UNIFIED COMPLIANCE LABORATORY

427 West 12800 South
Draper, UT 84020

Test Report

Certification

FCC ID	SWX-UBBXG
ISED ID	6545A-UBBXG
Equipment Under Test	UBB-XG
Test Report Serial Number	TR5712_05
Date of Test(s)	15, 17 December 2020; 5 January 2021
Report Issue Date	14th January 2021

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

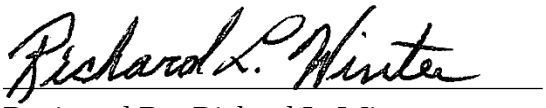
Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	UniFi
Model Number	UBB-XG
FCC ID	SWX-UBBXG
ISED ID	6545A-UBBXG

On this 14th day of January 2021, 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: Noah Vickers



Reviewed By: Richard L. Winter

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	14th January 2021
02	Amend Section 2.2 , 5.5.1, 5.4 and 5.6	29th January 2021
03	Updated Section 5.5.1	2nd February 2021
04	Added test data tables in Section 5.2	25th February 2021
05	Updated AC line conducted emissions data	18th March 2021

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	UBB-XG
Serial Number	0418D6A24C9F
Dimensions (cm)	19.18 x 19.18 x 5.9

2.2 Description of EUT

The UBB-XG is a PTP 60 GHz building to building network bridge transmitter with a 5 GHz backup redundancy transmitter. The UBB-XG is paired with a second UBB-XG for ease in setup and operation. When used with the UniFi Controller it provides bridging two networks with a high Gbps throughput. The UBB-XG is powered from a Model U-PoE-at 48 Volt PoE power adapter.

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: UBB-XG (Note 1) SN: 0418D6A24C9F	Building-to-Building Bridge	See Section 2.4
BN: Ubiquiti MN: U-POE-48V SN: N/A	PoE Power Adapter	Shielded or Un-Shielded Cat 5e cable (Note 2)
BN: Toshiba	Laptop Personal Computer	Shielded or Un-Shielded Cat 5e

MN: Satellite SN: N/A		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
Ethernet/PoE	1	Un-Shielded Cat 5e Cable / 3m
SFP+	1	N/A

2.5 Operating Environment

Power Supply	120 VAC
AC Mains Frequency	60 Hz
Temperature	20.4 – 23.8 °C
Humidity	18.18 – 24.4 %
Barometric Pressure	1024 mBar

