UNIFIED COMPLIANCE LABORATORY

427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-U6MESHP
Equipment Under Test	U6-Mesh-Pro
Test Report Serial Number	TR8696_03
Date of Tests	5-8, 14, 22 December 2023
Report Issue Date	16 April 2024

Test Specification	Applicant
47 CFR FCC Part 15, Subpart E	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.

NVLAP TESTING ilac-MRA

NVLAP LAB CODE 600241-0

Certification of Engineering Report

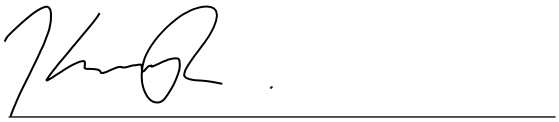
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with 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	UBIQUITI
Model Number	U6-Mesh-Pro
FCC ID	SWX-U6MESHP
ISED ID	6545A-U6MESHP

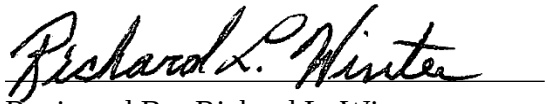
On this 16th day of April 2024, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

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 U.S. federal government.

Unified Compliance Laboratory



Written By: Kimberly Rodriguez



Reviewed By: Richard L. Winter

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	29 December 2023
02	Added Power Table in Section 5.4	11 April 2024
03	Updated Elevation Angle info of section 5.4.	16 April 2024

Table of Contents

1 Client Information

1.1 Applicant

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Alex Macon
Title	Compliance

1.2 Manufacturer

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name	Alex Macon
Title	Compliance

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	Ubiquiti
Model Number	U6-Mesh-Pro
Serial Number	1FA1CC
Dimensions (cm)	34.32 x 18.12 x 6.02

2.2 Description of EUT

The U6-Mesh-Pro is a four-stream Wi-Fi 6 access point that delivers up to 2.4 Gbps aggregate radio rate with 2X2 5 GHz (DL/UL MU-MIMO) and 2.4 GHz (DL/UL MU-MIMO) radios.

Band	WiFi Mode	Modulation Bandwidth	Modulation Type	Frequency (MHz)
UNII-1	a	20 MHz	OFDM	5180, 5200, 5210, 5240
	ax	20 MHz	HE	5180, 5200, 5210, 5240
	ax	40 MHz	HE	5190, 5230
	ax	80 MHz	HE	5210

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 test 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-Mesh (Note 1) SN: 68D79A1F02AB	WiFi Access Point	See Section 2.4
BN: Ubiquiti MN: UPOE-at (Note 1) 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
Data	1	Shielded Cat 5e cable/8meters
AC (PoE Injector)	1	3 conductor power cord/80cm
LAN (PoE Injector)	1	Un-shielded Cat 5e cable/1 meter

2.5 Operating Environment

Power Supply	240V AC to 48V PoE
AC Mains Frequency	50 Hz
Temperature	22.7-25.2 ºC
Humidity	19.43 %
Barometric Pressure	1016 mBar

2.6 Operating Modes

The U6-Mesh-Pro tested using test software in order to enable a constant transmission. The measurements within this report are corrected to reference a 100% duty cycle. All emission modes of 802.11 a/ax were investigated. All measurements are reported with the worst-case mode (802.11ax) unless otherwise stated.

2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

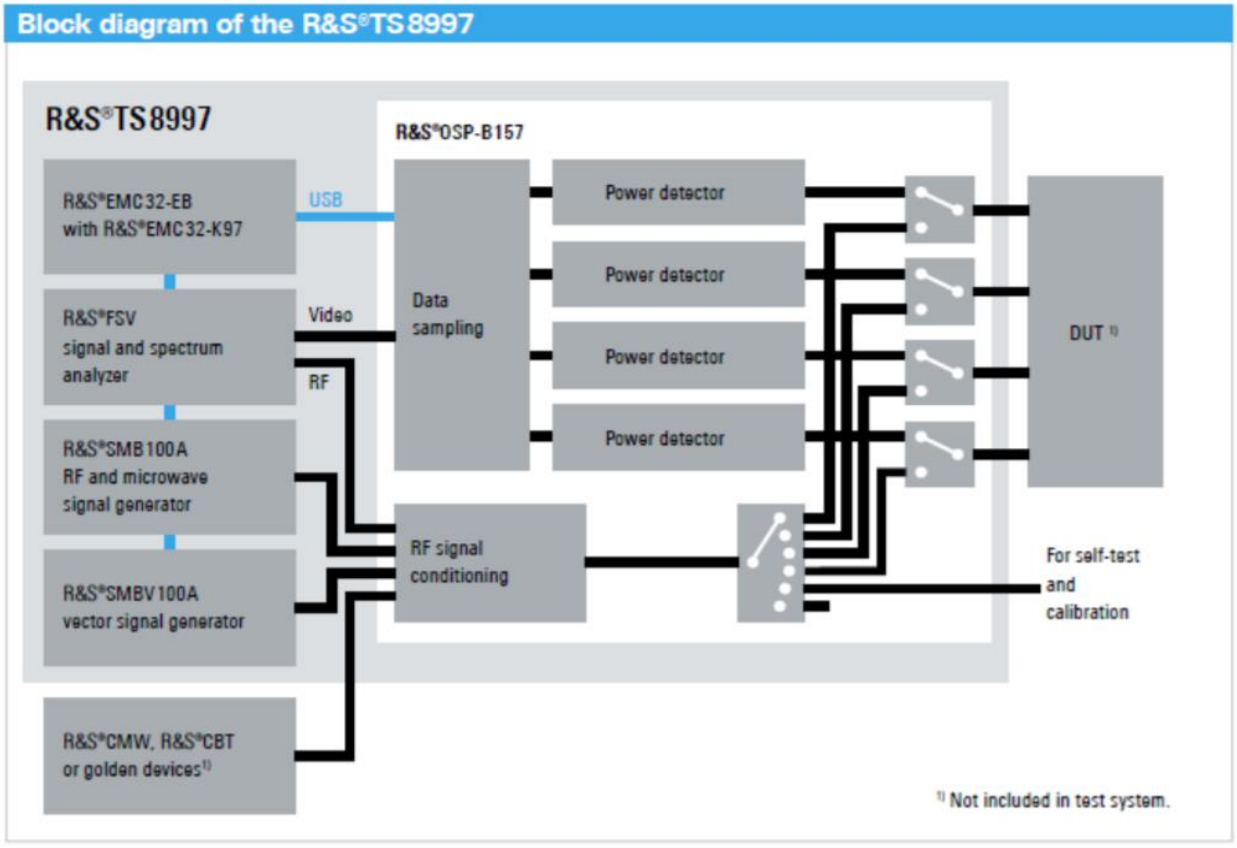


Diagram 1: Test Configuration Block Diagram

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	5180 to 5240	Compliant
15.407(e)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5180 to 5240	Compliant
15.407(f)	RSS-247 §6.2.2, §6.2.3	Antenna Conducted Spurious Emissions	0.009 to 40000	N/A
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	5180 to 5240	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.				

