

NORTHWEST EMC

Tether Technologies, Inc.

Belt Unit, Rev. AB

Key Unit, Rev. AB

FCC 15.247:2015

Report # TETH0001.2



NVLAP Lab Code: 200629-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: January 23, 2015
Tether Technologies, Inc.
Model: Belt Unit, Rev. AB
Key Unit, Rev. AB

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2015	ANSI C63.10:2009, KDB 558074 V3 (DTS)

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not requested.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
9.9	Band Edge Compliance	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Rod Munro, 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.

REVISION HISTORY

Revision Number		Description	Date	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 Guide 65 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

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and 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

OFTA – Recognized by OFTA 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/>

MEASUREMENT UNCERTAINTY

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.

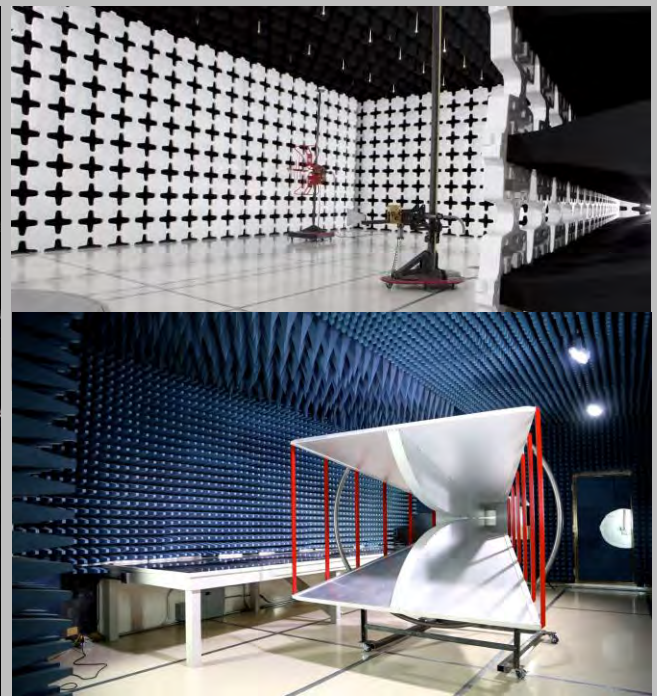
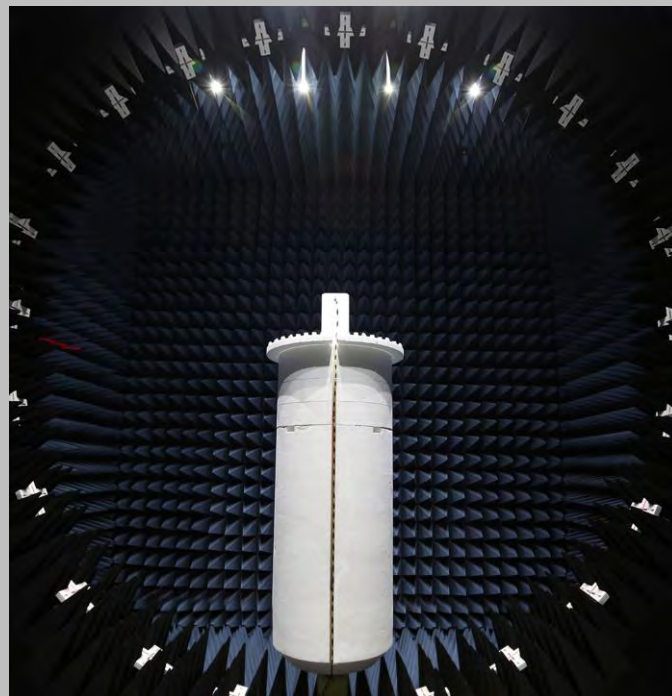
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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)	4.5 dB	-4.5 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (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
Industry 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



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Tether Technologies, Inc.
Address:	24 Roy Street, Suite 25
City, State, Zip:	Seattle, WA 98109
Test Requested By:	John Suryan
Model:	Belt Unit, Rev. AB Key Unit, Rev. AB
First Date of Test:	January 22, 2015
Last Date of Test:	January 23, 2015
Receipt Date of Samples:	January 22, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
A Belt unit and a Key unit that comprises a system and communicates via BLE.
Testing Objective:
To demonstrate compliance to FCC 15.247 requirements.

CONFIGURATIONS

Configuration PROU0034- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Key Unit Board, Rev. AB	Tether Technologies	EKTv2 / PCB-00544-01	T2

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Debug Board	Product Creation Studio	PCB00419-01	4
DC Power Supply	BK Precision	1697	S240500437
Laptop PC	Dell	Dell Precision	None
AC Brick	Delta Electronics	DA150PM100-00	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Leads	No	0.7m	No	DC Power Supply	Key Unit Board, Rev. AB
AC Power (DC Supply)	Yes	1.7m	No	AC Mains	DC Power Supply
FTDI Serial to USB	No	1.8m	No	Laptop PC	Debug Board
AC Power (Laptop)	No	0.5m	No	AC Mains	AC Brick
DC Power (Laptop)	No	1.7m	No	AC Brick	Laptop PC

Configuration PROU0034- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Belt Unit Board, Rev. AB	Tether Technologies	EKTv2 / PCB-00546-01	T1

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Debug Board	Product Creation Studio	PCB00419-01	4
DC Power Supply	BK Precision	1697	S240500437
Laptop PC	Dell	Dell Precision	None
AC Brick	Delta Electronics	DA150PM100-00	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Leads	No	0.7m	No	DC Power Supply	Key Unit Board, Rev. AB
AC Power (DC Supply)	Yes	1.7m	No	AC Mains	DC Power Supply
FTDI Serial to USB	No	1.8m	No	Laptop PC	Debug Board
AC Power (Laptop)	No	0.5m	No	AC Mains	AC Brick
DC Power (Laptop)	No	1.7m	No	AC Brick	Laptop PC

CONFIGURATIONS

Configuration PROU0034- 3

Software/Firmware Running during test			
Description		Version	
FCC Test Build		1.01	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Key Unit, Rev. AB	Tether Technologies	EKTv2 / PCB-00395-01	11

Configuration PROU0034- 4

Software/Firmware Running during test			
Description		Version	
FCC Test Build		1.01	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Belt Unit, Rev. AB	Tether Technologies	EKTv2 / PCB-00397-01	11

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	1/22/2015	Powerline Conducted 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	1/22/2015	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.
3	1/22/2015	Spurious Conducted 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.
4	1/22/2015	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.
5	1/22/2015	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.
6	1/22/2015	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.
7	1/22/2015	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.
8	1/23/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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 Bluetooth Low Energy, 100% Duty Cycle

CHANNELS TESTED

Low Channel 0, 2402 MHz

Mid Channel 20, 2442 MHz

High Channel 39, 2480 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

PROU0034 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz
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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
Spectrum Analyzer	Agilent	E4440A	AFE	10/28/2014	12 mo
High Pass Filter	Micro-Tronics	HPM50111	HHI	12/9/2014	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	10/13/2014	12 mo
Low Pass Filter	Micro-Tronics	LPM50004	LFF	11/14/2013	24 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	6/10/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	10/13/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	10/13/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	9/8/2014	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	9/8/2014	12 mo
Antenna, Horn	ETS	3160-09	AIY	NCR	0 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	0 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Antenna, Horn	EMCO	3115	AHM	6/3/2014	24 mo
Antenna, Biconilog	EMCO	3142B	AXJ	5/16/2012	36 mo
Cable I	N/A	N/A	SUM	6/10/2014	12 mo
NC01 Cables	N/A	Standard Gain Horn Cable	NC3	10/13/2014	12 mo
NC01 Cables	N/A	3115 Horn Cable	NC2	10/13/2014	12 mo
NC01 Cables	N/A	Bilog Cables	NC1	9/8/2014	12 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

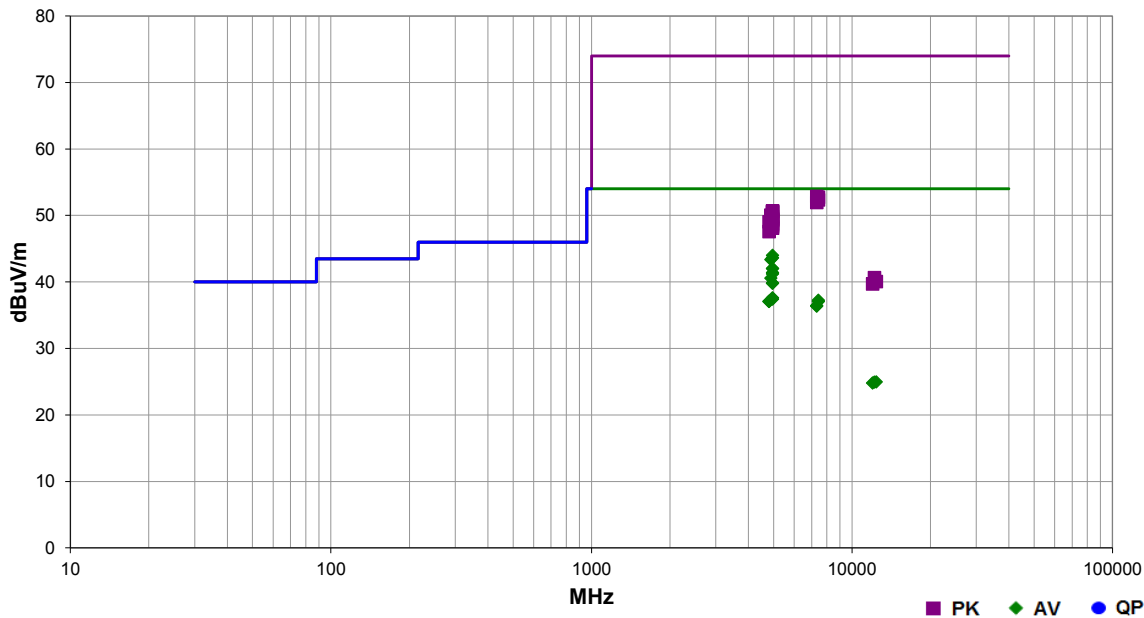
TEST DESCRIPTION

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.

Work Order:	PROU0034	Date:	01/23/15	
Project:	None	Temperature:	24 °C	
Job Site:	NC01	Humidity:	38% RH	
Serial Number:	11	Barometric Pres.:	1028 mbar	
EUT: Belt Unit, Rev. AB				Tested by: Richard Mellroth
Configuration:	4			
Customer:	Product Creation Studio			
Attendees:	Matt Darval			
EUT Power:	Battery			
Operating Mode:	Transmitting BTLE, 100% Duty Cycle. See comments next to data points for EUT channel, antenna port, and orientation.			
Deviations:	None			
Comments:	None			


Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	57-58	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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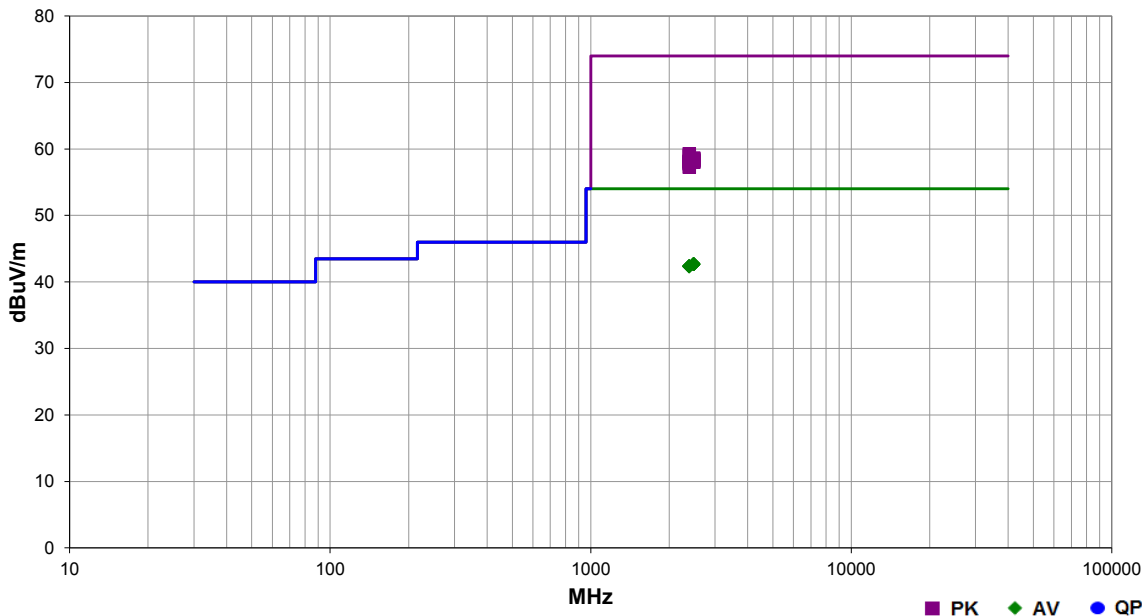
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4957.880	35.4	8.6	1.3	113.0	3.0	0.0	Horz	AV	0.0	44.0	54.0	-10.0	High Ch 39, EUT Flat, Ant A2
4957.870	35.0	8.6	1.4	112.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	High Ch 39, EUT Horz, Ant A1
4881.880	34.7	8.7	1.2	111.0	3.0	0.0	Horz	AV	0.0	43.4	54.0	-10.6	Mid Ch 20, EUT Flat, Ant A2
4957.865	33.4	8.6	1.2	51.0	3.0	0.0	Horz	AV	0.0	42.0	54.0	-12.0	High Ch 39, EUT Horz, Ant A2
4957.870	33.4	8.6	1.2	111.0	3.0	0.0	Horz	AV	0.0	42.0	54.0	-12.0	High Ch 39, EUT Flat, Ant A1
4957.875	32.8	8.6	1.1	108.0	3.0	0.0	Vert	AV	0.0	41.4	54.0	-12.6	High Ch 39, EUT Vert, Ant A1
4957.885	32.6	8.6	1.2	110.0	3.0	0.0	Vert	AV	0.0	41.2	54.0	-12.8	High Ch 39, EUT Horz, Ant A2
4881.880	31.9	8.7	1.2	110.0	3.0	0.0	Vert	AV	0.0	40.6	54.0	-13.4	Mid Ch 20, EUT Horz, Ant A2
4957.860	31.2	8.6	1.2	20.0	3.0	0.0	Vert	AV	0.0	39.8	54.0	-14.2	High Ch 39, EUT Flat, Ant A2
4957.900	31.2	8.6	1.2	49.0	3.0	0.0	Vert	AV	0.0	39.8	54.0	-14.2	High Ch 39, EUT Vert, Ant A2
4957.880	29.0	8.6	1.2	360.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	High Ch 39, EUT Flat, Ant A1
4957.860	28.8	8.6	1.2	216.0	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	High Ch 39, EUT Vert, Ant A2
7440.617	23.1	14.1	1.2	100.0	3.0	0.0	Horz	AV	0.0	37.2	54.0	-16.8	High Ch 39, EUT Horz, Ant A2
4805.907	28.9	8.2	1.2	110.0	3.0	0.0	Vert	AV	0.0	37.1	54.0	-16.9	Low Ch 0, EUT Flat, Ant A2
4803.900	28.9	8.1	1.2	54.0	3.0	0.0	Horz	AV	0.0	37.0	54.0	-17.0	Low Ch 0, EUT Flat, Ant A2
7439.170	22.9	14.1	1.9	168.0	3.0	0.0	Vert	AV	0.0	37.0	54.0	-17.0	High Ch 39, EUT Vert, Ant A2
7324.650	23.1	13.3	1.2	9.0	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid Ch 20, EUT Flat, Ant A2
7324.885	23.0	13.3	1.2	6.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7	Mid Ch 20, EUT Horz, Ant A2
7327.440	39.5	13.4	1.2	6.0	3.0	0.0	Vert	PK	0.0	52.9	74.0	-21.1	Mid Ch 20, EUT Vert, Ant A2
7439.255	38.6	14.1	1.9	168.0	3.0	0.0	Vert	PK	0.0	52.7	74.0	-21.3	High Ch 39, EUT Flat, Ant A2
7438.225	38.2	14.1	1.2	100.0	3.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	High Ch 39, EUT Horz, Ant A2
7326.085	38.6	13.4	1.2	9.0	3.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	Mid Ch 20, EUT Flat, Ant A2
4957.950	42.1	8.6	1.4	112.0	3.0	0.0	Horz	PK	0.0	50.7	74.0	-23.3	High Ch 39, EUT Horz, Ant A1
4957.930	42.0	8.6	1.3	113.0	3.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	High Ch 39, EUT Flat, Ant A2
4959.115	41.9	8.6	1.2	51.0	3.0	0.0	Horz	PK	0.0	50.5	74.0	-23.5	High Ch 39, EUT Horz, Ant A2

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
4881.920	41.4	8.7	1.2	111.0	3.0	0.0	Horz	PK	0.0	50.1	74.0	-23.9	Mid Ch 20, EUT Flat, Ant A2
4957.735	41.2	8.6	1.2	111.0	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	High Ch 39, EUT Flat, Ant A1
4958.310	40.9	8.6	1.2	110.0	3.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	High Ch 39, EUT Horz, Ant A2
4958.045	40.8	8.6	1.2	49.0	3.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	High Ch 39, EUT Vert, Ant A2
4957.630	40.6	8.6	1.1	108.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	High Ch 39, EUT Vert, Ant A1
4881.933	40.5	8.7	1.2	110.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	Mid Ch 20, EUT Horz, Ant A2
4803.933	40.9	8.1	1.2	54.0	3.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	Low Ch 0, EUT Flat, Ant A2
4957.955	40.1	8.6	1.2	20.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	High Ch 39, EUT Flat, Ant A2
4957.695	39.8	8.6	1.2	216.0	3.0	0.0	Horz	PK	0.0	48.4	74.0	-25.6	High Ch 39, EUT Vert, Ant A2
4957.630	39.5	8.6	1.2	360.0	3.0	0.0	Vert	PK	0.0	48.1	74.0	-25.9	High Ch 39, EUT Flat, Ant A1
4804.933	39.4	8.2	1.2	110.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	Low Ch 0, EUT Flat, Ant A2
12399.950	26.7	-1.7	1.1	155.0	3.0	0.0	Horz	AV	0.0	25.0	54.0	-29.0	High Ch 39, EUT Flat, Ant A2
12211.120	26.6	-1.7	1.4	104.0	3.0	0.0	Horz	AV	0.0	24.9	54.0	-29.1	Mid Ch 20, EUT Flat, Ant A2
12011.230	26.6	-1.8	1.2	140.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	Low Ch 0, EUT Flat, Ant A2
12206.100	42.3	-1.7	1.4	104.0	3.0	0.0	Horz	PK	0.0	40.6	74.0	-33.4	Mid Ch 20, EUT Flat, Ant A2
12398.630	41.8	-1.7	1.1	155.0	3.0	0.0	Horz	PK	0.0	40.1	74.0	-33.9	High Ch 39, EUT Flat, Ant A2
12013.670	41.5	-1.8	1.2	140.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	Low Ch 0, EUT Flat, Ant A2

Work Order:	PROU0034	Date:	01/23/15		
Project:	None	Temperature:	24 °C		
Job Site:	NC01	Humidity:	38% RH		
Serial Number:	11	Barometric Pres.:	1028 mbar	Tested by:	Richard Mellroth
EUT:	Belt Unit, Rev. AB				
Configuration:	4				
Customer:	Product Creation Studio				
Attendees:	Matt Darval				
EUT Power:	Battery				
Operating Mode:	Transmitting BTLE, 100% Duty Cycle. See comments next to data points for EUT channel, antenna port, and orientation.				
Deviations:	None				
Comments:	2390 MHz and 2483.5 MHz Restricted Band Edge Measurements				

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	56	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
2485.193	24.9	-2.2	1.2	155.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	High Ch 39, EUT Flat, Ant A1
2485.353	24.9	-2.2	1.2	81.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	High Ch 39, EUT Flat, Ant A2
2485.323	24.9	-2.2	2.6	53.0	3.0	20.0	Vert	AV	0.0	42.7	54.0	-11.3	High Ch 39, EUT Vert, Ant A2
2483.720	24.8	-2.2	1.2	149.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Horz, Ant A2
2484.380	24.8	-2.2	1.2	215.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Vert, Ant A2
2485.113	24.8	-2.2	1.2	139.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Horz, Ant A2
2485.283	24.8	-2.2	1.2	110.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Flat, Ant A1
2485.400	24.8	-2.2	1.2	8.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Flat, Ant A2
2389.970	24.7	-2.3	1.2	136.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Vert, Ant A2
2389.963	24.7	-2.3	1.2	210.0	3.0	20.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Horz, Ant A2
2389.900	24.7	-2.3	2.7	139.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Vert, Ant A1
2389.780	24.7	-2.3	1.2	151.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Flat, Ant A2
2389.627	24.7	-2.3	1.6	322.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Horz, Ant A2
2389.320	24.7	-2.3	1.2	59.0	3.0	20.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Vert, Ant A2
2388.140	24.7	-2.3	1.9	193.0	3.0	20.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Horz, Ant A1
2388.303	24.6	-2.3	1.2	196.0	3.0	20.0	Horz	AV	0.0	42.3	54.0	-11.7	Low Ch 0, EUT Flat, Ant A2
2389.827	41.6	-2.3	1.2	59.0	3.0	20.0	Horz	PK	0.0	59.3	74.0	-14.7	Low Ch 0, EUT Vert, Ant A2
2388.673	41.3	-2.3	1.2	136.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	Low Ch 0, EUT Vert, Ant A2
2484.040	40.8	-2.2	1.2	139.0	3.0	20.0	Vert	PK	0.0	58.6	74.0	-15.4	High Ch 39, EUT Horz, Ant A2
2484.670	40.7	-2.2	1.2	155.0	3.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	High Ch 39, EUT Flat, Ant A1
2484.873	40.6	-2.2	1.2	81.0	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	High Ch 39, EUT Flat, Ant A2
2483.750	40.5	-2.2	1.2	110.0	3.0	20.0	Vert	PK	0.0	58.3	74.0	-15.7	High Ch 39, EUT Flat, Ant A1
2484.160	40.4	-2.2	1.2	215.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	High Ch 39, EUT Vert, Ant A2
2484.207	40.4	-2.2	1.2	8.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	High Ch 39, EUT Flat, Ant A2
2389.067	40.5	-2.3	1.2	151.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	Low Ch 0, EUT Flat, Ant A2

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
2388.737	40.4	-2.3	2.7	139.0	3.0	20.0	Vert	PK	0.0	58.1	74.0	-15.9	Low Ch 0, EUT Vert, Ant A1
2388.607	40.4	-2.3	1.2	210.0	3.0	20.0	Horz	PK	0.0	58.1	74.0	-15.9	Low Ch 0, EUT Horz, Ant A2
2485.050	40.2	-2.2	2.6	53.0	3.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	High Ch 39, EUT Vert, Ant A2
2485.280	40.2	-2.2	1.2	149.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	High Ch 39, EUT Horz, Ant A2
2389.217	40.2	-2.3	1.2	196.0	3.0	20.0	Horz	PK	0.0	57.9	74.0	-16.1	Low Ch 0, EUT Flat, Ant A2
2388.567	40.1	-2.3	1.9	193.0	3.0	20.0	Horz	PK	0.0	57.8	74.0	-16.2	Low Ch 0, EUT Horz, Ant A1
2389.837	39.6	-2.3	1.6	322.0	3.0	20.0	Vert	PK	0.0	57.3	74.0	-16.7	Low Ch 0, EUT Horz, Ant A2

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 Bluetooth Low Energy, 100% Duty Cycle

CHANNELS TESTED

Low Channel 0, 2402 MHz

Mid Channel 20, 2442 MHz

High Channel 39, 2480 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

PROU0034 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26000 MHz
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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
Spectrum Analyzer	Agilent	E4440A	AFE	10/28/2014	12 mo
High Pass Filter	Micro-Tronics	HPM50111	HHI	12/9/2014	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	10/13/2014	12 mo
Low Pass Filter	Micro-Tronics	LPM50004	LFF	11/14/2013	24 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	6/10/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	10/13/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	10/13/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	9/8/2014	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAB	9/8/2014	12 mo
Antenna, Horn	ETS	3160-09	AIY	NCR	0 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	0 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	0 mo
Antenna, Horn	EMCO	3115	AHM	6/3/2014	24 mo
Antenna, Biconilog	EMCO	3142B	AXJ	5/16/2012	36 mo
Cable I	N/A	N/A	SUM	6/10/2014	12 mo
NC01 Cables	N/A	Standard Gain Horn Cable	NC3	10/13/2014	12 mo
NC01 Cables	N/A	3115 Horn Cable	NC2	10/13/2014	12 mo
NC01 Cables	N/A	Bilog Cables	NC1	9/8/2014	12 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

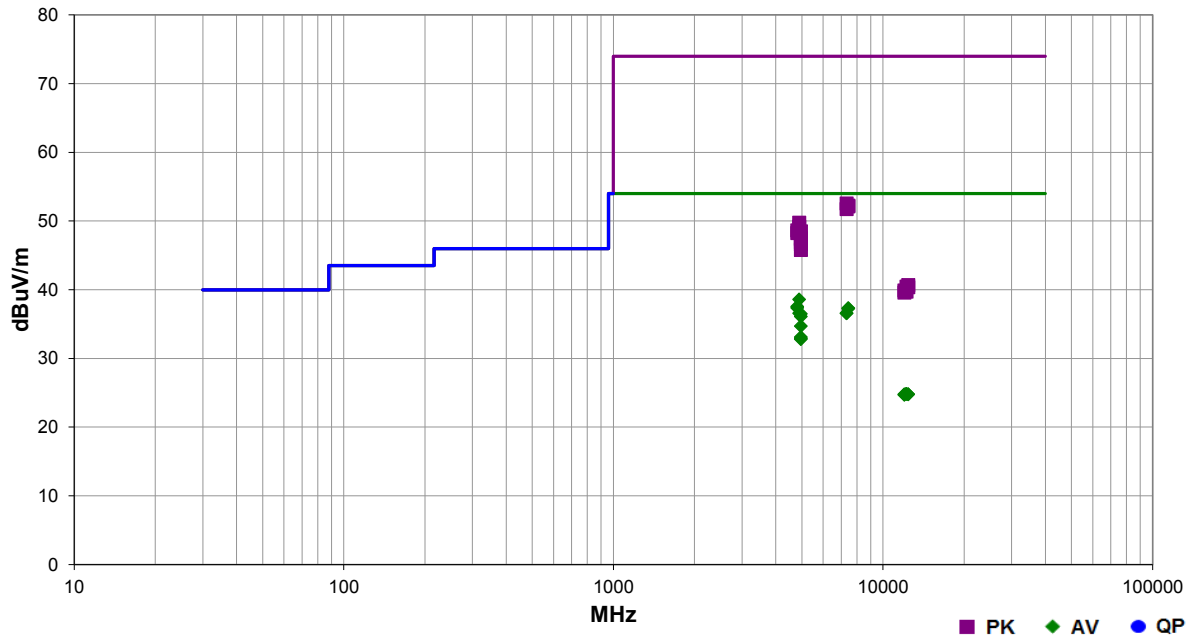
TEST DESCRIPTION

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.

