



Compliance Testing, LLC

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Test Report

Prepared for: Ubiquiti Networks, Inc

Model: UAP-AC-M

Description: UniFi® AC Access Point

Serial Number: N/A

FCC ID: SWX-UAPACM

IC: 6545A-UAPACM

To

FCC Part 15.247

Date of Issue: November 30, 2017

On the behalf of the applicant:

Ubiquiti Networks, Inc
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Attention of:

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Poona Saber
Project Test Engineer

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All results contained herein relate only to the sample tested.

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	August 14, 2017	Poona Saber	Original Document
2.0	October 13, 2017	Poona Saber	Added Band edge measurement section and annex A
3.0	November 10,2017	Poona Saber	Revised power and power spectral density tables Revised page 6 reference data section explanation
4.0	November 14,2017	Poona Saber	Added setup photo for radiated measurement and receiver antenna on the test Equipment table
5.0	November 30,2017	Poona Saber	Added Block Diagram for the band edge test procedure

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
20.6 – 21.7	44.7 – 47.2	975.7 – 980.4

EUT Operation during Tests

EUT was put on continuous transmission test mode

EUT Description

Model: UAP-AC-M

Description: UniFi® AC Access Point

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information: None

Reference Test Data

This report contains test data for new antenna for ubiquity access point model UAP-AC-M which has already been certified pursuant to Part 15.407 with following FCC ID: SWX-UAPACM.

The Class II permissive change being sought for UAP-AC-M contains the same RF circuitry as the mentioned FCC ID With a new antenna model UMA-D added.

Spot check testing has been done conducted on UAP-AC-M for power and power spectral density on selected modes and frequency with highest output power and results are included and can be compared with reference data in reports under the original gran with above FCC ID.

Power tables has been adjusted for new antenna (UMA-D) gain per rule part 15.407 and included below. Other testing is referenced to the part 407 report for the mentioned FCC ID.

EUT Specifications

Equipment Code	NII
Model(s) Tested	UAP-AC-M
EUT supports Radio application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80
Frequency Range	2402 MHz – 2483.5 MHz
Modulations	802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11a/c: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

Antenna List

No.	Manufacturer	Model	Antenna Type	Peak Gain
1	Ubiquiti	UMA-D	Dual Band directional Array	9 dBi

15.203: Antenna Requirement:

- _____ The antenna is permanently attached to the EUT
- _____ The antenna uses a unique coupling
- X** _____ The EUT must be professionally installed
- _____ The antenna requirement does not apply

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	POE Power Adapter	Ubiquiti	N/A	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
2	Ethernet Cables	<3	N	N	N

Modifications: None

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Peak Output Power	Pass	
15.247(b)	Conducted Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Emissions At Band Edges	Pass	
15.247(e)	Transmitter Power Spectral Density	Pass	

References	Description
CFR47, Part 15, Subpart B	Unintentional Radiators
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63.10-2009	American National standard for testing Unlicensed Wireless Devices
ANSI C63.4-2009	Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz.
ISO/IEC 17025:2005	General requirements for the Competence of Testing and Calibrations Laboratories
KDB 558074 D01 v04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247

Conducted Output Power

Engineer: Poona Saber

Test Date: 8/14/2017

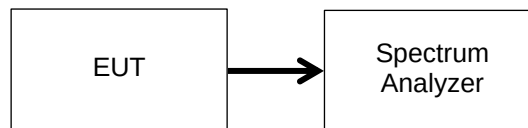
Test Procedure

The EUT was connected directly to a spectrum analyzer. The Spectrum Analyzer was set to the following:

RBW = 1-5% of the OBW, not to exceed 1MHz
 VBW $\geq 3 \times$ RBW
 RMS Detector
 Number of points in sweep $\geq 2 \times$ span / RBW
 Trace average at least 100 traces in power averaging mode
 Sweep = auto
 Span = $1.5 \times$ EBW

The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. The RF output power was measured using the spectrum analyzer's channel power function

Test Setup



Transmitter Output Power

Power									
Mode	Data Rate	Frequency	Port 1	Port 2	Port 1	Port 2	Combined spectral density	Limit	Margin
MHz		MHz	dBm	dBm	mW	mW	dBm	dBm	dB
11b	1Mbps	2412	16.6	16.3	45.8	42.3	19.4	27	-7.6
11b	1Mbps	2437	20.3	20.6	108.1	115.9	23.5	27	-3.5
11b	1Mbps	2462	17.7	17.3	58.9	54.2	20.5	27	-6.5
11g	6Mbps	2412	22.2	22.0	165.6	160.0	25.1	27	-1.9
11g	6Mbps	2437	23.2	23.2	209.9	206.5	26.2	27	-0.8
11g	6Mbps	2462	23.3	23.2	213.8	207.5	26.2	27	-0.8
HT20	MCS0	2412	23.1	23.0	205.1	199.5	26.1	27	-0.9
HT20	MCS0	2437	23.2	23.3	207.5	211.3	26.2	27	-0.8
HT20	MCS0	2462	23.2	23.3	209.9	214.8	26.3	27	-0.7
HT40	MCS0	2412	21.3	21.5	135.8	141.9	24.4	27	-2.6
HT40	MCS0	2437	23.1	23.3	204.2	213.3	26.2	27	-0.8
HT40	MCS0	2462	21.3	21.9	134.0	155.6	24.6	27	-2.4