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 3-meter and 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 2024. 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 30 June 2024.

Unified Compliance Laboratory has been assigned Designation Number US5037 by the FCC and 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	7/13/2023	7/13/2024
LISN	AFJ	LS16C/10	UCL-2512	5/26/2023	5/26/2024
ISN	Teseq	ISN T800	UCL-2974	6/27/2022	6/27/2024
LISN	Com-Power	LIN-120C	UCL-2612	1/24/2023	1/24/2024
AC Power Source	Laplace Instruments	AC1000A	UCL-2857	N/A	N/A
Test Software	UCL	Revision 1	UCL-3107	N/A	N/A

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

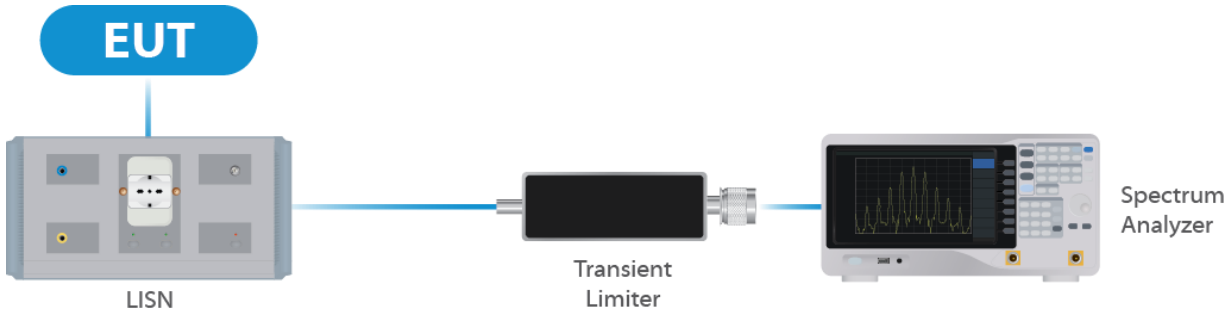


Figure 1: Conducted Emissions Test

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	11/27/2023	11/27/2024
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	2/22/2023	2/22/2024
Switch Extension	R&S	OSP-150W	UCL-2870	2/22/2023	2/22/2024

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

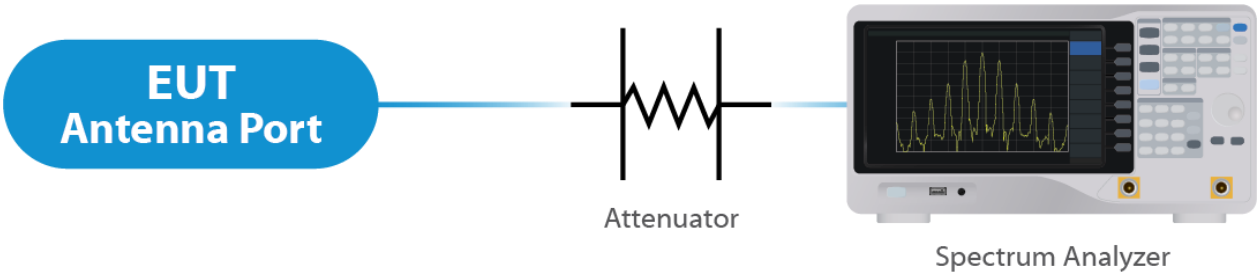


Figure 2: Direct Connect at the Antenna Port Test

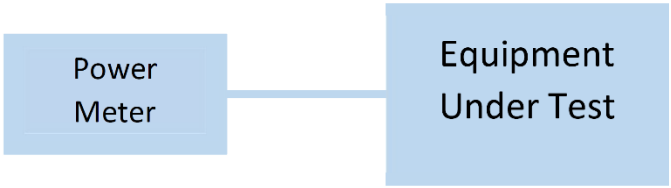


Figure 3: Output Power Measurement

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	1/27/2023	1/27/2024
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	10/7/2021	12/7/2023
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	2/22/2023	2/22/2025
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3071	1/11/2023	1/11/2025
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	9/22/2022	9/22/2024
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	1/27/2023	1/27/2025
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	6/09/2022	6/09/2024
1 – 18 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	12/9/2022	12/9/2023
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3: List of equipment used for Radiated Emissions

