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Emissions
Test Report

EUT Name: Wireless Audio Headset

Model No.: Stealth 700X Gen 2

CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017

Prepared for:

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Prepared by:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	10/01/2020	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 Headset
Model No.	Stealth 700X Gen 2 (TB300-2780-01)
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017
Test Dates:	May 14, 2020 to September 30, 2020

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02

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

Test Engineer Date October 1, 2020

Kerwinn Corpuz

Review Signature Date October 1, 2020

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 15.247: 2020 and RSS 247 Issue 2, 2017 based on the results of testing performed on May 14, 2020 to September 30, 2020 on the Wireless Audio Headset Model Stealth 700X Gen 2 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 2412 MHz to 2462 MHz frequency band for Wi-Fi 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
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.247 (d) RSS-GEN Sect.8.9	Class B	-1.44 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	-10.95 dB (Margin)	**Complied**
Occupied Bandwidth	CFR47 15.247 (a1), RSS GEN Sect.6.7, RSS 247 Sect. 5.2 (a)	≥ 500 kHz	10.081 MHz (DTS) 13.991 MHz (99%)	**Complied**
Maximum Output Power	CFR47 15.247 (b), RSS 247 Sect. 5.4 (d)	30 dBm w/ 6 dBi antenna	+5.26 dBm (802.11b) +5.07 dBm (802.11g) +5.21 dBm (HT 20)	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 247 Sect. 5..2 (b)	8 dBm/ 3 kHz	-26.79 dBm	**Complied**
Out of Band Emission	CFR47 15.247 (d), RSS 247 Sect.5.5	-30 dBr	-5.66 dB (Margin)	**Complied**

Note: This test report covers the 2400 to 2483.5 MHz band.

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 17025:2017 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

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-0326

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). 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 C63.4-2014, 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

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 – 40 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

Measurement Uncertainty - EMC 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
The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.	Per IEC 61000-4-4
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.	Per IEC 61000-4-5
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.	Per IEC 61000-4-11

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 ± 0.70 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 17025:2017. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Stealth 700X Gen 2 is a completely wireless Xbox One audio gaming headset. It wirelessly connects directly to the Xbox One and future Xbox consoles over a 2.4 or 5.0 GHz Wi-Fi link. The headset also contains a Bluetooth radio for communication with other mobile devices. The functionality in the headset consists of 50mm speaker drivers, a flip up non-removable microphone, microphone monitoring and game/chat mix controls on the headset. Additionally, it has a ProSpecs alternative glasses relief ear pad design. With the Microsoft integrated radio module, this headset is also capable of working with compatible Windows PCs in the future.

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.

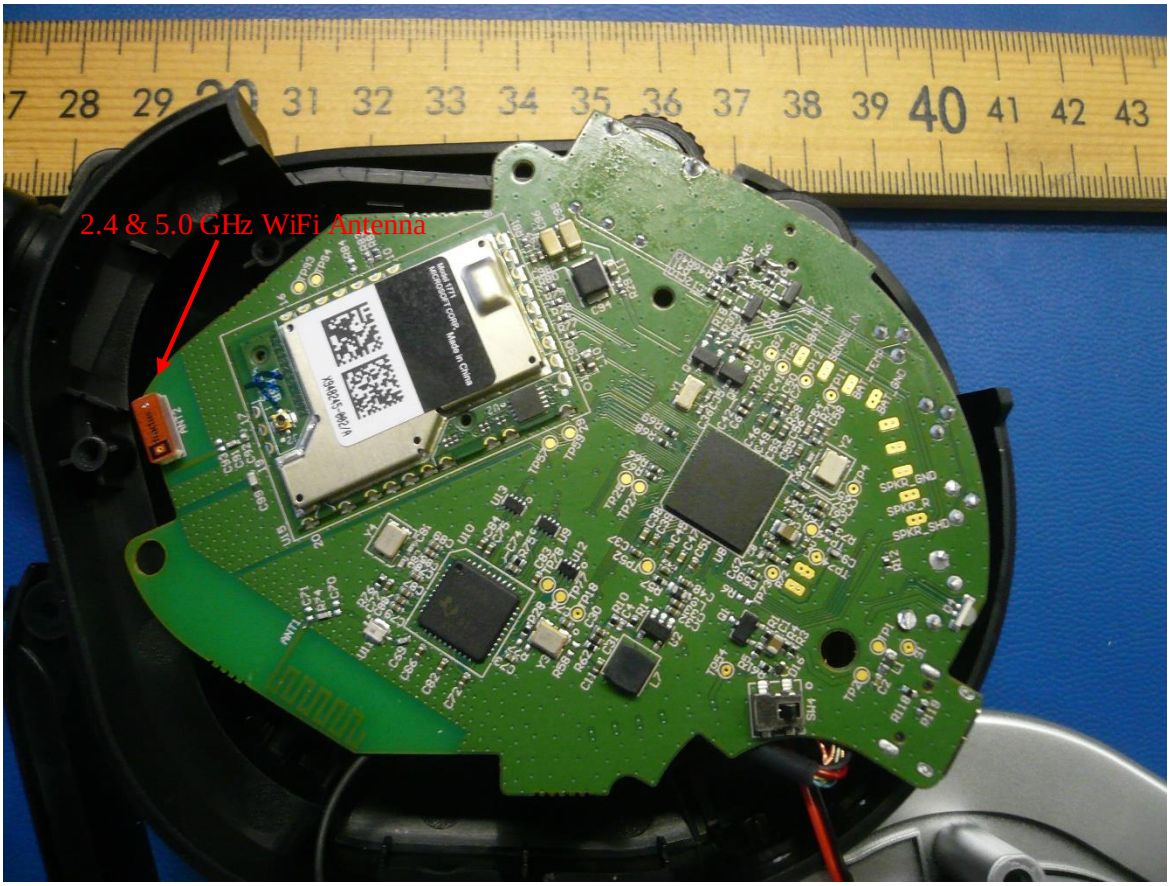
3.4 Unique Antenna Connector

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 Stealth 700X Gen 2 uses a dual band Unictron chip antenna for the 2.4 GHz and 5150 MHz to 5850 MHz bands. The chip antenna is integrated onto the PCB. It has a maximum peak gain of 3.3 dBi in the 2.4 GHz band and 3.7 dBi in the 5150 MHz to 5850 MHz bands.

There is an additional antenna specification available in the submittal package.



3.5 Duty Cycle

The Stealth 700X Gen 2, SN: PP1 was measured for the duty cycle

3.5.1 Results

Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	100	0	100	0
802.11g	100	0	100	0
802.11n HT20	100	0	100	0
Notes: EUT configured and measured for the specified duty cycle. All measurements use 100% duty cycle.				

Figure 1: Duty Cycle for 802.11b

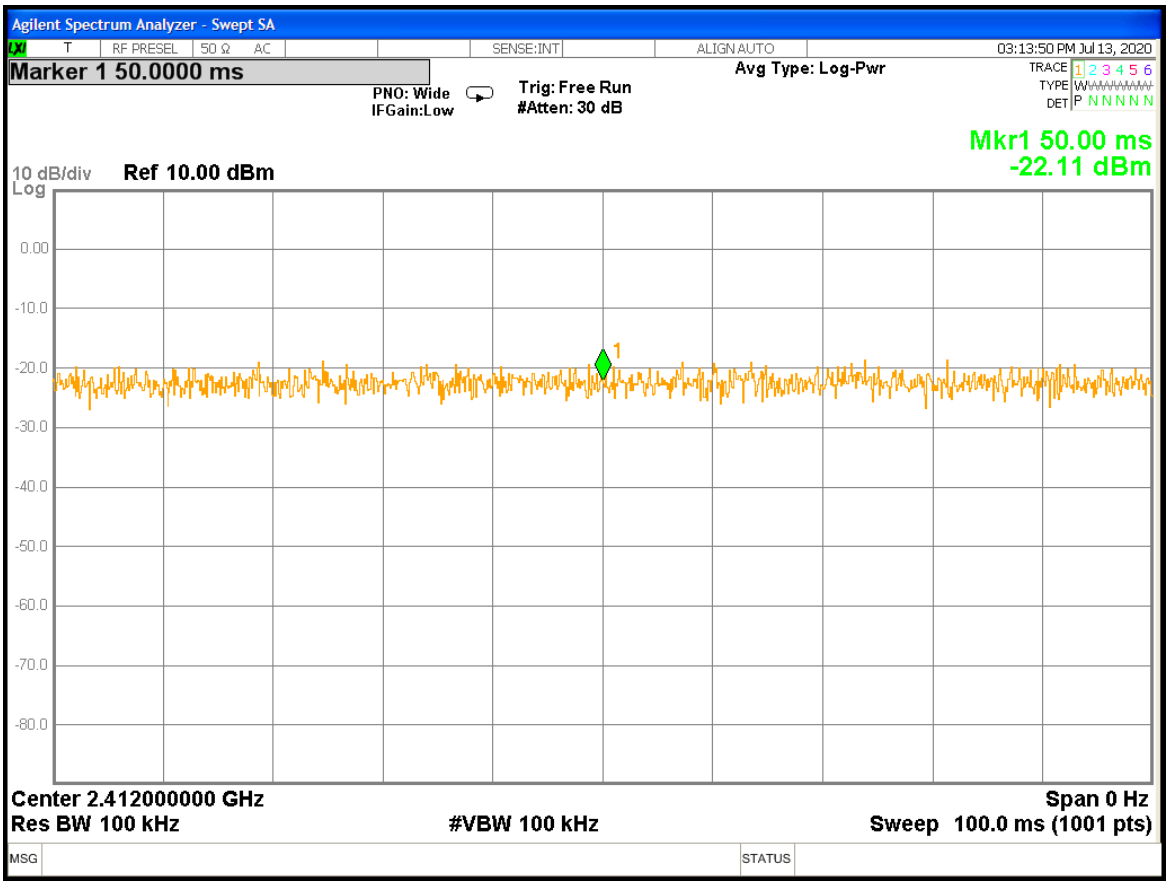


Figure 2: Duty Cycle for 802.11g

Figure 3: Duty Cycle for 802.11n HT20

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 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.

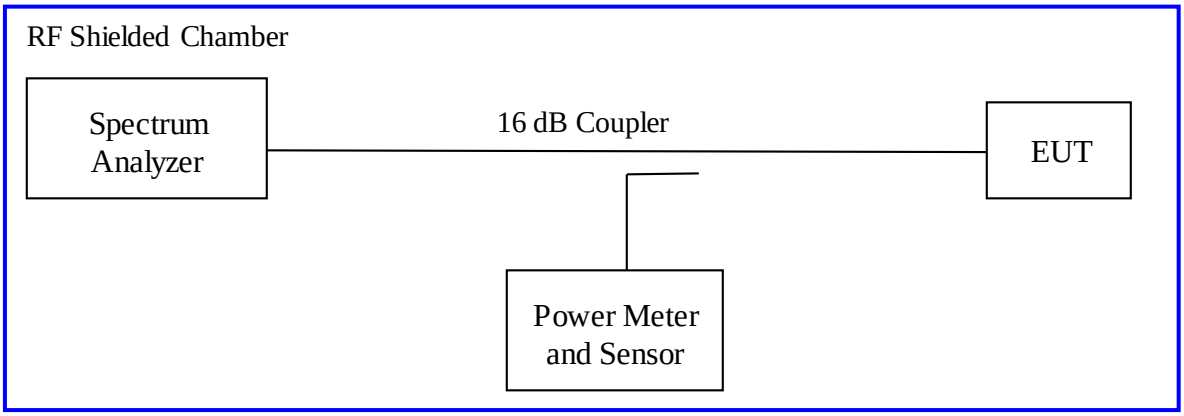
The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (b):2020 and RSS 247: 2017 Sect. 5.4 (d).

The maximum transmitted power in the band 2400-2483.5 MHz: 1 W

4.1.1 Test Method

The ANSI C63.10-2013 Section 11.9.2.2.2 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 15.247(b): 2020 and RSS 247 Sect. 5.4 (d). This test was conducted on 3 channels of Sample, S/N PP #1. The worst mode result indicated below.

Test Setup:



Method AVGSA-1 of "KDB 558074 – DTS Measurement Guidance v05r02" applies since the EUT continuously transmits with duty cycle 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:** July 14, 2020		
Antenna Type: Chip			**Power Setting:** See test plan.		
Antenna Gain: +3.3 dBi			**Signal State:** Modulated at 100%		
Ambient Temp.: 23 °C			**Relative Humidity:** 38%		
802.11b					
Frequency (MHz)	**Limit [dBm]**	**Output [dBm]**	**Duty Cycle [dB]**	**∑ Power [dBm]**	**Margin [dB]**
2412	+30.00	4.99			-25.01
2437	+30.00	5.26			-24.74
2462	+30.00	4.87			-25.13
Note: The headset transmitted at 100% duty cycle.					
802.11g					
Frequency (MHz)	**Limit [dBm]**	**Output [dBm]**	**Duty Cycle [dB]**	**∑ Power [dBm]**	**Margin [dB]**
2412	+30.00	4.82			-25.18
2437	+30.00	5.07			-24.93
2462	+30.00	4.75			-25.25
Note: The headset transmitted at 100% duty cycle.					
802.11n HT20					
Frequency (MHz)	**Limit [dBm]**	**Output [dBm]**	**Duty Cycle [dB]**	**∑ Power [dBm]**	**Margin [dB]**
2412	+30.00	4.83			-25.17
2437	+30.00	5.09			-24.91
2462	+30.00	5.21			-24.79
Note: The headset transmitted at 100% duty cycle.					

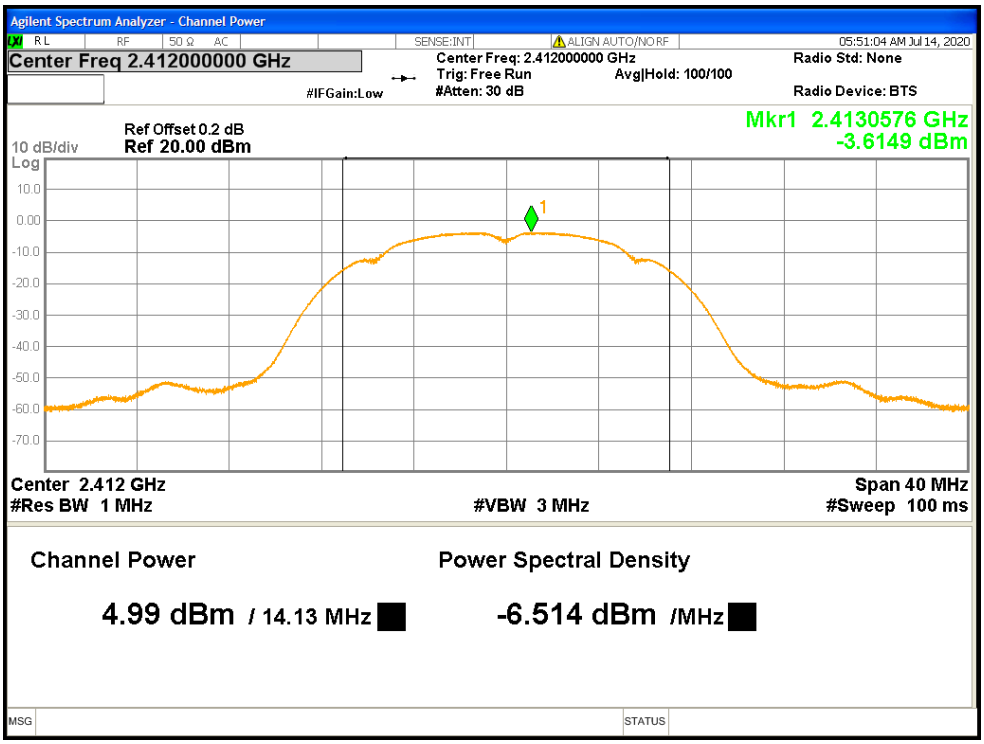


Figure 4: Maximum Transmitted Power, 2412 MHz, 802.11b @ 1 Mbps

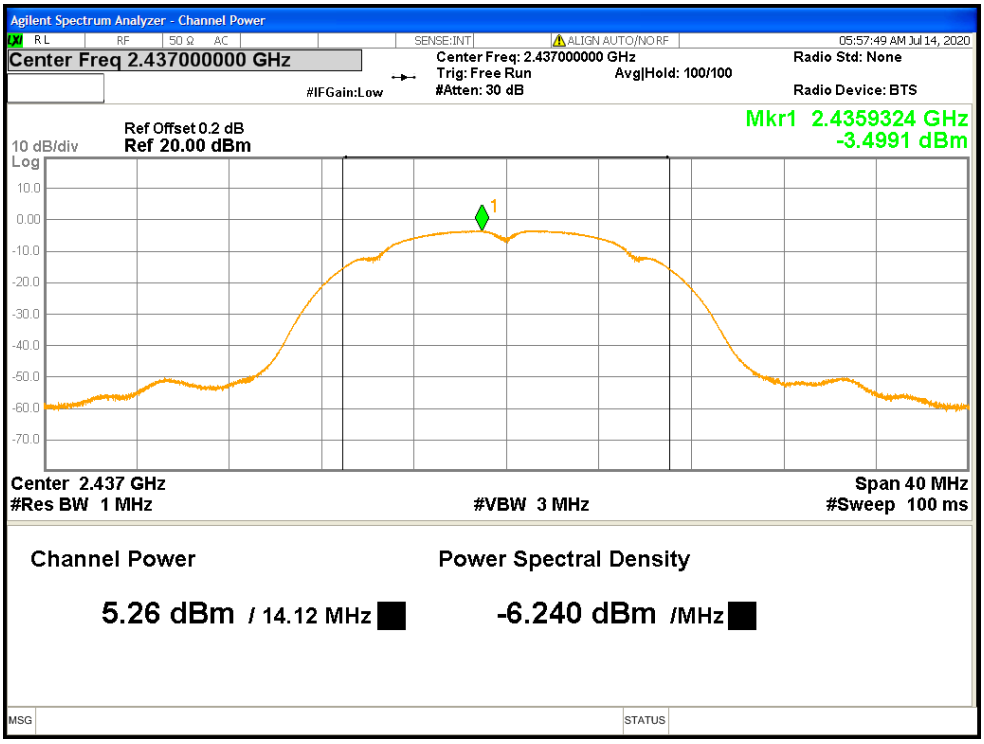


Figure 5: Maximum Transmitted Power, 2437 MHz, 802.11b @ 1 Mbps

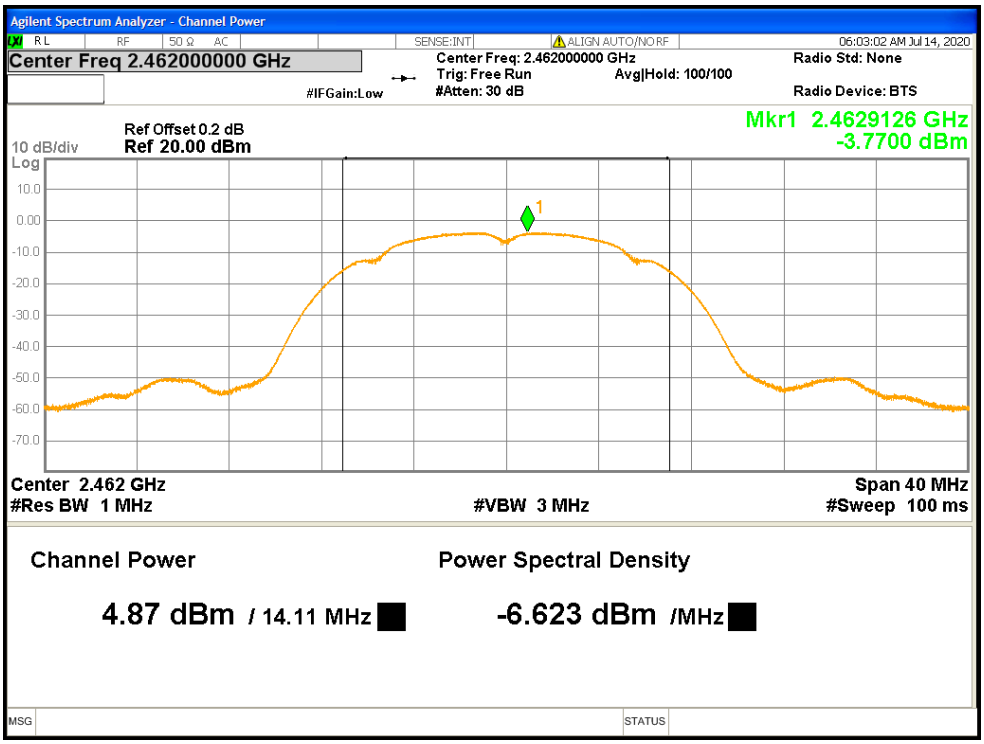


Figure **6:** Maximum Transmitted Power, 2462 MHz, 802.11b @ 1 Mbps

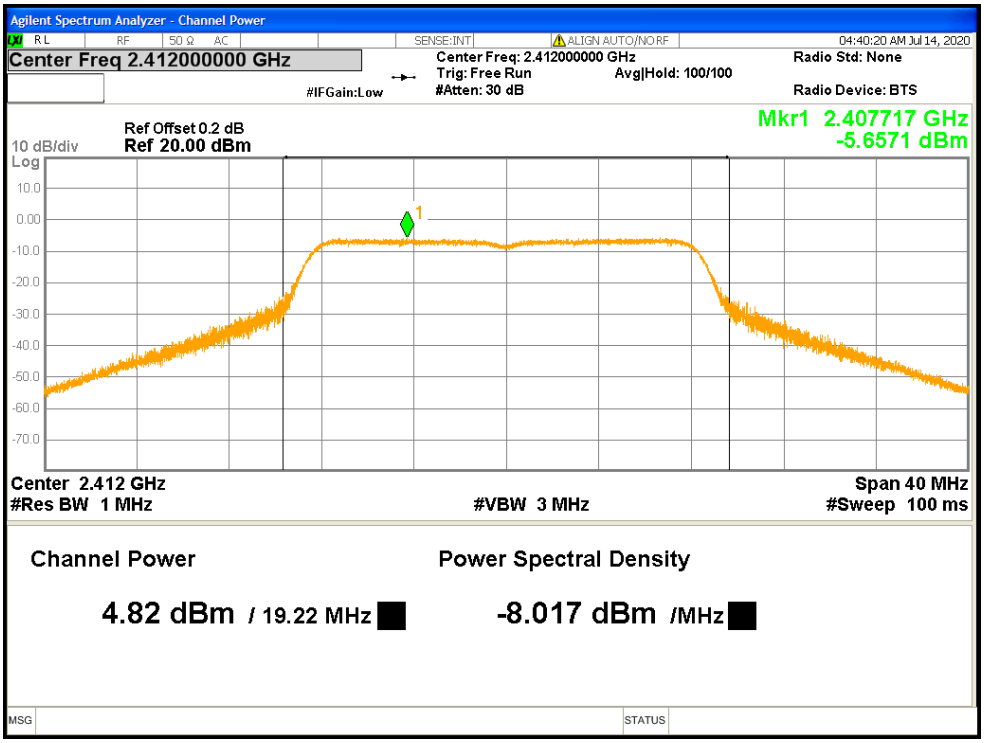


Figure 7: Maximum Transmitted Power, 2412 MHz, 802.11g @ 6 Mbps

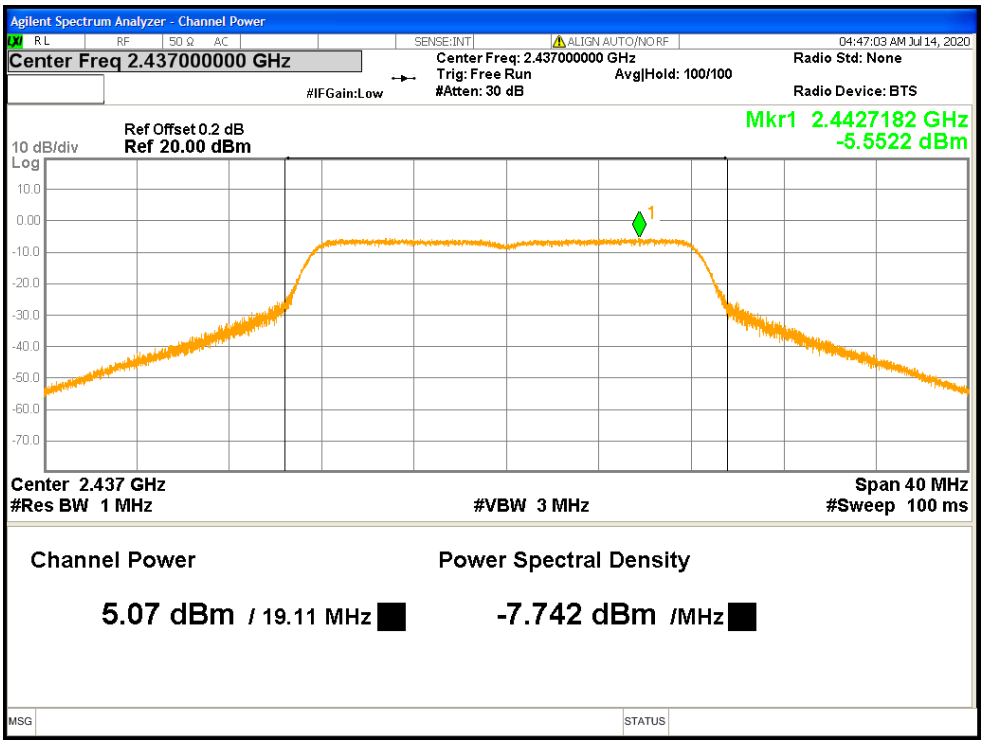


Figure 8: Maximum Transmitted Power, 2437 MHz, 802.11g @ 6 Mbps

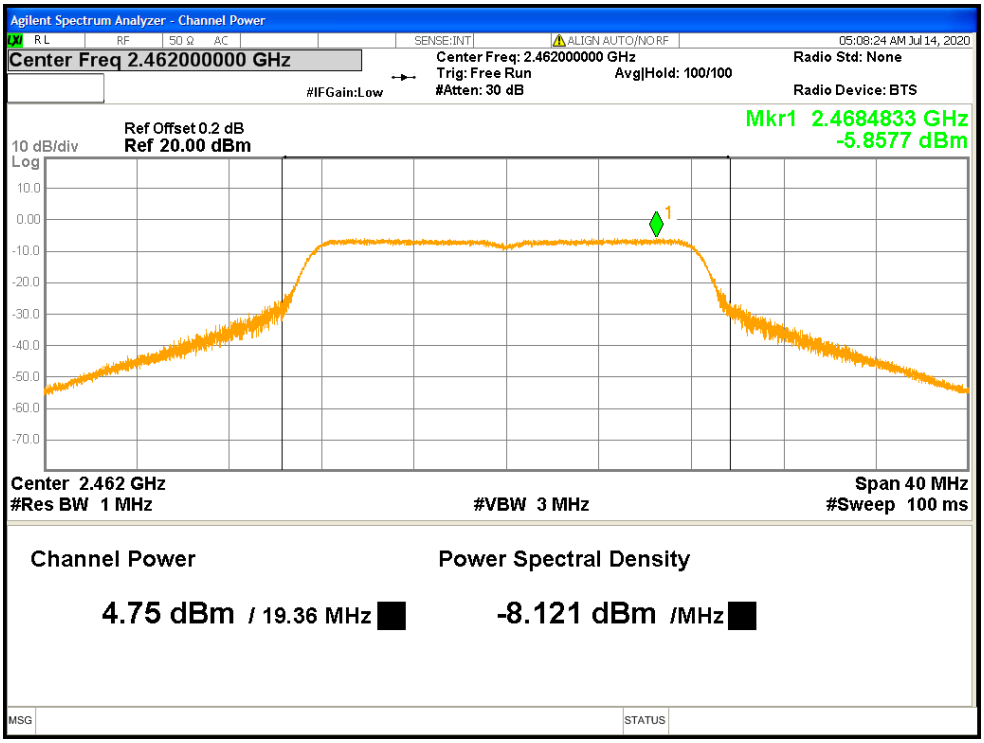


Figure 9: Maximum Transmitted Power, 2462 MHz, 802.11g @ 6 Mbps

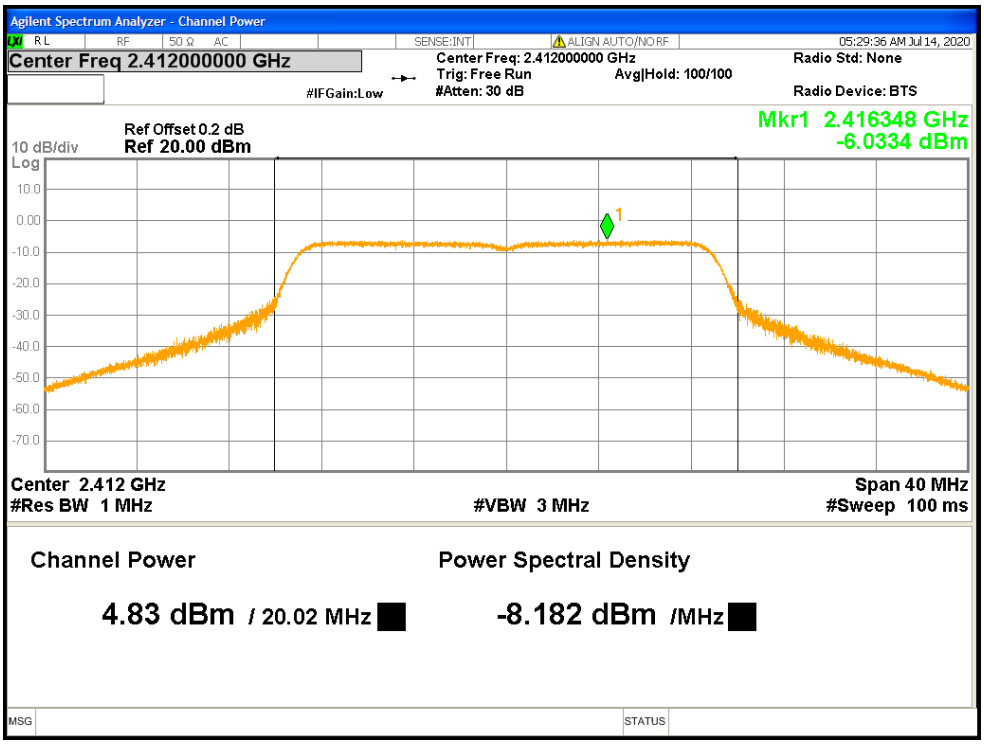


Figure 10: Maximum Transmitted Power, 2412 MHz, 802.11n HT20 @ 6.5 Mbps

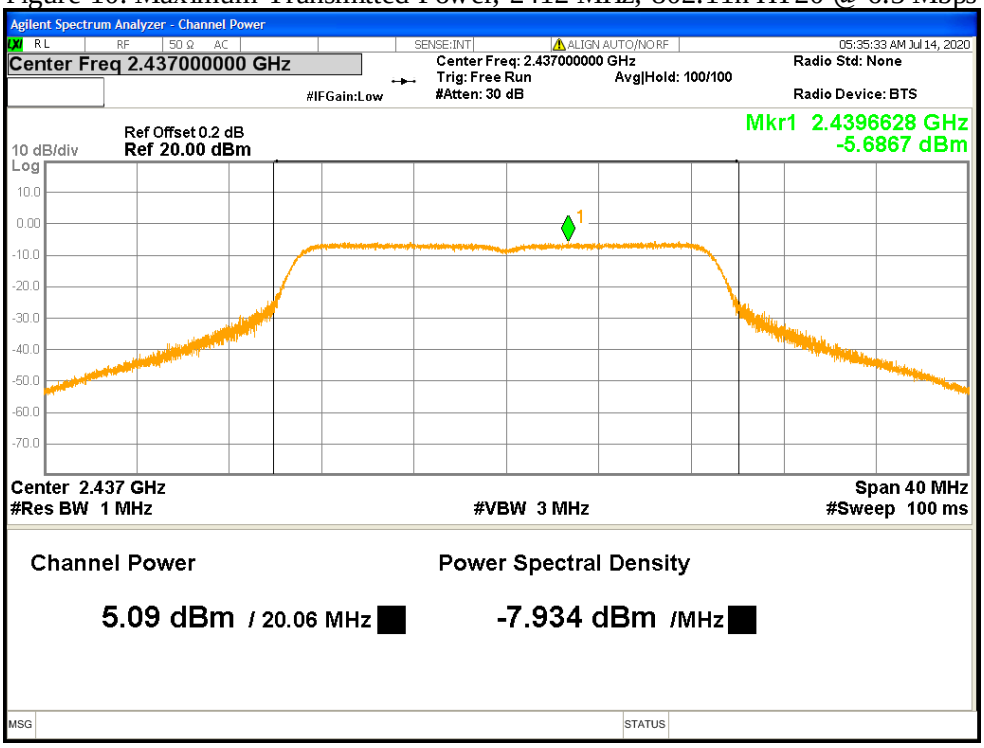


Figure 11: Maximum Transmitted Power, 2437 MHz, 802.11n HT20 @ 6.5 Mbps

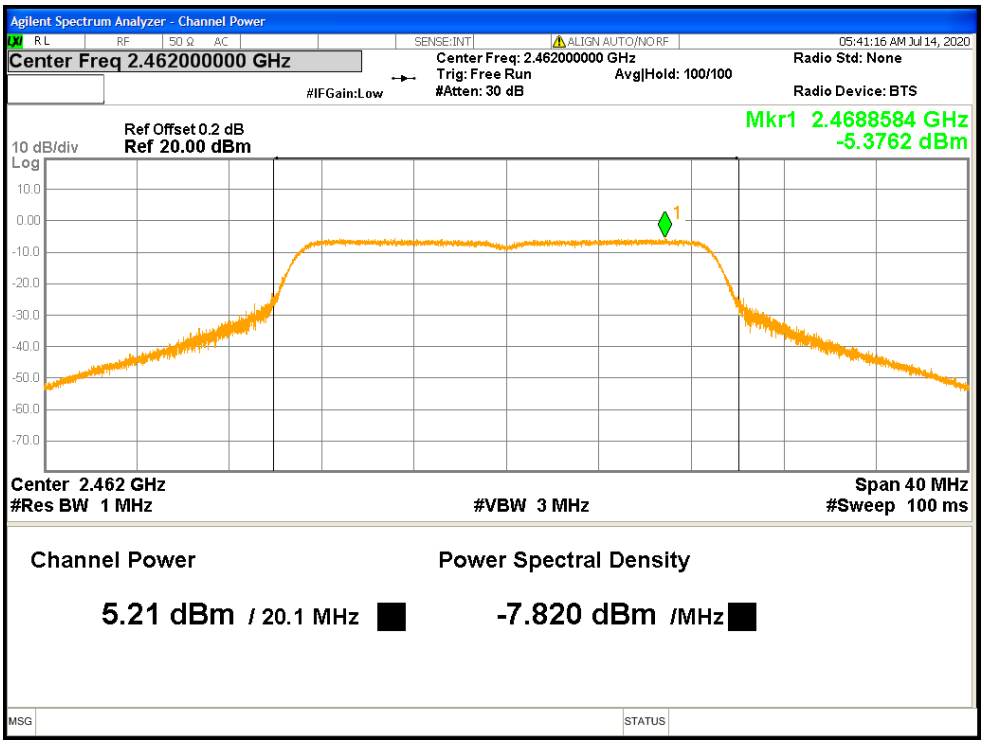


Figure 12: Maximum Transmitted Power, 2462 MHz, 802.11n HT20 @ 6.5 Mbps

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.

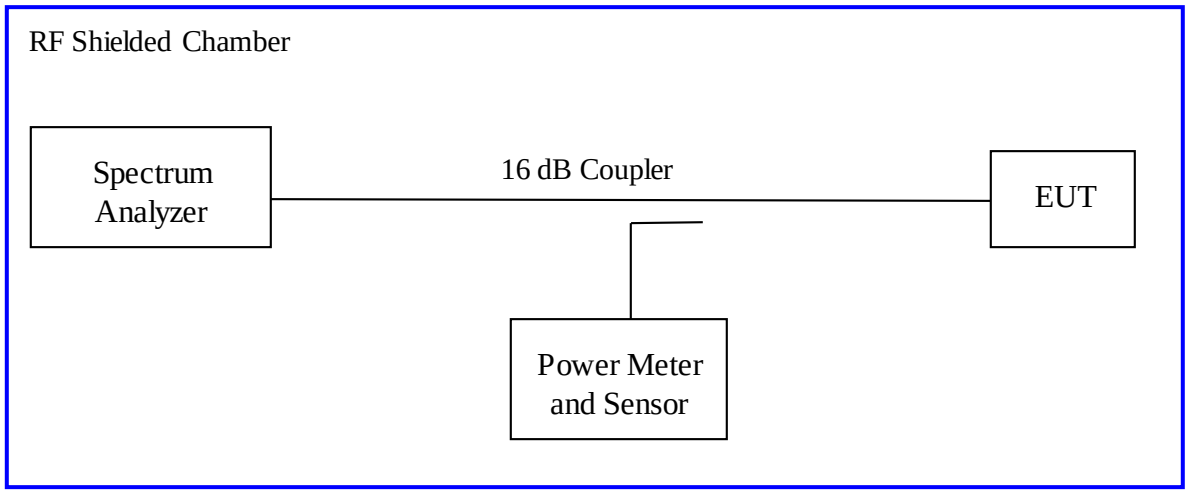
The 6dB bandwidth is defined the bandwidth of 6dBr from highest transmitted level of the fundamental frequency.

