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

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

Model: WCBN4513R

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: August 22, 2016

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		August 22, 2016		Initial Issue	ALL	Doris Chu
01		August 30, 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 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

Product	Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.2LE) USB Combo Module
Model Number	WCBN4513R
Model Discrepancy	N/A
Trade Name	LITE-ON
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 ☐ 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	**BT** 1. Walsin / RFMTA400530IMAB302 PIFA Antenna / Gain: 3.79dBi 2. Walsin / RFMTA400550IMAB301 PIFA Antenna / Gain: 3.79dBi 3. Hong Lin / 290-10311 PIFA Antenna / Gain: 3.79dBi 4. Hong Lin / 290-10289 PIFA Antenna / Gain: 3.79dBi **2.4G** Walsin / RFMTA200700NNLB002 PIFA Antenna Ant0: Gain: 1.63dBi Ant1: Gain: 2.49dBi **5G** Walsin / RFMTA200700NNLB002 PIFA Antenna Ant0: Gain: 2.62dBi Ant1: Gain: 3.22dBi BT: Antenna Gain : 3.79 dBi (Numeric gain: 2.39) Worst 2.4GHz: Antenna Gain : 2.49 dBi (Numeric gain: 1.77) Worst 5GHz: Antenna Gain : 3.22 dBi (Numeric gain: 2.10) Worst 2.4GHz: Directional gain = 2.49 dBi +10log (2) = 5.50 dBi (Numeric gain: 3.55) 5GHz: Directional gain = 3.22 dBi +10log (2) = 6.23 dBi (Numeric gain: 4.20)
Maximum Average output power	Bluetooth Mode : 8.39 dBm (6.902 mW) IEEE 802.11b Mode: 18.00 dBm (63.096 mW) IEEE 802.11g Mode: 22.52 dBm (178.649 mW) IEEE 802.11n HT 20 Mode: 22.46 dBm (176.198 mW) IEEE 802.11n HT 40 Mode: 13.40 dBm (21.878 mW) IEEE 802.11a Mode: 13.36 dBm (21.677 mW) IEEE 802.11n HT 20 Mode: 18.48 dBm (70.469 mW) IEEE 802.11n HT 40 Mode: 16.70 dBm (46.774 mW)
Maximum Tune up Power	Bluetooth Mode : 9.50 dBm (8.913 mW) IEEE 802.11b Mode: 19.50 dBm (89.125 mW) IEEE 802.11g Mode: 24.00 dBm (251.189 mW) IEEE 802.11n HT 20 Mode: 23.50 dBm (223.872 mW) IEEE 802.11n HT 40 Mode: 14.50 dBm (28.184 mW) IEEE 802.11a Mode: 14.50 dBm (28.184 mW) IEEE 802.11n HT 20 Mode: 19.50 dBm (89.125 mW) IEEE 802.11n HT 40 Mode: 18.00 dBm (63.096 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

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

Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
79	2480	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 / cm²	Limit (mW/cm2)
6	2437	89.125	1.77	20	0.0314	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	251.189	1.77	20	0.0885	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	223.872	3.55	20	0.1582	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	28.184	3.55	20	0.0199	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
44	5220	28.184	2.10	20	0.0118	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
157	5785	89.125	4.20	20	0.0745	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
38	5190	63.096	4.20	20	0.0527	1

6. SIMULTANEOUS TRANSMISSION SAR ANALYSIS

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

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 + 0.1582 / 1 = 0.1624, which is less than “1”.