

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

TEST REPORT**Report Reference No.**.....: **GTS20221226005-1-11**Compiled by
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Date of issue.....: Jan.12, 2023

Test Laboratory Name: **Shenzhen Global Test Service Co.,Ltd.**

Address.....: No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong,China

Applicant's name: **Wuxi Yolenet Technology Co.,Ltd.**

Address.....: Floor17, Building 3, Zhongao Plaza, Xishan Distirct, Wuxi City, China

Test specification:Standard: **MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19
ARIB STD-T66 V3,7**

TRF Originator: Shenzhen Global Test Service Co.,Ltd.

Master TRF: Dated 2014-12

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Test item description.....: **2.4G 1T1R WIFI+Bluetooth2.1/4.2 SDIO Module**

Trade Mark: N/A

Manufacturer: Wuxi Yolenet Technology Co.,Ltd.

Model/Type reference.....: RTL8723DS

List Model: N/A

Operation Frequency.....: From 2402MHz to 2480MHz

Modulation Type: GFSK, $\pi/4$ -DQPSK, 8DPSK

Hardware version: V2.0

Software version.....: V2.0

Ratings.....: DC 3.3V

Result.....: **PASS**

TEST REPORT

Test Report No. : GTS20221226005-1-11

Jan.12, 2023

Date of issue

Equipment under Test : 2.4G 1T1R WIFI+Bluetooth2.1/4.2 SDIO Module**Model /Type** : RTL8723DS**Listed model** : N/A**Applicant** : Wuxi Yolenet Technology Co.,Ltd.**Address** : Floor17, Building 3, Zhongao Plaza, Xishan Distirct, Wuxi City, China**Manufacturer** : Wuxi Yolenet Technology Co.,Ltd.**Address** : Floor17, Building 3, Zhongao Plaza, Xishan Distirct, Wuxi City, China**Test Result:****PASS**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19](#)

[ARIB STD-T66 V3.7](#)

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec. 29, 2022
Testing commenced on	:	Dec. 29, 2022
Testing concluded on	:	Jan. 11, 2023

2.2. General Description of EUT

Product Name:	2.4G 1T1R WIFI+Bluetooth2.1/4.2 SDIO Module
Trade Mark:	N/A
Model/Type reference:	RTL8723DS
List Model:	N/A
Model Declaration	N/A
Power supply:	DC 3.3V
BT	
Operation frequency	2402-2480MHz
Channel Number	79 channels for Bluetooth (DSS) 40 channels for Bluetooth (DTS)
Channel Spacing	1MHz for Bluetooth (DSS) 2MHz for Bluetooth (DTS)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth (DSS) GFSK for Bluetooth (DTS)
WIFI	
WLAN	Supported 802.11 b/g/n
Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Operation frequency	IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz IEEE 802.11n HT40:2422-2462MHz
Channel number	13 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20) 9 Channels for WIFI 40MHz Bandwidth(802.11n-HT40)
Antenna Description	External Antenna, 2.00dBi(Max.) for 2.4G Band

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 230V / 50Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.3V

2.4. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	00007090-Win7_MP_Kit_RTL11n_8723DS_SDIO_v0.05_20161128		
Frequency	2402MHz	2441MHz	2480MHz
Bluetooth	Default	Default	Default

2.5. Description of Test Modes

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Operation Frequency List:

Channel	Frequency (MHz)
00	2402
01	2403
⋮	⋮
38	2440
39	2441
40	2442
⋮	⋮
77	2479
78	2480

Note: Test performed at the lowest/middle/highest frequencies selected in the list above for EUT supported while working on specified mode.

Summary of measurement results

EUT and Module Power tables			
EUT Setup Value(Vdc)	Normal	High(+10%)	Low(-10%)
	3.3	3.6	3.0
Module Vdd Power Measurement Value(Vdc)	Normal	High(+10%)	Low(-10%)
	3.303	3.306	3.297
Voltage error(%)	Result	Ref.level	0.09
	Limit	±1	
Judgment		pass	pass

NOTE:When EUT be operated at 10% from the normal supply voltage,the battery voltage of RF part was varied within ±1%.All test cased were done under the normal battery voltage.

