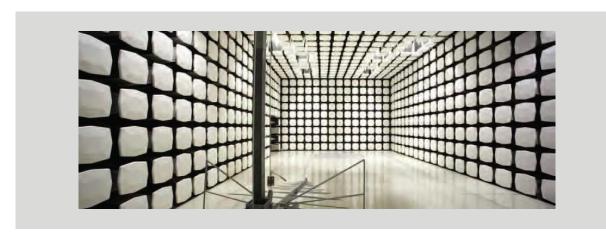


Starkey Laboratories, Inc.

Livio 2.4 GHz Rechargeable BTE hearing aid

FCC 15.247:2019
Bluetooth Low Energy DTS Radio

Report # STAK0176.1







NVLAP LAB CODE: 200881-0

CERTIFICATE OF TEST



Last Date of Test: September 19, 2019
Starkey Laboratories, Inc.
EUT: Livio 2.4 GHz Rechargeable BTE hearing aid

Radio Equipment Testing

Standards

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

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Matt Nuernberg, Operations Manager

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

REVISION HISTORY



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

Report No. STAK0176.1

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

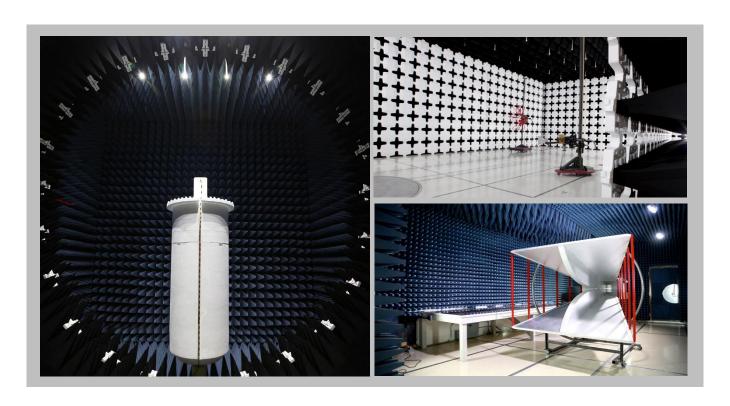
FACILITIES







California	Minnesota	Oregon	Texas	Washington	
Labs OC01-17 41 Tesla Irvine, CA 92618	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074	Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011	
(949) 861-8918	(612)-638-5136	(503) 844-4066	(469) 304-5255	(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	



Report No. STAK0176.1 5/58

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.

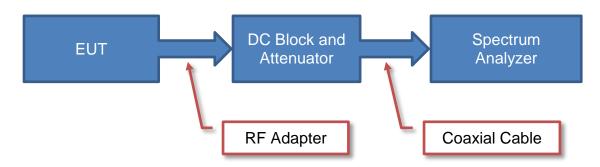
Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field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

Report No. STAK0176.1

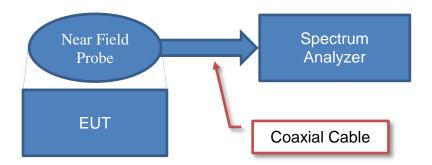
Test Setup Block Diagrams



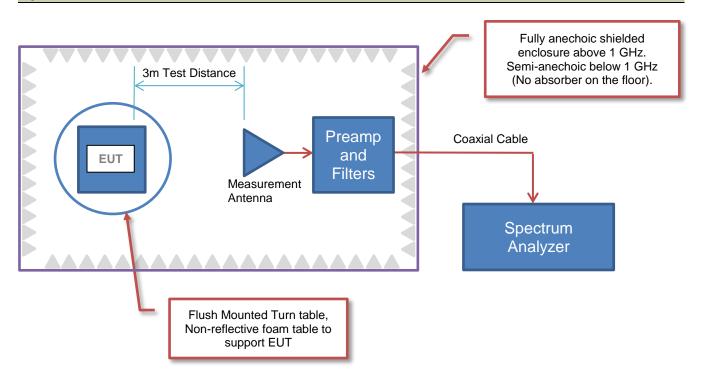
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



Report No. STAK0176.1 7/58

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 2.4 GHz Rechargeable BTE hearing aid
First Date of Test:	August 19, 2019
Last Date of Test:	September 19, 2019
Receipt Date of Samples:	August 16, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Function	Description of the EUT:
Rohind	par hearing aid with a 2.4 GHz RI E radio

Testing Objective:

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

Report No. STAK0176.1

CONFIGURATIONS



Configuration STAK0176-1

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Livio 2.4 GHz Rechargeable BTE hearing aid	Starkey Laboratories, Inc.	Livio BTE R	190494755		

Configuration STAK0176-3

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Livio 2.4 GHz Rechargeable BTE hearing aid	Starkey Laboratories, Inc.	Livio BTE R	190494775		

Remote Equipment Outside of Test Setup Boundary					
Description Manufacturer Model/Part Number Serial Number					
Bluetooth Dongle Dock	TruLink	None	None		
Bluetooth Dongle	Anatel	BLE0112	Unknown		
Laptop	Lenovo	ThinkPad T430	11079		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable (Bluetooth Dongle Dock)	No	1.8m	No	Bluetooth Dongle Dock	Laptop

Configuration STAK0176-4

EUT				
Description Manufacturer Model/Part Serial Number Number				
Livio 2.4 GHz Rechargeable BTE hearing aid	Starkey Laboratories, Inc.	Livio BTE R	190494757	

Report No. STAK0176.1 9/58

MODIFICATIONS



Equipment Modifications

Data	Tast	NA - diff ti	Maka	Diamonitian of EUT
Date	-		******	Disposition of EUT
	· •			EUT remained at
2019-08-19	Radiated	delivered to	devices were added or	Element following the
	Emissions	Test Station.	modified during this test.	test.
		Tested as	No EMI suppression	EUT remained at
2019-09-19	Duty Cycle	delivered to	devices were added or	Element following the
		Test Station.	modified during this test.	test.
	Occupied	Tested as	No EMI suppression	EUT remained at
2019-09-19	•	delivered to	devices were added or	Element following the
	Bandwidth	Test Station.	modified during this test.	test.
		Tested as	No EMI suppression	EUT remained at
2019-09-19	Output Power	delivered to	devices were added or	Element following the
		Test Station.	modified during this test.	test.
	Equivalent	Tested as	No EMI suppression	EUT remained at
2019-09-19	Isotropic	delivered to	devices were added or	Element following the
	Radiated Power	Test Station.	modified during this test.	test.
	Davisa Calastral	Tested as	No EMI suppression	EUT remained at
2019-09-19		delivered to	devices were added or	Element following the
	Density	Test Station.	modified during this test.	test.
	Dand Edge	Tested as	No EMI suppression	EUT remained at
2019-09-19		delivered to	devices were added or	Element following the
	Compliance	Test Station.	modified during this test.	test.
	Spurious	Tested as		Cob adulad taating
2019-09-19	Conducted	delivered to	devices were added or	Scheduled testing
	Emissions	Test Station.	modified during this test.	was completed.
	2019-09-19 2019-09-19 2019-09-19 2019-09-19	2019-08-19 Spurious Radiated Emissions 2019-09-19 Duty Cycle 2019-09-19 Occupied Bandwidth 2019-09-19 Output Power Equivalent Isotropic Radiated Power 2019-09-19 Power Spectral Density 2019-09-19 Band Edge Compliance Spurious Conducted	Spurious Radiated delivered to Emissions Test Station. 2019-09-19 Duty Cycle delivered to Test Station. 2019-09-19 Occupied Bandwidth Tested as delivered to Test Station. 2019-09-19 Output Power delivered to Test Station. 2019-09-19 Equivalent Isotropic Radiated Power Test Station. 2019-09-19 Power Spectral Density Tested as delivered to Test Station. 2019-09-19 Fower Spectral Density Tested as delivered to Test Station. 2019-09-19 Spurious Tested as delivered to Test Station. Spurious Tested as delivered to Test Station. Tested as delivered to Test Station.	Spurious Radiated Radiated Emissions Tested as delivered to Test Station.

Report No. STAK0176.1 10/58

SPURIOUS RADIATED EMISSIONS



PSA-FSCI 2019.05.1

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

Tx on Low Ch 0 2402 MHz, Mid Ch 18 2440 MHz, High Ch 39 2480 MHz, 1 mb Data Rate Tx on Low Ch 0 2402 MHz, Mid Ch 18 2440 MHz, High Ch 39 2480 MHz, 2 mb Data Rate

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

STAK0176 - 1

STAK0176- 4

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 26000 MHz	
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - High Pass	Micro-Tronics	HPM50111	HFM	26-Sep-2018	12 mo
Attenuator	Coaxicom	3910-20	AXY	26-Sep-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	13-Sep-2018	12 mo
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	12-Sep-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-12001800-30-10P	PAP	23-Feb-2019	12 mo
Antenna - Standard Gain	ETS-Lindgren	3160-08	AJP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	23-Feb-2019	12 mo
Cable	Element	Standard Gain Cable	MNW	23-Feb-2019	12 mo
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	0 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXV	15-May-2018	24 mo
Cable	Element	Double Ridge Guide Horn Cables	MNV	23-Feb-2019	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIB	27-Aug-2018	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	13-Dec-2018	12 mo
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	28-Jul-2019	12 mo
Antenna - Double Ridge	ETS-Lindgren	3115	AJQ	16-Jan-2019	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	17-Sep-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	8-Feb-2019	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	17-Sep-2019	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	LFN	12-Sep-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	23-Feb-2019	12 mo
Antenna - Biconilog	EMCO	3141	AXE	NCR	0 mo

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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

Report No. STAK0176.1 11/58

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 2019.08.01		PSA-ESCI 2019.05.10	<u>_</u>
We	ork Order:		(0176		Date:		g-2019		1	/	74		
	Project:		one	Ter	nperature:		1 °C		(1	M		
	Job Site:	MM	109		Humidity:	58.89	% RH						
Seria	al Number:	19049	94755	Barome	etric Pres.:	1019	mbar		Tested by:	Chris Patte	erson		='
	EUT:	Livio 2.4 G	Hz Rechar	eable BTE	hearing ai	d							-
Conf	figuration:		,	,	<u> </u>								=
			boratories,	Inc									-
		Charlie Es		1110.									=
	UT Power:		CII										-
			Ch 0 2402	NALI - NA: - A	Ch 10 0110	MII- Iliah	Ch 20 240	1 MI I= 1 =	h Doto Dot				-
Operat	ting Mode:	IX OII LOW	CII 0 2402	ivi⊓∠, iviid v	JII 16 2440	IVIDZ, DIGIT	CII 39 246	J IVIMZ, I II	ib Dala Kal	е			
D	Deviations:	None	e Correction	Factor de	rived using	this formula	DCCF = 1	0*I OG(1/I	Outv Cvcle)				-
	Comments:	Daty Cycle		1 40101 401	TVOG GOING								:
Test Spec							Test Meth						_
FCC 15.24	47:2019						ANSI C63.	10:2013					
Run #	30	Test Dis	stance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Р	ass	- -
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						MHz				■ PK	◆ AV	QP	
										■ PK	▼ AV	- QF	
					Duty Cycle Correction	External	Polarity/ Transducer		B			Compared to	
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Factor	Attenuation (dB)	Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Spec. (dB)	Comments

