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Emissions
Test Report

EUT Name: Wireless Audio Headset

Model No.: Elite 800X RX

CFR 47 Part 15.407:2014 and RSS-210:2010

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	04/02/2015	Original Document	N/A
1	05/11/2015	Update Typo on Page 26 and 28	Jluong

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	Voyetra Turtle Beach, Inc. 100 Summit Lake Drive, Suite 100 Valhalla, New York, 10595 USA
Requester / Applicant:	Tim Blaney
Name of Equipment:	Wireless Audio Headset
Model No.	Elite 800X RX (TB300-2390-01)
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.407:2014 and RSS-210:2010
Test Dates:	20 January 2015 to 21 March 2015

Guidance Documents:

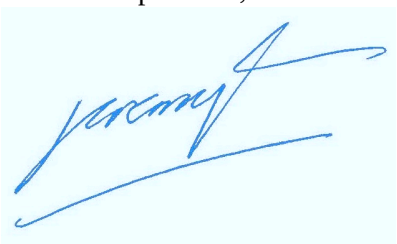
Emissions: ANSI C63.10-2009, KDB 789033 D02 General UNII Test Procedure New Rules v01

Test Methods:

Emissions: ANSI C63.10-2009, KDB 789033 D02 General UNII Test Procedure New Rules v01

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.



Jeremy Luong	May 11, 2015	David Spencer	May 11, 2015
Test Engineer	Date	Laboratory Signature	Date

Testing Cert #3331.02 **US5254** **2932M-1**

INDUSTRY CANADA

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.407:2014 and RSS-210:2010 based on the results of testing performed on 20 January 2015 to 20 March 2015 on the Wireless Audio Headset Model Elite 800X RX manufactured by Voyetra Turtle Beach, Inc. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

The report documents the 5GHz radio characteristics inside the Elite 800X RX.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.4:2003/ ANSI C63.10:2009	Test Parameters	Measured Value	Result
5180 MHz to 5240 MHz Band				
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.407 (b) RSS-GEN Sect.7.2.3, RSS-210 Sect. A.9.2	Class B	-0.70 dB (margin)	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS-210 Sect.2.6	Class B		**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.7.2.2	Class B	N/A	**Complied**
Occupied Bandwidth	CFR47 15.407 (a), RSS GEN Sect.4.4.1	N/A	26dB BW: 33.07 MHz 99% BW: 18.29 MHz	**Complied**
Maximum Output Power	CFR47 15.407 (a), RSS-210 Sect. A.9.2	22.62 dBm	6.98 dBm	**Complied**
Peak Power Spectral Density	CFR47 15.407 (a), RSS-210 Sect. A.9.2	4.00 dBm/MHz	-3.98 dBm/MHz	**Complied**
Peak Excursion Ratio	Information Only	N/A	N/A	**Complied**
Conducted Emission – Antenna Port	CFR47 15.407 (b), RSS-210 Sect.6.2.2	< -27 dBm/MHz	Na	**Complied**
Frequency Stability	CFR47 15.31(e), 15.407 (g), RSS GEN Sect. 4.7.	±20 ppm	15.87 ppm	**Complied**
Maximum Permissible Exposure	CFR47 15.247 (i), 2.1093 / KDB 447498 D01	≤ 3.0 for 1-g	0.770 for 1-g (SAR Exempted)	**Complied**

Note: 1. Meet restricted band emission requirements.
2. This report is only documented for 5150 – 5250 MHz.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US5254). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2005 and ISO 9002 (Lab Code 3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0031

VCCI Registration No. for Santa Clara: A-0032

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 2305 Mission College, Santa Clara, 95054, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code 3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2009, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2 Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is ± 11.6%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 5.84%.
The estimated combined standard uncertainty for surge immunity measurements is ± 5.84 %.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 3.48%.

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 1.59 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 4.01 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005.

3 Product Information

3.1 Product Description

The Elite 800X Wireless Gaming System consists of two main communication modules, the Elite 800X RX ("Headset") and the Elite 800X TX ("Transmitter"). These two modules comprise a closed-loop wireless audio gaming system that utilize a Wi-Fi communication technology to offer wireless streaming audio and chat/talkback capabilities. The Elite 800X RX ("Headset") has an additional Bluetooth feature supporting the mobile configuration.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of a EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of a EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

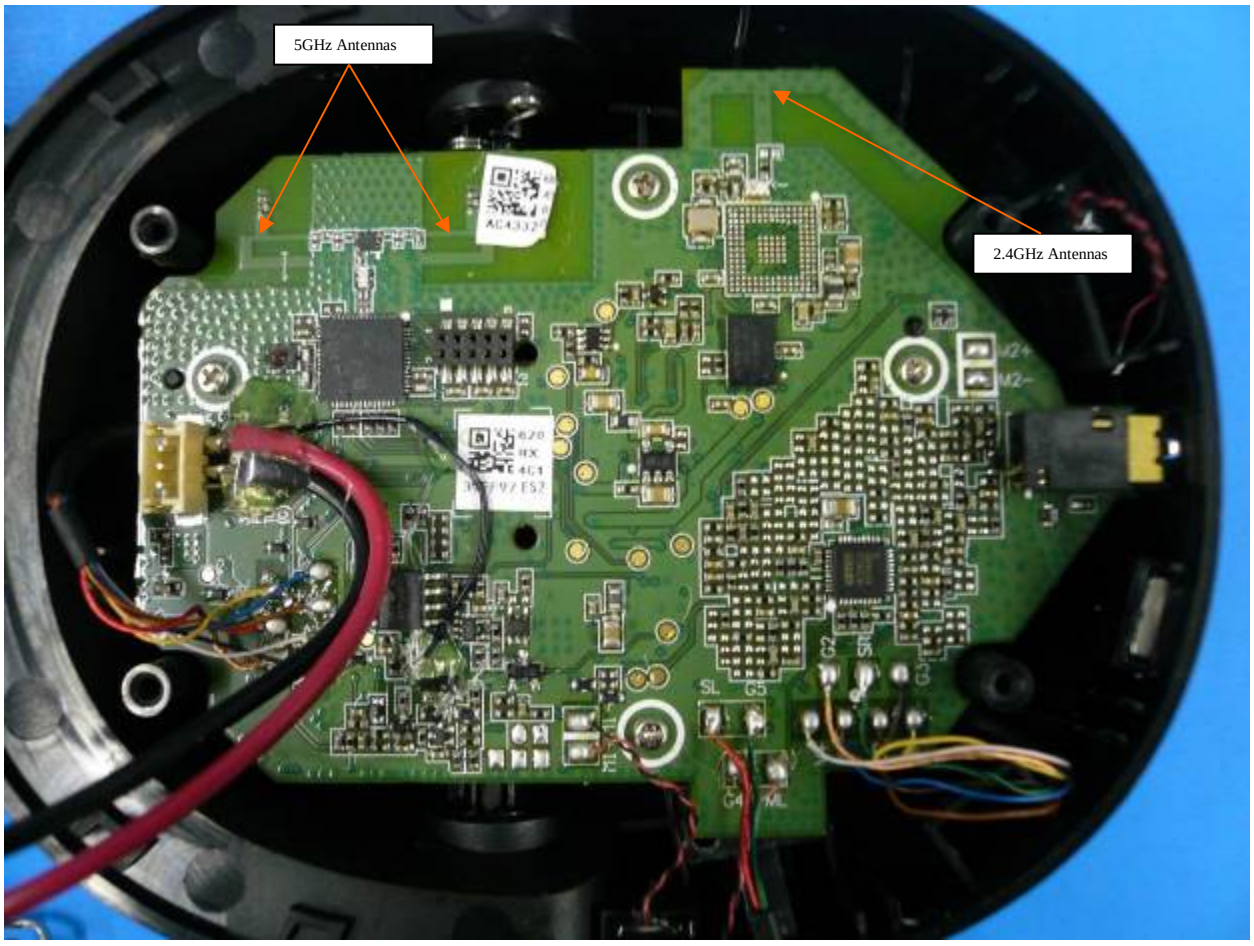
The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The Elite 800X RX uses the permanently attached PCB trace antennas inside the device. See EUT Photo for details. There is no external antenna connection available.



4 Emission Requirements - 5150 MHz to 5250 MHz Band

Testing was performed in accordance with CFR 47 Part 15.407: 2014 and RSS 210 Annex 9: 2010. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

The maximum output power and harmonics shall not exceed CFR47 Part 15.407 (a):2014 and RSS-210 A9.2: 2010.

The maximum transmitted powers for mobile and portable client device is

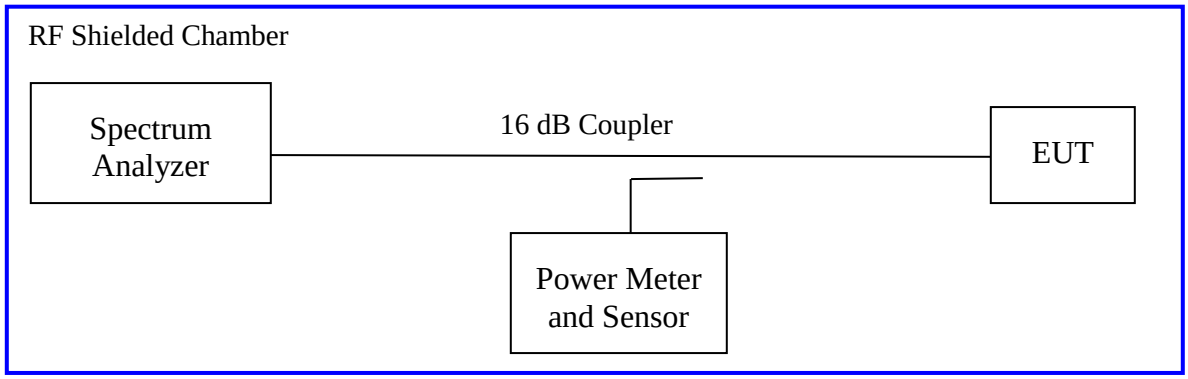
Band 5150-5250 MHz: 250 mW; per CFR47 Part 15.407:2014

Band 5150-5250 MHz: 200 mW or 10+10Log(B); where B is 99% Bandwidth.

4.1.1 Test Method

The ANSI C63.10-2009 Section 6.10.3.1 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate to determine the highest power output for each mode. The worst findings were conducted on 3 channels on the sample, S/N PP #3, per CFR47 Part 15.407(a): 2014 and RSS-210 A.9.2; 5150 MHz to 5250 MHz. The worst mode results indicated below.

Test Setup:



Method SA-2 of KDB 789033 D02 General UNII Test Procedure New Rules v01, "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices", applies since the EUT continuously transmit with duty cycle less 100%. The duty cycle, CF = 10Log(1/duty cycle), did not applied since EUT transmitted at 100% duty cycle.

4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 2: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement	**Test Date:** February 27, 2015
Antenna Type: Integrated	**Power Setting:** SPW 0
Antenna Gain: +1.3 dBi	**Signal State:** Modulated
Ambient Temp.: 23 °C	**Relative Humidity:**32%

Result

Operating Channel	Limit [dBm]	Output Power [dBm]	Margin [dB]
5180	22.62	6.13	-16.49
5200	22.62	6.12	-16.50
5240	22.62	6.98	-15.64

Note: 1. The highest output power was observed at 802.11a, 6Mbps.
2. EUT is a portable device. The limit under CFR47 Part 15.407 (*a)(1)(iv*) is 250 mW or 23.98 dBm. RSS 210 Sect 9.2 limit calculated using 99% bandwidth is 22.62 dBm. Since the calculated limit is more stricken, it is used to show compliance to both FCC and IC.
3. Measurements performed at 100% duty cycle; therefore, duty correction factor do not include to the final calculation.
4. Maximum antenna gain is less than 6 dBi; therefore, no antenna correction factor was applied.

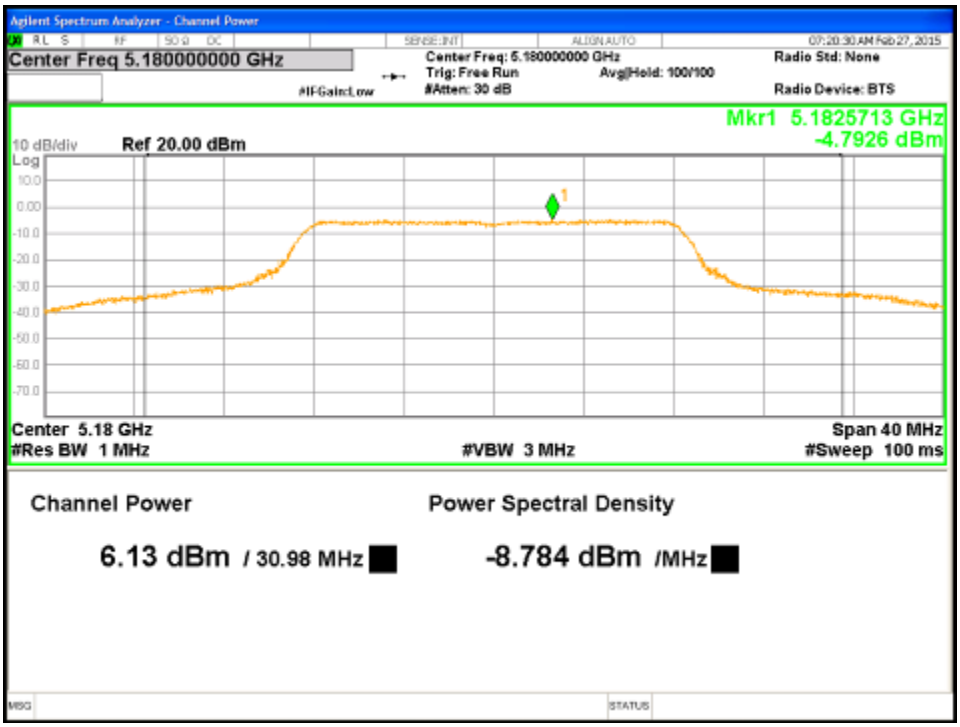


Figure 1: Maximum Conducted Output Power-5180 MHz-11a-6Mbps

Figure 2: Maximum Conducted Output Power-5200 MHz-11a-6Mbps

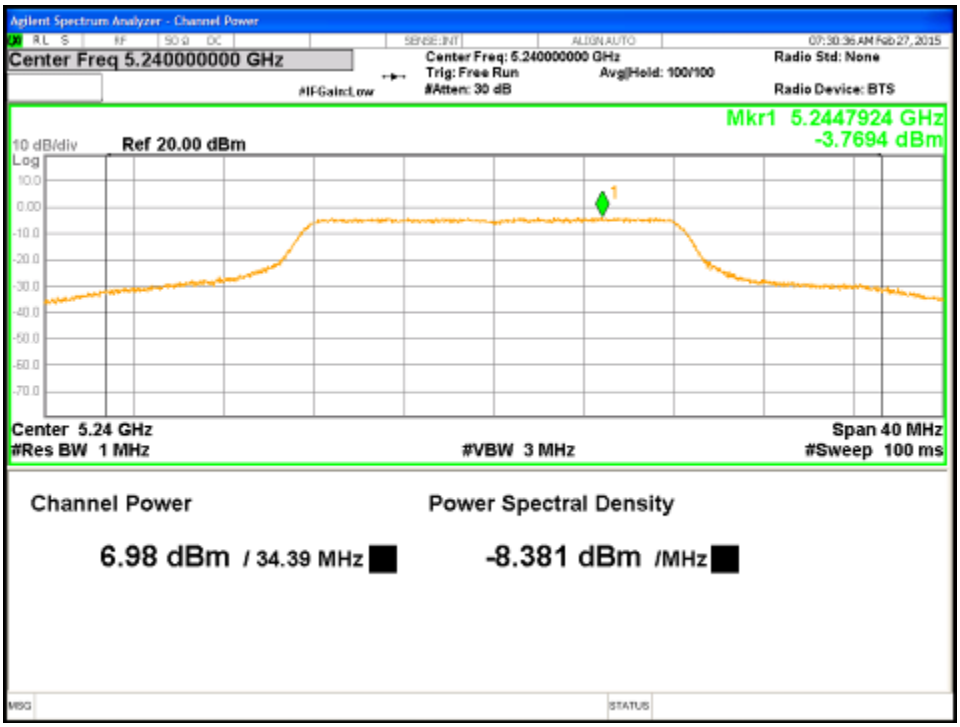


Figure 3: Maximum Conducted Output Power-5240 MHz-11a-6Mbps

4.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

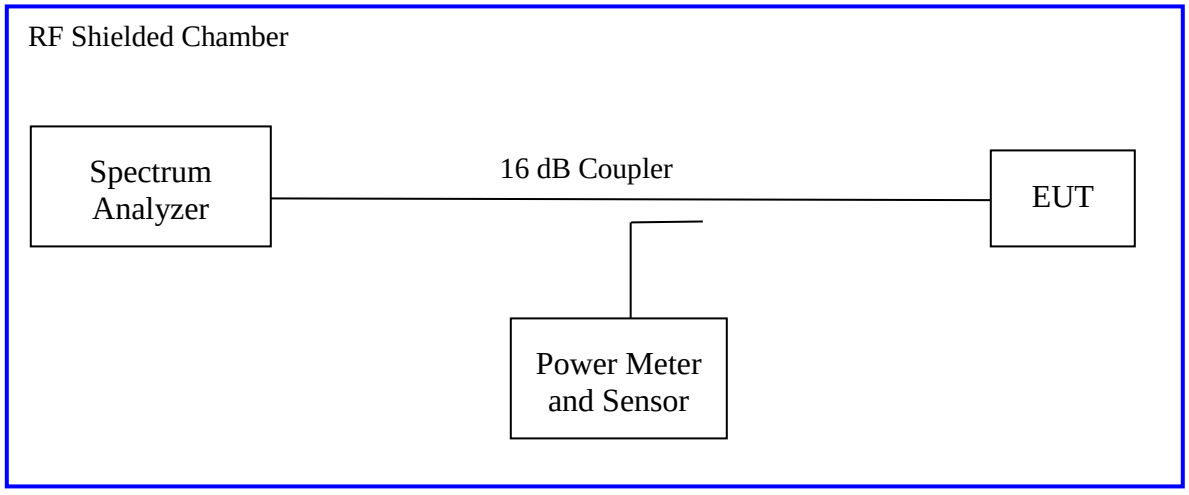
The 26 dB bandwidth is defined the bandwidth of 26 dBr from highest transmitted level of the fundamental frequency.