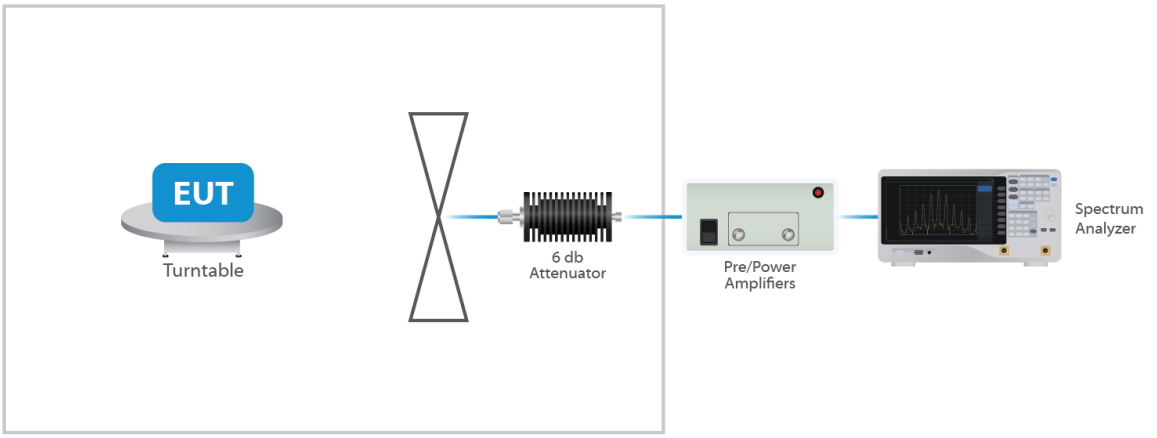


Figure 4: Radiated Emissions Test

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)	4.38	95
Radiated Emissions (1 GHz to 18 GHz)	4.37	95
Radiated Emissions (18 GHz to 40 GHz)	3.93	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 folding antenna structure. Per the manufacturer, the maximum gain of the antenna per chain is 8 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna is not user replaceable.

For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT ≤ 4;

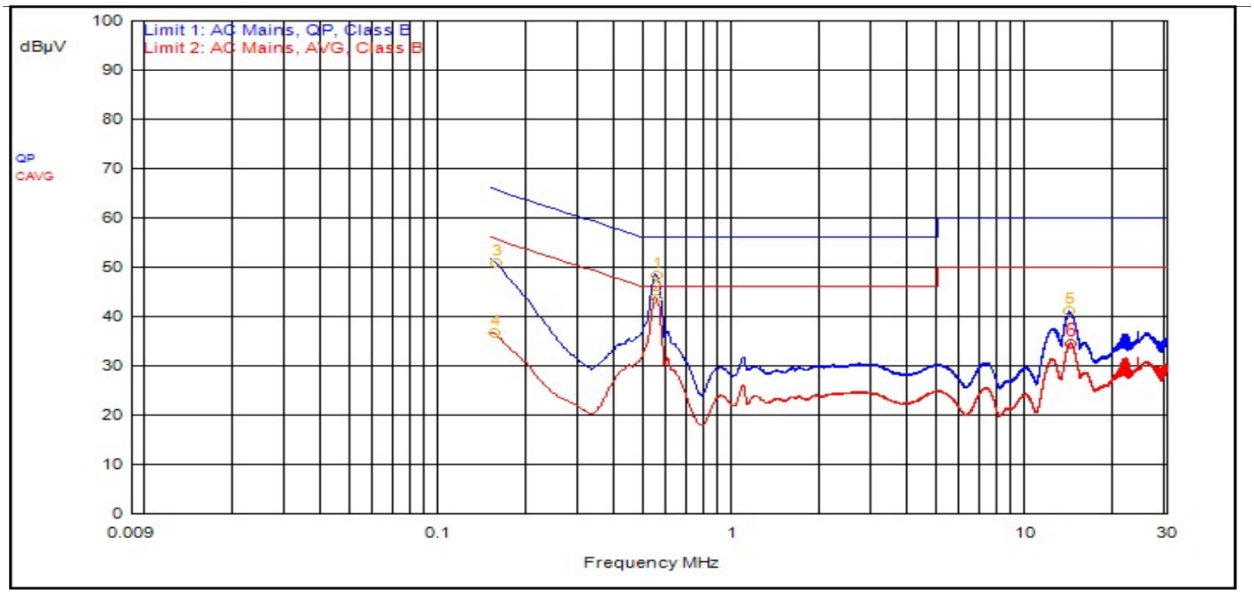
For PSD measurements when Nss=1: Array Gain = 10 log(Nant/Nss) dB = 3.01dB

Results

The EUT complied with the specification

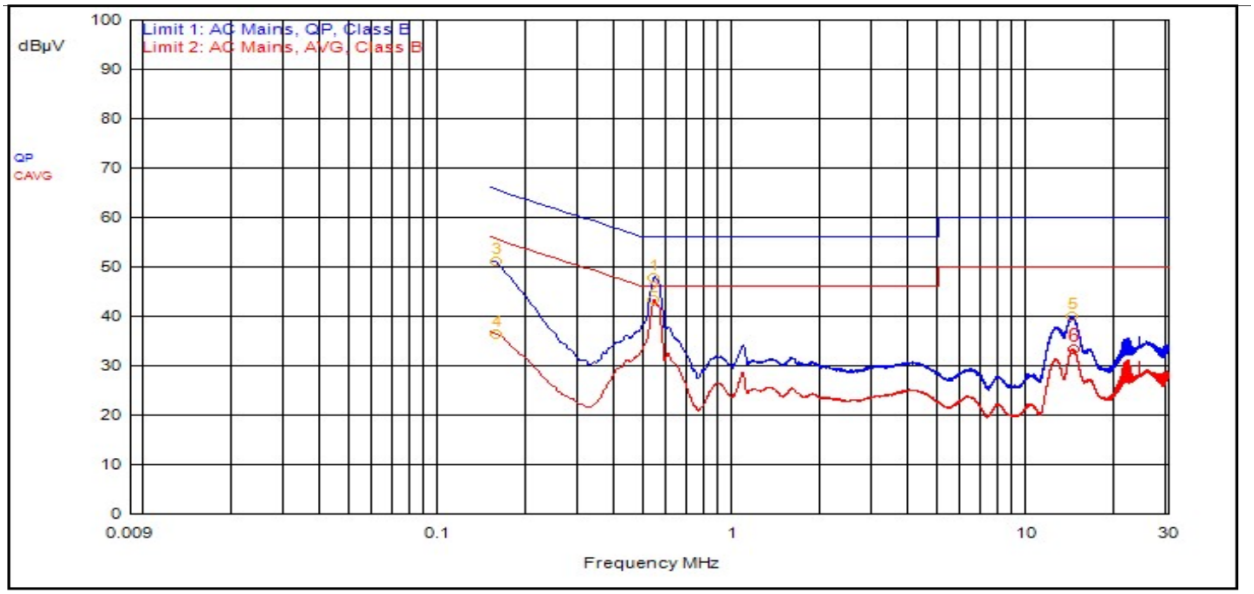
5.2 Conducted Emissions at Mains Ports Data

