Emissions
Test Report

EUT Name: eero 6 Pro

Model No.: K010001

CFR 47 Part 15.407 2021 and RSS 247: 2017

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	03/29/2021	Original Document	AS

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	eero LLC 660 3rd Street San Francisco, CA 94107
Requester / Applicant:	eero LLC +1 415-738-7972
Name of Equipment:	eero 6 Pro
Model No.	K010001
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.407 2021 and RSS 247: 2017
Test Dates:	January 22, 2021 to March 19, 2021

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v02r01, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v02r01, KDB 662911 D01 Multiple Transmitter Output v02r01

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.

Alexander Sowinski

Test Engineer Date March 29, 2021

Richard Decker

Reviewer Signature Date March 29, 2021

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

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.407 2021 and RSS 247: 2017 based on the results of testing performed on January 22, 2021 to March 19, 2021 on the eero 6 Pro, Model K010001 manufactured by eero LLC. 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 5250 – 5350 MHz (UNII-2A), and 5470-5725 MHz (UNII-2C) frequency bands are covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10:2013	Test Parameters	Measured Value	Result
Duty Cycle	Information Only	N/A	See Section 3.5	N/A
Spurious Emission in Transmit Mode	CFR47 15.209, CFR47 15.407 (b) RSS-GEN Sect.8.9, RSS 247 Sect. 6.2.1.2	Class B	-0.16 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	-4.38 dB Margin	**Complied**
Occupied Bandwidth	CFR47 15.407 (a) & (e), RSS GEN Sect.6.7	N/A	99% BW: 16.38 – 75.42 MHz 26dB BW: 18.99 – 81.78 MHz	**Complied**
Maximum Output Power	CFR47 15.407 (a) RSS 247 Sect. 6.2.2.1 [see Note 1]	UNII2A: 250mW UNII2C: 250mW	UNII2A: 23.79dBm/ 239.33mW UNII2C: 23.96dBm/ 248.89mW	**Complied**
Power Spectral Density	CFR47 15.407 (a) RSS 247 Sect. 6.2.2.1	UNII2A: 11dBm/MHz UNII2C: 11dBm/MHz	UNII2A: 8.97dBm/ MHz UNII2C: 8.91dBm/ MHz	**Complied**
Conducted Emission – Antenna Port	CFR47 15.407 (b)(2) RSS 247 Sect.6.2.2.2	< -27 dBm/MHz	-8.73 dB Margin	**Complied**
Frequency Stability	CFR47 15.407 (g), RSS GEN Sect. 6.11	±20 ppm	Manufacturer Declaration	**Complied**
Voltage Variation	CFR47 15.31(e) RSS-Gen Sect. 6.11	±20 ppm	Manufacturer Declaration	**Complied**

Note: 1. Measurements are conducted 2x2 total power for UNII-2A correlated and 4x4 total power for UNII-2C.
* = max PSD for non-correlated.

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 and 5015 Brandin Ct, Fremont CA 94538 are 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 and 5015 Brandin Ct, Fremont CA 94538 have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326
VCCI Registration No. for Fremont: A-0327

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

Test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, U.S.A. and 5015 Brandin Ct, Fremont, CA. 94538, U.S.A. (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, 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. 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 eero 6 Pro, Model K010001 Wi-Fi router/Access point utilizes the Qualcomm IPQ8174 SoC for Wi-Fi and the Qorvo QPG7015M radio chip for Bluetooth/ZigBee/802.15.4. The QCA IPQ8174 SoC radio chip supports tri-band Wi-Fi; 2.4 GHz and 5 GHz split into low and high bands. Each radio output will pass through a LNA, bandpass filter circuitry and Power Amplifier (PA). The 2.4 GHz and low 5 GHz (U-NII-1 and U-NII-2A) radio circuits are 2x2 MIMO circuits capable of driving 2 separate "chains", each with their own antenna. The high 5 GHz (U NII-2C and U-NII-3) is a 4x4 MIMO and drives 4 outputs, each having their own antenna.

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 K010001 has 7 internal antennas, each made of flexible printed circuit board(Flex PCB).

Antenna	Connector	Max Gain (dBi)	TX Type
ANT1	J11	4.0	2.4GHz: BLE/Zigbee
ANT2	J21	3.7	5.5GHz: UNII-2C CH3
		2.8	5.8 GHz: UNII-3 CH3
ANT3	J17	4.3	2.4GHz: WiFi Ch0
		4.3	5.2GHz: UNII-1 CH0
		4.2	5.3GHz: UNII-2A CH0
ANT4	J18	4.6	5.5GHz: UNII-2C CH0
		5.1	5.8GHz: UNII-3 CH0
ANT5	J19	4.7	5.5GHz: UNII-2C CH1
		5.2	5.8GHz: UNII-3 CH1
ANT6	J16	5.1	2.4GHz: WiFi CH1
		3.4	5.2GHz: UNII-1 CH1
		3.3	5.3GHz: UNII-2A CH1
ANT7	J20	4.1	5.5GHz: UNII-2C CH2
		3.4	5.8GHz: UNII-3 CH2

3.5 Duty Cycle

The K010001 were measured for the duty cycle.
Calculation of transmit duty cycle. Duty cycle (%) = (ON time / Period) * 100%

3.5.1 Results

Band	Mode	Duty Cycle (%)	Duty Cycle (dB)	Remark
UNII-2A	802.11a	83.9	1.53	Conducted
	802.11n HT20	91.7	0.75	Conducted
	802.11ac VHT20	92.1	0.71	Conducted
	802.11n HT40	95.8	0.37	Conducted
	802.11ac VHT40	92.0	0.72	Conducted
	802.11ac VHT80	91.7	0.76	Conducted
UNII-2C	802.11a	83.9	1.53	Conducted
	802.11n HT20	91.8	0.74	Conducted
	802.11ac VHT20	91.9	0.73	Conducted
	802.11n HT40	95.7	0.38	Conducted
	802.11ac VHT40	91.6	0.76	Conducted
	802.11ac VHT80	91.9	0.73	Conducted

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5320.000000	23.3	23.9	23.3	83.884	PASS

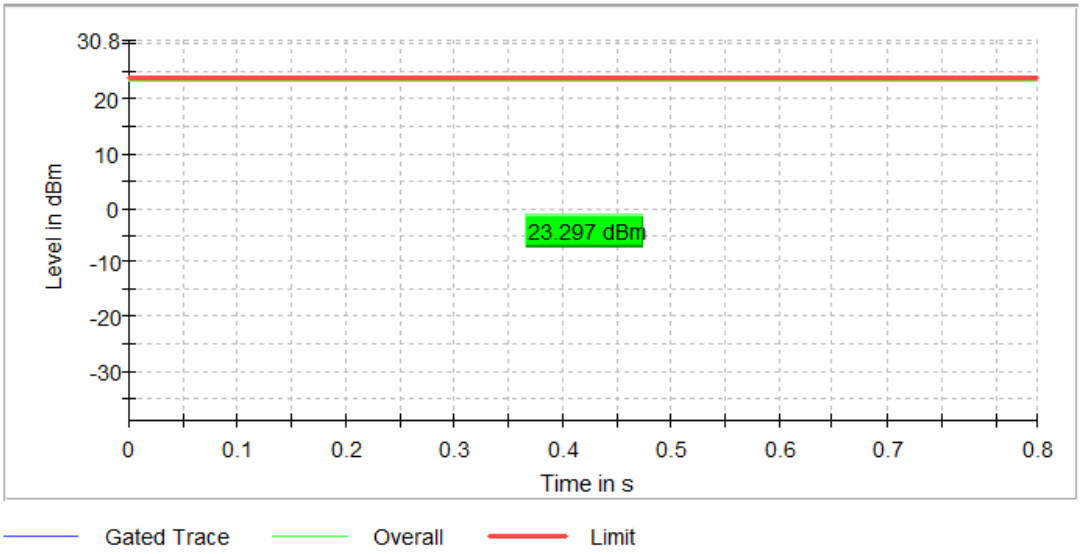


Figure 1: Sample Trace, UNII-2A 802.11a

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5500.000000	23.6	24.0	23.6	83.965	PASS

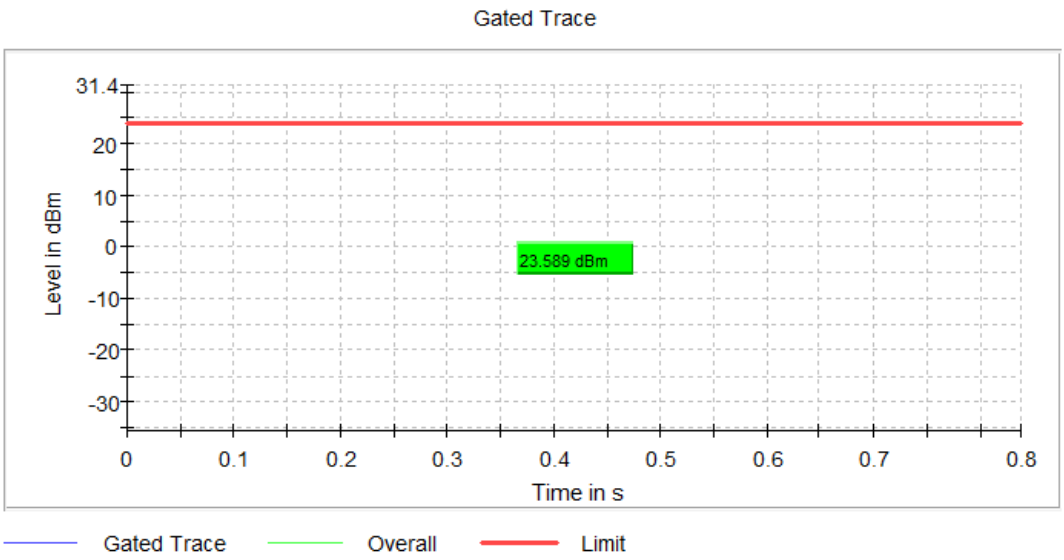


Figure 2: Sample Trace: UNII-2C, 802.11a

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.407: 2021 and RSS 247: 2017. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

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

The maximum transmitted power limits per CFR47 Part 15.407 and RSS-247 are

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

Part 15.407(a)(2) – Band 5250-5350 MHz, 5470-5725 MHz:250 mW or 11 dBm + 10Log B.

Part 15.407(a)(3) – Band 5725-5825 MHz:1 W

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

RSS 247 Sect. 6.2.2.1, 6.2.3.1 – Band 5250-5350 MHz, 5470-5725 MHz: 250 mW or 11 dBm + 10Log B.

RSS 247 Sect. 6.2.2.3 (b) – Band 5250-5350 MHz (e.i.r.p.): 200 mW

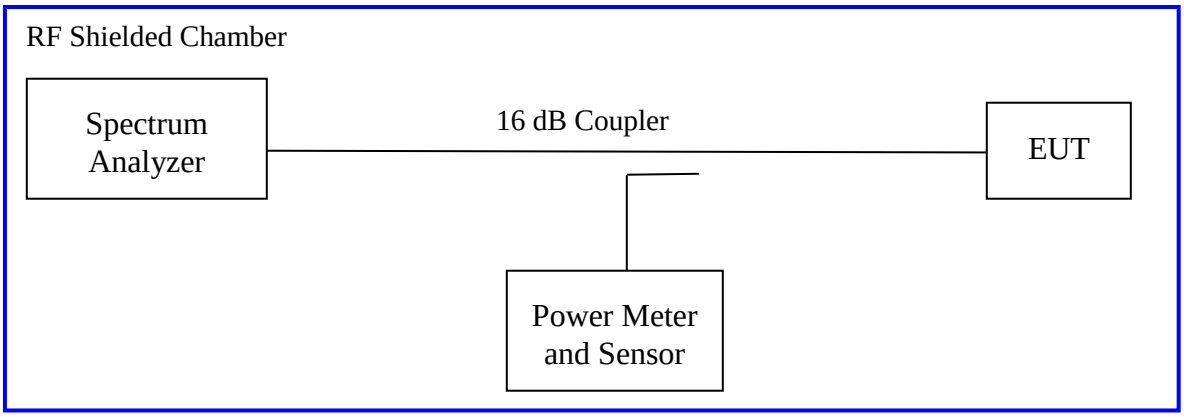
RSS 247 Sect. 6.2.4.1 – Band 5725-5850 MHz: 1 W

Note: B is the 99% emission bandwidth.

4.1.1 Test Method

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

Test Setup:



Method SA-2 of "KDB 789033 D02 – Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices" applies since the EUT continuously transmit; where duty cycle is less 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). The below results show the combined measured output power chains. The low 5.3GHz UNII-2A is a 2x2 MIMO system and the high 5.5GHz UNII-2C is a 4x4 MIMO system.

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

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 83.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11a at 6 Mbps (FCC & RSS Limit)						
Frequency (MHz)	**Channel**	**Conducted Output [dBm]**	**Duty Cycle [dB]**	**Max Power [dBm]**	**Limit [dBm]**	**Margin [dB]**
5260	52	21.643	1.53	23.173	24	-0.827
5300	60	21.803	1.53	23.333	24	-0.667
5320	64	21.767	1.53	23.297	24	-0.703
5500	100	22.159	1.53	23.689	24	-0.311
5600	120	22.092	1.53	23.622	24	-0.378
5700	140	21.926	1.53	23.456	24	-0.544

Note: 1. Worst case was observed at 6 Mbps.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 3: RF Output Power at the Antenna Port – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT20 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Conducted Output [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
5260	52	22.967	0.74	23.707	24	-0.293
5300	60	22.687	0.74	23.427	24	-0.573
5320	64	22.659	0.74	23.399	24	-0.601
5500	100	22.845	0.74	23.585	24	-0.415
5600	120	23.175	0.74	23.915	24	-0.085
5700	140	22.529	0.74	23.269	24	-0.731

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 4: RF Output Power at the Antenna Port – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.1%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT20 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Conducted Output [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
5260	52	23.072	0.71	23.782	24	-0.218
5300	60	22.732	0.71	23.442	24	-0.558
5320	64	22.758	0.71	23.468	24	-0.532
5500	100	22.887	0.71	23.597	24	-0.403
5600	120	23.205	0.71	23.915	24	-0.085
5700	140	22.558	0.71	23.268	24	-0.732

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 5: RF Output Power at the Antenna Port – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 95.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT40 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Conducted Output [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
5270	54	23.338	0.37	23.708	24	-0.292
5310	62	23.014	0.37	23.384	24	-0.616
5510	102	23.344	0.37	23.714	24	-0.286
5590	118	23.455	0.37	23.825	24	-0.175
5670	134	23.259	0.37	23.629	24	-0.371

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 6: RF Output Power at the Antenna Port – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.0%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT40 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Conducted Output [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
5270	54	23.018	0.72	23.738	24	-0.262
5310	62	22.669	0.72	23.389	24	-0.611
5510	102	23.070	0.72	23.790	24	-0.21
5590	118	23.112	0.72	23.832	24	-0.168
5670	134	22.977	0.72	23.697	24	-0.303

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 7: RF Output Power at the Antenna Port – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT80 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Conducted Output [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
5290	58	22.694	0.73	23.424	24	-0.576
5530	106	22.822	0.73	23.552	24	-0.448
5610	122	23.234	0.73	23.964	24	-0.036

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5300.000000	23.3	23.9	23.3	83.861	PASS

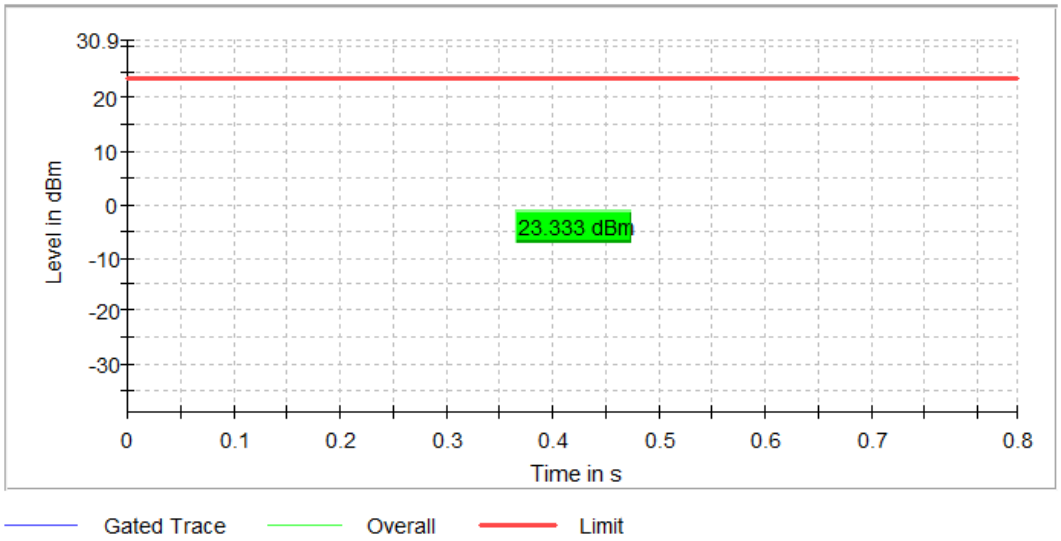


Figure 3: Conducted power – 802.11a UNII-2A Mid Channel 5300MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5500.000000	23.6	24.0	23.6	83.965	PASS

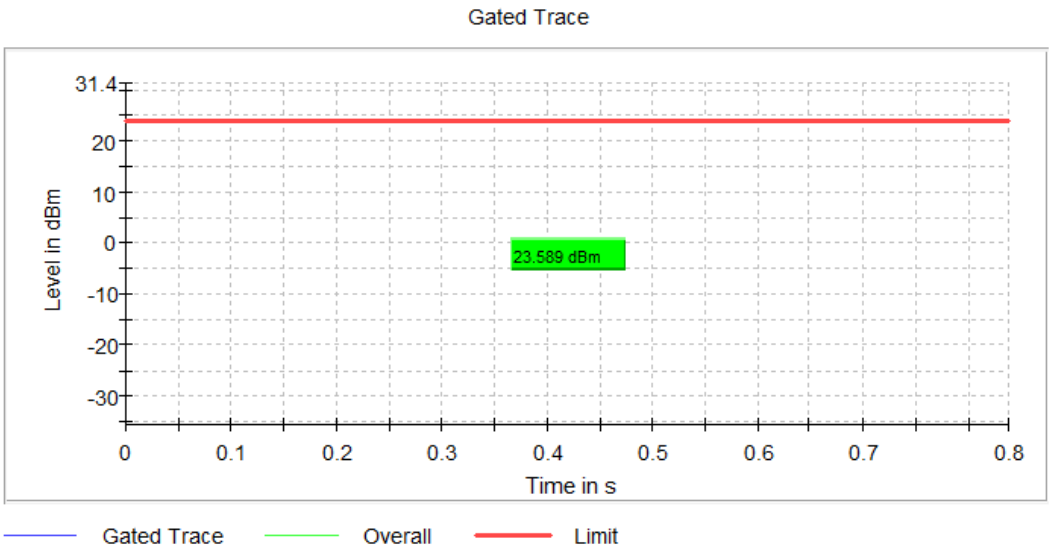


Figure 4: Conducted power – 802.11a UNII-2C Low Channel 5500MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5260.000000	23.7	23.9	23.7	91.612	PASS