2.6. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

● /	Length (m) :	/
	Shield :	/
	Detachable :	/

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong, China.

3.2. Test Facility

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

CNAS (No. CNAS L8169)

Shenzhen Global Test Service 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: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

Industry Canada Registration Number. is 24189.

FCC Designation Number is CN1234.

FCC Registered Test Site Number is 165725.

3.3. Environmental conditions

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

Normal Temperature: 25 °C

High Temperature: 50 °C

Low Temperature: -0 °C

Normal Voltage : DC 3.3V

High Voltage: DC 3.6V

Low Voltage: DC 3.0V

Relative Humidity: 55 %

Air Pressure: 989 hPa

3.4. Test Description

MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19		
Clause	Description of Test (Transmitter Parameters)	Result
6	Antenna Power	PASS
6	Tolerances for Antenna Power	PASS
3	Frequency Tolerance	PASS
4	Transmission Rate	PASS
4	Occupied Frequency Bandwidth	PASS
4	Spread Bandwidth	PASS
13	Dwell Time	PASS
5	Spurious Emissions	PASS
10	Transmission Antenna Gain (EIRP Antenna Power)	PASS
11	Transmission Radiated Angle Width (3dB Beam width)	N/A
12	Interference prevention function	PASS
8	Carrier Sensing function	N/A
Receiver Parameters		
7	Secondary Radiated Emissions	PASS
N/A is an abbreviation for Not Applicable.		

3.5. Measurement Uncertainty

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR100028-1 [2] and shall correspond to an expansion factor (coverage factor) $K=1.96$ or $K=2$ (which provide confidence levels of respectively 95% and 95.5% in the case where the distributions characterizing the actual measurement uncertainties are normal).

Parameter	Uncertainty
Frequency error / 99%&90% bandwidth	$\pm 1.62 \times 10^{-6}$
Total RF power, conducted	$\pm 0.8\text{dB}$
Spurious emissions, conducted	$\pm 0.8\text{dB}$
DC and low frequency voltages	$\pm 0.05\%$
Humidity	$\pm 5\%$
Temperature	$\pm 1^\circ\text{C}$

3.6. Measurement Instruments List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	N9020A	MY48010425	2022/09/09	1
2	RF Cable	H&S	GTS-C008	---	2022/09/09	1
3	DC Power Supply	Yizhan	PS-202D	40015841	2022/09/09	1

Calibration by the calibration agencies listed in the table correspond to paragraph 4 (ii) (c) of Article 24-2 in the Radio Law".

4. TEST CONDITIONS AND RESULTS

4.1. Frequency Error

LIMIT

50ppm

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: non-modulation

Spectrum Condition:

- Frequency: test frequency
- Span: 3MHz
- RBW: 10KHz
- VBW: 10 KHz
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

TEST RESULTS

For reporting purpose only.

Please refer to Appendix A.1.

4.2. Antenna Output Power and Output Power Tolerance

LIMIT

- $\leq 3 \text{ mW /MHz}$ (FHSS from 2402-2480 MHz)
- $\leq 10 \text{ mW/MHz}$ (OFDM, DSSS from 2400-2483.5 MHz)
- $\leq 10 \text{ mW}$ (other from 2400-2483.5 MHz)

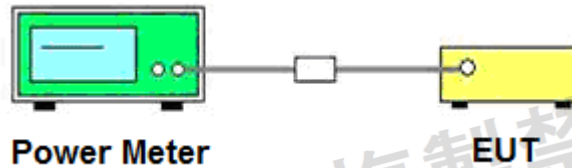
The Output Power Tolerance must be within +20%, -80%.

E.i.r.p:

- $\leq 12.14 \text{ dBm/MHz}$ (OFDM, DS form 2400-2483.5 MHz)

Note: E.I.R.P will not be applied to the transmission antenna which has a gain of 2.14dBi or less.

TEST CONFIGURATION



TEST PROCEDURE

- EUT have transmitted continuous maximum power
- Antenna Power Error is definition that actual measure antenna power tolerance between +20% to -80% power range that base on manufacturer declare the conducted power density.
- The EUT was programmed to be in continuously transmitting mode.

