F2 Labs
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Middlefield, Ohio 44062
United States of America
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CERTIFICATION TEST REPORT

Manufacturer:	**Sound Quest, LLC** **806 Beaver Street** **Bristol, Pennsylvania 19007 USA**
Applicant:	**Hearing Lab Technology, LLC** **14301 FAA Boulevard, Suite 105** **Forth Worth, Texas 76155 USA**
Product Description:	**U56 Series Hearing Aid**
Operating Voltage/Frequeny:	Battery-operated
Model:	**5560***
	**Denotes actual model tested as worst-case representative of product family that includes the following:*
	5562/5565/5566; 4560-4562/4565/4566; 3560/3562/3565/3566; 2560/2562/2565/2566;1560/1562/1565/1566. Instruments are the same BOM, first digit represents number of channels embedded in firmware, last is receiver tube/ear link utilized.
FCC ID:	**2AC2WSQ-U56**
Testing Commenced:	Aug. 6, 2018
Testing Ended:	Aug. 17, 2018
Summary of Test Results:	**In Compliance**
	The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

- **FCC Part 15 Subpart C, Section 15.249**
- **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD**.**

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of DXT Low Power Transceivers operating under Section 15.249. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of k=2. The Uncertainty for a laboratory are referred to as *U*lab. For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the *U*cispr values to determine if a specific margin is required to deem compliance.

*U*lab

Measurement Range	Combined Uncertainly	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

*U*cispr

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If *U*lab is less than or equal to *U*cispr, then:
- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If *U*lab is greater than *U*cispr in table 1, then:
- compliance is deemed to occur if no measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.

1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2P19344-01E	First Issue	Aug. 22, 2018	K. Littell

2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
-20dB Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
Field Strength of Emissions	CFR 47 Part 15.249(a)(d)	Complies
Conducted Emissions	CFR 47 Part 15.207(a)	Not Applicable
Voltage Variation	CFR 47 Part 15.31(e)	Complies*

**Requirements of 15.31 were met by using new batteries.*

Modifications Made to the Equipment
None

3 TABLE OF MEASURED RESULTS

Test	Low Channel 2402 MHz	Mid Channel 2440 MHz	High Channel 2480 MHz
Average Field Strength of Fundamental	0.54 mV/m (54.7 dBµV/m)	0.55 mV/m (54.8 dBµV/m)	0.54 mV/m 54.7 dBµV/m
Average Limit for Fundamental	50 millivolts/meter (93.97 dBµV/m)	50 millivolts/meter (93.97 dBµV/m)	50 millivolts/meter (93.97 dBµV/m)
-20dB Occupied Bandwidth (MHz)	1.22	1.225	1.221

The -20dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.

4 ENGINEERING STATEMENT

This report has been prepared on behalf of Hearing Lab Technology, LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.249 of the FCC Rules using ANSI C63.10 2013 standard. The test results found in this test report relate only to the items tested.

5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: **U56 Series Hearing Aid**

Model: **5560***

**Denotes actual model tested as worst-case representative of product family that includes the following:*

5562/5565/5566;4560-4562/4565/4566; 3560/3562/3565/3566;
2560/2562/2565/2566;1560/1562/1565/1566.
Instruments are the same BOM, first digit represents number of channels embedded in firmware, last is receiver tube/ear link utilized.

Serial No.: 18029084

FCC ID: **2AC2WSQ-U56**

5.2 Trade Name:

SoundQuest LLC

5.3 Power Supply:

Battery-operated

5.4 Applicable Rules:

CFR 47, Part 15.249

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

0dBi Gain Integral Antenna

5.7 Accessories:

USB-UART, Dekla 52247B, s/n 001
USB-12C, AHPRO03, s/n n/a

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was set up in a normal operating mode. Device was transmitting in three different channels, low (2402 MHz), mid (2440 (MHz) and high (2480 (MHz).

6 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	Jan. 9, 2019
Spectrum Analyzer	CL138	Agilent Technologies	E4407B	US41192779	June 19, 2019
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Nov. 17, 2018
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 28, 2018
Horn Antenna 18-26.5 GHz	CL114	A.H. Systems, Inc.	SAS-572	237	Nov. 17, 2018
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	Sept. 20, 2018
Active 18” Loop Antenna	CL163-Loop	A.H. Systems, Inc.	EHA-52B	100	June 4, 2019
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	Oct.11, 2019
Pre-Amplifier	0197	Hewlett Packard	8447D	1726A01006	Nov. 17, 2018
Software:	EMC 32, Version 5.20.2		Software Verified: Aug. 6, 2018		

7 OCCUPIED BANDWIDTH

7.1 Requirements:

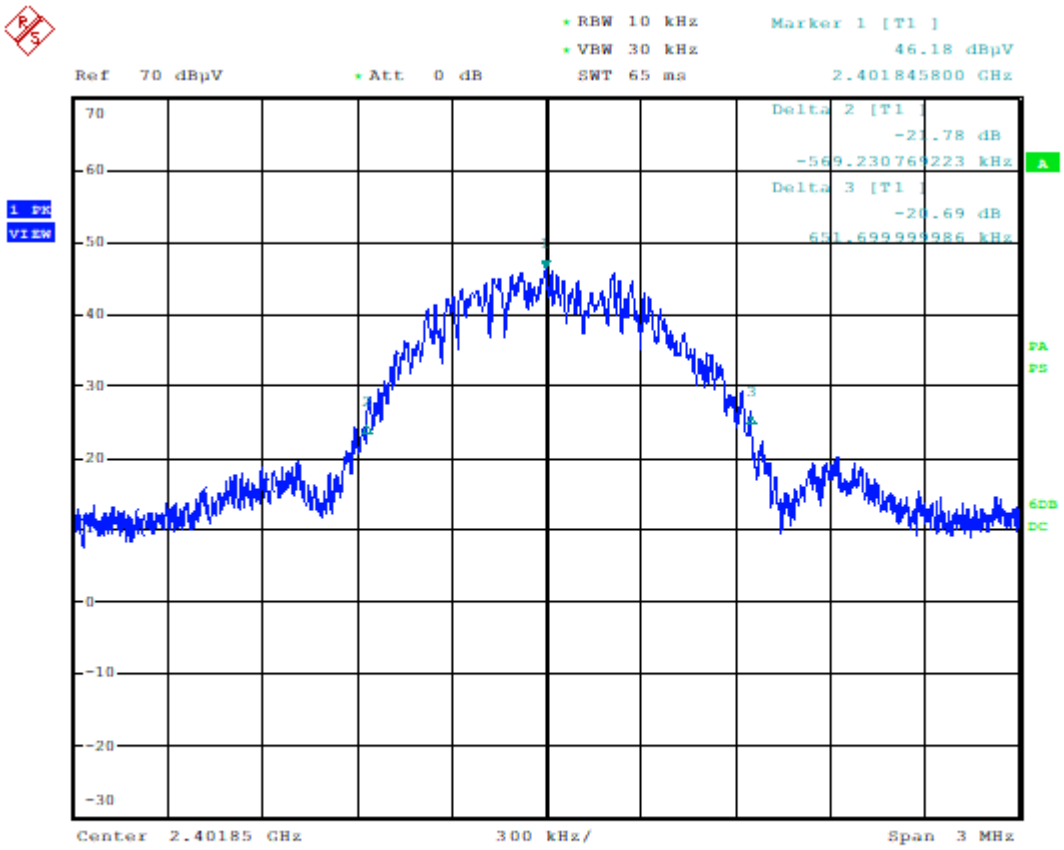
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the -20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

