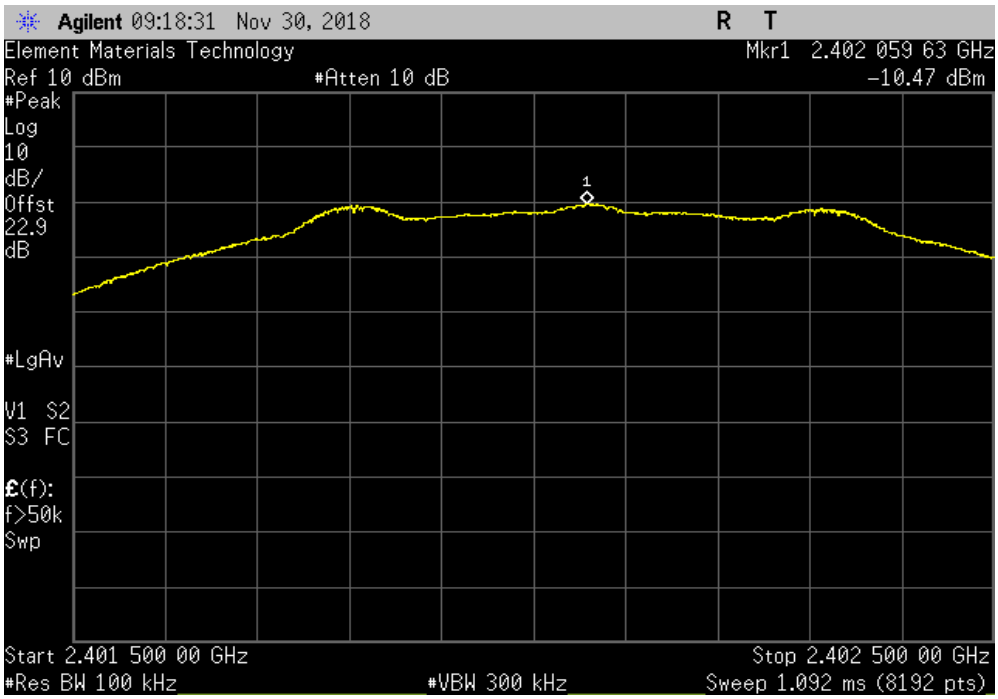
DEVIATIONS FROM TEST STANDARD

None

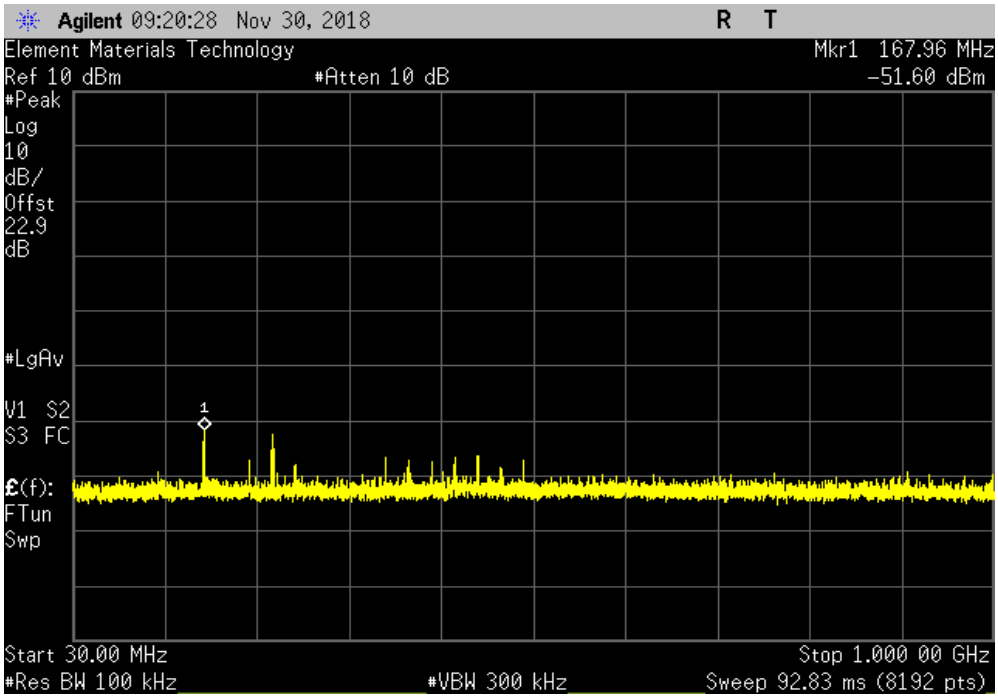
Configuration #	**1**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	2402.06	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 1 GHz	167.96	-41.13	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	1 GHz - 8.2 GHz	1750.7	-43.06	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	8.2 GHz - 12.4 GHz	9607	-35.12	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.4 GHz - 18 GHz	13630.6	-41.68	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	18 GHz - 25 GHz	24598.3	-42.02	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	Fundamental	2440.07	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	30 MHz - 1 GHz	167.96	-41.78	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	1 GHz - 8.2 GHz	1086.1	-42.70	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	8.2 GHz - 12.4 GHz	9759.3	-33.91	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	12.4 GHz - 18 GHz	13874.7	-42.16	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	18 GHz - 25 GHz	24599.2	-42.31	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	2480.08	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 1 GHz	167.96	-38.67	-20	Pass
BLE/GFSK High Channel, 2480 MHz	1 GHz - 8.2 GHz	1008.8	-40.50	-20	Pass
BLE/GFSK High Channel, 2480 MHz	8.2 GHz - 12.4 GHz	9919.3	-29.47	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.4 GHz - 18 GHz	13802.9	-38.61	-20	Pass
BLE/GFSK High Channel, 2480 MHz	18 GHz - 25 GHz	24201	-38.00	-20	Pass

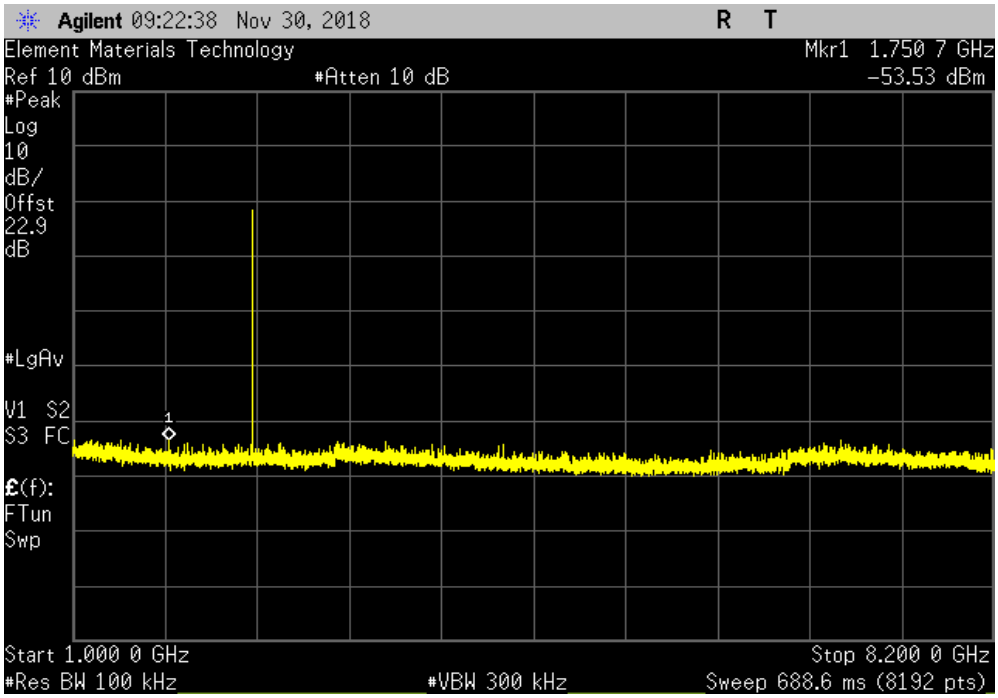
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		2402.06	N/A	N/A	N/A



