

Company: Model Tested: Report Number: DLS Project:

Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# **Code of Federal Regulations 47 Part 15 – Radio Frequency Devices**

Subpart E – Unlicensed National Information Infrastructure Devices Section 15.407 General Technical Requirements.

# Part 1 - 10 MHz Bandwidth Data

THE FOLLOWING MEETS THE ABOVE TEST SPECIFICATION (DFS not tested by DLS Electronic Systems Inc.)

Formal Name:	Air Fiber 5 - 5.4GHz Radio
Kind of Equipment:	Point-to-Point Digital Transmission Transceiver
Frequency Range:	5476 to 5719 MHz
Test Configuration:	Pole Mounted
Model Number(s):	AF5
Model(s) Tested:	AF5
Serial Number(s):	RF Conducted Unit: MAC address: 02:27:22:DA:5F:24 Radiated Unit: MAC address: 02:27:22:DA:5F:29
Date of Tests:	October 2013
Test Conducted For:	Ubiquiti Networks, Inc. 12F, No105, Song Ren Rd Taipei, Taiwan

"This test report relates only to the items tested and must not be used by the client to claim product NOTICE: endorsement by NVLAP or any agency of the U.S. Government". Please see the "Description of Test Sample" page listed inside of this report.

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# SIGNATURE PAGE

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Approved By:

Brian J. Math

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# **1.0 Summary of Test Report**

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It was determined that the Ubiquiti Networks Air Fiber 5 - 5.4GHz Radio, Model: AF5, complies with the requirements of CFR 47 Part 15 Subpart E Section 15.407.

# Subpart E Section 15.407 Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	<b>Compliant?</b>
Informative	Duty Cycle	FCC KDB 789033 D01	1	NA
		General UNII Test		
		Procedures $v01r03$		
Informativa	Emission Dondwidth 26 dD	FCC KDR 789033 D01	1	NIA
Informative	Emission Bandwidth – $20 \text{ dB}$	General UNII Test	1	NA
	bandwidth	Procedures v01r03		
		Section C		
Informative	99 Percent Occupied	FCC KDB 789033 D01	1	NA
linoiniaanvo	Bandwidth	General UNII Test	-	1 11 1
	Dundwiddii	Procedures v01r03		
		Section D		
15407(a)(2)	Maximum Conducted Output	FCC KDB 789033 D01	1	Yes
15.107(a)(2)	Power	General UNII Test	1	105
	1 Ower	Procedures v01r03		
		Section E(3)(a)		
15.407(b)(7)	Unwanted Emission Levels –	FCC KDB 789033 D01	2	Yes
& 15.205	Radiated Restricted Band-Edge	General UNII Test		
	(with antenna connected)	Procedures v01r03		
		Sections $H(1)$ , $H(2)$ , $H(3)$ ,		
15.407(-)(2)	De ele Derrore Creaturel Derroiter	$H(5), H(6) \ll H(6)(C)$	1	V
15.40/(a)(2)	Peak Power Spectral Density -	General UNII Test	1	Yes
	Conducted	Procedures v01r03		
		Section $E(2)(b)$ or (d)		
15 407(a)(6)	Peak Excursion - Conducted	FCC KDB 789033 D01	1	Yes
101107(0)(0)		General UNII Test	-	1.05
		Procedures v01r03		
		Section G		
15.407(b)(3)	Unwanted Emission Levels –	FCC KDB 789033 D01	2	Yes
&	Radiated Operating Band-Edge	General UNII Test		
15.407(b)(5)	(with antenna connected)	Procedures v01r03		
	,	Sections H, $H(2)$ , $H(3)$ , H(2)(d)(ii) & $H(5)$		
15.407(h)(2)	Unwanted Emission Levels	FCC KDB 780022 D01	2	Vag
13.407(0)(3)	D li 4 l 41	General UNII Test	2	res
& 15.4074240	Radiated with integral antenna	Procedures v01r03		
15.407(b)(6)		Sections $H(1)$ , $H(2)$ , $H(3)$ .		
		H(4), H(5), H(6) & H(6)(c)		



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# Subpart E Section 15.407 Applicable Technical Requirements: continued

15.407(b)(6) & 15.207(a)	AC Line Conducted Emissions	ANSI C63.10:2009	3	Yes
15.407(h)(2)	Dynamic Frequency Selection (DFS)	Not tested by DLS		NA

Note 1: RF Conducted emission measurement.

Note 2: Radiated emission measurement.

Note 3: AC Line Conducted measurement.

# 2.0 Introduction

In October of 2013 the Air Fiber 5 - 5.4GHz Radio, Model: AF5, as provided from Ubiquiti Networks, was tested to the requirements of CFR 47 Part 15 Subpart E Section 15.407. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S Electronic Systems, Inc.

# 3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at <u>http://www.dlsemc.com/certificate</u>. Our facilities are registered with the FCC, Industry Canada, and VCCI.

# Wisconsin Test Facility:

D.L.S. Electronic Systems, Inc. 166 S. Carter Street Genoa City, Wisconsin 53128

#### Wheeling Test Facility:

D.L.S. Electronic Systems, Inc. 1250 Peterson Drive Wheeling, IL 60090

# 4.0 Description of Test Sample

# **Description:**

The Ubiquiti Networks model AirFiber 5 is a 5.4Ghz and 5.8GHz Point-to-Point radio that uses OFDM with a 50MHz/40MHz/20MHz/10MHz bandwidth configuration. The EUT would be used outdoors and pole mounted. It is powered from a POE adapter. The integral antenna has a 23 dBi gain. This is an uncorrelated MIMO software defined radio.

# **Type of Equipment / Frequency Range:**

Stand-Alone / 5476 to 5719 MHz (10 MHz bandwidth) (in this report) 5481 to 5714 MHz (20 MHz bandwidth) 5492 to 5703 MHz (40 MHz bandwidth) 5497 to 5698 MHz (50 MHz bandwidth)

> (The 5.8 radio data is in a separate report.) Page **6** of **187**



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# **Physical Dimensions of Equipment Under Test:**

Length: 93.8 cm. Width: 46.8 cm. Height: 28.1 cm.

# **Power Source:**

50 VDC (Power Over Ethernet to Radio) 120 Vac, 60 Hz using Ubiquiti Networks power supply model: GP-C500-120G or Ubiquiti Networks power supply model: PSA60M-500(G)-R (for AC Line Conducted testing)

# **Internal Frequencies:**

150 kHz (Switching Power Supply Frequency)5.719 GHz (Highest Operating Frequency for the 5.4GHz radio)

# **Transmit / Receive Frequencies Used For Test Purpose:**

10 MHz Channel Bandwidth:	Low channel: 5476 MHz, Middle channel: 5575 MHz, High channel: 5719 MHz
20 MHz Channel Bandwidth:	Low channel: 5481 MHz, Middle channel: 5575 MHz, High channel: 5714 MHz
40 MHz Channel Bandwidth:	Low channel: 5492 MHz, Middle channel: 5575 MHz, High channel: 5703 MHz
50 MHz Channel Bandwidth:	Low channel: 5497 MHz, Middle channel: 5575 MHz, High channel: 5698 MHz

# **Type of Modulation(s):**

OFDM: 1024QAM, 256QAM, 64QAM, 16QAM, QPSK

# **Description of Circuit Board(s) / Part Number:**

Radio PC Board	11-02042-05 Rev 7



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166 South Carter, Genoa City, WI 53128

# 5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7-23-13	7-23-14
LISN	Solar	9252-50-R- 24-BNC	961019	9 kHz – 30 MHz	5-24-13	5-24-14
Filter- High- Pass	SOLAR	7930-120	090702	120 kHz – 30 MHz	1-7-13	1-7-14
Limiter	Electro-Metrics	EM-7600	706	9 kHz – 30 MHz	1-7-13	1-7-14
Preamp	Miteq	AMF-7D- 01001800-22- 10P	1809602	1GHz-18GHz	5-29-13	5-29-14
Horn Antenna	EMCO	3115	9502-4451	1-18GHz	3-18-13	3-18-15
High Pass Filter	Planar	HP8G-7G8- CD-SFF	PF1226/0728	7.5-18 GHz	8-14-13	8-14-14
Preamp	Miteq	AMF-8B- 180265-40- 10P-H/S	438727	18GHz-26GHz	8-12-13	8-12-14
Horn Antenna	EMCO	3116	2549	18 – 40GHz	9-6-12	9-6-14
High Pass Filter	Planar	CL22500- 9000-CD-SS	PF1229/0728	15-40 GHz	8-14-13	8-14-14
20 dB attenuator	Aeroflex/weinschel	75A-20-12	1071	DC – 40 GHz	8-14-13	8-14-14
20 dB attenuator	MCE/Weinschel	5955A-20	0256	DC – 40 GHz	8-12-13	8-12-14
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	1-3-13	1-3-14
Preamplifier	Rohde & Schwarz	TS-PR10	032001/005	9 kHz – 1 GHz	1-10-13	1-10-14
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	8-22-12	8-22-14
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	9-6-12	9-6-14
Power Meter	Anritsu	ML2487A	6K00002069	N/A	3-8-13	3-8-14
Thermal Power Sensor	Anritsu	MA24002A	1204359	10MHz-18GHz	3-3-13	3-3-14
Spectrum Analyzer	Agilent Technologies	N9030A	MY52350705	3Hz - 26.5GHz	2-13-13	2-13-14

# **D.L.S.** Wisconsin



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## 6.0 Test Arrangements

## **RF Conducted Emissions Measurement Arrangement:**

All RF conducted emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC Publication KDB 789033 D01 General UNII test Procedures v01r03 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for photos of the test set up.

