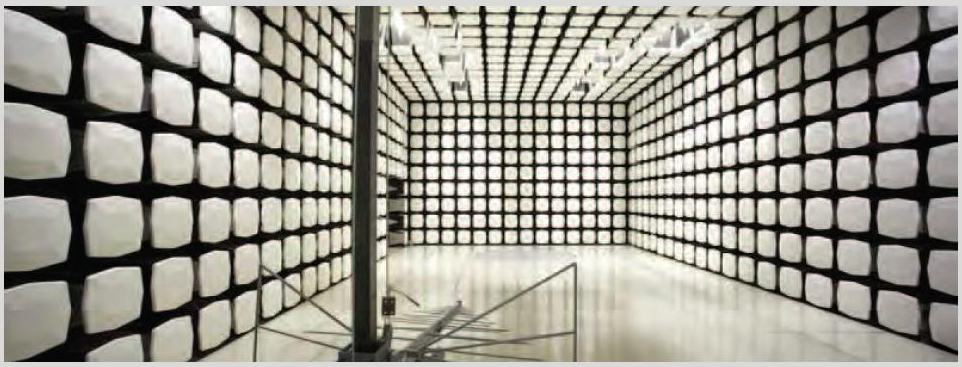
ESCO Corporation

GET Detect Sensor 4286605

FCC 15.247:2019

Bluetooth Low Energy (DTS) Radio

Report # ESCO0012



NVLAP LAB CODE: 200630-0

CERTIFICATE OF TEST

Last Date of Test: February 22, 2019
ESCO Corporation
Model: GET Detect Sensor 4286605

Radio Equipment Testing

Standards

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

Results

Method Clause	Test Description	Applied	Results	Comments
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	Characterization of radio operation.
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:

Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). 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

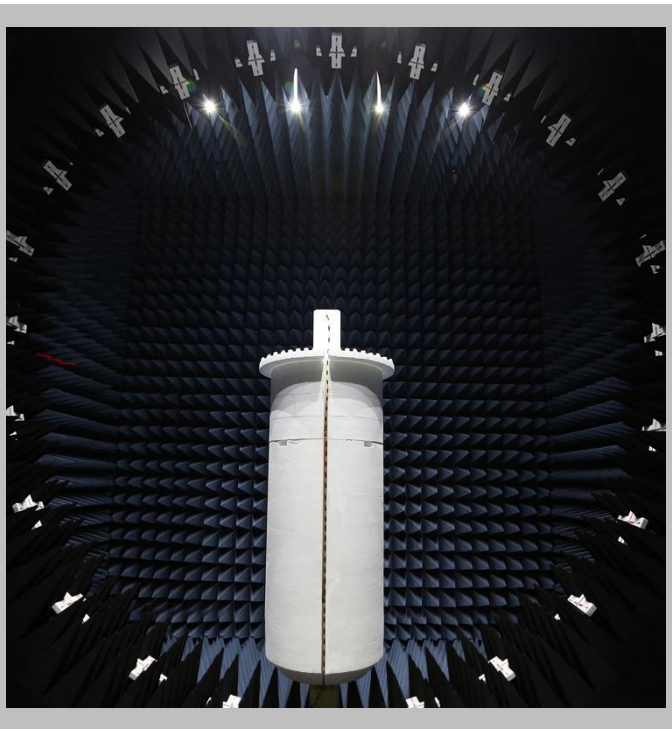
MIC – Recognized by MIC as a CAB for the acceptance of test data.

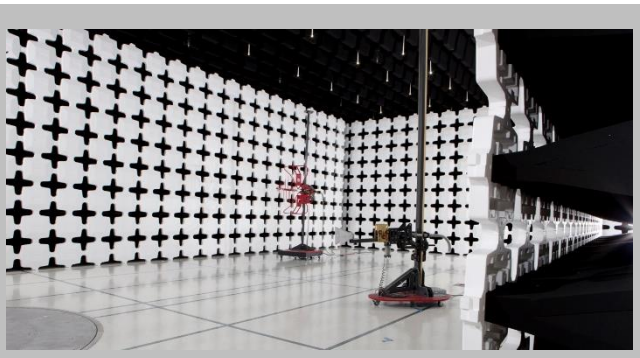
SCOPE

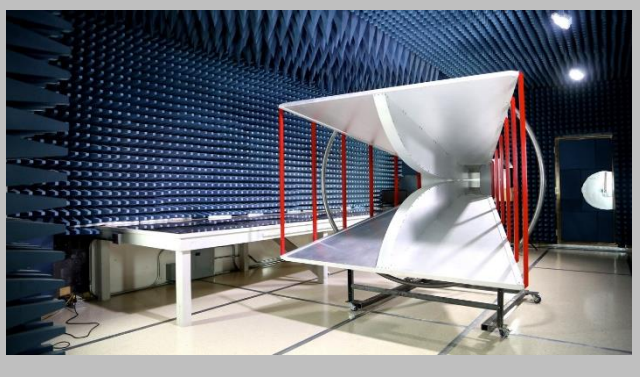
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

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	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.

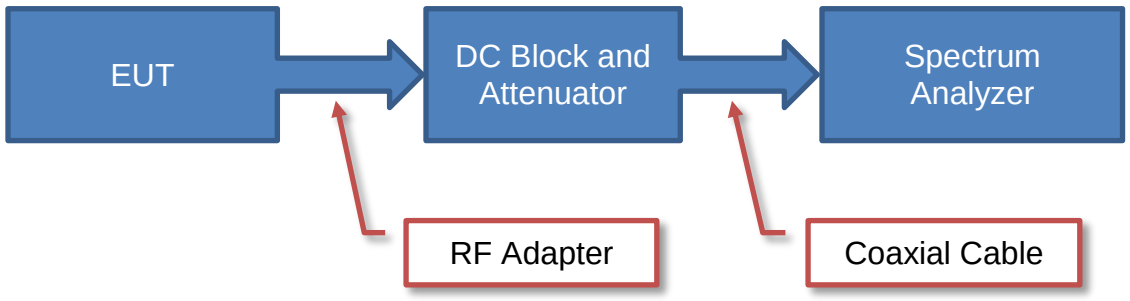
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

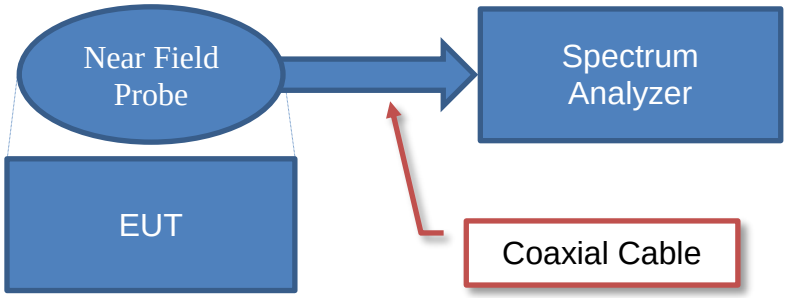
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

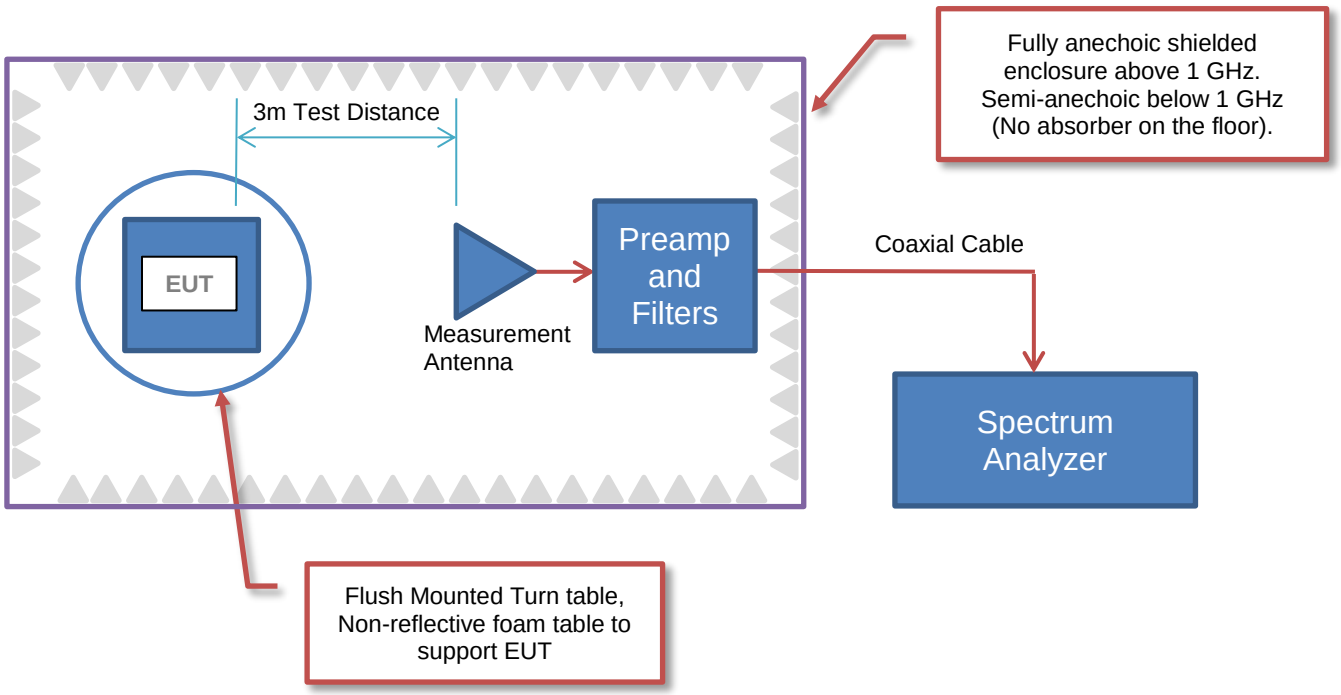
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	ESCO Corporation
Address:	Building #3 2141 NW 25th Ave.
City, State, Zip:	Portland, OR 97210
Test Requested By:	Jason Betournay
Model:	GET Detect Sensor 4286605
First Date of Test:	February 19, 2019
Last Date of Test:	February 22, 2019
Receipt Date of Samples:	February 19, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Battery operated telemetry sensor (BTLE Radio)

