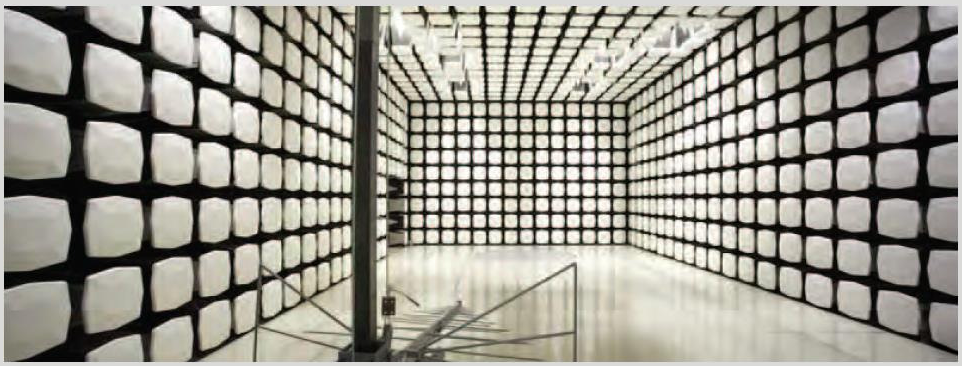
Starkey Laboratories, Inc.

The Dash Pro Right

FCC 15.247:2017

Bluetooth Radio

Report # STAK0082.2



NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

2017-1-25

Last Date of Test: March 8, 2017
Starkey Laboratories, Inc.
Model: The Dash Pro Right

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2017	ANSI C63.10:2013
	KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC - Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
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	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Dean Ghizzone, General 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

2017.1.25

United States

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

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows 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 – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

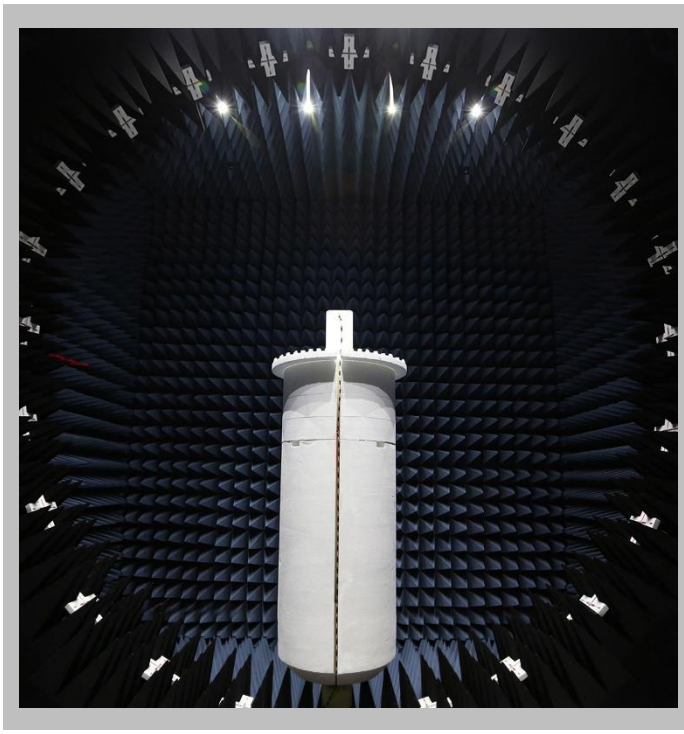
SCOPE

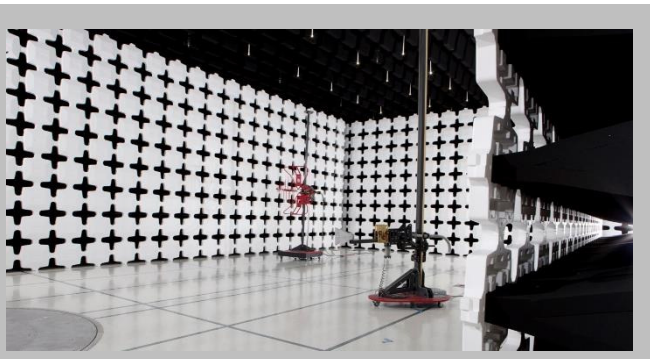
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

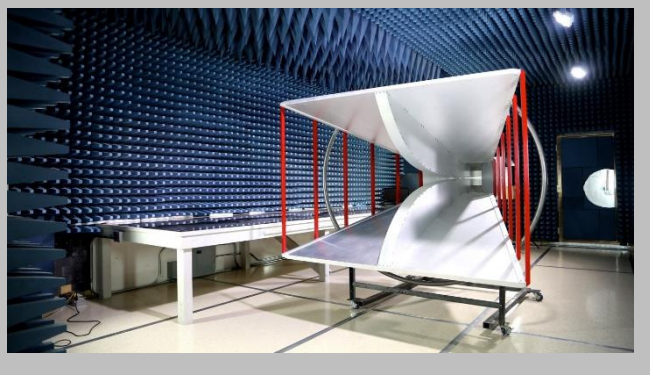
FACILITIES

2017.3.2

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

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

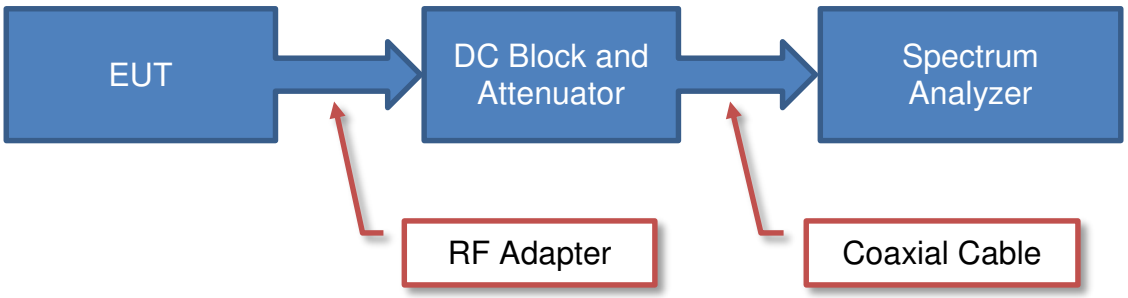
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

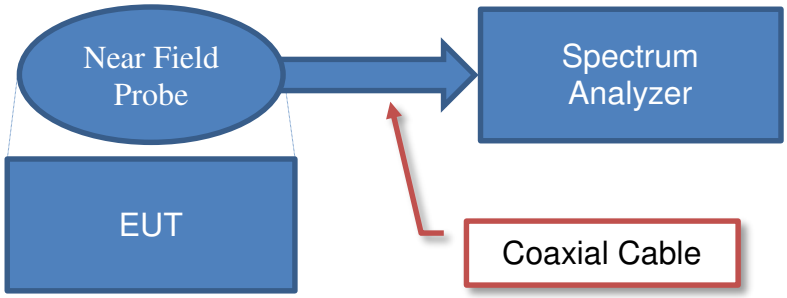
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

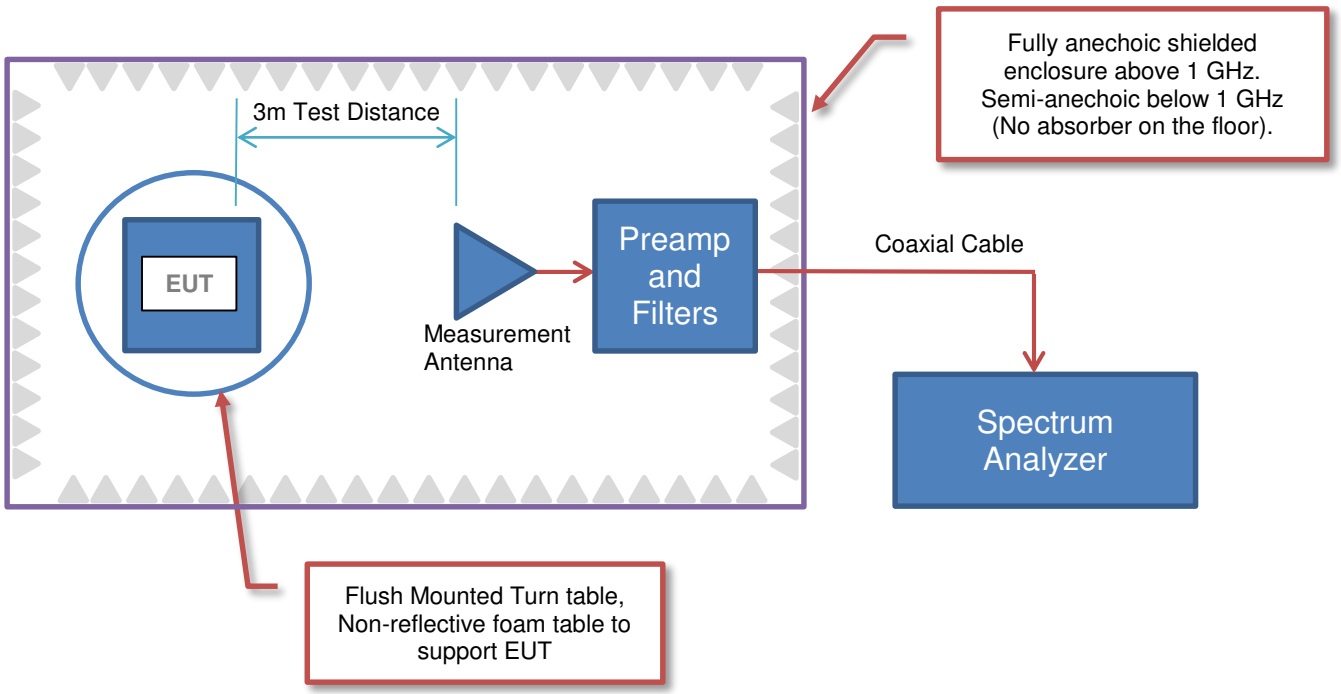
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Starkey Laboratories, Inc.
Address:	6600 Washington Ave. SO.
City, State, Zip:	Eden Prairie, MN 55344
Test Requested By:	Bill Mitchell
Model:	The Dash Pro Right
First Date of Test:	March 3, 2017
Last Date of Test:	March 8, 2017
Receipt Date of Samples:	March 3, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Earphone containing both a 10.6 MHz NFMI radio and a 2.4 GHz Bluetooth Radio utilizing both Bluetooth Classic (BR/EDR) and Bluetooth Low Energy.

