Shottracker

WPTX

FCC 15.247:2018

Bluetooth Low Energy (DTS) Radio

Report # SHOT0005.1

NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: July 26, 2018
Shottracker
Model: WPTX

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2018	ANSI C63.10:2013, KDB 558074
FCC 15.247:2018	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
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:

Jeremiah Darden, 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

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 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

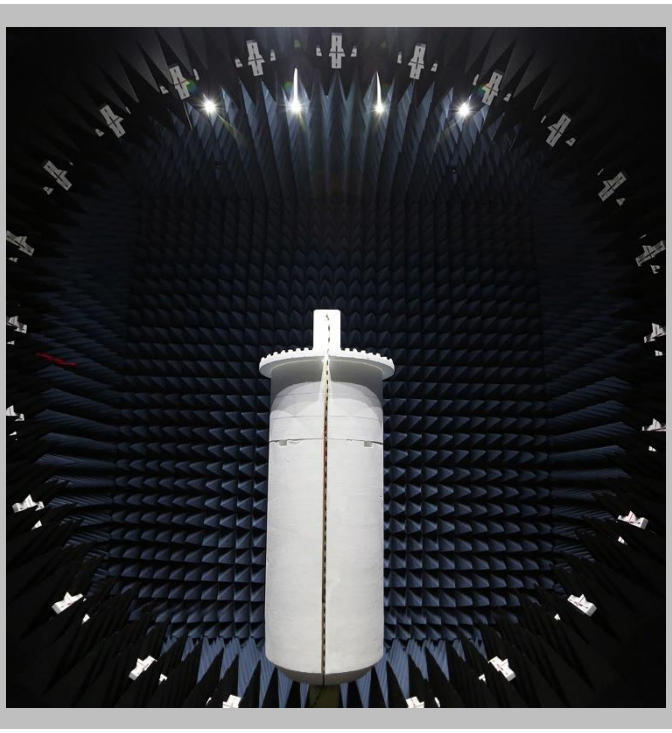
MIC – Recognized by MIC as a CAB for the acceptance of test data.

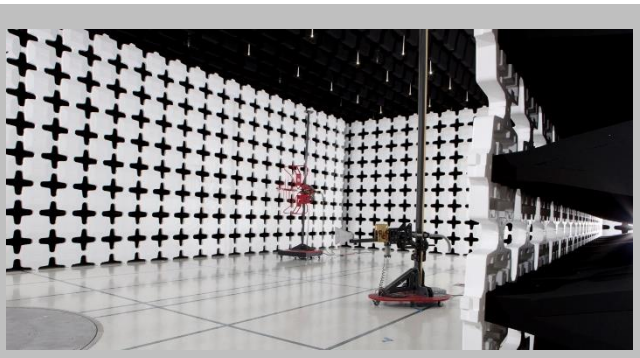
SCOPE

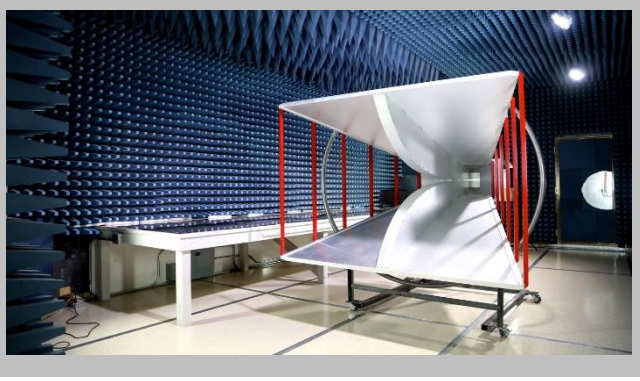
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

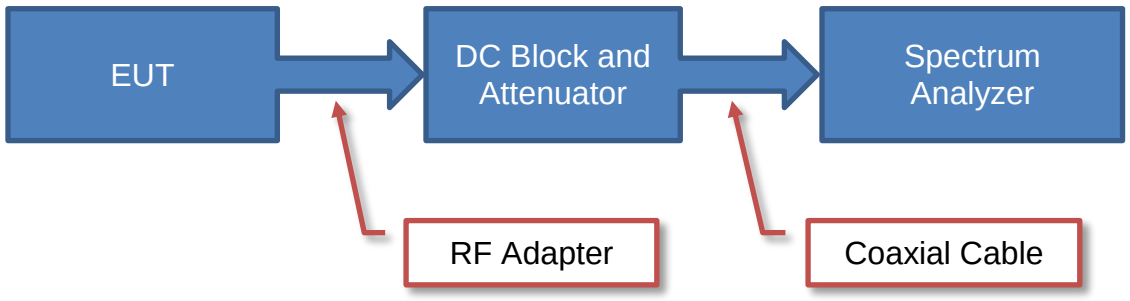
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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

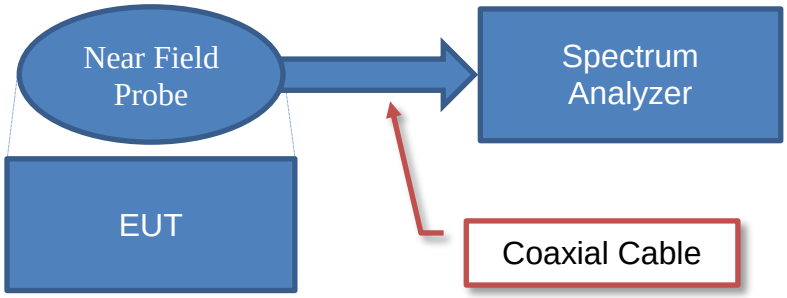
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

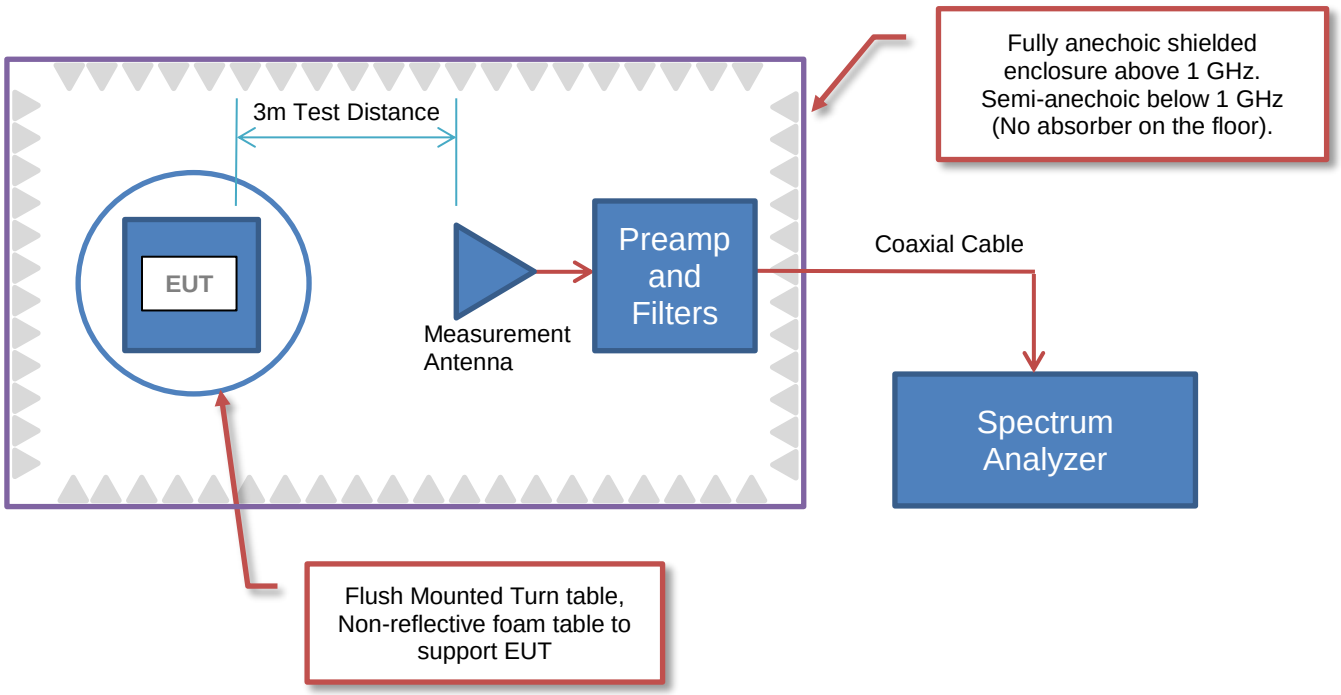
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Shottracker
Address:	7220 W. Frontage Rd.
City, State, Zip:	Merriam, KS 66203
Test Requested By:	Patrick Herron
Model:	WPTX
First Date of Test:	July 24, 2018
Last Date of Test:	July 26, 2018
Receipt Date of Samples:	July 24, 2018
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
ShotTracker is a sensor based system that autonomously captures statistical and performance analytics for an entire team in real-time during practice and games. Use ShotTracker analytics to motivate players, engage fans and improve your team's record. Includes Wireless Charging and Bluetooth Low Energy.

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

CONFIGURATIONS

Configuration SHOT0005- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
WPTX	Shottracker	S8D1	30

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Brick	Intai	IN2405000	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.7m	No	AC Mains	AC/DC Brick
DC Cable	No	.2m	No	AC/DC Brick	WPTX

Configuration SHOT0005- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
WPTX (Direct Connect)	Shottracker	S8D1	30

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Brick	Intai	IN2405000	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.7m	No	AC Mains	AC/DC Brick
DC Cable	No	.2m	No	AC/DC Brick	WPTX

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/24/2018	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	7/25/2018	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	7/26/2018	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	7/26/2018	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	7/26/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	7/26/2018	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	7/26/2018	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	7/26/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
LISN	Solar Electronics	9252-50-R-24-BNC	LJK	9/11/2017	9/11/2018
Cable - Conducted Cable Assembly	Northwest EMC	TXA, HHZ, TQU	TXAA	1/31/2018	1/31/2019
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	3/19/2018	3/19/2019

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

SHOT0005-1

MODES INVESTIGATED

Continuously Transmitting at Mid Ch 2440 MHz

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	WPTX	Work Order:	SHOT0005
Serial Number:	30	Date:	07/25/2018
Customer:	Shottracker	Temperature:	23°C
Attendees:	Patrick Herron	Relative Humidity:	53.5%
Customer Project:	None	Bar. Pressure:	1019 mb
Tested By:	Marty Martin	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	SHOT0005-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Standard Configuration

