427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-U6PRO
ISED ID	6545A-U6PRO
Equipment Under Test	U6-Pro
Test Report Serial Number	TR5011_02
Date of Test(s)	23 – 29 July and 11 – 17 August 2020
Report Issue Date	17 August 2020

Test Specification	Applicant
47 CFR FCC Part 15, Subpart E	Ubiquiti Inc. 685 Third Avenue New York, NY 10019 U.S.A.

NVLAP LAB CODE 600241-0

Certification of Engineering Report

This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

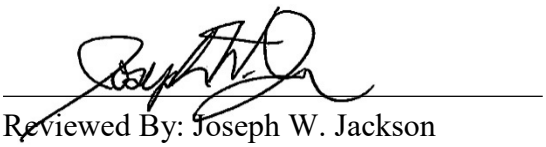
Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	UniFi
Model Number	U6-Pro
FCC ID	SWX-U6PRO
ISED ID	6545A-U6PRO

On this 17th day of August 2020, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government.

Unified Compliance Laboratory

Written By: Alex Macon



Reviewed By: Joseph W. Jackson

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	17 August 2020
02	Added KDB 662911 Reference in Table 3.3.1	18 August 2020

Table of Contents

1 Client Information

1.1 Applicant

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Mark Feil
Title	Compliance Manager

1.2 Manufacturer

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Mark Feil
Title	Compliance Manager

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	UniFi
Model Number	U6-Pro
Serial Number	7483C29FF2FB
Dimensions (cm)	22.0 x 22.0 x 4.8

2.2 Description of EUT

The U6-Pro is a Wi-Fi 6 access point designed for wide-ranging wireless coverage while maintaining overall network capacity. It delivers an aggregate radio rate of up to 2.7 Gbps with 5 GHz (4x4 MU-MIMO and OFDMA) and 2.4 GHz (2x2 MIMO) radios. U6-Pro uses a sophisticated antenna design with sideways amplification to offer excellent range when mounted horizontally. U6-Pro combines its purpose-built antenna with powerful Wi-Fi 6 features like OFDMA, beamforming, and BSS coloring for reliable long-range wireless performance.

Band	Modulation Bandwidth	Frequency (MHz)
UNII-1	20 MHz	5180, 5200, 5220, 5240
	40 MHz	5190, 5230
	80 MHz	5210
UNII-3	20 MHz	5745, 5765, 5785, 5805, 5825
	40 MHz	5755, 5795
	80 MHz	5775

This report covers the circuitry of the device subject to FCC Part 15, Subpart E. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory report.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: Unifi MN: U6-Pro SN: 7483C29FF2FB	WiFi Access Point	See Section 2.4
BN: Ubiquiti MN: U-POE-af SN: N/A	POE Power Adapter	Shielded or Un-Shielded Cat 5e cable (Note 2)
BN: Dell MN: XPS 13 SN: N/A	Laptop PC	Shielded or Un-Shielded Cat 5e cable (Note 2)

Notes: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
AC Mains	1	3 conductor power cord/80 cm
POE (POE Injector)	1	Shielded Cat 5e cable/8 meters
LAN (POE Injector)	1	Unshielded Cat 5e cable/1 meter

2.5 Operating Environment

Power Supply	120 VAC
AC Mains Frequency	60 Hz
Temperature	27.3 – 28.5 °C
Humidity	22.3 – 37.4 %
Barometric Pressure	1015 psi

2.6 Operating Modes

The U6-Pro was tested using test software in order to enable to constant transmission of over 98% All emission modes of 802.11 a/n/ac/ax were investigated.

2.7 EUT Exercise Software

Ubiquiti test software and firmware were used to control the transceivers of the EUT. (ART)