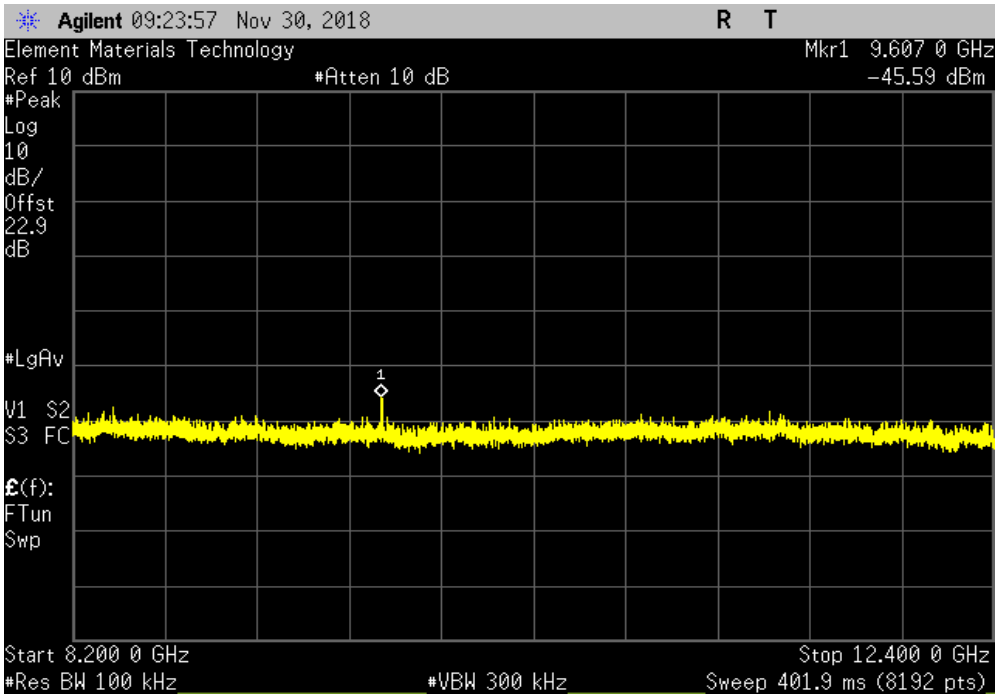
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	30 MHz - 1 GHz		167.96	-41.13	-20	Pass



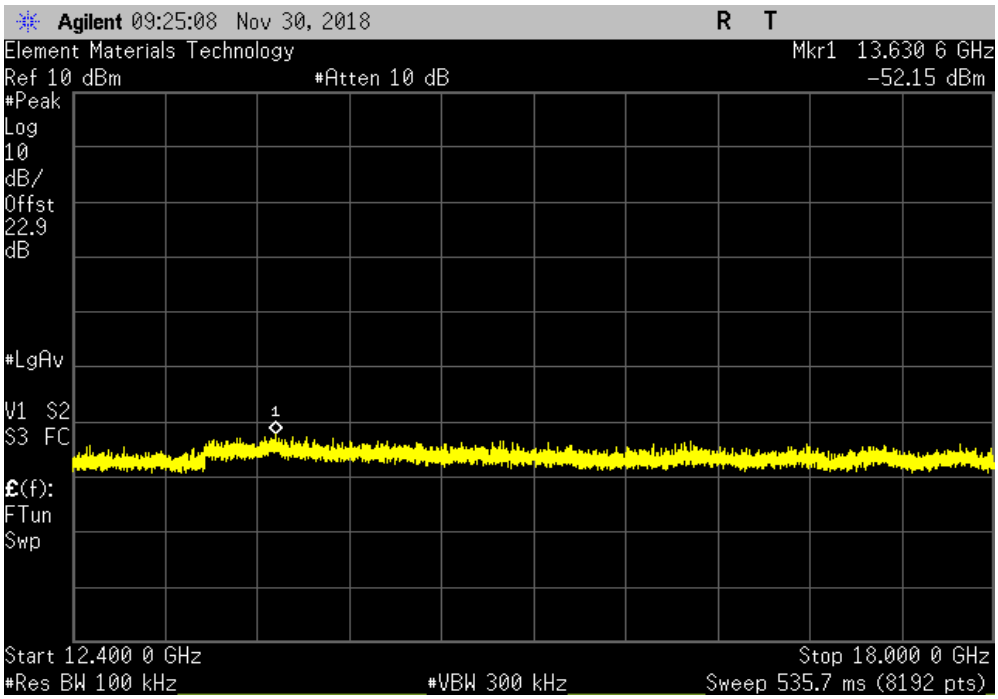
BLE/GFSK Low Channel, 2402 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	1 GHz - 8.2 GHz	1750.7	-43.06	-20	Pass



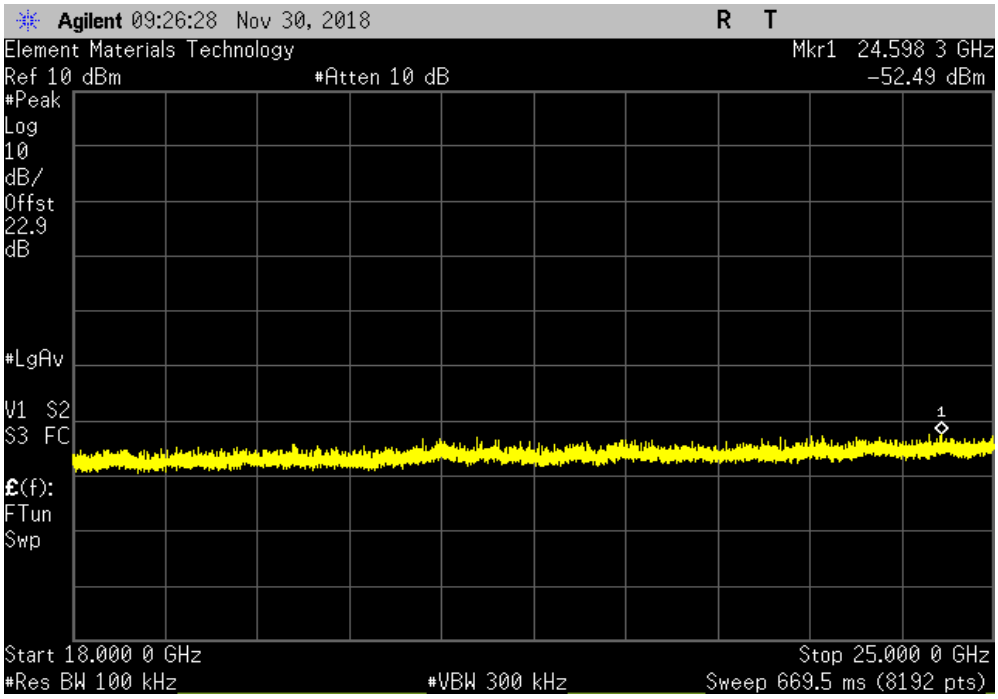
BLE/GFSK Low Channel, 2402 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	8.2 GHz - 12.4 GHz	9607	-35.12	-20	Pass



