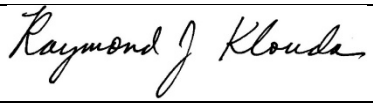
Engineering Test Report No. 2102662-01		
Report Date	2 August 2021	
Manufacturer Name	Hearing Lab Technology LLC	
Manufacturer Address	14301 FAA Blvd, Ste 105 Fort Worth, TX 76155	
Model No.	Fio Charger	
Date Received	13 July 2021	
Test Dates	13 through 15 July 2021	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 FCC “Code of Federal Regulations” Title 47, Part15, Subpart 15B Innovation, Science, and Economic Development Canada, ICES-003	
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515	FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107
Signature		
Tested by	David L. Sherman	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	WP009600	

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Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, ICES-003 test specifications. The data presented in this test report pertains to the EUT on the test date(s) specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Table of Contents

1. Report Revision History 3
2. Introduction 4
2.1. Scope of Tests 4
2.2. Purpose 4
2.3. Identification of the EUT 4
3. Power Input 5
4. Grounding 5
5. Support Equipment 5
6. Interconnect Leads 5
7. Modifications Made to the EUT 5
8. Modes of Operation 5
9. Test Specifications 6
10. Test Plan 6
11. Deviation, Additions to, or Exclusions from Test Specifications 6
12. Laboratory Conditions 6
13. Summary 6
14. Sample Calculations 7
15. Statement of Conformity 7
16. Certification 7
17. Photographs of EUT 8
18. Equipment List 9
19. Block Diagram of Test Setup 10
20. Transceiver Conducted Emissions Test (AC Mains) 11
21. Receiver Radiated Emissions Test 19
22. 6dB Bandwidth 29
23. Occupied Bandwidth (99%) 33
24. Effective Isotropic Radiated Power (EIRP) 37
25. Duty Cycle Factor Measurements 40
26. Spurious Radiated Emissions 47
27. Band-Edge Compliance 61
28. Power Spectral Density 66
29. Scope of Accreditation 74

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1. Report Revision History

Revision	Date	Description
–	4 AUG 2021	Initial Release of Engineering Test Report No. 2101950-01

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Hearing Lab Technology LLC Hearing Aid & Charging Case (hereinafter referred to as the Equipment Under Test (EUT)). The EUTs were manufactured and submitted for testing by Hearing Lab Technology LLC located in Fort Worth, TX.

2.2. Purpose

The test series was performed to determine if the EUTs meets the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part15, Subpart 15B, Section 15.107 and 15.109 for Receivers and Part 15, Subpart C, Sections 15.247 for a Digital Modulation intentional radiator operating within the 2400-2483.5MHz band.

The test series was also performed to determine if the EUTs meets the RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification ICES-003for a Digital Modulation intentional radiator operating within the 2400-2483.5MHz band.

Testing was performed in accordance with ANSI C63.10-2013.

2.3. Identification of the EUT

The EUTs were identified as follows:

EUT Identification	
Product Description	Hearing aid and charging case
Model/Part No.	Fio Charger
S/N	Advertising
Device Type	Digitally Modulated Transmission Device
Band of Operation	2400-2483.5MHz
Software/Firmware Version	Application_adv_leds_chg.gbl (Charging Connected operating mode) Pico_Charger_0714_adv_0db_leds_chg.gbl (Continuous Transmit operating mode)
Rated Output Power	-2.8dBm
Antenna Type	Chip antenna embedded in module
Manufacturer Supplied* Antenna Gain (dBi)	1dBi
6dB Bandwidth	654.30 kHz (2402MHz) 659.30 kHz (2440MHz) 654.30 kHz (2480MHz)
Occupied Bandwidth (99% CBW)	1MHz
Size of EUT	7.6cm x 4.0cm x 1.7cm
Product Description	Hearing aid and charging case
Model/Part No.	Fio Charger
S/N	No Advertising
Device Type	Digitally Modulated Transmission Device
Band of Operation	2400-2483.5MHz
Software/Firmware Version	Pico_Charger_0714_leds_chg.gbl (Charging Disconnected operating mode)
Rated Output Power	-2.8dBm
Antenna Type	Chip antenna embedded in module

EUT Identification	
Manufacturer Supplied* Antenna Gain (dBi)	1dBi
6dB Bandwidth	654.30 kHz (2402MHz) 659.30 kHz (2440MHz) 654.30 kHz (2480MHz)
Occupied Bandwidth (99% CBW)	1MHz
Size of EUT	7.6cm x 4.0cm x 1.7cm

*- Antenna gain is supplied by the manufacturer and Elite is not responsible for the accuracy of the antenna gain.

The EUTs listed above were used throughout the test series.

3. Power Input

The EUTs obtained 5V DC power through a USB type-C cable from the output of an AC/DC converter. The input to the converter received 115V 60Hz power through low-pass powerline filters on the wall of the shielded enclosure.

4. Grounding

The EUTs were not connected to ground.

5. Support Equipment

The EUTs were submitted for testing along with the following support equipment:

Description	Model #	S/N
Hearing Aid	Fio Earpiece	Black
Hearing Aid	Fio Earpiece	Silver
Apple iPhone 8	MQ6K2LL/A	F4HWQE9QJC6C
Apple AC/DC Power Supply	A1265	1X334606V18QY

6. Interconnect Leads

No interconnect leads were used during the tests.

7. Modifications Made to the EUT

The EUT (S/N: Advertising) was loaded with “Pico_Charger_0714_adv_0db_leds_chg.gbl” firmware to enable continuous transmission at 2402MHz, 2440MHz and 2480MHz. This firmware was used for the measurements detailed in Sections 22, 23, 24, 25, 26, 27, and 28 of this document. For the conducted emissions test, the EUT was loaded with “Application_adv_leds_chg.gbl” firmware.

8. Modes of Operation

The EUTs and all peripheral equipment were energized. The unit was programmed to transmit in one of the following modes:

Mode	Description
Continuous Transmit at 2402MHz	Continuously transmitting at 2402MHz with a power setting of 0dBm and 40% duty cycle
Continuous Transmit at 2440MHz	Continuously transmitting at 2440MHz with a power setting of 0dBm and 40% duty cycle

Mode	Description
Continuous Transmit at 2480MHz	Continuously transmitting at 2480MHz with a power setting of 0dBm and 40% duty cycle
Charging Connected	Connected to the support phone with a power setting of 0dBm and charging the earpieces
Charging Disconnected	Not connected to the support phone and charging the earpieces

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 test specifications.

- Federal Communications Commission “Code of Federal Regulations”, Title 47, Part 15, Subpart C
- Federal Communications Commission “Code of Federal Regulations”, Title 47, Part 15, Subpart B
- ANSI C63.4-2014, “American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz”
- ANSI C63.10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- ICES-003, Issue7, October 2020, Interference-Causing Equipment Standard, Innovation, Science, and Economic Development Canada, “Information Technology Equipment (including Digital Apparatus)”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Hearing Lab Technology LLC and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, ICES-003, and ANSI C63.4-2014 specification.

11. Deviation, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

12. Laboratory Conditions

Ambient Parameters	Value
Temperature	22.2°C
Relative Humidity	53%
Atmospheric Pressure	1019.0mb

13. Summary

The following EMC tests were performed, and the results are shown below:

Test Description	Requirements	Test Methods	S/N	Results
Transceiver Conducted Emissions Test (AC Mains)	FCC 15B 15.107 ICES-003	ANSI C63.4: 2014	Advertising	Conforms
Receiver Radiated Emissions Test	FCC 15B 15.107 ICES-003	ANSI C63.4: 2014	No Advertising	Conforms
6dB Bandwidth	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms
Occupied Bandwidth (99%)	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms

Test Description	Requirements	Test Methods	S/N	Results
Effective Isotropic Radiated Power (EIRP)	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms
Duty Cycle Factor Measurements	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	—
Spurious Radiated Emissions	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms
Band-Edge Compliance	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms
Power Spectral Density	FCC 15C 15.247 ICES-003	ANSI C63.10: 2013	Advertising	Conforms

14. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBuV) = MTR (dBuV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

15. Statement of Conformity

The Hearing Lab Technology LLC Hearing Aid & Charging Case, Model No. Fio Charger, Serial Nos. Advertising and No Advertising, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, ICES-003.

16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, ICES-003 test specifications. The data presented in this test report pertains to the EUTs on the test date specified. Any electrical or mechanical modifications made to the EUTs after the specified test date will serve to invalidate the data and void this certification.

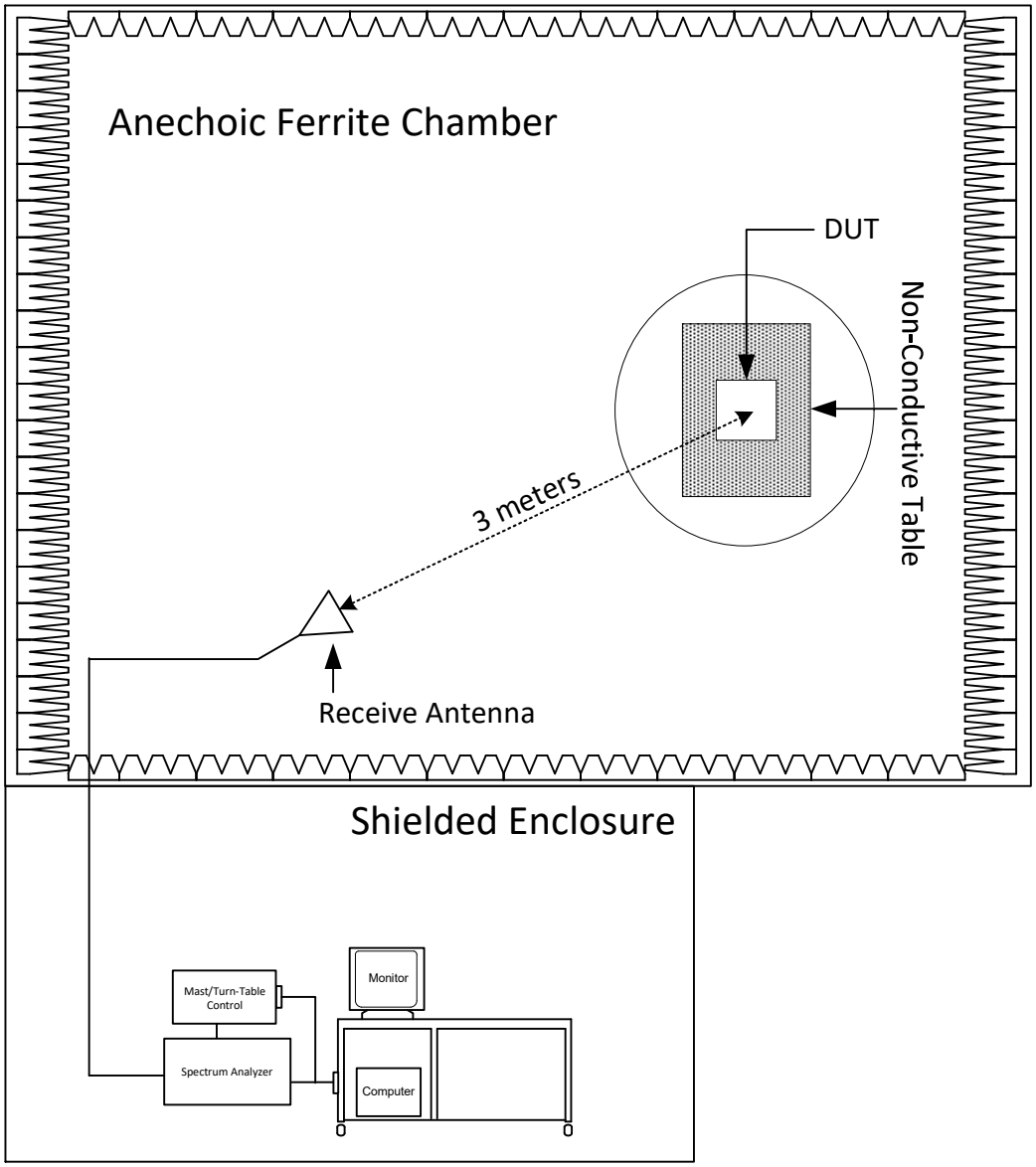
17. Photographs of EUT

18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	9/24/2020	9/24/2021
APW14	PREAMPLIFIER	PLANAR	PE2-35-120-5R0-10-12-SFF	PL22671	1-20GHz	9/24/2020	9/24/2021
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	NOTE 1	
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	10/5/2020	10/5/2021
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/7/2020	4/7/2022
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	4/8/2021	4/8/2022
PLF3	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	4/8/2021	4/8/2022
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101533	10HZ-44GHZ	3/2/2021	3/2/2022
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
NOTE 1: For this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. Transceiver Conducted Emissions Test (AC Mains)

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Charging Connected

Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Semi-Anechoic Chamber
Test site used	29
Note	Vertical ground plane present

Requirements

All radio frequency voltages on the power lines for any frequency or frequencies of an unintentional radiator shall not exceed the limits in the following table:

Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15-05	66 to 56*	56-46*
0.5-5	56	46
5-30	60	50

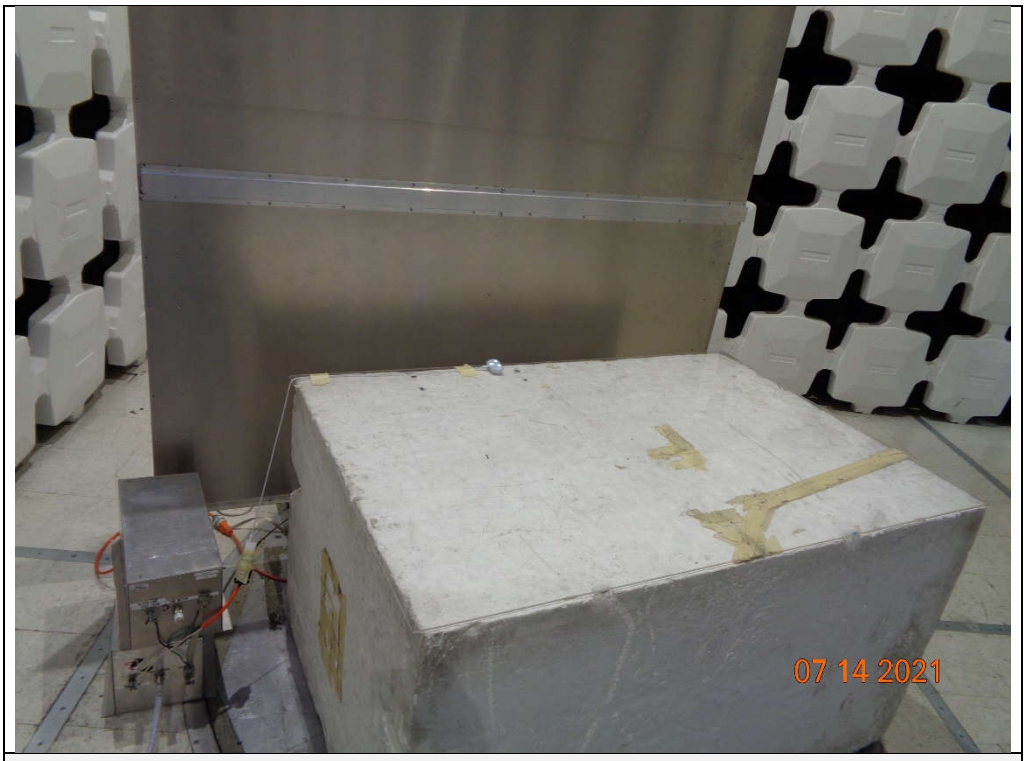
*Decreases with the logarithm of the frequency

Procedures

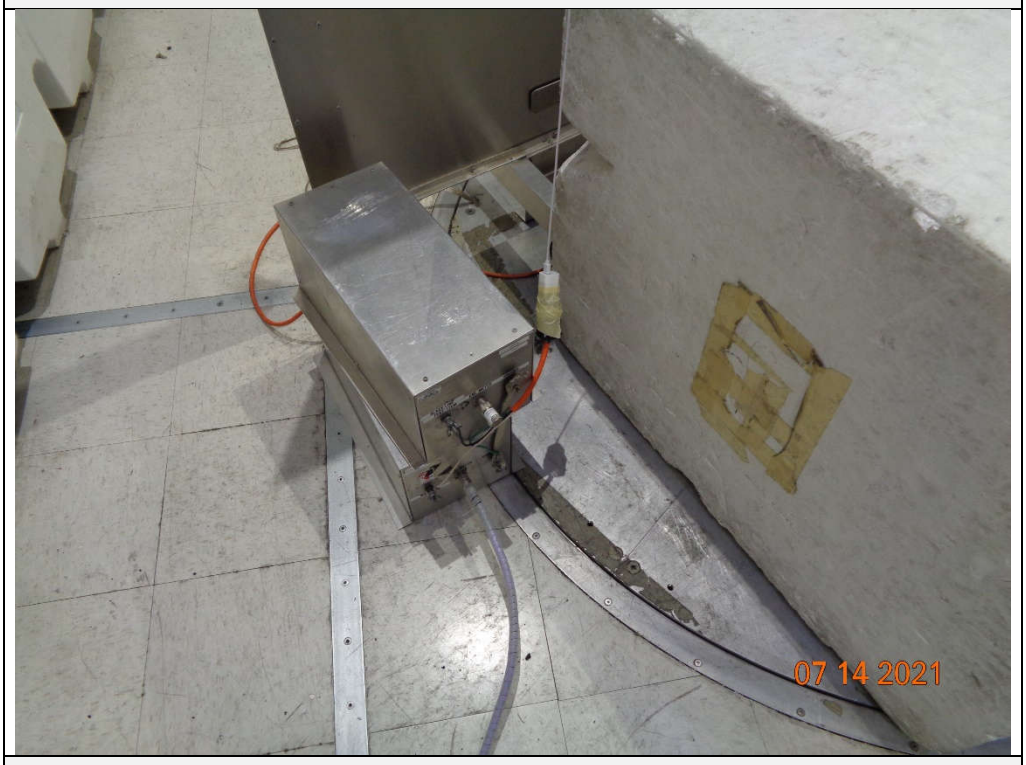
The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

