FCC RF EXPOSURE REPORT

FCC ID: TE7HC220G1

Project No. : 1808C052
Equipment : AC1300 Home Wi-Fi System
Test Model : HC220-G1
Series Model : M53
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

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1. CERTIFICATION

Equipment : AC1300 Home Wi-Fi System
Brand Name : tp-link
Test Model : HC220-G1
Series Model : M53
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. 14, 2018 ~ Oct. 23, 2018
Test Sample : Engineering Sample No.: D180806696 for Conducted, D180806693 for Radiated.
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-3-1808C052) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO-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	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Internal	N/A	3.71
2	N/A	N/A	Internal	N/A	3.71

Note: This EUT supports CDD, and all antennas have the same gain,

(1) For Non Beamforming function,

Directional gain=G_{ANT}+Array Gain,

For power spectral density measurements, Array Gain=$10\log(N_{ANT}/N_{SS})$ dB

that is Directional gain=3.71+10log(2/1)=6.72.

So, the power density limit is 8-6.72+6=7.28.

(2) For Beamforming function,

Beamforming gain: 3dBi,so Directional gain=3+3.71=6.71dBi.

Then, the average output power limit is 30-6.71+6=29.29.

The power density limit is 8-6.71+6=7.29..

For 5G:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	Internal	N/A	4.17	UNII-1
1	N/A	N/A	Internal	N/A	4.78	UNII-3
2	N/A	N/A	Internal	N/A	4.17	UNII-1
2	N/A	N/A	Internal	N/A	4.78	UNII-3

Note: This EUT supports CDD, and all antennas have the same gain,so,

    (1) For Non Beamforming function,

    Directional gain=G_{ANT}+Array Gain,

    For power spectral density measurements, Array Gain=$10\log(N_{ANT}/N_{SS})$ dB

    UNII-1 Directional gain= 4.17+10log(2/1) =7.18.

    So, the power density limit is 17-7.18+6=15.82.

    UNII-3 Directional gain=4.78+10log(2/1)=7.79.

    So, the power density limit is 30-7.79+6=28.21.

    (2)For Beamforming function, Beamforming gain: 3dBi, So,

    UNII-1 Directional gain=3+4.17=7.17dBi.

    Then, the output power limit is 30-7.17+6=28.83.

    The power density limit is 17-7.17+6=15.83 .

    UNII-3 Directional gain=3+4.78=7.78dBi.

    Then, the output power limit is 30-7.78+6=28.22.

    The power density limit is 30-7.78+6=28.22 . .

For 2.4G:

The worst case for 2TX as follow:

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)
vht(20 MHz)	V (ANT 1+ANT 2)
vht(40 MHz)	V (ANT 1+ANT 2)

For 5G:

The worst case for 2TX as follow:

Operating Mode / TX Mode	2TX
802.11a	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)
802.11ac (80 MHz)	V (ANT 1+ANT 2)

3. TEST RESULTS

2.4G WIFI 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
6.72	4.6989	22.98	198.6095	0.1858	1	Complies

2.4G WIFI 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
6.71	4.6881	22.69	185.7804	0.1734	1	Complies

5G Band UNII-1 Non Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.18	5.2240	23.02	200.4472	0.2084	1	Complies

5G Band UNII-3 Non Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.79	6.0117	23.12	205.1162	0.2454	1	Complies

5G Band UNII-1 Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.17	5.2119	22.71	186.6380	0.1936	1	Complies

5G Band UNII-3 Beamforming:

Directional gain (dBi)	Directional gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
7.78	5.9979	22.8	190.5461	0.2275	1	Complies

For the max simultaneous transmission MPE:

Power Density (S) (mW/cm^2) 2.4G	Power Density (S) (mW/cm^2) 5G	Total	Limit of Power Density (S) (mW/cm^2)	Test Result
0.1858	0.2454	0.4312	1	Complies

Note: the calculated distance is 20 cm.

End of Test Report