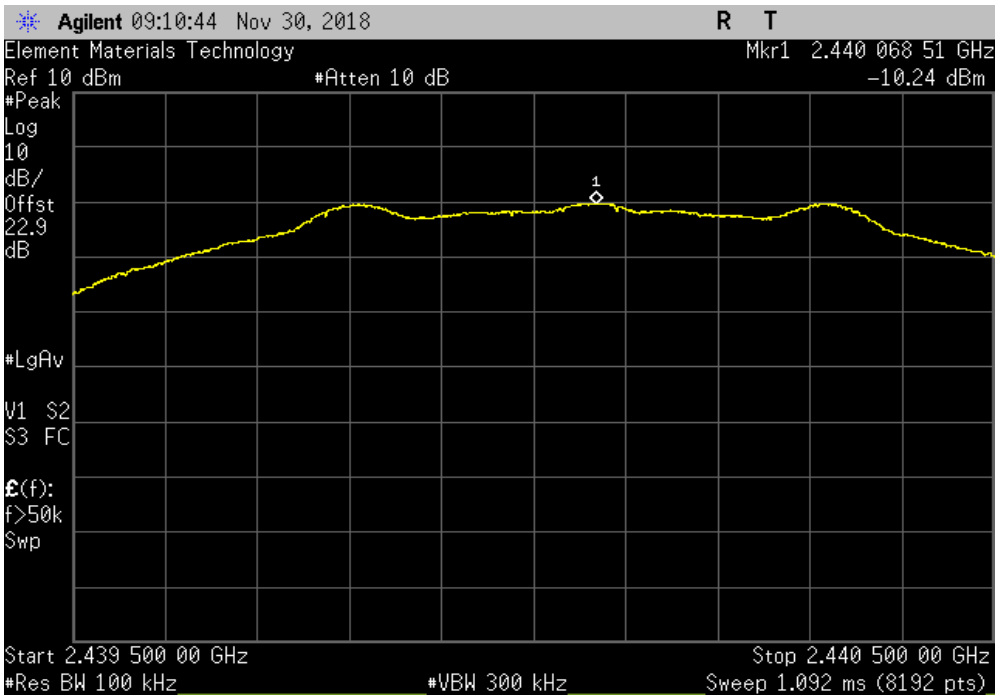
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.4 GHz - 18 GHz	13630.6	-41.68	-20	Pass



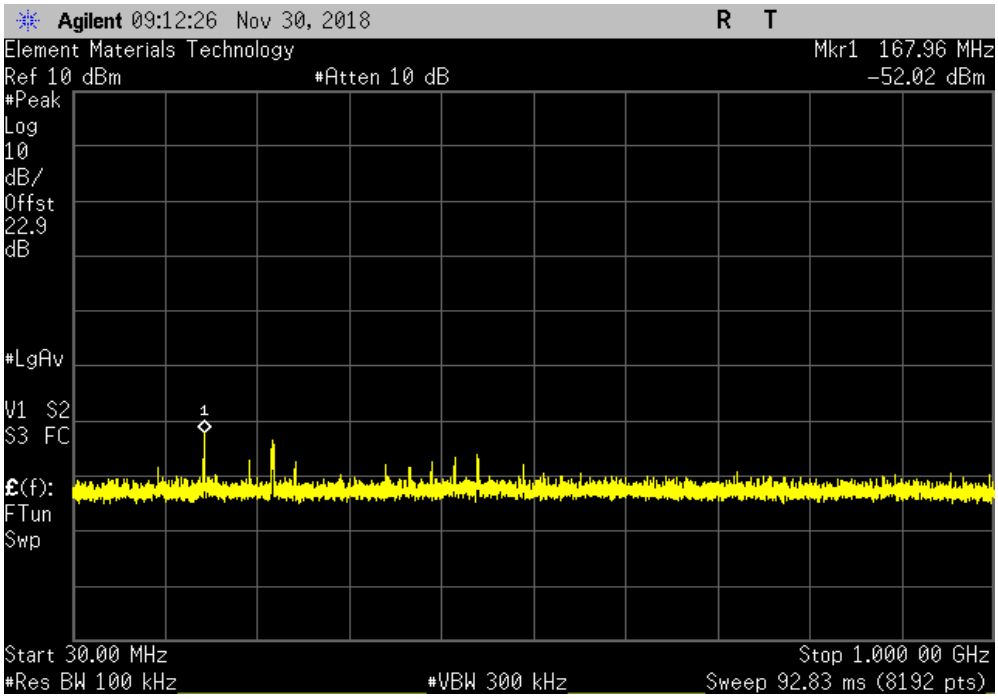
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
18 GHz - 25 GHz	24598.3	-42.02	-20	Pass



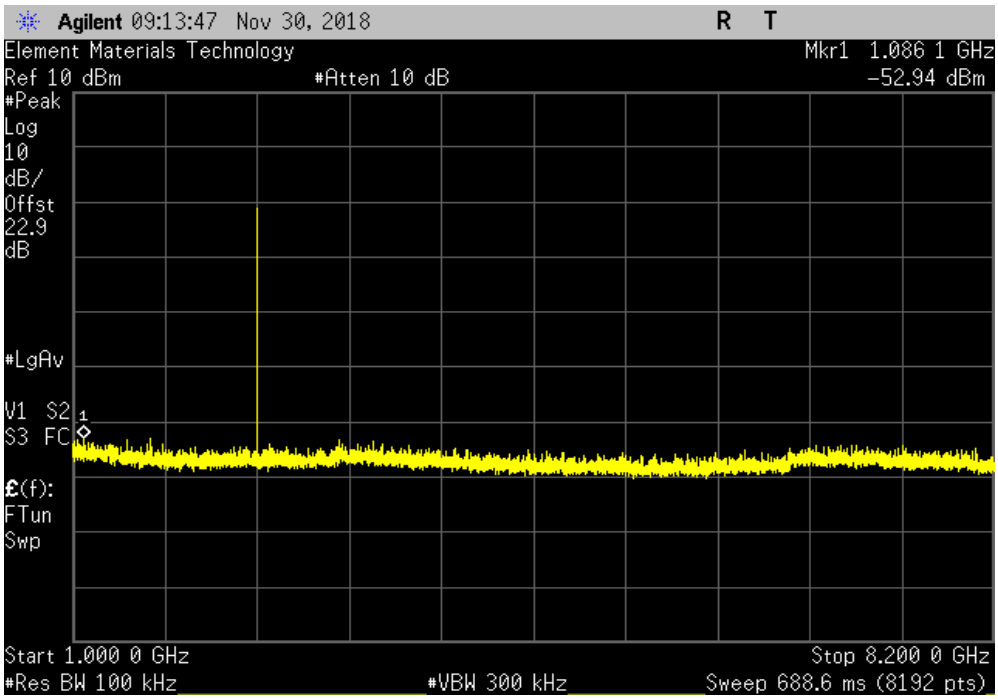
BLE/GFSK Mid Channel, 2440 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		2440.07	N/A	N/A	N/A