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

CONFIGURATIONS

Configuration ESCO0008- 2

Software/Firmware Running during test	
Description	**Version**
nRF Connect	4.22.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Battery operated telemetry sensor (BTLE Radio)	ESCO Corporation	GET Detect Sensor 4286605	None

CONFIGURATIONS

Configuration ESCO0012- 1

Software/Firmware Running during test	
Description	**Version**
nRF Connect	4.22.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Battery operated telemetry sensor (BTLE Radio)	ESCO Corporation	GET Detect Sensor 4286605	None

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-12-19	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.
2	2018-12-19	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.
3	2018-12-19	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.
4	2018-12-19	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.
5	2018-12-19	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.
6	2018-12-19	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
17	2019-02-22	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

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

BTLE continuous TX, Low Channel = 2402 MHz, Mid Channel = 2442 MHz, High Channel = 2480 MHz, Software power setting = 10

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

ESCO0012 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26.5 GHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	ESM Cable Corp.	KMKM-72	EVY	24-Aug-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	24-Aug-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIV	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	24-Nov-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	0 mo
Cable	None	Standard Gain Horns Cable	EVF	24-Nov-2018	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	24-Nov-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	24-Nov-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	24-Nov-2018	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	7-Feb-2018	24 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	15-Feb-2019	12 mo
Attenuator	Coaxicom	3910-20	AXZ	15-Feb-2019	12 mo
Cable	N/A	Bilog Cables	EVA	24-Nov-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	24-Nov-2018	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	2-Oct-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	18-Mar-2018	12 mo

TEST DESCRIPTION

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

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

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

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

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

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

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

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

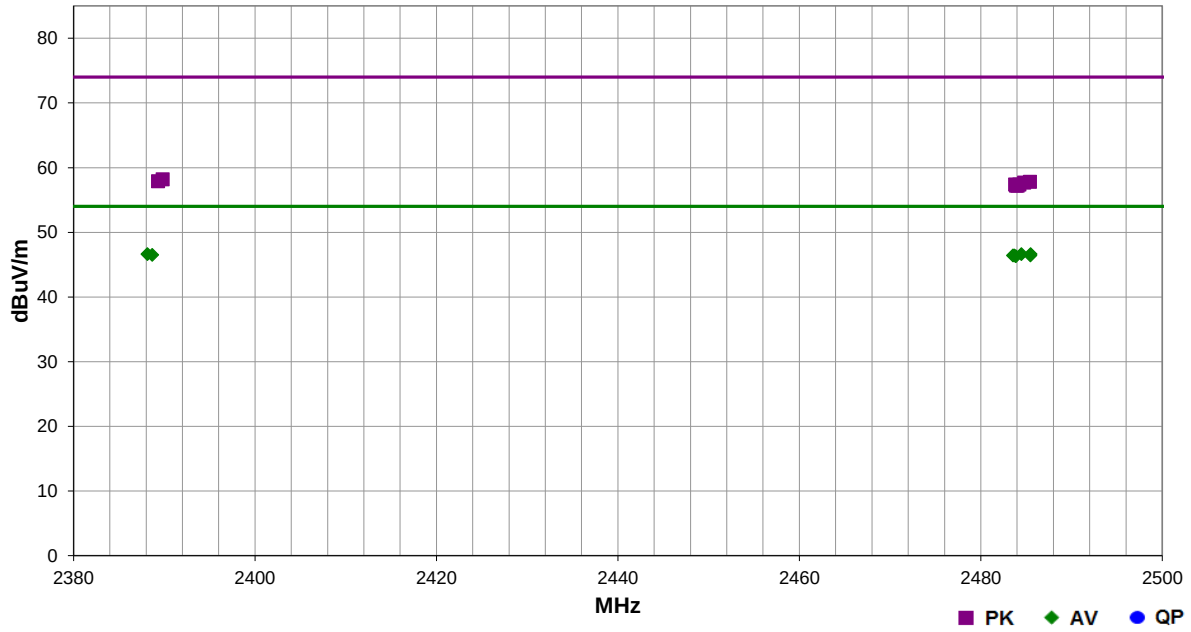
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	ESCO0012	**Date:**	22-Feb-2019		
Project:	None	**Temperature:**	19.2 °C		
Job Site:	EV01	**Humidity:**	31.7% RH		
Serial Number:	None	**Barometric Pres.:**	1022 mbar	**Tested by:**	Jeff Alcoke
EUT:	GET Detect Sensor 4286605				
Configuration:	1				
Customer:	ESCO Corporation				
Attendees:	Jason Betournay				
EUT Power:	Battery				
Operating Mode:	BTLE continuous TX, Low Channel = 2402 MHz, Mid Channel = 2442 MHz, High Channel = 2480 MHz, Software power setting = 10				
Deviations:	None				
Comments:	See comments below for channel and EUT orientation.				

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

Run #	12	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.497	31.4	-4.8	1.0	166.0	3.0	20.0	Horz	AV	0.0	46.6	54.0	-7.4	High Ch, EUT Vert
2484.480	31.4	-4.8	1.0	195.0	3.0	20.0	Vert	AV	0.0	46.6	54.0	-7.4	High Ch, EUT Vert
2388.160	31.7	-5.1	2.5	254.0	3.0	20.0	Horz	AV	0.0	46.6	54.0	-7.4	Low Ch, EUT Vert
2388.670	31.6	-5.1	2.0	132.0	3.0	20.0	Vert	AV	0.0	46.5	54.0	-7.5	Low Ch, EUT Vert
2483.710	31.3	-4.9	2.6	177.0	3.0	20.0	Horz	AV	0.0	46.4	54.0	-7.6	High Ch, EUT Horz
2483.550	31.3	-4.9	1.0	277.0	3.0	20.0	Vert	AV	0.0	46.4	54.0	-7.6	High Ch, EUT Horz
2485.467	31.2	-4.8	1.2	312.0	3.0	20.0	Horz	AV	0.0	46.4	54.0	-7.6	High Ch, EUT on Side
2483.873	31.2	-4.9	1.3	75.0	3.0	20.0	Vert	AV	0.0	46.3	54.0	-7.7	High Ch, EUT on Side
2389.830	43.3	-5.1	2.0	132.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	Low Ch, EUT Vert
2389.320	43.0	-5.1	2.5	254.0	3.0	20.0	Horz	PK	0.0	57.9	74.0	-16.1	Low Ch, EUT Vert
2485.410	42.6	-4.8	1.0	277.0	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	High Ch, EUT Horz
2484.777	42.5	-4.8	1.2	312.0	3.0	20.0	Horz	PK	0.0	57.7	74.0	-16.3	High Ch, EUT on Side
2484.250	42.2	-4.8	1.0	166.0	3.0	20.0	Horz	PK	0.0	57.4	74.0	-16.6	High Ch, EUT Vert
2483.783	42.3	-4.9	2.6	177.0	3.0	20.0	Horz	PK	0.0	57.4	74.0	-16.6	High Ch, EUT Horz
2484.050	42.1	-4.9	1.0	195.0	3.0	20.0	Vert	PK	0.0	57.2	74.0	-16.8	High Ch, EUT Vert
2483.900	42.1	-4.9	1.3	75.0	3.0	20.0	Vert	PK	0.0	57.2	74.0	-16.8	High Ch, EUT on Side

SPURIOUS RADIATED EMISSIONS

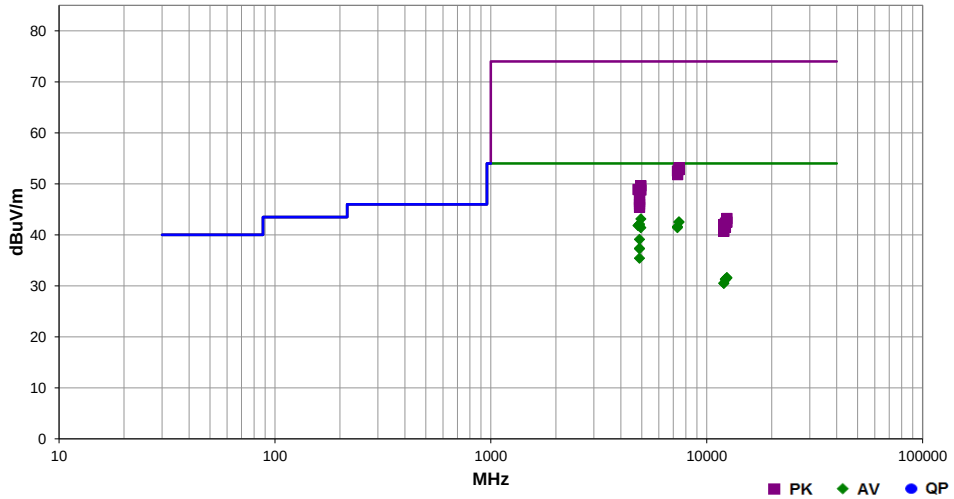
element

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	ESCO0012	**Date:**	22-Feb-2019		
Project:	None	**Temperature:**	19.2 °C		
Job Site:	EV01	**Humidity:**	31.7% RH		
Serial Number:	None	**Barometric Pres.:**	1022 mbar	**Tested by:**	Jeff Alcoke
EUT:	GET Detect Sensor 4286605				
Configuration:	1				
Customer:	ESCO Corporation				
Attendees:	Jason Betournay				
EUT Power:	Battery				
Operating Mode:	BTLE continuous TX, Low Channel = 2402 MHz, Mid Channel = 2442 MHz, High Channel = 2480 MHz, Software power setting = 10				
Deviations:	None				
Comments:	See comments below for channel and EUT orientation.				

