

# Test Report

**Verified code:** 876876

**Report No.:** E20240311968201-4

**Customer:** Lumi United Technology Co., Ltd

**Address:** B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

**Sample Name:** Smart Lock U100, Smart Lock U50

**Sample Model:** SDL-D01, DL-D05D

**Receive Sample Date:** Mar.12,2024

**Test Date:** Mar.21,2024 ~ Mar.22,2024

**Reference Document:** 47 CFR Part 15 Subpart C Intentional Radiators

**Test Result:** Pass

**Prepared by:** Huang Lifang  
Huang Lifang

**Reviewed by:** Wu Haoting  
Wu Haoting

**Approved by:** Xiao Liang  
Xiao Liang

Guangzhou GRG Metrology & Test Co., Ltd.

**Issued Date:** 2024-04-15

Guangzhou GRG Metrology & Test Co., Ltd.

**Address:** No.163 Pingyun Road, West of Huangpu Avenue, Guangzhou GuangdongChina  
**Tel:** (+86) 400-602-0999 **FAX:** (+86) 020-38698685 **Web:** <http://www.grgtest.com>



## Statement

1. The report is invalid without "special seal for inspection and testing"; some copies are invalid; The report is invalid if it is altered or missing; The report is invalid without the signature of the person who prepared, reviewed and approved it.
2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.
3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.
4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.
5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

----- The following blanks -----

## TABLE OF CONTENTS

1.	TEST RESULT SUMMARY.....	5
2.	GENERAL DESCRIPTION OF EUT.....	6
2.1	APPLICANT.....	6
2.2	MANUFACTURER.....	6
2.3	BASIC DESCRIPTION OF EQUIPMENT UNDER TEST.....	6
2.4	TEST OPERATION MODE.....	8
2.5	LOCAL SUPPORTIVE.....	8
2.6	CONFIGURATION OF SYSTEM UNDER TEST.....	8
2.7	TEST SOFTWARE.....	8
3.	LABORATORY AND ACCREDITATIONS.....	9
3.1	LABORATORY.....	9
3.2	ACCREDITATIONS.....	9
3.3	MEASUREMENT UNCERTAINTY.....	9
4.	LIST OF USED TEST EQUIPMENT AT GRGT.....	10
5.	RADIATED SPURIOUS EMISSIONS.....	11
5.1	LIMITS.....	11
5.2	TEST PROCEDURES.....	11
5.3	MEASURING INSTRUMENTS SETTING.....	13
5.4	TEST SETUP.....	13
5.5	DATA SAMPLE.....	14
5.6	TEST RESULTS.....	15
5.6.1	OUT BAND RADIATED SPURIOUS EMISSIONS.....	15
APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM.....		20
APPENDIX B. PHOTOGRAPH OF THE EUT.....		20

----- The following blanks -----

**REPORT ISSUED HISTORY**

Report Version	Report No.	Description	Compile Date
1.0	E20240311968201-4	Original Issue	2024-03-25

**Note:**

The new EUT (Smart Lock U50) model numbers DL-D05D & DL-D05E (they have the same technical construction including circuit diagram PCB layout, hardware version and software version identical, except the model name) and the old EUT (Smart Lock U100) model numbers SDL-D01 & DL-D01D have the same technical construction including circuit diagram and PCB layout in the rear lock, it didn't affect bluetooth and zigbee RF chip performance. The differences in the new front lock on the basis of the old as below:

- a. The new front lock was canceled the fingerprint.
- b. The new front lock C board PCB layout and PIC type were changed.
- c. The new front lock B board PCB added 1pc LED 0603 White, 1pc LED 0603 RED and 2pcs 180R 5% 0402, connector P6B type was changed, deleted devices as below:
  - a) 150R 0402 1/16W: R104B, R107B;
  - b) 51R 0402 1/16W: R105B, R106B, R108B, R110B;
  - c) 100K 0402 1/16W: R109B;
  - d) 10nF/6.3V 0402 X5R: C107B;
  - e) 100nF/16V 0402 X5R: C83B;
  - f) 1uF/6.3V 0402 X5R: C82B;
  - g) BEAD\300Ω@100MHZ\250mA\0402: L7B;
  - h) ESD\Bi\±25/20KV\VRWM=3.3V, VBR=6.5V, Ir=0.1uA, CJ=12pF;
  - i) Ipp=6A\ SOD-882: D23B, D24B, D25B, D26B, D27B, D28B;
  - j) CONN: P4B.