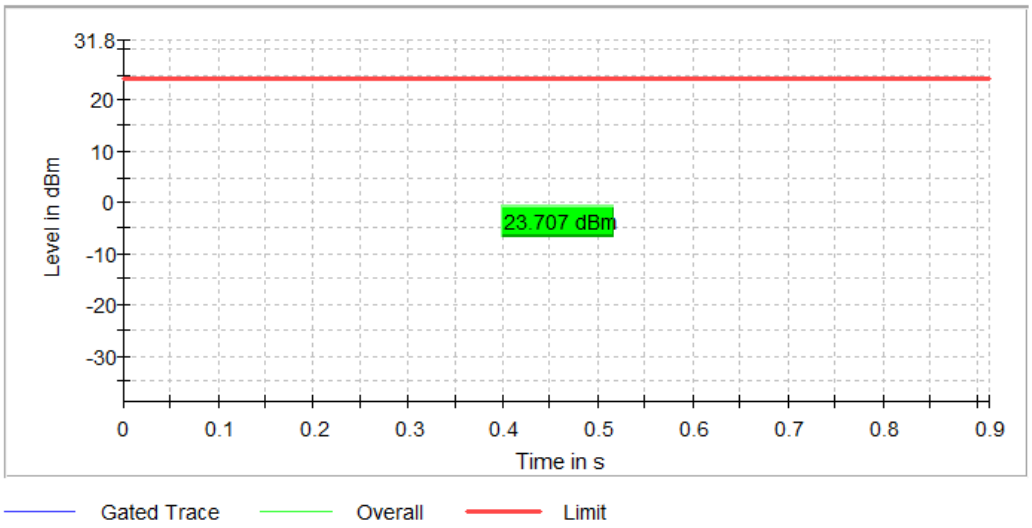


Figure 5: Conducted power – 802.11n HT20 UNII-2A Low Channel 5260MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5600.000000	23.9	23.9	23.9	91.570	PASS

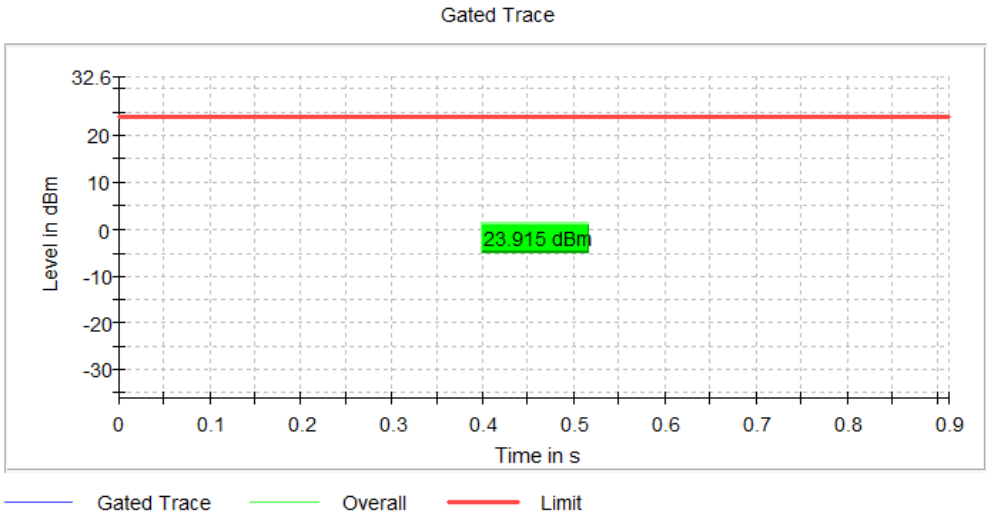


Figure 6: Conducted power – 802.11n HT20 UNII-2C Mid Channel 5600MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5260.000000	23.8	23.8	23.8	91.723	PASS

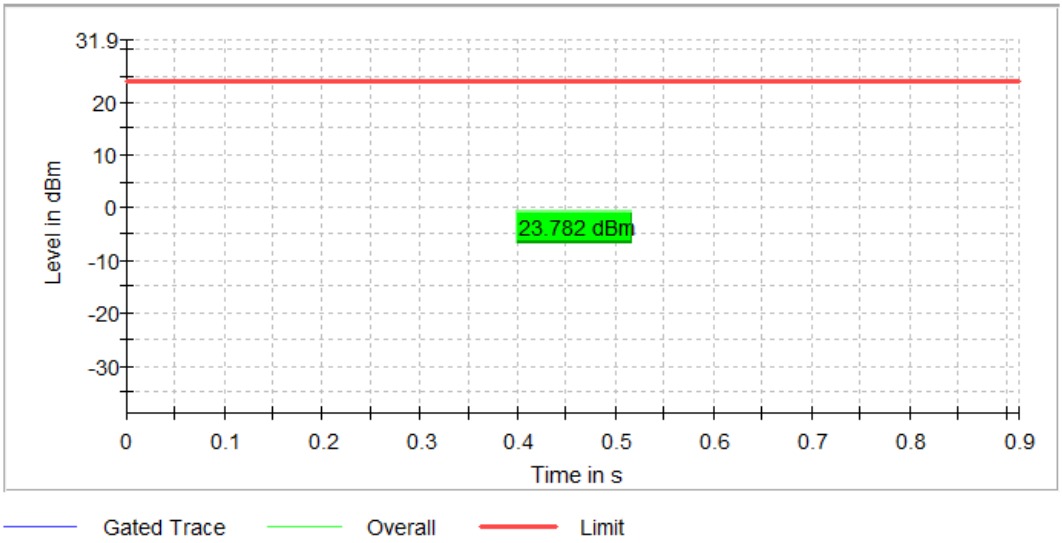


Figure 7: Conducted Power – 802.11ac VHT20 UNII-2A Low Channel 5260MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5600.000000	23.9	23.8	23.9	91.645	PASS

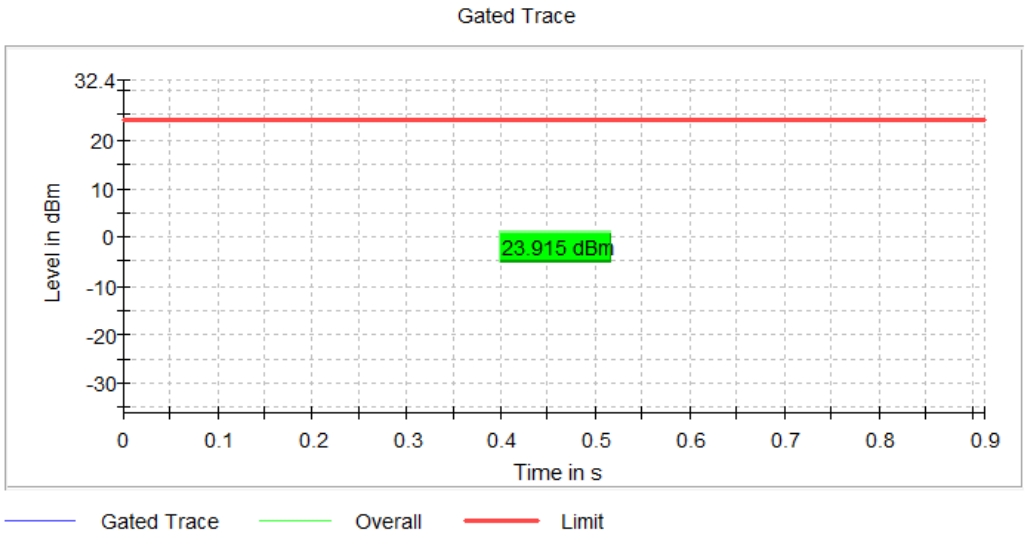


Figure 8: Conducted Power – 802.11ac VHT20 UNII-2C Mid Channel 5600MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5270.000000	23.7	23.8	23.7	95.803	PASS

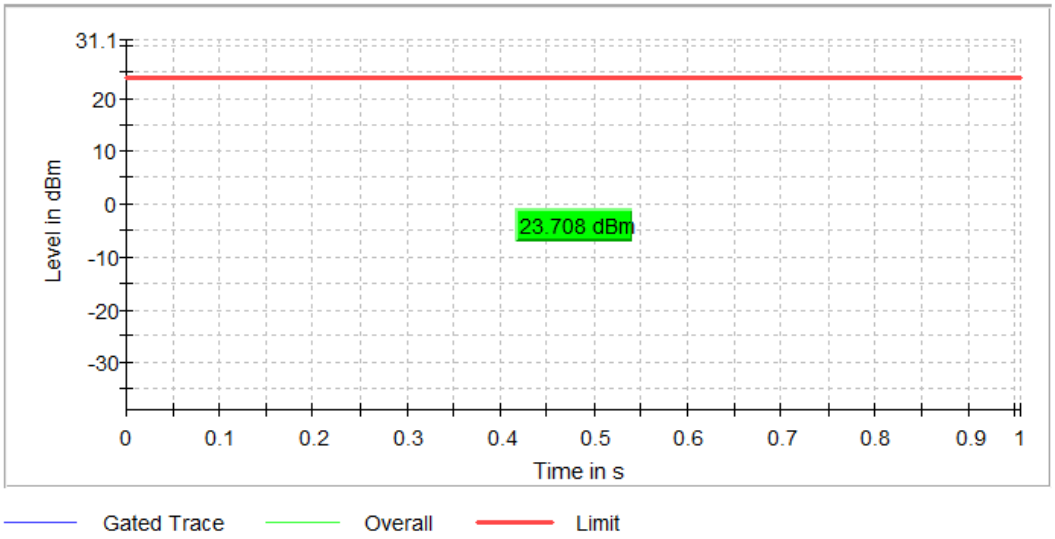


Figure 9: Conducted Power – 802.11n HT40 UNII-2A Low Channel 5270MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5590.000000	23.8	23.8	23.8	95.717	PASS

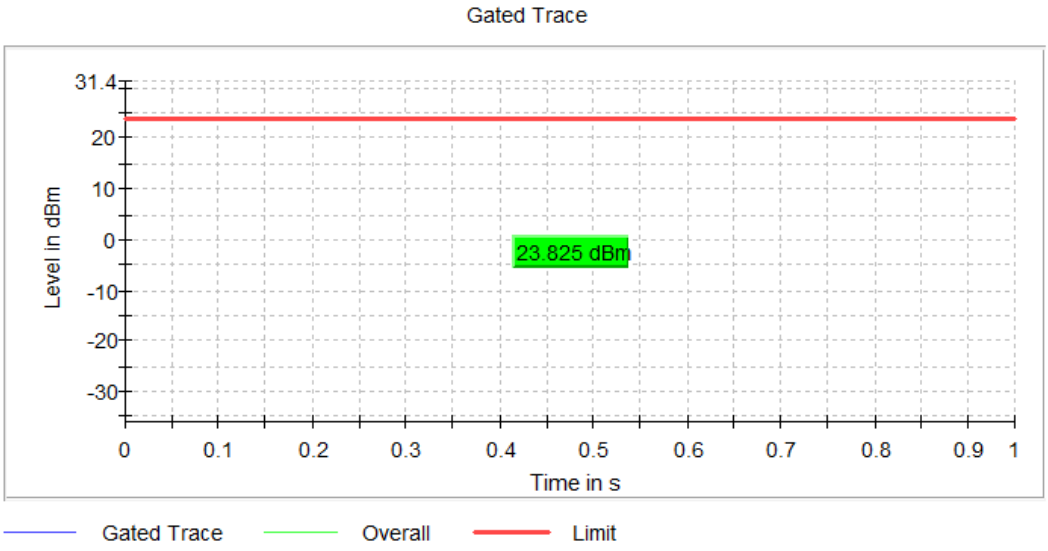


Figure 10: Conducted Power – 802.11n HT40 UNII-2C Mid Channel 5590MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5270.000000	23.7	23.8	23.7	92.045	PASS

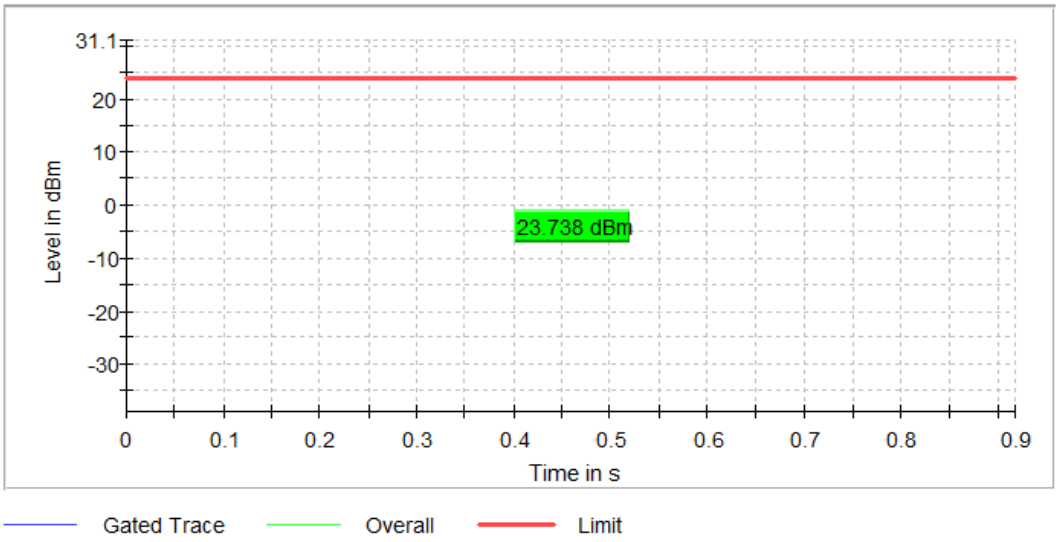


Figure 11: Conducted Power – 802.11ac VHT40 UNII-2A Low Channel 5270MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5590.000000	23.8	24.0	23.8	91.154	PASS

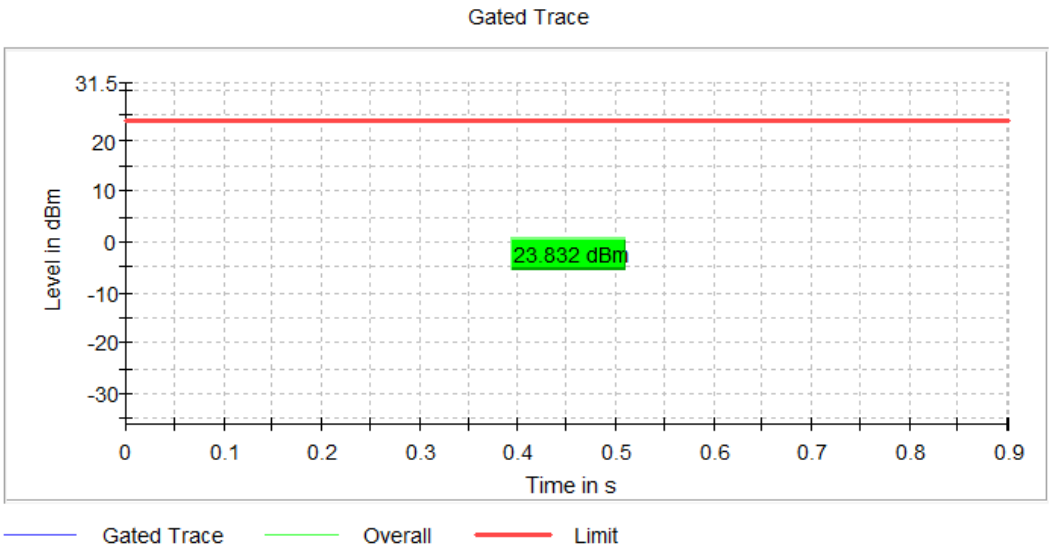


Figure 12: Conducted Power – 802.11ac VHT40 UNII-2C Mid Channel 5590MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5290.000000	23.4	24.0	23.4	91.669	PASS

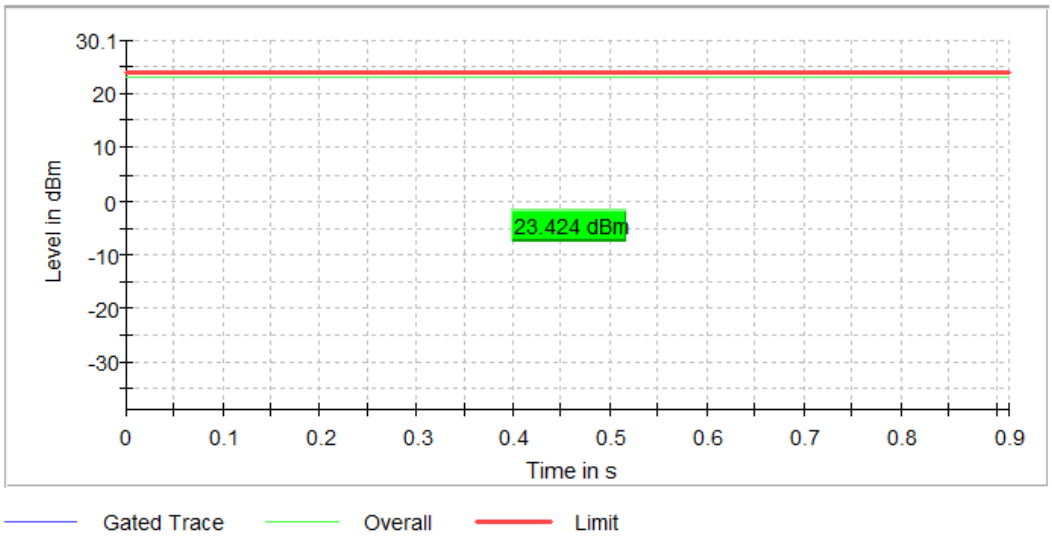


Figure 13: Conducted Power – 802.11ac VHT80 UNII-2A Mid Channel 5290MHz

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5530.000000	23.5	24.0	23.5	90.900	PASS