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.683	31.5	-4.1	1.5	349.0	2.1	20.0	Horz	AV	0.0	49.5	54.0	-4.5	EUT On Side, High Ch, 1 mb
2485.317	31.4	-4.1	1.5	287.0	2.1	20.0	Vert	AV	0.0	49.4	54.0	-4.6	EUT On Side, High Ch, 1 mb
2388.410	31.3	-4.2	1.5	71.0	2.1	20.0	Horz	AV	0.0	49.2	54.0	-4.8	EUT On Side, Low Ch, 1 mb
2384.360	31.3	-4.2	2.6	8.0	2.1	20.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT On Side, Low Ch, 1 mb
7319.417	32.9	12.7	2.5	312.0	2.1	0.0	Horz	AV	0.0	47.7	54.0	-6.3	EUT On Side, Mid Ch, 1 mb
7319.500	30.7	12.7	3.1	68.0	2.1	0.0	Vert	AV	0.0	45.5	54.0	-8.5	EUT Vert, Mid Ch, 1 mb
7319.375	30.5	12.7	1.5	124.0	2.1	0.0	Vert	AV	0.0	45.3	54.0	-8.7	EUT Horz, Mid Ch, 1 mb
7319.458	30.5	12.7	2.5	111.0	2.1	0.0	Horz	AV	0.0	45.3	54.0	-8.7	EUT Vert, Mid Ch, 1 mb
7319.417	30.0	12.7	1.9	355.0	2.1	0.0	Horz	AV	0.0	44.8	54.0	-9.2	EUT Horz, Mid Ch, 1 mb
7319.375	28.3	12.7	1.5	297.0	2.1	0.0	Vert	AV	0.0	43.1	54.0	-10.9	EUT On Side, Mid Ch, 1 mb
7439.292	28.2	12.8	2.1	320.0	2.1	0.0	Horz	AV	0.0	43.1	54.0	-10.9	EUT On Side, High Ch, 1 md
7205.375	28.7	12.3	2.9	253.0	2.1	0.0	Horz	AV	0.0	43.1	54.0	-10.9	EUT On Side, Low Ch, 1 mb
7428.167	28.1	12.8	1.1	272.0	2.1	0.0	Vert	AV	0.0	43.0	54.0	-11.0	EUT On Side, High Ch, 1 mb
7215.250	28.3	12.3	1.5	324.0	2.1	0.0	Vert	AV	0.0	42.7	54.0	-11.3	EUT On Side, Low Ch, 1 mb
2483.517	43.4	-4.1	1.5	287.0	0.0	20.0	Vert	PK	0.0	59.3	74.0	-14.7	EUT On Side, High Ch, 1 mb
2385.570	43.2	-4.2	2.6	8.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT On Side, Low Ch, 1 mb
2384.000	42.8	-4.2	1.5	71.0	0.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT On Side, Low Ch, 1 mb
2484.408	42.7	-4.1	1.5	349.0	0.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT On Side, High Ch, 1 mb
12008.830	36.7	-1.2	2.0	176.0	2.1	0.0	Horz	AV	0.0	37.6	54.0	-16.4	EUT On Side, Low Ch, 1 mb
12198.830	35.1	-0.4	2.0	352.0	2.1	0.0	Horz	AV	0.0	36.8	54.0	-17.2	EUT On Side, Mid Ch, 1 mb

Report No. STAK0176.1 13/58

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4880.042	29.4	3.6	1.5	294.0	2.1	0.0	Horz	AV	0.0	35.1	54.0	-18.9	EUT On Side, Mid Ch, 1 mb
4959.750	29.2	3.8	1.5	242.0	2.1	0.0	Horz	AV	0.0	35.1	54.0	-18.9	EUT On Side, High Ch, 1 mb
7319.292	42.3	12.7	2.5	312.0	0.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	EUT On Side, Mid Ch, 1 mb
4868.000	29.2	3.6	1.5	230.0	2.1	0.0	Vert	AV	0.0	34.9	54.0	-19.1	EUT On Side, Mid Ch, 1 mb
4952.958	28.9	3.7	1.5	261.0	2.1	0.0	Vert	AV	0.0	34.7	54.0	-19.3	EUT On Side, High Ch, 1 md
7320.542	42.0	12.7	1.5	124.0	0.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	EUT Horz, Mid Ch, 1 mb
4804.042	29.0	3.5	1.5	338.0	2.1	0.0	Horz	AV	0.0	34.6	54.0	-19.4	EUT On Side, Low Ch, 1 mb
4815.958	28.8	3.5	1.5	219.0	2.1	0.0	Vert	AV	0.0	34.4	54.0	-19.6	EUT On Side, Low Ch, 1 mb
12398.900	32.3	-0.2	2.0	163.0	2.1	0.0	Horz	AV	0.0	34.2	54.0	-19.8	EUT On Side, High Ch, 1 mb
7319.167	40.4	12.7	2.5	111.0	0.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	EUT Vert, Mid Ch, 1 mb
7321.000	39.9	12.7	3.1	68.0	0.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4	EUT Vert, Mid Ch, 1 mb
7321.208	39.8	12.7	1.9	355.0	0.0	0.0	Horz	PK	0.0	52.5	74.0	-21.5	EUT Horz, Mid Ch, 1 mb
7442.458	39.4	12.7	2.1	320.0	0.0	0.0	Horz	PK	0.0	52.1	74.0	-21.9	EUT On Side, High Ch, 1 mb
7427.583	39.0	12.8	1.1	272.0	0.0	0.0	Vert	PK	0.0	51.8	74.0	-22.2	EUT On Side, High Ch, 1 mb
7323.208	38.9	12.7	1.5	297.0	0.0	0.0	Vert	PK	0.0	51.6	74.0	-22.4	EUT On Side, Mid Ch, 1 mb
7204.000	39.3	12.3	1.5	324.0	0.0	0.0	Vert	PK	0.0	51.6	74.0	-22.4	EUT On Side, Low Ch, 1 mb
7195.667	39.0	12.3	2.9	253.0	0.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	EUT On Side, Low Ch, 1 mb
12201.210	28.8	-0.4	2.3	199.0	2.1	0.0	Vert	AV	0.0	30.5	54.0	-23.5	EUT On Side, Mid Ch, 1 mb
12018.380	29.4	-1.2	1.5	66.0	2.1	0.0	Vert	AV	0.0	30.3	54.0	-23.7	EUT On Side, Low Ch, 1 mb
12388.880	28.5	-0.3	1.5	19.0	2.1	0.0	Vert	AV	0.0	30.3	54.0	-23.7	EUT On Side, High Ch, 1 mb
4954.208	41.0	3.7	1.5	242.0	0.0	0.0	Horz	PK	0.0	44.7	74.0	-29.3	EUT On Side, High Ch, 1 mb
4878.208	40.7	3.6	1.5	294.0	0.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	EUT On Side, Mid Ch, 1 mb
12009.130	45.5	-1.2	2.0	176.0	0.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	EUT On Side, Low Ch, 1 mb
4884.250	40.6	3.5	1.5	230.0	0.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	EUT On Side, Mid Ch, 1 mb
12201.290	44.3	-0.4	2.0	352.0	0.0	0.0	Horz	PK	0.0	43.9	74.0	-30.1	EUT On Side, Mid Ch, 1 mb
4968.833	39.8	3.8	1.5	261.0	0.0	0.0	Vert	PK	0.0	43.6	74.0	-30.4	EUT On Side, High Ch, 1 mb
4806.542	40.0	3.5	1.5	338.0	0.0	0.0	Horz	PK	0.0	43.5	74.0	-30.5	EUT On Side, Low Ch, 1 mb
4796.000	40.0	3.5	1.5	219.0	0.0	0.0	Vert	PK	0.0	43.5	74.0	-30.5	EUT On Side, Low Ch, 1 mb
12398.670	41.8	-0.2	2.0	163.0	0.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	EUT On Side, High Ch, 1 mb
12210.460	39.6	-0.4	2.3	199.0	0.0	0.0	Vert	PK	0.0	39.2	74.0	-34.8	EUT On Side, Mid Ch, 1 mb
12391.190	39.2	-0.3	1.5	19.0	0.0	0.0	Vert	PK	0.0	38.9	74.0	-35.1	EUT On Side, High Ch, 1 mb
12007.420	40.1	-1.2	1.5	66.0	0.0	0.0	Vert	PK	0.0	38.9	74.0	-35.1	EUT On Side, Low Ch, 1 mb

