



427 West 12800 South
Draper, UT 84020

Test Report Certification

FCC ID	SWX-USP1
Equipment Under Test	USP-Plug
Test Report Serial Number	TR3673_01
Date of Test(s)	10/22/2019
Report Issue Date	10/28/2019

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



NVLAP LAB CODE 600241-0

Certification of Engineering Report

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Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	Unifi
Model Number	USP-Plug
FCC ID	SWX-USP1

On this 28th day of October 2019, 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: Clay Allred

Revision History		
Revision	Description	Date
01	Original Report Release	10/28/2019

Table of Contents

1	Client Information.....	5
1.1	Applicant.....	5
1.2	Manufacturer.....	5
2	Equipment Under Test (EUT).....	6
2.1	Identification of EUT.....	6
2.2	Description of EUT.....	6
2.3	EUT and Support Equipment.....	6
2.4	Interface Ports on EUT.....	7
2.5	Operating Environment.....	7
2.6	Operating Modes.....	7
2.7	EUT Exercise Software.....	7
2.8	Modification Incorporated/Special Accessories on EUT.....	7
2.9	Deviation, Opinions Additional Information or Interpretations from Test Standard.....	7
3	Test Specification, Method and Procedures.....	8
3.1	Test Specification.....	8
3.2	Methods & Procedures.....	8
3.3	FCC Part 15, Subpart C.....	8
3.4	Results.....	9
3.5	Test Location.....	9
4	Test Equipment.....	10
4.1	Conducted Emissions at Mains Ports.....	10
4.2	Direct Connect at the Antenna Port Tests.....	10
4.3	Radiated Emissions.....	12
4.4	Equipment Calibration.....	12
4.5	Measurement Uncertainty.....	13
5	Test Results.....	14
5.1	§15.203 Antenna Requirements.....	14
5.2	Conducted Emissions at Mains Ports Data.....	15
5.3	§15.247(a)(2) Measured Bandwidth.....	17
5.4	§15.247(b)(3) Maximum Average Output Power.....	18
5.5	§15.247(d) Spurious Emissions.....	19
5.6	§15.247(e) Maximum Average Power Spectral Density.....	21

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	USP-Plug
Serial Number	N/A
Dimensions (mm)	50x48

2.2 Description of EUT

The UniFi USP-Plug is a Wi-Fi connected device which is inserted between wall AC outlet socket and power plug of a non-UniFi Internet router. UniFi Network Controller continuously monitors availability of an Internet connection. In case of lost connection, the USP-Plug automatically restarts the router by disconnecting the AC power for a short period.

This report covers the circuitry of the device subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant.

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: USP-Plug SN: N/A	Client Transceiver	See section 2.4 (Note 1)
BN: Apple MN: iPhone7 SN: None	Mobile Device	WiFi

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
N/A	N/A	N/A

2.5 Operating Environment

Power Supply	120 VAC
AC Mains Frequency	60 Hz
Temperature C	20.1 – 21.3
Humidity	24.11 – 27.04 %
Barometric Pressure	1024 mBar

2.6 Operating Modes

The transmitter was tested while the DTS transceiver was in a constant transmit mode at the upper, middle, and lower channels for each modulation bandwidth and frequency band.

2.7 EUT Exercise Software

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

2.8 Modification Incorporated/Special Accessories on EUT

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

2.9 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 C 15.203, 15.207 and 15.247 Limits and methods of measurement of radio interference characteristics of radio frequency 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 15.203

See test standard for details.

3.2.2 47 CFR FCC Part 15 Section 15.207

See test standard for details.

3.2.3 47 CFR FCC Part 15 Section 15.247

See test standard for details.

3.3 FCC Part 15, Subpart C

3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.203	N/A	Antenna requirements	Structural Requirement	Compliant
15.207	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.247(a)	RSS-247 §5.2	Bandwidth Requirement	2400 to 2483.5	Compliant
15.247(b)	RSS-247 §5.4	Peak Output Power	2400 to 2483.5	Compliant
15.247(d)	RSS-247 §5.5	Antenna Conducted Spurious Emissions	0.009 to 25000	Compliant
15.247(d)	RSS-247 §5.5	Radiated Spurious Emissions	0.009 to 25000	Compliant
15.247(e)	RSS-247 §5.2	Peak Power Spectral Density	2400 to 2483.5	Compliant
The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074 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 3-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.