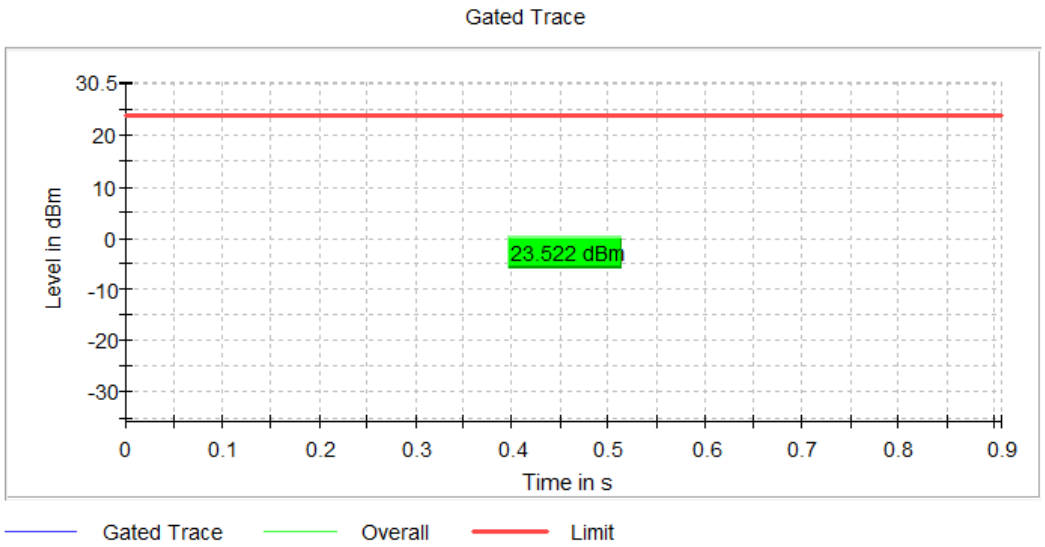


Figure 14: Conducted Power – 802.11ac VHT80 UNII-2C High Channel 5610MHz

4.2 Occupied Bandwidth

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

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

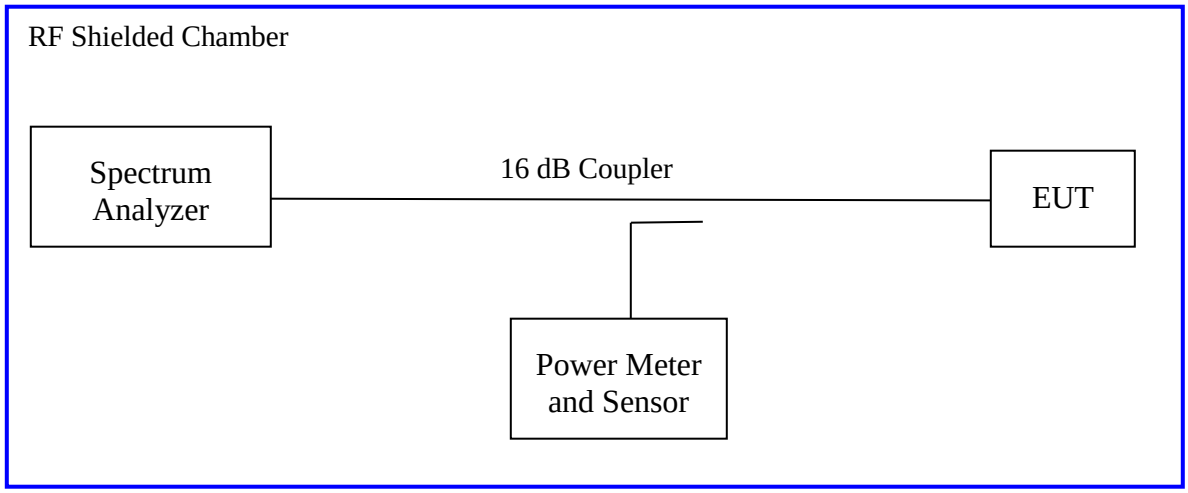
The 26 dB bandwidth is defined the bandwidth of 26 dBr from highest transmitted level of the fundamental frequency.

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

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.407(a), and RSS Gen Sect.6.7. The preliminary investigation was performed to find the narrowest 26 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range. The worst results indicated below.

Test Setup:



4.2.2 Results

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

Table 8: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 83.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11a, 6Mbps						
Frequency [MHz]	**99% Bandwidth [MHz]**			**26dB Bandwidth [MHz]**		
	Measured	**FLow**	**FHigh**	**Measured**	**FLow**	**FHigh**
5260	16.386	5251.782	5268.168	19.355	5250.302	5269.658
5300	16.375	5291.782	5308.158	19.175	5290.472	5309.648
5320	16.376	5211.792	5328.168	19.185	5310.502	5329.688
5500	16.386	5491.782	5508.168	19.375	5490.212	5509.588
5600	16.386	5591.792	5608.178	18.995	5590.492	5609.488
5700	16.376	5691.782	5708.158	19.095	5690.402	5709.498

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

Table 9: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT20, MCS0						
Frequency [MHz]	**99% Bandwidth [MHz]**			**26dB Bandwidth [MHz]**		
	Measured	**FLow**	**FHigh**	**Measured**	**FLow**	**FHigh**
5260	17.826	5251.032	5268.858	24.484	5247.333	5271.817
5300	17.826	5291.052	5308.878	23.624	5288.153	5311.777
5320	17.806	5311.062	5328.868	22.604	5308.673	5331.277
5500	17.786	5491.072	5508.858	22.774	5488.463	5511.237
5600	17.795	5591.062	5608.858	22.554	5588.643	5611.197
5700	17.776	5691.072	5708.848	22.564	5688.893	5711.457

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

Table 10: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.1%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT20, MCS0						
Frequency [MHz]	**99% Bandwidth [MHz]**			**26dB Bandwidth [MHz]**		
	Measured	**FLow**	**FHigh**	**Measured**	**FLow**	**FHigh**
5260	17.816	5251.052	5268.868	24.434	5247.353	5271.787
5300	17.826	5291.052	5308.878	23.964	5287.323	5311.287
5320	17.816	5311.042	5328.858	24.694	5307.393	5332.087
5500	17.856	5491.072	5508.928	22.634	5488.613	5511.247
5600	17.767	5591.072	5608.838	22.524	5588.573	5611.097
5700	17.816	5691.052	5708.868	22.224	5688.893	5711.117

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

Table 11: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 95.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT40, MCS0

Frequency [MHz]	99% Bandwidth [MHz]			26dB Bandwidth [MHz]		
	Measured	FLow	FHigh	Measured	FLow	FHigh
5270	36.011	5251.925	5287.936	40.290	5245.685	5289.975
5310	36.171	5291.845	5328.015	40.090	5289.925	5330.150
5510	35.971	5492.064	5528.035	40.150	5490.045	5530.195
5590	36.071	5571.925	5607.996	40.150	5569.865	5610.015
5670	36.200	5651.900	5688.100	39.630	5650.085	5689.715

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

Table 12: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.0%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT40, MCS0

Frequency [MHz]	99% Bandwidth [MHz]			26dB Bandwidth [MHz]		
	Measured	FLow	FHigh	Measured	FLow	FHigh
5270	36.071	5251.845	5287.916	41.190	5249.325	5290.515
5310	36.071	5291.925	5327.996	40.690	5289.445	5330.135
5510	36.111	5291.945	5528.055	40.650	5489.805	5530.456
5590	36.271	5571.785	5608.055	40.230	5569.945	5610.175
5670	36.071	5651.885	5687.956	40.390	5649.725	5690.115

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

Table 13: Occupied Bandwidth – Test Results

Date: January 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT80, MCS0						
Frequency [MHz]	**99% Bandwidth [MHz]**			**26dB Bandwidth [MHz]**		
	Measured	**FLow**	**FHigh**	**Measured**	**FLow**	**FHigh**
5290	75.421	5252.089	5327.511	81.740	5249.010	5330.750
5530	75.141	5492.529	5567.671	81.020	5490.130	5571.150
5610	75.381	5572.169	5647.551	81.780	5568.850	5650.630

Note: 1. The 99% bandwidth measurements are informative, and 26 dB bandwidths are used to determine the output power limits.
2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5300.000000	16.375907	---	---	5291.782054	5308.157961

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5300.000000	PASS

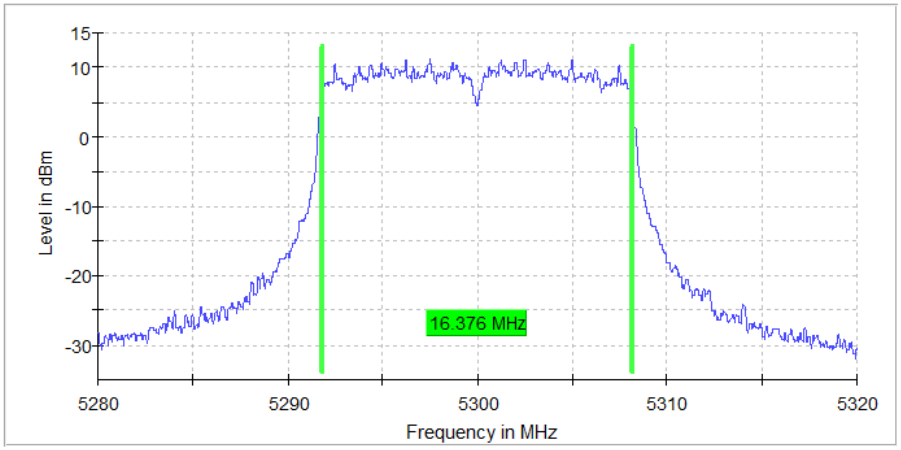


Figure 15: 99% Occupied Bandwidth – 802.11a UNII-2A Mid Channel 5300MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5600.000000	16.385904	---	---	5591.792052	5608.177956

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5600.000000	PASS

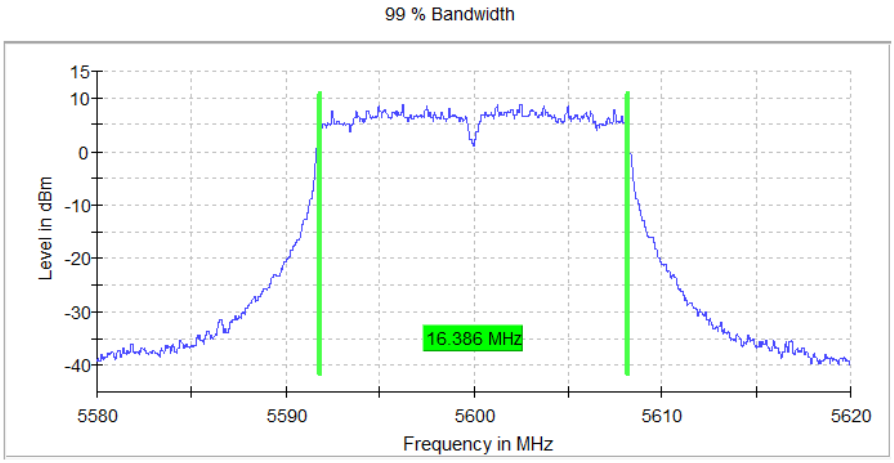


Figure 16: 99% Occupied Bandwidth – 802.11a UNII-2C Mid Channel 5600MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5300.000000	19.175206	---	---	5290.472382	5309.647588

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5300.000000	10.7	PASS

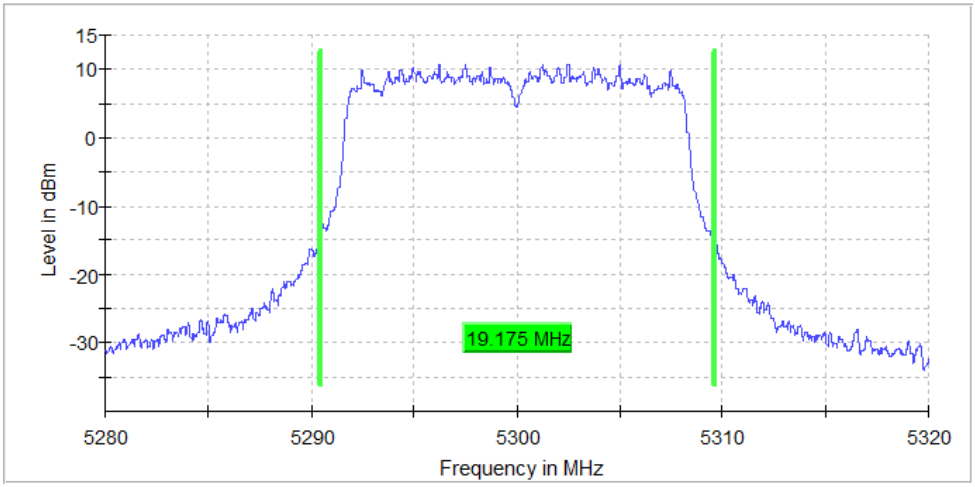


Figure 17: 26dB Occupied Bandwidth – 802.11a UNII-2A Mid Channel 5300MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5600.000000	18.995251	---	---	5590.492377	5609.487628

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5600.000000	8.6	PASS

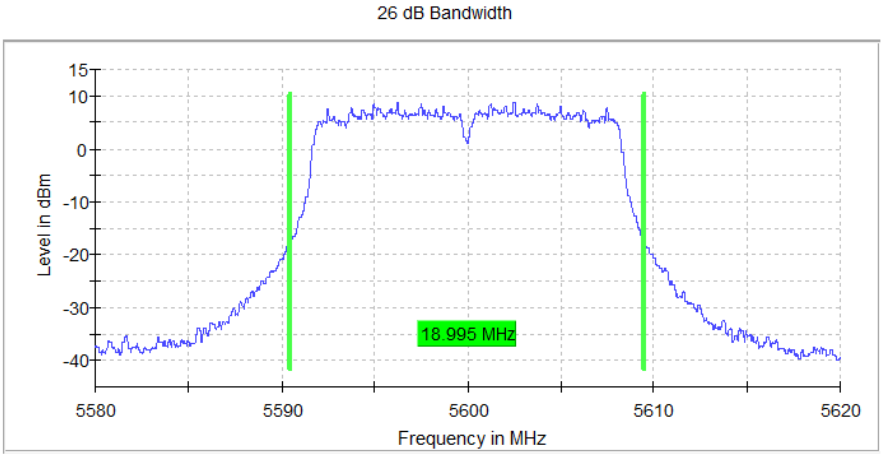


Figure 18: 26dB Occupied Bandwidth – 802.11a UNII-2C Mid Channel 5600MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5320.000000	17.805549	---	---	5311.062234	5328.867783

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5320.000000	PASS

Figure 19: 99% Occupied Bandwidth – 802.11n HT20 UNII-2A High Channel 5320MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5700.000000	17.775556	---	---	5691.072232	5708.847788

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5700.000000	PASS

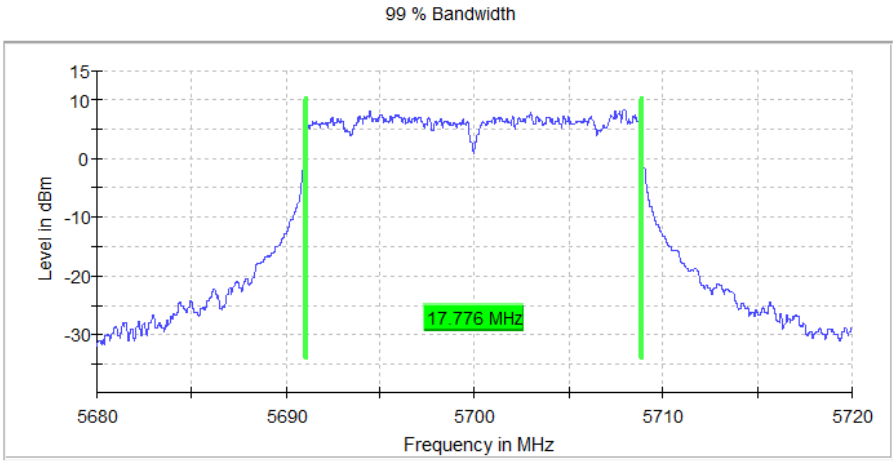


Figure 20: 99% Occupied Bandwidth – 802.11n HT20 UNII-2C High Channel 5700MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5320.000000	22.604349	---	---	5308.672832	5331.277181

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5320.000000	11.2	PASS

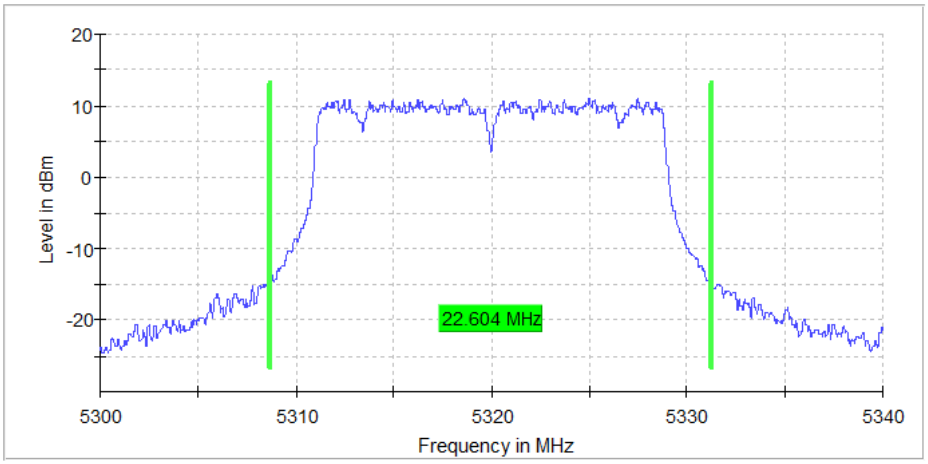


Figure 21: 26dB Occupied Bandwidth – 802.11n HT20 UNII-2A High Channel 5320MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5600.000000	22.554362	---	---	5588.642839	5611.197201

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5600.000000	8.9	PASS

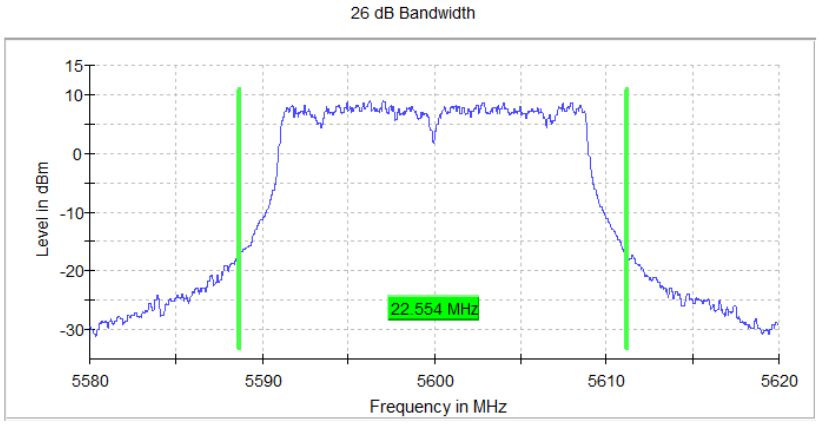


Figure 22: 26dB Occupied Bandwidth – 802.11n HT20 UNII-2C Mid Channel 5600MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5260.000000	17.815546	---	---	5251.052237	5268.867783