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

CONFIGURATIONS

Configuration STAK0082- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Earphone	Starkey Laboratories, Inc.	The Dash Pro Right	FCC-2

Configuration STAK0082- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Earphones	Starkey Laboratories, Inc.	The Dash Pro Right	FCC-1C

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB Board	CSR	CNS10020V5A	361972
Laptop 1	Lenovo	T460p	PF0MVAWB
AC Adapter (Laptop 1)	Lenovo	ADLX90NCC2A	11S45N0251Z1ZS9C65BJ57

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Serial Cable	No	.30m	No	Wireless Earphones	USB Board
USB Cable	No	1.3m	Yes	USB Board	Laptop 1
AC Mains Cable 1	No	1.0m	No	AC Adapter (Laptop 1)	AC Mains
DC Cable 1	No	1.8m	Yes	AC Adapter (Laptop 1)	Laptop 1

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/3/2017	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	3/8/2017	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.
3	3/8/2017	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
4	3/8/2017	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	3/8/2017	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.
6	3/8/2017	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.
7	3/8/2017	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE

XMit 2017.01.26

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	Agilent	N5182A	TIF	8/12/2014	8/12/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

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 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			Work Order:	STAK0082
Serial Number:	FCC-1C			Date:	03/08/17
Customer:	Starkey Laboratories, Inc.			Temperature:	22.8 °C
Attendees:	Michael Thompson			Humidity:	18.7% RH
Project:	None			Barometric Pres.:	1019 mbar
Tested by:	Dustin Sparks	Power:	110VAC/60Hz	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

DEVIATIONS FROM TEST STANDARD

None

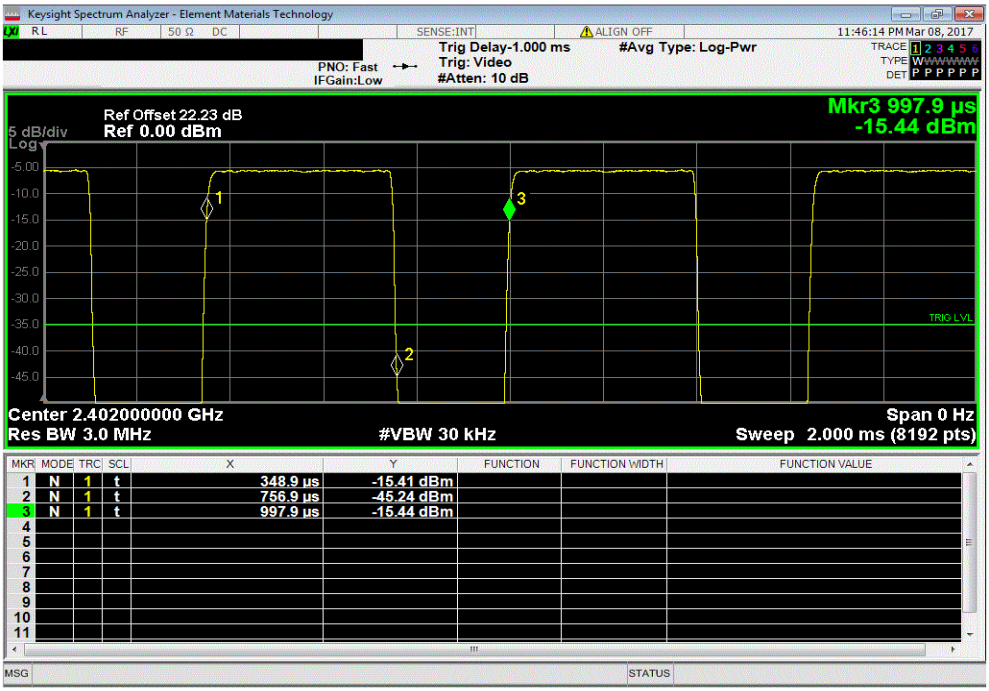
Configuration #	6	Signature

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK Low Channel, 2402 MHz	408 us	649 us	1	62.9	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	406.3 us	649 us	1	62.6	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	406.3 us	649.3 us	1	62.6	N/A	N/A
BLE/GFSK High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

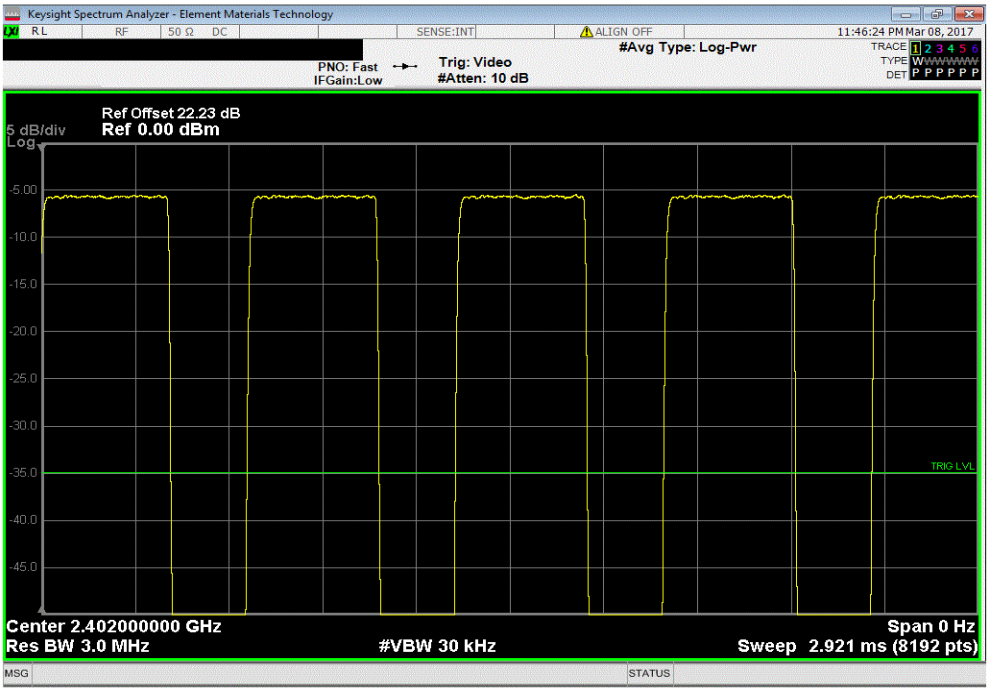
DUTY CYCLE

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	408 us	649 us	1	62.9	N/A	N/A



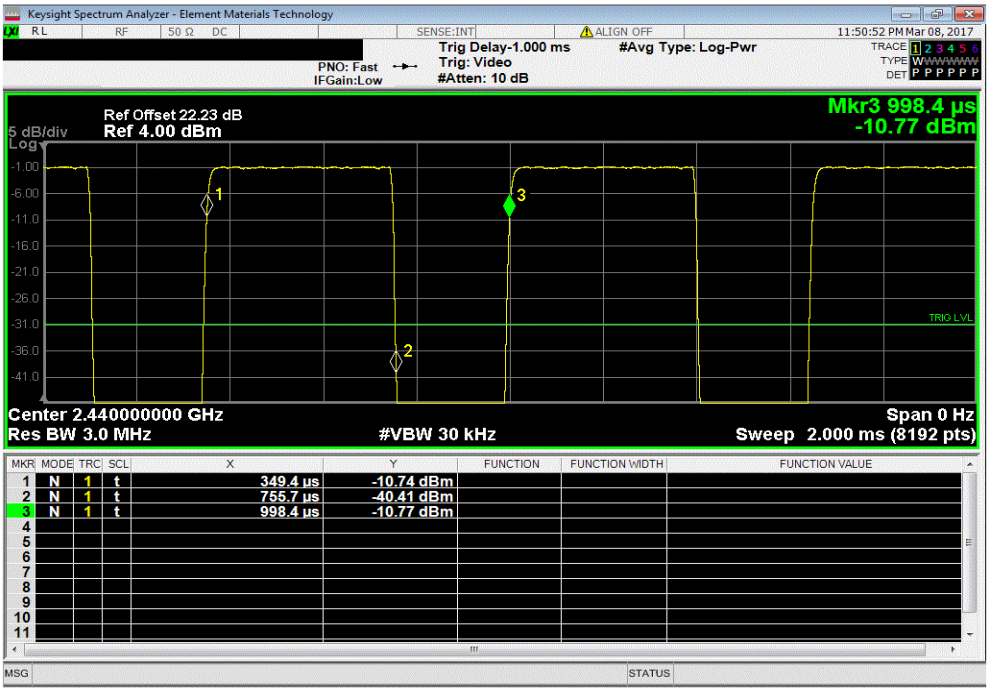
BLE/GFSK Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



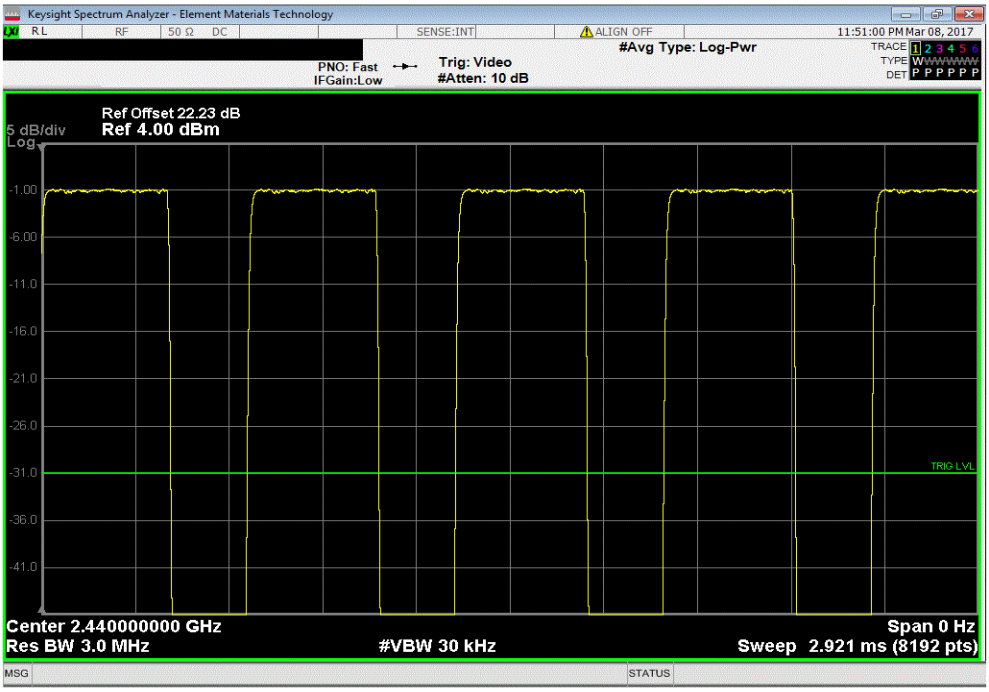
DUTY CYCLE

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.3 us	649 us	1	62.6	N/A	N/A



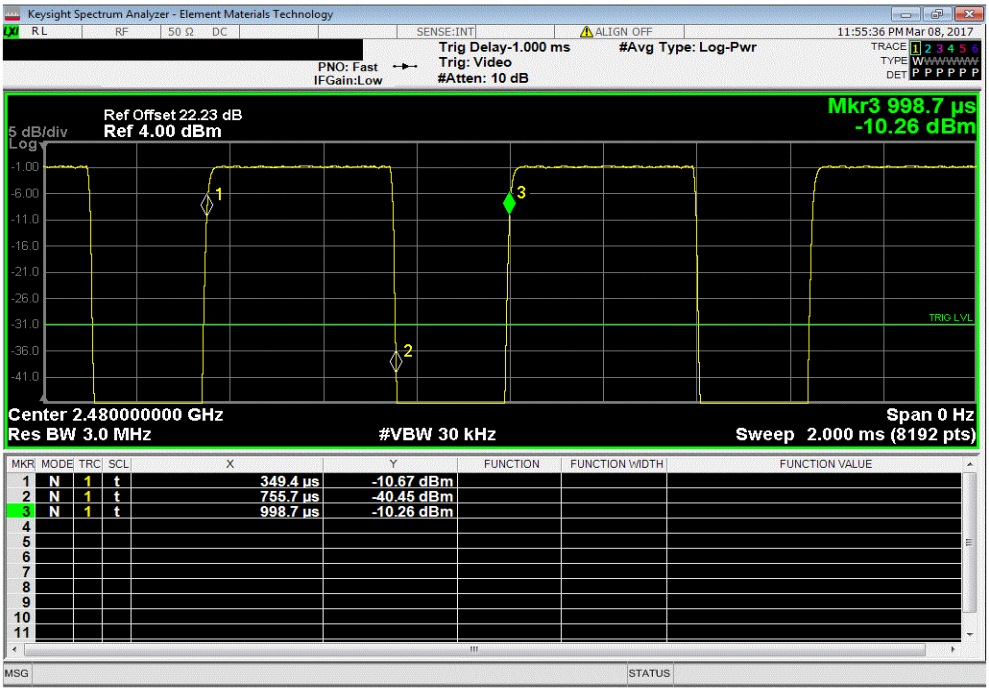
BLE/GFSK Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