Test Spot Check Result

Ubiquiti Test Spot for U-NII-1

Band Width	Frequency	Data Rate	TP	J1 Level	J5 Level	J1 Level	J5 Level	Combined output power	Limit	Margin
MHz	MHz			dBm	dBm	mW	mW	dBm	dBm	dB
b										
20	2412	t0	10	17.2	17.1	52.8445	51.5229	20.2	30	-9.8
20	2437	t0	12	21.0	21.3	126.4736	136.1445	24.2	30	-5.8
20	2462	t0	11	18.3	18.1	67.7642	64.1210	21.2	30	-8.8
n vht20										
20	2412	vt0	12	24.0	23.8	250.0345	241.5461	26.9	30	-3.1
20	2437	vt0	12	23.1	24.2	206.0630	261.2161	26.7	30	-3.3
20	2462	vt0	12	24.1	24.1	254.0973	257.6321	27.1	30	-2.9

Transmitter Power Spectral Density (PSD)

Engineer: Poona Saber

Test Date: 8/14/2017

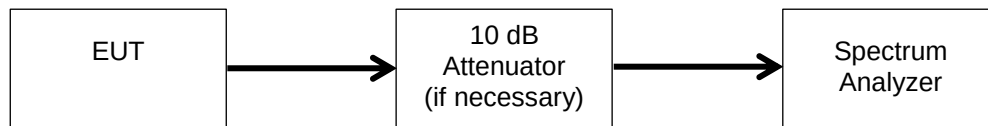
Test Procedure

The EUT was connected directly to a spectrum analyzer. The Spectrum Analyzer was set to the following:

DTS channel center frequency
 Span 1.5 x DTS bandwidth
 RBW = 3 kHz ≤ RBW ≤ 100 kHz
 VBW ≥ 3 x RBW
 Peak Detector
 Sweep time = auto couple
 Trace mode = max hold

The EUT was set to transmit at the lowest, middle and highest channels of the band at the maximum power levels. Once the trace has stabilize the peak marker was used to determine the peak power spectral density.

Test Setup



PSD Summary

Power Spectral Density									
Mode		Frequency	Port 1	Port 2	Port 1	Port 2	Combined spectral density	Limit	Margin
MHz		MHz	dBm	dBm	Mw	mW	dBm	dBm	dB
11b	1Mbps	2412	-7.2	-9.4	0.2	0.1	-5.1	5	-10.1
11b	1Mbps	2437	-5.7	-4.8	0.3	0.3	-2.2	5	-7.2
11b	1Mbps	2462	-7.0	-8.1	0.2	0.2	-4.5	5	-9.5
11g	6Mbps	2412	-13.5	-11.8	0.0	0.1	-9.6	5	-14.6
11g	6Mbps	2437	-10.7	-9.8	0.1	0.1	-7.2	5	-12.2
11g	6Mbps	2462	-9.0	-9.4	0.1	0.1	-6.2	5	-11.2
HT20	MCS0	2412	-9.9	-9.7	0.1	0.1	-6.8	5	-11.8
HT20	MCS0	2437	-8.7	-9.7	0.1	0.1	-6.2	5	-11.2
HT20	MCS0	2462	-8.8	-8.1	0.1	0.2	-5.4	5	-10.4
HT40	MCS0	2412	-13.9	-14.3	0.0	0.0	-11.1	5	-16.1
HT40	MCS0	2437	-11.4	-10.2	0.1	0.1	-7.7	5	-12.7
HT40	MCS0	2462	-14.4	-13.1	0.0	0.0	-10.7	5	-15.7

Test Spot Check Results

Band Width	Frequency	Data Rate	TP	J1 Level	J5 Level	J1 Level	J5 Level	Combined output power	Limit	Margin
MHz	MHz			dBm	dBm	mW	mW	dBm	dBm	dB
b										
20	2412	t0	10	-6.0	-7.2	0.2523	0.1928	-3.5	15.99	-19.5
20	2437	t0	12	-4.6	-3.7	0.3499	0.4295	-1.1	15.99	-17.1
20	2462	t0	11	-5.8	-6.9	0.2642	0.2051	-3.3	15.99	-19.3
n vht20										
20	2412	vt0	12	-8.7	-8.5	0.1365	0.1429	-5.5	15.99	-21.5
20	2437	vt0	12	-7.3	-8.0	0.1854	0.1592	-4.6	15.99	-20.6
20	2462	vt0	12	-7.5	-7.3	0.1799	0.1854	-4.4	15.99	-20.4

Unwanted Band Edge Emissions Measurements

Engineer: Poona Saber

Test Date: 10/13/2017

Unwanted emissions at the Band edges that fall within FCC part 15.205 are tested for spot check to make sure they comply with the general field strength limits of 15.209 at 3 meters distance

Procedure for peak band edge measurement for above 1000 MHz is as following:

RBW= 1 MHz

VBW= 3 Mhz

Detector= Peak

Sweep time= auto

Trace mode= Max hold

Procedure for Average band edge measurement for above 1000 MHz is as following:

RBW= 1 MHz

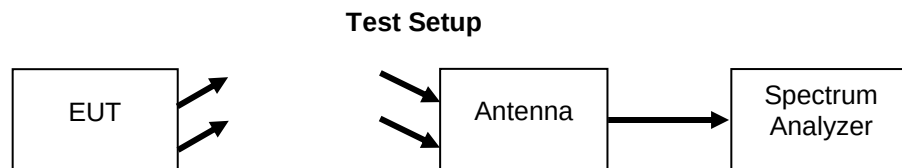
VBW= 30 Hz

Detector= Peak

Sweep time= auto

Trace mode= Max hold

EUT was placed on a turn table at 1.5 meter above the ground and 3 meters away from the receive antenna. The receive antenna was adjusted from 1-4 meter and turn table was positioned from 0 to 360 degrees to capture the highest emission coming from the EUT. The spot check data was captured for worst case transmission mode from the EUT and is included in Annex A.



Please refer to Annex A for test results

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4407B	i00331	09/18/15	09/18/16
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT