

Starkey Laboratories, Inc.

Livio Custom BLE Hearing Aid (Left Ear)

FCC 15.247:2020 Bluetooth Low Energy (DTS) Radio

Report # STAK0202.4



TESTING

NVLAP LAB CODE: 200881-0







Last Date of Test: January 6, 2020 Starkey Laboratories, Inc. EUT: Livio Custom BLE Hearing Aid (Left Ear)

Radio Equipment Testing

Standards	
Specification	Method
FCC 15.247:2020	ANSI C63.10:2013, KDB 558074

Results

Method Clause Test Description		Applied	Results	Comments
6.2	Powerline Conducted Emissions		N/A	Not required for a battery powered EUT.
11.12.1, 11.13.2, 6.5, 6.6			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:

a

Eric Brandon, Department 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

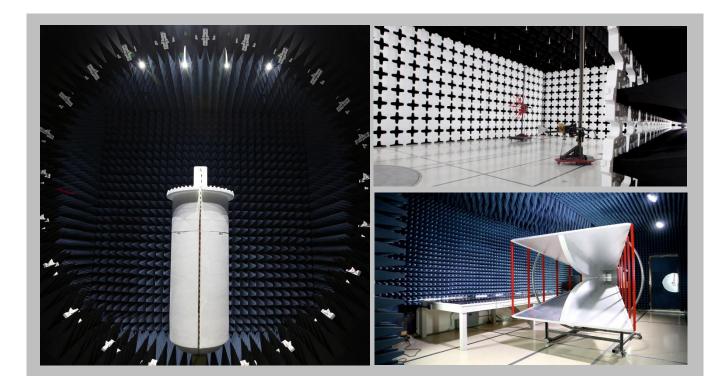
For details on the Scopes of our Accreditations, please visit: https://www.nwemc.com/emc-testing-accreditations

FACILITIES





California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 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



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.

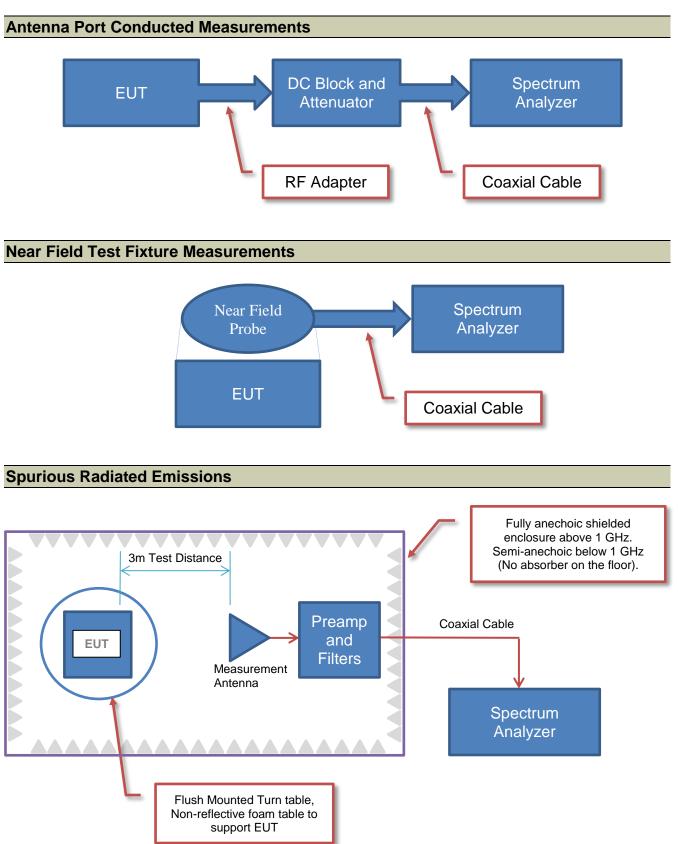
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 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





PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Starkey Laboratories, Inc.	
Address:	6600 Washington Ave S	
City, State, Zip:	Eden Prairie, MN 55344-3404	
Test Requested By:	Bill Mitchell	
EUT:	Livio Custom BLE Hearing Aid (Left Ear)	
First Date of Test:	December 18, 2019	
Last Date of Test:	January 6, 2020	
Receipt Date of Samples:	December 18, 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:

Custom ITE hearing aid with a 2.4 GHz BLE radio that will support both 1 MB/s BLE and 2 MB/s BLE per Bluetooth 5.0

Testing Objective:

To demonstrate compliance of the Bluetooth Low Energy (DTS) radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration STAK0202-1

Software/Firmware Running during test		
Description	Version	
Firmware	7.2.0.7	
Monaco	2.0.13.0	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Livio Custom BLE Hearing Aid (Left Ear)	Starkey Laboratories, Inc.	Livio Custom BLE Hearing Aid	2911328220

Configuration STAK0202-13

Software/Firmware Running during test		
Description	Version	
Firmware	7.2.0.7	
Monaco	2.0.13.0	

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Livio Custom BLE Hearing Aid Face Plate (Left Ear)	Starkey Laboratories, Inc.	Livio Custom BLE Hearing Aid Face Plate	2911328236

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-12-18	Spurious Radiated	Tested as delivered to	No EMI suppression devices were added or	EUT remained at Element following the
		Emissions	Test Station.	modified during this test.	test.
-			Tested as	No EMI suppression	EUT remained at
2	2020-01-06	Duty Cycle	delivered to Test Station.	devices were added or	Element following the test.
			Tested as	modified during this test.	EUT remained at
3	2020-01-06	Occupied	delivered to	No EMI suppression devices were added or	
3	2020-01-00	Bandwidth			Element following the test.
			Test Station.	modified during this test.	EUT remained at
4	2020-01-06	Output Bower	Tested as delivered to	No EMI suppression devices were added or	
4	2020-01-06	Output Power			Element following the
		E au di ve la vet	Test Station.	modified during this test.	test.
5	2020 04 00	Equivalent	Tested as	No EMI suppression	EUT remained at
Э	2020-01-06	Isotropic	delivered to	devices were added or	Element following the
		Radiated Power	Test Station.	modified during this test.	test.
0	0000 04 00	Power Spectral	Tested as	No EMI suppression	EUT remained at
6	2020-01-06	Density	delivered to	devices were added or	Element following the
		,	Test Station.	modified during this test.	test.
_		Band Edge	Tested as	No EMI suppression	EUT remained at
7	2020-01-06	Compliance	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
-		Spurious	Tested as	No EMI suppression	Scheduled testing
8	2020-01-06	Conducted	delivered to	devices were added or	was completed.
		Emissions	Test Station.	modified during this test.	nae completed.

POWER SETTINGS



The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

ITE BLE Hearing Aid	Power Setting
1 Mbps – Low channel (2402 MHz)	0 dBm
1 Mbps – Mid channel (2442 MHz)	0 dBm
1 Mbps – High channel (2480 MHz)	0 dBm
2 Mbps – Low channel (2402 MHz)	0 dBm
2 Mbps – Mid channel (2442 MHz)	0 dBm
2 Mbps – High channel (2480 MHz)	0 dBm

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2019.05.10

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 (2442 MHz), and High channel (2480 MHz); 1 Mbps and 2 Mbps

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

STAK0202 - 1

FREQUENCY RANGE INVESTIGATED

Stop Frequency 26500 MHz

SAMPLE CALCULATIONS

Start Frequency 30 MHz

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
Attenuator	Fairview Microwave	SA18E-10	TYA	17-Sep-2019	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	17-Sep-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	11-Sep-2019	12 mo
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	11-Sep-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	8-Feb-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	8-Feb-2019	12 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	8-Mar-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	8-Feb-2019	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	17-Sep-2019	12 mo
Antenna - Double Ridge	ETS-Lindgren	3115	AJQ	16-Jan-2019	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	18-Oct-2019	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	18-Oct-2019	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	21-Dec-2019	12 mo

TEST DESCRIPTION

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

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

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

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

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).

SPURIOUS RADIATED EMISSIONS



Work Order: STAK0202 Date: 18-Dec-2019 Job Site: MN05 Humidity: 15.7% RH Job Site: MN05 Humidity: 15.7% RH Serial Number: 20132820 Barometric Press; 1029 mbar Tested by: Dusin Sparks, Andrew Rogst EUT: Live Ocusion BLE Hearing Aid (Left Ear) Configuration: Tested by: Dusin Sparks, Andrew Rogst Configuration: Tested by: Dusin Sparks, Andrew Rogst Tested by: Dusin Sparks, Andrew Rogst EUT Power Battery Battery Tested by: Dusin Sparks, Andrew Rogst Operating Mode: Tested By: Name Tested by: Dusin Sparks, Andrew Rogst Metal: Tested By: Name Name Deviations: Nore Tested By: Name State Press Tested By: Name Name Comments: Left ear. For the 1 Mbps mode a DCCF of 5.0 dB was appiled based on a measured duty cycle of 31.6%. See da comments for transmit channel, EUT orientation, and data rate. ANSI C63.10:2013 St Specifications: Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass Mode Mame Maximum data rate. Maximum data rate. Maximum data rate.<			AT · · · ·				10 5					EmiR5 2019.08.1	5.1		PSA-ESC	512015.00
Job Site: MN05 Humidity: 15.7% RH Serial Number: 291128220 Barometric Press: 1029 mbar Tested by: Dustin Sparks, Andrew Rogst Configuration: 1 Configuration: 1 Configuration: 1 Customer: Starkey Laboratories, Inc. Heat Heat Heat Heat Attendes: Zhenchao Yang EUT Power: Battery Personation: 1 Operating Mode: Transmitting Bluetooth Low Energy (BLE) - Low channel (2402 MHz), Mid channel (2442 MHz), and High channel (2480 MHz), Mid pa and 2 Mbps Deviations: Deviations: None EUT orientation, and data rate. Eut and the pa and 2 Mbps Comments: Specifications Test Method Ansi C63.10:2013 Run # 12 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 80 0 0 0 0 0 0 0 0 0 90 0 0 0 0 0 0 0 0 0	VVC				_	Date:			\sim	9-	0.1	\square)		2	
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	70 - 60 - W/Ngp 30 - 20 - 10 - 0 -			100			1000			10	\$ 00000				1000	000

