LSR
a Laird Business
ACCREDITED
TESTING CERT #1255.01
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ENGINEERING TEST REPORT #: 316339
LSR JOB #: C-2612

Compliance Testing of:

MixPre 6

Test Date(s):

12/6/2016	12/9/2016	12/13/2016
12/8/2016	12/12/2016	1/6/2017

Prepared For:
Sound Devices
Attn: Don Zahrte
E7556 State Road 23/33
Reedsburg, WI 53959

This Test Report is issued under the Authority of:
John Johnston, EMC Engineer

Signature: Date: 1/13/17

Reviewed by:	**Project Engineer:**
Adam Alger, Quality Systems Engineer	John Johnston, EMC Engineer
Signature: Date: 1-14-17	Signature: Date: 1/13/17

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LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01

Federal Communications Commission (FCC) – USA

Listing of two 3 Meter Semi-Anechoic Chambers based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756

Industrie Canada Industry Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-GEN – Issue 4
File Number: IC 3088A-2
On file, 3 Meter Semi-Anechoic Chamber based on RSS-GEN – Issue 4
File Number: IC 3088A-3

Summary of Test Report

Between December 6, 2016 and December 13, 2016 the MixPre 6, provided by Sound Devices, was tested and MEETS the following requirements:

FCC and IC Paragraph	Test Requirements	Compliance (Yes/No)
FCC: 15.247 (a)(2) IC: RSS-247 sect. 5.2 (1) IC: RSS-Gen sect. 6.6	Minimum 6 dB Bandwidth / Occupied Bandwidth	Yes
FCC: 15.247 (b)(3) IC: RSS-247 sect. 5.4 (4)	Maximum Output Power	Yes
FCC: 15.247 (e) IC: RSS-247 sect. 5.2 (2)	Power Spectral Density of a Digitally Modulated System	Yes
FCC: 15.247(d) IC: RSS-247 sect. 5.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
FCC: 15.209 & 15.205 IC: RSS-Gen sect 6.13	Transmitter Radiated Emissions	Yes
FCC: 2.1055 (d) IC: RSS Gen sect. 6.11	Frequency Stability	Yes
FCC : 15.207 IC : RSS Gen sect. 8.8	AC Power Line Conducted Emissions	Yes

Test Facilities

All testing was performed at:

LS Research, LLC
W66 N220 Commerce Court
Cedarburg, Wisconsin, 53012 USA

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to the requirements of ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted.

1.0 Client Information

Manufacturer Name:	Sound Devices
Address:	E7556 State Road 23/33, Reedsburg, WI 53959
Contact Person:	Don Zahrte

1.1 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	MixPre 6
Model Number:	MixPre 6
Serial Number:	QC0116270004

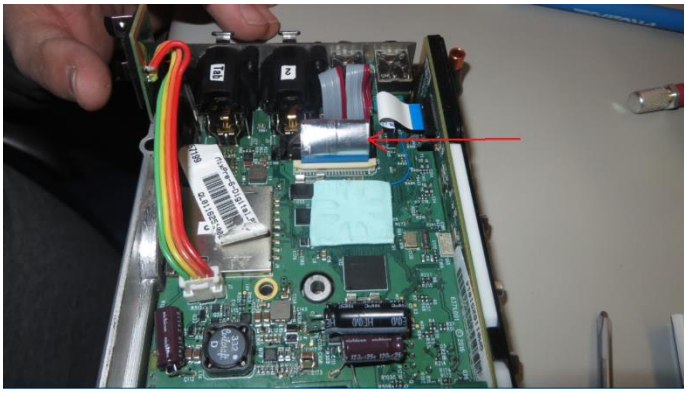
1.2 Product Information

The MixPre 6 is a studio-quality, portable, stereo microphone preamplifier/mixer. The MixPre 6 includes multiple input/output ports. The MixPre 6 can be powered via: (1) an AA battery cartridge (2) an L-mount battery cartridge (3) 5 V output AC/DC adapter. Two AC/DC adapters included in test set-up during testing: (1) Model JD-AP024U-050300BB-B1 including a 1 meter long cable, referred to herein as "Adapter 1;" (2) Adapter Tech Model ATM012T-W051V including a 1.8 meter long cable, referred to herein as "Adapter 2." The MixPre 6 may be configured to operate in a recording mode using one of four designated sampling rates (44.1 kHz, 48 kHz, 96 kHz, and 192 kHz).

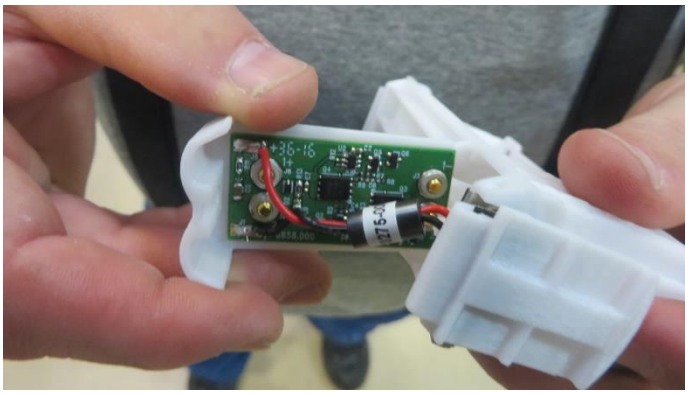
Moreover, the MixPre 6 includes a Murata BLE module (Model # P2ML3599 Type ZS).

1.3 Modifications Incorporated In the EUT for Compliance Purposes

A shielded ribbon cable internal to the MixPre6 was implemented for compliance purposes.



Additionally, the power cabling within the L-mount battery cartridge was routed through a Laird 28B0275-000 ferrite, as shown in the image below.



1.4 Deviations & Exclusions from Test Specifications

None noted at time of test.

1.5 Additional Information

The MixPre 6, referred to herein as the *Equipment Under Test*, or *EUT*, operates nominally when supplied 3.3 V DC. The EUT operated on firmware Version 0.01, Build 592, Beta: MixPre, which allowed RF test modes to be selected.

It should be noted that conducted measurements were performed directly on the Murata BLE module (Model # P2ML3599 Type ZS) with the aid of a development board (Murata P2ML3656) and a Windows command prompt. The location of the BLE radio is inaccessible within the MixPre 6 and, as such, the development board and test tool were used.

Test operational modes (transmit, receive, and channel selection (2402 MHz, 2440 MHz, and 2480 MHz)) were instantiated by pressing a combination of buttons on the EUT. The test operational modes were enabled through firmware Version 0.01, Build 592, Beta: MixPre.

1.6 Conditions of Test

Environmental:

Temperature:	20-25º C
Relative Humidity:	30-60%
Atmospheric Pressure:	86-106 kPa

1.7 Test Equipment

All test equipment is calibrated by a calibration laboratory accredited by A2LA to the requirements of ISO 17025. For a complete list of test equipment and calibration dates, see Appendix A. Unless otherwise noted, resolution bandwidth of measuring instrument used during testing for given frequency range, see below.

Frequency Range	Resolution Bandwidth
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz
30 MHz – 1000 MHz	120 kHz
Above 1000 MHz	1 MHz

1.8 EUT Technical Specifications

BLE:

EUT Frequency Range (in MHz)	2402-2480 MHz
EIRP (in W)	
Maximum	0.000695
Minimum	0.000681
Occupied Bandwidth (99% (MHz)	1.095
Type of Modulation	GFSK
Emission Designator	1M10G1D
Frequency Tolerance %, Hz, ppm	Better than 100 ppm
Antenna Information	
Gain (dBi)	2.7
EUT will be operated under FCC Rule Part(s)	15.247
EUT will be operated under RSS Rule Part(s)	247
Modular Filing?	No

2.0 Conformance Summary

When tested on 12/6/2016, 12/8/2016, 12/9/2016, 12/12/2016, 12/13/2016, and 1/6/2017, it was determined that the EUT was compliant with the requirements of FCC Title 47, CFR Part 15.247, 15.209,15.207, Industry Canada RSS-247, Issue 1 (2015), and RSS-Gen Issue 4 (2014) using the methods of ANSI C63.10 2013.

Any modifications made to the EUT after the specified test date(s) will invalidate the data herein.

If some measurements are seen to be within the uncertainty value, as listed in Appendix C there is a possibility that this unit may not meet the required limit specification if subsequently tested.

3.0 – RF Conducted Measurements

Manufacturer	Sound Devices
Test Location	LS Research
Rule Part	FCC Part 15.247 / RSS-247
General Measurement Procedure	ANSI C63.10-2013
General Description of Measurement	A direct measurement of the transmitted signal was performed at the antenna port of the EUT via a cable connection to a spectrum analyzer. A 10 dB attenuator was placed in series with the cable to protect the spectrum analyzer. The attenuator was added on the analyzer as gain offset settings thereby allowing direct measurements, without the need for any further corrections. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. Conducted measurements were performed on the Murata BLE radio with an SMA connector appended to the antenna port.

