# RF Exposure Report

| | |
|---|---|
| **Report No.:** | MFBERD-WTW-P22090179-1 |
| **FCC ID:** | TVE-391CBE0291 |
| **Test Model:** | FAP-U231G |
| **Series Model:** | FortiAP U231Gxxxxxx, FAP-U231Gxxxxxx, FORTIAP-U231Gxxxxxx (Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only) |
| **Received Date:** | 2022/9/6 |
| **Issued Date:** | 2023/3/21 |
| **Applicant:** | Fortinet, Inc. |
| **Address:** | 899 Kifer Rd. Sunnyvale CA. 94086 United States |
| **Issued By:** | Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch<br>Lin Kou Laboratories |
| **Lab Address:** | No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan |
| **Test Location:** | No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kewi Shan Dist., Taoyuan City 33383, Taiwan |
| **FCC Registration / Designation Number:** | 788550 / TW0003 |

Testing Laboratory
2021

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## Release Control Record

| Issue No. | Description | Date Issued |
|---|---|---|
| MFBERD-WTW-P22090179-1 | Original release | 2023/3/21 |

## 1 Certificate of Conformity

| | |
|---|---|
| **Product:** | Secured Wireless Access Point |
| **Brand:** | FORTINET |
| **Test Model:** | FAP-U231G |
| **Series Model:** | FortiAP U231Gxxxxxx, FAP-U231Gxxxxxx, FORTIAP-U231Gxxxxxx (Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only) |
| **Sample Status:** | Engineering sample |
| **Applicant:** | Fortinet, Inc. |
| **FCC Rule Part:** | FCC Part 2 (Section 2.1091) |
| **Standards:** | KDB 447498 D01 General RF Exposure Guidance v06 |

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :** Pettie Chen , **Date:** 2023/3/21

Pettie Chen / Senior Specialist

**Approved by :** Jeremy Lin , **Date:** 2023/3/21

Jeremy Lin / Project Engineer

## 2 RF Exposure

### 2.1 Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Average Time (minutes) |
|---|---|---|---|---|
| Limits For General Population / Uncontrolled Exposure | | | | |
| 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 |

f = Frequency in MHz; *Plane-wave equivalent power density

### 2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$
where
Pd = power density in $mW/cm^2$
Pout = output power to antenna in mW
G = gain of antenna in linear scale
pi = 3.1416
r = distance between observation point and center of the radiator in cm

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 23cm away from the body of the user. So, this device is classified as **Mobile Device**.

## 3 Calculation Result of Maximum Conducted Power

| Frequency Band (MHz) | Max AV Power (dBm) | Antenna Gain (dBi) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| Radio 1 | | | | | |
| CDD Mode | | | | | |
| 2412-2462 | 25.94 | 3.89 | 23 | 0.145 | 1 |
| 5500-5720 | 23.61 | 5.75 | 23 | 0.130 | 1 |
| 5745-5825 | 26.40 | 5.78 | 23 | 0.249 | 1 |
| Beamforming Mode | | | | | |
| 2412-2462 | 21.02 | 6.87 | 23 | 0.093 | 1 |
| 5500-5720 | 21.35 | 8.62 | 23 | 0.149 | 1 |
| 5745-5825 | 26.40 | 8.67 | 23 | 0.483 | 1 |
| Radio 2 | | | | | |
| CDD Mode | | | | | |
| 5180-5240 | 25.53 | 5.19 | 23 | 0.178 | 1 |
| 5260-5320 | 23.18 | 4.93 | 23 | 0.097 | 1 |
| 5500-5720 | 23.70 | 5.56 | 23 | 0.127 | 1 |
| 5745-5825 | 24.61 | 5.59 | 23 | 0.158 | 1 |
| Beamforming Mode | | | | | |
| 5180-5240 | 25.53 | 7.94 | 23 | 0.334 | 1 |
| 5260-5320 | 22.13 | 7.85 | 23 | 0.150 | 1 |
| 5500-5720 | 21.43 | 8.56 | 23 | 0.150 | 1 |
| 5745-5825 | 24.51 | 8.43 | 23 | 0.296 | 1 |