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
2487.075	33.6	-3.7	1.5	109.0	2.1	20.0	Horz	AV	0.0	52.0	54.0	-2.0	High ch, EUT horz, 1 Mbps
7439.325	36.6	13.2	1.05	64.0	2.1	0.0	Horz	AV	0.0	51.9	54.0	-2.1	High ch, EUT vert, 1 Mbps
7325.367	36.3	13.5	3.9	292.0	2.1	0.0	Vert	AV	0.0	51.9	54.0	-2.1	Mid ch, EUT horz, 1 Mbps
2486.192	33.5	-3.7	1.5	275.0	2.1	20.0	Horz	AV	0.0	51.9	54.0	-2.1	High ch, EUT vert, 1 Mbps
2485.525	33.5	-3.7	1.5	112.0	2.1	20.0	Vert	AV	0.0	51.9	54.0	-2.1	High ch, EUT vert, 1 Mbps
2485.650	33.5	-3.7	1.5	242.0	2.1	20.0	Horz	AV	0.0	51.9	54.0	-2.1	High ch, EUT on side, 1 Mbps
2486.550	33.5	-3.7	1.5	275.0	2.1	20.0	Vert	AV	0.0	51.9	54.0	-2.1	High ch, EUT on side, 1 Mbps
2486.817	33.4	-3.7	1.6	303.0	2.1	20.0	Vert	AV	0.0	51.8	54.0	-2.2	High ch, EUT horz, 1 Mbps
2388.467	33.2	-3.6	2.4	17.0	2.1	20.0	Horz	AV	0.0	51.7	54.0	-2.3	Low ch, EUT horz, 1 Mbps
7439.350	36.2	13.2	2.1	271.0	2.1	0.0	Horz	AV	0.0	51.5	54.0	-2.5	High ch, EUT vert, 1 Mbps
7438.392	33.2	13.2	1.7	243.9	5.0	0.0	Horz	AV	0.0	51.4	54.0	-2.6	High ch, EUT vert, 2 Mbps
7439.283	35.9	13.2	4.0	113.0	2.1	0.0	Vert	AV	0.0	51.2	54.0	-2.8	High ch, EUT horz, 1 Mbps
7439.425	35.7	13.2	1.29	335.0	2.1	0.0	Vert	AV	0.0	51.0	54.0	-3.0	High ch, EUT horz, 1 Mbps
7439.392	35.0	13.2	2.4	130.0	2.1	0.0	Vert	AV	0.0	50.3	54.0	-3.7	High ch, EUT on side, 1 Mbps
7439.383	34.9	13.2	3.6	199.9	2.1	0.0	Horz	AV	0.0	50.2	54.0	-3.8	High ch, EUT on side, 1 Mbps
7439.458	34.8	13.2	1.0	297.0	2.1	0.0	Vert	AV	0.0	50.1	54.0	-3.9	High ch, EUT horz, 1 Mbps
7325.292	34.4	13.5	1.5	16.9	2.1	0.0	Horz	AV	0.0	50.0	54.0	-4.0	Mid ch, EUT vert, 1 Mbps
7439.325	34.4	13.2	1.8	225.0	2.1	0.0	Horz	AV	0.0	49.7	54.0	-4.3	High ch, EUT vert, 1 Mbps
7439.358	34.0	13.2	2.3	160.9	2.1	0.0	Horz	AV	0.0	49.3	54.0	-4.7	High ch, EUT horz, 1 Mbps
7439.350	33.1	13.2	4.0	18.0	2.1	0.0	Vert	AV	0.0	48.4	54.0	-5.6	High ch, EUT vert, 1 Mbps
2483.613	32.8	-3.8	1.5	19.9	5.0	10.0	Vert	AV	0.0	44.0	54.0	-10.0	High ch., EUT on side, 2 Mbps
2487.825	45.7	-3.7	1.5	242.0	0.0	20.0	Horz	PK	0.0	62.0	74.0	-12.0	High ch, EUT on side, 1 Mbps

Freq	Amplitude	Factor	Antenna Height	Azimuth	Duty Cycle Correction Factor	External Attenuation	Polarity/ Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(dB)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
2483.692	45.3	-3.8	1.5	109.0	0.0	20.0	Horz	PK	0.0	61.5	74.0	-12.5	High ch, EUT horz, 1 Mbps
2486.917	45.1	-3.7	1.6	303.0	0.0	20.0	Vert	PK	0.0	61.4	74.0	-12.6	High ch, EUT horz, 1 Mbps
2488.033	44.9	-3.7	1.5	275.0	0.0	20.0	Horz	PK	0.0	61.2	74.0	-12.8	High ch, EUT vert, 1 Mbps
2487.675	44.9	-3.7	1.5	275.0	0.0	20.0	Vert	PK	0.0	61.2	74.0	-12.8	High ch, EUT on side, 1 Mbps
2484.233	44.7	-3.8	1.5	112.0	0.0	20.0	Vert	PK	0.0	60.9	74.0	-13.1	High ch, EUT vert, 1 Mbps
2385.917	44.5	-3.6	2.4	17.0	0.0	20.0	Horz	PK	0.0	60.9	74.0	-13.1	Low ch, EUT horz, 1 Mbps
12401.170	32.3	5.4	1.7	274.0	2.1	0.0	Horz	AV	0.0	39.8	54.0	-14.2	High ch, EUT vert, 1 Mbps
7326.308	45.7	13.5	3.9	292.0	0.0	0.0	Vert	PK	0.0	59.2	74.0	-14.8	Mid ch, EUT horz, 1 Mbps
4884.800	31.9	4.7	3.4	58.0	2.1	0.0	Horz	AV	0.0	38.7	54.0	-15.3	Mid ch, EUT vert, 1 Mbps
4881.517	31.9	4.7	1.5	67.0	2.1	0.0	Vert	AV	0.0	38.7	54.0	-15.3	Mid ch, EUT horz, 1 Mbps
7440.875	45.2	13.2	1.05	64.0	0.0	0.0	Horz	PK	0.0	58.4	74.0	-15.6	High ch, EUT vert, 1 Mbps
4802.675	31.7	4.6	1.5	289.0	2.1	0.0	Vert	AV	0.0	38.4	54.0	-15.6	Low ch, EUT horz, 1 Mbps
7440.775	45.1	13.2	3.6	199.9	0.0	0.0	Horz	PK	0.0	58.3	74.0	-15.7	High ch, EUT on side, 1 Mbps
7439.383	45.1	13.2	2.1	271.0	0.0	0.0	Horz	PK	0.0	58.3	74.0	-15.7	High ch, EUT vert, 1 Mbps
4959.667	31.4	4.8	1.6	29.0	2.1	0.0	Horz	AV	0.0	38.3	54.0	-15.7	High ch, EUT vert, 1 Mbps
4959.142	31.4	4.8	1.5	186.9	2.1	0.0	Vert	AV	0.0	38.3	54.0	-15.7	High ch, EUT horz, 1 Mbps
7326.408	44.7	13.5	1.5	16.9	0.0	0.0	Horz	PK	0.0	58.2	74.0	-15.8	Mid ch, EUT vert, 1 Mbps
7439.158	45.0	13.2	1.29	335.0	0.0	0.0	Vert	PK	0.0	58.2	74.0	-15.8	High ch, EUT horz, 1 Mbps
4805.608	31.5	4.6	3.1	249.0	2.1	0.0	Horz	AV	0.0	38.2	54.0	-15.8	Low ch, EUT vert, 1 Mbps
7438.975	44.8	13.2	4.0	113.0	0.0	0.0	Vert	PK	0.0	58.0	74.0	-16.0	High ch, EUT horz, 1 Mbps
12400.710	30.3	5.4	1.5	12.1	2.1	0.0	Vert	AV	0.0	37.8	54.0	-16.2	High ch, EUT horz, 1 Mbps
7439.050	44.4	13.2	1.0	297.0	0.0	0.0	Vert	PK	0.0	57.6	74.0	-16.4	High ch, EUT horz, 1 Mbps
7440.725	43.9	13.2	1.8	225.0	0.0	0.0	Horz	PK	0.0	57.1	74.0	-16.9	High ch, EUT vert, 1 Mbps
7438.958	43.7	13.2	1.7	243.9	0.0	0.0	Horz	PK	0.0	56.9	74.0	-17.1	High ch, EUT vert, 2 Mbps
7439.308	43.5	13.2	2.3	160.9	0.0	0.0	Horz	PK	0.0	56.7	74.0	-17.3	High ch, EUT horz, 1 Mbps
7439.508	43.4	13.2	2.4	130.0	0.0	0.0	Vert	PK	0.0	56.6	74.0	-17.4	High ch, EUT on side, 1 Mbps
7439.533	43.0	13.2	4.0	18.0	0.0	0.0	Vert	PK	0.0	56.2	74.0	-17.8	High ch, EUT vert, 1 Mbps
12398.740	32.5	-0.6	1.5	91.1	2.1	0.0	Horz	AV	0.0	34.0	54.0	-20.0	High ch, EUT vert, 1 Mbps
12208.760	33.0	-1.7	1.6	271.9	2.1	0.0	Horz	AV	0.0	33.4	54.0	-20.6	Mid ch, EUT vert, 1 Mbps
12008.900	32.1	-2.2	1.7	307.9	2.1	0.0	Horz	AV	0.0	32.0	54.0	-22.0	Low ch, EUT vert, 1 Mbps
12399.800	30.4	-0.6	1.5	109.0	2.1	0.0	Vert	AV	0.0	31.9	54.0	-22.1	High ch, EUT horz, 1 Mbps
12208.530	31.2	-1.7	1.7	0.0	2.1	0.0	Vert	AV	0.0	31.6	54.0	-22.4	Mid ch, EUT horz, 1 Mbps
2487.373	44.9	-3.7	1.5	19.9	0.0	10.0	Vert	PK	0.0	51.2	74.0	-22.8	High ch., EUT on side, 2 Mbps
12008.880	30.9	-2.2	1.5	326.9	2.1	0.0	Vert	AV	0.0	30.8	54.0	-23.2	Low ch, EUT horz, 1 Mbps
12400.500	43.1	5.4	1.7	274.0	0.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	High ch, EUT vert, 1 Mbps
4882.775	42.9	4.7	3.4	58.0	0.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	Mid ch, EUT vert, 1 Mbps
4959.367	42.5	4.8	1.5	186.9	0.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	High ch, EUT horz, 1 Mbps
4806.467	42.7	4.6	1.5	289.0	0.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	Low ch, EUT horz, 1 Mbps
4960.308	42.3	4.8	1.6	29.0	0.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	High ch, EUT vert, 1 Mbps
12400.640	41.5	5.4	1.5	12.1	0.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1	High ch, EUT horz, 1 Mbps
4884.742	42.0	4.7	1.5	67.0	0.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	Mid ch, EUT horz, 1 Mbps
4801.792	41.8	4.6	3.1	249.0	0.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	Low ch, EUT vert, 1 Mbps
12399.950	42.7	-0.6	1.5	91.1	0.0	0.0	Horz	PK	0.0	42.1	74.0	-31.9	High ch, EUT vert, 1 Mbps
12210.480	43.4	-1.7	1.6	271.9	0.0	0.0	Horz	PK	0.0	41.7	74.0	-32.3	Mid ch, EUT vert, 1 Mbps
12397.760	41.9	-0.6	1.5	109.0	0.0	0.0	Vert	PK	0.0	41.3	74.0	-32.7	High ch, EUT horz, 1 Mbps
12008.930	43.3	-2.2	1.7	307.9	0.0	0.0	Horz	PK	0.0	41.1	74.0	-32.9	Low ch, EUT vert, 1 Mbps
12009.170	42.4	-2.2	1.5	326.9	0.0	0.0	Vert	PK	0.0	40.2	74.0	-33.8	Low ch, EUT horz, 1 Mbps
12210.830	41.5	-1.7	1.7	0.0	0.0	0.0	Vert	PK	0.0	39.8	74.0	-34.2	Mid ch, EUT horz, 1 Mbps



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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

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.