2.6 Operating Modes

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

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

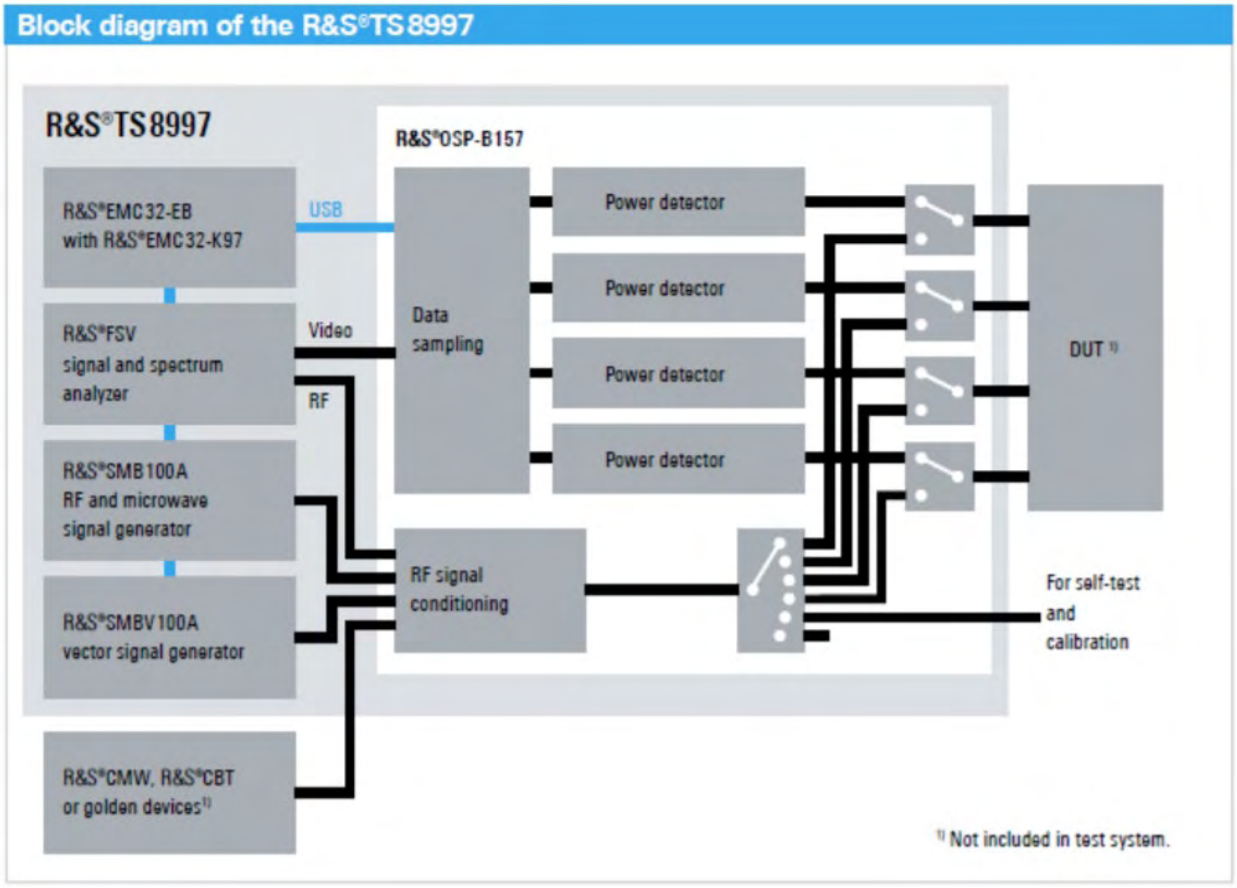


Diagram 1: Test Configuration Block Diagram

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	5725 to 5850	Compliant
15.407(e)	RSS-247 §6.2.2, §6.2.3	Peak Output Power	5725 to 5850	Compliant
15.407(f)	RSS-247 §6.2.2, §6.2.3	Antenna Conducted Spurious Emissions	0.009 to 25000	Compliant
15.407(g)	RSS-247 §6.2.2, §6.2.3	Radiated Spurious Emissions	0.009 to 25000	Compliant
15.407(h)	RSS-247 §6.2.2, §6.2.3	Peak Power Spectral Density	5725 to 5850	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033 and 47 CFR Part 15.				

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 2021. 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	9/18/2020	9/18/2021
LISN	AFJ	LS16C/10	UCL-2512	5/26/2020	5/26/2021
Cat6 ISN	Teseq	ISN T8-Cat6	UCL-2971	5/18/2020	5/18/2021
ISN	Teseq	ISN T800	UCL-2974	6/1/2020	6/1/2021
LISN	Com-Power	LIN-120C	UCL-2612	5/19/2020	5/19/2021
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

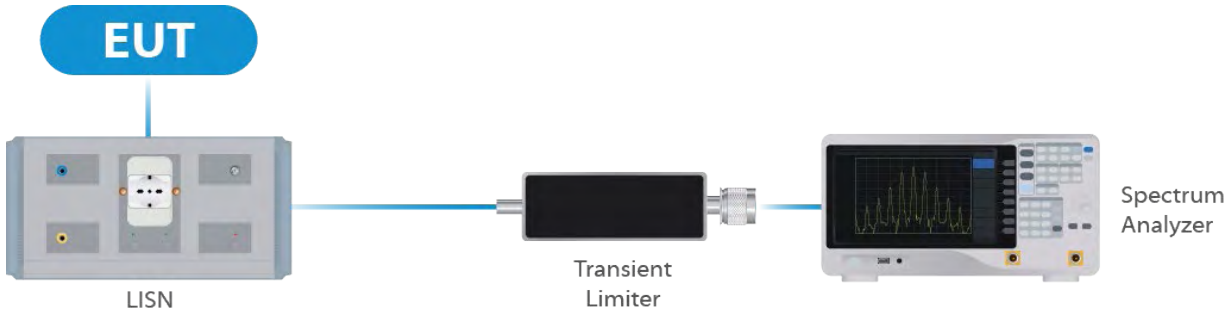


Figure 1: Conducted Emissions Test

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	8/24/2020	8/24/2021
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	8/25/2020	8/25/2021
Switch Extension	R&S	OSP-150W	UCL-2870	8/21/2020	8/21/2021

