



element

Starkey Laboratories, Inc.

Starlink Remote Control 2.0

Bluetooth Radio

Report: STAK0319.0 Rev. 0, Issue Date: August 25, 2023



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CERTIFICATE OF TEST

Last Date of Test: August 8, 2023
Starkey Laboratories, Inc.
EUT: Starlink Remote Control 2.0

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	
RSS-Gen Issue 5:2018+A1:2019+A2:2021	

Guidance

FCC KDB 558074 v05r02:2019
Notice 2021 - CEB0001

Results

Test Description	Result	FCC Section(s)	RSS Section(s)	ANSI C63.10 Section(s)	Comments
Powerline Conducted Emissions	N/A	15.207	RSS-Gen 8.8	6.2	Not required for a battery powered EUT.
Duty Cycle	Pass	KDB 558074 -6.0	RSS-Gen 3.2	11.6	
DTS Bandwidth (6 dB)	Pass	15.247(a)(2), KDB 558074 -8.2	RSS-247 5.2(a)	11.8.2	
Occupied Bandwidth (99%)	Pass	KDB 558074 -2.1	RSS-Gen 6.7	6.9.3	
Output Power	Pass	15.247(b)(3), KDB 558074 - 8.3.1	RSS-247 5.4(d, f), RSS-Gen 6.12	11.9.1.1	
Equivalent Isotropic Radiated Power	Pass	15.247(b)(3), KDB 558074 - 8.3.1	RSS-247 5.4(d, f), RSS-Gen 6.12	11.9.1.1	
Power Spectral Density	Pass	15.247(e), KDB 558074 -8.4	RSS-247 5.2(b)	11.10.2	
Band Edge Compliance	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Spurious Conducted Emissions	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Spurious Radiated Emissions	Pass	15.247(d), KDB 558074 - 8.6, 8.7	RSS-247 5.5, RSS-Gen 6.13, 8.10	11.12.1, 11.13.2, 6.5, 6.6	

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.

CERTIFICATE OF TEST



Deviations From Test Standards

None

Approved By:

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 - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

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 – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

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:

[California](#)

[Minnesota](#)

[Oregon](#)

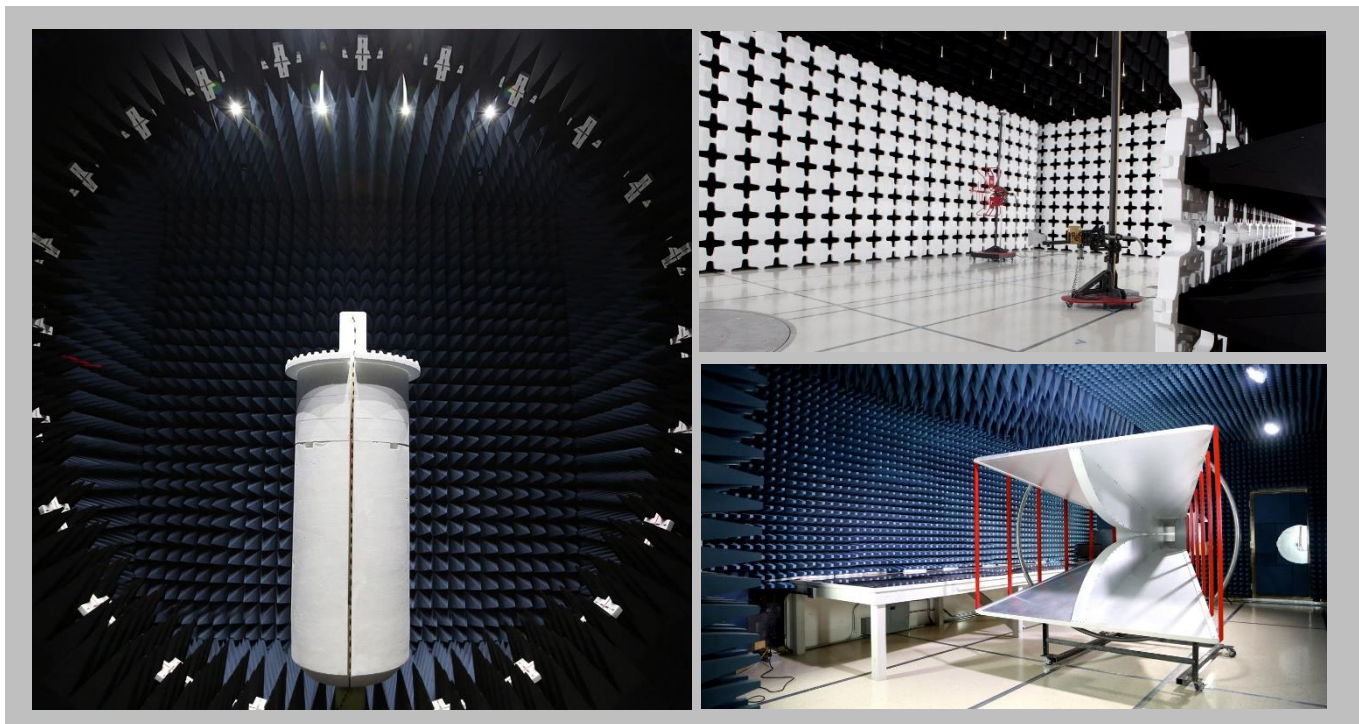
[Texas](#)

[Washington](#)

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 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
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
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 in the table below. A lab specific value may also be found in the applicable test description section. 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 Location: Minneapolis

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)	3.2 dB	-3.2 dB

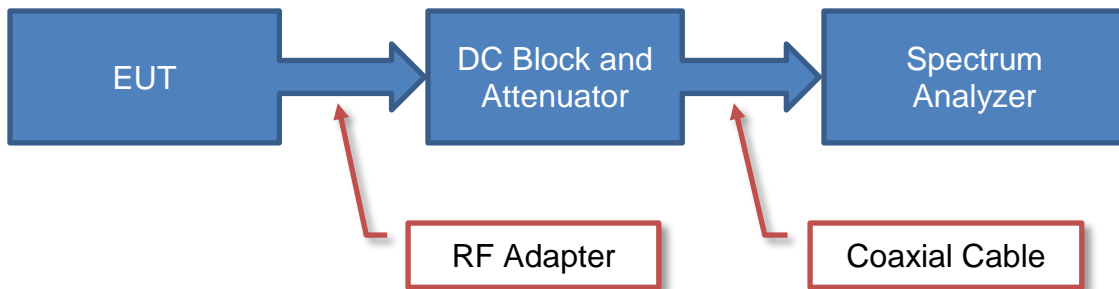
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

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

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

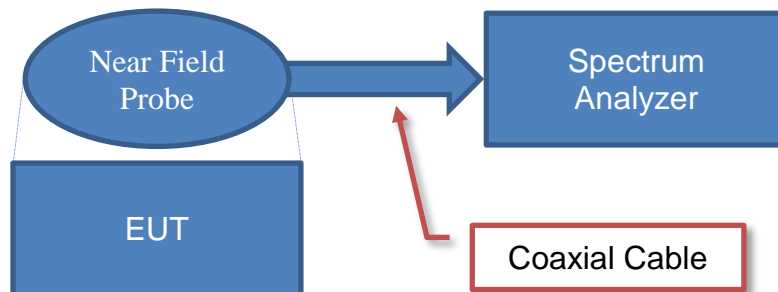
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

$$\begin{array}{r}
 \text{Measured Value} \\
 71.2
 \end{array}
 =
 \begin{array}{r}
 \text{Measured Level} \\
 42.6
 \end{array}
 +
 \begin{array}{r}
 \text{Reference Level Offset} \\
 28.6
 \end{array}$$

Near Field Test Fixture Measurements

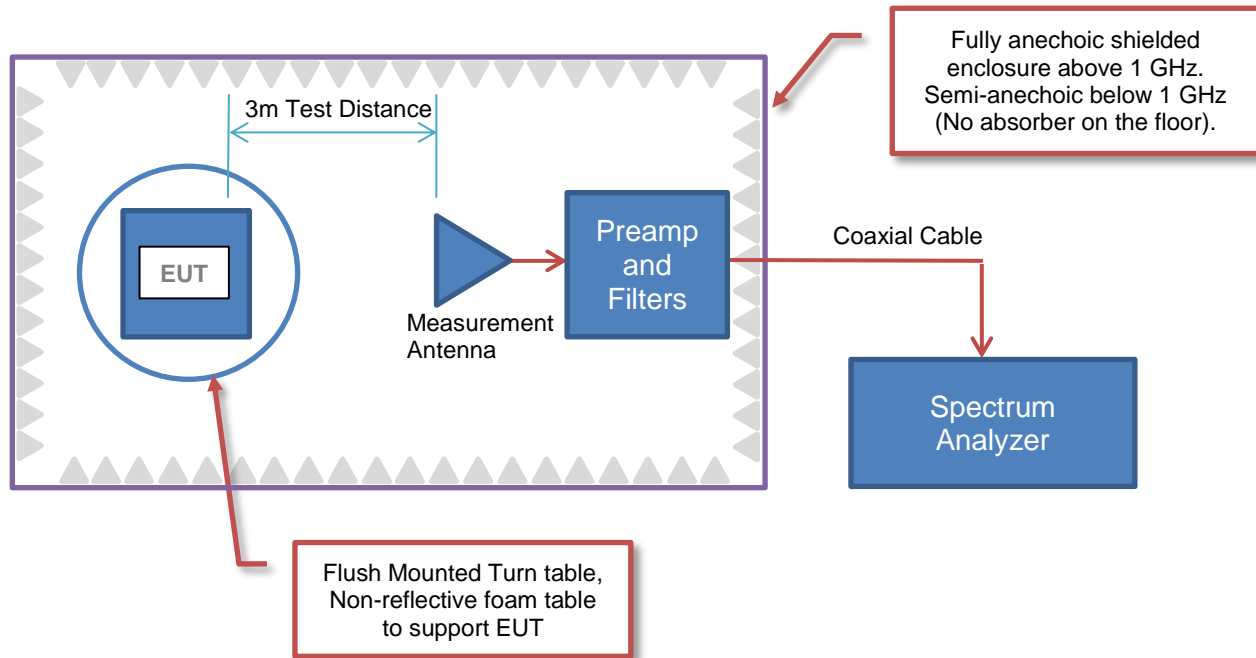


Sample Calculation (logarithmic units)

$$\begin{array}{r}
 \text{Measured Value} \\
 71.2
 \end{array}
 =
 \begin{array}{r}
 \text{Measured Level} \\
 42.6
 \end{array}
 +
 \begin{array}{r}
 \text{Reference Level Offset} \\
 28.6
 \end{array}$$

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)	Factor			Distance Adjustment Factor	External Attenuation	Field Strength
	Antenna Factor	Cable Factor	Amplifier Gain			
42.6	28.6	3.1	40.8	0.0	0.0	33.5

42.6 + 28.6 + 3.1 - 40.8 + 0.0 + 0.0 = 33.5

Conducted Emissions:

Measured Level (Amplitude)	Factor		External Attenuation	Adjusted Level
	Transducer Factor	Cable Factor		
26.7	0.3	0.1	20.0	47.1

26.7 + 0.3 + 0.1 + 20.0 = 47.1

Radiated Power (ERP/EIRP) – Substitution Method:

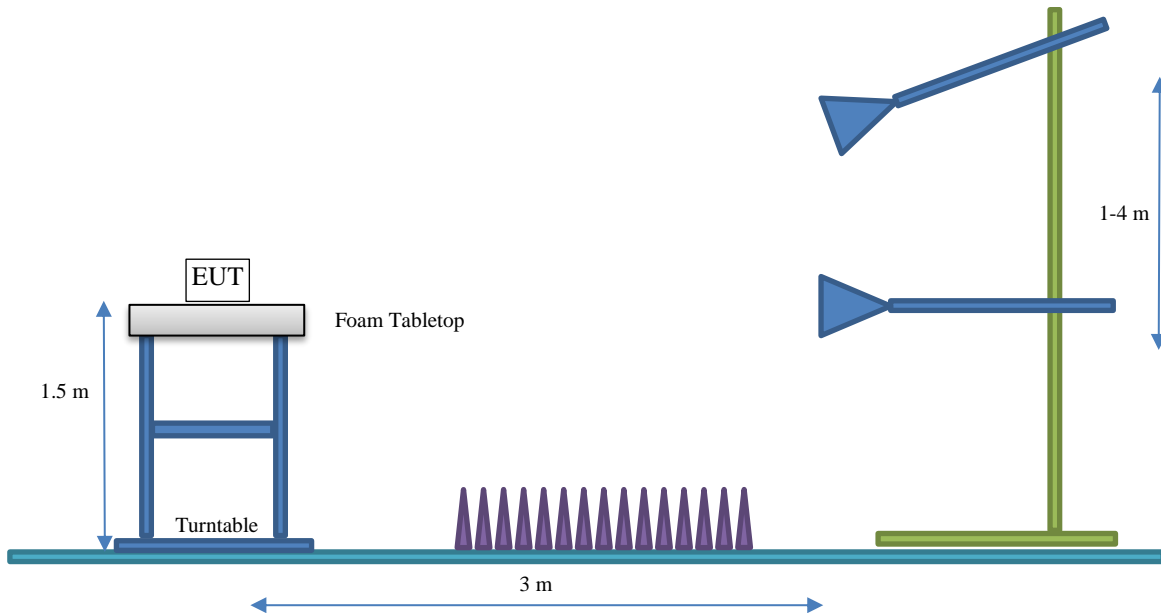
Measured Level into Substitution Antenna (Amplitude dBm)	Substitution Antenna Factor (dBi)	EIRP to ERP (if applicable)	Measured power (dBm ERP/EIRP)
10.0	6.0	2.15	13.9/16.0

10.0 + 6.0 - 2.15 = 13.9/16.0

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.





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:	Starlink Remote Control 2.0
First Date of Test:	August 7, 2023
Last Date of Test:	August 8, 2023
Receipt Date of Samples:	August 7, 2023
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Remote Control with a BLE radio
Testing Objective:
To demonstrate compliance of the Bluetooth LE radio to FCC 15.247/RSS-247 requirements.

POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Inverted F PCB Trace	Starkey	2400-2483.5	-1.4

The EUT was tested using the power settings provided by the manufacturer which were based upon:

- Test software settings Test software/firmware installed on EUT: Firmware 0.5.0
 Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types / Data Rates	Type	Channel	Frequency (MHz)	Power Setting
BLE GFSK	DTS	0 or 37	2402	+4
		20 or 18	2440	+4
		39	2480	+4

CONFIGURATIONS



Configuration STAK0319-1

Software/Firmware Running During Test	
Description	Version
Firmware	0.5.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Starlink Remote Control 2.0	Starkey	Model # 620	23236200119K

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Dell	Precision 5540	60VG2Z2

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Programming UART Connector	No	0.1 m	Yes	Starlink Remote Control 2.0	Unterminated

CONFIGURATIONS



Configuration STAK0319-2

Software/Firmware Running During Test	
Description	Version
Firmware	0.5.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Remote Control 2.0	Starkey	Model # 620	23236200165K

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
FT232 Interface Board	Waveshare	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Dell	Precision 5540	60VG2Z2

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Leads	No	1.1 m	No	Remote Control 2.0	DC Mains (TPZ)
Programming UART Connector (no ferrites)	No	0.1 m	No	Remote Control	FT232 Interface Board

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-08-07	Spurious Radiated Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2023-08-08	Band Edge Compliance	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2023-08-08	DTS Bandwidth (6 dB)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2023-08-08	Duty Cycle	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2023-08-08	Equivalent Isotropic Radiated Power	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2023-08-08	Occupied Bandwidth (99%)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2023-08-08	Output Power	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2023-08-08	Power Spectral Density	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2023-08-08	Spurious Conducted Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE



XMH 2023.02.14.0

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
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

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

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

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

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

DUTY CYCLE



TelTx 2022.06.03.0 XMI 2023.02.14.0

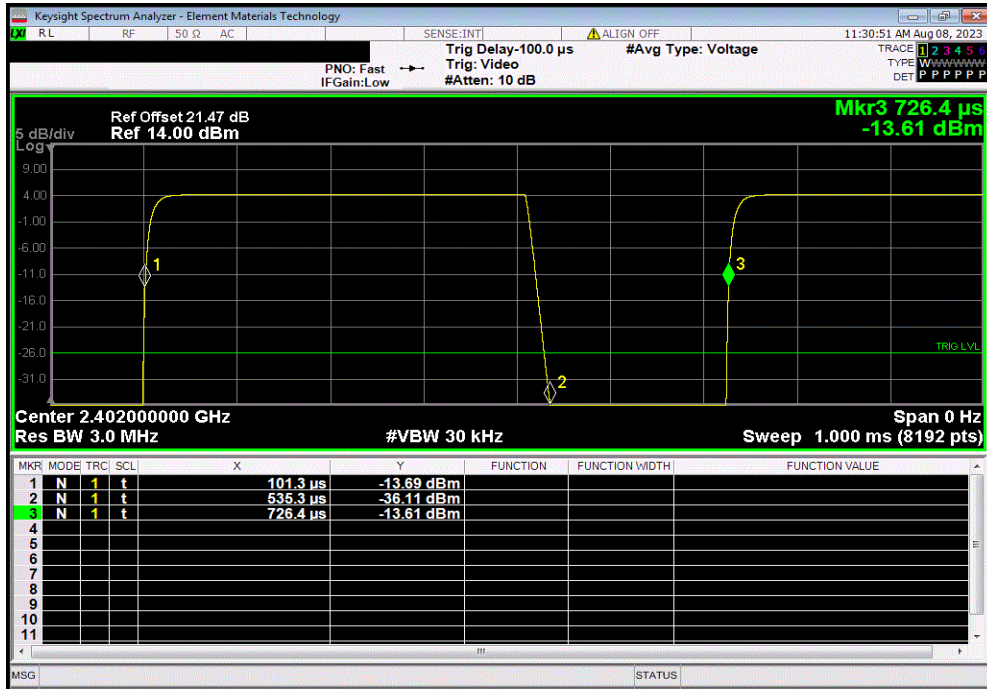
EUT: Starlink Remote Control 2.0		Work Order: STAK0319					
Serial Number: 23236200165K		Date: 08/08/2023					
Customer: Starkey Laboratories, Inc.		Temperature: 22.3°C					
Attendees: Aaron Anderson		Humidity: 49.6%					
Project: None		Barometric Pres.: 1013 mbar					
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11					
TEST SPECIFICATIONS							
FCC 15.247:2023		ANSI C63.10:2013					
RSS-247 Issue 2:2017		ANSI C63.10:2013					
COMMENTS							
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.							
DEVIATIONS FROM TEST STANDARD							
None							
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>					
		Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK 1 Mbps							
	Low Channel, 2402 MHz	434 us	625.1 us	1	69.4	N/A	N/A
	Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
	Mid Channel, 2440 MHz	434.1 us	625 us	1	69.5	N/A	N/A
	Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
	High Channel, 2480 MHz	434.1 us	625 us	1	69.5	N/A	N/A
	High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

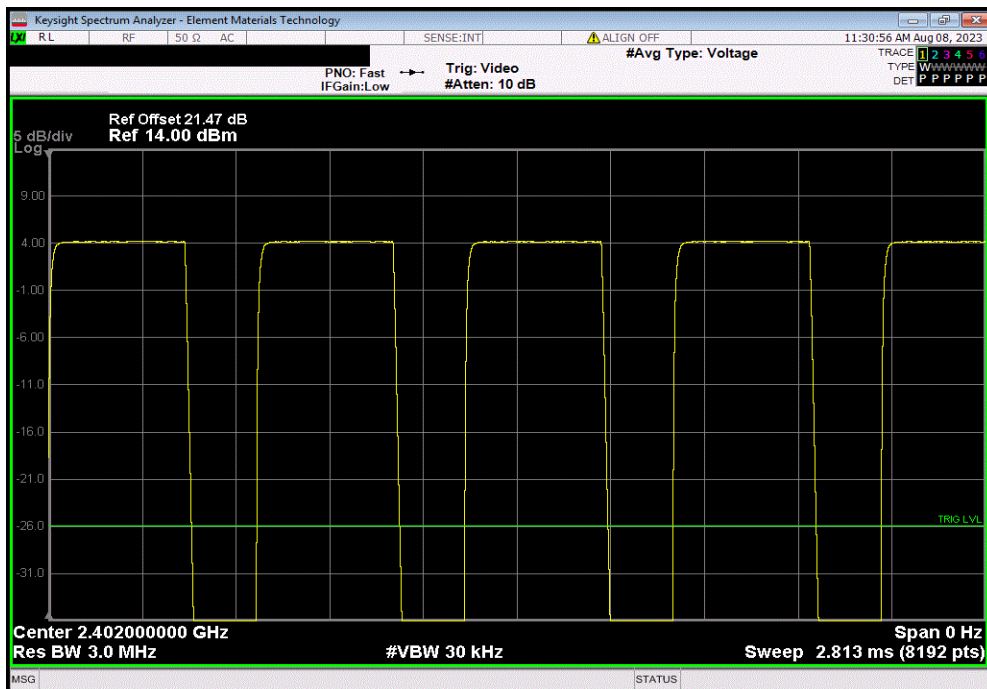


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
434 us	625.1 us	1	69.4	N/A	N/A	



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

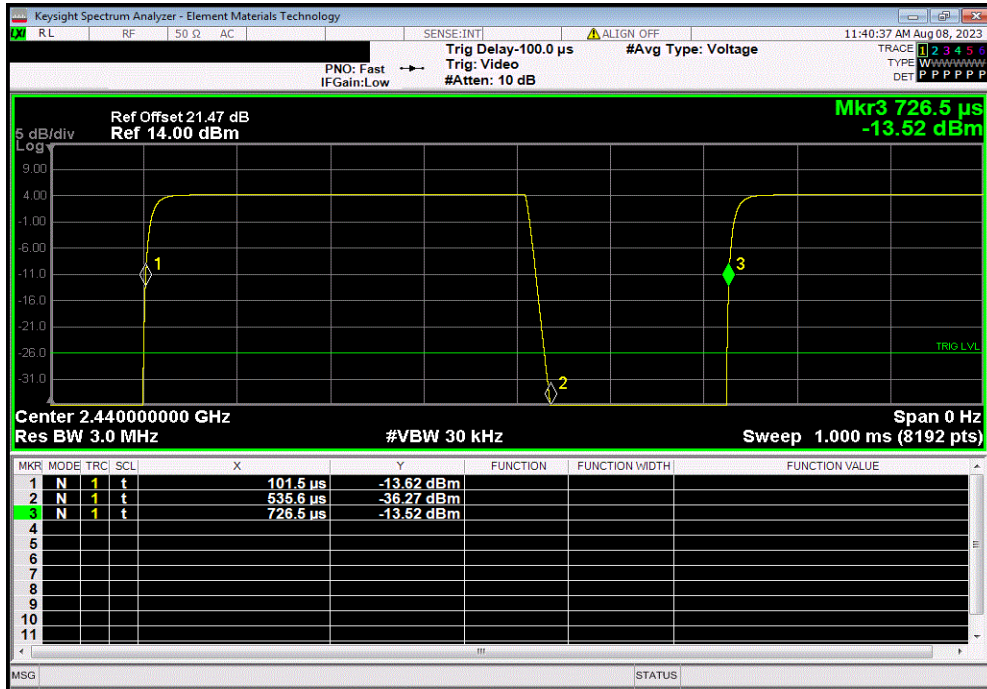


DUTY CYCLE

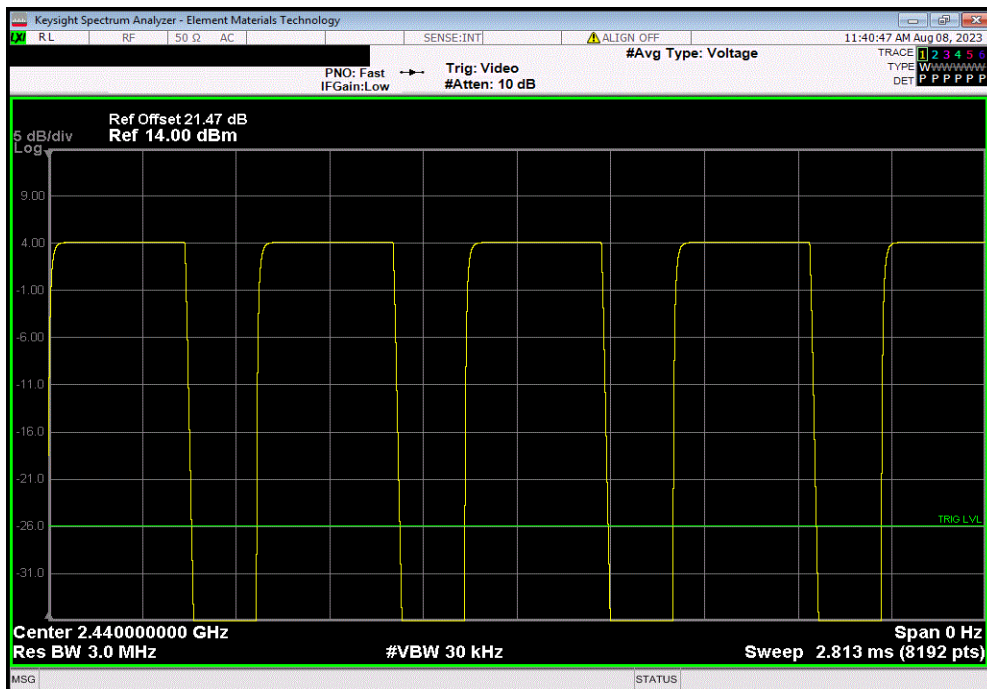


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
434.1 us	625 us	1	69.5	N/A	N/A	



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

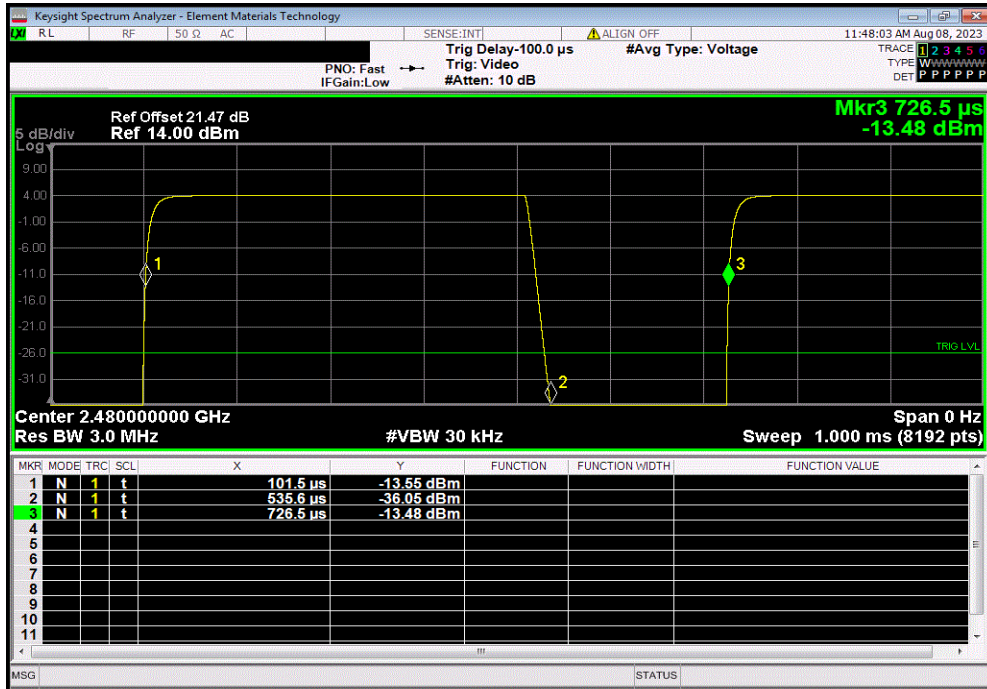


DUTY CYCLE

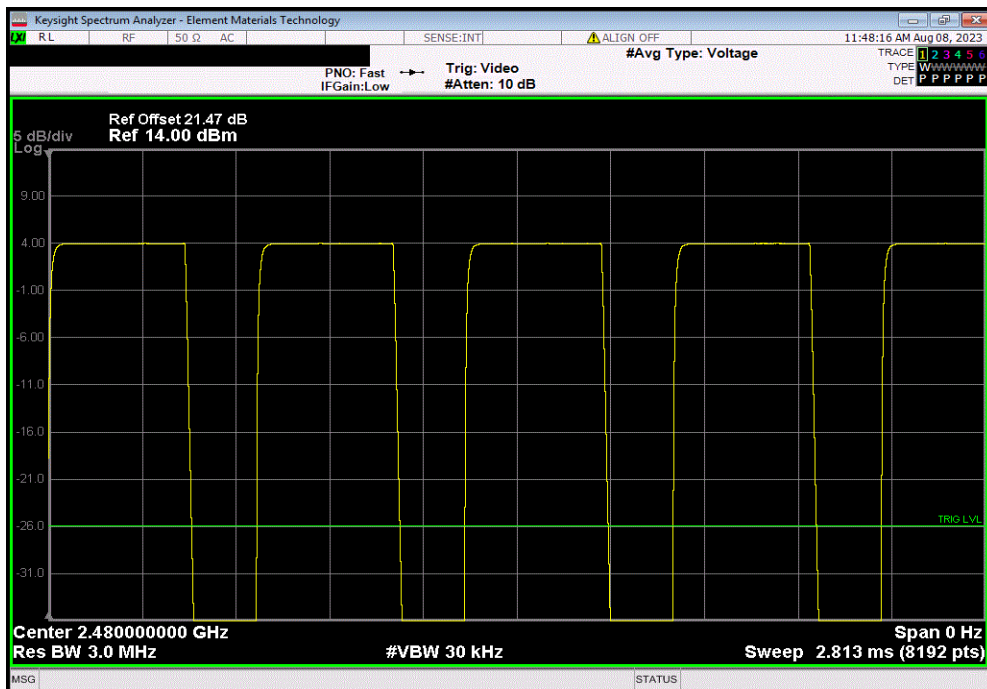


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
434.1 us	625 us	1	69.5	N/A	N/A	



