NORTHWEST EMC

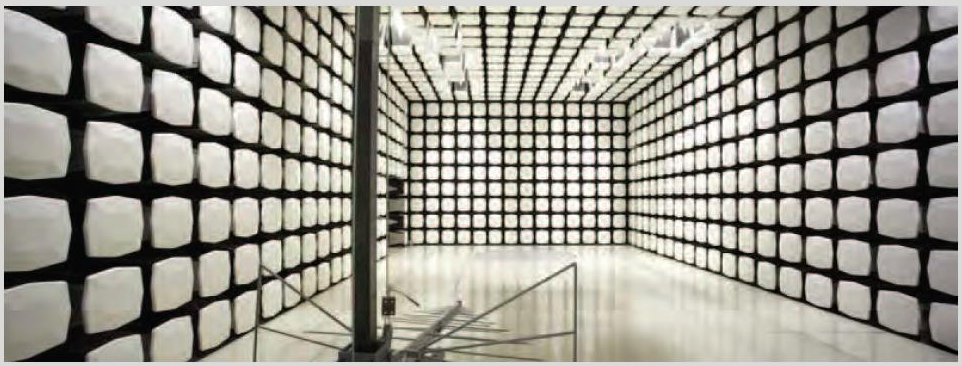
Awarepoint Corporation

BLEE

FCC 15.247:2016

Bluetooth Radio

Report # AWAR0022.5



NVLAP TESTING

NVLAP Lab Code: 200676-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: August 9, 2016
Awarepoint Corporation
Model: BLEE

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2016	ANSI C63.10:2013, KDB 558074

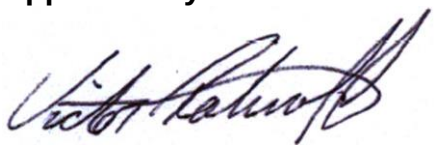
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.5	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	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations from Test Standards

None

Approved By:



Victor Ratinoff, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2016.7.25

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 Northwest EMC 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 – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

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 WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

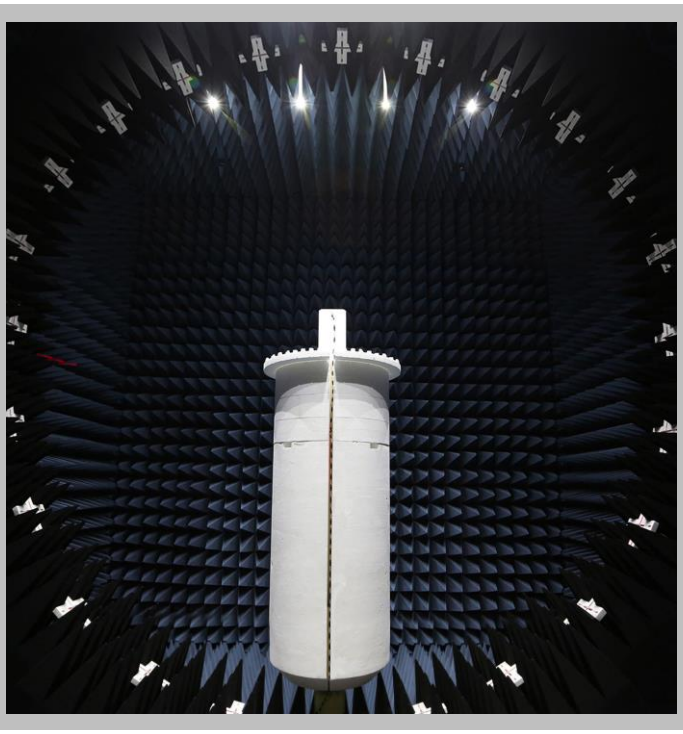
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

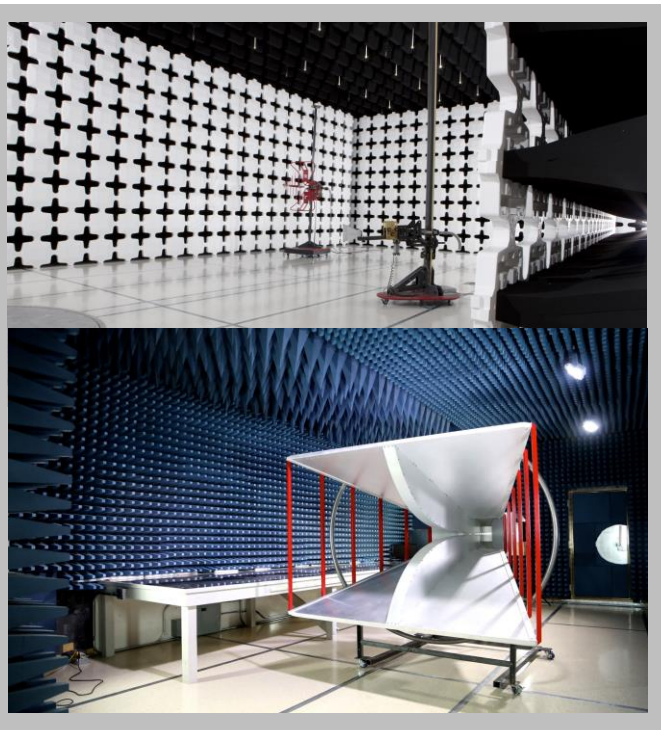
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

FACILITIES

NORTHWEST EMC
REV 2016.7.25

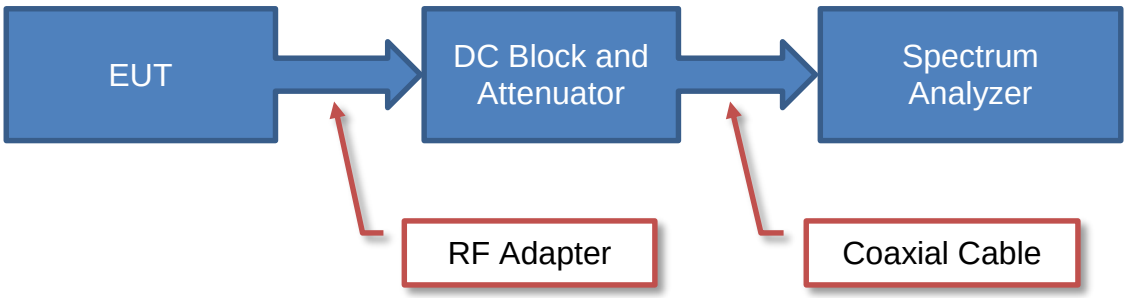
California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 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	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



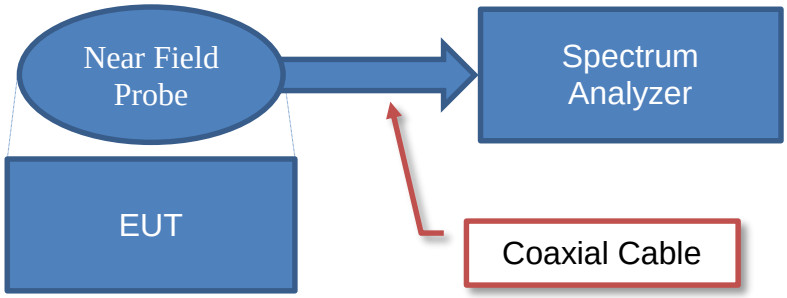


Test Setup Block Diagrams

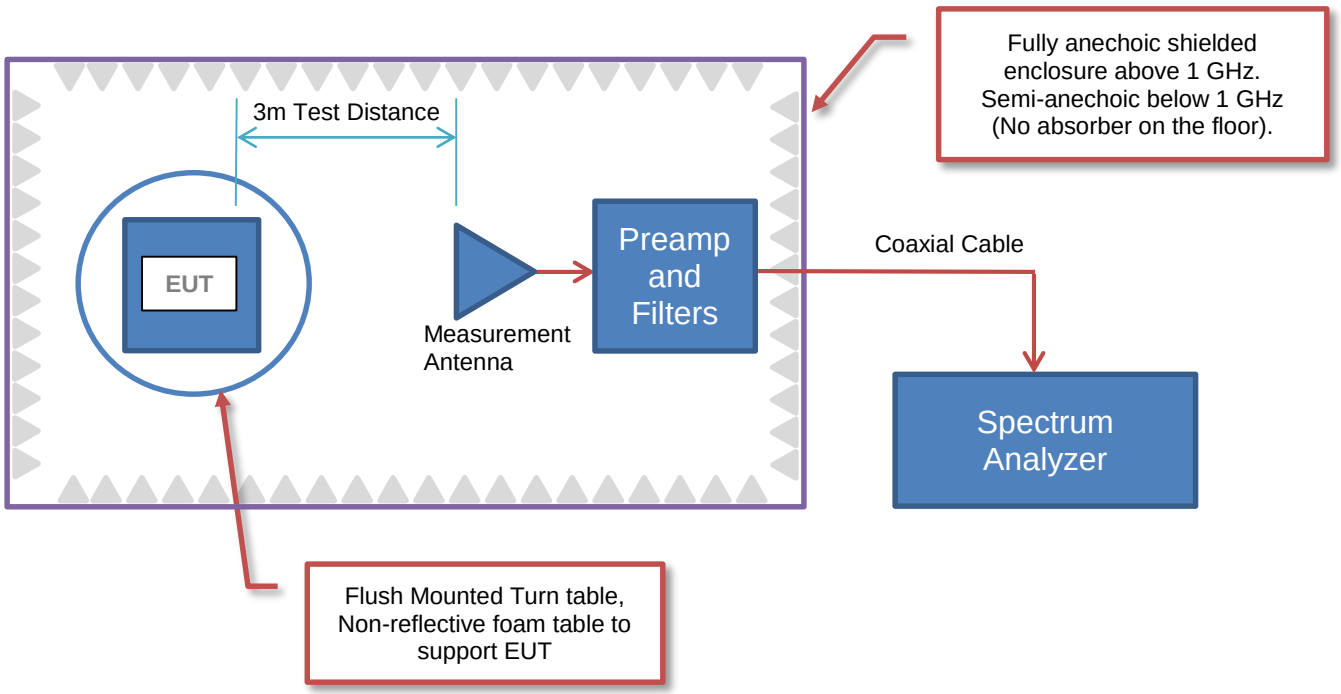
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Awarepoint Corporation
Address:	600 W. Broadway Suite 250
City, State, Zip:	San Diego, CA 92101
Test Requested By:	John Taylor
Model:	BLEE
First Date of Test:	July 28, 2016
Last Date of Test:	August 9, 2016
Receipt Date of Samples:	July 28, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
BLE Environmental Tag: Operates like a BLE Tag except with the additional functionality of reporting readings from one of a variety of connected environmental sensors.

