



# RF Exposure evaluation

Report Reference No. .... : CTL2410232073-WFH

Compiled by:  
( position+printed name+signature)

Happy Guo  
(File administrators)

Tested by:  
( position+printed name+signature)

James Yu  
(Test Engineer)

Approved by:  
( position+printed name+signature)

Ivan Xie  
(Manager)

Happy Guo  
华检检测  
James Yu  
Shenzhen CTL Testing Technology Co., Ltd.  
Ivan Xie

**Product Name** ..... : Battery Monitor

**Model/Type reference** ..... : BMS100

**List Model(s)** ..... : Please look at page 2.

**Trade Mark** ..... : QUICKLYNKS

**FCC ID** ..... : 2AU4A-BMS100

**Applicant's name** ..... : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

**Address of applicant** ..... : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

**Test Firm** ..... : Shenzhen CTL Testing Technology Co., Ltd.

**Address of Test Firm** ..... : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

**Test specification** ..... :

47CFR §1.1310

**Standard** ..... : 47CFR §2.1091

KDB447498 D01 General RF Exposure Guidance v06

**TRF Originator** ..... : Shenzhen CTL Testing Technology Co., Ltd.

**Master TRF** ..... : Dated 2017-01

**Date of receipt of test item** ..... : Nov 14, 2024

**Date of Test** ..... : Nov 14, 2024–Mar 03, 2025

**Date of Issue** ..... : Mar 05, 2025

**Result** ..... : Pass

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# TEST REPORT

<b>Test Report No. :</b>	<b>CTL2410232073-WFH</b>	Mar 05, 2025
		Date of issue

Product Name : Battery Monitor

Sample No : CTL2410232073

Model /Type : BMS100

Listed Models : BMS100 Pro, BMS200, BMS200 Pro, BMS300, BMS300 Pro, BMS400, BMS400 Pro, BMS500, BMS500 Pro, BMS600, BMS600 Pro, BMS700, BMS700 Pro, BMS800, BMS800 Pro, BMS900, BMS900 Pro

**Applicant** : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

Address : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

**Manufacturer** : SHENZHEN LEAGEND OPTOELECTRONICS CO., LTD

Address : 4F, Bld. 26, No. 1301, Guanguang Rd., Xinlan Community, Longhua District, Shenzhen, China

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

## \*\* Modified History \*\*

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# 1 GENERAL INFORMATION

## 1.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C -35°C
Relative Humidity:	35%-55 %
Air Pressure:	101 KPa

## 1.2 Product Description

Product Name:	Battery Monitor
Model/Type reference:	BMS100
Power supply:	DC 6V-32V
Test Voltage:	DC12V

### Bluetooth Low Energy

Supported type:	Bluetooth Low Energy
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	PCB Antenna
Antenna gain:	2.1dBi

### LTE

Mode:	LTE Band 5;		
Modulation Type:	QPSK 16QAM		
Operating Frequency Range(S)	Band	Tx(MHz)	Rx(MHz)
	LTE Band 5	824~849	869~894
Release Version:	Release 9		
Category:	Cat 4		
Antenna type:	FPC Antenna		
Antenna gain:	3dBi		

### LTE

Mode:	LTE Band 7		
Modulation Type:	LTE QPSK 16QAM		
Operating Frequency Range(S)	Band	Tx(MHz)	Rx(MHz)
	LTE Band 7	2500~2570	2620~2690
Release Version:	Release 9		
Category:	Cat 4		
Antenna type:	FPC Antenna		

Antenna gain:	3dBi
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Note 1: For more details, refer to the user's manual of the EUT.

Note 2: Antenna gain and cable loss provided by the applicant.

## 1.3 Test Facility

### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

### 1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### **CNAS-Lab Code: L7497**

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No. 4343.01**

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **IC Registration No.: 9618B**

#### **CAB identifier: CN0041**

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B.

#### **FCC-Registration No.: 399832**

#### **Designation No.: CN1216**

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832.

## 1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	±2.20 dB	(1)

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 2 METHOD OF MEASUREMENT

### 2.1 Applicable Standard

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Device, RF Exposure, Equipment Authorization Procedures.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

### 2.2 Evaluation Method and Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

\*=Plane-wave equivalent power density

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

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

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is  $\leq 1.0$ . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

### 3 Conducted Power Results

#### Bluetooth Low Energy

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
1M	2402	-0.58
	2440	-0.07
	2480	-0.35
2M	2402	-0.53
	2440	-0.05
	2480	-0.35

#### <LTE Max Conducted Power>

Test Mode		Modulation	Max Conducted Power (dBm)
LTE	Band 5	QPSK	24.02
		16QAM	23.53
	Band 7	QPSK	22.94
		16QAM	22.27

## 4 Manufacturing Tolerance

### Bluetooth Low Energy

GFSK (Peak)			
Frequency	2402	2440	2480
Target (dBm)	-1	0	0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

### <LTE Max Conducted Power>

Test Mode		Modulation	Max Conducted Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 5	QPSK	24.02	24.0 $\pm$ 1.0
		16QAM	23.53	24.0 $\pm$ 1.0
	Band 7	QPSK	22.94	23.0 $\pm$ 1.0
		16QAM	22.27	22.0 $\pm$ 1.0

## 5 Evaluation Results

### 5.1 Standalone Evaluation

#### Bluetooth Low Energy

Mode	f (GHz)	Antenna Distance (cm)	RF output power		G (Num.)	Result	SAR Test Exclusion
			dBm	mW			
1M	2.402	20	0	1.00	1.6218	0.0003 <1.0	Yes
	2.440	20	1	1.26	1.6218	0.0004 <1.0	Yes
	2.480	20	1	1.26	1.6218	0.0004 <1.0	Yes
2M	2.402	20	0	1.00	1.6218	0.0003 <1.0	Yes
	2.440	20	1	1.26	1.6218	0.0004 <1.0	Yes
	2.480	20	1	1.26	1.6218	0.0004 <1.0	Yes

#### <LTE Max Conducted Power>

Test Mode	f (GHz)	Modulation	Antenna Distance (cm)	RF output power		G (Num.)	Result	SAR Test Exclusion
				dBm	mW			
LTE	Band 5	QPSK	20	25	316.23	1.9953	0.1255 < 0.5498	Yes
		16QAM	20	25	316.23	1.9953	0.1255 < 0.5498	Yes
	Band 7	QPSK	20	24	251.19	1.9953	0.0997 < 1.0	Yes
		16QAM	20	23	199.53	1.9953	0.0792 < 1.0	Yes

#### Simultaneous Transmission MPE:

$$0.0004/1+0.1255/0.5498+0.0997/1=0.3284<1$$

Test Results: PASS

Remark:

1. Output power including tune up tolerance;
2. When the minimum test separation distance is  $\geq 20\text{cm}$ , In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091

## 6 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB447498 D01 General RF Exposure Guidance v06, No SAR is required.

\*\*\*\*\*THE END\*\*\*\*\*