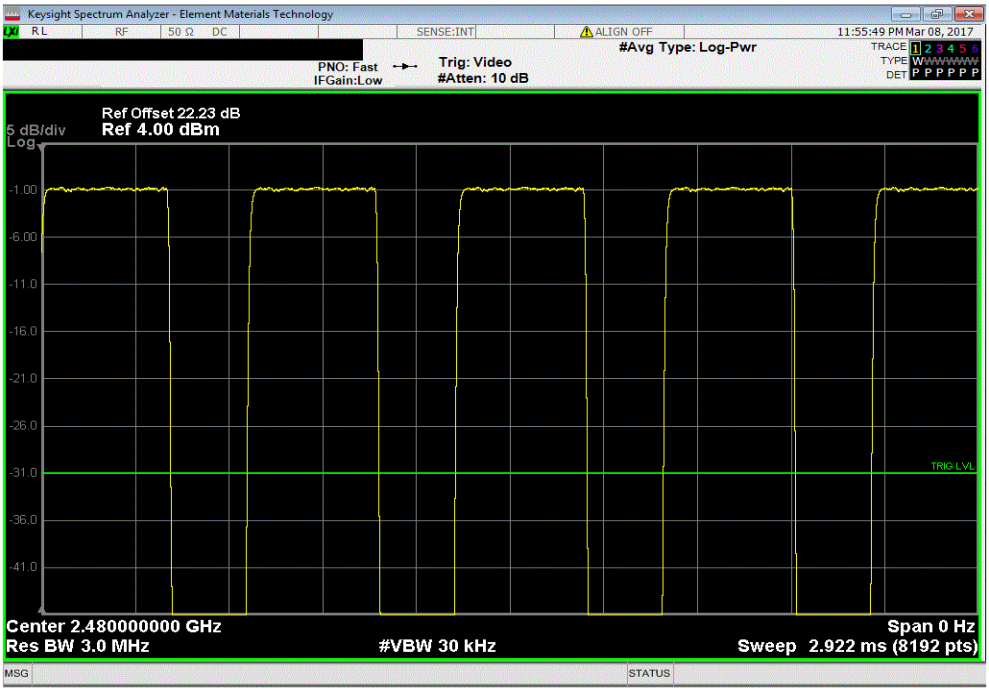
DUTY CYCLE

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.3 us	649.3 us	1	62.6	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 2017.01.26

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	Agilent	N5182A	TIF	8/12/2014	8/12/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

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

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

OCCUPIED BANDWIDTH

TbtTx 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			**Work Order:**	STAK0082
Serial Number:	FCC-1C			**Date:**	03/08/17
Customer:	Starkey Laboratories, Inc.			**Temperature:**	22.8 °C
Attendees:	Michael Thompson			**Humidity:**	18.5% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

DEVIATIONS FROM TEST STANDARD

None

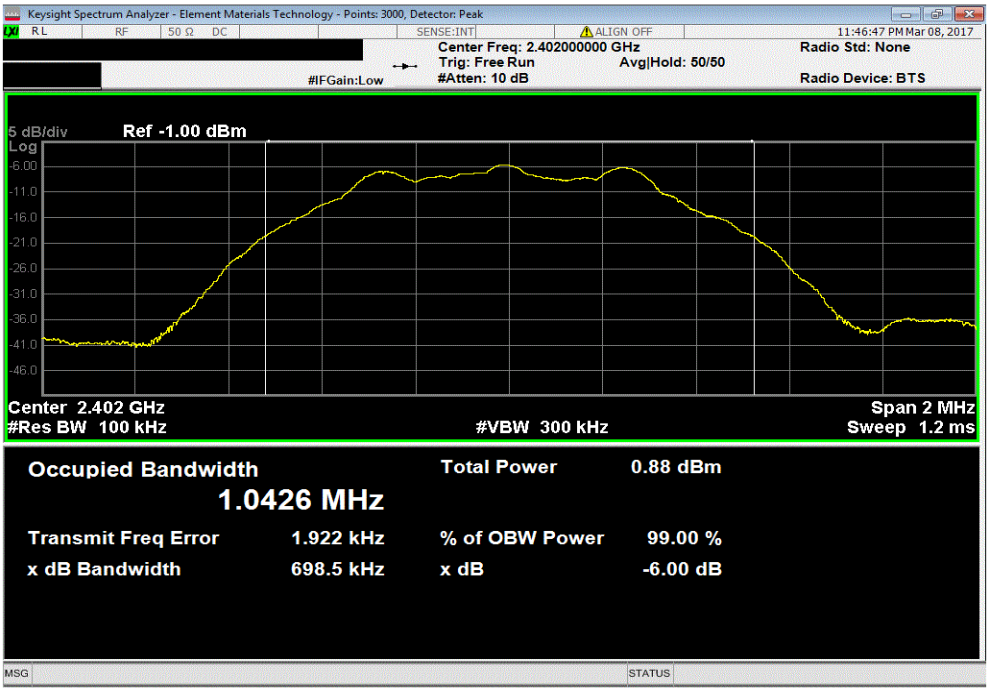
Configuration #	6	*Signature* Dustin Sparks

	Value	Limit (≥)	Result
BLE/GFSK Low Channel, 2402 MHz	698.506 kHz	500 kHz	Pass
BLE/GFSK Mid Channel, 2440 MHz	707.317 kHz	500 kHz	Pass
BLE/GFSK High Channel, 2480 MHz	695.267 kHz	500 kHz	Pass

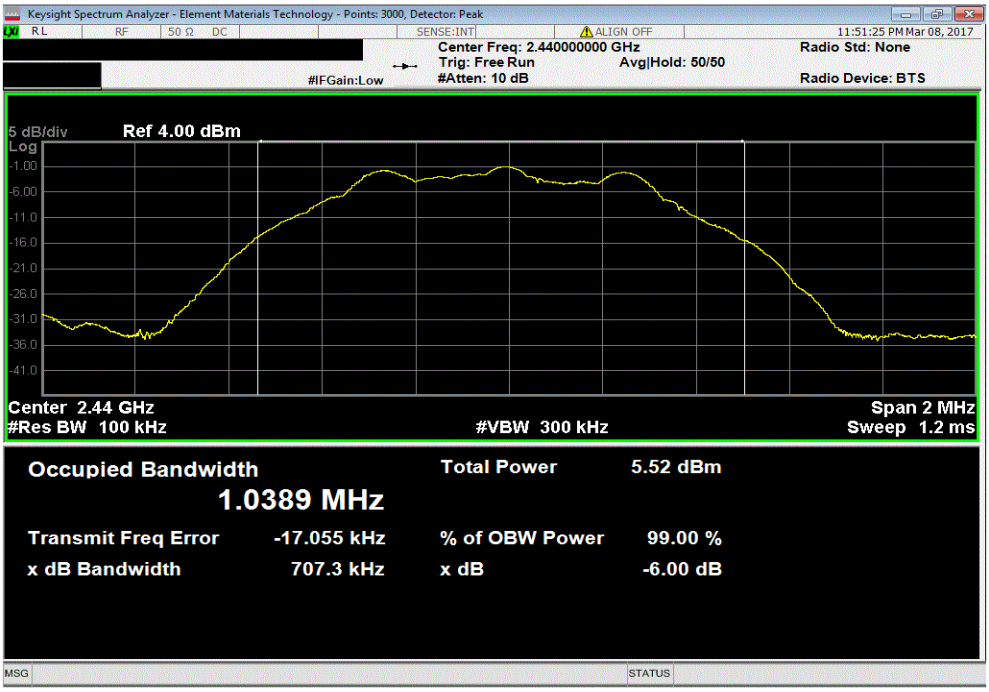
OCCUPIED BANDWIDTH

TbtTx 2017.01.27 XMit 2017.01.26

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



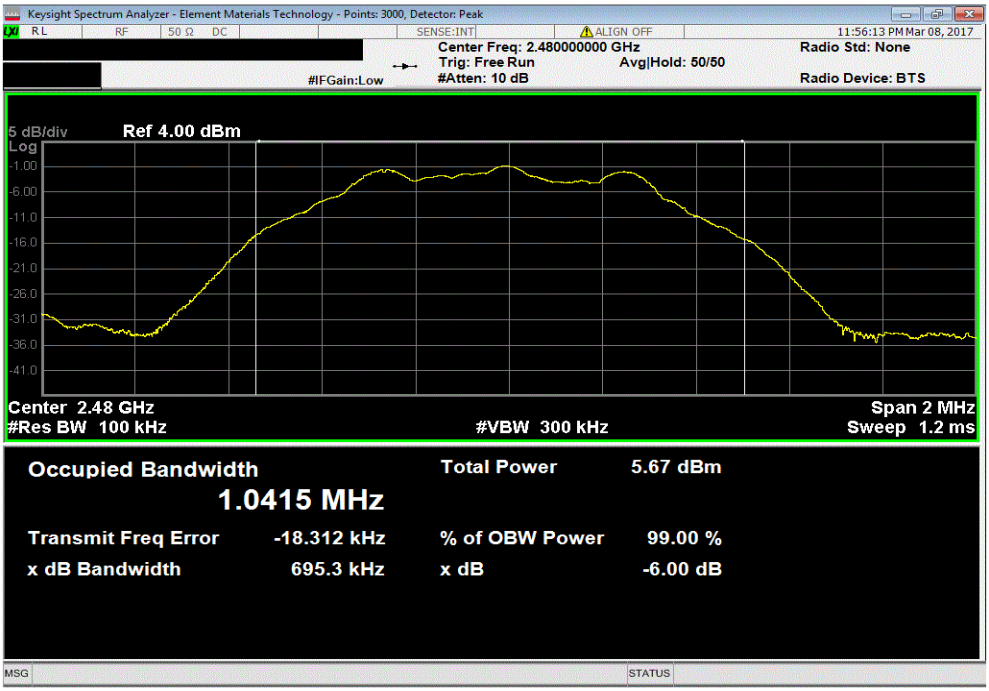
BLE/GFSK Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				707.317 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2017.01.27 XMit 2017.01.26