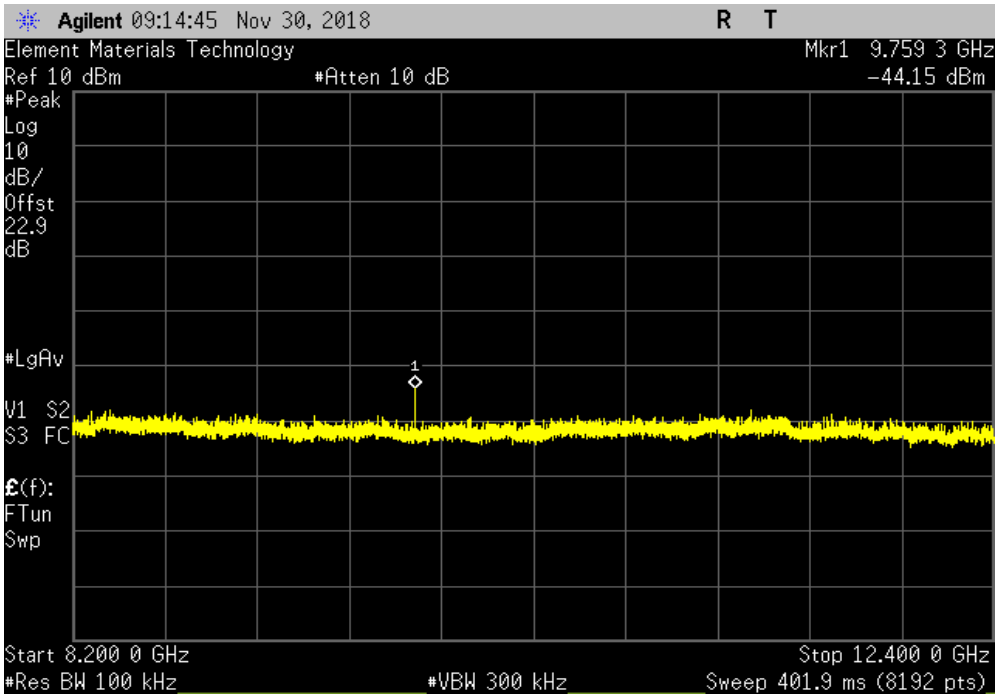
BLE/GFSK Mid Channel, 2440 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	30 MHz - 1 GHz		167.96	-41.78	-20	Pass



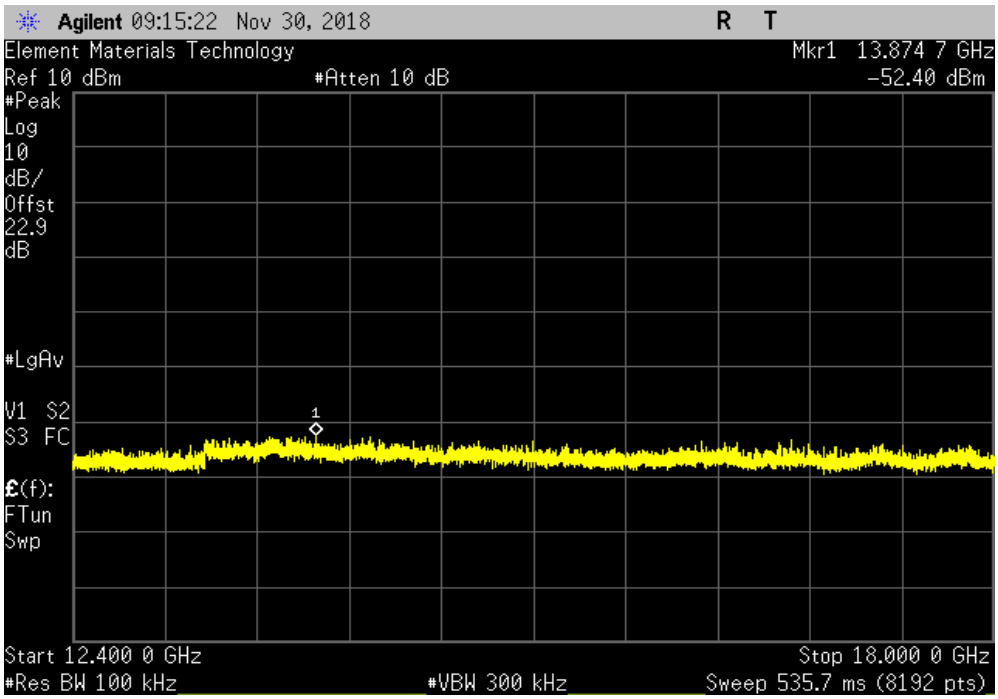
BLE/GFSK Mid Channel, 2440 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	1 GHz - 8.2 GHz	1086.1	-42.7	-20	Pass



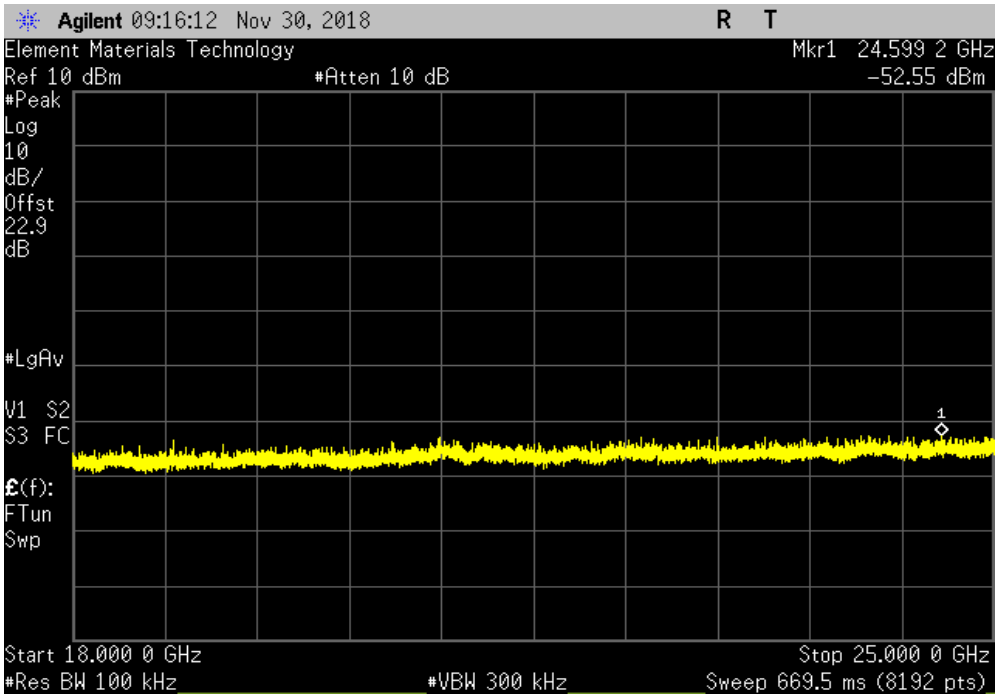
BLE/GFSK Mid Channel, 2440 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	8.2 GHz - 12.4 GHz	9759.3	-33.91	-20	Pass