1) The EUT was operated in the Charging Connected mode.
2) Measurements were first made on the 115/230V, 50/60Hz high line.
3) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.
7) Steps (3) through (6) were repeated on the 115/230V, 50/60Hz neutral line.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Connected
Line Tested	:	115V, 60Hz Line (LISN ID: PLF3)
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	With Apple (Model: A1265 Serial: 1X334606V18QY) AC/DC Power Supply
Test Engineer	:	D. Sherman
Limit	:	Class B
Test Date	:	Jul 14, 2021 12:51:50 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

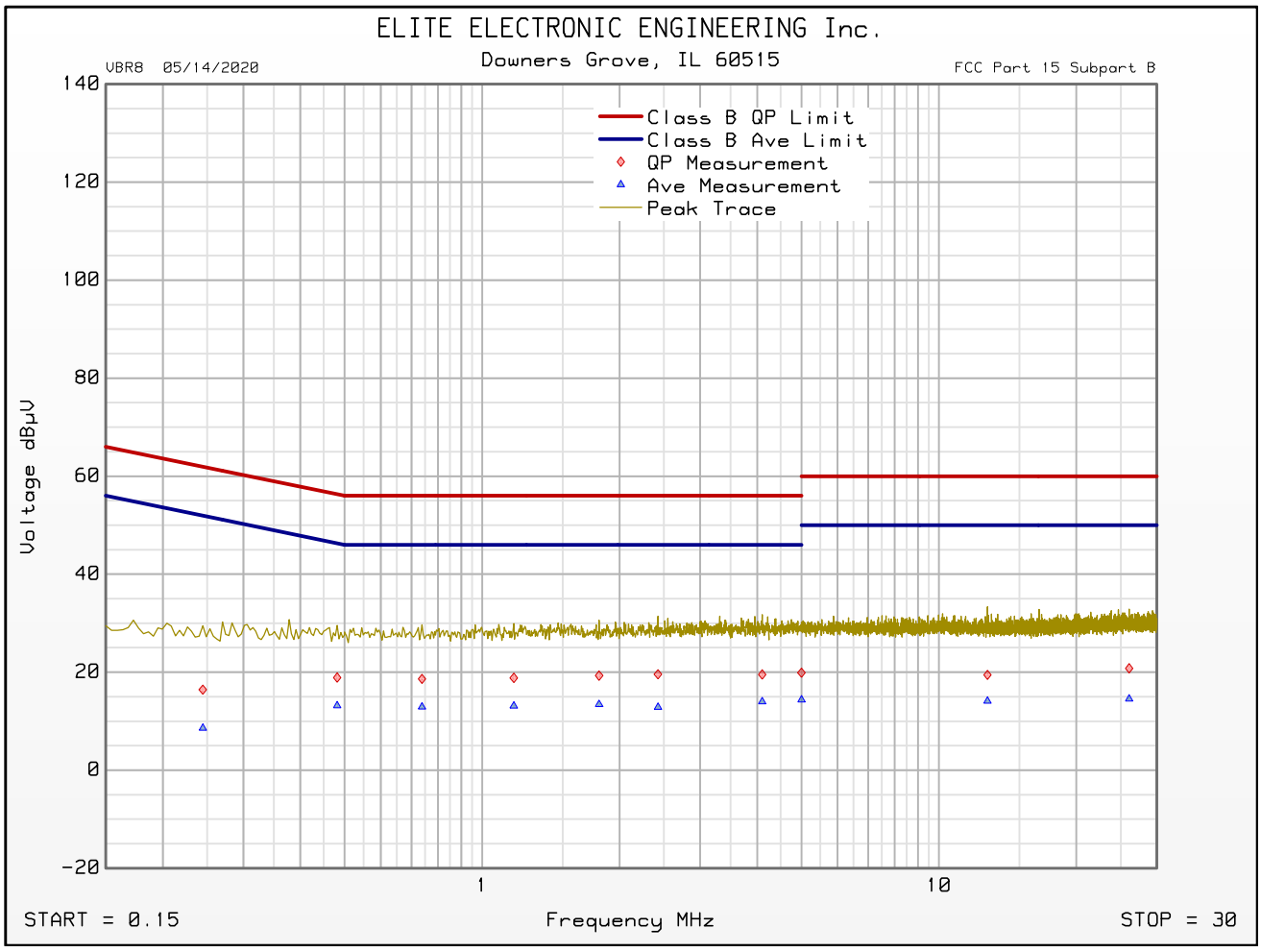
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.245	16.4	61.9		8.6	51.9	
0.482	18.9	56.3		13.2	46.3	
0.739	18.6	56.0		12.9	46.0	
1.173	18.8	56.0		13.1	46.0	
1.804	19.3	56.0		13.4	46.0	
2.426	19.6	56.0		12.9	46.0	
5.000	19.9	56.0		14.3	46.0	
12.776	19.5	60.0		14.1	50.0	
26.083	20.8	60.0		14.5	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Connected
Line Tested	:	115V, 60Hz Line (LISN ID: PLF3)
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	With Apple (Model: A1265 Serial: 1X334606V18QY) AC/DC Power Supply
Test Engineer	:	D. Sherman
Limit	:	Class B
Test Date	:	Jul 14, 2021 12:51:50 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Connected
Line Tested	:	115V, 60Hz Neutral (LISN ID: PLF1)
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	With Apple (Model: A1265 Serial: 1X334606V18QY) AC/DC Power Supply
Test Engineer	:	D. Sherman
Limit	:	Class B
Test Date	:	Jul 14, 2021 12:45:12 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

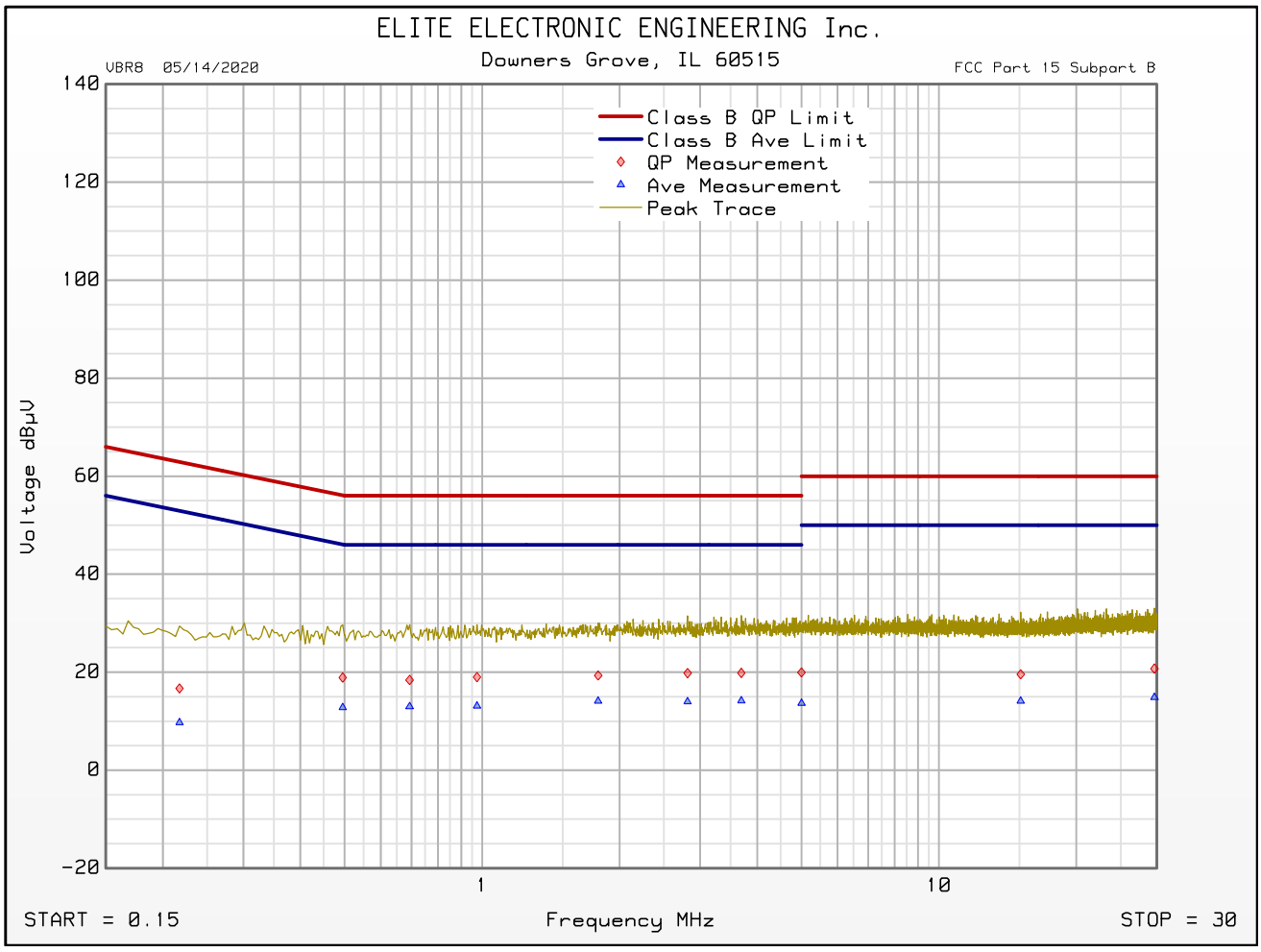
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.218	16.7	62.9		9.7	52.9	
0.495	18.9	56.1		12.8	46.1	
0.694	18.4	56.0		13.0	46.0	
0.975	19.0	56.0		13.1	46.0	
1.795	19.3	56.0		14.1	46.0	
2.817	19.8	56.0		14.0	46.0	
5.000	19.9	56.0		13.7	46.0	
15.107	19.6	60.0		14.1	50.0	
29.642	20.7	60.0		14.9	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Connected
Line Tested	:	115V, 60Hz Neutral (LISN ID: PLF1)
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	With Apple (Model: A1265 Serial: 1X334606V18QY) AC/DC Power Supply
Test Engineer	:	D. Sherman
Limit	:	Class B
Test Date	:	Jul 14, 2021 12:45:12 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

21. Receiver Radiated Emissions Test

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	No Advertising
Mode	Charging Disconnected

Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Highest Internal Frequency of the EUT:	2480MHz
Highest Measurement Frequency:	13GHz

Requirements

The field strength of radiated emissions from unintentional radiators at 3-meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (µV/m)
30-88	100
88-216	150
216-960	200
Above 960	500

Procedures

Since a quasi-peak detector and an average detector requires a long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector.

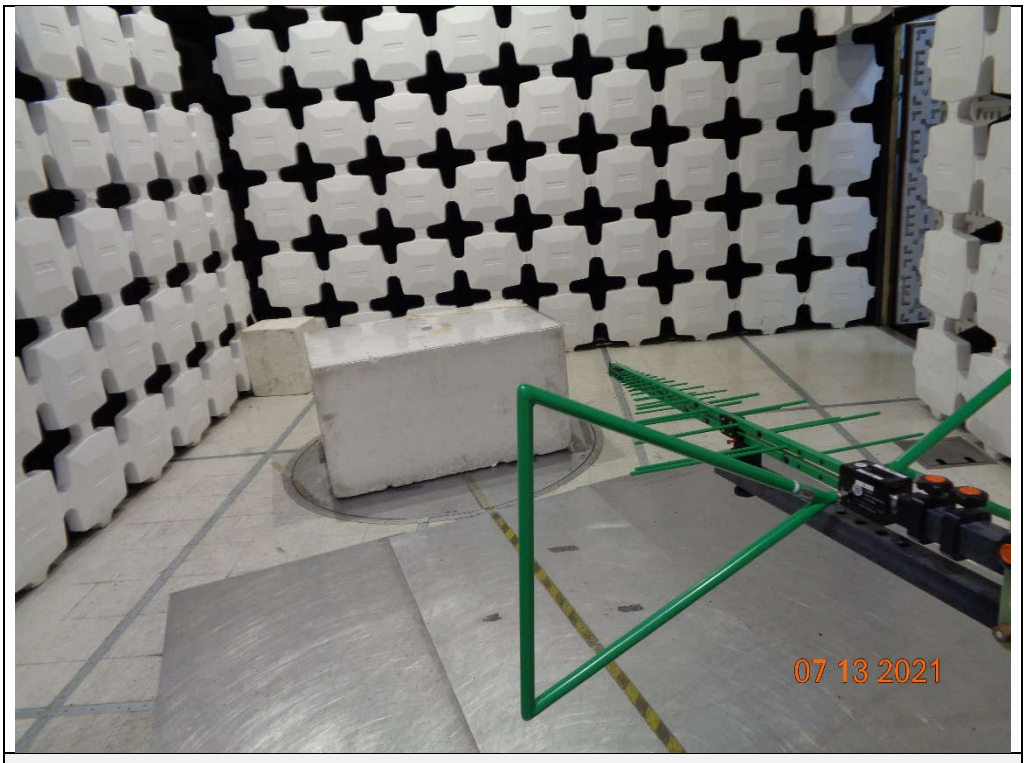
The EUT was placed on a non-conductive stand. The broadband measuring antenna was positioned at a 3-meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency ranges from 1GHz to 13GHz was investigated using a peak detector function with the double ridged waveguide antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the exploratory sweeps using the following methods:

1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.
2) To ensure that maximum or worst case, emission levels were measured, the following steps were

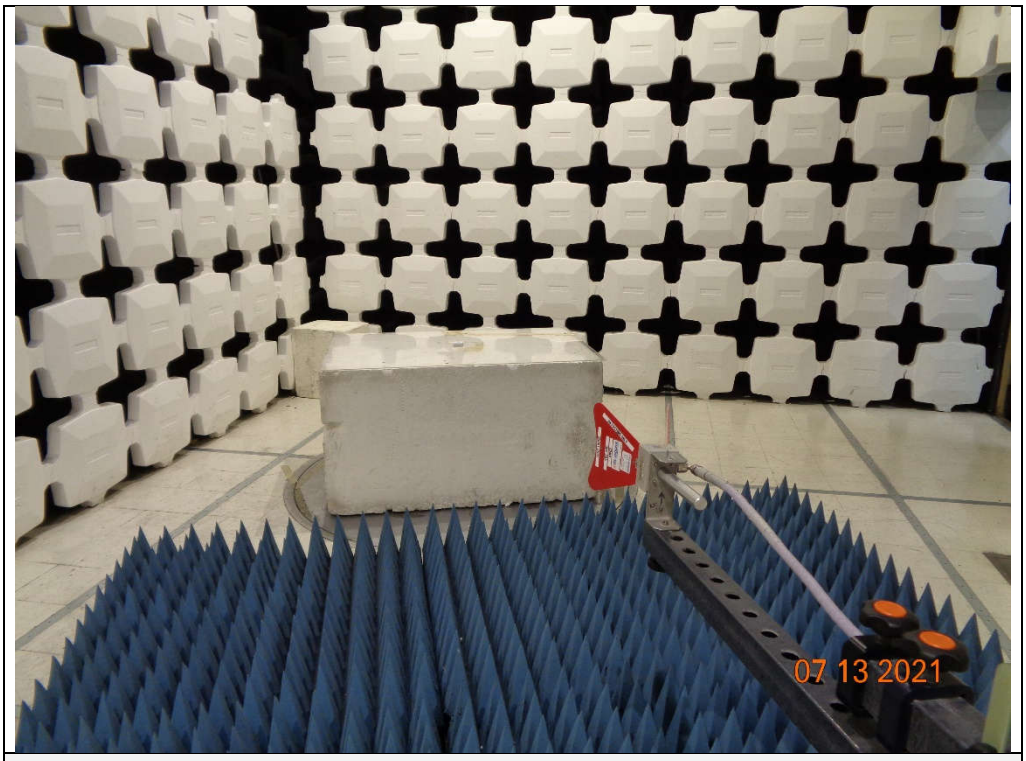
Procedures
taken: a) The EUT was rotated so that all sides were exposed to the receiving antenna. b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured. c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings. d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

