



# TEST REPORT

|                                                                                                                                                                                                                                    |                                                                                                                       |                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Eurofins KCTL Co.,Ltd.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-70-4904-0113 FAX: 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a>                            | Report No.:<br><b>KR25-SRF0229</b><br>Page (1) of (10)                                                                |   |
| <b>1. Client</b>                                                                                                                                                                                                                   |                                                                                                                       |                                                                                                                                                                         |
| ◦ Name : GigaTera Lighting Inc.<br>◦ Address : 21, Dongtan-daero 25-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea<br>◦ Date of Receipt : 2025-04-29                                                                             |                                                                                                                       |                                                                                                                                                                         |
| <b>2. Use of Report</b> : Certification                                                                                                                                                                                            |                                                                                                                       |                                                                                                                                                                         |
| <b>3. Name of Product / Model</b> : Zigbee Module / INT NODE HP MAHA                                                                                                                                                               |                                                                                                                       |                                                                                                                                                                         |
| <b>4. Manufacturer / Country of Origin</b> : GigaTera Lighting Inc. / Korea                                                                                                                                                        |                                                                                                                       |                                                                                                                                                                         |
| <b>5. FCC ID</b> : 2BMIG-INTNODEHPM                                                                                                                                                                                                |                                                                                                                       |                                                                                                                                                                         |
| <b>6. IC Certificate No.</b> : 33375-INTNODEHPM                                                                                                                                                                                    |                                                                                                                       |                                                                                                                                                                         |
| <b>7. Date of Test</b> : 2025-07-26 to 2025-11-12                                                                                                                                                                                  |                                                                                                                       |                                                                                                                                                                         |
| <b>8. Location of Test</b> : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing<br>(Address: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)                     |                                                                                                                       |                                                                                                                                                                         |
| <b>9. Test method used</b> : 47 CRF Part 1.1310<br>RSS-102 Issue 6 December 2023                                                                                                                                                   |                                                                                                                       |                                                                                                                                                                         |
| <b>10. Test Result</b> : Refer to the test result in the test report                                                                                                                                                               |                                                                                                                       |                                                                                                                                                                         |
| Affirmation                                                                                                                                                                                                                        | Tested by<br><br>Name : Seung Kim  | Technical Manager<br><br>Name : Kwonse Kim                                         |
| 2025-12-23                                                                                                                                                                                                                         |                                                                                                                       |                                                                                                                                                                         |
| <b>Eurofins KCTL Co.,Ltd.</b>                                                                                                                                                                                                      |                                                                                                                       |                                                                                                                                                                         |
| As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd. |                                                                                                                       |                                                                                                                                                                         |

|                                                                                                                                                                                                         |                                                        |                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>Eurofins KCTL Co.,Ltd.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-70-4904-0113 FAX: 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a> | Report No.:<br><b>KR25-SRF0229</b><br>Page (2) of (10) |    <b>KCTL</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------|

## REPORT REVISION HISTORY

| Date       | Revision          | Page No |
|------------|-------------------|---------|
| 2025-12-23 | Originally issued | -       |
|            |                   |         |
|            |                   |         |
|            |                   |         |
|            |                   |         |

*This report shall not be reproduced except in full, without the written approval of Eurofins KCTL Co.,Ltd. This document may be altered or revised by Eurofins KCTL Co.,Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by Eurofins KCTL Co.,Ltd. will constitute fraud and shall nullify the document. This test report is a general report that does not use the KOLAS accreditation mark and is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.*

## General remarks for test reports

### Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

### Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ Statement not required by the standard or client used for type testing