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

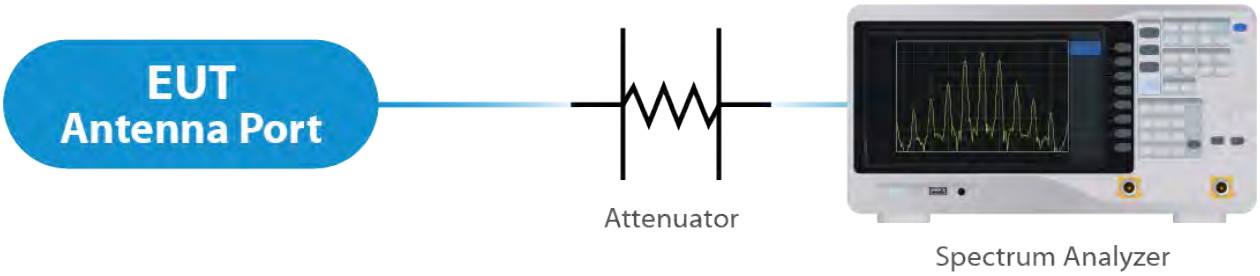


Figure 2: Direct Connect at the Antenna Port Test

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	6/1/2020	6/1/2021
Pre-Amplifier	Sonoma Instruments	310N	UCL-2889	9/10/2020	9/10/2021
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	7/8/2020	7/8/2021
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	5/20/2020	5/20/2021
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	5/21/2020	5/21/2021
18 – 40 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	1/28/2020	1/28/2021
0.5 – 18 GHz Amplifier	Scwarzbeck	BBV 9718C	UCL-2493	1/24/2020	1/24/2021
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3:List of equipment used for Radiated Emissions

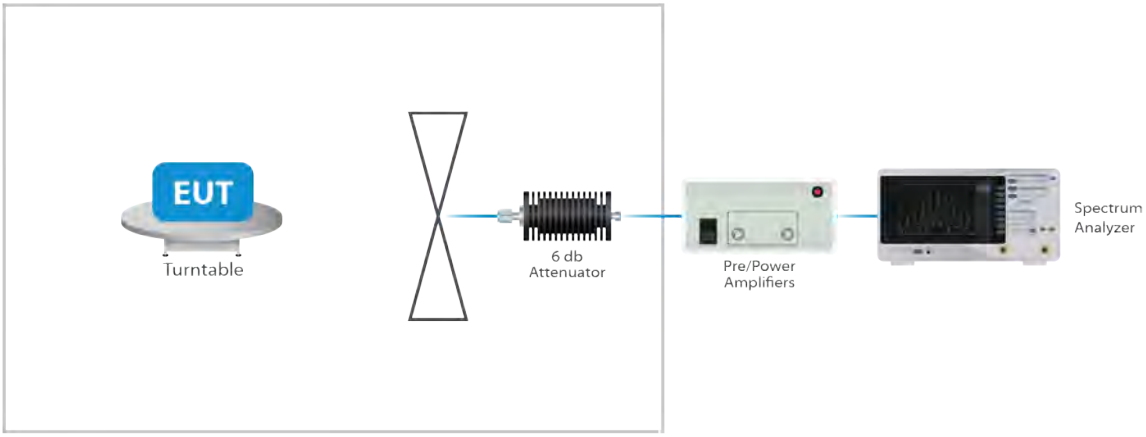


Figure 3: Radiated Emissions Test

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)	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

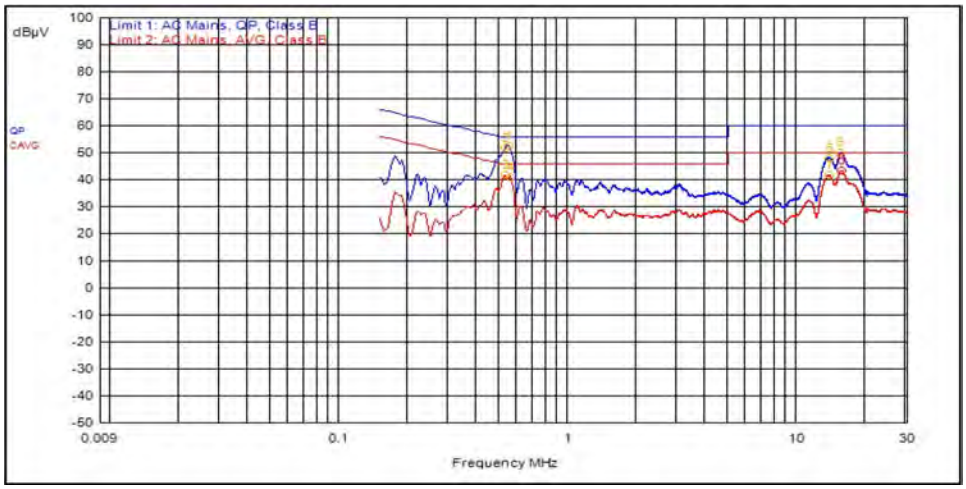
The EUT uses an integral antenna. The Maximum gain of the antenna is 14 dBi. The antenna is not user replaceable.

