TEST REPORT

Report Reference No. ..... :	**TZ0032250809TRF01**
Prepared by (+signature)..... :	Nancy Li
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Approved by (+signature)..... :	Max Zhang (Authorized Officer)
Date of issue ..... :	2025-08-11
Testing Laboratory Name ..... :	Shenzhen Tongzhou Testing Co., Ltd.
Address ..... :	1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China
Applicant's name ..... :	**shenzhenshiyunmokejiyouxiangongsi**
Address ..... :	F23, Unit 2905B International Culture Building No. 3039, Shennan Middle Road Funan Community, Futian Street Shenzhen, Guangdong 518033, China
Manufacturer's name ..... :	**shenzhenshiyunmokejiyouxiangongsi**
Address ..... :	F23, Unit 2905B International Culture Building No. 3039, Shennan Middle Road Funan Community, Futian Street Shenzhen, Guangdong 518033, China
Test specification ..... :	
Standard..... :	**MIC Notice No.88 Appendix No.43 Article 2, paragraph 1, item 19**
TRF Originator ..... :	SZTZ
Master TRF ..... :	Dated 2024-08

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Test item description..... :	**Portable Electronic Piano**
Trade Mark..... :	RHYMO
Model/Type reference ..... :	FP88A, FP88S, DP88A, DP88S, UP88A, UP88S, AP88F, AIP61, FP88H, FP88D, FP88B, FP88C, FP88E, P88A, P61A
Ratings ..... :	DC 3.7V by battery
Result ..... :	**PASS**

** Report Revise Record **

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2025-08-11	Valid	Initial release

Notes:
The original test report Ref. No. TZ240405594-EDR (dated Apr. 29, 2024, tested Apr. 24, 2024 – Apr. 28, 2024), was modified on Aug. 11, 2025 to include the following changes:
- Change the applicant, manufacturer information, trade mark and models.
Based on above changes, no further testing necessary.

複製禁止

Contents

1. TEST STANDARDS AND DESCRIPTION 4

1.1. Test Standards 4
1.2. Test description 4

2. SUMMARY 5

2.1. General Remarks 5
2.2. Product Description 5
2.3. Wireless Function Tested in this report 5
2.4. EUT operation mode 6
2.5. Test Voltage 6
2.6. EUT configuration 7
2.7. Modifications 7

3. TEST ENVIRONMENT 8

3.1. Address of the test laboratory 8
3.2. Statement of the measurement uncertainty 8
3.3. Equipments Used during the Test 9

4. TEST CONDITIONS AND RESULTS 10

4.1. Antenna Power 10
4.2. Frequency Error 12
4.3. Interference Prevention Function 14
4.4. Occupied Bandwidth (99%) 15
4.5. Spectrum bandwidth (90%) 17
4.6. Spurious emission intensity 19
4.7. Limit of secondary radiated emissions 30
4.8. Transmission Antenna Gain (EIRP antenna power) Measurement 36
4.9. Transmission Radiation Angle Width (3db Beamwidth) Measurement 38
4.10. Dwell Time 39

5. TEST SETUP PHOTOS OF THE EUT 41

6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT 42

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1. Test Standards and description

1.1. Test Standards

The tests were performed according to following standards:

Regulation: Item I of Article 49-20 and the relevant Articles of the ordinance of Regulatory Radio Equipment.

Test Method: (1)the test method suppassed on is equal to Appendix No.43 of MIC Nofication No 88

1.2. Test description

Test Item	Test Method	Result
Antenna Power	Appendix No.43 of MIC Nofication No 88 section 6	Pass
Frequency Error	Appendix No.43 of MIC Nofication No 88 section 3	Pass
Interference prevention function	Appendix No.43 of MIC Nofication No 88 section 12	Pass
99% Occupied bandwidth	Appendix No.43 of MIC Nofication No 88 section 4	Pass
Spurious Emissions Intensity	Appendix No.43 of MIC Nofication No 88 section 5	Pass
Limit of secondary radiated emissions	Appendix No.43 of MIC Nofication No 88 section 7	Pass
Dwell Time	Appendix No.43 of MIC Nofication No 88 section 13	Pass
Transmission Antenna Gain (EIRP antenna power)	Appendix No.43 of MIC Nofication No 88 section 10	N/A
Transmission Radiation Angle Width (3db Beamwidth)	Appendix No.43 of MIC Nofication No 88 section 11	N/A

N/A: means not applicable

2. Summary

2.1. General Remarks

Date of receipt of test sample : 2024-04-24

Testing commenced on : 2024-04-24

Testing concluded on : 2024-04-28

2.2. Product Description

Name of EUT	:	Portable Electronic Piano
Trade Mark	:	RHYMO
Model/Type reference	:	FP88A, FP88S, DP88A, DP88S, UP88A, UP88S, AP88F, AIP61 , FP88H, FP88D, FP88B, FP88C, FP88E, P88A, P61A
Test Model	:	FP88A
Model Declaration	:	All the same except for the model name
Hardware Version	:	PJ88CT_MAIN_V3.0-20231027
Software Version	:	20230531-01-Y61
Power supply	:	DC 3.7V by battery, Input: DC 5V

2.3. Wireless Function Tested in this report

Bluetooth		
Modulation	:	BR ☒GFSK:1Mbps; EDR ☒π /4-DQPSK:2Mbps ☐8DPSK:3Mbps
Operation frequency	:	2402MHz~2480MHz
Channel number	:	79
Channel separation	:	1MHz
Antenna type	:	PCB Antenna
Antenna gain	:	-0.58dBi

Operation Frequency List:

Channel No.	Frequency (GHz)	Channel No.	Frequency (GHz)	Channel No.	Frequency (GHz)
00	2.402	28	2.430	56	2.458
01	2.403	29	2.431	57	2.459
02	2.404	30	2.432	58	2.460
03	2.405	31	2.433	59	2.461
04	2.406	32	2.434	60	2.462
05	2.407	33	2.435	61	2.463
06	2.408	34	2.436	62	2.464
07	2.409	35	2.437	63	2.465
08	2.410	36	2.438	64	2.466
09	2.411	37	2.439	65	2.467
10	2.412	38	2.440	66	2.468
11	2.413	39	2.441	67	2.469

12	2.414	40	2.442	68	2.470
13	2.415	41	2.443	69	2.471
14	2.416	42	2.444	70	2.472
15	2.417	43	2.445	71	2.473
16	2.418	44	2.446	72	2.474
17	2.419	45	2.447	73	2.475
18	2.420	46	2.448	74	2.476
19	2.421	47	2.449	75	2.477
20	2.422	48	2.450	76	2.478
21	2.423	49	2.451	77	2.479
22	2.424	50	2.452	78	2.480
23	2.425	51	2.453		
24	2.426	52	2.454		
25	2.427	53	2.455		
26	2.428	54	2.456		
27	2.429	55	2.457		

2.4. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software (FCC_assist_1.0.2.2 at default power level) to control the EUT for staying in continuous transmitting and receiving mode for testing.

2.5. Test Voltage

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Input To EUT	DC 3.7V	DC 4.2V	DC 3.4V
Output To RF Module	DC 3.3V	DC 3.333V	DC 3.234V
Voltage Variation (%)	--	--	--

Note: During the input supply voltage to the EUT from the external power source is varied by ±10%, the fluctuation of input voltage to the circuit of RF unit of test equipment is exceed ±1%. So, all measurement has been conducted by normal and limit voltage.

2.6. EUT configuration

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

● - supplied by the manufacturer
○ - supplied by the lab

（2）Protective Structure

☐ *The exterior cover was sealed by Special screws, it can not be easily open.*
☐ *The enclosure was sealed with strong adhesive glue, it can not be easily open.*
☐ *All high-frequency section and modulation section was packaged in one IC, and shield by metal shield, it can not be easily open.*
☐ *The top and the bottom is connected with strong Buckles, it can not be easily open.*
☒ *Others: The top and the bottom is connected with strong Buckles, So We can not open the it easily at the normal condition. The high-frequency section and modulation section can not be capable of being opened easily*

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. Test Environment

3.1. Address of the test laboratory

Shenzhen Tongzhou Testing Co.,Ltd
1st Floor, Building 1, Haomai High-tech Park, Huating Road 387, Dalang Street, Longhua, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2014) and CISPR Publication 22.

3.2. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Tongzhou Testing Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Tongzhou Testing Co.,Ltd is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	Uc = ±25 Hz	(1)
Transmitter power conducted	Uc = ±0.57 dB	(1)
Uncertainty of Occupied Channel Bandwidth	Uc = ±2 %	(1)
Uncertainty of RF Power Density, Conducted	Uc = ±2.6 dB	(1)
Uncertainty of Spurious Emissions, Conducted (30MHz-1GHz)	Uc = ±2.7 dB	(1)
Uncertainty of Spurious Emissions, Conducted (1GHz-26GHz)	Uc = ±3.2 dB	(1)
Uncertainty of Dwell Time	Uc = ±2%	(1)

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

3.3. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Latest Cal.	Next Cal.
1	MXA Signal Analyzer	Keysight	N9020A	MY52091623	2024-1-4	2025-1-3
2	EMI Test Receiver	R&S	ESCI	100849/003	2024-1-4	2025-1-3
3	DC power supply	Chroma	RXN-305D	62012PD02811	2024-1-4	2025-1-3
4	Power Meter	Agilent	NRVD	835843/014	2024-1-4	2025-1-3
5	Wideband Radio Communication Tester	R&S	CMW500	101855	2024-1-4	2025-1-3
6	Oscilloscope	Tektronix	TDS2024C	C044925	2024-1-4	2025-1-3

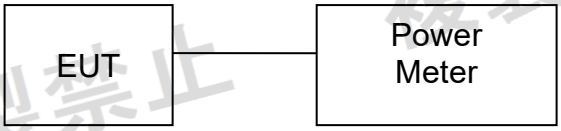
Full Name of calibration company: Guangzhou Lisai Metrology & Test co., Ltd.

Calibration by the calibration agencies listed in the table correspond to paragraph 4 (ii) (c) of Article 24-2 in the Radio Law.
☐a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18-1 of the Radio Act
☐ (b) Calibration conducted based on the regulations of Article 135 or 144 of the Measurement Act
☒ (c) Calibration conducted in foreign countries, which is equivalent to calibration conducted by the NICT or a designated calibration agency under Article 102-18-1 of the Radio Act
☐ (d) Calibration, etc. conducted by using measuring instruments and other facilities listed at the bottom of appended table 3 of the Radio Act, which is to have been calibrated as described in (a) through (c) above

4. Test conditions and Results

4.1. Antenna Power

TEST CONFIGURATION



TEST PROCEDURE

1. EUT have transmitted continuous maximum power..
2. Frequency hopping system or combined systems of direct spread and frequency hopping
   i. Connect the high frequency Power Meter or Spectrum Analyzer to the output of the attenuator and measure the total power (without bandwidth limitation)
   ii. Divide the total power by the spread bandwidth to find the “average” power per MHz. The average power per MHz is equal to the power meter value dBm + cable loss dB.
   iii. Set the antenna power as follows:
   - Continuous waves: value in ii.

LIMIT

Item	Limits
Antenna Power Density	≦ 3mW/MHz (FH form 2400~2483.5MHz) ≦ 10mW/MHz (OFDM,DS from 2400~2483.5MHz) ≦ 10mW (Other from 2400~2483.5MHz)
Antenna Power Error	≤20% (Base on manufacturer declare antenna power density)

TEST RESULTS

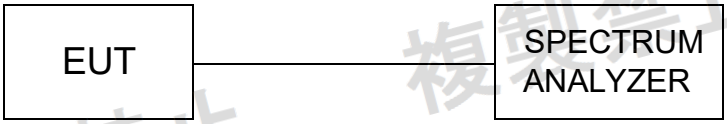
Antenna Power								
Test Condition	TestMode	Antenna	Channel	Ave. Burst Power [mW]	Spread BW [MHz]	Result (mW/ MHz)	Limit (mW/ MHz)	Verdict
NTNV	DH5	Ant1	Hop	0.0117	70.949	0.0002	≤3	PASS
	2DH5	Ant1	Hop	0.0067	71.104	0.0001	≤3	PASS
NTHV	DH5	Ant1	Hop	0.012	71.748	0.0002	≤3	PASS
	2DH5	Ant1	Hop	0.006	71.871	0.0001	≤3	PASS
NTLV	DH5	Ant1	Hop	0.011	71.734	0.0002	≤3	PASS
	2DH5	Ant1	Hop	0.006	71.956	0.0001	≤3	PASS

Tolerance								
Test Condition	Test Mode	Antenna	Channel	Power (mW/ MHz)	Rated Power (mW/ MHz)	Result (%)	Limit (%)	Verdict
NTNV	DH5	Ant1	Hop	0.0002	0.0002	0.00	≤20	PASS
	2DH5	Ant1	Hop	0.0001	0.0002	-50.00	≤20	PASS
NTHV	DH5	Ant1	Hop	0.0002	0.0002	0.00	≤20	PASS
	2DH5	Ant1	Hop	0.0001	0.0002	-50.00	≤20	PASS
NTLV	DH5	Ant1	Hop	0.0002	0.0002	0.00	≤20	PASS
	2DH5	Ant1	Hop	0.0001	0.0002	-50.00	≤20	PASS

Remark:
1, The item was tested at 25℃ and 55% humidity condition;
2, Result = the power meter value + cable loss

4.2. Frequency Error

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.
EUT Condition: non-modulation
Spectrum Condition:
Frequency: test frequency
Span:1MHz
Rbw:10KHz
Vbw:10KHz
Sweep time:Auto
Dectector mode: Positive peak
Indication mode: max hold

LIMIT

Tolerance of frequency shall be ±50 ppm.