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5260.000000	PASS

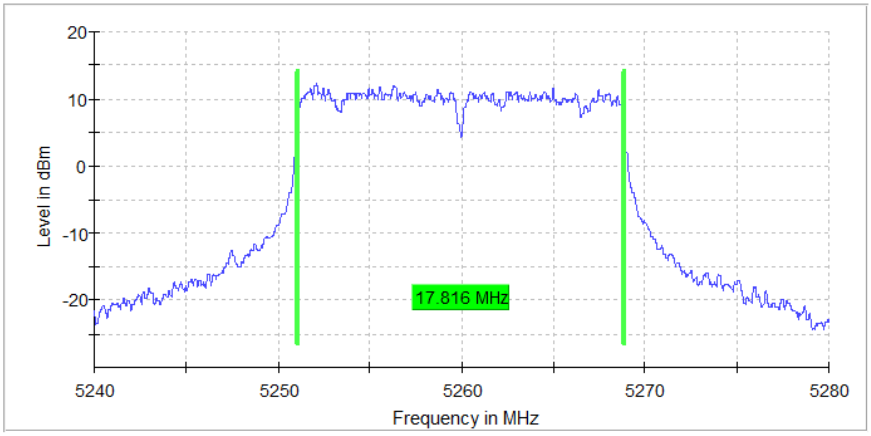


Figure 23: 99% Occupied Bandwidth – 802.11ac VHT20 UNII-2A Low Channel 5260MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5600.000000	17.765559	---	---	5591.072232	5608.837791

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5600.000000	PASS

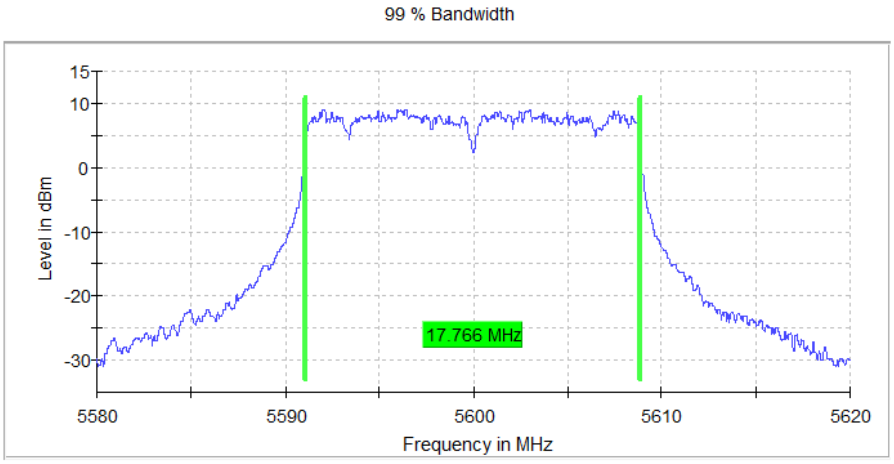


Figure 24: 99% Occupied Bandwidth – 802.11ac VHT20 UNII-2C Mid Channel 5600MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5300.000000	23.964009	---	---	5287.323169	5311.287178

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5300.000000	11.3	PASS

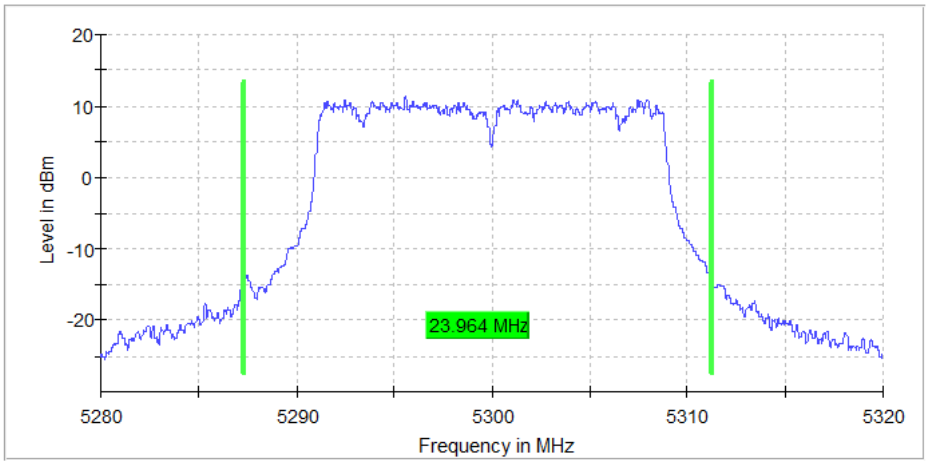


Figure 25: 26dB Occupied Bandwidth – 802.11ac VHT20 UNII-2A Mid Channel 5300MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5700.000000	22.224444	---	---	5688.892777	5711.117221

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5700.000000	8.1	PASS

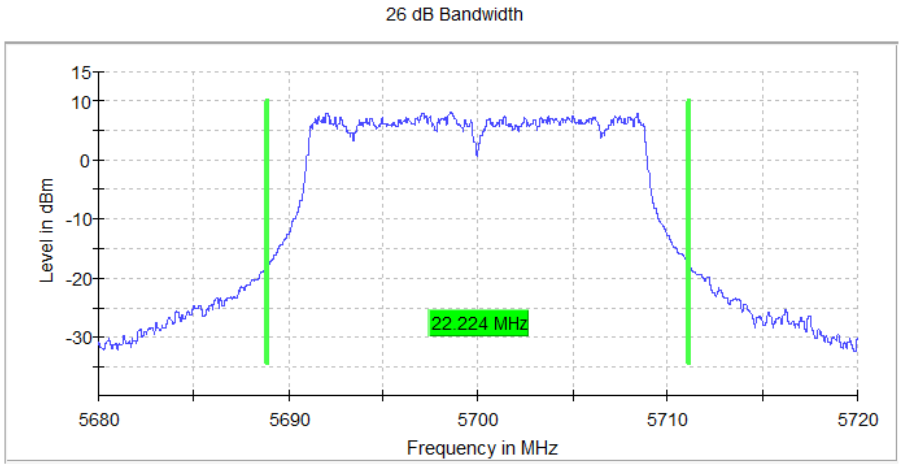


Figure 26: 26dB Occupied Bandwidth – 802.11ac VHT20 UNII-2C High Channel 5700MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5270.000000	36.010997	---	---	5251.924519	5287.935516

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5270.000000	PASS

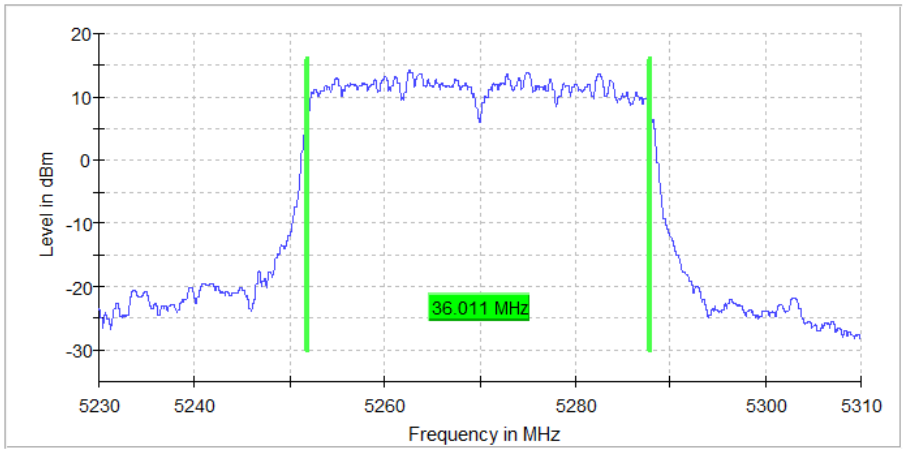


Figure 27: 99% Occupied Bandwidth – 802.11n HT40 UNII-2A Low Channel 5270MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5510.000000	35.971007	---	---	5492.064484	5528.035491

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5510.000000	PASS

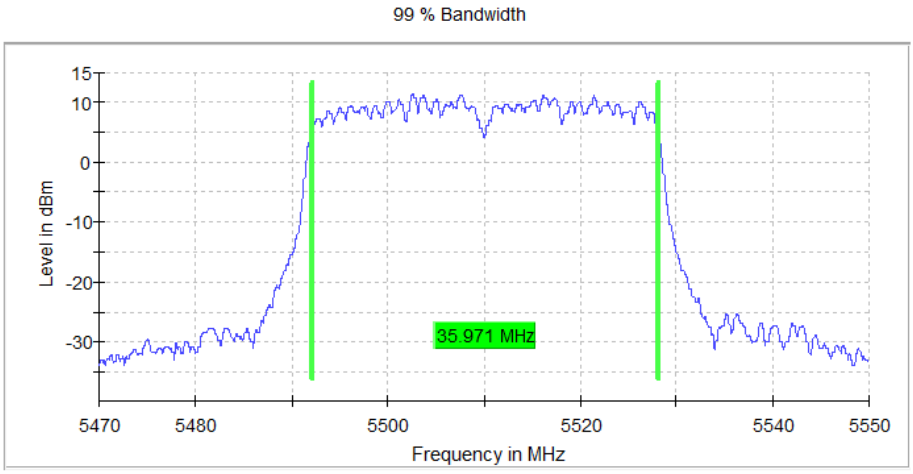


Figure 28: 99% Occupied Bandwidth – 802.11n HT40 UNII-2C Low Channel 5510MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5310.000000	40.089977	---	---	5289.925019	5330.014996

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5310.000000	13.1	PASS

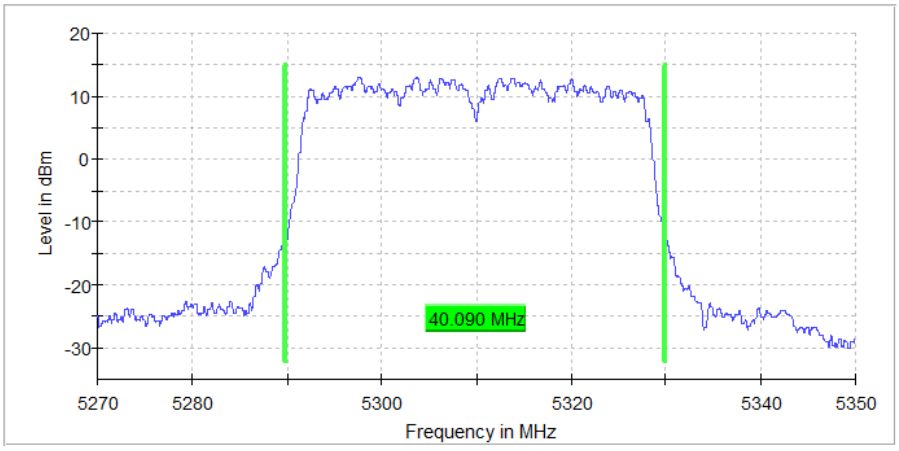


Figure 29: 26dB Occupied Bandwidth – 802.11n HT40 UNII-2A High Channel 5310MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5670.000000	39.630092	---	---	5650.084979	5689.715071

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5670.000000	11.1	PASS

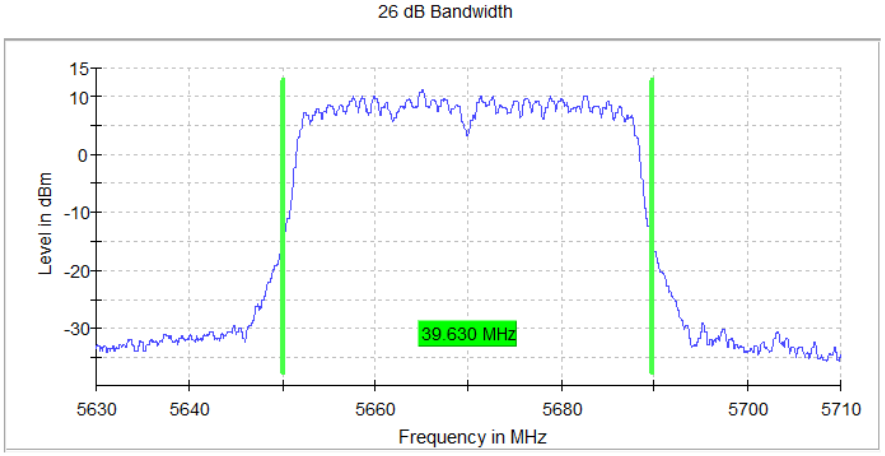


Figure 30: 26dB Occupied Bandwidth – 802.11n HT40 UNII-2C High Channel 5670MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5310.000000	36.070982	---	---	5291.924519	5327.995501

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5310.000000	PASS

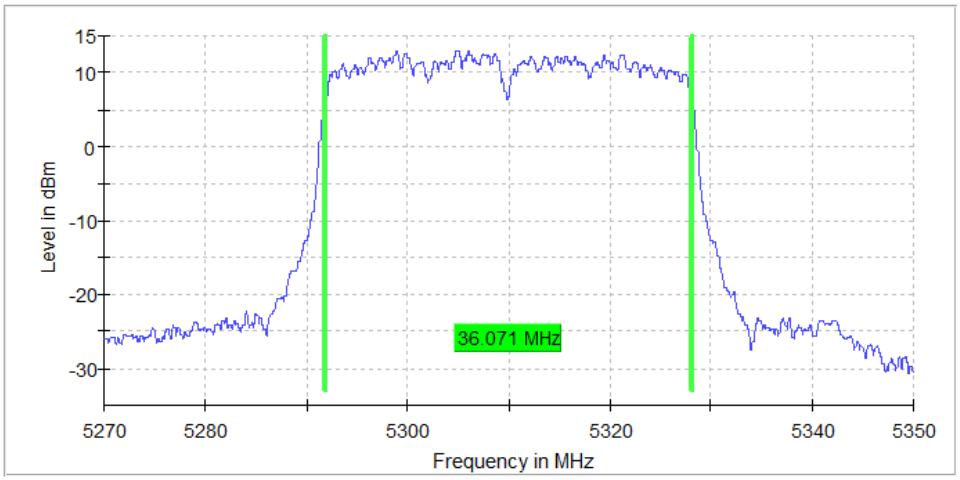


Figure 31: 99% Occupied Bandwidth – 802.11ac VHT40 UNII-2A High Channel 5310MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5670.000000	36.070982	---	---	5651.884529	5687.955511

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5670.000000	PASS

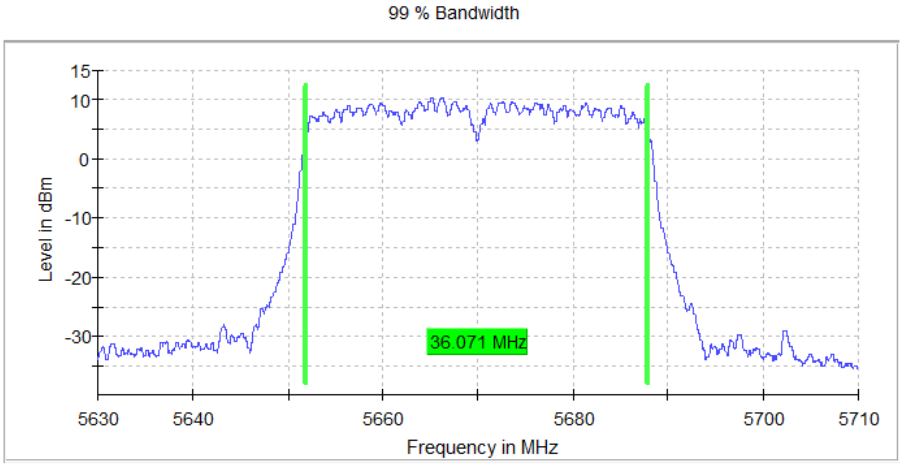


Figure 32: 99% Occupied Bandwidth – 802.11ac VHT40 UNII-2C High Channel 5670MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5310.000000	40.689827	---	---	5289.445139	5330.134966

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5310.000000	12.7	PASS

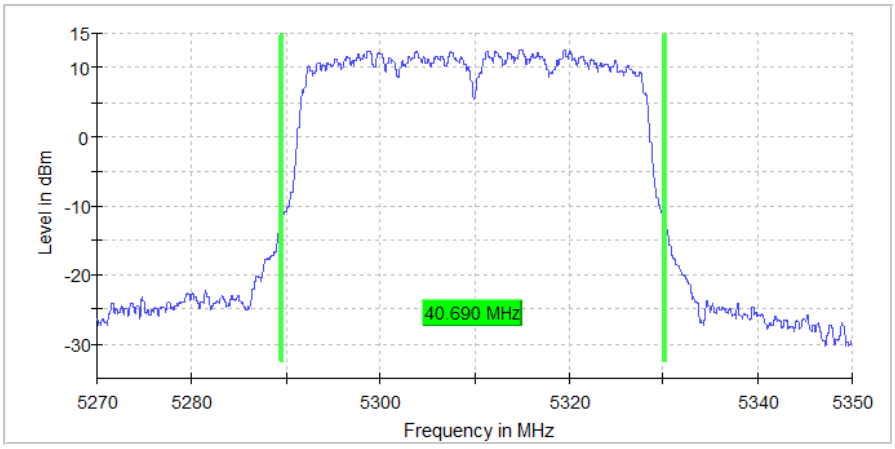


Figure 33: 26dB Occupied Bandwidth – 802.11ac VHT40 UNII-2A High Channel 5310MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5590.000000	40.229942	---	---	5569.945014	5610.174956

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5590.000000	11.6	PASS

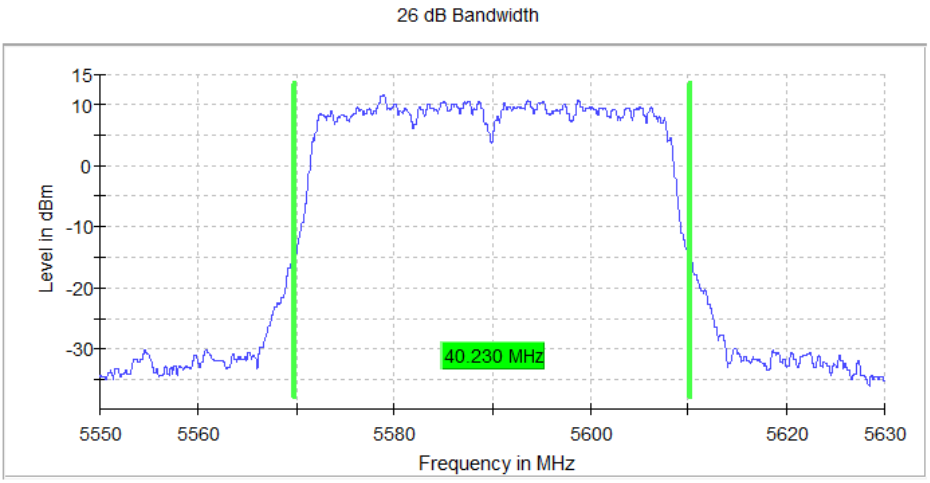


Figure 34: 26dB Occupied Bandwidth – 802.11ac VHT40 UNII-2C Mid Channel 5590MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5290.000000	75.421144	---	---	5252.089478	5327.510622

