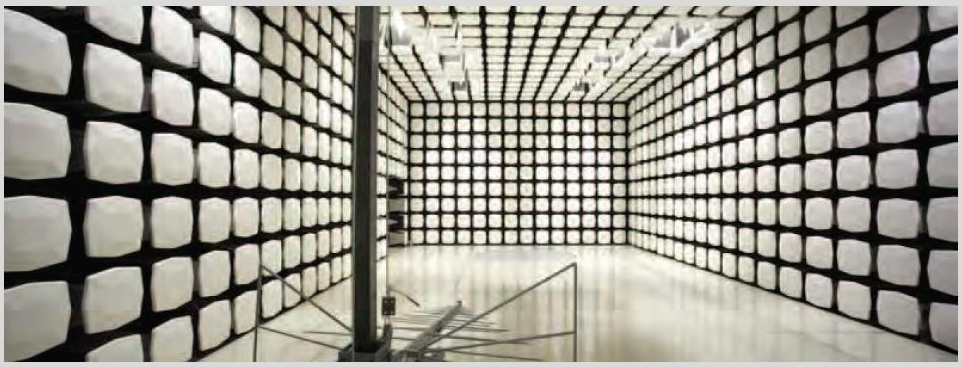
PayRange Inc.

BluKey Pro

FCC 15.247:2019

Bluetooth Low Energy DTS Radio

Report # PAYR0015.1



NVLAP LAB CODE: 200630-0

CERTIFICATE OF TEST

Last Date of Test: March 23, 2019
PayRange Inc.
Model: BluKey Pro

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2019	ANSI C63.10:2013, KDB 558074
FCC 15.247:2019	

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	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

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

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

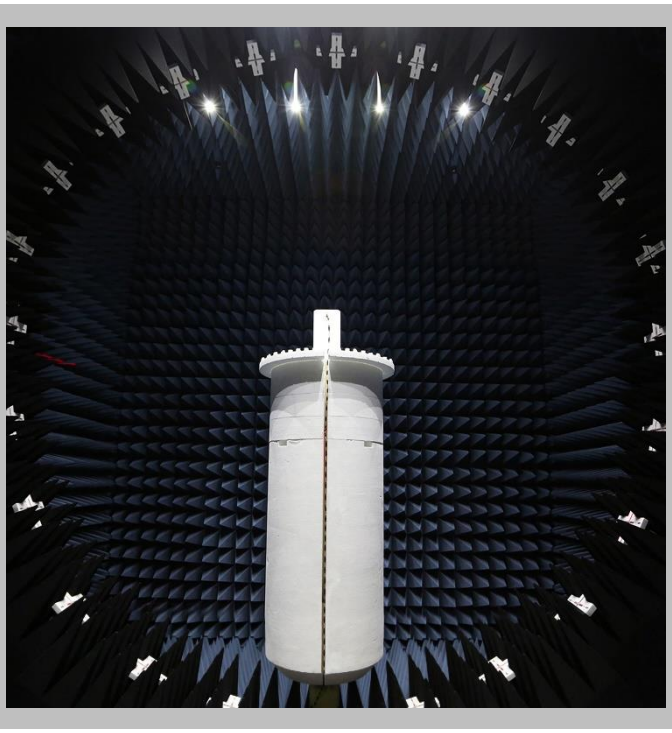
MIC – Recognized by MIC as a CAB for the acceptance of test data.

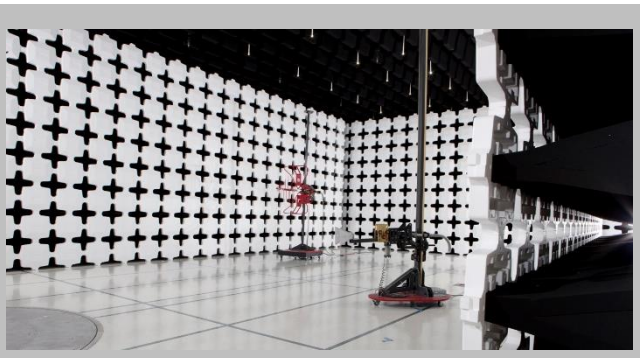
SCOPE

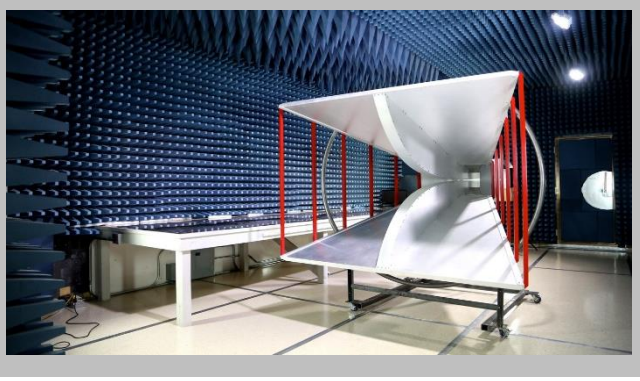
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	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 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: 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	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

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

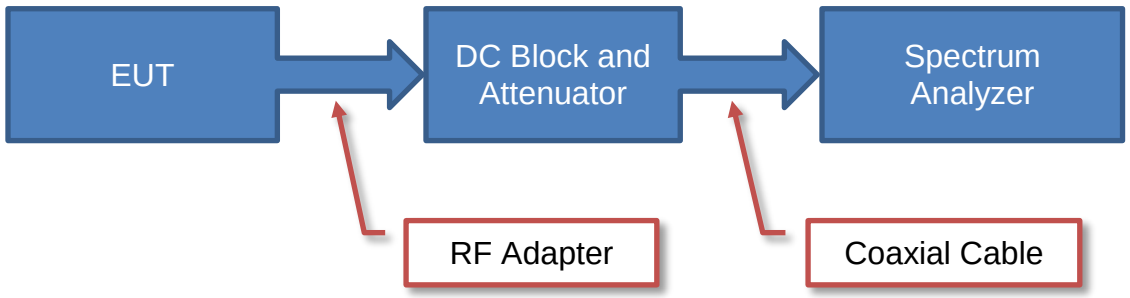
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

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

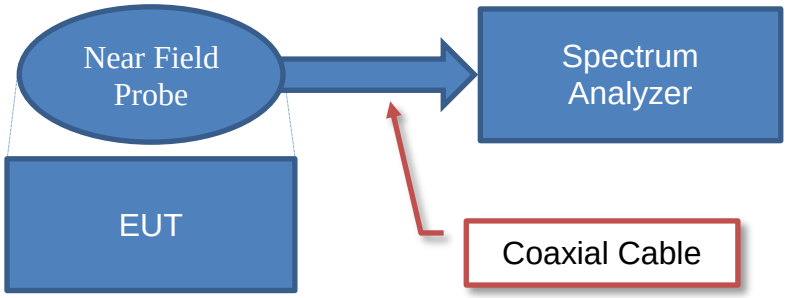
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

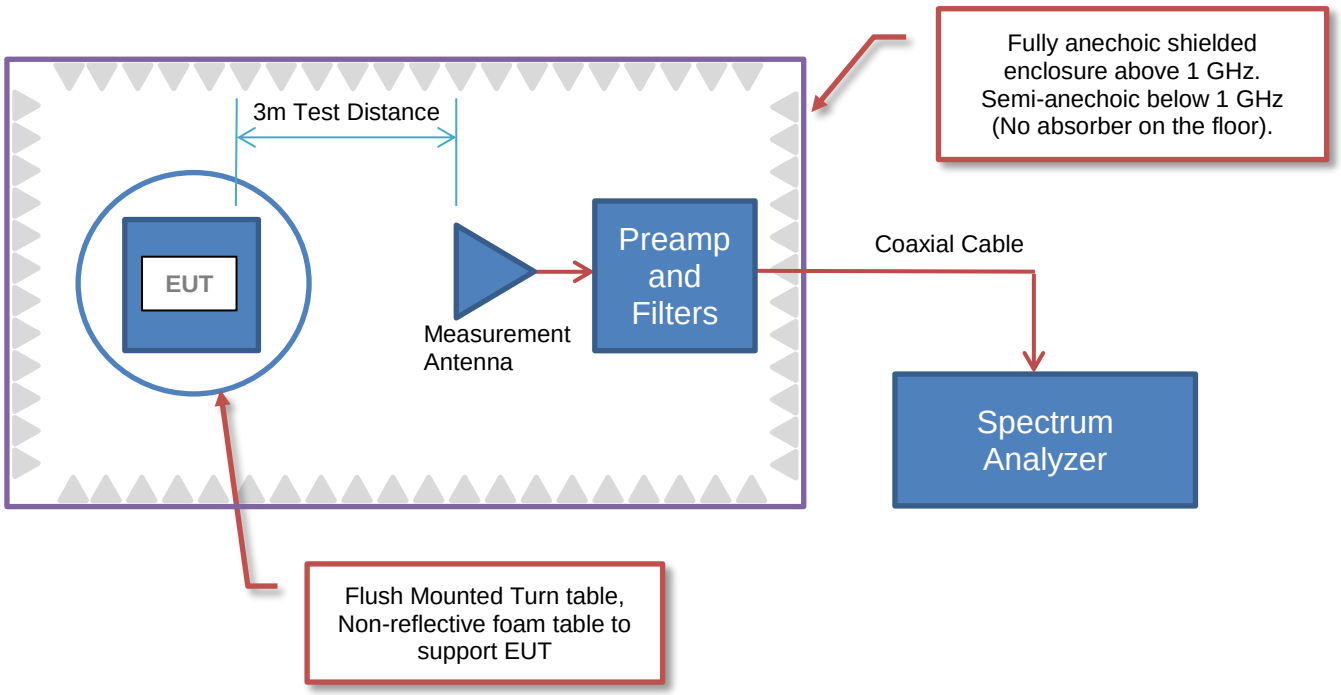
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	PayRange Inc.
Address:	9600 NE Cascades Pkwy, Suite 280
City, State, Zip:	Portland, OR 97220
Test Requested By:	Mike Mitchell
Model:	BluKey Pro
First Date of Test:	March 12, 2019
Last Date of Test:	March 23, 2019
Receipt Date of Samples:	March 12, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Payrange devices allow wireless payment from smartphones to vending machines, in this case laundry devices.

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

CONFIGURATIONS

Configuration PAYR0015- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BLE device	PayRange, Inc.	BluKey Pro	1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transformer	Basier	BE34406001 G19 1520	None
Battery	PayRange, Inc.	11.01201	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Extension	No	1 m	No	BLE device	Power Cable
Extension	No	1 m	No	BLE device	Power Cable
Power Cable	No	1 m	No	Extension	Transformer
AC Power Cable	No	1 m	No	Transformer	AC Mains
Battery cable	No	0.1 m	No	BLE Device	Battery

Configuration PAYR0015- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BLE device	PayRange, Inc.	BluKey Pro	2

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transformer	Basier	BE34406001 G19 1520	None
Battery	PayRange, Inc.	11.01201	None
Laptop	HP	15BS115DX	CND8076QJL
BK Module Programmer	PayRange, Inc.	None	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Extension	No	1 m	No	BLE device	Power Cable
Extension	No	1 m	No	BLE device	Power Cable
Power Cable	No	1 m	No	Extension	Transformer
AC Power Cable	No	1 m	No	Transformer	AC Mains
Battery cable	No	0.1 m	No	BLE Device	Battery
SMA Cable	Yes	0.1 m	No	BLE Device	SMA Connector
USB Cable	Yes	0.5 m	No	Laptop	BK Module Programmer
Serial Cable	No	0.05 m	No	BK Module Programmer	BLE Device

CONFIGURATIONS

Configuration PAYR0015- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
BLE device	PayRange, Inc.	BluKey Pro	1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Transformer	Basier	BE34406001 G19 1520	None
Battery	PayRange, Inc.	11.01201	None
Laptop	HP	15BS115DX	CND8076QJL

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Extension	No	1 m	No	BLE device	Power Cable
Extension	No	1 m	No	BLE device	Power Cable
Power Cable	No	1 m	No	Extension	Transformer
AC Power Cable	No	1 m	No	Transformer	AC Mains
Battery cable	No	0.1 m	No	BLE Device	Battery

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-03-12	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.
2	2019-03-13	Spurious Radiated Emissions	Modified from delivered configuration.	Client shorted the cavity on a PCB level antenna that had no EUT function. Modification authorized by Mike Mitchell.	EUT remained at Element following the test.
3	2019-03-19	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-03-22	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.
5	2019-03-22	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-03-23	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.
7	2019-03-23	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.
8	2019-03-23	Power Spectra 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.
9	2019-03-23	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.
10	2019-03-23	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.2019.1.24

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
Receiver	Rohde & Schwarz	ESCI	ARH	2018-04-11	2019-04-11
LISN	Solar Electronics	9252-50-R-24-BNC	LIP	2018-09-11	2020-09-11
Cable - Conducted Cable Assembly	Northwest EMC	EVG, HHD, RKA	EVGA	2019-01-07	2020-01-07

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

PAYR0015-1

MODES INVESTIGATED

BLE radio continuous transmission. Mid channel = 2442 MHz. Maximum power setting.

