FCC PART 15 SUBPART B & SUBPART C SECTION 15.249
TEST REPORT

for

SMART EARPLUGS
Model: 1H116

Prepared for

HUSH TECHNOLOGY, INC.
4225 EXECUTIVE SQUARE SUITE 420
LA JOLLA, CA 92037

Prepared by:_____

TOREY OLIVER

Approved by:_____

MATT HARRISON

COMPATIBLE ELECTRONICS INC.
20621 PASCAL WAY
LAKE FOREST, CALIFORNIA 92630
(949) 587-0400

DATE: NOVEMBER 10th, 2015

	REPORT BODY	APPENDICES					TOTAL
		A	***B***	***C***	***D***	***E***	
PAGES	18	2	2	2	14	22	**60**

This report shall not be reproduced except in full, without the written approval of Compatible Electronics.

TABLE OF CONTENTS

Section / Title	PAGE
GENERAL REPORT SUMMARY	***4***
SUMMARY OF TEST RESULTS	***5***
1. PURPOSE	**6**
2. ADMINISTRATIVE DATA	**7**
2.1 Location of Testing	7
2.2 Traceability Statement	7
2.3 Cognizant Personnel	7
2.4 Date Test Sample was Received	7
2.5 Disposition of the Test Sample	7
2.6 Abbreviations and Acronyms	7
3. APPLICABLE DOCUMENTS	**8**
4. DESCRIPTION OF TEST CONFIGURATION	**9**
4.1 Description of Test Configuration	9
4.1.1 Photograph Test Configuration	9
4.1.2 Cable Construction and Termination	10
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT	**11**
5.1 EUT and Accessory List	11
5.2 EMI Test Equipment	12
6. TEST SITE DESCRIPTION	**13**
6.1 Test Facility Description	13
6.2 EUT Mounting, Bonding and Grounding	13
6.3 Facility Environmental Characteristics	13
7. CHARACTERISTICS OF THE TRANSMITTER	**14**
7.1 Channel Number and Frequencies	14
7.2 Antenna	14
8. TEST PROCEDURES	**15**
8.1 RF Emissions	15
8.1.1 Conducted Emissions Test	15
8.1.2 Radiated Emissions (Spurious and Harmonics) Test	16
8.1.3 Fundamental Field Strength	17
8.1.4 Emissions Radiated Outside of the Fundamental Frequency Band	17
9. TEST PROCEDURE DEVIATIONS	**18**
10. CONCLUSIONS	**18**

LIST OF APPENDICES

APPENDIX	TITLE
A	Laboratory Accreditations and Recognitions
B	Modifications to the EUT
C	Additional Models Covered Under This Report
D	Diagrams, Charts, and Photos • Test Setup Diagrams • Antenna and Amplifier Factors • Radiated and Conducted Emissions Photos
E	Radiated and Conducted Emissions Data Sheets

LIST OF FIGURES

FIGURE	TITLE
1	Plot Map And Layout of Test Site Below 1GHz
2	Plot Map And Layout of Test Site Above 1GHz
3	Conducted Emissions Test Setup

GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

Device Tested:	Smart Earplugs Model: 1H116 S/N: None
Product Description:	The Smart Earplugs are a pair of in-ear audio devices that receive small 40kb audio files from a Bluetooth low energy connection to a paired smartphone. The Smart Earplugs then loop and play back those audio files for up to 8 hours, while maintaining a low duty cycle BLE connection.
Modifications:	The EUT was not modified in order to comply with specifications.
Manufacturer:	Hush Technology, Inc. 4225 Executive Square Suite 420 La Jolla, CA 92037
Test Date:	November 9 & 10, 2015
Test Specifications:	EMI requirements CFR Title 47, Part 15 Subpart B Sections 15.107, 15.109, Subpart C Sections 15.205, 15.207, 15.209 and 15.249
Test Procedure:	ANSI C63.4 & C63.10

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B, Section 15.107 and Subpart C Section 15.207
2	Radiated RF Emissions & Harmonics, 9 kHz – 10,000 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B Section 15.109 & Subpart C Sections 15.205, 15.209, & 15.249
3	Fundamental Field Strength	Complies with the limits of CFR Title 47 Part 15 Subpart C Section 15.249
4	Emissions Radiated Outside of the Fundamental Frequency Band	Complies with the limits of CFR Title 47 Part 15 Subpart C Sections 15.205 & 15.249

TABLE 1:

SIX HIGHEST CONDUCTED EMISSIONS READINGS

	Reading Type (PK / QP / AV)	Line (Line / Neutral)	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta (dB)
1	AV	Line	0.51	38.13	46.00	-7.87
2	AV	Line	1.28	36.49	46.00	-9.51
3	AV	Neutral	0.51	36.29	46.00	-9.71
4	AV	Line	0.76	35.35	46.00	-10.65
5	AV	Line	2.55	34.37	46.00	-11.63
6	AV	Line	1.53	34.31	46.00	-11.69

TABLE 2
SIX HIGHEST RADIATED EMISSIONS READINGS

	Reading Type (PK / QP / AV)	Polarization (Vert / Horz)	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Test Distance
1	QP	V	48.00	23.02	40.00	-16.98	3-Meter
2	QP	V	775.80	26.93	46.00	-19.07	3-Meter
3	QP	H	750.90	26.92	46.00	-19.08	3-Meter
4	QP	H	39.80	20.13	40.00	-19.87	3-Meter
5	QP	V	36.30	19.59	40.00	-20.41	3-Meter
6	QP	H	43.10	19.10	40.00	-20.90	3-Meter

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Smart Earplugs Model: 1H116. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 & C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT (equipment under test) hereafter, are within the specification limits defined by the Code of Federal Regulations Title 47, Part 15 Subpart B sections 15.107, 15.109, & Part 15 Subpart C sections 15.205, 15.207, 15.209 and 15.249.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way Lake Forest, California 92630.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

HUSH TECHNOLOGY, INC.

Daniel Lee	CEO

Compatible Electronics, Inc.

Torey Oliver	Test Technician
Matt Harrison	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on November 10th, 2015.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
NVLAP	National Voluntary Laboratory Accreditation Program
CFR	Code of Federal Regulations
PCB	Printed Circuit Board
TX	Transmit
RX	Receive

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this Test Report.

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2014	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	American National Standard for Testing Unlicensed Wireless Devices

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The Smart Earplugs Model: 1H116 (EUT) was setup in a tabletop configuration. The EUT was checked all 3 axis. The worst case was found to be the Y-Axis while in the charging case without the power adapter, constantly transmitting. The EUT was continuously transmitting a data stream during transmit tests and continuously receiving during receive tests. The EUT was checked for worst case in all orientations such as the charger charging the EUT with no power adapter, the charger connected to a power adapter, and the EUT in a stand-alone configuration.

The tests were performed using a new battery.

It was determined that the emissions were at their highest level when the EUT was transmitting in the configuration described above for Radiated Emissions. The final radiated data was taken in the above configuration. Please see Appendix E for the test data.

4.1.1 Photograph Test Configuration

4.1.2 Cable Construction and Termination

Cable 1

This is a 1-meter, braid shielded USB cable. This cable connects the EUT to a 5VDC power adapter. It has a USB Type A connector at the power supply end and a micro USB connector at the EUT end of the cable. The cable was not bundled.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	SERIAL NUMBER
1	SMART EARPLUGS (EUT)	HUSH TECHNOLOGY, INC.	1H116	NONE
2	SMART PHONE	SAMSUNG	S5	NONE
3	USB POWER ADAPTER	APPLE	A1265	NONE

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Computer	Compatible Electronics	NONE	NONE	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100219	09/03/2015	09/03/2016
Antenna, Loop	Com Power	AL-130	121049	12/06/2013	12/06/2015
Antenna, CombiLog	Com Power	AC-220	25857	05/21/2014	05/21/2016
Antenna, Horn 1-18GHz	Com Power	AH-118	071250	07/01/2014	07/01/2016
Antenna, Horn 18-26GHz	Com-Power	AH-826	081033	07/06/2014	07/06/2016
Pre-Amp, 1-18GHz	Com Power	PAM-118A	551034	2/6/2015	2/6/2016
Pre-Amp, 18-40GHz	Com-Power	PA-840	181289	6/16/2015	6/16/2016
Notch Filter	AMTI Microwave Circuits	N03019-01	3709-01 DC0415	01/06/2015	01/06/2016
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Antenna Mast	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Turntable	Sunol Science Corporation	FM 2001	N/A	N/A	N/A
Mast and Turntable Controller	Sunol Science Corporation	SC104V	020808-1	N/A	N/A
LISN	Com-Power	LI-150	191935	3/17/2014	3/17/2016

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and the figures in Appendix D of this report for test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

For above 1GHz testing the EUT was place 1.5 meters above high, above the ground plane.

