

TEST REPORT

Applicant: Huaqin Technology Co., Ltd.
Address: No.699, Lvke Road, Pudong New Area, Shanghai
Equipment Type: wireless controller
Model Name: Legion Go 2 Controller R (refer to section 2.3)
Brand Name: Lenovo
Test Standard: MIC Notice No.88 Appendix No.43
Ordinance of MPT No.37, 1981:
Article 2 paragraph 1 item (19)
Sample Arrival Date: May 16, 2025
Test Date: May 23, 2025 - May 31, 2025
Date of Issue: Jun. 24, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.



Tested by: Li Ganming

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(Technical Director)

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Ye Hongji

Sunny Zou

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jun. 24, 2025</u>	<u>Initial Issue</u>

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1. GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2. PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Huaqin Technology Co., Ltd.
Address	No.699, Lvke Road, Pudong New Area, Shanghai

2.2 Manufacturer Information

Manufacturer	Huaqin Technology Co., Ltd.
Address	No.699, Lvke Road, Pudong New Area, Shanghai

2.3 General Description for Equipment under Test (EUT)

EUT Name	wireless controller
Model Name Under Test	Legion Go 2 Controller R
Series Model Name	Legion Go 2 Controller R***** (The "*" in the model name can be 0 to 9, A to Z, a to z, any symbol or blank for marketing use only)
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name. (this information provided by the applicant)
Hardware Version	GC8023-LM-V1.3
Software Version	v0326
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	Bluetooth (BR+EDR)
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	Bluetooth(For Classic): FHSS
Modulation Type	Bluetooth(For Classic): GFSK, $\pi/4$ -DQPSK
Transfer Rate	DH5: 1 Mbps 2DH5: 2 Mbps
Frequency Range	The frequency range used is 2402MHz - 2480MHz; The frequency block is 2400MHz to 2483.5MHz.
Number of Channel	Bluetooth(For Classic): 79 (at intervals of 1 MHz)
Tested Channel	Bluetooth(For Classic): 0 (2402 MHz), 39 (2441 MHz), 78 (2480 MHz)
Antenna Type	Ceramic Antenna
Antenna Gain	0.7 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.)
Whether to support AFH mode in Classic Bluetooth	The EUT does need to measure AFH occupied bandwidth, spread bandwidth and output power density (total power divided by spread bandwidth)
Declare Max rated power density	Bluetooth (For Classic): 0.1300 mW/MHz
About the Product	Only the Bluetooth was tested in this report.

All channel was listed on the following table:

For Classic

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

3. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

Part	Description	Channel (BT for Classic)	Test Mode	Data Rate (Mbps)	Verdict
5.1	Frequency Error	Low/Middle/High	un-modulation	/	Pass
5.2	Occupied Bandwidth and Spread-spectrum Bandwidth	Hopping Mode AFH Mode	GFSK, $\pi/4$ -DQPSK	1/2	Pass
5.3	The frequency retention time	Hopping Mode	GFSK, $\pi/4$ -DQPSK	1/2	Pass
5.4	Unwanted Emission Intensity	Low/Middle/High	GFSK, $\pi/4$ -DQPSK	1/2	Pass
5.5	Antenna Power Error	Hopping Mode AFH Mode	GFSK, $\pi/4$ -DQPSK	1/2	Pass
5.6	Limitation of Collateral Emission of Receiver	Low/Middle/High	GFSK, $\pi/4$ -DQPSK	1/2	Pass
5.7	Transmission Antenna Gain (EIRP Antenna Power)	N/A	N/A	N/A	N/A ^{Note2}
5.8	Transmission Radiation Angle Width (3dB Beamwidth)	N/A	N/A	N/A	N/A ^{Note2}
5.9	Radio Interference Prevention Capability	---	---	---	Pass
5.10	Construction Protection Confirmation	---	---	---	Pass

Note 1: The tests were performed according to the method of measurements prescribed in MIC Notice No.88 Appendix No.43.

Note 2: When the EIRP is less than 6.91 dBm/MHz, it is not necessary.

3.1 MEASUREMENT UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameters	Uncertainty
Frequency Error / 99% & 90% Bandwidth	$(3.2 \times f \times 10^{-6})$ Hz
Antenna Power	1.82 dB
TX-RX Spurious Emissions	1.84 dB
Transmission Antenna Gain	5.36 dB
Temperature	0.8°C
Humidity	4%
DC / AC Power Source	0.04%

Note: “ f ” is the nominal signal frequency in Hz.

4. GENERAL TEST CONFIGURATIONS

4.1 Test Environment Conditions

During the measurement, the normal environment conditions were within the listed ranges:

Relative Humidity (%)	57% to 67%	
Atmospheric Pressure (kPa)	86 kPa to 106 kPa	
Temperature	+20.4°C to +23.4°C	
Working Voltage of the EUT	NV (Normal Voltage)	3.7 V
	LV (Low Voltage)	3.3 V
	HV (High Voltage)	4.1 V

4.2 Test Equipment List

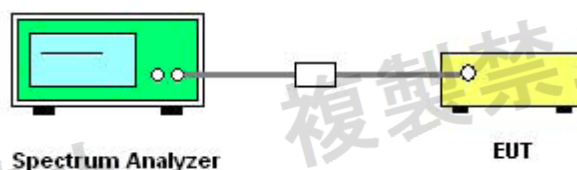
Description	Manufacturer	Model	Serial No.	Calibration Company	Calibration Address	Calibration By	Cal. Date	Cal. Due	Calibration Method
Spectrum Analyzer	KEYSIGHT	N9020A	MY50330200	Ti Testing & Certification Group Co., Ltd. Shenzhen Branch	103, Building B, Ganghongji High tech Intelligent Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen	HeWedong	2025.04.28	2026.04.27	c)
Power Sensor	KEYSIGHT	U2063XA	MY58000251	Ti Testing & Certification Group Co., Ltd. Shenzhen Branch	103, Building B, Ganghongji High tech Intelligent Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen	Zhang Suting	2024.07.04	2025.07.03	c)
Signaling Unit	ROHDE & SCHWARZ	CMW500	104808	Ti Testing & Certification Group Co., Ltd. Shenzhen Branch	103, Building B, Ganghongji High tech Intelligent Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen	HeWedong	2024.09.25	2025.09.24	c)
DC Power Supply	ITECH	IT6720	600103010717610007	Ti Testing & Certification Group Co., Ltd. Shenzhen Branch	103, Building B, Ganghongji High tech Intelligent Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen	Zhang Suting	2024.07.04	2025.07.03	c)

Note:

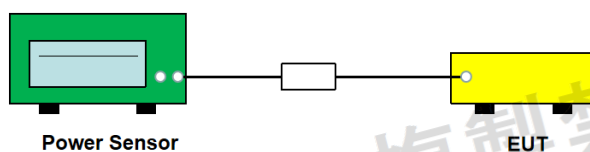
- Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)
- Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c)

4.3 Description of Test Setup

4.3.1 For Antenna Port Test

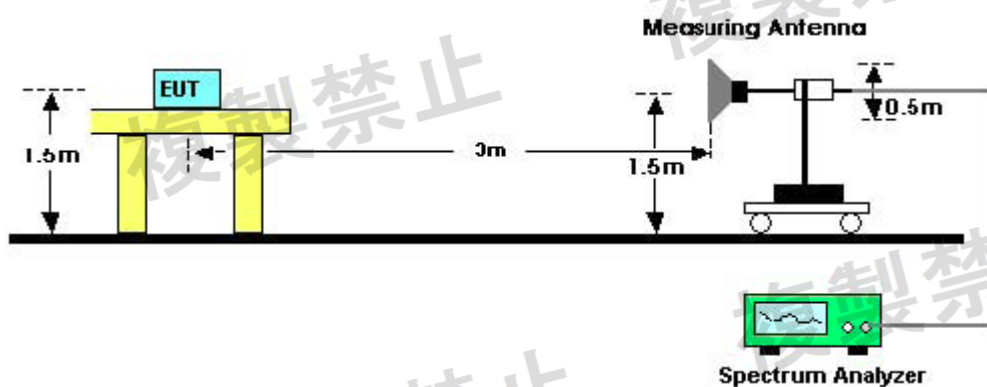


(Diagram 1)

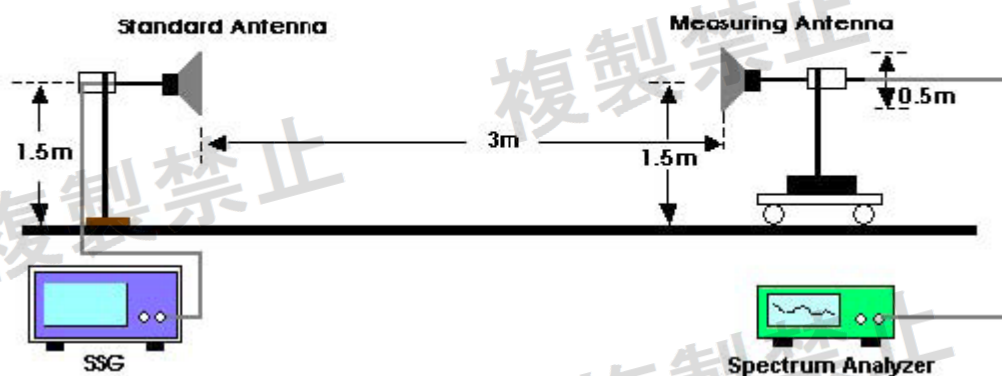


(Diagram 2)

4.3.2 For EIRP Antenna Power Test

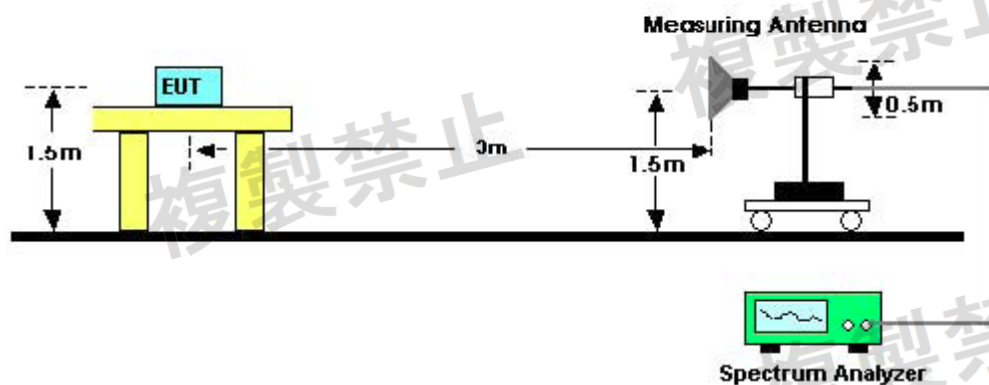


(Diagram 3)



(Diagram 4)

4.3.3 For 3dB Beamwidth Test



(Diagram 5)

5. TEST ITEMS

5.1 Frequency Error Measurement

5.1.1 Limit

Item	Limits
Frequency Tolerance	$\leq \pm 50$ ppm

5.1.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.1.3 Test Procedure

- 1 Frequency accuracy of SA shall be less than 10% of limits tolerance (5 ppm)
- 2 Setting of SA is following as: RB:1 kHz / VB:3 kHz / SPAN: 100 kHz
- 3 Center Frequency: The center frequency of testing for EUT
- 4 Sweep time: Auto
- 5 Sweep mode: Continuous sweep
- 6 Detect mode: Positive peak
- 7 Mark function: Frequency Counter (Resolution 100 Hz)
- 8 EUT have transmitted absence of modulation signal and fixed channelize. f is using the mark cursor to mark the peak frequency value, fc is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 50 ppm

5.1.4 Test Deviation

There is no deviation with the original standard.

5.1.5 EUT Operation during Test

The EUT was placed on the test table and programmed in un-modulation function.

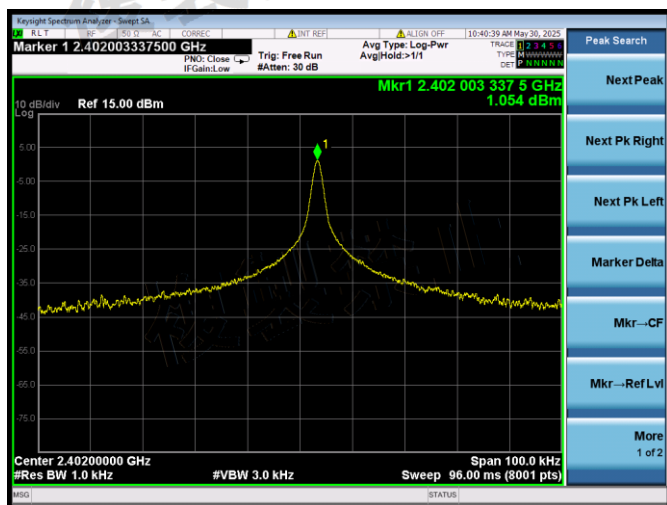
5.1.6 Test Result

Test Data for Bluetooth (Classic)

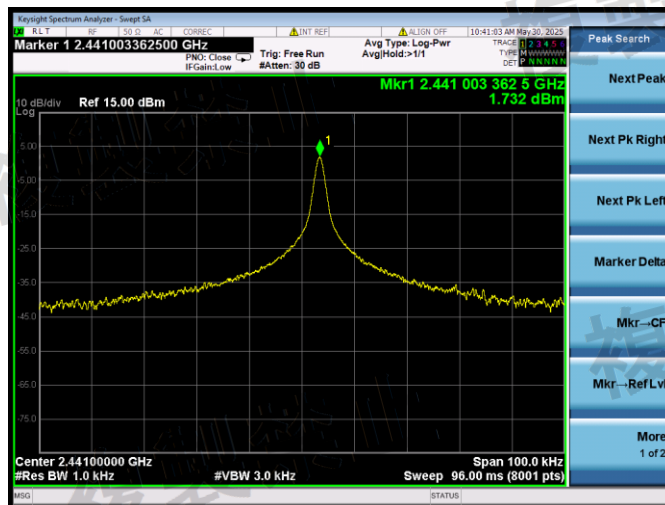
Test Mode	Test Voltage	Frequency (MHz)	Test Frequency (MHz)	Frequency Error (ppm)	Limit (ppm)	Refer to Plot	Verdict
Unmodulated	LV	2402	2402.00334	1.39	± 50	A.1.1	Pass
		2441	2441.00336	1.38	± 50	A.1.2	Pass
		2480	2480.00343	1.38	± 50	A.1.3	Pass
	NV	2402	2402.00200	0.83	± 50	A.1.4	Pass
		2441	2441.00189	0.77	± 50	A.1.5	Pass
		2480	2480.00195	0.79	± 50	A.1.6	Pass
	HV	2402	2402.00293	1.22	± 50	A.1.7	Pass
		2441	2441.00301	1.23	± 50	A.1.8	Pass
		2480	2480.00298	1.20	± 50	A.1.9	Pass

Test Plots

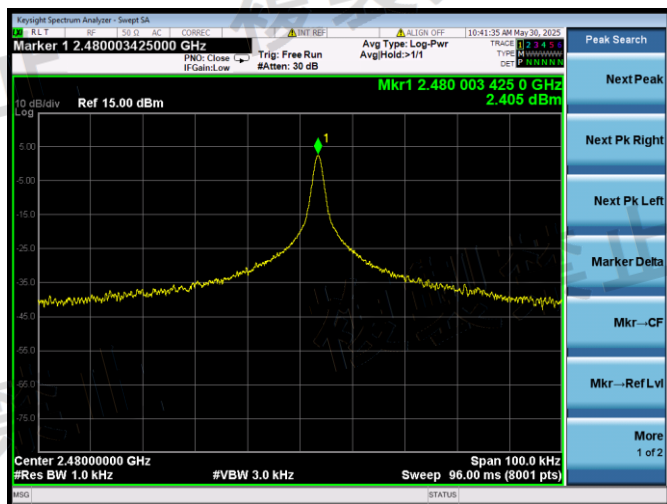
A.1.1 LV 2402 Channel



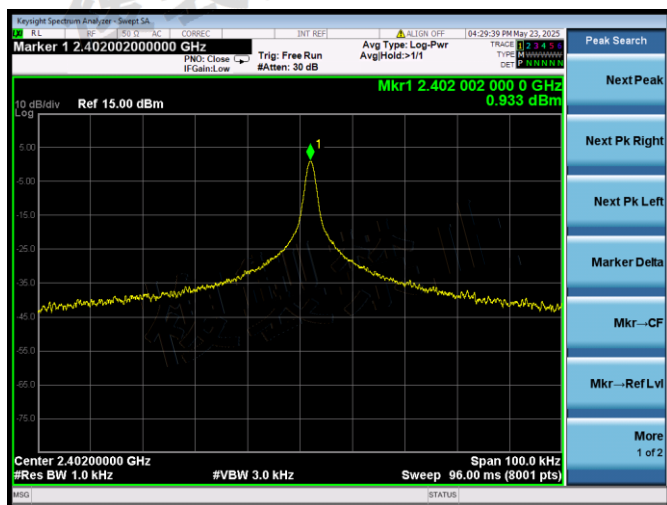
A.1.2 LV 2441 Channel



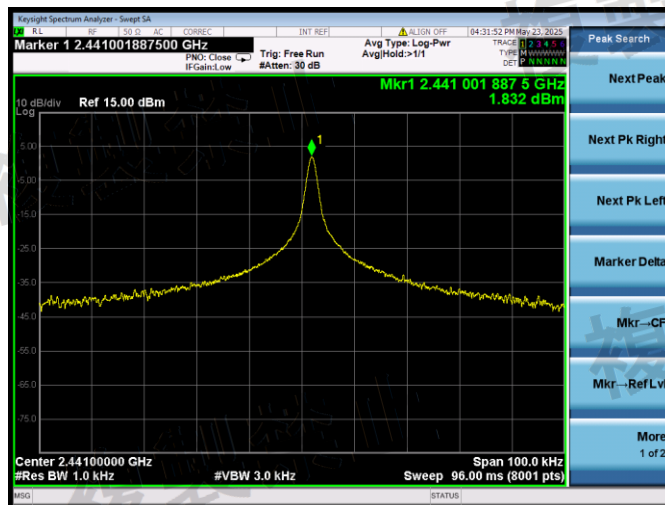
A.1.3 LV 2480 Channel



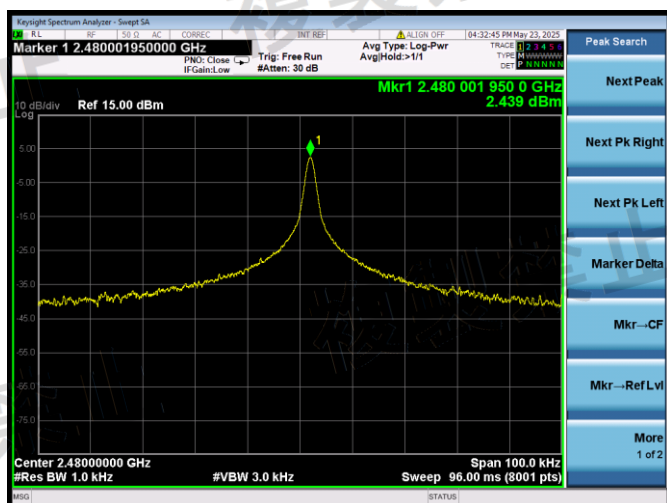
A.1.4 NV 2402 Channel



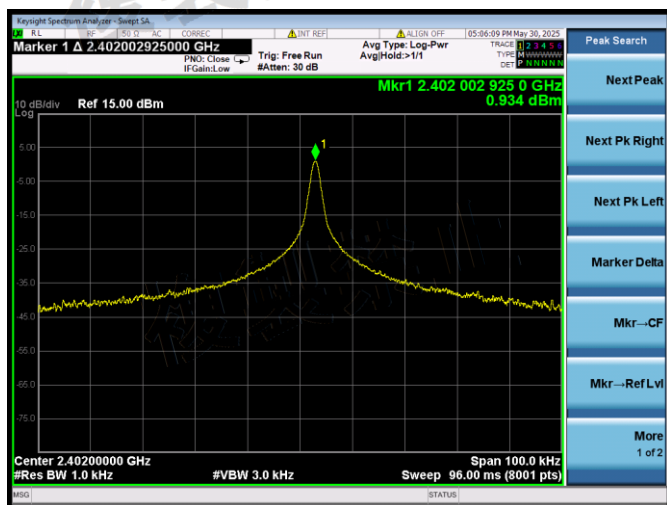
A.1.5 NV 2441 Channel



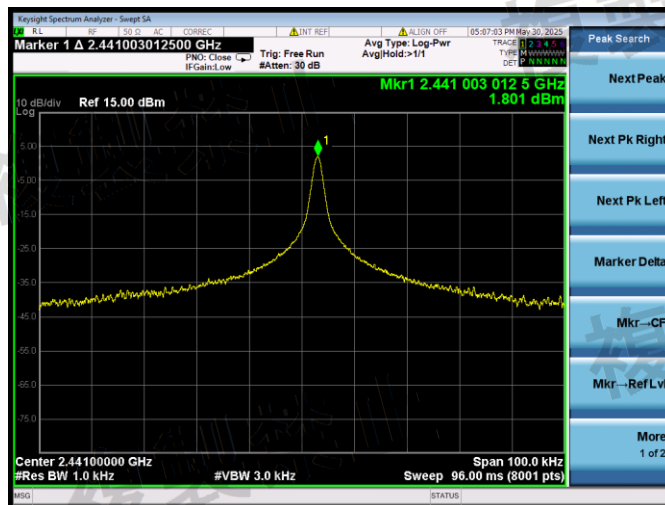
A.1.6 NV 2480 Channel



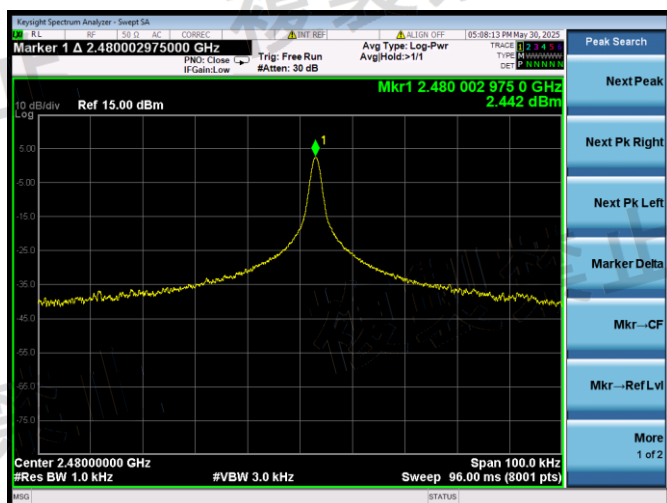
A.1.7 HV 2402 Channel



A.1.8 HV 2441 Channel



A.1.9 HV 2480 Channel



5.2 Occupied Bandwidth and Spread-spectrum Bandwidth

5.2.1 Limit

Item	Limits
Occupied Band Width	FHSS $\leq$ 83.5MHz; OFDM $\leq$ 40MHz; DSSS $\leq$ 26MHz; Others $\leq$ 26MHz

5.2.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.2.3 Test Procedure

- Set the spectrum analyzer as follows:
 - Center frequency: Test frequency
 - Span: Approximately 2 to 3.5 times nominal bandwidth
 - Resolution bandwidth: Approximately 3% or less nominal bandwidth
 - Video bandwidth: equivalent to resolution bandwidth
 - Sweep time: auto
 - Sweep mode: Continuous sweep
 - Detection: Positive peak
 - Trace mode: Maximum hold
- After repeating sweeps until the display shows steady data, store the values at all data points into the computer array variables.
- Convert the dB values at all data points to antilogarithm on the power dimension.
- Obtain sum total of the power at all data points, and store it as "total power".
- Accumulate the power at each data point sequentially upward from the lowest frequency and obtain the limit data point where the accumulated power becomes 0.5% (5% for spreading bandwidth) of the "total power". Then convert the limit data point into frequency and store it as "lower limit frequency"
- Accumulate the power at each data point sequentially downward from the highest frequency and obtain the limit data point where the accumulated power becomes 0.5% (5% for spreading bandwidth) of the "total power". Then convert the limit data point into frequency and store it as "upper limit frequency".

5.2.4 Test Deviation

There is no deviation with the original standard.

5.2.5 EUT Operation during Test

The EUT was programmed to be in continuous transmit, channel-hopping mode.