3.1 – RF Conducted – Fundamental Bandwidth

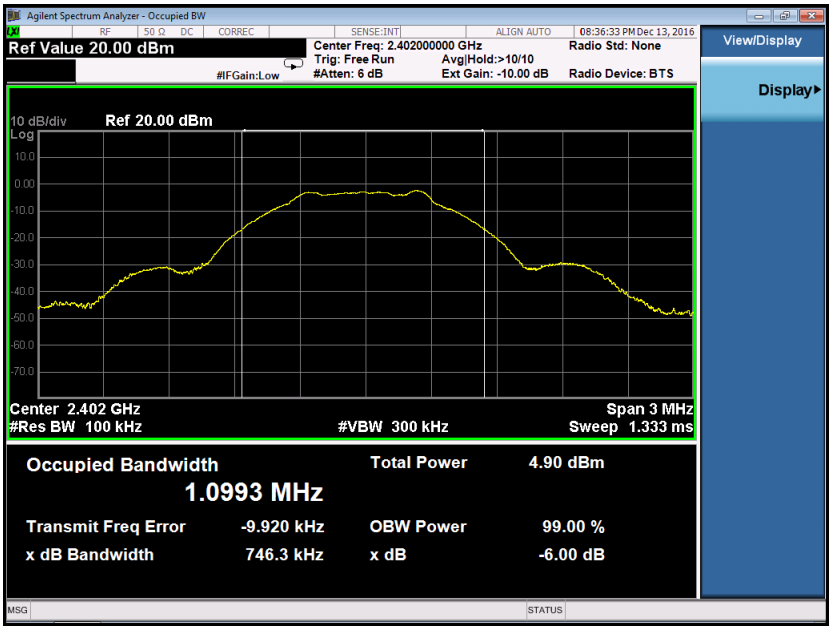
Manufacturer	Sound Devices
Date	12/13/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	FCC Part 15.247 (a)(2) / RSS-247 sect. 5.2 (1)
Specific Measurement Procedure	ANSI C63.10 2013 Sections 11.8 and 6.9.3
Additional Description of Measurement	Peak detector used
Additional Notes	1. Continuous modulated transmit used for this test.

Table

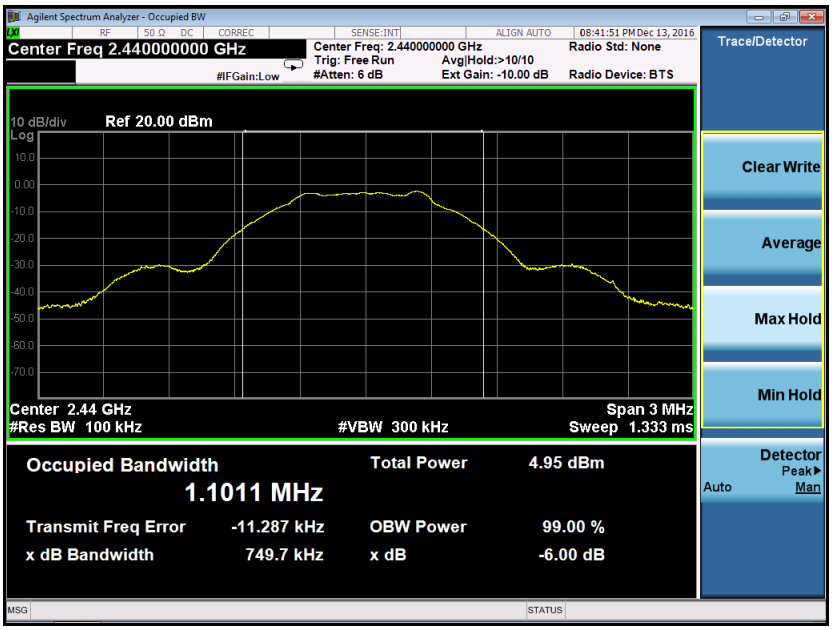
Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
2402	0.746	1.090
2440	0.750	1.092
2480	0.755	1.095

Plots

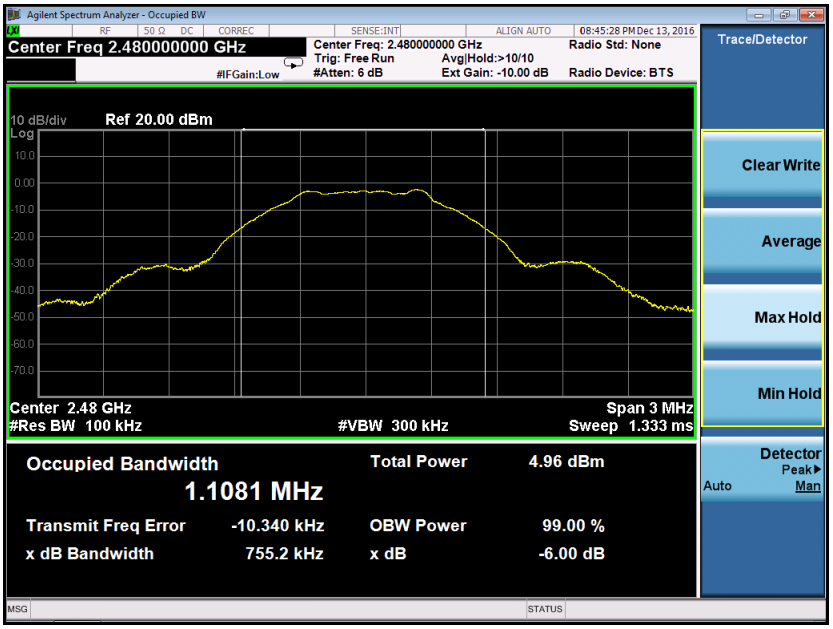
Low Channel – DTS (-6dB) BW



Mid Channel - DTS (-6dB) BW



High Channel - DTS (-6dB) BW



Low Channel – 99% BW

Mid Channel – 99% BW

High Channel – 99% BW

3.2 – RF Conducted – Fundamental Power and Spectral Density

Manufacturer	Sound Devices
Date	12/13/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	FCC 15.247(b)(3)/ FCC 15.247(e) / RSS-247 Section 5.4(3)/ RSS-247 Section 5.2(2)
Specific Measurement Procedure	ANSI C63.10 Section 11.9.1.1 and 11.10.2
Additional Description of Measurement	Peak Output Power and Peak PSD methods utilized for measurement 100 kHz resolution bandwidth used for Peak Power Spectral Density measurement
Additional Notes	1. Continuous transmit modulated used for this test. Sample Calculation: Margin (dB) = Limit – Measured Level

Table

Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Power Limit (dBm)	Power Margin (dB)	Peak PSD in 100 kHz RBW (dBm)	PSD Limit in 3kHz Band Limit (dBm)	PSD Margin (dBm)
2402	-1.635	30	31.635	-2.437	8	10.437
2440	-1.583	30	31.583	-2.409	8	10.409
2480	-1.666	30	31.666	-2.505	8	10.505

Plots

Low Channel – Peak Output Power

Low Channel – Peak Power Spectral Density

Mid Channel – Peak Output Power

Mid Channel – Peak Power Spectral Density

High Channel – Peak Output Power

High Channel – Peak Power Spectral Density

3.3 – RF Conducted – Spurious Emissions/ Band Edges

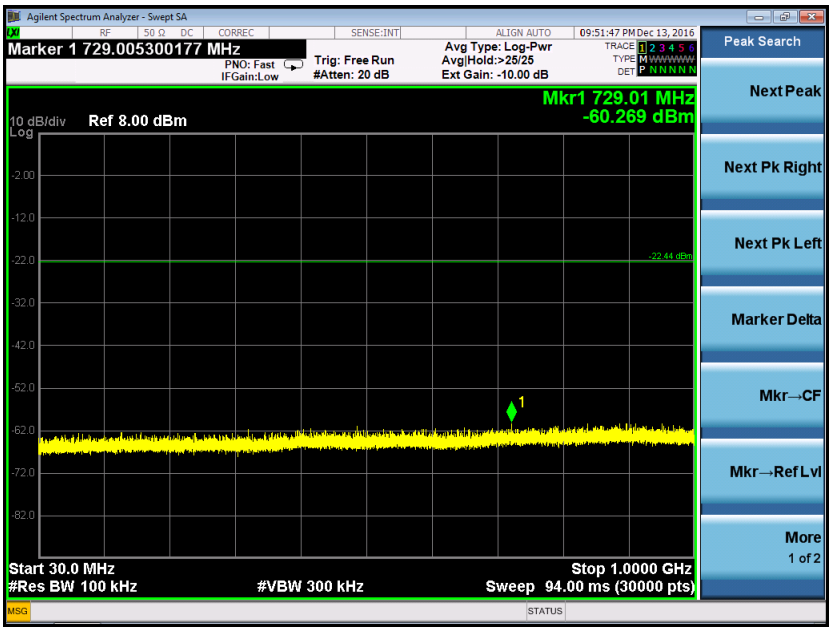
Manufacturer	Sound Devices
Date	12/13/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	FCC 15.247 (d) / RSS-247 sect. 5.5
Specific Measurement Procedure	ANSI C63.10 Section 11.11
Additional Description of Measurement	Peak output power measured in any 100 kHz band outside the authorized frequency band shall be attenuated by at least 20 dBc.
Additional Notes	1. Continuous modulated transmission used for this test. 2. Reference Level Plots were taken at the transmitted frequency and used to determine the 20 dBc limit line. 3. Reference levels were determined using the PSD values for each of the low, middle, and high transmit channels

Top 3 Emissions – unrestricted bands

Frequency (MHz)	Transmit Channel	Emission amplitude (dBm)	Limit (dBm)	Margin (dB)
16278	High	-53.242	-22.505	30.737
13600	Mid	-52.977	-22.409	30.568
24768	Low	-50.315	-22.437	27.878