| Frequency Band (MHz) | Max AV Power (dBm) | Antenna Gain (dBi) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|---|
| Radio 3 | | | | | |
| CDD Mode | | | | | |
| 2412-2462 | 25.42 | 3.78 | 23 | 0.125 | 1 |
| 5180-5240 | 26.27 | 5.47 | 23 | 0.225 | 1 |
| 5260-5320 | 23.46 | 5.28 | 23 | 0.113 | 1 |
| 5500-5720 | 23.81 | 5.78 | 23 | 0.137 | 1 |
| 5745-5825 | 26.60 | 5.42 | 23 | 0.240 | 1 |
| Beamforming Mode | | | | | |
| 2412-2462 | 22.31 | 6.78 | 23 | 0.122 | 1 |
| 5180-5240 | 26.27 | 7.78 | 23 | 0.382 | 1 |
| 5260-5320 | 22.03 | 7.93 | 23 | 0.149 | 1 |
| 5500-5720 | 21.17 | 8.79 | 23 | 0.149 | 1 |
| 5745-5825 | 26.60 | 8.38 | 23 | 0.474 | 1 |
| BT | | | | | |
| 2402-2482 | 9.23 | 3.96 | 23 | 0.003 | 1 |
| Zigbee | | | | | |
| 2405-2480 | 17.88 | 3.96 | 23 | 0.023 | 1 |

| Frequency Band (MHz) | EIRP (dBm) | Distance (cm) | Power Density ($mW/cm^2$) | Limit ($mW/cm^2$) |
|---|---|---|---|---|
| CDD Mode | | | | |
| 5955-6415 | 24.11 | 23 | 0.039 | 1 |
| 6435-6525 | 23.62 | 23 | 0.035 | 1 |
| 6525-6875 | 23.87 | 23 | 0.037 | 1 |
| 6875-7115 | 23.66 | 23 | 0.035 | 1 |
| Beamforming Mode | | | | |
| 5955-6415 | 23.84 | 23 | 0.036 | 1 |
| 6435-6525 | 23.41 | 23 | 0.033 | 1 |
| 6525-6875 | 23.84 | 23 | 0.036 | 1 |
| 6875-7115 | 23.63 | 23 | 0.035 | 1 |

Note:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2.4G:
Radio 1: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.87 dBi
Radio 3: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 6.78 dBi
5.0G
Radio 1:
5500-5720 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.62 dBi
5745-5825 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.67 dBi
Radio 2:
5180-5240 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 7.94 dBi
5260-5320 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 7.85 dBi
5500-5720 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.56 dBi
5745-5825 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.43 dBi
Radio 3:
5180-5240 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 7.78 dBi
5260-5320 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 7.93 dBi
5500-5720 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.79 dBi
5745-5825 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.38 dBi
6GHz:
5955-6415 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.62 dBi
6435-6525 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.30 dBi
6525-6875 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.76 dBi
6875-7115 MHz: Directional gain = 10 log[$(10^{Chain0/20} + 10^{Chain1/20})^2$ / 2] = 8.72 dBi

**Conclusion:**

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

| No | Mode |
|---|---|
| 1 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 2.4GHz radio (Radio 3) + BLE<br>= 0.145 + 0.334 + 0.125 + 0.003 = 0.607 |
| 2 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 2.4GHz radio (Radio 3) + Zigbee<br>= 0.145 + 0.334 + 0.125 + 0.023 = 0.627 |
| 3 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 5GHz radio (Radio 3) + BLE<br>= 0.145 + 0.334 + 0.474 + 0.003 = 0.956 |
| 4 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 5GHz radio (Radio 3) + Zigbee<br>= 0.145 + 0.334 + 0.474 + 0.023 = 0.976 |
| 5 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 6GHz radio (Radio 3) + BLE<br>= 0.145 + 0.334 + 0.039 + 0.003 = 0.521 |
| 6 | 2.4GHz radio (Radio 1) + 5GHz radio (Radio 2) + 6GHz radio (Radio 3) + Zigbee<br>= 0.145 + 0.334 + 0.039 + 0.023 = 0.541 |
| 7 | 5GHz radio (Radio 1) + 5GHz radio (Radio 2) + 2.4GHz radio (Radio 3) + BLE<br>= 0.483 + 0.334 + 0.125 + 0.003 = 0.945 |
| 8 | 5GHz radio (Radio 1) + 5GHz radio (Radio 2) + 2.4GHz radio (Radio 3) + Zigbee<br>= 0.483 + 0.334 + 0.125 + 0.023 = 0.965 |

Therefore the maximum calculations of above situations are less than the “1” limit.

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