There is no power limitation referencing to the 26 dB bandwidth under CFR47 Part 15.407 (a)(1)(iv). The 26 dB bandwidth recorded for information only.

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.407(a) 2014 and RSS Gen Sect. 4.4.1:2010. The preliminary investigation was performed to find the narrowest 26 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range; 5150 MHz to 5250 MHz on the sample, S/N PP#3. The results indicated below.

Test Setup:



Method in Sect. C and D of KDB 789033 D02 General UNII Test Procedure New Rules v01, “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices”, used to perform measurements.

4.2.2 Results

These occupied bandwidth measurements were taken for references only.

Table 3: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement		**Test Date:** February 27, 2015
Antenna Type: Integrated		**Power Setting:** SPW 0
Antenna Gain: +1.3 dBi		**Signal State:** Modulated
Ambient Temp.: 23 °C		**Relative Humidity:**32%
Bandwidth for 802.11a		
Frequency (MHz)	**99% Bandwidth (MHz)**	**26dB Bandwidth (MHz)**
5180	18.288	33.070
5200	18.458	34.700
5240	19.308	36.870
Note: 1. The bandwidth was measured at 802.11a, 6Mbps. 2. The 18.288 MHz is used toward the maximum output power limit calculation per RSS210 Sect. 9.2.		

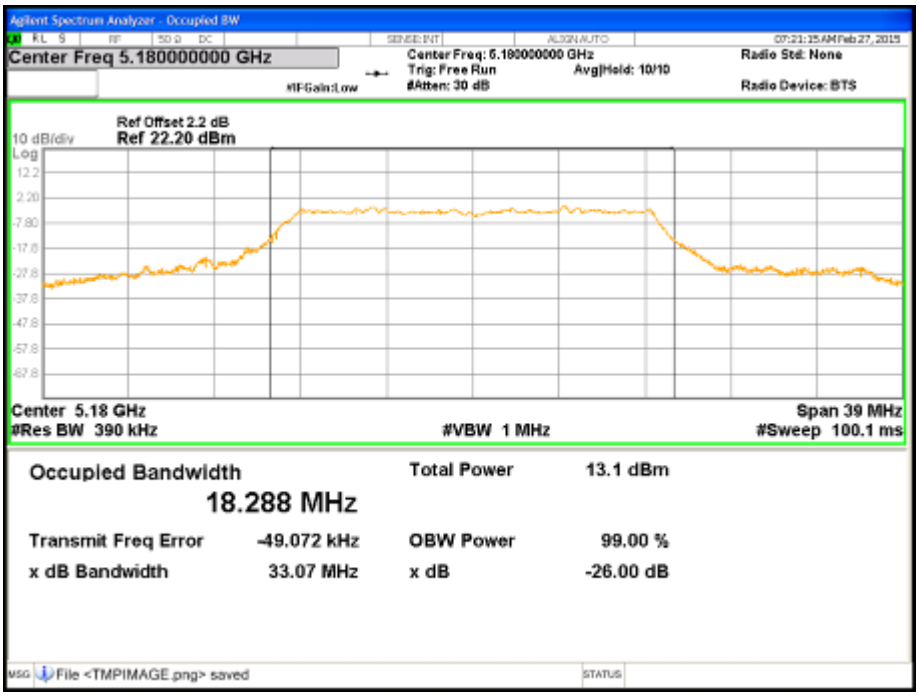


Figure 4: Occupied Bandwidth-5180 MHz-11a-6Mbps

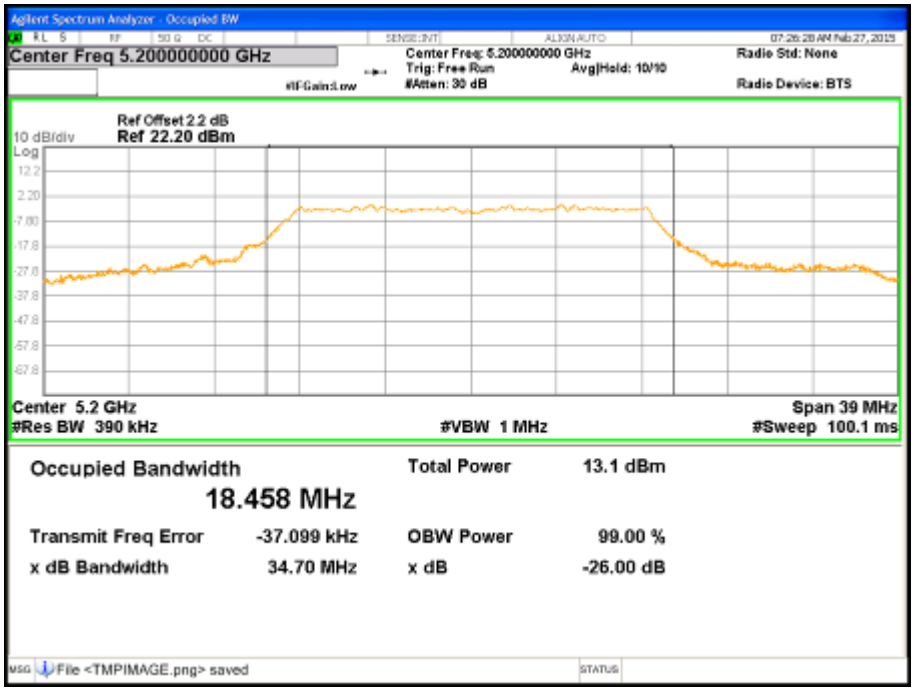


Figure 5: Occupied Bandwidth-5200 MHz-11a-6Mbps

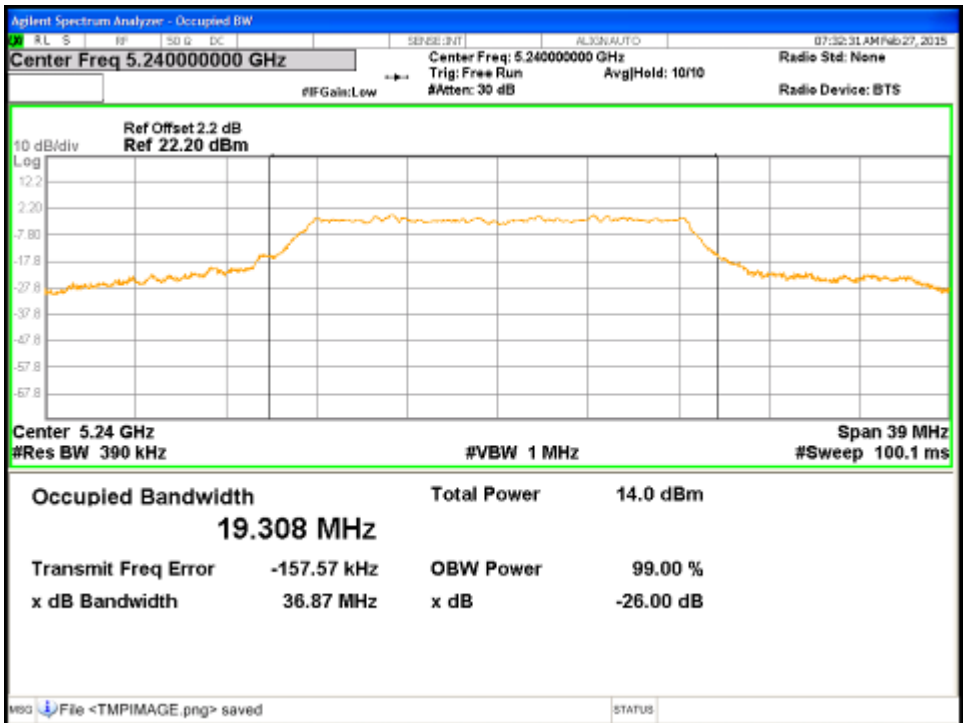


Figure 6: Occupied Bandwidth-5240 MHz-11a-6Mbps

4.3 Peak Excursion

The ratio of the peak excursion of the modulation envelope, measured using a peak hold function, to the maximum conducted output power performed under Section 4.1 shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

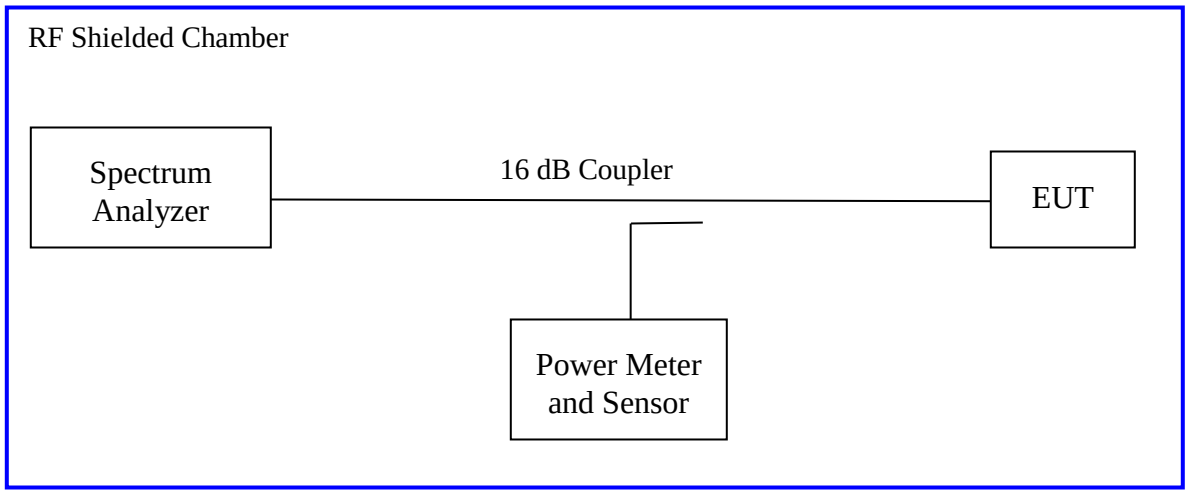
The peak excursion is not required under CFR47 Part 15.407:2014. These measurements recorded for information only.

4.3.1 Test Method

The ANSI C63.10-2009 Section 6.10.4 conducted method was used to measure the peak excursion.

The measurement was performed with modulation at all data rates. This test was conducted on 3 channels in each operating mode in frequency range 5150 MHz to 5250 MHz on the test sample, S/N PP#3. The worst sample result indicated below.

Test Setup:



4.3.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 4: Peak Excursion – Test Results

Test Conditions: Conducted Measurement		**Test Date:** February 27, 2015		
Antenna Type: Integrated		**Power Setting:** SPW 0		
Antenna Gain: +1.3 dBi		**Signal State:** Modulated		
Ambient Temp.: 23 °C		**Relative Humidity:**32%		
802.11a Mode				
Operating Channel	**Mode**	**Peak Excursion [dB]**	**Limit [dB]**	**Margin [dB]**
5180	6 Mbps	-7.26		
5200	6 Mbps	-6.86		
5240	6 Mbps	-6.90		
Note: Information only.				

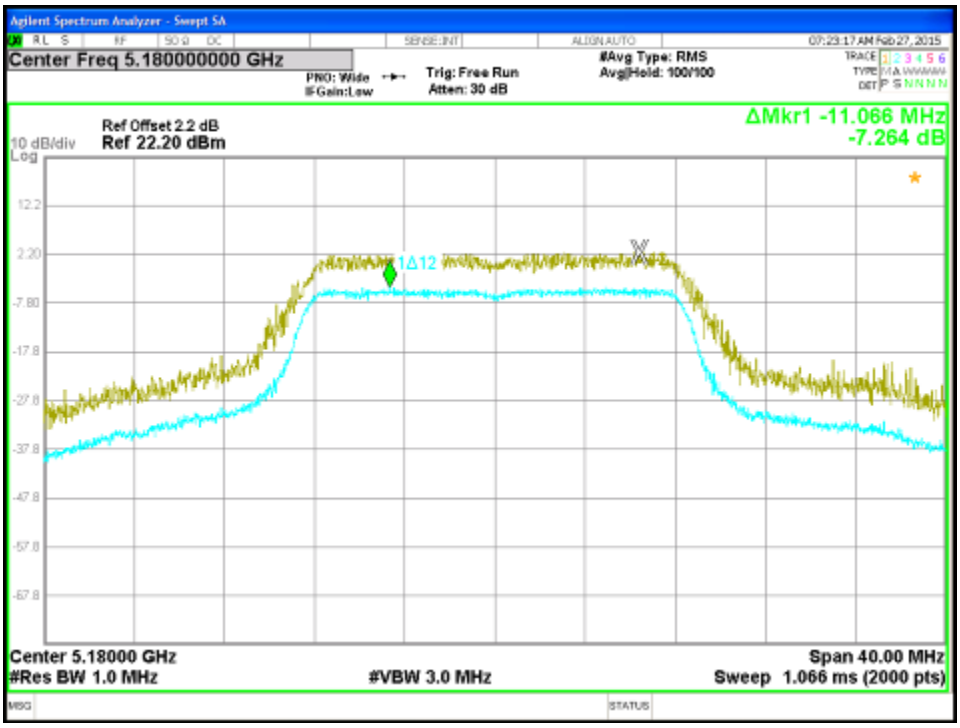


Figure 7: Peak Excursion-5180 MHz-11a-6Mbps

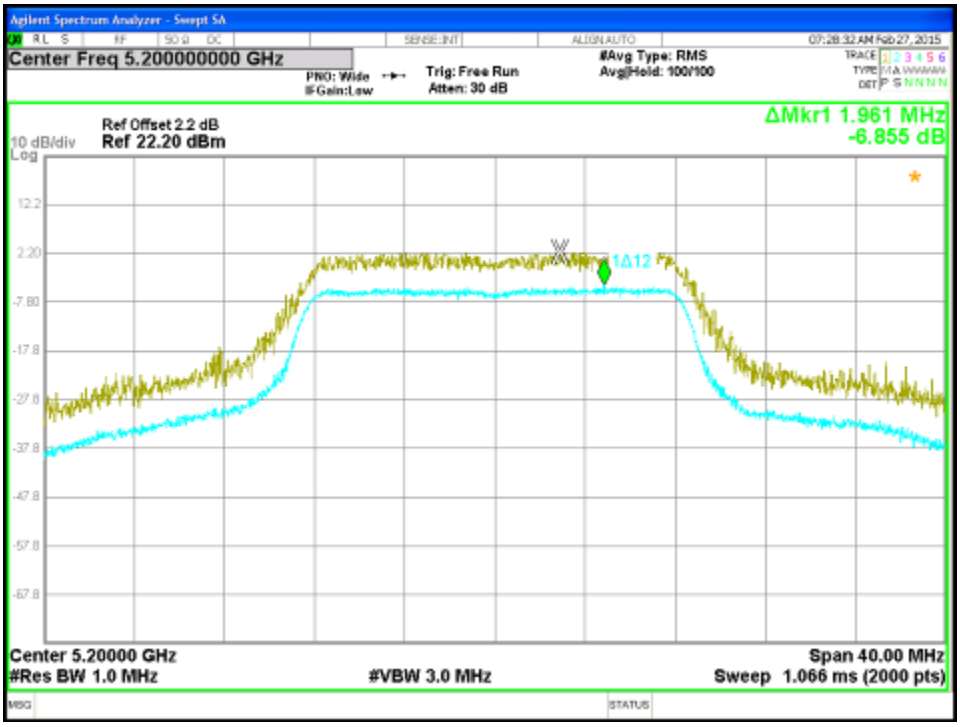


Figure 8: Peak Excursion-5200 MHz-11a-6Mbps

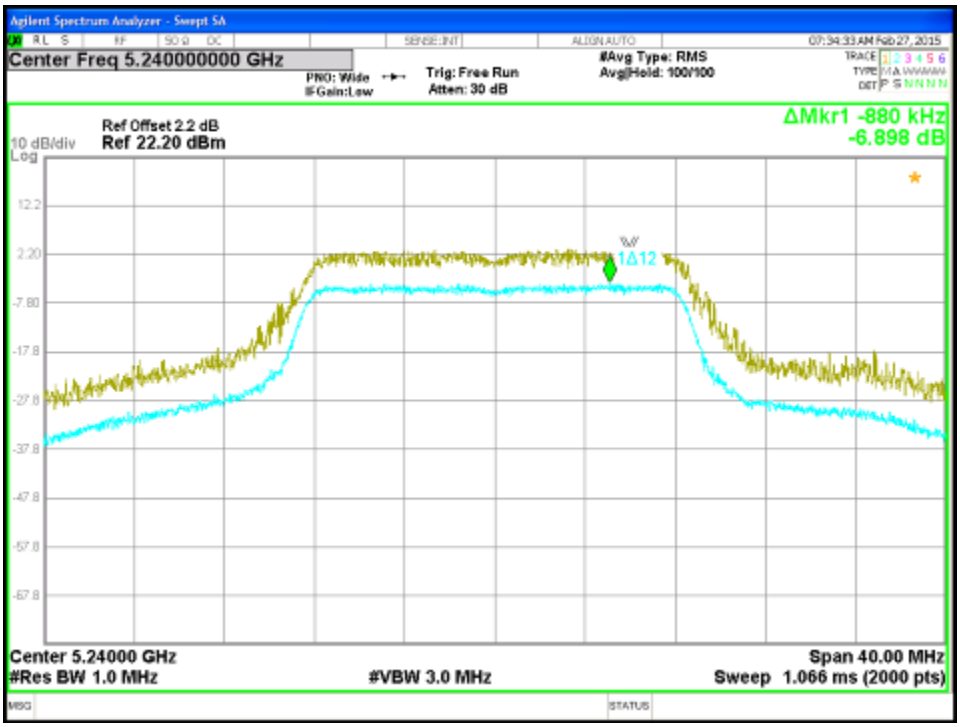


Figure 9: Peak Excursion-5240 MHz-11a-6Mbps

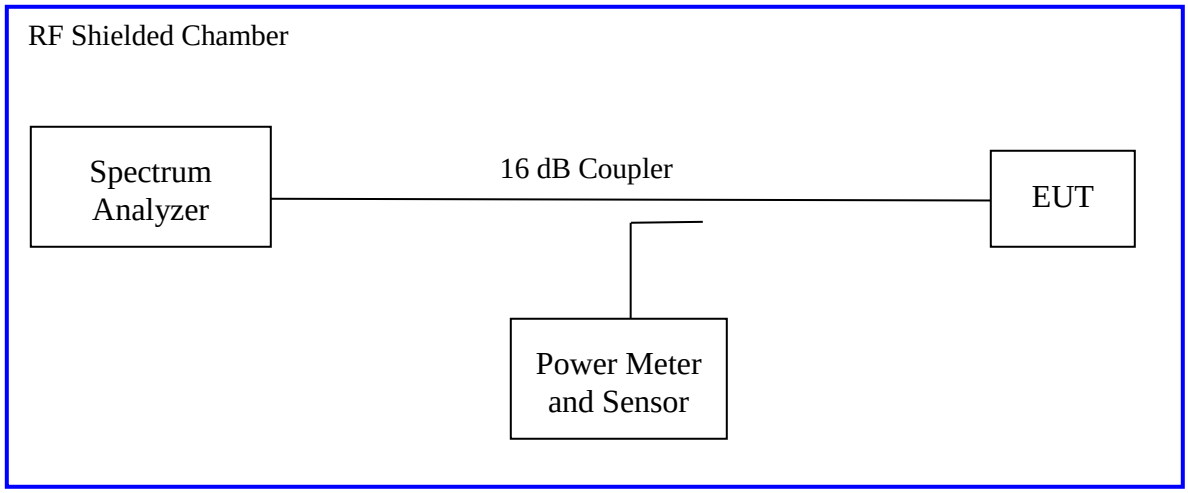
4.4 Peak Power Spectral Density

According to the CFR47 Part 15.407 (a) (1)(iv) the spectral power density output of the antenna port shall be less than 11 dBm in any 1 MHz band during any time interval of continuous transmission. RSS-210 (A9.2)has the e.i.r.p limit of 10.0 dBm in any 1 MHz.

