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Emissions
Test Report

EUT Name: Wireless Audio Transmitter

Model No.: Ear Force Stealth 700P TX

CFR 47 Part 15.407 2017 and RSS 247: 2017

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	10/16/2017	Original Document	N/A

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 (530) 277-3482
Requester / Applicant:	Tim Blaney
Name of Equipment:	Wireless Audio Transmitter
Model No.	Ear Force Stealth 700P TX (TB300-3771-01)
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.407 2017 and RSS 247: 2017
Test Dates:	August 22, 2017 to September 26, 2017

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01r04

Test Methods:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01r04

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	October 16, 2017	David Spencer	October 16, 2017
Test Engineer	Date	Laboratory Signatory	Date

Testing Cert #3331.02 **US1131** **2932M**

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 2017 and RSS 247: 2017 based on the results of testing performed on August 22, 2017 to September 26, 2017 on the Wireless Audio Transmitter Model Ear Force Stealth 700P TX 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 5180 MHz – 5240 MHz frequency band is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10:2013	Test Parameters	Measured Value	Result
Duty Cycle	Information Only	N/A	100%	N/A
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.407 (b) RSS-GEN Sect.8.9, RSS 247 Sect. 6.2.1.2	Class B	-2.48 dB Margin	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS GEN Sect.8.10	Class B		**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	-3.38 dB Margin	**Complied**
Occupied Bandwidth	CFR47 15.407 (a) RSS GEN Sect.6.6	N/A	99% BW: 17.398 MHz 26dB BW: 29.980 MHz	**Complied**
Maximum Output Power	CFR47 15.407 (a) RSS 247 Sect. 6.2	250mW	7.05 dBm/ 5.07 mW	**Complied**
Peak Power Spectral Density	CFR47 15.407 (a)	< 11 dBm/MHz	-4.89 dBm/ MHz	**Complied**
	RSS 247 Sect.6.2.1.1	< 10 dBm/MHz (e.i.r.p)		**Complied**
Conducted Emission – Antenna Port	CFR47 15.407 (b)(1) (2)(3) RSS 247 Sect.6.2.1 to 6.2.3	< -27 dBm/MHz	-11.57 dB Margin	**Complied**
Frequency Stability	CFR47 15.407 (g), RSS GEN Sect. 6.11	±20 ppm	12.98 ppm	**Complied**
Voltage Variation	CFR47 15.31(e)	±20 ppm	15.50 ppm	**Complied**

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 (US1131). 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 17025:1999 and ISO 9002 (Lab Code Testing Cert #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-0268

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.

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 C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). 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

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 ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

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 ± 0.7 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 ± 2.06 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. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Ear Force Stealth 700P Wireless Gaming System consists of two main communication modules, the Stealth 700P RX ("Headset") and the Stealth 700P TX ("Transmitter"). These two modules comprise a closed-loop wireless audio gaming system that utilize a proprietary 5.2 GHz communication technology to offer wireless streaming audio and chat/talkback capabilities. The devices are designed to operate with a PS4 gaming console or PC-based system.

The Stealth 700P RX has 50mm drivers, fixed omni-directional gooseneck microphone with flip up microphone mute and microphone monitoring. Additional advanced functionality includes a Bluetooth radio that provides simultaneous connection to a Turtle Beach mobile app and device for streaming audio. Other audio processing features and controls include Superhuman Hearing, Virtual Surround, a Master Volume Wheel, a Microphone Monitor Wheel and EQ Presets Button on the headset.

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 an 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 an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

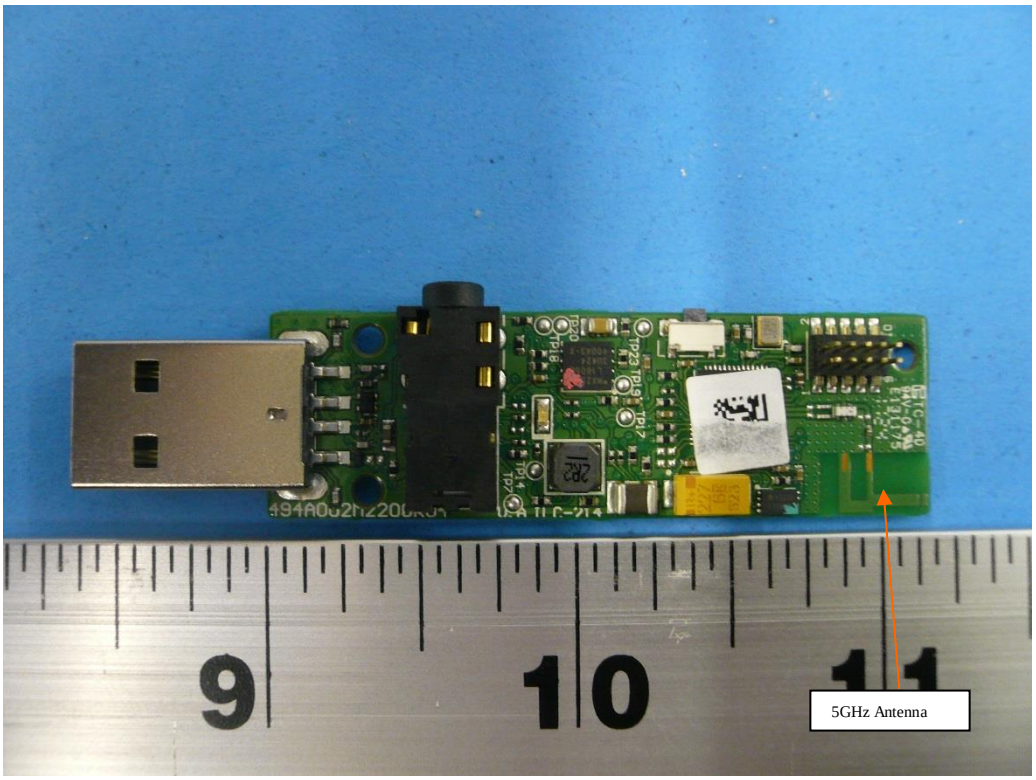
The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

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 Wireless Audio Transmitter has a permanently attached PCB trace antenna inside the device. See EUT Photo for details. There is no external antenna connection available.



3.5 Duty Cycle

The Ear Force Stealth 700P TX, SN: PP1 was measured for the duty cycle

3.5.1 Results

Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11a	100	0	100	0
Notes: EUT configured and measured for the duty cycle. All measurements use 100% duty cycle.				

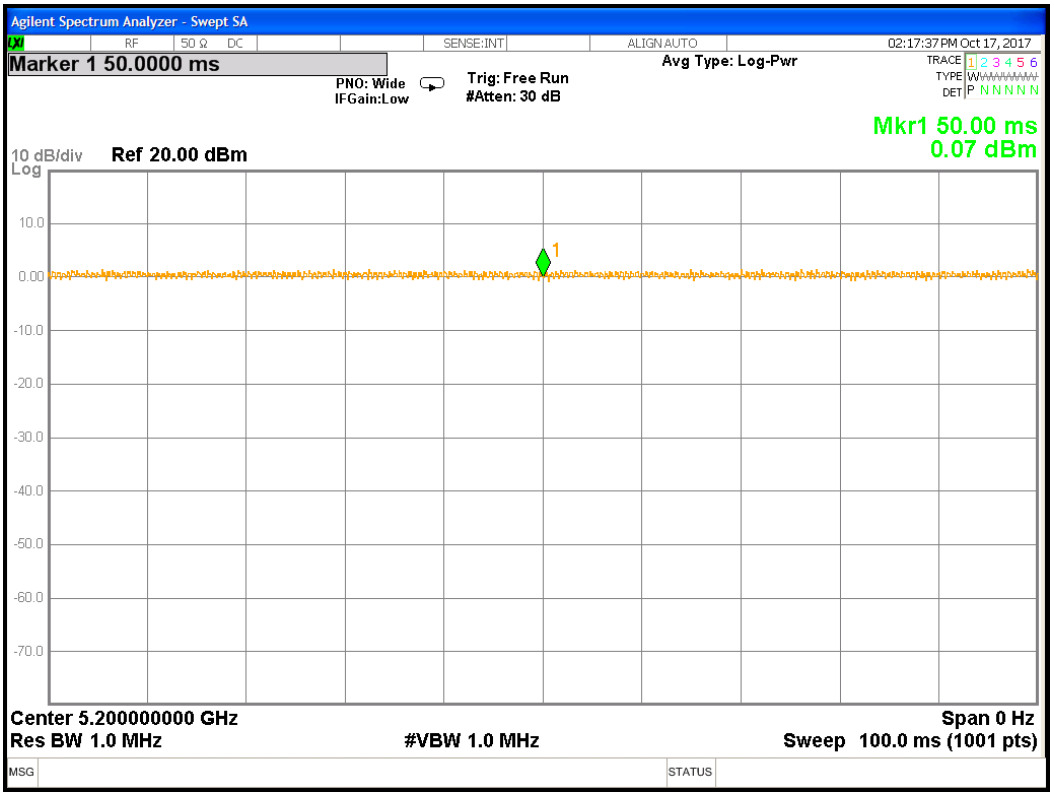


Figure 1: Duty Cycle for 802.11a

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.407: 2017 and RSS 247: 2017. 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 transmitted power limits per CFR47 Part 15.407 and RSS-247 are

Part 15.407(a)(1)(iv) – Band 5150-5250 MHz:250 mW.

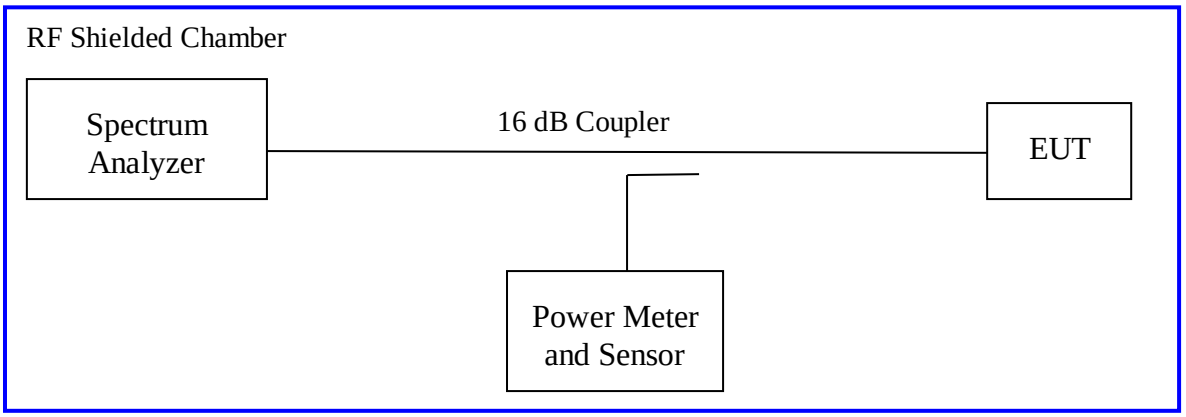
RSS 247 Sect. 6.2.1.1 – Band 5150-5250 MHz (e.i.r.p.): 200 mW or 10 + 10Log(B)

Note: B is the 99% emission bandwidth.

4.1.1 Test Method

The ANSI C63.10-2013 Section 12.3.2.2 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.407(a) and RSS 247 Sect. 6.2.1.1. The worst mode results indicated below.

Test Setup:



Method SA-1 of "KDB 789033 D02 – Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices" applies since the EUT continuously transmit; where duty cycle is greater than 98%. Sample detector was used.

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	**Date:** September 21, 2017
Antenna Type: Integrated PCB	**Power Setting:** Level 0
Antenna Gain: 3.5 dBi	**Signal State:** Modulated at 100%
Ambient Temp.: 23 °C	**Relative Humidity:**38%

802.11a at 6 Mbps (FCC Limit)					
Frequency (MHz)	**Limit [dBm]**	**Output [dBm]**	**Duty Cycle [dB]**	**∑ Power [dBm]**	**Margin [dB]**
5180	23.98	6.38			-17.60
5200	23.98	6.59			-17.39
5240	23.98	7.05			-16.93
802.11a at 6 Mbps (RSS-247 Limit)					
Frequency (MHz)	**Limit [dBm]**	**Output [dBm]**	**Duty Cycle [dB]**	**∑ Power [dBm]**	**Margin [dB]**
5180	19.50	6.38			-13.12
5200	19.50	6.59			-12.91
5240	19.50	7.05			-12.45

Note: The headset is a client device.
Worst case condition was observed at 6 Mbps.
For 5150 – 5250 MHz, RSS-247 Limit = 23 dBm – 3.5 dBi = 19.5 dBm

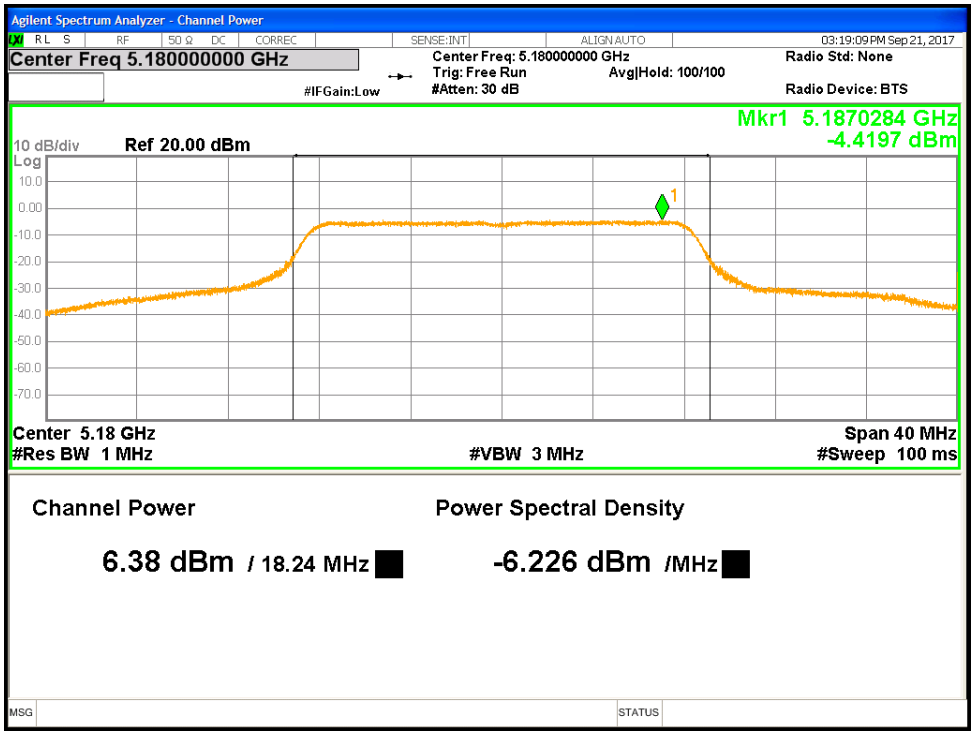


Figure 2: Conducted Output Power-5180 MHz-11a-6 Mbps

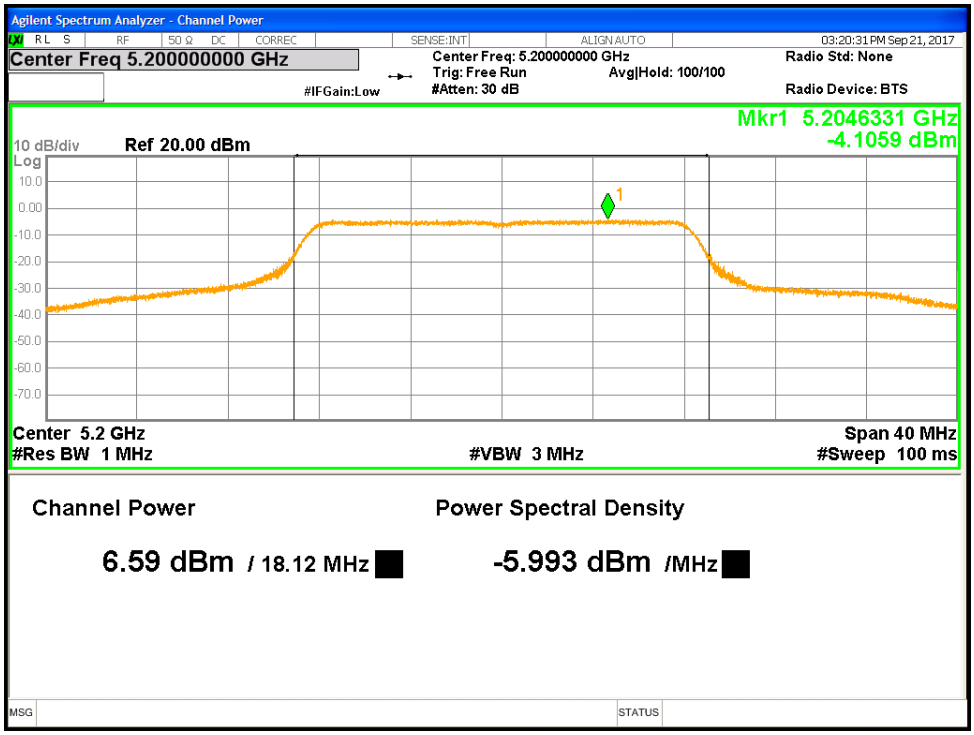


Figure 3: Conducted Output Power -5200 MHz-11a-6 Mbps

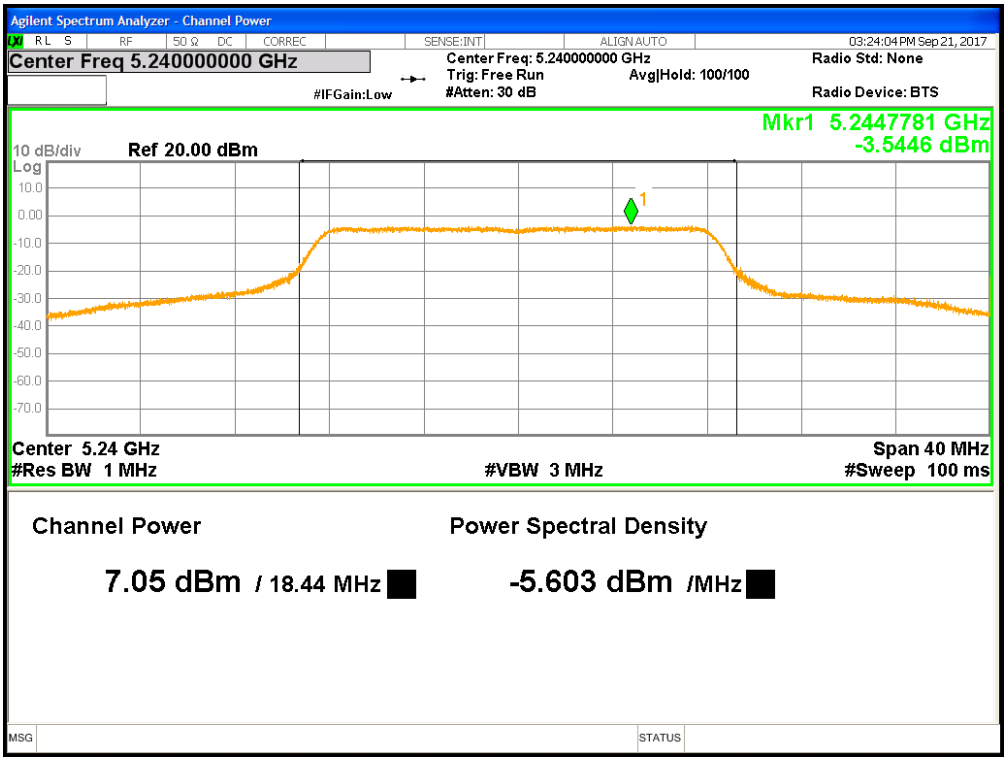


Figure 4: Conducted Output Power-5240 MHz-11a-6 Mbps

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.

