



RADIO EXPOSURE TEST REPORT

FCC ID : TVE-241003

Equipment : Secured Wireless Access Point

Brand Name : FORTINET

Model Name : FortiAP 231Kxxxxxxxxx, FAP-231Kxxxxxxxxx,
FORTIAP-231Kxxxxxxxxx
(Please refer to section 0 for detail information.)

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

Manufacturer : Fortinet, Inc.
909 Kifer Road, Sunnyvale, CA 94086, USA

Standard : 47 CFR Part 2.1091

The product was received on Dec. 24, 2024, and testing was started from Jan. 09, 2025 and completed on May 26, 2025. We, Sporton International Inc. Hsinchu 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. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Rex Liao

Sporton International Inc. Hsinchu Laboratory

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History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
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Summary of Test Result

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

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Wendy Pan



1 General Description

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) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850 5725-5895	5180-5250 5250-5320 5500-5720 5745-5825 5815-5885	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
6GHz WLAN	5925-7125	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
Bluetooth	2400-2483.5	2402-2480	LE: GFSK
Zigbee	2400-2483.5	2405-2480	O-QPSK

1.2 Antenna Information

Ant.	Port					Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth / Zigbee	GNSS					
1	2	1	-	-	-	Grand-Tek	1034G00000500	PIFA	MHF I	Note 1
2	1	2	-	-	-	Grand-Tek	1034G00000510	PIFA	MHF I	
3	-	-	1	-	-	Grand-Tek	1033G00000220	PIFA	MHF I	
4	-	-	2	-	-	Grand-Tek	103CG00000560	Alford Loop	MHF I	
5	-	-	-	1	-	Grand-Tek	1039G00000050	PIFA	MHF I	
6	-	-	-	-	1	Grand-Tek	1031G00000330	PATCH	MHF I	

Note 1:

Ant.	Antenna Gain (dBi)												
	WLAN 2.4GHz			WLAN 5GHz					WLAN 6GHz				
	2400 MHz	2450 MHz	2500 MHz	5150 MHz	5350 MHz	5500 MHz	5650 MHz	5850 MHz	5925 MHz	6350 MHz	6550 MHz	6950 MHz	7125 MHz
1	4.7	5	5	5	5.1	5.1	5.1	5.8	-	-	-	-	-
2	4.2	4.2	4.4	5.9	6.1	6.1	5.7	6	-	-	-	-	-
3	-	-	-	-	-	-	-	-	5.3	5.1	5.2	4.9	5.2
4	-	-	-	-	-	-	-	-	6	6	6.1	5.6	5.6

Ant.	Bluetooth /Zigbee			GNSS	
	2400 MHz	2450 MHz	2500 MHz	1575 MHz	1602 MHz
5	3.8	3.4	3.8	-	-
6	-	-	-	4.5	3.6

Note2: The above information was declared by manufacturer.

For 2.4GHz function

For IEEE 802.11 b/g/n/VHT/ax/be (2TX/2RX):

Port 1~2 can be used as transmitting/receiving antenna.

Port 1~2 could transmit/receive simultaneously.

For 5GHz function:

For IEEE 802.11 a/n/ac/ax/be (2TX/2RX):

Port 1~2 can be used as transmitting/receiving antenna.

Port 1~2 could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11 ax/be (2TX/2RX):

Port 1~2 can be used as transmitting/receiving antenna.

Port 1~2 could transmit/receive simultaneously.

For Bluetooth/Zigbee function (1TX/1RX):

Only Port 1 can be used as transmitting antenna.

Note3: Directional gain information

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ss}} \left[\sum_{k=1}^{N_{ANT}} g_{j,k} \right]^2}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ; NSS1(g1,3) = 10^{G3/20} ; NSS1(g1,4) = 10^{G4/20}$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2 / N_{ANT}] \Rightarrow 10$$

$$\log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2 / N_{ANT}]$$

Where ;

For nonTXBF power :