The EUT was not grounded.

6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

There are a total of 40 channels. The low channel is at 2402.0 MHz and the high channel is at 2480.0 MHz. There is approximately 2 MHz separation between channels and the EUT uses GFSK modulation.

7.2 Antenna

The antenna is a chip located on the PCB.

8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Conducted Emissions Test

The EMI receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. The LISN output was measured using the EMI receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT received its power through the LISN, which was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The different configurations were investigated to find the worst case as well the worst case channel. The final data was collected under program control by the computer software. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.107, & Subpart C section 15.207. The six highest emissions are listed in table 1.

8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI receiver was used as a measuring meter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. Amplifiers were used to increase the sensitivity of the instrument. There was one Microwave Preamplifier used for frequencies above 1 GHz.

For spurious emissions the quasi-peak detector was used for frequencies below 1GHz and the average detector was used for frequencies above 1 GHz.

For the harmonics and fundamental emissions a duty cycle average was used. For the non-intentional emissions a linear average was used.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE (MHz)	TRANSDUCER	EFFECTIVE MEASUREMENT BANDWIDTH
.009 to .150	Active Loop Antenna	200 Hz
.150 to 30	Active Loop Antenna	9 kHz
30 to 1000	Combilog Antenna	100 kHz
1000 to 25000	Horn Antenna	1 MHz

The TDK FAC-3 shielded test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4 & ANSI C63.10. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters in both vertical and horizontal polarizations (for E field radiated field strength).

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.109, & Part 15 Subpart C sections 15.205, 15.209 and 15.249. The six highest emissions are listed in table 2.

8.1.3 Fundamental Field Strength

The Peak Transmit Radiated Field Strength was measured at a 3-meter test distance. The EMI Receiver was used to obtain the final test data. The final qualification data sheets are located in Appendix E.

Where

$$\delta(\mathrm{dB}) = 20\log\left[\sum\left(nt_1 + mt_2 + \ldots + \xi t_x\right)/T\right]$$

n is the number of pulses of duration *t*1
m is the number of pulses of duration *t*2
ξ is the number of pulses of duration *tx*
T is the period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

Duty Cycle Correction Factor = -20.00dB

Pulse Type 1 = 24 * 0.119 mS = 2.856 mS

Total On Time = 2.856 mS

100ms / 2.856 = 0.03

20 log (0.03) = -30.88 dB correction factor

Max Duty Cycle Correction Factor = -20.00dB

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.249.

8.1.4 Emissions Radiated Outside of the Fundamental Frequency Band

The Band Edge measurement was measured using the EMI Receiver at a 3-meter test distance to obtain the final test data. The lower and upper channels were tuned during the low and high band edge tests. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.205 & 15.249.

9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Smart Earplugs Model: 1H116 meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart B section 15.107, 15.109, & Subpart C sections 15.205, 15.207, 15.209 and 15.249.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP LAB CODES 200063-0, 200528-0, 200527-0

For US, Canada, Australia/New Zealand, Taiwan and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025 an ISO 9002 equivalent. Please follow the link to the NIST site for each of our facilities NVLAP certificate and scope of accreditation.

NVLAP listing links
Agoura Division - http://ts.nist.gov/Standards/scopes/2000630.htm
Brea Division - http://ts.nist.gov/Standards/scopes/2005280.htm
Silverado/Lake Forest Division - http://ts.nist.gov/Standards/scopes/2005270.htm

ANSI listing
CETCB
https://www.ansica.org/wwwversion2/outside/ALLdirectoryDetails.asp?menuID=1&prgID=3&orgID=123&status=4

Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).

Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

We are also certified/listed for IT products by the following country/agency:

VCCI Listing, from VCCI site
Enter "Compatible" in search form http://www.vcci.or.jp/vcci_e/activity/registration/setsubi.html

FCC Listing, from FCC OET site
FCC test lab search https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm

Industry Canada Industrie Canada
Compatible Electronics IC listing can be found at:
http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

There were no modifications were made during testing.

APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	SMART EARPLUGS Model: 1H116 S/N: NONE

No additional models were tested.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: PLOT MAP AND LAYOUT OF TEST SITE BELOW 1GHZ