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



OUTPUT POWER

XMit 2017.01.26

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Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

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

Prior to measuring peak transmit power the DTS bandwidth (B) 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 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			**Work Order:**	STAK0082
Serial Number:	FCC-1C			**Date:**	03/08/17
Customer:	Starkey Laboratories, Inc.			**Temperature:**	22.8 °C
Attendees:	Michael Thompson			**Humidity:**	18.6% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

DEVIATIONS FROM TEST STANDARD

None

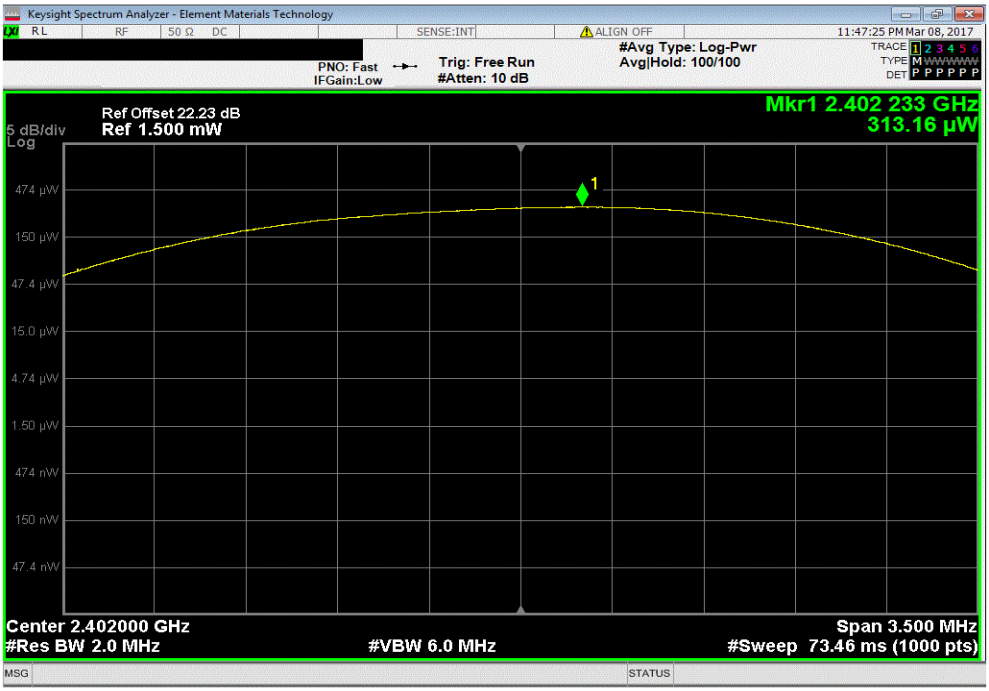
Configuration #	6	*Signature* Dustin Sparks

	Value	Limit (<)	Result
BLE/GFSK Low Channel, 2402 MHz	313.16 uW	1 W	Pass
BLE/GFSK Mid Channel, 2440 MHz	887.8 uW	1 W	Pass
BLE/GFSK High Channel, 2480 MHz	937.63 uW	1 W	Pass

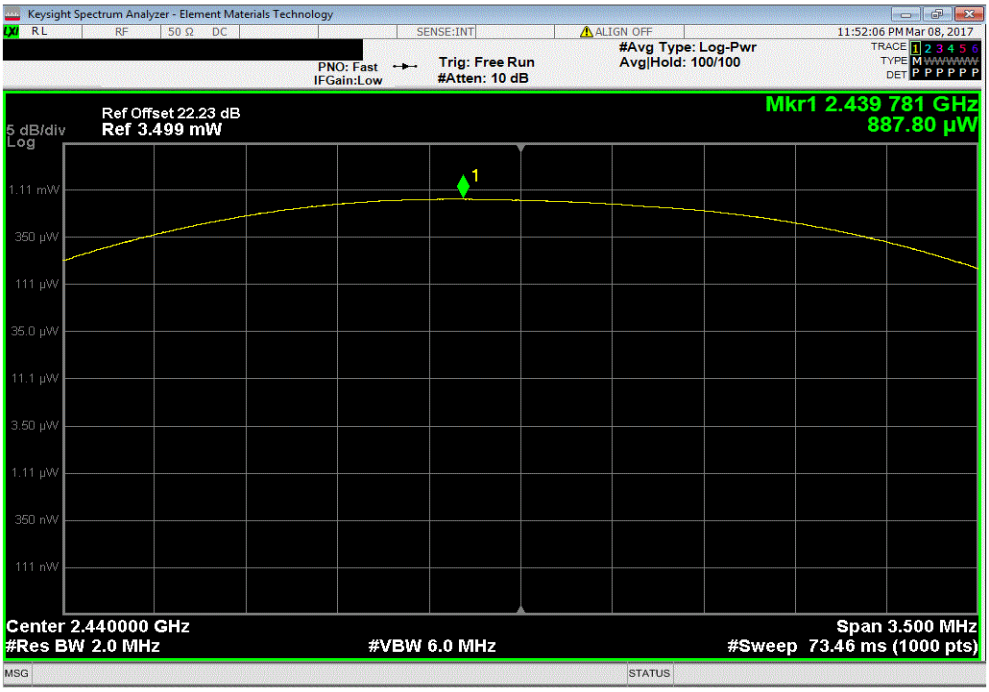
OUTPUT POWER

TbtTx 2017.01.27 XMit 2017.01.26

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



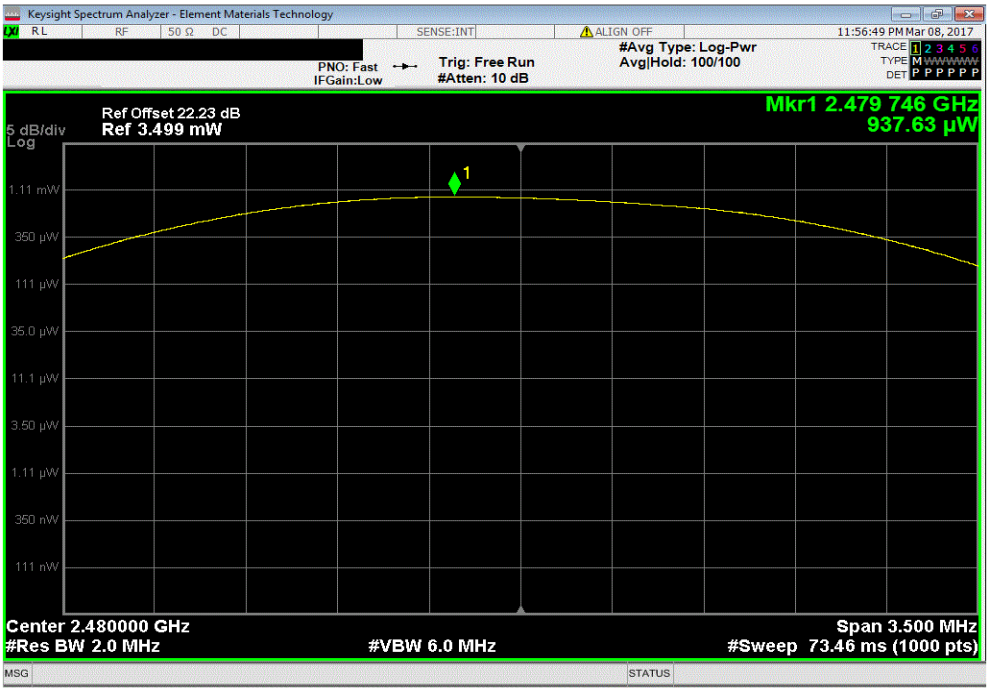
BLE/GFSK Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				887.8 uW	1 W	Pass



OUTPUT POWER

TbtTx 2017.01.27 XMit 2017.01.26

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



POWER SPECTRAL DENSITY

XMit 2017.01.26

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	Agilent	N5182A	TIF	8/12/2014	8/12/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

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

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

POWER SPECTRAL DENSITY

TbtTx 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			**Work Order:**	STAK0082
Serial Number:	FCC-1C			**Date:**	03/08/17
Customer:	Starkey Laboratories, Inc.			**Temperature:**	22.8 °C
Attendees:	Michael Thompson			**Humidity:**	18.6% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

