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Report No.: 16-11355707-FCC2  
Date: November 2, 2016  
Model No.: RMBLE-M5  
FCC ID : 2AISERMBLEM5  
IC ID : 21613-RMBLES5

## **FCC/IC RF Exposure Report**

**in accordance with  
FCC Part 1 Subpart I §1.1307(b) & §1.1310  
RSS-102**

**for**

## **Bluetooth Low Energy Module**

**Honeywell Analytics Asia Pacific Co., Ltd.  
7F SangAm IT Tower, 434 Worldcup Buk-ro, Mapo-gu, Seoul 03922, South Korea**

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**Summary of Test Results:**

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 1 Subpart I Section 1.1307(b) & 1.1310 and RSS-102

| No | FCC Reference Clause No. | IC Reference Clause No. | Conformance Requirements           | Result Verdict | Remark |
|----|--------------------------|-------------------------|------------------------------------|----------------|--------|
| 1  | 1.1307(b)(1)             | RSS-102                 | RF Exposure of Humans to RF Fields | Complied       |        |
|    | 1.1310                   | Section 4               |                                    |                |        |

**Conclusion:**

The tests listed above have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test items were determined to ensure the requirements set out in the FCC CFR 47 Part 1 Subpart I and RSS-102. As a result, the subject product has been verified to comply or not comply with each test specification. The test results relate only to the items tested.



Witness tested by  
Jihoon Lee, WiSE Laboratory Engineer  
Consumer Technology Division  
UL Korea Ltd.  
November 2, 2016



Reviewed by  
Jeonghwan Kim, WiSE Laboratory Engineer  
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UL Korea Ltd.  
November 2, 2016

## Test Report Details

Witnessed By: UL Korea Ltd.  
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Test Site: ENG Co., Ltd  
135-60 Gyeongchungdae-ro, Gonjiam-eup, Gwangju-si, Gyeonggi-do, Korea  
464-942

Applicant: Honeywell Analytics Asia Pacific Co., Ltd.  
7F SangAm IT Tower, 434 Worldcup Buk-ro, Mapo-gu, Seoul 03922, South Korea

Manufacturer: RAE Systems by Honeywell  
No.990E. Hwujwang Road, JIADING DISTRICT, Shanghai 201815, China

Applicant Contact: Hyun mook Kim

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Product Type: Bluetooth Low Energy Module

Model Number: RMBLE-M5

Host Model Number: SPL A BB C D E F XNZZ

Trademark: N/A

Sample Serial Number: N/A

Test standards: FCC Part 1 Subpart I §1.1307(b) & §1.1310  
IC RSS-102 Issue 5

Sample Receive Date: August 05, 2016

Testing Start Date: August 10, 2016

Testing Complete Date: November 2, 2016

**Overall Results:** **Pass**

The test reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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## 1. General Product Information

### 1.1. Equipment Description:

RMBLE-M5 is a Bluetooth Low Energy Module

### 1.2. Details of Test Equipment (EUT)

- Equipment Type : Bluetooth Low Energy Module
- Model No. : RMBLE-M5
- Type of test Equipment : Portable type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band
- Manufacturer : RAE Systems by Honeywell  
No.990E. Hwuijwang Road, JIADING DISTRICT, Shanghai 201815, China

### 1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

| Use* | Product Type                | Manufacturer             | Model    | Comments |
|------|-----------------------------|--------------------------|----------|----------|
| EUT  | Bluetooth Low Energy Module | RAE Systems by Honeywell | RMBLE-M5 | -        |

**Note:** Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)

### 1.4. Technical Data:

| Item                   | Description                |
|------------------------|----------------------------|
| Frequency Ranges       | 2 402 – 2 480 MHz          |
| Output power           | Max. -14.0 dBm             |
| Kind of modulation (s) | GFSK                       |
| Channel                | 40 channels (Bluetooth LE) |
| Antenna Gain           | Max. -1.50 dBi             |
| Working temperature    | -40 ~ 60 °C                |
| Supply Voltage         | DC 3.30 V                  |

Note ;

1. All the technical data described above were provided by the manufacturer.

### 1.5. Antenna Information:

Antenna Type : PCB Pattern antenna  
Manufacturer : RAE Systems by Honeywell  
Transmit Gain dBi : Max. -1.50 dBi

