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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 Name: Custom ITC-I/Custom ITC-A

Product Description: Custom Hearing Aid with Bluetooth Connectivity

**Operating Voltage/Freq.
of EUT During Testing:** Battery-Operated (1.5VDC)

Model(s): ITC-U*
**Denotes actual model tested as representative of product family that includes Custom ITC-I (also known as U - made for i-Phone) and Custom ITC-A (also known as Android).*

FCC ID: 2AC2W-SQCUSITC

Testing Commenced: 2022-03-09

Testing Ended: 2022-03-10

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**



Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC

Model: ITC-U

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Vice President of EMC

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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 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 is 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 Uncertainty	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.



Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC
Model: ITC-U

1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2P27157A-06E	First Issue	2022-04-11	K. Littell

**2 SUMMARY OF TEST RESULTS**

Test Name	Standard(s)	Results
99% Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
-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	2.4 mV/m 67.6 dB μ V/m	2.25 mV/m 67.0 dB μ V/m	1.86 mV/m 65.4 dB μ V/m
Average Limit for Fundamental	50 millivolts/meter 93.97 dB μ V/m	50 millivolts/meter 93.97 dB μ V/m	50 millivolts/meter 93.97 dB μ V/m
-20dB Occupied Bandwidth (MHz)	1.114	1.153	1.169
99% Occupied Bandwidth (MHz)	1.049	1.065	1.057

The 99% / -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: **ITC-U***

**Denotes actual model tested as representative of product family that includes Custom ITC-I (also known as U - made for i-Phone) and Custom ITC-A (also known as Android).*

Serial No.: 22912346

FCC ID: **2AC2W-SQCUSITC**

5.2 Trade Name:

SoundQuest LLC

5.3 Power Supply:

Battery-operated (1.5VDC)

5.4 Applicable Rules:

CFR 47, Part 15.249

5.5 Antenna:

Integral, -12dB max/-16dB Avg Gain

5.6 Accessories:

None

5.7 Test Item Condition:

The equipment to be tested was received in good condition.

5.8 Testing Algorithm:

Bluetooth radio in hearing aid was tested on the low (2402 MHz), mid (2440 MHz) and high (2480 MHz) channels.

**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	2022-06-09
Temp./Hum. Recorder	CL234	Extech	44581	03	2022-04-01
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2023-03-31
Horn Antenna	CL098	Emco	3115	9809-5580	2023-01-26
Horn Antenna 18-26.5 GHz	CL114	A.H. Systems, Inc.	SAS-572	237	2023-07-30
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	2022-04-01
Pre-amplifier	CL285	Com-Power	PAM-0207	322	2023-03-30
Active 18" Loop Antenna	CL163-Loop	A.H. Systems, Inc.	EHA-52B	100	2022-09-14
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2022-09-14
Software:	EMC 32, Version 5.20.2		Software Verified: 2022-03-07 to 2022-03-08		
Software	Tile Version 3.4.B.3		Software Verified: 2022-03-07 to 2022-03-08		
Low Loss Cable Set	--	Pasternack	PE3C0666-252 / PE3C066-50CM	None Spec.	2023-10-12



7 OCCUPIED BANDWIDTH

7.1 Requirements:

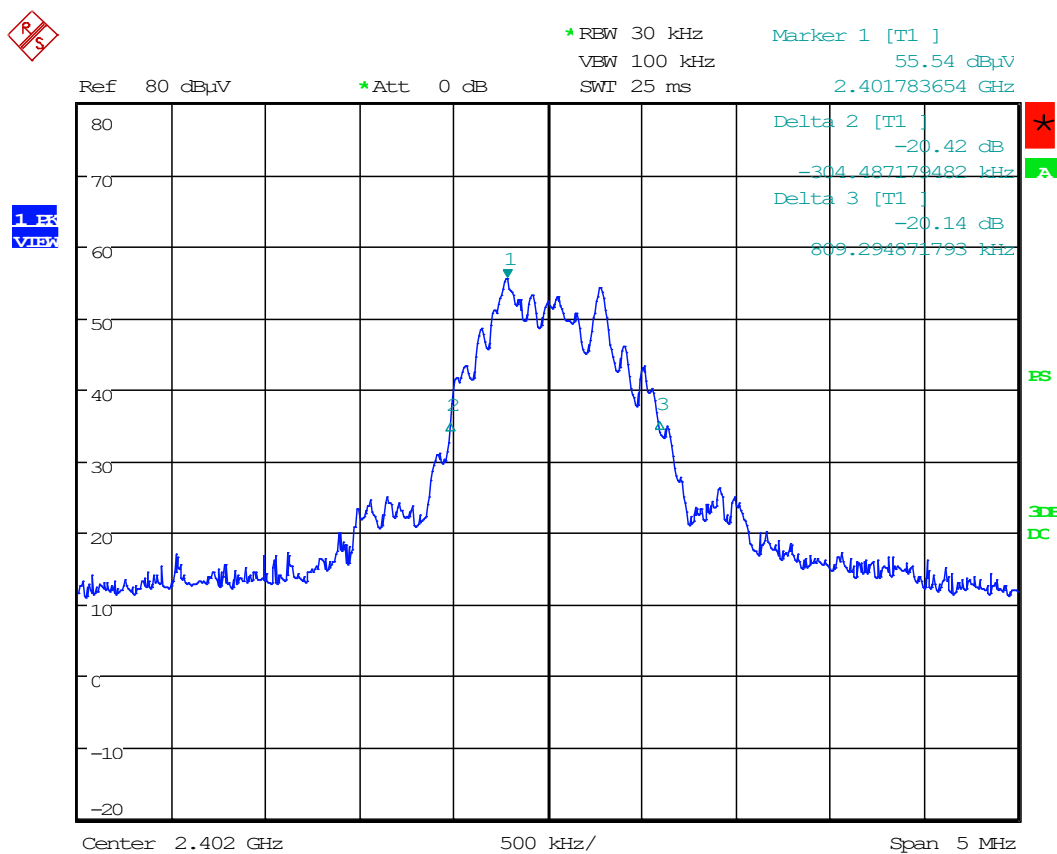
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the -20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific 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

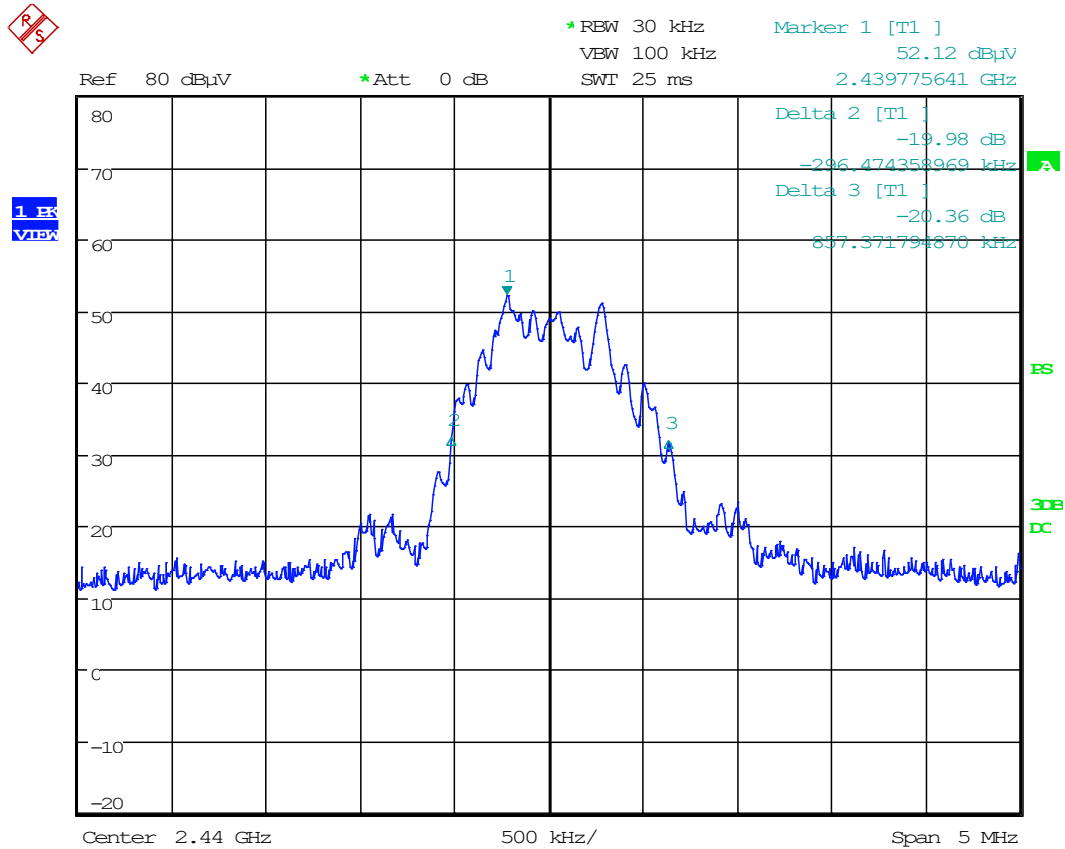
Test Date(s):	2022-03-09	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.215(c)	Air Temperature:	20.4°C
		Relative Humidity:	29%