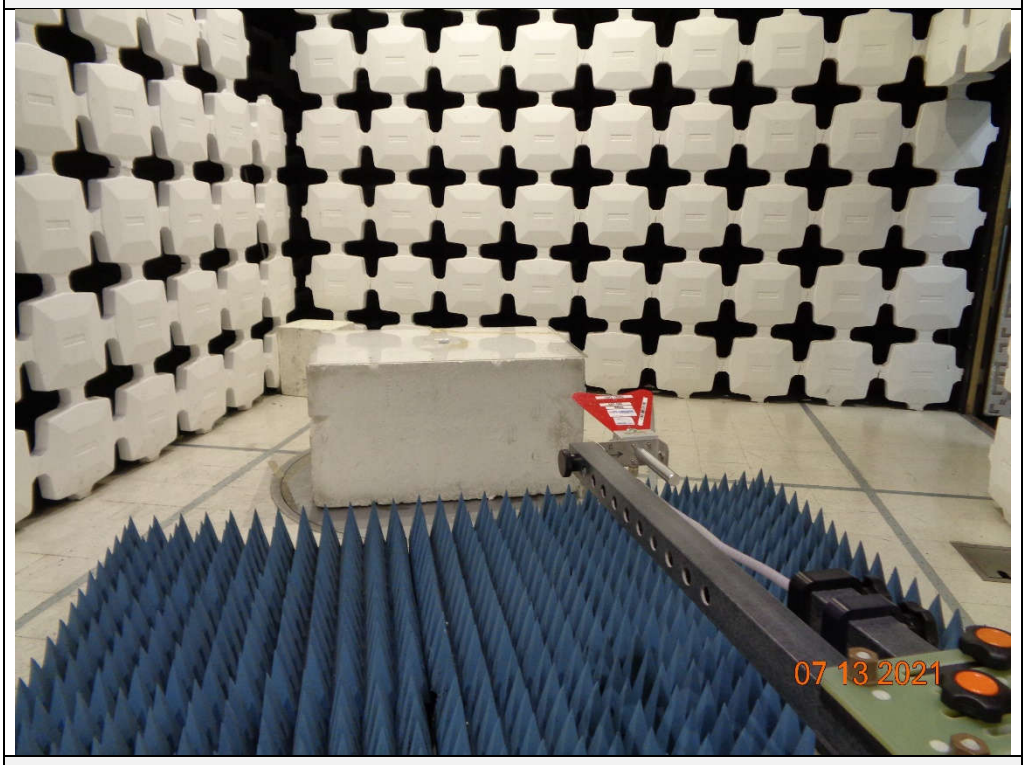


Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization

Test Setup for Radiated Emissions: 30MHz to 1GHz, Vertical Polarization



Test Setup for Radiated Emissions: 1GHz to 18GHz, Horizontal Polarization



Test Setup for Radiated Emissions: 1GHz to 18GHz, Vertical Polarization

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

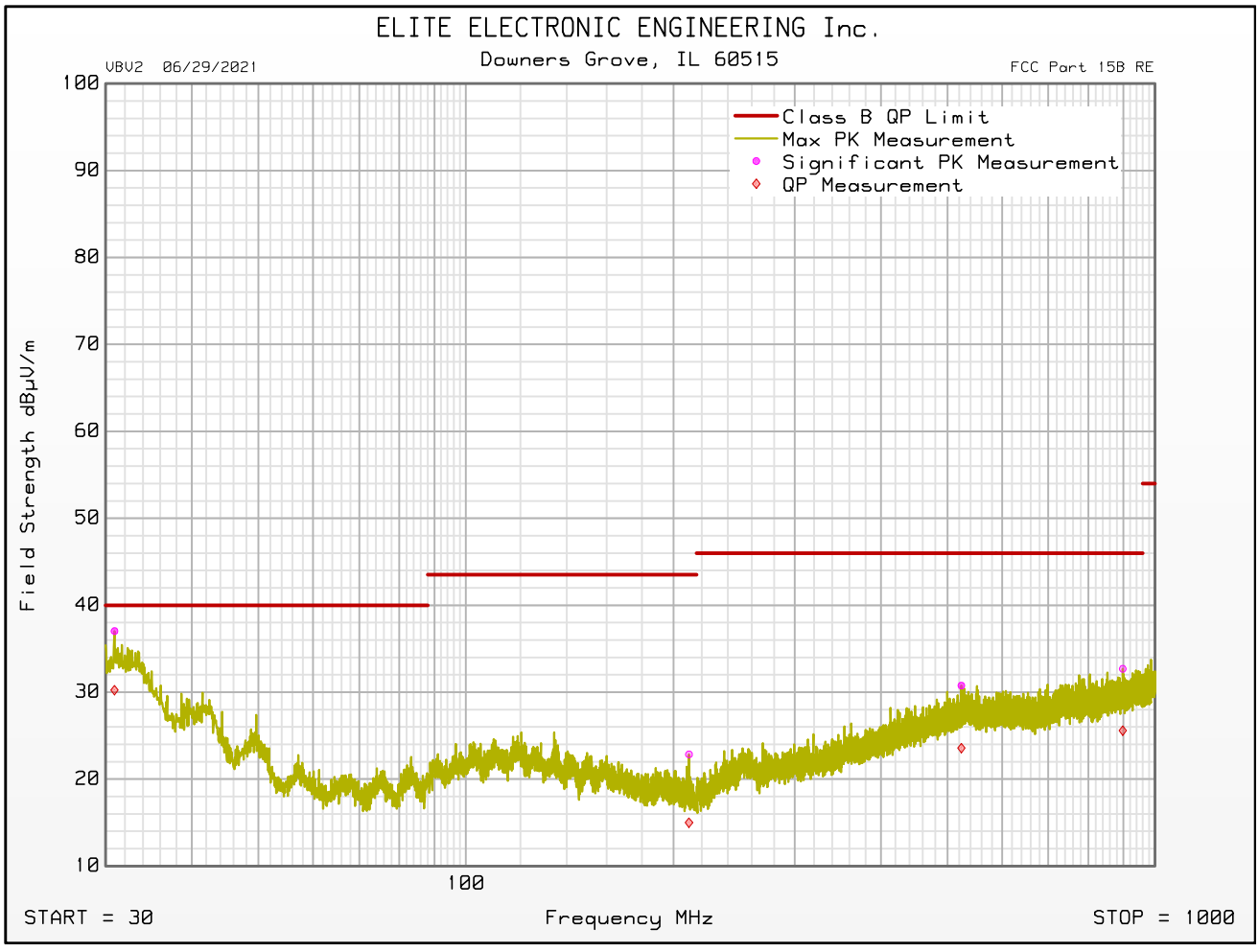
Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 11:14:54 AM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
30.900	12.2	5.4	24.4	0.0	0.4	0.0	37.0	30.2	40.0	-9.8	Horizontal	340	315	
58.320	10.5	4.7	12.7	0.0	0.5	0.0	23.6	17.9	40.0	-22.1	Vertical	200	315	
110.820	7.3	1.1	17.7	0.0	0.7	0.0	25.7	19.5	43.5	-24.0	Vertical	200	225	
210.720	6.7	-1.1	15.2	0.0	0.9	0.0	22.8	15.0	43.5	-28.5	Horizontal	200	180	
523.520	4.8	-2.4	24.6	0.0	1.4	0.0	30.8	23.6	46.0	-22.4	Horizontal	120	180	
897.720	4.4	-2.7	26.5	0.0	1.8	0.0	32.7	25.6	46.0	-20.4	Horizontal	200	45	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

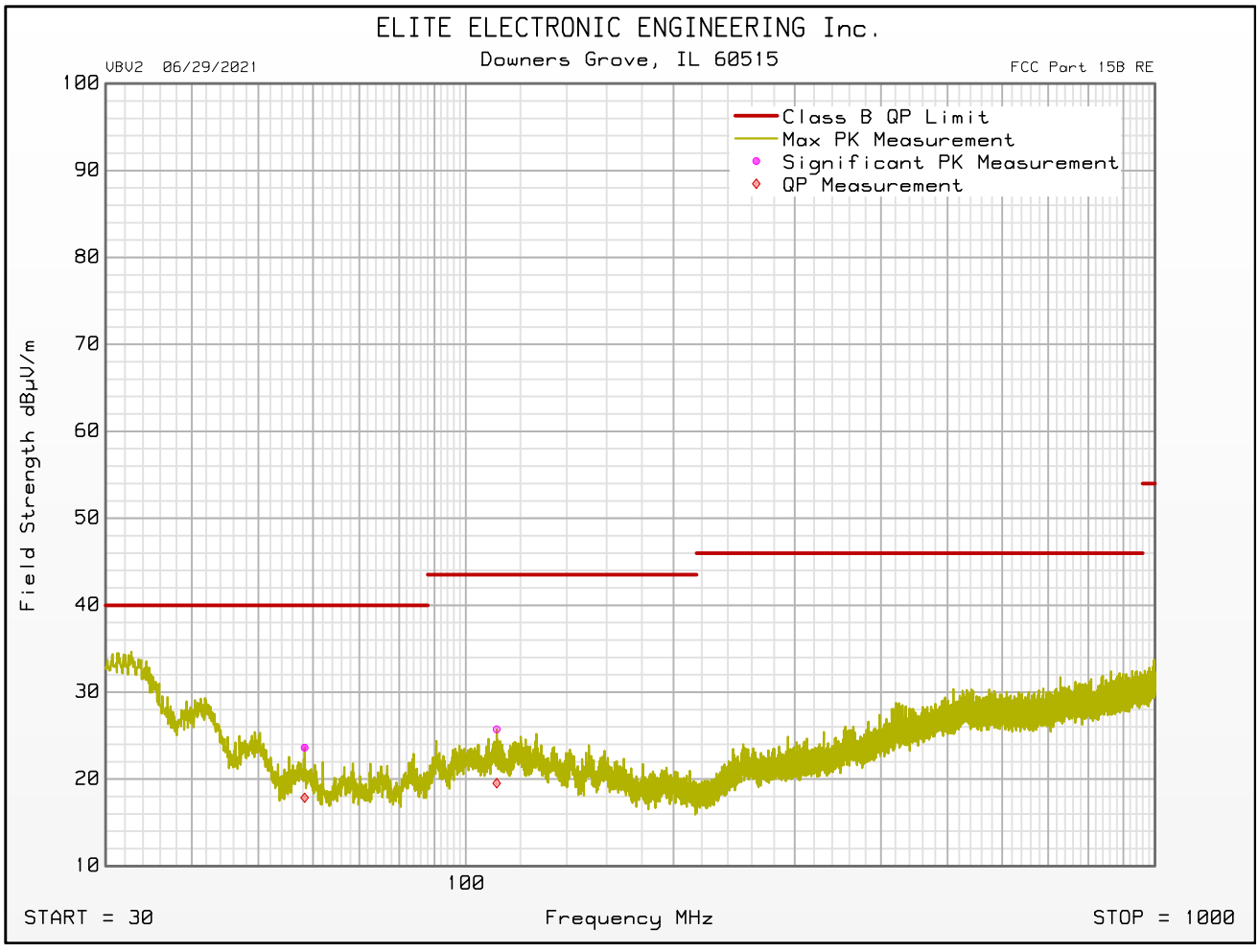
Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 11:14:54 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 11:14:54 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 12:31:39 PM

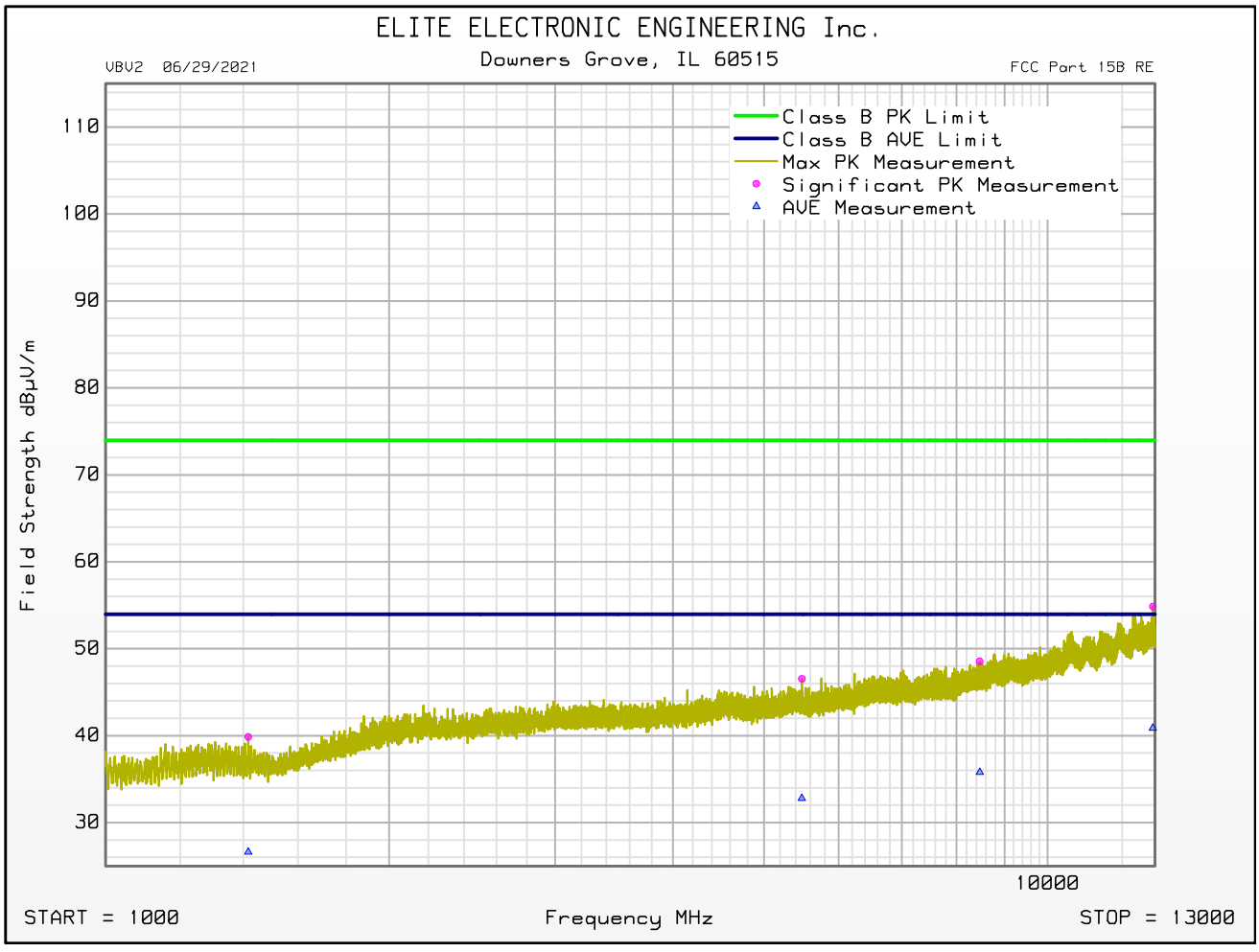
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
1417.000	49.4	28.4	-40.3	2.4	0.0	39.9	74.0	-34.1	Horizontal	340	270	
2072.000	48.7	31.9	-39.9	2.8	0.0	43.5	74.0	-30.5	Vertical	340	135	
2418.500	52.2	32.2	-40.2	3.0	0.0	47.2	74.0	-26.7	Vertical	120	0	
5484.000	46.9	34.7	-39.4	4.4	0.0	46.5	74.0	-27.4	Horizontal	340	135	
8467.500	46.3	36.2	-39.4	5.4	0.0	48.5	74.0	-25.4	Horizontal	340	180	
12930.500	47.7	38.7	-38.4	6.8	0.0	54.9	74.0	-19.1	Horizontal	340	90	

Freq MHz	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1417.000	36.2	28.4	-40.3	2.4	0.0	26.6	54.0	-27.4	Horizontal	340	270	
2072.000	34.8	31.9	-39.9	2.8	0.0	29.6	54.0	-24.3	Vertical	340	135	
2418.500	35.3	32.2	-40.2	3.0	0.0	30.3	54.0	-23.7	Vertical	120	0	
5484.000	33.2	34.7	-39.4	4.4	0.0	32.8	54.0	-21.2	Horizontal	340	135	
8467.500	33.5	36.2	-39.4	5.4	0.0	35.8	54.0	-18.2	Horizontal	340	180	
12930.500	33.7	38.7	-38.4	6.8	0.0	40.9	54.0	-13.1	Horizontal	340	90	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