TEST RESULTS

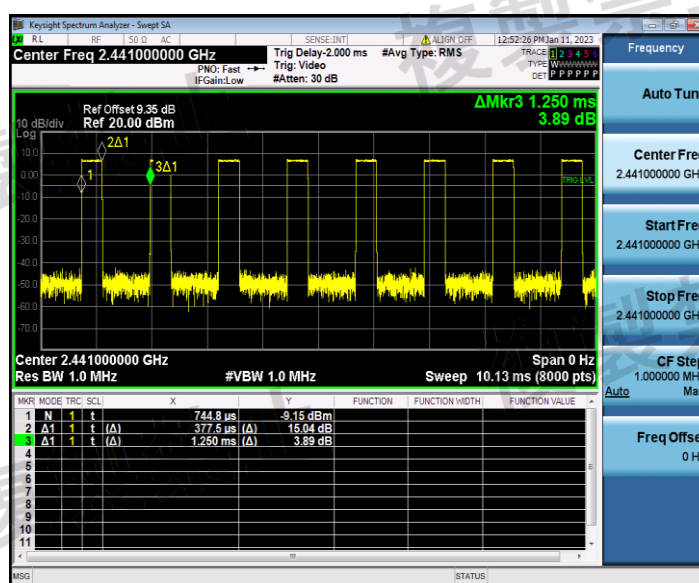
Modulation type	mode	Average burst power (dBm)	Duty cycle	Spread Bandwidth (MHz)	Output power (mW/MHz)	Limit (mW/MHz)	Rated output power (mW/MHz)	Tolerance (%)	Limit	Result
GFSK	Hopping	6.30	0.30	69.686	0.20	3	0.30	-33.33	-80% ~20 %	Pass
$\pi/4$ -DQPSK	Hopping	4.03	0.30	70.859	0.12	3	0.30	-60.00		
8DPSK	Hopping	5.06	0.30	70.381	0.15	3	0.30	-50.00		

Remark:

Output power= Average value / (Duty Cycle * Spreading bandwidth)

Duty cycle=30.4%

Duty cycle= [Ton/ (Ton+Toff)]*100%=0.38/1.25*100%=30.4%



Test Result of EIRP					
Mode	mode	Conducted test Power(mW/MHz)	Antenna gain	Measured EIRP Value(dBm/MHz)	Limit (dBm/MHz)
GFSK	Hopping	0.20	2.00	-4.99	6.91
$\pi/4$ -DQPSK	Hopping	0.12	2.00	-7.21	6.91
8DPSK	Hopping	0.15	2.00	-6.24	6.91

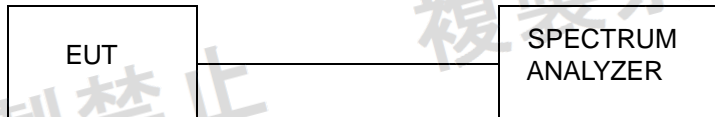
Note: Declared E.I.R.P= Conduced test Power+ Antenna gain

4.3. Occupied Bandwidth and Spreading Bandwidth

LIMIT

- Occupied bandwidth: FH≤83.5 MHz; OFDM≤40 MHz, DS≤26 MHz; Others≤26 MHz
- Spread Bandwidth:≥ 500 kHz(FH,DS)
- Spread factor>5.

TEST CONFIGURATION



TEST PROCEDURE

1. Setting of SA is following as follow:
 - RBW: under 3% of OBW
 - VBW: = RBW
 - Sweep time: Auto
 - Sweep Mode: Continuous sweep
 - Detect mode: Positive peak
 - Trace mode: Max hold
2. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of occupied bandwidth to measure occupied bandwidth.
3. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 90% of occupied bandwidth to measure spread bandwidth.
4. Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1Mbps (declare by client)

TEST RESULTS

For reporting purpose only.

Please refer to Appendix A.2.

Please refer to Appendix A.3.

Note: Spread Factor=Spread Bandwidth/modulation rate.