## **Radiated Emissions Measurement Arrangement:**

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for photos of the test set up.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

# 7.0 Test Conditions

# Normal Test Conditions:

#### **Temperature and Humidity:**

70° F at 46 % RH (or noted on the test data)

#### **Supply Voltage:**

50 VDC (Power Over Ethernet to Radio) 120 Vac, 60 Hz using Ubiquiti Networks power supply model: GP-C500-120G or Ubiquiti Networks power supply model: PSA60M-500(G)-R (for AC Line Conducted testing)



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# 8.0 Modifications Made To EUT For Compliance

No modifications were made to the EUT at the time of test.

# 9.0 Additional Descriptions

Testing was performed at low, mid, and high channels over 4 modulation bandwidths (10MHz, 20MHz, 40MHz & 50MHz). All 5 OFDM modulations types have been tested (1024QAM, 256QAM, 64QAM, 16QAM, & QPSK). The antenna ports were tested (Channel 0 & 1). AC line conducted tested in transmit mode.

# 10.0 Results

Measurements were performed in accordance with FCC Publication KDB 789033 D01 General UNII test Procedures v01r03 and ANSI C63.10-2009. Graphical and tabular data can be found in Appendix B at the end of this report.

# 11.0 Conclusion

Dynamic Frequency Selection (DFS) testing was not performed by DLS Electronic Systems, Inc. Otherwise, the Air Fiber 5 - 5.4GHz Radio, Model: AF5, as provided from Ubiquiti Networks tested in October 2013 **meets** the requirements of CFR 47 Part 15 Subpart E Section 15.407.



# Appendix A – Test Photos

# **Photo Information and Test Setup:**

Item0:	Air Fiber 5 - 5.4GHz Radio, Model: AF5
Item1:	Shielded Power Over Ethernet Cable, 15 meters long

# Radiated - Below 1 GHz - front

Company:

Model Tested:

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**Appendix A – Test Photos** 

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# **Radiated - Below 1 GHz - Back**





Appendix A – Test Photos

# Company: Model Tested: Report Number: DLS Project:

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# Radiated - above 1 GHz





# Appendix A – Test Photos

# **<u>RF Conducted / Output Power</u>**

Company:

Model Tested:

Report Number: DLS Project: Ubiquiti Networks, Inc.

AF5

6154

19519 Part 1





Appendix A – Test Photos

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# **<u>RF</u>** Conducted / In Band Emissions





Appendix A – Test Photos

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154



# AC Line Conducted with Ubiquiti Power Supply GP-C500-120G



Appendix A – Test Photos

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154



# AC Line Conducted with Ubiquiti Power Supply PSA60M-500(G)-R



Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

#### Appendix B – Measurement Data

- **B1.0** Duty Cycle of Test Unit
  - **Rule Part:** FCC Section 15.35(c)

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance* for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E Section B(2)(b) – Duty cycle (x)

Center frequency = center of emission
RBW ≥ OBW (otherwise, RBW = largest possible)
VBW ≥ RBW
Detector = Peak or Average
Span = Zero Span
Verify both RBW and VBW are > 50/minimum transmission duration (T)
Verify the number of sweep points across T exceeds 100

Limits: Info	rmative. Use corre	ction factor if dut	ty cycle is less that	100% (x < 1).
--------------	--------------------	---------------------	-----------------------	---------------

<b>Results:</b>	10 MHz BW mode:	Requires a correction factor of 0.13 dB
	20 MHz BW mode:	Requires a correction factor of 0.13 dB
	40 MHz BW mode:	Requires a correction factor of 0.07 dB
	50 MHz BW mode:	Requires a correction factor of 0.07 dB

- Sample Equations: Total Cycle time = 2.004008 ms Total on Time = 1.943887 ms Duty cycle factor x = 1.943887 / 2.004008 = 0.970Correction for duty cycle = $10 \log (1/x) = 0.13$  dB
- **Notes:** Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date:10-17-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Duty Cycle during testingOperator:Lillian LTest Procedure used:KDB 789033 D01 v01r03 – B)2)b) zero-span method

 $\begin{array}{ll} RBW = 10 \ \text{MHz} & VBW = 10 \ \text{MHz} \\ \text{Span} = 0 \ \text{Hz} & \text{SWT} = 5 \ \text{ms} \\ \text{Mid Channel: Transmit} = 5.575 \ \text{GHz} & 10 \ \text{MHz} \ \text{BW} & 16 \ \text{QAM} \\ \text{Total Cycle time} = 4.398798 \ \text{-}2.394790 = 2.004008 \\ \text{Total on Time} = 4.338677 \ \text{-}2.394790 = 1.943887 \ \text{ms} \end{array}$ 

**Duty cycle factor x** = 1.943887 / 2.004008 = 0.970Adjustment for duty cycle = $10\log 1/x = 0.13$ 





Test Date:10-17-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Duty Cycle during testingOperator:Lillian LTest Procedure used:KDB 789033 D01 v01r03 - B)2)b) zero-span method

 $\begin{array}{ll} RBW = 10 \ \text{MHz} & VBW = 10 \ \text{MHz} \\ \text{Span} = 0 \ \text{Hz} & \text{SWT} = 5 \ \text{ms} \\ \text{Mid Channel: Transmit} = 5.575 \ \text{GHz} & 10 \ \text{MHz} \ \text{BW} & 64 \ \text{QAM} \\ \text{Total Cycle time} = 3.907816 \ \text{-} 1.903808 = 2.004008 \\ \text{Total on Time} = 3.847695 \ \text{-} 1.903808 = 1.943887 \ \text{ms} \end{array}$ 

**Duty cycle factor x** = 1.943887 / 2.004008 = 0.970Adjustment for duty cycle = $10\log 1/x = 0.13$ 





Test Date:10-17-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Duty Cycle during testingOperator:Lillian LTest Procedure used:KDB 789033 D01 v01r03 - B)2)b) zero-span method

 $\begin{array}{ll} RBW = 10 \ MHz & VBW = 10 \ MHz \\ Span = 0 \ Hz & SWT = 5 \ ms \\ Mid \ Channel: \ Transmit = 5.575 \ GHz & 10 \ MHz \ BW & 256 \ QAM \\ Total \ Cycle \ time = 4.809619 \ -2.805611 = 2.004008 \\ Total \ on \ Time = 4.749499 \ -2.805611 = 1.943888 \ ms \end{array}$ 

**Duty cycle factor x** = 1.943888 / 2.004008 = 0.970Adjustment for duty cycle = $10\log 1/x = 0.13$ 





Test Date:10-17-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Duty Cycle during testingOperator:Lillian LTest Procedure used:KDB 789033 D01 v01r03 – B)2)b) zero-span method

 $\begin{array}{ll} RBW = 10 \ \text{MHz} & VBW = 10 \ \text{MHz} \\ \text{Span} = 0 \ \text{Hz} & \text{SWT} = 5 \ \text{ms} \\ \text{Mid Channel: Transmit} = 5.575 \ \text{GHz} & 10 \ \text{MHz} \ \text{BW} & 1024 \ \text{QAM} \\ \text{Total Cycle time} = 3.607214 \text{-} 1.603206 = 2.004008 \\ \text{Total on Time} = 3.547094 \text{-} 1.603206 = 1.943888 \ \text{ms} \end{array}$ 

**Duty cycle factor x** = 1.943888 / 2.004008 = 0.970Adjustment for duty cycle = $10\log 1/x = 0.13$ 





Test Date:10-17-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Duty Cycle during testingOperator:Lillian LTest Procedure used:KDB 789033 D01 v01r03 - B)2)b) zero-span method

 $\begin{array}{ll} RBW = 10 \ \text{MHz} & VBW = 10 \ \text{MHz} \\ \text{Span} = 0 \ \text{Hz} & \text{SWT} = 5 \ \text{ms} \\ \text{Mid Channel: Transmit} = 5.575 \ \text{GHz} & 10 \ \text{MHz} \ \text{BW} & \text{QPSK} \\ \text{Total Cycle time} = 3.436874 \\ \text{Total on Time} = 3.376754 \\ \text{-}1.432866 = 1.943887 \ \text{ms} \\ \end{array}$ 

**Duty cycle factor x** = 1.943887 / 2.004008 = 0.970Adjustment for duty cycle = $10\log 1/x = 0.13$ 







## Appendix B – Measurement Data

## **B2.0** Emission Bandwidth – 26 dB bandwidth – conducted

- **Rule Section**: Informative
- **Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E* 
  - Section C Emission bandwidth
- Description: RBW = approximately 1% of EBW VBW > RBW Detector = Peak Trace mode = max hold
  - Measure the maximum width of the emission between the lower and upper frequencies that measure 26 dB below the maximum level of the in-band emission.
- Limit: Informative
- Notes: Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.
  - Output power was set to 30 dBm eirp using special test software.