POWERLINE CONDUCTED EMISSIONS

EUT:	BluKey Pro	Work Order:	PAYR0015
Serial Number:	1	Date:	2019-03-12
Customer:	PayRange Inc.	Temperature:	20.4°C
Attendees:	Michael Mitchell	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jody House	Job Site:	EV07
Power:	24 VAC via 110VAC/60Hz	Configuration:	PAYR0015-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

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

COMMENTS

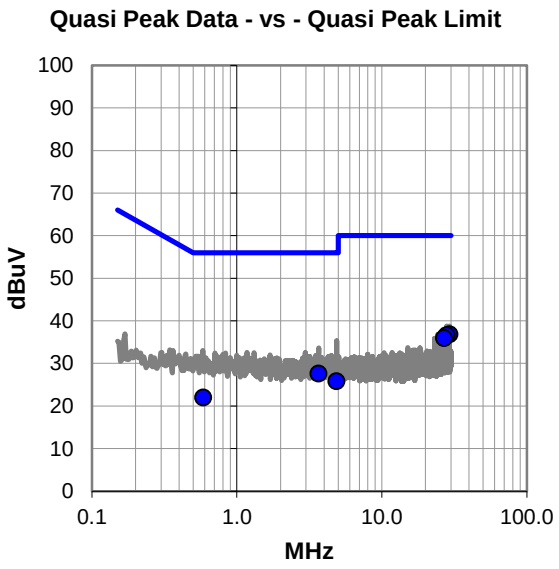
None

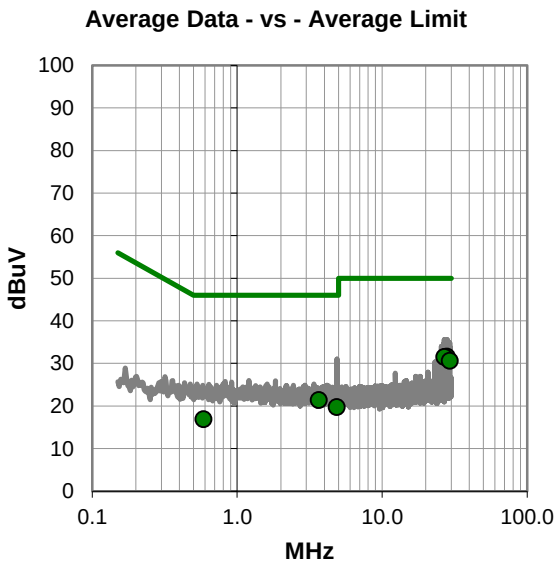
EUT OPERATING MODES

BLE radio continuous transmission. Mid channel = 2442 MHz. Maximum power setting.

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.282	14.6	22.2	36.8	60.0	-23.2
28.065	14.6	22.0	36.6	60.0	-23.4
26.842	14.0	21.9	35.9	60.0	-24.1
3.660	7.4	20.2	27.6	56.0	-28.4
4.875	5.6	20.2	25.8	56.0	-30.2
0.587	2.0	20.0	22.0	56.0	-34.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
28.065	9.6	22.0	31.6	50.0	-18.4
26.842	9.6	21.9	31.5	50.0	-18.5
29.282	8.4	22.2	30.6	50.0	-19.4
3.660	1.2	20.2	21.4	46.0	-24.6
4.875	-0.5	20.2	19.7	46.0	-26.3
0.587	-3.1	20.0	16.9	46.0	-29.1

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

EUT:	BluKey Pro	Work Order:	PAYR0015
Serial Number:	1	Date:	2019-03-12
Customer:	PayRange Inc.	Temperature:	20.4°C
Attendees:	Michael Mitchell	Relative Humidity:	36%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jody House	Job Site:	EV07
Power:	24 VAC via 110VAC/60Hz	Configuration:	PAYR0015-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2019	ANSI C63.10:2013

TEST PARAMETERS

Run #:	6	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

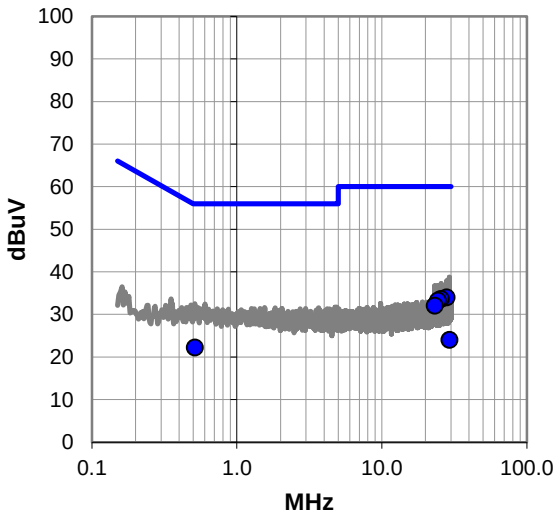
EUT OPERATING MODES

BLE radio continuous transmission. Mid channel = 2442 MHz. Maximum power setting.

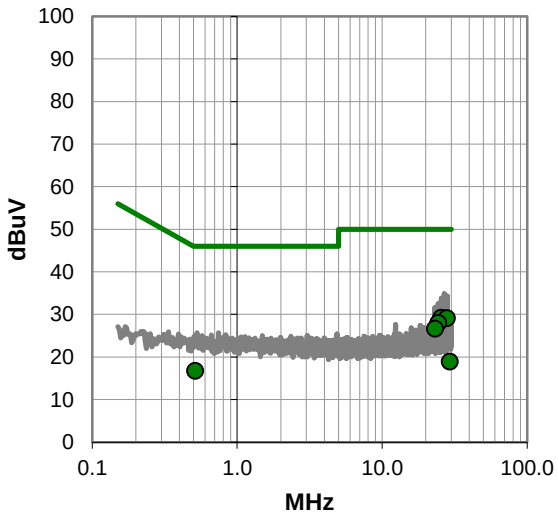
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2019.1.24

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
28.058	12.0	22.0	34.0	60.0	-26.0
25.620	11.8	21.8	33.6	60.0	-26.4
24.400	11.6	21.6	33.2	60.0	-26.8
23.180	10.5	21.5	32.0	60.0	-28.0
0.515	2.3	19.9	22.2	56.0	-33.8
29.267	1.8	22.2	24.0	60.0	-36.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
25.620	7.4	21.8	29.2	50.0	-20.8
28.058	7.1	22.0	29.1	50.0	-20.9
24.400	6.4	21.6	28.0	50.0	-22.0
23.180	5.1	21.5	26.6	50.0	-23.4
0.515	-3.2	19.9	16.7	46.0	-29.3
29.267	-3.3	22.2	18.9	50.0	-31.1

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2019.02.26

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

BLE Tx, GFSK, Low Ch. = 2402 MHz, Mid Ch. = 2442 MHz, High Ch. = 2480 MHz, Maximum power setting, Duty cycle during test: 62.2%. Protocol limited duty cycle: 5.7%.

POWER SETTINGS INVESTIGATED

24 VAC via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

PAYR0015 - 3

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
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	18-Mar-2018	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1-Feb-2019	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	15-Feb-2019	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HFO	11-Dec-2018	12 mo
Attenuator	Coaxicom	3910-20	AXZ	15-Feb-2019	12 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	24-Aug-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	24-Aug-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIV	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	24-Nov-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	0 mo
Cable - Conducted Cable	None	Conducted Cable	EVG	NCR	0 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	24-Nov-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	24-Nov-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	24-Nov-2018	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	7-Feb-2018	24 mo
Cable	N/A	Bilog Cables	EVA	24-Nov-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	24-Nov-2018	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	2-Oct-2018	24 mo

TEST DESCRIPTION

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

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

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

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

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

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

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

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

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc). For an EUT with a protocol limited duty cycle, a 20*LOG(dc) correction is subtracted from the average measurements.

During testing, the EUT operated at a 62.2% duty cycle. In the field, the EUT has a 5.7% protocol limited duty cycle. The total duty cycle correction factor applied was thus: 20*LOG(0.057)-10*LOG(0.622) = -22.8 dB.

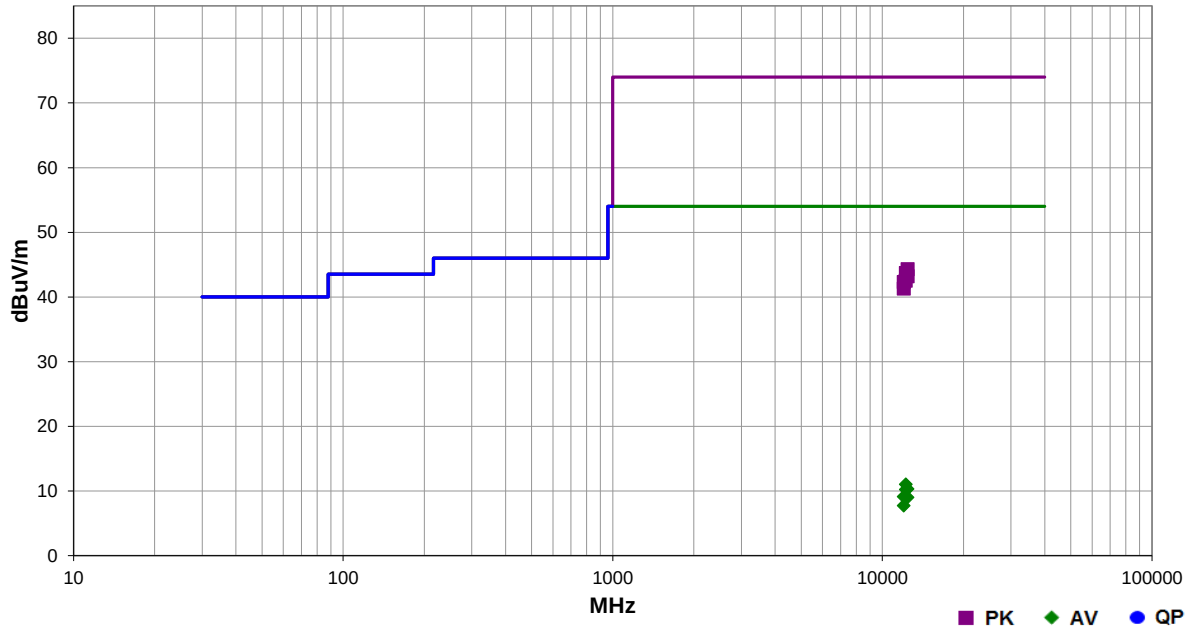
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2019.02.26

Work Order:	PAYR0015	**Date:**	13-Mar-2019		
Project:	None	**Temperature:**	18.5 °C		
Job Site:	EV01	**Humidity:**	37.6% RH		
Serial Number:	2	**Barometric Pres.:**	1028 mbar	**Tested by:**	Jody House & Rod Peloquin
EUT:	BluKey Pro				
Configuration:	3				
Customer:	PayRange Inc.				
Attendees:	Michael Mitchell				
EUT Power:	24 VAC via 110VAC/60Hz				
Operating Mode:	BLE Tx, GFSK, Low Ch. = 2402 MHz, Mid Ch. = 2442 MHz, High Ch. = 2480 MHz, Maximum power setting, Duty cycle during test: 62.2%. Protocol limited duty cycle: 5.7%.				
Deviations:	None				
Comments:	See comments for EUT channel and orientation.				

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

Run #	29	**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
12398.330	42.3	2.0	1.0	113.0	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	High Ch, EUT On Side
12210.940	42.0	1.7	1.0	334.0	0.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	Mid Ch, EUT On Side
12398.490	41.2	2.0	1.0	317.0	0.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	High Ch, EUT Vert
12210.830	40.8	1.7	1.0	166.0	0.0	0.0	Horz	PK	0.0	42.5	74.0	-31.5	Mid Ch, EUT Vert
12010.430	41.5	0.8	1.0	335.0	0.0	0.0	Vert	PK	0.0	42.3	74.0	-31.7	Low Ch, EUT On side
12008.620	40.5	0.8	1.0	218.0	0.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Low Ch, EUT Vert
12211.190	32.1	1.7	1.0	334.0	-22.8	0.0	Vert	AV	0.0	11.0	54.0	-43.0	Mid Ch, EUT On Side
12398.880	31.1	2.0	1.0	113.0	-22.8	0.0	Vert	AV	0.0	10.3	54.0	-43.7	High Ch, EUT On Side
12211.080	31.3	1.7	1.0	166.0	-22.8	0.0	Horz	AV	0.0	10.2	54.0	-43.8	Mid Ch, EUT Vert
12011.070	31.1	0.8	1.0	335.0	-22.8	0.0	Vert	AV	0.0	9.1	54.0	-44.9	Low Ch, EUT On side
12398.950	29.8	2.0	1.0	317.0	-22.8	0.0	Horz	AV	0.0	9.0	54.0	-45.0	High Ch, EUT Vert
12009.350	29.7	0.8	1.0	218.0	-22.8	0.0	Horz	AV	0.0	7.7	54.0	-46.3	Low Ch, EUT Vert

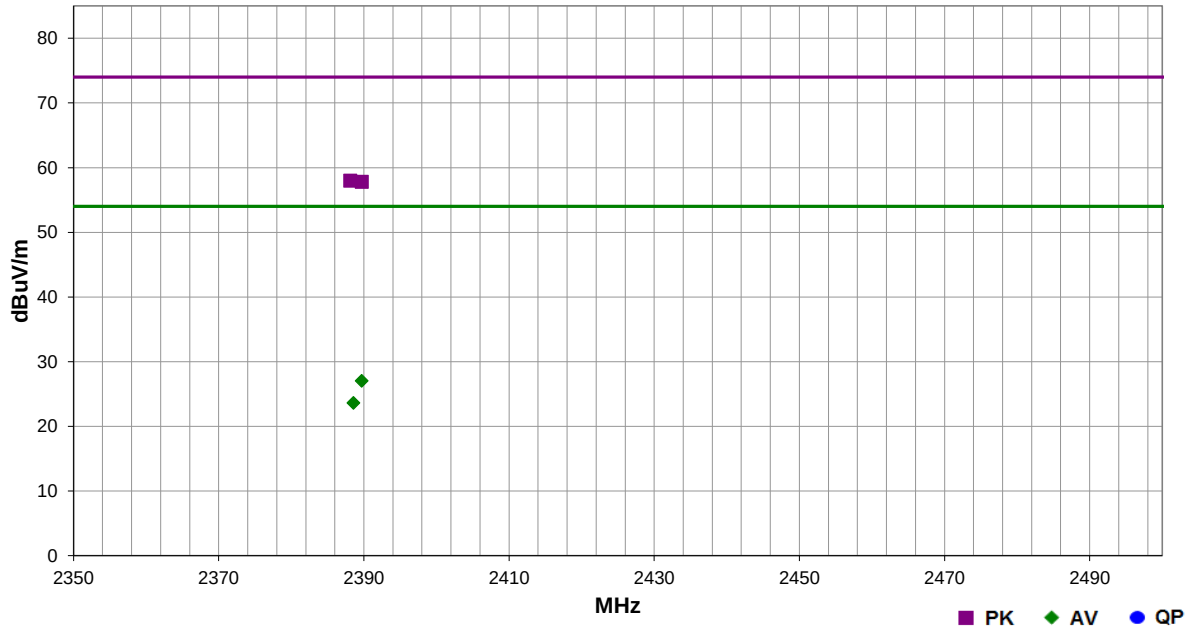
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2019.02.26

Work Order:	PAYR0015	**Date:**	13-Mar-2019		
Project:	None	**Temperature:**	18.5 °C		
Job Site:	EV01	**Humidity:**	37.6% RH		
Serial Number:	2	**Barometric Pres.:**	1028 mbar	**Tested by:**	Jody House & Rod Peloquin
EUT:	BluKey Pro				
Configuration:	3				
Customer:	PayRange Inc.				
Attendees:	Michael Mitchell				
EUT Power:	24 VAC via 110VAC/60Hz				
Operating Mode:	BLE Tx, GFSK, Low Ch. = 2402 MHz, Mid Ch. = 2442 MHz, High Ch. = 2480 MHz, Maximum power setting, Duty cycle during test: 62.2%. Protocol limited duty cycle: 5.7%.				
Deviations:	None				
Comments:	See comments for EUT channel and orientation.				