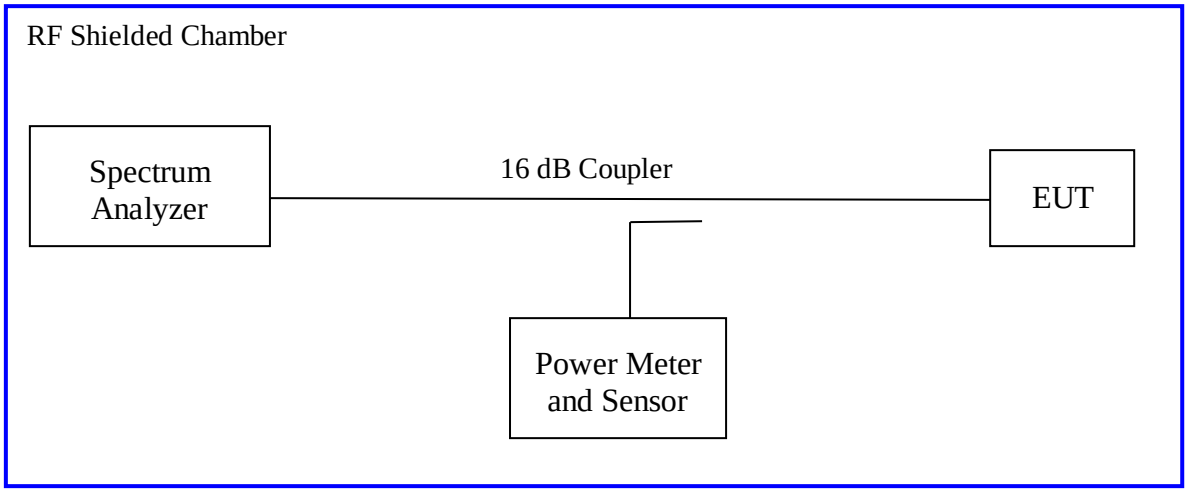
The 26 dB bandwidth is defined the bandwidth of 26 dBr from highest transmitted level of the fundamental frequency.

There is no restriction limits for the bandwidth. The 26 dB bandwidth was used to determine the limit for maximum conducted output power per CFR47 Part 15.407(a).

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) & (e), RSS Gen Sect.6.6. 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. The worst results indicated below.

Test Setup:



4.2.2 Results

These occupied bandwidth measurements were taken for reference only.

Table 3: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement		**Date:** September 21, 2017		
Antenna Type: Integrated PCB		**Power Setting:** Level 0		
Antenna Gain: 3.5 dBi		**Signal State:** Modulated at 100%		
Ambient Temp.: 23 °C		**Relative Humidity:**38%		
Bandwidth (MHz) for 802.11a				
Frequency (MHz)	**Limit (kHz)**	**99% BW**	**26 dB BW**	**Results**
5180	NA	17.250	29.840	NA
5200	NA	17.320	29.890	NA
5240	NA	17.398	29.980	NA
Note: The bandwidth was measured at 6 Mbps for 802.11a mode. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.				

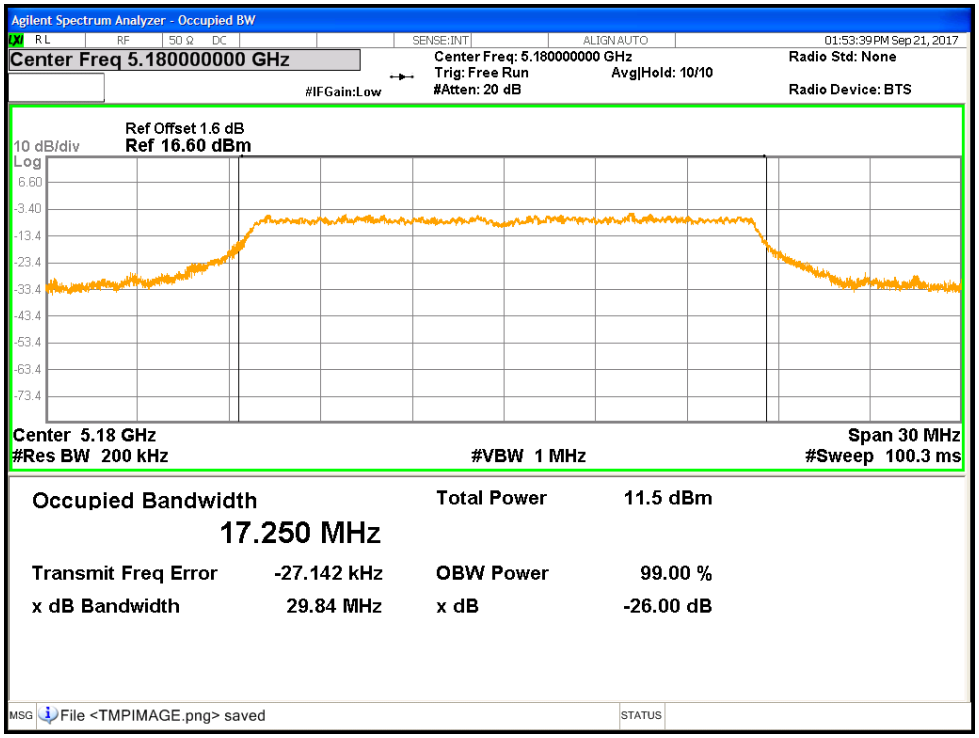


Figure 5: Occupied Bandwidth-5180 MHz-11a

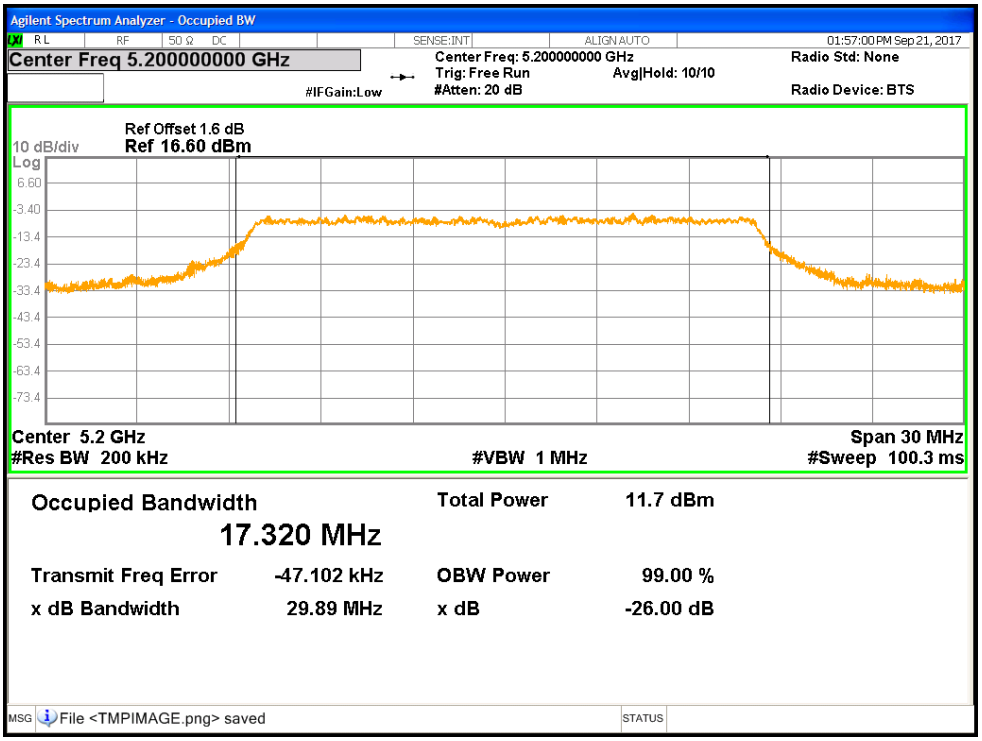


Figure 6: Occupied Bandwidth-5200 MHz-11a

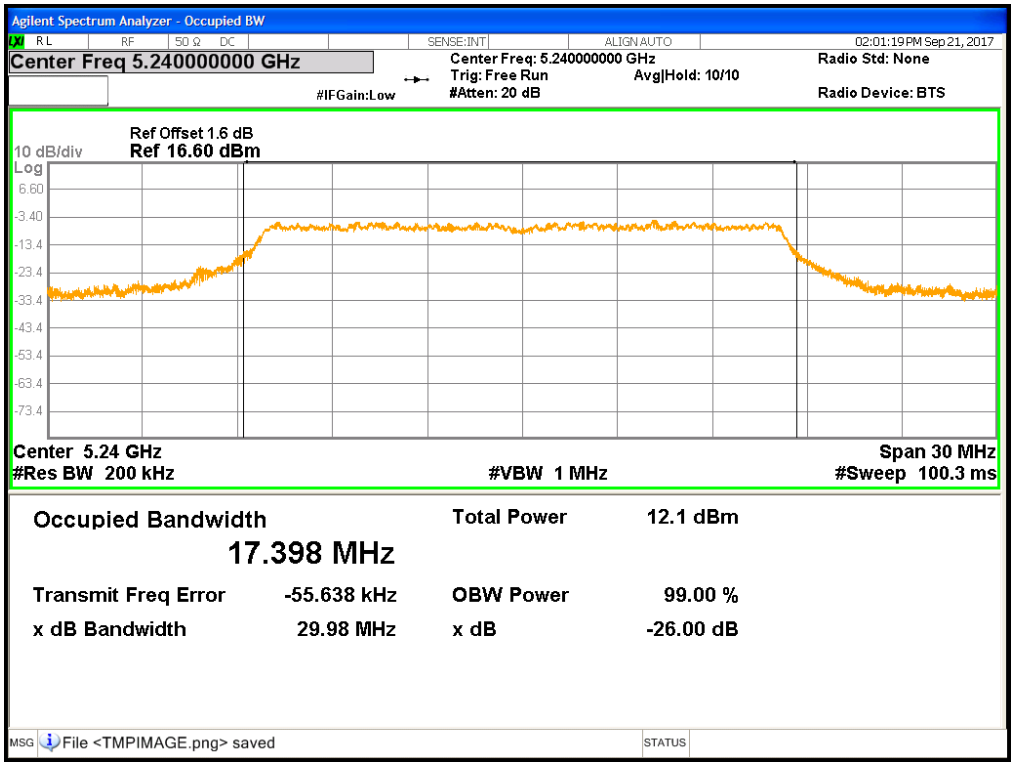


Figure 7: Occupied Bandwidth-5240 MHz-11a

4.3 Power Spectral Density

According to the CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2, the spectral power density output of the antenna port shall be as followed listed below during any time interval of continuous transmission.

The power spectral density limits per CFR47 Part 15.407 (a):

Band 5150-5250 MHz, 5250-5350 MHz, and 5470-5725 MHz: 11 dBm in any 1 MHz band

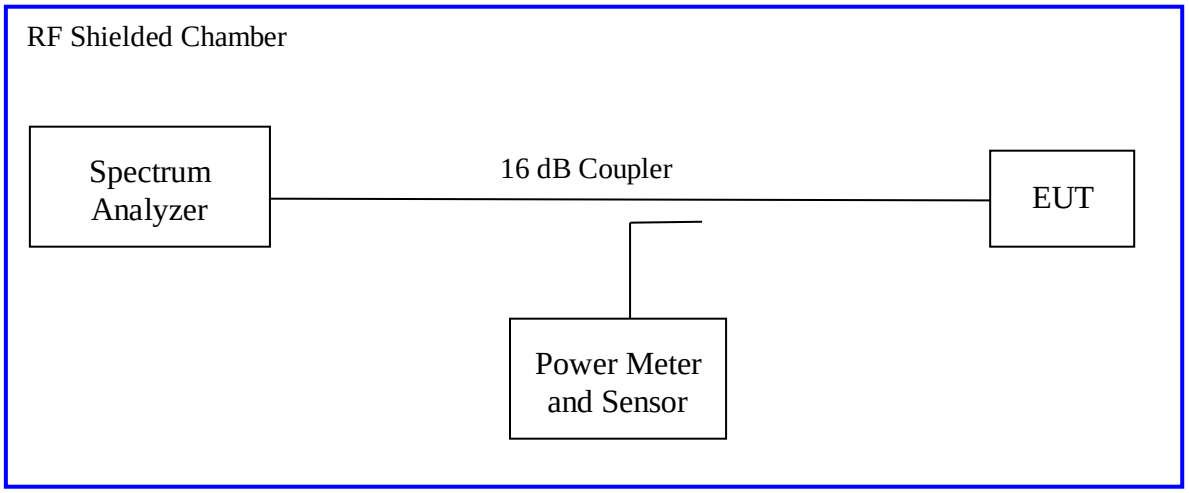
The power spectral density limits per RSS-247 Section 6.2:

Band 5150-5250 MHz: 10 dBm in any 1 MHz band, E.I.R.P.

4.3.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10-2013 Section 12.3.2.2. The measurement was performed with modulation per CFR47 Part 15.407 (a) and RSS 247 Sect. 6.2. The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range. 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: Power Spectral Density – Test Results

Test Conditions: Conducted Measurement			**Date:** September 21, 2017		
Antenna Type: Integrated PCB			**Power Setting:** Level 0.		
Antenna Gain: 3.5 dBi			**Signal State:** Modulated at 100%, 6 Mbps		
Ambient Temp.: 23 °C			**Relative Humidity:**38%		
802.11a (FCC Limit)					
Freq. (MHz)	**Output [dBm]**	**CF [dB]**	**Total PPD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5180	-4.93			11.00	-15.93
5200	-5.23			11.00	-16.23
5240	-4.89			11.00	-15.89
802.11a (RSS-247 Limit)					
5180	-4.93			6.50	-11.43
5200	-5.23			6.50	-11.73
5240	-4.89			6.50	-11.39
Note: RSS-247 Limit at 5150-5250 MHz is eirp; 10dBm – 3.5dBi = 6.5 dBm					