NFC function is front lock, after evaluation, the worst case with adapter power supply for the model DL-D05D, section 5.6.1 OUT BAND RADIATED SPURIOUS EMISSIONS was tested and recorded in this report, other test datas refer to E20230117700901-4.

The difference about the report E20240311968201-4 and E20230117700901-4 are as follows:

- 1) Adding the equipment Smart Lock U50, the models DL-D05D in the page 1.
- 2) Adding the equipment Smart Lock U50, the models DL-D05D & DL-D05E, model difference description and hardware version in the section 2.3.
- 3) Adding the EUT photos of the models DL-D05D in the APPENDIX B.

**1. TEST RESULT SUMMARY**

<b>Technical Requirements</b>			
47 CFR Part 15 Subpart C Intentional Radiators			
<b>Item</b>	<b>FCC Standard Chapter</b>	<b>Report Chapter</b>	<b>Result</b>
Radiated Spurious Emissions	§15.225(a),(b),(c),(d) §15.209	Chapter 5	Complied

----- The following blanks -----

## 2. GENERAL DESCRIPTION OF EUT

### 2.1 APPLICANT

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

### 2.2 MANUFACTURER

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

### 2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Smart Lock U100

Adding  
Equipment: Smart Lock U50

Model No.: SDL-D01

Adding Model: DL-D01D, DL-D05D, DL-D05E

Models Difference: 1).That EUT (Smart Lock U100) Model Numbers SDL-D01 and DL-D01D have the same technical construction including circuit diagram PCB layout, hardware version and software version identical, except sales area, packaging and accessories are different, and all the tests were performed on the model SDL-D01.

2).The adding EUT (Smart Lock U50) model numbers DL-D05D & DL-D05E (they have the same technical construction including circuit diagram PCB layout, hardware version and software version identical, except the model name) and the EUT (Smart Lock U100) model numbers SDL-D01 & DL-D01D have the same technical construction including circuit diagram and PCB layout in the rear lock, it didn't affect bluetooth and zigbee RF chip performance. The differences in the new front lock on the basis of the old as below:

a.The new front lock was canceled the fingerprint.

b.The new front lock C board PCB layout and PIC type were changed.

c.The new front lock B board PCB added 1pc LED 0603 White, 1pc LED 0603 RED and 2pcs 180R 5% 0402, connector P6B type was changed, deleted devices as below:

150R 0402 1/16W: R104B,R107B;

51R 0402 1/16W: R105B, R106B, R108B, R110B;

100K 0402 1/16W: R109B;

10nF/6.3V 0402 X5R: C107B;

100nF/16V 0402 X5R: C83B;

1uF/6.3V 0402 X5R: C82B;

BEAD\300Ω@100MHZ\250mA\0402: L7B;

ESD\Bi\±25/20KV\VRWM=3.3V, VBR=6.5V, Ir=0.1uA, CJ=12pF;

Ipp=6A\ SOD-882: D23B,D24B,D25B,D26B,D27B,D28B;

CONN: P4B.

Trade Name: Aqara

FCC ID: 2AKIT-SDL01

Power supply: DC 6V power supplied by 4 AA batteries,DC 5V supplied by USB-C emergency port

Frequency Range: 13.56MHz

Modulation type: ASK

Antenna Specification: PCB Antenna

Temperature Range: -35 °C~66 °C

Hardware Version: V2.1 for SDL-D01 & DL-D01D;  
V3.1 for DL-D05D & DL-D05E.

Software Version: 1.0.4\_0007

Sample No: E20240311968201-0002

Note: The basic description of the EUT is provided by the applicant. This report is made Solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

----- The following blanks -----

## 2.4 TEST OPERATION MODE

Test Item	Mode No.	Description of the modes
Radiated Spurious Emission	2	EUT powered by USB-C emergency port Continuously Transmitting (13.56MHz TX)

Note: 1.The EUT is powered on to emit NFC signal.

## 2.5 LOCAL SUPPORTIVE

Name of Equipment	Manufacturer	Model	Serial Number	Note
Adapter	/	/	/	/

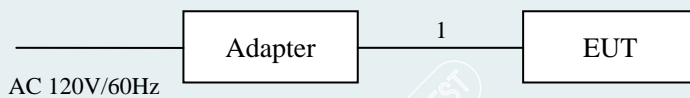
No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	USB cable	1	No	0	1.5m

## 2.6 CONFIGURATION OF SYSTEM UNDER TEST

For Mode 1



For Mode 2



## 2.7 TEST SOFTWARE

Software version	Test level
/	/



### 3. LABORATORY AND ACCREDITATIONS

#### 3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add : Address: No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China

P.C. : 518110

Tel : 0755-61180008

Fax : 0755-61180008

#### 3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017)

**USA** A2LA(Certificate #2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

**Canada** ISED (Company Number: 24897, CAB identifier:CN0069)

**USA** FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.grgtest.com>

#### 3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Coaxial	9kHz~30MHz	4.4dB
	Coplanar	9kHz~30MHz	4.4dB
	Horizontal	30MHz~200MHz	4.6dB
	Horizontal	200MHz~1000MHz	4.8dB
	Vertical	30MHz~200MHz	4.7dB
	Vertical	200MHz~1000MHz	4.7dB

Measurement	Uncertainty
RF frequency	$6.0 \times 10^{-6}$
Humidity	6.0 %
Temperature	2.0°C

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95%.

This uncertainty represents an expanded uncertainty factor of  $k=2$ .

**4. LIST OF USED TEST EQUIPMENT AT GRGT**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
<b>Radiated Spurious Emission</b>				
Test S/W	FARAD	EZ	CCS-03A1	/
Test Receiver	R&S	ESR26	101758	2024-09-22
Preamplifier	SHIRONG ELECTRONIC	DLNA-30M1G-G41	20200928002	2024-10-24
Bi-log Antenna	Schwarzbeck	VULB 9160	VULB9160-3402	2024-10-06
Loop Antenna	Schwarzbeck	FMZB 1513-60	1513-60-56	2024-07-15
Test S/W	Tonscend	JS32-RE		

Note: The calibration cycle of the above instruments is 12 months.

----- The following blanks -----

## 5. RADIATED SPURIOUS EMISSIONS

### 5.1 LIMITS

#### IN BAND SPURIOUS EMISSIONS

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

#### OUT BAND RADIATED SPURIOUS EMISSIONS

Frequency (MHz)	Quasi-peak( $\mu\text{V}/\text{m}$ )	Measurement distance(m)	Quasi-peak( $\text{dB}\mu\text{V}/\text{m}$ )@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

**NOTE:** (1) The lower limit shall apply at the transition frequencies.

### 5.2 TEST PROCEDURES

#### 1) Sequence of testing 9 kHz to 30 MHz

##### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The measurement distance is 3 meter.
- The EUT was set into operation.

##### Pre measurement:

- The turntable rotates from 0 ° to 360 °.
- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position ( $0^{\circ}$  to  $360^{\circ}$ ) and by rotating the elevation axes ( $0^{\circ}$  to  $360^{\circ}$ ).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

**2) Sequence of testing 30 MHz to 1 GHz****Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Pre measurement:**

--- The turntable rotates from  $0^{\circ}$  to  $360^{\circ}$ .

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable position ( $0^{\circ}$  to  $360^{\circ}$ ) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

**Remark:** Pre-scan all modes, mode 1 is the worst mode. Therefore, only the data of mode 1 is recorded in the report.

### 5.3 MEASURING INSTRUMENTS SETTING

Frequency (MHz)	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
0.009 to 30	Receiver	QP	200Hz: 0.009 to 0.15MHz 10kHz: 0.15 to 30MHz	3*RBW
30 to 1000	Receiver	QP	120kHz	3*RBW

