Test Report

Report No.	:	MTi251027007-0101E1
Date of issue	:	2025-11-06
Applicant	:	Sanwa Supply Inc
Product	:	Wireless Open-ear HeadSet
Model(s)	:	MM-BTSH73BK

Issued by:

Shenzhen Microtest Co., Ltd.

TEST REPORT

Report No.: MTi251027007-0101E1

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TEST REPORT

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Test Result Certification	
Applicant	Sanwa Supply Inc
Applicant Address	OKAYAMA OFFICE 1-10-1, Tamachi.Kita-Ku. Okayama Pref, 700-0825 , Japan
Manufacturer	Sky Wing Communication Electronics Co., Ltd.
Manufacturer Address	NO.23, Xincun Road, Chigang Zone, Humen Town, Dongguan City, Guangdong, China
Factory	Sky Wing Communication Electronics Co., Ltd.
Factory Address	NO.23, Xincun Road, Chigang Zone, Humen Town, Dongguan City, Guangdong, China
Product description	
Product name	Wireless Open-ear HeadSet
Trademark	Sanwa Supply
Model name	MM-BTSH73BK
Series Model(s)	N/A
Standards	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43
Testing Information	
Date of test	2025-10-31 to 2025-11-03
Test result	Pass

Prepared by:	James Qin	James Qin
Reviewed by:	David Lee	David. Lee
Approved by:	Lewis Lian	Lewis Lian

1 General Description

1.1 Description of the EUT

Product name:	Wireless Open-ear HeadSet
Model name:	MM-BTSH73BK
Series Model(s):	N/A
Model difference:	N/A
Electrical rating:	Input: DC 5V/ 500mA Battery: DC 3.7V, 120mAh, 0.444Wh
Accessories:	N/A
Hardware version:	V01
Software version:	V001
Test sample(s) number:	MTi251027007-01-R001
RF specification	
Bluetooth version:	V5.4
Operating frequency range:	2402-2480MHz
Channel number:	79
Modulation type:	GFSK, π/4-DQPSK, 8DPSK
Antenna(s) type:	Ceramic
Antenna(s) gain:	2.78dBi

1.2 Description of test modes

No.	Emission test modes
Mode1	TX-GFSK
Mode2	TX-π/4-DQPSK
Mode3	TX-8DPSK
Mode4	unmodulated carrier
Mode5	RX

1.2.1 Operation channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465

4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	-	-

Test Channel List
Operation Band: 1

Bandwidth (MHz)	Lowest Channel (LCH) (MHz)	Middle Channel (MCH) (MHz)	Highest Channel (HCH) (MHz)
1	2402	2441	2480

Note: The test software provided by manufacturer is used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting mode.

Test Software: BT_Tool
For power setting, refer to below table.

Mode	2402MHz	2441MHz	2480MHz
GFSK	3	3	3
π/4-DQPSK	3	3	3
8DPSK	3	3	3

1.3 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15°C ~ 35°C
Humidity:	20% RH ~ 75% RH
Atmospheric pressure:	98 kPa ~ 101 kPa

Test Conditions		Power Supply (V)	Input Voltage to the circuit of RF unit (V)
NTNV (V_{normal})	/	3.7	3.3
NTHV ($V_{max.}$)	+10%	4.07	3.3
NTLV ($V_{min.}$)	-10%	3.33	3.3

Note: If the fluctuation of input voltage to the circuit of RF unit (except power supply) of test equipment is under ±1%, when input voltage from external power supply to the test equipment is fluctuated by ±10%: conduct the test with the rated voltage only

1.4 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
Laptop	e485	/	Lenovo
Support cable list			
Description	Length (m)	From	To
/	/	/	/

1.5 Measurement uncertainty

Parameter	Measurement uncertainty
Frequency tolerance	±10 ppm
Occupied channel bandwidth	±3 %
RF output power, conducted	±1 dB
Power Spectral Density, conducted	±1 dB
Unwanted Emissions, conducted	±1 dB
All emissions, radiated	±4.7 dB
Temperature	±1 °C
Supply voltages	±1 %
Time	±1 %

Note: the measurement uncertainty is calculated and correspond to a factor k-=2 (which provide confidence levels of.95.45%)

2 Summary of Test Result

No.	Item	Standard	Requirement	Result
1	Tolerance of Frequency	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
2	Occupied Bandwidth (99%)	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
3	Spread Bandwidth (90%)	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
4	Antenna Power and Tolerance	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
5	Spurious Emission Intensity	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
6	Secondary Radiated Emissions	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
7	Dwell Time	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
8	Interference Prevention Function	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
9	Transmission Antenna Absolute Gain	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	Pass
10	Half Powe Beam Angie(Radiation angle of antenna)	Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43	Article 2-1, Item 19	N/A

Notes:

N/A means not applicable

Transmitter antenna beam width: this requirement does not applicable to the EUT when its EIRP is under 6.91dBm/MHz.

3 Test Facilities and accreditations

3.1 Test laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573
IC Registration No.:	21760
CABID:	CN0093

4 List of test equipment

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due	Calibration method
Dwell Time Tolerance of Frequency Occupied Bandwidth (99%) Spread Bandwidth (90%) Antenna Power and Tolerance Spurious Emission Intensity Secondary Radiated Emissions							
1	Wideband Radio Communication Tester	Rohde&schwarz	CMW500	149155	2025-03-18	2026-03-17	C
2	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2025-03-14	2026-03-13	C
3	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2025-03-14	2026-03-13	C
4	Synthesized Sweeper	Agilent	83752A	3610A01957	2025-03-14	2026-03-13	C
5	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2025-03-14	2026-03-13	C
6	RF Control Unit	Tonscend	JS0806-1	19D8060152	2025-03-18	2026-03-17	C
7	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2025-03-14	2026-03-13	C
8	ESG Vector Signal Generator	Agilent	N5182A	MY50143762	2025-03-14	2026-03-13	C
9	DC Power Supply	Agilent	E3632A	MY40027695	2025-03-18	2026-03-17	C
10	RF Test System	Tonscend	JS1120-3 Test System Ver. V3.5.39	/	/	/	C

Remark:
(a) Calibration conducted by the National institute of information and Communications Technology (NICT)in Japan (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1) in JRL.
(b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Act (Act No. 51 of 1992).
(c) Calibration conducted in countries except Japan, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
(d) Calibration, etc, conducted by using measuring instruments and other equipment listed in the right column of appended table No. 3, which shall have been given any type of calibration, etc. listed above from (a) to (c)

From JRL Article 24-2, paragraph 4, Item 2

5 Evaluation Results (Evaluation)

5.1 Interference Prevention Function

Test Requirement:	The EUT shall support one of the following functions: - Automatic identification transmission - Automatic identification reception
Test Method:	Notification No.88 of MIC, 2004
Procedure:	(1) For EUTs capable of automatically transmitting identification data a. Transmit identification data from EUT to Demodulator b. Confirm identification data is correctly received by Demodulator (2) For EUTs capable of automatically receiving identification data a. Transmit identification data from Link Partner to EUT b. Confirm communication link is established c. Link Partner shall respond by transmitting different identification data back to the EUT d. Confirm EUT stops transmitting, or confirm EUT recognizes that the two identification data are different

5.1.1 Conclusion:

The detected ID of the device is below: 414287A1D79E Test result: The device meet the requirements PASS

6 Radio Spectrum Matter Test Results (RF)

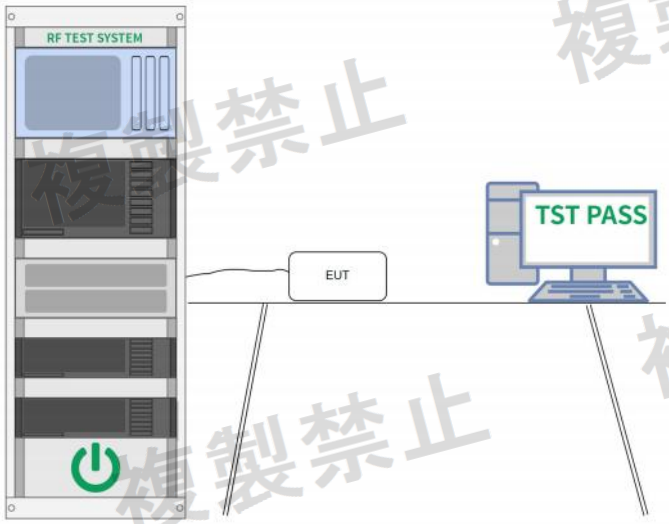
6.1 Tolerance of Frequency

Test Requirement:	Article 2-1, Item 19
Test Limit:	±50ppm or less.
Test Method:	Notification No.88 of MIC, 2004
Procedure:	Center frequency: Test frequency Span: 1 MHz RBW: 10 kHz (unmodulated) VBW: 10 kHz (unmodulated) Sweep data points: 1001 or greater Sweep time: Auto Detector mode: Positive peak Indication mode: Max hold (1) Find the peak carrier signal and measure its frequency (2) For multiple antenna systems each antenna shall be measured (3) For an EUT with multiple antennas it is permissible to test a single antenna only, provided all the antenna measurement values are expected to be same for either of the following reasons: a) The frequency of all antenna transmissions are phase-synchronized to a common (fundamental) oscillator b) The antenna transmissions share a common clock signal

6.1.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode4				
Final test mode:	Mode4				

6.1.2 Test Setup Diagram:



6.1.3 Test Data:

Please Refer to Appendix for Details.

6.2 Occupied Bandwidth (99%)

Test Requirement:	Article 2-1, Item 19
Test Limit:	For FHSS or FHSS and other modulation Hybird: 83.5 MHz or less: The measured bandwidth at the low and high channels shall meet the following requirements: - The lowest frequency of the measured bandwidth shall not be less than 2400 MHz - The highest frequency of the measured bandwidth shall not be greater than 2483.5 MHz [Occupied Bandwidth] 83.5 MHz or less
Test Method:	Notification No.88 of MIC, 2004
Procedure:	

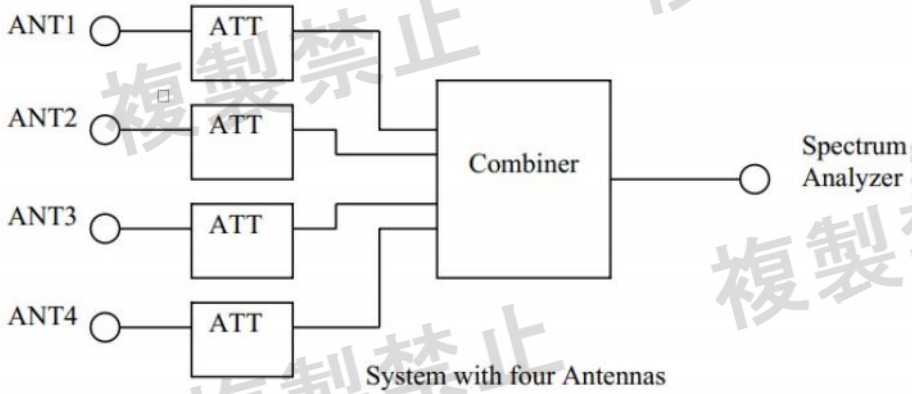
Center Frequency:	Test frequency
Span:	2 - 3.5 times the technical standard
RBW:	Within 3% of the technical standard
VBW:	Same as RBW
Sweep time:	Auto
Sweep data points:	1001 or greater
Detector mode:	Positive peak
Indication mode:	Max hold
BW setting:	99%

(1) Measure the signal bandwidth using a spectrum analyzer

(2) For multiple antenna systems:

a) Each antenna shall be individually measured

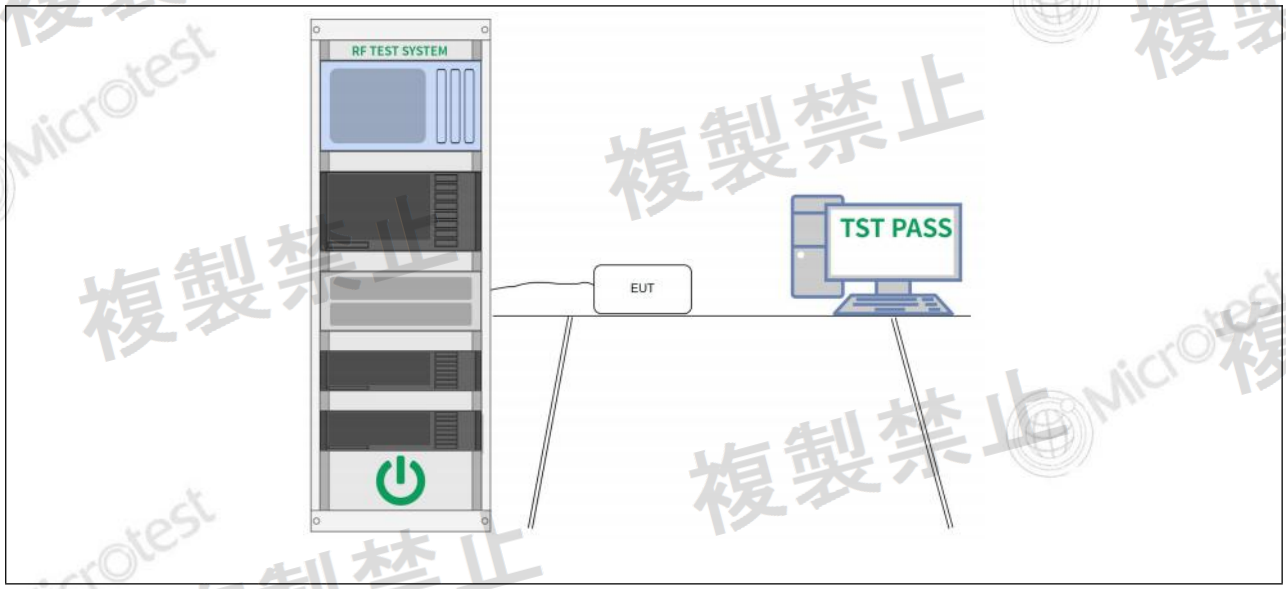
b) If the measured occupied bandwidth for any antenna exceeds [(Occupied Bandwidth Limit) – 100kHz] then, in addition, the occupied bandwidth shall be measured with all antennas combined – see diagram below:



6.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.2.2 Test Setup Diagram:



6.2.3 Test Data:

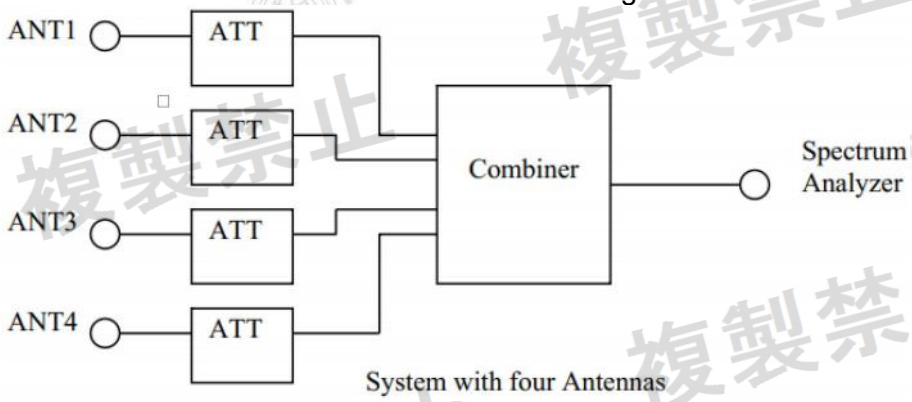
Please Refer to Appendix for Details.

6.3 Spread Bandwidth (90%)

Test Requirement:	Article 2-1, Item 19
Test Limit:	Only for report use.
Test Method:	Notification No.88 of MIC, 2004
Procedure:	

Center Frequency:	Test frequency
Span:	2 - 3.5 times the technical standard
RBW:	Within 3% of the technical standard
VBW:	Same as RBW
Sweep time:	Auto
Sweep data points:	1001 or greater
Detector mode:	Positive peak
Indication mode:	Max hold
BW setting:	90%

(1) Measure the signal bandwidth using a spectrum analyzer
(2) For multiple antenna systems:
a) Each antenna shall be individually measured
b) If the measured occupied bandwidth for any antenna exceeds [(Occupied Bandwidth Limit) – 100kHz] then, in addition, the occupied bandwidth shall be measured with all antennas combined – see diagram below:

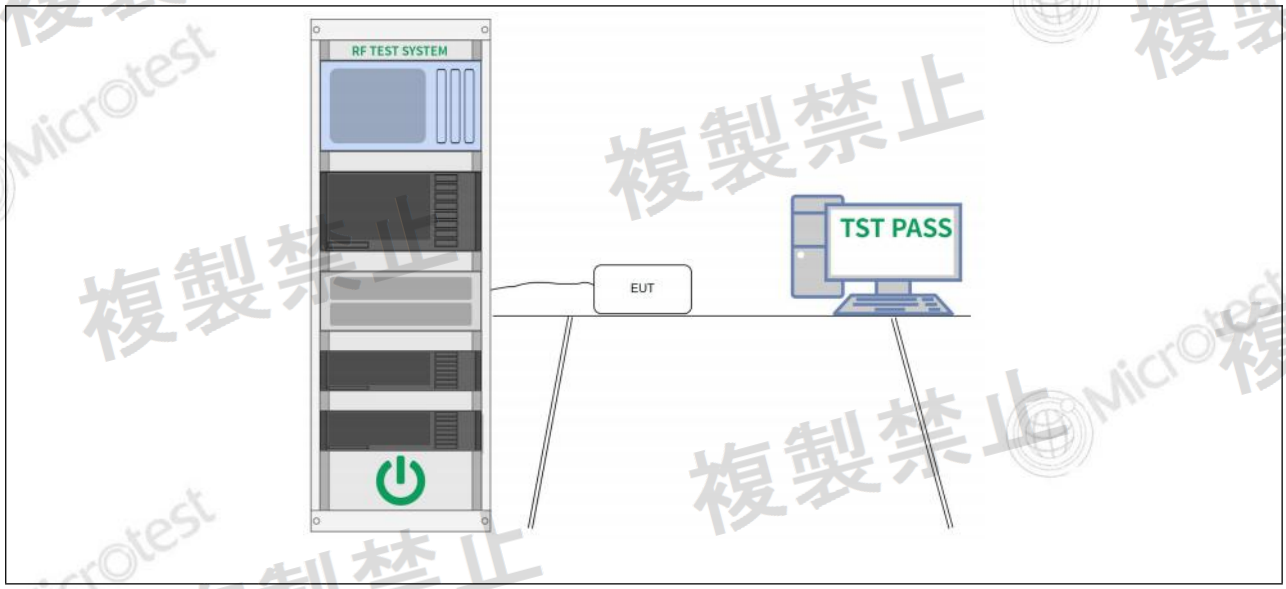


System with four Antennas

6.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

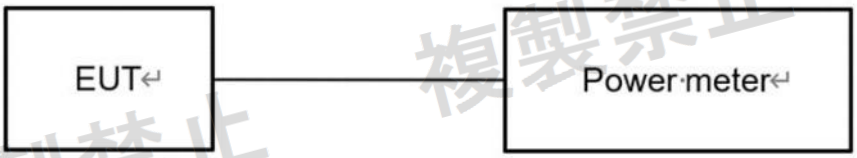
6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

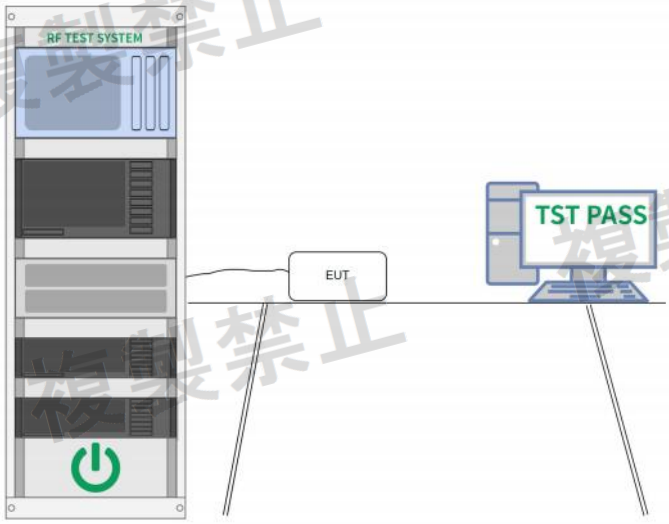
6.4 Antenna Power and Tolerance

Test Requirement:	Article 2-1, Item 19
Test Limit:	Antenna Power: 3 mW/MHz or less Tolerance: +20% or less EIRP: 6.91dBm/MHz
Test Method:	Notification No.88 of MIC, 2004
Procedure:	Connect high frequency power meter to the RF output of the EUT with a suitable attenuator and measure the total electric power. 

