RF EXPOSURE REPORT

Report No.: 14021236-FCC-H1
Supersede Report No.: N/A

Applicant	Shandong Bittel Electronics Co.,Ltd.
Product Name	Wireless Access Point
Model No.	Lim-AP
Test Standard	FCC 2.1091
Test Date	January 17 to January 22, 2015
Issue Date	January 29, 2015
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Herith shi	Alex.Liu	
Herith Shi Test Engineer	Alex Liu Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:
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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
14021236-FCC-H1	NONE	Original	January 29, 2015

2 Customer information

Applicant Name	Shandong Bittel Electronics Co.,Ltd.
Applicant Add	No.1 N. Rizhao Rd., Rizhao,Shandong,China
Manufacturer	Shandong Bittel Electronics Co.,Ltd.
Manufacturer Add	No.1 N. Rizhao Rd., Rizhao,Shandong,China

3 Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	Labview of SIEMIC version 1.0

4 Equipment under Test (EUT) Information

Description of EUT:	Wireless Access Point
Main Model:	Lim-AP
Serial Model:	N/A
Date EUT received:	December 31, 2014
Test Date(s):	January 17 to January 22, 2015
Output power	802.11b:17.54 dBm(ANT2#) 802.11g:15.02 dBm(ANT2#) 802.11n(20M):15.04 dBm(ANT2#) 802.11n(40M):15.31 dBm(ANT2#) 802.11n(20M):16.55 dBm(MIMO) 802.11n(40M):16.95 dBm(MIMO)
Antenna Gain:	WIFI ANT1#: 3 dBi WIFI ANT2#: 3 dBi
Type of Modulation:	802.11b/g/n: DSSS/OFDM
RF Operating Frequency (ies):	802.11b/g/n(20M): 2412-2462 MHz(TX/RX) 802.11n(40M): 2422-2452 MHz (TX/RX)
Number of Channels:	802.11b/g/n(20M): 11CH 802.11n(40M): 7CH
Port:	RJ45 Port*2
Input Power:	Power Supply By 48V 500mA POE
Trade Name :	Limark
FCC ID:	WI6LIM-AP

5 FCC §2.1091 - MaximuM Permissible exposure (MPE)

Applicable Standard

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

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	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

Test Data

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Tune Up Power (dBm)
Output power (ANT2#)	802.11b	Low	2412	16.98	17±1
		Mid	2437	17.54	
		High	2462	17.26	
	802.11g	Low	2412	14.65	14.5±1
		Mid	2437	15.02	
		High	2462	14.53	
	802.11n(20M)	Low	2412	15.00	14.5±1
		Mid	2437	15.04	
		High	2462	14.93	
	802.11n(40M)	Low	2422	15.18	14.5±1
		Mid	2437	15.25	
		High	2452	15.31	

Type	Test mode	CH	Freq (MHz)	MIMO Conducted Power (dBm)	Tune Up Power (dBm)
Output power (MIMO)	802.11n(20M)	Low	2412	16.46	16±1
		Mid	2437	16.51	
		High	2462	16.55	
	802.11n(40M)	Low	2422	16.66	16±1
		Mid	2437	16.71	
		High	2452	16.95	

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

802.11b Mode:
The maximum peak output power (turn-up power) in low channel of WIFI is 18 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 63.10 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2412(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0250(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0250 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in Middle channel of WIFI is 18 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 63.10 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2437(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.0250 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0250 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in High channel of WIFI is 18dBm
Maximum peak output power (turn-up power) at antenna input terminal: 63.10 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2462(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0250(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0250 (mW/cm^2) < 1(mW/cm^2)

802.11g Mode:
The maximum peak output power (turn-up power) in low channel of WIFI is 15.5 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 35.48 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2412(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0141(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0141 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in Middle channel of WIFI is 15.5 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 35.48(mW)

Prediction distance: >20 (cm)
Predication frequency: 2437(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.0141 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0141 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in High channel of WIFI is 15.5 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 35.48 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2462(MHz) lowest frequency
Antenna Gain (typical): 3 (dBi)

Antenna Gain (typical): 1.995(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0141(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)
0.0141 (mW/cm^2) < 1(mW/cm^2)

802.11 n(20M)-MIMO Mode:

The maximum peak output power (turn-up power) in low channel of WIFI is 17 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 50.12 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2422(MHz) lowest frequency
Antenna Gain (typical): 6 (dBi)

Antenna Gain (typical): 3.981(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in Middle channel of WIFI is 17 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 35.48 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2437(MHz) lowest frequency
Antenna Gain (typical): 6 (dBi)

Antenna Gain (typical): 3.981 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in High channel of WIFI is 17dBm
Maximum peak output power (turn-up power) at antenna input terminal: 50.12 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2462(MHz) lowest frequency
Antenna Gain (typical):6 (dBi)

Antenna Gain (typical): 3.981(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

802.11n (40M)-MIMO Mode:
The maximum peak output power (turn-up power) in low channel of WIFI is 17 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 50.12 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2422(MHz) lowest frequency
Antenna Gain (typical):6 (dBi)

Antenna Gain (typical): 3.981(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in Middle channel of WIFI is 17 dBm
Maximum peak output power (turn-up power) at antenna input terminal: 50.12 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2437(MHz) lowest frequency
Antenna Gain (typical): 6 (dBi)

Antenna Gain (typical): 3.981 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

The maximum peak output power (turn-up power) in High channel of WIFI is 17dBm
Maximum peak output power (turn-up power) at antenna input terminal: 50.12 (mW)

Prediction distance: >20 (cm)
Predication frequency: 2452(MHz) lowest frequency
Antenna Gain (typical):6 (dBi)

Antenna Gain (typical): 3.981(numeric)
The worst case is power density at predication frequency at 20 cm: 0.0397 (mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.0397 (mW/cm^2) < 1(mW/cm^2)

Result: Pass