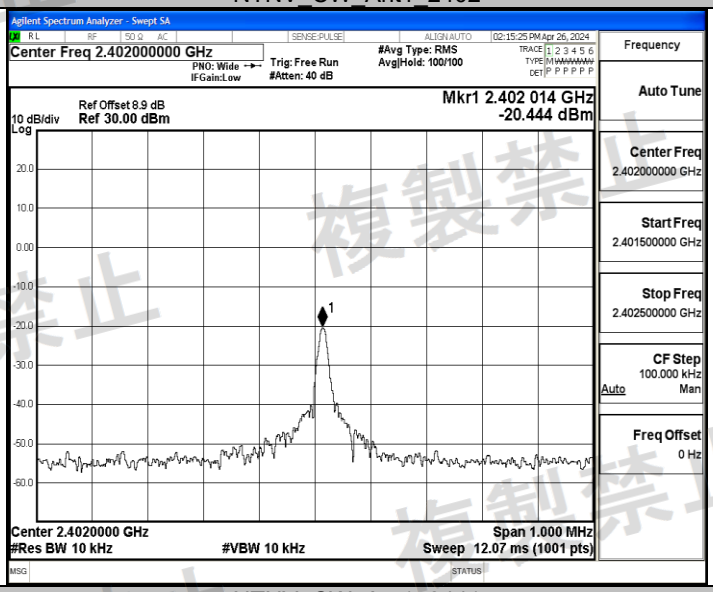
TEST RESULTS

Test Condition	Test Mode	Antenna	Freq(MHz)	Result[ppm]	Limit[ppm]	Verdict
NTNV	CW	Ant1	2402	5.82848	±50	PASS
			2441	6.14502	±50	PASS
			2480	6.04839	±50	PASS
NTHV	CW	Ant1	2402	5.72879	±50	PASS
			2441	6.04344	±50	PASS
			2480	5.67798	±50	PASS
NTLV	CW	Ant1	2402	5.74153	±50	PASS
			2441	5.93322	±50	PASS
			2480	5.50262	±50	PASS

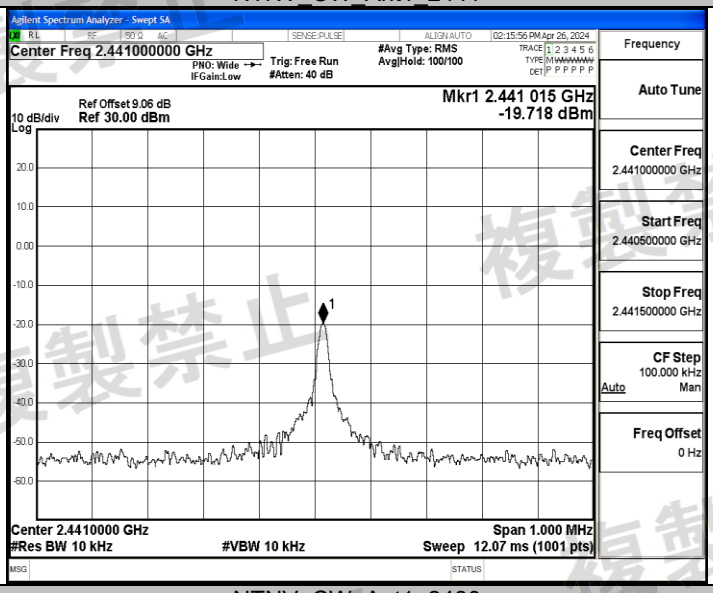
Note: 1. The test results including the cable lose.
2. The item was tested at 25℃ and 55% humidity condition;
3.All condition has been testd,list the worst case in this item

Test plot as follows:

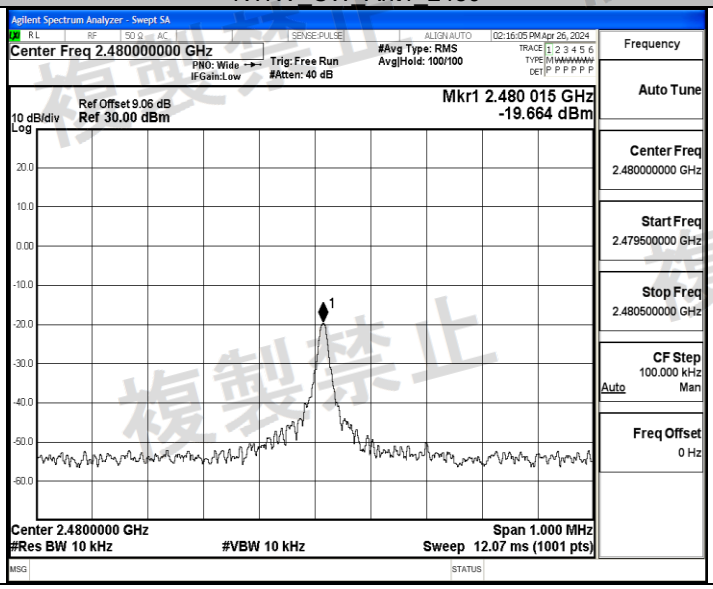
NTNV_CW_Ant1_2402



NTNV_CW_Ant1_2441



NTNV_CW_Ant1_2480



4.3. Interference Prevention Function

The device consists of the Antenna and transimtter module.Component transmitter module also can use the protocol function to protect interference come from outside.

TEST EQUIPMENT

CMW500

TEST SOFTWARE

N/A

TEST PROCEDURE

1. Open the software
2. Scan for EUT, and read the MAC address.

TEST RESULTS

The unit does meet the requirements.

MAC Address:22:5D:36:6C:E9:51

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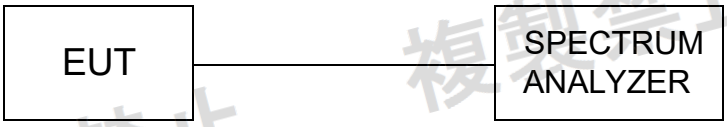
4.4. Occupied Bandwidth (99%)

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.
EUT Condition: modulation
Spectrum Condition:
Frequency: Center frequency in the band to be used
Span:200MHz
RBW:1MHz
VBW:1MHz
Sweep time:Auto
Dectector mode: Positive peak
Indication mode: max hold

LIMIT

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

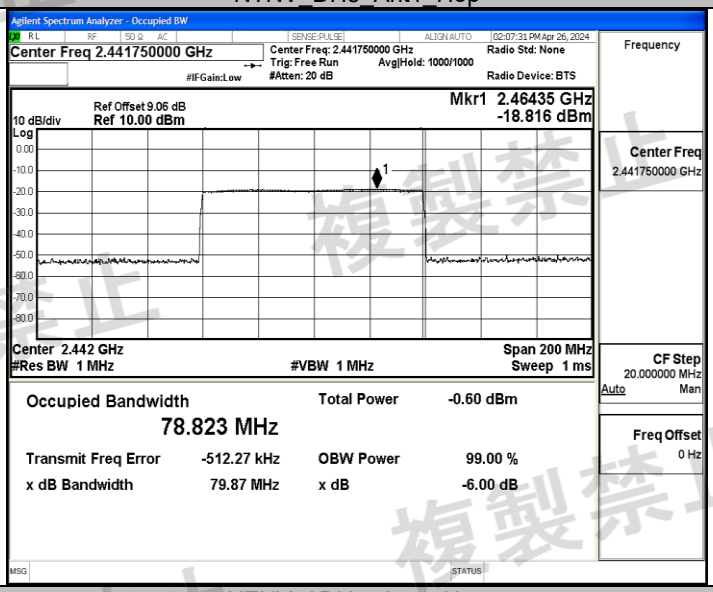
TEST RESULTS

Test Condition	Test Mode	Antenna	Freq(MHz)	Result [MHz]	Limit [MHz]	Verdict
NTNV	DH5	Ant1	Hop	78.823	≤83.5	PASS
	2DH5	Ant1	Hop	78.938	≤83.5	PASS
NTHV	DH5	Ant1	Hop	78.633	≤83.5	PASS
	2DH5	Ant1	Hop	78.742	≤83.5	PASS
NTLV	DH5	Ant1	Hop	78.79	≤83.5	PASS
	2DH5	Ant1	Hop	78.898	≤83.5	PASS

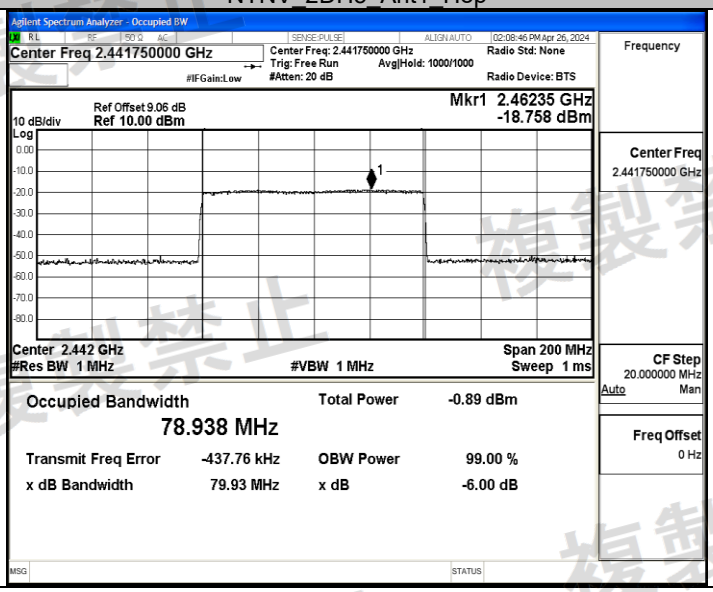
Note: 1. The test results including the cable lose.
2. The item was tested at 25℃ and 55% humidity condition;
3.All condition has been testd,list the worst case in this item

Test plot as follows:

NTNV_DH5_Ant1_Hop

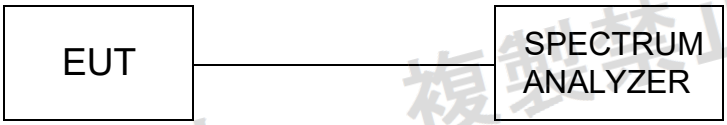


NTNV_2DH5_Ant1_Hop



4.5. Spectrum bandwidth (90%)

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.
EUT Condition: modulation
Spectrum Condition:
Frequency: Center frequency in the band to be used
Span:200MHz
RBW:1MHz
VBW: 1MHz
Sweep time:Auto
Dectector mode: Positive peak
Indication mode: max hold
Spread Factor =Spread Bandwidth/ Transsmission rate

LIMIT

N/A

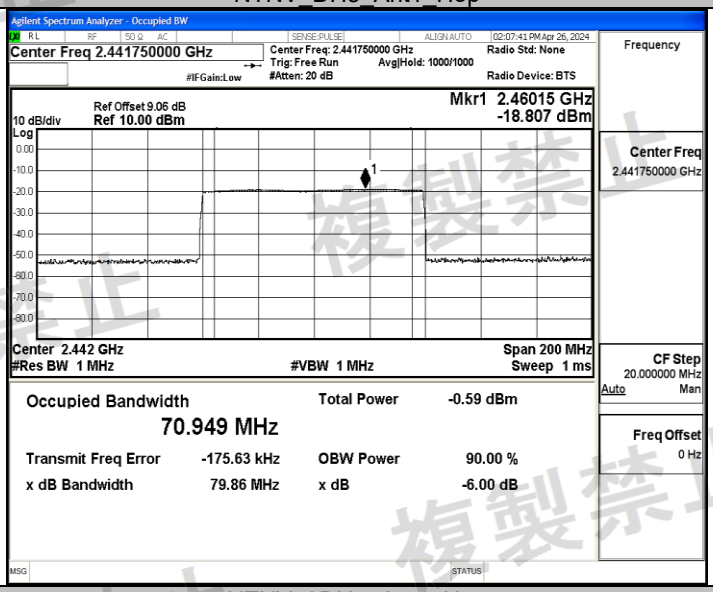
TEST RESULTS

Test Condition	Test Mode	Antenna	Freq(MHz)	Result [MHz]	Limit [MHz]	SpreadFactor	Limit	Verdict
NTNV	DH5	Ant1	Hop	70.949	≥0.5	70.949	>5	PASS
	2DH5	Ant1	Hop	71.104	≥0.5	35.552	>5	PASS
NTHV	DH5	Ant1	Hop	70.801	≥0.5	70.801	>5	PASS
	2DH5	Ant1	Hop	71.041	≥0.5	35.521	>5	PASS
NTLV	DH5	Ant1	Hop	70.807	≥0.5	70.807	>5	PASS
	2DH5	Ant1	Hop	71.043	≥0.5	35.522	>5	PASS

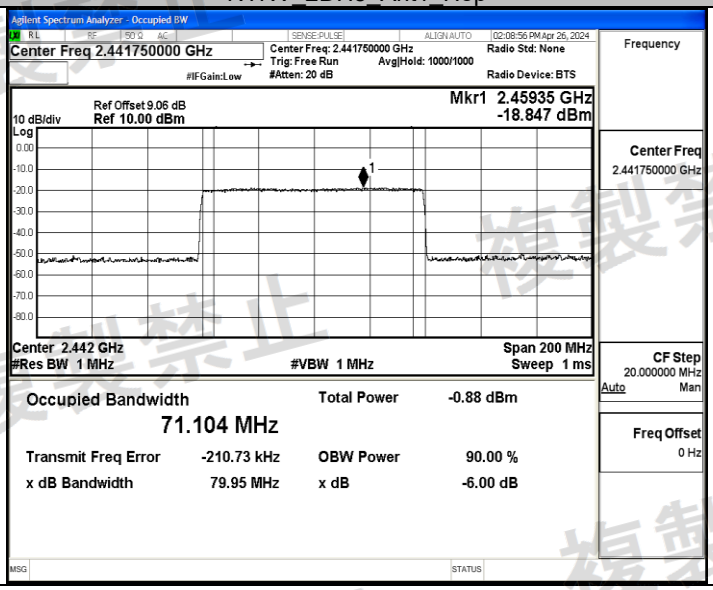
Note: 1. The test results including the cable lose.
2. The item was tested at 25℃ and 55% humidity condition;
3.All condition has been testd,list the worst case in this item

Test plot as follows:

NTNV_DH5_Ant1_Hop

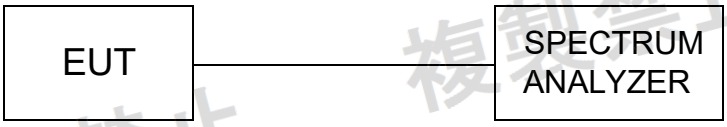


NTNV_2DH5_Ant1_Hop



4.6. Spurious emission intensity

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.
EUT Condition: modulation
Spectrum Condition:
Frequency: 30MHz-13GHz
RBW: 1MHz (30MHz-1GHz), 1MHz(1GHz-13GHz)
VBW: 1MHz (30MHz-1GHz), 1MHz(1GHz-13GHz)
Sweep time:Auto
Dectector mode: Positive peak
Indication mode: max hold

LIMIT

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:
a. 2,387 MHz ⩽ f ⩽ 2,400 MHz and 2,483.5 MHz < f ⩽ 2,496.5 MHz 25 μW/MHz(-16dBm/MHz) or less
b. 2,387 MHz > f and 2,496.5 MHz < f 2.5 μW/MHz (-26dBm/MHz) or less

TEST RESULTS

Test Condition	Test Mode	Antenna	Freq(MHz)	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	DH5	Ant1	2402	30~2387	-50.59	≤-26	PASS
				2387~2400	-41.94	≤-16	PASS
				2483.5~2496.5	-40.03	≤-16	PASS
				2496.5~13000	-46.64	≤-26	PASS
			2441	30~2387	-50.52	≤-26	PASS
				2387~2400	-41.68	≤-16	PASS
				2483.5~2496.5	-40.78	≤-16	PASS
				2496.5~13000	-46.03	≤-26	PASS
			2480	30~2387	-50.71	≤-26	PASS
				2387~2400	-42.13	≤-16	PASS
				2483.5~2496.5	-41.11	≤-16	PASS
				2496.5~13000	-46.32	≤-26	PASS
	2DH5	Ant1	2402	30~2387	-50.81	≤-26	PASS
				2387~2400	-42.43	≤-16	PASS
				2483.5~2496.5	-40.89	≤-16	PASS
				2496.5~13000	-46.02	≤-26	PASS
			2441	30~2387	-50.6	≤-26	PASS
				2387~2400	-41.3	≤-16	PASS