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

Run #	33	**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
2389.720	34.9	-5.1	1.0	357.0	-22.8	20.0	Vert	AV	0.0	27.0	54.0	-27.0	Low Ch, EUT Vert
2389.707	42.9	-5.1	1.0	277.0	0.0	20.0	Horz	PK	0.0	57.8	74.0	-16.2	Low Ch, EUT Horz
2388.580	31.5	-5.1	1.0	277.0	-22.8	20.0	Horz	AV	0.0	23.6	54.0	-30.4	Low Ch, EUT Horz
2388.120	43.1	-5.1	1.0	357.0	0.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	Low Ch, EUT Vert

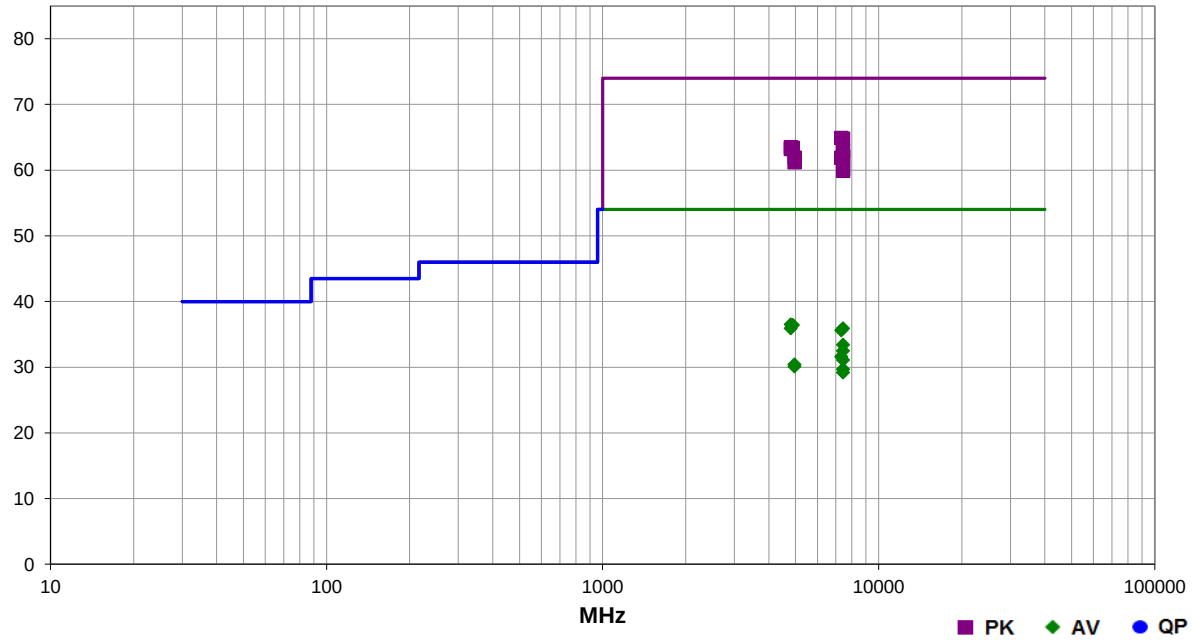
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2019.02.26

Work Order:	PAYR0015	**Date:**	19-Mar-2019		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	EV01	**Humidity:**	35.6% RH		
Serial Number:	2	**Barometric Pres.:**	1017 mbar	**Tested by:**	Jeff Alcoke
EUT:	BluKey Pro				
Configuration:	3				
Customer:	PayRange Inc.				
Attendees:	Michael Mitchell				
EUT Power:	24 VAC via 110VAC/60Hz				
Operating Mode:	BLE Tx, GFSK, Low Ch. = 2402 MHz, Mid Ch. = 2442 MHz, High Ch. = 2480 MHz, Maximum power setting, Duty cycle during test: 62.2%. Protocol limited duty cycle: 5.7%.				
Deviations:	None				
Comments:	See comments below for Channel and EUT orientation. Spot check measurements taken to show that installation of 0.5 pF at C11 does not generate failing emissions.				

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

Run #	39	**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
7326.750	51.7	13.2	2.6	144.0	0.0	0.0	Horz	PK	0.0	64.9	74.0	-9.1	Mid Ch, EUT Vert
7439.317	50.6	14.2	1.0	221.0	0.0	0.0	Horz	PK	0.0	64.8	74.0	-9.2	High Ch, EUT Vert
4804.542	58.9	4.6	2.6	24.0	0.0	0.0	Horz	PK	0.0	63.5	74.0	-10.5	Low Ch, EUT Vert
4884.533	58.0	5.4	1.1	166.0	0.0	0.0	Vert	PK	0.0	63.4	74.0	-10.6	Mid Ch, EUT on Side
4804.442	58.6	4.6	1.0	188.0	0.0	0.0	Vert	PK	0.0	63.2	74.0	-10.8	Low Ch, EUT on Side
4884.533	57.8	5.4	2.3	154.0	0.0	0.0	Horz	PK	0.0	63.2	74.0	-10.8	Mid Ch, EUT Vert
7439.350	48.7	14.2	2.8	116.0	0.0	0.0	Horz	PK	0.0	62.9	74.0	-11.1	High Ch, EUT Horz
7439.033	48.0	14.2	3.7	10.0	0.0	0.0	Vert	PK	0.0	62.2	74.0	-11.8	High Ch, EUT on Side
7439.342	47.7	14.2	1.0	17.0	0.0	0.0	Vert	PK	0.0	61.9	74.0	-12.1	High Ch, EUT Vert
7326.558	48.7	13.2	2.6	230.0	0.0	0.0	Vert	PK	0.0	61.9	74.0	-12.1	Mid Ch, EUT on Side
4959.483	56.3	5.6	2.4	167.0	0.0	0.0	Horz	PK	0.0	61.9	74.0	-12.1	High Ch, EUT Vert
4959.467	55.6	5.6	3.1	193.0	0.0	0.0	Vert	PK	0.0	61.2	74.0	-12.8	High Ch, EUT on Side
7439.375	46.0	14.2	1.7	52.0	0.0	0.0	Horz	PK	0.0	60.2	74.0	-13.8	High Ch, EUT on Side
7439.058	45.7	14.2	1.0	337.0	0.0	0.0	Vert	PK	0.0	59.9	74.0	-14.1	High Ch, EUT Horz
4803.967	54.8	4.5	2.6	24.0	-22.8	0.0	Horz	AV	0.0	36.5	54.0	-17.5	Low Ch, EUT Vert
4883.883	53.8	5.4	1.1	166.0	-22.8	0.0	Vert	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT on Side
4884.017	53.8	5.4	2.3	154.0	-22.8	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT Vert

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
7439.500	44.5	14.2	1.0	221.0	-22.8	0.0	Horz	AV	0.0	35.9	54.0	-18.1	High Ch, EUT Vert
4804.008	54.2	4.5	1.0	188.0	-22.8	0.0	Vert	AV	0.0	35.9	54.0	-18.1	Low Ch, EUT on Side
7326.442	45.2	13.2	2.6	144.0	-22.8	0.0	Horz	AV	0.0	35.6	54.0	-18.4	Mid Ch, EUT Vert
7439.417	42.0	14.2	2.8	116.0	-22.8	0.0	Horz	AV	0.0	33.4	54.0	-20.6	High Ch, EUT Horz
7439.525	41.1	14.2	3.7	10.0	-22.8	0.0	Vert	AV	0.0	32.5	54.0	-21.5	High Ch, EUT on Side
7326.417	41.2	13.2	2.6	230.0	-22.8	0.0	Vert	AV	0.0	31.6	54.0	-22.4	Mid Ch, EUT on Side
7439.492	39.7	14.2	1.0	17.0	-22.8	0.0	Vert	AV	0.0	31.1	54.0	-22.9	High Ch, EUT Vert
4959.933	47.6	5.6	2.4	167.0	-22.8	0.0	Horz	AV	0.0	30.4	54.0	-23.6	High Ch, EUT Vert
4959.933	47.3	5.6	3.1	193.0	-22.8	0.0	Vert	AV	0.0	30.1	54.0	-23.9	High Ch, EUT on Side
7439.483	38.3	14.2	1.7	52.0	-22.8	0.0	Horz	AV	0.0	29.7	54.0	-24.3	High Ch, EUT on Side
7439.467	37.8	14.2	1.0	337.0	-22.8	0.0	Vert	AV	0.0	29.2	54.0	-24.8	High Ch, EUT Horz

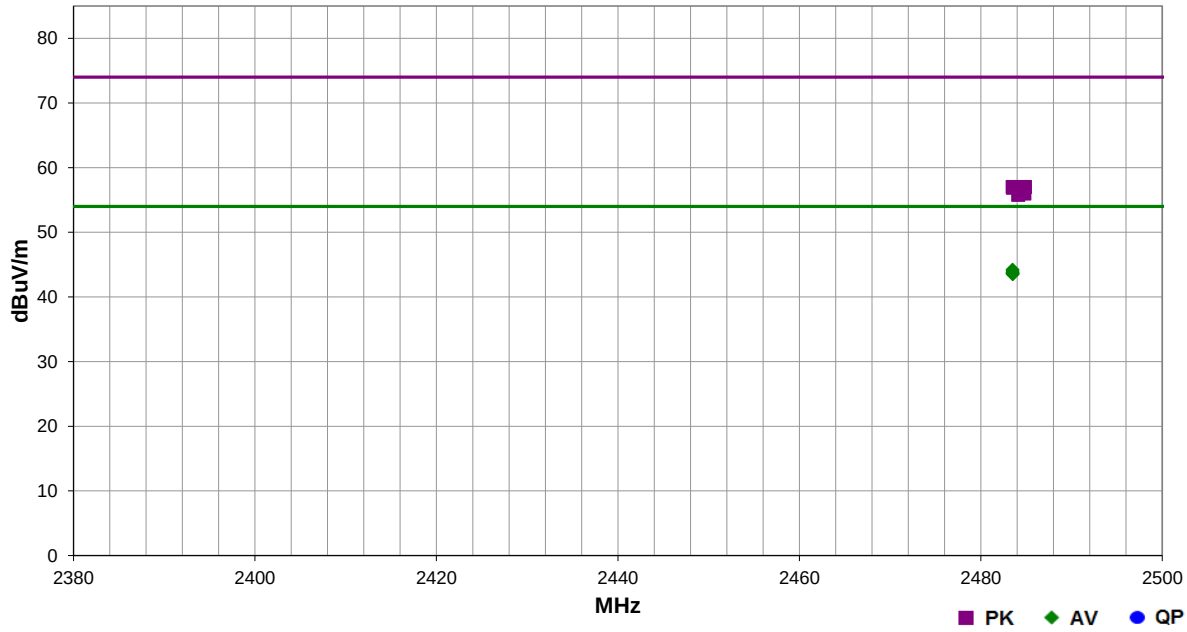
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2019.02.26

Work Order:	PAYR0015	**Date:**	19-Mar-2019		
Project:	None	**Temperature:**	20.1 °C		
Job Site:	EV01	**Humidity:**	42.2% RH		
Serial Number:	2	**Barometric Pres.:**	1016 mbar	**Tested by:**	Jeff Alcoke
EUT:	BluKey Pro				
Configuration:	3				
Customer:	PayRange Inc.				
Attendees:	Michael Mitchell				
EUT Power:	24 VAC via 110VAC/60Hz				
Operating Mode:	BLE Tx, GFSK, Low Ch. = 2402 MHz, Mid Ch. = 2442 MHz, High Ch. = 2480 MHz, Maximum power setting, Duty cycle during test: 62.2%. Protocol limited duty cycle: 5.7%.				
Deviations:	None				
Comments:	See comments below for Channel and EUT orientation. Spot check measurements taken to show that installation of 0.5 pF at C11 does not generate failing emissions.				