6.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.4.2 Test Setup Diagram:



6.4.3 Test Data:

Please Refer to Appendix for Details.

6.5 Spurious Emission Intensity

Test Requirement:	Article 2-1, Item 19
Test Limit:	(1) Below 2387 MHz: 2.5 μW (-26 dBm)/MHz or less (2) 2387 to 2400 MHz: 25.0 μW (-16 dBm)/MHz or less (3) 2483.5 to 2496.5 MHz: 25.0 μW (-16 dBm)/MHz or less (4) Over 2496.5 MHz: 2.5 μW (-26 dBm)/MHz or less
Test Method:	Notification No.88 of MIC, 2004
Procedure:	

[Setting 1]	
Frequency range:	(see Note 1)
RBW:	1 MHz
VBW:	1 MHz
Sweep time:	Minimum time required to make an accurate measurement
Sweep Data Points:	1001 or greater
Detector mode:	Positive peak
Indication mode:	Max hold (see Note 2)
Note 1:	Measurement range shall be 30 MHz to 12.5 GHz, except for the following cases: -FHSS, FHSS+DSSS, FHSS+OFDM:2374 MHz to 2509.5 MHz -Other than FHSS, FHSS+DSSS, FHSS+OFDM: 2400 MHz to 2483.5 MHz
Note 2:	Sweep shall be repeated until the max hold waveform is stable.
[Setting 2]	
Center frequency:	Frequency of spurious emission found using [Setting 1]
Span:	0 Hz
RBW:	1 MHz
VBW:	1 MHz
Sweep time:	Minimum time required to make an accurate measurement. For burst type (intermittent) spurious emissions, sweep time shall be greater than one burst interval
Sweep Data Points:	1001 or greater
Detector mode:	Sample
[Setting 3]	
Frequency range:	2374 MHz to 2400 MHz 2483.5 MHz to 2509.5 MHz
RBW:	30 kHz
VBW:	30 kHz
Sweep time:	Minimum time required to make an accurate measurement.

Sweep data points:	1001 or greater
Detector mode:	Positive peak
Indication mode:	Max hold

(1) After configuring the spectrum analyzer to [Setting 1], search for spurious emissions from 30 MHz to 12.5 GHz. If the sweep range does not cover the required measurement frequency range then the measurement range will need to be divided into sufficient sections of size [RBW x Sweep Data Points]. If spurious emissions greater than [Limit - 3dB] are found, then more detailed measurements are required, go to step (2)
(2) Configure the spectrum analyzer using [Setting 2] and measure the average signal amplitude.
If the spurious emission is burst type (intermittent), then the average value shall not include signal OFF time.
If spurious emissions ranging from 30 MHz to 2374 MHz and from 2509.5MHz to 12.5GHz are over the limit, then the test result is Fail.
If spurious emissions ranging from 2374 MHz to 2400 MHz and from 2483.5 MHz to 2509.5 MHz are over the limit, then further detailed measurements are required, go to step (3)
(3) In the following cases, measure the spurious emissions using [Setting 3]
- Case1: FHSS, FHSS+DSSS, FHSS+OFDM
- Case2: Other than FHSS, FHSS+DSSS, FHSS+OFDM, and the spurious emissions in step (2) are over the limit
(4) Calculate the spurious emission value (Calculated Value) using following the formula below:
Calculated Value = (Measured Value using (3) + 15.2dB)
Note: 15.2dB adjustment is derived from the Conversion Factor of RBW
Conversion Factor of RBW = 10 x Log (Reference Bandwidth / RBW of measurement) = 15.2 [dB] Where: Reference Bandwidth = 1 MHz
RBW of measurement = 30 kHz
(5) If the calculated value using (4) is over the Limit (section 6.7), go to (6)
(6) Configure the spectrum analyzer to [Setting 3] then make the following changes: Frequency: Frequency of spurious emission
Span: 1 MHz
(7) After sweep, send the span data set to the PC
(8) Convert measured data from dBm to Watts
(9) Sum all the data using the formula below. If the sum is within the limit, the test result is Pass, otherwise, Fail

$$P_s = (\sum_{i=1}^{n} E_i) \times \frac{S_w}{RBW \times k \times n}$$

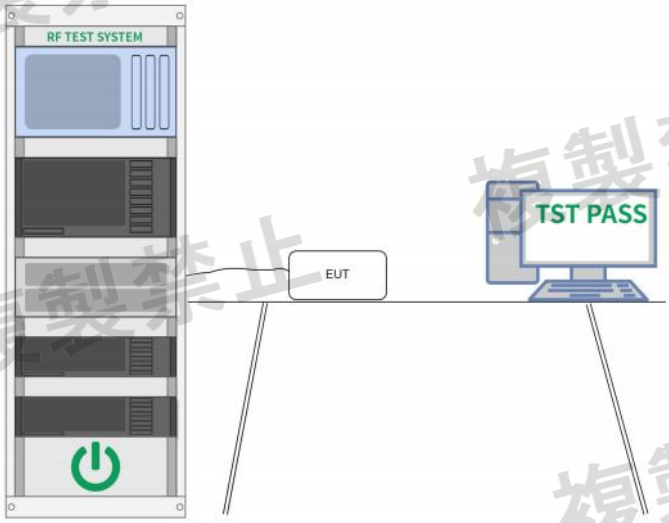
Ps: Sum (Watts)
Ei: Measured value at each point in the Span (Watts) Sw: Span (1MHz)
n: Number of measurement points in the Span
k: Correction factor for Equivalent Noise Bandwidth, specific to each spectrum analyzer, check the instrument user guide
RBW: Resolution Bandwidth (MHz).

	(10) If the EUT has multiple antennas, measure the spurious emission form each individual antenna using steps (1) through (9) (11) Convert the individual antenna spurious level measurements (step (10)) from dB to absolute values (12) Combine (sum) the absolute values of the spurious measurements at each frequency for each antenna (to create a single composite spectrum of spurious emissions) (13) Ensure that the composite spectrum does not exceed the Limit defined in 6.7 (Technical Standard) (14) Configuring the spectrum analyzer using [Setting 3] and measure the spurious emissions with all the antennas electrically combined

6.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.5.2 Test Setup Diagram:



6.5.3 Test Data:

Please Refer to Appendix for Details.

6.6 Secondary Radiated Emissions

Test Requirement:	Article 2-1, Item 19
Test Limit:	(1) Below 1 GHz: 4 nW (-54dBm) or less (2) Above 1 GHz: 20 nW (-47dBm) or less
Test Method:	Notification No.88 of MIC, 2004
Procedure:	

[Setting 1]	
Frequency range:	30 MHz ~ 12.5 GHz
RBW:	Below 1 GHz:100 kHz
	Above 1 GHz:1 MHz
VBW:	Below 1 GHz:100 kHz
	Above 1 GHz:1 MHz
Sweep time:	Auto
Sweep data points:	1001 or greater
Detector mode:	Positive peak
Indication mode:	Max hold
[Setting 2]	
Center Frequency:	Frequency of spurious emission found using [Setting 1]
Span:	0 Hz
RBW:	Below 1 GHz:100 kHz
	Above 1 GHz:1 MHz
VBW:	Below 1 GHz:100 kHz
	Above 1 GHz:1 MHz
Sweep time:	Auto
Sweep data points:	1001 or greater
Detector mode:	Sample

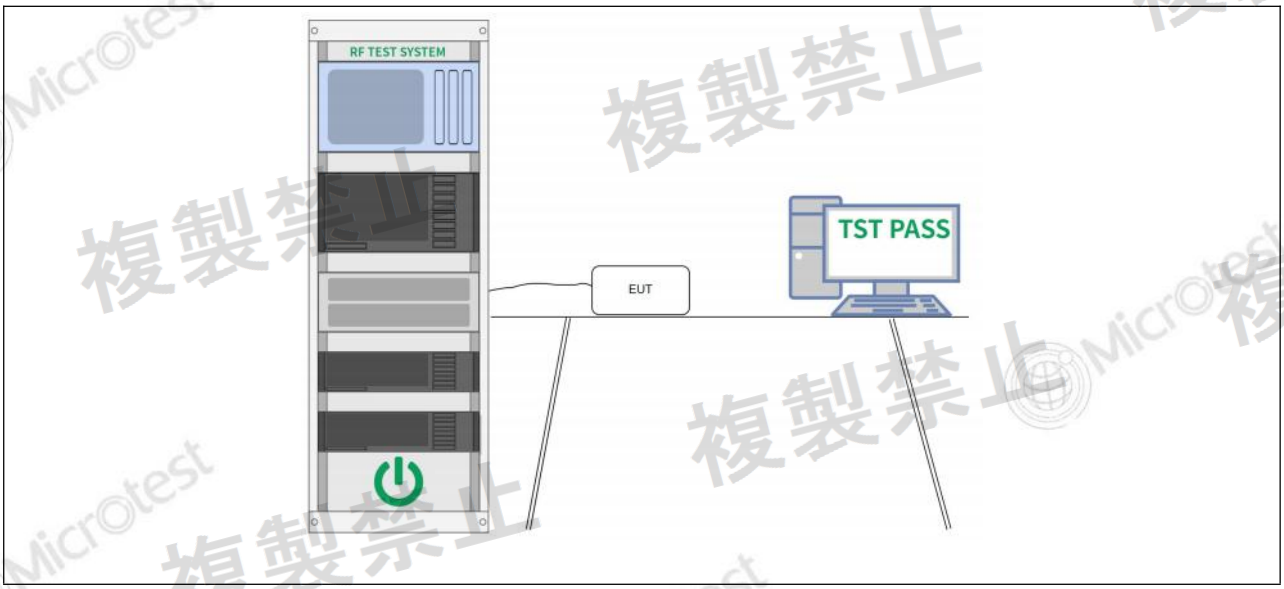
(1) Configure the spectrum analyzer to [Setting 1] and then search for spurious emissions in the range 30 MHz to 12.5GHz. If the sweep range does not cover the required measurement frequency range then the measurement range will need to be divided into sufficient sections of size [RBW x Sweep Data Points].
(2) If spurious emissions are found with an amplitude greater than [Limit - 10dB] then perform further detailed measurements as described in (3)
(3) Configure the spectrum analyzer using [Setting 2] and measure the average signal amplitude.
If the spurious emission is burst type (intermittent), then the average value shall not include signal OFF time Multiple Antenna Systems
If the EUT has multiple antennas then emissions from each antenna shall be measured individually, as described below
(4) For each antenna repeat steps (1) through (3). Convert all spurious level measurements from dB to absolute value
(5) Combine (sum) the absolute values of the spurious measurements at each frequency for each antenna (to create a single composite spectrum of spurious emissions)
(6) Ensure that the composite spectrum does not exceed the Limit

6.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode5				

Final test mode:	Mode5

6.6.2 Test Setup Diagram:



6.6.3 Test Data:

Please Refer to Appendix for Details.

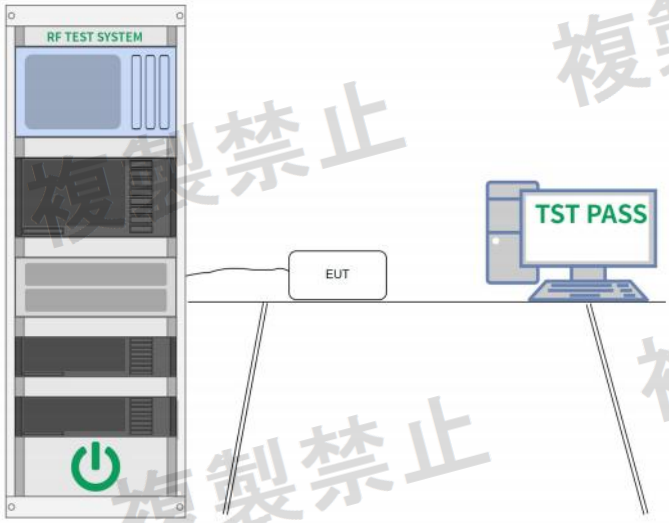
6.7 Dwell Time

Test Requirement:	Article 2-1, Item 19
Test Limit:	Transmit ON Time shall be less than 0.4 seconds Total Dwell Time shall be less than 0.4 seconds
Test Method:	Notification No.88 of MIC, 2004
Procedure:	[Setting 1] Frequency: Test frequency Span: 0 Hz RBW: 1 MHz VBW: 1 MHz Sweep data points: 1001 or greater Trigger: Video trigger Detection mode: Positive peak (1) Configure the spectrum analyzer to [Setting 1] (2) Measure the Burst Cycle and Transmit ON Time (3) Total Dwell Time shall be calculated by the following formula: Total Dwell Time = (0.4 x Spreading Rate x Transmit ON Time) / (Burst Cycle x Number of Hopping Channels) [Notes] a. Spreading Rate = Spread Bandwidth (measured value) / Transmission Rate b. Transmit ON Time and Burst Cycle are both measured in Seconds c. Numerical Coefficient (0.4) is a dimensionless number defined in the technical standard

6.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	25.2 °C	Humidity:	62 %	Atmospheric Pressure:	101 kPa
Pre test mode:	Mode1, Mode2, Mode3				
Final test mode:	Mode1, Mode2, Mode3				

6.7.2 Test Setup Diagram:



6.7.3 Test Data:

Please Refer to Appendix for Details.

Photographs of the test setup

Refer to Appendix - Test Setup Photos

Photographs of the EUT

Refer to Appendix - EUT Photos

Appendix

Appendix A: Deviation of frequency

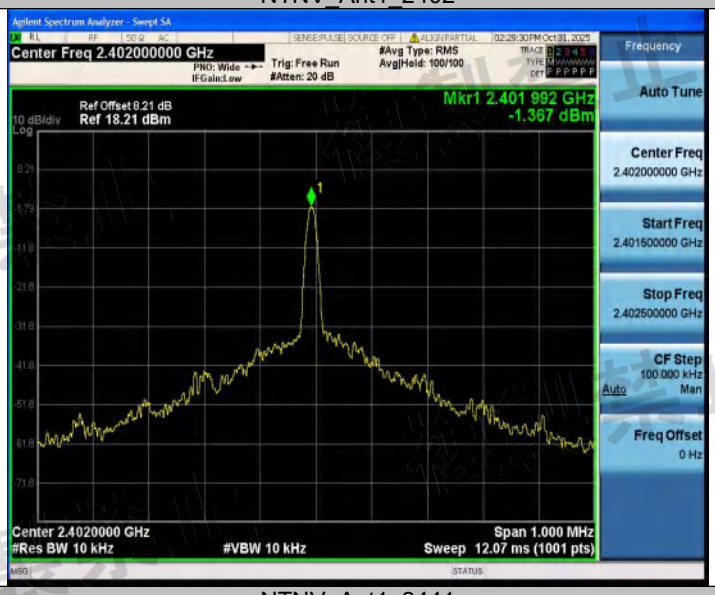
Test Result

Test Condition	Test Mode	Antenna	Freq. [MHz]	CenterFreq [MHz]	Result [ppm]	Limit [ppm]	Verdict
NTNV	unmodulated carrier	Ant1	2402	2401.992	-3.33056	±50	PASS
			2441	2440.991	-3.68701	±50	PASS
			2480	2479.991	-3.62903	±50	PASS

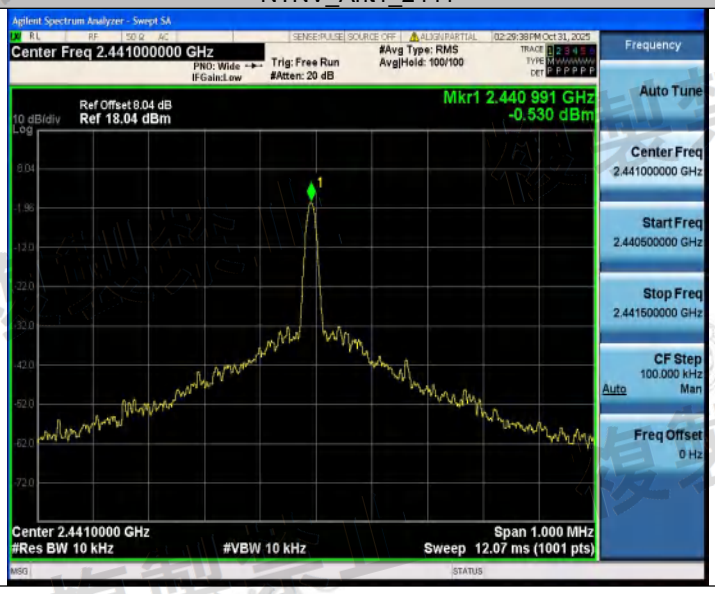
Note: Result [ppm] = (CenterFreq [MHz] – Freq. [MHz]) / Freq. [MHz] * 1000000

Test Graphs

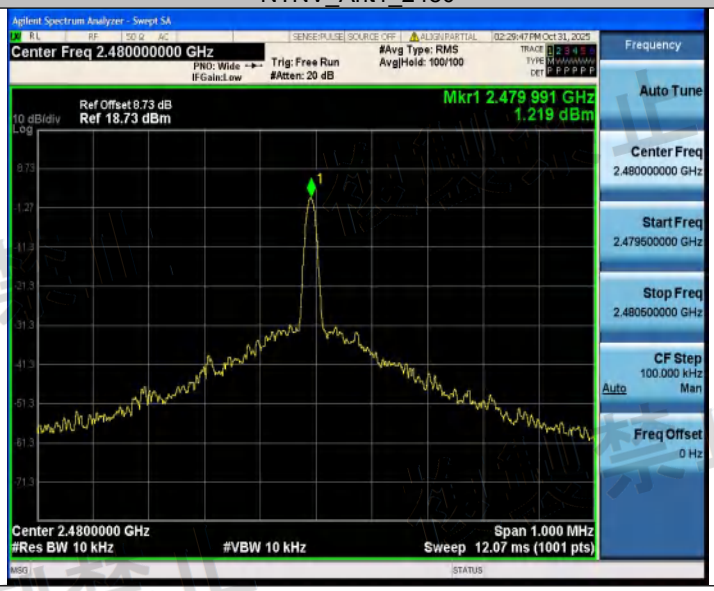
NTNV_Ant1_2402



NTNV_Ant1_2441



NTNV_Ant1_2480



Appendix B: Deviation of antenna power

Test Result

Antenna Power									
Test Condition	Test Mode	Antenna	Freq. [MHz]	Result [dBm]	Result [mW]	Spread bandwidth [MHz]	Result [mW/MHz]	Limit [mW /MHz]	Verdict
NTNV	DH5	Ant1	Hop	19.8	95.4993	70.592	1.3528	≤3	PASS
	2DH5	Ant1	Hop	17.9	61.6595	70.613	0.8732	≤3	PASS
	3DH5	Ant1	Hop	18.0	63.0957	70.245	0.8982	≤3	PASS

Notes:
Result [mW/MHz] = Result [mW] / Spread bandwidth [MHz]
The duty cycle factor has been in compensation during the testing.
Duty cycle of DH5: 77.33%,
Duty cycle of 2DH5: 77.33%
Duty cycle of 3DH5: 77.60%

Tolerance								
Test Condition	Test Mode	Antenna	Freq [MHz]	Power [mW/MHz]	RatedPower [mW/MHz]	Result [%]	Limit [%]	Verdict
NTNV	DH5	Ant1	Hop	1.3528	1.5	-9.81	≤20	PASS
	2DH5	Ant1	Hop	0.8732	0.8	9.15	≤20	PASS
	3DH5	Ant1	Hop	0.8982	0.8	12.28	≤20	PASS

Notes:
Result = (Power [mW] – RatedPower [mW]) / RatedPower [mW] * 100
The rated power is 1.5 mW/MHz for DH5 mode, which is declared by the manufacturer.
The rated power is 0.8 mW/MHz for 2DH5 mode, which is declared by the manufacturer.
The rated power is 0.8 mW/MHz for 3DH5 mode, which is declared by the manufacturer.

	EIRP						
Test Condition	Test Mode	Antenna	Freq [MHz]	Power [dBm/ MHz]	EIRP [dBm/ MHz]	Limit [dBm/ MHz]	Verdict
NTNV	DH5	Ant1	Hop	1.31	4.09	≤6.91	PASS
	2DH5	Ant1	Hop	-0.59	2.19	≤6.91	PASS
	3DH5	Ant1	Hop	-0.46	2.32	≤6.91	PASS

Notes:
The antenna gain is 2.78 dBi.
EIRP= Conducted Peak Power+ antenna gain.

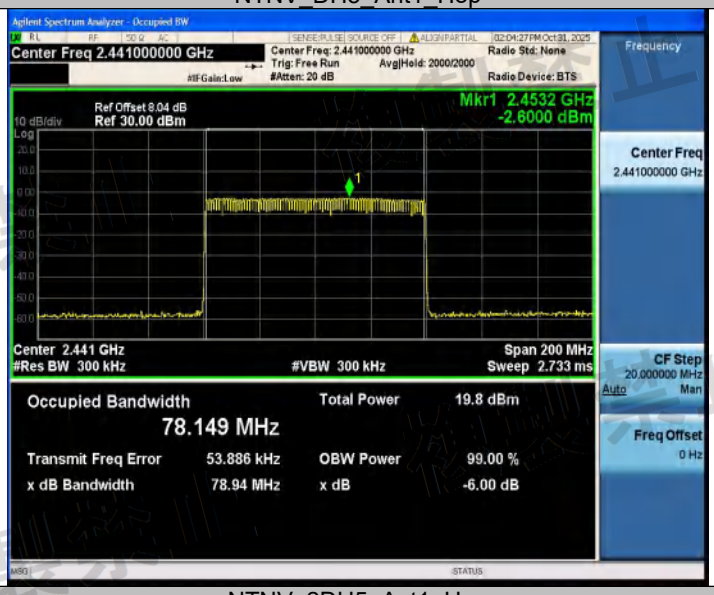
Appendix C: Occupied Bandwidth

Test Result

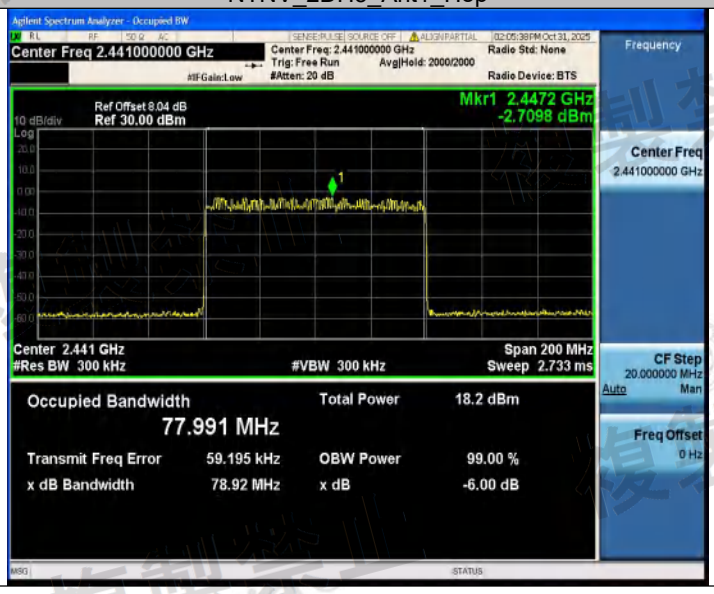
Test Condition	Test Mode	Antenna	Freq. [MHz]	Result [MHz]	Limit [MHz]	Verdict
NTNV	DH5	Ant1	Hop	78.149	≤83.5	PASS
	2DH5	Ant1	Hop	77.991	≤83.5	PASS
	3DH5	Ant1	Hop	78.295	≤83.5	PASS

Test Graphs

NTNV_DH5_Ant1_Hop



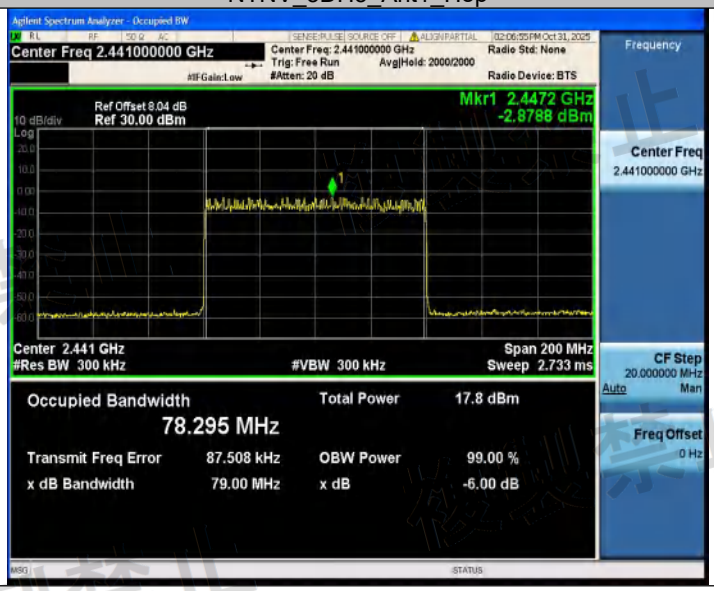
NTNV_2DH5_Ant1_Hop



TEST REPORT

Report No.: MTi251027007-0101E1

NTNV_3DH5_Ant1_Hop



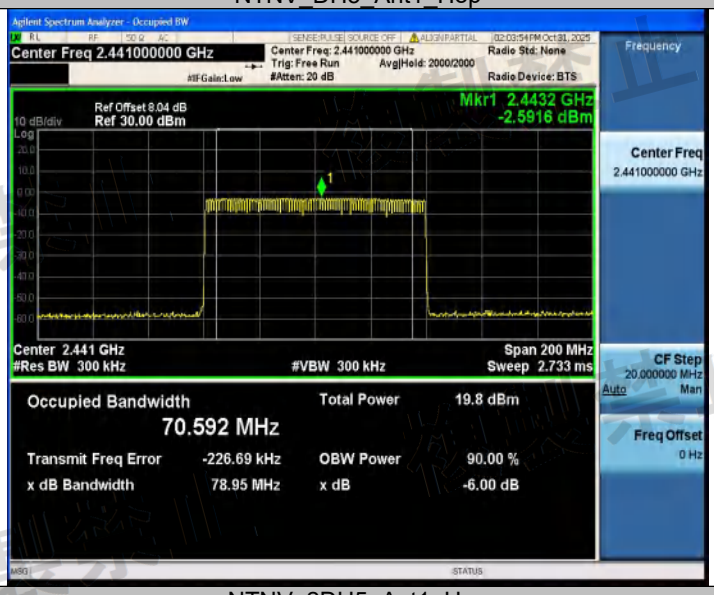
Appendix D: Spread Bandwidth

Test Result

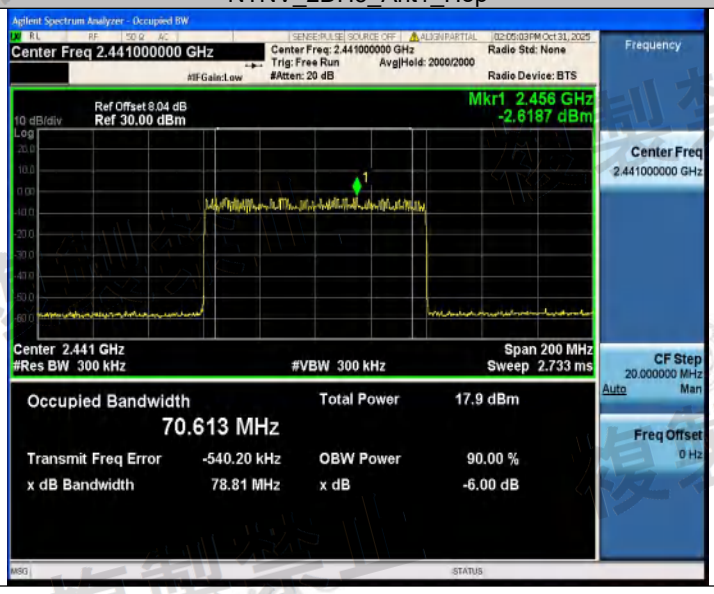
Test Condition	Test Mode	Antenna	Freq. [MHz]	Result [MHz]	Limit [MHz]	Spread Factor	Limit	Verdict
NTNV	DH5	Ant1	Hop	70.592	≥0.5	70.592	>5	PASS
	2DH5	Ant1	Hop	70.613	≥0.5	70.613	>5	PASS
	3DH5	Ant1	Hop	70.245	≥0.5	70.245	>5	PASS

Test Graphs

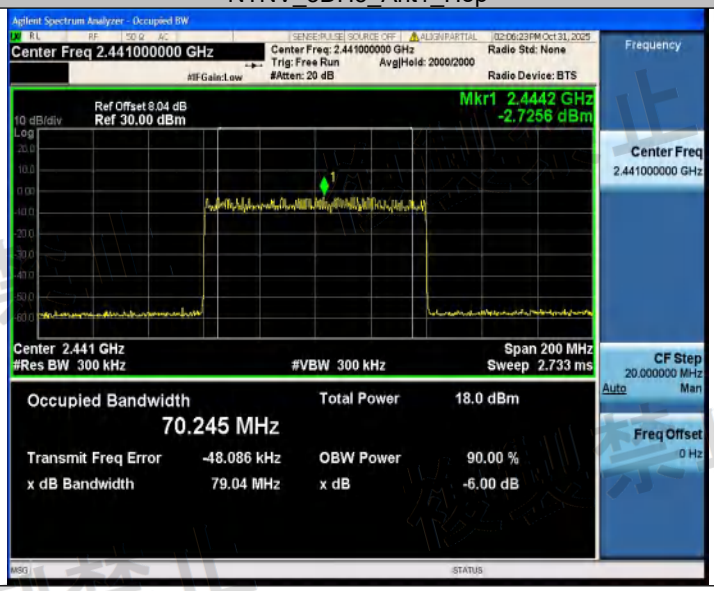
NTNV_DH5_Ant1_Hop



NTNV_2DH5_Ant1_Hop



NTNV_3DH5_Ant1_Hop



Appendix E: Spurious and unwanted emission intensity

Test Result

Test Condition	Test Mode	Antenna	Freq. [MHz]	Freq.Range [MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Result [μW/MHz]	Limit [μW/MHz]	Verdict
NTNV	DH5	Ant1	2402	30~1000	-51.38	≤-26	0.00728	≤2.5	PASS
				1000~2387	-50.34	≤-26	0.00925	≤2.5	PASS
				2387~2400	-34.12	≤-16	0.38726	≤25	PASS
				2483.5~2496.5	-40.83	≤-16	0.08260	≤25	PASS
				2496.5~13000	-28.86	≤-26	1.30017	≤2.5	See table below
			2441	30~1000	-51.68	≤-26	0.00679	≤2.5	PASS
				1000~2387	-51.39	≤-26	0.00726	≤2.5	PASS
				2387~2400	-41.97	≤-16	0.06353	≤25	PASS
				2483.5~2496.5	-41.27	≤-16	0.07464	≤25	PASS
				2496.5~13000	-28.35	≤-26	1.46218	≤2.5	See table below
			2480	30~1000	-50.74	≤-26	0.00843	≤2.5	PASS
				1000~2387	-49.57	≤-26	0.01104	≤2.5	PASS
				2387~2400	-40.73	≤-16	0.08453	≤25	PASS
				2483.5~2496.5	-40.52	≤-16	0.08872	≤25	PASS
				2496.5~13000	-27.94	≤-26	1.60694	≤2.5	See table below
	2DH5	Ant1	2402	30~1000	-50.75	≤-26	0.00841	≤2.5	PASS
				1000~2387	-50.15	≤-26	0.00966	≤2.5	PASS
				2387~2400	-37.26	≤-16	0.18793	≤25	PASS
				2483.5~2496.5	-40.76	≤-16	0.08395	≤25	PASS
				2496.5~13000	-31.36	≤-26	0.73114	≤2.5	PASS
			2441	30~1000	-51.51	≤-26	0.00706	≤2.5	PASS
				1000~2387	-50.47	≤-26	0.00897	≤2.5	PASS
				2387~2400	-40.77	≤-16	0.08375	≤25	PASS
				2483.5~2496.5	-40.63	≤-16	0.08650	≤25	PASS
				2496.5~13000	-29.02	≤-26	1.25314	≤2.5	PASS
			2480	30~1000	-51.20	≤-26	0.00759	≤2.5	PASS
				1000~2387	-49.69	≤-26	0.01074	≤2.5	PASS
				2387~2400	-40.65	≤-16	0.08610	≤25	PASS
				2483.5~2496.5	-40.48	≤-16	0.08954	≤25	PASS
				2496.5~13000	-31.27	≤-26	0.74645	≤2.5	PASS
	3DH5	Ant1	2402	30~1000	-51.29	≤-26	0.00743	≤2.5	PASS
				1000~2387	-50.87	≤-26	0.00818	≤2.5	PASS
				2387~2400	-41.43	≤-16	0.07194	≤25	PASS
				2483.5~2496.5	-41.02	≤-16	0.07907	≤25	PASS
				2496.5~13000	-47.58	≤-26	0.01746	≤2.5	PASS
			2441	30~1000	-51.18	≤-26	0.00762	≤2.5	PASS
				1000~2387	-51.40	≤-26	0.00724	≤2.5	PASS
				2387~2400	-40.33	≤-16	0.09268	≤25	PASS

				2483.5~2496.5	-41.23	≤-16	0.07534	≤25	PASS
				2496.5~13000	-30.94	≤-26	0.80538	≤2.5	PASS
			2480	30~1000	-50.49	≤-26	0.00893	≤2.5	PASS
				1000~2387	-48.57	≤-26	0.01390	≤2.5	PASS
				2387~2400	-40.79	≤-16	0.08337	≤25	PASS
				2483.5~2496.5	-40.49	≤-16	0.08933	≤25	PASS
				2496.5~13000	-30.17	≤-26	0.96161	≤2.5	PASS

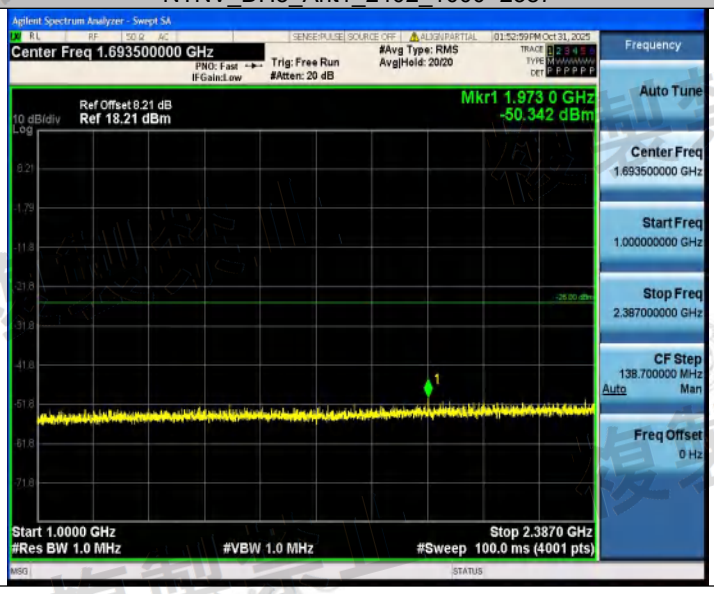
Test Result_Step2

Test Condition	Test Mode	Antenna	Freq. [MHz]	Freq. [MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Result [μW/MHz]	Limit [μW/MHz]	Verdict
NTNV	DH5	Ant1	2402	4803.63	-30.19	≤-26	0.95719	≤2.5	PASS
			2441	4881.68	-29.86	≤-26	1.03276	≤2.5	PASS
			2480	4960.23	-29.59	≤-26	1.09901	≤2.5	PASS