Work Order:	PROU0034	Date:	01/23/15	
Project:	None	Temperature:	24 °C	
Job Site:	NC01	Humidity:	38% RH	
Serial Number:	11	Barometric Pres.:	1028 mbar	
EUT:	Key Unit, Rev. AB			
Configuration:	3			
Customer:	Product Creation Studio			
Attendees:	Matt Darval			
EUT Power:	Battery			
Operating Mode:	Transmitting BTLE, 100% Duty Cycle, See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	None			


Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	60-61	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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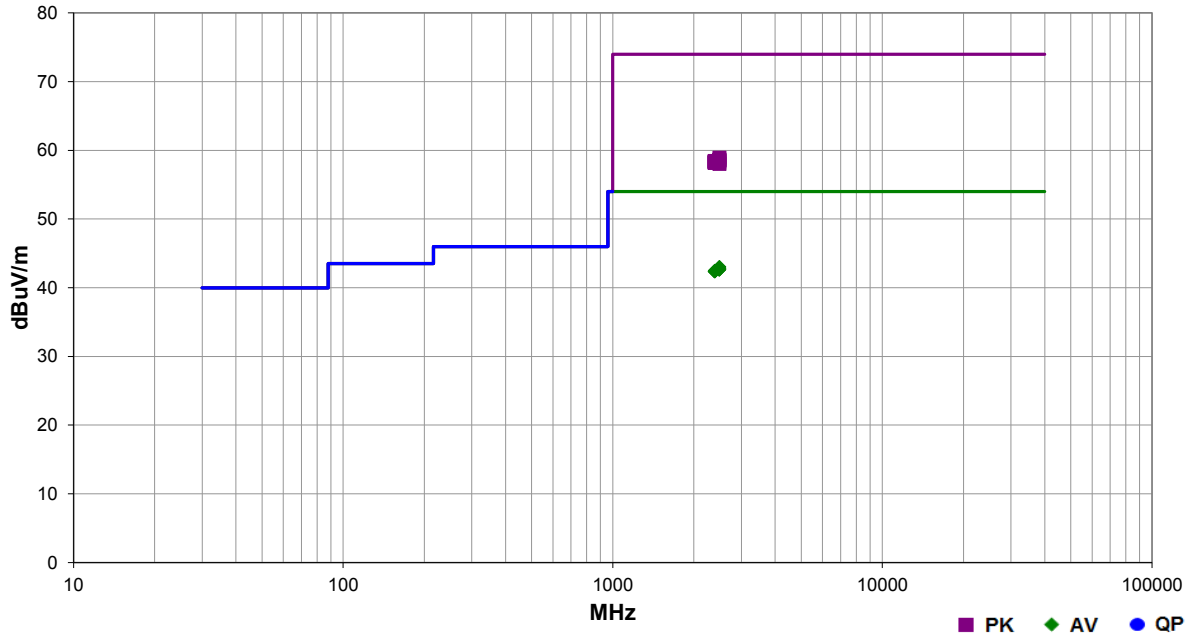
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4883.840	29.9	8.7	1.4	15.0	3.0	0.0	Horz	AV	0.0	38.6	54.0	-15.4	Mid Ch 20, EUT Flat
4803.870	29.4	8.1	1.2	50.0	3.0	0.0	Horz	AV	0.0	37.5	54.0	-16.5	Low Ch 0, EUT Flat
4803.850	29.2	8.1	1.2	226.0	3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	Low Ch 0, EUT Horz
7441.867	23.2	14.1	1.2	115.0	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	High Ch 39, EUT Flat
7440.492	23.1	14.1	1.2	138.0	3.0	0.0	Vert	AV	0.0	37.2	54.0	-16.8	High Ch 39, EUT Horz
4883.820	27.9	8.7	1.2	62.0	3.0	0.0	Vert	AV	0.0	36.6	54.0	-17.4	Mid Ch 20, EUT Horz
7326.367	23.2	13.4	1.2	55.0	3.0	0.0	Vert	AV	0.0	36.6	54.0	-17.4	Mid Ch 20, EUT Horz
7326.042	23.2	13.4	1.8	158.0	3.0	0.0	Horz	AV	0.0	36.6	54.0	-17.4	Mid Ch 20, EUT Flat
4959.850	27.9	8.6	1.6	26.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	High Ch 39, EUT Flat
4957.870	27.5	8.6	1.2	0.0	3.0	0.0	Horz	AV	0.0	36.1	54.0	-17.9	High Ch 39, EUT Vert
4959.767	26.1	8.6	1.2	236.0	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	High Ch 39, EUT Horz
4957.880	24.5	8.6	1.2	249.0	3.0	0.0	Vert	AV	0.0	33.1	54.0	-20.9	High Ch 39, EUT Vert
4957.850	24.3	8.6	1.2	83.0	3.0	0.0	Vert	AV	0.0	32.9	54.0	-21.1	High Ch 39, EUT Flat
4959.708	24.2	8.6	1.2	25.0	3.0	0.0	Horz	AV	0.0	32.8	54.0	-21.2	High Ch 39, EUT Horz
7325.708	39.2	13.4	1.2	55.0	3.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4	Mid Ch 20, EUT Horz
7439.233	38.1	14.1	1.2	138.0	3.0	0.0	Vert	PK	0.0	52.2	74.0	-21.8	High Ch 39, EUT Horz
7440.833	38.0	14.1	1.2	115.0	3.0	0.0	Horz	PK	0.0	52.1	74.0	-21.9	High Ch 39, EUT Flat
7325.308	38.4	13.3	1.8	158.0	3.0	0.0	Horz	PK	0.0	51.7	74.0	-22.3	Mid Ch 20, EUT Flat
4883.430	41.1	8.7	1.4	15.0	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	Mid Ch 20, EUT Flat
4884.130	40.5	8.7	1.2	62.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	Mid Ch 20, EUT Horz
4804.400	40.5	8.2	1.2	50.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low Ch 0, EUT Flat
4959.280	39.9	8.6	1.6	26.0	3.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	High Ch 39, EUT Flat

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
4803.500	40.1	8.1	1.2	226.0	3.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Low Ch 0, EUT Horz
4960.067	38.9	8.6	1.2	236.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	High Ch 39, EUT Horz
4959.658	38.7	8.6	1.2	25.0	3.0	0.0	Horz	PK	0.0	47.3	74.0	-26.7	High Ch 39, EUT Horz
4957.700	38.3	8.6	1.2	0.0	3.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1	High Ch 39, EUT Vert
4958.950	38.0	8.6	1.2	249.0	3.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	High Ch 39, EUT Vert
4957.950	37.2	8.6	1.2	83.0	3.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	High Ch 39, EUT Flat
12209.900	26.5	-1.7	1.2	94.0	3.0	0.0	Vert	AV	0.0	24.8	54.0	-29.2	Mid Ch 20, EUT Horz
12210.460	26.5	-1.7	1.2	162.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	Mid Ch 20, EUT Flat
12009.890	26.6	-1.8	1.2	24.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	Low Ch 0, EUT Flat
12397.840	26.5	-1.7	1.2	10.0	3.0	0.0	Vert	AV	0.0	24.8	54.0	-29.2	High Ch 39, EUT Horz
12397.960	26.5	-1.7	1.2	174.0	3.0	0.0	Horz	AV	0.0	24.8	54.0	-29.2	High Ch 39, EUT Flat
12011.400	26.5	-1.8	1.2	355.0	3.0	0.0	Vert	AV	0.0	24.7	54.0	-29.3	Low Ch 0, EUT Horz
12398.780	42.4	-1.7	1.2	174.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	High Ch 39, EUT Flat
12211.100	42.1	-1.7	1.2	94.0	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Mid Ch 20, EUT Horz
12399.330	42.1	-1.7	1.2	10.0	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	High Ch 39, EUT Horz
12011.630	41.7	-1.8	1.2	355.0	3.0	0.0	Vert	PK	0.0	39.9	74.0	-34.1	Low Ch 0, EUT Horz
12211.950	41.4	-1.7	1.2	162.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	Mid Ch 20, EUT Flat
12009.580	41.4	-1.8	1.2	24.0	3.0	0.0	Horz	PK	0.0	39.6	74.0	-34.4	Low Ch 0, EUT Flat

Work Order:	PROU0034	Date:	01/22/15	
Project:	None	Temperature:	24 °C	
Job Site:	NC01	Humidity:	34% RH	
Serial Number:	11	Barometric Pres.:	1027 mbar	
EUT:	Key Unit, Rev. AB			
Configuration:	3			
Customer:	Product Creation Studio			
Attendees:	Matt Darval			
EUT Power:	Battery			
Operating Mode:	Transmitting BTLE, 100% Duty Cycle, See comments next to data points for EUT channel and orientation.			
Deviations:	None			
Comments:	2390 MHz and 2483.5 MHz Restricted Band Edge Measurements			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	24,59	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
2485.157	25.2	-2.2	1.2	205.0	3.0	20.0	Vert	AV	0.0	43.0	54.0	-11.0	High Ch 39, EUT Vert
2485.030	25.0	-2.2	1.0	50.0	3.0	20.0	Vert	AV	0.0	42.8	54.0	-11.2	High Ch 39, EUT Horz
2485.053	24.9	-2.2	1.2	319.0	3.0	20.0	Horz	AV	0.0	42.7	54.0	-11.3	High Ch 39, EUT Flat
2483.637	24.8	-2.2	1.2	47.0	3.0	20.0	Vert	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Flat
2483.957	24.8	-2.2	3.3	83.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Vert
2485.070	24.8	-2.2	1.5	108.0	3.0	20.0	Horz	AV	0.0	42.6	54.0	-11.4	High Ch 39, EUT Horz
2389.953	24.8	-2.3	1.0	187.0	3.0	20.0	Horz	AV	0.0	42.5	54.0	-11.5	Low Ch 0, EUT Horz
2389.913	24.7	-2.3	1.0	260.0	3.0	20.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Flat
2389.900	24.7	-2.3	1.0	342.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Vert
2389.857	24.7	-2.3	1.0	99.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Flat
2389.807	24.7	-2.3	1.0	326.0	3.0	20.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Horz
2389.620	24.7	-2.3	1.0	358.0	3.0	20.0	Horz	AV	0.0	42.4	54.0	-11.6	Low Ch 0, EUT Vert
2485.490	41.1	-2.2	1.2	319.0	3.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	High Ch 39, EUT Flat
2484.233	40.8	-2.2	1.5	108.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	High Ch 39, EUT Horz
2484.590	40.8	-2.2	3.3	83.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	High Ch 39, EUT Vert
2485.103	40.7	-2.2	1.2	205.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	High Ch 39, EUT Vert
2388.110	40.8	-2.3	1.0	187.0	3.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	Low Ch 0, EUT Horz
2389.310	40.7	-2.3	1.0	260.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	Low Ch 0, EUT Flat
2388.133	40.7	-2.3	1.0	99.0	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	Low Ch 0, EUT Flat
2483.990	40.5	-2.2	1.0	50.0	3.0	20.0	Vert	PK	0.0	58.3	74.0	-15.7	High Ch 39, EUT Horz
2388.697	40.6	-2.3	1.0	326.0	3.0	20.0	Vert	PK	0.0	58.3	74.0	-15.7	Low Ch 0, EUT Horz
2388.270	40.6	-2.3	1.0	342.0	3.0	20.0	Vert	PK	0.0	58.3	74.0	-15.7	Low Ch 0, EUT Vert

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
2388.610	40.5	-2.3	1.0	358.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	Low Ch 0, EUT Vert
2485.403	40.2	-2.2	1.2	47.0	3.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	High Ch 39, EUT Flat

SPURIOUS CONDUCTED EMISSIONS

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

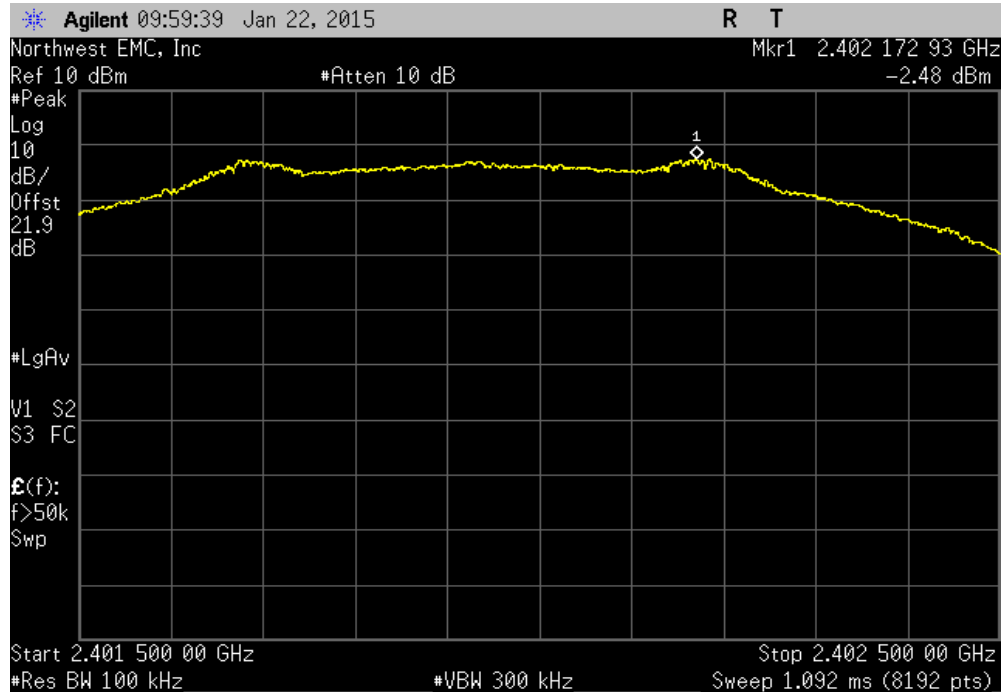
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each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

SPURIOUS CONDUCTED EMISSIONS

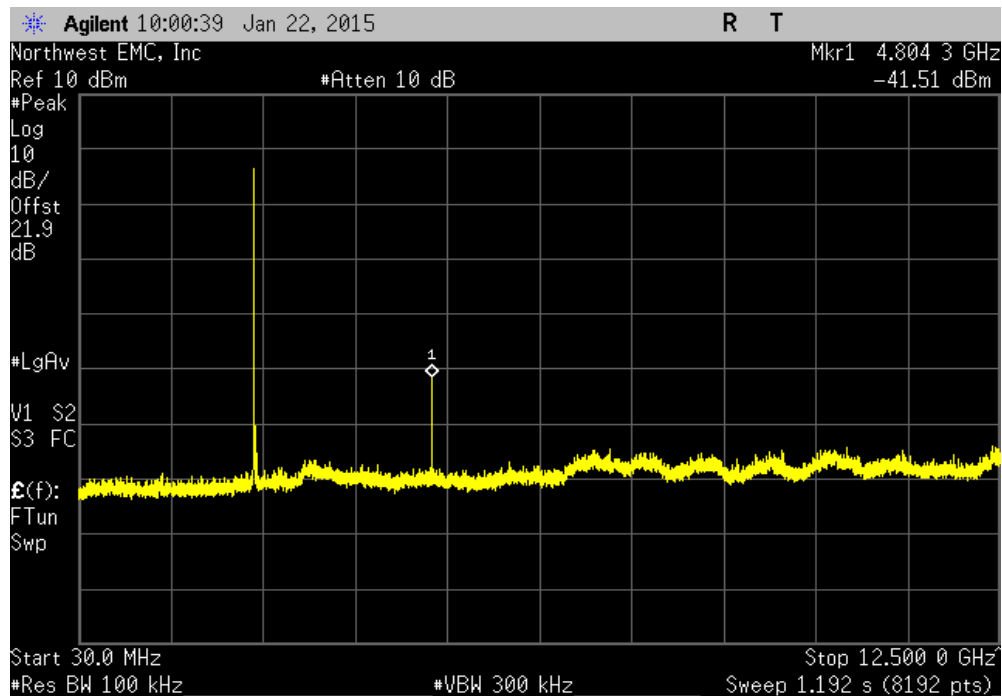
EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth		Power: 1.2 VDC	
Job Site: NC02			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Frequency Range	Value (dBc)
			Limit ≤ (dBc)
			Result
Bluetooth Low Energy			
Antenna A - J4			
	Low Channel 0, 2402 MHz	Fundamental	N/A
	Low Channel 0, 2402 MHz	30 MHz - 12.5 GHz	-39.02
	Low Channel 0, 2402 MHz	12.5 GHz - 25 GHz	-46.89
	Mid Channel 20, 2442 MHz	Fundamental	N/A
	Mid Channel 20, 2442 MHz	30 MHz - 12.5 GHz	-40.05
	Mid Channel 20, 2442 MHz	12.5 GHz - 25 GHz	-45.93
	High Channel 39, 2480 MHz	Fundamental	N/A
	High Channel 39, 2480 MHz	30 MHz - 12.5 GHz	-38.75
	High Channel 39, 2480 MHz	12.5 GHz - 25 GHz	-45.05
Antenna B - J5			
	Low Channel 0, 2402 MHz	Fundamental	N/A
	Low Channel 0, 2402 MHz	30 MHz - 12.5 GHz	-37.44
	Low Channel 0, 2402 MHz	12.5 GHz - 25 GHz	-46.84
	Mid Channel 20, 2442 MHz	Fundamental	N/A
	Mid Channel 20, 2442 MHz	30 MHz - 12.5 GHz	-38.43
	Mid Channel 20, 2442 MHz	12.5 GHz - 25 GHz	-46.26
	High Channel 39, 2480 MHz	Fundamental	N/A
	High Channel 39, 2480 MHz	30 MHz - 12.5 GHz	-37.6
	High Channel 39, 2480 MHz	12.5 GHz - 25 GHz	-45.79

SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

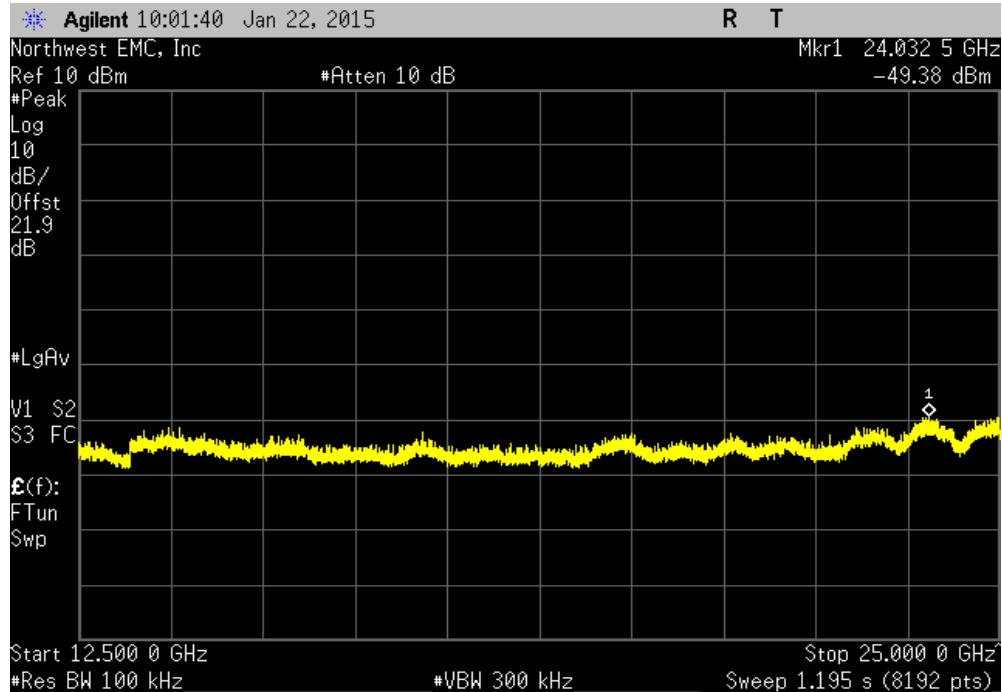


Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-39.02	-20	Pass		

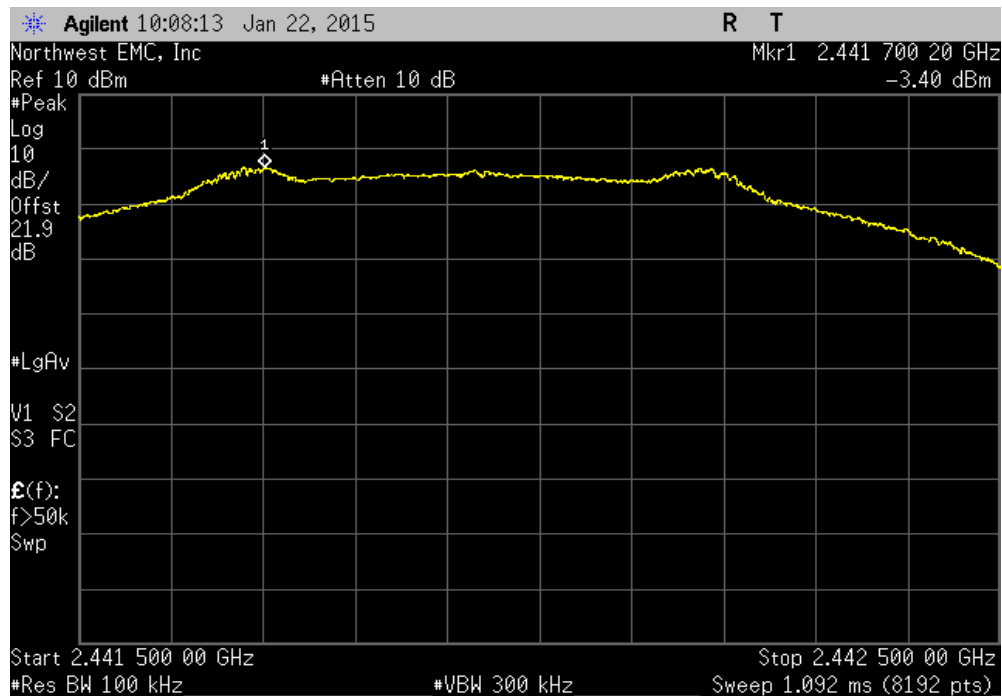


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-46.89	-20	Pass	

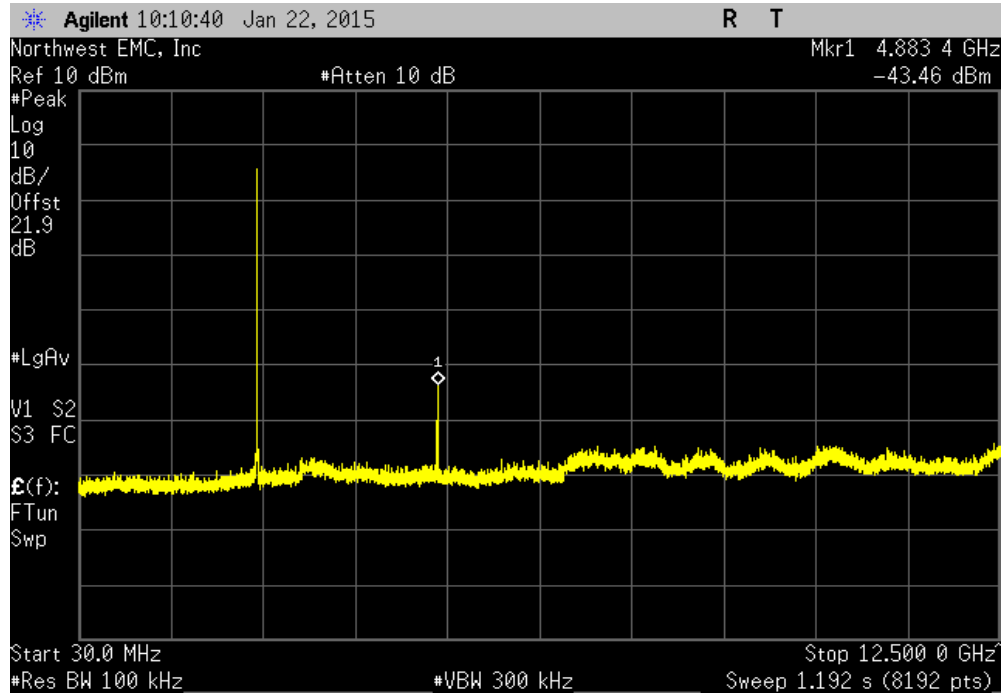


Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

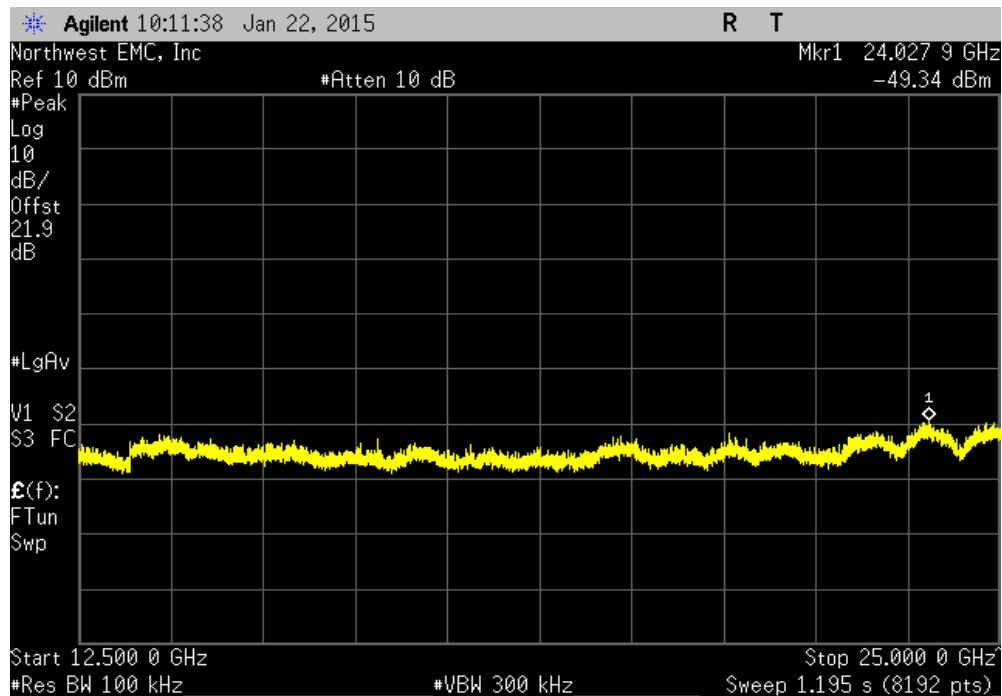


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-40.05	-20	Pass	

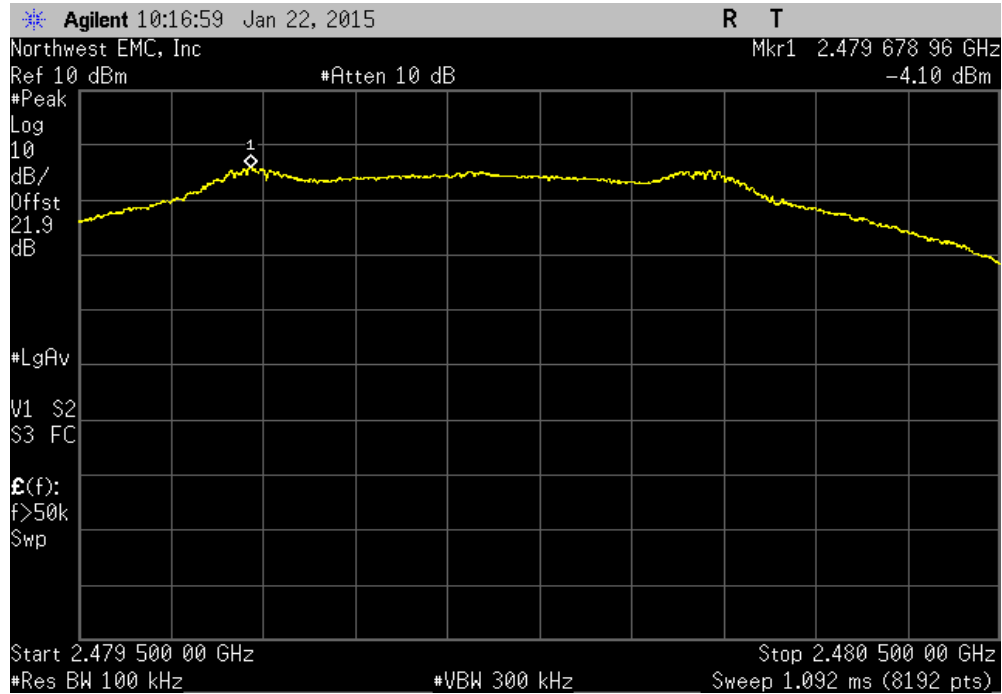


Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-45.93	-20	Pass	

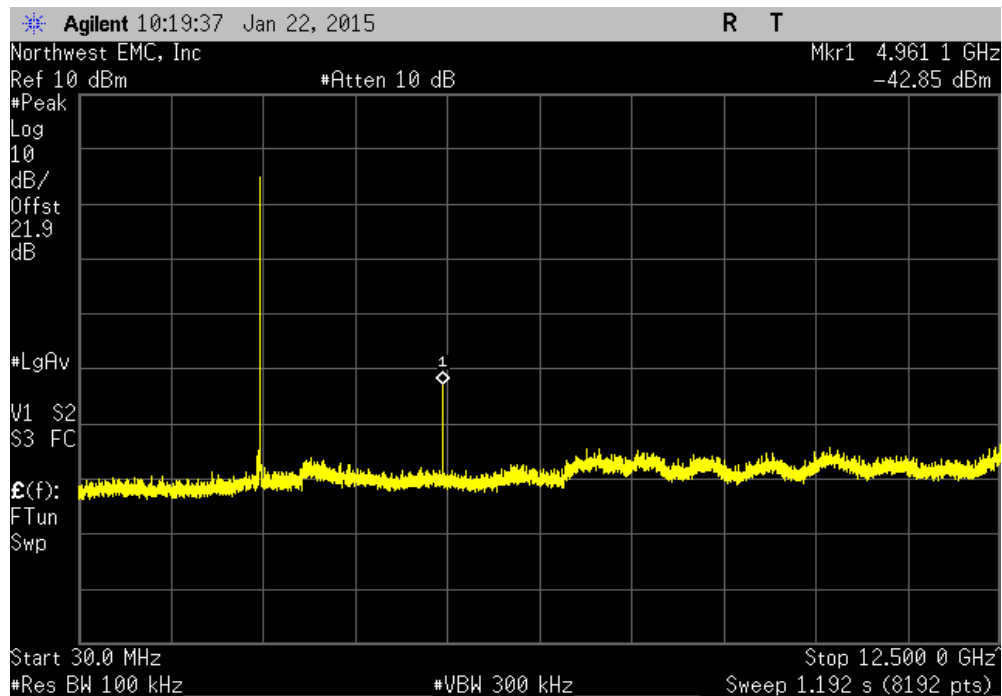


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

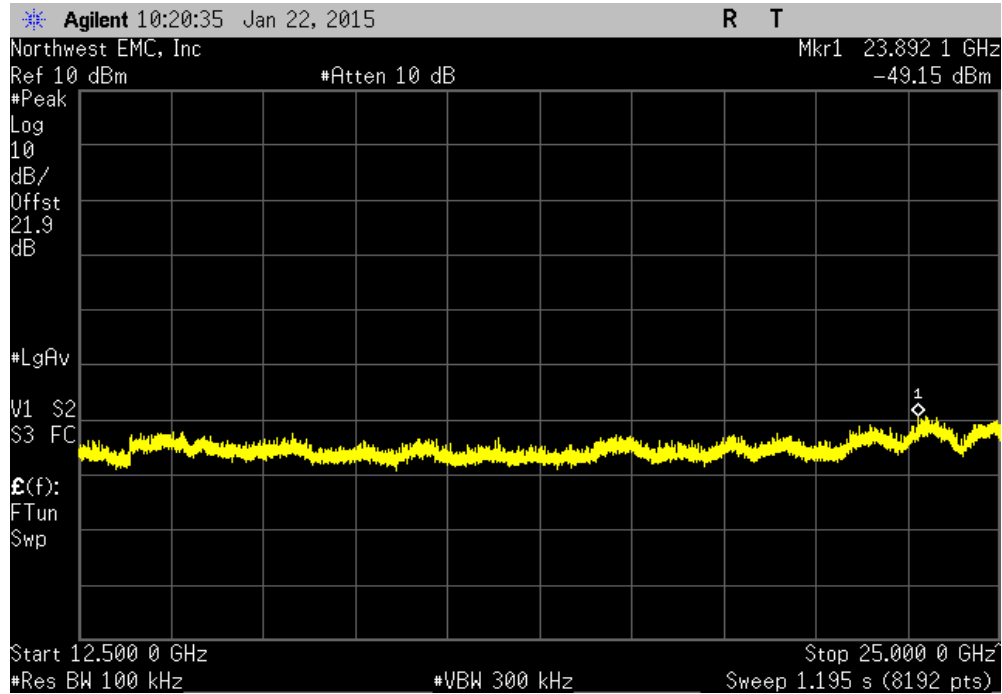


Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-38.75	-20	Pass		

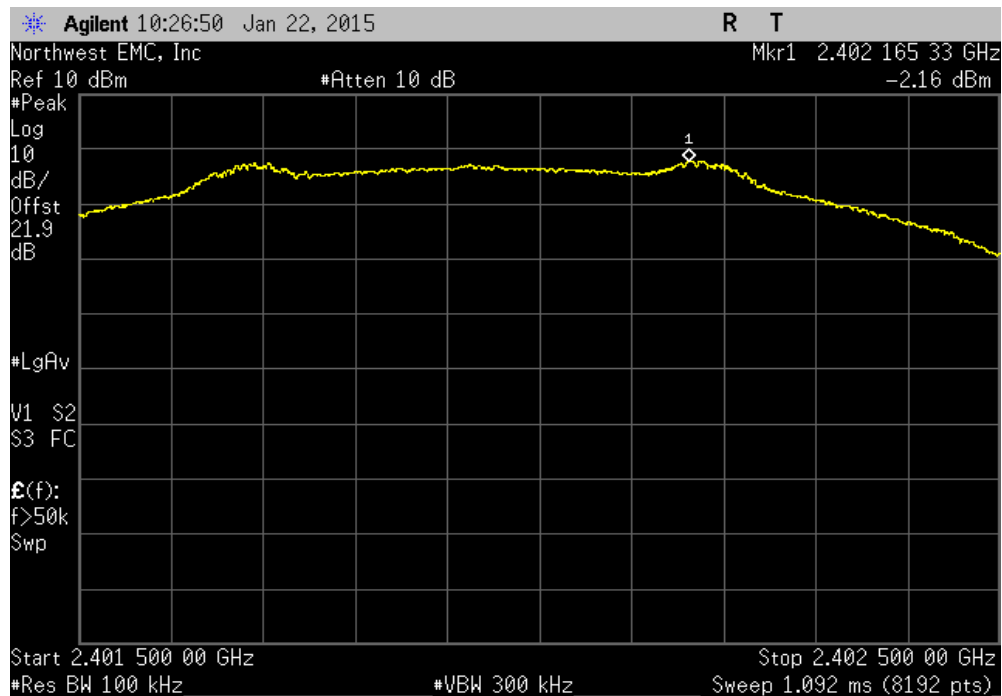


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-45.05	-20	Pass	

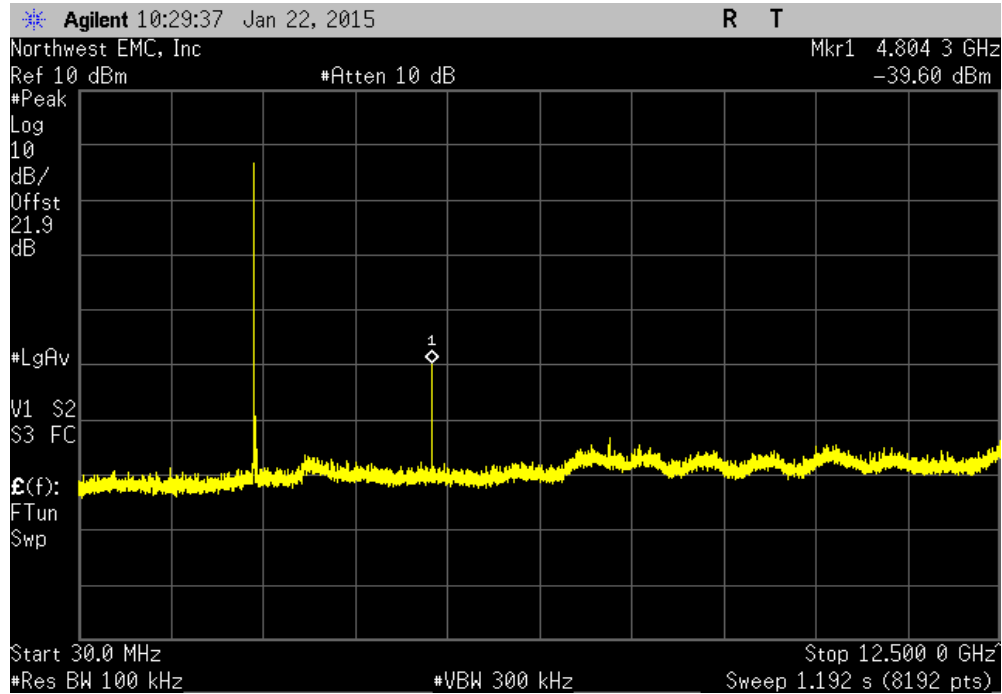


Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

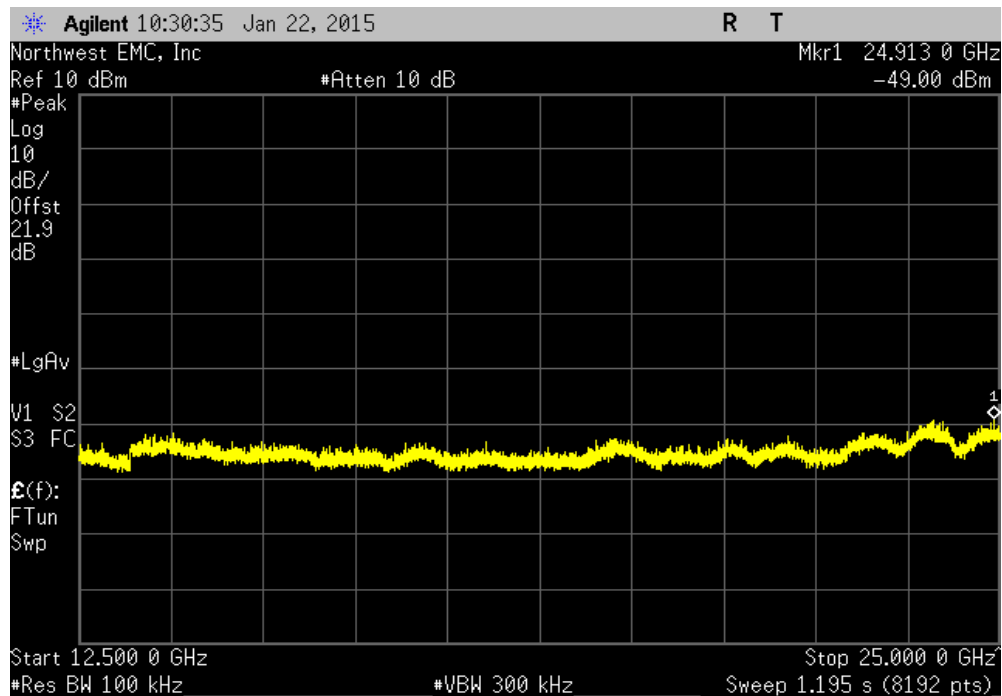


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-37.44	-20	Pass	

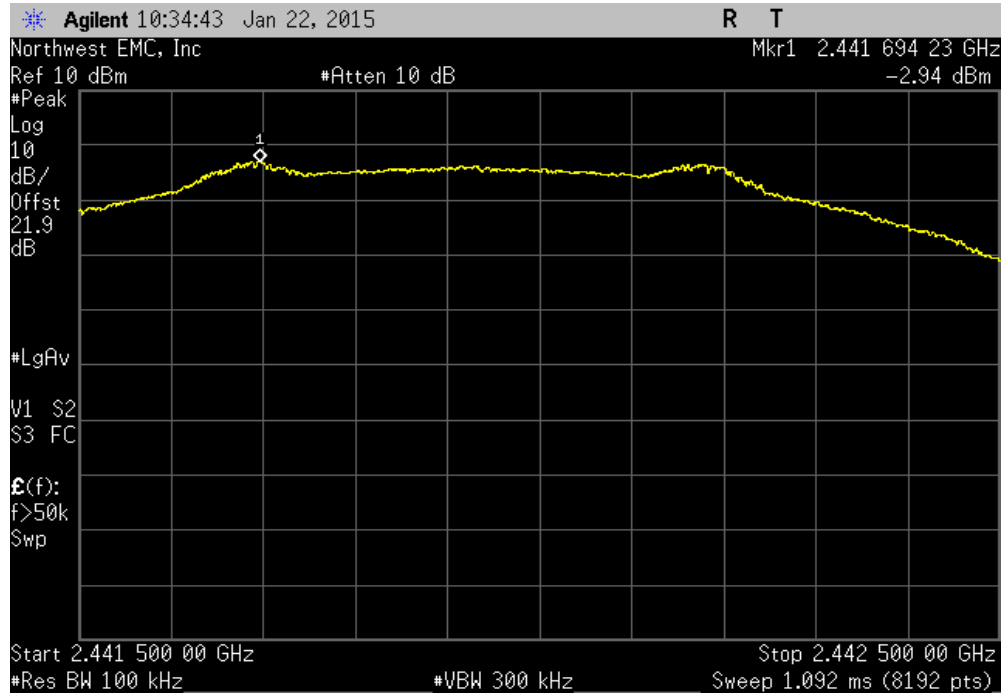


Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-46.84	-20	Pass	

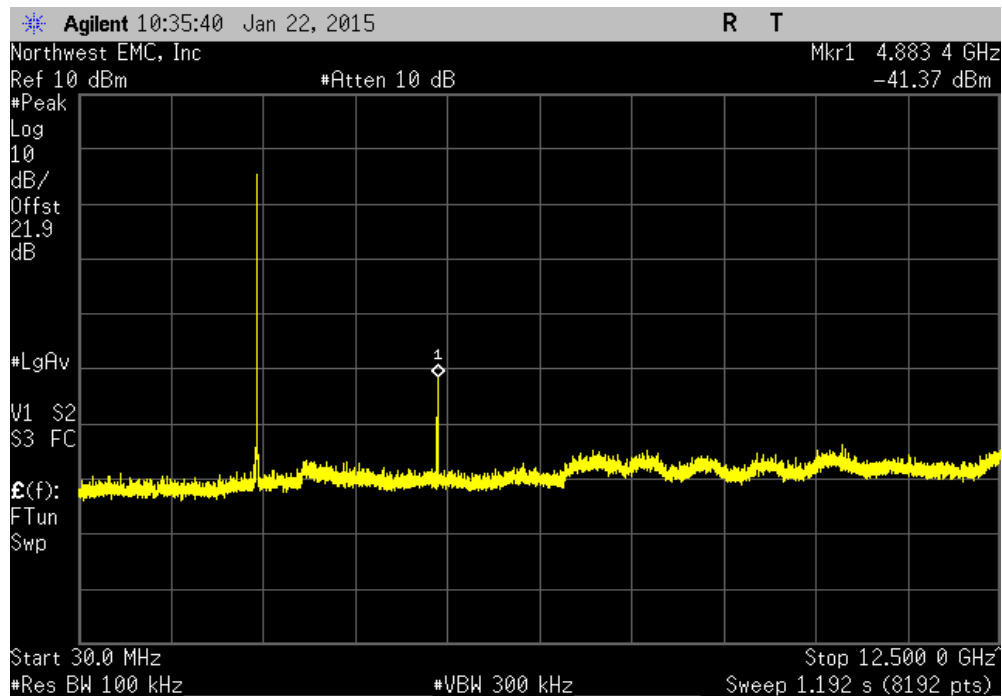


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

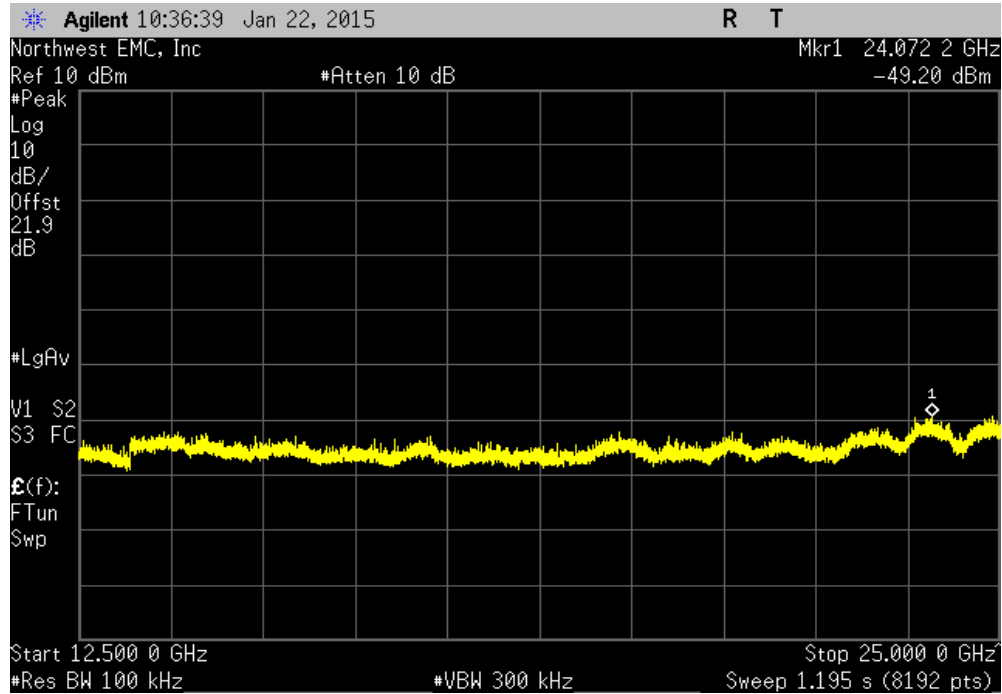


Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-38.43	-20	Pass		

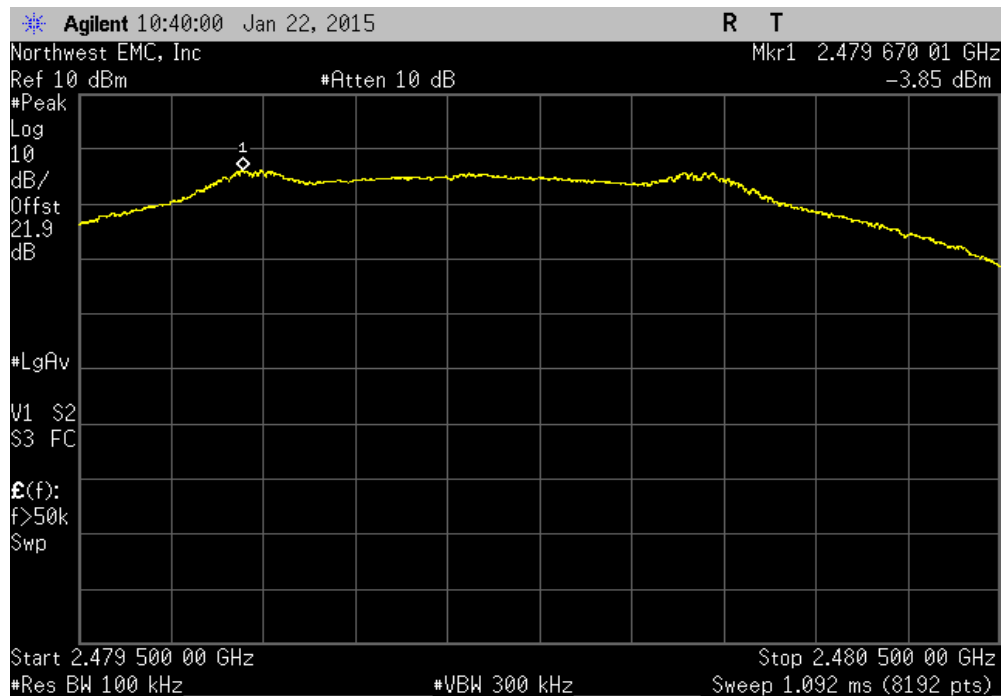


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-46.26	-20	Pass	

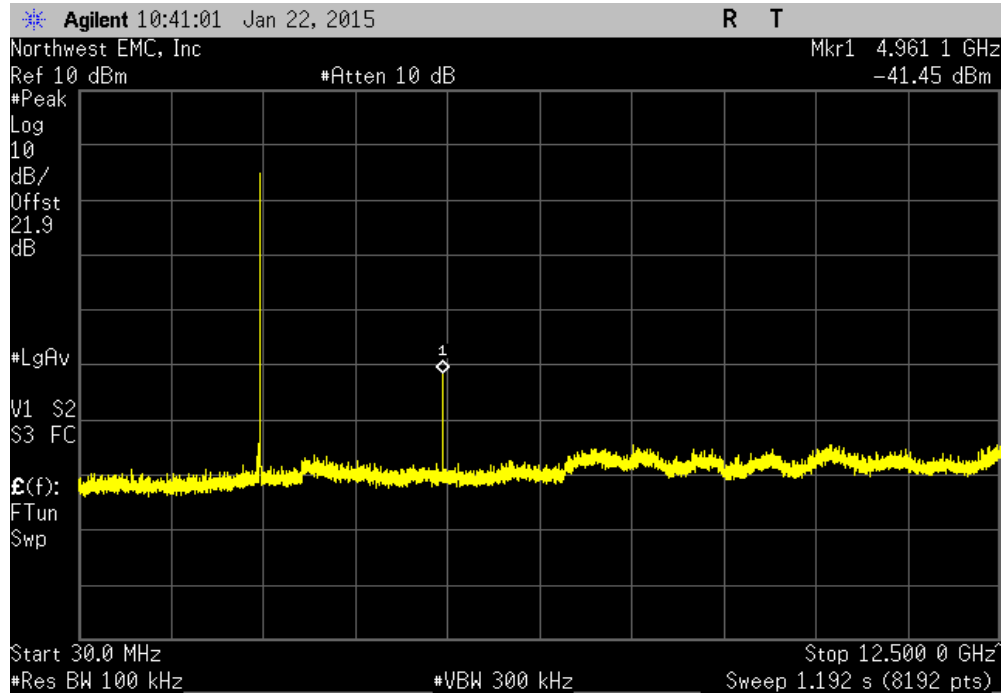


Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

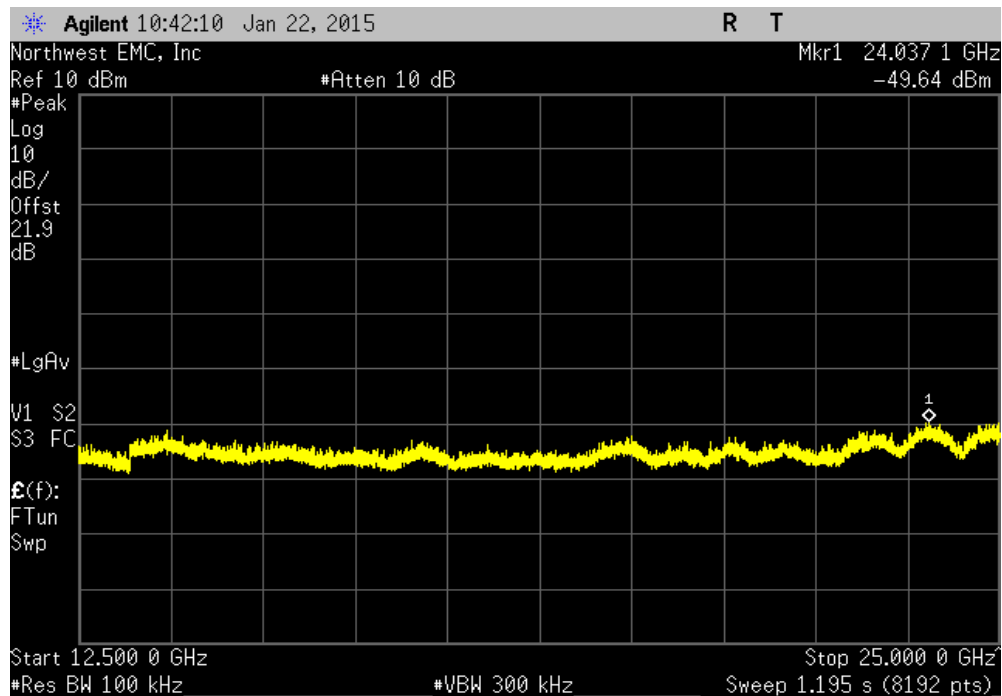


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-37.6	-20	Pass	



Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-45.79	-20	Pass	



SPURIOUS CONDUCTED EMISSIONS

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

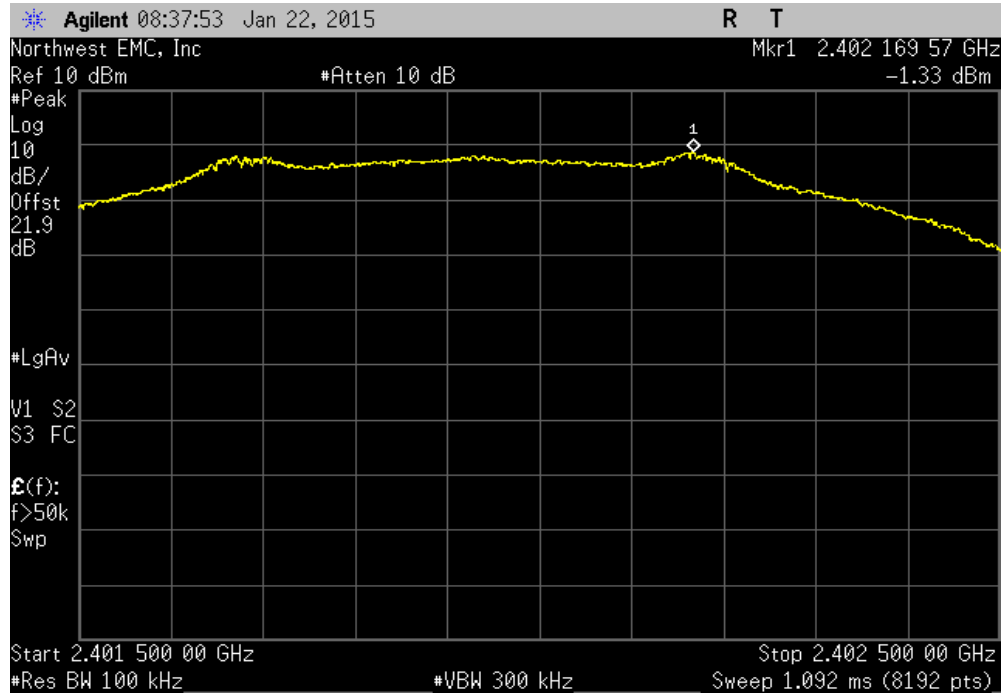
