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Project No: CB10409264

Maximum Permissible Exposure Report

Applicant's company	Linksys LLC
Applicant Address	121 Theory, Irvine CA 92617, United States
FCC ID	Q87-EA7500

Product Name	LINKSYS MAX-STREAM AC1900 MU-MIMO GIGABIT ROUTER
Brand Name	LINKSYS
Model Name	EA7500
Ref. Standard(s)	47 CFR FCC Part 2 Subpart J, section 2.1091
Received Date	Aug. 14, 2015
Final Test Date	Sep. 01, 2015
Submission Type	Original Equipment


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Table of Contents

1. GENERAL DESCRIPTION.....	1
1.1. EUT General Information	1
1.2. Testing Location.....	1
2. MAXIMUM PERMISSIBLE EXPOSURE.....	2
2.1. Limit of Maximum Permissible Exposure	2
2.2. MPE Calculation Method	2
2.3. Calculated Result and Limit.....	3

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA582115	Rev. 01	Initial issue of report	Oct. 16, 2015

1. GENERAL DESCRIPTION

1.1. EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
5GHz WLAN	5150-5250 5725-5850	5180-5240 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

1.2. Testing Location

Testing Location		
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
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2. MAXIMUM PERMISSIBLE EXPOSURE

2.1. Limit of Maximum Permissible Exposure

(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 E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	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 E ² , H ² or S (minutes)
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

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2. MPE Calculation Method

The MPE was calculated at 24 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

2.3. Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For 5GHz Band (NII):

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 29.64 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
24	5230	5.74	3.7464	29.6380	920.0268	0.476434	1	Complies

Note:

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{AS}} \left\{ \sum_{k=1}^{N_{AQ}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 5.74 \text{ dBi.}$$

For 5GHz Band (DTS):

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 29.51 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
24	5755	6.40	4.3698	29.5084	892.9712	0.539365	1	Complies

Note:

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{AS}} \left\{ \sum_{k=1}^{N_{AQ}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 6.40 \text{ dBi.}$$

For 2.4GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 29.60 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
24	2437	5.41	3.4785	29.5992	911.8449	0.438430	1	Complies

Note:

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{AS}} \left\{ \sum_{k=1}^{N_{AQ}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 5.41 \text{ dBi.}$$

Conclusion:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously, the formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.438430 / 1 + 0.539365 / 1 = 0.977795$, which is less than "1". This confirmed that the device complies.