

Radio Exposure Evaluation Report

FCC ID : TVE-371BB072

Equipment : Secured Wireless Access Point

Brand Name : FORTINET

Model Name : FortiAP U231Fxxxxxx, FAP-U231Fxxxxxx,
FORTIAP-U231Fxxxxxx (Where "x" can be used as
"A-Z", or "0-9", or "-", or blank for software changes
or marketing purposes only)

Applicant : Fortinet, Inc.
899 Kifer Road, Sunnyvale, CA 94086, USA

Manufacturer : Universal Global Scientific Industrial Co., Ltd
141, Lane 351, Sec. 1, Taiping Road, Tsao-tuen,
Nantou 54261, Taiwan

Standard : 47 CFR Part 2.1091

The product was received on Jul. 08, 2020, and testing was started from Aug. 04, 2020 and completed on Sep. 14, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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TEL : 886-3-327-3456
FAX : 886-3-327-0973
Report Template No.: HE
FCC ID: TVE-371BB072



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

None.

Reviewed by: Sam Tsai

Report Producer: Debby Hung

1 General Description

The EUT has Four radio chip.

Function	Radio 1	Radio 2	Radio 3	Radio 4
WiFi 2.4G	V	X	V	X
WiFi 5G	V	V	V	X
Bluetooth / Zigbee	X	X	X	V

1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5700 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	LE: DSSS (GFSK)
ZigBee	2400-2483.5	2405-2480	DSSS (O-QPSK)

1.2 Table for Multiple Listing

Model Name	Description
FortiAP U231Fxxxxxx, FAP-U231Fxxxxxx, FORTIAP-U231Fxxxxxx (Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)	The difference of models is in sales marketing.

Note: The information from manufacturer.

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 25 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

WLAN 2.4G Function:

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)
2.4G;G1D (Radio 1)	3.89	26.37	30.26	0.50	30.76	1.19124	25	0.15167	1.00000
2.4G;D1D (Radio 1)	3.89	23.14	27.03	0.50	27.53	0.56624	25	0.07210	1.00000
2.4G;G1D (Radio 3)	3.97	23.39	27.36	0.50	27.86	0.61094	25	0.07779	1.00000
2.4G;D1D (Radio 3)	3.97	23.12	27.09	0.50	27.59	0.57412	25	0.07310	1.00000

WLAN 5G Function:

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)
5.8G;D1D (Radio 1)	5.07	29.39	34.46	0.50	34.96	3.13329	25	0.39894	1.00000
5.2G;D1D (Radio 2)	5.89	21.98	27.87	0.50	28.37	0.68707	25	0.08748	1.00000
5.8G;D1D(Radio 2)	5.89	28.21	34.10	0.50	34.60	2.88403	25	0.36721	1.00000
5.2G;D1D(Radio 3)	5.44	22.26	27.70	0.50	28.20	0.66069	25	0.08412	1.00000
5.8G;D1D(Radio 3)	5.44	21.90	27.34	0.50	27.84	0.60814	25	0.07743	1.00000

WLAN BT Function:

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)
2.4G;BT-LE(Radio 4)	3.69	7.31	11.00	0.50	11.50	0.01413	25	0.00180	1.00000

WLAN Zigbee Function:

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)
2.4G;G1D(Radio 4)	3.69	8.43	12.12	0.50	12.62	0.01828	25	0.00233	1.00000

**WLAN 2.4G+5G+BT+Zigbee Function:**

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)	Ratio (S/Limit)
5.8G;D1D(Radio 1)	5.07	29.39	34.46	0.50	34.96	3.13329	25	0.39894	0.97103	0.41084
5.8G;D1D(Radio 2)	5.89	28.21	34.10	0.50	34.60	2.88403	25	0.36721	0.97565	0.37637
2.4G;G1D(Radio 3)	3.97	23.39	27.36	0.50	27.86	0.61094	25	0.07779	0.54342	0.14314
2.4G;G1D(Radio 4)	3.69	8.43	12.12	0.50	12.62	0.01828	25	0.00233	0.53554	0.00435
									Sum Ratio	0.93806
									Ratio Limit	1

————THE END————