

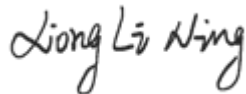
TEST REPORT

Applicant: Libre Wireless Technologies, Inc.
Address: 17835 Newhope Street, Ste A, Fountain Valley, CA 92708, US
Equipment Type: High Performance Wireless Media Module
Model Name: LS8 (refer to section 2.3)
Brand Name: LIBRE
FCC ID: 2ADBM-LS8
Test Standard: 47 CFR Part 2.1091
KDB 447498 D04 v01
Sample Arrival Date: Sep. 09, 2024
Test Date: Sep. 19, 2024 - Oct. 13, 2024
Date of Issue: Nov. 04, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Lining



Checked by: Xu Rui



Approved by: Tolan Tu

(Testing Director)



Revision History		
Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Nov. 04, 2024</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1	GENERAL INFORMATION.....	3
1.1	Test Laboratory	3
1.2	Test Location	3
2	PRODUCT INFORMATION	4
2.1	Applicant Information	4
2.2	Manufacturer Information.....	4
2.3	General Description for Equipment under Test (EUT).....	4
2.4	Technical Information	5
3	SUMMARY OF TEST RESULT	6
3.1	Test Standards	6
3.2	Limit Standards.....	6
4	DEVICE CATEGORY AND LEVELS LIMITS	7
5	ASSESSMENT RESULT	9
5.1	Output Power	9
5.2	Tune-up power	9
5.3	RF Exposure Evaluation Result	10
5.4	Collocated Power Calculation	10
5.5	Conclusion.....	10

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	<input type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	<input checked="" type="checkbox"/> 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Libre Wireless Technologies, Inc.
Address	17835 Newhope Street, Ste A, Fountain Valley, CA 92708, US

2.2 Manufacturer Information

Manufacturer	Libre Wireless Technologies, Inc.
Address	17835 Newhope Street, Ste A, Fountain Valley, CA 92708, US

2.3 General Description for Equipment under Test (EUT)

EUT Name	High Performance Wireless Media Module
Model Name Under Test	LS8
Series Model Name	LS8-NFK-22G-S, LS8-NFK-24G-S, LS8-NFK-44G-S, LS8-NFK-22G-R, LS8-NFK-24G-R, LS8-NFK-44G-R, LS8-NFK-11G-R, LS8-NFK-12G-R, LS8-NFK-21G-R, LS8-NFK-42G-R
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and memory, the R series WIFI only has one IPEX port. (this information provided by the applicant)
Hardware Version	8118
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n and 802.11ac
-----------------------------------	--

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth, 2.4G WLAN, 5G WLAN	
Frequency Range	Bluetooth	2402 ~ 2480 MHz
	802.11b/g/n(HT20/HT40)	2412 ~ 2462 MHz
	802.11a/ n(HT20/HT40)	5150 ~ 5250 MHz
		5250 ~ 5350 MHz
		5470 ~ 5725 MHz
	802.11ac (VHT20/VHT40/VHT80)	5725 ~ 5850 MHz
		5150 ~ 5250 MHz
		5250 ~ 5350 MHz
5470 ~ 5725 MHz		
Antenna Type	Bluetooth	PCB Antenna
	WLAN	PCB Antenna
Exposure Category	General Population/Uncontrolled Exposure	
Product Type	Mobile Device	

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	KDB 447498 D04 v01	447498 D04 Interim General RF Exposure Guidance v01

3.2 Limit Standards

No.	Identity	Document Title
1	47 CFR Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices

4 DEVICE CATEGORY AND LEVELS LIMITS

Mobile Devices:

CFR Title 47 §2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D04 General RF Exposure Guidance v01 Limit

Evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i. e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1). The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

5 ASSESSMENT RESULT

5.1 Output Power

Mode	Bluetooth
Conducted Power (dBm)	6.96
Antenna Gain (dBi)	3.50
EIRP (dBm)	10.46

Note: This report listed the maximal case power value, please refer to BL-SZ2490059-601&BL-SZ2490059-602 report for more details.

Mode	2.4G WIFI
Conducted Power (dBm)	18.86
Antenna Gain (dBi)	3.50
EIRP (dBm)	22.36

Note: This report listed the maximal case power value, please refer to BL-SZ2490059-603 report for more details.

Mode	5.2G WIFI	5.3G WIFI	5.6G WIFI	5.8G WIFI
Conducted Power (dBm)	16.95	16.97	16.99	16.98
Antenna Gain (dBi)	5.90	5.90	5.90	5.90
EIRP (dBm)	22.85	22.87	22.89	22.88

Note: This report listed the maximal case power value, please refer to BL-SZ2490059-604 report for more details.

5.2 Tune-up power

Mode	Conducted Power Range (dBm)	EIRP Range (dBm)	ERP Range (dBm)
Bluetooth	[5.00, 7.00]	[9.00, 11.00]	[6.85, 8.85]
2.4G WIFI	[17.00, 19.00]	[21.00, 23.00]	[18.85, 20.85]
5.2G WIFI	[14.00, 16.00]	[20.00, 22.00]	[17.85, 19.85]
5.3G WIFI	[15.00, 17.00]	[21.00, 23.00]	[18.85, 20.85]
5.6G WIFI	[15.00, 17.00]	[21.00, 23.00]	[18.85, 20.85]
5.8G WIFI	[15.00, 17.00]	[21.00, 23.00]	[18.85, 20.85]

Note1: ERP= EIRP -2.15dB.
Note2: According KDB 447498 D04, used the greater of maximum conducted power and ERP to compare with the threshold value Pth.

5.3 RF Exposure Evaluation Result

Evolution mode	Maximum power (dBm)	Maximum power (mw)	Distance (mm)	Threshold Power (mW)	Power / Limit	Verdict
Bluetooth	8.85	7.67	200	3060.00	0.003	Pass
2.4G WIFI	20.85	121.62	200	3060.00	0.040	Pass
5.2G WIFI	19.85	96.61	200	3060.00	0.032	Pass
5.3G WIFI	20.85	121.62	200	3060.00	0.040	Pass
5.6G WIFI	20.85	121.62	200	3060.00	0.040	Pass
5.8G WIFI	20.85	121.62	200	3060.00	0.040	Pass

5.4 Collocated Power Calculation

Evolution mode	Frequency(MHz)	Power / Limit	Σ (Power / Limit) of Bluetooth + 2.4G WIFI + Max. 5G WIFI	Verdict
Bluetooth	2480	0.003	0.083	Pass
2.4G WIFI	2462	0.040		
5.3G WIFI	5250	0.040		

Note:

- Σ (Power / Limit): This is a summation of [(power for each transmitter/ antenna included in the simultaneous transmission)/ (corresponding Power limit)], for Bluetooth + 2.4G WIFI + Max. 5G WIFI.
- Both of the Bluetooth/WIFI can transmit simultaneously, the formula of calculated the Power is $CP1 / LP1 + CP2 / LP2 + \dots$ etc. < 1
 CP = Calculation power
 LP = Limit of power
- The worst-case situation is 0.083, which is less than "1". This confirmed that the device comply with FCC KDB 447498 D04 Power limit.
- The DUT work frequency range used is 2402 ~ 2480 MHz, 2412 ~ 2462 MHz, 5150 MHz~ 5250 MHz, 5250 MHz~ 5350 MHz, 5470 ~ 5725 MHz and 5725 MHz ~ 5850 MHz the result close to the limit by the above formula, so we select worst case power to calculate the exclusion power threshold.

5.5 Conclusion

This EUT is deemed to comply with the reference level limits, therefore the basic restrictions are compliant with human exposure limits.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--