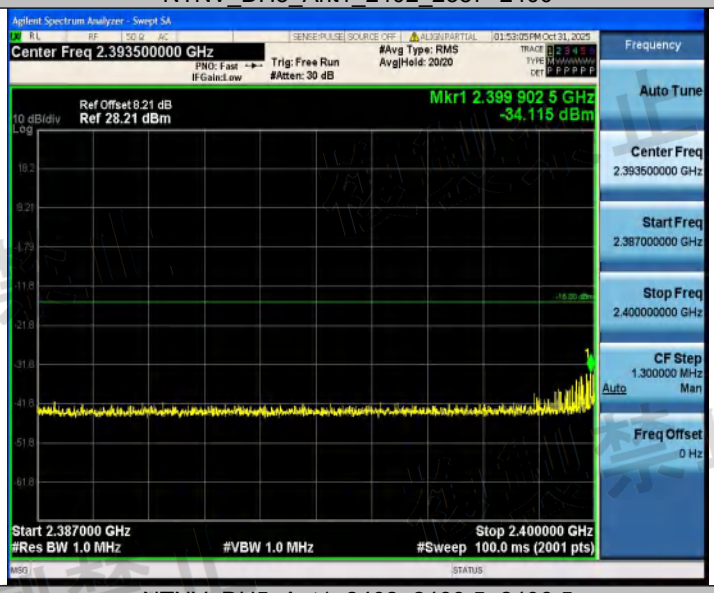
Test Graphs

NTNV_DH5_Ant1_2402_30~1000

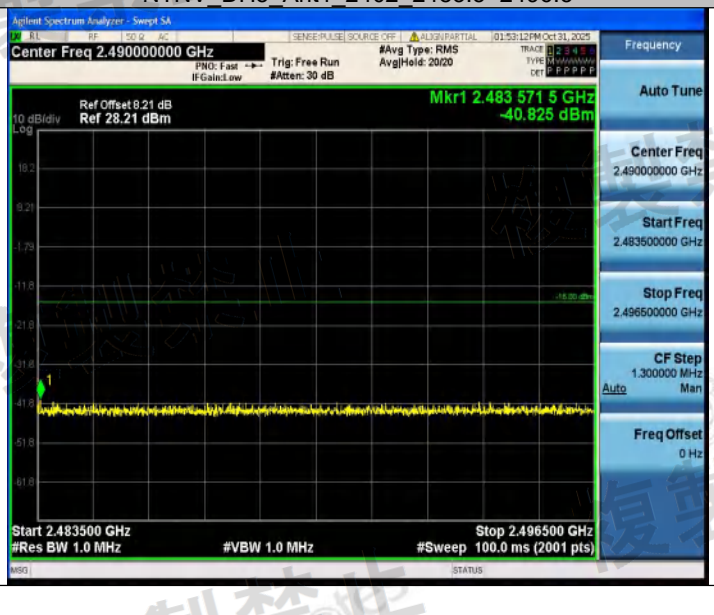
NTNV_DH5_Ant1_2402_1000~2387



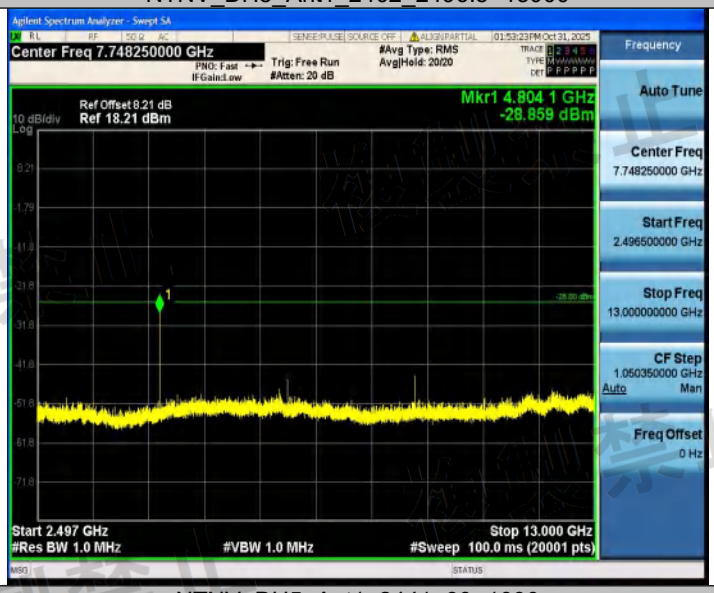
NTNV_DH5_Ant1_2402_2387~2400



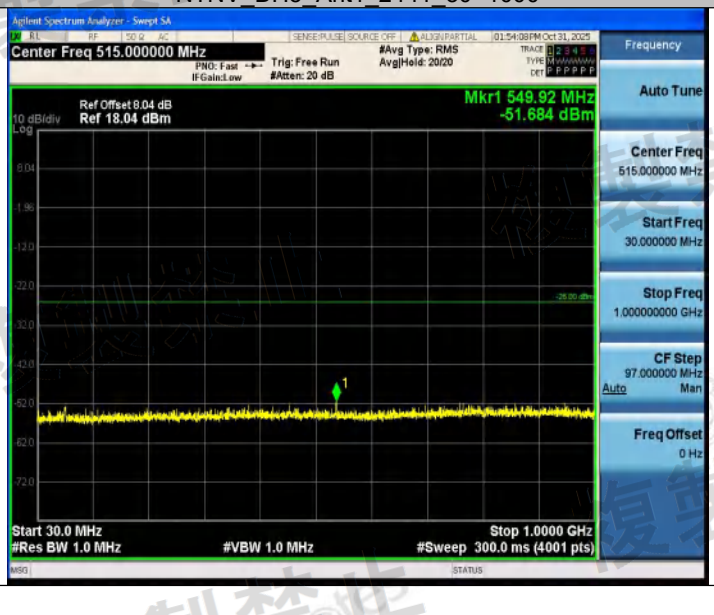
NTNV_DH5_Ant1_2402_2483.5~2496.5



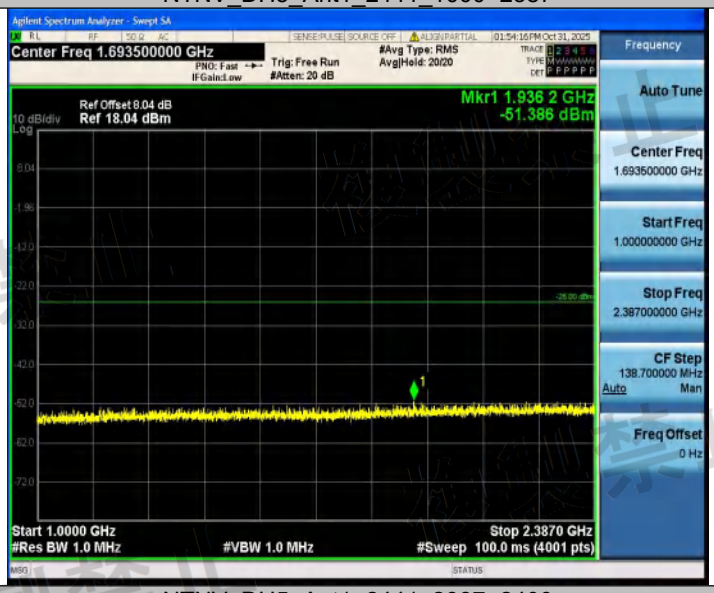
NTNV_DH5_Ant1_2402_2496.5~13000



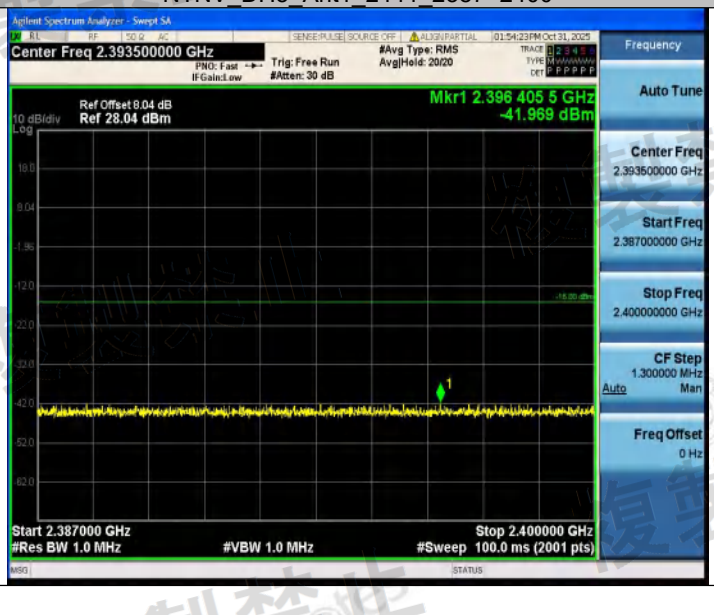
NTNV_DH5_Ant1_2441_30~1000



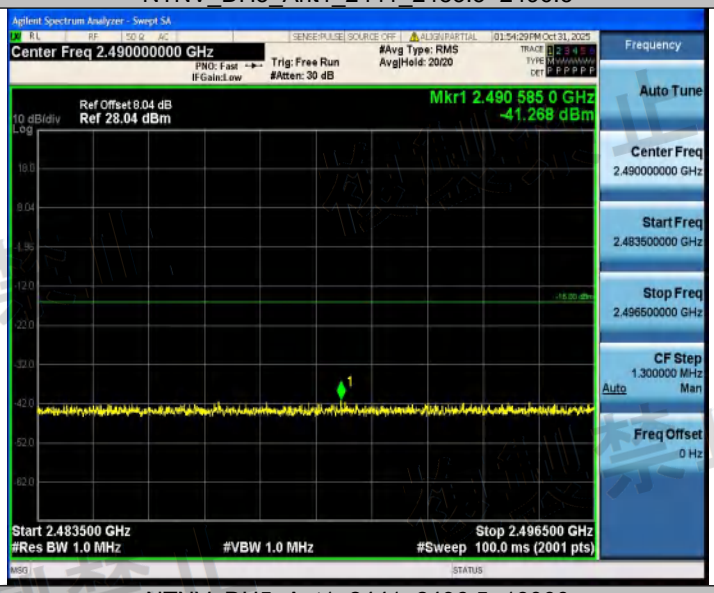
NTNV_DH5_Ant1_2441_1000~2387



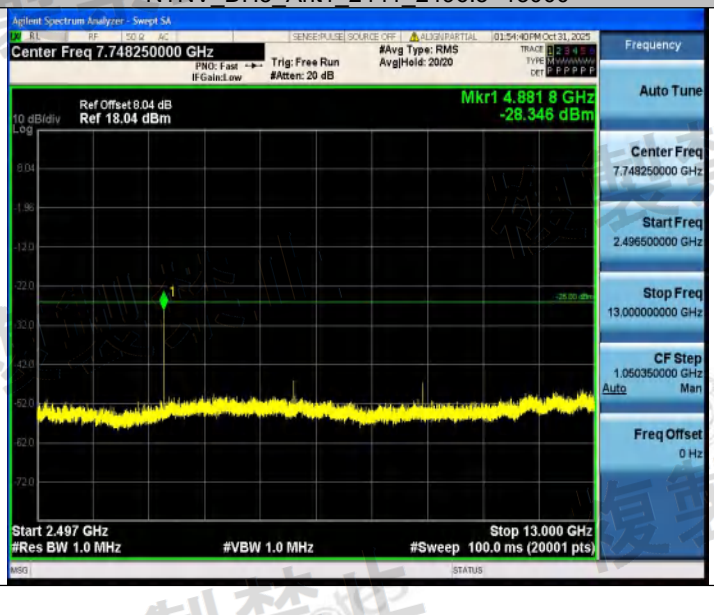
NTNV_DH5_Ant1_2441_2387~2400



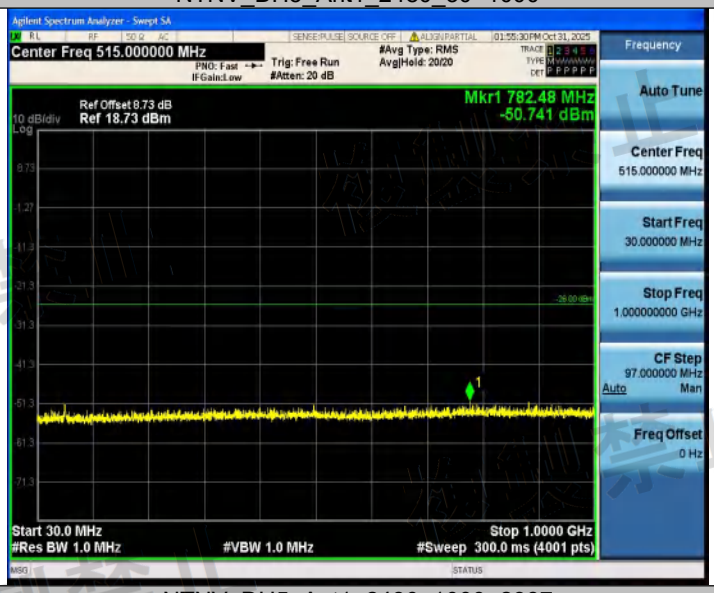
NTNV_DH5_Ant1_2441_2483.5~2496.5



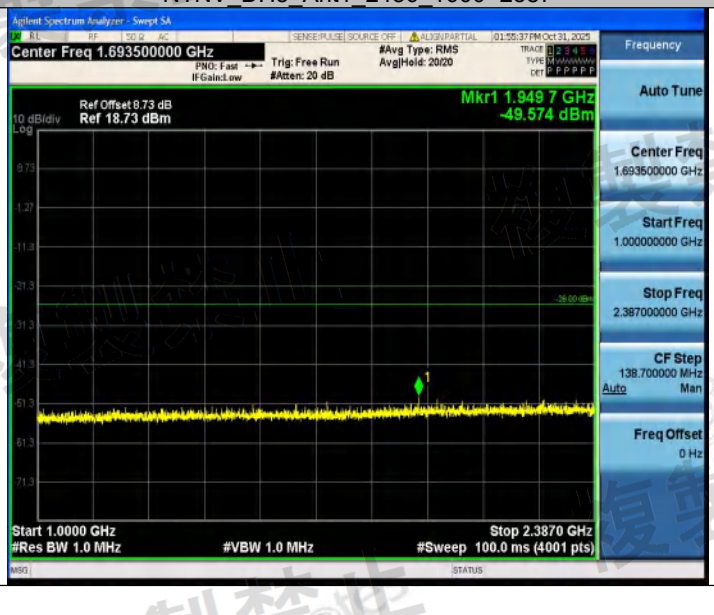
NTNV_DH5_Ant1_2441_2496.5~13000



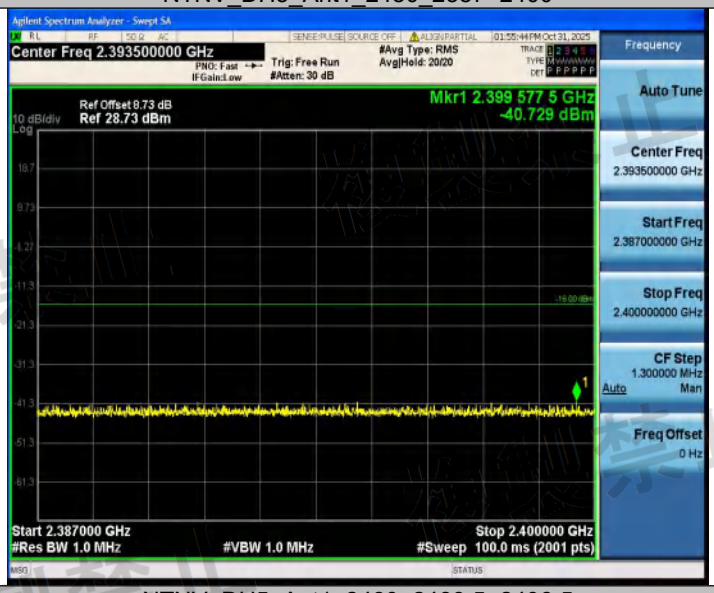
NTNV_DH5_Ant1_2480_30~1000



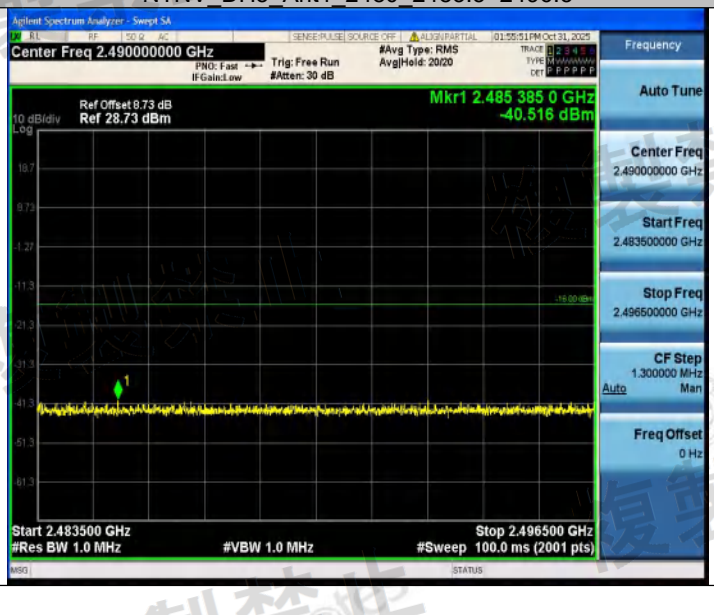
NTNV_DH5_Ant1_2480_1000~2387



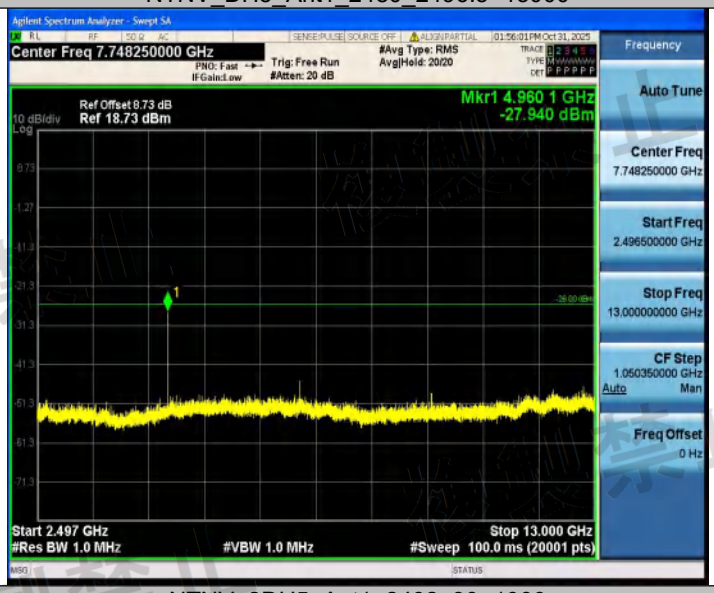
NTNV_DH5_Ant1_2480_2387~2400



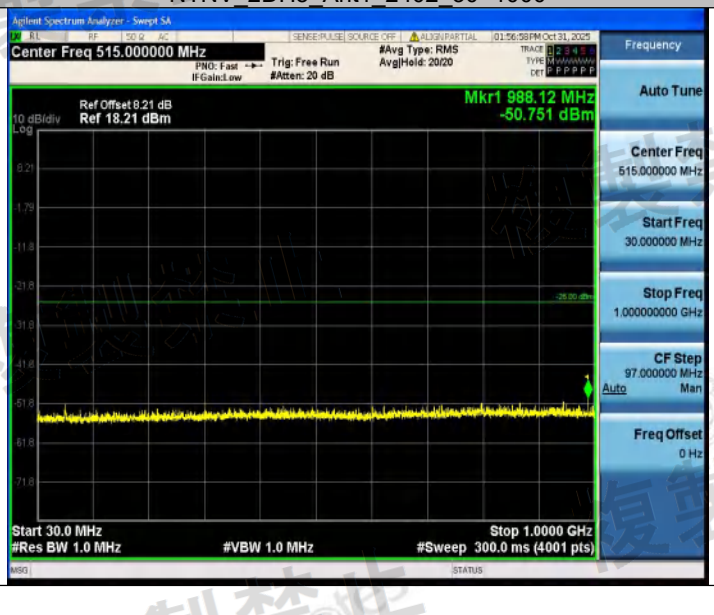
NTNV_DH5_Ant1_2480_2483.5~2496.5



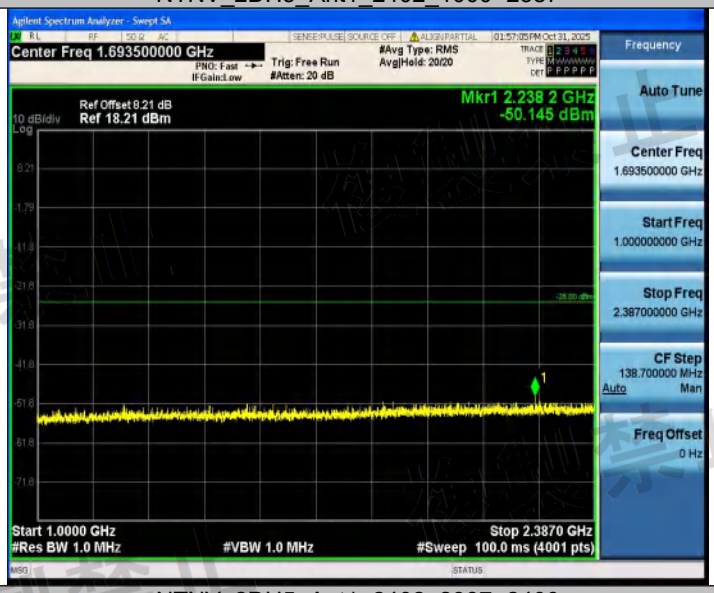
NTNV_DH5_Ant1_2480_2496.5~13000



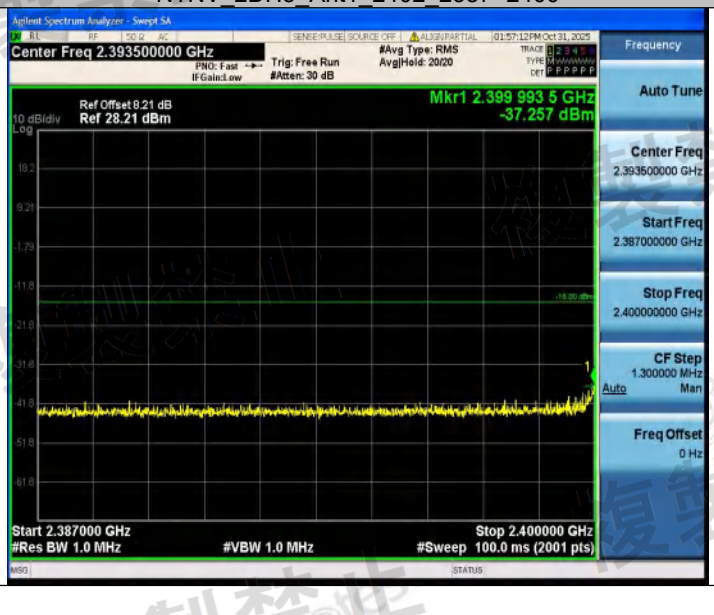
NTNV_2DH5_Ant1_2402_30~1000



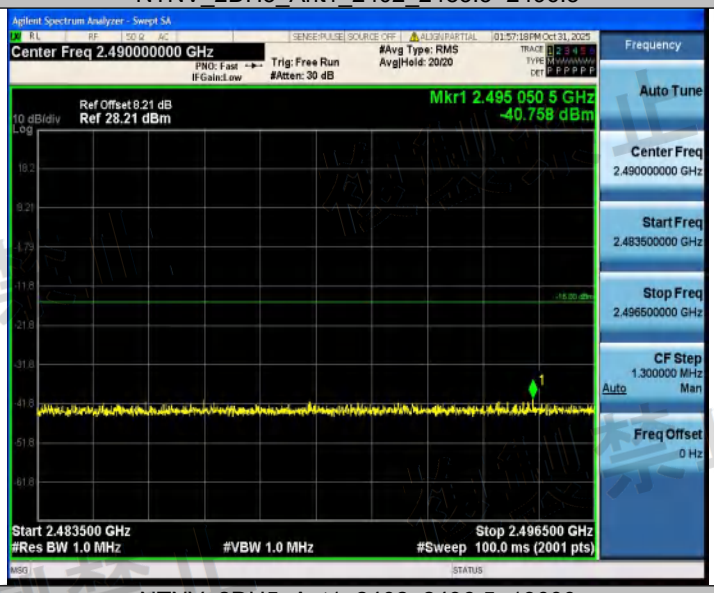
NTNV_2DH5_Ant1_2402_1000~2387



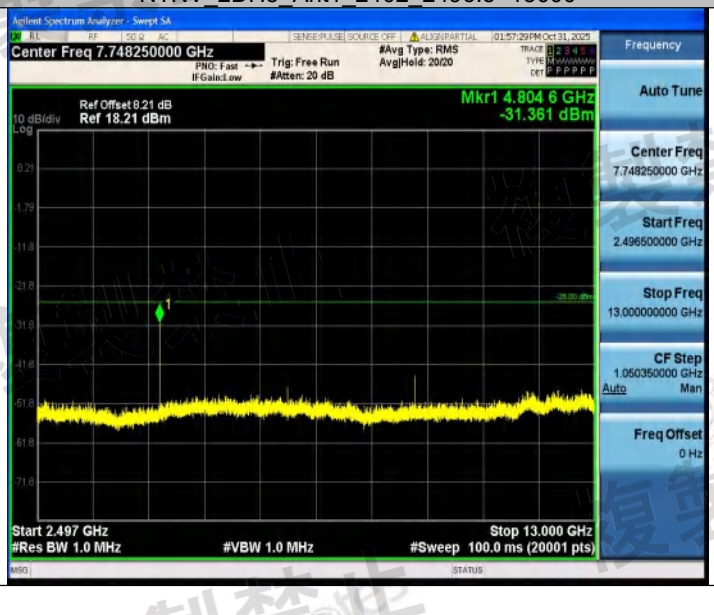