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

#### **26 dB Emission Bandwidth = 10.70MHz**



TX 1:



#### 26 dB Emission Bandwidth = 10.66MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)High Channel:Transmit = 5.719 GHz10MHz BW64QAMOutput power setting: 30 dBm eirp

TX 0:

#### **26 dB Emission Bandwidth = 10.58MHz**



TX 1:



#### 26 dB Emission Bandwidth = 10.62MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

#### **26 dB Emission Bandwidth = 10.42MHz**





#### **26 dB Emission Bandwidth = 10.50MHz**

TX 1:

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

#### 26 dB Emission Bandwidth = 10.62MHz



TX 1:



#### 26 dB Emission Bandwidth = 10.66MHz

Test Date:	10-4&7-2013		
Company:	Ubiquiti Networks		
EUT:	Air Fiber 5 - 5.4GHz WiFi Ra	adio	
Test:	Emission Bandwidth (26 dB)	- Conducted	
Operator:	Lillian Li		
Test Procedure	e used: KDB 789033 D01 v01	(r03 - C)	
High Channel:	Transmit = 5.719 GHz	10MHz BW	QPSK
Output power	setting: 30 dBm eirp		

TX 0:

## 26 dB Emission Bandwidth = 10.74MHz



TX 1:



#### 26 dB Emission Bandwidth = 10.58MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

#### **26 dB Emission Bandwidth = 10.54MHz**



TX 1:



#### **26 dB Emission Bandwidth = 10.58MHz**
Test Date:	10-18-2013		
Company:	Ubiquiti Networks		
EUT:	Air Fiber 5 - 5.4GHz WiFi Radio		
Test:	Emission Bandwidth (26 dB) - Conducted		
Operator:	Lillian Li		
Comment:	FCC Test Guidelines for UNII Devices under 15.407 – OET 4/8/2013		
	- C) Emission bandwidth( Page 3)		
	RBW = 200  kHz	VBW = 500 k	Hz
	Mid Channel: Transmit = 5.575 GHz	10MHz BW	64QAM
	Output power setting: 30 dBm eirp		

# Channel 0:





Channel 1:



## 26 dB Emission Bandwidth = 10.58MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

## **26 dB Emission Bandwidth = 10.46MHz**





# **26 dB Emission Bandwidth = 10.66MHz**

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

# 26 dB Emission Bandwidth = 10.54MHz





## 26 dB Emission Bandwidth = 10.58MHz

Test Date:	10-4&7-2013		
Company:	Ubiquiti Networks		
EUT:	Air Fiber 5 - 5.4GHz WiF	'i Radio	
Test:	Emission Bandwidth (26	dB) - Conducted	
Operator:	Lillian Li		
Test Procedu	re used: KDB 789033 D01	v01r03 – C)	
Mid Channel	: Transmit = 5.575 GHz	10MHz BW	QPSK
Output powe	r setting: 30 dBm eirp		-

TX 0:

# 26 dB Emission Bandwidth = 10.70MHz





## 26 dB Emission Bandwidth = 10.62MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

## **26 dB Emission Bandwidth = 10.74MHz**





# 26 dB Emission Bandwidth = 10.58MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Low Channel:Transmit = 5.476 GHz10MHz BW64QAMOutput power setting: 30 dBm eirp

TX 0:

## 26 dB Emission Bandwidth = 10.62MHz





## 26 dB Emission Bandwidth = 10.50MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

## **26 dB Emission Bandwidth = 10.66MHz**





# 26 dB Emission Bandwidth = 10.58MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Emission Bandwidth (26 dB) - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - C)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

## **26 dB Emission Bandwidth = 10.66MHz**





## 26 dB Emission Bandwidth = 10.50MHz

Test Date:	10-04-2013		
Company:	Ubiquiti Networks		
EUT:	Air Fiber 5 - 5.4GHz WiFi Ra	adio	
Test:	Emission Bandwidth (26 dB)	- Conducted	
Operator:	Lillian Li		
Test Procedure used: KDB 789033 D01 v01r03 – C)			
Low Channel:	Transmit = $5.476 \text{ GHz}$	10MHz BW	QPSK
Output power setting: 30 dBm eirp			

TX 0:

# 26 dB Emission Bandwidth = 10.70MHz





## **26 dB Emission Bandwidth = 10.66MHz**



Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# **Appendix B – Measurement Data**

- **B3.0** 99 Percent Occupied Bandwidth
- **Rule Section**: Informative

**Test Procedure**: FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E* 

Section D – 99 Percent Occupied Bandwidth

**Description**: SPAN = 1.5 to 5 times the OBW RBW = 1% to 5% of OBW VBW  $\geq$  RBW Detector = Peak Trace mode = max hold

Measure the width of the emission using the 99% power bandwidth function of the spectrum analyzer

Limit:	Informative.
	The emission designators are:
	10 MHz BW: 10M0x1D
	20 MHz BW: 20M0x1D
	40 MHz BW: 40M0x1D
	50 MHz BW: 50M0x1D

Notes: Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

Output power was set to 30 dBm eirp using special test software.

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

### 99% OBW = 9.66MHz







Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)High Channel:Transmit = 5.719 GHz10MHz BW64QAMOutput power setting:30 dBm eirp

TX 0:

### 99% OBW = 9.66MHz



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

### 99% OBW = 9.66MHz





#### 99% OBW = 9.66MHz

Test Date:10-07-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)High Channel:Transmit = 5.719 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:



TX 1:



Test Date:	10-07-2013		
Company:	Ubiquiti Networks		
EUT:	Air Fiber 5 - 5.4GHz WiFi Ra	adio	
Test:	99% Occupied Bandwidth - C	Conducted	
Operator:	Lillian Li		
Test Procedure used: KDB 789033 D01 v01r03 – D)			
High Channel:	Transmit = $5.719 \text{ GHz}$	10MHz BW	QPSK
Output power	setting: 30 dBm eirp		

TX 0:



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:





Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Mid Channel:Transmit = 5.575 GHz10MHz BW64QAMOutput power setting: 30 dBm eirp

TX 0:



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

### 99% OBW = 9.66MHz





#### 99% OBW = 9.66MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Mid Channel:Transmit = 5.575 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:


TX 1:



Test Date:10-07-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Mid Channel:Transmit = 5.575 GHz10MHz BWQPSKOutput power setting:30 dBm eirp

TX 0:



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Low Channel:Transmit = 5.476 GHz10MHz BW64QAMOutput power setting: 30 dBm eirp

TX 0:



TX 1:



Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:

## 99% OBW = 9.66MHz



TX 1:



#### 99% OBW = 9.66MHz

Test Date:10-18-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:



TX 1:



#### 99% OBW = 9.66MHz

Test Date:10-07-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:99% Occupied Bandwidth - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - D)Low Channel:Transmit = 5.476 GHz10MHz BWOutput power setting:30 dBm eirp

TX 0:



TX 1:





166 South Carter, Genoa City, WI 53128

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# Appendix B – Measurement Data

B4.0 Maximum Conducted Output Power			
Rule Section:	Section 15.407(a)(2)		
Test Procedure:	FCC KDB 789033 D01 General UNII Test Procedures v01r03 – Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E		
	Section E(3)(a) Method PM (Measurement using an RF average power meter): Measurements performed using a wideband RF power meter with a thermocouple detector		
Description:	Measure the average power of each RF output port of the transmitter Sum the powers of each port in linear power units Convert linear power units to dBm Add 10 log ( $1/x$ ), where x is the duty cycle, to the measured power		
Limit:	<ul> <li>Lesser of: 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.</li> <li>Limit shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi</li> </ul>		
Results:	Passed		
Notes:	Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.		
	Output power was set to 30 dBm eirp using special test software.		

Test Date:	10-22-2013
Company:	Ubiquiti Networks
EUT:	Air Fiber 5 - 5.4GHz WiFi Radio
Test:	Maximum conducted output power – Conducted
Operator:	Lillian L
Test Procedure used:	KDB 789033 D01 v01r03 – E)3)a) Method PM
Limit: [15.407(a)(2)]: le	esser of 250mW or 11dBm+10log B (B=26dB EBW)
Operating Mode: Point-	to-Point; Antenna Gain = 23 dBi
EUT Conducted Limit:	= Limit - (23 dBi - 6 dB)

10MHz Operating Bandwidth:

FCC Maximum Conducted						
Output Power		10MHz (Adjustment for duty cycle =10log1/x = 0.13)				
	dBm	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit $\leq$ 250mW	EUT FCC limit:	4.24	4.23	4.21	4.18	4.21
	TX0 (mW)	1.22	1.2	1.19	1.18	1.18
	TX1 (mW)	1.2	1.21	1.2	1.22	1.19
	total(mW)	2.42	2.41	2.39	2.40	2.37
	Total(dBm)	3.97	3.95	3.91	3.93	3.88
HCH = 5719 MHz	Margin	0.28	0.28	0.30	0.25	0.33
	ТХО	1.22	1.22	1.18	1.26	1.22
	TX1	1.19	1.19	1.19	1.18	1.21
	total(mW)	2.41	2.41	2.37	2.44	2.43
	Total(dBm)	3.95	3.95	3.88	4.00	3.99
MCH = 5575 MHz	Margin	0.29	0.28	0.33	0.17	0.23
	ТХО	1.22	1.12	1.19	1.2	1.2
	TX1	1.32	1.27	1.27	1.29	1.3
	total(mW)	2.54	2.39	2.46	2.49	2.50
	Total(dBm)	4.18	3.91	4.04	4.09	4.11
LCH = 5476 MHz	Margin	0.07	0.31	0.17	0.09	0.10



Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# Appendix B – Measurement Data

# **B5.0** Unwanted Emission Levels – Radiated Restricted Band-Edge Radiated with antenna connected

**Rule Part:** FCC Part 15.407(b)(7) and FCC Part 15.205

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – *Guidance* for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E

Section H(1) – Unwanted emissions in the restricted bands Section H(3) – General Requirements for Unwanted Emissions Measurements Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz Section H(6) – Procedure for Average Unwanted Emissions Measurements Above 1 GHz Section H(6)(c) – Average Detection method

Limit: FCC Part 15.209

# **Results:** Compliant

**Notes:** Because the lower operating band-edge is near a restricted band, compliance with this restricted band was determined by measuring the field strength of the lower channel emission at the restricted band edge.

Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024QAM modulations at the lowest channel of operation. The EUT was set to transmit continuously.

Both transmit chains active. Output power was set to 30 dBm eirp using special test software.

Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 1024QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





10-03-2013
Ubiquiti Networks
AF5
Lower Restricted Band-Edge Compliance - Radiated - Peak
(FCC 15.407(b)(7))
Craig B
10 MHz channel Bandwidth
Low Channel: Frequency – 5475 MHz
Modulation: 1024QAM
Horizontal
Restricted Band-Edge Frequency: 5460 MHz (F2)
Band-Edge Limit: 74 dB $\mu$ V/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 1024QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 1024QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 16QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 16QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: $74 \text{ dB}\mu\text{V/m}$ PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 16QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 16QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 256QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 256QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 256QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 256QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 64QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 64QAM
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dB $\mu$ V/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated - AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 64QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: 64QAM
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: QPSK
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: QPSK
	Horizontal
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: $74 \text{ dB}\mu\text{V/m}$ PEAK at a test distance of 3 meters.



Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – AVG
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: QPSK
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 54 dB $\mu$ V/m AVERAGE at a test distance of 3 meters.





Test Date:	10-03-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Restricted Band-Edge Compliance - Radiated – Peak
	(FCC 15.407(b)(7))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5475 MHz
	Modulation: QPSK
	Vertical
	Restricted Band-Edge Frequency: 5460 MHz (F2)
	Band-Edge Limit: 74 dBµV/m PEAK at a test distance of 3 meters.






166 South Carter, Genoa City, WI 53128

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# Appendix B – Measurement Data

# **B6.0** Peak Power Spectral Density – Conducted

Rule Section:	Section 15.407(a)(2)
Test Procedure:	FCC KDB 789033 D01 General UNII Test Procedures v01r03 – Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
	Section F – Peak power spectral density (PPSD) Using method E(2)(d) SA-2 for power spectrum (10 and 20 MHz BW's) Using method E(2)(b) SA-1 for power spectrum (40 and 50 MHz BW's)
<b>Description</b> :	SPAN: set to encompass entire emission bandwidth RBW = 1 MHz VBW $\ge$ 3 MHz Number of points $\ge$ 2 x Span/RBW Sweep time: auto Detector = RMS Sweep: trace average 200 sweeps in RMS mode Use peak search to find the peak of the spectrum Add 10 log (1/x) where x is the duty cycle when duty cycle is < 98%
Limit:	11 dBm in any 1 MHz band Limit shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi
Results:	Passed
Notes:	Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.
	Output power was set to 30 dBm eirp using special test software.

Test Date:	10-22-2013	
Company:	Ubiquiti Networks	
EUT:	Air Fiber 5 - 5.4GHz WiFi Radio	
Test:	Peak Power Spectral Density - Conducted	
Operator:	Lillian Li	
Test Procedure	used: KDB 789033 D01 v01r03 – F)	
Limit: [15.407(a	a)(4)( *c+(5); RSS-210 A9.2*5+]: < 11dBm/MHz	
Operating Mode: Point-to-Point; Antenna Gain = 23 dBi		
EUT Limit: < 1	11-(23-6) = -6 dBm/MHz	

10MHz Operating Bandwidth( Method SA-2):

Pesk Power Spectral						
Density (PPSD)		10M (Adjustment for duty cycle =10log1/x = 0.13)				
	dBm	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit=11dBm/MHz	EUT FCC Limit	-6	-6	-6	-6	-6
	TX0	-11.13	-10.91	-11.19	-11.2	-11.25
	TX1	-10.32	-10.24	-10.11	-10.17	-10.25
	total(mW)	0.1752	0.1811	0.1788	0.1772	0.1745
	Total(dBm)	-7.57	-7.42	-7.48	-7.51	-7.58
HCH = 5719 MHz	Margin	1.57	1.42	1.48	1.51	1.58
	TX0	-10.52	-10.69	-10.48	-10.6	-10.76
	TX1	-10.82	-10.54	-10.71	-10.99	-10.7
	total(mW)	0.1767	0.1789	0.1798	0.1718	0.1742
	Total(dBm)	-7.53	-7.47	-7.45	-7.65	-7.59
MCH = 5575 MHz	Margin	1.53	1.47	1.45	1.65	1.59
	TX0	-9.49	-9.3	-9.44	-9.39	-9.46
	TX1	-11.17	-10.6	-10.97	-10.63	-11.06
	total(mW)	0.1946	0.2108	0.1996	0.2077	0.1974
	Total(dBm)	-7.11	-6.76	-7.00	-6.83	-7.05
LCH = 5476 MHz	Margin	1.11	0.76	1.00	0.83	1.05





















22.OCT.2013 13:27:38



22.OCT.2013 13:31:48







Date: 22.0CT.2013 13:35:22





# Appendix B – Measurement Data

**B7.0** Peak Excursion – Conducted

Rule Section:	Section 15.407(a)(6)			
Test Procedure:	FCC KDB 789033 D01 General UNII Test Procedures v01r03 – Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E			
	Section G – Peak excursion measurement			
<b>Description</b> :	SPAN: set to encompass entire emission bandwidth RBW = 1 MHz VBW $\geq$ 3 MHz Detector = Peak Trace mod = max hold Use peak search to find the peak of the spectrum Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD			
Limit:	13 dB peak-to-average ratio across any 1 MHz bandwidth			
Results:	Passed			
Notes:	Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.			
	Output power was set to 30 dBm eirp using special test software.			

Test Date:10-22-2013Company:Ubiquiti NetworksEUT:Air Fiber 5 - 5.4GHz WiFi RadioTest:Peak Excursion Measurement - ConductedOperator:Lillian LiTest Procedure used:KDB 789033 D01 v01r03 - G)Limit:[15.407(a)(6)]: < 13dB/MHz</td>

Peak Excursion				10MHz		
	dB	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit = 13dB	FCC limit:	13	13	13	13	13
	РК	0.77	0.89	1.51	0.78	1
	AVG	-11.13	-10.91	-11.19	-11.2	-11.25
	Excursion	11.9	11.8	12.7	11.98	12.25
HCH = 5719 MHz	Margin	1.10	1.20	0.30	1.02	0.75
	РК	-0.15	-0.19	0.2	-0.25	-0.27
	AVG	-10.52	-10.69	-10.48	-10.6	-10.76
	Excursion	10.37	10.5	10.68	10.35	10.49
MCH = 5575 MHz	Margin	2.63	2.50	2.32	2.65	2.51
	РК	2.32	2.41	1.46	2.4	2.44
	AVG	-9.49	-9.3	-9.44	-9.39	-9.46
	Excursion	11.81	11.71	10.9	11.79	11.9
LCH = 5476 MHz	Margin	1.19	1.29	2.10	1.21	1.10

10MHz Operating Bandwidth:



## 10MHz BW, HCH, 16QAM, 26 dB EBW = 10.70MHz



## 10MHz BW, HCH, 64QAM, 26 dB EBW = 10.58MHz



#### 10MHz BW, HCH, 256QAM, 26 dB EBW = 10.42MHz



#### 10MHz BW, HCH, 1024QAM, 26 dB EBW = 10.62MHz





## 10MHz BW, HCH, QPSK, 26 dB EBW = 10.74MHz

Date: 22.0CT.2013 13:45:39



#### 10MHz BW, MCH, 16QAM, 26 dB EBW = 10.54MHz



#### 10MHz BW, MCH, 64QAM, 26 dB EBW = 10.58MHz

Date: 22.OCT.2013 13:54:24



### 10MHz BW, MCH, 256QAM, 26 dB EBW = 10.46MHz



# 10MHz BW, MCH, 1024QAM, 26 dB EBW = 10.54MHz



### 10MHz BW, MCH, QPSK, 26 dB EBW = 10.70MHz

Date: 22.0CT.2013 13:56:15



### 10MHz BW, LCH, 16QAM, 26 dB EBW = 10.74MHz

Date: 22.0CT.2013 13:58:50



#### 10MHz BW, LCH, 64QAM, 26 dB EBW = 10.62MHz

Date: 22.0CT.2013 14:06:11

#### Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 10 dB 16 dBm VBW -9.44 dBm 3 MHz -10 dBm 5.47861693 GHz SWT 5 ms Unit dBm 16 **v**1 [T1] -9.44 dBn A 10 5.47861693 GHz **v**<sub>2</sub> 2 Anna .40 dB [T2] m 4721 130 GH: J. 1 ٦ -10 INI IVIEW. 1 RM -20 2 M A -30 TDF -40-50 -60 -70 -80 -84 Center 5.476 GHz 1.066 MHz/ Span 10.66 MHz 42.0CT.2013 14:37:29 Max/Ref Lvl Marker 1 [T1] 16 dBm Date: RBW RF Att 1 MHz 10 dB -9.39 dBm VBW 3 MHz -10 dBm 5.47438711 GHz SWT dBm 5 ms Unit 10 ▼1 [T1] -9.39 dBm A 10 5.47438711 GHz 1 -10 IN1 **WIEW** 1 RM -20 -30 -40 TDF -50 -60 -70 -80 -84 Center 5.476 GHz 1.066 MHz/ Span 10.66 MHz

#### 10MHz BW, LCH, 256QAM, 26 dB EBW = 10.66MHz





### 10MHz BW, LCH, 1024QAM, 26 dB EBW = 10.66MHz



## 10MHz BW, LCH, QPSK, 26 dB EBW = 10.70MHz



166 South Carter, Genoa City, WI 53128

### Appendix B – Measurement Data

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

<b>B8.0</b> Unwanted Emi	ission Levels – Radiated Operating Band-Edge Radiated with antenna connected				
Rule Section:	Sections 15.407(b)(3) and 15.407(b)(5)				
Test Procedure:	FCC KDB 789033 D01 General UNII Test Procedures v01r03 – Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E				
	Section H – Unwanted emission levels Section H(2) – Unwanted emissions that fall outside of the restricted bands Section H(3) – General Requirements for Unwanted Emissions Measurements Section H(3)(d)(ii) – Band edge measurements, Integration method Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz				
<b>Description</b> :	Measure the band-edge emission level using the following settings				
	$ \begin{array}{ll} \mbox{Standard method:} & (only used for the 20MHz BW) \\ \mbox{RBW} = 1 \ \mbox{MHz} \\ \mbox{VBW} \geq 3 \ \mbox{MHz} \\ \mbox{Detector} = peak \\ \mbox{Sweep time} = auto \\ \mbox{Trace mode} = max \ \mbox{hold} \\ \end{array} $				
	Integration method (if band edge is within 2 MHz of the 99% occupied bandwidth edge: RBW = 100 kHz VBW $\ge$ 3 x RBW Use the band power integration function of the spectrum analyzer to integrate the power across the 1 MHz bandwidth at the operating band edge				
Limit:	-27 dBm/MHz				
Results:	Passed				
Notes:	Measurements were taken for QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulations at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.				
	Both transmit chains active. Output power was set to 30 dBm eirp using special test software. Test distance was 1 meter.				

Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: QPSK
	Horizontal
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 69.569 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -35.20 dBm/MHz


Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 16QAM
	Horizontal
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 69.025 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -35.74 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 64QAM
	Horizontal
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$-60.022 \text{ dPuV/m} \pm 20 \log(1 \text{ mater}) = 104.77$

=  $69.032 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$ = -35.73 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 256QAM
	Horizontal
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 70.639 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -34.13 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 1024QAM
	Horizontal
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 73.078 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -31.69 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: QPSK
	Vertical
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 67.622 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -37.14 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 16QAM
	Vertical
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 67.248 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -37.52 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 64QAM
	Vertical
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 67.814 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.95 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 256QAM
	Vertical
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 68.007 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.76 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Lower Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	Low Channel: Frequency – 5476 MHz
	Modulation: 1024QAM
	Vertical
	Operating Band-Edge Frequency: 5470 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 67.968 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.80 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: QPSK
	Horizontal
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 69.661 dD_{\rm H} V/m + 20 \log(1 \text{ mator}) = 104.77$

=  $68.661 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$ = -36.10 dBm/MHz

Agilent Spect	rum Analyzer - Sw	ept SA								
<mark>(X)</mark> Marker 1	RF 50 Ω		7	SEI	NSE:INT	Ανα Τνρε	ALIGN OFF	10:50:21 A TRAC	MOct 04, 2013	Trace/Detector
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10 dB/div	Ref Offset 36 Ref 123.49	.5 dB d <b>BµV</b>				Ban	Mkr d Powe	1 5.725 er 68.66	50 GHz 1 dBµV	1
113 - 113	hphalleneterholistration	<b>៱</b> ۦ₽ <b>·ϥ</b> ϻ≠ϟϒ <b>ϳ</b> ʹϧϧͻϚ <sub>ͷ</sub> ϼϧϧϥʹ	la long frighting							Clear Write
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MKR MODE T		× 5.725 50 G	#VDVV	9.900 dBµ	FUNCTI	DN FUNCT	ion wid 0 MHz	FUNCTION VA	LUE 1 dBµV	More 1 of 3

Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 16QAM
	Horizontal
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 68.641 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.12 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 64QAM
	Horizontal
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 68.687 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.08 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 256QAM
	Horizontal
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 68.148 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -36.62 dBm/MHz

Agilent Spectrum Analyze	r - Swept SA					
Marker 1 5 7255		SENS	BE:INT AV	ALIGN OFF	10:53:25 AM Oct 04, 2013 TRACE 1 2 3 4 5 6	Trace/Detector
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93.5						Trace Average
73.5 63.5			1			Max Hold
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33.5					Spop 10 00 MHz	View Blank Trace On
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10-04-2013
Ubiquiti Networks
AF5
Upper Operating Band-Edge Compliance - Radiated
(FCC 15.407(b)(3))
Craig B
10 MHz channel Bandwidth
High Channel: Frequency – 5719 MHz
Modulation: 1024QAM
Horizontal
Operating Band-Edge Frequency: 5725 MHz
Band-Edge Limit: -27 dBm/MHz
Test method: Integration
Offset on analyzer includes horn antenna and cable loss correction factors
-27 dBm/MHz
$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
$= 68.874 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -35.89 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: QPSK
	Vertical
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 66.577 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -38.19 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 16QAM
	Vertical
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 66.823 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$





Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 64QAM
	Vertical
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 66.608 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -38.16 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 256QAM
	Vertical
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 66.841 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -37.92 dBm/MHz



Test Date:	10-04-2013
Company:	Ubiquiti Networks
EUT:	AF5
Test:	Upper Operating Band-Edge Compliance - Radiated
	(FCC 15.407(b)(3))
Operator:	Craig B
Comment:	10 MHz channel Bandwidth
	High Channel: Frequency – 5719 MHz
	Modulation: 1024QAM
	Vertical
	Operating Band-Edge Frequency: 5725 MHz
	Band-Edge Limit: -27 dBm/MHz
	Test method: Integration
	Offset on analyzer includes horn antenna and cable loss correction factors
Limit:	-27 dBm/MHz
Measurement:	$EIRP[dBm] = E[dB\mu V/m] + 20 \log(d[meters]) - 104.77$
	$= 67.003 \text{ dB}\mu\text{V/m} + 20 \log(1 \text{ meter}) - 104.77$

= -37.76 dBm/MHz





166 South Carter, Genoa City, WI 53128

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

## Appendix B – Measurement Data

### **B9.0** Unwanted Emission Levels – Radiated with integral antenna

**Rule Section**: Sections 15.407(b)(3) and 15.407(b)(6)

**Test Procedure:** FCC KDB 789033 D01 General UNII Test Procedures v01r03 – Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E Section H(1) – Unwanted emissions in the restricted bands Section H(2) – Unwanted emissions that fall outside of the restricted bands Section H(3) – General Requirements for Unwanted Emissions Measurements Section H(4) – Procedure for Unwanted Emissions Measurements Below 1 GHz Section H(5) – Procedure for Peak Unwanted Emissions Measurements Above 1 GHz Section H(6) – Procedure for Average Unwanted Emissions Measurements Above 1 GHz Section H(6)(c) – Average Detection method Below 1000 MHz Detector = quasi-peak Alternately, peak detector is permitted Peak measurements above 1000 MHz RBW = 1 MHz $VBW \ge 3 MHz$ Detector = peakSweep time = auto; increased by a factor of (1 / duty cycle)Trace mode = max hold Average measurements above 1000 MHz (required for peak emissions that are above the average limits) - Method AD (Average Detection) RBW = 1 MHz $VBW \ge 3 MHz$ Detector = RMS (span/(# of points in sweep)  $\leq$  RBW/2) Averaging type = power Sweep time = auto; increased by a factor of (1 / duty cycle)Trace mode = trace average 100 sweeps; increased by a factor of (1 / duty cycle) For a duty cycle less than 98%, add 10 log (1/duty cycle) Limits: Outside restricted bands: Peak EIRP shall not exceed -27 dBm/MHz

Limits: Outside restricted bands: Peak EIRP shall not exceed -27 dBm/MHz Inside restricted bands: Peak and Average limits of FCC Part 15.209 Per Section H(2)(c)(i): "an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit."

**Results:** Passed

**Notes:** Both transmit chains active. Output power was set to 30 dBm eirp using special test software. Measurements were taken for QPSK modulation (worst case) at the lowest, middle, and highest channels of operation. EUT was set to transmit continuously.

## FCC Part 15.209

## Electric Field Strength

EUT:	Model: AF5
Manufacturer:	Ubiquiti Networks
Operating Condition:	70 deg. F; 46% R.H.
Test Site:	DLS O.F. Site 3
Operator:	Craig B
Test Specification:	All channel BW; L, M, and H channels
Comment:	Power set to 30 dBm eirp; QPSK
	Date: 10-02-2013; 10-17-2013

## TEXT: "Horz 3 meters"

Short Description:		Test Set-up				
Test Set-up:	EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization					
Equations:	Total Level( $dB\mu V/m$ ) = Level( $dB\mu V$ ) + System Loss( $dB$ ) + Antenna Factor( $dB\mu V$ )					
	Margin(d	B) = Limit(dBµV/m) - Total Level(dBµV/m)				
Graph Markers:	+	Frequency marker (Level of marker not related to final level)				
	1	Final maximized level using Quasi-Peak detector				
	Х	Final maximized level using Average dector				
	#	Final maximized level using Peak detector				