DEVIATIONS FROM TEST STANDARD

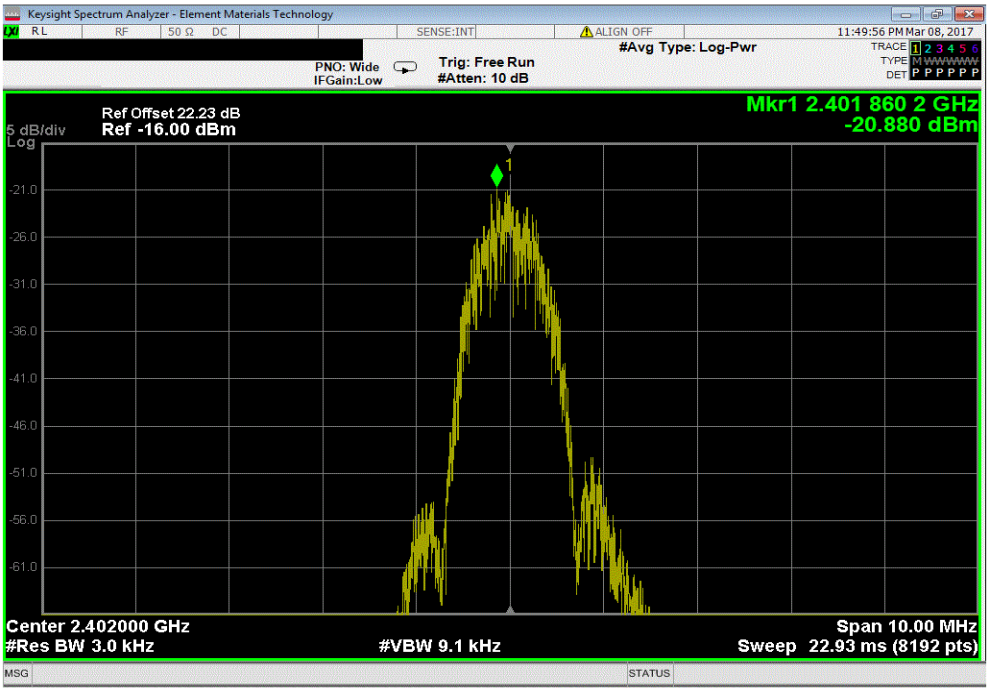
None

Configuration #	6	*Signature* Dustin Sparks

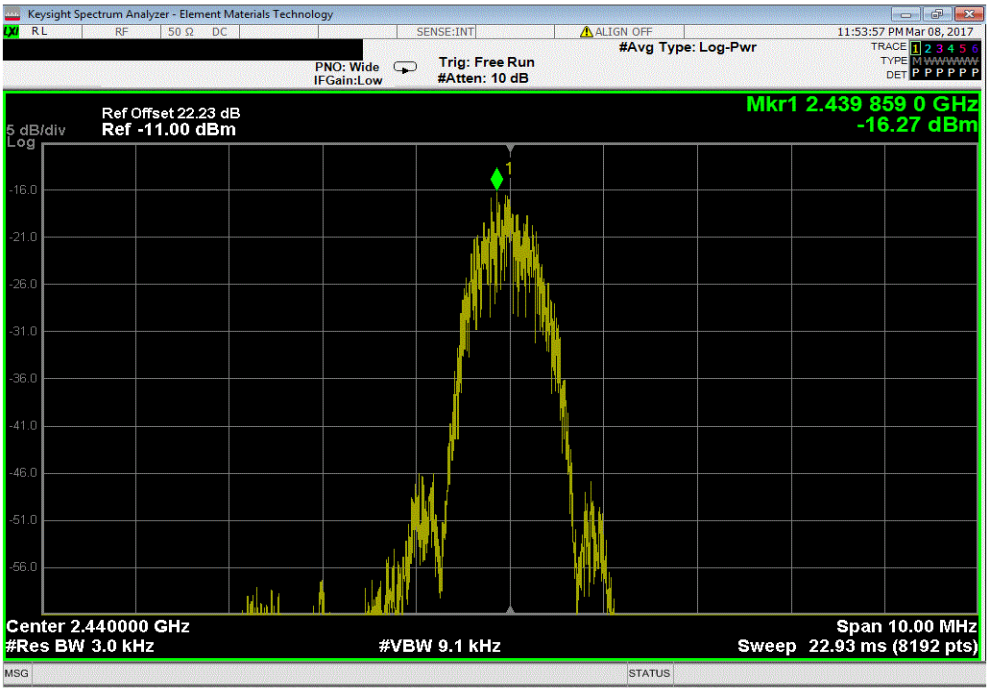
	Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK Low Channel, 2402 MHz	-20.88	8	Pass
BLE/GFSK Mid Channel, 2440 MHz	-16.267	8	Pass
BLE/GFSK High Channel, 2480 MHz	-16.198	8	Pass

POWER SPECTRAL DENSITY

BLE/GFSK Low Channel, 2402 MHz							
					Value dBm/3kHz	Limit < dBm/3kHz	Results
					-20.88	8	Pass

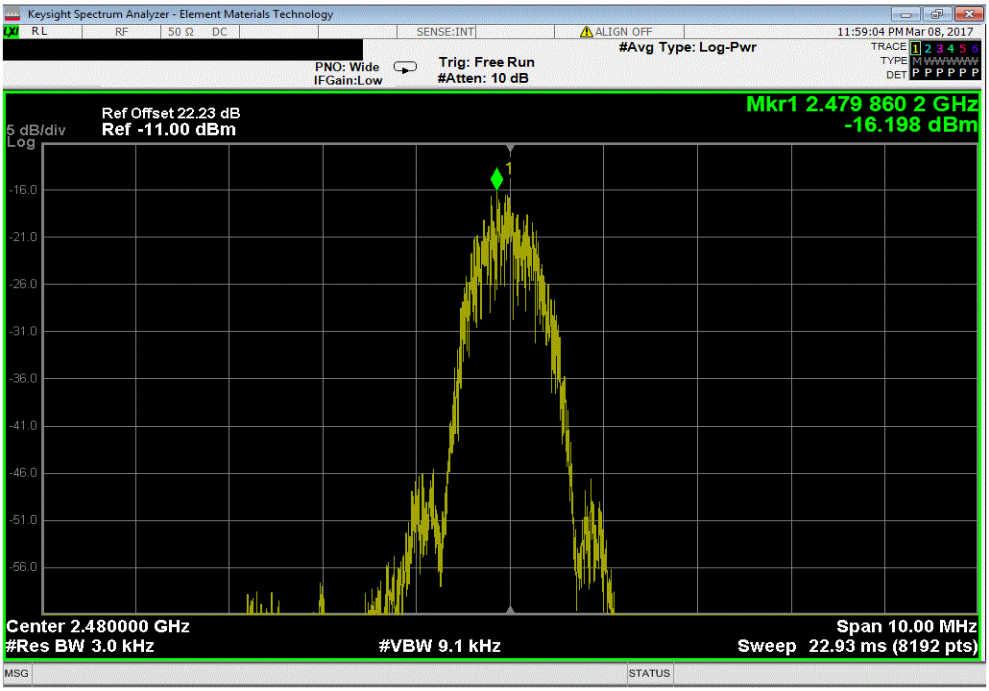


BLE/GFSK Mid Channel, 2440 MHz							
					Value dBm/3kHz	Limit < dBm/3kHz	Results
					-16.267	8	Pass



POWER SPECTRAL DENSITY

BLE/GFSK High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-16.198	8	Pass



BAND EDGE COMPLIANCE

XMit 2017.01.26

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	Agilent	N5182A	TIF	8/12/2014	8/12/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

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

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

BAND EDGE COMPLIANCE

TbtTx 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			**Work Order:**	STAK0082
Serial Number:	FCC-1C			**Date:**	03/08/17
Customer:	Starkey Laboratories, Inc.			**Temperature:**	22.9 °C
Attendees:	Michael Thompson			**Humidity:**	18.5% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

DEVIATIONS FROM TEST STANDARD

None

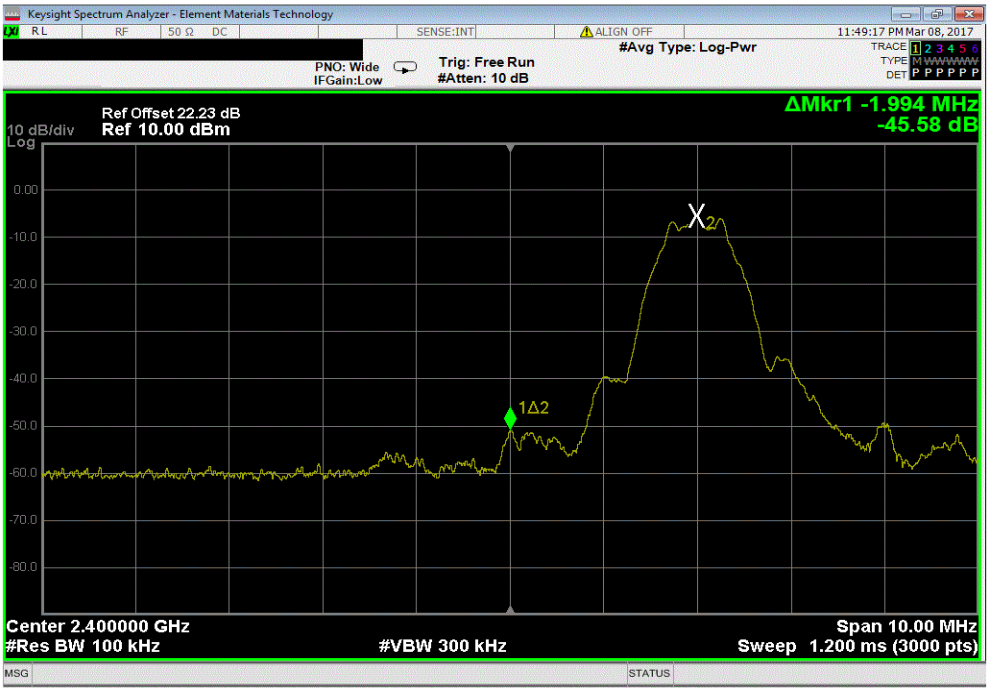
Configuration #	6	*Signature* Dustin Sparks

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	-45.58	-20	Pass
BLE/GFSK High Channel, 2480 MHz	-55.08	-20	Pass

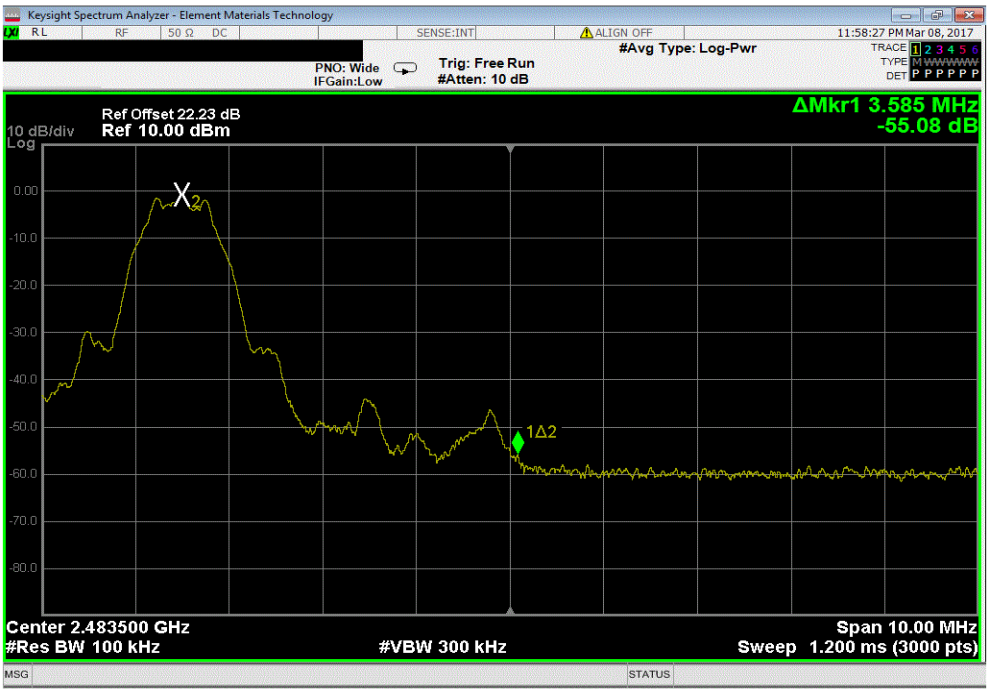
BAND EDGE COMPLIANCE

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.58	-20	Pass



BLE/GFSK High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-55.08	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.01.26

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	Agilent	N5182A	TIF	8/12/2014	8/12/2017
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	9/15/2017
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Block - DC	Fairview Microwave	SD3379	AMI	9/15/2016	9/15/2017
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

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

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.01.26

EUT:	The Dash Pro Right			**Work Order:**	STAK0082
Serial Number:	FCC-1C			**Date:**	03/08/17
Customer:	Starkey Laboratories, Inc.			**Temperature:**	22.8 °C
Attendees:	Michael Thompson			**Humidity:**	18.6% RH
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Dustin Sparks	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2017	ANSI C63.10:2013