### 5.4 TEST SETUP

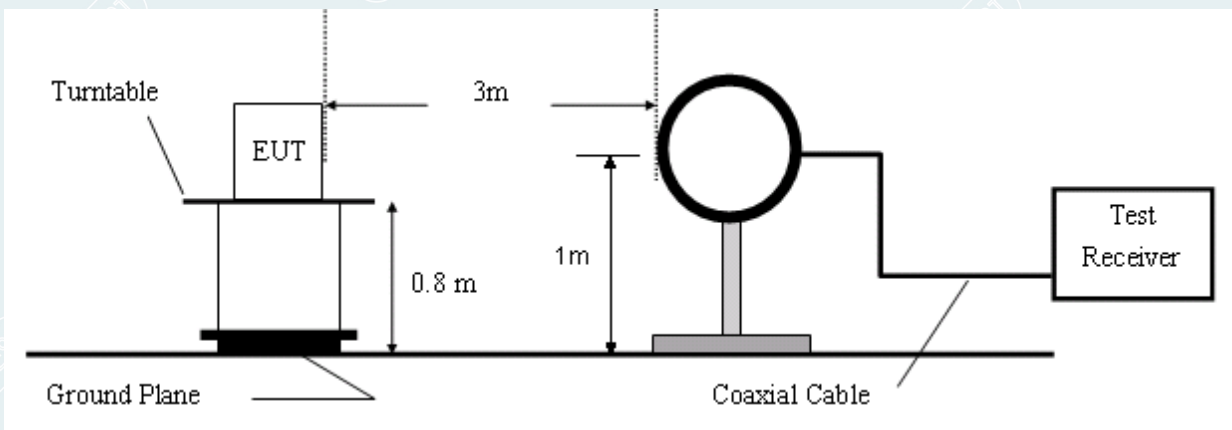


Figure 1. 9kHz to 30MHz radiated emissions test configuration

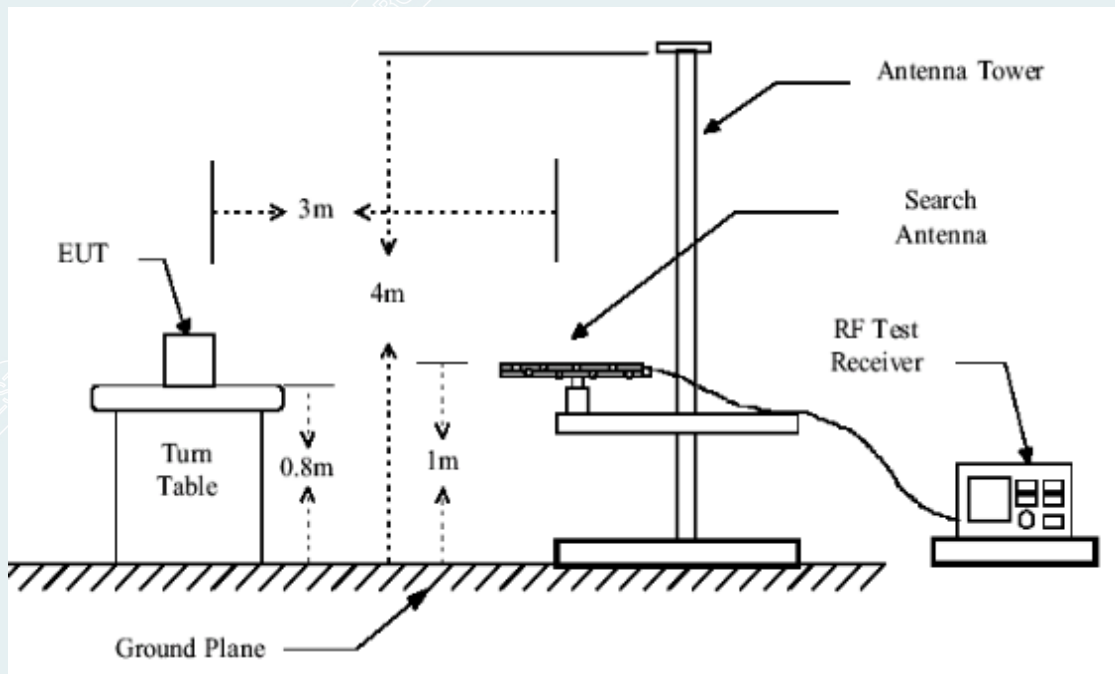


Figure 2. 30MHz to 1GHz radiated emissions test configuration

**5.5 DATA SAMPLE**

**0.009MHz to 1GHz**

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark	Pole
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)		
xxx	xxx	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

- Frequency (MHz) = Emission frequency in MHz
- Ant.Pol. (H/V/coaxial/coplanar) = Antenna polarization
- Reading (dBuV) = Uncorrected Analyzer / Receiver reading
- Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Remark Result (dBuV/m) – Limit (dBuV/m)
- QP = Quasi-peak Reading

