



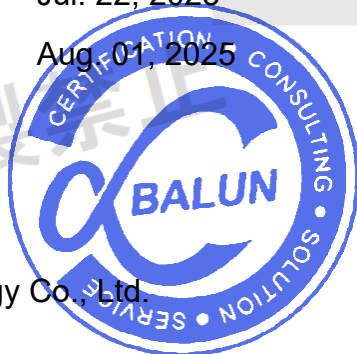
中国认可
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检测
TESTING
CNAS L6791

TEST REPORT

Applicant: Ugreen Group Limited
Address: Ugreen Building, Longcheng Industrial Park,
Longguanxi Road, Longhua, ShenZhen, China
Equipment Type: UGREEN Finder 2
Model Name: CM919
Brand Name: **UGREEN**
Test Standard: MIC Notice No.88 Appendix No.43
Ordinance of MPT No.37, 1981:
Article 2 paragraph 1 item (19)
Sample Arrival Date: Jun. 23, 2025
Test Date: Jul. 22, 2025
Date of Issue: Aug. 01, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.



Tested by: Julie Zhu

Checked by: Ye Hongji

Approved by: Sunny Zou
(Technical Director)

Julie Zhu

Ye Hongji

Sunny Zou

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Aug. 01, 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	Ugreen Group Limited
Address	Ugreen Building, Longcheng Industrial Park, Longguanxi Road, Longhua, ShenZhen, China

2.2 Manufacturer Information

Manufacturer	Ugreen Group Limited
Address	Ugreen Building, Longcheng Industrial Park, Longguanxi Road, Longhua, ShenZhen, China

2.3 Factory Information

Factory	Huizhou Zhize Technology Co., Ltd
Address	No.1, Nantang Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City (Factory Building No.5)

2.4 General Description for Equipment under Test (EUT)

EUT Name	UGREEN Finder 2
Model Name Under Test	CM919
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.1
Software Version	1.3.3
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

Remark:

- Product Number (P/N) code in the below table, for marketing purpose, will be marked on the marking plate.

75119	75119EU	75119UK	75119US	75119JP	75119CN	75119KC	75119A	75119B	75119C
75119D	75119E	75119F	75119P	75119P1	75119P2	75119P3	75119X	75119U	KC-75119

2.5 Technical Information

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

Modulation Technology	Bluetooth Low Energy: Digital modulation method other than orthogonal frequency division multiplexing (OFDM) or spread spectrum method
Modulation Type	Bluetooth Low Energy: GFSK
Transfer Rate	BLE: 1 Mbps BLE: 2 Mbps
Frequency Range	The frequency range used is 2402MHz - 2480MHz; The frequency block is 2400MHz to 2483.5MHz.
Number of Channel	Bluetooth Low Energy: 40 (at intervals of 2 MHz) ^{Note 1}
Tested Channel	Bluetooth Low Energy: 1 Mbps: 0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz) 2 Mbps: 1 (2404 MHz), 19 (2440 MHz), 38 (2478 MHz)
Antenna Type	PCB Antenna
Antenna Gain	-2.12 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 not support AFH mode (declared by client).
Declare Max rated power density	Bluetooth Low Energy: 2.5000 mW
About the Product	Only the Bluetooth was tested in this report.
Note1: 2Mbps does not support Channel 0, Channel 12, Channel 39.	

All channel was listed on the following table:

BLE 1Mbps:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

BLE 2Mbps:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
\	\	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	\	\	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	\	\

3. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

Part	Description	Channel (BLE)	Test Mode	Data Rate (Mbps)	Verdict
5.1	Frequency Error	Low/Middle/High	un-modulation	/	Pass
5.2	Occupied Bandwidth	Low/Middle/High	GFSK(BLE)	1/2(BLE)	Pass
5.3	The frequency retention time	N/A	N/A	N/A	N/A
5.4	Unwanted Emission Intensity	Low/Middle/High	GFSK(BLE)	1/2(BLE)	Pass
5.5	Antenna Power Error	Low/Middle/High	GFSK(BLE)	1/2(BLE)	Pass
5.6	Limitation of Collateral Emission of Receiver	Low/Middle/High	GFSK(BLE)	1/2(BLE)	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 12.14 dBm, 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 (%)	56%	
Atmospheric Pressure (kPa)	86 kPa to 106 kPa	
Temperature	+23.8°C	
Working Voltage of the EUT	NV (Normal Voltage)	3.80 V
	LV (Low Voltage)	3.42 V
	HV (High Voltage)	4.18 V

Note: When the input voltage deviation from the external power supply is $\pm 10\%$, and the voltage deviation provided to the radio part of the EUT (excluding the power circuit) is kept within $\pm 1\%$, only the normal voltage is used for testing.

Voltage fluctuation results:

External power supply	Rated operating voltage of EUT	Actual measured voltage of EUT	$\pm 1\%$ voltage operating range
3.420 V	3.300 V	3.288 V	3.267 V~3.333 V
3.800 V	3.300 V	3.289 V	3.267 V~3.333 V
4.180 V	3.300 V	3.288 V	3.267 V~3.333 V

4.2 Test Equipment List

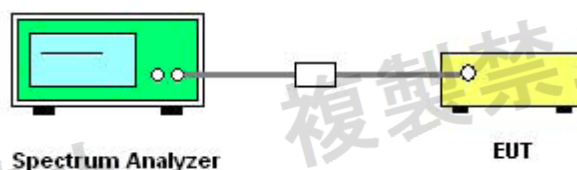
Description	Manufacturer	Model	Serial No.	Calibration Company	Calibration Address	Calibration By	Cal. Date	Cal. Due	Calibration Method
Spectrum Analyzer	KEYSIGHT	N9020A	MY46471071	GUANGZHOU NEM METROLOGY & TEST TECHNOLOGY CO., LTD.	2/F., Buiding. No.176 Hedong Road, Liwan District, Guangzhou, Guangdong, China	LiWengeng	2025.06.16	2026.06.15	c)
Power Sensor	KEYSIGHT	U2063XA	MY58000247	GUANGZHOU NEM METROLOGY & TEST TECHNOLOGY CO., LTD.	2/F., Buiding. No.176 Hedong Road, Liwan District, Guangzhou, Guangdong, China	LiWengeng	2025.06.16	2026.06.15	c)
Multimeter	Fluke	289	44860089	Ti Testing & Certification Group Co., Ltd. Shenzhen Branch	103, Building B, Ganghongji High tech Intelligent Industrial Park, No. 1008 Songbai Road, Nanshan District, Shenzhen	Huang Guoliang	2024.08.07	2025.08.06	c)
DC Power Supply	ITECH	IT6720	600103010717610007	GUANGZHOU NEM METROLOGY & TEST TECHNOLOGY CO., LTD.	2/F., Buiding. No.176 Hedong Road, Liwan District, Guangzhou, Guangdong, China	LuoJisong	2025.06.17	2026.06.16	c)

Note:

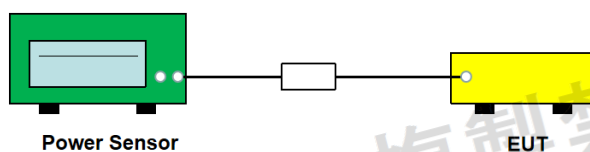
- a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- c) 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)
- d) 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

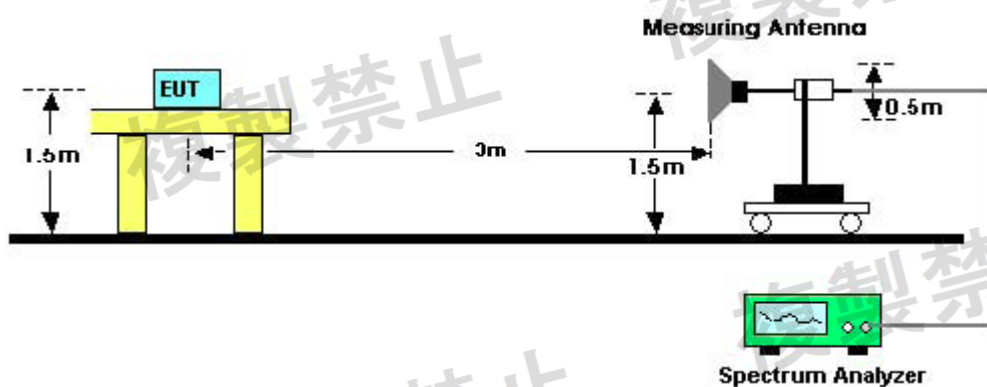


(Diagram 1)

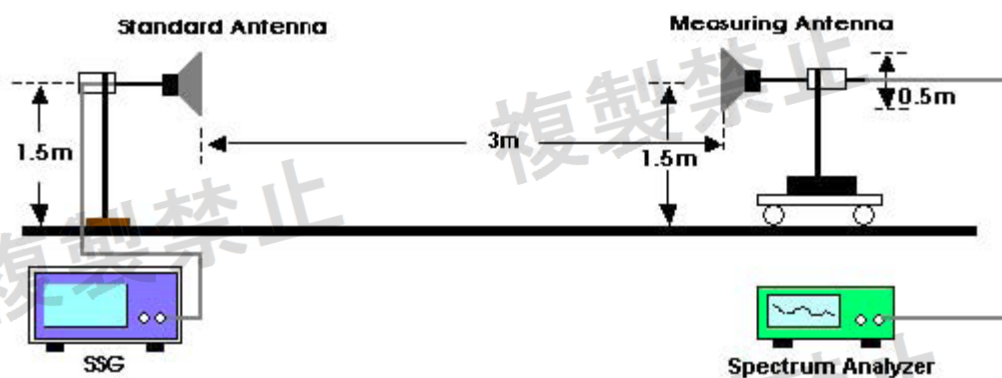


(Diagram 2)

4.3.2 For EIRP Antenna Power Test

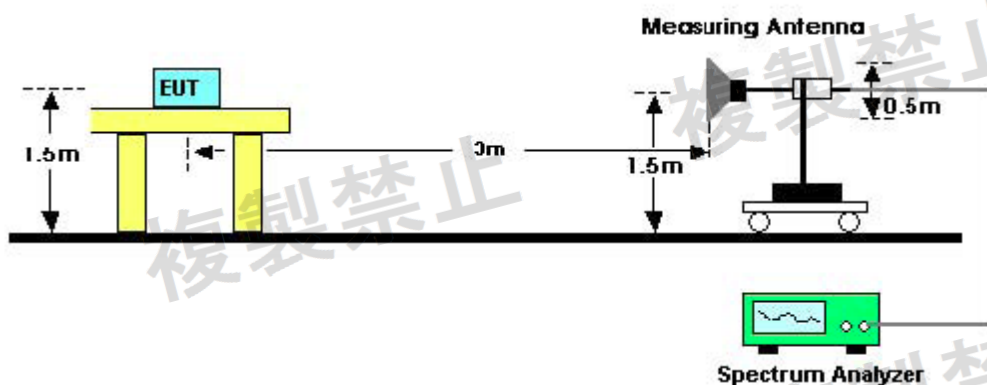


(Diagram 3)



(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 GSFK (BLE 1Mbps)

