

FCC RF EXPOSURE REPORT

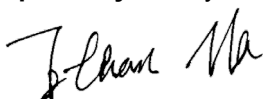
FCC ID: TE7AX20V1

Project No. : 1907C233A
Equipment : AX1800 Wi-Fi 6 Router
Brand Name : tp-link
Test Model : Archer AX20
Series Model : N/A
Applicant : TP-Link Technologies Co., Ltd.
Address : Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China
Manufacturer : TP-Link Technologies Co., Ltd.
Address : Building 24(floors1,3,4,5) and 28(floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China
Date of Receipt : Jan. 15, 2020
Date of Test : Jan. 15, 2020 ~ Mar. 13, 2020
Issued Date : Mar. 19, 2020
Report Version : R00
Test Sample : Engineering Sample No.: DG2020011473 for conducted, DG2020030638 for radiated.
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	Mar. 19, 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

Antenna Specification:

For 2.4GHz:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1		3101502557	Dipole	Weld	3.82
2		3101502647	Dipole	Weld	3.82

Note:

This EUT supports CDD, and all antennas have the same gain, Directional gain = G_{ANT} +Array Gain, where Array Gain is as follows:

- For Non Beamforming Function, Directional gain = G_{ANT} + Array Gain = $10 \log (N_{ANT}/ N_{SS})$ dB
For the power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the Directional gain=3.82.
For power spectral density measurements, $N_{ANT} = 2$, $N_{SS} = 1$. Then Directional gain = G_{ANT} + Array Gain = $10 \log (N_{ANT}/ N_{SS})$ dB = $3.82+10\log(2/1)$ dB=6.83. So the power spectral density limit is $8-(6.83-6)=7.17$.
- For Beamforming Function, Beamforming Gain: 3.01 dB. Then Directional gain = $3.01+3.82=6.83$. So the output power limit is $30-(6.83-6)=29.17$. The power spectral density limit is $8-(6.83-6)=7.17$.

For 5GHz:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)	Note
1		3101502648	Dipole	I-PEX	4.37	UNII-1
2		3101502649	Dipole	I-PEX	4.37	UNII-1
1		3101502648	Dipole	I-PEX	5.80	UNII-3
2		3101502649	Dipole	I-PEX	5.80	UNII-3

Note:

This EUT supports CDD, and all antennas have the same gain, Directional gain = G_{ANT} +Array Gain, where Array Gain is as follows:

- For Non Beamforming Function,
For power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the UNII-1 Directional gain=4.37, the UNII-3 Directional gain=5.80.
For power spectral density measurements, $N_{ANT} = 2$, $N_{SS} = 1$.
The UNII-1 Directional gain = G_{ANT} + Array Gain = $10 \log (N_{ANT}/ N_{SS})$ dB = $4.37+10\log(2/1)$ dB=7.38, the UNII-3 Directional gain = G_{ANT} + Array Gain = $10 \log (N_{ANT}/ N_{SS})$ dB = $5.80+10\log(2/1)$ dB=8.81.
So the UNII-1 power spectral density limit is $17-(7.38-6)=15.62$, the UNII-3 power spectral density limit is $30-(8.81-6)=27.19$.
- For Beamforming Function, Beamforming Gain: 3.01 dB.
Then the UNII-1 Directional gain = $4.37+3.01=7.38$, the UNII-3 Directional gain = $5.80+3.01=8.81$.
So the UNII-1 output power limit is $30-(7.38-6)=28.62$, the UNII-3 output power limit is $30-(8.81-6)=27.19$.
the UNII-1 power spectral density limit is $17-(7.38-6)=15.62$, the UNII-3 power spectral density limit is $30-(8.81-6)=27.19$.

Table for Antenna Configuration:

For 2.4GHz:

For Non Beamforming Function:

Operating Mode	TX Mode	2TX
IEEE 802.11b		V (Ant. 1 + Ant. 2)
IEEE 802.11g		V (Ant. 1 + Ant. 2)
IEEE 802.11n (HT20)		V (Ant. 1 + Ant. 2)
IEEE 802.11n (HT40)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW20)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW40)		V (Ant. 1 + Ant. 2)

For Beamforming Function:

Operating Mode	TX Mode	2TX
IEEE 802.11n (HT20)		V (Ant. 1 + Ant. 2)
IEEE 802.11n (HT40)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW20)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW40)		V (Ant. 1 + Ant. 2)

For 5GHz:

For Non Beamforming Function:

Operating Mode	TX Mode	2TX
IEEE 802.11a		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)
IEEE 802.11ax (HEW20)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW40)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW80)		V (Ant. 1 + Ant. 2)

For Beamforming Function:

Operating Mode	TX Mode	2TX
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)
IEEE 802.11ax (HEW20)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW40)		V (Ant. 1 + Ant. 2)
IEEE 802.11ax (HEW80)		V (Ant. 1 + Ant. 2)

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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.82	2.4099	29.97	993.1160	0.30488	1	Complies

For 2.4GHz_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
6.83	4.8084	28.92	779.8301	0.47877	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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
4.37	2.7353	28.20	660.6934	0.23021	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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
5.80	3.8019	29.82	959.4006	0.46465	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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
7.38	5.4702	28.25	668.3439	0.46573	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 ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
8.81	7.6033	27.14	517.6068	0.50134	1	Complies

For the max simultaneous transmission MPE:

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			
0.47877	0.50134	0.98011	1	Complies

Note: The calculated distance is 25 cm.

End of Test Report