----- The following blanks -----

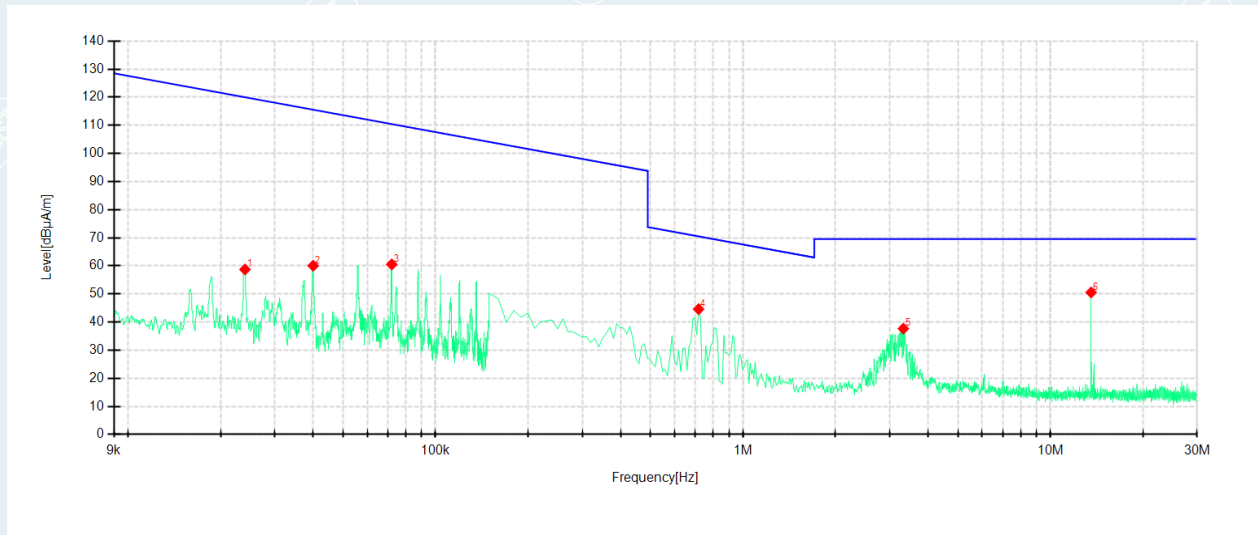
## 5.6 TEST RESULTS

### 5.6.1 OUT BAND RADIATED SPURIOUS EMISSIONS

9kHz-30MHz

For adapter power supply

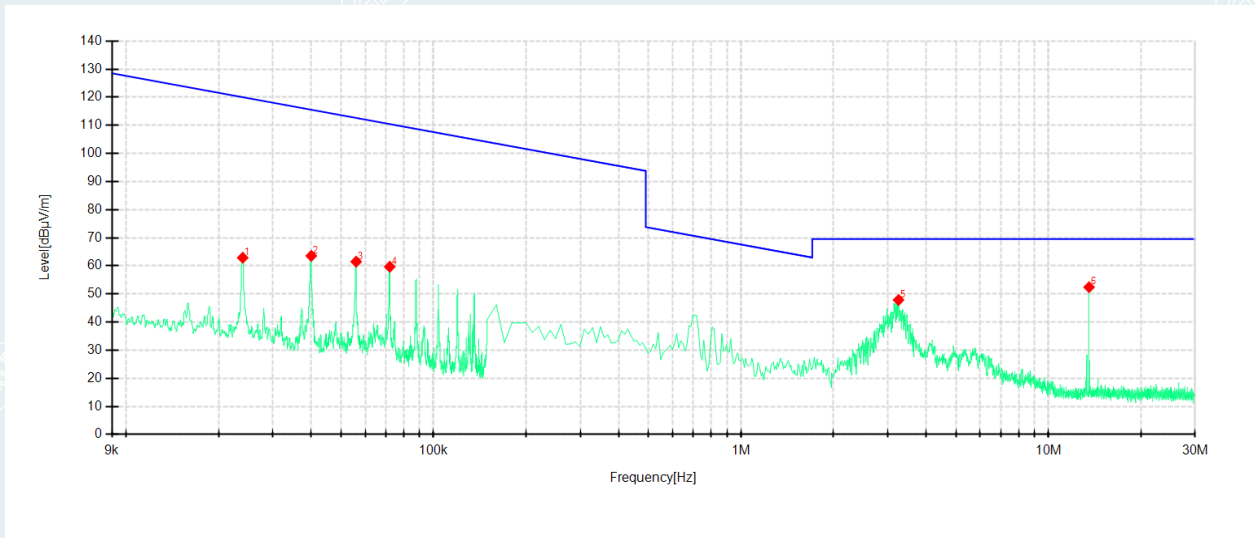
Project Information			
Application No.:	E20240311968201	EUT:	Smart Lock U50
Model:	DL-D05D	SN:	E20240311968201-0002
Mode:	Mode 2	Voltage:	AC 120V/60Hz
Environment:	22.5°C/52%RH/101.0kPa	Engineer:	Zhang Zishan
Test date:	2024-03-21	/	/