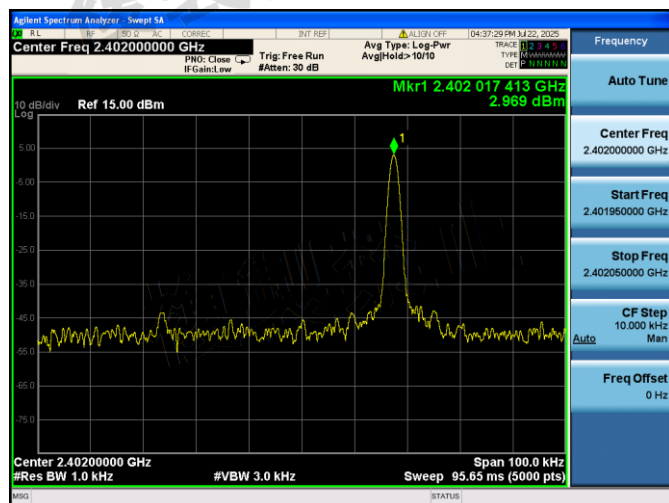
Test Mode	Test Voltage	Frequency (MHz)	Test Frequency (MHz)	Frequency Error (ppm)	Limit (ppm)	Refer to Plot	Verdict
Unmodulated	NV	2402	2402.017413	7.25	±50	A.1.1	Pass
		2440	2440.017654	7.24	±50	A.1.2	Pass
		2480	2480.017934	7.23	±50	A.1.3	Pass

Test Data for GSFK (BLE 2Mbps)

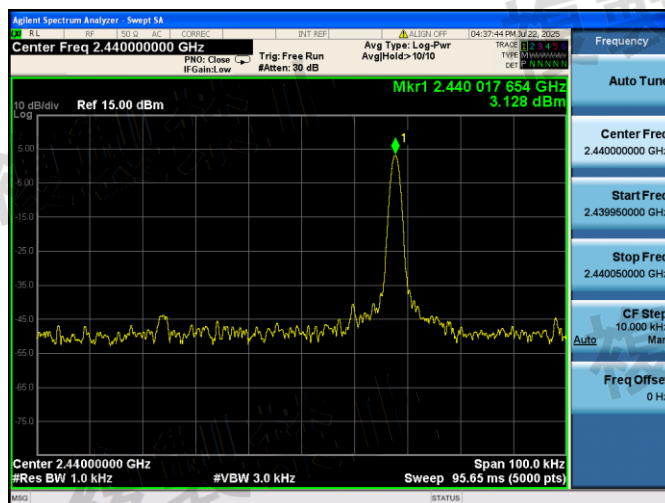
Test Mode	Test Voltage	Frequency (MHz)	Test Frequency (MHz)	Frequency Error (ppm)	Limit (ppm)	Refer to Plot	Verdict
Unmodulated	NV	2404	2404.017473	7.27	±50	A.1.4	Pass
		2440	2440.017794	7.29	±50	A.1.5	Pass
		2478	2478.018134	7.32	±50	A.1.6	Pass

Test Plots for GSKF (BLE 1Mbps)

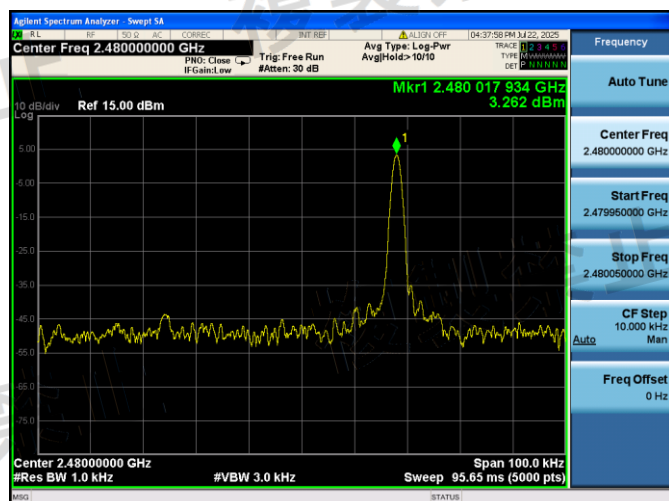
A.1.1 NV 2402 Channel



A.1.2 NV 2440 Channel

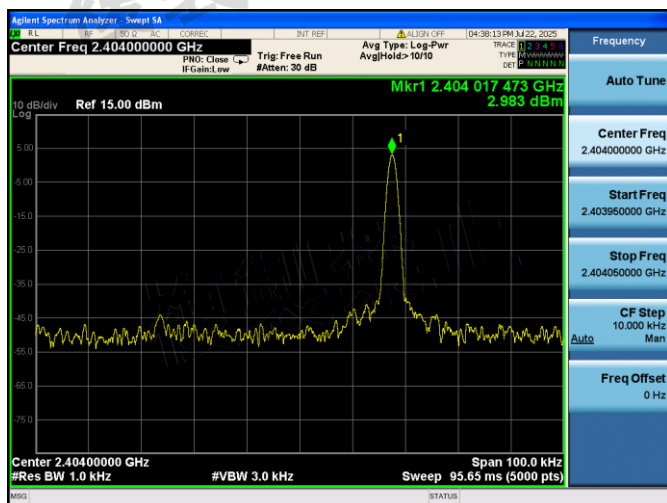


A.1.3 NV 2480 Channel

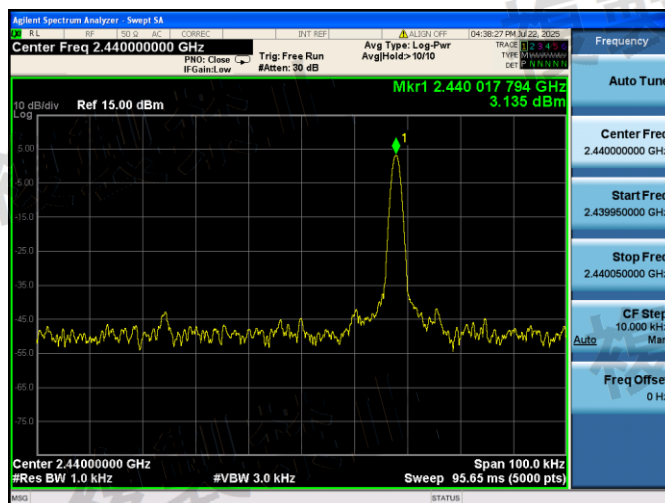


Test Plots for GSKF (BLE 2Mbps)

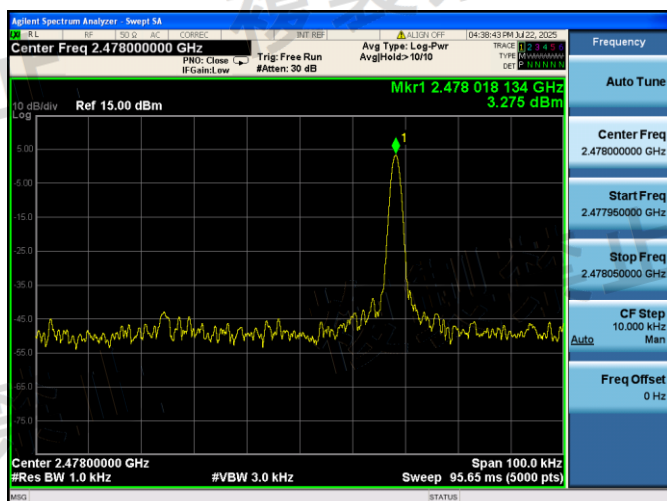
A.1.4 NV 2404 Channel



A.1.5 NV 2440 Channel



A.1.6 NV 2478 Channel



5.2 Occupied 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

- 1 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

- 2 After repeating sweeps until the display shows steady data, store the values at all data points into the computer array variables.
- 3 Convert the dB values at all data points to antilogarithm on the power dimension.
- 4 Obtain sum total of the power at all data points, and store it as "total power".
- 5 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".
- 6 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 GSFK (BLE 1Mbps)

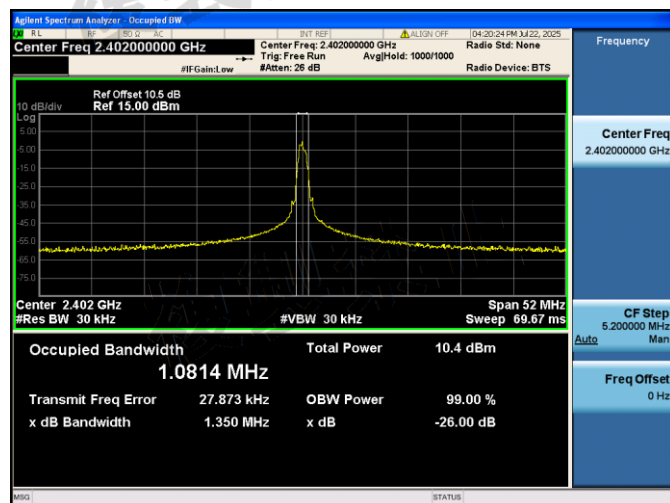
Results of Occupied Bandwidth	Channel	Test Voltage	Measured 99% Occupied Bandwidth (MHz)	Occupied Bandwidth Limit (MHz)	Refer to Plot	Verdict
	Low	NV	1.08	≤ 26	A.2.1	Pass
	Middle		1.08	≤ 26	A.2.2	Pass
	High		1.09	≤ 26	A.2.3	Pass

Test Data for GSFK (BLE 2Mbps)

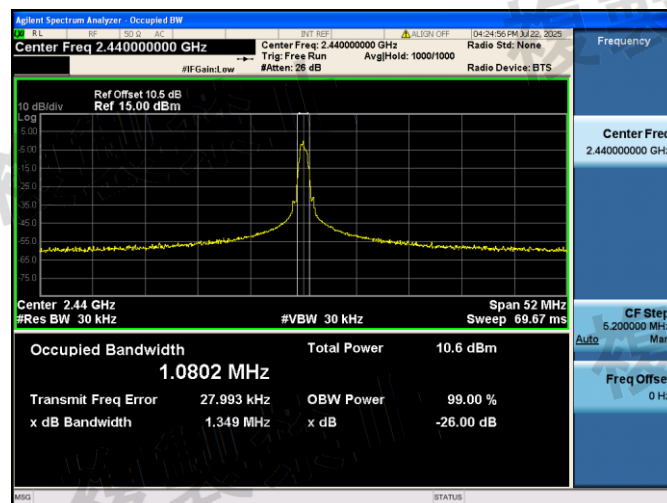
Results of Occupied Bandwidth	Channel	Test Voltage	Measured 99% Occupied Bandwidth (MHz)	Occupied Bandwidth Limit (MHz)	Refer to Plot	Verdict
	Low	NV	2.08	≤ 26	A.2.4	Pass
	Middle		2.08	≤ 26	A.2.5	Pass
	High		2.08	≤ 26	A.2.6	Pass

Test Plots for GSKF (BLE 1Mbps)