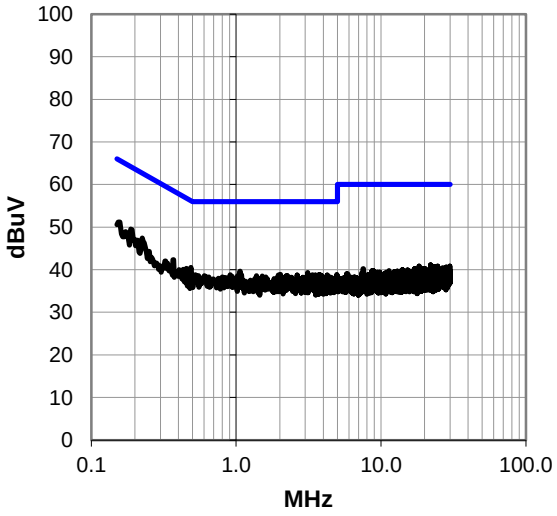
EUT OPERATING MODES

Continuously Transmitting at Mid Ch 2440 MHz

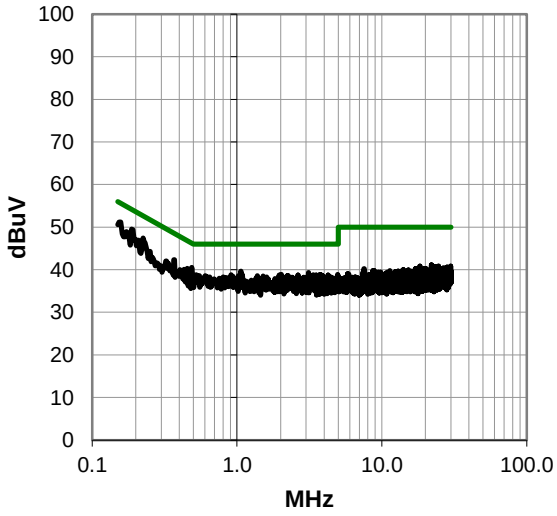
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.154	31.1	20.1	51.2	65.8	-14.6
0.187	29.4	20.1	49.5	64.2	-14.7
0.225	27.4	20.0	47.4	62.6	-15.2
0.486	20.3	20.2	40.5	56.2	-15.7
0.366	22.2	20.1	42.3	58.6	-16.3
1.060	19.6	20.0	39.6	56.0	-16.4
0.452	20.1	20.2	40.3	56.8	-16.5
3.112	19.2	20.1	39.3	56.0	-16.7
2.015	18.7	20.2	38.9	56.0	-17.1
4.944	18.7	20.2	38.9	56.0	-17.1
0.911	18.6	20.2	38.8	56.0	-17.2
3.373	18.7	20.1	38.8	56.0	-17.2
3.728	18.6	20.2	38.8	56.0	-17.2
1.948	18.6	20.1	38.7	56.0	-17.3
2.635	18.5	20.2	38.7	56.0	-17.3
3.523	18.5	20.2	38.7	56.0	-17.3
3.851	18.5	20.2	38.7	56.0	-17.3
4.254	18.5	20.2	38.7	56.0	-17.3
1.381	18.5	20.1	38.6	56.0	-17.4
2.213	18.5	20.1	38.6	56.0	-17.4
2.250	18.5	20.1	38.6	56.0	-17.4
3.295	18.5	20.1	38.6	56.0	-17.4
3.802	18.4	20.2	38.6	56.0	-17.4
1.512	18.4	20.1	38.5	56.0	-17.5
1.605	18.2	20.1	38.3	56.0	-17.7
2.176	18.2	20.1	38.3	56.0	-17.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.154	31.1	20.1	51.2	55.8	-4.6
0.187	29.4	20.1	49.5	54.2	-4.7
0.225	27.4	20.0	47.4	52.6	-5.2
0.486	20.3	20.2	40.5	46.2	-5.7
0.366	22.2	20.1	42.3	48.6	-6.3
1.060	19.6	20.0	39.6	46.0	-6.4
0.452	20.1	20.2	40.3	46.8	-6.5
3.112	19.2	20.1	39.3	46.0	-6.7
2.015	18.7	20.2	38.9	46.0	-7.1
4.944	18.7	20.2	38.9	46.0	-7.1
0.911	18.6	20.2	38.8	46.0	-7.2
3.373	18.7	20.1	38.8	46.0	-7.2
3.728	18.6	20.2	38.8	46.0	-7.2
1.948	18.6	20.1	38.7	46.0	-7.3
2.635	18.5	20.2	38.7	46.0	-7.3
3.523	18.5	20.2	38.7	46.0	-7.3
3.851	18.5	20.2	38.7	46.0	-7.3
4.254	18.5	20.2	38.7	46.0	-7.3
1.381	18.5	20.1	38.6	46.0	-7.4
2.213	18.5	20.1	38.6	46.0	-7.4
2.250	18.5	20.1	38.6	46.0	-7.4
3.295	18.5	20.1	38.6	46.0	-7.4
3.802	18.4	20.2	38.6	46.0	-7.4
1.512	18.4	20.1	38.5	46.0	-7.5
1.605	18.2	20.1	38.3	46.0	-7.7
2.176	18.2	20.1	38.3	46.0	-7.7

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	WPTX	Work Order:	SHOT0005
Serial Number:	30	Date:	07/25/2018
Customer:	Shottracker	Temperature:	23°C
Attendees:	Patrick Herron	Relative Humidity:	53.5%
Customer Project:	None	Bar. Pressure:	1019 mb
Tested By:	Marty Martin	Job Site:	TX01
Power:	110VAC/60Hz	Configuration:	SHOT0005-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	5	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Standard Configuration

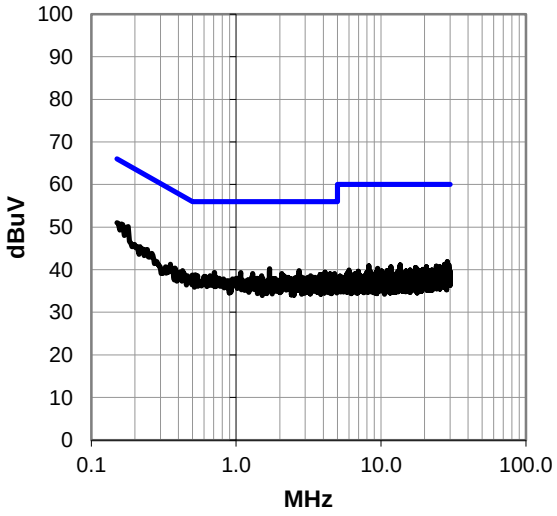
EUT OPERATING MODES

Continuously Transmitting at Mid Ch 2440 MHz

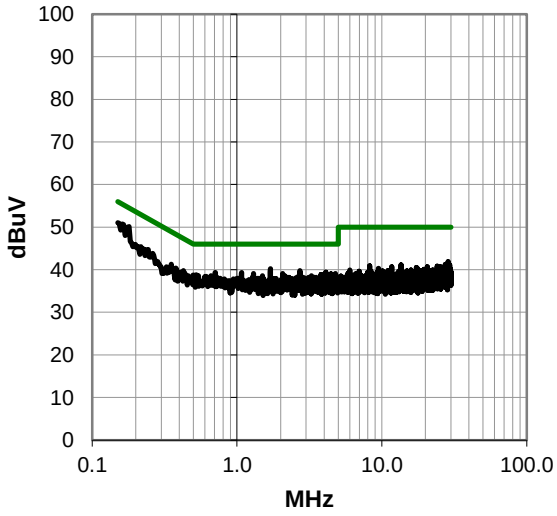
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #5

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	30.9	20.1	51.0	66.0	-15.0
1.698	20.1	20.1	40.2	56.0	-15.8
2.724	19.7	20.1	39.8	56.0	-16.2
4.105	19.2	20.2	39.4	56.0	-16.6
0.706	19.0	20.3	39.3	56.0	-16.7
1.075	19.2	20.1	39.3	56.0	-16.7
1.299	19.1	20.0	39.1	56.0	-16.9
2.068	18.9	20.2	39.1	56.0	-16.9
4.772	18.9	20.2	39.1	56.0	-16.9
4.448	18.8	20.2	39.0	56.0	-17.0
3.799	18.7	20.2	38.9	56.0	-17.1
4.623	18.5	20.2	38.7	56.0	-17.3
1.497	18.5	20.1	38.6	56.0	-17.4
2.679	18.4	20.2	38.6	56.0	-17.4
3.269	18.5	20.1	38.6	56.0	-17.4
4.090	18.3	20.2	38.5	56.0	-17.5
2.773	18.3	20.1	38.4	56.0	-17.6
4.582	18.2	20.2	38.4	56.0	-17.6
4.813	18.2	20.2	38.4	56.0	-17.6
4.243	18.1	20.2	38.3	56.0	-17.7
4.993	18.1	20.2	38.3	56.0	-17.7
3.123	18.1	20.1	38.2	56.0	-17.8
3.422	18.0	20.2	38.2	56.0	-17.8
3.530	18.0	20.2	38.2	56.0	-17.8
2.911	18.1	20.0	38.1	56.0	-17.9
3.922	17.9	20.2	38.1	56.0	-17.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	30.9	20.1	51.0	56.0	-5.0
1.698	20.1	20.1	40.2	46.0	-5.8
2.724	19.7	20.1	39.8	46.0	-6.2
4.105	19.2	20.2	39.4	46.0	-6.6
0.706	19.0	20.3	39.3	46.0	-6.7
1.075	19.2	20.1	39.3	46.0	-6.7
1.299	19.1	20.0	39.1	46.0	-6.9
2.068	18.9	20.2	39.1	46.0	-6.9
4.772	18.9	20.2	39.1	46.0	-6.9
4.448	18.8	20.2	39.0	46.0	-7.0
3.799	18.7	20.2	38.9	46.0	-7.1
4.623	18.5	20.2	38.7	46.0	-7.3
1.497	18.5	20.1	38.6	46.0	-7.4
2.679	18.4	20.2	38.6	46.0	-7.4
3.269	18.5	20.1	38.6	46.0	-7.4
4.090	18.3	20.2	38.5	46.0	-7.5
2.773	18.3	20.1	38.4	46.0	-7.6
4.582	18.2	20.2	38.4	46.0	-7.6
4.813	18.2	20.2	38.4	46.0	-7.6
4.243	18.1	20.2	38.3	46.0	-7.7
4.993	18.1	20.2	38.3	46.0	-7.7
3.123	18.1	20.1	38.2	46.0	-7.8
3.422	18.0	20.2	38.2	46.0	-7.8
3.530	18.0	20.2	38.2	46.0	-7.8
2.911	18.1	20.0	38.1	46.0	-7.9
3.922	17.9	20.2	38.1	46.0	-7.9

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.05.04

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

Continuously Transmitting at Low Ch 2402 MHz, Mid Ch 2440 MHz, High Ch 2480 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

SHOT0005 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 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
Cable	Northwest EMC	18-40GHz	TXE	17-Nov-2017	12 mo
Cable	Northwest EMC	8-18GHz	TXD	31-May-2018	12 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	31-May-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAM	17-Nov-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	9-Oct-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	9-Oct-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	31-May-2018	12 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXW	5-Aug-2016	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Filter - High Pass	Micro-Tronics	HPM50111	HGC	3/16/2018	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	8/3/2017	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	5/10/2018	24 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	10/10/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAH	10/10/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJN	9/15/2016	24 mo
Attenuator	Weinschel Corp	4H-20	AWB	3/16/2018	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-2018	12 mo