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

Run #	13	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4959.933	37.5	5.6	1.3	188.0	3.0	0.0	Horz	AV	0.0	43.1	54.0	-10.9	High Ch, EUT on Side
7439.500	28.3	14.2	1.0	58.0	3.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	High Ch, EUT Horz
7442.233	28.3	14.2	1.0	304.0	3.0	0.0	Horz	AV	0.0	42.5	54.0	-11.5	High Ch, EUT on Side
4883.792	36.7	5.4	2.3	341.0	3.0	0.0	Horz	AV	0.0	42.1	54.0	-11.9	Mid Ch, EUT on Side
4803.900	37.3	4.5	1.0	148.0	3.0	0.0	Vert	AV	0.0	41.8	54.0	-12.2	Low Ch, EUT Horz
4883.883	36.3	5.4	1.0	329.0	3.0	0.0	Vert	AV	0.0	41.7	54.0	-12.3	Mid Ch, EUT Horz
7323.750	28.5	13.1	1.0	0.0	3.0	0.0	Vert	AV	0.0	41.6	54.0	-12.4	Mid Ch, EUT Horz
7325.033	28.2	13.2	2.0	354.0	3.0	0.0	Horz	AV	0.0	41.4	54.0	-12.6	Mid Ch, EUT on Side
4959.817	35.8	5.6	1.0	237.0	3.0	0.0	Vert	AV	0.0	41.4	54.0	-12.6	High Ch, EUT Horz
4883.750	33.7	5.4	2.4	97.0	3.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	Mid Ch, EUT Vert
4883.933	31.9	5.4	1.0	289.0	3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	Mid Ch, EUT Vert
4883.683	31.9	5.4	3.1	36.0	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	Mid Ch, EUT Horz
4883.908	30.0	5.4	1.0	302.0	3.0	0.0	Vert	AV	0.0	35.4	54.0	-18.6	Mid Ch, EUT on Side
7437.667	38.9	14.2	1.0	304.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	High Ch, EUT on Side
7438.042	38.6	14.2	1.0	58.0	3.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	High Ch, EUT Horz
7325.925	39.3	13.2	1.0	0.0	3.0	0.0	Vert	PK	0.0	52.5	74.0	-21.5	Mid Ch, EUT Horz
7327.042	38.6	13.2	2.0	354.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	Mid Ch, EUT on Side
12397.570	29.6	2.0	1.0	172.0	3.0	0.0	Horz	AV	0.0	31.6	54.0	-22.4	High Ch, EUT on Side
12398.020	29.5	2.0	2.1	188.0	3.0	0.0	Vert	AV	0.0	31.5	54.0	-22.5	High Ch, EUT Horz
12208.730	29.6	1.7	1.0	0.0	3.0	0.0	Vert	AV	0.0	31.3	54.0	-22.7	Mid Ch, EUT Horz
12209.550	29.5	1.7	1.0	100.0	3.0	0.0	Horz	AV	0.0	31.2	54.0	-22.8	Mid Ch, EUT on Side
12011.180	29.7	0.8	1.0	0.0	3.0	0.0	Vert	AV	0.0	30.5	54.0	-23.5	Low Ch, EUT Horz
12012.030	29.7	0.8	1.0	360.0	3.0	0.0	Horz	AV	0.0	30.5	54.0	-23.5	Low Ch, EUT on Side
4960.200	44.0	5.6	1.3	188.0	3.0	0.0	Horz	PK	0.0	49.6	74.0	-24.4	High Ch, EUT on Side
4804.183	44.3	4.6	1.0	148.0	3.0	0.0	Vert	PK	0.0	48.9	74.0	-25.1	Low Ch, EUT Horz
4959.967	43.2	5.6	1.0	237.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	High Ch, EUT Horz
4883.433	43.3	5.4	2.3	341.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Mid Ch, EUT on Side
4883.917	43.2	5.4	1.0	329.0	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	Mid Ch, EUT Horz
4883.442	41.5	5.4	2.4	97.0	3.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1	Mid Ch, EUT Vert
4884.125	41.1	5.4	1.0	289.0	3.0	0.0	Vert	PK	0.0	46.5	74.0	-27.5	Mid Ch, EUT Vert
4883.500	40.6	5.4	3.1	36.0	3.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	Mid Ch, EUT Horz
4883.458	40.0	5.4	1.0	302.0	3.0	0.0	Vert	PK	0.0	45.4	74.0	-28.6	Mid Ch, EUT on Side
12399.730	41.2	2.0	1.0	172.0	3.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	High Ch, EUT on Side
12398.530	40.5	2.0	2.1	188.0	3.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	High Ch, EUT Horz
12210.430	40.6	1.7	1.0	0.0	3.0	0.0	Vert	PK	0.0	42.3	74.0	-31.7	Mid Ch, EUT Horz
12010.580	41.2	0.8	1.0	0.0	3.0	0.0	Vert	PK	0.0	42.0	74.0	-32.0	Low Ch, EUT Horz
12208.060	39.8	1.7	1.0	100.0	3.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	Mid Ch, EUT on Side
12008.220	40.0	0.7	1.0	360.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Low Ch, EUT on Side

DUTY CYCLE

TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

The EUT operates at 100% Duty Cycle.

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
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-19	1-Feb-20
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21

TEST DESCRIPTION

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

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

OCCUPIED BANDWIDTH

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.3% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

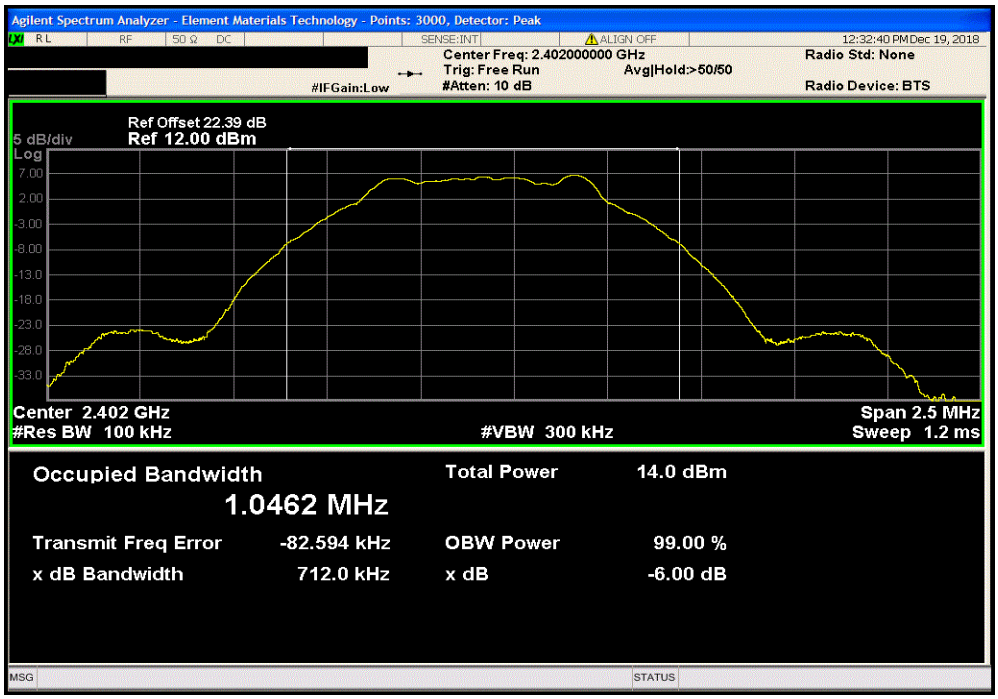
DEVIATIONS FROM TEST STANDARD

None

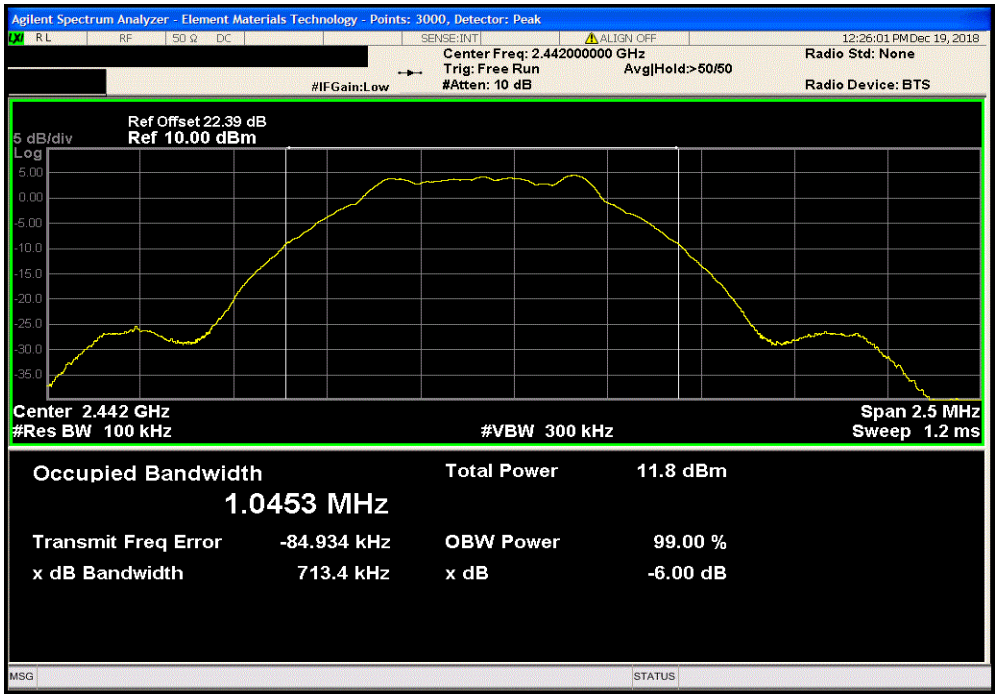
Configuration #	**2**	*Signature*

	Value	**Limit (≥)**	**Result**
Power Setting = 10			
BLE/GFSK Low Channel, 2402 MHz	712.019 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	713.433 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	707.772 kHz	500 kHz	Pass

Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				712.019 kHz	500 kHz	Pass

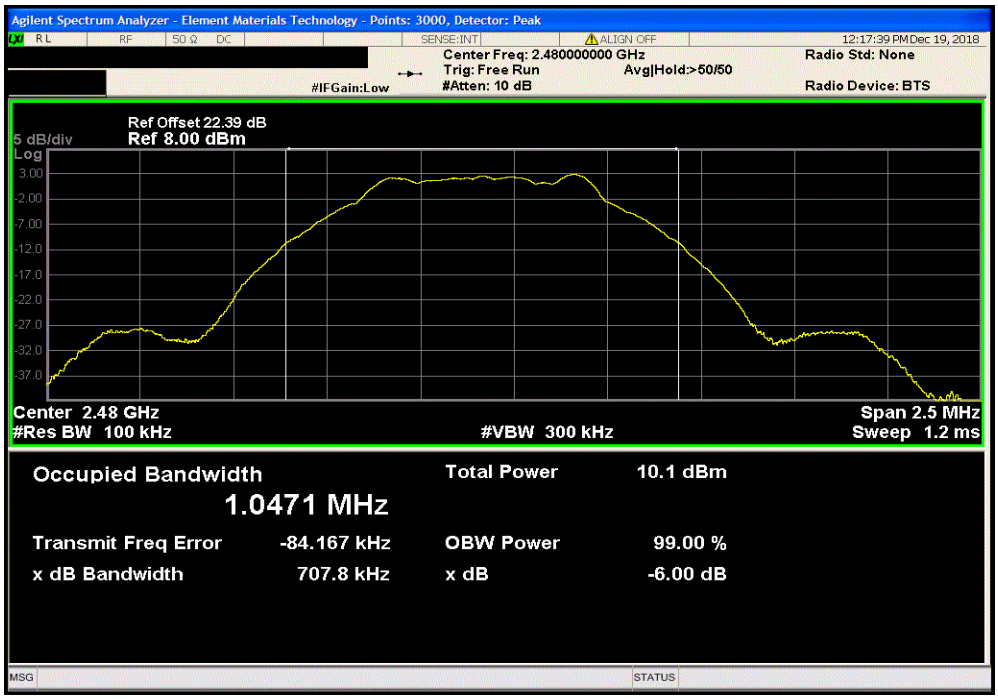


Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				713.433 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

Power Setting = 10, BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				707.772 kHz	500 kHz	Pass



OUTPUT POWER

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
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-19	1-Feb-20
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21

TEST DESCRIPTION

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

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

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

OUTPUT POWER

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.3% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

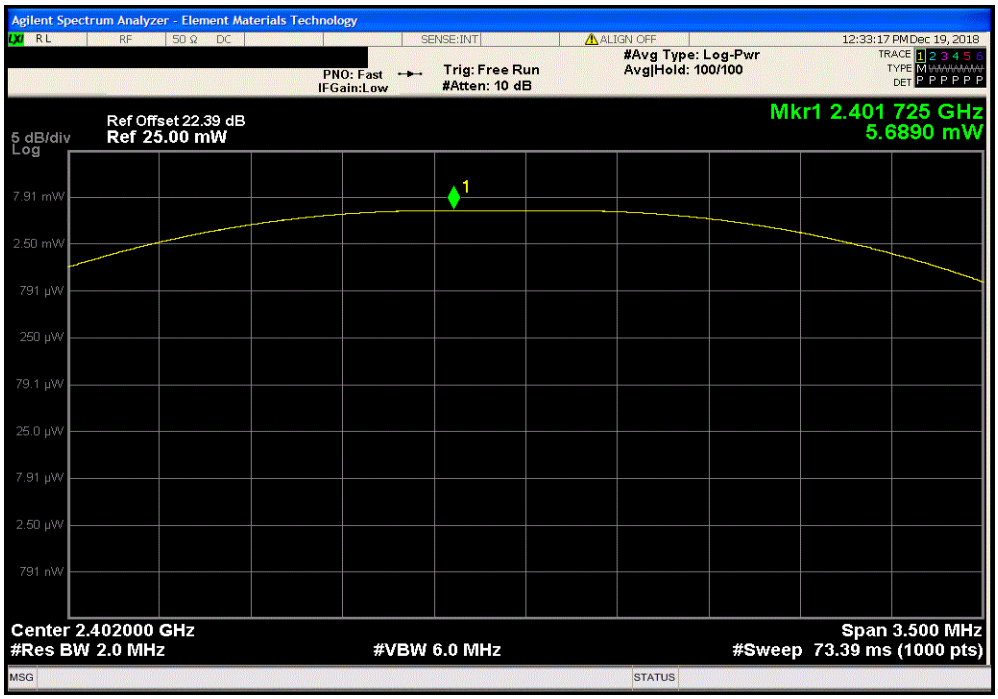
DEVIATIONS FROM TEST STANDARD

None

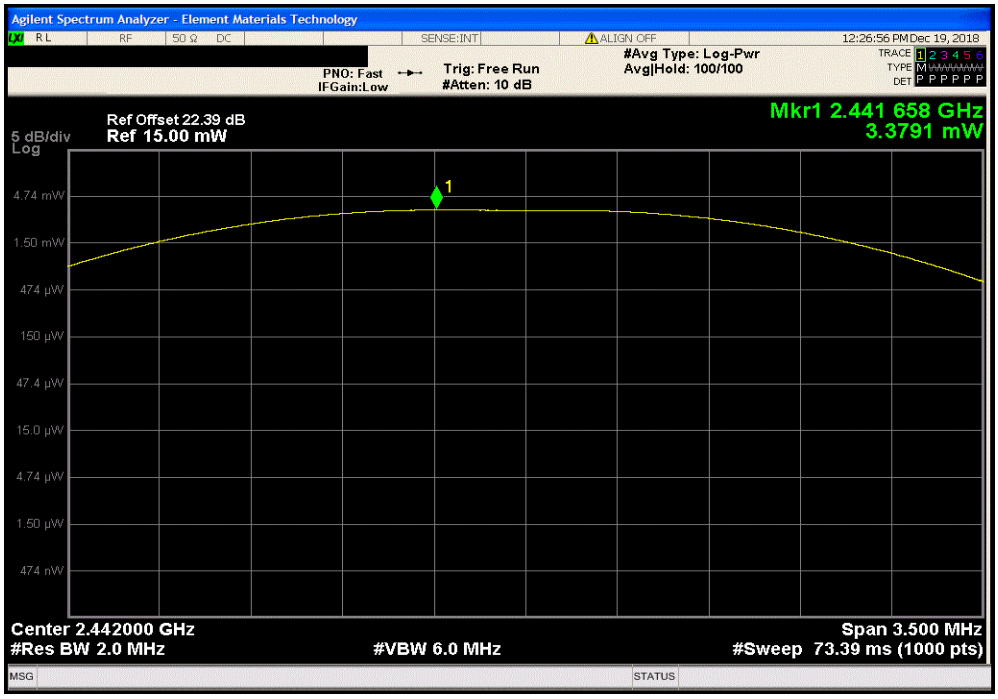
Configuration #	**2**	*Signature*

	Value	**Limit (<)**	**Result**
Power Setting = 10			
BLE/GFSK Low Channel, 2402 MHz	5.689 mW	1 W	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.379 mW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	2.299 mW	1 W	Pass

