FCC ID: PPQ-WCBN4511R

IEEE C95.1 2005 KDB 447498 D01 V06 47 C.F.R. Part 1, Subpart I, Section 1.1310

47 C.F.R. Part 2, Subpart J, Section 2.1091

Report No.: T160608W02-MF

RF EXPOSURE REPORT

For

WLAN + BT Combo Module

Model: WCBN4511R

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. No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) http://www.ccsrf.com service@ccsrf.com Issued Date: July 29, 2016





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Revision History

Rev.	Issue Date	Issue Date Revisions		Revised By	
00	July 29, 2016	Initial Issue	ALL	Doris Chu	
01	August 26, 2016	1. Added section 6.	P.9	Doris Chu	

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1. TEST RESULT CERTIFICATION

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified 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	No non-compliance noted					
47 C.F.R. Part 2, Subpart J, Section 2.1091						

Approved by:	Test by:		
Willer Lee	Ooris Chu		
Miller Lee Manager Compliance Certification Services Inc.	Doris Chu 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.

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3. EUT SPECIFICATION

EUT	WLAN + BT Combo Module
Model	WCBN4511R
Trade Name	LITE-ON
Model Discrepancy	N/A
Frequency band (Operating)	 ☑ Bluetooth 2.1 + EDR / 4.0: 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 VHT80: 5210MHz ~ 5290MHz / 5530 MHz ~ 5775MHz ☑ Others
Device category	☐ Portable (<20cm separation)☑ Mobile (>20cm separation)☐ Others
Exposure classification	 ☐ Occupational/Controlled exposure (S = 5mW/cm²) ☐ General Population/Uncontrolled exposure (S=1mW/cm²)

	ВТ							
	Walsin / RFMTA400536IMAB301							
	PIFA Antenna / Gain: 3.79dBi 2.4G							
	2.4G LITE-ON / WCBN4511R							
	PIFA Antenna							
	ANT-L: Gain: 2.54dBi ANT-R: Gain: 0.93dBi							
	5G							
	LITE-ON / WCBN4511R PIFA Antenna							
Antenna	ANT-L: Gain: 2.94dBi							
Specification	ANT-R: Gain: 3.35dBi							
	BT: Antenna Gain: 3.79 dBi (Numeric gain: 2.39) Worst							
	2.4GHz: Antenna Gain: 2.54 dBi (Numeric gain: 1.79) Worst							
	5GHz: Antenna Gain: 3.35 dBi (Numeric gain: 2.16) Worst							
	2.4GHz:							
	Directional gain = 2.54 dBi +10log (2) = 5.55 dBi (Numeric gain: 3.59) 5GHz:							
	Directional gain = 3.35 dBi +10log (2) = 6.36 dBi (Numeric gain: 4.33)							
	Bluetooth Mode: 8.22 dBm (6.637 mW)							
	IEEE 802.11b Mode: 19.06 dBm (80.538 mW)							
	IEEE 802.11g Mode: 19.55 dBm (90.157 mW) IEEE 802.11n HT 20 Mode: 18.85 dBm (76.736 mW)							
Maximum Average output power	IEEE 802.11n HT 40 Mode: 13.53 dBm (22.542 mW)							
	IEEE 802.11a Mode: 19.05 dBm (80.353 mW) IEEE 802.11n HT20 Mode: 18.58 dBm (72.111 mW)							
	IEEE 802.11n HT40 Mode: 18.66 dBm (73.451 mW)							
	IEEE 802.11ac VHT80 Mode: 14.26 dBm (26.669 mW)							
	Bluetooth Mode : 9.50 dBm (8.913 mW) IEEE 802.11b Mode: 20.50 dBm (112.202 mW)							
	IEEE 802.11b Mode: 20.50 dBm (112.202 mW) IEEE 802.11g Mode: 21.00 dBm (125.893 mW)							
Maximum	IEEE 802.11n HT 20 Mode: 20.00 dBm (100.000 mW)							
Tune up Power	IEEE 802.11n HT 40 Mode: 15.00 dBm (31.623 mW) IEEE 802.11a Mode: 20.50 dBm (112.202 mW)							
	IEEE 802.11n HT20 Mode: 20.00 dBm (100.000 mW)							
	IEEE 802.11n HT40 Mode: 20.00 dBm (100.000 mW)							
	IEEE 802.11ac VHT80 Mode: 15.50 dBm (35.481 mW)							
	MPE Evaluation*							
Evaluation applied	SAR Evaluation N/A							

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4. TEST RESULTS

No non-compliance noted.

Calculation

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:

$$P(mW) = P(W) / 1000$$
 and

$$d(cm) = d(m) / 100$$

Yields

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

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

 $S = Power density in mW / cm^2$

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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

 $S = Power density in mW / cm^2$

Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
40	2441	8.913	2.39	20	0.0042	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
11	2462	112.202	3.59	20	0.0802	1

IEEE 802.11g mode:

I	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
ſ	6	2437	125.893	3.59	20	0.0899	1

IEEE 802.11n HT20 mode:

ĺ	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
ſ	6	2437	100.000	3.59	20	0.0714	1

IEEE 802.11n HT40 mode:

ĺ	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
ĺ	6	2437	31.623	3.59	20	0.0226	1

IEEE 802.11a mode:

ĺ	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
ſ	116	5580	112.202	4.33	20	0.0967	1

IEEE 802.11a HT20 mode:

I	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
I	157	5785	100.000	4.33	20	0.0862	1

IEEE 802.11a HT40 mode:

	Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
Γ	110	5550	100.000	4.33	20	0.0862	1

IEEE 802.11ac VHT80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
58	5290	35.481	4.33	20	0.0306	1

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6. SIMULTANEOUS TRANSMISSION SAR ANALYSIS

Both of the BT and WLAN can transmit simultaneously, the formula of calculated the MPE

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CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

BT+WIFI

Therefore, the worst-case situation is 0.0042 / 1 + 0.0967 / 1 = 0.1009, which is less than "1".