	Livio Custom BLE Hearin	g Aid (Left Ear)						Work Order:		
Serial Number									6-Jan-20	
	Starkey Laboratories, Inc							Temperature:		
	Charlie Esch							Humidity:		
Project							I	Barometric Pres.:		
	Andrew Rogstad			Power: Ba				Job Site:	MN08	
ST SPECIFICAT	IONS				st Method					
C 15.247:2020				AN	ISI C63.10:2013					
OMMENTS										
it ear. Reference	e level offset includes Meas	urment Cable, DC Bloc	k, and 20 dB A	ttenuator.						
EVIATIONS FRO	M TEST STANDARD									
one										
					. 16					
onfiguration #	13		a	Ros	tal					
onfiguration #	13	Signature	a	Roo Roo	start					
onfiguration #	13	Signature	a				Number of	Value	Limit	
-		Signature	a		Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Result
-	3)	Signature	a		Pulse Width			(%)	(%)	
	;) Low Channel, 2402 MHz	Signature	a		Pulse Width 385.7 us	625.2 us	Pulses 1	(%) 61.7	(%) N/A	N/A
-) Low Channel, 2402 MHz Low Channel, 2402 MHz	Signature	<i>C</i> a		Pulse Width 385.7 us N/A	625.2 us N/A		(%) 61.7 N/A	(%) N/A N/A	N/A N/A
	b) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz	Signature	G		Pulse Width 385.7 us N/A 385.5 us	625.2 us N/A 625 us	Pulses 1	(%) 61.7 N/A 61.7	(%) N/A N/A N/A	N/A N/A N/A
-) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz	Signature	a		Pulse Width 385.7 us N/A 385.5 us N/A	625.2 us N/A 625 us N/A	Pulses 1	(%) 61.7 N/A 61.7 N/A	(%) N/A N/A N/A N/A	N/A N/A N/A N/A
-) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2440 MHz High Channel, 2480 MHz	Signature	a		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us	625.2 us N/A 625 us N/A 624.8 us	Pulses 1 5 1 5 1 5 1	(%) 61.7 N/A 61.7 N/A 61.7	(%) N/A N/A N/A N/A	N/A N/A N/A N/A
.E/GFSK (1 Mbps	b) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Migh Channel, 2480 MHz High Channel, 2480 MHz	Signature	a		Pulse Width 385.7 us N/A 385.5 us N/A	625.2 us N/A 625 us N/A	Pulses 1	(%) 61.7 N/A 61.7 N/A	(%) N/A N/A N/A N/A	N/A N/A N/A N/A
.E/GFSK (1 Mbps) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz)	Signature	G		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A	625.2 us N/A 625 us N/A 624.8 us N/A	Pulses 1 5 1 5 1 5 1	(%) 61.7 N/A 61.7 N/A 61.7 N/A	(%) N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A
.E/GFSK (1 Mbps	b) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2440 MHz High Channel, 2480 MHz High Channel, 2480 MHz b) Low Channel, 2402 MHz	Signature	Ca		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A 197.4 us	625.2 us N/A 625 us N/A 624.8 us N/A 625 us	Pulses 1 5 1 5 1 5 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 1 5 1	(%) 61.7 N/A 61.7 N/A 61.7 N/A 31.6	(%) N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A
.E/GFSK (1 Mbps	b) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz High Channel, 2448 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz	Signature	C.		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A 197.4 us N/A	625.2 us N/A 625 us N/A 624.8 us N/A 625 us N/A	Pulses 1 5 1 5 1 5 1	(%) 61.7 N/A 61.7 N/A 61.7 N/A 31.6 N/A	(%) N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A
_E/GFSK (1 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Migh Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz	Signature	<i>Ci</i>		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A 197.4 us N/A 197.1 us	625.2 us N/A 625 us N/A 624.8 us N/A 625 us N/A 625.1 us	Pulses 1 5 1 5 1 5 1 5 1 5 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 5 1 1 5 5 1 1 5	(%) 61.7 N/A 61.7 N/A 61.7 N/A 31.6 N/A 31.5	(%) N/A N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A
LE/GFSK (1 Mbps	b) Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Migh Channel, 2440 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz	Signature	Ca		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A 197.4 us N/A 197.1 us N/A	625.2 us N/A 625 us N/A 624.8 us N/A 625 us N/A 625.1 us N/A	Pulses 1 5 1 5 1 5 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 1 5 1	(%) 61.7 N/A 61.7 N/A 61.7 N/A 31.6 N/A 31.5 N/A	(%) N/A N/A N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A N/A N/A
onfiguration # LE/GFSK (1 Mbps LE/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Migh Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz	Signature	G		Pulse Width 385.7 us N/A 385.5 us N/A 385.6 us N/A 197.4 us N/A 197.1 us	625.2 us N/A 625 us N/A 624.8 us N/A 625 us N/A 625.1 us	Pulses 1 5 1 5 1 5 1 5 1 5 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 1 5 1 5 1 1 5 5 1 1 5	(%) 61.7 N/A 61.7 N/A 61.7 N/A 31.6 N/A 31.5	(%) N/A N/A N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A N/A N/A



		BLE/GFSK (1	Mbps), Low Chan				
			Number of	Value	Limit		
	Pulse Width	Period	Pulses	(%)	(%)	Results	-
	385.7 us	625.2 us	1	61.7	N/A	N/A	L
Keysight Spectrum Analy	zer - Element Materials Techno	ology					X
LXI RL RF	50 Ω DC		NSE:INT	ALIGN OFF		08:36:32 AM Jan 07, 2	2020
		PNO: Fast +> IFGain:Low	Trig Delay-100.0 µs Trig: Video #Atten: 10 dB	#Avg Type	e: Log-Pwr	TRACE 1 2 3 4 TYPE WWW DET P P P F	4 5 6 AWAW P P P
5 dB/div Ref 2.	fset 21.6 dB .00 dBm					Mkr3 721.0 -20.46 dE	µs 3m
Log							
-3.00	·						
-8.00							
-13.0							
-18.0			2		3		
-23.0			Y				
-28.0							
			,			TRIG	e vi
-33.0						1140	
-38.0							
-43.0							
Center 2.402000						Span 0	117
Res BW 3.0 MHz		#VB\A	/ 30 kHz		Sween 1	sparro 1.000 ms (8192 p	nz sts)
						-	
MKR MODE TRC SCL	× 95.80 (Y -20.75 d	FUNCTION	FUNCTION WIDTH	FUNC	FION VALUE	Â
2 N 1 t	481.5 (ıs -20.56 d	Bm				
3 N 1 t	721.0	ıs -20.46 d	BIM				
5							E
6							
8							
10							
11							-
			m	lesies 1			•
MSG				STATUS			
				nel, 2402 MHz			

			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

Keysight Spectrum Analyzer - Element Materials T		erree are	• • • • • • • • • •		
RL RF 50 Ω DC	5	ENSE:INT	ALIGN OFF #Avg Type	Log Pur	08:36:40 AM Jan 07, 2020 TRACE 1 2 3 4 5
	PNO: Fast ↔ IFGain:Low	Trig: Video #Atten: 10 dB	#Avg Type	:. Log-Pwr	TYPE WWWWW DET PPPP
Ref Offset 21.6 dB dB/div Ref 2.00 dBm					
3.0					
.0					
3.0					
.0					TRIG L
.0					
enter 2.402000000 GHz es BW 3.0 MHz	#VBV	V 30 kHz		Sweep	Span 0 H 2.813 ms (8192 pt
3			STATUS		



		BLE/GFSK (1 M				
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	385.5 us	625 us	1	61.7	N/A	N/A
📁 Keysight Spectrum Analyzer						
LXIRL RF !	50 Ω DC		E:INT Frig Delay-100.0 µs	ALIGN OFF	e: Log-Pwr	08:42:52 AM Jan 07, 2020
		PNO: East	Frig: Video #Atten: 10 dB		c. Log i m	TRACE 1 2 3 4 5 6 TYPE WWWWW DET P P P P P P
Ref Offse 5 dB/div Ref 3.00	t 21.6 dB					Mkr3 721.0 µs -19.69 dBm
Log						
-2.00						
-7.00						
-12.0						
-17.0			∆ 2		3	
-22.0			Ϋ́́		T Y	
-27.0						
-32.0						TRIG LVL
-37.0						
-42.0						
Center 2.44200000 Res BW 3.0 MHz	0 GHz	#VBW 3			0	Span 0 Hz 1.000 ms (8192 pts)
					•	
MKR MODE TRC SCL	× 96.00 µ	۲ s19.54 dBı		FUNCTION WIDTH	FUNC	CTION VALUE
2 N 1 t	481.5 µ	s -18.96 dBr	m			
3 N 1 t	721.0 µ	s -19.69 dBr	m			
5						H
6						
8						
9						
11						-
•			m			•
MSG				STATUS		
No. of Concession, Name		Manufacture of the second s		Construction of the second second second second second second	and the second	and the second

		BLE/GFSK (1	ivibps), iviid Chan	inei, 2442 MHZ		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

RL	RF	er - Element N 50 Ω DC		CEI	SE:INT		GN OFF			08-	42:59 AM Jan 07, 2
	13	50 R DC	PNO: Fas IFGain:Lo	t ++-	Trig: Vide #Atten: 1	eo 0 dB	#Avg T	ype: Lo	og-Pwr		TRACE 1 2 3 TYPE WWWA DET P P P
dB/div	Ref Offs Ref 3.0	et 21.6 dB 00 dBm									
.00			 	,							
.00											
.0											
'.0 <u> </u>											
.0											
.0											
.0											TRIC
.0											
enter 2	.4420000	00 GH7									Span 0
s BW	3.0 MHz			#VBW	30 kHz				Swe	ep 2.813	Span 0 ms (8192)



		BLE/GFSK (1 M					
			Number of	Value	Limit		
	Pulse Width	Period	Pulses	(%)	(%)	Results	-
	385.6 us	624.8 us	1	61.7	N/A	N/A	
Keysight Spectrum Analyzer X RL RF	- Element Materials Technol 50 Ω DC	SEN	SE:INT	ALIGN OFF		08:49:24 AM Jan 07, 2	2020
		PNO: East	Trig Delay-100.0 μ: Trig: Video #Atten: 10 dΒ	s #Avg Typ	e: Log-Pwr	TRACE 1 2 3 4 TYPE WWW DET P P P	-
Ref Offse 5 dB/div Ref 2.00	ot 21.6 dB 0 dBm					Mkr3 720.8 -20.67 dE	us Sm
-3.00							
-8.00							
-13.0							
-18.01			<mark>2</mark>		3		
-23.0			Ľ				
-28.0							
-33.0						TRIG	LVL
-38.0							
-43.0							
Center 2.48000000 Res BW 3.0 MHz	10 GHz	#VBW	30 kHz		Sweep	Span 0 1.000 ms (8192 p	Hz ots)
MKR MODE TRC SCL	x	Y	FUNCTION	FUNCTION WIDTH	-	TION VALUE	
1 N 1 t 2 N 1 t 3 N 1 t 4	96.00 µs 481.6 µs 720.8 µs	s -20.60 dE	lm				
5							E
7							
8 9							
10							Ţ
•			m				P.
MSG				STATUS			
			1bps), High Char				_