4.4.1 Test Method

The conducted method was used to measure the peak power spectral density per ANSI C63.10-2009 Section 6.11.2. The measurement was performed with modulation per CFR47 Part 15.407 (a) and RSS-210 (A9.2). The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in frequency range of 5150 MHz to 5250 MHz for the test sample, S/N PP#3. The result indicated below.

Test Setup:



KDB 789033 D02 General UNII Test Procedure New Rules v01, "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices" Section F applies for measuring maximum power spectral density with duty cycle less than 100%. There was no duty cycle correction factor applied.

4.4.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 5: Maximum Power Spectral Density – Test Results

Test Conditions: Conducted Measurement		**Test Date:** February 27, 2015	
Antenna Type: Integrated		**Power Setting:** SPW 0	
Antenna Gain: +1.3 dBi		**Signal State:** Modulated	
Ambient Temp.: 23 °C		**Relative Humidity:**32%	
802.11a Mode			
Freq. [MHz]	**Limit [dBm]**	**Max. Power Spectral Density [dBm]**	**Margin [dB]**
5180	4.00	-4.56	-8.56
5200	4.00	-4.73	-8.73
5240	4.00	-3.98	-7.98
Note: 1. The maximum power spectral density was observed at 802.11a 6 Mbps at 100% duty cycle. 2. The conducted maximum spectral density limit with 6dBi antenna for CFR47 Part 15.407 (a)(1)(iv) is 11.0 dBm, and it is 4.0 dBm for RSS210 Sect. 9.2. The 4.0 dBm limit is used to show compliance to both standards.			

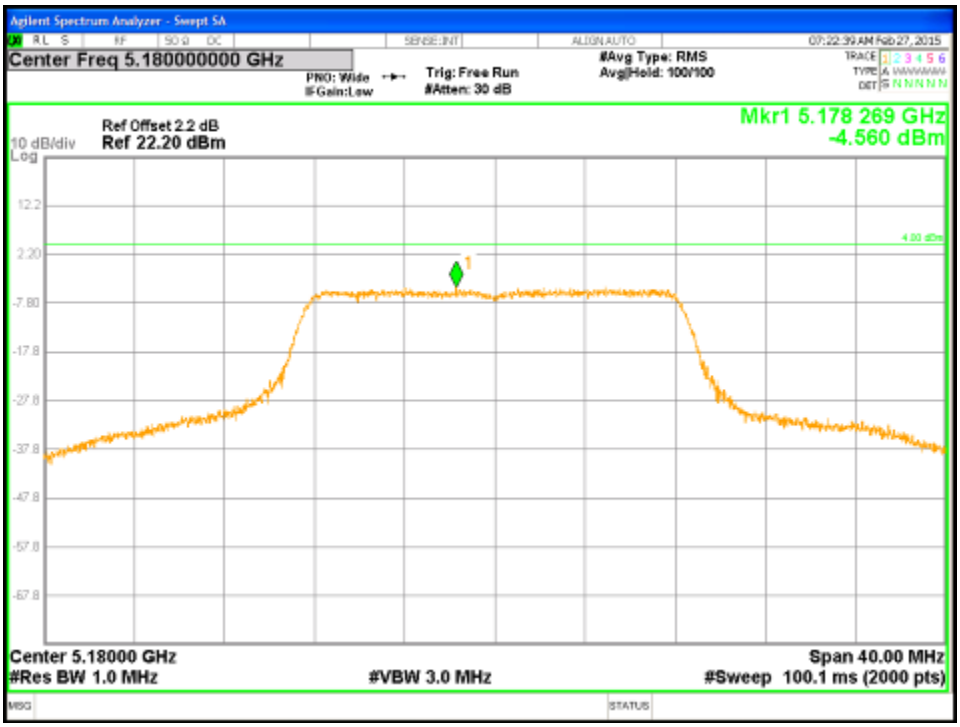


Figure 10: Maximum Power Spectral Density-5180 MHz-11a-6Mbps

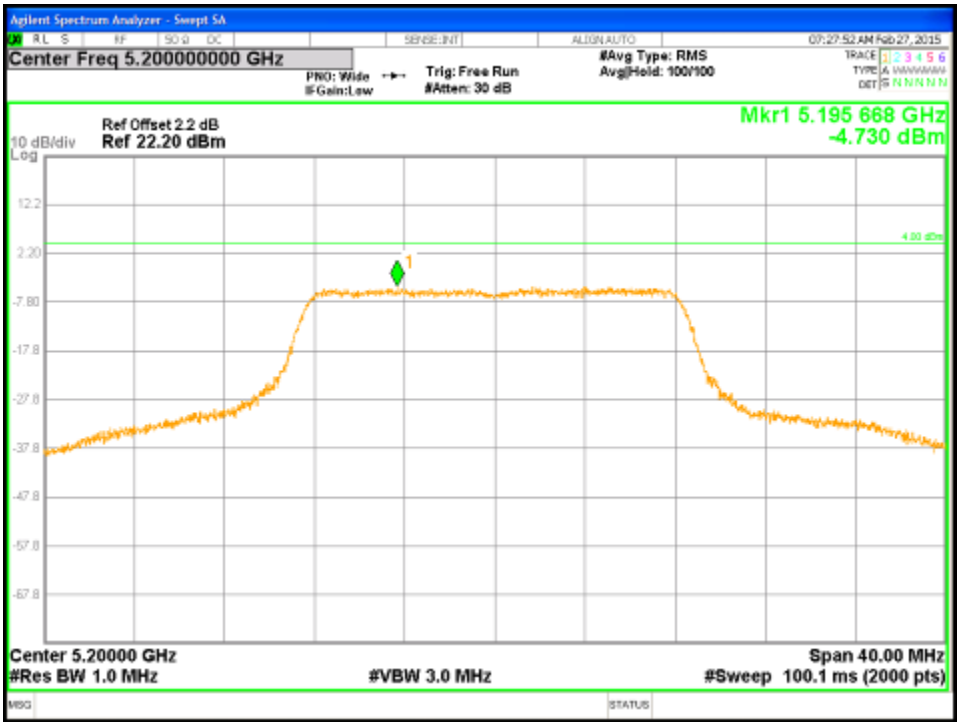


Figure 11: Maximum Power Spectral Density-5200 MHz-11a-6Mbps

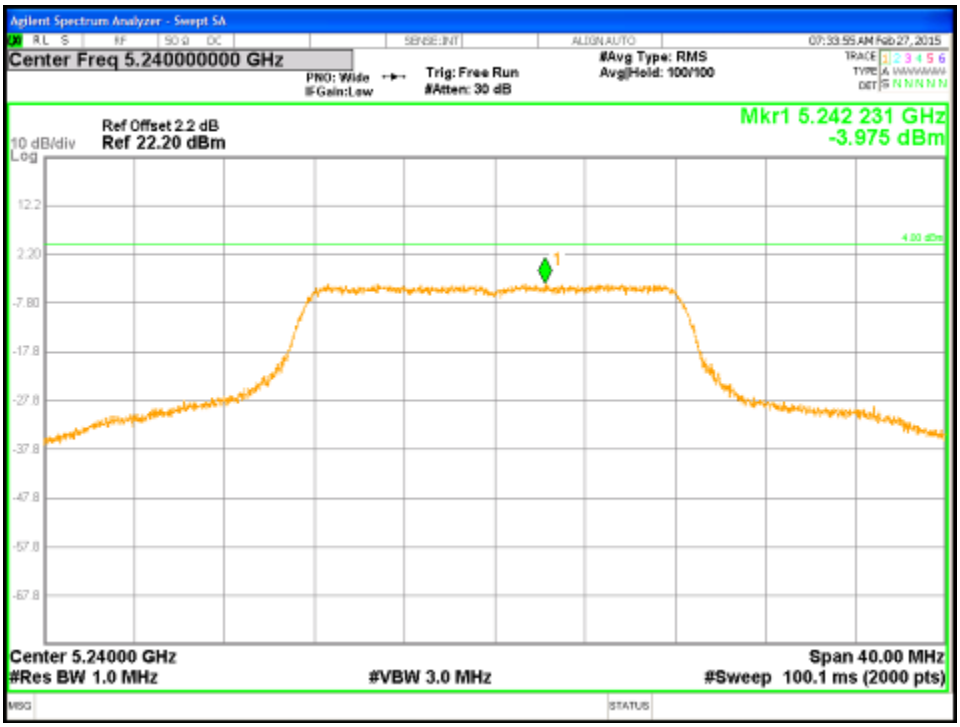


Figure 12: Maximum Power Spectral Density-5240 MHz-11a-6Mbps

4.5 Transmitter Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.407(b), RSS-210 Sect. A.9.2

4.5.1 Test Methodology

4.5.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pre-scans were performed to determine the worst axis, and data rate.

4.5.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans performed on the worst axis, Y-Axis, for three operating channels;

6 Mbps for 802.11a Mode: 5180 MHz, 5200 MHz, 5240 MHz

4.5.1.3 Deviations

None.

4.5.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2014 and RSS-210 A1.1.2 2010.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F(kHz)	300
0.490-1.705.....	24000/F(kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

According to CFR47 15.407 (b), all harmonics and spurious emissions which are outside the 5150 MHz - 5350 MHz shall not exceed -27 dBm/MHz. This is equivalent to 68.2 dBuV/m at 3 meter distance.

4.5.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

This section also addressed the simultaneous transmission of both radio; Bluetooth and 802.11a.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 6: Transmit Spurious Emission at Band-Edge Requirements

Test Conditions: Radiated Measurement					**Test Date:** March 2, 2015			
Antenna Type: Integrated					**Power Setting:** SPW 0			
Antenna Gain: +1.3 dBi					**Signal State:** Modulated			
Ambient Temp.: 23 °C					**Relative Humidity:**38%			
Band-Edge Results								
Freq. (MHz)	Level (dBuV/m)	Polarity (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
5150	52.23	H	74.00	-21.77	Pk	117	132	5180 MHz-11a-6Mbps
5150	42.68	H	54.00	-11.32	Ave	117	132	5180 MHz-11a-6Mbps
5150	52.84	V	74.00	-21.16	Pk	46	184	5180 MHz-11a-6Mbps
5150	41.04	V	54.00	-12.96	Ave	46	184	5180 MHz-11a-6Mbps
5150	51.29	H	74.00	-22.71	Pk	290	203	5240 MHz-11a-6Mbps
5150	40.28	H	54.00	-13.72	Ave	290	203	5240 MHz-11a-6Mbps
5150	51.23	V	74.00	-22.77	Pk	18	181	5240 MHz-11a-6Mbps
5150	41.04	V	54.00	-12.96	Ave	18	181	5240 MHz-11a-6Mbps

Note: 1. All the band-edge measurements met the restricted band requirements of CFR47 15.205.