The minimum 6 dB bandwidth shall be at least 500 kHz per Section CFR47 15.247(a2) 2020 and RSS-247 Sect. 5.2(a) Issue 2, 2017.

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to ANSI C63.10:2013 Section 11.8.1. The measurement was performed with modulation per CFR47 15.247(a) (2) 2020 and RSS 247 Sect. 5.2 (a) 2019. The preliminary investigation was performed to find the narrowest 6 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range; 2400 MHz to 2483.5 MHz. This test was conducted on 3 channels in each mode of Sample S/N PP #1. The worst sample result indicated below.

Test Setup:



4.2.2 Results

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

Table 3: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement		**Date:** July 14 2020		
Antenna Type: Chip		**Power Setting:** See test plan.		
Antenna Gain: +3.3 dBi		**Signal State:** Modulated at 100%		
Ambient Temp.: 23 °C		**Relative Humidity:** 38%		
Bandwidth (MHz) for 802.11b				
Frequency (MHz)	**Limit (kHz)**	**99% BW**	**6 dB BW**	**Results**
2412	500	13.998	10.081	Pass
2437	500	13.996	10.081	Pass
2462	500	13.991	10.085	Pass
Note: The bandwidth was measured at 1 Mbps for 802.11b mode.				
Bandwidth (MHz) for 802.11g				
Frequency (MHz)	**Limit (kHz)**	**99% BW**	**6 dB BW**	**Results**
2412	500	16.950	16.573	Pass
2437	500	16.946	16.596	Pass
2462	500	16.950	16.555	Pass
Note: The bandwidth was measured at 6 Mbps for 802.11g mode.				
Bandwidth (MHz) for 802.11n HT20				
Frequency (MHz)	**Limit (kHz)**	**99% BW**	**6 dB BW**	**Results**
2412	500	18.063	17.811	Pass
2437	500	18.059	17.826	Pass
2462	500	18.044	17.811	Pass
Note: The bandwidth was observed at MCS0 6.5 Mbps mode.				