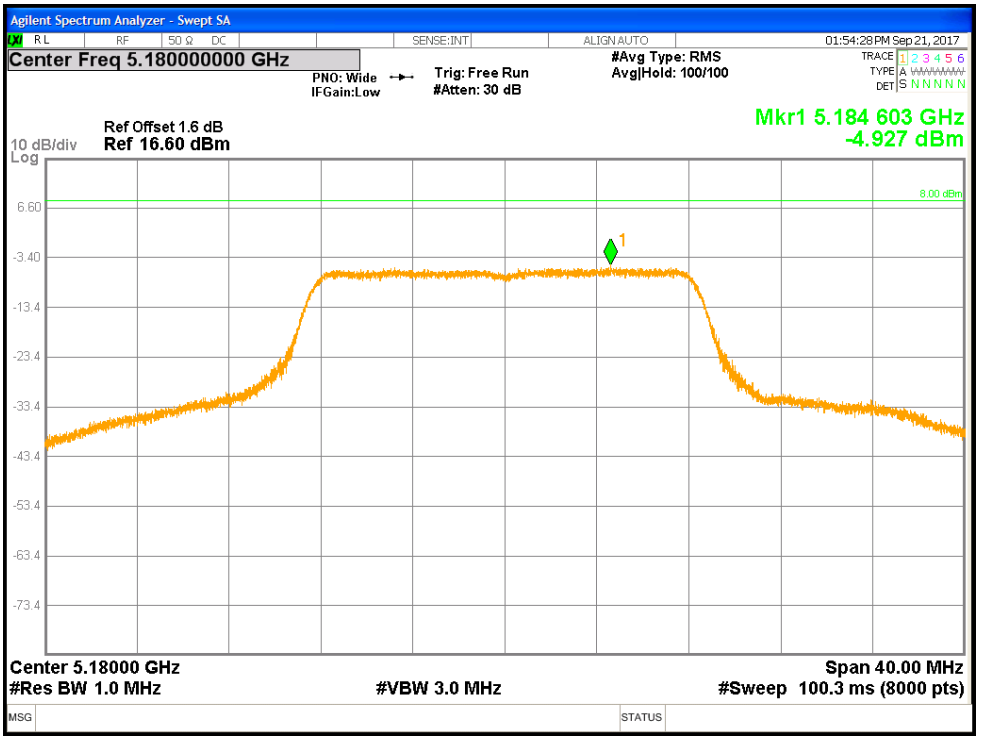


Figure 8: FCC-PPSD-5 GHz-5180 MHz-11a-6 Mbps

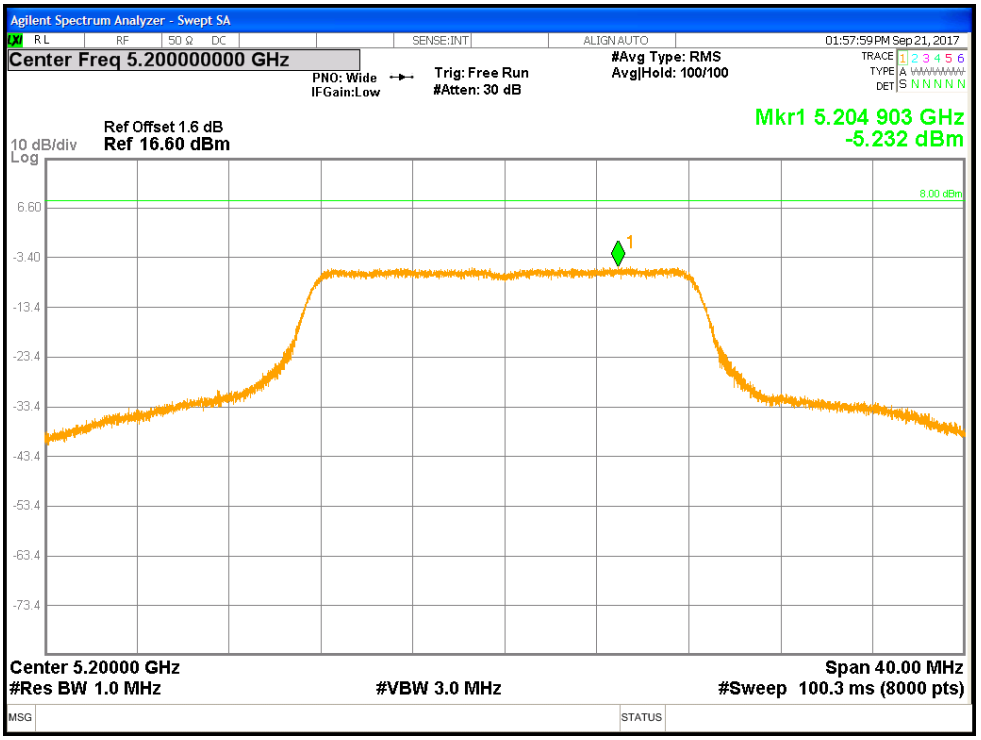


Figure 9: FCC-PPSD-5 GHz-5200 MHz-11a-6 Mbps

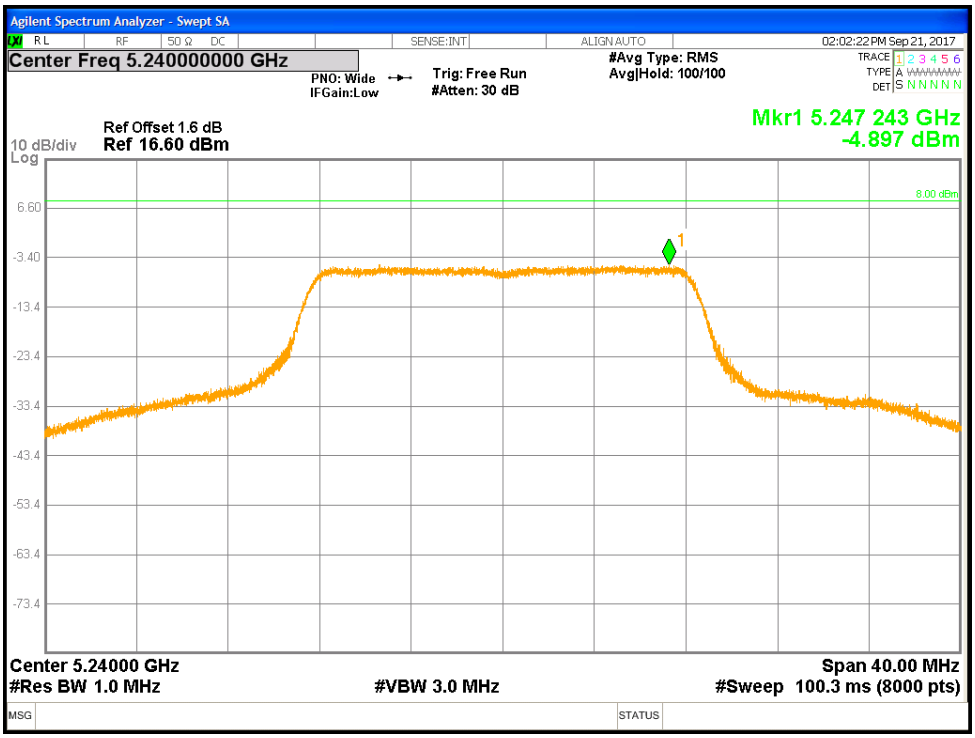


Figure 10: FCC-PPSD-5 GHz-5240 MHz-11a-6 Mbps

4.4 Undesirable Emission Limits

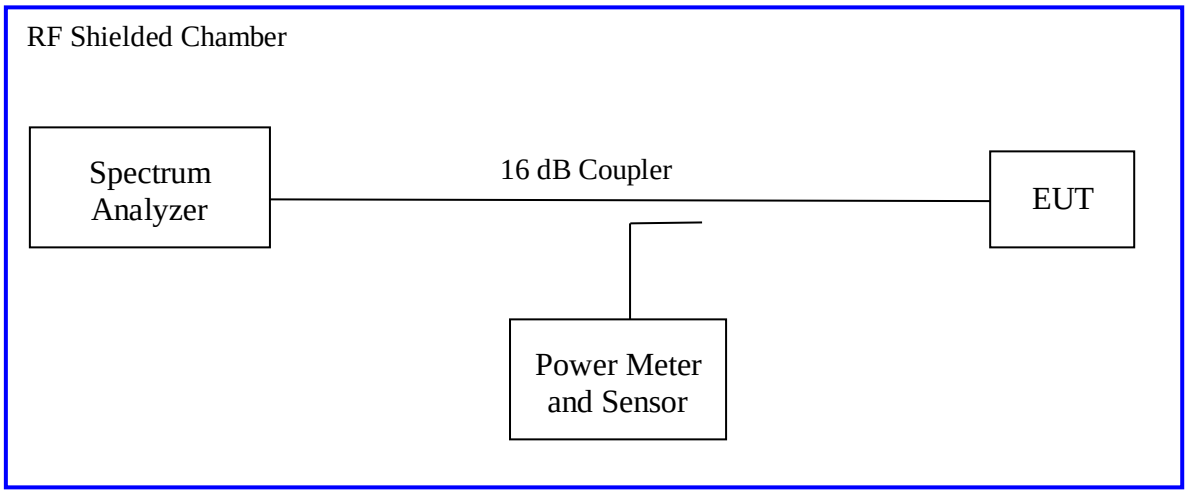
CFR47 15.407 (b) and RSS 247 Sect.6.2.1.2, 6.2.2.2, and 6.2.3.2: The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

4.4.1 Test Method

The conducted method was used to measure the undesirable emission requirement. The measurement was performed with modulation. This test was conducted on 3 channels of Sample in each mode on Sample. The worst sample result indicated below.

Test Setup:



4.4.2 Results

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

Table 5: Undesired Emissions for 802.11a – Test Results

Test Conditions: Conducted Measurement	**Date:** September 21, 2017
Antenna Type: Integrated PCB	**Power Setting:** Level 0.
Antenna Gain: 3.5 dBi	**Signal State:** Modulated at 100%
Ambient Temp.: 23° C	**Relative Humidity:** 35%

Undesired Emissions for 802.11a

Frequency	Level	Det.	Port	Limit	Margin	Comments
MHz	dBuV/m			cm	dB	
5023.77	-44.37	Pk	RF	-27.00	-17.37	11a, 5180MHz, 6.0Mbps
5341.43	-39.92	Pk	RF	30.00	-69.92	11a, 5180MHz, 6.0Mbps
5496.85	-46.59	Pk	RF	-27.00	-19.59	11a, 5180MHz, 6.0Mbps
5660.79	-51.54	Pk	RF	-27.00	-24.54	11a, 5180MHz, 6.0Mbps
6906.51	-53.57	Pk	RF	-27.00	-26.57	11a, 5180MHz, 6.0Mbps
5367.61	-38.57	Pk	RF	-27.00	-11.57	11a, 5200MHz, 6.0Mbps
5207.40	-0.61	Pk	RF	30.00	-30.61	11a, 5200MHz, 6.0Mbps
5047.47	-44.30	Pk	RF	-27.00	-17.30	11a, 5200MHz, 6.0Mbps
5361.21	-40.10	Pk	RF	-27.00	-13.10	11a, 5200MHz, 6.0Mbps
5516.46	-47.95	Pk	RF	-27.00	-20.95	11a, 5200MHz, 6.0Mbps
5684.15	-52.42	Pk	RF	-27.00	-25.42	11a, 5200MHz, 6.0Mbps
5398.24	-38.91	Pk	RF	-27.00	-11.91	11a, 5240MHz, 6.0Mbps
5236.50	0.18	Pk	RF	30.00	-29.82	11a, 5240MHz, 6.0Mbps
5394.82	-40.10	Pk	RF	-27.00	-13.10	11a, 5240MHz, 6.0Mbps
5556.26	-49.00	Pk	RF	-27.00	-22.00	11a, 5240MHz, 6.0Mbps
5722.15	-54.08	Pk	RF	-27.00	-27.08	11a, 5240MHz, 6.0Mbps
5074.22	-44.29	Pk	RF	-27.00	-17.29	11a, 5240MHz, 6.0Mbps

Note: 1. Worst case condition observed at 6.0 Mbps.
2. All out of band emissions are lower than the -27dBm level.
3. 99% OBW emission of 5240 MHz operating channel did not leak into 5250 MHz-5350 MHz band.