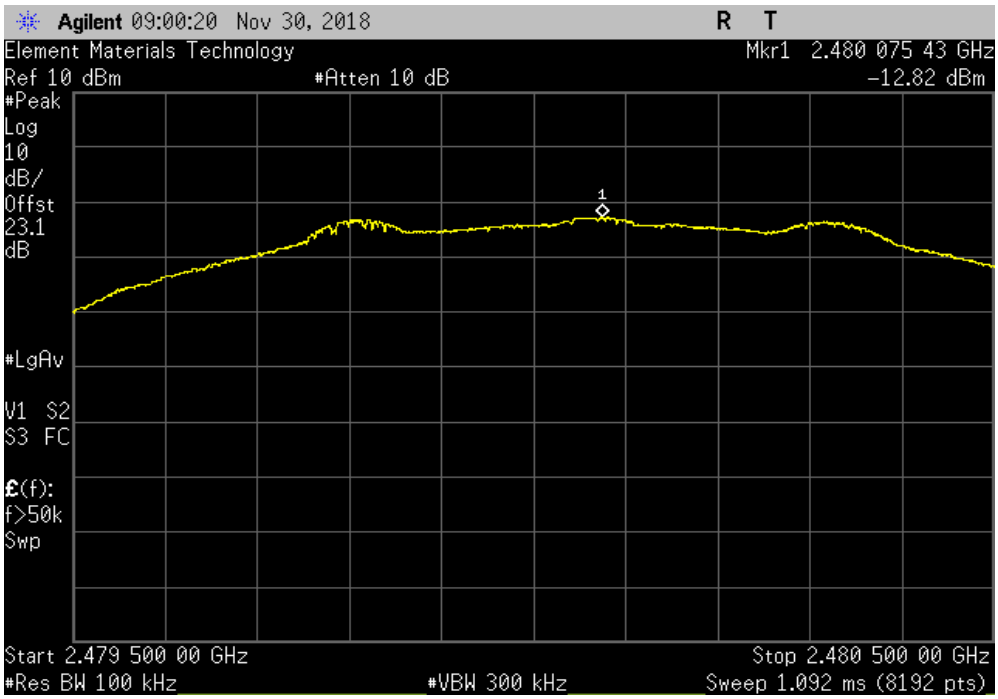
BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.4 GHz - 18 GHz	13874.7	-42.16	-20	Pass



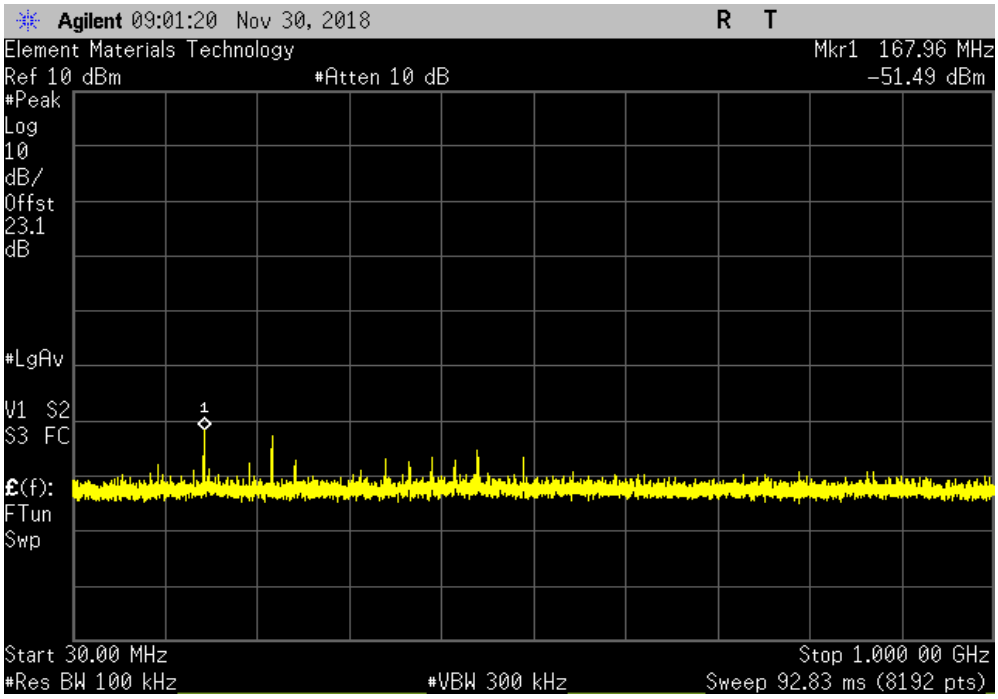
BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
18 GHz - 25 GHz	24599.2	-42.31	-20	Pass



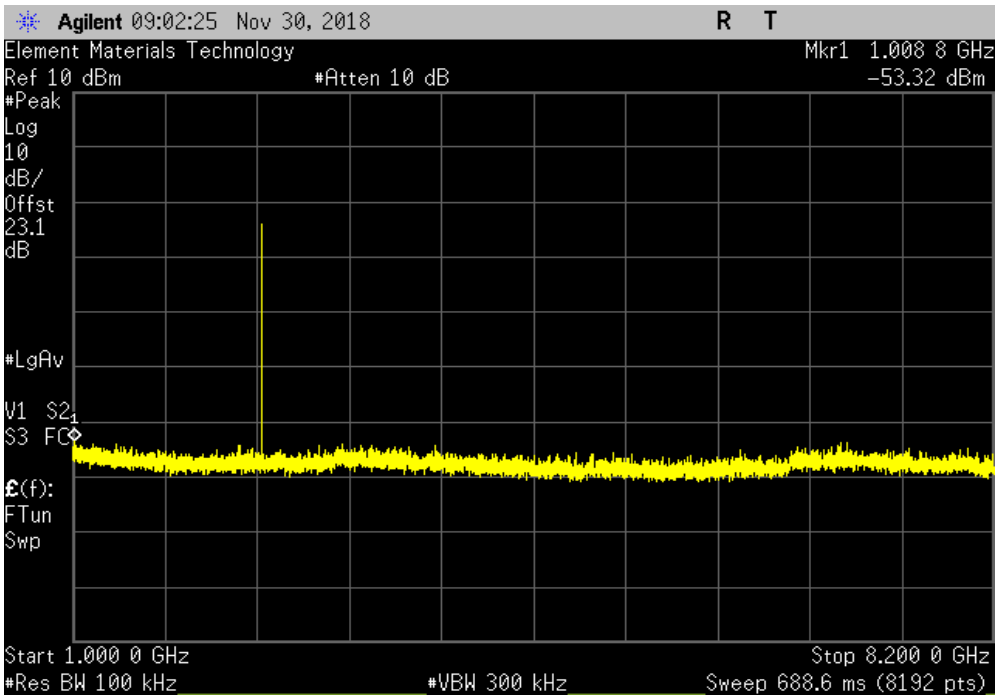
BLE/GFSK High Channel, 2480 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		2480.08	N/A	N/A	N/A



