

FCC RF EXPOSURE REPORT

FCC ID: TVE-37146T064

Project No. : 1906C186
Equipment : Secured Wireless Access Point
Brand Name : FORTINET
Test Model : FAP-321E
Series Model : FAP-321Exxxxxx, FortiAP 321Exxxxxx, FORTIAP-321Exxxxxx (where "x" can be used as "A-Z" or "0-9" or "-" or blank for software changes or marking purposes only)
Applicant : Fortinet, Inc.
Address : 899 Kifer Road, Sunnyvale, CA 94086 USA
Manufacturer : SHENZHEN TENDA TECHNOLOGY CO.,LTD
Address : 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Date of Receipt : Jun. 28, 2019
Nov. 14, 2019
Date of Test : Jul. 01, 2019 ~ Oct. 10, 2019
Nov. 14, 2019 ~ Dec. 27, 2019
Issued Date : Jan. 09, 2020
Report Version : R00
Test Sample : Engineering Sample No.: DG19062851
Standard(s) : FCC Guidelines for Human Exposure IEEE C95.1 & FCC Part 2.1091
FCC Title 47 Part 2.1091, OET Bulletin 65 Supplement C

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Compared with the previous report (BTL-FCCP-4-1906C186), added the description and test data of UNII-2A & UNII-2C.	Jan. 09, 2020

1. MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

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

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Antenna Specification:

For LE:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Tenda	N/A	PCB	IPEX	4.0

For 2.4G:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Tenda	N/A	Internal	IPEX	3.0
2	Tenda	N/A	Internal	IPEX	3.0
3	Tenda	N/A	Internal	IPEX	3.0

Note: This EUT supports CDD, and all antennas have the same gain,

(1) For Non Beamforming function, Directional gain= G_{ANT} +Array Gain,

For output power measurements, Array Gain=0, so, Directional gain=3.0

For power spectral density measurements, Array Gain= $10\log(N_{ANT}/N_{SS})$ dB

Directional gain=3.0+ $10\log(3/1)$ =7.77. So, the power density limit is 8-7.77+6=6.23

(2) For Beamforming function, Beamforming gain: 4.5dB, so Directional gain=3.0+4.5=7.50

Then, the output Power limit is 30-7.50+6=28.50

For 5G:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Tenda	N/A	Internal	IPEX	4.0
2	Tenda	N/A	Internal	IPEX	4.0
3	Tenda	N/A	Internal	IPEX	4.0

Note: This EUT supports CDD, and all antennas have the same gain,

(1) For Non Beamforming function, Directional gain= G_{ANT} +Array Gain,

For output power measurements, Array Gain=0, so, Directional gain=4.0

For power spectral density measurements, Array Gain= $10\log(N_{ANT}/N_{SS})$ dB

Directional gain=4.0+ $10\log(3/1)$ =8.77.

So, the UNII-1 power density limit is 17-8.77+6=14.23

the UNII-2A&UNII-2C power density limit is 11-8.77+6=8.23

the UNII-3 power density limit is 30-8.77+6=27.23

(2) For Beamforming function, Beamforming gain: 4.5dB, so Directional gain=4.0+4.5=8.50

Then, the UNII-2A&UNII-2C output Power limit is 24-8.50+6=21.50

the UNII-1&UNII-3 output Power limit is 30-8.50+6=27.50

Table for Antenna Configuration:

For 2.4G:

For Non Beamforming:

Operating Mode	TX Mode	3TX
IEEE 802.11b		V (Ant. 1+Ant. 2+Ant. 3)
IEEE 802.11g		V (Ant. 1+Ant. 2+Ant. 3)
IEEE 802.11n(HT20)		V (Ant. 1+Ant. 2+Ant. 3)
IEEE 802.11n(HT40)		V (Ant. 1+Ant. 2+Ant. 3)

For Beamforming:

Operating Mode	TX Mode	3TX
IEEE 802.11n(HT20)		V (Ant. 1+Ant. 2+Ant. 3)
IEEE 802.11n(HT40)		V (Ant. 1+Ant. 2+Ant. 3)

For 5G:

For Non Beamforming:

Operating Mode	TX Mode	3TX
IEEE 802.11a		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11n (HT20)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11n (HT40)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT20)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT40)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT80)		V (Ant. 1 + Ant. 2 + Ant. 3)

For Beamforming:

Operating Mode	TX Mode	3TX
IEEE 802.11n (HT20)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11n (HT40)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT20)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT40)		V (Ant. 1 + Ant. 2 + Ant. 3)
IEEE 802.11ac (VHT80)		V (Ant. 1 + Ant. 2 + Ant. 3)

2. TEST RESULTS

For LE:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Peak Output Power (dBm)	Max. Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.0	2.5119	4.19	2.6242	0.00084	1	Complies

For 2.4GHz_Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.0	1.9953	29.99	997.7001	0.25359	1	Complies

For 2.4GHz_Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
7.50	5.6234	28.36	685.4882	0.49106	1	Complies

For 5GHz UNII-1_Non Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.0	2.5119	25.42	348.3373	0.11146	1	Complies

For 5GHz UNII-1_Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8.50	7.0795	23.63	230.6747	0.20803	1	Complies

For 5GHz UNII-2A_Non Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.0	2.5119	23.90	245.4709	0.12273	1	Complies

For 5GHz UNII-2A_Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8.50	7.0795	20.41	109.9006	0.15486	1	Complies

For 5GHz UNII-2C_Non Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.0	2.5119	23.90	245.4709	0.12273	1	Complies

For 5GHz UNII-2C_Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8.50	7.0795	21.49	140.9289	0.19859	1	Complies

For 5GHz UNII-3_Non Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.0	2.5119	29.96	990.8319	0.31705	1	Complies

For 5GHz UNII-3_Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8.50	7.0795	27.49	561.0480	0.50598	1	Complies

For the max simultaneous transmission MPE:

Power Density (S) (mW/cm ²)	Power Density (S) (mW/cm ²)	Power Density (S) (mW/cm ²)	Total	Limit of Power Density (S) (mW/cm ²)	Test Result
LE	2.4GHz	5GHz			
0.00084	0.49106	0.50598	0.99788	1	Complies

Note: The calculated distance is 25 cm.

End of Test Report