NTNV_2DH5_Ant1_2402_2387~2400



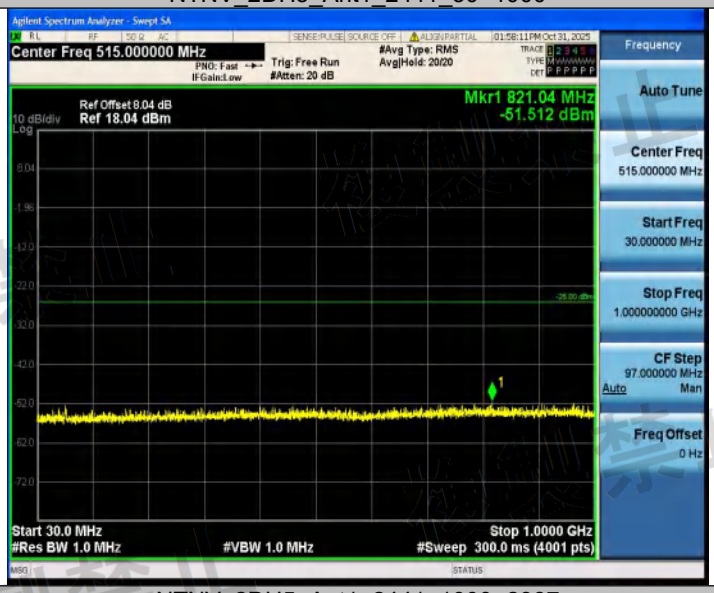
NTNV_2DH5_Ant1_2402_2483.5~2496.5



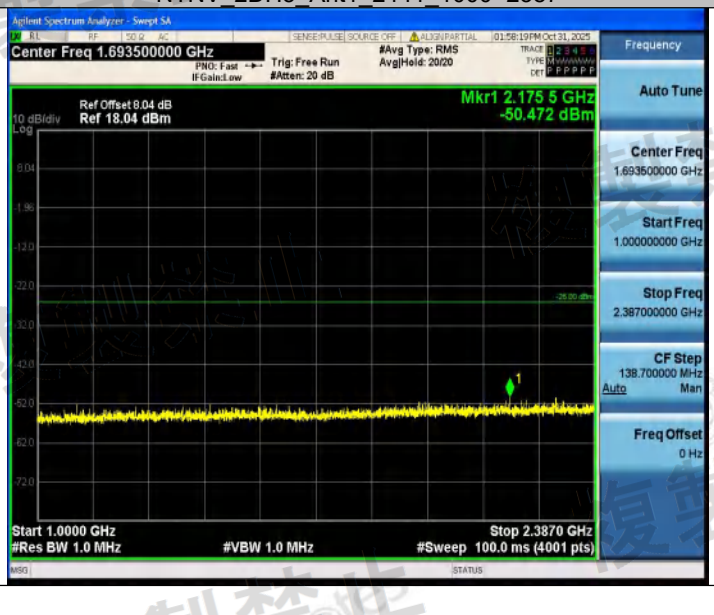
NTNV_2DH5_Ant1_2402_2496.5~13000



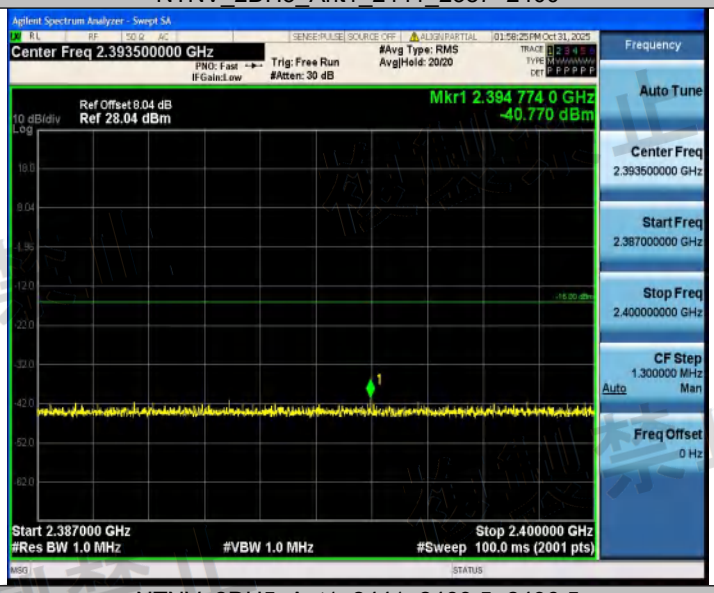
NTNV_2DH5_Ant1_2441_30~1000



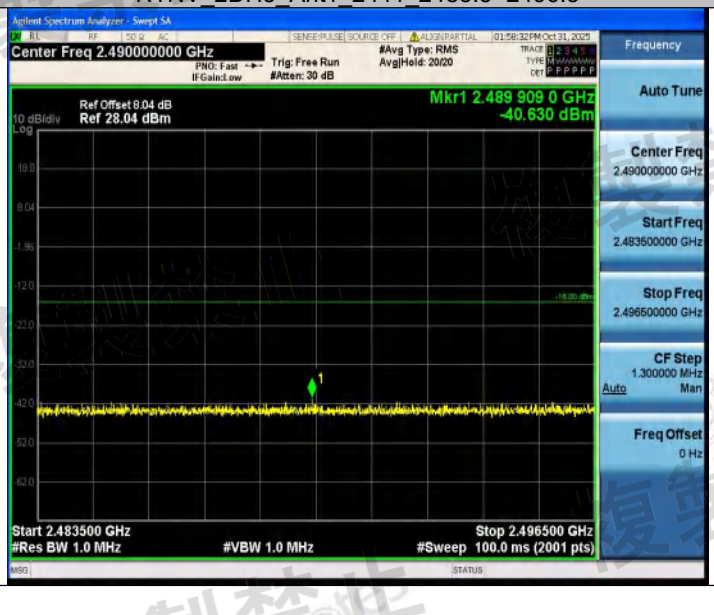
NTNV_2DH5_Ant1_2441_1000~2387



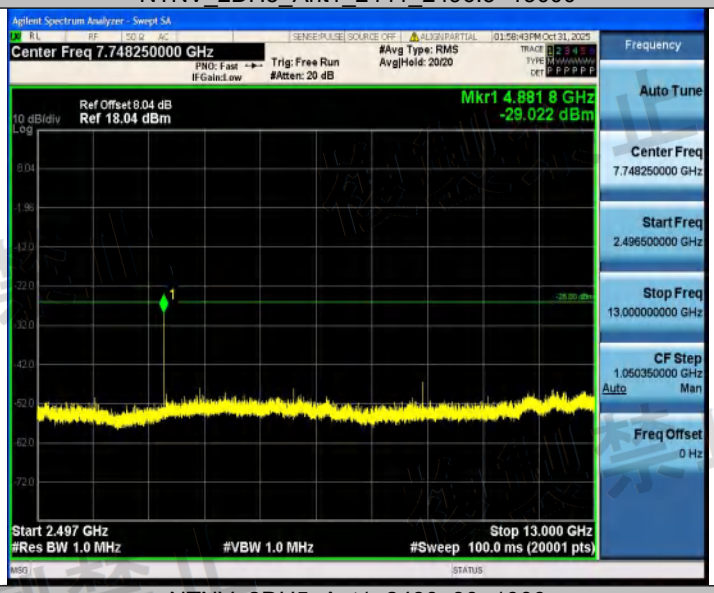
NTNV_2DH5_Ant1_2441_2387~2400



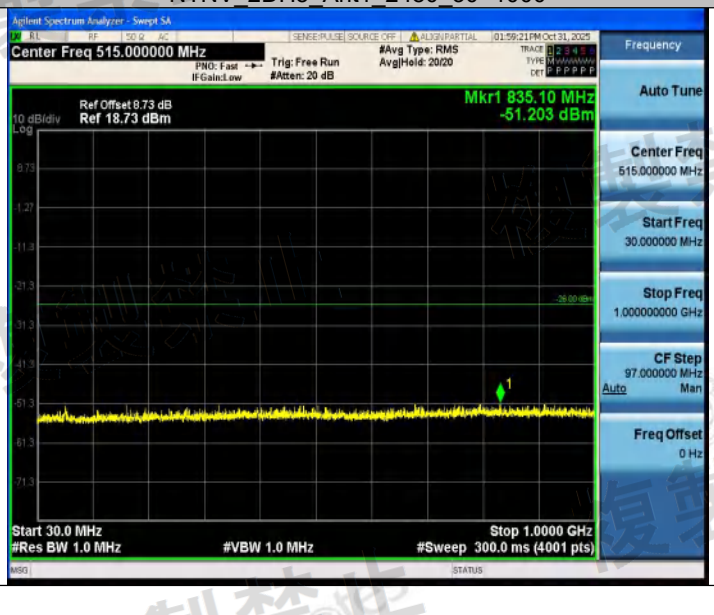
NTNV_2DH5_Ant1_2441_2483.5~2496.5



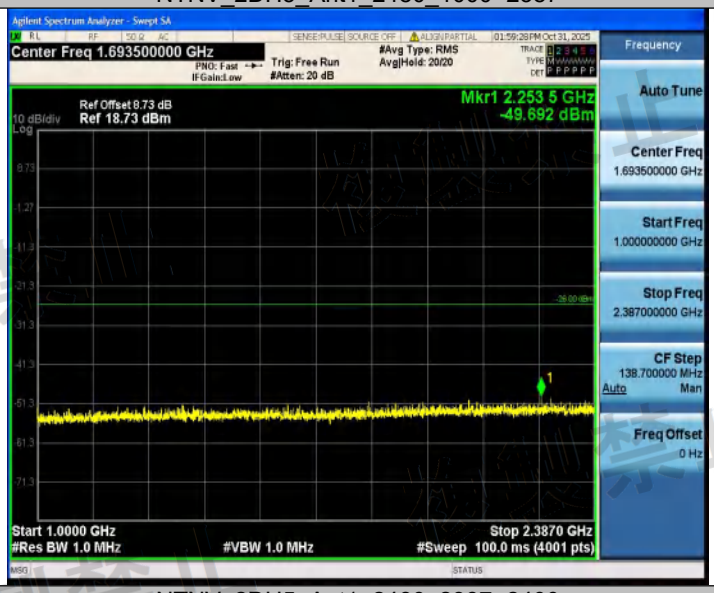
NTNV_2DH5_Ant1_2441_2496.5~13000



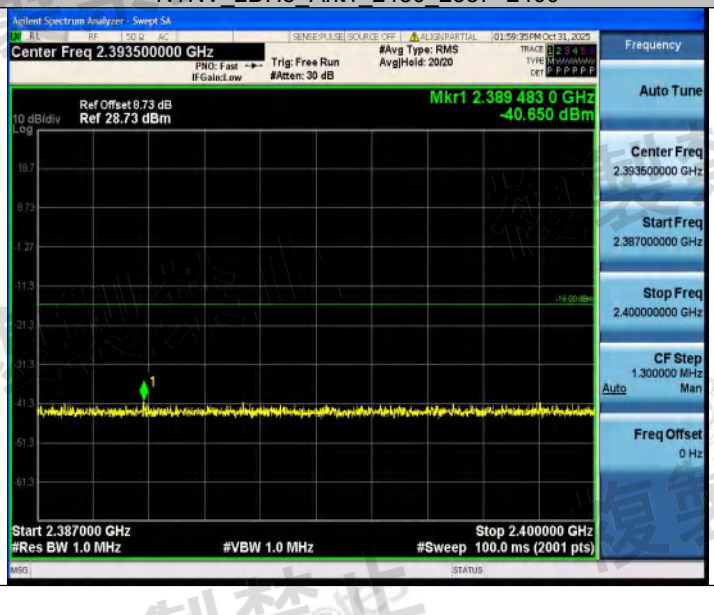
NTNV_2DH5_Ant1_2480_30~1000



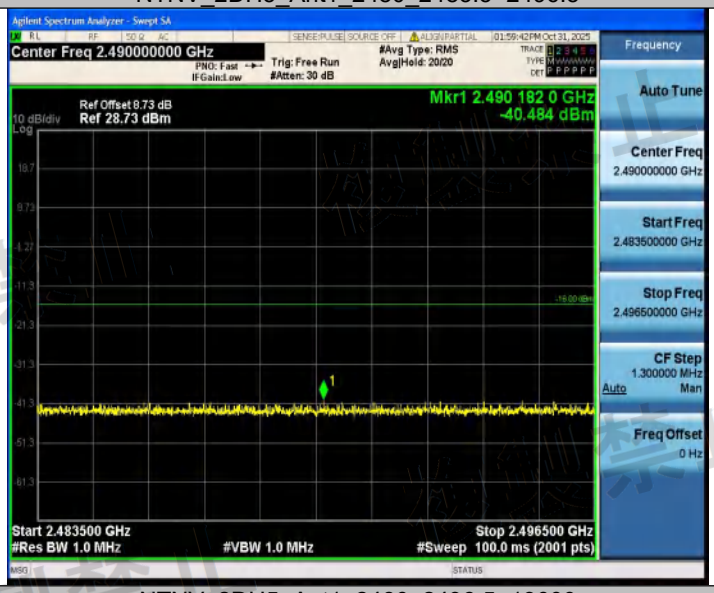
NTNV_2DH5_Ant1_2480_1000~2387



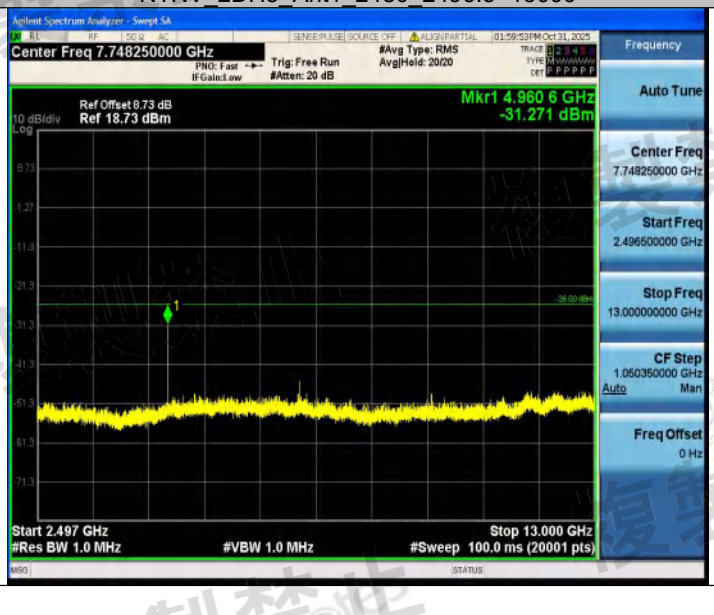
NTNV_2DH5_Ant1_2480_2387~2400



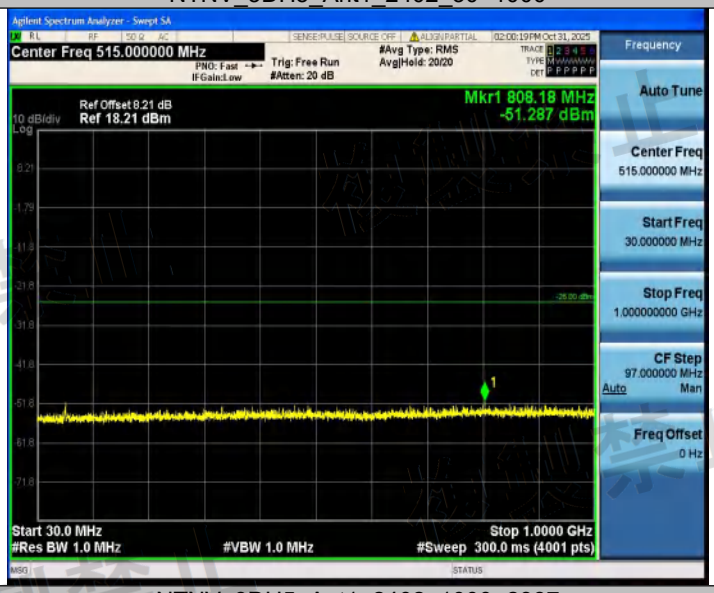
NTNV_2DH5_Ant1_2480_2483.5~2496.5



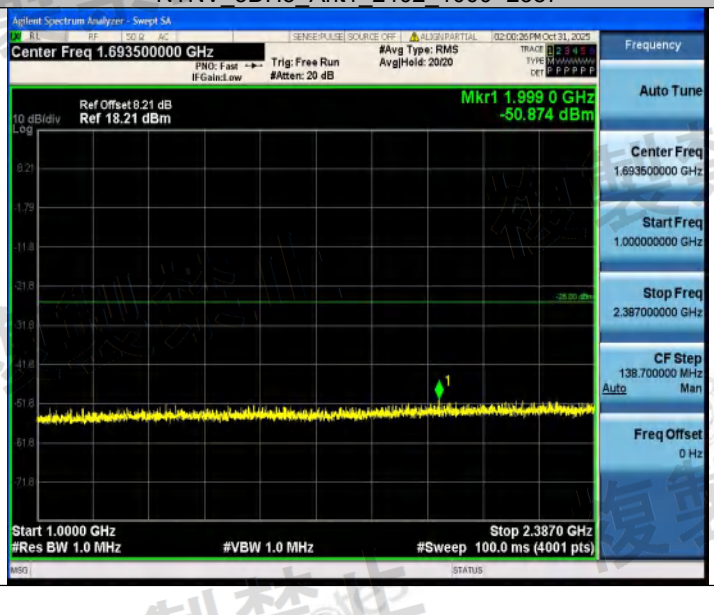
NTNV_2DH5_Ant1_2480_2496.5~13000



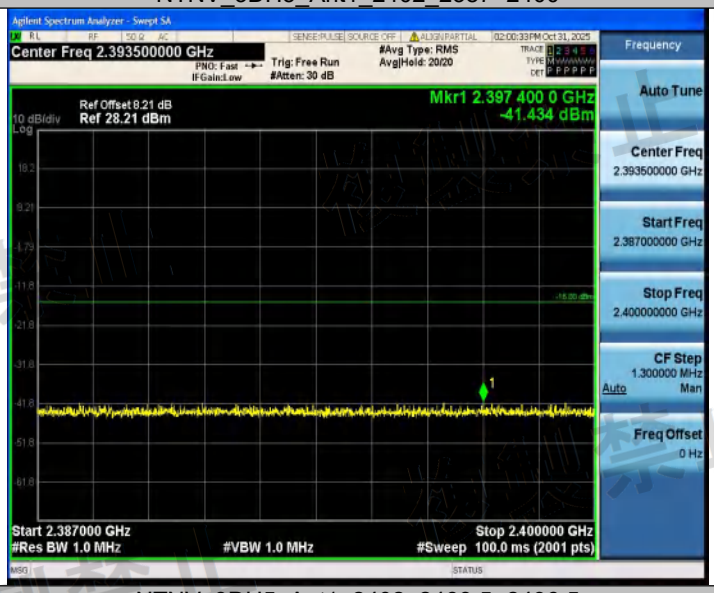
NTNV_3DH5_Ant1_2402_30~1000



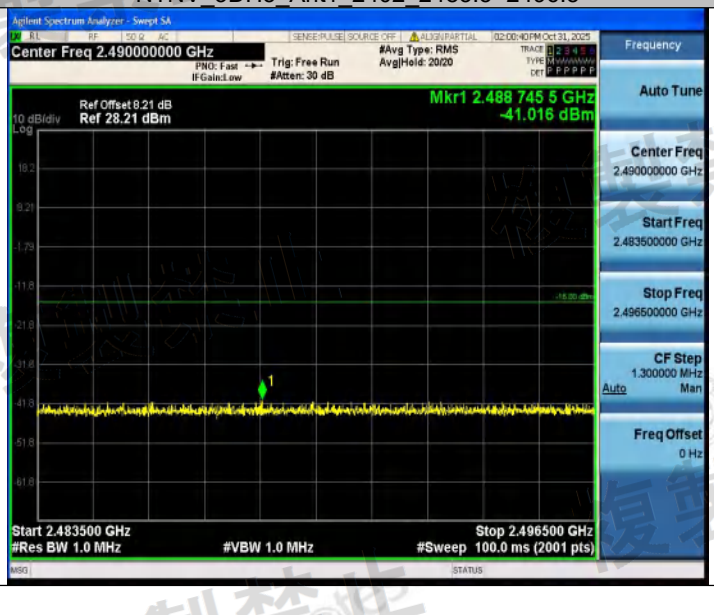
NTNV_3DH5_Ant1_2402_1000~2387



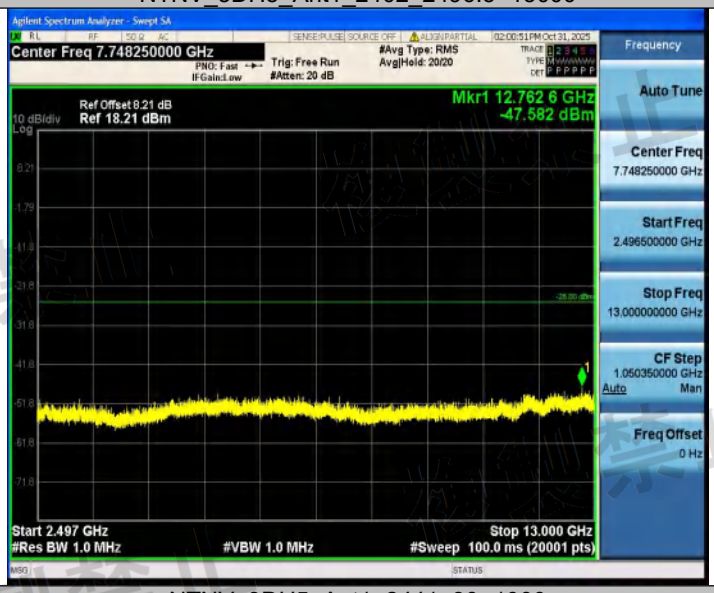
NTNV_3DH5_Ant1_2402_2387~2400



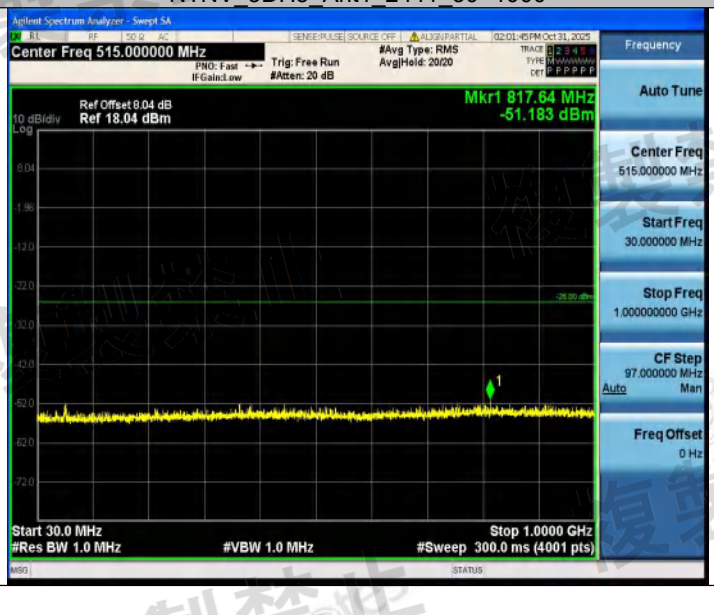
NTNV_3DH5_Ant1_2402_2483.5~2496.5



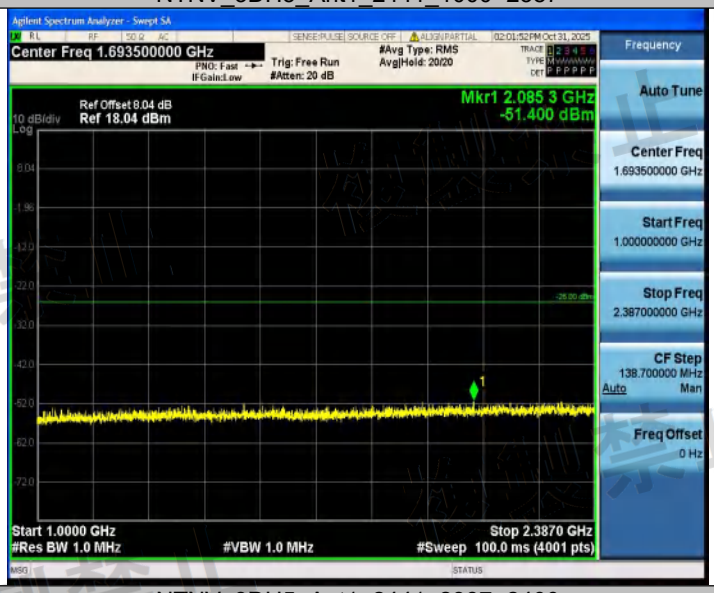
NTNV_3DH5_Ant1_2402_2496.5~13000



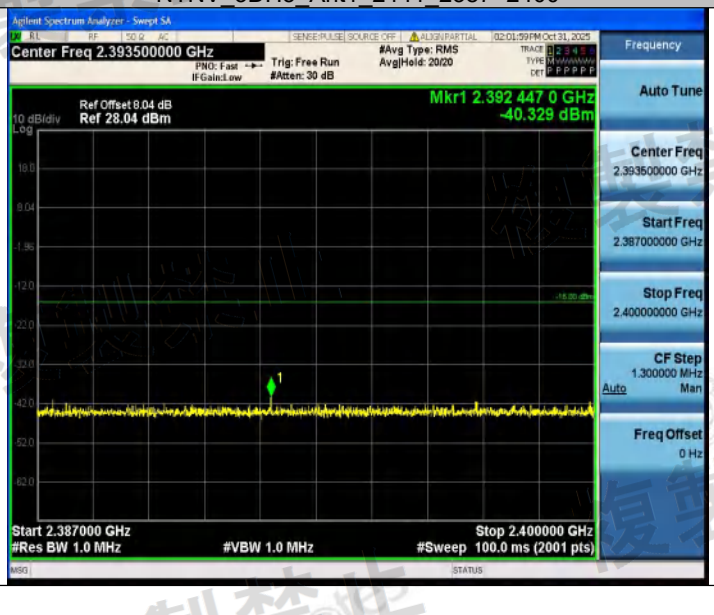
NTNV_3DH5_Ant1_2441_30~1000



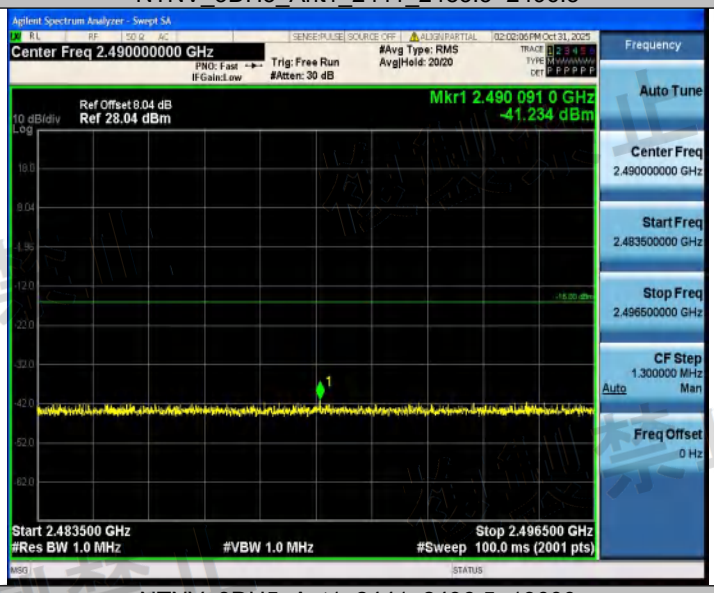
NTNV_3DH5_Ant1_2441_1000~2387



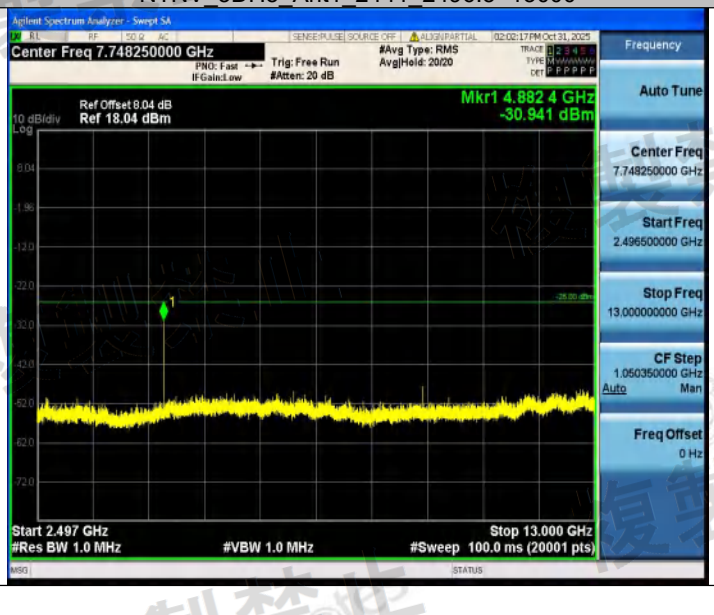
NTNV_3DH5_Ant1_2441_2387~2400



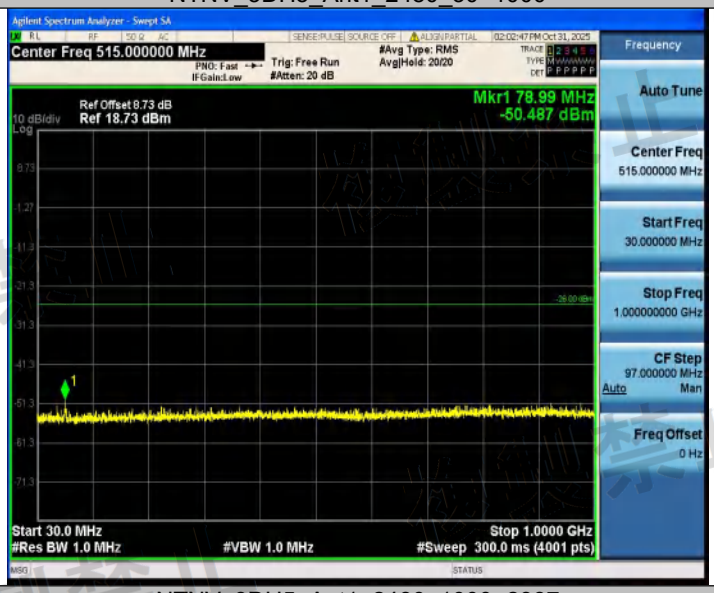
NTNV_3DH5_Ant1_2441_2483.5~2496.5



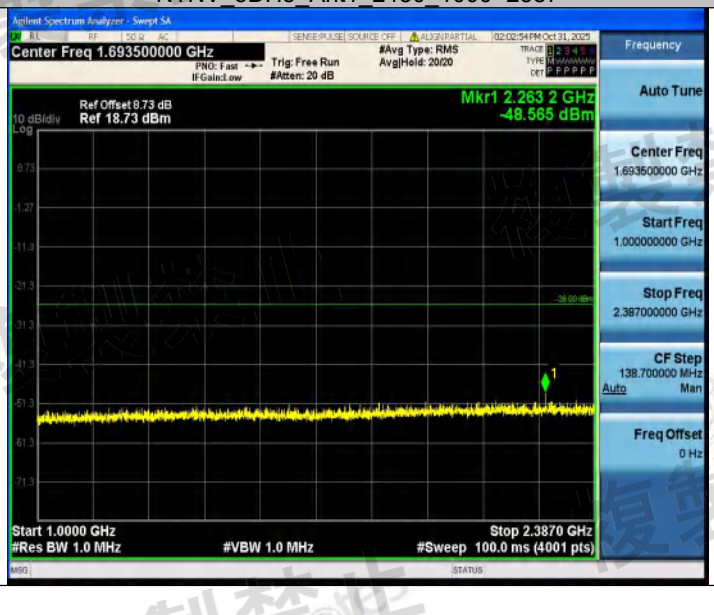
NTNV_3DH5_Ant1_2441_2496.5~13000



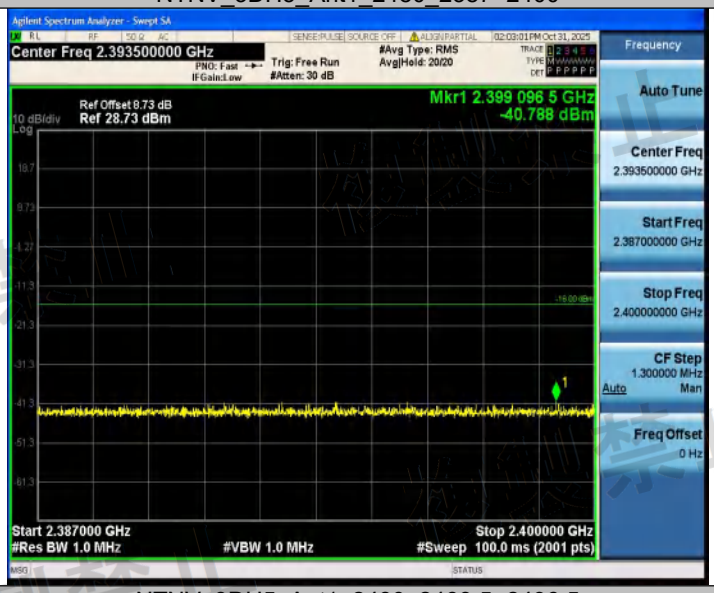
NTNV_3DH5_Ant1_2480_30~1000



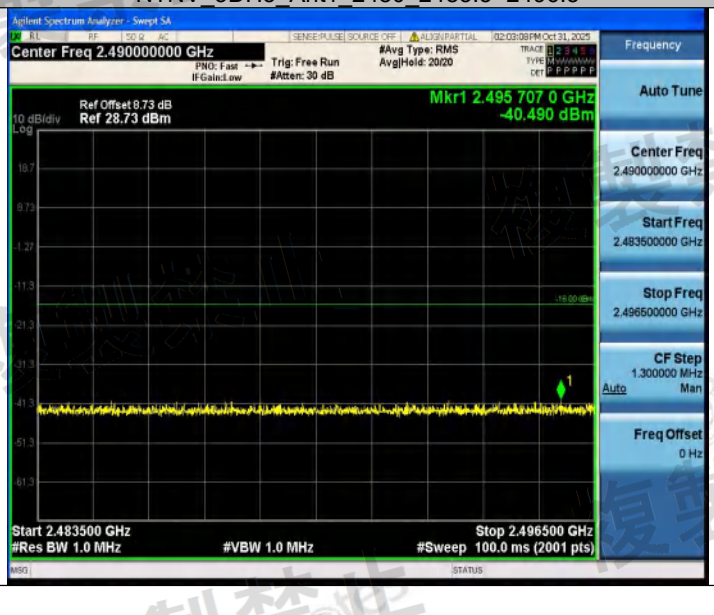
NTNV_3DH5_Ant1_2480_1000~2387



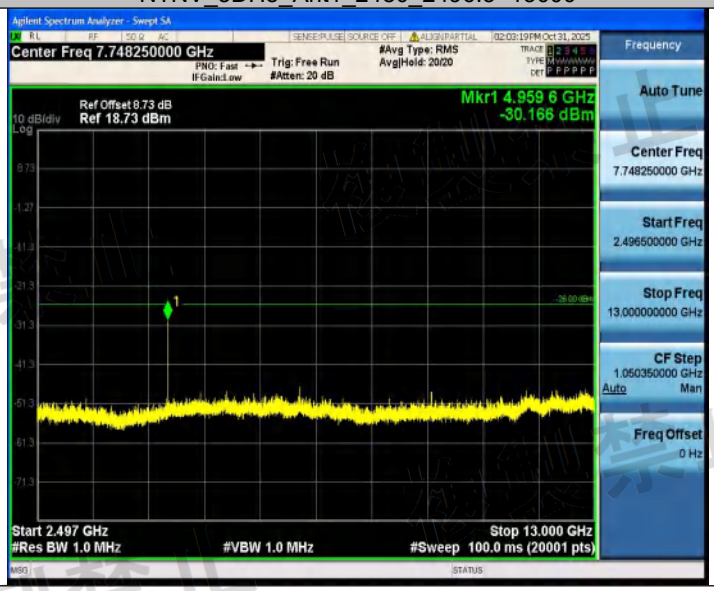
NTNV_3DH5_Ant1_2480_2387~2400



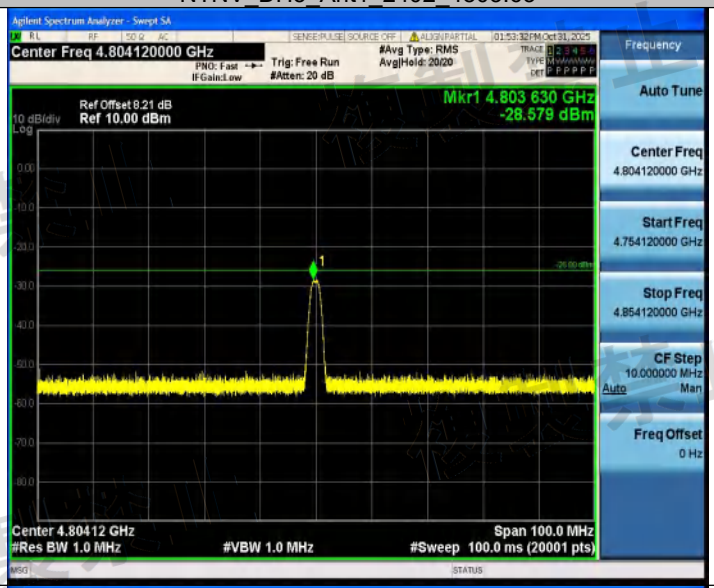
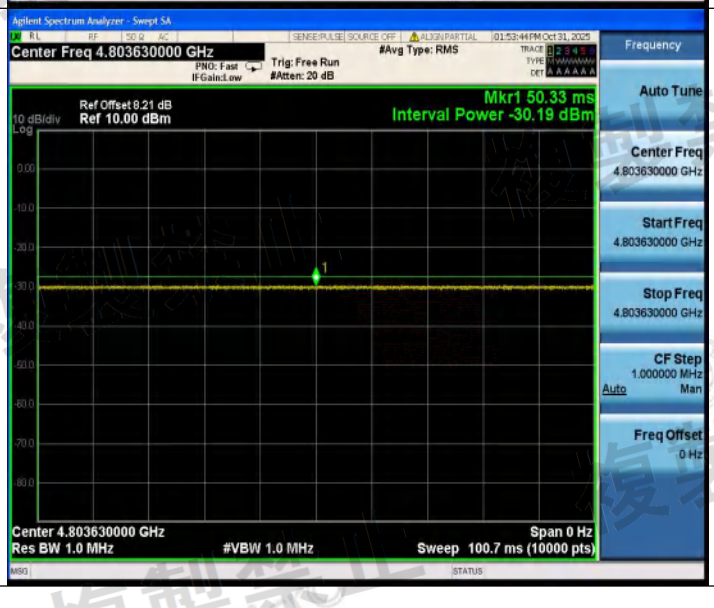
NTNV_3DH5_Ant1_2480_2483.5~2496.5



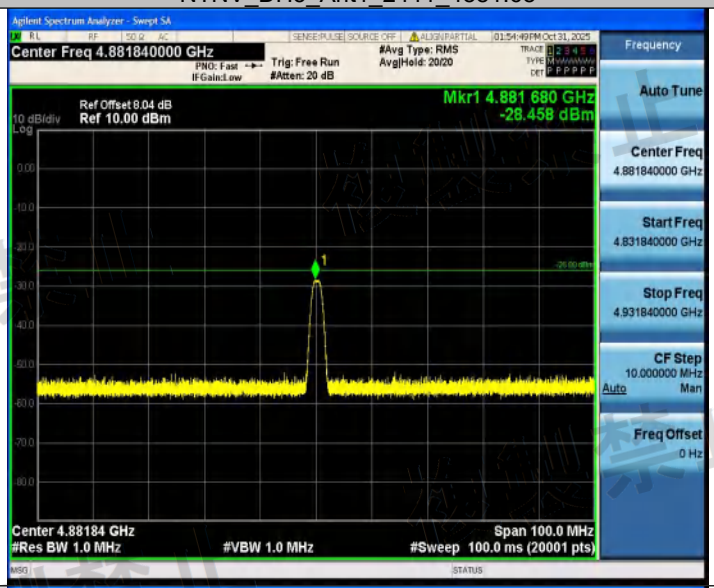
NTNV_3DH5_Ant1_2480_2496.5~13000

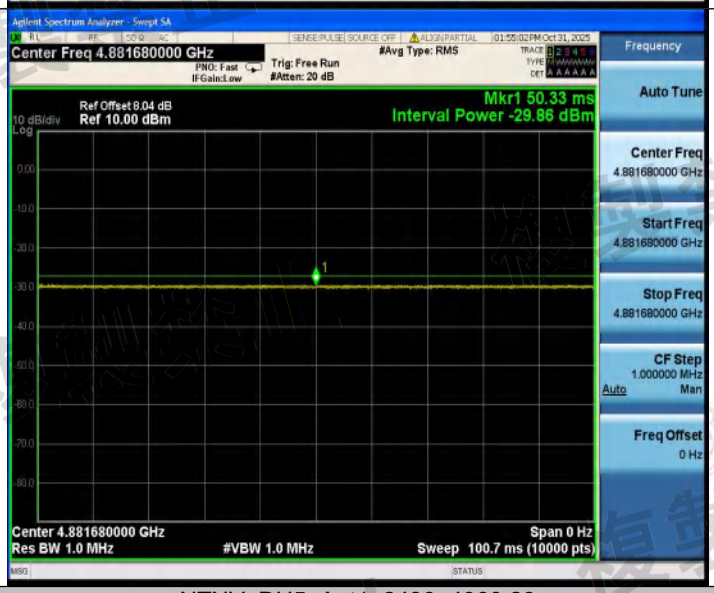


Test Graphs_Step2

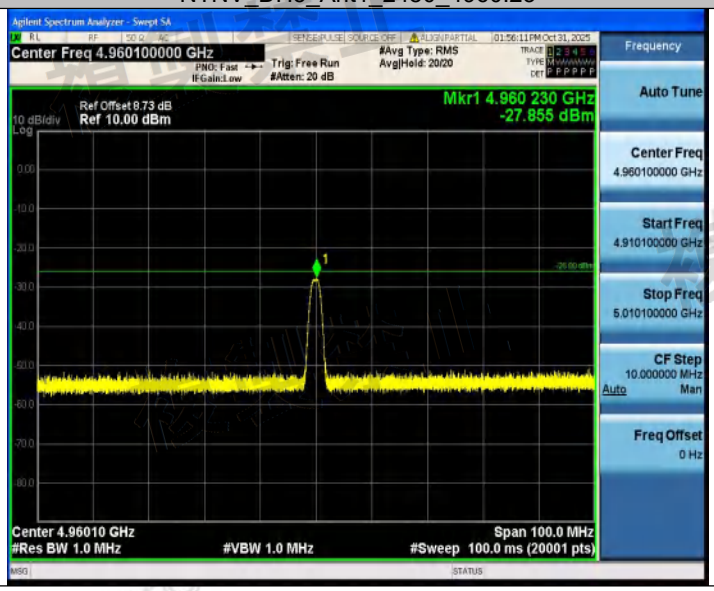
NTNV_DH5_Ant1_2402_4803.63



NTNV_DH5_Ant1_2441_4881.68





NTNV_DH5_Ant1_2480_4960.23



Agilent Spectrum Analyzer - Swept SA
Center Freq 4.960230000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Ref Offset 8.73 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 50.33 ms
Interval Power -29.59 dBm