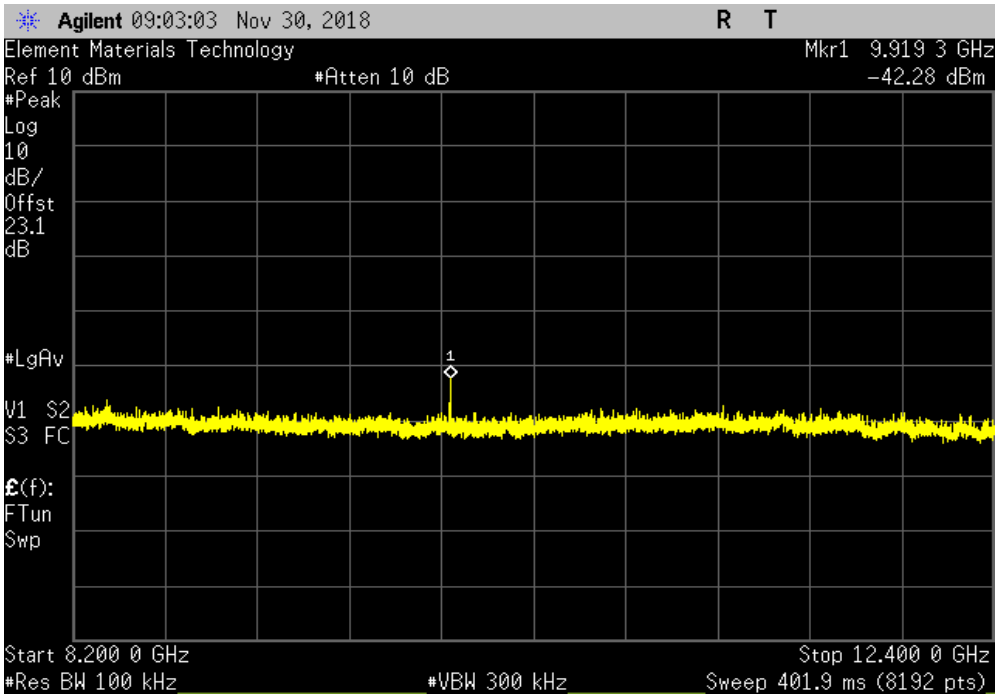
BLE/GFSK High Channel, 2480 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	30 MHz - 1 GHz		167.96	-38.67	-20	Pass



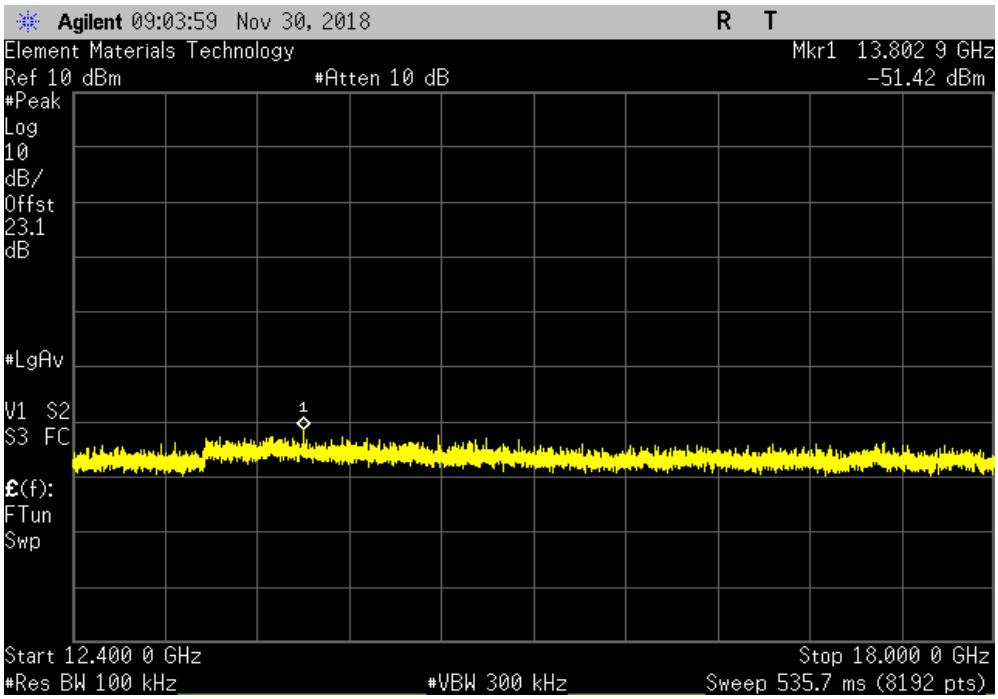
BLE/GFSK High Channel, 2480 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	1 GHz - 8.2 GHz	1008.8	-40.5	-20	Pass



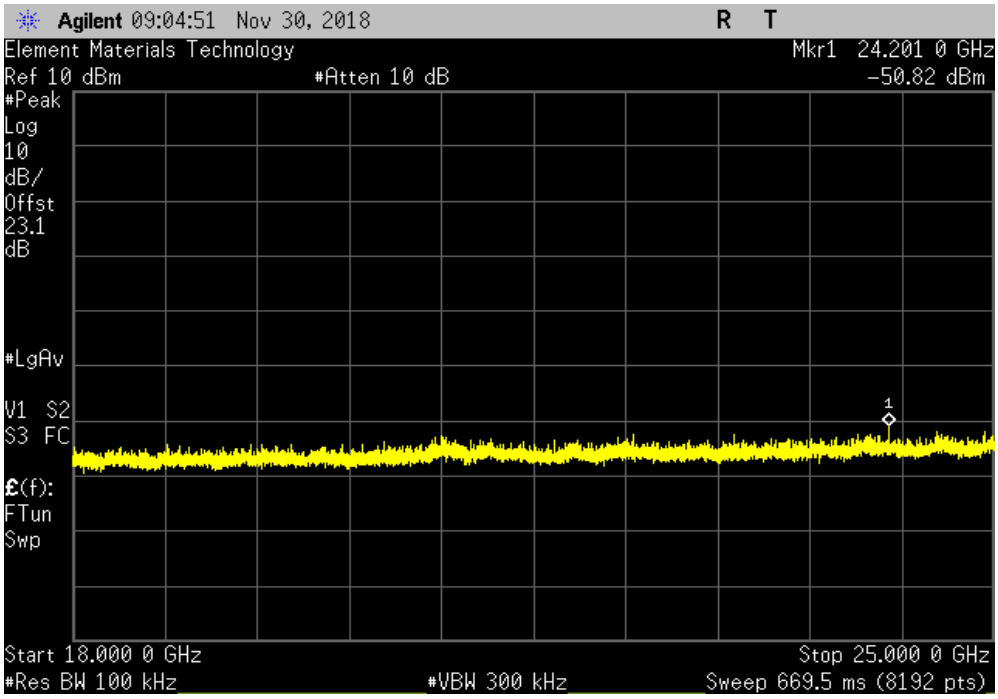
BLE/GFSK High Channel, 2480 MHz					
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	8.2 GHz - 12.4 GHz	9919.3	-29.47	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.4 GHz - 18 GHz	13802.9	-38.61	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
18 GHz - 25 GHz	24201	-38	-20	Pass



SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.07.27

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 at 2402 MHz, 2440 MHz, & 2480 MHz

POWER SETTINGS INVESTIGATED

USB via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MASI0520 - 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
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	10-Jul-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	7-Sep-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	7-Sep-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	0 mo
Antenna - Biconilog	Teseq	CBL 6141A	AYE	7-Nov-2017	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	27-Dec-2017	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	27-Dec-2017	12 mo
Attenuator	Fairview Microwave	SA18H-20	TKQ	12-Jul-2018	12 mo
Attenuator	S.M. Electronics	SA18H-10	REN	25-Jan-2018	12 mo
Cable	Northwest EMC	8-18GHz RE Cables	OCO	6-Sep-2018	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHX	16-Jul-2018	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	HGP	25-Jan-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-2018	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	13-Jun-2018	12 mo
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-2018	24 mo

MEASUREMENT BANDWIDTHS

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

SPURIOUS RADIATED EMISSIONS

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TEST DESCRIPTION

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.