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

Run #	52	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.503	29.1	-4.9	1.0	320.0	3.0	20.0	Vert	AV	0.0	44.2	54.0	-9.8	High Ch, EUT Horz
2483.503	28.9	-4.9	4.0	250.0	3.0	20.0	Horz	AV	0.0	44.0	54.0	-10.0	High Ch, EUT on Side
2483.503	28.7	-4.9	1.0	235.0	3.0	20.0	Horz	AV	0.0	43.8	54.0	-10.2	High Ch, EUT Vert
2483.503	28.6	-4.9	1.0	98.0	3.0	20.0	Horz	AV	0.0	43.7	54.0	-10.3	High Ch, EUT Horz
2483.503	28.5	-4.9	1.0	50.0	3.0	20.0	Vert	AV	0.0	43.6	54.0	-10.4	High Ch, EUT Vert
2483.523	28.4	-4.9	1.9	170.0	3.0	20.0	Vert	AV	0.0	43.5	54.0	-10.5	High Ch, EUT on Side
2484.863	41.8	-4.8	1.0	50.0	3.0	20.0	Vert	PK	0.0	57.0	74.0	-17.0	High Ch, EUT Vert
2483.517	41.9	-4.9	4.0	250.0	3.0	20.0	Horz	PK	0.0	57.0	74.0	-17.0	High Ch, EUT on Side
2483.543	41.8	-4.9	1.0	320.0	3.0	20.0	Vert	PK	0.0	56.9	74.0	-17.1	High Ch, EUT Horz
2484.220	41.5	-4.8	1.0	235.0	3.0	20.0	Horz	PK	0.0	56.7	74.0	-17.3	High Ch, EUT Vert
2484.803	40.8	-4.8	1.9	170.0	3.0	20.0	Vert	PK	0.0	56.0	74.0	-18.0	High Ch, EUT on Side
2484.117	40.7	-4.9	1.0	98.0	3.0	20.0	Horz	PK	0.0	55.8	74.0	-18.2	High Ch, EUT Horz

DUTY CYCLE

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	27-Jul-18	27-Jul-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

element

TbtTx 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**23-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**21.4 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**39.5% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation.

DEVIATIONS FROM TEST STANDARD

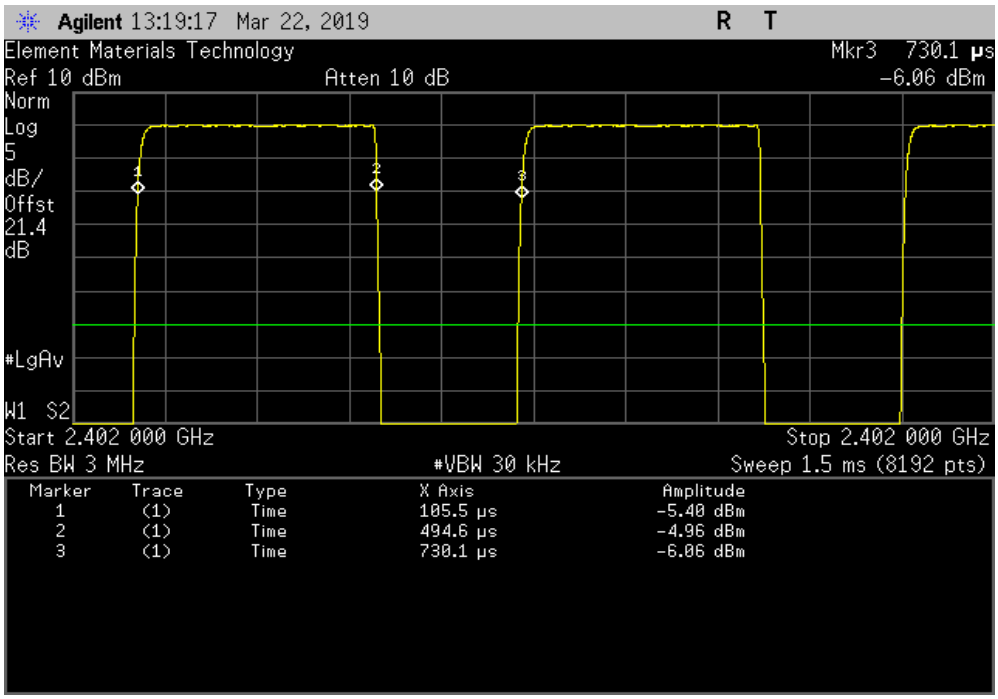
None

Configuration #	**2**	*Signature*

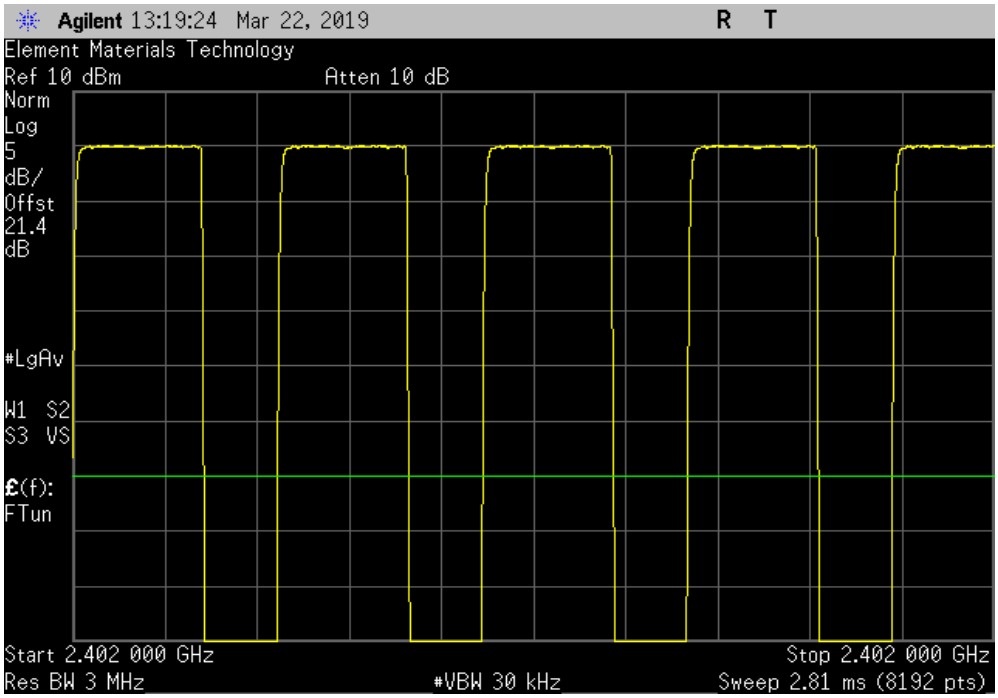
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	389.03 us	624.513 us	1	62.3	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	389.604 us	624.681 us	1	62.4	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	390.655 us	625.179 us	1	62.5	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	389.03 us	624.513 us	1	62.3	N/A	N/A

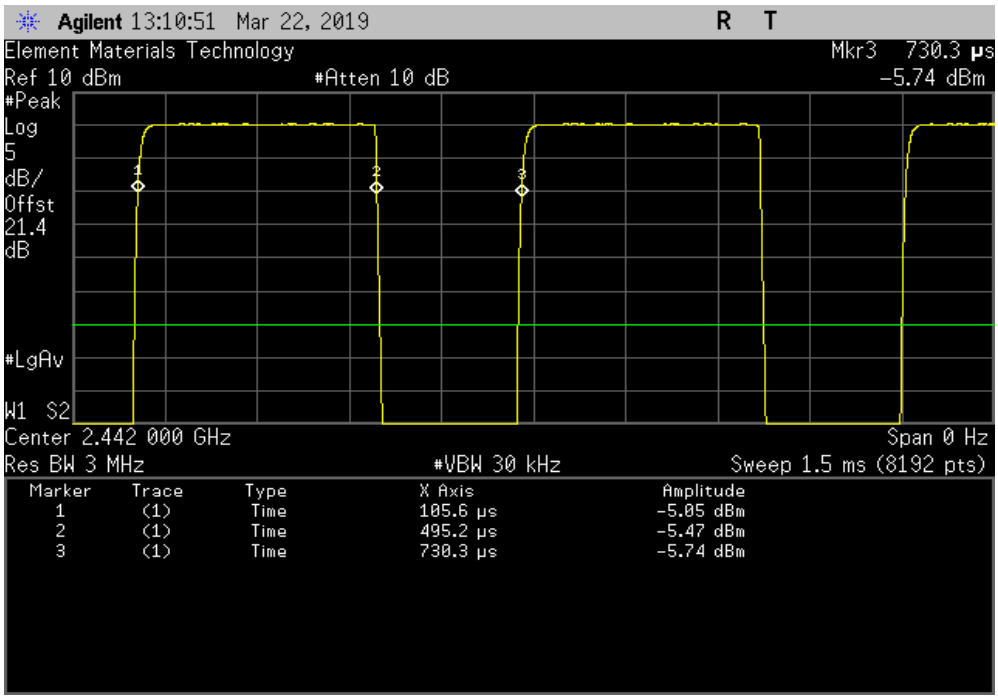


BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

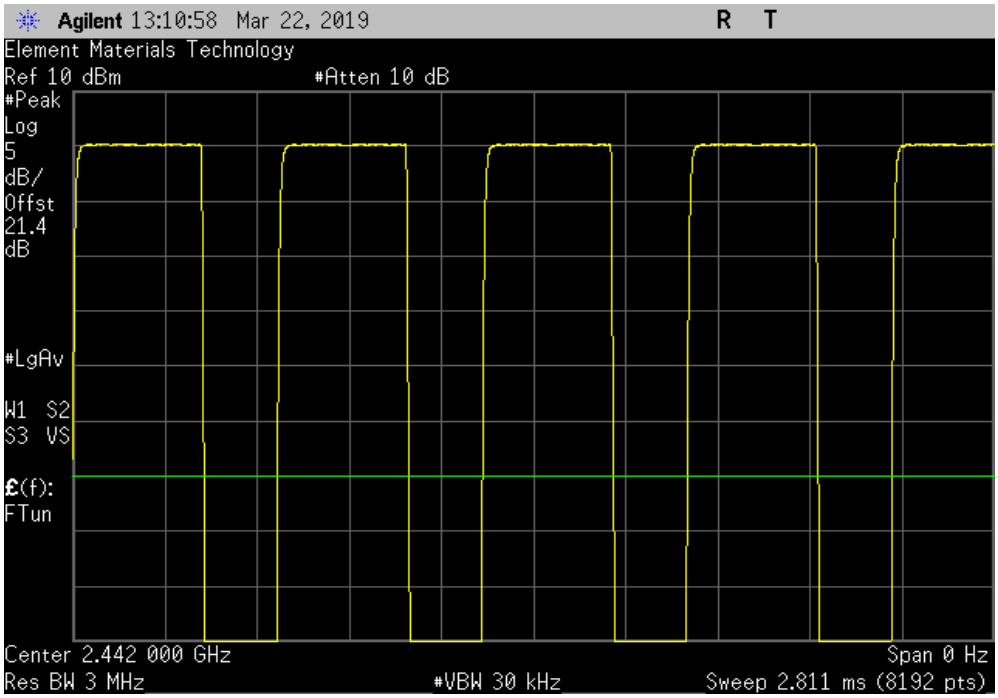


DUTY CYCLE

BLE/GFSK Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	389.604 us	624.681 us	1	62.4	N/A	N/A

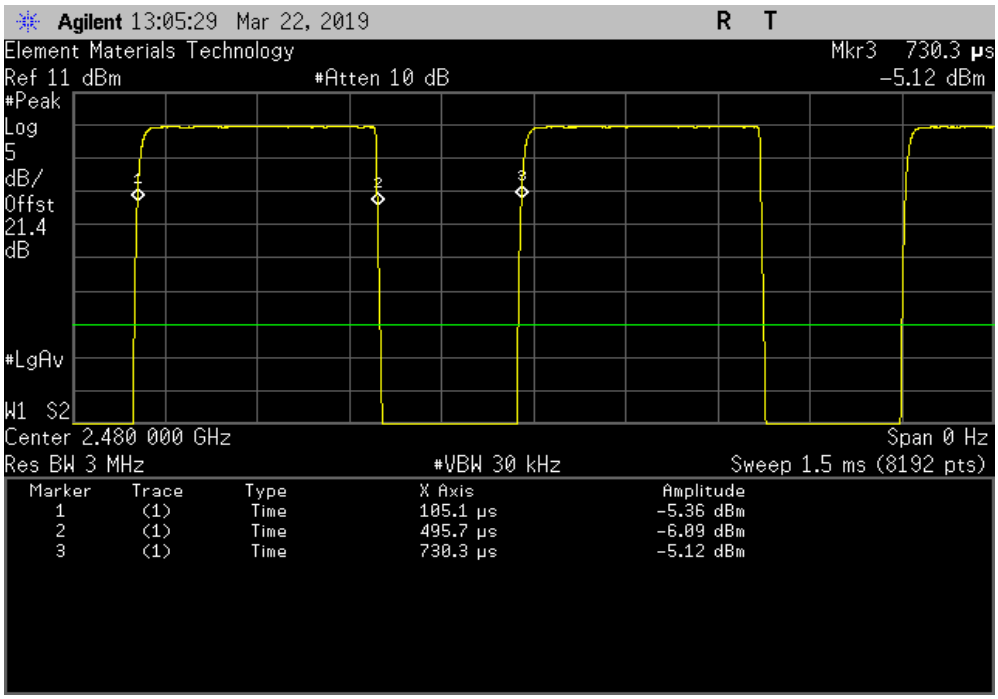


BLE/GFSK Mid Channel, 2442 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

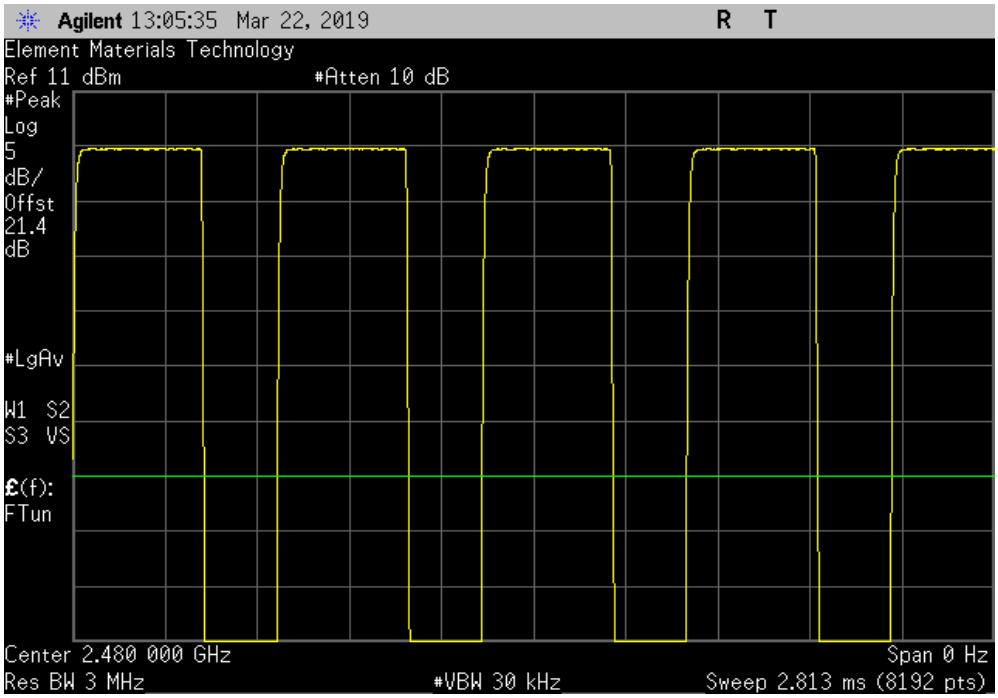


DUTY CYCLE

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	390.655 us	625.179 us	1	62.5	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 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	27-Jul-18	27-Jul-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 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**23-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**21.3 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**39.2% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation.