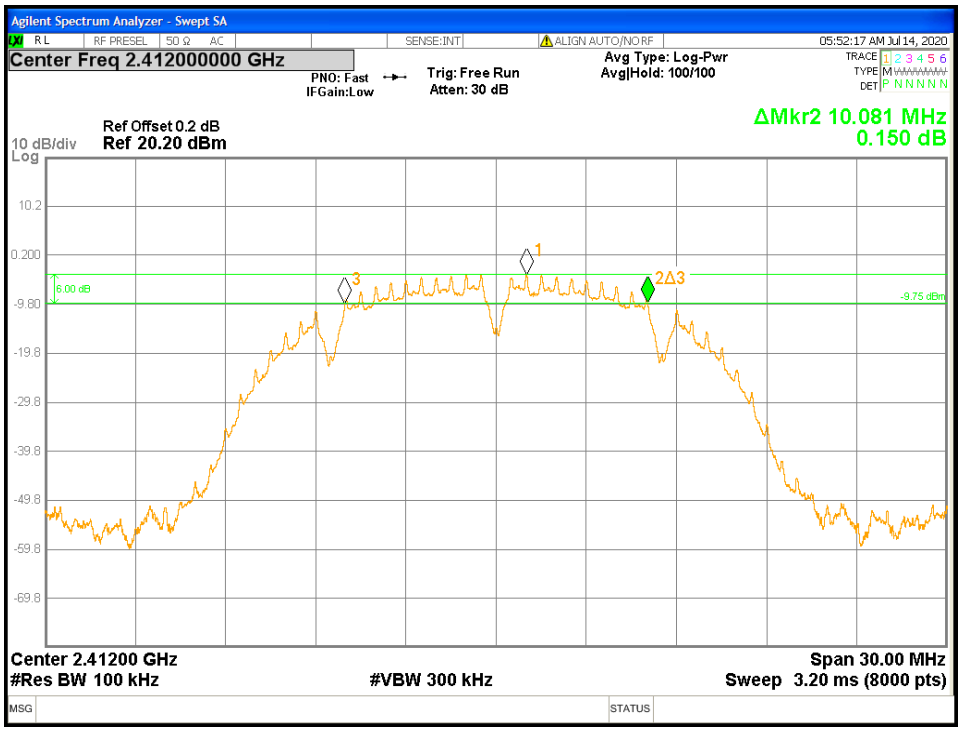


Figure 13: DTS Bandwidth-802.11b-2412 MHz

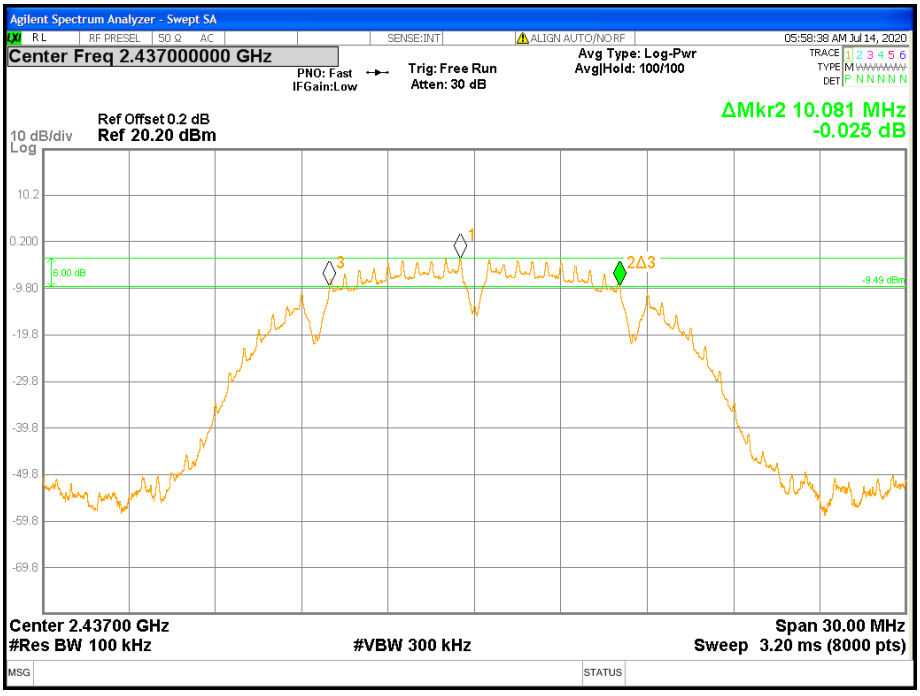


Figure 14: DTS Bandwidth-802.11b-2437 MHz

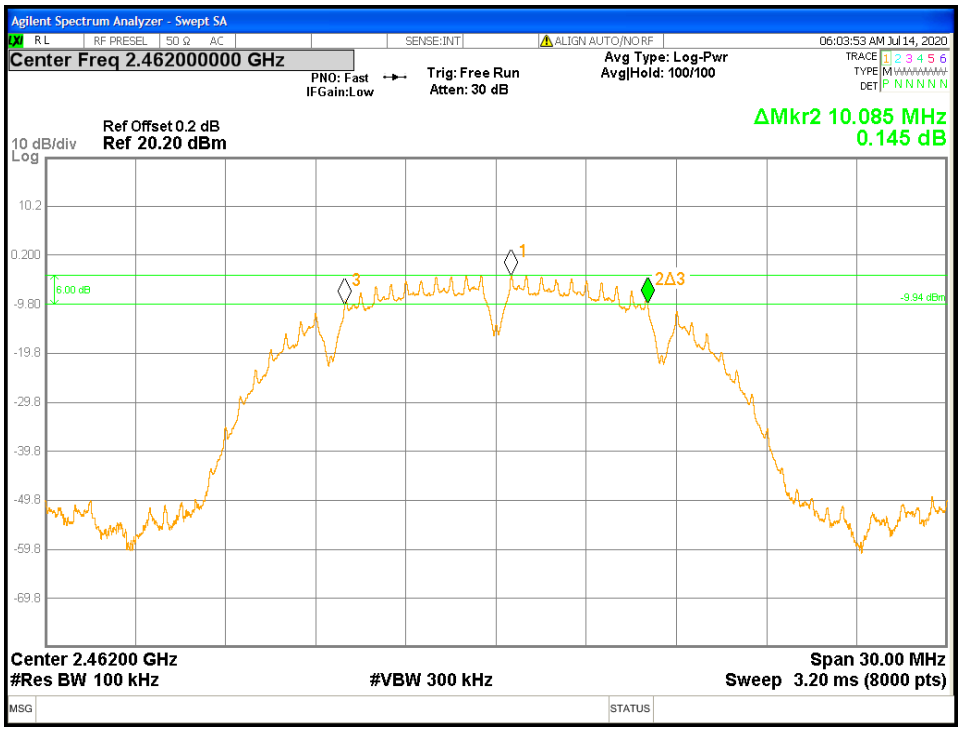


Figure 15: DTS Bandwidth-802.11b-2462 MHz

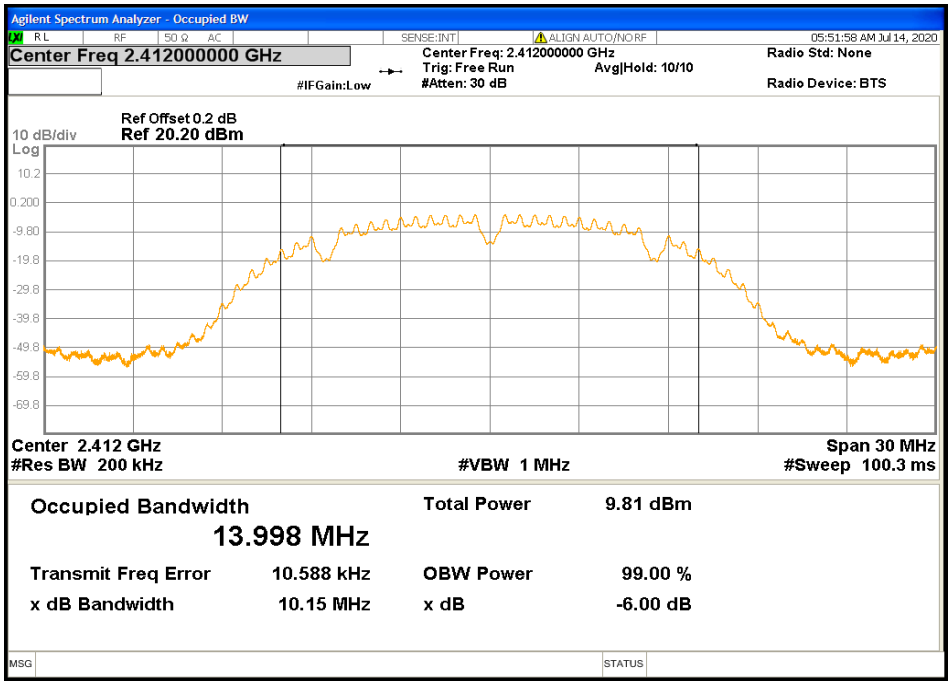


Figure 16: 99% Bandwidth-802.11b-2412 MHz

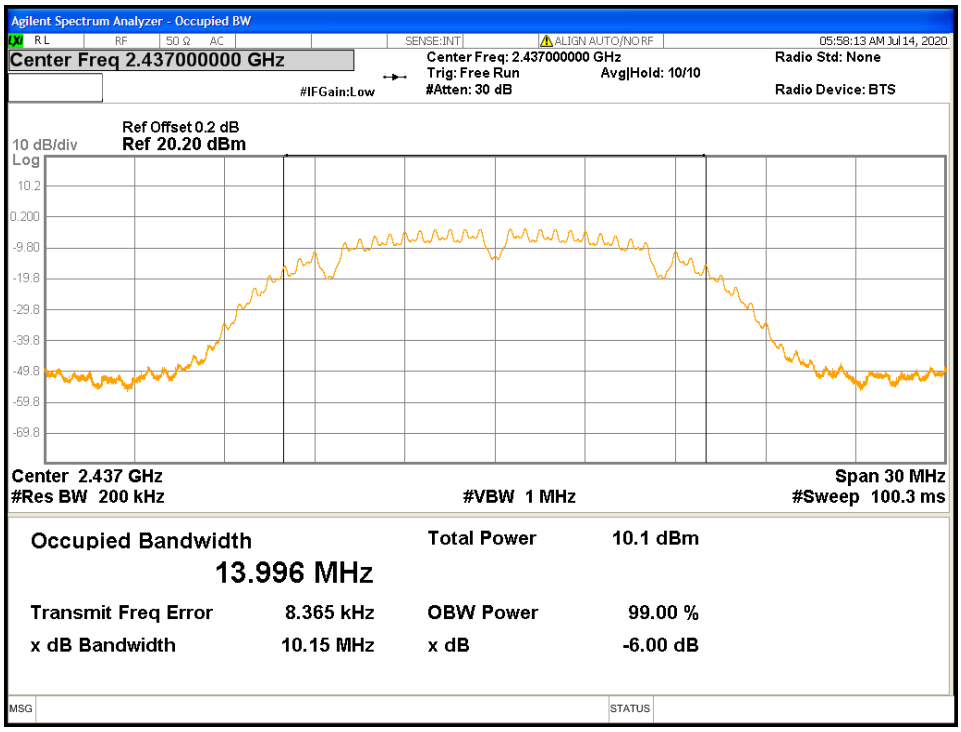


Figure 17: 99% Bandwidth-802.11b-2437 MHz

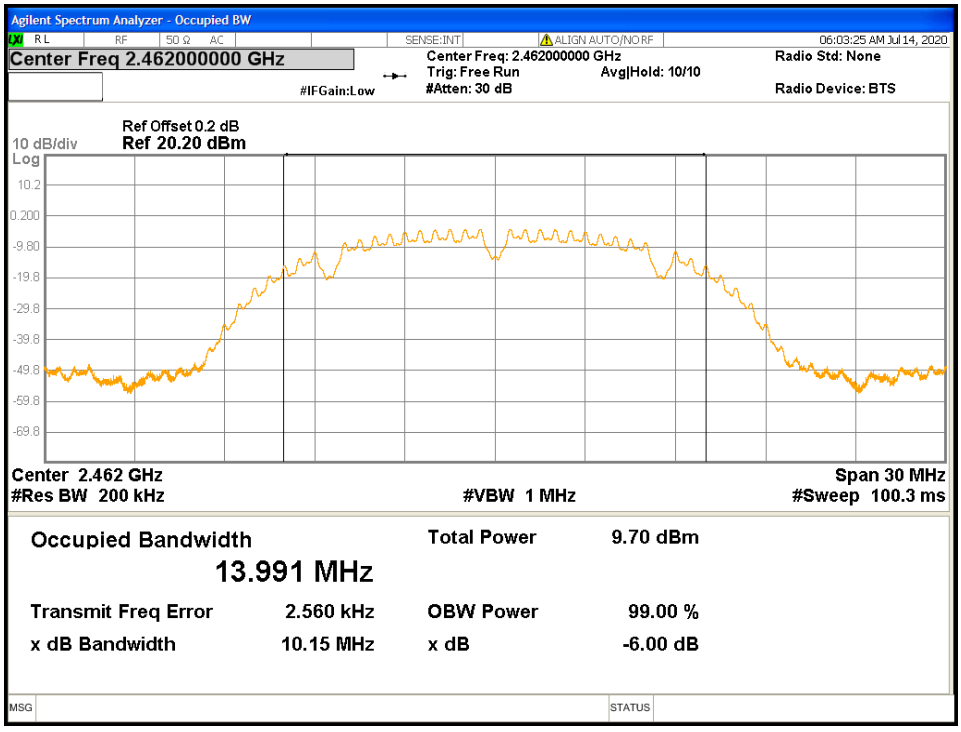


Figure 18: 99% Bandwidth-802.11b-2462 MHz

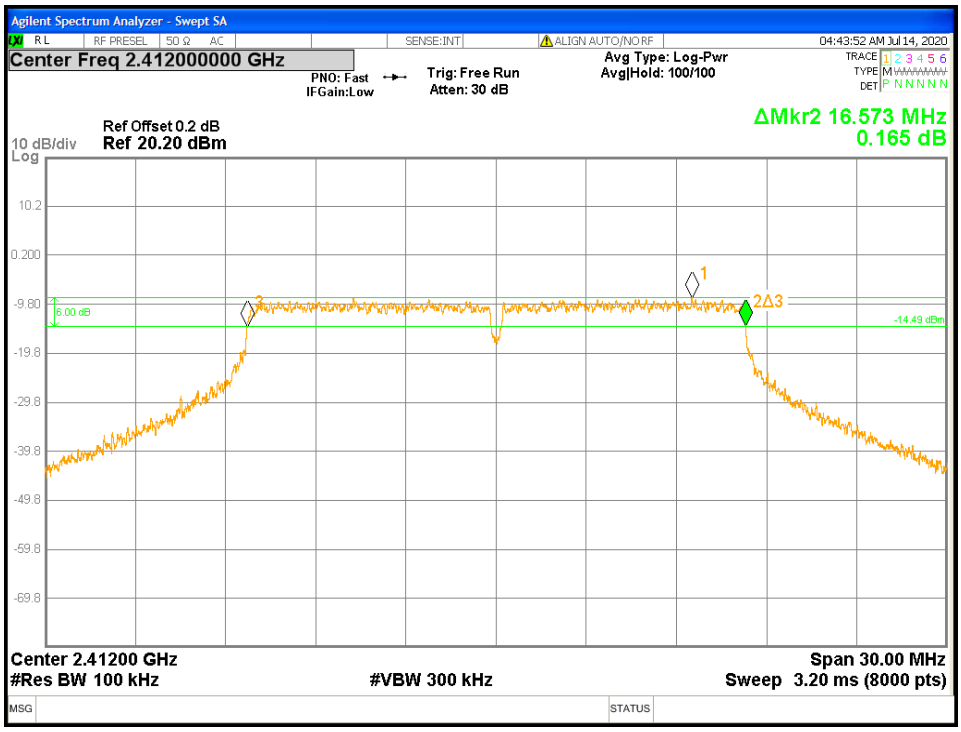


Figure 19: DTS Bandwidth-802.11g-2412 MHz

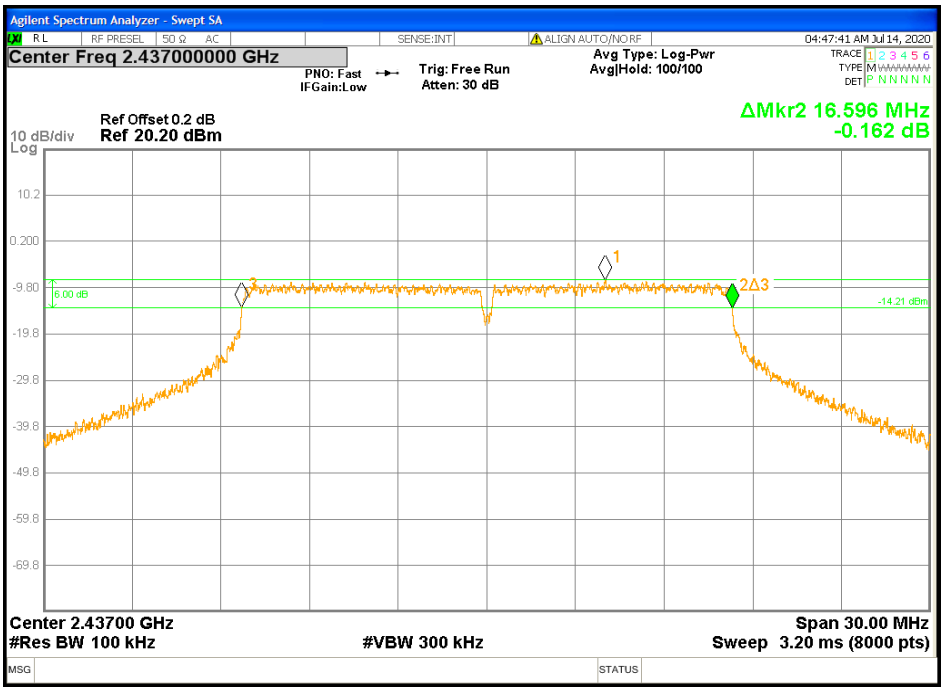


Figure 20: DTS Bandwidth-802.11g-2437 MHz

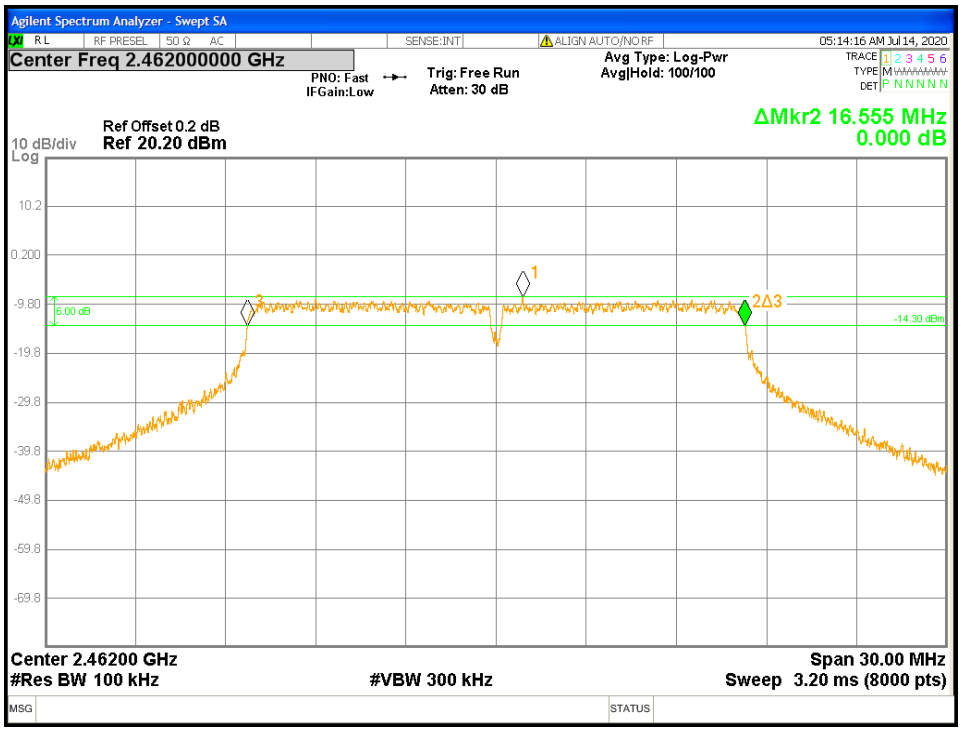


Figure 21: DTS Bandwidth-802.11g-2462 MHz

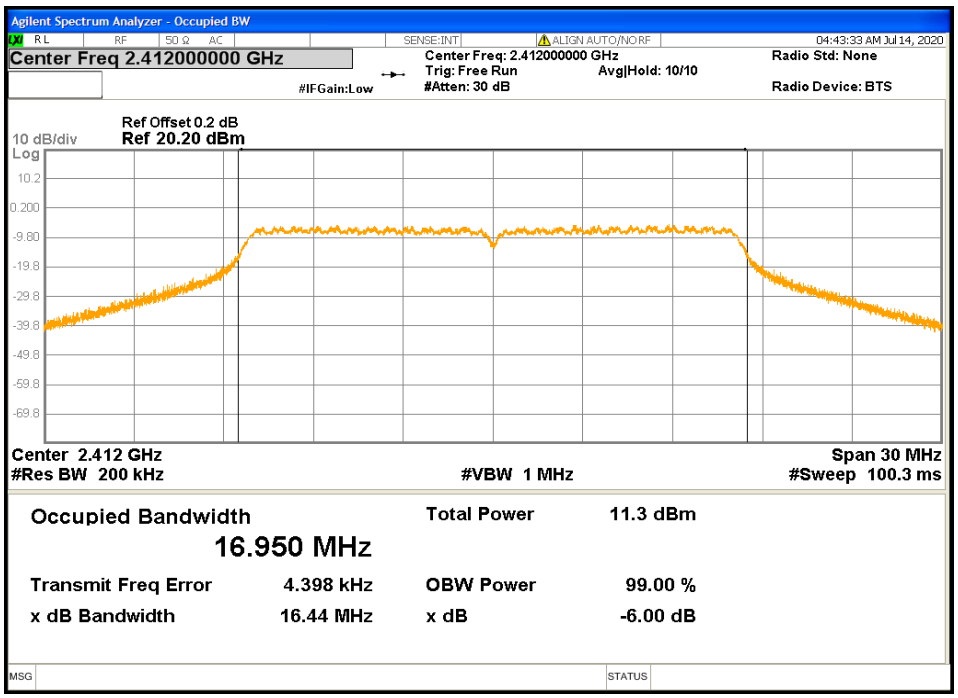


Figure 22: 99% Bandwidth-802.11g-2412 MHz

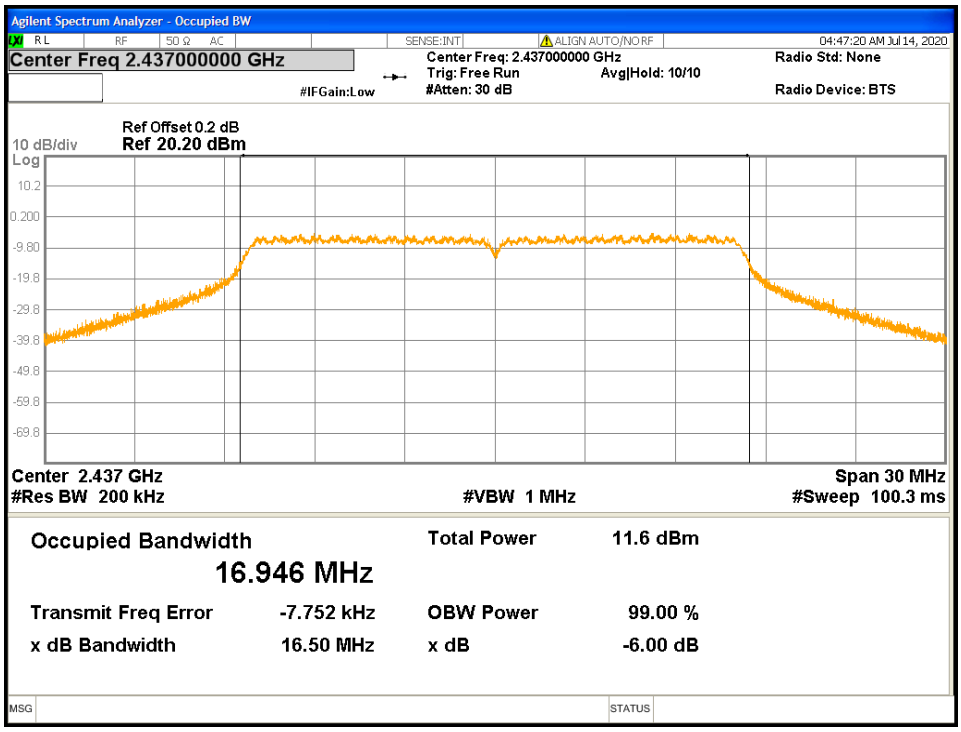


Figure 23: 99% Bandwidth-802.11g-2437 MHz

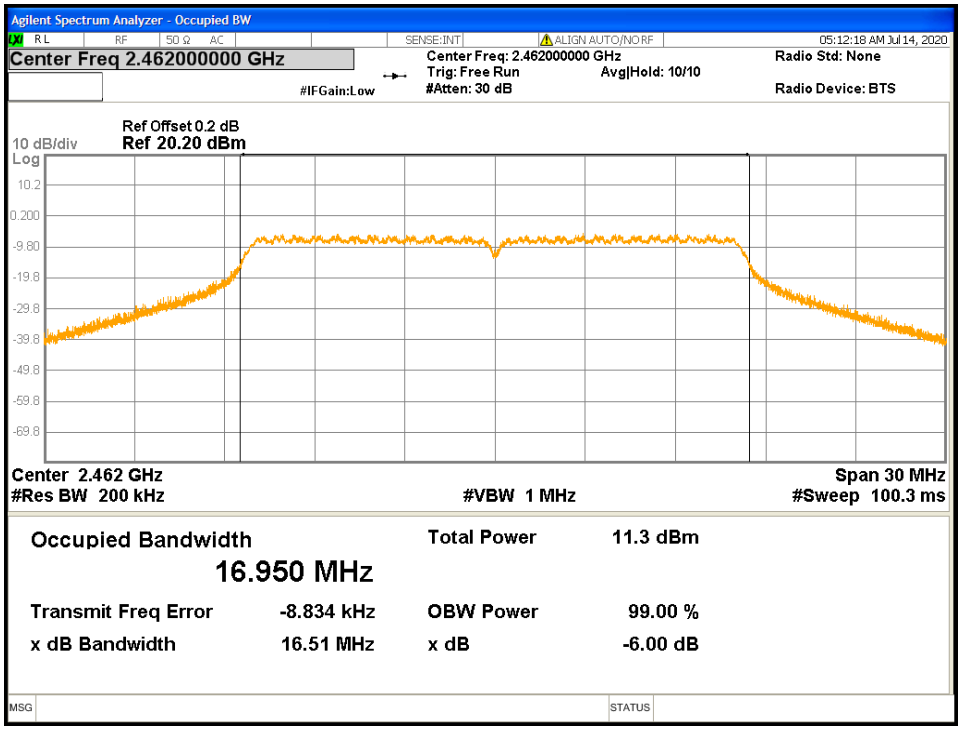


Figure 24: 99% Bandwidth-802.11g-2462 MHz

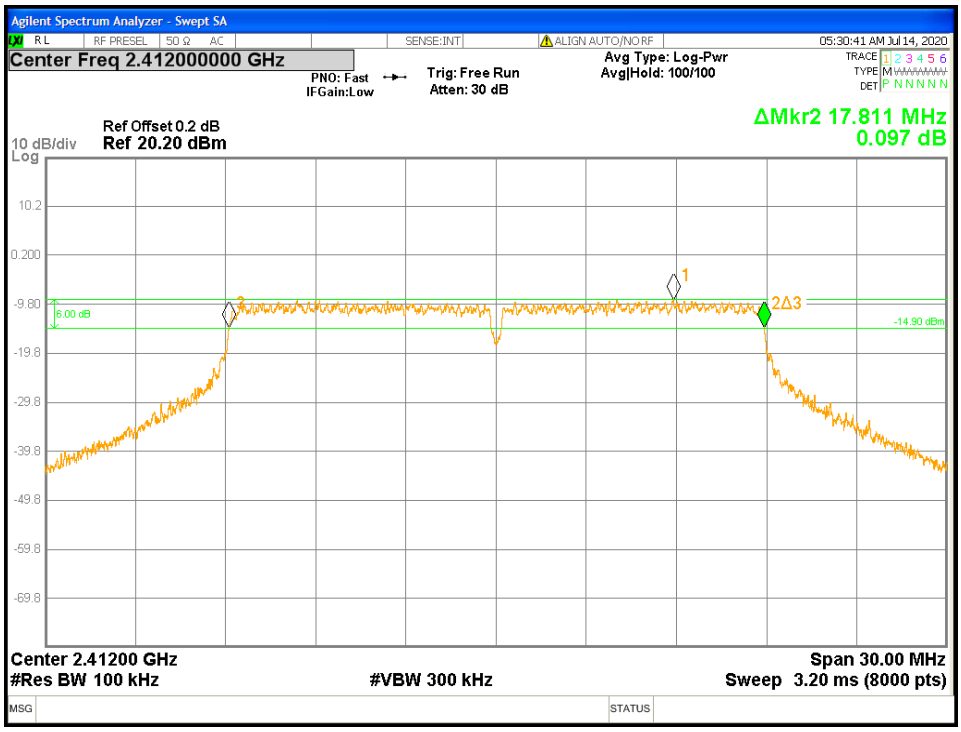


Figure 25: DTS Bandwidth-802.11n HT20-2412 MHz

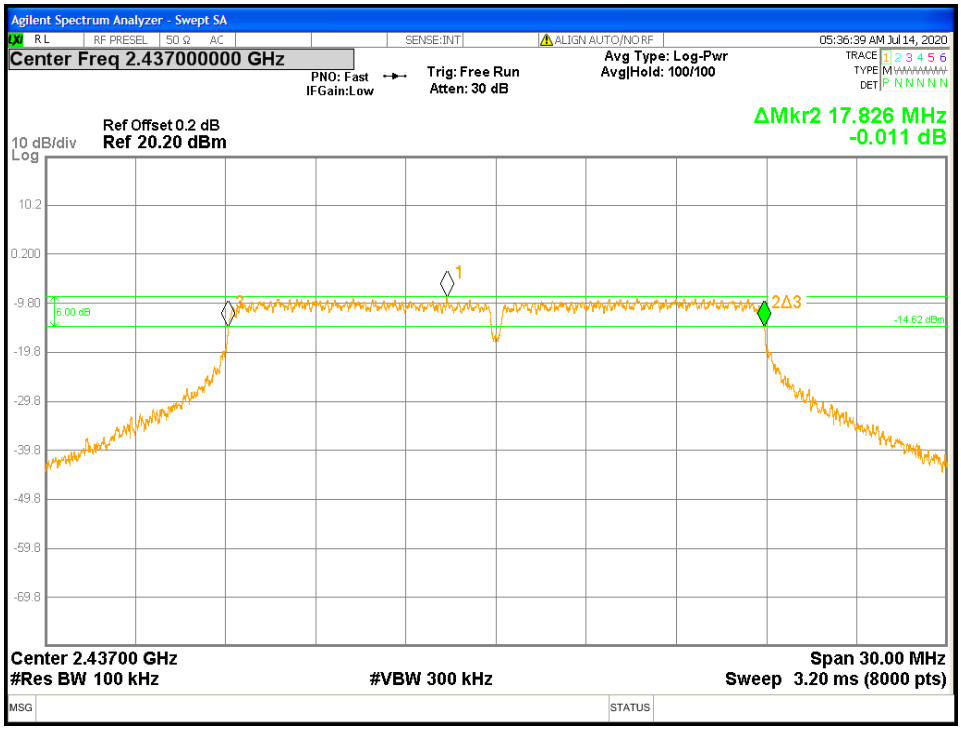


Figure 26: DTS Bandwidth-802.11n HT20-2437 MHz

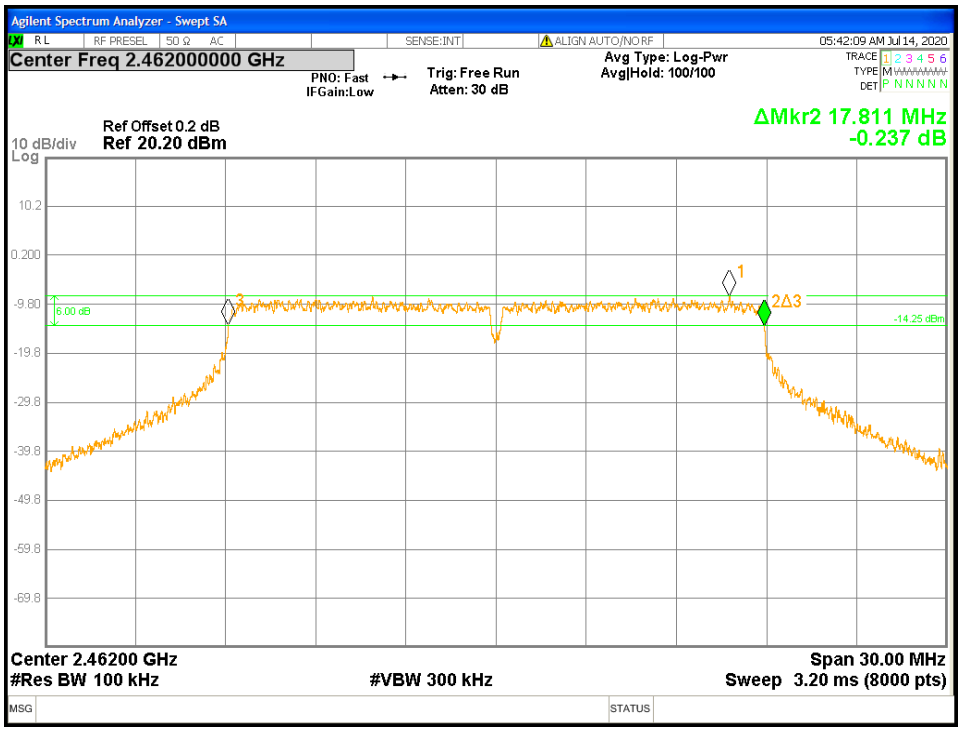


Figure 27: DTS Bandwidth-802.11n HT20-2462 MHz

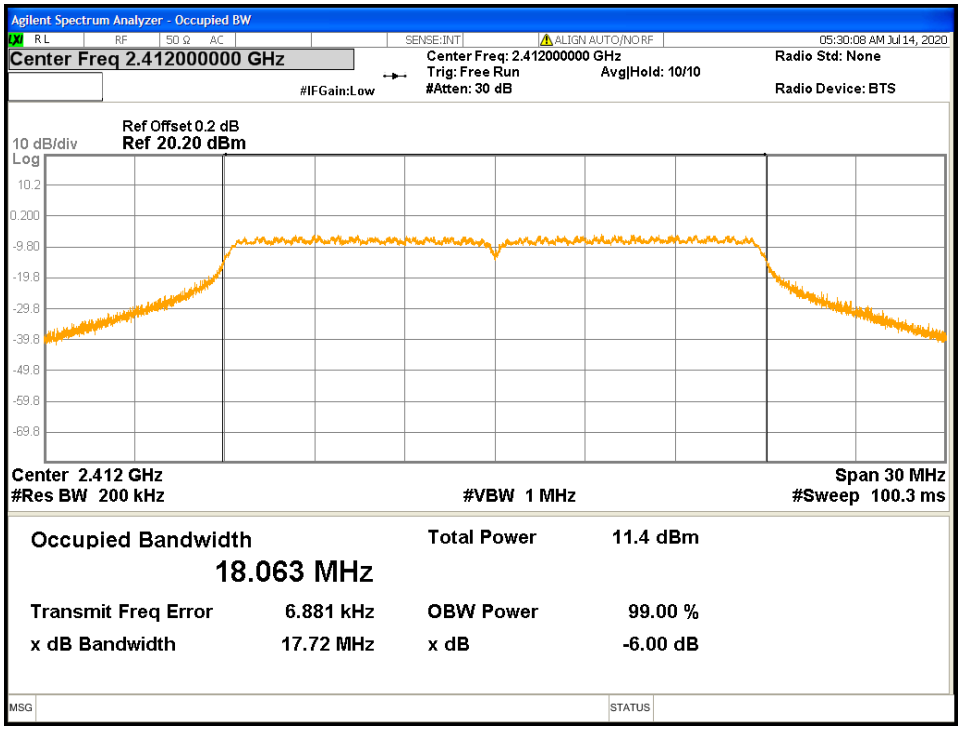


Figure 28: 99% Bandwidth-802.11n HT20-2412 MHz

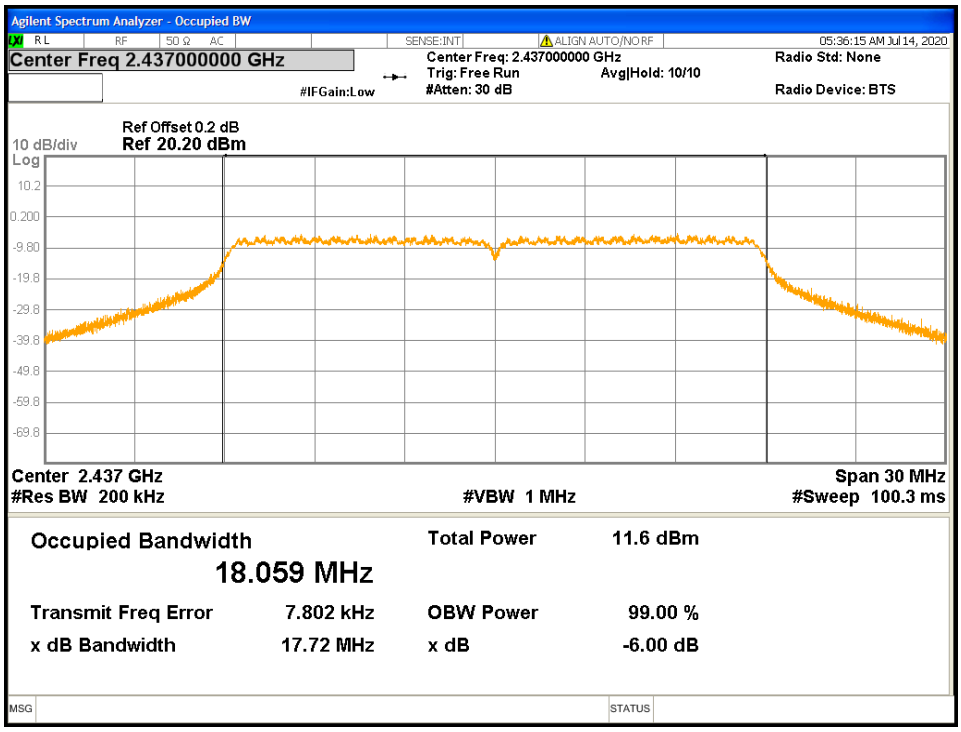


Figure 29: 99% Bandwidth-802.11n HT20-2437 MHz

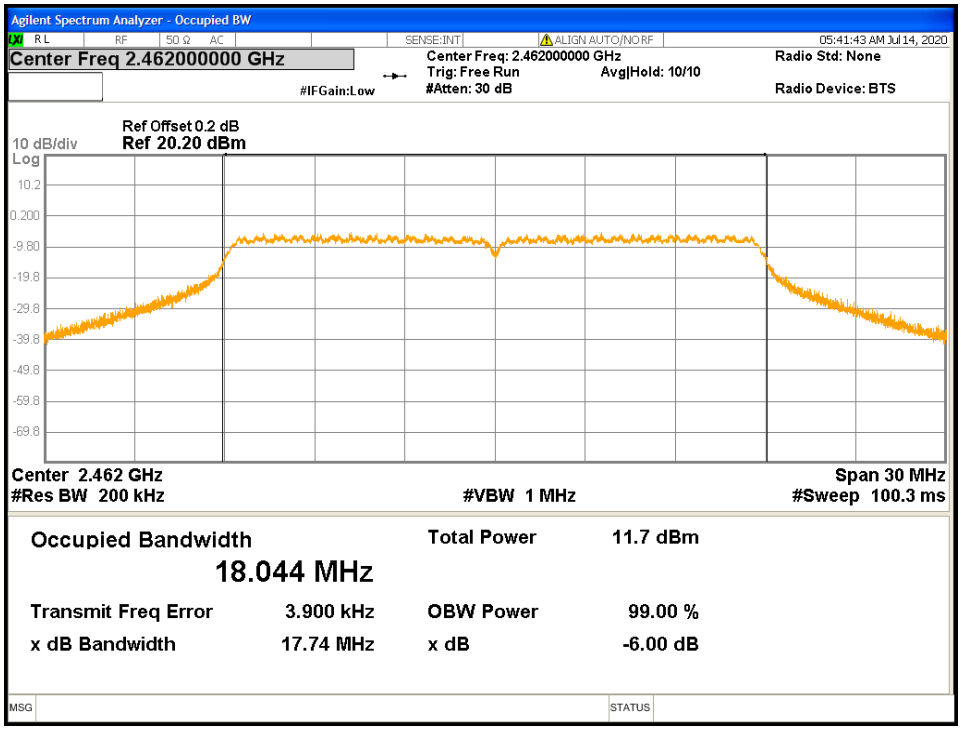


Figure 30: 99% Bandwidth-802.11n HT20-2462 MHz

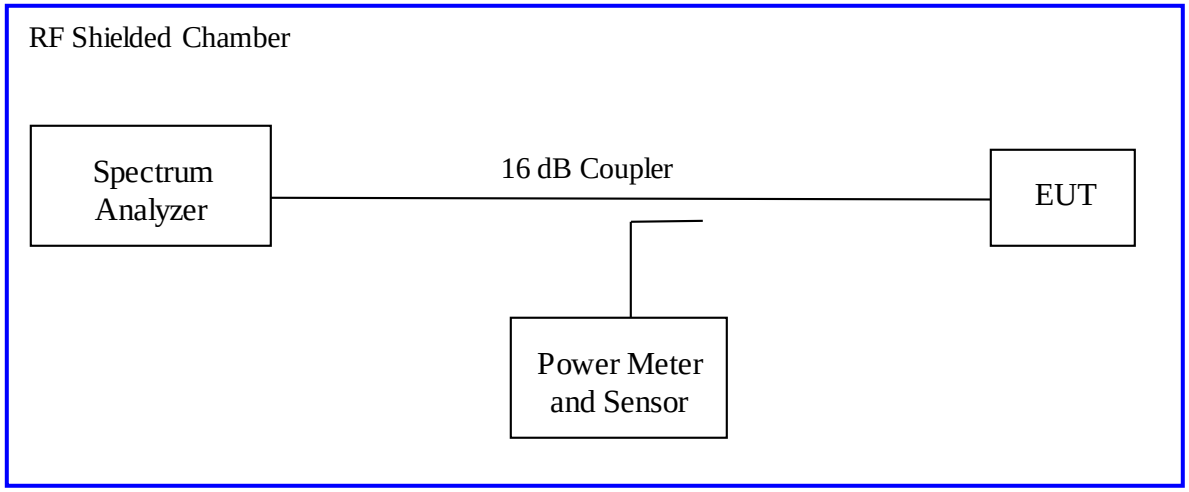
4.3 Peak Power Spectral Density

According to the CFR47 Part 15.247 (e) and RSS 247 Sect.5.2 (b), the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10-2013 Section 11.10.3. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 247 Sect.5.2 (b). The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range of 2400 MHz to 2483.5 MHz. This test was conducted on 3 channels of Sample SN PP #1. The worst sample result indicated below.

Test Setup:



Method AVGSA-1 of "KDB 558074 – DTS Measurement Guidance v05r02" applies since the EUT continuously transmits with duty cycle greater than 98%. Sample detector was used.

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 Power Spectral Density – Test Results

Test Conditions: Conducted Measurement	**Date:** July 14, 2020
Antenna Type: Chip	**Power Setting:** See test plan.
Antenna Gain: +3.3 dBi	**Signal State:** Modulated at 100%
Ambient Temp.: 23 °C	**Relative Humidity:** 38%

Peak Power Spectral Density

Freq. (MHz)	Mode	Output [dBm]	CF [dB]	Max. PPSD [dBm]	Limit [dBm]	Margin [dB]
2412	802.11b 1 Mbps	-11.98	-15.23	-27.21	8.00	-35.21
2437	802.11b 1 Mbps	-11.56	-15.23	-26.79	8.00	-34.79
2462	802.11b 1 Mbps	-12.02	-15.23	-27.25	8.00	-35.25
2412	802.11g 6 Mbps	-14.64	-15.23	-29.87	8.00	-37.87
2437	802.11g 6 Mbps	-14.62	-15.23	-29.85	8.00	-37.85
2462	802.11g 6 Mbps	-13.89	-15.23	-29.12	8.00	-37.12
2412	HT20 6.5 Mbps	-14.85	-15.23	-30.08	8.00	-38.08
2437	HT20 6.5 Mbps	-14.57	-15.23	-29.8	8.00	-37.8
2462	HT20 6.5 Mbps	-14.42	-15.23	-29.65	8.00	-37.65

Note: CF accounted for the measured RBW.
The bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB
Headset transmitted at 100% duty cycle.

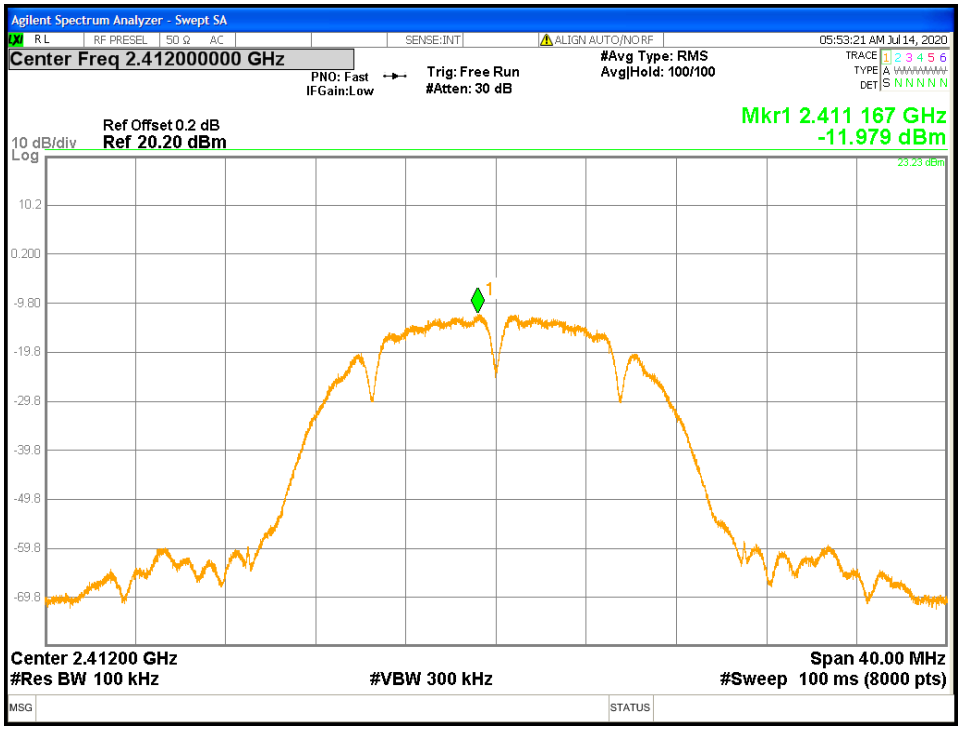


Figure 31: Maximum Power Spectral Density-2412 MHz-802.11b-1 Mbps

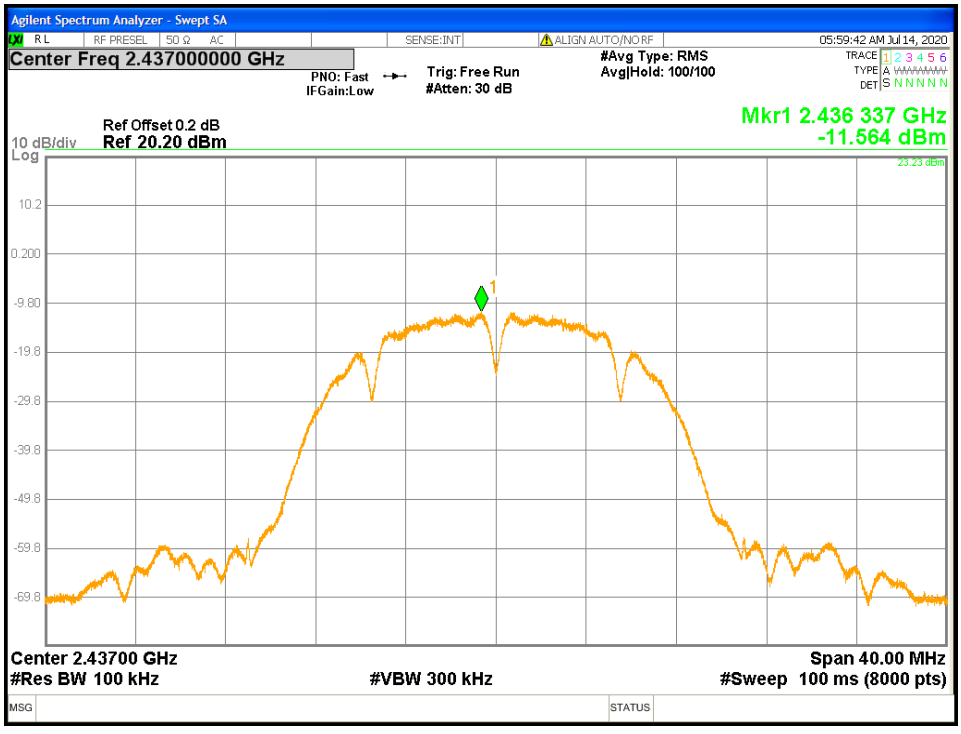


Figure 32: Maximum Power Spectral Density-2437 MHz-802.11b-1 Mbps

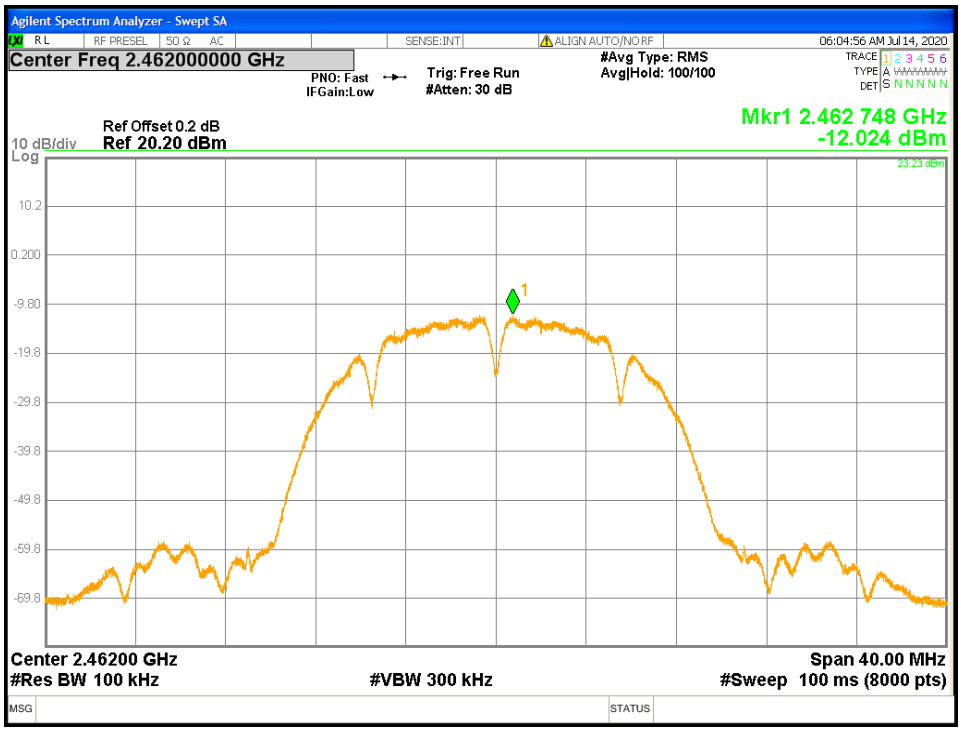


Figure 33: Maximum Power Spectral Density-2462 MHz-802.11b-1 Mbps

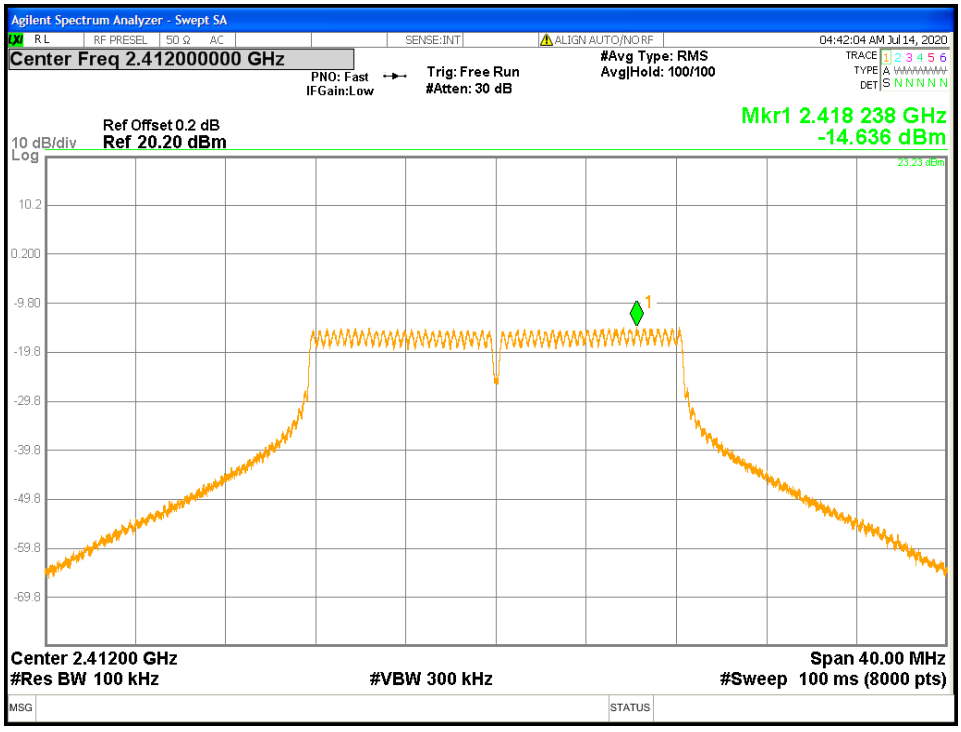


Figure 34: Maximum Power Spectral Density-2412 MHz-802.11g-6 Mbps

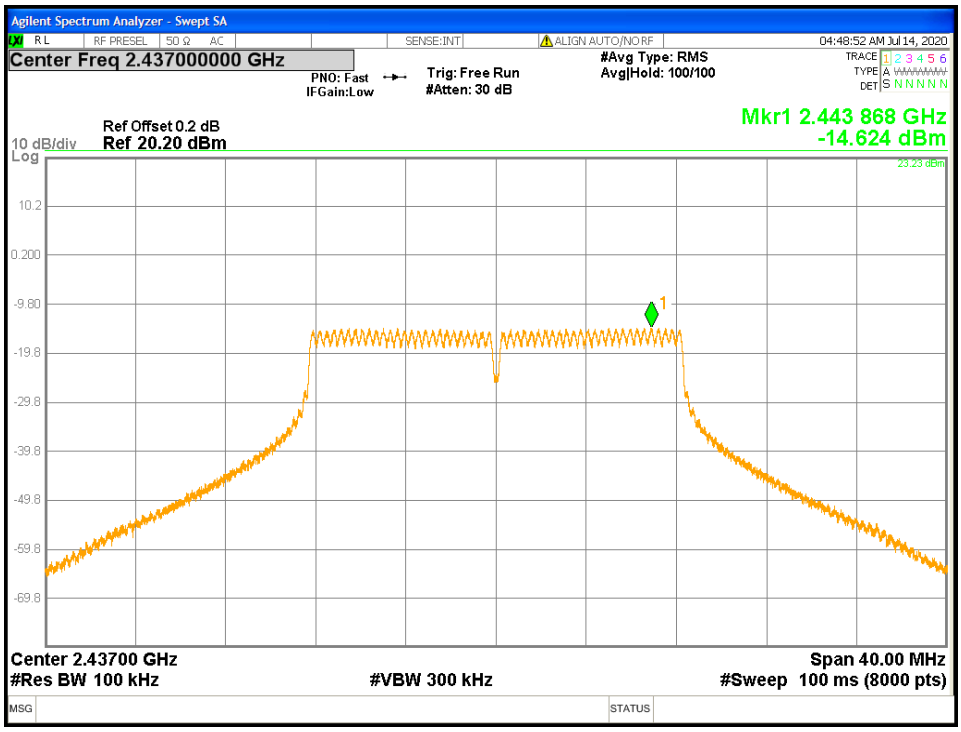


Figure 35: Maximum Power Spectral Density-2437 MHz-802.11g-6 Mbps

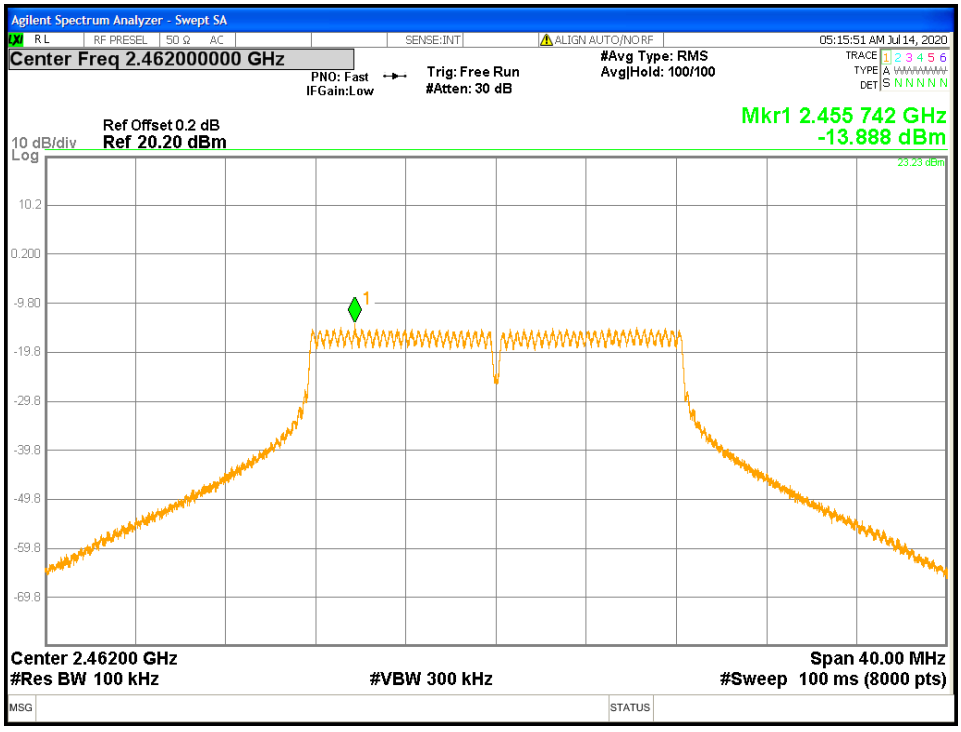


Figure 36: Maximum Power Spectral Density-2462 MHz-802.11g-6 Mbps

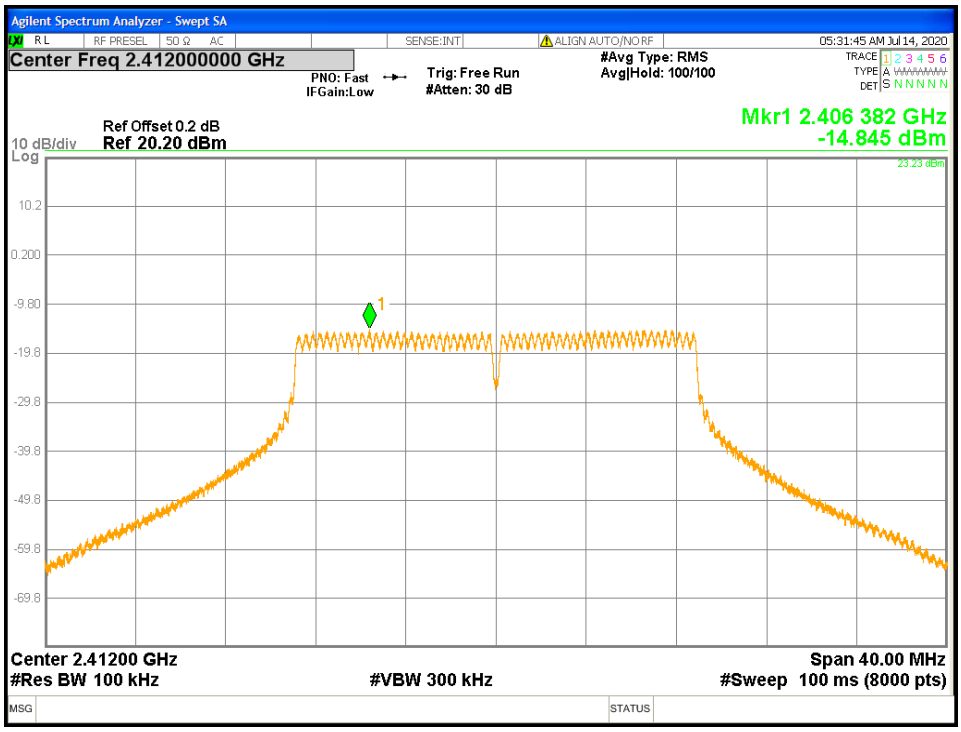


Figure 37: Maximum Power Spectral Density-2412 MHz-802.11n HT20-MCS0

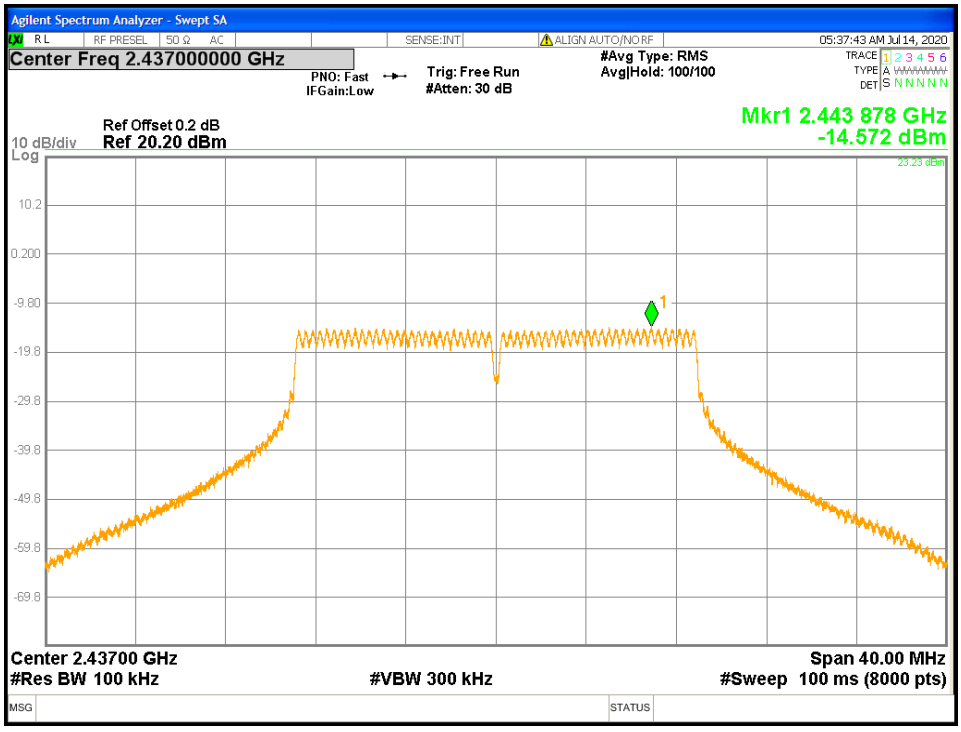


Figure 38: Maximum Power Spectral Density-2437 MHz-802.11n HT20-MCS0

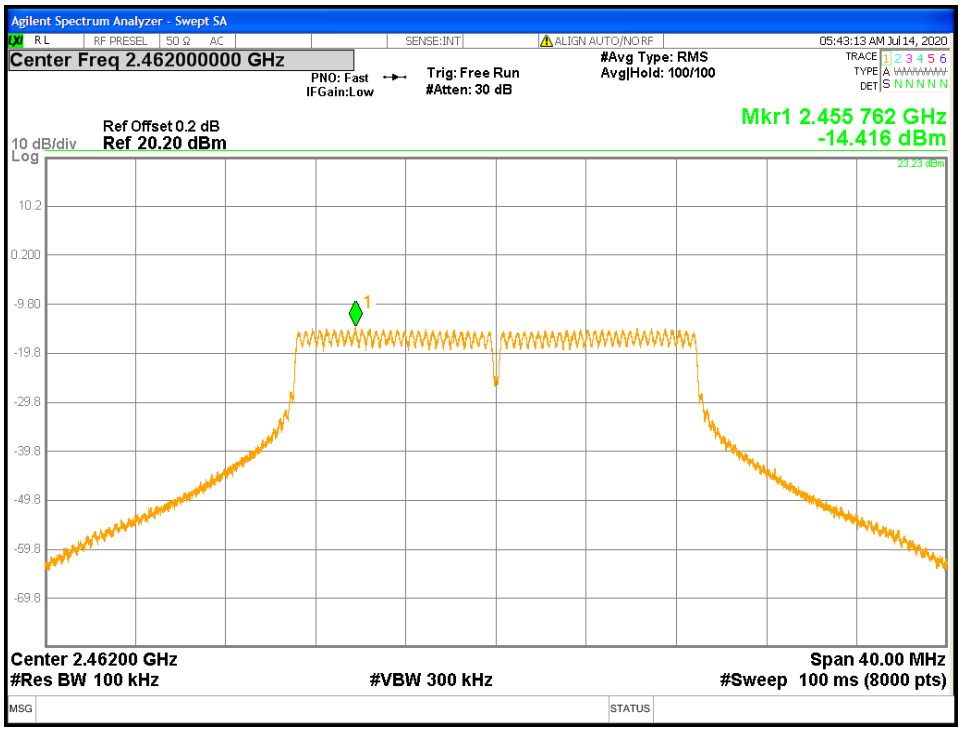


Figure 39: Maximum Power Spectral Density-2462 MHz-802.11n HT20-MCS0

4.4 Out of Band Emissions

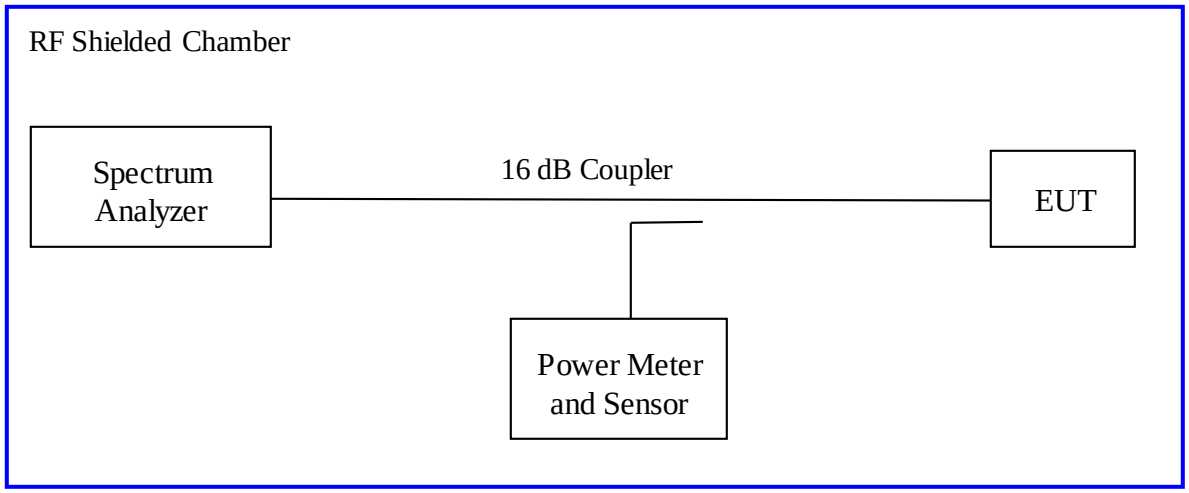
The setup was identical to RF output power measurement. Intentional radiators operating under the alternative provisions to the general emission limits, must be designed to ensure that the 20 dB or 30 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Since the transmitter complies with the conducted power limits base on the use of RMS averaging per CFR47 Part 15.247(b)(3), any frequency outside the band of 2400MHz to 2483.5MHz, the power output level must be below 30db from the in-band transmitting signal; CFR 47 Part 15.215, 15.247(d) and RSS-247 Sect.5.5.

4.4.1 Test Method

The conducted method was used to measure the out-of-band emission requirement. The measurement was performed with modulation per CFR47 15.247(4) (d) 2020 and *RSS-247 Sect.5.5: 2017*. This test was conducted on 3 channels of Sample S/N PP #1. 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: Emissions at the Band-Edge – Test Results

Test Conditions: Conducted Measurement		**Date:** July 14, 2020		
Antenna Type: Chip		**Power Setting:** See test plan.		
Antenna Gain: +3.3 dBi		**Signal State:** Modulated at 100%		
Ambient Temp.: 23 °C		**Relative Humidity:** 38%		
Out of Band Results for Wireless Audio Headset				
Frequency (MHz)	**Mode**	**Out of Band Level (dBm)**	**30 dBr Level (dBm)**	**Margin (dB)**
2412	802.11b, 1 Mbps	-46.28	-33.71	-12.57
2437	802.11b, 1 Mbps	-45.58	-33.45	-12.13
2462	802.11b, 1 Mbps	-45.97	-33.95	-12.02
2412	802.11g, 6 Mbps	-44.64	-38.98	-5.66
2437	802.11g, 6 Mbps	-45.62	-38.62	-7.00
2462	802.11g, 6 Mbps	-45.21	-38.69	-6.52
2412	HT20, MCS0	-45.55	-38.83	-6.72
2437	HT20, MCS0	-46.15	-38.64	-7.51
2462	HT20, MCS0	-46.29	-38.77	-7.52
Note: The band-edge level must be lower than the 30dBr level. (*) The band-edge is compared to the highest -30dBr level of the test mode.				