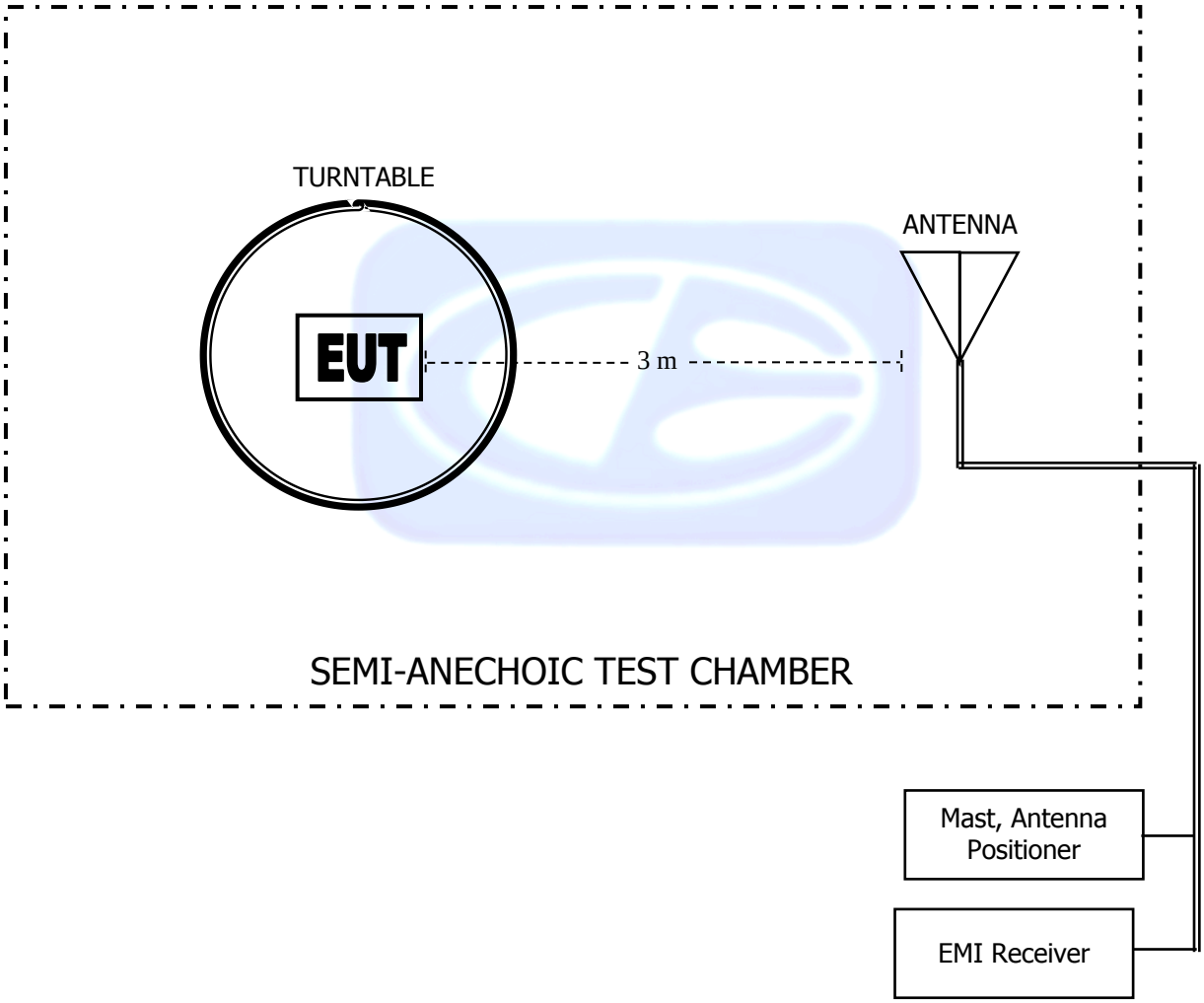


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ

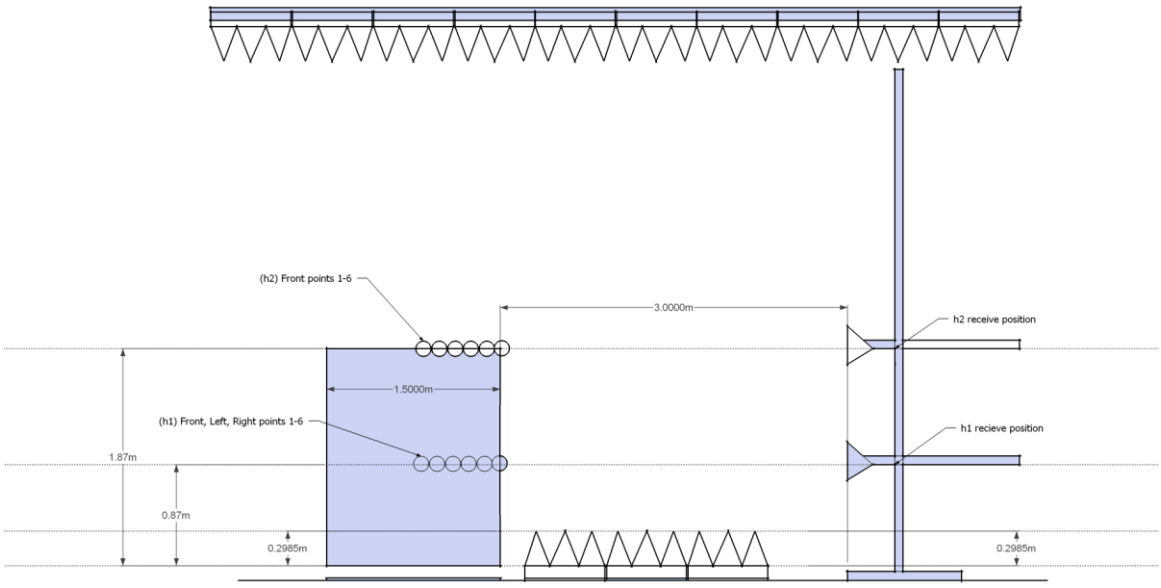
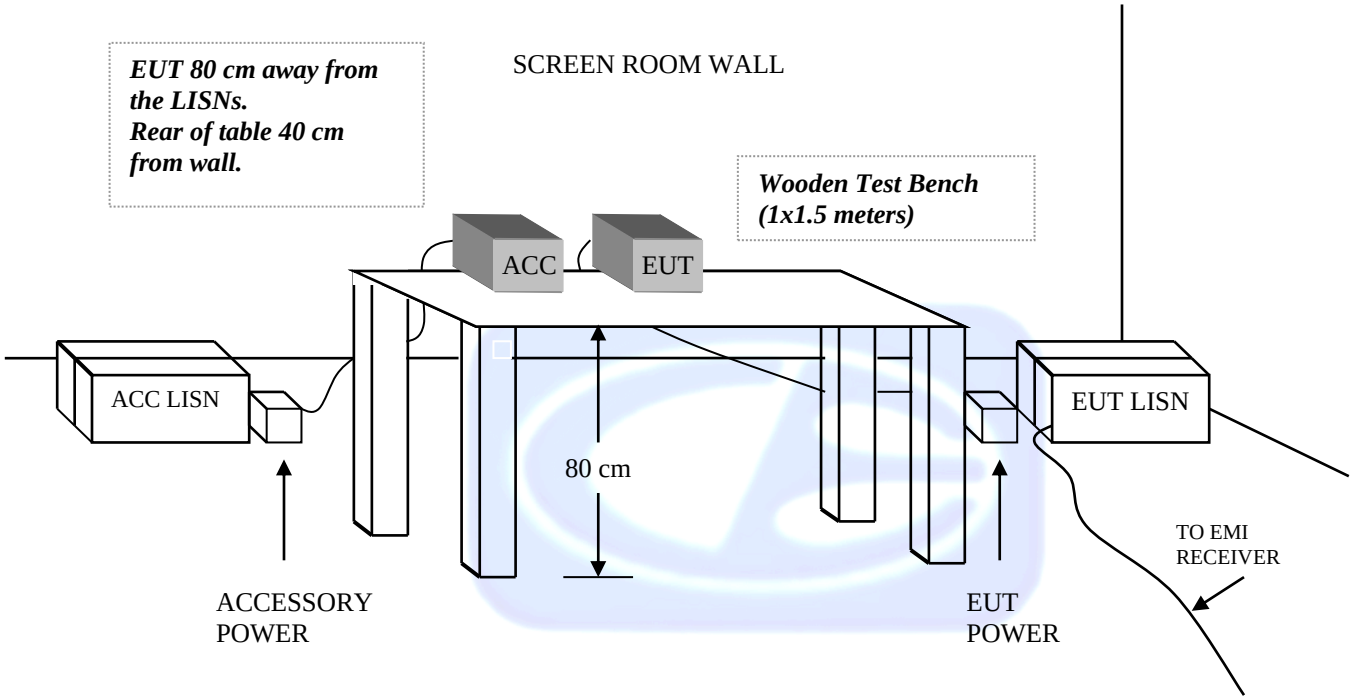


FIGURE 3: CONDUCTED EMISSIONS TEST SETUP



COM-POWER AL-130

LOOP ANTENNA

S/N: 121049

CALIBRATION DUE: DECEMBER 6, 2015

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-34.64	16.86	**0.8**	-36.32	15.18
0.01	-34.78	16.72	**0.9**	-36.22	15.28
0.02	-35.91	15.59	**1.0**	-36.22	15.28
0.03	-35.48	16.02	**2.0**	-35.91	15.59
0.04	-35.82	15.68	**3.0**	-35.91	15.59
0.05	-36.49	15.01	**4.0**	-36.01	15.49
0.06	-36.30	15.20	**5.0**	-35.80	15.70
0.07	-36.43	15.07	**6.0**	-36.00	15.50
0.08	-36.30	15.20	**7.0**	-35.90	15.60
0.09	-36.39	15.11	**8.0**	-35.70	15.80
0.1	-36.41	15.09	**9.0**	-35.70	15.80
0.2	-36.61	14.89	**10.0**	-35.60	15.90
0.3	-36.63	14.87	**15.0**	-36.52	14.98
0.4	-36.52	14.99	**20.0**	-35.75	15.75
0.5	-36.63	14.87	**25.0**	-37.78	13.72
0.6	-36.62	14.88	**30.0**	-38.62	12.88
0.7	-36.53	14.97			

COM-POWER AC-220

LAB R - COMBILOG ANTENNA

S/N: 25857

CALIBRATION DUE: MAY 21, 2016

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.5	**160**	13.3
35	22.5	**180**	15.0
40	23.0	**200**	14.6
45	21.5	**250**	16.5
50	21.3	**300**	18.1
60	18.2	**400**	19.4
70	13.2	**500**	21.4
80	11.6	**600**	21.6
90	11.9	**700**	23.7
100	12.6	**800**	26.0
120	15.1	**900**	26.6
140	13.6	**1000**	28.5

COM-POWER AH-118

HORN ANTENNA

S/N: 071250

CALIBRATION DUE: JULY 1, 2016

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	30.1	**9500**	44.2
1500	29.2	**10000**	43.4
2000	31.6	**10500**	44.6
2500	35.5	**11000**	45.1
3000	33.7	**11500**	45.7
3500	36.0	**12000**	46.2
4000	35.4	**12500**	45.4
4500	35.5	**13000**	44.8
5000	40.1	**13500**	46.7
5500	37.8	**14000**	47.8
6000	39.0	**14500**	46.4
6500	39.9	**15000**	47.2
7000	40.4	**15500**	45.5
7500	44.4	**16000**	45.0
8000	44.1	**16500**	44.5
8500	43.1	**17000**	47.0
9000	43.0	**17500**	47.8
		18000	44.2