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



DTS BANDWIDTH (6 dB)



element

XMIT 2023.02.14.0

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
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01

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 DTS bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

DTS BANDWIDTH (6 dB)



TelTx 2022.06.03.0 XMI 2023.02.14.0

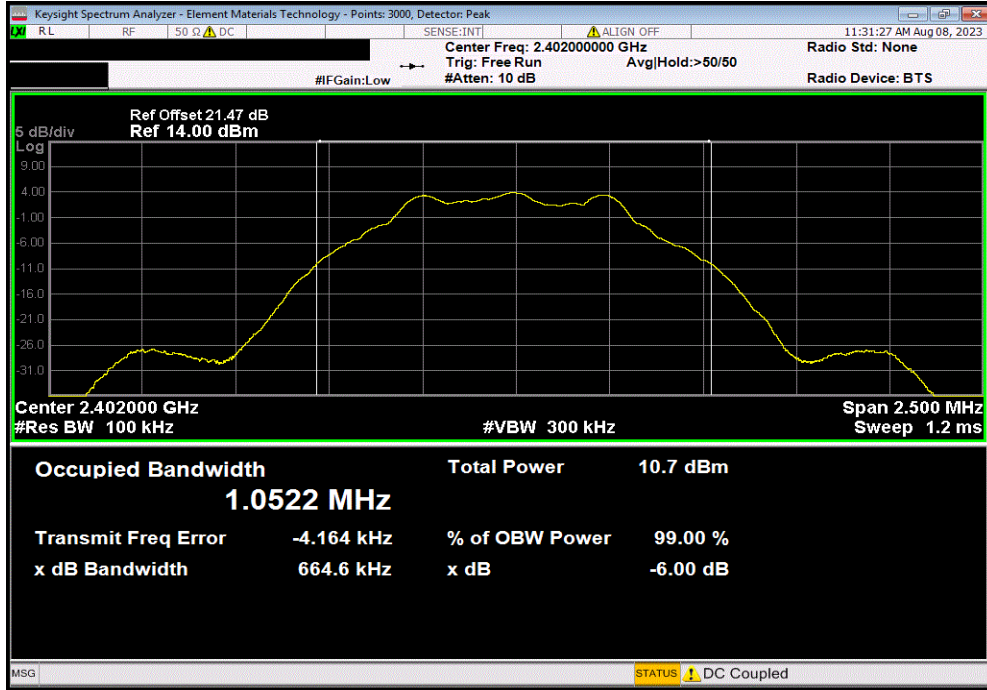
EUT: Starlink Remote Control 2.0		Work Order: STAK0319	
Serial Number: 23236200165K		Date: 08/08/2023	
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C	
Attendees: Aaron Anderson		Humidity: 49.5%	
Project: None		Barometric Pres.: 1013 mbar	
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11	
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>	
		Value	Limit (±) Result
BLE/GFSK 1 Mbps			
	Low Channel, 2402 MHz	664.566 kHz	500 kHz Pass
	Mid Channel, 2440 MHz	670.761 kHz	500 kHz Pass
	High Channel, 2480 MHz	684.529 kHz	500 kHz Pass

DTS BANDWIDTH (6 dB)

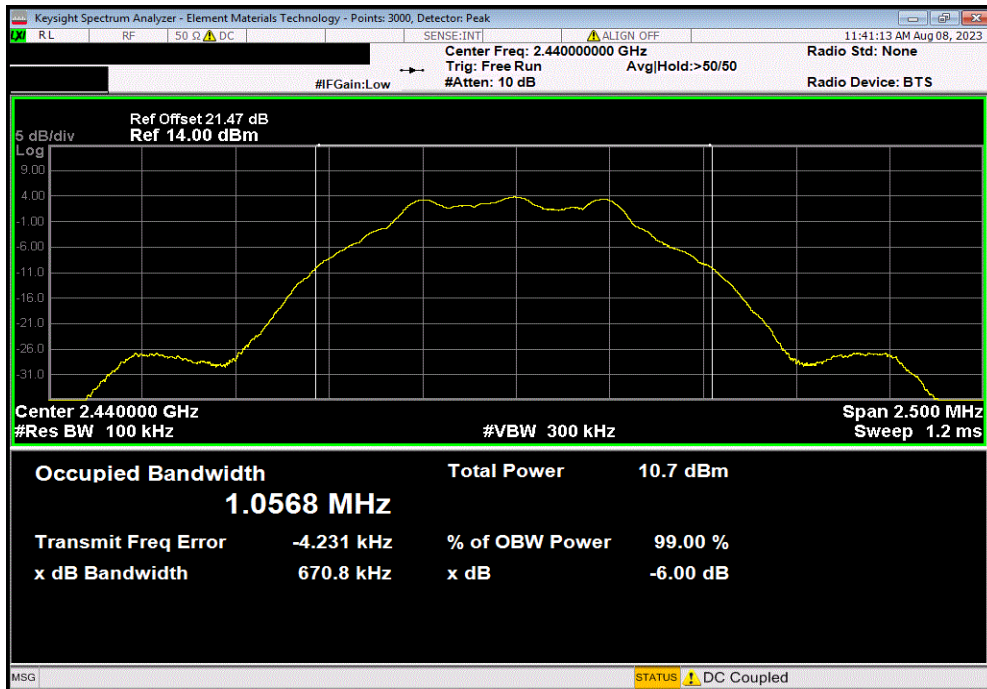


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Value	Limit	Result
					(≥)	
				664.566 kHz	500 kHz	Pass



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
				Value	Limit	Result
					(≥)	
				670.761 kHz	500 kHz	Pass

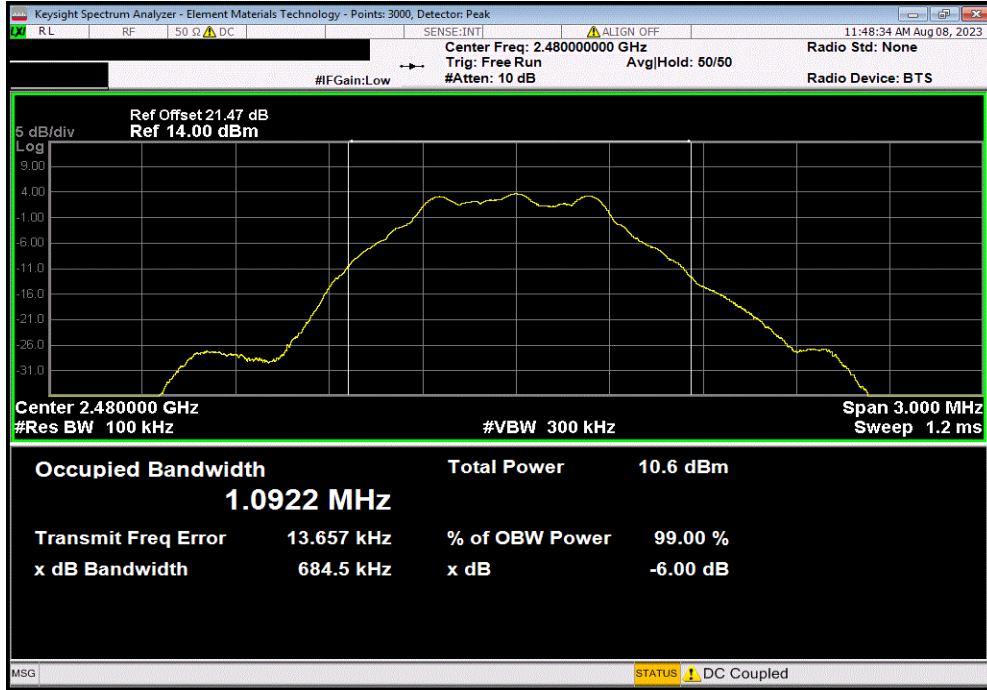


DTS BANDWIDTH (6 dB)



TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz				Value	Limit	Result
				(≥)		
				684.529 kHz	500 kHz	Pass





OCCUPIED BANDWIDTH (99%)

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
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation.

Per ANSI C63.10:2013, 6.9.3, the spectrum analyzer was configured as follows:

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) of the spectrum analyzer was set to the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) bandwidth was set to at least 3 times the resolution bandwidth. The analyzer sweep time was set to auto to prevent video filtering or averaging. A sample detector was used unless the device was not able to be operated in a continuous transmit mode, in which case a peak detector was used.

The spectrum analyzer occupied bandwidth measurement function was used to sum the power of the transmission in linear terms to obtain the 99% bandwidth.

OCCUPIED BANDWIDTH (99%)



TelTx 2022.06.03.0 XMI 2023.02.14.0

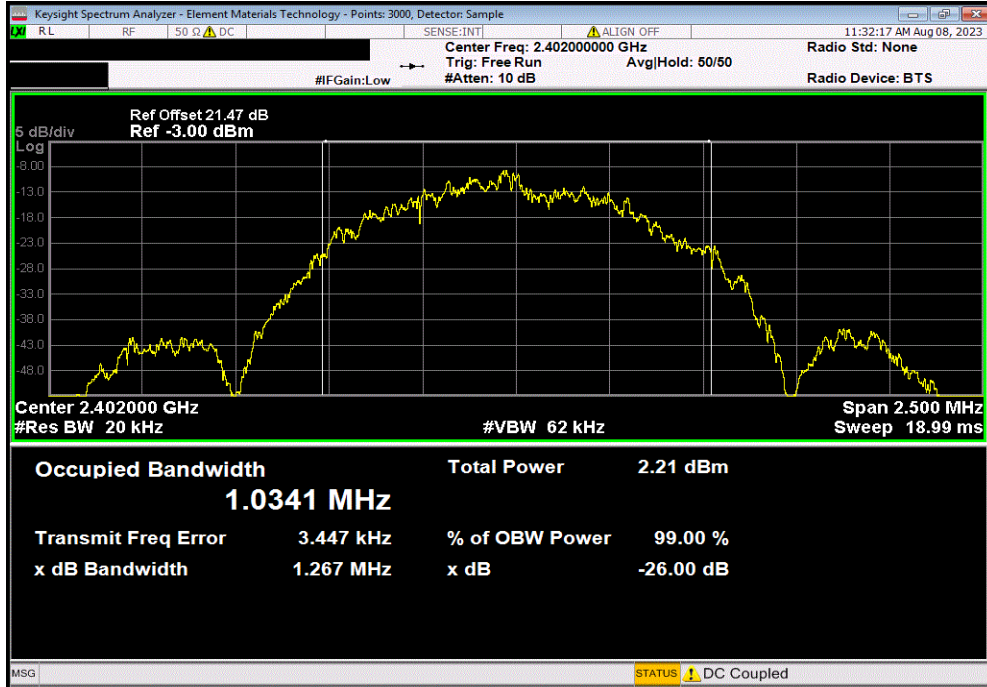
EUT: Starlink Remote Control 2.0		Work Order: STAK0319	
Serial Number: 23236200165K		Date: 08/08/2023	
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C	
Attendees: Aaron Anderson		Humidity: 49.7%	
Project: None		Barometric Pres.: 1013 mbar	
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11	
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>	
		Value	Limit
BLE/GFSK 1 Mbps			Result
Low Channel, 2402 MHz		1.034 MHz	N/A
Mid Channel, 2440 MHz		1.034 MHz	N/A
High Channel, 2480 MHz		1.039 MHz	N/A

OCCUPIED BANDWIDTH (99%)

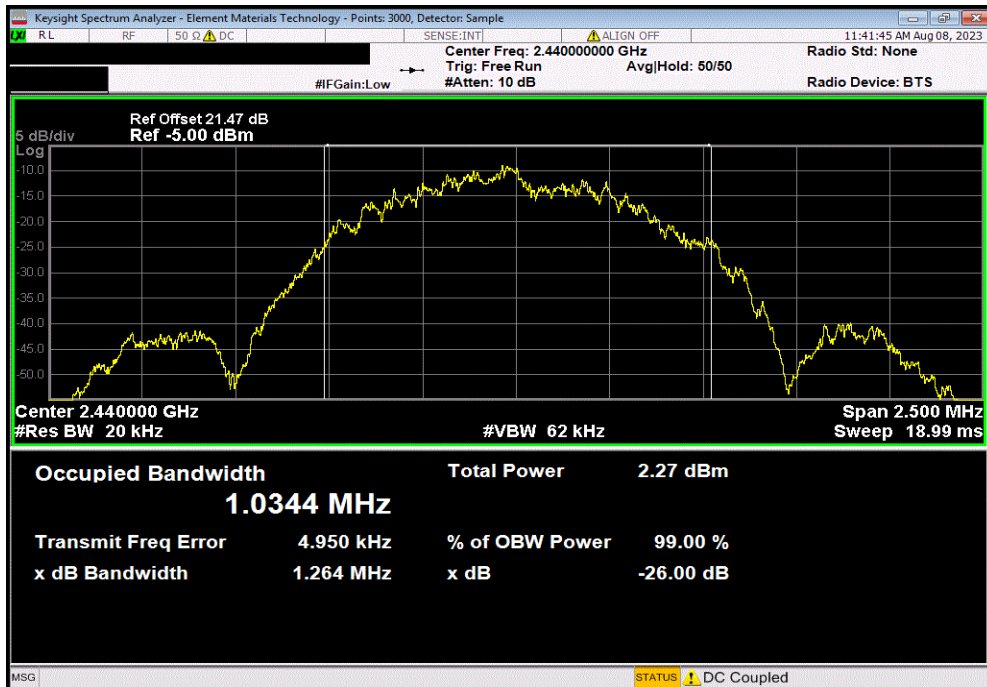


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Value	Limit	Result
				1.034 MHz	N/A	N/A