DEVIATIONS FROM TEST STANDARD

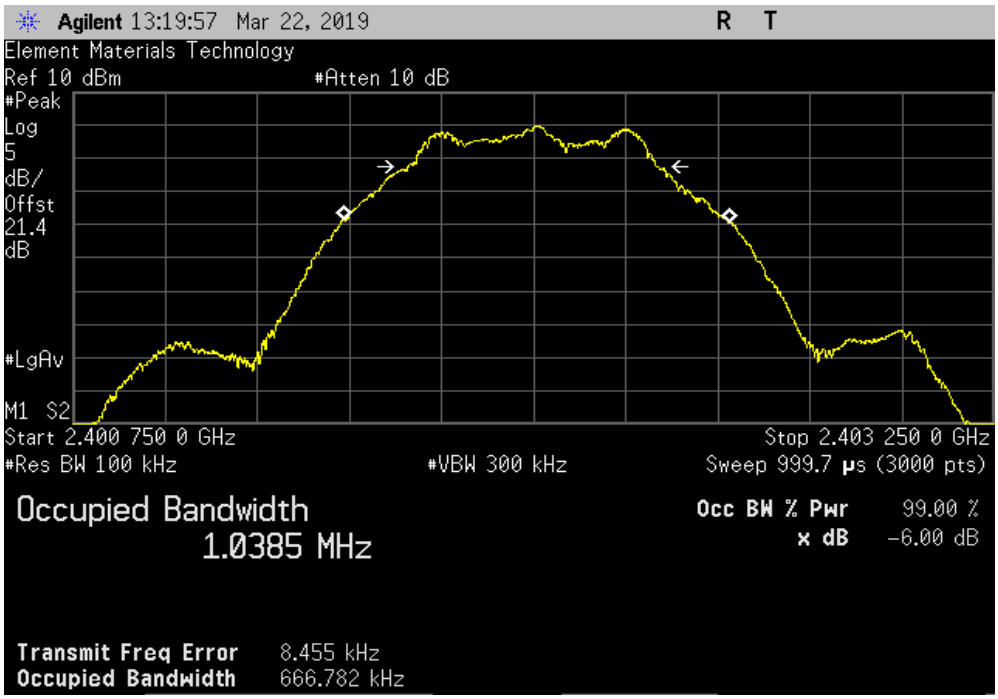
None

Configuration #	**2**	*Signature* 

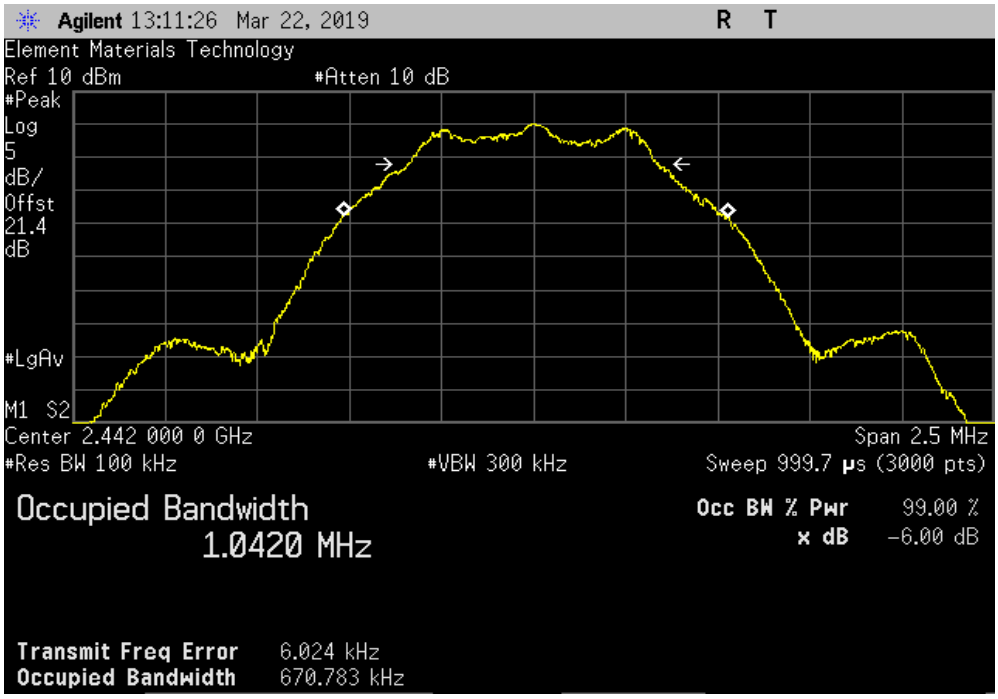
	Value	**Limit (≥)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	666.782 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2442 MHz	670.783 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	667.308 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

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

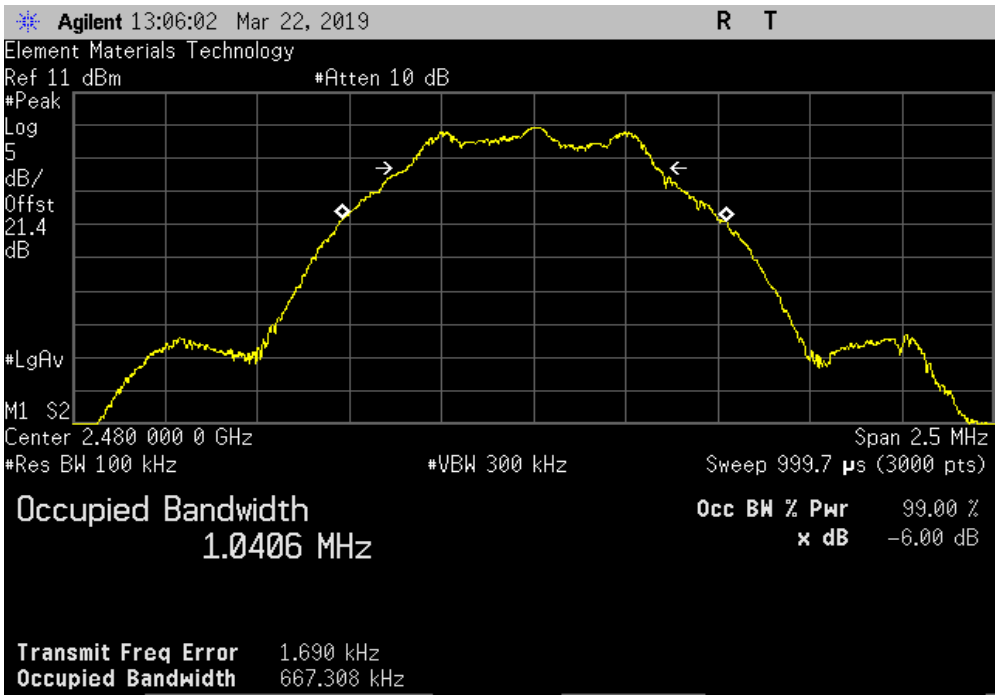


BLE/GFSK Mid Channel, 2442 MHz						
				Value	Limit (≥)	Result
				670.783 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

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



OUTPUT POWER

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19

TEST DESCRIPTION

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

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

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

OUTPUT POWER

TbtTx 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**22-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**20.1 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**43% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation. Measurements were taken to show the effects of adding 0.5 pF capacitor to C11.

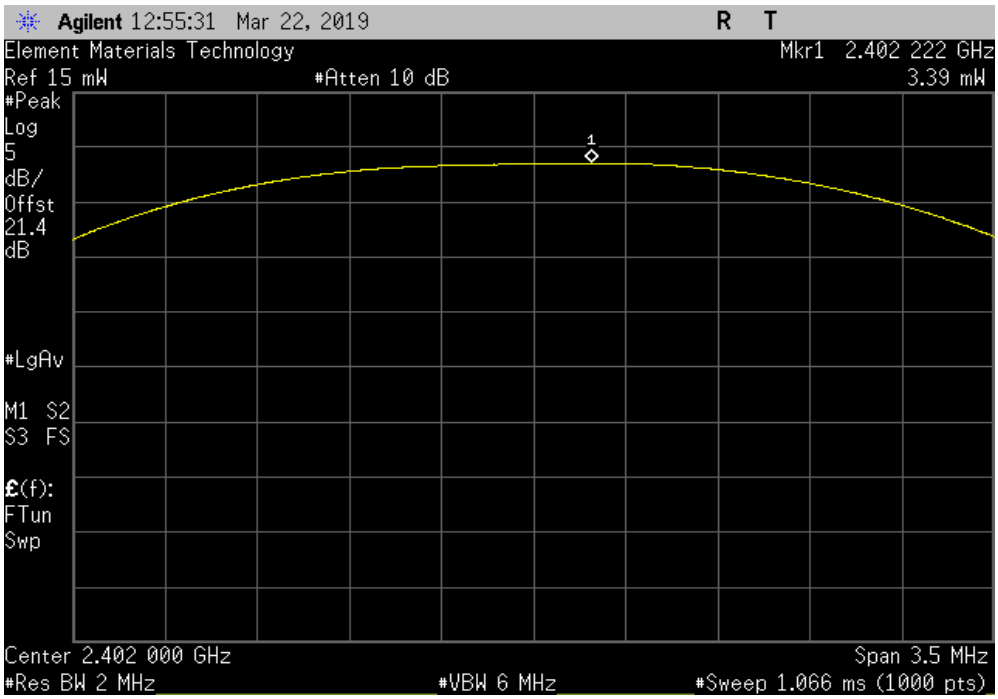
DEVIATIONS FROM TEST STANDARD

None

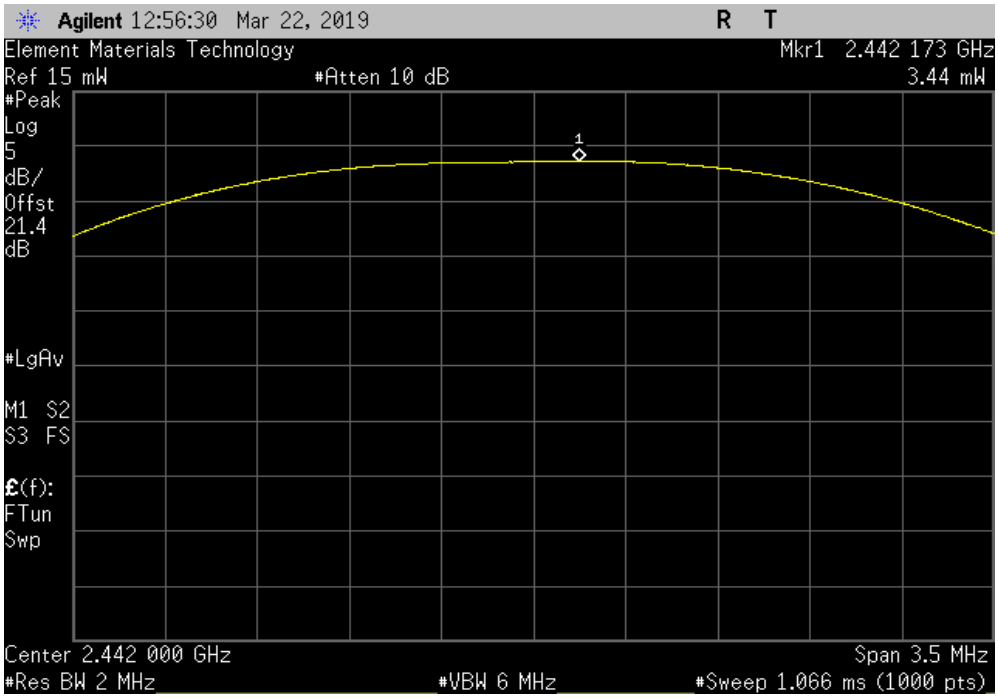
Configuration #	**2**	*Signature*

	Value	**Limit (<)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	3.395 mW	1 W	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.441 mW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	3.920 mW	1 W	Pass