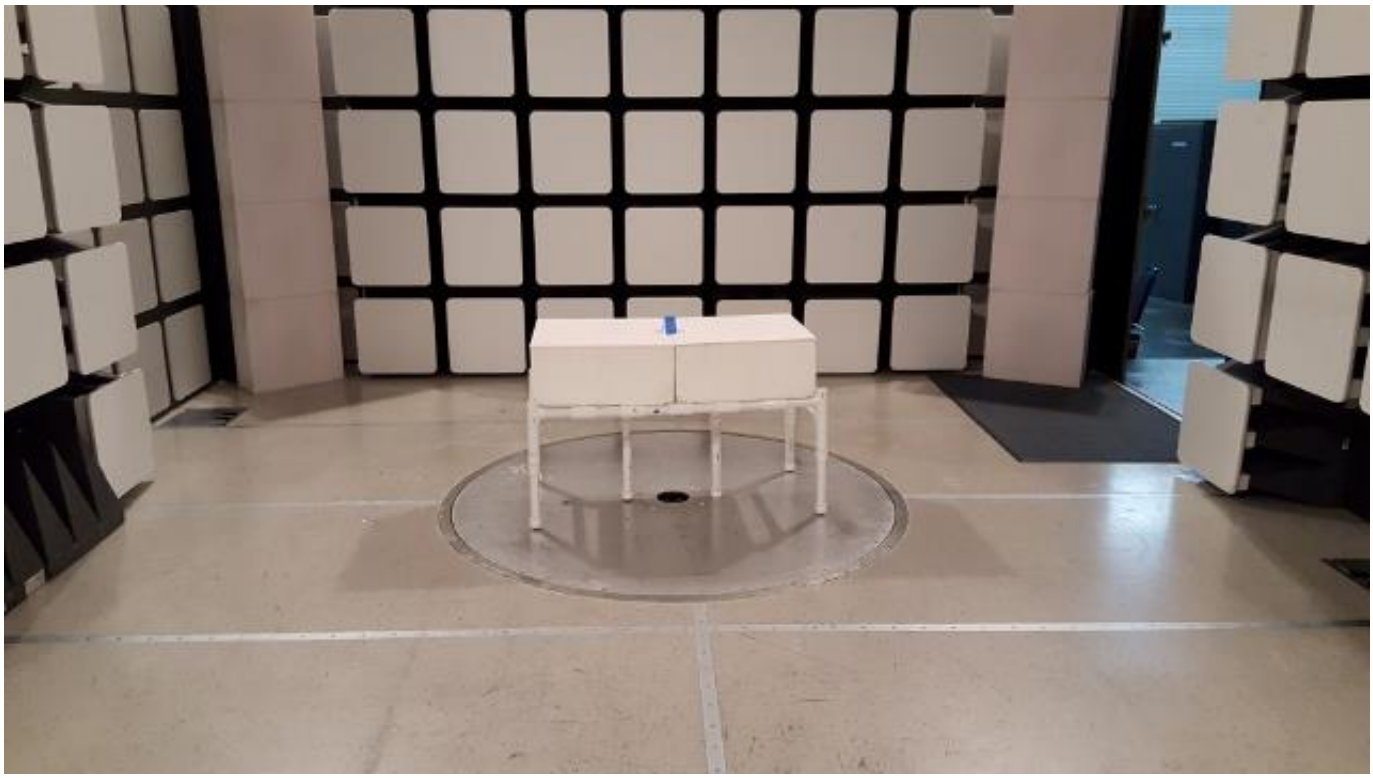
COM-POWER PAM-118A

1-18GHz - PREAMPLIFIER

S/N: 551034

CALIBRATION DUE: FEBRUARY 6, 2016

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
500	36.77	**5500**	39.82
1000	38.63	**6000**	38.74
1100	38.72	**6500**	39.60
1200	38.97	**7000**	35.52
1300	38.59	**7500**	36.61
1400	39.18	**8000**	36.92
1500	38.71	**8500**	37.13
1600	39.28	**9000**	36.50
1700	39.25	**9500**	38.92
1800	39.06	**10000**	38.74
1900	40.34	**11000**	35.23
2000	40.07	**12000**	35.64
2500	39.69	**13000**	36.73
3000	40.94	**14000**	36.48
3500	40.41	**15000**	37.57
4000	40.44	**16000**	38.10
4500	41.20	**17000**	37.34
5000	39.35	**18000**	36.80



FRONT VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - RADIATED EMISSIONS > 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - CONDUCTED EMISSIONS

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

HUSH TECHNOLOGY, INC.
SMART EARPLUGS
Model: 1H116
FCC SUBPART B & C - CONDUCTED EMISSIONS

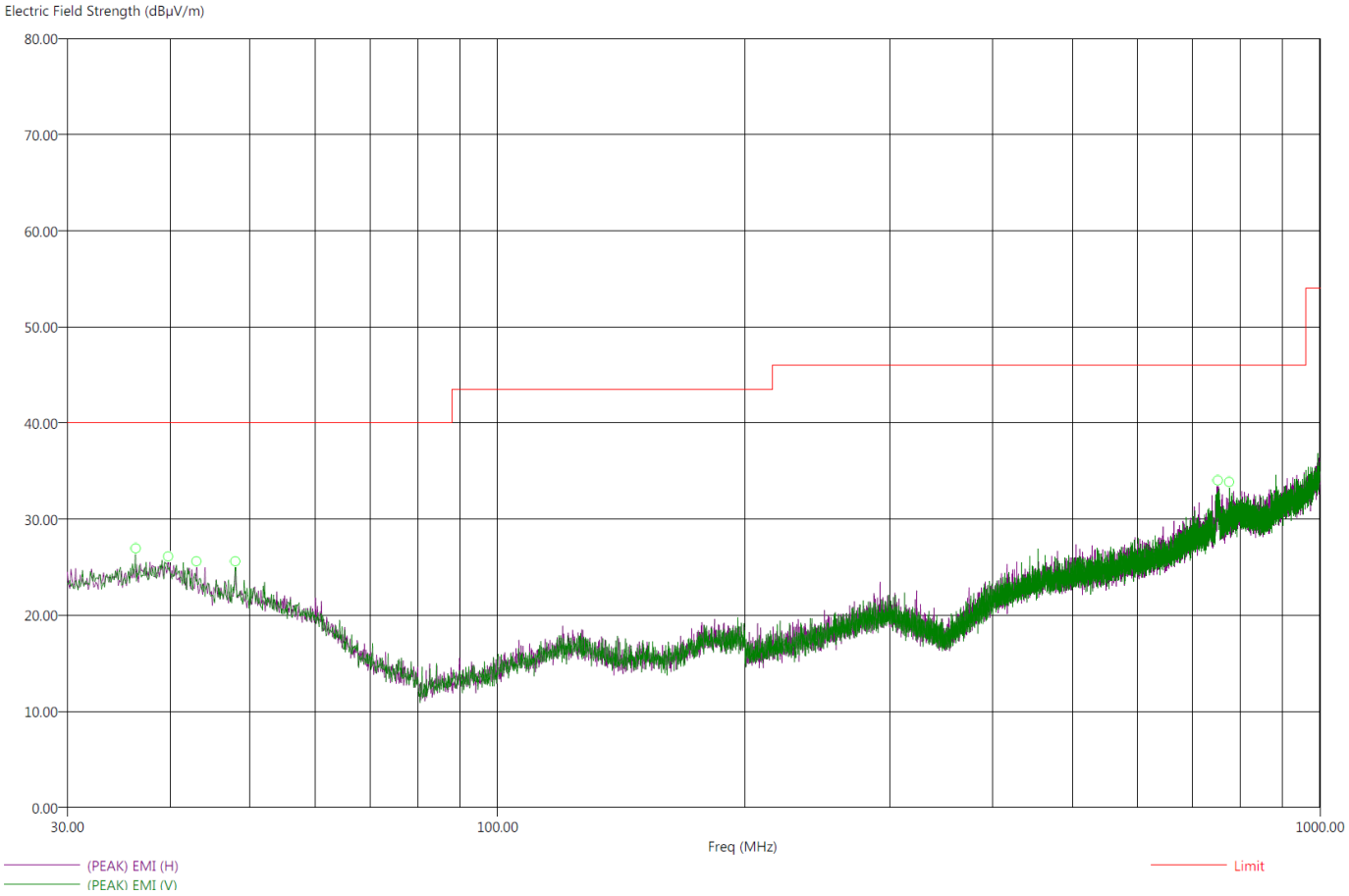
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

RADIATED EMISSIONS DATA SHEETS

Title: FCC 15.209 11/10/2015 3:52:50 PM
File: Radiated Pre-Scan 30-1000Mhz.set Sequence: Preliminary Scan
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Y Axis 2440 MHz
Temp: 70f
Hum: 50%
3.6VDC

Compatible Electronics, Inc. FAC-3 (Lab R)



There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.
This is the worst case channel and mode.

Title: FCC 15.209 11/10/2015 4:22:11 PM
File: Radiated Final 30-1000Mhz.set Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Y Axis 2440 MHz
Temp: 70f
Hum: 50%
3.6VDC

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dBµV/m)	(PEAK) EMI (dBµV/m)	Limit (dBµV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer(dB)	Cable(dB)
36.30	-20.41	19.59	25.66	40.00	V	305.50	399.98	22.62	1.09
39.80	-19.87	20.13	25.37	40.00	H	66.25	235.32	22.97	1.29
43.10	-20.90	19.10	24.47	40.00	H	160.00	179.62	22.04	0.89
48.00	-16.98	23.02	26.69	40.00	V	355.75	400.16	21.38	0.32
750.90	-19.08	26.92	32.59	46.00	H	344.00	399.98	24.92	3.01
775.80	-19.07	26.93	32.70	46.00	V	322.75	243.14	25.48	3.16

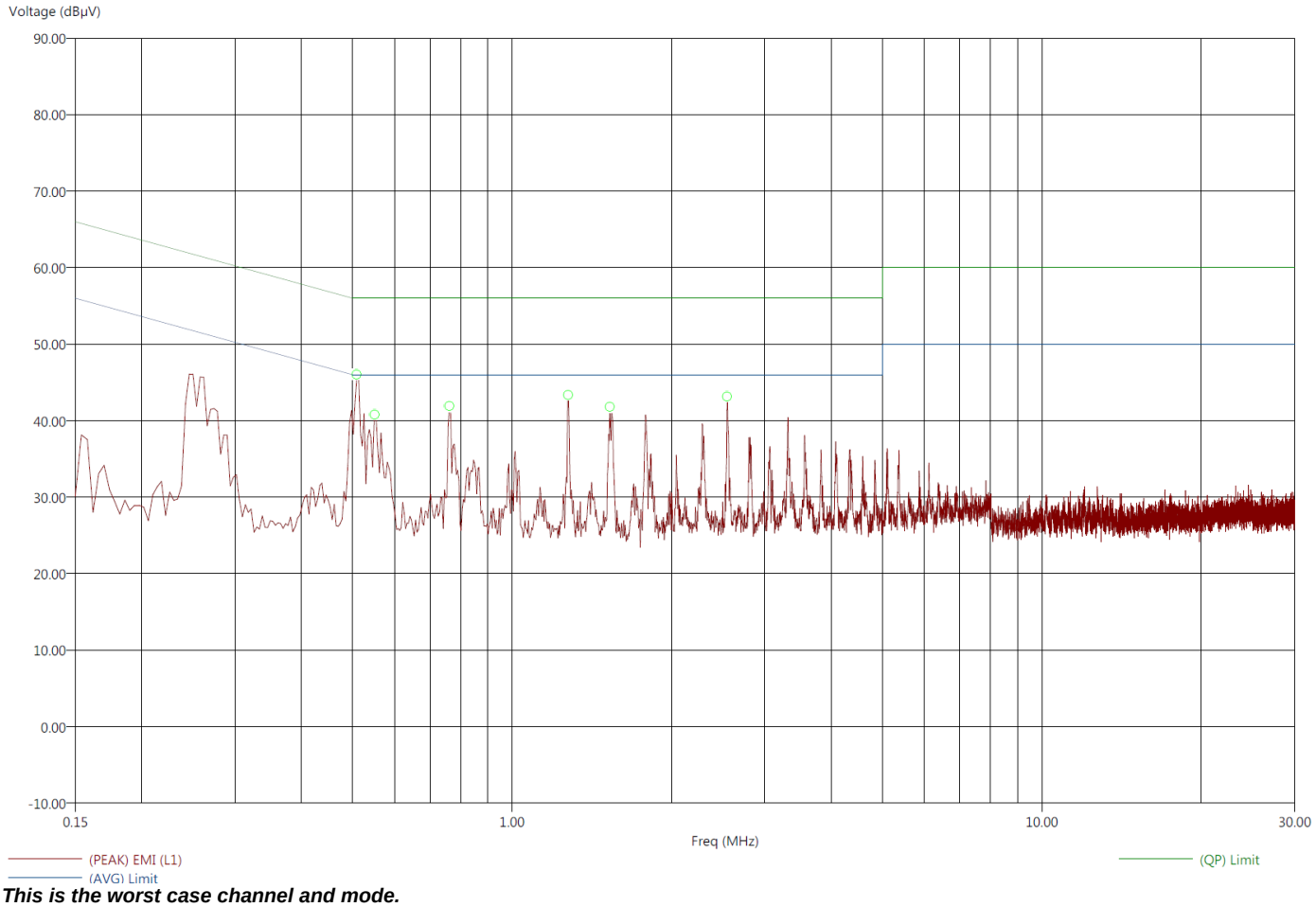
There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.
This is the worst case channel and mode.

CONDUCTED EMISSIONS

DATA SHEETS

Title: FCC 15.207 11/10/2015 5:10:55 PM
File: Conducted Pre-Line.set Sequence: Preliminary Scan
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Temp: 70f
Hum: 50%
3.6VDC
Host: 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)



This is the worst case channel and mode.

Title: FCC 15.207 11/10/2015 5:13:47 PM
File: Conducted Final-Line.set Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Temp: 70f
Hum: 50%
3.6VDC
Host: 120V 60Hz

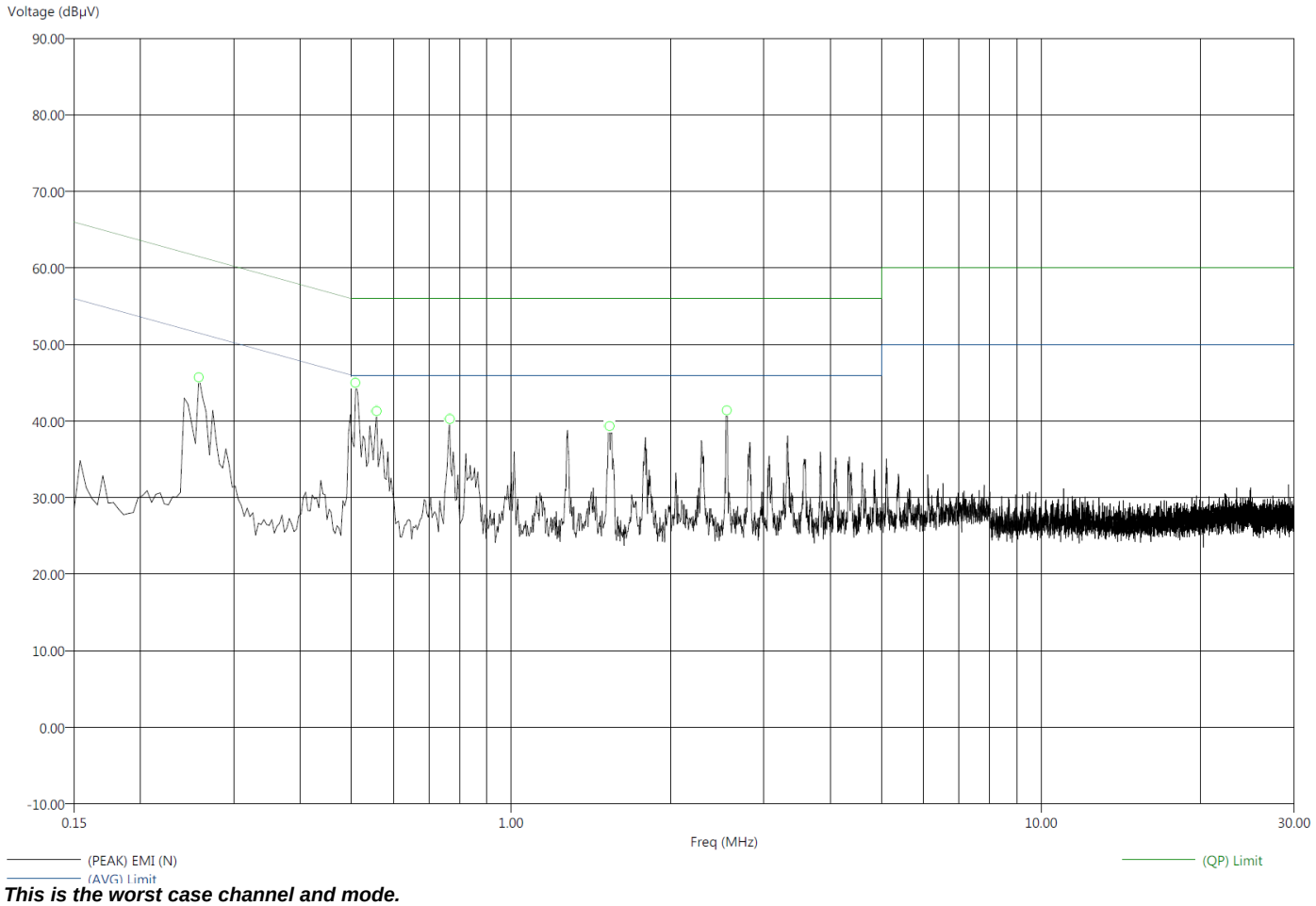
Compatible Electronics, Inc. FAC-3 (LAB R)

Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer (dB)	Cable (dB)
0.51	-7.87	-11.78	38.13	44.22	46.42	46.00	56.00	0.02	0.00
0.55	-16.66	-19.35	29.34	36.65	40.19	46.00	56.00	0.02	0.00
0.76	-10.65	-15.65	35.35	40.35	41.66	46.00	56.00	0.04	0.00
1.28	-9.51	-14.69	36.49	41.31	43.34	46.00	56.00	0.04	0.11
1.53	-11.69	-18.17	34.31	37.83	42.50	46.00	56.00	0.04	0.18
2.55	-11.63	-13.27	34.37	42.73	44.21	46.00	56.00	0.04	0.27

This is the worst case channel and mode.

