IEEE C95.1
KDB447498 D03
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 2T2R + BT4.1LE USB Combo Module

Model: WCBN4502B

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

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Testing Laboratory
1309

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	July 14, 2015	Initial Issue	ALL	Doris Chu

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1. 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.

2. EUT SPECIFICATION

EUT	802.11a/b/g/n/ac 2T2R + BT4.1LE USB Combo Module
Model	WCBN4502B
Trade Name	LITE-ON
Frequency band (Operating)	☒ Bluetooth 2.1 + EDR / 4.0: 2402 ~ 2480 MHz 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz 802.11a/n HT20: 5.180GHz ~ 5.320GHz / 5.500 ~ 5.825GHz 802.11n HT40: 5.190GHz ~ 5.310GHz / 5.510 ~ 5.795GHz 802.11ac VHT80: 5.210GHz ~ 5.290GHz / 5.530 ~ 5.775GHz ☐ 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 / RFMTA400550IMAB301 PIFA Antenna Gain: 3.79 dBi 2. Walsin / RFMTA400536IMAB301 PIFA Antenna Gain: 3.79 dBi 2.4G 1. HONGLIN / 290-10031 PIFA Antenna Ant_1: Gain: 2.2 dBi Ant_2: Gain: 1.1 dBi 2. Walsin / RFMTA200700NNLB002 PIFA Antenna ANT0: Gain: 1.38 dBi ANT2: Gain: 2.49 dBi 5G 1. HONGLIN / 290-10031 PIFA Antenna Ant_1: Gain: 4.6 dBi Ant_2: Gain: 4.7 dBi 2. Walsin / RFMTA200700NNLB002 PIFA Antenna ANT0: Gain: 2.48 dBi ANT2: Gain: 3.22 dBi 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 : 4.70 dBi (Numeric gain: 2.95) Worst
Maximum Average output power	Bluetooth Mode : 10.16 dBm (10.375 mW) IEEE 802.11b Mode: 19.40 dBm (87.096 mW) IEEE 802.11g Mode: 18.32 dBm (67.920 mW) IEEE 802.11n HT 20 Mode: 20.48 dBm (111.686 mW) IEEE 802.11n HT 40 Mode: 16.14 dBm (41.115 mW) IEEE 802.11a Mode: 18.86 dBm (76.913 mW) IEEE 802.11n HT20 Mode: 19.56 dBm (90.365 mW) IEEE 802.11n HT40 Mode: 19.43 dBm (87.700 mW) IEEE 802.11ac VHT80 Mode: 18.47 dBm (70.307 mW)

Maximum Tune up Power	Bluetooth Mode : 12.00 dBm (15.849 mW) IEEE 802.11b Mode: 21.00 dBm (125.893 mW) IEEE 802.11g Mode: 20.00 dBm (100.000 mW) IEEE 802.11n HT 20 Mode: 22.00 dBm (158.489 mW) IEEE 802.11n HT 40 Mode: 18.00 dBm (63.096 mW) IEEE 802.11a Mode: 20.50 dBm (112.202 mW) IEEE 802.11n HT20 Mode: 21.50 dBm (141.254 mW) IEEE 802.11n HT40 Mode: 21.00 dBm (125.893 mW) IEEE 802.11ac VHT80 Mode: 20.50 dBm (112.202 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

3. 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

4. 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)
1	2402	15.849	2.39	20	0.0075	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	125.893	1.77	20	0.0443	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
6	2437	100	1.77	20	0.0352	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	158.489	1.77	20	0.0558	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	63.096	1.77	20	0.0222	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
157	5785	112.202	2.95	20	0.0659	1

IEEE 802.11a HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
44	5220	141.254	2.95	20	0.0829	1

IEEE 802.11a HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
151	5755	125.893	2.95	20	0.0739	1

IEEE 802.11ac VHT80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm2)
138	5690	112.202	2.95	20	0.0659	1