			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

RL	RF 50 Ω DC		SENSE:INT	ALIGN OFF		08:49:30 AM Jan 07, 202
		PNO: Fast ↔→ IFGain:Low		#Avg Type:	Log-Pwr	TRACE 1 2 3 4 5 TYPE WWWWW DET P P P P P
dB/div	Ref Offset 21.6 dB Ref 2.00 dBm					
00						
.0						
.0						
.0						
.0 0.						
.0						TRIGL
.0						
).0						
	.480000000 GHz 3.0 MHz	#VR	W 30 kHz		Sween	Span 0 H 2.812 ms (8192 pt
	0.00-111112	<i>#</i> 4 (5)		STATUS	Gweep	zio iz ma to iaz po



		BLE/GFSK (2 M				
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	197.4 us	625 us	1	31.6	N/A	N/A
	- Element Materials Technol					
LXI RL RF	50 Ω DC		E:INT Trig Delay-100.0 μs	ALIGN OFF #Avg Type	a: Log-Pwr	08:55:17 AM Jan 07, 2020 TRACE 1 2 3 4 5
		PNO: Fast	Trig: Video #Atten: 10 dB	#rivg iyp		TYPE WWWWWW DET PPPPP
Ref Offse 5 dB/div Ref 2.0	et 21.6 dB 0 dBm					Mkr3 720.8 µs -20.91 dBm
Log						
-3.00						
-8.00						
-13.0						
-18.0		2			3	
-23.0						
-28.0						
-33.0						
-38.0						
-43.0						
Center 2.4020000	IN GHZ		<u>I</u>			Span 0 Hz
Res BW 3.0 MHz		#VBW 3				.000 ms (8192 pts)
MKR MODE TRC SCL	X	-20.70 dB		FUNCTION WIDTH	FUNCT	ION VALUE
2 N 1 t	95.80 µs 293.2 µs	-20.97 dB	m			
3 N 1 t	720.8 µs	-20.91 dB	m			
5						
6						
8						
9						
11						
			m			•
MSG				STATUS		
				nel, 2402 MHz		

			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

Keysight Spectrum Analyzer - Element Materials Teo RL RF 50 Ω DC	S	ENSE:INT	ALIGN OFF	08:55:24 AM Jan 07, 202
	PNO: Fast ↔→ IFGain:Low	Trig: Video #Atten: 10 dB	#Avg Type: Log-P	
Ref Offset 21.6 dB dB/div Ref 2.00 dBm				
.00				
.00				
3.0				
3.0				
.0				
8.0				
				TRIG L'
8.0				
enter 2.402000000 GHz				Span () H
es BW 3.0 MHz	#VBV	V 30 kHz		Span 0 H Sweep 2.813 ms (8192 pt



		BLE/GFSK (2 I	Mbps), Mid Chan			
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	197.1 us	625.1 us	1	31.5	N/A	N/A
	50 Ω DC		ISE:INT Trig Delay-100.0 µ: Trig: Video #Atten: 10 dB	ALIGN OFF	: Log-Pwr	09:00:47 AM Jan 07, 2020 TRACE 2 3 4 3 TYPE WWWWW DET P P P P P Mkr3 720.8 µs -19,49 dBm
-22.0 -27.0 -37.0 -42.0 -42.0 	00 GHz	#VP.M	30 kHz		Sween	Span 0 Hz 1.000 ms (8192 pts)
MKRI MODEI TRCI SCLI	x	# 9 🗆 9 9	FUNCTION	FUNCTION WIDTH	•	CTION VALUE
1 N 1 t 2 N 1 t 3 N 1 t 4 5 6	95.70 µ 292.8 µ 720.8 µ	s -19.87 dE	3m 3m			E
7 8 9 10 11			m			
MSG				STATUS		
			Mbps), Mid Chan			

		BLE/GFSK (2	Mbps), Mid Chan	nnel, 2442 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

RL RF 50 Ω DC	C	SENSE:INT	ALIGN OFF		09:00:54 AM Jan 07	202
	PNO: Fast ↔→ IFGain:Low	Trig: Video #Atten: 10 dB		Type: Log-Pwr	TRACE 1 2 TYPE WW DET P P	3 4 5
Ref Offset 21.6 dB dB/div Ref 3.00 dBm	1					
	-					
.00						
2.0						
2.0						
.0						
.0					т	RIG L
.0						
.0						
enter 2.442000000 GHz es BW 3.0 MHz	#VB\	N 30 kHz		Swee	Span p 2.813 ms (8192	0 H pt



			BLE/GESK (2 N	Ibps), High Chan		Lineit	
		Pulse Width	Devied	Number of	Value	Limit	Desults
			Period	Pulses	(%)	(%) N/A	Results N/A
		197.3 us	625.1 us	1	31.6	IN/A	IN/A
-					ander ander stern der der		
Keysight S		zer - Element Materials Technolo 50 Ω DC		ISE:INT	ALIGN OFF		09:06:59 AM Jan 07, 2020
		F	PNO: Fast +++	Trig Delay-100.0 µs Trig: Video #Atten: 10 dB		: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P P P P P P
5 dB/div	Ref Off Ref 2.	set 21.6 dB 00 dBm					Mkr3 720.9 µs -20.60 dBm
Log							
-3.00	\int						
-8.00							
-13.0	1		2			3	
-18.0			-			- • •	
-23.0	<mark>/</mark>						
-28.0							
-33.0							TRIG LVL
-38.0	ļ						
-43.0							
	2.480000 3.0 MHz		#VBW	30 kHz		Sweep ′	Span 0 Hz 1.000 ms (8192 pts)
MKR MODE	TRC SCL	x	Y	FUNCTION	FUNCTION WIDTH	FUNC	FION VALUE
	1 t 1 t 1 t	<u>95.80 μs</u> 293.1 μs 720.9 μs	-20.79 dE -20.45 dE -20.60 dE	3m			
4 5							
6							
8							
9							
11							-
				m	OTATI		•
MSG					STATUS		
_			BLE/GFSK (2 N	/lbps), High Char	nel, 2480 MHz		
				Number of	Value	Limit	
		Pulse Width	Period	Pulses	(%)	(%)	Results

			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

RL	rum Analyzer - Element RF 50 Ω D0			SENSE:INT	A	ALIGN OFF			09:07:07 AM J	
	10 0032 00	-	PNO: Fast ↔→ IFGain:Low	Trig: Video #Atten: 10			ype: Log-P	wr	TRACE TYPE	12345 WWWWW PPPPP
dB/div	Ref Offset 21.6 d Ref 2.00 dBm	В								
.00										
.00							$\left\{ \right\}$			
3.0										
3.0										
3.0										
3.0										TRIGL
.0										
3.0										
enter 2.48 es BW 3.0	80000000 GHz 0 MHz		#VB	AV 30 kHz				Sweep 2.	Sp 813 ms (8	an 0 H 192 pt
3						STATU				_



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

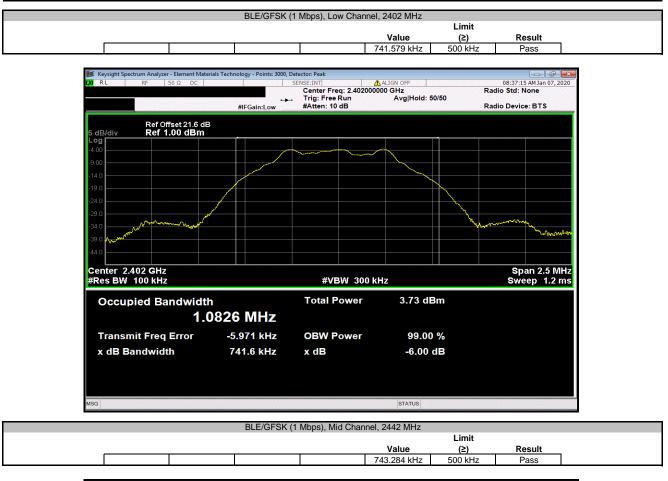
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

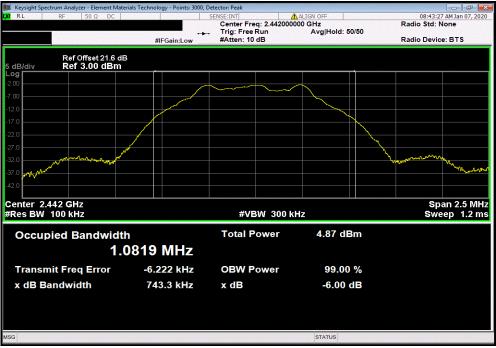
The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.



							TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	Livio Custom BLE Hearin	g Aid (Left Ear)				Work Order	STAK0202	
Serial Number:	2911328236						6-Jan-20	
Customer:	Starkey Laboratories, Inc.					Temperature		
Attendees:	Charlie Esch					Humidity	24.9% RH	
Project:	None				Barc	metric Pres.		
	Andrew Rogstad		Power:	Battery		Job Site	MN08	
TEST SPECIFICATI	ONS			Test Method				
FCC 15.247:2020				ANSI C63.10:2013				
COMMENTS				-				
Left ear. Reference	level offset includes Meas	surment Cable, DC Block, an	nd 20 dB Attenuator.					
DEVIATIONS FROM	I TEST STANDARD							
None								
Configuration #	13			10				
ooninguration #	10	Signature	as k	- Jalan				
							Limit	
						Value	(≥)	Result
BLE/GFSK (1 Mbps)	1							
	Low Channel, 2402 MHz				7	41.579 kHz	500 kHz	Pass
	Mid Channel, 2442 MHz				7	43.284 kHz	500 kHz	Pass
	High Channel, 2480 MHz				7	52.799 kHz	500 kHz	Pass
BLE/GFSK (2 Mbps)								
	Low Channel, 2402 MHz					.277 MHz	500 kHz	Pass
	Mid Channel, 2442 MHz					.279 MHz	500 kHz	Pass
	High Channel, 2480 MHz					.285 MHz	500 kHz	Pass

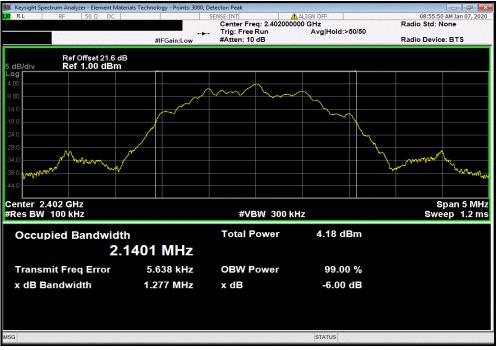






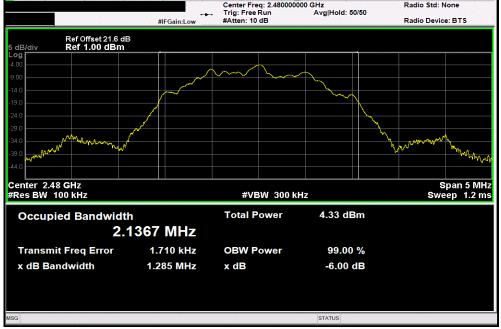














XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

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.