Title: FCC 15.207 11/10/2015 5:16:51 PM
File: Conducted Pre-Neutral.set Sequence: Preliminary Scan
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Temp: 70f
Hum: 50%
3.7VDC
Host: 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)



This is the worst case channel and mode.

Title: FCC 15.207 11/10/2015 5:19:58 PM
File: Conducted Final-Neutral.set Sequence: Final Measurements
Operator: Torey Oliver
EUT Type: Smart Earplugs
EUT Condition: The EUT is constantly transmitting while connected to the charger.
Comments: Temp: 70f
Hum: 50%
3.7VDC
Host: 120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)

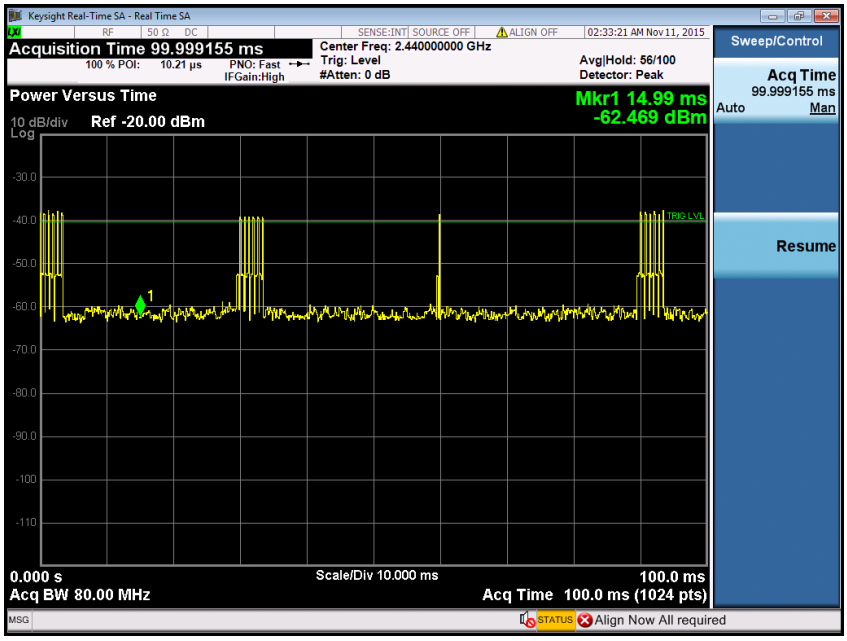
Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dBµV)	(QP) EMI (dBµV)	(PEAK) EMI (dBµV)	(AVG) Limit (dBµV)	(QP) Limit (dBµV)	Transducer (dB)	Cable (dB)
0.26	-20.49	-23.24	31.01	38.26	44.76	51.50	61.50	0.18	0.22
0.51	-9.71	-14.94	36.29	41.06	44.26	46.00	56.00	0.03	0.00
0.56	-12.62	-19.03	33.38	36.97	41.81	46.00	56.00	0.03	0.00
0.77	-12.63	-19.91	33.37	36.09	40.53	46.00	56.00	0.04	0.00
1.53	-16.89	-20.54	29.11	35.46	41.30	46.00	56.00	0.03	0.19
2.56	-11.81	-16.79	34.19	39.21	42.65	46.00	56.00	0.04	0.27

This is the worst case channel and mode.

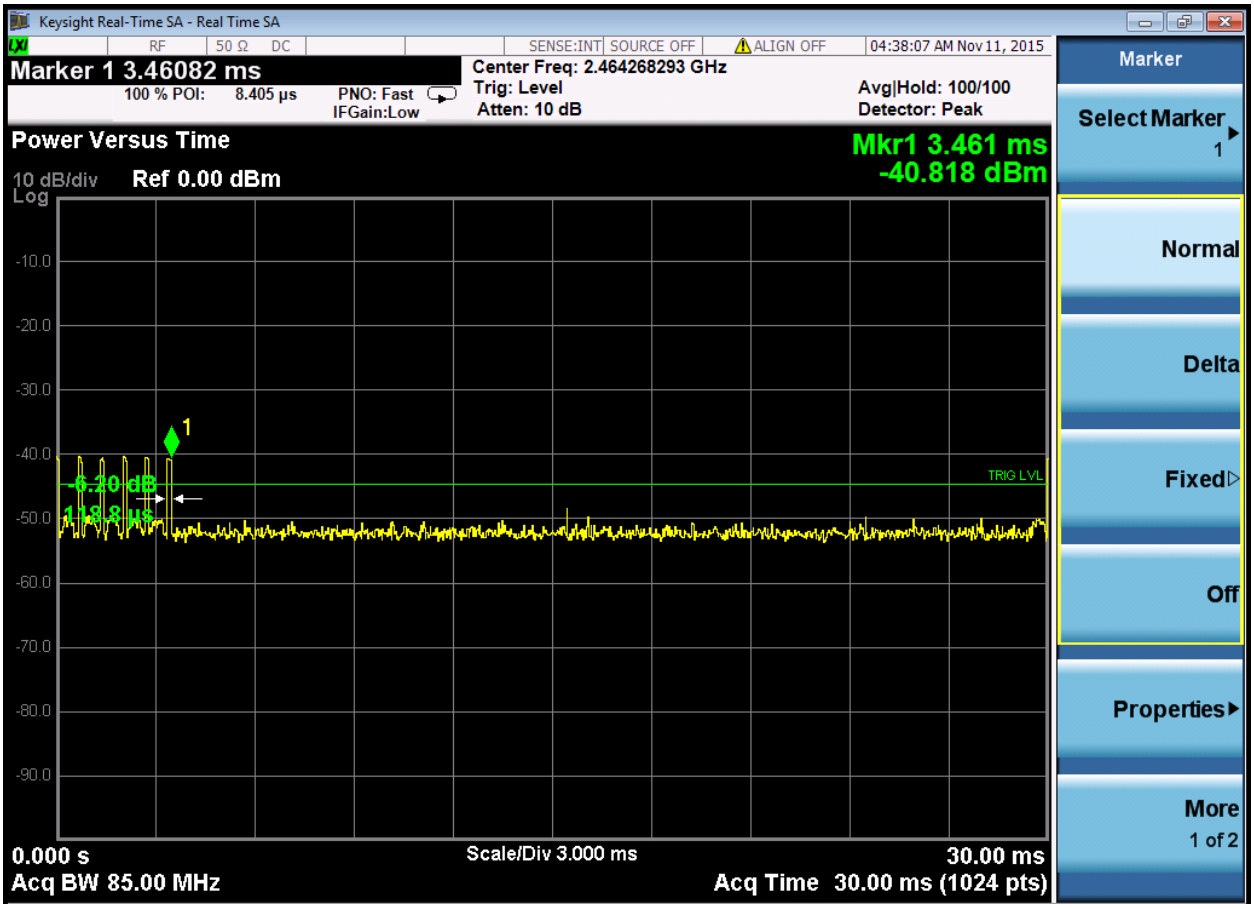
DUTY CYCLE DATA SHEETS

DUTY CYCLE

Pulse Time (ms)	# of Pulses	Total on Time (ms)	period (ms)	Duty Cycle	Correction (db)	Applied Correction (db)
0.119	24	2.856	100	0.03	-30.88	-20.00



DUTY CYCLE



Duty cycle was checked in each mode, advertise and burst data transfer. Worst case duty cycle is when the product is in burst data transfer mode. Every 30ms, 6 bursts at 118.8 us each for a total of 24 in 100ms.