COMMENTS

Powered by USB connection to laptop

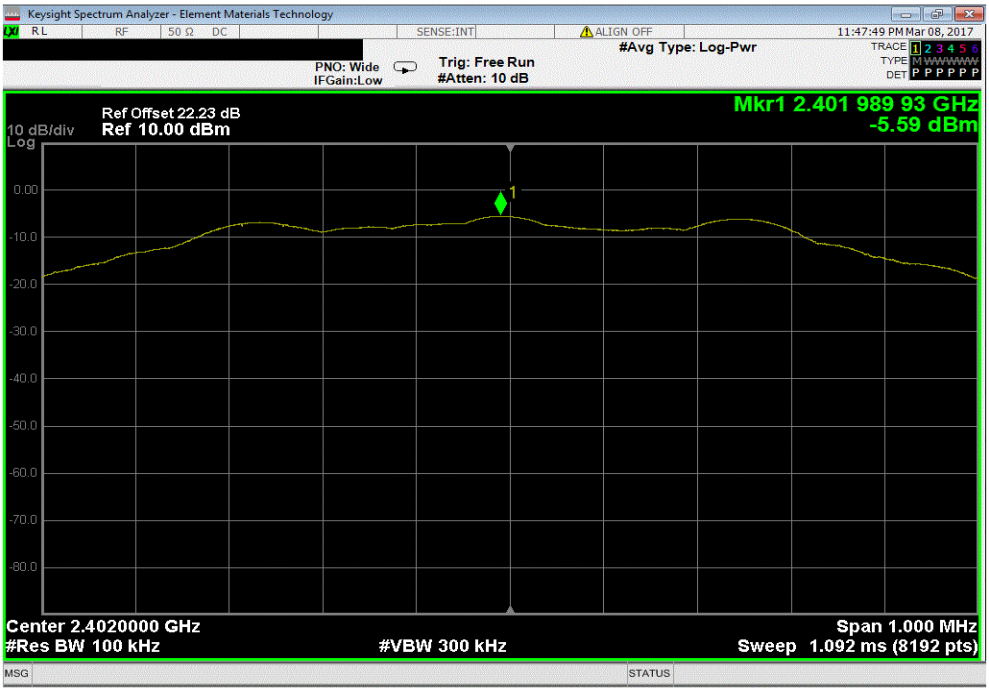
DEVIATIONS FROM TEST STANDARD

None

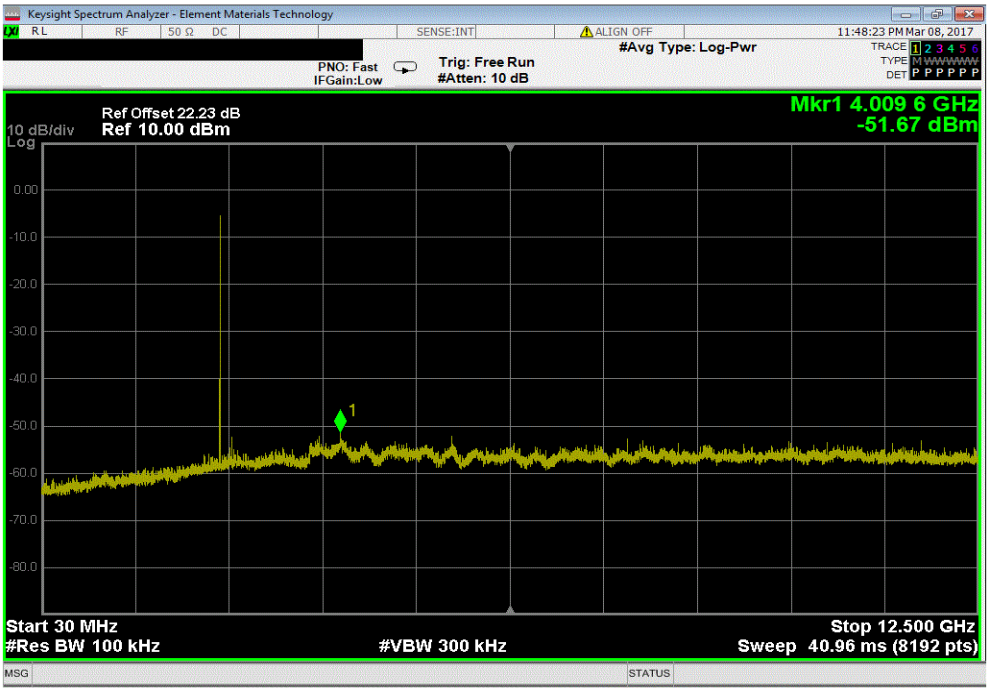
Configuration #	6	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
BLE/GFSK Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-46.08	-20	Pass
BLE/GFSK Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-43.91	-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	-51.04	-20	Pass
BLE/GFSK Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	-48.89	-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	-50.95	-20	Pass
BLE/GFSK High Channel, 2480 MHz	12.5 GHz - 25 GHz	-49.01	-20	Pass

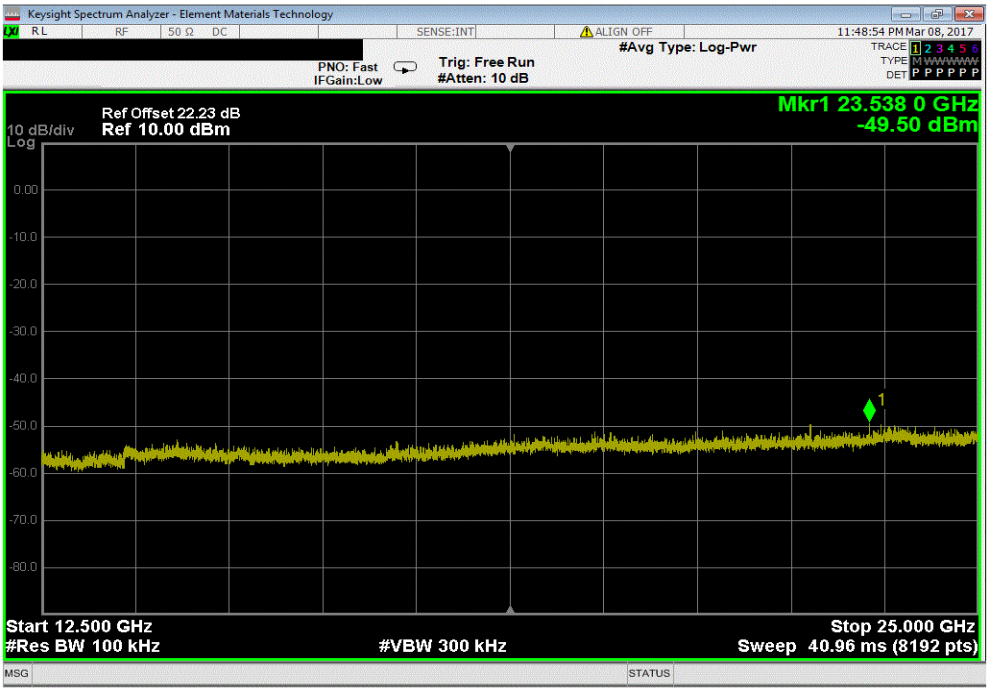
BLE/GFSK Low Channel, 2402 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



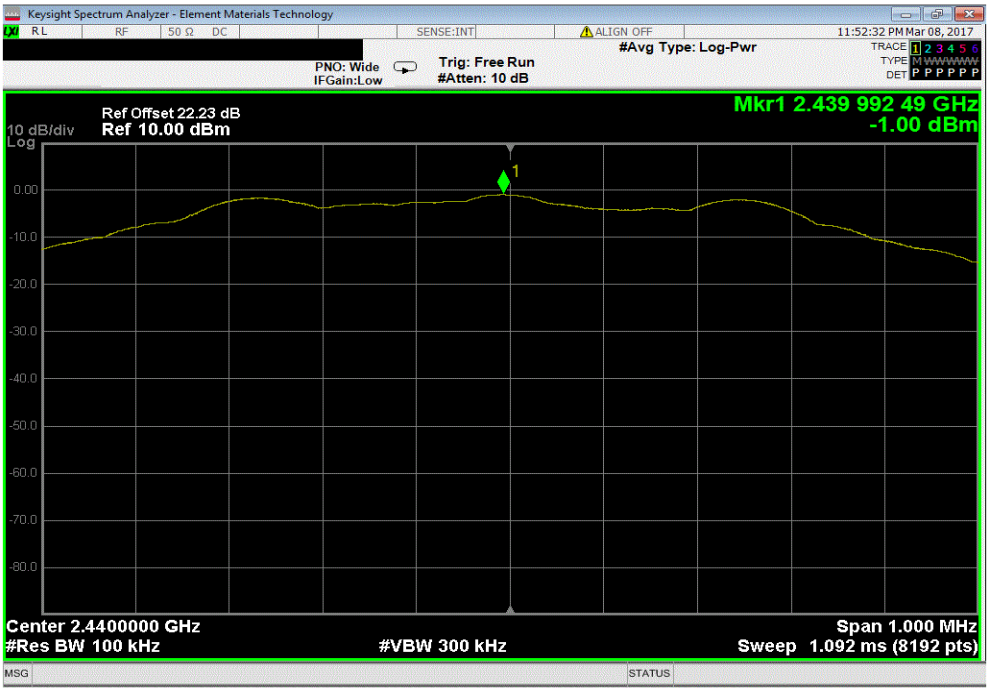
BLE/GFSK Low Channel, 2402 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-46.08	-20	Pass



BLE/GFSK Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-43.91	-20	Pass



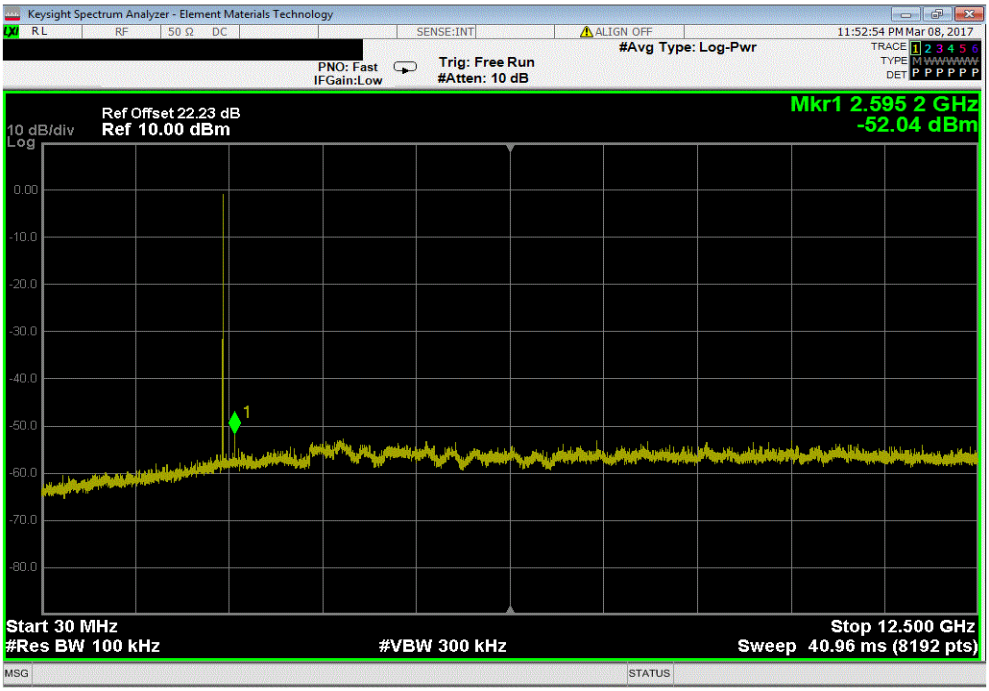
BLE/GFSK Mid Channel, 2440 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