TEST DESCRIPTION

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

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

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

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

PK = Peak Detector
AV = RMS Detector

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

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

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

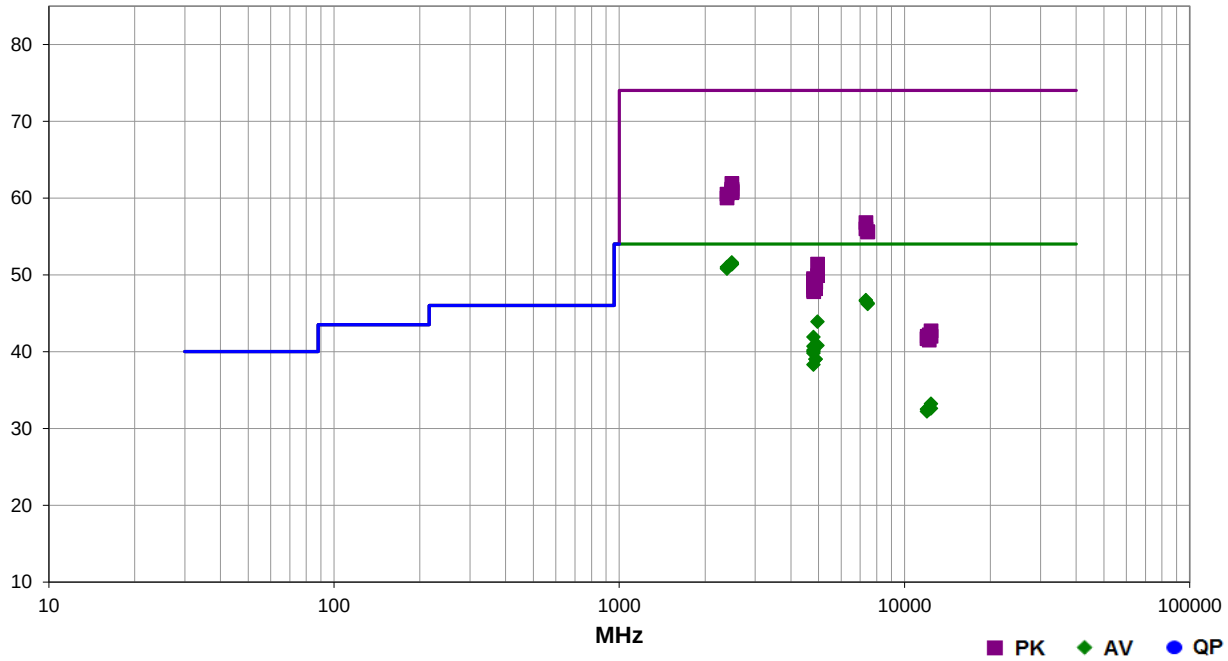
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SHOT0005	**Date:**	24-Jul-2018		
Project:	None	**Temperature:**	22 °C		
Job Site:	TX02	**Humidity:**	50.1% RH		
Serial Number:	30	**Barometric Pres.:**	1020 mbar	**Tested by:**	Marty Martin
EUT:	WPTX				
Configuration:	1				
Customer:	Shottracker				
Attendees:	Patrick Herron				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continuously Transmitting at Low Ch 2402 MHz, Mid Ch 2440 MHz, High Ch 2480 MHz				
Deviations:	None				
Comments:	Standard Configuration. Duty Cycle Correction Factor of 10*log(1/DC) = 1*log(1/.6) = 2.2 dB added to Average detector measurements.				

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

Run #	57	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.587	32.8	-3.4	1.0	271.0	2.2	20.0	Vert	AV	0.0	51.6	54.0	-2.4	EUT X, High Ch
2485.250	32.6	-3.4	3.6	358.9	2.2	20.0	Horz	AV	0.0	51.4	54.0	-2.6	EUT Y, High Ch
2484.423	32.6	-3.4	1.4	144.0	2.2	20.0	Vert	AV	0.0	51.4	54.0	-2.6	EUT Y, High Ch
2484.170	32.6	-3.4	1.8	69.9	2.2	20.0	Horz	AV	0.0	51.4	54.0	-2.6	EUT X, High Ch
2485.147	32.6	-3.4	3.8	204.0	2.2	20.0	Horz	AV	0.0	51.4	54.0	-2.6	EUT Z, High Ch
2484.653	32.6	-3.4	1.0	88.9	2.2	20.0	Vert	AV	0.0	51.4	54.0	-2.6	EUT Z, High Ch
2388.980	32.8	-4.0	3.1	202.9	2.2	20.0	Vert	AV	0.0	51.0	54.0	-3.0	EUT X, Low Ch
2389.900	32.6	-4.0	1.0	73.0	2.2	20.0	Horz	AV	0.0	50.8	54.0	-3.2	EUT X, Low Ch
7327.150	29.8	14.7	1.0	25.0	2.2	0.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT X, Mid Ch
7326.390	29.7	14.7	1.0	271.0	2.2	0.0	Horz	AV	0.0	46.6	54.0	-7.4	EUT Y, Mid Ch
7441.065	29.4	14.7	1.0	32.0	2.2	0.0	Horz	AV	0.0	46.3	54.0	-7.7	EUT Y, High Ch
7441.370	29.3	14.7	1.0	309.0	2.2	0.0	Vert	AV	0.0	46.2	54.0	-7.8	EUT X, High Ch
4960.030	34.6	7.1	2.0	36.0	2.2	0.0	Vert	AV	0.0	43.9	54.0	-10.1	EUT X, High Ch
4803.935	32.9	6.8	2.0	261.0	2.2	0.0	Vert	AV	0.0	41.9	54.0	-12.1	EUT X, Low Ch

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.573	45.3	-3.4	1.4	144.0	0.0	20.0	Vert	PK	0.0	61.9	74.0	-12.1	EUT Y, High Ch
2483.610	44.6	-3.4	3.8	204.0	0.0	20.0	Horz	PK	0.0	61.2	74.0	-12.8	EUT Z, High Ch
2483.537	44.5	-3.4	1.0	271.0	0.0	20.0	Vert	PK	0.0	61.1	74.0	-12.9	EUT X, High Ch
2485.317	44.3	-3.4	3.6	358.9	0.0	20.0	Horz	PK	0.0	60.9	74.0	-13.1	EUT Y, High Ch
4960.200	31.5	7.1	3.7	261.0	2.2	0.0	Horz	AV	0.0	40.8	54.0	-13.2	EUT Y, High Ch
2485.083	44.2	-3.4	1.8	69.9	0.0	20.0	Horz	PK	0.0	60.8	74.0	-13.2	EUT X, High Ch
2483.977	44.1	-3.4	1.0	88.9	0.0	20.0	Vert	PK	0.0	60.7	74.0	-13.3	EUT Z, High Ch
4803.570	31.7	6.8	1.3	274.9	2.2	0.0	Horz	AV	0.0	40.7	54.0	-13.3	EUT Y, Low Ch
2389.783	44.5	-4.0	1.0	73.0	0.0	20.0	Horz	PK	0.0	60.5	74.0	-13.5	EUT X, Low Ch
4804.035	31.2	6.8	1.0	7.0	2.2	0.0	Horz	AV	0.0	40.2	54.0	-13.8	EUT Z, Low Ch
2389.783	44.0	-4.0	3.1	202.9	0.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	EUT X, Low Ch
4803.970	31.0	6.8	1.0	267.0	2.2	0.0	Vert	AV	0.0	40.0	54.0	-14.0	EUT Z, Low Ch
4803.780	30.8	6.8	1.7	90.0	2.2	0.0	Vert	AV	0.0	39.8	54.0	-14.2	EUT Y, Low Ch
4882.660	29.8	7.0	2.3	242.0	2.2	0.0	Horz	AV	0.0	39.0	54.0	-15.0	EUT Y, Mid Ch
4883.680	29.8	7.0	1.0	217.0	2.2	0.0	Vert	AV	0.0	39.0	54.0	-15.0	EUT X, Mid Ch
4803.195	29.3	6.8	1.0	3.0	2.2	0.0	Horz	AV	0.0	38.3	54.0	-15.7	EUT X, Low Ch
7324.725	42.1	14.7	1.0	271.0	0.0	0.0	Horz	PK	0.0	56.8	74.0	-17.2	EUT Y, Mid Ch
7326.920	41.3	14.7	1.0	25.0	0.0	0.0	Vert	PK	0.0	56.0	74.0	-18.0	EUT X, Mid Ch
7440.655	40.9	14.7	1.0	32.0	0.0	0.0	Horz	PK	0.0	55.6	74.0	-18.4	EUT Y, High Ch
7441.385	40.9	14.7	1.0	309.0	0.0	0.0	Vert	PK	0.0	55.6	74.0	-18.4	EUT X, High Ch
12398.720	30.4	0.6	1.0	302.0	2.2	0.0	Vert	AV	0.0	33.2	54.0	-20.8	EUT X, High Ch
12209.870	30.4	0.1	2.8	334.9	2.2	0.0	Vert	AV	0.0	32.7	54.0	-21.3	EUT X, Mid Ch
12399.640	29.8	0.6	1.0	255.9	2.2	0.0	Horz	AV	0.0	32.6	54.0	-21.4	EUT Y, High Ch
12008.800	30.8	-0.5	1.0	199.0	2.2	0.0	Vert	AV	0.0	32.5	54.0	-21.5	EUT X, Low Ch
12211.100	30.3	0.0	1.0	133.0	2.2	0.0	Horz	AV	0.0	32.5	54.0	-21.5	EUT Y, Mid Ch
12009.880	30.5	-0.5	1.0	322.9	2.2	0.0	Horz	AV	0.0	32.2	54.0	-21.8	EUT Y, Low Ch
4960.720	44.3	7.1	2.0	36.0	0.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	EUT X, High Ch
4960.545	42.8	7.1	3.7	261.0	0.0	0.0	Horz	PK	0.0	49.9	74.0	-24.1	EUT Y, High Ch
4803.090	42.7	6.8	1.3	274.9	0.0	0.0	Horz	PK	0.0	49.5	74.0	-24.5	EUT Y, Low Ch
4803.325	42.5	6.8	2.0	261.0	0.0	0.0	Vert	PK	0.0	49.3	74.0	-24.7	EUT X, Low Ch
4803.755	42.4	6.8	1.0	7.0	0.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	EUT Z, Low Ch
4883.605	42.0	7.0	2.3	242.0	0.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	EUT Y, Mid Ch
4803.505	41.6	6.8	1.7	90.0	0.0	0.0	Vert	PK	0.0	48.4	74.0	-25.6	EUT Y, Low Ch
4882.830	41.1	7.1	1.0	217.0	0.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	EUT X, Mid Ch
4803.655	41.2	6.8	1.0	267.0	0.0	0.0	Vert	PK	0.0	48.0	74.0	-26.0	EUT Z, Low Ch
4804.520	41.0	6.8	1.0	3.0	0.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	EUT X, Low Ch
12398.790	42.1	0.6	1.0	302.0	0.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	EUT X, High Ch
12210.660	42.1	0.1	2.8	334.9	0.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	EUT X, Mid Ch
12010.940	42.5	-0.5	1.0	199.0	0.0	0.0	Vert	PK	0.0	42.0	74.0	-32.0	EUT X, Low Ch
12399.690	41.4	0.6	1.0	255.9	0.0	0.0	Horz	PK	0.0	42.0	74.0	-32.0	EUT Y, High Ch
12008.710	42.2	-0.5	1.0	322.9	0.0	0.0	Horz	PK	0.0	41.7	74.0	-32.3	EUT Y, Low Ch
12210.170	41.4	0.1	1.0	133.0	0.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	EUT Y, Mid Ch

DUTY CYCLE

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

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

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

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

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	WPTX			**Work Order:**	SHOT0005
Serial Number:	30			**Date:**	26-Jul-18
Customer:	Shottracker			**Temperature:**	22.9 °C
Attendees:	Patrick Herron			**Humidity:**	49.4% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Jonathan Kiefer	**Power:**	110VAC/60Hz	**Job Site:**	TX09