-20dB, Low Channel

Date: 9.MAR.2022 15:11:27



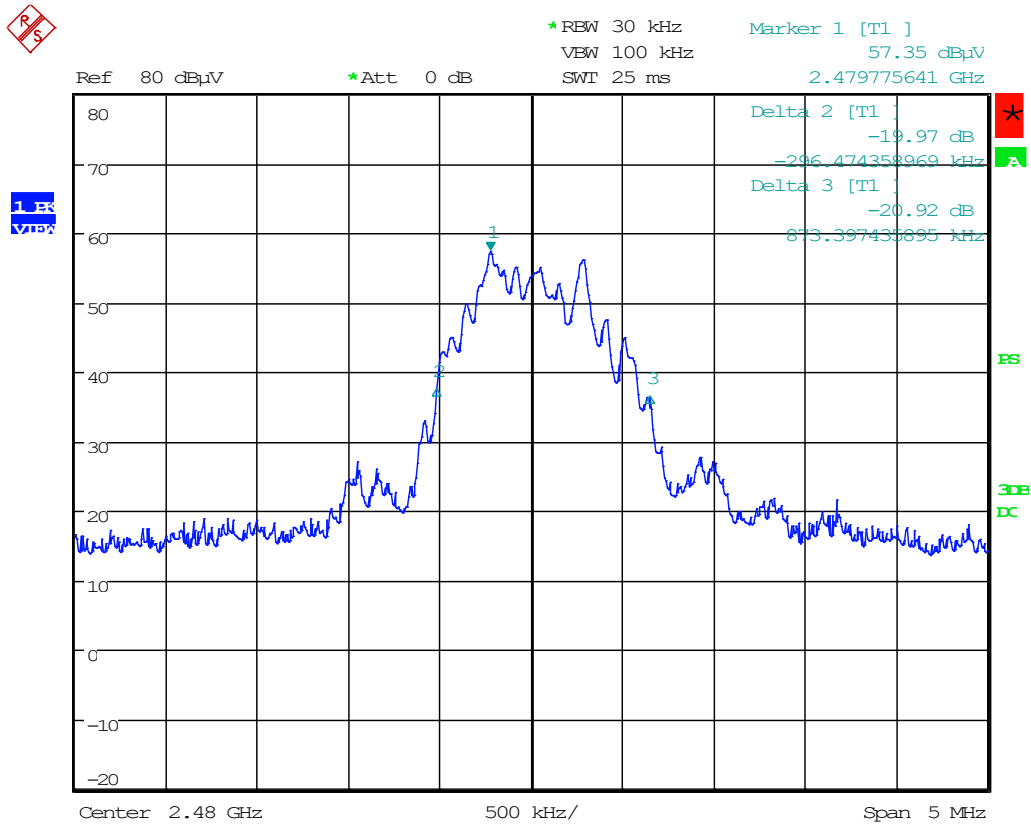
-20dB, Mid Channel



Date: 9.MAR.2022 15:17:32



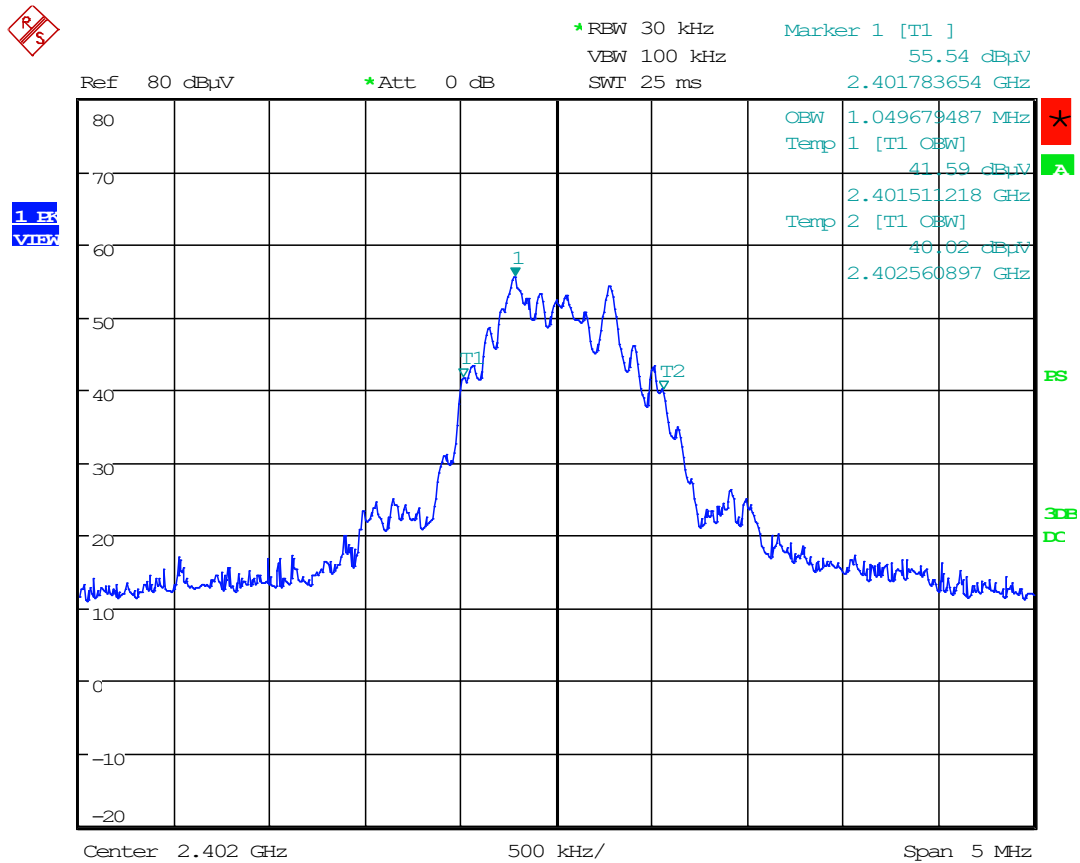
-20dB, High Channel



Date: 9.MAR.2022 15:20:35

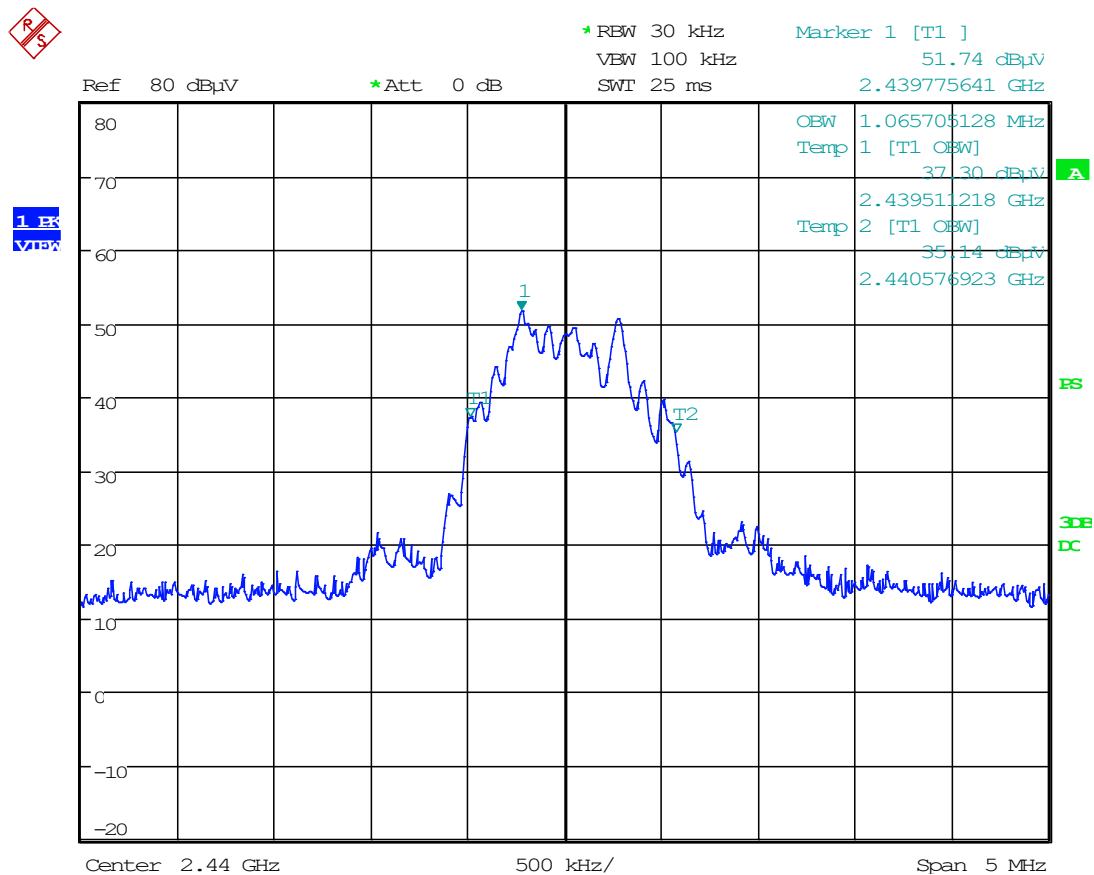


99%, Low Channel



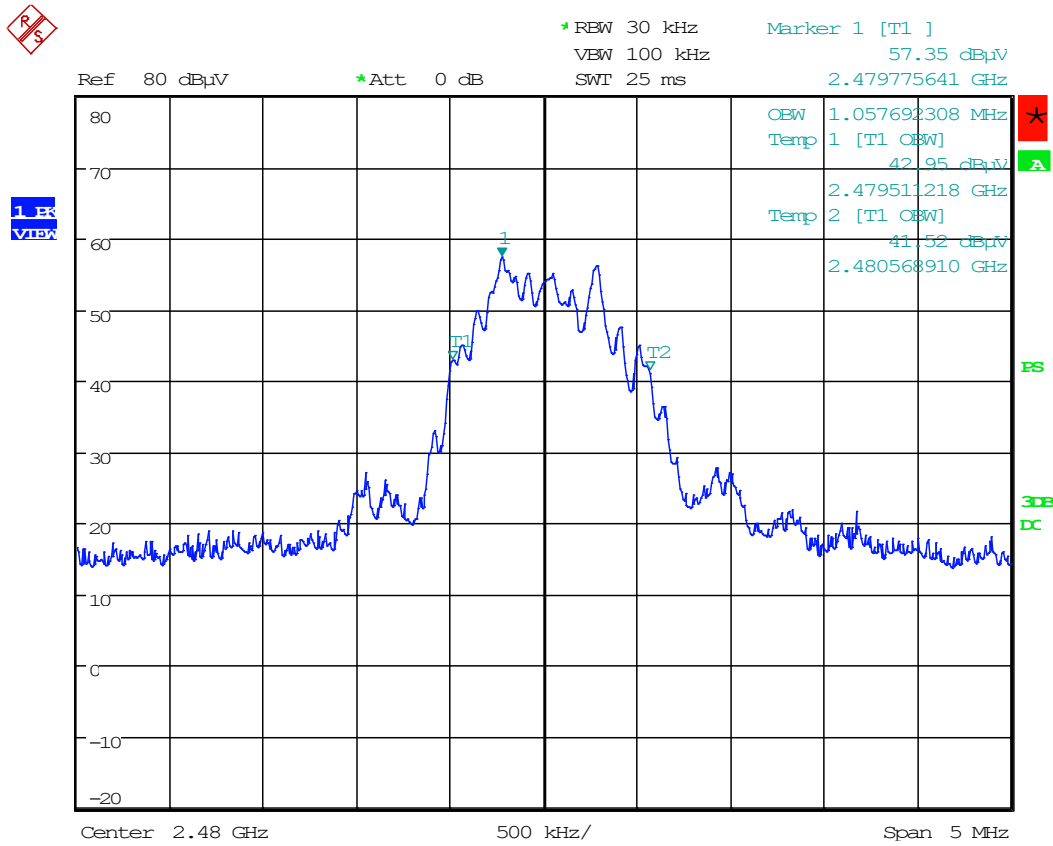
Date: 9.MAR.2022 15:10:46

99%, Mid Channel





99%, High Channel





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.

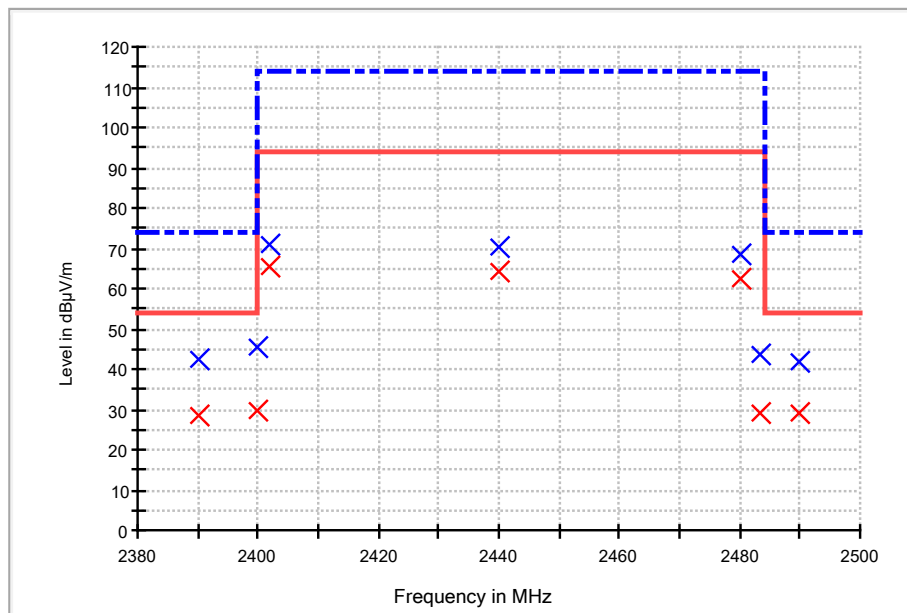


8.1 Test Data - Field Strength – Band Edges

Test Date(s):	2022-03-09	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(a)	Air Temperature:	20.6°C
		Relative Humidity:	29%

