Testing Laboratory 3785

Radio Exposure Evaluation Report

FCC ID	:	**TVE-41417T07866**
Equipment	:	**Secured Wireless Access Point**
Brand Name	:	**FORTINET**
Model Name	:	**FortiAP 831Fxxxxxx, FAP-831Fxxxxxx, FORTIAP-831Fxxxxxx** **(where "x" can be "A-Z", or "0-9", or "-", or blank for software purposes or marketing purposes only)**
Applicant	:	**Fortinet, Inc.** **899 Kifer Road, Sunnyvale, CA 94086, USA**
Manufacturer	:	**Fortinet, Inc.** **899 Kifer Road, Sunnyvale, CA 94086, USA**
Standard	:	**47 CFR FCC Part 2 Subpart J, section 2.1091**

The product was received on Jan. 26, 2021, and testing was started from Feb. 05, 2021 and completed on Aug. 20, 2021. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR FCC Part 2 Subpart J, section 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. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. Hsinhua Laboratory
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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Photographs of EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FA111206-03	01	Initial issue of report	Aug. 30, 2021

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

1.1 Information

1.1.1 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 5725-5850	5180-5240 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)

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	Senao	5718A0607300	PIFA	I-Pex
2	Senao	5718A0608300	PIFA	I-Pex
3	Senao	5718A0609300	PIFA	I-Pex
4	Senao	5718A0610300	PIFA	I-Pex
5	Senao	5718A0611300	PIFA	I-Pex
6	Senao	5718A0612300	PIFA	I-Pex
7	Senao	5718A0613300	PIFA	I-Pex
8	Senao	5718A0614300	PIFA	I-Pex
9	Senao	5718A0611300	PIFA	I-Pex
10	Senao	5718A0612300	PIFA	I-Pex
11	Senao	5718A0613300	PIFA	I-Pex
12	Senao	5718A0614300	PIFA	I-Pex
13	Senao	5718A0615300	PIFA	I-Pex
14	Senao	5718A0616300	Dipole	I-Pex

<table>
<tr><th rowspan="2">Ant.</th><th colspan="2">2.4GHz</th><th colspan="3">5GHz</th><th>BT LE
Zigbee</th><th colspan="2" rowspan="2">Remark</th></tr>
<tr><th>Max. Peak Gain(dBi)</th><th>Correlated Gain(dBi)</th><th>Max. Peak Gain(dBi)</th><th colspan="2">Correlated Gain(dBi)</th><th>Antenna Gain(dBi)</th></tr>
<tr><td>1</td><td>4.4</td><td>6.7</td><td rowspan="4">-</td><td colspan="2" rowspan="4">-</td><td rowspan="4">-</td><td colspan="2">Radio 2, 4*4</td></tr>
<tr><td>2</td><td>4.49</td><td>6.7</td><td colspan="2">Radio 2, 4*4</td></tr>
<tr><td>3</td><td>4.32</td><td>6.7</td><td colspan="2">Radio 2, 4*4</td></tr>
<tr><td>4</td><td>4.14</td><td>6.7</td><td colspan="2">Radio 2, 4*4</td></tr>
<tr><td>5</td><td rowspan="8">-</td><td rowspan="8">-</td><td>6.10</td><td rowspan="4">Band1:9.52
Band2:9.01
Band3:7.95
Band4:7.84</td><td rowspan="2">Band1:7.23
Band2:7.18</td><td rowspan="8">-</td><td rowspan="4">Radio 1
8*8
mode</td><td>Radio 1
4*4
mode
Low
Band
mode</td></tr>
<tr><td>6</td><td>6.21</td></tr>
<tr><td>7</td><td>6.11</td></tr>
<tr><td>8</td><td>6.12</td></tr>
<tr><td>9</td><td>6.24</td><td rowspan="4">Band3:6.09
Band4:7.44</td><td rowspan="4">Radio 1
4*4
mode
Hi Band
mode</td></tr>
<tr><td>10</td><td>6.20</td></tr>
<tr><td>11</td><td>6.27</td></tr>
<tr><td>12</td><td>6.13</td></tr>
<tr><td>13</td><td>4.69</td><td>-</td><td>4.60</td><td colspan="2" rowspan="2">-</td><td>-</td><td colspan="2">Radio 3</td></tr>
<tr><td>14</td><td>-</td><td>-</td><td>-</td><td>5.20</td><td colspan="2">BT+ Zigbee</td></tr>
</table>

For 2.4 GHz function:

Radio 2

For IEEE 802.11b/g/n/VHT/ax mode (4TX/4RX)

Ant.1, Ant.2, Ant.3, and Ant.4 could transmit/receive simultaneously.