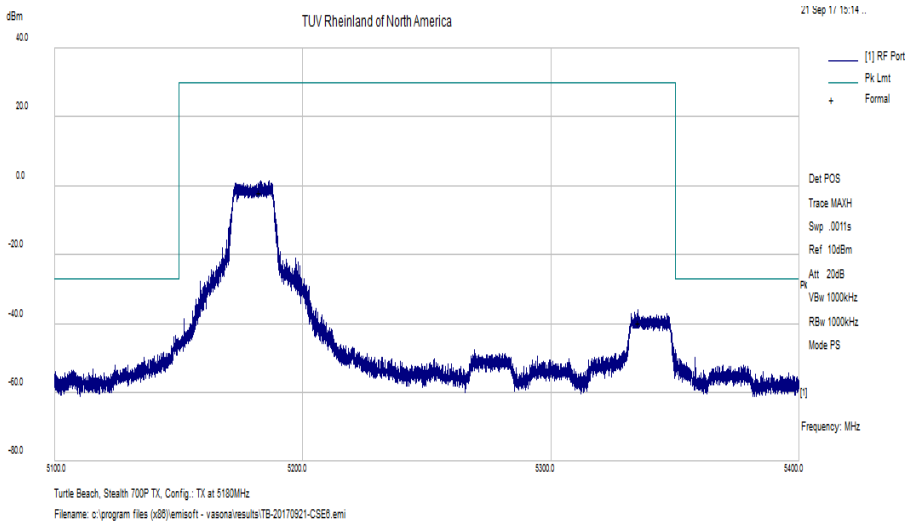


Figure 11: Measured Band-edge for 802.11a-6 Mbps at 5180 MHz

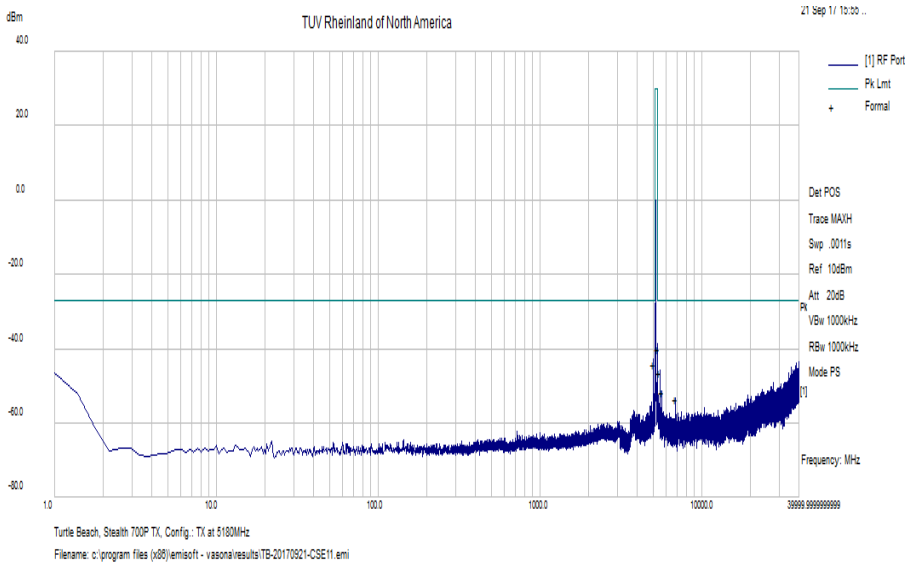


Figure 12: Undesirable Emission for 802.11a-6 Mbps at 5180 MHz

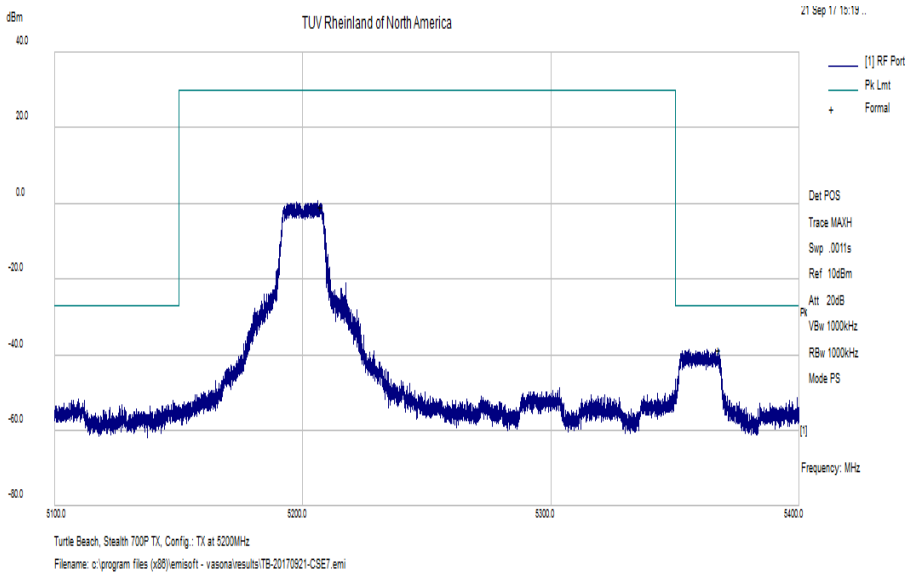


Figure 13: Measured Band-edge for 802.11a-6 Mbps at 5200 MHz

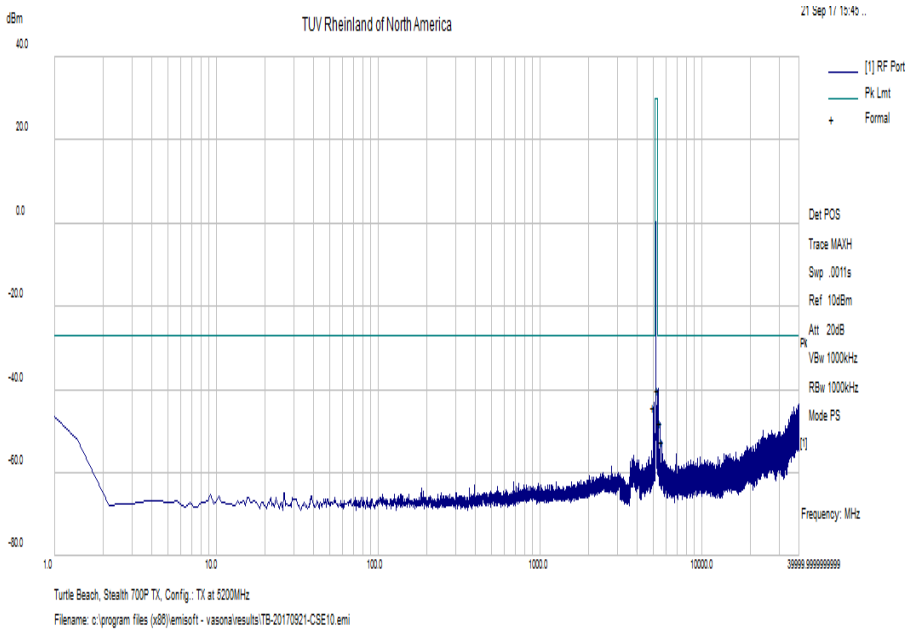


Figure 14: Undesirable Emission for 802.11a-6 Mbps at 5200 MHz

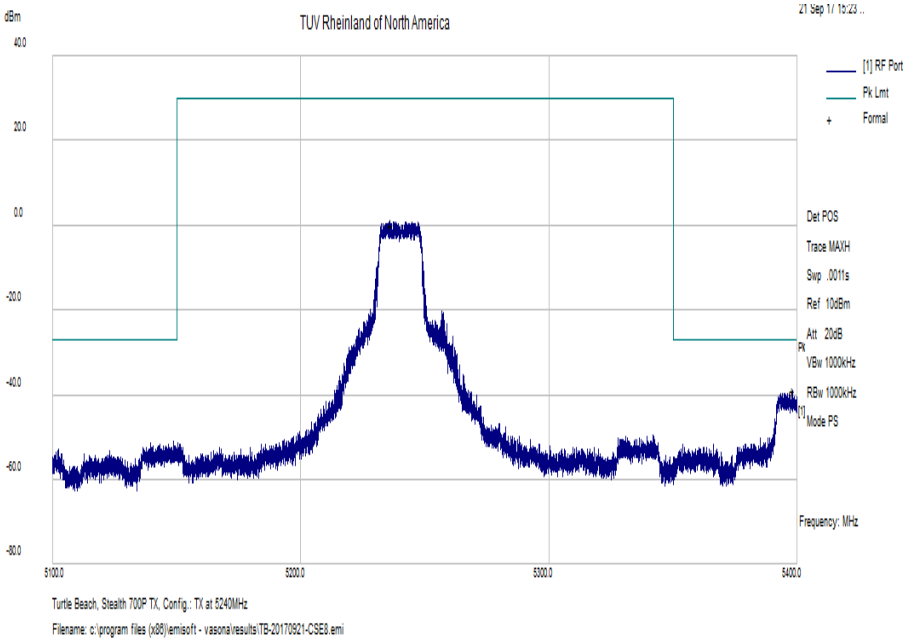


Figure 15: Measured In-Band Band-edge for 802.11a-6 Mbps at 5240 MHz

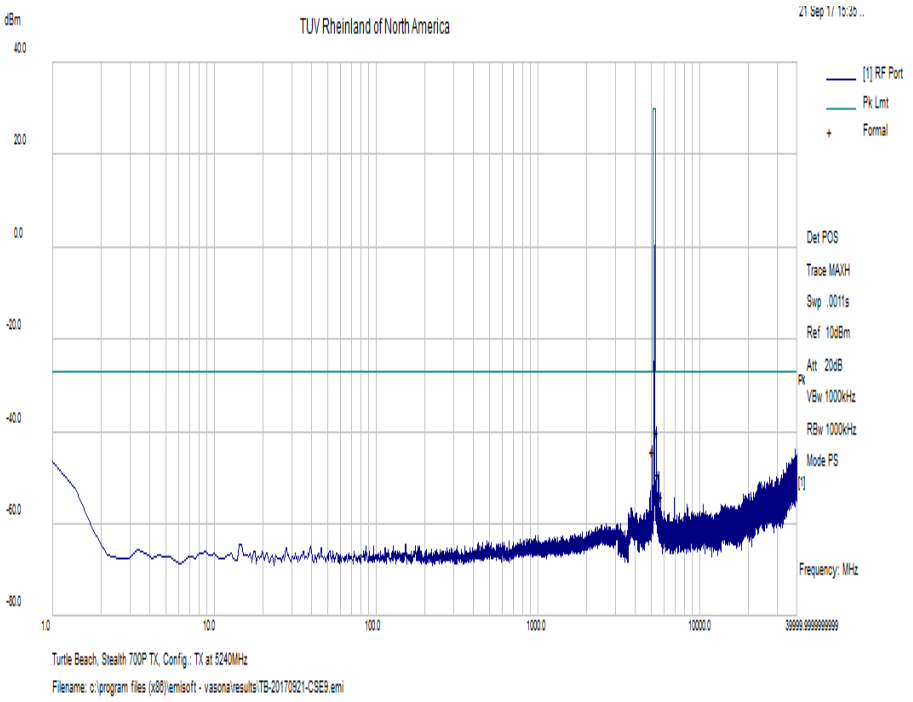


Figure 16: Measured In-Band Band-edge for 802.11a-6 Mbps at 5240 MHz

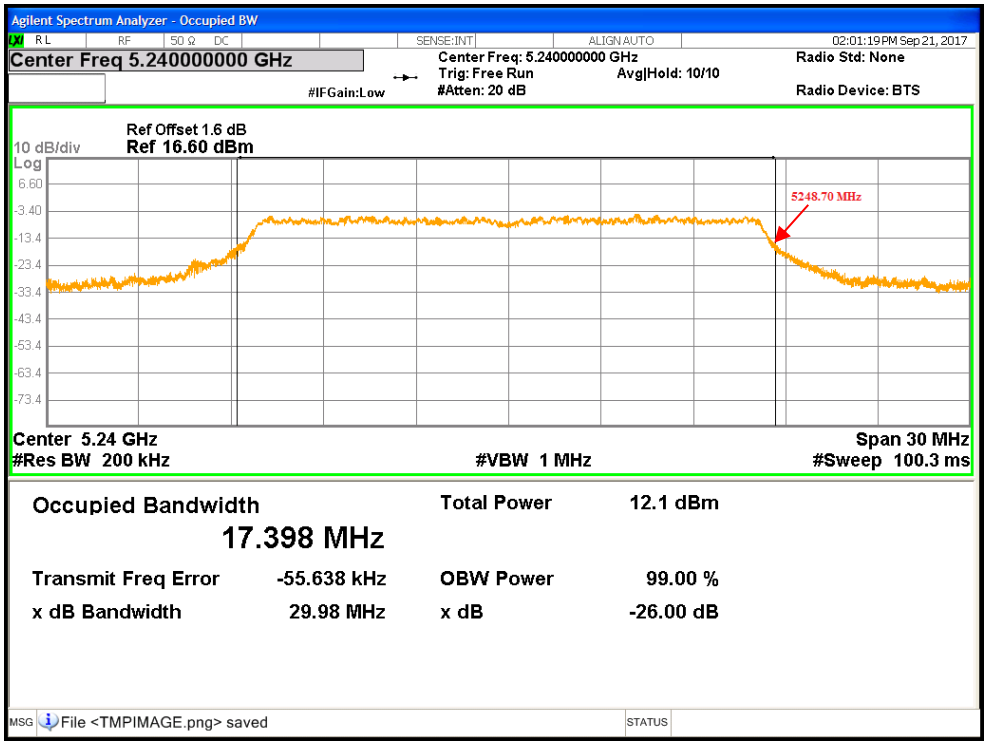


Figure 17: Measured Band-edge for 11a-6 Mbps at 5240 MHz

Note: The 99% bandwidth marker at 5240 MHz is below 5248.70 MHz. Since the 99% bandwidth emission did not cross over into the UNII2a band, DFS is not required for 5240 MHz operating channel.

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 15.205:2017, 15.209:2017, 15.407(b:2017), RSS 247 Sect. 6:2017, RSS GEN Sect.8.9 and 8.10:2014

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 (<1 GHz) and 150cm (>1 GHz) 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.

Pres-scans were performed to determine the worst, data rate/ chains for 802.11a.

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 (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

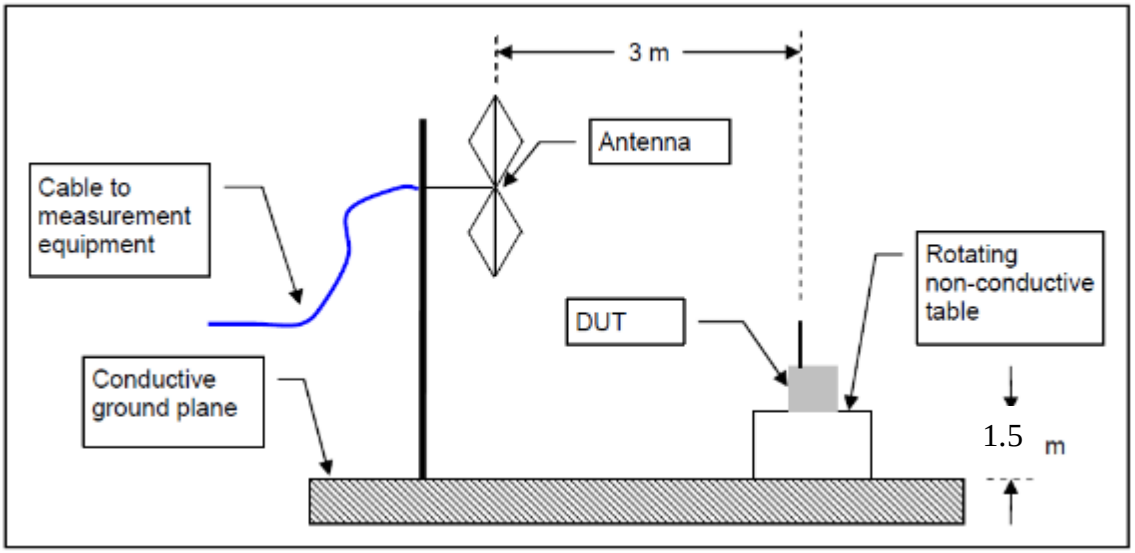
Final results are:

802.11a at 6 Mbps on upright position.

4.5.1.3 Deviations

None.

Test Setup:



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, RSS 247 Sect. 6, RSS GEN Sect. 8.9 and 8.10

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) and RSS 247 Sect. 6.2, all harmonics and spurious emissions which are outside the 5150 MHz - 5250 MHz, shall not exceed -27 dBm/MHz. This is equivalent to 68.2 dBuV/m at 3 meter distance.

4.5.3 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.

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, Normal Temperature and Voltage only	**Date:** August 22, 2017
Antenna Type: Integrated PCB	**Power Setting:** Level 0
Max. Gain: + 3.5 dBi	**Signal State:** Modulated at 100%.
Ambient Temp.: 19° C	**Relative Humidity:** 34 %RH

Band-Edge Results for 5150 MHz to 5240MHz

Freq. (MHz)	Level (dBuV/m)	Pol. (H/V)	Limit (dBuV/m)	Margin (dB)	Det.	Table Deg.	Tower (cm)	Note
5150	54.60	V	74.00	−19.40	Pk	253	258	700P TX – 5180 MHz – 6Mbps
5150	45.20	V	54.00	−8.80	Ave	253	258	700P TX – 5180 MHz – 6Mbps
5150	54.15	V	74.00	−19.85	Pk	253	258	700P TX – 5180 MHz – 6Mbps – 2 MHz Span
5150	44.80	V	54.00	−9.20	Ave	253	258	700P TX – 5180 MHz – 6Mbps – 2 MHz Span
5150	55.72	H	74.00	−18.28	Pk	135	291	700P TX – 5180 MHz – 6Mbps
5150	45.59	H	54.00	−8.41	Ave	135	291	700P TX – 5180 MHz – 6Mbps
5150	54.47	H	74.00	−19.53	Pk	135	291	700P TX – 5180 MHz – 6Mbps – 2 MHz Span
5150	45.00	H	54.00	−9.00	Ave	135	291	700P TX – 5180 MHz – 6Mbps – 2 MHz Span
5396	59.83	V	74.00	−14.17	Pk	282	292	700P TX – 5240 MHz – 6Mbps
5393	49.24	V	54.00	−4.76	Ave	282	292	700P TX – 5240 MHz – 6Mbps
5350	52.63	V	74.00	−21.37	Pk	282	292	700P TX – 5240 MHz – 6Mbps – 2MHz Span
5350	42.96	V	54.00	−11.04	Ave	282	292	700P TX – 5240 MHz – 6Mbps – 2MHz Span
5396	61.02	H	74.00	−12.98	Pk	138	301	700P TX – 5240 MHz – 6Mbps
5395	51.52	H	54.00	−2.48	Ave	138	301	700P TX – 5240 MHz – 6Mbps
5350	53.30	H	74.00	−20.70	Pk	138	301	700P TX – 5240 MHz – 6Mbps – 2MHz Span
5350	43.22	H	54.00	−10.78	Ave	138	301	700P TX – 5240 MHz – 6Mbps – 2MHz Span

Note: 1. Band-edge frequencies were taken at 5150 MHz and 5350 MHz since these band-edges are adjacent to the restricted bands.

2. All the band-edge measurements met the restricted band requirements of CFR47 15.205.

3. For 5250 MHz In-band-edge, refer to Section 4.4.2.

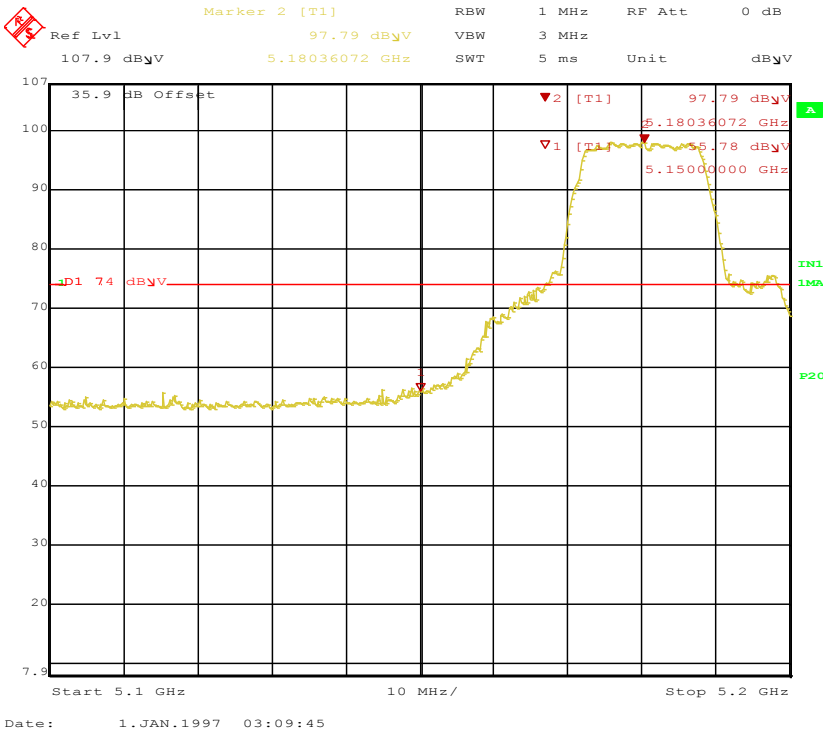


Figure 18: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz – Horz. (Pk)

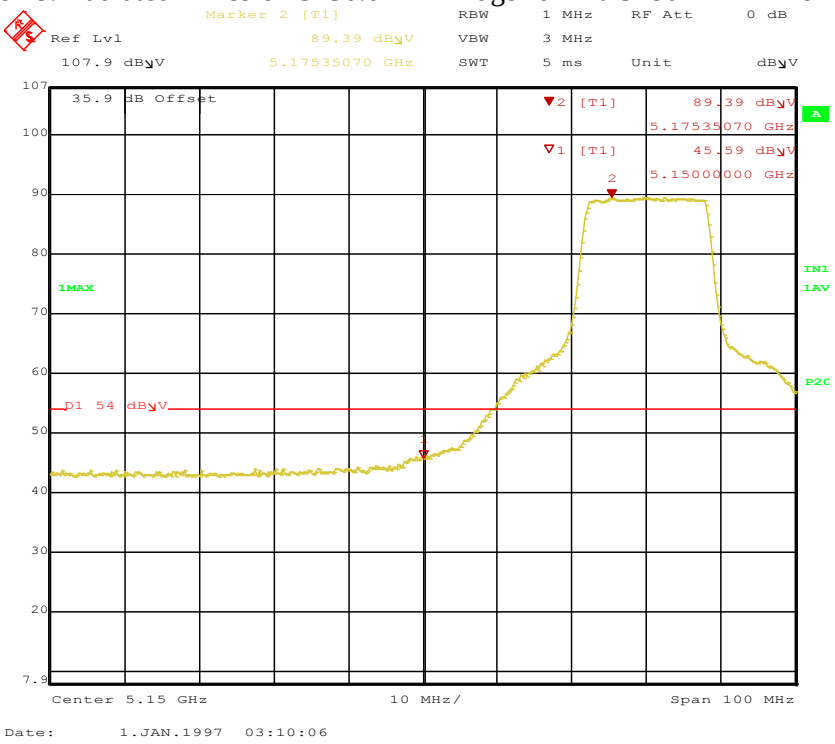


Figure 19: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz – Horz. (Ave)

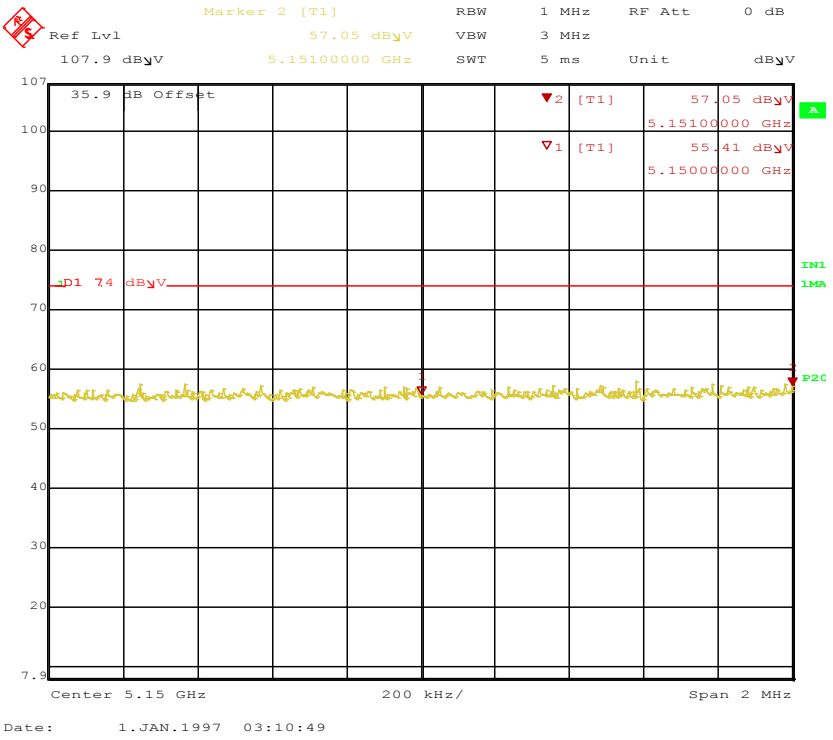


Figure 20: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz, 2 MHz Span – Horz. (Pk)

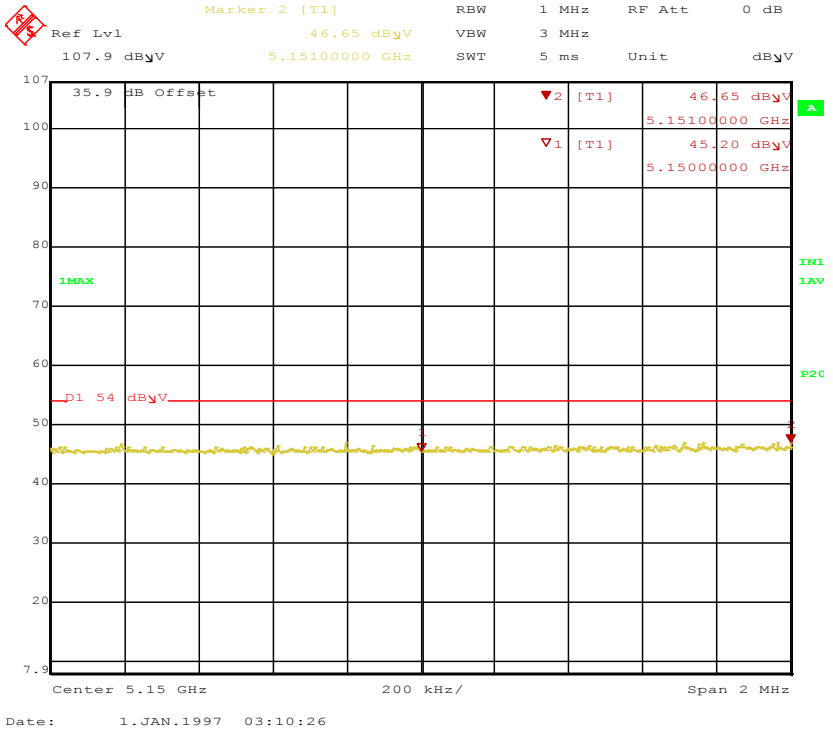


Figure 21: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz 2 MHz Span – Horz. (Ave)