Results

The EUT complied with the specification

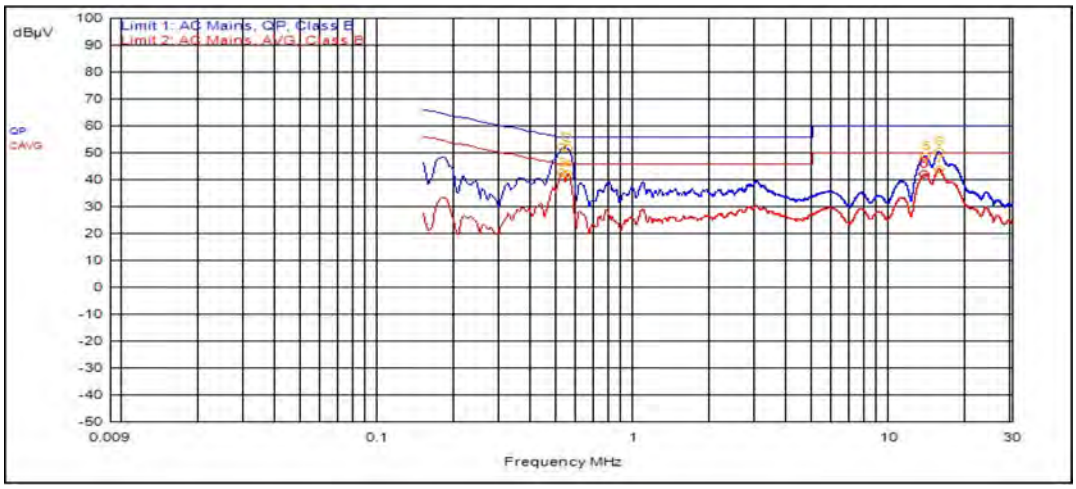
5.2 Conducted Emissions at Mains Ports Data

5.2.1 Line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
1	546.000kHz	12.4	0.0		QPeak	40.2	52.6	56.0	-3.4
2	528.000kHz	12.4	0.0		QPeak	39.4	51.8	56.0	-4.2
3	528.000kHz	12.4	0.0		C_AVG	29.1	41.5	46.0	-4.5
4	558.000kHz	12.4	0.0		C_AVG	28.5	40.9	46.0	-5.1
8	15.465MHz	12.5	0.2		C_AVG	30.8	43.5	50.0	-6.5
7	13.644MHz	12.4	0.2		C_AVG	28.9	41.5	50.0	-8.5
6	15.363MHz	12.5	0.2		QPeak	37.2	49.9	60.0	-10.1
5	13.689MHz	12.4	0.2		QPeak	35.3	48.0	60.0	-12.0

5.2.2 Neutral



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
3	519.000kHz	12.4	0.0		C_AVG	30.0	42.4	46.0	-3.6
1	522.000kHz	12.4	0.0		QPeak	39.4	51.9	56.0	-4.1
4	552.000kHz	12.4	0.0		C_AVG	29.5	41.9	46.0	-4.1
2	549.000kHz	12.4	0.0		QPeak	39.1	51.5	56.0	-4.5
7	15.405MHz	12.5	0.2		C_AVG	31.3	43.9	50.0	-6.1
8	13.563MHz	12.4	0.2		C_AVG	29.4	42.1	50.0	-7.9
6	15.450MHz	12.5	0.2		QPeak	37.8	50.4	60.0	-9.6
5	13.623MHz	12.4	0.2		QPeak	35.9	48.6	60.0	-11.4

Result

The EUT complied with the specification limit.

5.3 §15.403(i) Emissions Bandwidth

Nominal BW (MHz)	Frequency (MHz)	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
20	5745	17.8	16.1	22.2
20	5775	17.8	15.6	23
20	5825	17.8	15.2	23.8
40	5755	37.3	36.4	42.2
40	5775	37.3	33.9	50
40	5795	37.3	35.8	45
80	5775	76.5	13.9	87