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
				Value	Limit	Result
				1.034 MHz	N/A	N/A

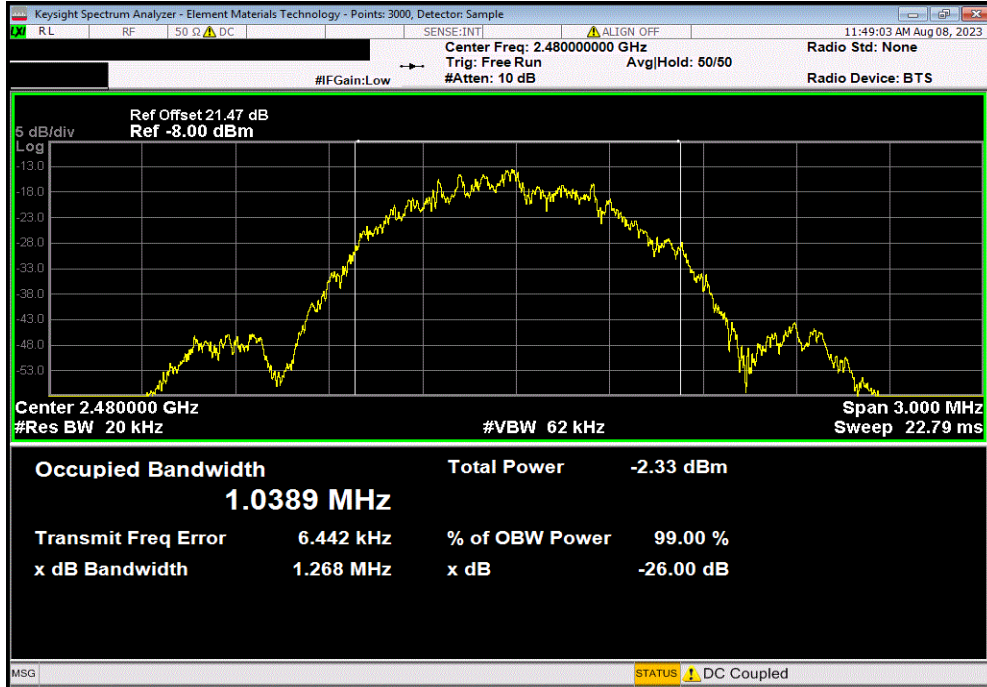


OCCUPIED BANDWIDTH (99%)



TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz			
	Value	Limit	Result
	1.039 MHz	N/A	N/A



OUTPUT POWER



element

XMIT 2023.02.14.0

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
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

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

OUTPUT POWER



TstTx 2022.06.03.0 XMI 2023.02.14.0

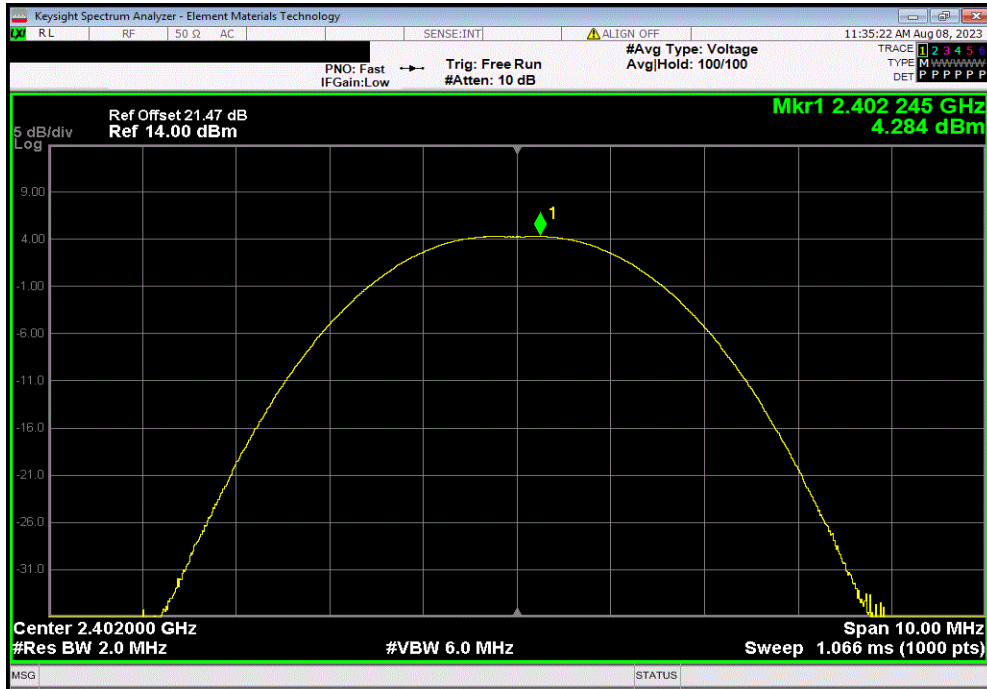
EUT: Starlink Remote Control 2.0		Work Order: STAK0319
Serial Number: 23236200165K		Date: 08/08/2023
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C
Attendees: Aaron Anderson		Humidity: 49.6%
Project: None		Barometric Pres.: 1013 mbar
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11
TEST SPECIFICATIONS		
Test Method		
FCC 15.247:2023	ANSI C63.10:2013	
RSS-247 Issue 2:2017	ANSI C63.10:2013	
COMMENTS		
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.		
DEVIATIONS FROM TEST STANDARD		
None		
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>
		Out Pwr (dBm) Limit (dBm) Result
BLE/GFSK 1 Mbps		
Low Channel, 2402 MHz	4.284	30 Pass
Mid Channel, 2440 MHz	4.24	30 Pass
High Channel, 2480 MHz	4.072	30 Pass

OUTPUT POWER

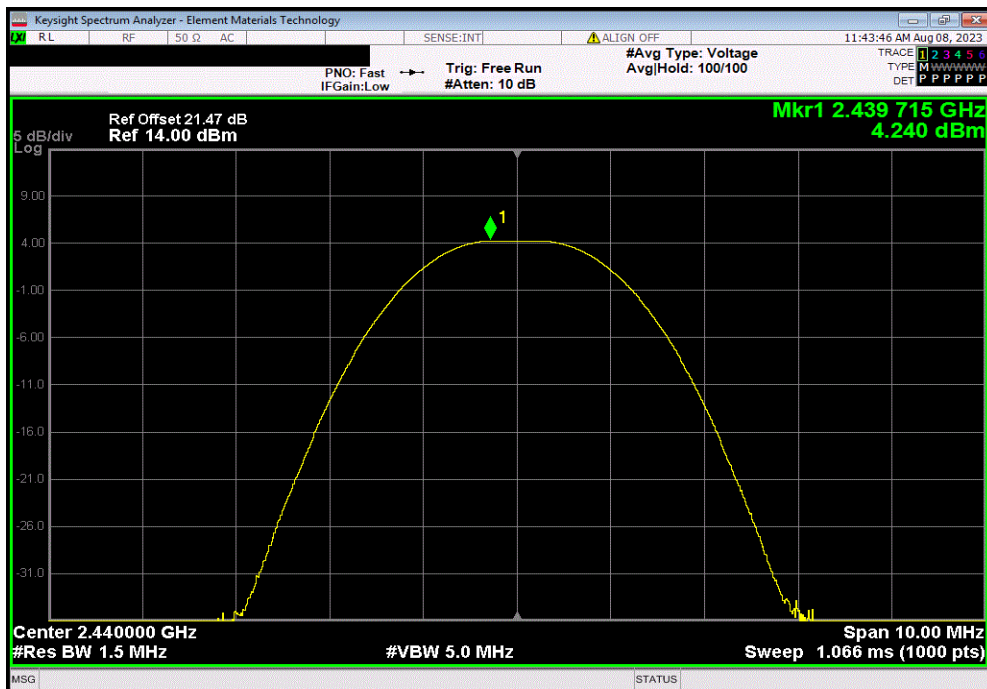


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.284	30	Pass



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.24	30	Pass

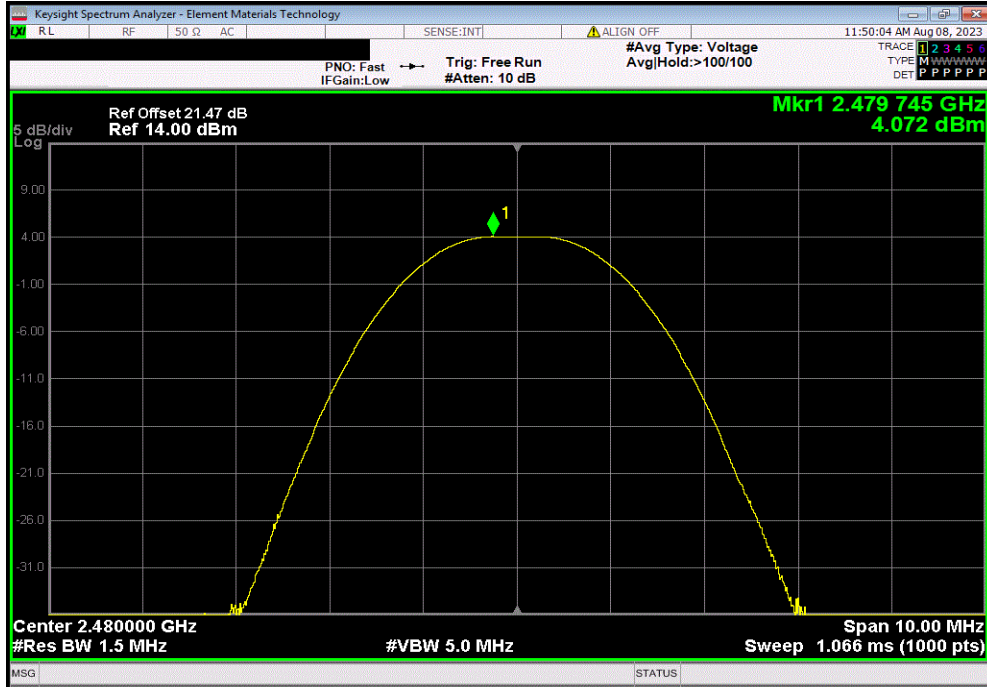


OUTPUT POWER



TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				4.072	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



XMit 2023.02.14.0

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
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10

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.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TelTx 2022.06.03.0 XMI 2023.02.14.0

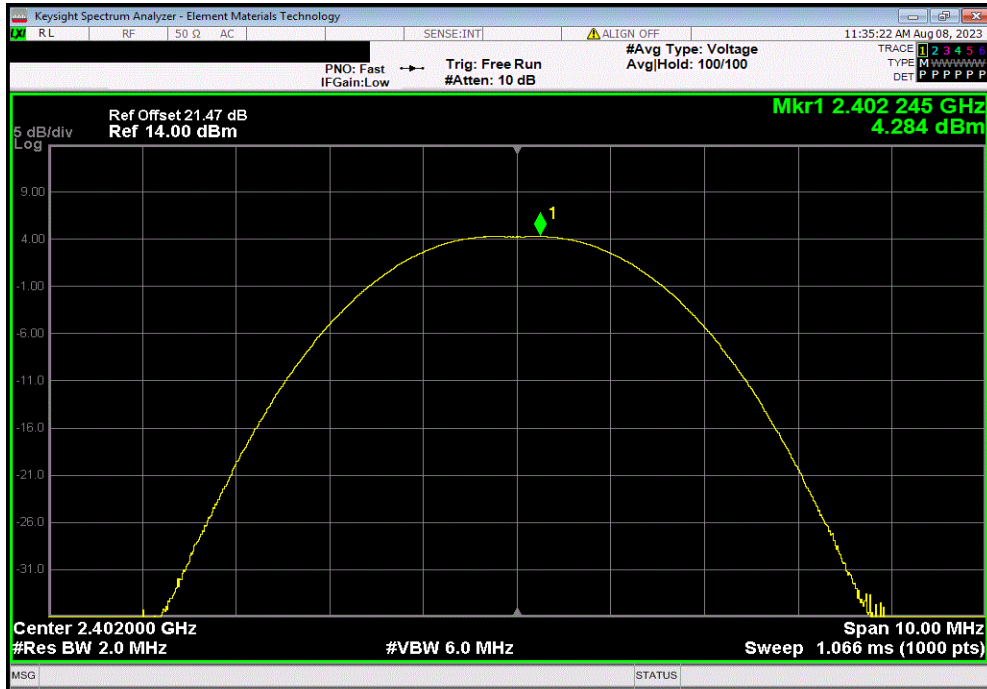
EUT: Starlink Remote Control 2.0		Work Order: STAK0319				
Serial Number: 23236200165K		Date: 08/08/2023				
Customer: Starkey Laboratories, Inc.		Temperature: 22.3°C				
Attendees: Aaron Anderson		Humidity: 49.7%				
Project: None		Barometric Pres.: 1013 mbar				
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11				
TEST SPECIFICATIONS						
FCC 15.247:2023		ANSI C63.10:2013				
RSS-247 Issue 2:2017		ANSI C63.10:2013				
COMMENTS						
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>				
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK 1 Mbps						
	Low Channel, 2402 MHz	4.284	-1.4	2.88	36	Pass
	Mid Channel, 2440 MHz	4.24	-1.4	2.84	36	Pass
	High Channel, 2480 MHz	4.072	-1.4	2.672	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