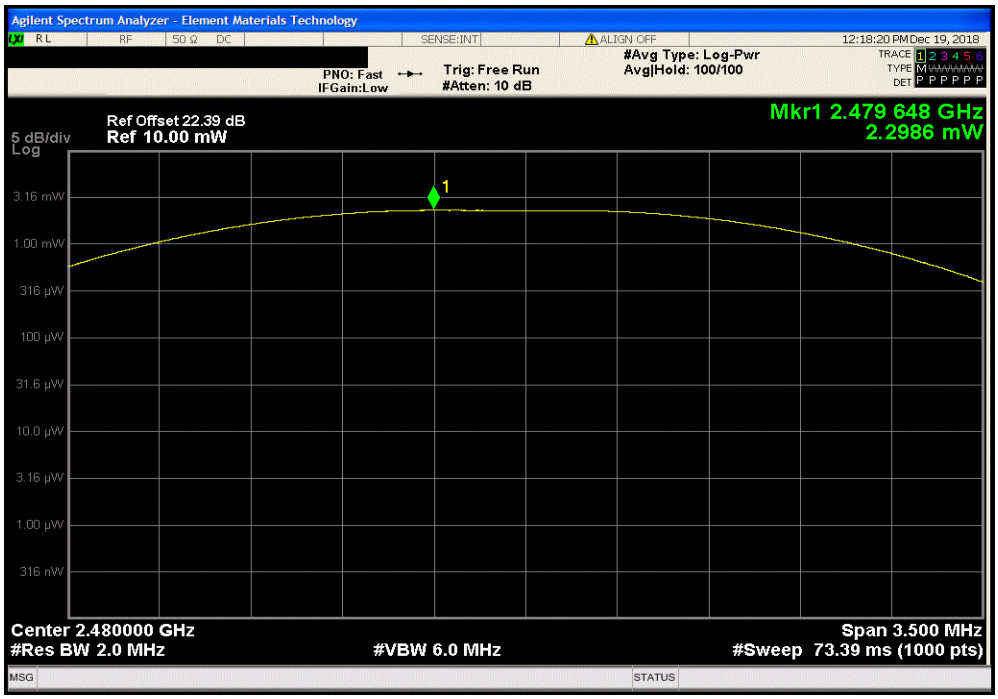
Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				5.689 mW	1 W	Pass



Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (<)	Result
				3.379 mW	1 W	Pass



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (<)	Result
				2.299 mW	1 W	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

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
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-19	1-Feb-20
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21

TEST DESCRIPTION

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

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

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

The antenna gain of the EUT was then added to the conducted output power to derive the EIRP Values.

EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.3% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

DEVIATIONS FROM TEST STANDARD

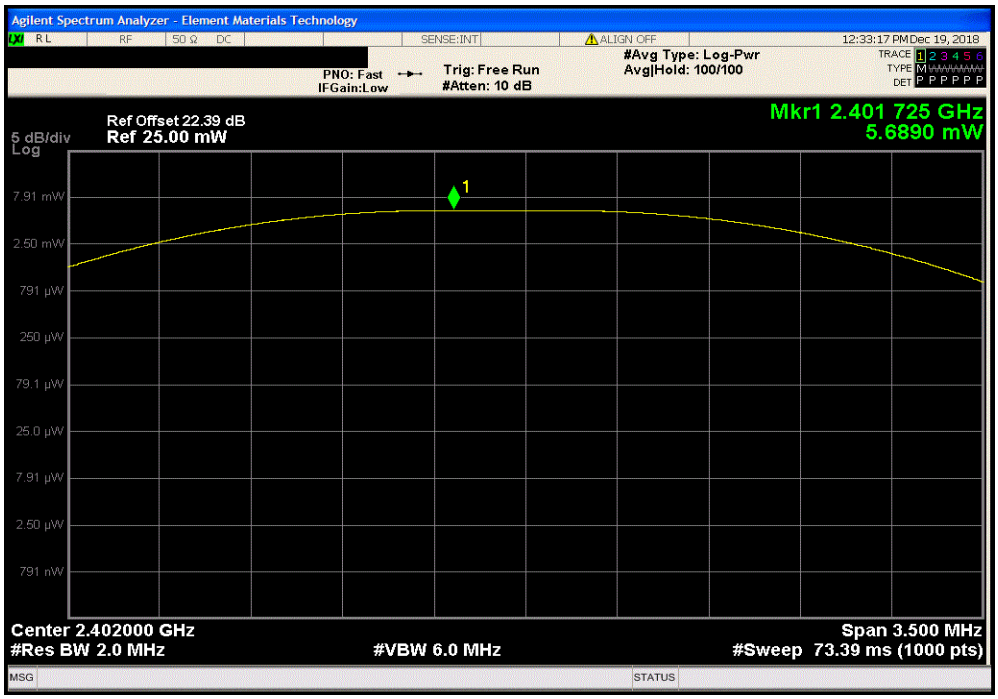
None

Configuration #	**2**	*Signature*

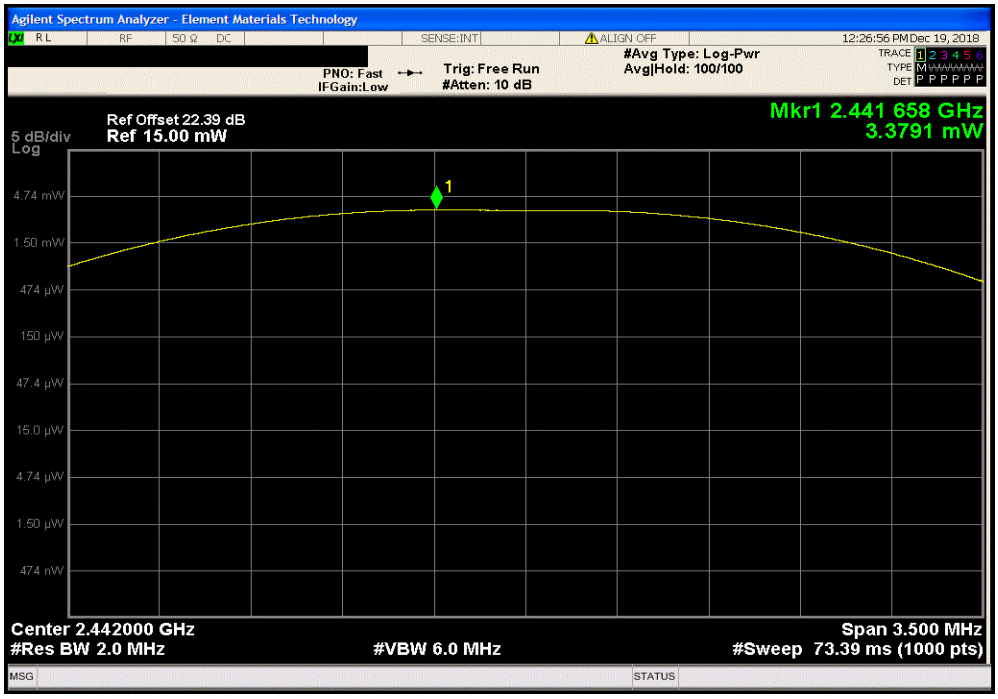
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (dBm)	Result
Power Setting = 10						
BLE/GFSK Low Channel, 2402 MHz	5.69	7.55	1.7	9.3	< 36	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.38	5.29	1.7	7.0	< 36	Pass
BLE/GFSK High Channel, 2480 MHz	2.30	3.61	1.7	5.3	< 36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (dBm)	Result
	5.689	7.55	1.7	9.3	< 36	Pass

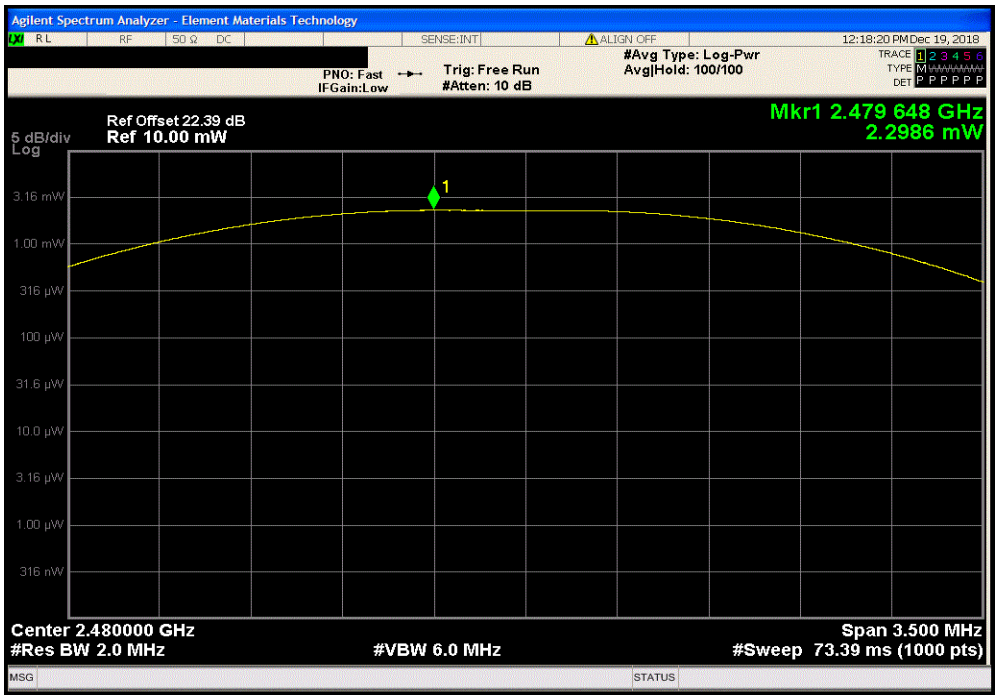


Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (dBm)	Result
	3.3791	5.29	1.7	7.0	< 36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

Power Setting = 10, BLE/GFSK High Channel, 2480 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (dBm)	Result
	2.2986	3.61	1.7	5.3	< 36	Pass



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
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-19	1-Feb-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.3% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

