FCC RF EXPOSURE REPORT

FCC ID: TE7EC330G5U

Project No.	**: 1808C222**
Equipment	**: AC1900 Wireless Dual Band Gigabit Router**
Test Model	**: EC330-G5u**
Series Model	**: N/A**
Applicant	**: TP-Link Technologies Co., Ltd.**
Address	**: Building 24 (floors 1,3,4,5) and 28 (floors1-4), Central Science and Technology Park,Nanshan Shenzhen, 518057 China**
According:	**: FCC Guidelines for Human Exposure IEEE C95.1 & FCC Part 2.1091**

BTL INC.

No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000

Certificate #5123.02

1. GENERAL SUMMARY

Equipment	:	AC1900 Wireless Dual Band Gigabit Router
Brand Name	:	tp-link
Test Model	:	EC330-G5u
Series Model	:	N/A
Applicant	:	TP-Link Technologies Co., Ltd.
Manufacturer	:	TP-Link Technologies Co., Ltd.
Address	:	Building 24 (floors 1,3,4,5) and 28 (floors1-4), Central Science and Technology Park, Nanshan Shenzhen, 518057 China
Date of Test	:	Aug. 28, 2018 ~ Nov. 14, 2018
Test Sample	:	Engineering Sample No.: D180807220
Standards	:	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.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-3-1808C222) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2. 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:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1	TP-LINK	3101501579	Dipole	I-PEX	1.98
2	TP-LINK	3101501578	Dipole	I-PEX	1.98
3	TP-LINK	3101501578	Dipole	I-PEX	1.98
4	TP-LINK	3101501724	PCB	IPEX	1.95

Note: This EUT supports MIMO 4X4, any transmit signals are correlated with each other, so Directional gain $=10\log[(10^{G1/20}+10^{G2/20}+...10^{GN/20})^2/N]$dBi,
that is Directional gain$=10\log[(10^{1.98/20}+10^{1.98/20}+10^{1.98/20}+10^{1.95/20})^2/4]$dBi $=7.99$.
So, the average output power limit is 30-7.99+6=28.01,
the power density limit is 8-7.99+6=6.01.

For 5G:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1	TP-LINK	3101501579	Dipole	I-PEX	1.98
2	TP-LINK	3101501578	Dipole	I-PEX	1.98
3	TP-LINK	3101501578	Dipole	I-PEX	1.98
4	TP-LINK	3101501724	PCB	IPEX	1.84

Note: This EUT supports MIMO 4X4, any transmit signals are correlated with each other,So,

(1) For Non Beamforming function,

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

that is Directional gain=10log[$(10^{1.98/20}+10^{1.98/20}+10^{1.98/20}+10^{1.84/20})^2$/4]dBi=7.97dBi.

For UNII-1, the output power limit is 30-7.97+6=28.03,

the power density limit is 17-7.97+6=15.03.

For UNII-3, the output power limit is 30-7.97+6=28.03,

the power density limit is 30-7.97+6=28.03.

(2) For Beamforming function, Beamforming gain: 6.02dBi.

So Directional gain=6.02+1.98=8dBi.

For UNII-1, the output power limit is 30-8+6=28.00,

the power density limit is 17-8+6=15.00 .

For UNII-3, the output power limit is 30-8+6=28.00,

the power density limit is 30-8+6=28.00 .

For 2.4G:

The worst case for 4TX as follow:

Operating Mode / TX Mode	4TX
802.11b	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11g	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11n(20 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11n(40 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
vht (20 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
vht (40 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)

For 5G:

The worst case for 4TX as follow:

Operating Mode / TX Mode	4TX
802.11a	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11n (20 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11n (40 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11ac (20 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11ac (40 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)
802.11ac (80 MHz)	V (ANT 1+ANT 2+ ANT 3+ANT 4)

3. TEST RESULTS

2.4G

Directional gain (dBi)	Directional gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.99	6.2951	25.87	386.3670	0.48412	1	Complies

5G Band UNII-1 Non Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.97	6.2661	25.11	324.3396	0.40453	1	Complies

5G Band UNII-3 Non Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.97	6.2661	25.94	392.6449	0.48972	1	Complies

5G Band UNII-1 Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
8	6.3096	25.93	391.7419	0.49198	1	Complies

5G Band UNII-3 Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
8	6.3096	25.90	389.0451	0.48860	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
2.4G	5G			
0.48412	0.49198	0.9761	1	Complies

Note: the calculated distance is 20 cm.

End of Test Report