**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 USB WLAN Module

## Model: WCBN3509A(NB)

## Trade Name: LITE-ON

*Issued to*

**LITE-ON Technology Corp.**
**Bldg. C, 90, Chien 1 Road,**
**Chung Ho, New Taipei City 23585,**
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*Issued by*

**Compliance Certification Services Inc.**
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**Issued Date: December 4, 2017**

Testing Laboratory
1309

# Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|---|---|---|---|---|
| 00 | December 4, 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<br>KDB 447498 D03<br>47 C.F.R. Part 1, Subpart I, Section 1.1310<br>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 USB WLAN Module |
| **Model** | WCBN3509A(NB) |
| **Trade Name** | LITE-ON |
| **Model Discrepancy** | N/A |
| **Frequency band (Operating)** | ☒ 802.11b/g/n HT20: 2412MHz ~ 2462MHz<br>802.11n HT40: 2422MHz ~ 2452MHz<br>802.11a/n HT20: 5180MHz ~ 5240MHz / 5260MHz ~ 5320MHz / 5500MHz ~ 5720MHz / 5720MHz ~ 5825MHz<br>802.11n HT40: 5190MHz ~ 5230MHz / 5270MHz ~ 5310MHz / 5510MHz ~ 5710MHz / 5710MHz ~ 5795MHz<br>802.11ac VHT80: 5210MHz / 5290 MHz / 5530MHz ~ 5690 MHz / 5690MHz ~ 5775MHz<br>☐ Others |
| **Device category** | ☐ Portable (<20cm separation)<br>☒ Mobile (>20cm separation)<br>☐ Others |
| **Exposure classification** | ☐ Occupational/Controlled exposure (S = 5mW/cm$^2$)<br>☒ General Population/Uncontrolled exposure (S=1mW/cm$^2$) |

**Antenna Specification**

**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 |

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 / Max time Average Power** | IEEE 802.11b Mode: 17.00 dBm (50.119 mW)<br>IEEE 802.11g Mode: 15.50 dBm (35.481 mW)<br>IEEE 802.11n HT 20 Mode: 18.00 dBm (63.096 mW)<br>IEEE 802.11n HT 40 Mode: 16.50 dBm (44.668 mW)<br>IEEE 802.11a Mode: 16.00 dBm (39.811 mW)<br>IEEE 802.11n HT 20 Mode: 18.00 dBm (63.096 mW)<br>IEEE 802.11n HT 40 Mode: 17.00 dBm (50.119 mW)<br>IEEE 802.11ac VHT 80 Mode: 14.00 dBm (25.119 mW) |
| **Evaluation applied** | ☒ MPE Evaluation*<br>☐ SAR Evaluation<br>☐ N/A |

***Notes:*** *For Canada the EUT Frequency Range 5600~5650MHz will be disabled.*

# 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*

**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 |