				2483.5~2496.5	-41.18	≤-16	PASS
				2496.5~13000	-45.59	≤-26	PASS
			2480	30~2387	-50.63	≤-26	PASS
				2387~2400	-41.77	≤-16	PASS
				2483.5~2496.5	-41.47	≤-16	PASS
				2496.5~13000	-46.32	≤-26	PASS
NTHV	DH5	Ant1	2402	30~2387	-51.77	≤-26	PASS
				2387~2400	-43.45	≤-16	PASS
				2483.5~2496.5	-40.94	≤-16	PASS
				2496.5~13000	-48.21	≤-26	PASS
			2441	30~2387	-51.86	≤-26	PASS
				2387~2400	-42.61	≤-16	PASS
				2483.5~2496.5	-42.61	≤-16	PASS
				2496.5~13000	-46.78	≤-26	PASS
			2480	30~2387	-52.18	≤-26	PASS
				2387~2400	-43.46	≤-16	PASS
				2483.5~2496.5	-43.1	≤-16	PASS
				2496.5~13000	-47.94	≤-26	PASS
	2DH5	Ant1	2402	30~2387	-52.22	≤-26	PASS
				2387~2400	-43.33	≤-16	PASS
				2483.5~2496.5	-42.59	≤-16	PASS
				2496.5~13000	-47.62	≤-26	PASS
			2441	30~2387	-52.03	≤-26	PASS
				2387~2400	-42.49	≤-16	PASS
				2483.5~2496.5	-41.87	≤-16	PASS
				2496.5~13000	-46.72	≤-26	PASS
			2480	30~2387	-51.31	≤-26	PASS
				2387~2400	-42.86	≤-16	PASS
				2483.5~2496.5	-42.44	≤-16	PASS
				2496.5~13000	-47.29	≤-26	PASS
NTLV	DH5	Ant1	2402	30~2387	-51.88	≤-26	PASS
				2387~2400	-42.6	≤-16	PASS
				2483.5~2496.5	-41.57	≤-16	PASS
				2496.5~13000	-48.18	≤-26	PASS
			2441	30~2387	-52.5	≤-26	PASS
				2387~2400	-42.57	≤-16	PASS
				2483.5~2496.5	-41.32	≤-16	PASS
				2496.5~13000	-46.9	≤-26	PASS
			2480	30~2387	-51.74	≤-26	PASS
				2387~2400	-43.92	≤-16	PASS
				2483.5~2496.5	-42.58	≤-16	PASS
				2496.5~13000	-48.07	≤-26	PASS
	2DH5	Ant1	2402	30~2387	-52.03	≤-26	PASS
				2387~2400	-43.19	≤-16	PASS

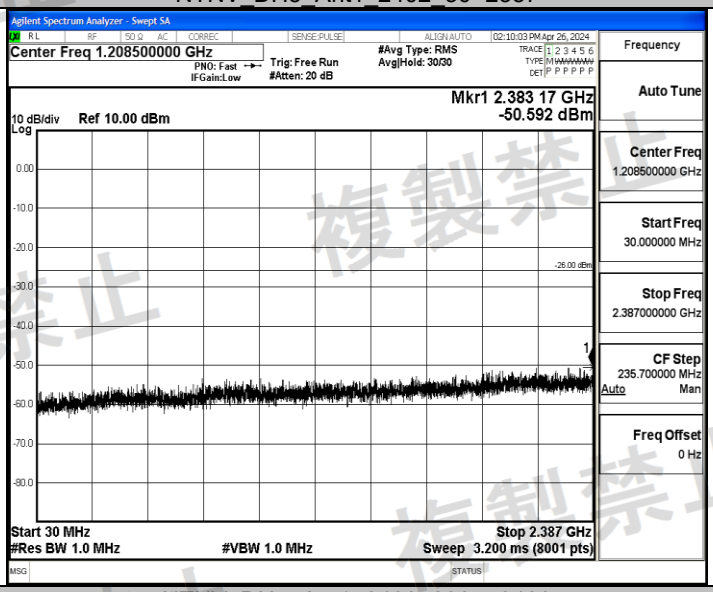
				2483.5~2496.5	-42.77	≤-16	PASS
				2496.5~13000	-47.18	≤-26	PASS
			2441	30~2387	-52.16	≤-26	PASS
				2387~2400	-41.92	≤-16	PASS
				2483.5~2496.5	-41.92	≤-16	PASS
				2496.5~13000	-47.04	≤-26	PASS
			2480	30~2387	-52.1	≤-26	PASS
				2387~2400	-43.11	≤-16	PASS
				2483.5~2496.5	-42.64	≤-16	PASS
				2496.5~13000	-46.94	≤-26	PASS

Note: *1.The product was tested at 25℃ and 55% humidity condition;*

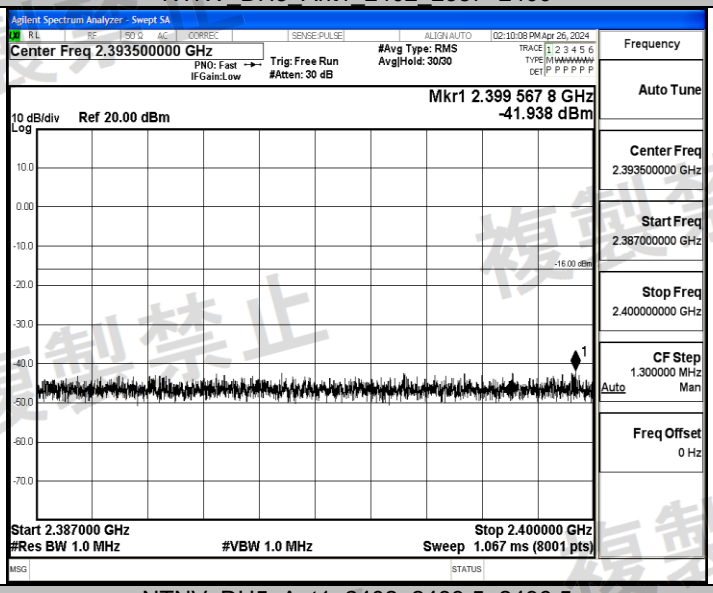
2.All condition has been testd,list the worst case in this item