Center 4.960230000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 100.7 ms (10000 pts)
Frequency
Auto Tune
Center Freq
4.960230000 GHz
Start Freq
4.960230000 GHz
Stop Freq
4.960230000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz

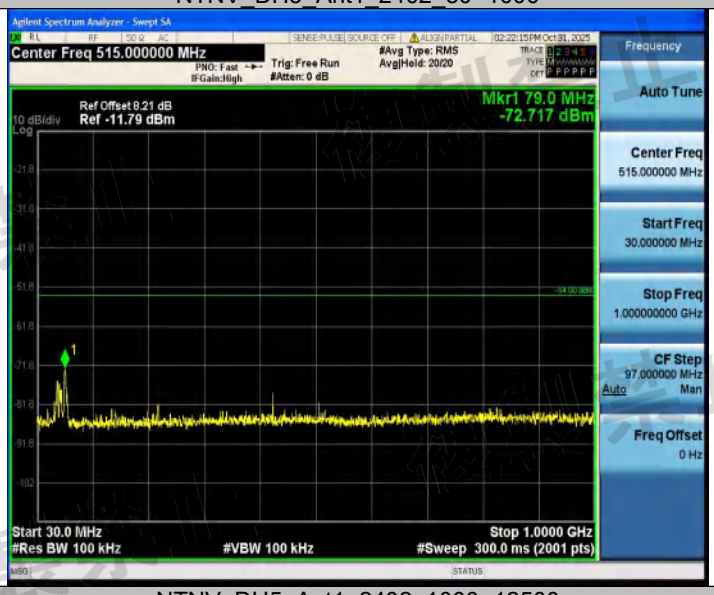
Appendix F: Secondary radiated emissions

Test Result

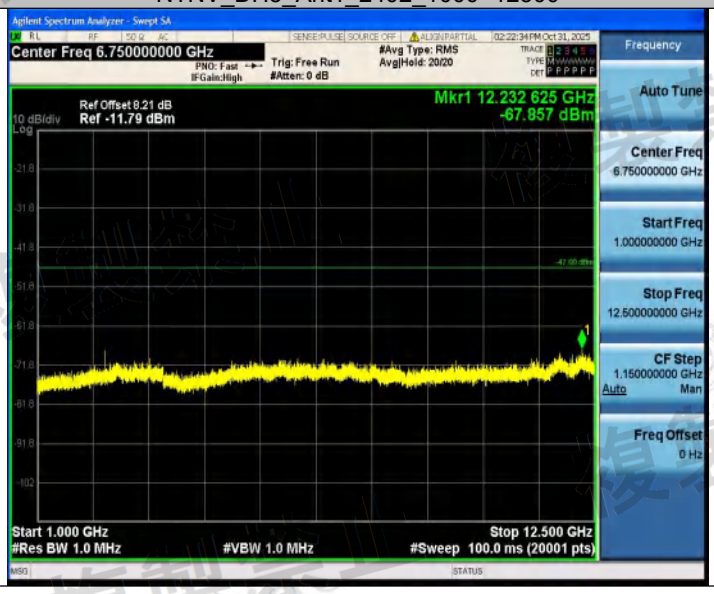
Test Condition	Test Mode	Antenna	Freq. [MHz]	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Result [nW]	Limit [nW]	Verdict
NTNV	DH5	Ant1	2402	30~1000	-72.72	≤-54	0.05346	≤4	PASS
				1000~12500	-67.86	≤-47	0.16368	≤20	PASS
			2441	30~1000	-73.14	≤-54	0.04853	≤4	PASS
				1000~12500	-69.08	≤-47	0.12359	≤20	PASS
			2480	30~1000	-73.78	≤-54	0.04188	≤4	PASS
				1000~12500	-62.31	≤-47	0.58749	≤20	PASS
	2DH5	Ant1	2402	30~1000	-73.14	≤-54	0.04853	≤4	PASS
				1000~12500	-67.37	≤-47	0.18323	≤20	PASS
			2441	30~1000	-72.69	≤-54	0.05383	≤4	PASS
				1000~12500	-67.46	≤-47	0.17947	≤20	PASS
			2480	30~1000	-75.12	≤-54	0.03076	≤4	PASS
				1000~12500	-67.98	≤-47	0.15922	≤20	PASS
	3DH5	Ant1	2402	30~1000	-76.12	≤-54	0.02443	≤4	PASS
				1000~12500	-68.82	≤-47	0.13122	≤20	PASS
			2441	30~1000	-75.23	≤-54	0.02999	≤4	PASS
				1000~12500	-66.78	≤-47	0.20989	≤20	PASS
			2480	30~1000	-74.16	≤-54	0.03837	≤4	PASS
				1000~12500	-68.42	≤-47	0.14388	≤20	PASS