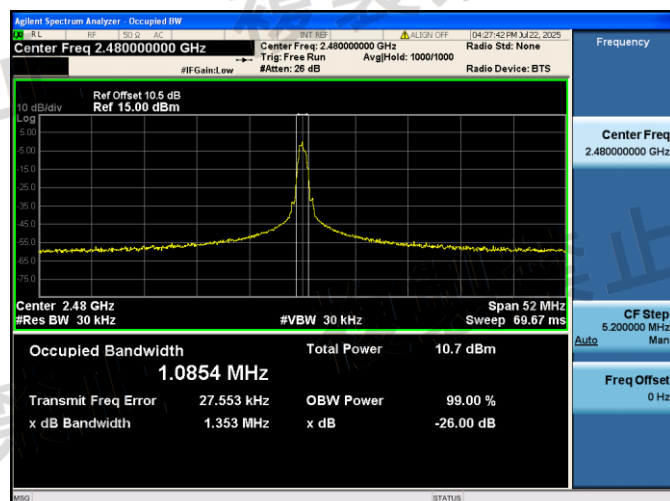
A.2.1 Low Channel NV



A.2.2 Middle Channel NV

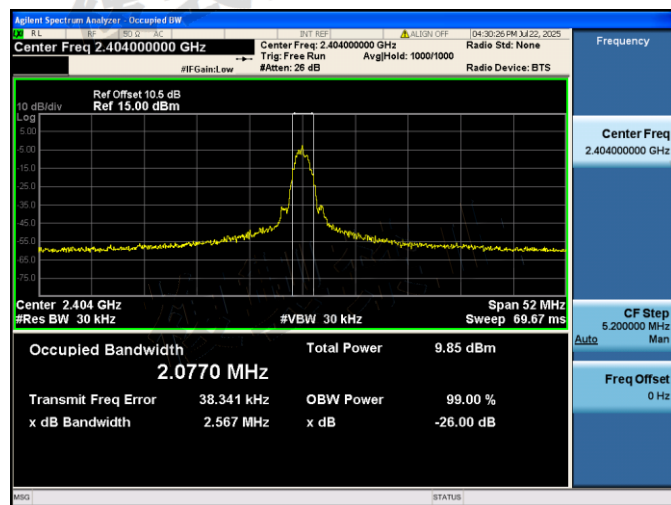


A.2.3 High Channel NV

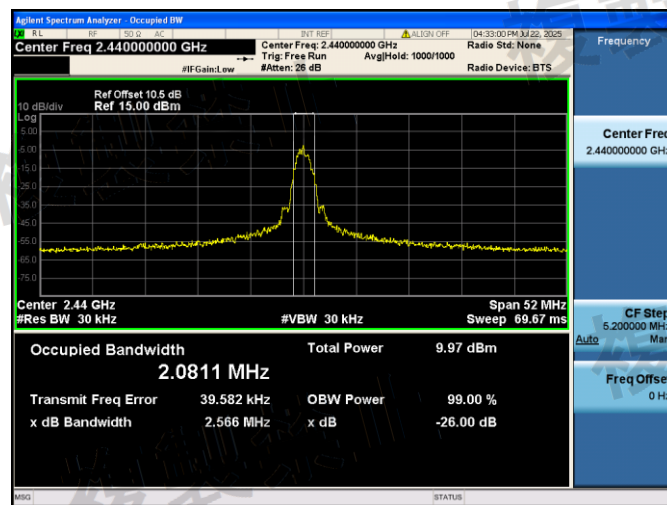


Test Plots for GSKF (BLE 2Mbps)

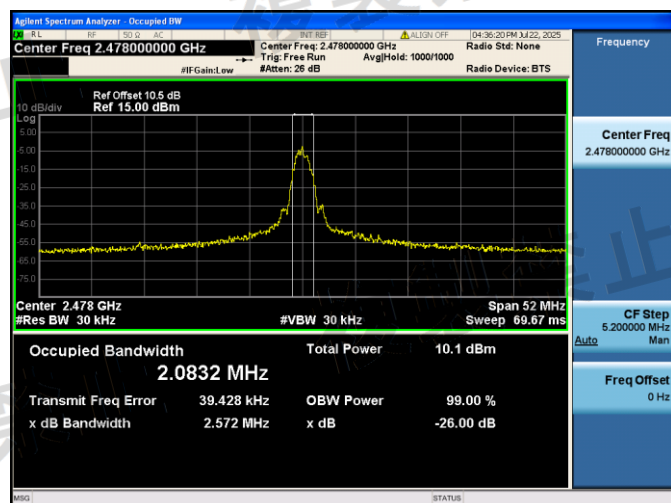
A.2.4 Low Channel NV



A.2.5 Middle Channel NV



A.2.6 High Channel NV



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

Note: Not applicable.

5.4 Unwanted Emission Intensity Measurement

5.4.1 Limit

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

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.

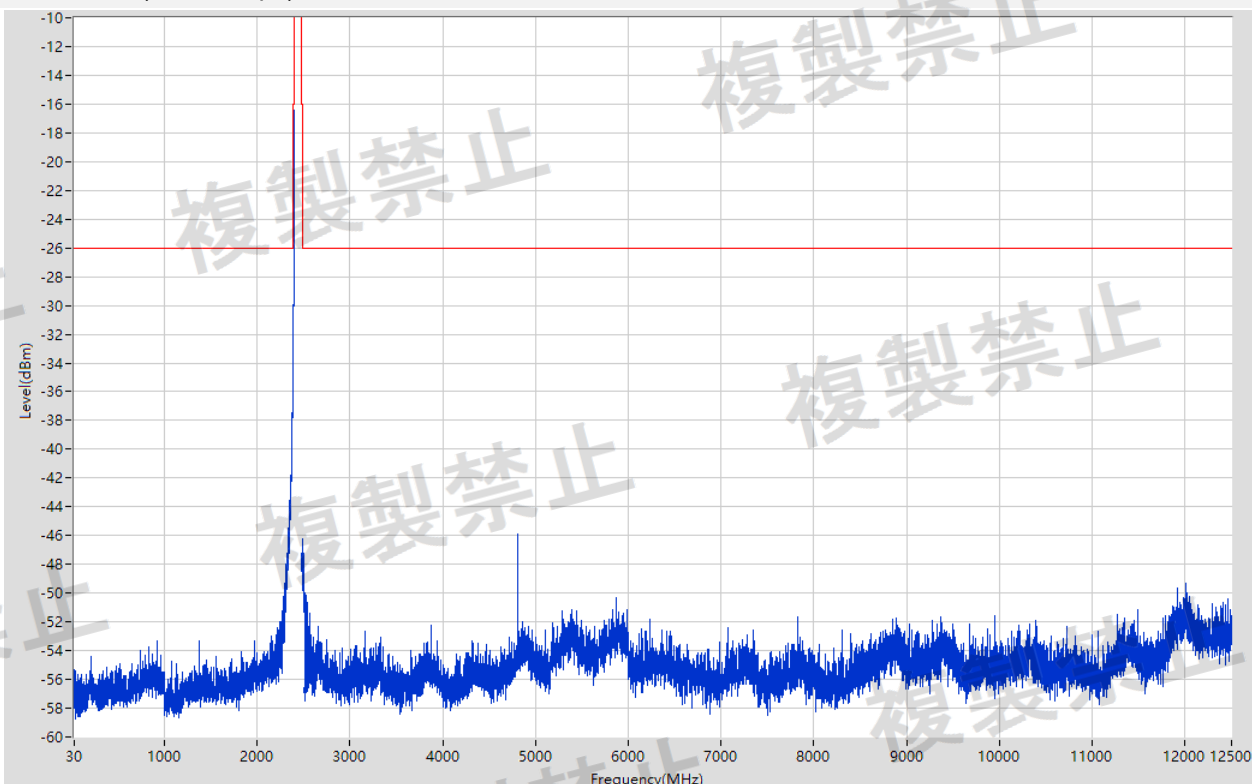
5.4.6 Test Result

Test Data

Mode	Test Voltage	Channel	Refer to Plot	Verdict
GFSK (BLE 1Mbps)	Low	NV	A.4.1	Pass
	Middle		A.4.2	Pass
	High		A.4.3	Pass
GFSK (BLE 2Mbps)	Low	NV	A.4.4	Pass
	Middle		A.4.5	Pass
	High		A.4.6	Pass