Report No. STAK0176.1

SPURIOUS RADIATED EMISSIONS

32.6

32.7 32.5

32.5

44.1

43.9

43.8

43.1

2487.800

2485.100 2387.350

2389.560

2388.820

2484.083

2484.542

2385.780

-3.7 -3.8 -3.6

-3.6

-3.6

-3.8 -3.8

1.5 2.37

1.5

1.5 1.5



PSA-ESCI 2019.05.10

W													
	ork Order:	STAK017	6	Date:	18-Se	p-2019		1		7 4			
	Project:	None		Temperature:	22.4	4 °C			//	M			
	Job Site:	MN05		Humidity:	61.8°	% RH							
Seria	al Number:	19049475	7 Baro	metric Pres.:		mbar	-	Tested by:	Chris Patte	erson			_
OCITE		Livio 2.4 GHz F				moai		rested by.	Omis i atte	713011			_
0			vecilal geable i	or Linearing aid									_
	figuration:												_
	Customer:	Starkey Labora	itories, Inc.										<u>_</u>
-	Attendees:	John Quach											
E	UT Power:	Battery											_
		Tx on Low Ch (0 2402 MHz M	id Ch 18 2440	MHz High	Ch 39 2480	MHz 2 mł	Data Rate	,				_
Operat	ting Mode:	TX OII LOW OII (0 2 102 IVII 12, IV	10 011 10 2 1 10	.v 12, 1g.	011 00 2 101	7 1411 12, 2 1111	bala Hale	,				
		NI											_
D	Deviations:	None											
													_
		Duty Cycle Cor	rection Factor	derived using t	nis formula	, DCCF = 1	0*LOG(1/D	uty Cycle)					
С	comments:												
													=
Test Spec	cifications				l.	Test Meth	od						
FCC 15.24	47:2019					ANSI C63.	10:2013						_
					l.								
					l.								
					l.								
					l.								
					l.								
					l.								
Run #	13	Test Distan	ce (m) 3	Antonna	Height(s)		1 to 4(m)		Results		Pa	e e	=
Ruii #	13	Test Distail	ce (III)	Antenna	rieigiii(s)	<u> </u>	1 10 4(111)		Nesuits		га	55	_
г												\neg	
80 +													
										-			
70					+++-								
60													
00													
00													
50 -								*					
50 -						•		*					
50 -						•		*					
50 -						•		*		_			
						•		*					
50 -						•		*					
50 - M gp 40 -						•		*					
50 -						•		•					
50 - M gp 40 -						•							
E/Ang 40 -						*		*					
50 - M gp 40 -						*		*					
E/Ang 40 -						•		*					
E//Ng 40						•		*					
E/Ang 40 -						•		*					
E//Ng 40						•		*					
E//Ng 40								*					
30 - 20 -						•		*					
w//ngp 40 30 10 0	0		100		1000	•						00000	
30 - 20 -	0		100		1000			10000			1	00000	
w//ngp 40 30 10 0	0		100		1000 MHz	•							
w//ngp 40 30 10 0	0		100			•			■ PK	* A		00000 • QP	
w//ngp 40 30 10 0	0		100	Duty Code					■ PK	◆ A			
w//ngp 40 30 10 0	0	Ar	100	Duty Cycle Correction		Polarity/			■ PK	→ A		• QP	
w//ngp 40 30 10 0	O Amplitude			Correction	MHz		Detector	10000	■ PK Adjusted	◆ A Spec. L	v		
#/ \ng 40 - 30 - 20 - 10 - 10		Factor H	ntenna	Correction h Factor	MHz	Polarity/ Transducer		10000 Distance			V .imit	• QP Compared to	
w//ngp 40 30 10 10	Amplitude	Factor H	ntenna Height Azimut	Correction h Factor	MHz External Attenuation	Polarity/ Transducer		10000 Distance Adjustment	Adjusted	Spec. L	V .imit	OP Compared to Spec.	Comments
#/ \ng 40 - 30 - 20 - 10 - 10	Amplitude	Factor H (dB) (m	ntenna Height Azimut	Correction h Factor s)	MHz External Attenuation	Polarity/ Transducer		10000 Distance Adjustment	Adjusted	Spec. L	Limit /m)	OP Compared to Spec.	
#/ \ng 40	Amplitude (dBuV)	Factor (dB) (m	ntenna teight Azimut neters) (degree	Correction Factor 5.0	External Attenuation (dB)	Polarity/ Transducer Type	Detector	10000 Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. L (dBuV)	Limit /m)	Compared to Spec. (dB)	Comments
30 20 10	Amplitude (dBuV) 33.1 31.0	Factor (dB) (m	ntenna deight Azimut (degree 2.15 92.9 1.5 131.5	Correction Factor 5.0 5.0	External Attenuation (dB) 0.0 0.0	Polarity/ Transducer Type Horz Vert	Detector	10000 Distance Adjustment (dB) 0.0 0.0	Adjusted (dBuV/m) 51.6 49.5	Spec. L (dBuV) 54.0 54.0	Limit /m)	Opportunity QP Compared to Spec. (dB) -2.4 -4.5	Comments EUT On Side, Mid Ch, 2 mb
#/ Ang 40	Amplitude (dBuV)	Factor (dB) (n 13.5 13.5 13.4	ntenna deight Azimut (degree 2.15 92.9 1.5 131.5	5.0 5.0 0.0	External Attenuation (dB)	Polarity/ Transducer Type	Detector AV AV	10000 Distance Adjustment (dB) 0.0	Adjusted (dBuV/m) 51.6	Spec. L (dBuV)	Limit //m)	Compared to Spec. (dB)	Comments EUT On Side, Mid Ch, 2 mb EUT On Side, Mid Ch, 2 mb

0.0

0.0

0.0

0.0

339.0

189.0

52.0

8.0

8.0

189.0

339.0

20.0

20.0

20.0

20.0

20.0 20.0

Horz

Vert

Horz

Vert

Vert

Vert

Horz

ΑV

AV AV

AV PK PK

PK

Report No. STAK0176.1 15/58

48.9

48.9

48.9

48.9

60.5

60.1

60.0

EUT On Side, High Ch, 2 mb EUT On Side, High Ch, 2 mb EUT On Side, Low Ch, 2 mb

EUT On Side, Low Ch, 2 mb EUT On Side, Low Ch, 2 mb EUT On Side, High Ch, 2 mb

EUT On Side, High Ch, 2 mb

EUT On Side, Low Ch, 2 mb

-5.1 -5.1 -5.1

-5.1

-13.5

-13.9 -14.0

54.0 54.0

54.0

54.0

74.0

74.0 74.0

0.0

0.0

0.0

0.0



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
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.



EUT: Livio 2.4 GHz Rechargeable BTE hearing aid Serial Number: 190494775 Customer: Starkey Laboratories, Inc. Work Order: STAK0176
Date: 19-Sep-19
Temperature: 22.3 °C Humidity: 56.1% RH
Barometric Pres.: 1018 mbar Attendees: John Quach Project: None
Tested by: Kyle McMullan, Dustin Sparks
TEST SPECIFICATIONS Power: Battery
Test Method Job Site: MN08 FCC 15.247:2019 COMMENTS DEVIATIONS FROM TEST STANDARD mathella Kryla Configuration # 3 Signature Number of Pulses Value (%) Limit (%) Results Pulse Width Period BLE, 1 Mbps BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz 624.9 us N/A 624.9 us 61.7 N/A 61.7 N/A N/A N/A N/A N/A N/A N/A N/A 385.4 us N/A 385.8 us BLE/GFSK Mid Channel, 2442 MHz N/A N/A N/A BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz 385.8 us 625 us N/A 61.7 N/A N/A N/A N/A N/A N/A BLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz 197.6 us 625.1 us 31.6 N/A N/A BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz N/A 197.256 us N/A 625.344 us N/A 31.5 N/A N/A N/A N/A 5 1 BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz N/A 197.556 us N/A 625.1 us N/A N/A N/A N/A N/A 31.6 N/A N/A N/A

Report No. STAK0176.1 17/58

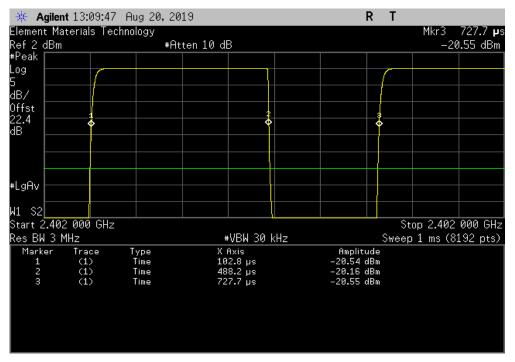


BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

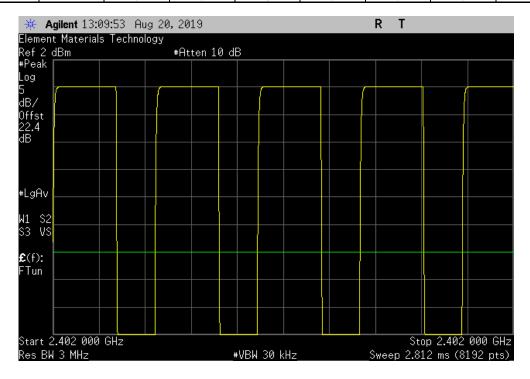
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

385.4 us 624.9 us 1 61.7 N/A N/A



		BLE, 1 Mbps, BL	E/GFSK Low Ch	annel, 2402 MHz		
			Number of	Value	Limit	
	 Pulse Width	Period	Pulses	(%)	(%)	Results
1	N/A	N/A	5	N/A	N/A	N/A



Report No. STAK0176.1 18/58

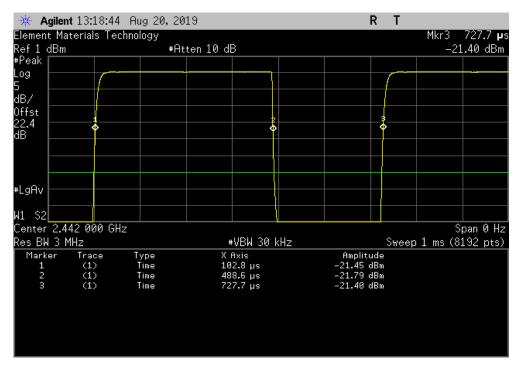


BLE, 1 Mbps, BLE/GFSK Mid Channel, 2442 MHz

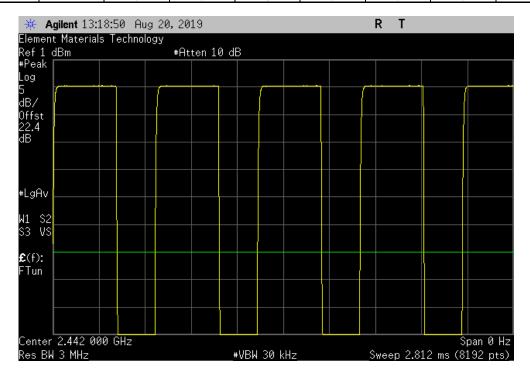
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

385.8 us 624.9 us 1 61.7 N/A N/A



		BLE, 1 Mbps, Bl	E/GFSK Mid Ch	annel, 2442 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A