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5290.000000	PASS

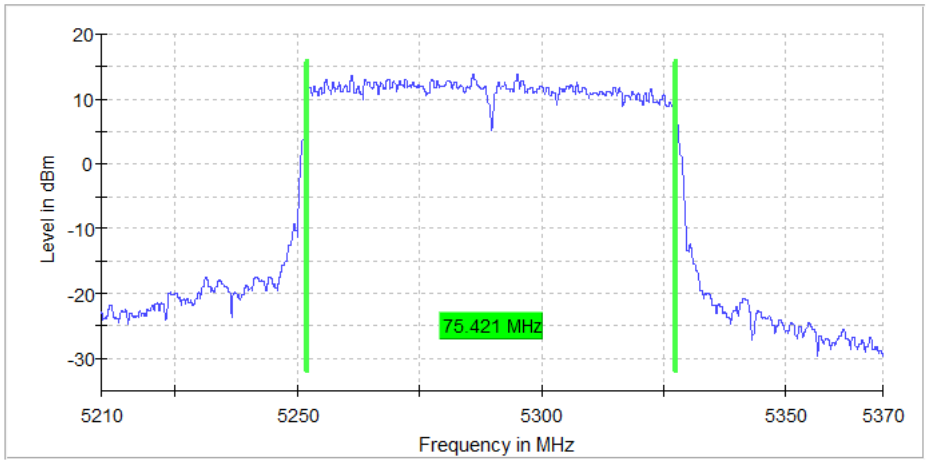


Figure 35: 99% Occupied Bandwidth – 802.11ac VHT80 UNII-2A Mid Channel 5290MHz

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5530.000000	75.141214	---	---	5492.529368	5567.670582

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
5530.000000	PASS

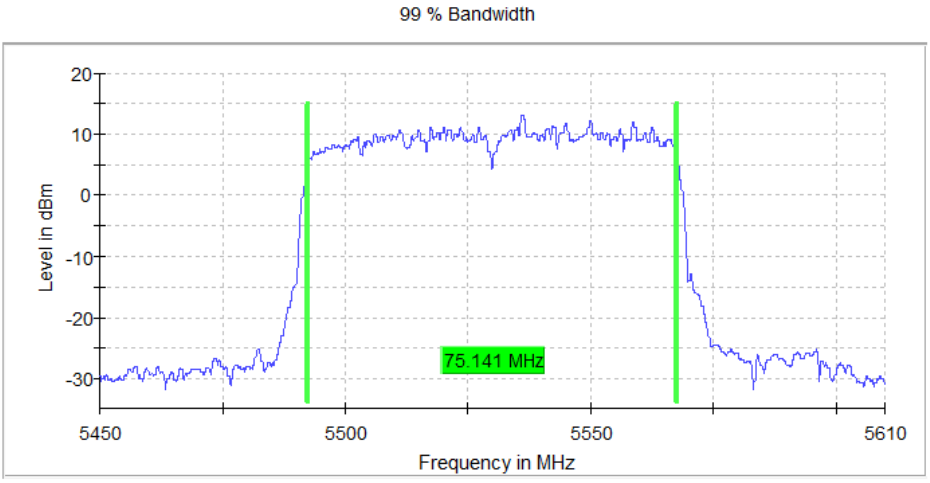


Figure 36: 99% Occupied Bandwidth – 802.11ac VHT40 UNII-2C Low Channel 5530MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5290.000000	81.739566	---	---	5249.010247	5330.749813

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5290.000000	14.0	PASS

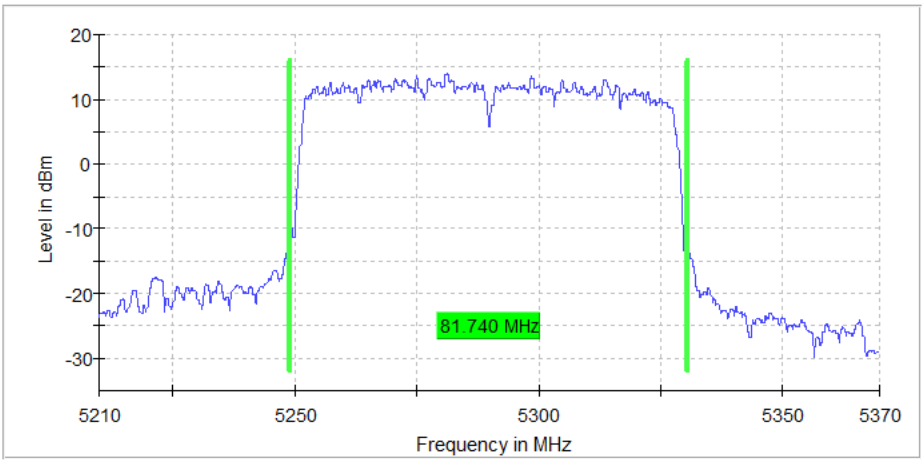


Figure 37: 26dB Occupied Bandwidth – 802.11ac VHT80 UNII-2A Mid Channel 5290MHz

26 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
5530.000000	81.019745	---	---	5490.129968	5571.149713

(continuation of the "26 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
5530.000000	11.8	PASS

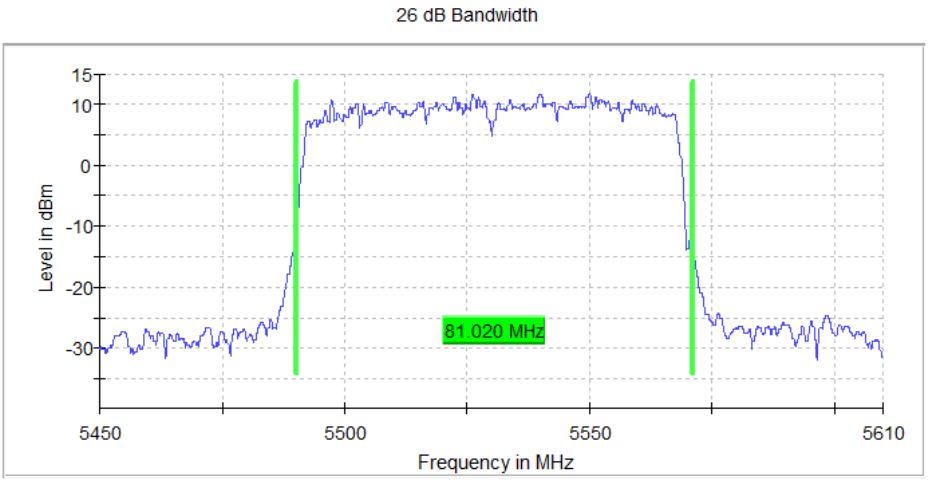


Figure 38: 26dB Occupied Bandwidth – 802.11ac VHT80 UNII-2C Low Channel 5530MHz

4.3 Power Spectral Density

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

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

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

Band 5725-5850 MHz: 30 dBm in any 500 kHz band.

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

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

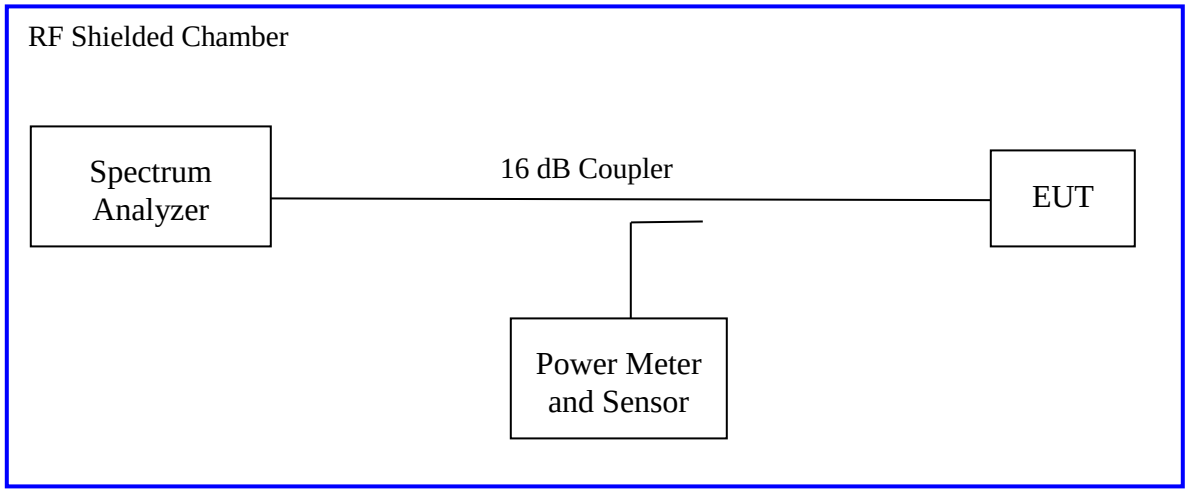
Band 5250-5350 MHz, and 5470-5725 MHz: 11 dBm in any 1 MHz band

Band 5725-5850 MHz: 30 dBm in any 500 kHz band

4.3.1 Test Method

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

Test Setup:



4.3.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s). The below results show the combined measured power spectral density chains. The low 5.3GHz UNII-2A is a 2x2 MIMO system and the high 5.5GHz UNII-2C is a 4x4 MIMO system.

Table 14: Power Spectral Density – Test Results

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 83.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11a at 6 Mbps (FCC & RSS Limit)						
Frequency (MHz)	**Channel**	**Measured [dBm]**	**Duty Cycle [dB]**	**Max PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
5260	52	4.98	0.74	6.510	11.00	-4.49
5300	60	4.721	0.74	6.251	11.00	-4.749
5320	64	4.689	0.74	6.219	11.00	-4.781
5500	100	4.517	0.74	6.047	11.00	-4.953
5600	120	5.191	0.74	6.721	11.00	-4.279
5700	140	4.506	0.74	6.036	11.00	-4.964

Note: 1. Worst case was observed at 6 Mbps.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 15: Power Spectral Density – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT20 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Measured [dBm]	Duty Cycle [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
5260	52	8.234	0.74	8.974	11.00	-2.026
5300	60	7.823	0.74	8.563	11.00	-2.437
5320	64	7.751	0.74	8.491	11.00	-2.509
5500	100	7.695	0.74	8.435	11.00	-2.565
5600	120	8.171	0.74	8.911	11.00	-2.089
5700	140	7.077	0.74	7.817	11.00	-3.183

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 16: Power Spectral Density – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.1%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT20 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Measured [dBm]	Duty Cycle [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
5260	52	7.984	0.71	8.694	11.00	-2.306
5300	60	7.907	0.71	8.617	11.00	-2.383
5320	64	7.771	0.71	8.481	11.00	-2.519
5500	100	7.978	0.71	8.688	11.00	-2.312
5600	120	8.102	0.71	8.812	11.00	-2.188
5700	140	7.423	0.71	8.133	11.00	-2.867

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 17: Power Spectral Density – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 95.8%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11n HT40 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Measured [dBm]	Duty Cycle [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
5270	54	7.582	0.37	7.952	11.00	-3.048
5310	62	7.104	0.37	7.474	11.00	-3.526
5510	102	7.398	0.37	7.768	11.00	-3.232
5590	118	7.707	0.37	8.077	11.00	-2.923
5670	134	7.330	0.37	7.700	11.00	-3.3

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 18: Power Spectral Density – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 92.0%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT40 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Measured [dBm]	Duty Cycle [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
5270	54	5.853	0.72	6.573	11.00	-4.427
5310	62	5.286	0.72	6.006	11.00	-4.994
5510	102	5.428	0.72	6.148	11.00	-4.852
5590	118	5.883	0.72	6.603	11.00	-4.397
5670	134	5.723	0.72	6.443	11.00	-4.557

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

Table 19: Power Spectral Density – Test Results Continued

Date: January 23, 2020	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 91.9%
Ambient Temp.: 22 - 23 °C	**Relative Humidity:** 35 - 38%

802.11ac VHT80 at MCS0 (FCC & RSS Limit)

Frequency (MHz)	Channel	Measured [dBm]	Duty Cycle [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
5290	58	4.535	0.73	5.265	11.00	-5.735
5530	106	2.280	0.73	3.010	11.00	-7.99
5610	122	2.814	0.73	3.544	11.00	-7.456

Note: 1. Worst case was observed at MCS0.
3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.