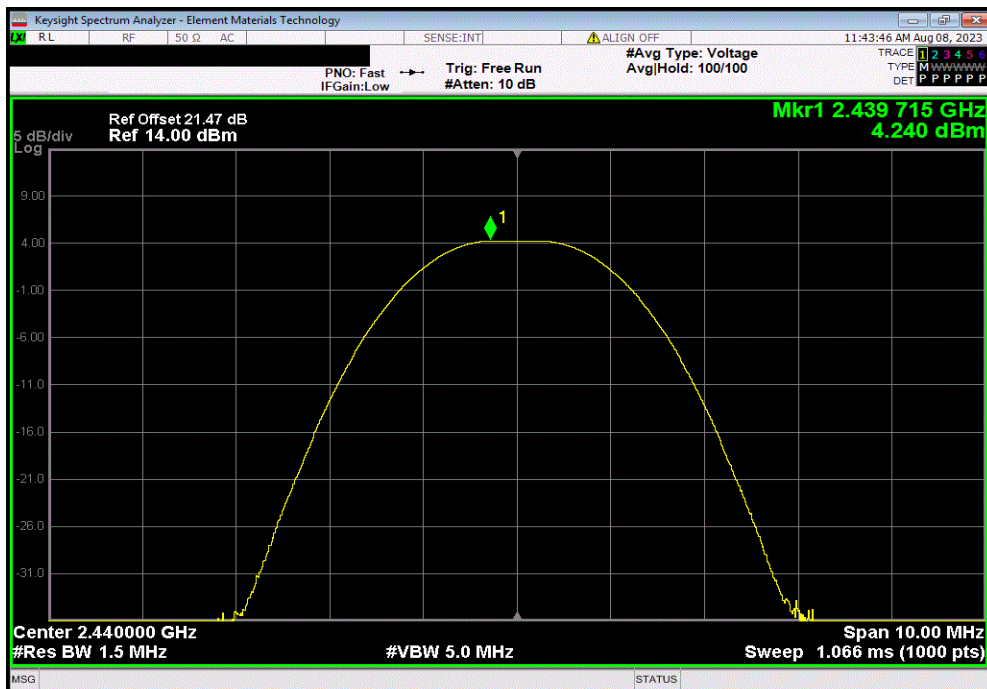


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result		
4.284	-1.4	2.88	36	Pass		



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result		
4.24	-1.4	2.84	36	Pass		



POWER SPECTRAL DENSITY



XMit 2023.02.14.0

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
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

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

POWER SPECTRAL DENSITY



TstTx 2022.06.03.0 XMI 2023.02.14.0

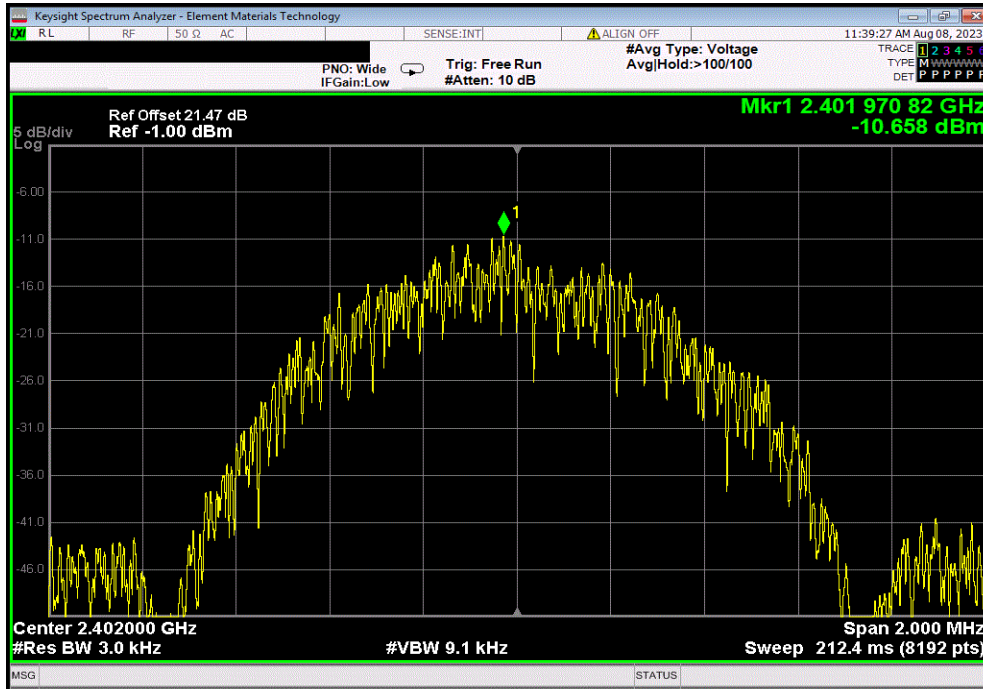
EUT: Starlink Remote Control 2.0		Work Order: STAK0319	
Serial Number: 23236200165K		Date: 08/08/2023	
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C	
Attendees: Aaron Anderson		Humidity: 49.5%	
Project: None		Barometric Pres.: 1013 mbar	
Tested by: Christopher Heintzelman		Power: 3VDC via Variable DC Supply	
		Job Site: MN11	
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>	
		Value	Limit
		dBm/3kHz	< dBm/3kHz
BLE/GFSK 1 Mbps			Results
Low Channel, 2402 MHz		-10.658	8 Pass
Mid Channel, 2440 MHz		-10.892	8 Pass
High Channel, 2480 MHz		-10.824	8 Pass

POWER SPECTRAL DENSITY

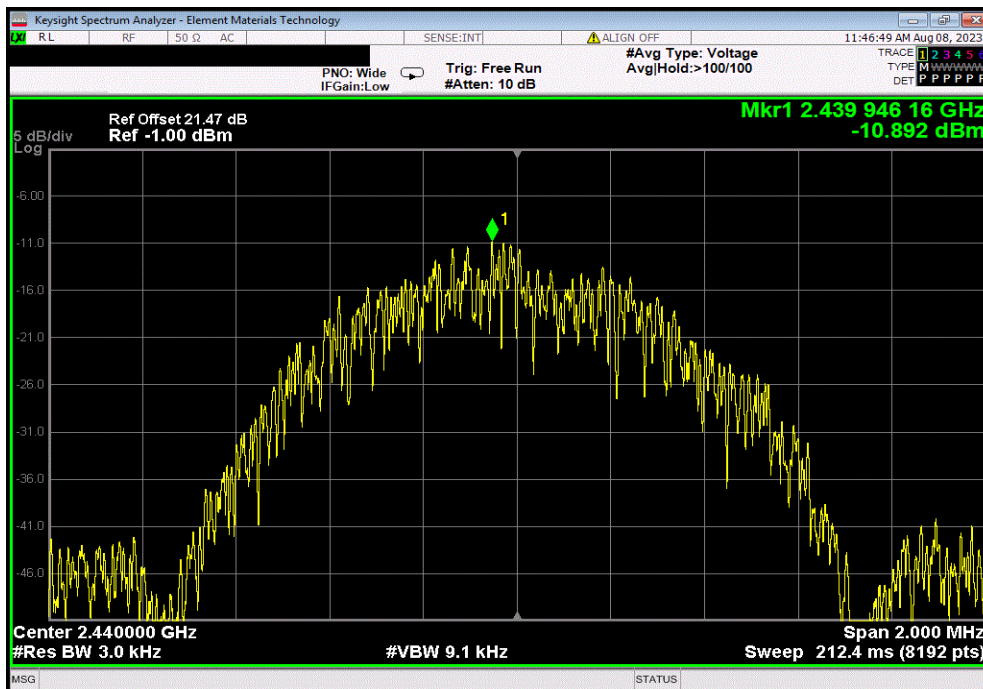


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
	Value	Limit	Results			
	dBm/3kHz	< dBm/3kHz				
	-10.658	8	Pass			



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz						
	Value	Limit	Results			
	dBm/3kHz	< dBm/3kHz				
	-10.892	8	Pass			

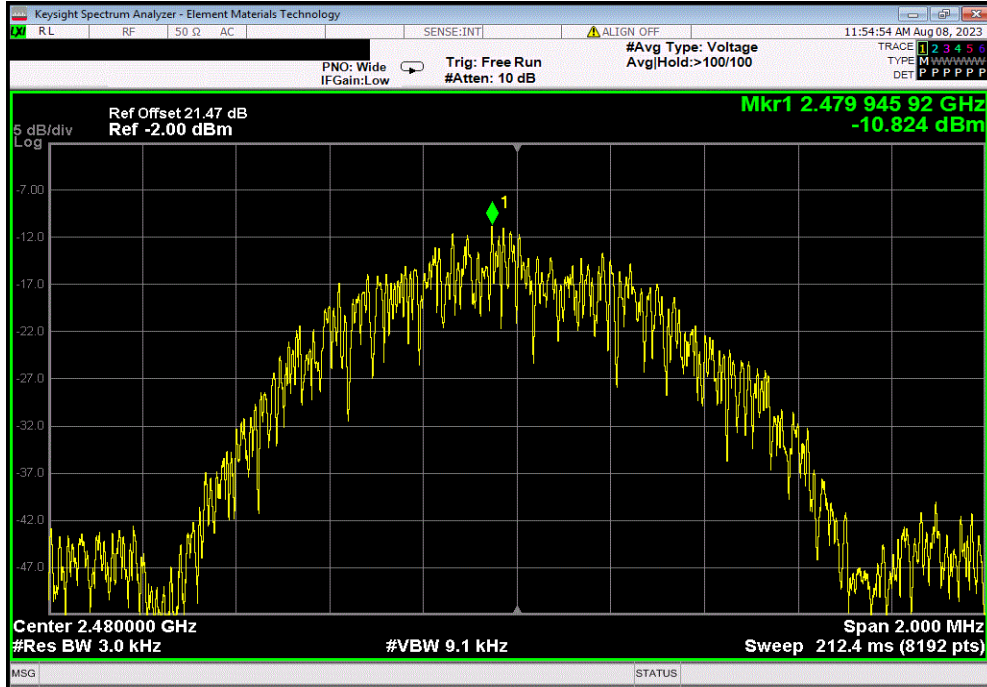


POWER SPECTRAL DENSITY



TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-10.824	8	Pass



BAND EDGE COMPLIANCE



XMH 2023.02.14.0

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
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

BAND EDGE COMPLIANCE



TelTx 2022.06.03.0 XMI 2023.02.14.0

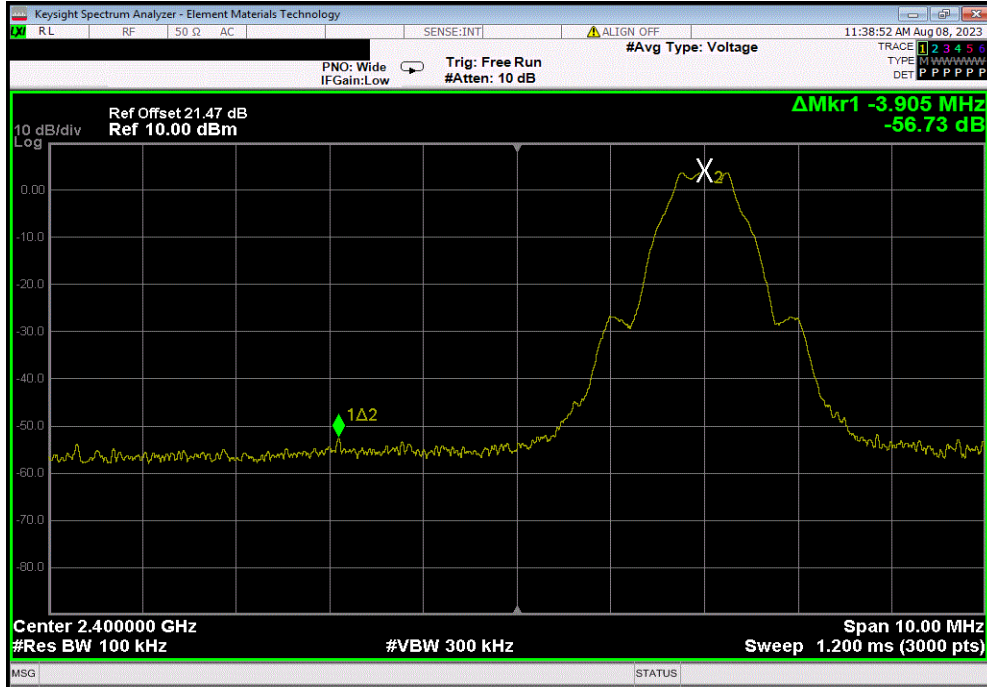
EUT: Starlink Remote Control 2.0		Work Order: STAK0319	
Serial Number: 23236200165K		Date: 08/08/2023	
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C	
Attendees: Aaron Anderson		Humidity: 50%	
Project: None		Barometric Pres.: 1014 mbar	
Tested by: Christopher Heintzelman	Power: 3VDC via Variable DC Supply	Job Site: MN11	
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>	
		Value (dBc)	Limit ≤ (dBc) Result
BLE/GFSK 1 Mbps			
	Low Channel, 2402 MHz	-56.73	-20 Pass
	High Channel, 2480 MHz	-57.65	-20 Pass

BAND EDGE COMPLIANCE

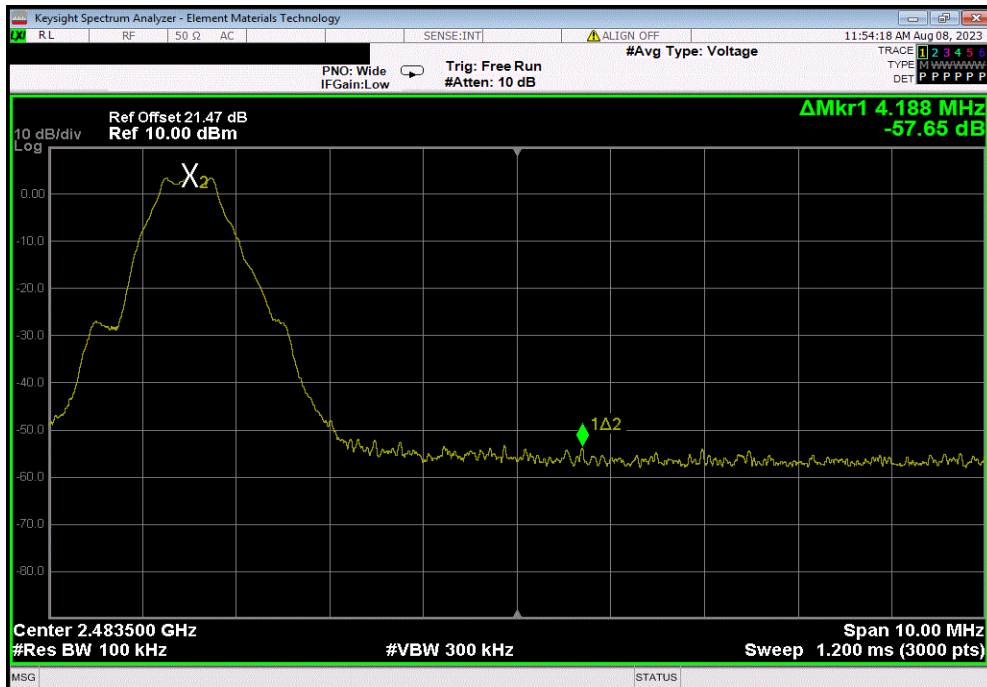


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.73	-20	Pass



BLE/GFSK 1 Mbps, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-57.65	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

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
Meter - Multimeter	Fluke	114	MMU	2023-01-13	2024-01-13
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Attenuator	Fairview Microwave	SA4014-20	AQI	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24

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 fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

The reference level offset for the fundamental screen capture was based on a measured value of the loss between the spectrum analyzer and the EUT which was verified at the time of test. The remaining screen capture(s) use an internal transducer factor on the analyzer to correct the displayed trace based on the cable loss over frequency. The reference level offset for the additional screen capture(s) is then based on the expected attenuator value and any other losses.