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	4/17/2020
Transient Limiter	Com-Power	LIT-930A	UCL-2496	2/11/2019	2/11/2020
LISN	AFJ	LS16C/10	UCL-2512	12/14/2018	4/17/2020
Cat6 ISN	Teseq	ISN T8-Cat6	UCL-2971	2/11/2019	5/21/2020
ISN	Teseq	ISN T800	UCL-2974	2/19/2019	5/21/2020
LISN	Com-Power	LIN-120C	UCL-2612	2/11/2019	2/11/2020
AC Power Source	Laplace Instruments	AC1000A	UCL-2857	N/A	N/A
Monitoring Probe	Teseq	MD 4070A	UCL-2980	3/16/2019	5/21/2020
Test Software	UCL	Revision 1	UCL-3107	N/A	N/A

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

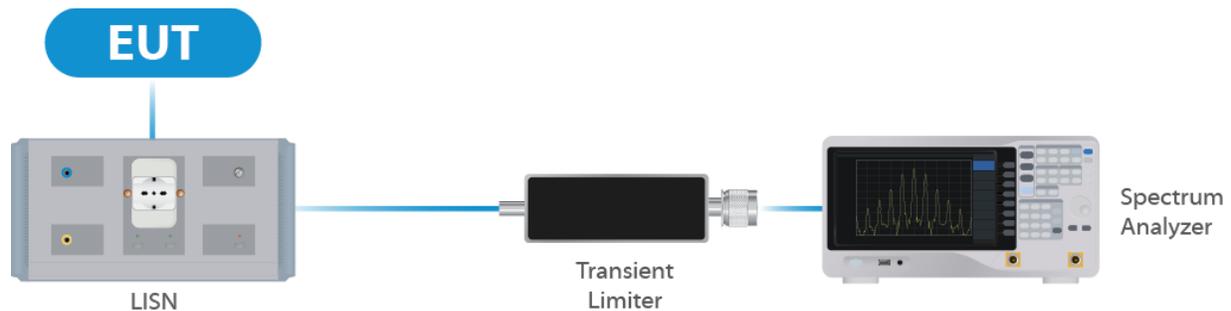


Figure 1: Conducted Emissions Test

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	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
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