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

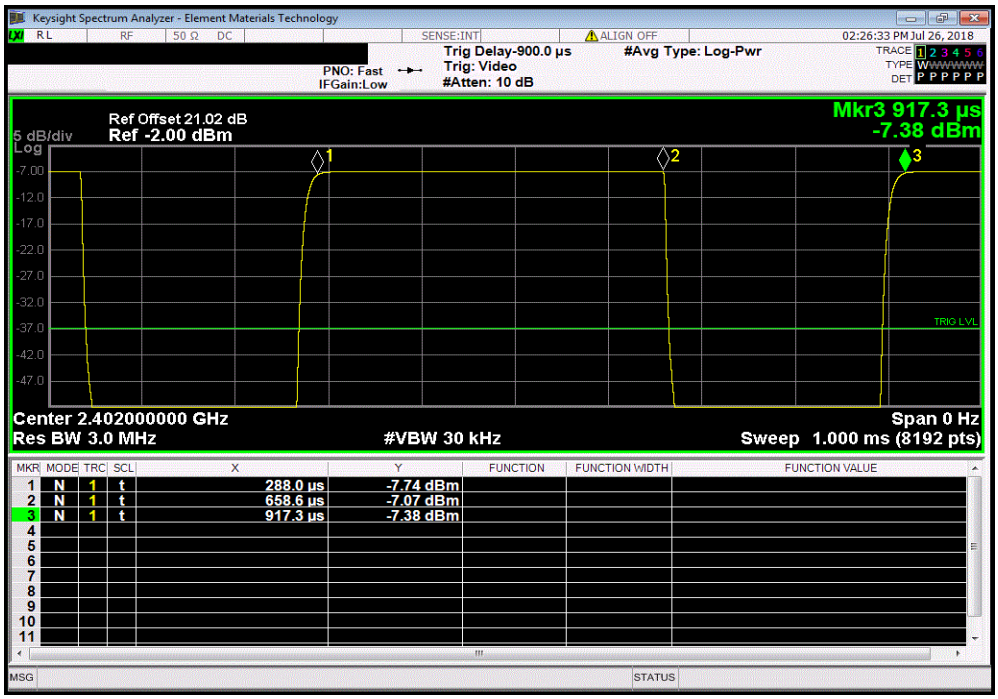
Configuration #	3	*Signature* Jonathan Kiefer

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	370.593 us	629.295 us	1	58.9	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	374.466 us	627.219 us	1	59.7	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	370.216 us	625.389 us	1	59.2	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

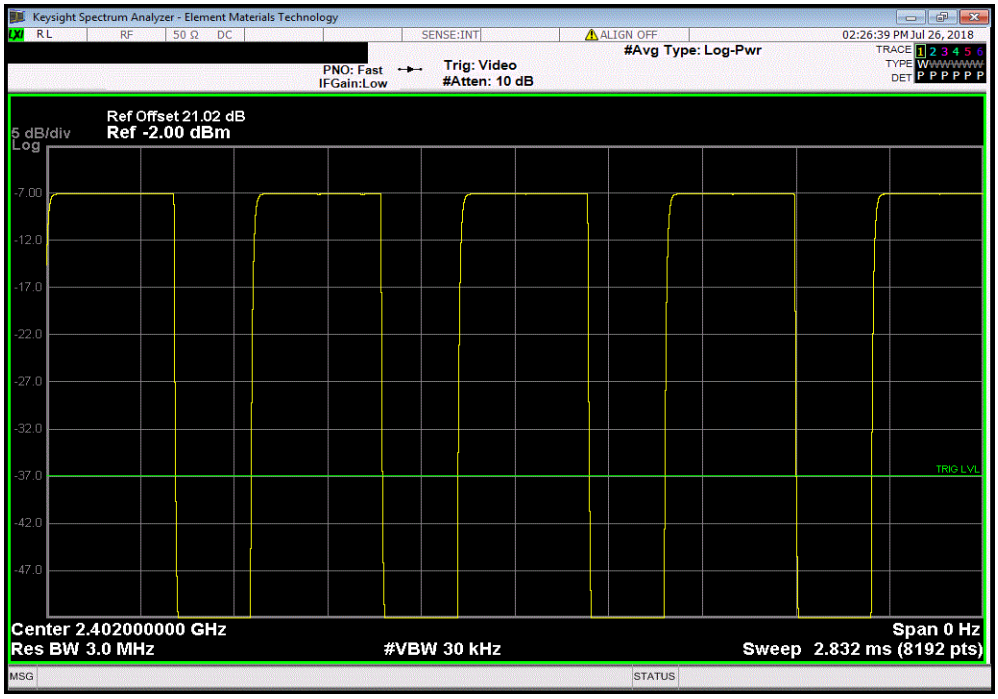
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	370.593 us	629.295 us	1	58.9	N/A	N/A



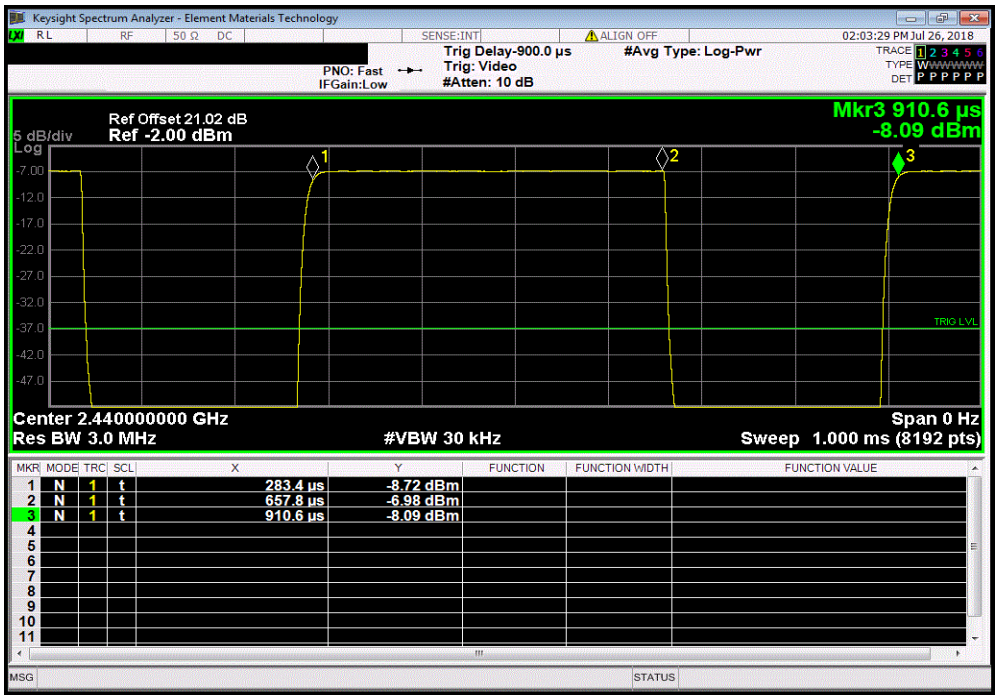
BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



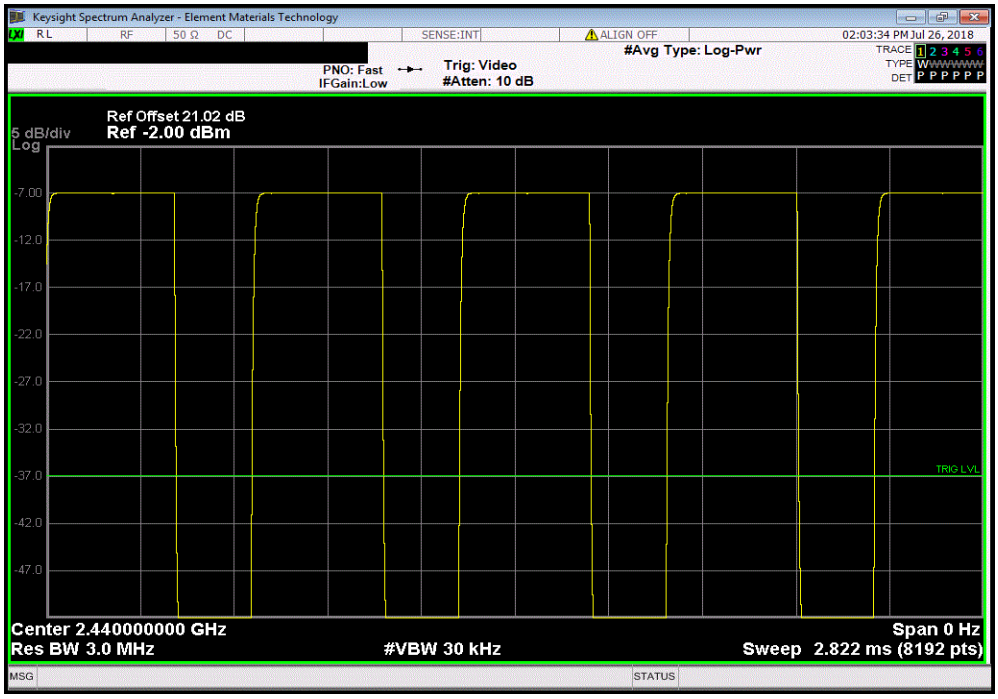
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	374.466 us	627.219 us	1	59.7	N/A	N/A



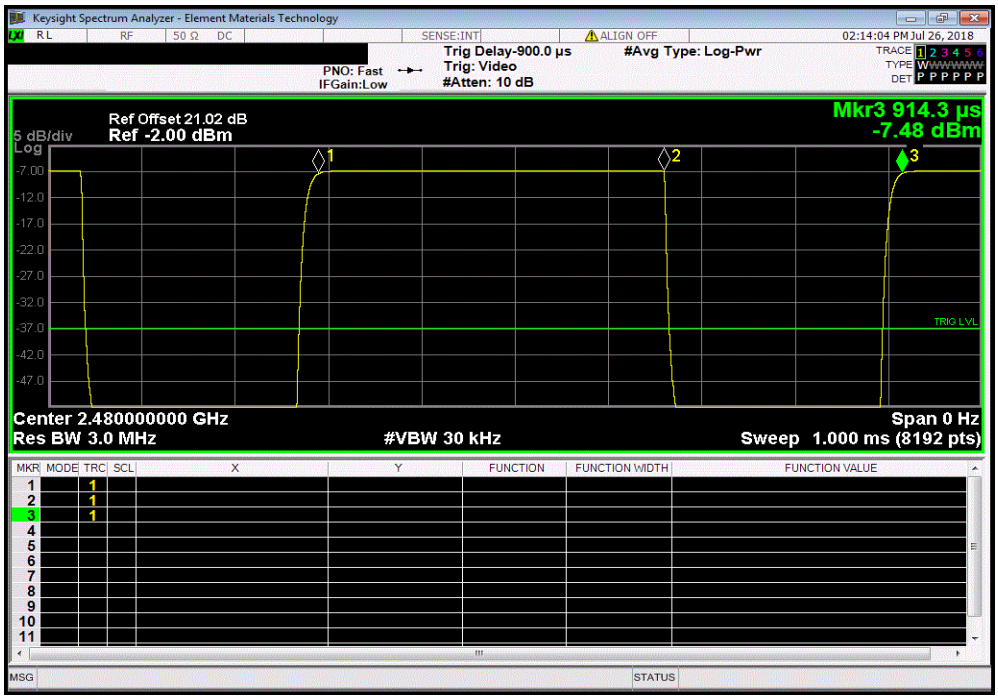
BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