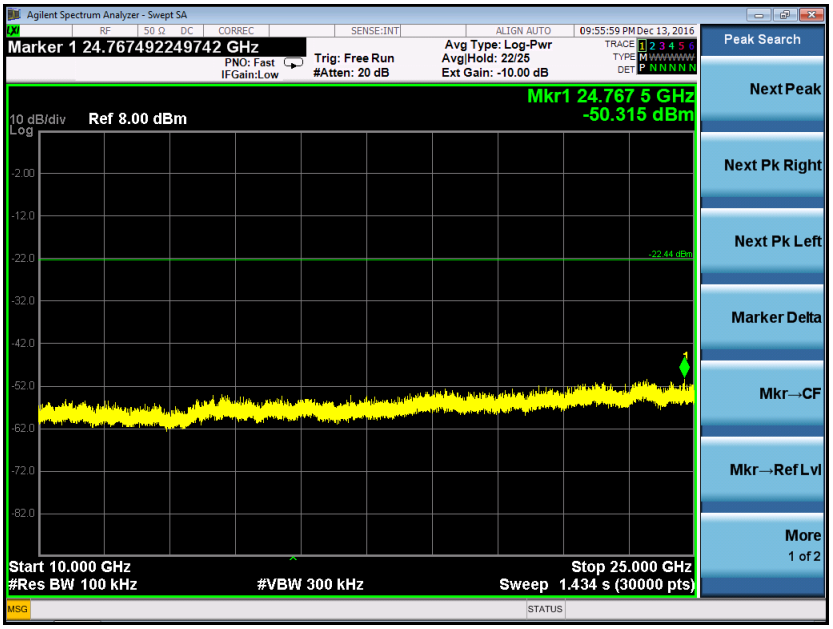
Plots

Low Channel: 30 MHz – 1 GHz

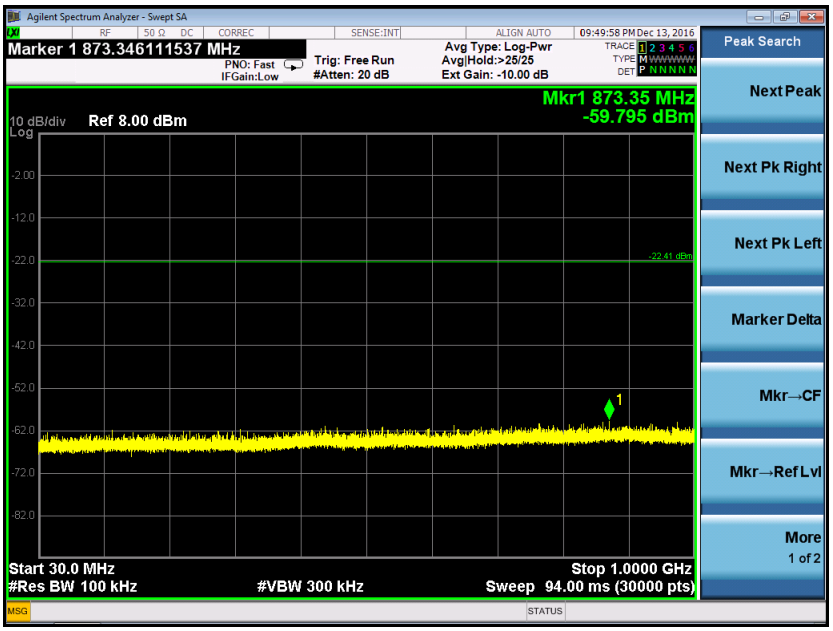


Low Channel: 1 GHz – 10 GHz

Low Channel: 10 GHz – 25 GHz



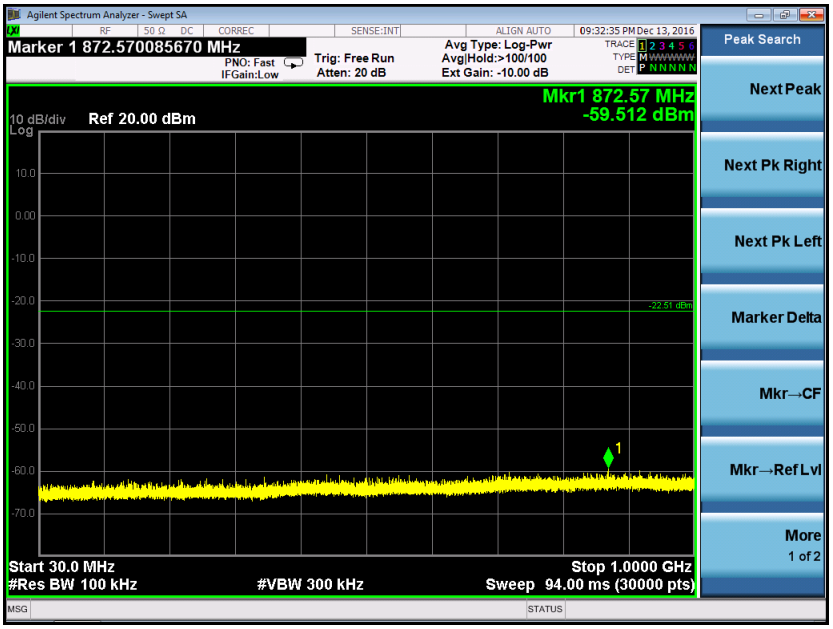
Mid Channel: 30 MHz – 1 GHz



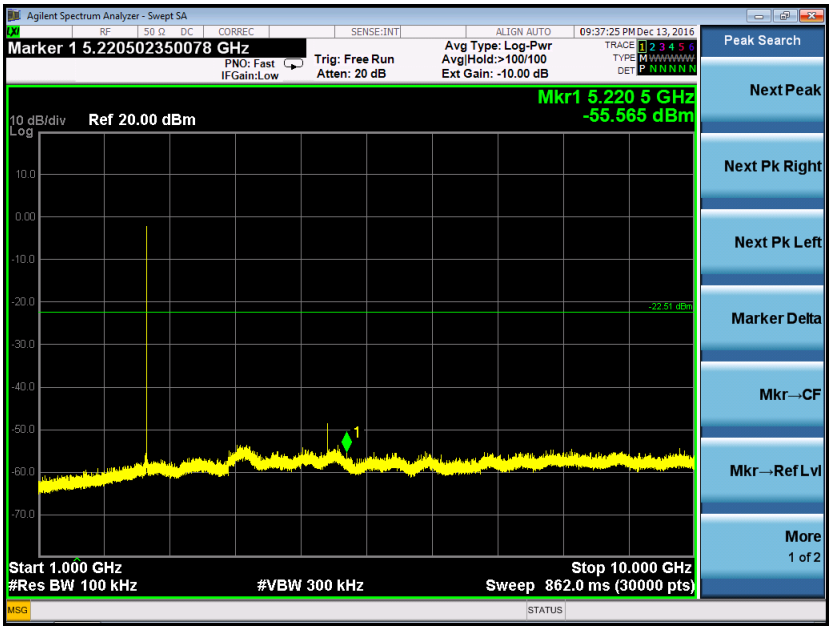
Mid Channel: 1 GHz – 10 GHz

Mid Channel: 10 GHz – 25 GHz

High Channel – 30 MHz – 1 GHz

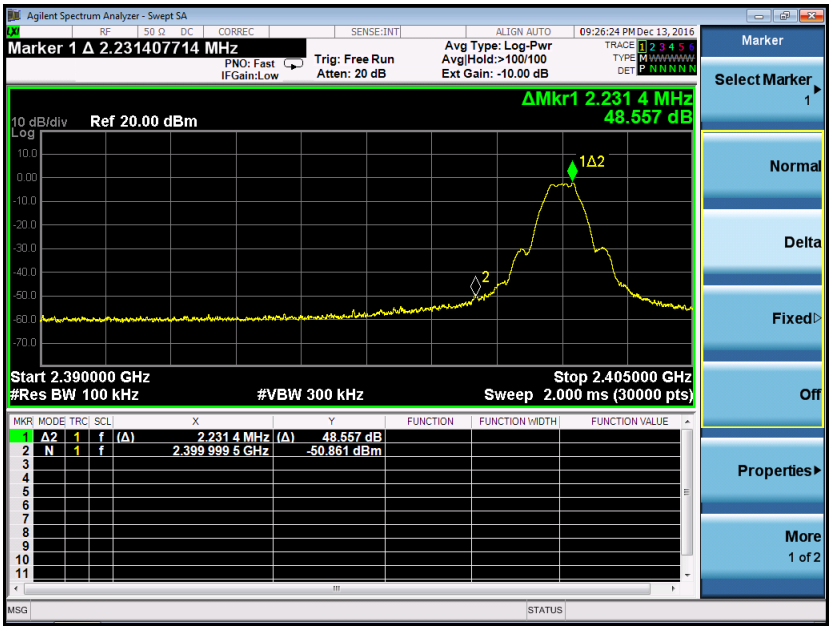


High Channel: 1 GHz – 10 GHz

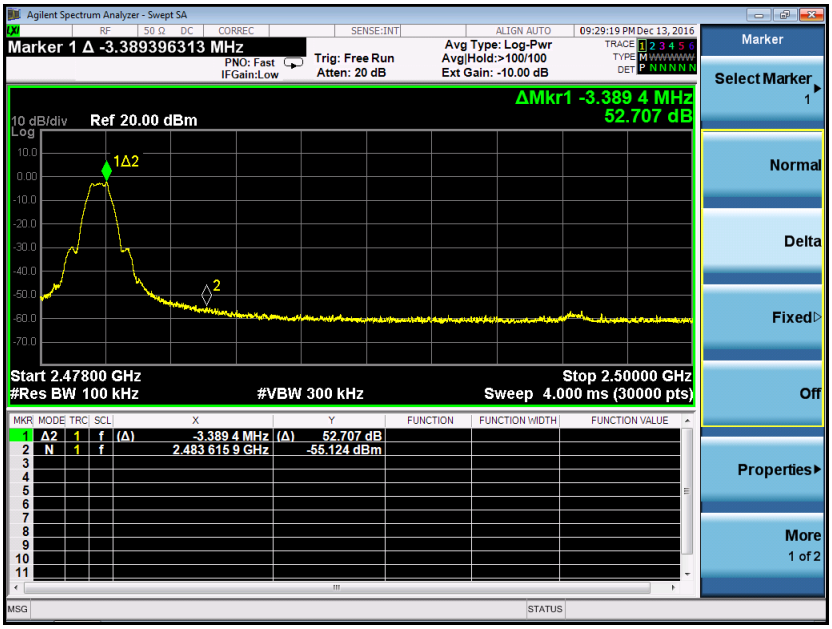


High Channel: 10 GHz – 25 GHz

Low Channel – Lower Band Edge



High Channel – Upper Band Edge



3.4 – RF Conducted – Frequency Stability

Manufacturer	Sound Devices
Date	12/13/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	FCC 15.247 and 2.1055 / RSS-247
Specific Measurement Procedure	ANSI C63.10 Section 6.8 ANSI C63.10 Section 5.13(b)
Additional Description of Measurement	RF Conducted Measurement
Additional Notes	1. Continuous unmodulated transmission used for this test. 2. EUT Voltage Ratings – Nominal: 3.0 V; Minimum: 2.55 V; Maximum 3.45 V

The equations below illustrate how the limits and margin were calculated.