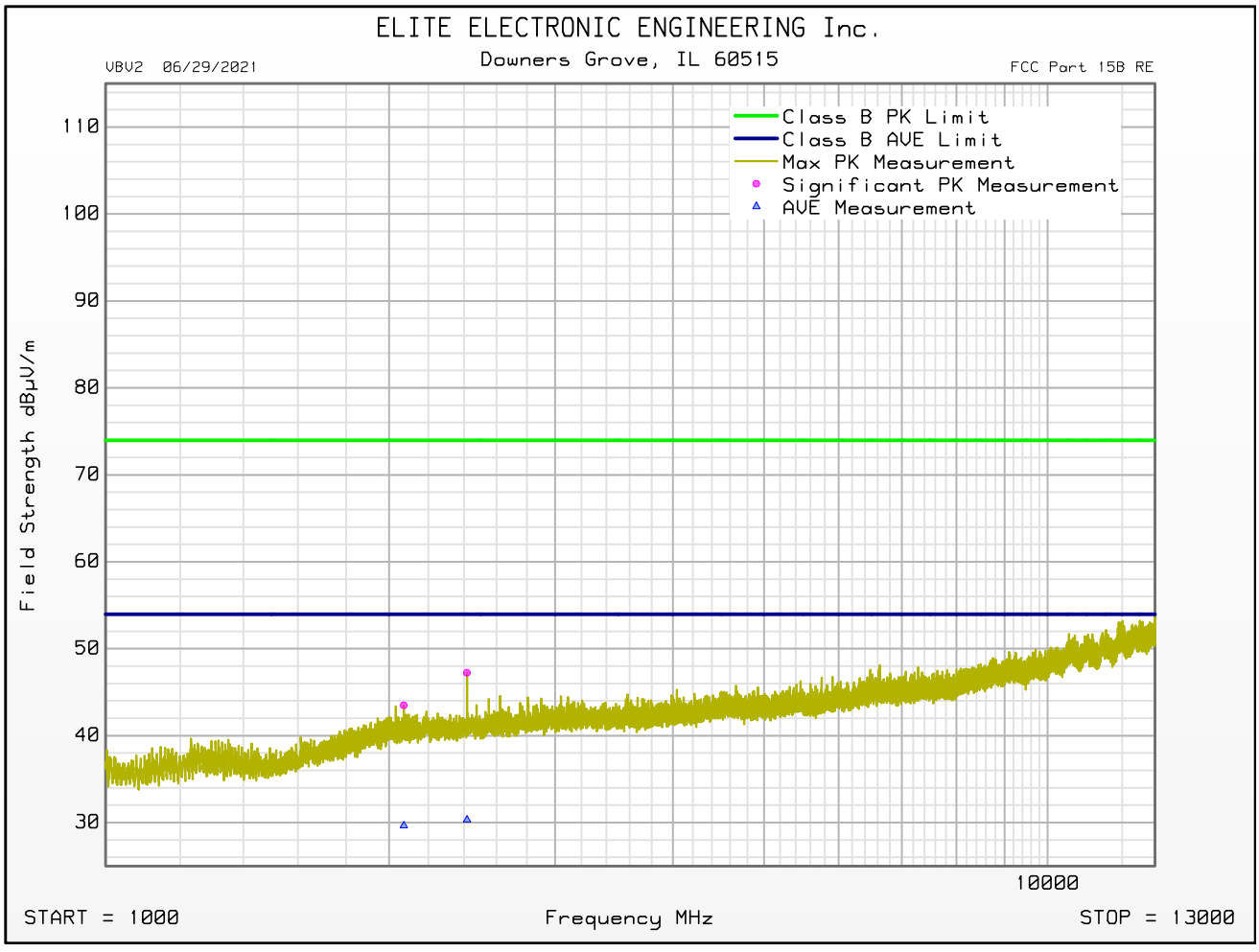
Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 12:31:39 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 06/29/2021

Manufacturer	:	HLT
Model	:	Fio Charger and Fio Earpieces
Serial Number	:	Not Advertising (Charger) and Silver & Black (Earpieces)
DUT Mode	:	Charging Disconnected
Turntable Step Angle (°)	:	45
Mast Positions (cm)	:	120, 200, 340
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	D. Sherman
Test Date	:	Jul 13, 2021 12:31:39 PM



22. 6dB Bandwidth

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

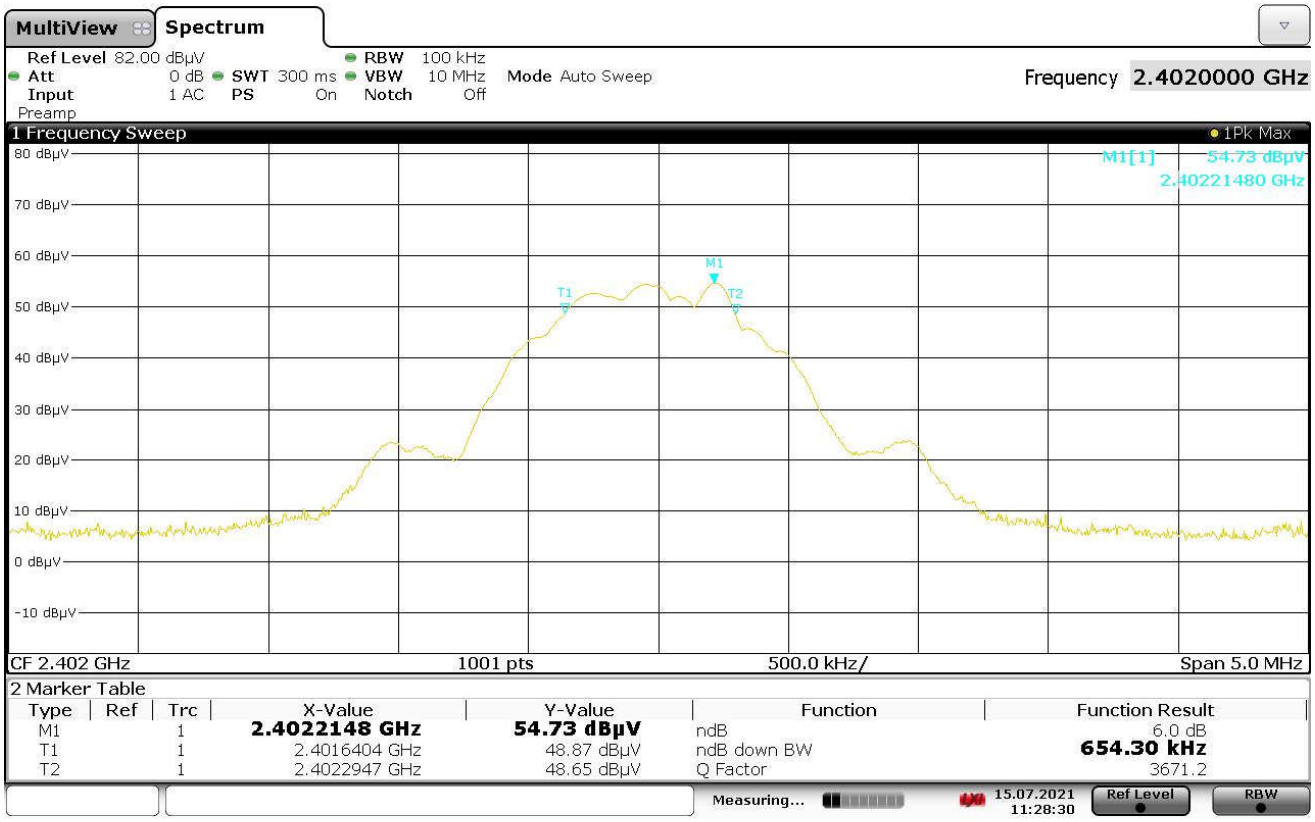
Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)

Requirements
Systems using digital modulation techniques shall have a minimum 6 dB bandwidth of 500 kHz

Procedures
The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz, the video bandwidth (VBW) was set to the same as or 3 times greater than the RBW, and the span was set to 3 times the RBW. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

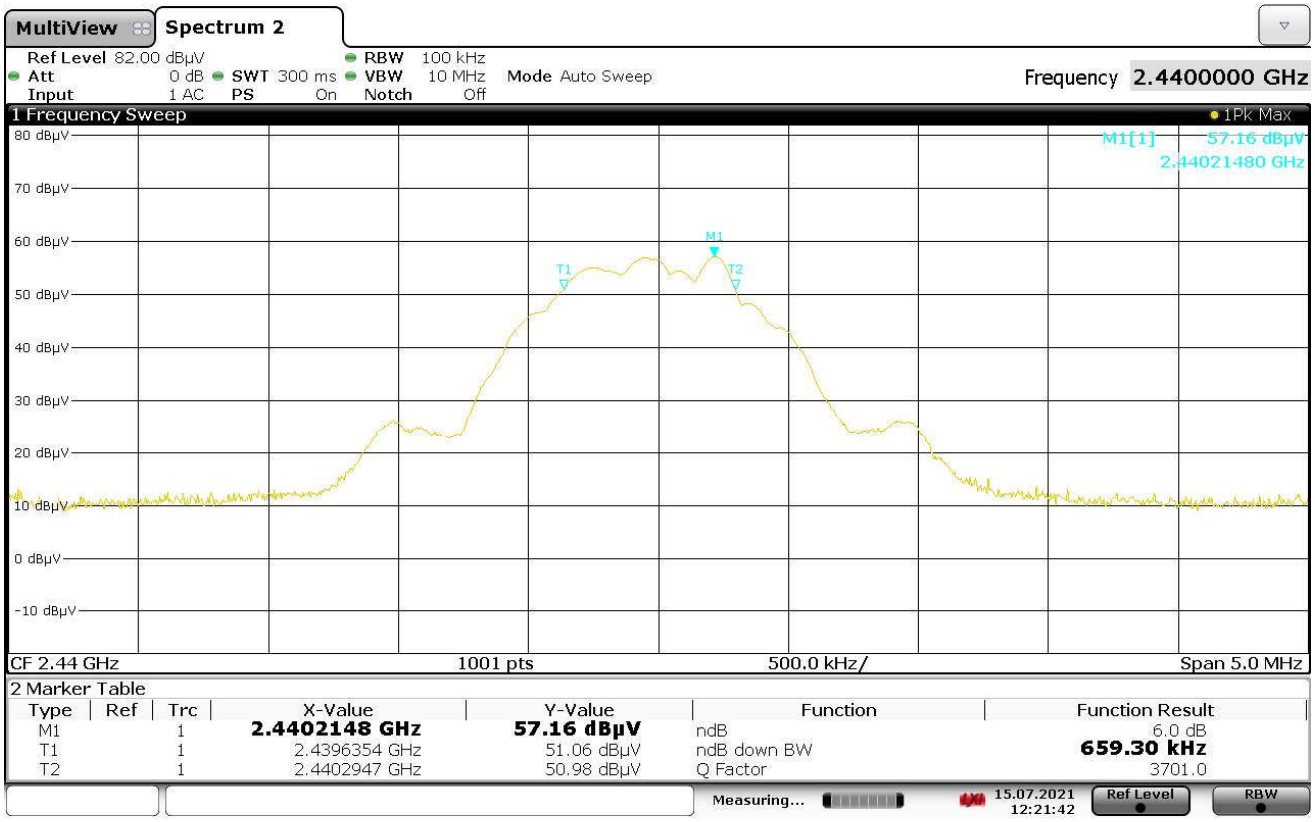
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	6dB BW = 654.30kHz



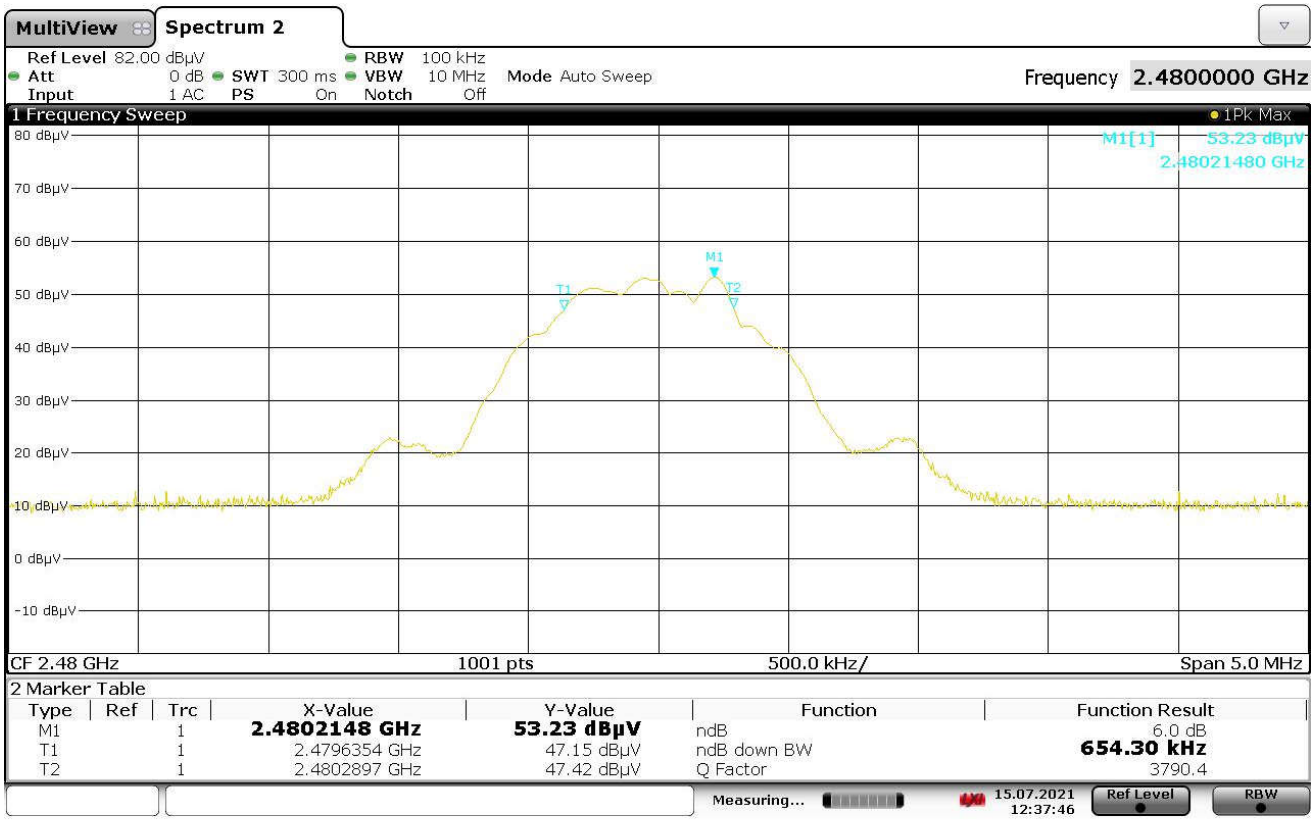
11:28:30 15.07.2021

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	6dB BW = 659.30kHz



12:21:42 15.07.2021

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	6dB BW = 654.30kHz



12:37:47 15.07.2021

23. Occupied Bandwidth (99%)

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)

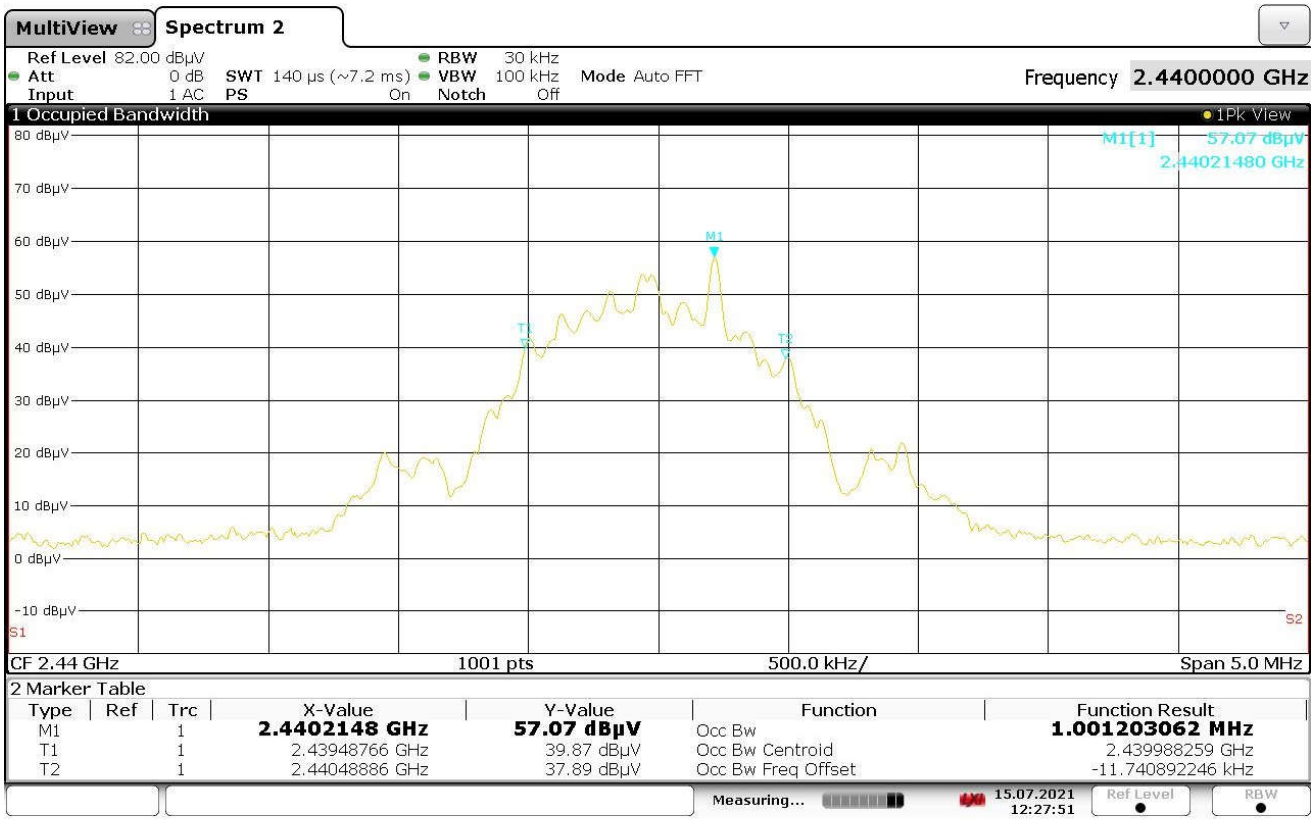
Procedures
The EUT was setup inside the chamber. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 1% to 5% of the actual occupied / x dB bandwidth, the video bandwidth (VBW) was set 3 times greater than the RBW, and the span was set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	OBW = 1.00MHz

