

RF Exposure Evaluation Report

Equipment : WiFi 5G Module
Brand Name : UBIQUITI
Model No. : 4x4-5GL
FCC ID : SWX-M445GL
Standard : 47 CFR Part 2.1091
Applicant/ : Ubiquiti Networks, Inc.
Manufacturer : 685 Third Avenue, 27th Floor New York,
New York 10017 USA

The product sample received on Dec. 05, 2017 and completely tested on Jan. 22, 2018. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit.

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Kevin Liang / Assistant Manager



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REVISION HISTORY

[illegible]

1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
5GHz WLAN	5150-5250 5250-5350	5180-5240 5260-5320	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac:OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM).

1.2 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA661623-20

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Enable indoor and outdoor operation. 2. Enable AP mode. 3. Enable 5GHz transmit beamforming operation in Band1+2 by software. 4. Disable VHT80+80 indoor and outdoor operations.	All

1.3 Testing Location

Testing Location			
☒	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test site Designation No. TW1190 with FCC.			
☐	JHUBEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085
Test site Designation No. TW0006 with FCC.			

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



2.3 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Non-Beamforming

< Antenna Gain 10dBi>

Indoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	10.00	22.82	32.82	0.50	33.32	2.14783	20	0.42730	1.00000
5.3G;D1D	10.00	19.80	29.80	0.20	30.00	1.00000	20	0.19894	1.00000

Outdoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	10.00	10.98	20.98	0.50	21.48	0.14060	20	0.02797	1.00000
5.3G;D1D	10.00	19.80	29.80	0.20	30.00	1.00000	20	0.19894	1.00000

**Non-Beamforming**

< Antenna Gain 15dBi>

Indoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	15.00	17.53	32.53	0.50	33.03	2.00909	20	0.39970	1.00000
5.3G;D1D	15.00	14.89	29.89	0.11	30.00	1.00000	20	0.19894	1.00000

Outdoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	15.00	5.98	20.98	0.50	21.48	0.14060	20	0.02797	1.00000
5.3G;D1D	15.00	14.89	29.89	0.11	30.00	1.00000	20	0.19894	1.00000

**Beamforming**

< Antenna Gain 10dBi>

Client

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	13.01	16.81	29.82	0.50	30.32	1.07647	20	0.21416	1.00000
5.3G;D1D	13.01	16.85	29.86	0.50	30.36	1.08643	20	0.21614	1.00000

Indoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	16.02	19.52	35.54	0.50	36.04	4.01791	16.02	19.52	1.00000
5.3G;D1D	13.01	16.85	29.86	0.50	30.36	1.08643	13.01	16.85	1.00000

Outdoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	16.02	4.97	20.99	0.50	21.49	0.14093	20	0.02804	1.00000
5.3G;D1D	16.02	13.67	29.69	0.50	30.19	1.04472	20	0.20784	1.00000

**Beamforming**

< Antenna Gain 15dBi>

Client

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	21.02	8.89	29.91	0.09	30.00	1.00000	20	0.19894	1.00000
5.3G;D1D	21.02	8.87	29.89	0.11	30.00	1.00000	20	0.19894	1.00000

Indoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	21.02	14.57	35.59	0.41	36.00	3.98107	20	0.79201	1.00000
5.3G;D1D	21.02	8.87	29.89	0.11	30.00	1.00000	20	0.19894	1.00000

Outdoor Master

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
5.2G;D1D	21.02	-0.05	20.97	0.50	21.47	0.14028	20	0.02791	1.00000
5.3G;D1D	21.02	8.87	29.89	0.50	30.39	1.09396	20	0.21764	1.00000