FUNDAMENTAL & HARMONICS

DATA SHEETS

FUNDAMENTAL FIELD STRENGTH

FCC 15.249 RSS210

Company: Hush Technology, Inc.
EUT: Smart Earplugs
Model: 1H116

Date: 11/9/2015
Lab: R
Tested By: Torey Oliver

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table	Tower	Comments
2402.00	93.98	H	113.97	-19.99	Peak	360.00	1.40	Y-Axis
2402.00	73.98	H	93.97	-19.99	Avg	360.00	1.40	Y Axis
2402.00	93.02	V	113.97	-20.95	Peak	280.00	1.28	Y-Axis
2402.00	73.02	V	93.97	-20.95	Avg	280.00	1.28	Y-Axis
2440.00	91.32	H	113.97	-22.65	Peak	39.00	1.11	Y-Axis
2440.00	71.32	H	93.97	-22.65	Avg	39.00	1.11	Y-Axis
2440.00	87.71	V	113.97	-26.26	Peak	93.00	1.19	Y-Axis
2440.00	67.71	V	93.97	-26.26	Avg	93.00	1.19	Y-Axis
2480.00	90.29	H	113.97	-23.68	Peak	87.00	1.28	Y-Axis
2480.00	70.29	H	93.97	-23.68	Avg	87.00	1.28	Y-Axis
2480.00	85.64	V	113.97	-28.33	Peak	356.00	2.08	Y-Axis
2480.00	65.64	V	93.97	-28.33	Avg	356.00	2.08	Y-Axis

Test distance
3 meter

HARMONICS LOW CHANNEL HORIZONTAL

FCC 15.249

Date: 11/10/2015
EUT: Smart Earplugs
Lab: R
Model: 1H116
Tested By: Torey Oliver

Frequency: 2402 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4804.0	56.53	H	73.98	-17.45	Peak	1.10	341	
4804.0	36.53	H	53.98	-17.45	Avg	1.10	341	
7206.0	58.72	H	73.98	-15.26	Peak	1.02	292	
7206.0	38.72	H	53.98	-15.26	Avg	1.02	292	
9608.0	65.75	H	73.98	-8.23	Peak	1.01	224	
9608.0	45.75	H	53.98	-8.23	Avg	1.01	224	
12010.0	64.84	H	73.98	-9.14	Peak	1.00	227	
12010.0	44.84	H	53.98	-9.14	Avg	1.00	227	
14412.0	60.27	H	73.98	-13.71	Peak	2.36	360	
14412.0	40.27	H	53.98	-13.71	Avg	2.36	360	
16814.0		H	73.98		Peak			No emissions found
16814.0		H	53.98		Avg			No emissions found
19216.0		H	73.98		Peak			No emissions found
19216.0		H	53.98		Avg			No emissions found
21618.0		H	73.98		Peak			No emissions found
21618.0		H	53.98		Avg			No emissions found
24020.0		H	73.98		Peak			No emissions found
24020.0		H	53.98		Avg			No emissions found

Test distance
3 meter

HARMONICS LOW CHANNEL VERTICAL

FCC 15.249

Company: Hush
EUT: Smart Earplugs
Model: 1H116

Date: 11/10/2015
Lab: R
Tested By: Torey Oliver

Frequency: 2402 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4804.0	63.23	V	73.98	-10.75	Peak	1.00	237	
4804.0	43.23	V	53.98	-10.75	Avg	1.00	237	
7206.0	59.10	V	73.98	-14.88	Peak	1.05	299	
7206.0	39.10	V	53.98	-14.88	Avg	1.05	299	
9608.0	59.69	V	73.98	-14.29	Peak	1.21	360	
9608.0	39.69	V	53.98	-14.29	Avg	1.21	360	
12010.0	66.75	V	73.98	-7.23	Peak	2.14	279	
12010.0	46.75	V	53.98	-7.23	Avg	2.14	279	
14412.0	63.15	V	73.98	-10.83	Peak	1.18	301	
14412.0	43.15	V	53.98	-10.83	Avg	1.18	301	
16814.0		V	73.98		Peak			No emissions found
16814.0		V	53.98		Avg			No emissions found
19216.0		V	73.98		Peak			No emissions found
19216.0		V	53.98		Avg			No emissions found
21618.0		V	73.98		Peak			No emissions found
21618.0		V	53.98		Avg			No emissions found
24020.0		V	73.98		Peak			No emissions found
24020.0		V	53.98		Avg			No emissions found

Test distance 3 meter

HARMONICS MID CHANNEL HORIZONTAL

FCC 15.249

Date: 11/10/2015
EUT: Smart Earplugs
Lab: R
Model: 1H116
Tested By: Torey Oliver

Frequency 2440 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4880.0	57.43	H	73.98	-16.55	Peak	1.00	6	
4880.0	37.43	H	53.98	-16.55	Avg	1.00	6	
7320.0	57.18	H	73.98	-16.80	Peak	1.67	360	
7320.0	37.18	H	53.98	-16.80	Avg	1.67	360	
9760.0	64.43	H	73.98	-9.55	Peak	1.00	299	
9760.0	44.43	H	53.98	-9.55	Avg	1.00	299	
12200.0	63.27	H	73.98	-10.71	Peak	1.16	278	
12200.0	43.27	H	53.98	-10.71	Avg	1.16	278	
14640.0	63.84	H	73.98	-10.14	Peak	1.13	276	
14640.0	43.84	H	53.98	-10.14	Avg	1.13	276	
17080.0		H	73.98		Peak			No emissions found
17080.0		H	53.98		Avg			No emissions found
19520.0		H	73.98		Peak			No emissions found
19520.0		H	53.98		Avg			No emissions found
21960.0		H	73.98		Peak			No emissions found
21960.0		H	53.98		Avg			No emissions found
24400.0		H	73.98		Peak			No emissions found
24400.0		H	53.98		Avg			No emissions found

Test distance
3 meter

HARMONICS MID CHANNEL VERTICAL

FCC 15.249

Date: 11/10/2015
EUT: Smart Earplugs
Lab: R
Model: 1H116
Tested By: Torey Oliver

Frequency: 2440 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4880.0	62.00	V	73.98	-11.98	Peak	1.02	312	
4880.0	42.00	V	53.98	-11.98	Avg	1.02	312	
7320.0	60.49	V	73.98	-13.49	Peak	1.07	263	
7320.0	40.49	V	53.98	-13.49	Avg	1.07	263	
9760.0	66.09	V	73.98	-7.89	Peak	1.30	182	
9760.0	46.09	V	53.98	-7.89	Avg	1.30	182	
12200.0	64.47	V	73.98	-9.51	Peak	1.11	273	
12200.0	44.47	V	53.98	-9.51	Avg	1.11	273	
14640.0	59.18	V	73.98	-14.80	Peak	1.84	14	
14640.0	39.18	V	53.98	-14.80	Avg	1.84	14	
17080.0		V	73.98		Peak			No emissions found
17080.0		V	53.98		Avg			No emissions found
19520.0		V	73.98		Peak			No emissions found
19520.0		V	53.98		Avg			No emissions found
21960.0		V	73.98		Peak			No emissions found
21960.0		V	53.98		Avg			No emissions found
24400.0		V	73.98		Peak			No emissions found
24400.0		V	53.98		Avg			No emissions found

Test distance 3 meter

HARMONICS HIGH CHANNEL HORIZONTAL

FCC 15.249

Date: 11/10/2015
EUT: Smart Earplugs
Lab: R
Model: 1H116
Tested By: Torey Oliver

Frequency: 2480 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4960.0	59.44	H	73.98	-14.54	Peak	1.01	175	
4960.0	39.44	H	53.98	-14.54	Avg	1.01	175	
7440.0	61.36	H	73.98	-12.62	Peak	1.05	293	
7440.0	41.36	H	53.98	-12.62	Avg	1.05	293	
9920.0	59.57	H	73.98	-14.41	Peak	2.17	236	
9920.0	39.57	H	53.98	-14.41	Avg	2.17	236	
12400.0	58.00	H	73.98	-15.98	Peak	1.00	360	
12400.0	38.00	H	53.98	-15.98	Avg	1.00	360	
14880.0	57.21	H	73.98	-16.77	Peak	2.13	0	
14880.0	37.21	H	53.98	-16.77	Avg	2.13	0	
17360.0		H	73.98		Peak			No emissions found
17360.0		H	53.98		Avg			No emissions found
19840.0		H	73.98		Peak			No emissions found
19840.0		H	53.98		Avg			No emissions found
22320.0		H	73.98		Peak			No emissions found
22320.0		H	53.98		Avg			No emissions found
24800.0		H	73.98		Peak			No emissions found
24800.0		H	53.98		Avg			No emissions found