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each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

**NORTHWEST
EMC**

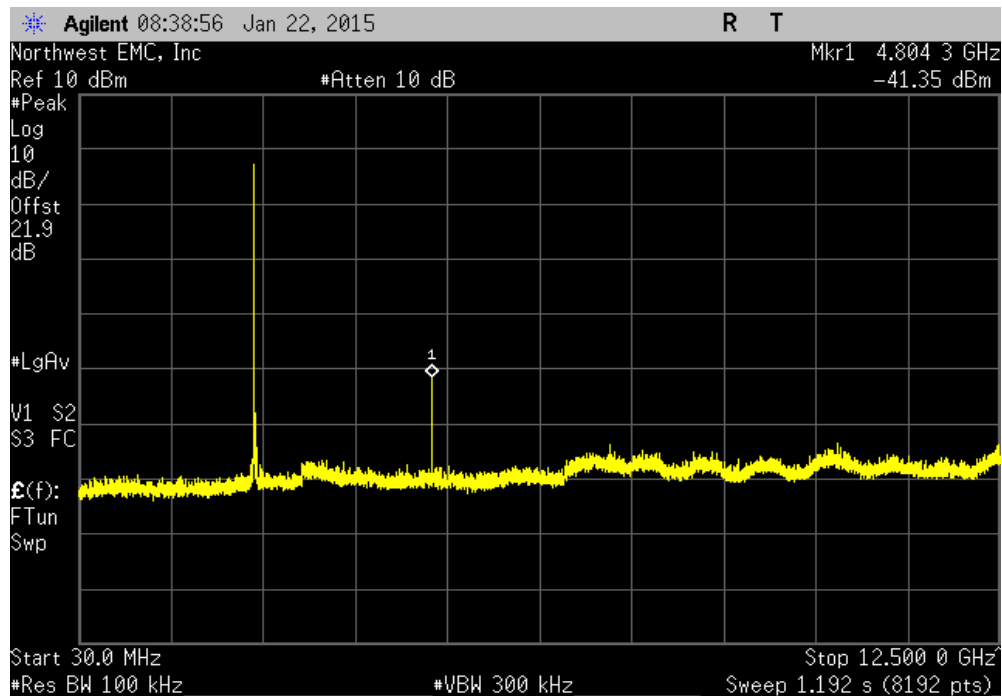
EUT: Key Unit, Rev. AB		Work Order: PROU0034			
Serial Number: T2		Date: 01/22/15			
Customer: Product Creation Studio		Temperature: 24°C			
Attendees: Matt Darval		Humidity: 33%			
Project: None		Barometric Pres.: 1025mb			
Tested by: Richard Melloth		Power: 1.2 VDC			
Job Site: NC02					
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2015		ANSI C63.10:2009			
COMMENTS					
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature 			
		Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result
Bluetooth Low Energy					
	Low Channel 0, 2402 MHz	Fundamental	N/A	N/A	N/A
	Low Channel 0, 2402 MHz	30 MHz - 12.5 GHz	-40.02	-20	Pass
	Low Channel 0, 2402 MHz	12.5 GHz - 25 GHz	-47.95	-20	Pass
	Mid Channel 20, 2442 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel 20, 2442 MHz	30 MHz - 12.5 GHz	-39.32	-20	Pass
	Mid Channel 20, 2442 MHz	12.5 GHz - 25 GHz	-47.11	-20	Pass
	High Channel 39, 2480 MHz	Fundamental	N/A	N/A	N/A
	High Channel 39, 2480 MHz	30 MHz - 12.5 GHz	-38.49	-20	Pass
	High Channel 39, 2480 MHz	12.5 GHz - 25 GHz	-46.52	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

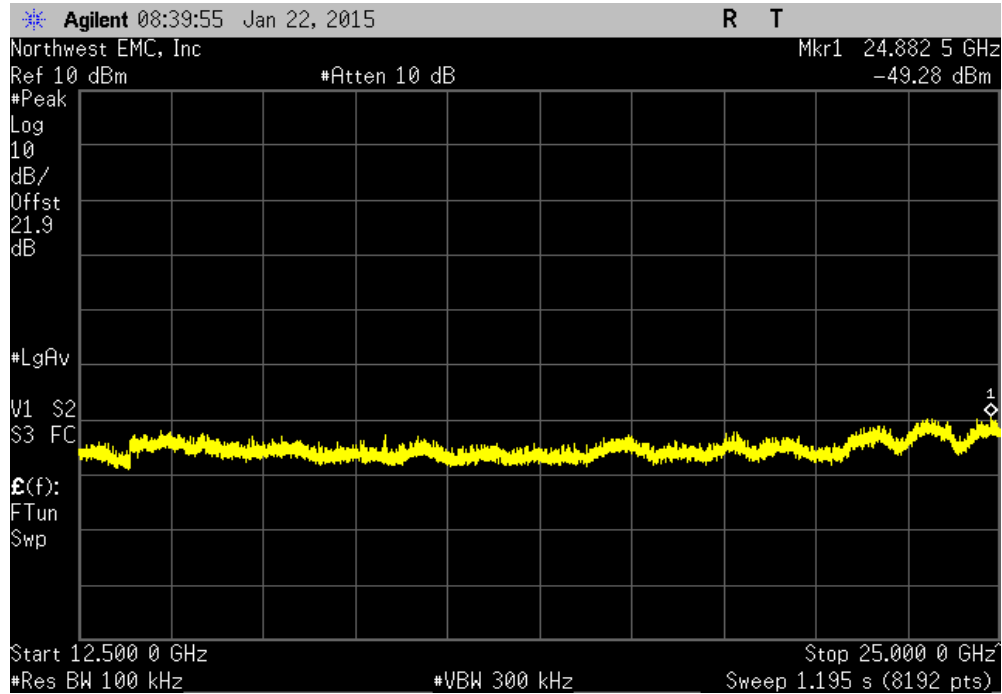


Bluetooth Low Energy, Low Channel 0, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-40.02	-20	Pass		

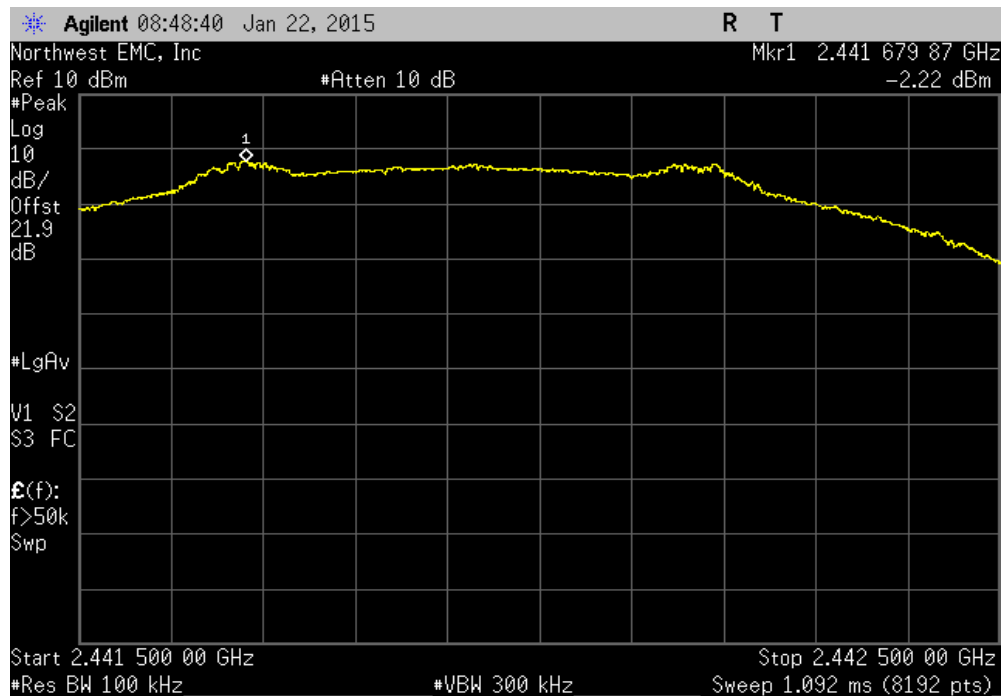


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Low Channel 0, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-47.95	-20	Pass	

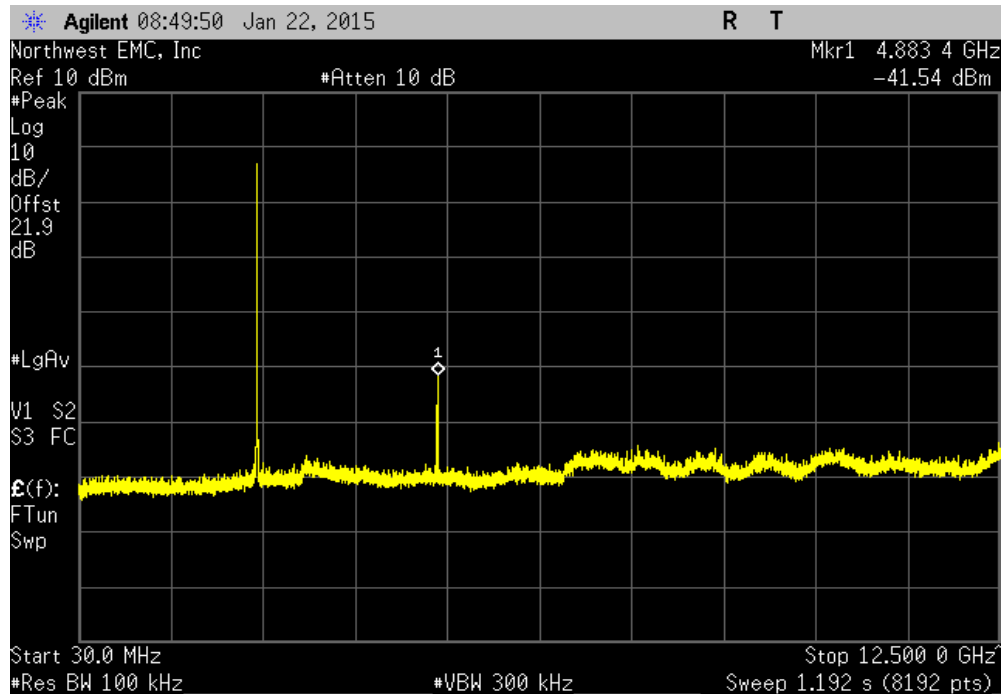


Bluetooth Low Energy, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

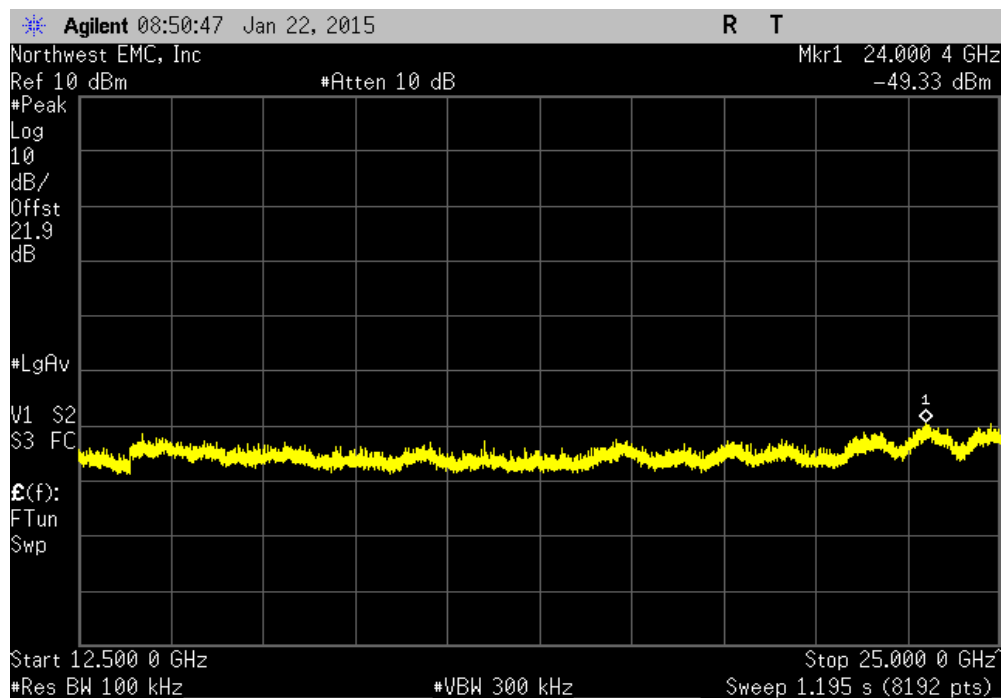


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-39.32	-20	Pass	

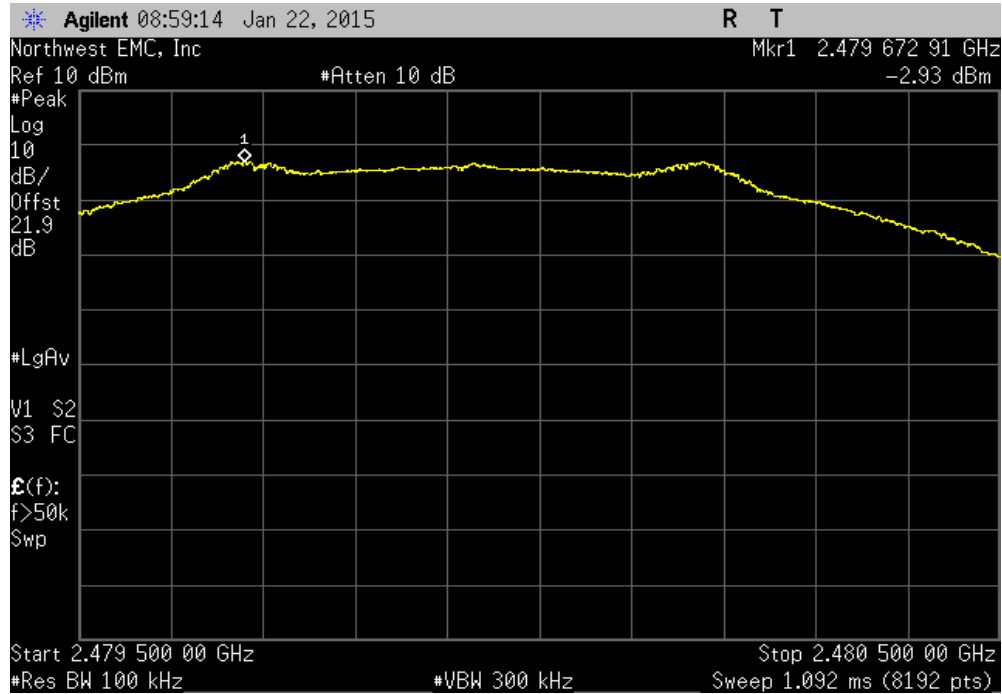


Bluetooth Low Energy, Mid Channel 20, 2442 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-47.11	-20	Pass	