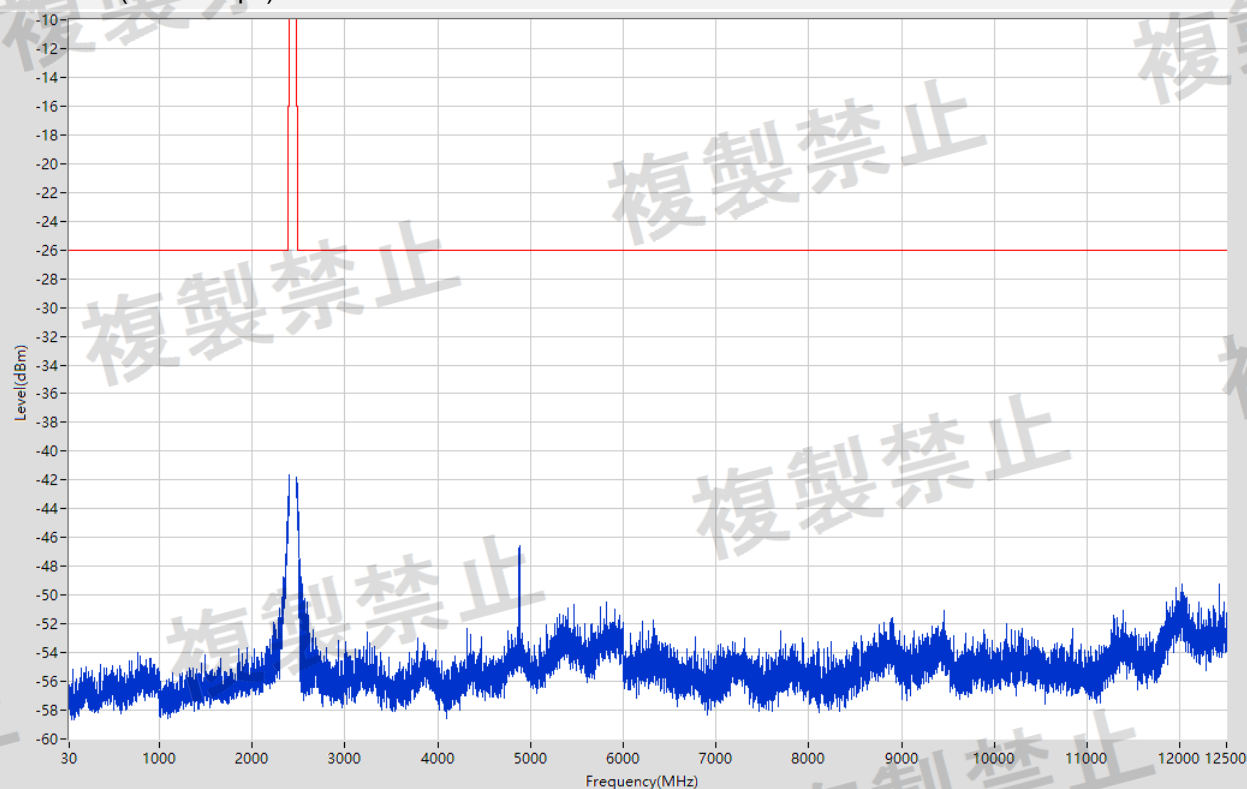
Test Plots

A.4.1 GFSK (BLE 1Mbps) NV Low Channel



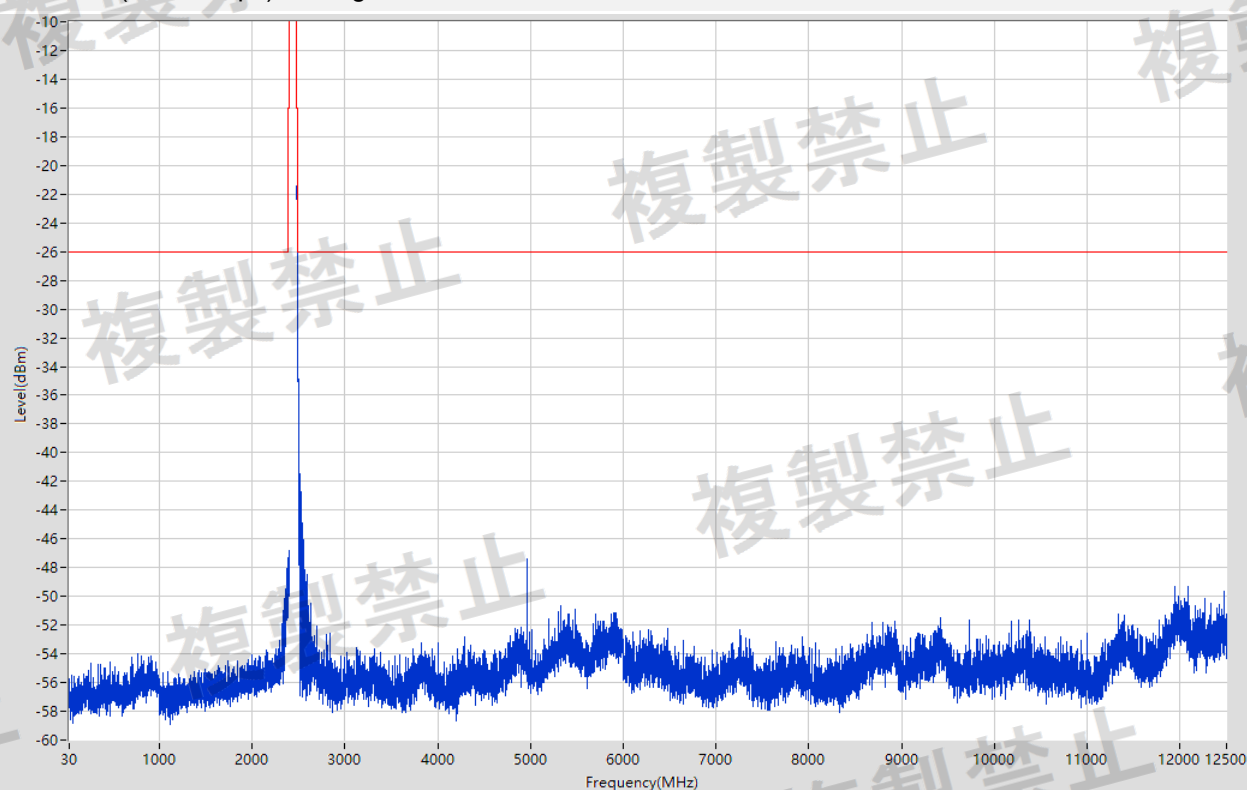
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	922	-53.34	0.005	2.5	Pass
1000	2374	1	Peak	2374	-39.86	0.103	2.5	Pass
2374	2387	1	Peak	2386.935	-34.31	0.370	2.5	Pass
2387	2400	1	Peak	2400	-16.42	22.807	25	N/A
			Sample		-49.713	0.011	25	Pass
2483.5	2496.5	1	Peak	2486.49	-46.23	0.024	25	Pass
2496.5	2509.5	1	Peak	2498.938	-47.27	0.019	2.5	Pass
2509.5	6000	1	Peak	4803.829	-45.88	0.026	2.5	Pass
6000	12500	1	Peak	12011	-49.34	0.012	2.5	Pass

A.4.2 GFSK (BLE 1Mbps) NV Middle Channel



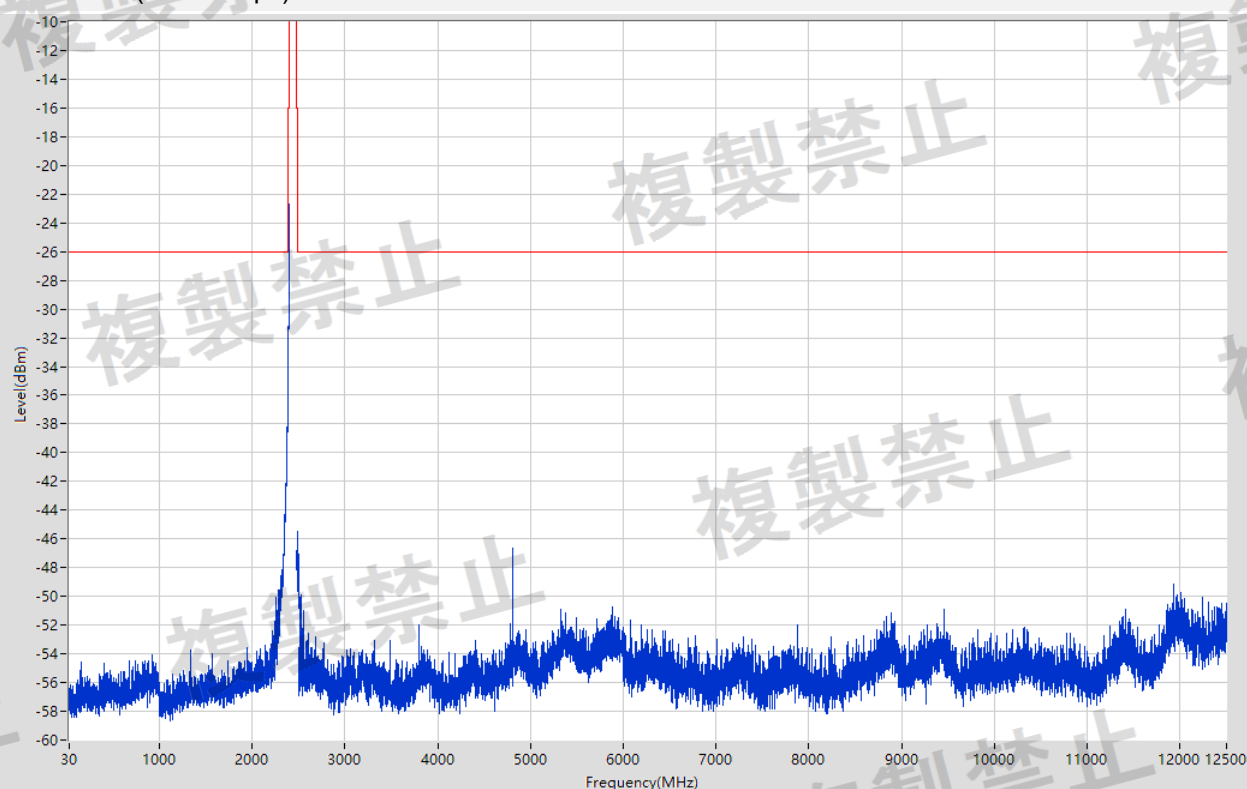
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	766	-53.96	0.004	2.5	Pass
1000	2374	1	Peak	2371	-46.19	0.024	2.5	Pass
2374	2387	1	Peak	2384.66	-43.91	0.041	2.5	Pass
2387	2400	1	Peak	2399.61	-41.67	0.068	25	Pass
2483.5	2496.5	1	Peak	2483.598	-41.84	0.065	25	Pass
2496.5	2509.5	1	Peak	2496.5	-44.16	0.038	2.5	Pass
2509.5	6000	1	Peak	4879.84	-46.53	0.022	2.5	Pass
6000	12500	1	Peak	12424	-49.24	0.012	2.5	Pass

A.4.3 GFSK (BLE 1Mbps) NV High Channel



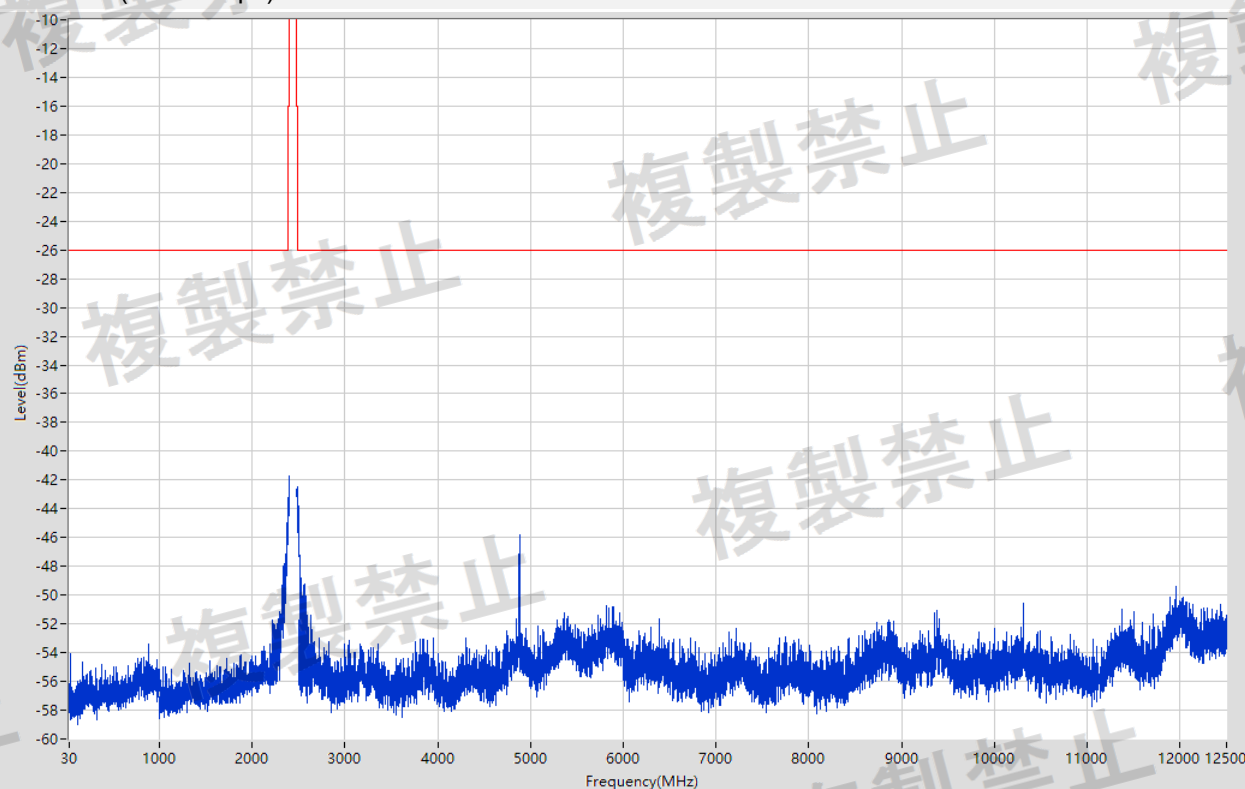
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	773	-53.99	0.004	2.5	Pass
1000	2374	1	Peak	2359	-49.48	0.011	2.5	Pass
2374	2387	1	Peak	2382.515	-47.88	0.016	2.5	Pass
2387	2400	1	Peak	2399.058	-46.78	0.021	25	Pass
2483.5	2496.5	1	Peak	2483.5	-21.42	7.204	25	Pass
2496.5	2509.5	1	Peak	2496.728	-34.66	0.342	2.5	Pass
2509.5	6000	1	Peak	2509.5	-40.08	0.098	2.5	Pass
6000	12500	1	Peak	12081	-49.31	0.012	2.5	Pass

