

Maximum Permissible Exposure (MPE) Evaluation Report

Report No. : TS11070025-EME

Model No. : WAP5605

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Applicant: ZyXEL Communications Corporation
No. 6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan

Test Method/ Standard: FCC 1.1310

Test By: Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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The test report was prepared by: Sign on File
Jill Chen / Assistant

These measurements were taken by: Sign on File
Terry Hsu / Engineer

The test report was reviewed by:

Name Jimmy Yang
Title Engineer



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Summary of Tests

MPE Evaluation meet FCC OET No. 65: 1997, IEEE C95.1-2005

5-GHz Wireless N Media Streaming Box - Model: WAP5605
FCC ID: I88WAP5605

Test	Reference	Results
MPE Evaluation	FCC Guidelines for Human Exposure IEEE C95.1	Complies

1. Introduction

The EUT operates in the 5 GHz ISM band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20 cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and Safety Code 6 are followed.

According to 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

2. RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

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)
(A) Limits for Occupational / Control Exposures				
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				
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

F= Frequency in MHz

3. RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/(cm²) (or 10 W/m²)*

Power density (S) is calculated by the following formula:

$$S = (P * G) / 4\pi R^2$$

where, S = Power density (mW/cm²)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$\pi = 3.1416$

Example:

Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

then the power density (S) = $(50 * 1) / 4 * \pi * 20^2 = 0.00995$ (mW/cm²) (or = 0.0995 W/m²)



4 Description of EUT

The EUT is 5-GHz Wireless N Media Streaming Box, and was defined as information technology equipment.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

4.1 Antenna description

(1) Antenna 1 (DAC 0)

The EUT uses a permanently connected antenna.

Antenna Gain	: 1.484 dBi
Antenna Type	: Printed PCB antenna
Connector Type	: N/A

(2) Antenna 2 (DAC 1)

The EUT uses a permanently connected antenna.

Antenna Gain	: 1.155 dBi
Antenna Type	: Printed PCB antenna
Connector Type	: N/A

5. Test results

EUT : WAP5605

Mode	Channel	Frequency (MHz)	Antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
			Antenna 1			
802.11a (DAC0)	36	5180	1.40734	29.17	0.00861	1
	40	5200	1.40734	29.99	0.00885	1
	48	5240	1.40734	30.27	0.00894	1
	149	5745	1.40734	28.44	0.00840	1
	157	5785	1.40734	28.77	0.00850	1
	161	5805	1.40734	28.38	0.00838	1

Mode	Channel	Frequency (MHz)	Antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
			Antenna 2			
802.11a (DAC1)	36	5180	1.30467	28.51	0.00655	1
	40	5200	1.30467	29.72	0.00683	1
	48	5240	1.30467	28.58	0.00657	1
	149	5745	1.30467	28.44	0.00654	1
	157	5785	1.30467	30.27	0.00696	1
	161	5805	1.30467	30.34	0.00697	1

Mode	Channel	Frequency (MHz)	Antenna gain (numeric)		Output power to antenna (mW)		Power density (mW/cm ²)	Limit of power density (mW/cm ²)
			Antenna 1	Antenna 2	DAC 0	DAC 1		
802.11n HT20	36	5180	1.40734	1.30467	24.66	24.04	0.01281	1
	40	5200	1.40734	1.30467	24.04	24.38	0.01270	1
	48	5240	1.40734	1.30467	23.17	24.60	0.01250	1
	149	5745	1.40734	1.30467	29.31	29.72	0.01548	1
	157	5785	1.40734	1.30467	29.85	29.38	0.01556	1
	161	5805	1.40734	1.30467	28.58	29.31	0.01517	1
802.11n HT40	38	5190	1.40734	1.30467	23.99	23.07	0.01238	1
	46	5230	1.40734	1.30467	24.43	23.12	0.01253	1
	151	5755	1.40734	1.30467	31.33	30.34	0.01622	1
	159	5795	1.40734	1.30467	30.13	30.13	0.01582	1

The Notice in Installation Manual has been stated as below:

While installing and operating this transmitter, the radio frequency exposure limit of 1 mW/ (cm²) may be exceeded at distances close to the transmitter. Therefore, the user must maintain a minimum distance of 20 cm from the device at all time.