5.2.6 Test Result

Test Data for Bluetooth (Classic)

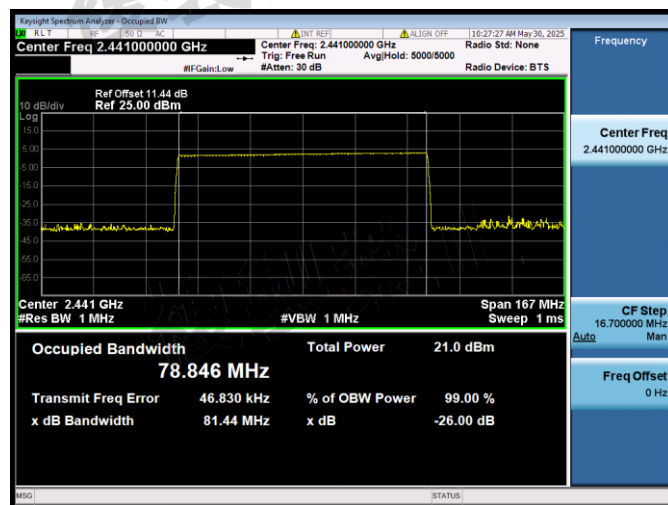
Results of Occupied Bandwidth	MODE	Test Voltage	Measured 99% Occupied Bandwidth (MHz)	Occupied Bandwidth Limit (MHz)	Refer to Plot	Verdict
	GFSK	LV	78.85	≤ 83.5	A.2.1	Pass
		NV	78.84	≤ 83.5	A.2.2	Pass
		HV	78.85	≤ 83.5	A.2.3	Pass
	$\pi/4$ -DQPSK	LV	78.88	≤ 83.5	A.2.4	Pass
		NV	78.90	≤ 83.5	A.2.5	Pass
		HV	78.87	≤ 83.5	A.2.6	Pass
Results of Spread-spectrum Bandwidth	MODE	Test Voltage	Measured 90% Spread-spectrum Bandwidth (MHz)		Refer to Plot	Verdict
	GFSK	LV	71.40		A.2.7	Pass
		NV	71.40		A.2.8	Pass
		HV	71.59		A.2.9	Pass
	$\pi/4$ -DQPSK	LV	71.51		A.2.10	Pass
		NV	71.40		A.2.11	Pass
		HV	71.50		A.2.12	Pass

Test Data for AFH Mode

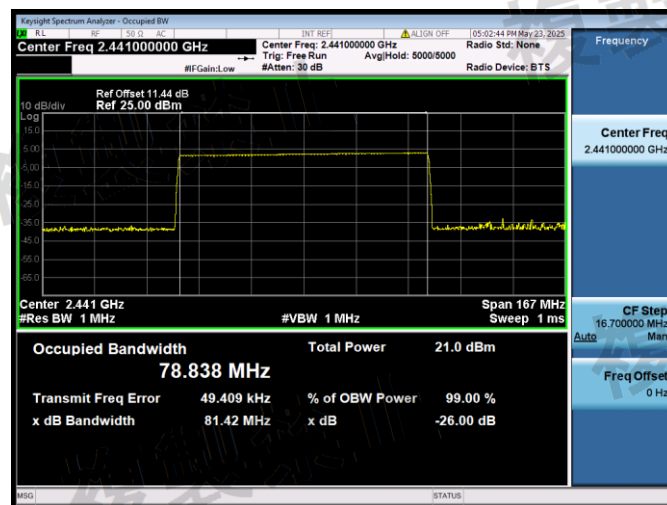
Results of Occupied Bandwidth	MODE	Test Voltage	Measured 99% Occupied Bandwidth (MHz)	Occupied Bandwidth Limit (MHz)	Refer to Plot	Verdict
	GFSK	LV	20.60	≤ 83.5	A.2.13	Pass
		NV	20.60	≤ 83.5	A.2.14	Pass
		HV	20.60	≤ 83.5	A.2.15	Pass
	$\pi/4$ -DQPSK	LV	20.78	≤ 83.5	A.2.16	Pass
		NV	20.80	≤ 83.5	A.2.17	Pass
		HV	20.80	≤ 83.5	A.2.18	Pass
Results of Spread-spectrum Bandwidth	MODE	Test Voltage	Measured 90% Spread-spectrum Bandwidth (MHz)		Refer to Plot	Verdict
	GFSK	LV	18.55		A.2.19	Pass
		NV	18.55		A.2.20	Pass
		HV	18.56		A.2.21	Pass
	$\pi/4$ -DQPSK	LV	18.65		A.2.22	Pass
		NV	18.63		A.2.23	Pass
		HV	18.56		A.2.24	Pass

Test Plots (Occupied Bandwidth)

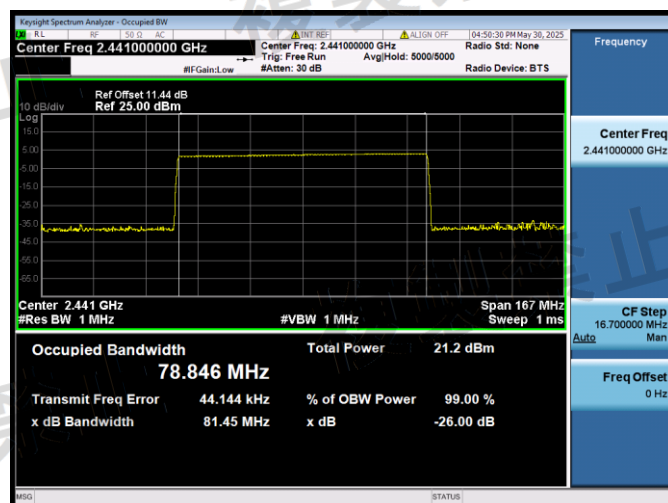
A.2.1 GFSK LV

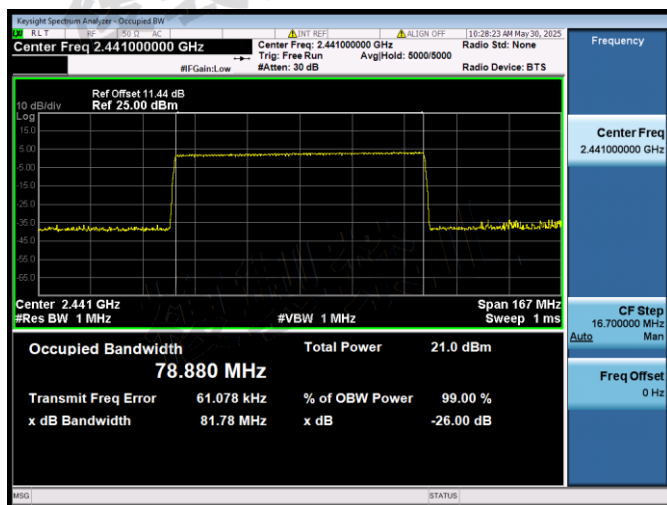
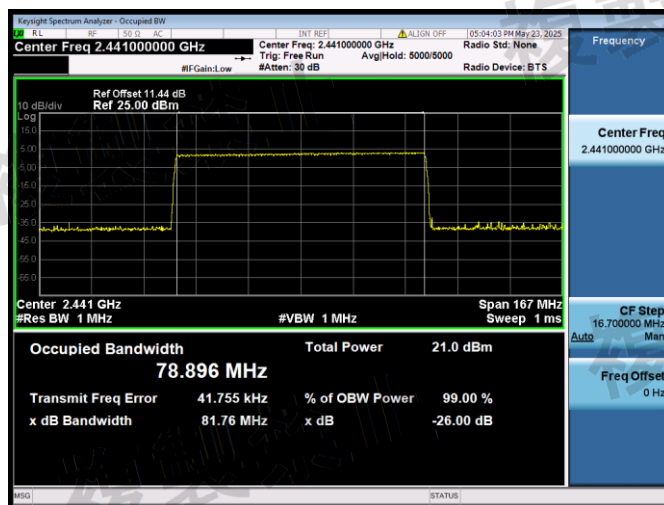
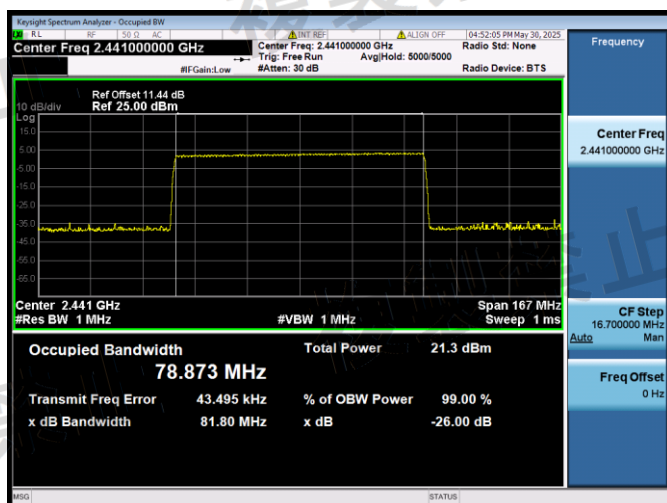


A.2.2 GFSK NV



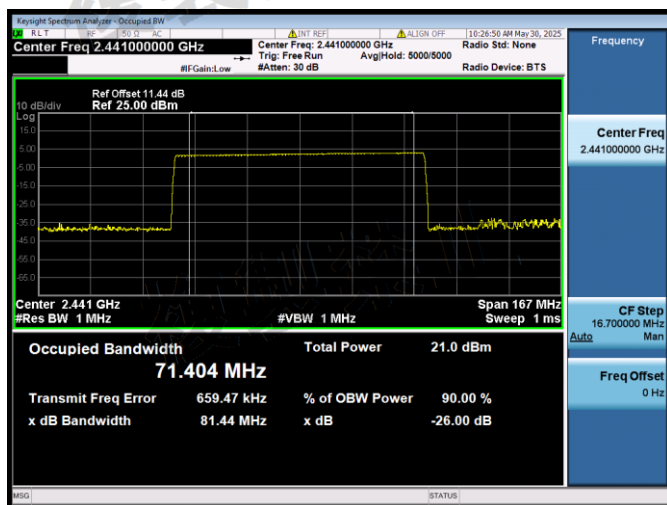
A.2.3 GFSK HV



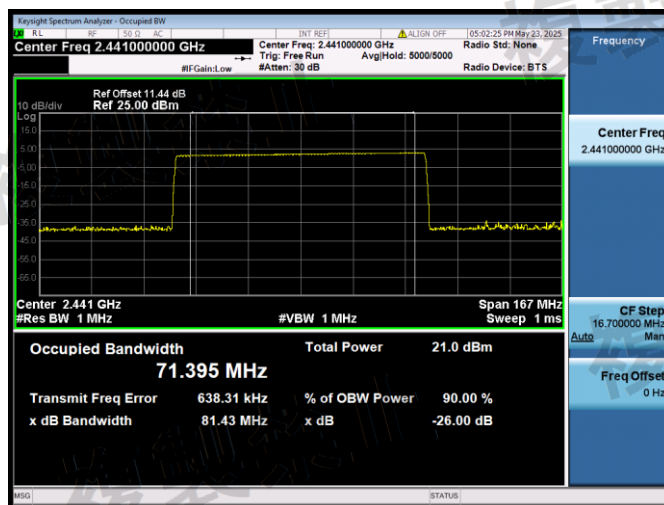
A.2.4 $\pi/4$ -DQPSK LVA.2.5 $\pi/4$ -DQPSK NVA.2.6 $\pi/4$ -DQPSK HV

Test Plots (Spread-spectrum Bandwidth)

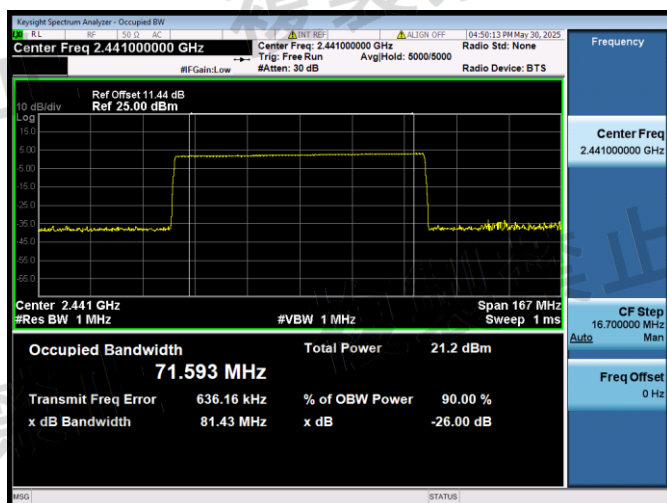
A.2.7 GFSK LV

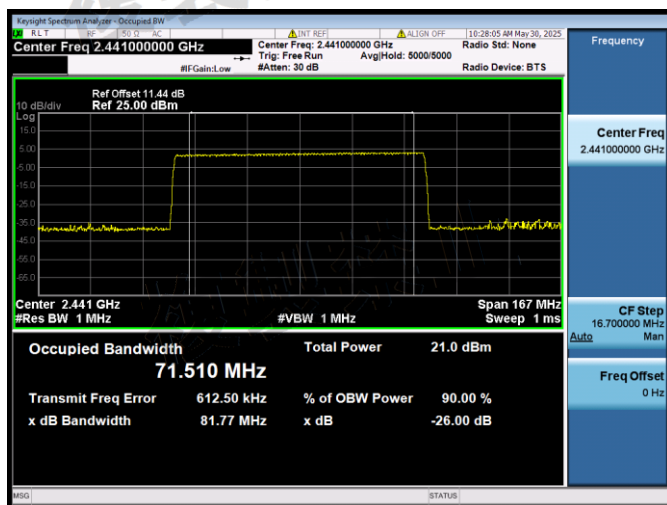
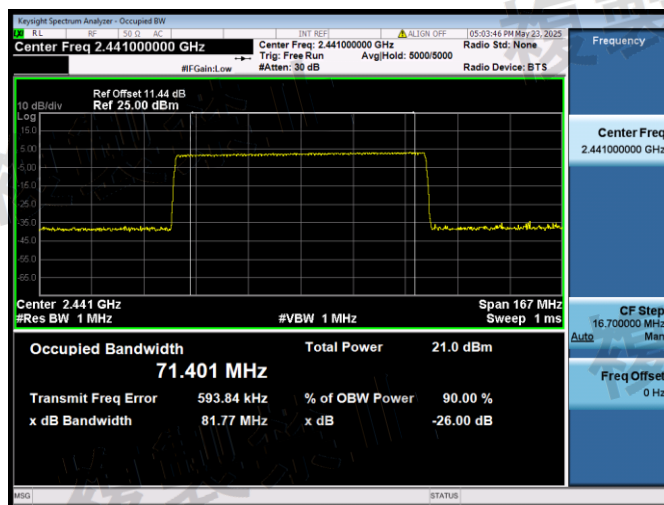
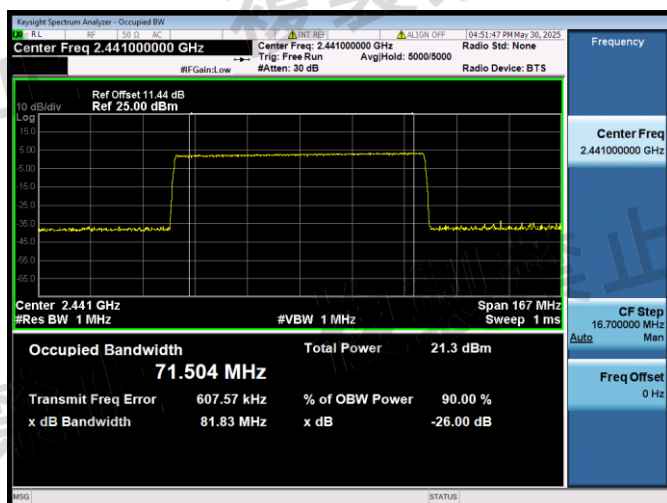


A.2.8 GFSK NV



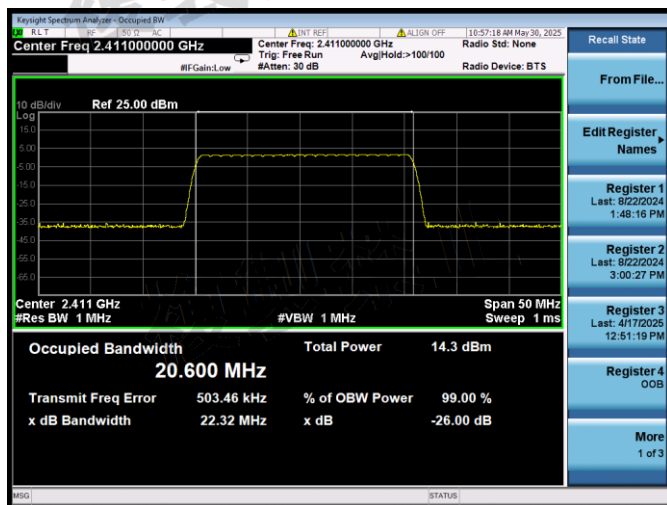
A.2.9 GFSK HV



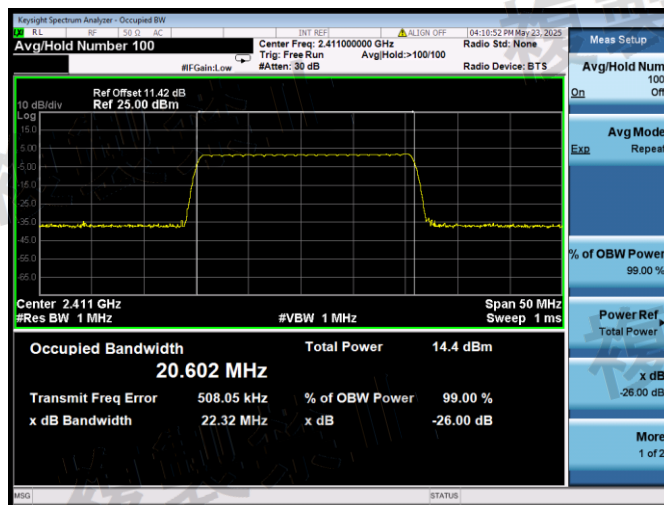
A.2.10 $\pi/4$ -DQPSK LVA.2.11 $\pi/4$ -DQPSK NVA.2.12 $\pi/4$ -DQPSK HV

Test Plots (Occupied Bandwidth)-AFH Mode

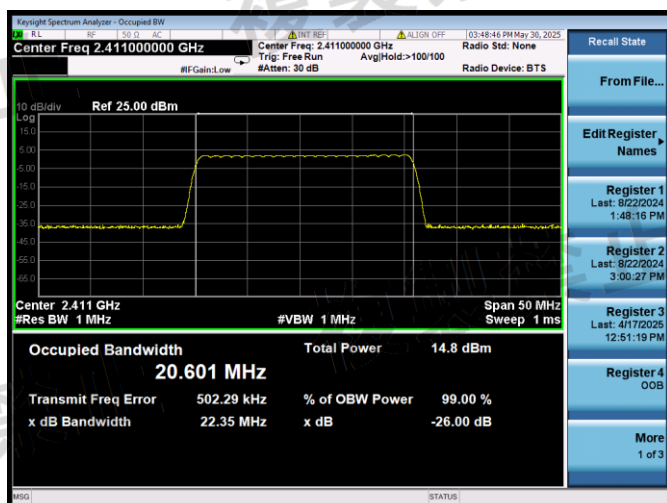
A.2.13 GFSK LV

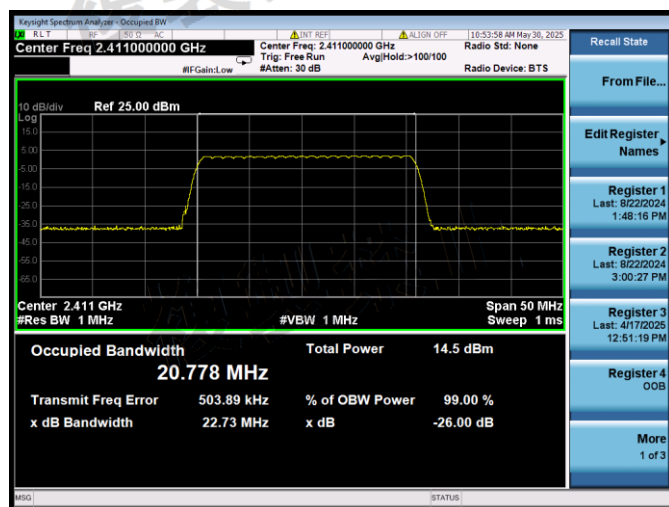
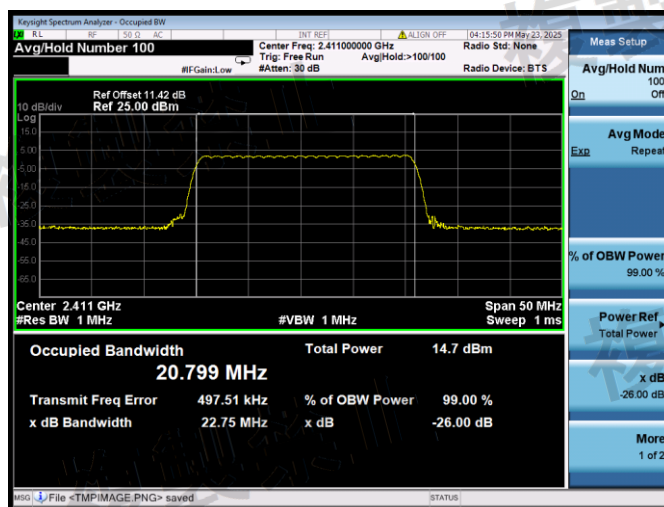
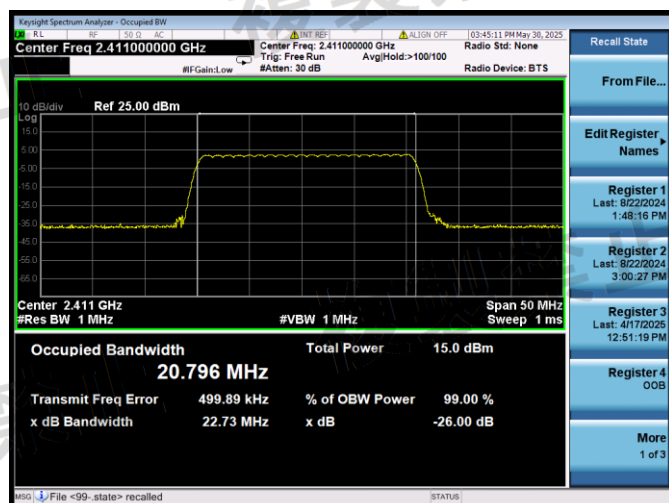


A.2.14 GFSK NV



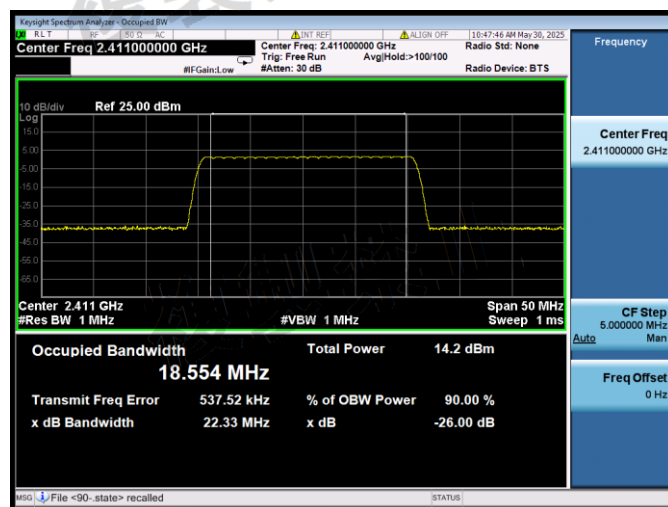
A.2.15 GFSK HV



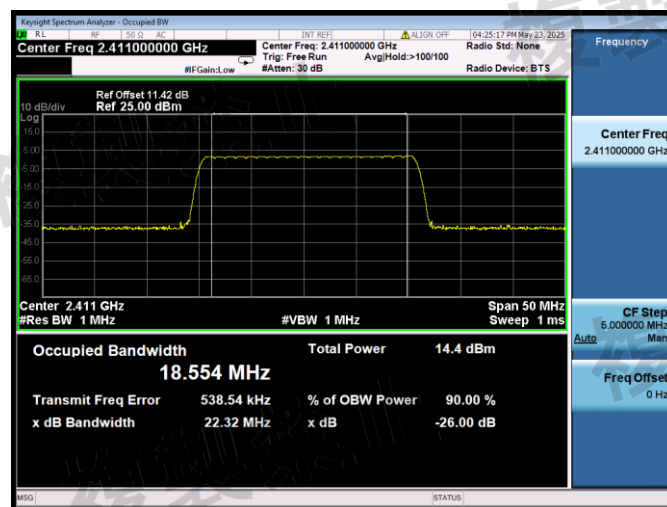
A.2.16 $\pi/4$ -DQPSK LVA.2.17 $\pi/4$ -DQPSK NVA.2.18 $\pi/4$ -DQPSK HV

Test Plots (Spread-spectrum Bandwidth)-AFH Mode

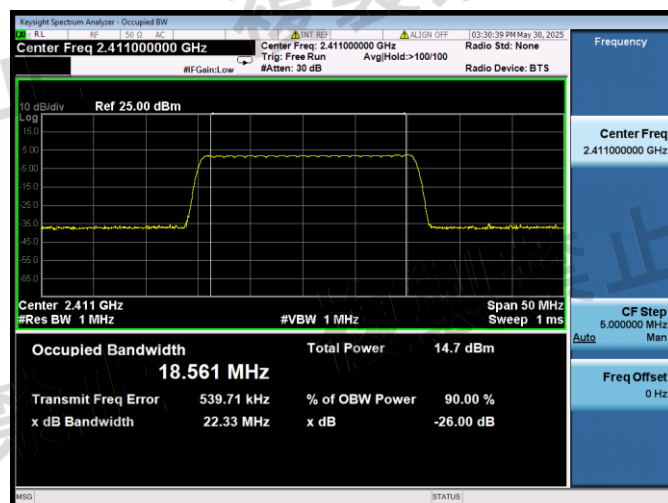
A.2.19 GFSK LV



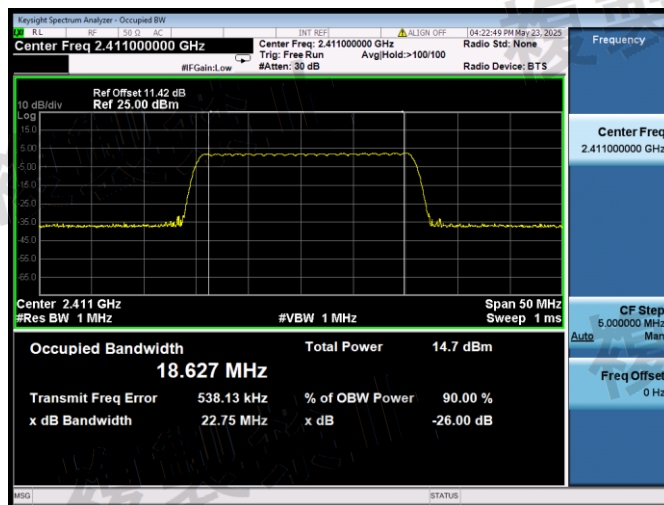
A.2.20 GFSK NV



A.2.21 GFSK HV



A.2.23 $\pi/4$ -DQPSK NV



Keysight Spectrum Analyzer - Occupied BW

Center Freq 2.411000000 GHz

Center Freq: 2.411000000 GHz
Trig: Free Run
#Atten: 30 dB

ALIGN OFF
Avg|Hold:>100/100

Radio Std: None
Radio Device: BTS

Frequency

Center Freq
2.411000000 GHz

CF Step
5.000000 MHz
Man

Auto

Freq Offset
0 Hz

Ref 25.00 dBm

10 dBmV
Log
15.0
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0

Center 2.411 GHz
#Res BW 1 MHz

#VBW 1 MHz

Span 50 MHz
Sweep 1 ms

Occupied Bandwidth

Total Power

14.7 dBm

18.564 MHz

Transmit Freq Error

543.12 kHz

% of OBW Power

90.00 %

x dB Bandwidth

22.34 MHz

x dB

-26.00 dBm

MSG

STATUS

5.3 The frequency retention time

5.3.1 Limit

Item	Limits
retention time	For the radio equipment that uses the frequency hopping method excluding a combination of the spread spectrum method and OFDM, the total sum of the frequency retention time in any frequency within the time obtained by multiplying the diffusion rate by 0.4 second shall be 0.4 second or shorter

5.3.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.3.3 Measuring Instruments and setting

Spectrum analyzer setting up is as follows.

Center frequency Hopping test frequency

Sweep bandwidth 0 Hz

Resolvable bandwidth 1 MHz

Video bandwidth equivalent to resolvable bandwidth

Y-axis scale 10 dB/Div.

Sweep time hopping cycle

Sweep mode Single sweep

Trigger condition Video trigger

Detection mode Positive peak

5.3.4 Test procedure

- (1) Set the spectrum analyzer according to the above 2 and wait the hopping signal with the hopping frequency.
- (2) Read the maximum level of the residence time of the hopping frequency at hopping cycle using marker etc. from the trace on the display and confirm that it is shorter than 0.4sec.
- (3) By means of the method same to the above (2), read the sum of the residence time of the hopping frequency at hopping cycle.
- (4) Calculate the total of frequency residence time of the hopping frequency as follows.
 1. Total = (0.4s x diffusion rate / hopping cycle) x sum of the residence time of (3)
 2. There, "diffusion rate" is a value of the diffusion bandwidth divided by a frequency equal to transmitting velocity of modulation signal.