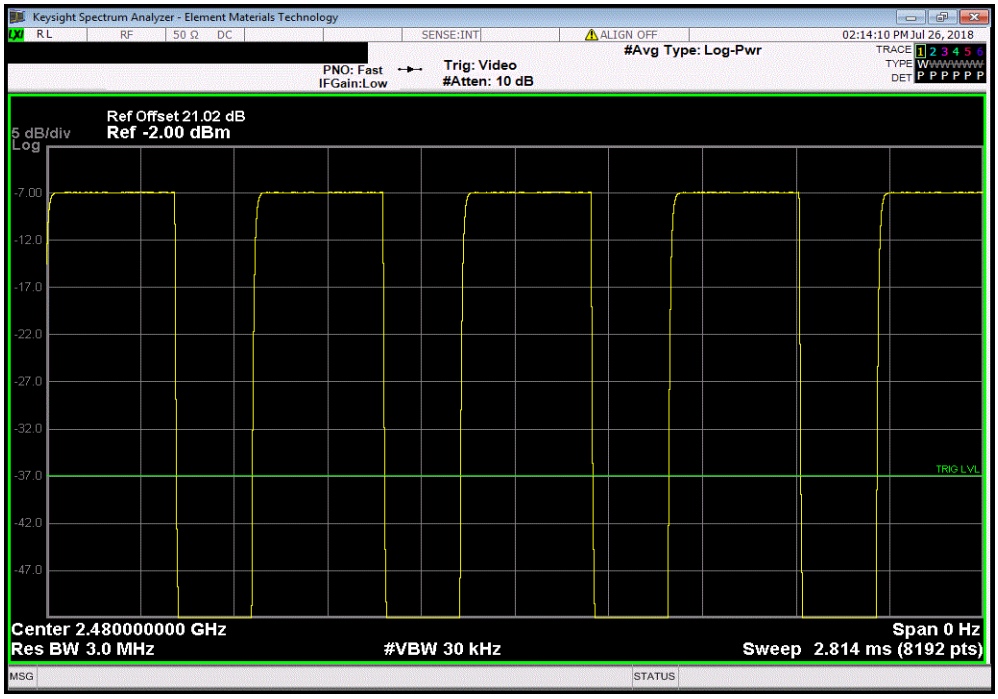
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	370.216 us	625.389 us	1	59.2	N/A	N/A



BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



OCCUPIED BANDWIDTH

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

TEST DESCRIPTION

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

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

OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**WPTX**			**Work Order:**	**SHOT0005**
Serial Number:	**30**			**Date:**	**26-Jul-18**
Customer:	**Shottracker**			**Temperature:**	**22.5 °C**
Attendees:	**Patrick Herron**			**Humidity:**	**50.8% RH**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

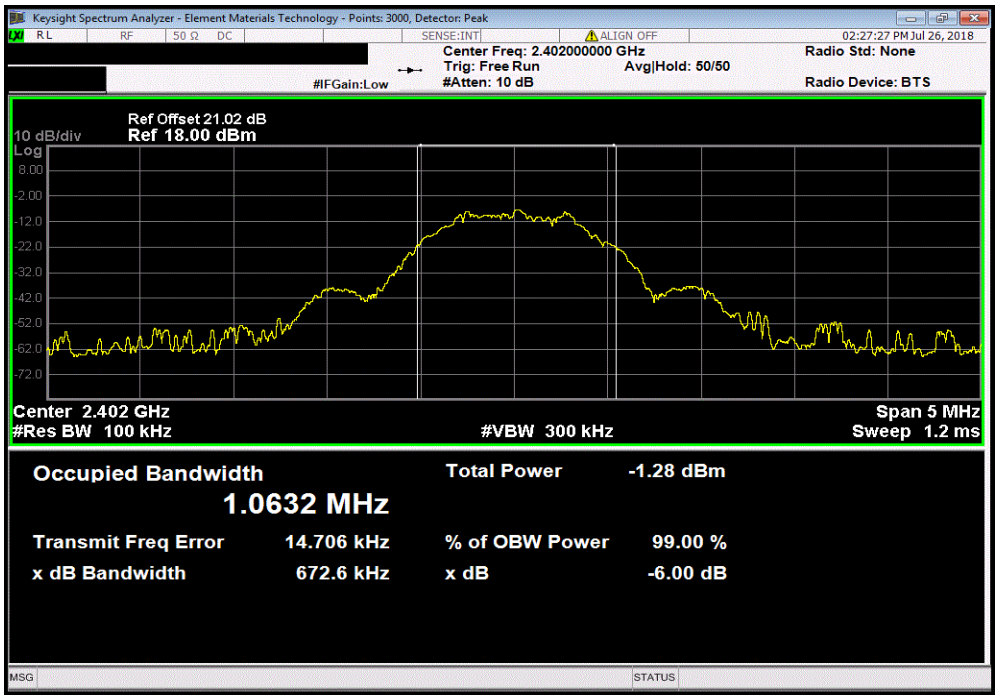
Configuration #	**3**	*Signature* Jonathan Kiefer

	Value	**Limit (≥)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	672.599 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2440 MHz	741.272 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	694.065 kHz	500 kHz	Pass

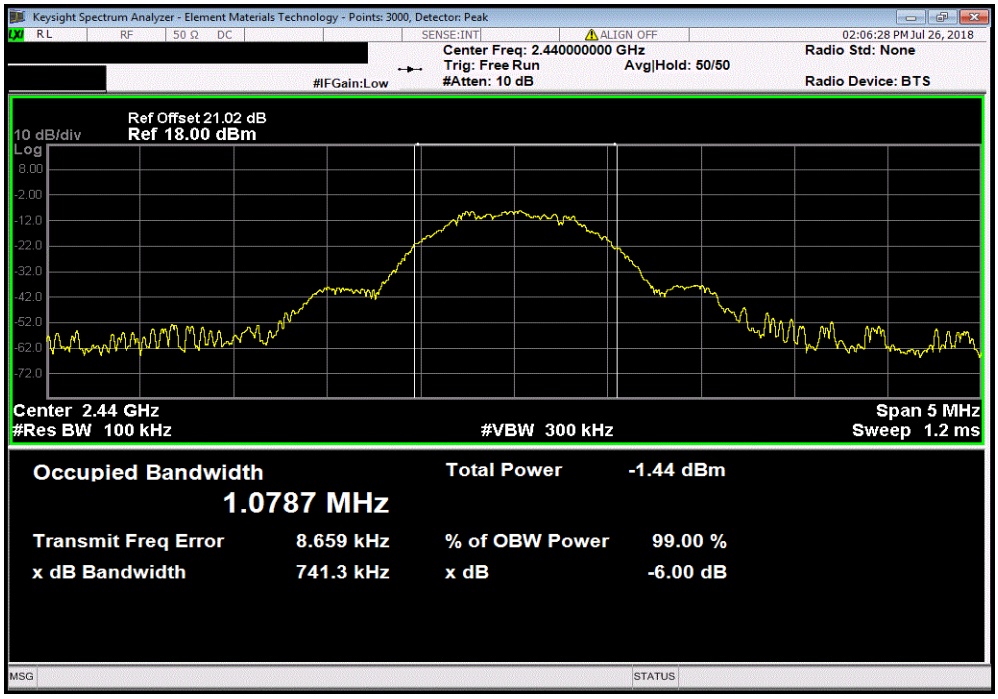
OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

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



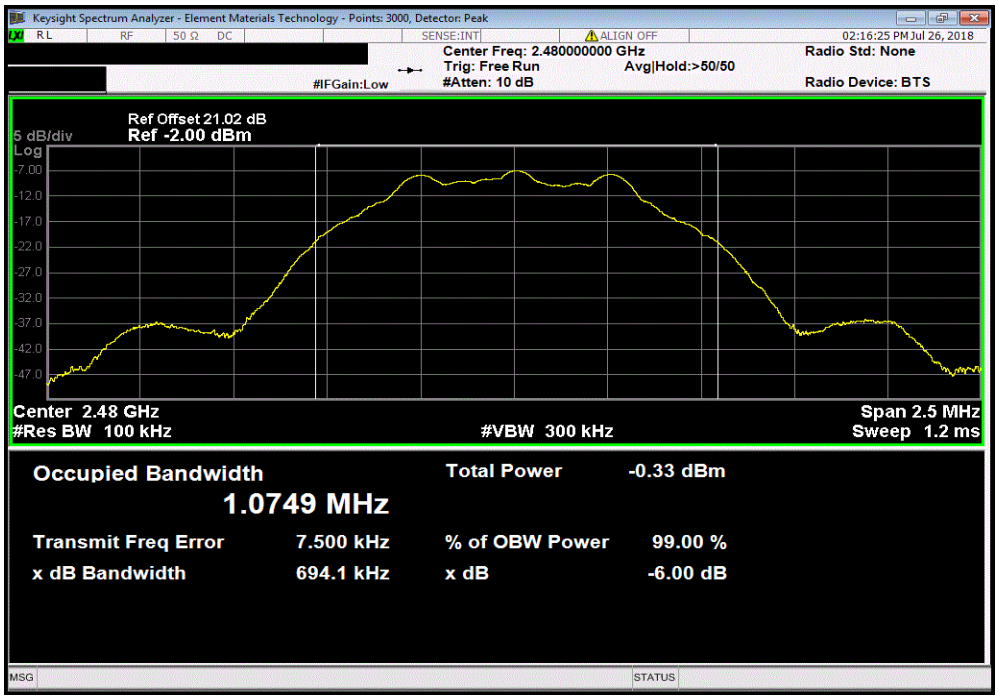
BLE/GFSK Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				741.272 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

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



OUTPUT POWER

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

TEST DESCRIPTION

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

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

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

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

OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**WPTX**			**Work Order:**	**SHOT0005**
Serial Number:	**30**			**Date:**	**26-Jul-18**
Customer:	**Shottracker**			**Temperature:**	**22.6 °C**
Attendees:	**Patrick Herron**			**Humidity:**	**52.5% RH**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

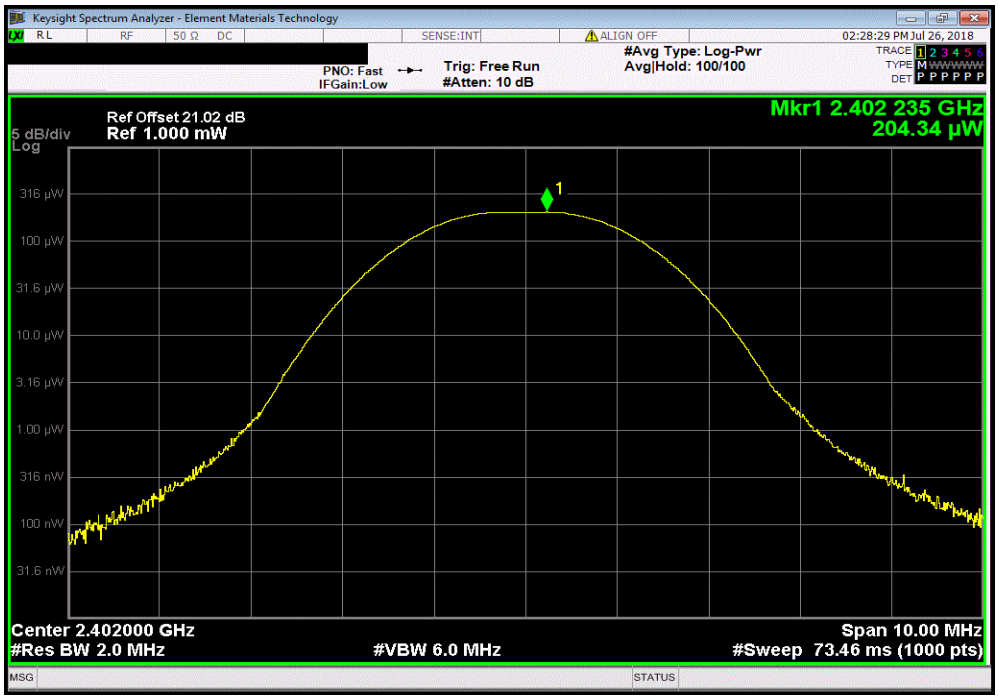
Configuration #	**3**	*Signature* Jonathan Kiefer