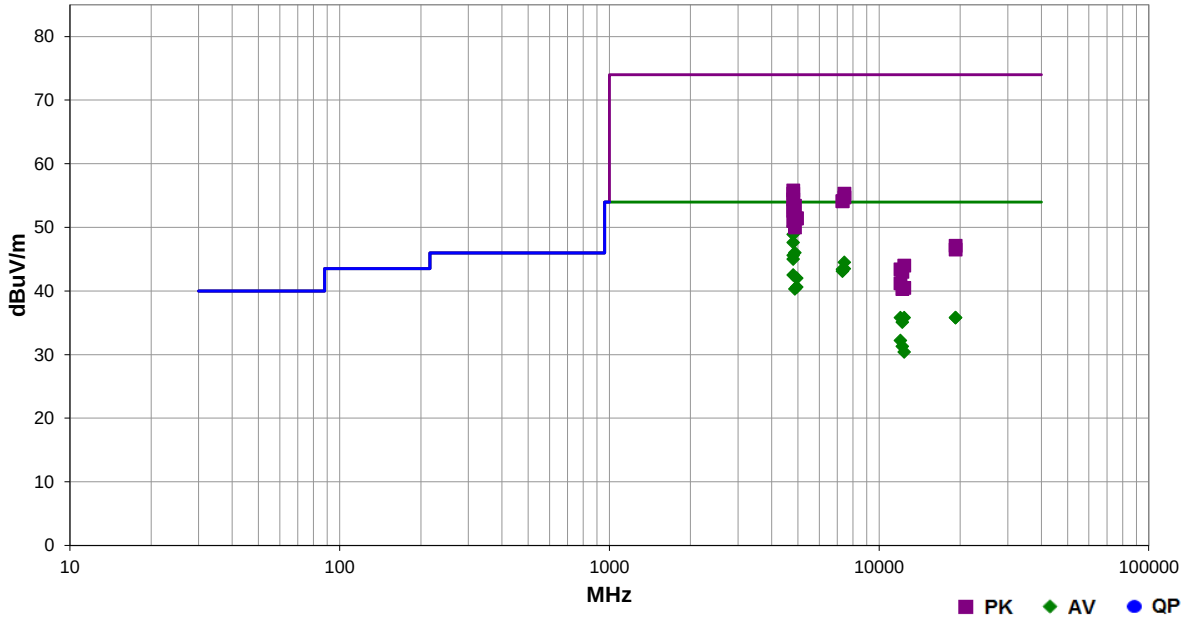
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	MASI0520	**Date:**	29-Nov-2018		
Project:	None	**Temperature:**	20.3 °C		
Job Site:	OC10	**Humidity:**	55.9% RH		
Serial Number:	ENG-R-1	**Barometric Pres.:**	1013 mbar	**Tested by:**	Salvador Solorzano
EUT:	AIR01 Technology Board				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	Nghi Nguyen				
EUT Power:	USB via 110VAC/60Hz				
Operating Mode:	Transmitting at 2402 MHz, 2440 MHz, & 2480 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	14	**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
4803.890	38.6	11.3	1.1	192.0	0.3	0.0	Vert	AV	0.0	50.2	54.0	-3.8	Low Ch, EUT Horz
4803.775	37.3	11.3	1.2	183.0	0.3	0.0	Horz	AV	0.0	48.9	54.0	-5.1	Low Ch, EUT Horz
4803.785	36.0	11.3	3.5	342.0	0.3	0.0	Vert	AV	0.0	47.6	54.0	-6.4	Low Ch, EUT on Side
4880.500	33.6	12.1	2.8	221.0	0.3	0.0	Horz	AV	0.0	46.0	54.0	-8.0	Mid Ch, EUT Horz
4803.775	34.0	11.3	2.8	221.0	0.3	0.0	Horz	AV	0.0	45.6	54.0	-8.4	Low Ch, EUT on Side
4803.805	33.4	11.3	1.3	7.0	0.3	0.0	Horz	AV	0.0	45.0	54.0	-9.0	Low Ch, EUT Vert
7440.955	26.4	17.8	1.5	202.0	0.3	0.0	Horz	AV	0.0	44.5	54.0	-9.5	High Ch, EUT Horz
7440.695	25.4	17.8	1.5	153.0	0.3	0.0	Vert	AV	0.0	43.5	54.0	-10.5	High Ch, EUT Horz
7319.590	25.8	17.3	1.5	110.0	0.3	0.0	Horz	AV	0.0	43.4	54.0	-10.6	High Ch, EUT Horz
7320.210	25.5	17.3	1.5	229.0	0.3	0.0	Vert	AV	0.0	43.1	54.0	-10.9	Mid Ch, EUT Horz
4803.765	30.9	11.3	1.6	136.0	0.3	0.0	Vert	AV	0.0	42.5	54.0	-11.5	Low Ch, EUT Vert
4959.780	29.2	12.5	1.5	174.0	0.3	0.0	Horz	AV	0.0	42.0	54.0	-12.0	High Ch, EUT Horz
4959.830	27.8	12.5	2.9	132.0	0.3	0.0	Vert	AV	0.0	40.6	54.0	-13.4	High Ch, EUT Horz
4879.755	27.9	12.1	1.2	214.0	0.3	0.0	Vert	AV	0.0	40.3	54.0	-13.7	Mid Ch, EUT Horz
4804.655	44.5	11.3	1.1	192.0	0.0	0.0	Vert	PK	0.0	55.8	74.0	-18.2	Low Ch, EUT Horz
12009.090	40.9	-5.4	1.0	7.0	0.3	0.0	Vert	AV	0.0	35.8	54.0	-18.2	Low Ch, EUT Horz
12399.100	38.9	-3.4	1.0	14.0	0.3	0.0	Vert	AV	0.0	35.8	54.0	-18.2	High Ch, EUT Horz
19216.290	39.4	-3.9	1.5	284.0	0.3	0.0	Horz	AV	0.0	35.8	54.0	-18.2	Low Ch, EUT Horz
19217.280	39.4	-3.9	1.5	165.0	0.3	0.0	Vert	AV	0.0	35.8	54.0	-18.2	Low Ch, EUT Horz
4804.665	44.0	11.3	1.2	183.0	0.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	Low Ch, EUT Horz