5.3.5 Test Result

Test Data

GFSK Mode:

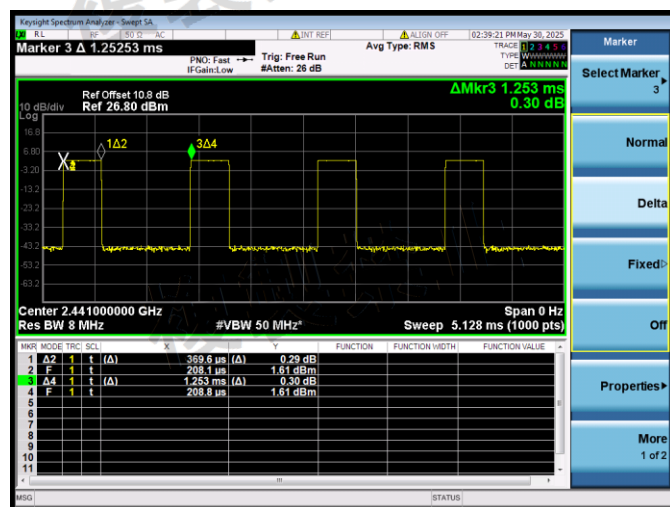
Package Mode	Test Voltage	On Time (ms)	On+Off Time (ms)	Duty Cycle	Total of Dwell (ms)	Limit (ms)	Refer to Plot	Verdict
DH1	LV	0.370	1.253	0.295	106.644	≤400	A.3.1	Pass
DH3		1.619	2.497	0.648	234.414	≤400	A.3.2	Pass
DH5		2.858	3.749	0.762	275.615	≤400	A.3.3	Pass
DH1	NV	0.370	1.247	0.296	107.144	≤400	A.3.4	Pass
DH3		1.610	2.497	0.645	233.082	≤400	A.3.5	Pass
DH5		2.868	3.749	0.765	276.544	≤400	A.3.6	Pass
DH1	HV	0.365	1.247	0.292	105.958	≤400	A.3.7	Pass
DH3		1.627	2.505	0.650	235.442	≤400	A.3.8	Pass
DH5		2.858	3.749	0.762	276.344	≤400	A.3.9	Pass

 $\pi/4$ -DQPSK Mode:

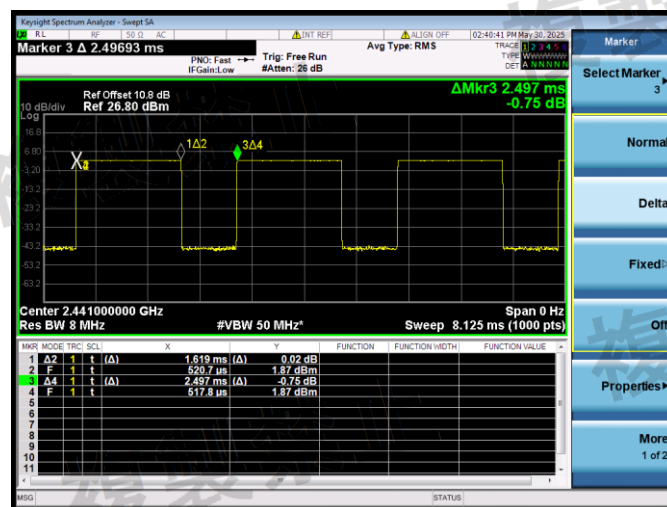
Package Mode	Test Voltage	On Time (ms)	On+Off Time (ms)	Duty Cycle	Total of Dwell (ms)	Limit (ms)	Refer to Plot	Verdict
2DH1	LV	0.380	1.253	0.303	109.779	≤400	A.3.10	Pass
2DH3		1.627	2.505	0.650	235.169	≤400	A.3.11	Pass
2DH5		2.868	3.749	0.765	276.990	≤400	A.3.12	Pass
2DH1	NV	0.380	1.253	0.303	109.611	≤400	A.3.13	Pass
2DH3		1.627	2.505	0.650	234.810	≤400	A.3.14	Pass
2DH5		2.868	3.749	0.765	276.567	≤400	A.3.15	Pass
2DH1	HV	0.375	1.253	0.299	108.267	≤400	A.3.16	Pass
2DH3		1.635	2.505	0.653	236.305	≤400	A.3.17	Pass
2DH5		2.868	3.749	0.765	276.966	≤400	A.3.18	Pass

Test Plots

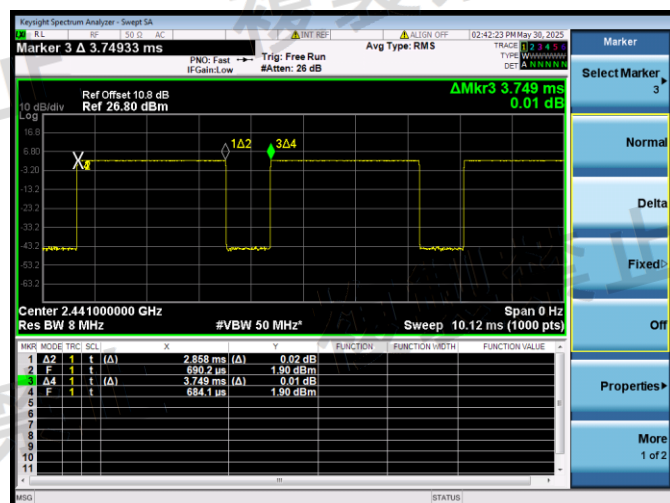
A.3.1. GFSK DH1 LV



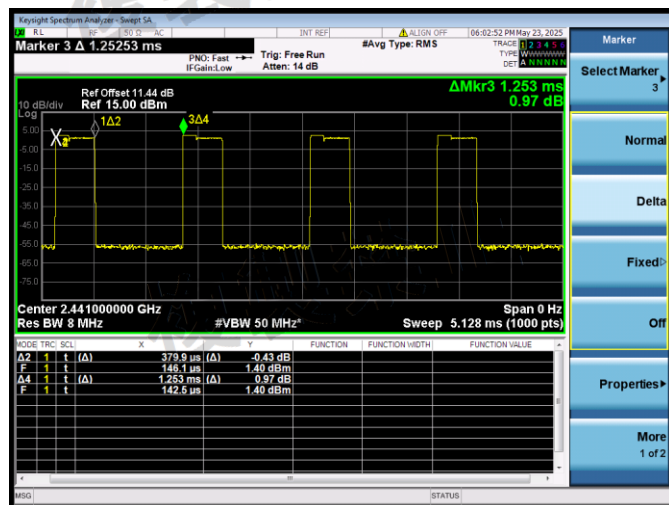
A.3.2. GFSK DH3 LV



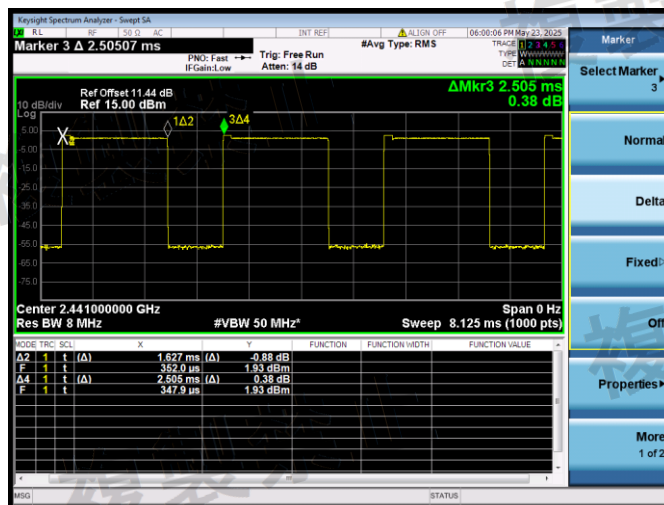
A.3.3. GFSK DH5 LV



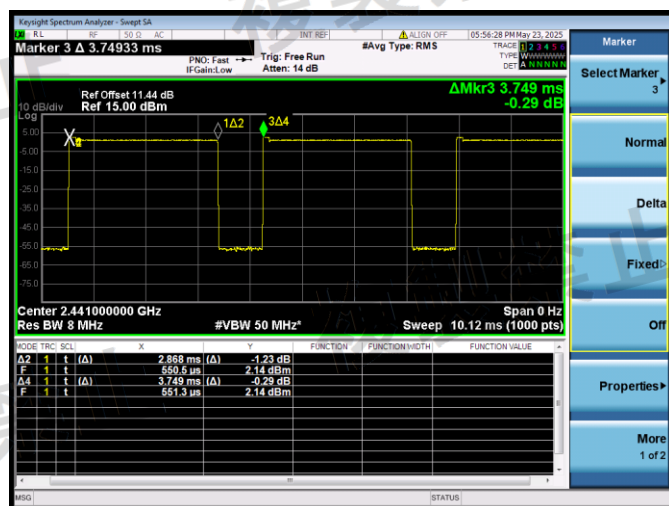
A.3.4. GFSK DH1 NV



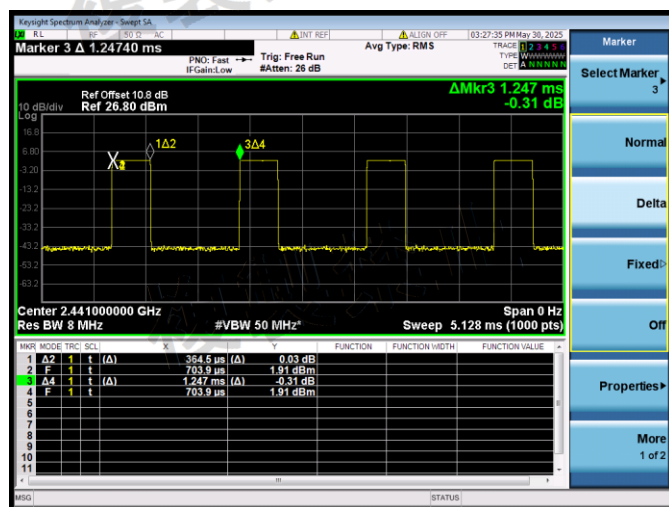
A.3.5. GFSK DH3 NV



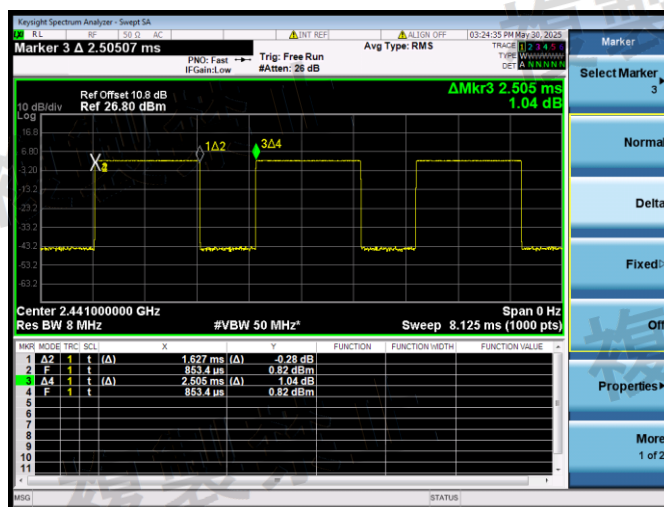
A.3.6. GFSK DH5 NV



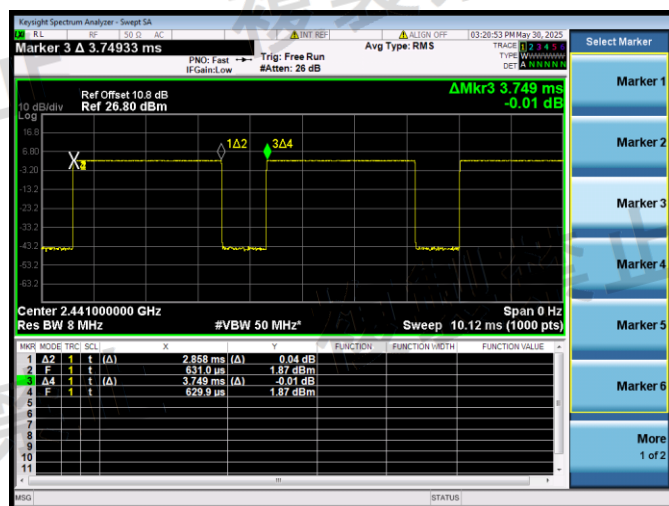
A.3.7. GFSK DH1 HV

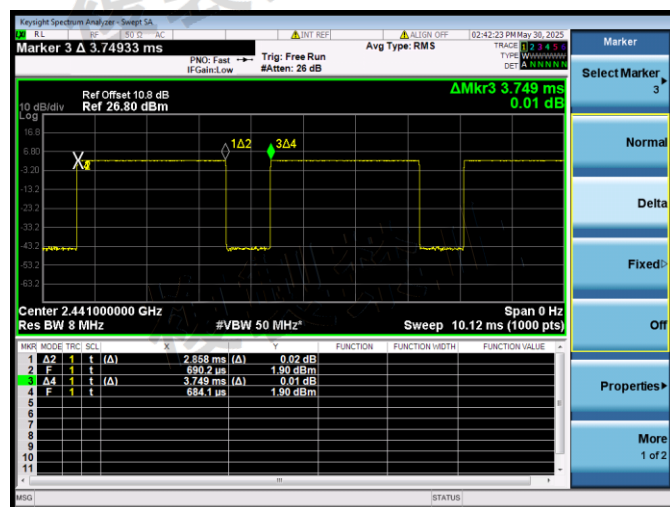
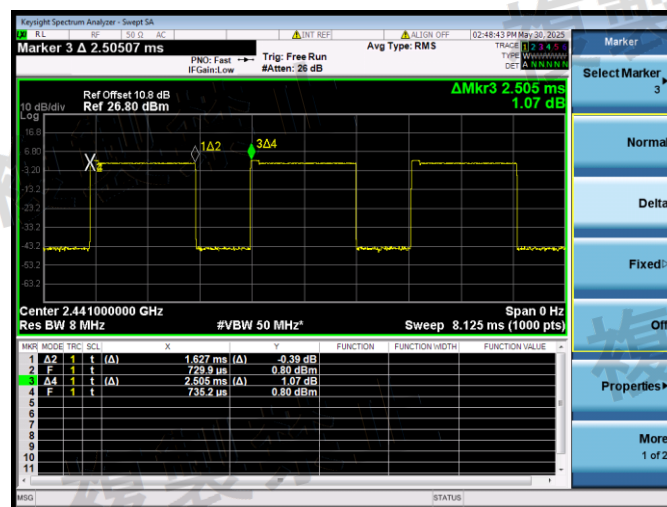
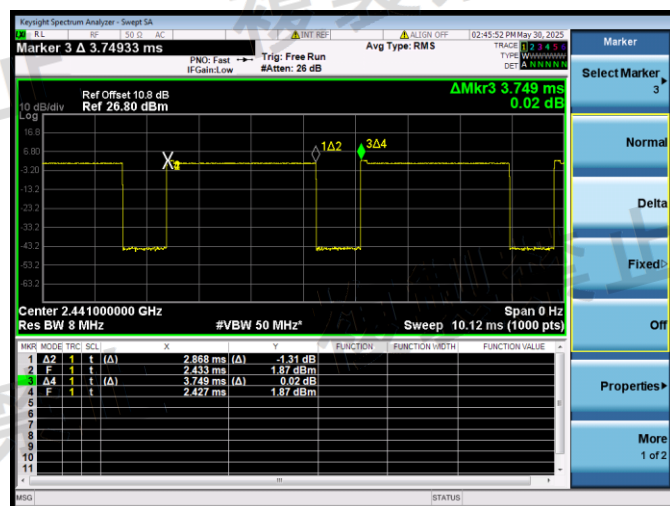


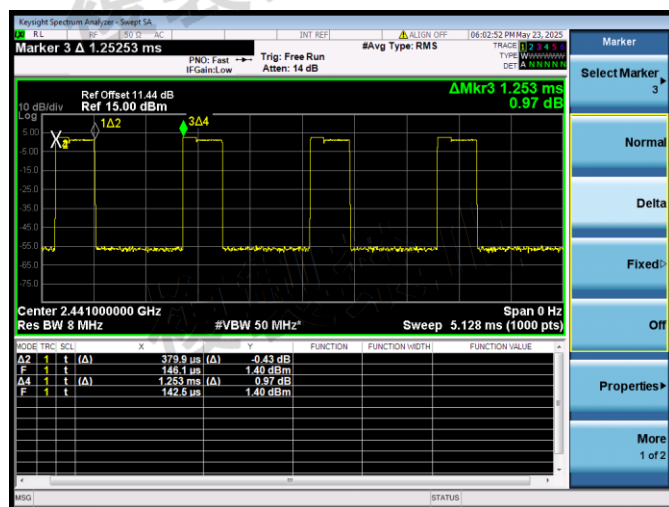
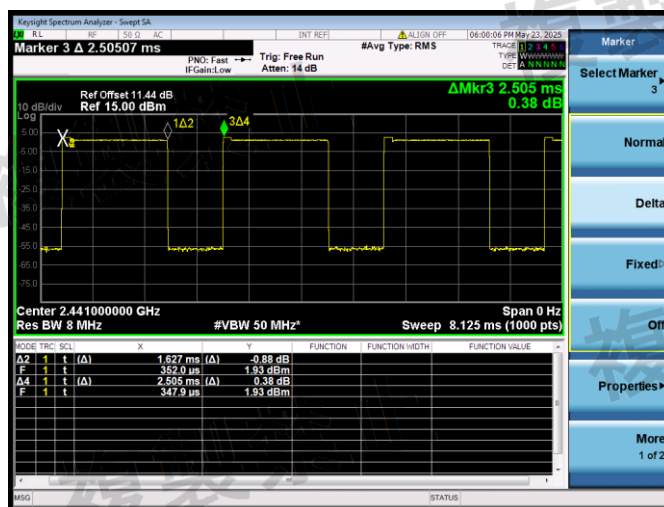
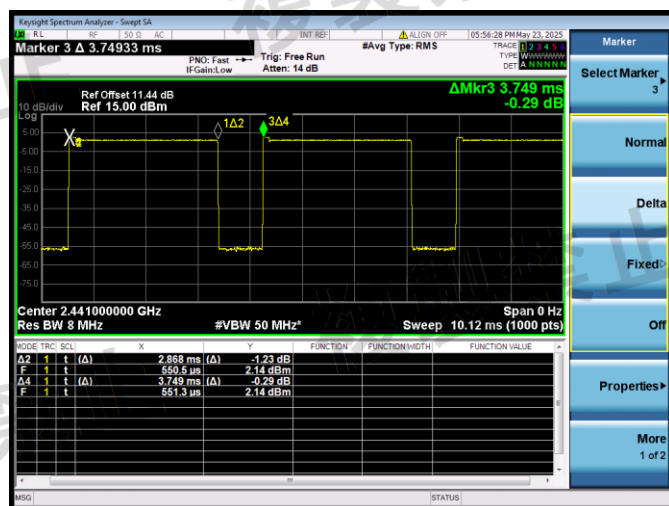
A.3.8. GFSK DH3 HV

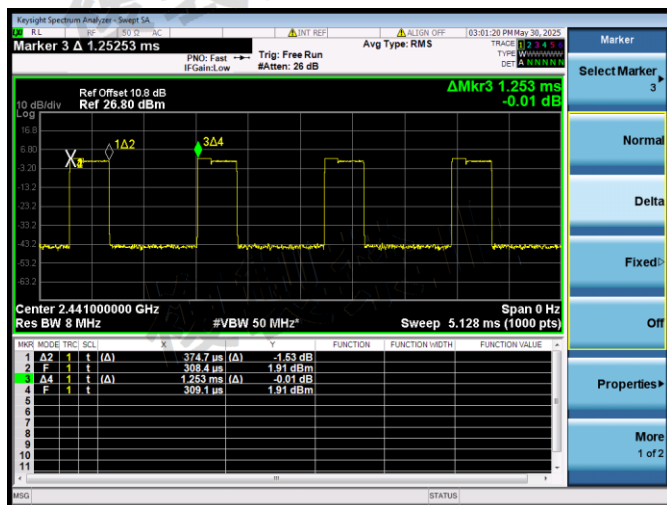
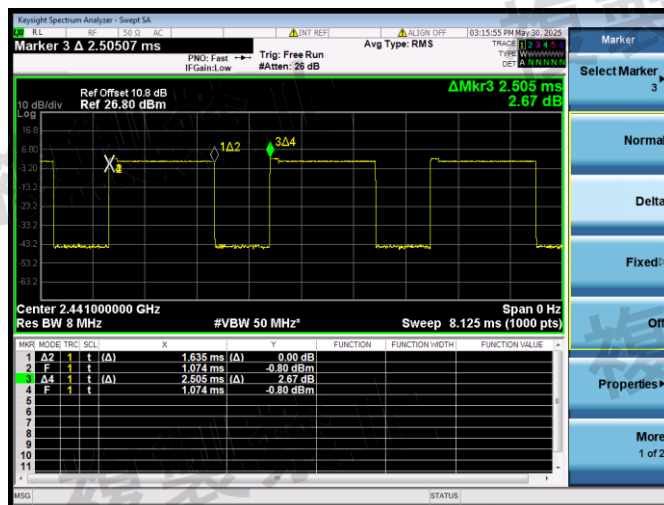
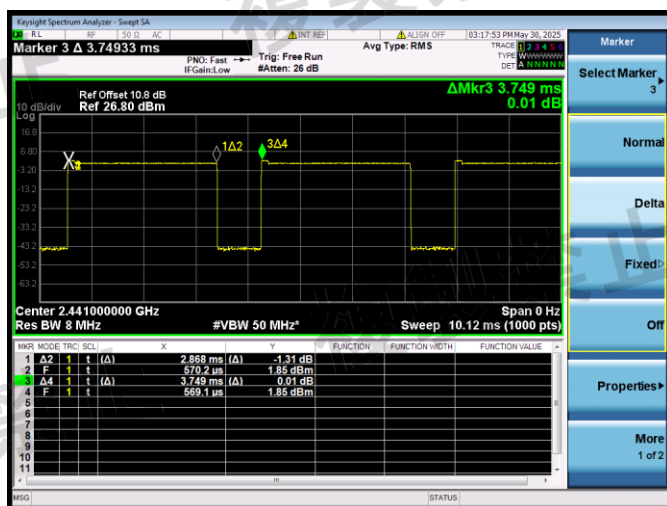


A.3.9. GFSK DH5 HV



A.3.10. $\pi/4$ -DQPSK 2DH1 LVA.3.11. $\pi/4$ -DQPSK 2DH3 LVA.3.12. $\pi/4$ -DQPSK 2DH5 LV

A.3.13. $\pi/4$ -DQPSK 2DH1 NVA.3.14. $\pi/4$ -DQPSK 2DH3 NVA.3.15. $\pi/4$ -DQPSK 2DH5 NV

A.3.16. $\pi/4$ -DQPSK 2DH1 HVA.3.17. $\pi/4$ -DQPSK 2DH3 HVA.3.18. $\pi/4$ -DQPSK 2DH5 HV

5.4 Unwanted Emission Intensity Measurement

5.4.1 Limit

Item	Limits
TX Spurious Emission	$\leq 2.5\mu\text{W}$ ($2387\text{MHz} < f$; $2496.5\text{MHz} < f$)
	$\leq 25\mu\text{W}$ ($2387\text{MHz} \leq f < 2400\text{MHz}$) and ($2483.5\text{MHz} < f \leq 2496.5\text{MHz}$)

5.4.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.4.3 Test Procedure

- 1 The EUT is placed in transmit mode at maximum power/modulation at a fixed channel.
- 2 Setting of SA is following as: RBW/VBW = 1MHz; / AT: 10dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
- 3 Setting of SA is following as 30 MHz and stop frequency 2387 MHz Then to mark peak reading value + cable loss shall be less than 2.5 μW
- 4 SA adjusted to start frequency 2387 MHz and stop frequency 2400 MHz. Then to mark peak reading value + cable loss shall be less than 25 μW .
- 5 SA adjusted to start frequency 2483.5 MHz and stop frequency 2496.5 MHz Then to mark peak reading value + cable loss shall be less than 25 μW
- 6 SA adjusted to start frequency 2496.5 MHz and stop frequency 12500 MHz Then to mark peak reading value + cable loss shall be less than 2.5 μW
- 7 Measure side band spurious as follows: For 2.4 GHz band: 2374 MHz~2400 MHz and 2483.5 MHz~2509.5 MHz RBW = VBW = 30 kHz, Result_Value = Measured_Value + 15.2 [dBm]
- 8 If the Result_Value is over the requirement, take total sum of 1MHz band centered at the spur frequency like ACLP measurement as Result_Value.

5.4.4 Test Deviation

There is no deviation with the original standard.

5.4.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

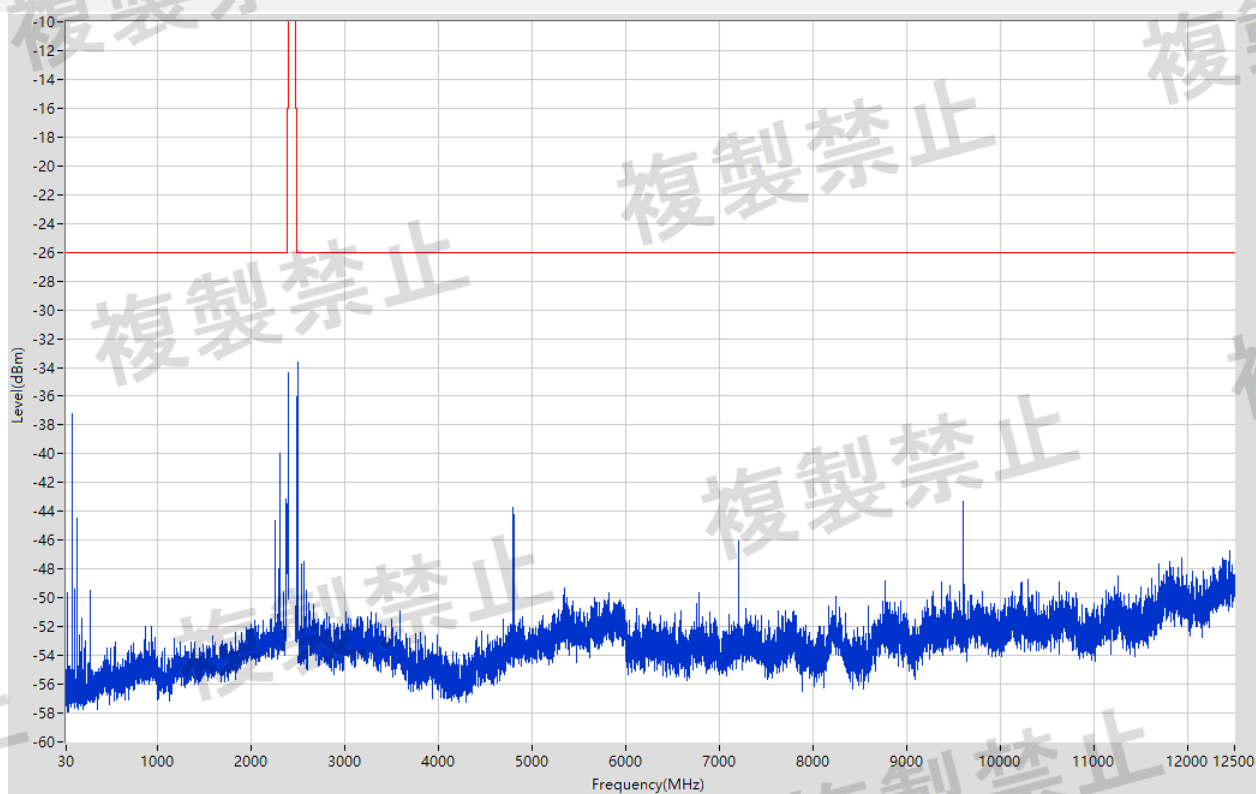
5.4.6 Test Result

Test Data

Mode	Test Voltage	Channel	Refer to Plot	Verdict
GFSK	LV	Low	A.4.1	Pass
	NV		A.4.2	Pass
	HV		A.4.3	Pass
	LV	Middle	A.4.4	Pass
	NV		A.4.5	Pass
	HV		A.4.6	Pass
	LV	High	A.4.7	Pass
	NV		A.4.8	Pass
	HV		A.4.9	Pass
$\pi/4$ -DQPSK	LV	Low	A.4.10	Pass
	NV		A.4.11	Pass
	HV		A.4.12	Pass
	LV	Middle	A.4.13	Pass
	NV		A.4.14	Pass
	HV		A.4.15	Pass
	LV	High	A.4.16	Pass
	NV		A.4.17	Pass
	HV		A.4.18	Pass