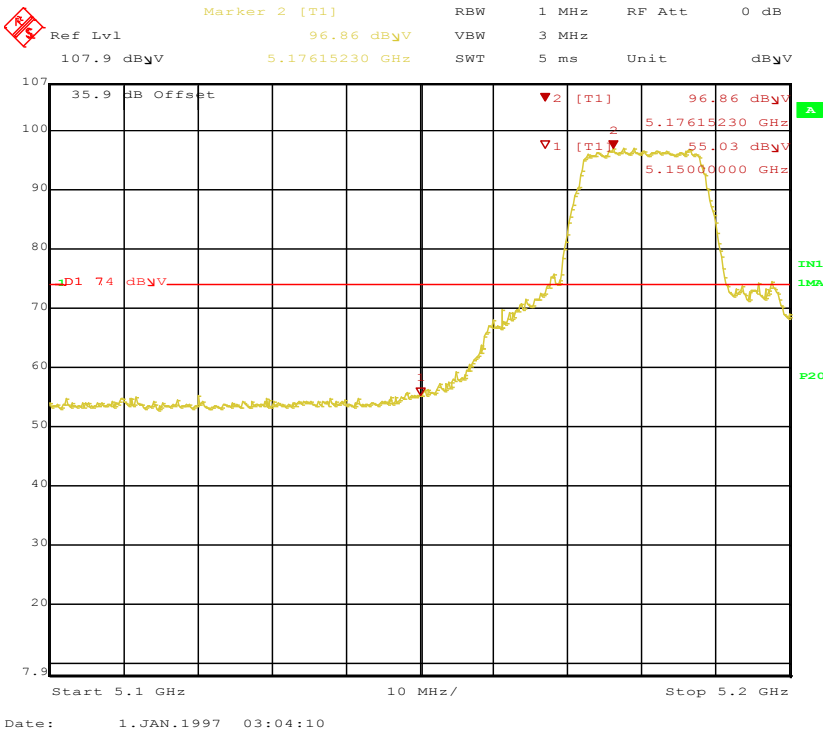


Figure 22: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz – Vert. (Pk)

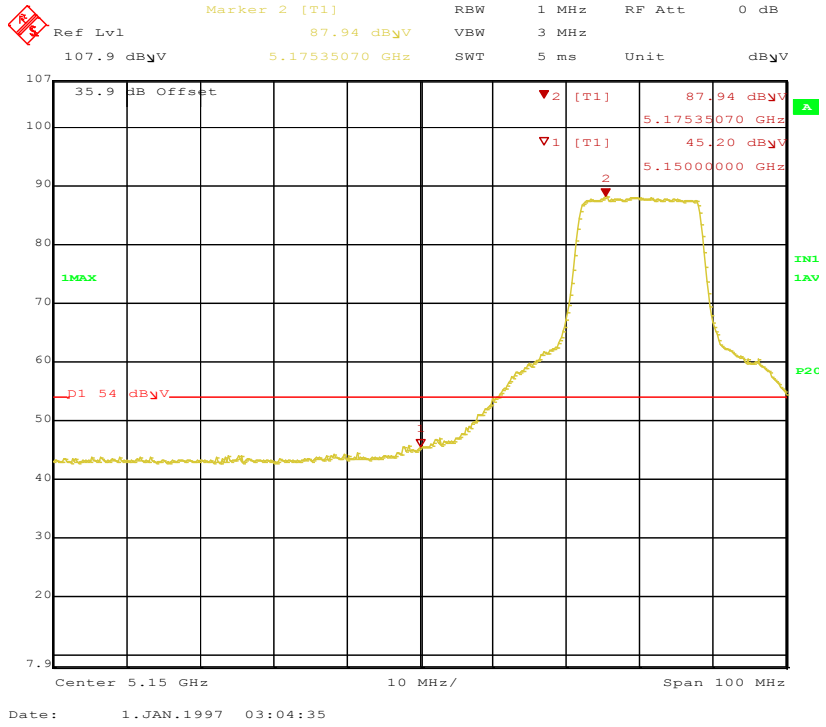


Figure 23: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz – Vert. (Ave)

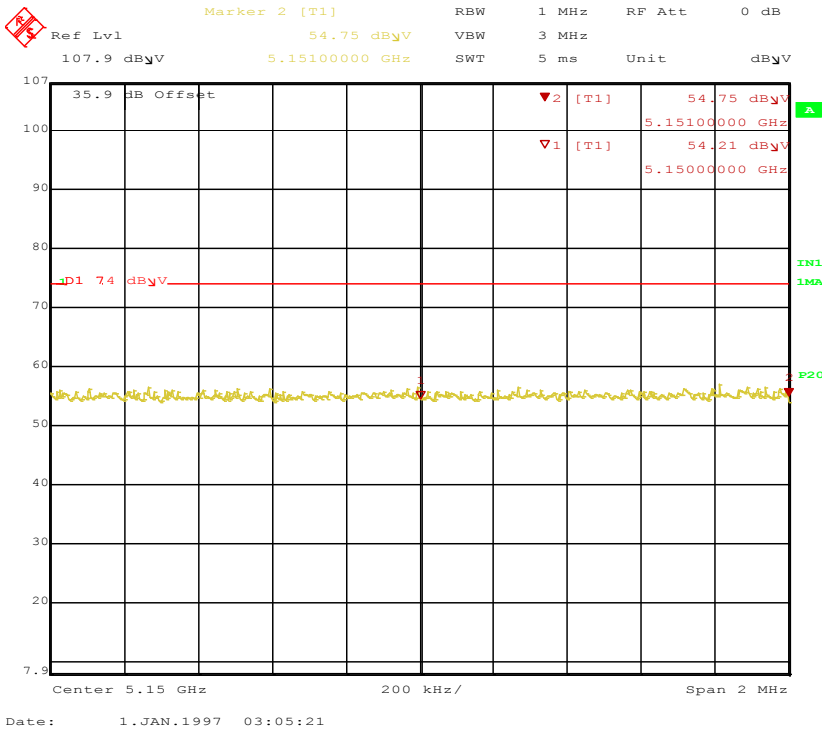


Figure 24: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz, 2 MHz Span – Vert. (Pk)

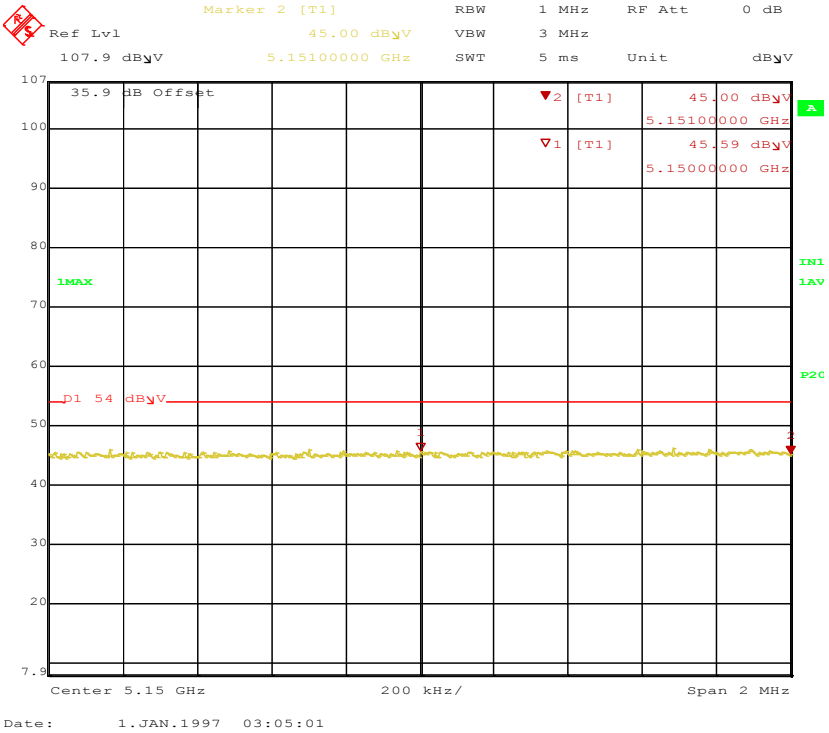


Figure 25: Radiated Emission 5150.0 MHz Edge for 11a 5180 MHz 2 MHz Span –Vert. (Ave)

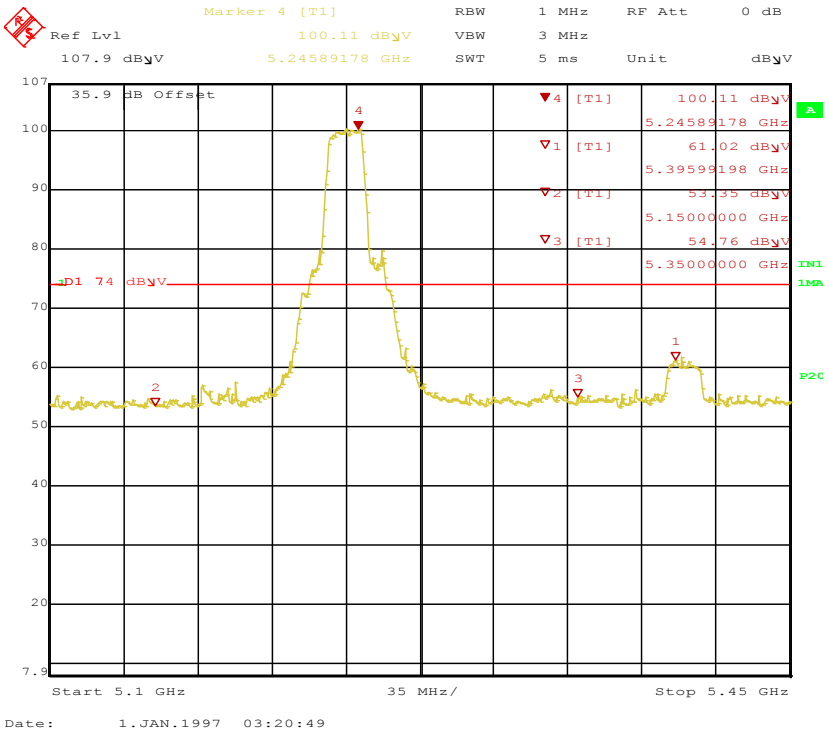


Figure 26: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz – Horz. (Pk)

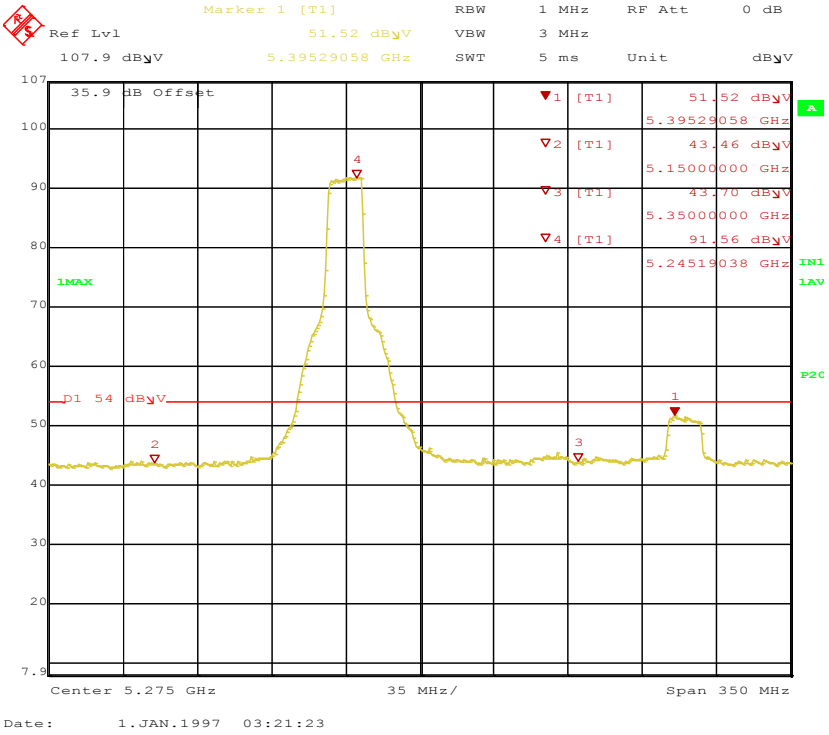


Figure 27: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz – Horz. (Ave)

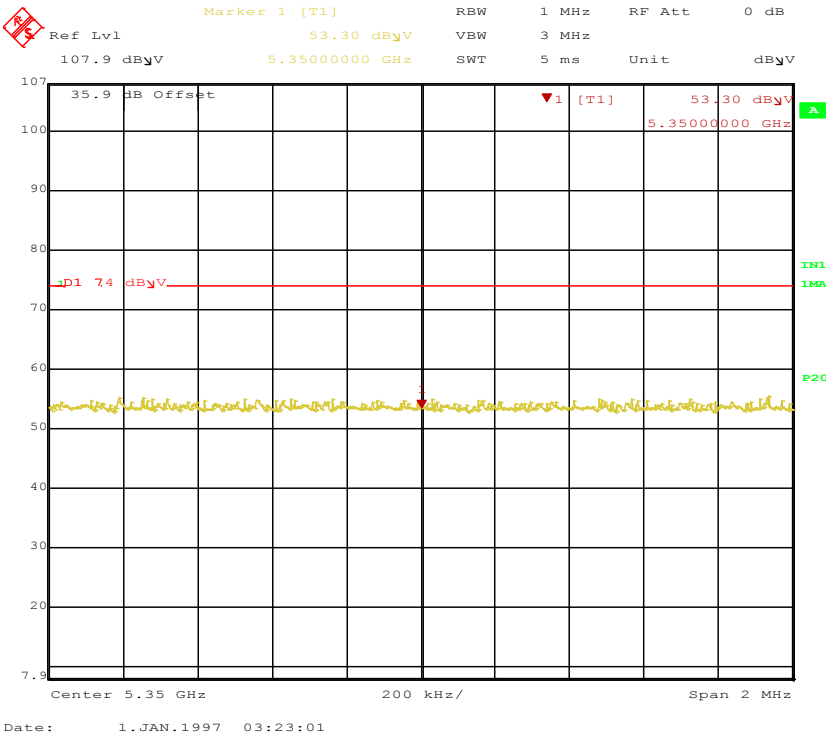


Figure 28: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz, 2 MHz Span – Horz. (Pk)

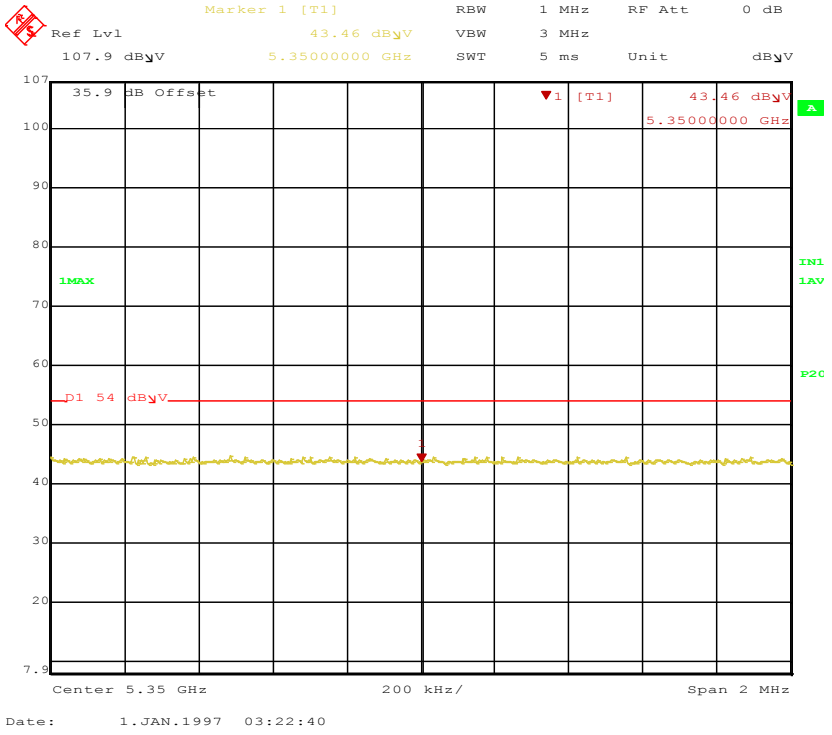


Figure 29: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz 2 MHz Span – Horz. (Ave)

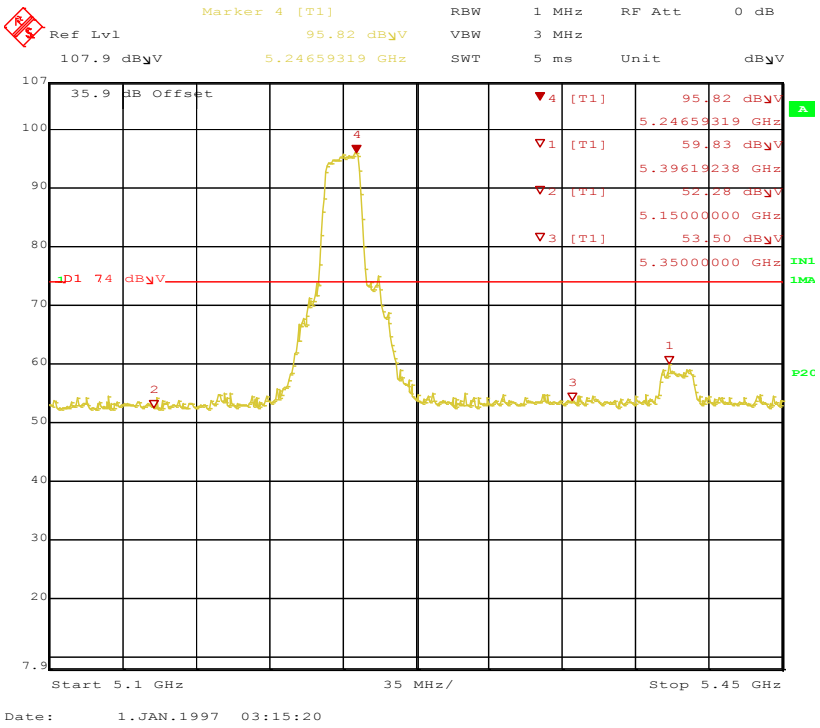


Figure 30: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz – Vert. (Pk)