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
7440.950	37.5	17.8	1.5	202.0	0.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	High Ch, EUT Horz
12199.110	38.6	-3.8	1.0	16.0	0.3	0.0	Vert	AV	0.0	35.1	54.0	-18.9	Mid Ch, EUT Horz
7440.870	36.9	17.8	1.5	153.0	0.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	High Ch, EUT Horz
4803.790	43.1	11.3	3.5	342.0	0.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	Low Ch, EUT on Side
7320.690	36.8	17.3	1.5	110.0	0.0	0.0	Horz	PK	0.0	54.1	74.0	-19.9	Mid Ch, EUT Horz
7318.585	36.8	17.3	1.5	229.0	0.0	0.0	Vert	PK	0.0	54.1	74.0	-19.9	Mid Ch, EUT Horz
4879.930	41.3	12.1	2.8	221.0	0.0	0.0	Horz	PK	0.0	53.4	74.0	-20.6	Mid Ch, EUT Horz
4803.665	41.8	11.3	2.8	221.0	0.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	Low Ch, EUT on Side
4804.630	41.3	11.3	1.3	7.0	0.0	0.0	Horz	PK	0.0	52.6	74.0	-21.4	Low Ch, EUT Vert
12009.180	37.3	-5.4	2.6	175.0	0.3	0.0	Horz	AV	0.0	32.2	54.0	-21.8	Low Ch, EUT Horz
4960.550	38.9	12.5	1.5	174.0	0.0	0.0	Horz	PK	0.0	51.4	74.0	-22.6	High Ch, EUT Horz
4959.450	38.9	12.5	2.9	132.0	0.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	High Ch, EUT Horz
4804.215	39.7	11.3	1.6	136.0	0.0	0.0	Vert	PK	0.0	51.0	74.0	-23.0	Low Ch, EUT Vert
12199.120	34.8	-3.8	1.0	168.0	0.3	0.0	Horz	AV	0.0	31.3	54.0	-22.7	Mid Ch, EUT Horz
12399.140	33.5	-3.4	1.5	307.0	0.3	0.0	Horz	AV	0.0	30.4	54.0	-23.6	High Ch, EUT Horz
4880.775	37.9	12.1	1.2	214.0	0.0	0.0	Vert	PK	0.0	50.0	74.0	-24.0	Mid Ch, EUT Horz
19217.380	51.0	-3.9	1.5	165.0	0.0	0.0	Vert	PK	0.0	47.1	74.0	-26.9	Low Ch, EUT Horz
19214.880	50.4	-3.9	1.5	284.0	0.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	Low Ch, EUT Horz
12399.140	47.4	-3.4	1.0	14.0	0.0	0.0	Vert	PK	0.0	44.0	74.0	-30.0	High Ch, EUT Horz
12008.960	48.8	-5.4	1.0	7.0	0.0	0.0	Vert	PK	0.0	43.4	74.0	-30.6	Low Ch, EUT Horz
12199.040	46.8	-3.8	1.0	16.0	0.0	0.0	Vert	PK	0.0	43.0	74.0	-31.0	Mid Ch, EUT Horz
12008.740	46.6	-5.4	2.6	175.0	0.0	0.0	Horz	PK	0.0	41.2	74.0	-32.8	Low Ch, EUT Horz
12399.390	43.9	-3.4	1.5	307.0	0.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	High Ch, EUT Horz
12199.230	44.1	-3.8	1.0	168.0	0.0	0.0	Horz	PK	0.0	40.3	74.0	-33.7	Mid Ch, EUT Horz

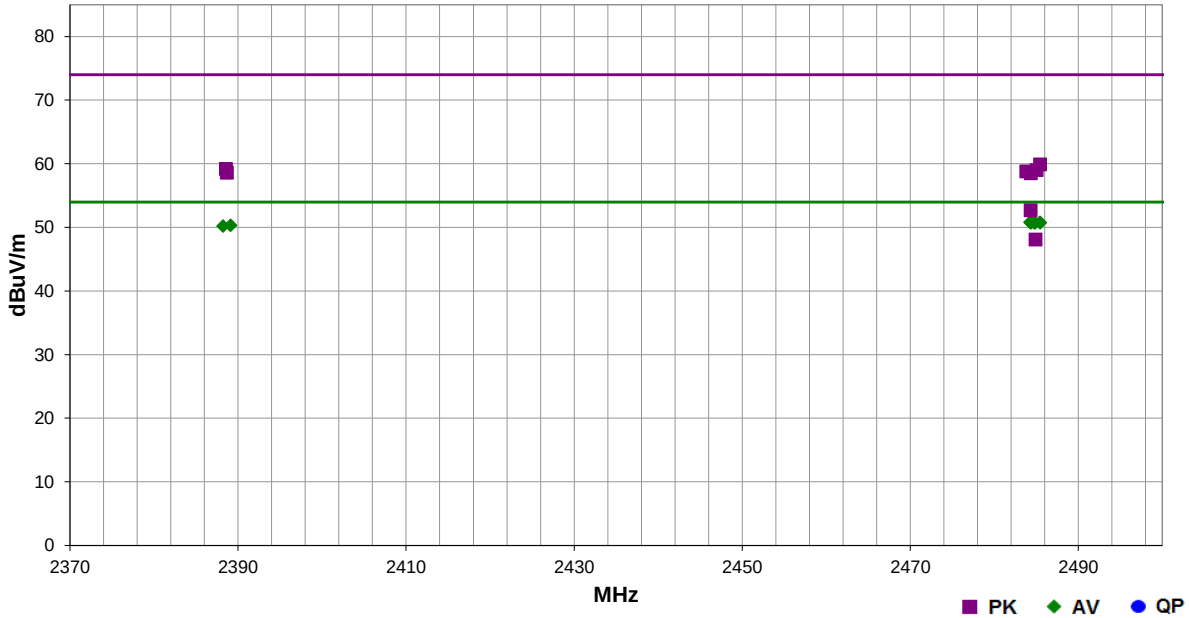
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	MASI0520	**Date:**	29-Nov-2018		
Project:	None	**Temperature:**	20.6 °C		
Job Site:	OC10	**Humidity:**	55.9% RH		
Serial Number:	ENG-R-1	**Barometric Pres.:**	1017 mbar	**Tested by:**	Salvador Solorzano
EUT:	AIR01 Technology Board				
Configuration:	1				
Customer:	Masimo Corporation				
Attendees:	None				
EUT Power:	USB via 110VAC/60Hz				
Operating Mode:	Transmitting at 2402 MHz & 2480 MHz				
Deviations:	None				
Comments:	Band Edge				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	21	**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)
2484.257	27.5	3.0	1.5	271.0	0.3	20.0	Horz	AV	0.0	50.8	54.0	-3.2
2485.443	27.5	3.0	1.5	160.0	0.3	20.0	Vert	AV	0.0	50.8	54.0	-3.2
2484.837	27.4	3.0	1.5	243.0	0.3	20.0	Horz	AV	0.0	50.7	54.0	-3.3
2484.390	27.4	3.0	1.5	8.0	0.3	20.0	Vert	AV	0.0	50.7	54.0	-3.3
2484.810	27.4	3.0	1.5	323.0	0.3	20.0	Horz	AV	0.0	50.7	54.0	-3.3
2485.473	27.4	3.0	2.8	200.0	0.3	20.0	Vert	AV	0.0	50.7	54.0	-3.3
2389.117	27.4	2.6	2.1	229.0	0.3	20.0	Horz	AV	0.0	50.3	54.0	-3.7
2388.233	27.3	2.6	1.5	145.0	0.3	20.0	Vert	AV	0.0	50.2	54.0	-3.8
2485.440	36.9	3.0	1.5	271.0		20.0	Horz	PK	0.0	59.9	74.0	-14.1
2388.560	36.6	2.6	2.1	229.0		20.0	Horz	PK	0.0	59.2	74.0	-14.8
2485.030	36.0	3.0	1.5	160.0		20.0	Vert	PK	0.0	59.0	74.0	-15.0
2483.813	35.8	3.0	1.5	8.0		20.0	Vert	PK	0.0	58.8	74.0	-15.2
2388.680	36.0	2.6	1.5	145.0		20.0	Vert	PK	0.0	58.6	74.0	-15.4
2484.350	35.5	3.0	2.8	200.0		20.0	Vert	PK	0.0	58.5	74.0	-15.5
2484.330	29.7	3.0	1.5	243.0		20.0	Horz	PK	0.0	52.7	74.0	-21.3
2484.910	25.1	3.0	1.5	323.0		20.0	Horz	PK	0.0	48.1	74.0	-25.9