2. It is also complied with the -27 dBm/MHz (68.2dBuV/m at 3m) requirements as stated in CFR47 15.407 (b) (1).

3. It is also confirm that the 20dBr point of the highest channel in each mode is within the 5150-5250 MHz range.

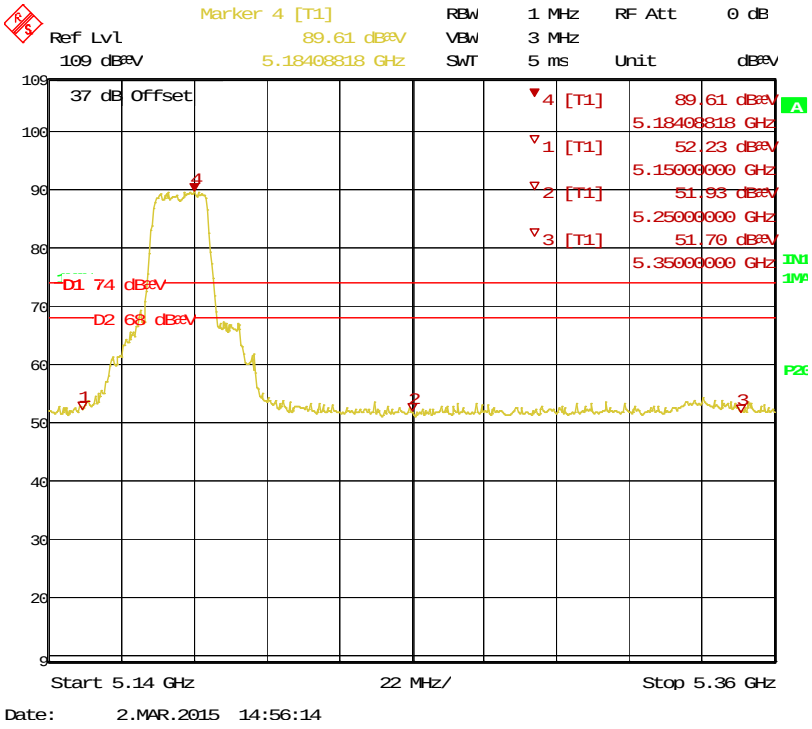


Figure 13: Bandedge-5180 MHz-11a-H-Pk

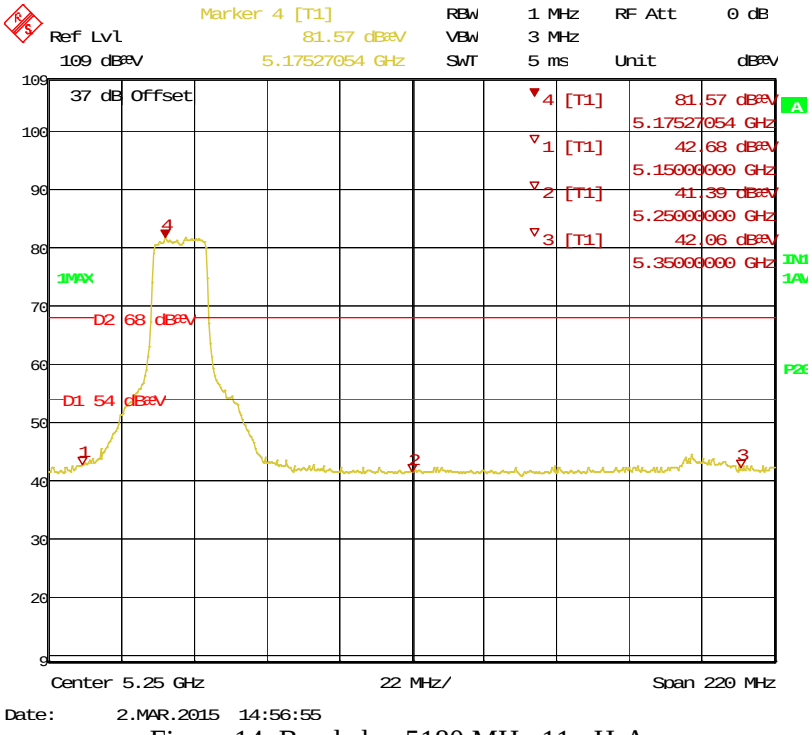


Figure 14: Bandedge-5180 MHz-11a-H-Ave

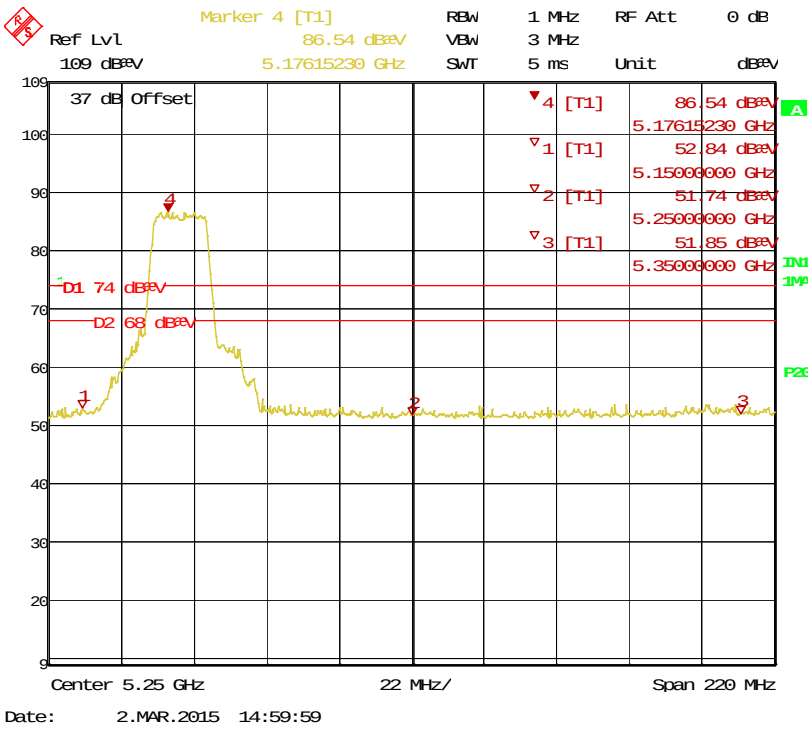


Figure 15: Bandedge-5180 MHz-11a-V-pk

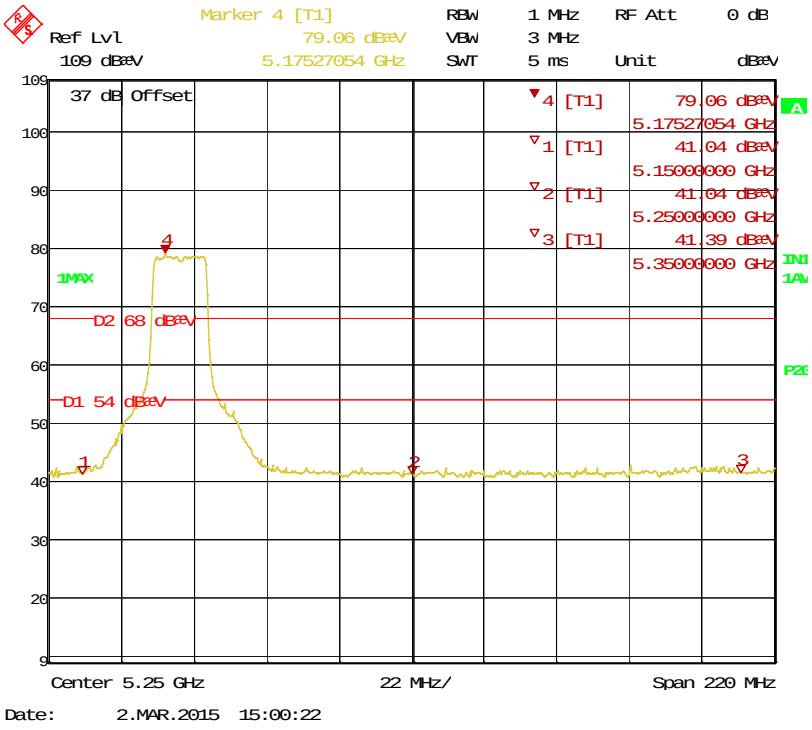


Figure 16: Bandedge-5180 MHz-11a-V-Ave

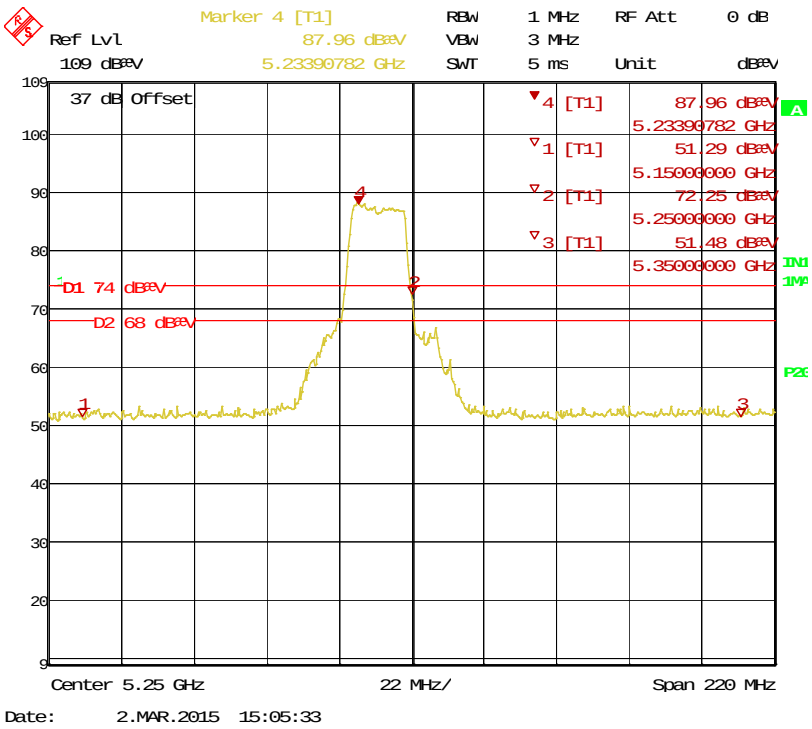


Figure 17: Bandedge-5240 MHz-11a-H-Pk

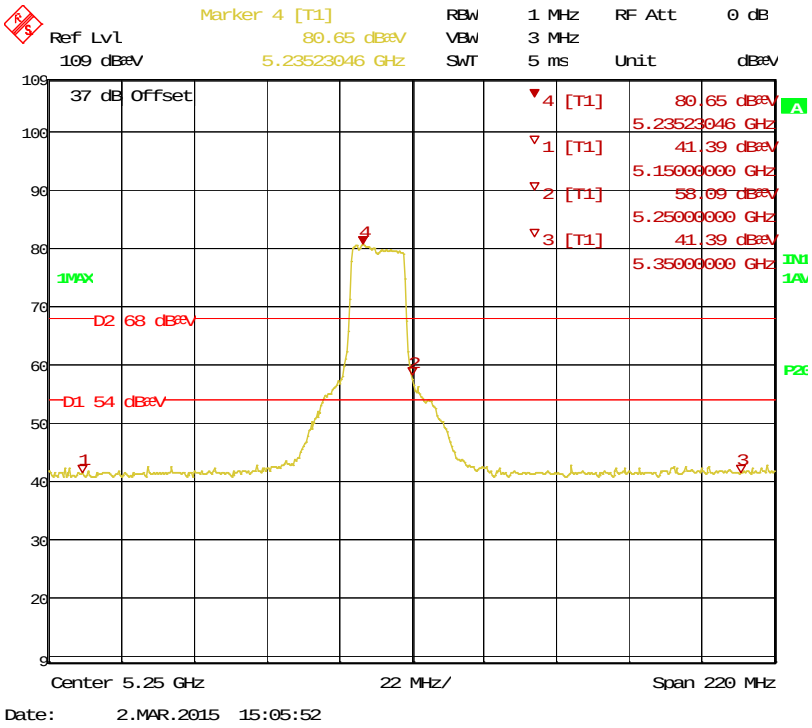


Figure 18: Bandedge-5240 MHz-11a-H-Ave

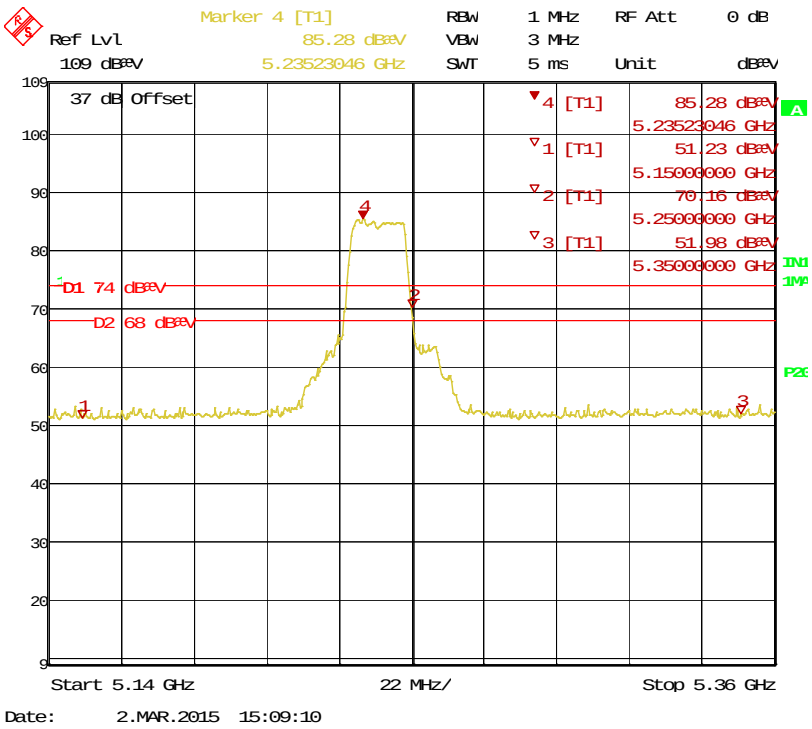


Figure 19: Bandedge-5240 MHz-11a-V-Pk

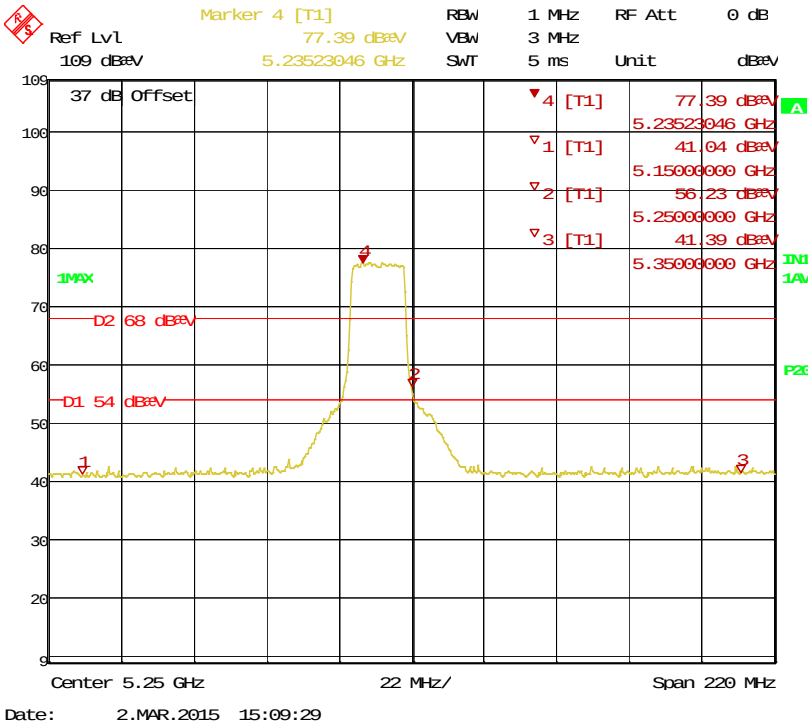


Figure 20: Bandedge-5240 MHz-V-Ave

SOP 1 Radiated Emissions

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EUT Name	Wireless Audio Headset	**Date**	March 21, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 34%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis (30 MHz-1GHz)	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Jeremy Luong

Freq.	Raw	Cbl	AF	Level	Det.	Pol.	Hght.	Azt	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
Transmitted Data at 802.11a, 5200 MHz											
38.11	53.00	2.70	-17.00	38.60	QP	V	117	166	40.00	-1.40	Pass
45.14	58.40	2.70	-21.80	39.30	QP	V	104	304	40.00	-0.70	Pass
47.99	58.90	2.80	-23.20	38.50	QP	V	161	364	40.00	-1.50	Pass
59.99	60.70	2.90	-25.10	38.40	QP	V	103	346	40.00	-1.60	Pass
72.07	56.80	2.90	-24.50	35.30	QP	V	108	234	40.00	-4.70	Pass
84.16	59.80	3.00	-25.20	37.60	QP	V	122	250	40.00	-2.40	Pass

Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty
CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 4.52 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: The worst case was observed at 802.11a, 5200 MHz.
All other emissions passed Class B limit.

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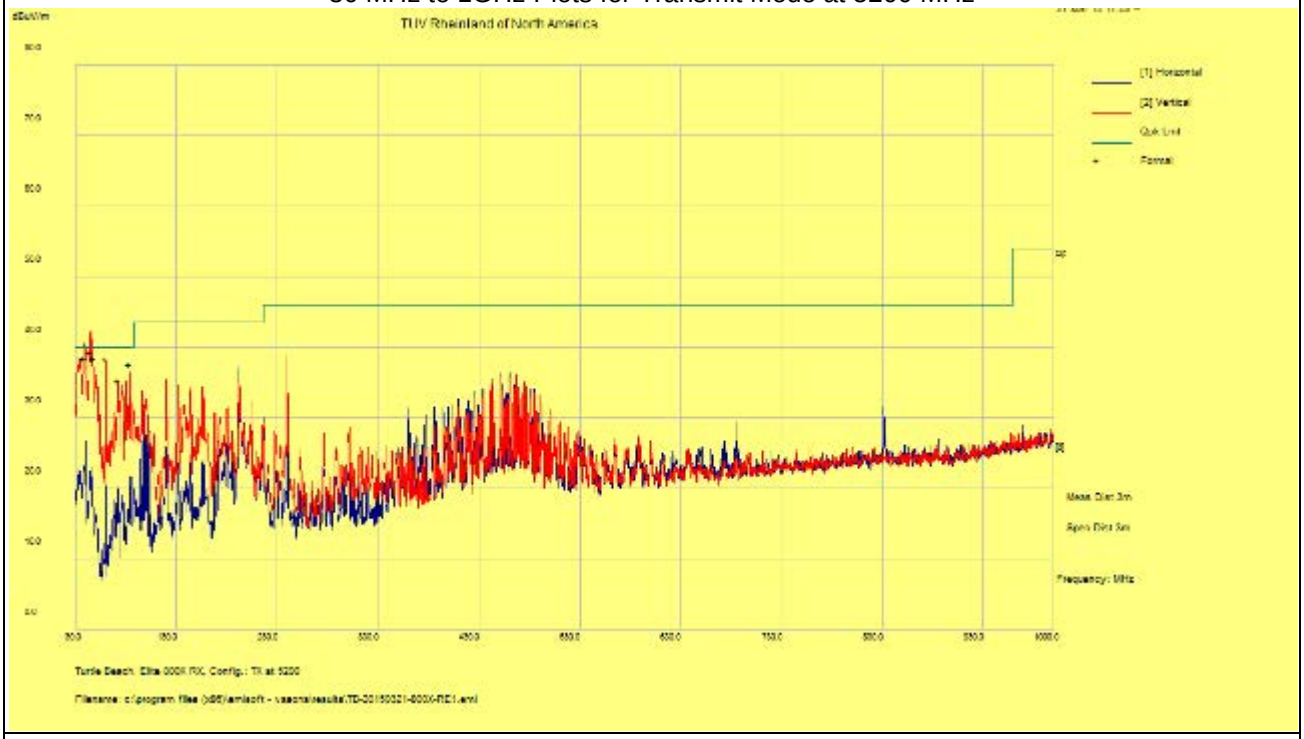
EUT Name	Wireless Audio Headset	**Date**	March 21, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 34%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Jeremy Luong

30 MHz to 1GHz Plots for Transmit Mode at 5200 MHz



Notes: FCC Class B Limit.

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EUT Name	Wireless Audio Headset	**Date**	February 28, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
Transmitted Data at 5180 MHz at 802.11a, 6Mbit/s											
10359.77	41.18	2.76	-8.59	35.35	Ave	H	153	350	54.00	-18.65	Harmonics
1597.23	45.20	1.00	-25.10	21.10	Ave	V	175	151	54.00	-32.90	Spurious
Transmitted Data at 5200 MHz at 802.11a, 6Mbit/s											
1740.36	43.90	1.00	-23.80	21.10	Ave	H	189	337	54.00	-32.90	Spurious
6932.54	41.40	2.20	-13.00	30.60	Ave	H	131	98	54.00	-23.40	Spurious
10393.53	39.20	2.80	-8.70	33.30	Ave	H	206	-9	54.00	-20.70	Harmonics
Transmitted Data at 5240 MHz at 802.11a, 6Mbit/s											
3776.09	44.00	1.60	-17.10	28.50	Ave	H	185	150	54.00	-25.50	Spurious
4717.72	42.90	1.80	-15.80	29.00	Ave	H	131	256	54.00	-25.00	Spurious
10479.86	43.80	2.80	-8.80	37.80	Ave	H	207	-8	54.00	-16.20	Harmonics

Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty
CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 4.93dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions passed the spurious emission limit. No significant emission was observed from 18GHz to 40GHz.