Result

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

5.4 §15.403(a)(3) Maximum Average Output Power

The maximum average RF conducted output power measured for this device was 22.3 dBm or 169.8 mW. The limit is 30 dBm, or 1 W. The antenna has a gain of 14 dBi.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power	Measured EIRP	Measured PSD
OFDM 20	5745	Mcs0	45	22.3	36.3	5.3
OFDM 20	5775	Mcs0	39	19.5	33.5	2.4
OFDM 20	5825	Mcs0	33	16.8	30.8	-0.6
HT 20	5745	Mcs0	45	22.3	36.3	5.4
HT 20	5775	Mcs0	39	19.3	33.3	2.5
HT 20	5825	Mcs0	33	16.9	30.9	-0.7
HT 40	5755	Mcs0	45	22.2	36.2	6.5
HT 40	5775	Mcs0	39	19.5	33.5	3.4
HT 40	5795	Mcs0	33	16.6	30.6	1.2
VHT 20	5745	Mcs0	45	22.2	36.2	4.7
VHT 20	5775	Mcs0	39	19.5	33.5	2
VHT 20	5825	Mcs0	33	16.9	30.9	-1
VHT 40	5755	Mcs0	45	22.1	36.1	2.8
VHT 40	5775	Mcs0	39	19.6	33.6	-1
VHT 40	5795	Mcs0	33	16.5	30.5	-3.2
VHT80	5775	Mcs0	45	22.3	36.3	2.4

