

RF Exposure Compliance

Company: Ubiquiti Networks, Inc.
Model: AF5
Formal Name: Air Fiber 5 - 5.4 and 5.8 GHz Radio

Rule Part: RSS-102 Issue 4 March 2010 Section 4.2
 4.2 RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Test Procedure: RF exposure evaluation based on measured RF conducted output power and calculated power density.

Limits: The RSS-102 power density limit in the frequency range 1500-15000 MHz is 10 W/m².
 10 W/m² = 1 mW/cm²

Results:

Power Density (mW/cm²):

$$S = \frac{PG}{4\pi R^2}$$

S = Power Density (mW/cm²)

P = Power Input to the antenna (mW)

G = Numeric Power Gain of the antenna

R = Distance to the center of the radiation of the antenna (cm)

RF Exposure Calculation

RF Exposure Calculation								
	Input							
Frequency =	5823	MHz						
P =	29.99335	dBm						
G =	23	dB						
R =	126	cm						
π	3.14159							
Transmit Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Antenna Gain (dBi)	Antenna Gain (numeric)	Distance (cm)	Power Density (mW/cm ²)	Power Density Limit (mW/cm ²)	Margin
5823	29.99335	998.46995	23	199.52623	126	0.9986	1.0	0.001

Summary of Results:

With a minimum separation distance of 126 cm, the Ubiquiti Networks Air Fiber 5 - 5.4 and 5.8 GHz Radio **meets** the RF exposure evaluation requirements for maximum permissible exposure to any radiating structure and the general population / uncontrolled exposure.

Conclusion:

The Ubiquiti Networks Air Fiber 5 - 5.4 and 5.8 GHz Radio operating under RSS-210 complies with the requirements of RSS-102 Issue 4 for RF Exposure Evaluation.

Supporting data to follow...

Test Date: 11-05-2013
 Company: Ubiquiti Networks
 EUT: Air Fiber 5 - 5.8GHz WiFi Radio
 Test: Maximum peak conducted output power - Conducted
 Operator: Lillian Li
 Test Procedure used: KDB 558074 D01 v01r03 – 9.2.3.1) – Method AVGPM
 Limit: [15.247(b)(3); RSS-210 A8.4(4)]: < 1 Watt (30 dBm)
 Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
 EUT Limit[15.247(c)(1)(ii) PTP]: ≤ 30dBm

10MHz Operating Bandwidth:

FCC Maximum Conducted Output Power		10M				
		QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit =1W(30dBm)	mW					
	<i>EUT FCC limit:[15.247(b)(4)]</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>
HCH = 5844 MHz	TX0 (mW)	486.29	484.32	483.93	484.56	495.02
	TX1 (mW)	495.84	494.52	493.38	495.56	495.24
	total(mW)	982.13	978.84	977.31	980.12	990.26
	Margin(mW)	17.87	21.16	22.69	19.88	9.74
MCH = 5785 MHz	TX0	497.52	497.53	495.68	496.12	496.81
	TX1	496.31	496.35	496.58	496.21	497.45
	total(mW)	993.83	993.88	992.26	992.33	994.26
	Margin(mW)	6.17	6.12	7.74	7.67	5.74
LCH = 5731 MHz	TX0	470.12	467.85	466.89	467.87	467.32
	TX1	490.56	490.36	489.56	491.56	490.62
	total(mW)	960.68	958.21	956.45	959.43	957.94
	Margin(mW)	39.32	41.79	43.55	40.57	42.06

20MHz Operating Bandwidth:

FCC Maximum Conducted Output Power		20M				
	mW	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit =1W(30dBm)	<i>EUT FCC limit:[15.247(b)(4)]</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>
HCH = 5838 MHz	TX0 (mW)	483.12	471.96	471.56	472.56	483.31
	TX1 (mW)	492.22	491.87	491.45	491.06	491.97
	total(mW)	975.34	963.83	963.01	963.62	975.28
	Margin(mW)	24.66	36.17	36.99	36.38	24.72
MCH = 5785 MHz	TX0	487.82	486.39	485.32	485.92	498.12
	TX1	497.85	497.62	497.56	497.34	497.33
	total(mW)	985.67	984.01	982.88	983.26	995.45
	Margin(mW)	14.33	15.99	17.12	16.74	4.55
LCH = 5737 MHz	TX0	495.23	493.72	492.41	492.15	492.37
	TX1	499.82	499.24	498.56	499.32	499.32
	total(mW)	995.05	992.96	990.97	991.47	991.69
	Margin(mW)	4.95	7.04	9.03	8.53	8.31