2.4G G1= 5 dBi ;G2= 4.4 dBi ;DG= 5 dBi

5G UNII-1 G1= 5 dBi ;G2= 5.9 dBi ;DG= 5.9 dBi

5G UNII-2A G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 6.1 dBi

5G UNII-2C G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 6.1 dBi

5G UNII-3 G1= 5.8 dBi ;G2= 6 dBi ;DG= 6 dBi

5G UNII-4 G1= 5.8 dBi ;G2= 6 dBi ;DG= 6 dBi

For nonTXBF PSD / TXBF power :

2.4G G1= 5 dBi ;G2= 4.4 dBi ;DG= 7.72 dBi

5G UNII-1 G1= 5 dBi ;G2= 5.9 dBi ;DG= 8.47 dBi

5G UNII-2A G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 8.62 dBi

5G UNII-2C G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 8.62 dBi

5G UNII-3 G1= 5.8 dBi ;G2= 6 dBi ;DG= 8.91 dBi

5G UNII-4 G1= 5.8 dBi ;G2= 6 dBi ;DG= 8.91 dBi



1.3 Table for Multiple Listing

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

Model Name	Description
FortiAP 231Kxxxxxxxxx	All three model names are the same, no difference. The purpose for these three model names is for marketing sales.
FAP-231Kxxxxxxxxx	
FORTIAP-231Kxxxxxxxxx	
(Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)	

Note 1: From the above models, model: FAP-231K was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.4 Accessories

Wall Bracket*1

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2.1091
 - ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01
- The following reference test guidance is not within the scope of accreditation of TAF.
- ♦ 47 CFR Part 1.1307
 - ♦ 47 CFR Part 1.1310

1.6 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
	Test site Designation No. TW3787 with FCC.
	Conformity Assessment Body Identifier (CABID) TW3787 with ISCED.



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 53 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 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= P_{th}.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance

R between the person and the antenna / radiating structure, where $R > \lambda / 2 \pi$.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.
Note: R is in meters, f is in MHz.	



2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.72	28.12	33.69	0.15	2421.029	53	C	5393.3	0.4491
5.2G;D1D	8.47	27.25	33.57	0.27	2421.029	53	C	5393.3	0.4491
5.3G;D1D	8.62	21.31	27.78	0.04	605.341	53	C	5393.3	0.1123
5.6G;D1D	8.62	21.32	27.79	0.03	605.341	53	C	5393.3	0.1123
5.8G;D1D	8.91	27.05	33.81	0.03	2421.029	53	C	5393.3	0.4491
5.81G;D1D	8.91	26.98	33.74	0.10	2421.029	53	C	5393.3	0.4491
6.2G;D1D	6.00	-	25.51	0.50	399.025	53	C	5393.3	0.0740
6.4G;D1D	6.10	-	25.29	0.50	379.315	53	C	5393.3	0.0704
6.7G;D1D	6.10	-	23.06	0.50	226.986	53	C	5393.3	0.0421
7.0G;D1D	5.60	-	21.75	0.50	167.880	53	C	5393.3	0.0311
2.4G;BT-LE	3.80	17.37	19.02	0.50	89.536	53	C	5393.3	0.0166
2.4G;G1D Zigbee	3.80	17.55	19.20	0.50	93.325	53	C	5393.3	0.0173

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz+WLAN 6GHz+Bluetooth

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.72	28.12	33.69	0.15	2421.029	53	C	5393.3	0.4491
5.8G;D1D	8.91	27.05	33.81	0.03	2421.029	53	C	5393.3	0.4491
2.4G;BT-LE	3.80	17.37	19.02	0.50	89.536	53	C	5393.3	0.0166
6.2G;D1D	6.00	-	25.51	0.50	399.025	53	C	5393.3	0.0740
Sum TL Ratio_C	0.9888								
Ratio Limit	1								

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz+WLAN 6GHz+Zigbee

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.72	28.12	33.69	0.15	2421.029	53	C	5393.3	0.4491
5.8G;D1D	8.91	27.05	33.81	0.03	2421.029	53	C	5393.3	0.4491
2.4G;G1D Zigbee	3.80	17.55	19.20	0.50	93.325	53	C	5393.3	0.0173
6.2G;D1D	6.00	-	25.51	0.50	399.025	53	C	5393.3	0.0740
Sum TL Ratio_C	0.9895								
Ratio Limit	1								

————THE END————