Report No. STAK0176.1 19/58

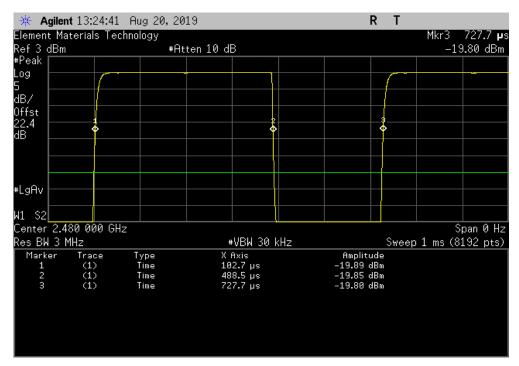


BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

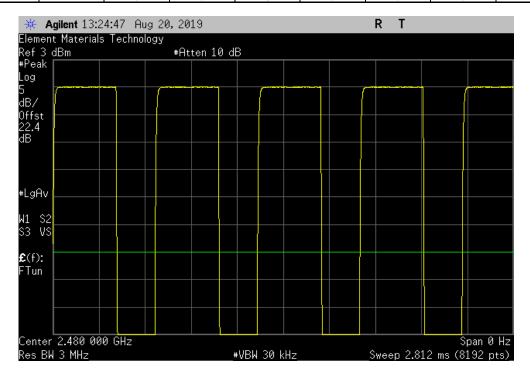
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

385.8 us 625 us 1 61.7 N/A N/A



		BLE, 1 Mbps, BL	E/GFSK High Ch	annel, 2480 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A



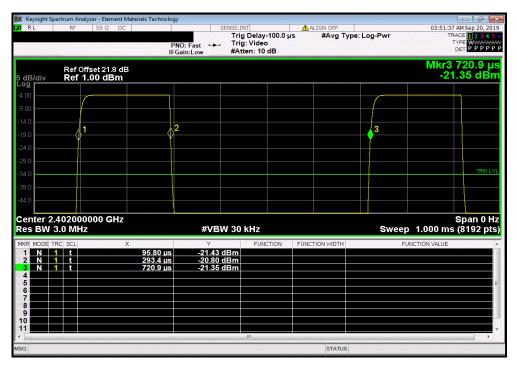


BLE, 2 Mbps, BLE/GFSK Low Channel, 2402 MHz

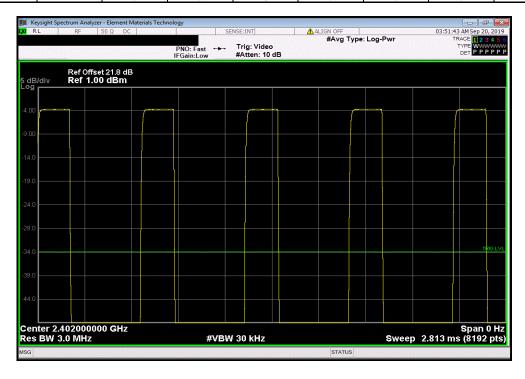
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

197.6 us 625.1 us 1 31.6 N/A N/A



		BLE, 2 Mbps, Bl	E/GFSK Low Ch	annel, 2402 MHz		
			Number of	Value	Limit	
_	Pulse Width	Period	Pulses	(%)	(%)	Results
ĺ	N/A	N/A	5	N/A	N/A	N/A



Report No. STAK0176.1 21/58

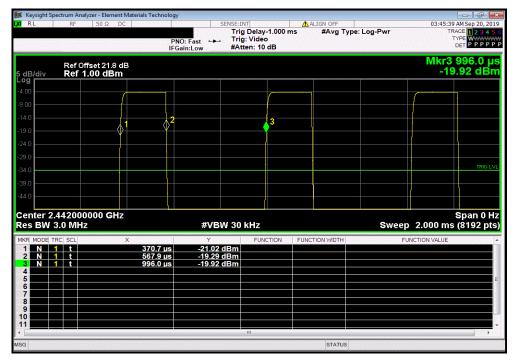


BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

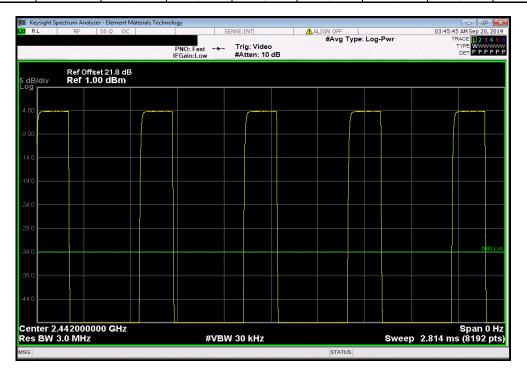
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

197.256 us 625.344 us 1 31.5 N/A N/A



		BLE, 2 Mbps, Bl	E/GFSK Mid Ch	annel, 2442 MHz		
			Number of	Value	Limit	
	 Pulse Width	Period	Pulses	(%)	(%)	Results
l	N/A	N/A	5	N/A	N/A	N/A



Report No. STAK0176.1 22/58

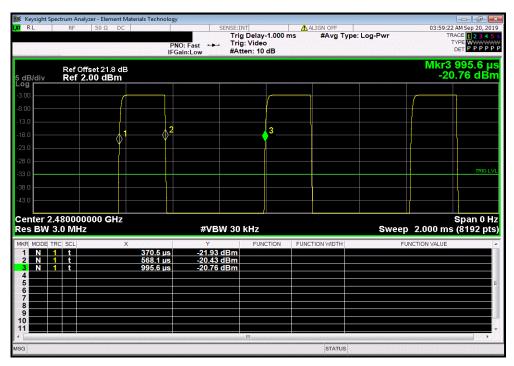


BLE, 2 Mbps, BLE/GFSK High Channel, 2480 MHz

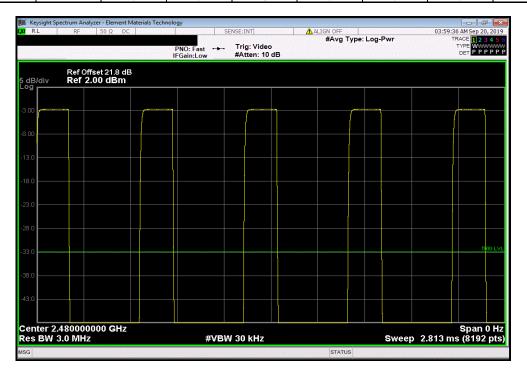
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

197.556 us 625.1 us 1 31.6 N/A N/A



		BLE, 2 Mbps, BL	E/GFSK High Ch	annel, 2480 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A



Report No. STAK0176.1 23/58



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
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.



COMMENTS None								TbtTx 2019.08.02	XMit 2019.09.05
Customer: Starkey Laboratories, Inc. Temperature: 22.3 °C Attendees: John Quach Huld; 56.2% RH Project; None Barometric Press. 1018 mbar Tested by: Kyle McMullan, Dustin Sparks Power: Battery Job Site: MN08 EETS PECIFICATIONS Test Method			ring aid						
Attendees: John Quach Barometric Pres. 1018 mbar									
Project: None									
Tested by: Kyle McMullan, Dustin Sparks Power: Battery Job Site: MN08 Test Method Test Method Test Metho	Attendees	: John Quach					Humidity:	56.2% RH	
Test Method ANSI C63.10:2013 ANSI C63.10:2013	Projec	t: None					Barometric Pres.:	1018 mbar	
ANSI C63.10:2013	Tested by	/: Kyle McMullan, Dustin Sparks			Power: Ba	ttery	Job Site:	MN08	
COMMENTS None Signature	TEST SPECIFICAT	TIONS			Tes	st Method			
DEVIATIONS FROM TEST STANDARD	FCC 15.247:2019				AN	SI C63.10:2013			
DEVIATIONS FROM TEST STANDARD									
DEVIATIONS FROM TEST STANDARD Signature Signatur	COMMENTS								
None Signature	None								
None Signature									Į.
None Signature									Ų
Signature Sign	DEVIATIONS FRO	M TEST STANDARD							
Signature Value Limit (2) Result	None								
Signature Value Limit (2) Result						72 22			
Signature Value Limit (2) Result	Configuration #	3		Kryla	Ma	mella			
Name			Signature	0					Ų
BLE, 1 Mbps BLE/GFSK Low Channel, 2402 MHz 750.251 kHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 500 kHz Pass BLE/GFSK High Channel, 2480 MHz 742.402 kHz 500 kHz Pass BLE/GFSK Low Channel, 2490 MHz 1.283 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2402 MHz 1.283 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 1.2								Limit	
BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2402 MHz							Value	(≥)	Result
BLE/GFSK Mid Channel, 2442 MHz 727.741 kHz 500 kHz Pass BLE/GFSK High Channel, 2480 MHz 742.402 kHz 500 kHz Pass PLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz 1.283 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 500 kHz Pass PLE/GFSK Mid Channel, 2442 MHz 500 kHz Pass Plex Pas	BLE, 1 Mbps								
BLE/GFSK High Channel, 2480 MHz 742.402 kHz 500 kHz Pass BLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz 1.283 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass		BLE/GFSK Low Channel, 2402 MHz					750.251 kHz	500 kHz	Pass
BLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass		BLE/GFSK Mid Channel, 2442 MHz					727.741 kHz	500 kHz	Pass
BLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass		BLE/GFSK High Channel, 2480 MHz					742.402 kHz	500 kHz	Pass
BLE/GFSK Low Channel, 2402 MHz 1.283 MHz 500 kHz Pass BLE/GFSK Mid Channel, 2442 MHz 1.28 MHz 500 kHz Pass	BLE, 2 Mbps								
		BLE/GFSK Low Channel, 2402 MHz					1.283 MHz	500 kHz	Pass
BLE/GFSK High Channel. 2480 MHz 500 kHz Pass		BLE/GFSK Mid Channel, 2442 MHz					1.28 MHz	500 kHz	Pass
		BLE/GFSK High Channel, 2480 MHz					1.28 MHz	500 kHz	Pass

Report No. STAK0176.1 25/58

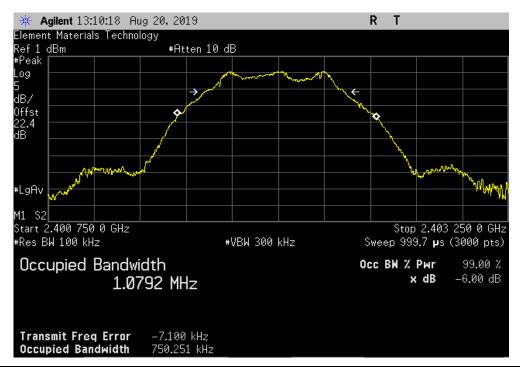


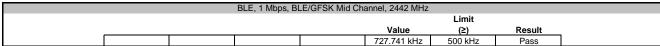
BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