Delta (Hz) = (Channel Frequency (Hz)/10,000) - | (Channel Frequency (Hz) – Measured Frequency (Hz) |

Tables

Low Channel

Frequency Stability f = 2402 MHz			
Supply Voltage (VDC)	Frequency (Hz)	Deviation	
		Measured Frequency (Hz)	Delta (Hz)
2.55	2402000000	2401985007	225207
3	2402000000	2401985067	225267
3.45	2402000000	2401985393	225593

Mid Channel

Frequency Stability f = 2440 MHz			
Supply Voltage (VDC)	Frequency (Hz)	Deviation	
		Measured Frequency (Hz)	Delta (Hz)
2.55	2440000000	2439984829	228829
3	2440000000	2439984837	228837
3.45	2440000000	2439984823	228823

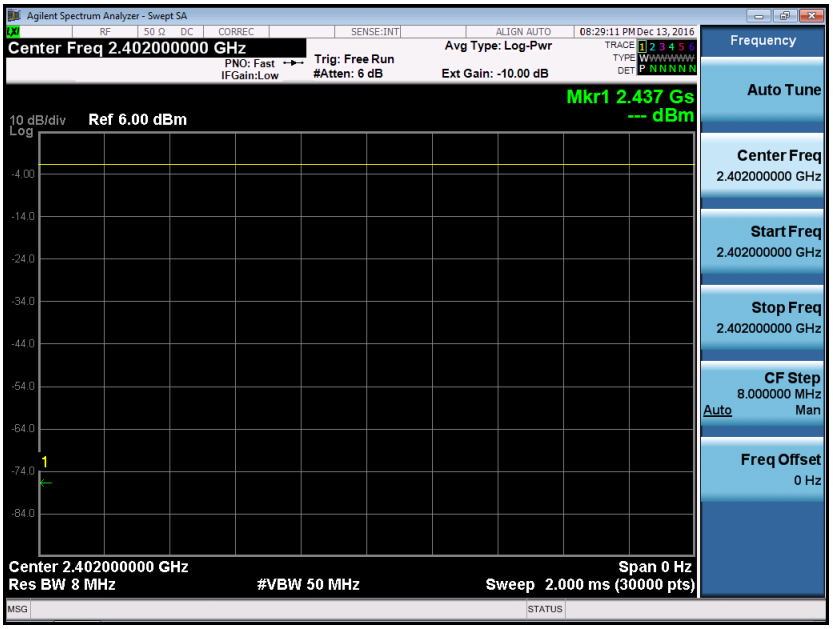
High Channel

Frequency Stability f = 2480 MHz			
Supply Voltage (VDC)	Frequency (Hz)	Deviation	
		Measured Frequency (Hz)	Delta (Hz)
2.55	2480000000	2479984426	232426
3	2480000000	2479984472	232472
3.45	2480000000	2479984585	232585

3.5 – RF Conducted – Duty Cycle

Manufacturer	Sound Devices
Date	12/13/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	15.247 / RSS-247
Specific Measurement Procedure	ANSI C63.10 Section 11.6
Additional Description of Measurement	RF Conducted Measurement
Additional Notes	1. Continuous transmit modulated used for this test. 2. Measurement used to determine VBW used for average measurements for transmitter radiated measurements

Plots



Note: The transmitter on time in the above screen capture is representative of all channels.

The transmitter never stops transmitting and, thus, the duty cycle is 100%.

4.0 – Radiated Emissions

Rule Part(s)	FCC: 15.247 / 15.205 / 15.209 IC: RSS-247 / RSS-Gen			
Measurement Procedure	ANSI C63.10 2013			
Test Location	LS Research, LLC - FCC Listed 3 meter Semi-Anechoic Chamber			
Test Distance	3 meters			
EUT Placement	Transmitter Mode: Below 1 GHz: 80 cm height Above 1 GHz: 150 cm height			
Frequency Range of Measurement	Biconical: 30-200 MHz	Log Periodic Dipole Array: 200-1000 MHz	Double-Ridged Waveguide Horn: 1-18 GHz	Small Horn: 18-25 GHz
Measurement Detectors	30-1000MHz RBW: 120 kHz VBW: ≥ 300 kHz		1 – 25 GHz: RBW : 1 MHz VBW: 3 MHz (Transmitter Peak Measurements); 10 Hz (Transmitter Average Measurements)	
Measurement Description	The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer before the measurements are performed. Data is gathered and reported as corrected values. The EUT is placed on a non-conductive pedestal centered on a turn-table in the test location with the antenna at a 3 meter separation distance from the EUT. Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height. The EUT was tested in three orthogonal orientations when operating in low, middle, and high transmission modes.			
Example Calculations	Reported Measurement data = Raw receiver measurement + Antenna Correction Factor + Cable factor (dB) - amplification factor (when applicable) + Additional factor(s) (when applicable)			

FCC Part 15.209 / IC RSS-GEN sect 8.9 limits:

Frequency (MHz)	3 m Limit (µV/m)	3 m Limit (dBµV/m)	Detector Type
30-88	100	40.0	Quasi-Peak
88-216	150	43.5	Quasi-Peak
216-960	200	46.0	Quasi-Peak
Above 960	500	54.0	Quasi-Peak
Above 1 GHz	-	54.0	Average
Above 1 GHz	-	74.0	Peak

4.1 – Transmitter Band-Edge Restricted Band

Manufacturer	Sound Devices	
Date	12/8/2016	
Operator	John Johnston	
Temp. / R.H.	20 - 25º C / 30-60% R.H.	
Rule Part	FCC 15.247/ 15.205 / 15.209	
Measurement Procedure	ANSI C63.10 - 2013 Section 6.10	
Test Distance	3 meters	
EUT Placement	150 cm above floor in each of three orientations	
Detectors	Peak: RBW = 1 MHz VBW ≥ 3 MHz	Average: RBW = 1 MHz VBW : 3 MHz (peak); 10 Hz (average)
Additional Notes	1) Tested in continuous transmit modulated mode with EUT rotated in three orientations. 2) EUT maximized in azimuth and antenna height with maximum results reported. 3) Video bandwidth greater than [1/(minimum transmitter on time)]. Since duty cycle is 100%, a 10 Hz video bandwidth was used for average measurements.	

Example Calculations:

Radiated Emissions Limits:

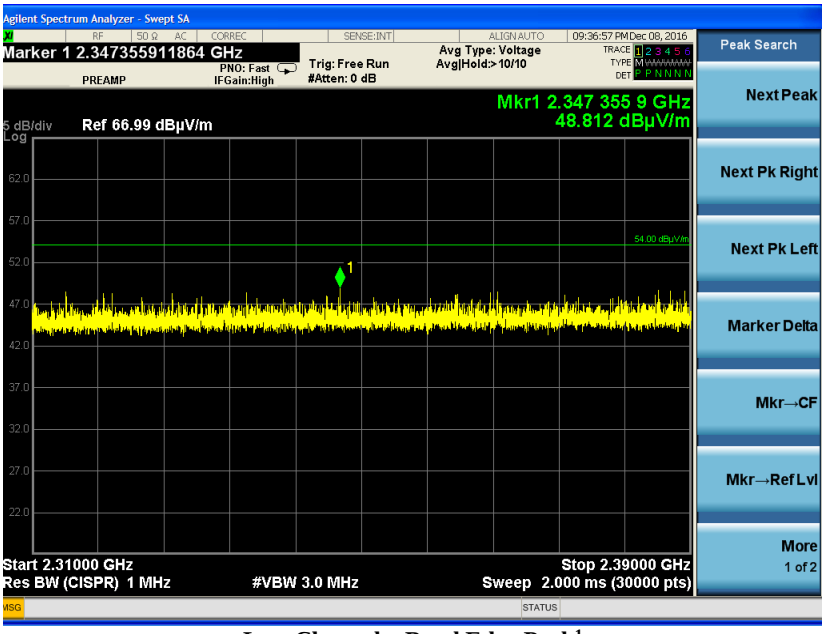
FCC 15.209 Average Limit @ 3 meter (dBµV/m) – Average Reading (dBµV/m) = Margin
FCC 15.209 Peak Limit @ 3 meter (dBµV/m) – Peak Reading (dBµV/m) = Margin

Video Bandwidth:

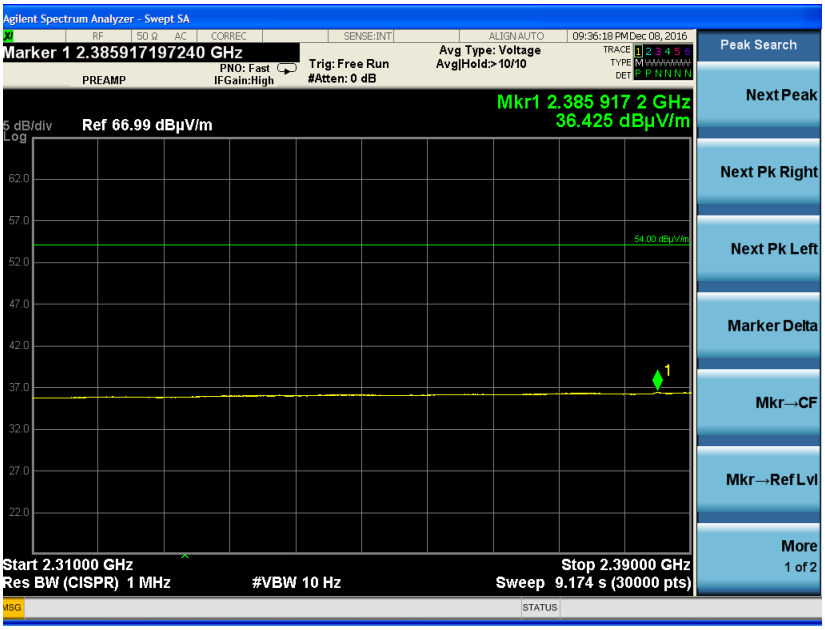
1/∞ s = 0 Hz = 10 Hz default

Tx Frequency (MHz)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)
2402	48.812	74.000	25.188	36.425	54.000	17.575
2480	48.841	74.000	25.159	36.831	54.000	17.169

Plots

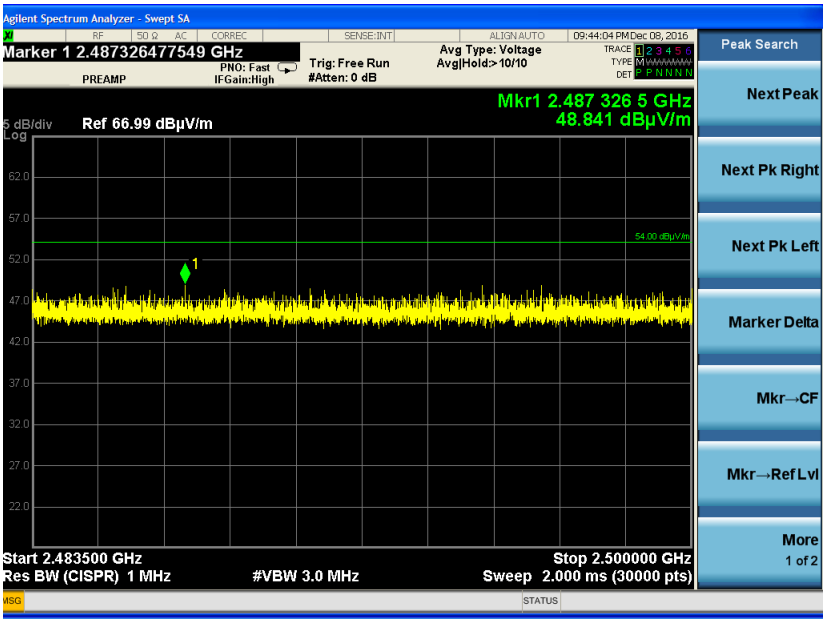


Low Channel – Band Edge Peak[1]

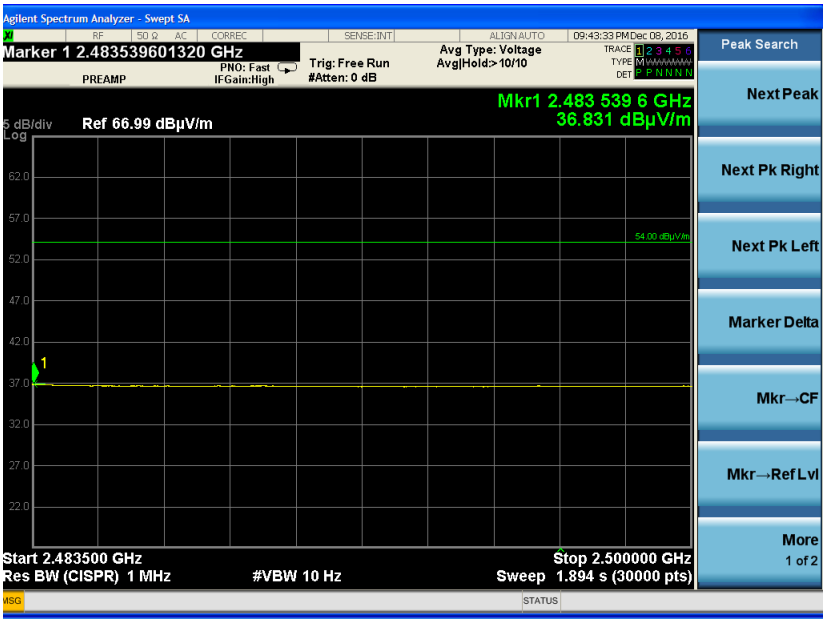


Low Channel – Band Edge Average

[1] Note: The average limit (i.e., 54 dBµV/m) is shown in this peak capture rather than the correct peak limit (i.e., 74 dBµV/m)



High Channel – Band Edge Peak[2]



High Channel – Band Edge Average

[2] Note: The average limit (i.e., 54 dBµV/m) is shown in this peak capture rather than the correct peak limit (i.e., 74 dBµV/m)

4.2 – Transmitter Radiated Spurious Emissions in Restricted Bands

Manufacturer	Sound Devices		
Date	12/6/2016, 12/8/2016, 12/9/2016, 12/12/2016, and 1/6/2017		
Operator	John Johnston		
Temp. / R.H.	20 - 25º C / 30-60% R.H.		
Rule Part	15.247/ 15.205 / 15.209		
Measurement Procedure	ANSI C63.10 - 2013 Sections 6.3, 6.5, and 6.6		
Test Distance	3 meters		
EUT Placement	Below 1 GHz: 80 cm above ground plane. Above 1 GHz: 150 cm above ground plane.		
Detectors Above 1 GHz	Quasi-Peak: RBW: 120 kHz VBW: ≥ 300 kHz	Peak: RBW = 1 MHz VBW ≥ 3 MHz	Average: RBW = 1 MHz VBW = 10 Hz
Additional Notes	1) Tested in continuous transmit modulated mode on three channels in three orientations. 2) EUT maximized in azimuth and antenna height with maximum results reported. 3) Video bandwidth greater than [1/(minimum transmitter on time)]. Since duty cycle is 100%, a 10 Hz video bandwidth was used for average measurements. 4) A 6 dB attenuator was used to perform measurements in the 30-200 MHz range with the biconical antenna.		

Example Calculation:

FCC 15.209 Quasi-Peak Limit @ 3 meter (dBµV/m) – Quasi-Peak Reading (dBµV/m) = Margin
FCC 15.209 Average Limit @ 3 meter (dBµV/m) – Average Reading (dBµV/m) = Margin
FCC 15.209 Peak Limit @ 3 meter (dBµV/m) – Peak Reading (dBµV/m) = Margin

Tables

Below 1 GHz

Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	FCC Quasi Peak Limit(dBµV/m)	Margin (dB)	Antenna Polarity	EUT Orientation	Tx Channel
258.00	1.25	188	33.360	46.000	12.640	H	F	Low
282.70	1.00	73	29.200	46.000	16.800	V	F	Low
405.50	1.57	1	30.460	46.000	15.540	V	V	Low
282.60	1.00	174	34.680	46.000	11.320	H	V	Low
135.16	1.00	0	39.630	43.500	3.870	V	V	Low
135.15	1.00	349	39.070	43.500	4.430	V	S	Low

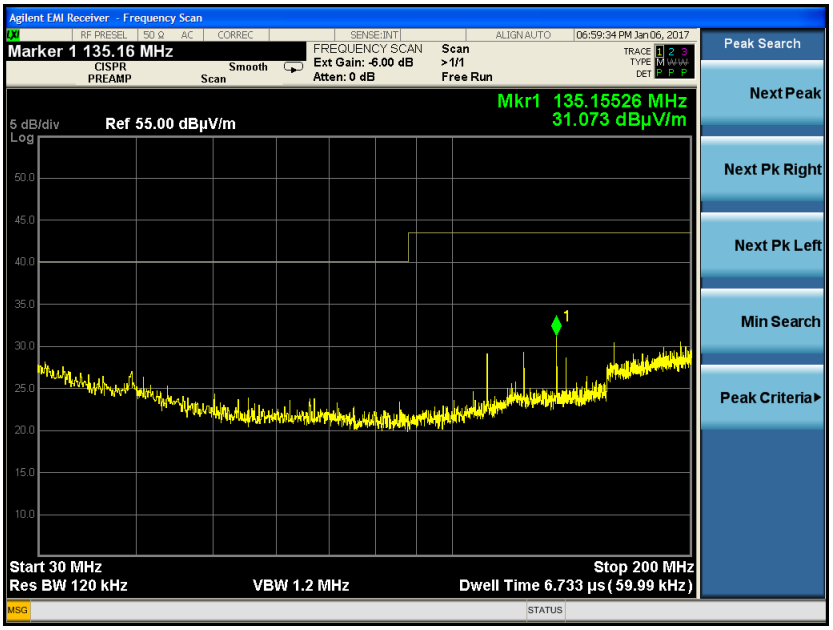
Above 1 GHz

Frequency (MHz)	Tx Channel	Height (m)	Azimuth (degree)	Peak Reading (dBuV/m)	Average Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Antenna Polarization	EUT Orientation
4804	Low	1.00	222	43.754	34.267	54.000	19.733	H	S
4804	Low	1.09	0	42.508	32.629	54.000	21.371	V	F
4880	Mid	1.00	227	43.505	32.100	54.000	21.900	H	S
21001*	Low	1.00	0	49.954	37.578	54.000	16.422	V	S
21037*	Low	1.00	0	49.280	37.348	54.000	17.652	H	S

