

**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.**..... **GTS20221226005-1-12**

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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**Shenzhen Global Test Service Co.,Ltd. All rights reserved.**

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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**Hardware version** ..... V2.0**Software version**..... V2.0**Ratings** ..... DC 3.3V**Result**..... **PASS**

## TEST REPORT

Test Report No. : GTS20221226005-1-12

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. Product Description

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
<b>BT</b>	
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)
<b>WIFI</b>	
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

**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**Operation Frequency List:**

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480



## 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(+1%)	Low(-1%)
		3.303	3.306	3.297
Voltage error(%)	Result	Ref.level	0.09	-0.18
	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  $\pm 1\%$ .All test cases were done under the normal battery voltage.

## 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	2440MHz	2480MHz
Bluetooth	Default	Default	Default

## 2.5. 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 :	-

## 2.6. 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 is165725.

#### 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
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. 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 TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Global Test Service 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 Shenzhen GTS laboratory is reported:

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	$\pm 1^\circ\text{C}$

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

### 3.6. Equipments Used during the Test

#### Details for Conducted test equipment

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

The Cal. Interval was one year.

## 4. TEST CONDITIONS AND RESULTS

### 4.1. Antenna Power (Conducted) Measurement

#### 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.

#### LIMIT

The antenna power of a transmitting equipment using a spread spectrum system shall be such that the mean power within a bandwidth of 1 MHz is 10 mW or less in the case of modulation using a standard coding test signal with the same transmission rate as that of the modulation signal. the tolerance of Antenna Power is less than +20% and more than -80%.

#### TEST RESULTS

(NTNV)								
Modulation type	Channel (MHz)	Power (dBm)	Power (mW)	Limit (mW)	Rated power (mW)	Tolerance (%)	Limit	Result
GFSK	2402	-4.32	0.37	10.00	1.00	-63.00	-80%~+20%	Pass
	2440	-2.66	0.54	10.00	1.00	-46.00		
	2480	-2.86	0.52	10.00	1.00	-48.00		

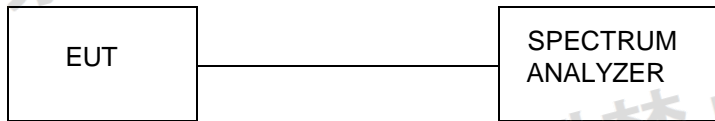
- Note :1. Measured Power include the cable loss;  
 2. The item was tested at 23℃ and 50% humidity condition;  
 3. Refer to following test plots.

Test Result of EIRP					
Mode	Channel (MHz)	Conducted test Power(dBm)	Antenna gain	Measured EIRP Value(dBm)	Limit (dBm)
GFSK	2402	-4.32	2.00	-2.32	12.14
	2440	-2.66	2.00	-0.66	12.14
	2480	-2.86	2.00	-0.86	12.14

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

## 4.2. Frequency Tolerance

### 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:1MHz

Rbw:10KHz

Vbw:10KHz

Sweep time:Auto

Dectector mode: Positive peak

Indication mode: max hold

### LIMIT

Tolerance of frequency shall be  $\pm 50 \times 10^{-6}$ .

### TEST RESULTS

For reporting purpose only.

Please refer to Appendix B.1.

Note:

1. Measured Power include the cable loss;
2. The item was tested at 23°C and 50% humidity condition.
3. Refer to following test plots.

### 4.3. Radio Interference Prevention Capability Measurement

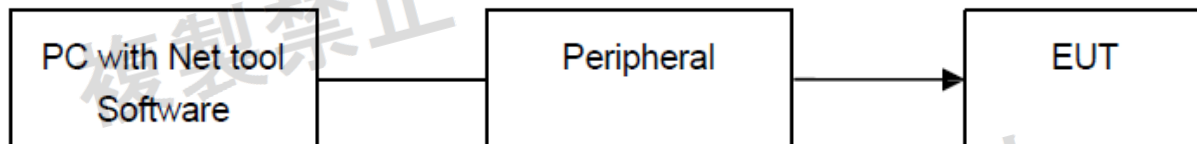
#### LIMIT

Identification code  $\geq$  48 bits

#### Measuring Id Code Software

MAC IP List: MAC Scan

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes from EUT. b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification code: a. Transmit the predetermined identification codes from the counterpart. b. Check if communication is normal. c. Transmit the signals other than predetermined ID codes from the counterpart. d. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