A.4.4 GFSK (BLE 2Mbps) NV Low Channel



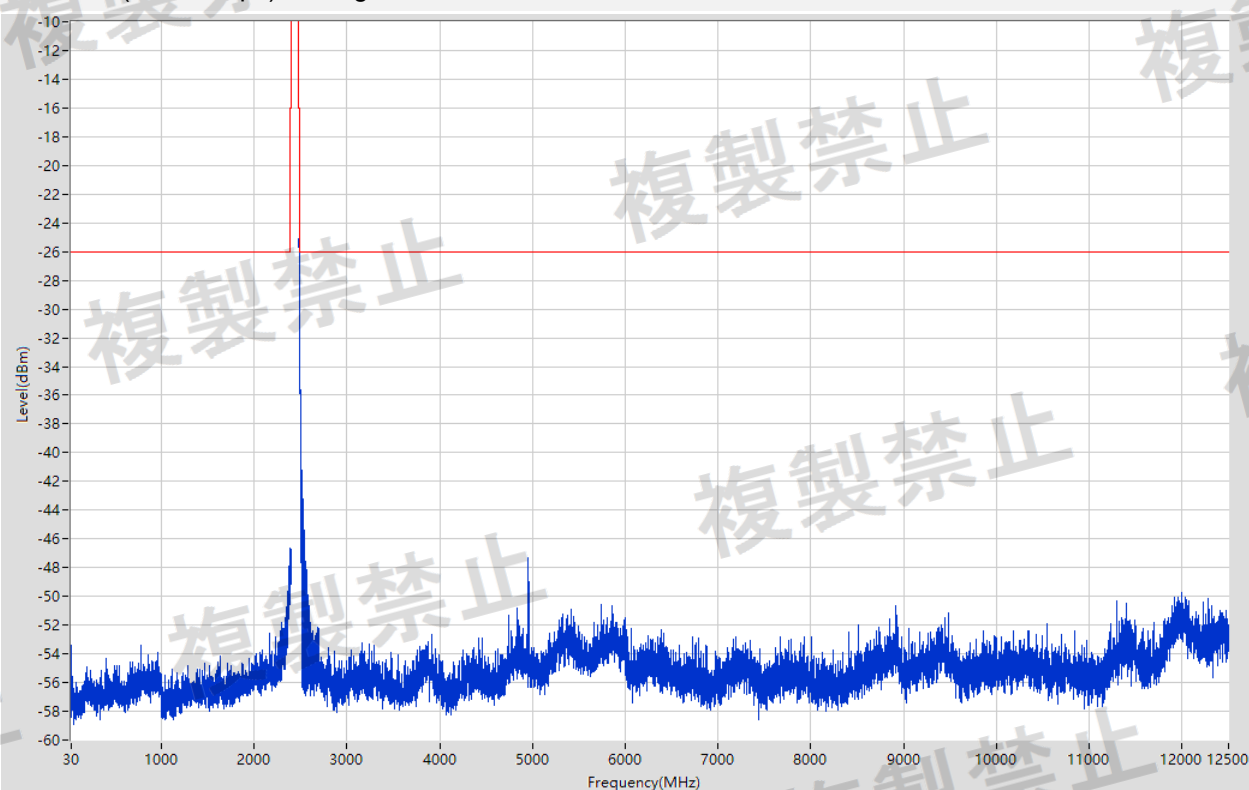
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm/MHz)	Power (μW/MHz)	Limit (μW/MHz)	Verdict
30	1000	1	Peak	926	-54.09	0.004	2.5	Pass
1000	2374	1	Peak	2374	-40.78	0.084	2.5	Pass
2374	2387	1	Peak	2386.545	-35.68	0.271	2.5	Pass
2387	2400	1	Peak	2400	-22.72	5.348	25	Pass
2483.5	2496.5	1	Peak	2484.085	-45.49	0.028	25	Pass
2496.5	2509.5	1	Peak	2497.053	-47.06	0.020	2.5	Pass
2509.5	6000	1	Peak	4807.829	-46.66	0.022	2.5	Pass
6000	12500	1	Peak	11927	-49.17	0.012	2.5	Pass

A.4.5 GFSK (BLE 2Mbps) 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	884	-53.38	0.005	2.5	Pass
1000	2374	1	Peak	2369	-46.07	0.025	2.5	Pass
2374	2387	1	Peak	2385.538	-44.04	0.039	2.5	Pass
2387	2400	1	Peak	2399.545	-41.74	0.067	25	Pass
2483.5	2496.5	1	Peak	2484.443	-42.44	0.057	25	Pass
2496.5	2509.5	1	Peak	2498.353	-43.84	0.041	2.5	Pass
2509.5	6000	1	Peak	4880.84	-45.84	0.026	2.5	Pass
6000	12500	1	Peak	11961	-49.37	0.012	2.5	Pass

A.4.6 GFSK (BLE 2Mbps) 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	32	-53.41	0.005	2.5	Pass
1000	2374	1	Peak	2374	-48.93	0.013	2.5	Pass
2374	2387	1	Peak	2386.513	-46.75	0.021	2.5	Pass
2387	2400	1	Peak	2390.64	-46.65	0.022	25	Pass
2483.5	2496.5	1	Peak	2483.533	-25.1	3.090	25	Pass
2496.5	2509.5	1	Peak	2496.89	-35.61	0.275	2.5	Pass
2509.5	6000	1	Peak	2509.5	-40.28	0.094	2.5	Pass
6000	12500	1	Peak	11999	-49.71	0.011	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 (BLE 1Mbps) Test Result

Duty cycle = 0.617

Manufacturer declares the rated power = 2.5000 mW

Test Channel	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Error	Upper Limit (%)	Verdict
Low	NV	3.07	2.0277	-18.89%	20	Pass
Middle		3.23	2.1038	-15.85%	20	Pass
High		3.38	2.1777	-12.89%	20	Pass

EIRP Antenna Power

Channel	Test Voltage	Frequency (MHz)	Measured EIRP (dBm)	Limit (dBm)	Verdict
Low	NV	2402	0.95	12.14	Pass
Middle		2440	1.11		Pass
High		2480	1.26		Pass

GFSK (BLE 2Mbps) Test Result

Duty cycle = 0.315

Manufacturer declares the rated power = 2.5000 mW

Test Channel	Test Voltage	Antenna Power (dBm)	Antenna Power (mW)	Antenna Power Error	Upper Limit (%)	Verdict
Low	NV	3.08	2.0324	-18.71%	20	Pass
Middle		3.22	2.0989	-16.04%	20	Pass
High		3.32	2.1478	-14.09%	20	Pass

EIRP Antenna Power

Channel	Test Voltage	Frequency (MHz)	Measured EIRP (dBm)	Limit (dBm)	Verdict
Low	NV	2404	0.96	12.14	Pass
Middle		2440	1.10		Pass
High		2478	1.20		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.

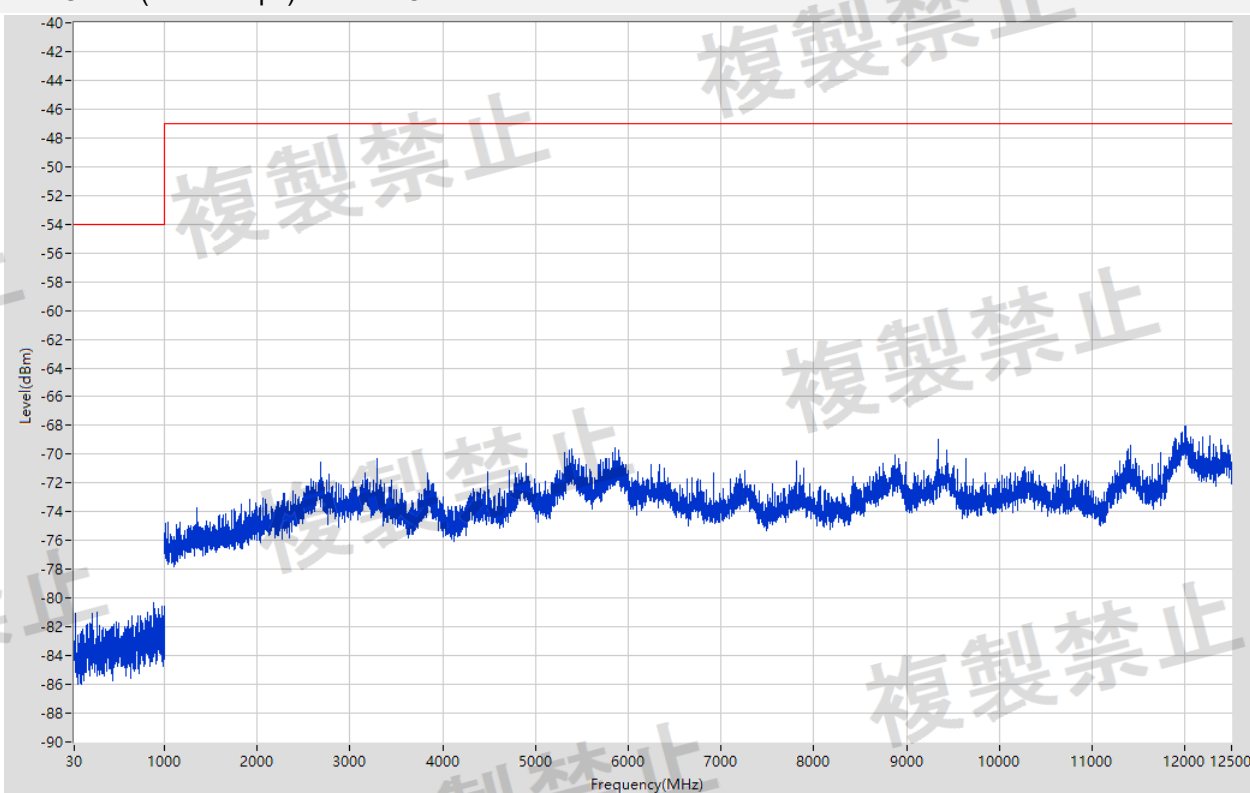
5.6.6 Test Result

Test Data

Mode	Test Voltage	Channel	Refer to Plot	Verdict
GFSK (BLE 1Mbps)	Low	NV	A.6.1	Pass
	Middle		A.6.2	Pass
	High		A.6.3	Pass
GFSK (BLE 2Mbps)	Low	NV	A.6.4	Pass
	Middle		A.6.5	Pass
	High		A.6.6	Pass

