



# SPORTON International Inc.

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Project No: CB10504148

## Maximum Permissible Exposure Report

Applicant's company	Linksys LLC
Applicant Address	121 Theory Drive, Irvine, CA 92617, USA
FCC ID	Q87-EA9500V11

Product Name	Linksys Tri-Band Wireless-AC Router
Brand Name	LINKSYS
Model Name	EA9500 V1.1 , EA9400
Ref. Standard(s)	47 CFR FCC Part 2 Subpart J, section 2.1091
Received Date	Aug. 05, 2015
Final Test Date	May 17, 2016
Submission Type	Original Equipment

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SPORTON INTERNATIONAL INC.





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## History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA581108-01	Rev. 01	Initial issue of report	Jun. 06, 2016

## 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, 1024QAM)
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, 1024QAM)

### 1.2. Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
EA9500 V1.1	All the models are identical, the different model names served as marketing strategy.
EA9400	

Note: Assessed as above, there is only model: EA9500 V1.1 selected to test and recorded in the report as a result.

### 1.3. Table for the differences of the EUT

The differences of the EUTs as below table:

EUT	Chip	Description
EUT 1	BCM4366C0	The difference is the allocation of the antenna cables.
EUT 2	BCM4366B1	

### 1.4. Testing Location

Testing Location		
<input type="checkbox"/>	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
<input checked="" type="checkbox"/>	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

## 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> 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 31 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 1:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 28.00 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
				(dBm)	(mW)			
31	5200	7.98	6.2748	27.9999	630.9360	0.328000	1	Complies

Note:  $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right]$

For 5GHz Band 4:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 27.59 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
				(dBm)	(mW)			
31	5785	8.02	6.3334	27.5870	573.7247	0.301041	1	Complies

Note:  $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right]$

For 2.4GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 27.87 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
				(dBm)	(mW)			
31	2437	8.07	6.4077	27.8667	611.8791	0.324827	1	Complies

Note:  $Directional\ Gain = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{K=1}^{N_{ANT}}g_{j,k}\right\}^2}{N_{ANT}}\right]$

#### Conclusion:

Both of the WLAN 2.4GHz Band, WLAN 5GHz Band 1 and Band 4 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

Therefore, the worst-case situation is  $0.324827 / 1 + 0.328000 / 1 + 0.301041 / 1 = 0.953868$ , which is less than "1". This confirmed that the device complies.