Band Edges - Vertical

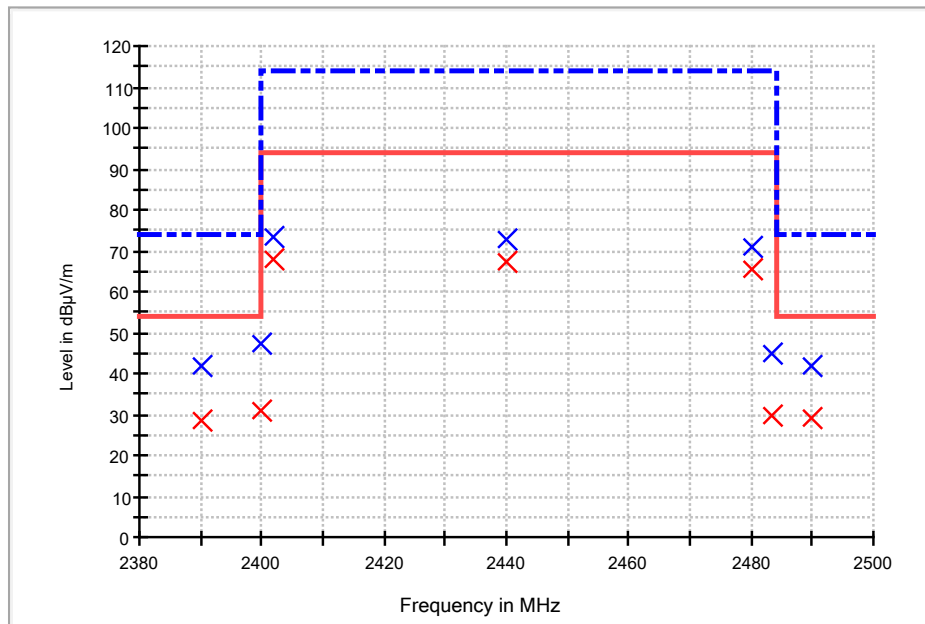
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	42.1	28.7	1000.000	100.0	V	149.0	5.9	25.3	54.0
2400.000000	45.7	29.9	1000.000	100.0	V	149.0	5.8	24.1	54.0
2402.000000	71.2	65.6	1000.000	100.0	V	149.0	5.8	28.4	94.0
2440.000000	70.1	64.5	1000.000	100.0	V	149.0	5.7	29.5	94.0
2480.000000	68.2	62.6	1000.000	100.0	V	149.0	5.7	31.4	94.0
2483.500000	43.5	29.2	1000.000	100.0	V	149.0	5.8	24.8	54.0
2490.000000	41.9	28.8	1000.000	100.0	V	149.0	5.8	25.2	54.0





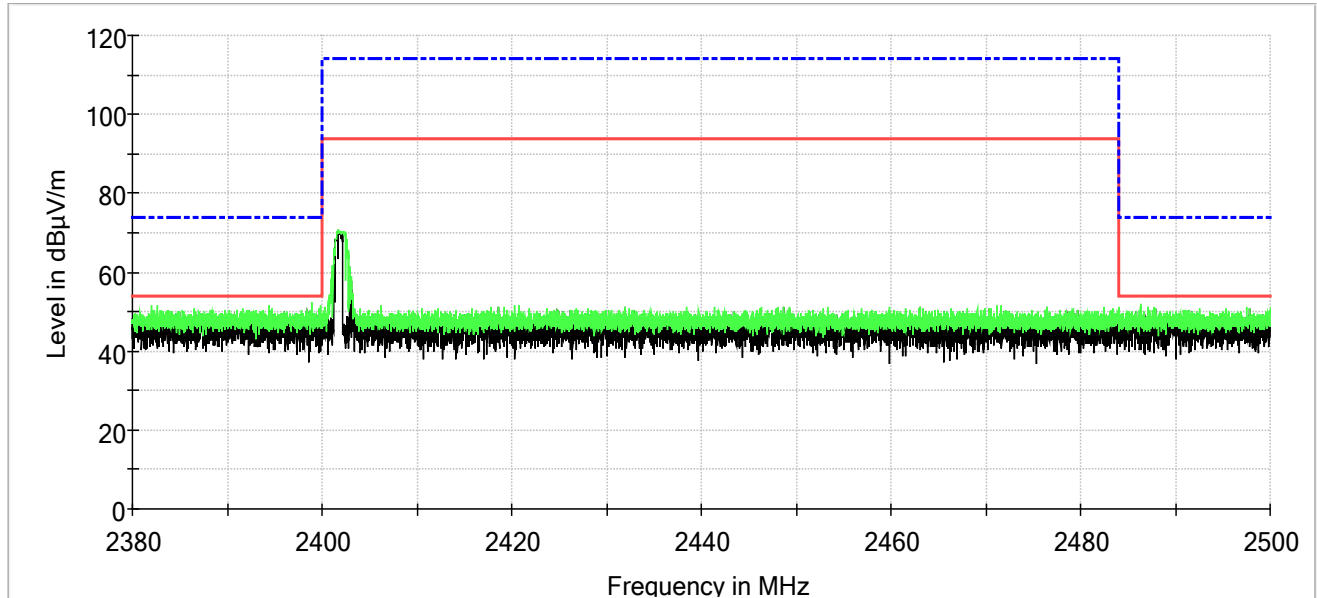
Band Edges - Horizontal

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	42.0	28.7	1000.000	100.0	H	157.0	5.9	25.3	54.0
2400.000000	47.3	30.7	1000.000	100.0	H	157.0	5.8	23.3	54.0
2402.000000	73.2	67.6	1000.000	100.0	H	157.0	5.8	26.4	94.0
2440.000000	72.5	67.0	1000.000	100.0	H	155.0	5.7	27.0	94.0
2480.000000	71.0	65.4	1000.000	100.0	H	159.0	5.7	28.6	94.0
2483.500000	45.0	29.5	1000.000	100.0	H	159.0	5.8	24.5	54.0
2490.000000	41.7	28.8	1000.000	100.0	H	159.0	5.8	25.2	54.0