Limit

Value (≥) Result

750.251 kHz 500 kHz Pass







Report No. STAK0176.1 26/58



BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

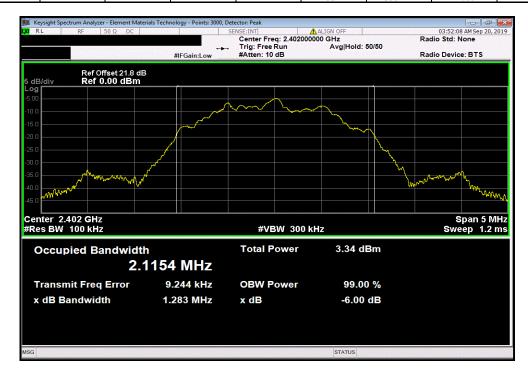
Limit

Value (2) Result

742.402 kHz 500 kHz Pass







Report No. STAK0176.1 27/58



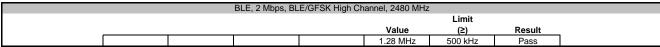
BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

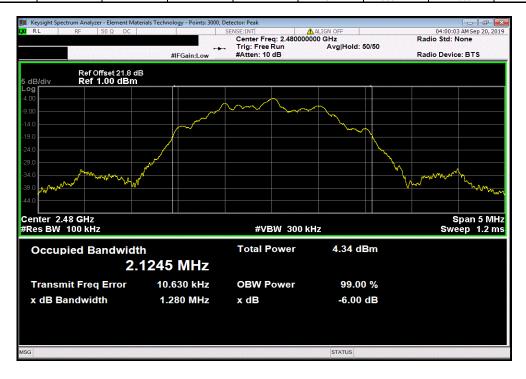
Limit

Value (2) Result

1.28 MHz 500 kHz Pass







Report No. STAK0176.1 28/58



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

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 2019.08.02	XMit 2019.09.05
EUT: Livio 2.4 GHz Rechargeable BTE h	earing aid			Work Order:		
Serial Number: 190494775					19-Sep-19	
Customer: Starkey Laboratories, Inc.				Temperature:		
Attendees: John Quach					56.1% RH	
Project: None				Barometric Pres.:		
Tested by: Kyle McMullan, Dustin Sparks			Power: Battery	Job Site:	MN08	
TEST SPECIFICATIONS			Test Method			
FCC 15.247:2019			ANSI C63.10:2013			
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
			2			
Configuration # 3		Kryla	mamela			
	Signature	0				
				Out Pwr	Limit	
				(dBm)	(dBm)	Result
BLE, 1 Mbps						
BLE/GFSK Low Channel, 2402 MHz				-2.754	30	Pass
BLE/GFSK LOW Channel, 2402 MHZ						
BLE/GFSK Mid Channel, 2442 MHz				-3.621	30	Pass
				-3.621 -1.849	30 30	Pass Pass
BLE/GFSK Mid Channel, 2442 MHz						
BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz						
BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE, 2 Mbps				-1.849	30	Pass

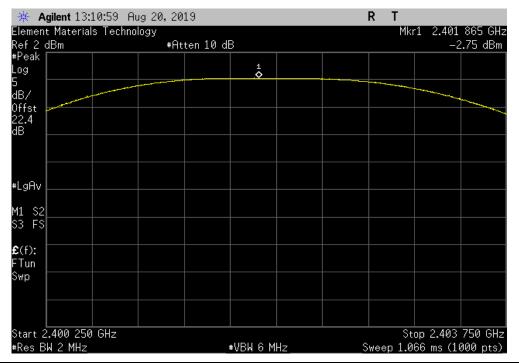
Report No. STAK0176.1 30/58



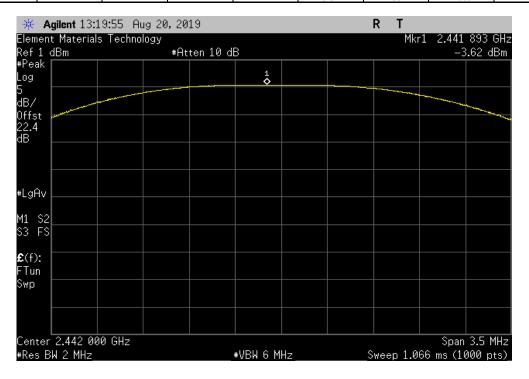
BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

Out Pwr Limit
(dBm) (dBm) Result

-2.754 30 Pass



	BLE, 1 Mbps, Bl	_E/GFSK Mid Cha	annel, 2442 MHz		
			Out Pwr	Limit	
			(dBm)	(dBm)	Result
			-3.621	30	Pass



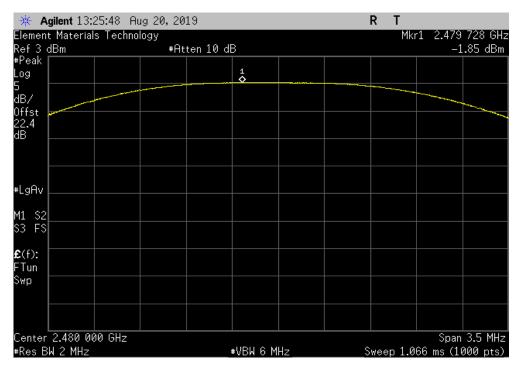
Report No. STAK0176.1 31/58



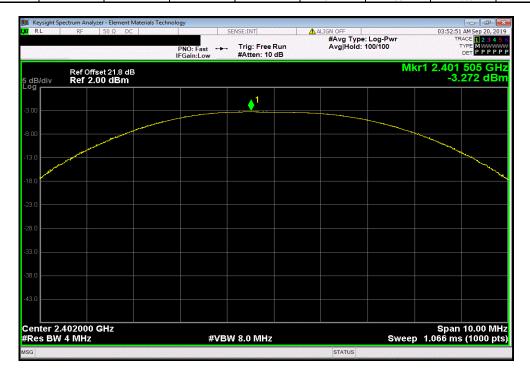
BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

Out Pwr Limit
(dBm) (dBm) Result

-1.849 30 Pass



		BLE, 2 Mbps, BL	E/GFSK Low Ch	annel, 2402 MHz			
				Out Pwr	Limit		
_				(dBm)	(dBm)	Result	_
				-3.272	30	Pass	l



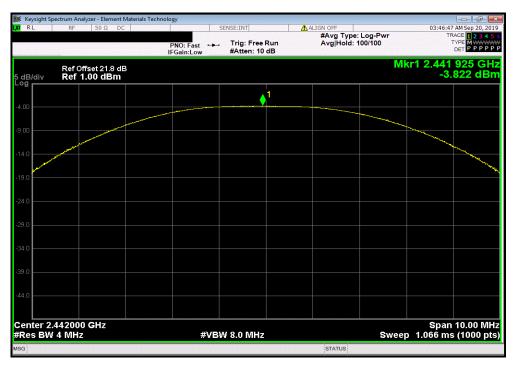
Report No. STAK0176.1 32/58



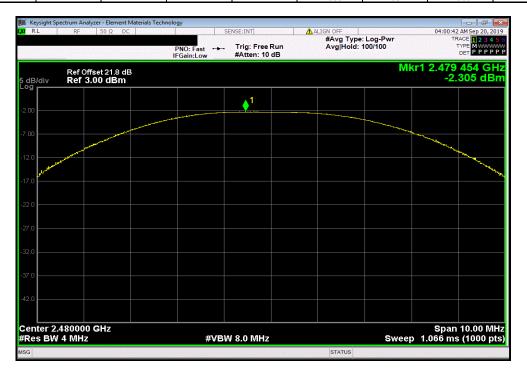
BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

Out Pwr Limit
(dBm) (dBm) Result

-3.822 30 Pass



		BLE, 2 Mbps, BL	E/GFSK High Ch	annel, 2480 MHz			
				Out Pwr	Limit		
_				(dBm)	(dBm)	Result	
				-2.305	30	Pass	l



Report No. STAK0176.1 33/58

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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

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 out the conducted output power value to calculate the EIRP.

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



	Livio 2.4 GHz Rechargeable BTE hea	aring aid					Work Order:		
Serial Number								19-Sep-19	
	r: Starkey Laboratories, Inc.						Temperature:		
	s: John Quach							56.4% RH	
	t: None						Barometric Pres.:		
	/: Kyle McMullan, Dustin Sparks			Power: Battery			Job Site:	MN08	
TEST SPECIFICAT	TIONS			Test Method					
FCC 15.247:2019				ANSI C63.10:2013					
COMMENTS									
None									
DEVIATIONS FRO	DM TEST STANDARD								
DEVIATIONS FRO	OM TEST STANDARD								
	OM TEST STANDARD								
	DM TEST STANDARD		Knyli	mamela					
None		Signature	Knyli	Mathela					
None		Signature	Vingle	Mamella	Out Pwr	Antenna	EIRP	EIRP Limit	
None		Signature	Hayla	Wathelln	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
None Configuration #		Signature	Kayla	Mastella					Result
None		Signature	Vingla	MMilla					Result Pass
None Configuration #	3	Signature	Vingle	MaMalla	(dBm)	Gain (dBi)	(dBm)	(dBm)	
None Configuration #	3 BLE/GFSK Low Channel, 2402 MHz	Signature	Vayle	Mastella	(dBm) -2.754	Gain (dBi) -11.5	(dBm) -14.254	(dBm) 36	Pass
None Configuration #	3 BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz	Signature	Vnyli	MMella	-2.754 -3.621	Gain (dBi) -11.5 -11.5	-14.254 -15.121	(dBm) 36 36	Pass Pass
None Configuration # BLE, 1 Mbps	3 BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz	Signature	Knyli	MaMalla	-2.754 -3.621	Gain (dBi) -11.5 -11.5	-14.254 -15.121	(dBm) 36 36	Pass Pass
None Configuration # BLE, 1 Mbps	BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz	Signature	Vayli	Masterlen	-2.754 -3.621 -1.849	Gain (dBi) -11.5 -11.5 -11.5	-14.254 -15.121 -13.349	(dBm) 36 36 36	Pass Pass Pass
None Configuration # BLE, 1 Mbps	BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz	Signature	Virgli	Mithelen	-2.754 -3.621 -1.849	Gain (dBi) -11.5 -11.5 -11.5 -11.5	-14.254 -15.121 -13.349 -14.772	(dBm) 36 36 36	Pass Pass Pass

Report No. STAK0176.1 35/58

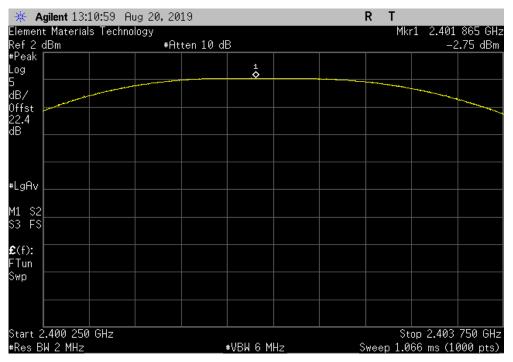
EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



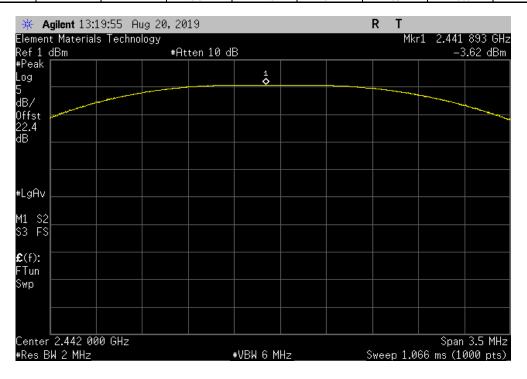
BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result

-2.754 -11.5 -14.254 36 Pass



BLE, 1 Mbps, BLE/GFSK Mid Channel, 2442 MHz							
			Out Pwr	Antenna	EIRP	EIRP Limit	
			(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
			-3.621	-11.5	-15.121	36	Pass



Report No. STAK0176.1 36/58

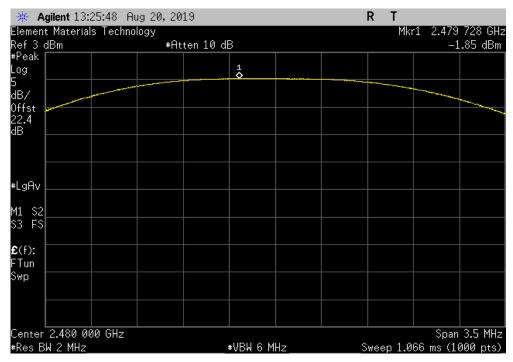
EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



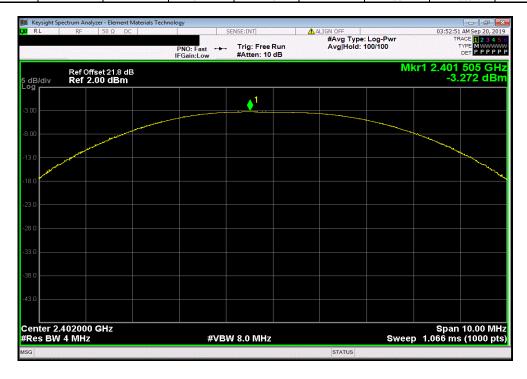
BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result

-1.849 -11.5 -13.349 36 Pass



		BLE, 2 Mbps, BL	E/GFSK Low Ch	annel, 2402 MHz		
		Out Pwr	Antenna	EIRP	EIRP Limit	
_		(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
1 [<u> </u>	-3.272	-11.5	-14.772	36	Pass



Report No. STAK0176.1 37/58

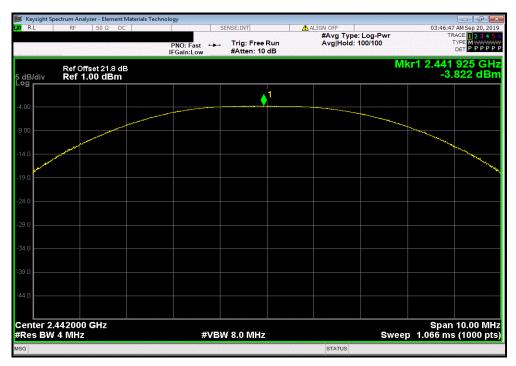
EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



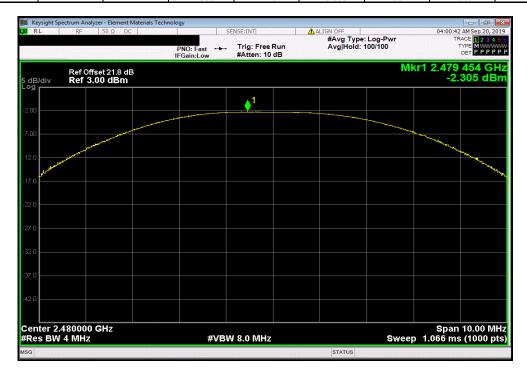
BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result

-3.822 -11.5 -15.322 36 Pass



	BLE, 2 Mbps, BL	E/GFSK High Ch	annel, 2480 MHz		
	Out Pwr	Antenna	EIRP	EIRP Limit	
	(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
	-2.305	-11.5	-13.805	36	Pass



Report No. STAK0176.1 38/58



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
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 2019.08.02	XMit 2019.09.05
	: Livio 2.4 GHz Rechargeable B	TE hearing aid			Work Order:		
Serial Number						19-Sep-19	
	: Starkey Laboratories, Inc.				Temperature:		
Attendees	: John Quach				Humidity:	56% RH	
Project	: None				Barometric Pres.:	1018 mbar	
Tested by	: Kyle McMullan, Dustin Sparks	1	Po	wer: Battery	Job Site:	MN08	
TEST SPECIFICAT	TIONS			Test Method			
FCC 15.247:2019				ANSI C63.10:2013			
COMMENTS							
None							
DEVIATIONS FRO	M TEST STANDARD						
None							
Configuration #	3		Kryla	mathella			
		Signature	0				
	-				Value	Limit	
					dBm/3kHz	< dBm/3kHz	Results
BLE, 1 Mbps							
	BLE/GFSK Low Channel, 2402 I	MHz			-18.206	8	Pass
	BLE/GFSK Mid Channel, 2442 N	ИHz			-19.078	8	Pass
	BLE/GFSK High Channel, 2480	MHz			-17.265	8	Pass
BLE, 2 Mbps							
	BLE/GFSK Low Channel, 2402 I	MHz			-21.479	8	Pass
	BLE/GFSK Mid Channel, 2442 N				-22.073	8	Pass
						_	
	BLE/GFSK High Channel, 2480	MHz			-20.549	8	Pass

Report No. STAK0176.1 40/58

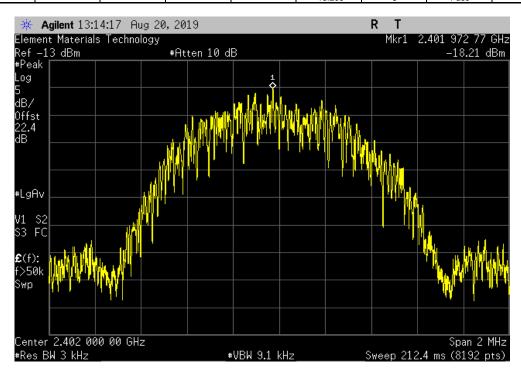


BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

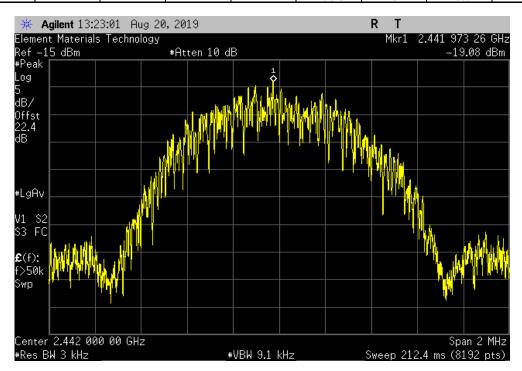
Value Limit

dBm/3kHz < dBm/3kHz Results

-18.206 8 Pass







Report No. STAK0176.1 41/58

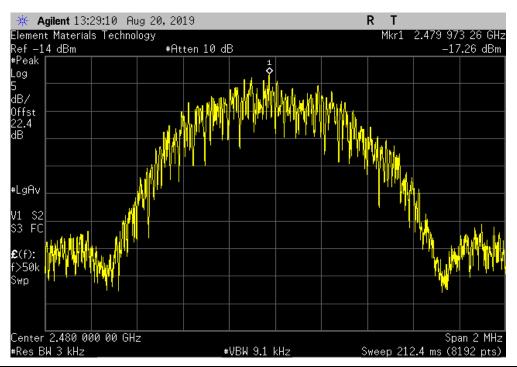


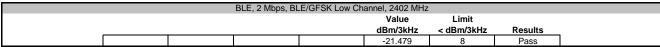
BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

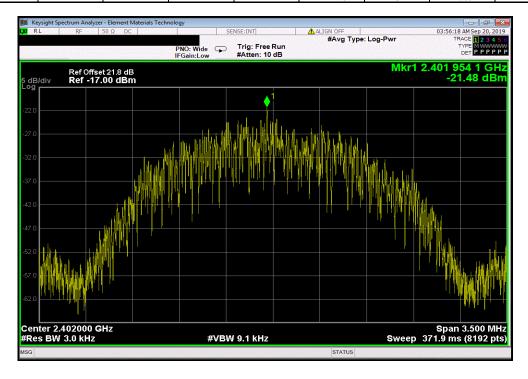
Value Limit

dBm/3kHz < dBm/3kHz Results

-17.265 8 Pass







Report No. STAK0176.1 42/58

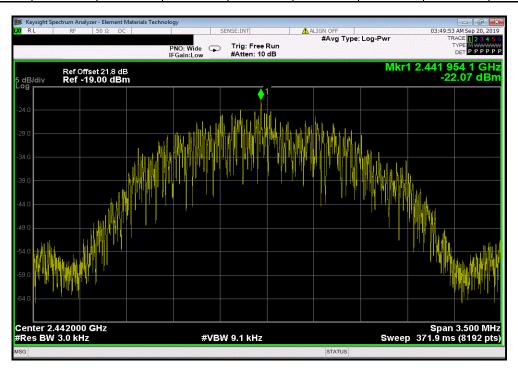


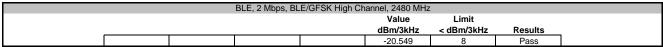
BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

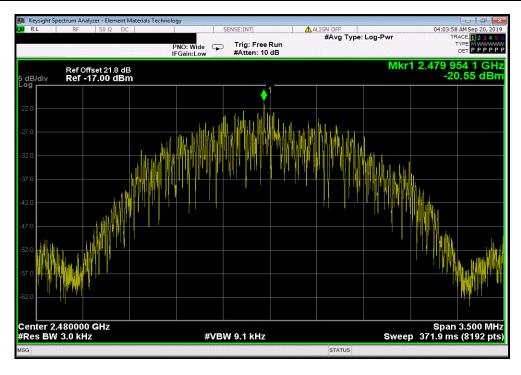
Value Limit

dBm/3kHz < dBm/3kHz Results

-22.073 8 Pass







Report No. STAK0176.1 43/58



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
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.