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0240	39.01	58.72	19.71	120.00	61.28	100	264	X
2	0.0400	40.54	60.04	19.50	115.57	55.53	100	20	X
3	0.0720	40.80	60.52	19.72	110.45	49.93	100	229	X
4	0.7172	24.26	44.60	20.34	70.49	25.89	100	106	X
5	3.3241	17.24	37.65	20.41	69.54	31.89	100	95	X
6	13.562	29.39	50.54	21.15	69.54	19.00	100	128	X

Note:NO.6 is the fundamental frequency point.

Project Information			
Application No.:	E20240311968201	EUT:	Smart Lock U50
Model:	DL-D05D	SN:	E20240311968201-0002
Mode:	Mode 2	Voltage:	AC 120V/60Hz
Environment:	22.5°C/52%RH/101.0kPa	Engineer:	Zhang Zishan
Test date:	2024-03-21	/	/

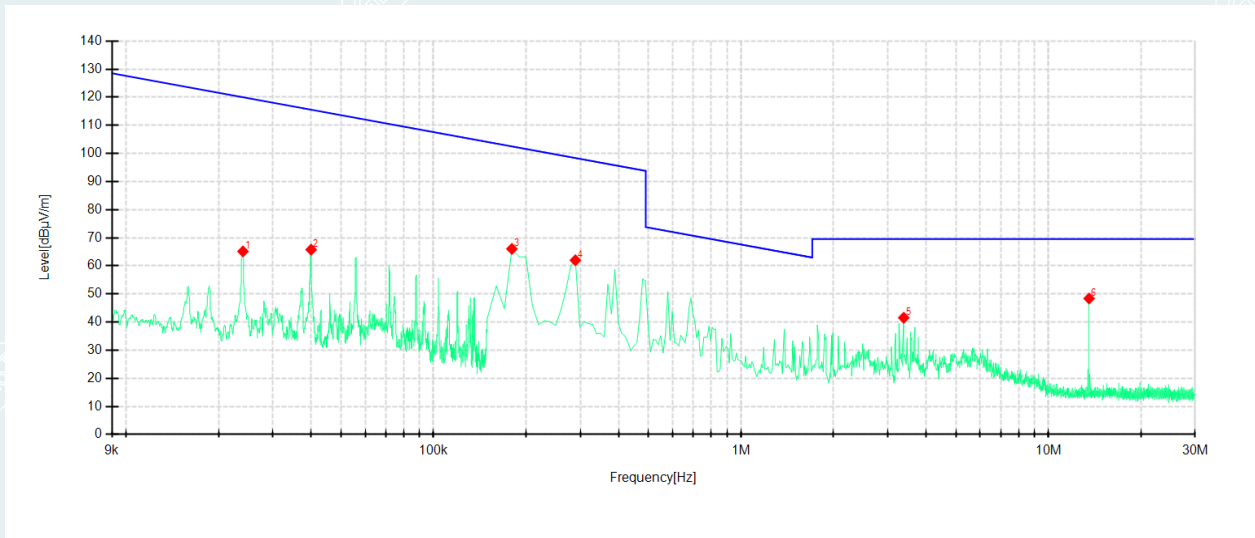


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0239	43.18	62.89	19.71	120.02	57.13	100	216	Y
2	0.0400	44.06	63.56	19.50	115.56	52.00	100	135	Y
3	0.0560	41.93	61.49	19.56	112.64	51.15	100	135	Y
4	0.0720	39.97	59.69	19.72	110.45	50.76	100	135	Y
5	3.2544	27.46	47.87	20.41	69.54	21.67	100	340	Y
6	13.562	31.26	52.41	21.15	69.54	17.13	100	282	Y

Note:NO.6 is the fundamental frequency point.