						TbtTx 2019.08.30.0	XMit 2019.09.05
	Livio Custom BLE Hearin	g Aid (Left Ear)			Work Order:		
Serial Number:						6-Jan-20	
	Starkey Laboratories, Inc				Temperature:	22.2 °C	
Attendees:	Charlie Esch				Humidity:	25.1% RH	
Project:	None				Barometric Pres.:	1019 mbar	
Tested by:	Andrew Rogstad		Power:	Battery	Job Site:	MN08	
TEST SPECIFICATI	ONS			Test Method			
FCC 15.247:2020				ANSI C63.10:2013			
COMMENTS							
Left ear. Reference	level offset includes Meas	surment Cable, DC Block, and 2	0 dB Attenuator.				
DEVIATIONS FROM	I TEST STANDARD						
None							
Configuration #	13		and R	andad			
		Signature	U-\$ 1	0			
					Out Pwr	Limit	
					(dBm)	(dBm)	Result
BLE/GFSK (1 Mbps)							
	Low Channel, 2402 MHz				-2.702	30	Pass
	Mid Channel, 2442 MHz				-1.553	30	Pass
	High Channel, 2480 MHz				-2.539	30	Pass
BLE/GFSK (2 Mbps)							
	Low Channel, 2402 MHz				-2.647	30	Pass
	Mid Channel, 2442 MHz				-1.501	30	Pass
	High Channel, 2480 MHz				-2.431	30	Pass
	5						



		BLE/GFSK	(1 Mbps), Low	Channel, 2402 MH		
				Out Pwr		
				(dBm)	(dBm)	Result
				-2.702	30	Pass
-						
Keysight Spectrum	Analyzer - Element Materials 1 50 Ω DC	echnology	SENSE:INT	ALIGN OFF		08:37:55 AM Jan 07, 2020
	- 50 Ω DC			#Avg	Type: Log-Pwr	TRACE 1 2 3 4 5
		PNO: Fast ↔	Trig: Free Ri #Atten: 10 d		old: 100/100	TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
		IFGain:Low	#Atten: 10 d			
Ref 5 dB/div Re Log	f Offset 21.6 dB f 2.00 dBm				IVIKI	r1 2.401 749 GHz -2.702 dBm
			. 1			
-3.00			↓ ¹			
-3.00						
-8.00						
-0.00						
-13.0						
10.0						
-18.0						
-23.0						
-28.0						
-33.0						
-38.0						
-43.0						
Center 2.4020	00 GHz	I				Span 3.500 MHz
#Res BW 2.0		#VI	BW 6.0 MHz		Sweep	1.066 ms (1000 pts
MSG				STATU	JS	
		BLE/GFSK	(1 Mbps), Mid	Channel, 2442 MH		
				Out Pwr		
				(dBm)	(dBm)	Result

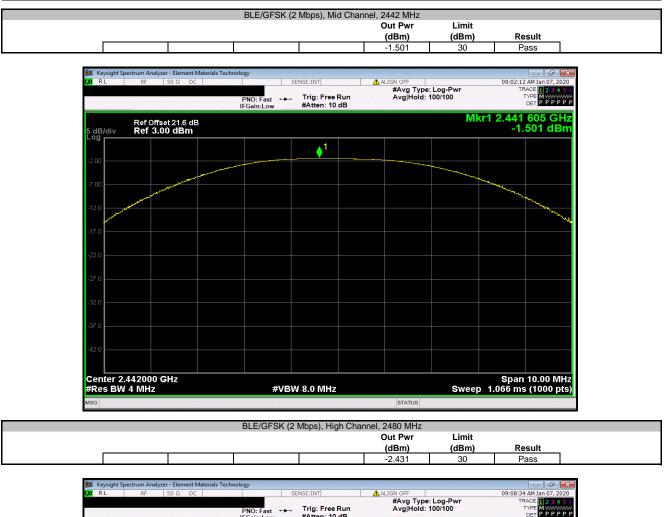
RL	RF 50 Ω DC		SENSE:INT		ALIGN OFF		08:44:06 AM Jan 07, 20
		PNO: Fast IFGain:Lov	🛻 Trig: I	Free Run n: 10 dB	#Avg Type: I Avg Hold: 10	00/100	TRACE 1 2 3 4 TYPE MWW DET P P P P
B/div	Ref Offset 21.6 dE Ref 3.00 dBm	3				Mkr	1 2.441 749 GI -1.553 dB
g 10			∮ ¹				
0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
.0							
0							
0							
0							
0							
0							
0							
nter 2.44	42000 GHz						Span 3.500 M
es BW 2	.0 MHz		#VBW 6.0 N	1Hz		Sweep	1.066 ms (1000 p



	BLE/GFSK	(1 Mbps), High Ch			
			Out Pwr	Limit	
			(dBm)	(dBm)	Result
			-2.539	30	Pass
			ales class class class class		
Keysight Spectrum Analyzer - Element Material	s Technology	SENSE:INT	ALIGN OFF		08:50:37 AM Jan 07, 2020
			#Avg Type:		TRACE 1 2 3 4 5 6
	PNO: Fast + IFGain:Low	 Trig: Free Run #Atten: 10 dB 	Avg Hold: 1	100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P P
Ref Offset 21.6 dB				Mkr	1 2.479 693 GHz
5 dB/div Ref 2.00 dBm					-2.539 dBm
Log		▲ 1			
-3.00					
-8.00					and the second s
-13.0					
-18.0					
-23.0					
-28.0					
-33.0					
-38.0					
-30.0					
-43.0					
					0
Center 2.480000 GHz #Res BW 2.0 MHz	#V	BW 6.0 MHz		Sweep	Span 3.500 MHz 1.066 ms (1000 pts)
MSG			STATUS		
	BLE/GFSH	K (2 Mbps), Low Cha		1 1	
			Out Pwr (dBm)	Limit (dBm)	Result
			-2.647	(dBm) 30	Pass
I	1	1	2.071		1 433

Keysight Spectrum Analy:	zer - Element Materials Tech 50 Ω DC		SENSE:INT	ALIGN OFF	08:56:29 AM Jan 07, 2020
	20 22 DC	PNO: Fast ↔ → → IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: Log Avg Hold: 100/1	PWr TRACE 2 3 4 5 6 00 TYPE MWWWWW DET P P P P P
Ref Offs 5 dB/div Ref 2.1	set 21.6 dB 00 dBm				Mkr1 2.401 585 GHz -2.647 dBm
-3.00					
-8.00					
-13.0	- And the second s				
-18.0					
-23.0					
-28.0					
-33.0					
-38.0					
-43.0					
Center 2.402000	GHz				Span 10.00 MHz
#Res BW 4 MHz		#VB	W 8.0 MHz		Span 10.00 MHz Sweep 1.066 ms (1000 pts)
NSG				STATUS	





α RL RF 50 Ω DC	SENSE:INT	ALIGN OFF	09:08:34 AM Jan 07, 2020
	PNO: Fast Trig: Free Run IFGain:Low #Atten: 10 dB	#Avg Type: Log-Pwr Avg Hold: 100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P
Ref Offset 21.6 dB 6 dB/div Ref 3.00 dBm		Mk	r1 2.479 494 GHz -2.431 dBm
2.00	1		
7.00			
12.0			
17.0			
22.0			
27.0			
32.0			
37.0			
42.0			
Center 2.480000 GHz #Res BW 4 MHz	#VBW 8.0 MHz	Sweep	Span 10.00 MHz 1.066 ms (1000 pts)
ISG		STATUS	

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

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 antenna gain was added to the conducted output power to calculate the EIRP.

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



				TbtTx 2019.08.30.0	XMit 2019.09.05
EUT: Livio Custom BLE Hearing Aid (Left Ear)			Work Order:		
Serial Number: 2911328236				6-Jan-20	
Customer: Starkey Laboratories, Inc.		T	emperature:	22.2 °C	
Attendees: Charlie Esch			Humidity:	24.7% RH	
Project: None		Baror	metric Pres.:	1019 mbar	
Tested by: Andrew Rogstad Po	ower: Battery		Job Site:	MN08	
TEST SPECIFICATIONS	Test Method				
FCC 15.247:2020	ANSI C63.10:2013				
COMMENTS	·				
Left ear. Reference level offset includes Measurment Cable, DC Block, and 20 dB Attenuator.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration # 13	Rogatal				
Signature					
	Out Pwr	Antenna	EIRP	EIRP Limit	
	(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
BLE/GFSK (1 Mbps)					
Low Channel, 2402 MHz	-2.702	-2	-4.702	36	Pass
Mid Channel, 2442 MHz	-1.553	-2	-3.553	36	Pass
High Channel, 2480 MHz	-2.539	-2	-4.539	36	Pass
BLE/GFSK (2 Mbps)					
Low Channel, 2402 MHz	-2.647	-2	-4.647	36	Pass
Mid Channel, 2442 MHz	-1.501	-2	-3.501	36	Pass
High Channel, 2480 MHz	-2.431	-2	-4.431	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

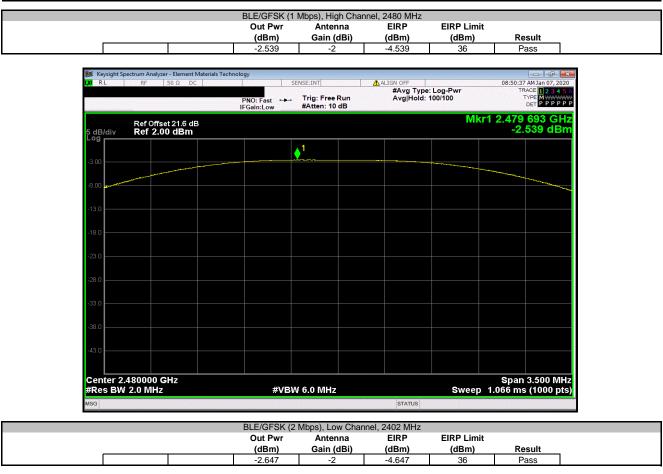


			I Mbps), Low Chan			
		Out Pwr	Antenna	EIRP	EIRP Limit	
		(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
		-2.702	-2	-4.702	36	Pass
	m Analyzer - Element Materials Te					
CA RL	RF 50 Ω DC	3	SENSE:INT	ALIGN OFF #Avg Tvp	e: Log-Pwr	08:37:55 AM Jan 07, 2020
		PNO: Fast +++ IFGain:Low	Trig: Free Run #Atten: 10 dB	AvgiHold	: 100/100	TRACE 1 2 3 4 5 TYPE MWWWW DET PPPP
R 5 dB/div R	ef Offset 21.6 dB ef 2.00 dBm				Mkr1	2.401 749 GHz -2.702 dBm
5 dB/div R			_			
			♦ ¹			
-3.00						
-8.00						and the second sec
-0.00						
-13.0						
-13.0						
-18.0						
10.0						
-23.0						
-28.0						
-33.0						
-38.0						
-43.0						
Center 2.402	2000 GHz					Span 3.500 MHz
#Res BW 2.0		#VB	№ 6.0 MHz		Sweep 1.	066 ms (1000 pts
MSG				STATUS		
		BLE/GFSK (1 Mbps), Mid Chani	nel. 2442 MHz		
		Out Pwr	Antenna	EIRP	EIRP Limit	
		(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
		-1.553	-2	-3.553	36	Pass