Bandwidth measurements were made at the low (2.402 GHz), mid (2.440 GHz) and upper (2.480 GHz) frequencies. The bandwidth was measured using the analyzer's marker function.

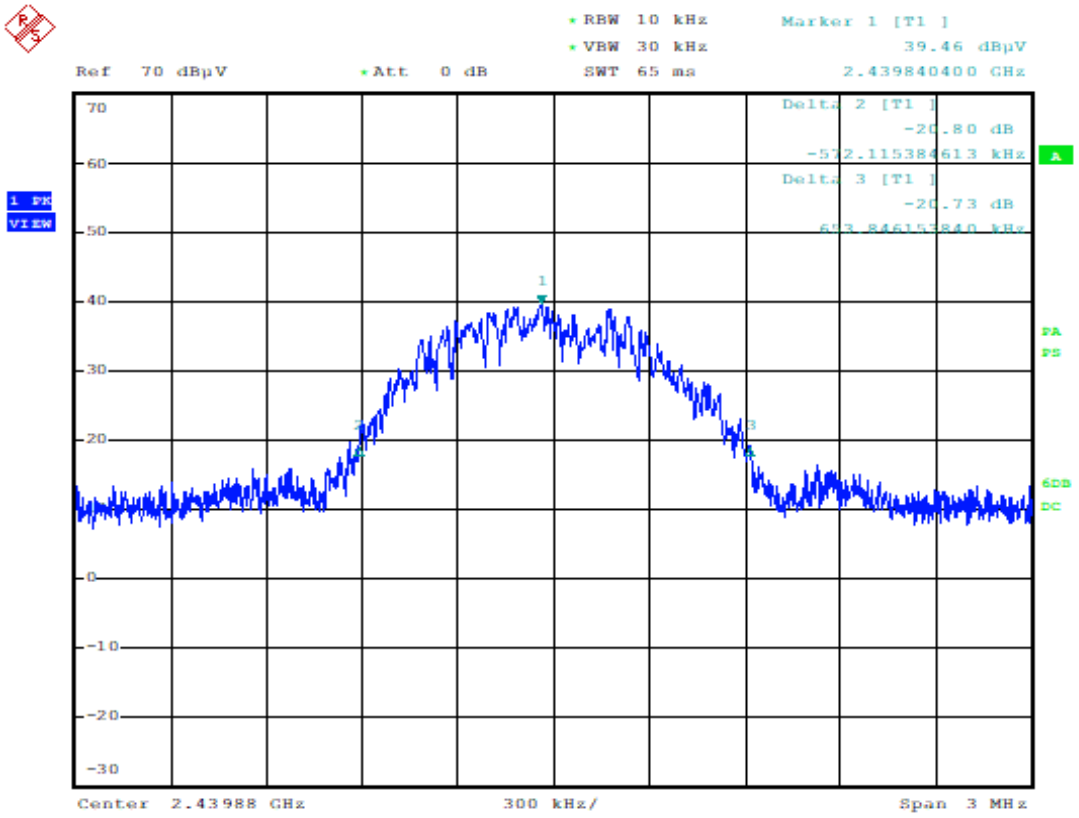
7.2 Occupied Bandwidth Test Data

Test Date(s):	Aug. 17, 2018	**Test Engineer(s):**	J. Chiller
Standards:	CFR 47 Part 15.215(c)	**Air Temperature:**	22.4ºC
		Relative Humidity:	42%