### 1.6. Equipment Type:

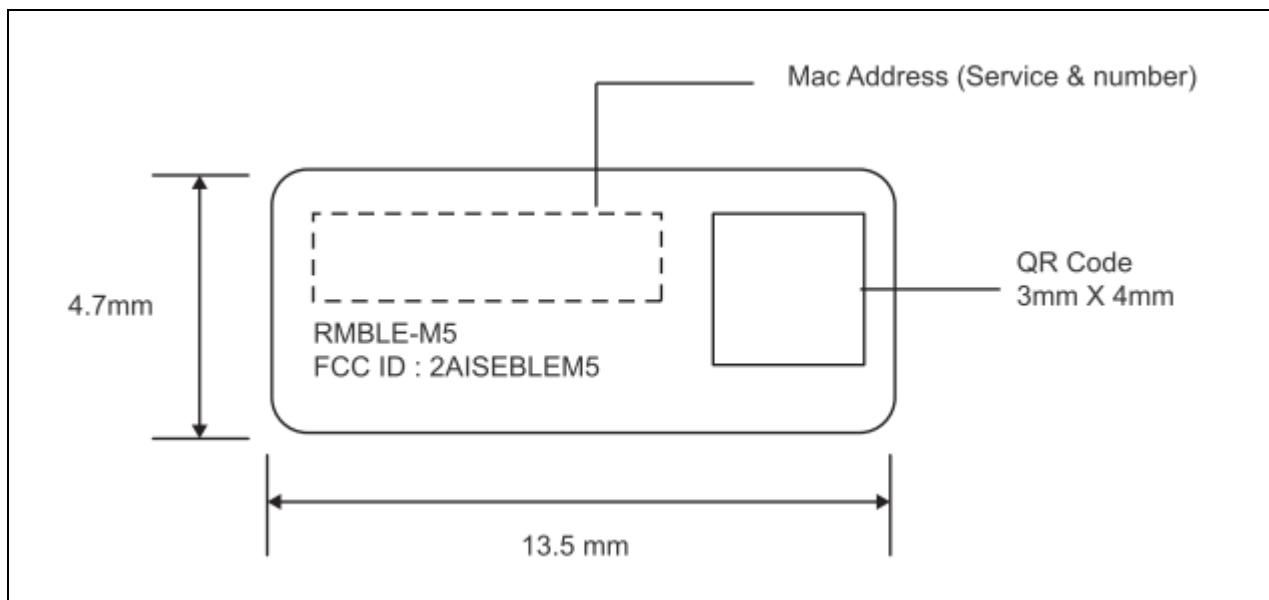
- Radio and ancillary equipment for fixed or semi-fixed use
- Radio and ancillary equipment for vehicular mounted use
- Radio and ancillary equipment for portable or handheld use
  
- Stand alone  Host connected
  
- Self contained single unit  Module with associated connection or interface

### 1.7. Technical description and documents:

| No. | Document Title and Description |
|-----|--------------------------------|
| 1   | User Manual                    |

Note: The following documents were provided by the manufacturer.

### 1.8. Equipment Marking Plate



## 1.9. Description of host model name

| Model name                   | Description of designation | Description of design   |
|------------------------------|----------------------------|---|
| SPL A <u>BB</u> C D E F XNZZ | A (Type)                   | 1) L: Compliance version<br>2) C: Commercial version  |
|                              | BB (Gas)                   | 1) O1: O2<br>2) C1: CO<br>3) H1: H2S (L)<br>4) H2: H2S (H)<br>5) G1: H2<br>6) N1: NO2<br>7) A1: NH3 (L)<br>8) F6: CH4 (CAT)<br>9) FR: CH4 (IR)<br>10) B1: CO2 (IR ppm)<br>11) B2: CO2 (IR Vol)<br>12) FP: C3H8 (IR) |
|                              | C (Bluetooth)              | 1) X: No Bluetooth<br>2) B: Bluetooth   |
|                              | D (Output)                 | A: mA<br>M: Modbus  |
|                              | E (Relay)                  | X: No Relay<br>R: Relay   |
|                              | F (Color)                  | C: Charcoal (All)<br>W: White (For Compliance & Commercial)   |

## 2. Test Specification

The following test specifications and standards have been applied and used for testing.