5.2.1 Line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.	P/F
MU	MHz	dB	dB	dB	Type	dBµV	dBµV	dBµV	dB	dBµV	dB	P/F
1	546,000kHz	12.42	0.00		QPeak	36.02	48.44	56.00	-7.56			
3	156,000kHz	12.38	0.00		QPeak	38.48	50.86	65.67	-14.81			
5	13.953	12.46	0.20		QPeak	28.35	41.01	60.00	-18.99			
2	546,000kHz	12.42	0.00		C_AVG	31.09	43.51			46.00	-2.49	
4	153,000kHz	12.37	0.00		C_AVG	24.17	36.54			55.84	-19.30	
6	14.064	12.46	0.20		C_AVG	21.88	34.54			50.00	-15.46	

5.2.2 Neutral



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.	P/F
MU	MHz	dB	dB	dB	Type	dBµV	dBµV	dBµV	dB	dBµV	dB	P/F
1	537,000kHz	12.42	0.00		QPeak	35.48	47.90	56.00	-8.10			
3	156,000kHz	12.38	0.00		QPeak	38.65	51.03	65.67	-14.64			
5	14.085	12.46	0.20		QPeak	27.26	39.92	60.00	-20.08			
2	537,000kHz	12.42	0.00		C_AVG	30.99	43.41			46.00	-2.59	
4	156,000kHz	12.38	0.00		C_AVG	24.10	36.48			55.67	-19.20	
6	14.190	12.47	0.20		C_AVG	20.75	33.42			50.00	-16.58	

Result

The EUT complied with the specification limit.

5.3 §15.403(i) 26 dB Emissions Bandwidth

All chains were measured under the guidance of KDB 789033 Section II.C. and KDB 66291 D01. Please see associated annex for details on instrument settings.

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	Emissions 26 dB Bandwidth (MHz)
a 20	5180	16.3	19.9
a 20	5210	18.6	32.2
a 20	5240	16.7	28.4
ax 20	5180	19.0	20.3
ax 20	5210	19.3	25.9
ax 20	5240	21.8	23.6
ax 40	5190	38.0	39.8
ax 40	5230	38.5	40.2
ax 80	5210	77.0	81.5

Result

All chains were tested and the highest bandwidth per chain is reported above.

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

5.4 §15.407(a)(2) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.
The maximum average RF conducted output power measured for this device was 27.97 dBm or 626.61 mW. The limit is 30 dBm, or 1 Watt when using an antenna with 23 dBi (Fixed point to point) or 6 dBi (indoor/outdoor access point) or less gain. The antenna has a gain of 8 dBi.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	44	23.92	31.92	10.32
OFDM 20	5210	Mcs0	51	27.97	35.97	14.43
OFDM 20	5240	Mcs0	50	27.25	35.25	13.57
HE 20	5180	Mcs0	42	22.12	30.12	8.21
HE 20	5210	Mcs0	51	27.14	35.14	13.15
HE 20	5240	Mcs0	51	26.85	34.85	12.68
HE 40	5190	Mcs0	33	17.8	25.80	1.09
HE 40	5230	Mcs0	47	25.51	33.51	9.15
HE 80	5210	Mcs0	32	17.34	25.34	-1.85

PSD NSS=1 Directional Gain Table

Modulation (BW)	Frequency (MHz)	Data Rate	Backoff TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	44	23.92	31.92	10.32
OFDM 20	5210	Mcs0	46	25.47	33.47	11.93
OFDM 20	5240	Mcs0	46	25.25	33.25	11.57
HE 20	5180	Mcs0	42	22.12	30.12	8.21
HE 20	5210	Mcs0	48	25.64	33.64	11.65
HE 20	5240	Mcs0	49	25.85	33.85	11.68
HE 40	5190	Mcs0	33	17.8	25.80	1.09
HE 40	5230	Mcs0	47	25.51	33.51	9.15
HE 80	5210	Mcs0	32	17.34	25.34	-1.85

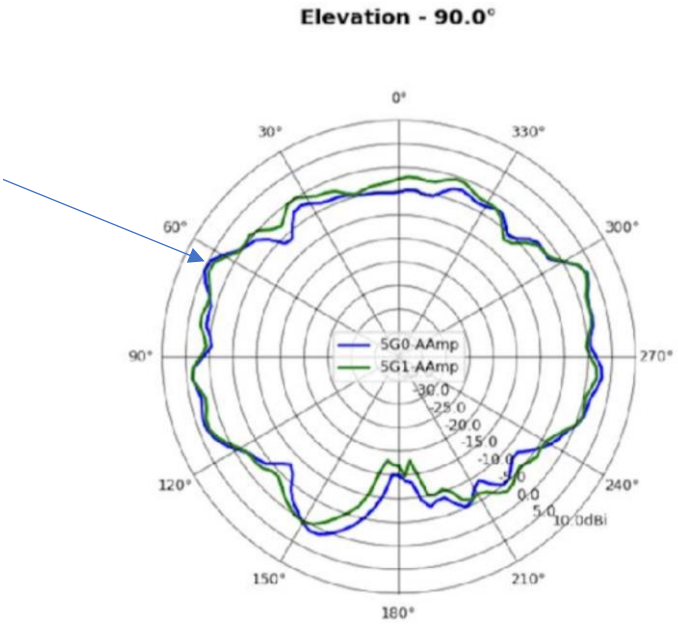
30+ Degree Elevation Angle Adjustment Results.

Modulation (BW)	Frequency (MHz)	Data Rate	Backoff TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5180	Mcs0	28	15.54	20.54	2.05
OFDM 20	5210	Mcs0	28	15.60	20.60	2.05
OFDM 20	5240	Mcs0	28	15.88	20.88	2.12
HE 20	5180	Mcs0	30	15.93	20.93	2.09
HE 20	5210	Mcs0	29	15.75	20.75	1.80
HE 20	5240	Mcs0	29	15.82	20.82	1.68
HE 40	5190	Mcs0	29	15.98	20.98	-0.58
HE 40	5230	Mcs0	29	15.60	20.60	-1.36
HE 80	5210	Mcs0	29	15.99	20.99	-3.31

Result

In the configuration tested, the maximum summed average RF output power was less than 1 watt; therefore, the EUT compiled with the requirements of the specification (see spectrum analyzer plots in attached Annex).

