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 (V4.1LE) USB Combo Module

Model:
WCBN4515R, WCBN4515R(Ext), WCBN4515R(Emb)

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: November 17, 2016

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		November 17, 2016		Initial Issue	ALL	Doris Chu

TABLE OF CONTENTS

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:

Sam Chuang
Manager
Compliance Certification Services Inc.

Prepared by:

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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 (V4.1LE) USB Combo Module
Model Number	WCBN4515R, WCBN4515R(Ext), WCBN4515R(Emb)
Model Discrepancy	WCBN4515R：PCB Antenna WCBN4515R(Ext)：WiFi PCB Antenna, BT PIFA Antenna WCBN4515R(Emb)：PCB Antenna
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. PCB Antenna Ant3: Gain: -0.80dBi 2. PIFA Antenna Gain: 2.28 dBi **2.4G** PIFA Antenna Ant1: Gain: 3.41dBi Ant2: Gain: 2.18dBi **5G** PIFA Antenna Ant1: Gain: 1.88dBi Ant2: Gain: -0.17dBi BT: Antenna Gain : 2.28 dBi (Numeric gain: 1.69) Worst 2.4GHz: Antenna Gain : 3.41 dBi (Numeric gain: 2.19) Worst 5GHz: Antenna Gain : 1.88 dBi (Numeric gain: 1.54) Worst 2.4GHz: Directional gain = 3.41 dBi +10log (2) = 6.42 dBi (Numeric gain: 4.39) 5GHz: Directional gain = 1.88 dBi +10log (2) = 4.89 dBi (Numeric gain: 3.08)
Maximum Average output power	Bluetooth Mode : 9.46 dBm (8.831 mW) IEEE 802.11b Mode: 17.01 dBm (50.234 mW) IEEE 802.11g Mode: 16.21 dBm (41.783 mW) IEEE 802.11n HT 20 Mode: 19.32 dBm (85.507 mW) IEEE 802.11n HT 40 Mode: 17.90 dBm (61.660 mW) IEEE 802.11a Mode: 15.46 dBm (35.156 mW) IEEE 802.11n HT 20 Mode: 19.43 dBm (87.700 mW) IEEE 802.11n HT 40 Mode: 17.90 dBm (61.660 mW)
Maximum Tune up Power	Bluetooth Mode : 10.50 dBm (11.220 mW) IEEE 802.11b Mode: 18.50 dBm (70.795 mW) IEEE 802.11g Mode: 17.50 dBm (56.234 mW) IEEE 802.11n HT 20 Mode: 20.50 dBm (112.202 mW) IEEE 802.11n HT 40 Mode: 19.00 dBm (79.433 mW) IEEE 802.11a Mode: 16.50 dBm (44.668 mW) IEEE 802.11n HT 20 Mode: 20.50 dBm (112.202 mW) IEEE 802.11n HT 40 Mode: 19.00 dBm (79.433 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Notes: For WIFI and BT 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

Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
39	2441	11.220	1.69	20	0.0038	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
11	2462	70.795	2.19	20	0.0309	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
1	2412	56.234	2.19	20	0.0245	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
11	2462	112.202	4.39	20	0.0980	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
9	2452	79.433	4.39	20	0.0694	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
64	5320	44.668	1.54	20	0.0137	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
36	5180	112.202	3.08	20	0.0688	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
46	5230	79.433	3.08	20	0.0487	1