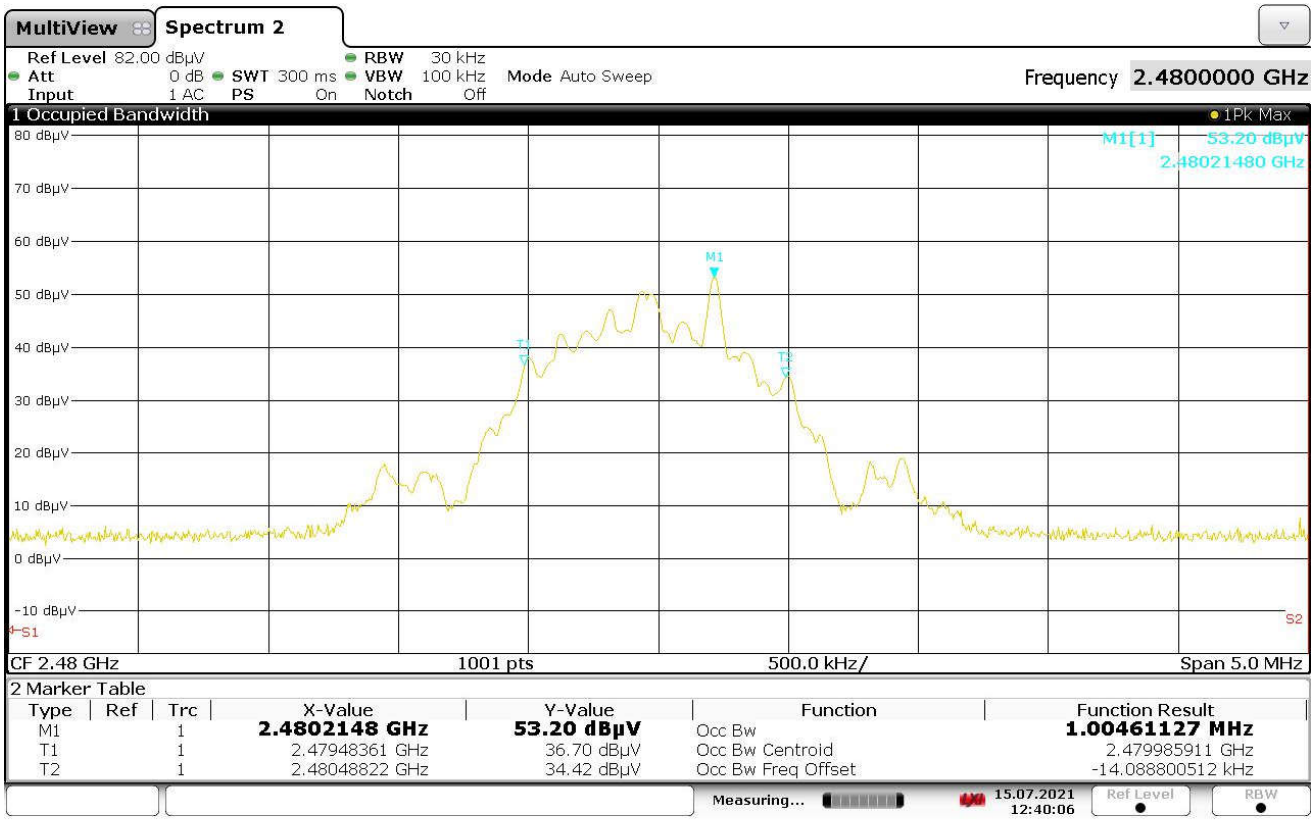
11:31:56 15.07.2021

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	OBW = 1.00MHz



12:27:52 15.07.2021

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	OBW = 1.00MHz



12:40:07 15.07.2021

24. Effective Isotropic Radiated Power (EIRP)

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

Test Setup Details	
Setup Format	Tabletop
Height of Support	Radiated
Measurement Method	Semi-Anechoic Chamber
Type of Test Site	Room 29
Test site used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Type of Antennas Used	Tabletop

Requirements
The output power shall not exceed 4W (36dBm).

Procedures
The EUT was placed on the non-conductive stand and set to transmit. A bilog antenna (double ridged waveguide antenna for all measurements above 1GHz) was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 6dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle and high channels. The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site)	3.3

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
(18 GHz – 26.5 GHz)	
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Notes	Measurements taken at 2MHz RBW

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2402.00	H	54.9	3.0	32.2	0.0	90.1	-4.9	36.0	-40.9
2402.00	V	52.3	3.0	32.2	0.0	87.5	-7.5	36.0	-43.5
2440.00	H	56.9	3.0	32.3	0.0	92.2	-2.8	36.0	-38.8
2440.00	V	53.6	3.0	32.3	0.0	88.9	-6.1	36.0	-42.1
2480.00	H	54.6	3.1	32.3	0.0	90.0	-5.0	36.0	-41.0
2480.00	V	50.5	3.1	32.3	0.0	85.8	-9.2	36.0	-45.2

25. Duty Cycle Factor Measurements

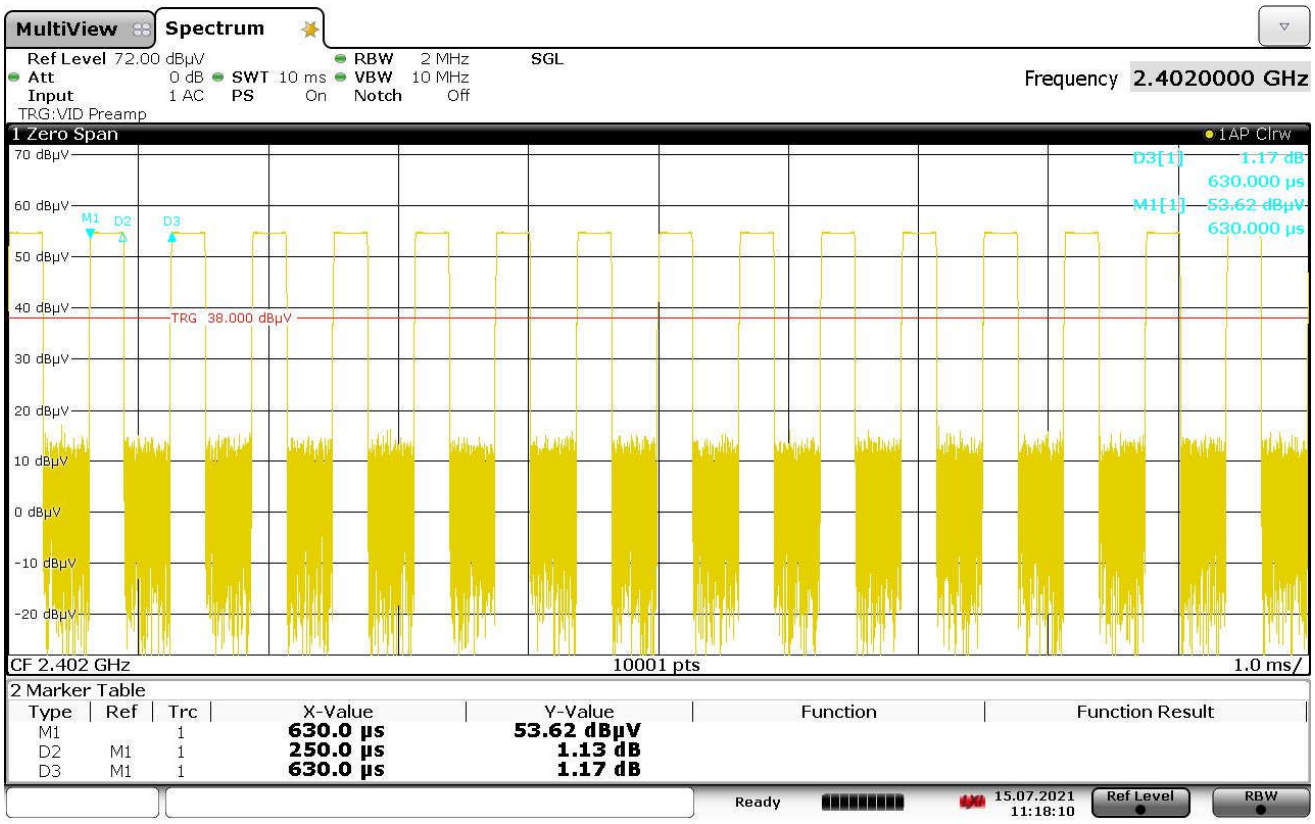
Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29

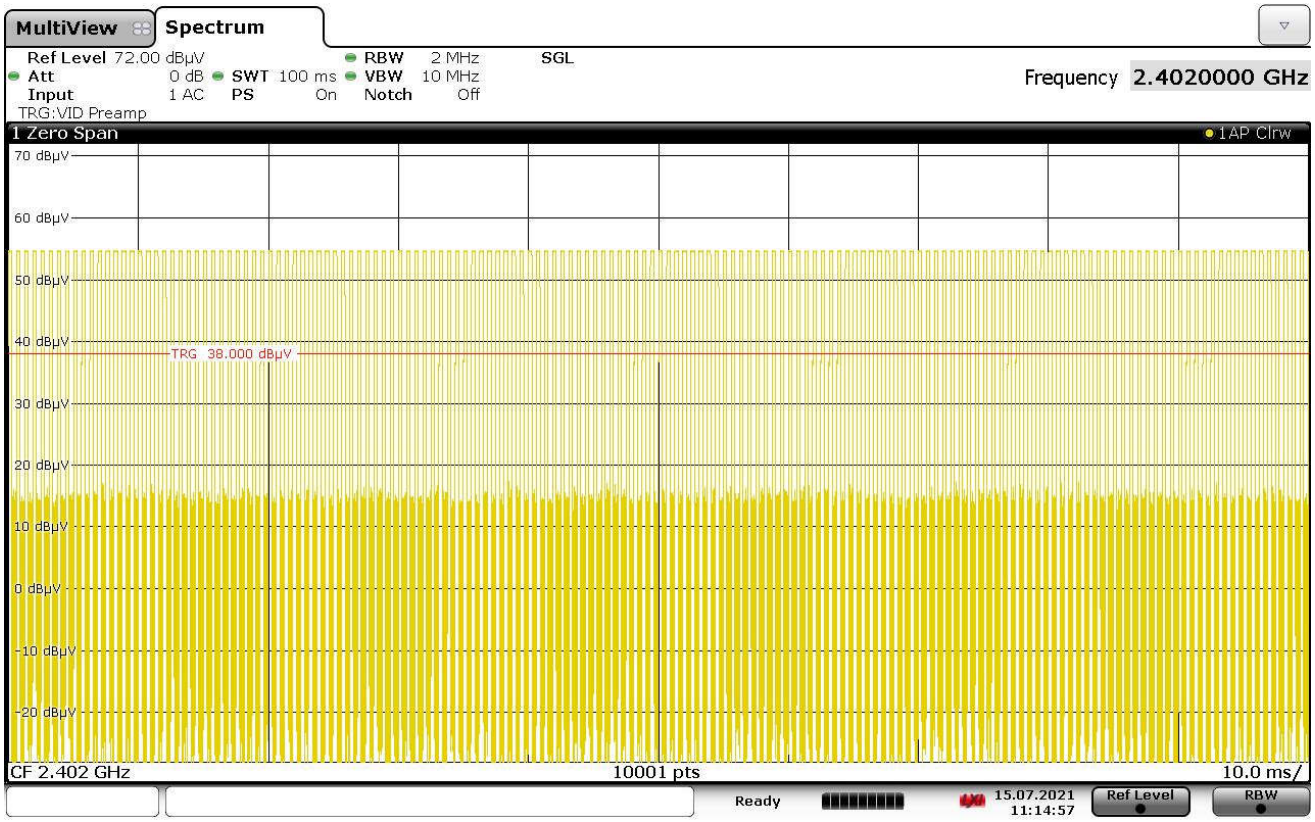
Procedures
The duty cycle factor is used to convert peak detected readings to average readings when pulsed modulation is employed. This factor is computed from the time domain trace of the pulse modulation signal. With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero-span width with 10msec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of the “on-time”. The trace is recorded. Next the spectrum analyzer center frequency is set to the transmitter frequency with a zero-span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	On time = 40ms



11:18:10 15.07.2021

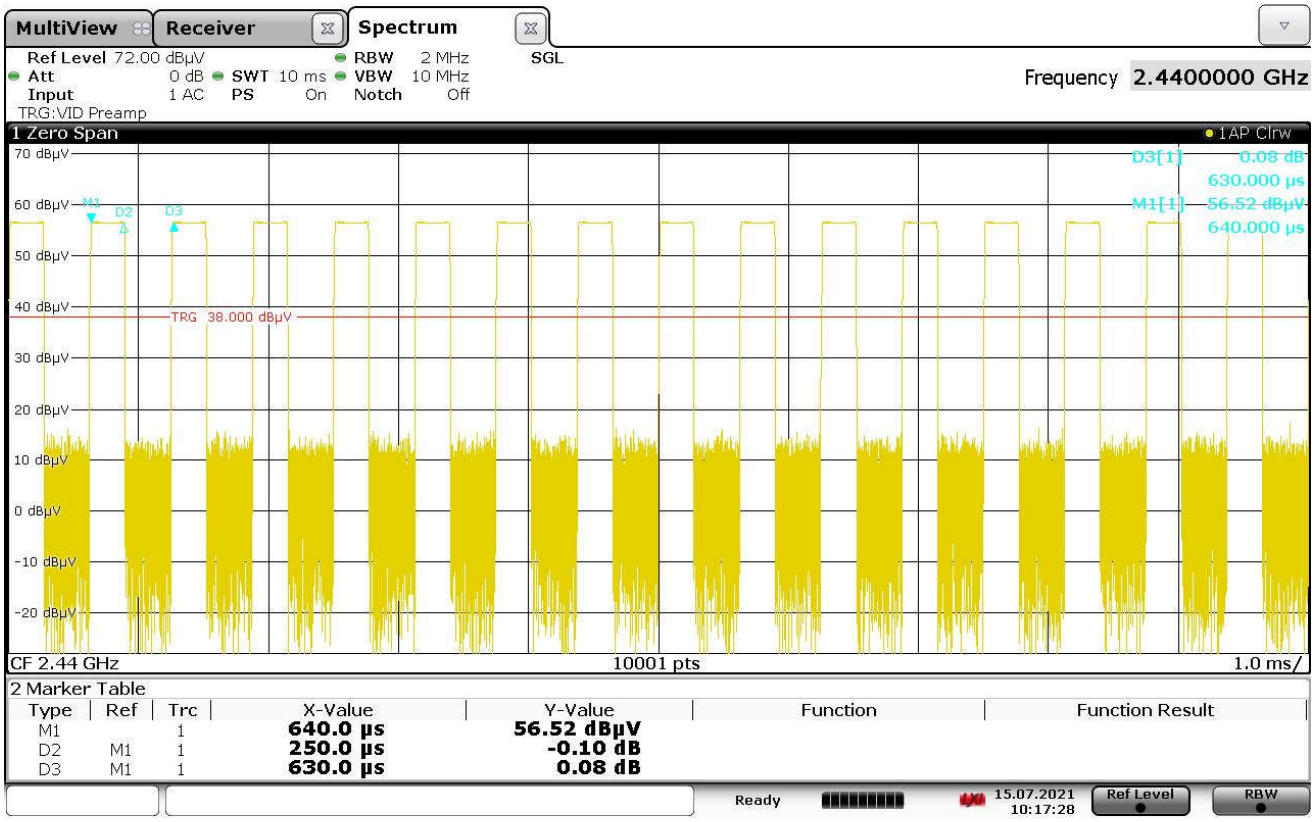


11:14:58 15.07.2021

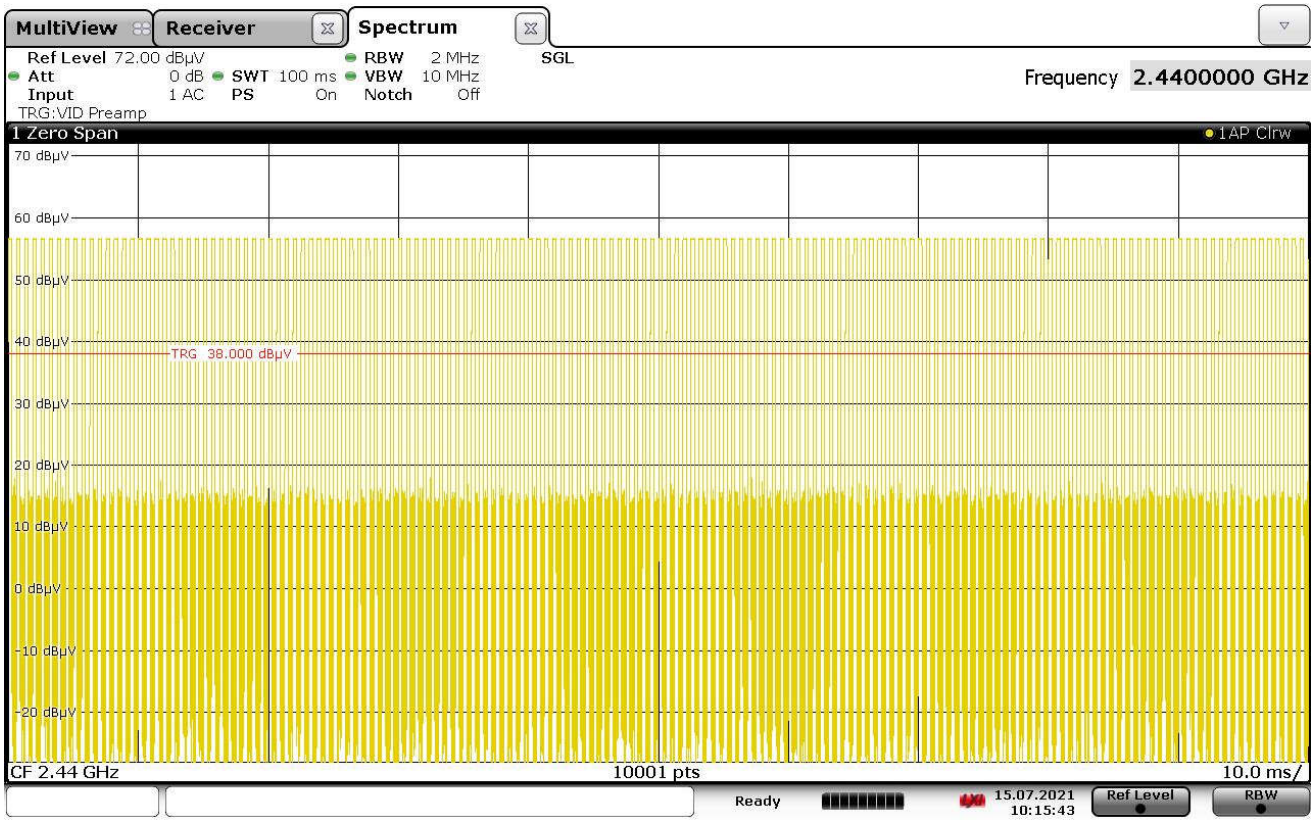
160 pulses within 100ms: On time = 160*250µs pulse width = 40ms