CONTENTS

1. General information .....4

2. Device information .....4

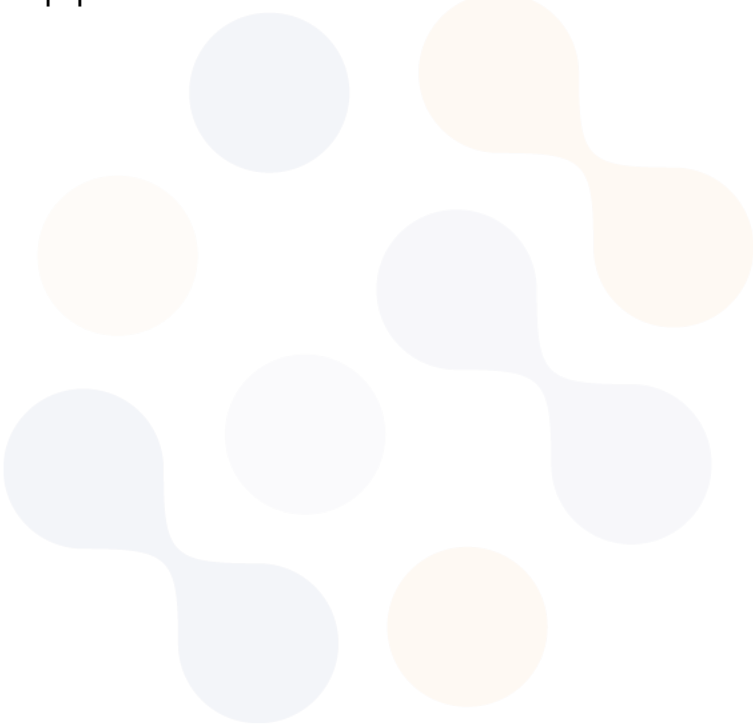
2.1. Frequency/channel operations.....5

3. Measurement uncertainty .....5

4. RF Exposure.....6

4.1. Test results.....9

5. Measurement Equipment.....10



## 1. General information

Client : GigaTera Lighting Inc.  
 Address : 21, Dongtan-daero 25-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea  
 Manufacturer : GigaTera Lighting Inc.  
 Address : 21, Dongtan-daero 25-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea  
 Factory1 : GigaTera Lighting Inc.  
 Address1 : 21, Dongtan-daero 25-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea  
 Factory2 : KMW VIETNAM CO.,LTD  
 Address2 : Lot C, Dong Van I Industrial Park, Yen Bac Ward, Duy Tien Town, Ha Nam Province, VietNam  
 Laboratory : Eurofins KCTL Co.,Ltd.  
 Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
 Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
                           VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
                           CAB Identifier: KR0040, ISED Number: 8035A  
                           KOLAS No.: KT231

## 2. Device information

Equipment under test : Zigbee Module  
 Model : INT NODE HP MAHA  
 Modulation technique : DSSS - OQPSK(Zigbee)  
 Number of channels : 16 ch  
 Power source : DC 12 V  
 Antenna specification : IFA antenna  
 Antenna gain : 2.0 dBi  
 Frequency range : 2 405 MHz ~ 2 480 MHz (Zigbee)  
 Software version : 1.0  
 Hardware version : 1.0  
 Operation temperature : -30 °C ~ 70 °C  
 Test device serial No. : E3:14

## 2.1. Frequency/channel operations

This device contains the following capabilities:

Zigbee

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 11  | 2 405           |
| .   | .               |
| 18  | 2 440           |
| .   | .               |
| 26  | 2 480           |

Table 2.1.1. Zigbee mode

## 3. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2020, ANSI C63.10-2020+Cor.1-2023.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

| Parameter          | Expanded uncertainty ( $\pm$ ) |
|--------------------|--------------------------------|
| Conducted RF power | 0.9 dB                         |

## 4. RF Exposure

### FCC Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Table 1 – Limits for Maximum Permissible Exposure (MPE)

| Frequency Range<br>(MHz)                                  | Electric Field<br>Strength<br>[V/m] | Magnetic Field<br>Strength<br>[A/m] | Power Density<br>[mW/cm <sup>2</sup> ] | Averaging<br>Time<br>[minute] |
|-----------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-------------------------------|
| (A) Limits for Occupational / Controlled Exposure         |                                     |                                     |                                        |                               |
| 0.3 ~ 3.0                                                 | 614                                 | 1.63                                | *100                                   | 6                             |
| 3.0 ~ 30                                                  | 1842/f                              | 4.89/f                              | *900/f <sup>2</sup>                    | 6                             |
| 30 ~ 300                                                  | 61.4                                | 0.163                               | 1.0                                    | 6                             |
| 300 ~ 1 500                                               | /                                   | /                                   | f/300                                  | 6                             |
| 1 500 ~ 15 000                                            | /                                   | /                                   | 5                                      | 6                             |
| (B) Limits for General Population / Uncontrolled Exposure |                                     |                                     |                                        |                               |
| 0.3 ~ 1.34                                                | 614                                 | 1.63                                | *100                                   | 30                            |
| 1.34 ~ 30                                                 | 824/f                               | 2.19/f                              | *180/f <sup>2</sup>                    | 30                            |
| 30 ~ 300                                                  | 27.5                                | 0.073                               | 0.2                                    | 30                            |
| 300 ~ 1 500                                               | /                                   | /                                   | f/1 500                                | 30                            |
| 1 500 ~ 15 000                                            | /                                   | /                                   | 1.0                                    | 30                            |