Fundamental Offset = Ref Lvl Offset showing measured composite factor of all losses

Remaining Screen capture(s) Offset = "Internal" cable loss factor not shown on screen capture + Ref Lvl Offset showing expected attenuator value and any other losses

SPURIOUS CONDUCTED EMISSIONS



TelTx 2022.06.03.0 XMit 2023.02.14.0

EUT: Starlink Remote Control 2.0		Work Order: STAK0319	
Serial Number: 23236200165K		Date: 08/08/2023	
Customer: Starkey Laboratories, Inc.		Temperature: 22.2°C	
Attendees: Aaron Anderson		Humidity: 49.5%	
Project: None		Barometric Pres.: 1013 mbar	
Tested by: Christopher Heintzelman		Power: 3VDC via Variable DC Supply	
		Job Site: MN11	
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Power setting +4 dBm. 3VDC is declared to be the nominal battery voltage.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	STAK0319-2	Signature <i>Christopher Heintzelman</i>	

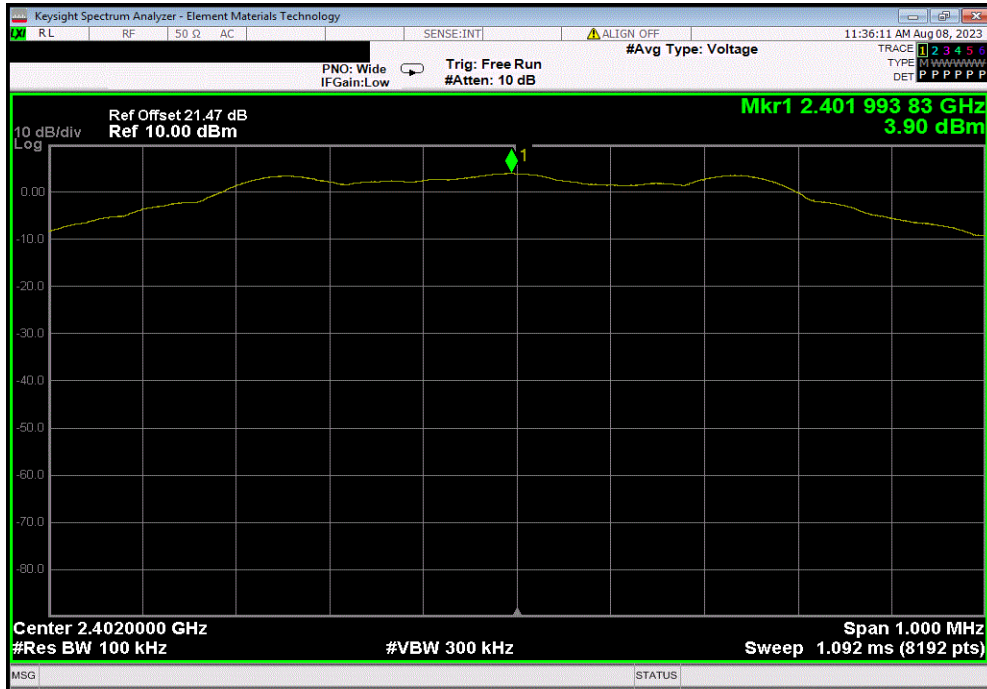
BLE/GFSK 1 Mbps	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 2402 MHz	Fundamental	2401.99	N/A	N/A	N/A
Low Channel, 2402 MHz	30 MHz - 12.5 GHz	5816.65	-52.61	-20	Pass
Low Channel, 2402 MHz	12.5 GHz - 25 GHz	24980.16	-40.73	-20	Pass
Mid Channel, 2440 MHz	Fundamental	2439.99	N/A	N/A	N/A
Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	5802.95	-53.07	-20	Pass
Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	24925.22	-41.11	-20	Pass
High Channel, 2480 MHz	Fundamental	2480	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	12063.07	-53.21	-20	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	24993.9	-40.58	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

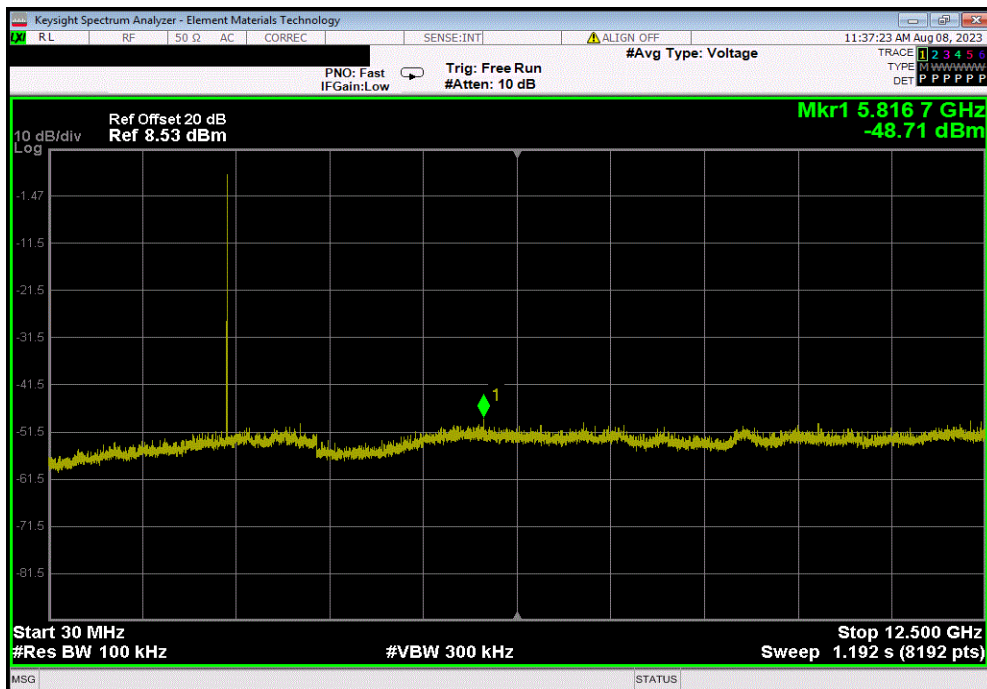


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	2401.99	N/A	N/A	N/A	



BLE/GFSK 1 Mbps, Low Channel, 2402 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	5816.65	-52.61	-20	Pass	

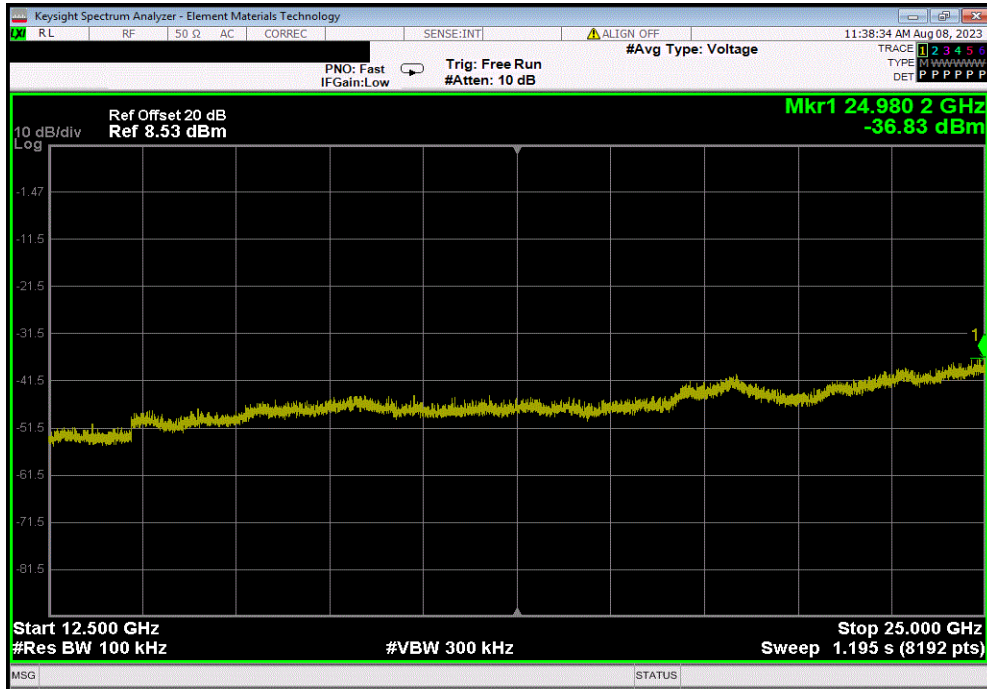


SPURIOUS CONDUCTED EMISSIONS

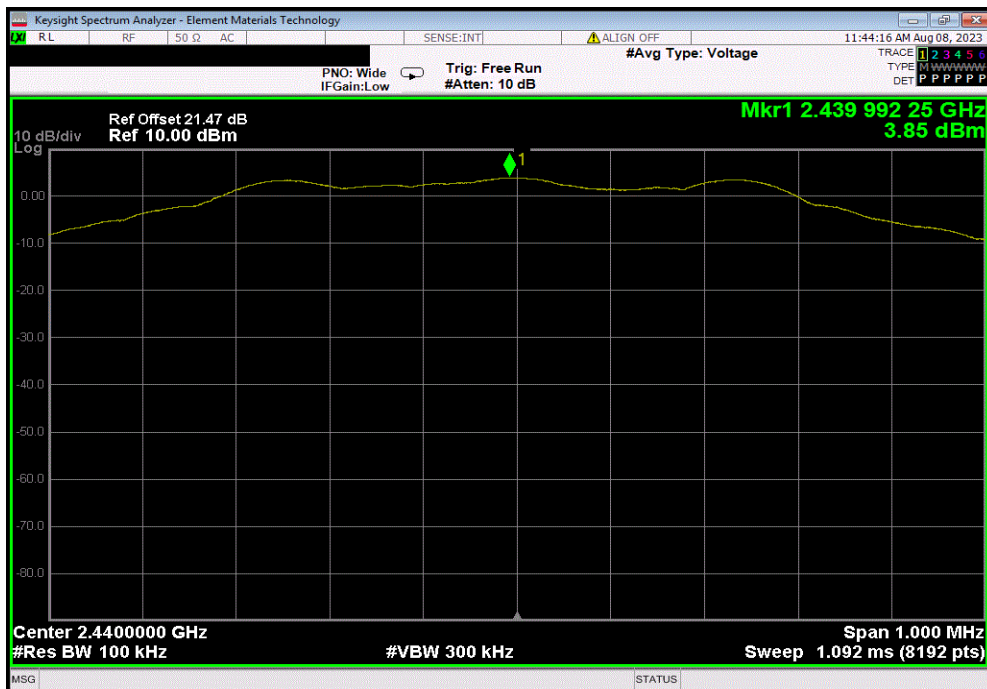


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Low Channel, 2402 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	24980.16	-40.73	-20	Pass	



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	2439.99	N/A	N/A	N/A	

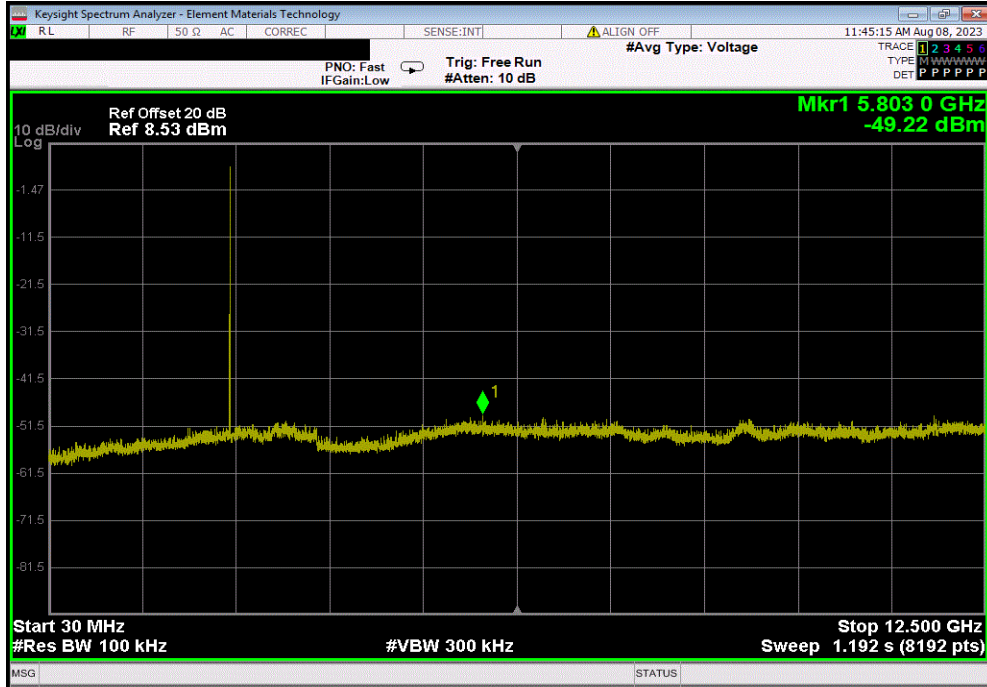


SPURIOUS CONDUCTED EMISSIONS

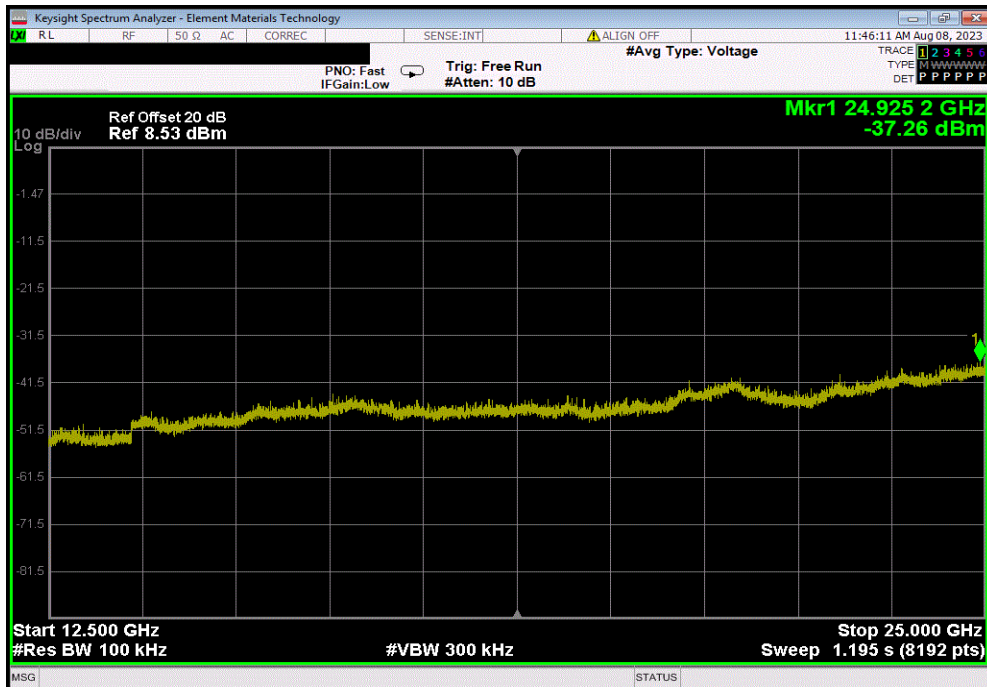


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	5802.95	-53.07	-20	Pass



BLE/GFSK 1 Mbps, Mid Channel, 2440 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24925.22	-41.11	-20	Pass