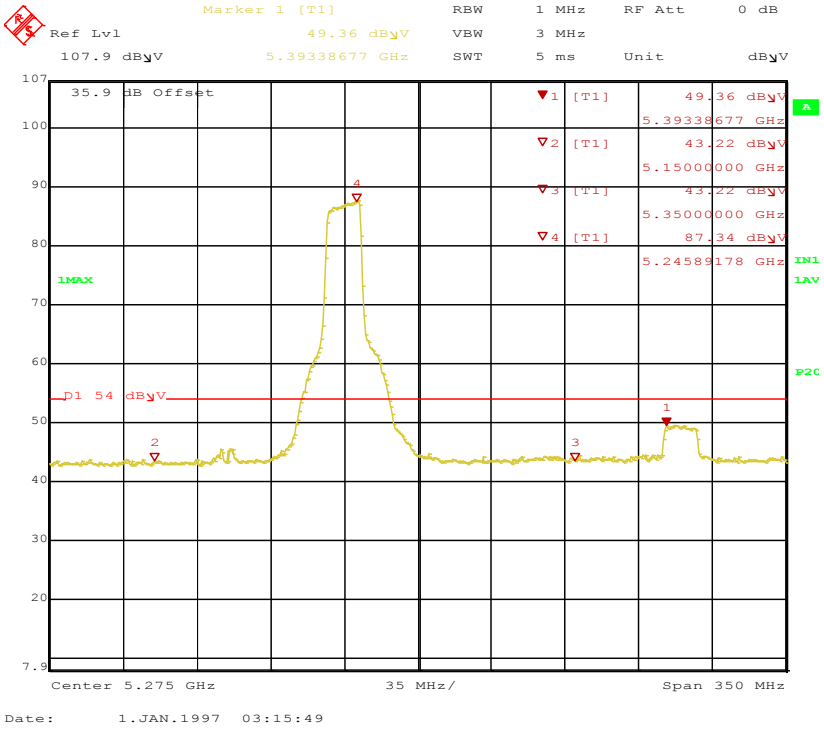


Figure 31: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz – Vert. (Ave)

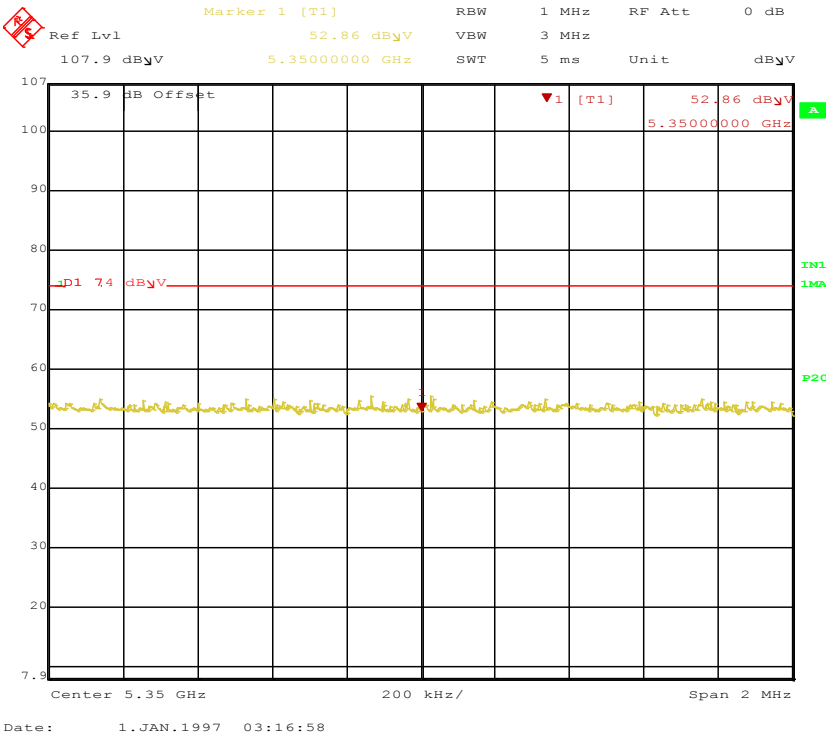


Figure 32: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz, 2 MHz Span – Vert. (Pk)

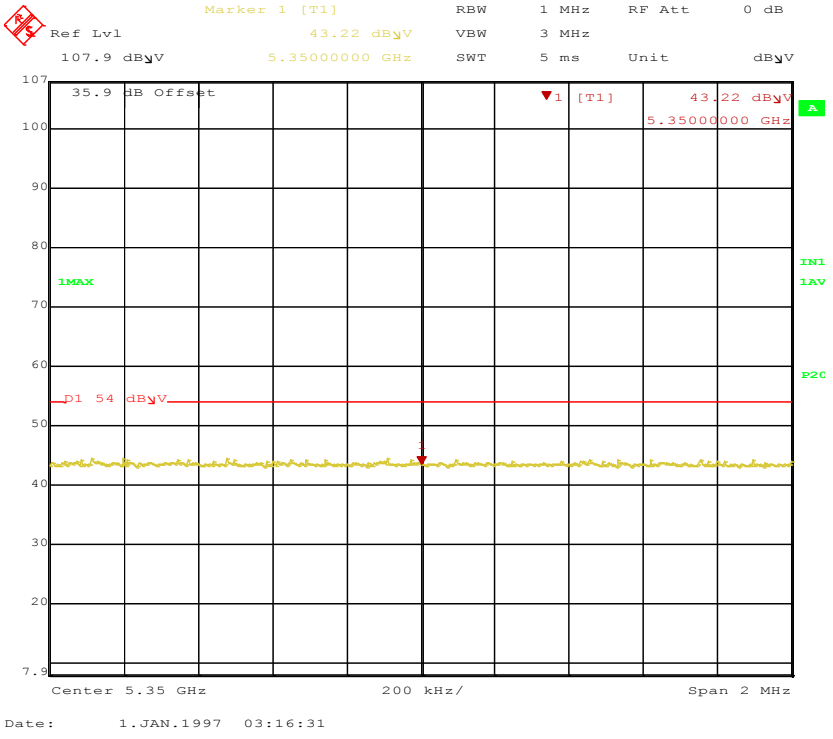


Figure 33: Radiated Emission 5350.0 MHz Edge for 11a 5240 MHz 2 MHz Span –Vert. (Ave)

SOP 1 Radiated Emissions		Tracking # 31763316.001 Page 1 of 6	
EUT Name	Wireless Audio Transmitter	**Date**	August 29, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	23° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Jeremy Luong

9 kHz – 1 GHz Transmit at 5200 MHz

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
44.99	49.69	2.70	-17.32	35.06	QP	V	124	64	40.00	-4.94
48.03	44.51	2.72	-18.94	28.29	QP	V	133	322	40.00	-11.71
60.00	47.52	2.81	-20.72	29.61	QP	V	115	216	40.00	-10.39
69.16	48.76	2.87	-20.11	31.52	QP	V	145	93	40.00	-8.48
120.01	51.90	3.20	-14.50	40.60	QP	V	108	93	43.50	-2.90
240.02	46.70	3.70	-16.00	34.40	QP	V	103	20	46.00	-11.60

Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

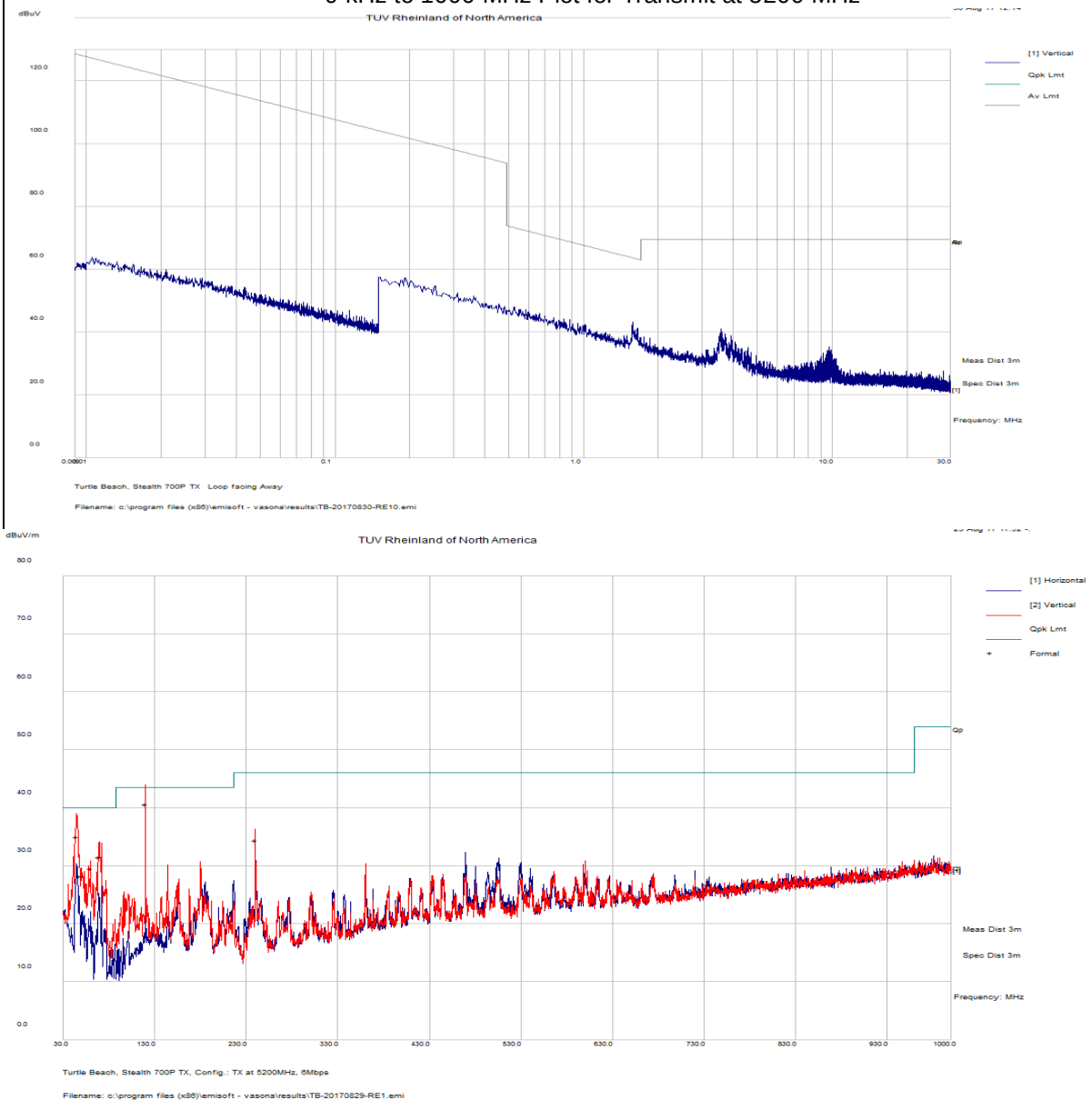
Note: 1. Mode tested was 802.11a (low, mid & high channel).
2. Worst case emission was observed at 6 Mbps in the 802.11a mode.
3. No significant emission was observed below 30 MHz

SOP 1 Radiated Emissions

Tracking # 31763316.001 Page 2 of 6

EUT Name	Wireless Audio Transmitter	**Date**	August 29, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	23° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3 & 6505	**Date**	Jeremy Luong

9 kHz to 1000 MHz Plot for Transmit at 5200 MHz



Notes: None.

SOP 1 Radiated Emissions		Tracking # 31763316.001 Page 3 of 6	
EUT Name	Wireless Audio Transmitter	**Date**	August 13, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	21° C / 40%rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m - EMCO3115 / 1m – AHA-840	**Performed by**	Jeremy Luong

1 – 40 GHz Transmit at 5180 MHz (Low Channel)

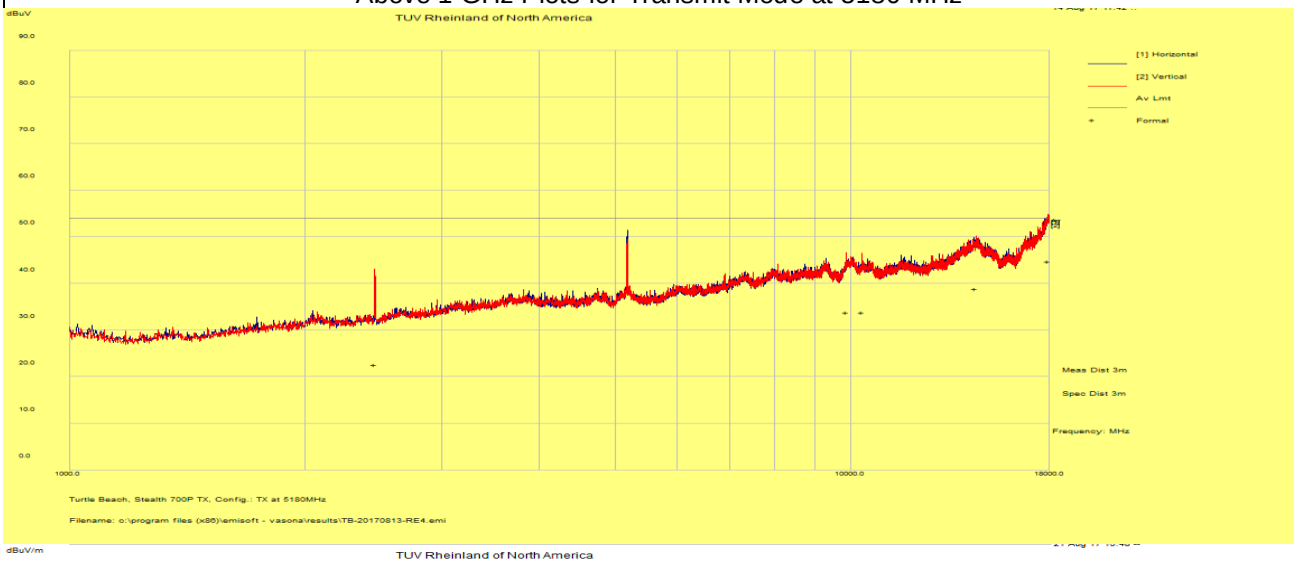
Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
2459.64	27.51	1.30	-6.28	22.52	Ave	V	153	94	54.00	-31.48
9887.31	24.26	2.91	6.65	33.82	Ave	V	104	298	54.00	-20.18
10360.85	24.50	3.06	6.27	33.83	Ave	V	205	164	54.00	-20.17
14479.87	23.69	3.50	11.68	38.87	Ave	V	160	198	54.00	-15.13
17918.52	24.73	4.20	15.81	44.75	Ave	V	180	124	54.00	-9.25
1 – 40 GHz Transmit at 5200 MHz (Middle Channel)										
2457.59	27.47	1.30	-6.30	22.47	Ave	H	243	338	54.00	-31.53
6933.32	29.82	2.31	1.52	33.65	Ave	H	104	144	54.00	-20.35
10399.55	24.53	3.06	6.59	34.18	Ave	V	225	124	54.00	-19.82
14500.40	23.68	3.54	11.97	39.19	Ave	V	211	360	54.00	-14.81
17967.29	24.76	4.20	15.94	44.90	Ave	V	228	360	54.00	-9.10
1 – 40 GHz Transmit at 5240 MHz (High Channel)										
2462.35	27.04	1.30	-6.26	22.08	Ave	H	172	248	54.00	-31.92
10607.77	23.62	3.00	7.08	33.70	Ave	H	208	265	54.00	-20.30
14540.87	23.70	3.58	11.44	38.72	Ave	H	163	344	54.00	-15.28
1971.23	26.72	1.20	-7.10	20.82	Ave	V	145	314	54.00	-33.18
16661.97	25.37	3.86	9.09	38.32	Ave	V	224	226	54.00	-15.68
17940.92	24.78	4.20	15.84	44.81	Ave	V	186	318	54.00	-9.19

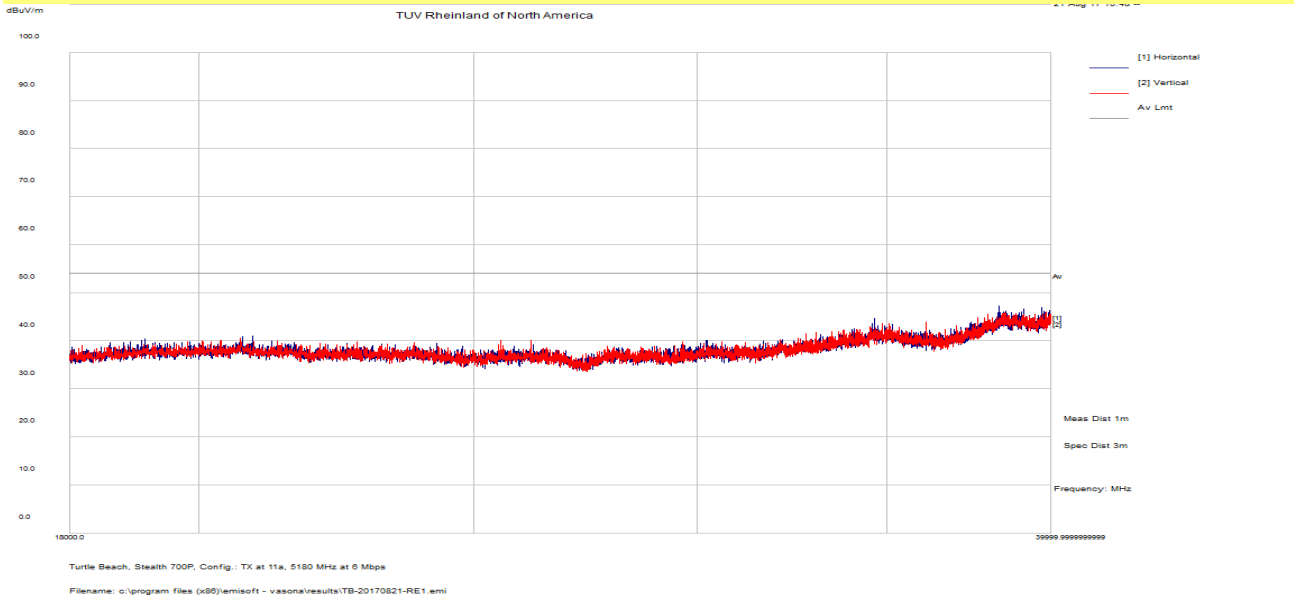
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case emission was observed at 6 Mbps for 802.11a mode.
No significant emission was observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 31763316.001 Page 4 of 6	
EUT Name	Wireless Audio Transmitter	**Date**	August 13, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	21° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / DRH-118, 1m / RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 5180 MHz