Radio 3(Scan radio)

For IEEE 802.11b/g/n mode (1TX/1RX)

Only Ant.13 can be used as transmitting/receiving.

For 5 GHz function:

Radio 1

For IEEE 802.11a/n/ac/ax mode (8TX/8RX)

Ant.5, Ant.6, Ant.7, Ant.8, Ant.9, Ant.10, Ant.11 and Ant.12 could transmit/receive simultaneously.

For IEEE 802.11a/n/ac/ax mode (4TX/4RX) (Low Band mode)

Ant.5, Ant.6, Ant.7, and Ant.8 could transmit/receive simultaneously.

For IEEE 802.11a/n/ac/ax mode (4TX/4RX) (Hi Band mode)

Ant.9, Ant.10, Ant.11 and Ant.12 could transmit/receive simultaneously.

Radio 3(Scan radio)

For IEEE 802.11a/n/ac mode (1TX/1RX)

Only Ant.13 can be used as transmitting/receiving.

For Bluetooth function:

For Bluetooth mode (1TX/1RX)
Only Ant.14 can be used as transmitting/receiving.
For Zigbee function:
For Zigbee mode (1TX/1RX)
Only Ant.14 can be used as transmitting/receiving.

1.1.3 Table for Multiple Listing

The brand/model names in the following table are all refer to the identical product.

Brand Name	Model Name	Description
FORTINET	FortiAP 831Fxxxxxx, FAP-831Fxxxxxx, FORTIAP-831Fxxxxxx (where “x” can be “A-Z”, or “0-9”, or “-“, or blank for software purposes or marketing purposes only)	All the models are identical, the difference model for difference brand served as marketing strategy.

1.1.4 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA111206

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

Modifications	Performance Checking
The Zigbee function was added	MPE was evaluated

1.1.5 Accessories

Accessories				
Bracket ceiling mount 1	Brand Name	Senao Networks, Inc.	Model Name	CLIP CEILING 9/16 LFP
Bracket ceiling mount 2	Brand Name	Senao Networks, Inc.	Model Name	CLIP CEILING 15/16 LFP

Reminder: Regarding to more detail and other information, please refer to user manual.

1.2 Testing Location

Test Lab.：Sporton International Inc. Hsinhua Laboratory			
☒	Hsinhua **(TAF:** 3785**)**	**ADD:** No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)	
		TEL: 886-3-327-3456	**FAX:** 886-3-327-0973
Test site Designation No. TW3785 with FCC.			
☐	Wen 33rd.St. **(TAF:** 3785**)**	**ADD:** No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)	
		TEL: 886-3-318-0787	**FAX:** 886-3-318-0287
Test site Designation No. TW0008 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/ cm²)	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 / f²)*	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/ cm²)	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/f²)*	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

Multiple Transmitters Condition
Co-location as simultaneously transmitting (co-transmitting) and the evaluation shall be consider that simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. After sum of the individual value (basic restriction / reference level) are measured/calculated also have to under basic restriction / reference level.
Co-transmitting mode: 1. Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+BT 2. Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+BT 3. Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+BT 4. Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+BT 5. Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+ Zigbee 6. Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+ Zigbee 7. Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+ Zigbee 8. Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+ Zigbee

2.2 MPE Calculation Method

The MPE was calculated at 21 cm to show compliance with the power density limit.
The following formula was used to calculate the Power Density:

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

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

Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+BT

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)
5.2G;D1D;R18T	9.27	26.13	35.40	0.00	35.40	3.46737	21	0.62568	1.00000	0.62568
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
2.4G;D1D;R3	4.69	21.68	26.37	0.00	26.37	0.43351	21	0.07823	1.00000	0.07823
2.4G;BT-LE	5.20	7.10	12.30	0.00	12.30	0.01698	21	0.00306	1.00000	0.00306
									Sum Ratio	0.96900
									Ratio Limit	1

Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+BT

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)
5.2G;D1D;R18T	9.27	26.13	35.40	0.00	35.40	3.46737	21	0.62568	1.00000	0.62568
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
5.8G;D1D;R3	4.60	20.98	25.58	0.00	25.58	0.36141	21	0.06522	1.00000	0.06522
2.4G;BT-LE	5.20	7.10	12.30	0.00	12.30	0.01698	21	0.00306	1.00000	0.00306
									Sum Ratio	0.95599
									Ratio Limit	1

Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+BT

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)
5.2G;D1D;R14T	6.21	25.46	31.67	0.00	31.67	1.46893	21	0.26506	1.00000	0.26506
5.8G;D1D;R14T	6.27	25.85	32.12	0.00	32.12	1.62930	21	0.29400	1.00000	0.29400
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
2.4G;D1D;R3	4.69	21.68	26.37	0.00	26.37	0.43351	21	0.07823	1.00000	0.07823
2.4G;BT-LE	5.20	7.10	12.30	0.00	12.30	0.01698	21	0.00306	1.00000	0.00306
									Sum Ratio	0.90238
									Ratio Limit	1

Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+BT

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)
5.2G;D1D;R14T	6.21	25.46	31.67	0.00	31.67	1.46893	21	0.26506	1.00000	0.26506
5.8G;D1D;R14T	6.27	25.85	32.12	0.00	32.12	1.62930	21	0.29400	1.00000	0.29400
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
5.8G;D1D;R3	4.60	20.98	25.58	0.00	25.58	0.36141	21	0.06522	1.00000	0.06522
2.4G;BT-LE	5.20	7.10	12.30	0.00	12.30	0.01698	21	0.00306	1.00000	0.00306
									Sum Ratio	0.88937
									Ratio Limit	1

Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+Zigbee

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)
5.2G;D1D;R18T	9.27	26.13	35.40	0.00	35.40	3.46737	21	0.62568	1.00000	0.62568
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
2.4G;D1D;R3	4.69	21.68	26.37	0.00	26.37	0.43351	21	0.07823	1.00000	0.07823
2.4G;G1D	5.20	5.54	10.74	0.00	10.74	0.01186	21	0.00214	1.00000	0.00214
									Sum Ratio	0.96808
									Ratio Limit	1

Radio1: WLAN 5G(8*8)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+ Zigbee

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)
5.2G;D1D;R18T	9.27	26.13	35.40	0.00	35.40	3.46737	21	0.62568	1.00000	0.62568
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
5.8G;D1D;R3	4.60	20.98	25.58	0.00	25.58	0.36141	21	0.06522	1.00000	0.06522
2.4G;G1D	5.20	5.54	10.74	0.00	10.74	0.01186	21	0.00214	1.00000	0.00214
									Sum Ratio	0.95507
									Ratio Limit	1

Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 2.4G+Zigbee

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)
5.2G;D1D;R14T	6.21	25.46	31.67	0.00	31.67	1.46893	21	0.26506	1.00000	0.26506
5.8G;D1D;R14T	6.27	25.85	32.12	0.00	32.12	1.62930	21	0.29400	1.00000	0.29400
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
2.4G;D1D;R3	4.69	21.68	26.37	0.00	26.37	0.43351	21	0.07823	1.00000	0.07823
2.4G;G1D	5.20	5.54	10.74	0.00	10.74	0.01186	21	0.00214	1.00000	0.00214
									Sum Ratio	0.90146
									Ratio Limit	1

Radio1: WLAN 5G(4*4 Hi+4*4 Low)+Radio2: WLAN 2.4G+Radio3: WLAN 5G+ Zigbee

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)
5.2G;D1D;R14T	6.21	25.46	31.67	0.00	31.67	1.46893	21	0.26506	1.00000	0.26506
5.8G;D1D;R14T	6.27	25.85	32.12	0.00	32.12	1.62930	21	0.29400	1.00000	0.29400
2.4G;G1D;R2	4.49	27.13	31.62	0.00	31.62	1.45211	21	0.26203	1.00000	0.26203
5.8G;D1D;R3	4.60	20.98	25.58	0.00	25.58	0.36141	21	0.06522	1.00000	0.06522
2.4G;G1D	5.20	5.54	10.74	0.00	10.74	0.01186	21	0.00214	1.00000	0.00214
									Sum Ratio	0.88845
									Ratio Limit	1

————THE END————