2.8 Block Diagram of Test Configuration

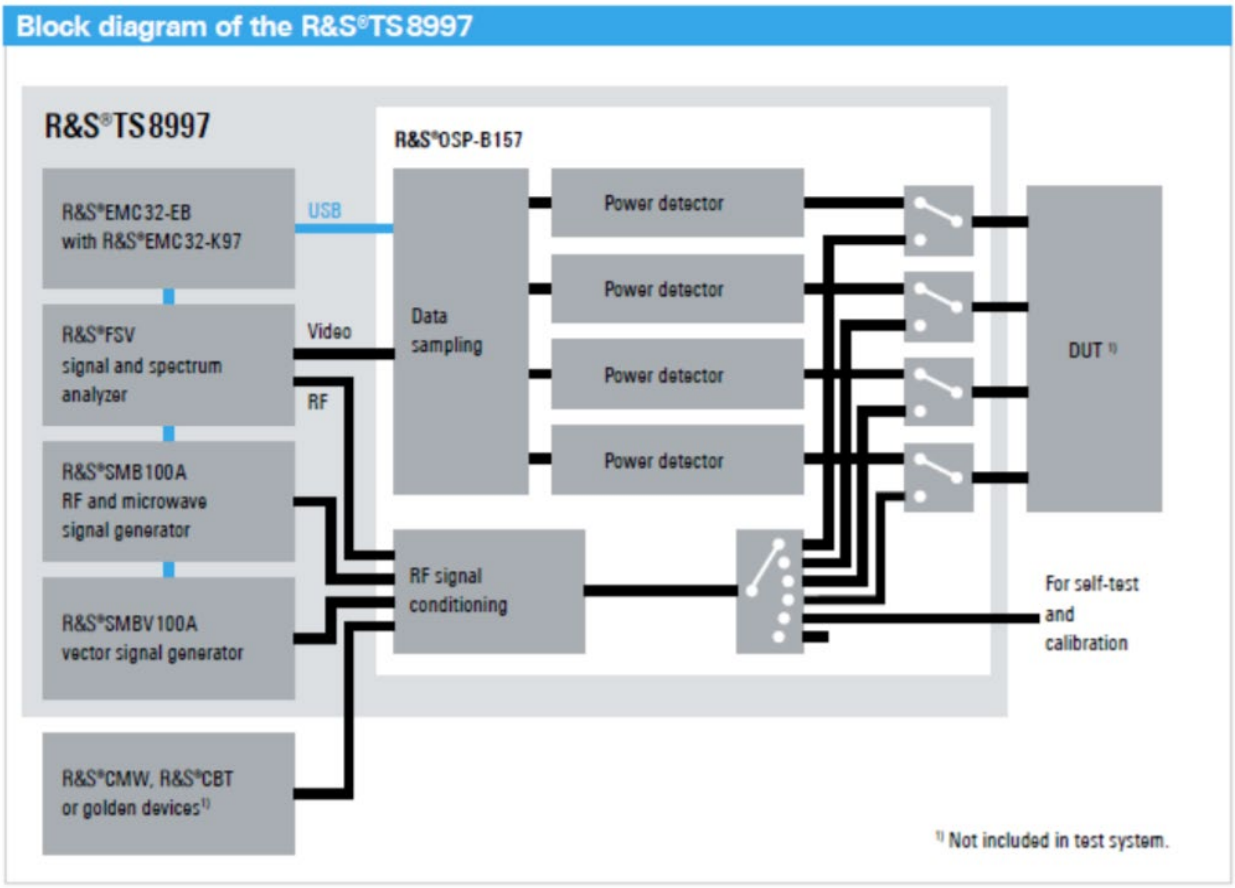


Diagram 1: Test Configuration Block Diagram

2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.

3 Test Specification, Method and Procedures

3.1 Test Specification

Title	47 CFR FCC Part 15, Subpart E, Section 15.407 Limits and methods of measurement of radio interference characteristics of Unlicensed National Information Infrastructure Devices
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 47 CFR FCC Part 15 Section 15.407

See test standard for details.

3.3 FCC Part 15, Subpart E

3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.407(a)	N/A	Antenna requirements	Structural Requirement	Compliant
15.407(b)	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.407(c)	RSS-247 §6.2.2, §6.2.3	Bandwidth Requirement	5150 to 5250	Compliant
15.407(e)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5150 to 5250	Compliant
15.407(f)	RSS-247 §6.2.2, §6.2.3	Antenna Conducted Spurious Emissions	0.009 to 40000	Compliant
15.407(g)	RSS-247 §6.2.2, §6.2.3	Radiated Spurious Emissions	0.009 to 40000	Compliant
15.407(h)	RSS-247 §6.2.2, §6.2.3	Peak Power Spectral Density	5150 to 5250	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033 and 47 CFR Part 15. The conducted power was summed per FCC KDB 662911 in sections 5.4 and 5.6.				

3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

3.5 Test Location

Testing was performed at the Unified Compliance Laboratory 10-Meter chamber located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2020. . This site has also been registered with Innovations, Science and Economic Development (ISED) department as was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until June 30, 2021. Unified Compliance Laboratory has been assigned Conformity Assessment Number US0223 by ISED.

4 Test Equipment

4.1 Conducted Emissions at Mains Ports

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	AFJ	FFT3010	UCL-2500	12/14/2018	8/17/2020
LISN	AFJ	LS16C/10	UCL-2512	5/26/2020	5/26/2021

Table 1:List of equipment used for Conducted Emissions Testing at Mains Port

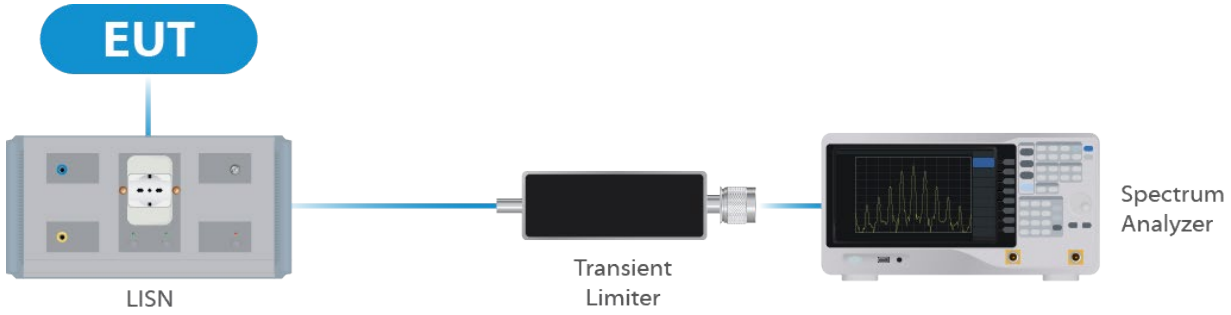


Figure 1: Conducted Emissions Test

4.2 Direct Connect at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	R&S	FSV40	UCL-2861	06/12/2019	06/12/2020
Signal Generator	R&S	SMB100A	UCL-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Switch Extension	R&S	OSP-B157WX	UCL-2867	06/13/2019	06/13/2020
Switch Extension	R&S	OSP-150W	UCL-2870	06/14/2019	06/14/2020