	Value	**Limit (<)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	204.34 uW	1 W	Pass
BLE/GFSK Mid Channel, 2440 MHz	207.06 uW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	208.98 uW	1 W	Pass

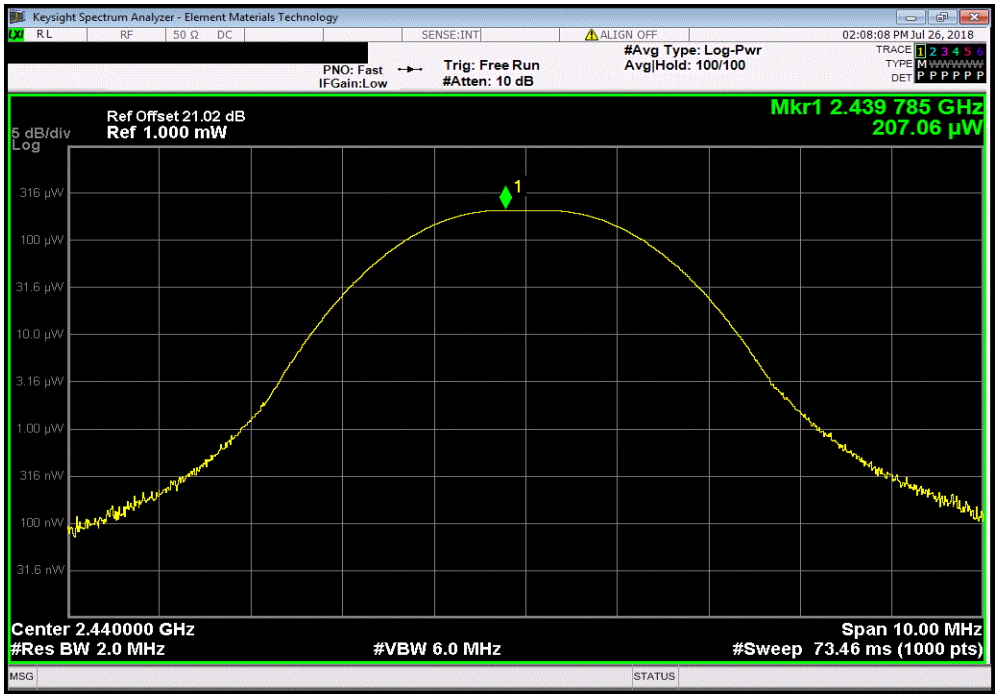
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

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



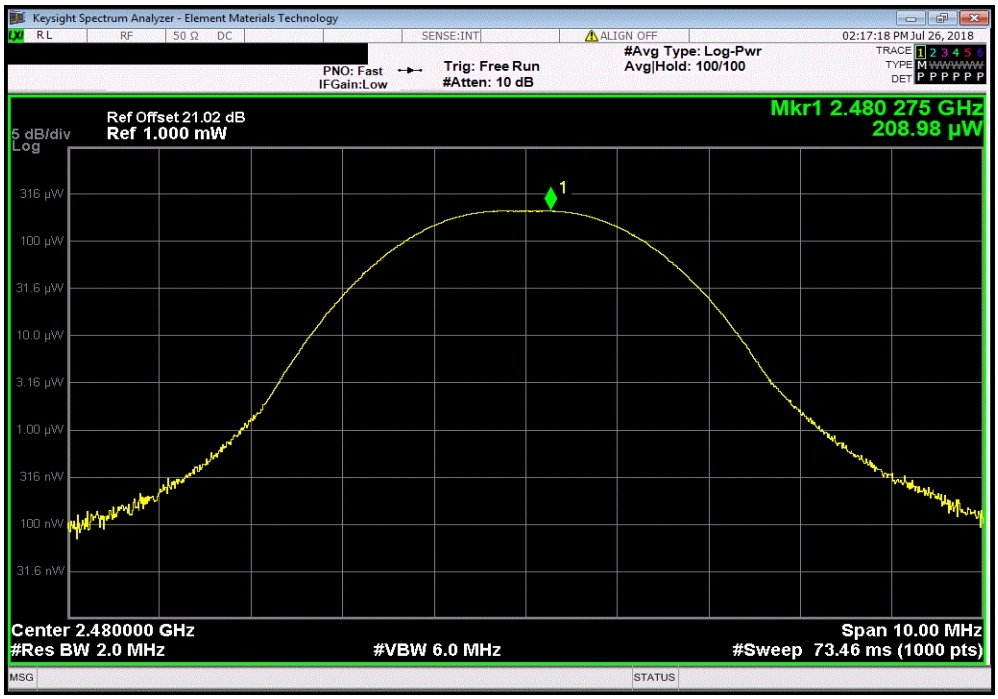
BLE/GFSK Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				207.06 uW	1 W	Pass



OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

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



POWER SPECTRAL DENSITY

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**WPTX**			**Work Order:**	**SHOT0005**
Serial Number:	**30**			**Date:**	**26-Jul-18**
Customer:	**Shottracker**			**Temperature:**	**22.8 °C**
Attendees:	**Patrick Herron**			**Humidity:**	**53.6% RH**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

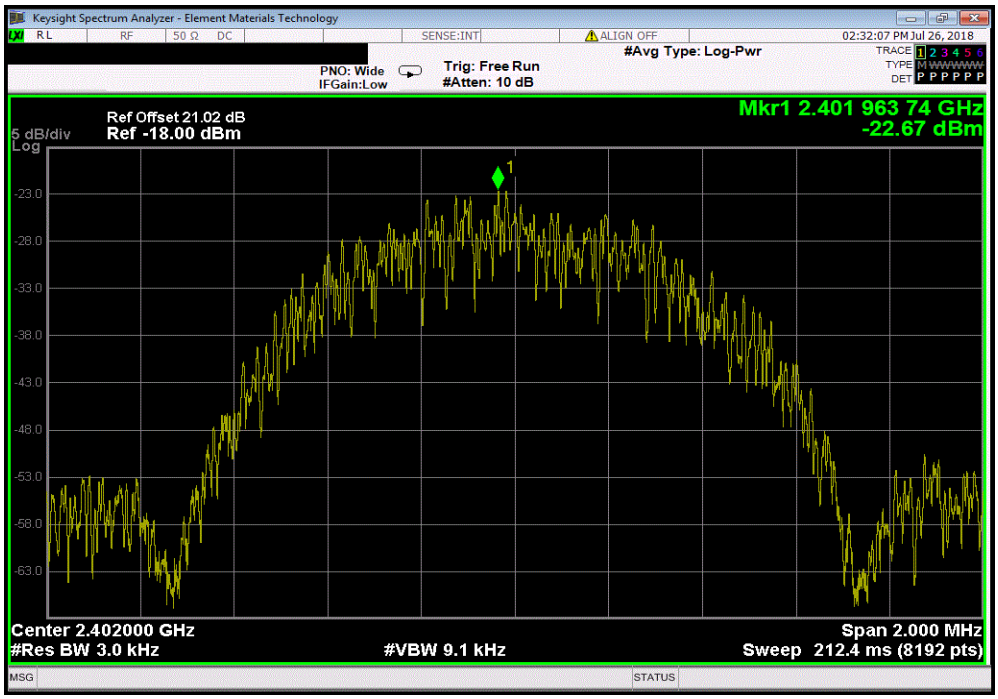
Configuration #	**3**	*Signature* Jonathan Kiefer

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
BLE/GFSK Low Channel, 2402 MHz	-22.669	8	Pass
BLE/GFSK Mid Channel, 2440 MHz	-22.532	8	Pass
BLE/GFSK High Channel, 2480 MHz	-22.441	8	Pass

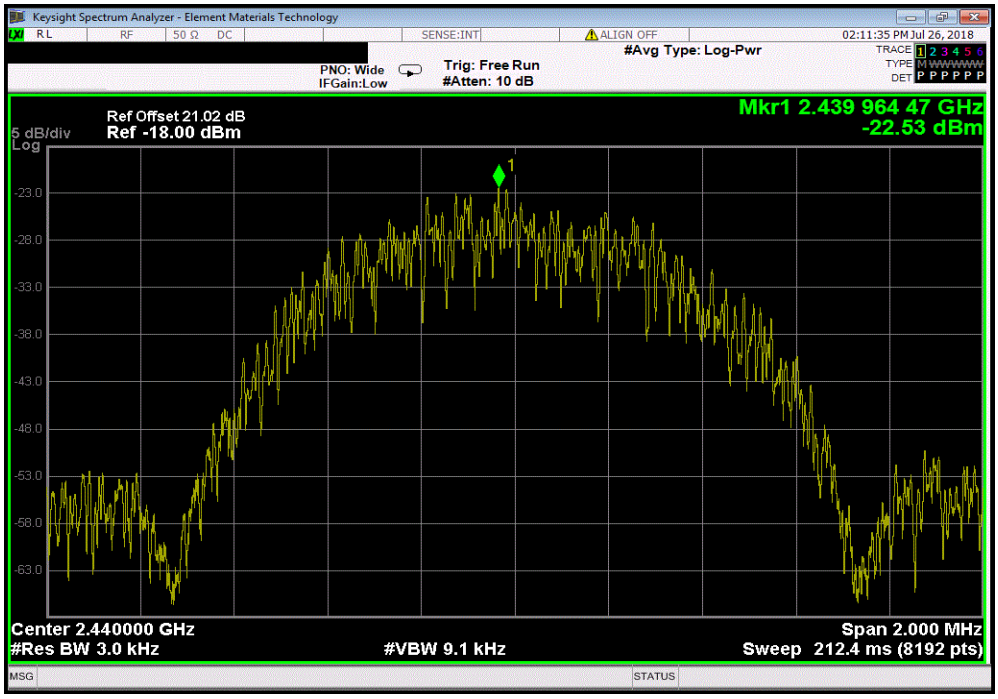
POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-22.669	8	Pass