3. SA set to from 2.4965GHz to 13GHz, plot shows from 2.497GHz to 13GHz as of SA's default format

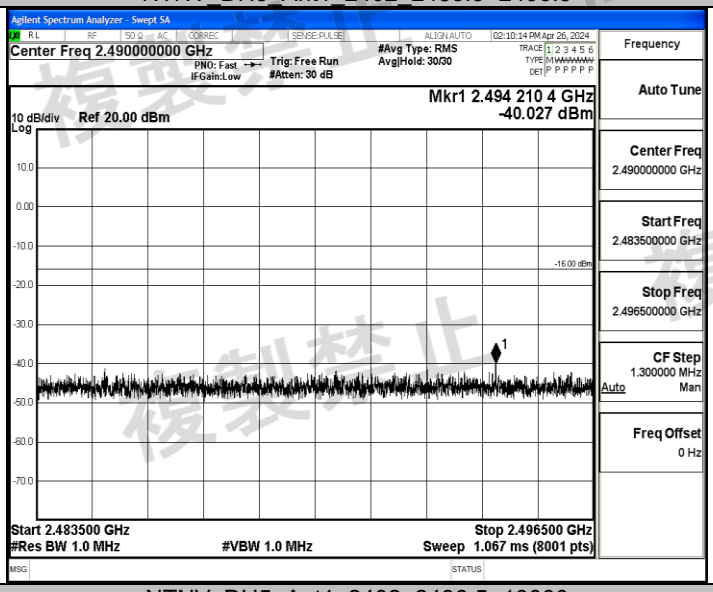
NTNV_DH5_Ant1_2402_30~2387



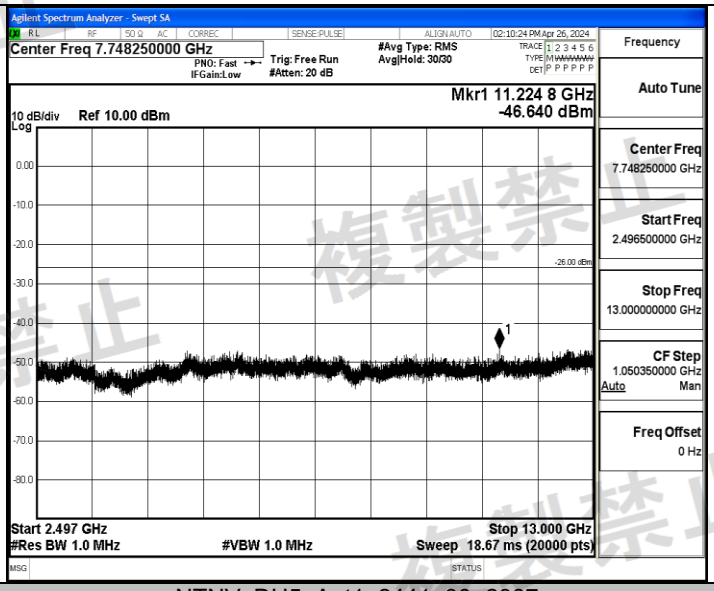
NTNV_DH5_Ant1_2402_2387~2400



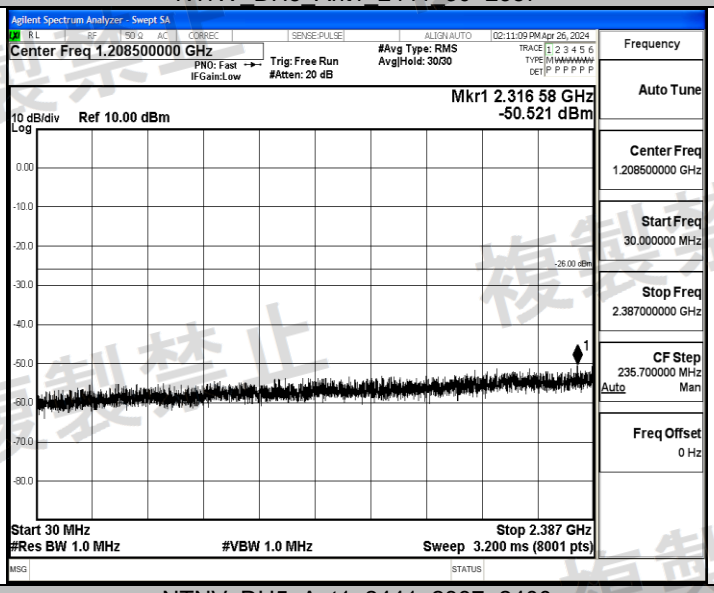
NTNV_DH5_Ant1_2402_2483.5~2496.5



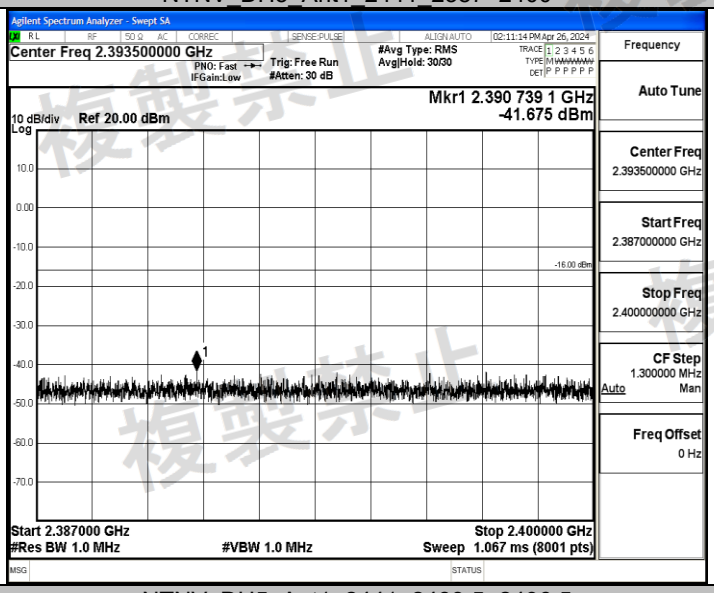
NTNV_DH5_Ant1_2402_2496.5~13000



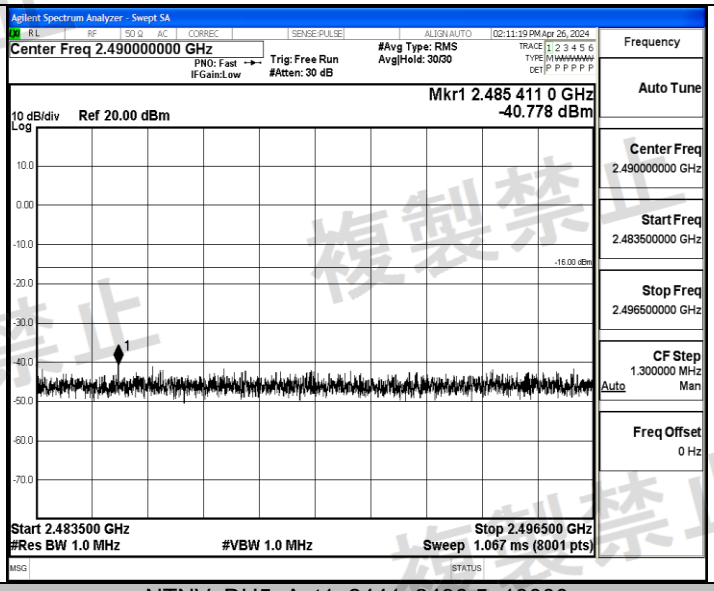
NTNV_DH5_Ant1_2441_30~2387



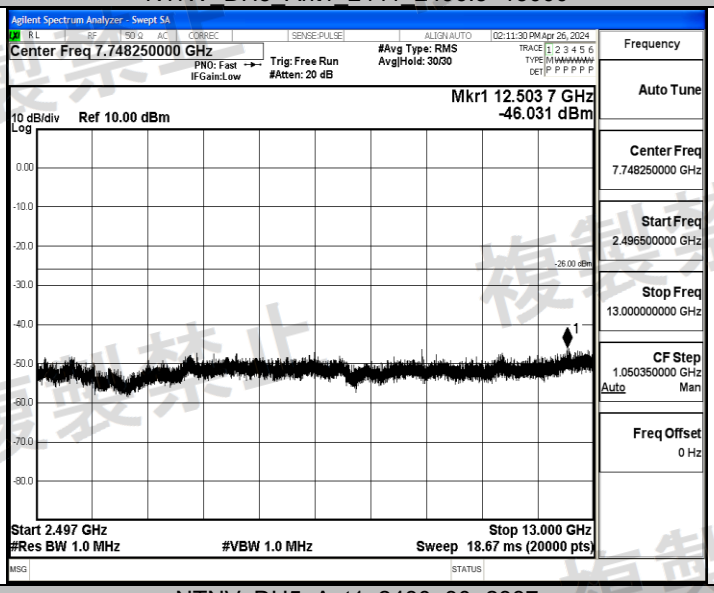
NTNV_DH5_Ant1_2441_2387~2400



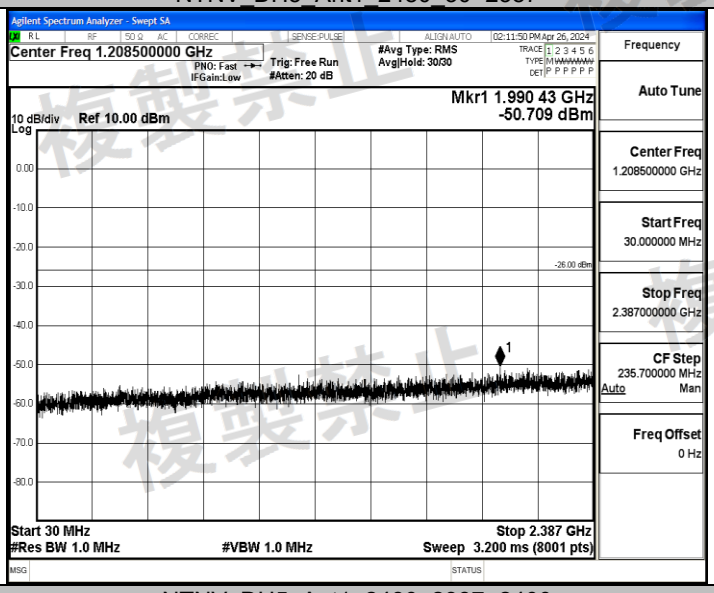
NTNV_DH5_Ant1_2441_2483.5~2496.5



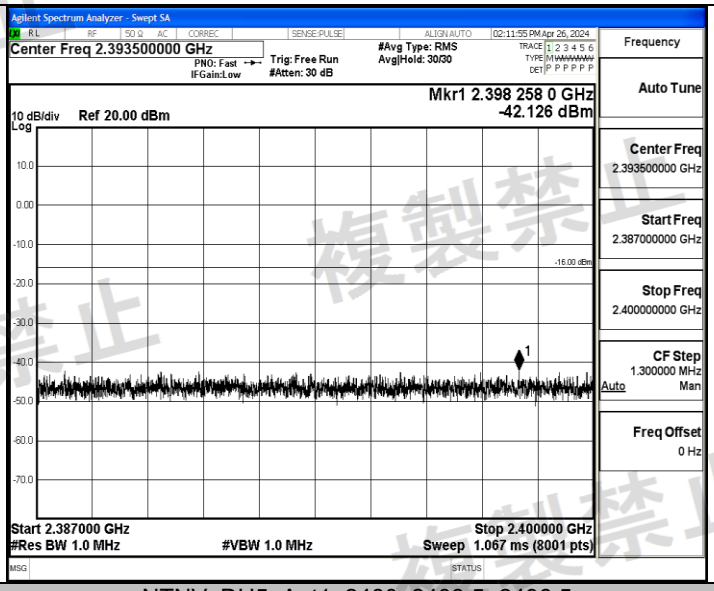
NTNV_DH5_Ant1_2441_2496.5~13000



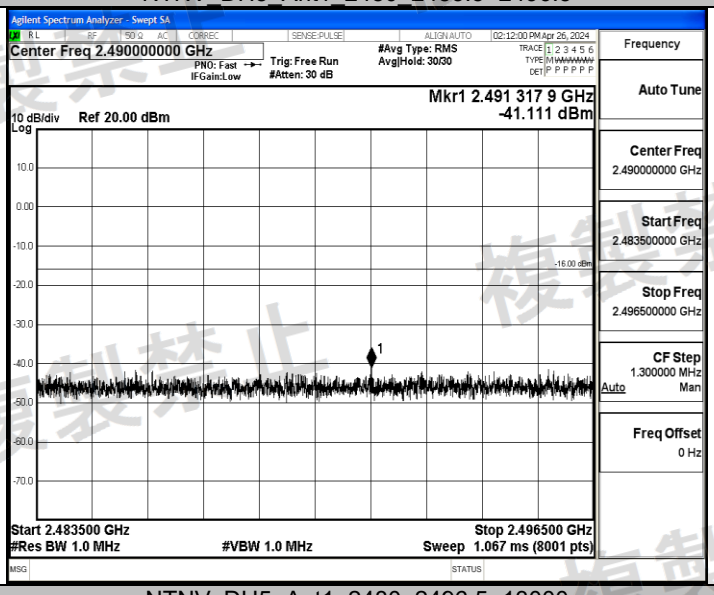
NTNV_DH5_Ant1_2480_30~2387



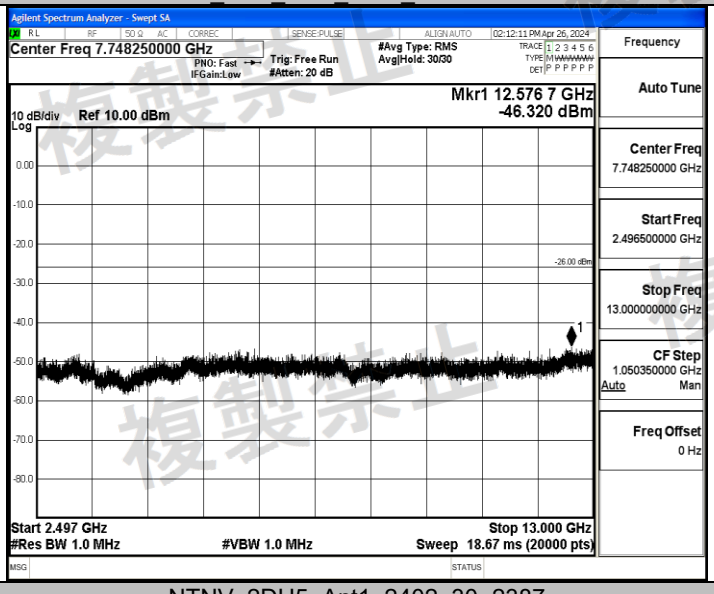
NTNV_DH5_Ant1_2480_2387~2400



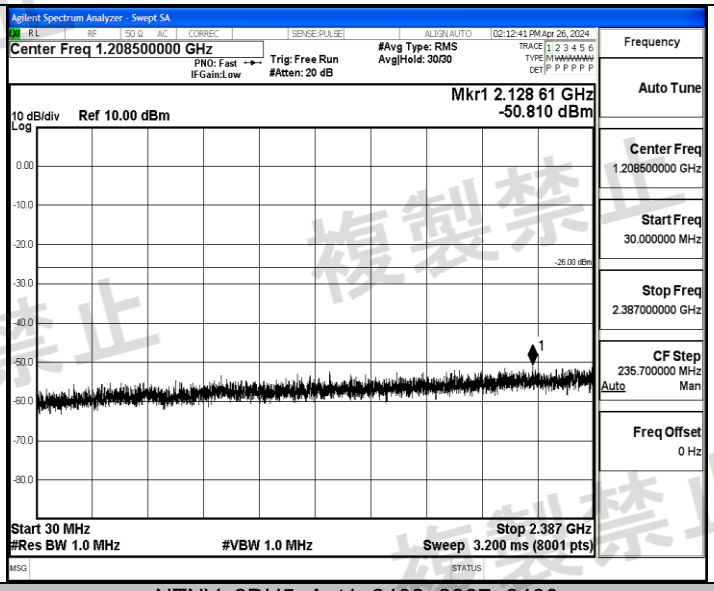
NTNV_DH5_Ant1_2480_2483.5~2496.5



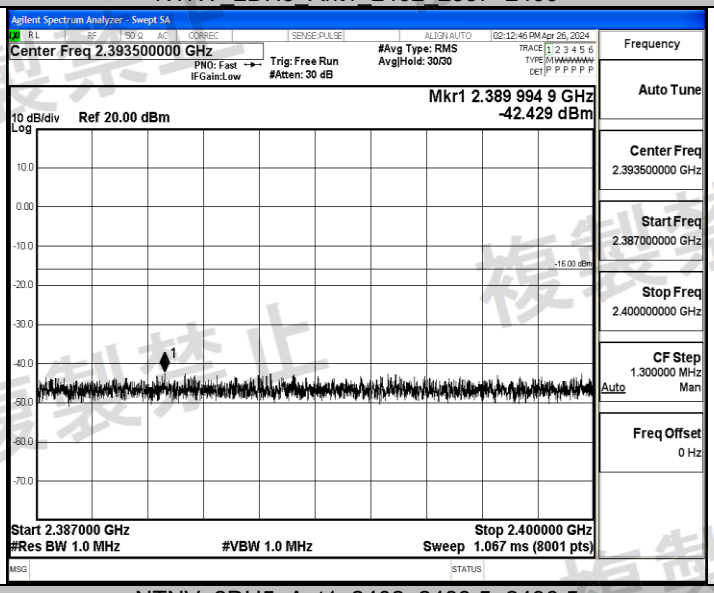
NTNV_DH5_Ant1_2480_2496.5~13000



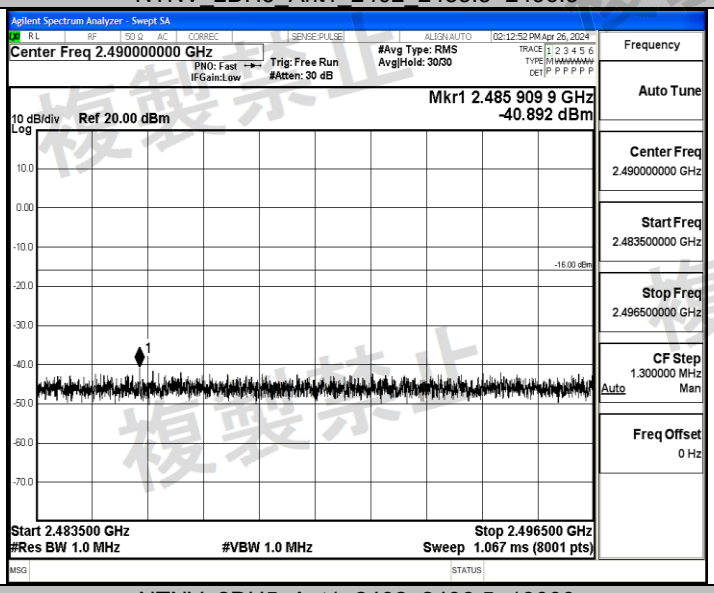
NTNV_2DH5_Ant1_2402_30~2387



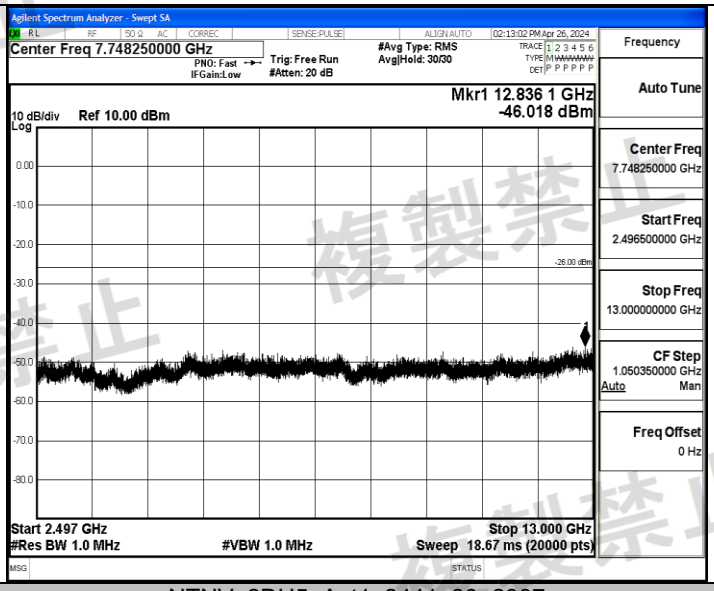
NTNV_2DH5_Ant1_2402_2387~2400



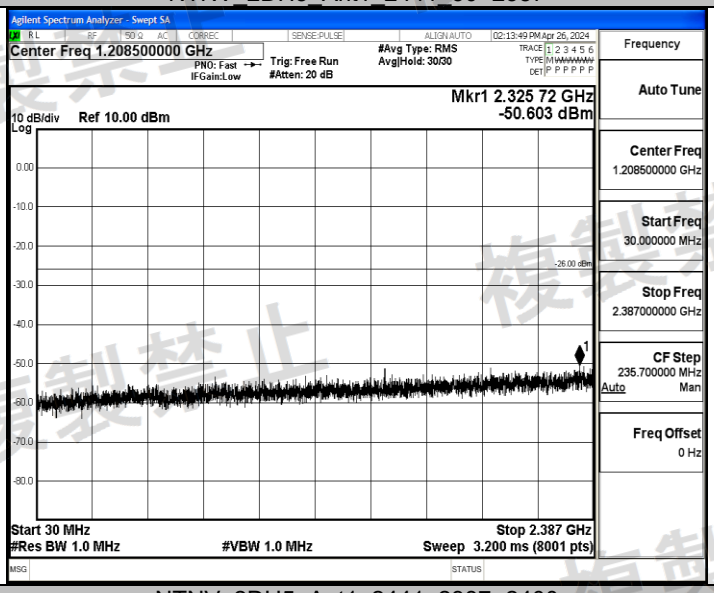
NTNV_2DH5_Ant1_2402_2483.5~2496.5



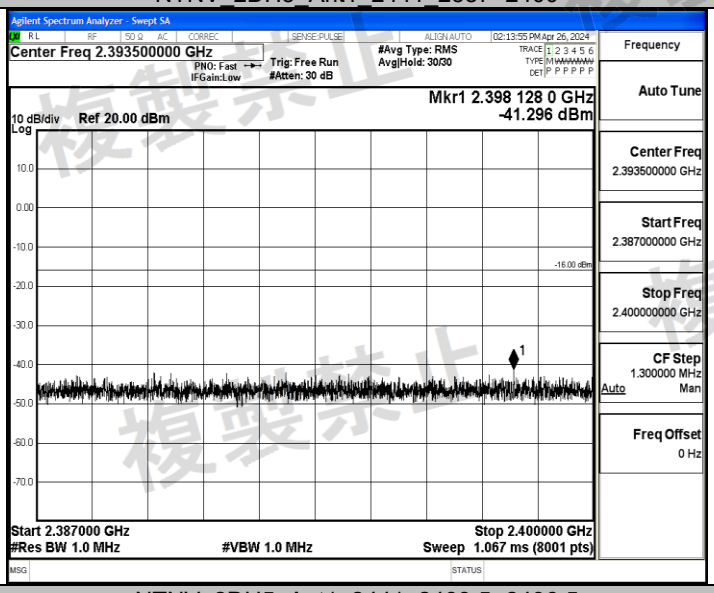
NTNV_2DH5_Ant1_2402_2496.5~13000



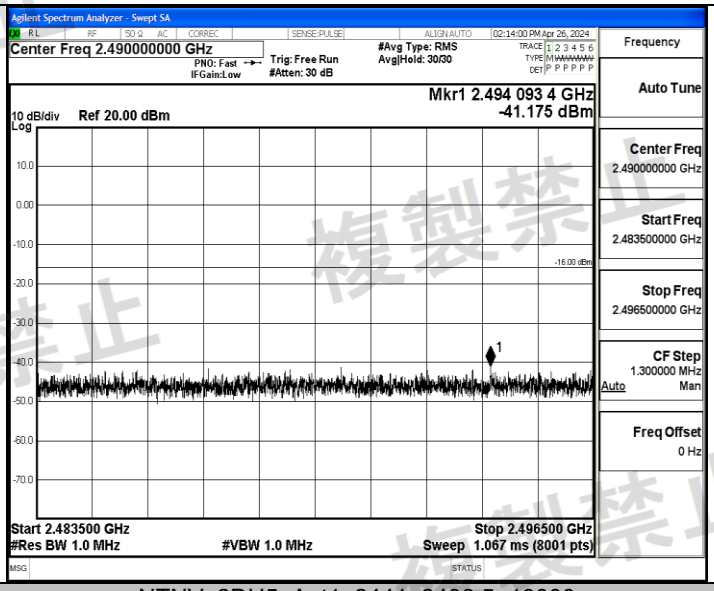
NTNV_2DH5_Ant1_2441_30~2387



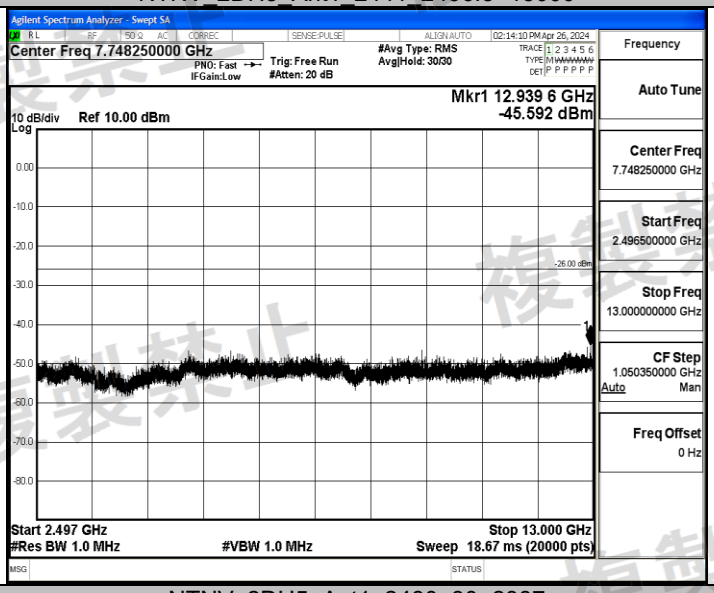
NTNV_2DH5_Ant1_2441_2387~2400



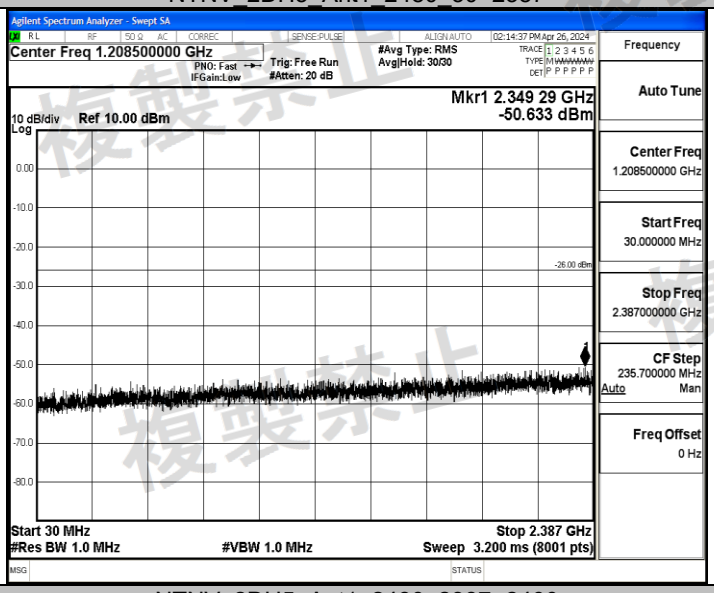
NTNV_2DH5_Ant1_2441_2483.5~2496.5



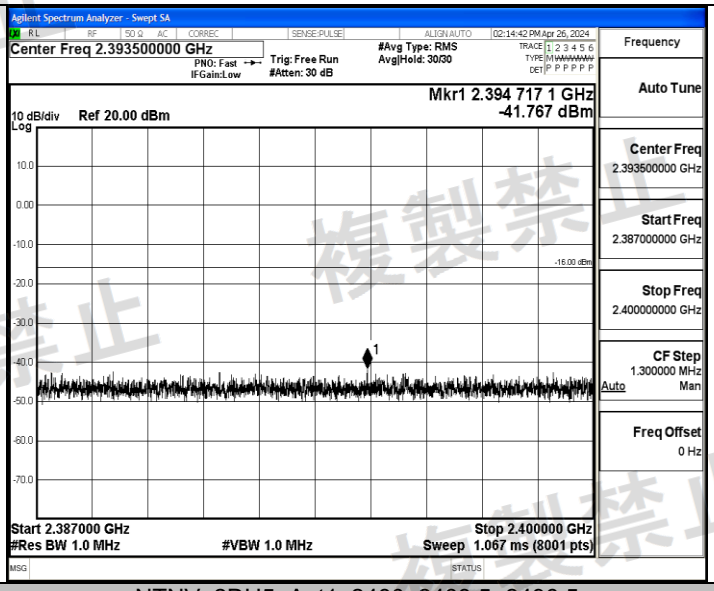
NTNV_2DH5_Ant1_2441_2496.5~13000



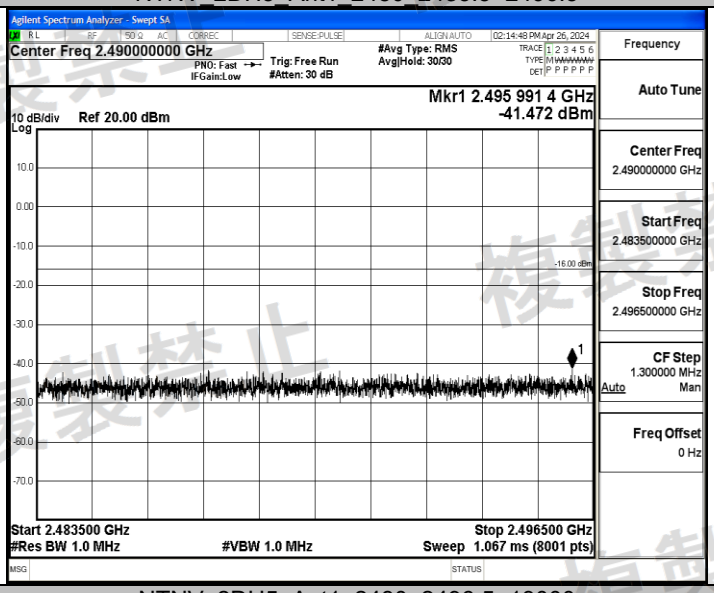
NTNV_2DH5_Ant1_2480_30~2387



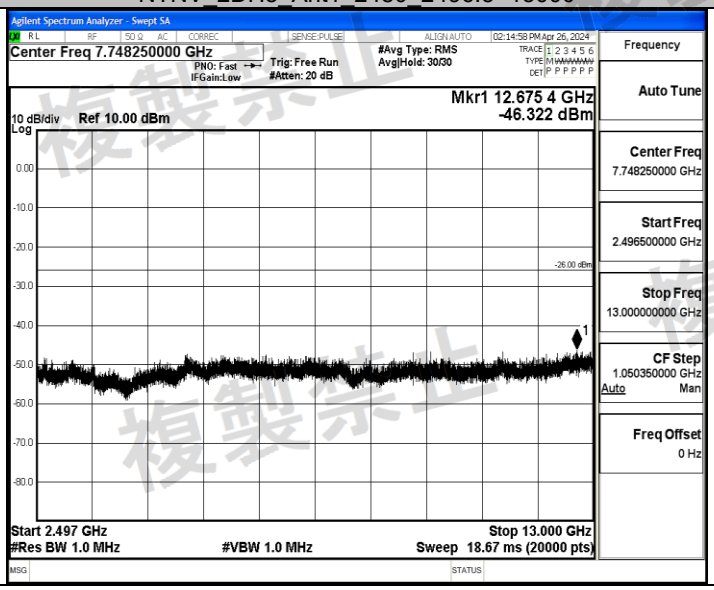
NTNV_2DH5_Ant1_2480_2387~2400



NTNV_2DH5_Ant1_2480_2483.5~2496.5

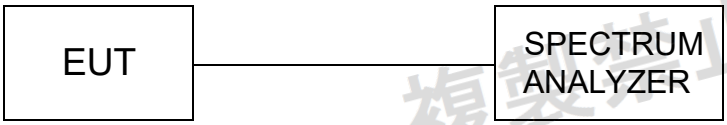


NTNV_2DH5_Ant1_2480_2496.5~13000



4.7. Limit of secondary radiated emissions