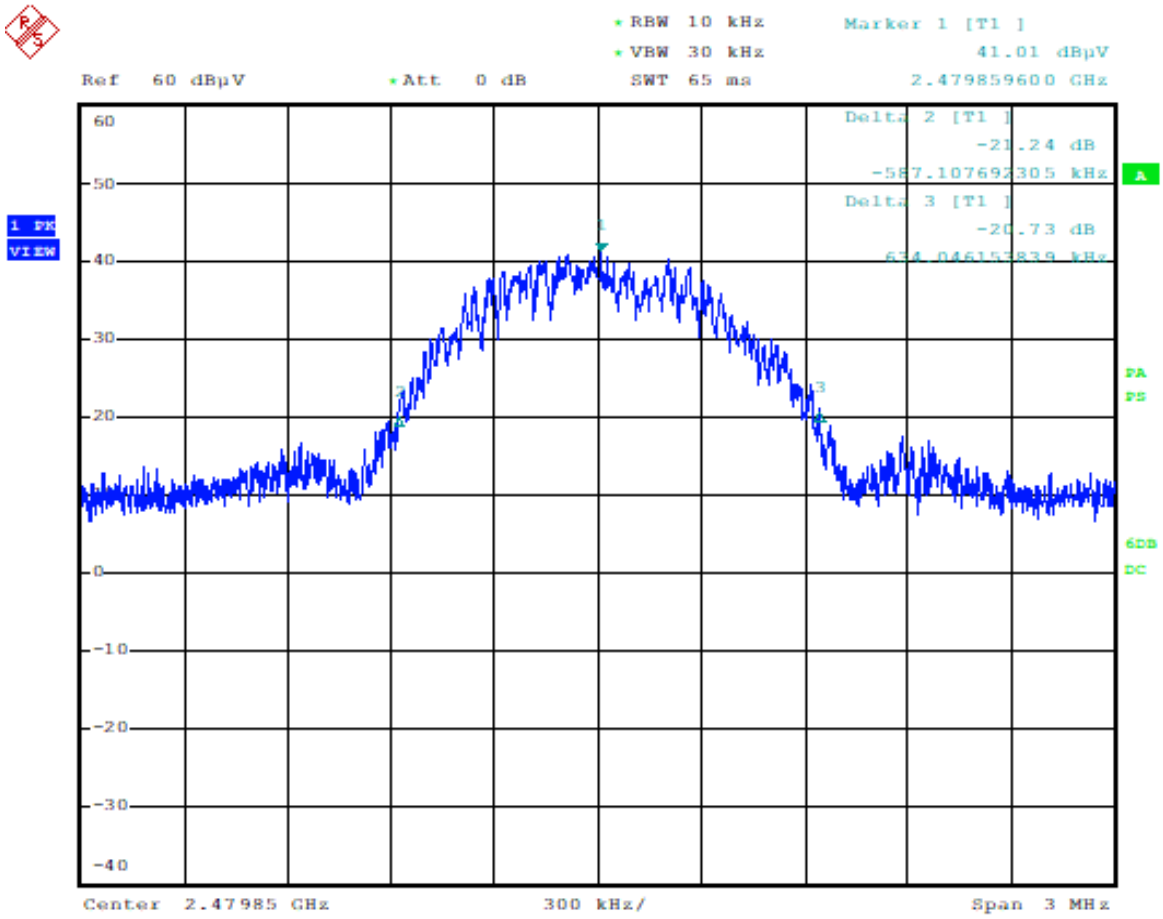
-20dB, Low Channel



Mid Channel


RBW 10 kHz
VBW 30 kHz
Ref 70 dBµV
Att 0 dB
SWT 65 ms
Marker 1 [T1]
39.46 dBµV
2.439840400 GHz
Delta 2 [T1]
-20.80 dB
-572.115384613 kHz
Delta 3 [T1]
-20.73 dB
1 PK
VIEW
A
PA
PS
6DB
DC
70
60
50
40
30
20
0
-10
-20
-30
Center 2.43988 GHz
300 kHz/
Span 3 MHz
Date: 17.AUG.2018 12:18:36

High Channel



Date: 17.AUG.2018 12:25:06

8 FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

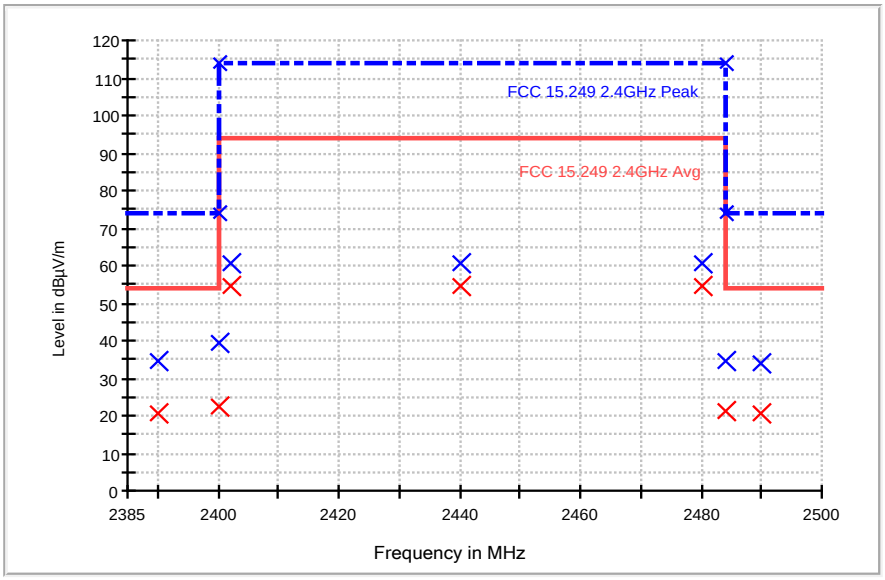
NOTE: During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.

8.1 Test Data - Field Strength – Band Edges

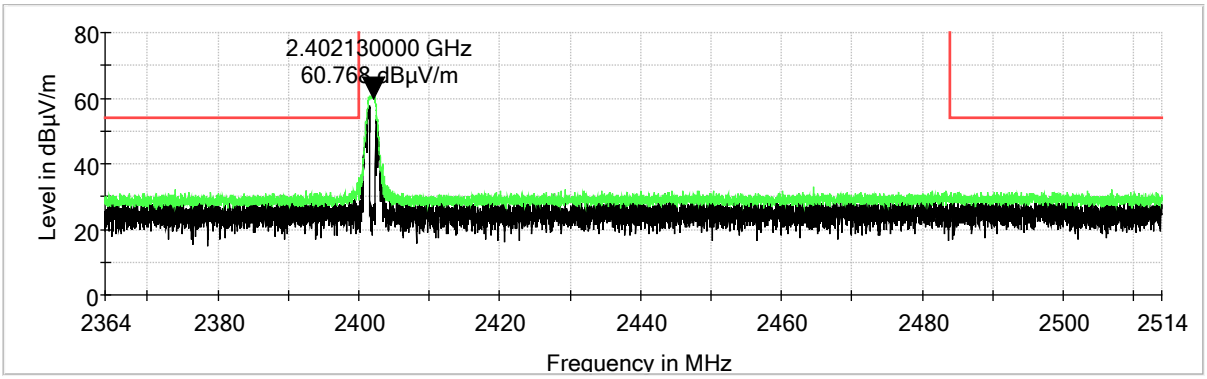
Test Date(s):	Aug. 6, 2018	**Test Engineer(s):**	J. Chiller
Standards:	CFR 47 Part 15.249(a)	**Air Temperature:**	21.6ºC
		Relative Humidity:	46%