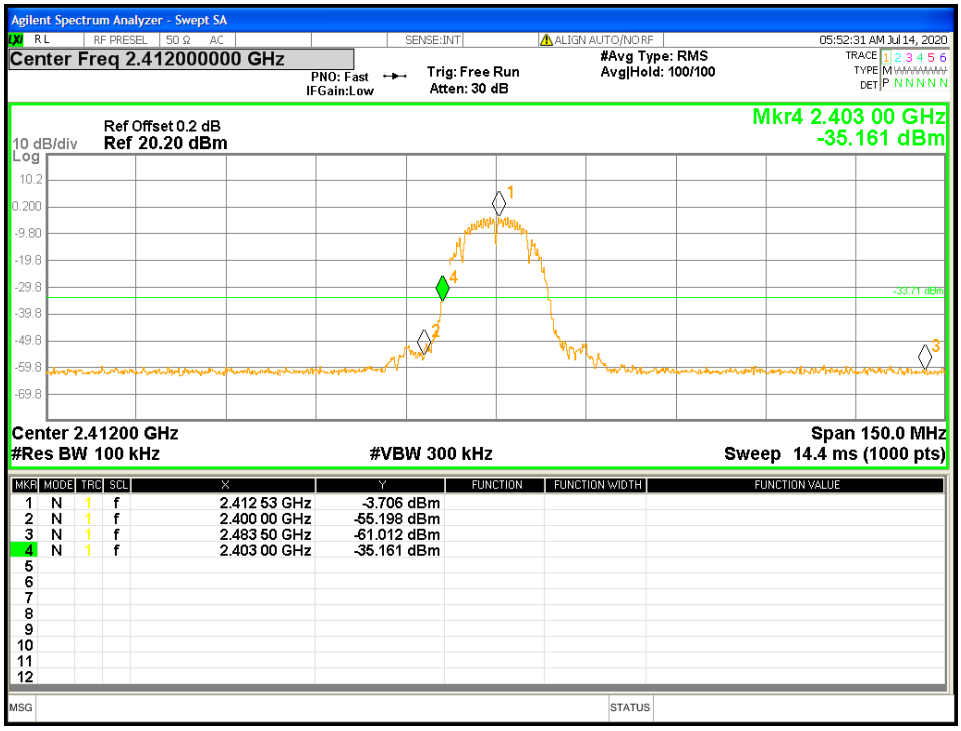


Figure 40: Conducted Band Edge-2412 MHz-802.11b-1 Mbps

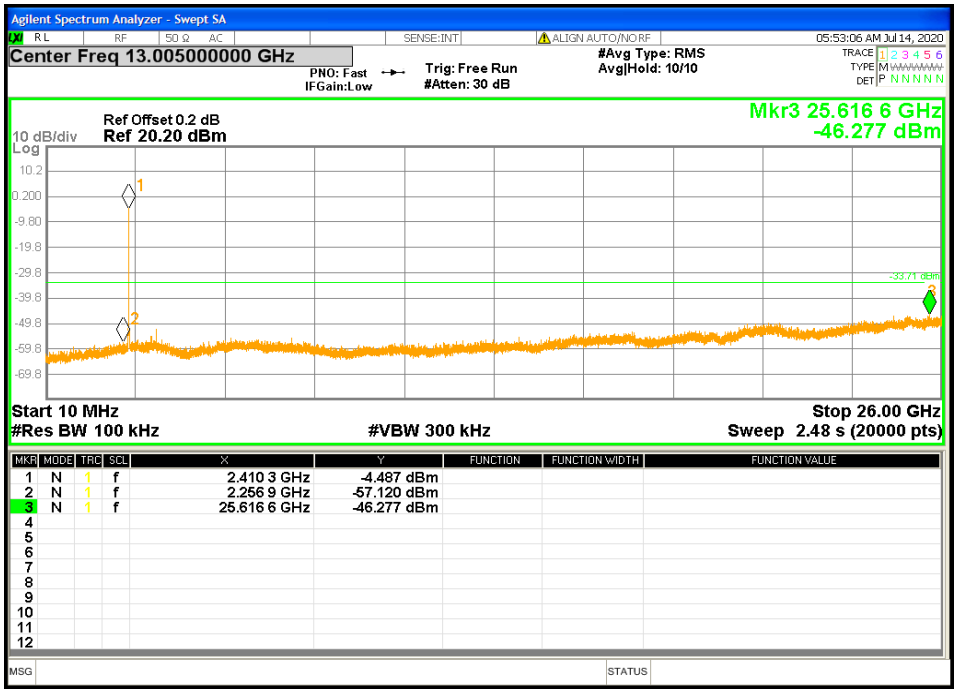


Figure 41: Out of band Emission-2412 MHz-802.11b-1 Mbps

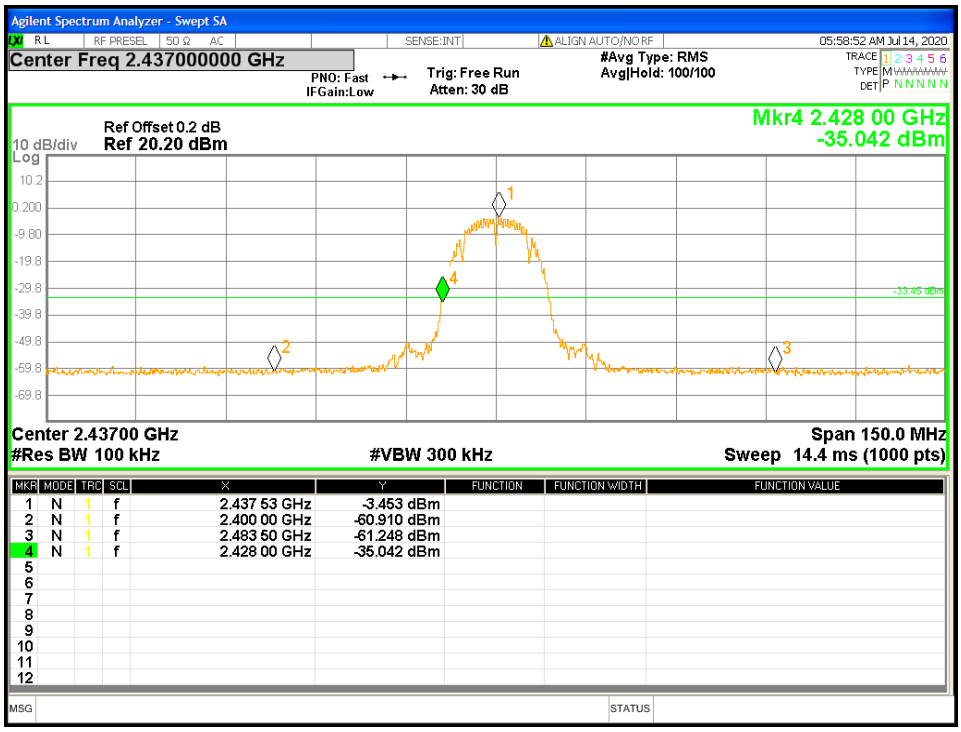


Figure 42: Conducted Band Edge-2437 MHz-802.11b-1 Mbps

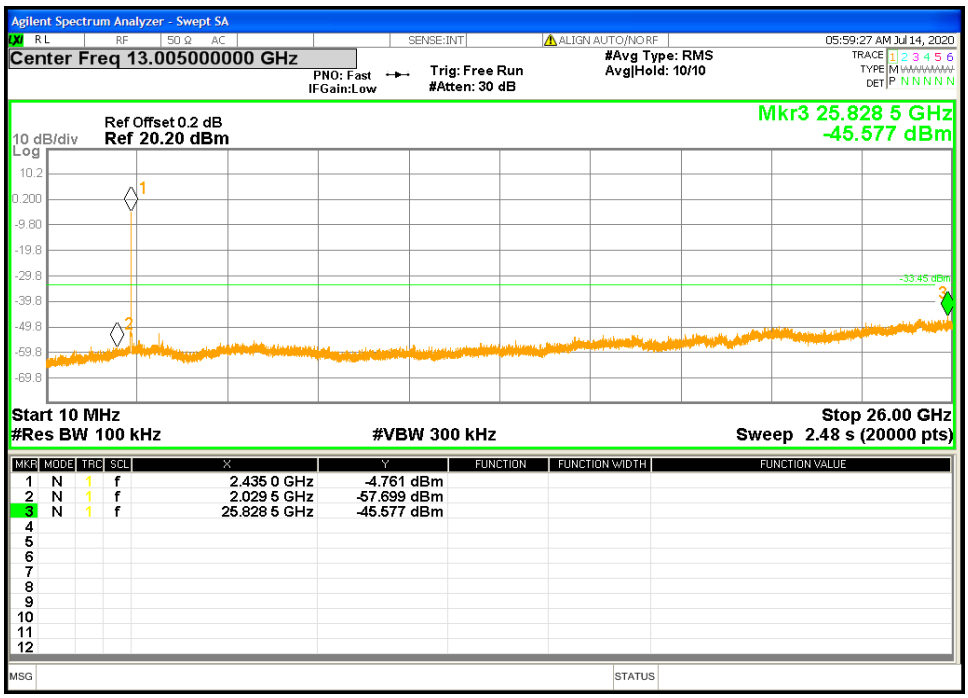


Figure 43: Out of band Emission-2437 MHz-802.11b-1 Mbps

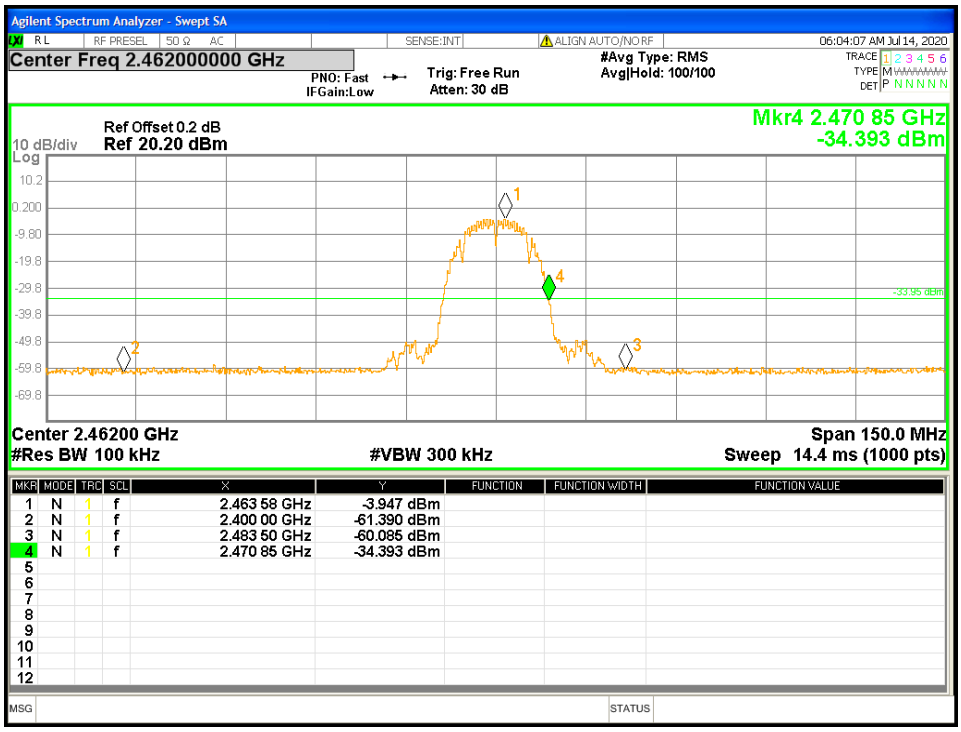


Figure 44: Conducted Band Edge-2462 MHz-802.11b-1 Mbps

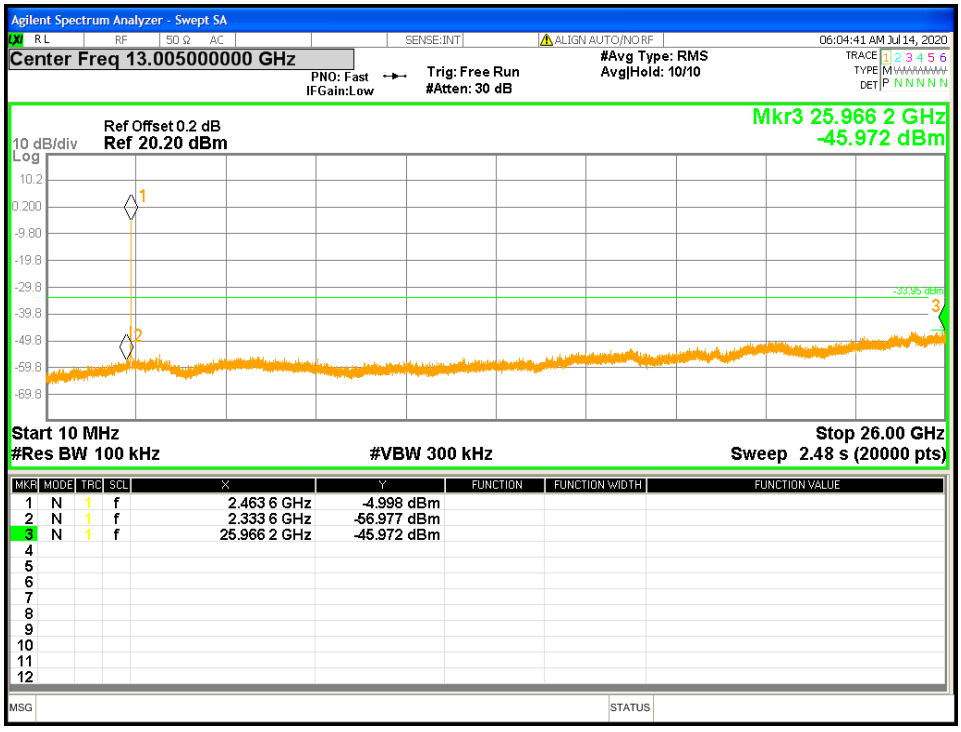


Figure 45: Out of band Emission-2462 MHz-802.11b-1 Mbps

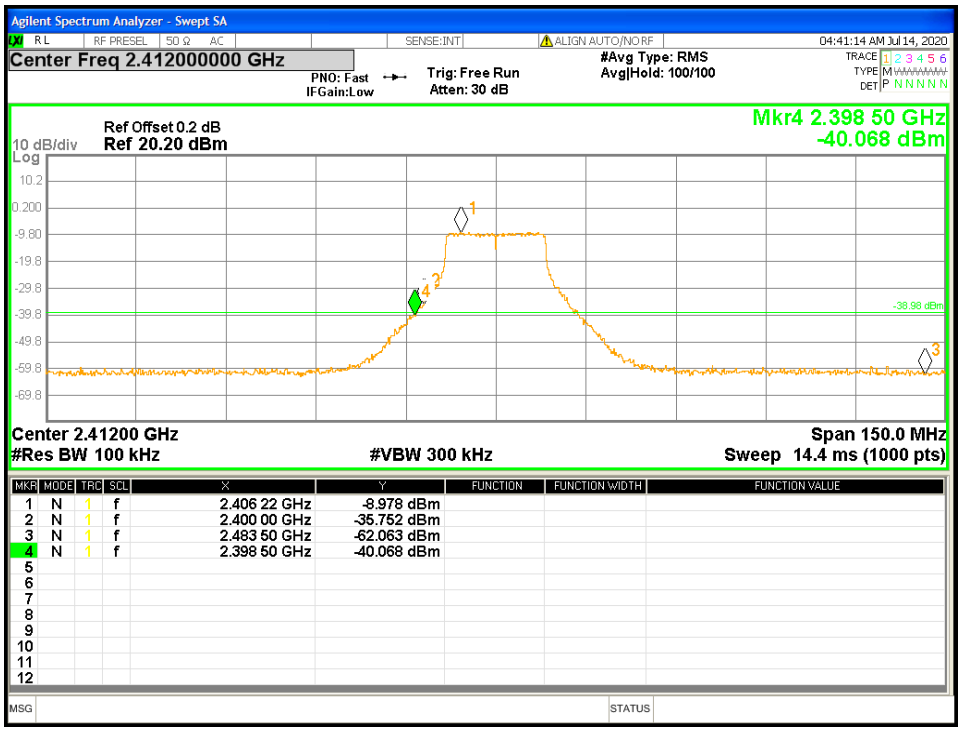


Figure 46: Conducted Band Edge-2412 MHz-802.11g-6 Mbps

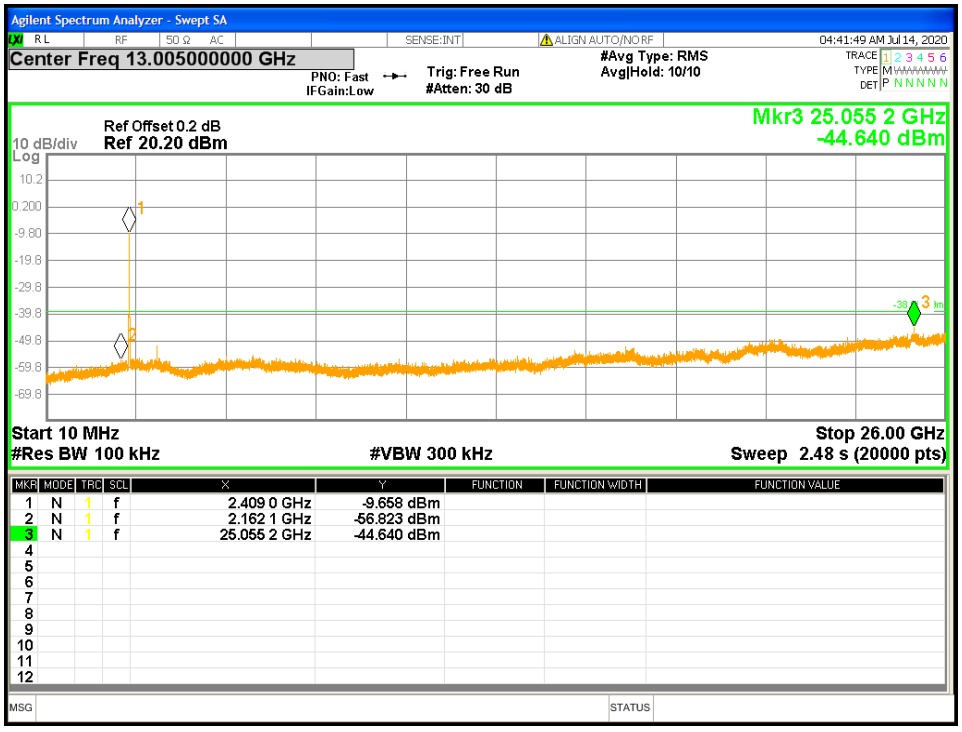


Figure 47: Out of band Emission-2412 MHz-802.11g-6 Mbps

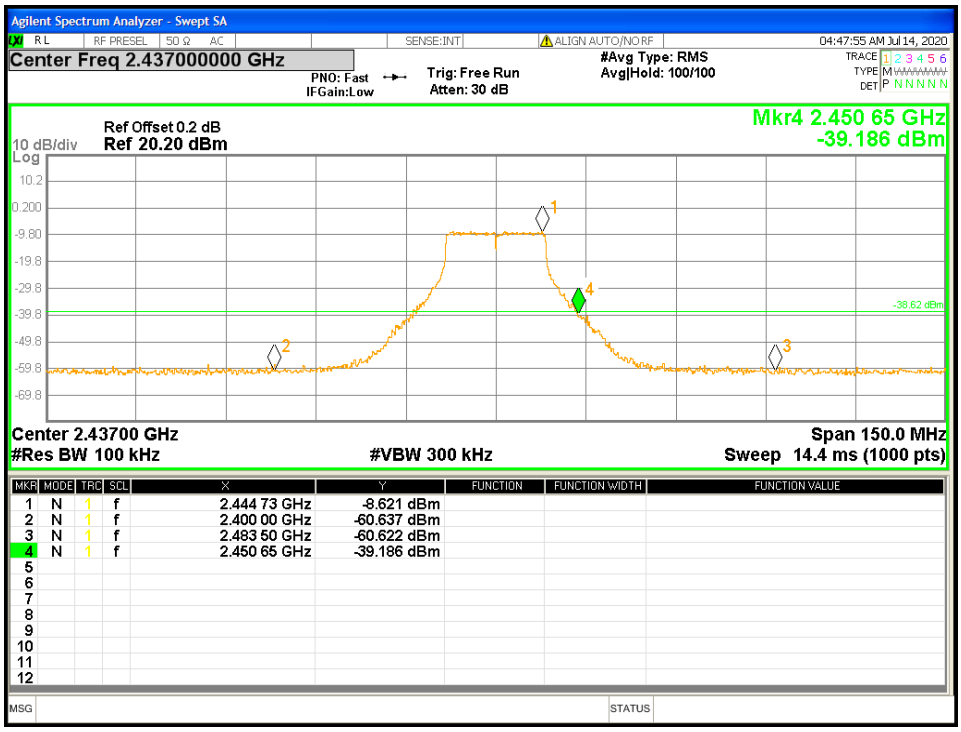


Figure 48: Conducted Band Edge-2437 MHz-802.11g-6 Mbps

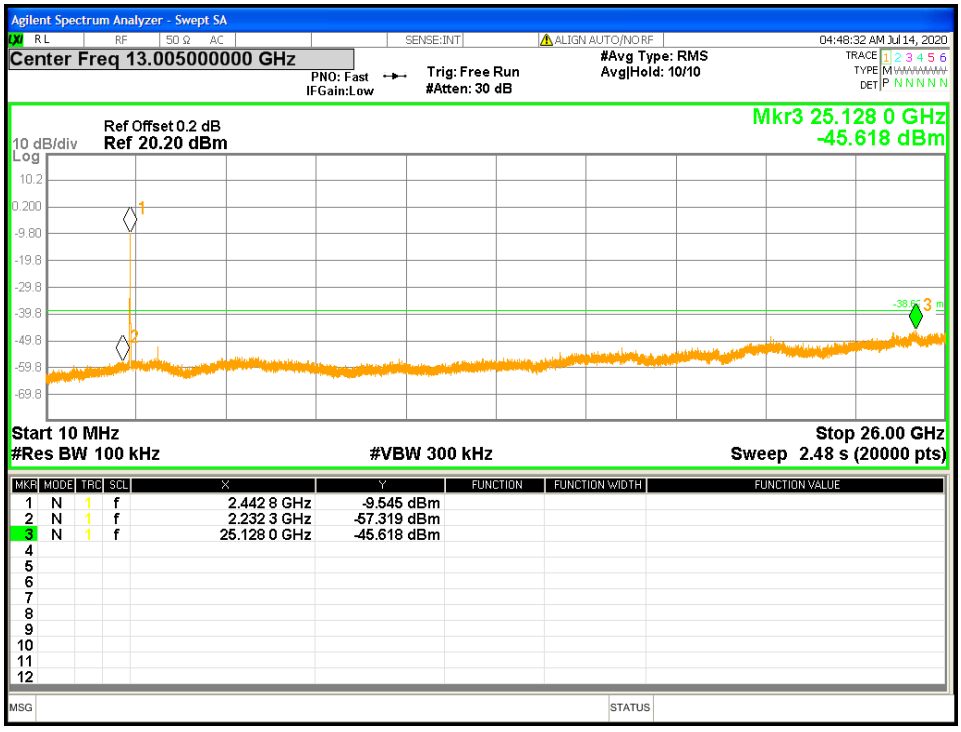


Figure 49: Out of band Emission-2437 MHz-802.11g-6 Mbps

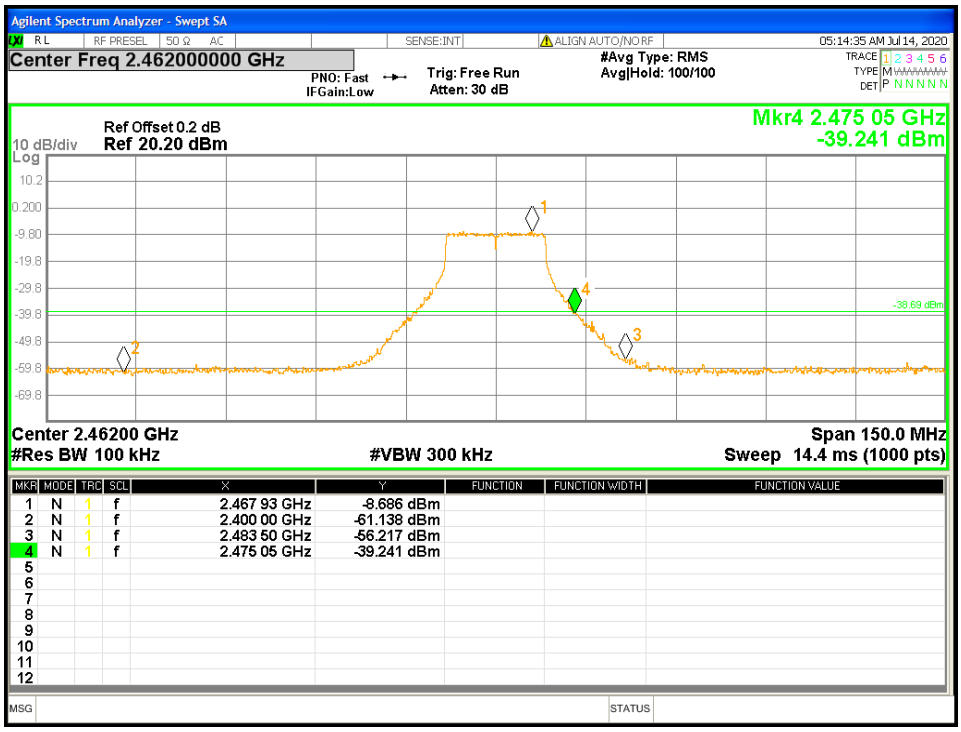


Figure 50: Conducted Band Edge-2462 MHz-802.11g-6 Mbps

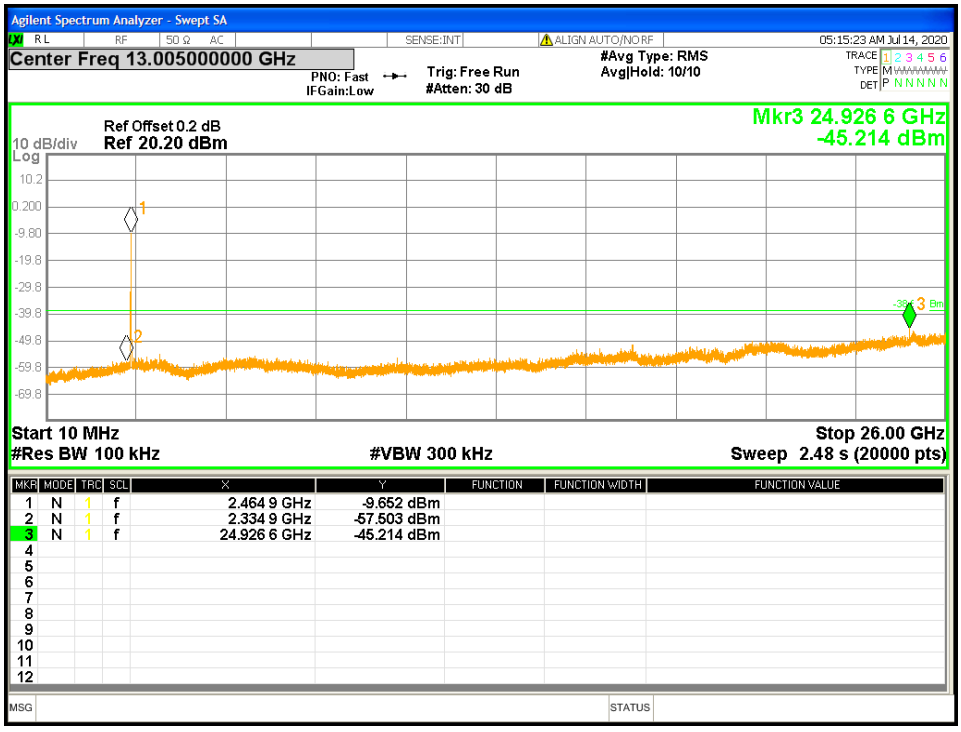


Figure 51: Out of band Emission-2462 MHz-802.11g-6 Mbps

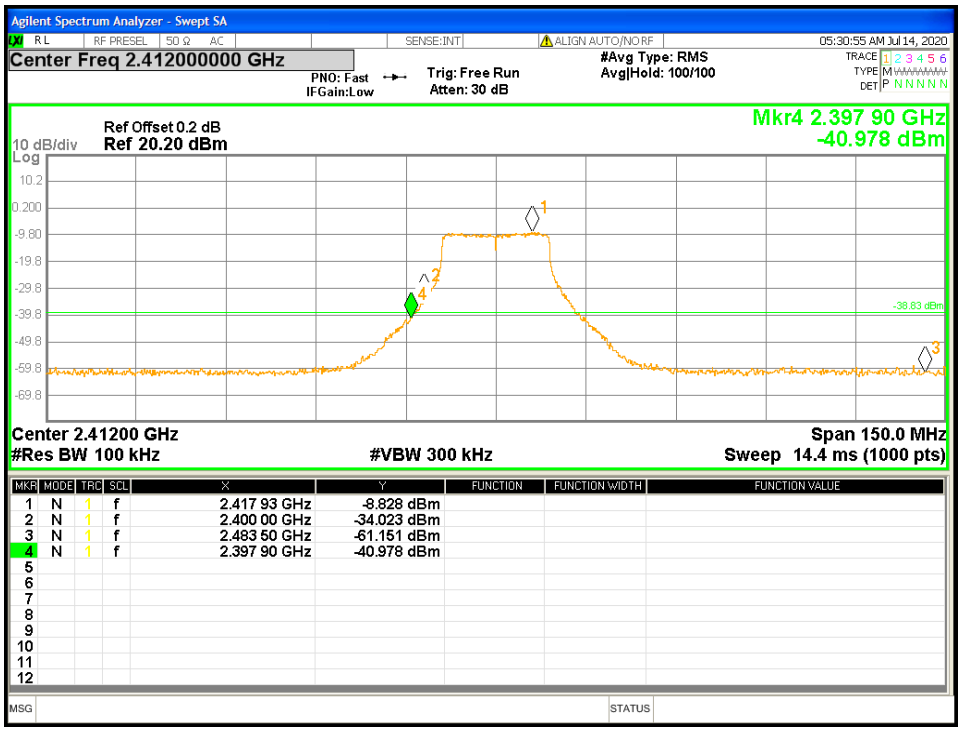


Figure 52: Conducted Band Edge-2412 MHz-802.11n HT20-MCS0

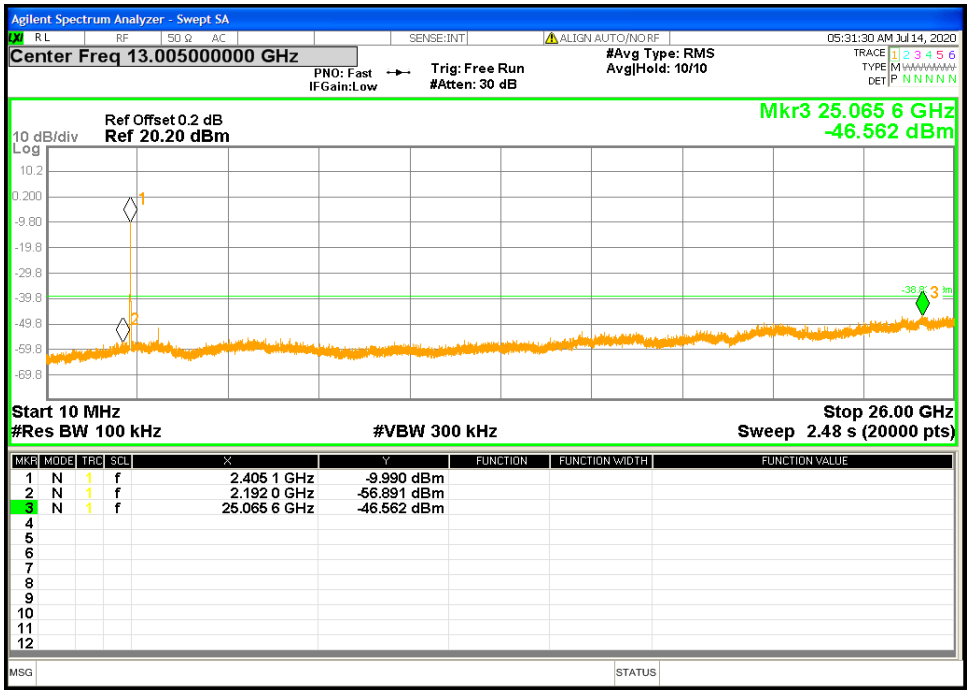


Figure 53: Out of band Emission-2412 MHz-802.11n HT20-MCS0

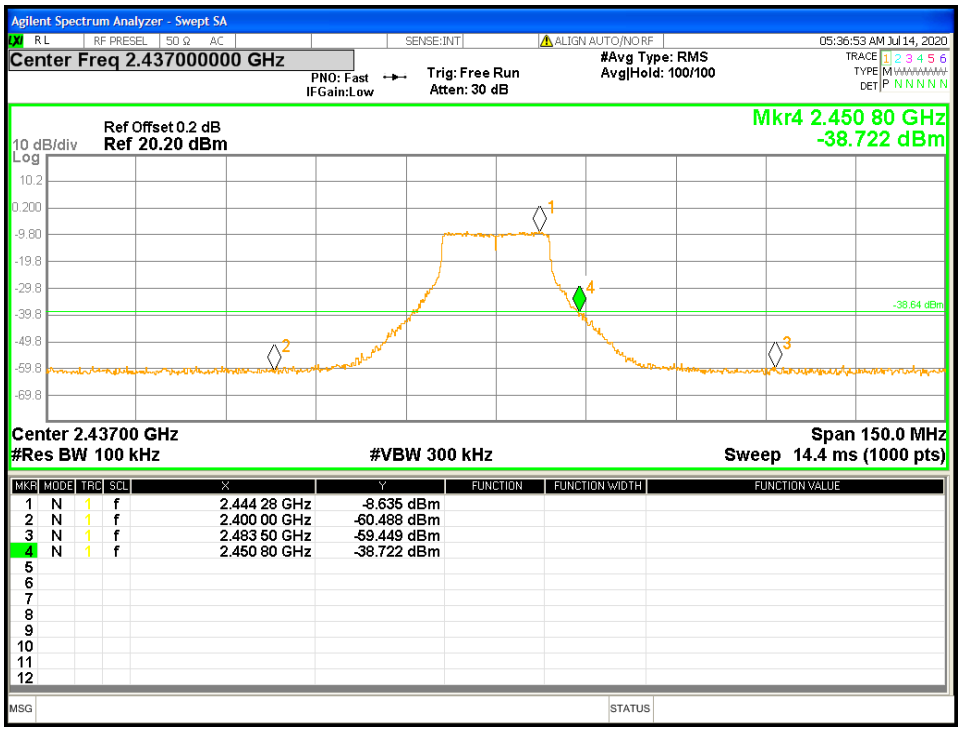


Figure 54: Conducted Band Edge-2437 MHz-802.11n HT20-MCS0

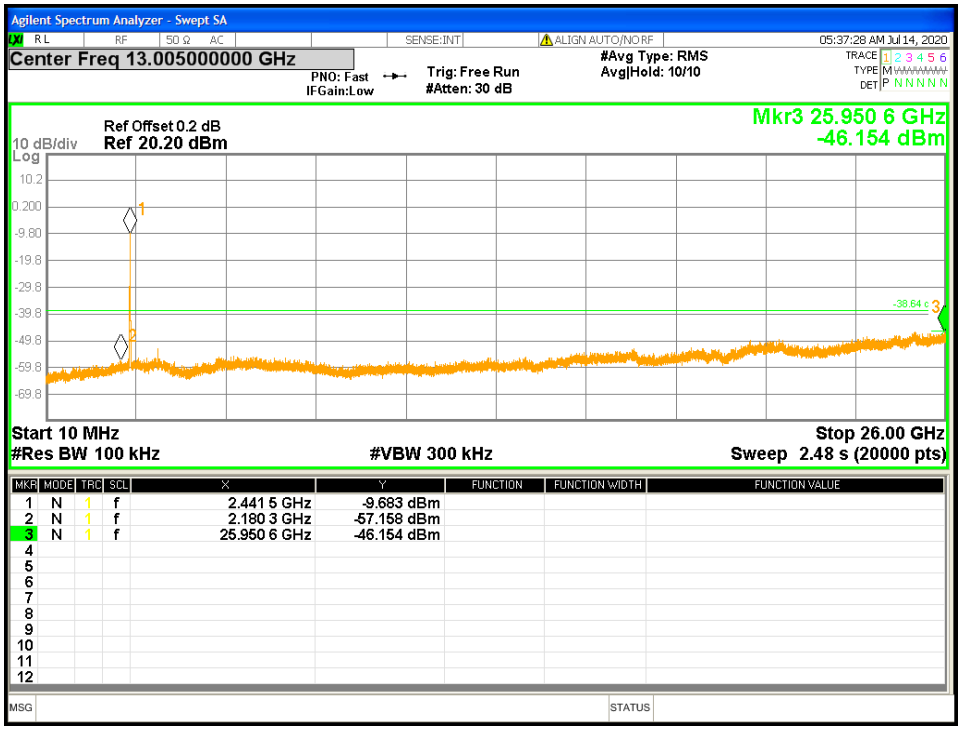


Figure 55: Out of band Emission-2437 MHz-802.11n HT20-MCS0

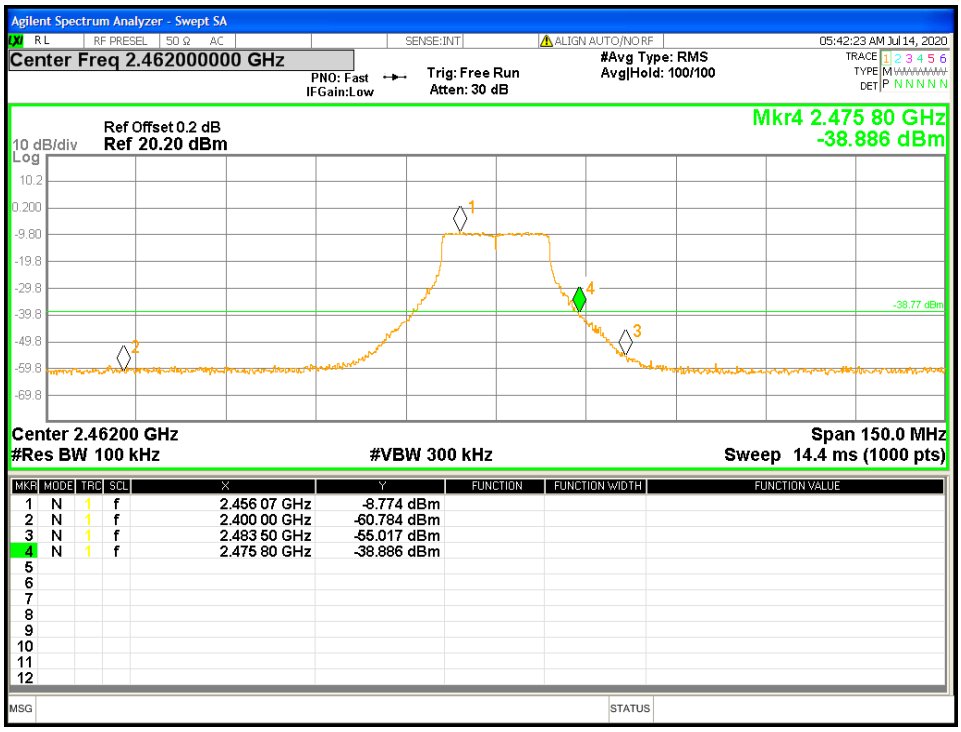


Figure 56: Conducted Band Edge-2462 MHz-802.11n HT20-MCS0

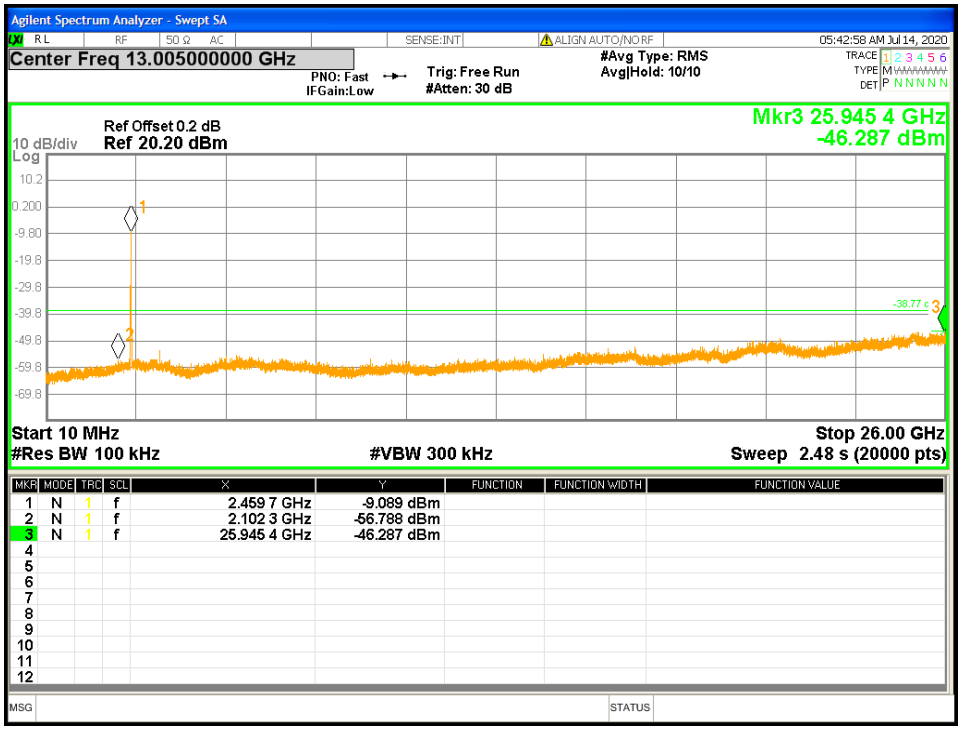


Figure 57: Out of band Emission-2462 MHz-802.11n HT20-MCS0

4.5 Transmit 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, 15.247(d), RSS-Gen Sect. 8.9.

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.