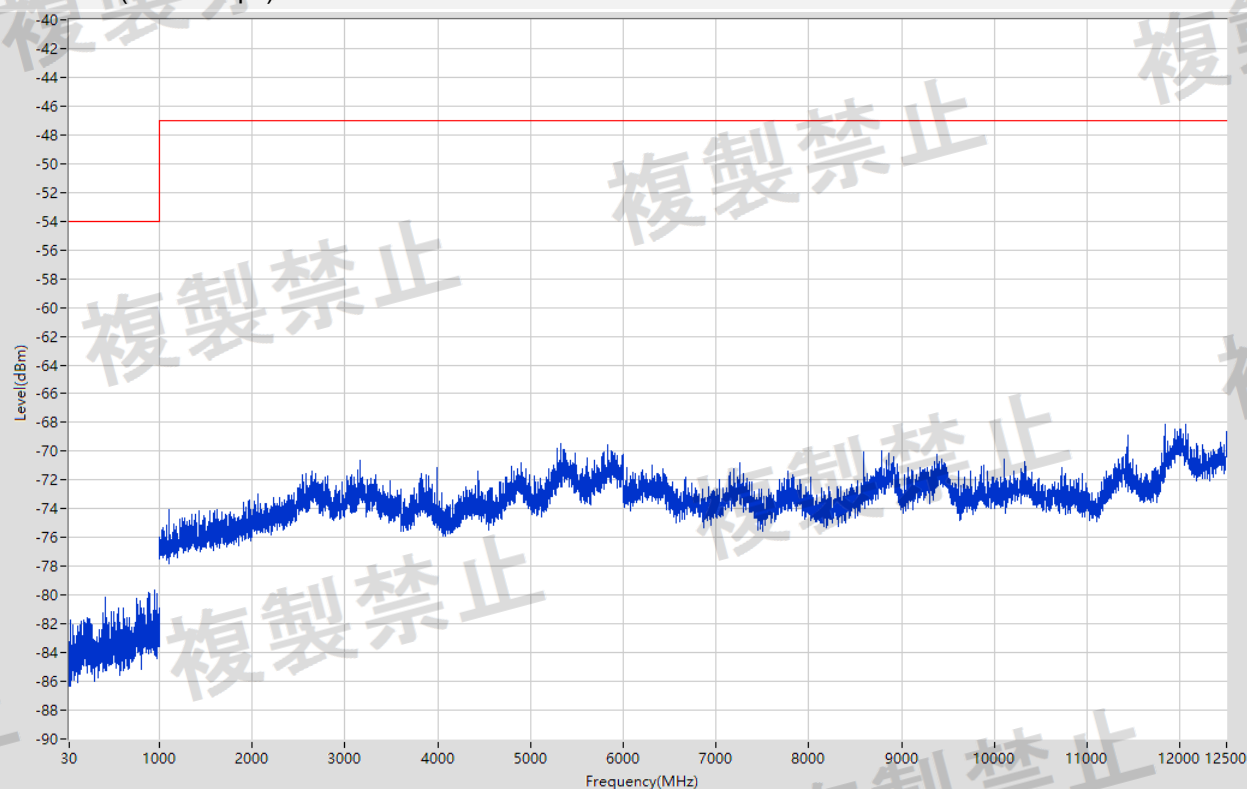
Test Plots

A.6.1 GFSK (BLE 1Mbps) NV Low Channel



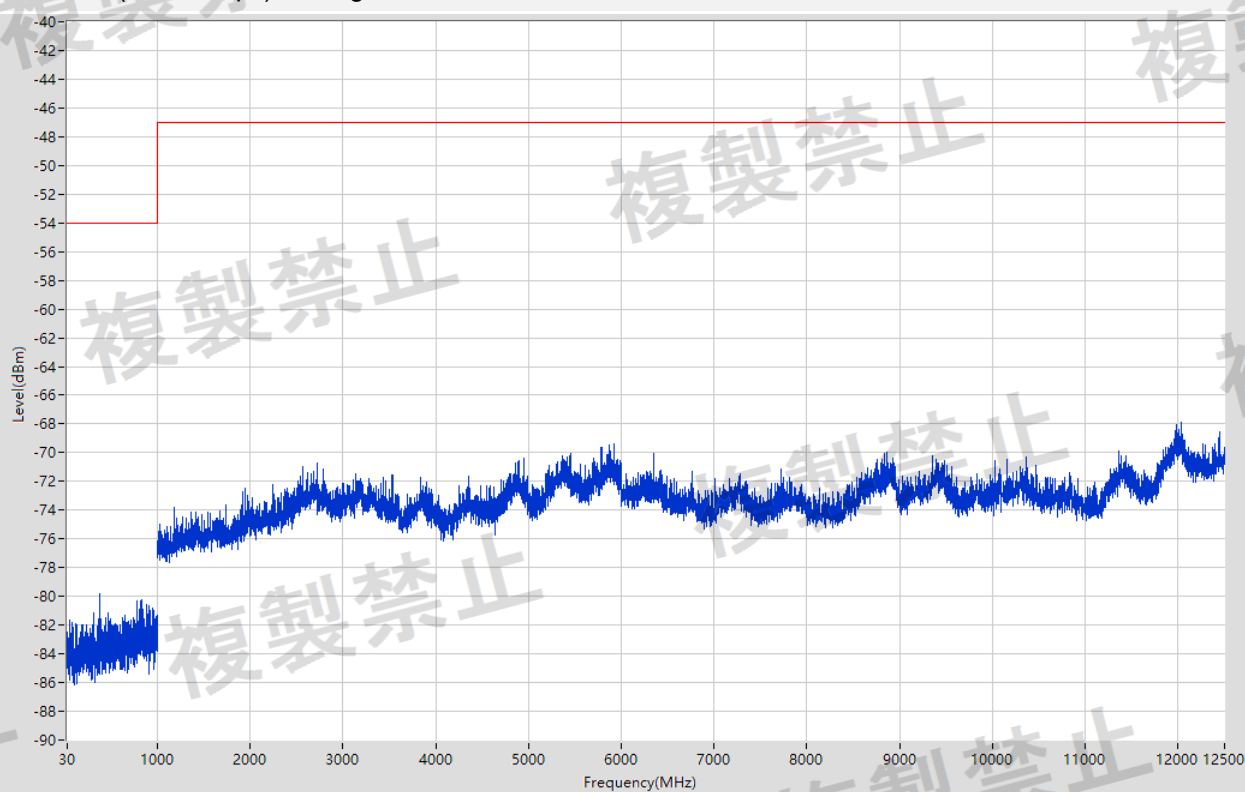
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	881.66	-80.34	0.01	-54	4.0	26.34	Pass
1000	6000	1	Peak	5855	-69.52	0.11	-47	20.0	22.52	Pass
6000	12500	1	Peak	11996.25	-68.01	0.16	-47	20.0	21.01	Pass

A.6.2 GFSK (BLE 1Mbps) NV Middle Channel



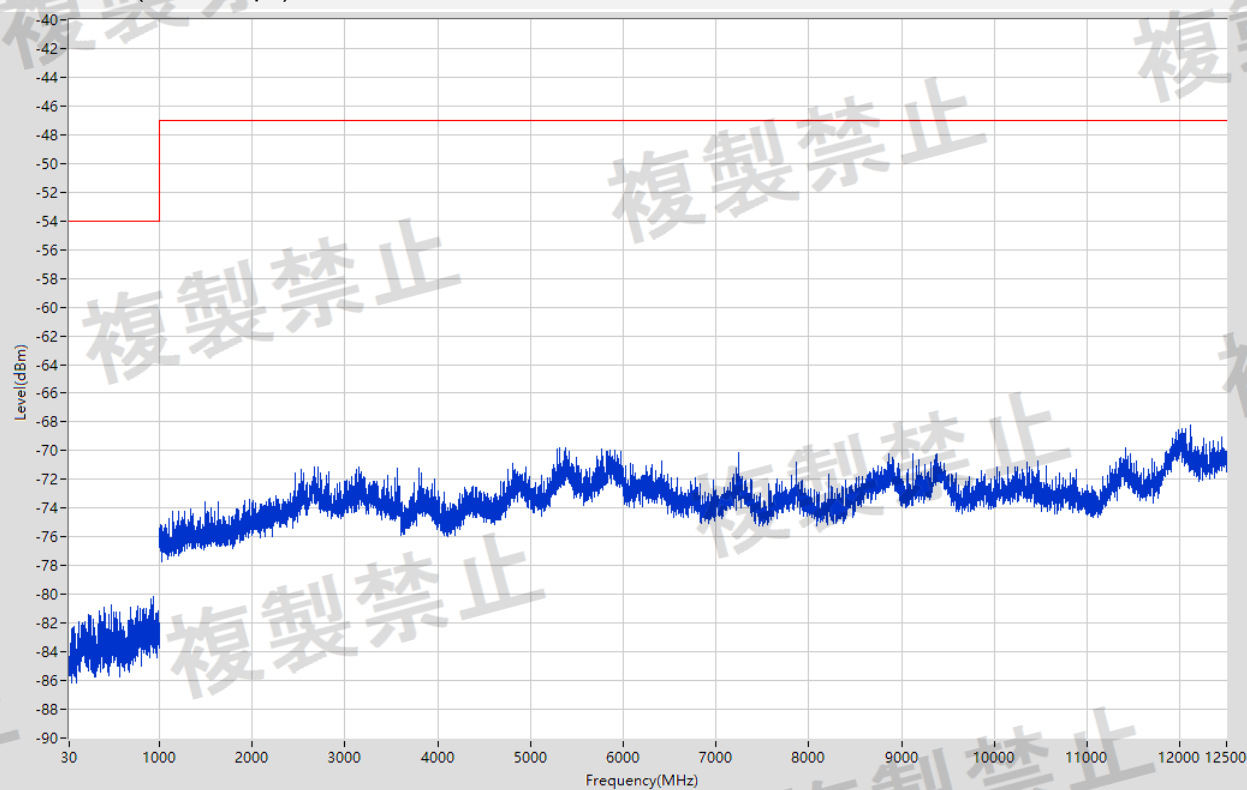
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	952.47	-79.61	0.01	-54	4.0	25.61	Pass
1000	6000	1	Peak	5321.25	-69.48	0.11	-47	20.0	22.48	Pass
6000	12500	1	Peak	11833.75	-68.13	0.15	-47	20.0	21.13	Pass

A.6.3 GFSK (BLE 1Mbps) NV High Channel



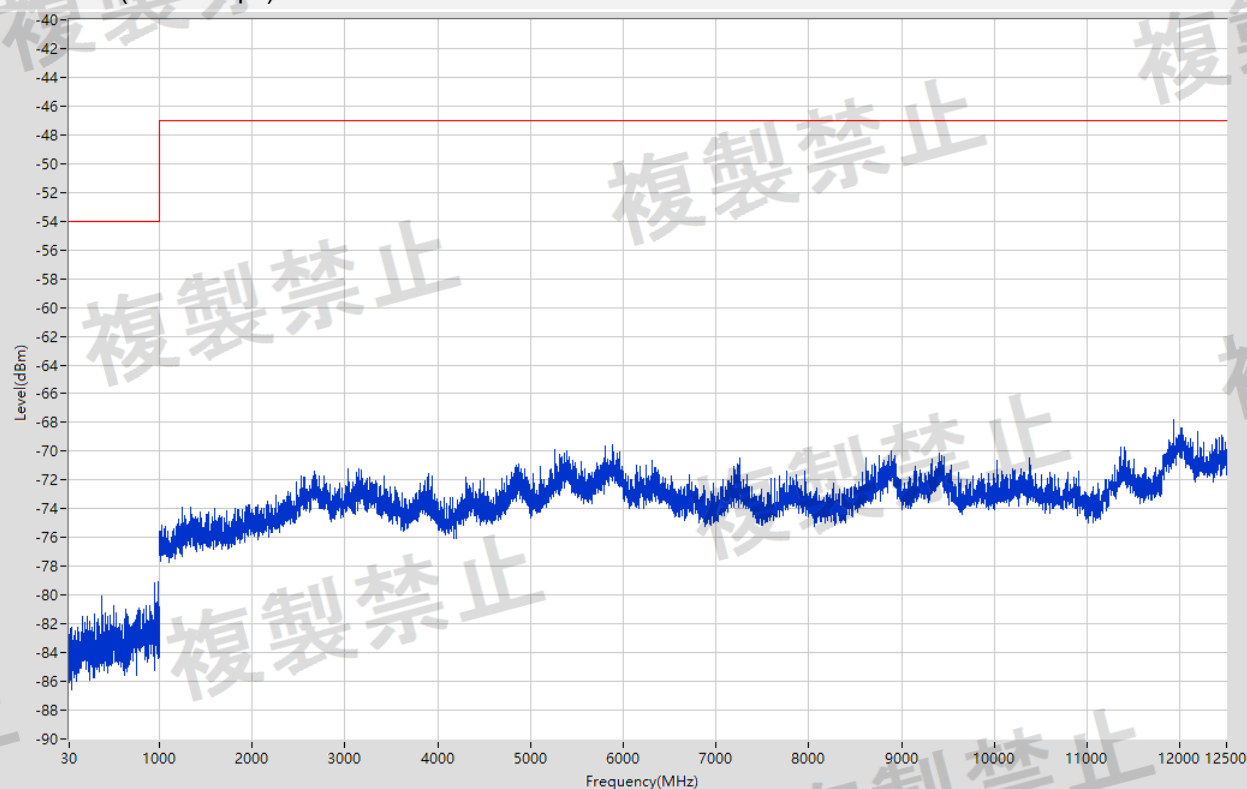
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	385.99	-79.84	0.01	-54	4.0	25.84	Pass
1000	6000	1	Peak	5920	-69.35	0.12	-47	20.0	22.35	Pass
6000	12500	1	Peak	12032	-67.91	0.16	-47	20.0	20.91	Pass