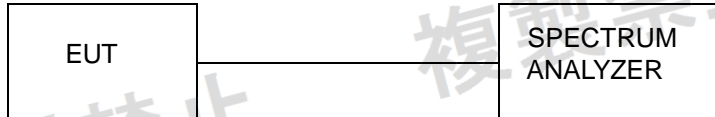
4.4. Dwell time

LIMIT

0.4 second or less

NOTE: Dwell time only applicable to HFSS system device.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

- Frequency: test channel
- Span=0MHz
- RBW: 1MHz
- VBW: 1MHz
- Sweep time: Auto
- Detector mode: Positive peak

TEST RESULTS

For reporting purpose only.

Please refer to Appendix A.6.

Remark: Dwell time= transmission time of 1 burst* Total Hops*1000

4.5. Unwanted Emission Strength

LIMIT

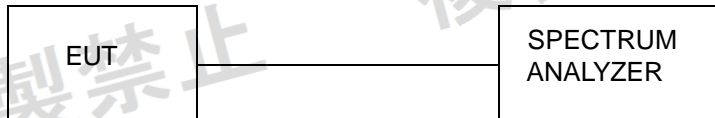
Below 2387 MHz: 2.5 μ W/MHz or less

2387 to 2400 MHz: 25 μ W/MHz or less

2483.5 Through 2496.5 MHz: 25 μ W/MHz or less

Over 2496.5 MHz: 2.5 μ W/MHz or less

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

- Frequency: 30MHz-13GHz
- RBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- VBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

NOTE:30~1000MHz,limit is 2.5uW/MHz=-26dBm/MHz=-36dBm/100KHz

TEST RESULTS

For reporting purpose only.

Please refer to Appendix A.4.

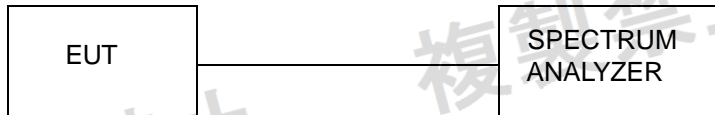
4.6. Secondary Radiated Emission Strength

LIMIT

Below 1GHz: 4.0nW or less

Above 1GHz: 20nW or less

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

- Frequency: 30MHz-13GHz
- RBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- VBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

TEST RESULTS

For reporting purpose only.

Please refer to Appendix A.5.

4.7. Construction protection method

Requirement

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily

Confirmation method

Protected Method	special construction
Description	The Number of Terminals of the module RF chip is 49, and the Terminal Pitch is 1.2mm.

4.8. Interference Prevention Function

Requirement

Clarify the one automatically to transmit and to receive identification code with the wireless equipment of the wireless station used in the same premises.

Interference Prevention Function Confirm

A communication link was made where the ID code is correct (Identical).

TEST PROCEDURE

1. Connect the EUT in network
2. Open the software
3. We can get the information as follows:

TEST RESULTS

The radio equipment has an identification code. A verification of this code is done before a communication channel is established.