Table 2:List of equipment used for Direct Connect at the Antenna Port

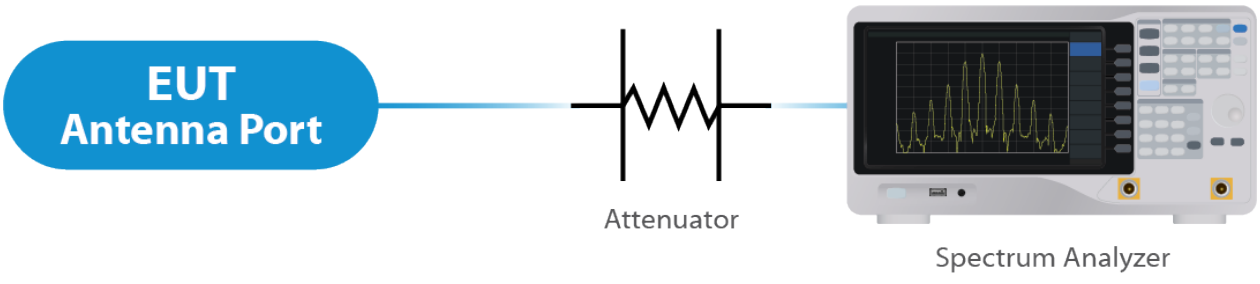


Figure 2: Direct Connect at the Antenna Port Test

4.3 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	UCL-2778	11/26/2018	5/3/2020
Pre-Amplifier	Sonoma Instruments	310N	UCL-2889	9/13/2018	5/16/2020
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	4/11/2019	6/3/2020
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	4/11/2019	6/3/2020
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	2/15/2017	4/16/2020
18 – 40 GHz Amplifier	Scwarzbeck	BBV 9721	UCL-2490	4/1/2019	4/1/2020
0.5 – 18 GHz Amplifier	Scwarzbeck	BBV 9718C	UCL-2493	4/1/2019	4/1/2020
Loop Antenna	Com-Power	AL-130R	UCL-2596	10/26/2018	4/23/2020
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3:List of equipment used for Radiated Emissions

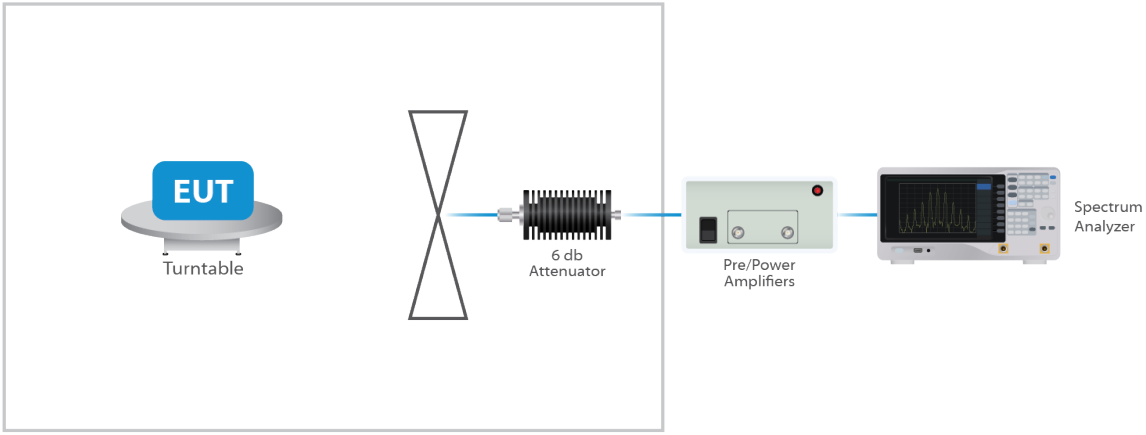


Figure 3: Radiated Emissions Test

4.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

4.5 Measurement Uncertainty

Test	Uncertainty (± dB)	Confidence (%)
Conducted Emissions	1.44	95
Radiated Emissions (9 kHz to 30 MHz)	2.50	95
Radiated Emissions (30 MHz to 1 GHz)	3.95	95
Radiated Emissions (1 GHz to 18 GHz)	5.56	95
Radiated Emissions (18 GHz to 40 GHz)	5.16	95
Direct Connect Tests	**K Factor**	**Value**
Emissions Bandwidth	2	2.0%
Output Power	2	1.0 dB
Peak Power Spectral Density	2	1.3 dB
Band Edge	2	0.8 dB
Transmitter Spurious Emissions	2	1.8 dB

5 Test Results

5.1 §15.203 Antenna Requirements

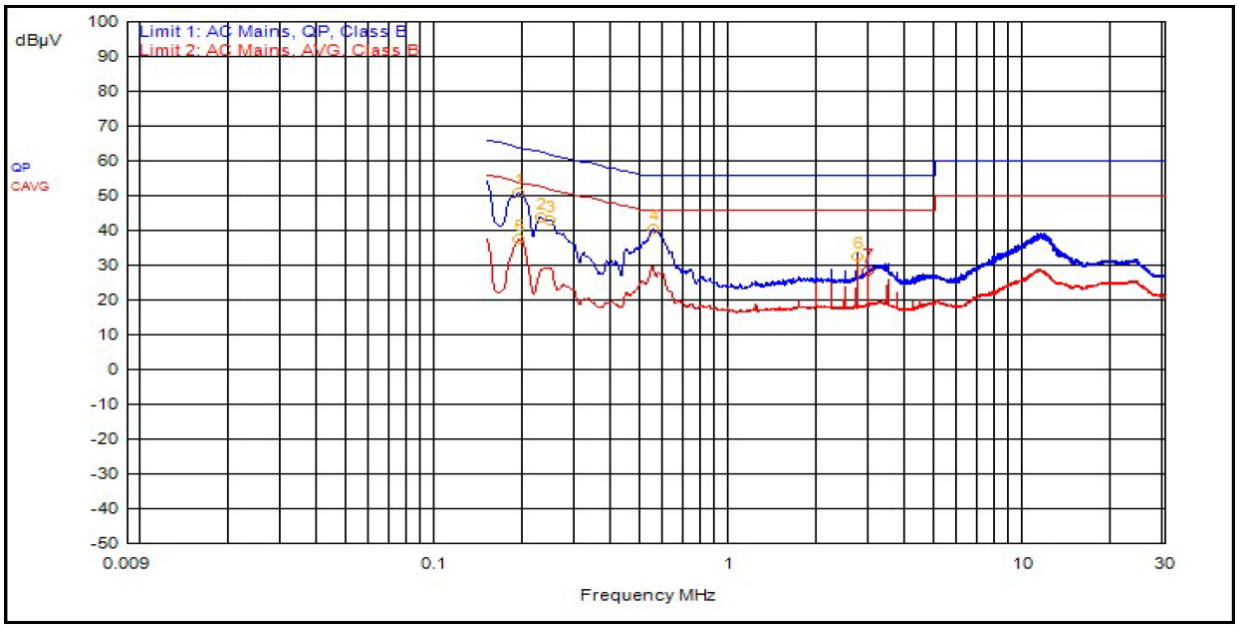
The EUT uses an integral antenna The Maximum gain of the antenna is 6.0 dBi. The antenna is not user replaceable.