RL RF 50 Ω DC		SENSE:INT	ALIGN OFF #Avg Type: Log-Pwr	08:44:06 AM Jan 07, 202 TRACE 2 3 4 5
	PNO: Fast ↔ IFGain:Low	 Trig: Free Run #Atten: 10 dB 	Avg Hold: 100/100	TYPE MWWWW DET P P P P
Ref Offset 21.6 dB dB/div Ref 3.00 dBm			Mk	r1 2.441 749 GH -1.553 dBr
		↓ ¹		
2.0				
7.0				
2.0				
7.0				
2.0				
7.0				
2.0				
				0 0 500 M
enter 2.442000 GHz Res BW 2.0 MHz	#VE	3W 6.0 MHz	Sweep	Span 3.500 MH 1.066 ms (1000 pt

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

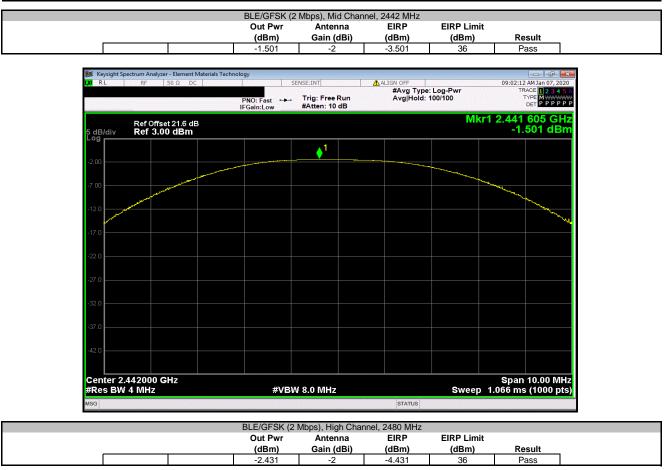


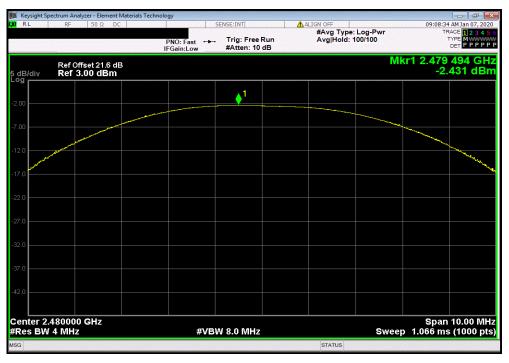


RL		r - Element Materia 50 Ω DC	is rechnology	SENSE:INT		ALIGN OFF		ا الصار میں (08:56:29 AM Jan 07, 202
KL	RF	50 52 DC		SENSE:INT	4	#Avg Type: L	og-Pwr	TRACE 1 2 3 4
			PNO: Fast IFGain:Low			Avg Hold: 10		TYPE MWWW DET PPPP
dB/div	Ref Offse Ref 2.0	et 21.6 dB 0 dBm					Mkr1	2.401 585 GH -2.647 dB
g				1				
10								
10		www.www.www.						
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nter 2.4 es BW	102000 G 4 MHz	iHz		#VBW 8.0 MHz			Sweep 1	Span 10.00 Mł .066 ms (1000 pt
1						STATUS		

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)









XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

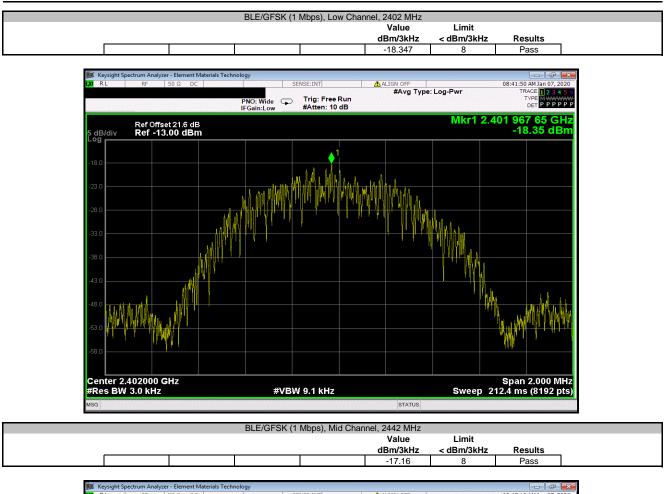
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

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



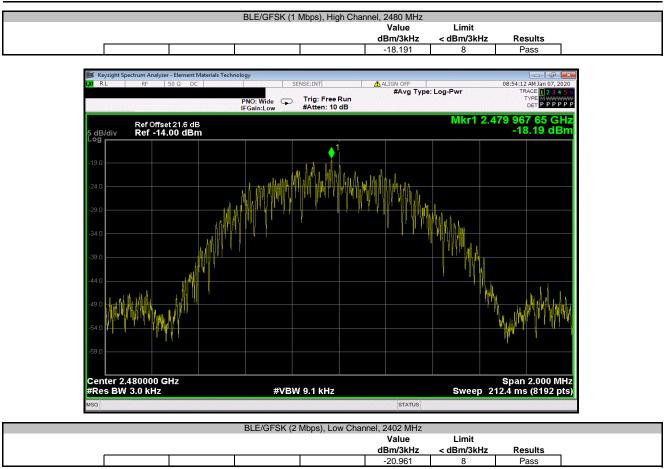
		TbtTx 2019.08.30.0	XMit 2019.09.05
EUT: Livio Custom BLE Hearing Aid (Left Ear)	Work Order:		
Serial Number: 2911328236	Date:	6-Jan-20	
Customer: Starkey Laboratories, Inc.	Temperature:	22.2 °C	
Attendees: Charlie Esch	Humidity:	25.7% RH	
Project: None	Barometric Pres.:	1019 mbar	
Tested by: Andrew Rogstad Power: Battery	Job Site:	MN08	
TEST SPECIFICATIONS Test Method			
FCC 15.247:2020 ANSI C63.10:2013			
COMMENTS			
Left ear. Reference level offset includes Measurment Cable, DC Block, and 20 dB Attenuator.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration # 13 Signature Chap Rogatant			
Signature			
	Value	Limit	
	dBm/3kHz	< dBm/3kHz	Results
BLE/GFSK (1 Mbps)			
Low Channel, 2402 MHz	-18.347	8	Pass
Mid Channel, 2442 MHz	-17.16	8	Pass
High Channel, 2480 MHz	-18.191	8	Pass
BLE/GFSK (2 Mbps)			
Low Channel, 2402 MHz	-20.961	8	Pass
Mid Channel, 2442 MHz	-19.779	8	Pass
High Channel, 2480 MHz	-20.795	8	Pass

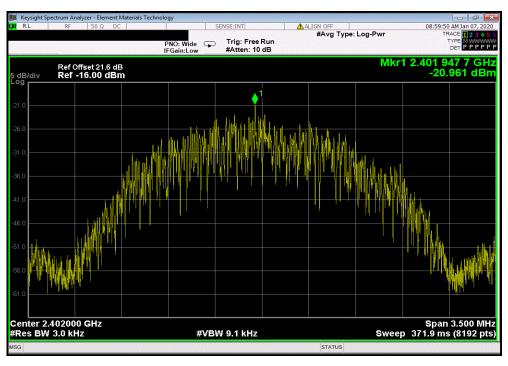




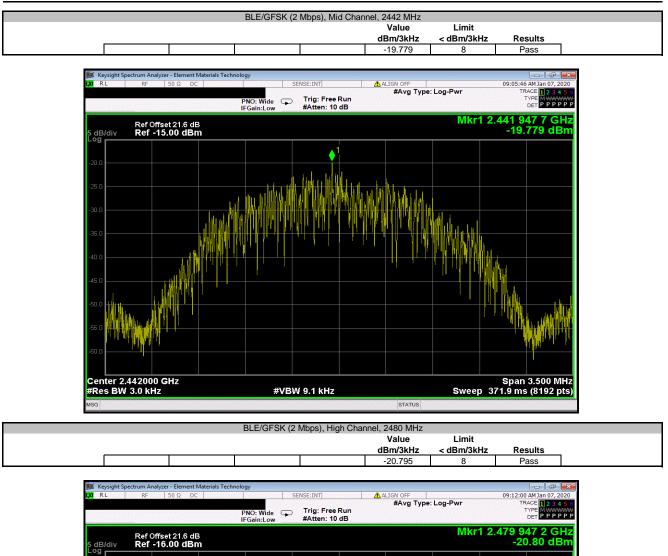


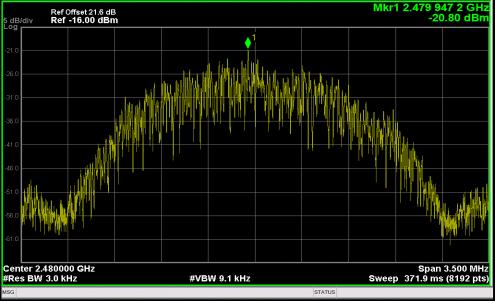














XMit 2019.09.05

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
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

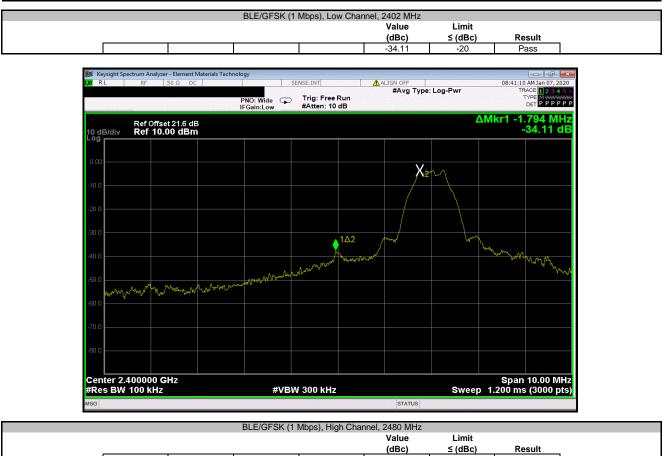
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the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



