

TEST REPORT

Product Name : Smart Lock U300
Model Number : DL-D02E, DL-D02D
FCC ID : 2AKIT-DLD02

Prepared for : Lumi United Technology Co., Ltd
Address : B1, Chongwen Park, Nanshan iPark, Liuxian Avenue,
Taoyuan Residential District, Nanshan District, Shenzhen,
China

Prepared by : EMTEK (DONGGUAN) CO., LTD.
Address : -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology
Research and Development Base, No.9, Xincheng Avenue,
Songshanhu High-technology Industrial Development Zone,
Dongguan, Guangdong, China

TEL: +86-0769-22807078

FAX: +86-0769-22807079

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Table of Contents

1. TEST RESULT CERTIFICATION	3
2. EUT SPECIFICATION	5
3. TEST REQUIREMENT:	6
RF EXPOSURE EVALUATION	6
4. MEASUREMENT RESULT	7



1. TEST RESULT CERTIFICATION

Applicant : Lumi United Technology Co., Ltd
 Address : B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
 Manufacturer : Lumi United Technology Co., Ltd
 Address : B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
 EUT : Smart Lock U300
 Model Name : DL-D02E, DL-D02D
 Trademark : Aqara

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
§ 15.247(i), § 2.1093,1.1307(b)(1)	PASS

The above equipment was tested by EMTEK(DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules FCC § 15.247(i), § 2.1093, 1.1307(b)(1). The test results of this report relate only to the tested sample identified in this report


Date of Test : April 30, 2024 to May 31, 2024

Prepared by : Warren Deng

Warren Deng /Editor

Reviewer : Tim Dong

Tim Dong /Supervisor



Approve & Authorized Signer : Sam Lv / Manager

Modified History

Version	Report No.	Revision Date	Summary
	EDG2404300196E00404R	/	Original Report



2. EUT Specification

Characteristics	Description
Product:	Smart Lock U300
Model Number:	DL-D02E, DL-D02D All models are the same, except the model name. Here, DL-D02E is selected to test all the test items.
Sample:	2#
Device Type:	BLE, Thread, NFC
Modulation:	O-QPSK for BLE GFSK for Thread ASK for NFC
Operating Frequency Range(s) :	2402-2480 MHz for BLE 2405-2480 MHz for Thread 13.56MHz for NFC
Number of Channels:	40 channels for BLE 16 channels for Thread 1 channels for NFC
Transmit Power Max:	5.60 dBm(0.003631 W) for BLE 7.06 dBm(0.005082 W) for Thread
Antenna Gain:	2 dBi for BLE and Thread 0 dBi for NFC
Power supply:	DC 5V from USB DC 6V from Battery
Evaluation applied:	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

3. Test Requirement:

RF EXPOSURE EVALUATION

According to FCC 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)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

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

Where

P_d = Power density in mW/cm²

P_{out} =output power to antenna in mW

G = Numeric gain of the antenna relative to isotropic antenna

π =3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

4. Measurement Result

Antenna gain:
2.4G: 2 dBi

Thread

Channel	Output Power(dBm)	E.I.R.P(dBm)	Target Power W/tolerance (dBm)	Max tune up power(dBm) tolerance	Max tuneup power(mW) tolerance	Power Density at R=20cm (mW/cm2)	Power density Limits (mW/cm2)
1	7.06	9.06	9±1	10	10.00	0.003153	1
8	6.85	8.85	8±1	9	7.94	0.002505	1
15	5.96	7.96	7±1	8	6.31	0.001989	1

BLE

Mode	Frequency (MHz)	Output Power(dBm)	E.I.R.P(dBm)	Target Power W/tolerance (dBm)	Max tune up power(dBm) tolerance	Max tuneup power(mW) tolerance	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)
1M	2402	5.6	7.6	7±1	8	6.31	0.001989	1
	2440	5.24	7.24	7±1	8	6.31	0.001989	1
	2480	4.29	6.29	6±1	7	5.01	0.001580	1
2M	2402	5.6	7.6	7±1	8	6.31	0.001989	1
	2440	5.24	7.24	7±1	8	6.31	0.001989	1
	2480	4.31	6.31	6±1	7	5.01	0.001580	1

According to KDB 447498, no stand-alone required for Thread & BLE antenna, and no simultaneous SAR measurement is required.

According to KDB 447498 and §1.1307(b)(1), systems operating under the provisions of this 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.

- a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \sqrt{f_{\text{(GHz)}}} \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR,}^{30} \text{ where}$$

- $f_{\text{(GHz)}}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation³¹
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) below

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 according to 4.1 f) is applied to determine SAR test exclusion.

- b) For 100 MHz to 6 GHz and *test separation distances* > 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following (also illustrated in Appendix B):³²

- 1) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f_{\text{(MHz)}}/150)]\}$ mW, for 100 MHz to 1500 MHz
- 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

- c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):³³

- 1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by $[1 + \log(100/f_{\text{(MHz)}})]$
- 2) For *test separation distances* ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$
- 3) SAR measurement procedures are not established below 100 MHz.

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval. One antenna is available for the EUT. The minimum separation distance is 5mm.

According to ANSI C63.10-2013

9.5 Equations to calculate EIRP

Calculate the EIRP from the radiated field strength in the far field using Equation (22):

$$\text{EIRP} = E + 20 \log(d) - 104.7 \quad (22)$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E is the field strength of the emission at the measurement distance, in dB μ V/m

d is the measurement distance, in m

NFC

Channel Freq. (MHz)	Max Field Strength (dBuV/m)	peak output power (dBm)	Tune upPower (dBm)	Max tune up power(dBm)	Calculation Result	1-g SAR
13.56	30.68	-64.4776	-65±1	-64	0.0000000035	3

According to KDB 447498, no stand-alone required for NFC antenna, and no simultaneous SAR measurement is required.

