



# JAPAN RADIO TEST REPORT

## Client Information:

Applicant: REDSPYCE CO., LTD  
Applicant add.: 5F, 2-8-8, FUROCHO, YOKOHAMA NAKA-KU, KANAGAWA, JAPAN

## Product Information:

Product Name: Wireless Speaker  
Model No.: YD-1756  
Derivative model No.: YD-1780, YD-1781, YD-1782, YD-1783, YD-1784, YD-1785, YD-1786, YD-1787, YD-1788, YD-1789, YD-1790  
Brand Name: N/A  
Report No.: CTT2024011802R21T-01

Standards: Item 19 of Article 2 Paragraph 1

## Prepared By:

Shenzhen C-link Testing & Technology Co., Ltd.  
Add.: No.709, Enhai Building, No.1 Hangkong Road, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China

Date of Receipt: Jan. 17, 2023

Date of Test: Jan. 17, 2023~ Jan. 29, 2023

Date of Issue: Jan. 29, 2023

Test Result: Pass

This device has been tested and found to comply with the stated standard(s) above, which is (are) applicable only to the tested sample identified in the report.

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen C-link Testing & Technology Co., Ltd. this document may be altered or revised by Shenzhen C-link Testing & Technology Co., Ltd. personal only, and shall be noted in the revision of the document. This test report must not be used by the client to claim product endorsement.

Reviewed by:

Mary Ye

Approved by:

Brown Lu





# 1 Contents

1	CONTENTS .....	2
2	TEST SUMMARY.....	3
2.1	Measurement Uncertainty .....	3
3	GENERAL INFORMATION.....	5
3.1	Test Location .....	6
3.2	EUT Peripheral List .....	6
3.3	Test Peripheral List.....	6
4	EQUIPMENT USED DURING TEST.....	6
5	TEST RESULTS.....	7
5.1	Radio Technical Requirements Specification.....	7
5.2	E.U.T. Test Conditions .....	8
5.3	Antenna Requirement.....	10
5.4	Interference Prevention Function .....	11
5.5	Frequency Error .....	12
5.6	Occupied Bandwidth (99%) .....	16
5.7	Spread Spectrum Bandwidth (90%) .....	19
5.8	Antenna Power .....	22
5.9	Spurious Emissions of Tx.....	24
5.10	Dwell Time.....	41
5.11	Pseudorandom Frequency Hopping Sequence .....	46
5.12	RF Accessibility .....	47
5.13	Spurious Emissions of Rx .....	48
6	PHOTOGRAPHS .....	51
6.1	EUT TEST PHOTO .....	51



## 2 Test Summary

TEST	TEST REQUIREMENT	LIMIT/SEVERITY	RESULT
Antenna Requirement	Item 19 of Article 2-1	Notice 88 Appendix 43,B-1 (1)&(2)	PASS
Test frequency	Item 19 of Article 2-1	Notice 88 Appendix 43, A-3	PASS
Frequency Error	Item 19 of Article 2-1	±50 PPM or less	PASS
Occupied Bandwidth	Item 19 of Article 2-1	83.5 MHz or less	PASS
Spread-spectrum Bandwidth	Item 19 of Article 2-1	Only for reported	PASS
Antenna Power	Item 19 of Article 2-1	3 mW /MHz or less Error + 20% -80%; 10mW Error + 20% -80%	PASS
Spurious Emission of Tx	Item 19 of Article 2-1	(1) Below 2387 MHz : -26dBm (2) 2387 to 2400 MHz : -16dBm (3) 2483.5 through 2496.5 MHz : -16dBm (4) Over 2496.5 MHz : -26dBm	PASS
Dwell Time	Item 19 of Article 2-1	less than 0.4sec	PASS
Interference prevention capability	Item 19 of Article 2-1	Notice 88 Appendix 43	PASS
RF accessibility	Item 19 of Article 2-1	Notice 88 Appendix 43	PASS
Spurious Emission of Rx	Item 19 of Article 2-1	(1) Below 1 GHz: -54dBm (2) 1GHz or higher: -47dBm	PASS
Carrier sense function	Item 19 of Article 2-1	/	N/A, Note2
Carrier sense function	Item 19 of Article 2-1	/	N/A, Note3

### Remark:

Note 1:EUT: In this whole report EUT means Equipment Under Test.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radio Frequency.

Note 2: Not apply to this device, since EIRP does not require compensation through Antenna Power.

Note 3: Apply for 802.11n40 which the Occupied bandwidth within 26MHz- 40MHz.

### 2.1 Measurement Uncertainty

The report uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty Multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

No.	Item	Uncertainty
1	Frequency Error / 99% & 90% Bandwidth	$\pm 0.85 \times 10^{-7}$



2	Antenna Power	$\pm 0.70$ dB
3	Spurious Emissions	$\pm 0.80$ dB
4	DC / AC Power Source	$\pm 1.4\%$



### 3 General Information

Manufacturer:	SHEN ZHEN CHUSEI INDUSTRY & TRADE CO., LTD.
Manufacturer Address:	3rd floor, Building B, Runchangyuan Industrial Zone, Bantian Street, Longgang District, Shenzhen
Product Name:	Wireless Speaker
Model No.:	YD-1756
Brand Name:	N/A
Derivative model No.:	YD-1780, YD-1781, YD-1782, YD-1783, YD-1784, YD-1785, YD-1786, YD-1787, YD-1788, YD-1789, YD-1790
Operating Frequency	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, ( $\pi/4$ )DQPSK
Number of Channels	79 Channels (for FHSS)
Channel Separation:	1 MHz (for FHSS)
Dwell time	Per channel is less than 0.4s.
Antenna Type	PCB Antenna
Antenna gain:	-0.58 dBi
Normal antenna power:	FHSS: F1D: 0.03 mW/MHz, G1D: 0.03 mW/MHz
Bluetooth version:	Bluetooth 5.0
Power Supply Range:	INPUT: DC5V DC 3.7V from battery
Normal Test Voltage:	The same as above
Hard Ware Version:	V2.1
Soft Ware Version:	V1.0
Model difference:	All the model are the same circuit and RF module, Only the model name and color are different.





3.1 Test Location

Shenzhen C-link Testing & Technology Co., Ltd.  
No.709, Enhai Building, No.1 Hangkong Road, Sanwei Community, Hangcheng Street, Bao 'an District,  
Shenzhen, Guangdong, China

3.2 EUT Peripheral List

No.	Equipment	Manufacturer	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A

3.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4 Equipment Used during Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date	Cal. Lab
1	SIGNAL Analyzer	Keysight	N9020A	MY53300466	2023.03.05	2024.03.04	Guangdong Jingheng
2	RF Automatic Test System	迈微	MV100-RFCB	/	2023.12.20	2024.12.19	Guangdong LiSai

## 5 Test Results

### 5.1 Radio Technical Requirements Specification

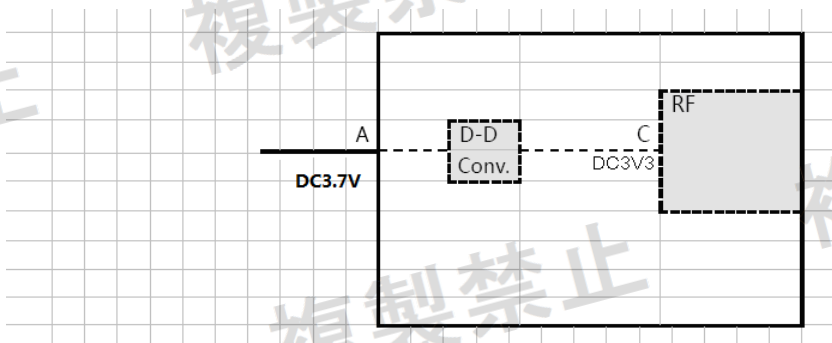
**Table 1: Radio Technical Requirements Specification for 2.4 GHz band wide-band low-power data communication system (Item 19 of Article 2-1)**

Items	Technical standard
Assigned frequency or designated frequency	2,400-2,483.5MHz
Communication method	One-way communication, simplex, semi-duplex, or duplex operation of digital signal transmission including spread spectrum
Tolerance of frequency ( $\times 10^{-6}$ )	$\pm 50$
Tolerance of occupied bandwidth	FH : 83.5MHz or less FH + DS : 83.5MHz or less FH + OFDM : 83.5MHz or less OFDM : 38MHz or less Others : 26MHz or less
Antenna power	Designated value (1) FH, FH+DS , FH+OFDM: 3mW/MHz (used in the range of 2400 – 2483.5 MHz) (2) OFDM , DS other than (1) 10mW/MHz (3) Other than (1) & (2) 10mW (4) OFDM OBW 26 - 38MHz: 5mW/MHz Tolerance: +20%, -80%
Antenna gain	1) 12.14 dBi or less in principle 2) In case of directional antenna (1) FH, FH+DS or FH+OFDM using 2400 – 2483.5 MHz EIRP $\leq$ 16.91 dBm/MHz (2) OFDM or DS other than (1) EIRP $\leq$ 22.14 dBm/MHz (3) Other than (1) and (2): 22.14 dBm or less (4) OFDM OBW 26 - 38MHz: 19.14dBm/MHz (5) Half-power angle of directional antenna (e) in case of the item 2): $e \leq 360/A$ (The A is 10 in maximum.)
Tolerance of spurious emission intensity	(1) Below 2387 MHz : 2.5 $\mu$ W (2) 2387 to 2400 MHz : 25 $\mu$ W (3) 2483.5 through 2496.5 MHz : 25 $\mu$ W (4) Over 2496.5 MHz : 2.5 $\mu$ W
Spreading bandwidth	Only for reported
Limit of secondary radiated emissions	(1) Below 1 GHz : 4 nW (2) 1 GHz or higher : 20 nW
Interference prevention function	Shall have the function of automatic transmission and reception of identification sign.
Structure	Shall be of the structure that the RF and modulator sections excluding antenna cannot easily be opened.
Note	DS: Direct spread FH: Frequency hopping OFDM: Orthogonal frequency division multiplexing

## 5.2 E.U.T. Test Conditions

### Power supply:

The EUT has the input voltage to the circuit of RF unit complies with output voltage limitation ( $\pm 1\%$ ) against input voltage fluctuation ( $\pm 10\%$ ). So, all measurements were conducted at only rated voltage DC 3.7V.



Test below:

1: The fluctuation of C point is under  $\pm 1\%$ , when input voltage from A point to the test equipment is fluctuated by  $\pm 10\%$ .

The measurement result of the voltage fluctuation at RF circuit when DC 3.7V  $\pm 10\%$

DC 3.7V	DC3V3
3.7V	3.33V
4.2V	3.33V
3.5V	3.33V

Pre-test the EUT in all voltage mode at the DC 4.2V, DC 3.7V and DC3.5V and conducted to determine the worst-case mode, only the worst-case results (DC 3.7V) are recorded in this report.

The EUT has the input voltage to the circuit of RF unit complies with output voltage limitation ( $\pm 1\%$ ) against input voltage fluctuation ( $\pm 10\%$ ). So, all measurements were conducted at only rated voltage DC 3.7V.

### Temperature:

5.0 -35.0 °C

### Humidity:

45-85 % RH

### Atmospheric Pressure:

1000 -1010 mbar

### Test frequencies:

If the EUT can be set to 3 of more different (carrier) frequencies in 1 allocated band, testing shall be performed using the Lowest, Middle and the Highest frequency (L, M and H). If there are 2 or fewer frequencies, testing shall be performed with the available frequencies.



**EUT channels and frequencies list:****For FHSS:**

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	/	/
26	2428	53	2455	/	/

Test frequencies are the lowest channel: 0 channel(2402 MHz), middle channel: 39 channel(2441 MHz) and highest channel: 78 channel(2480 MHz)

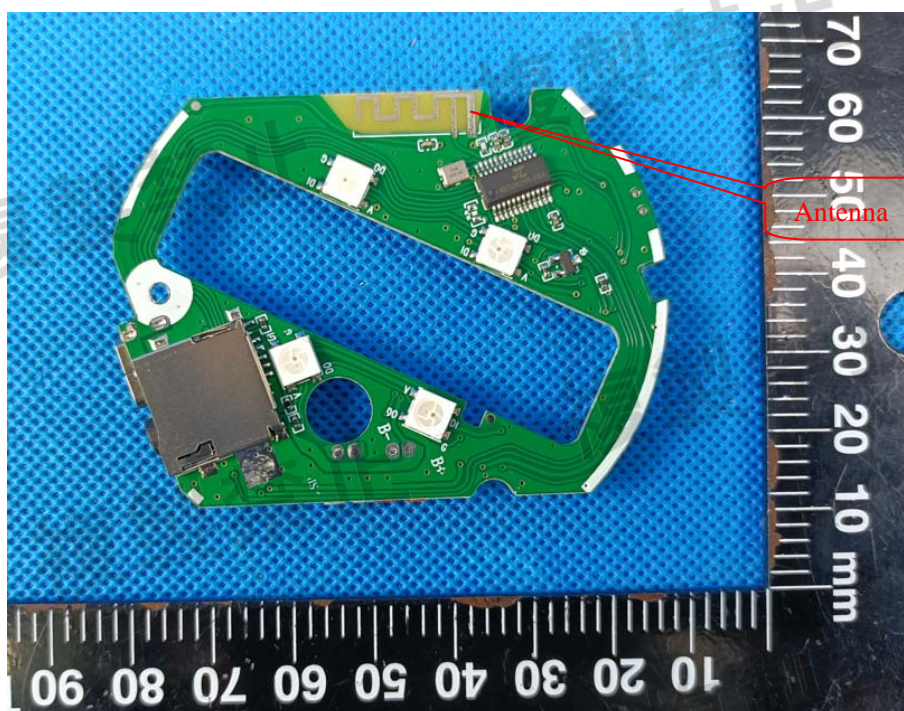
### 5.3 Antenna Requirement

#### Standard requirement

Applicable for equipment with an antenna terminal, including testing terminals) If an antenna connector is available, all relevant tests will be carried out conducted. If not, tests will be carried out in an anechoic room or with a suitable test-fixture.

#### EUT Antenna

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -0.58dBi



**Result:** All relevant tests will be carried out conducted.

## 5.4 Interference Prevention Function

### LIMIT

Item	Limits
Identification code	$\geq 48$ bits

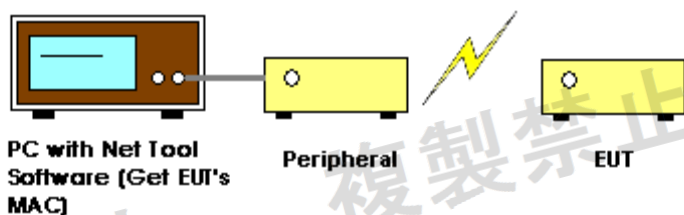
### MEASURING ID CODE SOFTWARE

Item	Limits
MAC IP List	MAC Scan

### TEST PROCEDURES

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

### TEST SETUP LAYOUT



### TEST DEVIATION

There is no deviation with the original standard.

### EUT OPERATION DURING TEST

The EUT was programmed to be in normal transmitting mode.