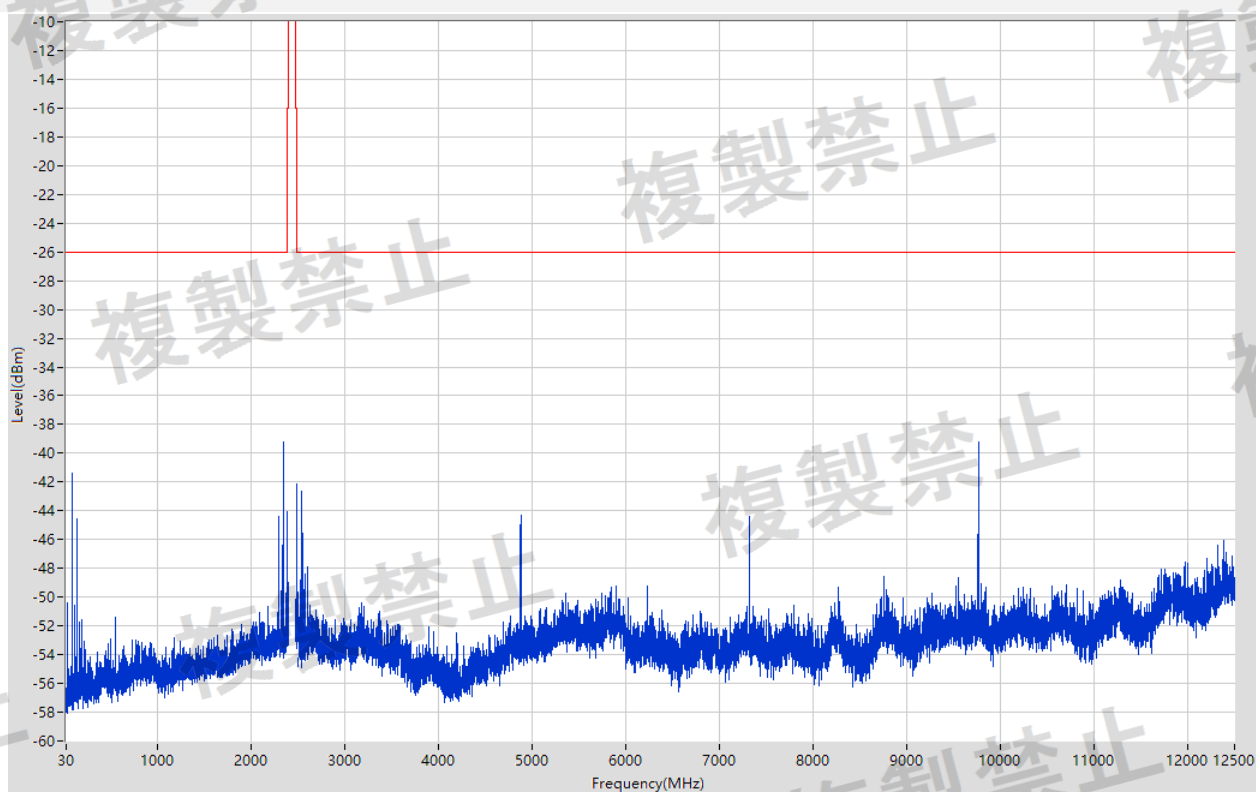
Test Plots

A.4.1 GFSK LV Low Channel



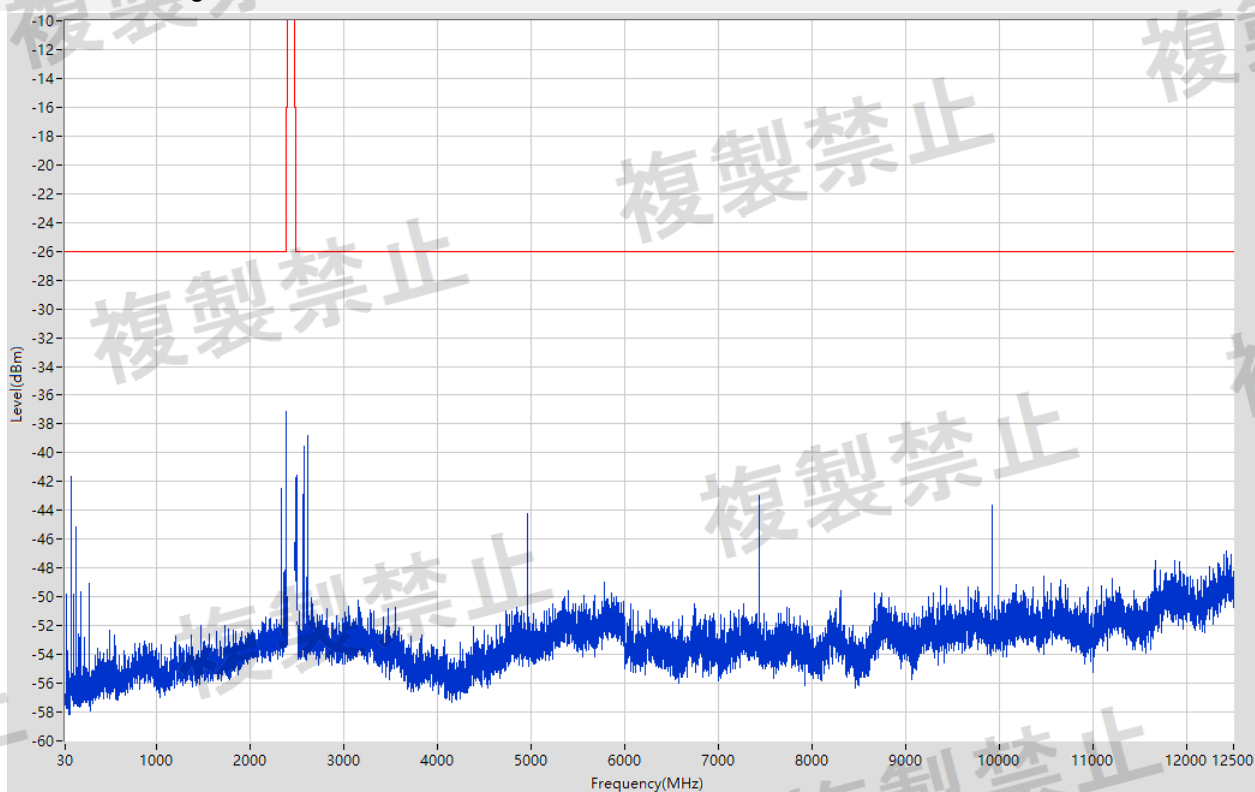
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	96	-37.25	0.188	2.5	Pass
1000	2374	1	Peak	2306	-39.93	0.102	2.5	Pass
2374	2387	1	Peak	2378.355	-43.11	0.049	2.5	Pass
2387	2400	1	Peak	2400	-34.38	0.365	25	Pass
2483.5	2496.5	1	Peak	2496.5	-39.01	0.126	25	Pass
2496.5	2509.5	1	Peak	2498.093	-33.61	0.435	2.5	Pass
2509.5	6000	1	Peak	4803.829	-43.72	0.042	2.5	Pass
6000	12500	1	Peak	9608	-43.29	0.047	2.5	Pass

A.4.2 GFSK LV Middle Channel



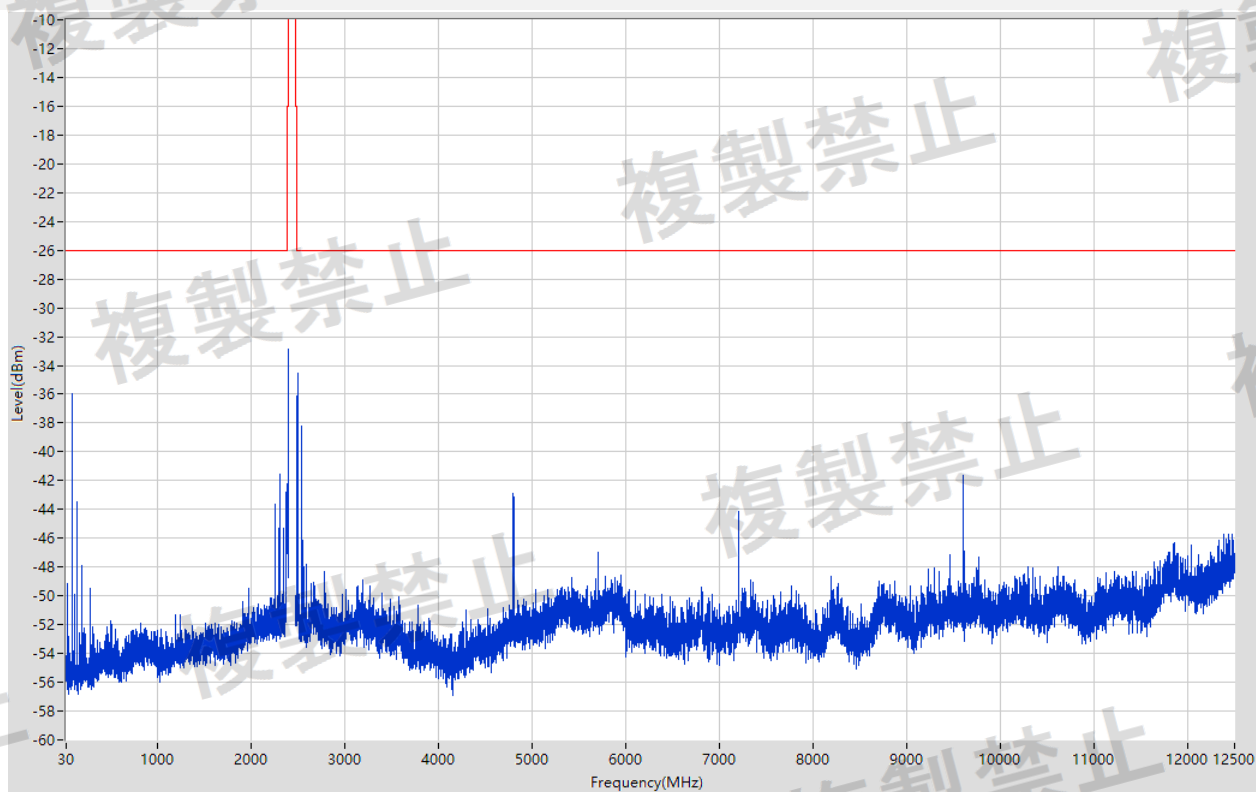
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	96	-41.4	0.073	2.5	Pass
1000	2374	1	Peak	2345	-39.23	0.119	2.5	Pass
2374	2387	1	Peak	2379.135	-49.74	0.011	2.5	Pass
2387	2400	1	Peak	2393.078	-44.08	0.039	25	Pass
2483.5	2496.5	1	Peak	2489.025	-42.17	0.061	25	Pass
2496.5	2509.5	1	Peak	2507.648	-49.66	0.011	2.5	Pass
2509.5	6000	1	Peak	2538.504	-42.66	0.054	2.5	Pass
6000	12500	1	Peak	9764	-39.21	0.120	2.5	Pass

A.4.3 GFSK LV High Channel



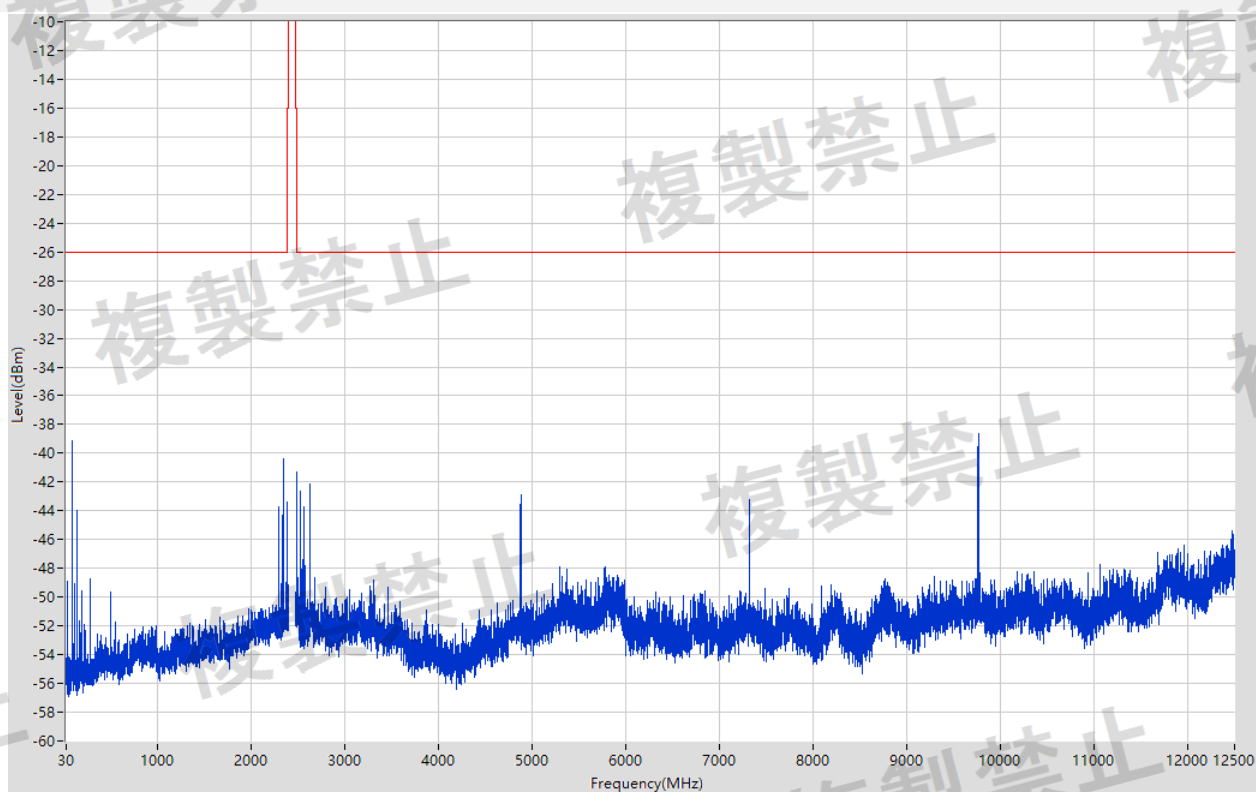
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-41.66	0.068	2.5	Pass
1000	2374	1	Peak	2336	-42.47	0.057	2.5	Pass
2374	2387	1	Peak	2383.848	-37.13	0.194	2.5	Pass
2387	2400	1	Peak	2388.203	-49.45	0.011	25	Pass
2483.5	2496.5	1	Peak	2496.468	-41.99	0.063	25	Pass
2496.5	2509.5	1	Peak	2501.538	-41.56	0.070	2.5	Pass
2509.5	6000	1	Peak	2623.516	-38.77	0.133	2.5	Pass
6000	12500	1	Peak	7440	-42.97	0.050	2.5	Pass

A.4.4 GFSK NV Low Channel



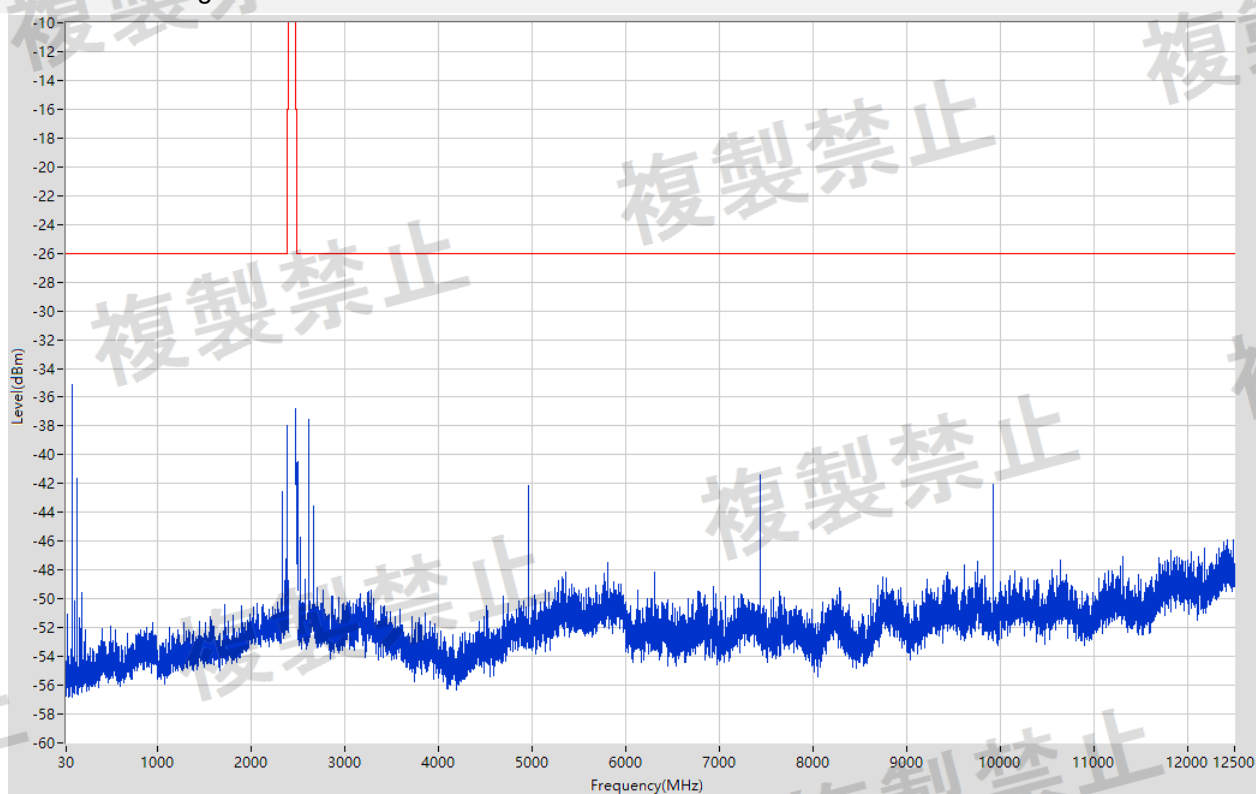
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-35.99	0.252	2.5	Pass
1000	2374	1	Peak	2307	-41.51	0.071	2.5	Pass
2374	2387	1	Peak	2384.985	-42.22	0.060	2.5	Pass
2387	2400	1	Peak	2400	-32.84	0.520	25	Pass
2483.5	2496.5	1	Peak	2496.5	-38.39	0.145	25	Pass
2496.5	2509.5	1	Peak	2498.255	-34.5	0.355	2.5	Pass
2509.5	6000	1	Peak	2546.505	-38.22	0.151	2.5	Pass
6000	12500	1	Peak	9608	-41.63	0.069	2.5	Pass

A.4.5 GFSK NV Middle Channel



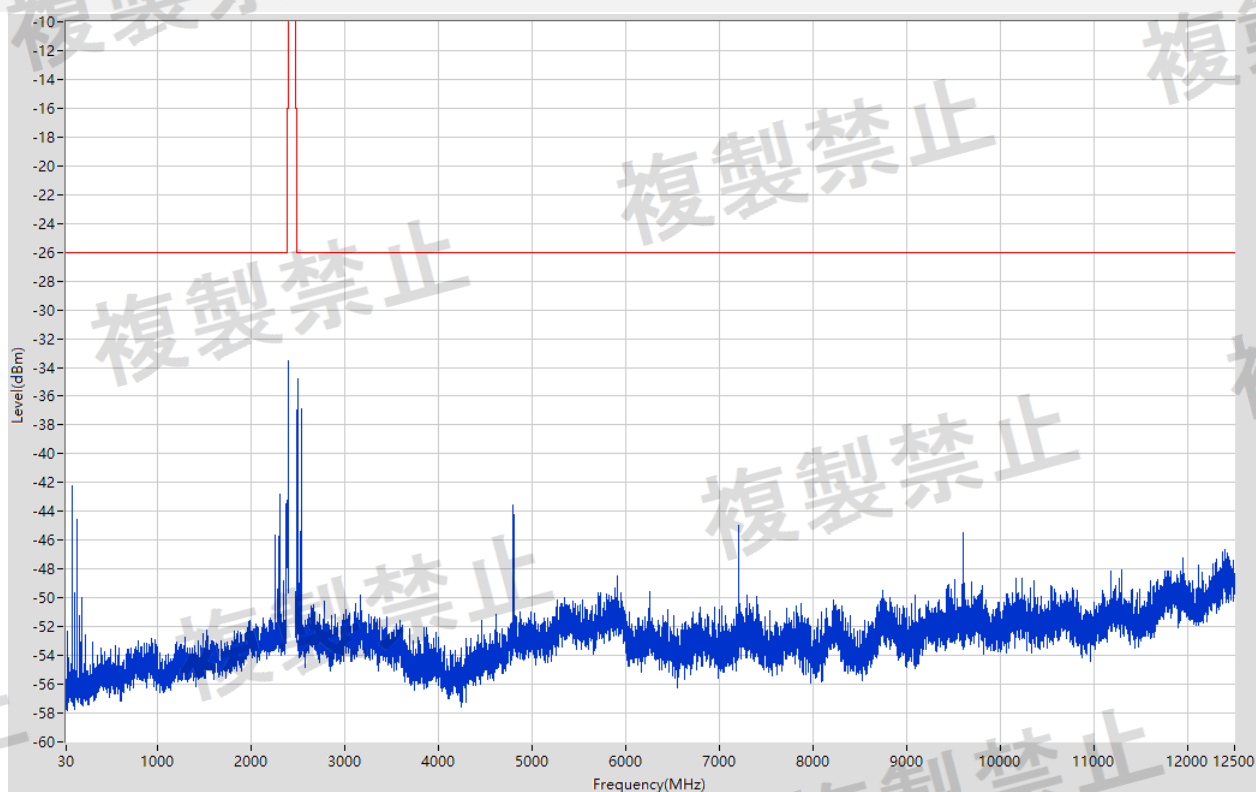
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	95	-39.11	0.123	2.5	Pass
1000	2374	1	Peak	2346	-40.39	0.091	2.5	Pass
2374	2387	1	Peak	2374.52	-49.01	0.013	2.5	Pass
2387	2400	1	Peak	2392.623	-43.39	0.046	25	Pass
2483.5	2496.5	1	Peak	2488.765	-41.26	0.075	25	Pass
2496.5	2509.5	1	Peak	2505.99	-48.68	0.014	2.5	Pass
2509.5	6000	1	Peak	2632.518	-42.16	0.061	2.5	Pass
6000	12500	1	Peak	9764	-38.6	0.138	2.5	Pass

A.4.6 GFSK NV High Channel



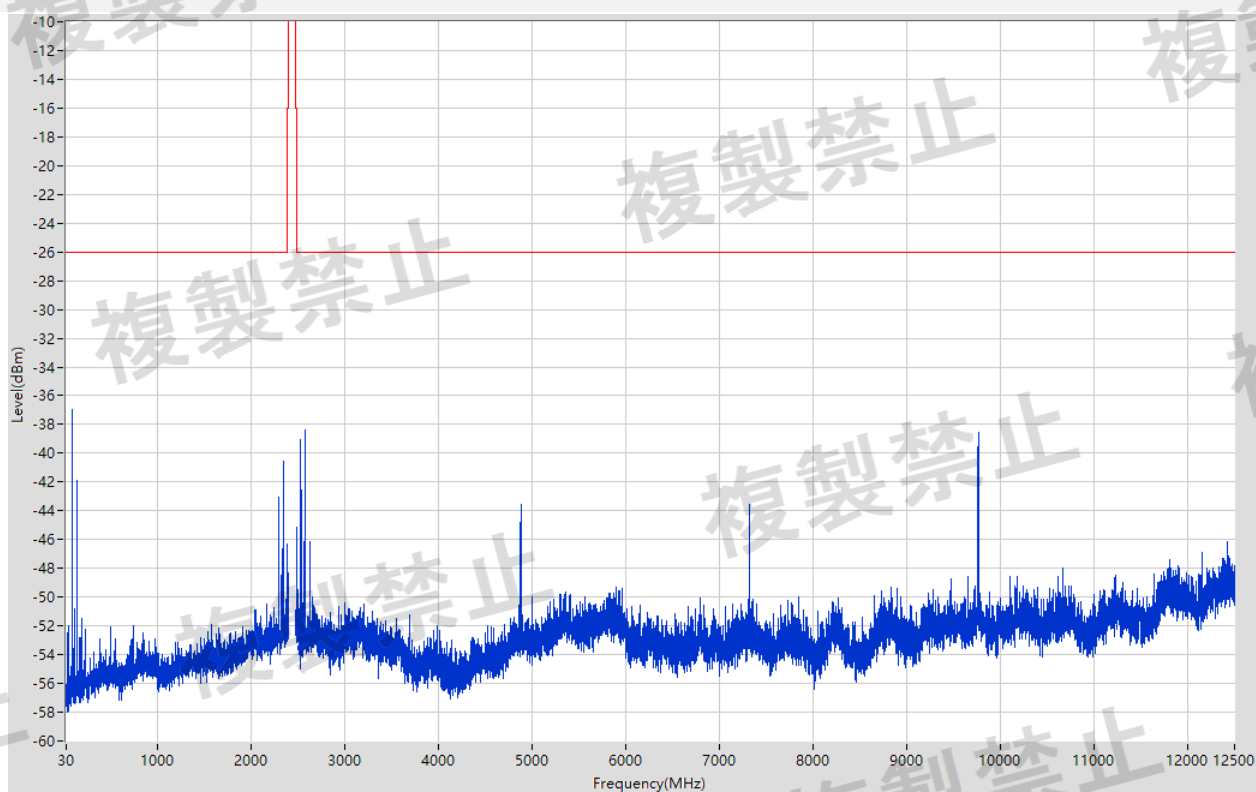
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	96	-35.1	0.309	2.5	Pass
1000	2374	1	Peak	2337	-42.51	0.056	2.5	Pass
2374	2387	1	Peak	2384.043	-37.93	0.161	2.5	Pass
2387	2400	1	Peak	2388.528	-47.37	0.018	25	Pass
2483.5	2496.5	1	Peak	2483.5	-36.81	0.209	25	Pass
2496.5	2509.5	1	Peak	2497.15	-40.47	0.090	2.5	Pass
2509.5	6000	1	Peak	2623.516	-37.57	0.175	2.5	Pass
6000	12500	1	Peak	7440	-41.39	0.073	2.5	Pass

A.4.7 GFSK HV Low Channel



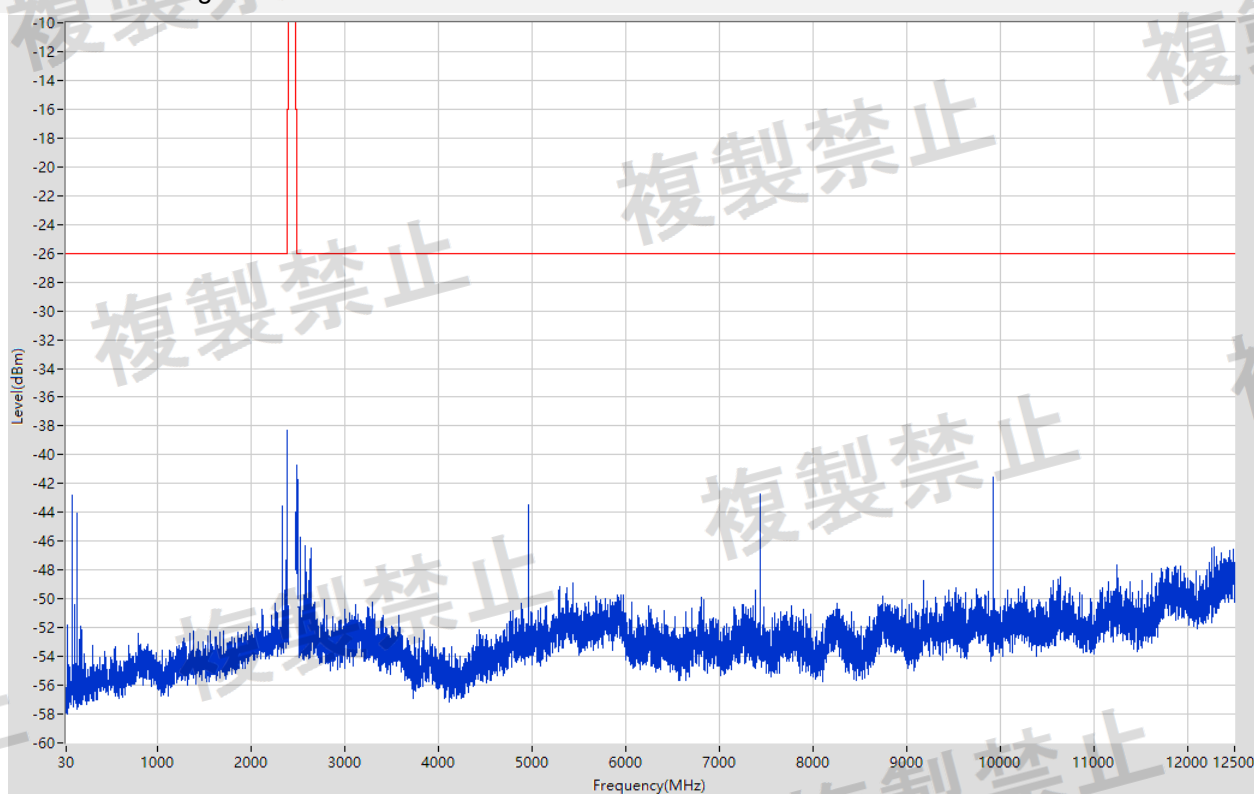
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	96	-42.2	0.060	2.5	Pass
1000	2374	1	Peak	2307	-42.82	0.052	2.5	Pass
2374	2387	1	Peak	2382.84	-43.23	0.048	2.5	Pass
2387	2400	1	Peak	2400	-33.53	0.444	25	Pass
2483.5	2496.5	1	Peak	2496.5	-39.02	0.125	25	Pass
2496.5	2509.5	1	Peak	2498.028	-34.82	0.330	2.5	Pass
2509.5	6000	1	Peak	2545.505	-36.89	0.205	2.5	Pass
6000	12500	1	Peak	7206	-44.97	0.032	2.5	Pass