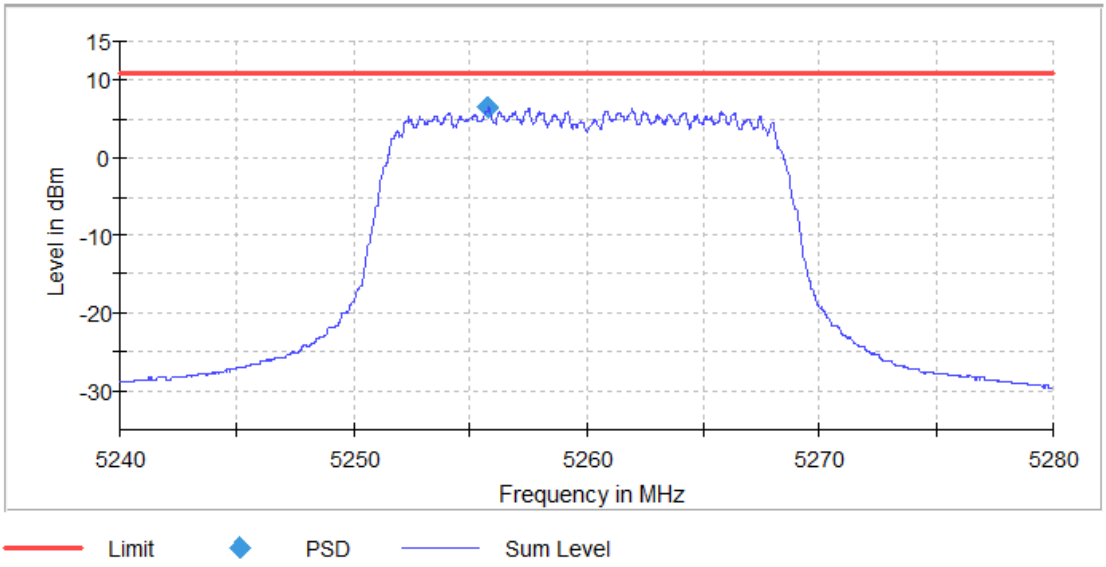


Figure 39: Power Spectral Density – 802.11a UNII-2A Low Channel 5260MHz

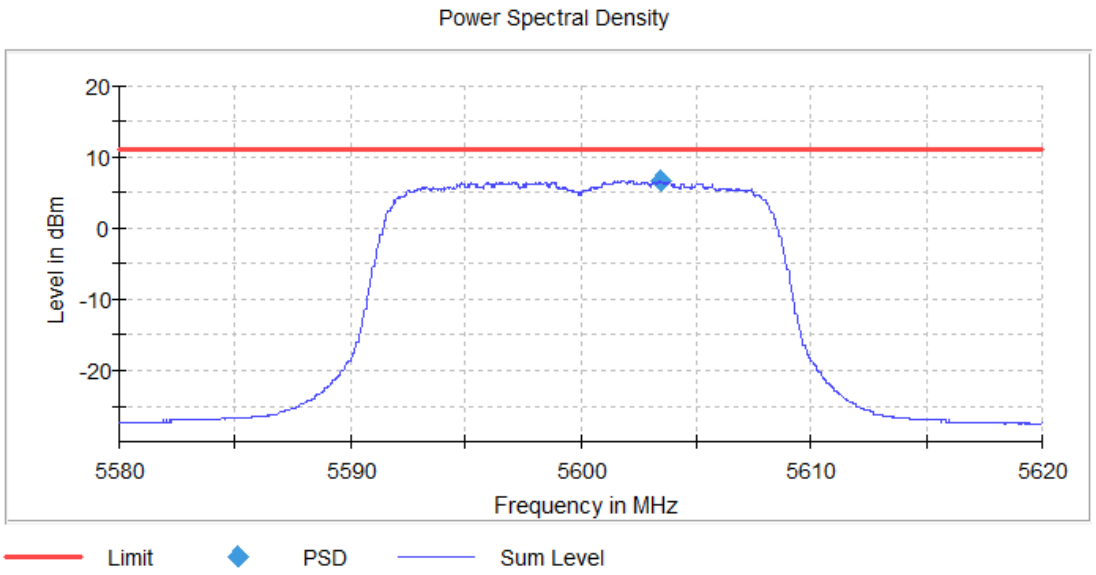


Figure 40: Power Spectral Density – 802.11a UNII-2C Mid Channel 5600MHz

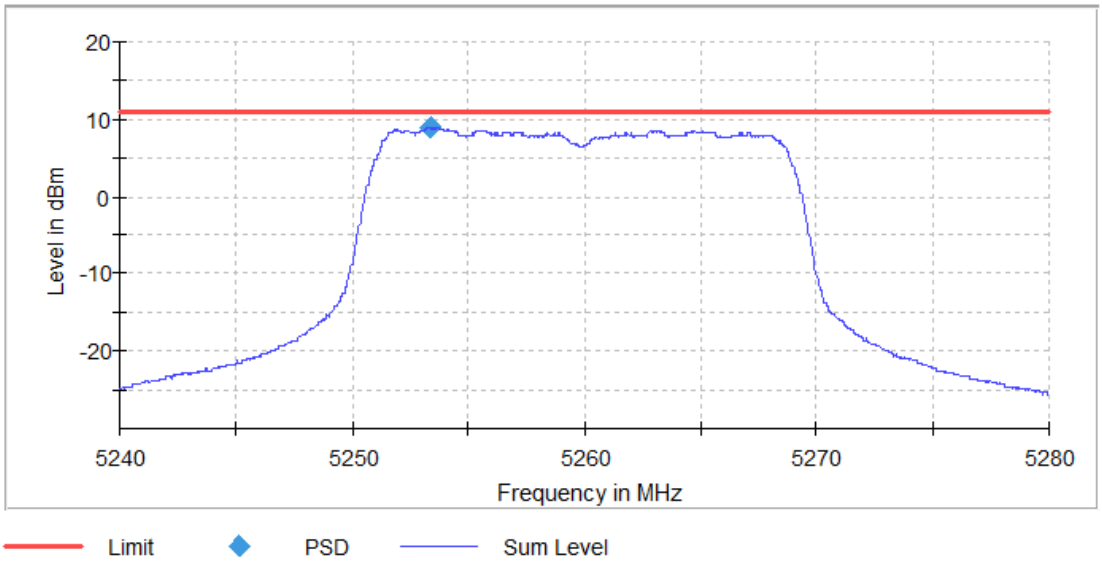


Figure 41: Power Spectral Density – 802.11n HT20 UNII-2A Low Channel 5260MHz

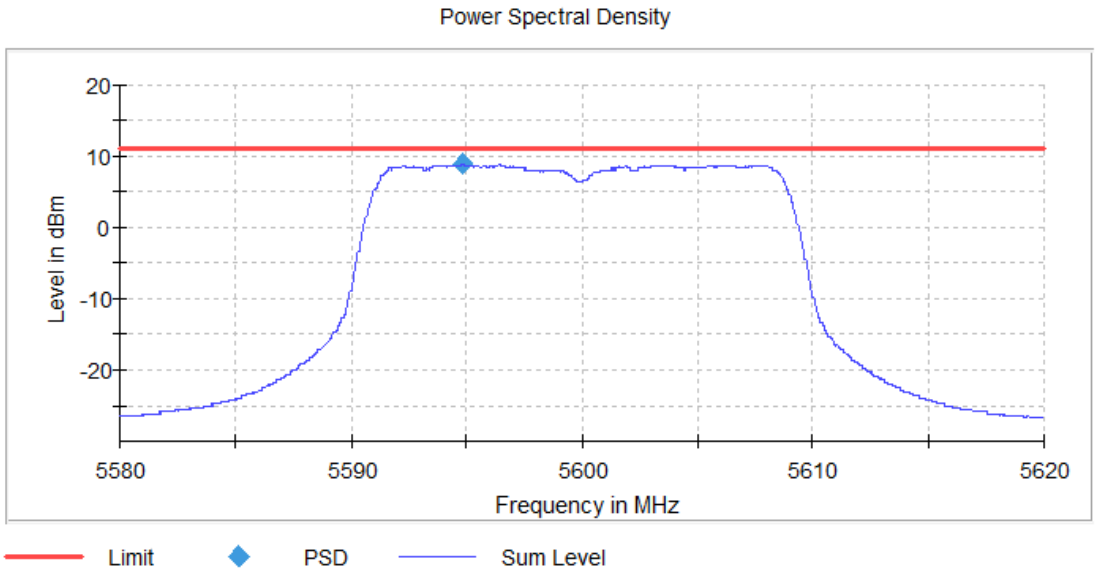


Figure 42: Power Spectral Density – 802.11n HT20 UNII-2C Mid Channel 5600MHz

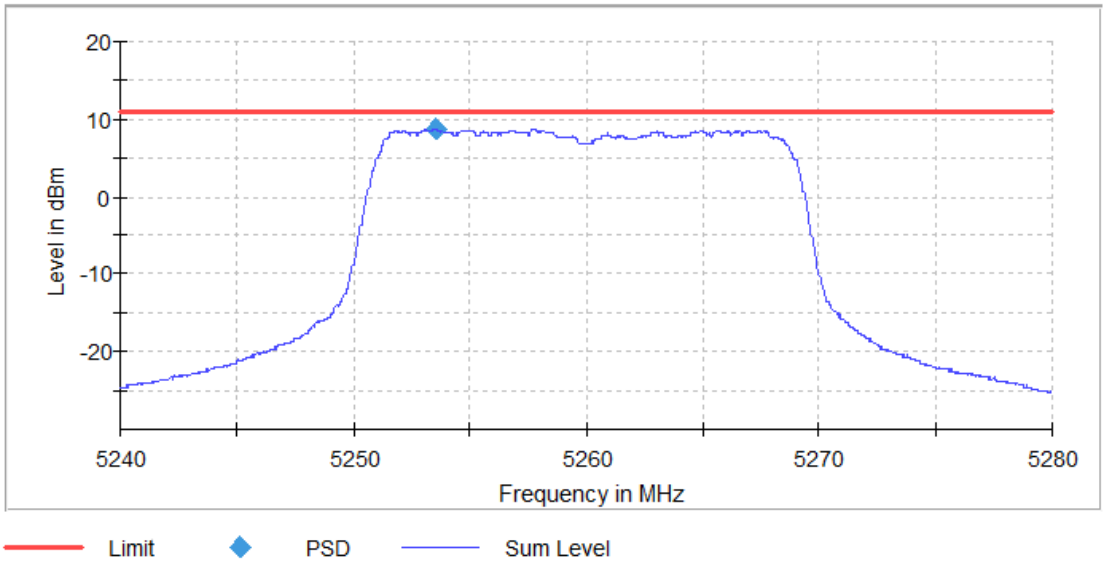


Figure 43: Power Spectral Density – 802.11ac VHT20 UNII-2A Low Channel 5260MHz

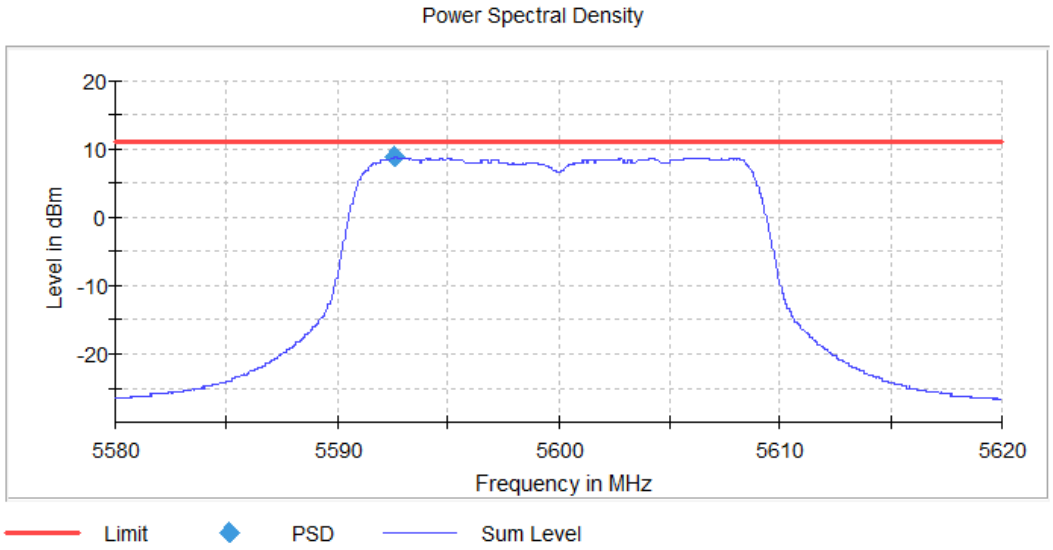


Figure 44: Power Spectral Density – 802.11ac VHT20 UNII-2C Mid Channel 5600MHz

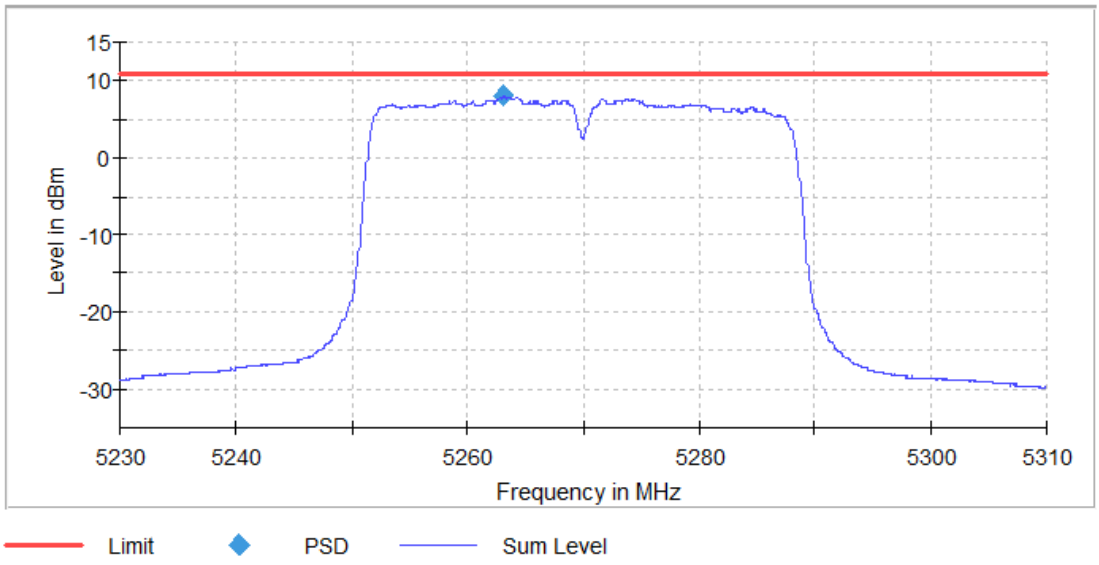


Figure 45: Power Spectral Density – 802.11n HT40 UNII-2A Low Channel 5270MHz

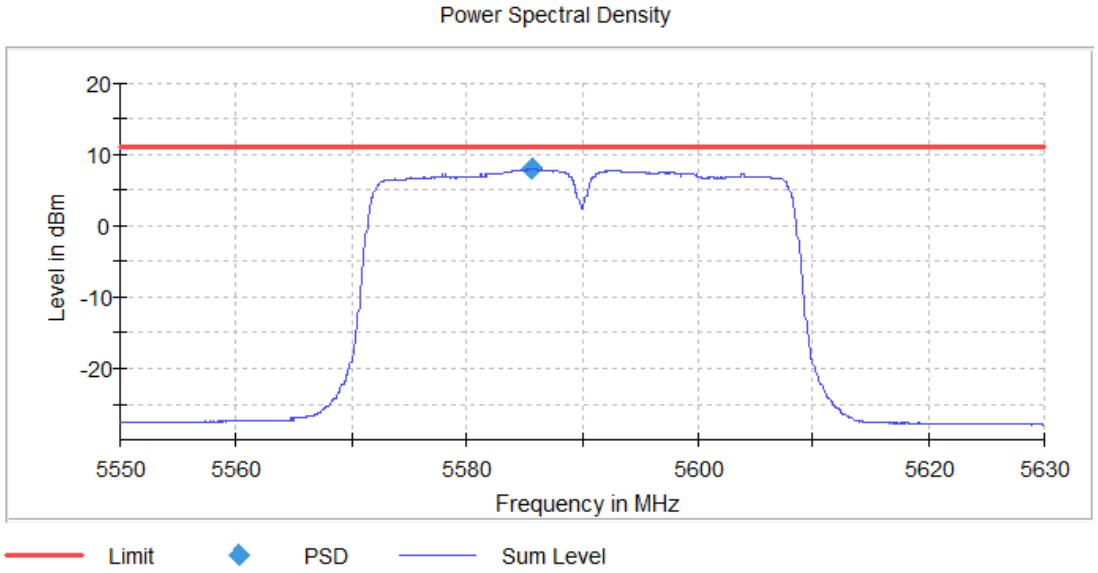


Figure 46: Power Spectral Density – 802.11n HT40 UNII-2C Mid Channel 5590MHz

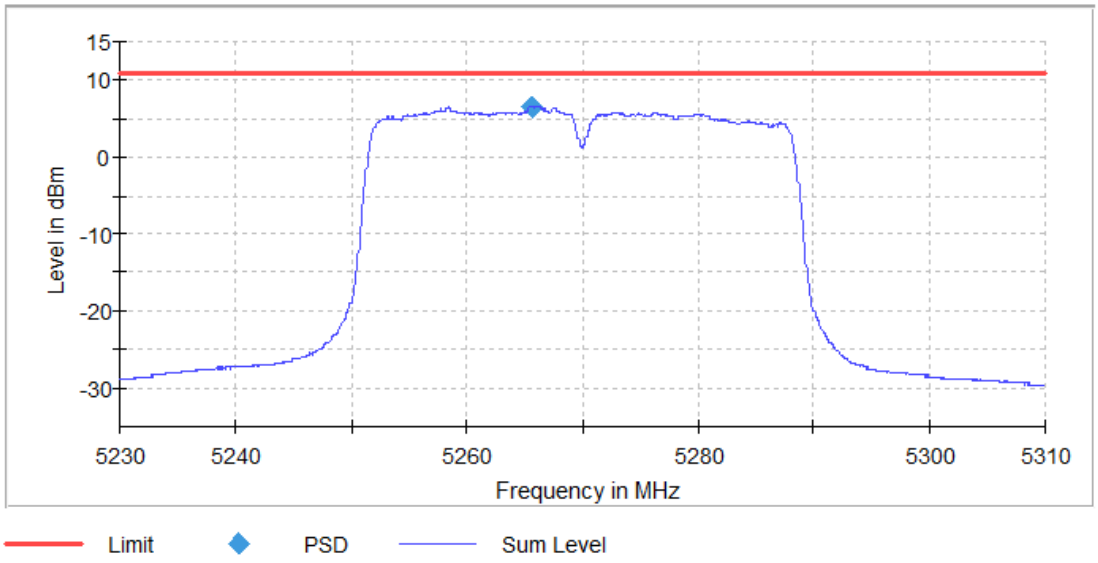


Figure 47: Power Spectral Density – 802.11ac VHT40 UNII-2A Low Channel 5270MHz

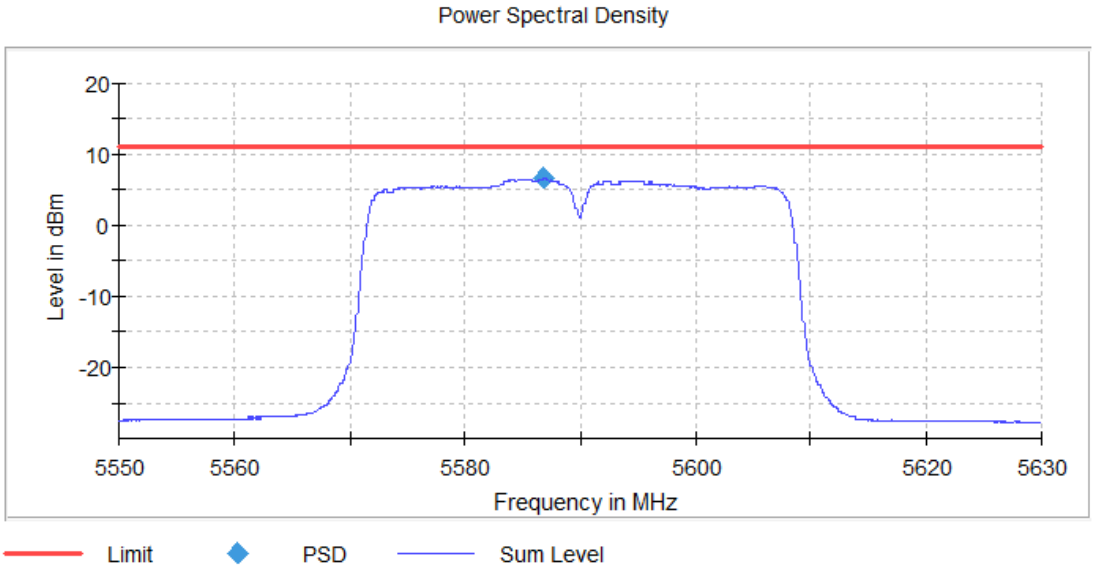


Figure 48: Power Spectral Density – 802.11ac VHT40 UNII-2C Mid Channel 5590MHz

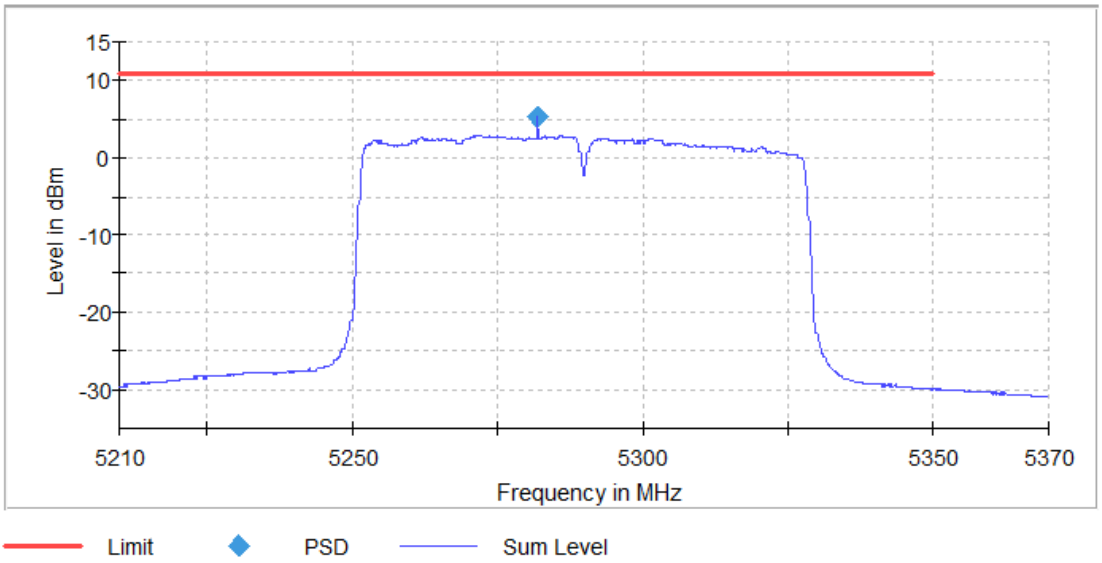


Figure 49: Power Spectral Density – 802.11ac VHT80 UNII-2A Mid Channel 5290MHz

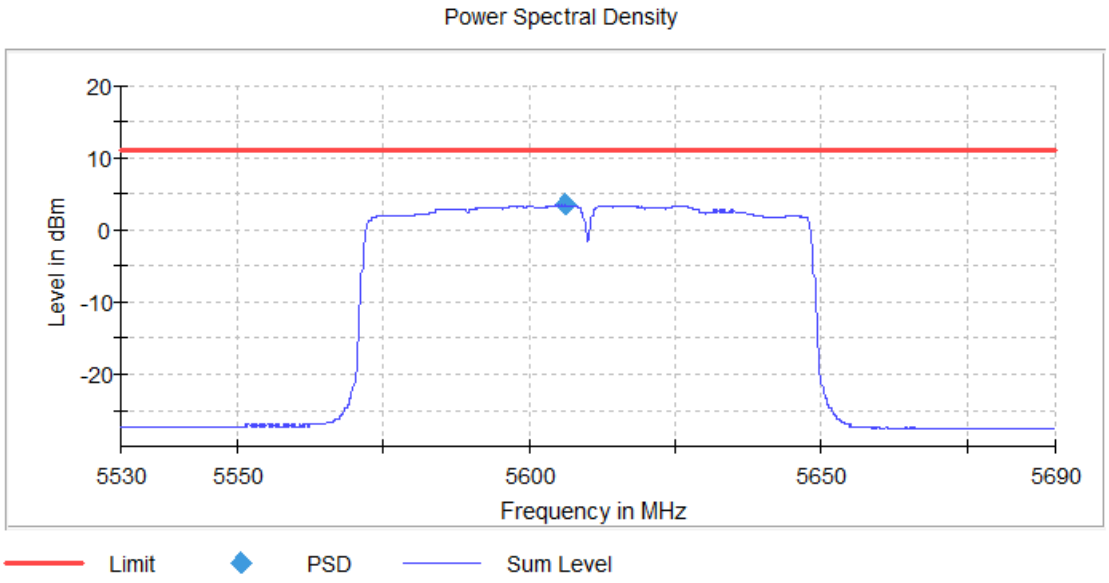


Figure 50: Power Spectral Density – 802.11AC VHT80 UNII-2C High Channel 5610MHz

4.4 Undesirable Emission Limits

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

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

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

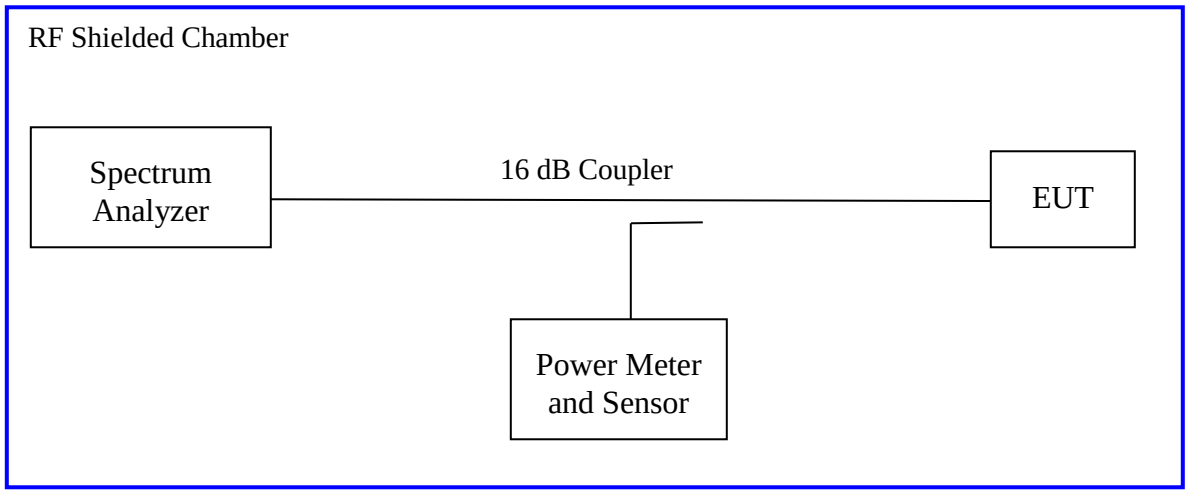
For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