# MEASUREMENT RESULT: "A1022\_F1H\_Final"

10/17/2013 11:53AM

Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
	Factor	Loss	Level			Ant.	Angle	Detector	
dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
44.19	14.90	-20.9	38.2	46.0	7.8	2.00	290	QUASI-PEAK	broadband
42.57	14.90	-21.0	36.5	46.0	9.5	2.00	270	QUASI-PEAK	broadband
41.69	10.15	-23.8	28.0	40.0	12.0	1.90	270	QUASI-PEAK	broadband
39.72	13.10	-22.7	30.1	43.5	13.4	1.60	260	QUASI-PEAK	None
26.63	23.44	-17.7	32.4	46.0	13.6	1.20	135	QUASI-PEAK	None
35.09	15.95	-22.1	29.0	43.5	14.5	1.00	340	QUASI-PEAK	broadband
34.96	16.70	-20.5	31.2	46.0	14.9	2.00	290	QUASI-PEAK	None
36.98	14.27	-21.2	30.1	46.0	15.9	2.20	260	QUASI-PEAK	broadband
	Level dBµV 44.19 42.57 41.69 39.72 26.63 35.09 34.96 36.98	Level Antenna Factor dBµV dBµV/m 44.19 14.90 42.57 14.90 41.69 10.15 39.72 13.10 26.63 23.44 35.09 15.95 34.96 16.70 36.98 14.27	Level Antenna System Factor Loss dBµV dBµV/m dB 44.19 14.90 -20.9 42.57 14.90 -21.0 41.69 10.15 -23.8 39.72 13.10 -22.7 26.63 23.44 -17.7 35.09 15.95 -22.1 34.96 16.70 -20.5 36.98 14.27 -21.2	Level Antenna System Total Factor Loss Level dBµV dBµV/m dB dBµV/m 44.19 14.90 -20.9 38.2 42.57 14.90 -21.0 36.5 41.69 10.15 -23.8 28.0 39.72 13.10 -22.7 30.1 26.63 23.44 -17.7 32.4 35.09 15.95 -22.1 29.0 34.96 16.70 -20.5 31.2 36.98 14.27 -21.2 30.1	Level Antenna System Total Limit Factor Loss Level dBµV dBµV/m dB dBµV/m dBµV/m 44.19 14.90 -20.9 38.2 46.0 42.57 14.90 -21.0 36.5 46.0 41.69 10.15 -23.8 28.0 40.0 39.72 13.10 -22.7 30.1 43.5 26.63 23.44 -17.7 32.4 46.0 35.09 15.95 -22.1 29.0 43.5 34.96 16.70 -20.5 31.2 46.0 36.98 14.27 -21.2 30.1 46.0	Level Antenna System Total Limit Margin Factor Loss Level dBµV dBµV/m dB dBµV/m dBµV/m dB 44.19 14.90 -20.9 38.2 46.0 7.8 42.57 14.90 -21.0 36.5 46.0 9.5 41.69 10.15 -23.8 28.0 40.0 12.0 39.72 13.10 -22.7 30.1 43.5 13.4 26.63 23.44 -17.7 32.4 46.0 13.6 35.09 15.95 -22.1 29.0 43.5 14.5 34.96 16.70 -20.5 31.2 46.0 14.9 36.98 14.27 -21.2 30.1 46.0 15.9	Level         Antenna         System         Total         Limit         Margin         Height           ABµV         ABµV/m         Loss         Level         Ant.           dBµV         dBµV/m         dB         dBµV/m         dB         m           44.19         14.90         -20.9         38.2         46.0         7.8         2.00           42.57         14.90         -21.0         36.5         46.0         9.5         2.00           41.69         10.15         -23.8         28.0         40.0         12.0         1.90           39.72         13.10         -22.7         30.1         43.5         13.4         1.60           26.63         23.44         -17.7         32.4         46.0         13.6         1.20           35.09         15.95         -22.1         29.0         43.5         14.5         1.00           34.96         16.70         -20.5         31.2         46.0         14.9         2.00           36.98         14.27         -21.2         30.1         46.0         15.9         2.20	Level       Antenna       System       Total       Limit       Margin       Height       EuT         Factor       Loss       Level       Ant.       Angle         dBµV       dBµV/m       dB       dBµV/m       dB       m       deg         44.19       14.90       -20.9       38.2       46.0       7.8       2.00       290         42.57       14.90       -21.0       36.5       46.0       9.5       2.00       270         41.69       10.15       -23.8       28.0       40.0       12.0       1.90       270         39.72       13.10       -22.7       30.1       43.5       13.4       1.60       260         26.63       23.44       -17.7       32.4       46.0       13.6       1.20       135         35.09       15.95       -22.1       29.0       43.5       14.5       1.00       340         34.96       16.70       -20.5       31.2       46.0       14.9       2.00       290         36.98       14.27       -21.2       30.1       46.0       15.9       2.20       260	Level       Antenna       System       Total       Limit       Margin       Height       EuT       Final         Factor       Loss       Level       Ant.       Angle       Detector         dBµV       dBµV/m       dB       dBµV/m       dB       m       deg         44.19       14.90       -20.9       38.2       46.0       7.8       2.00       290       QUASI-PEAK         42.57       14.90       -21.0       36.5       46.0       9.5       2.00       270       QUASI-PEAK         41.69       10.15       -23.8       28.0       40.0       12.0       1.90       270       QUASI-PEAK         39.72       13.10       -22.7       30.1       43.5       13.4       1.60       260       QUASI-PEAK         26.63       23.44       -17.7       32.4       46.0       13.6       1.20       135       QUASI-PEAK         35.09       15.95       -22.1       29.0       43.5       14.5       1.00       340       QUASI-PEAK         34.96       16.70       -20.5       31.2       46.0       14.9       2.00       290       QUASI-PEAK         36.98       14.27       -21.2

#### FCC Part 15.209

## Electric Field Strength

EUT:	Model: AF5						
Manufacturer:	Ubiquiti Networks						
Operating Condition:	70 deg. F; 46% R.H.						
Test Site:	DLS O.F. Site 3						
Operator:	Craig B						
Test Specification:	All channel BW; L, M, and H channels						
Comment:	Power set to 30 dBm eirp; QPSK						
	Date: 10-02-2013; 10-17-2013						

#### TEXT: "Vert 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Sample Equations: Total Level( $dB\mu V/m$ ) = Level( $dB\mu V$ ) + System Loss(dB) + Antenna Factor( $dB\mu V/m$ ) 24.6 = 35.51 + (-22.1) + 11.20 Margin(dB) = Limit( $dB\mu V/m$ ) - Total Level( $dB\mu V/m$ ) 15.4 = 40 - 24.6

- Graph Markers: + Frequency marker (Level of marker not related to final level)
  - Final maximized level using Quasi-Peak detector
  - X Final maximized level using Average dector
  - # Final maximized level using Peak detector



# MEASUREMENT RESULT: "A1022\_F1V\_Final"

10/17/2013 11:50AM

Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
	Factor	Loss	Level			Ant.	Angle	Detector	
dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
49.07	10.15	-23.8	35.4	40.0	4.6	1.00	200	QUASI-PEAK	broadband
43.12	13.10	-22.7	33.5	43.5	10.0	1.00	180	QUASI-PEAK	None
43.39	12.78	-21.5	34.6	46.0	11.4	1.80	180	QUASI-PEAK	broadband
26.87	23.44	-17.7	32.6	46.0	13.4	1.10	110	QUASI-PEAK	None
38.83	13.15	-21.5	30.5	46.0	15.5	2.00	180	QUASI-PEAK	broadband
39.75	11.49	-21.6	29.6	46.0	16.4	1.70	130	QUASI-PEAK	broadband
36.99	12.68	-22.8	26.9	43.5	16.6	1.00	180	QUASI-PEAK	broadband
32.32	14.90	-20.9	26.3	46.0	19.7	2.00	260	QUASI-PEAK	broadband
	Level dBµV 49.07 43.12 43.39 26.87 38.83 39.75 36.99 32.32	Level Antenna Factor dBµV dBµV/m 49.07 10.15 43.12 13.10 43.39 12.78 26.87 23.44 38.83 13.15 39.75 11.49 36.99 12.68 32.32 14.90	Level Antenna System Factor Loss dBµV dBµV/m dB 49.07 10.15 -23.8 43.12 13.10 -22.7 43.39 12.78 -21.5 26.87 23.44 -17.7 38.83 13.15 -21.5 39.75 11.49 -21.6 36.99 12.68 -22.8 32.32 14.90 -20.9	Level Antenna System Total Factor Loss Level dBµV dBµV/m dB dBµV/m 49.07 10.15 -23.8 35.4 43.12 13.10 -22.7 33.5 43.39 12.78 -21.5 34.6 26.87 23.44 -17.7 32.6 38.83 13.15 -21.5 30.5 39.75 11.49 -21.6 29.6 36.99 12.68 -22.8 26.9 32.32 14.90 -20.9 26.3	Level         Antenna         System         Total         Limit           Factor         Loss         Level           dBµV         dBµV/m         dB         dBµV/m         dBµV/m           49.07         10.15         -23.8         35.4         40.0           43.12         13.10         -22.7         33.5         43.5           43.39         12.78         -21.5         34.6         46.0           26.87         23.44         -17.7         32.6         46.0           38.83         13.15         -21.5         30.5         46.0           39.75         11.49         -21.6         29.6         46.0           36.99         12.68         -22.8         26.9         43.5           32.32         14.90         -20.9         26.3         46.0	Level         Antenna         System         Total         Limit         Margin           Factor         Loss         Level         Level         dBµV         dBµV/m         dB         dBµV/m         dB           49.07         10.15         -23.8         35.4         40.0         4.6           43.12         13.10         -22.7         33.5         43.5         10.0           43.39         12.78         -21.5         34.6         46.0         11.4           26.87         23.44         -17.7         32.6         46.0         13.4           38.83         13.15         -21.5         30.5         46.0         15.5           39.75         11.49         -21.6         29.6         46.0         16.4           36.99         12.68         -22.8         26.9         43.5         16.6           32.32         14.90         -20.9         26.3         46.0         19.7	Level         Antenna         System         Total         Limit         Margin         Height           ABµV         ABµV/m         Loss         Level         Ant.           ABµV         dBµV/m         dB         dBµV/m         dB         m           49.07         10.15         -23.8         35.4         40.0         4.6         1.00           43.12         13.10         -22.7         33.5         43.5         10.0         1.00           43.39         12.78         -21.5         34.6         46.0         11.4         1.80           26.87         23.44         -17.7         32.6         46.0         15.5         2.00           39.75         11.49         -21.6         29.6         46.0         16.4         1.70           36.99         12.68         -22.8         26.9         43.5         16.6         1.00           32.32         14.90         -20.9         26.3         46.0         19.7         2.00	LevelAntennaSystemTotalLimitMarginHeightEuTFactorLossLevelAnt.AngledB $\mu$ VdB $\mu$ V/mdBdB $\mu$ V/mdB $\mu$ V/mdBmdgadB $\mu$ V/mdBdB $\mu$ V/mdB $\mu$ V/mdBm49.0710.15-23.835.440.04.61.0043.1213.10-22.733.543.510.01.0043.3912.78-21.534.646.011.41.8026.8723.44-17.732.646.013.41.1038.8313.15-21.530.546.015.52.0039.7511.49-21.629.646.016.41.7036.9912.68-22.826.943.516.61.0032.3214.90-20.926.346.019.72.00	Level       Antenna       System       Total       Limit       Margin       Height       EuT       Final         Factor       Loss       Level       Ant.       Angle       Detector         dBµV       dBµV/m       dB       dBµV/m       dB       m       deg         49.07       10.15       -23.8       35.4       40.0       4.6       1.00       200       QUASI-PEAK         43.12       13.10       -22.7       33.5       43.5       10.0       1.00       180       QUASI-PEAK         43.39       12.78       -21.5       34.6       46.0       11.4       1.80       180       QUASI-PEAK         26.87       23.44       -17.7       32.6       46.0       13.4       1.10       110       QUASI-PEAK         38.83       13.15       -21.5       30.5       46.0       15.5       2.00       180       QUASI-PEAK         39.75       11.49       -21.6       29.6       46.0       16.4       1.70       130       QUASI-PEAK         36.99       12.68       -22.8       26.9       43.5       16.6       1.00       180       QUASI-PEAK         32.32       14.90       -20.9