$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right)$ = -7.96dB

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	On time = 40ms



10:17:29 15.07.2021

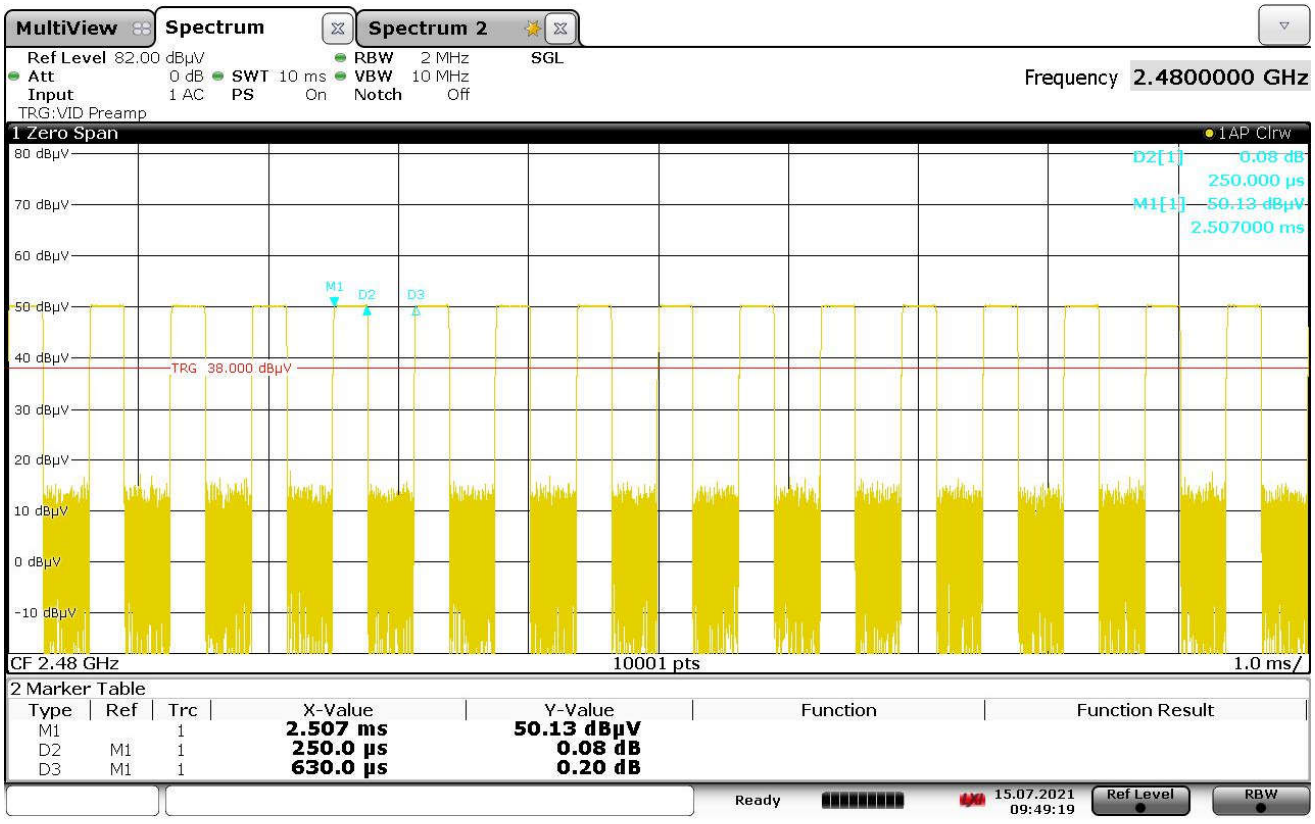


10:15:44 15.07.2021

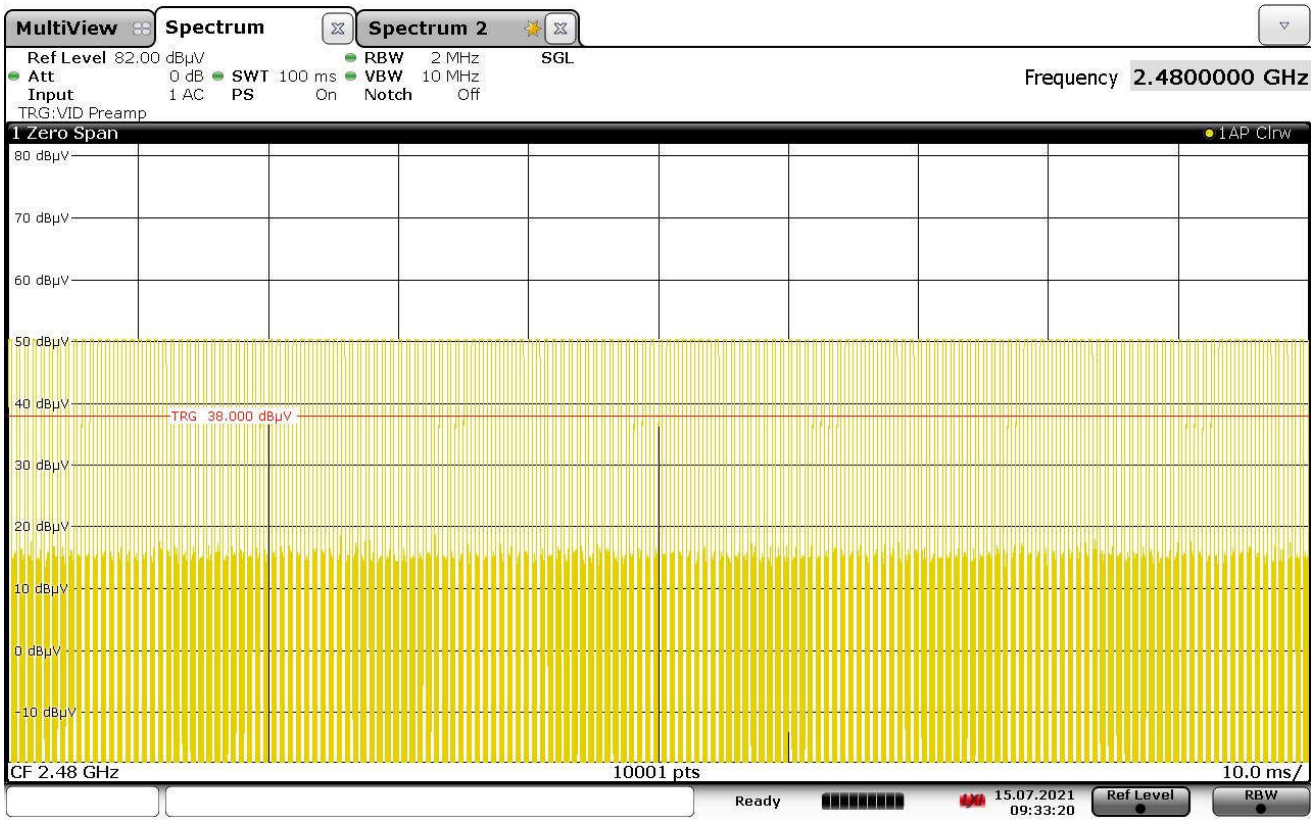
160 pulses within 100ms: On time = 160*250µs pulse width = 40ms

$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right)$ = -7.96dB

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	On time = 40ms



09:49:20 15.07.2021



09:33:21 15.07.2021

160 pulses within 100ms: On time = 160*250µs pulse width = 40ms

$\text{Duty Cycle Factor} = 20\log\left(\frac{On-Time}{100\text{msec}}\right)$ = -7.96dB

26. Spurious Radiated Emissions

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3-meter distance from the EUT. The entire frequency range from 30MHz to 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:

   a) The field strength of the fundamental was measured using a double ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the

Procedures

spectrum analyzer.

b) The field strengths of all the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

c) To ensure that maximum or worst-case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:

i) The EUT was rotated so that all its sides were exposed to the receiving antenna.

ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

d) All harmonics not in the restricted bands must be at least 20 dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.

2) For all emissions in the restricted bands, the following procedure was used:

a) The field strengths of all emissions below 1 GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.

b) The field strengths of all emissions above 1 GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a non-conductive stand. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.

c) To ensure that maximum or worst-case emission levels were measured, the following steps were taken when taking all measurements:

i) The EUT was rotated so that all its sides were exposed to the receiving antenna.

ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

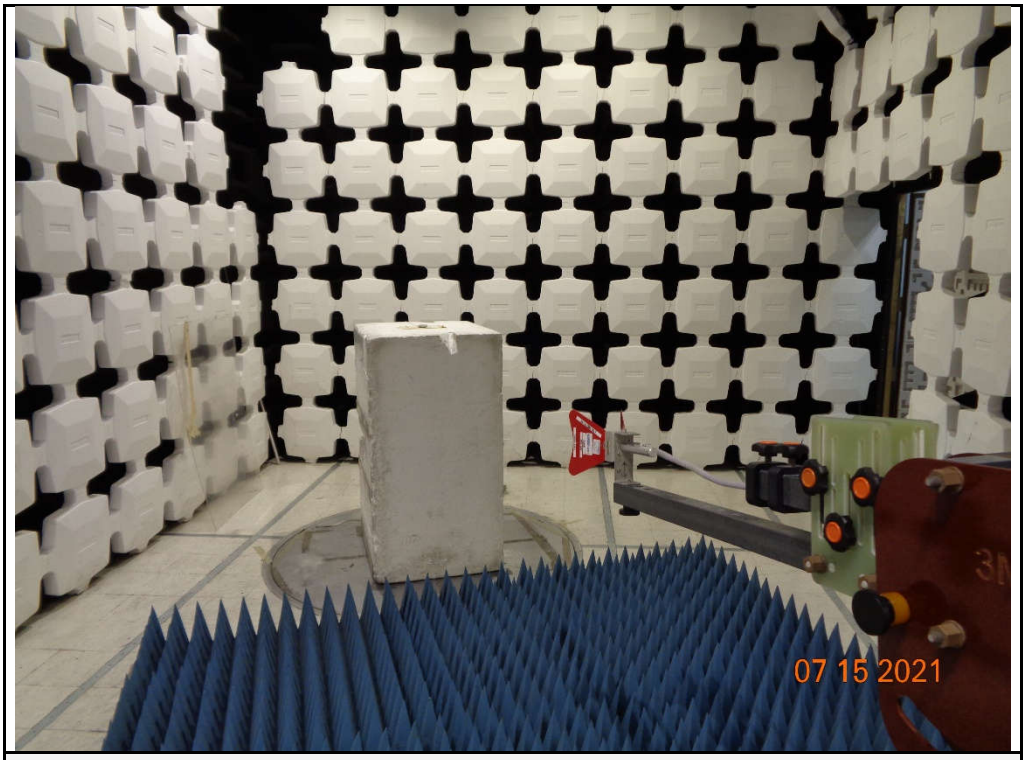
iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

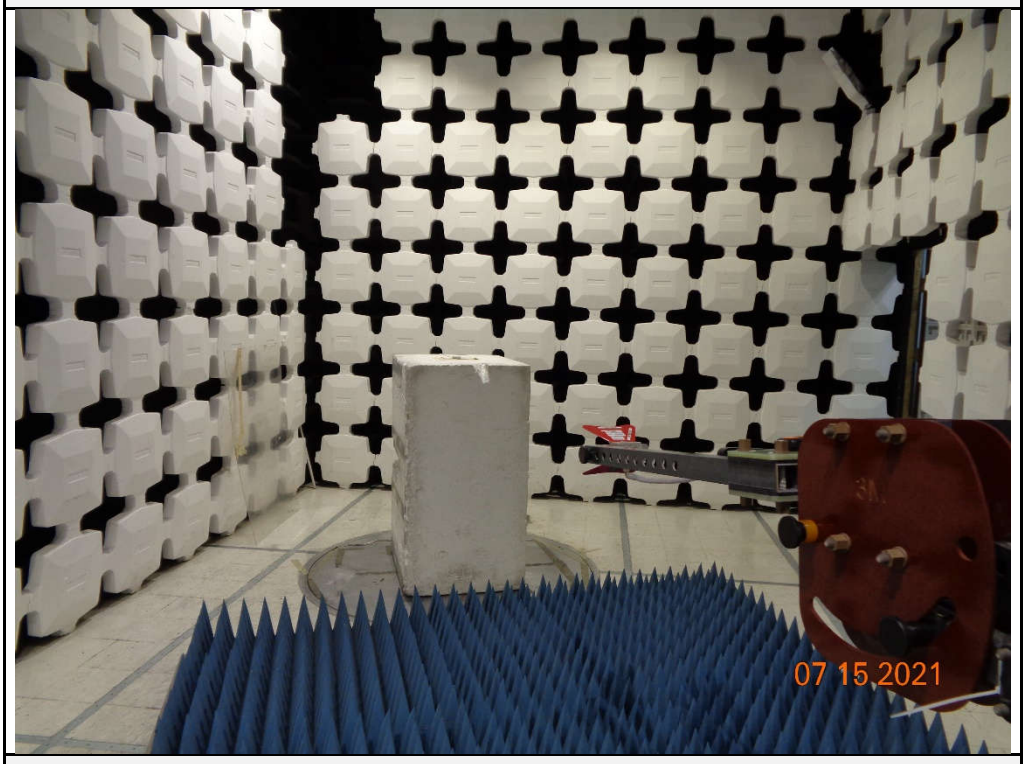
d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, the peak readings must comply with the 15.35(b) limits. 15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency

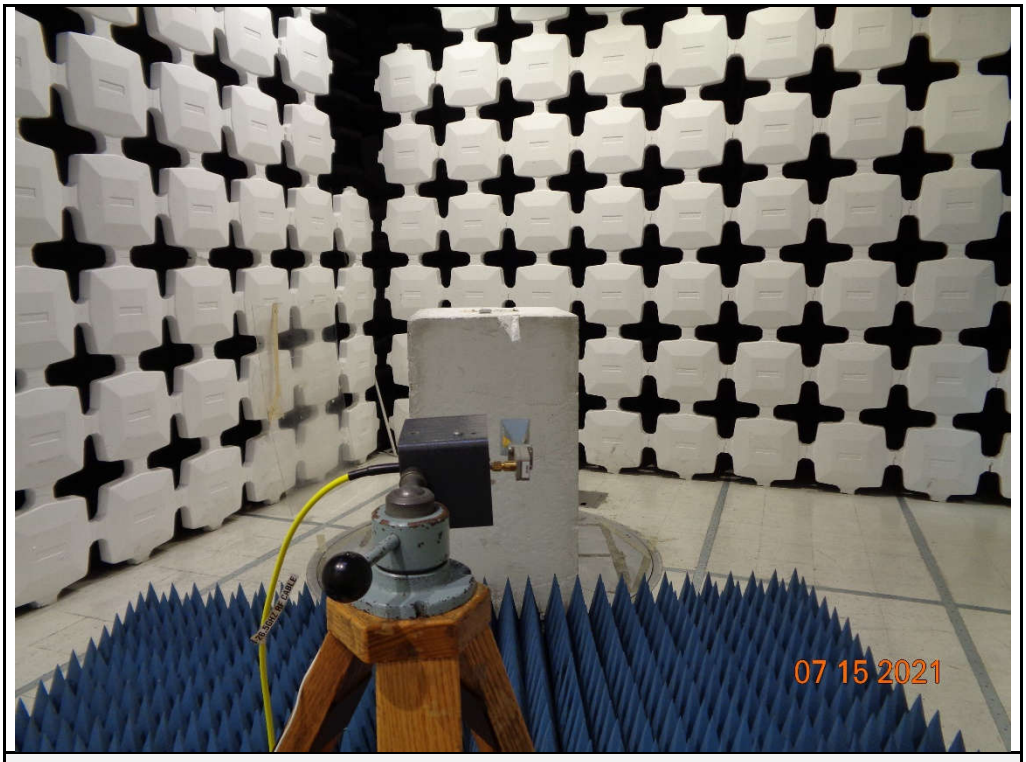
Procedures
emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a). f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth to simulate an average detector. An average reading was taken.