Band Edges

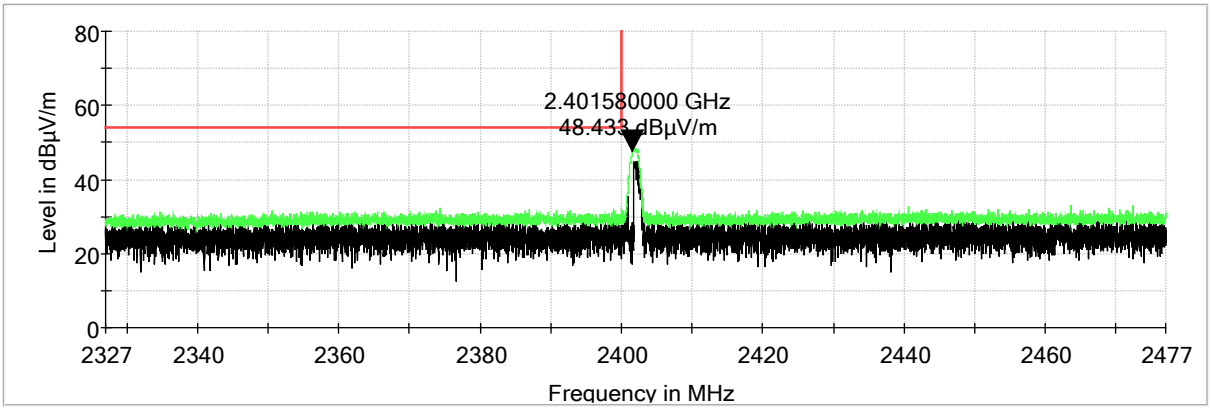
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
2390.000000	34.4	20.5	1000.0	1000.000	100.0	V	84.0	-4.4	33.5	54.0
2400.000000	39.6	22.3	1000.0	1000.000	100.0	V	84.0	-4.7	31.7	54.0
2402.000000	60.9	54.7	1000.0	1000.000	100.0	V	84.0	-4.7	39.3	94.0
2440.000000	60.6	54.8	1000.0	1000.000	100.0	V	125.0	-4.3	39.2	94.0
2480.000000	60.6	54.7	1000.0	1000.000	110.0	V	122.0	-4.3	39.3	94.0
2484.000000	34.5	21.0	1000.0	1000.000	110.0	V	122.0	-4.2	33.0	54.0
2490.000000	33.9	20.8	1000.0	1000.000	110.0	V	122.0	-4.2	33.2	54.0