40MHz Operating Bandwidth:

FCC Maximum Conducted Output Power		40M				
	mW	QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit =1W(30dBm)	<i>EUT FCC limit:[15.247(b)(4)]</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>
HCH = 5828 MHz	TX0 (mW)	476.54	478.68	476.68	475.51	476.39
	TX1 (mW)	494.16	489.78	487.92	487.95	487.36
	total(mW)	970.70	968.46	964.60	963.46	963.75
	Margin(mW)	29.30	31.54	35.40	36.54	36.25
MCH = 5785 MHz	TX0	471.56	470.78	469.82	472.56	470.18
	TX1	487.66	488.56	488.42	488.78	488.92
	total(mW)	959.22	959.34	958.24	961.34	959.10
	Margin(mW)	40.78	40.66	41.76	38.66	40.90
LCH = 5727 MHz	TX0	485.78	483.12	483.21	482.98	495.23
	TX1	493.13	491.56	491.85	492.39	491.78
	total(mW)	978.91	974.68	975.06	975.37	987.01
	Margin(mW)	21.09	25.32	24.94	24.63	12.99

50MHz Operating Bandwidth:

FCC Maximum Conducted Output Power		50MHz				
		QPSK	16QAM	64QAM	256QAM	1024Q
FCC limit =1W(30dBm)	mW					
	<i>EUT FCC limit:[15.247(b)(4)]</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>	<i>1,000.00</i>
HCH = 5823 MHz	TX0 (mW)	500.12	499.85	499.87	499.89	499.72
	TX1 (mW)	495.23	498.22	497.23	498.55	498.75
	total(mW)	995.35	998.07	997.10	998.44	998.47
	Margin(mW)	4.65	1.93	2.90	1.56	1.53
MCH = 5785 MHz	TX0	474.48	475.25	474.98	475.34	487.52
	TX1	495.23	491.75	490.25	490.23	490.34
	total(mW)	969.71	967.00	965.23	965.57	977.86
	Margin(mW)	30.29	33.00	34.77	34.43	22.14
LCH = 5752 MHz	TX0	485.24	484.03	484.13	483.53	483.24
	TX1	489.78	488.79	487.92	488.92	491.34
	total(mW)	975.02	972.82	972.05	972.45	974.58
	Margin(mW)	24.98	27.18	27.95	27.55	25.42

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)3a) Method PM
 Limit: [RSS-210 A9.2(3)]: lesser of 250mW or 11dBm+10log B (B=99% OBW)
 Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
 EUT conducted limit: = Limit - (23 dBi - 6 dB)

10MHz Operating Bandwidth:

IC Max OP PWR: IC limit<24dBm		10M (Adjustment for duty cycle =10log1/x = 0.13)				
		QPSK	16QAM	64QAM	256QAM	1024Q
EUT limits	dBm					
	IC limit	3.87	3.85	3.85	3.85	3.85
HCH = 5719 MHz	TX0 (mW)	1.07	1.08	1.08	1.09	1.09
	TX1 (mW)	1.2	1.21	1.2	1.22	1.19
	total(mW)	2.27	2.29	2.28	2.31	2.28
	Total(dBm)	3.69	3.73	3.71	3.77	3.71
MCH = 5575 MHz	TX0	1.11	1.12	1.1	1.12	1.1
	TX1	1.19	1.19	1.19	1.18	1.21
	total(mW)	2.30	2.31	2.29	2.30	2.31
	Total(dBm)	3.75	3.77	3.73	3.75	3.77
LCH = 5476 MHz	TX0	1	1.04	1.05	1.05	1.02
	TX1	1.32	1.27	1.27	1.29	1.3
	total(mW)	2.32	2.31	2.32	2.34	2.32
	Total(dBm)	3.78	3.77	3.78	3.82	3.78

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 Operator: Lillian L
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 Limit: [RSS-210 A9.2(3)]: lesser of 250mW or 11dBm+10log B (B=99% OBW)
 Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
 EUT conducted limit: = Limit - (23 dBi - 6 dB)

20MHz Operating Bandwidth:

IC Max OP PWR: IC limit<24dBm		20M (Adjustment for duty cycle =10log1/x = 0.13 or 0.11)				
EUT limits	dBm	QPSK	16QAM	64QAM	256QAM	1024Q
	<i>IC limit</i>	<i>6.88</i>	<i>6.86</i>	<i>6.86</i>	<i>6.86</i>	<i>6.84</i>
HCH = 5714 MHz	TX0 (mW)	2.22	2.25	2.26	2.22	2.16
	TX1 (mW)	2.37	2.35	2.35	2.34	2.35
	total(mW)	4.59	4.60	4.61	4.56	4.51
	Total(dBm)	6.73	6.76	6.77	6.72	6.67
MCH = 5575 MHz	TX0	2.19	2.18	2.1	2.12	2.14
	TX1	2.49	2.51	2.5	2.5	2.5
	total(mW)	4.68	4.69	4.60	4.62	4.64
	Total(dBm)	6.81	6.84	6.76	6.78	6.80
LCH = 5481 MHz	TX0	2.19	2.16	2.21	2.16	2.18
	TX1	2.49	2.48	2.47	2.48	2.46
	total(mW)	4.68	4.64	4.68	4.64	4.64
	Total(dBm)	6.81	6.80	6.83	6.80	6.80

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 Operator: Lillian L
 Test Procedure used: KDB 789033 D01 v01r03 – E)3a) Method PM
 Limit: [RSS-210 A9.2(3)]: lesser of 250mW or 11dBm+10log B (B=99% OBW)
 Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
 EUT conducted limit: = Limit - (23 dBi - 6 dB)

40MHz Operating Bandwidth:

IC Maximum Conducted Output Power		40MHz				
		QPSK	16QAM	64QAM	256QAM	1024Q
IC limit $\leq$ 250mW	dBm					
	<i>EUT IC limit:</i>	7	7	7	7	7
HCH = 5703 MHz	TX0 (mW)	2.33	2.34	2.35	2.34	2.34
	TX1 (mW)	2.59	2.6	2.59	2.58	2.58
	total(mW)	4.92	4.94	4.94	4.92	4.92
	Total(dBm)	6.92	6.94	6.94	6.92	6.92
	Margin	0.08	0.06	0.06	0.08	0.08
MCH = 5575 MHz	TX0	2.35	2.34	2.32	2.33	2.34
	TX1	2.58	2.46	2.46	2.43	2.41
	total(mW)	4.93	4.80	4.78	4.76	4.75
	Total(dBm)	6.93	6.81	6.79	6.78	6.77
	Margin	0.07	0.19	0.21	0.22	0.23
LCH = 5492 MHz	TX0	2.41	2.4	2.42	2.4	2.46
	TX1	2.57	2.54	2.54	2.55	2.5
	total(mW)	4.98	4.94	4.96	4.95	4.96
	Total(dBm)	6.97	6.94	6.95	6.95	6.95
	Margin	0.03	0.06	0.05	0.05	0.05

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 Limit: [RSS-210 A9.2(3)]: lesser of 250mW or 11dBm+10log B (B=99% OBW)
 Operating Mode: Point-to-Point; Antenna Gain = 23 dBi
 EUT conducted limit: = Limit - (23 dBi - 6 dB)

50MHz Operating Bandwidth:

IC Maximum Conducted Output Power		50MHz				
		QPSK	16QAM	64QAM	256QAM	1024Q
IC limit $\leq$ 250mW	dBm					
	<i>EUT IC limit:</i>	<i>7</i>	<i>7</i>	<i>7</i>	<i>7</i>	<i>7</i>
HCH = 5698 MHz	TX0 (mW)	2.25	2.24	2.23	2.22	2.22
	TX1 (mW)	2.72	2.68	2.56	2.58	2.76
	total(mW)	4.97	4.92	4.79	4.80	4.98
	Total(dBm)	6.96	6.92	6.80	6.81	6.97
	Margin	0.04	0.08	0.20	0.19	0.03
MCH = 5575 MHz	TX0	2.33	2.32	2.33	2.36	2.45
	TX1	2.58	2.51	2.49	2.63	2.5
	total(mW)	4.91	4.83	4.82	4.99	4.95
	Total(dBm)	6.91	6.84	6.83	6.98	6.95
	Margin	0.09	0.16	0.17	0.02	0.05
LCH = 5497 MHz	TX0	2.36	2.36	2.37	2.36	2.36
	TX1	2.53	2.58	2.56	2.52	2.5
	total(mW)	4.89	4.94	4.93	4.88	4.86
	Total(dBm)	6.89	6.94	6.93	6.88	6.87
	Margin	0.11	0.06	0.07	0.12	0.13