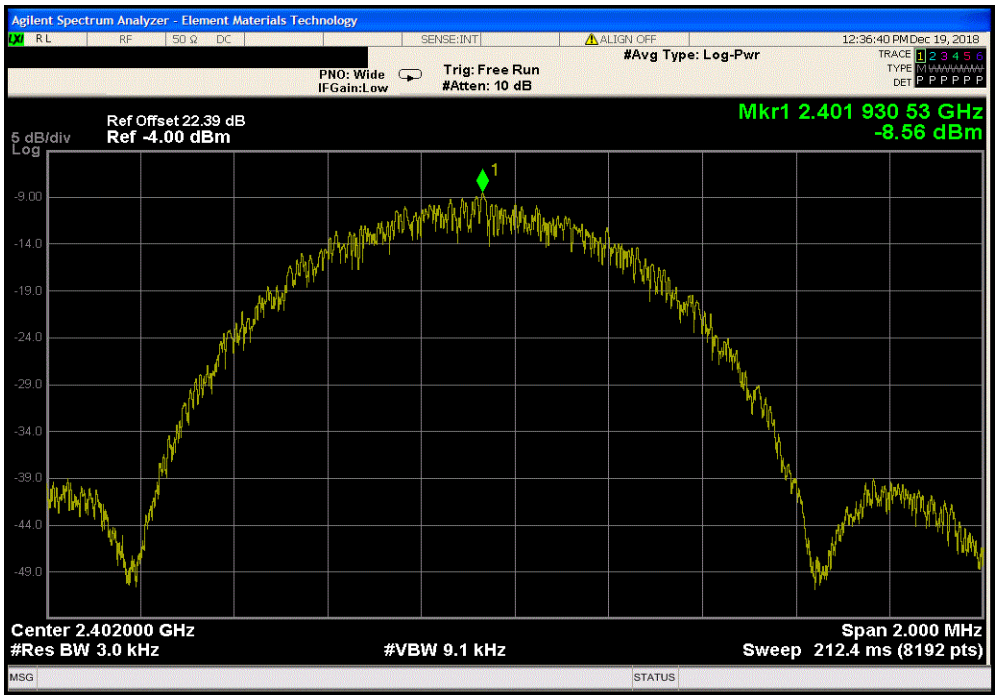
DEVIATIONS FROM TEST STANDARD

None

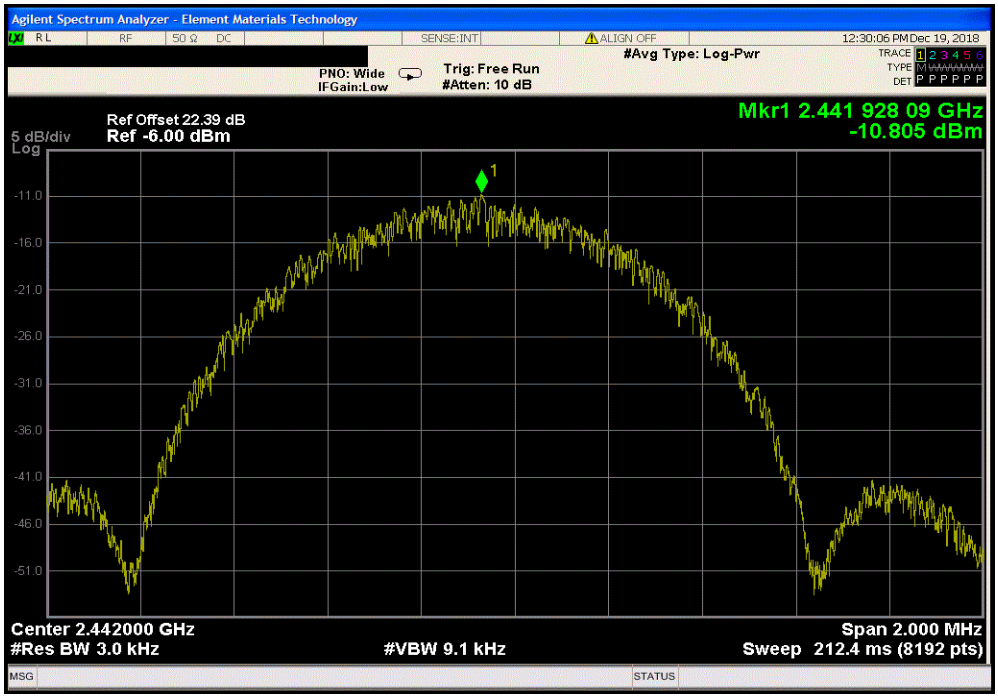
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
Power Setting = 10			
BLE/GFSK Low Channel, 2402 MHz	-8.564	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-10.805	8	Pass
BLE/GFSK High Channel, 2480 MHz	-12.491	8	Pass

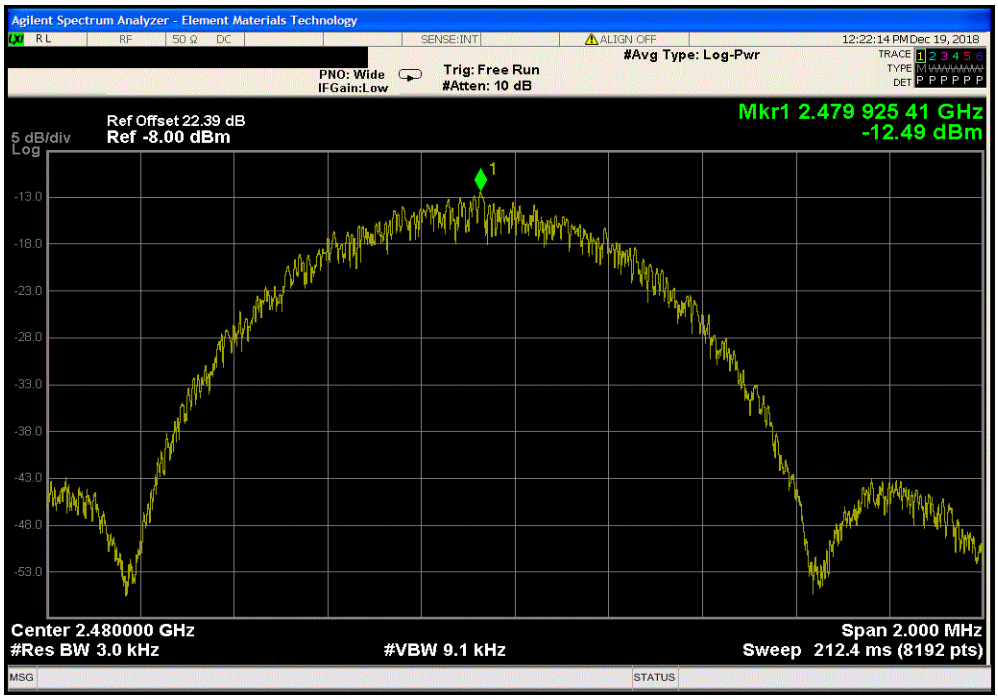
Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.564	8	Pass



Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.805	8	Pass



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.491	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	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21

TEST DESCRIPTION

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

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.3% RH**
Project:	**None**			**Barometric Pres.:**	**1020 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