## FCC Part 15.209

## Electric Field Strength

EUT:	Model: AF5
Manufacturer:	Ubiquiti Networks
Operating Condition:	70 deg. F; 53% R.H.
Test Site:	DLS O.F. Site 3
Operator:	Craig B
Test Specification:	10 MHz channel BW; 5485, 5585, 5710 MHz channels
Comment:	Power set to 30 dBm eirp; QPSK
	Date: 10-01-2013

## TEXT: "Horz 3 meters"

Short Descript	cion: Test Set-up
Test Set-up:	EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization
Equations:	Total Level( $dB\mu V/m$ ) = Level( $dB\mu V$ ) + System Loss( $dB$ ) + Antenna Factor( $dB\mu V/m$ ) Margin( $dB$ ) = Limit( $dB\mu V/m$ ) - Total Level( $dB\mu V/m$ )
Graph Markers:	<ul> <li>Frequency marker (Level of marker not related to final level)</li> <li>Final maximized level using Quasi-Peak detector</li> <li>Final maximized level using Average dector</li> <li>Final maximized level using Peak detector</li> </ul>



## MEASUREMENT RESULT: "B1011\_sh\_Final"

10/1/2013 1:22PM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
		Factor	Loss	Level			Ant.	Angle	Detector	
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
12255.000000	60.39	38.94	-52.1	47.3	54.0	6.7	1.10	0	AVERAGE	High ch; QPSK
11880.000000	60.31	39.07	-52.5	46.9	54.0	7.1	1.00	225	AVERAGE	Low ch; QPSK
12225.000000	59.31	38.95	-52.0	46.2	54.0	7.8	1.00	170	AVERAGE	Low ch; QPSK
13800.000000	56.95	40.75	-51.6	46.1	54.0	7.9	1.00	150	AVERAGE	High ch; QPSK
12180.000000	58.98	38.97	-52.1	45.9	54.0	8.1	1.10	0	AVERAGE	Mid ch; QPSK
8625.000000	57.73	37.73	-52.5	43.0	54.0	11.0	1.20	225	AVERAGE	Low ch; QPSK
13800.000000	65.88	40.75	-51.6	55.1	74.0	18.9	1.00	150	MAX PEAK	High ch; QPSK
11880.000000	67.74	39.07	-52.5	54.3	74.0	19.7	1.00	225	MAX PEAK	Low ch; QPSK
12255.000000	67.13	38.94	-52.1	54.0	74.0	20.0	1.10	0	MAX PEAK	High ch; QPSK
12225.000000	67.01	38.95	-52.0	53.9	74.0	20.1	1.00	170	MAX PEAK	Low ch; QPSK
12180.000000	66.26	38.97	-52.1	53.2	74.0	20.8	1.10	0	MAX PEAK	Mid ch; QPSK
8625.000000	66.63	37.73	-52.5	51.9	74.0	22.1	1.20	225	MAX PEAK	Low ch; QPSK

#### FCC Part 15.209

## Electric Field Strength

EUT:	Model: AF5
Manufacturer:	Ubiquiti Networks
Operating Condition:	70 deg. F; 53% R.H.
Test Site:	DLS O.F. Site 3
Operator:	Craig B
Test Specification:	10 MHz channel BW; 5485, 5585, 5710 MHz channels
Comment:	Power set to 30 dBm eirp; QPSK
	Date: 10-01-2013

#### TEXT: "Vert 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Sample Equations: Total Level( $dB\mu V/m$ ) = Level( $dB\mu V$ ) + System Loss(dB) + Antenna Factor( $dB\mu V/m$ ) 24.6 = 35.51 + (-22.1) + 11.20 Margin(dB) = Limit( $dB\mu V/m$ ) - Total Level( $dB\mu V/m$ ) 15.4 = 40 - 24.6

- Graph Markers: + Frequency marker (Level of marker not related to final level)
  - Final maximized level using Quasi-Peak detector
  - X Final maximized level using Average dector
  - # Final maximized level using Peak detector



## MEASUREMENT RESULT: "B1011\_sv\_Final"

10/1/2013 1:21PM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
		Factor	Loss	Level			Ant.	Angle	Detector	
MHz	dBµV	dBµV/m	dB	dBµV/m	dBµV/m	dB	m	deg		
12255.000000	60.46	38.94	-52.1	47.3	54.0	6.7	1.30	0	AVERAGE	High ch; QPSK
11880.000000	59.40	39.07	-52.5	46.0	54.0	8.0	1.10	0	AVERAGE	Low ch; QPSK
12180.000000	57.27	38.97	-52.1	44.2	54.0	9.8	1.30	0	AVERAGE	Mid ch; QPSK
13800.000000	52.42	40.75	-51.6	41.6	54.0	12.4	1.50	135	AVERAGE	High ch; QPSK
12225.000000	52.22	38.95	-52.0	39.1	54.0	14.9	1.20	170	AVERAGE	Low ch; QPSK
8625.000000	53.67	37.73	-52.5	38.9	54.0	15.1	1.20	150	AVERAGE	Low ch; QPSK
12255.000000	67.13	38.94	-52.1	54.0	74.0	20.0	1.30	0	MAX PEAK	High ch; QPSK
11880.000000	67.13	39.07	-52.5	53.7	74.0	20.3	1.10	0	MAX PEAK	Low ch; QPSK
13800.000000	64.46	40.75	-51.6	53.6	74.0	20.4	1.50	135	MAX PEAK	High ch; QPSK
12180.000000	66.38	38.97	-52.1	53.3	74.0	20.7	1.30	0	MAX PEAK	Mid ch; QPSK
12225.000000	63.53	38.95	-52.0	50.4	74.0	23.6	1.20	170	MAX PEAK	Low ch; QPSK
8625.000000	64.72	37.73	-52.5	50.0	74.0	24.0	1.20	150	MAX PEAK	Low ch; QPSK

# No measurable emissions were detected from the EUT from 18 to 40 GHz.



Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# Appendix B – Measurement Data

## **B10.0** AC Line Conducted Emissions

- Rule Part:FCC Part 15.207
- Test Procedure: ANSI C63.10-2009 Section 6.2
- Limit: FCC Part 15.207(a)
- **Results:** Compliant
- Notes:This was an AC Conducted emissions measurement.<br/>The EUT was powered from a representative AC Adapter with an input of<br/>120 VAC 60 Hz.

## FCC Part 15.207

#### Voltage Mains Test

EUT:	Airfiber 5 - 5.4 GHz radio
Manufacturer:	Ubiquiti Networks, Inc.
Operating Condition:	70 deg. F, 45% R.H.
Test Site:	DLS O.F. Screen Room
Operator:	Craig B
Test Specification:	120 V 60 Hz; Adpt1 Model: GP-C500-120G
Comment:	continuous TX Line 1
	10-03-2013

#### SCAN TABLE: "Line Cond SR Final"

Short Description: Line Conducte					sions	
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
			CISPR AV			



## MEASUREMENT RESULT: "103a\_fin"

10/3/2013 8:4	6AM				
Frequency	Level	Transd	Limit	Margin	Detector
MHz	dBµV	dB	dBµV	dB	
0.187600	54.00	12.9	64	10.1	QP
0.332000	52.00	11.7	59	7.4	QP
0.333200	51.90	11.7	59	7.5	QP
0.468000	48.70	11.3	57	7.8	QP
0.468200	48.60	11.3	57	7.9	QP
0.494800	46.00	11.2	56	10.1	QP
0.556000	50.10	11.1	56	5.9	QP
0.640000	45.50	10.9	56	10.5	QP
1.464000	45.60	10.6	56	10.4	QP
1.856000	45.40	10.6	56	10.6	QP
3.712000	44.00	10.7	56	12.0	QP
4.620000	44.20	10.6	56	11.8	QP
7.430000	45.70	10.8	60	14.3	QP
8.168000	46.20	10.9	60	13.8	QP
8.609000	46.10	10.9	60	13.9	QP
8.627000	46.10	10.9	60	13.9	QP
8.906000	45.80	10.9	60	14.2	QP
9.203000	45.80	10.9	60	14.2	QP

# MEASUREMENT RESULT: "103a\_fin2"

10/3/2013 8:4	6AM				
Frequency	Level	Transd	Limit	Margin	Detector
MHz	dBµV	dB	dBµV	dB	
0 191600	45 80	12.8	54	8 2	CAV
0 327400	42 70	11 7	50	6.8	CAV
0.330200	41.90	11.7	49	7.5	CAV
0.450400	40.00	11.3	47	6.9	CAV
0.459200	38.50	11.3	47	8.2	CAV
0.461400	38.00	11.3	47	8.7	CAV
0.508000	32.70	11.2	46	13.3	CAV
0.564000	37.70	11.0	46	8.3	CAV
0.568000	37.70	11.0	46	8.3	CAV
1.736000	31.00	10.6	46	15.0	CAV
3.404000	30.90	10.7	46	15.1	CAV
3.924000	37.10	10.7	46	8.9	CAV
10.463000	42.00	10.9	50	8.0	CAV
10.787000	41.30	10.9	50	8.7	CAV
11.120000	40.60	11.0	50	9.4	CAV
11.444000	41.10	11.0	50	8.9	CAV
11.768000	43.10	11.0	50	6.9	CAV
12.425000	39.80	11.0	50	10.2	CAV
## FCC Part 15.207