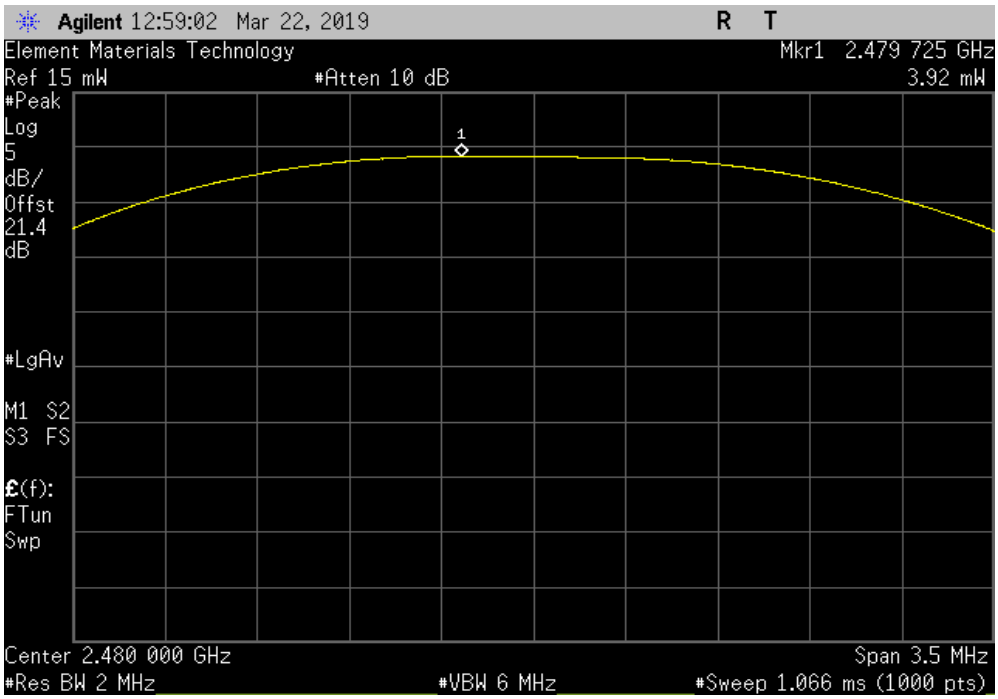
BLE/GFSK Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				3.395 mW	1 W	Pass



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



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



EQUIVALENT ISOTROPIC RADIATED POWER

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19

TEST DESCRIPTION

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

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

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio. The actual antenna gain of the EUT was added to the conducted output power to derive the EIRP values.

EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**22-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**20.1 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**43% RH**
Project:	**None**			**Barometric Pres.:**	**1017 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation. Measurements were taken to show the effects of adding 0.5 pF capacitor to C11.

DEVIATIONS FROM TEST STANDARD

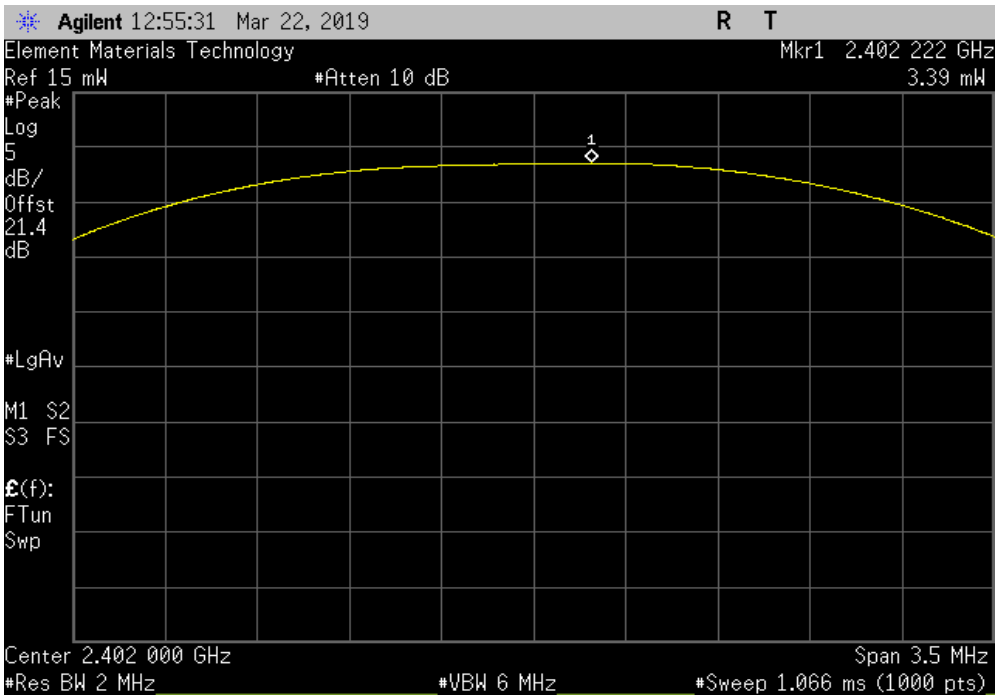
None

Configuration #	**2**	*Signature*

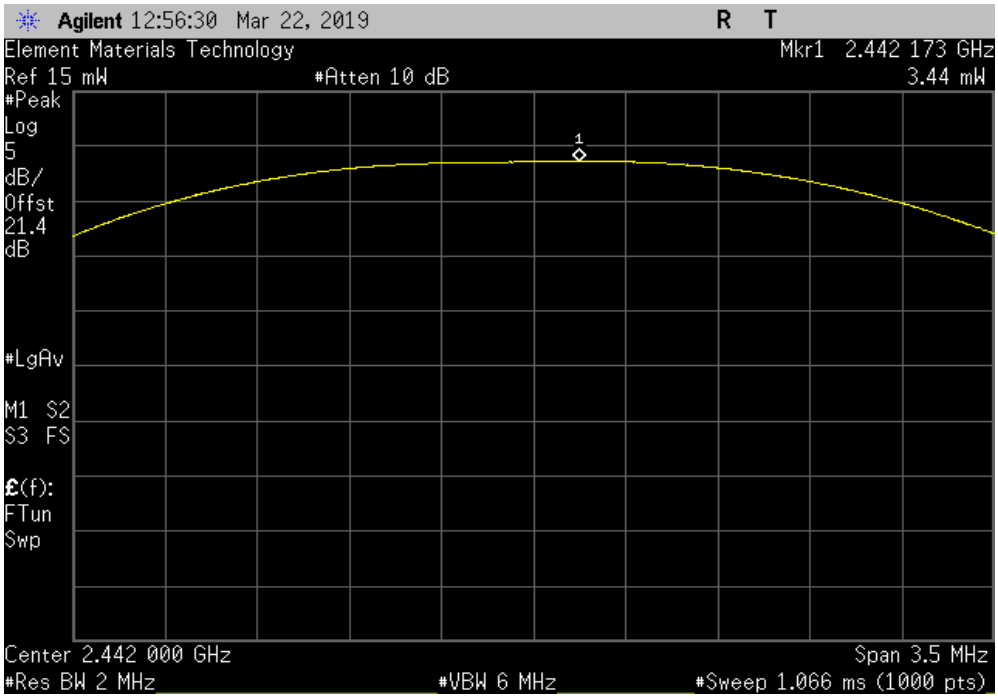
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (< dBm)	Result
BLE/GFSK Low Channel, 2402 MHz	3.395	5.31	3	8.31	36	Pass
BLE/GFSK Mid Channel, 2442 MHz	3.441	5.37	3	8.37	36	Pass
BLE/GFSK High Channel, 2480 MHz	3.920	5.93	3	8.93	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

BLE/GFSK Low Channel, 2402 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (< dBm)	Result
	3.395	5.31	3	8.31	36	Pass

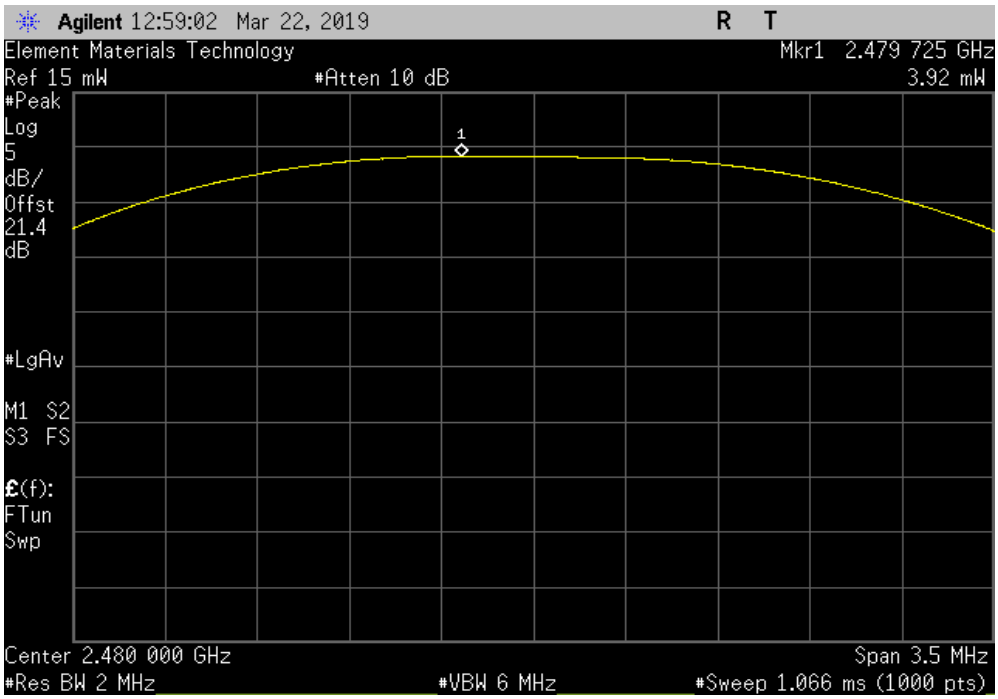


BLE/GFSK Mid Channel, 2442 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (< dBm)	Result
	3.441	5.37	3	8.37	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

BLE/GFSK High Channel, 2480 MHz						
	Value (mW)	Value (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (< dBm)	Result
	3.920	5.93	3	8.93	36	Pass



POWER SPECTRAL DENSITY

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMU	18-Jan-19	18-Jan-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	27-Jul-18	27-Jul-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 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**23-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**21.3 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**39.2% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation.

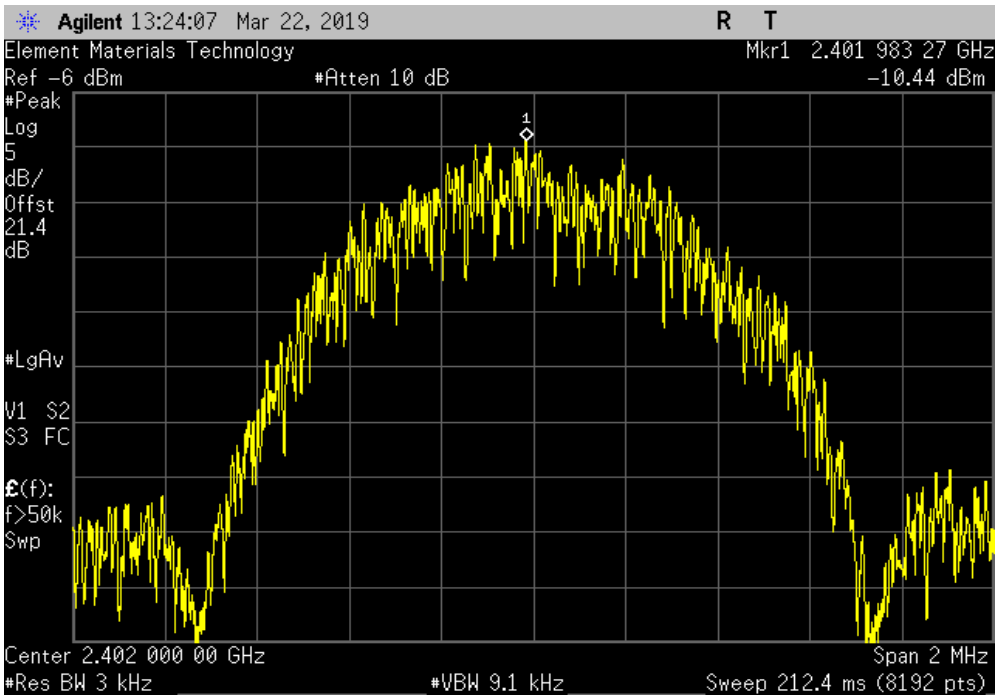
DEVIATIONS FROM TEST STANDARD

None

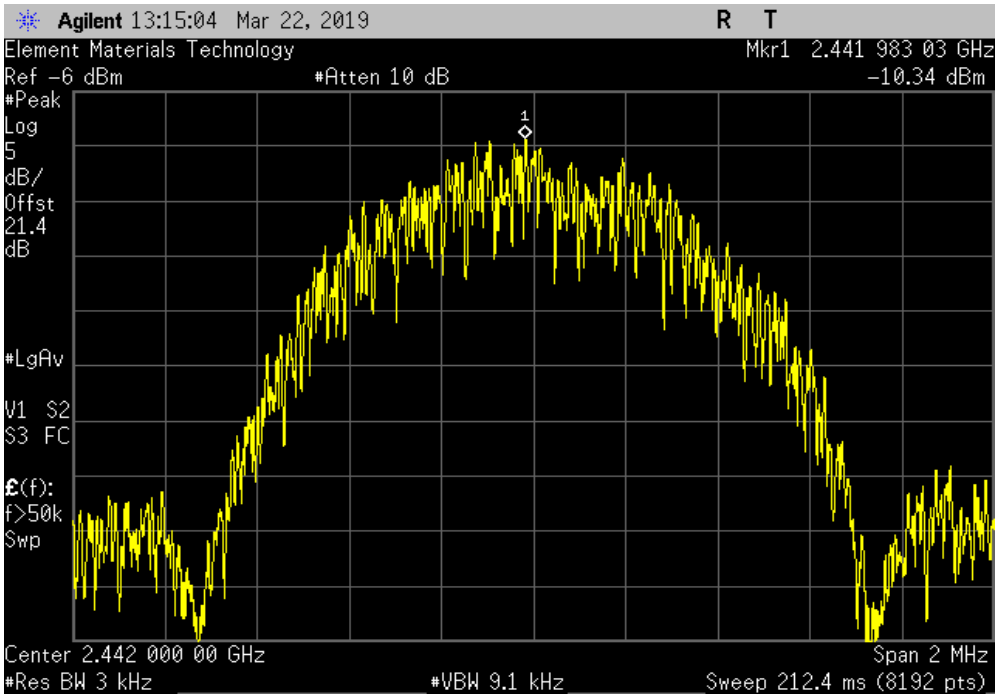
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
BLE/GFSK Low Channel, 2402 MHz	-10.439	8	Pass
BLE/GFSK Mid Channel, 2442 MHz	-10.336	8	Pass
BLE/GFSK High Channel, 2480 MHz	-9.532	8	Pass