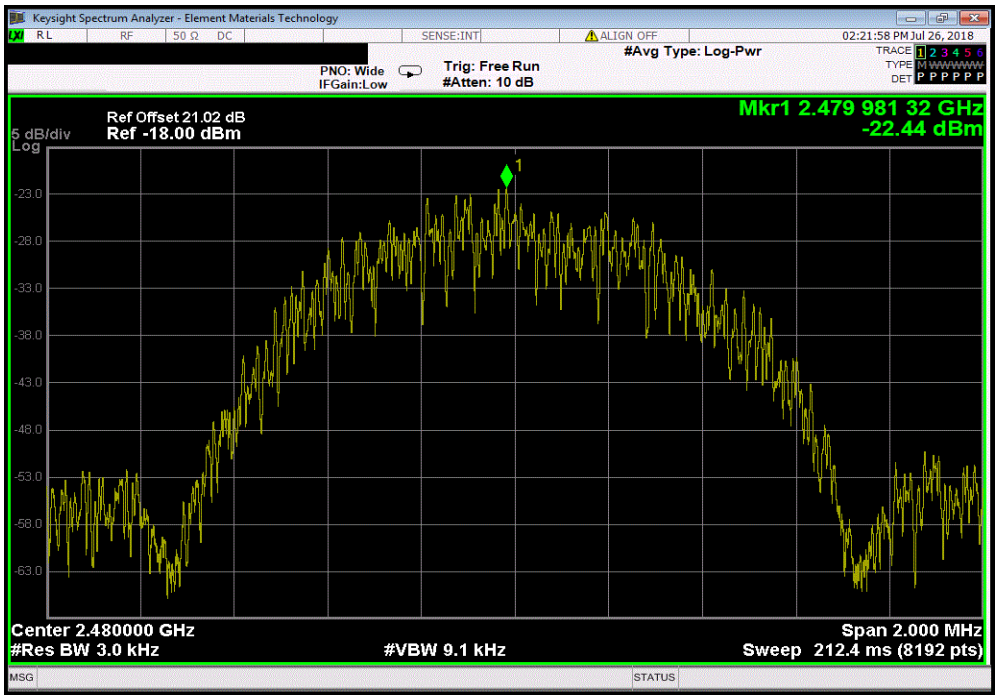
BLE/GFSK Mid Channel, 2440 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-22.532	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-22.441	8	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

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

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**WPTX**			**Work Order:**	**SHOT0005**
Serial Number:	**30**			**Date:**	**26-Jul-18**
Customer:	**Shottracker**			**Temperature:**	**23.1 °C**
Attendees:	**Patrick Herron**			**Humidity:**	**53.4% RH**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

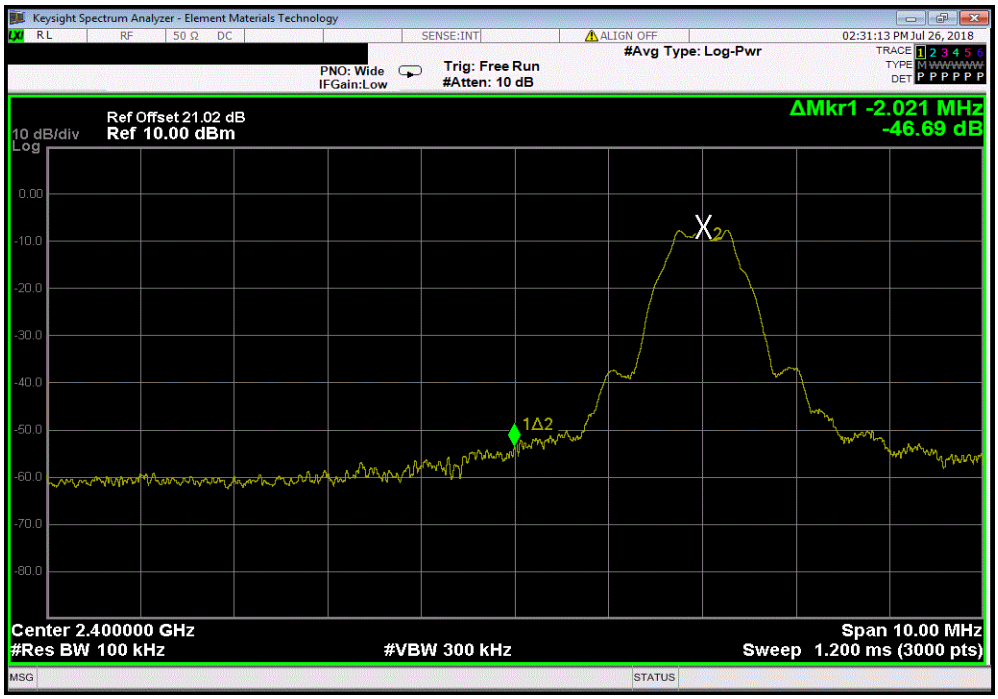
Configuration #	**3**	*Signature* Jonathan Kiefer

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	-46.69	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-49.68	-20	Pass

BAND EDGE COMPLIANCE

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-46.69	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.68	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

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

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**WPTX**			**Work Order:**	**SHOT0005**
Serial Number:	**30**			**Date:**	**26-Jul-18**
Customer:	**Shottracker**			**Temperature:**	**23.3 °C**
Attendees:	**Patrick Herron**			**Humidity:**	**52.3% RH**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**110VAC/60Hz**	**Job Site:**	**TX09**

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

COMMENTS

None

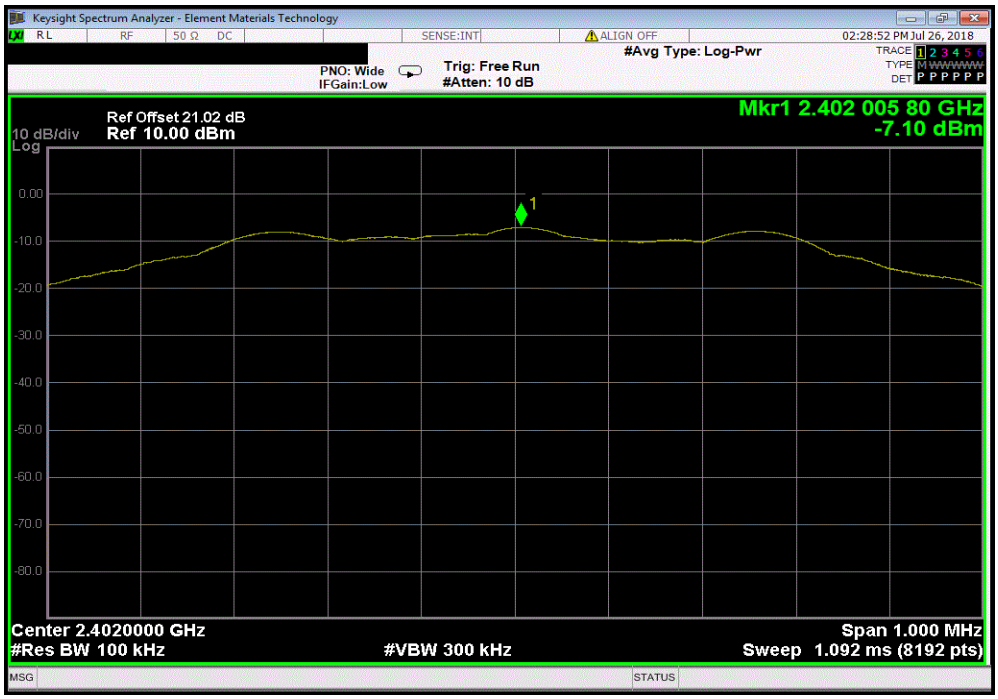
DEVIATIONS FROM TEST STANDARD

None

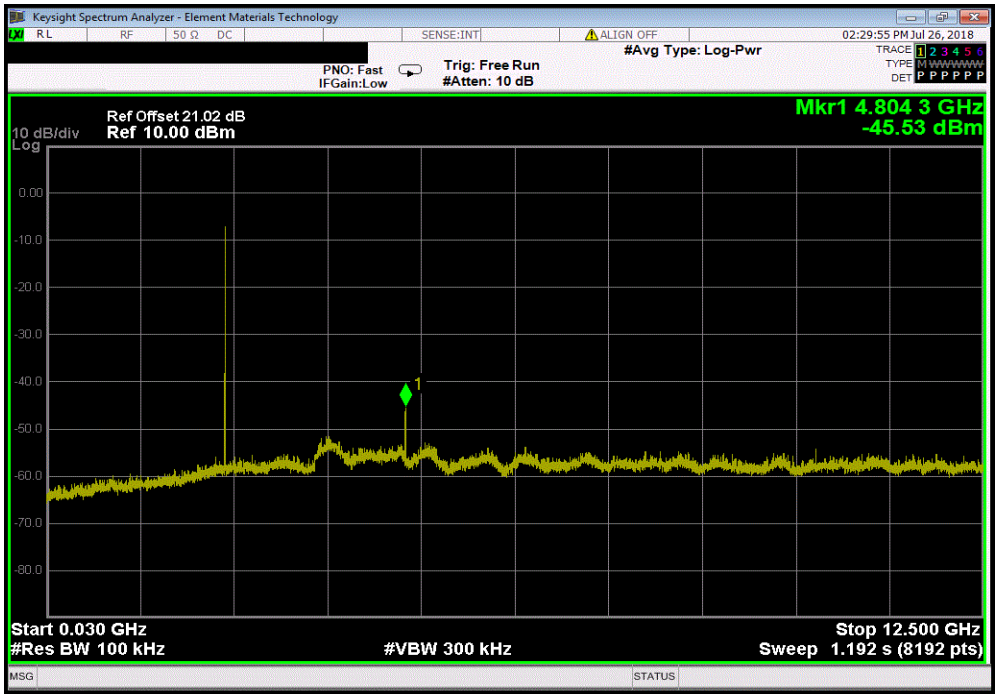
Configuration #	**3**	*Signature* Jonathan Kiefer

	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	-38.43	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-45.23	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	-45.11	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	-44.73	-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	-43.71	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	-45	-20	Pass

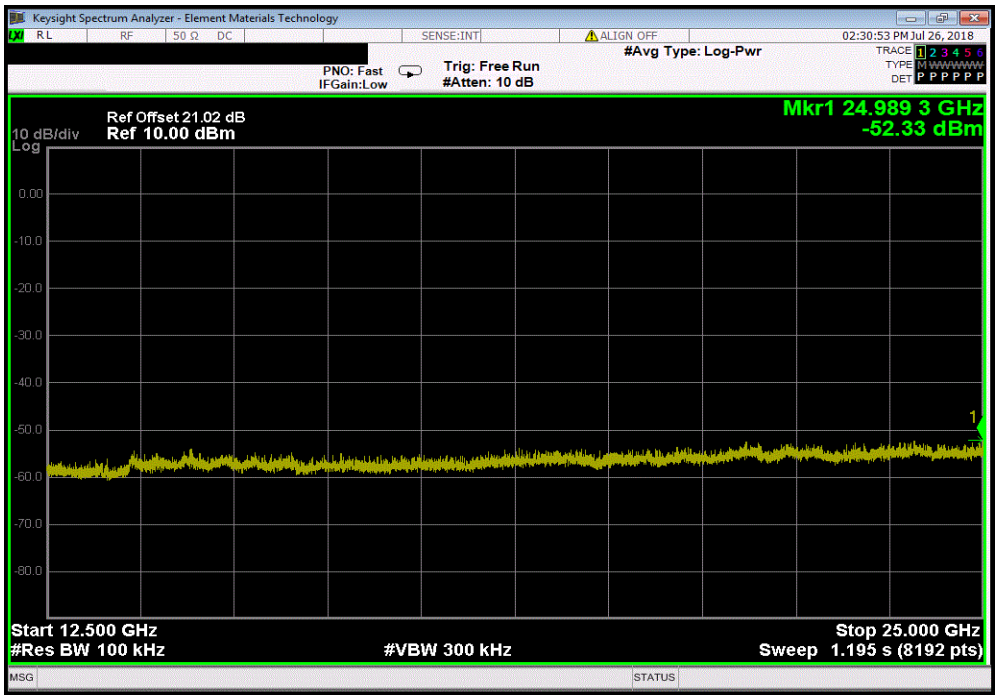
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