Results

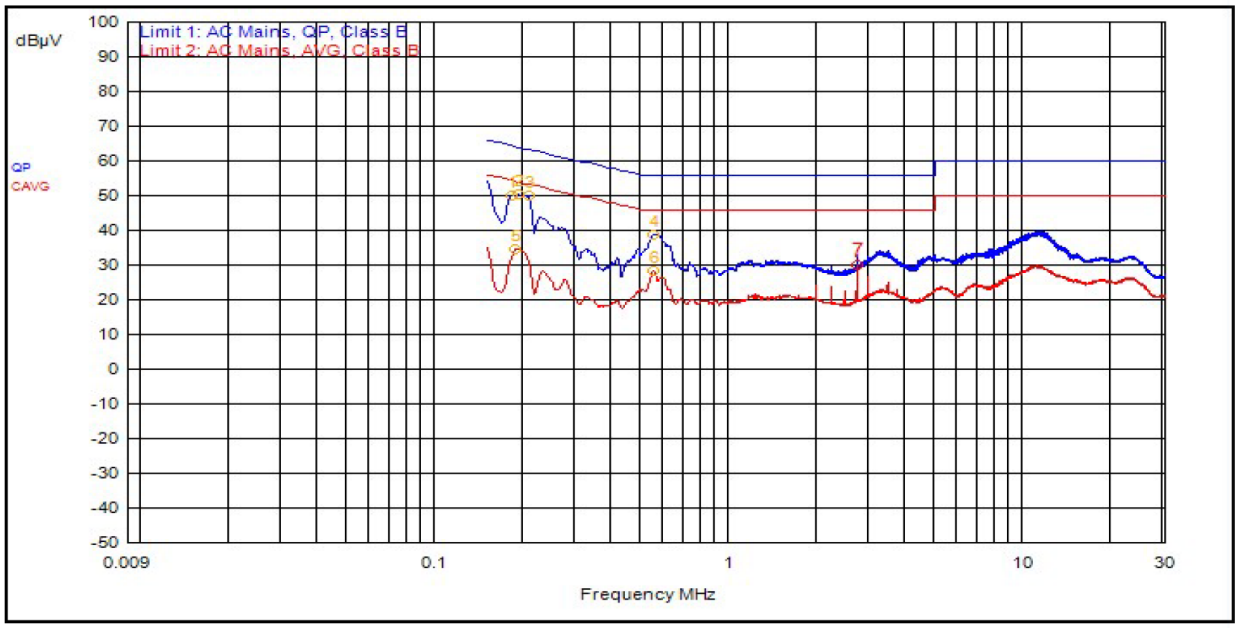
The EUT complied with the specification

5.2 Conducted Emissions at Mains Ports Data

5.2.1 Line



5.2.2 Neutral



Result

The EUT complied with the specification limit.

5.3 §15.403(i) Emissions Bandwidth

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
20	5180	19.1	21.3
20	5210	19.1	39.1
20	5240	19.7	39.1
40	5190	37.5	39.6
40	5230	37.5	39.6
80	5210	77	80.5

Result

The 26 dB bandwidths are reported for information purposes. Please see Annex for all bandwidth measurements.

5.4 §15.403(a)(1) Maximum Average Output Power

The maximum average RF conducted output power measured for this device was 28.7dBm or 741 mW. The limit is 30 dBm, or 1 Watt when using antennas with 6 dBi or less gain. The antenna has a gain of 6 dBi.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	15.5	23.8	29.8	11.6
OFDM 20	5210	Mcs0	18	26.6	32.6	14.2
OFDM 20	5240	Mcs0	20.5	28.7	34.7	16.3
HT 20	5180	Mcs0	15	23.3	29.3	10.7
HT 20	5210	Mcs0	18	26.5	32.5	13.8
HT 20	5240	Mcs0	20	28.5	34.5	15.8
HT 40	5190	Mcs0	15	23.5	29.5	9.6
HT 40	5230	Mcs0	15	23.5	29.5	11.5
VHT 20	5180	Mcs0	15	23.2	29.2	10.7
VHT 20	5210	Mcs0	17.5	26	32	13.3
VHT 20	5240	Mcs0	19.5	27.9	33.9	15.2
VHT 40	5190	Mcs0	12.5	20.8	26.8	6.9
VHT 40	5230	Mcs0	16.5	25.3	31.3	11.2
VHT 80	5210	Mcs0	10	17.9	23.9	0.9
HE 20	5180	Mcs0	16	23.3	29.3	8.4
HE 20	5210	Mcs0	18.5	26.2	32.2	12.7
HE 20	5240	Mcs0	20	27.6	33.6	14.2
HE 40	5190	Mcs0	14	21.5	27.5	6.9
HE 40	5230	Mcs0	17	24.9	30.9	10.2
HE 80	5210	Mcs0	11	18.1	24.1	0.9