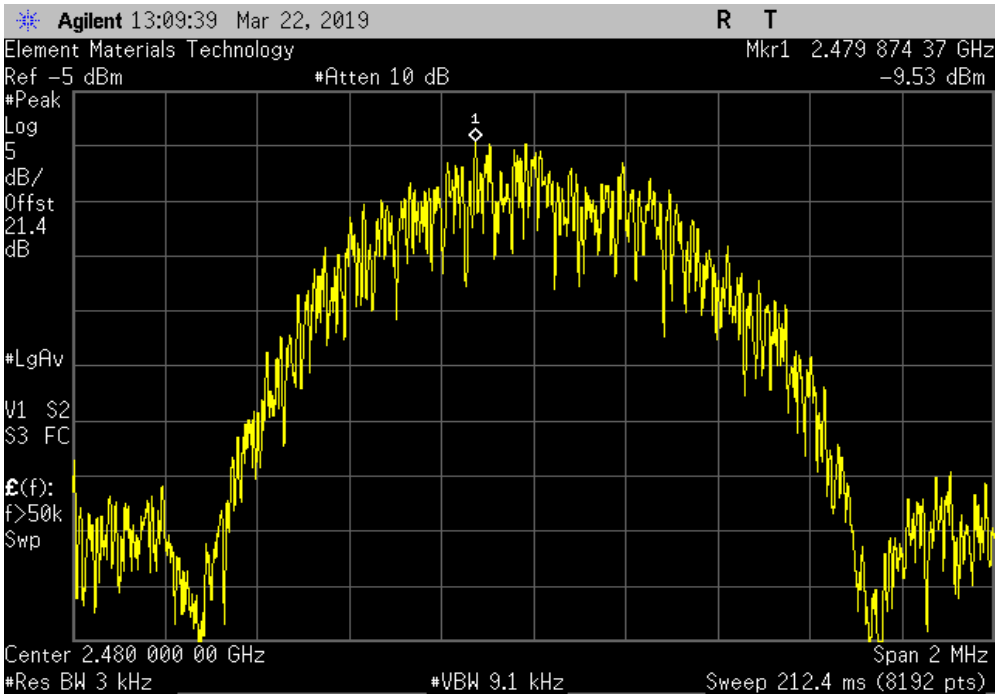
BLE/GFSK Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.439	8	Pass



BLE/GFSK Mid Channel, 2442 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.336	8	Pass



BLE/GFSK High Channel, 2480 MHz							
					Value dBm/3kHz	Limit < dBm/3kHz	Results
					-9.532	8	Pass



BAND EDGE COMPLIANCE

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	27-Jul-18	27-Jul-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 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**23-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**21.3 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**39.1% RH**
Project:	**None**			**Barometric Pres.:**	**1014 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation.

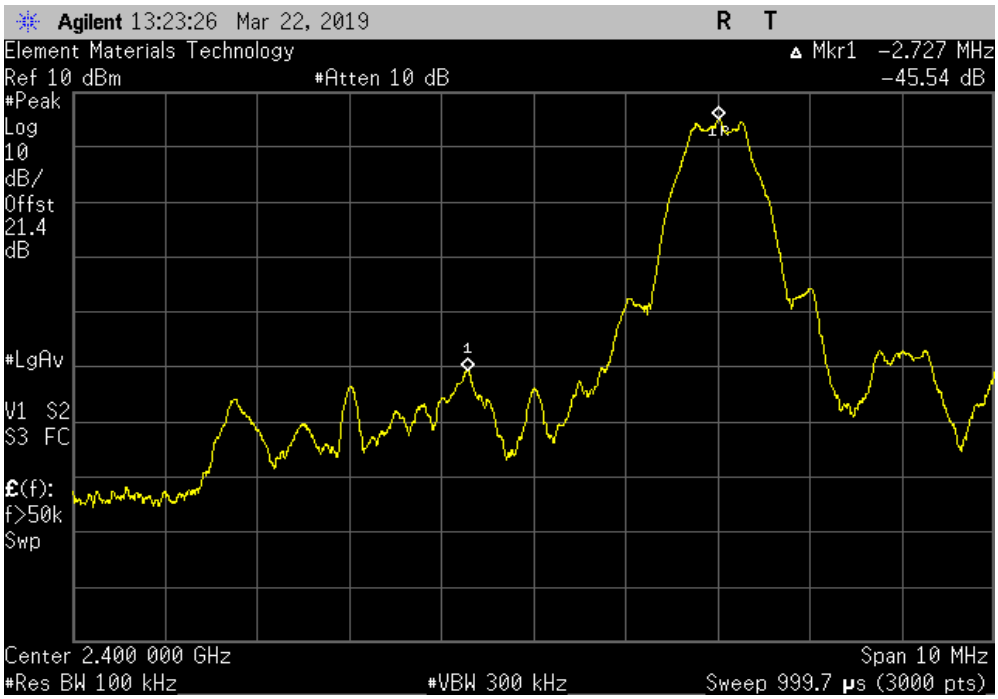
DEVIATIONS FROM TEST STANDARD

None

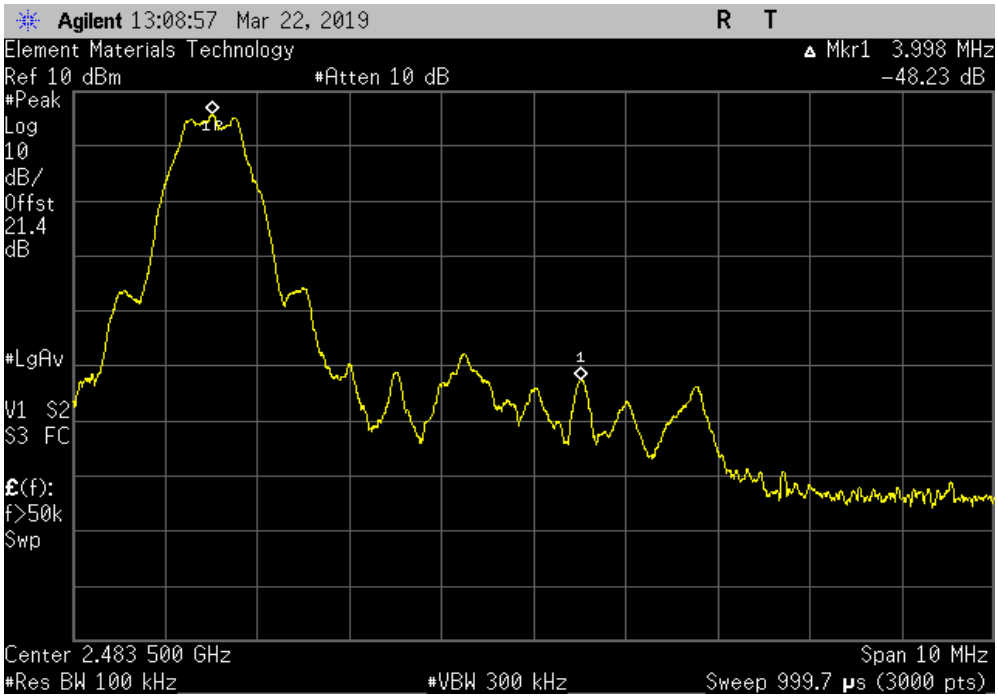
Configuration #	**2**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
BLE/GFSK Low Channel, 2402 MHz	-45.54	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-48.23	-20	Pass

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.54	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-48.23	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2019.02.26

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	N5182B	TFU	5-Nov-18	5-Nov-21
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	S.M. Electronics	SA26B-20	AUY	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	27-Jul-18	27-Jul-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 2018.09.13 XMit 2019.02.26

EUT:	**BluKey Pro**			**Work Order:**	**PAYR0015**
Serial Number:	**2**			**Date:**	**23-Mar-19**
Customer:	**PayRange Inc.**			**Temperature:**	**21.4 °C**
Attendees:	**Michael Mitchell**			**Humidity:**	**39.4% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**24 VAC via 110VAC/60Hz**	**Job Site:**	**EV06**

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

COMMENTS

Referenece level offset includes Cable loss and inline attenuation.

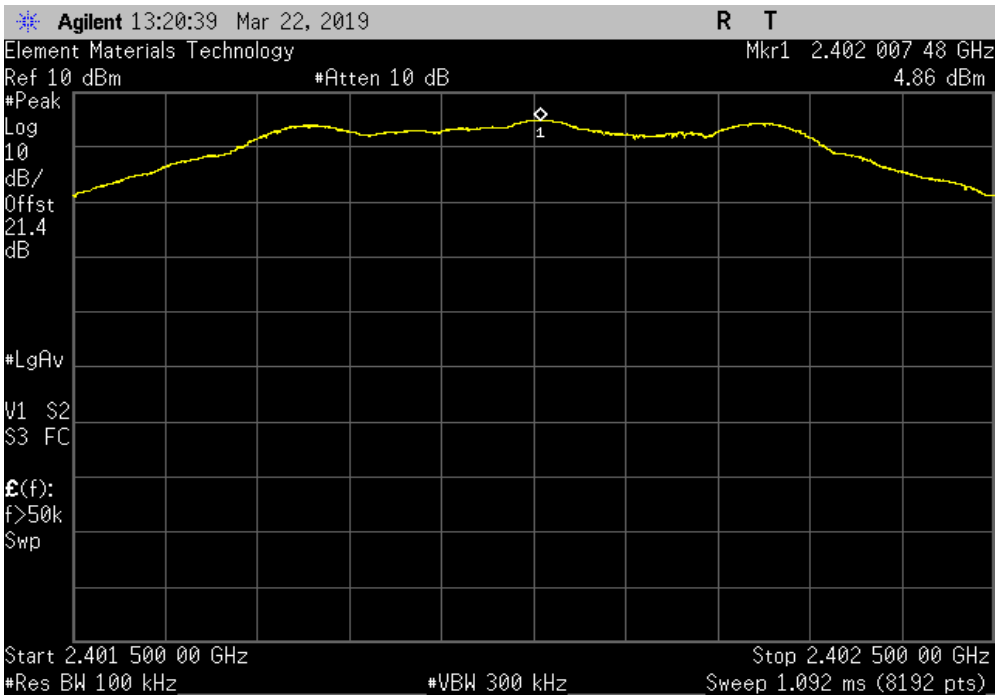
DEVIATIONS FROM TEST STANDARD

None

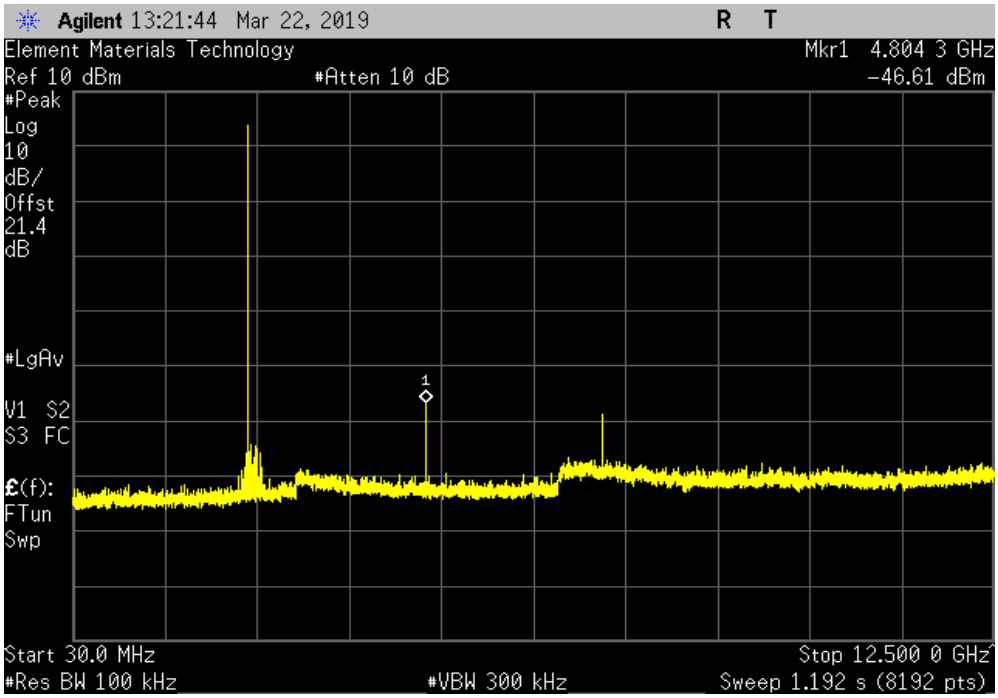
Configuration #	**2**	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	2402.01	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	4804.3	-51.47	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	13333.2	-57.99	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	Fundamental	2442.01	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz	30 MHz - 12.5 GHz	7326.9	-48.73	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz	12.5 GHz - 25 GHz	13656.8	-58.01	-20	Pass
BLE/GFSK High Channel, 2480 MHz	Fundamental	2480.01	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	30 MHz - 12.5 GHz	7439.5	-46.18	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	13655.2	-59.08	-20	Pass