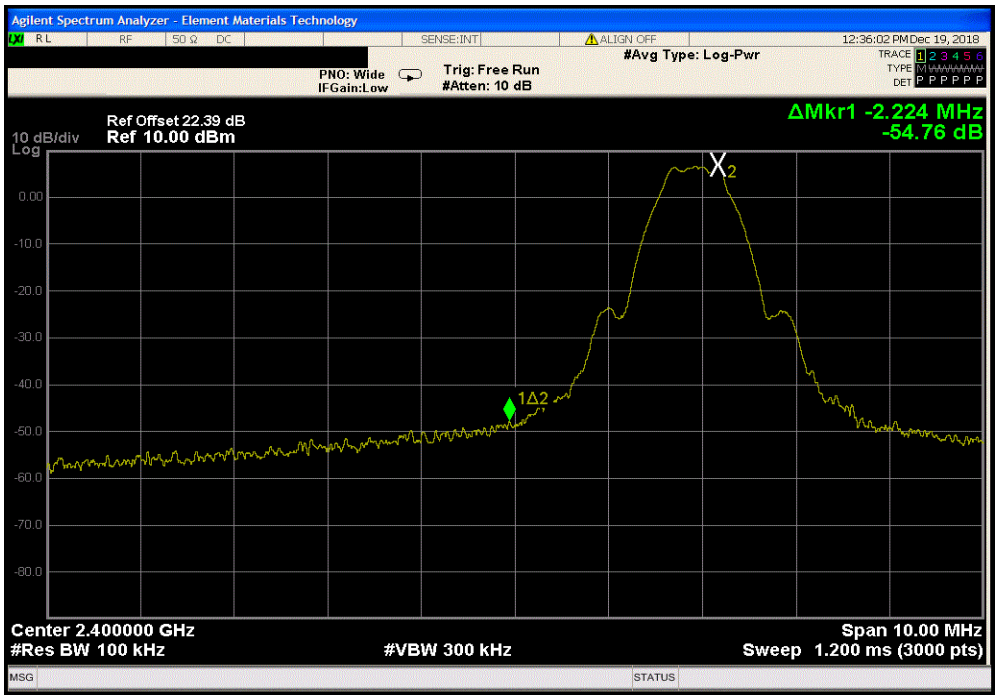
DEVIATIONS FROM TEST STANDARD

None

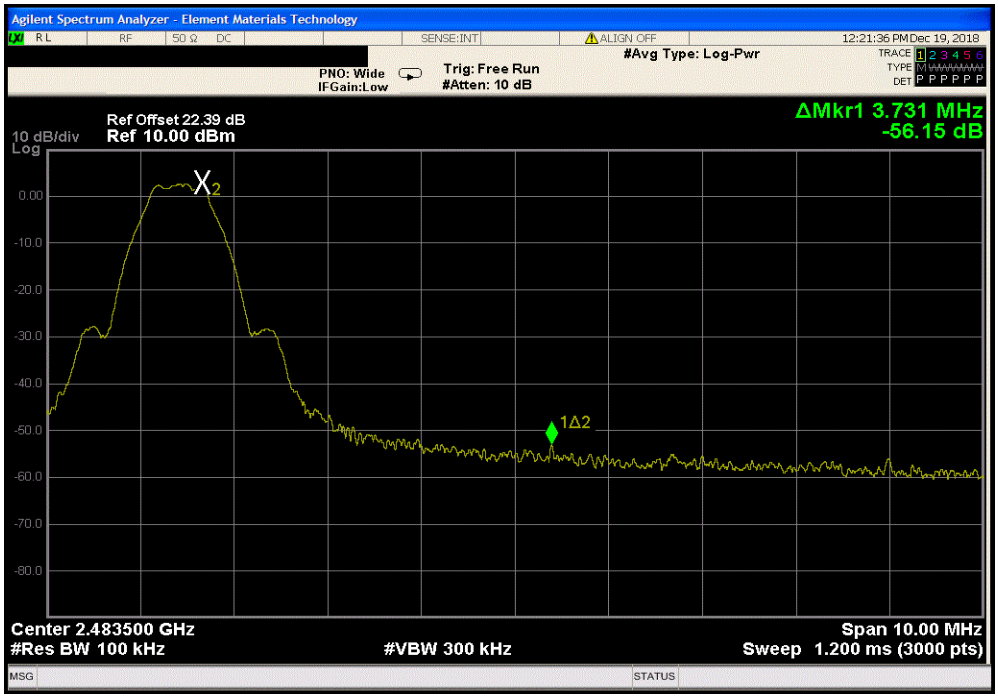
Configuration #	**2**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
Power Setting = 10			
BLE/GFSK Low Channel, 2402 MHz	-54.76	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-56.15	-20	Pass

Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-54.76	-20	Pass



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.15	-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
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	5-Nov-18	5-Nov-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-19	1-Feb-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**GET Detect Sensor 4286605**			**Work Order:**	**ESCO0008**
Serial Number:	**None**			**Date:**	**19-Dec-18**
Customer:	**ESCO Corporation**			**Temperature:**	**19.4 °C**
Attendees:	**Jason Betournay**			**Humidity:**	**32.2% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

Reference level offset includes measurement system loss of 21.54 dB (Cable and Attenuator), and the clients soldered on coax cable with N-SMA adaptor loss of 0.85 for a total loss of 22.39 dB.

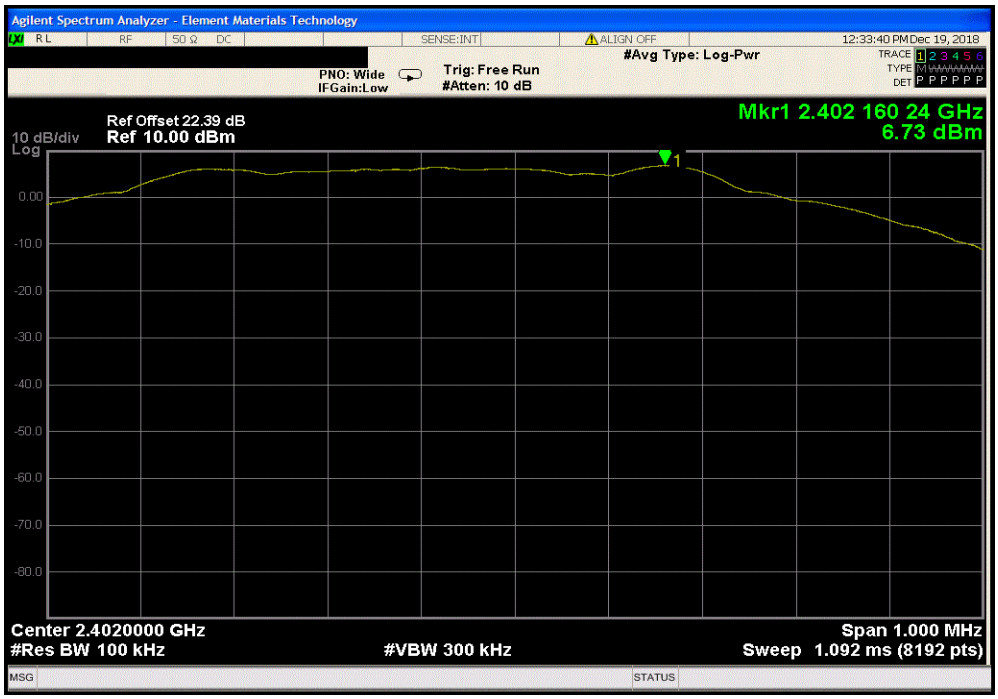
DEVIATIONS FROM TEST STANDARD

None

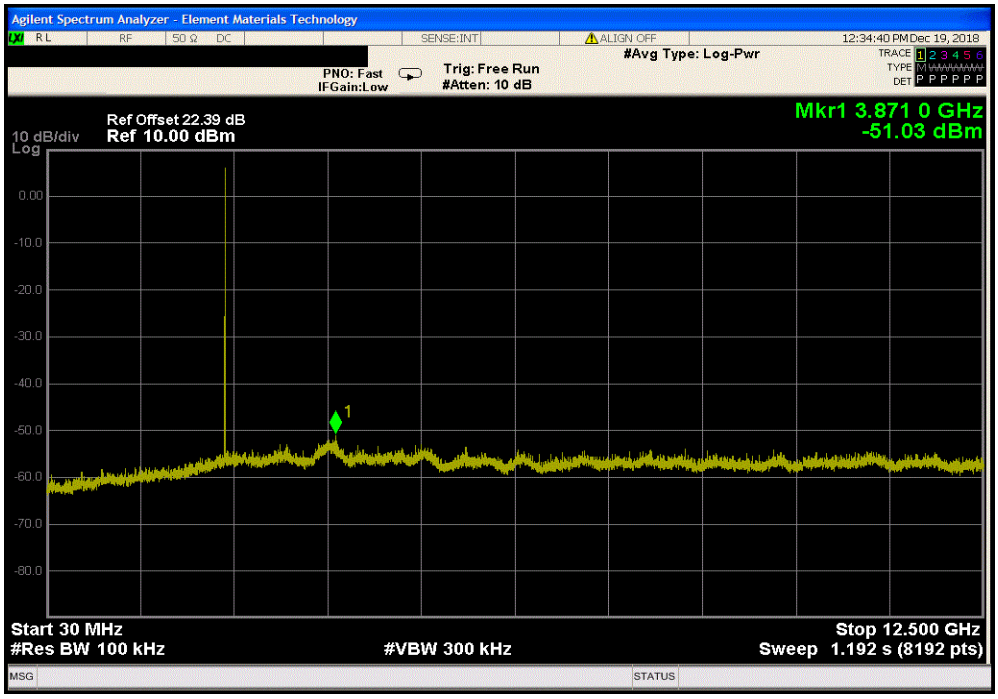
Configuration #	**2**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Power Setting = 10					
BLE/GFSK Low Channel, 2402 MHz	Fundamental	2402.16	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	3871.02	-57.76	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24450.62	-56.53	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	2442.16	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	3764.45	-54.84	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	21657.92	-55.4	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	2480.15	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	3765.98	-53.96	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	23995.85	-53.08	-20	Pass

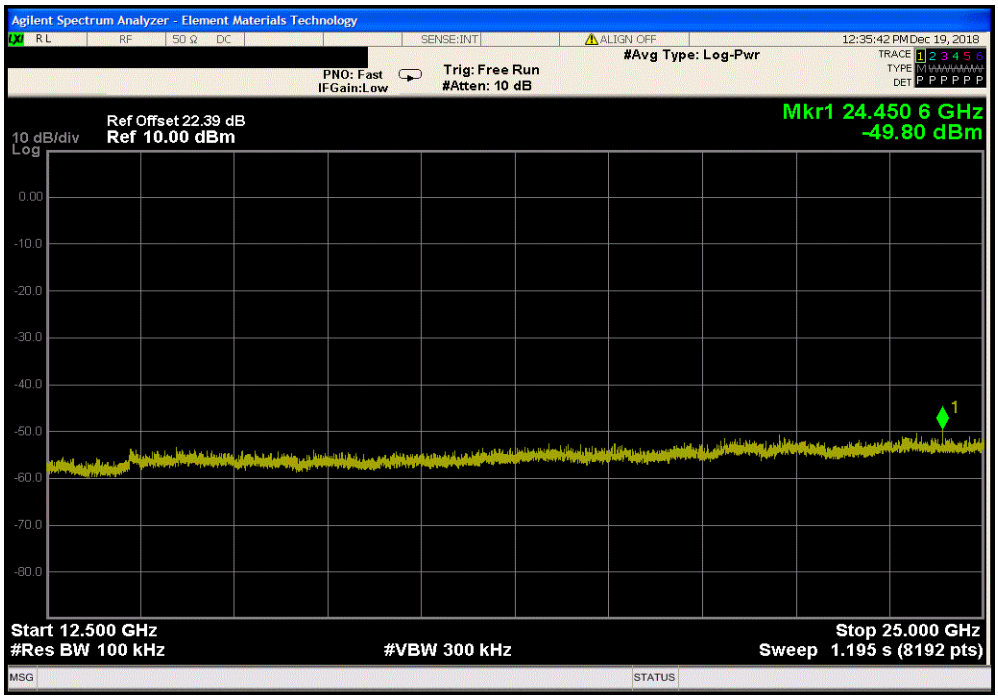
Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2402.16	N/A	N/A	N/A



Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	3871.02	-57.76	-20	Pass

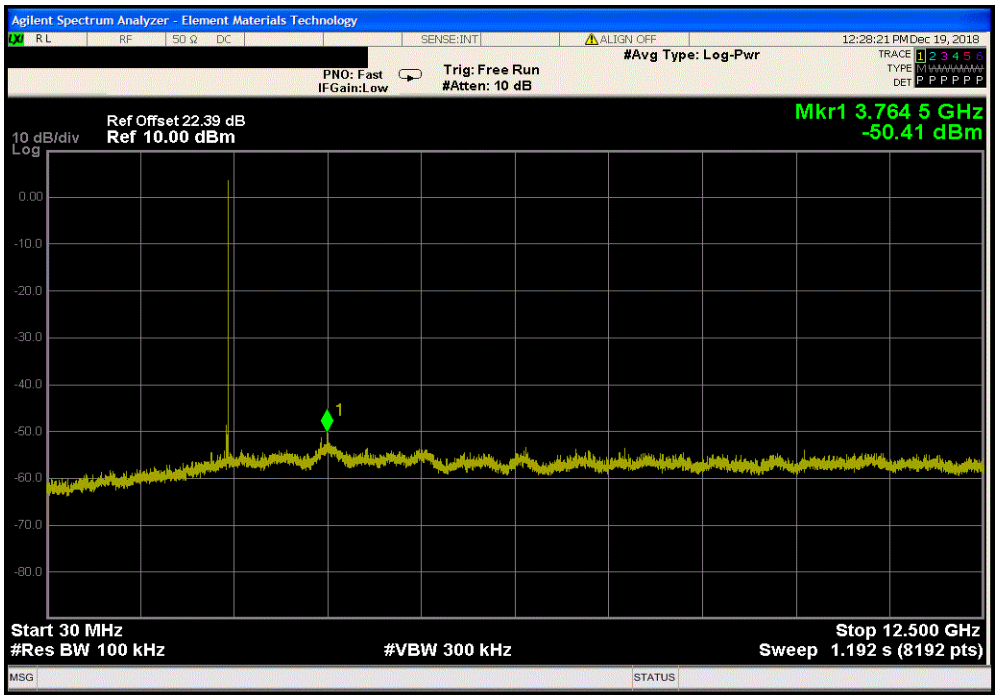


Power Setting = 10, BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24450.62	-56.53	-20	Pass

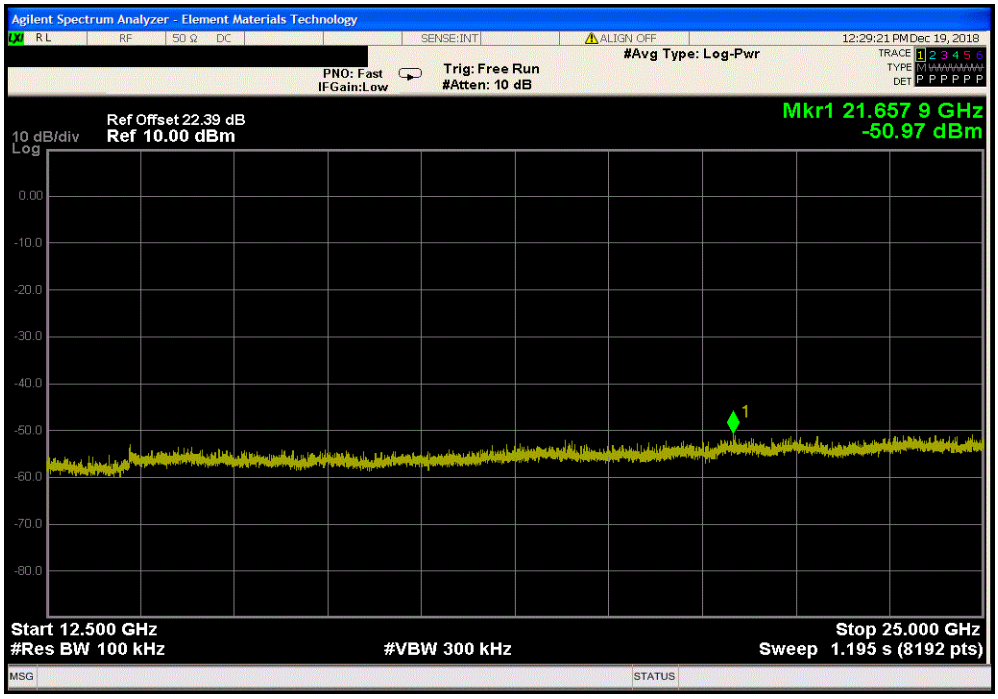


Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental	2442.16	N/A	N/A	N/A

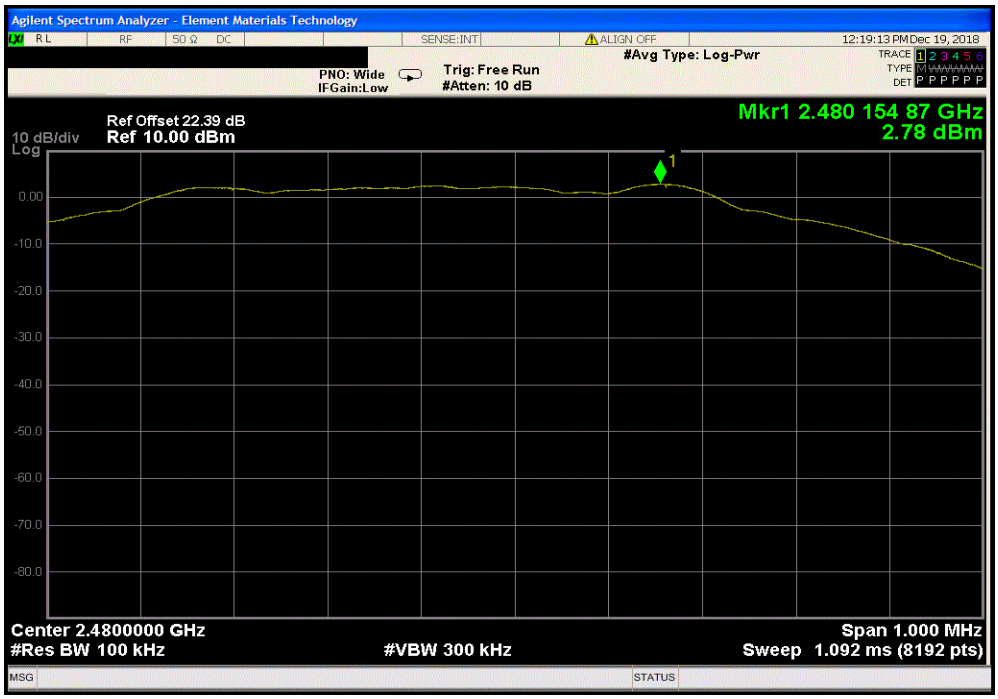
Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	3764.45	-54.84	-20	Pass



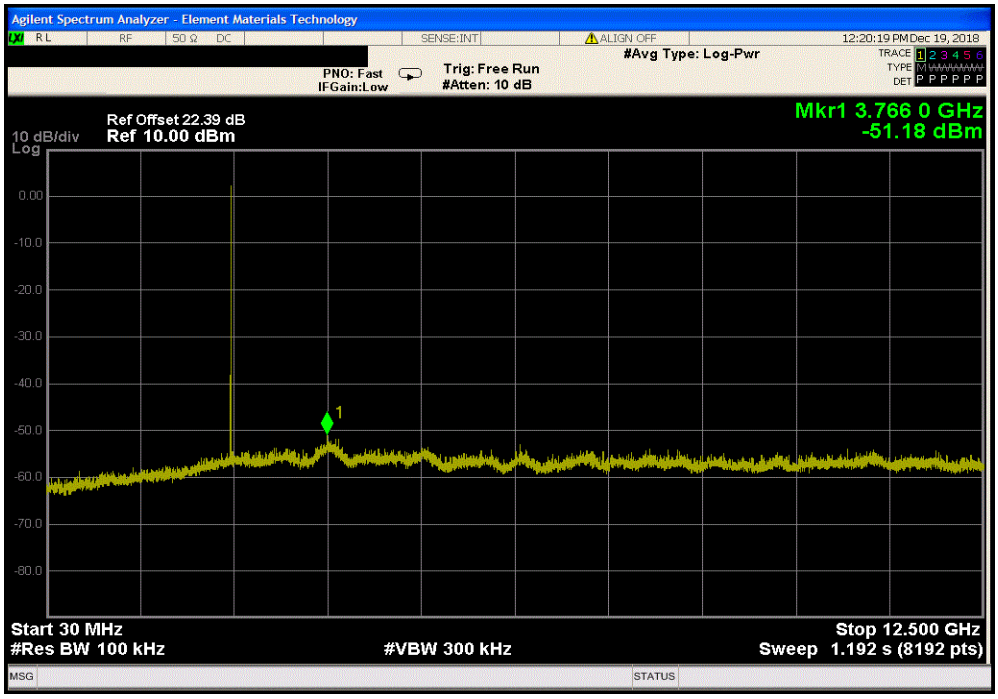
Power Setting = 10, BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	21657.92	-55.4	-20	Pass



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.15	N/A	N/A	N/A



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	3765.98	-53.96	-20	Pass



Power Setting = 10, BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	23995.85	-53.08	-20	Pass