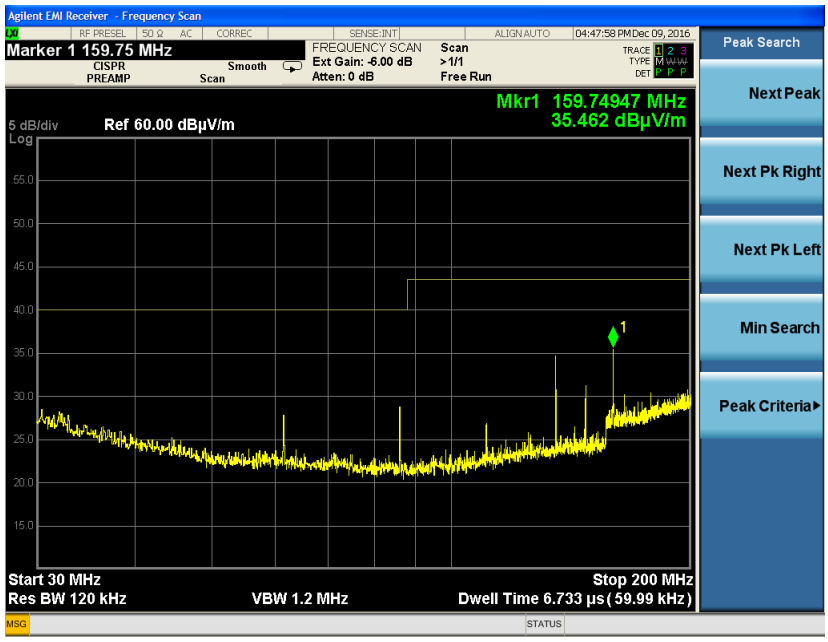
***Note: Frequencies labeled with a "*" above 1 GHz are noise floor measurements.**

Plots[3]

30 MHz – 200 MHz, Vertical Polarity

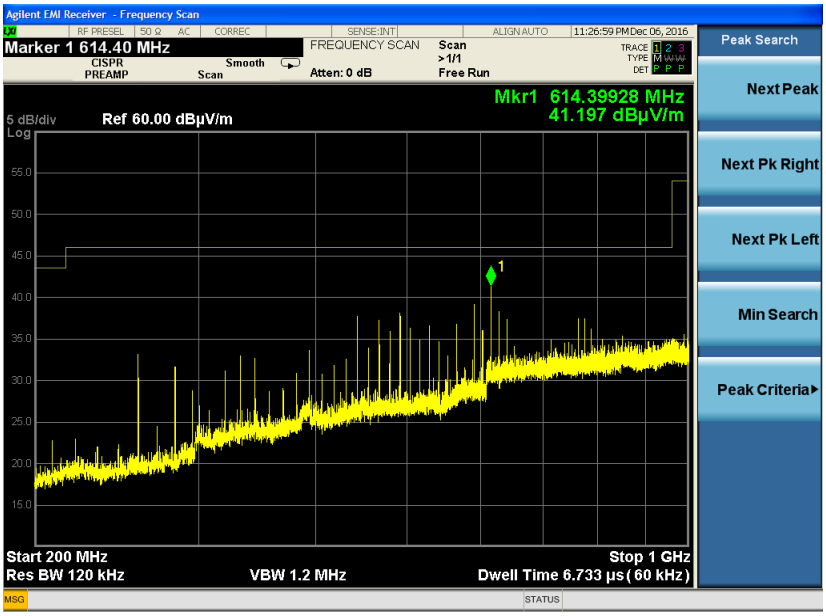


30 MHz – 200 MHz, Horizontal Polarity

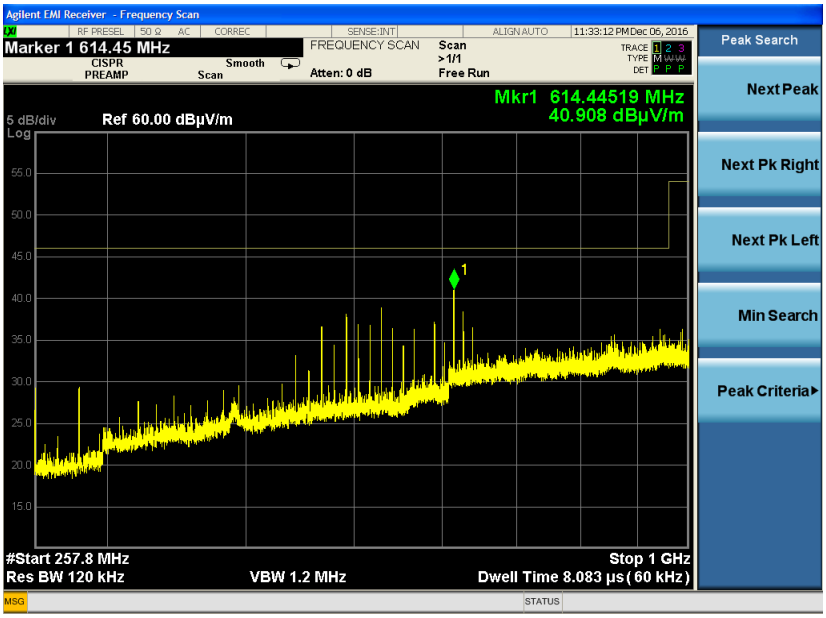


[3] The plots provided are the worst case traces across all transmission modes, orientations, and power supplies

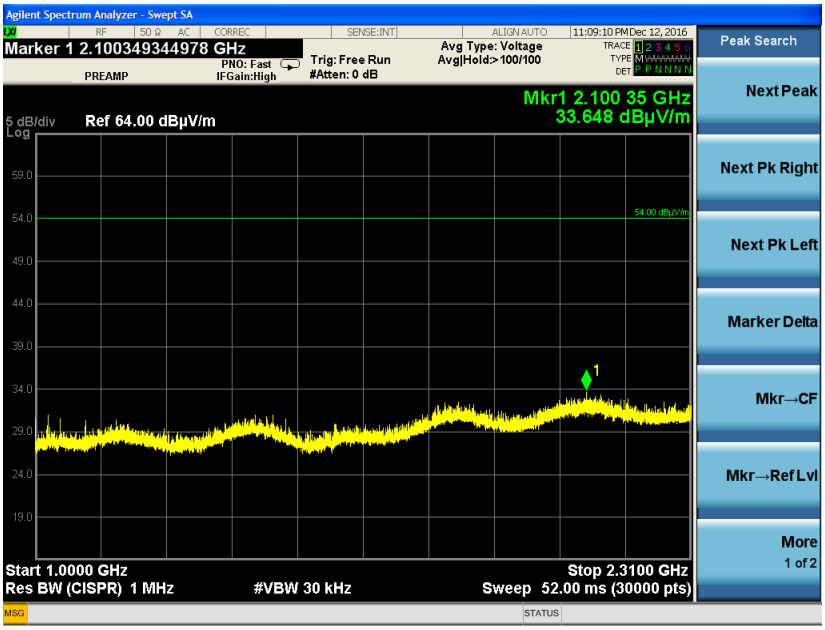
200 MHz – 1000 MHz, Horizontal Polarity



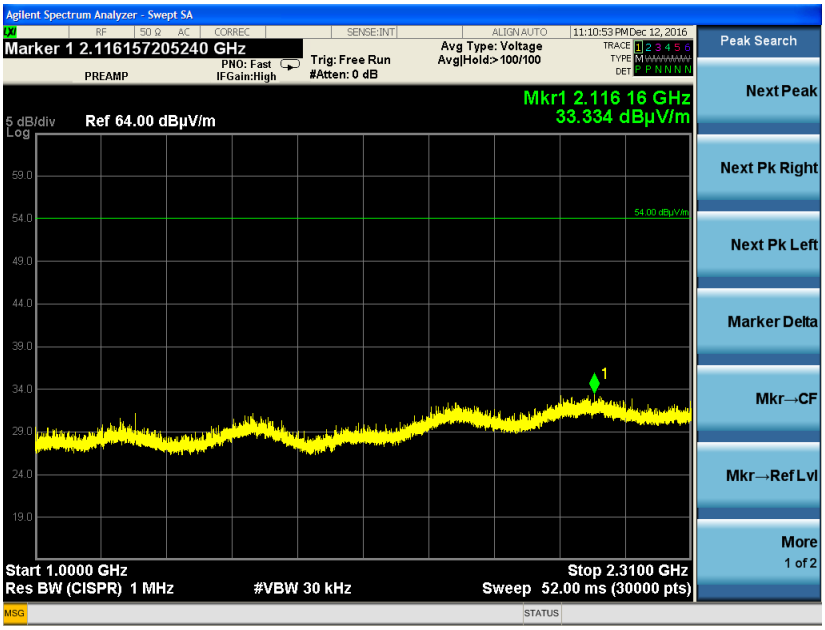
200 MHz – 1000 MHz, Vertical Polarity



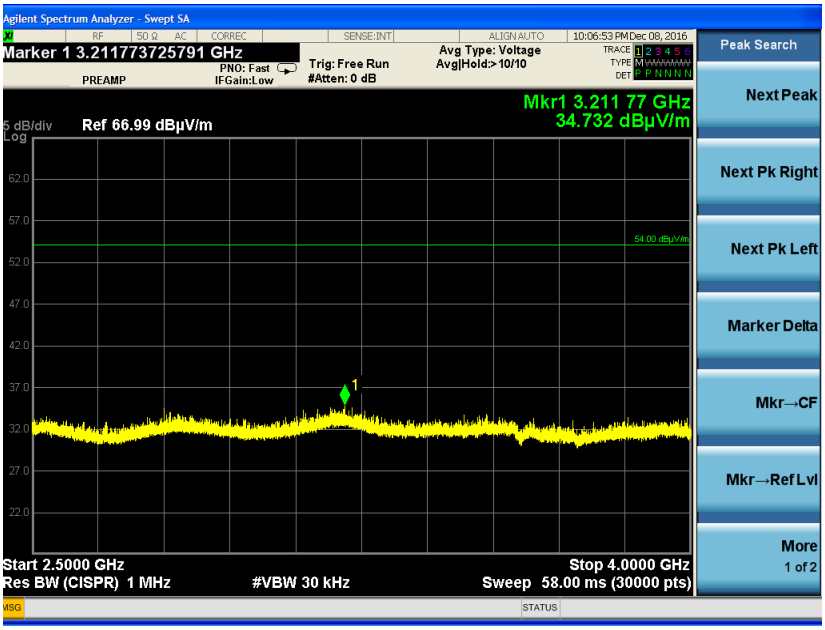
1000 MHz – 2310 MHz, Vertical Polarity, Reduced VBW