Max Antenna gain above 30 degrees = ~5dBi.



Plot 1: Elevation Plot Greater Than 30-Degrees from Horizon

5.5 §15.407(b) Spurious Emissions

5.5.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The graphs show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below are plots with the EUT turned to the upper and lower channels with the antenna gain of 8 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be remain below -27 dBm EIRP.

Result

Conducted spurious emissions were below -27 dBm; therefore, the EUT complies with the specification.

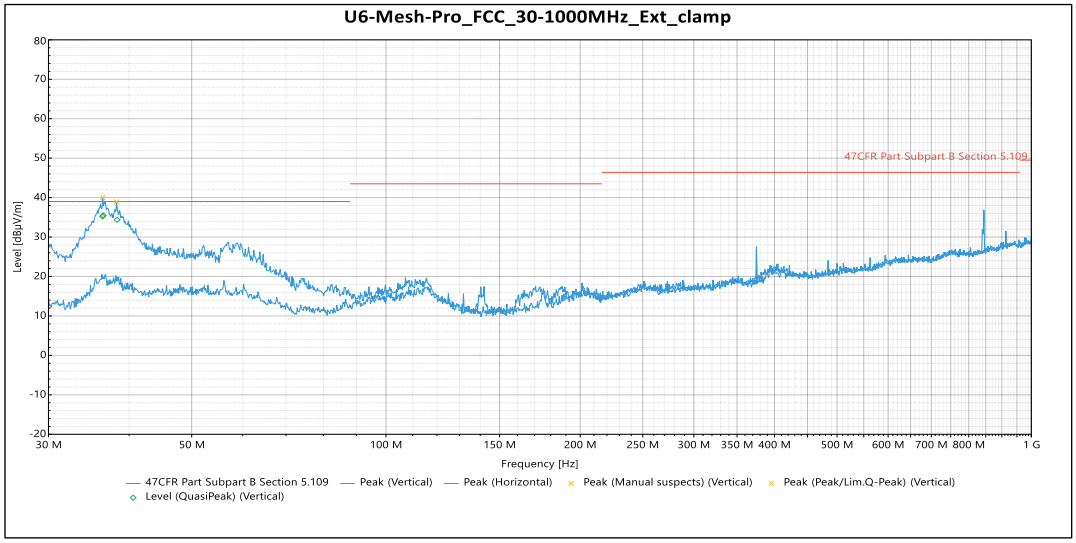
5.5.2 Radiated Spurious Emissions in the Restricted Bands of § 15.205

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 TP55, 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 worst-case measurement are shown below. For frequencies above 1 GHz, a measurement of 3 meters was used. For frequencies below 1 GHz, a measurement distance of 10 meters was used.

Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

Result

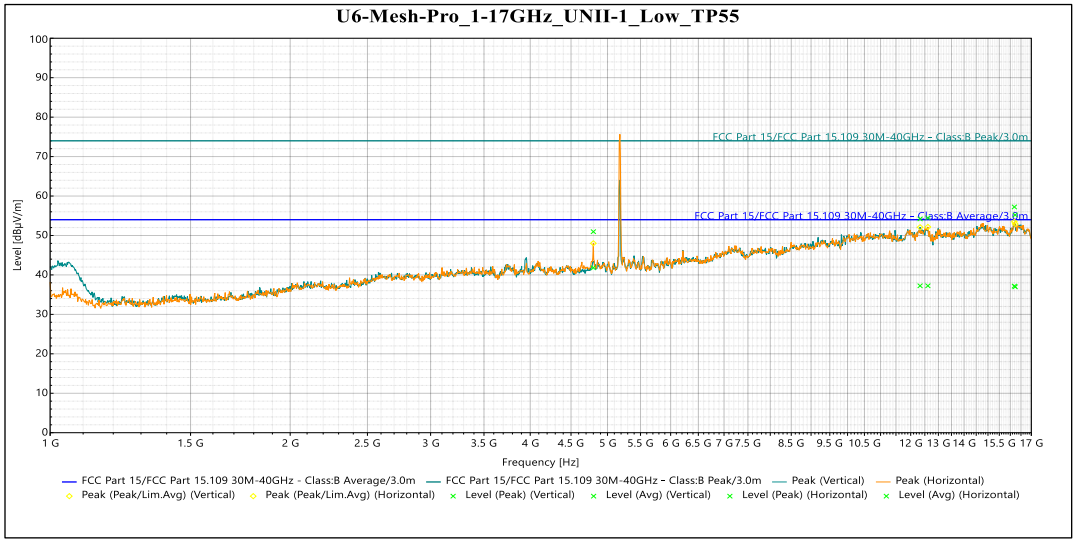
All emissions in the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. All emissions me the limits specified in § 15.407(b). Representative band edge plots are included in this report.



QuasiPeak

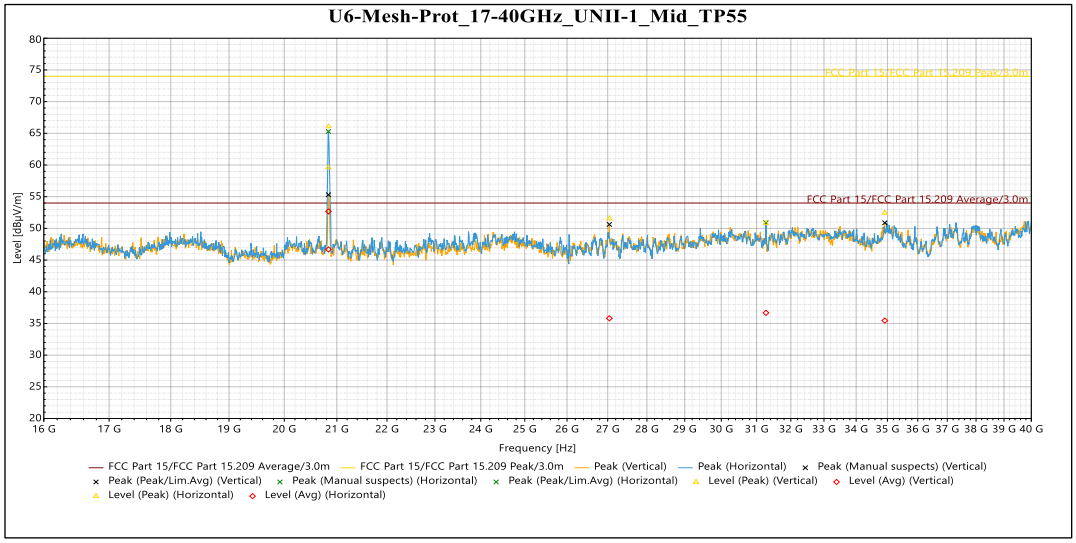
Frequency	SR #	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
36.374 MHz	1	35.221	39	-3.779	71	1.842	Vertical	-14.833
36.48 MHz	1	35.51	39	-3.49	63	1.156	Vertical	-14.823
38.328 MHz	1	34.369	39	-4.631	8	0.998	Vertical	-14.439