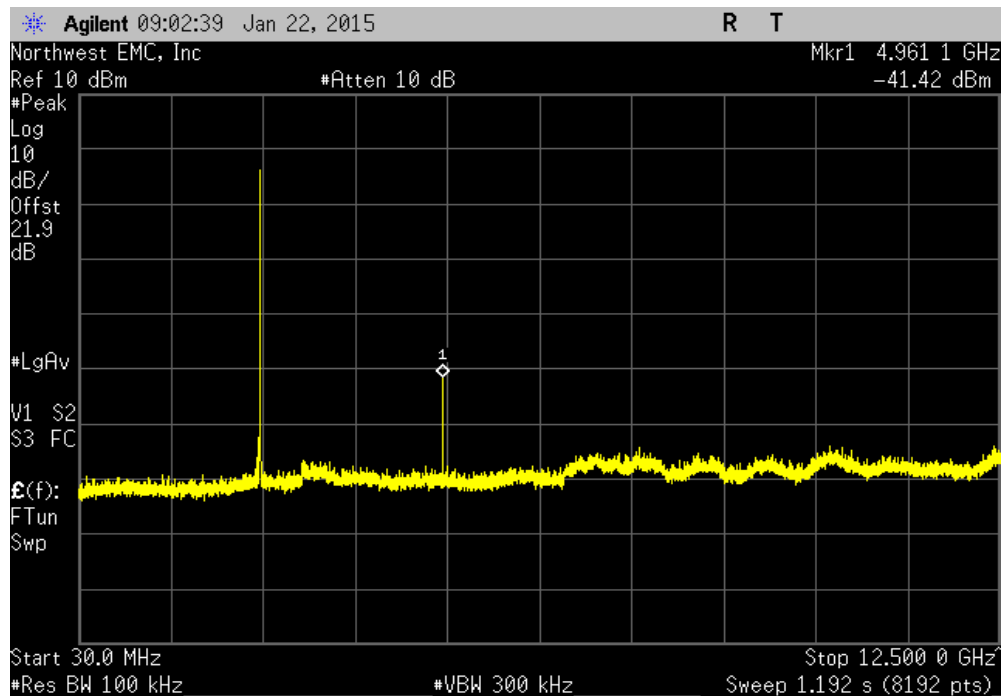


SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, High Channel 39, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

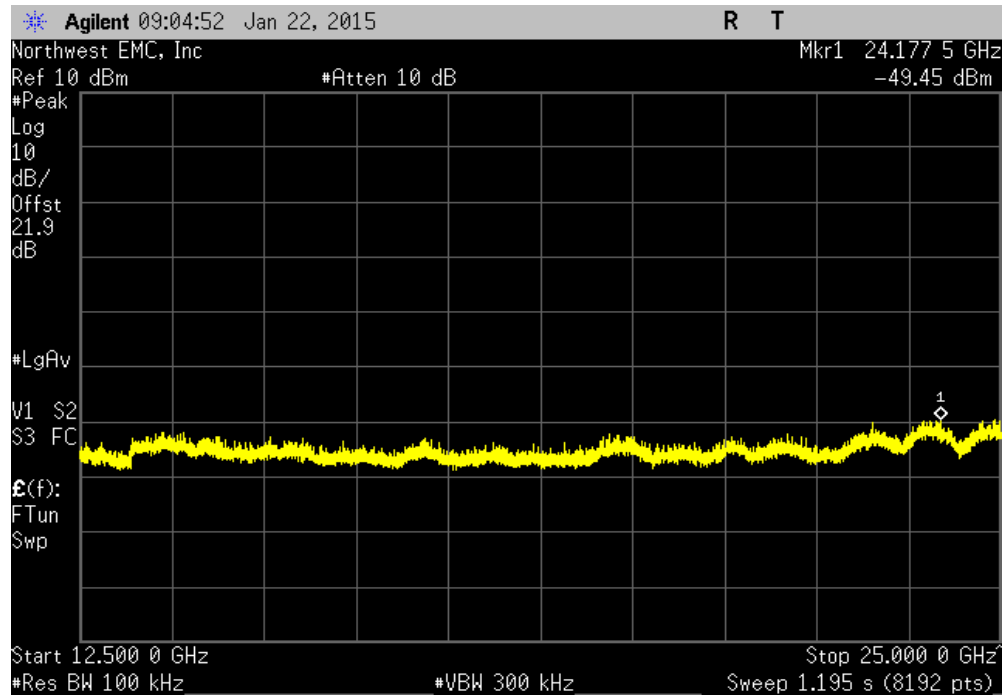


Bluetooth Low Energy, High Channel 39, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-38.49	-20	Pass		



SPURIOUS CONDUCTED EMISSIONS

Bluetooth Low Energy, High Channel 39, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-46.52	-20	Pass	



OCCUPIED BANDWIDTH

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

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

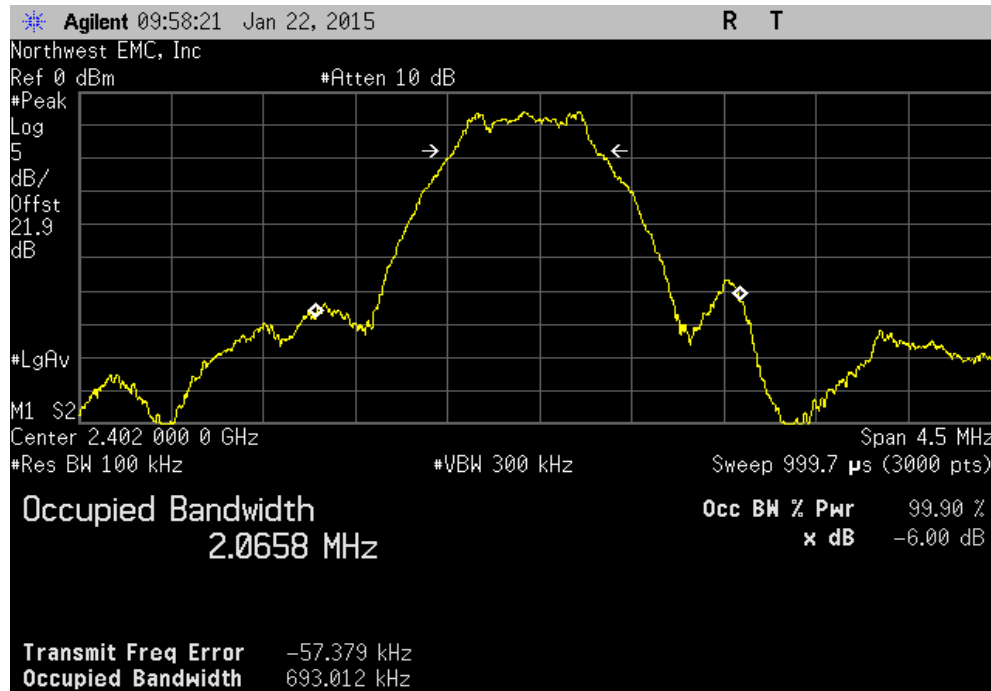
OCCUPIED BANDWIDTH

EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (±) Result
Bluetooth Low Energy			
Antenna A - J4			
	Low Channel 0, 2402 MHz	693.012 kHz	500 kHz Pass
	Mid Channel 20, 2442 MHz	734.013 kHz	500 kHz Pass
	High Channel 39, 2480 MHz	698.29 kHz	500 kHz Pass
Antenna B - J5			
	Low Channel 0, 2402 MHz	717.744 kHz	500 kHz Pass
	Mid Channel 20, 2442 MHz	697.064 kHz	500 kHz Pass
	High Channel 39, 2480 MHz	728.365 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

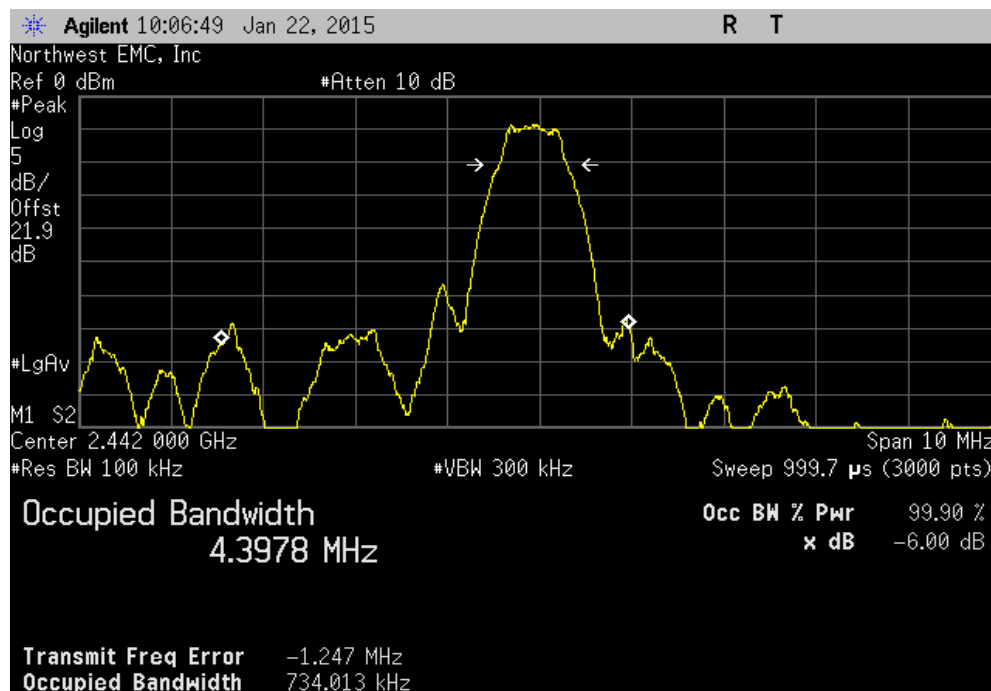
Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz

	Value	Limit (≥)	Result
	693.012 kHz	500 kHz	Pass



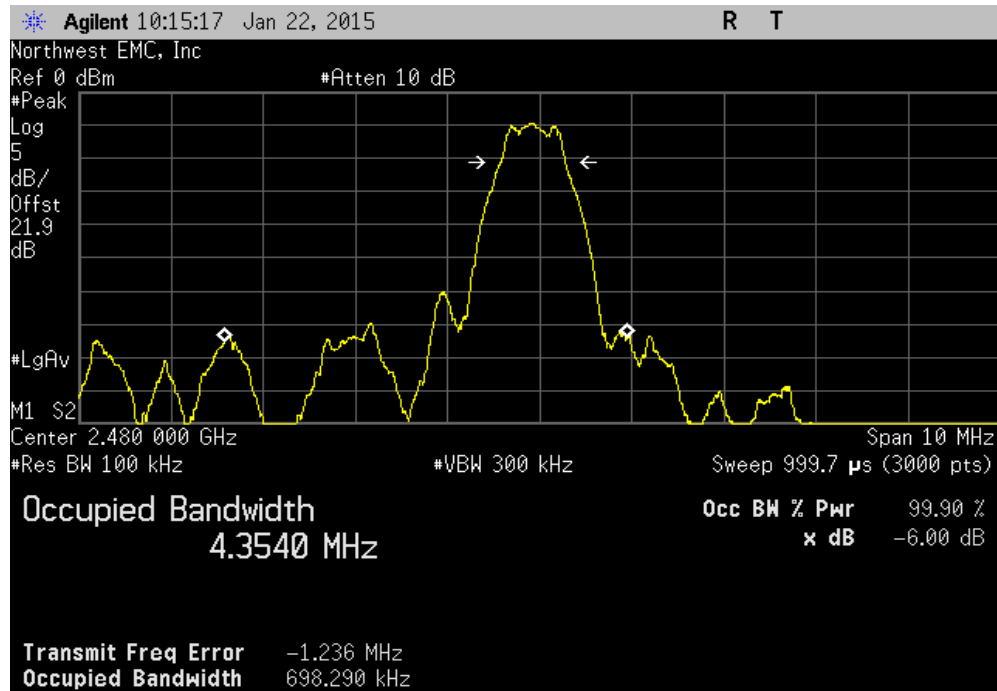
Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz

	Value	Limit (≥)	Result
	734.013 kHz	500 kHz	Pass

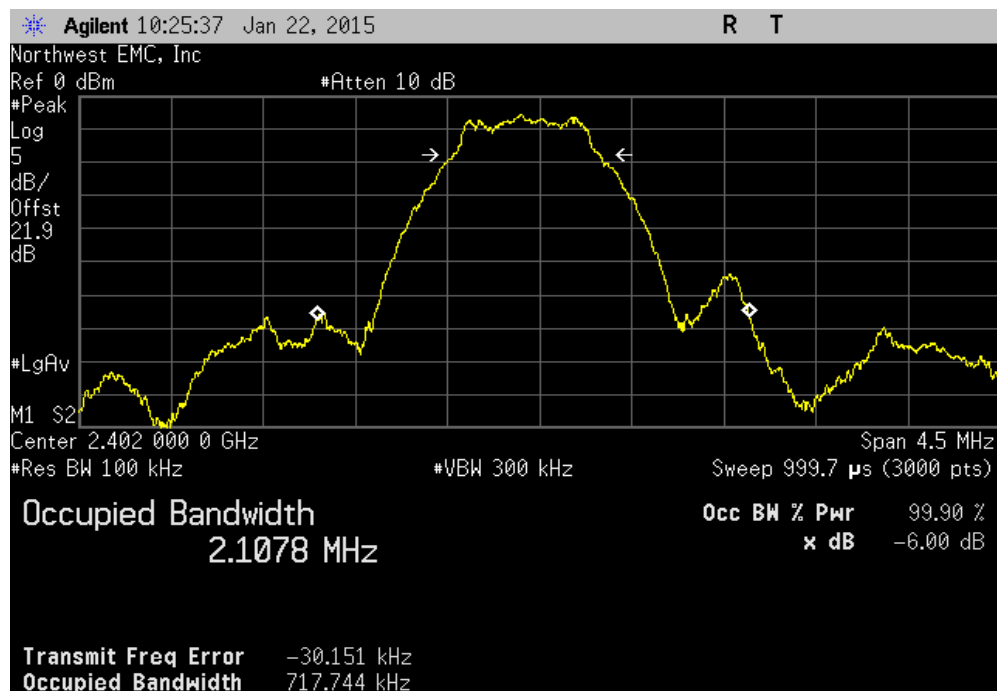


OCCUPIED BANDWIDTH

Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
				Value	Limit (≥)	Result
				698.29 kHz	500 kHz	Pass

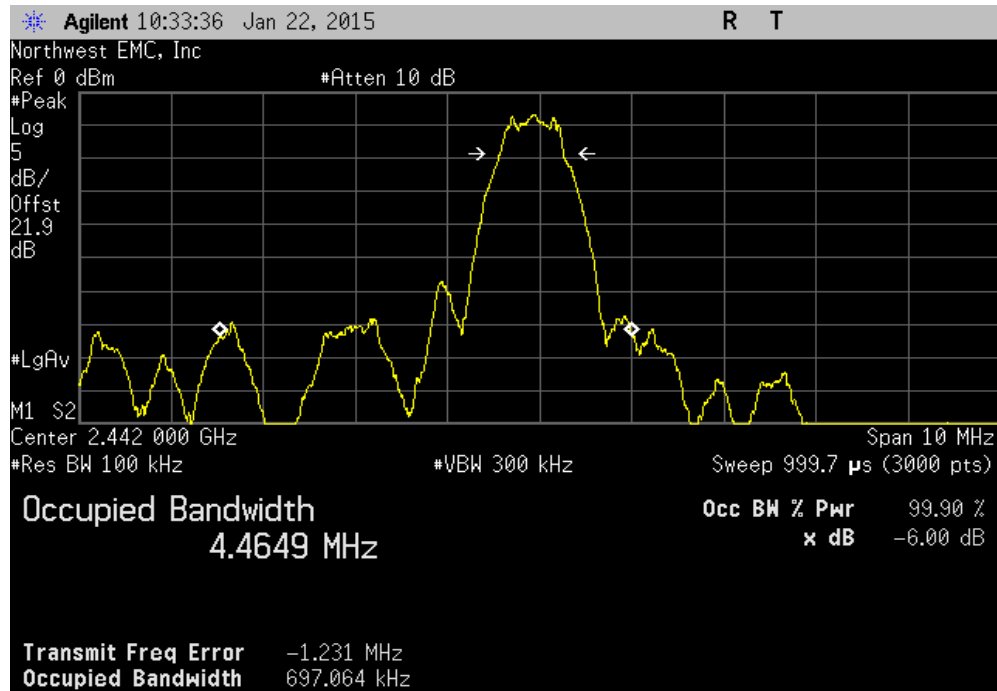


Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz						
				Value	Limit (≥)	Result
				717.744 kHz	500 kHz	Pass

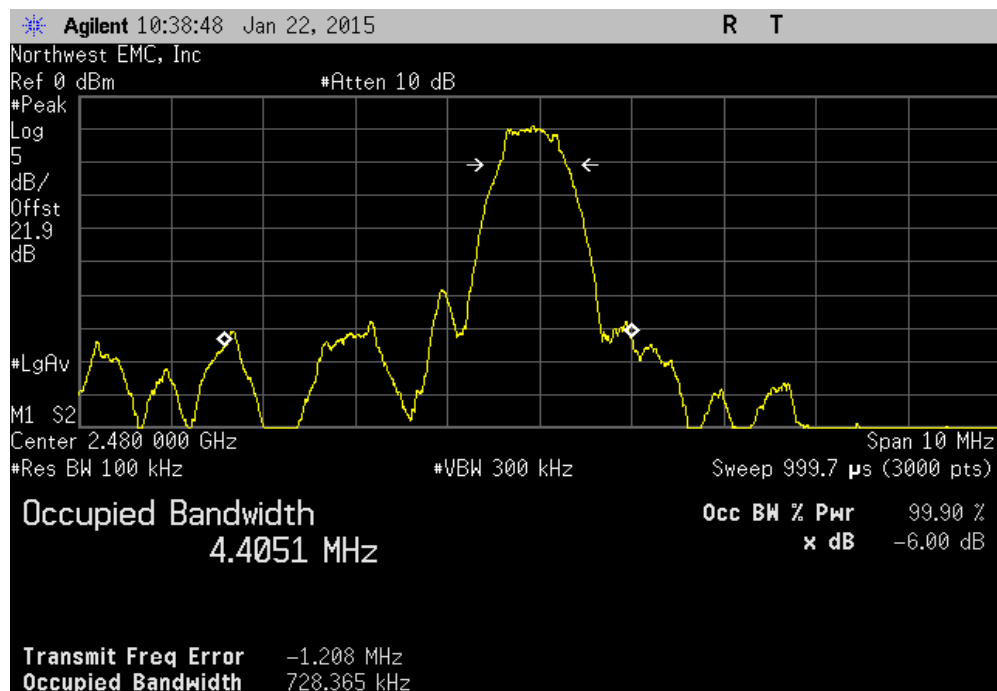


OCCUPIED BANDWIDTH

Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz						
				Value	Limit (≥)	Result
				697.064 kHz	500 kHz	Pass



Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz						
				Value	Limit (≥)	Result
				728.365 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

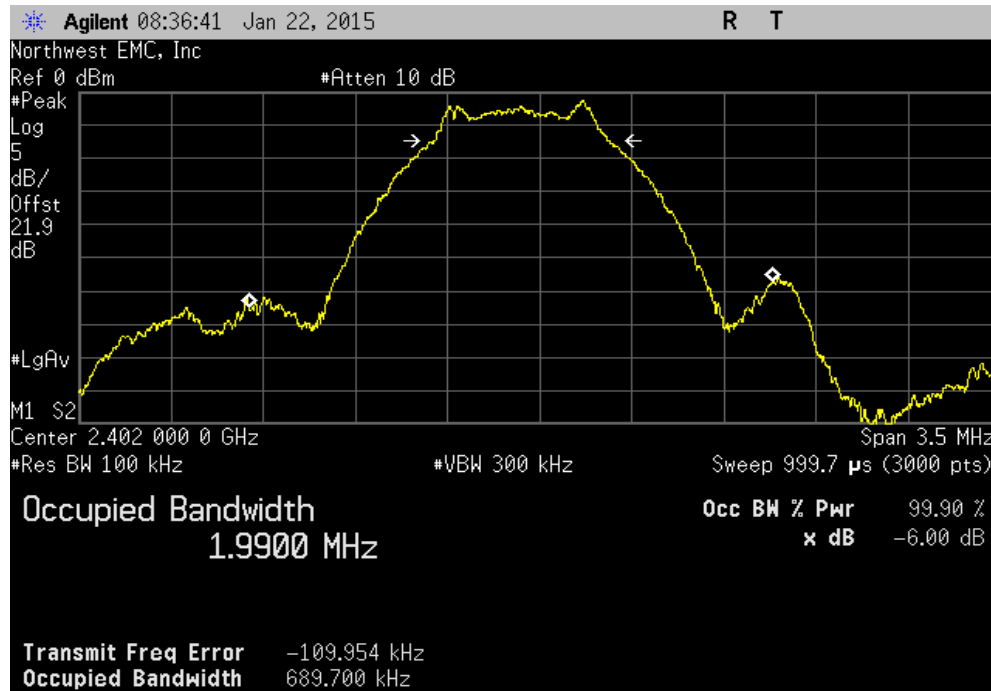
The EUT was set to the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer.