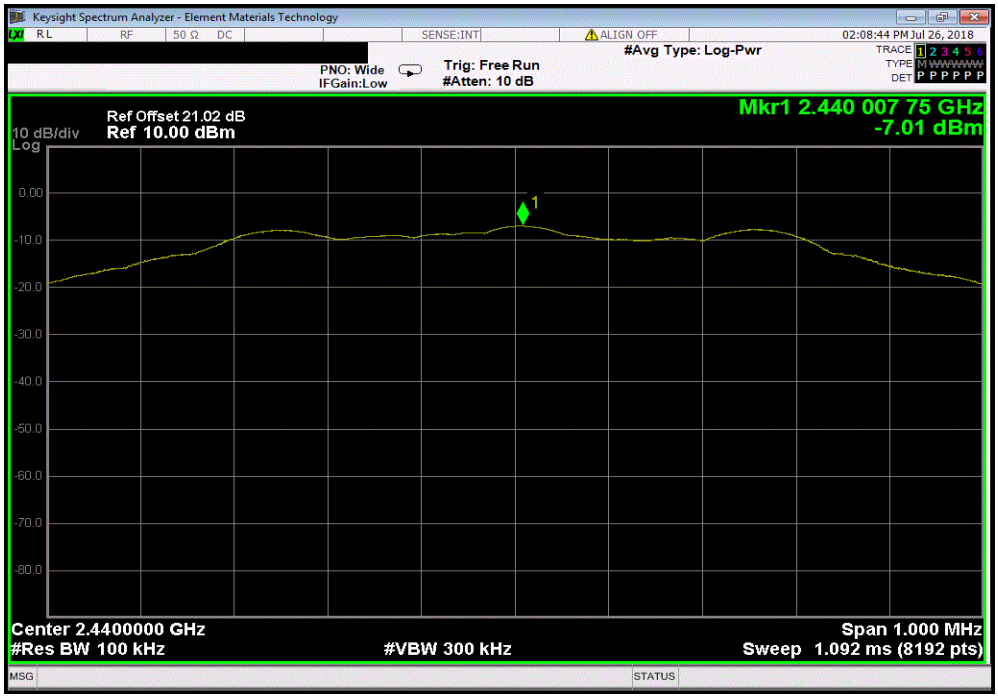
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-38.43	-20	Pass



BLE/GFSK Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-45.23	-20	Pass



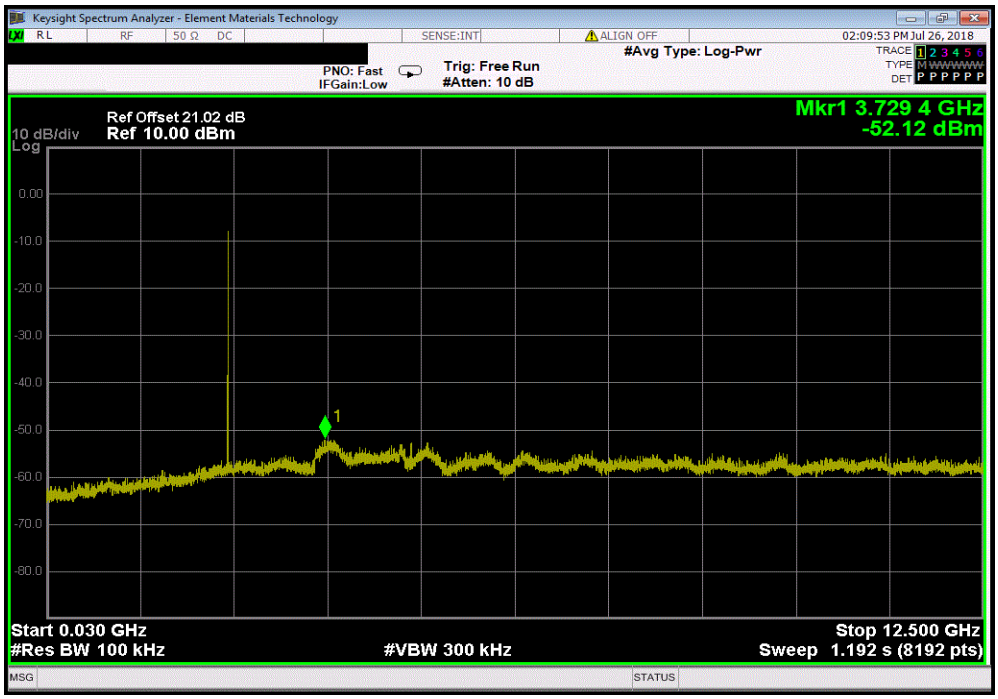
BLE/GFSK Mid Channel, 2440 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



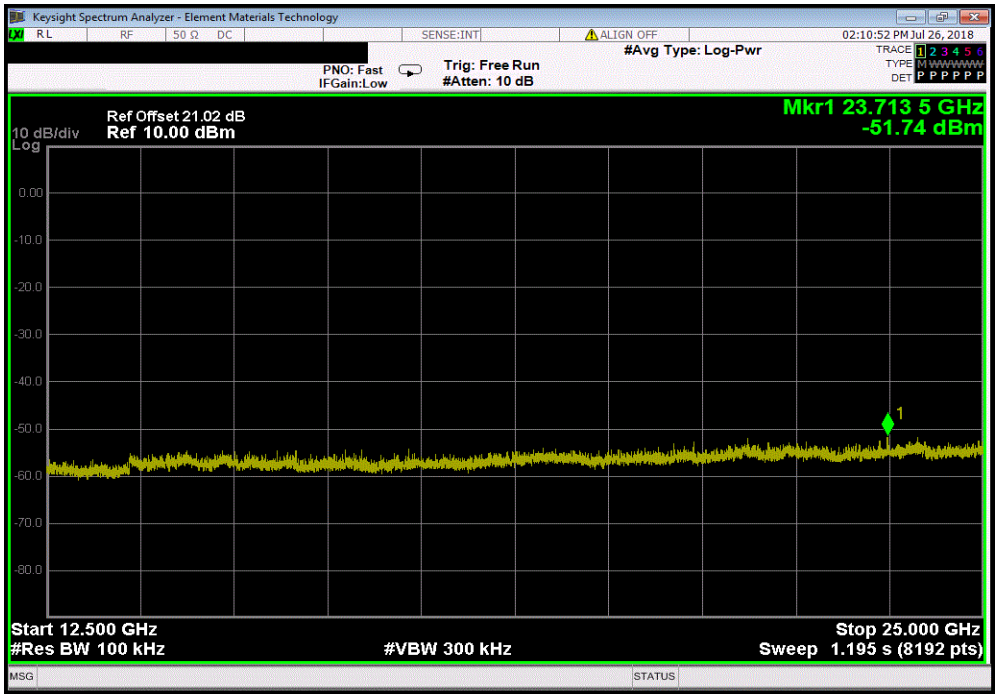
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

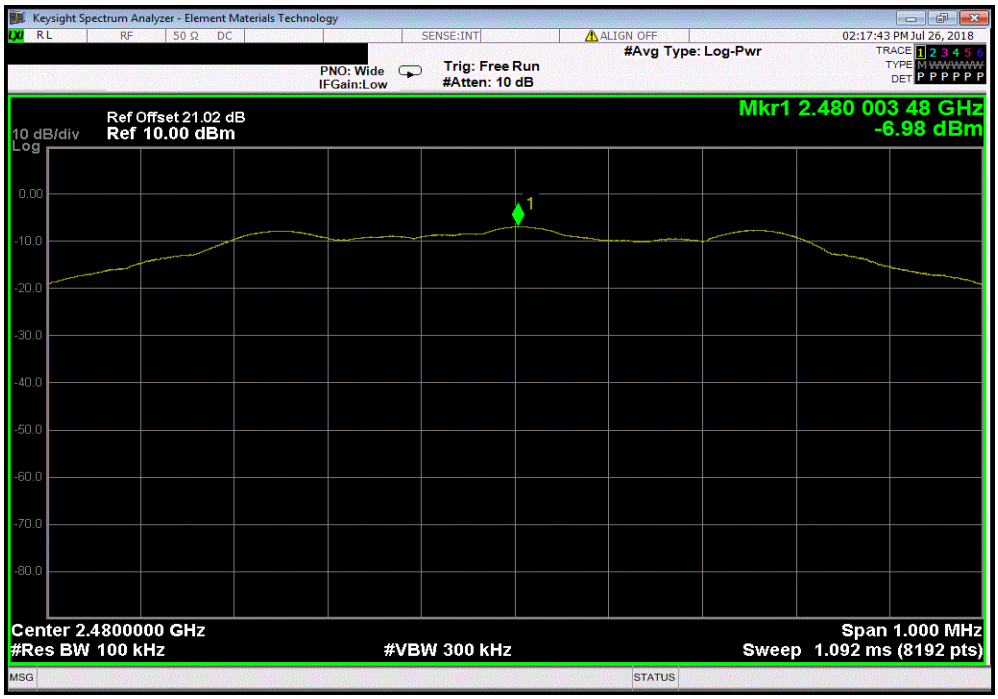
BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-45.11	-20	Pass



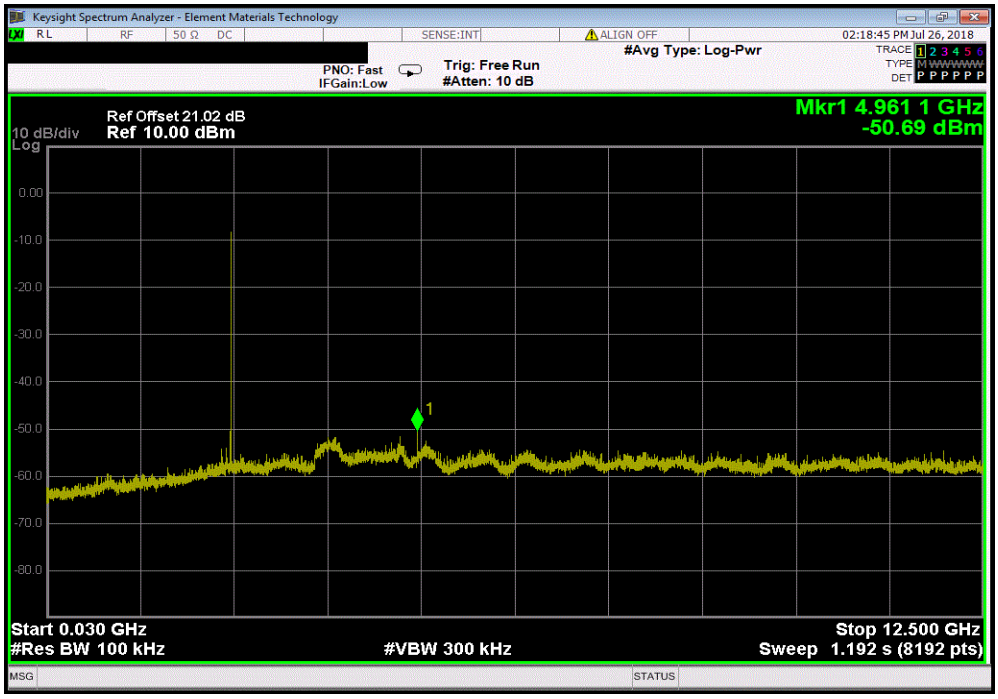
BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-44.73	-20	Pass



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			-43.71	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

BLE/GFSK High Channel, 2480 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-45	-20	Pass