- 1) KDB 447498 D01 v06 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
- 2) RSS 102 Issue 5: Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

### 3. RF Exposure Evaluation

#### Maximum Permissible Exposure

RF Exposure Evaluation of the EUT were measured according to the dictates in KDB 447498

Pd the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

**Friis transmission formula:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$**

Where  $P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi = 3.1416$

$R$  = distance between observation point and center of the radiator in  $\text{m}$

#### Limits

#### **Environmental evaluation and exposure limit according to FCC Part 1, Subpart I, Section 1.1307(b) & 1.1310**

According to Section 1.1310, The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

| Frequency Range (MHz)                                 | Electric Field Strength(V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time |
|---|------------------------------|-------------------------------|-------------------------------------|--------------|
| (A) Limits for Occupational /Control Exposures        |                              |                               |                                     |              |
| 300 – 1 500   | --                           | --                            | F/300                               | 6            |
| 1 500 – 100 000                                       | --                           | --                            | 5                                   | 6            |
| (B) Limits for General Population/Uncontrol Exposures |                              |                               |                                     |              |
| 300 – 1 500   | --                           | --                            | F/1500                              | 6            |
| <b>1 500 – 100 000</b>                                | <b>--</b>                    | <b>--</b>                     | <b>1</b>                            | <b>30</b>    |

#### **Environmental evaluation and exposure limit according to RSS-102**

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

| Frequency Range (MHz) | Electric Field (V/m rms) | Magnetic Field (A/m rms)     | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------------|--------------------------|------------------------------|-----------------------------------|----------------------------|
| 0.003- $10^{21}$      | 83                       | 90                           | -                                 | Instantaneous*             |
| 0.1-10                | -                        | $0.73/f$                     | -                                 | 6**                        |
| 1.1-10                | $87/f^{0.5}$             | $4.9/f$                      | -                                 | 6**                        |
| 10-20                 | 27.46                    | 0.0728                       | 2                                 | 6                          |
| 20-48                 | $58.07/f^{0.5}$          | $0.1540/f^{0.25}$            | $8.944/f^{0.5}$                   | 6                          |
| 48-300                | 22.06                    | 0.05852                      | 1.291                             | 6                          |
| 300-6000              | $3.141f^{0.3417}$        | $0.008335f^{0.3417}$         | $0.02619f^{0.6834}$               | 6                          |
| 6000-15000            | 61.4                     | 0.163                        | 10                                | 6                          |
| 15000-150000          | 61.4                     | 0.163                        | 10                                | $616000/f^{1.2}$           |
| 150000-300000         | $0.158f^{0.5}$           | $4.21 \times 10^{-4}f^{0.5}$ | $6.67 \times 10^{-4}f$            | $616000/f^{1.2}$           |

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

\*Based on nerve stimulation (NS).

\*\* Based on specific absorption rate (SAR).

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

| Frequency Range (MHz)  | Electric Field (V/m rms) | Magnetic Field (A/m rms)                 | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
|------------------------|--------------------------|--|-----------------------------------|----------------------------|
| 0.003-10 <sup>23</sup> | 170                      | 180                                      | -                                 | Instantaneous*             |
| 0.1-10                 | -                        | 1.6/f                                    | -                                 | 6**                        |
| 1.29-10                | 193/f <sup>0.5</sup>     | -  | -                                 | 6**                        |
| 10-20                  | 61.4                     | 0.163                                    | 10                                | 6                          |
| 20-48                  | 129.8/f <sup>0.25</sup>  | 0.3444/f <sup>0.25</sup>                 | 44.72/f <sup>0.5</sup>            | 6                          |
| 48-100                 | 49.33                    | 0.1309                                   | 6.455                             | 6                          |
| 100-6000               | 15.60 f <sup>0.25</sup>  | 0.04138 f <sup>0.25</sup>                | 0.6455 f <sup>0.5</sup>           | 6                          |
| 6000-15000             | 137                      | 0.364                                    | 50                                | 6                          |
| 15000-150000           | 137                      | 0.364                                    | 50                                | 616000/f <sup>1.2</sup>    |
| 150000-300000          | 0.354 f <sup>0.5</sup>   | 9.40 x 10 <sup>-4</sup> f <sup>0.5</sup> | 3.33 x 10 <sup>-4</sup> f         | 616000/f <sup>1.2</sup>    |

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

\*Based on nerve stimulation (NS).

\*\* Based on specific absorption rate (SAR).

### 3.1. The Result of RF Exposure Evaluation

#### 3.1.1. Evaluation at 20 cm distance

| Modulation Type | Frequency (MHz) | Max Power (dBm) | Antenna Gain (dBi) | Power Density at 20 cm (mW/cm <sup>2</sup> ) | FCC Limit (mW/cm <sup>2</sup> ) | IC Limit (W/m <sup>2</sup> ) |
|-----------------|-----------------|-----------------|--------------------|--|---------------------------------|------------------------------|
| GFSK            | 2 450           | -14.0           | - 1.5              | 0.000 01                                     | 1.0                             | 5.42                         |

Note :

1. EUT operated in 2.45 GHz frequency band.
2. The power density at a distance of 20 cm calculated from the friis transmission formula is far below each limits.