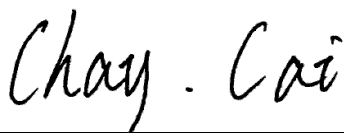


# FCC RF EXPOSURE REPORT

## FCC ID: TVE-120757

**Project No.** : 1909C046  
**Equipment** : PCIEV1.0-FRT01 WLAN 802.11AC 3x3 PCIE Module  
**Brand Name** : FORTINET  
**Test Model** : P25037-01  
**Series Model** : N/A  
**Applicant** : Fortinet, Inc.  
**Address** : 899 Kifer Road, Sunnyvale, CA 94086 USA  
**Manufacturer** : Fortinet, Inc.  
**Address** : 899 Kifer Road, Sunnyvale, CA 94086 USA  
**Date of Receipt** : Sep. 11, 2019  
**Date of Test** : Sep. 12, 2019 ~ Nov. 07, 2019  
**Issued Date** : Dec. 13, 2019  
**Report Version** : R00  
**Test Sample** : Engineering Sample No.: DG2019091147  
**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.



Prepared by : Chay Cai



Approved by : Ethan Ma



Certificate #5123.02

Add: No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

Tel: +86-769-8318-3000

Web: [www.newbtl.com](http://www.newbtl.com)

**REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue	Dec. 13, 2019

## 1. MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

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

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

Table for Filed Antenna

**For 2.4G:**

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1		W1800R	Dipole	SMA Male Reverse	4.16
2		W1800R	Dipole	SMA Male Reverse	4.16
3		W1800R	Dipole	SMA Male Reverse	4.16

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

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

For output power measurements, Array Gain = 0 ( $N_{ANT} \leq 4$ ), so the Directional gain = 4.16.




For power spectral density measurements, Array Gain =  $10\log(N_{ANT}/N_{SS})$  dB, so the Directional gain =  $4.16 + 10\log(3/1) = 8.93$ . So, the power density limit is  $8 - 8.93 + 6 = 5.07$ .

(2) For Beamforming function, Beamforming gain: 4.5dB,

so the Directional gain =  $4.16 + 4.5 = 8.66$ , Then, the output Power limit is  $30 - 8.66 + 6 = 27.34$ .

**For 5G:**




For UNII-1:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1		W1800R	Dipole	SMA Male Reverse	3.06
2		W1800R	Dipole	SMA Male Reverse	3.06
3		W1800R	Dipole	SMA Male Reverse	3.06

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

- (1) For Non Beamforming function, Directional gain= $G_{ANT} + \text{Array Gain}$ ,  
For output power measurements, Array Gain=0 ( $N_{ANT} \leq 4$ ), so, Directional gain=3.06  
For power spectral density measurements, Array Gain= $10\log(N_{ANT}/N_{SS})$  dB  
Directional gain= $3.06 + 10\log(3/1) = 7.83$ .  
So, the UNII-1 power density limit is  $17 - 7.83 + 6 = 15.17$
- (2) For Beamforming function, Beamforming gain: 4.5dB,  
so the Directional gain= $3.06 + 4.5 = 7.56$ , Then, the UNII-1 output Power limit is  $30 - 7.56 + 6 = 28.44$ .

For UNII-3:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1		W1800R	Dipole	SMA Male Reverse	3.58
2		W1800R	Dipole	SMA Male Reverse	3.58
3		W1800R	Dipole	SMA Male Reverse	3.58

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

- (1) For Non Beamforming function, Directional gain= $G_{ANT} + \text{Array Gain}$ ,  
For output power measurements, Array Gain=0 ( $N_{ANT} \leq 4$ ), so, Directional gain=3.58  
For power spectral density measurements, Array Gain= $10\log(N_{ANT}/N_{SS})$  dB  
Directional gain= $3.58 + 10\log(3/1) = 8.35$ .  
So, the UNII-3 power density limit is  $30 - 8.35 + 6 = 27.65$ .
- (2) For Beamforming function, Beamforming gain: 4.5dB,  
so the Directional gain= $3.58 + 4.5 = 8.08$ , Then, the UNII-3 output Power limit is  $30 - 8.08 + 6 = 27.92$

The worst case for 3TX as follow:

#### 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 2.4GHz\_Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
4.16	2.6062	29.67	926.8298	0.30770	1	Complies

For 2.4GHz\_With Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
8.66	7.3451	26.33	429.5364	0.40191	1	Complies

For 5GHz UNII-1\_Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
3.06	2.0230	26.58	454.9881	0.11725	1	Complies

For 5GHz UNII-1\_Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
7.56	5.7016	26.39	435.5119	0.31632	1	Complies

For 5GHz UNII-3\_Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
3.58	2.2803	29.24	839.4600	0.24385	1	Complies

For 5GHz UNII-3\_Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
8.08	6.4269	27.11	514.0437	0.42085	1	Complies

**For the max simultaneous transmission MPE:**

Power Density (S) (mW/cm <sup>2</sup> )	Power Density (S) (mW/cm <sup>2</sup> )	Total	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
2.4GHz	5GHz			
0.40191	0.42085	0.82276	1	Complies

Note: The calculated distance is 25 cm.

**End of Test Report**