

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 TX Mode	1TX	2TX
	802.11b	V (Ant. 1 or 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 TX Mode	2TX
	802.11b
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 ²)	Limit of Power Density (S) (mW/cm ²)	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 ²)	Limit of Power Density (S) (mW/cm ²)	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 ²)	Limit of Power Density (S) (mW/cm ²)	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 ²)	Limit of Power Density (S) (mW/cm ²)	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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
7.49	5.61050	26	398.1072	0.44440	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
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