Table 4: 30MHz to 1GHz Radiated Emissions



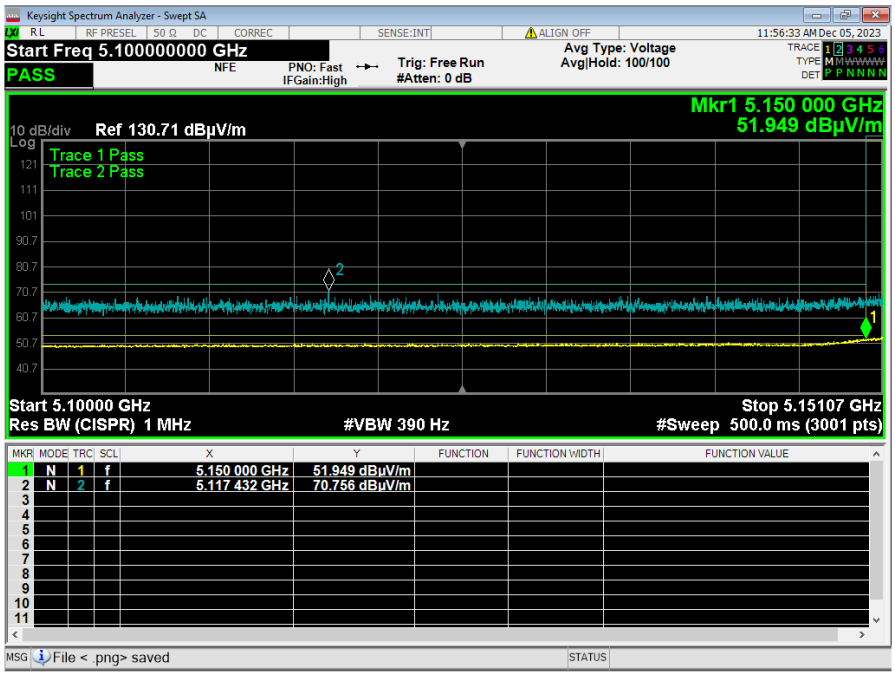
Frequency	SR #	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
12.33 GHz	Peak	54.202	74	-19.798	175	2.753	Vertical	16.634
16.226 GHz	Peak	55.197	74	-18.803	54	2.055	Vertical	17.676
12.33 GHz	AVG	37.242	54	-16.758	175	2.753	Vertical	16.634
16.226 GHz	AVG	36.984	54	-17.016	54	2.055	Vertical	17.676
4.8001 GHz	Peak	50.959	74	-23.041	125	1.812	Horizontal	4.45
12.611 GHz	Peak	54.459	74	-19.541	313	2.709	Horizontal	16.593
16.189 GHz	Peak	57.23	74	-16.77	138	3.071	Horizontal	17.894
4.8001 GHz	AVG	41.799	54	-12.201	125	1.812	Horizontal	4.45
12.611 GHz	AVG	37.244	54	-16.756	313	2.709	Horizontal	16.593
16.189 GHz	AVG	37.166	54	-16.834	138	3.071	Horizontal	17.894

Table 5: 1-17GHz Spurious Emissions Transmitting on the Low Frequency 5180 MHz

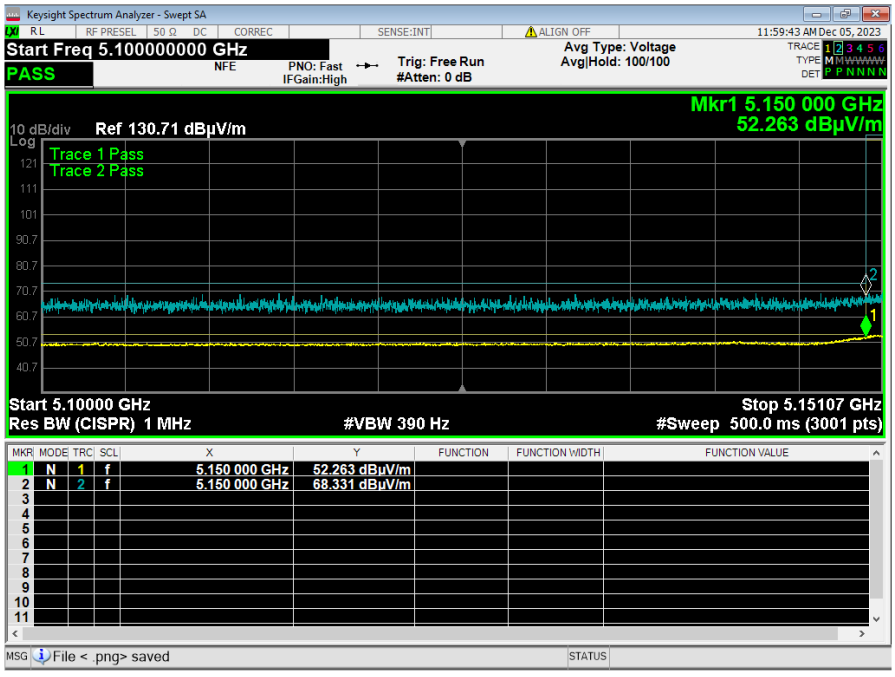


Frequency	SR #	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
20.837 GHz	Peak	59.616	74	-14.384	344	Vertical	-0.336
27.042 GHz	Peak	51.536	74	-22.464	173	Vertical	1.547
34.916 GHz	Peak	52.445	74	-21.555	96	Vertical	3.386
20.837 GHz	AVG	46.666	54	-7.334	344	Vertical	-0.336
27.042 GHz	AVG	35.811	54	-18.189	173	Vertical	1.547
34.916 GHz	AVG	35.455	54	-18.545	96	Vertical	3.386
20.837 GHz	Peak	66.077	74	-7.923	316	Horizontal	-0.336
31.27 GHz	Peak	50.808	74	-23.192	64	Horizontal	0.708
20.837 GHz	AVG	52.674	54	-1.326	316	Horizontal	-0.336
31.27 GHz	AVG	36.673	54	-17.327	64	Horizontal	0.708