A.4.8 GFSK HV Middle Channel

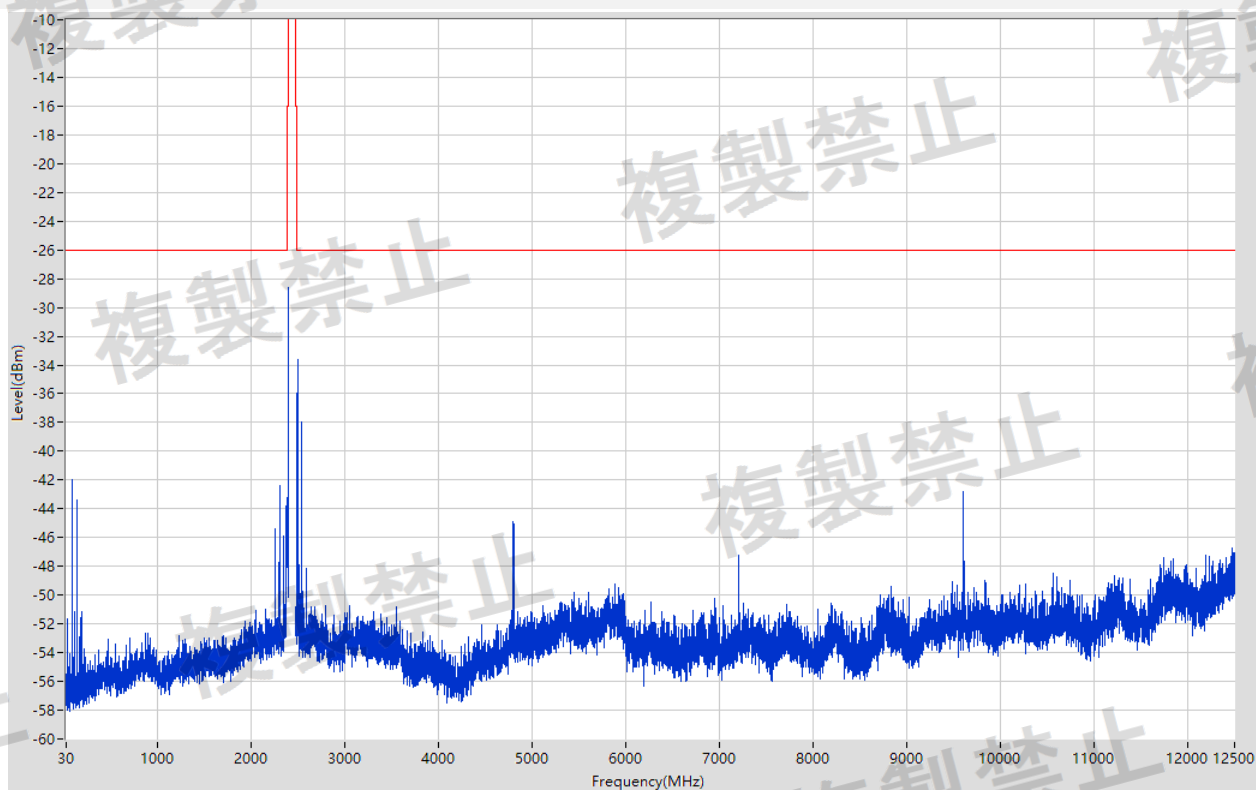


Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	97	-36.96	0.201	2.5	Pass
1000	2374	1	Peak	2345	-40.51	0.089	2.5	Pass
2374	2387	1	Peak	2380.793	-50.18	0.010	2.5	Pass
2387	2400	1	Peak	2392.59	-46.3	0.023	25	Pass
2483.5	2496.5	1	Peak	2488.928	-45.1	0.031	25	Pass
2496.5	2509.5	1	Peak	2508.005	-49.52	0.011	2.5	Pass
2509.5	6000	1	Peak	2584.511	-38.34	0.147	2.5	Pass
6000	12500	1	Peak	9764	-38.58	0.139	2.5	Pass

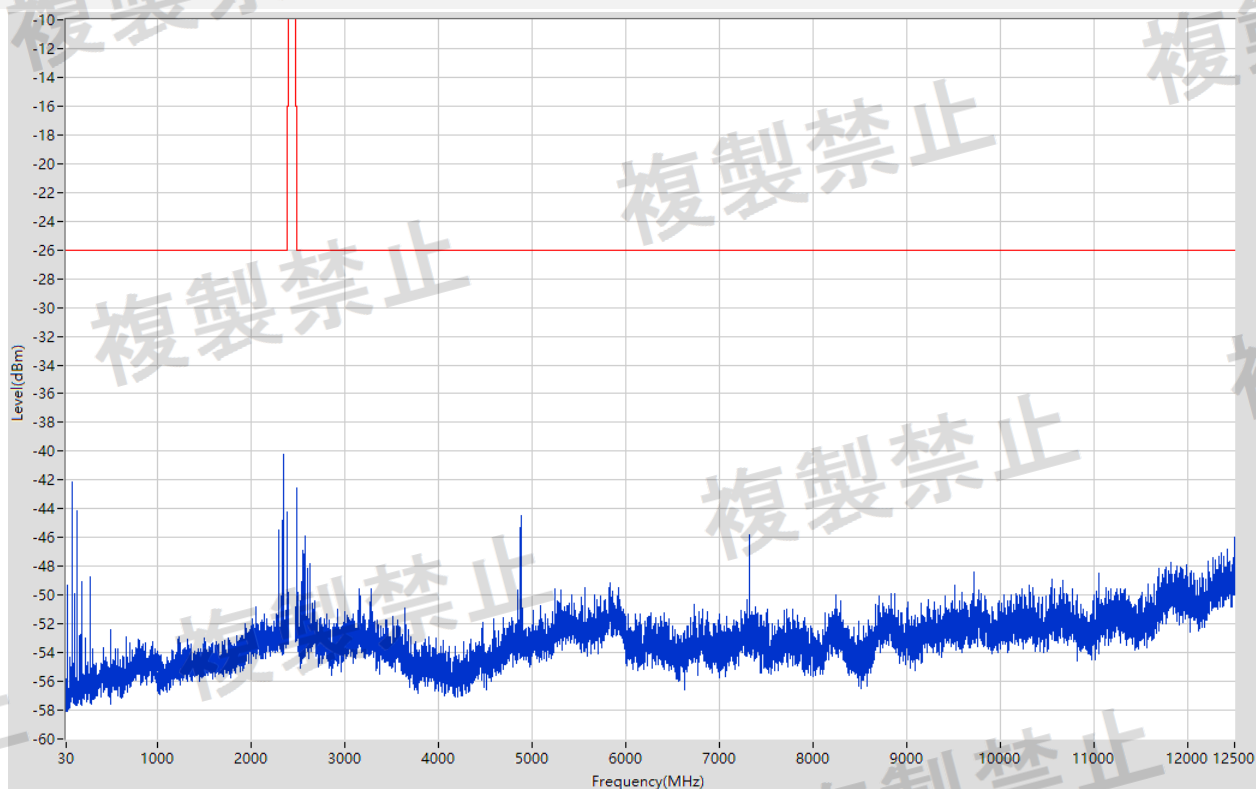
A.4.9 GFSK HV High Channel



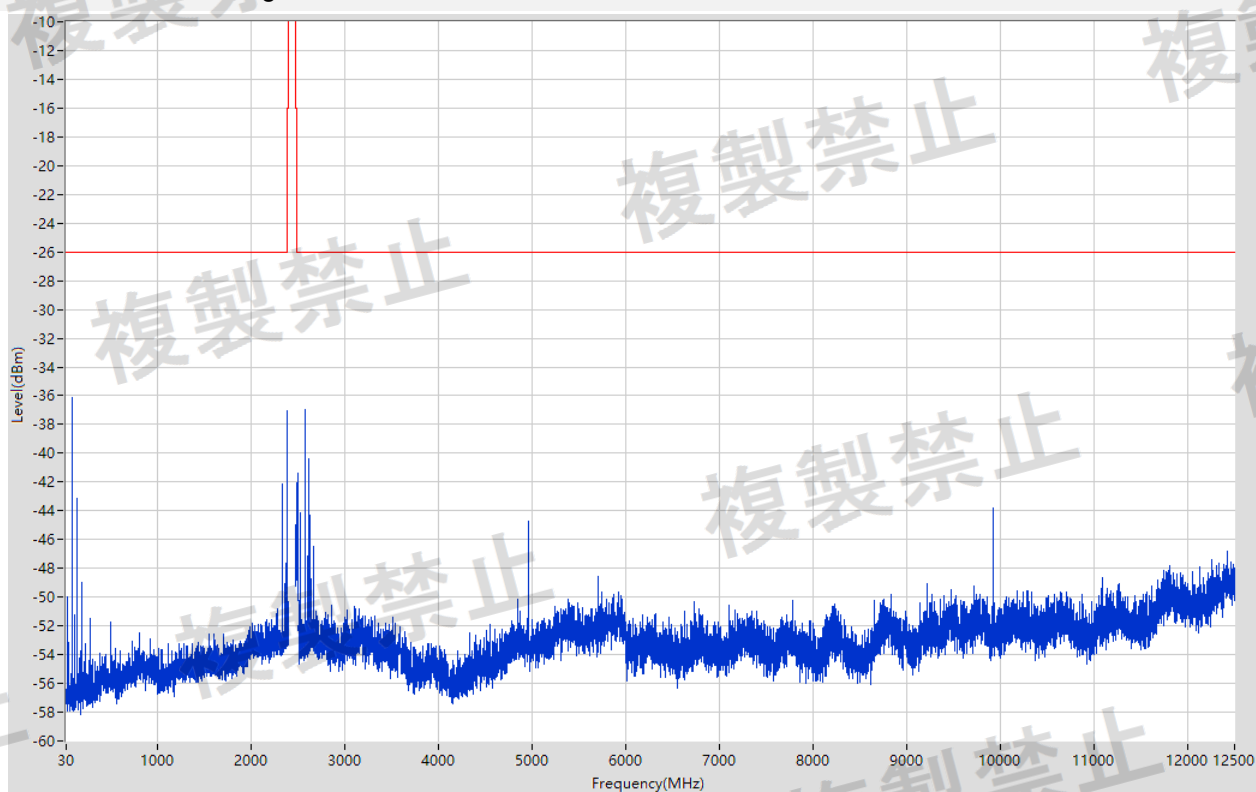
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	96	-42.78	0.053	2.5	Pass
1000	2374	1	Peak	2336	-43.52	0.044	2.5	Pass
2374	2387	1	Peak	2383.88	-38.28	0.149	2.5	Pass
2387	2400	1	Peak	2388.95	-48.53	0.014	25	Pass
2483.5	2496.5	1	Peak	2496.045	-40.7	0.085	25	Pass
2496.5	2509.5	1	Peak	2499.978	-41.7	0.068	2.5	Pass
2509.5	6000	1	Peak	4960.851	-43.49	0.045	2.5	Pass
6000	12500	1	Peak	9920	-41.51	0.071	2.5	Pass

A.4.10 $\pi/4$ -DQPSK LV Low Channel

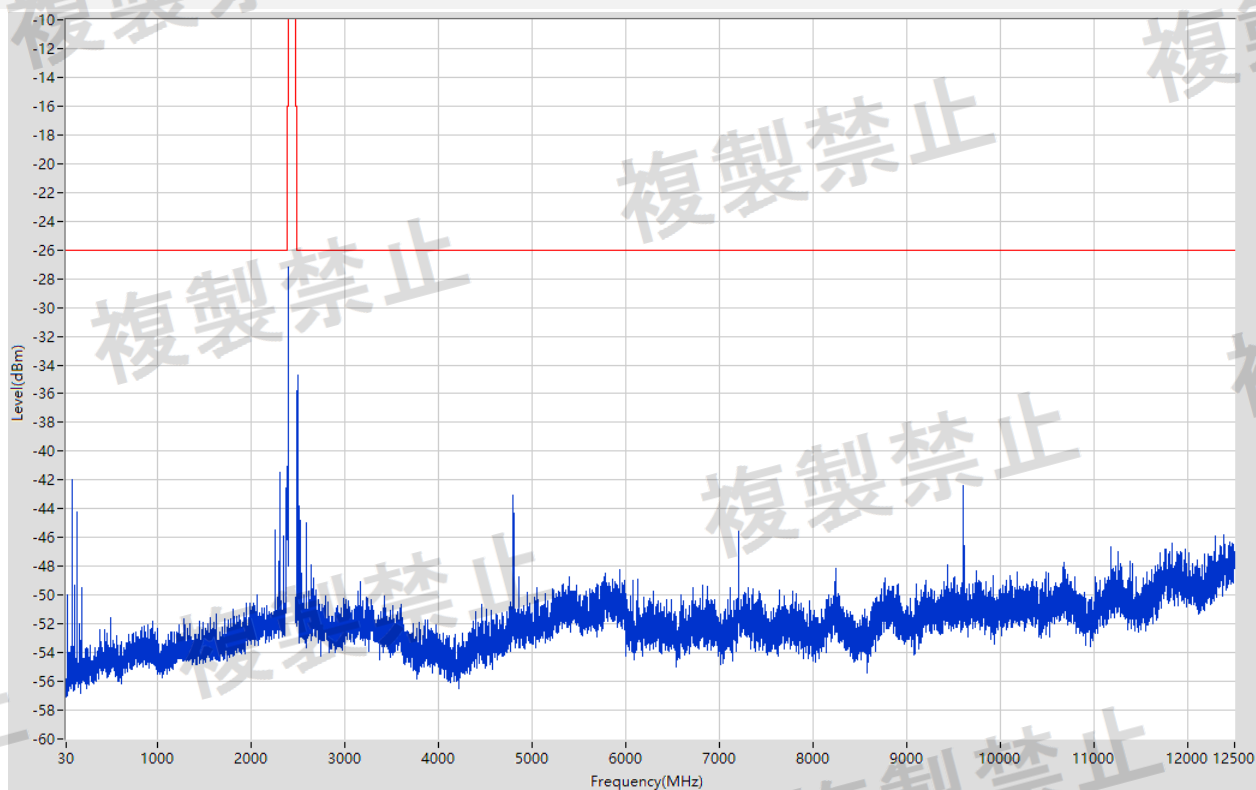
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-41.97	0.063	2.5	Pass
1000	2374	1	Peak	2307	-42.43	0.057	2.5	Pass
2374	2387	1	Peak	2382.97	-43.26	0.047	2.5	Pass
2387	2400	1	Peak	2400	-28.6	1.381	25	Pass
2483.5	2496.5	1	Peak	2496.5	-39.03	0.125	25	Pass
2496.5	2509.5	1	Peak	2498.19	-33.63	0.434	2.5	Pass
2509.5	6000	1	Peak	2544.505	-37.96	0.160	2.5	Pass
6000	12500	1	Peak	9608	-42.83	0.052	2.5	Pass

A.4.11 $\pi/4$ -DQPSK LV Middle Channel

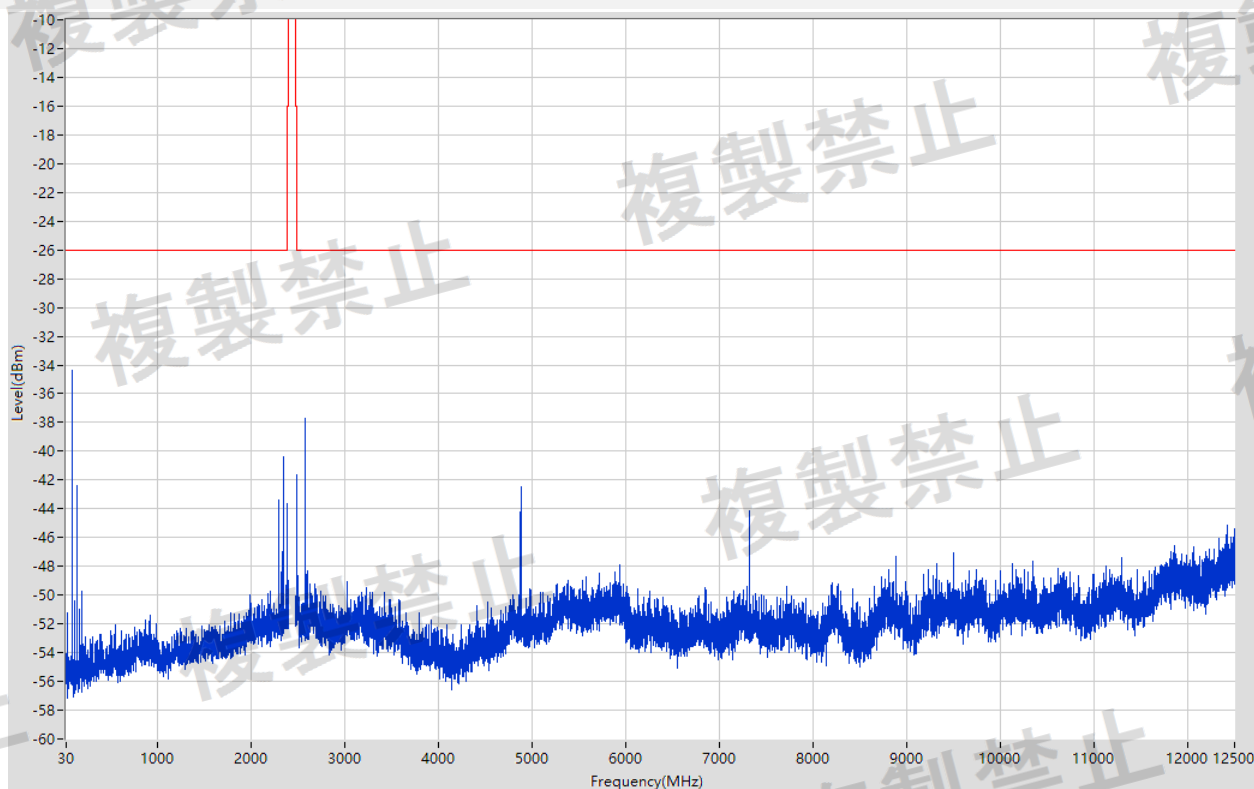
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	95	-42.13	0.061	2.5	Pass
1000	2374	1	Peak	2346	-40.19	0.096	2.5	Pass
2374	2387	1	Peak	2386.838	-50.27	0.009	2.5	Pass
2387	2400	1	Peak	2393.078	-44.21	0.038	25	Pass
2483.5	2496.5	1	Peak	2489.123	-42.54	0.056	25	Pass
2496.5	2509.5	1	Peak	2499.49	-49.8	0.010	2.5	Pass
2509.5	6000	1	Peak	4882.84	-44.48	0.036	2.5	Pass
6000	12500	1	Peak	7323	-45.81	0.026	2.5	Pass

A.4.12 $\pi/4$ -DQPSK LV High Channel

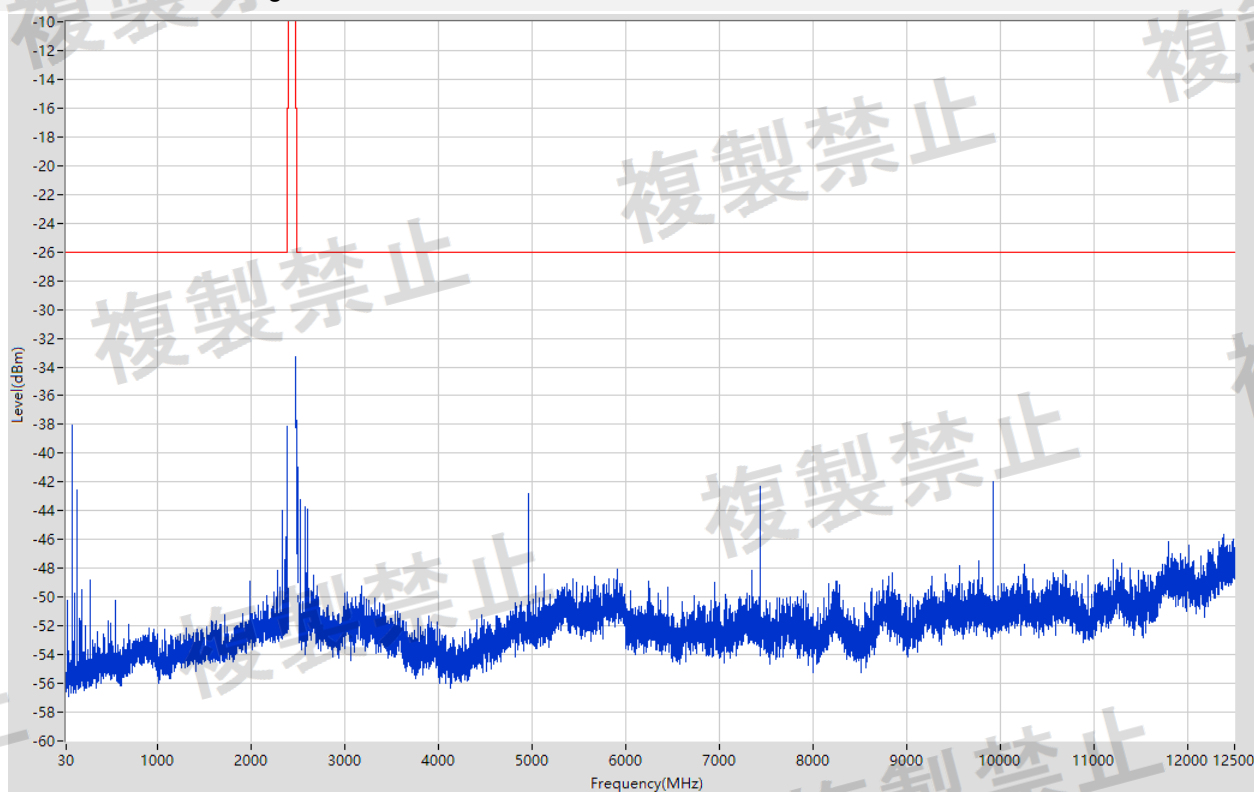
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-36.12	0.244	2.5	Pass
1000	2374	1	Peak	2336	-42.1	0.062	2.5	Pass
2374	2387	1	Peak	2384.238	-37.08	0.196	2.5	Pass
2387	2400	1	Peak	2388.463	-49.79	0.010	25	Pass
2483.5	2496.5	1	Peak	2494.713	-42.01	0.063	25	Pass
2496.5	2509.5	1	Peak	2498.255	-41.42	0.072	2.5	Pass
2509.5	6000	1	Peak	2576.51	-36.95	0.202	2.5	Pass
6000	12500	1	Peak	9921	-43.82	0.042	2.5	Pass

A.4.13 $\pi/4$ -DQPSK NV Low Channel

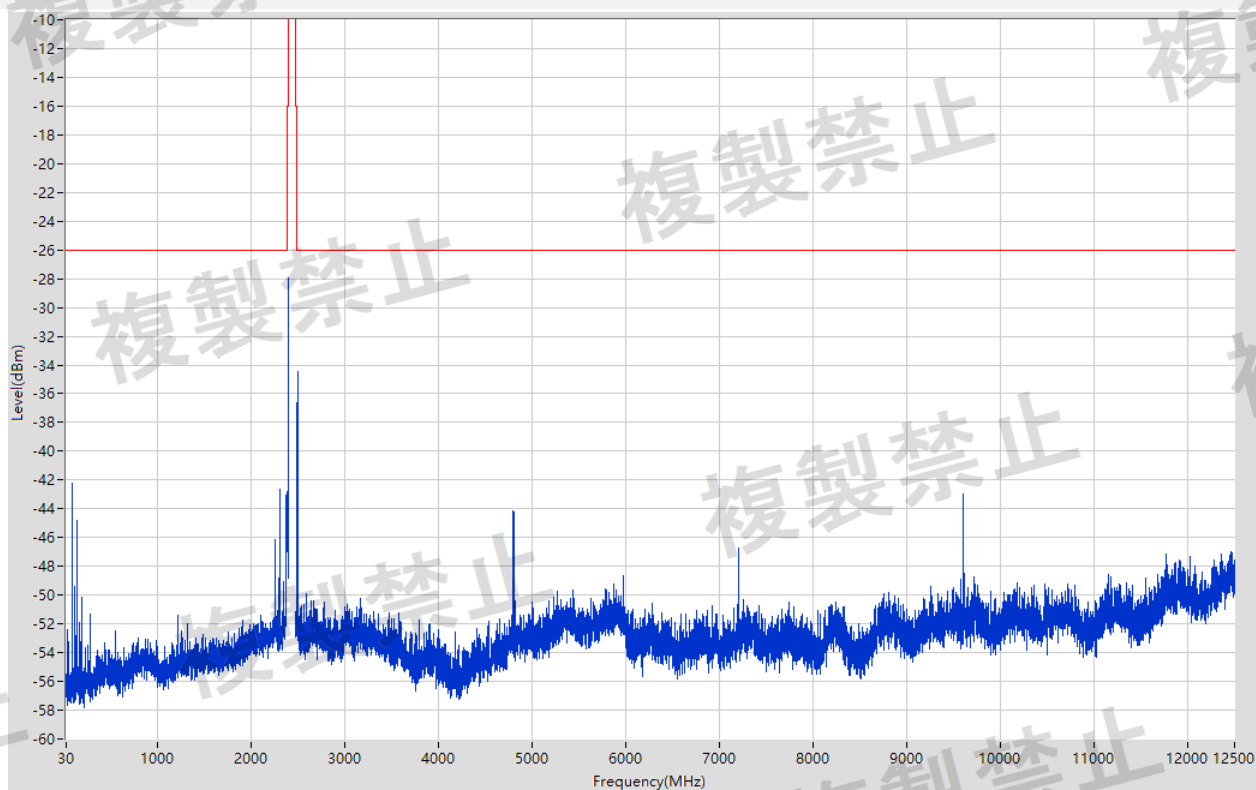
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-41.95	0.064	2.5	Pass
1000	2374	1	Peak	2306	-41.49	0.071	2.5	Pass
2374	2387	1	Peak	2381.995	-42.1	0.062	2.5	Pass
2387	2400	1	Peak	2400	-27.18	1.915	25	Pass
2483.5	2496.5	1	Peak	2496.5	-37.88	0.163	25	Pass
2496.5	2509.5	1	Peak	2497.963	-34.69	0.339	2.5	Pass
2509.5	6000	1	Peak	4803.829	-43.07	0.049	2.5	Pass
6000	12500	1	Peak	9608	-42.39	0.058	2.5	Pass

A.4.14 $\pi/4$ -DQPSK NV Middle Channel

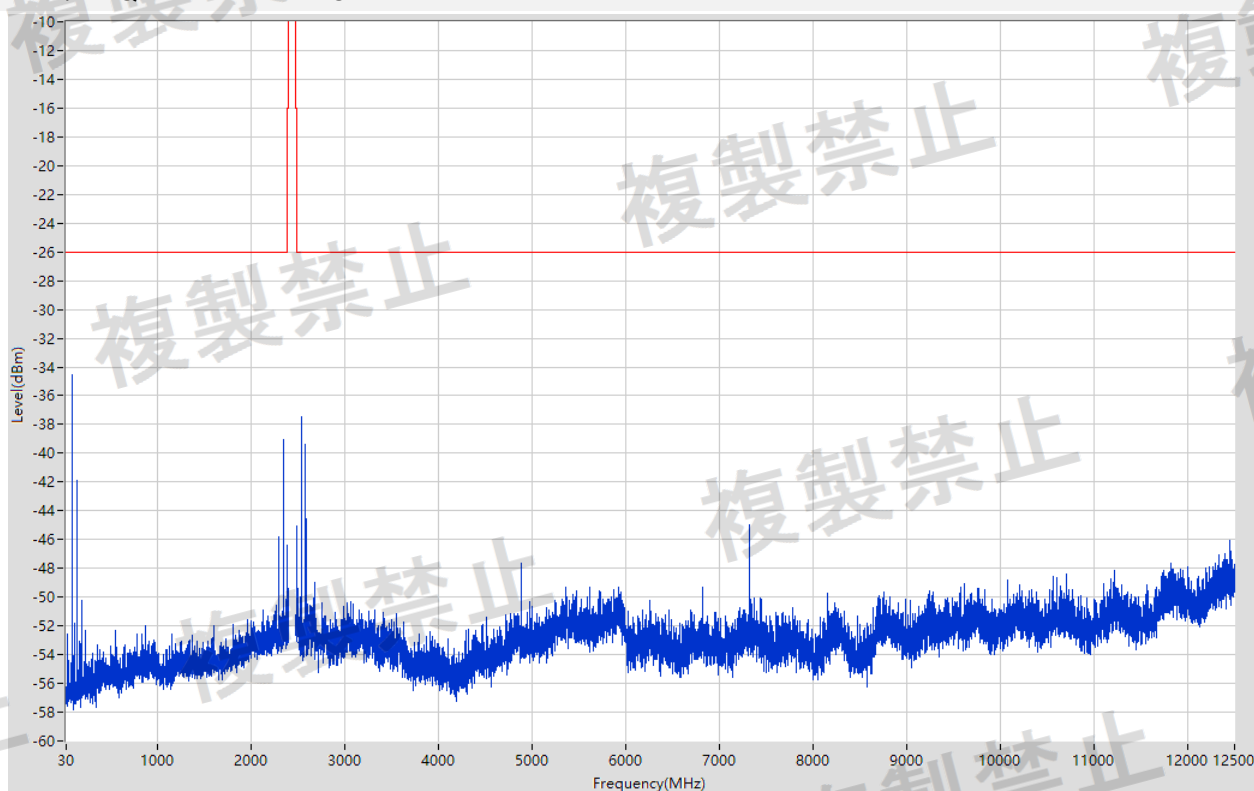
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-34.35	0.367	2.5	Pass
1000	2374	1	Peak	2345	-40.41	0.091	2.5	Pass
2374	2387	1	Peak	2375.983	-49.34	0.012	2.5	Pass
2387	2400	1	Peak	2393.435	-43.66	0.043	25	Pass
2483.5	2496.5	1	Peak	2489.383	-41.61	0.069	25	Pass
2496.5	2509.5	1	Peak	2506.51	-48.66	0.014	2.5	Pass
2509.5	6000	1	Peak	2585.511	-37.74	0.168	2.5	Pass
6000	12500	1	Peak	7323	-44.17	0.038	2.5	Pass