EUT: Livio 2.4 GHz Rechargeable BTE hearing aid
Serial Number: 190494775
Customer: Starkey Laboratories, Inc.
Attendees: John Quach
Project: None
Tested by: Kyle McMullan, Dustin Sparks
TEST SPECIFICATIONS Work Order: STAK0176
Date: 19-Sep-19
Temperature: 22.2 °C Humidity: 56.4% RH
Barometric Pres.: 1018 mbar Power: Battery
Test Method Job Site: MN08 FCC 15.247:2019 ANSI C63.10:2013 COMMENTS DEVIATIONS FROM TEST STANDARD Wryle Mathella Configuration # 3 Signature Value (dBc) Limit ≤ (dBc) Result BLE, 1 Mbps BLE/GFSK Low Channel, 2402 MHz BLE/GFSK High Channel, 2480 MHz -39.57 -42.47 -20 -20 Pass Pass BLE, 2 Mbps BLE/GFSK Low Channel, 2402 MHz BLE/GFSK High Channel, 2480 MHz -28.98 -20 Pass -38.53 -20 Pass

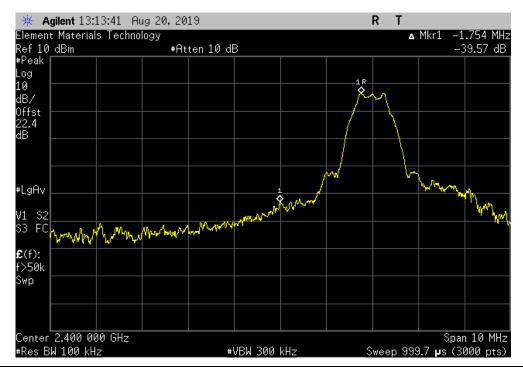
Report No. STAK0176.1 45/58

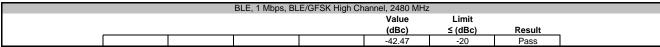


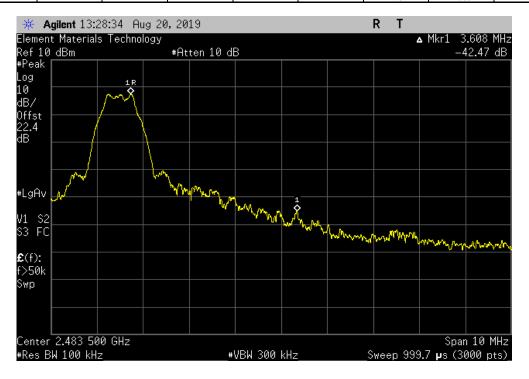
BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

Value Limit
(dBc) ≤ (dBc) Result

- 39.57 - 20 Pass







Report No. STAK0176.1 46/58

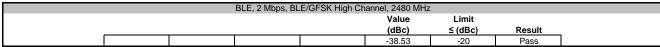


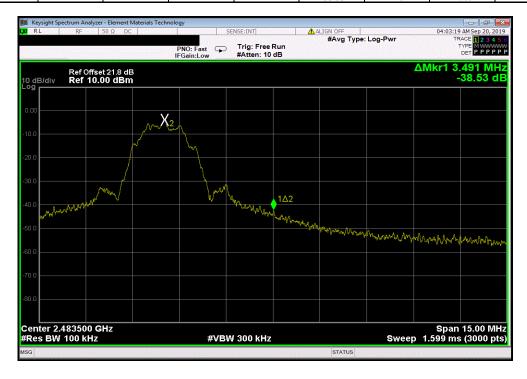
BLE, 2 Mbps, BLE/GFSK Low Channel, 2402 MHz

Value Limit
(dBc) ≤ (dBc) Result

-28.98 -20 Pass







Report No. STAK0176.1 47/58



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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	ESM Cable Corp.	TTBJ141-KMKM-72	MNU	11-Apr-19	11-Apr-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	11-Jul-19	11-Jul-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

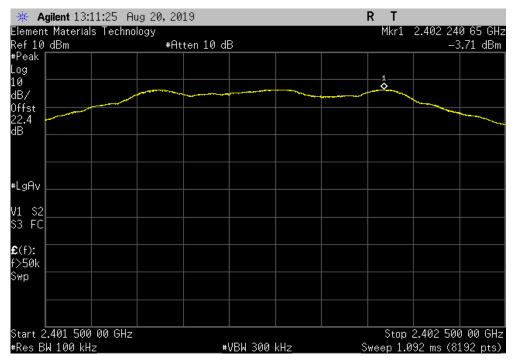
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each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



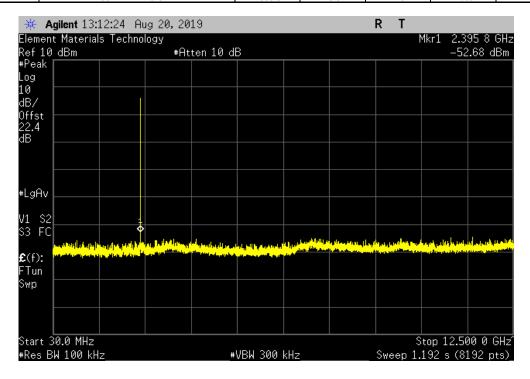
							TbtTx 2019.08.02	XMit 2
	: Livio 2.4 GHz Rechargeable BTE hea	aring aid				Work Order:		
Serial Number							19-Sep-19	
	: Starkey Laboratories, Inc.					Temperature:	: 56.1% RH	
	: John Quach							
Project						Barometric Pres.:		
	: Kyle McMullan, Dustin Sparks		P	ower: Battery		Job Site:	MN08	
TEST SPECIFICAT	IONS			Test Method				
CC 15.247:2019				ANSI C63.10:2013				
COMMENTS								
lone								
EVIATIONS FRO	M TEST STANDARD							
lone								
Configuration #	3	Signature	Thyle	Mathella				
		Signature		Frequency	Measured	Max Value	Limit	
				Range	Freq (MHz)	(dBc)	≤ (dBc)	Resul
BLE, 1 Mbps								
	BLE/GFSK Low Channel, 2402 MHz			Fundamental	2402.24	N/A	N/A	N/A
	BLE/GFSK Low Channel, 2402 MHz			30 MHz - 12.5 GHz	2395.8	-48.97	-20	Pass
	BLE/GFSK Low Channel, 2402 MHz			12.5 GHz - 25 GHz	20104.4	-46.88	-20	Pass
							20	1 433
	BLE/GFSK Mid Channel, 2442 MHz			Fundamental	2442.24	N/A	N/A	N/A
	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz			Fundamental 30 MHz - 12.5 GHz				
					2442.24	N/A	N/A	N/A
	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz			30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	2442.24 3866.5 24734.5 2480.24	N/A -49.95 -46.38 N/A	N/A -20 -20 N/A	N/A Pass Pass N/A
	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz			30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	2442.24 3866.5 24734.5 2480.24 7561.3	N/A -49.95 -46.38 N/A -51.74	N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass
	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz			30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	2442.24 3866.5 24734.5 2480.24	N/A -49.95 -46.38 N/A	N/A -20 -20 N/A	N/A Pass Pass N/A Pass
BLE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK 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	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6	N/A -49.95 -46.38 N/A -51.74 -47.63	N/A -20 -20 N/A -20 -20	N/A Pass Pass N/A Pass Pass
LE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK 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	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6	N/A -49.95 -46.38 N/A -51.74 -47.63	N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass Pass
LE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK 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	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75	N/A -20 -20 N/A -20 -20	N/A Pass Pass N/A Pass Pass
.E, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK 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	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37	N/A -20 -20 N/A -20 -20 -20 -20	N/A Pass Pass N/A Pass Pass Pass N/A Pass Pass
LE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK 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	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95 2442.02	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37 N/A	N/A -20 -20 N/A -20 -20 -20 N/A -20 -20 N/A	N/A Pass Pass N/A Pass Pass N/A Pass N/A Pass Pass
LE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK 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 12.5 GHz - 25 GHz 12.5 GHz - 35 GHz Fundamental 30 MHz - 12.5 GHz	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95 2442.02 3933.44	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37 N/A -48.14	N/A -20 -20 N/A -20 -20 N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass Pass N/A Pass N/A Pass Pass
ILE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK 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 Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95 2442.02 3933.44 24555.92	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37 N/A -48.14 -46.03	N/A -20 -20 N/A -20 -20 -20 N/A -20 -20 N/A -20 -20	N/A Pass Pass N/A Pass Pass N/A Pass N/A Pass Pass N/A Pass Pass
iLE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK 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 12.5 GHz - 25 GHz 12.5 GHz - 35 GHz Fundamental 30 MHz - 12.5 GHz	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95 2442.02 3933.44	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37 N/A -48.14	N/A -20 -20 N/A -20 -20 N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass Pass N/A Pass N/A Pass Pass
3LE, 2 Mbps	BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK High Channel, 2480 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Low Channel, 2402 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK Mid Channel, 2442 MHz BLE/GFSK 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 Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	2442.24 3866.5 24734.5 2480.24 7561.3 24949.6 2402.02 2397.34 23708.95 2442.02 3933.44 24555.92	N/A -49.95 -46.38 N/A -51.74 -47.63 N/A -46.75 -46.37 N/A -48.14 -46.03	N/A -20 -20 N/A -20 -20 -20 N/A -20 -20 N/A -20 -20	N/A Pass Pass N/A Pass Pass N/A Pass N/A Pass Pass N/A Pass Pass

Report No. STAK0176.1 49/58





	BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz				
Frequency	Measured	Max Value	Limit		
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
30 MHz - 12.5 (GHz 2395.8	-48.97	-20	Pass	