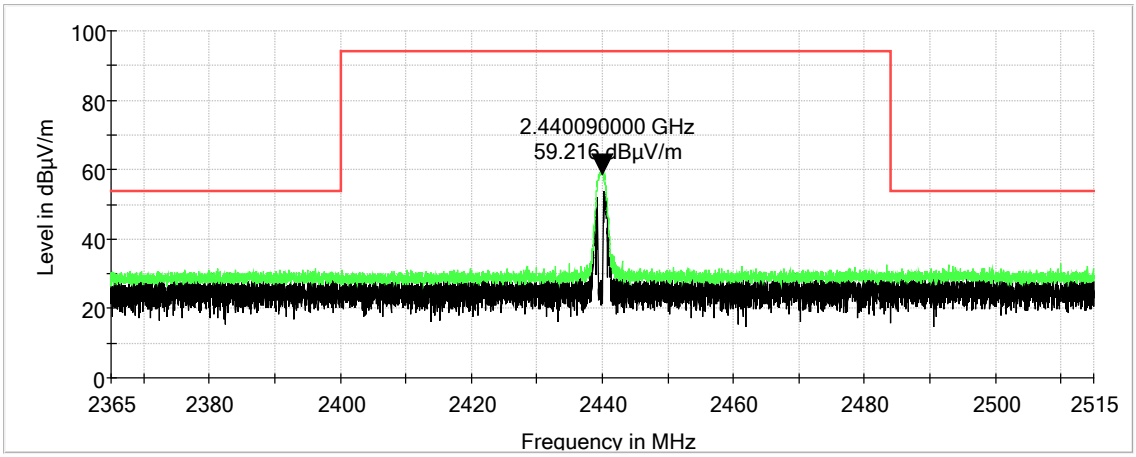
Low Edge, Vertical



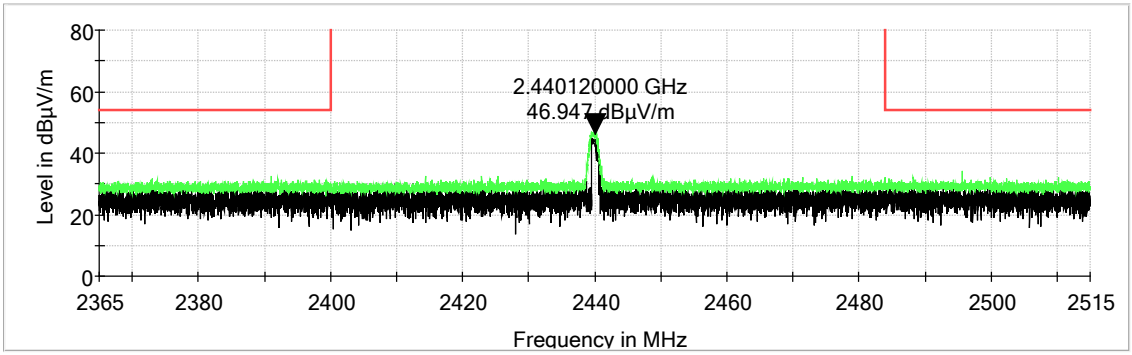
Low Edge, Horizontal



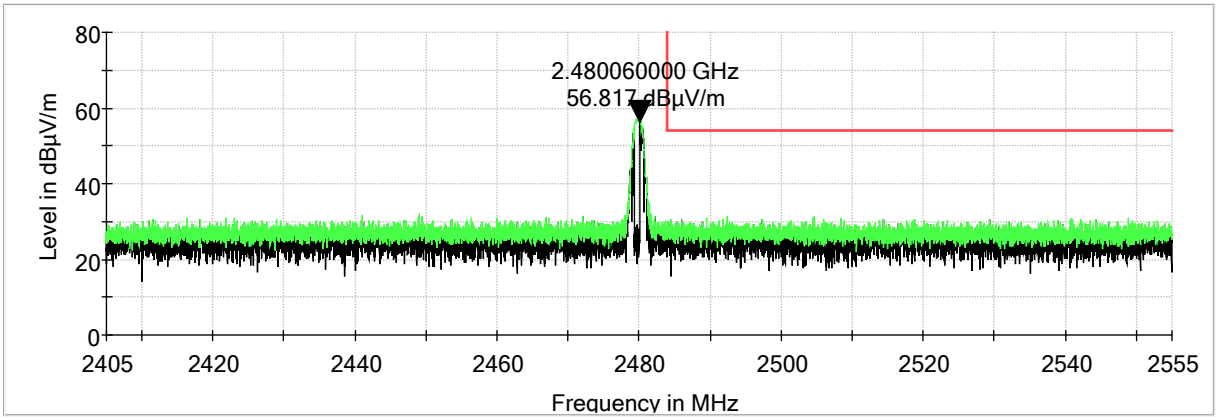
Mid Edge, Vertical



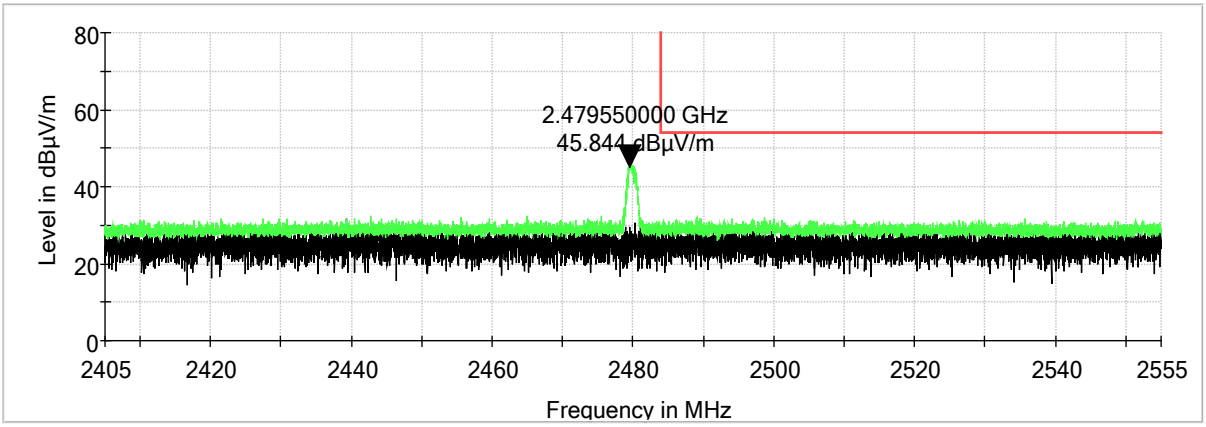
Mid Edge, Horizontal



High Edge, Vertical



High Edge, Horizontal



8.2 Test Data – Spurious Emissions

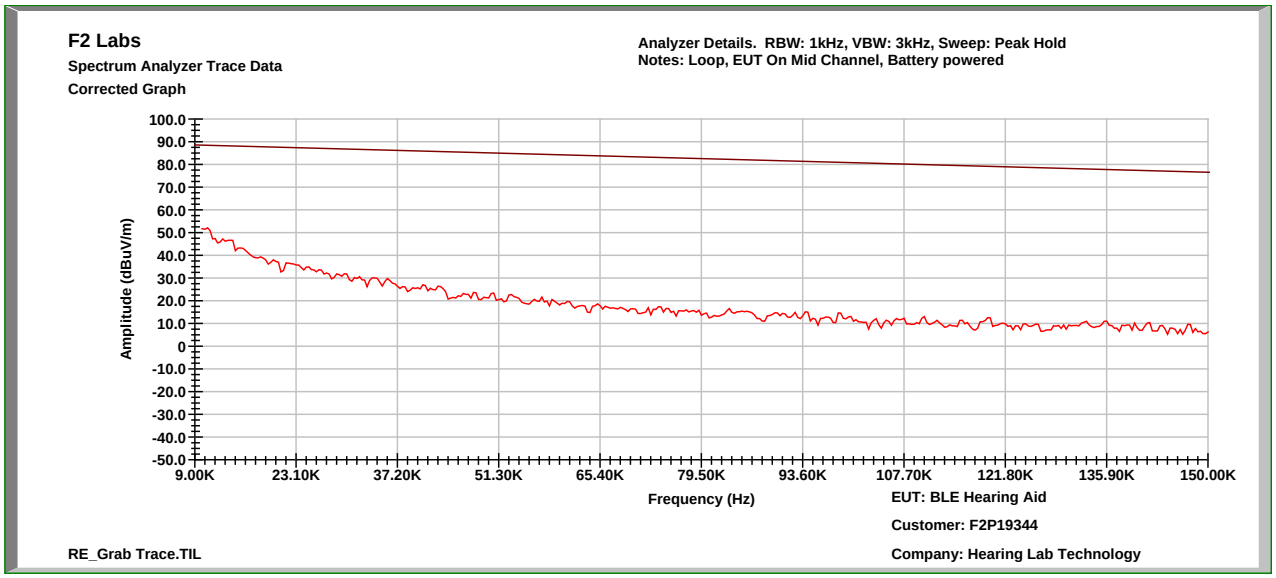
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

At least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit. Frequencies were scanned from 9kHz to 26 GHz and the highest emissions are listed below.