4.4.1 Test Method

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

Test Setup:



4.4.2 Results

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

Table 20: Undesired Emissions – Test Results

Date: February 23, 2021	**Tested By:** James Borrott
Test Method: Conducted Measurements	**Power Setting:** See test plan.
Antenna Type: FPCB	**Max Antenna Gain:** UNII2A = 4.2 dBi; UNII2C = 4.7 dBi
Operating Mode: Transmitting	**Signal State:** Modulated at 83.9% (11a), 95.7% (HT40), 91.9% (VHT80)
Ambient Temp.: 23 °C	**Relative Humidity:** 35-37%

Undesired Emissions for 802.11a, 6Mbps

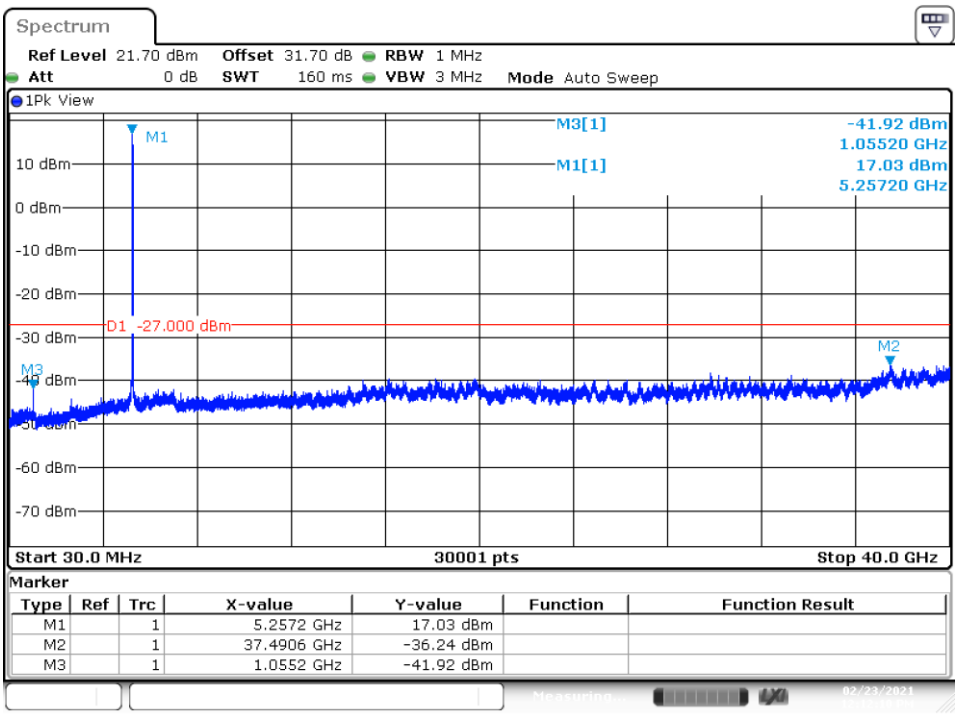
Band	TX Channel	TX Freq	Emission Freq	Corr. Level	Det.	Limit	Margin
		[MHz]	[MHz]	[dBm]		[dBm]	[dB]
UNII-2A	54	5260	1005.2	-41.92	Pk	-27	-14.92
			37490.6	-36.24	Pk	-27	-9.24
	60	5300	29854.0	-38.05	Pk	-27	-11.05
			38982.8	-36.55	Pk	-27	-9.55
	64	5320	29872.6	-38.42	Pk	-27	-11.42
			37428.0	-35.73	Pk	-27	-8.73
UNII-2C	100	5500	19864.5	-40.20	Pk	-27	-13.2
			38949.5	-36.35	Pk	-27	-9.35
	120	5600	24965.8	-38.90	Pk	-27	-11.9
			37505.3	-36.37	Pk	-27	-9.37
	140	5700	29854.0	-38.26	Pk	-27	-11.26
			38417.9	-36.03	Pk	-27	-9.03

Undesired Emissions for 802.11n HT40, MCS0

Band	TX Channel	TX Freq	Emission Freq	Corr. Level	Det.	Limit	Margin
		[MHz]	[MHz]	[dBm]		[dBm]	[dB]
UNII-2A	54	5270	1063.2	-40.16	Pk	-27	-13.16
			37525.3	-35.84	Pk	-27	-8.84
	62	5310	29856.6	-37.99	Pk	-27	-10.99
			38047.5	-36.33	Pk	-27	-9.33

UNII-2C	102	5510	18177.8	-38.85	Pk	-27	-11.85
			37445.3	-36.72	Pk	-27	-9.72
	118	5590	29855.3	-38.63	Pk	-27	-11.63
			37505.3	-36.39	Pk	-27	-9.39
	134	5670	19848.5	-39.41	Pk	-27	-12.41
			37519.9	-34.84	Pk	-27	-7.84
Undesired Emissions for 802.11ac VHT80, MCS0							
Band	TX Channel	TX Freq	Emission Freq	Corr. Level	Det.	Limit	Margin
		[MHz]	[MHz]	[dBm]		[dBm]	[dB]
UNII-2A	58	5290	1084.5	-41.40	Pk	-27	-14.4
			37438.7	-38.37	Pk	-27	-11.37
UNII-2C	106	5530	24871.2	-39.06	Pk	-27	-12.06
			37490.6	-36.26	Pk	-27	-9.26
	122	5610	17860.2	-38.66	Pk	-27	-11.66
			37497.8	-37.66	Pk	-27	-10.66

Note: 1. Worst case observed at Chain 1. Emissions detected, noise floor.
2. All out of band emissions are below the -27dBm level.



Date: 23.FEB.2021 12:12:10

Figure 51: Conducted OOB Emissions – 802.11a UNII-2A Low Channel 5260MHz

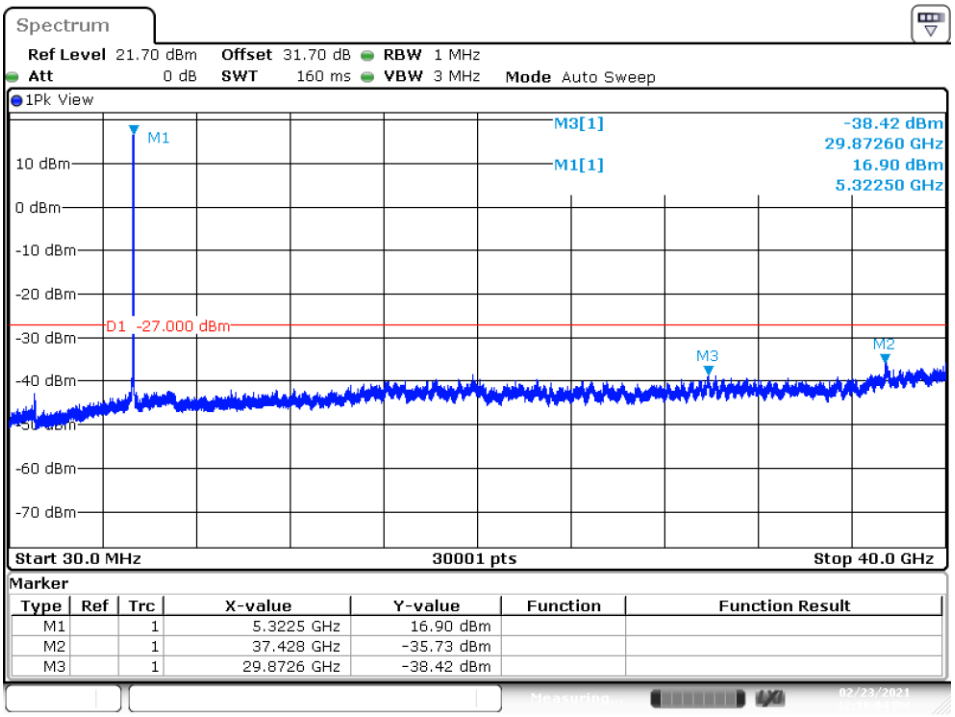


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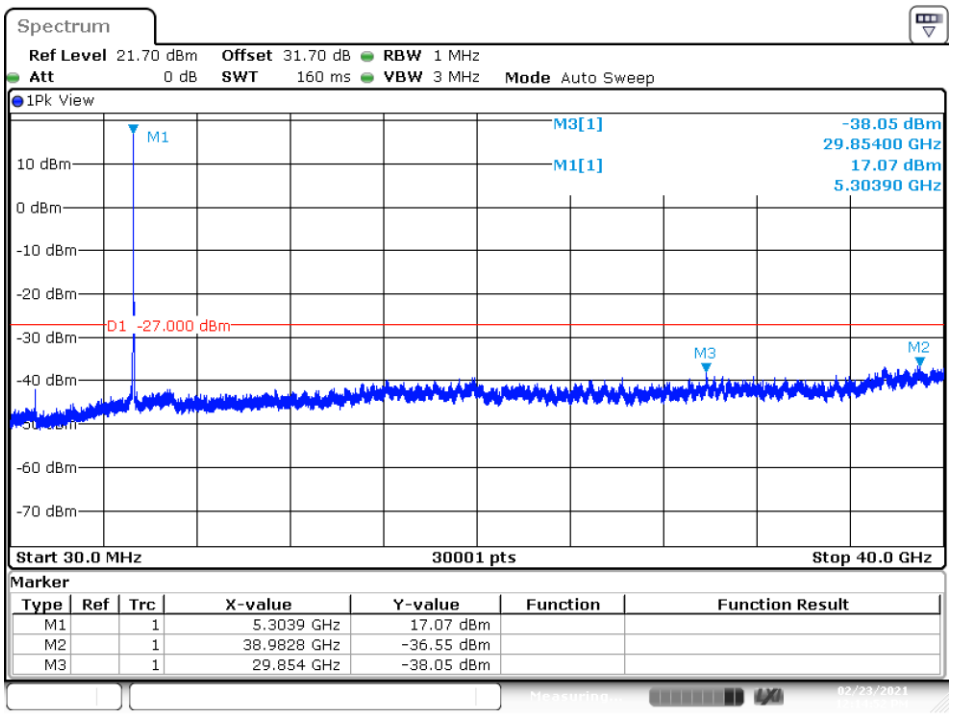
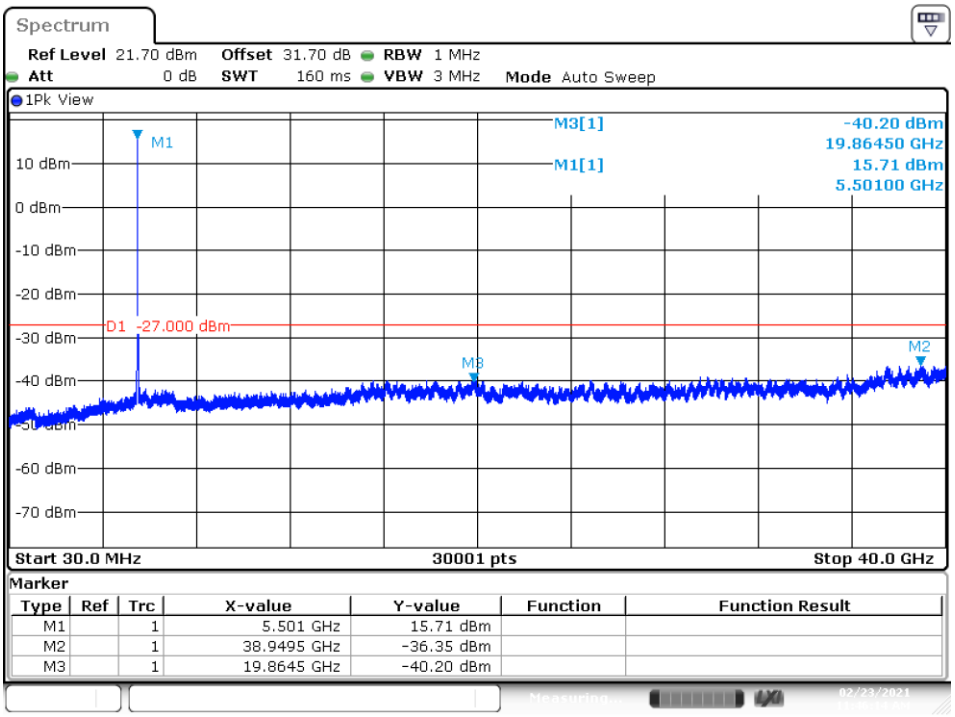
Figure 52: Conducted OOB Emissions – 802.11a UNII-2A Mid Channel 5300MHz