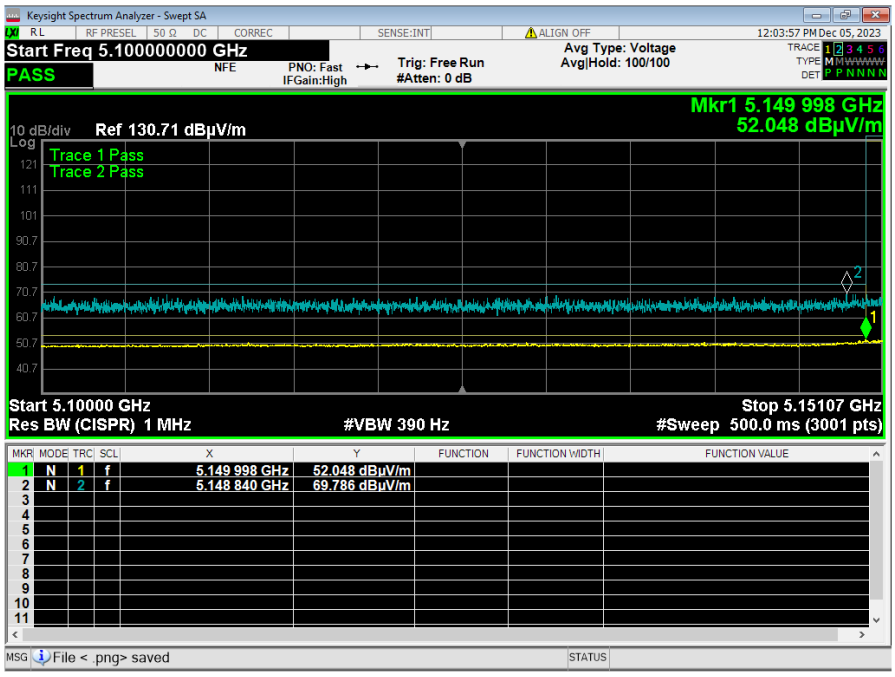
Table 6: Transmitting on the Highest Frequency 5200 MHz



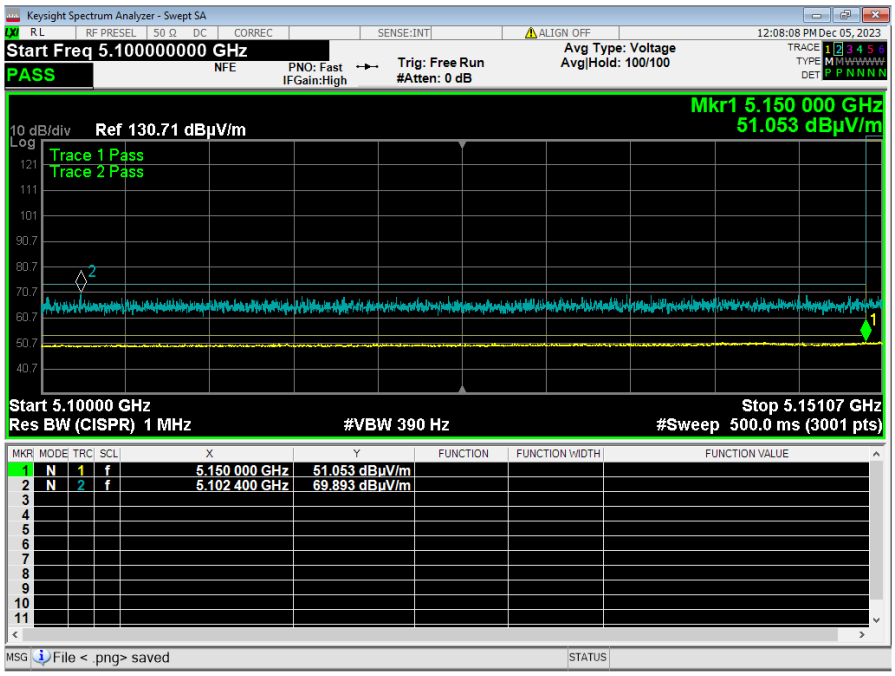
Graph 5: Band Edge ax Mode 20 MHz – 5180 MHz



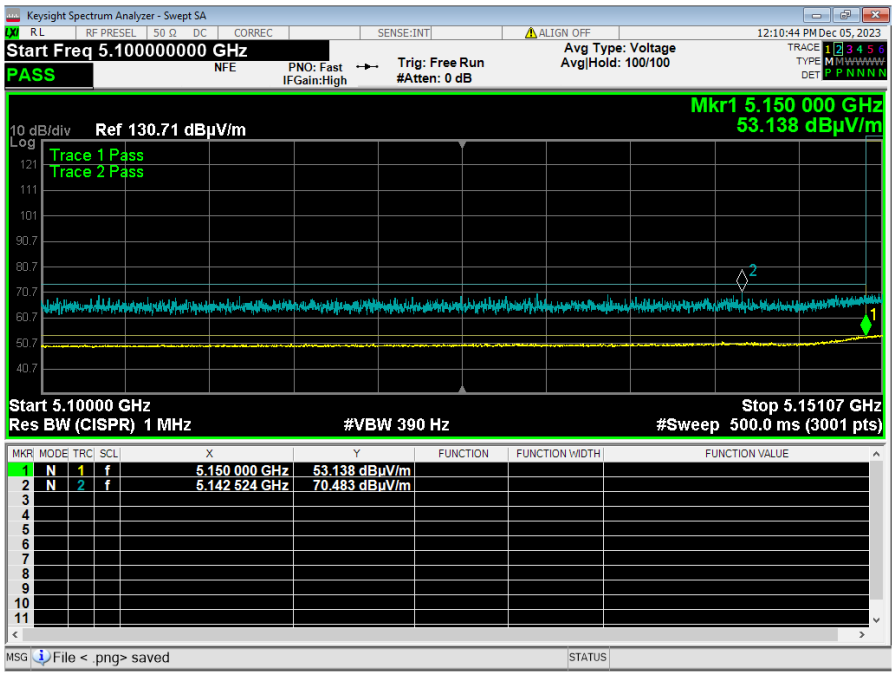
Graph 6: Band Edge ax Mode 20 MHz - 5200 MHz