Test distance
3 meter

HARMONICS HIGH CHANNEL VERTICAL

FCC 15.249

Date: 11/10/2015
EUT: Smart Earplugs
Lab: R
Model: 1H116
Tested By: Torey Oliver

Frequency: 2480 Mhz

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
4960.0	61.54	V	73.98	-12.44	Peak	1.00	312	
4960.0	41.54	V	53.98	-12.44	Avg	1.00	312	
7440.0	62.40	V	73.98	-11.58	Peak	1.54	266	
7440.0	42.40	V	53.98	-11.58	Avg	1.54	266	
9920.0	58.98	V	73.98	-15.00	Peak	2.41	251	
9920.0	38.98	V	53.98	-15.00	Avg	2.41	251	
12400.0	56.47	V	73.98	-17.51	Peak	1.07	21	
12400.0	36.47	V	53.98	-17.51	Avg	1.07	21	
14880.0	56.57	V	73.98	-17.41	Peak	3.66	74	
14880.0	36.57	V	53.98	-17.41	Avg	3.66	74	
17360.0		V	73.98		Peak			No emissions found
17360.0		V	53.98		Avg			No emissions found
19840.0		V	73.98		Peak			No emissions found
19840.0		V	53.98		Avg			No emissions found
22320.0		V	73.98		Peak			No emissions found
22320.0		V	53.98		Avg			No emissions found
24800.0		V	73.98		Peak			No emissions found
24800.0		V	53.98		Avg			No emissions found

Test distance 3 meter

EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND

DATA SHEETS

BAND EDGES LOW CHANNEL

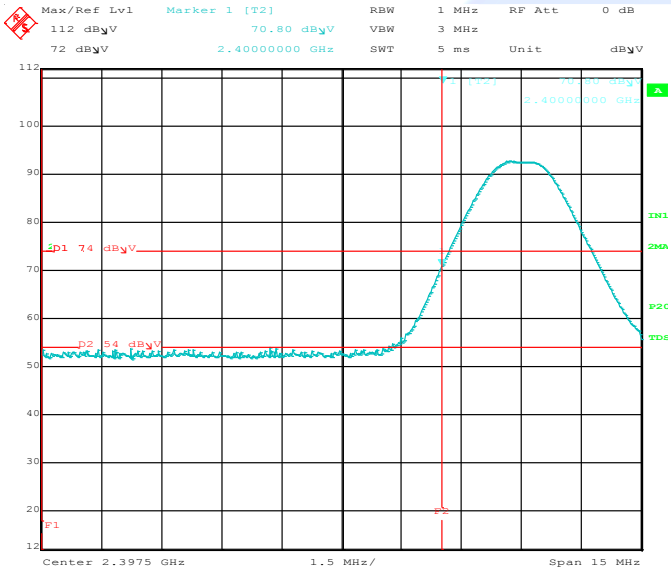
FCC 15.249

		Date:	11/10/2015
EUT:	Smart Earplugs	Lab:	R
Model:	1H116	ENG:	Torey Oliver

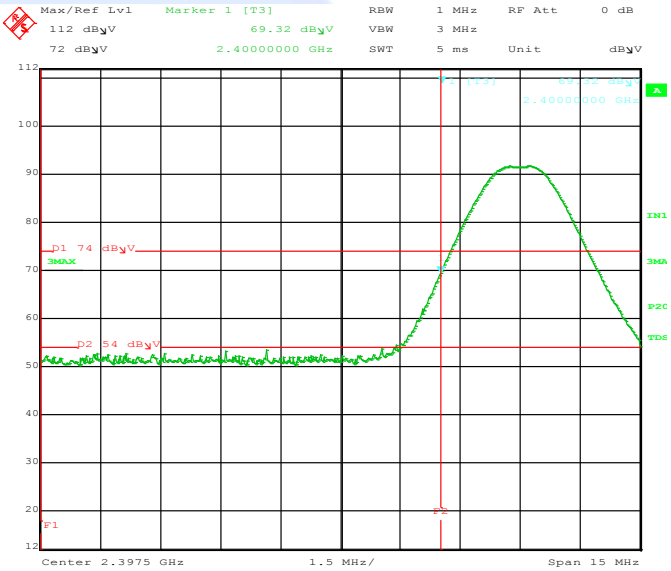
Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2400.00	70.80	H	73.98	-3.18	Peak	1.39	197	No Marker Delta
2400.00	50.80	H	53.98	-3.18	Avg	1.39	197	Method Used
2400.00	69.32	V	73.98	-4.66	Peak	1.00	95	No Marker Delta
2400.00	49.32	V	53.98	-4.66	Avg	1.00	95	Method Used

Test distance
3 meter



Comment A: Lower Band Edge 2402 MHz Horizontal
Date: 10.NOV.2015 07:56:57



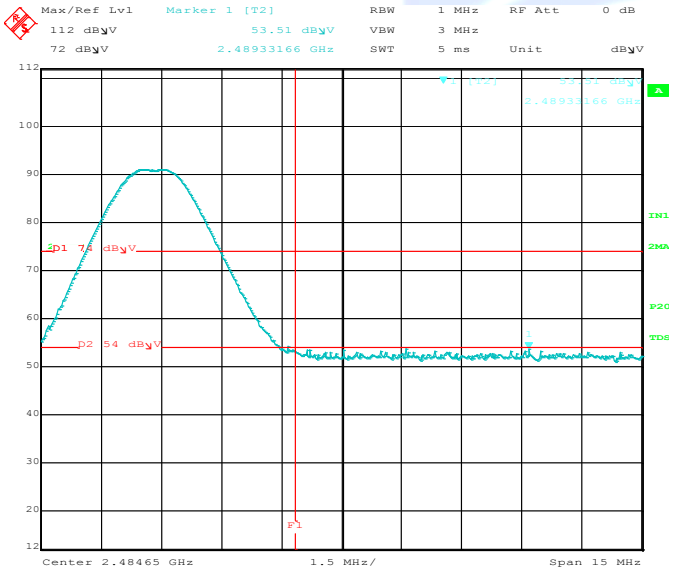
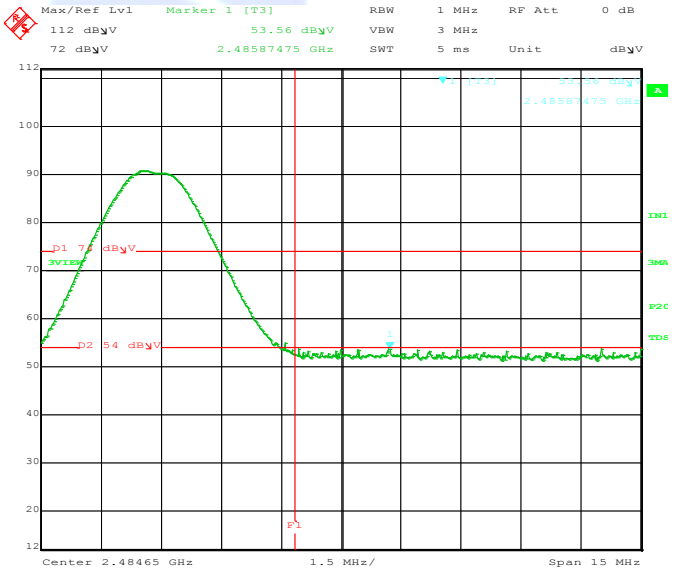
Comment A: Lower Band Edge 2402 MHz Vertical
Date: 10.NOV.2015 08:07:52

BAND EDGES HIGH CHANNEL

FCC 15.249

		Date:	11/9/2015
EUT:	Smart Earplugs	Lab:	R
Model:	1H116	ENG:	Torey Oliver

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq. (MHz)	Level (dBµV/m)	Pol	Limit (dBµV)	Margin (dB)	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
2489.33	53.51	H	73.98	-20.47	Peak	1.31	260	No Marker Delta
2489.33	33.51	H	53.98	-20.47	Avg	1.31	260	Method Used
2485.87	53.56	V	73.98	-20.42	Peak	1.20	283	No Marker Delta
2485.87	33.56	V	53.98	-20.42	Avg	1.20	283	Method Used

Test distance
3 meter