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.
EUT Condition: modulation
Spectrum Condition:
Frequency: 30MHz-13GHz
RBW:100KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)
VBW:100KHz(30MHz-1GHz), 1MHz(1GHz-13GHz)
Sweep time:Auto
Dectector mode: Positive peak
Indication mode: max hold

LIMIT

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

TEST RESULTS

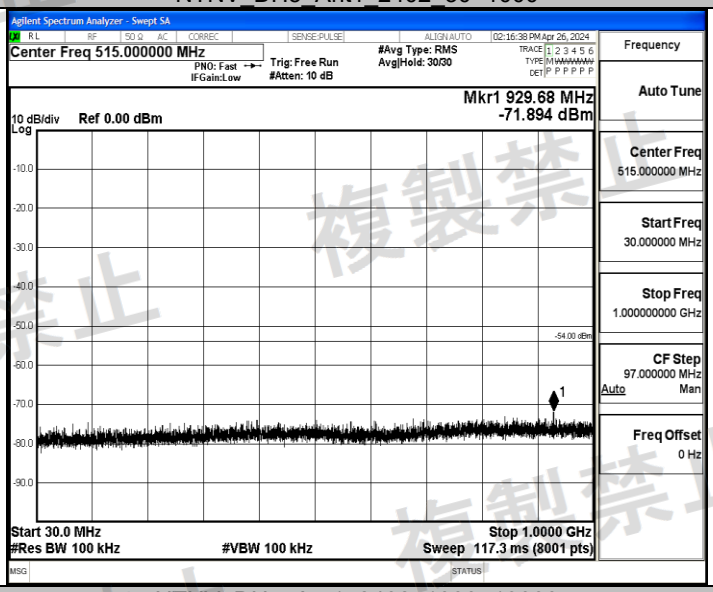
Test Condition	Test Mode	Antenna	Freq(MHz)	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	DH5	Ant1	2402	30~1000	-71.89	≤-54	PASS
				1000~13000	-66.89	≤-47	PASS
			2441	30~1000	-72.04	≤-54	PASS
				1000~13000	-67.13	≤-47	PASS
			2480	30~1000	-72.51	≤-54	PASS
				1000~13000	-66.5	≤-47	PASS
	2DH5	Ant1	2402	30~1000	-72.86	≤-54	PASS
				1000~13000	-67.28	≤-47	PASS
			2441	30~1000	-73.02	≤-54	PASS
				1000~13000	-66.57	≤-47	PASS
			2480	30~1000	-73.28	≤-54	PASS
				1000~13000	-66.44	≤-47	PASS
NTHV	DH5	Ant1	2402	30~1000	-70.14	≤-54	PASS
				1000~13000	-65.58	≤-47	PASS
			2441	30~1000	-70.73	≤-54	PASS
				1000~13000	-66.23	≤-47	PASS
			2480	30~1000	-71.45	≤-54	PASS
				1000~13000	-64.79	≤-47	PASS
	2DH5	Ant1	2402	30~1000	-71.58	≤-54	PASS

				1000~13000	-65.76	≤-47	PASS
			2441	30~1000	-72.49	≤-54	PASS
				1000~13000	-65.09	≤-47	PASS
			2480	30~1000	-71.89	≤-54	PASS
				1000~13000	-64.93	≤-47	PASS
NTLV	DH5	Ant1	2402	30~1000	-69.09	≤-54	PASS
				1000~13000	-64.52	≤-47	PASS
			2441	30~1000	-69.97	≤-54	PASS
				1000~13000	-65.57	≤-47	PASS
			2480	30~1000	-70	≤-54	PASS
				1000~13000	-62.88	≤-47	PASS
	2DH5	Ant1	2402	30~1000	-69.84	≤-54	PASS
				1000~13000	-63.89	≤-47	PASS
			2441	30~1000	-71	≤-54	PASS
				1000~13000	-63.37	≤-47	PASS
			2480	30~1000	-71.21	≤-54	PASS
				1000~13000	-63.83	≤-47	PASS

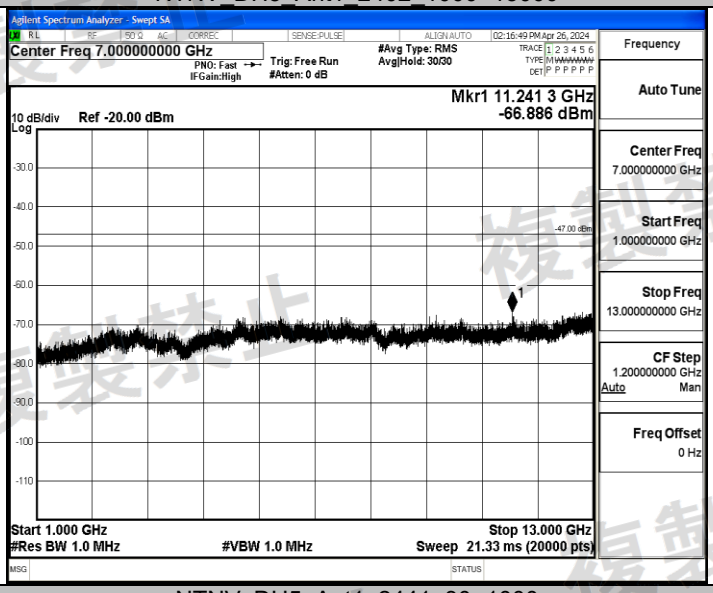
Note: *1.The product was tested at 25℃ and 55% humidity condition;*
2.All condition has been testd,list the worst case in this item

Test plot as follows:

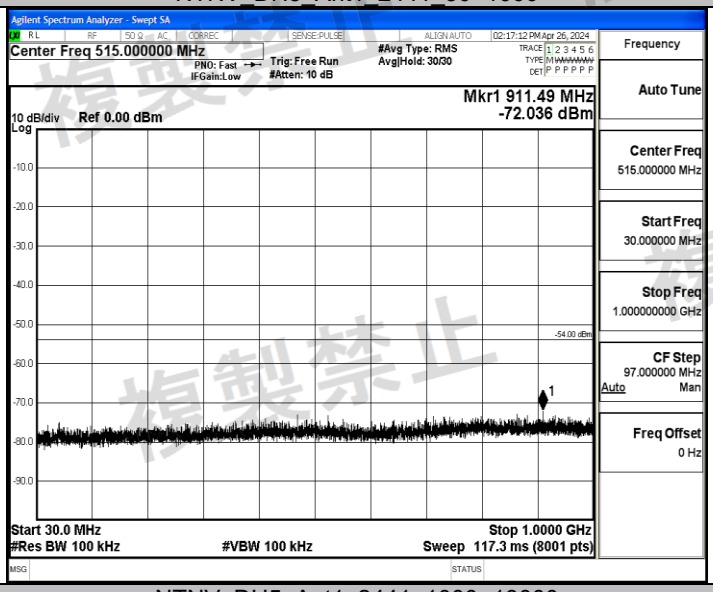
NTNV_DH5_Ant1_2402_30~1000



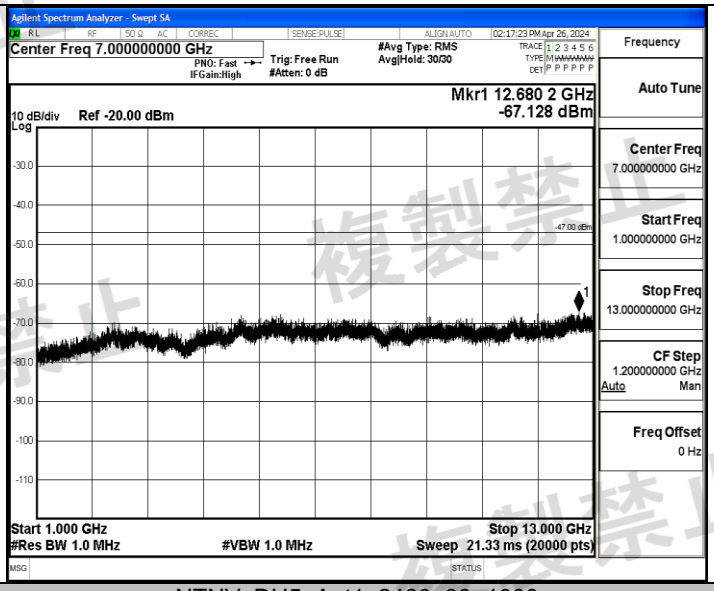
NTNV_DH5_Ant1_2402_1000~13000



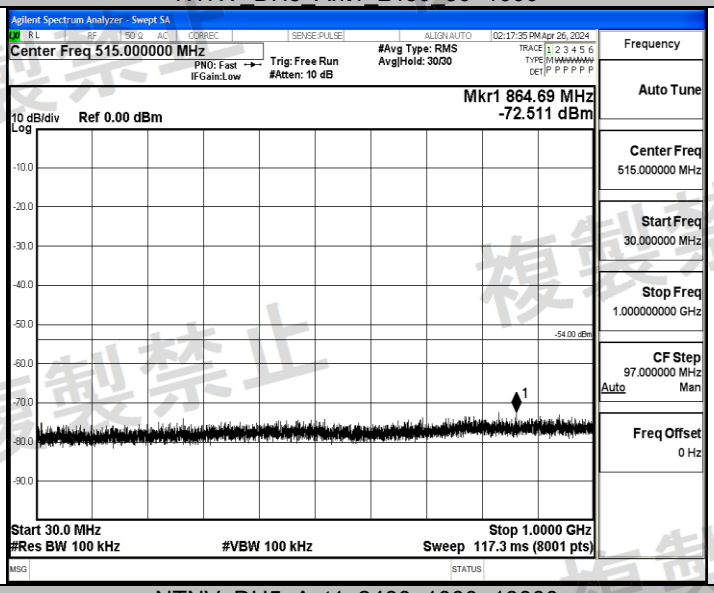
NTNV_DH5_Ant1_2441_30~1000



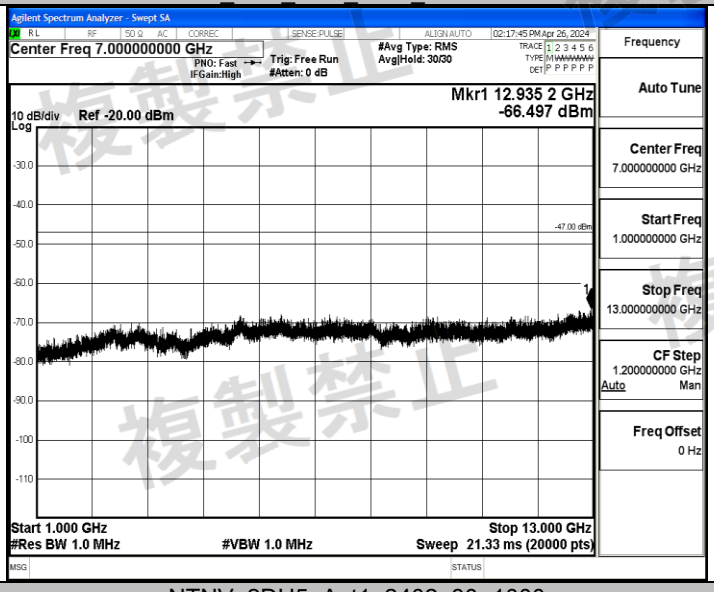
NTNV_DH5_Ant1_2441_1000~13000



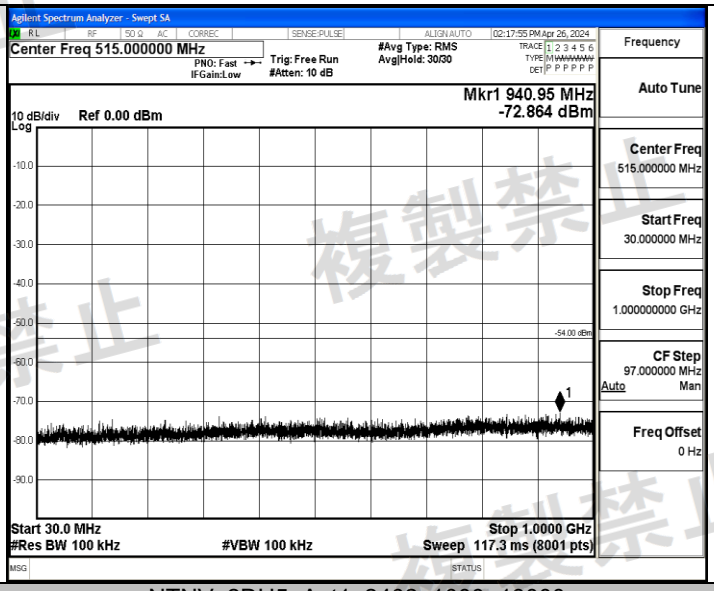
NTNV_DH5_Ant1_2480_30~1000



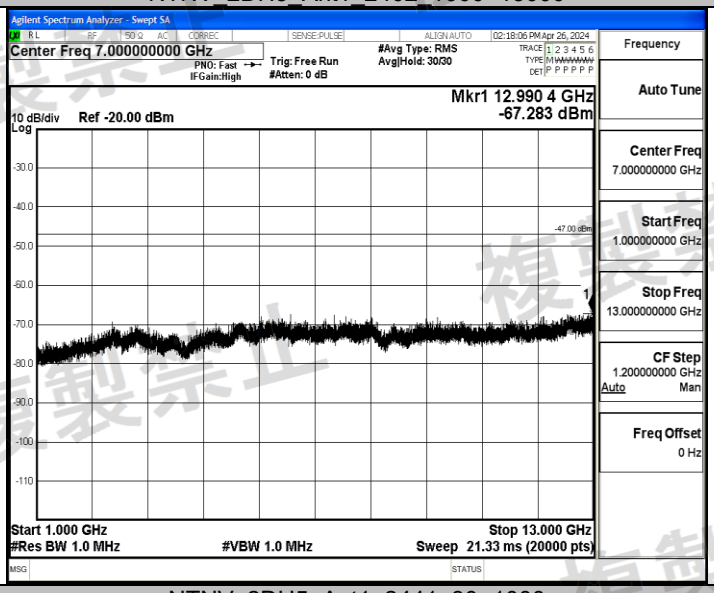
NTNV_DH5_Ant1_2480_1000~13000



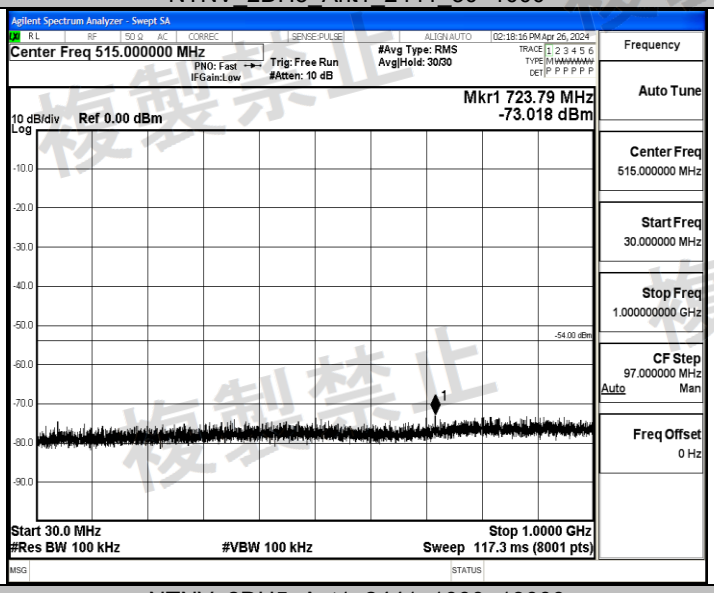
NTNV_2DH5_Ant1_2402_30~1000



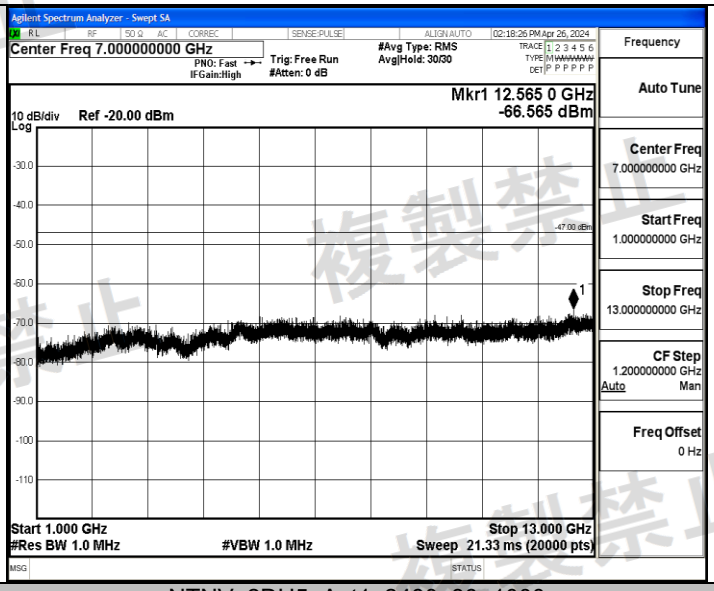
NTNV_2DH5_Ant1_2402_1000~13000



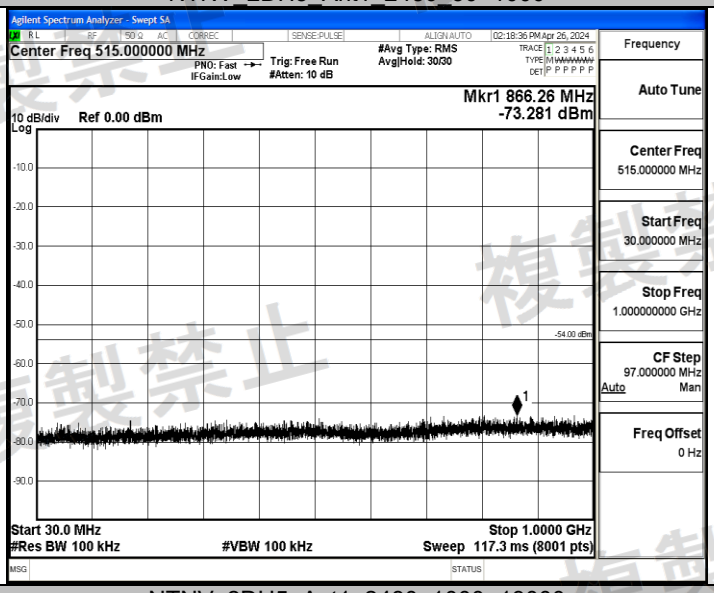
NTNV_2DH5_Ant1_2441_30~1000



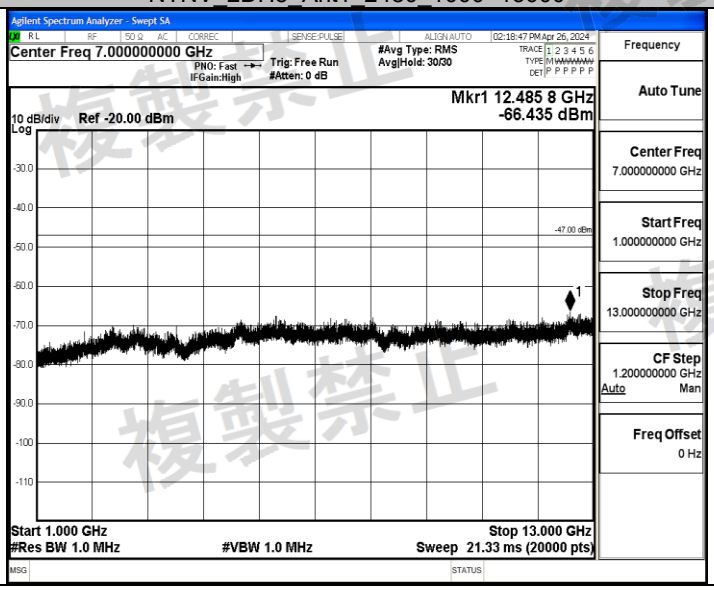
NTNV_2DH5_Ant1_2441_1000~13000



NTNV_2DH5_Ant1_2480_30~1000



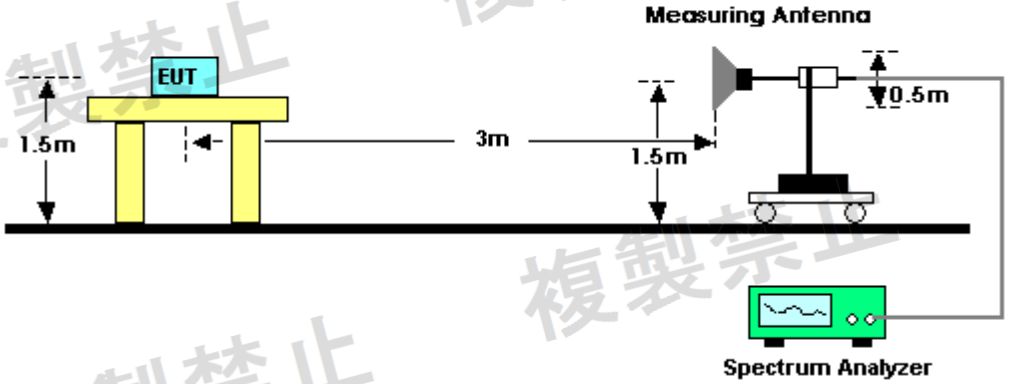
NTNV_2DH5_Ant1_2480_1000~13000



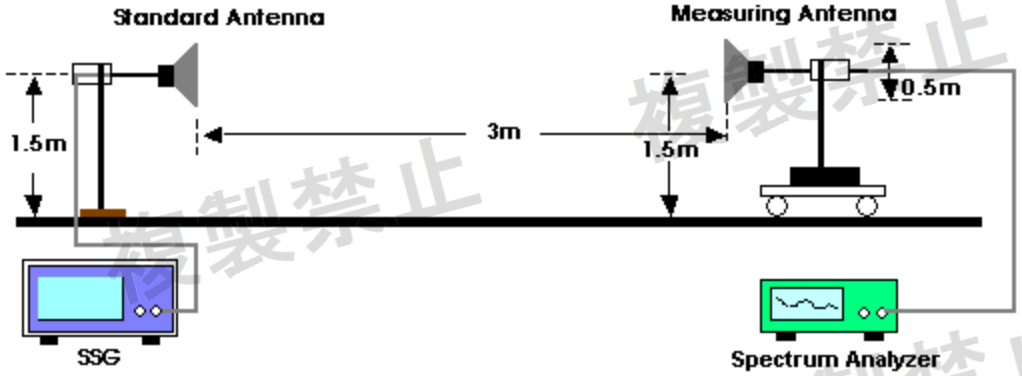
4.8. Transmission Antenna Gain (EIRP antenna power) Measurement