Pre-scans were performed to determine the worst data rate and EUT orientation.

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.

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

802.11b 1 Mbps at 2412 MHz, 2437 MHz, and 2462 MHz

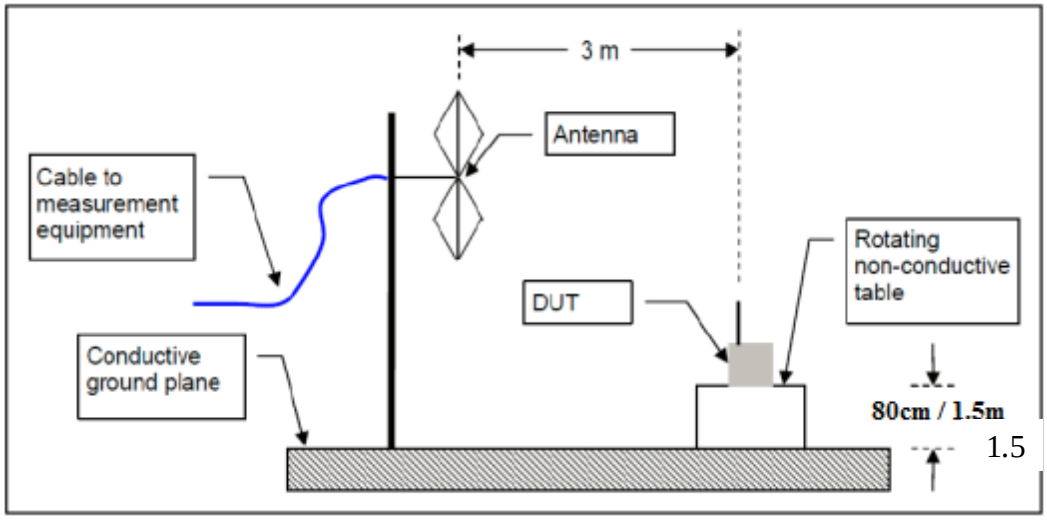
802.11g 6 Mbps at 2412 MHz, 2437 MHz, and 2462 MHz

802.11n HT20 MCS0 at 2412 MHz, 2437 MHz, and 2462 MHz

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: 2020 and RSS Gen Sect. 8.10: 2019.

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

All harmonics and spurious emission which are outside of the restricted band shall be 20dB below the in-band emission.

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.

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	**Date:** June 5, 2020
Antenna Type: Chip	**Power Setting:** See test plan.
Antenna Gain: +3.3 dBi	**Signal State:** Modulated at 100%
Ambient Temp.: 23 °C	**Relative Humidity:** 40%

Band-Edge Results

Center Freq.	Mode	Edge Freq.	Pol	Ant.	Table	Det.	Level	Limit	Margin
MHz		MHz	V/H	cm	Deg.	Pk/Avg	dBuV/m	dBuV/m	dB
2412	802.11b 1 Mbps	2390.00	V	312	232	PK	56.84	74.00	-17.16
2412	802.11b 1 Mbps	2390.00	V	312	232	AVG	42.60	54.00	-11.40
2412	802.11b 1 Mbps	2390.00	H	134	35	PK	55.34	74.00	-18.66
2412	802.11b 1 Mbps	2390.00	H	134	35	AVG	42.56	54.00	-11.44
2462	802.11b 1 Mbps	2483.50	H	188	251	PK	55.71	74.00	-18.29
2462	802.11b 1 Mbps	2483.50	H	188	251	AVG	42.91	54.00	-11.09
2462	802.11b 1 Mbps	2483.50	V	248	117	PK	56.18	74.00	-17.82
2462	802.11b 1 Mbps	2483.50	V	248	117	AVG	42.91	54.00	-11.09
2412	802.11g 6 Mbps	2390.00	V	257	53	PK	56.35	74.00	-17.65
2412	802.11g 6 Mbps	2390.00	V	257	53	AVG	42.77	54.00	-11.23
2412	802.11g 6 Mbps	2390.00	H	295	184	PK	55.94	74.00	-18.06
2412	802.11g 6 Mbps	2390.00	H	295	184	AVG	42.76	54.00	-11.24
2462	802.11g 6 Mbps	2483.50	H	233	299	PK	56.01	74.00	-17.99
2462	802.11g 6 Mbps	2483.50	H	233	299	AVG	43.05	54.00	-10.95
2462	802.11g 6 Mbps	2483.50	V	296	242	PK	56.46	74.00	-17.54
2462	802.11g 6 Mbps	2483.50	V	296	242	AVG	43.11	54.00	-10.89
2412	HT20 MCS0	2390.00	V	258	57	PK	55.55	74.00	-18.45
2412	HT20 MCS0	2390.00	V	258	57	AVG	42.83	54.00	-11.17
2412	HT20 MCS0	2390.00	H	296	185	PK	55.67	74.00	-18.33
2412	HT20 MCS0	2390.00	H	296	185	AVG	42.81	54.00	-11.19
2462	HT20 MCS0	2483.50	H	233	297	PK	56.07	74.00	-17.93
2462	HT20 MCS0	2483.50	H	233	297	AVG	43.09	54.00	-10.91
2462	HT20 MCS0	2483.50	V	298	240	PK	56.78	74.00	-17.22
2462	HT20 MCS0	2483.50	V	298	240	AVG	43.13	54.00	-10.87

Note: The emissions were measured at the adjacent restricted band of the fundamental signal.
All the band-edge measurements met the restricted band requirements of CFR47 15.205