#### Conditions of Equipment under Test

Required normal mode of the applicable equipment (EUT)

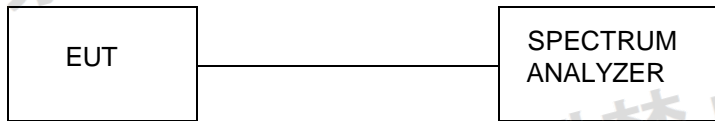
#### TEST RESULTS

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

MAC Address: E100200CABEE

#### 4.4. Occupied Bandwidth (99%)

##### 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: Center frequency in the band to be used:2440MHz

Span:4MHz

RBW:30KHz

VBW:30KHz

Sweep time:Auto

Dectector mode: Positive peak

Indication mode: max hold

##### LIMIT

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

##### TEST RESULTS

For reporting purpose only.

Please refer to Appendix B.2.

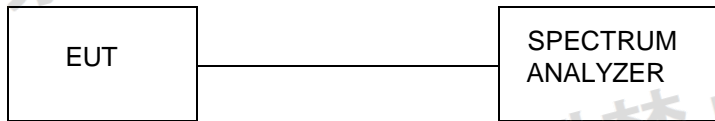
Note:

1. Measured Power include the cable loss;
2. The item was tested at 23℃ and 50% humidity condition.
3. Refer to following test plots.



#### 4.5. Spread spectrum bandwidth (90%)

##### 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: Center frequency in the band to be used:2440MHz

Span:4MHz

RBW:30KHz

VBW: 30KHz

Sweep time:Auto

Dectector mode: Positive peak

Indication mode: max hold

##### LIMIT

In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

##### TEST RESULTS

For reporting purpose only.

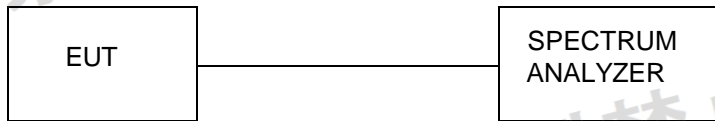
Please refer to Appendix B.3.

Note:

1. Measured Power include the cable loss;
2. The item was tested at 23℃ and 50% humidity condition.
3. Refer to following test plots.

#### 4.6. Spurious emission intensity

##### 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:100KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)

VBW:300KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)

Sweep time:Auto

Dectector mode: Positive peak

Indication mode: max hold

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

##### LIMIT

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

- a.  $2,387 \text{ MHz} \leq f \leq 2,400 \text{ MHz}$  and  $2,483.5 \text{ MHz} < f \leq 2,496.5 \text{ MHz}$      $25 \mu\text{W}(-16\text{dBm})$  or less
- b.  $2,387 \text{ MHz} > f$  and  $2,496.5 \text{ MHz} < f$      $2.5 \mu\text{W}(-26\text{dBm})$  or less

##### TEST RESULTS

For reporting purpose only.

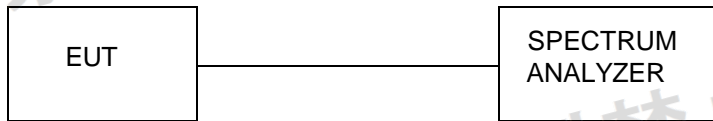
Please refer to Appendix B.4.

Note:

1. Measured Power include the cable loss;
2. The item was tested at 23°C and 50% humidity condition.
3. Refer to following test plots.

#### 4.7. Secondary Radiated Emissions Measurement

##### 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:100KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)

VBW:100KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)

Sweep time:Auto

Dectector mode: Positive peak

Indication mode: max hold

##### LIMIT

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit

##### TEST RESULTS

For reporting purpose only.

Please refer to Appendix B.5.

Note:

1. Measured Power include the cable loss;
2. The item was tested at 23°C and 50% humidity condition.
3. Refer to following test plots.

#### 4.8. Construction Protection Confirmation Method

##### LIMIT

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.

## **5. TEST SETUP PHOTOS OF THE EUT**

Reference to the Test Report: GTS20221226005-1-11.

## **6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT**

Reference to the Test Report: GTS20221226005-1-11.

.....End of Report.....