

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