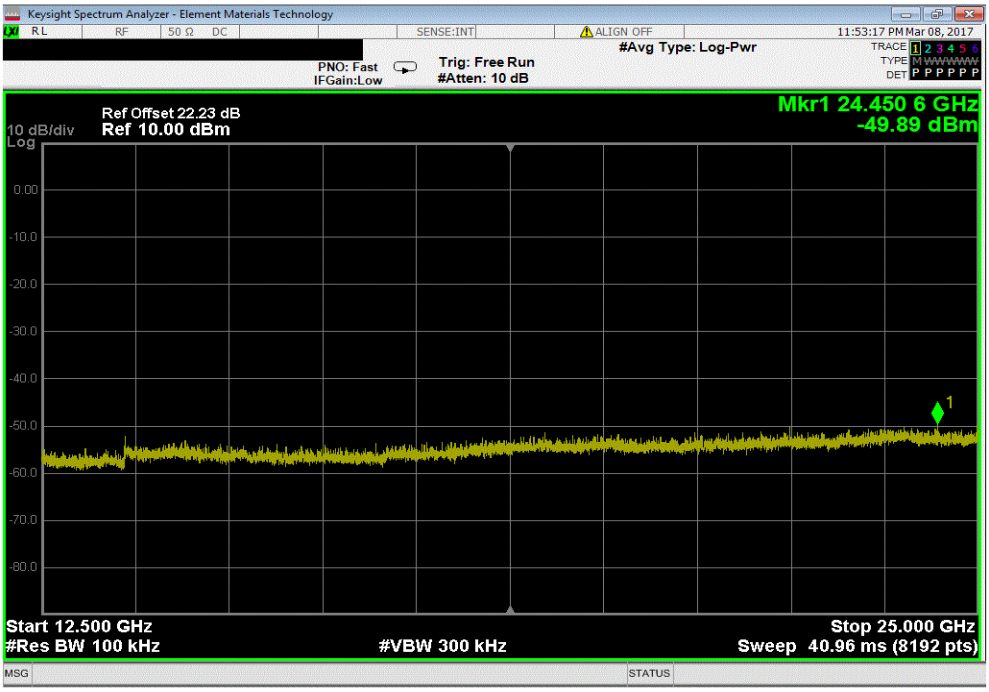
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-51.04	-20	Pass

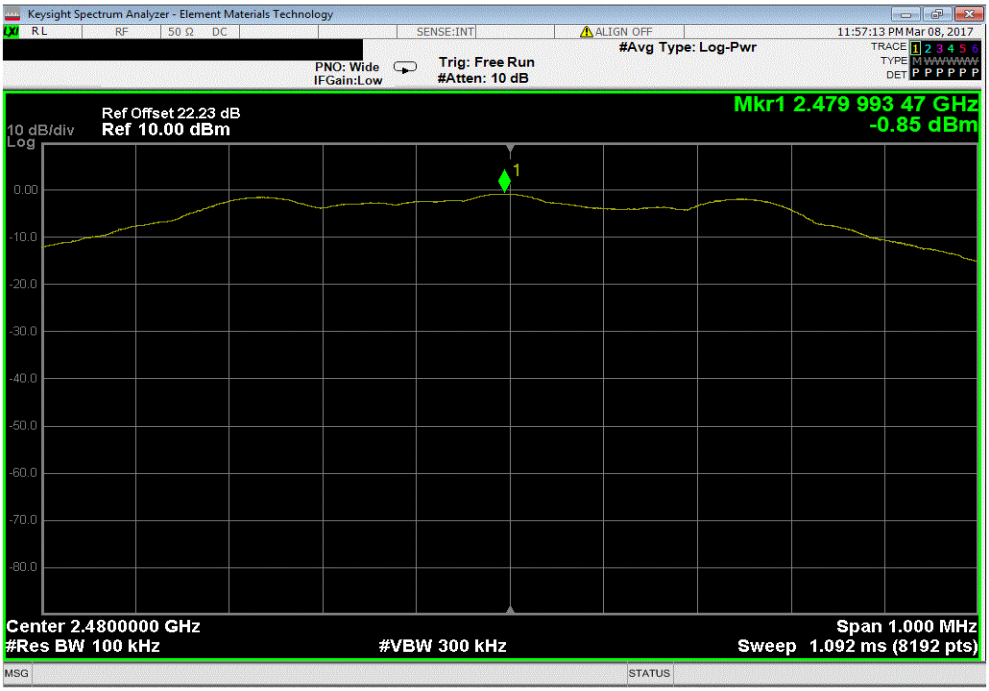


BLE/GFSK Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-48.89	-20	Pass

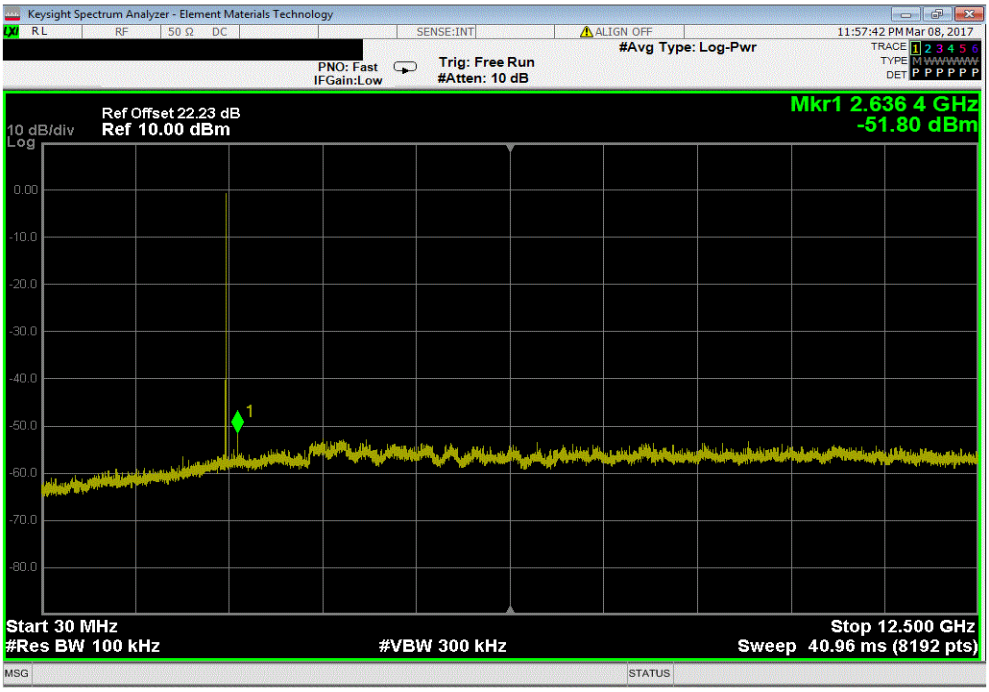


SPURIOUS CONDUCTED EMISSIONS

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



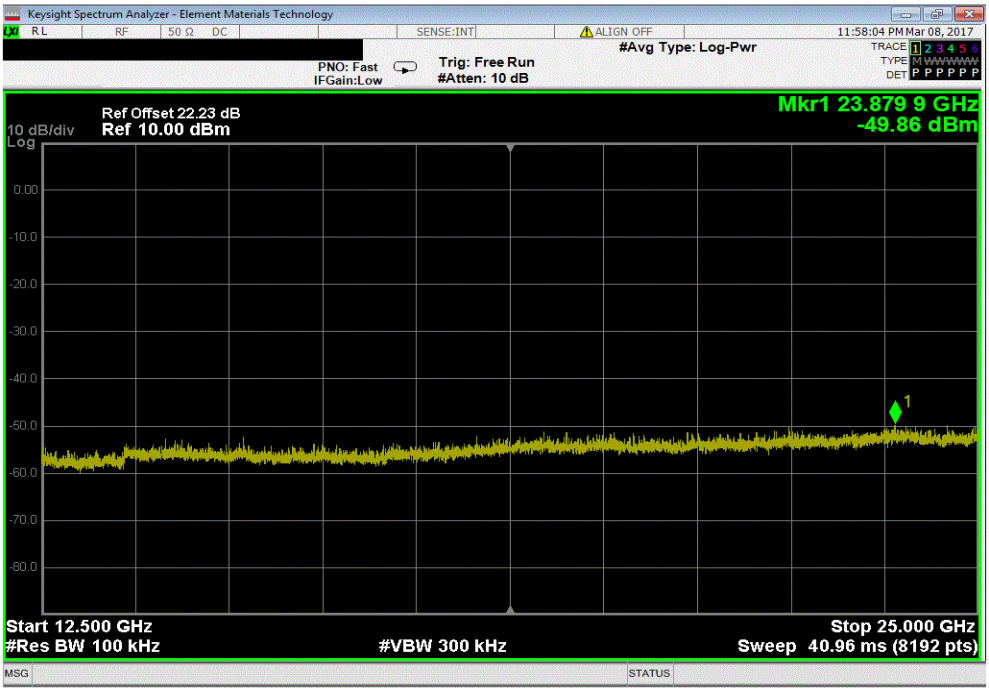
BLE/GFSK High Channel, 2480 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz			-50.95	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.01.26

BLE/GFSK High Channel, 2480 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-49.01	-20	Pass



SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

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

Transmitting Bluetooth low energy (BLE) - low channel (2402 MHz), mid channel (2440 MHz), and high channel (2480 MHz)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

STAK0082 - 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
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	9/15/2016	12 mo
Cable	Northwest EMC	18-26GHz Standard Gain Horn Cable	MNP	9/15/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	9/23/2016	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	9/22/2016	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	LFN	9/23/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	2/14/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2/14/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2/14/2017	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/1/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/1/2016	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