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

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration AWAR0022- 3

Software/Firmware Running during test	
Description	**Version**
SmartRF Studio 7	2.3.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
WiFi and Bluetooth Radio	Awarepoint Corporation	BLEE	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	VOSTRO 3550	FJRVLR1
AC/DC Power Supply	Dell	LA90PS0-00	CN-0DF266-71615-73O-0B34
BLE Interface Board	Texas Instruments	SmartRF06EB	0x00321

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	.75m	No	AC mains	AC/DC Power Supply
DC Cable	No	1.5m	Yes	AC/DC Power Supply	Laptop
Ribbon Cable	No	0.1m	No	BLE Interface Board	WiFi and Bluetooth Radio
Micro USB Cable	No	1.0m	No	BLE Interface Board	Laptop

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/28/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	8/9/2016	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	8/9/2016	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	8/9/2016	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	8/9/2016	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	8/9/2016	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	8/9/2016	Spurious Conducted 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 2016.04.26.1

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

MODES OF OPERATION

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

POWER SETTINGS INVESTIGATED

USB Powered

CONFIGURATIONS INVESTIGATED

AWAR0022 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - Low Pass	Micro-Tronics	LPM50004	LFC	11/3/2015	12 mo
Attenuator	Coaxicom	66702 3910AF-20	TKI	3/3/2016	12 mo
Cable	Northwest EMC	8-18GHz RE Cables	OCO	8/26/2015	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	1/6/2016	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	8/26/2015	12 mo
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	3/3/2016	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HFM	2/9/2016	12 mo
Antenna - Biconilog	EMCO	3142B	AXK	10/6/2014	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	8/26/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079	AOO	3/3/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	1/6/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	8/31/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	8/31/2015	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 - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	0 mo
Antenna - Double Ridge	EMCO	3115	AHB	3/21/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2/9/2016	12 mo

TEST DESCRIPTION

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

SPURIOUS RADIATED EMISSIONS

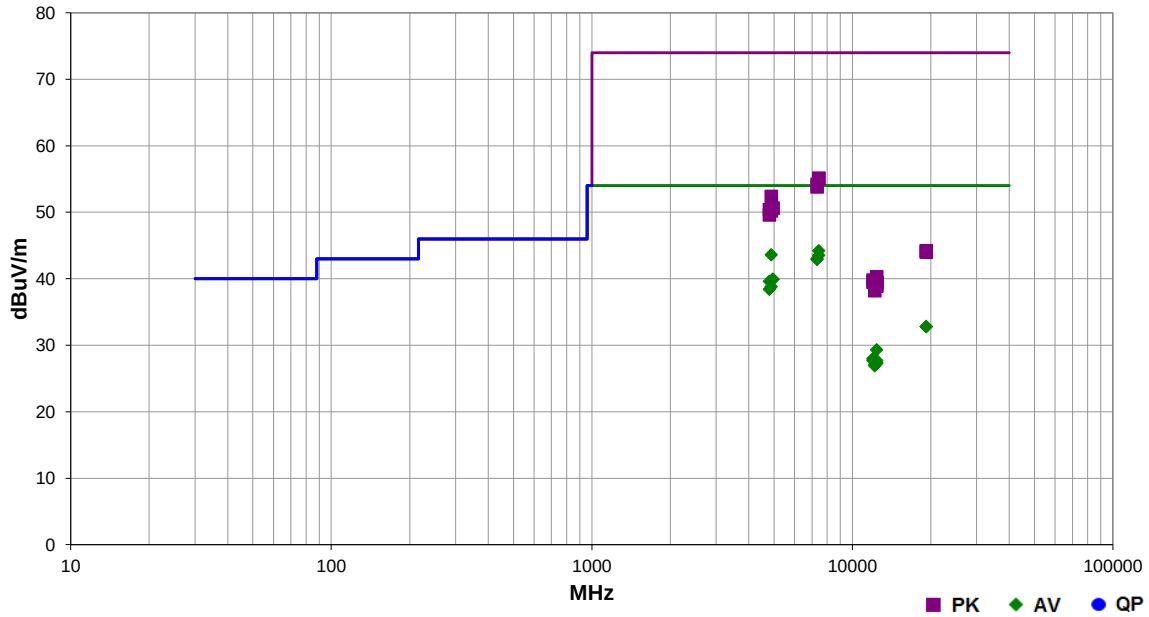
NORTHWEST EMC

PSA-ESCI 2016.04.26.1
EmiR5 2016.04.26.1

Work Order:	AWAR0022	**Date:**	07/28/16		
Project:	None	**Temperature:**	22.4 °C		
Job Site:	OC10	**Humidity:**	52.2% RH		
Serial Number:	None	**Barometric Pres.:**	1015 mbar	**Tested by:**	Mike Tran
EUT:	BLEE				
Configuration:	3				
Customer:	Awarepoint Corporation				
Attendees:	None				
EUT Power:	USB Powered				
Operating Mode:	Transmitting BLE at Low Channel 0 (2402MHz), Mid Channel 20 (2442MHz), and High Channel 39 (2480MHz)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2016	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
7439.383	27.8	16.4	1.6	320.0	3.0	0.0	Horz	AV	0.0	44.2	54.0	-9.8	EUT on Side, High Ch 2480MHz
4884.100	33.0	10.6	1.0	225.0	3.0	0.0	Vert	AV	0.0	43.6	54.0	-10.4	EUT Horz, Mid Ch 2442MHz
7439.433	27.1	16.4	1.7	164.0	3.0	0.0	Vert	AV	0.0	43.5	54.0	-10.5	EUT Horz, High Ch 2480MHz
7326.692	26.8	16.2	1.7	349.0	3.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	EUT Horz, Mid Ch 2442MHz
7323.808	26.7	16.2	1.7	272.0	3.0	0.0	Horz	AV	0.0	42.9	54.0	-11.1	EUT on Side, Mid Ch 2442MHz
4959.742	29.1	10.8	1.7	150.0	3.0	0.0	Vert	AV	0.0	39.9	54.0	-14.1	EUT Horz, High Ch 2480MHz
4960.208	29.1	10.8	1.5	76.0	3.0	0.0	Horz	AV	0.0	39.9	54.0	-14.1	EUT on Side, High Ch 2480MHz
4804.358	29.2	10.4	1.0	60.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	EUT Horz, Low Ch 2402Mhz
4886.483	28.2	10.6	1.7	298.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	EUT on Side, Mid Ch 2442MHz
4804.167	28.0	10.4	1.7	65.0	3.0	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT on Side, Low Ch 2402MHz
7438.200	38.7	16.4	1.7	164.0	3.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	EUT Horz, High Ch 2480MHz
7440.883	38.7	16.4	1.6	320.0	3.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	EUT on Side, High Ch 2480MHz
7325.125	38.0	16.2	1.7	349.0	3.0	0.0	Vert	PK	0.0	54.2	74.0	-19.8	EUT Horz, Mid Ch 2442MHz
7325.308	37.6	16.2	1.7	272.0	3.0	0.0	Horz	PK	0.0	53.8	74.0	-20.2	EUT on Side, Mid Ch 2442MHz
19215.020	38.4	-5.6	1.5	31.0	3.0	0.0	Vert	AV	0.0	32.8	54.0	-21.2	EUT Horz, Low Ch 2402MHz
19213.560	38.4	-5.6	1.5	5.0	3.0	0.0	Horz	AV	0.0	32.8	54.0	-21.2	EUT on Side, Low CH 2402MHz
4883.958	41.8	10.6	1.0	225.0	3.0	0.0	Vert	PK	0.0	52.4	74.0	-21.6	EUT Horz, Mid Ch 2442MHz
4960.083	39.8	10.8	1.7	150.0	3.0	0.0	Vert	PK	0.0	50.6	74.0	-23.4	EUT Horz, High Ch 2480MHz
4959.575	39.8	10.8	1.5	76.0	3.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	EUT on Side, High Ch 2480MHz
4803.617	40.0	10.4	1.0	60.0	3.0	0.0	Vert	PK	0.0	50.4	74.0	-23.6	EUT Horz, Low Ch 2402Mhz
4885.017	39.6	10.6	1.7	298.0	3.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	EUT on Side, Mid Ch 2442MHz
4803.258	39.2	10.4	1.7	65.0	3.0	0.0	Horz	PK	0.0	49.6	74.0	-24.4	EUT on Side, Low Ch 2402MHz