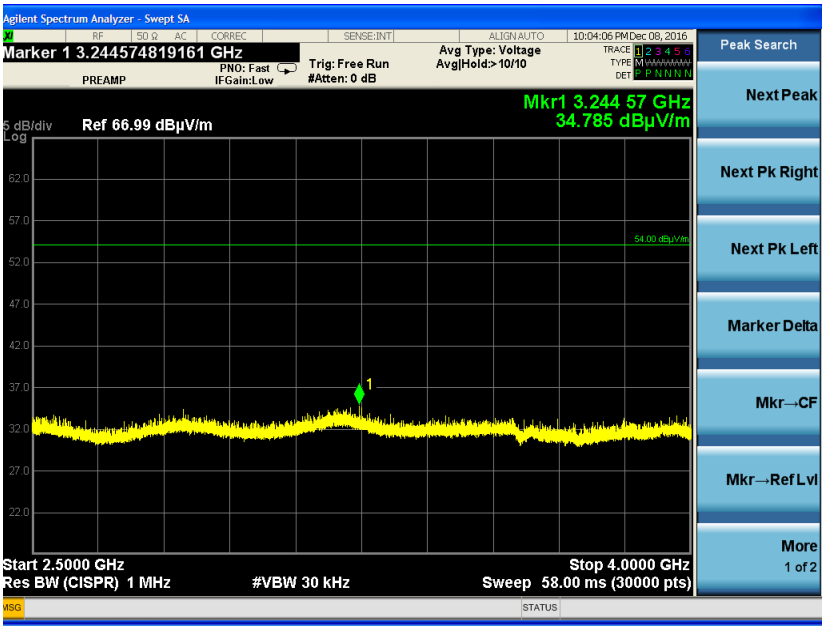
1000 MHz – 2310 MHz, Horizontal Polarity, Reduced VBW



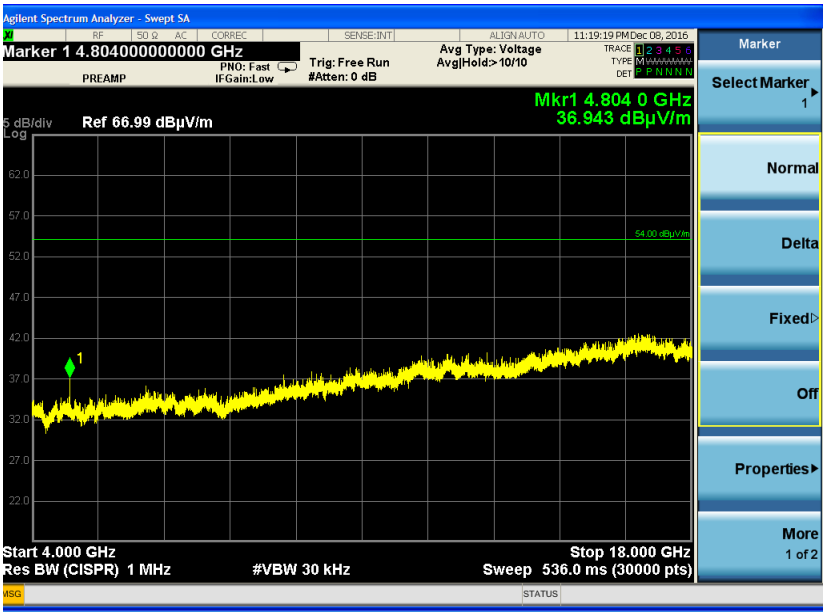
2500 MHz – 4000 MHz, Horizontal Polarity, Reduced VBW



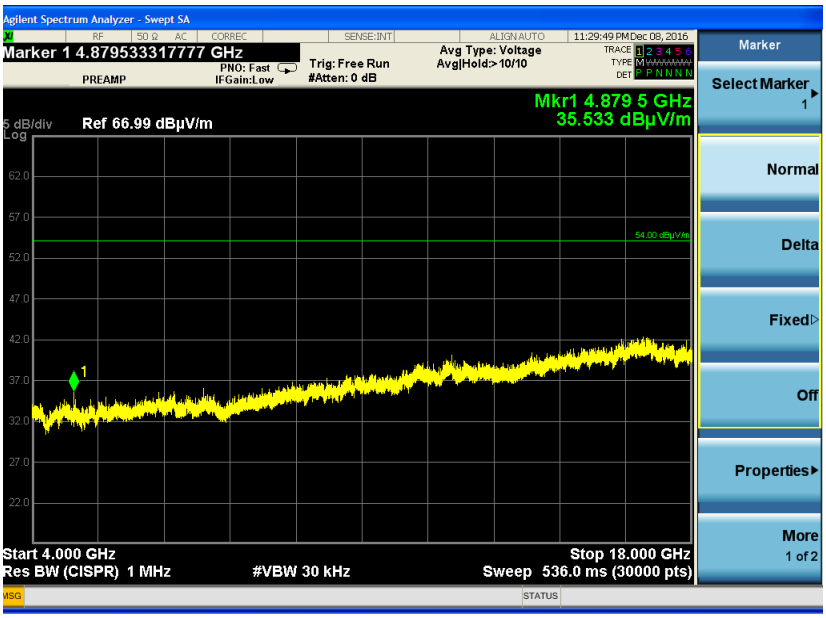
2500 MHz – 4000 MHz Peak, Vertical Polarity, Reduced VBW



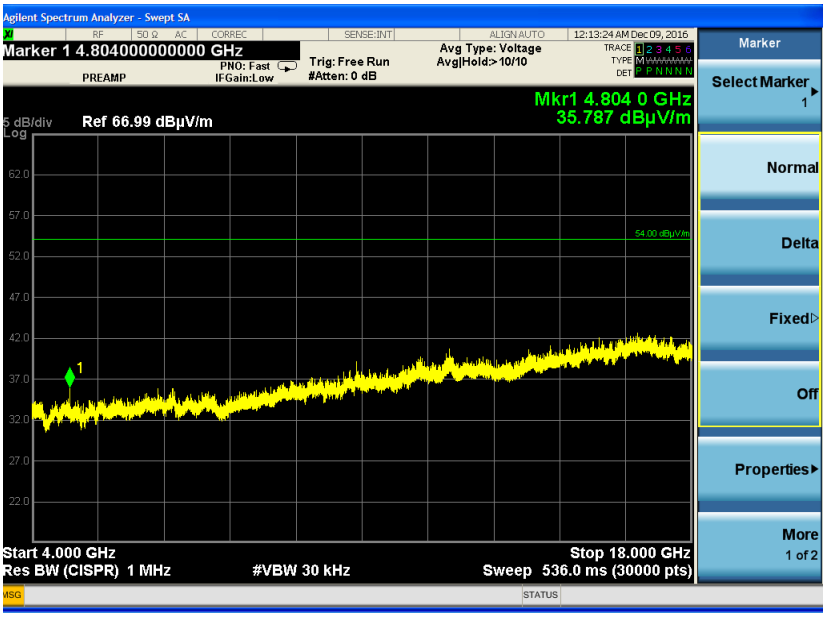
4 GHz – 18 GHz, Reduced VBW, Horizontal Polarity, Low Channel



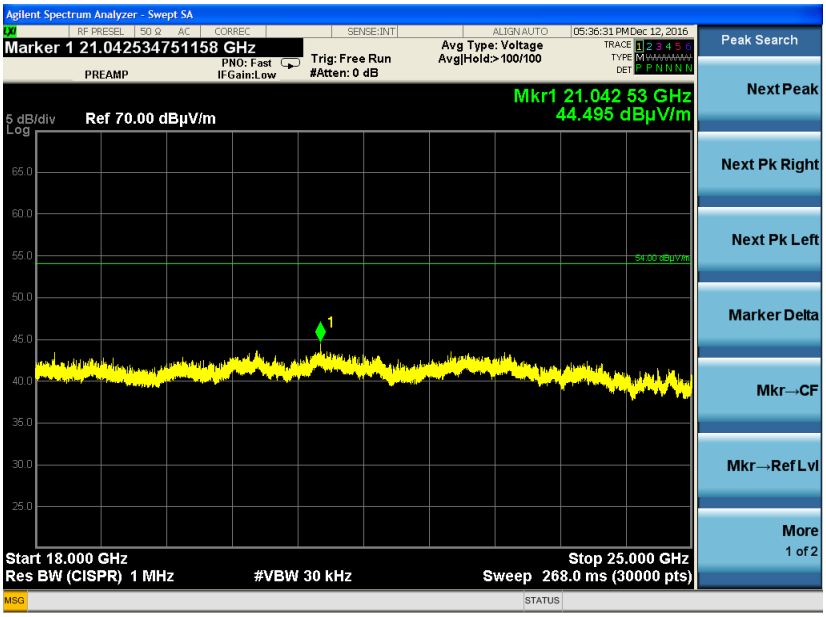
4 GHz – 18 GHz, Reduced VBW, Horizontal Polarity, Mid Channel



