FCC RF EXPOSURE REPORT

FCC ID: 2ACFN-QMIROP201W

Project No.	:	2004H039
Equipment	:	Tri-Band Mesh WiFi Satellite
Brand Name	:	QNAP
Test Model	:	QMiro-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	:	May. 25, 2020
Date of Test	:	May. 25, 2020~Jun. 17, 2020
Issued Date	:	Sep. 04, 2020
Report Version	:	R00
Test Sample	:	Engineering Sample No.: SH20200528127 for radiated; SH2020051457 for conducted; SH2020051457-1 for adapter.
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:

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

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

1.Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	GALTRONICS	N/A	PCB	N/A	4.6	N/A
2	GALTRONICS	N/A	PCB	N/A	2.7	N/A

Note:

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

(1) CDD:

For power spectral density measurements, Directional gain = 10log $[(10^{G1/20}+10^{G2/20}+...10^{GN/20})^2/N]$dBi.
that isDirectional gain = 10log $[(10^{2.54/20}+10^{2.62/20})^2/2]$=6.71

For power measurements, Directional gain =$G_{ANT\ MAX}$ +Array Gain , Array Gain =
0 dB ($N_{ANT} \leq 4$),so the Directional gain=4.6

(2) Beamforming:

Directional gain =10log $[(10^{G1/20}+10^{G2/20}+...10^{GN/20})^2/N]$dBi= 10log $[(10^{2.54/20}+10^{2.62/20})^2/2]$=6.71

2.Table for Antenna Configuration:

For CDD

Operating Mode / 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 / 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	4.9	N/A
2	GALTRONICS	N/A	PCB	N/A	6	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 = $10\log[(10^{G1/20}+10^{G2/20}+\ldots.+10^{GN/20})^2/N_{ANT}]$dBi,
that is Directional gain=$10\log[(10^{4.56/20}+10^{4.39/20})^2/2]$dBi =8.48;
Then, the UNII-1, UNII-3 output power limit is 30-(8.48-6)=27.52,
the UNII-2A,UNII-2C output power limit is 24-(8.48-6)=21.52.
The UNII-1 power spectral density limit is 17-(8.48-6)=14.52,
the UNII-2A,UNII-2C power spectral density limit is 11-(8.48-6)=8.52,
the UNII-3 power spectral density limit is 30-(8.48-6)=27.52.
2.) CDD:
For power spectral density measurements, the Directional gain=$10\log[(10^{G1/20}+10^{G2/20}+\ldots.+10^{GN/20})^2/N_{ANT}]$dBi,
that is Directional gain=$10\log[(10^{4.56/20}+10^{4.39/20})^2/2]$dBi =8.48;
Then, the UNII-1 power spectral density limited is 17-(8.48-6)=14.52,
the UNII-2A,UNII-2C power spectral density limit is 11-(8.48-6)=8.52,
the UNII-3 power spectral density limit is 30-(8.48-6)=27.52.
For power meansurements, Directional gain= $G_{ANT\ MAX.}$+Array Gain.Array Gain=0dB($N_{ANT}\leq 4$), so the Directional gain=6.

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/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2.3	1.69820	5.5	3.5481	0.00110	1	Complies

For 2.4GHz CDD:

Directional gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
4.6	2.8840	28	630.9573	0.32840	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/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
6.71	4.6881	27.5	562.3413	0.47570	1	Complies

For 5GHz UNII-1 CDD:

Directional gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
6	3.9811	26	398.1072	0.28600	1	Complies

For 5GHz With Beamforming:

Directional gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
8.48	7.0469	25.5	354.8134	0.45120	1	Complies

For the max simultaneous transmission MPE:

Power Density (S) (mW/cm²)	Power Density (S) (mW/cm²)	Power Density (S) (mW/cm²)	Total	Limit of Power Density (S) (mW/cm²)	Test Result
2.4GHz	5GHz	BLE			
0.4757	0.4512	0.0011	0.928	1	Complies

Note:
(1) The evaluated distance is 21cm.

End of Test Report