

# FCC RF EXPOSURE REPORT

## FCC ID: 2ACFN-QMIROP201W

**Project No.** : 2005H054  
**Equipment** : AI-Powered NAS with Tri-Band Mesh WiFi Router  
**Brand Name** : QNAP  
**Test Model** : QMiroPlus-201W  
**Series Model** : N/A  
**Applicant** : QNAP Systems, Inc.  
**Address** : 2F, No. 22, Zhongxing Road, Xizhi District., New Taipei City, Taiwan, 221  
**Manufacturer** : QNAP Systems, Inc.  
**Address** : 2F, No. 22, Zhongxing Rd, Xizhi Dist., New Taipei City, 221, Taiwan  
**Factory** : CIG Shanghai Co., Ltd., Shanghai Branch.  
**Address** : F/2, 3 Building 1, No. 505 Jiangyue Road, Minhang District, Shanghai, P.R. China  
**Date of Receipt** : Jun. 01, 2020  
**Date of Test** : Jun. 01, 2020 ~ Jul. 01, 2020  
**Issued Date** : Sep. 04, 2020  
**Report Version** : R00  
**Test Sample** : Engineering Sample No.: SH2020060215, SH2020060213-4  
**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            | Original Issue | Sep. 04, 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

# Table for Filed Antenna

For 2.4G

## 1. Antenna Specification:

| Ant. | Brand      | Model Name | Antenna Type | Connector | Gain (dBi) | Note |
|------|------------|------------|--------------|-----------|------------|------|
| 1    | GALTRONICS | N/A        | PCB          | N/A       | 2.54       | N/A  |
| 2    | GALTRONICS | N/A        | PCB          | N/A       | 2.62       | N/A  |

Note:

This EUT supports CDD, all antenna gains are not equal, so Directional gain =  $10\log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi,

(1) CDD:

For power spectral density measurements, Directional gain =  $10\log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi. that is Directional gain =  $10\log [(10^{2.54/20} + 10^{2.62/20})^2 / 2] = 5.59$

For power measurements, Directional gain =  $G_{ANT\ MAX} + \text{Array Gain}$ , Array Gain = 0 dB ( $N_{ANT} \leq 4$ ), so the Directional gain = 2.62

(2) Beamforming:

Directional gain =  $10\log [(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi =  $10\log [(10^{2.54/20} + 10^{2.62/20})^2 / 2] = 5.59$

## 2. Table for Antenna Configuration:

For CDD

| Operating Mode<br>TX Mode | 1TX                  | 2TX                 |
|---------------------------|----------------------|---------------------|
| 802.11b                   | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |
| 802.11g                   | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |
| 802.11n(20 MHz)           | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |
| 802.11n(40 MHz)           | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |
| 802.11ac(20 MHz)          | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |
| 802.11ac(40 MHz)          | V (Ant. 1 or Ant. 2) | V (Ant. 1 + Ant. 2) |

For Beamforming

| Operating Mode<br>TX Mode | 2TX                 |
|---------------------------|---------------------|
| 802.11b                   | V (Ant. 1 + Ant. 2) |
| 802.11g                   | V (Ant. 1 + Ant. 2) |
| 802.11n(20 MHz)           | V (Ant. 1 + Ant. 2) |
| 802.11n(40 MHz)           | V (Ant. 1 + Ant. 2) |
| 802.11ac(20 MHz)          | V (Ant. 1 + Ant. 2) |
| 802.11ac(40 MHz)          | V (Ant. 1 + Ant. 2) |

For 5G

#### 1. Antenna Specification:

| Ant. | Brand      | Model Name | Antenna Type | Connector | Gain (dBi) | Note |
|------|------------|------------|--------------|-----------|------------|------|
| 1    | GALTRONICS | N/A        | PCB          | N/A       | 4.56       | N/A  |
| 2    | GALTRONICS | N/A        | PCB          | N/A       | 4.39       | N/A  |

Note:

This EUT supports Beamforming and CDD, all antennas have unequal gains, any transmit signals are correlated with each other, so

##### 1.) Beamforming:

Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] \text{dBi}$ ,

that is Directional gain =  $10\log[(10^{4.56/20} + 10^{4.39/20})^2 / 2] \text{dBi} = 7.49$ ;

Then, the UNII-1, UNII-3 output power limit is  $30 - (7.49 - 6) = 28.51$ ,

the UNII-2A, UNII-2C output power limit is  $24 - (7.49 - 6) = 22.51$ .

The UNII-1 power spectral density limit is  $17 - (7.49 - 6) = 15.51$ ,

the UNII-2A, UNII-2C power spectral density limit is  $11 - (7.49 - 6) = 9.51$ ,

the UNII-3 power spectral density limit is  $30 - (7.49 - 6) = 28.51$ .

##### 2.) CDD:

For power spectral density measurements, the Directional gain =  $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] \text{dBi}$ ,

that is Directional gain =  $10\log[(10^{4.56/20} + 10^{4.39/20})^2 / 2] \text{dBi} = 7.49$ ;

Then, the UNII-1 power spectral density limited is  $17 - (7.49 - 6) = 15.51$ ,

the UNII-2A, UNII-2C power spectral density limit is  $11 - (7.49 - 6) = 9.51$ ,

the UNII-3 power spectral density limit is  $30 - (7.49 - 6) = 28.51$ .

For power measurements, Directional gain =  $G_{ANT \text{ MAX.}} + \text{Array Gain}$ . Array Gain =  $0 \text{dB}$  ( $N_{ANT} \leq 4$ ), so the Directional gain =  $4.56$ .

#### 2. Table for Antenna Configuration:

For CDD

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

For Beamforming

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

## 2. TEST RESULTS

For BLE

| 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 |
|------------------------|----------------------------|-------------------------|------------------------|-----------------------------------------|--------------------------------------------------|-------------|
| 3.42                   | 2.19790                    | 6                       | 3.9811                 | 0.00170                                 | 1                                                | Complies    |

For 2.4GHz CDD:

| 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 |
|------------------------|----------------------------|-------------------------|------------------------|-----------------------------------------|--------------------------------------------------|-------------|
| 2.62                   | 1.82810                    | 28                      | 630.9573               | 0.22950                                 | 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 |
|------------------------|----------------------------|-------------------------|------------------------|-----------------------------------------|--------------------------------------------------|-------------|
| 5.59                   | 3.62240                    | 26.5                    | 446.6836               | 0.32190                                 | 1                                                | Complies    |

For 5GHz CDD:

| 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 |
|------------------------|----------------------------|-------------------------|------------------------|-----------------------------------------|--------------------------------------------------|-------------|
| 4.56                   | 2.85760                    | 26                      | 398.1072               | 0.22630                                 | 1                                                | Complies    |

For 5GHz 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 |
|------------------------|----------------------------|-------------------------|------------------------|-----------------------------------------|--------------------------------------------------|-------------|
| 7.49                   | 5.61050                    | 26                      | 398.1072               | 0.44440                                 | 1                                                | Complies    |

For the max simultaneous transmission MPE:

| Power Density (S) (mW/cm <sup>2</sup> ) | 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                                    | BLE                                     |       |                                                  |             |
| 0.32190                                 | 0.44440                                 | 0.0017                                  | 0.768 | 1                                                | Complies    |

Note:

(1) The evaluated distance is 20cm.

**End of Test Report**