



## RF Exposure Evaluation Declaration

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**Applicant:** Compex Systems Pte Ltd  
**Address:** 135, Joo Seng Road, #08-01 Singapore 368363

**Product:** 802.11ac Dual Band Module  
**Model No.:** WLE900VX  
**Brand Name:** COMPEX  
**Standards:** EN 62311: 2008

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( Robin Wu )

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The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

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### Revision History

| Report No.   | Version | Description    | Issue Date |
|--------------|---------|----------------|------------|
| 1503RSU03011 | Rev. 01 | Initial report | 05-21-2015 |
|              |         |                |            |

## 1. PRODUCT INFORMATION

### 1.1. Equipment Description

|                    |  |
|--------------------|--|
| Product Name       | 802.11ac Dual Band Module  |
| Model No.          | WLE900VX   |
| Brand Name         | COMPEX   |
| Frequency Range    | <b><u>For 2.4GHz Band:</u></b><br>802.11b/g/n:<br>2412 ~ 2472 MHz<br><b><u>For 5GHz Band:</u></b><br>802.11a/n/ac:<br>5150 ~ 5350MHz<br>5470 ~ 5825MHz |
| Type of Modulation | 802.11b: DSSS<br>802.11g/a/n/ac: OFDM  |

## 1.2. Antenna Description

| Antenna No. | Manufacturer                          | Tx Paths | Max Directional Gain (dBi) |
|-------------|---------------------------------------|----------|----------------------------|
| Antenna 1#  | Kunshan Wavelink Electronic Co., Ltd. | 3        | 2.4GHz: 2.0, 5GHz: 2.0     |
| Antenna 2#  | TAOGLAS Inc                           | 3        | 2.4GHz: 4.5, 5GHz: 6.7     |
| Antenna 3#  | Compex Systems Pte Ltd                | 3        | 2.4GHz: 5.0, 5GHz: 5.0     |
| Antenna 4#  | Compex Systems Pte Ltd                | 3        | 2.4GHz: 5.0, 5GHz: 5.0     |
| Antenna 5#  | Smart Ant Inc                         | 3        | 5GHz: 7.0                  |
| Antenna 6#  | Kenbotong Communication LTD           | 3        | 5GHz: 10.0                 |

Note 1: The frequency bands (5150~5350MHz & 5470~5725MHz) support the max antenna gain 7dBi and another frequency band (5725~5850MHz) supports the max antenna gain 10dBi.

## **2. RF Exposure Measurement**

The scope of this standard is limited to apparatus which is intended for use by the general public as defined in the Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (Official Journal L 199 of 30 July 1999).

This generic standard applies to electronic and electrical apparatus for which no dedicated product or product family standard regarding human exposure to electromagnetic fields applies.

This generic standard does not cover equipment, which fulfils the requirements given in EN 50371 or is medical equipment as defined in the Council Directive 93/42/EEC of 14 June 1993 concerning medical devices.

The frequency range covered is 0 Hz to 300 GHz.

The object of this standard is to demonstrate the compliance of such apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields and induced and contact current.

### **2.1. Limits**

The electronic and electro-technical apparatus shall comply with the basic restriction as specified in Annex II of Council Recommendation 1999/519/EC.

The reference levels in the Council Recommendation 1999/519/EC on public exposure to electromagnetic fields are derived from the basic restrictions using worst-case assumptions about exposure.

According to EN62311, the reference level listed in the following table 2 shall be used to evaluate the environment impact of human exposure human exposure to electromagnetic fields (0 Hz - 300 GHz) as specified in 1999/519/EC.