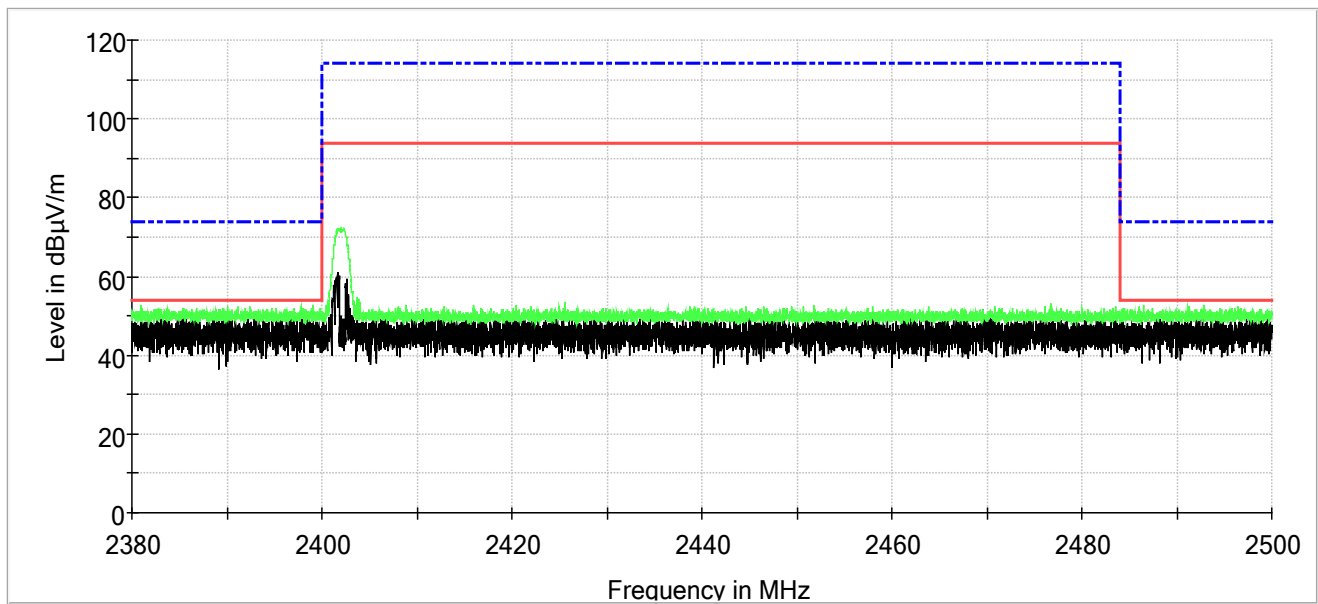




Low Band Edge, Vertical

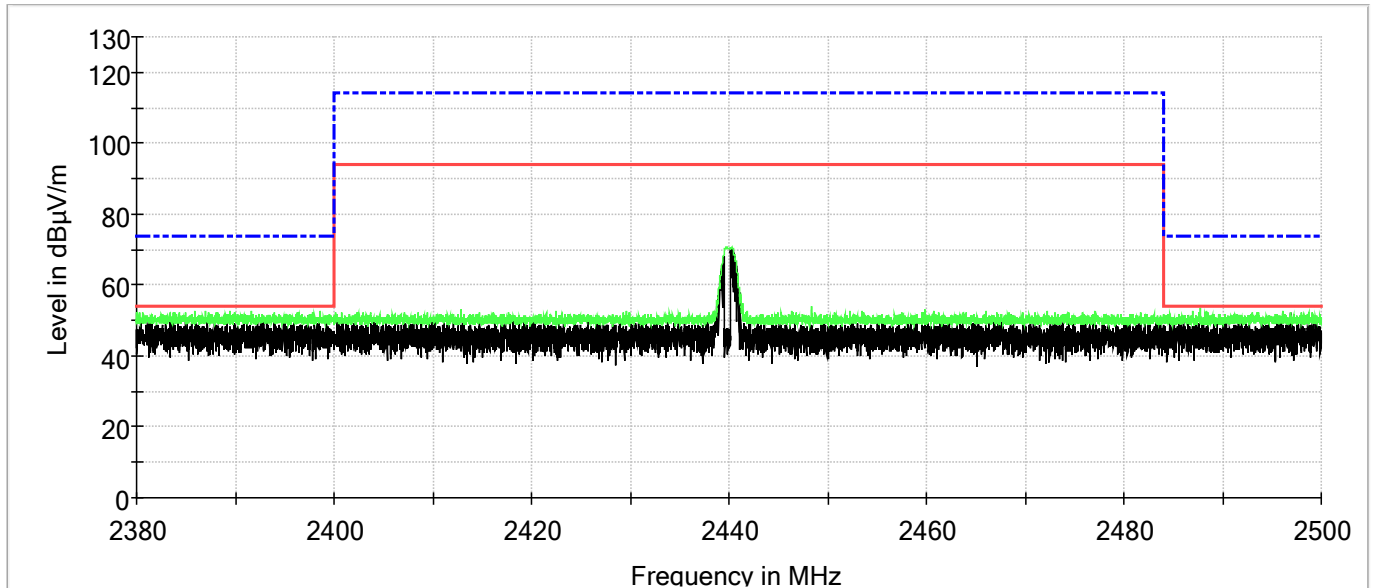


Low Band Edge, Horizontal

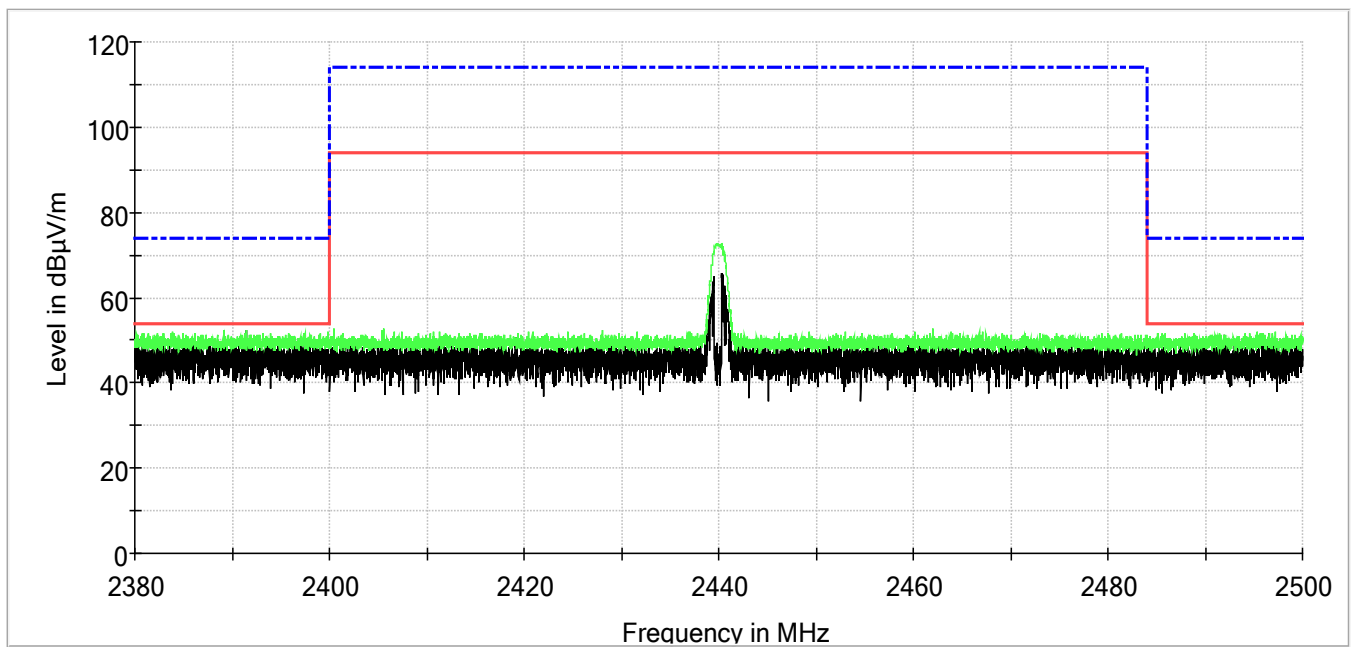




Mid Band Edge, Vertical

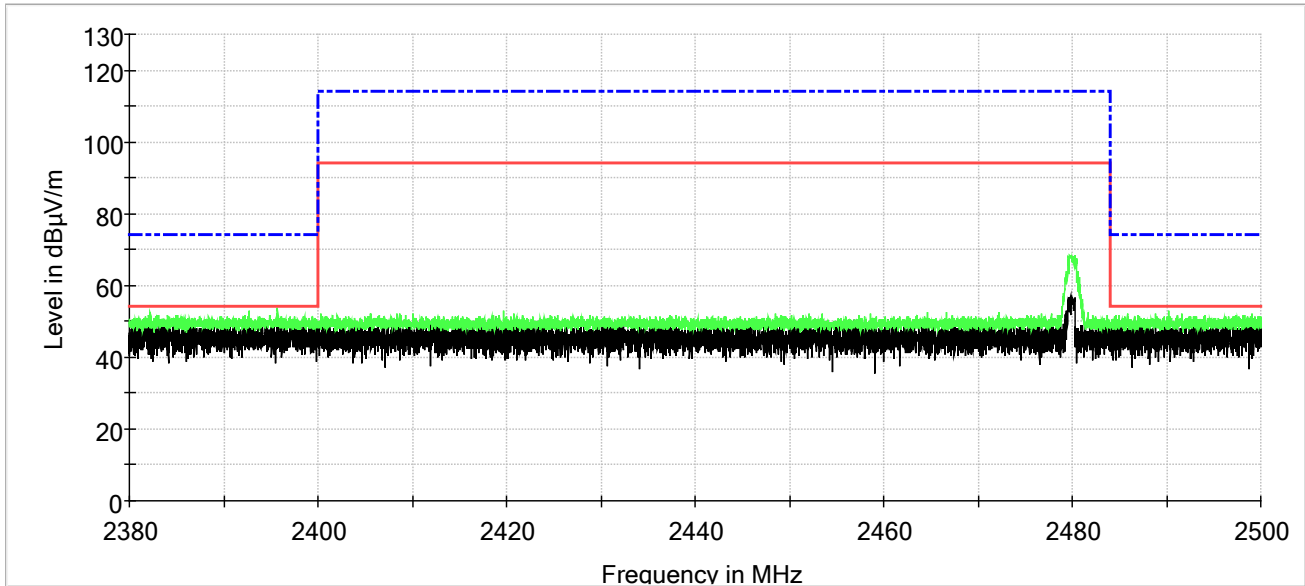


Mid Band Edge, Horizontal

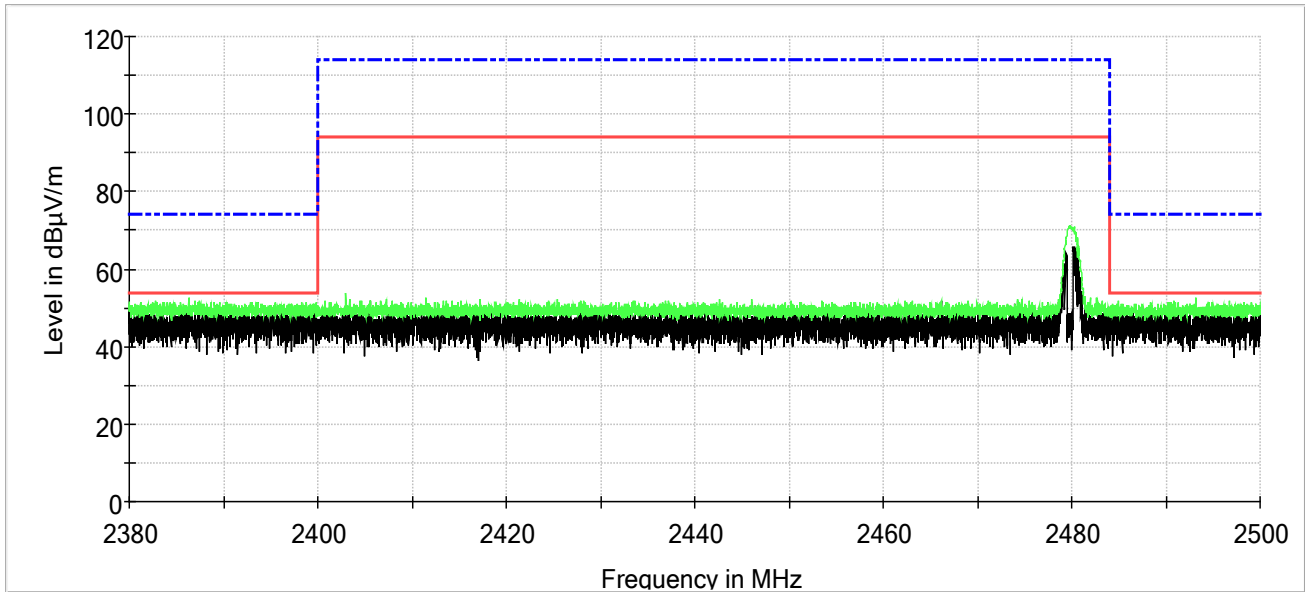




High Band Edge, Vertical



High Band 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.



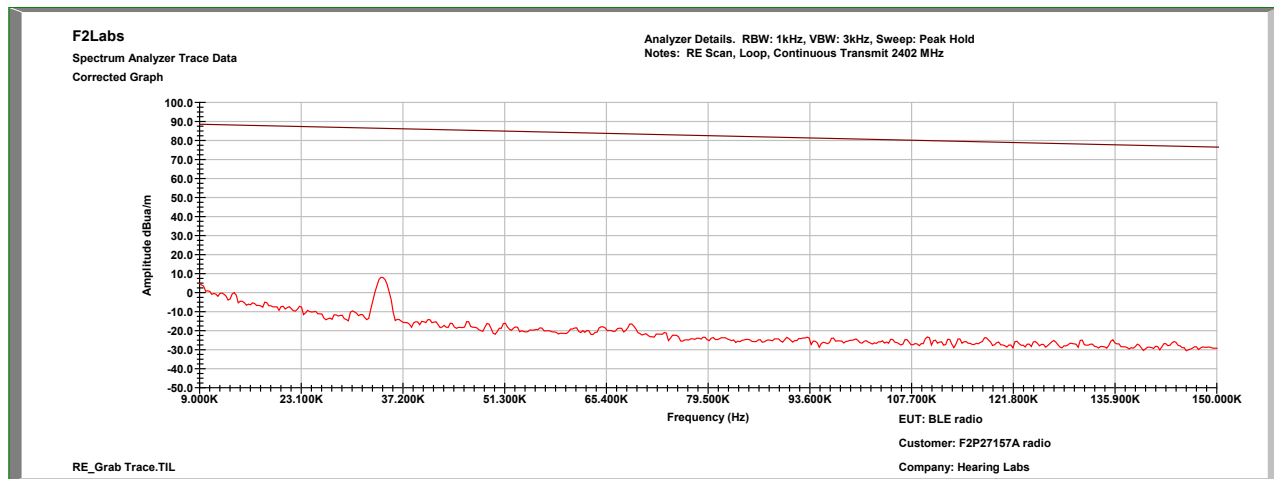
Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC

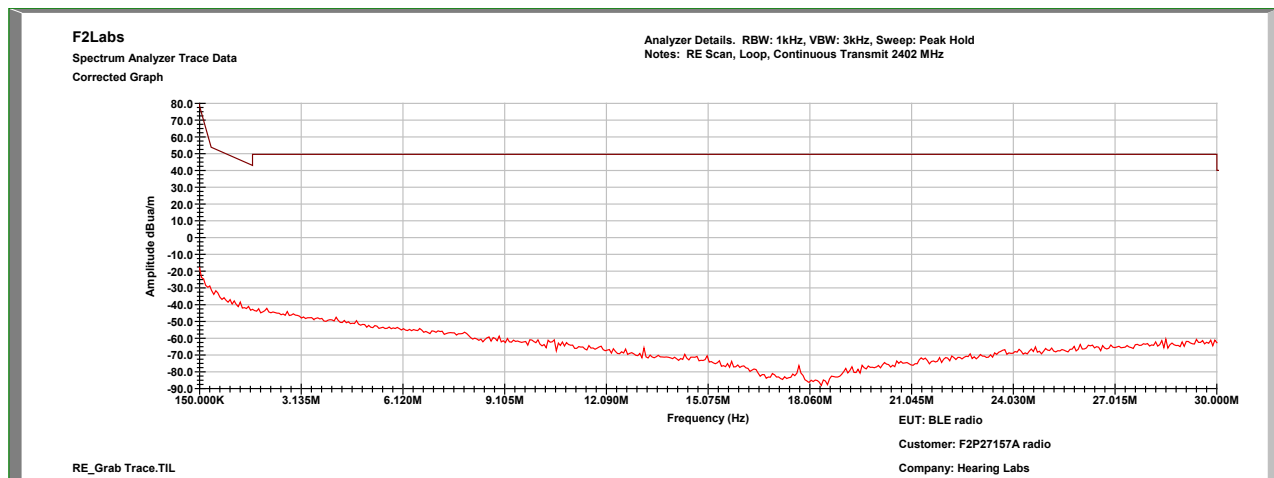
Model: ITC-U

Test Date(s):	2022-03-09 to 2022-03-10	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(d)	Air Temperature:	20.6°C
		Relative Humidity:	29%