OCCUPIED BANDWIDTH

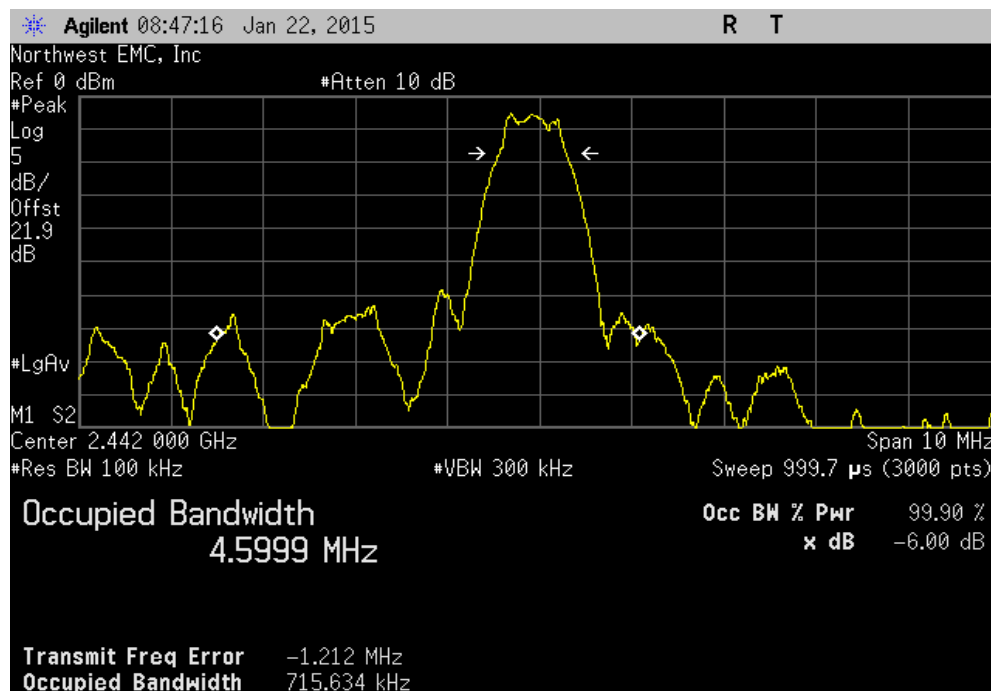
EUT: Key Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T2		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (±) Result
Bluetooth Low Energy			
Low Channel 0, 2402 MHz		689.7 kHz	500 kHz Pass
Mid Channel 20, 2442 MHz		715.634 kHz	500 kHz Pass
High Channel 39, 2480 MHz		706.281 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
				Value	Limit (≥)	Result
				689.7 kHz	500 kHz	Pass

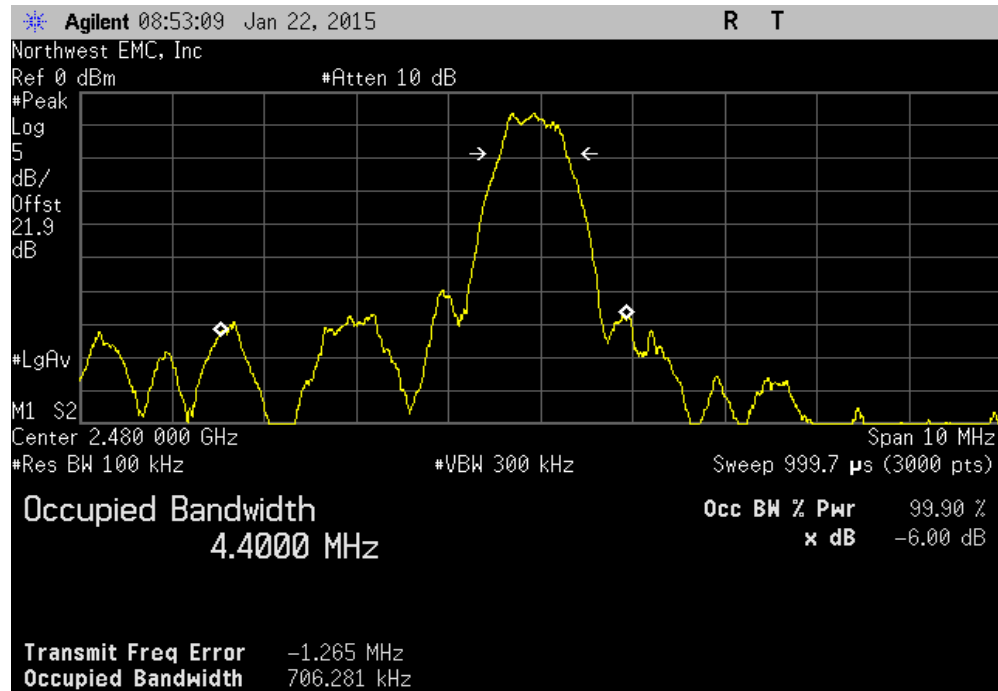


Bluetooth Low Energy, Mid Channel 20, 2442 MHz						
				Value	Limit (≥)	Result
				715.634 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

Bluetooth Low Energy, High Channel 39, 2480 MHz						
				Value	Limit (≥)	Result
				706.281 kHz	500 kHz	Pass



BAND EDGE COMPLIANCE

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

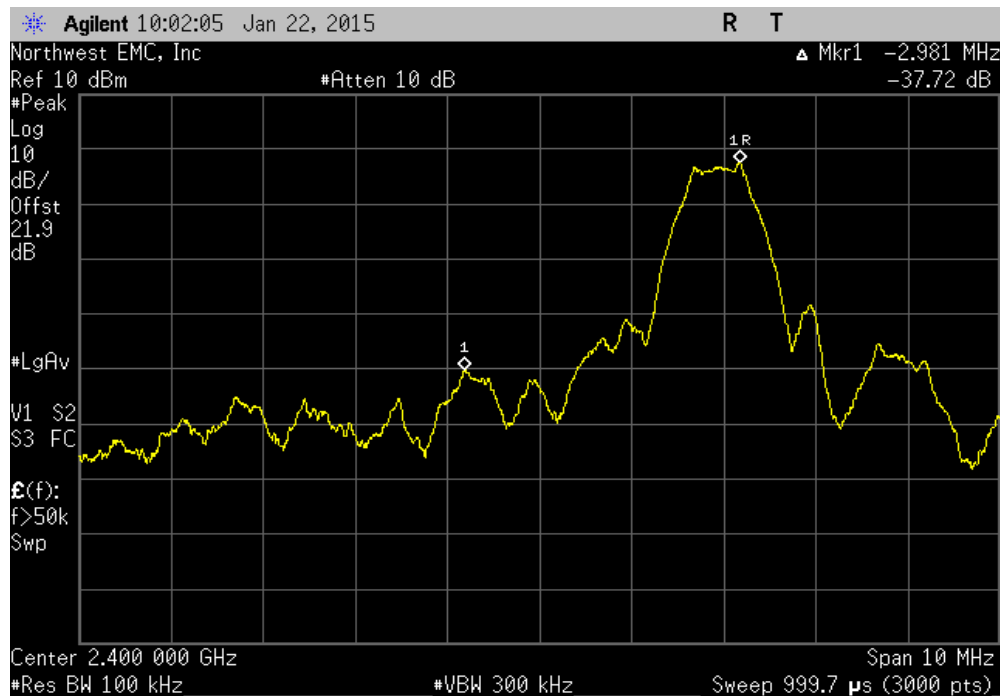
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

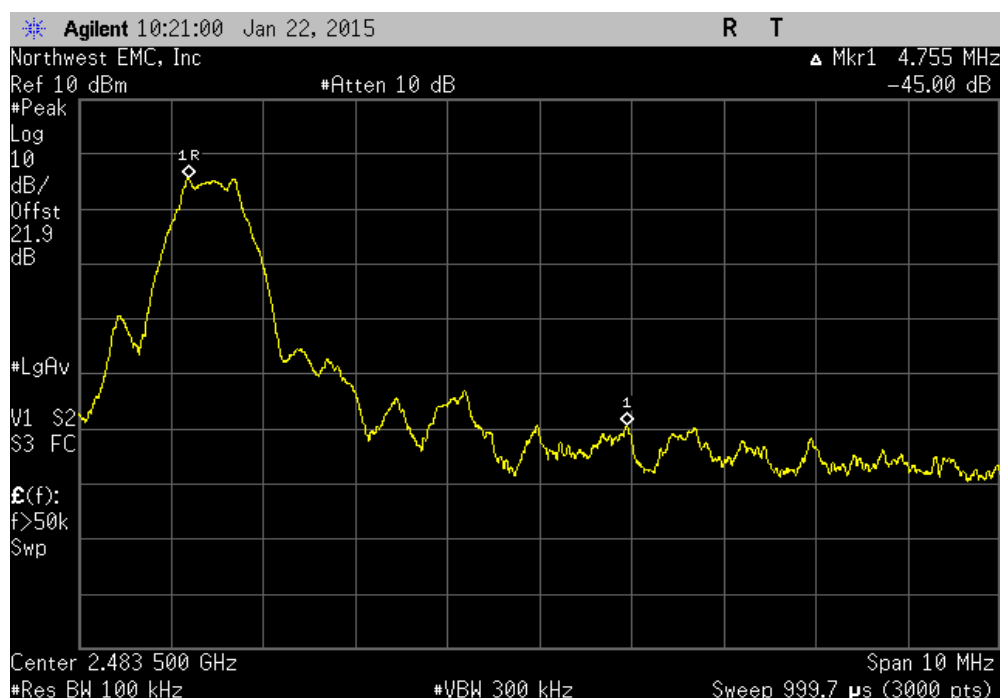
EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Bluetooth Low Energy			
Antenna A - J4			
	Low Channel 0, 2402 MHz	-37.72	-20 Pass
	High Channel 39, 2480 MHz	-45	-20 Pass
Antenna B - J5			
	Low Channel 0, 2402 MHz	-36.61	-20 Pass
	High Channel 39, 2480 MHz	-44.54	-20 Pass

BAND EDGE COMPLIANCE

Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-37.72	-20	Pass

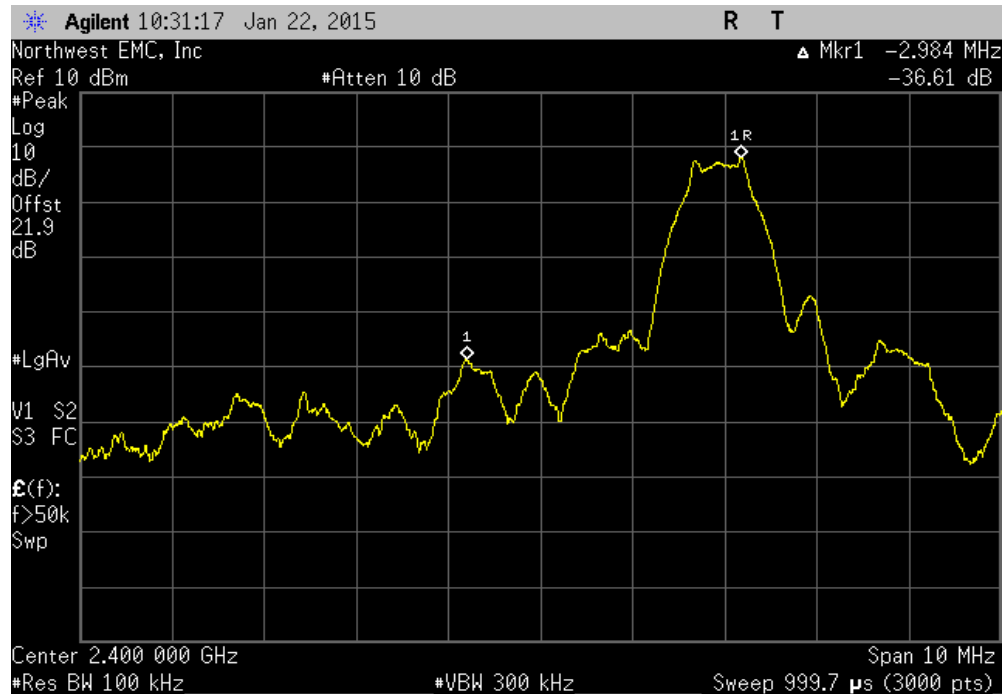


Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45	-20	Pass

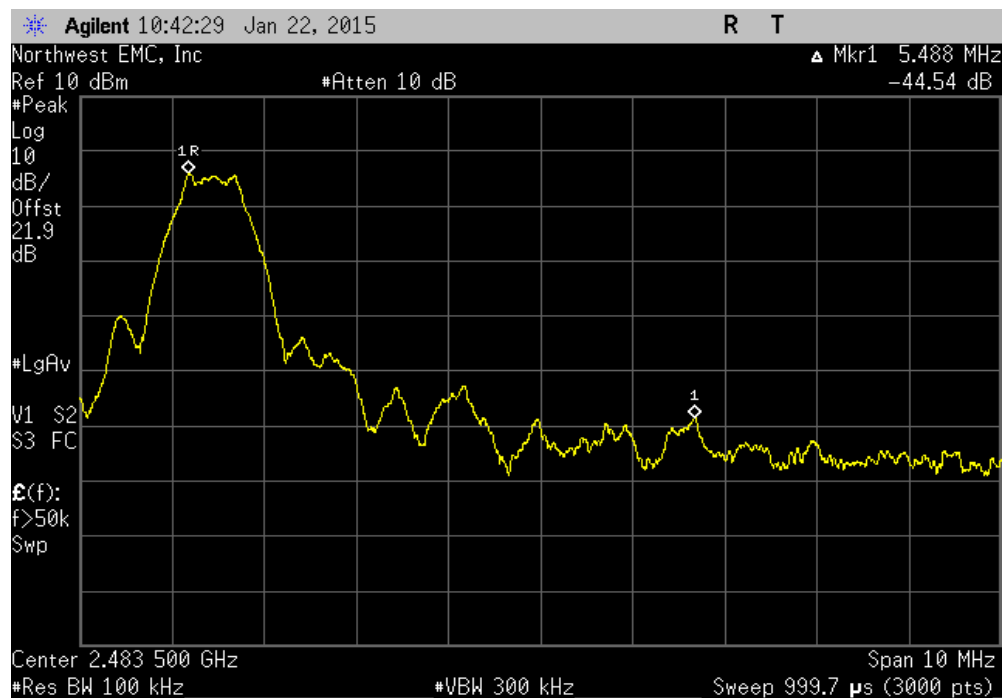


BAND EDGE COMPLIANCE

Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-36.61	-20	Pass



Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-44.54	-20	Pass



BAND EDGE COMPLIANCE

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

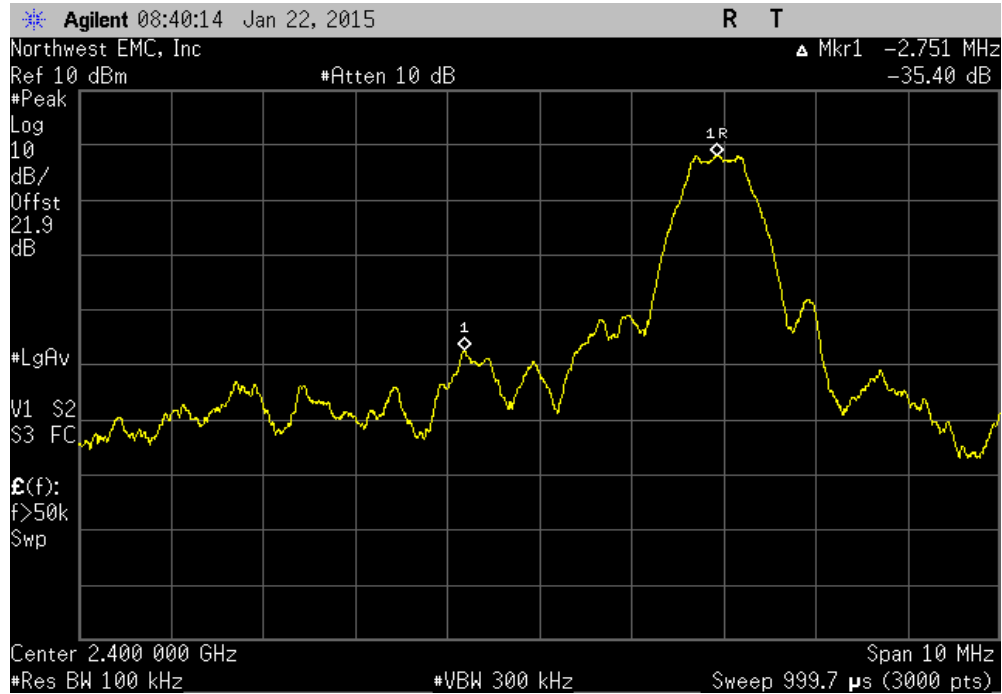
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

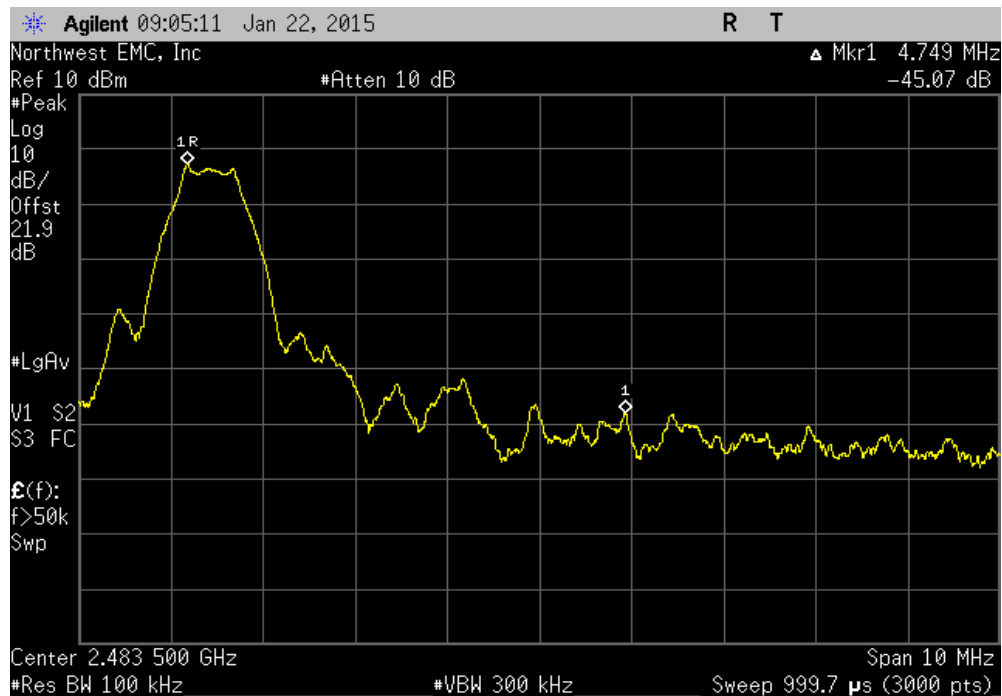
EUT: Key Unit Board, Rev. AB		Work Order: PROU0034	
Serial Number: T2		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Bluetooth Low Energy			
Low Channel 0, 2402 MHz		-35.4	-20 Pass
High Channel 39, 2480 MHz		-45.07	-20 Pass

BAND EDGE COMPLIANCE

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-35.4	-20	Pass



Bluetooth Low Energy, High Channel 39, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.07	-20	Pass



OUTPUT POWER

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION


The transmit frequency was set to the required channels in each band. 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 reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

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 KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

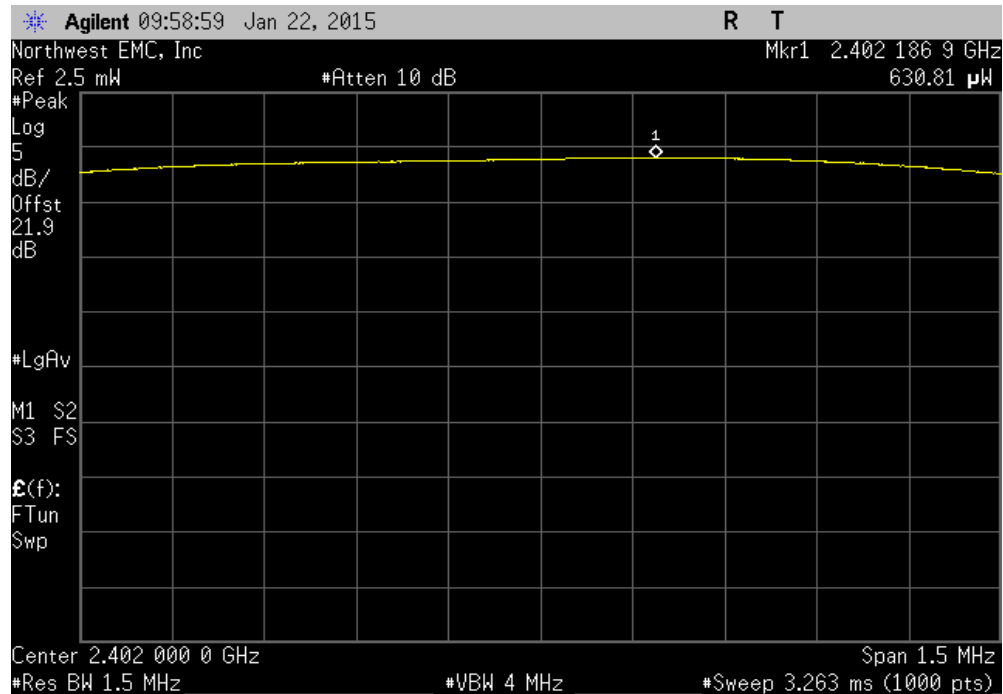
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

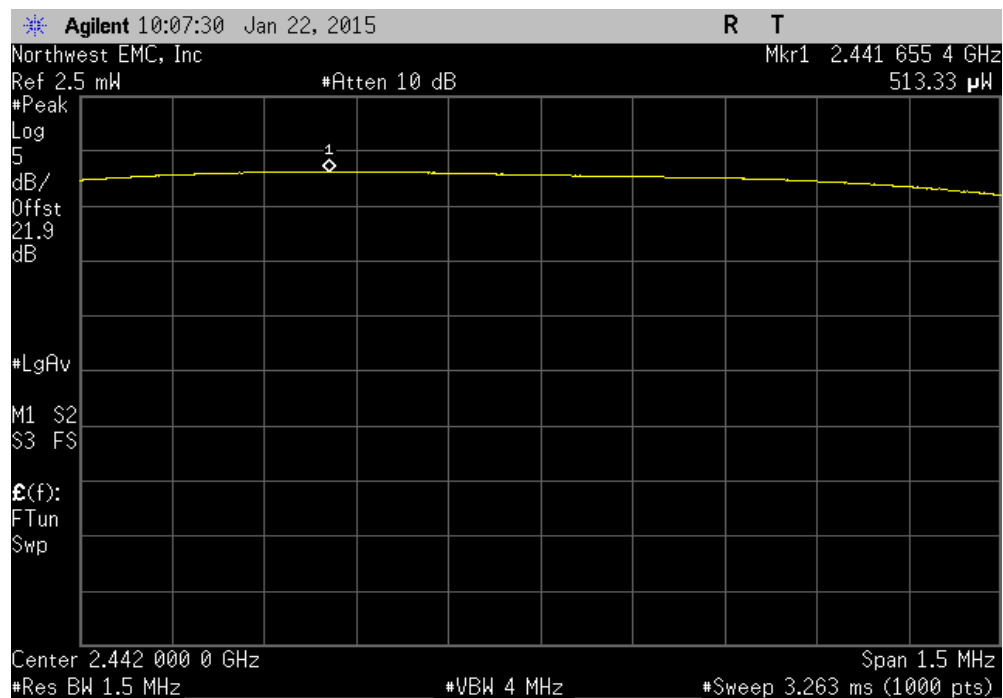
EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (<) Result
Bluetooth Low Energy			
Antenna A - J4			
	Low Channel 0, 2402 MHz	630.812 uW	1 W Pass
	Mid Channel 20, 2442 MHz	513.334 uW	1 W Pass
	High Channel 39, 2480 MHz	418.119 uW	1 W Pass
Antenna B - J5			
	Low Channel 0, 2402 MHz	668.806 uW	1 W Pass
	Mid Channel 20, 2442 MHz	553.86 uW	1 W Pass
	High Channel 39, 2480 MHz	460.575 uW	1 W Pass

OUTPUT POWER

Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz						
	Value	Limit	Result			
	630.812 uW	1 W	Pass			

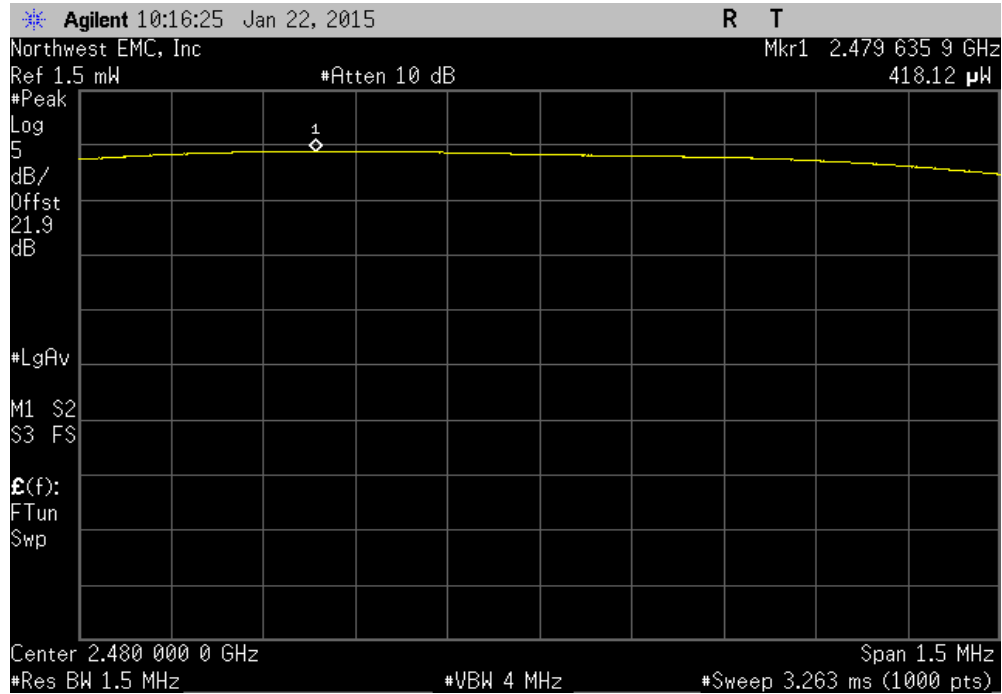


Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz						
	Value	Limit	Result			
	513.334 uW	1 W	Pass			

