

FCC RF Exposure Report

FCC ID : TFB-1005
Equipment : 2.4 GHz Bluetooth Low Energy Module
Model No. : SaBLE-x-R2
Brand Name : Laird Technologies
Applicant : Laird Technologies
Address : W66N220 Commerce Court, Cedarburg,
Wisconsin 53012, USA
Standard : 47 CFR FCC Part 2.1093
47 CFR FCC Part 2.1091
Received Date : Apr. 25, 2017
Tested Date : Apr. 27 ~ May 03, 2017

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

| Report No. | Version | Description | Issued Date |
|------------|---------|----------------------------|---------------|
| FA742502 | Rev. 01 | Initial issue | Jun. 02, 2017 |
| FA742502 | Rev. 02 | Corrected modulation modes | Jun. 12, 2017 |

1 EXPOSURE EVALUATION OF PORTABLE DEVICES

Human exposure to RF emissions from portable devices (47 CFR §2.1093), as defined by the FCC, must be evaluated with respect to the FCC-adopted limits for SAR. Evaluation of mobile devices, as defined by the FCC, may also be performed with respect to SAR limits, but in such cases it is usually simpler and more cost-effective to evaluate compliance with respect to field strength or power density limits. For certain devices that are designed to be used in both mobile and portable configurations similar to those described in 47 CFR §2.1091(d)(4), such as certain desktop phones and wireless modem modules, compliance for mobile configurations is also satisfied when the same device is evaluated for SAR compliance in portable configurations.

1.1 SAR TEST EXCLUSION THRESHOLD FOR 100MHz to 6GHz and ≤ 50mm

| Frequency (MHz) | 5 | 10 | 15 | 20 | 25 | Separation distance (mm) |
|-----------------|----|----|-----|-----|-----|-----------------------------------|
| 150 | 39 | 77 | 116 | 155 | 194 | SAR Test Exclusion Threshold (mW) |
| 300 | 27 | 55 | 82 | 110 | 137 | |
| 450 | 22 | 45 | 67 | 89 | 112 | |
| 835 | 16 | 33 | 49 | 66 | 82 | |
| 900 | 16 | 32 | 47 | 63 | 79 | |
| 1500 | 12 | 24 | 37 | 49 | 61 | |
| 1900 | 11 | 22 | 33 | 44 | 54 | |
| 2450 | 10 | 19 | 29 | 38 | 48 | |
| 3600 | 8 | 16 | 24 | 32 | 40 | |
| 5200 | 7 | 13 | 20 | 26 | 33 | |
| 5400 | 6 | 13 | 19 | 26 | 32 | |
| 5800 | 6 | 12 | 19 | 25 | 31 | |

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \sqrt{f(\text{GHz})} \leq 3.0$$
 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

1.2 EVALUATION RESULTS

| Maximum Conducted Output Power Result | | | | | |
|---------------------------------------|-------------|-----------------------|-------------------|------------------|--------------------|
| Condition | | RF Output Power (dBm) | | | |
| Modulation Mode | Freq. (MHz) | Average Power (dBm) | Rated Power (dBm) | Rated Power (mW) | Antenna Gain (dBi) |
| LE-125 kbps | 2402 | 5.54 | 6 | 3.98 | 2 |
| LE-125 kbps | 2440 | 5.29 | 6 | 3.98 | 2 |
| LE-125 kbps | 2480 | 4.99 | 6 | 3.98 | 2 |
| LE-500 kbps | 2402 | 5.53 | 6 | 3.98 | 2 |
| LE-500 kbps | 2440 | 5.28 | 6 | 3.98 | 2 |
| LE-500 kbps | 2480 | 4.98 | 6 | 3.98 | 2 |
| LE-1Mbps | 2402 | 5.56 | 6 | 3.98 | 2 |
| LE-1Mbps | 2440 | 5.31 | 6 | 3.98 | 2 |
| LE-1Mbps | 2480 | 5.02 | 6 | 3.98 | 2 |
| LE-2Mbps | 2402 | 5.55 | 6 | 3.98 | 2 |
| LE-2Mbps | 2440 | 5.30 | 6 | 3.98 | 2 |
| LE-2Mbps | 2480 | 5.01 | 6 | 3.98 | 2 |

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}]$
 $= 3.98 / 5 * \sqrt{2.402} = 1.234 < 3.0$

SAR Test Exclusion Thresholds is < 10mW and 3.0 for separation distance 5mm. Therefore, SAR test is not required.

2 MPE EVALUATION OF MOBILE DEVICES

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons.

2.1 LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE

| Frequency Range (MHz) | Power Density (mW /cm ²) | Averaging Time (minutes) |
|-----------------------|--------------------------------------|--------------------------|
| 300~1500 | F/1500 | 30 |
| 1500~100000 | 1.0 | 30 |

2.2 MPE EVALUATION FORMULA

$$Pd = \frac{Pt}{4 * Pi * R^2}$$

Where

Pd= Power density in mW/cm²

Pt= EIRP in mW

Pi= 3.1416

R= Measurement distance

2.3 MPE EVALUATION RESULTS

| Modulation Mode | Maximum Conducted Power (dBm) | Antenna Gain (dBi) | Distance (cm) | Power Density (mW/cm ²) | Limit (mW/cm ²) |
|-----------------|-------------------------------|--------------------|---------------|-------------------------------------|-----------------------------|
| LE-125 kbps | 5.54 | 2 | 20 | 0.00113 | 1 |
| LE-125 kbps | 5.29 | 2 | 20 | 0.00107 | 1 |
| LE-125 kbps | 4.99 | 2 | 20 | 0.00099 | 1 |
| LE-500 kbps | 5.53 | 2 | 20 | 0.00113 | 1 |
| LE-500 kbps | 5.28 | 2 | 20 | 0.00106 | 1 |
| LE-500 kbps | 4.98 | 2 | 20 | 0.00099 | 1 |
| LE-1Mbps | 5.56 | 2 | 20 | 0.00113 | 1 |
| LE-1Mbps | 5.31 | 2 | 20 | 0.00107 | 1 |
| LE-1Mbps | 5.02 | 2 | 20 | 0.00100 | 1 |
| LE-2Mbps | 5.55 | 2 | 20 | 0.00113 | 1 |
| LE-2Mbps | 5.30 | 2 | 20 | 0.00107 | 1 |
| LE-2Mbps | 5.01 | 2 | 20 | 0.00100 | 1 |

3 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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If you have any suggestion, please feel free to contact us as below information.

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