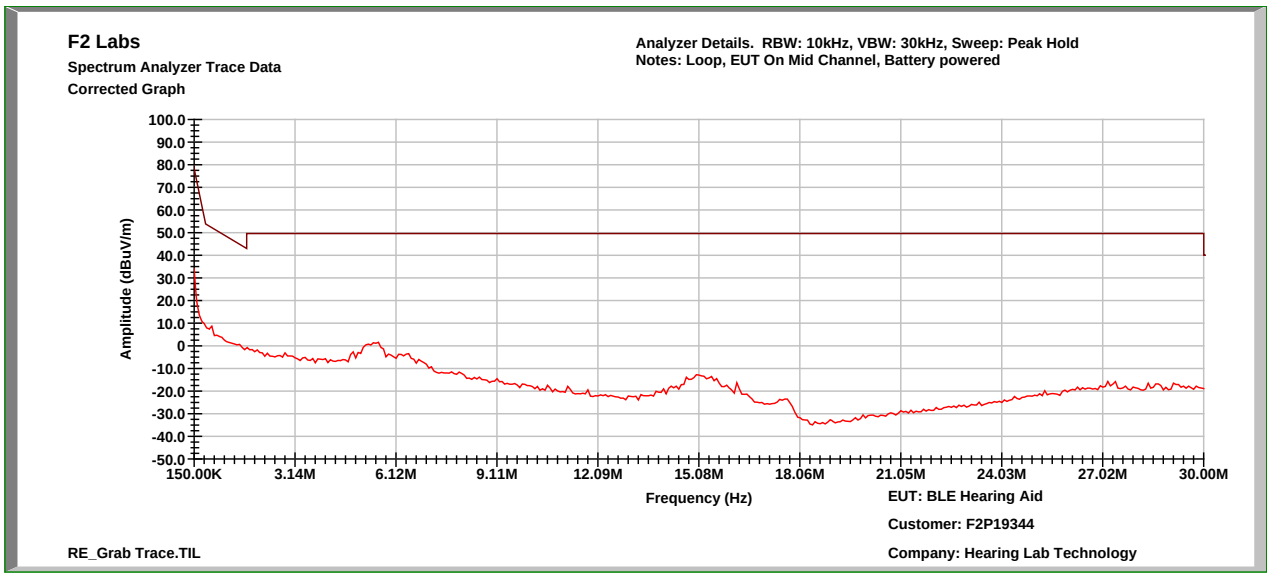
In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.

Test Date(s):	Aug. 6, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(d)	Air Temperature:	21.8ºC
		Relative Humidity:	43%