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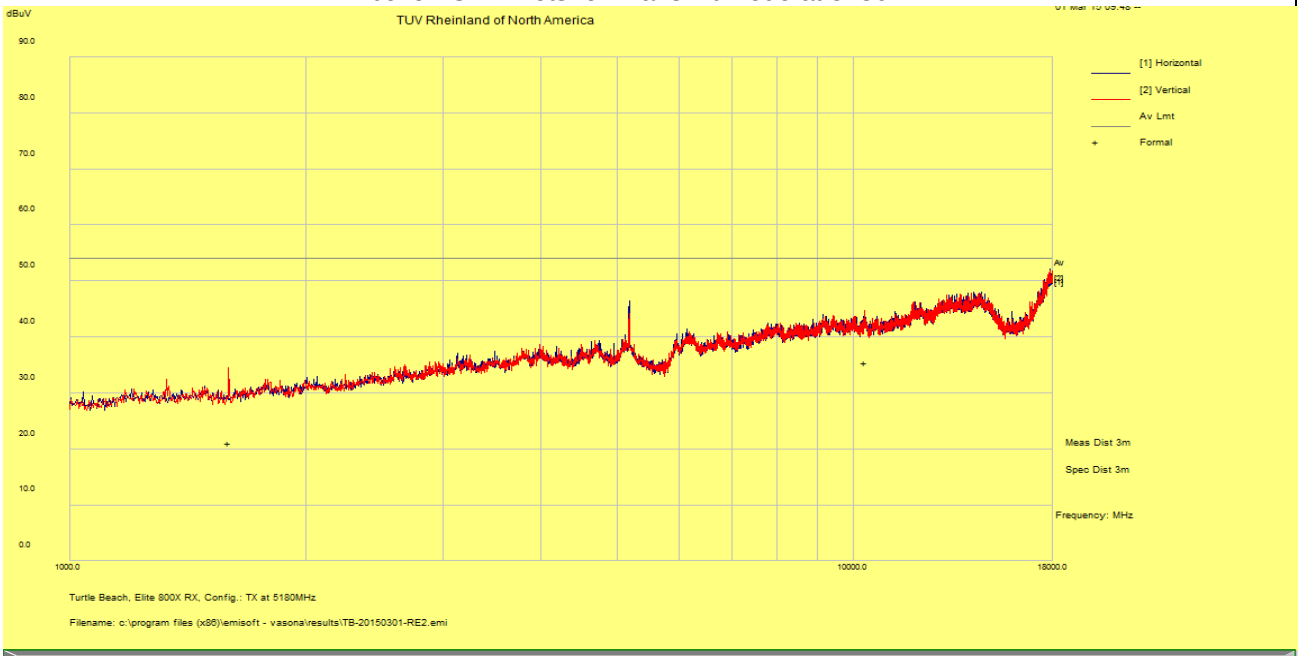
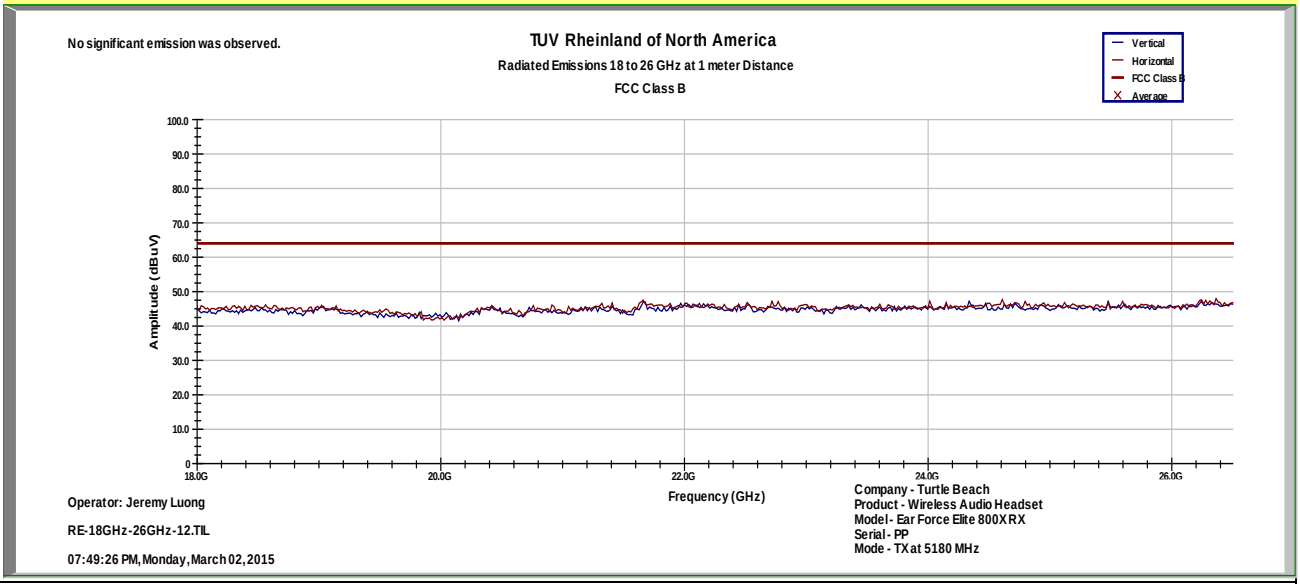
EUT Name	Wireless Audio Headset	**Date**	February 28, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5180 MHz





Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

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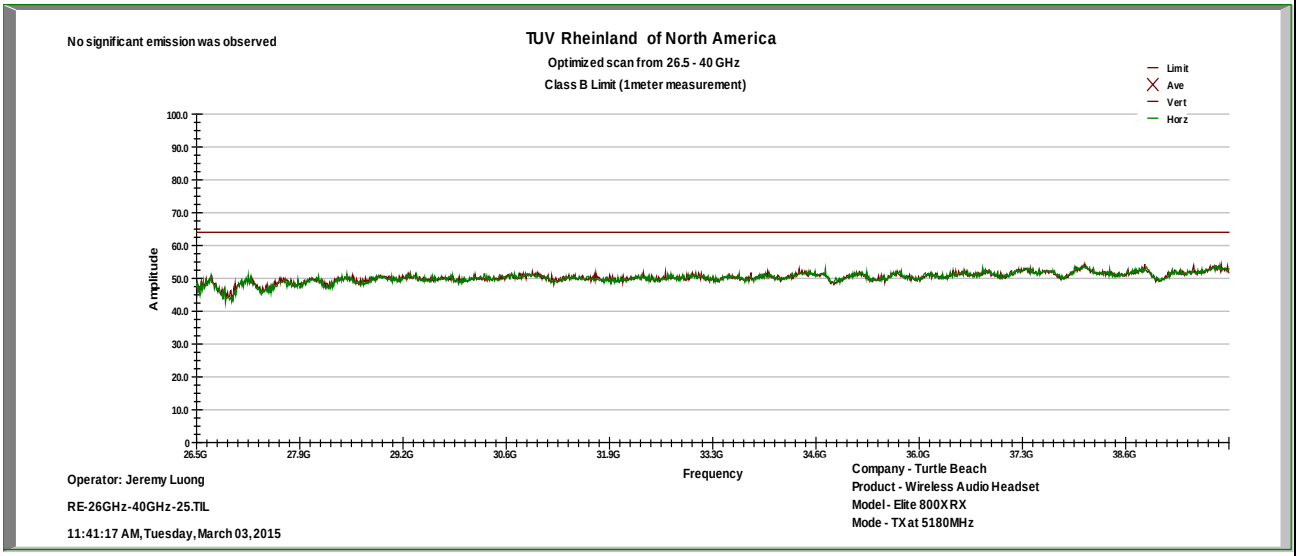
EUT Name	Wireless Audio Headset	**Date**	March 8, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 31%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5180 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

SOP 1 Radiated Emissions

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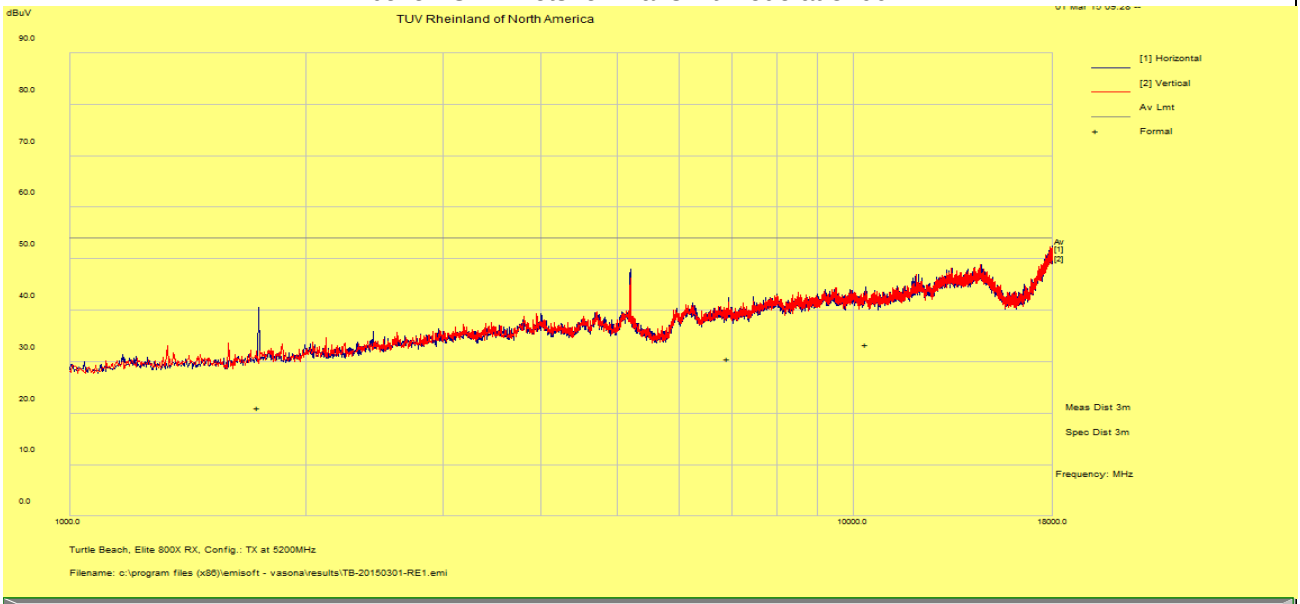
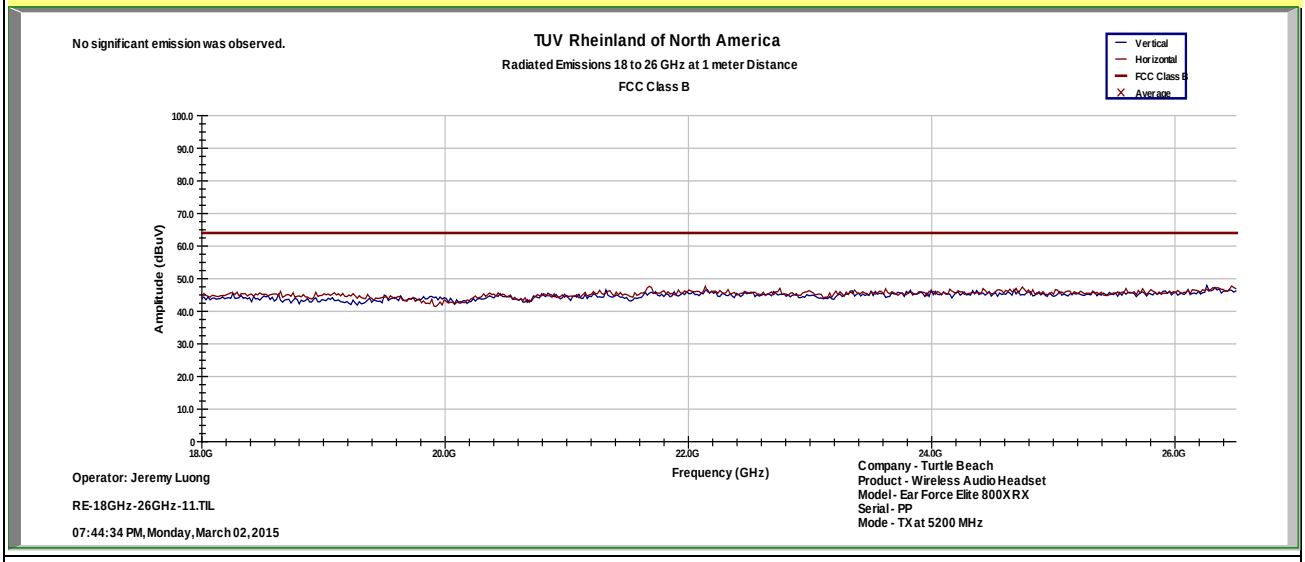
EUT Name	Wireless Audio Headset	**Date**	February 28, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5200 MHz





Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

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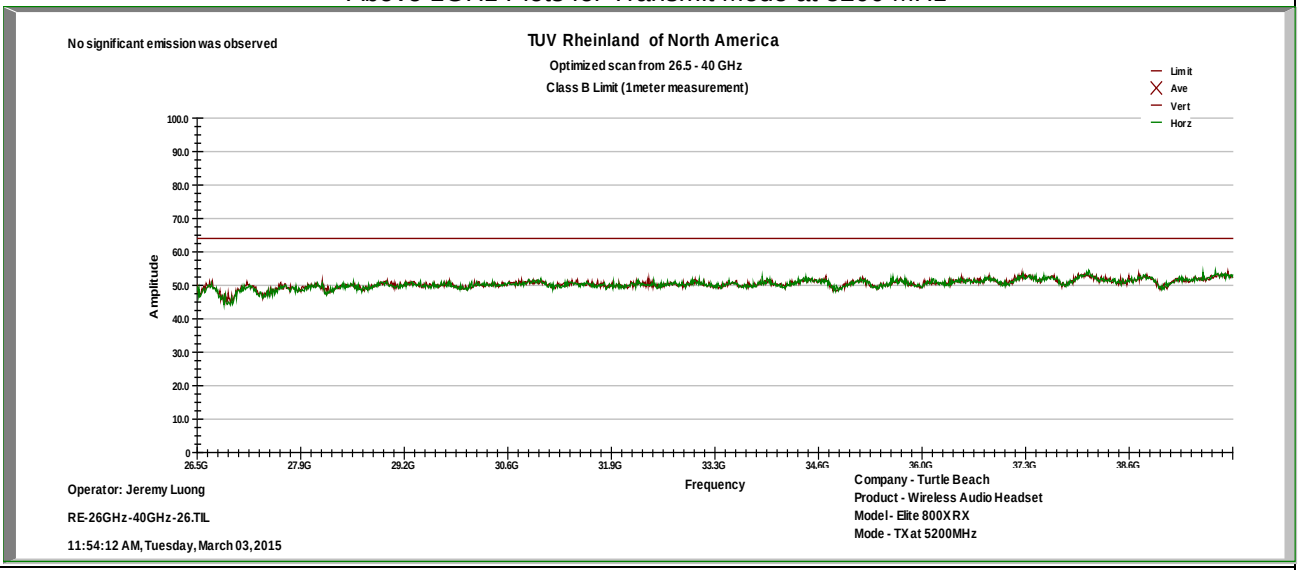
EUT Name	Wireless Audio Headset	**Date**	March 8, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 31%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5200 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

SOP 1 Radiated Emissions

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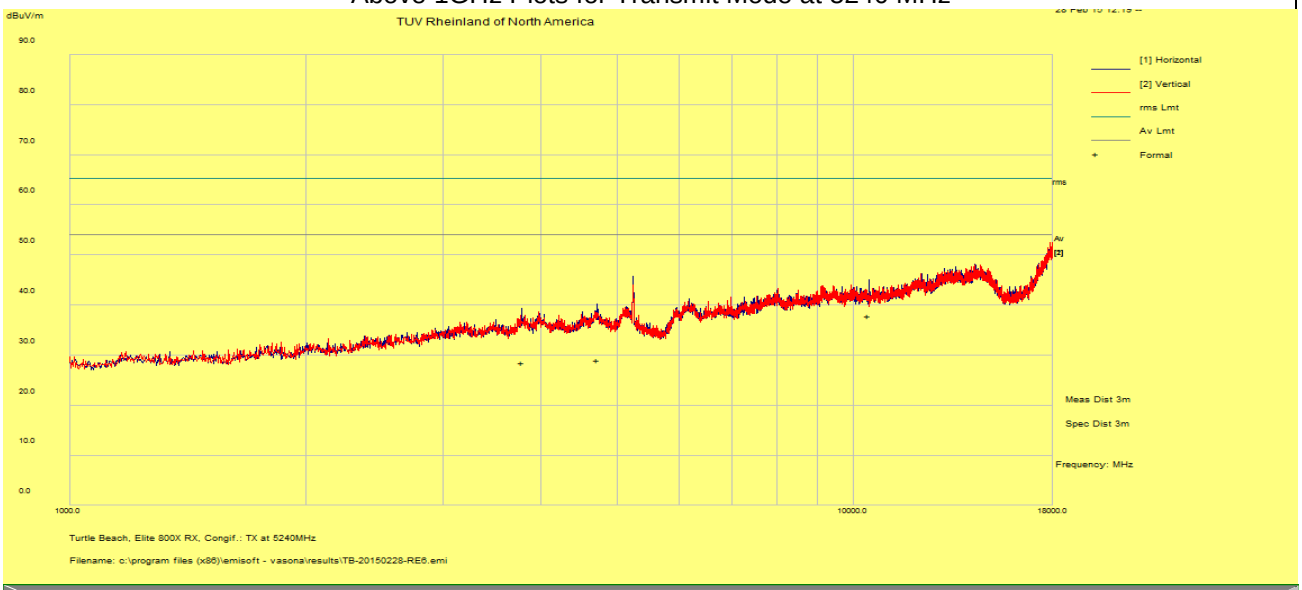
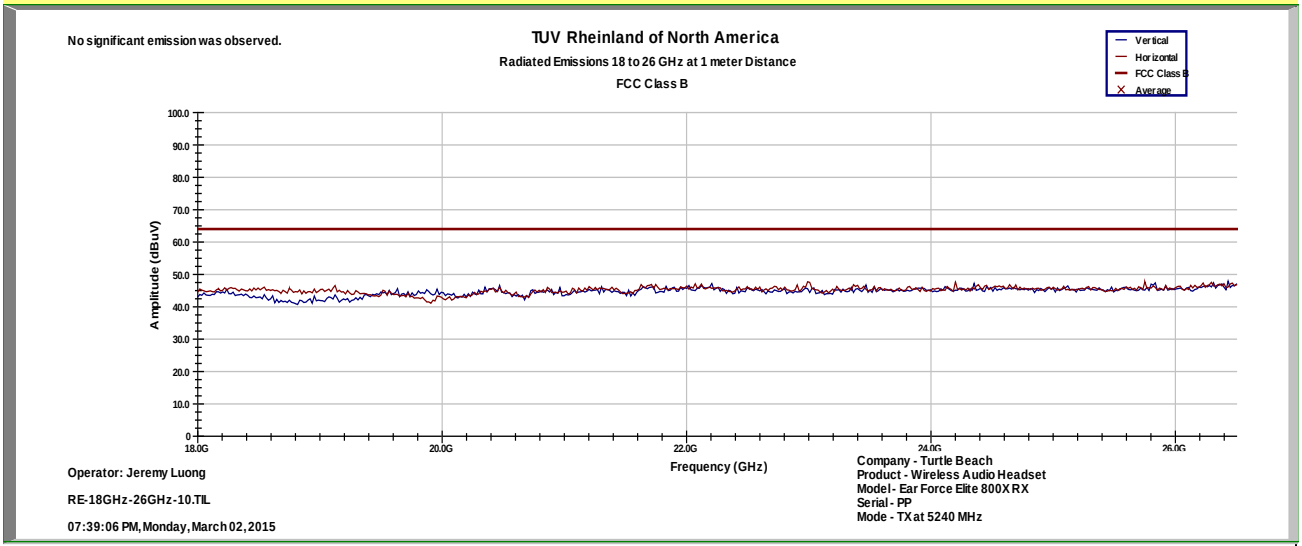
EUT Name	Wireless Audio Headset	**Date**	February 28, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5240 MHz





Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

SOP 1 Radiated Emissions

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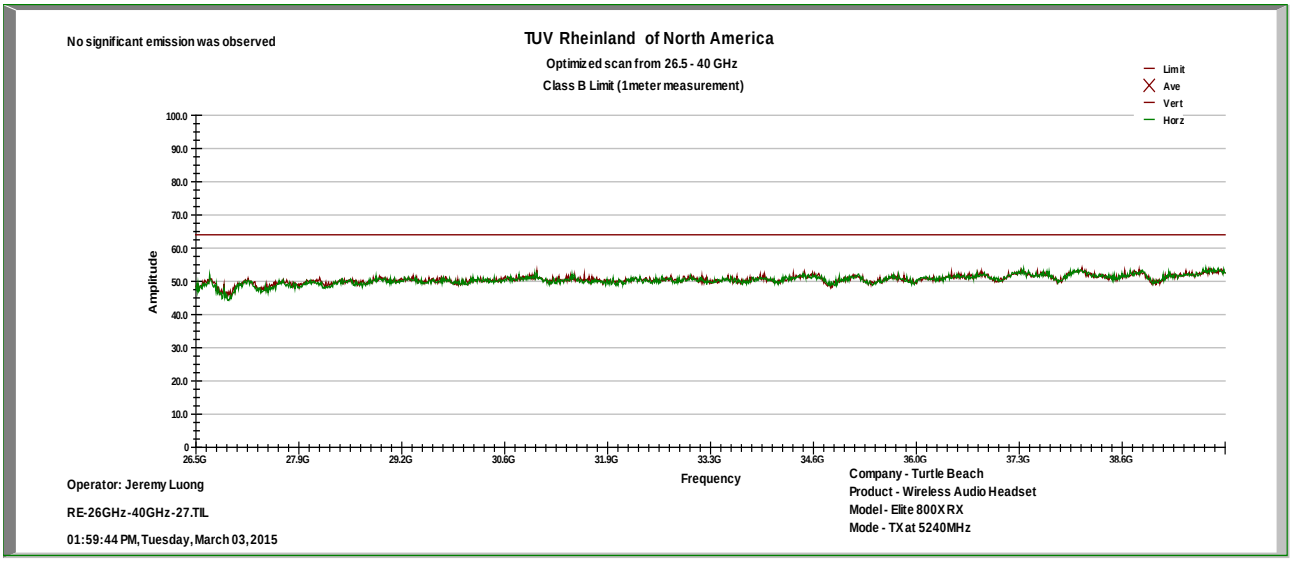
EUT Name	Wireless Audio Headset	**Date**	March 8, 2015
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 31%rh
EUT Serial	PP#4	**Temp / Hum out**	N/A
EUT Config.	802.11a on Y-Axis	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1GHz Plots for Transmit Mode at 5240 MHz



Notes: Limit was extrapolated to 1m distance for 18 GHz – 40 GHz range.

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EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 35%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5180 MHz											
4803.85	57.24	1.65	-16.37	42.52	Ave	H	232	244	54.00	-11.48	Harmonics
10359.98	39.82	2.52	-8.83	33.51	Ave	H	133	-4	54.00	-20.49	Harmonics
13541.35	37.96	2.91	-9.60	31.28	Ave	H	131	240	54.00	-22.72	Spurious
17589.65	34.02	3.40	-2.89	34.54	Ave	H	140	356	54.00	-19.46	Harmonics
1602.06	68.69	0.93	-25.49	44.13	Ave	V	216	316	54.00	-9.87	Spurious
3204.05	64.10	1.33	-19.71	45.72	Ave	V	155	96	54.00	-8.28	Spurious
Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5180 MHz											
2439.69	57.72	1.16	-22.34	36.53	Pk	H	100	157	54.00	-17.47	Fundamental
4883.44	58.15	1.67	-16.32	43.50	Pk	H	150	278	54.00	-10.50	Harmonics
5186.25	58.88	1.72	-16.15	44.46	Pk	H	250	296	54.00	-9.54	Fundamental
10359.14	48.96	2.52	-8.83	42.65	Pk	H	100	-9	54.00	-11.35	Harmonics
1626.88	70.25	0.94	-25.23	45.96	Pk	V	200	305	54.00	-8.04	Spurious
3252.50	66.03	1.34	-19.63	47.73	Pk	V	150	98	54.00	-6.27	Spurious
14148.44	51.20	2.97	-8.65	45.52	Pk	V	200	172	54.00	-8.48	Harmonics
Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5180 MHz											
1653.44	69.87	0.95	-24.93	45.89	Pk	H	250	257	54.00	-8.11	Spurious
4957.81	54.85	1.68	-16.37	40.16	Pk	H	200	330	54.00	-13.84	Harmonics
5186.25	59.16	1.72	-16.15	44.74	Pk	H	250	299	54.00	-9.26	Fundamental
6907.65	51.32	2.01	-13.57	39.76	Pk	H	100	-8	54.00	-14.24	Spurious
14042.19	51.72	2.97	-9.06	45.63	Pk	H	100	118	54.00	-8.37	Spurious
3305.63	62.59	1.35	-19.44	44.50	Pk	V	200	110	54.00	-9.50	Spurious
9163.12	47.50	2.40	-8.20	41.70	Pk	V	100	272	54.00	-12.30	Spurious

Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty
CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 4.93dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions passed the spurious emission limit. No significant emission was observed from 18GHz to 40GHz.

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EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5200 MHz											
4803.75	61.99	1.65	-16.37	47.27	Pk	H	250	274	54.00	-6.73	Harmonics
5196.88	58.48	1.73	-16.14	44.07	Pk	H	200	239	54.00	-9.93	Fundamental
10400.47	51.08	2.52	-9.02	44.58	Pk	H	200	306	54.00	-9.42	Harmonics
1602.97	69.98	0.93	-25.48	45.43	Pk	V	150	310	54.00	-8.57	Spurious
2402.50	57.98	1.15	-22.40	36.73	Pk	V	200	368	54.00	-17.27	Fundamental
3204.69	66.91	1.33	-19.71	48.53	Pk	V	150	106	54.00	-5.47	Spurious
14337.03	50.38	3.00	-8.13	45.25	Pk	V	150	270	54.00	-8.75	Spurious
Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5200 MHz											
4883.44	57.51	1.67	-16.32	42.87	Pk	H	250	259	54.00	-11.13	Harmonics
5204.84	59.75	1.73	-16.13	45.35	Pk	H	150	62	54.00	-8.65	Fundamental
8341.88	49.15	2.23	-9.49	41.89	Pk	H	100	346	54.00	-12.11	Spurious
10400.24	49.50	2.50	-9.00	42.96	Pk	H	98	245	54.00	-11.00	Harmonics
14671.72	49.98	3.05	-8.01	45.02	Pk	H	100	129	54.00	-8.98	Spurious
1626.88	70.23	0.94	-25.23	45.94	Pk	V	200	311	54.00	-8.06	Spurious
2442.34	58.56	1.16	-22.34	37.37	Pk	V	150	16	54.00	-16.63	Fundamental
3252.50	66.07	1.34	-19.63	47.78	Pk	V	150	93	54.00	-6.22	Spurious
Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5200 MHz											
4960.47	55.15	1.68	-16.38	40.45	Pk	H	150	324	54.00	-13.55	Harmonics
5204.84	59.13	1.73	-16.13	44.72	Pk	H	200	266	54.00	-9.28	Fundamental
6934.09	51.40	2.00	-13.50	39.90	Pk	H	100	256	54.00	-14.10	Spurious
10400.49	49.80	2.50	-9.00	43.31	Pk	H	100	210	54.00	-10.70	Harmonics
14329.06	50.58	3.00	-8.10	45.48	Pk	H	100	12	54.00	-8.52	Spurious
1653.44	69.40	0.95	-24.93	45.43	Pk	V	200	309	54.00	-8.57	Spurious
3305.63	63.10	1.35	-19.44	45.01	Pk	V	150	102	54.00	-8.99	Harmonics

Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty
CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 4.93dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions passed the spurious emission limit. No significant emission was observed from 18GHz to 40GHz.

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EUT Name	Wireless Audio Headset	**Date**	August 23, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 35%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5240 MHz											
4803.75	64.63	1.65	-16.37	49.91	Pk	H	100	268	54.00	-4.09	Harmonics
10480.16	50.39	2.53	-9.18	43.73	Pk	H	150	308	54.00	-10.27	Harmonics
1602.97	70.45	0.93	-25.48	45.90	Pk	V	100	152	54.00	-8.10	Spurious
2402.50	58.43	1.15	-22.40	37.18	Pk	V	150	144	54.00	-16.82	Fundamental
3204.69	66.11	1.33	-19.71	47.73	Pk	V	100	120	54.00	-6.27	Spurious
5239.38	58.24	1.73	-16.13	43.84	Pk	V	200	322	54.00	-10.16	Fundamental
8278.13	49.34	2.21	-9.71	41.84	Pk	V	100	-9	54.00	-12.16	Spurious
13545.47	52.93	2.91	-9.60	46.24	Pk	V	200	284	54.00	-7.76	Spurious
Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5240 MHz											
2442.34	59.01	1.16	-22.34	37.83	Pk	H	100	131	54.00	-16.17	Fundamental
4880.78	58.44	1.67	-16.32	43.80	Pk	H	150	319	54.00	-10.20	Harmonics
5236.72	58.03	1.73	-16.13	43.63	Pk	H	200	251	54.00	-10.37	Fundamental
10481.08	50.20	2.50	-9.20	43.56	Pk	H	98	261	54.00	-10.40	Harmonics
14480.47	50.85	3.02	-8.10	45.77	Pk	H	150	98	54.00	-8.23	Spurious
1626.88	70.40	0.94	-25.23	46.12	Pk	V	200	375	54.00	-7.88	Spurious
3252.50	65.23	1.34	-19.63	46.93	Pk	V	150	112	54.00	-7.07	Spurious
Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5240 MHz											
2479.53	58.12	1.17	-22.32	36.97	Pk	H	200	121	54.00	-17.03	Fundamental
3305.63	62.03	1.35	-19.44	43.94	Pk	H	100	150	54.00	-10.06	Spurious
4960.47	54.63	1.68	-16.38	39.93	Pk	H	150	271	54.00	-14.07	Harmonics
5234.06	59.04	1.73	-16.12	44.65	Pk	H	200	244	54.00	-9.35	Fundamental
10477.50	50.11	2.53	-9.17	43.47	Pk	H	200	312	54.00	-10.53	Harmonics
1653.44	69.96	0.95	-24.93	45.99	Pk	V	200	55	54.00	-8.01	Spurious
13505.63	52.52	2.90	-9.55	45.87	Pk	V	250	67	54.00	-8.13	Spurious

Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty
CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 4.93dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions passed the spurious emission limit. No significant emission was observed from 18GHz to 40GHz.

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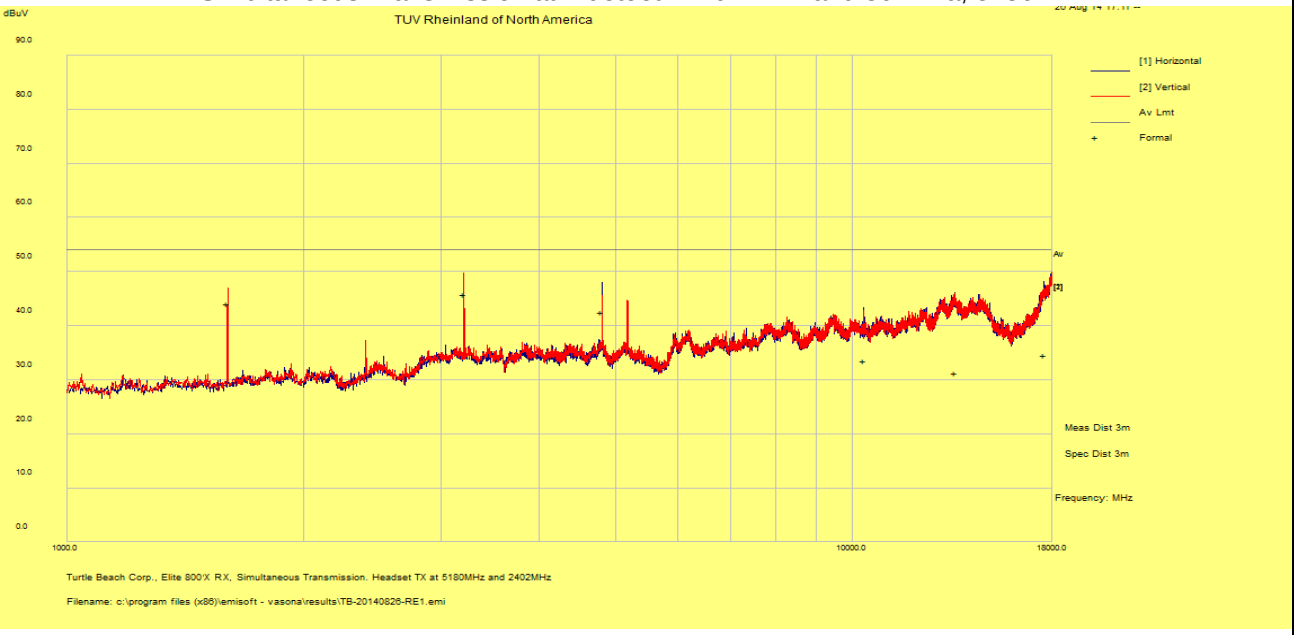
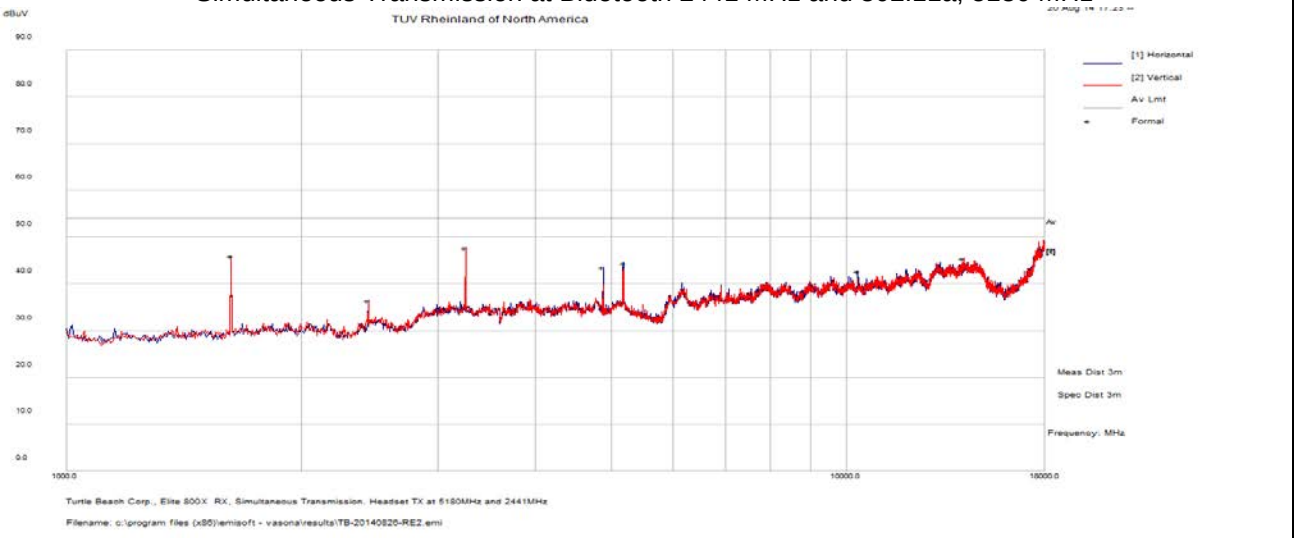
EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5180 MHz



Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5180 MHz



Notes: No significant emission was observed from 18 GHz – 40 GHz range.