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
12399.010	37.0	-7.7	1.1	318.0	3.0	0.0	Vert	AV	0.0	29.3	54.0	-24.7	EUT Horz, High Ch 2480MHz
12008.990	36.3	-8.3	1.7	41.0	3.0	0.0	Horz	AV	0.0	28.0	54.0	-26.0	EUT on Side, Low Ch 2402MHz
12398.940	35.4	-7.7	1.7	319.0	3.0	0.0	Horz	AV	0.0	27.7	54.0	-26.3	EUT on Side, High Ch 2480MHz
12008.230	36.0	-8.3	1.7	81.0	3.0	0.0	Vert	AV	0.0	27.7	54.0	-26.3	EUT Horz, Low Ch 2402MHz
12397.630	35.1	-7.7	1.7	216.0	3.0	0.0	Vert	AV	0.0	27.4	54.0	-26.6	EUT on Side, High Ch 2480MHz
12397.500	35.0	-7.7	3.1	236.0	3.0	0.0	Horz	AV	0.0	27.3	54.0	-26.7	EUT Horz, High Ch 2480MHz
12397.690	35.0	-7.7	1.7	127.0	3.0	0.0	Horz	AV	0.0	27.3	54.0	-26.7	EUT Vert, High Ch 2480MHz
12397.980	35.0	-7.7	1.7	83.0	3.0	0.0	Vert	AV	0.0	27.3	54.0	-26.7	EUT Vert, High Ch 2480MHz
12209.050	35.1	-8.0	1.7	48.0	3.0	0.0	Vert	AV	0.0	27.1	54.0	-26.9	EUT Horz, Mid Ch 2442MHz
12207.750	34.9	-8.0	1.7	37.0	3.0	0.0	Horz	AV	0.0	26.9	54.0	-27.1	EUT on Side, Mid Ch 2442MHz
19214.900	49.8	-5.6	1.5	31.0	3.0	0.0	Vert	PK	0.0	44.2	74.0	-29.8	EUT Horz, Low Ch 2402MHz
19213.910	49.6	-5.6	1.5	5.0	3.0	0.0	Horz	PK	0.0	44.0	74.0	-30.0	EUT on Side, Low CH 2402MHz
12398.640	48.0	-7.7	1.1	318.0	3.0	0.0	Vert	PK	0.0	40.3	74.0	-33.7	EUT Horz, High Ch 2480MHz
12008.940	48.1	-8.3	1.7	41.0	3.0	0.0	Horz	PK	0.0	39.8	74.0	-34.2	EUT on Side, Low Ch 2402MHz
12398.310	47.2	-7.7	3.1	236.0	3.0	0.0	Horz	PK	0.0	39.5	74.0	-34.5	EUT Horz, High Ch 2480MHz
12011.840	47.8	-8.3	1.7	81.0	3.0	0.0	Vert	PK	0.0	39.5	74.0	-34.5	EUT Horz, Low Ch 2402MHz
12398.270	47.1	-7.7	1.7	127.0	3.0	0.0	Horz	PK	0.0	39.4	74.0	-34.6	EUT Vert, High Ch 2480MHz
12398.460	47.1	-7.7	1.7	319.0	3.0	0.0	Horz	PK	0.0	39.4	74.0	-34.6	EUT on Side, High Ch 2480MHz
12399.650	46.7	-7.7	1.7	216.0	3.0	0.0	Vert	PK	0.0	39.0	74.0	-35.0	EUT on Side, High Ch 2480MHz
12399.610	46.6	-7.7	1.7	83.0	3.0	0.0	Vert	PK	0.0	38.9	74.0	-35.1	EUT Vert, High Ch 2480MHz
12208.280	46.9	-8.0	1.7	48.0	3.0	0.0	Vert	PK	0.0	38.9	74.0	-35.1	EUT Horz, Mid Ch 2442MHz
12210.980	46.2	-8.0	1.7	37.0	3.0	0.0	Horz	PK	0.0	38.2	74.0	-35.8	EUT on Side, Mid Ch 2442MHz

SPURIOUS RADIATED EMISSIONS

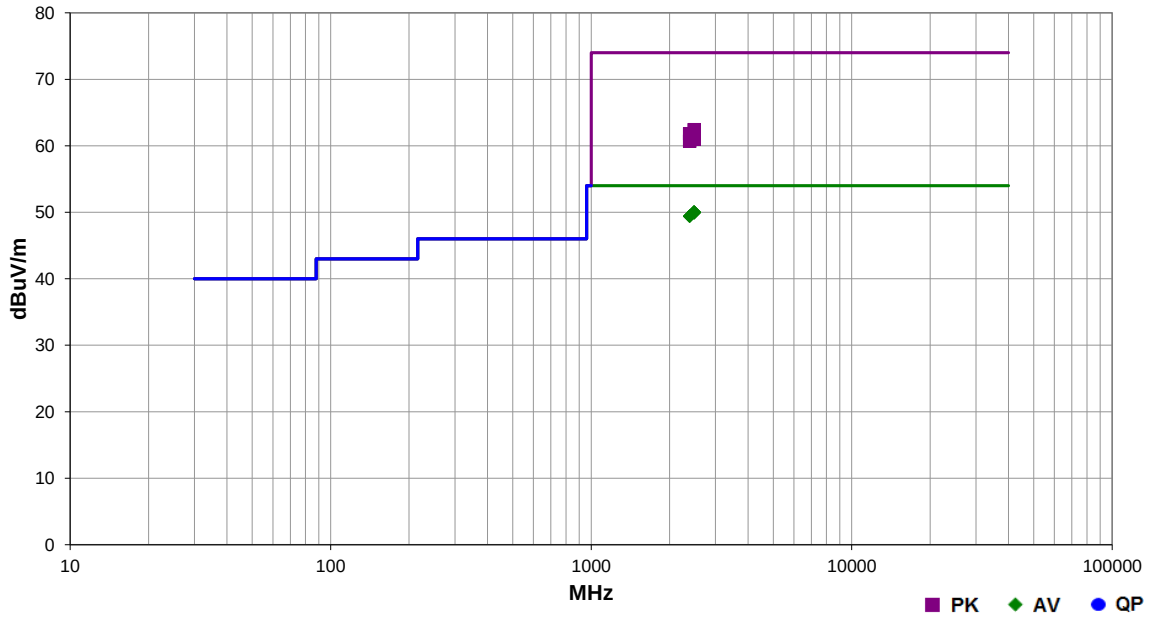
NORTHWEST EMC

PSA-ESCI 2016.04.26.1
EmiR5 2016.04.26.1

Work Order:	AWAR0022	**Date:**	07/28/16		
Project:	None	**Temperature:**	22.4 °C		
Job Site:	OC10	**Humidity:**	52.2% RH		
Serial Number:	None	**Barometric Pres.:**	1015 mbar	**Tested by:**	Mike Tran
EUT:	BLEE				
Configuration:	3				
Customer:	Awarepoint Corporation				
Attendees:	None				
EUT Power:	USB Powered				
Operating Mode:	Transmitting BLE at Low Channel 0 (2402MHz) and High Channel 39 (2480MHz)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2016	ANSI C63.10:2013

Run #	15	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.973	28.2	1.8	1.7	309.0	3.0	20.0	Horz	AV	0.0	50.0	54.0	-4.0	EUT Vert, High Ch 2480MHz
2484.347	28.2	1.8	1.7	18.0	3.0	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT Vert, High Ch 2480MHz
2485.300	28.2	1.8	1.7	295.0	3.0	20.0	Horz	AV	0.0	50.0	54.0	-4.0	EUT Horz, High Ch 2480MHz
2484.053	28.2	1.8	3.0	60.0	3.0	20.0	Vert	AV	0.0	50.0	54.0	-4.0	EUT Horz, High Ch 2480MHz
2483.703	28.1	1.8	1.7	76.0	3.0	20.0	Horz	AV	0.0	49.9	54.0	-4.1	EUT on Side, High Ch 2480MHz
2484.387	28.1	1.8	1.7	123.0	3.0	20.0	Vert	AV	0.0	49.9	54.0	-4.1	EUT on Side, High Ch 2480MHz
2388.653	28.1	1.3	1.7	21.0	3.0	20.0	Horz	AV	0.0	49.4	54.0	-4.6	EUT Vert, Low Ch 2402MHz
2388.847	28.1	1.3	1.7	276.0	3.0	20.0	Vert	AV	0.0	49.4	54.0	-4.6	EUT Vert, Low Ch 2402MHz
2484.743	40.6	1.8	1.7	295.0	3.0	20.0	Horz	PK	0.0	62.4	74.0	-11.6	EUT Horz, High Ch 2480MHz
2389.237	40.5	1.3	1.7	21.0	3.0	20.0	Horz	PK	0.0	61.8	74.0	-12.2	EUT Vert, Low Ch 2402MHz
2483.937	39.9	1.8	3.0	60.0	3.0	20.0	Vert	PK	0.0	61.7	74.0	-12.3	EUT Horz, High Ch 2480MHz
2483.660	39.8	1.8	1.7	309.0	3.0	20.0	Horz	PK	0.0	61.6	74.0	-12.4	EUT Vert, High Ch 2480MHz
2483.900	39.8	1.8	1.7	18.0	3.0	20.0	Vert	PK	0.0	61.6	74.0	-12.4	EUT Vert, High Ch 2480MHz
2483.897	39.4	1.8	1.7	76.0	3.0	20.0	Horz	PK	0.0	61.2	74.0	-12.8	EUT on Side, High Ch 2480MHz
2483.823	39.2	1.8	1.7	123.0	3.0	20.0	Vert	PK	0.0	61.0	74.0	-13.0	EUT on Side, High Ch 2480MHz
2389.193	39.4	1.3	1.7	276.0	3.0	20.0	Vert	PK	0.0	60.7	74.0	-13.3	EUT Vert, Low Ch 2402MHz

DUTY CYCLE

XMit 2016.05.06

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.