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

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

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

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

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

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

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

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

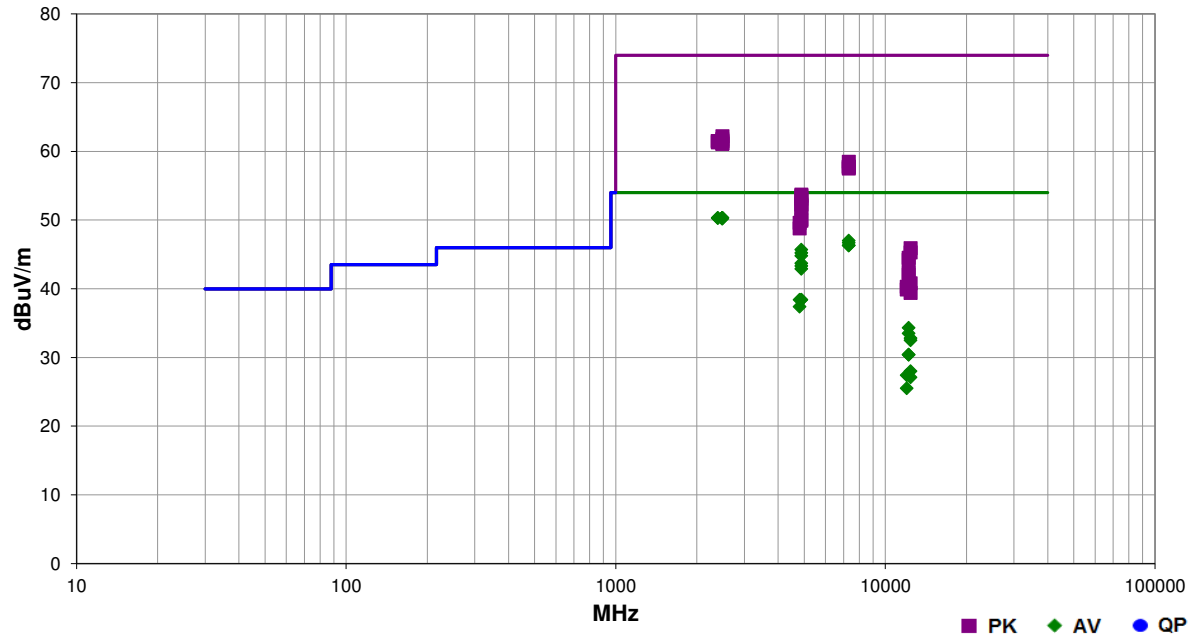
SPURIOUS RADIATED EMISSIONS

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	STAK0082	**Date:**	03/03/17	Trevor Buls	
Project:	None	**Temperature:**	22.5 °C		
Job Site:	MN05	**Humidity:**	17.4% RH		
Serial Number:	FCC-2	**Barometric Pres.:**	1033 mbar	**Tested by:**	Trevor Buls, Chris Patterson
EUT:	The Dash Pro Right				
Configuration:	1				
Customer:	Starkey Laboratories, Inc.				
Attendees:	Michael Thompson				
EUT Power:	Battery				
Operating Mode:	Transmitting Bluetooth low energy (BLE) - low channel (2402 MHz), mid channel (2440 MHz), and high channel (2480 MHz)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2017	ANSI C63.10:2013

Run #	23	**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
2483.590	32.8	-2.5	1.5	113.1	3.0	20.0	Horz	AV	0.0	50.3	54.0	-3.7	EUT Horz, High Ch
2484.383	32.8	-2.5	2.2	3.0	3.0	20.0	Vert	AV	0.0	50.3	54.0	-3.7	EUT Horz, High Ch
2484.997	32.8	-2.5	4.0	8.1	3.0	20.0	Horz	AV	0.0	50.3	54.0	-3.7	EUT Vert, High Ch
2484.957	32.8	-2.5	1.3	360.0	3.0	20.0	Vert	AV	0.0	50.3	54.0	-3.7	EUT Vert, High Ch
2483.937	32.8	-2.5	1.0	97.0	3.0	20.0	Horz	AV	0.0	50.3	54.0	-3.7	EUT on Side, High Ch
2389.513	32.6	-2.3	1.6	131.1	3.0	20.0	Horz	AV	0.0	50.3	54.0	-3.7	EUT Horz, Low Ch
2389.543	32.6	-2.3	2.1	303.0	3.0	20.0	Vert	AV	0.0	50.3	54.0	-3.7	EUT Horz, Low Ch
2484.117	32.7	-2.5	1.4	212.0	3.0	20.0	Vert	AV	0.0	50.2	54.0	-3.8	EUT on Side, High Ch
7319.475	31.9	15.1	1.0	360.0	3.0	0.0	Horz	AV	0.0	47.0	54.0	-7.0	EUT Horz, Mid Ch
7319.500	31.6	15.1	1.0	11.1	3.0	0.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT Horz, Mid Ch
7320.350	31.2	15.1	2.2	360.0	3.0	0.0	Horz	AV	0.0	46.3	54.0	-7.7	EUT Horz, High Ch
7319.683	31.2	15.1	1.0	224.1	3.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	EUT Horz, High Ch
4879.992	39.0	6.7	1.0	131.1	3.0	0.0	Vert	AV	0.0	45.7	54.0	-8.3	EUT on Side, Mid Ch
4879.775	38.5	6.7	1.0	306.0	3.0	0.0	Vert	AV	0.0	45.2	54.0	-8.8	EUT Vert, Mid Ch
4880.008	38.1	6.7	1.0	131.1	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	EUT Horz, Mid Ch
4879.808	37.0	6.7	1.0	92.0	3.0	0.0	Vert	AV	0.0	43.7	54.0	-10.3	EUT Horz, Mid Ch
4879.908	36.6	6.7	1.0	70.1	3.0	0.0	Horz	AV	0.0	43.3	54.0	-10.7	EUT Vert, Mid Ch
4879.850	36.2	6.7	1.0	23.1	3.0	0.0	Horz	AV	0.0	42.9	54.0	-11.1	EUT on Side, Mid Ch

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.880	44.7	-2.5	1.3	360.0	3.0	20.0	Vert	PK	0.0	62.2	74.0	-11.8	EUT Vert, High Ch
2484.690	44.3	-2.5	2.2	3.0	3.0	20.0	Vert	PK	0.0	61.8	74.0	-12.2	EUT Horz, High Ch
2484.583	44.0	-2.5	1.5	113.1	3.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	EUT Horz, High Ch
2484.243	44.0	-2.5	4.0	8.1	3.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	EUT Vert, High Ch
2388.043	43.8	-2.3	1.6	131.1	3.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	EUT Horz Low Ch
2389.307	43.6	-2.3	2.1	303.0	3.0	20.0	Vert	PK	0.0	61.3	74.0	-12.7	EUT Horz Low Ch
2484.993	43.7	-2.5	1.0	97.0	3.0	20.0	Horz	PK	0.0	61.2	74.0	-12.8	EUT on Side, High Ch
2483.820	43.6	-2.5	1.4	212.0	3.0	20.0	Vert	PK	0.0	61.1	74.0	-12.9	EUT on Side, High Ch
7319.425	43.4	15.1	1.0	11.1	3.0	0.0	Vert	PK	0.0	58.5	74.0	-15.5	EUT Horz, Mid Ch
4881.183	31.7	6.7	1.0	231.0	3.0	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT Horz, High Ch
4881.600	31.7	6.7	1.8	167.1	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	EUT Horz, High Ch
4803.867	31.8	6.6	2.2	39.0	3.0	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT Horz, Low Ch
7319.917	42.7	15.1	1.0	360.0	3.0	0.0	Horz	PK	0.0	57.8	74.0	-16.2	EUT Horz, Mid Ch
7317.767	42.6	15.1	2.2	360.0	3.0	0.0	Horz	PK	0.0	57.7	74.0	-16.3	EUT Horz, High Ch
7319.725	42.4	15.1	1.0	224.1	3.0	0.0	Vert	PK	0.0	57.5	74.0	-16.5	EUT Horz, High Ch
4803.867	30.8	6.6	1.0	360.0	3.0	0.0	Vert	AV	0.0	37.4	54.0	-16.6	EUT Horz, Low Ch
12198.830	34.3	0.0	1.8	80.1	3.0	0.0	Horz	AV	0.0	34.3	54.0	-19.7	EUT Horz, Mid Ch
4879.267	47.0	6.7	1.0	131.1	3.0	0.0	Vert	PK	0.0	53.7	74.0	-20.3	EUT on Side, Mid Ch
4880.317	46.8	6.7	1.0	131.1	3.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	EUT Horz, Mid Ch
12198.740	33.5	0.0	1.8	91.1	3.0	0.0	Vert	AV	0.0	33.5	54.0	-20.5	EUT Horz, Mid Ch
4880.667	46.4	6.7	1.0	306.0	3.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	EUT Vert, Mid Ch
12401.230	26.7	6.1	2.1	18.0	3.0	0.0	Vert	AV	0.0	32.8	54.0	-21.2	EUT Horz, High Ch
12400.020	26.4	6.1	1.0	144.0	3.0	0.0	Horz	AV	0.0	32.5	54.0	-21.5	EUT Horz, High Ch
4879.458	45.6	6.7	1.0	92.0	3.0	0.0	Vert	PK	0.0	52.3	74.0	-21.7	EUT Horz, Mid Ch
4879.783	45.4	6.7	1.0	70.1	3.0	0.0	Horz	PK	0.0	52.1	74.0	-21.9	EUT Vert, Mid Ch
4879.733	45.1	6.7	1.0	23.1	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	EUT on Side, Mid Ch
12198.610	30.4	0.0	1.2	335.0	3.0	0.0	Horz	AV	0.0	30.4	54.0	-23.6	EUT Horz, High Ch
12199.070	30.4	0.0	1.0	199.1	3.0	0.0	Vert	AV	0.0	30.4	54.0	-23.6	EUT Horz, High Ch
4882.058	43.4	6.7	1.0	231.0	3.0	0.0	Horz	PK	0.0	50.1	74.0	-23.9	EUT Horz, High Ch
4878.167	43.2	6.7	1.8	167.1	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	EUT Horz, High Ch
4804.158	43.0	6.6	2.2	39.0	3.0	0.0	Horz	PK	0.0	49.6	74.0	-24.4	EUT Horz, Low Ch
4803.558	42.2	6.6	1.0	360.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	EUT Horz, Low Ch
12398.760	27.1	0.9	1.0	6.0	3.0	0.0	Vert	AV	0.0	28.0	54.0	-26.0	EUT Horz, High Ch
12011.870	28.4	-1.0	1.0	11.1	3.0	0.0	Vert	AV	0.0	27.4	54.0	-26.6	EUT Horz, Low Ch
12398.710	26.2	0.9	1.0	105.1	3.0	0.0	Horz	AV	0.0	27.1	54.0	-26.9	EUT Horz, High Ch
12401.230	39.8	6.1	1.0	144.0	3.0	0.0	Horz	PK	0.0	45.9	74.0	-28.1	EUT Horz, High Ch
12007.530	26.5	-1.0	1.0	41.1	3.0	0.0	Horz	AV	0.0	25.5	54.0	-28.5	EUT Horz, Low Ch
12401.110	39.2	6.1	2.1	18.0	3.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	EUT Horz, High Ch
12198.830	44.5	0.0	1.8	80.1	3.0	0.0	Horz	PK	0.0	44.5	74.0	-29.5	EUT Horz, Mid Ch
12198.710	44.2	0.0	1.8	91.1	3.0	0.0	Vert	PK	0.0	44.2	74.0	-29.8	EUT Horz, Mid Ch
12202.000	42.3	0.0	1.2	335.0	3.0	0.0	Horz	PK	0.0	42.3	74.0	-31.7	EUT Horz, High Ch
12199.660	42.1	0.0	1.0	199.1	3.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9	EUT Horz, High Ch
12399.900	39.9	0.9	1.0	6.0	3.0	0.0	Vert	PK	0.0	40.8	74.0	-33.2	EUT Horz, High Ch
12010.530	41.3	-1.0	1.0	41.1	3.0	0.0	Horz	PK	0.0	40.3	74.0	-33.7	EUT Horz, Low Ch
12011.190	40.9	-1.0	1.0	11.1	3.0	0.0	Vert	PK	0.0	39.9	74.0	-34.1	EUT Horz, Low Ch
12397.540	38.5	0.9	1.0	105.1	3.0	0.0	Horz	PK	0.0	39.4	74.0	-34.6	EUT Horz, High Ch