

FCC RF Exposure Report

FCC ID : SQGBL654
Equipment : Bluetooth 5.0 BLE Data Module
Model No. : BL654
Brand Name : Laird
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 : Jan. 30, 2018
Tested Date : Feb. 06 ~ Apr. 24, 2018

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



Table of Contents

1	EXPOSURE EVALUATION OF PORTABLE DEVICES	4
1.1	SAR TEST EXCLUSION THRESHOLD FOR 100MHz to 6GHz and ≤ 50 mm	4
1.2	EVALUATION RESULTS	5
2	MPE EVALUATION OF MOBILE DEVICES	6
2.1	LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE.....	6
2.2	MPE EVALUATION FORMULA	6
2.3	MPE EVALUATION RESULTS	6
3	TEST LABORATORY INFORMATION	7

Release Record

Report No.	Version	Description	Issued Date
FA813002	Rev. 01	Initial issue	Jun. 25, 2018

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	7.20	8	6.31	2
LE-125 kbps	2440	7.41	8	6.31	2
LE-125 kbps	2480	7.50	8	6.31	2
LE-500 kbps	2402	7.19	8	6.31	2
LE-500 kbps	2440	7.40	8	6.31	2
LE-500 kbps	2480	7.49	8	6.31	2
LE-1Mbps	2402	7.19	8	6.31	2
LE-1Mbps	2440	7.40	8	6.31	2
LE-1Mbps	2480	7.49	8	6.31	2
LE-2Mbps	2402	7.19	8	6.31	2
LE-2Mbps	2440	7.39	8	6.31	2
LE-2Mbps	2480	7.49	8	6.31	2

$$\left[\frac{\text{(max. power of channel, including tune-up tolerance, mW)}}{\text{(min. test separation distance, mm)}} \right] * [\sqrt{f(\text{GHz})}]$$

$$= 6.31 / 5 * \sqrt{2.480} = 1.987 < 3.0$$

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

π= 3.1416

R= Measurement distance

2.3 MPE EVALUATION RESULTS

Modulation Mode	Maximum Conducted Power (dBm)	Rated Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
LE-125 kbps	7.20	8	2	20	0.002	1
LE-125 kbps	7.41	8	2	20	0.002	1
LE-125 kbps	7.50	8	2	20	0.002	1
LE-500 kbps	7.19	8	2	20	0.002	1
LE-500 kbps	7.40	8	2	20	0.002	1
LE-500 kbps	7.49	8	2	20	0.002	1
LE-1Mbps	7.19	8	2	20	0.002	1
LE-1Mbps	7.40	8	2	20	0.002	1
LE-1Mbps	7.49	8	2	20	0.002	1
LE-2Mbps	7.19	8	2	20	0.002	1
LE-2Mbps	7.39	8	2	20	0.002	1
LE-2Mbps	7.49	8	2	20	0.002	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

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

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

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==