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 2016.05.06

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/19/2015	11/19/2016
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18E-20	TKS	4/4/2016	4/4/2017
Block - DC	Aeroflex	INMET 8535	AMO	4/4/2016	4/4/2017

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

NORTHWEST EMC

XMit 2016.05.06

EUT:	BLEE			**Work Order:**	AWAR0022
Serial Number:	None			**Date:**	08/09/16
Customer:	Awarepoint Corporation			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	44.8% RH
Project:	None			**Barometric Pres.:**	1014 mbar
Tested by:	Mike Tran	**Power:**	USB Powered	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Total reference level offset: DC Block + 20dB attenuator + RF Cable + Patch Cable = 22.75 dB. Power setting = -9.

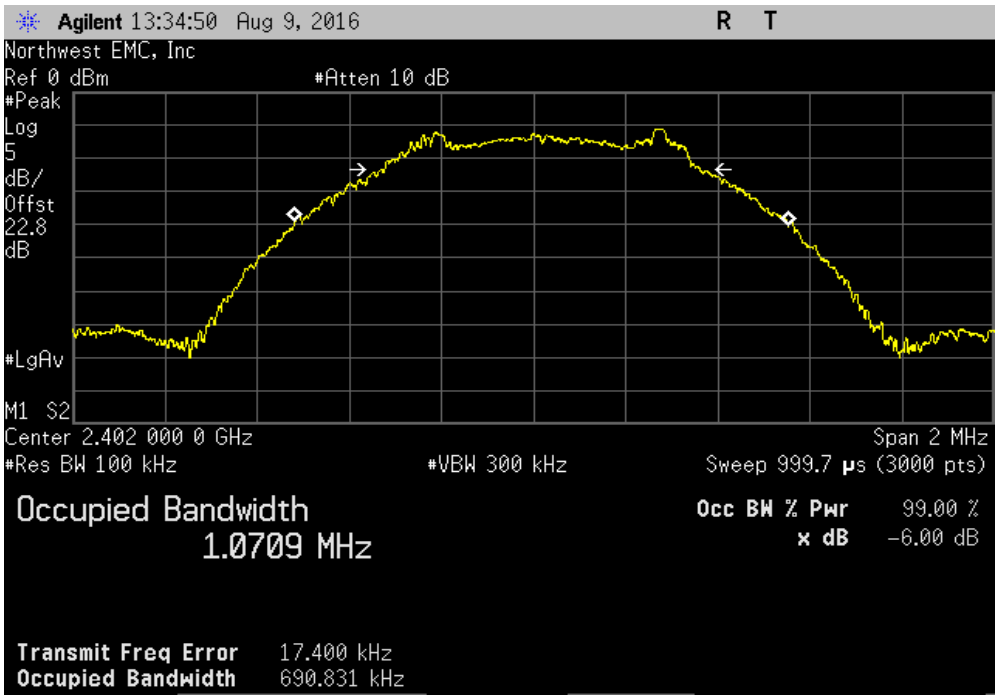
DEVIATIONS FROM TEST STANDARD

None

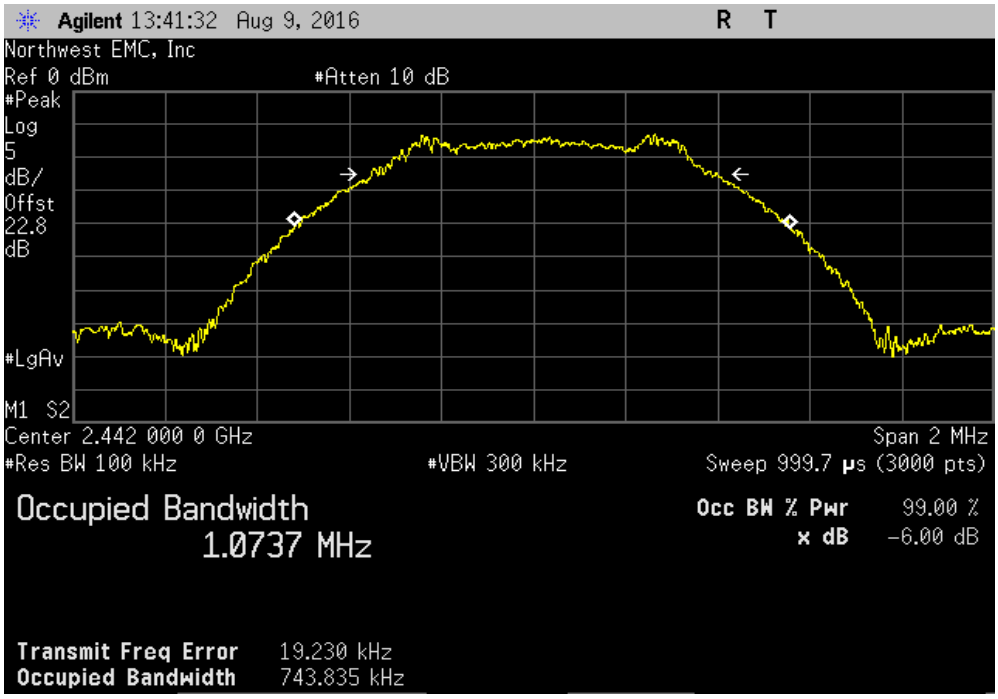
Configuration #	3	Signature

	Value	Limit (≥)	Result
BLE/GFSK Low Channel, 2402 MHz	690.831 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	743.835 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	726.233 kHz	500 kHz	Pass

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



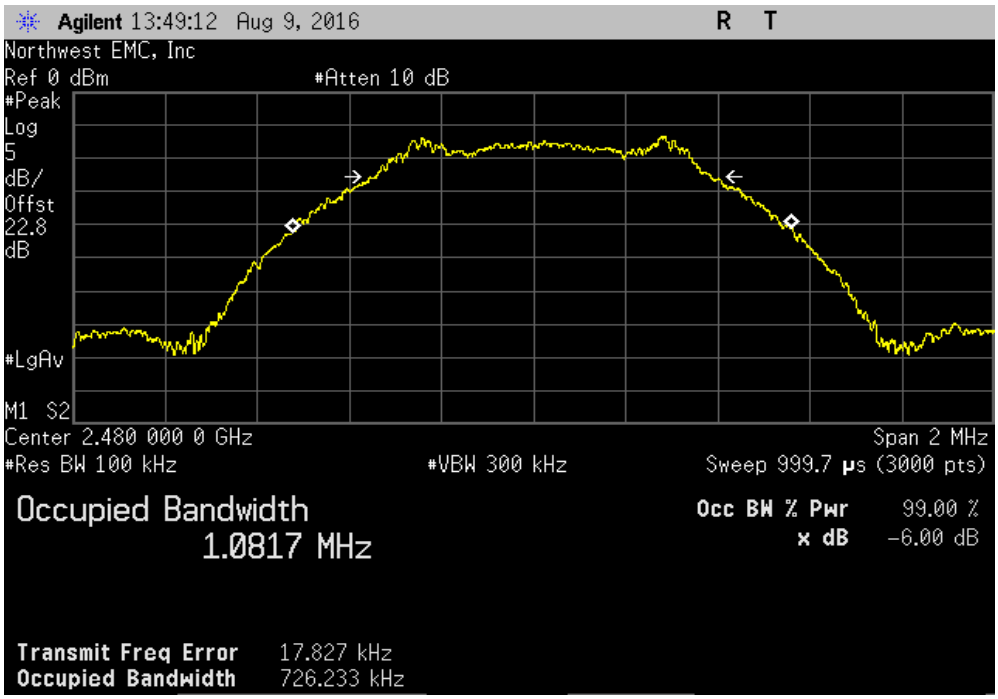
BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				743.835 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

XMit 2016.05.06

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



OUTPUT POWER

XMit 2016.05.06

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/19/2015	11/19/2016
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18E-20	TKS	4/4/2016	4/4/2017
Block - DC	Aeroflex	INMET 8535	AMO	4/4/2016	4/4/2017

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) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method found in 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..

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

NORTHWEST EMC

XMit 2016.05.06

EUT:	BLEE			**Work Order:**	AWAR0022
Serial Number:	None			**Date:**	08/09/16
Customer:	Awarepoint Corporation			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	44.8% RH
Project:	None			**Barometric Pres.:**	1014 mbar
Tested by:	Mike Tran	**Power:**	USB Powered	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Total reference level offset: DC Block + 20dB attenuator + RF Cable + Patch Cable = 22.75 dB. Power setting = -9.