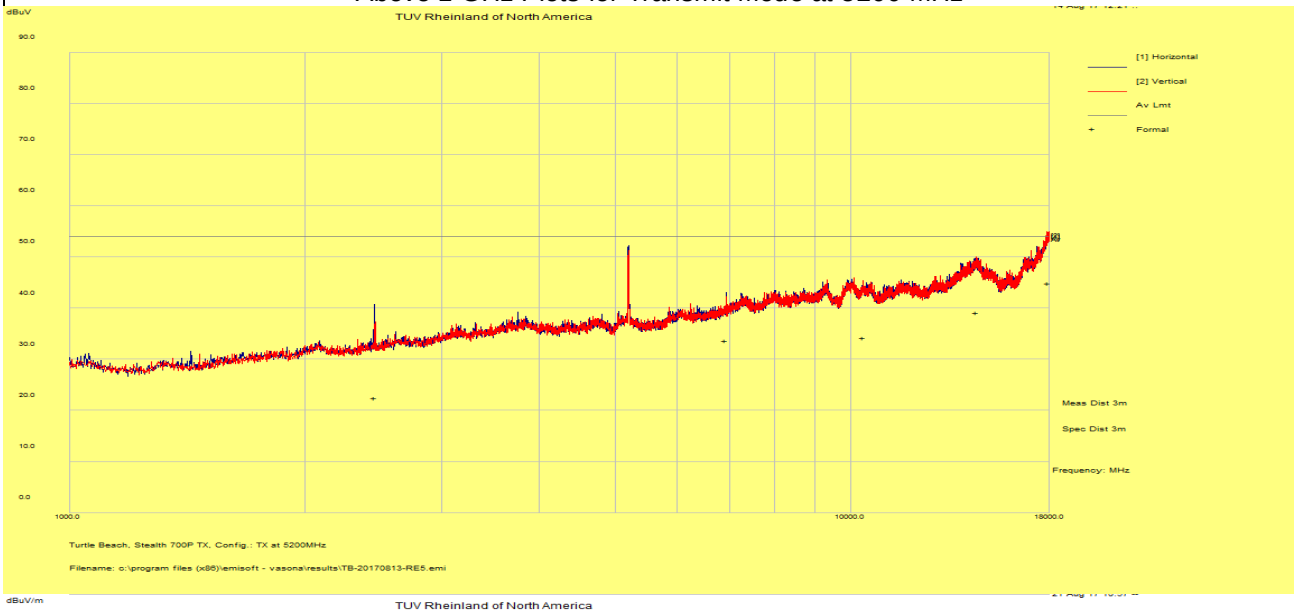


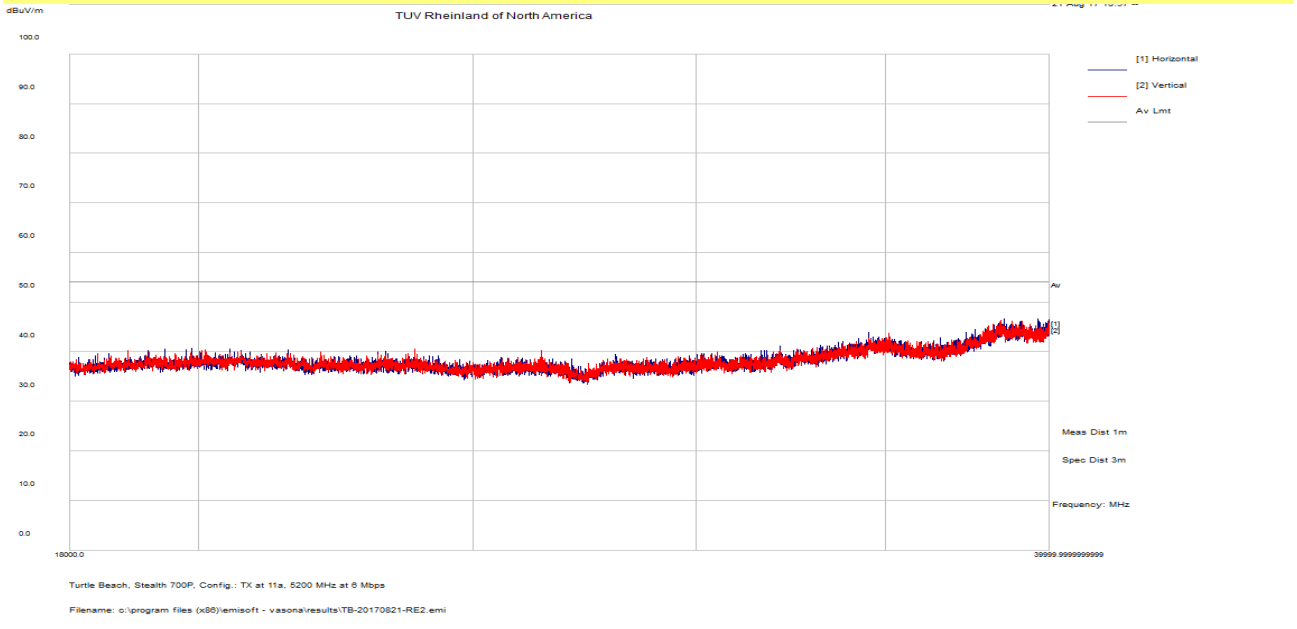


Notes: None.

SOP 1 Radiated Emissions		Tracking # 31763316.001 Page 5 of 6	
EUT Name	Wireless Audio Transmitter	**Date**	August 13, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	21° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / DRH-118, 1m / RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 5200 MHz





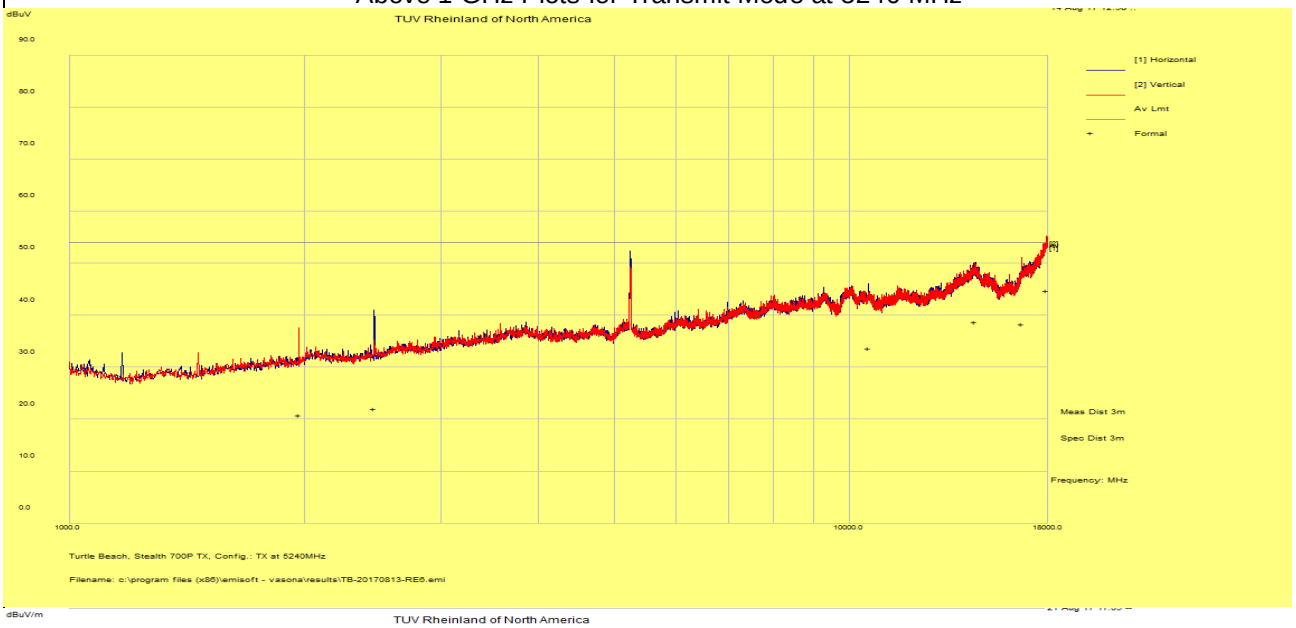
Notes: None.

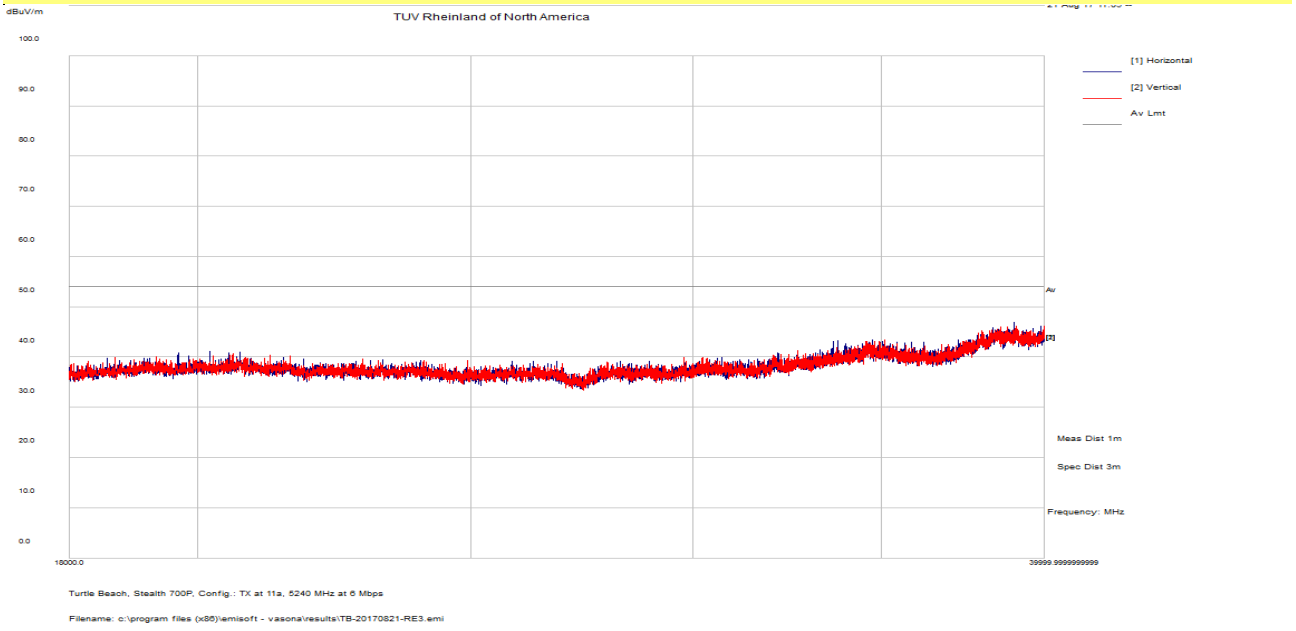
SOP 1 Radiated Emissions

Tracking # 31763316.001 Page 6 of 6

EUT Name	Wireless Audio Transmitter	**Date**	August 13, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	21° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	802.11a mode at 6 Mbps	**Line AC / Freq**	5 Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / DRH-118, 1m / RA42-K-F-4B-C	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 5240 MHz





Notes: None.

4.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. 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: 2017 and RSS GEN: 2014.

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 performed in Lab 5. 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

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

Table 7: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only	Date: August 17, 2017
Antenna Type: Integrated PCB	**Power Level:** Level 0
AC Power: 110 Vac/60 Hz at host device	**Configuration:** Tabletop
Ambient Temperature: 23° C	**Relative Humidity:** 38% RH

Configuration	Frequency Range	Test Result
Line 1 (Hot)	0.15 to 30 MHz	Pass
Line 2 (Neutral)	0.15 to 30 MHz	Pass

SOP 2 Conducted Emissions

Tracking # 31763316.001 Page 1 of 4

EUT Name	Wireless Audio Transmitter	**Date**	August 17, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	22° C / 38% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode: 802.11a mode at 6 Mbps, 5180 MHz	**Line AC / Freq**	110Vac / 60Hz (host)
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	**Performed by**	Jeremy Luong

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV			dBuV	dB	
0.199	36.04	9.83	0.04	45.90	QP	Live	63.67	-17.76	Pass
0.199	22.36	9.83	0.04	32.22	Ave	Live	53.67	-21.44	Pass
0.217	34.92	9.83	0.04	44.79	QP	Live	62.92	-18.13	Pass
0.217	21.74	9.83	0.04	31.61	Ave	Live	52.92	-21.31	Pass
0.270	42.28	9.83	0.04	52.15	QP	Live	61.13	-8.98	Pass
0.270	34.83	9.83	0.04	44.70	Ave	Live	51.13	-6.43	Pass
0.296	40.86	9.83	0.03	50.73	QP	Live	60.36	-9.63	Pass
0.296	31.36	9.83	0.03	41.22	Ave	Live	50.36	-9.13	Pass
0.412	39.25	9.84	0.03	49.12	QP	Live	57.61	-8.50	Pass
0.412	32.60	9.84	0.03	42.47	Ave	Live	47.61	-5.14	Pass
0.438	33.96	9.84	0.03	43.83	QP	Live	57.10	-13.27	Pass
0.438	22.07	9.84	0.03	31.94	Ave	Live	47.10	-15.16	Pass
0.516	39.55	9.84	0.03	49.42	QP	Live	56.00	-6.58	Pass
0.516	32.75	9.84	0.03	42.62	Ave	Live	46.00	-3.38	Pass
0.568	34.88	9.85	0.03	44.76	QP	Live	56.00	-11.24	Pass
0.568	30.55	9.85	0.03	40.43	Ave	Live	46.00	-5.57	Pass
0.599	32.05	9.85	0.03	41.93	QP	Live	56.00	-14.07	Pass
0.599	19.22	9.85	0.03	29.10	Ave	Live	46.00	-16.90	Pass
7.755	32.93	9.96	0.03	42.92	QP	Live	60.00	-17.08	Pass
7.755	22.30	9.96	0.03	32.29	Ave	Live	50.00	-17.71	Pass

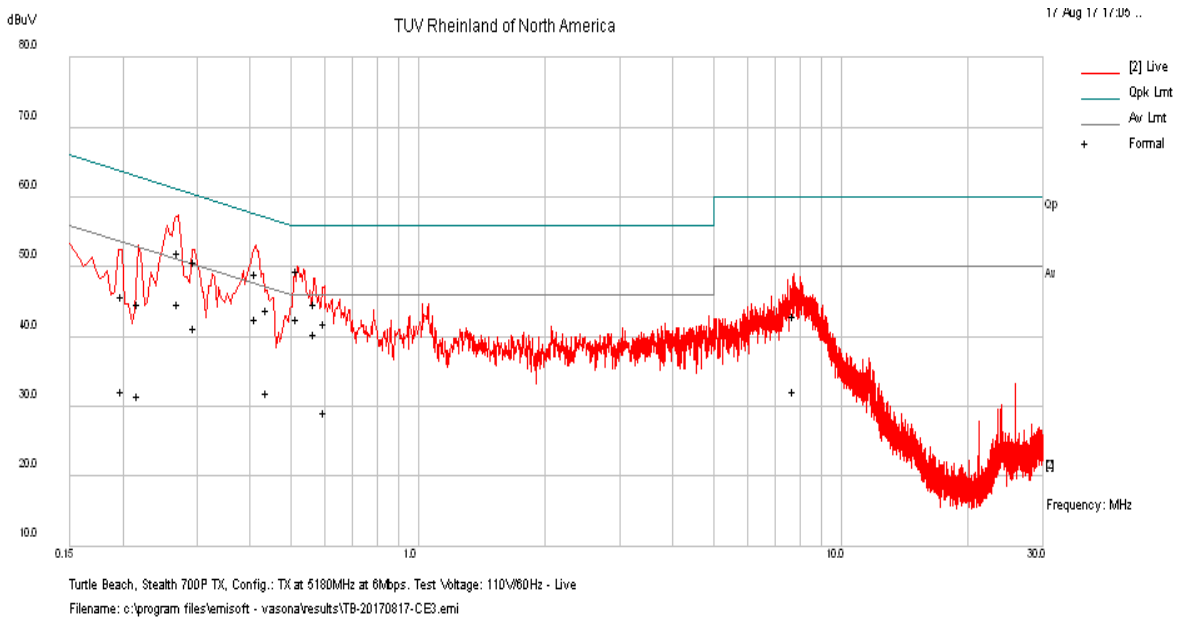
Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at 5180 MHz in 802.11a mode at 6 Mbps (worse case condition).

SOP 2 Conducted Emissions		Tracking # 31763316.001 Page 2 of 4	
EUT Name	Wireless Audio Transmitter	**Date**	August 17, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	22° C / 38% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode: 802.11a mode at 6 Mbps, 5180 MHz	**Line AC**	110Vac / 60Hz (host)
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	**Performed by**	Jeremy Luong

150 kHz to 30 MHz Plot for Line 1 (Live)



Note: Met FCC Class B limit.