MAC Address:E100200CABEE

4.9. Number of Carriers

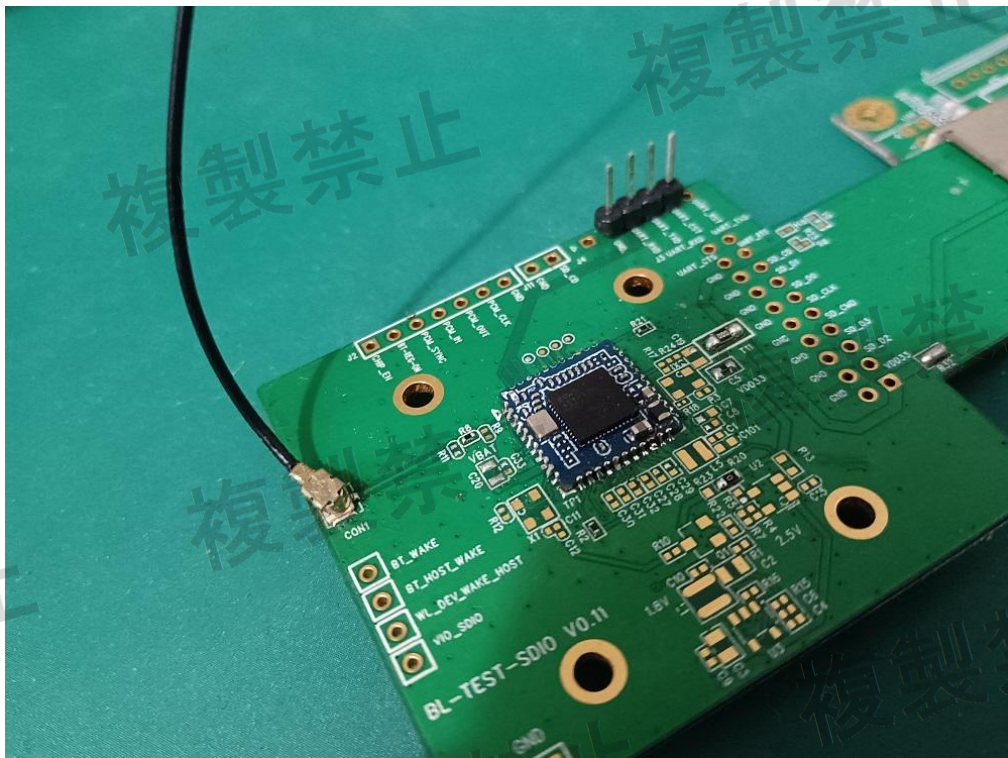
LIMIT

The number of Carriers: 1 or more/MHz

TEST RESULTS

N/A