Result

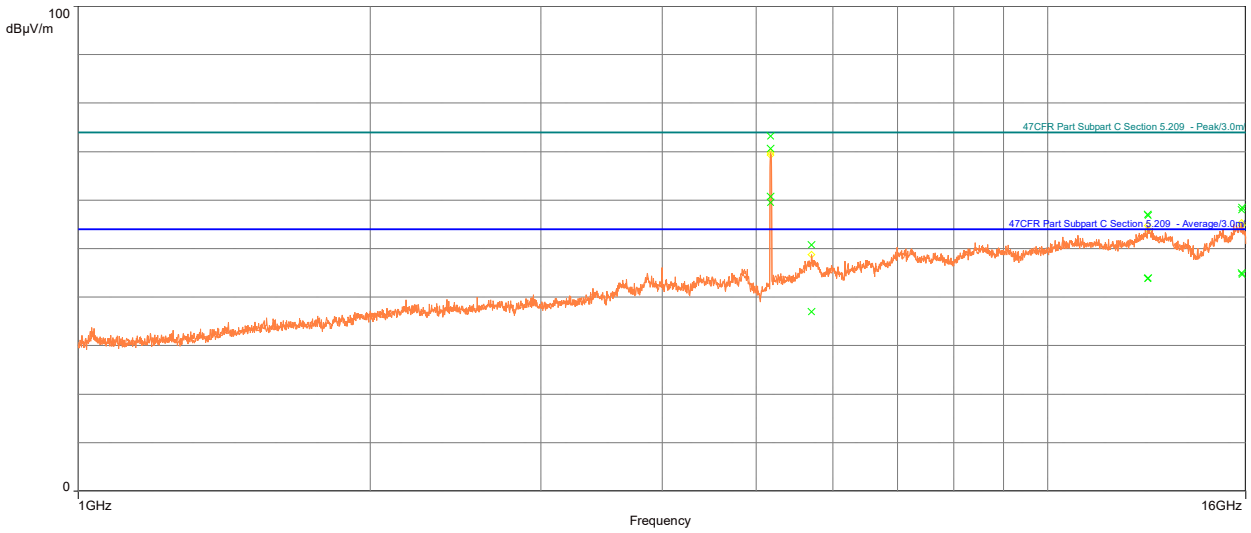
In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT compiled with the requirements of the specification.

5.5 §Radiated Spurious Emissions in the Restricted Bands

The EUT uses various power settings based on the channel in use. In order to reduce test time, the radiated spurious emissions at the lowest, middle, and highest channel were measured at the maximum power of TP 21 as this setting was found to be worst case for spurious emissions. Power was subsequently reduced during in-band and band edge testing. The band edge at the restricted band ending at 5150 MHz was measured using radiated measurement. All emissions modes were tested and the worse-case measurements are shown below.

Result

All emissions in and outside of the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. See below for band edge plots



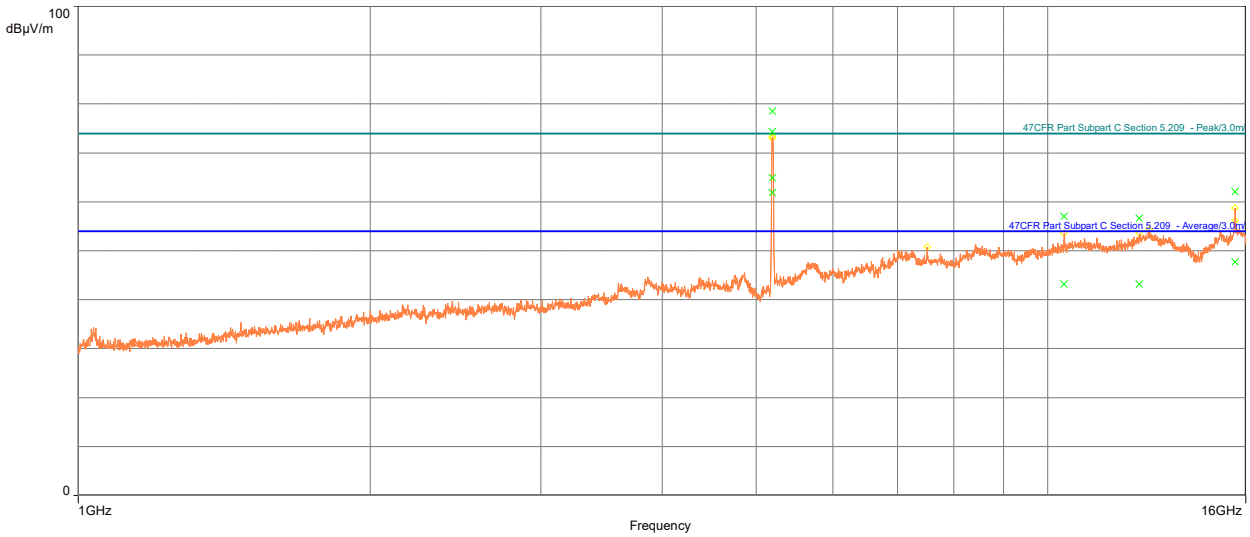
Average Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
5704.2	36.98	54.00	-17.02	273.00	4.00	Vertical	6.24
12681	43.86	54.00	-10.14	319.00	3.10	Vertical	14.88
15853	44.71	54.00	-9.29	320.00	1.86	Vertical	14.97
12696	43.97	54.00	-10.03	316.00	2.89	Horizontal	14.96
15841	44.96	54.00	-9.04	215.00	3.90	Horizontal	14.91

Peak Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
5704.2	50.79	74.00	-23.21	273.00	4.00	Vertical	6.24
12681	57.02	74.00	-16.98	319.00	3.10	Vertical	14.88
15853	58.46	74.00	-15.54	320.00	1.86	Vertical	14.97
12696	56.88	74.00	-17.12	316.00	2.89	Horizontal	14.96
15841	58.01	74.00	-15.99	215.00	3.90	Horizontal	14.91