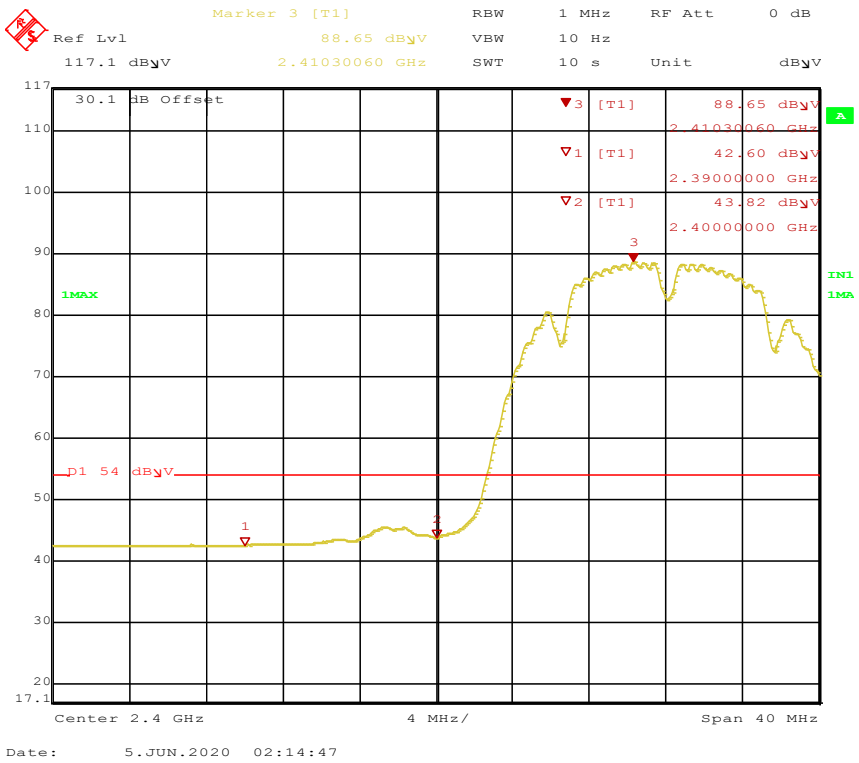


Figure 58: Radiated Emission at the Edge for 802.11b-2412 MHz-1 Mbps-V-Ave

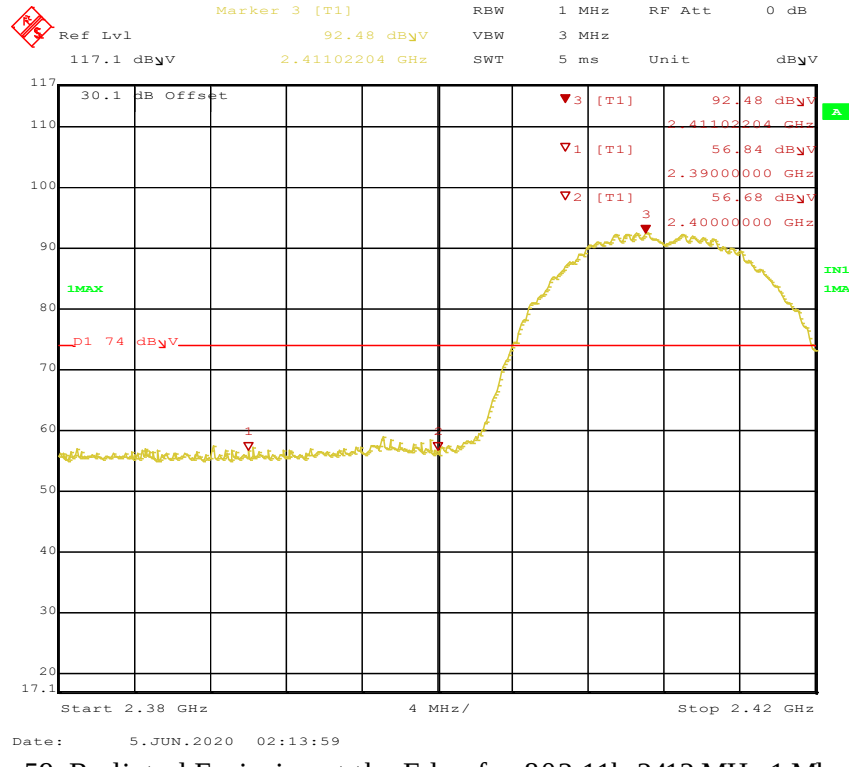


Figure 59: Radiated Emission at the Edge for 802.11b-2412 MHz-1 Mbps-V-Pk

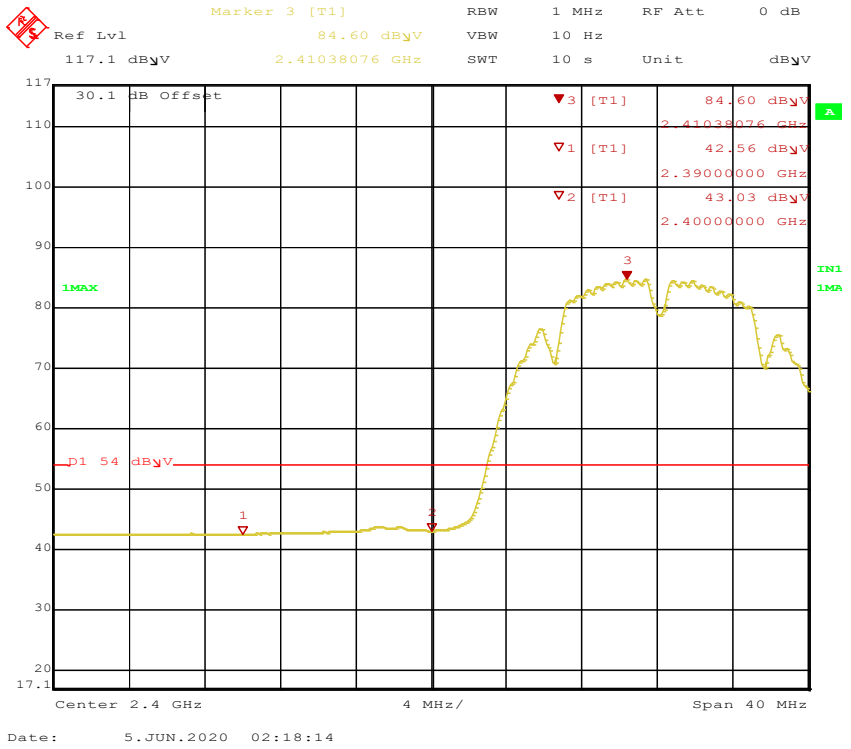


Figure 60: Radiated Emission at the Edge for 802.11b-2412 MHz-1 Mbps-H-Ave

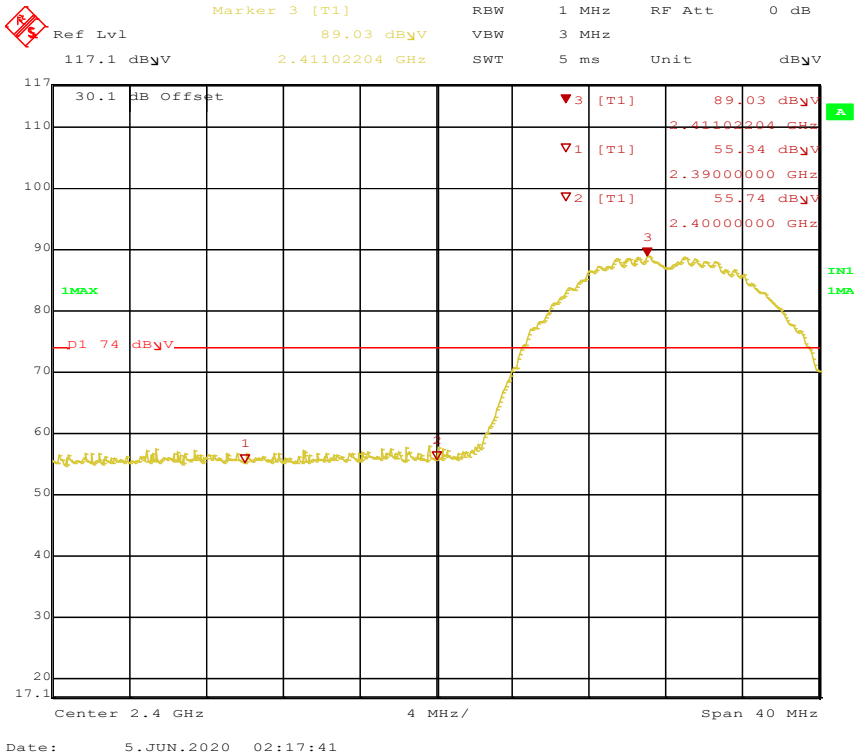


Figure 61: Radiated Emission at the Edge for 802.11b-2412 MHz-1 Mbps-H-Pk

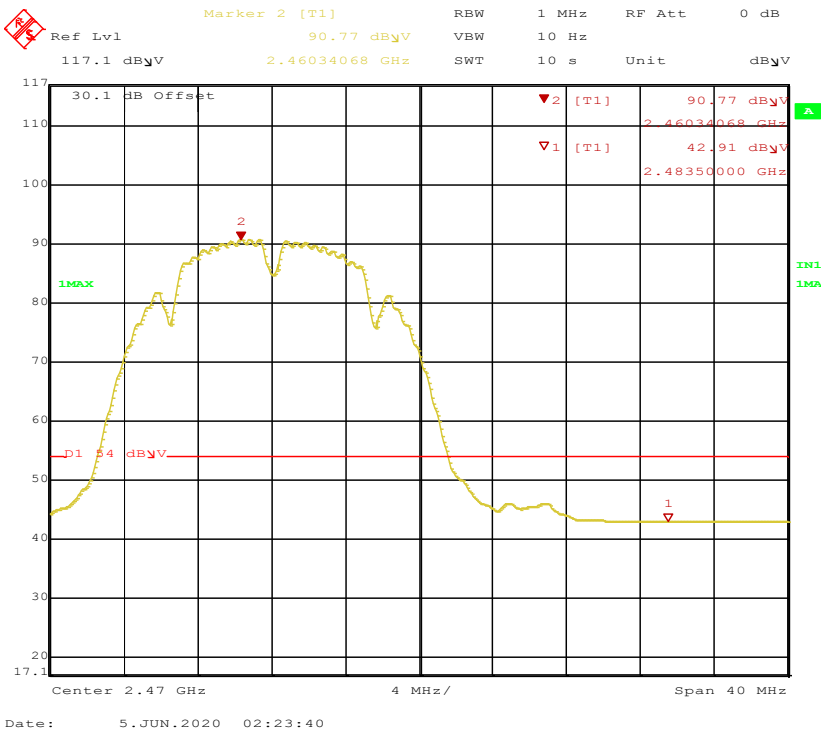


Figure 62: Radiated Emission at the Edge for 802.11b-2462 MHz-1 Mbps-H-Ave

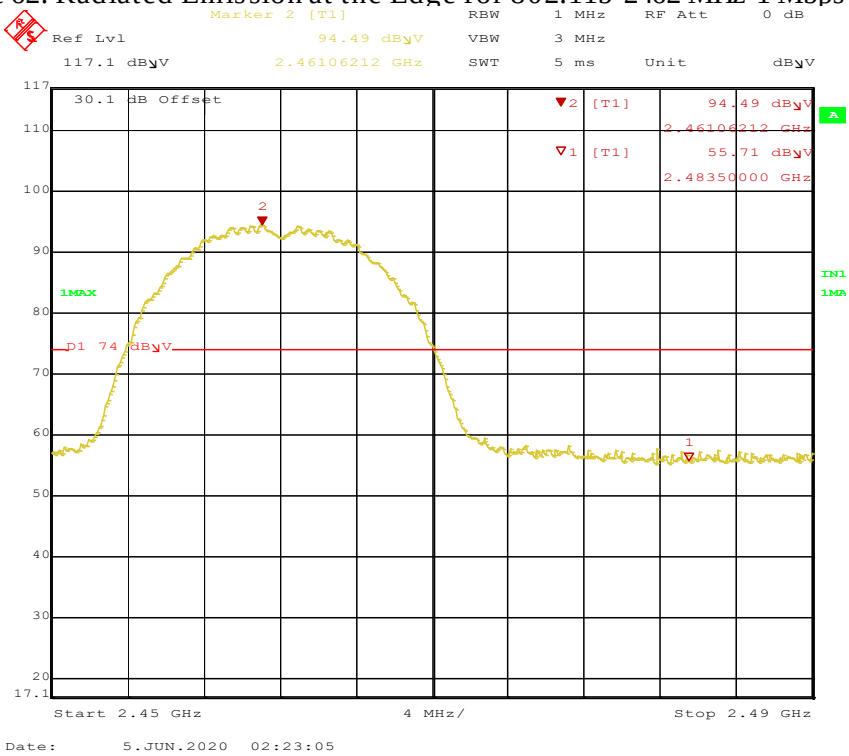


Figure 63: Radiated Emission at the Edge for 802.11b-2462 MHz-1 Mbps-H-Pk

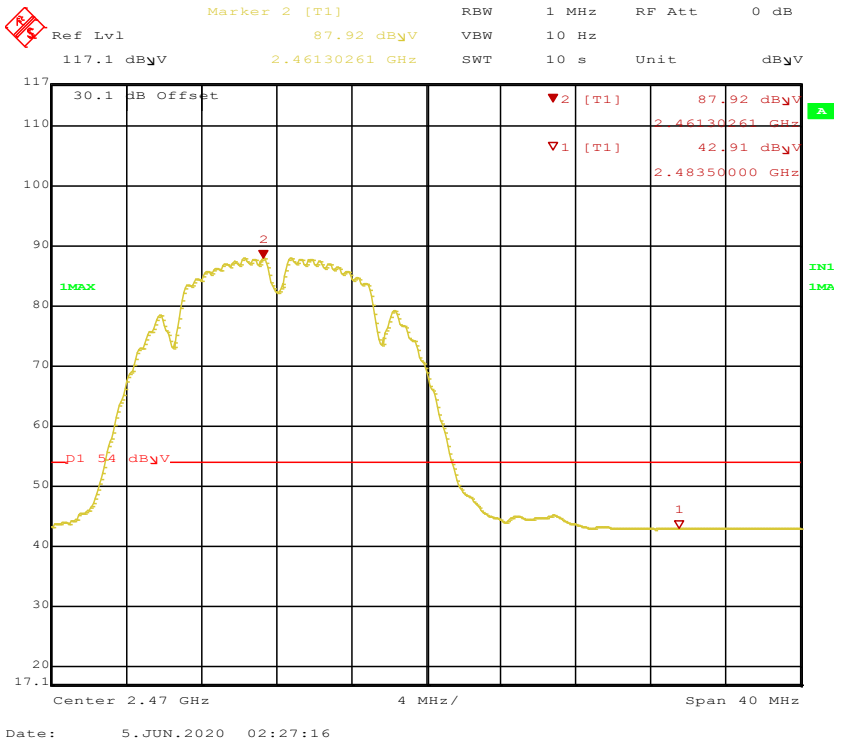


Figure 64: Radiated Emission at the Edge for 802.11b-2462 MHz-1 Mbps-V-Ave

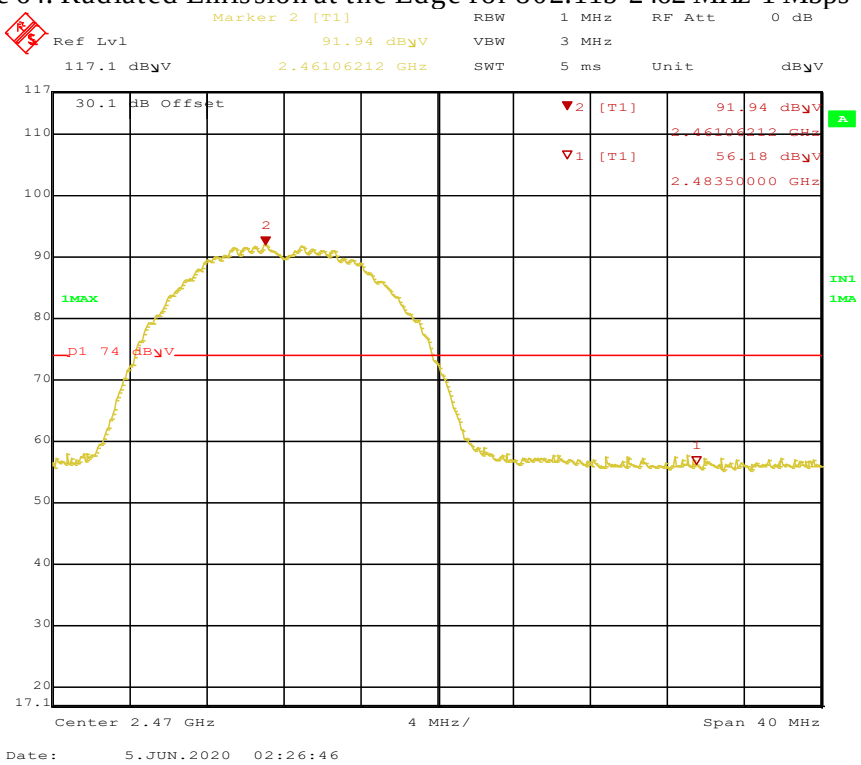


Figure 65: Radiated Emission at the Edge for 802.11b-2462 MHz-1 Mbps-V-Pk

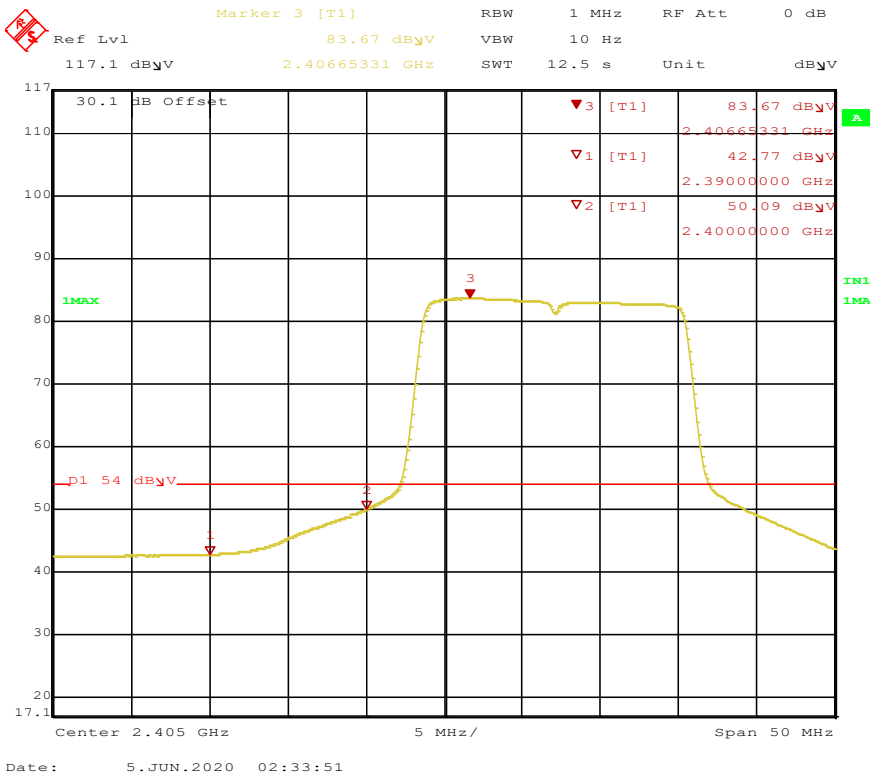


Figure 66: Radiated Emission at the Edge for 802.11g-2412 MHz-6 Mbps-V-Ave

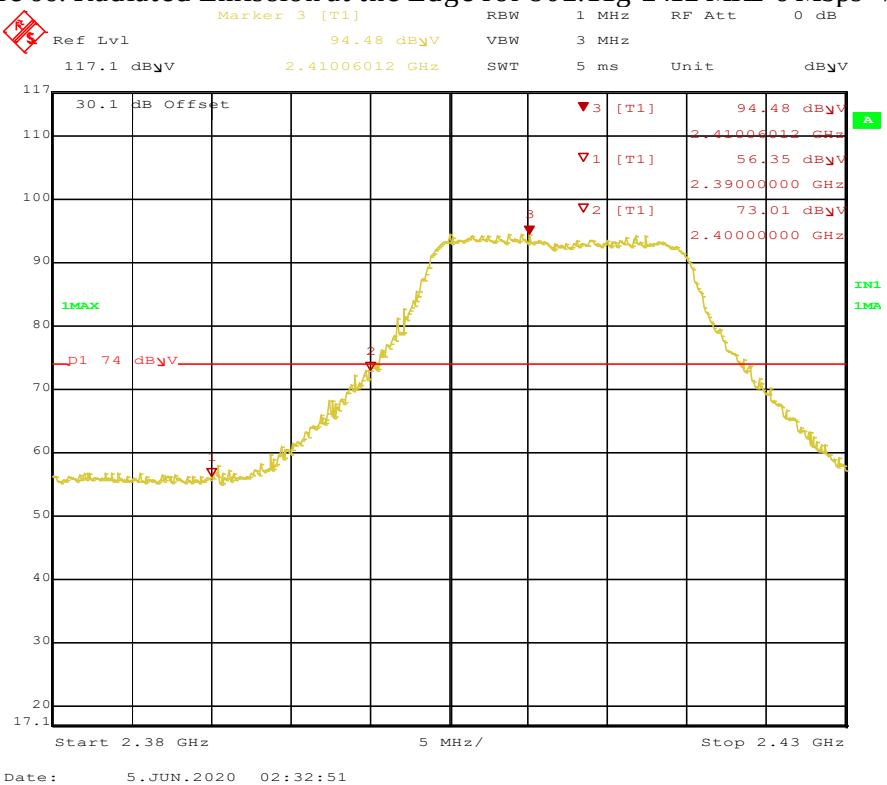


Figure 67: Radiated Emission at the Edge for 802.11g-2412 MHz-6 Mbps-V-Pk

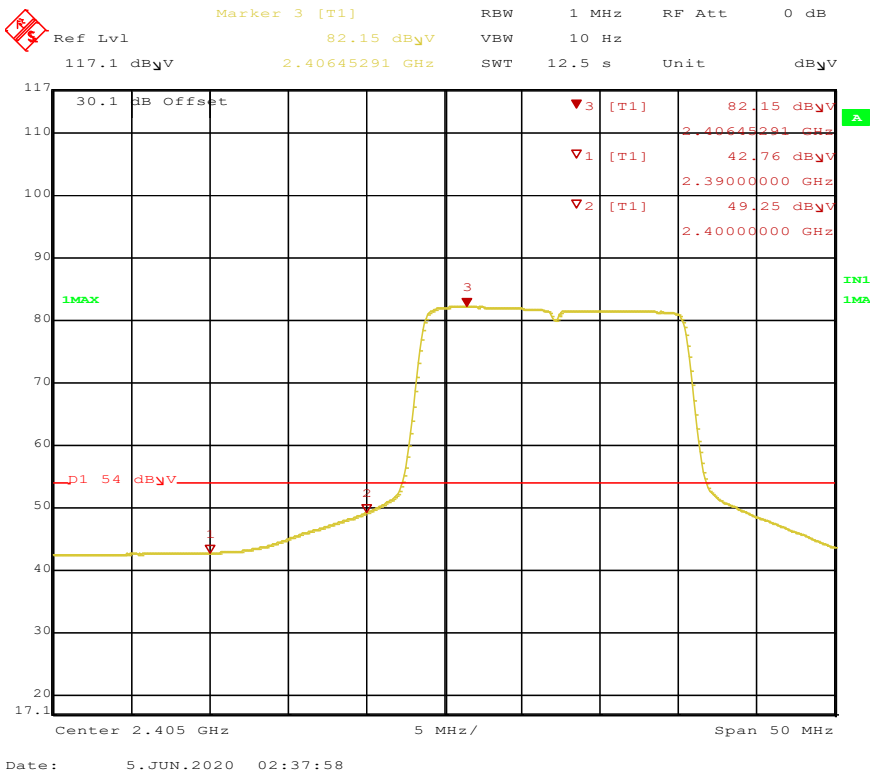


Figure 68: Radiated Emission at the Edge for 802.11g-2412 MHz-6 Mbps-H-Ave

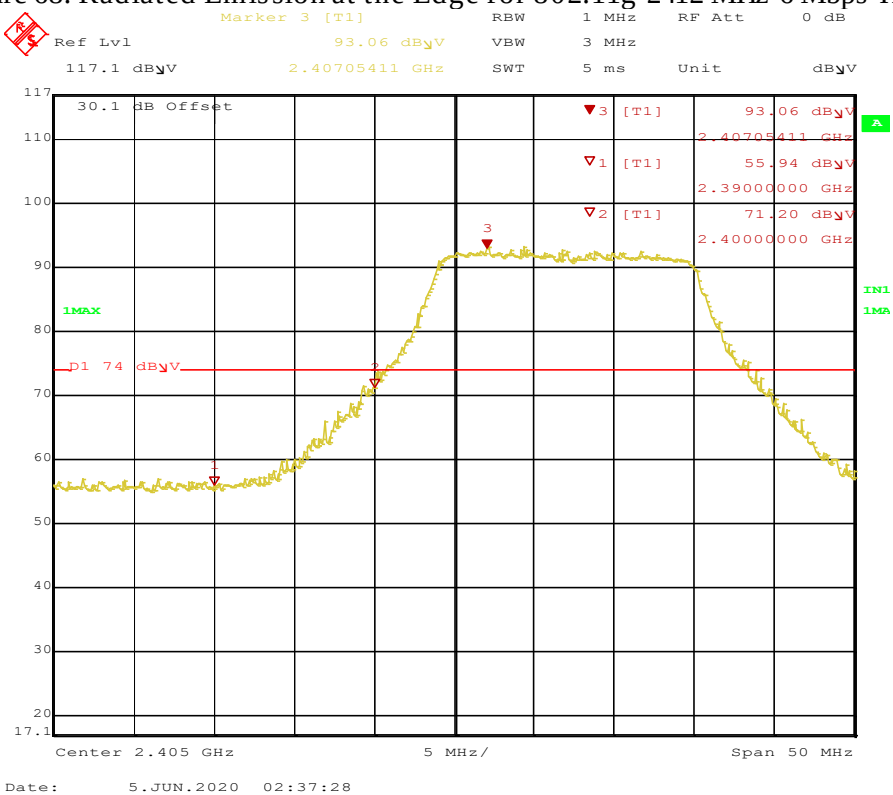


Figure 69: Radiated Emission at the Edge for 802.11g-2412 MHz-6 Mbps-H-Pk

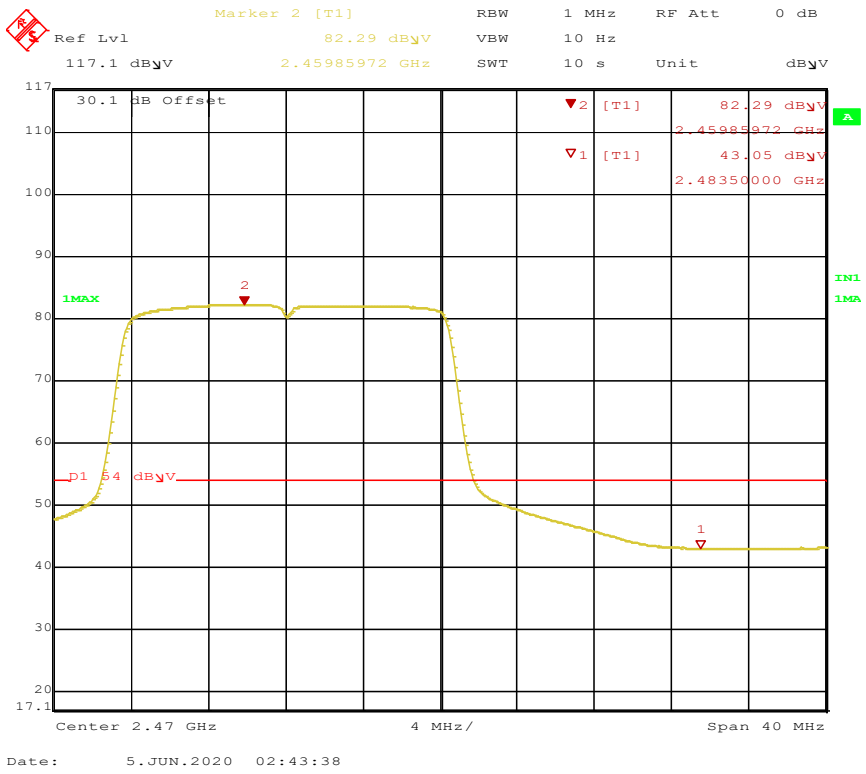


Figure 70: Radiated Emission at the Edge for 802.11g-2462 MHz-6 Mbps-H-Ave

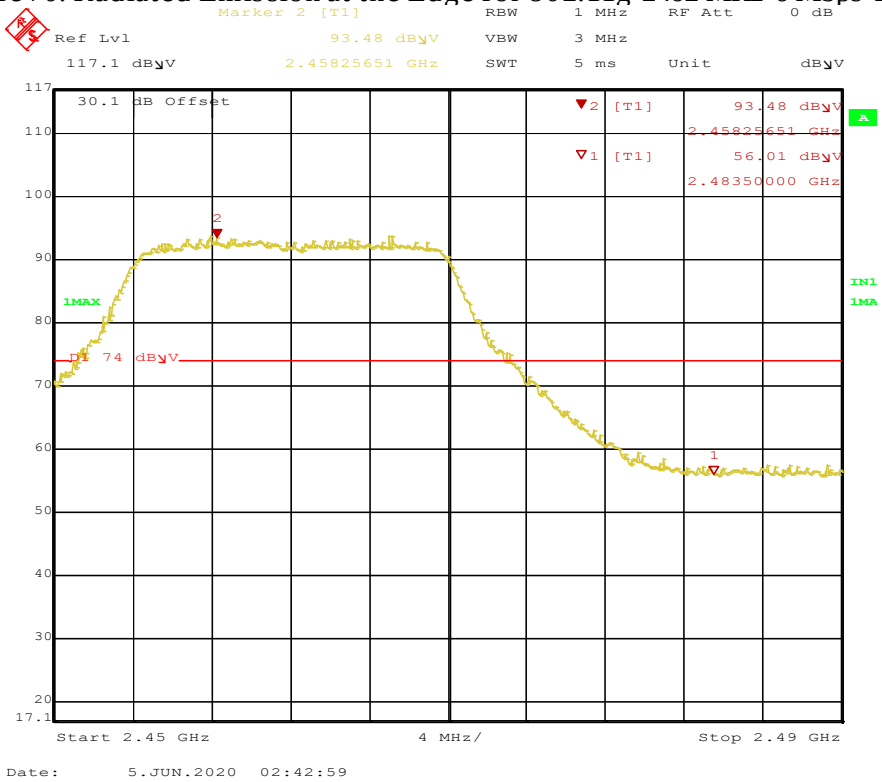


Figure 71: Radiated Emission at the Edge for 802.11g-2462 MHz-6 Mbps-H-Pk

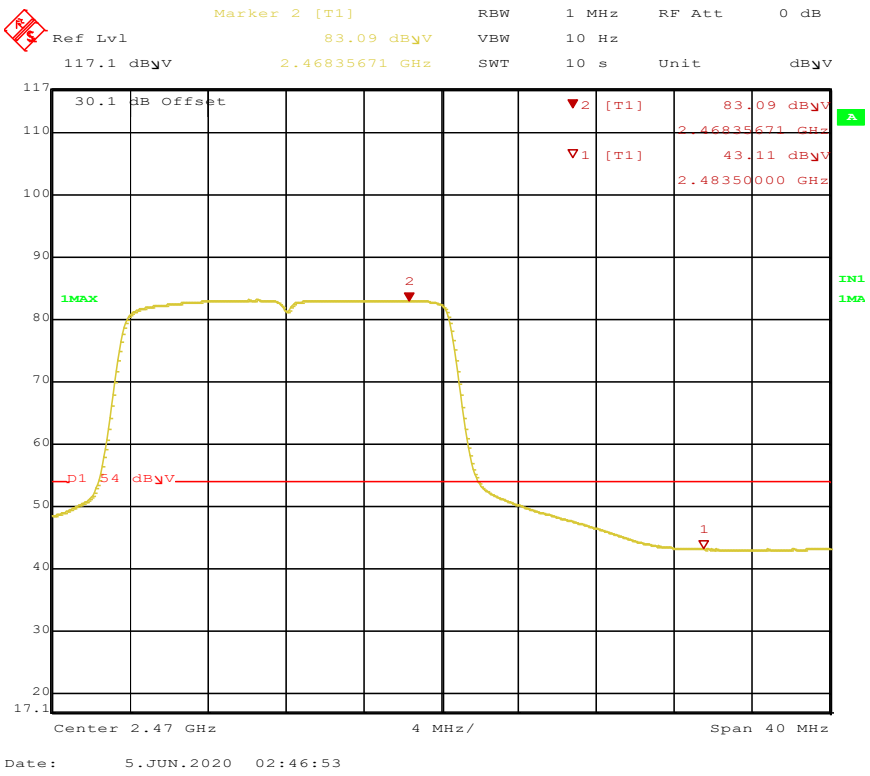


Figure 72: Radiated Emission at the Edge for 802.11g-2462 MHz-6 Mbps-V-Ave

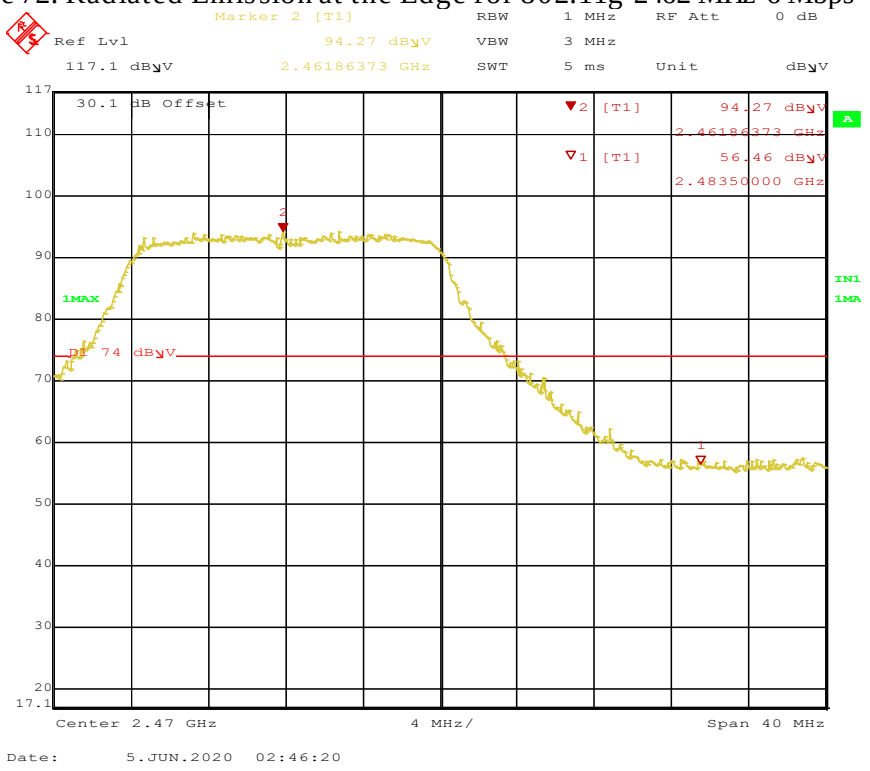


Figure 73: Radiated Emission at the Edge for 802.11g-2462 MHz-6 Mbps-V-Pk

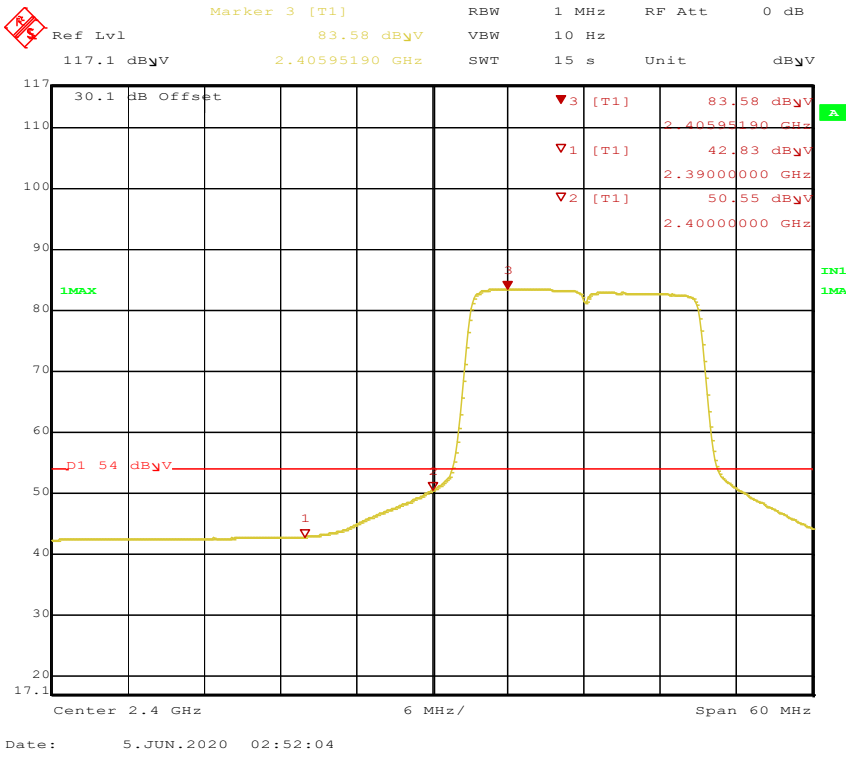


Figure 74: Radiated Emission at the Edge for 802.11n HT20-2412 MHz-6.5 Mbps-V-Ave

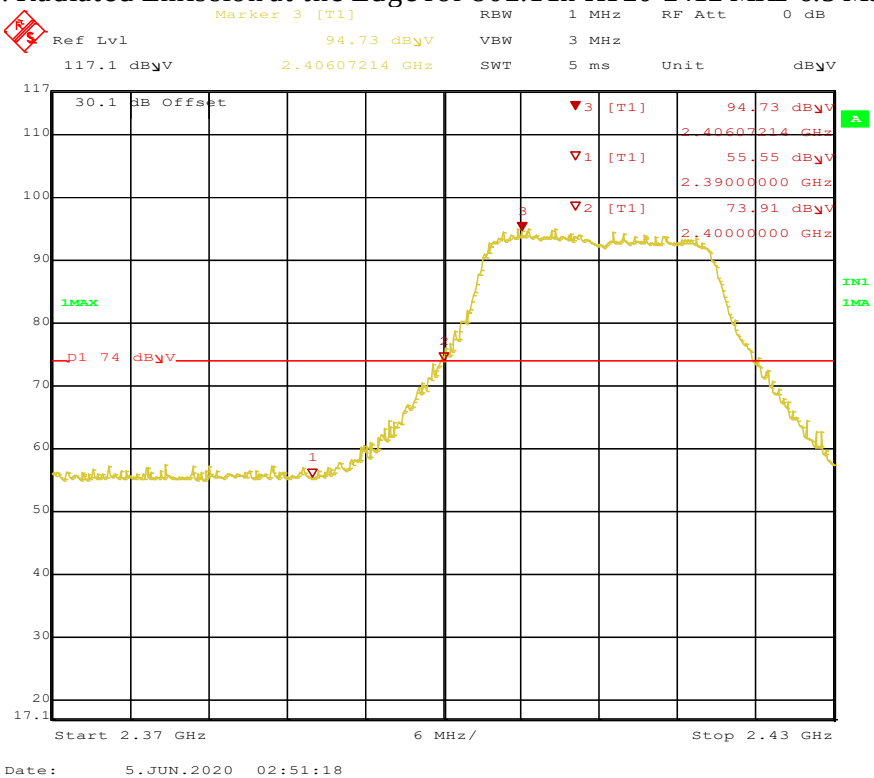


Figure 75: Radiated Emission at the Edge for 802.11n HT20-2412 MHz-6.5 Mbps-V-Pk

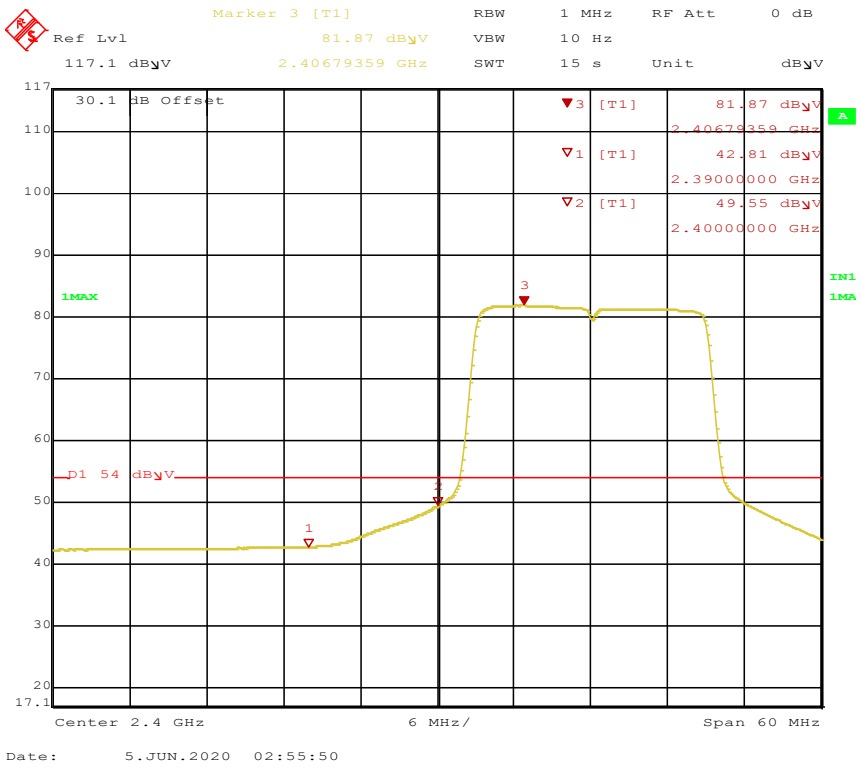


Figure 76: Radiated Emission at the Edge for 802.11n HT20-2412 MHz-6.5 Mbps-H-Ave

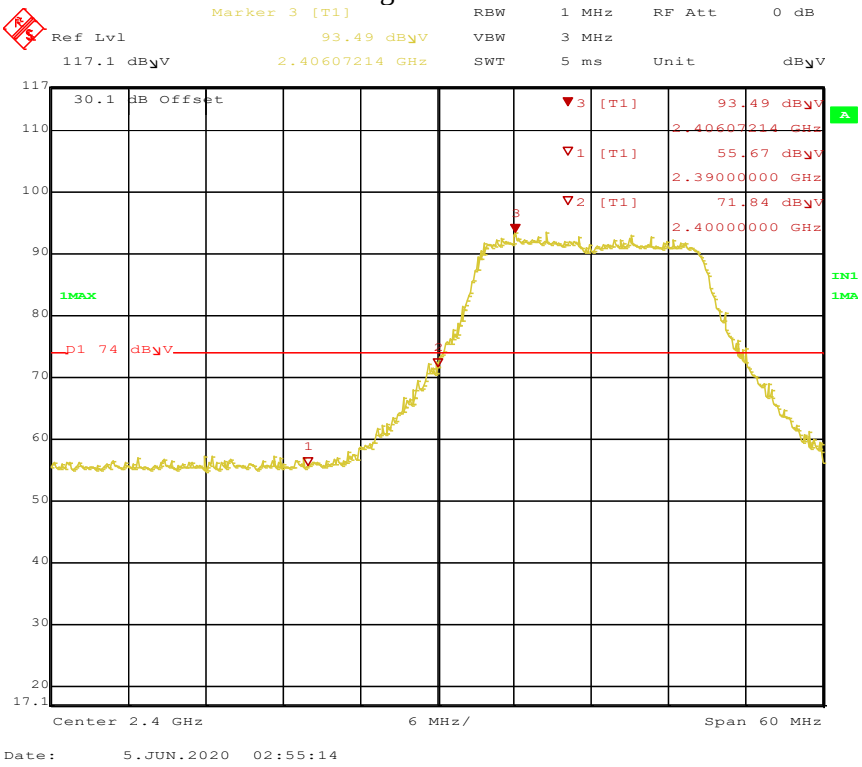


Figure 77: Radiated Emission at the Edge for 802.11n HT20-2412 MHz-6.5 Mbps-H-Pk

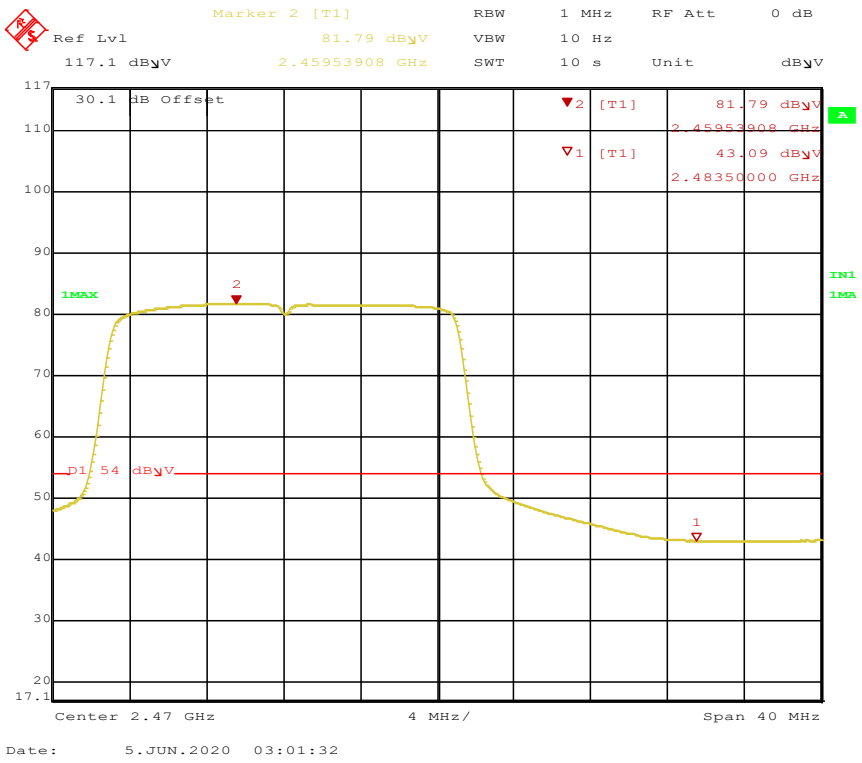


Figure 78: Radiated Emission at the Edge for 802.11n HT20-2462 MHz-6.5 Mbps-H-Ave

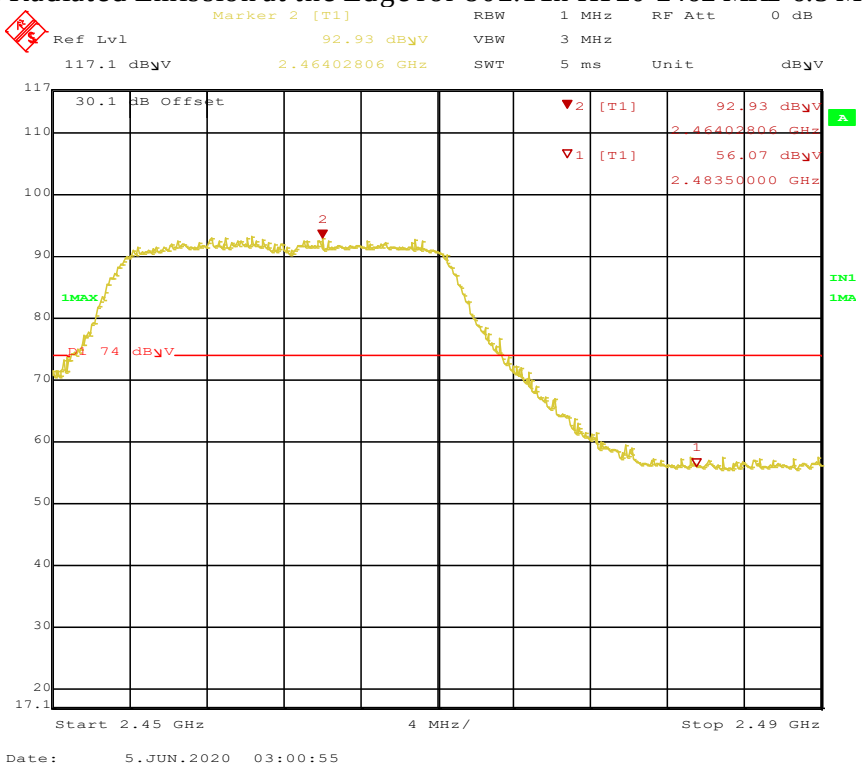


Figure 79: Radiated Emission at the Edge for 802.11n HT20-2462 MHz-6.5 Mbps-H-Pk

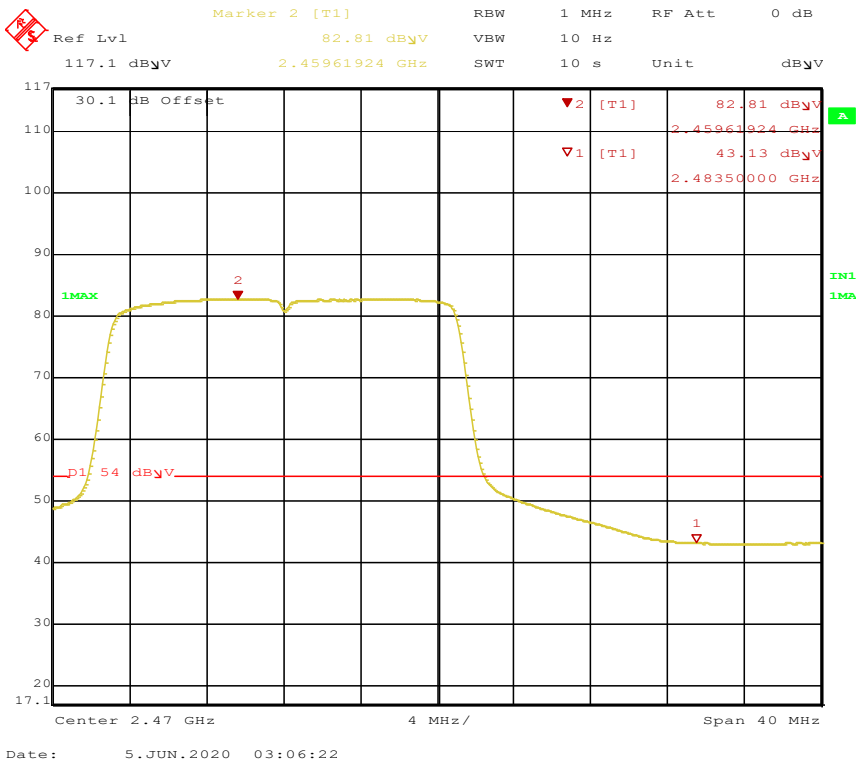


Figure 80: Radiated Emission at the Edge for 802.11n HT20-2462 MHz-6.5 Mbps-V-Ave

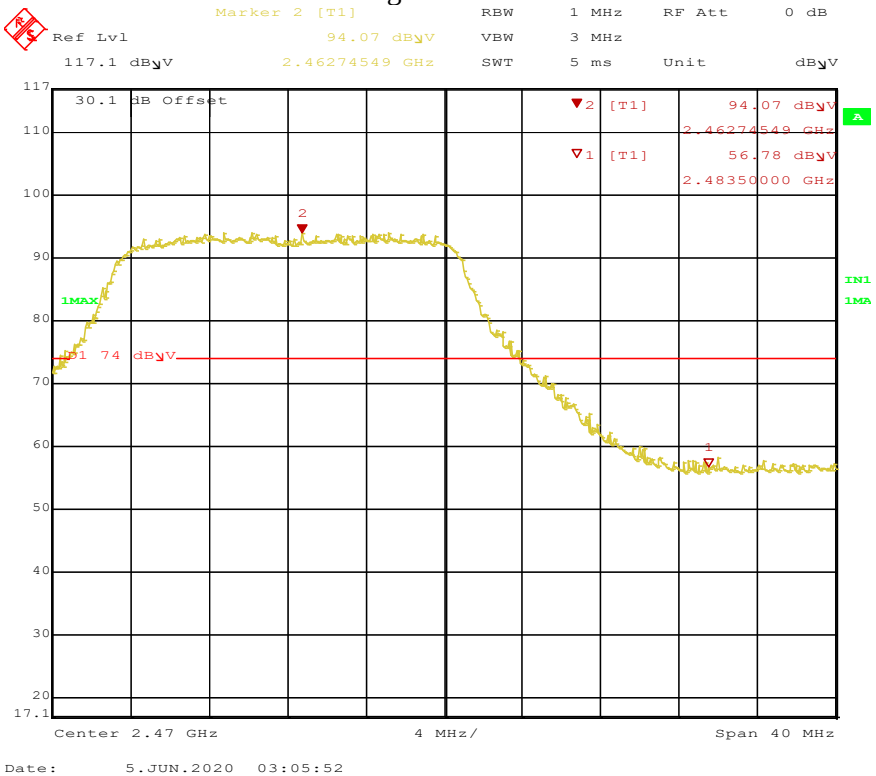


Figure 81: Radiated Emission at the Edge for 802.11n HT20-2462 MHz-6.5 Mbps-V-Pk

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 1 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 25, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 38%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	Per ANSI C63.10:2013
Dist/Ant Used	3m / JB3	**Performed by**	Jeremy Luong

9 kHz – 1 GHz Transmit at 2437 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
1.62	38.67	2.32	10.60	51.59	Pk	V	115	232	63.43	-11.84
3.15	38.67	2.36	10.62	51.65	Pk	V	115	69	69.50	-17.85
3.44	38.24	2.37	10.65	51.25	Pk	V	115	271	69.50	-18.25
240.03	49.58	3.43	-15.92	37.10	QP	H	186	353	46.00	-8.90
34.83	42.70	2.51	-9.97	35.25	QP	V	123	110	40.00	-4.75
44.82	53.27	2.59	-17.29	38.56	QP	V	102	4	40.00	-1.44
57.03	47.89	2.67	-20.80	29.77	QP	V	152	263	40.00	-10.24
59.98	48.74	2.68	-20.69	30.72	QP	V	117	242	40.00	-9.28
84.82	52.81	2.80	-20.67	34.94	QP	V	129	272	40.00	-5.06
720.04	39.51	4.64	-6.96	37.19	QP	V	129	331	46.00	-8.81

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

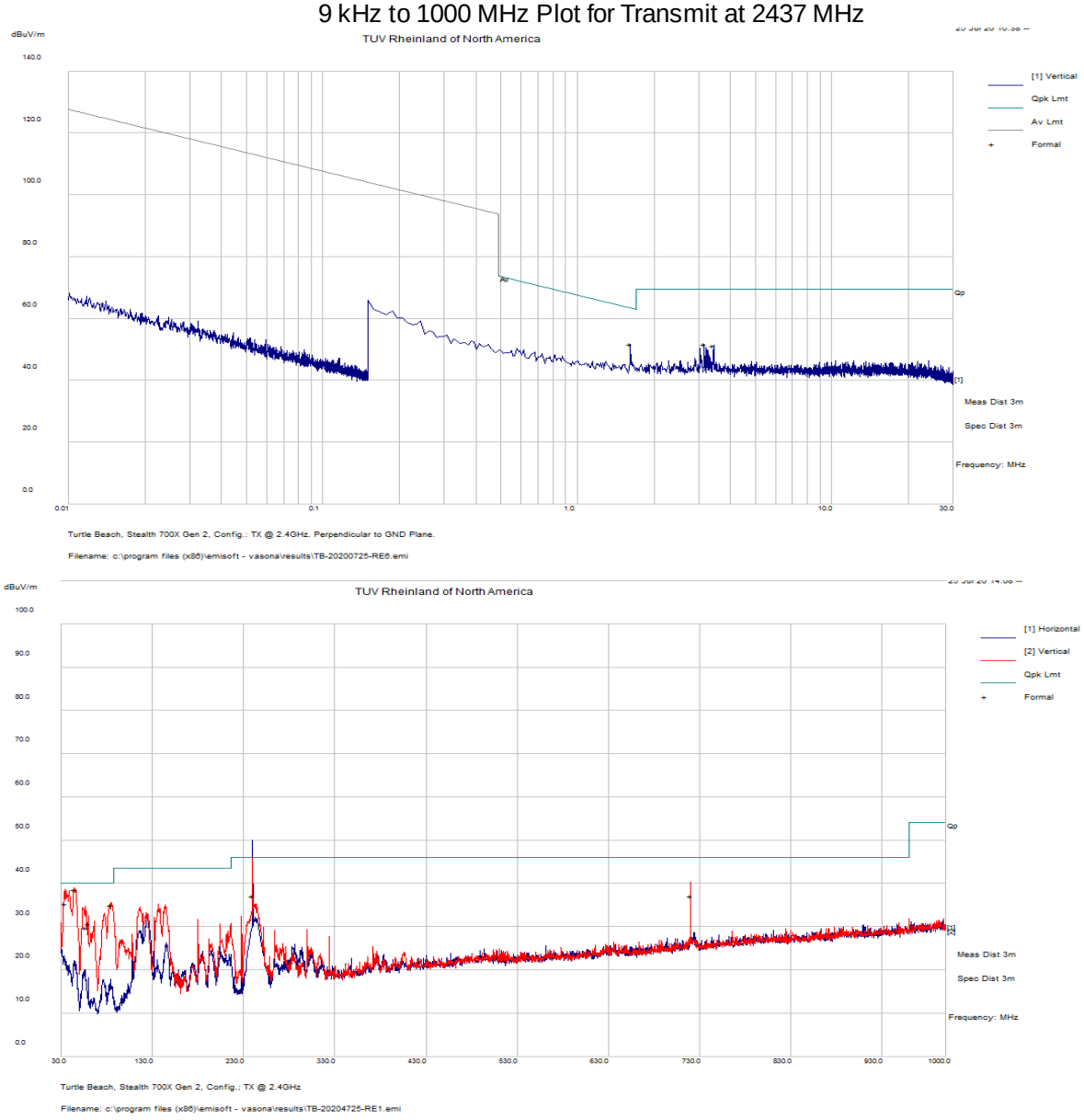
Note: 1. Worst case was observed on the Mid channel of 802.11b in 1 Mbps mode.
2. Modes tested were 802.11b, 802.11g and 802.11n HT20 (low, mid & high channels).

SOP 1 Radiated Emissions

Tracking # 32063006.001 Page 2 of 18

EUT Name	Wireless Audio Headset	**Date**	July 25, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 38%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	Per ANSI C63.10:2013
Dist/Ant Used	3m / JB3 & 6505	**Date**	Jeremy Luong

9 kHz to 1000 MHz Plot for Transmit at 2437 MHz



Notes: None.

SOP 1 Radiated Emissions — Tracking # 32063006.001 Page 3 of 18

EUT Name	Wireless Audio Headset	**Date**	July 15, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21° C / 39%rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

1 – 26 GHz Transmit at 2412 MHz (Low Channel)

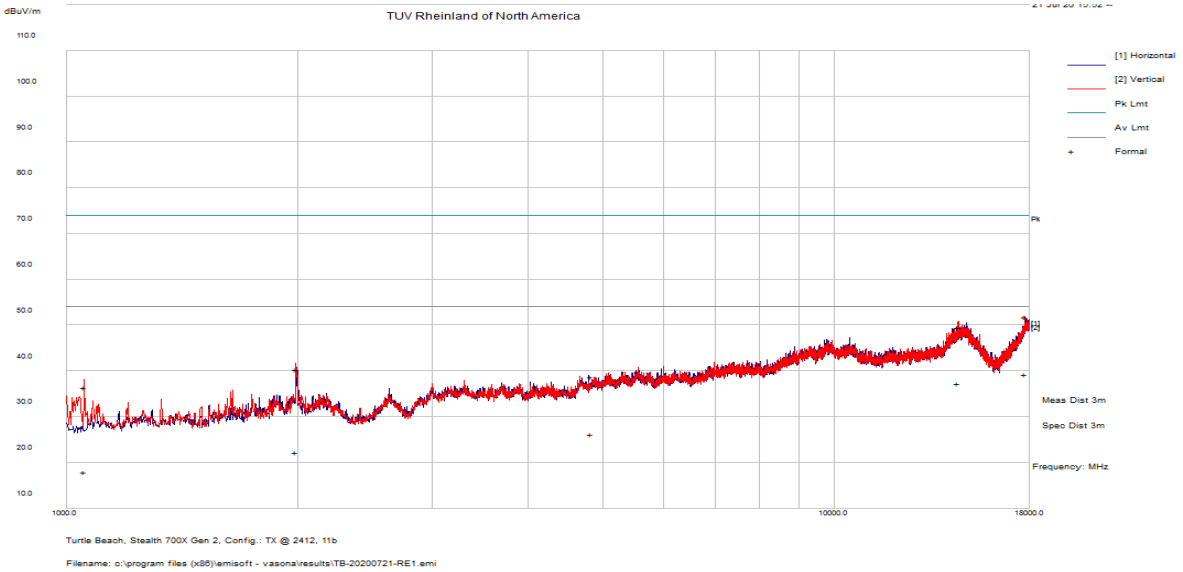
Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4824.81	60.32	1.89	-23.53	38.68	Pk	H	162	286	74.00	-35.32
4824.81	47.79	1.89	-23.53	26.15	Ave	H	162	286	54.00	-27.85
1055.78	68.94	0.60	-33.16	36.37	Pk	V	199	174	74.00	-37.63
1055.78	50.39	0.60	-33.16	17.82	Ave	V	199	174	54.00	-36.18
1990.78	69.01	0.89	-29.57	40.32	Pk	V	136	268	74.00	-33.68
1990.78	50.82	0.89	-29.57	22.13	Ave	V	136	268	54.00	-31.87
14541.56	58.93	3.47	-13.02	49.38	Pk	V	219	36	74.00	-24.62
14541.56	46.87	3.47	-13.02	37.31	Ave	V	219	36	54.00	-16.69
17763.59	55.95	4.08	-8.29	51.74	Pk	V	204	274	74.00	-22.26
17763.59	43.49	4.08	-8.29	39.28	Ave	V	204	274	54.00	-14.72
1 – 26 GHz Transmit at 2437 MHz (Middle Channel)										
1998.75	68.72	0.90	-29.59	40.03	Pk	H	243	221	74.00	-33.97
1998.75	51.30	0.90	-29.59	22.61	Ave	H	243	221	54.00	-31.39
4874.69	60.30	1.90	-23.17	39.03	Pk	V	129	360	74.00	-34.97
4874.69	48.14	1.90	-23.17	26.87	Ave	V	129	360	54.00	-27.13
17912.34	54.94	4.11	-7.94	51.11	Pk	V	136	360	74.00	-22.89
17912.34	43.25	4.11	-7.94	39.42	Ave	V	136	360	54.00	-14.58
1 – 26 GHz Transmit at 2462 MHz (High Channel)										
1993.44	69.07	0.89	-29.57	40.38	Pk	H	136	94	74.00	-33.62
1993.44	51.18	0.89	-29.57	22.49	Ave	H	136	94	54.00	-31.51
4875.47	60.81	1.90	-23.17	39.55	Pk	V	217	241	74.00	-34.46
4875.47	48.26	1.90	-23.17	26.99	Ave	V	217	241	54.00	-27.01
9972.81	58.70	2.83	-15.92	45.61	Pk	V	145	281	74.00	-28.39
9972.81	47.09	2.83	-15.92	34.00	Ave	V	145	281	54.00	-20.00

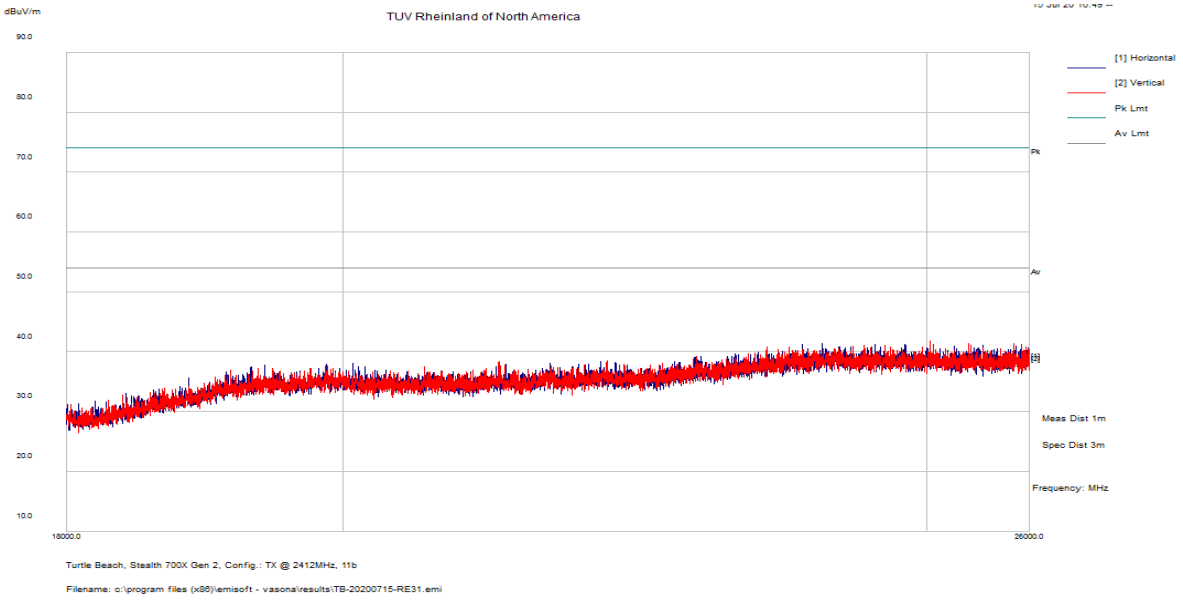
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed at 1 Mbps for 802.11b mode.
Headset intended to transmit at around +5 dBm.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 4 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 15, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21° C / 39%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz



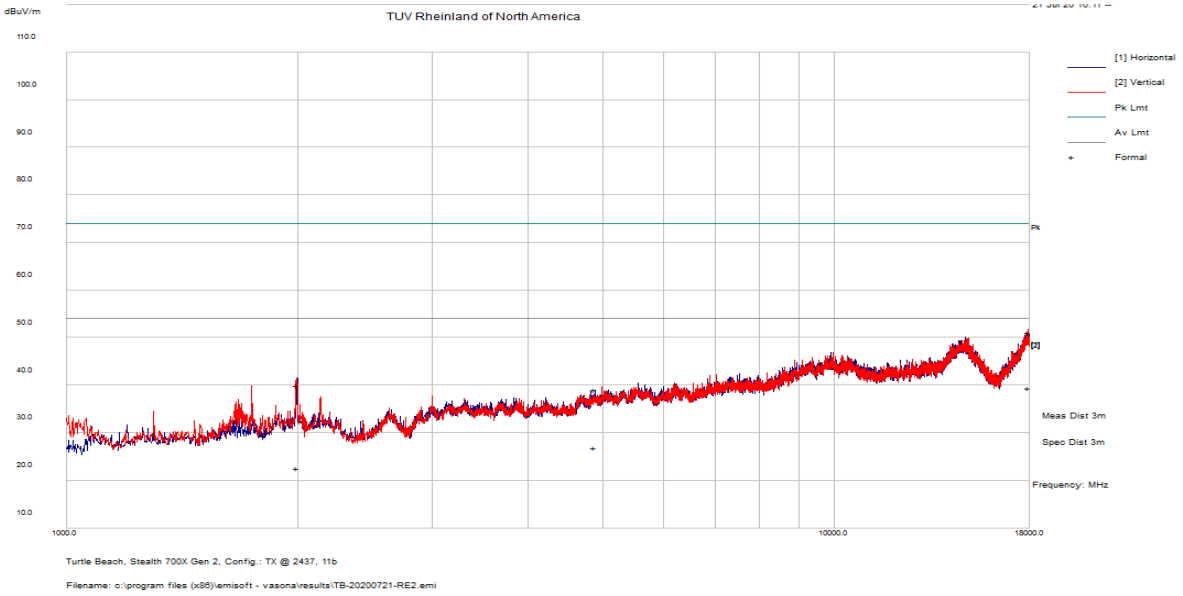


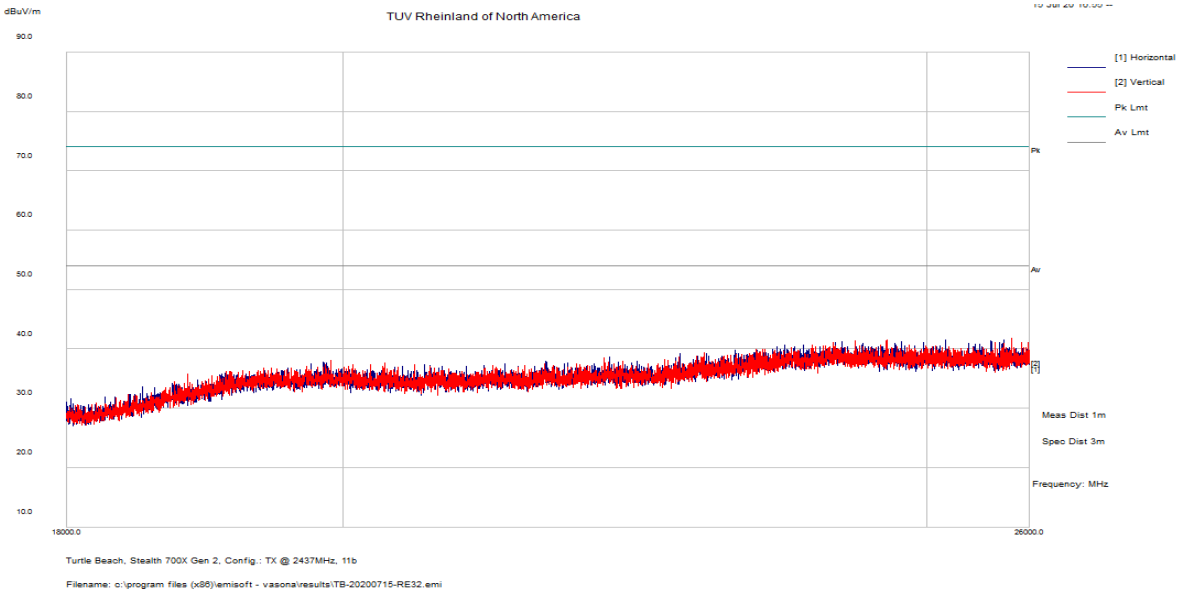
Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions — Tracking # 32063006.001 Page 5 of 18

EUT Name	Wireless Audio Headset	**Date**	July 15, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21° C / 39%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz

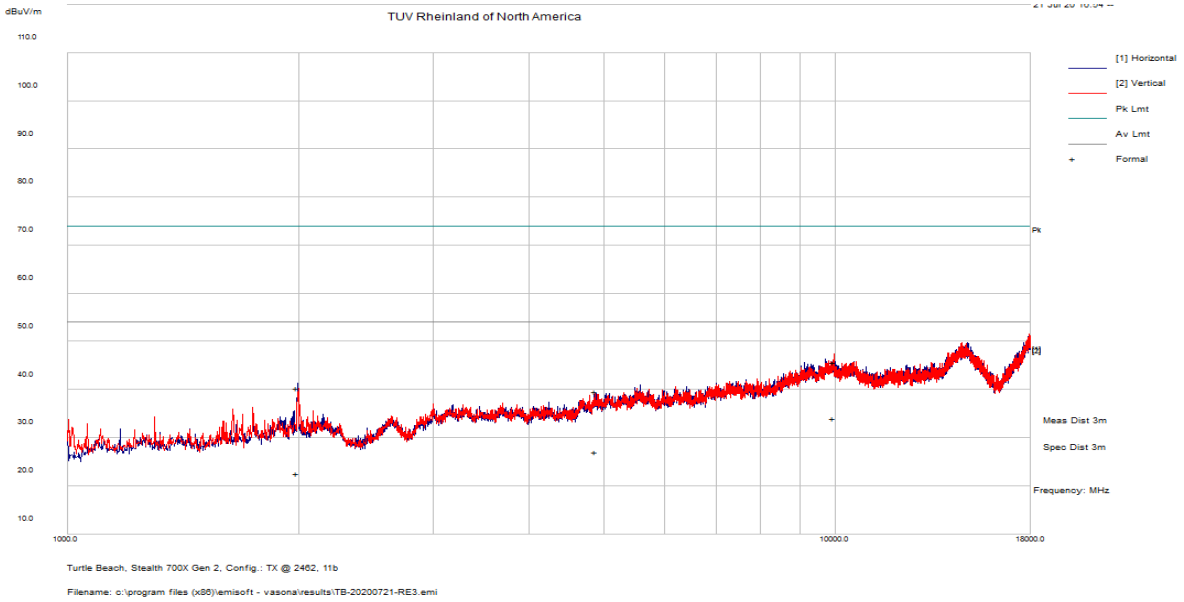


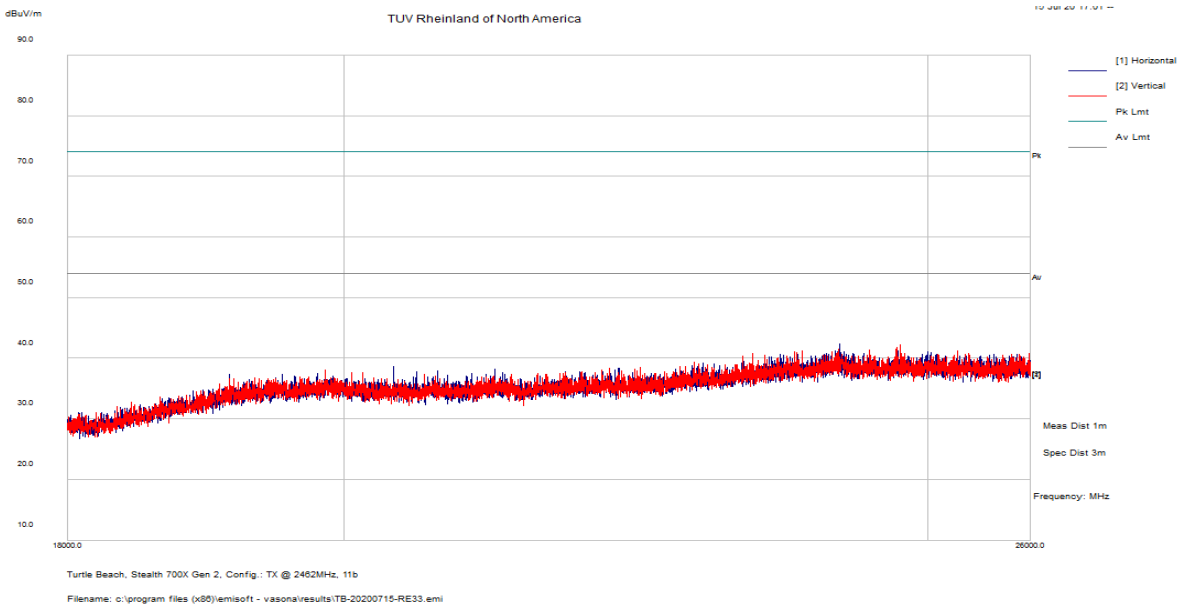


Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 6 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 15, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21° C / 39%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11b 1 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz





Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 7 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 36%rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11g 6 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

1 – 26 GHz Transmit at 2412 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
1998.75	73.57	0.90	-29.59	44.89	Pk	H	161	288	74.00	-29.11
1998.75	52.58	0.90	-29.59	23.89	Ave	H	161	288	54.00	-30.11
14870.94	58.17	3.64	-12.81	49.01	Pk	H	136	240	74.00	-25.00
14870.94	46.65	3.64	-12.81	37.48	Ave	H	136	240	54.00	-16.52
4824.47	60.66	1.89	-23.53	39.02	Pk	V	165	257	74.00	-34.98
4824.47	48.99	1.89	-23.53	27.35	Ave	V	165	257	54.00	-26.65
1 – 26 GHz Transmit at 2437 MHz (Middle Channel)										
1993.44	71.61	0.89	-29.57	42.93	Pk	H	193	318	74.00	-31.07
1993.44	52.27	0.89	-29.57	23.59	Ave	H	193	318	54.00	-30.42
14703.59	57.86	3.56	-12.59	48.83	Pk	H	217	20	74.00	-25.18
14703.59	46.26	3.56	-12.59	37.23	Ave	H	217	20	54.00	-16.77
17907.03	54.47	4.12	-7.92	50.67	Pk	H	117	218	74.00	-23.33
17907.03	42.91	4.12	-7.92	39.11	Ave	H	117	218	54.00	-14.89
4874.75	60.38	1.90	-23.17	39.10	Pk	V	207	156	74.00	-34.90
4874.75	48.32	1.90	-23.17	27.04	Ave	V	207	156	54.00	-26.96
9784.22	59.75	2.81	-15.74	46.83	Pk	V	243	321	74.00	-27.17
9784.22	47.42	2.81	-15.74	34.50	Ave	V	243	321	54.00	-19.51
1 – 26 GHz Transmit at 2462 MHz (High Channel)										
1993.44	68.16	0.89	-29.57	39.47	Pk	H	242	360	74.00	-34.53
1993.44	50.45	0.89	-29.57	21.77	Ave	H	242	360	54.00	-32.23
9436.25	56.79	2.77	-16.01	43.55	Pk	H	166	75	74.00	-30.46
9436.25	45.15	2.77	-16.01	31.91	Ave	H	166	75	54.00	-22.09
4924.97	61.30	1.90	-23.00	40.10	Pk	V	165	41	74.00	-33.90
4924.97	49.50	1.90	-23.00	28.30	Ave	V	165	41	54.00	-25.70
14886.88	58.74	3.63	-12.90	49.46	Pk	V	240	24	74.00	-24.54
14886.88	46.98	3.63	-12.90	37.70	Ave	V	240	24	54.00	-16.30

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 was observed at 6 Mbps for 802.11g mode.
Headset intended to transmit at around +5 dBm.

SOP 1 Radiated Emissions

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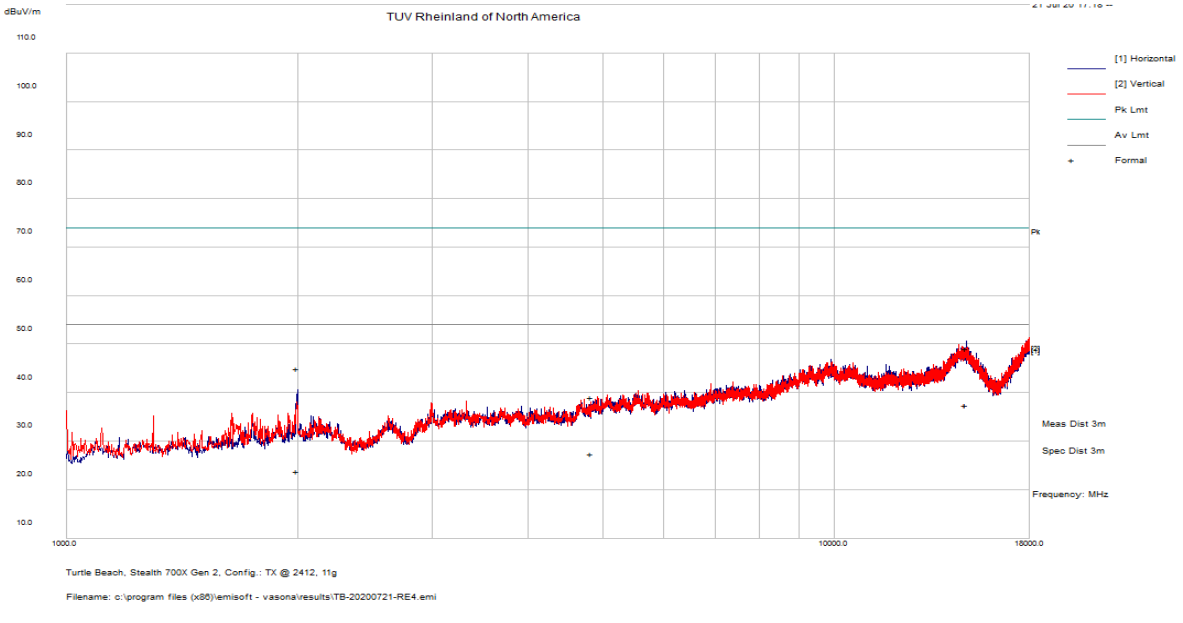
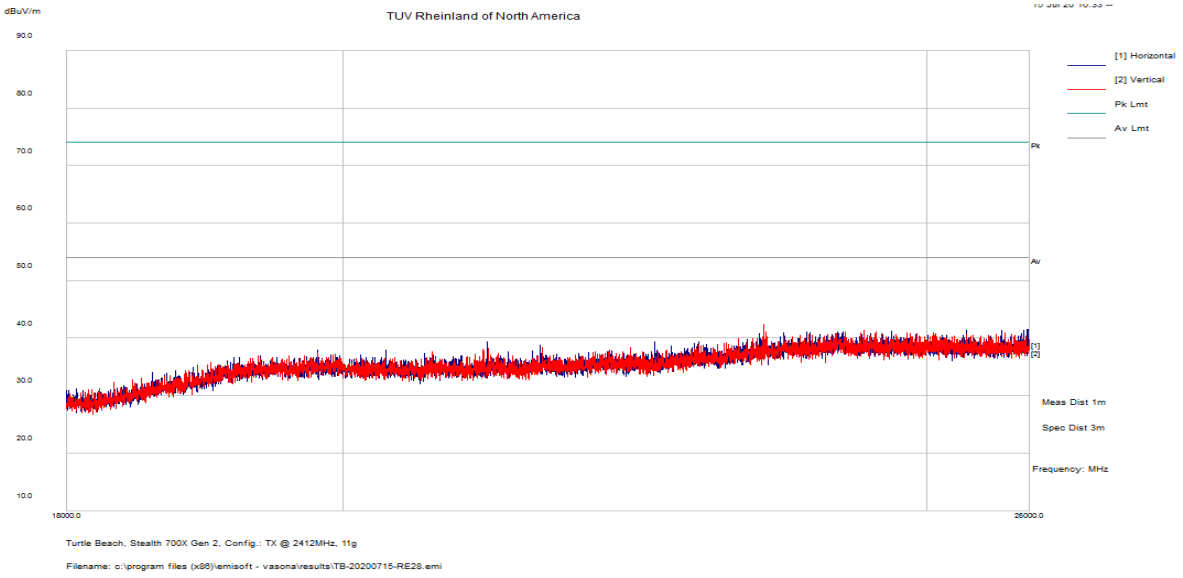
EUT Name	Wireless Audio Headset	**Date**	July 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 36%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11g 6 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz

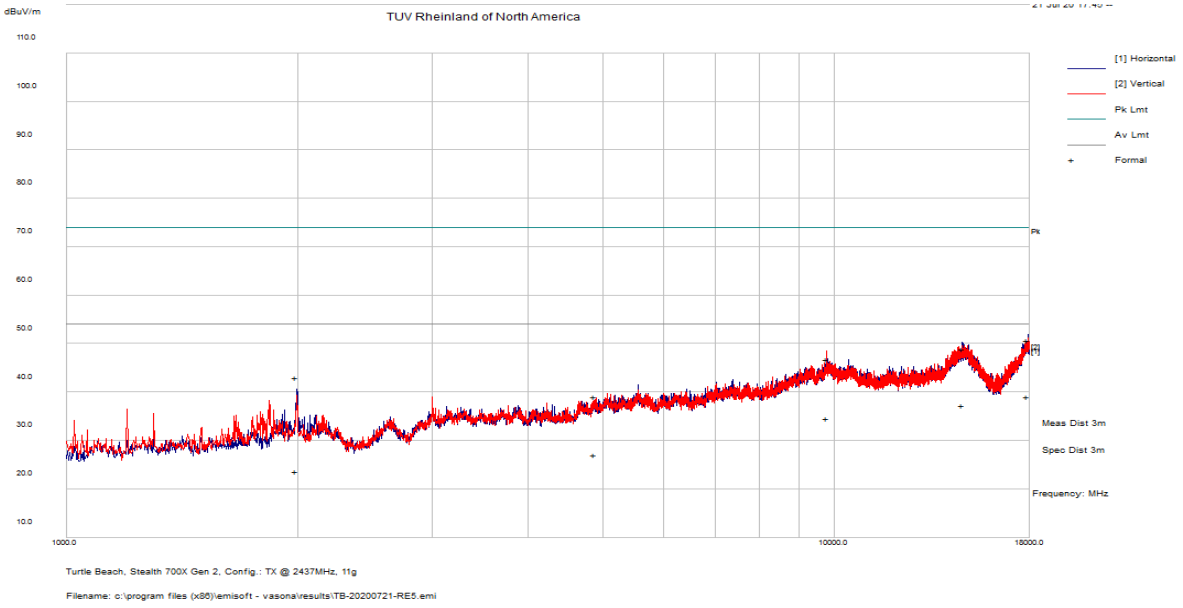


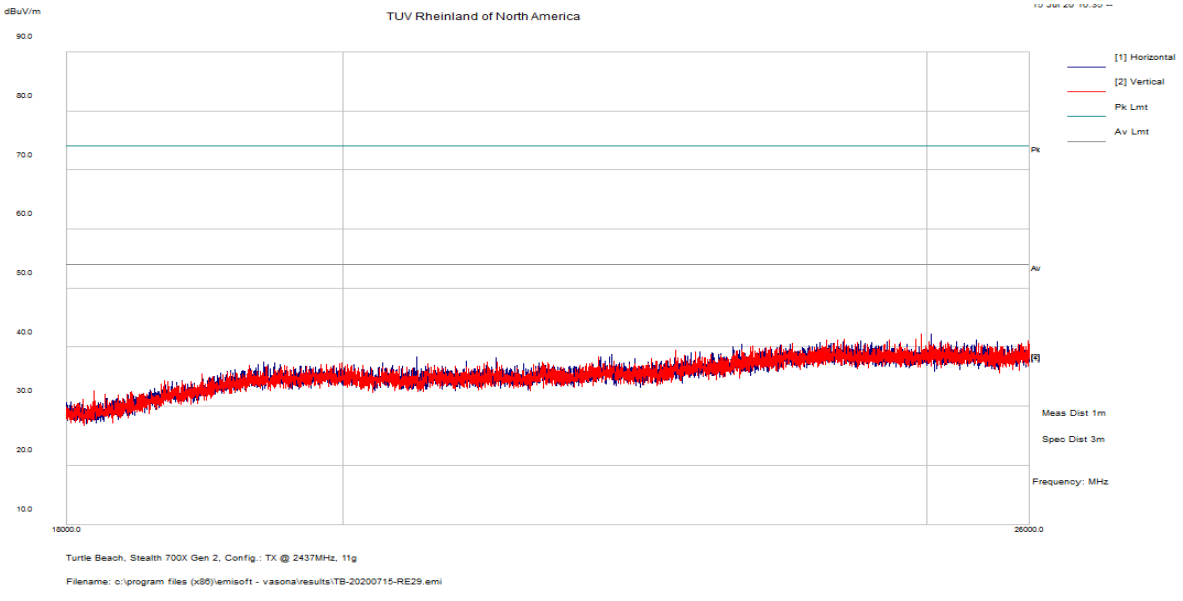


Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 9 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 36%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11g 6 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz





Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions

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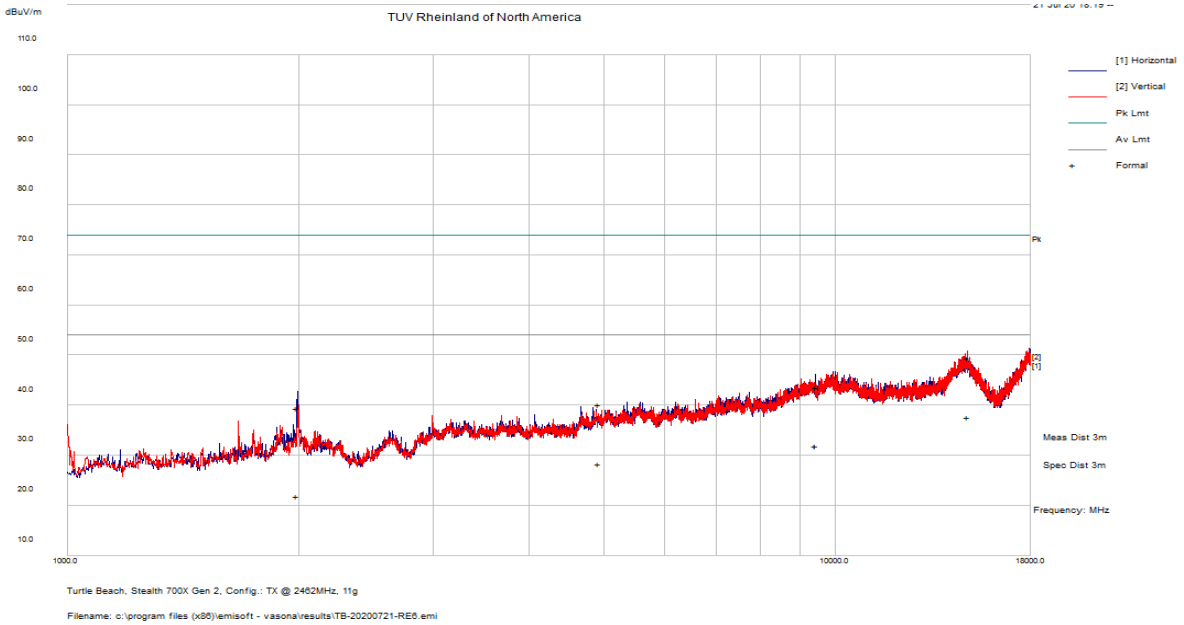
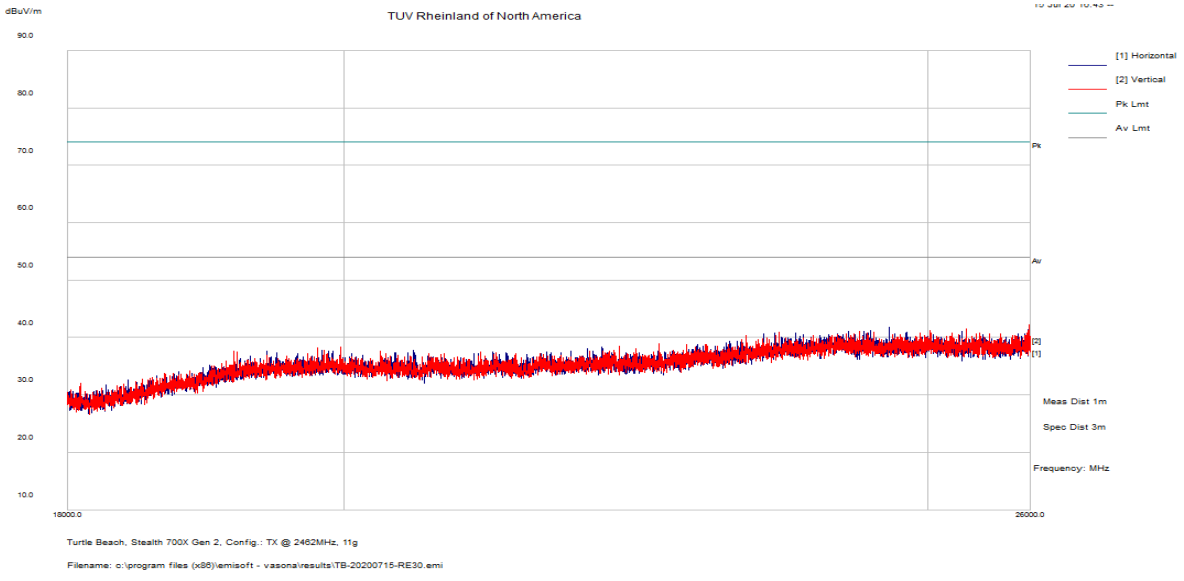
EUT Name	Wireless Audio Headset	**Date**	July 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 36%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11g 6 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz





Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 11 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 22, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 40%rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11n HT20 6.5 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

1 – 26 GHz Transmit at 2412 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
1993.44	71.36	0.89	-29.57	42.67	Pk	H	216	58	74.00	-31.33
1993.44	51.67	0.89	-29.57	22.98	Ave	H	216	58	54.00	-31.02
7481.25	58.53	2.51	-19.50	41.55	Pk	H	178	30	74.00	-32.45
7481.25	46.97	2.51	-19.50	29.98	Ave	H	178	30	54.00	-24.02
7927.50	59.52	2.52	-19.86	42.19	Pk	H	217	288	74.00	-31.81
7927.50	46.55	2.52	-19.86	29.22	Ave	H	217	288	54.00	-24.78
4822.38	60.66	1.89	-23.54	39.02	Pk	V	198	256	74.00	-34.98
4822.38	48.91	1.89	-23.54	27.27	Ave	V	198	256	54.00	-26.73
17994.69	55.84	4.12	-7.77	52.19	Pk	V	230	192	74.00	-21.81
17994.69	43.40	4.12	-7.77	39.75	Ave	V	230	192	54.00	-14.25
1 – 26 GHz Transmit at 2437 MHz (Middle Channel)										
2994.84	64.42	1.32	-26.47	39.27	Pk	V	152	334	74.00	-34.73
2994.84	50.69	1.32	-26.47	25.54	Ave	V	152	334	54.00	-28.46
4874.56	60.20	1.90	-23.17	38.93	Pk	V	178	202	74.00	-35.07
4874.56	48.59	1.90	-23.17	27.32	Ave	V	178	202	54.00	-26.68
9882.50	59.06	2.86	-15.82	46.10	Pk	V	251	20	74.00	-27.90
9882.50	46.96	2.86	-15.82	34.01	Ave	V	251	20	54.00	-19.99
17994.69	54.87	4.12	-7.77	51.22	Pk	V	263	12	74.00	-22.78
17994.69	43.30	4.12	-7.77	39.65	Ave	V	263	12	54.00	-14.35
1 – 26 GHz Transmit at 2462 MHz (High Channel)										
1998.75	71.79	0.90	-29.59	43.10	Pk	H	197	300	74.00	-30.90
1998.75	52.74	0.90	-29.59	24.05	Ave	H	197	300	54.00	-29.95
4924.09	59.71	1.86	-23.03	38.53	Pk	H	178	214	74.00	-35.47
4924.09	47.76	1.86	-23.03	26.58	Ave	H	178	214	54.00	-27.42
1680.00	78.05	0.85	-31.26	47.64	Pk	V	104	228	74.00	-26.36
1680.00	51.94	0.85	-31.26	21.53	Ave	V	104	228	54.00	-32.47
2992.19	62.35	1.33	-26.46	37.21	Pk	V	146	214	74.00	-36.79
2992.19	49.50	1.33	-26.46	24.37	Ave	V	146	214	54.00	-29.63
17877.81	54.94	4.10	-7.73	51.31	Pk	V	223	152	74.00	-22.69
17877.81	43.06	4.10	-7.73	39.43	Ave	V	223	152	54.00	-14.57

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 was observed at 6.5 Mbps for 802.11n HT20 mode. Headset intended to transmit at around +5 dBm.

SOP 1 Radiated Emissions

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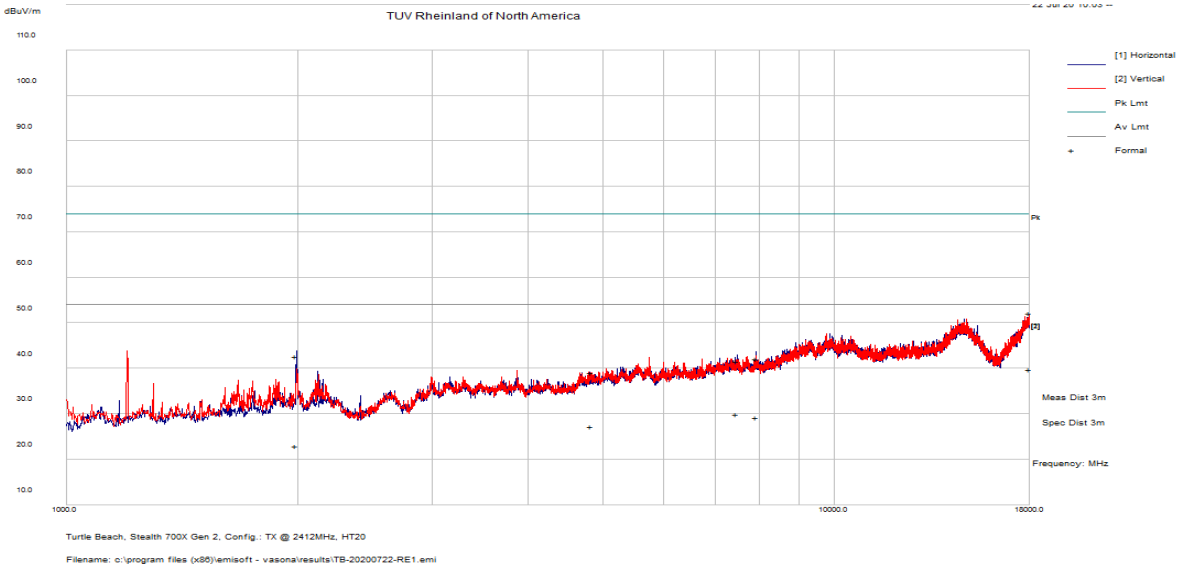
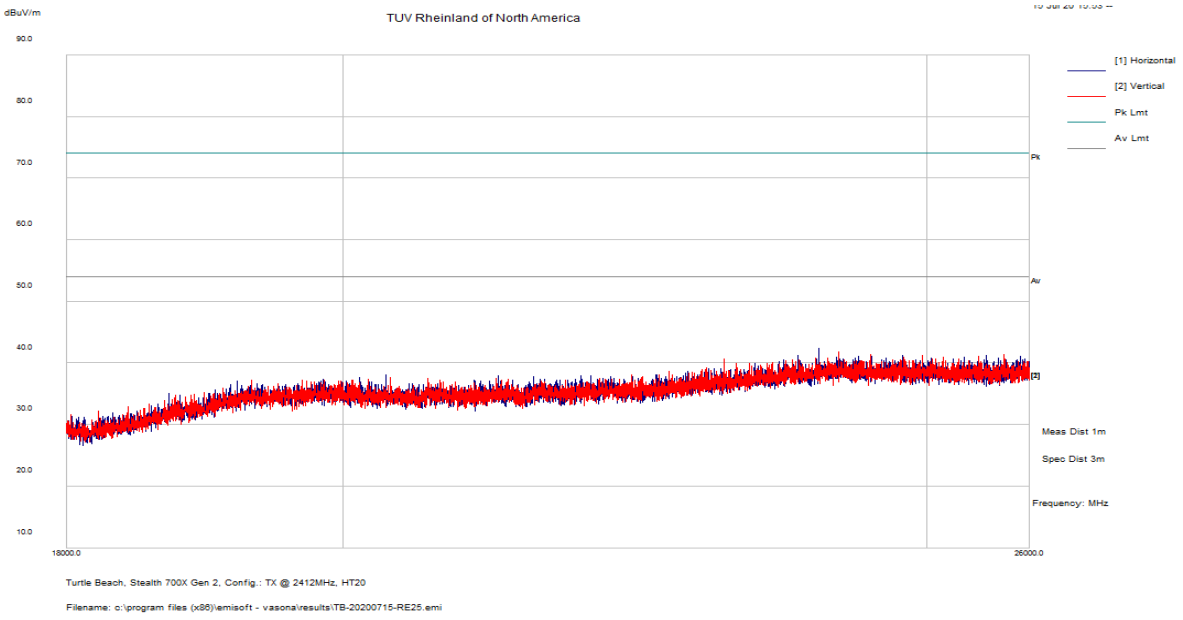
EUT Name	Wireless Audio Headset	**Date**	July 22, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11n HT20 6.5 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2412 MHz

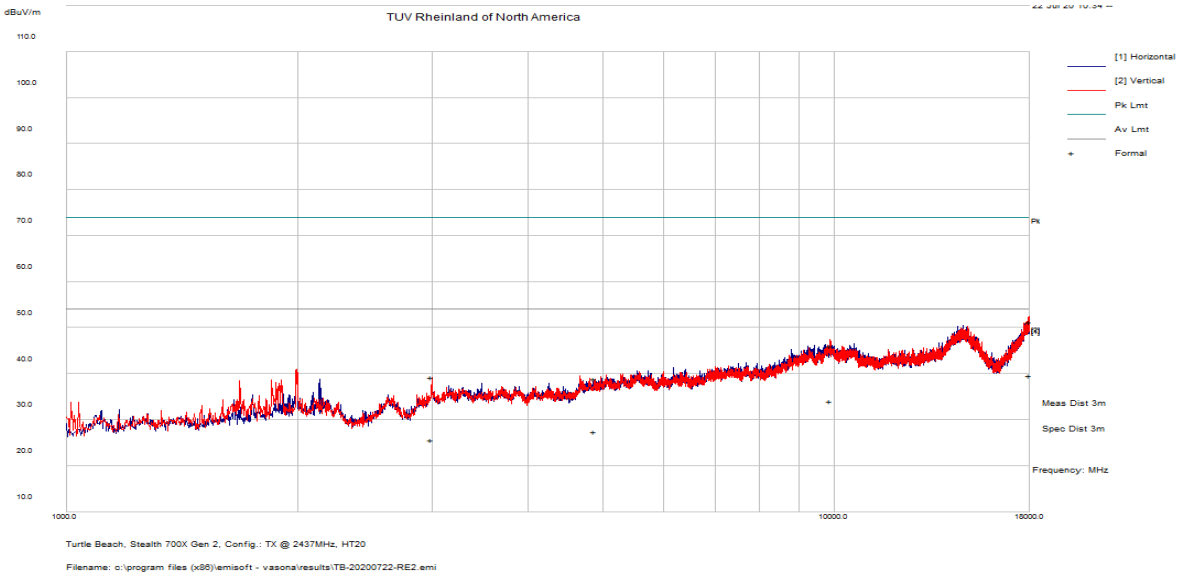


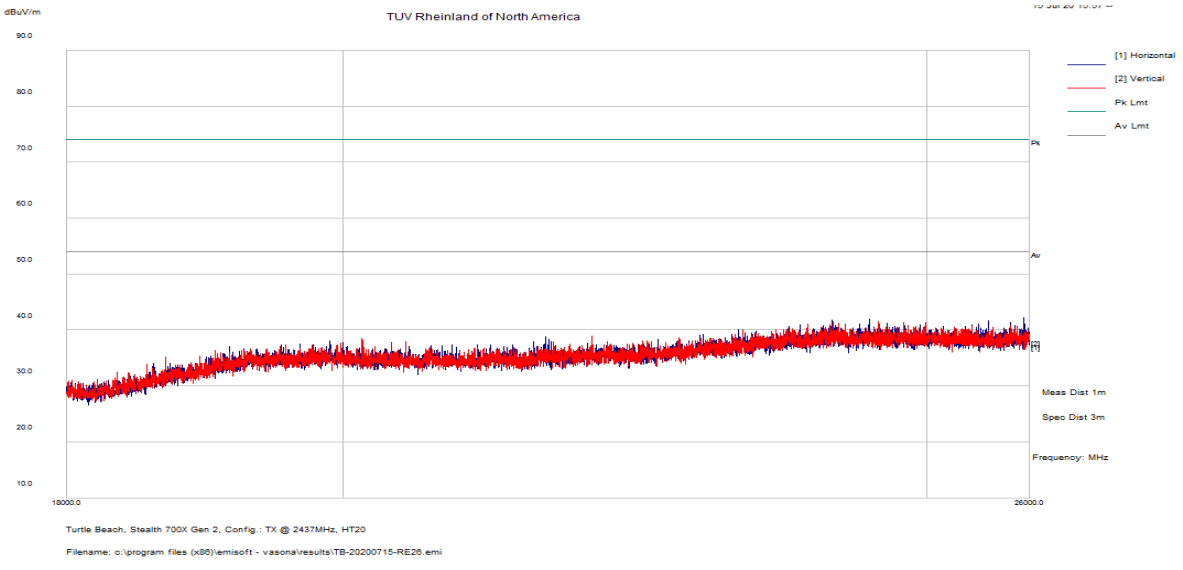


Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 13 of 18	
EUT Name	Wireless Audio Headset	**Date**	July 22, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11n HT20 6.5 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2437 MHz





Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions

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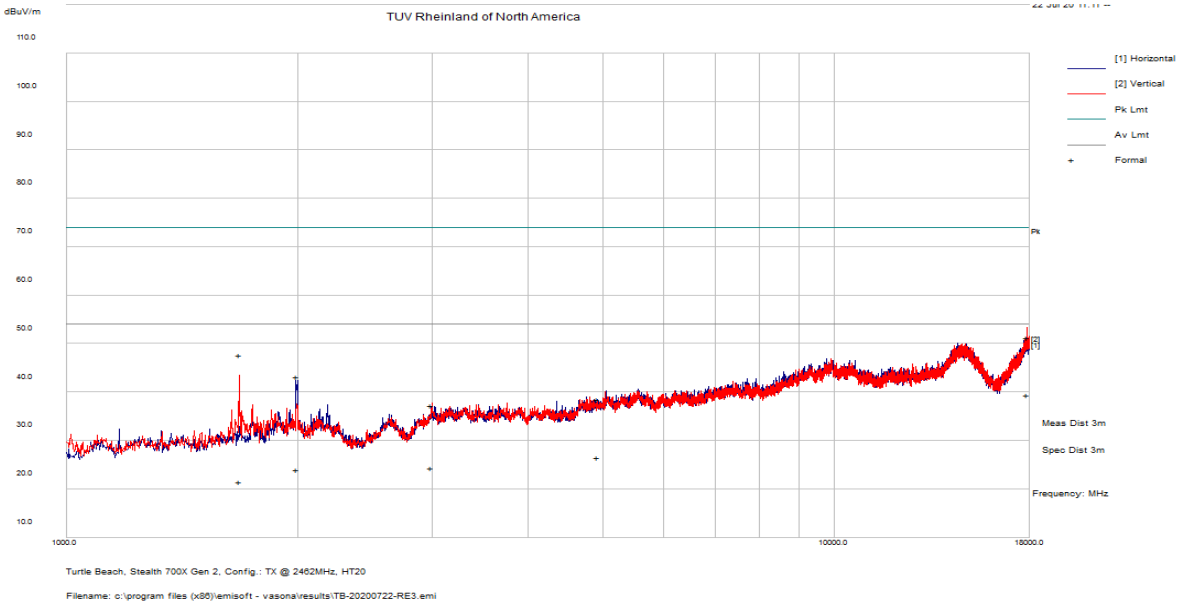
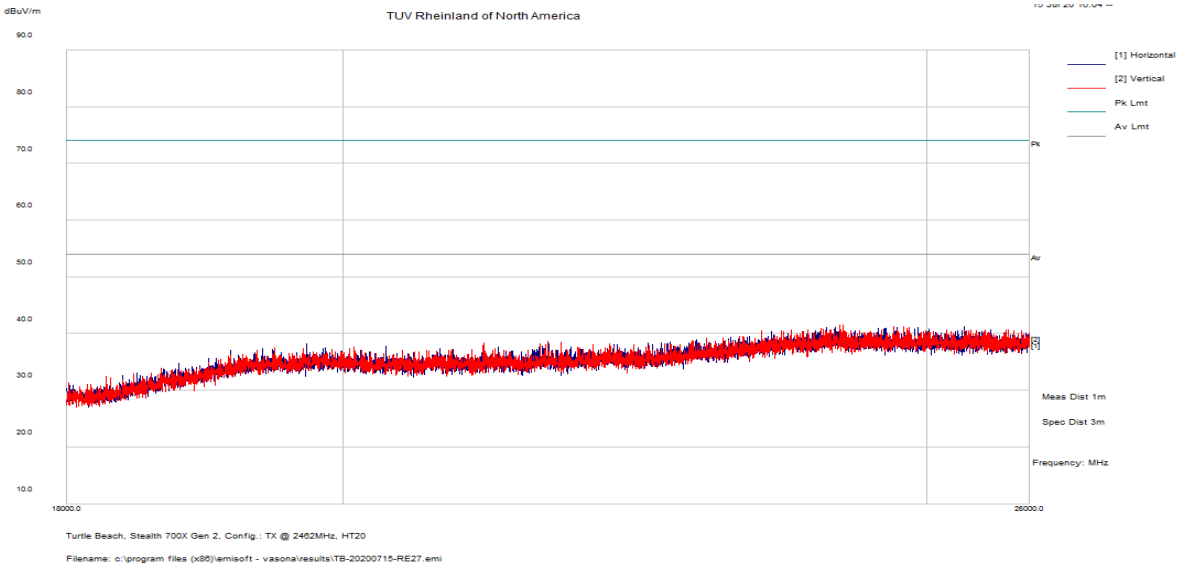
EUT Name	Wireless Audio Headset	**Date**	July 22, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 40%rh
EUT Serial	PP #2	**Temp / Hum out**	N/A
EUT Config.	Headset upright in 802.11n HT20 6.5 Mbps	**Line AC / Freq**	3.7Vdc
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz/ 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / COM-POWER AHA-840	**Performed by**	Jeremy Luong

Above 1 GHz Plots for Transmit Mode at 2462 MHz





Notes: No significant emissions observed above 18 GHz.