0.009 MHz to 0.15 MHz

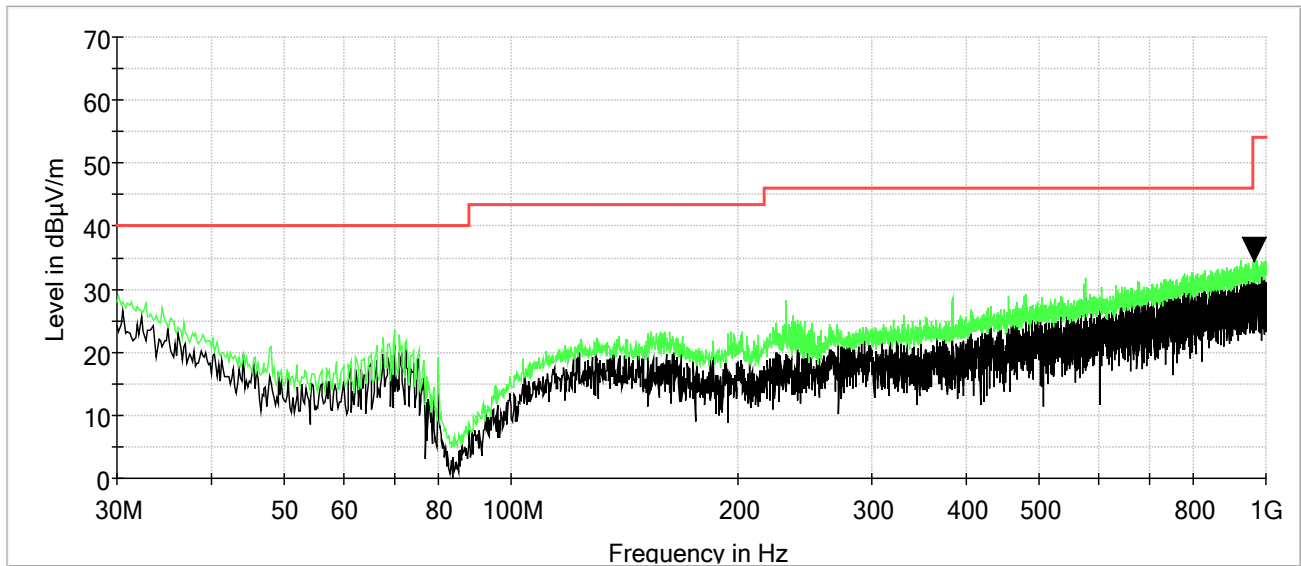


0.15 MHz to 30 MHz

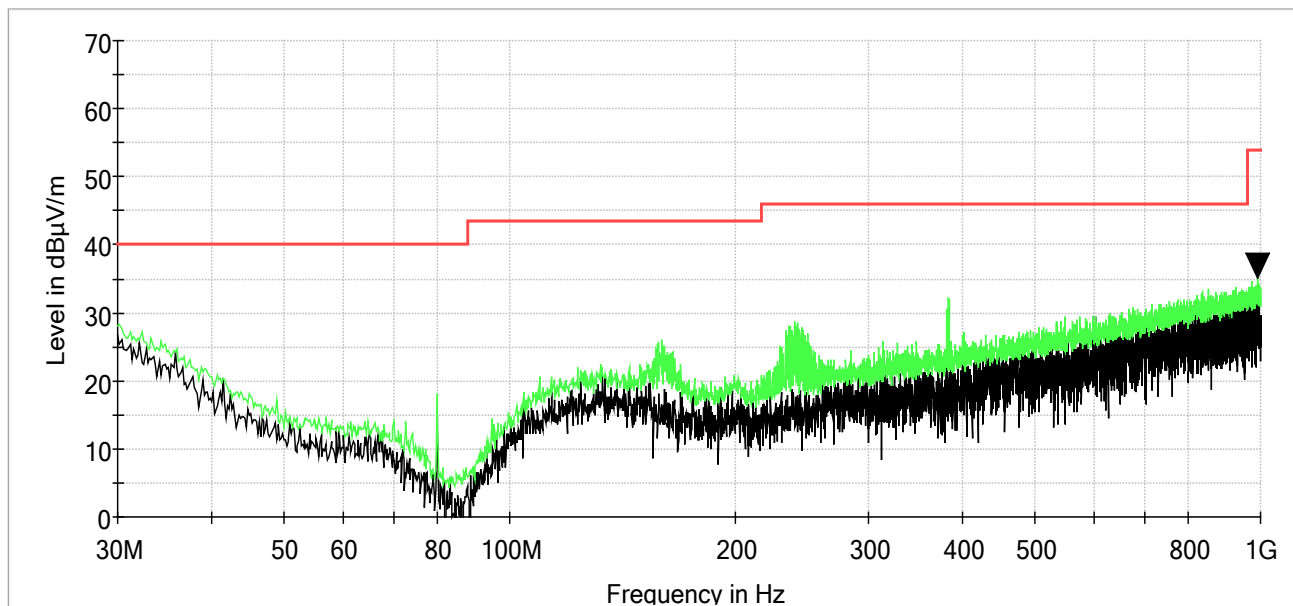




30 MHz to 1000 MHz, Vertical



30 MHz to 1000 MHz, Horizontal



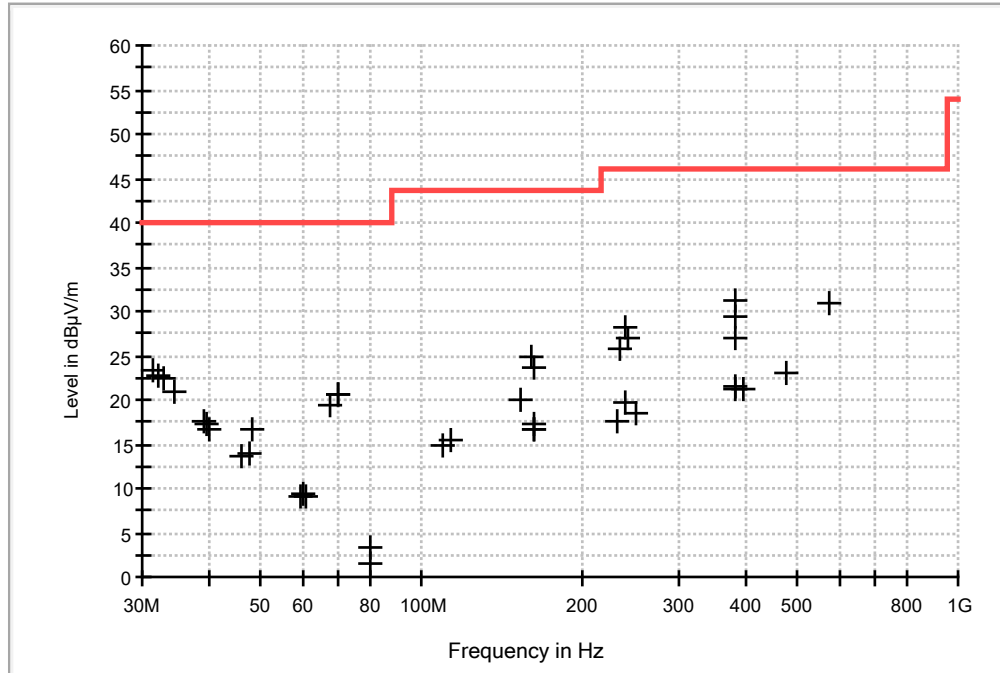


Measurements, 30 MHz to 1000 MHz (Includes data from all channels)

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dBμV)	Correction Factors (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
31.360000	V	100.00	141.00	25.6	-2.2	23.40	40.0	-16.6
32.120000	H	100.00	0.00	25.6	-2.7	22.90	40.0	-17.1
32.720000	V	100.00	142.00	25.6	-3.2	22.40	40.0	-17.6
34.480000	V	100.00	142.00	25.5	-4.5	21.00	40.0	-19.0
39.000000	H	100.00	0.00	25.4	-7.9	17.50	40.0	-22.5
39.520000	H	100.00	0.00	25.6	-8.3	17.30	40.0	-22.7
40.080000	H	100.00	0.00	25.6	-8.8	16.80	40.0	-23.2
45.720000	V	100.00	142.00	26.0	-12.5	13.50	40.0	-26.5
47.840000	V	100.00	142.00	27.4	-13.5	13.90	40.0	-26.1
48.040000	V	100.00	142.00	30.4	-13.6	16.80	40.0	-23.2
59.520000	H	100.00	0.00	24.2	-15.0	9.20	40.0	-30.8
60.080000	H	100.00	0.00	24.2	-15.0	9.20	40.0	-30.8
60.840000	H	100.00	0.00	24.1	-14.9	9.20	40.0	-30.8
67.640000	V	100.00	142.00	34.0	-14.6	19.40	40.0	-20.6
69.960000	V	100.00	142.00	34.9	-14.4	20.50	40.0	-19.5
69.960000	V	100.00	142.00	34.9	-14.4	20.50	40.0	-19.5
79.840000	H	100.00	4.00	16.3	-14.7	1.60	40.0	-38.4
79.920000	H	100.00	144.00	18.2	-14.8	3.40	40.0	-36.6
108.760000	V	100.00	142.00	24.6	-9.7	14.90	43.5	-28.6
113.600000	V	100.00	142.00	24.5	-9.0	15.50	43.5	-28.0
153.000000	V	100.00	142.00	29.5	-9.4	20.10	43.5	-23.4
159.400000	H	100.00	208.00	34.3	-9.5	24.80	43.5	-18.7
160.760000	H	100.00	245.00	33.3	-9.5	23.80	43.5	-19.7
160.840000	H	100.00	259.00	26.3	-9.5	16.80	43.5	-26.7
161.920000	V	100.00	142.00	26.7	-9.5	17.20	43.5	-26.3
162.120000	V	100.00	142.00	26.2	-9.5	16.70	43.5	-26.8
231.000000	V	100.00	142.00	27.5	-10.0	17.50	46.0	-28.5
232.720000	H	100.00	113.00	35.7	-9.9	25.80	46.0	-20.2
239.120000	V	100.00	142.00	29.3	-9.5	19.80	46.0	-26.2
239.120000	H	100.00	138.00	37.6	-9.5	28.10	46.0	-17.9
243.000000	H	100.00	88.00	36.5	-9.5	27.00	46.0	-19.0
249.400000	V	100.00	142.00	27.9	-9.5	18.40	46.0	-27.6
384.040000	H	100.00	262.00	34.4	-5.1	29.30	46.0	-16.7
384.040000	H	100.00	182.00	32.0	-5.1	26.90	46.0	-19.1
384.040000	H	100.00	316.00	36.4	-5.1	31.30	46.0	-14.7
384.240000	V	100.00	142.00	26.6	-5.1	21.50	46.0	-24.5
384.240000	V	100.00	142.00	26.4	-5.1	21.30	46.0	-24.7
395.680000	V	100.00	142.00	25.8	-4.7	21.10	46.0	-24.9
479.120000	V	100.00	142.00	25.4	-2.3	23.10	46.0	-22.9
576.320000	V	100.00	142.00	31.3	-0.5	30.80	46.0	-15.2