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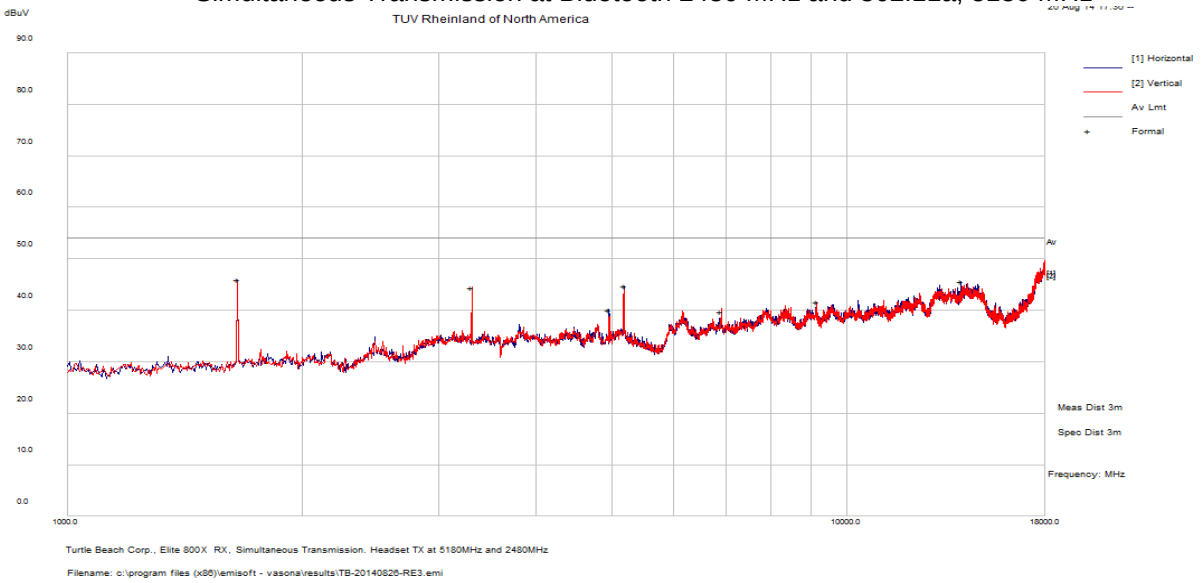
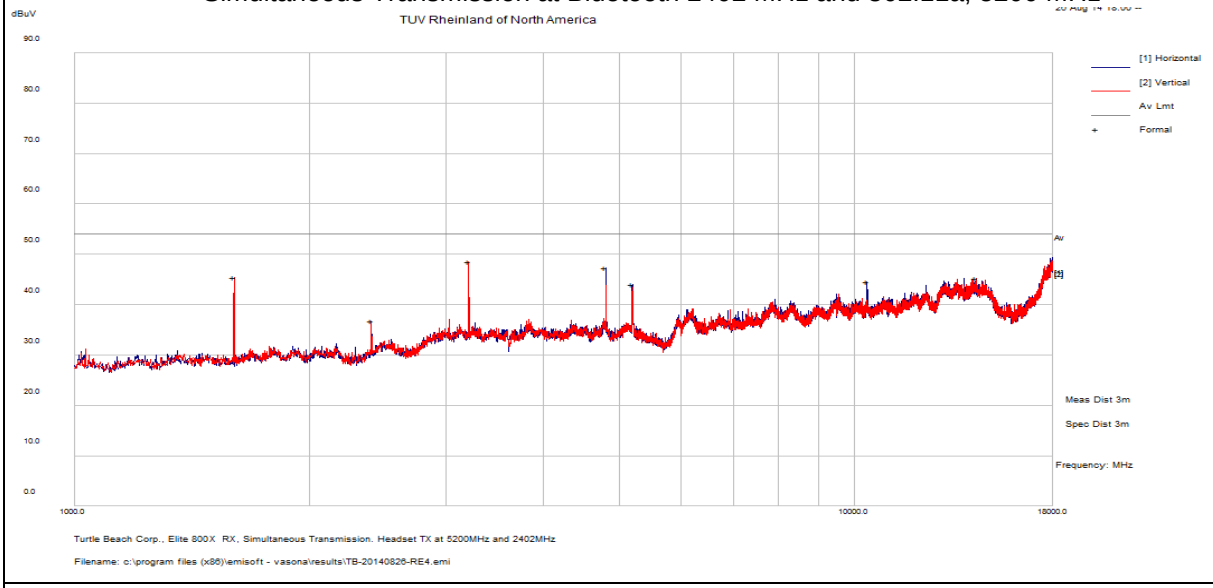
EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5180 MHz



Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5200 MHz



Notes: No significant emission was observed from 18 GHz – 40 GHz range.

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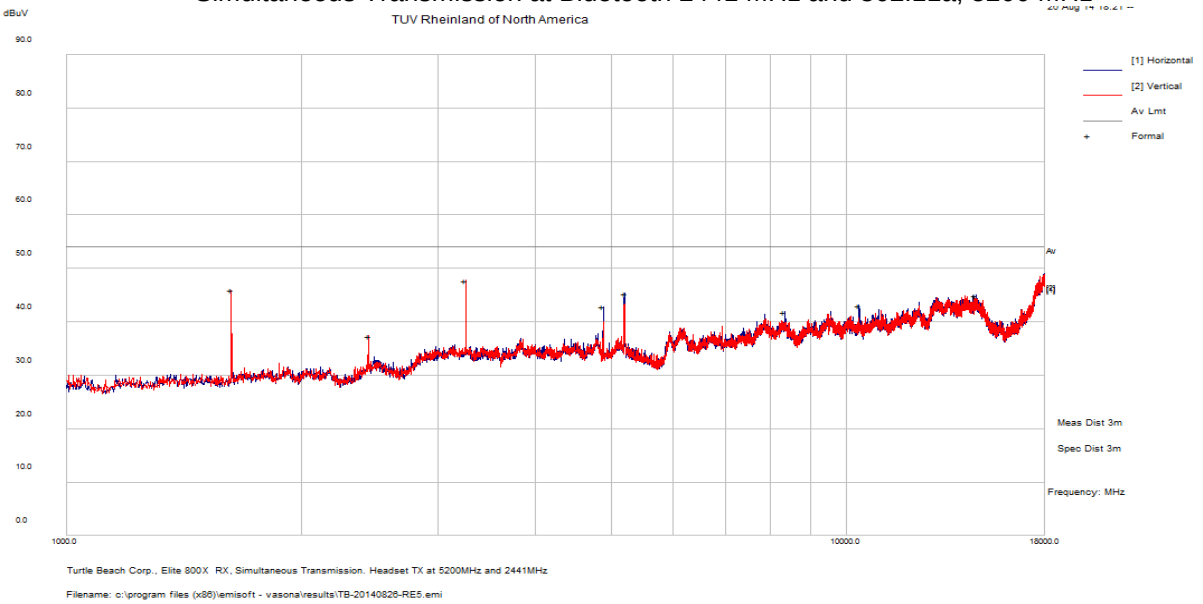
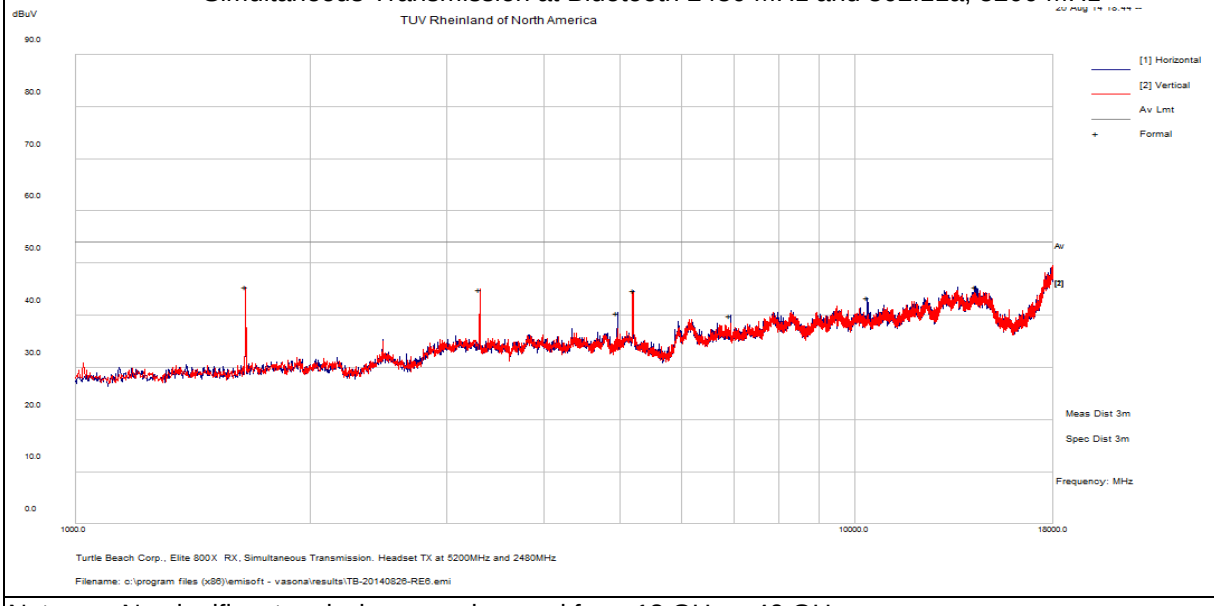
EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5200 MHz



Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5200 MHz



Notes: No significant emission was observed from 18 GHz – 40 GHz range.

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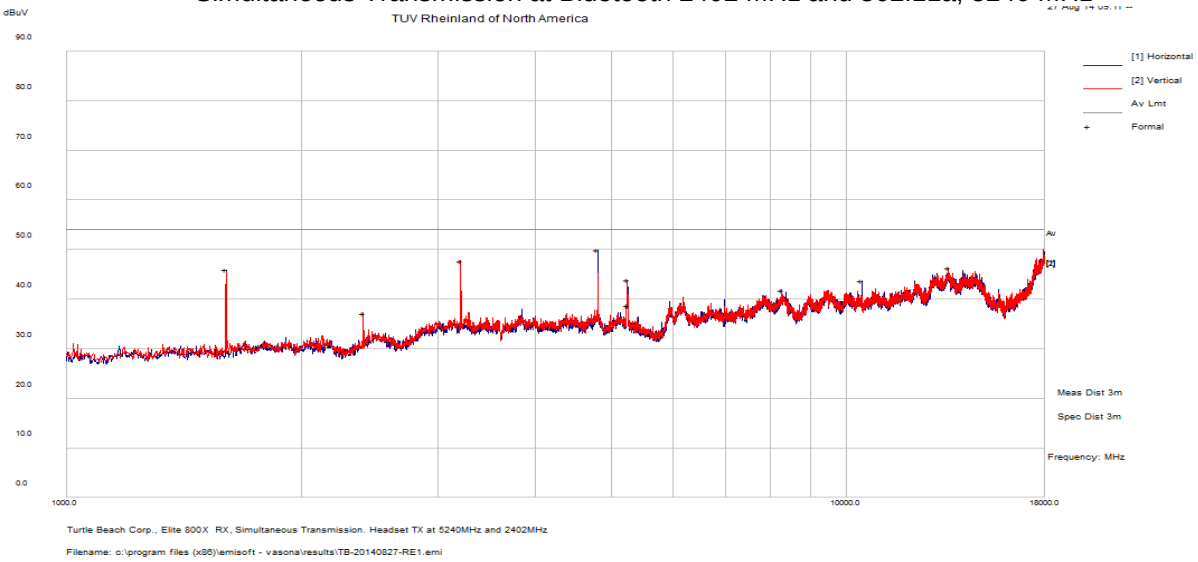
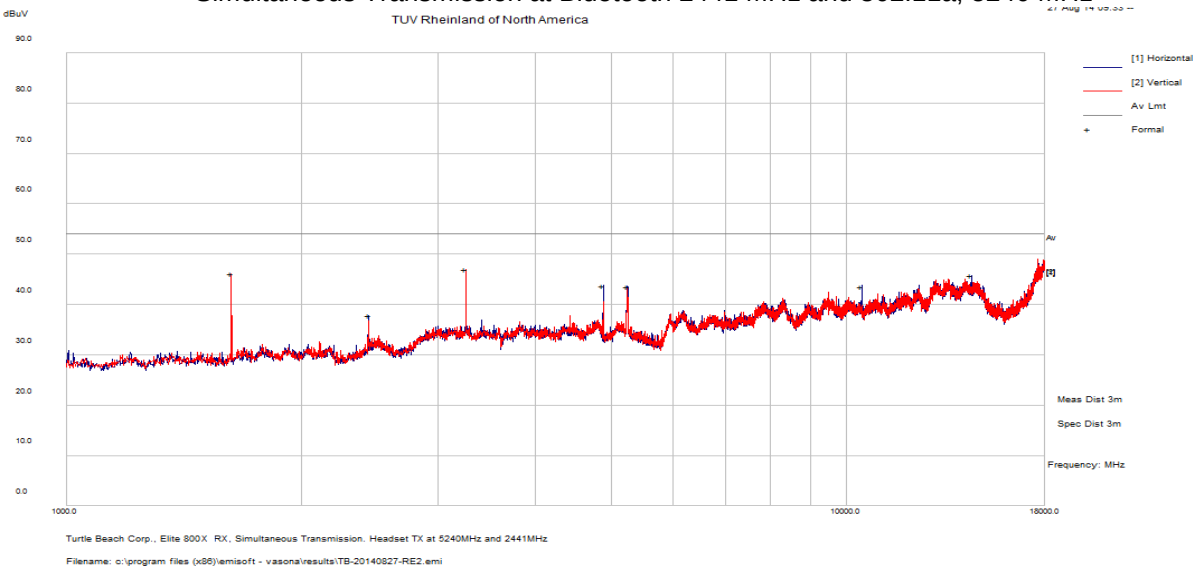
EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Simultaneous Transmission at Bluetooth 2402 MHz and 802.11a, 5240 MHz



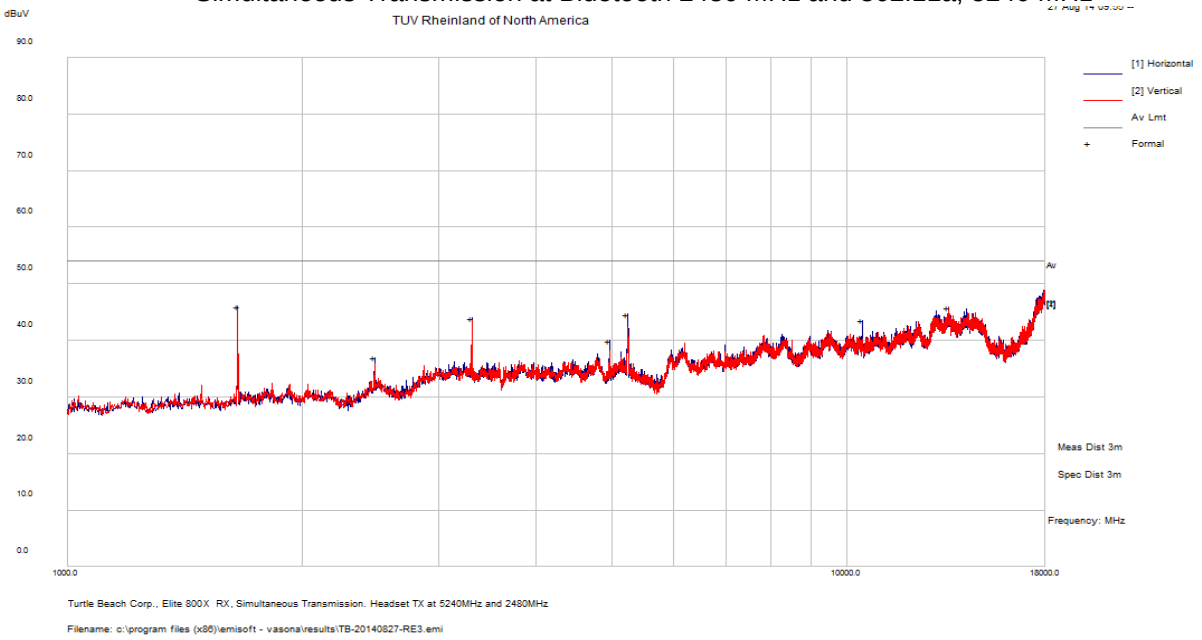
Simultaneous Transmission at Bluetooth 2441 MHz and 802.11a, 5240 MHz



Notes: No significant emission was observed from 18 GHz – 40 GHz range.

SOP 1 Radiated Emissions		Tracking # 31560638.001 Page 17 of 17	
EUT Name	Wireless Audio Headset	**Date**	August 27, 2014
EUT Model	Elite 800X RX	**Temp / Hum in**	23° C / 33%rh
EUT Serial	PP#5	**Temp / Hum out**	N/A
EUT Config.	Bluetooth and 802.11a on Y-Axis	**Line AC / Freq**	3.7 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	1m - RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Simultaneous Transmission at Bluetooth 2480 MHz and 802.11a, 5240 MHz



Notes: No significant emission was observed from 18 GHz – 40 GHz range.

4.5.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Level (dB}\mu\text{V/m)} = \text{Raw - AMP + CBL + ACF}$$

Where: Raw = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{dB\mu V/m}{20}}$$

4.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2010. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207: 2013 and RSS-210: 2010.

4.6.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50μH / 50Ω LISNs.

Testing is either performed in Lab 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.6.1.1 Deviations

There were no deviations from this test methodology.

4.6.2 Test Results

The Elite 800X RX is powered by a 3.7VDC battery. The AC conducted emission is not required.

4.7 Frequency Stability

In accordance with 47 CFR Part 15.407(g) the frequency stability of U-NII devices must be such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual. The Manufacturer calls out operating temperature ranges of +0º to +50º C

4.7.1 Test Methodology

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions. This test performs according to ANSI C63.10-2009 Section 6.8

4.7.2 Manufacturer Declaration

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver signals. Therefore all of the RF signal should have ±20ppm stability.

This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

Worst case:
5GHz - ±20ppm/103 kHz

±20ppm at 5 GHz translates to a maximum frequency shift of ±103 kHz. As the edge of the channels are at least one MHz from either of the band edges, ±103 kHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the radio.

4.7.3 Limit

CFR47 Part 407(g) - Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

4.7.4 Test results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s) since the maximum frequency drift was 15.87 ppm.