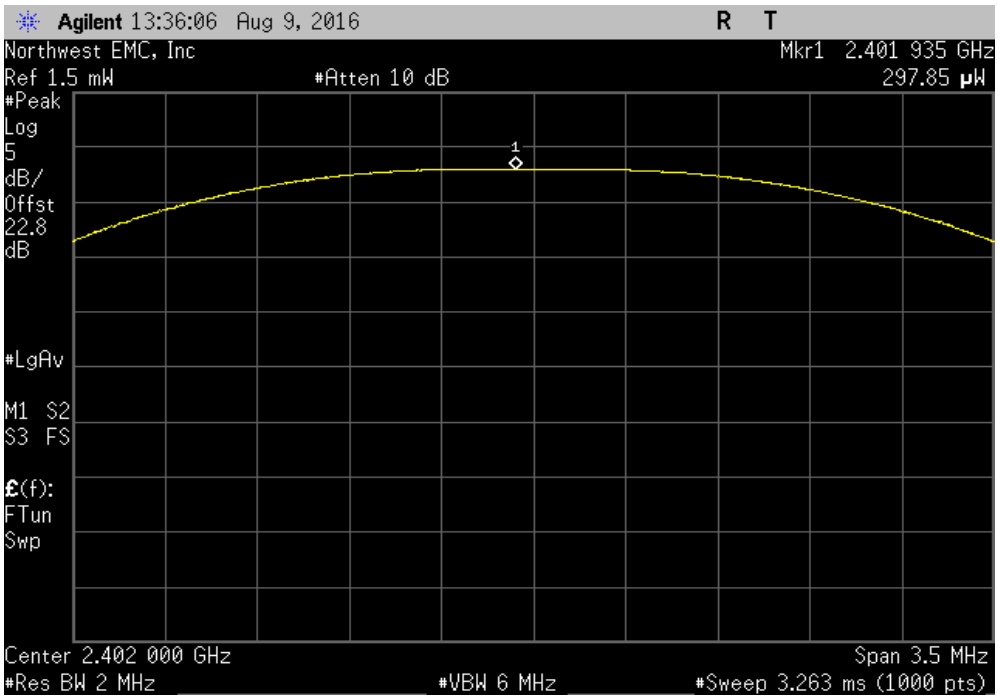
DEVIATIONS FROM TEST STANDARD

None

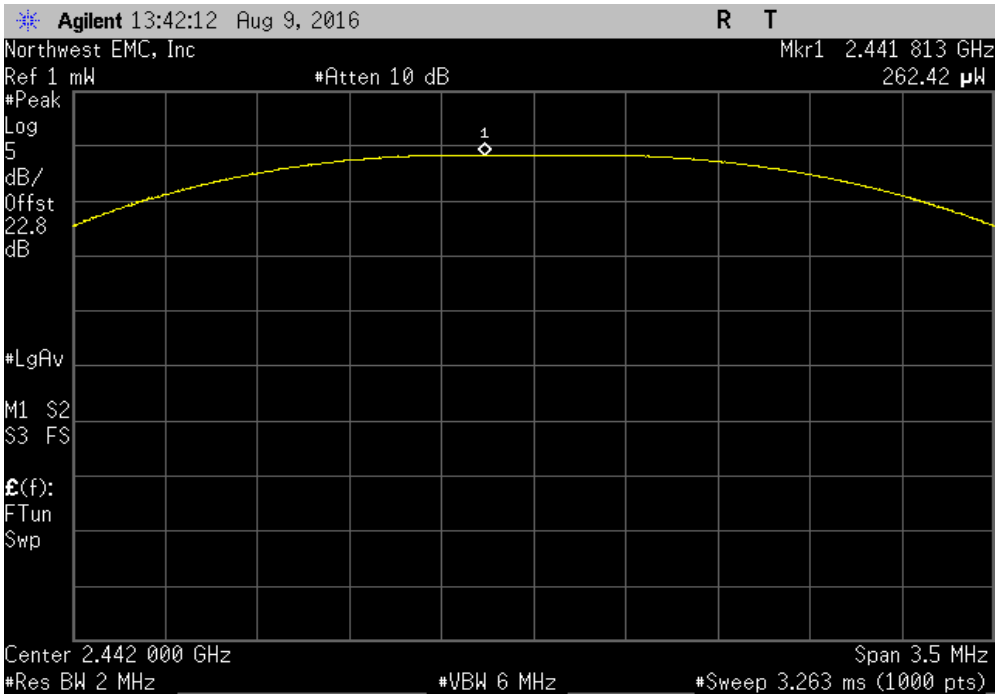
Configuration #	3	Signature

	Value	Limit (<)	Result
BLE/GFSK Low Channel, 2402 MHz	297.852 uW	1 W	Pass
BLE/GFSK Mid Channel, 2442 MHz	262.422 uW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	242.941 uW	1 W	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				297.852 uW	1 W	Pass



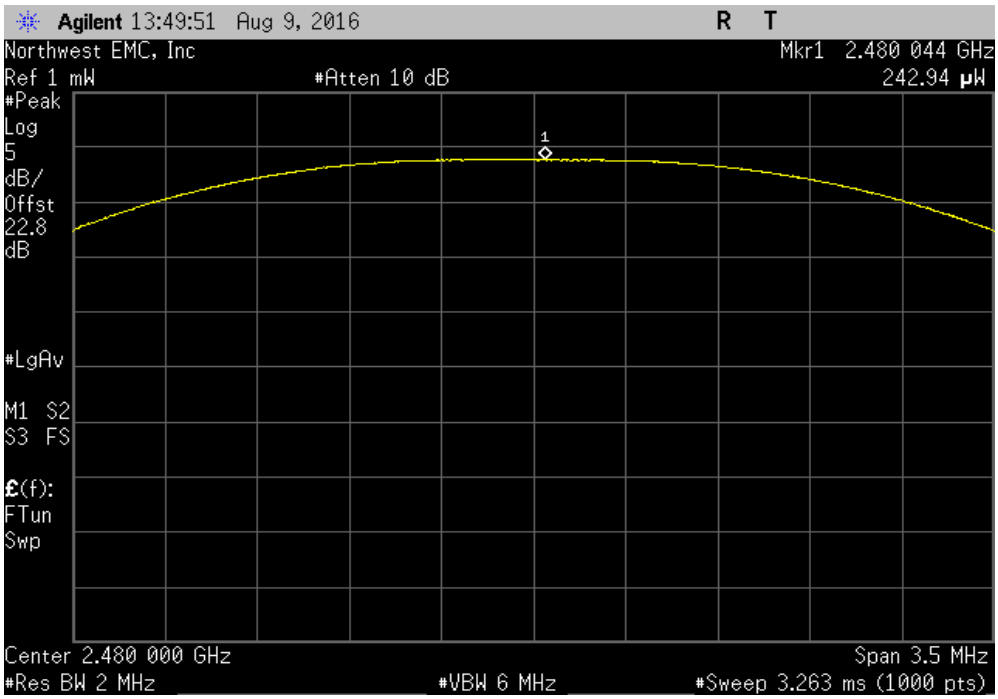
BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (<)	Result
				262.422 uW	1 W	Pass



OUTPUT POWER

XMit 2016.05.06

BLE/GFSK High Channel, 2480 MHz						
				Value	Limit (<)	Result
				242.941 uW	1 W	Pass



POWER SPECTRAL DENSITY

XMit 2016.05.06

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/19/2015	11/19/2016
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18E-20	TKS	4/4/2016	4/4/2017
Block - DC	Aeroflex	INMET 8535	AMO	4/4/2016	4/4/2017

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

NORTHWEST EMC

XMit 2016.05.06

EUT:	BLEE			**Work Order:**	AWAR0022
Serial Number:	None			**Date:**	08/09/16
Customer:	Awarepoint Corporation			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	44.8% RH
Project:	None			**Barometric Pres.:**	1014 mbar
Tested by:	Mike Tran	**Power:**	USB Powered	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Total reference level offset: DC Block + 20dB attenuator + RF Cable + Patch Cable = 22.75 dB. Power setting = -9.

