

**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**

| <b>Product</b>                                                 | <b>Model</b>          |
|----------------------------------------------------------------|-----------------------|
| <b>Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE) USB Combo Module</b> | <b>WCBN4507R</b>      |
|                                                                | <b>WCBN4508R</b>      |
| <b>Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.1LE) USB Combo Module</b>    | <b>WCBN4507R(32U)</b> |
|                                                                | <b>WCBN4508R(32U)</b> |

**Trade Name: LITE-ON**

*Issued to*

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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 / Model Number     | Product                                                                                                                                                                                                                                                                                                                                                                     | Model                            |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                            | Wi-Fi (11a/b/g/n/ac 2Tx2R)+BT (V4.1LE)<br>USB Combo Module                                                                                                                                                                                                                                                                                                                  | WCBN4507R                        |
|                            |                                                                                                                                                                                                                                                                                                                                                                             | WCBN4508R                        |
|                            | Wi-Fi (11a/b/g/n 2Tx2R)+BT (V4.1LE) USB<br>Combo Module                                                                                                                                                                                                                                                                                                                     | WCBN4507R(32U)<br>WCBN4508R(32U) |
| Model Discrepancy          | MT7662U – 802.11abgn + ac + BT ( WCBN4507R / WCBN4508R )<br>MT7632U – 802.11abgn + BT ( WCBN4507R(32U) /<br>WCBN4508R(32U) )                                                                                                                                                                                                                                                |                                  |
| Trade Name                 | LITE-ON                                                                                                                                                                                                                                                                                                                                                                     |                                  |
| Frequency band (Operating) | <input checked="" type="checkbox"/> Bluetooth 2.1 + EDR / 4.0: 2402 ~ 2480 MHz<br>802.11b/g/n HT20: 2.412GHz ~ 2.462GHz<br>802.11n HT40: 2.422GHz ~ 2.452GHz<br>802.11a/n HT20: 5.180GHz ~ 5.320GHz / 5.500 ~ 5.825GHz<br>802.11n HT40: 5.190GHz ~ 5.310GHz / 5.510 ~ 5.795GHz<br>802.11ac VHT80: 5.210GHz ~ 5.290GHz / 5.530 ~ 5.775GHz<br><input type="checkbox"/> Others |                                  |
| Device category            | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others                                                                                                                                                                                                                    |                                  |
| Exposure classification    | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )                                                                                                                                                                               |                                  |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Antenna Specification</b>        | <p>BT</p> <p>1. Tyco<br/>PCB Antenna<br/>2195488-1: Gain: 0.32 dBi</p> <p>2. Walsin<br/>PCB Antenna<br/>RFPCA311147IMAB701: Gain: 4.37 dBi</p> <p>2.4G</p> <p>1. Tyco<br/>PCB Antenna<br/>2195488-2: 4.06 dBi<br/>2195488-3: 4.92 dBi</p> <p>2. Walsin<br/>PCB Antenna<br/>RFPCA311131IMLB701: 4.94 dBi<br/>RFPCA311148IMLB701: 4.12 dBi</p> <p>5G</p> <p>1. Tyco<br/>PCB Antenna<br/>2195488-2: 0.96 dBi<br/>2195488-3: 3.54 dBi</p> <p>2. Walsin<br/>PCB Antenna<br/>RFPCA311131IMLB701: 5.54 dBi<br/>RFPCA311148IMLB701: 5.53 dBi</p> <p>BT:        Antenna Gain : 4.37 dBi (Numeric gain: 2.74) Worst<br/>2.4GHz:    Antenna Gain : 4.94 dBi (Numeric gain: 3.12) Worst<br/>5GHz:      Antenna Gain : 5.54 dBi (Numeric gain: 3.58) Worst</p> <p>2.4GHz:<br/>Directional gain = 4.94 dBi +10log ( 2 ) = 7.95 dBi (Numeric gain: 6.24)<br/>5GHz:<br/>Directional gain = 5.54 dBi +10log ( 2 ) = 8.55 dBi (Numeric gain: 7.16)</p> |
| <b>Maximum Average output power</b> | <p>Bluetooth Mode :                      9.50 dBm    (8.913 mW)</p> <p>IEEE 802.11b Mode:                    16.85 dBm   (48.417 mW)</p> <p>IEEE 802.11g Mode:                    15.95 dBm   (39.355 mW)</p> <p>IEEE 802.11n HT 20 Mode:            18.82 dBm   (76.208 mW)</p> <p>IEEE 802.11n HT 40 Mode:            16.87 dBm   (48.641 mW)</p> <p>IEEE 802.11a Mode:                    14.86 dBm   (30.620 mW)</p> <p>IEEE 802.11n HT20 Mode:            17.78 dBm   (59.979 mW)</p> <p>IEEE 802.11n HT40 Mode:            15.79 dBm   (37.931 mW)</p> <p>IEEE 802.11ac VHT80 Mode:        15.76 dBm   (37.670 mW)</p>                                                                                                                                                                                                                                                                                                         |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum<br/>Tune up Power</b> | Bluetooth Mode : 11.00 dBm (12.589 mW)<br>IEEE 802.11b Mode: 18.00 dBm (63.096 mW)<br>IEEE 802.11g Mode: 17.00 dBm (50.119 mW)<br>IEEE 802.11n HT 20 Mode: 20.00 dBm (100.000 mW)<br>IEEE 802.11n HT 40 Mode: 18.00 dBm (63.096 mW)<br>IEEE 802.11a Mode: 16.00 dBm (39.811 mW)<br>IEEE 802.11n HT20 Mode: 19.00 dBm (79.433 mW)<br>IEEE 802.11n HT40 Mode: 17.00 dBm (50.119 mW)<br>IEEE 802.11ac VHT80 Mode: 17.00 dBm (50.119 mW) |
| <b>Evaluation applied</b>        | <input checked="" type="checkbox"/> MPE Evaluation*<br><input type="checkbox"/> SAR Evaluation<br><input type="checkbox"/> 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:

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

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

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 / cm<sup>2</sup>

## 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 / cm<sup>2</sup>

### Bluetooth mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 1   | 2402      | 12.589 | 2.74        | 20     | 0.0069                                | 1              |

### IEEE 802.11b mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 1   | 2412      | 63.096 | 3.12        | 20     | 0.0392                                | 1              |

### IEEE 802.11g mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 6   | 2437      | 50.119 | 3.12        | 20     | 0.0311                                | 1              |

### IEEE 802.11n HT20 mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 6   | 2437      | 100    | 6.24        | 20     | 0.1242                                | 1              |

### IEEE 802.11n HT40 mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 6   | 2437      | 63.096 | 6.24        | 20     | 0.0784                                | 1              |

### IEEE 802.11a mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 36  | 5180      | 39.811 | 3.58        | 20     | 0.0284                                | 1              |

### IEEE 802.11a HT20 mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 140 | 5700      | 79.433 | 7.16        | 20     | 0.1132                                | 1              |

### IEEE 802.11a HT40 mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 159 | 5795      | 50.119 | 7.16        | 20     | 0.0714                                | 1              |

### IEEE 802.11ac VHT80 mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|
| 122 | 5610      | 50.119 | 7.16        | 20     | 0.0714                                | 1              |