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47 C.F.R. Part 2, Subpart J, Section 2.1091**

RF EXPOSURE REPORT

For

Wi-Fi (11a/b/g/n/ac 2Tx2R) + BT (V4.1 LE) SDIO Combo Module

Model: WCBN4503M

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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Revision History

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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

Product	Wi-Fi (11a/b/g/n/ac 2Tx2R) + BT (V4.1 LE) SDIO Combo Module
Model Number	WCBN4503M
Model Discrepancy	N/A
Trade Name	LITE-ON
Frequency band (Operating)	<input checked="" type="checkbox"/> 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 <input type="checkbox"/> Others
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)

<p>Antenna Specification</p>	<p>BT</p> <p>1. Walsin / RFMTA401029IMLB703 PIFA Antenna / 3.79 dBi</p> <p>2. Walsin / RFMTA34071AIMAB701 PIFA Antenna / 3.68 dBi</p> <p>3. Walsin / RFMTA34071AIMAB702 PIFA Antenna / 3.6 dBi</p> <p>4. Walsin / RFMTA34071AIMAB703 PIFA Antenna / 2.39 dBi</p> <p>2.4G</p> <p>1. Walsin / RFMTA401029IMLB703 PIFA Antenna / 1.93 dBi</p> <p>2. Walsin / RFMTA340770IMLB701 PIFA Antenna / 1.81 dBi</p> <p>3. Walsin / RFMTA340740IMLB701 PIFA Antenna / 1.87 dBi</p> <p>4. Walsin / RFMTA340770IMLB701 PIFA Antenna / 1.91 dBi</p> <p>5. Walsin / RFMTA340745IMLB701 PIFA Antenna / 1.78 dBi</p> <p>6. Walsin / RFMTA34071AIMLB701 PIFA Antenna / 1.74 dBi</p> <p>7. Walsin / RFMTA340745IMLB701 PIFA Antenna / 1.61 dBi</p> <p>5G</p> <p>1. Walsin / RFMTA401029IMLB703 PIFA Antenna / 3.77 dBi</p> <p>2. Walsin / RFMTA340770IMLB701 PIFA Antenna / 3.68 dBi</p> <p>3. Walsin / RFMTA340740IMLB701 PIFA Antenna / 3.24 dBi</p> <p>4. Walsin / RFMTA340770IMLB701 PIFA Antenna / 3.68 dBi</p> <p>5. Walsin / RFMTA340745IMLB701 PIFA Antenna / 2.76 dBi</p> <p>6. Walsin / RFMTA34071AIMLB701 PIFA Antenna / 2.75 dBi</p> <p>7. Walsin / RFMTA340745IMLB701 PIFA Antenna / 2.40 dBi</p> <p>BT: Antenna Gain : 3.79 dBi (Numeric gain: 2.39) Worst</p> <p>2.4GHz: Antenna Gain : 1.93 dBi (Numeric gain: 1.56) Worst</p> <p>5GHz: Antenna Gain : 3.77 dBi (Numeric gain: 2.38) Worst</p> <p>2.4GHz:</p> <p>Directional gain = 1.93 dBi +10log (2) = 4.94 dBi (Numeric gain: 3.12)</p> <p>5GHz:</p> <p>Directional gain = 3.77 dBi +10log (2) = 6.78 dBi (Numeric gain: 4.76)</p>
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<p>Maximum Average output power</p>	<p>Bluetooth Mode : 7.46 dBm (5.572 mW) IEEE 802.11b Mode: 21.09 dBm (128.529 mW) IEEE 802.11g Mode: 19.14 dBm (82.035 mW) IEEE 802.11n HT 20 Mode: 20.86 dBm (121.899 mW) IEEE 802.11n HT 40 Mode: 22.61 dBm (182.390 mW) IEEE 802.11a Mode: 16.61 dBm (45.814 mW) IEEE 802.11n HT20 Mode: 18.11 dBm (64.714 mW) IEEE 802.11n HT40 Mode: 17.62 dBm (57.810 mW) IEEE 802.11ac VHT80 Mode: 14.57 dBm (28.642 mW)</p>
<p>Maximum Tune up Power</p>	<p>Bluetooth Mode : 9.00 dBm (7.943 mW) IEEE 802.11b Mode: 23.00 dBm (199.526 mW) IEEE 802.11g Mode: 21.00 dBm (125.893 mW) IEEE 802.11n HT 20 Mode: 22.50 dBm (177.828 mW) IEEE 802.11n HT 40 Mode: 24.50 dBm (281.838 mW) IEEE 802.11a Mode: 18.50 dBm (70.795 mW) IEEE 802.11n HT20 Mode: 20.00 dBm (100.000 mW) IEEE 802.11n HT40 Mode: 19.50 dBm (89.125 mW) IEEE 802.11ac VHT80 Mode: 16.50 dBm (44.668 mW)</p>
<p>Evaluation applied</p>	<p><input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A</p>

3. TEST RESULTS

No non-compliance noted.

Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{377}$$

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:

$$S = \frac{30 \times P \times G}{377d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

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 / cm ²	Limit (mW/cm2)
40	2441	7.943	2.39	20	0.0038	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	199.526	1.56	20	0.0619	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	125.893	1.56	20	0.0391	1

IEEE 802.11n HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	177.828	3.12	20	0.1104	1

IEEE 802.11n HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
6	2437	281.838	3.12	20	0.1750	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
116	5580	70.795	2.38	20	0.0335	1

IEEE 802.11a HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
149	5745	100.000	4.76	20	0.0947	1

IEEE 802.11a HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
46	5230	89.125	4.76	20	0.0844	1

IEEE 802.11ac VHT80 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
58	5290	44.668	4.76	20	0.0423	1