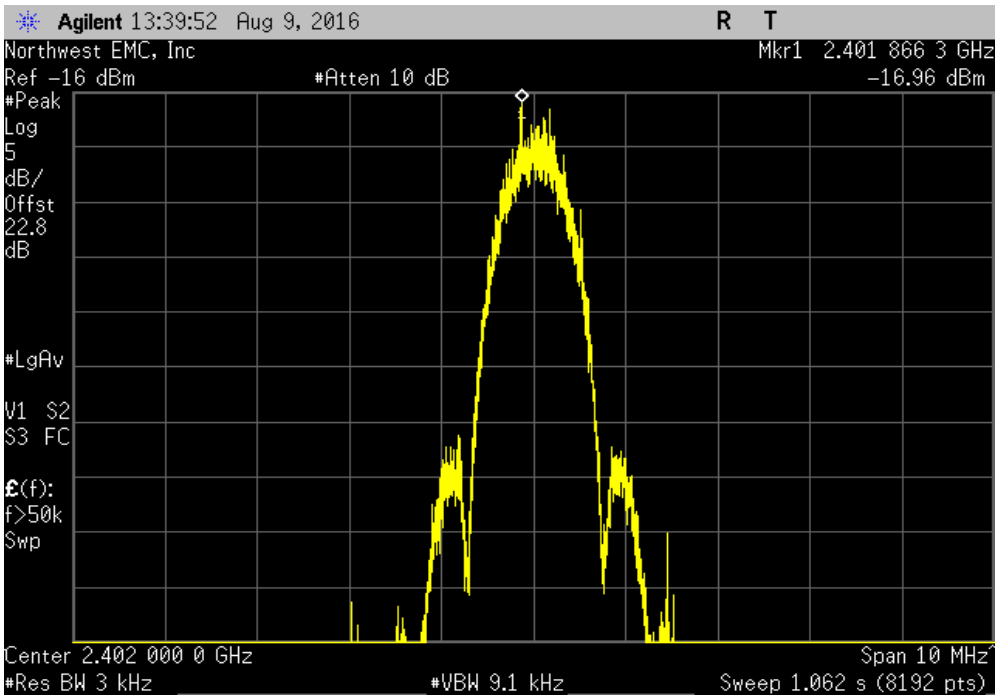
DEVIATIONS FROM TEST STANDARD

None

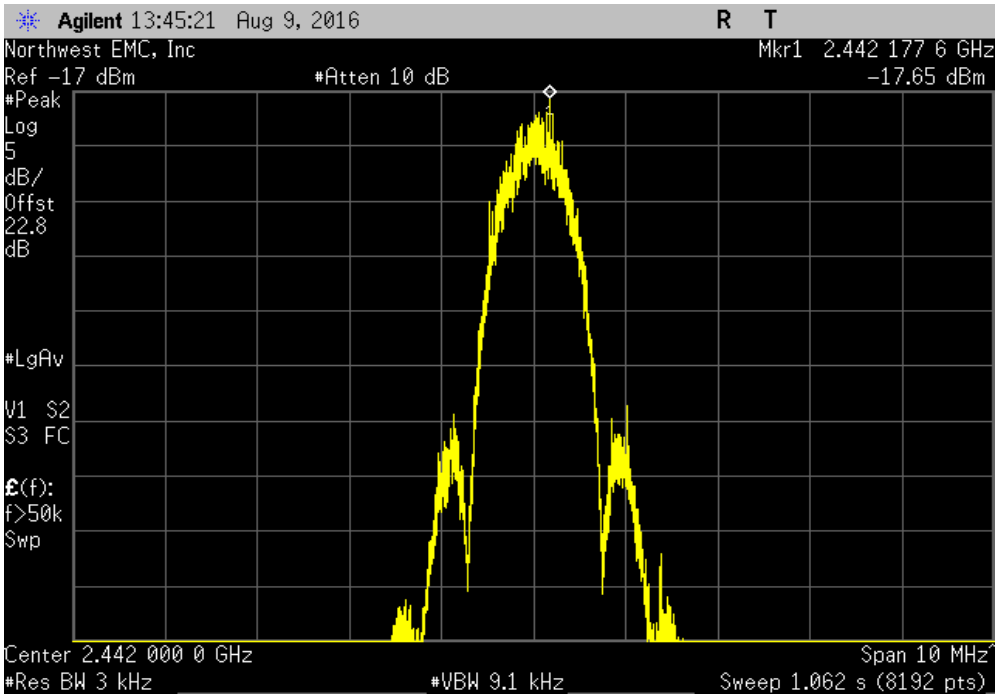
Configuration #	3	Signature

	Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK Low Channel, 2402 MHz	-16.959	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-17.648	8	Pass
BLE/GFSK High Channel, 2480 MHz	-19.63	8	Pass

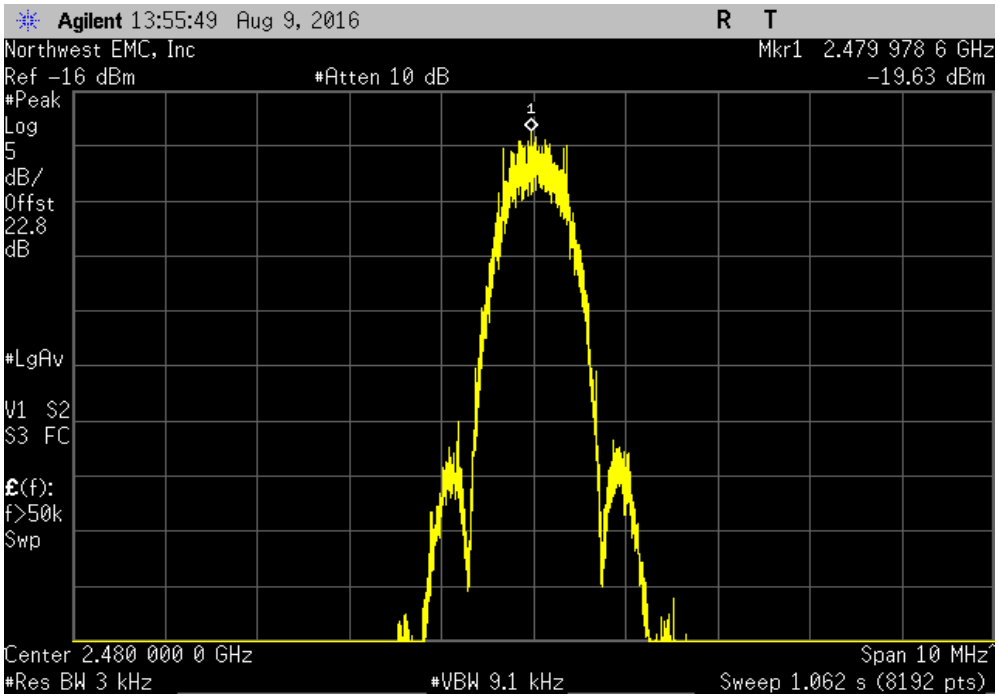
BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-16.959	8	Pass



BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-17.648	8	Pass



BLE/GFSK High Channel, 2480 MHz							
					Value dBm/3kHz	Limit < dBm/3kHz	Results
					-19.63	8	Pass



BAND EDGE COMPLIANCE

XMit 2016.05.06

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/19/2015	11/19/2016
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18E-20	TKS	4/4/2016	4/4/2017
Block - DC	Aeroflex	INMET 8535	AMO	4/4/2016	4/4/2017

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

NORTHWEST EMC

XMit 2016.05.06

EUT:	BLEE			**Work Order:**	AWAR0022
Serial Number:	None			**Date:**	08/09/16
Customer:	Awarepoint Corporation			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	44.9% RH
Project:	None			**Barometric Pres.:**	1013 mbar
Tested by:	Mike Tran	**Power:**	USB Powered	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Total reference level offset: DC Block + 20dB attenuator + RF Cable + Patch Cable = 22.75 dB. Power setting = -9.

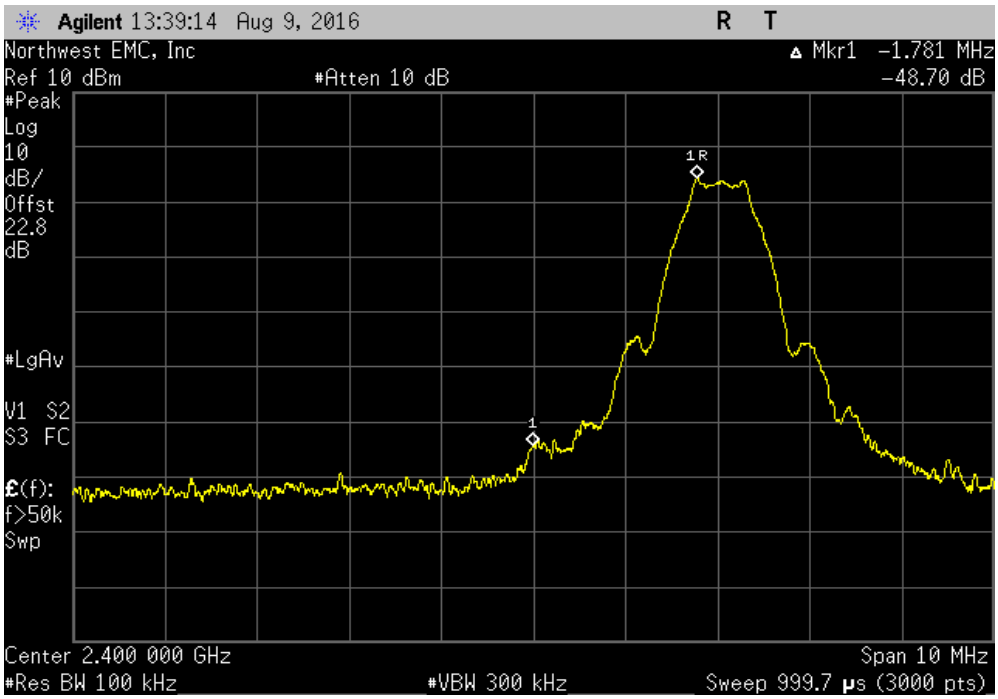
DEVIATIONS FROM TEST STANDARD

None

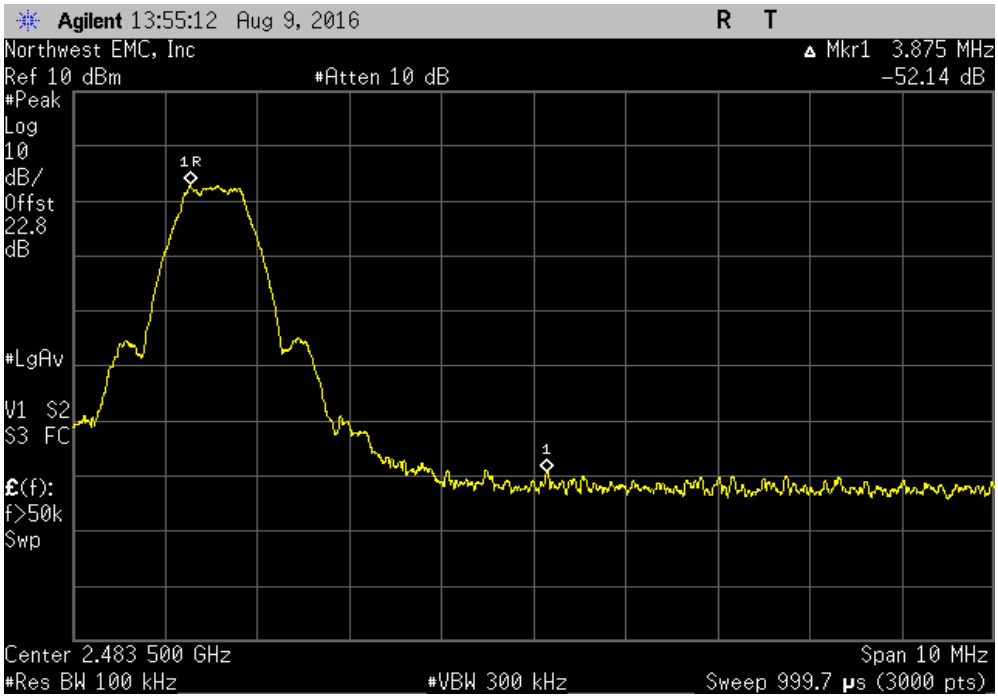
Configuration #	3	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	-48.7	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-52.14	-20	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-48.7	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-52.14	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2016.05.06

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/19/2015	11/19/2016
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18E-20	TKS	4/4/2016	4/4/2017
Block - DC	Aeroflex	INMET 8535	AMO	4/4/2016	4/4/2017

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

NORTHWEST EMC

XMit 2016.05.06

EUT:	BLEE			**Work Order:**	AWAR0022
Serial Number:	None			**Date:**	08/09/16
Customer:	Awarepoint Corporation			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	44.8% RH
Project:	None			**Barometric Pres.:**	1014 mbar
Tested by:	Mike Tran	**Power:**	USB Powered	**Job Site:**	OC13

TEST SPECIFICATIONS	Test Method
FCC 15.247:2016	ANSI C63.10:2013

COMMENTS

Total reference level offset: DC Block + 20dB attenuator + RF Cable + Patch Cable = 22.75 dB. Power setting = -9.