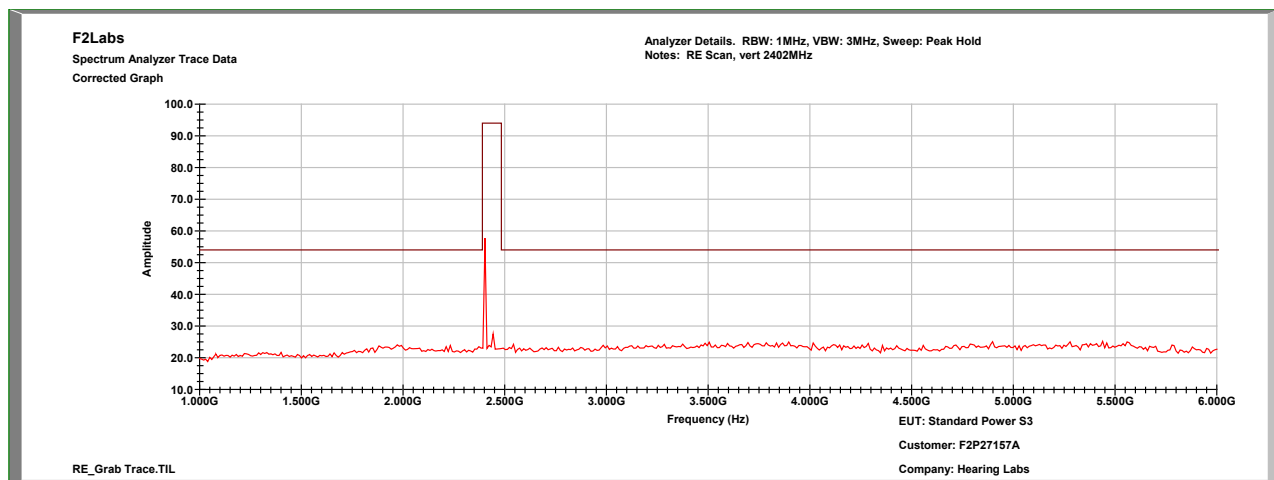


Measurements - 30 MHz to 1000 MHz

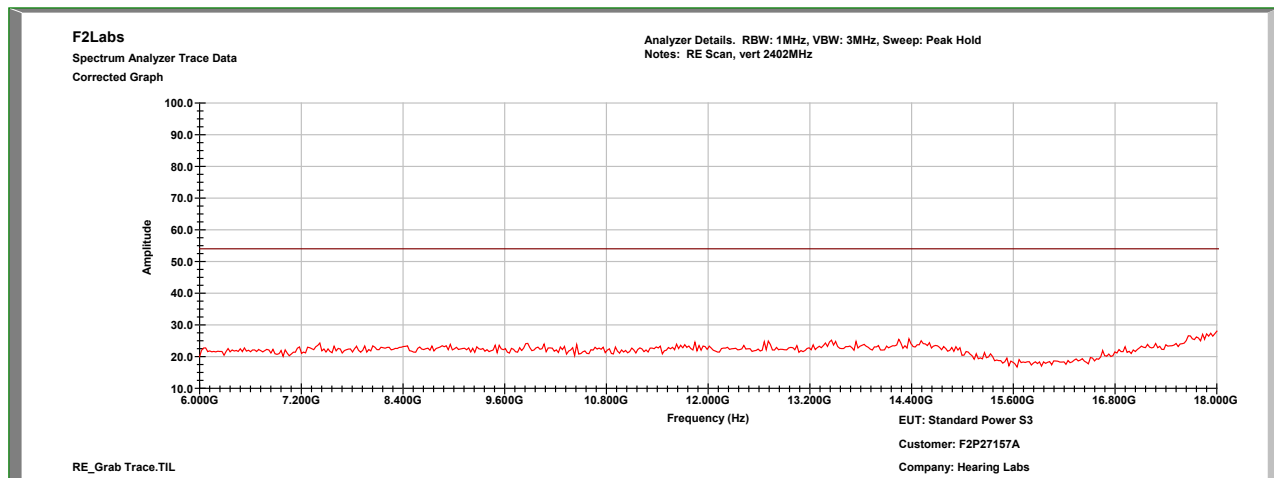




Low Channel: 1 GHz to 6 GHz, Vertical



Low Channel: 6 GHz to 18 GHz, Vertical

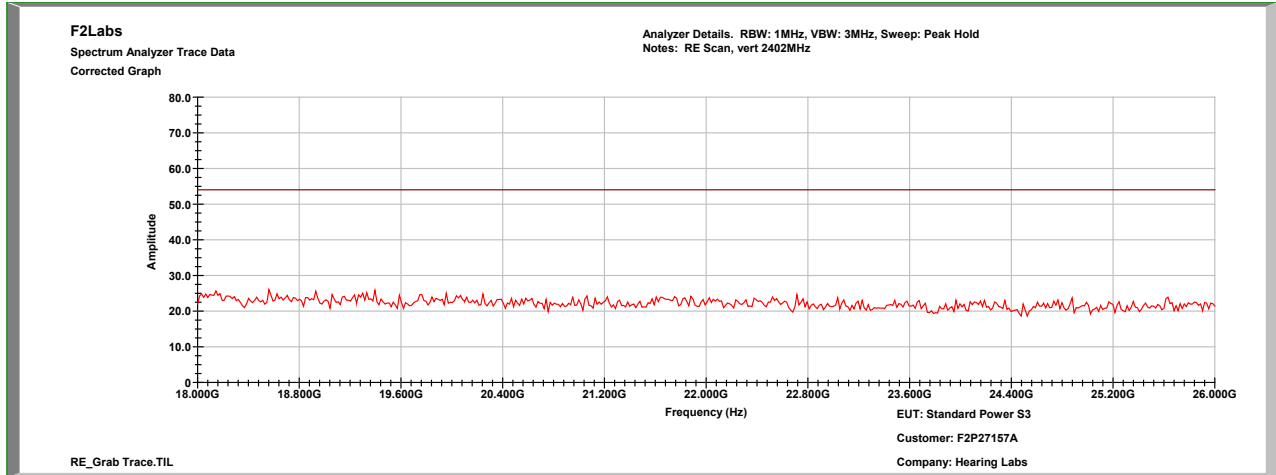




Order Number: F2P27157A

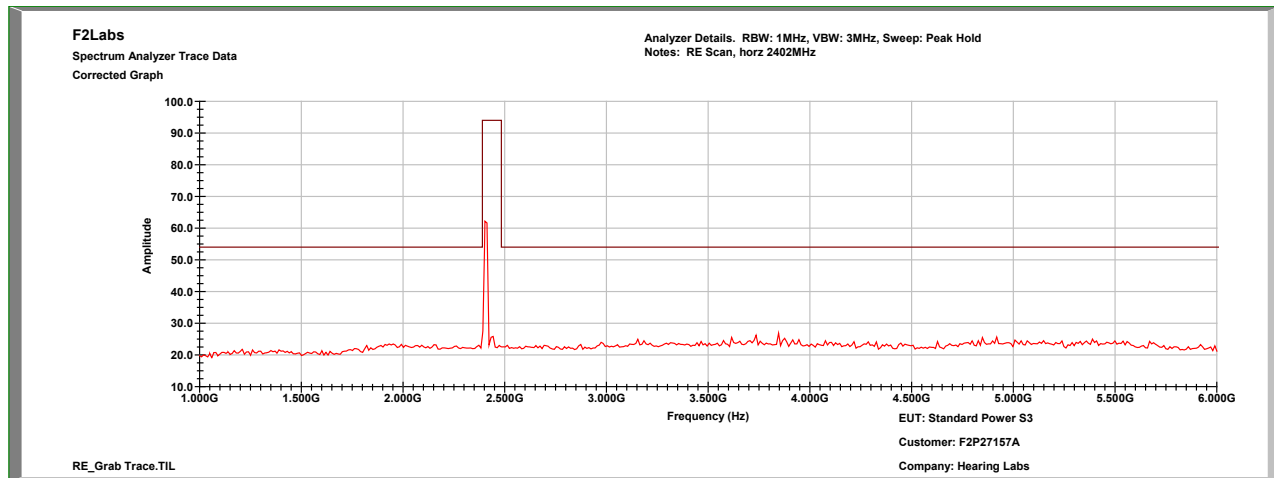
Applicant: Hearing Lab Technology, LLC
Model: ITC-U

Low Channel: 18 GHz to 26 GHz, Vertical

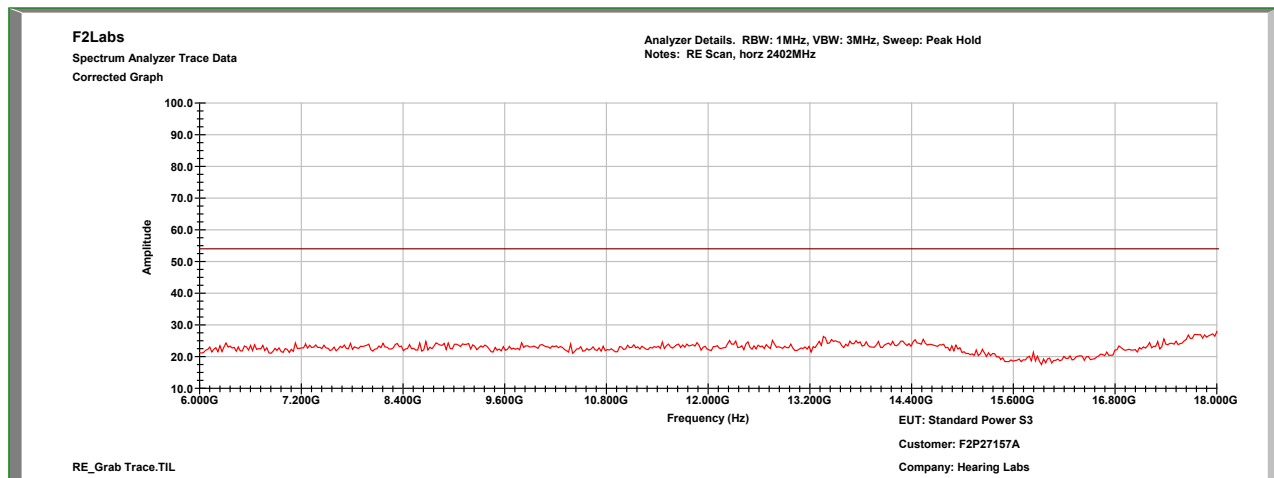




Low Channel: Low Channel: 1 GHz to 6 GHz, Horizontal



Low Channel: 6 GHz to 18 GHz, Horizontal

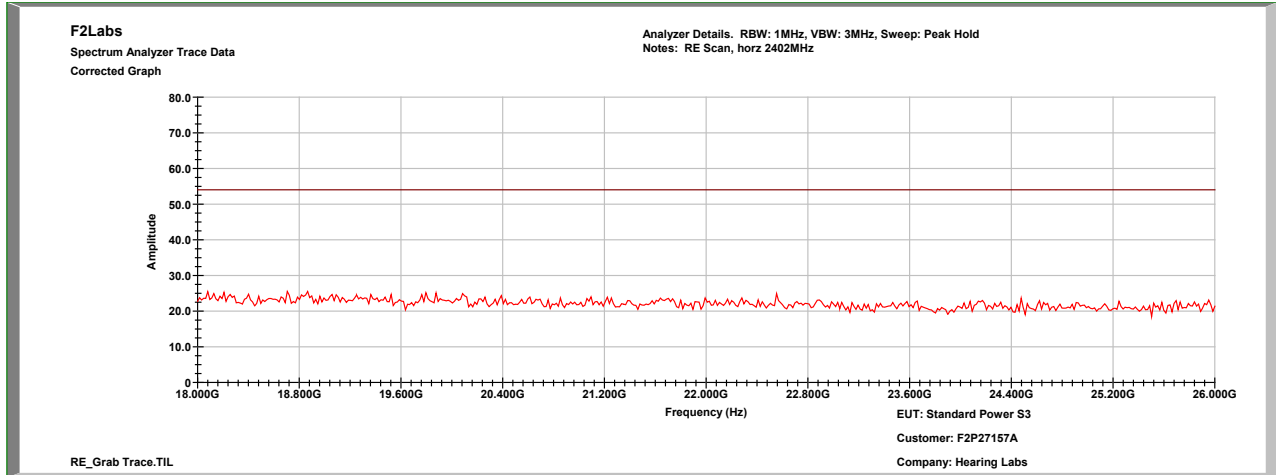




Order Number: F2P27157A

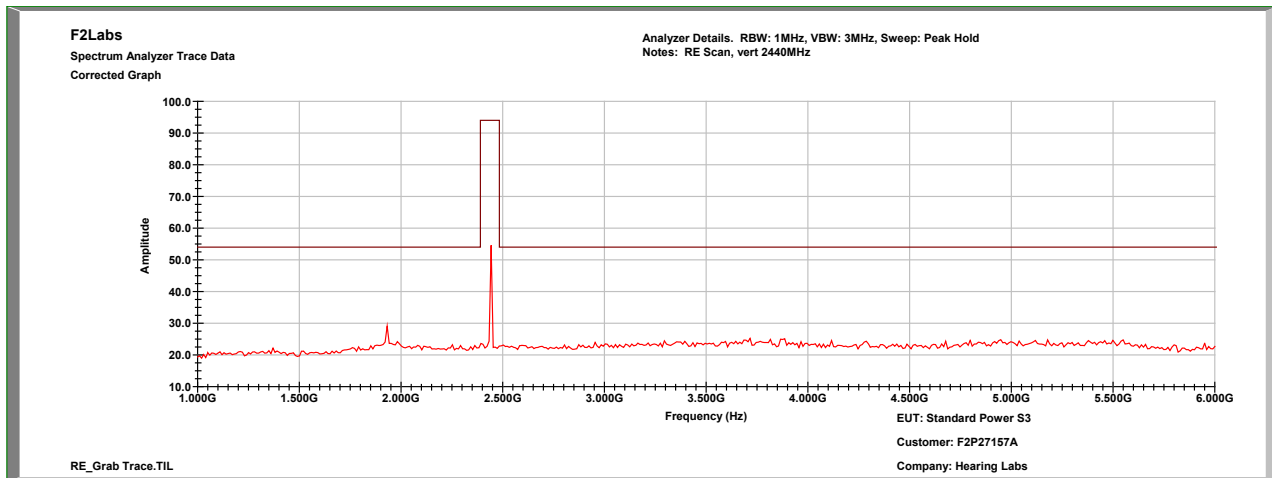
Applicant: Hearing Lab Technology, LLC
Model: ITC-U