Project Information			
Application No.:	E20240311968201	EUT:	Smart Lock U50
Model:	DL-D05D	SN:	E20240311968201-0002
Mode:	Mode 2	Voltage:	AC 120V/60Hz
Environment:	22.5°C/52%RH/101.0kPa	Engineer:	Zhang Zishan
Test date:	2024-03-21	/	/



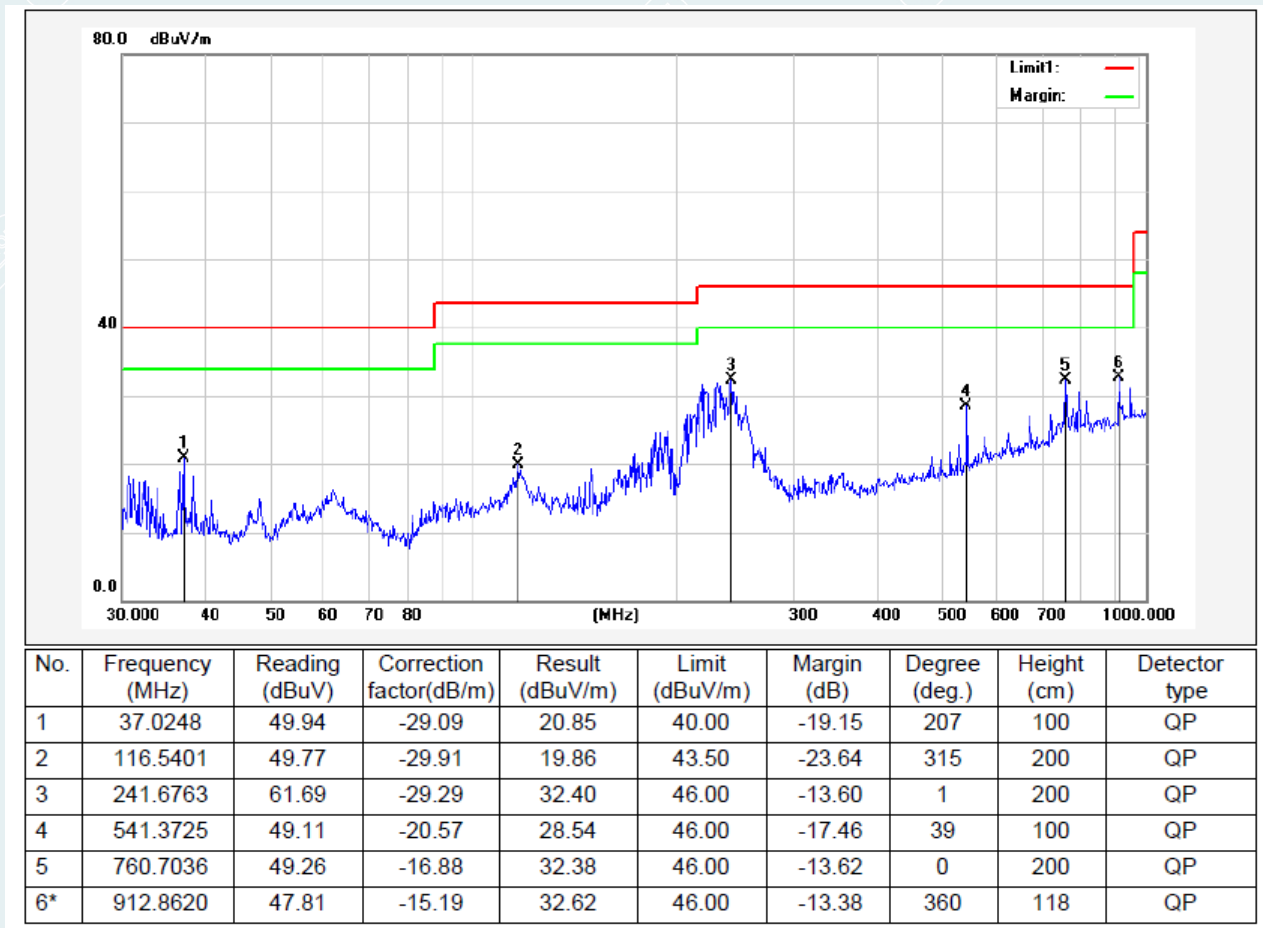
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0240	45.44	65.15	19.71	120.00	54.85	100	322	Z
2	0.0400	46.27	65.77	19.50	115.57	49.80	100	102	Z
3	0.1799	45.89	66.04	20.15	102.51	36.47	100	26	Z
4	0.2893	41.44	62.00	20.56	98.38	36.38	100	26	Z
5	3.3838	21.10	41.53	20.43	69.54	28.01	100	26	Z
6	13.562	27.24	48.39	21.15	69.54	21.15	100	14	Z

Note:NO.6 is the fundamental frequency point.