A.4.15 $\pi/4$ -DQPSK NV High Channel

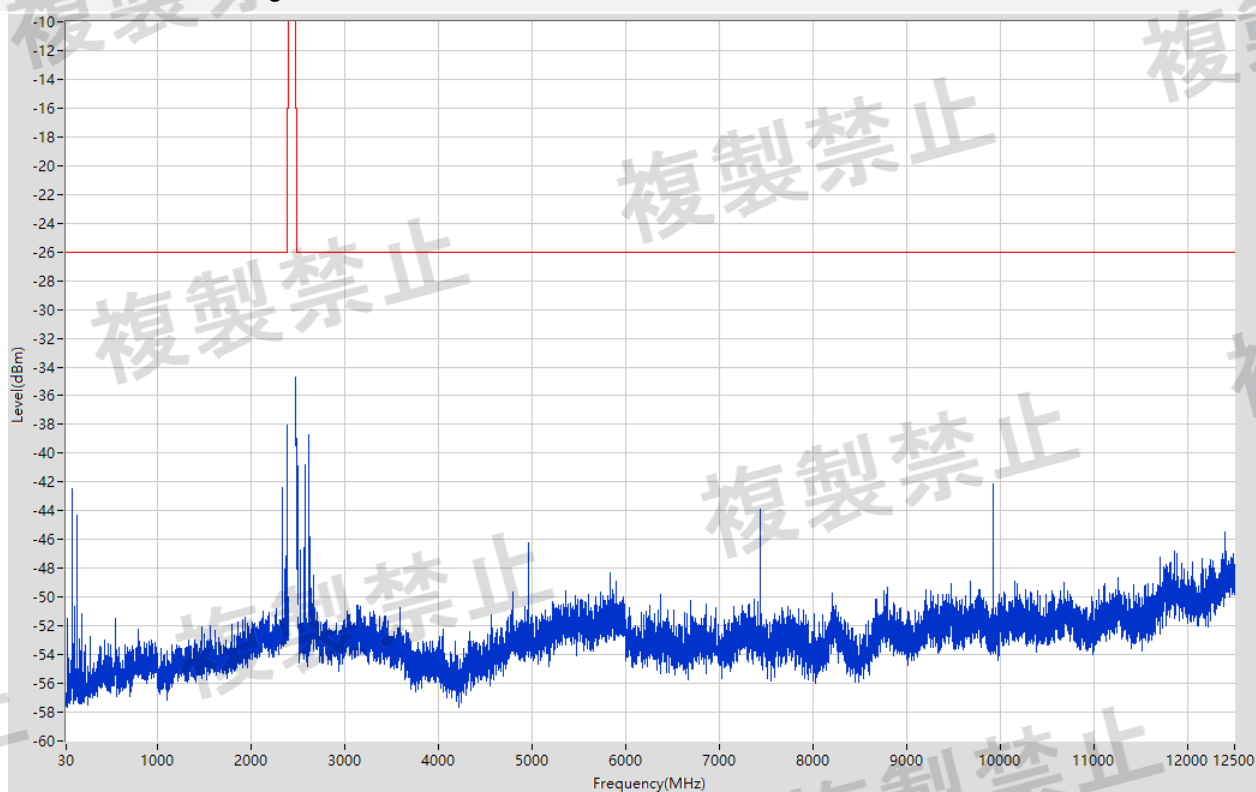
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	95	-38.01	0.158	2.5	Pass
1000	2374	1	Peak	2337	-43.98	0.040	2.5	Pass
2374	2387	1	Peak	2384.238	-38.16	0.153	2.5	Pass
2387	2400	1	Peak	2388.463	-48.13	0.015	25	Pass
2483.5	2496.5	1	Peak	2483.533	-33.25	0.473	25	Pass
2496.5	2509.5	1	Peak	2499.945	-40.93	0.081	2.5	Pass
2509.5	6000	1	Peak	4959.851	-42.83	0.052	2.5	Pass
6000	12500	1	Peak	9921	-41.94	0.064	2.5	Pass

A.4.16 $\pi/4$ -DQPSK HV Low Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-42.23	0.060	2.5	Pass
1000	2374	1	Peak	2307	-42.63	0.055	2.5	Pass
2374	2387	1	Peak	2386.545	-42.97	0.050	2.5	Pass
2387	2400	1	Peak	2400	-27.97	1.596	25	Pass
2483.5	2496.5	1	Peak	2496.5	-39.34	0.116	25	Pass
2496.5	2509.5	1	Peak	2497.963	-34.47	0.358	2.5	Pass
2509.5	6000	1	Peak	4803.829	-44.17	0.038	2.5	Pass
6000	12500	1	Peak	9608	-42.98	0.050	2.5	Pass

A.4.17 $\pi/4$ -DQPSK HV Middle Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-34.55	0.351	2.5	Pass
1000	2374	1	Peak	2345	-39.01	0.126	2.5	Pass
2374	2387	1	Peak	2375.625	-50.18	0.010	2.5	Pass
2387	2400	1	Peak	2393.013	-46.39	0.023	25	Pass
2483.5	2496.5	1	Peak	2488.83	-45.03	0.031	25	Pass
2496.5	2509.5	1	Peak	2499.88	-49.42	0.011	2.5	Pass
2509.5	6000	1	Peak	2537.504	-37.48	0.179	2.5	Pass
6000	12500	1	Peak	7323	-44.95	0.032	2.5	Pass

A.4.18 $\pi/4$ -DQPSK HV High Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μ W/MHz)	Limit (μ W/MHz)	Verdict
30	1000	1	Peak	96	-42.43	0.057	2.5	Pass
1000	2374	1	Peak	2336	-42.39	0.058	2.5	Pass
2374	2387	1	Peak	2383.815	-38.03	0.157	2.5	Pass
2387	2400	1	Peak	2387.91	-49.15	0.012	25	Pass
2483.5	2496.5	1	Peak	2483.5	-34.72	0.337	25	Pass
2496.5	2509.5	1	Peak	2498.093	-40.89	0.082	2.5	Pass
2509.5	6000	1	Peak	2624.516	-38.69	0.135	2.5	Pass
6000	12500	1	Peak	9920	-42.12	0.061	2.5	Pass

5.5 Antenna Power Error Measurement

5.5.1 Limit

Item	Limits
Antenna Power Density	a) FH,FH+DS, or FH+OFDM form 2427 - 2470.75 MHz: ≤ 3 mW/MHz b) DS but other than a) from 2400~2483.5 MHz: ≤ 10 mW/MHz c) OFDM, but other than a): For OCB of 26MHz or less: ≤ 10 mW/MHz For OCB of over 26 MHz to 40 MHz: ≤ 5 mw/MHz d) Other than a), b) and c): ≤ 10 mW
Antenna Power Error	+20% (Base on manufacturer declare antenna power density)

5.5.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.5.3 Test Procedure

- Setting of SA is following as: RB:1 MHz / VB: 3 MHz / SPAN: About twice the occupied frequency bandwidth / AT: 10 dB Ref: 10 dBm / Sweep time: Minimum time for guaranteed measurement accuracy/Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold/Trigger condition: Free run.
- Setting of SA is following as: RB:1 MHz / VB: 1 MHz / SPAN: 0 Hz/ AT: 10 dB Ref: 10 dBm / Sweep Mode: Continuous sweep
- Those using frequency hopping method (including DSSS or composite method with OFDM):
 - Confirming in the submitted document that the frequency hopping intervals in the frequency distribution of frequency hopping are equal intervals of 1 MHz or less, and that the probability of occurrence at each hopping frequency is uniform, and that the probability of occurrence at each hopping frequency is uniform. If it is, it is implemented by the following method.
 - Connect a high frequency power meter to the output of the dummy load (attenuator) and measure the total power.
 - Divide the total power by the spreading bandwidth to calculate the average power per 1 MHz.
 - Antenna power shall be as follows:
 - Value of b for continuous wave
 - For burst wave Average power in burst is calculated from the value of b and the transmission time rate.
 - If the frequency distribution of frequency hopping or the probability of occurrence at each hopping frequency is not uniform, set the spectrum analyzer as in 1 to search for the frequency that gives the maximum antenna power, and then perform spectrum analysis. Set the device as in 2, and measure the antenna power at the frequency that gives the maximum power.

4 In the case of those using OFDM or DSSS

- (1) Set the spectrum analyzer as in according to the above 1
- (2) After repeating the sweep until no change is observed in the display, measure the frequency at which the power per 1 MHz gives the maximum value.
- (3) Set the spectrum analyzer as in according to the above 2
- (4) Connect the high frequency power meter to the IF output terminal of the spectrum analyzer.
- (5) Antenna power shall be as follows:
 - a. For continuous wave
 - b. Burst wave Calculated average power in a burst from values corrected in the same way as for continuous waves and the transmission time rate

(6) In the case of using the orthogonal frequency division multiplexing system, when there are multiple subcarrier modulation systems, measure the antenna power at each time and take the largest value as the measured value.

5 In the case of items using other methods

- (1) Connect a high-frequency power meter to the output of the dummy load (attenuator) and measure the total power.
- (2) Antenna power shall be as follows:
 - a. Value of a for continuous wave
 - b. Burst wave The average power in the burst is calculated from the value of (a) and the transmission time rate.

6 Antenna Power Error is definition that actual measure antenna power tolerance Upper Limit +20% power that base on manufacturer declare the conducted power density.

5.5.4 Test Deviation

There is no deviation with the original standard.

5.5.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.5.6 Test Result

GFSK Test Result

Duty cycle = 0.766

Antenna Power Density PD = Antenna Power mW / Spread Spectrum Bandwidth MHz

Manufacturer declares the rated power density = 0.0400 mW/MHz

Test Mode	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Upper Limit (%)	Verdict
GFSK	LV	2.96	1.9756	0.0277	-30.83%	20	Pass
	NV	2.94	1.9688	0.0276	-31.06%	20	Pass
	HV	2.97	1.9820	0.0277	-30.79%	20	Pass

EIRP Antenna Power

Test Mode	Test Voltage	Measured EIRP (dBm/ MHz)	Limit (dBm/MHz)	Verdict
GFSK	LV	-14.88	6.91	Pass
	NV	-14.89	6.91	Pass
	HV	-14.88	6.91	Pass

 $\pi/4$ -DQPSK Test Result

Duty cycle = 0.766

Antenna Power Density PD = Antenna Power mW / Spread Spectrum Bandwidth MHz

Manufacturer declares the rated power density = 0.0400 mW/MHz

Test Mode	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Upper Limit (%)	Verdict
$\pi/4$ -DQPSK	LV	2.96	1.9770	0.0276	-30.88%	20	Pass
	NV	2.93	1.9643	0.0275	-31.22%	20	Pass
	HV	2.92	1.9575	0.0274	-31.56%	20	Pass

EIRP Antenna Power

Test Mode	Test Voltage	Measured EIRP (dBm/ MHz)	Limit (dBm/MHz)	Verdict
$\pi/4$ -DQPSK	LV	-14.88	6.91	Pass
	NV	-14.91	6.91	Pass
	HV	-14.93	6.91	Pass

GFSK (AFH Mode) Test Result

Duty cycle = 0.764

Antenna Power Density PD = Antenna Power mW / Spread Spectrum Bandwidth MHz

Manufacturer declares the rated power density = 0.1300 mW/MHz

Test Mode	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Upper Limit (%)	Verdict
GFSK	LV	2.88	1.9409	0.1046	-19.53%	20	Pass
	NV	2.83	1.9187	0.1034	-20.45%	20	Pass
	HV	2.85	1.9275	0.1038	-20.12%	20	Pass

EIRP Antenna Power

Test Mode	Test Voltage	Measured EIRP (dBm/ MHz)	Limit (dBm/MHz)	Verdict
GFSK	LV	-9.10	6.91	Pass
	NV	-9.15	6.91	Pass
	HV	-9.14	6.91	Pass

 $\pi/4$ -DQPSK (AFH Mode) Test Result

Duty cycle = 0.767

Antenna Power Density PD = Antenna Power mW / Spread Spectrum Bandwidth MHz

Manufacturer declares the rated power density = 0.1300 mW/MHz

Test Mode	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Density PD (mW / MHz)	Antenna Power Error	Upper Limit (%)	Verdict
$\pi/4$ -DQPSK	LV	2.90	1.9498	0.1045	-19.58%	20	Pass
	NV	2.87	1.9364	0.1040	-20.03%	20	Pass
	HV	2.86	1.9320	0.1041	-19.95%	20	Pass

EIRP Antenna Power

Test Mode	Test Voltage	Measured EIRP (dBm/ MHz)	Limit (dBm/MHz)	Verdict
$\pi/4$ -DQPSK	LV	-9.11	6.91	Pass
	NV	-9.13	6.91	Pass
	HV	-9.13	6.91	Pass

5.6 Limitation of Collateral Emission of Receiver Measurement

5.6.1 Limit

Item	Limits
RX Spurious Emission	$\leq 4\text{nW}$ ($f < 1\text{GHz}$)
	$\leq 20\text{nW}$ ($1\text{GHz} \leq f$)

5.6.2 Test Setup

See section 4.3.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.6.3 Test Procedure

- 1 The EUT is placed in Rx mode and set to a fixed channel.
- 2 Setting of SA is following as RB / VB: 100 kHz (below 1GHz emissions) / 1 MHz (above 1GHz emissions) / AT:10 dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
- 3 SA set RB: 100 kHz and VB: 100 kHz. Then adjust to start frequency 30 MHz and stop frequency 1000 MHz. Search to mark peak reading value + cable loss shall be less than 4 nW
- 4 SA set RB: 1 MHz and VB: 1 MHz. Then adjust to start frequency 1000 MHz and stop frequency 12500 MHz. Search to mark peak reading value + cable loss shall be less than 20 nW
- 5 If power level of lower emissions are more than 1/10 of limit (0.4nW for $f < 1\text{GHz}$, 2 nW for $f \geq 1\text{GHz}$), all those are to be indicated in the 2nd and 3rd lines. If others are 1/10 or less more of the limit, no necessary to be indicated

5.6.4 Test Deviation

There is no deviation with the original standard.

5.6.5 EUT Operation during Test

The EUT was programmed to be in continuously receiving mode.

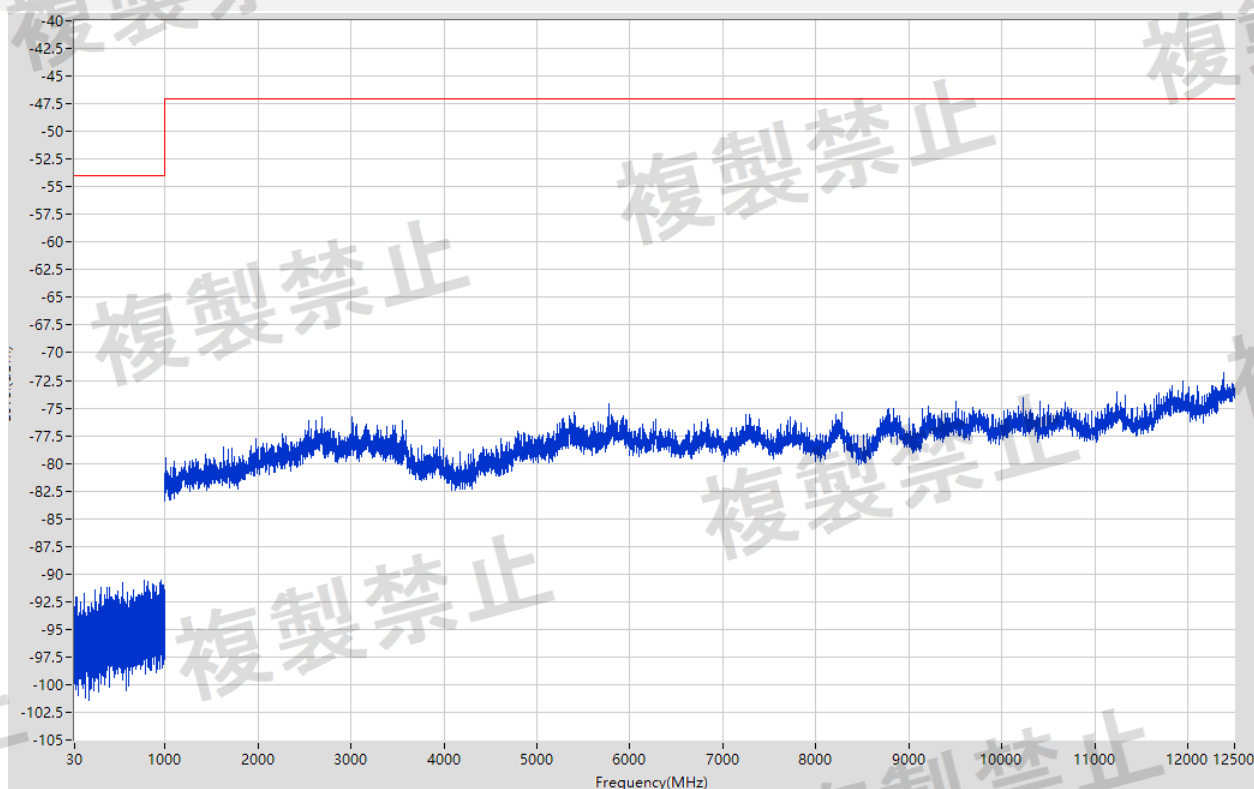
5.6.6 Test Result

Test Data

Mode	Test Voltage	Channel	Refer to Plot	Verdict
GFSK	LV	Low	A.6.1	Pass
	NV		A.6.2	Pass
	HV		A.6.3	Pass
	LV	Middle	A.6.4	Pass
	NV		A.6.5	Pass
	HV		A.6.6	Pass
	LV	High	A.6.7	Pass
	NV		A.6.8	Pass
	HV		A.6.9	Pass
$\pi/4$ -DQPSK	LV	Low	A.6.10	Pass
	NV		A.6.11	Pass
	HV		A.6.12	Pass
	LV	Middle	A.6.13	Pass
	NV		A.6.14	Pass
	HV		A.6.15	Pass
	LV	High	A.6.16	Pass
	NV		A.6.17	Pass
	HV		A.6.18	Pass

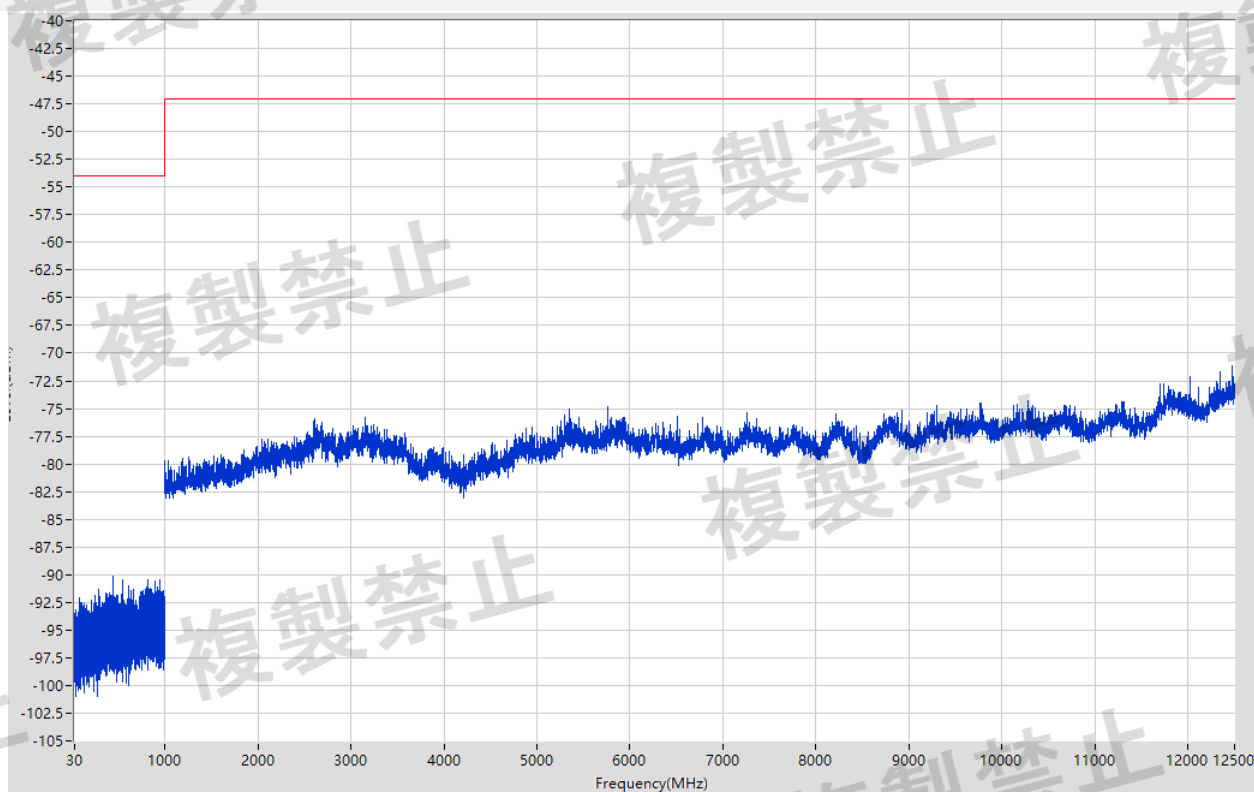
Test Plots

A.6.1 GFSK LV Low Channel



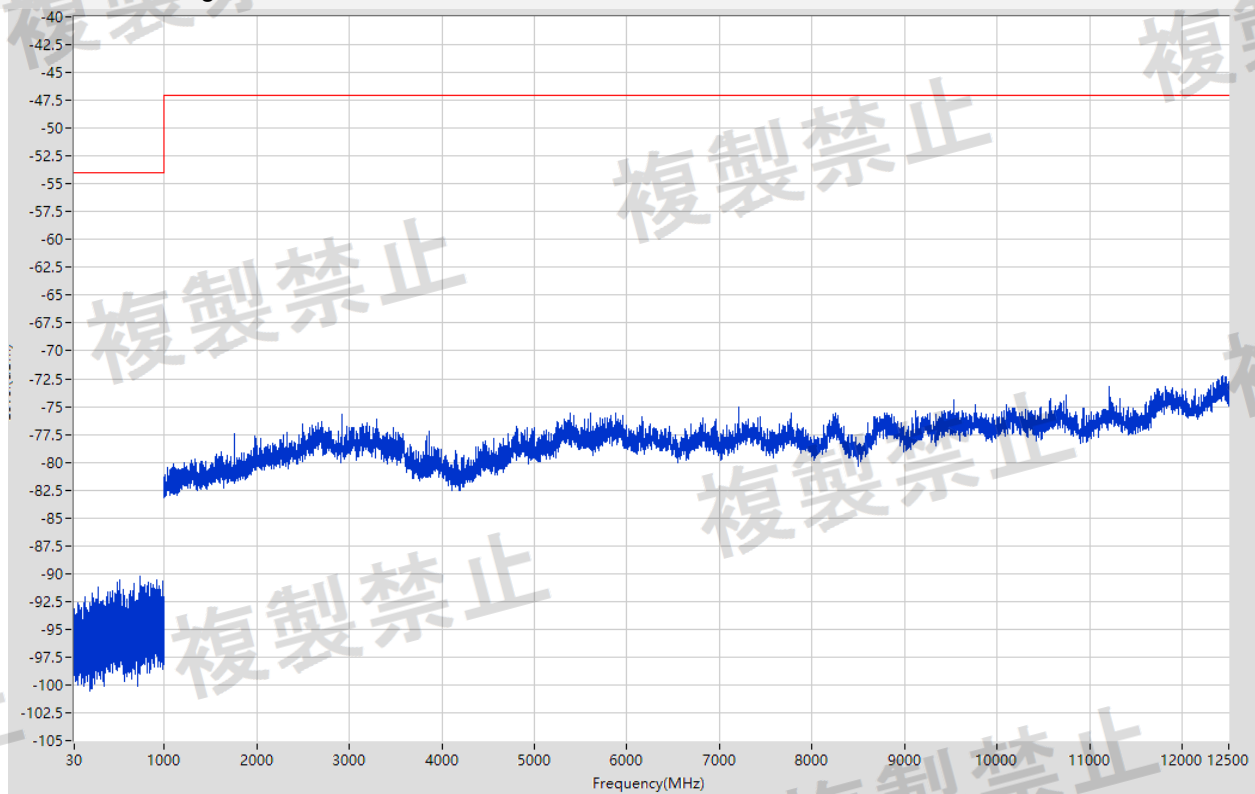
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	782.841	-90.56	0.01	-54	4.0	36.56	Pass
1000	6000	1	Peak	5771.25	-74.62	0.04	-47	20.0	27.62	Pass
6000	12500	1	Peak	12378.125	-71.83	0.07	-47	20.0	24.83	Pass

A.6.2 GFSK LV Middle Channel



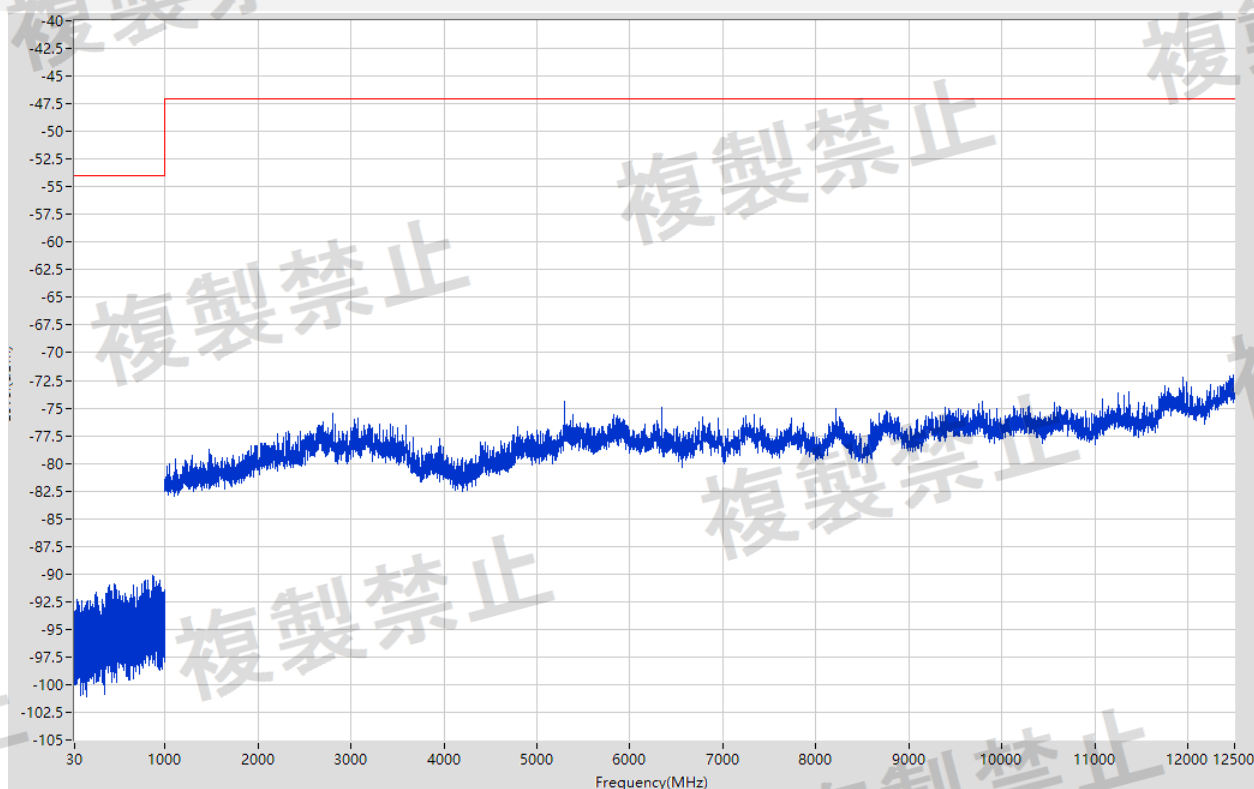
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	444.19	-90.16	0.01	-54	4.0	36.16	Pass
1000	6000	1	Peak	5757.5	-74.89	0.03	-47	20.0	27.89	Pass
6000	12500	1	Peak	12480.5	-71.13	0.08	-47	20.0	24.13	Pass