Low Channel: 18 GHz to 26 GHz, Horizontal

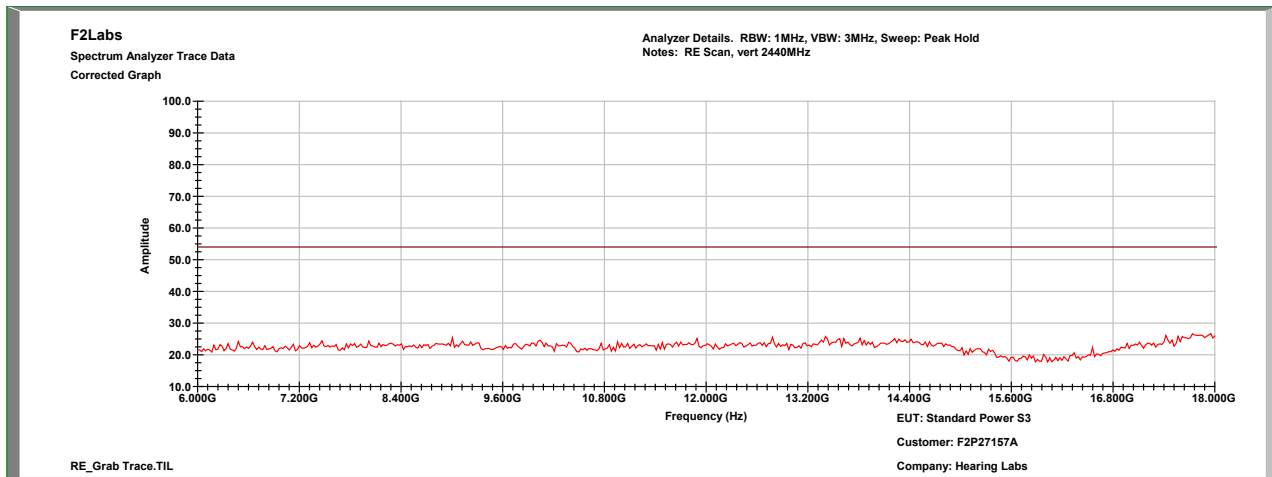




Mid Channel: 1 GHz to 6 GHz, Vertical



Mid Channel: 6 GHz to 18 GHz, Vertical

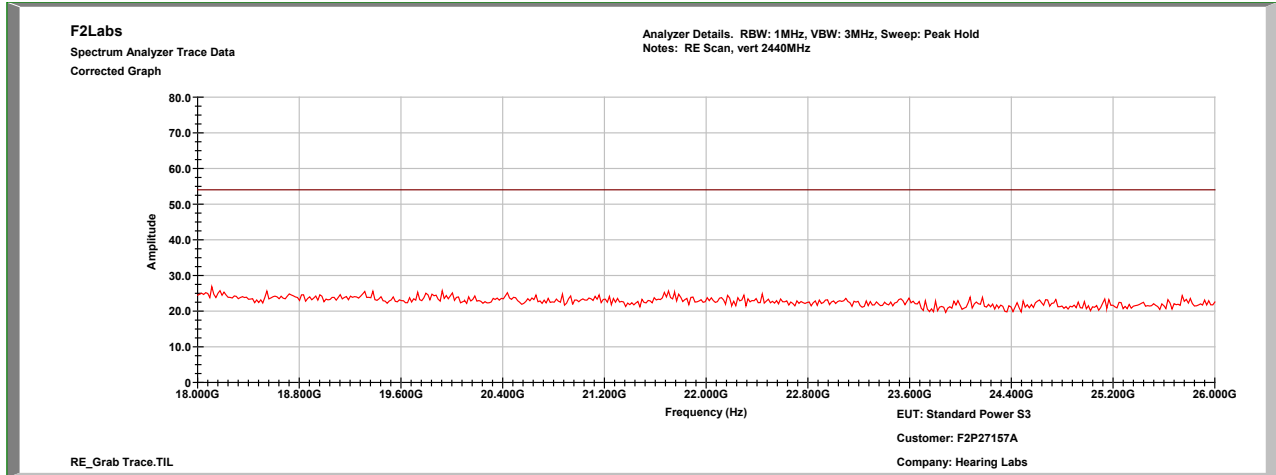




Order Number: F2P27157A

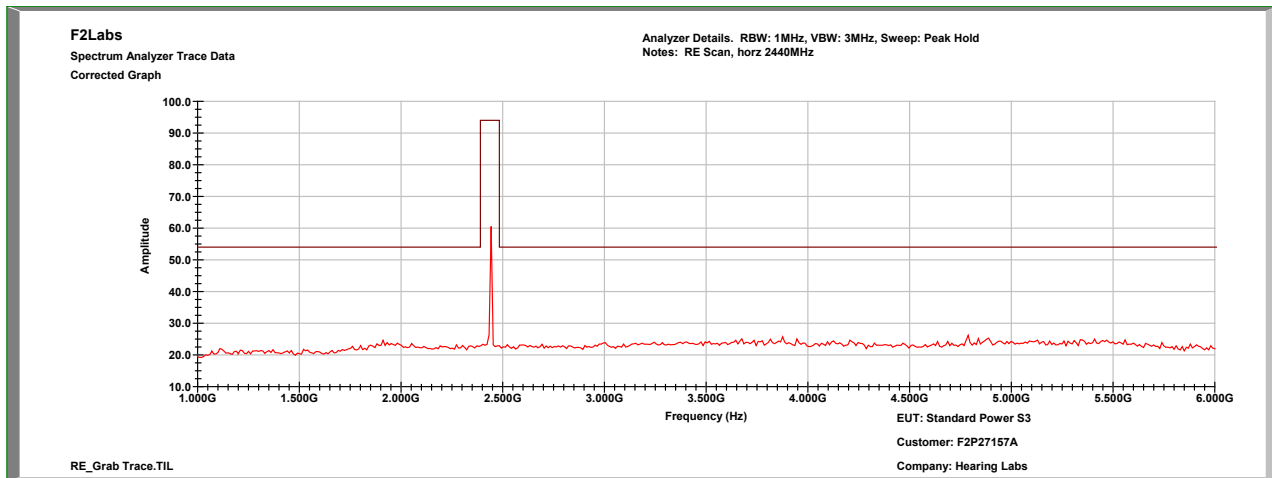
Applicant: Hearing Lab Technology, LLC
Model: ITC-U

