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

802.11a/b/g/n 2Tx2R + BT V4.1LE USB Combo Module

Model: WCBN4516R

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.)
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service@ccsrf.com
Issued Date: October 11, 2016

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		October 11, 2016		Initial Issue	ALL	Becca Chen

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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:

Becca Chen
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	802.11a/b/g/n 2Tx2R + BT V4.1LE USB Combo Module
Model Number	WCBN4516R
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 HT 20: 2412MHz ~ 2462MHz 802.11n HT 40: 2422MHz ~ 2452MHz 802.11a/n HT 20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz 802.11n HT 40: 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** PCB Antenna Gain: 4.85dBi **2.4G** PCB Antenna Ant1: Gain: 3.94dBi Ant2: Gain: 4.4dBi **5G** PCB Antenna Ant1: Gain: 5.52dBi Ant2: Gain: 5.67dBi BT: Antenna Gain : 4.85 dBi (Numeric gain: 3.05) Worst 2.4GHz: Antenna Gain : 4.4 dBi (Numeric gain: 2.75) Worst 5GHz: Antenna Gain : 5.67 dBi (Numeric gain: 3.69) Worst 2.4GHz: Directional gain = 4.4 dBi +10log (2) = 7.41 dBi (Numeric gain: 5.51) 5GHz: Directional gain = 5.67 dBi +10log (2) = 8.68 dBi (Numeric gain: 7.38)

Maximum Average output power	Bluetooth Mode : 9.79 dBm (9.528 mW) IEEE 802.11b Mode: 16.88 dBm (48.753 mW) IEEE 802.11g Mode: 16.32 dBm (42.855 mW) IEEE 802.11n HT 20 Mode: 19.23 dBm (83.753 mW) IEEE 802.11n HT 40 Mode: 17.70 dBm (58.884 mW) IEEE 802.11a Mode: 15.31 dBm (33.963 mW) IEEE 802.11n HT 20 Mode: 19.40 dBm (87.096 mW) IEEE 802.11n HT 40 Mode: 16.86 dBm (48.529 mW)
Maximum Tune up Power	Bluetooth Mode : 11.00 dBm (12.589 mW) IEEE 802.11b Mode: 18.00 dBm (63.096 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: 18.00 dBm (63.096 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)
79	2480	12.589	3.05	20	0.0076	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
1	2412	63.096	2.75	20	0.0345	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	56.234	2.75	20	0.0308	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	5.51	20	0.1230	1

IEEE 802.11n HT 40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
3	2422	79.433	5.51	20	0.0871	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
165	5825	44.668	3.69	20	0.0328	1

IEEE 802.11n HT 20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
56	5280	112.202	7.38	20	0.1648	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	7.38	20	0.0927	1