5. TEST SETUP PHOTOS OF THE EUT



6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

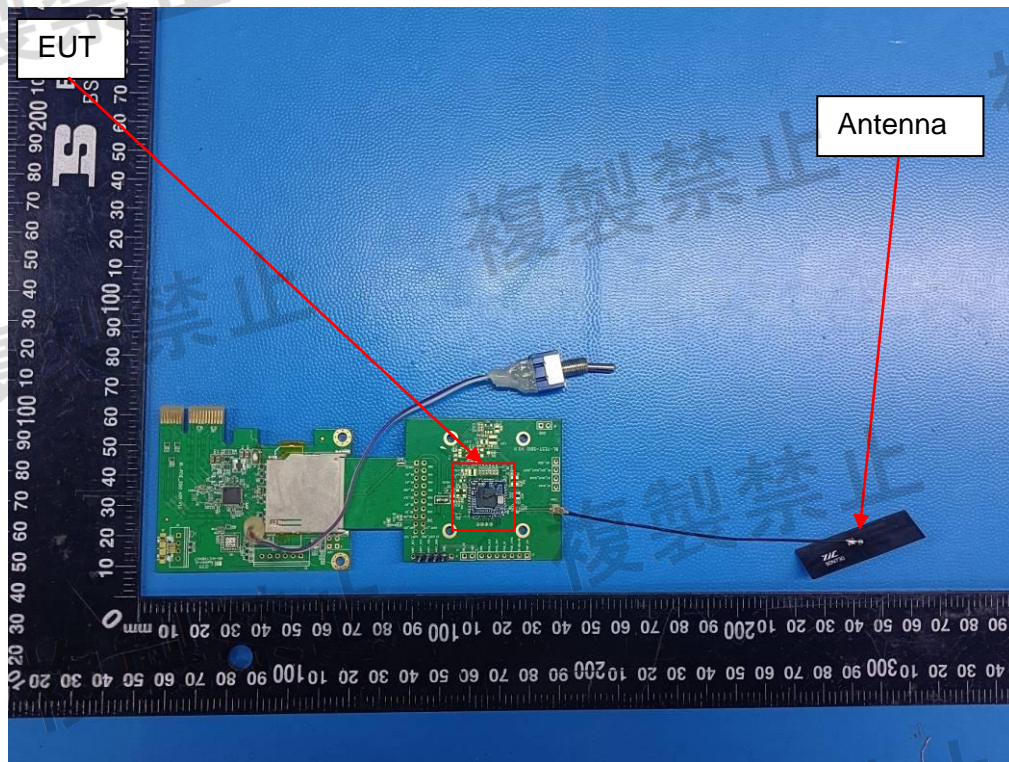


Fig. 1