A.6.3 GFSK LV High Channel



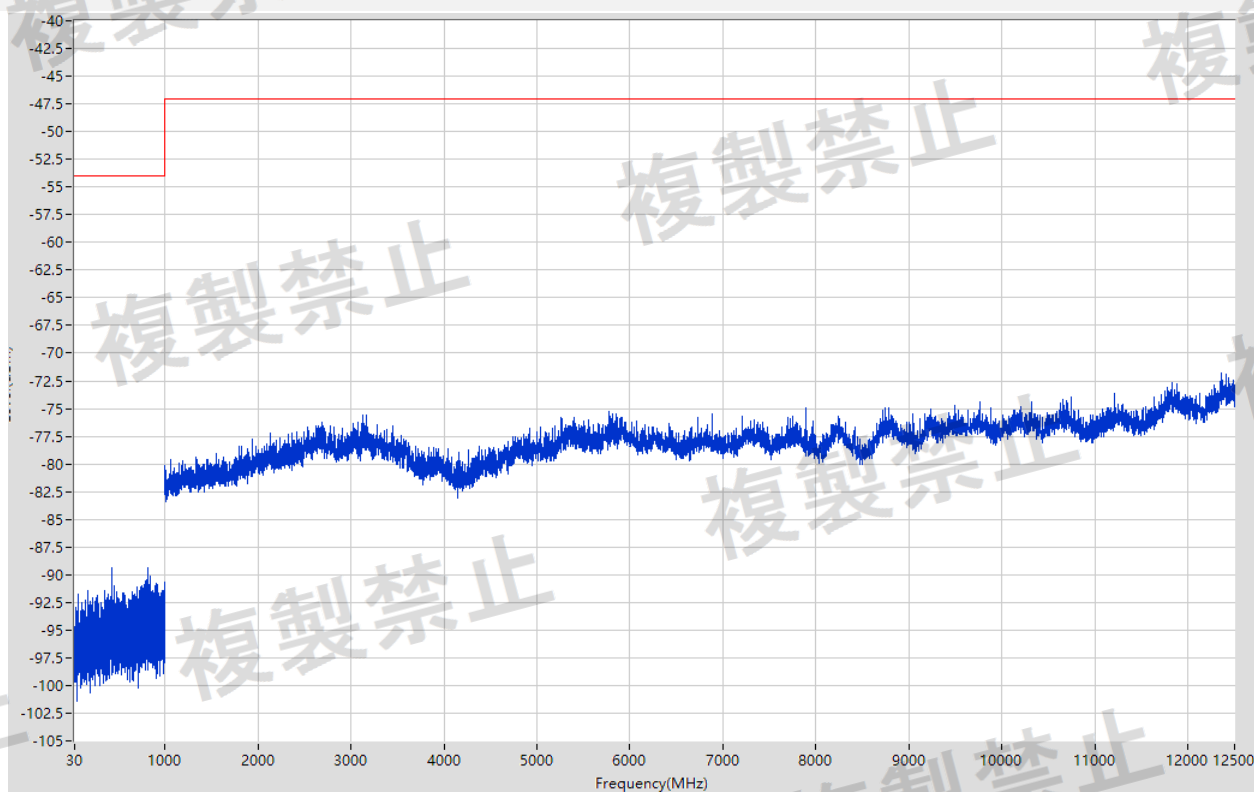
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	743.314	-90.28	0.01	-54	4.0	36.28	Pass
1000	6000	1	Peak	5388.75	-75.62	0.03	-47	20.0	28.62	Pass
6000	12500	1	Peak	12433.375	-72.23	0.06	-47	20.0	25.23	Pass

A.6.4 GFSK NV Low Channel



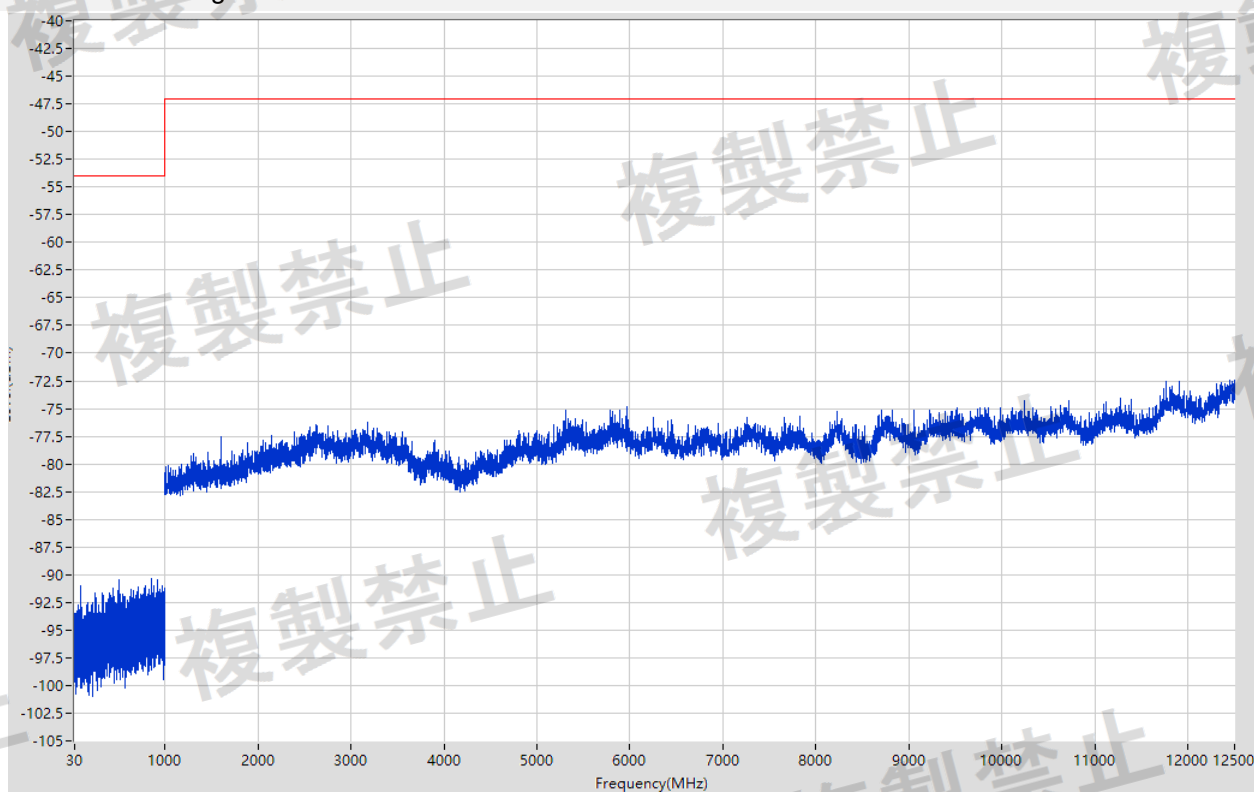
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	864.321	-90.1	0.01	-54	4.0	36.1	Pass
1000	6000	1	Peak	5292.5	-74.39	0.04	-47	20.0	27.39	Pass
6000	12500	1	Peak	12491.875	-72.01	0.06	-47	20.0	25.01	Pass

A.6.5 GFSK NV Middle Channel



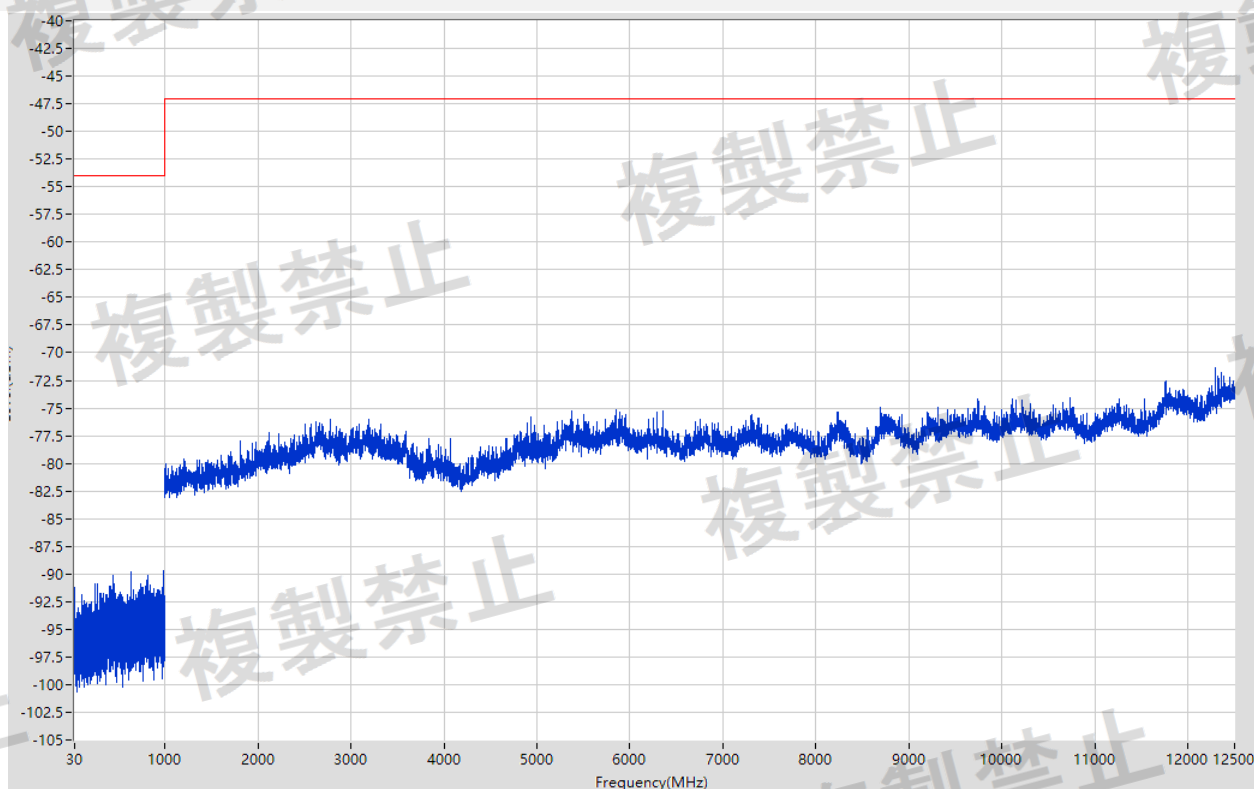
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	815.821	-89.32	0.01	-54	4.0	35.32	Pass
1000	6000	1	Peak	5775	-75.29	0.03	-47	20.0	28.29	Pass
6000	12500	1	Peak	12353.75	-71.76	0.07	-47	20.0	24.76	Pass

A.6.6 GFSK NV High Channel



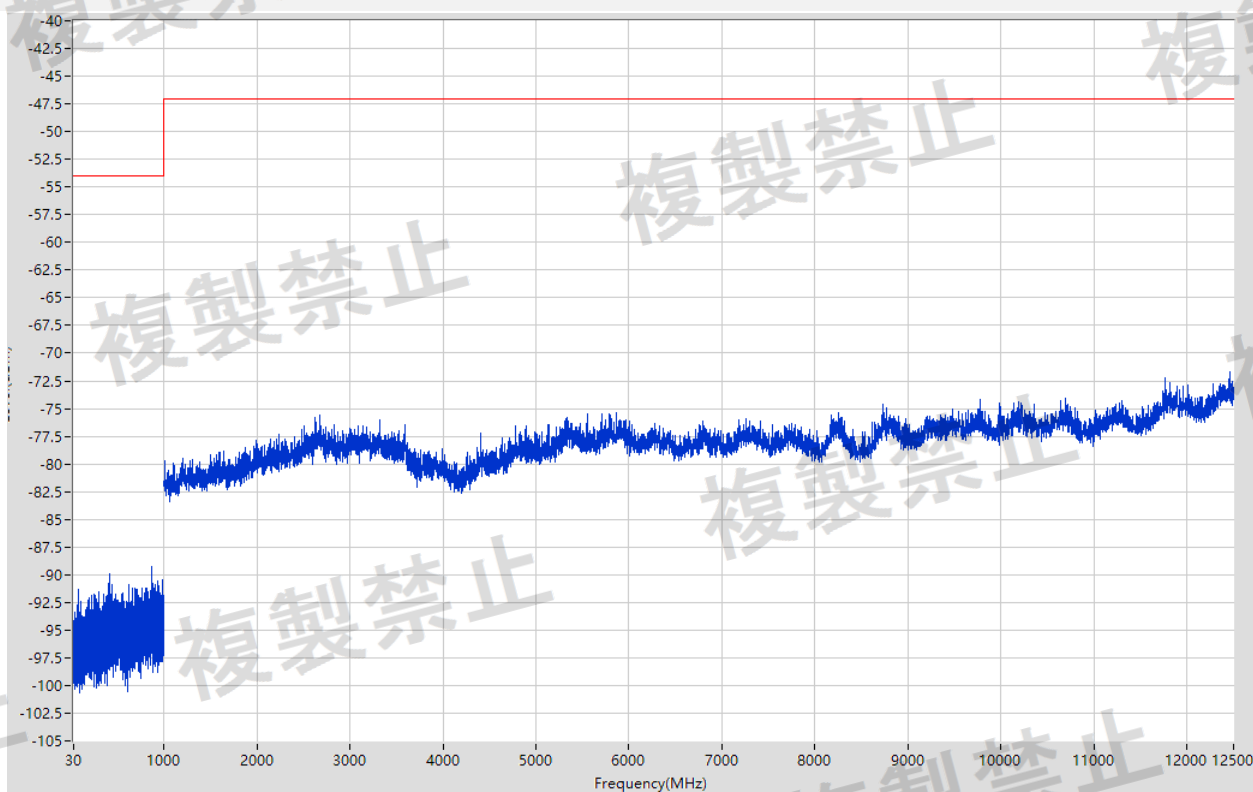
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	855.228	-90.36	0.01	-54	4.0	36.36	Pass
1000	6000	1	Peak	5967.5	-74.79	0.03	-47	20.0	27.79	Pass
6000	12500	1	Peak	12448	-72.41	0.06	-47	20.0	25.41	Pass

A.6.7 GFSK HV Low Channel



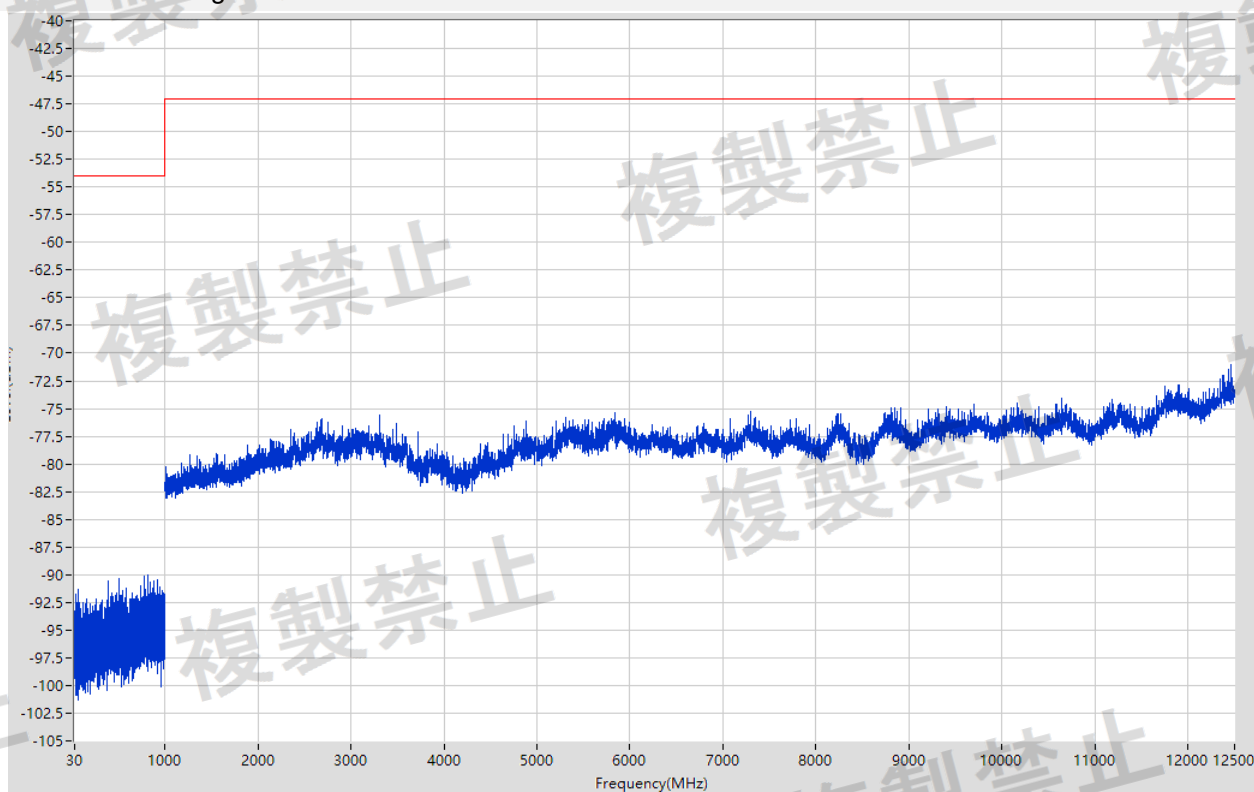
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	984.723	-89.74	0.01	-54	4.0	35.74	Pass
1000	6000	1	Peak	5846.25	-75.14	0.03	-47	20.0	28.14	Pass
6000	12500	1	Peak	12296.875	-71.41	0.07	-47	20.0	24.41	Pass

A.6.8 GFSK HV Middle Channel

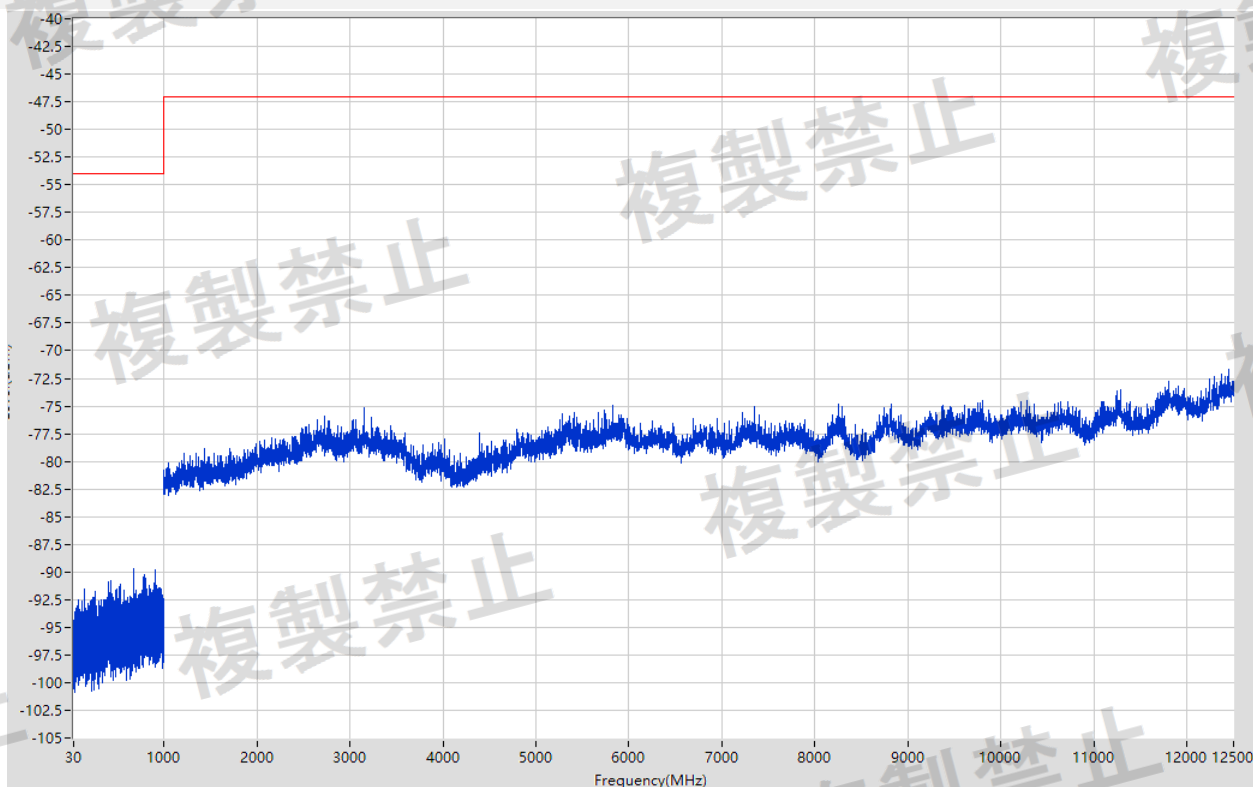


Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	870.141	-89.28	0.01	-54	4.0	35.28	Pass
1000	6000	1	Peak	5863.75	-75.35	0.03	-47	20.0	28.35	Pass
6000	12500	1	Peak	12457.75	-71.7	0.07	-47	20.0	24.7	Pass

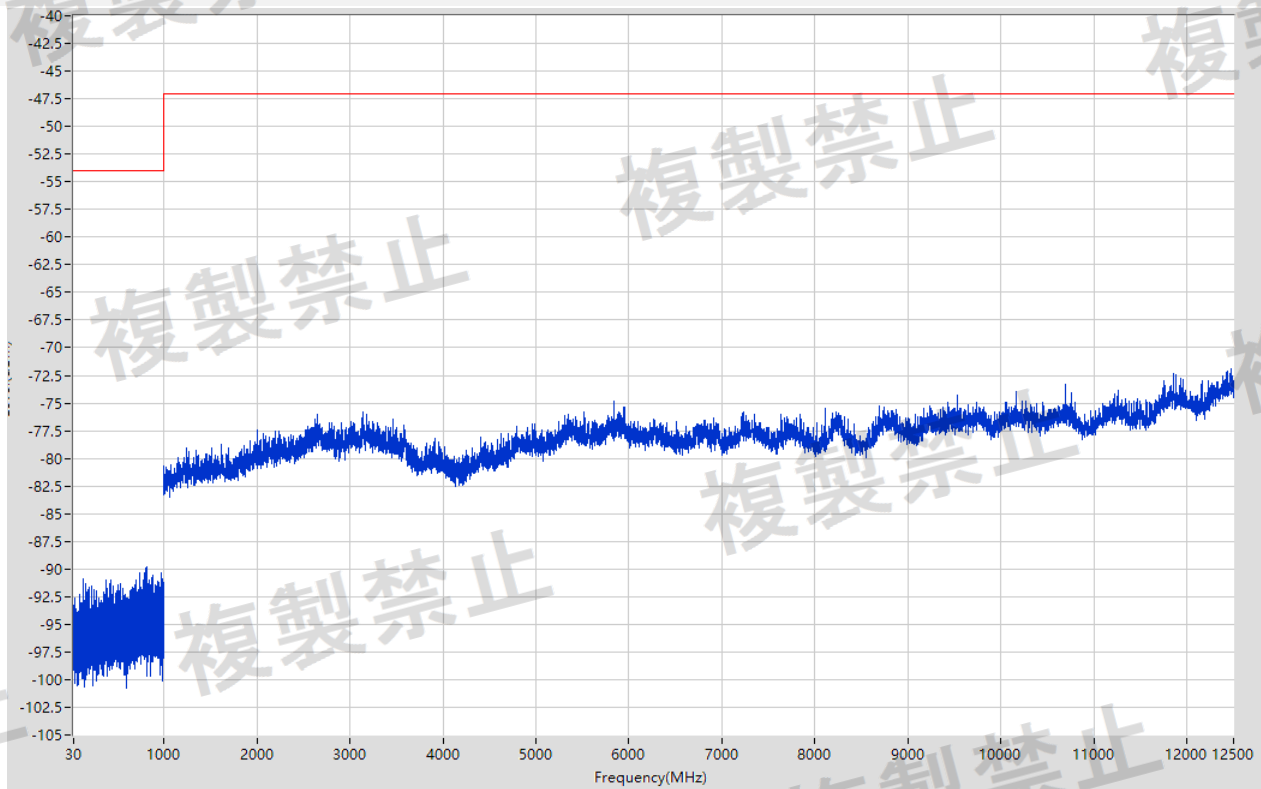
A.6.9 GFSK HV High Channel



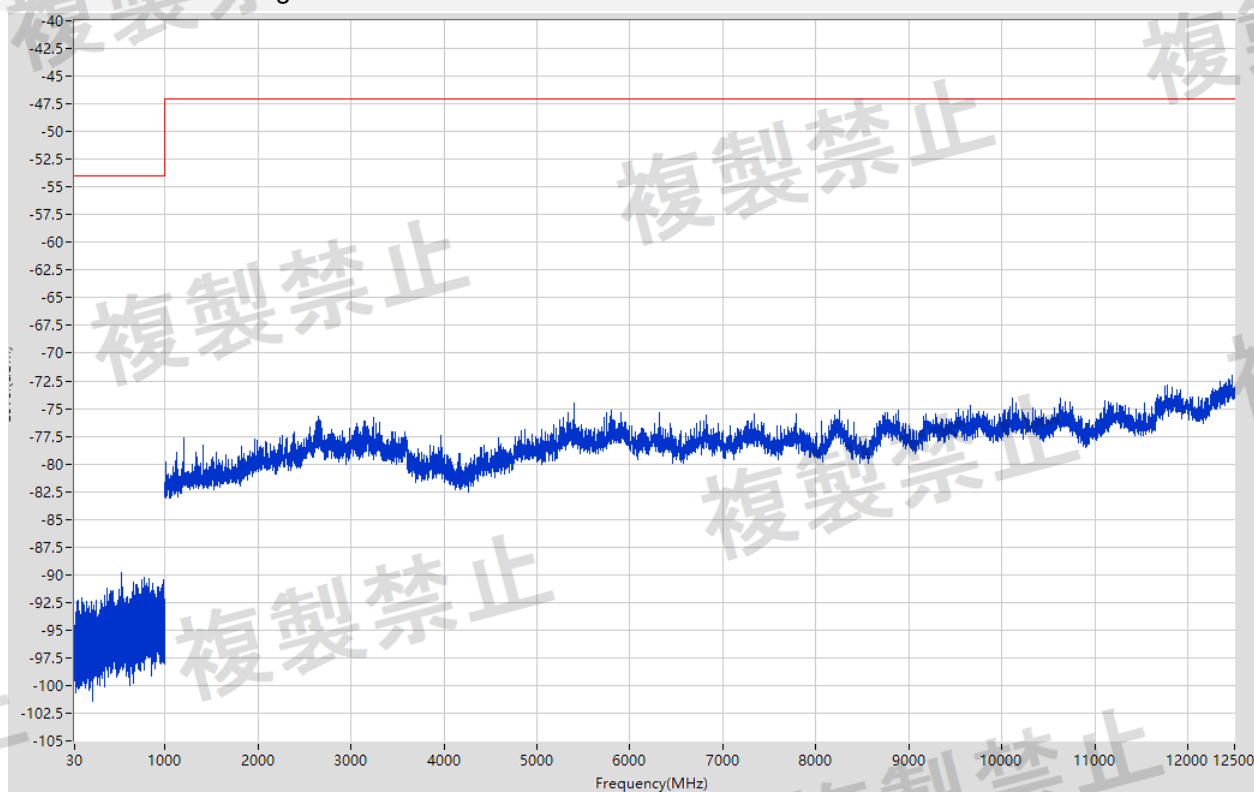
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	823.096	-89.99	0.01	-54	4.0	35.99	Pass
1000	6000	1	Peak	5837.5	-75.42	0.03	-47	20.0	28.42	Pass
6000	12500	1	Peak	12467.5	-71.08	0.08	-47	20.0	24.08	Pass