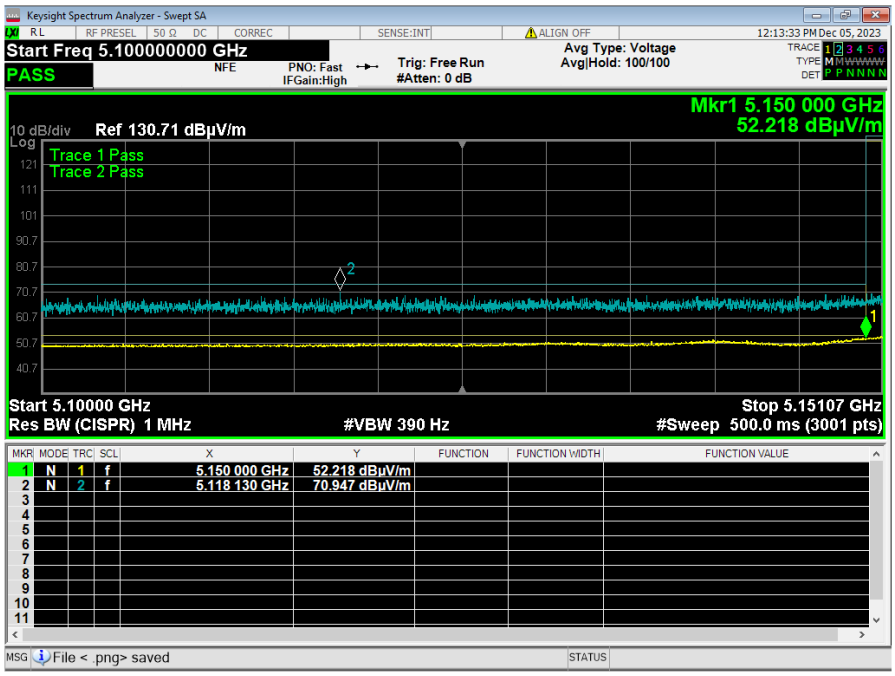
Graph 7: Band Edge ax Mode 20 MHz – 5210 MHz



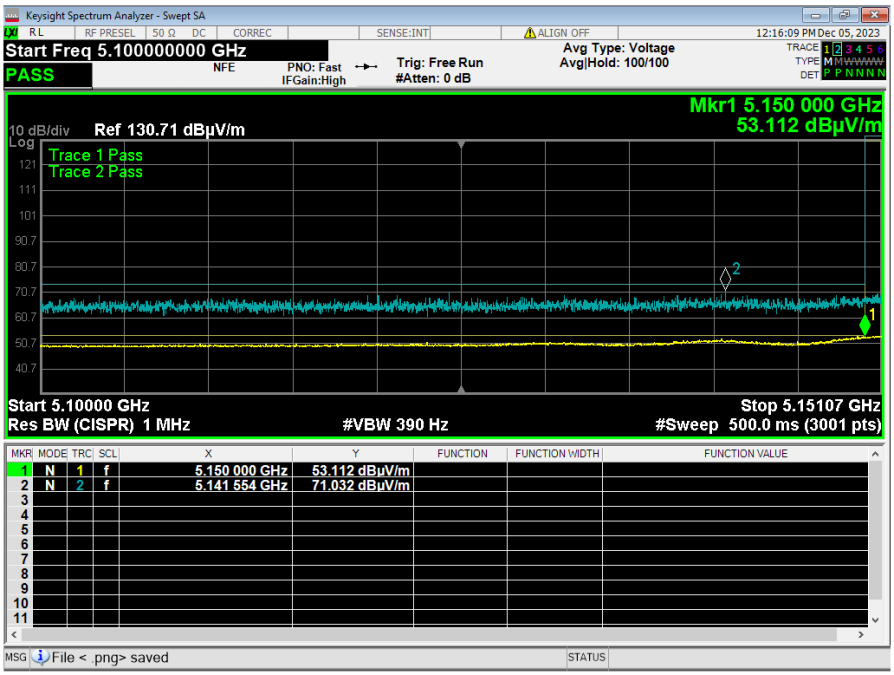
Graph 8: Band Edge ax Mode 40 MHz - 5240 MHz



Graph 9: Band Edge ax Mode 40 MHz - 5190 MHz



Graph 10: Band Edge ax Mode 40 MHz – 5230 MHz



Graph 11: Band Edge ax Mode 80 MHz - 5210 MHz

5.6 §15.407(a) Maximum Power Spectral Density

All chains were measured and summed under the guidance of KDB 789033 Section II. F. and KDB 66291 D01. Please see associated annex for details on instrument settings.

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.
As per KDB 662911, when the EUT is using spatial-multiplexing in HT to HE modes, there is not additional array gain to accommodate. When the EUT uses Nss=1 data rates, the antenna gain is 8 dBi + Array gain of 3.01 dB which is a total of 11.01 dBi
Results of this testing are summarized.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Measured PSD
OFDM 20	5180	Mcs0	44	10.32
OFDM 20	5210	Mcs0	46	11.93
OFDM 20	5240	Mcs0	46	11.57
HE 20	5180	Mcs0	42	8.21
HE 20	5210	Mcs0	48	11.65
HE 20	5240	Mcs0	49	11.68
HE 40	5190	Mcs0	33	1.09
HE 40	5230	Mcs0	47	9.15
HE 80	5210	Mcs0	32	-1.85

Result

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

-- End of Test Report --