Mid Channel: 18 GHz to 26 GHz, Vertical

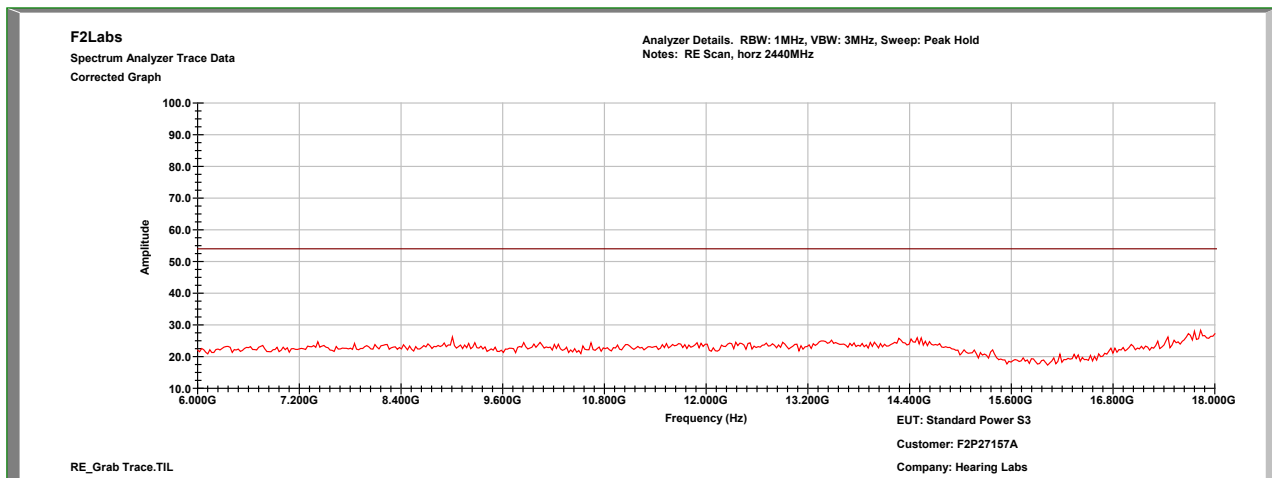




Mid Channel: Mid Channel: 1 GHz to 6 GHz, Horizontal



Mid Channel: 6 GHz to 18 GHz, Horizontal



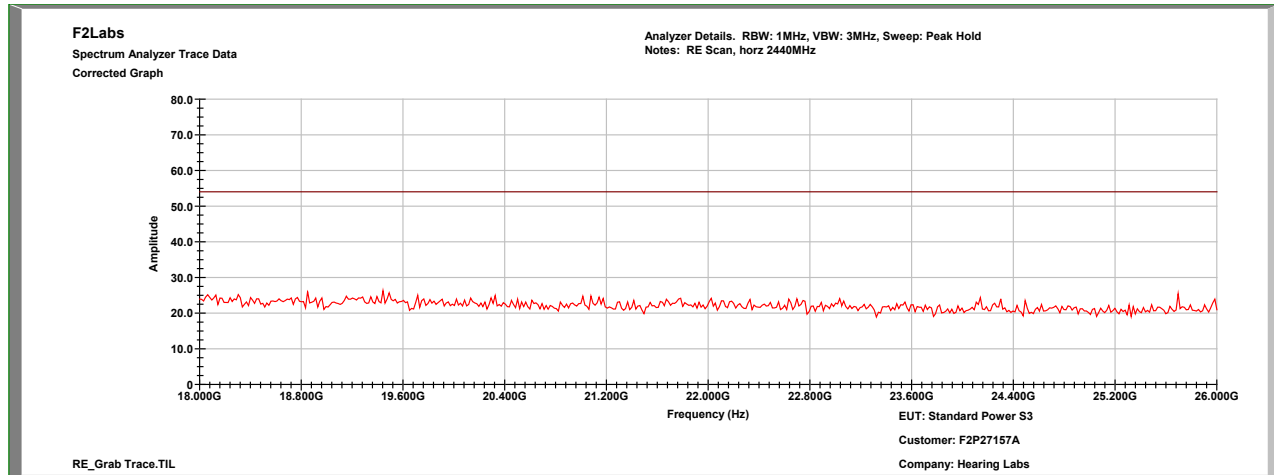


Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC

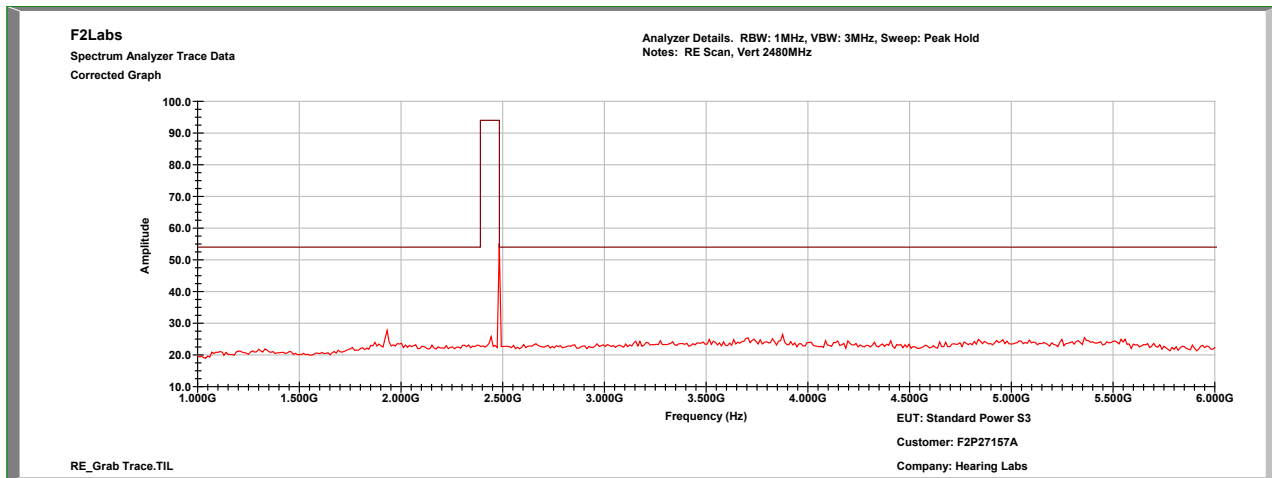
Model: ITC-U

Mid Channel: 18 GHz to 26 GHz, Horizontal

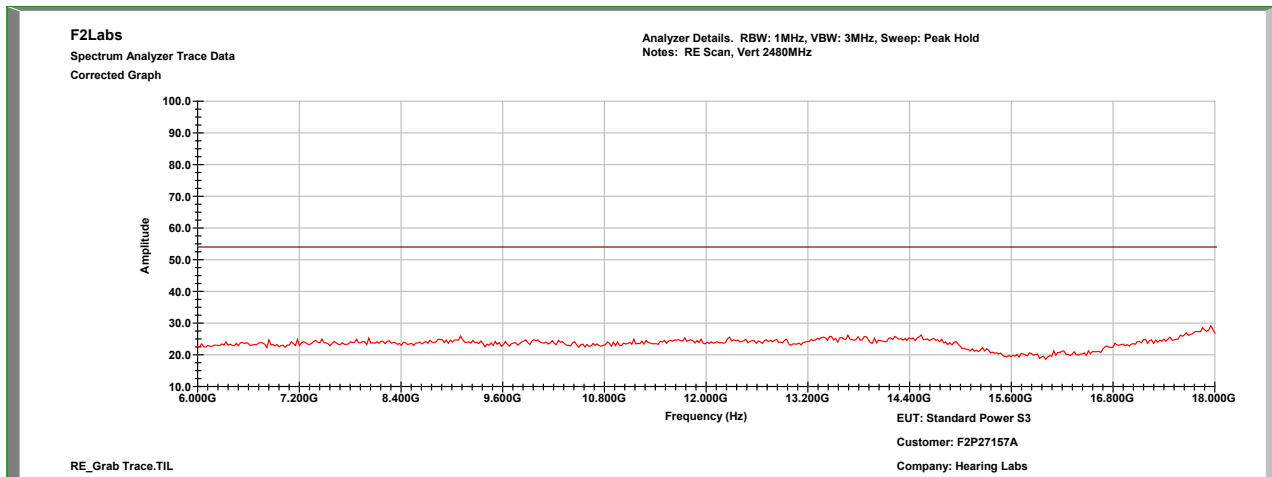




High Channel: 1 GHz to 6 GHz, Vertical



High Channel: 6 GHz to 18 GHz, Vertical



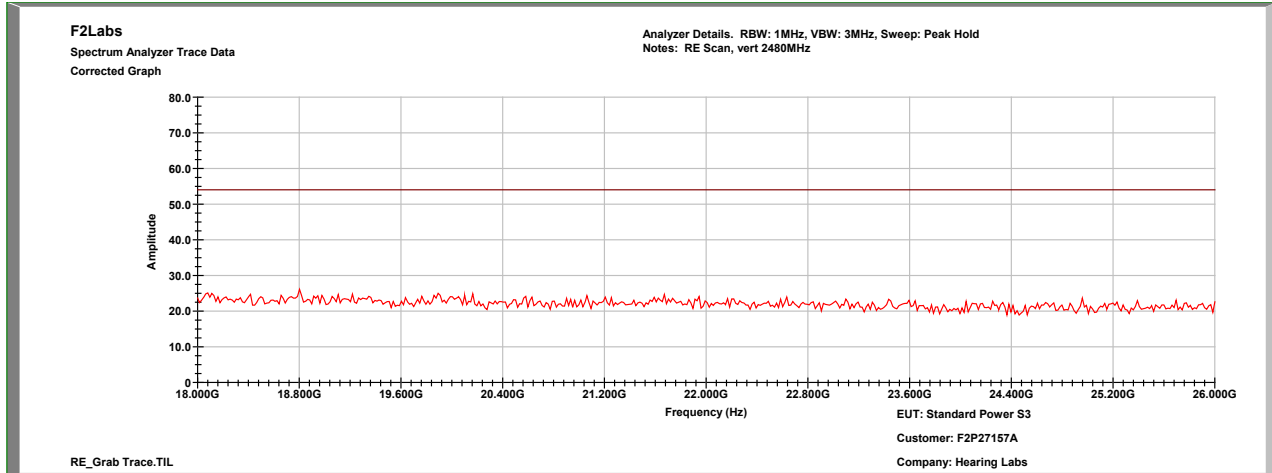


Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC

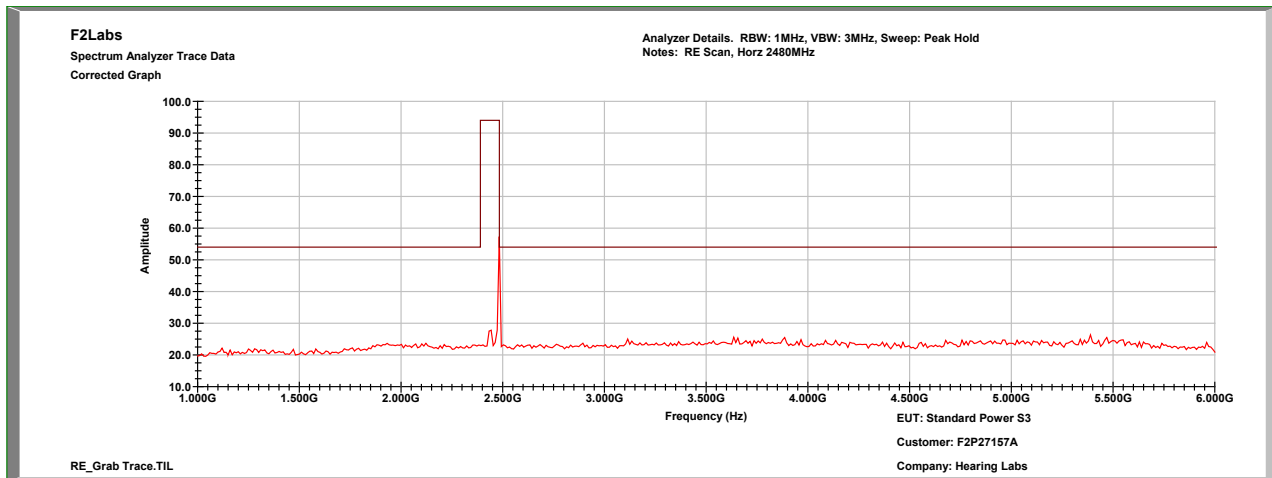
Model: ITC-U

High Channel: 18 GHz to 26 GHz, Vertical

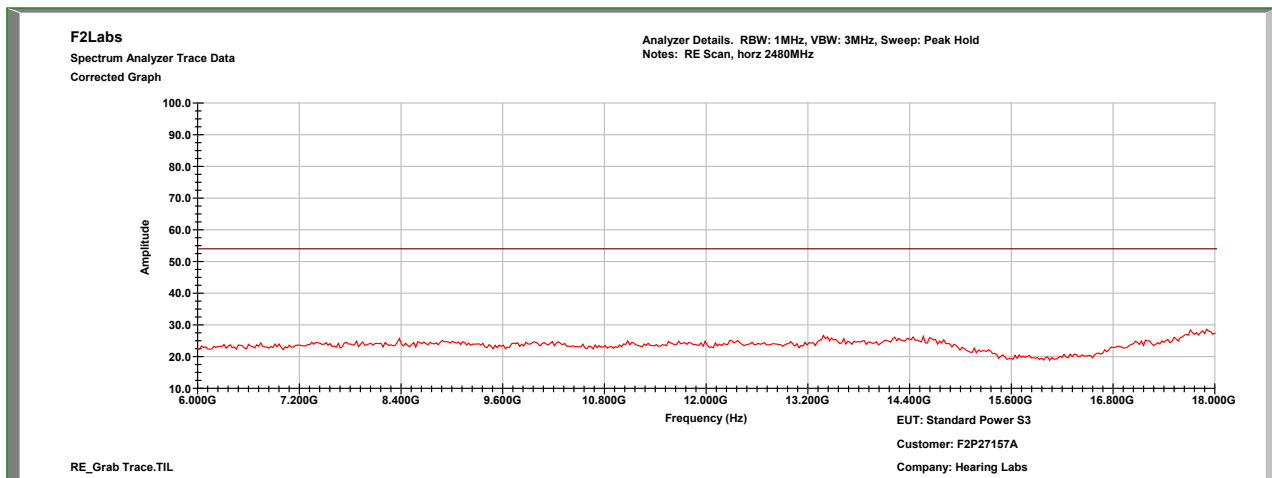




High Channel: Low Channel: 1 GHz to 6 GHz, Horizontal



High Channel: 6 GHz to 18 GHz, Horizontal

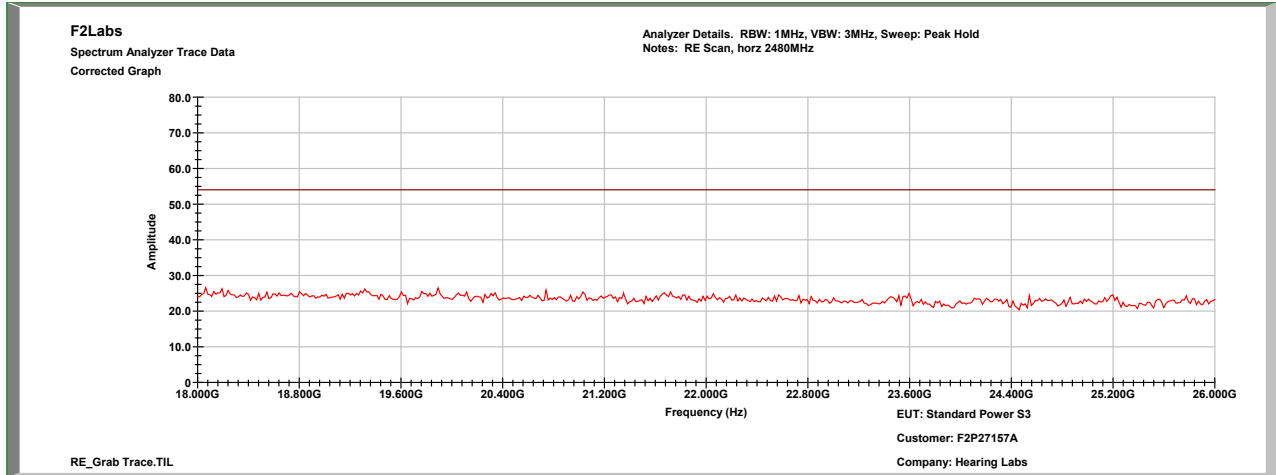




Order Number: F2P27157A

Applicant: Hearing Lab Technology, LLC
Model: ITC-U

High Channel: 18 GHz to 26 GHz, Horizontal



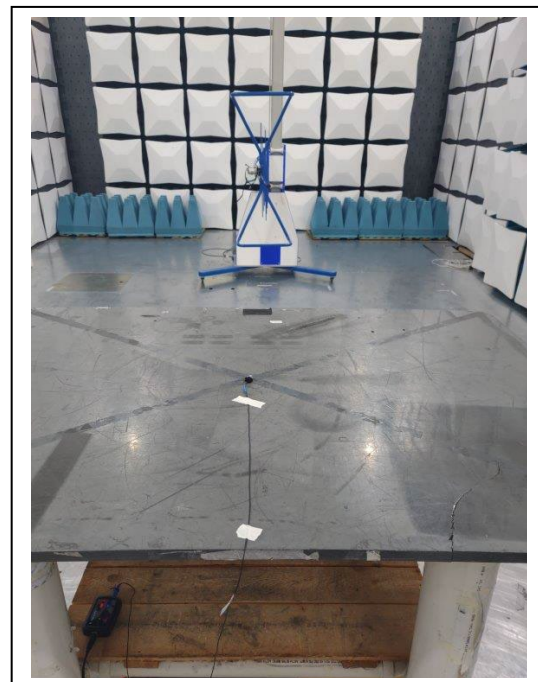


9 TEST SETUP PHOTOGRAPHS

Radiated Emissions: 0.009 MHz to 0.15 MHz



Radiated Emissions: 30 MHz to 1000 MHz





**Radiated Emissions: 1 GHz to 26 GHz,
Band Edge, Field Strength of Emissions, Occupied Bandwidth**