SOP 1 Radiated Emissions — Tracking # 32063006.001 Page 15 of 18

EUT Name	Wireless Audio Headset	**Date**	September 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21°C / 42%rh
EUT Serial	PP #6	**Temp / Hum out**	N/A
EUT Config.	Headset upright. Collocation testing	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	**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. 802.11b @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)											
1993.04	75.15	0.89	-29.57	46.46	Pk	V	176	360	74.00	-27.54	Spurious
1993.04	53.63	0.89	-29.57	24.94	Ave	V	176	360	54.00	-29.06	Spurious
4804.43	68.10	1.90	-23.60	46.40	Pk	V	217	346	74.00	-27.60	Harmonics
4804.43	62.10	1.90	-23.60	40.40	Ave	V	217	346	54.00	-13.60	Harmonics
7208.74	62.90	2.40	-20.00	45.30	Pk	V	234	34	74.00	-28.70	Harmonics
7208.74	56.40	2.40	-20.00	38.80	Ave	V	234	34	54.00	-15.20	Harmonics
9710.62	60.70	2.80	-16.10	47.40	Pk	V	141	16	74.00	-26.60	Harmonics
9710.62	50.60	2.80	-16.10	37.30	Ave	V	141	16	54.00	-16.70	Harmonics
14670.60	59.70	3.60	-12.70	50.60	Pk	V	162	284	74.00	-23.40	Harmonics
14670.60	51.00	3.60	-12.70	41.90	Ave	V	162	284	54.00	-12.10	Harmonics
Transmitted Data. 802.11g @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)											
1200.09	67.41	0.75	-32.54	35.62	Pk	H	229	50	74.00	-38.38	Spurious
1200.09	50.16	0.75	-32.54	18.37	Ave	H	229	50	54.00	-35.63	Spurious
1998.50	75.15	0.90	-29.59	46.46	Pk	H	242	272	74.00	-27.54	Harmonics
1998.50	56.11	0.90	-29.59	27.42	Ave	H	242	272	54.00	-26.58	Harmonics
4803.56	65.70	1.90	-23.60	44.00	Pk	V	150	74	74.00	-30.00	Harmonics
4803.56	60.10	1.90	-23.60	38.40	Ave	V	150	74	54.00	-15.60	Harmonics
7207.78	62.30	2.40	-20.00	44.70	Pk	V	170	78	74.00	-29.30	Harmonics
7207.78	54.80	2.40	-20.00	37.20	Ave	V	170	78	54.00	-16.80	Harmonics
9877.87	60.73	2.83	-15.85	47.71	Pk	V	133	300	74.00	-26.29	Harmonics
9877.87	47.73	2.83	-15.85	34.71	Ave	V	133	300	54.00	-19.30	Harmonics
Transmitted Data. 802.11n HT20 @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)											
1993.93	76.58	0.89	-29.58	47.89	Pk	V	143	296	74.00	-26.11	Spurious
1993.93	57.58	0.89	-29.58	28.89	Ave	V	143	296	54.00	-25.11	Spurious
4803.58	65.80	1.90	-23.60	44.10	Pk	V	231	329	74.00	-29.90	Harmonics
4803.58	59.40	1.90	-23.60	37.70	Ave	V	231	329	54.00	-16.30	Harmonics
7206.86	65.21	2.40	-20.04	47.57	Pk	V	121	174	74.00	-26.43	Harmonics
7206.86	55.78	2.40	-20.04	38.14	Ave	V	121	174	54.00	-15.86	Harmonics

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

Combined Standard Uncertainty $u_c(y) = \pm 3.2$dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions passed the spurious emission limit.

SOP 1 Radiated Emissions

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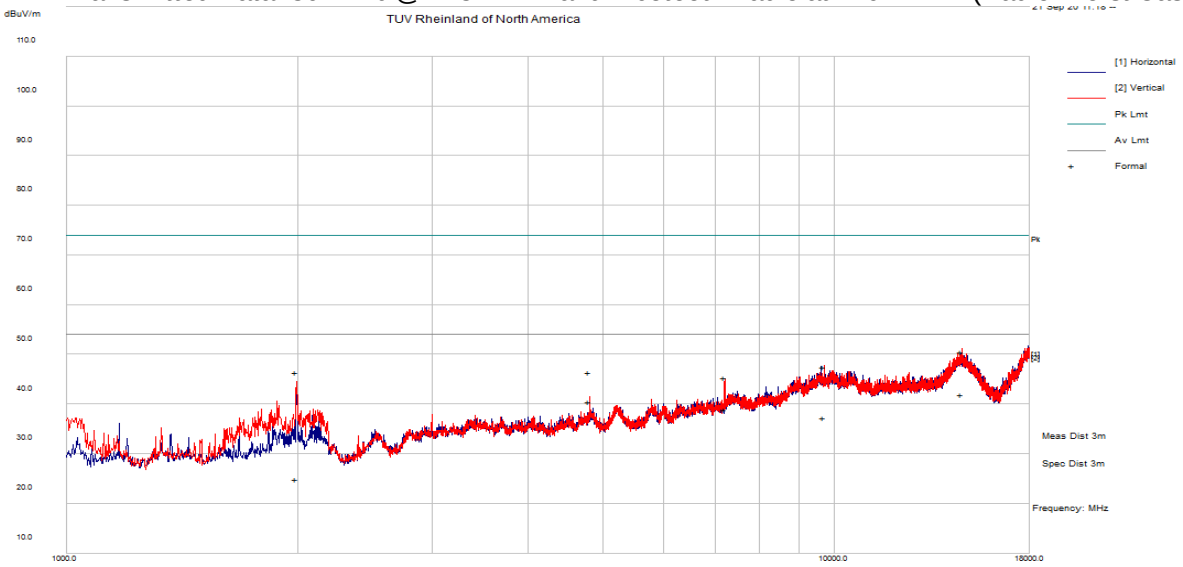
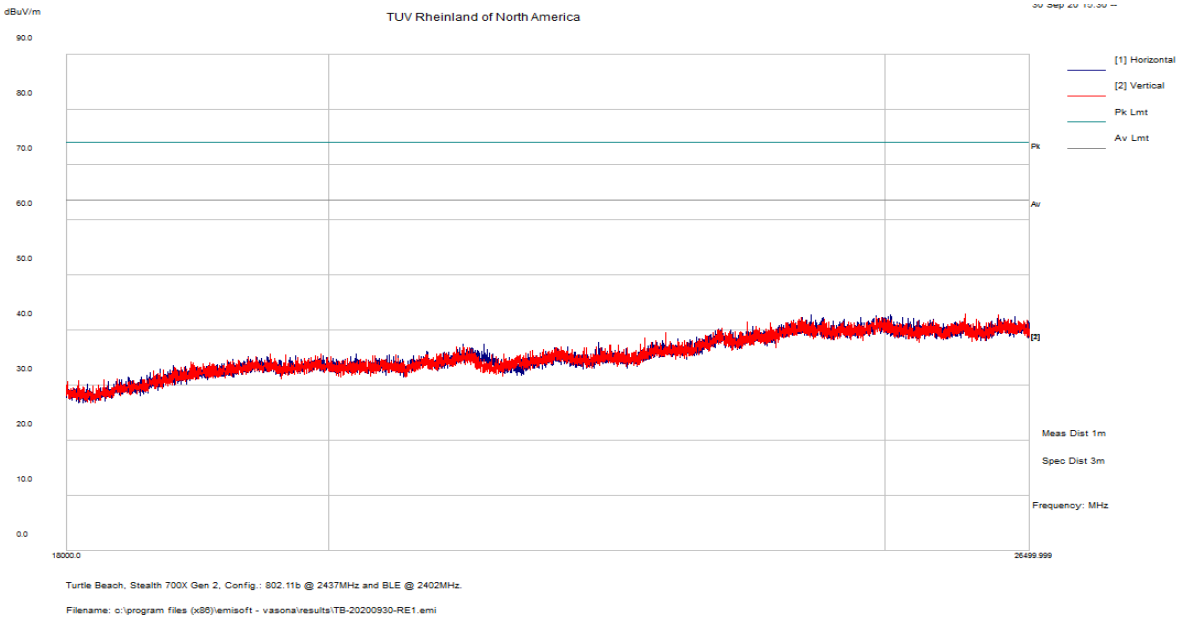
EUT Name	Wireless Audio Headset	**Date**	September 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21°C / 42%rh
EUT Serial	PP #6	**Temp / Hum out**	N/A
EUT Config.	Headset upright. Collocation testing	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	**Performed by**	Jeremy Luong

Transmitted Data. 802.11b @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)

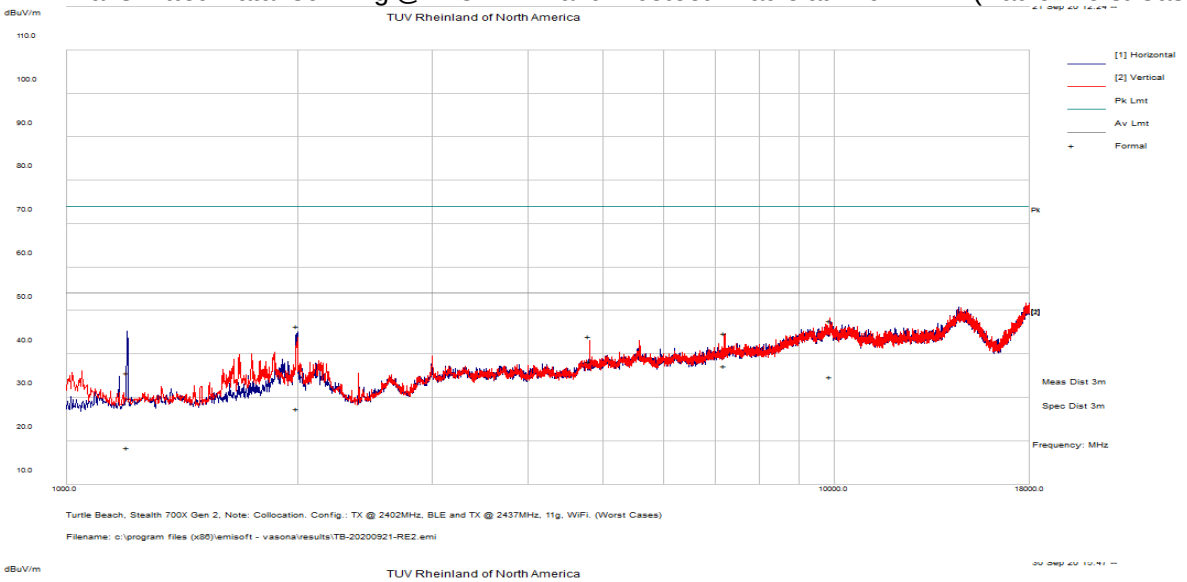


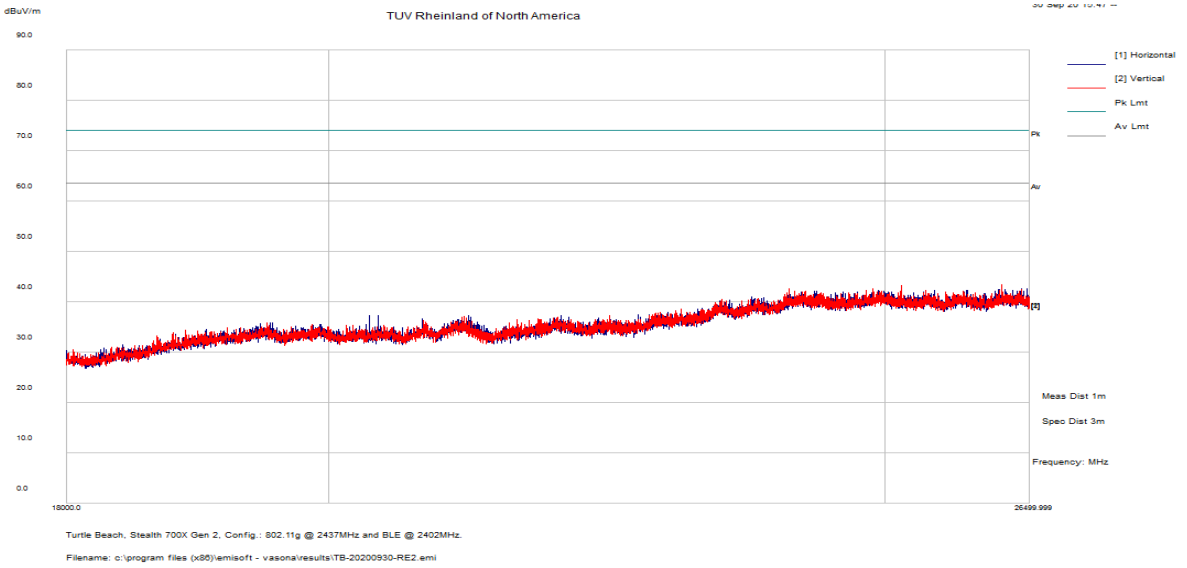


Notes: None.

SOP 1 Radiated Emissions		Tracking # 32063006.001 Page 17 of 18	
EUT Name	Wireless Audio Headset	**Date**	September 21, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	21°C / 42%rh
EUT Serial	PP #6	**Temp / Hum out**	N/A
EUT Config.	Headset upright. Collocation testing	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	**Performed by**	Jeremy Luong

Transmitted Data. 802.11g @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)





Notes: None.

SOP 1 Radiated Emissions

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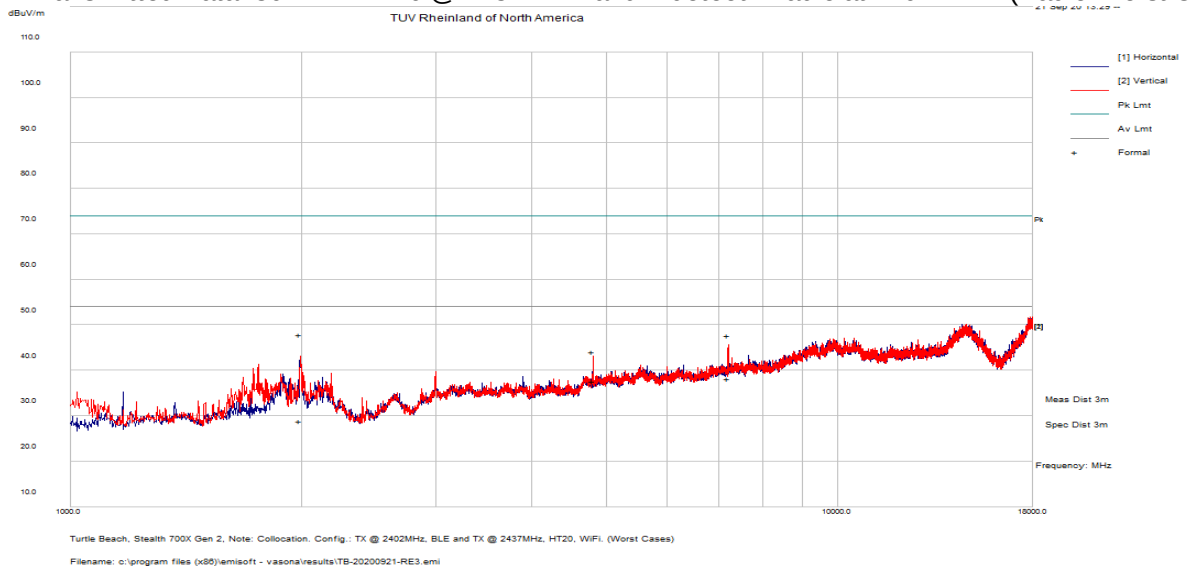
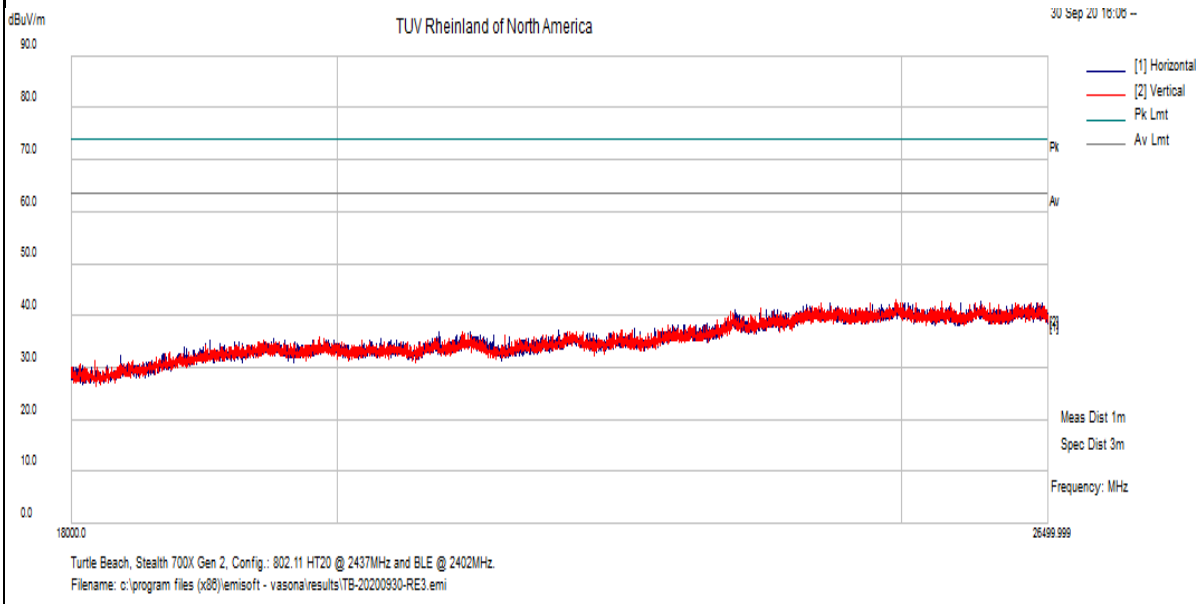
EUT Name	Wireless Audio Headset	**Date**	September 21, 2020
EUT Model	Stealth 700P Gen 2 RX	**Temp / Hum in**	21°C / 42%rh
EUT Serial	PP #6	**Temp / Hum out**	N/A
EUT Config.	Headset upright. Collocation testing	**Line AC / Freq**	3.7 VDC
Standard	CFR47 Part 15 Subpart C	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	**Performed by**	Jeremy Luong

Transmitted Data. 802.11n HT20 @ 2437 MHz and Bluetooth Radio at 2402 MHz. (Radio Worst Case)





Notes: None.

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:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{FIM - AMP + CBL + ACF}$$

Where: FIM = 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 C63.10: 2013. 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: 2020 and RSS Gen: 2019 Sect. 8.8.

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.

Preliminary test were performed: 802.11b, 802.11g, 802.11n HT20.

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		
Antenna Type: Chip	**Power Level:** See Test Plan	
AC Power: 110 Vac/60 Hz at host device	**Configuration:** Tabletop	
Ambient Temperature: 23° C	**Relative Humidity:** 36% 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 # 32063006.001 Page 1 of 4

EUT Name	Wireless Audio Headset	**Date**	September 17, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 41% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode at 802.11b 1 Mbps, 2437 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	
0.660	27.67	9.98	0.04	37.69	QP	Live	56.00	-18.31	Pass
0.660	10.81	9.98	0.04	20.83	Ave	Live	46.00	-25.17	Pass
1.605	24.05	10.00	0.04	34.09	QP	Live	56.00	-21.91	Pass
1.605	7.46	10.00	0.04	17.50	Ave	Live	46.00	-28.50	Pass
1.683	27.30	10.01	0.04	37.34	QP	Live	56.00	-18.66	Pass
1.683	11.54	10.01	0.04	21.58	Ave	Live	46.00	-24.42	Pass
18.264	34.65	10.19	-0.06	44.78	QP	Live	60.00	-15.22	Pass
18.264	28.92	10.19	-0.06	39.05	Ave	Live	50.00	-10.95	Pass
18.559	33.79	10.20	-0.06	43.92	QP	Live	60.00	-16.08	Pass
18.559	28.64	10.20	-0.06	38.77	Ave	Live	50.00	-11.23	Pass
18.759	32.65	10.20	-0.07	42.78	QP	Live	60.00	-17.22	Pass
18.759	27.94	10.20	-0.07	38.07	Ave	Live	50.00	-11.93	Pass
19.158	29.43	10.20	-0.07	39.56	QP	Live	60.00	-20.44	Pass
19.158	26.20	10.20	-0.07	36.33	Ave	Live	50.00	-13.67	Pass

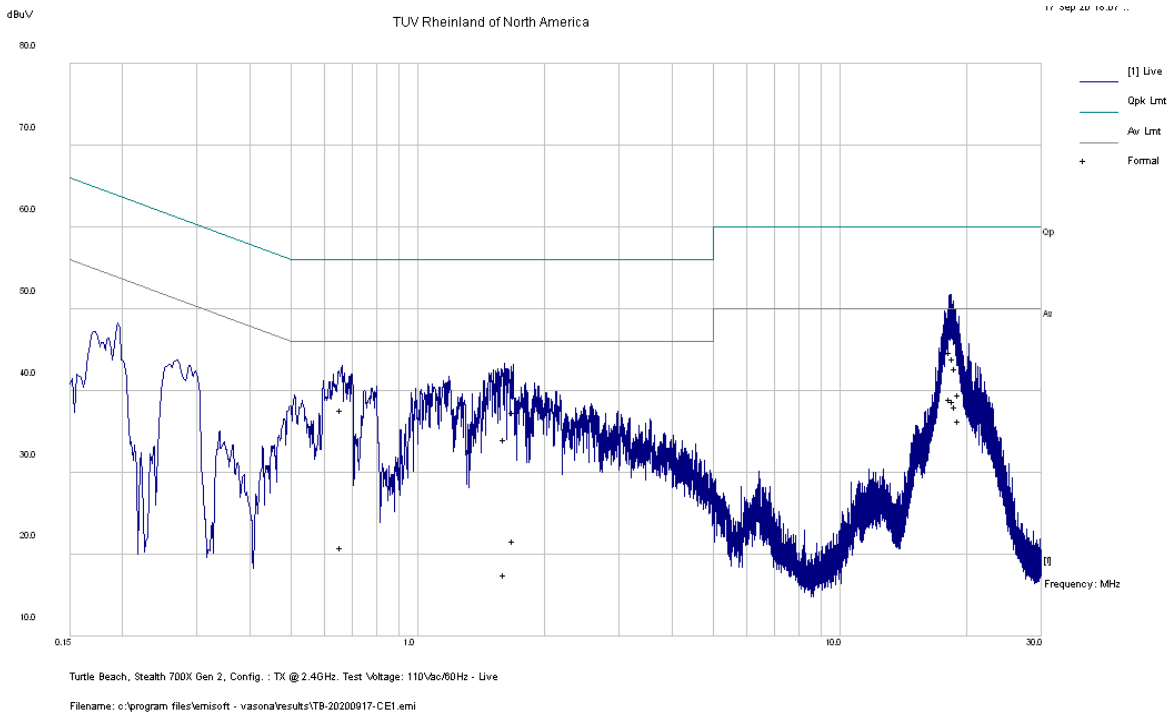
Spec Margin = QP./Ave. - Limit, ± Uncertainty

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

Notes: EUT was setup as table top equipment and transmitted at 2437 MHz in 802.11b at 1 Mbps (worse case configuration).

SOP 2 Conducted Emissions		Tracking # 32063006.001 Page 2 of 4	
EUT Name	Wireless Audio Headset	**Date**	September 17, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 41% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode at 802.11b 1 Mbps, 2437 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 # 32063006.001 Page 3 of 4

EUT Name	Wireless Audio Headset	**Date**	September 17, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 41% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode at 802.11b 1 Mbps, 2437 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	
0.666	25.85	9.98	0.04	35.87	QP	Neutral	56.00	-20.13	Pass
0.666	10.12	9.98	0.04	20.14	Ave	Neutral	46.00	-25.86	Pass
1.431	25.83	10.00	0.04	35.87	QP	Neutral	56.00	-20.13	Pass
1.431	9.36	10.00	0.04	19.40	Ave	Neutral	46.00	-26.60	Pass
1.597	23.18	10.00	0.04	33.22	QP	Neutral	56.00	-22.78	Pass
1.597	8.88	10.00	0.04	18.92	Ave	Neutral	46.00	-27.08	Pass
1.685	24.55	10.01	0.04	34.59	QP	Neutral	56.00	-21.41	Pass
1.685	9.51	10.01	0.04	19.55	Ave	Neutral	46.00	-26.45	Pass
1.732	25.07	10.01	0.04	35.12	QP	Neutral	56.00	-20.88	Pass
1.732	13.18	10.01	0.04	23.23	Ave	Neutral	46.00	-22.77	Pass
1.822	25.19	10.01	0.04	35.24	QP	Neutral	56.00	-20.76	Pass
1.822	14.12	10.01	0.04	24.17	Ave	Neutral	46.00	-21.83	Pass
1.861	23.87	10.01	0.04	33.92	QP	Neutral	56.00	-22.08	Pass
1.861	13.08	10.01	0.04	23.12	Ave	Neutral	46.00	-22.88	Pass

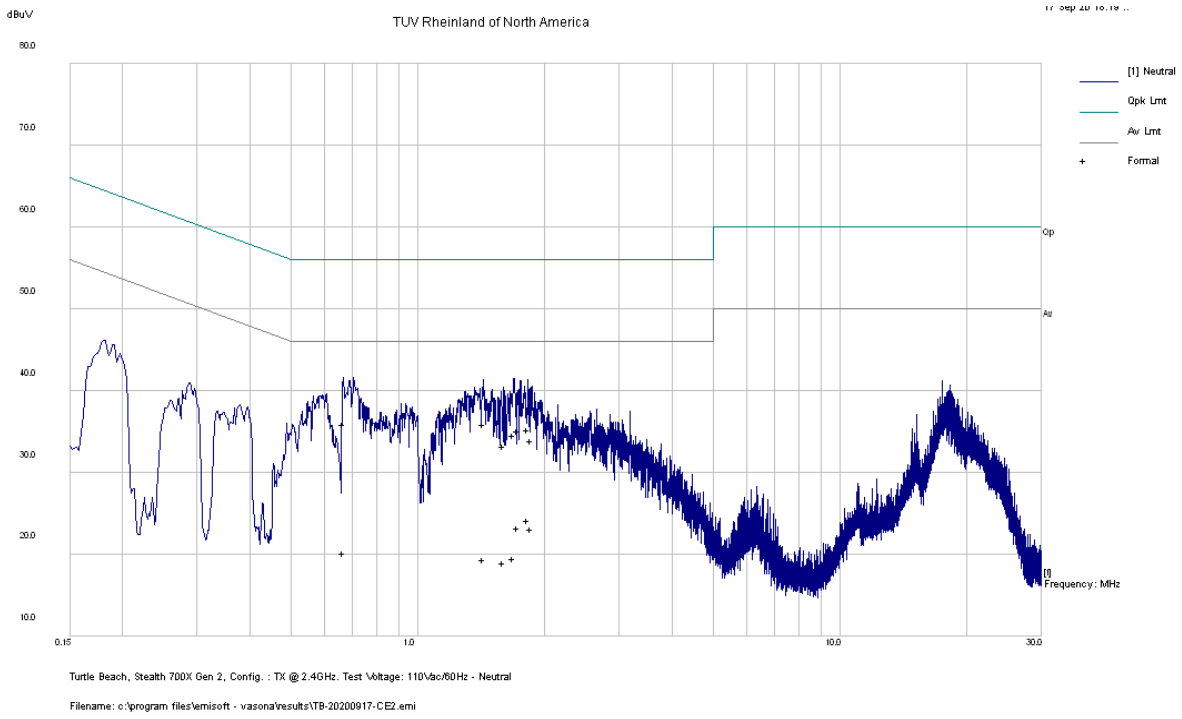
Spec Margin = QP./Ave. - Limit, ± Uncertainty

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

Notes: EUT was setup as table top equipment and transmitted at 2437 MHz in 802.11b at 1 Mbps (worse case configuration).

SOP 2 Conducted Emissions		Tracking # 32063006.001 Page 4 of 4	
EUT Name	Wireless Audio Headset	**Date**	September 17, 2020
EUT Model	Stealth 700X Gen 2	**Temp / Hum in**	22° C / 41% rh
EUT Serial	PP#2	**Temp / Hum out**	N/A
EUT Config.	TX mode at 802.11b 1 Mbps, 2437 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.

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
LISN	Com-Power	LI-200	12100	02/21/2020	02/21/2021
Loop Antenna	EMCO	6502	62531	07/01/2019	07/01/2021
Bilog Antenna	Sunol Sciences	JB3	A102606	08/01/2018	08/01/2020
Horn Ant. (1-18GHz)	EMCO	3115	9211-3969	06/20/2019	06/20/2021
Horn Ant. (18-40GHz)	Com-Power	AHA-840	105005	08/26/2019	08/26/2021
EMI Receiver	Agilent	N9038A	MY52260210	02/15/2020	02/15/2021
Spectrum Analyzer	Agilent	N9030A	MY52350885	10/26/2019	10/26/2020
Preamplifier	Sonoma Inst.	310	185516	02/12/2020	02/12/2021
Preamplifier	Miteq	TTA1800-30-HG	184252	02/12/2020	02/12/2021
RF Power Meter	Agilent	E4418A	MY45103902	02/13/2020	02/13/2021
Power Sensor	Agilent	8481A	US37295801	02/13/2020	02/13/2021
Thermometer	Extech Instruments	SD700	A095319	03/18/2020	03/18/2021
Thermo Chamber	Espec	BTZ-133	0613436	12/20/2019	12/20/2020
DC Power Supply	Agilent	E3634A	MY400004331	02/15/2020	02/15/2021
Signal Generator	Anritsu	MG3694A	042803	02/13/2020	02/13/2021
Notch Filter	Micro-Tronics	BRM50702	37	VBU	VBU

* 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.

NCR = No Calibration Required

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 8: 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 9: Technical Contact Information

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

6.3 Equipment Under Test (EUT)

Table 10: EUT Specifications

EUT Specifications	
Dimensions	215.8 mm (8.4") x 243 mm (9.5") x 111.5 mm (4.3")
DC Input	Headset Input Voltage: 3.7 Vdc (battery)
Environment	Indoor
Operating Temperature Range:	0 to 50 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Product Marketing Name (PMN)	Stealth 700X Gen 2
Hardware Version Identification Number (HVIN)	700X Gen 2
Firmware Version Identification Number (FVIN)	0.0.1
802.11-radio modules	
Operating Mode	802.11b, 802.11g, 802.11n HT20
Transmitter Frequency Band	2.4 GHz – 2.4835 GHz
Max. Rated Power Output	5.26 dBm
Power Setting @ Operating Channel	See Channel Planning Table.
Antenna Type	Chip
Antenna Gain	+3.3 dBi at 2.4GHz
Modulation Type	☐ Thread (Zigbee) ☐ BLE ☒ DSSS ☒ OFDM ☒ Other describe: 16QAM
Data Rate	802.11b: 1, 2, 5.5, and 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n HT20: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 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: The radio can only operate in one band and on one channel at a time.	

Table 11: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna 1	Chip	Unictron Technologies Corp (H2U84W1H1S0800) Max. peak gain at 2.4 GHz	+3.3

Table 12: EUT Channel Power Specifications

No.	Frequency (MHz)	Target Power Level in ART2					
		802.11b	802.11g	802.11n HT20			
1	2412	71	77	77			
2	2417						
3	2422						
4	2427						
5	2432						
6	2437	71	77	77			
7	2442						
8	2447						
9	2452						
10	2457						
11	2462	70	77	77			

Note: 1. The adjusted power target values are updated at the evaluated frequencies.
2. TX Power level in the ART2 was set according to this table to obtain the output power of around +5 dBm.
3. The power levels above are set and recorded from S/N PP#1.

Table 13: 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 14: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	Latitude	35521341769	Setup EUT operating channel
Note: None.				

Table 15: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.247
Stealth 700X Gen 2	PP#2	Radiated Sample	TX Emissions, AC Conducted Emission
	PP#1	Conducted Sample	Peak Transmit Power, Peak Power Spectral Density, Occupied Bandwidth Band-Edge Out-of-Band Emission
Note: N/A			

Table 16: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Stealth 700X Gen 2	Chip (Unictron Technologies Corp - H2U84W1H1S0800)	Transmit	EUT laid flat	Normal usage. Up right.	On the side
Note: The Y-Axis setup configuration was used for final testing.					

6.4 Test Specifications

Table 17: Test Specifications

Emissions and Immunity	
Regulation Rules / Standards	**Requirement**
CFR 47 Part 15.247: 2020	All
RSS 247 Issue 2, 2017	All

END OF REPORT