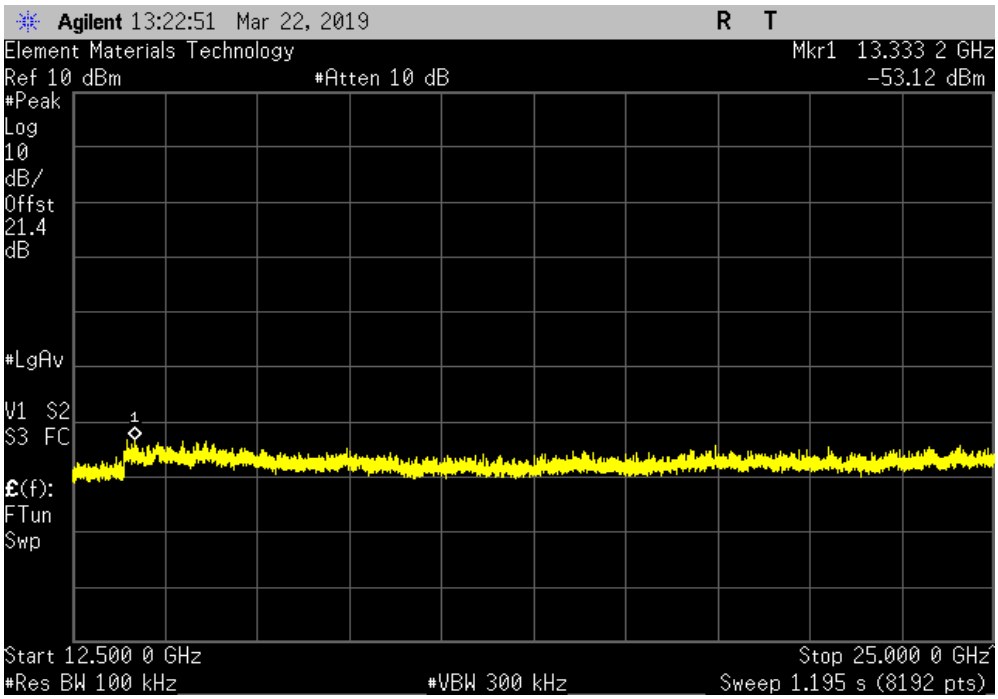
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2402.01	N/A	N/A	N/A



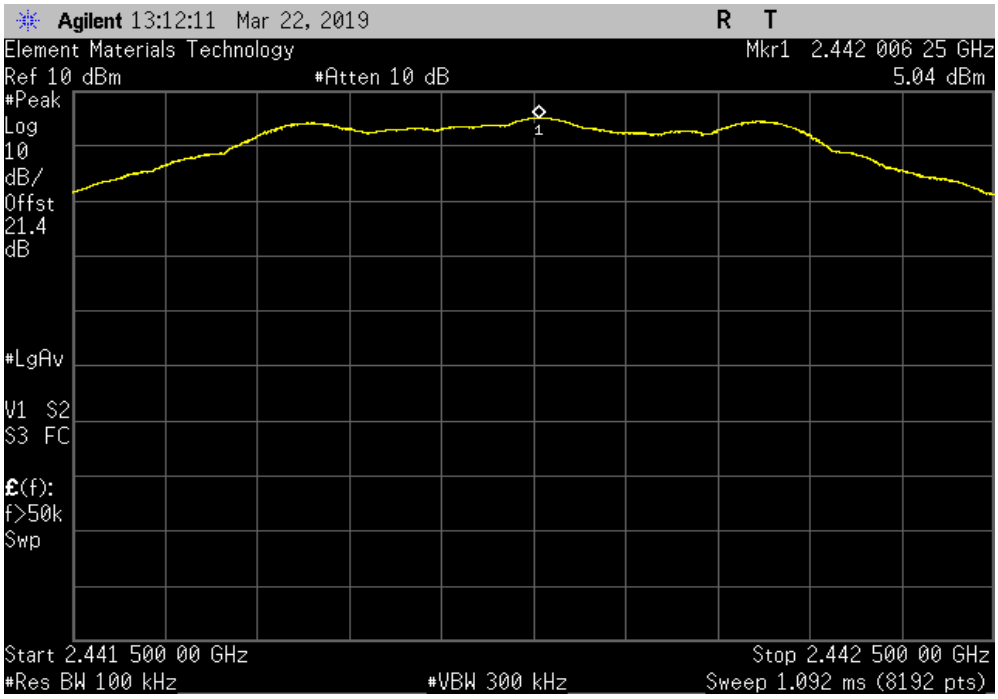
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	4804.3	-51.47	-20	Pass



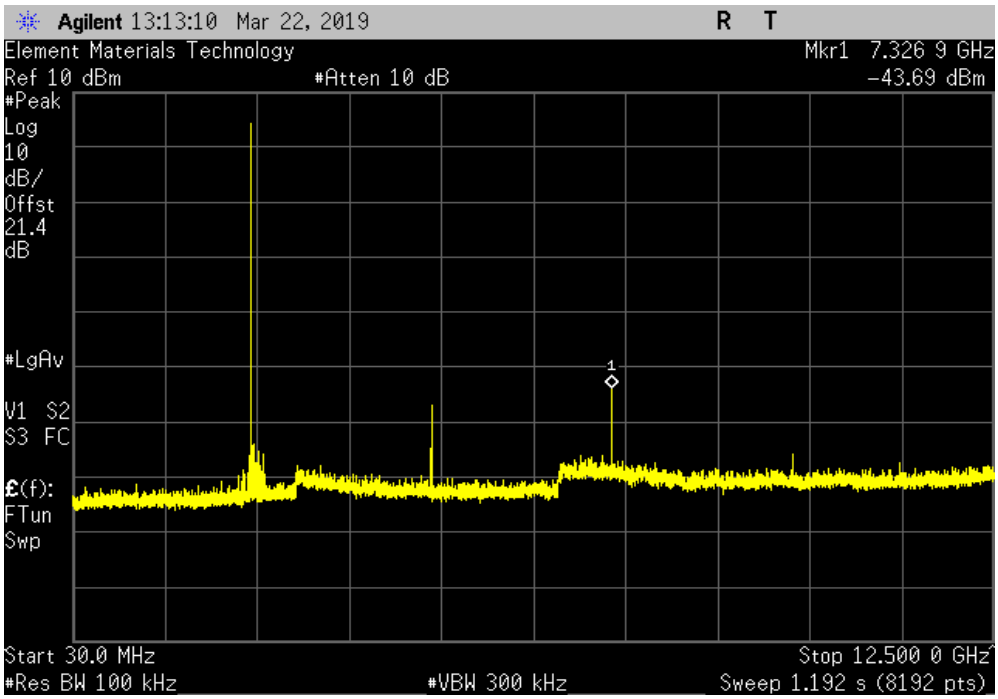
BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	13333.2	-57.99	-20	Pass



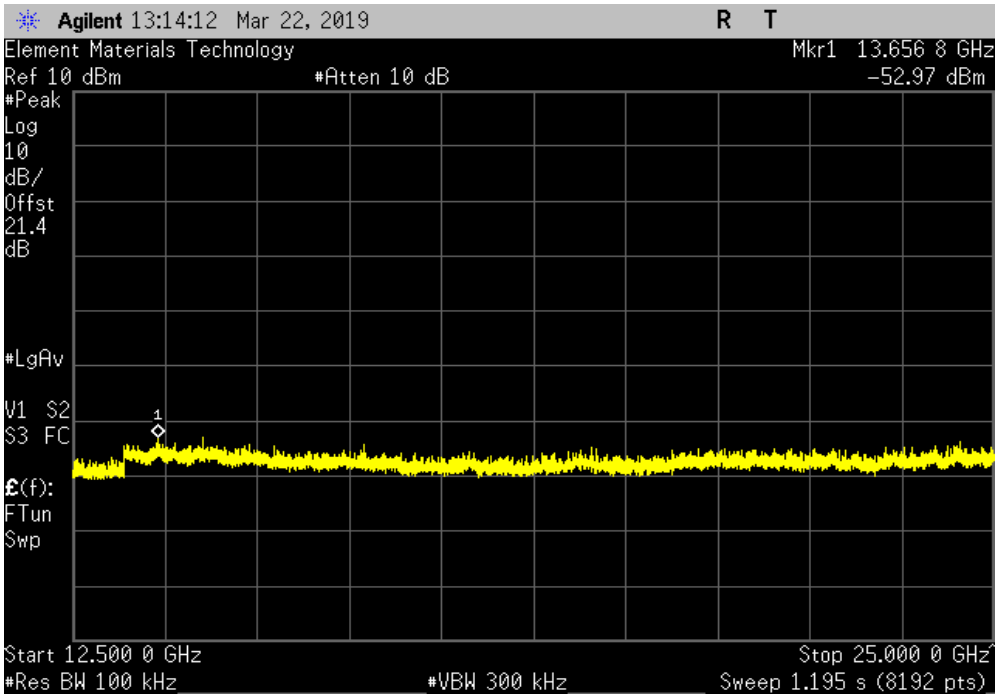
BLE/GFSK Mid Channel, 2442 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2442.01	N/A	N/A	N/A



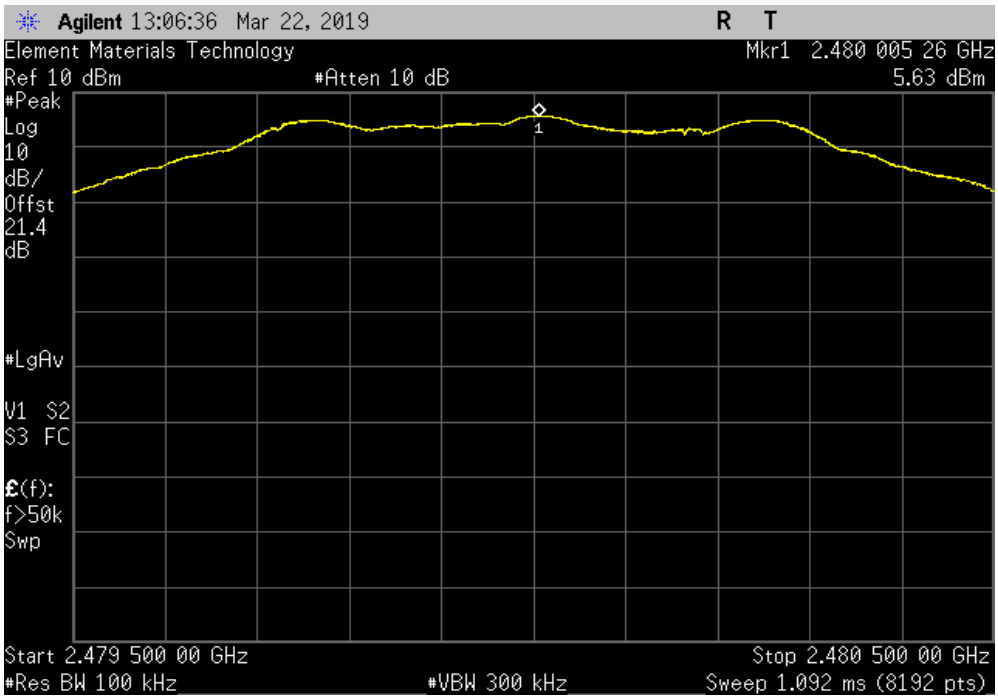
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz	7326.9	-48.73	-20	Pass



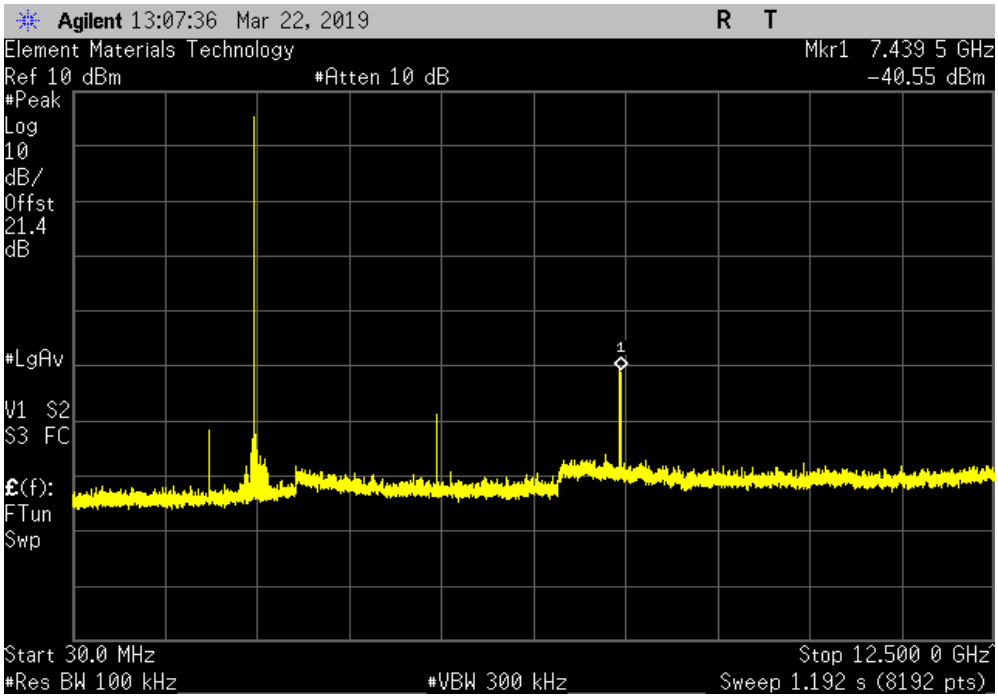
BLE/GFSK Mid Channel, 2442 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	13656.8	-58.01	-20	Pass



BLE/GFSK High Channel, 2480 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	2480.01	N/A	N/A	N/A



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	7439.5	-46.18	-20	Pass



BLE/GFSK High Channel, 2480 MHz				
Frequency Range	**Measured Freq (MHz)**	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz	13655.2	-59.08	-20	Pass