### TEST RESULT OF RADIO INTERFERENCE PREVENTION CAPABILIT

EUT:	Wireless Bluetooth	Test Date:	2024/01/27
Temperature:	25 <sup>0</sup> C	Tested by:	Renny
Humidity:	55 % RH	Test result:	CONFORM

MAC Address: 2C: 3G: B7: EF:15: 2A

## 5.5 Frequency Error

Test Requirement: Item 19 of Article 2-1  
Tolerance of frequency:  $\pm 50 \times 10^{-6}$   
Temperature: 23.0 °C  
Humidity: 55 % RH  
Test Status: Test the EUT in transmitting mode without modulation.  
Test Configuration:



Test Procedure:

1. Test Conditions:  
Frequency Counter or Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping OFF, CW Tx
3. Spectrum Analyzer conditions:  
Frequency: Test Frequency  
Span 1MHz  
RBW 10 kHz (Modulation OFF for FHSS; Modulation ON for DSSS ),  
VBW 30 kHz (Modulation OFF for FHSS; Modulation ON for DSSS),  
Sweep Time Auto  
Detector mode Positive peak  
Indication mode Max hold





Test result:  
For FHSS:

Test channel	Test Frequency (MHz)	Test Result			Unit	Limit
		Normal Voltage	High Voltage	Low Voltage		
		3.7V DC	4.2V DC	3.5V DC		
Lowest	2402.0	2401.969	N/A	N/A	MHz	±50 PPM or less
		-12.91	N/A	N/A	PPM	
Middle	2441.0	2440.968	N/A	N/A	MHz	
		-13.11	N/A	N/A	PPM	
Highest	2480.0	2479.967	N/A	N/A	MHz	
		-13.31	N/A	N/A	PPM	

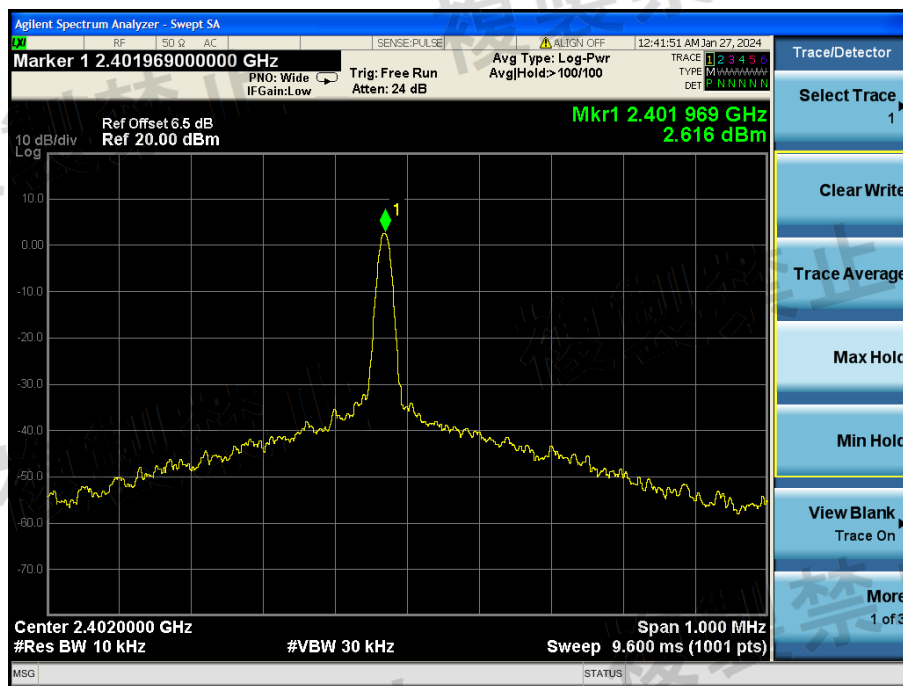
Note: The nominal frequency shall be confirmed by the applicant and test lab.



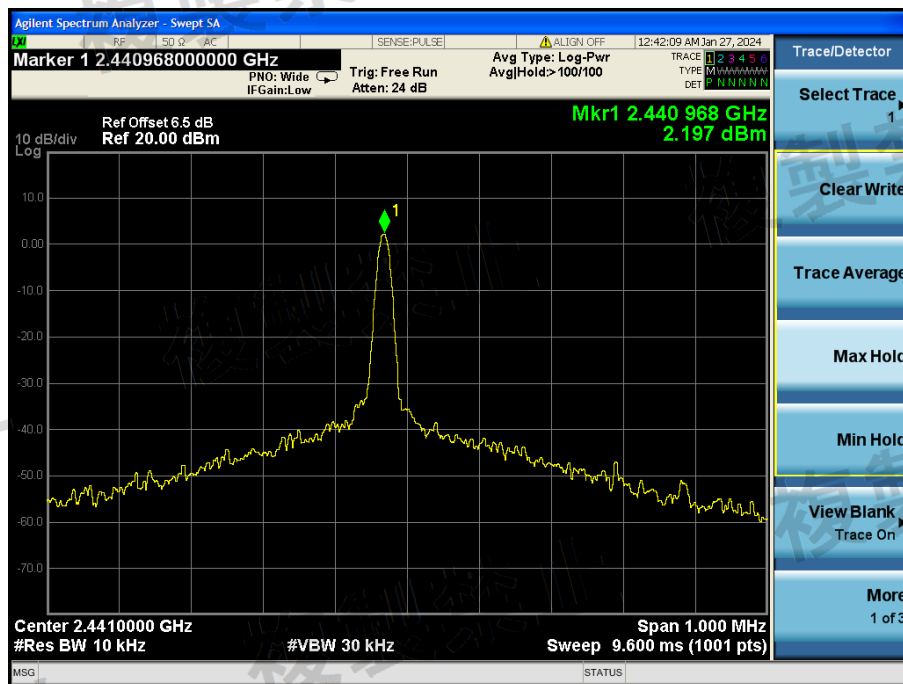
Result plot as follows:

For FHSS:

Channel 0: 2.402 GHz:

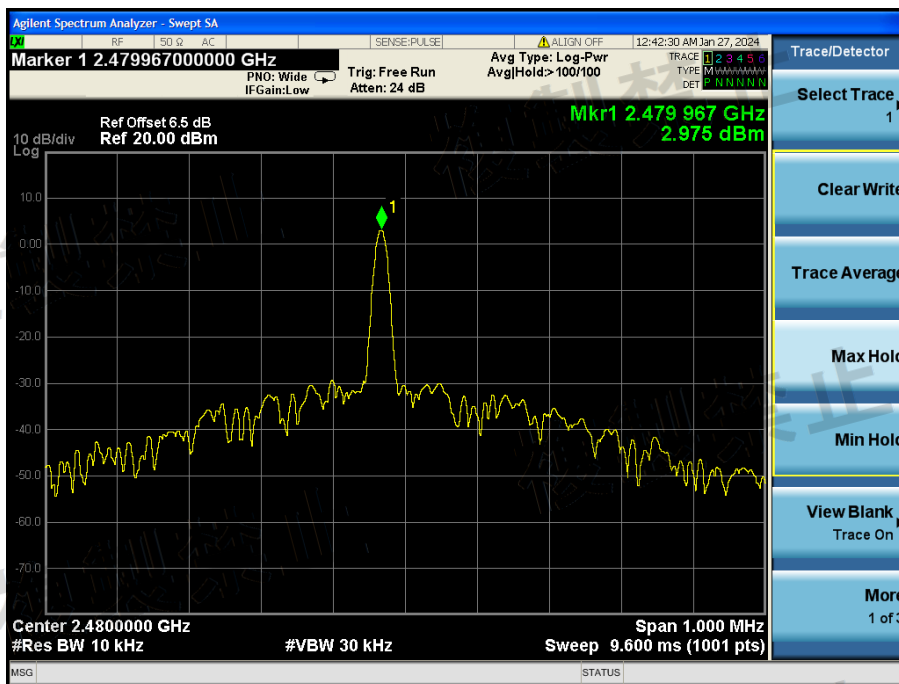


Channel 39: 2.441 GHz:





Channel 78: 2.480 GHz



Test result: The unit does meet the requirements.

## 5.6 Occupied Bandwidth (99%)

Test Requirement:	Item 19 of Article 2-1 83.5MHz or less(FHSS) 38 MHz or less(DSSS)
Temperature:	23.0 °C
Humidity:	55 % RH
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Test Conditions:  
Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping ON, PC Modulation Tx  
For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:  
Frequency: Test Frequency  
Span: 83.5 MHz(FHSS), 5MHz(DSSS)  
RBW: 1 MHz(FHSS), 300 kHz(DSSS)  
VBW: 1 MHz(FHSS), 300 kHz(DSSS)  
Sweep Time Auto  
detector mode Positive peak  
Indication mode Max hold  
OBW 99%

**Test result:****For FHSS:**

BR mode (GFSK):

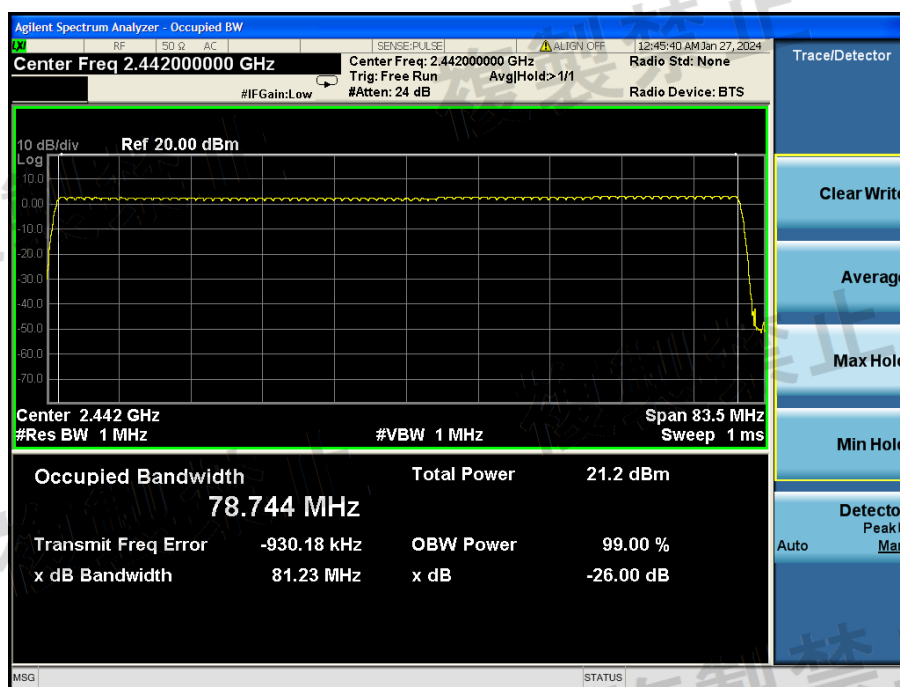
Test channels	Test Result			Unit	Limit
	Normal Voltage	High Voltage	Low Voltage		
	3.7V DC	N/A	N/A		
79 channels (2402~2480 MHz)	78.744	N/A	N/A	MHz	83.5 MHz or less

EDR mode ( $\pi/4$ )DQPSK

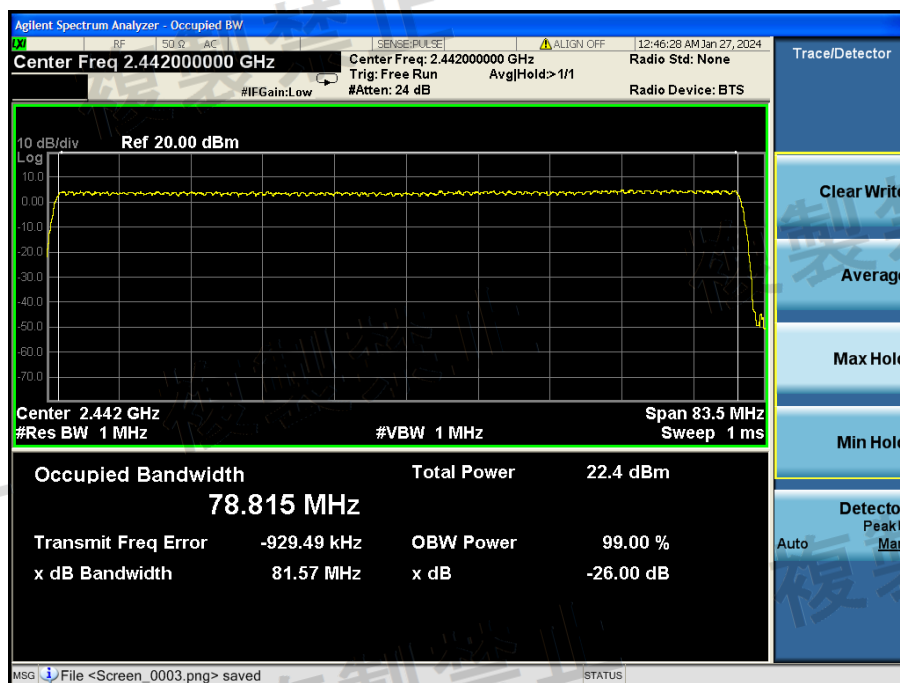
Test channels	Test Result			Unit	Limit
	Normal Voltage	High Voltage	Low Voltage		
	3.7V DC	N/A	N/A		
79 channels (2402~2480 MHz)	78.815	N/A	N/A	MHz	83.5 MHz or less

Result plot as follows:

For FHSS:BDR mode (GFSK):



EDR mode ( $\pi/4$ )DQPSK:



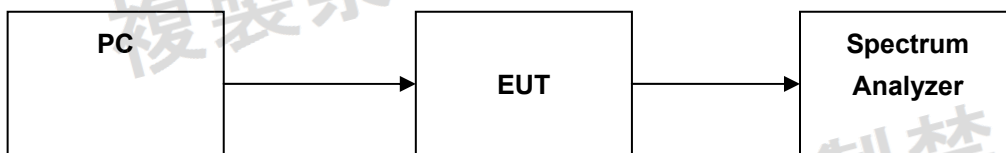
Test result: The unit does meet the requirements.



## 5.7 Spread Spectrum Bandwidth (90%)

Test Requirement:	Item 19 of Article 2-1 500 kHz or more
Temperature:	23.0 °C
Humidity:	55 % RH
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

1. Test Conditions:  
Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping ON, PC Modulation Tx  
  
For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:  
Frequency: Test Frequency  
Span: 83.5 MHz(FHSS), 5MHz(DSSS)  
RBW: 1 MHz(FHSS), 300 kHz(DSSS)  
VBW: 1 MHz(FHSS), 300 kHz(DSSS)  
Sweep Time Auto  
detector mode Positive peak  
Indication mode Max hold  
  
OBW 90%



**Test result:**

**For FHSS:**

BDR mode (GFSK):

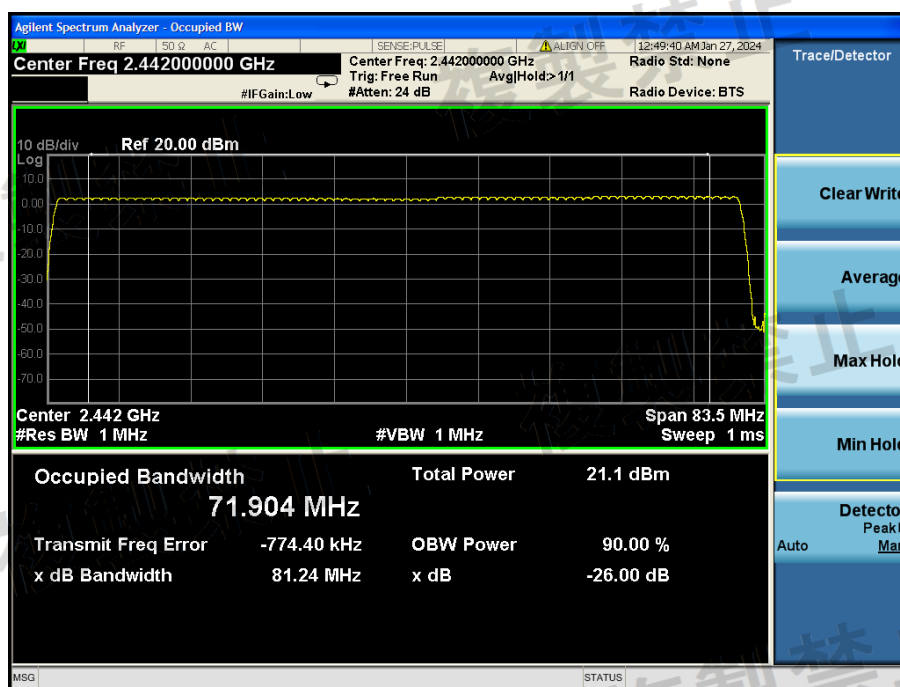
Test channels	Test Result (MHz)	Limit	Spreading Factor
	Normal Voltage		
	3.7V DC		
79 channels (2402~2480 MHz)	71.904	500 kHz or more	71.904

EDR mode ( $\pi/4$ )DQPSK:

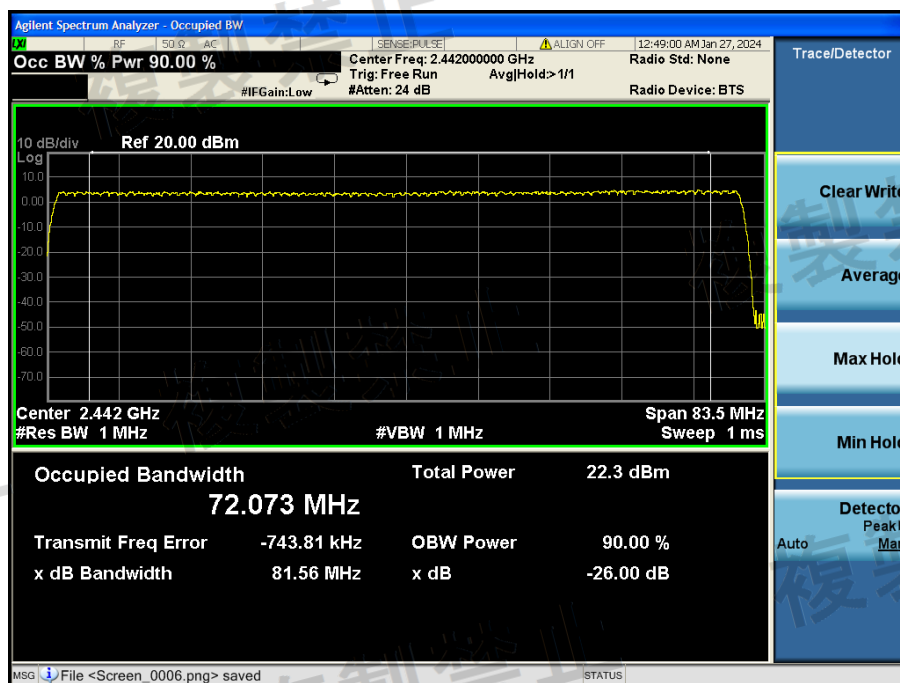
Test channels	Test Result (MHz)	Limit	Spreading Factor
	Normal Voltage		
	3.7V DC		
79 channels (2402~2480 MHz)	72.073	500 kHz or more	72.073

Result plot as follows:

For FHSS:BDR mode (GFSK):



For FHSS: EDR mode ( $\pi/4$ )DQPSK:



Test result: The unit does meet the requirements.

## 5.8 Antenna Power

Test Requirement:

Item 19 of Article 2-1

3 mW/MHz or less(FHSS)

10mW and less(DSSS)

Temperature:

23.0 °C

Humidity:

55 % RH

Test Status:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



Test Procedure:

The EUT was directly connected to the power meter and antenna output port as show in the block diagram above.



Test result:  
For FHSS:

Frequency MHz	Brust Power (dBm)	Brust Power (mW)	SBW MHz	Antenna Power (mW/MHz)	Rated output Power (mW/MHz)	Antenna Power (mW/MHz)	Antenna Power Tolerance(%)	
						Limit	Result	Limit
GFSK(1Mbps)								
2402	1.564	1.43	71.904	0.020	0.03	3	-33.3%	+20% to -80%
2441	1.768	1.50	71.904	0.021	0.03		-30.0%	
2480	1.992	1.58	71.904	0.022	0.03		-26.7%	
π/4/DQPSK(2Mbps)								
2402	2.678	1.85	72.073	0.026	0.03	3	-13.3%	+20% to -80%
2441	2.897	1.95	72.073	0.027	0.03		-10.0%	
2480	2.908	1.95	72.073	0.027	0.03		-10.0%	

Remark:

Normal antenna power: BR&EDR: F1D:0.03 mW/MHz, G1D:0.03 mW/MHz



## 5.9 Spurious Emissions of Tx

Test Requirement:	Item 19 of Article 2-1 (1) 30 to 1000 MHz : 2.5 $\mu$ W/MHz(-36dBm/100kHz) (2) 1000 to 2387 MHz : 2.5 $\mu$ W/MHz(-26dBm/MHz) (3) 2387 to 2400 MHz : 25 $\mu$ W/MHz(-16dBm/MHz) (4) 2483.5 through 2496.5 MHz : 25 $\mu$ W/MHz(-16dBm/MHz) (5) Over 2496.5 MHz : 2.5 $\mu$ W/MHz(-26dBm/MHz)
Temperature:	23.0 °C
Humidity:	55 % RH
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

### Test Configuration:



### Test Procedure:

1. Test Conditions:  
Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping ON, , PC Modulation Tx  
For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:  
Step 1  
All spurious are measured from 30 MHz to 13 GHz by peak mode.  
Step 2  
IF the value measured by Step1 is 2 dB or less, measure in average mode.  
Test setup for Step 1:  
Frequency: 30 MHz – 1000 MHz,  
RBW 100 kHz (Below 1000 MHz), VBW 100 kHz (Below 1000 MHz)  
1000 MHz – 2400 MHz, 2483.5 MHz –13 GHz  
RBW 1 MHz (above 1000 MHz), VBW 1 MHz (above 1000 MHz)  
Sweep Time Auto  
detector mode Positive peak, Indication mode Max hold  
Test setup for Step 2:  
Frequency: Spurious Frequency  
RBW 100 kHz (Below 1000 MHz), VBW 100 kHz (Below 1000 MHz)  
RBW 1 MHz (above 1000 MHz), VBW 1 MHz (above 1000 MHz)  
Sweep Time Auto,  
Detector mode Sample, Indication mode Max hold

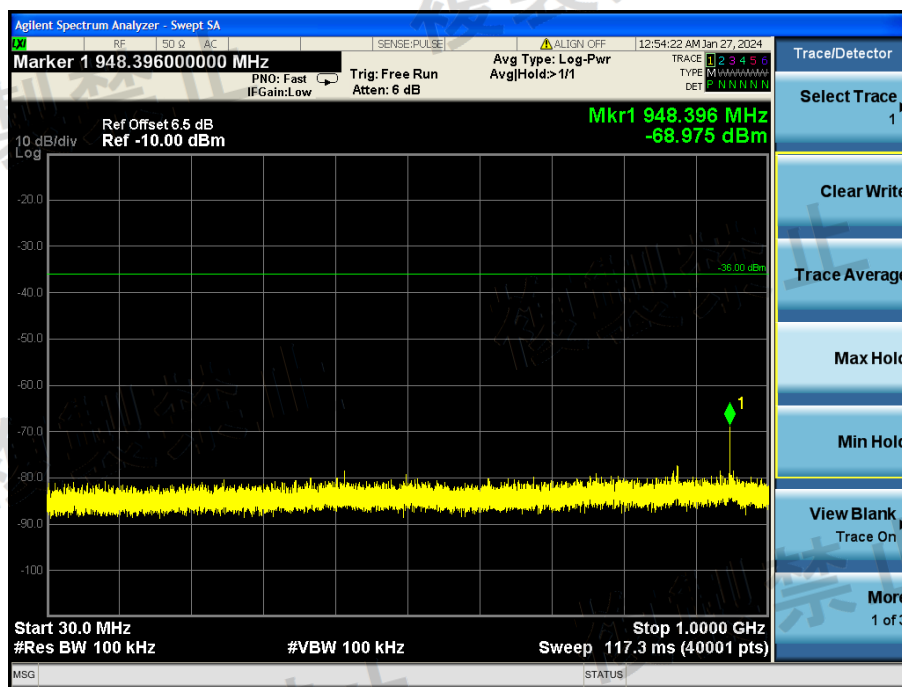
# Test result:

Result plot as follows:

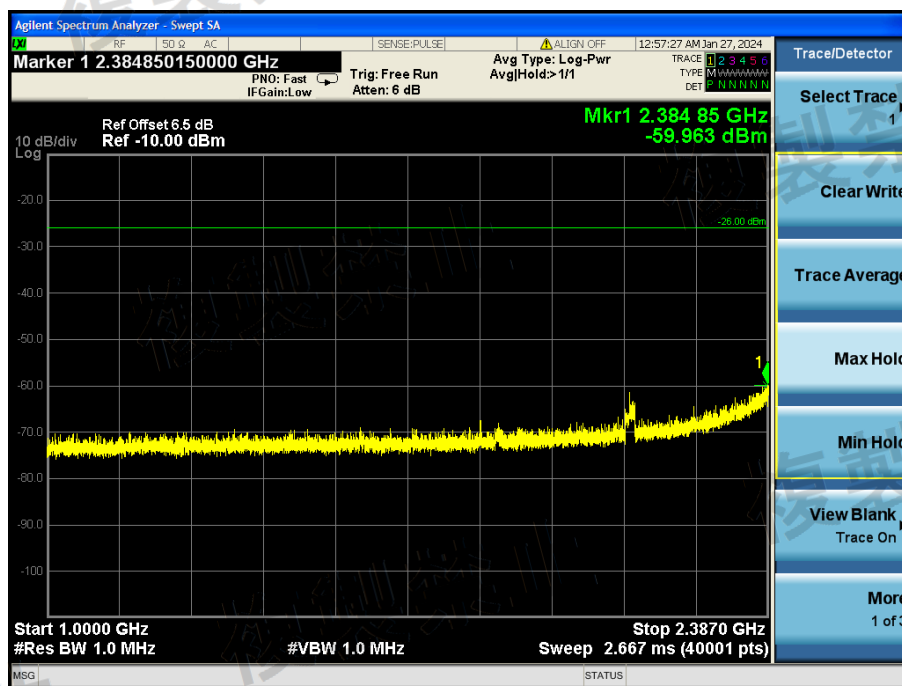
BDR mode (GFSK):

Channel 0: 2.402 GHz:

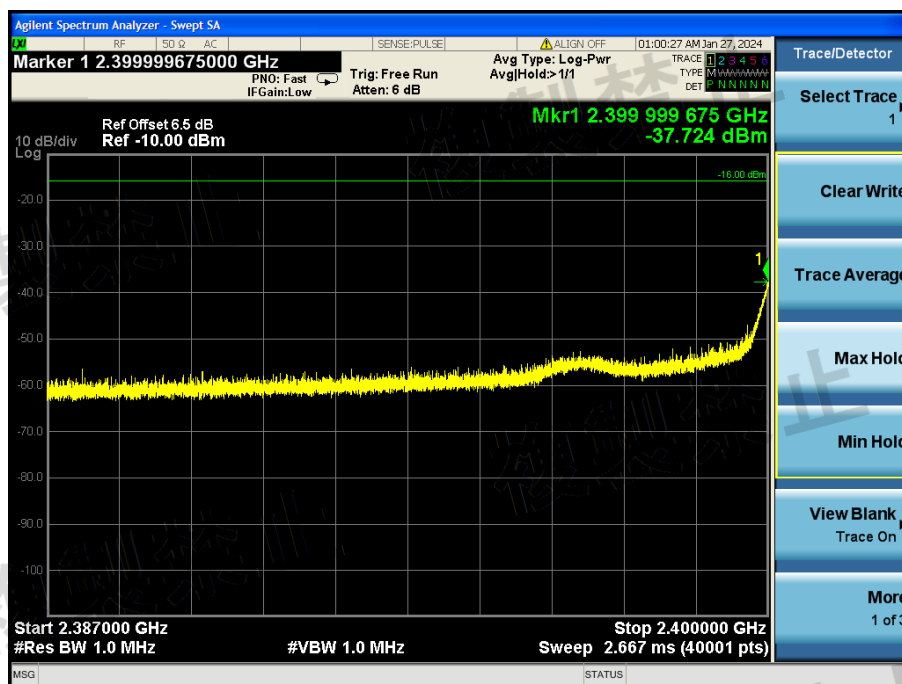
30 MHz to 1000 MHz:



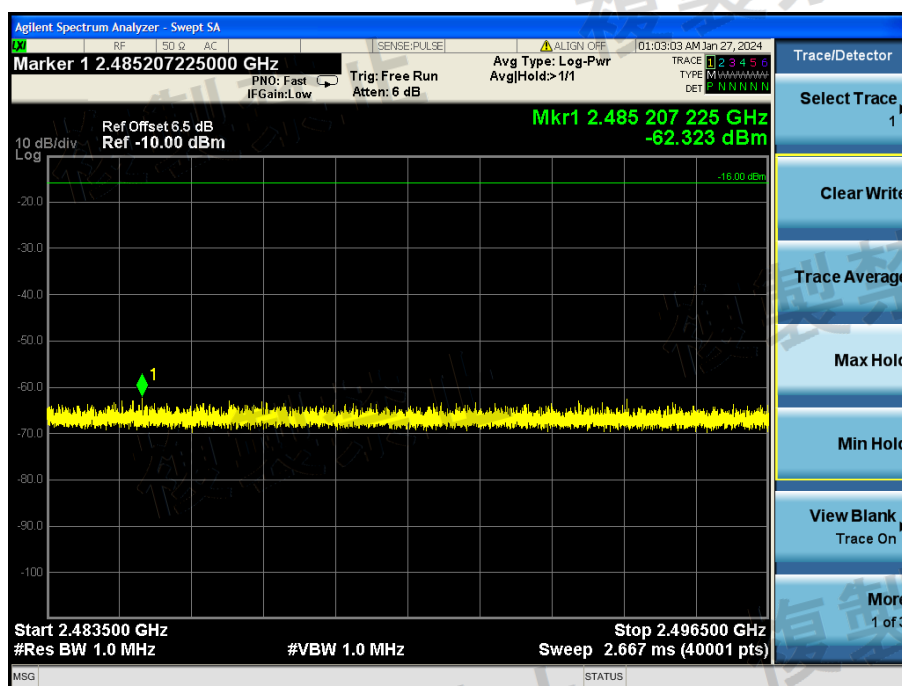
1000 MHz to 2387 MHz:



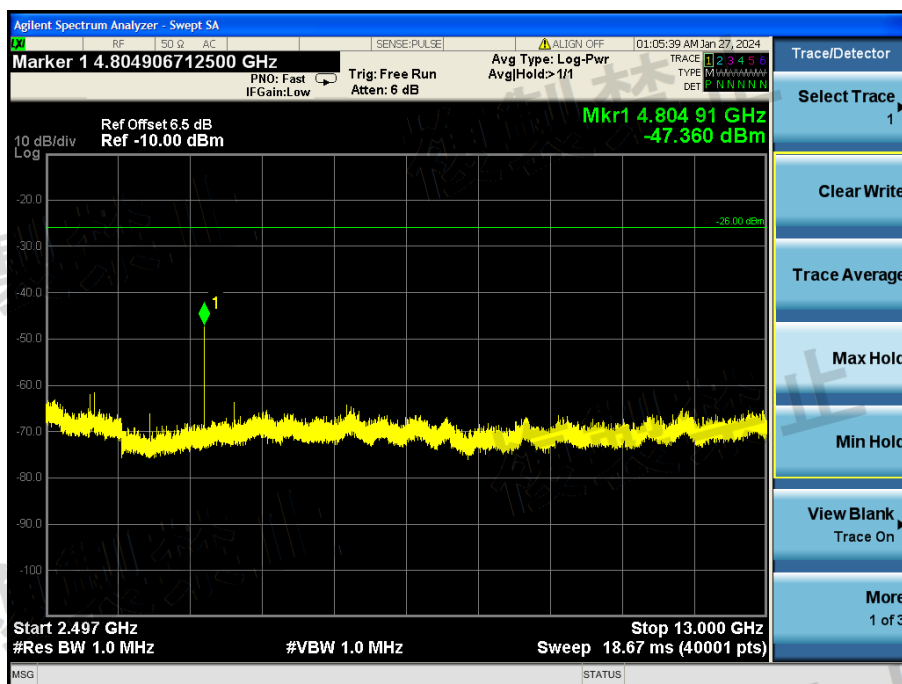
2387 MHz to 2400 MHz:



2483.5 MHz to 2496.5 MHz:

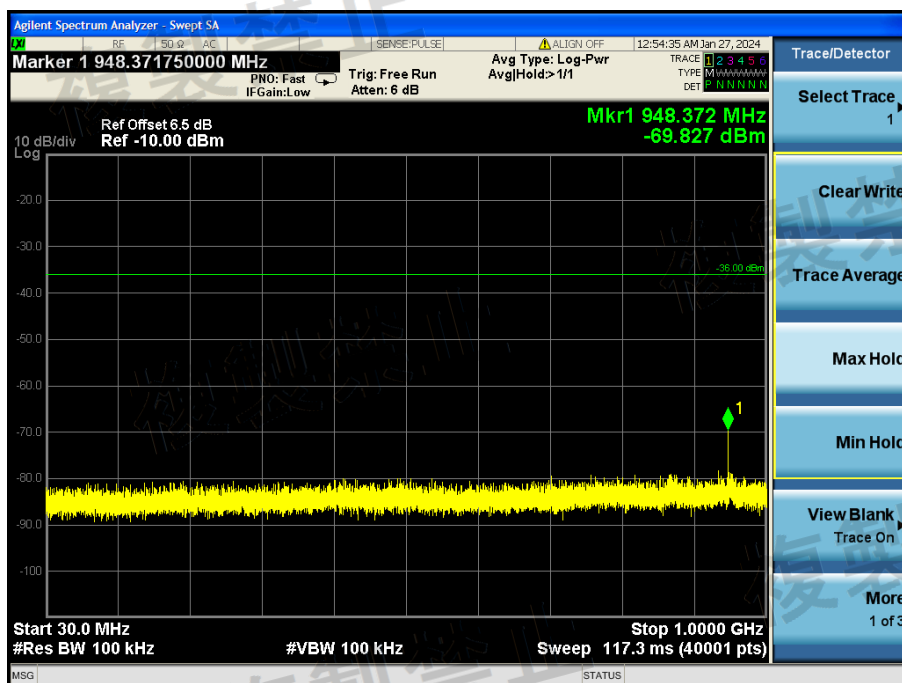


2496.5 MHz to 13 GHz:

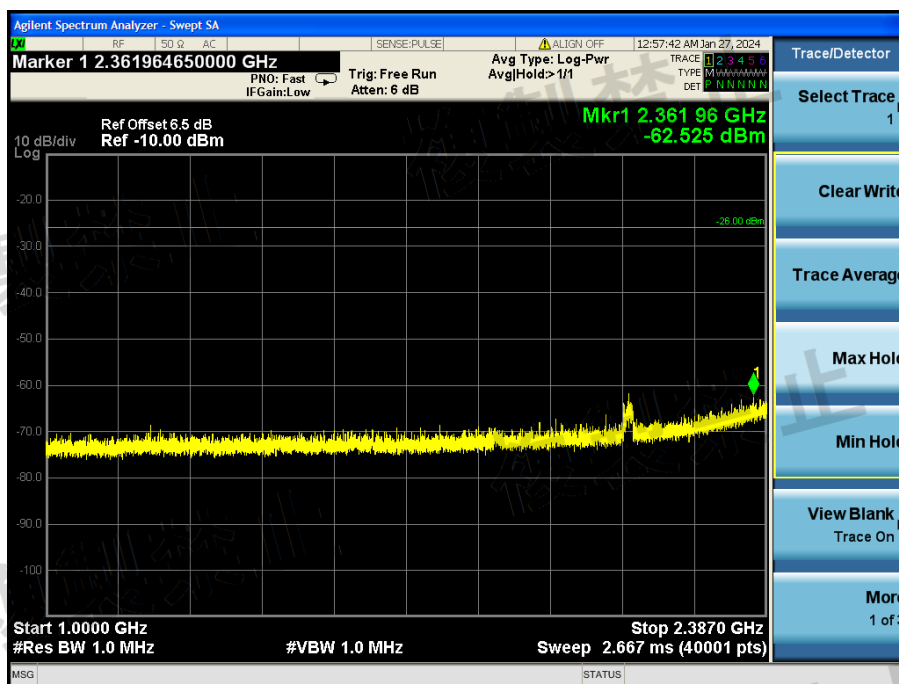


Channel 39: 2.441 GHz:

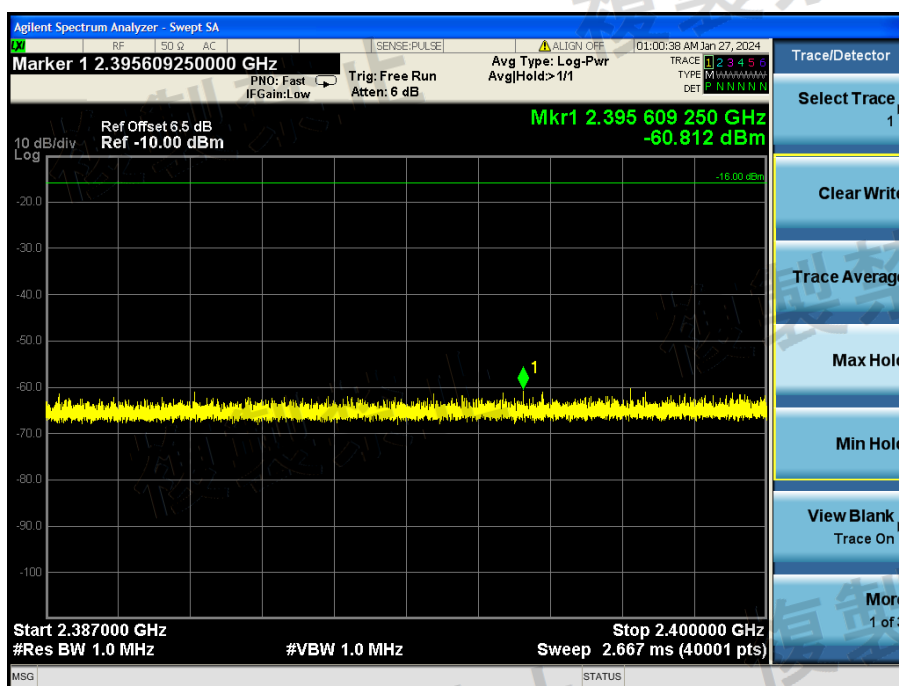
30 MHz to 1000 MHz:



1000 MHz to 2387 MHz:

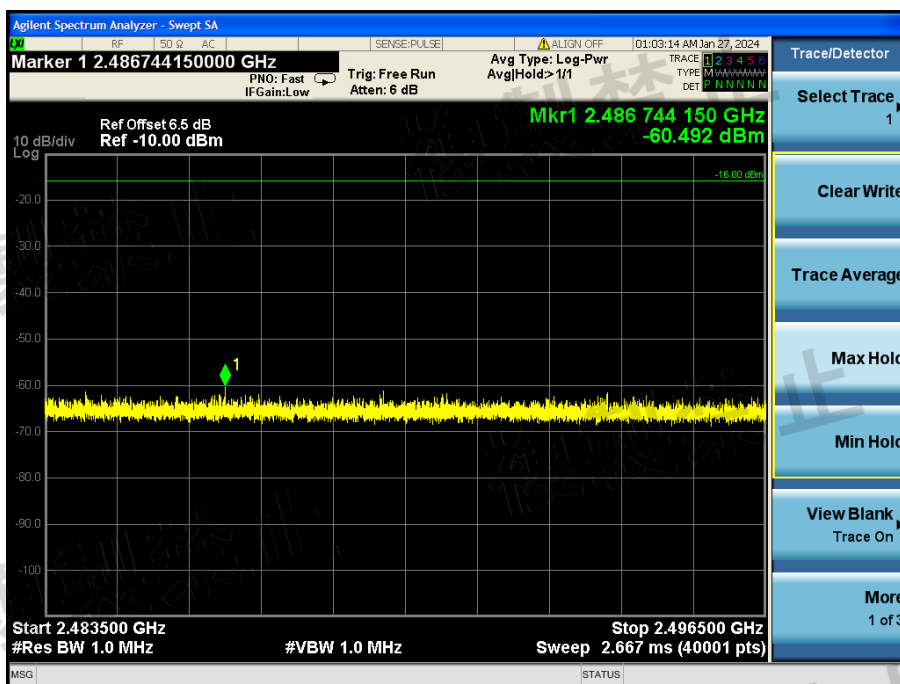


2387 MHz to 2400 MHz:

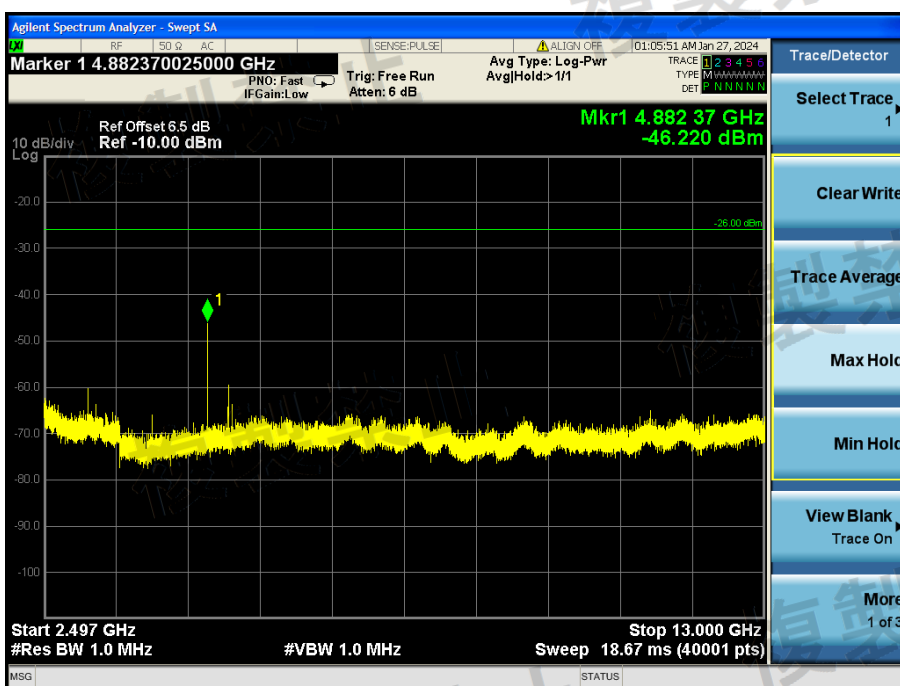




2483.5 MHz to 2496.5 MHz:

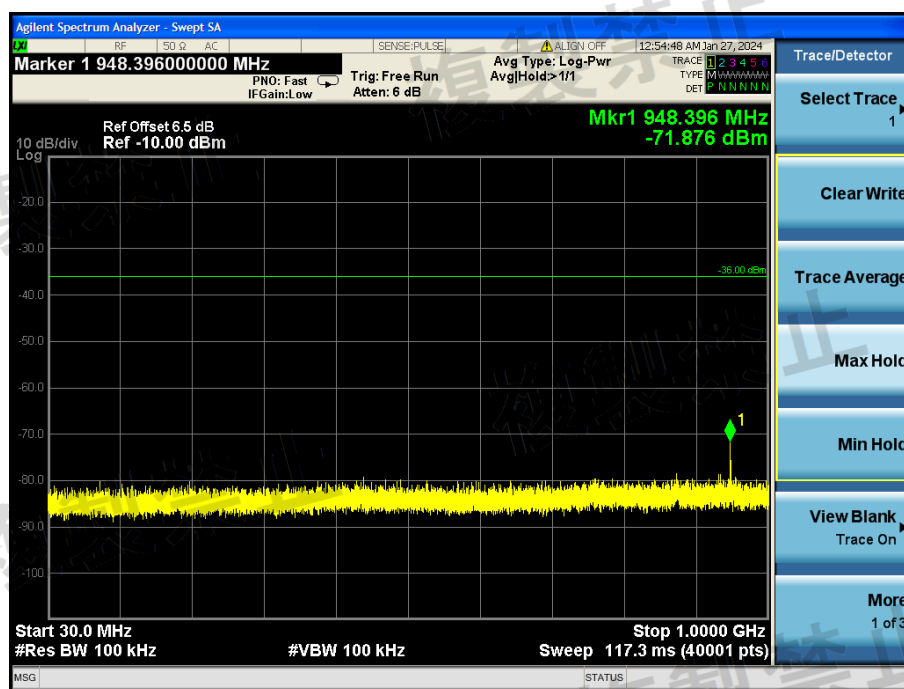


2496.5 MHz to 13 GHz:

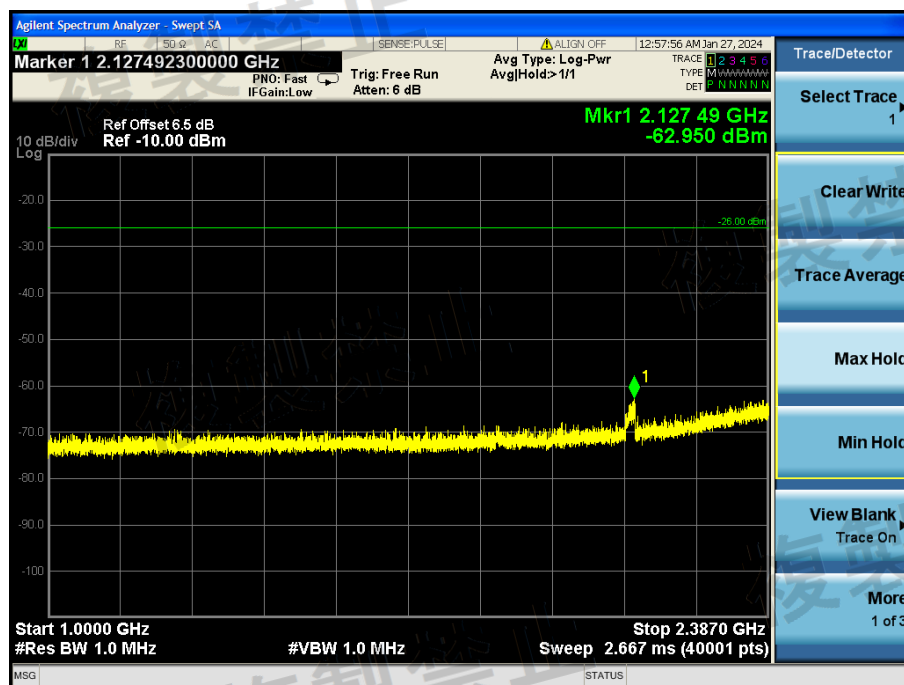


Channel 78: 2.480 GHz

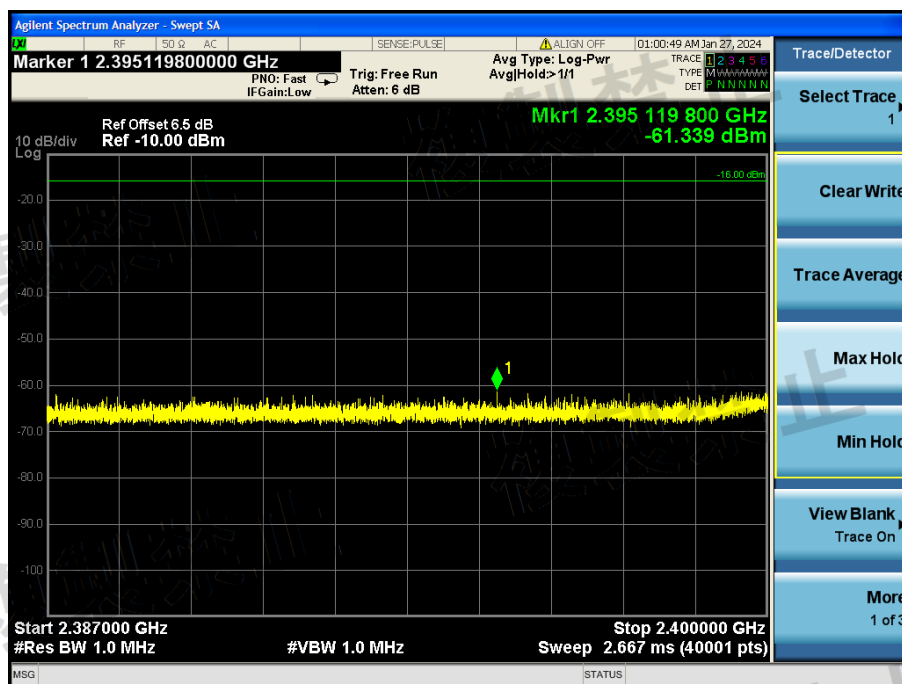
30 MHz to 1000 MHz:



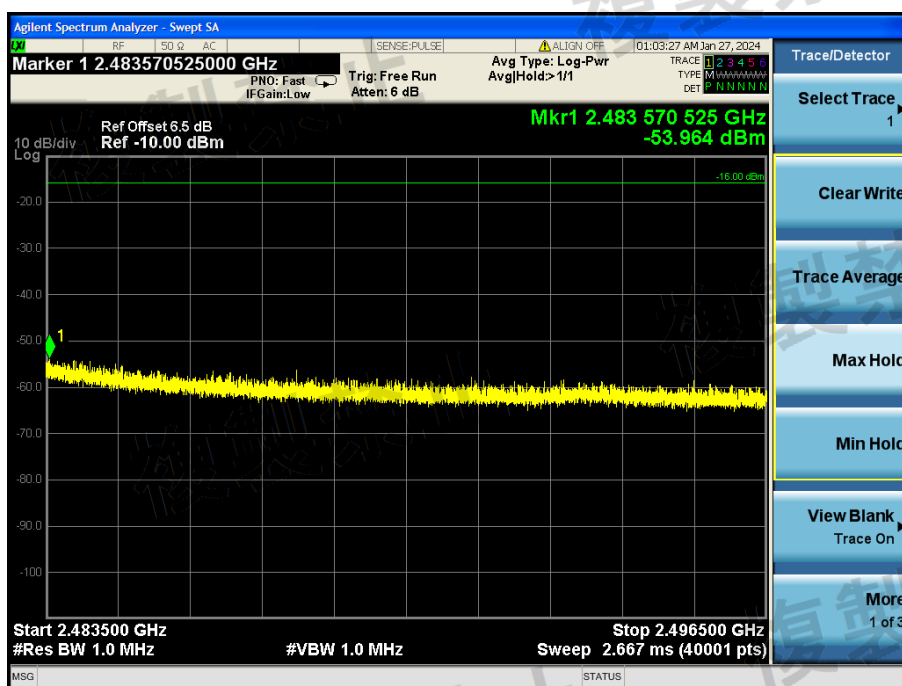
1000 MHz to 2387 MHz:



2387 MHz to 2400 MHz:

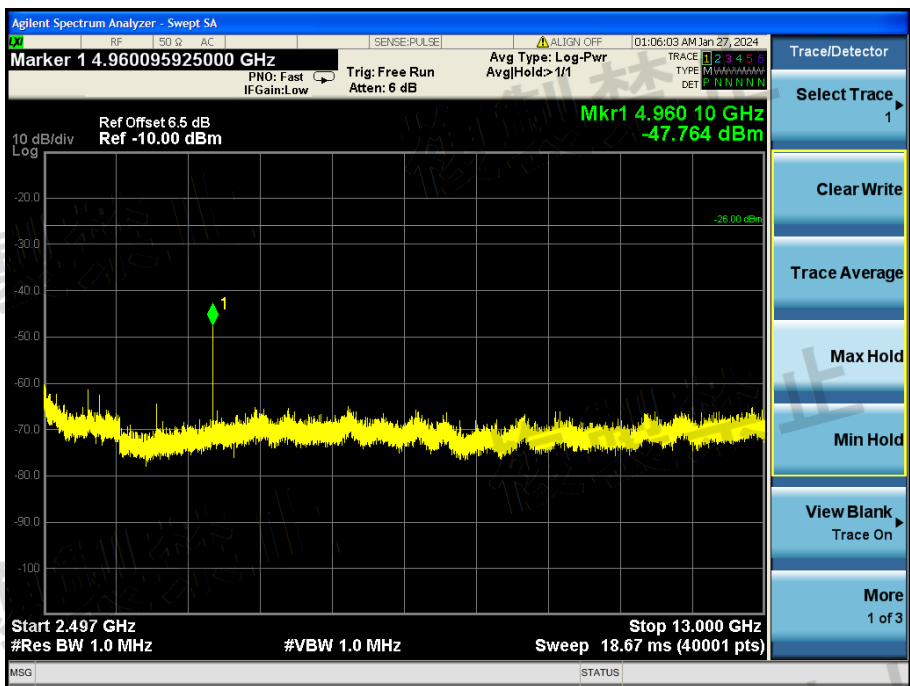


2483.5 MHz to 2496.5 MHz:



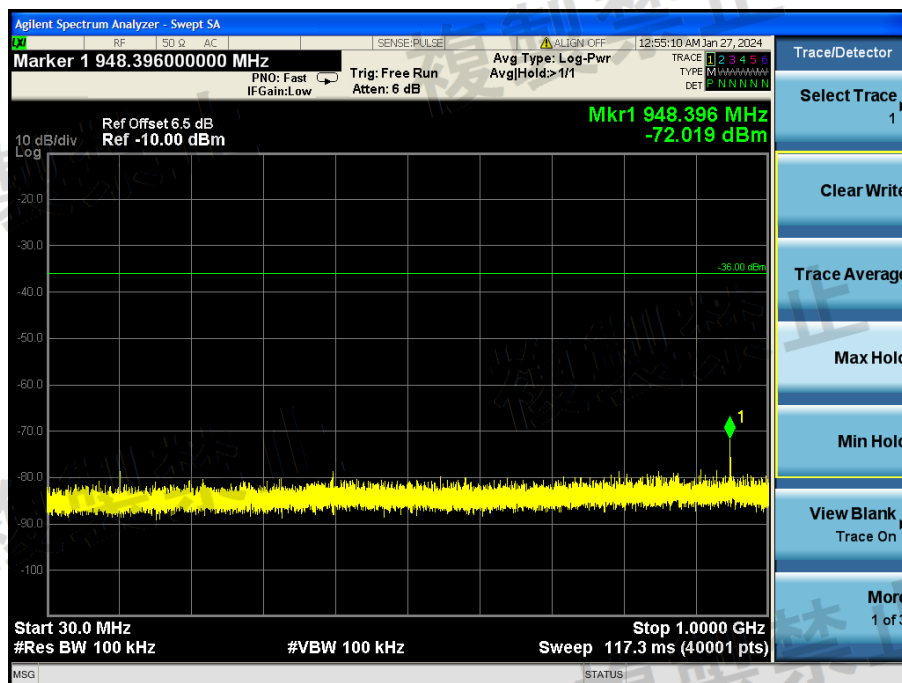


2496.5 MHz to 13 GHz:

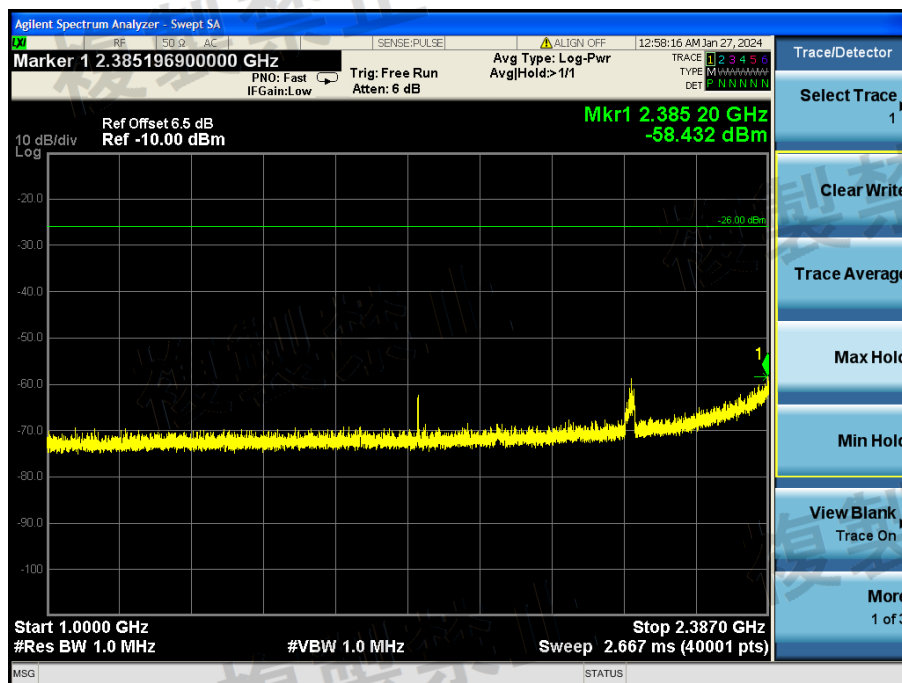


EDR mode ( $\pi$ 4)DQPSK:

30 MHz to 1000 MHz:

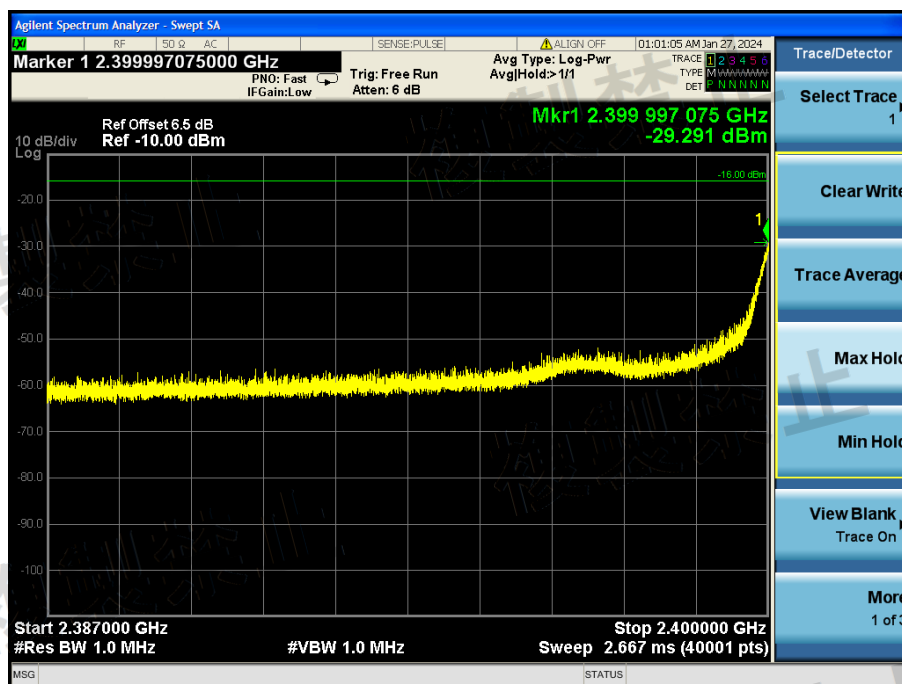


1000 MHz to 2387 MHz:

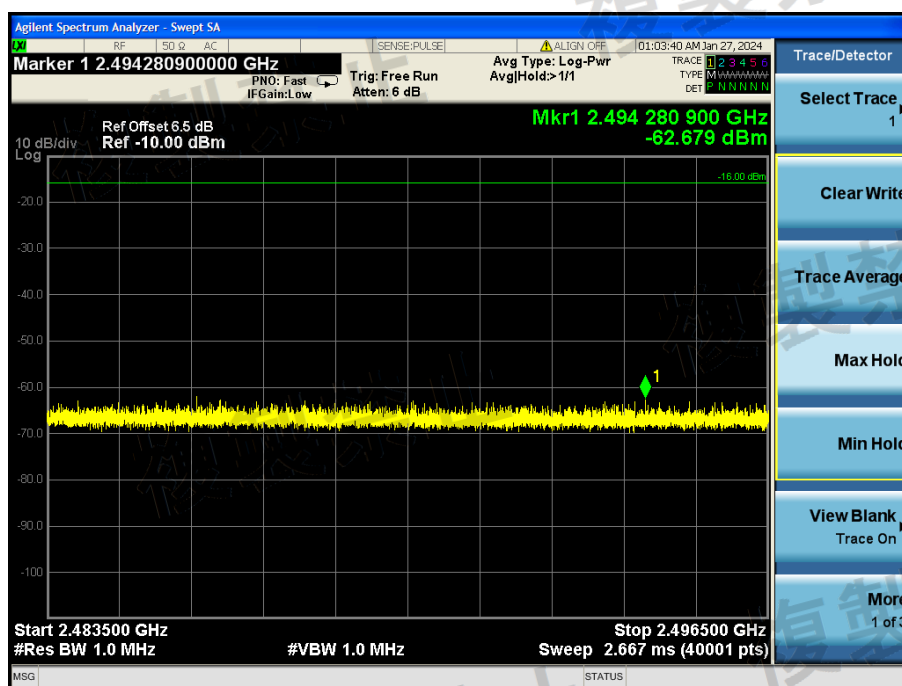




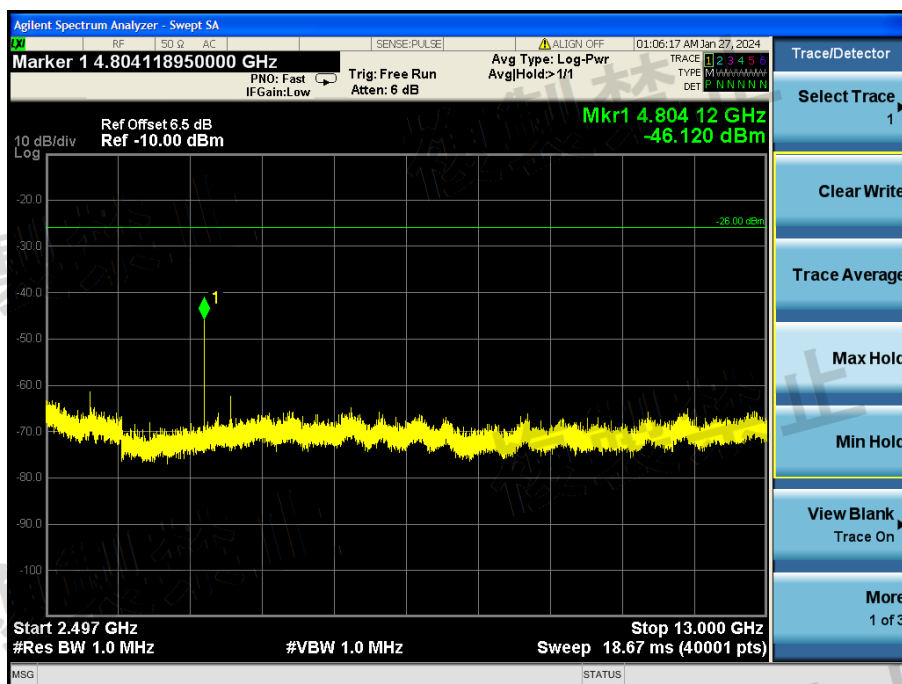
2387 MHz to 2400 MHz:



2483.5 MHz to 2496.5 MHz:

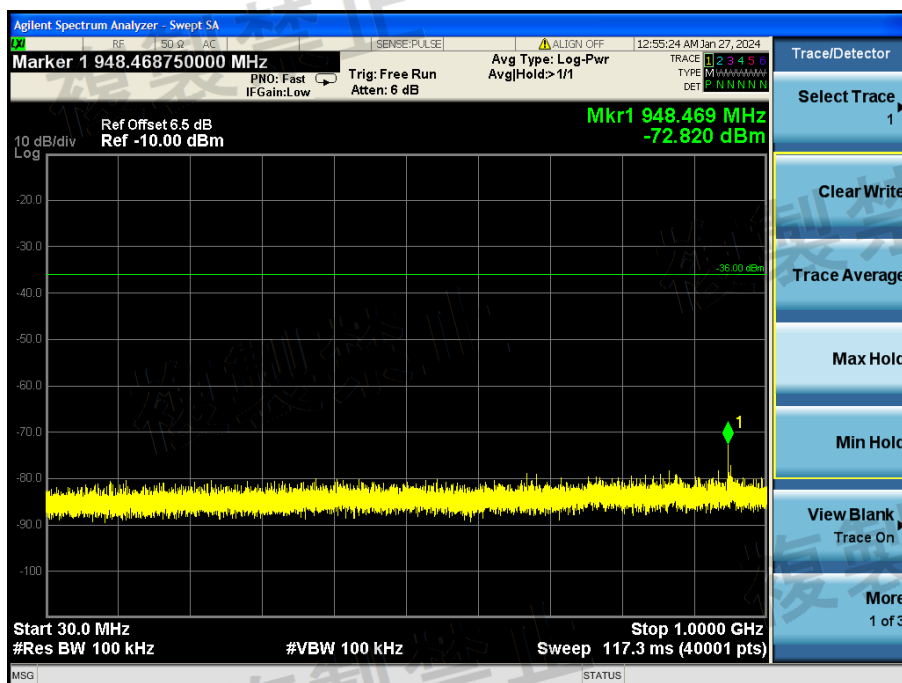


2496.5 MHz to 13 GHz:

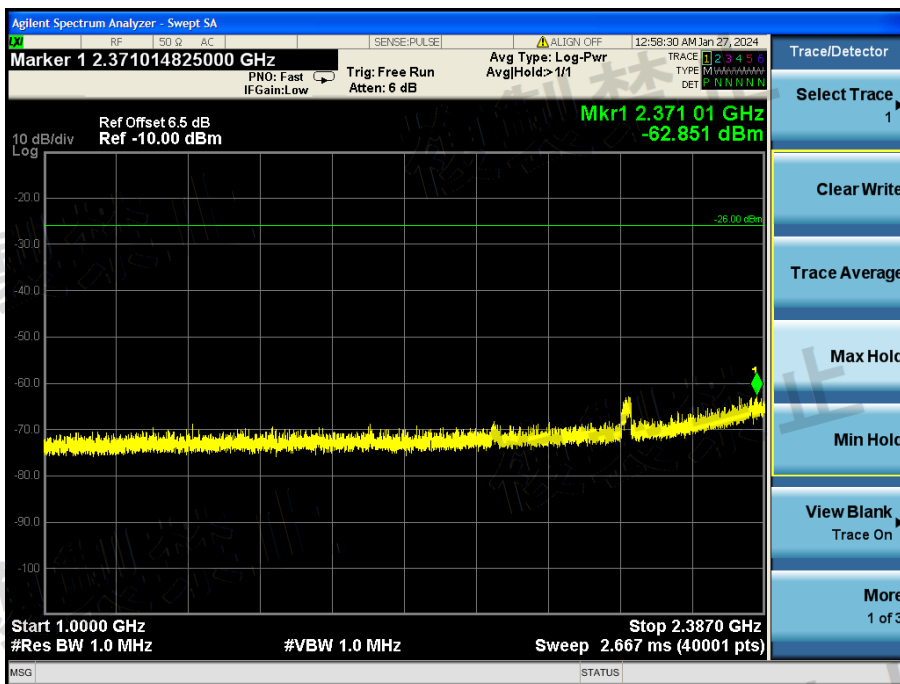


Channel 39: 2.441 GHz:

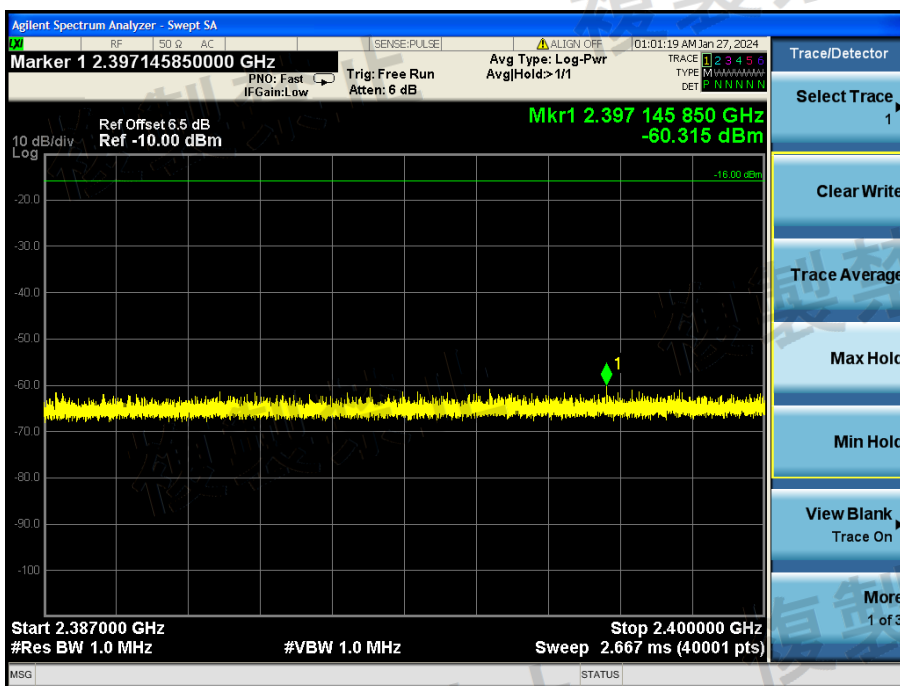
30 MHz to 1000 MHz:



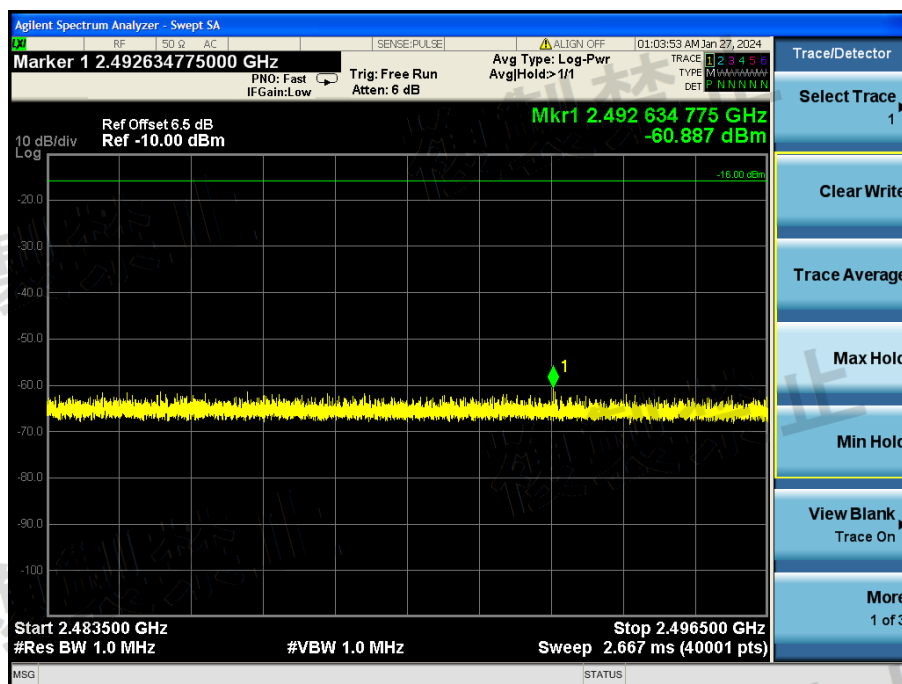
1000 MHz to 2387 MHz:



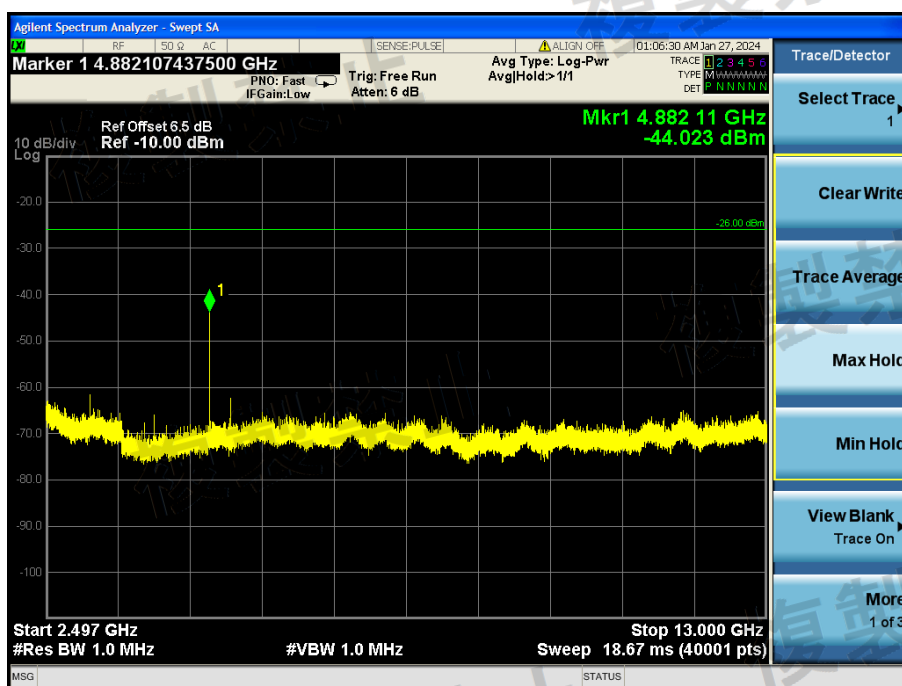
2387 MHz to 2400 MHz:



2483.5 MHz to 2496.5 MHz:

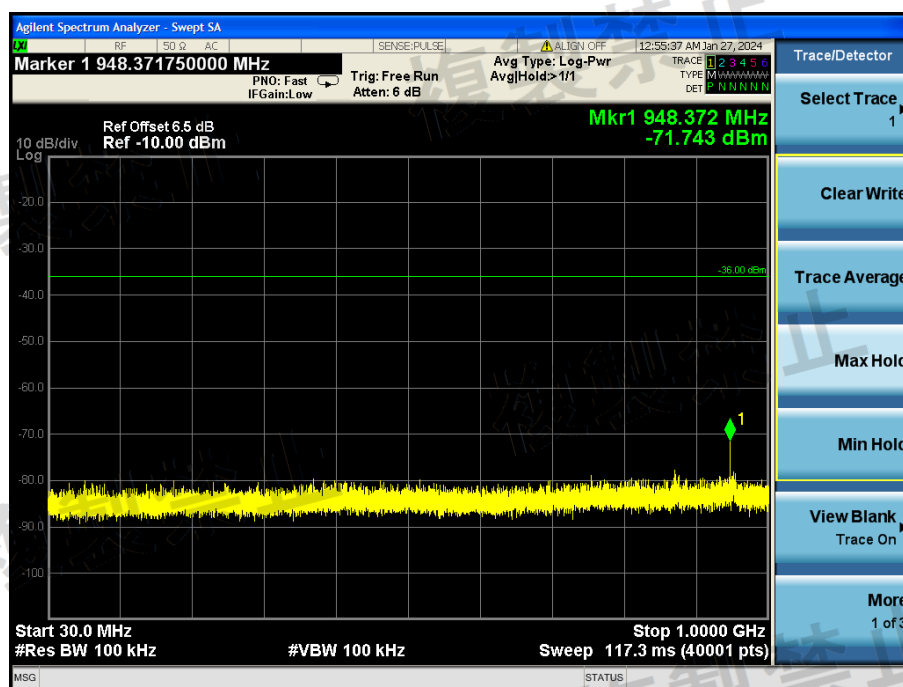


2496.5 MHz to 13 GHz:

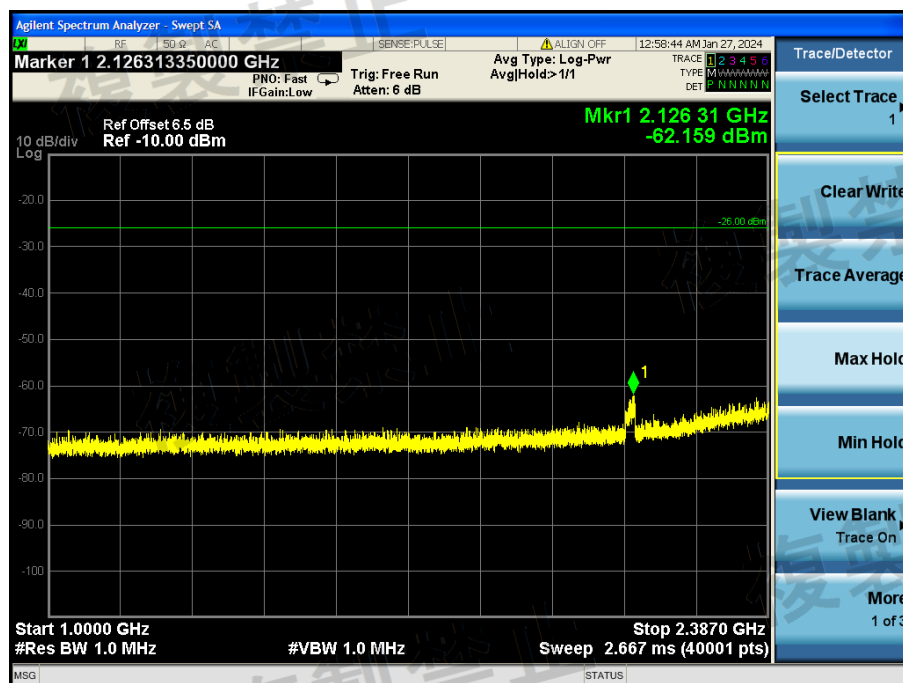


Channel 78: 2.480 GHz

30 MHz to 1000 MHz:

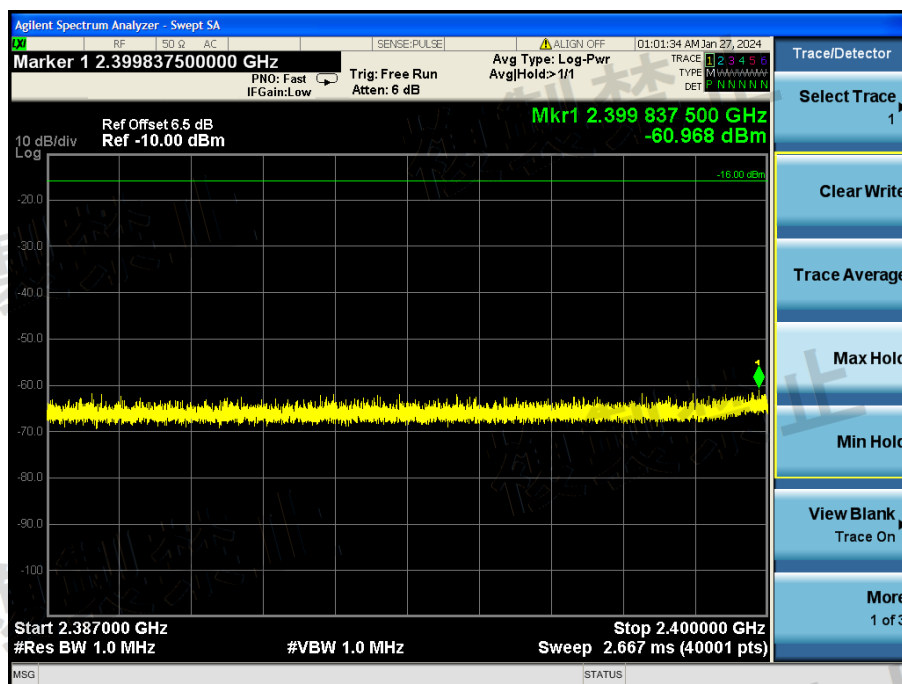


1000 MHz to 2387 MHz:

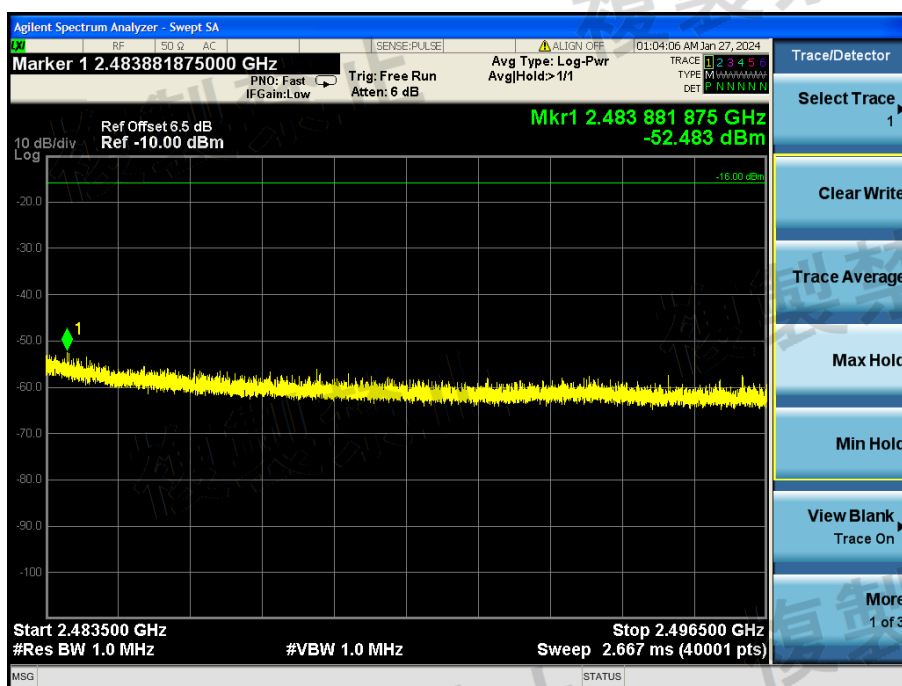




2387 MHz to 2400 MHz:

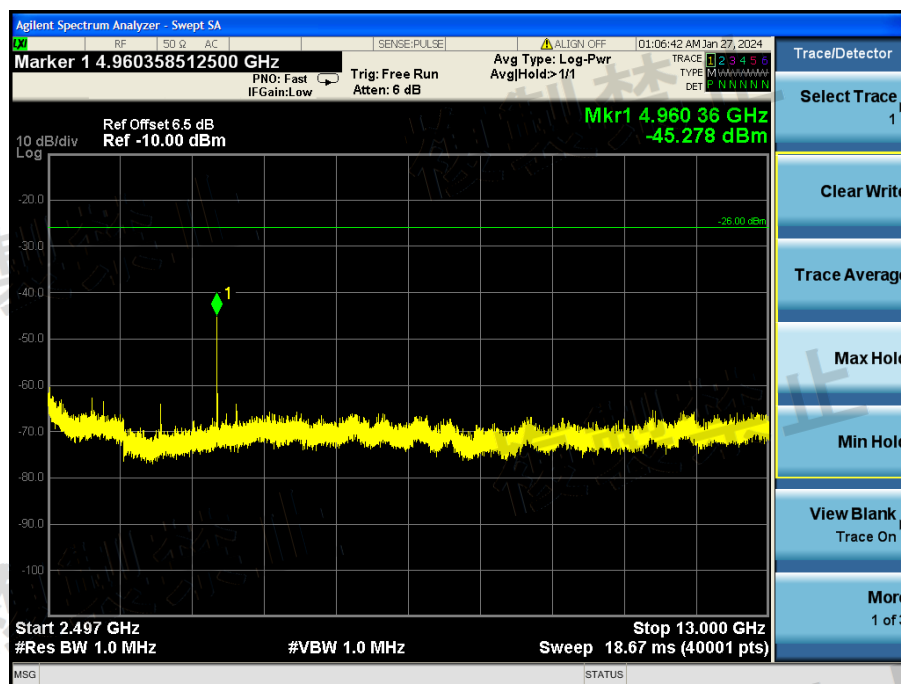


2483.5 MHz to 2496.5 MHz:





2496.5 MHz to 13 GHz:



Test result: The unit does meet the requirements.

## 5.10 Dwell Time

Test Requirement:	Item 19 of Article 2-1 less than 0.4sec
Temperature:	23.0 °C
Humidity:	55 % RH
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below. Modulation/Spread/Hopping ON, Hopping frequency is fixed, Bluetooth equipment is setting DH5 mode

Test Configuration:



Test Procedure:

1. Test Conditions:  
Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping ON, , Hopping frequency is fixed, Bluetooth equipment is setting DH5 mode  
For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:  
Frequency: Test Frequency (fixed hopping frequency)  
Span 0 Hz  
RBW 1 MHz  
VBW 1 MHz  
Sweep Time EUT condition  
Trigger Video Trigger  
Measures the Transmission time of 1 burst (sec)  
Measures the Burst cycle (sec)
4. Calculation procedure :  
$$\text{Dwell time} = (0.4(s) \times [\text{spreading rate}] \times [\text{Transmission time of 1 burst}(s)]) / ([\text{burst cycle}(s)] \times [\text{No. of hopping channel}])$$
  
Note:  
\* Spreading rate =  $[\text{Spread bandwidth (actual measurement value)}] / [\text{Transmission rate}]$

**Test result:**

For FHSS: BDR mode (GFSK):

Test channel	Test Frequency (MHz)	Test Result			Unit	Limit
		Normal Voltage	High Voltage	Low Voltage		
		3.7V DC	N/A	N/A		
Lowest	2402.0	0.282	N/A	N/A	Sec	less than 0.4 sec
Middle	2441.0	0.280	N/A	N/A	Sec	
Highest	2480.0	0.281	N/A	N/A	Sec	

For FHSS: EDR mode ( $\pi/4$ )DQPSK:

Test channel	Test Frequency (MHz)	Test Result			Unit	Limit
		Normal Voltage	High Voltage	Low Voltage		
		3.7V DC	N/A	N/A		
Lowest	2402.0	0.282	N/A	N/A	Sec	less than 0.4 sec
Middle	2441.0	0.282	N/A	N/A	Sec	
Highest	2480.0	0.283	N/A	N/A	Sec	

Remark: Calculated method: Dwell time=(0.4(s) x [spreading rate] x [Transmission time of 1 burst(s)])/([burst cycle(s)] x [No. of hopping channel])

Note: Spreading rate=[Spread bandwidth (actual measurement value)]/[Transmission rate]

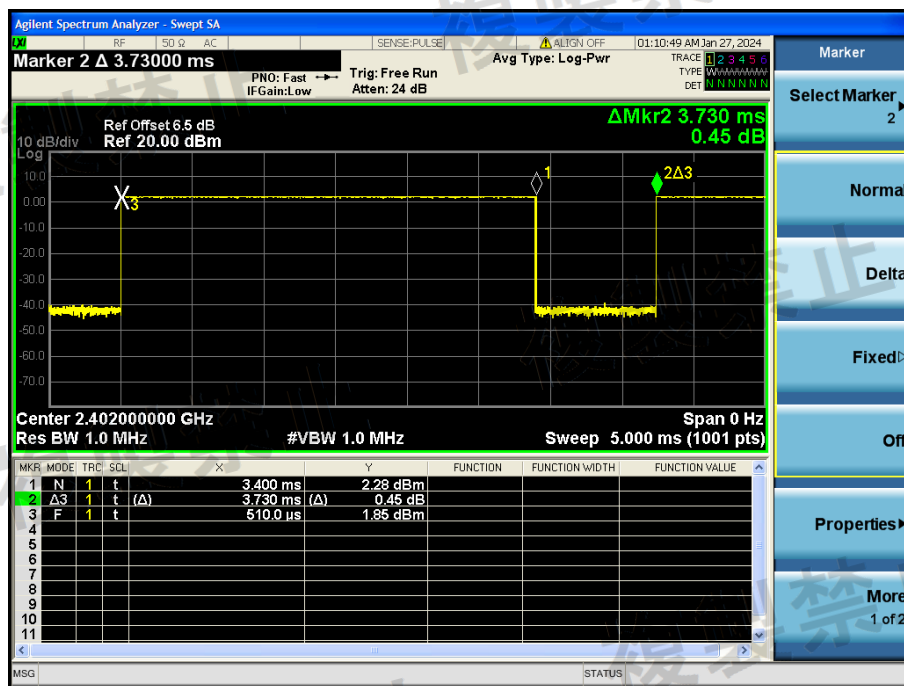
Transmission rate is 1.0 Mbps for Normal mode;

Transmission rate is 1.0 Mbps for EDR mode;

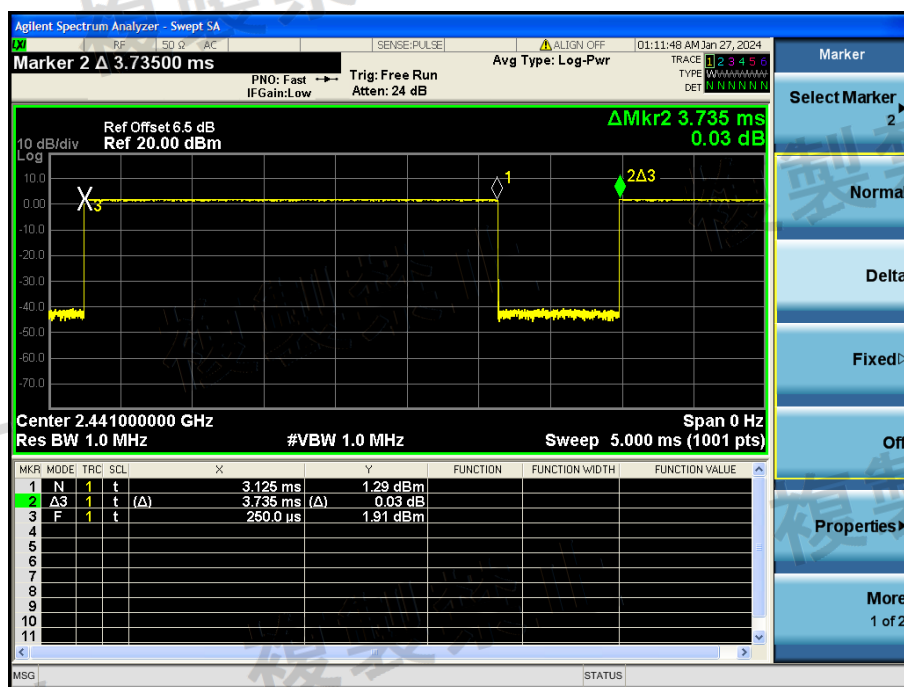
Result plot as follows:

BDR mode (GFSK):

Channel 0: 2.402 GHz:



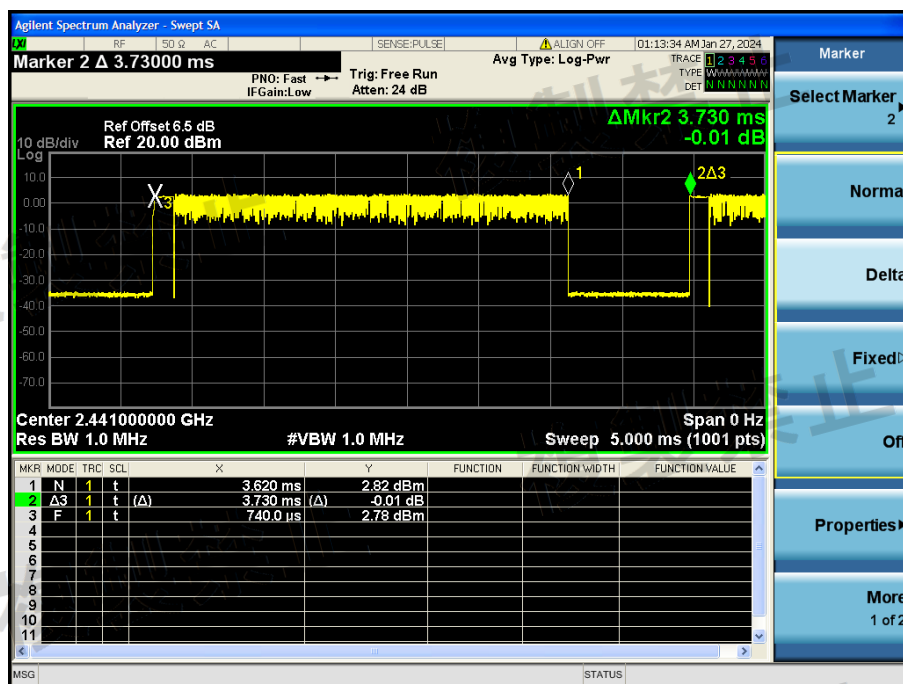
Channel 39: 2.441 GHz:



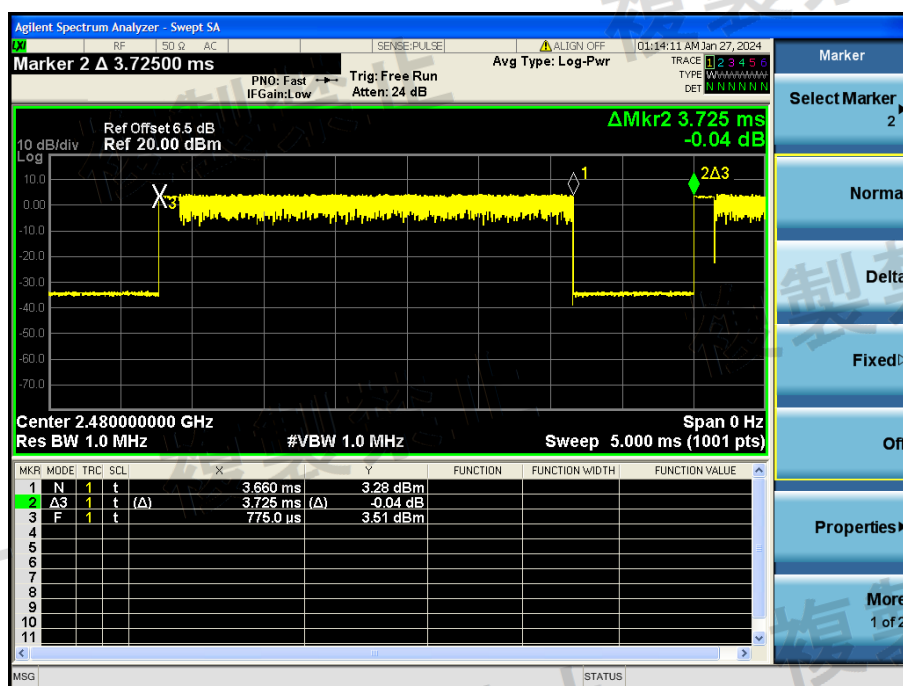




Channel 39: 2.441 GHz:



Channel 78: 2.480 GHz



Test result: The unit does meet the requirements.