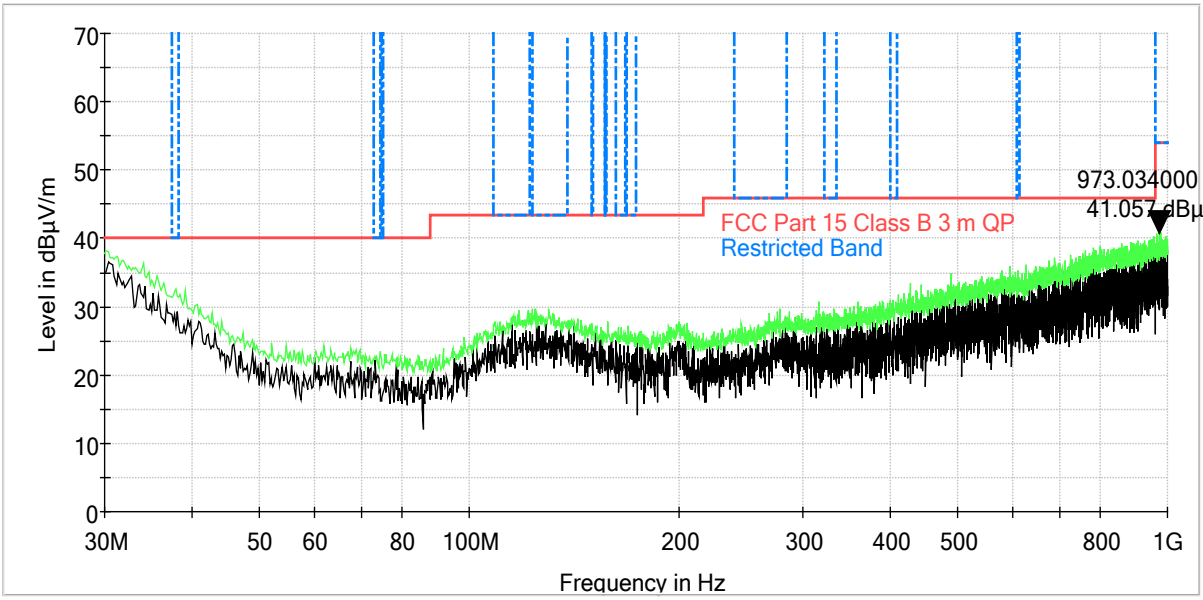
0.009 MHz to 0.15 MHz



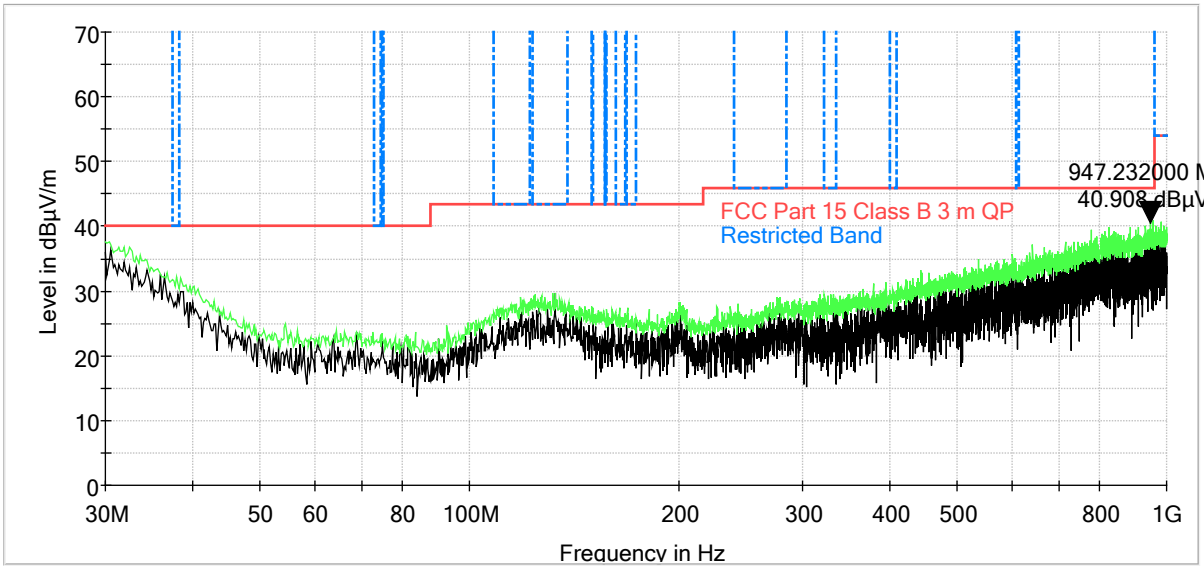
0.15 MHz to 30 MHz



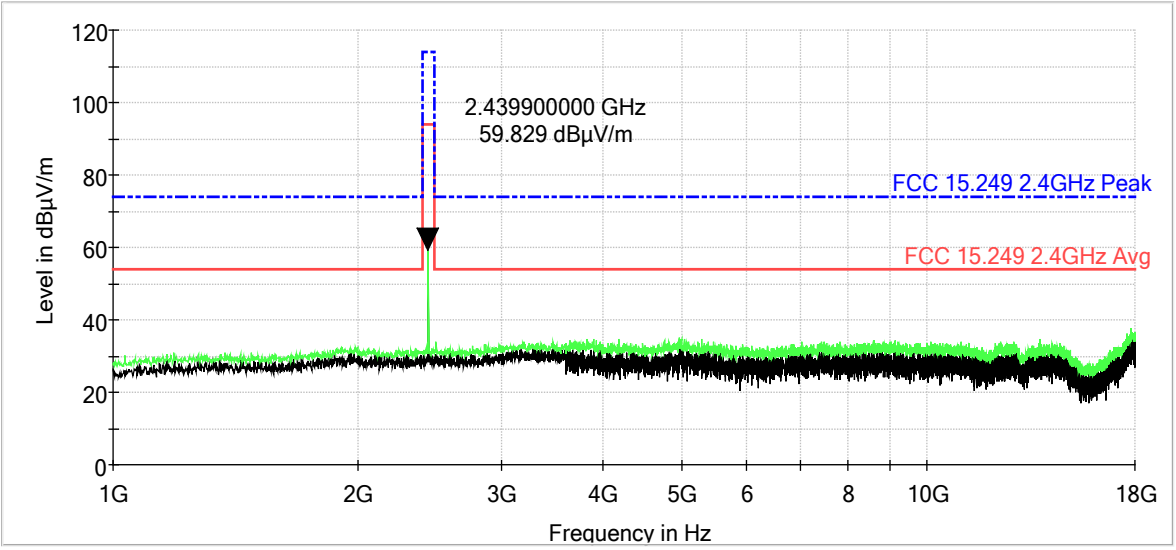
30 MHz to 1000 MHz, Restricted Band, Vertical



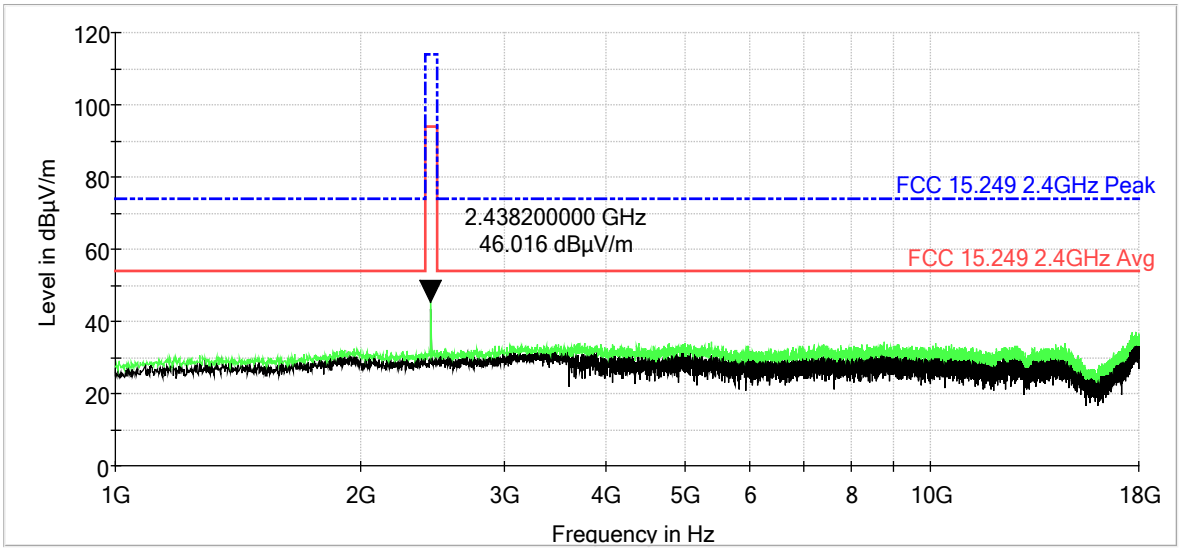
30 MHz to 1000 MHz, Restricted Band, Horizontal