TEST CONFIGURATION

For EUT radiation measurement



For standard antenna measurement



TEST PROCEDURE

1. Set EUT ad measuring antenna at the same height and roughly facing each other.
2. Move the measuring antenna height up and down within ± 50cm of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read sa “E“.
3. 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
4. Swing the replacing antenna give a maximum receiving level.
5. Move the measuring antenna height up and down within ± 50cm of replacing antenna height and swing it to find the maximum receiving level.
6. Set SSG output power at Pt to give the equivalent output level of “E” or caluate Pt with SSG output which gives the nearest of “E” and difference (± 1dB). Record the Pt.
7. Calculate EIRP by the formula below EIRP = Gt – L + Pt.
   Gt: gain of replacing antenna (dBi)

L: feeder loss between SSG and replacing antenna
Pt: Output power of the SSG

8. 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.

LIMIT

Modulation system	Frequency band used	Antenna power (max.)	EIRP (max.)	
			Omnidirectional case	Directional case
DS, OFDM	2,400 - 2,483.5 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
FH, DS-FH FH-OFDM	2,400 - 2,483.5 MHz	3 mW/MHz	6.91 dBm/MHz	16.91 dBm/MHz
	Excluding 2,427 - 2,470.75 MHz	10 mW/MHz	12.14 dBm/MHz	22.14 dBm/MHz
Other than the above	2,400 - 2,483.5 MHz	10 mW	12.14 dBm	22.14 dBm
Note: it is not applicable when Antenna gain do not exceed 2.14 dBi.				

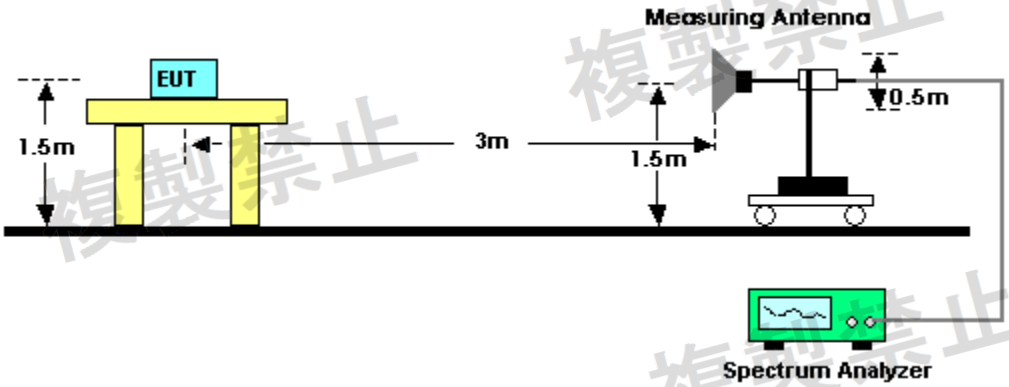
TEST RESULTS

N/A

AS:
☒Antenna gain do not exceed than 2.14 dBi

4.9. Transmission Radiation Angle Width (3db Beamwidth) Measurement

TEST CONFIGURATION



TEST PROCEDURE

1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Set spectrum analyzer with condition in section 4.8 and tune reference level to observe receving signal position.
3. Rotate directions of the EUT horizontally and ertically to find the maximum receiving power.
4. Move the measuring antenna height up and down within ± 50cm 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. Caluate 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 = { EIRP Power [mW] / 16.36 for DS, OFDM} = { EIRP Power [dBm] / 12.14 for DS, OFDM} or
   A = { EIRP Power [mW] / 4.9 for FH}={ EIRP Power [dBm] / 6.91 for FH}

LIMIT

Item	Upper Limits
3dB antenna beam width	360/A (If A<1; then A=1) A = {EIRP [mW] / 16.36 for DS, OFDM} or A = {EIRP [mW] / 4.9 for FH}
Note: it is not applicable when Antenna gain do not exceed 2.14 dBi or EIRP do not exceed the omnidirectional EIRP upper limit..	

TEST RESULTS

N/A

AS:

☒ Antenna gain do not exceed than 2.14 dBi
☐ EIRP do not exceed the omnidirectional EIRP upper limit

4.10. Dwell Time

TEST CONFIGURATION

TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set the spectrum analyzer as follows:
   Center frequency: Measurement hopping frequency
   Sweep frequency width: 0 Hz
   Resolution bandwidth: About 1 MHz
   Video bandwidth: Approximately the same as the resolution bandwidth
   Sweep time: Hopping period
   Trigger condition: Video trigger
   Sweep mode: Single sweep
   Detection mode: Positive peak
3. Set the EUT for DH5 packet transmitting.
4. Measure the maximum time duration of one single pulse.
5. Dwell time = [Spreading factor/79] x duty-cycle x 0.4 seconds (to be determined for each mode DH5)
   Duty-cycle = [on time/total time] x 100%

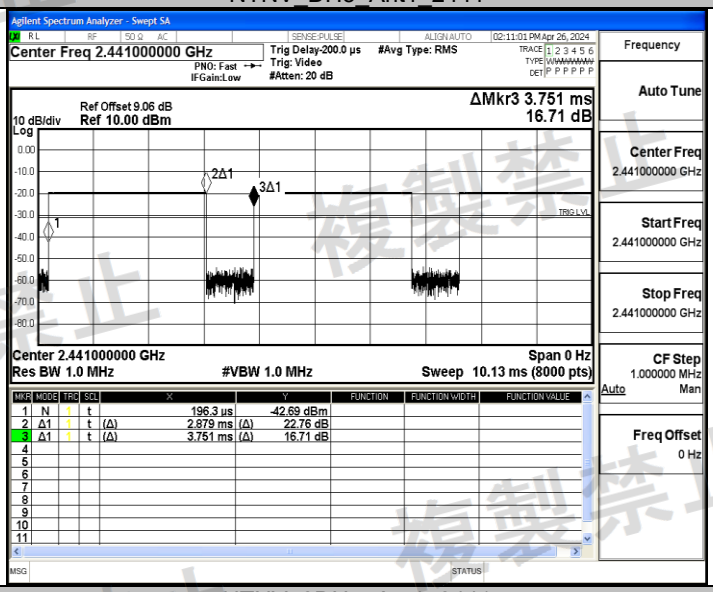
LIMIT

Item	Upper Limits
Dwell Time	≦ 0.4 sec

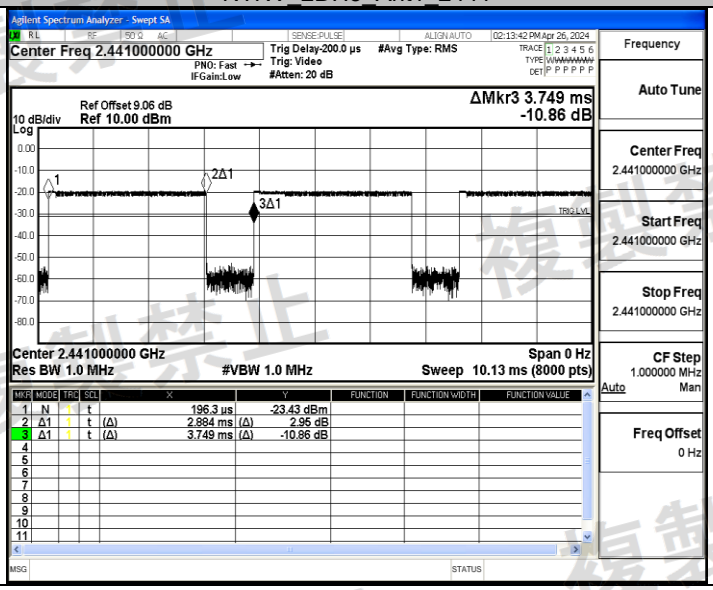
TEST RESULTS

Test Condition	Test Mode	Antenna	Freq(MHz)	90% Spread BW	Duty cycle(%)	Dwell Time(s)	Limits(s)
NTNV	DH5	Ant1	Hop	70.949	76.75%	0.28	0.4
	2DH5	Ant1	Hop	71.104	76.93%	0.14	0.4
NTHV	DH5	Ant1	Hop	70.882	76.06%	0.27	0.4
	2DH5	Ant1	Hop	71.053	76.41%	0.14	0.4
NTLV	DH5	Ant1	Hop	70.891	76.70%	0.28	0.4
	2DH5	Ant1	Hop	71.012	76.44%	0.14	0.4

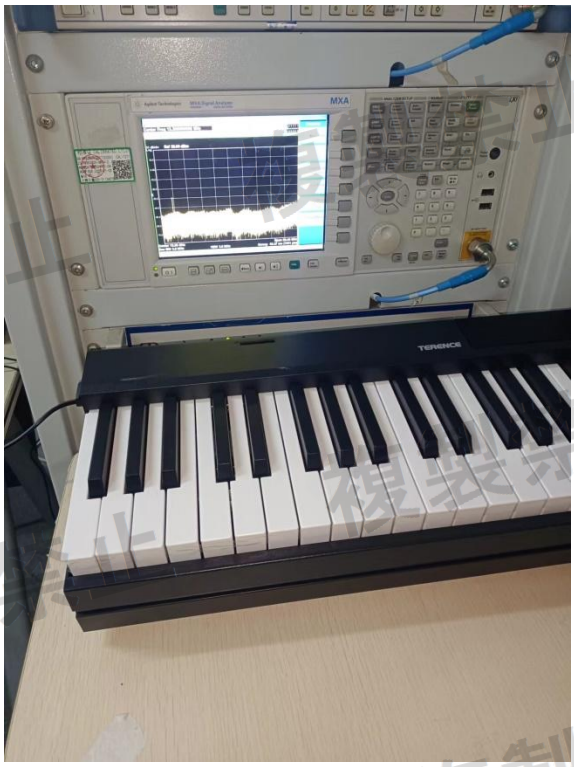
NTNV_DH5_Ant1_2441



NTNV_2DH5_Ant1_2441



5. Test Setup Photos of the EUT



6. External and Internal Photos of the EUT

External Photos

Fig.1

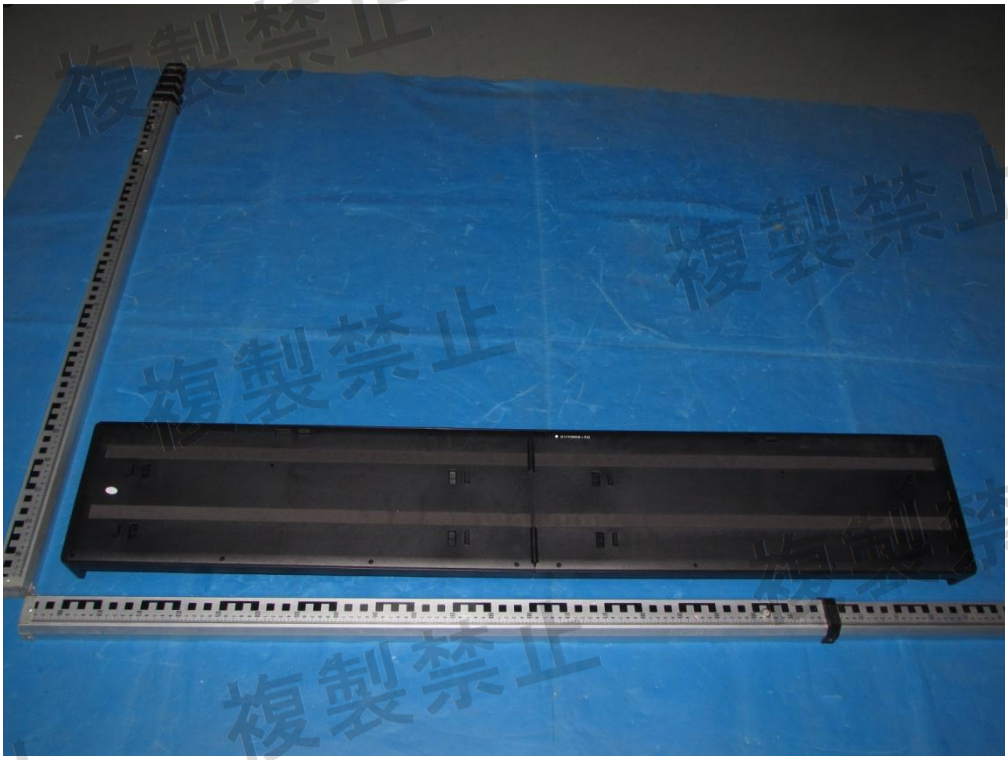


Fig.2

Fig.3

Fig.4

Fig.5

Fig.6

Power Adapter
品　番: JBP0201
入力定格: 100-240V~ 50/60Hz
0.3A Max
出力定格: 5V⎓2000mA
Zhongshan jiabei electrical technology Co.,Ltd.
MADE IN CHINA