Table 4: Transmitting on the Lowest Frequency 5180 MHz



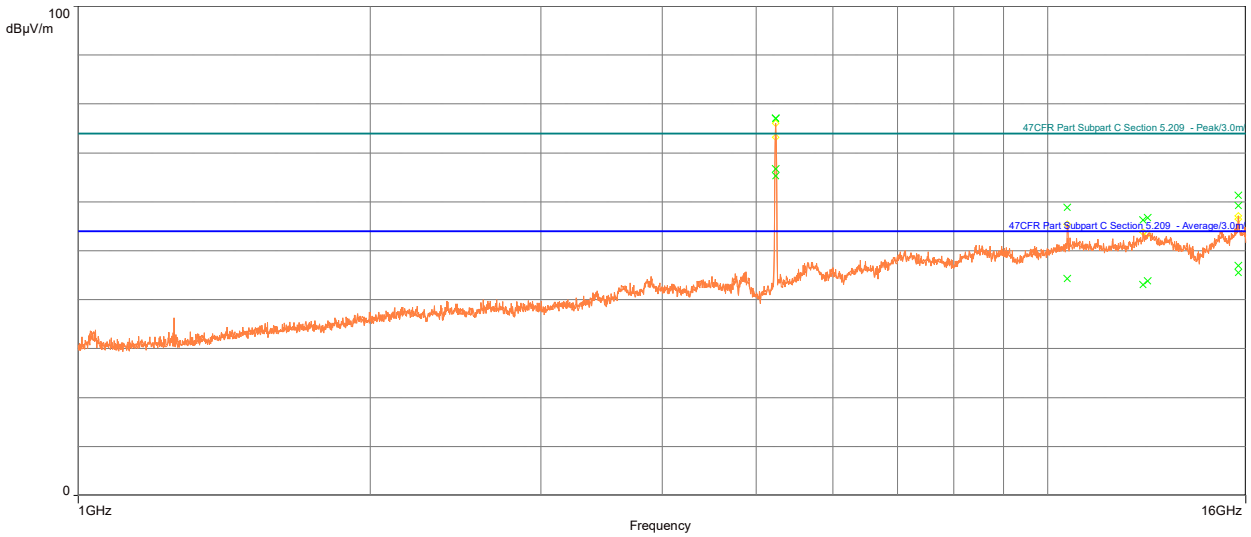
Average Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
10392	43.19	54.00	-10.81	67.00	1.58	Horizontal	11.53
12424	43.17	54.00	-10.83	1.00	2.65	Horizontal	13.56
15599	47.70	54.00	-6.30	259.00	1.59	Horizontal	14.52

Peak Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
10392	57.06	74.00	-16.94	67.00	1.58	Horizontal	11.53
12424	56.61	74.00	-17.39	1.00	2.65	Horizontal	13.56
15599	62.05	74.00	-11.95	259.00	1.59	Horizontal	14.52

Table 5: Transmitting on the Middle Frequency 5200 MHz



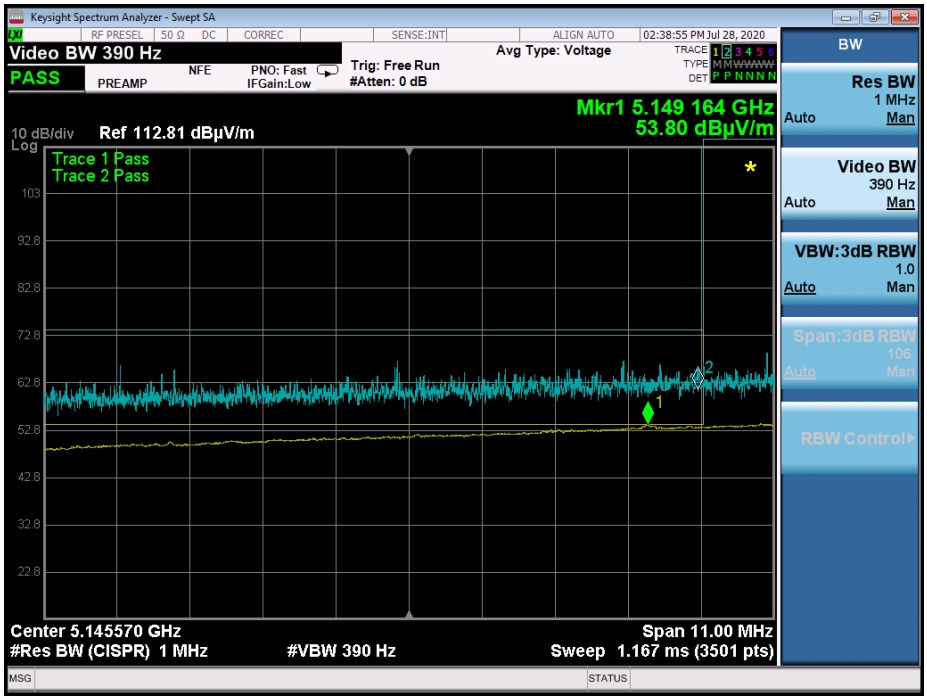
Average Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
12539	43.03	54.00	-10.97	79.00	2.97	Vertical	13.87
15723	45.52	54.00	-8.48	229.00	3.24	Vertical	14.59
10473	44.34	54.00	-9.66	210.00	2.95	Horizontal	11.74
12679	43.81	54.00	-10.19	98.00	3.08	Horizontal	14.87
15723	46.99	54.00	-7.01	243.00	2.03	Horizontal	14.59

