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RF Exposure Report

Report No.: SA150203C07

FCC ID: TE7TGR1900

Test Model: TGR1900

Received Date: Feb. 03, 2015

Test Date: May 01 ~ May 29, 2015

Issued Date: Jun. 01, 2015

Applicant: TP-LINK TECHNOLOGIES CO., LTD.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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Release Control Record

Issue No.	Description	Date Issued
SA150203C07	Original release	Jun. 01, 2015



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1 Certificate of Conformity

Product: OnHub

Brand: TP-LINK

Test Model: TGR1900

Sample Status: Prototype

Applicant: TP-LINK TECHNOLOGIES CO., LTD.

Test Date: May 01 ~ May 29, 2015

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D03

IEEE C95.1

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :



Date:

Jun. 01, 2015

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Approved by :



Date:

Jun. 01, 2015

Ken Liu / Senior Manager

2 RF Exposure

2.1 Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 31cm away from the body of the user.

So, this device is classified as **Mobile Device**.

3 Calculation Result Of Maximum Conducted Power

WLAN					
Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2.4GHz band					
1TX	22.24	2	31	0.022	1
3TX	28.92	8.77	31	0.486	1
5GHz Band					
1TX	21.93	5	31	0.041	1
3TX	29.51	7.77	31	0.443	1

EUT Function	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
BT LE	9.36	3.5	31	0.002	1
BT EDR	12.52	3.5	31	0.003	1
Zigbee	20.43	2	31	0.014	1

NOTE:

2.4GHz: 3TX: Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})/N_{ANT}] = 8.77\text{dBi}$

5.0GHz: 3TX: Directional gain = $3\text{dBi} + 10\log(3) = 7.77\text{dBi}$

FREQUENCY BAND	MAX POWER (dBm)					TOTAL POWER (dBm)	POWER LIMIT (dBm)
	WLAN 2.4GHz (1TX)	WLAN 2.4GHz (3TX)	BT LE	BT EDR	Zigbee		
2.4GHz	22.24	-	9.36	-	-	22.46	30
2.4GHz	22.24	-	-	12.52	-	22.68	30
2.4GHz	22.24	-	-	-	20.43	24.44	30
2.4GHz	-	28.92	9.36	-	-	28.97	30
2.4GHz	-	28.92	-	12.52	-	29.02	30
2.4GHz	-	28.92	-	-	20.43	29.50	30

CONCLUSION:

Both of the WLAN 2.4G & WLAN 5G can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{WLAN 2.4G (3TX) + WLAN 5G (3TX)} = 0.486 + 0.443 = 0.929$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (1TX) + Zigbee} = 0.486 + 0.041 + 0.014 = 0.541$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (1TX) + Bluetooth LE} = 0.486 + 0.041 + 0.002 = 0.529$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (1TX) + Bluetooth EDR} = 0.486 + 0.041 + 0.003 = 0.530$$

$$\text{WLAN 2.4G (1TX) + WLAN 5G (3TX) + Zigbee} = 0.022 + 0.443 + 0.014 = 0.479$$

$$\text{WLAN 2.4G (1TX) + WLAN 5G (3TX) + Bluetooth LE} = 0.022 + 0.443 + 0.002 = 0.467$$

$$\text{WLAN 2.4G (1TX) + WLAN 5G (3TX) + Bluetooth EDR} = 0.022 + 0.443 + 0.003 = 0.468$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (3TX) + Zigbee} = 0.486 + 0.443 + 0.014 = 0.943$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (3TX) + Bluetooth LE} = 0.486 + 0.443 + 0.002 = 0.931$$

$$\text{WLAN 2.4G (3TX) + WLAN 5G (3TX) + Bluetooth EDR} = 0.486 + 0.443 + 0.003 = 0.932$$

Therefore, the maximum calculation of this situation is 0.943, which is less than the "1" limit.

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