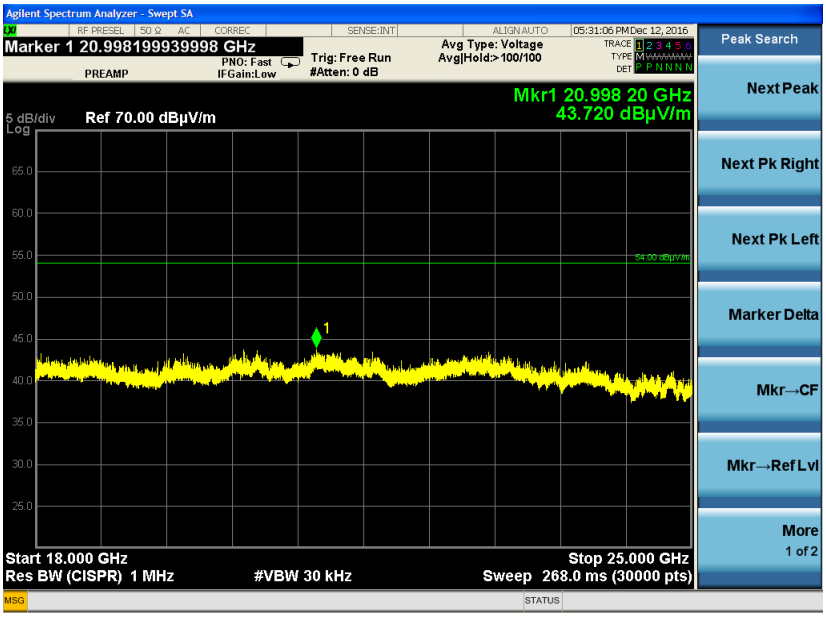
4 GHz – 18 GHz, Reduced VBW, Vertical Polarity, Low Channel



18 GHz – 25 GHz, Reduced VBW, Horizontal Polarization



18 GHz – 25 GHz, Reduced VBW, Vertical Polarization



5.0 – Conducted Emissions

Manufacturer	Sound Devices
Date	12/9/2016
Operator	John Johnston
Temp./R.H.	20 - 25º C / 30-60% R.H.
Rule Part(s)	FCC: 15.207 IC: RSS-GEN Section 8.8
Measurement Procedure	ANSI C63.10 2013
Test Location	Bench Testing
EUT Placement	80 cm height 40 cm from vertical ground plane
Frequency Range of Measurement	150 kHz to 30 MHz
Measurement Detectors	Quasi-Peak and Average Detectors
Measurement Description	The necessary measurement system correction factors are loaded onto the EMI receiver before the measurements are performed. Data is gathered and reported as corrected values. The EUT is placed on a non-conductive pedestal. Maximum conducted RF emissions are determined on Line 1 and Line 2. Adapter 1 and Adapter 2 were both tested. In each instance, the adapter was connected directly to the LISN.
Example Calculations	Reported Measurement data = Raw receiver measurement + Cable factor (dB) - amplification factor (when applicable) + Additional factor (when applicable)

Conducted Emission Limits

The 47 CFR Part 15 Section 207 and RSS-GEN Section 8.8 AC conducted emission limits are provided in the table below:

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

*Decreases with the logarithm of the frequency

5.1 – Conducted Emissions Test Set-Up

Manufacturer	Sound Devices
Date	12/9/2016
Operator	John Johnston
Temp. / R.H.	20 - 25º C / 30-60% R.H.
Rule Part	FCC 15.207 and RSS-GEN Section 8.8
Measurement Procedure	ANSI C63.10 (2013) Section 6.2
Additional Notes	1) Tested in continuous transmit modulated mode on each (i.e., low, middle, and high) transmission channel 2) Adapter 1 (1 meter length) and adapter 2 (1.8 meter length) were both tested

Test Results – Adapter 1

Line	Frequency (MHz)	Quasi-Peak Measurement (dBuV)	Quasi-Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV)	Average Limit (dBuV)	Margin (dB)	Notes
1	0.458	53.200	56.730	3.530	44.000	46.730	2.730	Tx 2402 MHz
2	0.454	53.800	56.800	3.000	43.600	46.800	3.200	Tx 2402 MHz
1	0.457	52.700	56.750	4.050	43.900	46.750	2.850	Tx 2440 MHz
2	0.455	53.200	56.790	3.590	43.200	46.790	3.590	Tx 2440 MHz
2	0.456	52.700	56.770	4.070	42.900	46.770	3.870	Tx 2480 MHz
1	0.454	54.200	56.800	2.600	43.600	46.800	3.200	Tx 2480 MHz

Test Results – Adapter 2

Line	Frequency (MHz)	Quasi-Peak Measurement (dBuV)	Quasi-Peak Limit (dBuV/m)	Margin (dB)	Average Measurement (dBuV)	Average Limit (dBuV)	Margin (dB)	Notes
2	0.150	55.500	66.000	10.500	38.900	56.000	17.100	Tx 2480 MHz
1	0.154	54.900	65.780	10.880	38.800	55.780	16.980	Tx 2480 MHz
1	0.155	55.500	65.730	10.230	39.200	55.730	16.530	Tx 2440 MHz
2	0.150	55.100	66.000	10.900	39.100	56.000	16.900	Tx 2440 MHz
2	0.161	54.700	65.410	10.710	37.200	55.410	18.210	Tx 2402 MHz
2	0.152	54.800	65.890	11.090	38.900	55.890	16.990	Tx 2402 MHz

Screen Captures[4]

Adapter 1

Line 1

Line 2

[4] Note: The screen captures provided depict the worst-case traces on each line across all transmission channels

Adapter 2

Line 1

Line 2

Appendix A – Test Equipment

LSR
a Laird Business

Date : 8-Dec-2016 Test : Radiated Emissions Job # : C-2612

PE: John Johnston Customer : Sound Devices Quote #: 316339

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
2	AA 960171	Cable - low loss 6m	A.H. Systems, Inc.	SAC-26G-6	386	3/31/2016	3/31/2017	Active Verification
3	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	10/13/2016	10/13/2017	Active Calibration
4	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213X-S+	40201429	10/13/2016	10/13/2017	Active Calibration
5	AA 960154	2.4GHz High Pass Filter	KWM	HPF-L-14186	7272-02	7/25/2016	7/25/2017	Active Calibration
6	AA 960174	Small Horn Antenna 18-40 GHz	ETS-Lindgren	3116C-PA	00206880	4/23/2016	4/23/2017	Active Calibration
7	AA 960150	Biconical Antenna	ETS	3110B	0003-3346	2/1/2016	1/31/2017	Active Calibration
8	AA 960163	Log Periodic Antenna	A.H. Systems, Inc.	SAS-512-2	500	3/18/2016	3/18/2017	Active Calibration
9	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	2/24/2016	2/23/2017	Active Calibration
10	AA 960005	Biconical Antenna	EMCO	93110B	9601-2280	1/14/2016	1/13/2017	Active Calibration

Project Engineer: Quality Assurance:

LSR
a Laird Business

Date : 9-Dec-2016 Test : Conducted Emissions Job # : C-2612

PE: John Johnston Customer : Sound Devices Quote #: 316339

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	2/24/2016	2/24/2017	Active Calibration
2	EE 960089	LISN - 15A	COM-POWER	LI-215A	191943	3/8/2016	3/8/2017	Active Calibration

Project Engineer: Quality Assurance:

LSR
a Laird Business

Date : 13-Dec-2016 Test : Conducted Measurements Job # : C-2612

PE: John Johnston Customer : Sound Devices Quote #: 316339

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	44GHz EXA Spectrum Analyzer	Agilent	N9010A	MY53400296	12/18/2015	12/18/2016	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	6/26/2015	6/26/2017	Active Calibration

Project Engineer: Quality Assurance:

Appendix B – Uncertainty Summary

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

Measurement Type	***Configuration***	***Uncertainty Values***
Radiated Emissions	*Biconical Antenna*	*5.0 dB*
Radiated Emissions	*Log Periodic Antenna*	*5.3 dB*
Radiated Emissions	*Horn Antenna*	*4.7 dB*
AC Line Conducted Emissions	*AMN*	*3.4 dB*
Telecom Conducted Emissions	*AAN*	*4.9 dB*
Disturbance Power (Emissions)	*Absorbing Clamp*	*4.1 dB*
Radiated Immunity	*3 Volts/Meter*	*2.2 dB*
Conducted Immunity	*CDN/EM/BCI*	*2.4/3.5/3.4 dB*
EFT Burst / Surge	*Peak pulse voltage*	*164 volts*
ESD Immunity	*15 kV level*	*1377 Volts*

Parameter	**ETSI U.C.+/-**	**U.C.+/-**
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (PM)	1.5 dB	1.2 dB
RF conducted emissions (SA)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

Appendix C - References

Publication	Year	Title
FCC CFR Parts 0-15	2016	Code of Federal Regulations – Telecommunications
ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
RSS-247 Issue 1	2015	Digital Transmission System (DTSs), Frequency Hopping System (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4	2014	General Requirements and Information for the Certification of Radio Apparatus