## Council Recommendation 1999/519/EC of 12 July 1999

Table 2

 Reference levels for electric, magnetic and electromagnetic fields  
 (0 Hz to 300 GHz, unperturbed rms values)

| Frequency Range | E-field Strength<br>(V/m) | H-field Strength<br>(A/m) | B-field<br>( $\mu$ T) | Equivalent plane<br>wave power<br>density<br>Seq (W/m <sup>2</sup> ) |
|-----------------|---------------------------|---------------------------|-----------------------|--|
| 0-1 Hz          | –                         | $3.2 \times 10^4$         | $4 \times 10^4$       | –  |
| 1-8 Hz          | 10000                     | $3.2 \times 10^4/f^2$     | $4 \times 10^4/f^2$   | –  |
| 8-25 Hz         | 10000                     | 4000/f                    | 5000/f                | –  |
| 0.025-0.8 kHz   | 250/f                     | 4/f                       | 5/f                   | –  |
| 0.8-3 kHz       | 250/f                     | 5                         | 6.25                  | –  |
| 3-150 kHz       | 87                        | 5                         | 6.25                  | –  |
| 0.15-1 MHz      | 87                        | 0.73/f                    | 0.92/f                | –  |
| 1-10 MHz        | $87/f^{1/2}$              | 0.73/f                    | 0.92/f                | –  |
| 10-400 MHz      | 28                        | 0.73                      | 0.092                 | 2  |
| 400-2000 MHz    | $1.375 f^{1/2}$           | $0.0037 f^{1/2}$          | $0.0046 f^{1/2}$      | f/200  |
| 2-300G Hz       | 61                        | 0.16                      | 0.20                  | 10   |

## Notes:

1.  $f$  as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, Seq, E<sub>2</sub>, H<sub>2</sub>, and B<sub>2</sub> are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E<sub>2</sub>, H<sub>2</sub>, and B<sub>2</sub> are to be averaged over any  $68/f^{1.05}$ -minute period ( $f$  in GHz).
4. No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

## 2.2. Assessment methods

Under normal use of condition, this device has a separation distance of at least 20cm between the antenna and the body of the user. A radiation exposure statement “this equipment should be installed and operated with minimum distance between the antenna and your body” is shown on the user manual, so human exposure to the electromagnetic field of this product is at far-field region under normal use.

### Far-field region Calculation Formula:

P watts are radiated, from a point, uniformly over the surface of sphere of radius r.

In free space

$$E = \eta_0 H = [30 \cdot P \cdot G(\theta, \phi)]^{0.5} / r$$

Where

G = antenna gain relative to an isotropic antenna

$\theta, \phi$  = elevation and azimuth angles to point of investigation

r = distance from observation point to the antenna (m)

$\eta$  = characteristic impedance of free space

### Safety Distance Calculation Formula:

The power flux:

$$S = \frac{P \cdot G_{(\theta, \phi)}}{4 \cdot \pi \cdot r^2}$$

So safety distance as following:

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}}$$

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

$\theta, \phi$  = elevation and azimuth angles.

r = distance from the antenna to the point of investigation

### 2.3. Test Result of RF Exposure Evaluation

|           |                           |
|-----------|---------------------------|
| Product   | 802.11ac Dual Band Module |
| Test Item | RF Exposure Evaluation    |

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 5dBi for 2.4GHz, 7dBi for 5.15~5.35GHz&5.47~5.725GHz and 10dBi for 5.725~5.85GHz in logarithm scale.

| Operation Mode          | Frequency Range (MHz)               | Maximum EIRP (dBm) | Limit of Power Density S(W/m <sup>2</sup> ) | Safety Distance r(cm) |
|-------------------------|-------------------------------------|--------------------|---|-----------------------|
| 802.11b/g/n-HT20        | 2412~2472                           | 19.97              | 10  | 5.00                  |
| 802.11n-HT40            | 2422~2462                           | 19.94              | 10  | 4.98                  |
| 802.11a/n-HT20/ac-VHT20 | 5180~5320<br>5500~5700<br>5745~5825 | 29.91              | 10  | 19.76                 |
|                         | 5745~5825                           | 29.90              | 10  | 27.89                 |
| 802.11n-HT40/ac-VHT40   | 5190~5310<br>5510~5670              | 29.85              | 10  | 19.63                 |
| 802.11ac-VHT80          | 5210~5290<br>5530~5610              | 29.60              | 10  | 19.07                 |

So the safety distance is 27.89cm for **802.11ac Dual Band Module** installed without any other radio equipment.

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