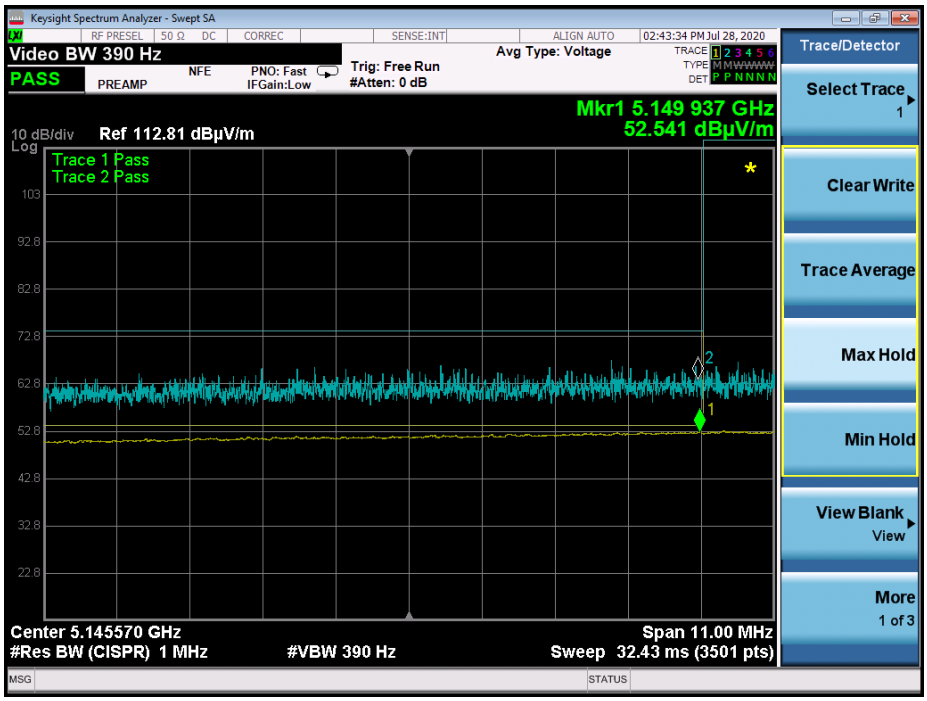
Peak Measurements

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
12539	56.30	74.00	-17.70	79.00	2.97	Vertical	13.87
15723	59.23	74.00	-14.77	229.00	3.24	Vertical	14.59
10473	58.88	74.00	-15.12	210.00	2.95	Horizontal	11.74
12679	56.74	74.00	-17.26	98.00	3.08	Horizontal	14.87
15723	61.34	74.00	-12.66	243.00	2.03	Horizontal	14.59

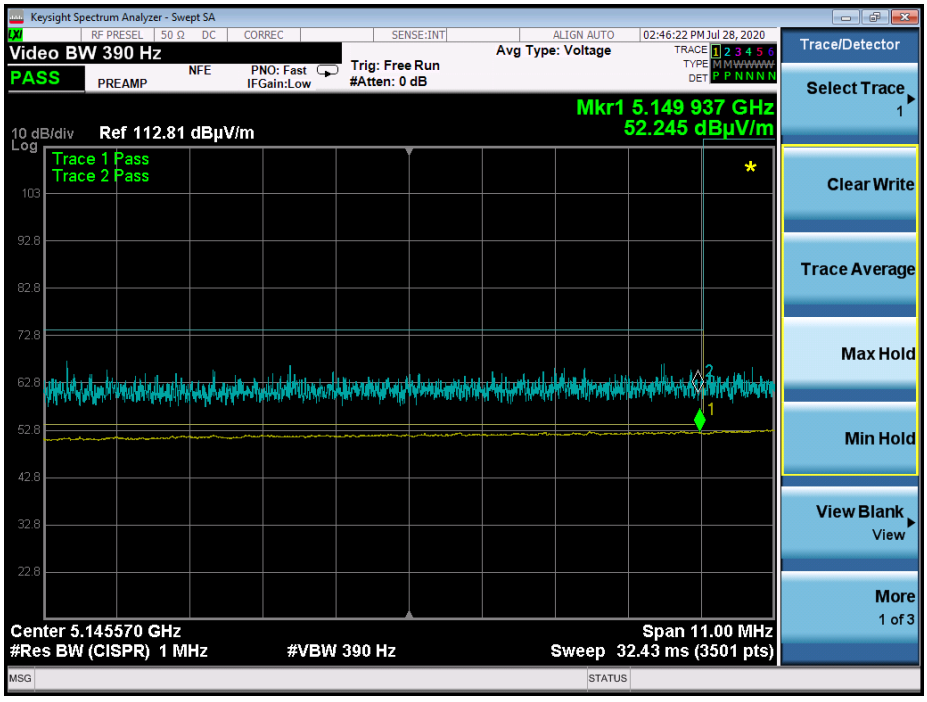
Table 6: Transmitting on the Highest Frequency 5240 MHz



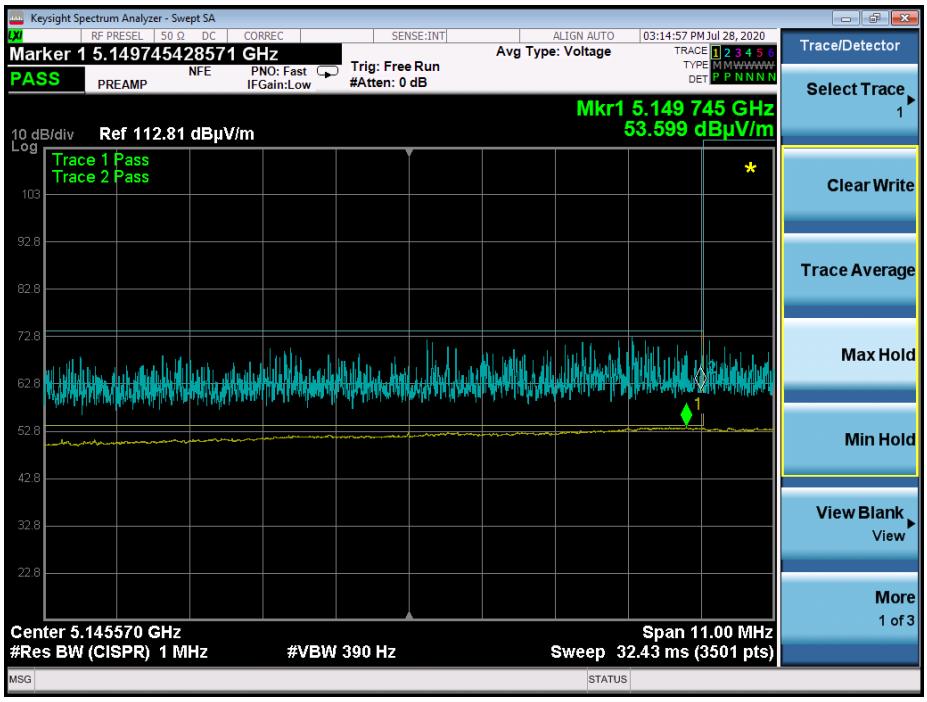
Plot 7: 20 MHz Transmitting on the Lowest Frequency 5180 MHz