Result

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

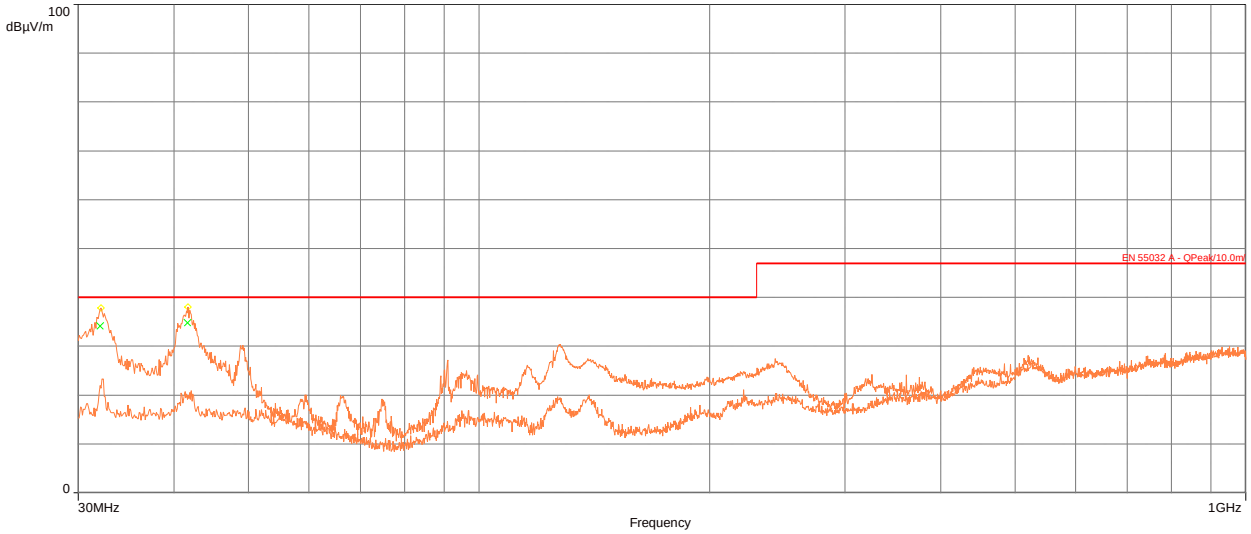
5.5 §15.407(b)(7) Spurious Emissions

5.5.1 Radiated Spurious Emissions in the Restricted Bands of § 15.205

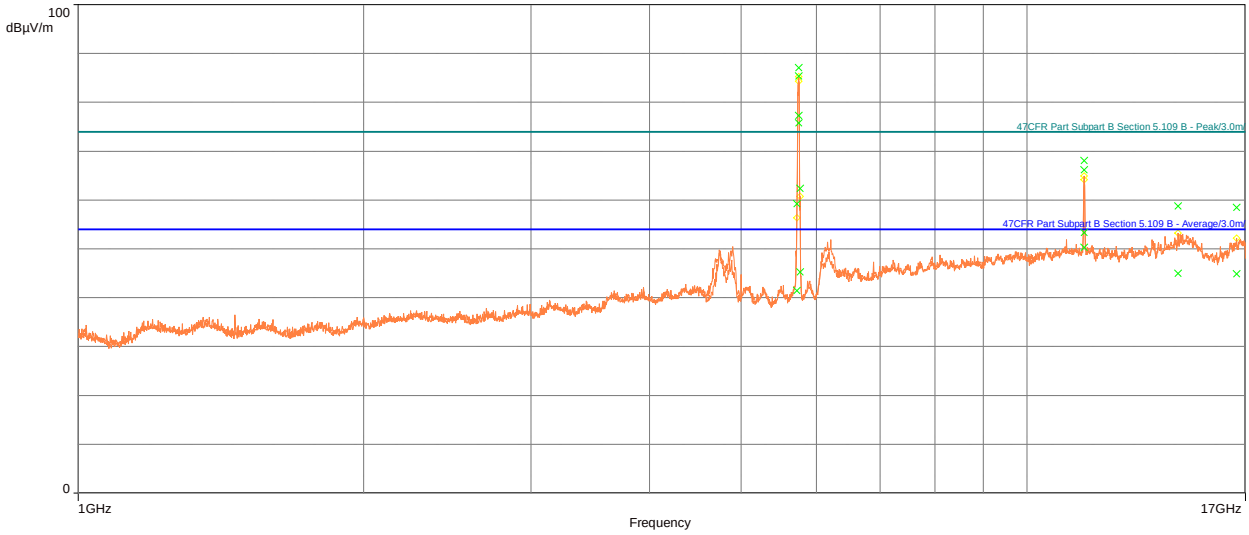
The EUT uses various power settings based on the channel in use. In order to reduce test time, the radiated spurious emissions at the lowest, middle, and highest channel were measured at the maximum power of TP 46. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. For frequencies between 1 GHz and 18 GHz, a measurement distance of 3 meters was used. For frequencies below 1 GHz, a measurement distance of 10 meters was used. When performing measurements at a distance other than that specified, the results have been extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements) e.g 20log(3m/10m) = -10.45

Result

All emissions in the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. See Annex for Conducted Band edge plots.

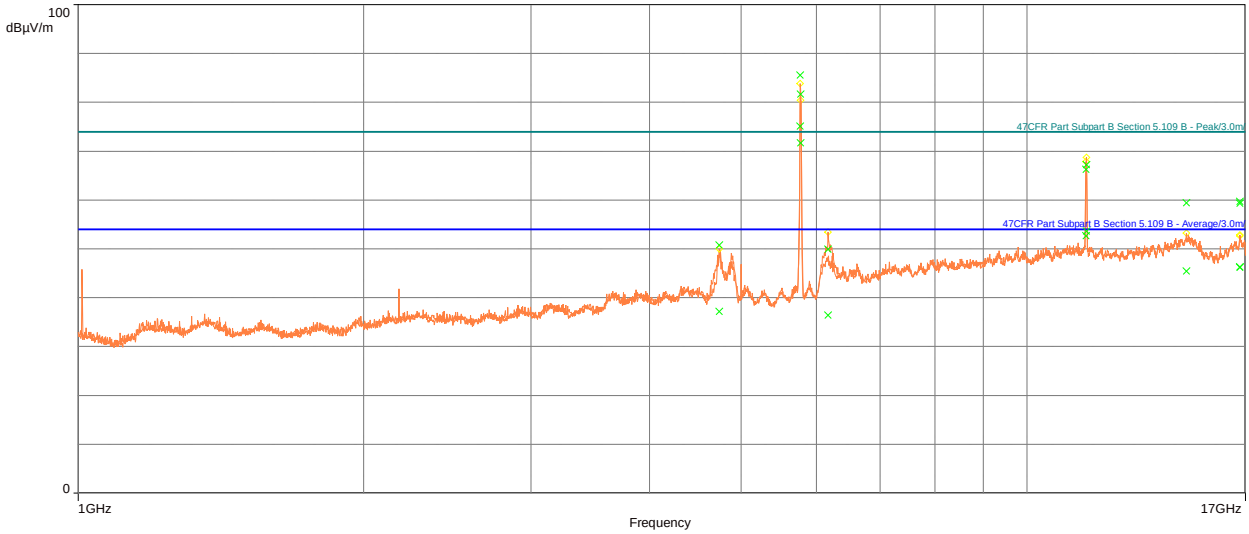


Frequency (MHz)	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
32.074	QP	34.13	40.00	-5.87	99.00	2.58	Vertical	-11.60
41.67	QP	34.77	40.00	-5.23	293.00	1.88	Vertical	-11.29