A.6.4 GFSK (BLE 2Mbps) NV Low Channel



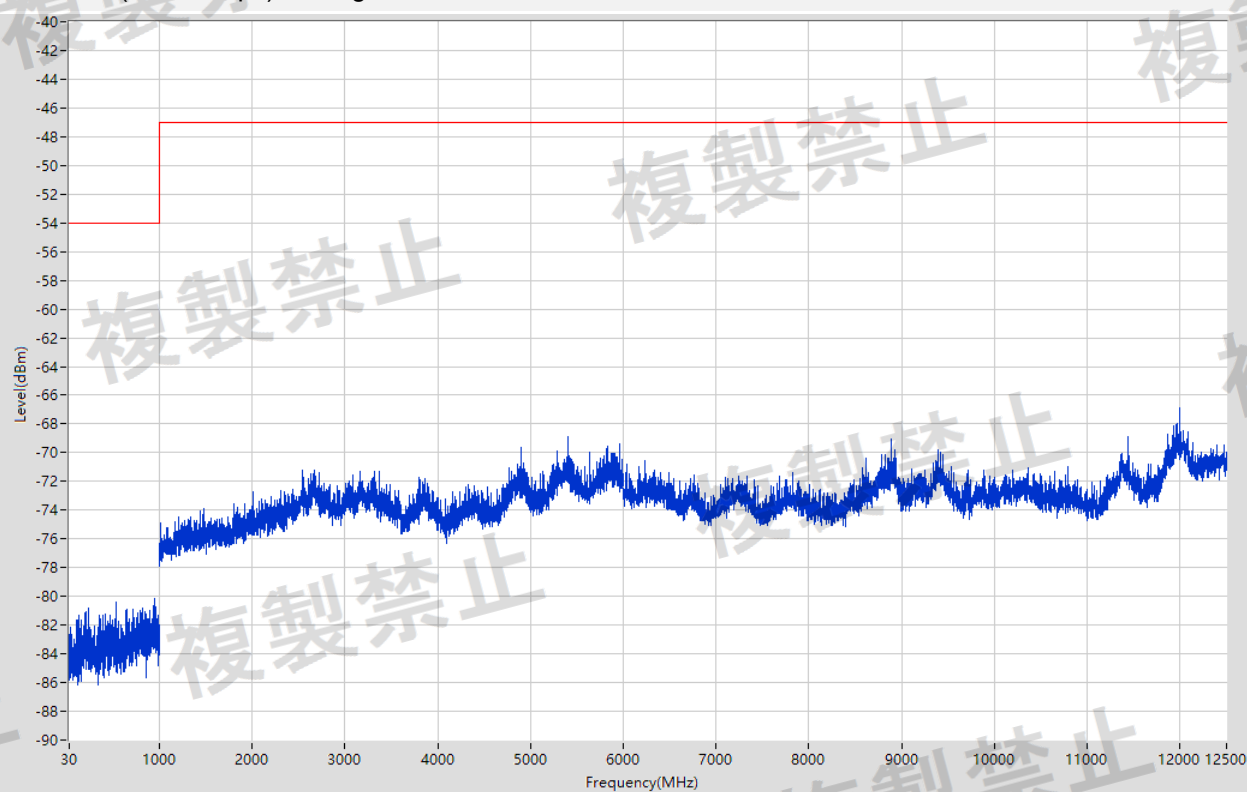
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Power (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Verdict
30	1000	0.1	Peak	941.8	-80.18	0.01	-54	4.0	26.18	Pass
1000	6000	1	Peak	5310	-69.78	0.11	-47	20.0	22.78	Pass
6000	12500	1	Peak	12110	-68.23	0.15	-47	20.0	21.23	Pass

A.6.5 GFSK (BLE 2Mbps) 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	991.27	-79.1	0.01	-54	4.0	25.1	Pass
1000	6000	1	Peak	5883.75	-69.59	0.11	-47	20.0	22.59	Pass
6000	12500	1	Peak	11929.625	-67.81	0.17	-47	20.0	20.81	Pass

A.6.6 GFSK (BLE 2Mbps) 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	947.62	-80.12	0.01	-54	4.0	26.12	Pass
1000	6000	1	Peak	5398.75	-68.87	0.13	-47	20.0	21.87	Pass
6000	12500	1	Peak	12001.125	-66.9	0.2	-47	20.0	19.9	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 P_t to give the equivalent output level of "E" or calculate P_t with SSG output which gives the nearest of "E" and difference ($\pm 1\text{dB}$). Record the P_t .
- 8 Calculate EIRP by the formula below $\text{EIRP} = G_t - L + P_t$.

G_t : 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.

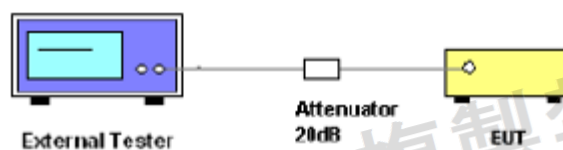
5.9 Radio Interference Prevention Capability Measurement

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 form EUT. b. Check the transmitted identification codes with the demodulator.
- In the case of receiving the identification code: a. Transmit the predetermined identification codes form the counterpart. b. Check if communication is 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 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

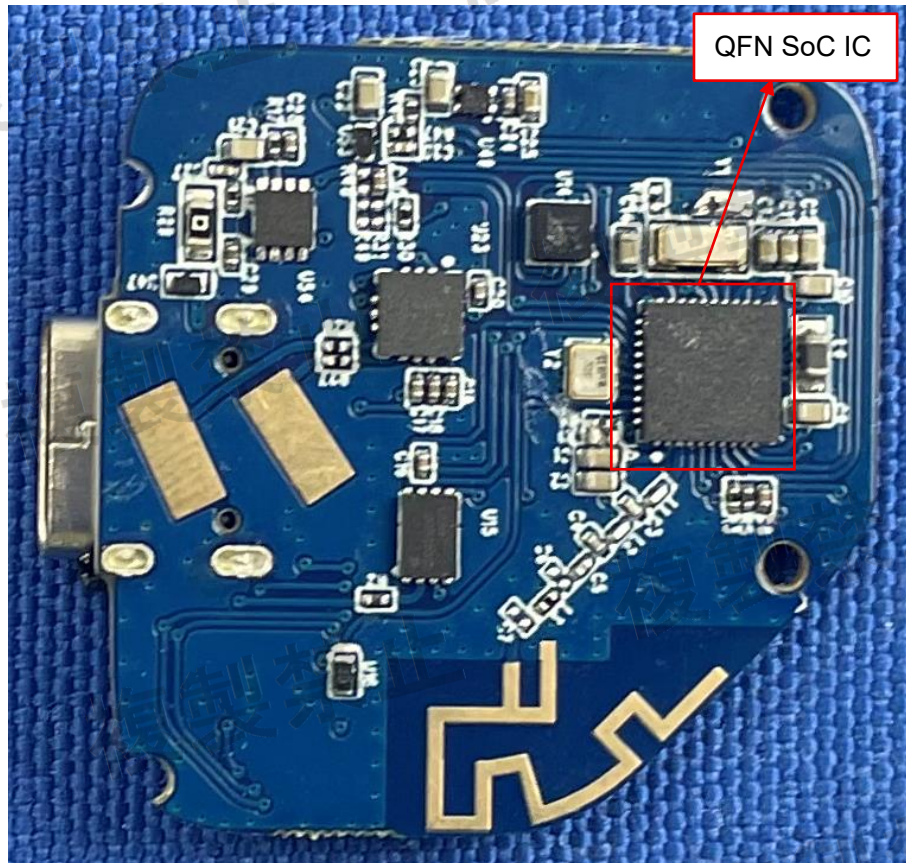
BD Address: E1464D0FAA25

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:

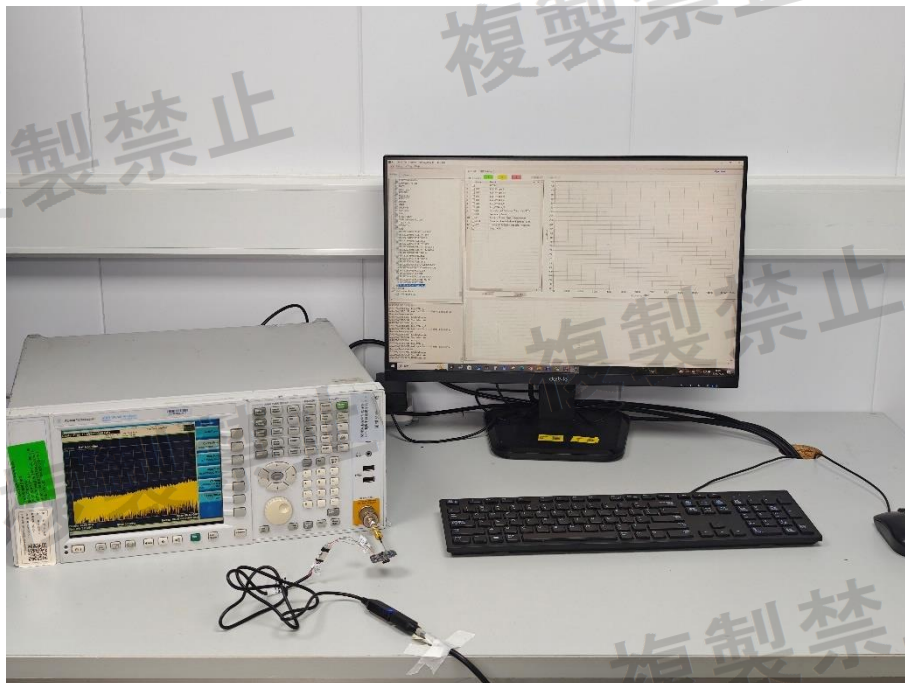
Protected Method	Description
Structure protection	The RF Module is QFN SoC IC, and RF part is mounted on PCB with surface mount technology, can't be easily modified
Reference Photo	