### Voltage Mains Test

EUT:	Airfiber 5 - 5.4 GHz radio
Manufacturer:	Ubiquiti Networks, Inc.
Operating Condition:	70 deg. F, 45% R.H.
Test Site:	DLS O.F. Screen Room
Operator:	Craig B
Test Specification:	120 V 60 Hz; Adpt1 Model: GP-C500-120G
Comment:	continuous TX Line 2
	10-03-2013

#### SCAN TABLE: "Line Cond SR Final"

Short Desc	Description: Line Conducted				sions	
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
			CISPR AV			



# MEASUREMENT RESULT: "103b\_fin"

10/3/2013 8	:54AM				
Frequency	Level	Transd	Limit	Margin	Detector
MHz	dBµV	dB	dBµV	dB	
0.189600	55.10	12.9	64	9.0	QP
0.334000	52.90	11.7	59	6.5	QP
0.334200	52.80	11.7	59	6.5	QP
0.459000	50.40	11.3	57	6.3	QP
0.468000	49.50	11.3	57	7.0	QP
0.560000	51.50	11.1	56	4.5	QP
0.648000	47.10	10.9	56	8.9	QP
0.804000	46.70	10.7	56	9.3	QP
3.500000	45.60	10.7	56	10.4	QP
3.756000	45.50	10.7	56	10.5	QP
4.548000	43.80	10.6	56	12.2	QP
5.000000	44.20	10.6	56	11.8	QP
6.548000	44.20	10.7	60	15.8	QP
7.979000	47.30	10.8	60	12.7	QP
8.474000	47.70	10.9	60	12.3	QP
8.906000	47.50	10.9	60	12.5	QP
9.194000	46.60	10.9	60	13.4	QP

# MEASUREMENT RESULT: "103b\_fin2"

10/3/2013	8:54AM				
Frequenc	cy Level	Transd	Limit	Margin	Detector
MH	- Iz dBμV	dB	dBµV	dB	
0.19180	48.00	12.8	54	6.0	CAV
0.32400	0 44.50	11.7	50	5.1	CAV
0.33060	0 42.50	11.7	49	6.9	CAV
0.44800	0 41.30	11.3	47	5.6	CAV
0.46260	0 38.50	11.3	47	8.1	CAV
0.56000	38.10	11.1	46	7.9	CAV
0.57200	38.70	11.0	46	7.3	CAV
3.92400	37.90	10.7	46	8.1	CAV
4.01200	0 31.50	10.7	46	14.5	CAV
4.58000	35.00	10.6	46	11.0	CAV
8.50100	39.80	10.9	50	10.2	CAV
8.82500	)0 39.90	10.9	50	10.1	CAV
10.46300	0 40.50	10.9	50	9.5	CAV
10.78700	42.20	10.9	50	7.8	CAV
11.11100	42.00	11.0	50	8.0	CAV
11.76800	0 44.20	11.0	50	5.8	CAV

## FCC Part 15.207

### Voltage Mains Test

EUT:	Airfiber 5 - 5.4 GHz radio
Manufacturer:	Ubiquiti Networks, Inc.
Operating Condition:	70 deg. F, 45% R.H.
Test Site:	DLS O.F. Screen Room
Operator:	Craig B
Test Specification:	120 V 60 Hz; Line 1
Comment:	TX ON; Adpt2 Model: PSA60M-500(G)-R
	10-15-2013

#### SCAN TABLE: "Line Cond SR Final"

Short Description: Line Conducte				ed Emis:	sions	
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
			CISPR AV			



#### Page 1/2 10/15/2013 3:13PM 105a L1

## MEASUREMENT RESULT: "105a L1\_fin"

10/15/2013 3:	13PM				
Frequency	Level	Transd	Limit	Marqin	Detector
MHz	dBµV	dB	dBµV	dB	
0.183800	52.70	13.0	64	11.6	QP
0.184200	52.80	12.9	64	11.5	QP
0.206800	45.50	12.7	63	17.8	QP
0.405200	45.80	11.4	58	11.9	QP
0.421600	38.20	11.4	57	19.2	QP
0.470600	47.30	11.3	57	9.2	QP
0.604000	53.00	10.9	56	3.0	QP
1.008000	47.60	10.7	56	8.4	QP
1.552000	46.90	10.6	56	9.1	QP
1.804000	46.00	10.6	56	10.0	QP
2.200000	44.50	10.7	56	11.5	QP
2.696000	43.90	10.6	56	12.1	QP
11.147000	39.80	11.0	60	20.2	QP
16.520000	38.20	11.2	60	21.8	QP
19.238000	41.10	11.3	60	18.9	QP
21.983000	47.10	11.3	60	12.9	QP
23.018000	48.90	11.4	60	11.1	QP
25.844000	41.10	11.5	60	18.9	QP

# MEASUREMENT RESULT: "105a L1\_fin2"

10/15/2013 3: Frequency MHz	13PM Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector
			p		
0.184200	37.40	12.9	54	16.9	CAV
0.188200	39.30	12.9	54	14.8	CAV
0.191600	39.20	12.8	54	14.8	CAV
0.330200	31.50	11.7	49	17.9	CAV
0.400000	36.10	11.4	48	11.8	CAV
0.465000	36.70	11.3	47	9.9	CAV
0.604000	42.10	10.9	46	3.9	CAV
0.676000	42.60	10.8	46	3.4	CAV
1.004000	35.60	10.7	46	10.4	CAV
1.536000	35.90	10.6	46	10.1	CAV
1.616000	34.30	10.6	46	11.7	CAV
2.084000	35.70	10.6	46	10.3	CAV
11.147000	35.80	11.0	50	14.2	CAV
12.785000	32.90	11.0	50	17.1	CAV
15.053000	32.40	11.1	50	17.6	CAV
22.280000	41.40	11.3	50	8.6	CAV
22.793000	42.20	11.4	50	7.8	CAV
26.213000	35.10	11.5	50	14.9	CAV

## FCC Part 15.207

### Voltage Mains Test

EUT:	Airfiber 5 - 5.4 GHz radio
Manufacturer:	Ubiquiti Networks, Inc.
Operating Condition:	70 deg. F, 45% R.H.
Test Site:	DLS O.F. Screen Room
Operator:	Craig B
Test Specification:	120 V 60 Hz; Line 2
Comment:	TX ON; Adpt2 Model: PSA60M-500(G)-R
	10-15-2013

#### SCAN TABLE: "Line Cond SR Final"

Short Description: Line Conducte				ed Emiss	sions	
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
			CISPR AV			



## MEASUREMENT RESULT: "105b L2\_fin"

10/15/2013 3:	21PM				
Frequency	Level	Transd	Limit	Margin	Detector
MHz	dBµV	dB	dBµV	dB	
0.185200	51.60	12.9	64	12.6	QP
0.186200	51.60	12.9	64	12.6	QP
0.402600	47.10	11.4	58	10.7	QP
0.466600	48.10	11.3	57	8.5	QP
0.498400	42.30	11.2	56	13.7	QP
0.500000	42.50	11.2	56	13.5	QP
0.676000	53.10	10.8	56	2.9	QP
0.984000	48.70	10.7	56	7.3	QP
1.216000	45.90	10.6	56	10.1	QP
2.140000	48.10	10.6	56	7.9	QP
2.724000	46.10	10.6	56	9.9	QP
4.156000	45.90	10.7	56	10.1	QP
5.000000	41.10	10.6	56	14.9	QP
7.160000	45.20	10.8	60	14.8	QP
11.408000	45.50	11.0	60	14.5	QP
22.397000	51.20	11.3	60	8.8	QP
22.937000	50.40	11.4	60	9.6	QP
25.466000	46.80	11.5	60	13.2	OP

## MEASUREMENT RESULT: "105b L2\_fin2"

10/15/2	2013 3:2	1PM				
Freq	quency	Level	Transd	Limit	Margin	Detector
_	MHz	dBµV	dB	dBµV	dB	
0.1	.84200	37.20	12.9	54	17.1	CAV
0.1	86600	38.70	12.9	54	15.5	CAV
0.3	29000	30.90	11.7	50	18.6	CAV
0.4	06200	35.20	11.4	48	12.5	CAV
0.4	62400	35.20	11.3	47	11.4	CAV
0.4	98800	28.00	11.2	46	18.0	CAV
0.5	56000	40.80	11.1	46	5.2	CAV
0.6	16000	41.10	10.9	46	4.9	CAV
0.6	76000	43.30	10.8	46	2.7	CAV
2.0	00088000	37.10	10.6	46	8.9	CAV
2.6	40000	36.80	10.6	46	9.2	CAV
3.7	88000	36.60	10.7	46	9.4	CAV
6.6	65000	38.00	10.7	50	12.0	CAV
7.2	32000	38.80	10.8	50	11.2	CAV
11.1	38000	40.70	11.0	50	9.3	CAV
15.8	36000	39.00	11.1	50	11.0	CAV
21.9	47000	44.80	11.3	50	5.2	CAV
22.5	95000	44.10	11.4	50	5.9	CAV



166 South Carter, Genoa City, WI 53128

Company: Model Tested: Report Number: DLS Project: Ubiquiti Networks, Inc. AF5 19519 Part 1 6154

# **END OF REPORT**

<b>Revision</b> #	Date	Comments	By
1.0	11-5-2013	Preliminary Release	JS
1.1	11-7-2013	Removed data for extra bandwidths	JS
1.2	11-11-2013	Additional Description	JS