Fig.7

複製禁止

Internal Photos

Fig.1

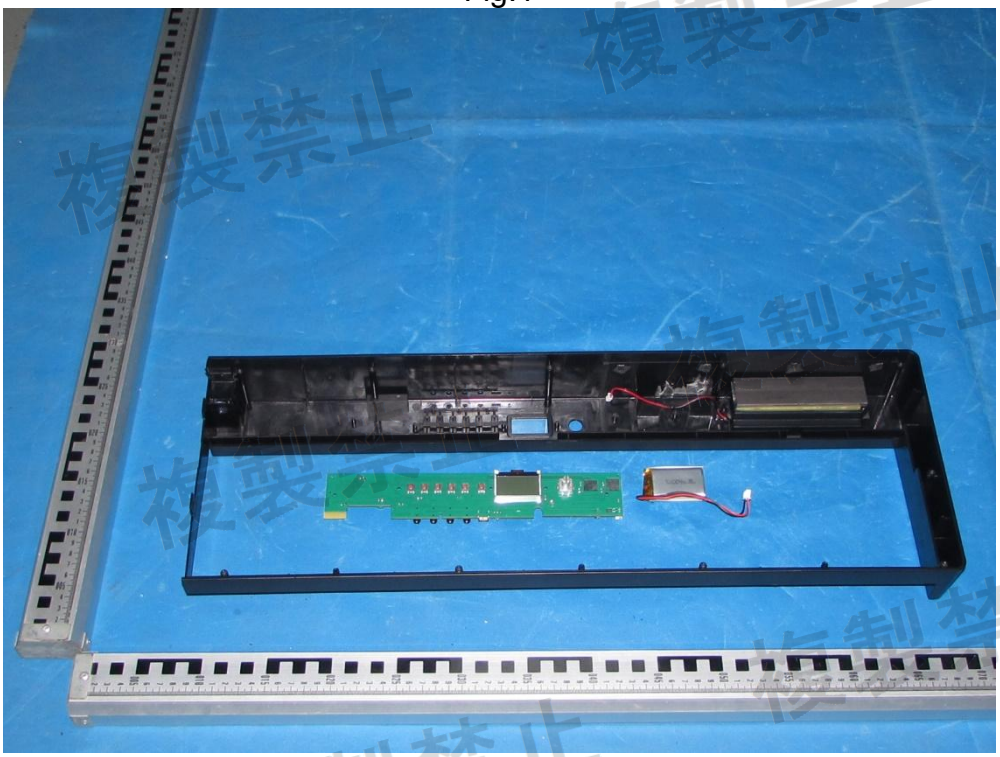


Fig.2

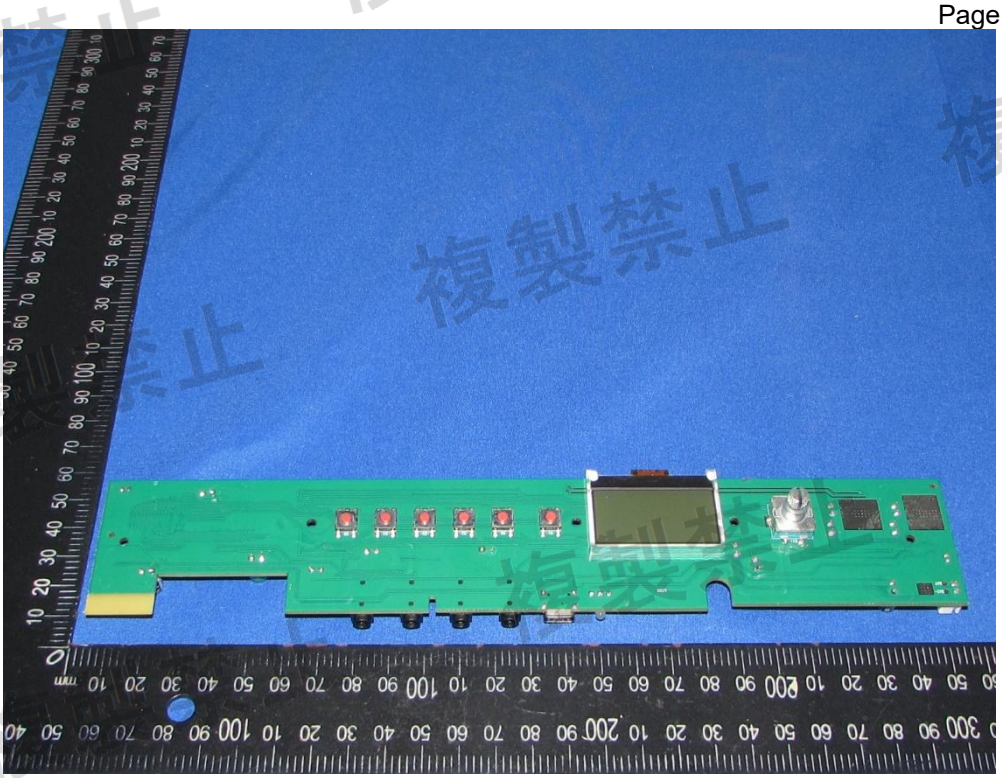


Fig.3

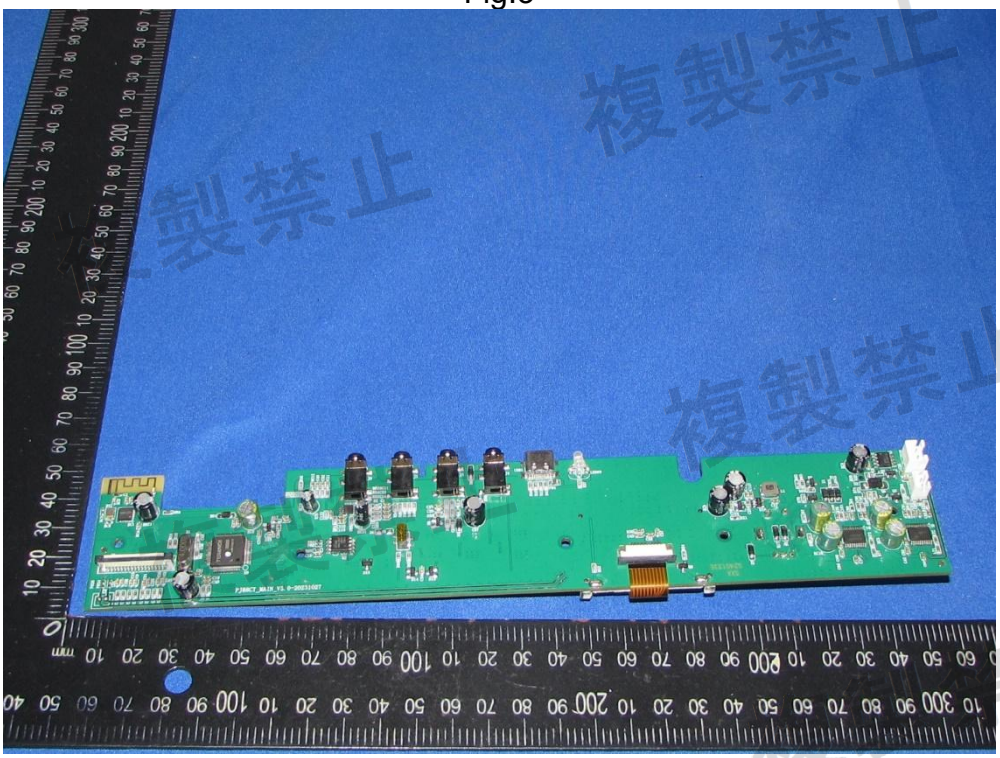


Fig.4

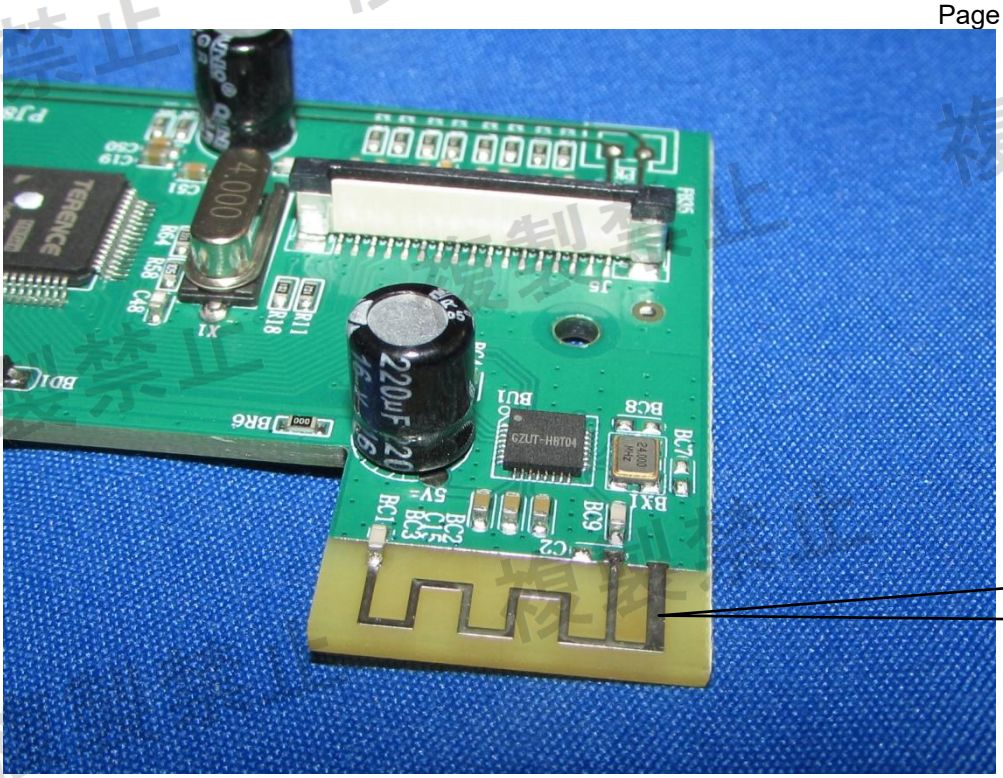


Fig.5

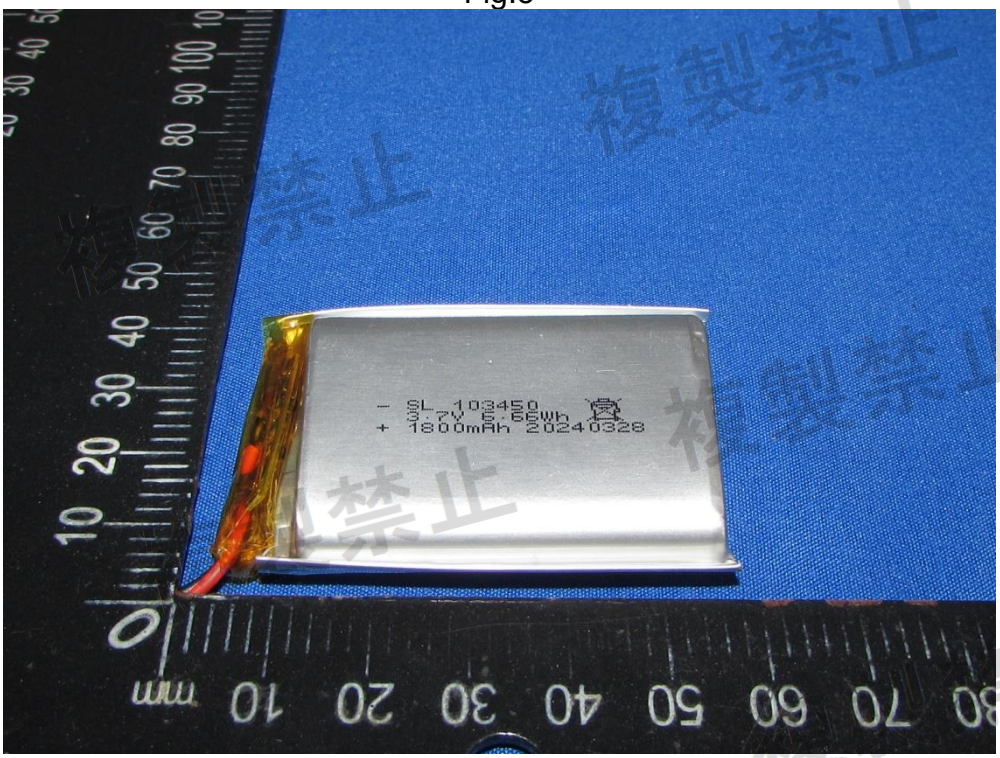


Fig.6

複製禁止

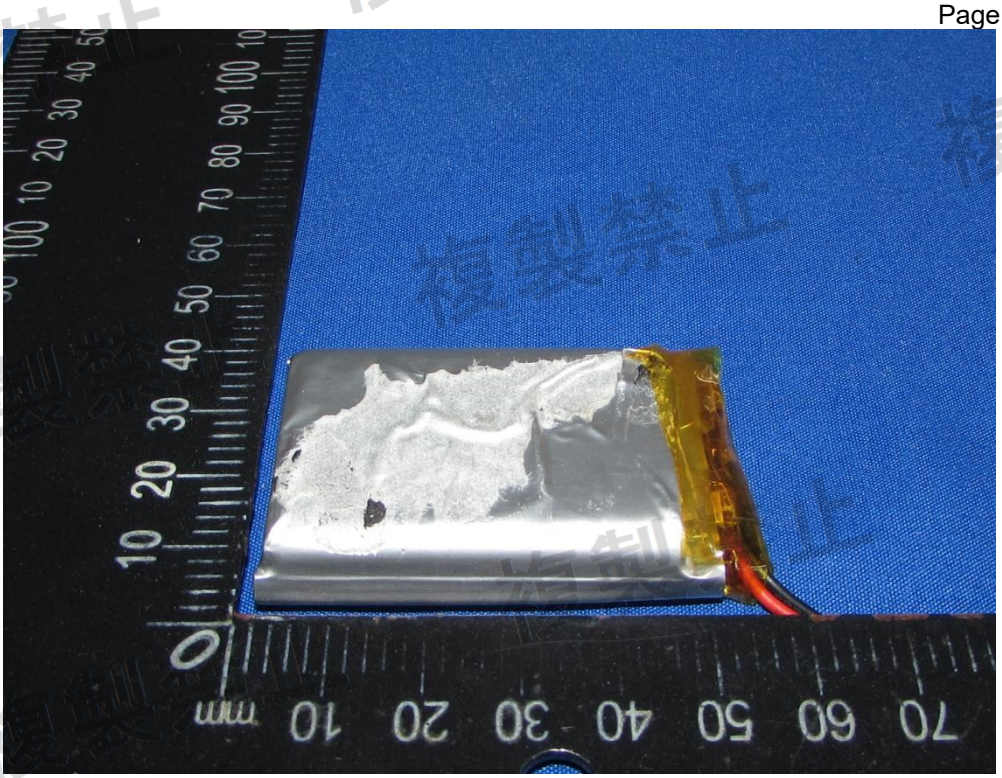


Fig.7

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