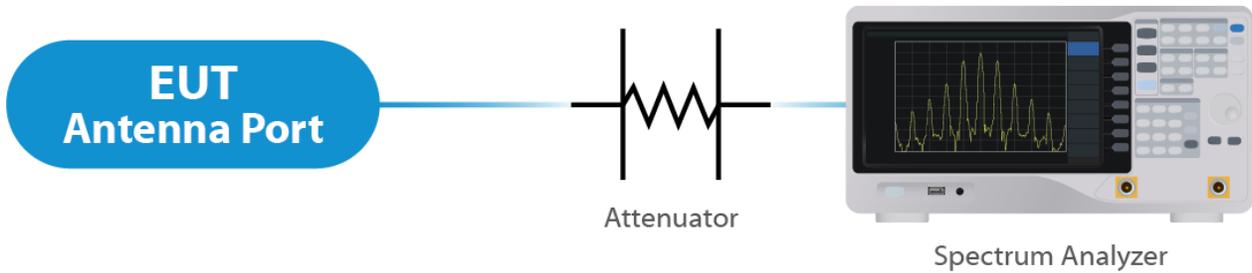


Figure 2: Direct Connect at the Antenna Port Test

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

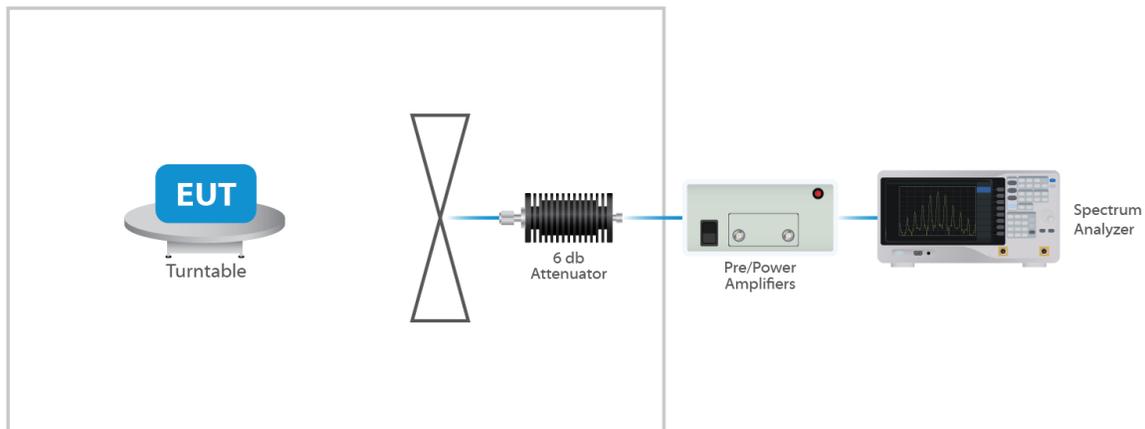


Figure 3: Radiated Emissions Test

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 (\pm 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

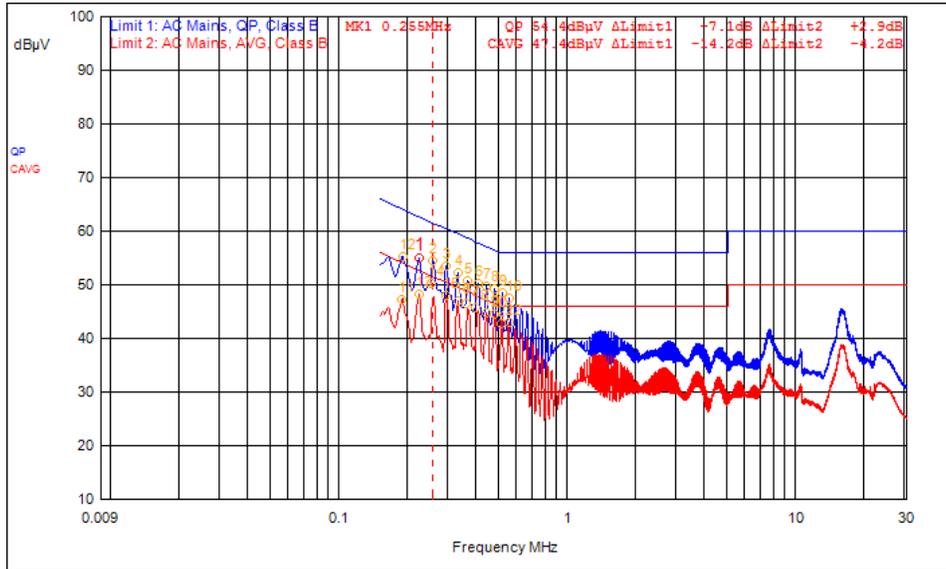
The EUT uses an integral PCB antenna The Maximum gain of the antenna is 0 dBi. The antenna is not user replaceable.