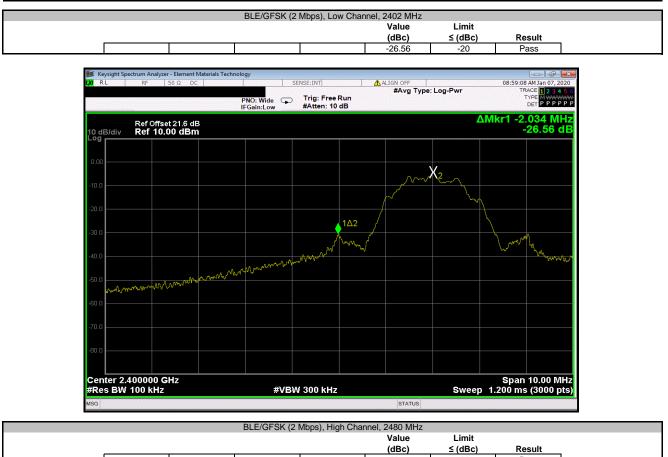
						10(1x 2019.06.30.0	XMII 2019.09.05
EUT:	Livio Custom BLE Hearing	ng Aid (Left Ear)			Work Order:	STAK0202	
Serial Number:	2911328236				Date:	6-Jan-20	
Customer:	Starkey Laboratories, Inc				Temperature:	22.2 °C	
	Charlie Esch					24.8% RH	
Project:					Barometric Pres.:		
	Andrew Rogstad		Power: Battery		Job Site:	MN08	
TEST SPECIFICAT	ONS		Test Method				
FCC 15.247:2020			ANSI C63.10:20	13			
COMMENTS							
Left ear. Reference	level offset includes Mea	surment Cable, DC Block, and 20 dB A	Attenuator.				
DEVIATIONS FROM	I TEST STANDARD						
None							
Configuration #	13		in Roptant	5			
		Signature	and the second				
					Value	Limit	
					(dBc)	≤ (dBc)	Result
BLE/GFSK (1 Mbps))						
	Low Channel, 2402 MHz				-34.11	-20	Pass
	High Channel, 2480 MHz				-45.6	-20	Pass
BLE/GFSK (2 Mbps)							
	Low Channel, 2402 MHz				-26.56	-20	Pass
	High Channel, 2480 MHz				-40.55	-20	Pass















XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	S.M. Electronics	SA26B-20	TZP	9-Nov-19	9-Nov-20
Block - DC	Fairview Microwave	SD3379	AMZ	9-Nov-19	9-Nov-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Generator - Signal	Keysight	N5182B	TFX	22-Oct-18	22-Oct-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

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.



						TbtTx 2019.08.30.0	XMit 201		
	Livio Custom BLE Hearing Aid	(Left Ear)			Work Order:				
Serial Number:						6-Jan-20			
	Starkey Laboratories, Inc.				Temperature:				
	Charlie Esch			Humidity: 25.9% RH					
Project:					Barometric Pres.:				
	Andrew Rogstad		Power: Battery		Job Site:	MN08			
EST SPECIFICAT	IONS		Test Method						
CC 15.247:2020			ANSI C63.10:2013						
OMMENTS									
oft ear. Reference	e level offset includes Measurme	nt Cable, DC Block, and 20 dB A	ttenuator.						
EVIATIONS FROM	M TEST STANDARD								
one									
onfiguration #	13		Rogetand						
		Signature	1 Cogsuer						
			Frequency	Measured	Max Value	Limit			
			Range	Freq (MHz)	(dBc)	≤ (dBc)	Result		
LE/GFSK (1 Mbps	s)								
	Low Channel, 2402 MHz								
			Fundamental	2402.24	N/A	N/A	N/A		
	Low Channel, 2402 MHz		Fundamental 30 MHz - 12.5 GHz	2402.24 2397.34	N/A -47.99	N/A -20	N/A Pass		
	Low Channel, 2402 MHz		30 MHz - 12.5 GHz	2397.34	-47.99	-20	Pass		
	Low Channel, 2402 MHz Low Channel, 2402 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2397.34 24885.55	-47.99 -47.63	-20 -20	Pass Pass		
	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	2397.34 24885.55 2442.24	-47.99 -47.63 N/A	-20 -20 N/A	Pass Pass N/A		
	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57	-47.99 -47.63 N/A -50.22	-20 -20 N/A -20	Pass Pass N/A Pass		
	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2397.34 24885.55 2442.24 3840.57 21987.55	-47.99 -47.63 N/A -50.22 -48.76	-20 -20 N/A -20 -20	Pass Pass N/A Pass Pass		
	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24	-47.99 -47.63 N/A -50.22 -48.76 N/A	-20 -20 N/A -20 -20 N/A	Pass Pass N/A Pass Pass N/A		
LE/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54	-20 -20 N/A -20 -20 N/A -20	Pass Pass N/A Pass Pass N/A Pass		
LE/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54	-20 -20 N/A -20 -20 N/A -20	Pass Pass N/A Pass Pass N/A Pass		
LE/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2397.34 24885.55 2442.24 3840.67 21987.55 2480.24 3805.56 24162.19	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48	-20 -20 N/A -20 -20 N/A -20 -20	Pass Pass N/A Pass Pass N/A Pass Pass		
.E/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56 24162.19 2402.01	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48	-20 -20 N/A -20 -20 N/A -20 -20 N/A	Pass Pass N/A Pass N/A Pass Pass Pass		
.E/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Jow Channel, 2402 MHz Low Channel, 2402 MHz		30 MHz - 12.5 GHz 12.6 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56 24162.19 2402.01 2397.34	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48	-20 -20 N/A -20 -20 N/A -20 -20 -20	Pass Pass N/A Pass N/A Pass Pass N/A Pass		
_E/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 24480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56 24162.19 2402.01 2397.34 24981.69 2442.01	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48.76 N/A -44.64 -46.5 N/A	-20 -20 N/A -20 -20 -20 -20 -20 N/A -20 -20 N/A	Pass Pass N/A Pass N/A Pass Pass N/A Pass Pass		
_E/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 20 MHz - 12.5 GHz Fundamental 30 MHz - 25 GHz Fundamental	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56 24162.19 2402.01 2397.34 24981.69	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48 N/A -44.64 -44.64 -46.5	-20 -20 N/A -20 -20 N/A -20 -20 N/A -20 -20	Pass Pass N/A Pass N/A Pass Pass N/A Pass Pass N/A		
.E/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Dow Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 38065.66 24162.19 2402.01 2397.34 24981.69 2442.01 9806.87 23672.32	-47.99 -47.63 -N/A -50.22 -48.76 N/A -49.54 -48 -44.64 -44.64 -44.64 -46.5 N/A -50.66	-20 -20 N/A -20 -20 N/A -20 -20 -20 -20 -20 N/A -20 -20	Pass Pass N/A Pass Pass Pass Pass N/A Pass N/A Pass N/A		
LE/GFSK (2 Mbps	Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2480 MHz High Channel, 2480 MHz High Channel, 2480 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz		30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz Fundamental 30 MHz - 12.5 GHz	2397.34 24885.55 2442.24 3840.57 21987.55 2480.24 3805.56 24162.19 2402.01 2397.34 24981.69 2442.01 9806.87	-47.99 -47.63 N/A -50.22 -48.76 N/A -49.54 -48 N/A -44.64 -46.5 N/A -50.68 -48.37	-20 -20 N/A -20 -20 N/A -20 -20 N/A -20 -20 N/A -20 -20 N/A -20 -20	Pass Pass N/A Pass N/A Pass Pass N/A Pass Pass N/A Pass Pass		



Frequency		Measured	Max Value	Limit	
Range		Freq (MHz)	(dBc)	≤ (dBc)	Result
Fundamenta	al	2402.24	N/A	N/A	N/A
Keysight Spectrum Analyzer - Element Materials T	echnology				
LXI RL RF 50Ω DC	SENSE	INT	ALIGN OFF		08:38:18 AM Jan 07, 2020
	PNO: Wide 🖵 Tr IFGain:Low #A	ig: Free Run Atten: 10 dB	#Avg Type:	Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWW DET PPPPP
Ref Offset 21.6 dB 10 dB/div Ref 10.00 dBm				Mkr1 2.4	02 237 76 GHz -3.72 dBm
Log					
0.00				1	
-10.0			~		
-20.0					
-30.0					
-40.0					
-50.0					
-60.0					
-70.0					
-80.0					
Center 2.4020000 GHz #Res BW 100 kHz	#VBW 3	00 kHz		Sweep 1	Span 1.000 MHz .092 ms (8192 pts)
MSG			STATUS		
	BLE/GFSK (1 Mb	ps), Low Chanr	nel, 2402 MHz		
Frequency	,	Measured	Max Value	Limit	Beault
Range 30 MHz - 12.5		Freq (MHz) 2397.34	(dBc) -47.99	≤ (dBc) -20	Result Pass

📜 Keysight Spe 🗶 R.L	ectrum Analyzer - Element l RF 50 Ω DC			SENSE:INT		ALIGN OFF		00.20.4	AM Jan 07, 2020
	N 30 2 DC	F	PNO: Fast 🖵		Run	#Avg Type:	Log-Pwr	TF	AACE 1 2 3 4 5 TYPE M WWWWW DET P P P P P
10 dB/div Log	Ref Offset 21.6 di Ref 10.00 dBm							Mkr1 2.3 -5	97 3 GHz 1.71 dBm
0.00									
10.0									
-20.0									
-30.0									
-40.0		1							
-50.0		ا الفدار سانتیفیر بینجیه	Winter Land	har casalahara	ينقاقين إدريه بمقد	ويعادد فالأفر الأحما	والمتعادية والأرباء		alalia mili ka mi
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80.0									
Start 30 № ≉Res BW			#VB	W 300 kHz			Swe	Stop ? ep 1.192 s	12.500 GHz s (8192 pts
ISG						STATUS			

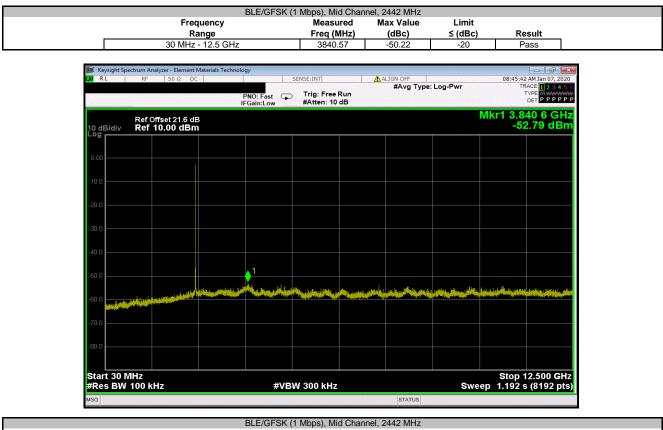


	BLE/G	FSK (1 Mbps), Low Char	nel, 2402 MHz		
	Frequency	Measured	Max Value	Limit	
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
1	12.5 GHz - 25 GHz	24885.55	-47.63	-20	Pass
	- Element Materials Technology				
CXI RL RF	50 Ω DC	SENSE:INT	ALIGN OFF		08:40:47 AM Jan 07, 2020
	PNO: Fas IFGain:Lo	st 🕞 Trig: Free Run w #Atten: 10 dB	#Avg Type:	: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWW DET P P P P P P
Ref Offse 10 dB/div Ref 10.0	t 21.6 dB)0 dBm			Mkr1	24.885 5 GHz -51.35 dBm
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-70.0					
-80.0					
Start 12.500 GHz #Res BW 100 kHz		#VBW 300 kHz		Sweep	Stop 25.000 GHz 1.195 s (8192 pts)
MSG			STATUS		
		FSK (1 Mbps), Mid Chan Measured	nel, 2442 MHz Max Value	Limit	
	Frequency Range	Freq (MHz)	Max value (dBc)	Limit ≤ (dBc)	Result
[
	Fundamental	2442.24	N/A	N/A	N/A

