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

RF EXPOSURE REPORT

For

WLAN Module

Model: WCBN4511R(12)

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: September 5, 2016

Testing Laboratory
1309

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 5, 2016	Initial Issue	ALL	Doris Chu
01	September 23, 2016	1. Added notes.	P.6	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 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by:

Miller Lee
Manager
Compliance Certification Services Inc.

Test by:

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.

3. EUT SPECIFICATION

EUT	WLAN Module
Model	WCBN4511R(12)
Trade Name	LITE-ON
Model Discrepancy	N/A
Frequency band (Operating)	☒ 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/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna Specification	**2.4G** LITE-ON / WCBN4511R PIFA Antenna ANT-L: Gain: 2.54dBi ANT-R: Gain: 0.93dBi **5G** LITE-ON / WCBN4511R PIFA Antenna ANT-L: Gain: 2.94dBi ANT-R: Gain: 3.35dBi 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)

Maximum Average output power	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) 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)
Maximum Tune up Power	IEEE 802.11b Mode: 20.50 dBm (112.202 mW) IEEE 802.11g Mode: 21.00 dBm (125.893 mW) IEEE 802.11n HT 20 Mode: 20.00 dBm (100.000 mW) 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)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

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

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

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:

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

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

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 / cm²

IEEE 802.11b mode:

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

IEEE 802.11g mode:

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

IEEE 802.11n HT20 mode:

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

IEEE 802.11n HT40 mode:

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

IEEE 802.11a mode:

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

IEEE 802.11a HT20 mode:

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