Results

The EUT complied with the specification

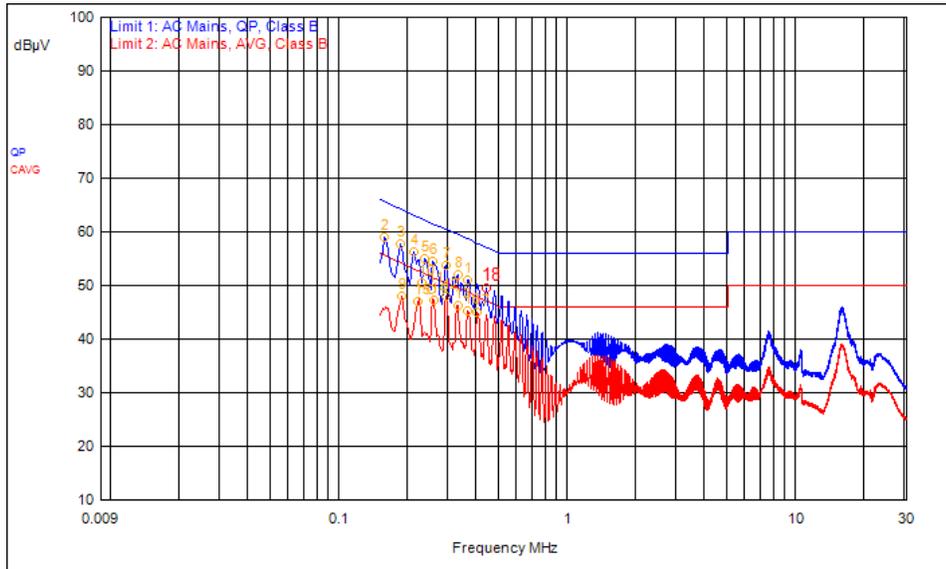
5.2 Conducted Emissions at Mains Ports Data

Line 1



ID	Frequency	Probe	Cable	Detector	Meter Read	Meas Level	Limit	Limit Dist.
20	474.000kHz	12.3	0.0	C_AVG	32.3	44.5	46.4	-1.9
19	438.000kHz	12.3	0.0	C_AVG	32.5	44.8	47.1	-2.3
16	327.000kHz	12.3	0.0	C_AVG	34.8	47.1	49.5	-2.4
15	291.000kHz	12.2	0.0	C_AVG	35.7	48.0	50.5	-2.5
22	546.000kHz	12.3	0.0	C_AVG	30.8	43.1	46.0	-2.9
21	507.000kHz	12.3	0.0	C_AVG	30.5	42.8	46.0	-3.2
13	222.000kHz	12.2	0.0	C_AVG	36.0	48.3	52.7	-4.5
3	291.000kHz	12.2	0.0	QPeak	41.3	53.6	60.5	-6.9
11	186.000kHz	12.2	0.0	C_AVG	35.1	47.3	54.2	-6.9
2	255.000kHz	12.2	0.0	QPeak	42.2	54.4	61.6	-7.1
4	327.000kHz	12.3	0.0	QPeak	40.1	52.3	59.5	-7.2
8	474.000kHz	12.3	0.0	QPeak	37.0	49.2	56.4	-7.2
7	438.000kHz	12.3	0.0	QPeak	37.6	49.8	57.1	-7.3
6	402.000kHz	12.3	0.0	QPeak	38.0	50.2	57.8	-7.6
9	510.000kHz	12.3	0.0	QPeak	36.2	48.4	56.0	-7.6
1	222.000kHz	12.2	0.0	QPeak	42.8	55.1	62.7	-7.7
5	363.000kHz	12.3	0.0	QPeak	38.6	50.8	58.7	-7.8
10	546.000kHz	12.3	0.0	QPeak	35.2	47.4	56.0	-8.6
12	189.000kHz	12.2	0.0	QPeak	42.9	55.2	64.1	-8.9
14	249.000kHz	12.2	0.0	QPeak	37.9	50.2	61.8	-11.6
17	354.000kHz	12.3	0.0	QPeak	34.3	46.6	58.9	-12.3
18	390.000kHz	12.3	0.0	QPeak	33.5	45.7	58.1	-12.3

