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/ac 2Tx2R+BT V4.1LE USB Combo Module

Model: WCBN3509A

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: December 6, 2017

Testing Laboratory
1309

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 6, 2017	Initial Issue	ALL	Allison Chen

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1. TEST RESULT CERTIFICATION

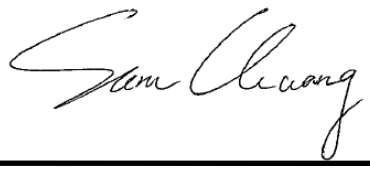
We hereby certify that:

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.

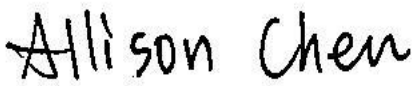
APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
IEEE C95.1 2005 KDB 447498 D03 47 C.F.R. Part 1, Subpart I, Section 1.1310 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by:



Sam Chuang
Manager
Compliance Certification Services Inc.

Test by:



Allison 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

EUT	802.11a/b/g/n/ac 2Tx2R+BT V4.1LE USB Combo Module
Model	WCBN3509A
Trade Name	LITE-ON
Model Discrepancy	N/A
Frequency band (Operating)	☒ Bluetooth 2.1+EDR / 4.0: 2402MHz ~ 2480MHz 802.11b/g/n HT20: 2412MHz ~ 2462MHz 802.11n HT40: 2422MHz ~ 2452MHz 802.11a/n HT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5720MHz / 5720MHz ~ 5825MHz 802.11n HT40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5710MHz / 5710MHz ~ 5795MHz 802.11ac VHT80: 5210MHz / 5290 MHz / 5530MHz ~ 5690 MHz / 5690MHz ~ 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

Bluetooth

Brand	P/N	Type	Cable length	Peak Gain	Worst case
HongBo	290-10569	PIFA	300mm	3.74dBi	V

1. Power Directional Gain: 3.74
2. Power Density Directional Gain: 3.74

2.4G

Brand	P/N	Type	Cable length	Peak Gain	Worst case
HongBo	290-10569	PIFA	300mm	3.74dBi	V

1. Power Directional Gain: 3.74
2. Power Density Directional Gain: 3.74

5G

Brand	P/N	Type	Cable length	Peak Gain	Worst case
HongBo	290-10569	PIFA	300mm	3.8dBi	V

1. Power Directional Gain: 3.8
2. Power Density Directional Gain: 3.8

Other antenna information:

Brand	P/N	Type	Cable length	Peak Gain
HongBo	290-10310	PIFA	500mm	3.60dBi
Walsin	RFMTA401032IMLB702	PIFA	320mm	2.6dBi
Walsin	RFMTA401080IMLB701	PIFA	800mm	1.72dBi
Walsin	RFMTA401082IMLB701	PIFA	820mm	1.62dBi

Bluetooth Antenna Gain : 3.74 dBi (Numeric gain: 2.37) Worst
2.4GHz Antenna Gain : 3.74 dBi (Numeric gain: 2.37) Worst
5GHz: Antenna Gain : 3.80 dBi (Numeric gain: 2.40) Worst

2.4GHz: Directional Gain : 3.74 dBi (Numeric gain: 2.37) Worst
5GHz: Directional Gain : 3.80 dBi (Numeric gain: 2.40) Worst

Notes:
1. Power Directional Gain: 10LOG(((10^(Ant1/10)+10^(Ant2/10))/2))
2. Power Density Directional Gain:
10LOG(((10^(Ant1/10)+10^(Ant2/10))/2))+10log(NTX/NSS)

Max tune up Power	Bluetooth Mode: 12.50 dBm (17.783 mW) IEEE 802.11b Mode: 17.00 dBm (50.119 mW) IEEE 802.11g Mode: 15.50 dBm (35.481 mW) IEEE 802.11n HT 20 Mode: 18.00 dBm (63.096 mW) IEEE 802.11n HT 40 Mode: 16.50 dBm (44.668 mW) IEEE 802.11a Mode: 16.00 dBm (39.811 mW) IEEE 802.11n HT 20 Mode: 18.00 dBm (63.096 mW) IEEE 802.11n HT 40 Mode: 17.00 dBm (50.119 mW) IEEE 802.11ac VHT 80 Mode: 14.00 dBm (25.119 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)
39	2441	17.783	2.37	20	0.0084	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	50.119	2.37	20	0.0236	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
1	2412	35.481	2.37	20	0.0167	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	63.096	2.37	20	0.0298	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	44.668	2.37	20	0.0211	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
116	5580	32.509	2.4	20	0.0155	1

IEEE 802.11n HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
56	5280	51.761	2.4	20	0.0247	1

IEEE 802.11n HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
110	5550	50.119	2.4	20	0.0239	1

IEEE 802.11ac VHT80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
155	5775	25.119	2.4	20	0.0120	1