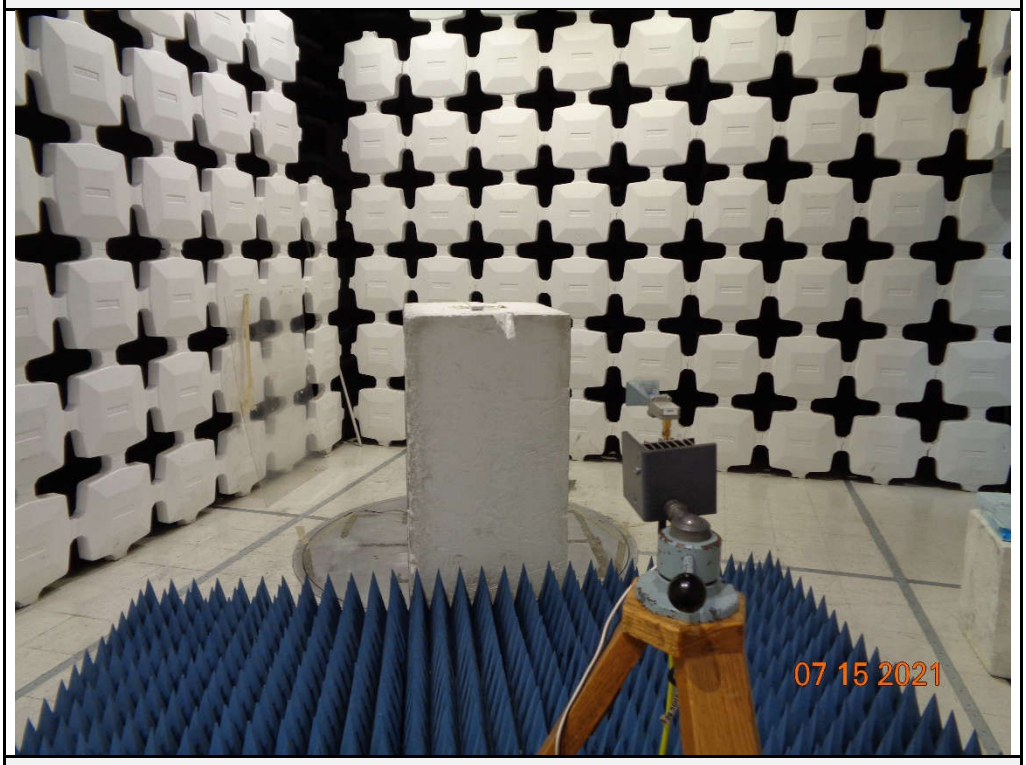
Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Vertical



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Vertical

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	Peak Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4804.00	H	49.3	*	4.2	34.2	-39.7	48.0	249.9	5000.0	-26.0
4804.00	V	48.9	*	4.2	34.2	-39.7	47.6	240.1	5000.0	-26.4
12010.00	H	47.4	*	6.6	38.7	-39.0	53.6	479.7	5000.0	-20.4
12010.00	V	47.8	*	6.6	38.7	-39.0	54.1	504.7	5000.0	-19.9
19216.00	H	30.5	*	2.2	40.4	-28.2	44.9	175.3	5000.0	-29.1
19216.00	V	30.4	*	2.2	40.4	-28.2	44.7	172.3	5000.0	-29.3

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	Average Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (db)	Ave Total dBuV/m at 3m	Ave Total uV/m at 3 m	Ave Limit uV/m at 3 m	Margin (dB)
4804.00	H	36.4	*	4.2	34.2	-39.7	8.0	43.0	141.7	500.0	-11.0
4804.00	V	36.3	*	4.2	34.2	-39.7	8.0	43.0	140.5	500.0	-11.0
12010.00	H	35.4	*	6.6	38.7	-39.0	8.0	49.6	302.0	500.0	-4.4
12010.00	V	35.5	*	6.6	38.7	-39.0	8.0	49.7	306.2	500.0	-4.3
19216.00	H	15.9	*	2.2	40.4	-28.2	8.0	38.2	81.4	500.0	-15.8
19216.00	V	15.9	*	2.2	40.4	-28.2	8.0	38.2	81.3	500.0	-15.8

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	Peak Measurements not in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2402.00	H	54.7		3.0	32.2	0.0	89.9	31360.1		
2402.00	V	51.9		3.0	32.2	0.0	87.0	22510.1		
7206.00	H	37.8	*	5.0	35.9	-39.7	39.0	89.5	3136.0	-30.9
7206.00	V	37.8	*	5.0	35.9	-39.7	39.1	89.8	3136.0	-30.9
9608.00	H	38.5	*	5.8	36.8	-39.3	41.8	123.6	3136.0	-28.1
9608.00	V	37.0	*	5.8	36.8	-39.3	40.3	103.8	3136.0	-29.6
14412.00	H	38.3	*	7.3	39.5	-38.6	46.5	211.7	3136.0	-23.4
14412.00	V	38.2	*	7.3	39.5	-38.6	46.4	209.8	3136.0	-23.5
16814.00	H	37.2	*	7.9	42.0	-37.4	49.7	304.4	3136.0	-20.3
16814.00	V	36.7	*	7.9	42.0	-37.4	49.2	288.3	3136.0	-20.7
21618.00	H	20.8	*	2.2	40.6	-28.5	35.1	57.0	3136.0	-34.8
21618.00	V	20.8	*	2.2	40.6	-28.5	35.2	57.2	3136.0	-34.8
24020.00	H	21.6	*	2.2	40.6	-29.3	35.1	57.2	3136.0	-34.8
24020.00	V	21.5	*	2.2	40.6	-29.3	35.1	56.6	3136.0	-34.9

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	Peak Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4880.00	H	49.5	*	4.2	34.2	-39.6	48.2	256.9	5000.0	-25.8
4880.00	V	48.7	*	4.2	34.2	-39.6	47.4	234.6	5000.0	-26.6
7320.00	H	48.6	*	5.1	35.8	-39.6	49.8	310.4	5000.0	-24.1
7320.00	V	48.2	*	5.1	35.8	-39.6	49.4	296.8	5000.0	-24.5
12200.00	H	48.8	*	6.7	38.6	-38.9	55.2	574.3	5000.0	-18.8
12200.00	V	49.3	*	6.7	38.6	-38.9	55.7	611.9	5000.0	-18.2
19520.00	H	30.9	*	2.2	40.4	-27.8	45.7	193.7	5000.0	-28.2
19520.00	V	30.8	*	2.2	40.4	-27.8	45.7	192.6	5000.0	-28.3

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	Average Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (db)	Ave Total dBuV/m at 3m	Ave Total uV/m at 3 m	Ave Limit uV/m at 3 m	Margin (dB)
4880.00	H	34.1	*	4.2	34.2	-39.6	8.0	40.8	109.9	500.0	-13.2
4880.00	V	33.8	*	4.2	34.2	-39.6	8.0	40.5	106.3	500.0	-13.4
7320.00	H	33.2	*	5.1	35.8	-39.6	8.0	42.5	133.6	500.0	-11.5
7320.00	V	33.2	*	5.1	35.8	-39.6	8.0	42.5	133.4	500.0	-11.5
12200.00	H	33.6	*	6.7	38.6	-38.9	8.0	47.9	249.7	500.0	-6.0
12200.00	V	33.5	*	6.7	38.6	-38.9	8.0	47.9	249.4	500.0	-6.0
19520.00	H	16.4	*	2.2	40.4	-27.8	8.0	39.2	91.6	500.0	-14.7
19520.00	V	16.4	*	2.2	40.4	-27.8	8.0	39.2	91.4	500.0	-14.8

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz
Parameters	Peak Measurements not in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2440.00	H	56.6		3.0	32.3	0.0	92.0	39668.7		
2440.00	V	53.1		3.0	32.3	0.0	88.5	26542.9		
9760.00	H	37.4	*	5.9	37.1	-39.3	41.1	114.0	3966.9	-30.8
9760.00	V	37.4	*	5.9	37.1	-39.3	41.1	114.0	3966.9	-30.8
14640.00	H	37.8	*	7.5	39.8	-38.6	46.4	209.9	3966.9	-25.5
14640.00	V	38.7	*	7.5	39.8	-38.6	47.3	232.3	3966.9	-24.6
17080.00	H	36.8	*	8.1	41.7	-37.4	49.1	286.4	3966.9	-22.8
17080.00	V	37.1	*	8.1	41.7	-37.4	49.5	297.5	3966.9	-22.5
21960.00	H	20.3	*	2.2	40.6	-28.9	34.2	51.0	3966.9	-37.8
21960.00	V	21.5	*	2.2	40.6	-28.9	35.4	59.2	3966.9	-36.5
24400.00	H	21.6	*	2.2	40.6	-29.3	35.1	57.0	3966.9	-36.9
24400.00	V	21.3	*	2.2	40.6	-29.3	34.8	55.1	3966.9	-37.1

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	Peak Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4960.00	H	49.5	*	4.2	34.2	-39.6	48.2	257.7	5000.0	-25.8
4960.00	V	48.6	*	4.2	34.2	-39.6	47.4	233.4	5000.0	-26.6
7440.00	H	48.2	*	5.1	35.8	-39.6	49.6	302.1	5000.0	-24.4
7440.00	V	48.6	*	5.1	35.8	-39.6	50.0	314.9	5000.0	-24.0
12400.00	H	47.1	*	6.7	38.6	-38.8	53.7	482.0	5000.0	-20.3
12400.00	V	46.7	*	6.7	38.6	-38.8	53.2	459.3	5000.0	-20.7
19840.00	H	31.0	*	2.2	40.4	-28.0	45.6	190.2	5000.0	-28.4
19840.00	V	31.1	*	2.2	40.4	-28.0	45.7	191.8	5000.0	-28.3
22320.00	H	31.3	*	2.2	40.6	-28.8	45.3	184.4	5000.0	-28.7
22320.00	V	31.1	*	2.2	40.6	-28.8	45.1	179.5	5000.0	-28.9

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	Average Measurements in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (db)	Ave Total dBuV/m at 3m	Ave Total uV/m at 3 m	Ave Limit uV/m at 3 m	Margin (dB)
4960.00	H	34.0	*	4.2	34.2	-39.6	8.0	40.7	108.3	500.0	-13.3
4960.00	V	34.0	*	4.2	34.2	-39.6	8.0	40.7	107.9	500.0	-13.3
7440.00	H	32.7	*	5.1	35.8	-39.6	8.0	42.0	126.2	500.0	-12.0
7440.00	V	32.7	*	5.1	35.8	-39.6	8.0	42.1	127.0	500.0	-11.9
12400.00	H	31.5	*	6.7	38.6	-38.8	8.0	46.0	200.2	500.0	-7.9
12400.00	V	31.5	*	6.7	38.6	-38.8	8.0	46.0	199.3	500.0	-8.0
19840.00	H	16.5	*	2.2	40.4	-28.0	8.0	39.1	89.8	500.0	-14.9
19840.00	V	16.5	*	2.2	40.4	-28.0	8.0	39.0	89.5	500.0	-14.9
22320.00	H	16.7	*	2.2	40.6	-28.8	8.0	38.7	85.6	500.0	-15.3
22320.00	V	16.7	*	2.2	40.6	-28.8	8.0	38.6	84.9	500.0	-15.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	Peak Measurements not in the Restricted Bands

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2480.00	H	54.3		3.1	32.3	0.0	89.7	30546.7		
2480.00	V	50.4		3.1	32.3	0.0	85.8	19564.3		
9920.00	H	37.8	*	6.0	37.1	-39.2	41.7	121.7	3054.7	-28.0
9920.00	V	37.9	*	6.0	37.1	-39.2	41.9	123.8	3054.7	-27.8
14880.00	H	37.1	*	7.6	39.8	-38.5	45.9	198.1	3054.7	-23.8
14880.00	V	36.9	*	7.6	39.8	-38.5	45.8	194.0	3054.7	-23.9
17360.00	H	37.9	*	8.1	41.7	-37.4	50.2	324.0	3054.7	-19.5
17360.00	V	38.2	*	8.1	41.7	-37.4	50.5	335.0	3054.7	-19.2
24800.00	H	23.1	*	2.2	40.6	-29.3	36.7	68.1	3054.7	-33.0
24800.00	V	22.7	*	2.2	40.6	-29.3	36.2	64.7	3054.7	-33.5

27. Band-Edge Compliance

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Continuous Transmit

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29

Procedures

Low Band Edge

1. The EUT was setup inside the test chamber on a non-conductive stand.
2. A broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
3. The EUT was set to transmit continuously at the channel closest to the low band-edge.
4. The EUT was maximized for worst case emissions at the measuring antenna. The maximum meter reading was recorded.
5. To determine the band edge compliance, the following spectrum analyzer settings were used:
    a. Center frequency = low band-edge frequency.
    b. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
    c. Resolution bandwidth (RBW) ≥ 1% of the span.
    d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
    e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)
    f. The analyzer's display was plotted using a 'screen dump' utility.

High Band Edge

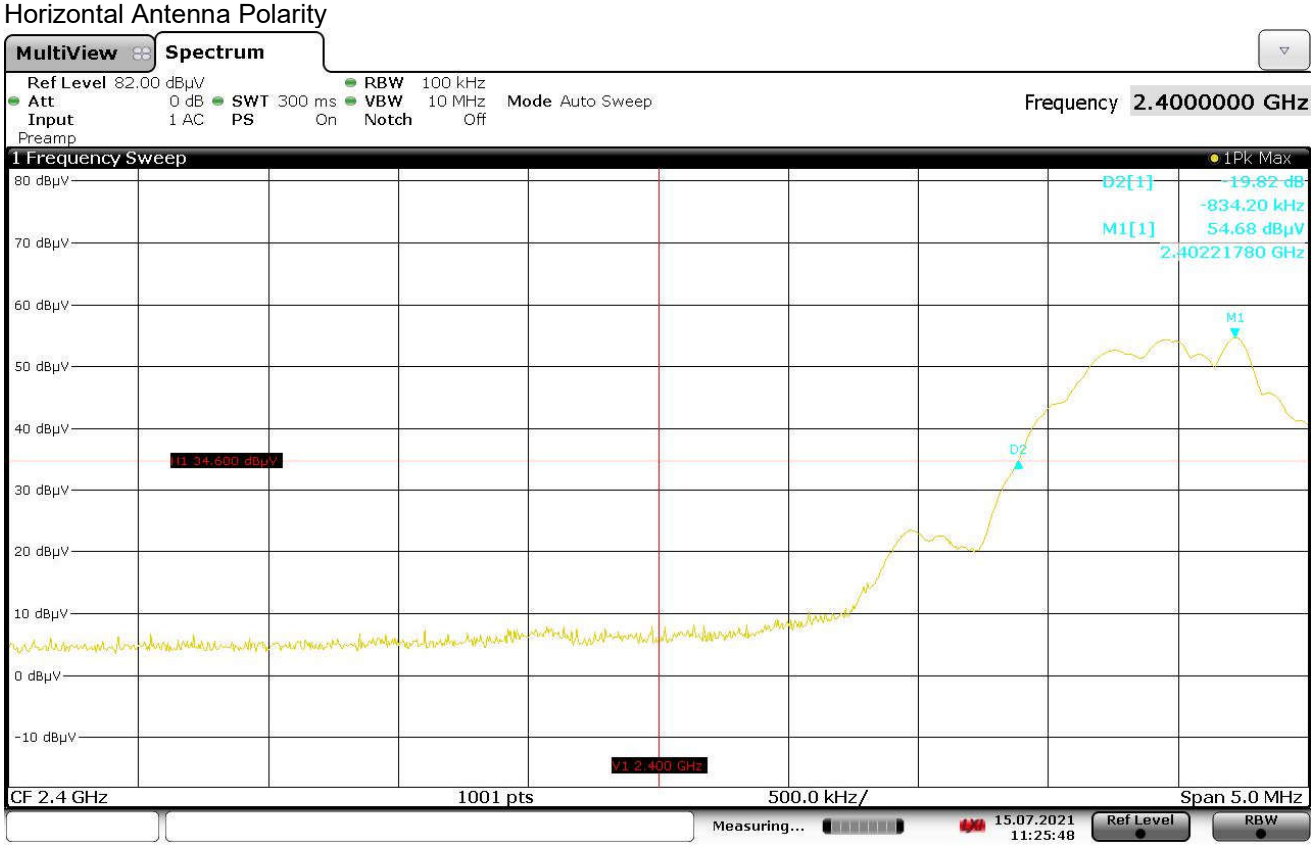
1. The EUT was set to transmit continuously at the channel closest to the high band-edge.
2. A double ridged waveguide was placed 3 meters away from the EUT. The antenna was connected to the input of a spectrum analyzer.
3. The center frequency of the analyzer was set to the high band edge (2483.5MHz)
4. The resolution bandwidth was set to 1MHz.
5. To ensure that the maximum or worst-case emission level was measured, the following steps were