Neutral



ID	Frequency	Probe	Cable	Detector	Meter Read	Meas Level	Limit	Limit Dist.
12	291.000kHz	12.2	0.0	C_AVG	35.7	48.0	50.5	-2.5
17	399.000kHz	12.3	0.0	C_AVG	32.6	44.9	47.9	-3.0
13	327.000kHz	12.3	0.0	C_AVG	34.1	46.3	49.5	-3.2
16	363.000kHz	12.3	0.0	C_AVG	33.0	45.3	48.7	-3.4
14	258.000kHz	12.2	0.0	C_AVG	35.0	47.3	51.5	-4.2
15	219.000kHz	12.2	0.0	C_AVG	34.8	47.1	52.9	-5.8
9	186.000kHz	12.2	0.0	C_AVG	35.8	48.0	54.2	-6.2
3	183.000kHz	12.2	0.0	QPeak	45.5	57.7	64.3	-6.6
2	156.000kHz	12.2	0.0	QPeak	46.7	59.0	65.7	-6.7
7	291.000kHz	12.2	0.0	QPeak	41.6	53.8	60.5	-6.7
4	210.000kHz	12.2	0.0	QPeak	44.0	56.3	63.2	-6.9
6	255.000kHz	12.2	0.0	QPeak	42.3	54.6	61.6	-7.0
5	234.000kHz	12.2	0.0	QPeak	42.7	54.9	62.3	-7.4
8	327.000kHz	12.3	0.0	QPeak	39.7	52.0	59.5	-7.5
18	438.000kHz	12.3	0.0	QPeak	37.2	49.5	57.1	-7.6
1	363.000kHz	12.3	0.0	QPeak	38.7	51.0	58.7	-7.7
10	228.000kHz	12.2	0.0	QPeak	38.3	50.5	62.5	-12.0
11	249.000kHz	12.2	0.0	QPeak	37.0	49.2	61.8	-12.6

Result

The EUT complied with the specification limit.

5.3 §15.247(a)(2) Measured Bandwidth

Mode	Frequency (MHz)	Emissions 99% Bandwidth (MHz)	Emissions 6 dB Bandwidth (MHz)
b	2412	10.4	8.2
	2442	10.4	8.65
	2462	10.4	8.15
g	2412	16.6	16.4
	2442	16.5	16.4
	2462	16.6	16.4
n	2412	17.5	17.65
	2442	17.6	17.0
	2462	17.5	16.65

Result

In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).

5.4 §15.247(b)(3) Maximum Average Output Power

The maximum average RF conducted output power measured for this device was 14.4 dBm or 27.5 mW.

The limit is 30 dBm or 1 Watt when using antennas with 6 dBi or less gain.

The antenna has a gain of 0 dBi.

Mode	Frequency (MHz)	Measured Output Power (dBm)	Output Power (mW)
b	2412	12.3	17.0
	2442	13.9	24.5
	2462	12.8	19.1
g	2412	13.2	20.9
	2442	14.4	27.5
	2462	13.6	22.9
n	2412	13.1	20.4
	2442	14.2	26.3
	2462	13.6	22.9