Report No. STAK0176.1 50/58

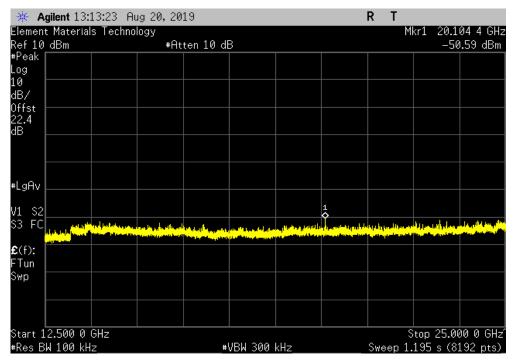


BLE, 1 Mbps, BLE/GFSK Low Channel, 2402 MHz

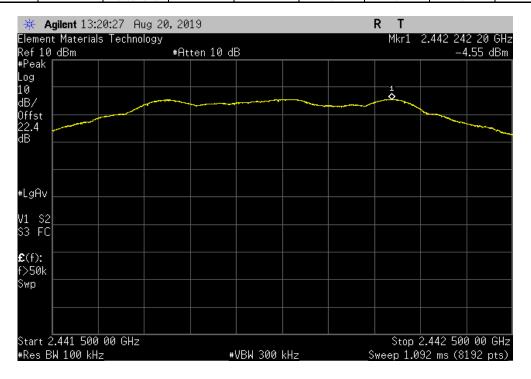
Frequency Measured Max Value Limit

Range Freq (MHz) (dBc) ≤ (dBc) Result

12.5 GHz - 25 GHz 20104.4 -46.88 -20 Pass



	BLE, 1 Mb	ps, BLE/GFSK Mid Cha	annel, 2442 MHz		
	Frequency	Measured	Max Value	Limit	
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
i	Fundamental	2442.24	N/A	N/A	N/A



Report No. STAK0176.1 51/58

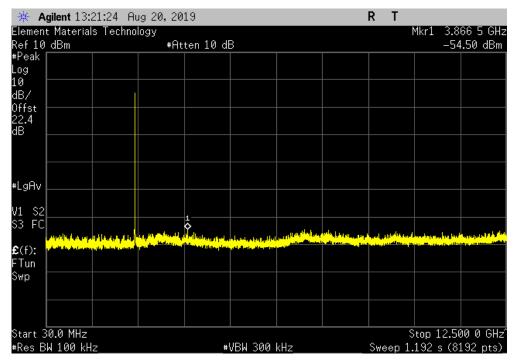


 BLE, 1 Mbps, BLE/GFSK Mid Channel, 2442 MHz

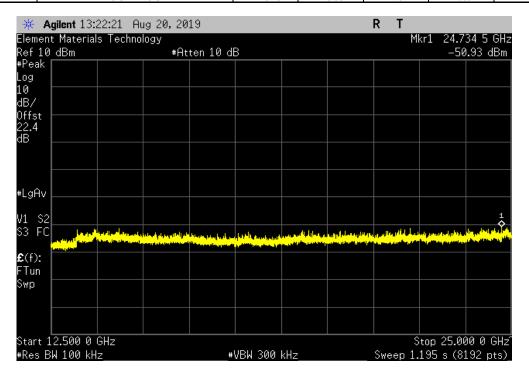
 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 30 MHz - 12.5 GHz
 3866.5
 -49.95
 -20
 Pass

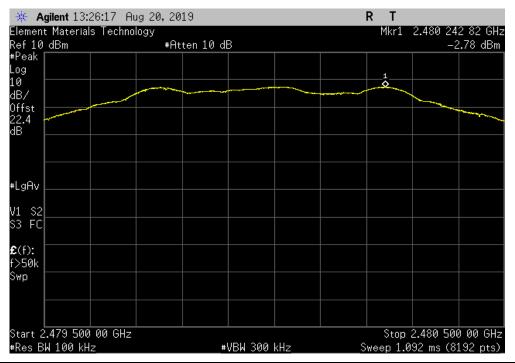


	BLE, 1 Mbps, BLE/GFSK Mid Cha	annel, 2442 MHz		
Frequency	Measured	Max Value	Limit	
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
12.5 GHz - 25 GH	Hz 24734.5	-46.38	-20	Pass

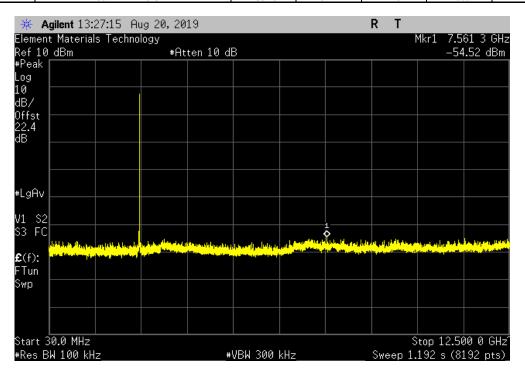


Report No. STAK0176.1 52/58





BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz					
Frequency	Measured	Max Value	Limit		
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
30 MHz - 12.5 GHz	7561.3	-51.74	-20	Pass	



Report No. STAK0176.1 53/58

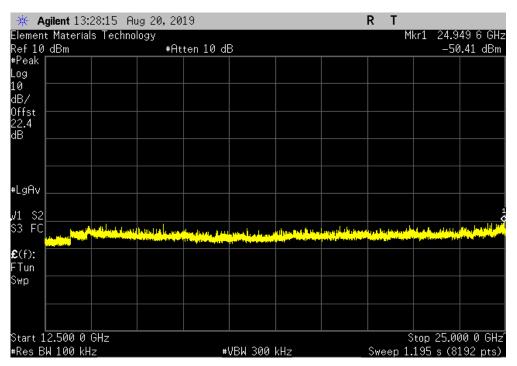


 BLE, 1 Mbps, BLE/GFSK High Channel, 2480 MHz

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24949.6
 -47.63
 -20
 Pass



BLE, 2 Mbps, BLE/GFSK Low Channel, 2402 MHz					
Frequency	Measured	Max Value	Limit		
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
Fundamental	2402.02	N/A	N/A	N/A	



Report No. STAK0176.1 54/58



BLE, 2 Mbps, BLE/GFSK Low Channel, 2402 MHz

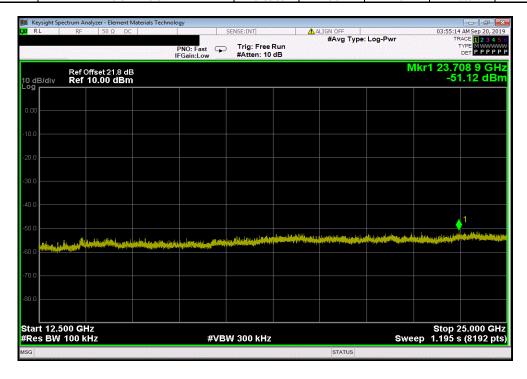
Frequency Measured Max Value Limit

Range Freq (MHz) (dBc) ≤ (dBc) Result

30 MHz - 12.5 GHz 2397.34 -46.75 -20 Pass



BLE, 2 Mbps, BLE/GFSK Low Channel, 2402 MHz					
	Frequency	Measured	Max Value	Limit	
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
l l	12.5 GHz - 25 GHz	23708.95	-46.37	-20	Pass

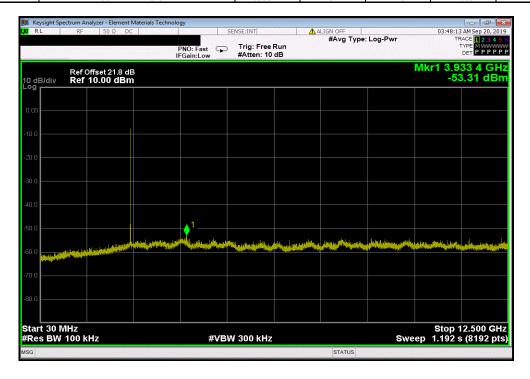


Report No. STAK0176.1 55/58





	BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz				
Frequ	uency Measure	d Max Value	Limit		
Ra	nge Freq (MH:	z) (dBc)	≤ (dBc)	Result	
30 MHz -	12.5 GHz 3933.44	-48.14	-20	Pass	



Report No. STAK0176.1 56/58

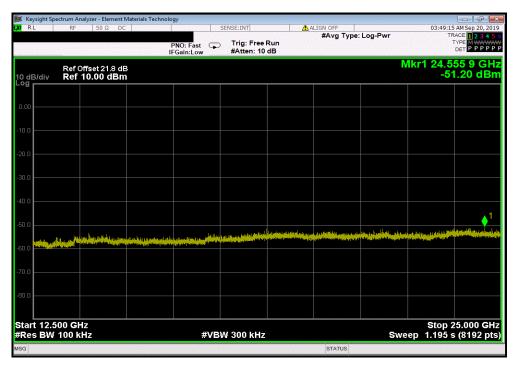


 BLE, 2 Mbps, BLE/GFSK Mid Channel, 2442 MHz

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24555.92
 -46.03
 -20
 Pass



BLE, 2 Mbps, BLE/GFSK High Channel, 2480 MHz				
Frequency	Measured	Max Value	Limit	
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
Fundamental	2480.02	N/A	N/A	N/A



Report No. STAK0176.1 57/58

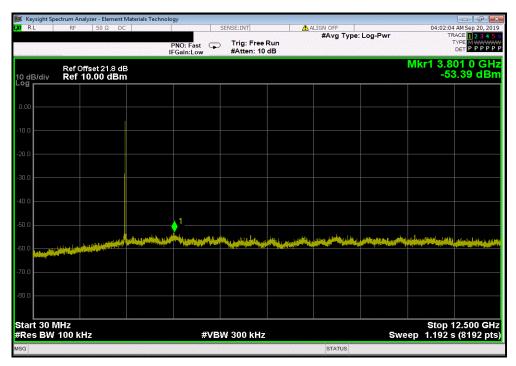


BLE, 2 Mbps, BLE/GFSK High Channel, 2480 MHz

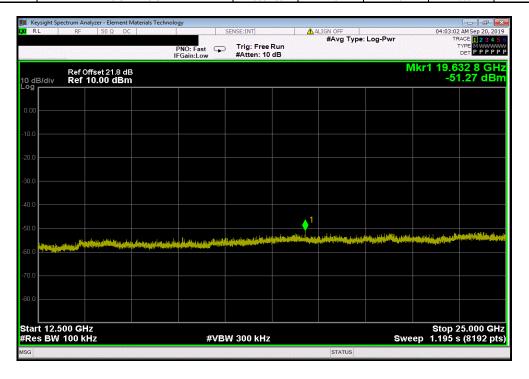
Frequency Measured Max Value Limit

Range Freq (MHz) (dBc) ≤ (dBc) Result

30 MHz - 12.5 GHz 3800.99 -49.63 -20 Pass



BLE, 2 Mbps, BLE/GFSK High Channel, 2480 MHz				
Frequency	Measured	Max Value	Limit	
 Range	Freq (MHz)	(dBc)	≤ (dBc)	Result
12.5 GHz - 25 GHz	19632.83	-47.51	-20	Pass



Report No. STAK0176.1 58/58