

**IEEE C95.1 2005  
KDB 447498 D03  
47 C.F.R. Part 1, Subpart I, Section 1.1310  
47 C.F.R. Part 2, Subpart J, Section 2.1091**

## **RF EXPOSURE REPORT**

**For**

**Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module**

**Model: WCBN4501A**

**Trade Name: LITE-ON**

*Issued to*

**Lite-On Technology Corp.  
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan,  
R.O.C**

*Issued by*

**Compliance Certification Services Inc.  
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Issued Date: June 1, 2017**



**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 1, 2017	Initial Issue	ALL	Angel Cheng
01	July 18, 2017	1.Revise Frequency band 2.Modify chapter 5	P.5, 8	Vicki Huang

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# 1. TEST RESULT CERTIFICATION

**We hereby certify that:**

The equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirement of the applicable standards. The test record, data evaluation and Equipment under Test (EUT) configurations represented herein are true and accurate accounts of the measurement of the sample’s RF characteristics under the conditions specified in this report.

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
IEEE C95.1 2005 KDB 447498 D03 47 C.F.R. Part 1, Subpart I, Section 1.1310 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by:




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Sam Chuang  
 Manager  
 Compliance Certification Services Inc.

Prepared by:




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Angel Cheng  
 Report coordinator  
 Compliance Certification Services Inc.

## 2. LIMIT

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

## 3. EUT SPECIFICATION

<b>Product</b>	Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module
<b>Model</b>	WCBN4501A
<b>Brand name</b>	LITE-ON
<b>Model Discrepancy</b>	N/A
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> Bluetooth 2.1 + EDR / 4.1: 2402 MHz ~ 2480 MHz 802.11b/g/n HT20: 2412MHz ~ 2462MHz 802.11n HT40: 2422MHz ~ 2452MHz 802.11a/n HT20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz 802.11n HT40: 5190MHz ~ 5670MHz / 5755MHz ~ 5795MHz 802.11ac VHT 20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz 802.11ac VHT 40: 5190MHz ~ 5670MHz / 5755MHz ~ 5795MHz 802.11ac VHT 80: 5210MHz / 5775MHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )

<p><b>Antenna Specification</b></p>	<p><b>Bluetooth:</b> PIFA Antenna / Gain: 2.49dBi</p> <p><b>2.4G</b> PIFA Antenna Ant 1: Gain: 2.49dBi Ant 2: Gain: 2.49dBi</p> <p><b>5G</b> PIFA Antenna Ant 1: Gain: 3.12dBi Ant 2: Gain: 3.12dBi</p> <p>BT:           Antenna Gain :    2.49 dBi (Numeric gain: 1.77) Worst 2.4GHz:       Antenna Gain :    2.49 dBi (Numeric gain: 1.77) Worst 5GHz:         Antenna Gain :    3.12 dBi (Numeric gain: 2.05) Worst</p> <p>2.4GHz: Directional gain = 2.49 dBi +10log ( 2 ) = 5.50 dBi (Numeric gain: 3.55) 5GHz: Directional gain = 3.12 dBi +10log ( 2 ) = 6.13 dBi (Numeric gain: 4.10)</p>
<p><b>Maximum Average output power</b></p>	<p>Bluetooth Mode :                   11.53 dBm (14.223 mW) IEEE 802.11b Mode:                21.73 dBm (148.936 mW) IEEE 802.11g Mode:                20.49 dBm (111.944 mW) IEEE 802.11n HT 20 Mode:        22.28 dBm (169.044 mW) IEEE 802.11n HT 40 Mode:        21.36 dBm (136.773 mW) IEEE 802.11a Mode:                17.33 dBm (54.075 mW) IEEE 802.11n HT 20 Mode:        17.80 dBm (60.256 mW) IEEE 802.11n HT 40 Mode:        16.93 dBm (49.317 mW) IEEE 802.11ac VHT 80 MHz:      13.90 dBm (24.547 mW)</p>
<p><b>Maximum Tune up Power</b></p>	<p>Bluetooth Mode :                   12.50 dBm (17.783 mW) IEEE 802.11b Mode:                22.50 dBm (177.828 mW) IEEE 802.11g Mode:                21.50 dBm (141.254 mW) IEEE 802.11n HT 20 Mode:        23.00 dBm (199.526 mW) IEEE 802.11n HT 40 Mode:        22.00 dBm (158.489 mW) IEEE 802.11a Mode:                18.00 dBm (63.096 mW) IEEE 802.11n HT 20 Mode:        18.50 dBm (70.795 mW) IEEE 802.11n HT 40 Mode:        17.50 dBm (56.234 mW) IEEE 802.11ac VHT 80 MHz:      14.50 dBm (28.184 mW)</p>
<p><b>Evaluation applied</b></p>	<p><input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A</p>

**Notes:** For 2.4GHz and 5GHz could not be use as transmit/receive at the same time.

## 4. TEST RESULTS

No non-compliance noted.

### Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{377}$$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

## 5. MAXIMUM PERMISSIBLE EXPOSURE

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P =$  Power in mW

$G =$  Numeric antenna gain

$S =$  Power density in mW / cm<sup>2</sup>

### Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
79	2480	17.783	3.55	20	0.0126	1

### IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
11	2462	177.828	3.55	20	0.1256	1

### IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	141.254	3.55	20	0.0998	1

### IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	199.526	3.55	20	0.1410	1

### IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
6	2437	158.489	3.55	20	0.1120	1

### IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
165	5825	63.096	4.10	20	0.0515	1

### IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
48	5240	70.795	4.10	20	0.0578	1

### IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
46	5230	56.234	4.10	20	0.0459	1

### IEEE 802.11ac VHT 80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm2)
155	5775	28.184	4.10	20	0.0230	1