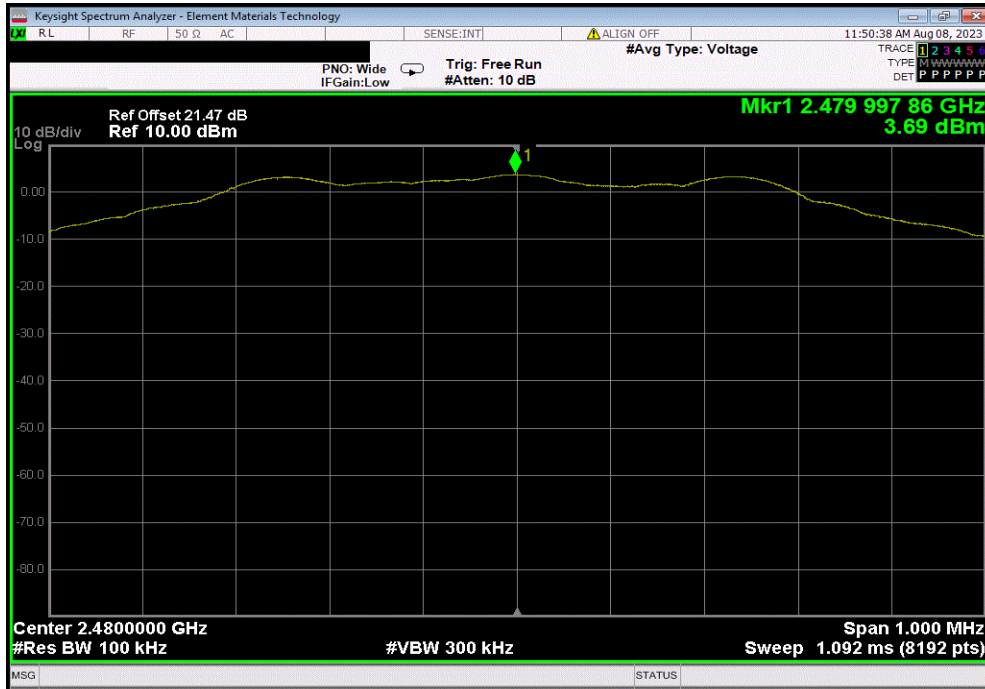


SPURIOUS CONDUCTED EMISSIONS

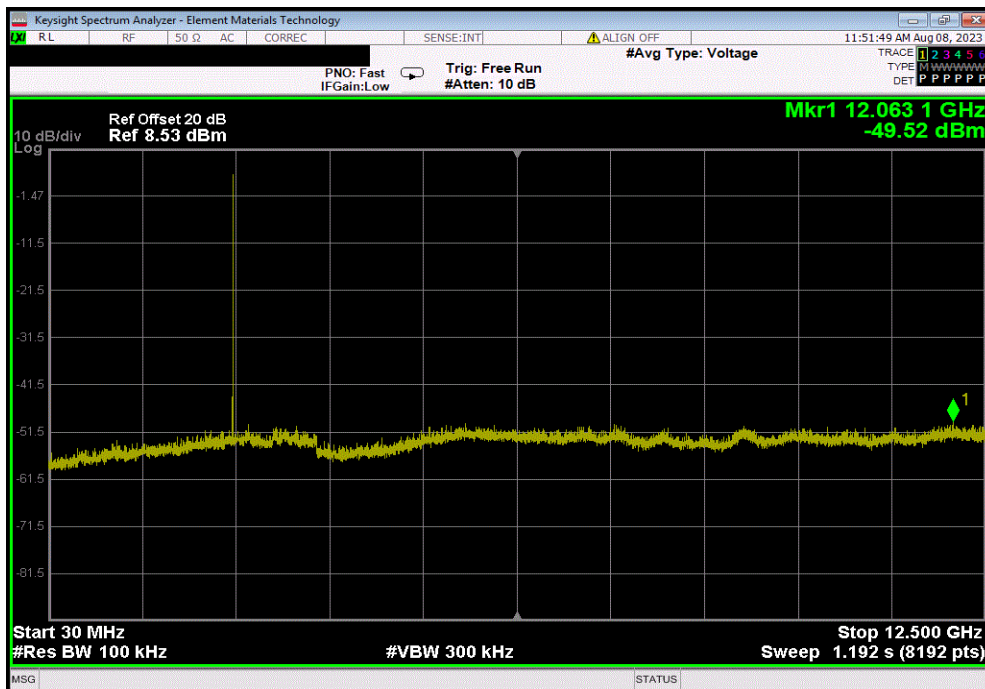


TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	2480	N/A	N/A	N/A	



BLE/GFSK 1 Mbps, High Channel, 2480 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	12063.07	-53.21	-20	Pass	

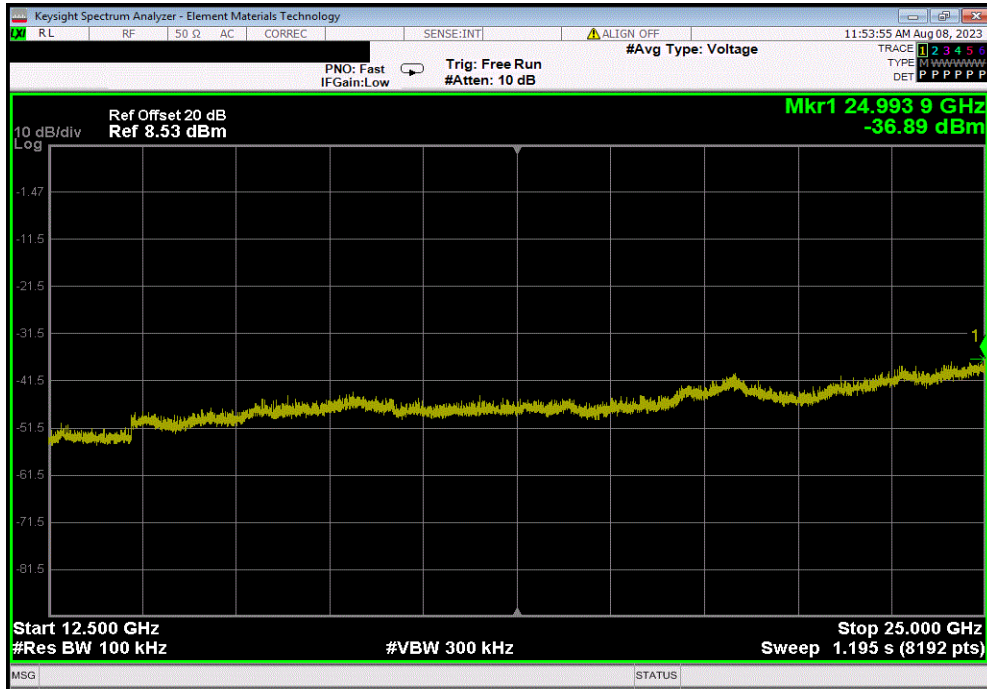


SPURIOUS CONDUCTED EMISSIONS



TbTx 2022.06.03.0 XMI 2023.02.14.0

BLE/GFSK 1 Mbps, High Channel, 2480 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24993.9	-40.58	-20	Pass



SPURIOUS RADIATED EMISSIONS

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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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 $10 \cdot \log(1/dc)$.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2022-09-01	2024-09-01
Cable	Element	Double Ridge Guide Horn Cables	MNV	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2023-01-31	2024-01-31
Attenuator	Coaxicom	3910-20	AXY	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2023-02-02	2024-02-02
Filter - High Pass	Micro-Tronics	HPM50111	HFM	2022-09-10	2023-09-10
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	NCR
Cable	Element	Standard Gain Cable	MNW	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2023-01-31	2024-01-31
Antenna - Standard Gain	ETS-Lindgren	3160-08	AJP	NCR	NCR
Amplifier - Pre-Amplifier	L-3 Narda-Miteq	AMF-6F-12001800-30-10P	PAP	2023-01-31	2024-01-31
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	NCR
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	2022-09-10	2023-09-10
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2022-09-10	2023-09-10
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2023-03-28	2025-03-28
Cable	Element	Biconilog Cable	MNX	2023-01-31	2024-01-31
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2023-01-31	2024-01-31
Filter - Low Pass	Micro-Tronics	LPM50004	HGG	2022-09-10	2023-09-10

SPURIOUS RADIATED EMISSIONS



MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 26500 MHz

POWER INVESTIGATED

3 VDC Internal Battery

CONFIGURATIONS INVESTIGATED

STAK0319-1

MODES INVESTIGATED

Transmitting Low, Mid, and High Chs (2402, 2440, and 2480 MHz), 1 Mbps

SPURIOUS RADIATED EMISSIONS



EUT:	Starlink Remote Control 2.0	Work Order:	STAK0319
Serial Number:	23236200119K	Date:	2023-08-07
Customer:	Starkey Laboratories, Inc.	Temperature:	22.4°C
Attendees:	Aaron Anderson	Relative Humidity:	55.1%
Customer Project:	None	Bar. Pressure (PMSL):	1013 mb
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3VDC Internal Battery	Configuration:	STAK0319-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	

TEST PARAMETERS

Run #:	12	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

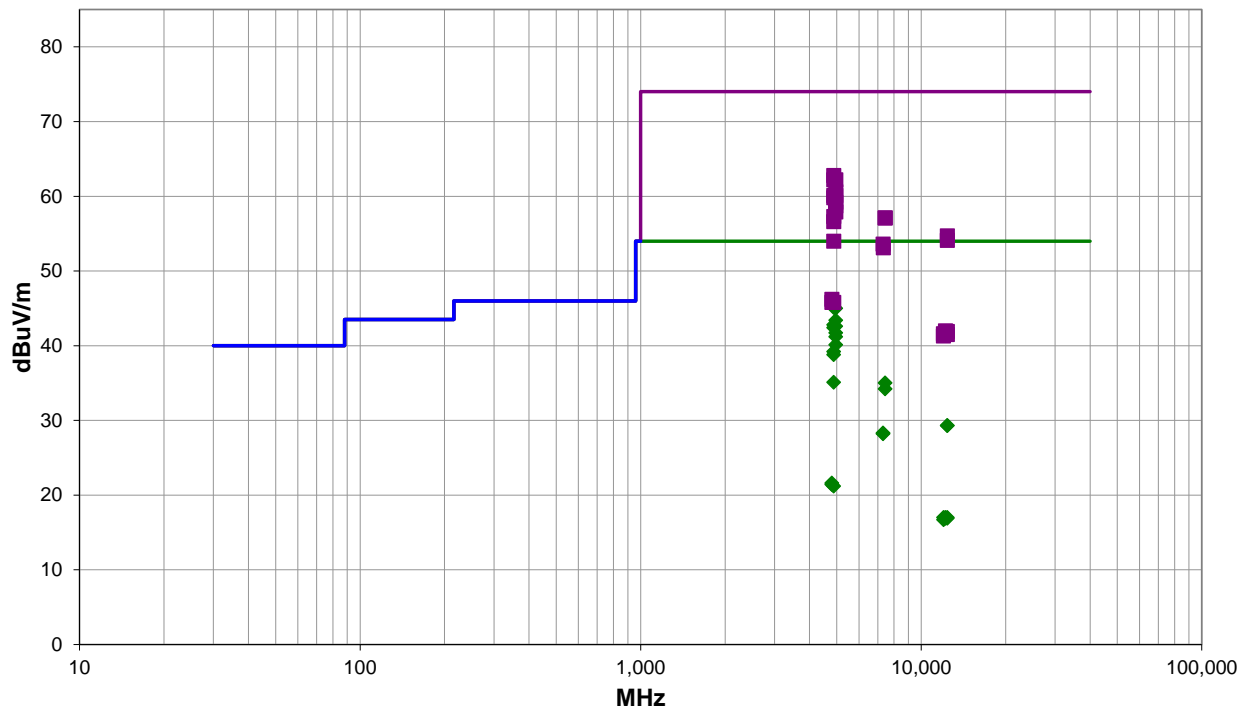
Power setting +4 dBm. Test mode is 65% duty cycle. The manufacturer declares the operational duty cycle will be limited to 3%. A duty cycle correction factor was applied to the final data using $10 \cdot \log(1/\text{duty cycle})$ to correct up from 65% to 100%, and then down from 100% to 3%. 1.9dB upwards correction + 15.2 dB downwards correction = -13.3dB total net correction factor.