Table 7: Frequency Stability – Test Results

Temperature	Time	PPM
0° C	Start	5.769231
	2 Min.	8.293269
	5 Min	6.490385
	10 min	2.884615
10° C	Start	6.850962
	2 Min.	8.653846
	5 Min	5.408654
	10 min	7.211538
20° C	Start	7.572115
	2 Min.	7.572115
	5 Min	5.408654
	10 min	0.721154
30° C	Start	4.6875
	2 Min.	8.293269
	5 Min	2.524038
	10 min	0.721154
40° C	Start	10.45673
	2 Min.	8.293269
	5 Min	5.048077
	10 min	4.6875
50° C	Start	9.3750
	2 Min.	13.70192
	5 Min	9.735577
	10 min	15.86538

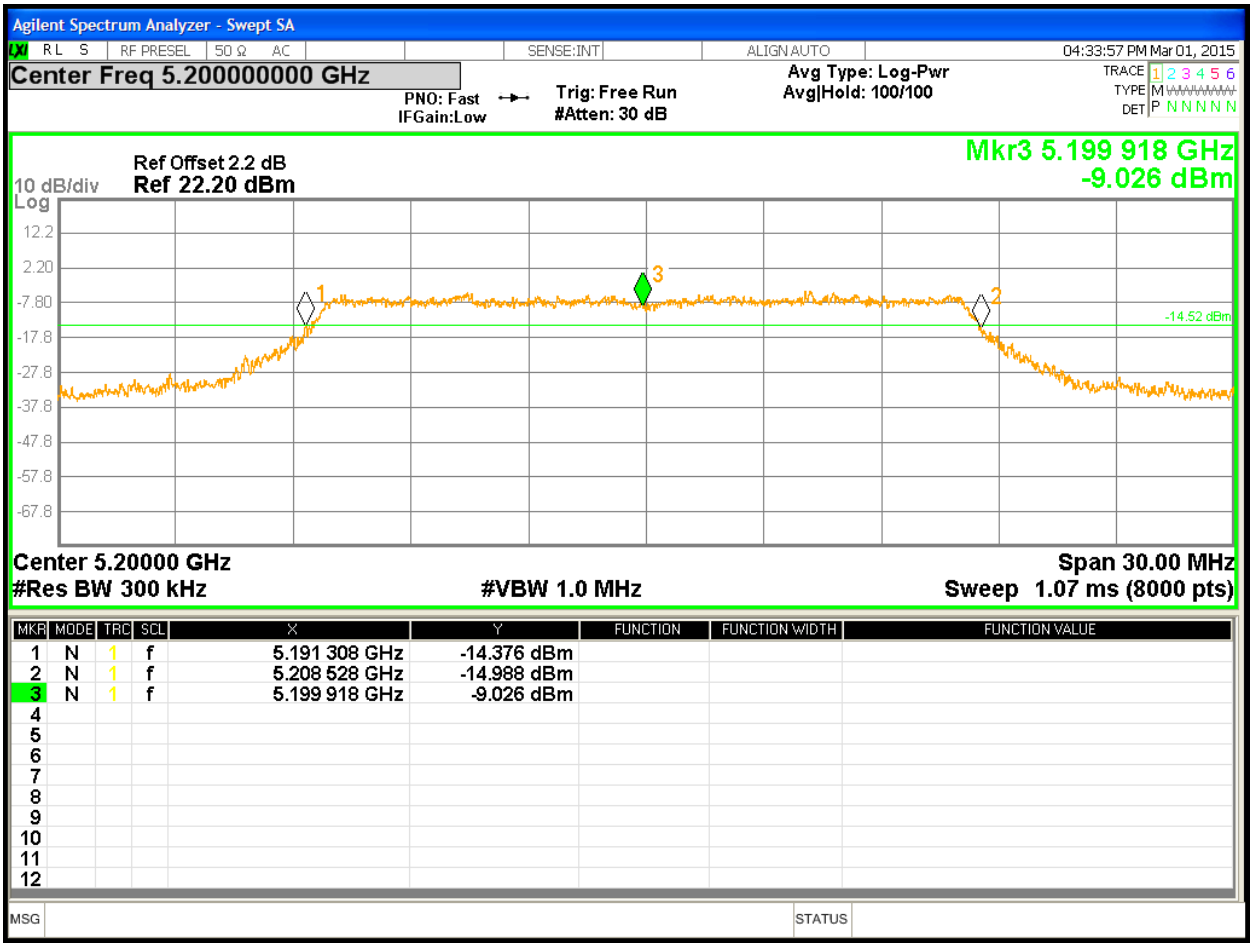


Figure 21: Frequency Stability – Worst Case

4.8 Voltage Variation

In accordance with 47 CFR Part 15.31 (e) intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.8.1 Test Methodology

The ac supply voltage was varied between 85% and 115% of the nominal rated supply voltage. The fundamental frequency was observed during the variation. The device was powered 3.7 Vdc by programmable power supply. The voltage was varied from 3.14Vdc to 4.26 Vdc mean while the fundamental frequencies were observed and record for the maximum drift in ppm; part per millions.

4.8.2 Test results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s). The fundamental frequencies drifted less than ±20ppm.

Table 8: Voltage Variation – Test Results

Frequency MHz	**Nominal** (3.7Vdc) ppm	**Lo Voltage** (3.14Vdc) ppm	**Hi Voltage** (4.26Vdc) ppm	**Max Drift** ppm
5200	9.375	15.14423	13.34135	15.14423

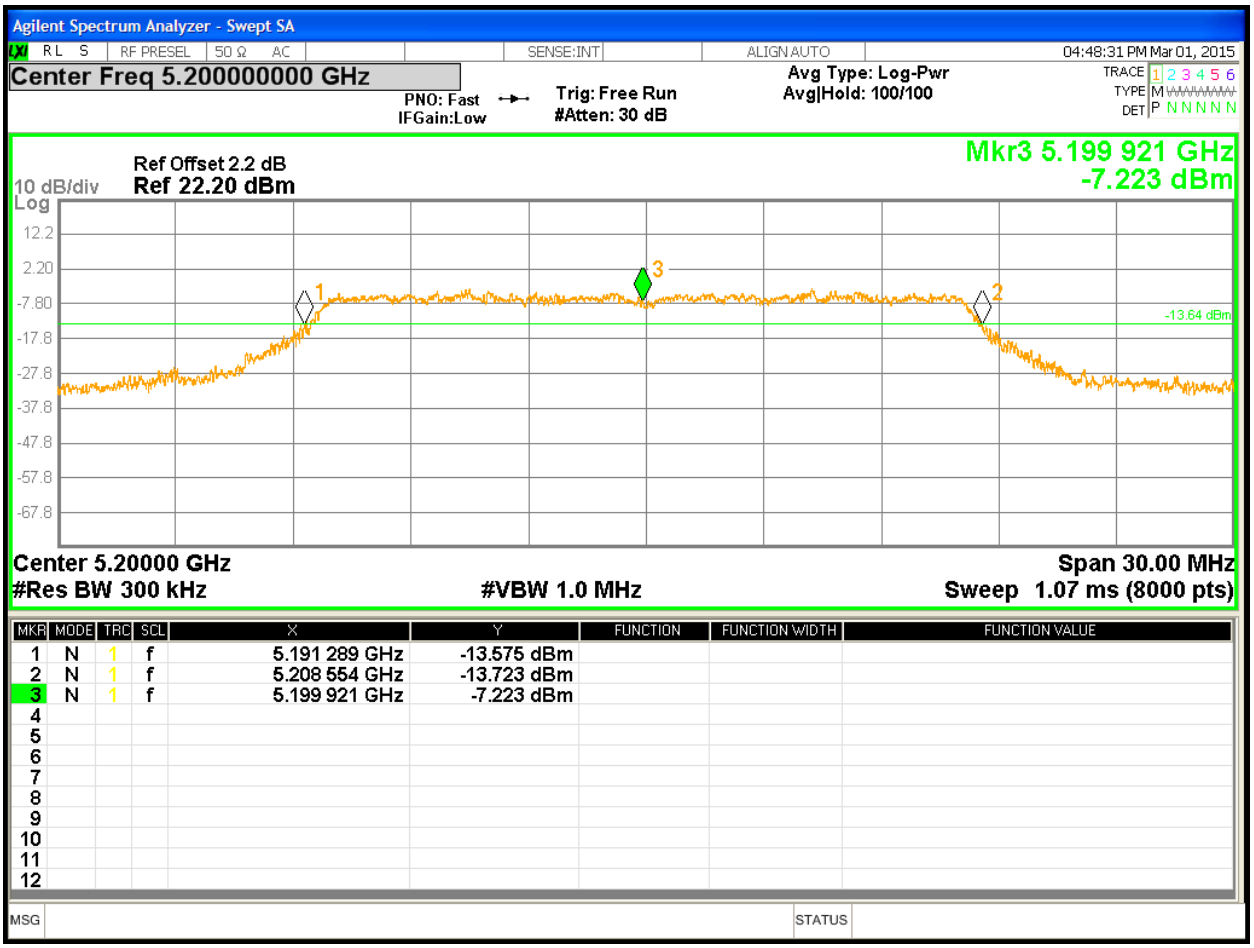


Figure 22: Voltage Variation – Worst Case

4.9 Maximum Permissible Exposure

4.9.1 Test Methodology

In this section, we try to prove the safety of radiation harmfulness to the human body for our product. The KDB 447498 D01 General RF Exposure Guidance is followed. The Gain of the antenna used in this calculation is declared by the manufacturer, and the maximum average power input to the antenna is measured. Using the general SAR test exclusion guidance in Section 4.3 of KDB 447498, we show the device meeting the SAR exclusion threshold.

4.9.2 FCC KDB 447498 D01 – General SAR Test Exclusion Guidance

The SAR exclusion threshold conditions are listed:

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,16 where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation17
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:18
a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

3) At frequencies below 100 MHz, the following may be considered for SAR test exclusion, and as illustrated in Appendix C:19
a) The threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by [1 + log(100/f(MHz))] for test separation distances > 50 mm and < 200 mm
b) The threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by ½ for test separation distances ≤ 50 mm
c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

4.9.3 EUT Operating Condition

The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually.

4.9.4 Classification

The antenna of the product, under normal use condition, is less than 2cm away from the body of the user. This device is classified as a **Portable Device**. It is intended to be with head wear device; extremity SAR limit is applied.

4.9.5 SAR Test Exclusion Threshold

4.9.5.1 Antenna Gain

The transmitting antennas were integrated. The 2.4GHz antenna gain was +2.8 dBi or 1.91 (numeric), and the 5GHz antenna gain was +1.3 dBi or 1.35 (numeric).

4.9.5.2 SAR Exclusion Threshold Calculation

Mode	Max. Power (dBm)	EIRP (dBm)	Min. Separation Distance (mm)	Cal. Excl. Threshold	1-g SAR Limit	10-g extremity SAR Limit	Result
Bluetooth (2.4GHz)	4.54	7.34	20	0.427073	≤3.0	≤7.5	Exempted *
802.11A (5GHz)	6.98	8.28	20	0.770257	≤3.0	≤7.5	Exempted *

Note:
1. Per manufacture the separation between the transmitter antenna and user is greater than 2cm. This separation distance was used for calculation per condition #1 of SAR Exclusion Threshold.
2. The maximum output power was taken from Table 2.
3. (*) The calculated threshold is less than 3.0; therefore, EUT is SAR exempted for head and body usage.

6 Test Equipment Use List

6.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A102606	07/08/2014	07/08/2016
Bilog Antenna	Sunol Sciences	JB3	A020502	04/12/2013	04/12/2015
Horn Antenna	EMCO	3115	9710-5301	09/04/2013	09/04/2015
Horn Antenna	EMCO	3115	9211-3969	03/18/2013	04/18/2015
Antenna (18-26GHz)	CMT	RA42-K-F-4B-C	020131-004	07/24/2014	07/24/2015
Spectrum Analyzer	Rohde & Schwarz	FSL6	100169	01/13/2015	01/13/2016
Spectrum Analyzer	Agilent	N9038A	MY51210195	01/12/2015	01/12/2016
Spectrum Analyzer	Agilent	N9030A	MY51380689	01/19/2015	01/19/2016
Spectrum Analyzer	Rohde Schwarz	ESIB	832427/002	01/13/2015	01/13/2016
Spectrum Analyzer	Rohde Schwarz	FSV40	1321.3008K40	11/01/2015	11/01/2016
Amplifier	Sonoma Instruments	310	213221	09/30/2014	09/30/2015
Amplifier	Miteq	TTA1800-30-4G	1842452	01/13/2015	01/13/2016
Amplifier	Rohde & Schwarz	TS-PR26	100011	07/24/2014	07/24/2016
Amplifier	Rohde & Schwarz	TS-PR40	100012	02/21/2015	02/21/2016
Power Meter	Agilent	E4418B	MY45103902	01/15/2015	01/15/2016
Power Sensor	Hewlett Packard	8482A	US37295801	01/15/2015	01/15/2016
Thermometer	Fluke	52II	96480032	06/28/2014	06/28/2015
Thermo Chamber	Espec	BTZ-133	0613436	03/16/2015	03/16/2016
DC Power Supply	Agilent	E3634A	MY400004331	01/12/2015	01/12/2016
Notch Filter	Micro-Tronics	BRM50716	003	01/30/2015	01/30/2016
Signal Generator	Anritsu	MG3694A	42803	01/13/2015	01/13/2016
Signal Generator	Rohde & Schwarz	SMF100A	1167.0000K02	10/14/2014	10/14/2015
Signal Generator	Rohde & Schwarz	SMBV100A	1407.6004K02	12/04/2014	12/04/2015
Power Sensors	Rohde & Schwarz	OSP120	1520.9010.02	12/19/2014	12/14/2015

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

7 EMC Test Plan

7.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

7.2 Customer

Table 9: Customer Information

Company Name	Voyetra Turtle Beach, Inc.
Address	100 Summit Lake Drive, Suite 100
City, State, Zip	Valhalla, New York 10595
Country	U.S.A.

Table 10: Technical Contact Information

Name	Tim Blaney
E-mail	tim@commcepts.net
Phone	(530) 277-3482

7.3 Equipment Under Test (EUT)

Table 11: EUT Specifications

EUT Specifications	
Package Dimensions	252mm (9.9”) x 268mm (10.5”) x 134mm (5.2”)
Input Voltage	Headset Input Voltage: 3.7 Vdc (battery)
Environment	Indoor
Operating Temperature Range:	0 to 50 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Hardware Version	PP V4.1
Part Number	AC4343ES2
RF Software Version	NA
802.11a Radio	
Operating Mode	802.11a
Transmitter Frequency Band	5.15 GHz to 5.25 GHz
Operating Channel	5180 MHz, 5200 MHz, 5220 MHz, 5240 MHz
Max. Power Output	6.98 dBm
Power Setting @ Operating Channel	SPW 0
Antenna Type	2 integrated PCB antennas
Antenna Gain	Ant1 = Ant2 = 1.3 dBi
Modulation Type	☐ AM ☐ FM ☐ DSSS ☒ OFDM ☐ Other describe:
Data Rate	6, 9, 12, 18, 24 Mbps
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Head wear Device.
Directional Gain Type	☒ Uncorrelated ☒ Non-Beam Forming ☐ Other describe:
Note: This report only documents the radio characteristics for 5150 – 5250 MHz bands.	

Table 12: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
USB	USB	☒ No	☒ Metric: 1 m	☒ M

Table 13: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	PP23LB	9271001233	Setup EUT operating channel
Interface Board	Turtle Beach	N.A	N.A	Access 5GHz radio chipset
Note: None.				

Table 14: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.407
Elite 800X RX	PP #4	Integrated Antenna	TX Emissions
	PP #3	Direct via SMA Connection	Peak Transmit Power, Peak Power Spectral Density, Peak Excursion Ratio Occupied Bandwidth Frequency Stability Voltage Variation
	PP #5 (800)	Integrated Antenna	Simultaneous TX Emissions

Table 15: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Elite 800X RX	Integrated	Transmit	N/A	EUT upright	N/A
Note: The Elite 800X RX is designed and intended to be worn upright. All emission scans performed on the Y-Axis; worst case.					

Table 16: Final Test Mode for 5150 - 5250 Bands

Test	802.11a
Occupied Bandwidth FCC Part 15.407(a), RSS210 Sect. 9.2	5180, 5220, 5240 MHz at 6Mbps
Output Power FCC Part 15.407(a)(1)(iv), RSS210 Sect. 9.2	5180, 5220, 5240 MHz at 6Mbps
Peak Excursion Ratio Information Only.	5180, 5220, 5240 MHz at 6Mbps
Peak Power Spectral Density FCC Part 15.407(a)(1)(iv), RSS210 Sect. 9.2	5180, 5220, 5240 MHz at 6Mbps
Band-Edge (Radiated) FCC Part 15.205, 15.209, 15.407(b)	5180, 5240 MHz at 6Mbps
Transmitted Spurious Emission (30 MHz – 1GHz) FCC Part 15.205, 15.209, 15.407(b)	5200 MHz at 6 Mbps
Transmitted Spurious Emission (Above 1GHz) FCC Part 15.205, 15.209, 15.407(b)	5180, 5220, 5240 MHz at 6Mbps
Conducted Spurious Emission (antenna port). FCC Part 15.407 (b)	According to CFR47 15.407 (b) EIPR shall not exceed -27 dBm/MHz. This is equivalent to the field strength of 68.2dBuV/m at 3 meter distance. The EUT is satisfied the requirement by meeting the limit under CFR47 Part 15.209.
AC Conducted Emission FCC Part 15.207	EUT is powered by a 3.7 VDC battery. Test Not required.
Frequency Stability FCC Part 15.407 (g)	5200 MHz at 6 Mbps
Voltage Variation FCC Part 15.31 (e)	5200 MHz at 6 Mbps
Dynamic Frequency Selection FCC Part 15.407 (h)	5150 – 5250 MHz band does not support DFS.
Transmitted Spurious Emission (Above 1GHz) FCC Part 15.205, 15.209, 15.407(b)	Simultaneous Transmission on both radios. 2402, 2441, 2480 MHz at DH5 5180, 5220, 5240 MHz at 6Mbps
Note: 1. Band 5150 MHz – 5250 MHz support only 802.11a. 2. All radiated emission performed on Y-Axis. 3. All tests were pre-scanned for worst case before final testing.	

7.4 Test Specifications

Testing requirements

Table 17: Test Specifications

Emissions and Immunity	
Standard	Requirement
CFR 47 Part 15.407: 2014 June 23	All
RSS-210 Issue 8, 2010	All

END OF REPORT