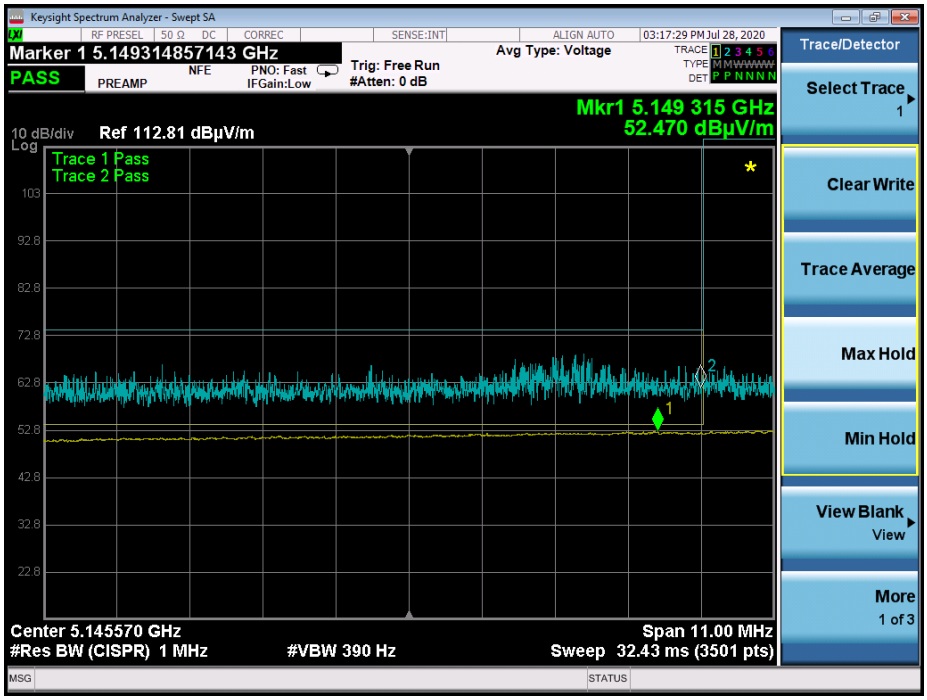
Plot 8: 20 MHz Transmitting on the Middle Frequency 5210 MHz



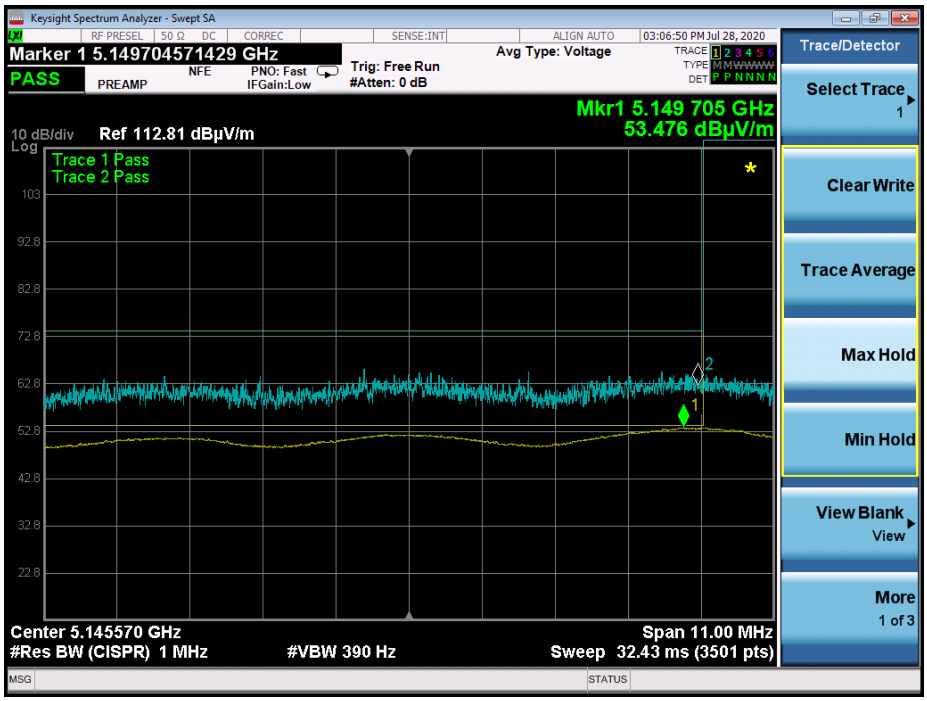
Plot 9: 20 MHz Transmitting on the Highest Frequency 5240 MHz



Plot 10: 40 MHz Transmitting on the Lowest Frequency 5190 MHz



Plot 11: 40 MHz Transmitting on the Highest Frequency 5230 MHz



Plot 12: 80 MHz Transmitting on 5210 MHz

5.6 §15.407(a) Maximum Power Spectral Density

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 17 dBm in any 1 MHz band during any time interval of continuous transmission. Results of this testing are summarized.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Measured PSD
OFDM 20	5180	Mcs0	15.5	11.6
OFDM 20	5210	Mcs0	18	14.2
OFDM 20	5240	Mcs0	20.5	16.3
HT 20	5180	Mcs0	15	10.7
HT 20	5210	Mcs0	18	13.8
HT 20	5240	Mcs0	20	15.8
HT 40	5190	Mcs0	15	9.6
HT 40	5230	Mcs0	15	11.5
VHT 20	5180	Mcs0	15	10.7
VHT 20	5210	Mcs0	17.5	13.3
VHT 20	5240	Mcs0	19.5	15.2
VHT 40	5190	Mcs0	12.5	6.9
VHT 40	5230	Mcs0	16.5	11.2
VHT 80	5210	Mcs0	10	0.9
HE 20	5180	Mcs0	16	8.4
HE 20	5210	Mcs0	18.5	12.7
HE 20	5240	Mcs0	20	14.2
HE 40	5190	Mcs0	14	6.9
HE 40	5230	Mcs0	17	10.2
HE 80	5210	Mcs0	11	0.9

Result

The maximum average power spectral density was less than the limit of 17dBm; therefore, the EUT complies with the specification.

-- End of Test Report --