## 5.11 Pseudorandom Frequency Hopping Sequence

Standard requirement

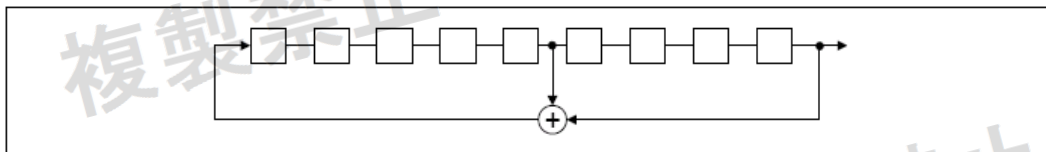
Article 2, Item (19) Notice 88 Appendix 43, 44, 45 requirement:

The EUT shall have the capability to transmit or to receive the MAC identification automatically, so that sender and receiver shall exclude other equipment.

EUT Pseudorandom Frequency Hopping Sequence

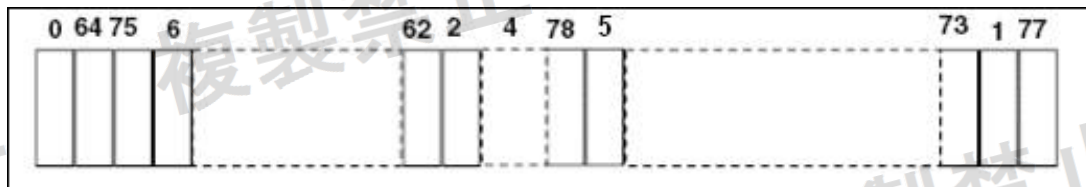
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits
- Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

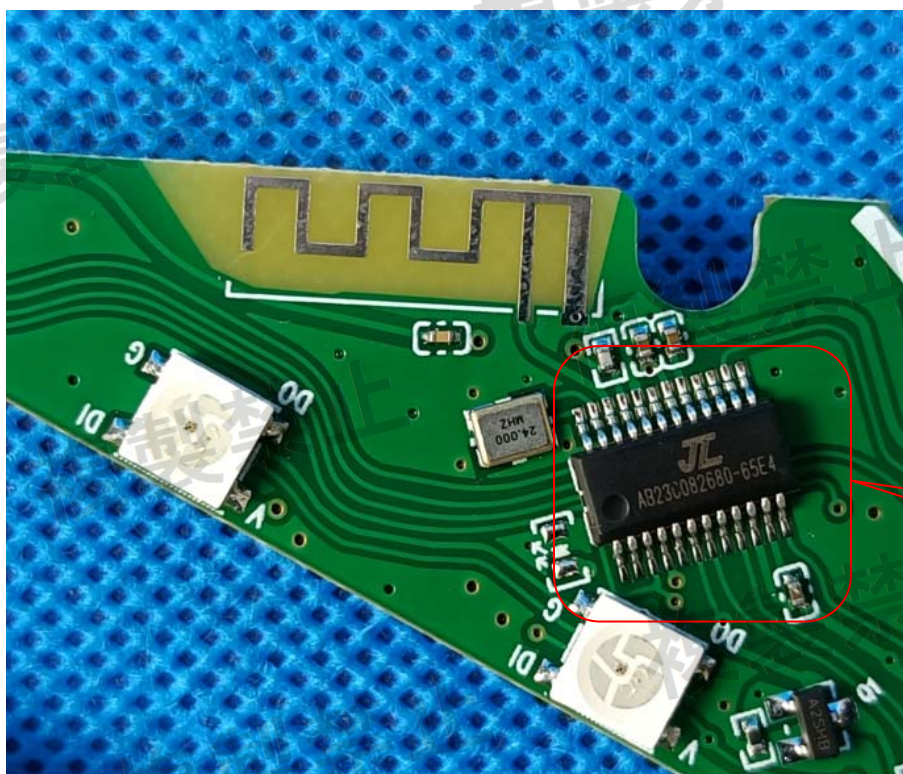
## 5.12 RF Accessibility

### Standard requirement

Article 2, Item (19) Notice 88 Appendix 43, 44, 45

The EUT shall be constructed in such a way that sensitive RF parts, (like modulation and oscillator parts) cannot be reached easily by the user. These parts shall be covered by soldered metal caps or glue or by other mechanical covers. If the covers are fixed with screws, these shall be not the common type(s) like a Phillips, but special versions like Torx, so that the user cannot open the device with common tools.

The chip's pin spacing is less than 1.5mm and is not easy to modify, The number of pins on the chip is 24.

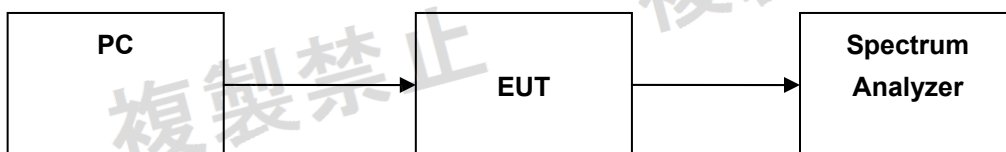


Welding



### 5.13 Spurious Emissions of Rx

Test Requirement:	Item 19 of Article 2-1 (1) Below 1 GHz : 4 nW or less(-54dBm) (2) 1 GHz and over : 20 nW or less(-47dBm)
Temperature:	23.0 °C
Humidity:	55 % RH
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	



#### Test Procedure:

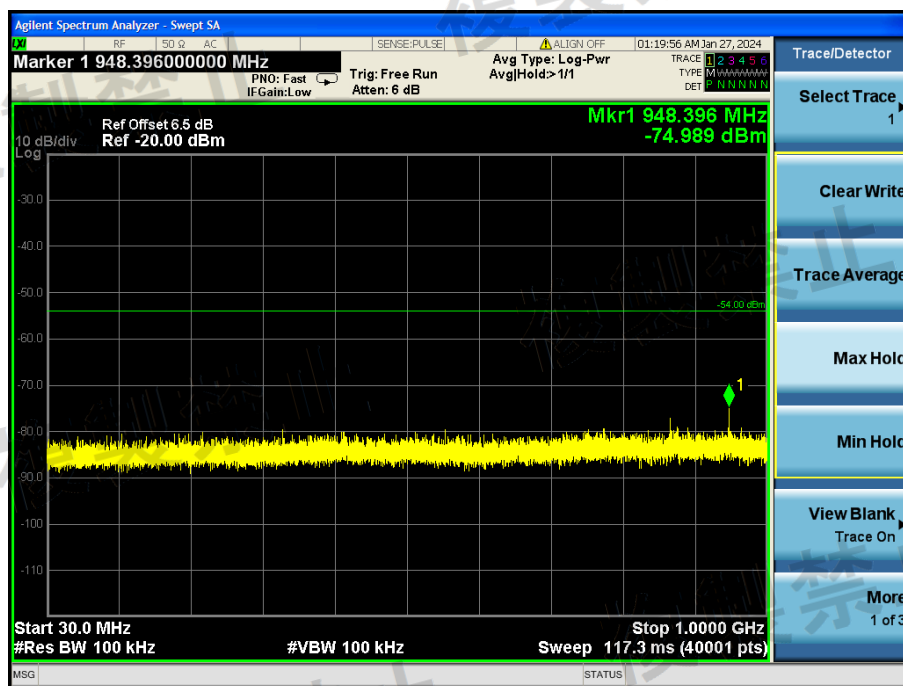
1. Test Conditions: Spectrum Analyzer is used for measurement.
2. EUT conditions:  
Modulation/Spread/Hopping ON  
For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:  
Step 1  
All spurious are measured from 30 MHz to 13 GHz by peak mode.  
Step 2  
IF the value measured by Step1 is 2 dB or less, measure in average mode.  
Test setup for Step 1:  
Frequency: 30 MHz – 2400 MHz , 2483.5 MHz –13 GHz  
RBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz)  
VBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz)  
Sweep Time Auto  
detector mode Positive peak  
Indication mode Max hold  
Test setup for Step 2:  
Frequency: Spurious Frequency  
Span 0 Hz  
RBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz)  
VBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz)  
Sweep Time Auto  
detector mode Sample  
Indication mode Max hold



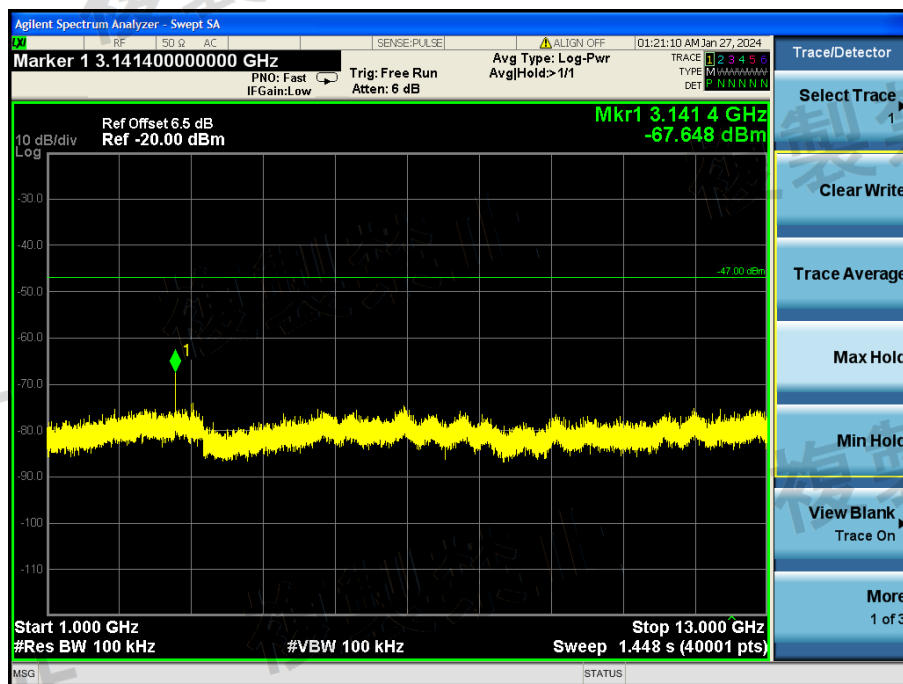
## Test result:

For FHSS: BDR mode (GFSK):

30 MHz to 1 GHz:

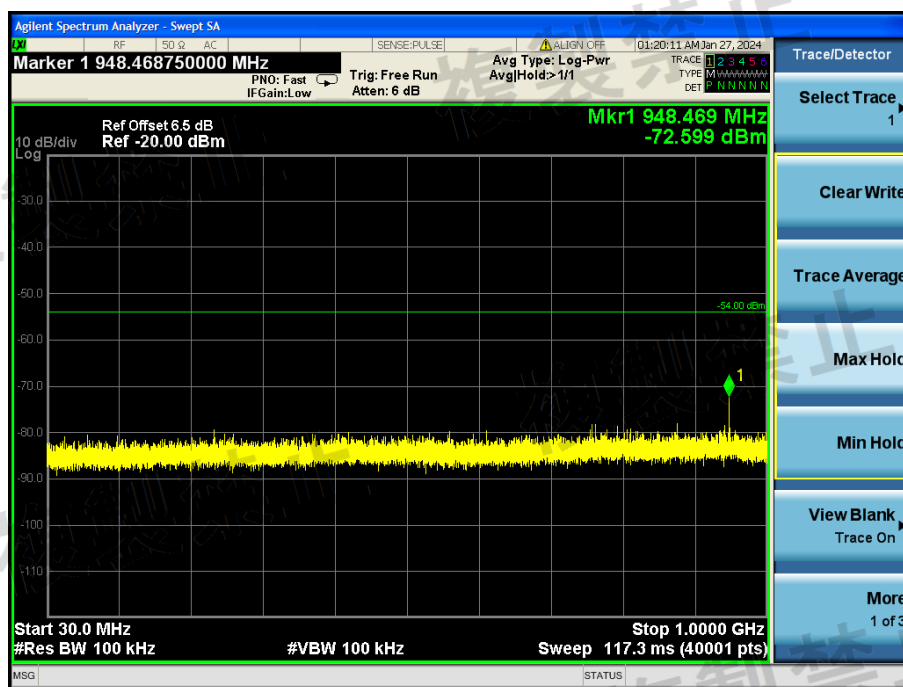


1 GHz to 13 GHz:

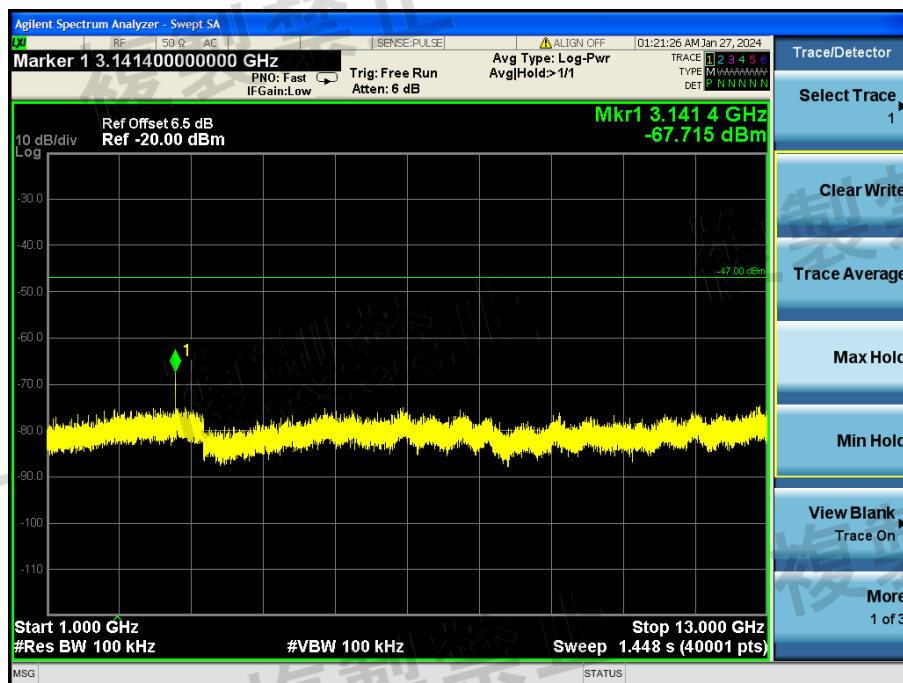


For FHSS: ( $\pi/4$ )DQPSK:

30 MHz to 1 GHz:



1 GHz to 13 GHz:



### 5.14 EUT TEST PHOTO