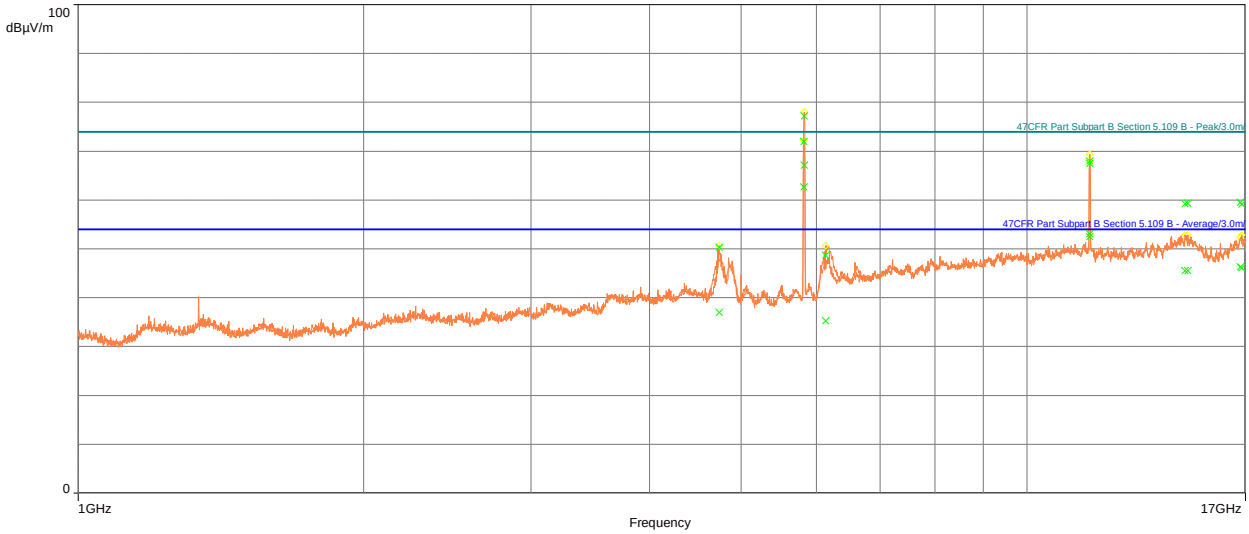
Frequency (MHz)	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
11488	A	53.34	54.00	-0.66	84.00	2.15	Vertical	14.96
11499	A	50.28	54.00	-3.72	47.00	2.10	Horizontal	14.99
14427	A	44.94	54.00	-9.06	254.00	1.87	Horizontal	17.12
16633	A	44.91	54.00	-9.09	346.00	4.00	Horizontal	17.61
11488	P	68.10	74.00	-5.90	84.00	2.15	Vertical	14.96
11499	P	66.19	74.00	-7.81	47.00	2.10	Horizontal	14.99
14427	P	58.79	74.00	-15.21	254.00	1.87	Horizontal	17.12
16633	P	58.44	74.00	-15.56	346.00	4.00	Horizontal	17.61

Table 4: Transmitting on the Lowest Frequency 5745 MHz



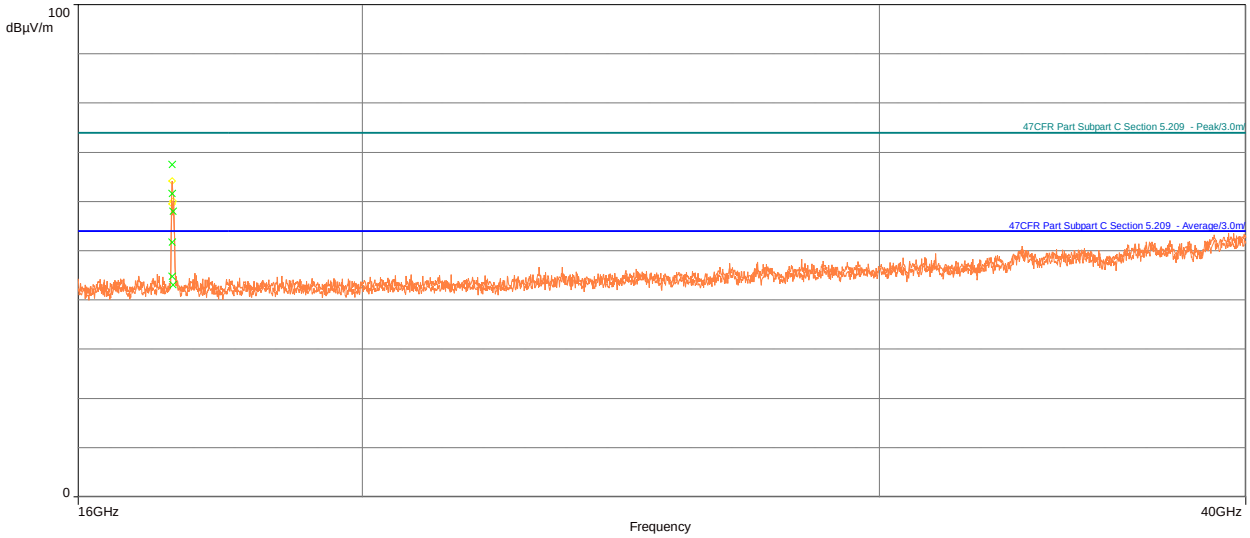
Frequency (MHz)	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
6173.3	A	36.42	54.00	-17.58	53.00	2.51	Vertical	4.09
11543	A	52.64	54.00	-1.36	57.00	2.23	Vertical	14.80
16779	A	46.25	54.00	-7.75	70.00	3.94	Vertical	18.71
4740.9	A	37.15	54.00	-16.85	54.00	2.39	Horizontal	1.81
11552	A	53.61	54.00	-0.39	143.00	2.47	Horizontal	14.73
14726	A	45.47	54.00	-8.53	276.00	2.23	Horizontal	17.60
16777	A	46.22	54.00	-7.78	341.00	3.08	Horizontal	18.71
6173.3	P	49.88	74.00	-24.12	53.00	2.51	Vertical	4.09
11543	P	66.24	74.00	-7.76	57.00	2.23	Vertical	14.80
16779	P	59.31	74.00	-14.69	70.00	3.94	Vertical	18.71
4740.9	P	50.80	74.00	-23.20	54.00	2.39	Horizontal	1.81
11552	P	67.22	74.00	-6.78	143.00	2.47	Horizontal	14.73
14726	P	59.38	74.00	-14.62	276.00	2.23	Horizontal	17.60
16777	P	59.67	74.00	-14.33	341.00	3.08	Horizontal	18.71