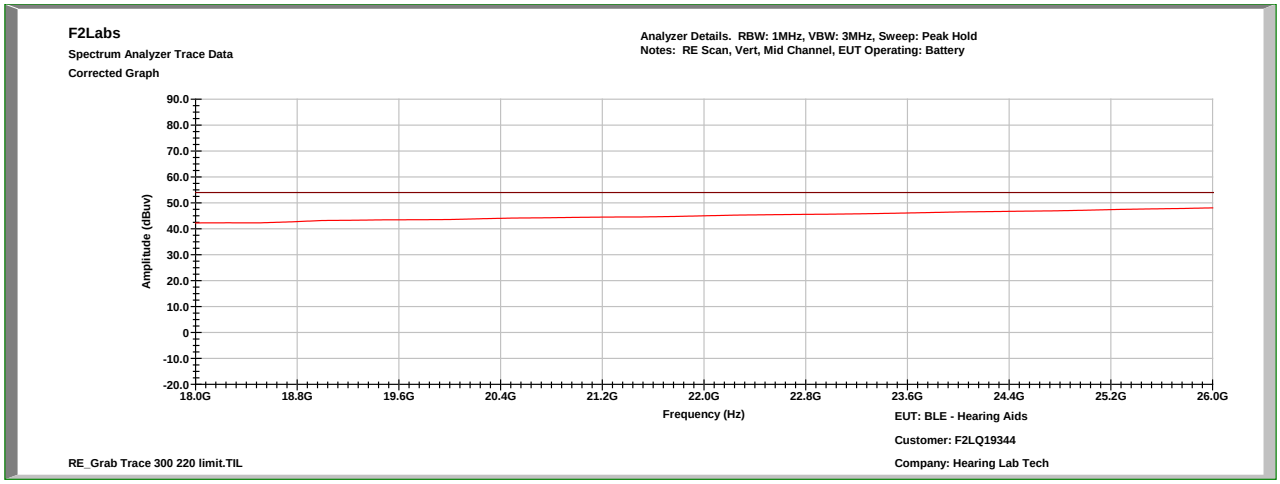
1 GHz to 18 GHz, Vertical



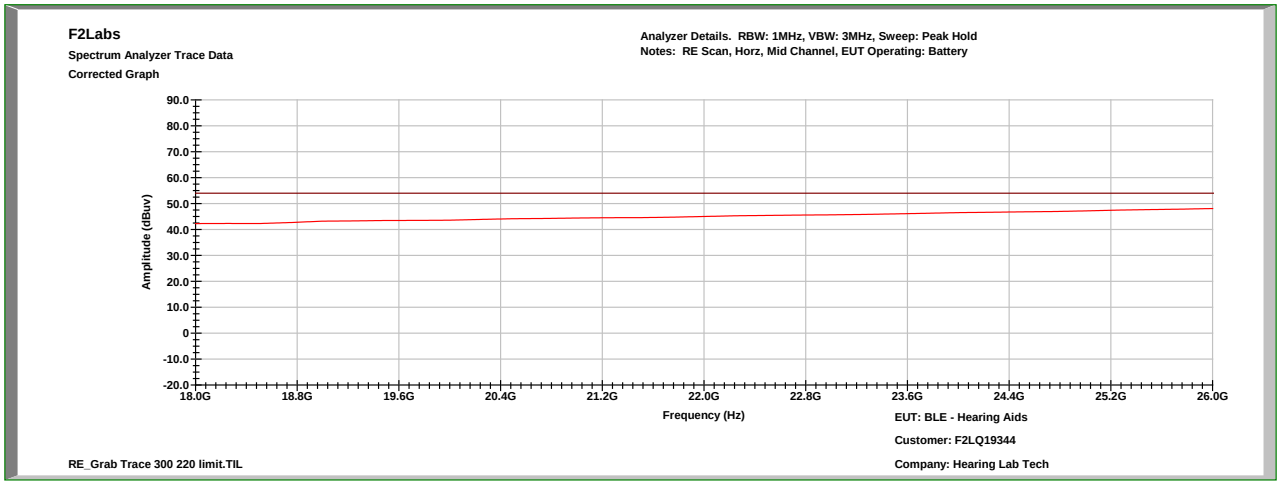
1 GHz to 18 GHz, Horizontal



18 GHz to 26 GHz, Vertical



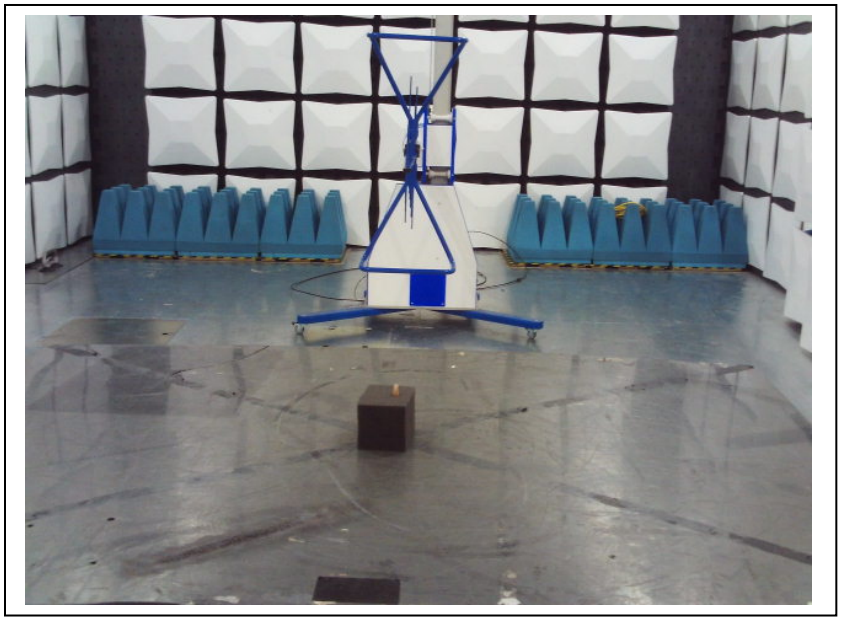
18 GHz to 26 GHz, Horizontal



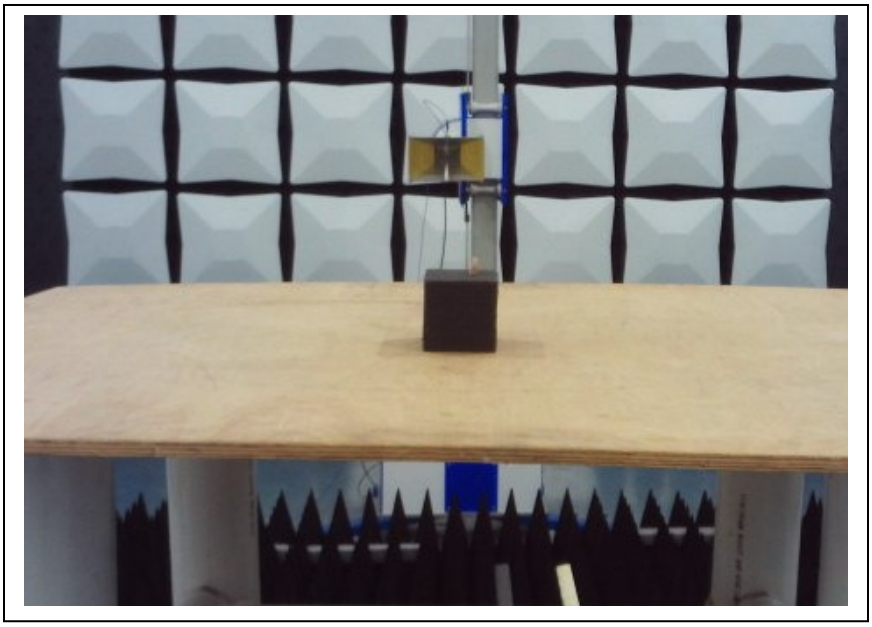
9 PHOTOGRAPHS

Radiated Emissions Less than 30 MHz

Radiated Emissions 30 MHz to 1000 MHz



Radiated Emissions 1-18 GHz,
Field Strength of Emissions, Occupied Bandwidth,



Radiated Emissions 18 to 26 GHz