Procedures
taken: a. The EUT was rotated so that all its sides were exposed to the receiving antenna. b. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured. c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings. 6. The highest measured peak reading was recorded. 7. The highest measured average reading was recorded.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz
Parameters	Low Band-Edge

Horizontal Antenna Polarity



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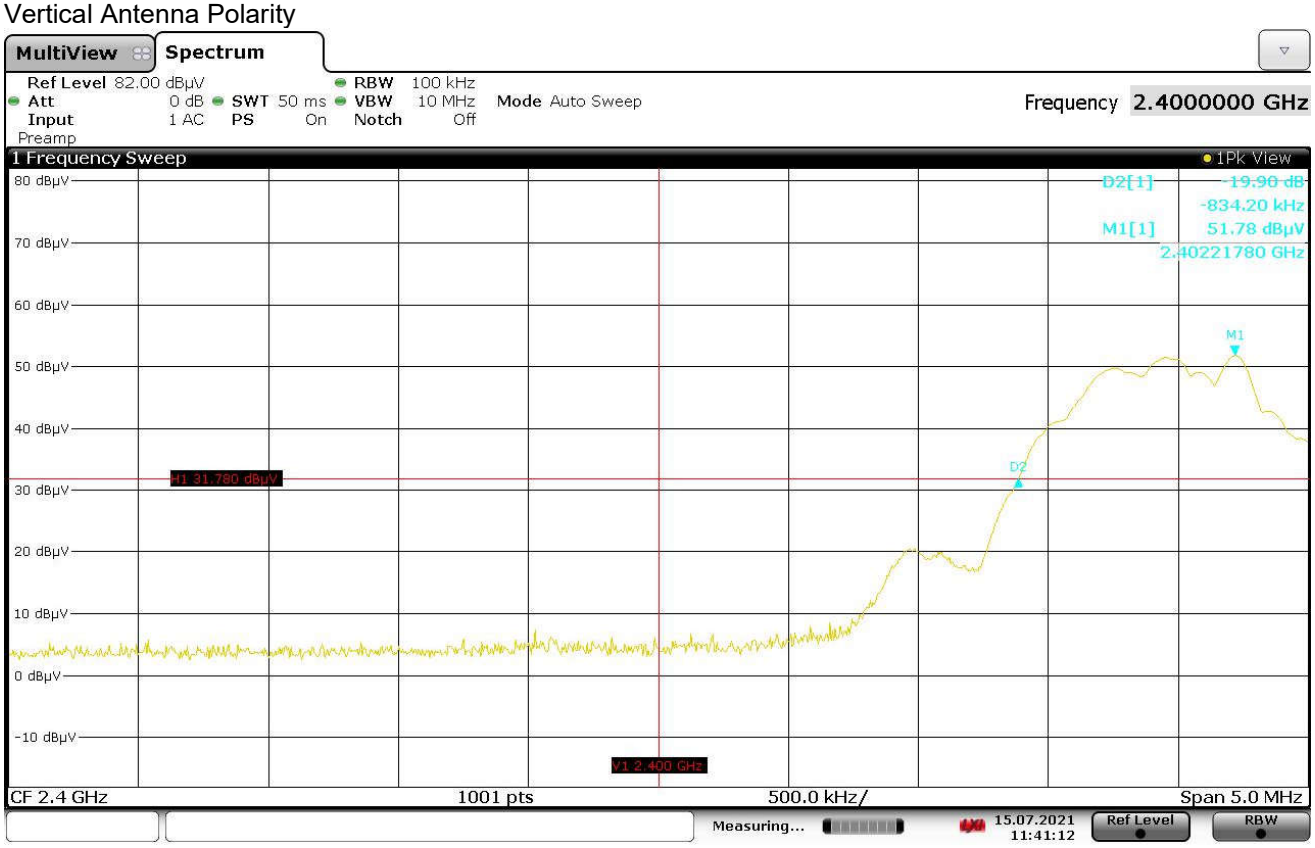
Vertical Antenna Polarity



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Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2480MHz
Parameters	High Band-Edge

Peak Measurements

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.51	H	19.1		3.1	32.3	0.0	54.5	530.7	5000.0	-19.5
2483.61	V	17.7		3.1	32.3	0.0	53.1	452.8	5000.0	-20.9

Average Measurements

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (db)	Ave Total dBuV/m at 3m	Ave Total uV/m at 3 m	Ave Limit uV/m at 3 m	Margin (dB)
2483.51	H	1.2		3.1	32.3	0.0	8.0	44.5	168.6	500.0	-9.4
2483.61	V	1.0		3.1	32.3	0.0	8.0	44.4	165.9	500.0	-9.6

28. Power Spectral Density

Test Information	
Manufacturer	Hearing Lab Technology LLC
Product	Hearing Aid & Charging Case
Model	Fio Charger
Serial No	Advertising
Mode	Charging Connected

Information	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test site used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)

Requirements
The power spectral density from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Procedures
The EUT was placed on the non-conductive stand and set to transmit continuously. A broadband measuring antenna was placed near the EUT. To determine the power spectral density, the following steps were followed: 1) Center frequency = transmit frequency 2) Span = 1.5 times the DTS (6 dB) bandwidth 3) Resolution bandwidth (RBW): > DTS (6 dB) bandwidth 4) Sweep time = auto 5) The peak detector and 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. 6) This reading corresponds to the peak output power. 7) Turn on the display line and place it at the corresponding +8dBm level. (e.g. if the peak output power is +18dBm then the +8dBm level will be 10dB down from the radiated level and if the peak output power is +6dBm then the +8dBm level will be 2dB above the radiated level.) 8) The resolution bandwidth (RBW) was then set to 3kHz ≤ RBW ≤ 100kHz. 9) The analyzer's display was plotted using a 'screen dump' utility. 10) This measurement corresponds to the power spectral density. 11) If the measured value exceeded the limit, the RBW was reduced (no less than 3kHz) and repeated.

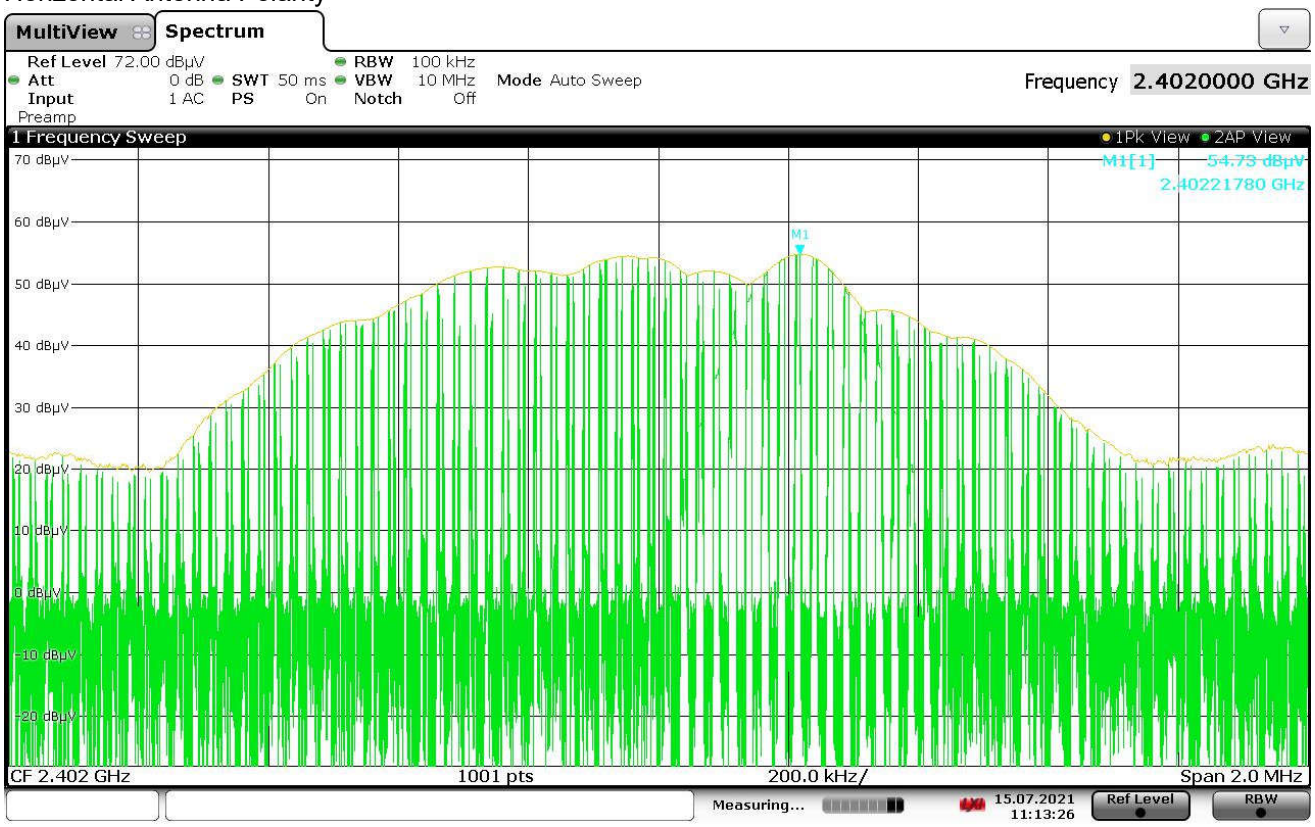
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test	3.1

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
site) (1 GHz – 6 GHz)	
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2402MHz

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	PSD (dBm)	Limit (dBm)	Margin (dBm)
2402.00	H	54.7	3.0	32.2	0.0	89.9	-5.1	8.0	-13.1
2402.00	V	51.9	3.0	32.2	0.0	87.0	-8.0	8.0	-16.0

Horizontal Antenna Polarity



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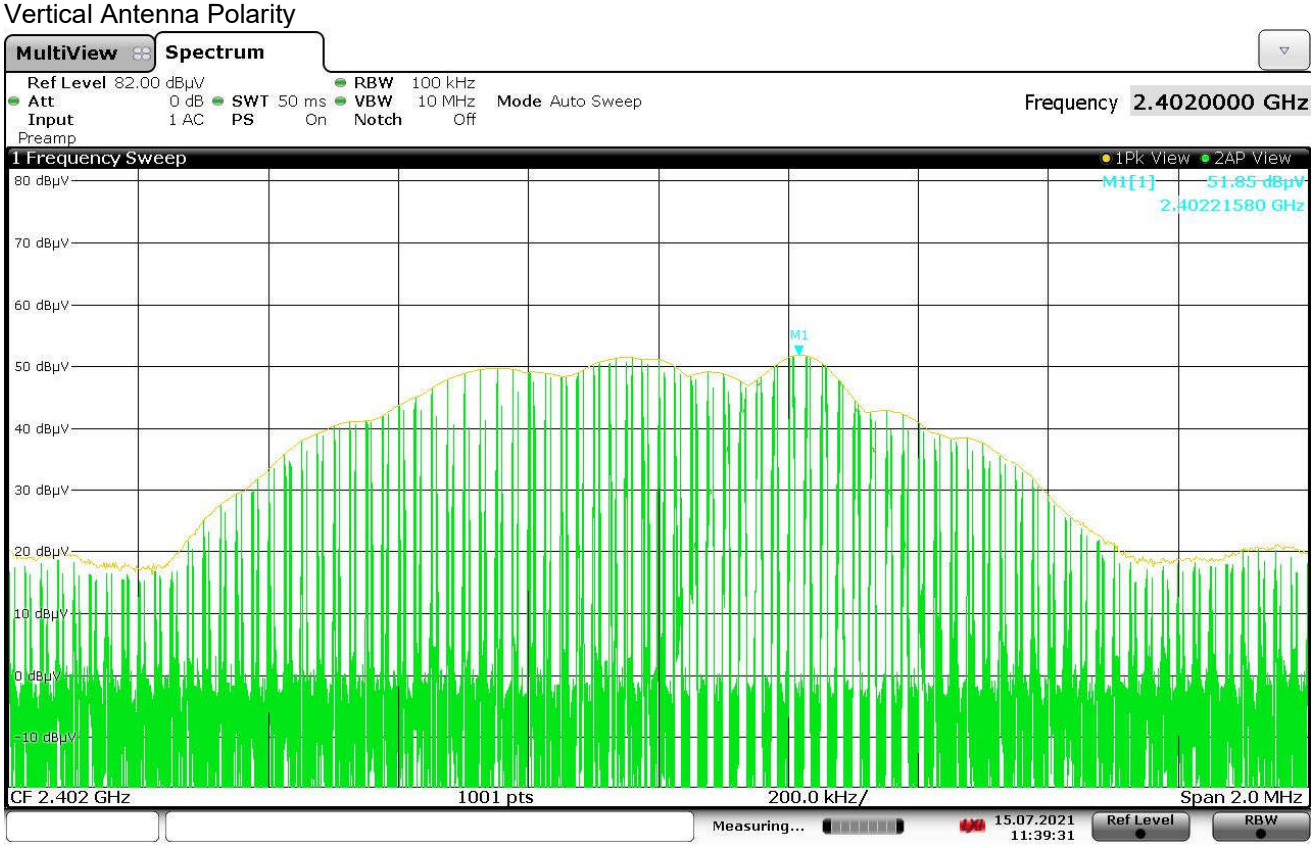
Vertical Antenna Polarity



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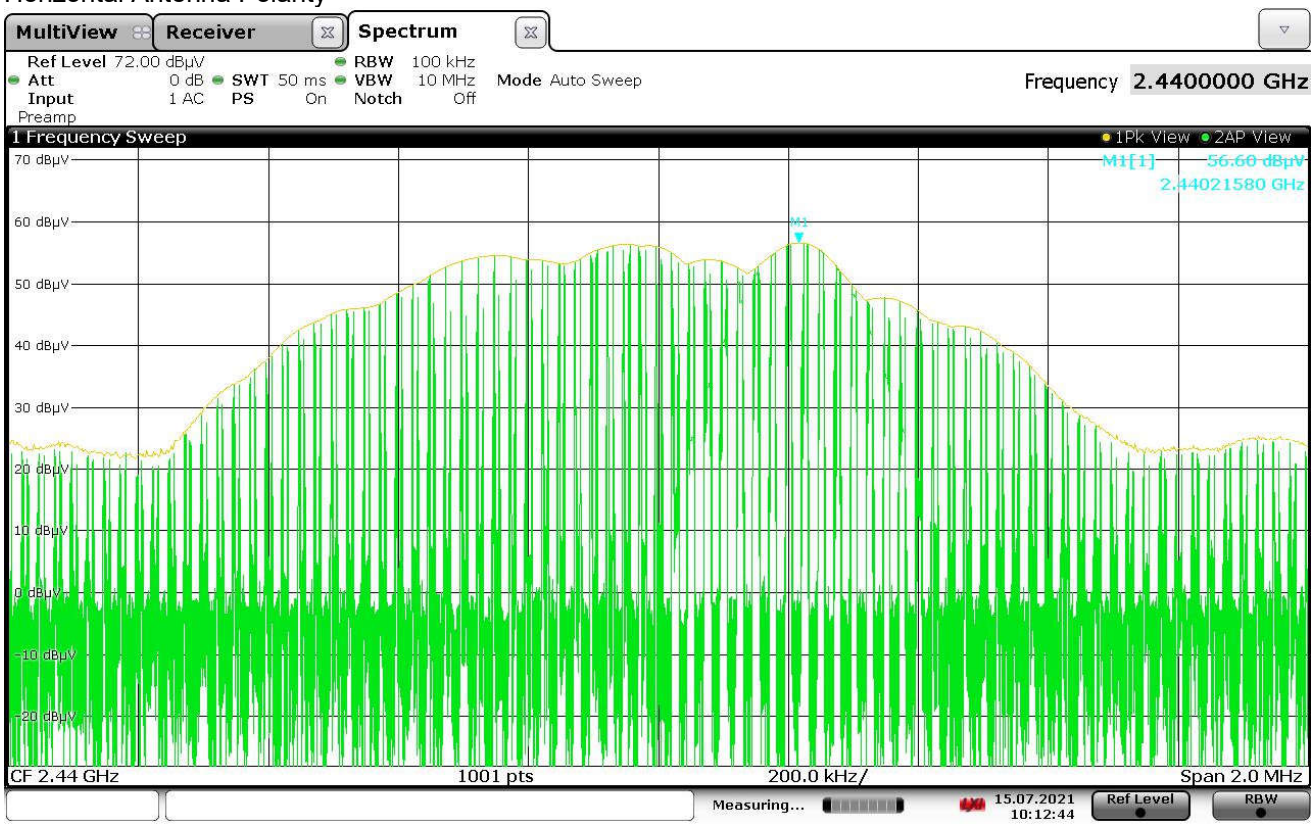
Test Details	
Manufacturer	Hearing Lab Technology LLC
Model	Fio Charger
S/N	Advertising
Mode	Continuous Transmit
Carrier Frequency	2440MHz

Freq. (MHz)	Ant Pol	Meter Reading (dBuV)	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	PSD (dBm)	Limit (dBm)	Margin (dBm)
2440.00	H	56.6	3.0	32.3	0.0	92.0	-3.0	8.0	-11.0
2440.00	V	53.1	3.0	32.3	0.0	88.5	-6.5	8.0	-14.5

Horizontal Antenna Polarity



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