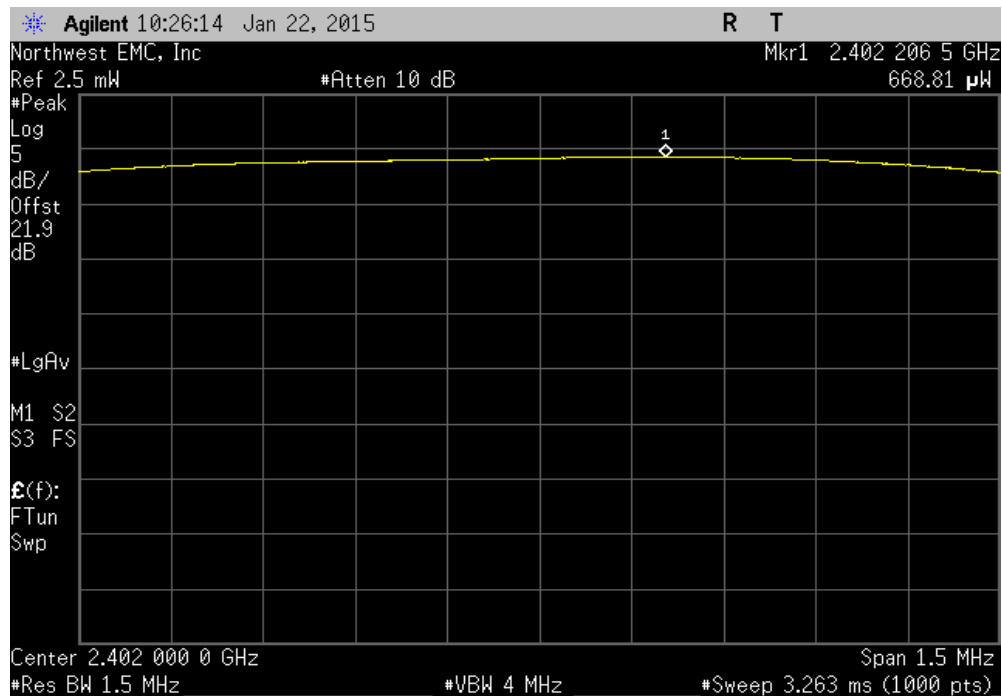


OUTPUT POWER

Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
	Value	Limit	Result			
	418.119 uW	1 W	Pass			

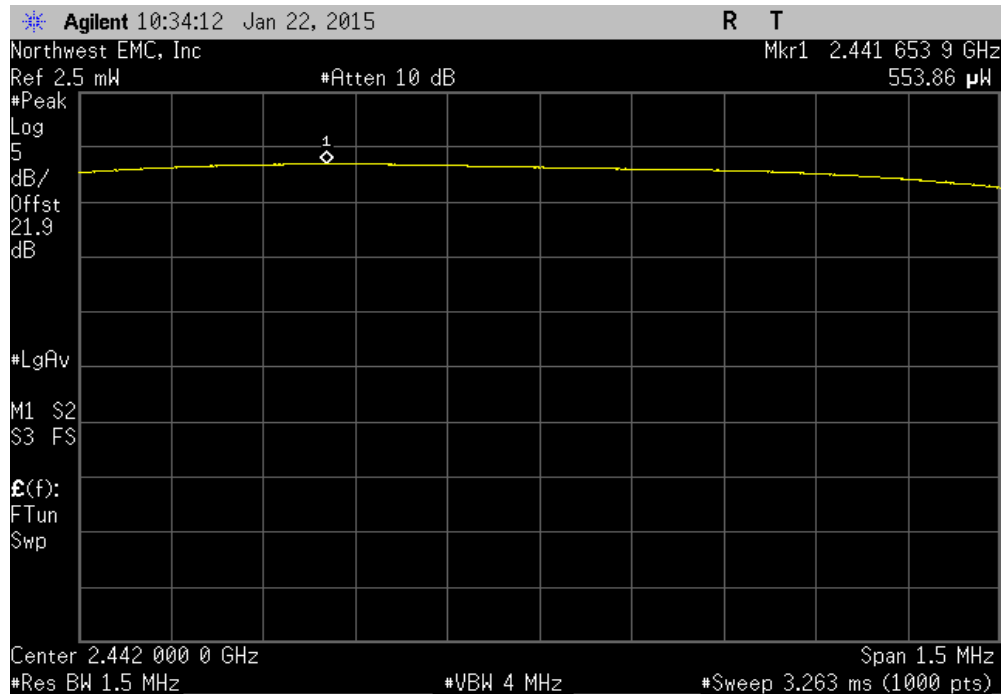


Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz						
	Value	Limit	Result			
	668.806 uW	1 W	Pass			

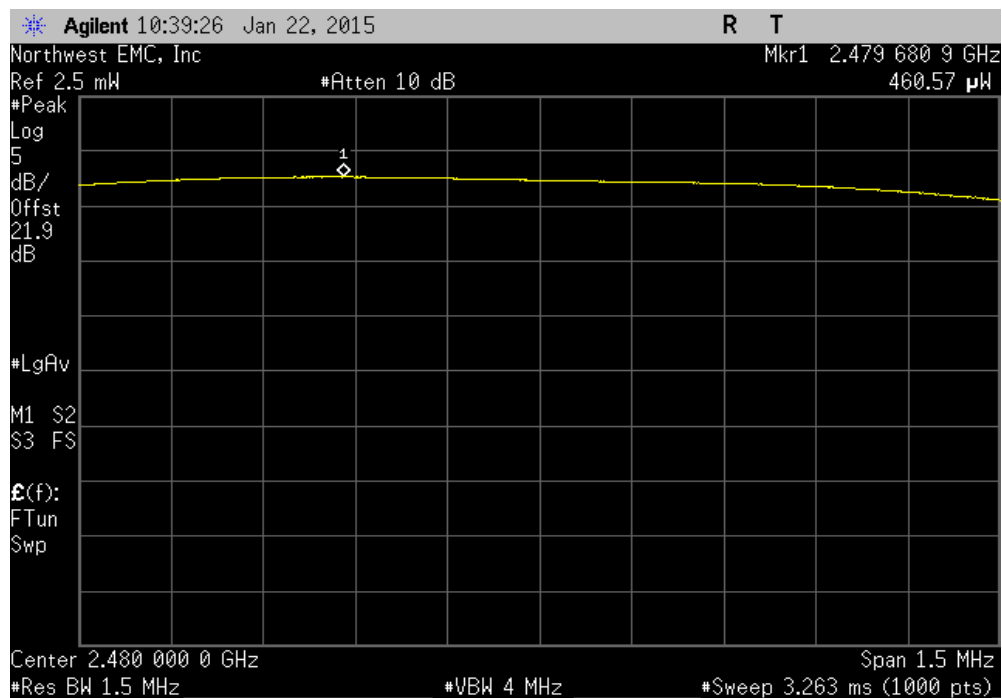


OUTPUT POWER

Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz						
	Value	Limit	Result			
	553.86 uW	1 W	Pass			



Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz						
	Value	Limit	Result			
	460.575 uW	1 W	Pass			



OUTPUT POWER

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION


The transmit frequency was set to the required channels in each band. 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 reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

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 KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

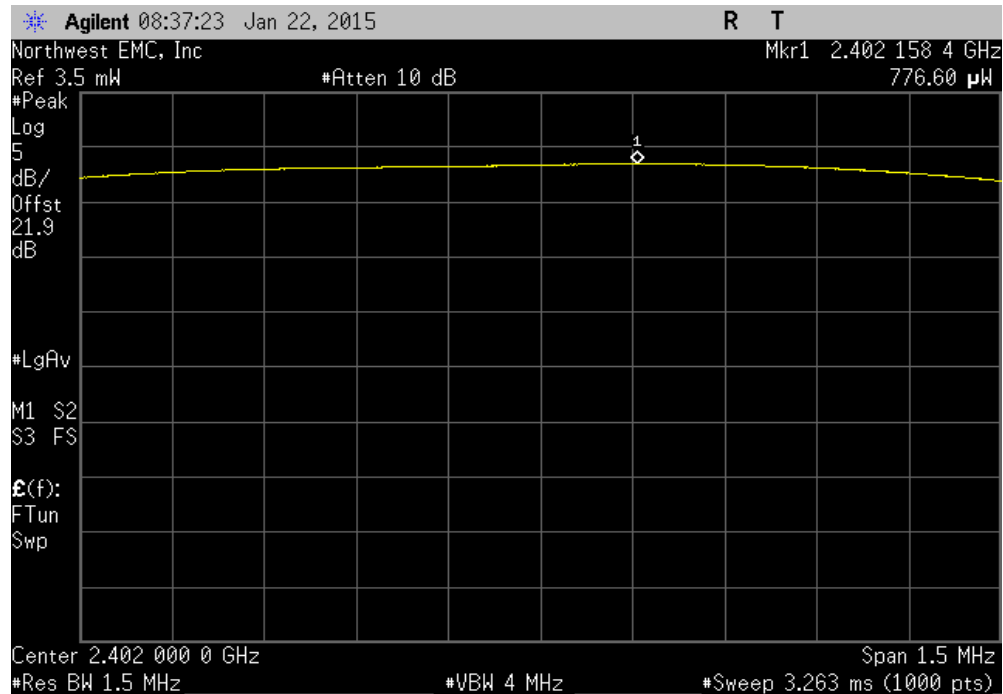
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

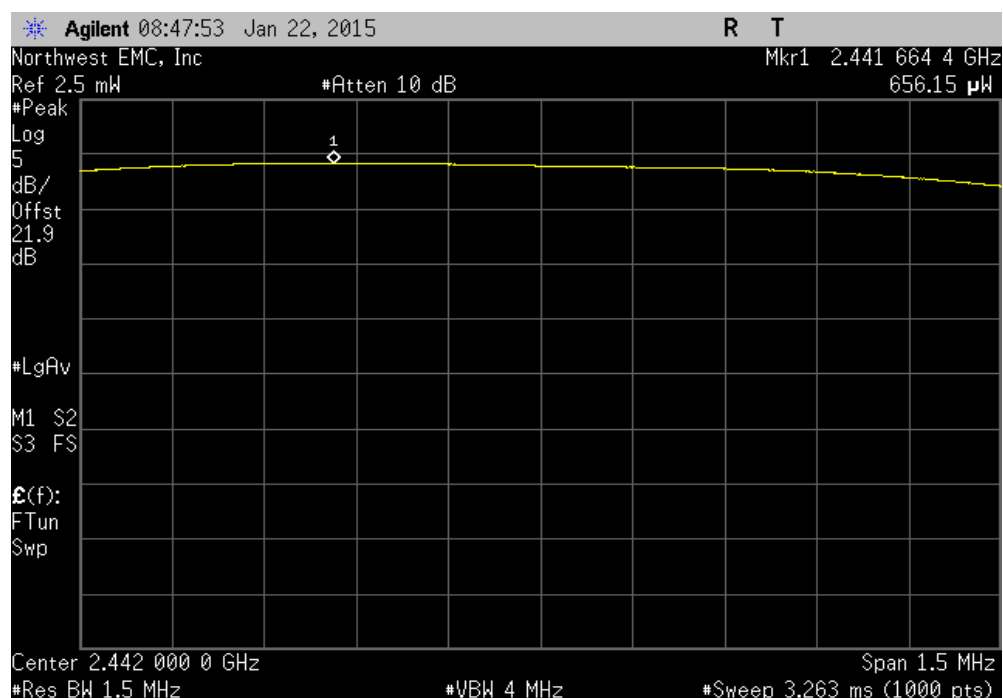
EUT: Key Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T2		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
Bluetooth Low Energy			
Low Channel 0, 2402 MHz		776.605 uW	1 W Pass
Mid Channel 20, 2442 MHz		656.145 uW	1 W Pass
High Channel 39, 2480 MHz		559.5 uW	1 W Pass

OUTPUT POWER

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
				Value	Limit (<)	Result
				776.605 uW	1 W	Pass

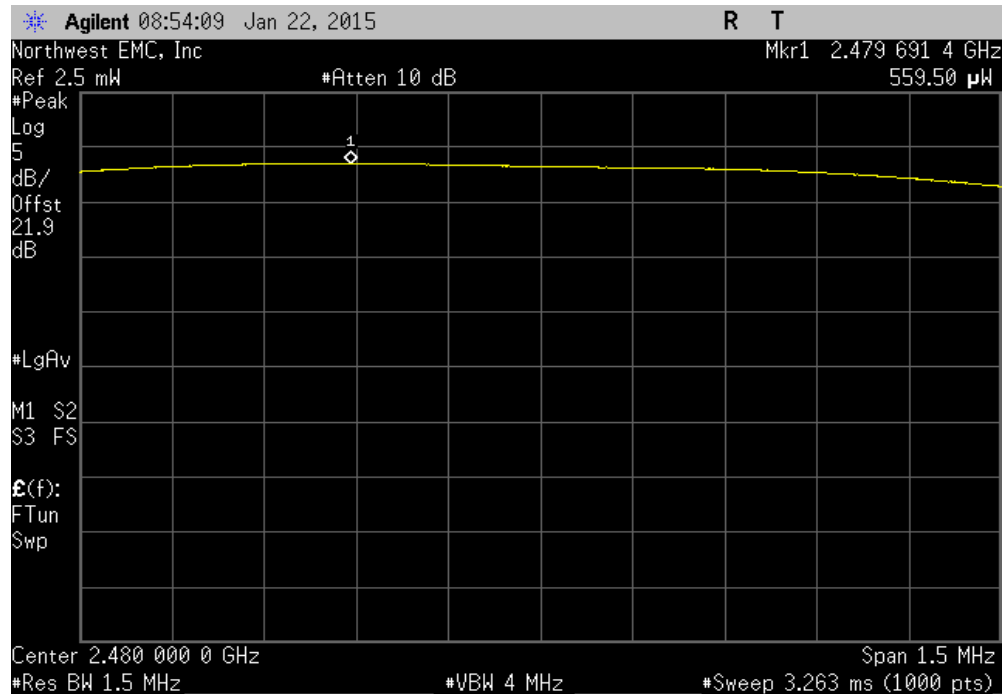


Bluetooth Low Energy, Mid Channel 20, 2442 MHz						
				Value	Limit (<)	Result
				656.145 uW	1 W	Pass



OUTPUT POWER

Bluetooth Low Energy, High Channel 39, 2480 MHz						
	Value	Limit (<)	Result			
	559.5 μ W	1 W	Pass			



POWER SPECTRAL DENSITY

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.


Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

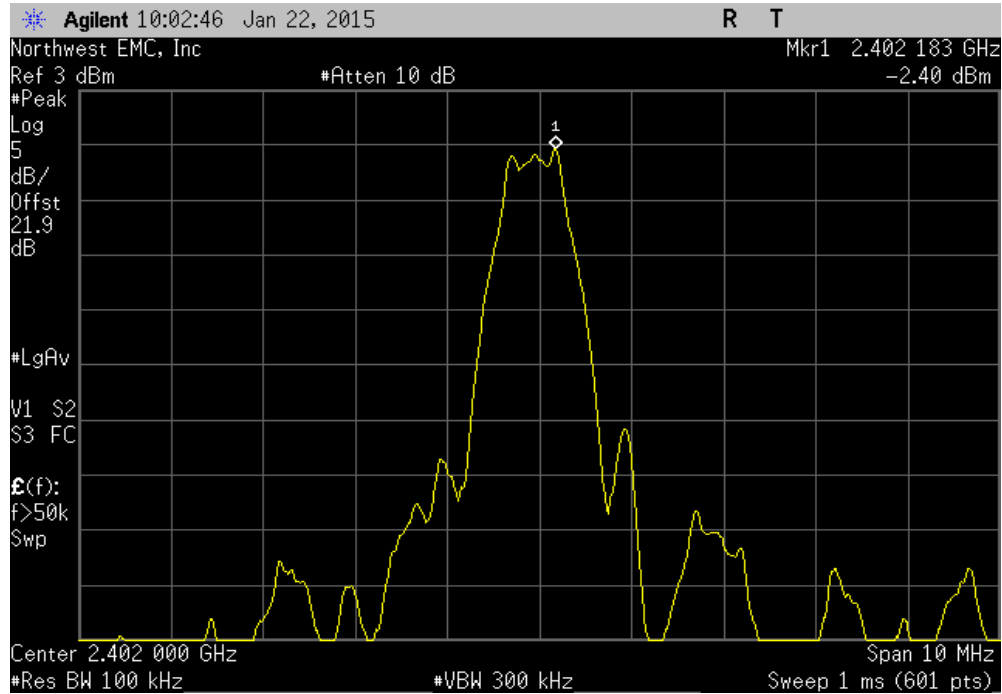
$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

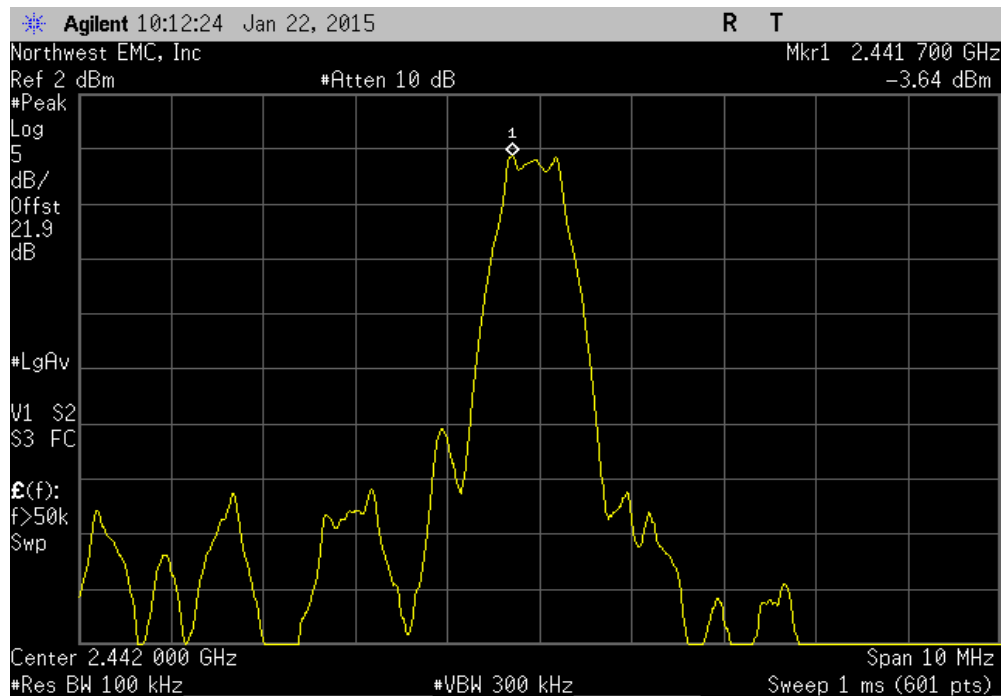
EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
Bluetooth Low Energy			
Antenna A - J4			
	Low Channel 0, 2402 MHz	-2.405	-15.2
	Mid Channel 20, 2442 MHz	-3.645	-15.2
	High Channel 39, 2480 MHz	-4.235	-15.2
Antenna B - J5			
	Low Channel 0, 2402 MHz	-2.27	-15.2
	Mid Channel 20, 2442 MHz	-3.119	-15.2
	High Channel 39, 2480 MHz	-3.664	-15.2

POWER SPECTRAL DENSITY

Bluetooth Low Energy, Antenna A - J4, Low Channel 0, 2402 MHz					
	Value	dBm/100kHz	Value	Limit	Results
		To dBm/3kHz			
	-2.405	-15.2	-17.605	8	Pass

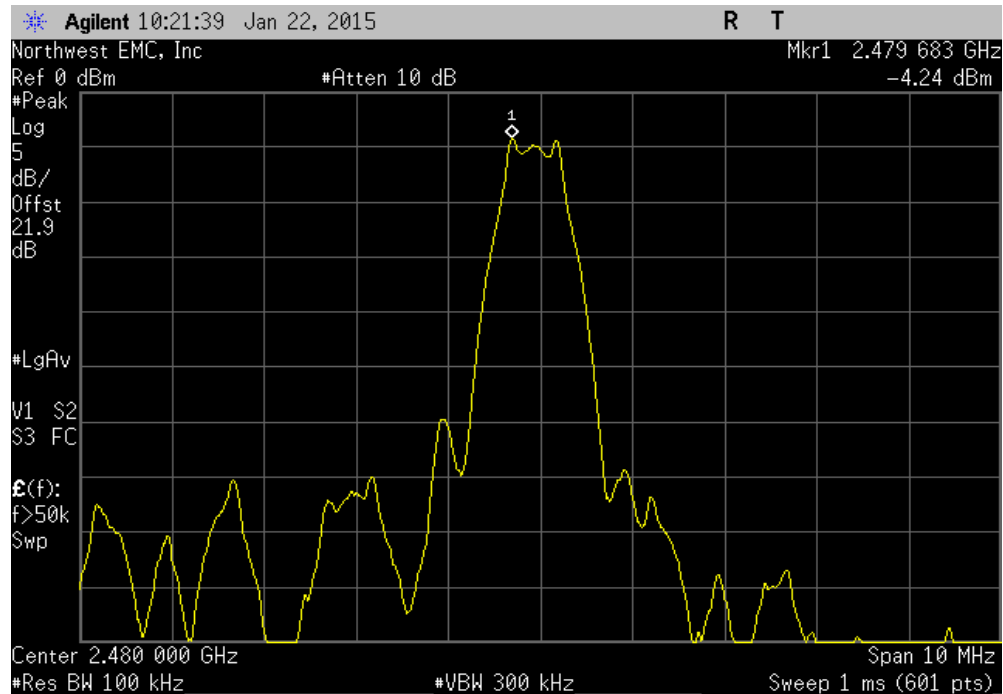


Bluetooth Low Energy, Antenna A - J4, Mid Channel 20, 2442 MHz					
	Value	dBm/100kHz	Value	Limit	Results
		To dBm/3kHz			
	-3.645	-15.2	-18.845	8	Pass

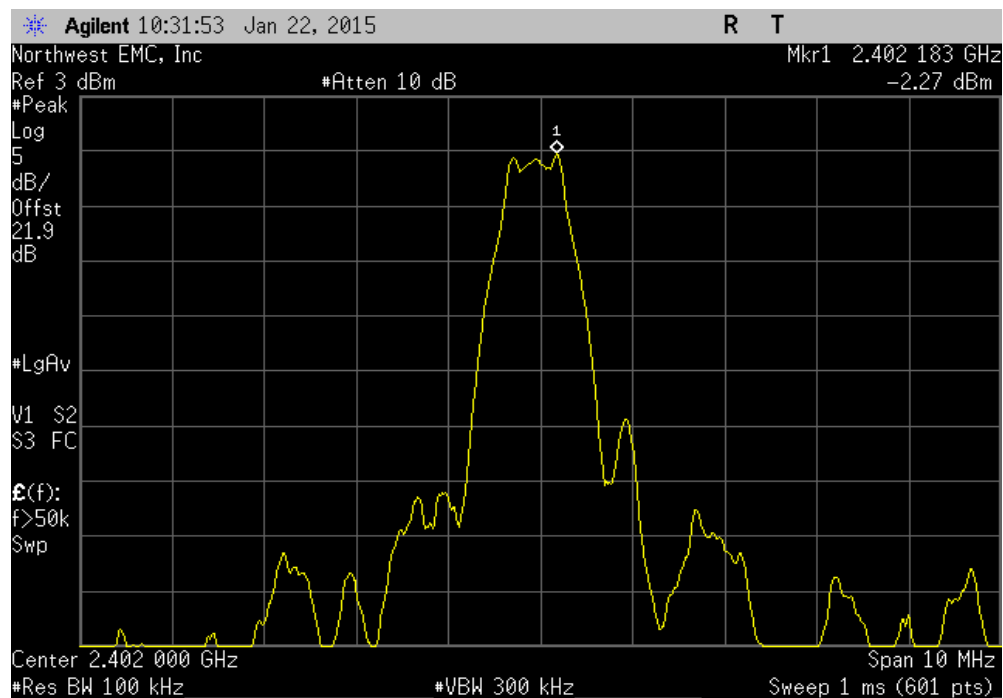


POWER SPECTRAL DENSITY

Bluetooth Low Energy, Antenna A - J4, High Channel 39, 2480 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	-4.235	-15.2	-19.435	8	Pass	