30MHz-1GHz  
 For adapter power supply

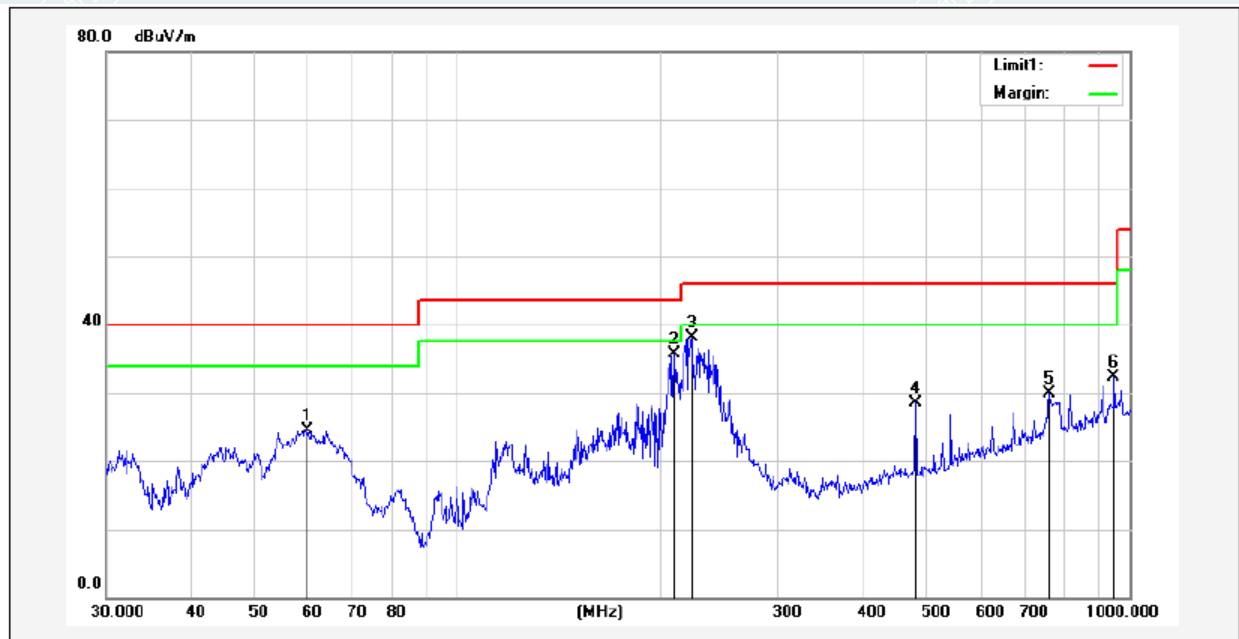
Project Information			
Application No.:	E20240311968201	EUT:	Smart Lock U50
Model:	DL-D05D	SN:	E20240311968201-0002
Mode:	Mode 2	Voltage:	AC 120V/60Hz
Environment:	22.3°C/53%RH/101.0kPa	Engineer:	Zhang Zishan
Test date:	2024-03-22	/	/

Polarity: Horizontal



Project Information			
Application No.:	E20240311968201	EUT:	Smart Lock U50
Model:	DL-D05D	SN:	E20240311968201-0002
Mode:	Mode 2	Voltage:	AC 120V/60Hz
Environment:	22.3°C/53%RH/101.0kPa	Engineer:	Zhang Zishan
Test date:	2024-03-22	/	/

Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Detector type
1	59.8588	53.57	-29.00	24.57	40.00	-15.43	31	100	QP
2*	210.0482	66.95	-31.32	35.63	43.50	-7.87	86	100	QP
3	222.9502	68.48	-30.46	38.02	46.00	-7.98	126	100	QP
4	480.5276	50.11	-21.59	28.52	46.00	-17.48	214	100	QP
5	760.7036	46.86	-16.88	29.98	46.00	-16.02	105	200	QP
6	948.7610	46.95	-14.67	32.28	46.00	-13.72	115	100	QP

**APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM**

Please refer to the attached document E20240311968201-11-Test Photo

**APPENDIX B. PHOTOGRAPH OF THE EUT**

Please refer to the attached document E20240311968201-12-EUT Photo.

----- **End of Report** -----