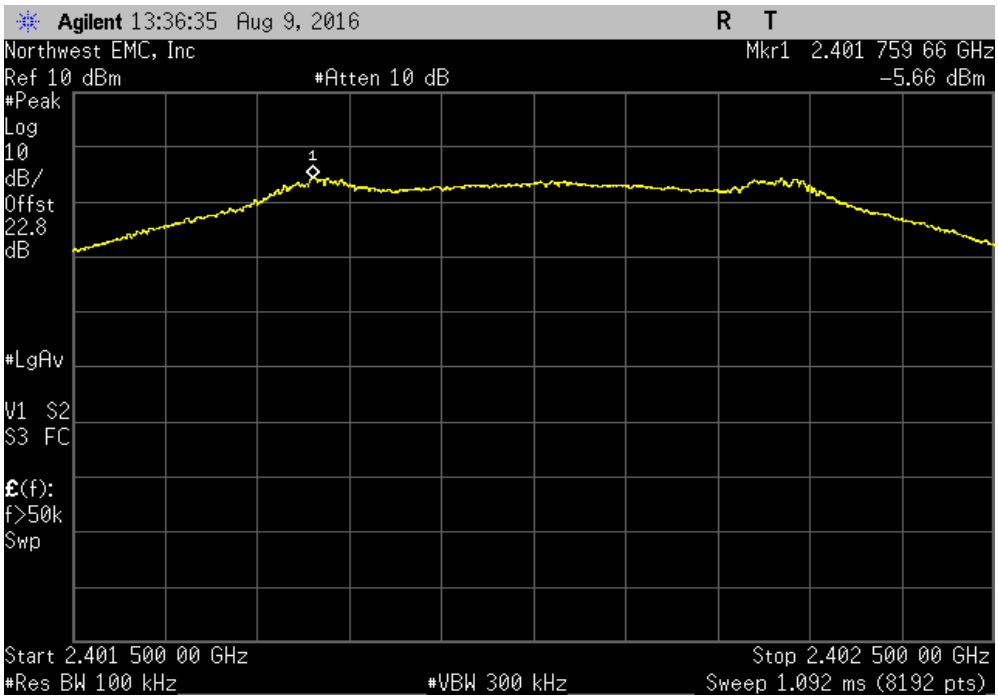
DEVIATIONS FROM TEST STANDARD

None

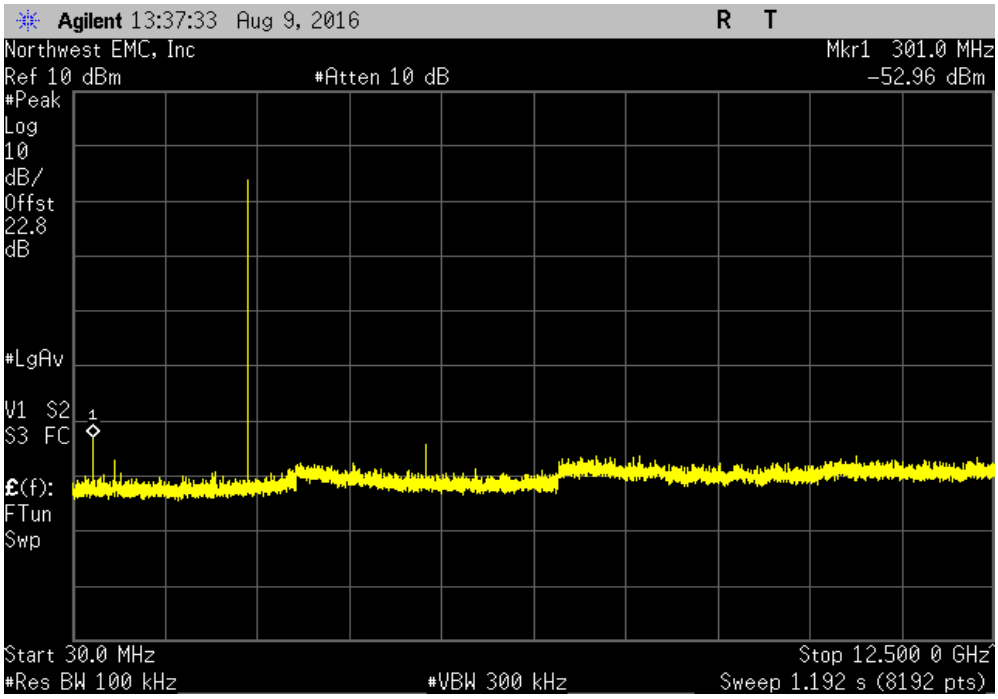
Configuration #	3	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-47.3	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-46.7	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	-47.46	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	-45.53	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	-46.29	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	-45.97	-20	Pass

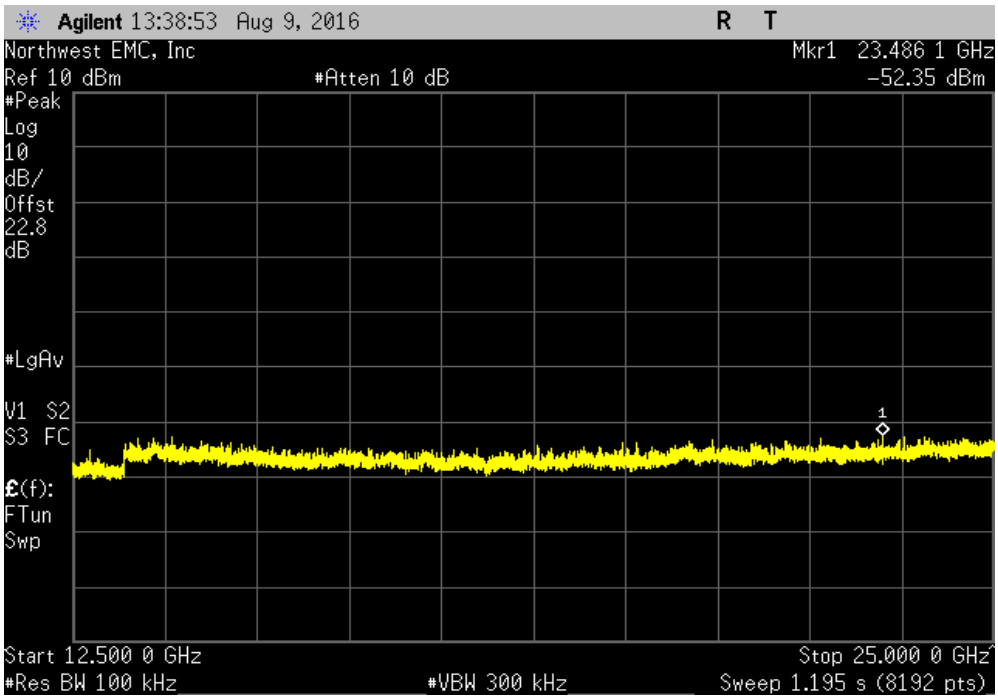
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



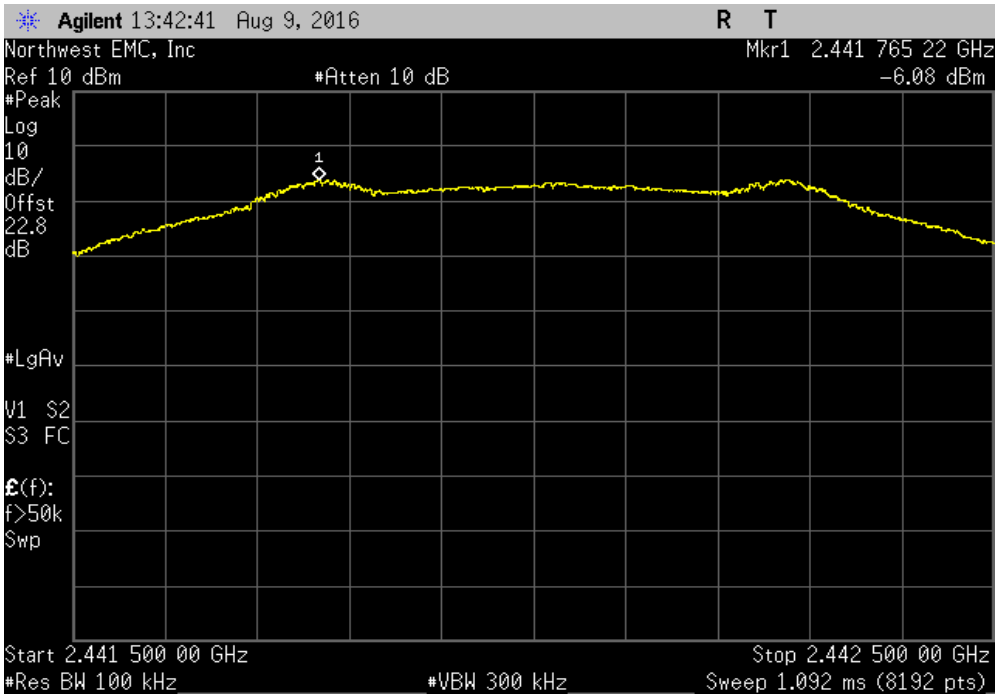
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-47.3	-20	Pass