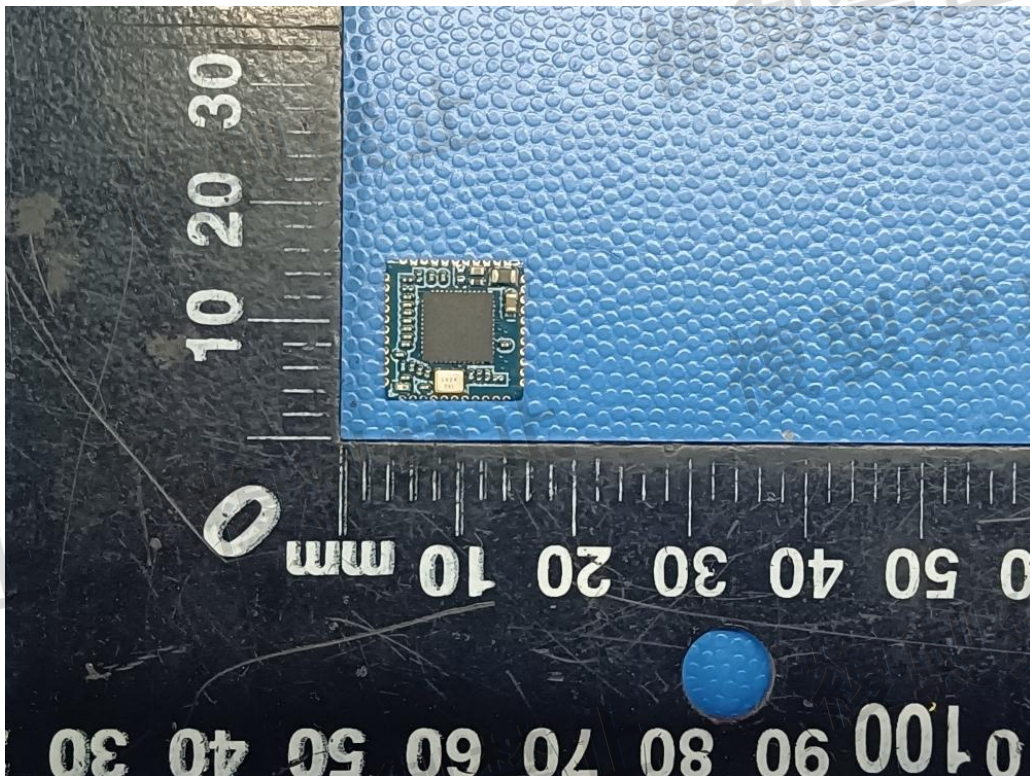


Fig. 2

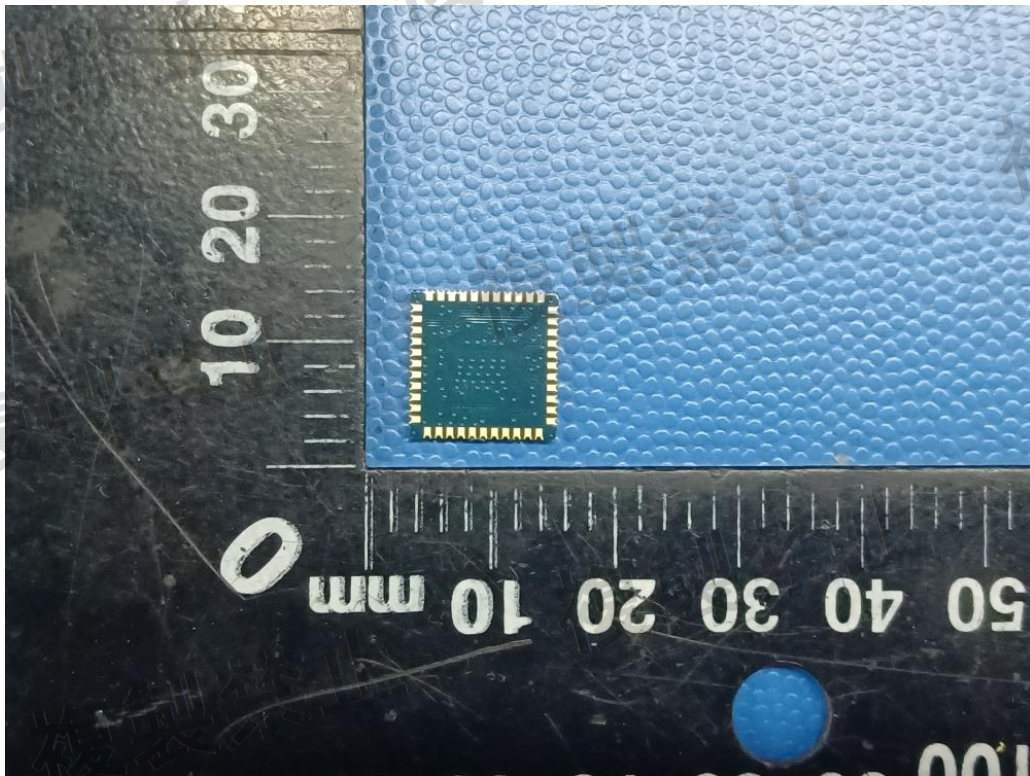


Fig. 3

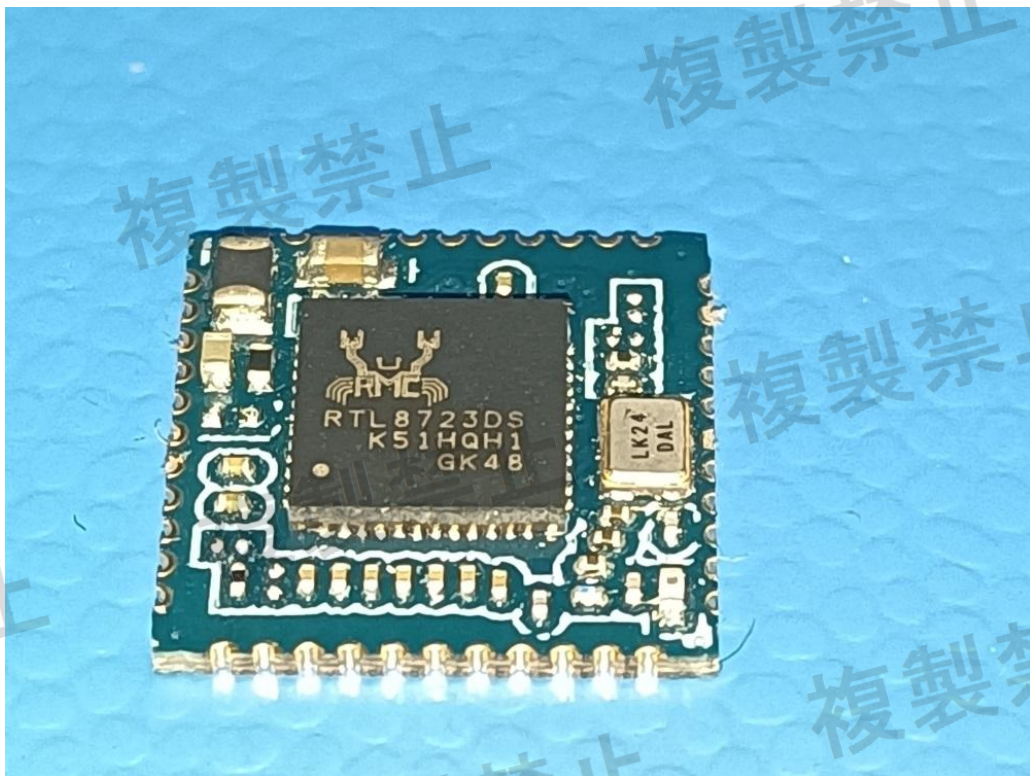


Fig. 4

*****THE END*****