Table 5: Transmitting on the Middle Frequency 5775 MHz



Frequency (MHz)	Det.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Polarization	Correction (dB)
4739.7	A	36.99	54.00	-17.01	60.00	1.98	Vertical	1.81
6137.6	A	35.26	54.00	-18.74	77.00	3.81	Vertical	4.00
11649	A	53.07	54.00	-0.93	91.00	1.74	Vertical	14.60
14686	A	45.53	54.00	-8.47	296.00	3.35	Vertical	17.77
16852	A	46.12	54.00	-7.88	310.00	1.92	Vertical	19.09
11648	A	52.49	54.00	-1.51	91.00	2.71	Horizontal	14.61
14788	A	45.50	54.00	-8.50	112.00	2.12	Horizontal	17.77
16795	A	46.32	54.00	-7.68	342.00	2.05	Horizontal	18.76
4739.7	P	50.25	74.00	-23.75	60.00	1.98	Vertical	1.81
6137.6	P	48.64	74.00	-25.36	77.00	3.81	Vertical	4.00
11649	P	67.95	74.00	-6.05	91.00	1.74	Vertical	14.60
14686	P	59.27	74.00	-14.73	296.00	3.35	Vertical	17.77
16852	P	59.09	74.00	-14.91	310.00	1.92	Vertical	19.09
11648	P	67.50	74.00	-6.50	91.00	2.71	Horizontal	14.61
14788	P	59.32	74.00	-14.68	112.00	2.12	Horizontal	17.77
16795	P	59.53	74.00	-14.47	342.00	2.05	Horizontal	18.76

Table 6: Transmitting on the Highest Frequency 5825 MHz



Frequency (MHz)	Det	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
17224	A	44.75	54.00	-9.25	3.00	Vertical	-5.63
17238	A	43.10	54.00	-10.90	347.00	Vertical	-5.62
17225	A	51.72	54.00	-2.28	323.00	Horizontal	-5.63

17224	P	61.62	74.00	-12.38	3.00	Vertical	-5.63
17238	P	57.96	74.00	-16.04	347.00	Vertical	-5.62
17225	P	67.53	74.00	-6.47	323.00	Horizontal	-5.63

Table 7 Transmitting on the Middle Frequency 5775 (worst case)

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 30 dBm in any 500 kHz 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	5745	Mcs0	45	5.3
OFDM 20	5775	Mcs0	39	2.4
OFDM 20	5825	Mcs0	33	-0.6
HT 20	5745	Mcs0	45	5.4
HT 20	5775	Mcs0	39	2.5
HT 20	5825	Mcs0	33	-0.7
HT 40	5755	Mcs0	45	6.5
HT 40	5775	Mcs0	39	3.4
HT 40	5795	Mcs0	33	1.2
VHT 20	5745	Mcs0	45	4.7
VHT 20	5775	Mcs0	39	2
VHT 20	5825	Mcs0	33	-1
VHT 40	5755	Mcs0	45	2.8
VHT 40	5775	Mcs0	39	-1
VHT 40	5795	Mcs0	33	-3.2
VHT80	5775	Mcs0	45	2.4

Result

The maximum average power spectral density was less than the limit of 30 dBm; therefore, the EUT complies with the specification.

-- End of Test Report --