SOP 2 Conducted Emissions

Tracking # 31763316.001 Page 3 of 4

EUT Name	Wireless Audio Transmitter	**Date**	August 17, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	22° C / 38% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode: 802.11a mode at 6 Mbps, 5180 MHz	**Line AC / Freq**	110Vac / 60Hz (host)
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	**Performed by**	Jeremy Luong

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV			dBuV	dB	
0.154	36.52	9.82	0.06	46.40	QP	Neutral	65.80	-19.40	Pass
0.154	23.21	9.82	0.06	33.09	Ave	Neutral	55.80	-22.71	Pass
0.262	42.30	9.83	0.04	52.17	QP	Neutral	61.36	-9.19	Pass
0.262	32.12	9.83	0.04	41.99	Ave	Neutral	51.36	-9.38	Pass
0.296	38.24	9.83	0.03	48.10	QP	Neutral	60.36	-12.26	Pass
0.296	30.18	9.83	0.03	40.04	Ave	Neutral	50.36	-10.32	Pass
0.412	35.11	9.84	0.03	44.98	QP	Neutral	57.61	-12.63	Pass
0.412	21.74	9.84	0.03	31.61	Ave	Neutral	47.61	-16.01	Pass
0.498	28.27	9.84	0.03	38.14	QP	Neutral	56.04	-17.90	Pass
0.498	15.13	9.84	0.03	25.00	Ave	Neutral	46.04	-21.03	Pass
0.528	32.76	9.84	0.03	42.63	QP	Neutral	56.00	-13.37	Pass
0.528	20.61	9.84	0.03	30.48	Ave	Neutral	46.00	-15.52	Pass
0.561	33.49	9.85	0.03	43.36	QP	Neutral	56.00	-12.64	Pass
0.561	21.39	9.85	0.03	31.26	Ave	Neutral	46.00	-14.74	Pass
0.610	28.60	9.85	0.03	38.49	QP	Neutral	56.00	-17.51	Pass
0.610	16.73	9.85	0.03	26.61	Ave	Neutral	46.00	-19.39	Pass
0.632	29.46	9.85	0.03	39.34	QP	Neutral	56.00	-16.66	Pass
0.632	15.44	9.85	0.03	25.32	Ave	Neutral	46.00	-20.68	Pass
7.740	29.52	9.96	0.03	39.51	QP	Neutral	60.00	-20.49	Pass
7.740	14.19	9.96	0.03	24.17	Ave	Neutral	50.00	-25.83	Pass

Spec Margin = QP./Ave. - Limit, ± Uncertainty

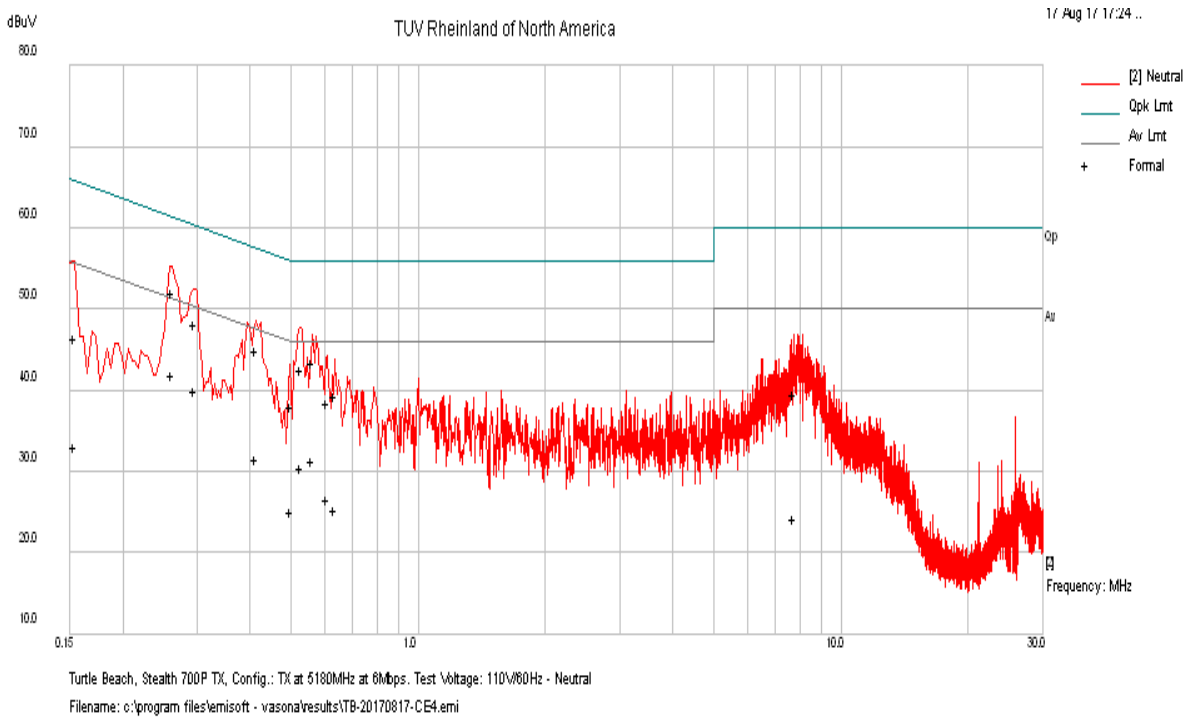
Combined Standard Uncertainty $u_c(y)$ = ± 1.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at 5180 MHz in 802.11a mode at 6 Mbps (worse case condition).

SOP 2 Conducted Emissions — Tracking # 31763316.001 Page 4 of 4

EUT Name	Wireless Audio Transmitter	**Date**	August 17, 2017
EUT Model	Ear Force Stealth 700P TX	**Temp / Hum in**	22° C / 38% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode: 802.11a mode at 6 Mbps, 5180 MHz	**Line AC**	110Vac / 60Hz (host)
Standard	CFR47 Part 15.207 and RSS Gen	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	**Performed by**	Jeremy Luong

150 kHz to 30 MHz Plot for Line 2 (Neutral)



Note: Met FCC Class B Limit.

4.7 Frequency Stability

In accordance with 47 CFR Part 15.407(g) and RSS GEN Sect. 6.11 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 C63.10-2013 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 ±20 ppm stability.

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

Worst case:
5.20 GHz ±20 ppm/104 kHz

±20 ppm at 5.20 GHz translates to a maximum frequency shift of ±104 kHz. As the edge of the channels are at least one MHz from either of the band edges, ±104 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 15.407(g) and RSS GEN Sect. 6.11 - 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 12.98 ppm.

Table 8: Frequency Stability – Test Results

Temperature	Time	PPM
0° C	Start	12.98
	2 Min.	12.26
	5 Min	9.19
	10 min	6.85
10° C	Start	11.54
	2 Min.	7.93
	5 Min	2.88
	10 min	0.00
20° C	Start	5.77
	2 Min.	3.61
	5 Min	9.01
	10 min	2.88
30° C	Start	1.80
	2 Min.	1.80
	5 Min	10.82
	10 min	6.49
40° C	Start	9.74
	2 Min.	6.85
	5 Min	1.44
	10 min	3.61
50° C	Start	3.61
	2 Min.	2.16
	5 Min	8.29
	10 min	9.74
Note: All frequency drifts were less than ±20 ppm. The worst frequency drift was 12.98 ppm		

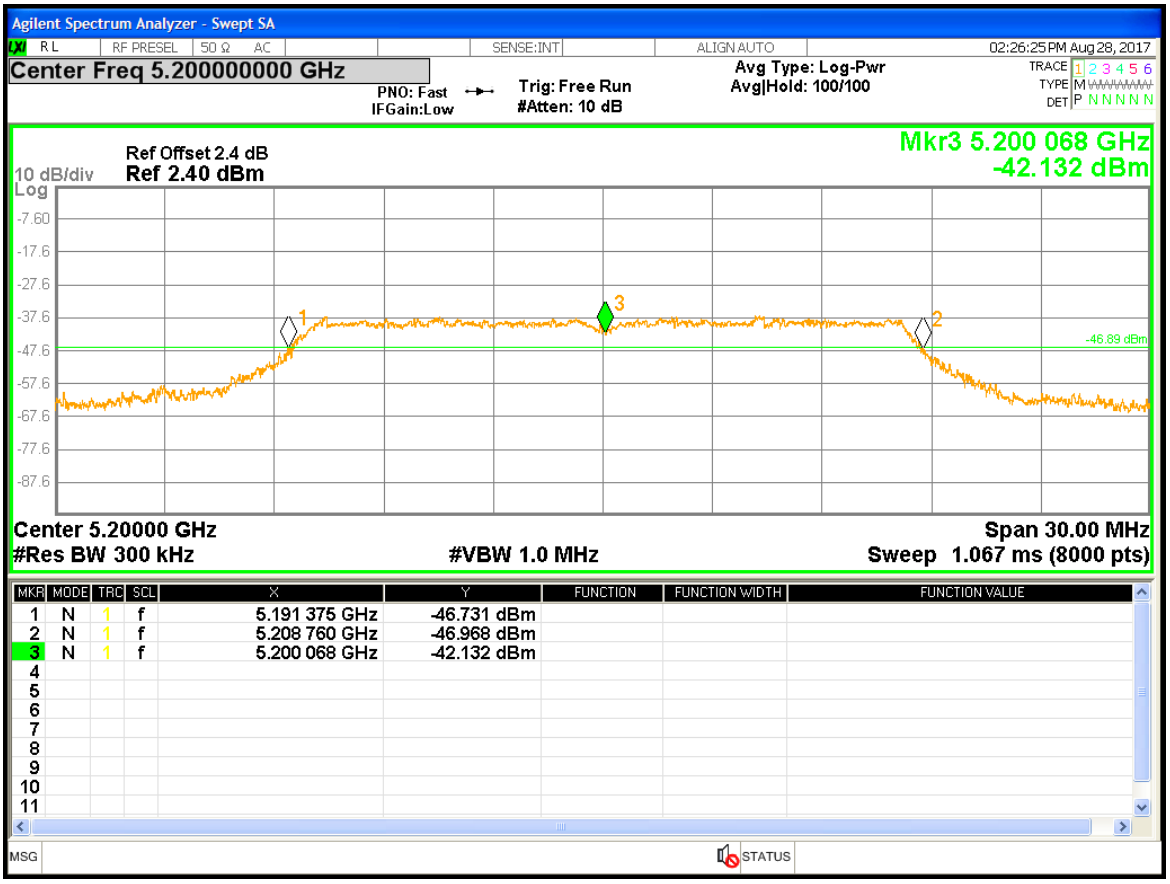


Figure 34: Frequency Stability – Worst Case

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 supply voltage was varied between 85% and 115% of the nominal rated supply voltage. The fundamental frequency was observed during the variation. The EUT was powered 3.7 Vdc by programmable power supply. The voltage was varied from 3.3 Vdc to 4.07 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 ±20 ppm.

Table 9: Voltage Variation – Test Results

Frequency	**Nominal (5.0 Vdc)**	**Lo Voltage (4.25Vdc)**	**Hi Voltage (5.75Vdc)**	**Max Drift**
MHz	MHz	MHz	MHz	ppm
5200	15.50	13.07	11.53	15.50
Note: EUT has operating voltage of 4.25 Vdc to 5.75 Vdc.				

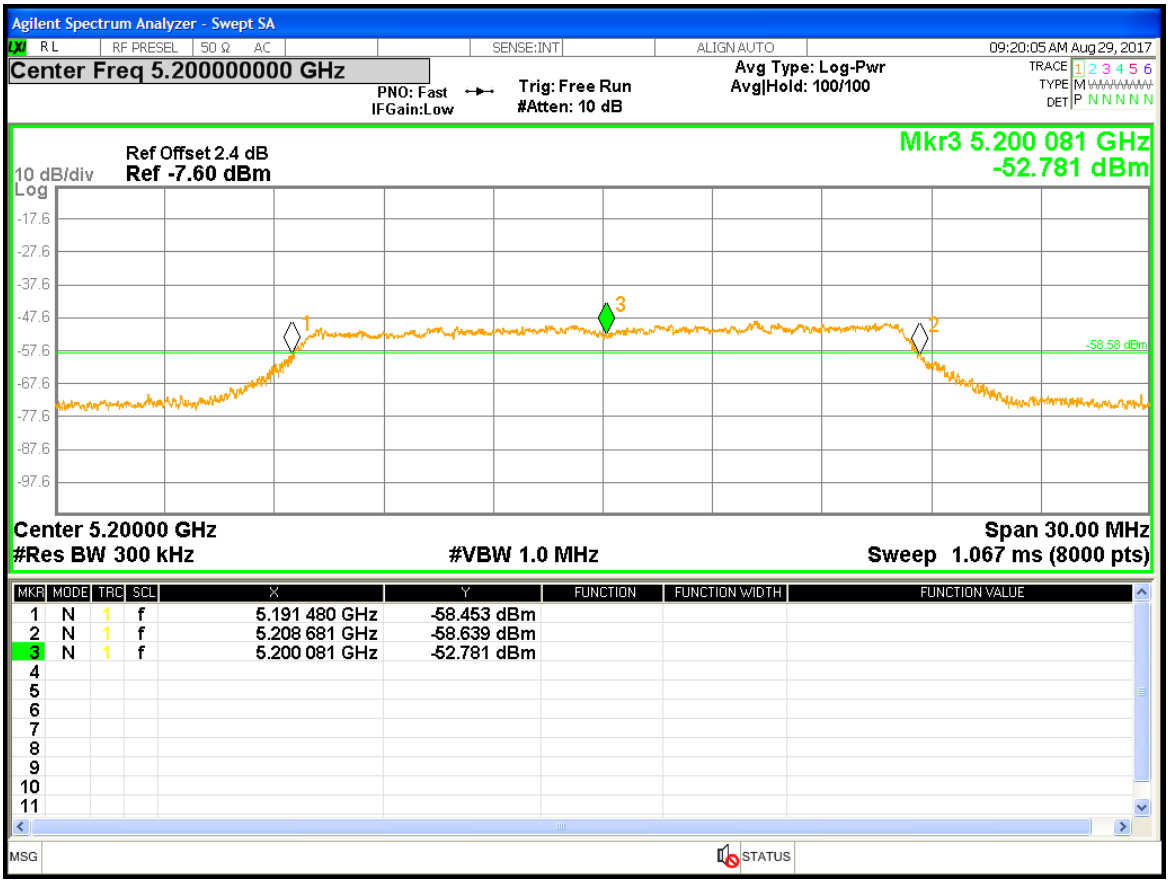


Figure 35: Voltage Variation – Worst Case Condition

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A102606	06/15/2016	06/15/2018
Horn Antenna	Sunol Sciences	3115	9710-5301	10/08/2015	10/08/2017
Antenna (18-40 GHz)	Com-Power	AHA-840	105005	05/26/2017	05/26/2019
Loop Antenna	ETS-Lindgren	6502	62531	06/08/2017	06/08/2018
Spectrum Analyzer	Rohde & Schwarz	FSL6	100169	01/13/2017	01/13/2018
Spectrum Analyzer	Agilent	N9038A	MY552260210	01/16/2017	01/16/2018
Spectrum Analyzer	Agilent	N9030A	US51350291	01/08/2017	01/08/2018
Spectrum Analyzer	Rohde Schwarz	ESIB40	832427/002	01/16/2017	01/16/2018
Spectrum Analyzer	Rohde Schwarz	FSV40	1321.3008K40	09/19/2017	09/19/2018
Amplifier	Sonoma Instruments	310	165516	01/19/2017	01/19/2018
Amplifier	Miteq	TTA1800-30-HG	2020728	11/12/2016	11/12/2017
Amplifier	Rohde & Schwarz	TS-PR26	100011	11/04/2017	11/04/2018
Amplifier	Rohde & Schwarz	TS-PR40	100012	08/02/2017	08/02/2018
Power Meter	Agilent	E4418B	MY45103902	01/11/2017	01/11/2018
Power Sensor	Hewlett Packard	8482A	1925A04647	01/01/2017	01/01/2018
Thermometer	Fluke	52II	88650033	11/04/2016	11/04/2017
Thermo Chamber	Espec	BTZ-133	0613436	NCR	NCR
Multimeter	Fluke	177	92780312	01/11/2017	01/11/2018
DC Power Supply	Agilent	E3634A	MY400004331	01/12/2017	01/12/2018
Notch Filter	Micro-Tronics	BRM50716	003	01/18/2017	01/18/2018
Signal Generator	Anritsu	MG3694A	42803	01/13/2017	01/13/2018
Signal Generator	Rohde & Schwarz	SMF100A	1167.0000K02	09/19/2017	09/19/2018
Signal Generator	Rohde & Schwarz	SMBV100A	1407.6004K02	09/19/2017	09/19/2018
Power Sensors	Rohde & Schwarz	OSP120	1520.9010.02	09/19/2017	09/19/2018

* 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.

6 EMC Test Plan

6.1 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.

6.2 Customer

Table 10: Customer Information

Company Name	Voyetra Turtle Beach, Inc.
Address	100 Summit Lake Drive, Suite 100
City, State, Zip	Valhalla, New York 10595 USA
Country	USA
Phone	(530) 277-3482

Table 11: Technical Contact Information

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

6.3 Equipment Under Test (EUT)

Table 12: EUT Specifications

EUT Specifications	
Dimensions	69.85mm (2.75”) x 25.4mm (1.0”) x 9.5mm (0.375”)
DC Input	5 Vdc (via host USB port)
Environment	Indoor
Operating Temperature Range:	0 to 50 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Product Marketing Name (PMN)	Ear Force Stealth 700P TX
Hardware Version Identification Number (HVIN)	Stealth 700P TX
Firmware Version Identification Number (FVIN)	1.0.6
802.11-radio modules	
Operating Mode	802.11a
Transmitter Frequency Band	5.15 GHz – 5.25 GHz
Max. Rated Power Output	7.05 dBm
Power Setting @ Operating Channel	See Channel Planning Table.
Antenna Type	Integrated PCB
Max. Peak Antenna Gain	+3.5 dBi at 5 GHz
Modulation Type	☐ Thread (Zigbee) ☐ BLE ☒ DSSS ☒ OFDM ☒ Other describe: 16QAM
Data Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
TX/RX Chain (s)	1
Directional Gain Type	☐ Correlated ☐ Beam-Forming ☒ Other describe: No beam-forming or correlated.
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Head wear device.
Note: This report is for operation in the 5150 to 5250 MHz band only.	

Table 13: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna	Integrated PCB	Max. peak gain at 5 GHz	+3.5

Table 14: 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	Laptop	☒ Yes	☒ Metric:3m	☒ M

Table 15: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	Latitude	35521341769	Setup EUT operating channel
Interface Board	Turtle Beach	N.A	N.A	Access 5GHz radio chipset
Note: None.				

Table 16: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.407
Ear Force Stealth 700P TX	PP#2	Radiated Sample	TX Emissions, Rad. Band-edge AC Conducted Emission
	PP#1	Conducted Sample	Output Power, Power Spectral Density, Occupied Bandwidth, Band-Edge Out-of-Band Emission, Frequency Stability, Voltage Variation
Note: None.			

Table 17: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Ear Force Stealth 700P TX	Integrated PCB	Transmit	EUT laid flat	Up right.	On the side
Note: The Y-Axis setup configuration used for final testing.					

Table 18: Final Test Mode for 5150 - 5250 Bands

Test	802.11a
Occupied Bandwidth FCC Part 15.407(a), RSS-247 Sect.6.2.4.1	5180, 5200, 5240 MHz at 6Mbps
Output Power FCC Part 15.407(a), RSS 247 Sect. 6.2	5180, 5200, 5240 MHz at 6Mbps
Peak Power Spectral Density FCC Part 15.407(a), RSS 247 Sect. 6.2	5180, 5200, 5240 MHz at 6Mbps
Band-Edge (Radiated) FCC Part 15.205, 15.209, 15.407(b)	5180, 5240 MHz at 6Mbps
Transmitted Spurious Emission (Below 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, 5200, 5240 MHz at 6Mbps
Conducted Spurious Emission (antenna port). FCC Part 15.407 (b), RSS 247 Sect.6.2.1	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 via host PC USB Port.
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.
Note: 1. Band 5150 MHz – 5250 MHz supports only 802.11a. 2. All radiated emissions were performed on the Y-Axis. 3. All tests were pre-scanned for worst case condition before final testing.	

6.4 Test Specifications

Testing requirements

Table 19: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.407: 2017	All
RSS 247 Issue 2, 2017	All

END OF REPORT