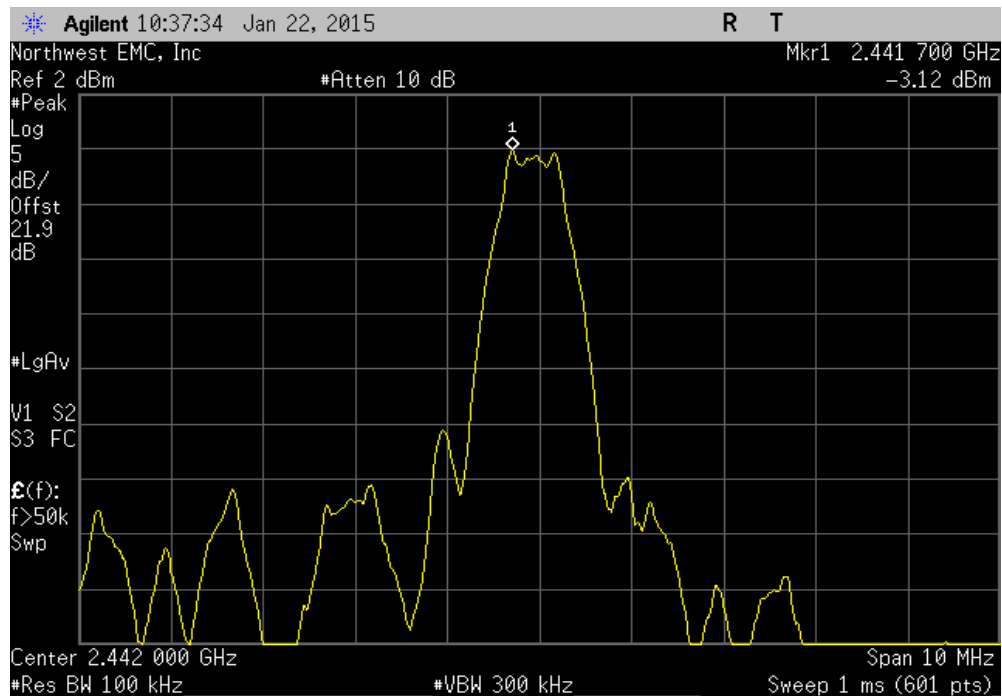


Bluetooth Low Energy, Antenna B - J5, Low Channel 0, 2402 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	-2.27	-15.2	-17.47	8	Pass	

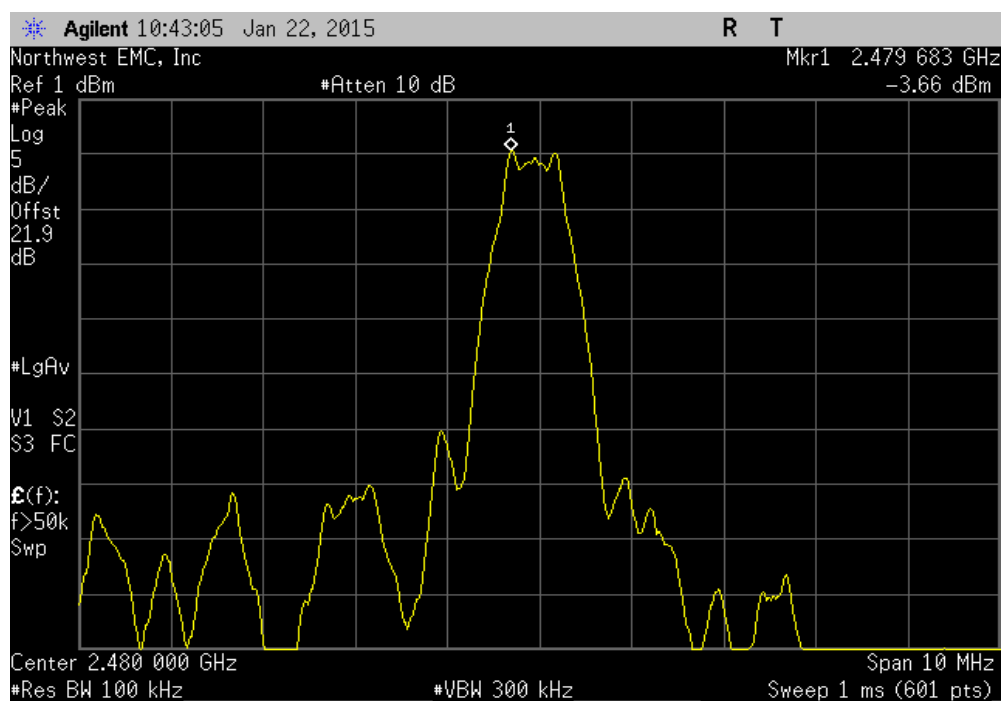


POWER SPECTRAL DENSITY

Bluetooth Low Energy, Antenna B - J5, Mid Channel 20, 2442 MHz						
	Value	dBm/100kHz	To dBm/3kHz	Value	Limit	Results
		-3.119	-15.2	-18.319	8	Pass



Bluetooth Low Energy, Antenna B - J5, High Channel 39, 2480 MHz						
	Value	dBm/100kHz	To dBm/3kHz	Value	Limit	Results
		-3.664	-15.2	-18.864	8	Pass



POWER SPECTRAL DENSITY

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.


Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

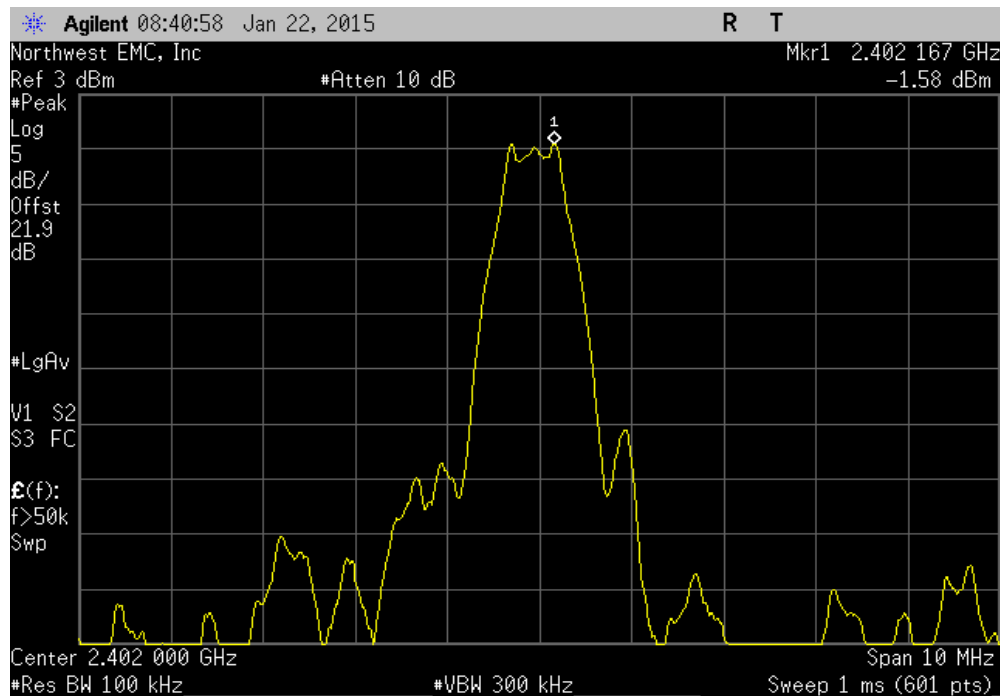
$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

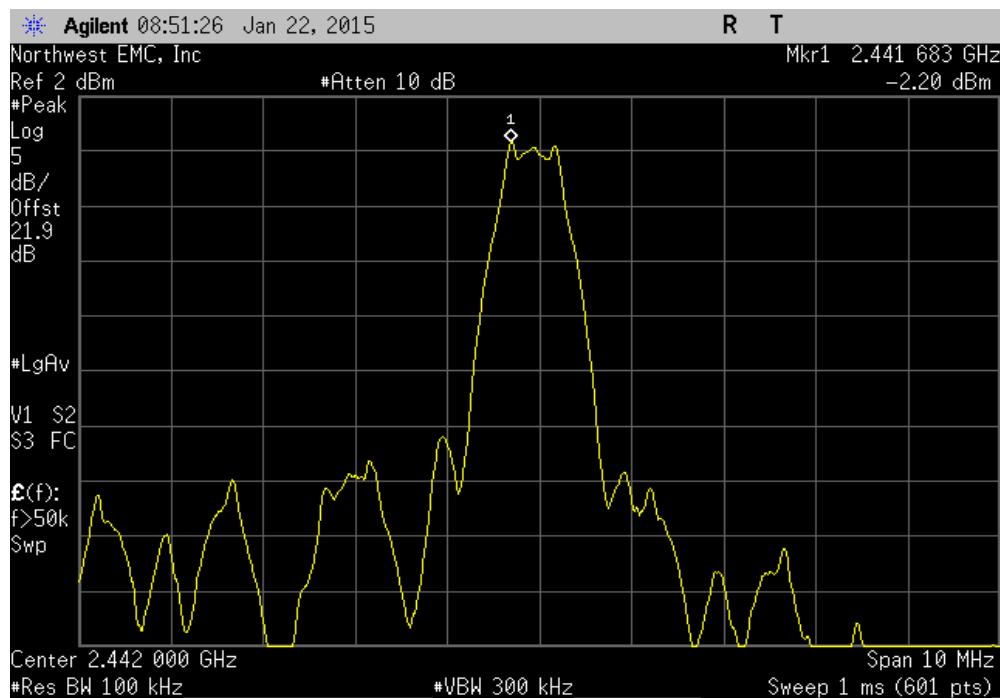
EUT: Key Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T2		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
Bluetooth Low Energy			
	Low Channel 0, 2402 MHz	-1.575	-15.2
	Mid Channel 20, 2442 MHz	-2.203	-15.2
	High Channel 39, 2480 MHz	-2.806	-15.2
		-16.775	8
		-17.403	8
		-18.006	8
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

Bluetooth Low Energy, Low Channel 0, 2402 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	-1.575	-15.2	-16.775	8	Pass

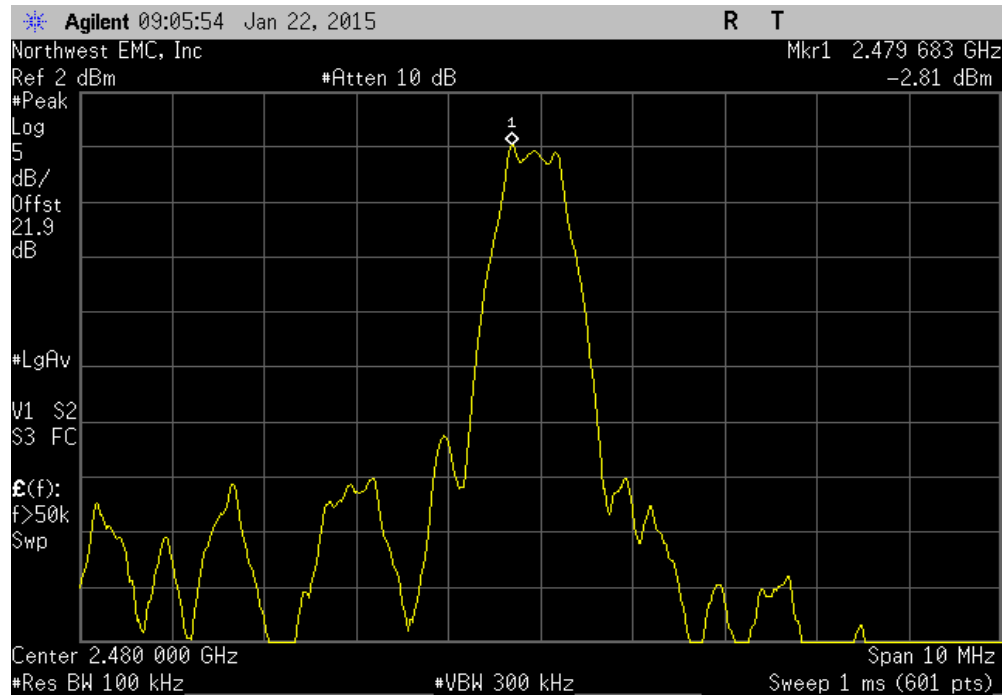


Bluetooth Low Energy, Mid Channel 20, 2442 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	-2.203	-15.2	-17.403	8	Pass



POWER SPECTRAL DENSITY

Bluetooth Low Energy, High Channel 39, 2480 MHz					
Value	dBm/100kHz	Value	Limit	Results	
dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
-2.806	-15.2	-18.006	8	Pass	



DUTY CYCLE

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36


TEST DESCRIPTION

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

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

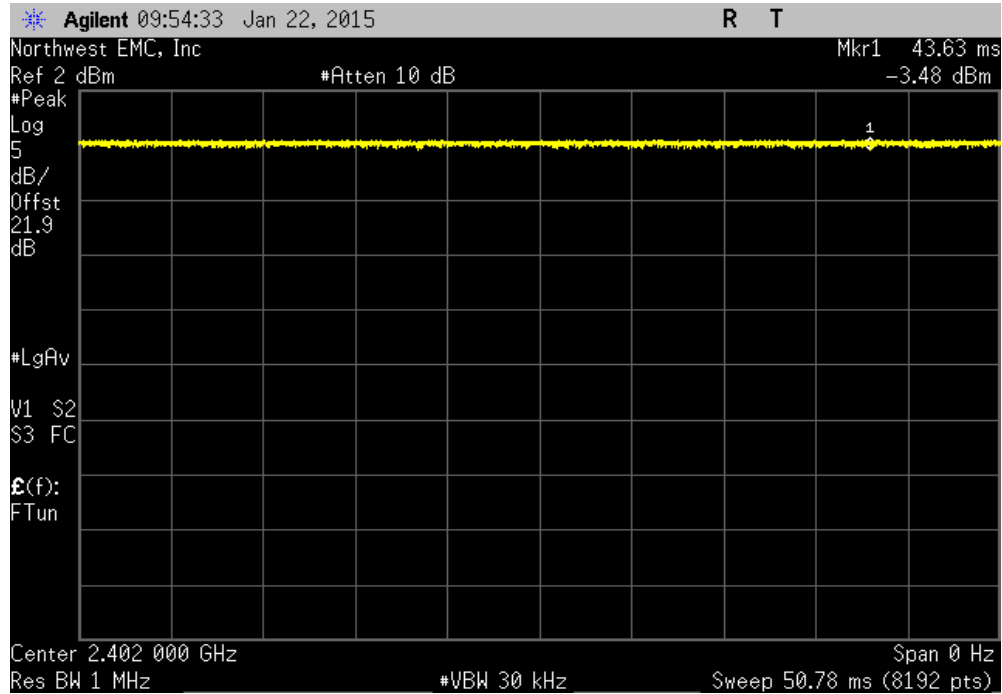
The test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

DUTY CYCLE

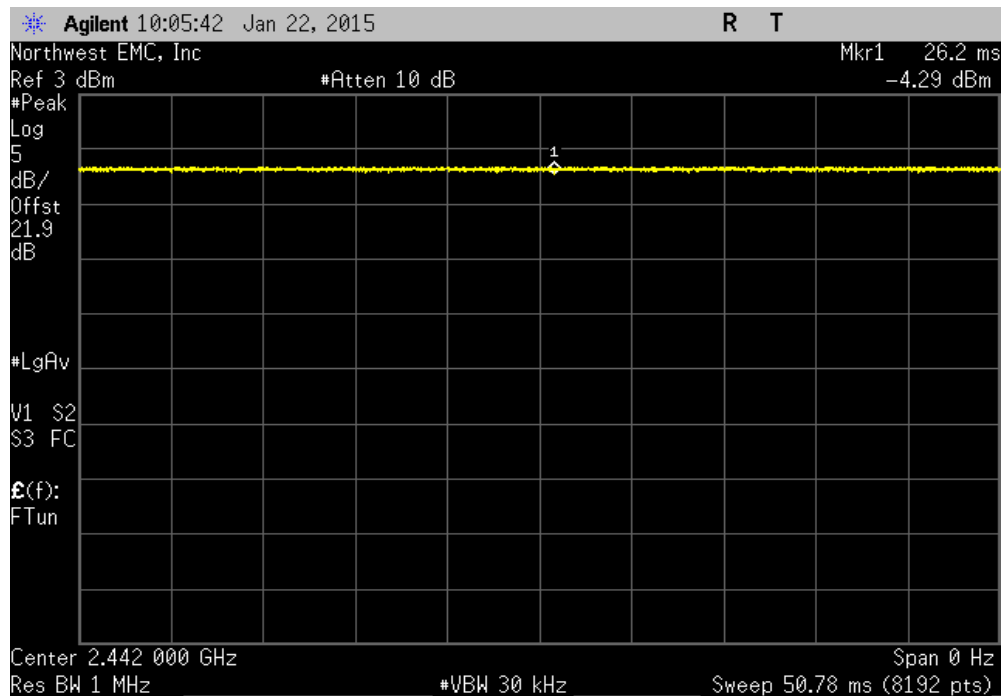
EUT: Belt Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T1		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value (%)	Limit
Bluetooth Low Energy			Result
Low Channel 0, 2402 MHz		100	N/A
Mid Channel 20, 2442 MHz		100	N/A
High Channel 39, 2480 MHz		100	N/A

DUTY CYCLE

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A

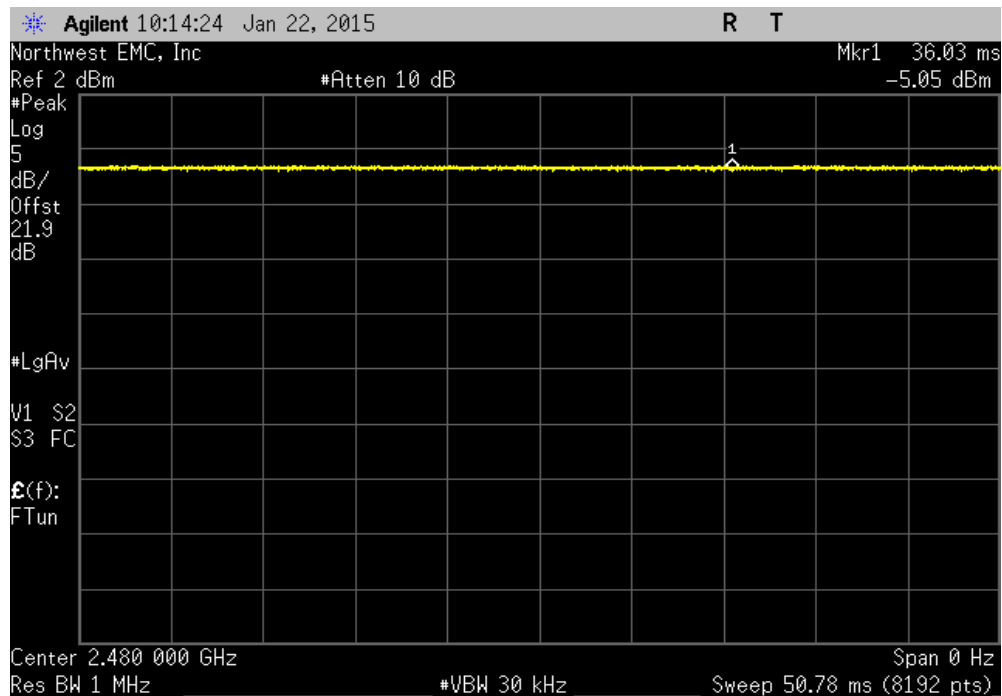


Bluetooth Low Energy, Mid Channel 20, 2442 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A



DUTY CYCLE

Bluetooth Low Energy, High Channel 39, 2480 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A



DUTY CYCLE

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.	Interval (mo)
Spectrum Analyzer	Agilent	E4446A	AAT	6/27/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	1/16/2015	12
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
Signal Generator	Agilent	N5183A	TIA	4/7/2014	36


TEST DESCRIPTION

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

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

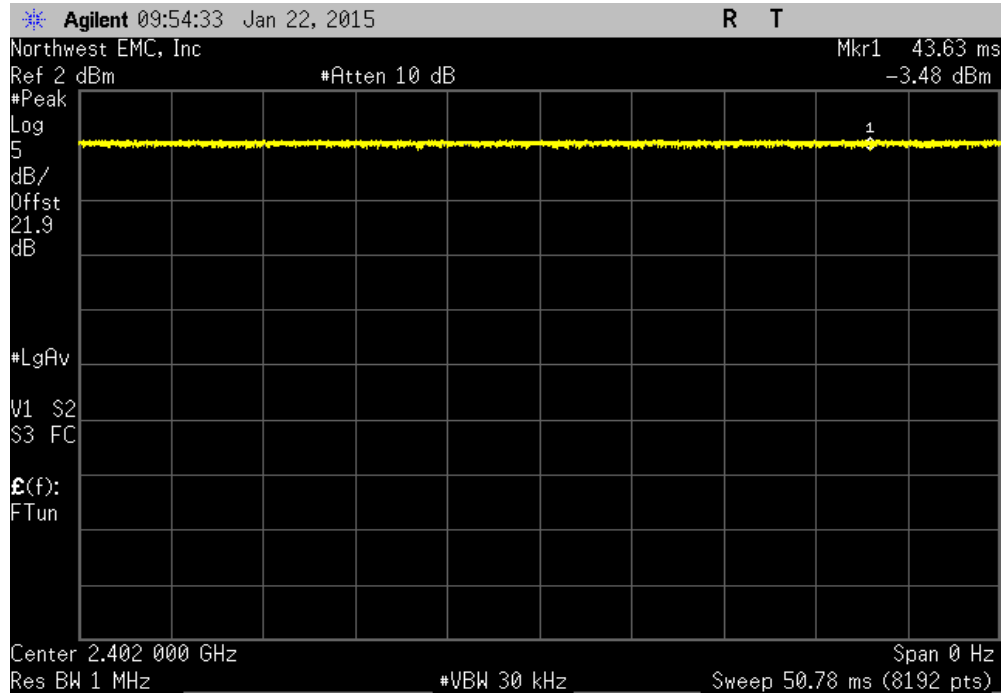
The test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

DUTY CYCLE

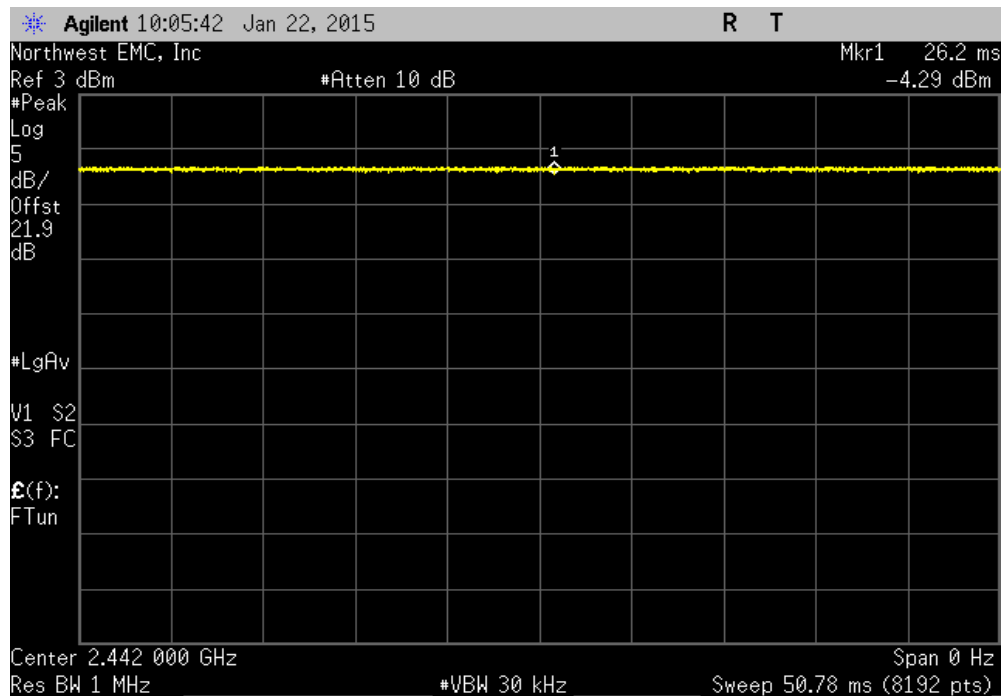
EUT: Key Unit, Rev. AB		Work Order: PROU0034	
Serial Number: T2		Date: 01/22/15	
Customer: Product Creation Studio		Temperature: 24°C	
Attendees: Matt Darval		Humidity: 33%	
Project: None		Barometric Pres.: 1025mb	
Tested by: Richard Mellroth	Power: 1.2 VDC	Job Site: NC02	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
U.FL to SMA adapter cable loss of 0.42dB included in reference level offset.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (%)	Limit
Bluetooth Low Energy			Result
Low Channel 0, 2402 MHz		100	N/A
Mid Channel 20, 2442 MHz		100	N/A
High Channel 39, 2480 MHz		100	N/A

DUTY CYCLE

Bluetooth Low Energy, Low Channel 0, 2402 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A



Bluetooth Low Energy, Mid Channel 20, 2442 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A



DUTY CYCLE

Bluetooth Low Energy, High Channel 39, 2480 MHz						
				Value (%)	Limit	Result
				100	N/A	N/A