A.6.10 $\pi/4$ -DQPSK LV Low Channel

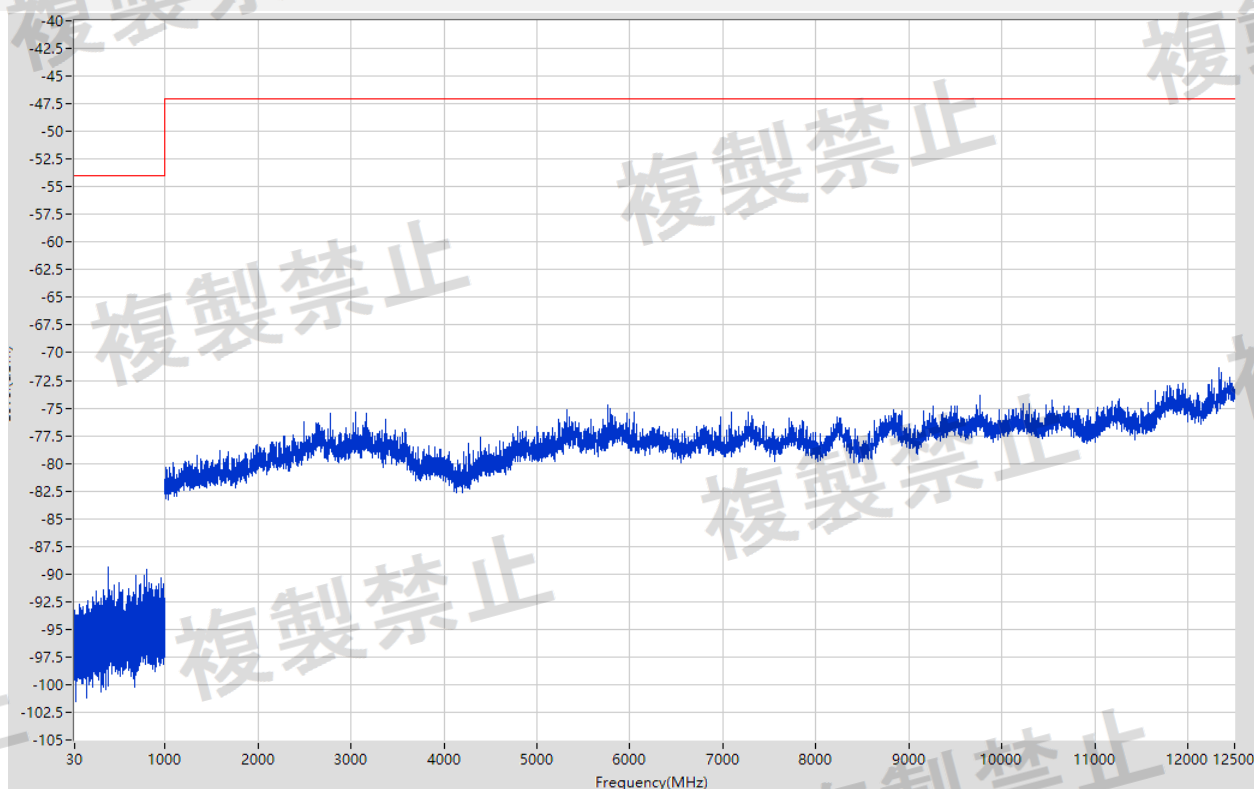
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	679.658	-89.65	0.01	-54	4.0	35.65	Pass
1000	6000	1	Peak	5826.25	-74.93	0.03	-47	20.0	27.93	Pass
6000	12500	1	Peak	12451.25	-71.63	0.07	-47	20.0	24.63	Pass

A.6.11 $\pi/4$ -DQPSK LV Middle Channel

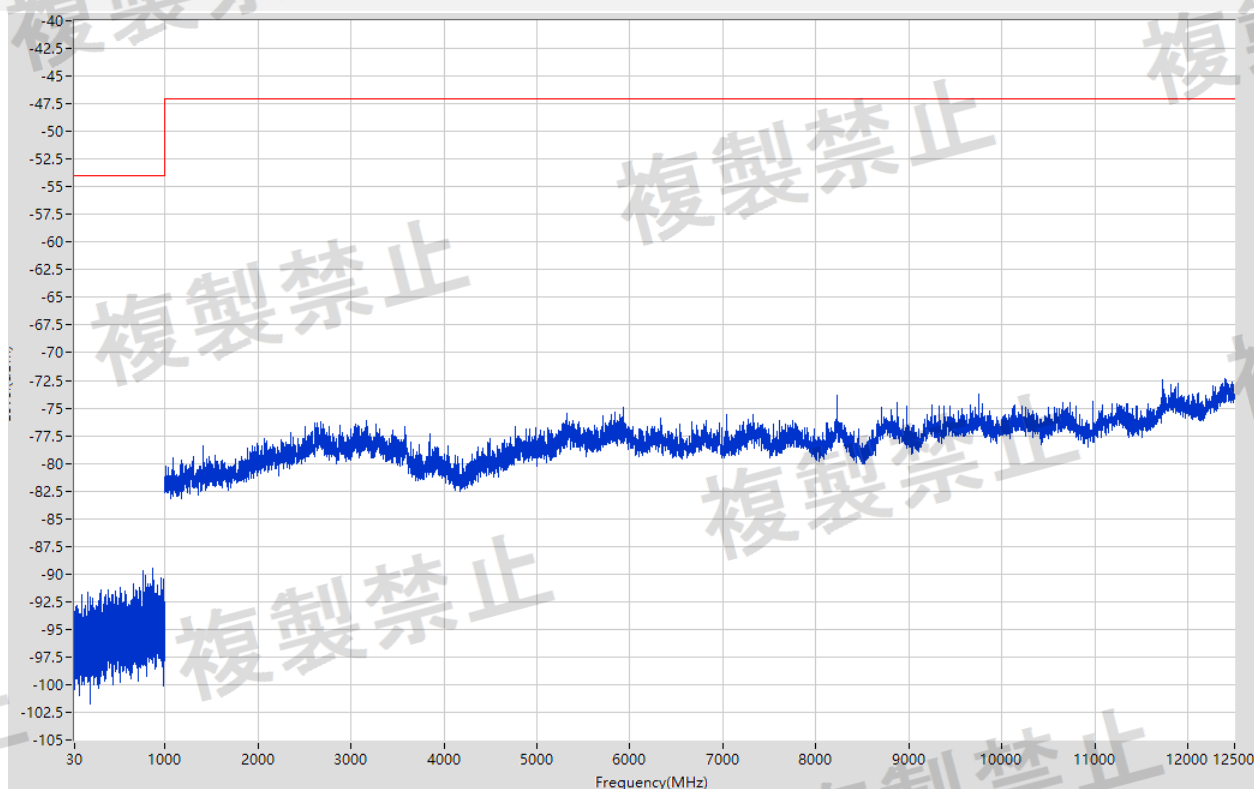
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	815.821	-89.85	0.01	-54	4.0	35.85	Pass
1000	6000	1	Peak	5838.75	-74.79	0.03	-47	20.0	27.79	Pass
6000	12500	1	Peak	12480.5	-71.86	0.07	-47	20.0	24.86	Pass

A.6.12 $\pi/4$ -DQPSK LV High Channel

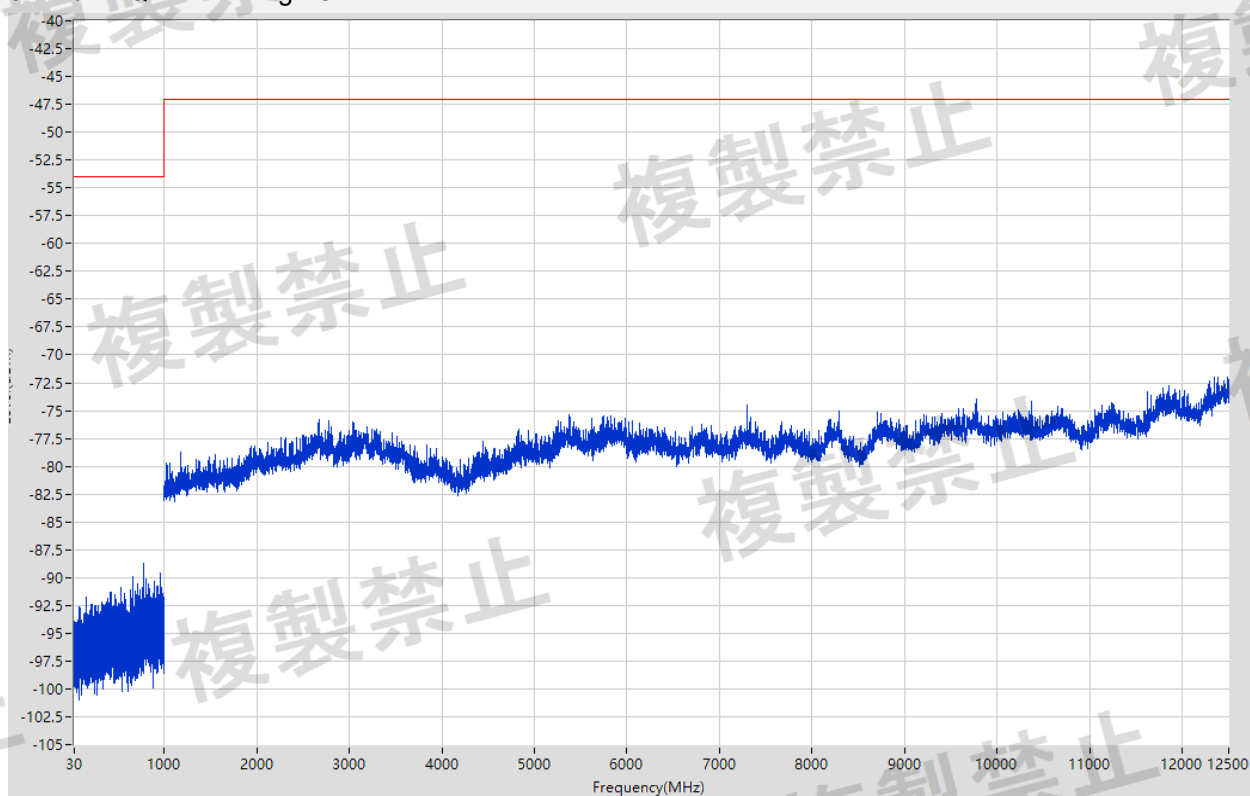
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	532.096	-89.75	0.01	-54	4.0	35.75	Pass
1000	6000	1	Peak	5393.75	-74.51	0.04	-47	20.0	27.51	Pass
6000	12500	1	Peak	12480.5	-72.06	0.06	-47	20.0	25.06	Pass

A.6.13 $\pi/4$ -DQPSK NV Low Channel

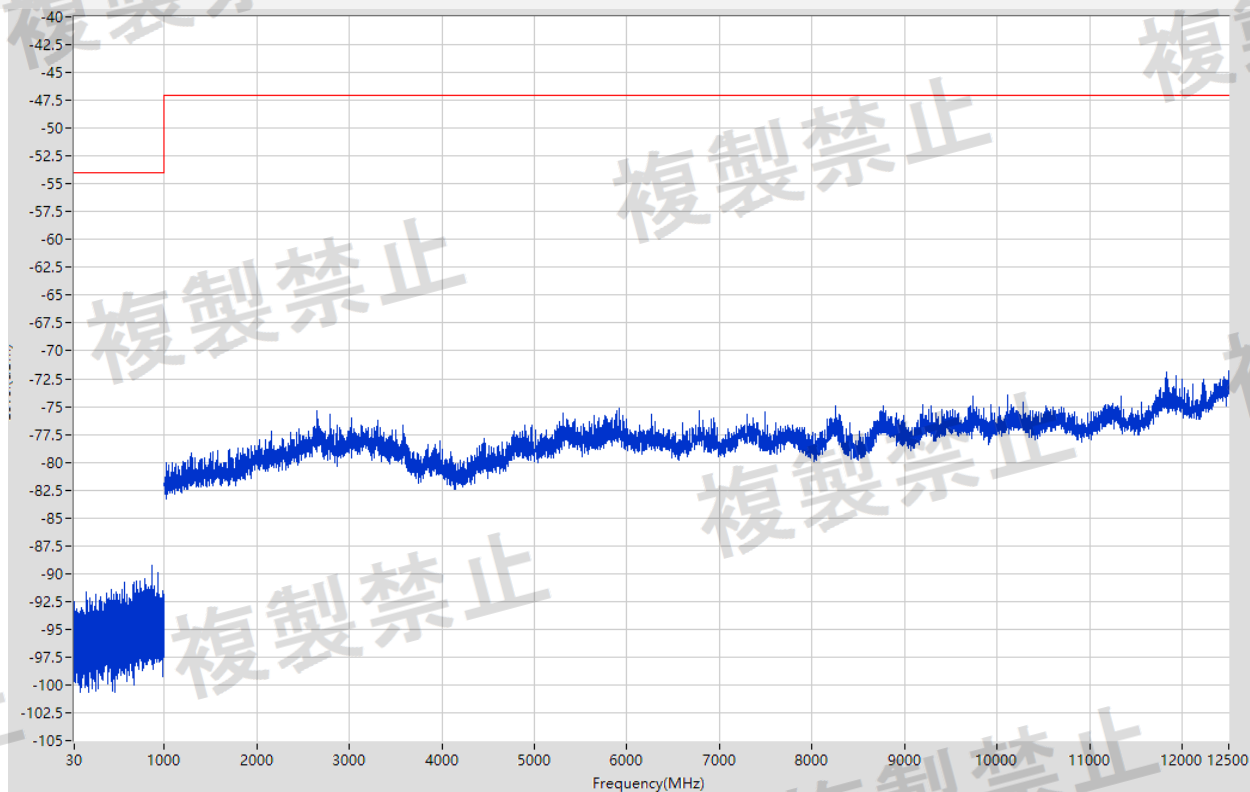
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	387.688	-89.37	0.01	-54	4.0	35.37	Pass
1000	6000	1	Peak	5765	-74.68	0.03	-47	20.0	27.68	Pass
6000	12500	1	Peak	12331	-71.31	0.07	-47	20.0	24.31	Pass

A.6.14 $\pi/4$ -DQPSK NV Middle Channel

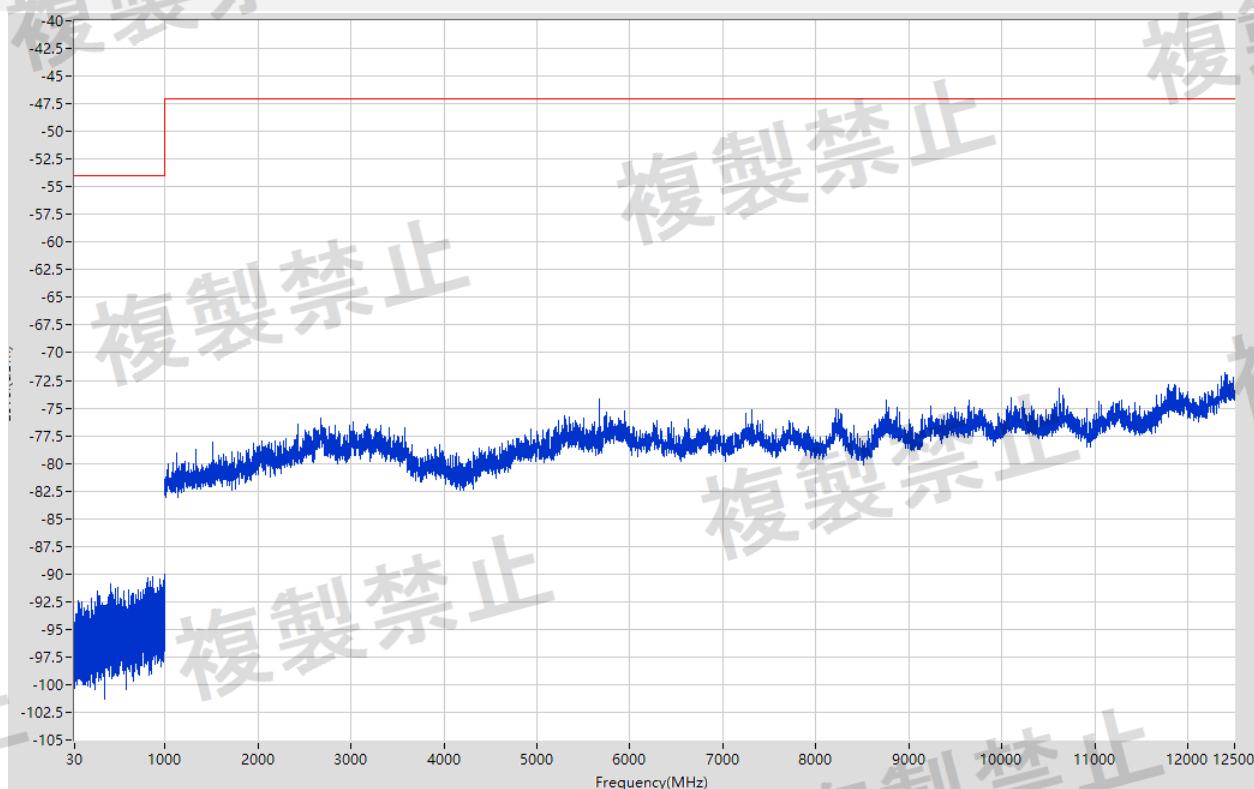
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	865.291	-89.46	0.01	-54	4.0	35.46	Pass
1000	6000	1	Peak	5923.75	-74.93	0.03	-47	20.0	27.93	Pass
6000	12500	1	Peak	12397.625	-72.38	0.06	-47	20.0	25.38	Pass

A.6.15 $\pi/4$ -DQPSK NV High Channel

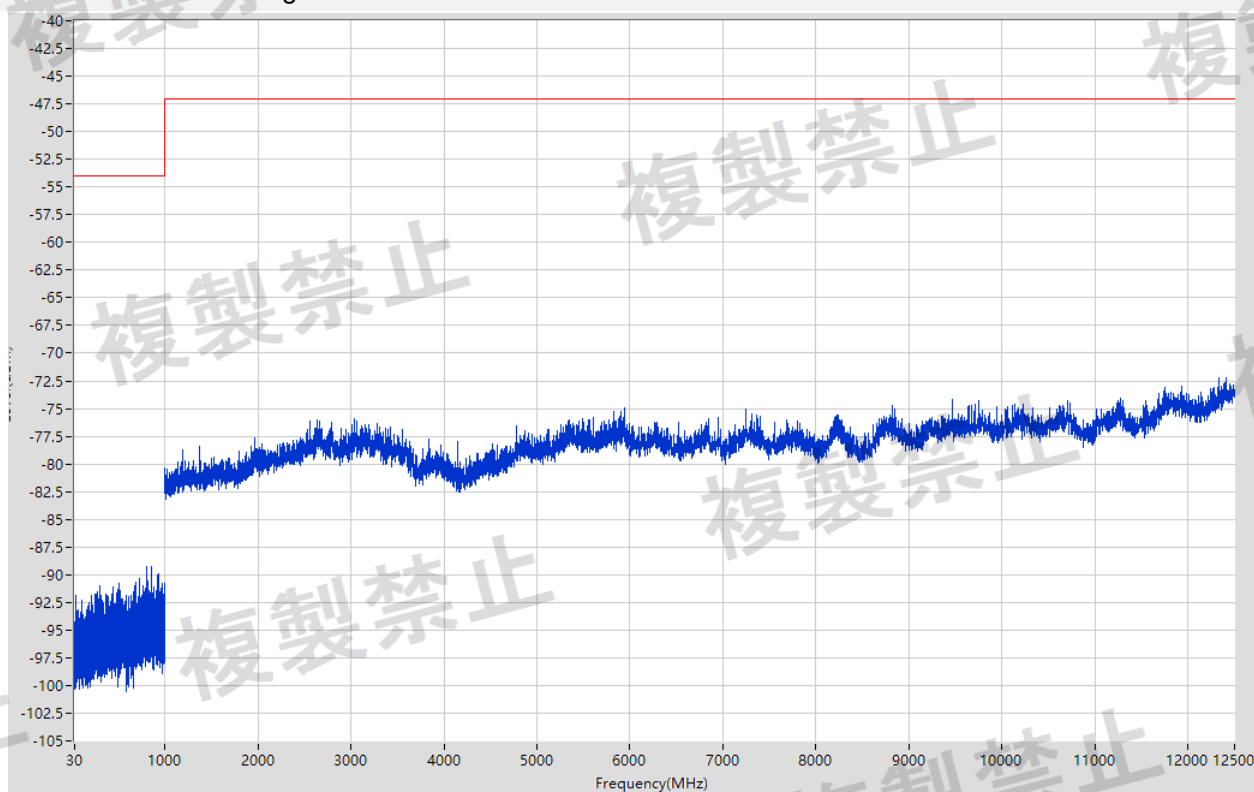
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	784.054	-88.73	0.01	-54	4.0	34.73	Pass
1000	6000	1	Peak	5371.25	-75.37	0.03	-47	20.0	28.37	Pass
6000	12500	1	Peak	12347.25	-71.98	0.06	-47	20.0	24.98	Pass

A.6.16 $\pi/4$ -DQPSK HV Low Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	874.991	-89.22	0.01	-54	4.0	35.22	Pass
1000	6000	1	Peak	5918.75	-75.14	0.03	-47	20.0	28.14	Pass
6000	12500	1	Peak	12495.125	-71.84	0.07	-47	20.0	24.84	Pass

A.6.17 $\pi/4$ -DQPSK HV Middle Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	991.755	-90.07	0.01	-54	4.0	36.07	Pass
1000	6000	1	Peak	5670	-74.23	0.04	-47	20.0	27.23	Pass
6000	12500	1	Peak	12402.5	-71.77	0.07	-47	20.0	24.77	Pass

A.6.18 $\pi/4$ -DQPSK HV High Channel

Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	803.575	-89.23	0.01	-54	4.0	35.23	Pass
1000	6000	1	Peak	5938.75	-74.98	0.03	-47	20.0	27.98	Pass
6000	12500	1	Peak	12334.25	-72.2	0.06	-47	20.0	25.2	Pass

5.7 Transmission Antenna Gain (EIRP Antenna Power) Measurement

5.7.1 Limit

Item	Non-directional antennal limits	Directional antennal limits
EIRP Power Density	a) FH, FH+DS, or FH+OFDM form 2427 - 2470.75 MHz: $\leq 6.91 \text{ dBm/MHz}$ b) DS but other than a) from 2400~2483.5 MHz: $\leq 12.14 \text{ dBm/MHz}$ c) OFDM, but other than a): For OCB of 26MHz or less: $\leq 12.14 \text{ dBm/MHz}$ For OCB of over 26 MHz to 40 MHz: $\leq 9.14 \text{ dBm/MHz}$ d) Other than a), b) and c): $\leq 12.14 \text{ dBm}$	a) FH, FH+DS, or FH+OFDM form 2427 - 2470.75 MHz: $\leq 16.91 \text{ dBm/MHz}$ b) DS but other than a) from 2400~2483.5 MHz: $\leq 22.14 \text{ dBm/MHz}$ c) OFDM, but other than a): For OCB of 26MHz or less: $\leq 22.14 \text{ dBm/MHz}$ For OCB of over 26 MHz to 40 MHz: $\leq 19.14 \text{ dBm/MHz}$ d) Other than a), b) and c): $\leq 22.14 \text{ dBm}$
Note: This test item is not applied to EUT with EIRP Antenna power lower than 12.14 dBm/MHz.		

5.7.2 Test Setup

See section 4.3.3 for test setup description for the antenna port.

5.7.3 Test Procedure

- 1 Set EUT and measuring antenna at the same height and roughly facing each other.
- 2 Set spectrum analyzer with RBW=1MHz, VBW=1MHz, Detector=Peak, Trace mode=Max Hold, and tune reference level to observe receiving signal position.
- 3 Move the measuring antenna height up and down within $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read as "E".
- 4 Remove the EUT from the turn table and put the replacing antenna facing to measuring antenna at same height. Set the standard signal generator (SSG) at same frequency and transmit on then receive the signal
- 5 Swing the replacing antenna give a maximum receiving level.
- 6 Move the measuring antenna height up and down within $\pm 50\text{cm}$ of replacing antenna height and swing it to find the maximum receiving level.
- 7 Set SSG output power at Pt to give the equivalent output level of "E" or calculate Pt with SSG output which gives the nearest of "E" and difference ($\pm 1\text{dB}$). Record the Pt.
- 8 Calculate EIRP by the formula below $\text{EIRP} = G_t - L + P_t$.

Gt: gain of replacing antenna (dBi)

L: feeder loss between SSG and replacing antenna

Pt: Output power of the SSG

- 9 If the antenna for the EUT has circular polarization, sum of V-field and H-field will be result if measuring antenna is linear polarization.

5.7.4 Test Deviation

There is no deviation with the original standard.

5.7.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.7.6 Test Result

Note: Not applicable.

5.8 Transmission Radiation Angle Width (3dB Beamwidth) Measurement

5.8.1 Limit

Item	Limits
3dB antenna beam width	$360/A$ (If $A < 1$; then $A = 1$) $A = \{ \text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM} \}$ or $A = \{ \text{EIRP Power [mW]} / 4.9 \text{ for FH} \}$
Note: This test item is not applied to EUT with EIRP Antenna power lower than 12.14 dBm/MHz.	

5.8.2 Test Setup

See section 4.3.3 for test setup description for the antenna port. The photo of test setup please refer to ANNEX A.

5.8.3 Test Procedure

- 1 Set EUT and measuring antenna at the same height and roughly facing each other.
- 2 Set spectrum analyzer with RBW=1 MHz, VBW=1 KHz, Y scale=5 dB, Detector=Peak, Trace mode=Max Hold, and tune reference level to observe receiving signal position.
- 3 Rotate directions of the EUT horizontally and vertically to find the maximum receiving power.
- 4 Move the measuring antenna height up and down within $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of measuring antenna. The output level at the spectrum analyzer is read as "E"
- 5 Calculate permitted radiation angle in horizontal and vertical using EIRP measured in another test method.
- 6 Calculate 3dB antenna beam width by the formula below $360/A$ (If $A < 1$; then $A = 1$). $A = \{ \text{EIRP Power [mW]} / 16.36 \text{ for DS, OFDM} \}$ or $A = \{ \text{EIRP Power [mW]} / 4.9 \text{ for FH} \}$

5.8.4 Test Deviation

There is no deviation with the original standard.

5.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.8.6 Test Result

Note: Not applicable.

5.9 Radio Interference Prevention Capability Measurement

5.9.1 Limit

Item	Limits
Identification	≥ 48 bits

5.9.2 Test Setup

The photo of test setup please refer to ANNEX A.



5.9.3 Test Procedure

- 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.
- 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.

5.9.4 Test Deviation

There is no deviation with the original standard.

5.9.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.9.6 Test Result

BD Address: 046894C23A59

Test Voltage	Test Result (ID Code)	Verdict
NV	GOOD	Pass

5.10 Construction Protection Confirmation Method

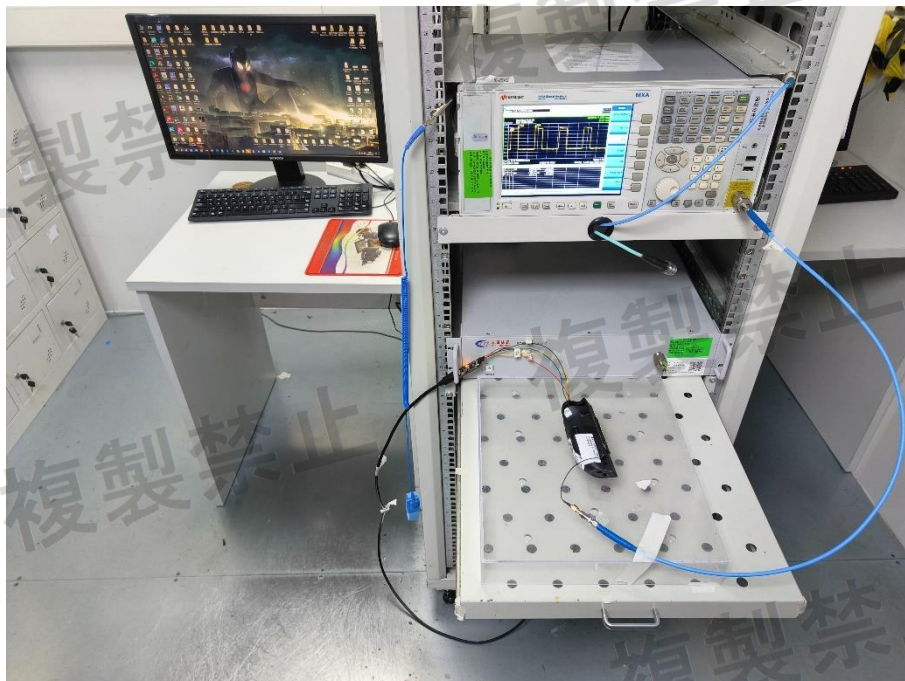
The RF and modulation portions are protected against illegal modification as following method:

Protected Method	Description
Structure protection	The RF Module is QFP SoC IC, and RF part is mounted on PCB with surface mount technology, can't be easily modified
Reference Photo	
 The image shows a top-down view of a black printed circuit board (PCB) with various electronic components. A central square integrated circuit (IC) is highlighted with a red rectangular box. A red arrow points from the text 'QFP SoC IC' in a white box below the image to this highlighted IC. The PCB has several circular cutouts and various surface-mounted components like capacitors and resistors. The background is a blue textured surface.	

ANNEX A TEST SETUP PHOTOS

1 Conducted Test Photo

Conducted Test



Statement

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4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
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7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--