EUT OPERATING MODES

Transmitting Low, Mid, and High Chs (2402, 2440, and 2480 MHz), 1 Mbps

DEVIATIONS FROM TEST STANDARD

None



Run #: 12

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #12

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4879.867	54.0	5.0	2.8	287.0	-13.3	0.0	Horz	AV	0.0	45.7	54.0	-8.3	EUT Horz, Mid Ch
4879.892	53.4	5.0	1.0	270.0	-13.3	0.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Horz, Mid Ch, Programming Cable Removed
4959.858	53.3	5.0	3.7	111.0	-13.3	0.0	Horz	AV	0.0	45.0	54.0	-9.0	EUT Horz, High Ch
4959.883	51.7	5.0	1.0	109.0	-13.3	0.0	Vert	AV	0.0	43.4	54.0	-10.6	EUT Vert, High Ch
4879.883	51.1	5.0	2.7	130.0	-13.3	0.0	Horz	AV	0.0	42.8	54.0	-11.2	EUT On Side, Mid Ch, Programming Cable Removed
4879.400	57.8	5.0	2.8	287.0	0.0	0.0	Horz	PK	0.0	62.8	74.0	-11.2	EUT Horz, Mid Ch
4959.875	50.9	5.0	2.7	132.0	-13.3	0.0	Horz	AV	0.0	42.6	54.0	-11.4	EUT Vert, High Ch
4879.867	50.7	5.0	2.5	245.0	-13.3	0.0	Vert	AV	0.0	42.4	54.0	-11.6	EUT Vert, Mid Ch, Programming Cable Removed
4959.567	57.2	5.0	3.7	111.0	0.0	0.0	Horz	PK	0.0	62.2	74.0	-11.8	EUT Horz, High Ch
4879.475	57.2	5.0	1.0	270.0	0.0	0.0	Horz	PK	0.0	62.2	74.0	-11.8	EUT Horz, Mid Ch, Programming Cable Removed
4959.875	50.0	5.0	1.8	299.0	-13.3	0.0	Vert	AV	0.0	41.7	54.0	-12.3	EUT On Side, High Ch
4959.883	49.5	5.0	1.5	318.0	-13.3	0.0	Horz	AV	0.0	41.2	54.0	-12.8	EUT On Side, High Ch
4959.450	55.6	5.0	1.0	109.0	0.0	0.0	Vert	PK	0.0	60.6	74.0	-13.4	EUT Vert, High Ch
4959.475	55.1	5.0	2.7	132.0	0.0	0.0	Horz	PK	0.0	60.1	74.0	-13.9	EUT Vert, High Ch
4879.367	55.1	5.0	2.7	130.0	0.0	0.0	Horz	PK	0.0	60.1	74.0	-13.9	EUT On Side, Mid Ch, Programming Cable Removed
4959.892	48.4	5.0	3.4	17.0	-13.3	0.0	Vert	AV	0.0	40.1	54.0	-13.9	EUT Horz, High Ch
4879.450	54.8	5.0	2.5	245.0	0.0	0.0	Vert	PK	0.0	59.8	74.0	-14.2	EUT Vert, Mid Ch, Programming Cable Removed
4879.933	47.5	5.0	3.9	199.0	-13.3	0.0	Vert	AV	0.0	39.2	54.0	-14.8	EUT Horz, Mid Ch, Programming Cable Removed
4959.533	54.2	5.0	1.8	299.0	0.0	0.0	Vert	PK	0.0	59.2	74.0	-14.8	EUT On Side, High Ch
4879.917	47.1	5.0	1.0	223.0	-13.3	0.0	Vert	AV	0.0	38.8	54.0	-15.2	EUT On Side, Mid Ch, Programming Cable Removed
4959.367	53.7	5.0	1.5	318.0	0.0	0.0	Horz	PK	0.0	58.7	74.0	-15.3	EUT On Side, High Ch
4959.458	52.9	5.0	3.4	17.0	0.0	0.0	Vert	PK	0.0	57.9	74.0	-16.1	EUT Horz, High Ch
4880.533	52.3	5.0	3.9	199.0	0.0	0.0	Vert	PK	0.0	57.3	74.0	-16.7	EUT Horz, Mid Ch, Programming Cable Removed
7439.117	43.3	13.8	1.5	143.0	0.0	0.0	Vert	PK	0.0	57.1	74.0	-16.9	EUT Vert, High Ch
7439.400	43.3	13.8	1.7	143.0	0.0	0.0	Horz	PK	0.0	57.1	74.0	-16.9	EUT Horz, High Ch
4879.450	51.6	5.0	1.0	223.0	0.0	0.0	Vert	PK	0.0	56.6	74.0	-17.4	EUT On Side, Mid Ch, Programming Cable Removed
4879.908	43.4	5.0	2.6	149.0	-13.3	0.0	Horz	AV	0.0	35.1	54.0	-18.9	EUT Vert, Mid Ch, Programming Cable Removed
7439.492	34.5	13.8	1.7	143.0	-13.3	0.0	Horz	AV	0.0	35.0	54.0	-19.0	EUT Horz, High Ch
12400.950	37.9	16.8	2.0	352.0	0.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	EUT Vert, High Ch
7439.350	33.7	13.8	1.5	143.0	-13.3	0.0	Vert	AV	0.0	34.2	54.0	-19.8	EUT Vert, High Ch
12401.440	37.3	16.8	1.5	151.0	0.0	0.0	Horz	PK	0.0	54.1	74.0	-19.9	EUT Horz, High Ch
4880.192	49.0	5.0	2.6	149.0	0.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	EUT Vert, Mid Ch, Programming Cable Removed
7319.583	40.6	13.0	2.3	323.0	0.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	EUT Horz, Mid Ch
7321.475	40.1	13.0	1.5	213.0	0.0	0.0	Vert	PK	0.0	53.1	74.0	-20.9	EUT Vert, Mid Ch
12402.200	25.8	16.8	2.0	352.0	-13.3	0.0	Vert	AV	0.0	29.3	54.0	-24.7	EUT Vert, High Ch
12400.810	25.8	16.8	1.5	151.0	-13.3	0.0	Horz	AV	0.0	29.3	54.0	-24.7	EUT Horz, High Ch
7318.367	28.6	13.0	2.3	323.0	-13.3	0.0	Horz	AV	0.0	28.3	54.0	-25.7	EUT Horz, Mid Ch
7317.950	28.5	13.0	1.5	213.0	-13.3	0.0	Vert	AV	0.0	28.2	54.0	-25.8	EUT Vert, Mid Ch
4803.125	41.1	5.1	1.5	187.0	0.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	EUT Horz, Low Ch
4805.292	40.7	5.1	1.5	124.0	0.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	EUT Vert, Low Ch

SPURIOUS RADIATED EMISSIONS

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4880.958	40.8	5.0	1.5	297.0	0.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	EUT Vert, Mid Ch
12200.940	41.5	0.5	1.5	44.0	0.0	0.0	Horz	PK	0.0	42.0	74.0	-32.0	EUT Horz, Mid Ch
12398.850	41.1	0.8	2.2	194.0	0.0	0.0	Horz	PK	0.0	41.9	74.0	-32.1	EUT Horz, High Ch
12201.590	41.2	0.5	1.4	186.0	0.0	0.0	Vert	PK	0.0	41.7	74.0	-32.3	EUT Vert, Mid Ch
4802.742	29.8	5.1	1.5	124.0	-13.3	0.0	Vert	AV	0.0	21.6	54.0	-32.4	EUT Vert, Low Ch
12010.030	42.2	-0.6	2.3	189.0	0.0	0.0	Vert	PK	0.0	41.6	74.0	-32.4	EUT Vert, Low Ch
12398.000	40.7	0.8	1.5	264.0	0.0	0.0	Vert	PK	0.0	41.5	74.0	-32.5	EUT Vert, High Ch
4801.583	29.6	5.1	1.5	187.0	-13.3	0.0	Horz	AV	0.0	21.4	54.0	-32.6	EUT Horz, Low Ch
12009.480	42.0	-0.7	1.5	235.0	0.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	EUT Horz, Low Ch
4878.325	29.5	5.0	1.5	297.0	-13.3	0.0	Vert	AV	0.0	21.2	54.0	-32.8	EUT Vert, Mid Ch
12399.310	29.5	0.8	2.2	194.0	-13.3	0.0	Horz	AV	0.0	17.0	54.0	-37.0	EUT Horz, High Ch
12202.450	29.8	0.5	1.4	186.0	-13.3	0.0	Vert	AV	0.0	17.0	54.0	-37.0	EUT Vert, Mid Ch
12010.920	30.9	-0.6	2.3	189.0	-13.3	0.0	Vert	AV	0.0	17.0	54.0	-37.0	EUT Vert, Low Ch
12397.760	29.4	0.8	1.5	264.0	-13.3	0.0	Vert	AV	0.0	16.9	54.0	-37.1	EUT Vert, High Ch
12200.610	29.7	0.5	1.5	44.0	-13.3	0.0	Horz	AV	0.0	16.9	54.0	-37.1	EUT Horz, Mid Ch
12010.520	30.6	-0.6	1.5	235.0	-13.3	0.0	Horz	AV	0.0	16.7	54.0	-37.3	EUT Horz, Low Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS



EUT:	Remote Control 2.0	Work Order:	STAK0319
Serial Number:	23236200119K	Date:	2023-08-07
Customer:	Starkey Laboratories, Inc.	Temperature:	22.4°C
Attendees:	Aaron Anderson	Relative Humidity:	55.1%
Customer Project:	None	Bar. Pressure (PMSL):	1013 mb
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3 VDC Internal Battery	Configuration:	STAK0319-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	19	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

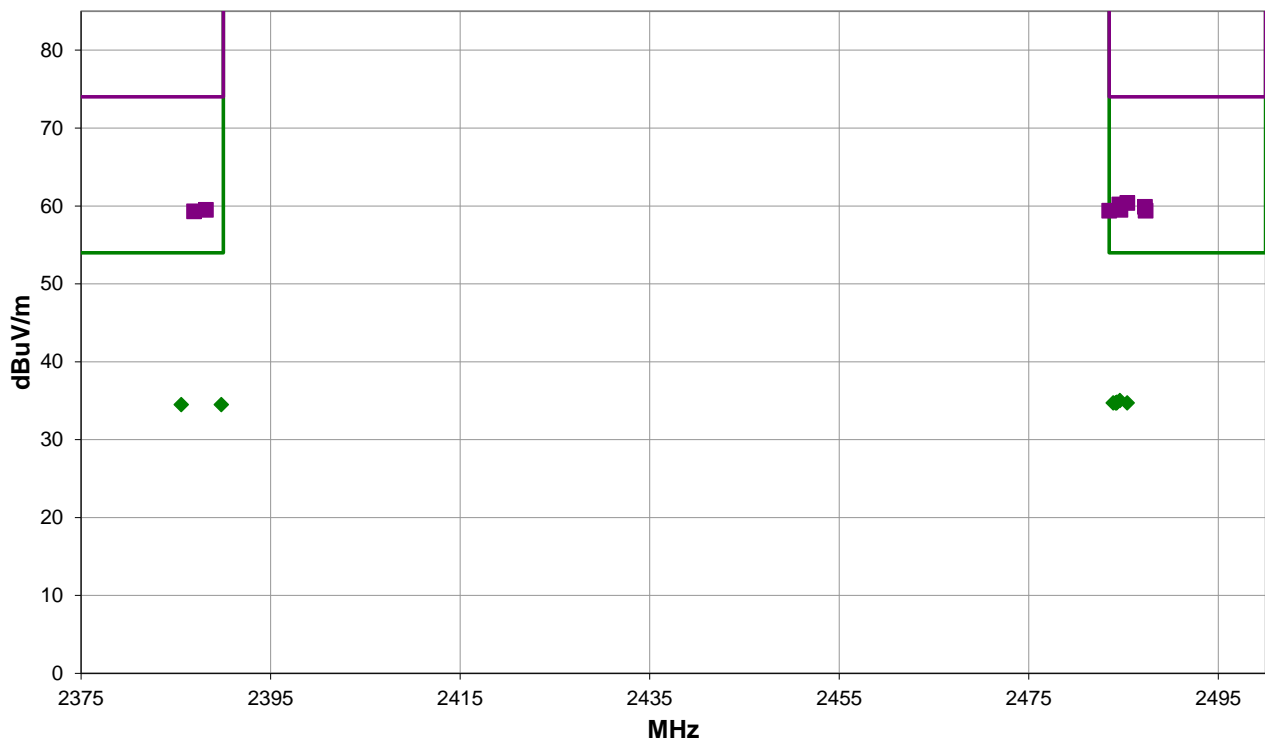
Power setting +4 dBm. Test mode is 65% duty cycle. The manufacturer declares the operational duty cycle will be limited to 3%. A duty cycle correction factor was applied to the final data using $10 \cdot \log(1/\text{duty cycle})$ to correct up from 65% to 100%, and then down from 100% to 3%. 1.9dB upwards correction + 15.2 dB downwards correction = -13.3dB total net correction factor.

EUT OPERATING MODES

Transmitting Low Ch 2402 MHz, 1 Mbps

DEVIATIONS FROM TEST STANDARD

None



Run #: 19

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #19

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.400	43.6	-3.2	1.5	114.0	0.0	20.0	Vert	PK	0.0	60.4	74.0	-13.6	EUT Horz, High Ch
2484.550	43.4	-3.2	1.5	0.0	0.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	EUT Horz, High Ch
2487.267	43.1	-3.2	1.5	157.0	0.0	20.0	Vert	PK	0.0	59.9	74.0	-14.1	EUT On Side, High Ch
2484.683	42.7	-3.2	1.5	354.0	0.0	20.0	Horz	PK	0.0	59.5	74.0	-14.5	EUT Vert, High Ch
2388.167	42.9	-3.4	1.5	39.0	0.0	20.0	Horz	PK	0.0	59.5	74.0	-14.5	EUT Horz, Low Ch
2483.500	42.6	-3.2	1.5	117.0	0.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6	EUT Vert, High Ch
2487.333	42.6	-3.2	2.1	162.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT On Side, High Ch
2386.908	42.8	-3.5	3.9	257.0	0.0	20.0	Vert	PK	0.0	59.3	74.0	-14.7	EUT Horz, Low Ch
2484.625	31.5	-3.2	1.5	0.0	-13.3	20.0	Horz	AV	0.0	35.0	54.0	-19.0	EUT Horz, High Ch
2484.317	31.3	-3.2	1.5	114.0	-13.3	20.0	Vert	AV	0.0	34.8	54.0	-19.2	EUT Horz, High Ch
2483.917	31.2	-3.2	1.5	354.0	-13.3	20.0	Horz	AV	0.0	34.7	54.0	-19.3	EUT Vert, High Ch
2485.408	31.2	-3.2	1.5	117.0	-13.3	20.0	Vert	AV	0.0	34.7	54.0	-19.3	EUT Vert, High Ch
2484.283	31.2	-3.2	2.1	162.0	-13.3	20.0	Horz	AV	0.0	34.7	54.0	-19.3	EUT On Side, High Ch
2484.175	31.2	-3.2	1.5	157.0	-13.3	20.0	Vert	AV	0.0	34.7	54.0	-19.3	EUT On Side, High Ch
2385.583	31.3	-3.5	1.5	39.0	-13.3	20.0	Horz	AV	0.0	34.5	54.0	-19.5	EUT Horz, Low Ch
2389.792	31.2	-3.4	3.9	257.0	-13.3	20.0	Vert	AV	0.0	34.5	54.0	-19.5	EUT Horz, Low Ch

CONCLUSION

Pass



Tested By

End of Test Report