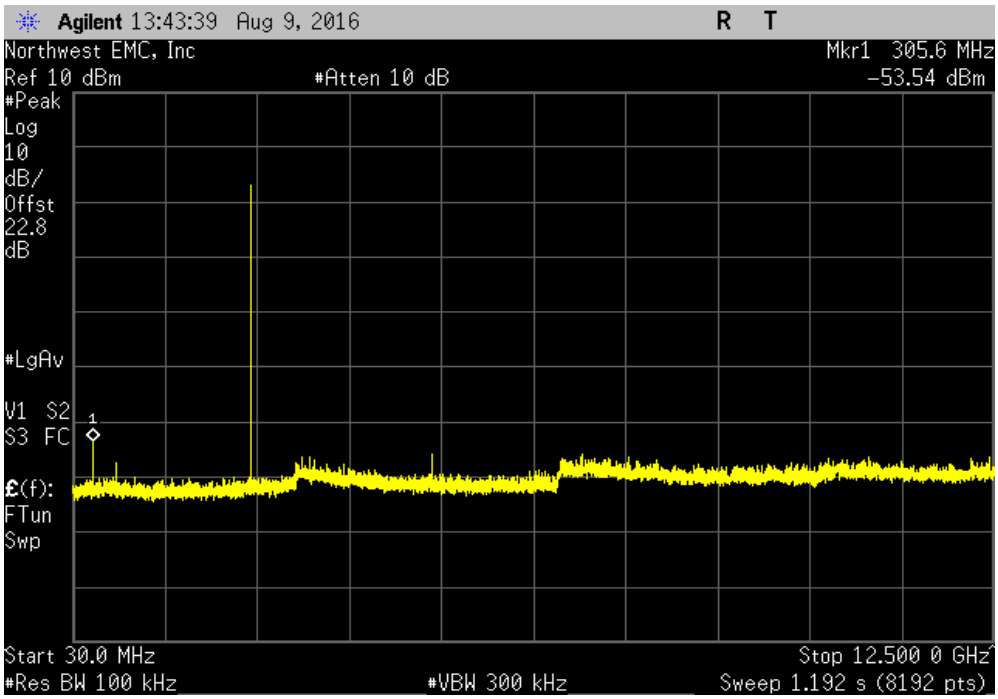
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-46.7	-20	Pass



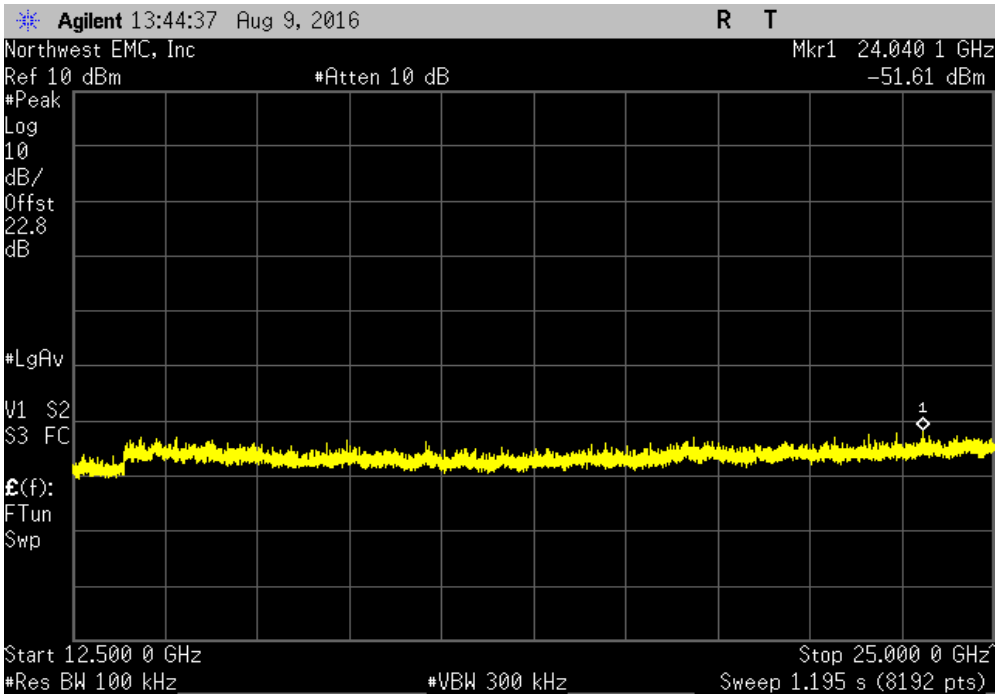
BLE/GFSK Mid Channel, 2442 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



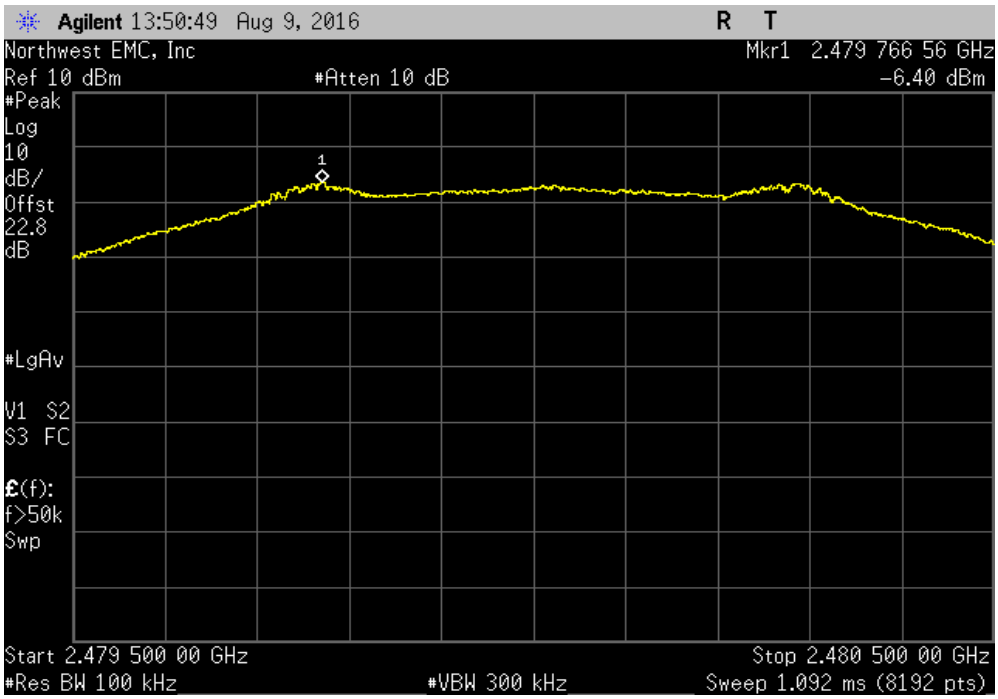
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-47.46	-20	Pass



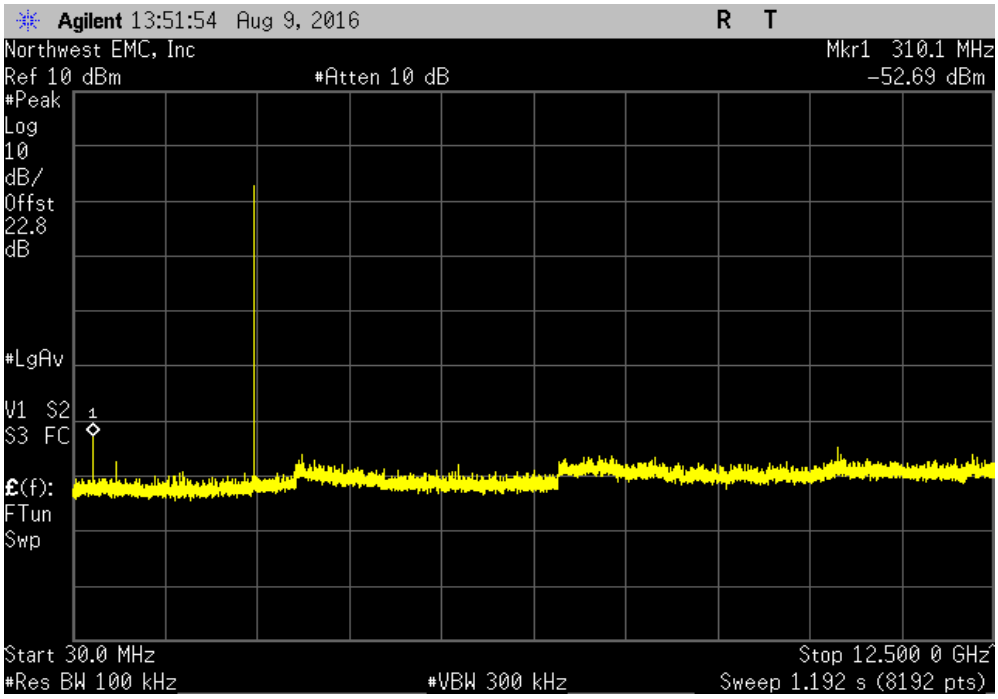
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-45.53	-20	Pass



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



BLE/GFSK High Channel, 2480 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-46.29	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-45.97	-20	Pass