BLE/GFSK (1 Mbps), Mid Channel, 2442 MHz							
Frequency Measured Max Value Limit							
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result			
Fundamental	2442.24	N/A	N/A	N/A			

RL RF 50 Ω DC	S	ENSE:INT	ALIGN OFF		08:44:44 AM Jan 07, 202
	PNO: Wide 🖵 IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: L	og-Pwr	TRACE 2 3 4 1 TYPE MWWW DET PPPP
Ref Offset 21.6 dB dB/div Ref 10.00 dBm				Mkr1 2.4	442 236 42 GH -2.58 dBi
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enter 2.4420000 GHz					Span 1.00 <u>0 M</u> I
tes BW 100 kHz	#VBV	V 300 kHz		Sweep 1	Span 1.000 Mi .092 ms (8192 pt





BLE/GFSK (1	Mbps), Mid Chan	nel, 2442 MHz						
Frequency Measured Max Value Limit								
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result				
12.5 GHz - 25 GHz	21987.55	-48.76	-20	Pass				

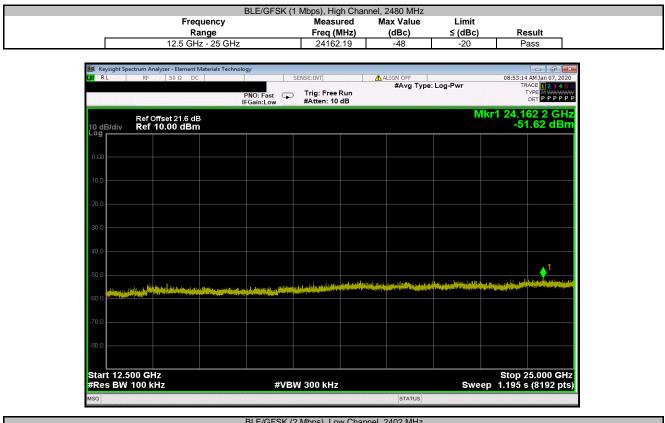
RL		RF	50 Ω		als Technolo		5	ENSE:INT			GN OFF		08:4	6:40 AM Jan 07, 202
		TG	1 30 1		1	PNO: Fast FGain:Low		Trig: Free I #Atten: 10	Run dB	<u> </u>	#Avg Type	: Log-Pwr	00.11	TRACE 1 2 3 4 5 TYPE MWWW DET PPPP
0 dB	3/div	Ref Of Ref 1	fset 21.6 0.00 di	dB 3m									Mkr1 21	.987 5 GH 51.34 dBr
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	12.50 BW 1					#	VBV	V 300 kHz				Sv	Sto eep 1.19	p 25.000 GH 5 s (8192 pt
SG											STATUS			



		(1 Mbps), High Char			
	Frequency	Measured	Max Value	Limit	Desself
T	Range Fundamental	Freq (MHz)	(dBc) N/A	<mark>≤ (dBc)</mark> N/A	Result N/A
	Fundamental	2480.24	IN/A	N/A	N/A
Keysight Spectrum Analyzer	- Element Materials Technology 50 Ω DC	SENSE:INT	ALIGN OFF		08:51:19 AM Jan 07, 2020
			#Avg Type	: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P
	PNO: Wide 🕞 IFGain:Low	Trig: Free Run #Atten: 10 dB			DET PPPPP
Ref Offset				Mkr1 2.4	180 236 66 GHz
10 dB/div Ref 10.0	10 dBm				-3.62 dBm
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-20.0					
-30.0					
-40.0					
-50.0					
-60.0					
70.0					
-70.0					
-80.0					
Center 2.4800000 G #Res BW 100 kHz		SW 300 kHz		Sweep 1	Span 1.000 MHz .092 ms (8192 pts)
MSG		544 300 KHZ	STATUS	aweep	.oaz ma (oraz pra)
MSG			STATUS		
	BLE/GFSK ((1 Mbps), High Char	nnel. 2480 MHz		
	Frequency	Measured	Max Value	Limit	
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
3	0 MHz - 12.5 GHz	3805.56	-49.54	-20	Pass
Keysight Spectrum Analyzer	- Element Materials Technology				

RL	RF 50	Ω DC	is here and here a		SENSE:INT	A	ALIGN OFF		08:52:16	AM Jan 07, 2020
				PNO: Fast 🖵	Trig: Free #Atten: 10	Run	#Avg Type:	Log-Pwr	TF	ACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
0 dB/div og r	Ref Offset 2 Ref 10.00								Mkr1 3.8 -53	05 6 GH 3.16 dBr
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tart 30 N Res BW	/IHz 100 kHz			#VB	W 300 kHz			Swe	Stop 1 ep 1.192 s	2.500 GH
G							STATUS			نغالفهم

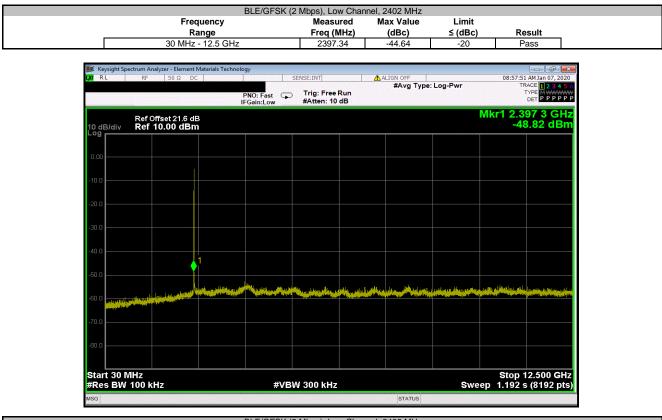




BLE/GFSK (2 Mbps), Low Channel, 2402 MHz									
Frequency	Measured	Max Value	Limit						
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	_				
Fundamental	2402.01	N/A	N/A	N/A					



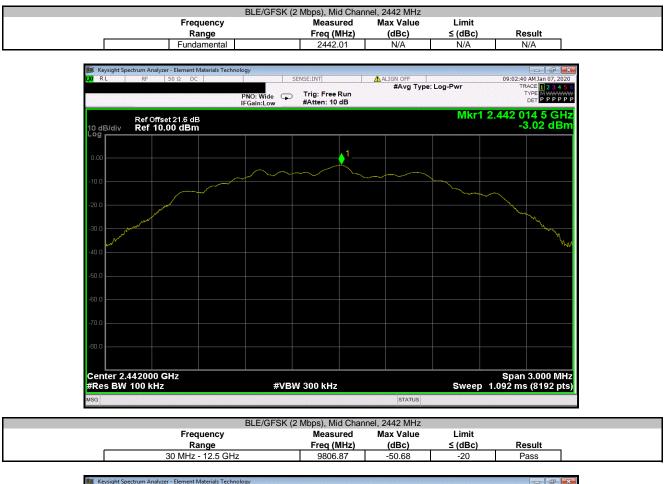




BLE/GFSK (2	2 Mbps), Low Char	nnel, 2402 MHz					
Frequency Measured Max Value Limit							
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result			
12.5 GHz - 25 GHz	24981.69	-46.5	-20	Pass			

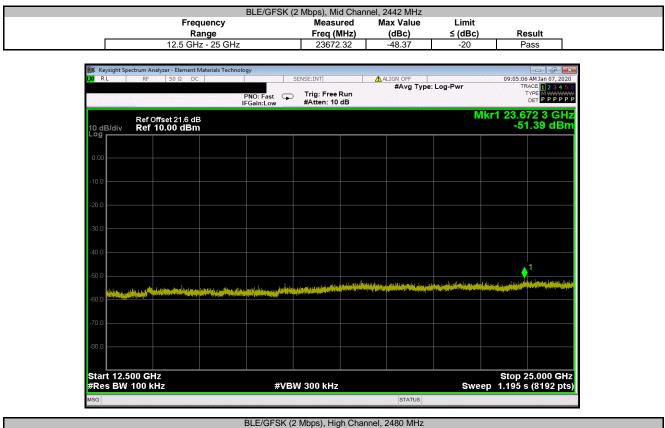
RL		RF	50 Ω	ent Materials 1 DC		C	ENSE:INT	A.	ALIGN OFF		08.58	48 AM Jan 07, 202
		14	1.00 12		PNO: Fast IFGain:Lov	-	Trig: Free #Atten: 10	Run	#Avg Type:	Log-Pwr		TRACE 1 2 3 4 5 TYPE MWWW DET P P P P
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	t 12.50									_	Stop	25.000 GI
(H	5 BW 1	00 kl	Z			#VBV	V 300 kHz			Sv	veep 1.195	s (8192 pt





RL	RF 50 Ω	DC		SENSE:INT	ALIGN OFF	and the states of the	09:03:40	AM Jan 07, 202
	_		PNO: Fast 😱 IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type:	Log-Pwr	TF	ACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
) dB/div	Ref Offset 21.6 Ref 10.00 di	dB 3m					Mkr1 9.8 -53	06 9 GH 3.70 dBr
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tart 30 M	1Hz						Stop 1	2.500 GF
	100 kHz		#VB	W 300 kHz		Swe	ep 1.192 s	(8192 pt
G					STATUS			

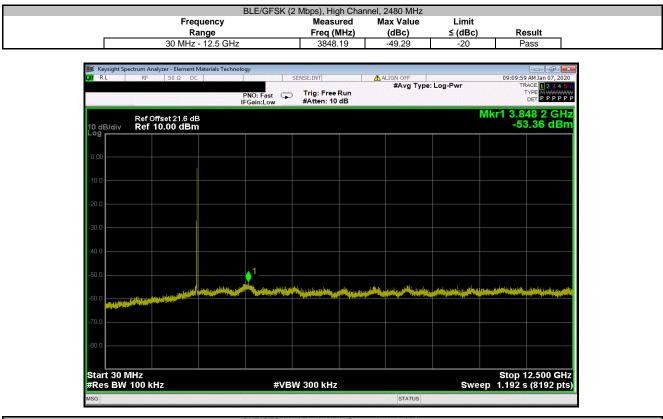




	BLE/GFSK (2 Mbps), High Cha	nnel, 2480 MHz			
Frequency	Measured	Max Value	Limit		
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
Fundamental	2480.01	N/A	N/A	N/A	







BLE/GFSK (2	Mbps), High Char	nnel, 2480 MHz					
Frequency Measured Max Value Limit							
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result			
12.5 GHz - 25 GHz	24001.95	-47.13	-20	Pass			

RL		RF	50 Ω		Technology		SENSE:INT		ALIGN OFF		09:1	1:03 AM Jan 07, 202
					PNO: IFGain	Fast 😱	Trig: Free #Atten: 10	Run	#Avg Type	: Log-Pwr		TRACE 1 2 3 4 5 TYPE MWWW DET P P P P F
0 45	3/div	Ref Of Pof 1	fset 21.6 0.00 di	dB Bm							Mkr1 24	.002 0 GH -51.20 dBr
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	t 12.50										Sto	p 25.000 GF
Res	SBW 1	00 kH	z			#VB	W 300 kHz			SW	reep 1.19	5 s (8192 pt