Result

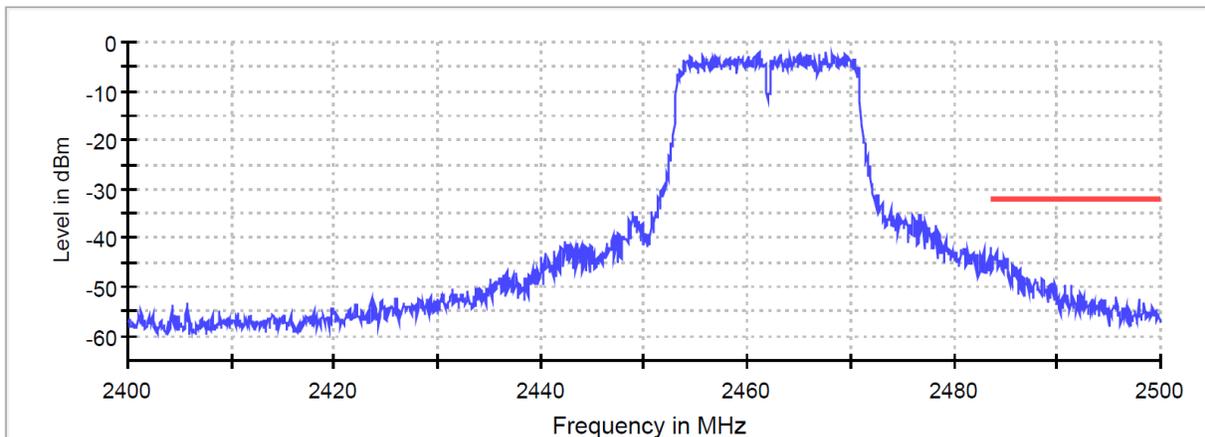
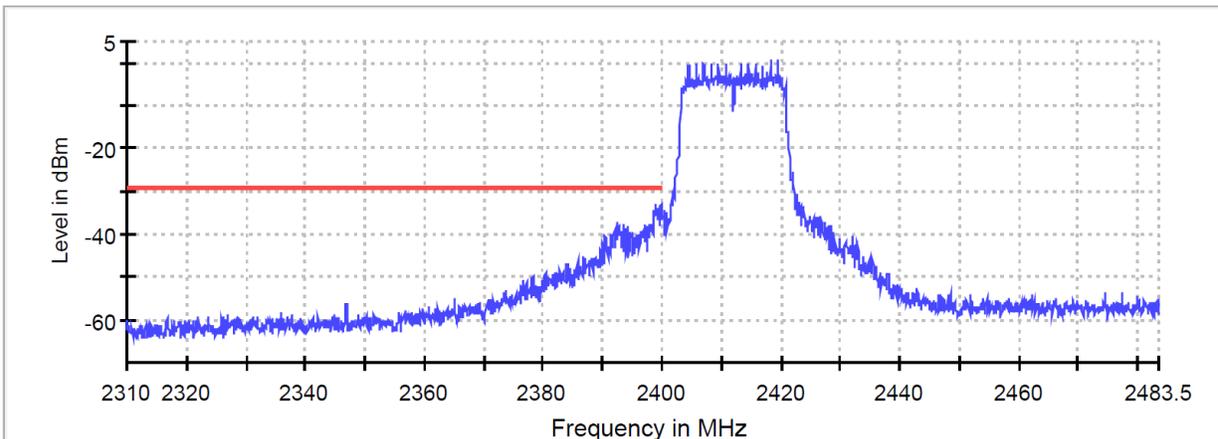
In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plots below).

5.5 §15.247(d) 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 Annex shows 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 tuned to the upper and lower channels. These, and the data contained in the associated Annex, demonstrates compliance with the provisions of this section at the band edges.

The emissions must be attenuated 20 dB below the highest power spectral density level measured within the authorized band as measured with a 100 kHz RBW.



Result

Conducted spurious emissions were attenuated 20 dB or more below the fundamental; therefore, the EUT complies with the specification.

5.5.2 Radiated Spurious Emissions in the Restricted Bands of §15.205

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emissions was investigated to measure any radiated emissions in the restricted bands that emanated from the cabinet of the EUT. The following plots show measurements of the worst case emissions that fell into the restricted bands of §15.205. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limits. The emissions in the restricted bands must meet the limits specified in §15.209. Band edge plots are found in the accompanied Annex.

Result

All emissions in the restricted bands of §15.205 met the limits specified in §15.209; therefore, the EUT complies with the specification.

Frequency (MHZ)	Antenna Polarity	Detector	Amplitude (dB μ V)	Correction Factor (dB)	Limit (dB μ V/m)	Margin (dB)
4884.5	H	PK	51.4	0.3	74.0	-22.6
4884.5	H	AVE	28.2	0.3	54.0	-25.8
9708.0	H	PK	58.3	12.1	74.0	-15.7
9708.0	H	AVE	35.1	12.1	54.0	-18.9
4874.0	V	PK	50.0	0.4	74.0	-24.0
4874.0	V	AVE	28.3	0.4	54.0	-25.7
9668.0	V	PK	60.6	12.0	74.0	-13.4
9668.0	V	AVE	36.1	12.0	54.0	-17.9

5.6 §15.247(e) Maximum Average Power Spectral Density

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. Results of this testing are summarized.

Mode	Frequency (MHz)	Measurement (dBm)	Criteria (dBm)
b	2412	1.25	8.0
	2442	1.38	8.0
	2462	1.74	8.0
g	2412	-0.77	8.0
	2442	-0.19	8.0
	2462	-0.32	8.0
n	2412	-0.37	8.0
	2442	0.45	8.0
	2462	-0.27	8.0

Result

The maximum average power spectral density was less than the limit of 8 dBm; therefore, the EUT complies with the specification.

-- End of Test Report --