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CNAS L0310



FCC Maximum Permissible Exposure(MPE) Estimation Report

Product Name: 300Mbps WiFi Extender

Model: WE3200

Report No.: SYBH(Z-SAR)20180622017001-2

FCC ID: QISWE3200

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DATE	2018-08-06	2018-08-06

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※ ※ **Modified History** ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2018-08-06	Yang Yunfei

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1 EUT Description

Device Information:			
Product Name :	300Mbps WiFi Extender		
Model :	WE3200		
FCC ID:	QISWE3200		
Device Type :	Mobile Device		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment/general population		
Hardware Version :	AM1WE3200M		
Software Version :	8.0.1.5		
Antenna Type :	Internal Antenna		
Device Operating Configurations:			
Supporting Mode(s)	WiFi 2.4G		
Test Modulation	WiFi(DSSS/OFDM)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	WiFi 2.4G	2400-2483.5	2400-2483.5

1.1 General Description

The WE3200 is a high-speed wireless router designed for homes. Complies with 802.11b/g/n multiple-input multiple-output (MIMO) technology and provides 2 Internal high-gain antennas. Externally it provides power supply interface, one auto-sensing Ethernet interfaces.

2 Test specification(s)

ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
KDB 447498 D01	General RF Exposure Guidance v06

3 Testing laboratory

Test Site	The Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	NO.2 New City Avenue Songshan Lake Sci.&Tech.Industry Park, Dongguan,Guangdong,P.R.C
Telephone	+86 755 28780808
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State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310 A2LA TESTING CERT #2174.01 & 2174.02 & 2174.03

4 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

5 Application details

Start Date of test	2018-08-06
End Date of test	2018-08-06

6 Ambient Condition

Ambient temperature	18°C – 25°C
Relative Humidity	30% – 70%

7 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

EIRP = P * G

The antenna of the product, under normal use condition is at least 20 cm away from the

body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

7.1 FCC MPE Limits

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

Table: Limits For Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/controlled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm ²)	Averaging Time (minute) E ² , H ² or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30
f=frequency in MHz			*Plane-wave equivalent power density	

8 RF Exposure Evaluation

8.1 Operation in WiFi 2.4G SISO

(uplink: 2400-2483.5MHz, downlink: 2400-2483.5MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Antenna 1	20	2.0	22.0	158.5	20	0.032	1.000	Pass
Antenna 2	20	2.0	22.0	158.5	20	0.032	1.000	Pass

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer
According to the Table, we can conclude the max power density level at 20 cm is 0.032 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

9 Exposure calculations for multiple sources

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E^2 , H^2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below:

Simultaneous Tx Combination	Configuration
1	WiFi 2.4G MIMO

9.1 Estimation for WiFi 2.4G MIMO

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
Antenna 1	20.0	2.0	22.0	158.5	20	0.032	1.000	0.064	Pass
Antenna 2	20.0	2.0	22.0	158.5	20	0.032	1.000		

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance. Therefore the product also meets the requirements under multiple sources condition.

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