Date: 23.FEB.2021 12:14:53

Figure 53: Conducted OOB Emissions – 802.11a UNII-2A High Channel 5320MHz



Date: 23.FEB.2021 11:46:14

Figure 54: Conducted OOB Emissions – 802.11a UNII-2C Low Channel 5500MHz

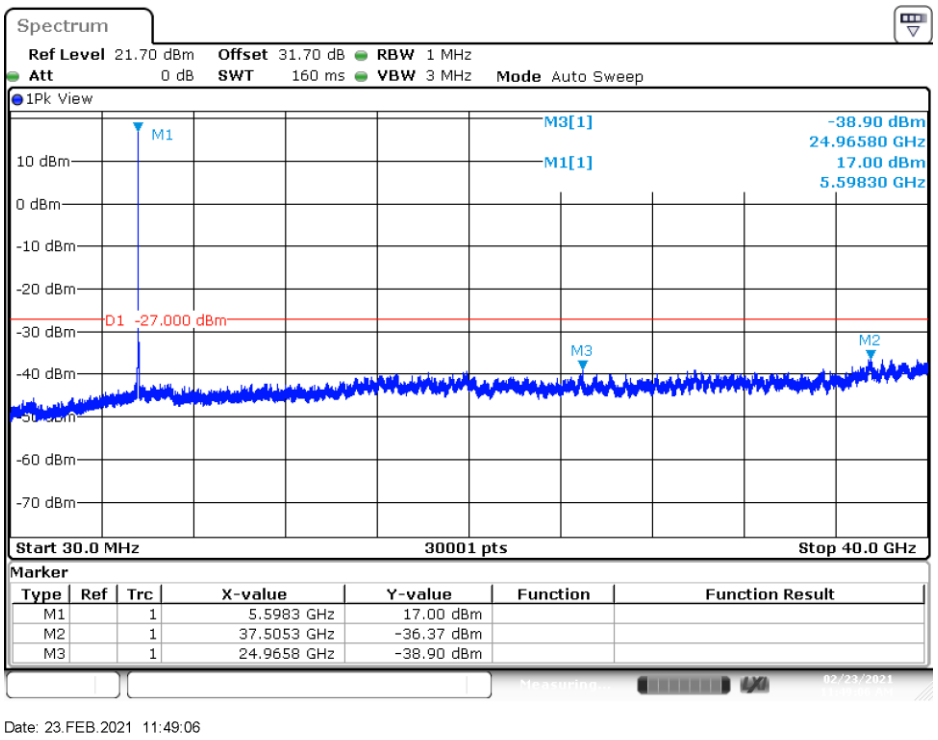


Figure 55: Conducted OOB Emissions – 802.11a UNII-2C Mid Channel 5600MHz

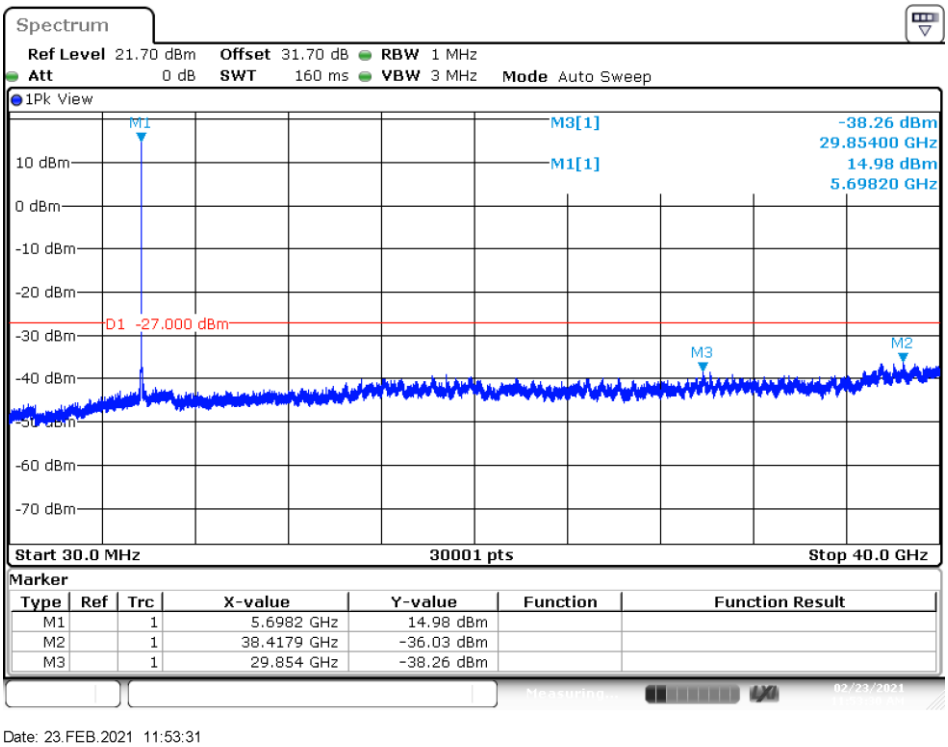


Figure 56: Conducted OOB Emissions – 802.11a UNII-2C High Channel 5700MHz

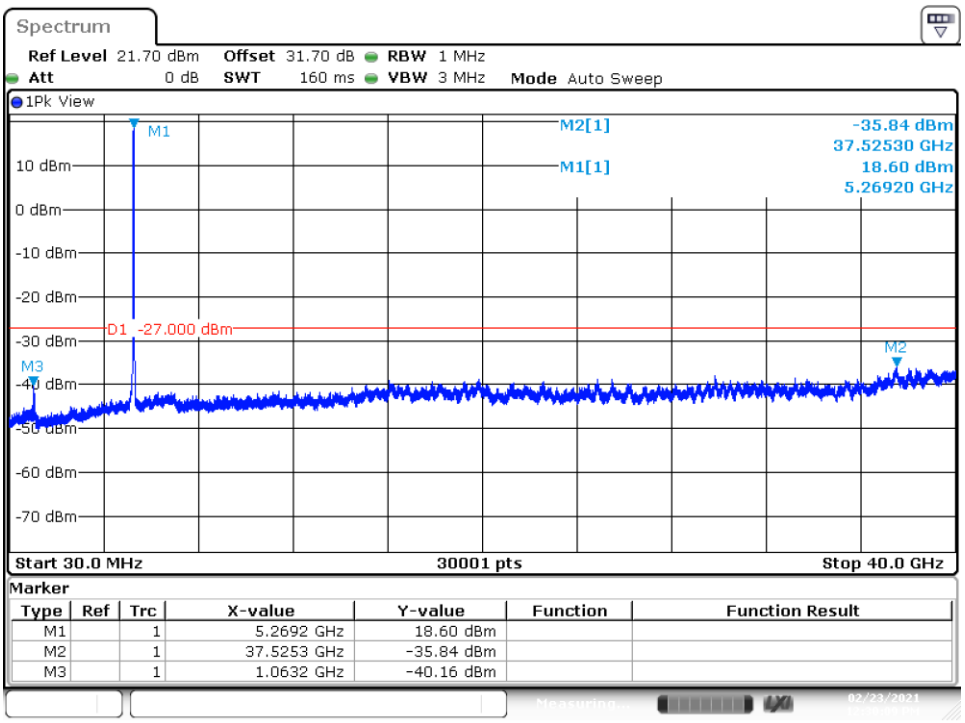


Figure 57: Conducted OOB Emissions – 802.11n HT40 UNII-2A Low Channel 5270MHz

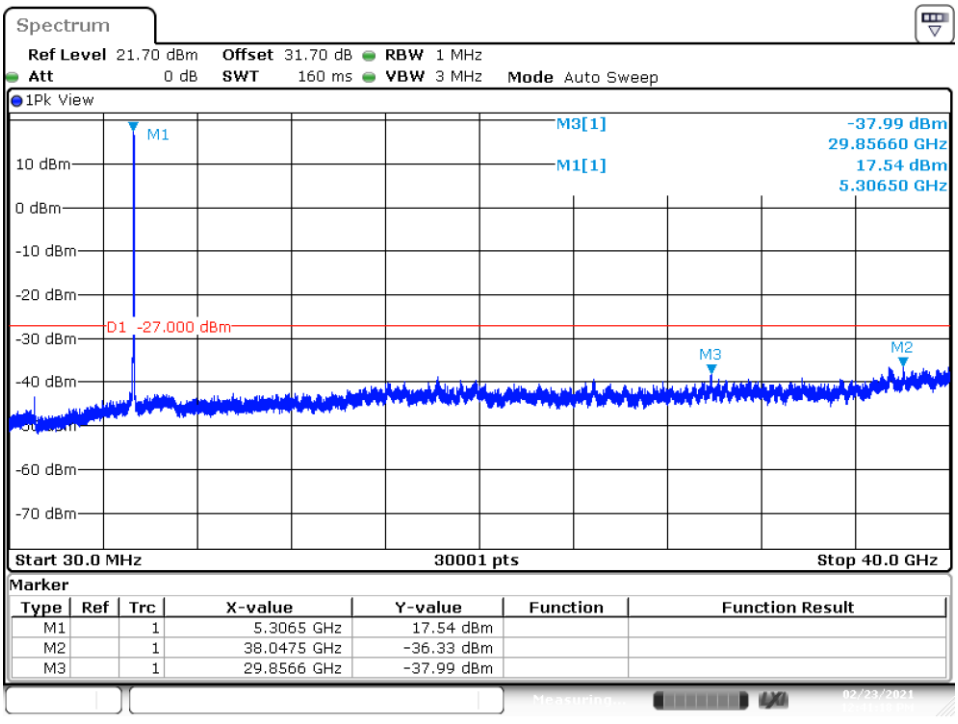


Figure 58: Conducted OOB Emissions – 802.11n HT40 UNII-2A High Channel 5310MHz

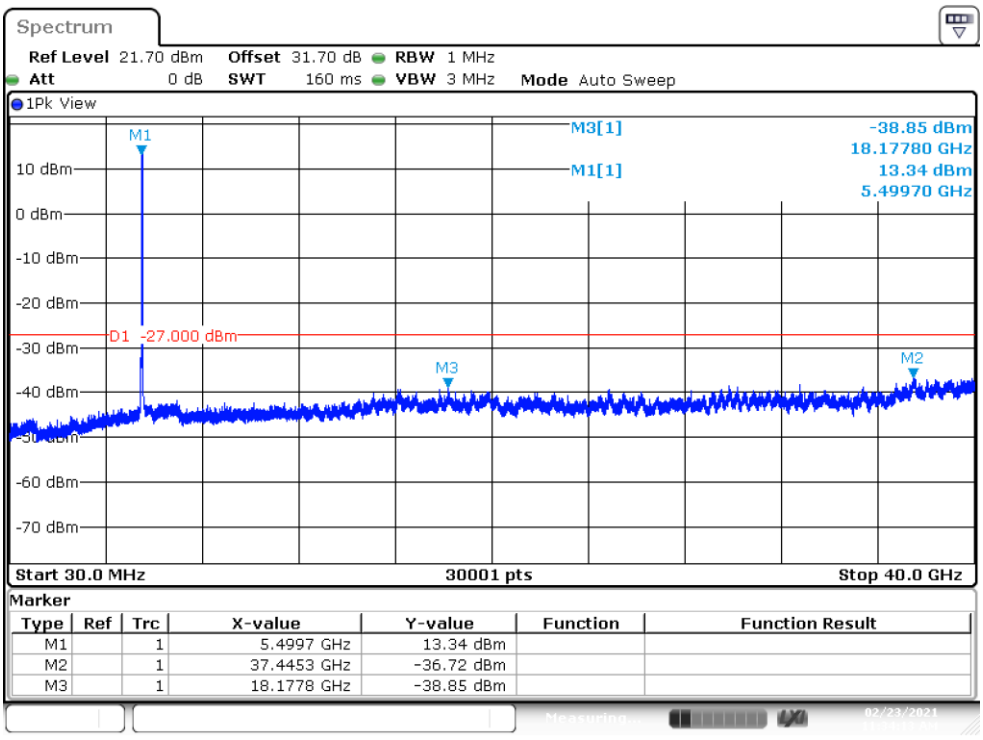


Figure 59: Conducted OOB Emissions – 802.11n HT40 UNII-2C Low Channel 5510MHz

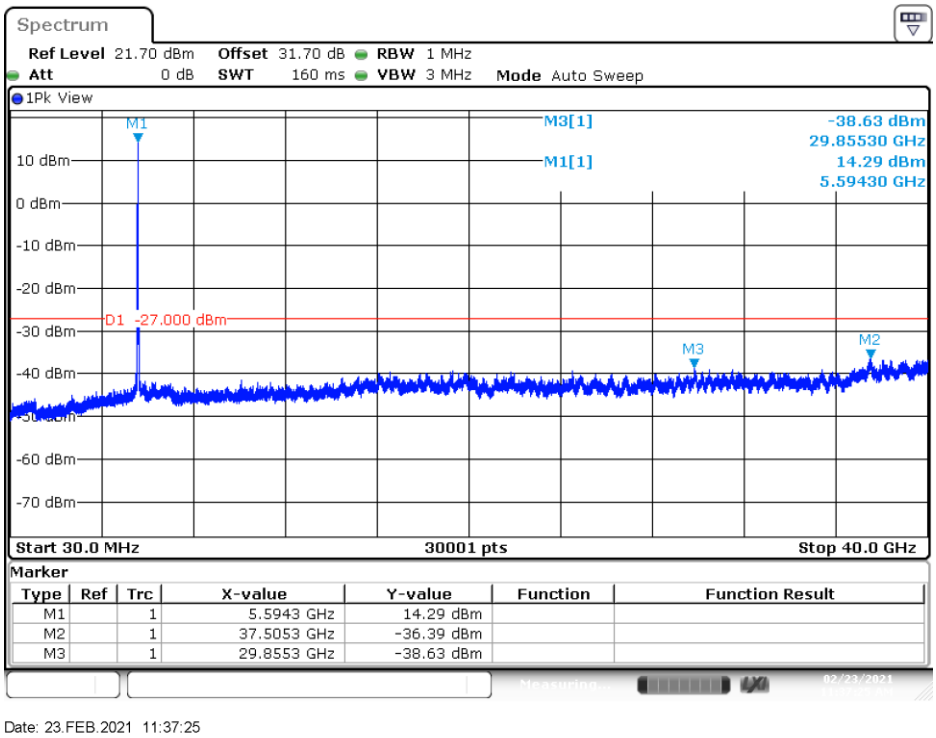


Figure 60: Conducted OOB Emissions – 802.11n HT40 UNII-2C Mid Channel 5590MHz

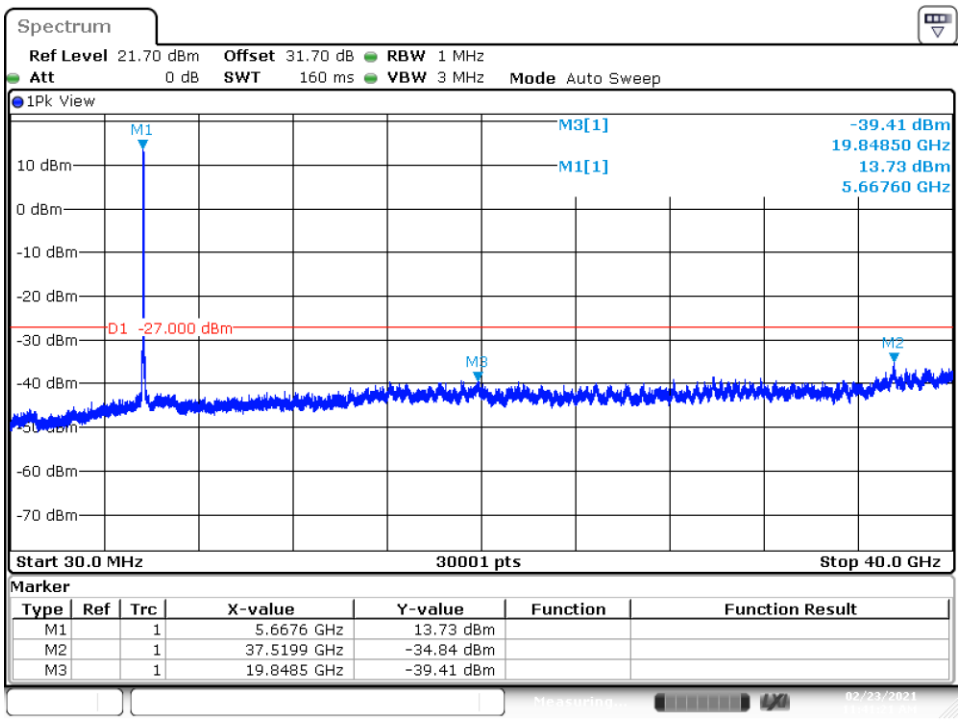


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Figure 61: Conducted OOB Emissions – 802.11n HT40 UNII-2C High Channel 5670MHz

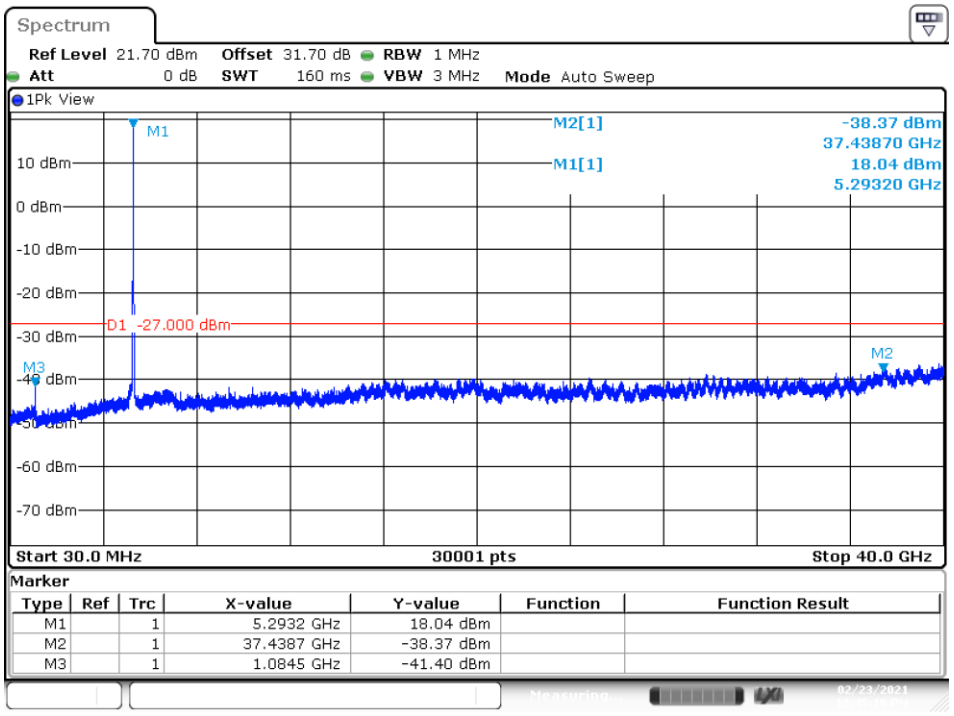

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Figure 62: Conducted OOB Emissions – 802.11ac VHT80 UNII-2A Mid Channel 5290MHz

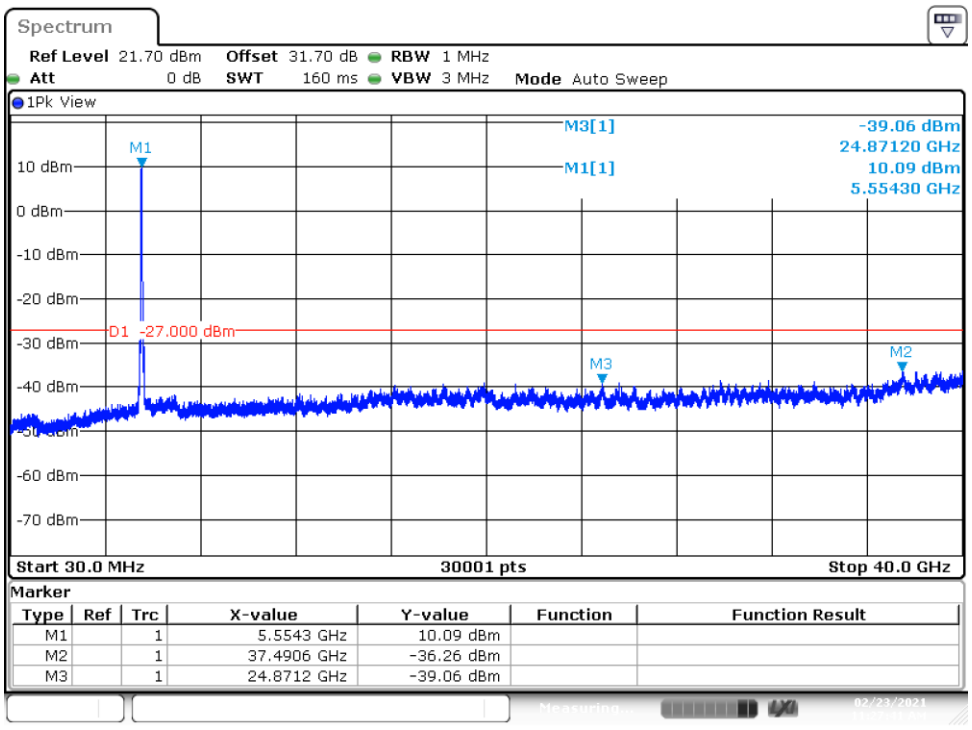

Figure 63: Conducted OOB Emissions – 802.11ac VHT80 UNII-2C Low Channel 5530MHz

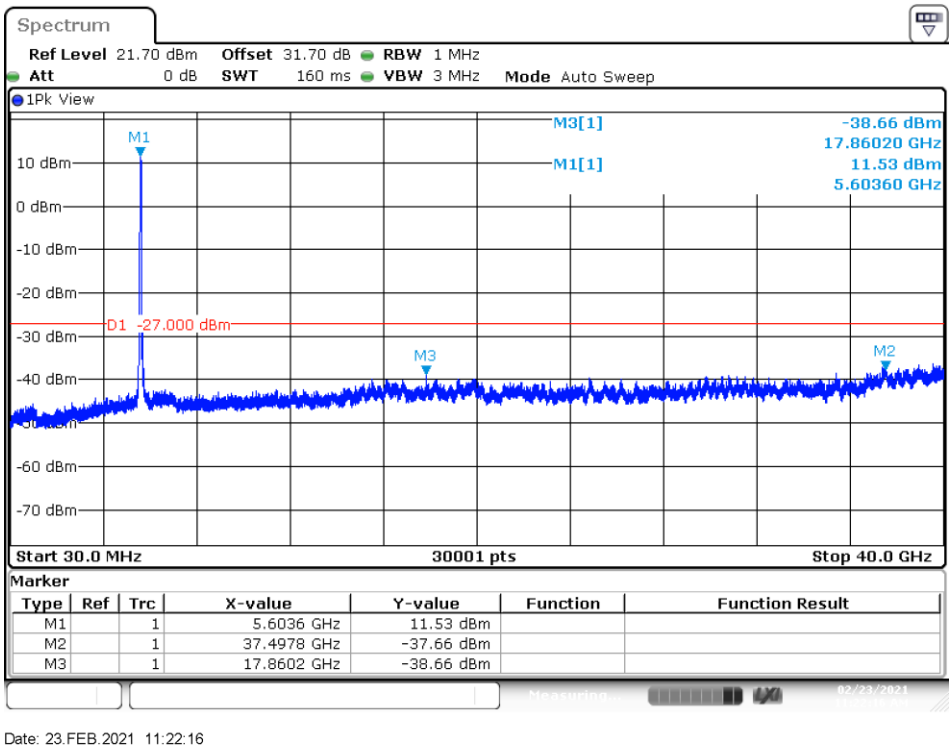

Figure 64: Conducted OOB Emissions – 802.11ac VHT80 UNII-2C High Channel 5610MHz