ANNEX A TEST SETUP PHOTOS

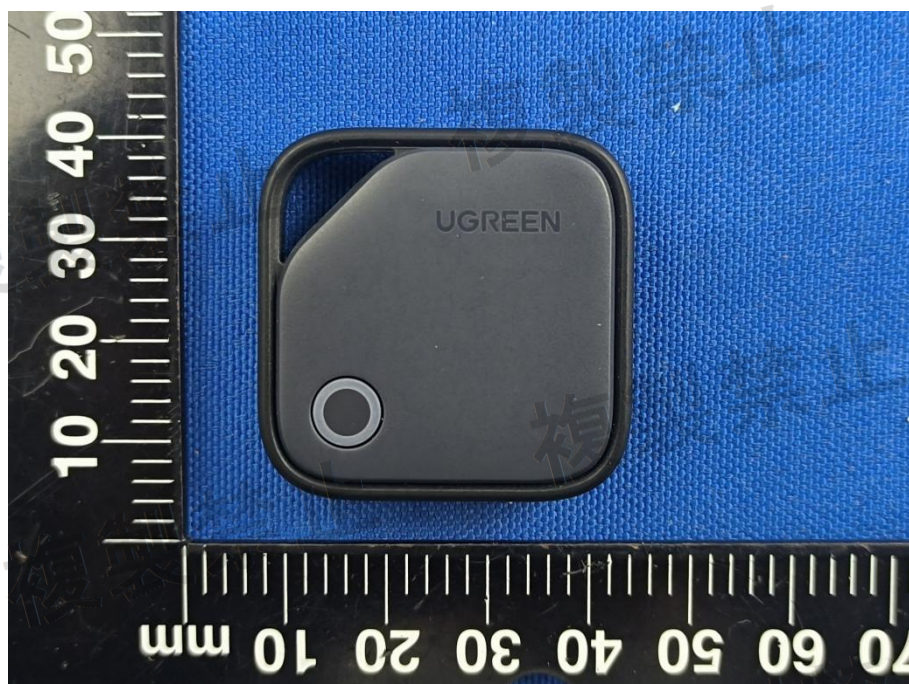
1 Conducted Test Photo

Conducted Test

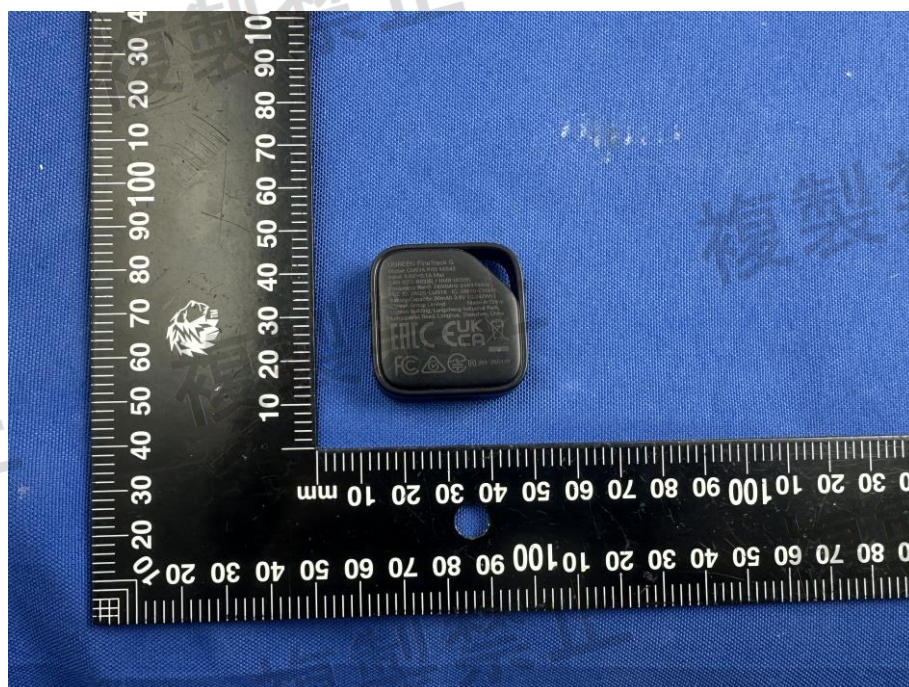


ANNEX B EUT EXTERNAL PHOTOS

FRONT VIEW OF EUT



REAR VIEW OF EUT



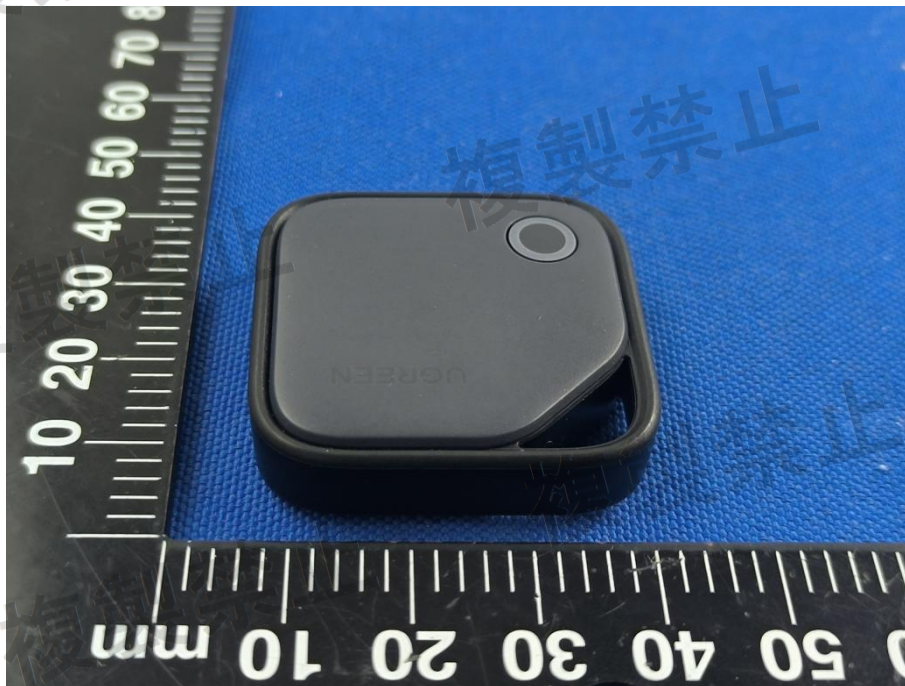
LEFT VIEW OF EUT



RIGHT VIEW OF EUT



TOP VIEW OF EUT



BOTTOM VIEW OF EUT



CLOSE-UP

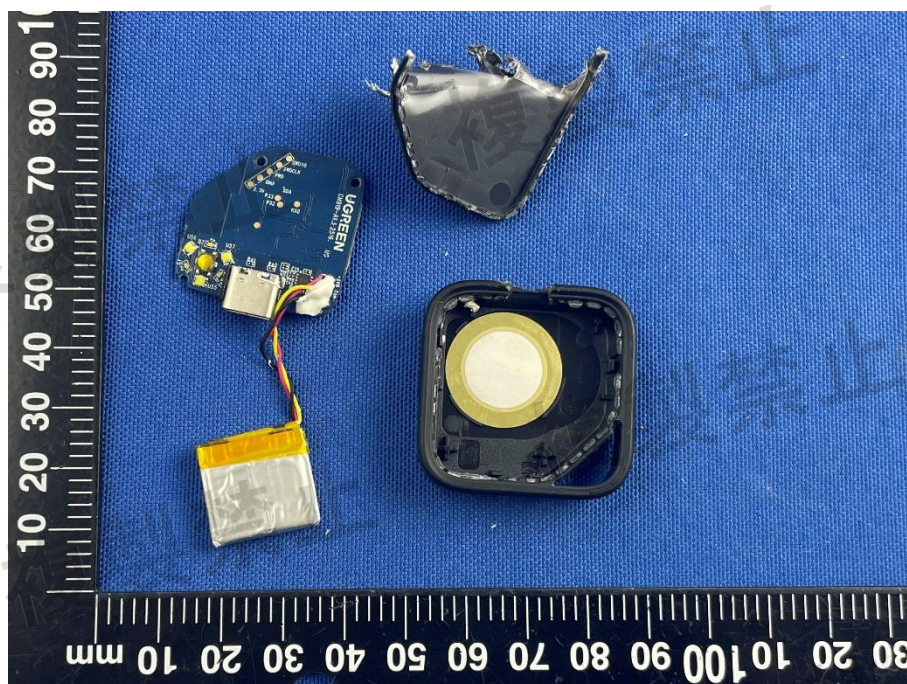


Accessory-USB Cable

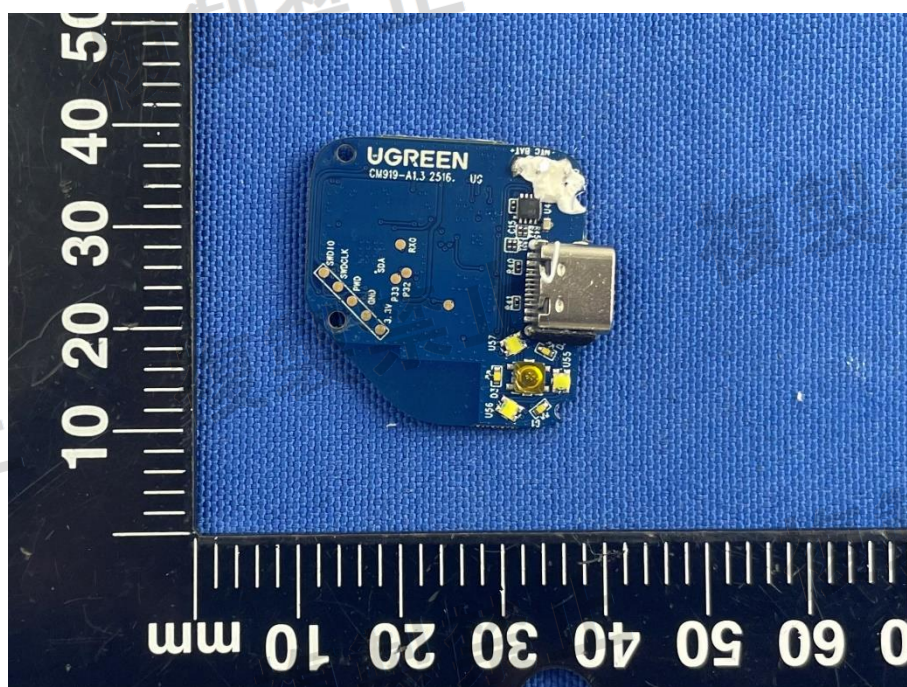


ANNEX C EUT INTERNAL PHOTOS

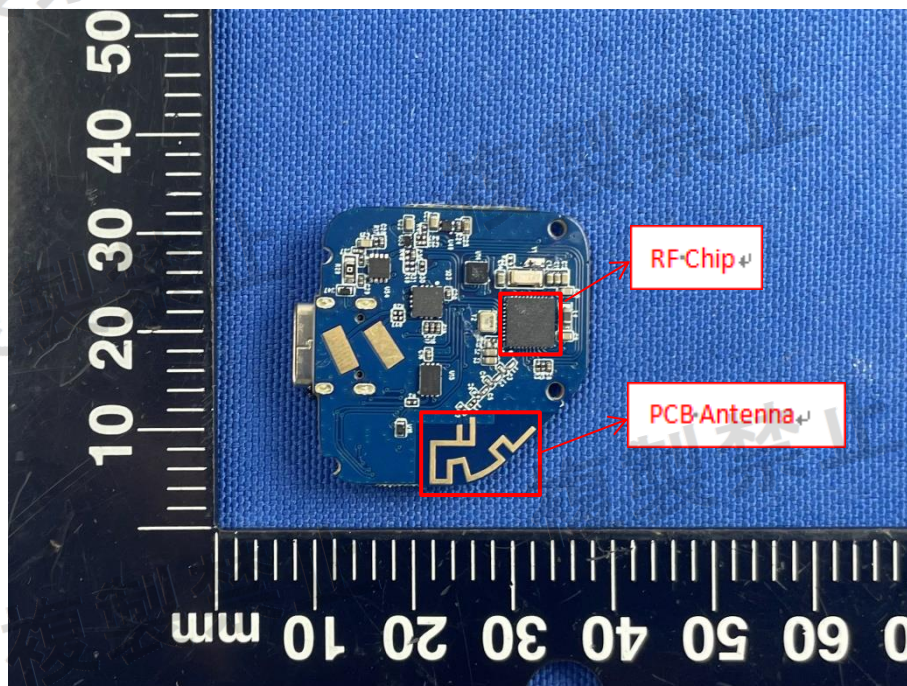
EUT UNCOVER VIEW 1



MAIN BOARD TOP VIEW



MAIN BOARD REAR VIEW



Statement

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