*f*=frequency in MHz, \* = plane-wave equivalent power density

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100 kHz

## IC

### **RF Field strength and power density limits for devices used by the general public (uncontrolled environment)**

| Frequency Range (MHz) | Electric Field (V <sub>RMS</sub> /m rms) | Magnetic Field (A <sub>RMS</sub> /m)      | Power Density (W/m <sup>2</sup> )        | Reference Period (minutes) |
|-----------------------|------------------------------------------|-------------------------------------------|------------------------------------------|----------------------------|
| 10-20                 | 27.46                                    | 0.072 8                                   | 2                                        | 6                          |
| 20-48                 | 58.07 / $f^{0.25}$                       | 0.154 0 / $f^{0.25}$                      | 8.944 / $f^{0.5}$                        | 6                          |
| 48-300                | 22.06                                    | 0.058 52                                  | 1.291                                    | 6                          |
| <u>300-6 000</u>      | <u>3.142 <math>f^{0.341 7}</math></u>    | <u>0.008 335 <math>f^{0.341 7}</math></u> | <u>0.026 19 <math>f^{0.683 4}</math></u> | <u>6</u>                   |
| 6 000-15 000          | 61.4                                     | 0.163                                     | 10                                       | 6                          |
| 15 000-150 000        | 61.4                                     | 0.163                                     | 10                                       | 616 000/ $f^{1.2}$         |
| 150 000-300 000       | 0.158 $f^{0.5}$                          | $4.21 \times 10^{-4} f^{0.5}$             | $6.67 \times 10^{-5} f$                  | 616 000/ $f^{1.2}$         |

**Note:**  $f$  is frequency in MHz.

### **RF field strength and power density limits for controlled-use devices (controlled environment)**

| Frequency Range (MHz) | Electric Field (V <sub>RMS</sub> /m rms) | Magnetic Field (A <sub>RMS</sub> /m) | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------------|------------------------------------------|--------------------------------------|-----------------------------------|----------------------------|
| 10-20                 | 61.4                                     | 0.163                                | 10                                | 6                          |
| 20-48                 | 129.8 / $f^{0.25}$                       | 0.344 4 / $f^{0.25}$                 | 44.72 / $f^{0.5}$                 | 6                          |
| 48-100                | 49.33                                    | 0.130 9                              | 6.455                             | 6                          |
| 100-6 000             | 15.60 $f^{0.25}$                         | 0.041 38 $f^{0.25}$                  | 0.645 5 $f^{0.5}$                 | <u>6</u>                   |
| 6 000-15 000          | 137                                      | 0.364                                | 50                                | 6                          |
| 15 000-150 000        | 137                                      | 0.364                                | 50                                | 616 000/ $f^{1.2}$         |
| 150 000-300 000       | 0.354 $f^{0.5}$                          | $9.40 \times 10^{-4} f^{0.5}$        | $3.33 \times 10^{-4} f$           | 616 000/ $f^{1.2}$         |

**Note:**  $f$  is frequency in MHz.

For both table 7 and table 8, refer to Health Canada's Safety Code 6 for relevant notes and additional information.

### **Field reference level exposure exemption limits**

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance)
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 5 W (adjusted for tune-up tolerance)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

## 4.1. Test results

### FCC

#### MPE (Maximum Permissible Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad (\Rightarrow R = \sqrt{PG / 4\pi S})$$

S = power density [ $\text{mW}/\text{cm}^2$ ]

P = Power input to antenna [ $\text{mW}$ ]

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna [ $\text{cm}$ ]

### IC

#### RF Exposure evaluation

At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834} \text{ W}$  (adjusted for tune-up tolerance), where  $f$  is in MHz;

#### Calculation Result of RF exposure (FCC)

Maximum tune-up tolerance (Worst Case)

| Mode   | Frequency [MHz] | Max Tune-up Power [dBm] | Max Tune-up Power [mW] | Ant Gain [dBi] | Power density at 20 cm [ $\text{mW}/\text{cm}^2$ ] | Limit [ $\text{mW}/\text{cm}^2$ ] |
|--------|-----------------|-------------------------|------------------------|----------------|----------------------------------------------------|-----------------------------------|
| Zigbee | 2 480           | -3.00                   | 0.50                   | 2.00           | 0.000 16                                           | 1.00                              |

#### Calculation Results of RF exposure (IC)

Maximum tune-up tolerance (Worst Case)

| Mode   | Frequency [MHz] | Max Tune-up Power [dBm] | Ant Gain [dBi] | E.I.R.P. |      | Limit [mW] |
|--------|-----------------|-------------------------|----------------|----------|------|------------|
|        |                 |                         |                | [dBm]    | [mW] |            |
| Zigbee | 2 480           | -3.00                   | 2.00           | -1.00    | 0.79 | 2 735.52   |

## 5. Measurement Equipment

| Equipment Name | Manufacturer | Model No. | Serial No.             | Next Cal. Date |
|----------------|--------------|-----------|------------------------|----------------|
| Power Sensor   | R&S          | NRP-Z81   | 1137.9009.02-106224-tg | 26.07.01       |
| Attenuator     | R&S          | DNF       | 0005                   | 26.01.17       |

**End of test report**