Test Graphs

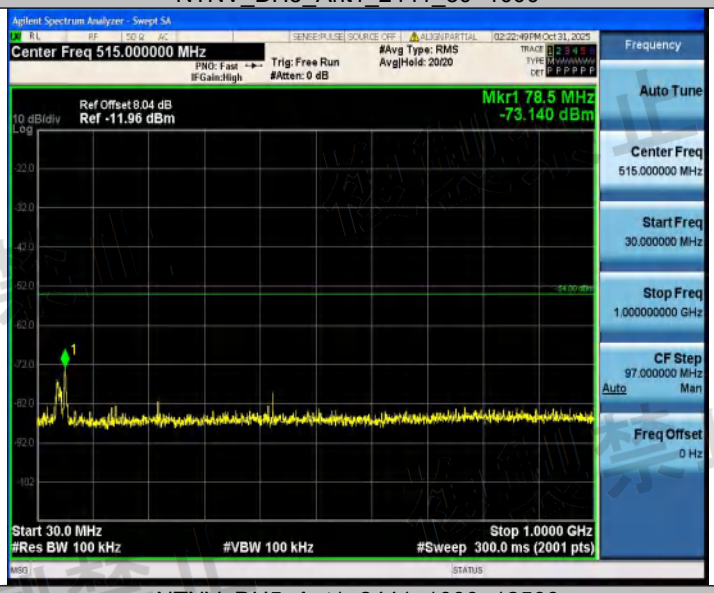
NTNV_DH5_Ant1_2402_30~1000



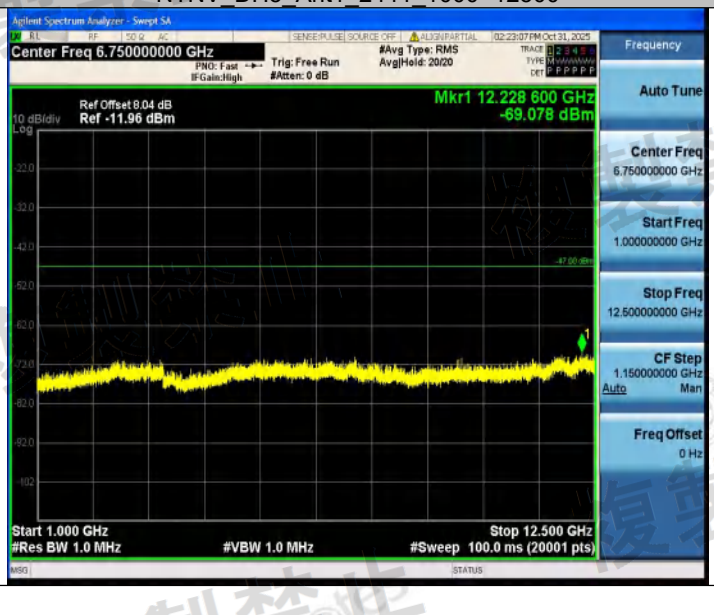
NTNV_DH5_Ant1_2402_1000~12500



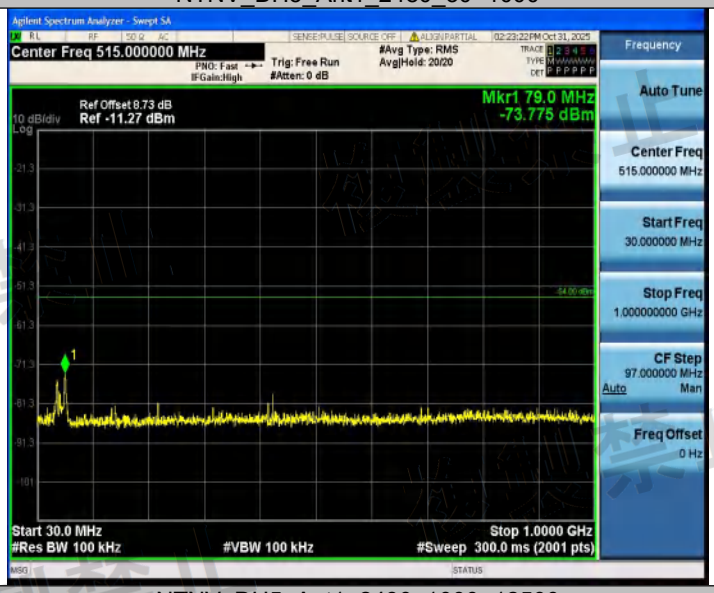
NTNV_DH5_Ant1_2441_30~1000



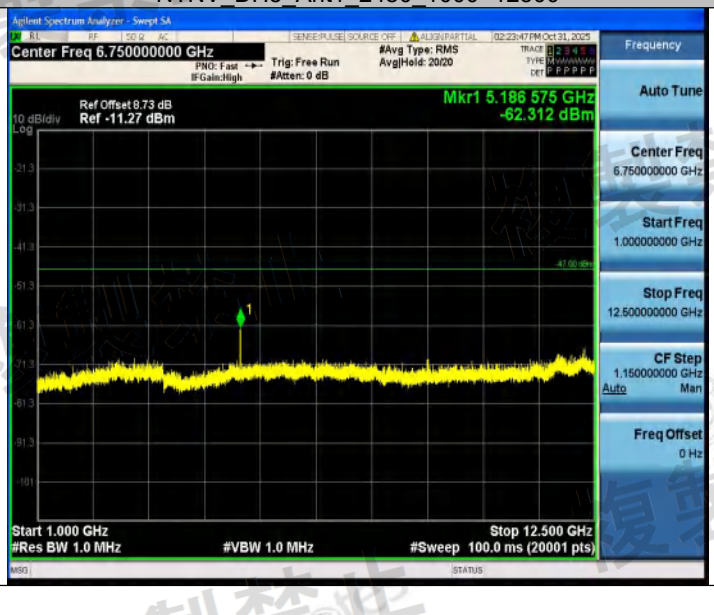
NTNV_DH5_Ant1_2441_1000~12500



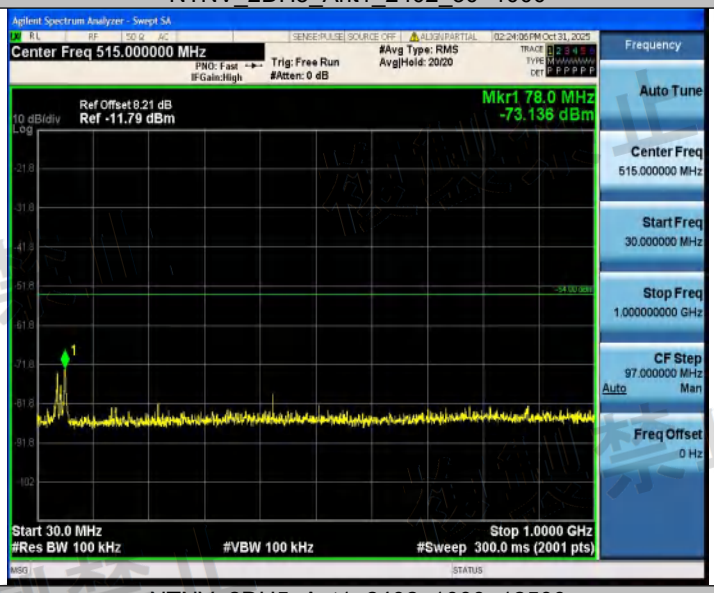
NTNV_DH5_Ant1_2480_30~1000



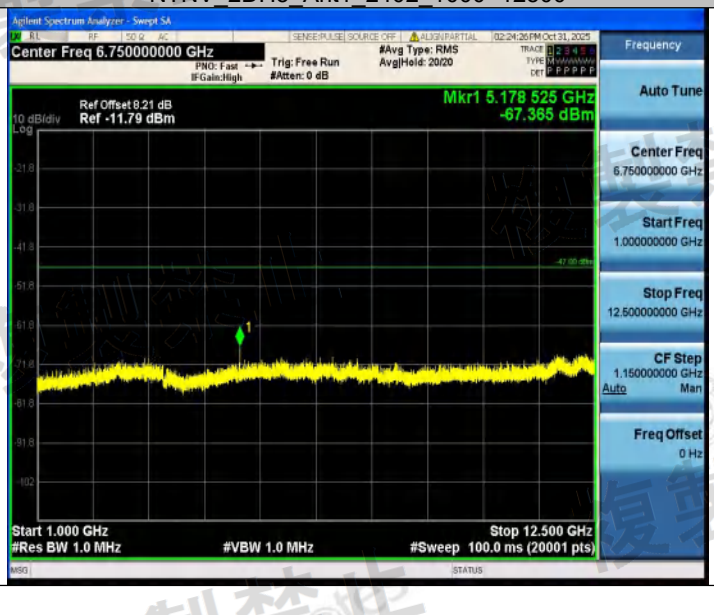
NTNV_DH5_Ant1_2480_1000~12500



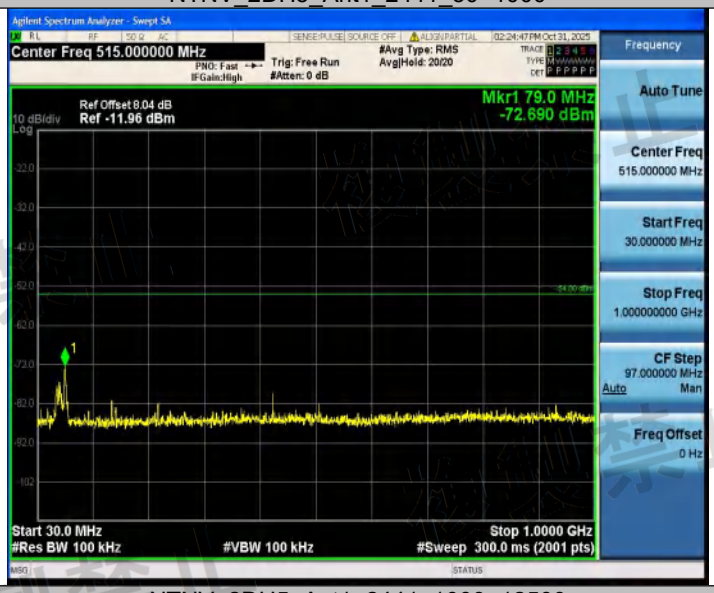
NTNV_2DH5_Ant1_2402_30~1000



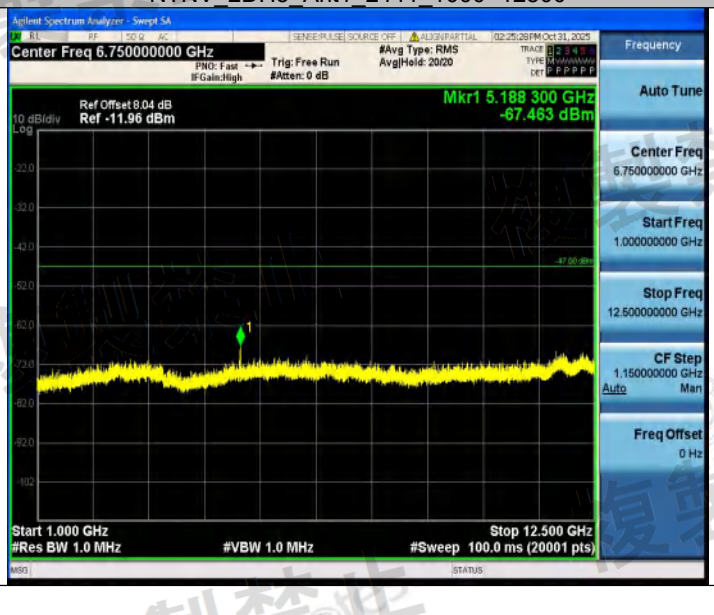
NTNV_2DH5_Ant1_2402_1000~12500



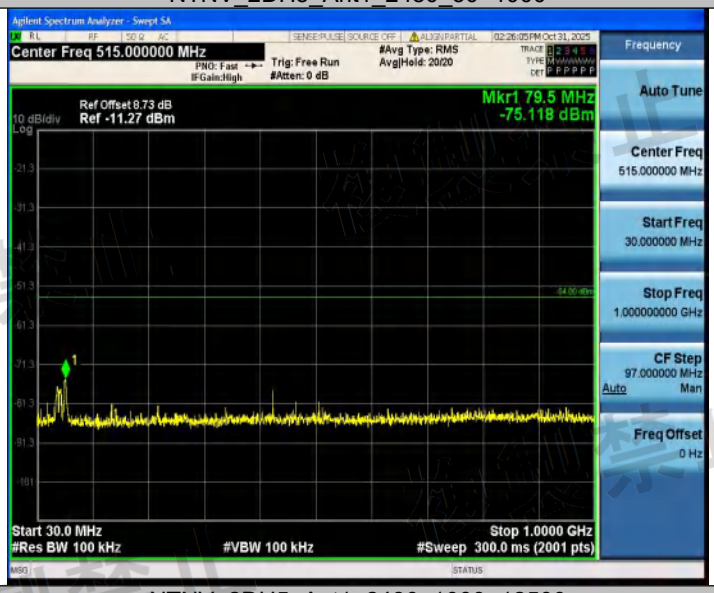
NTNV_2DH5_Ant1_2441_30~1000



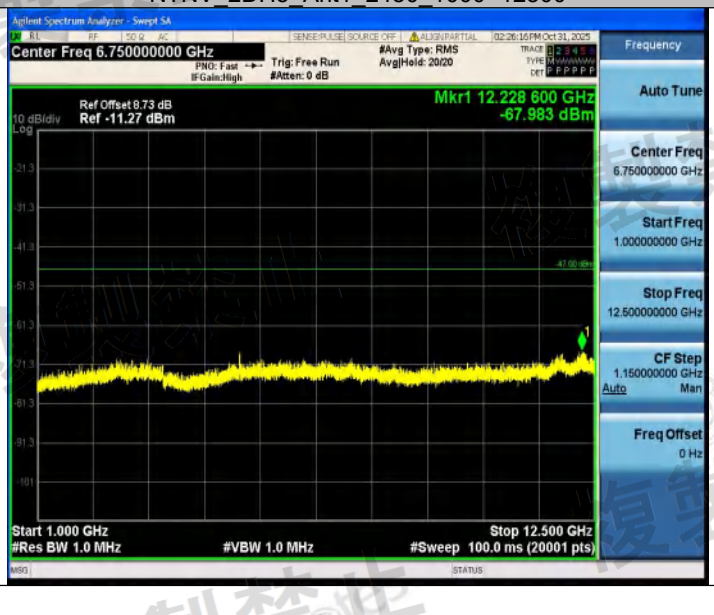
NTNV_2DH5_Ant1_2441_1000~12500



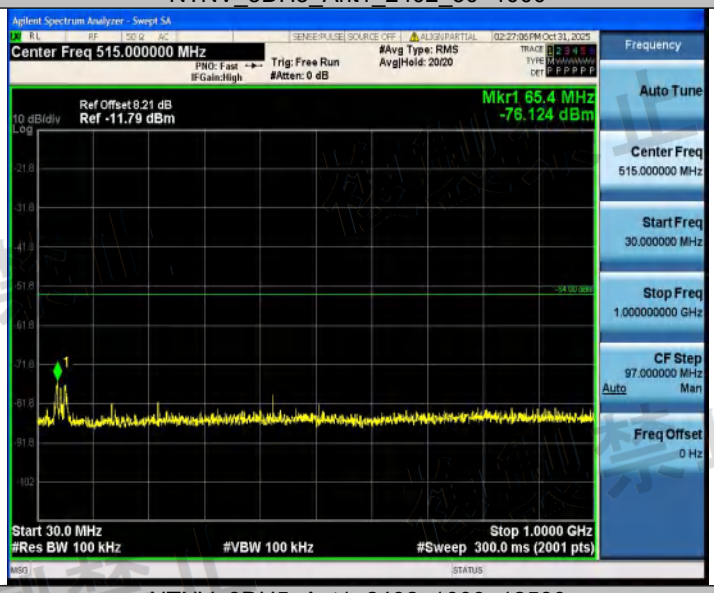
NTNV_2DH5_Ant1_2480_30~1000



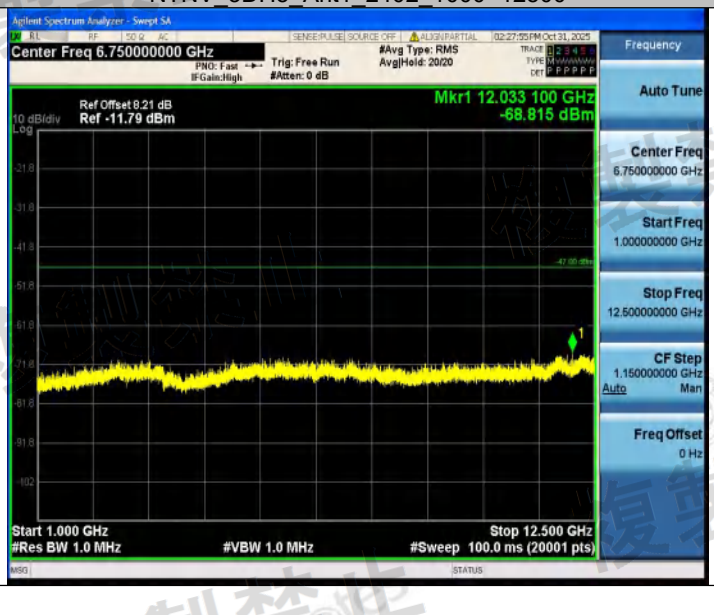
NTNV_2DH5_Ant1_2480_1000~12500



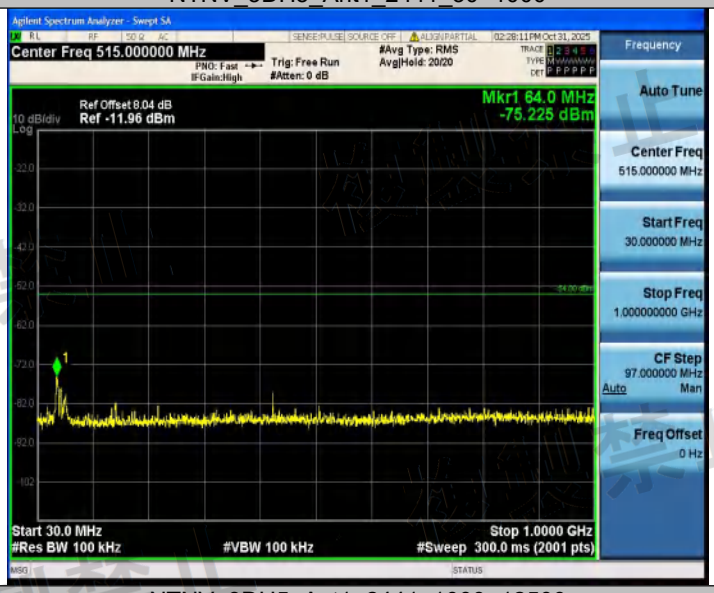
NTNV_3DH5_Ant1_2402_30~1000



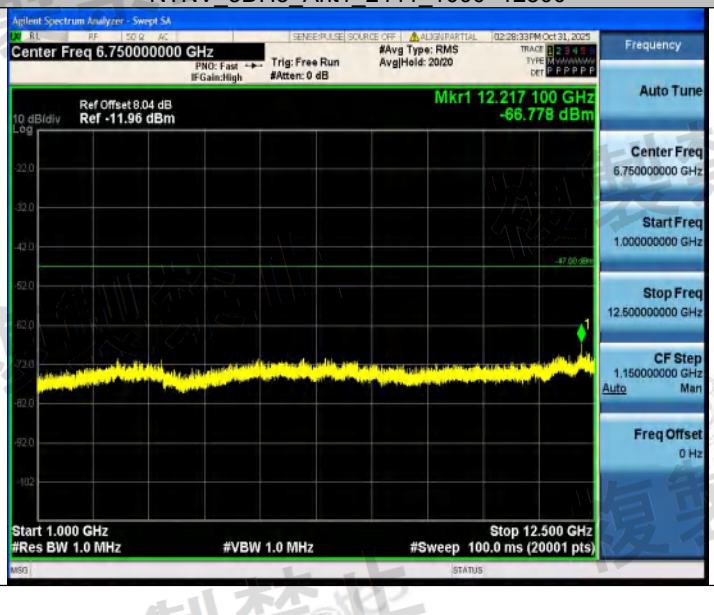
NTNV_3DH5_Ant1_2402_1000~12500



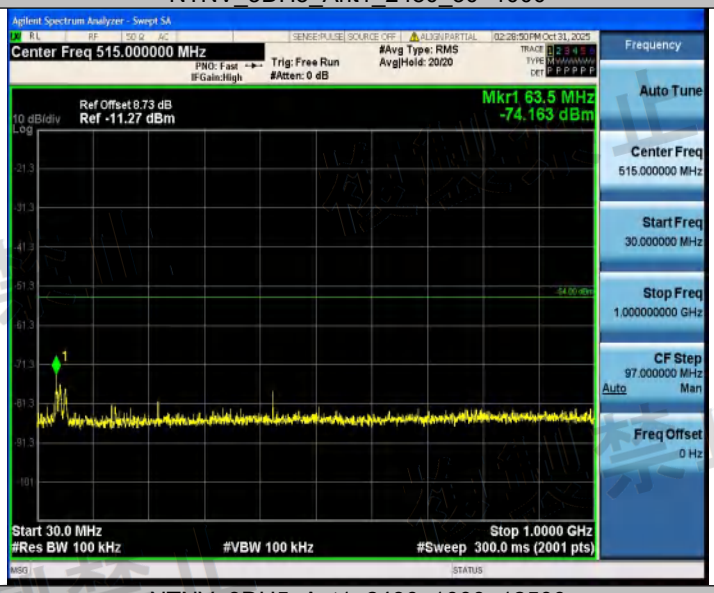
NTNV_3DH5_Ant1_2441_30~1000



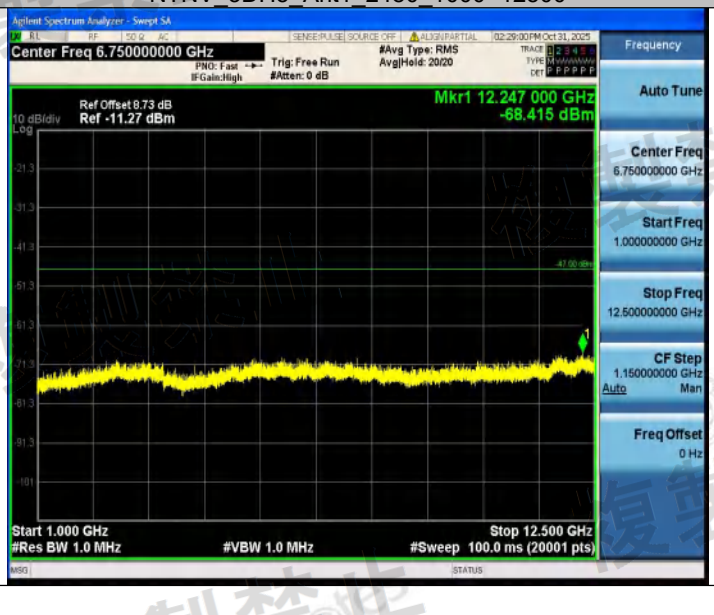
NTNV_3DH5_Ant1_2441_1000~12500



NTNV_3DH5_Ant1_2480_30~1000



NTNV_3DH5_Ant1_2480_1000~12500



Appendix G: Hopping frequency holding time

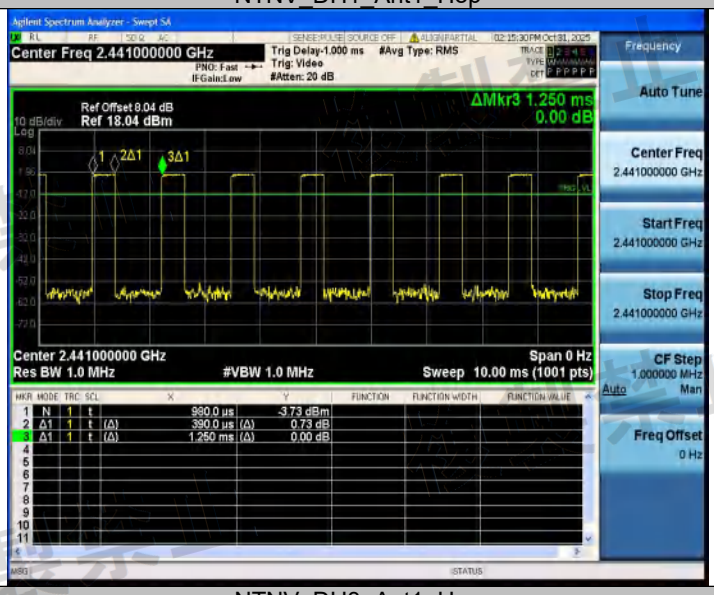
Test Result

Test Condition	Test Mode	Antenna	Freq. [MHz]	T_ON [ms]	Period [ms]	Result [s]	Limit [s]	Verdict
NTNV	DH1	Ant1	2441	0.39	1.25	0.112	≤0.4	PASS
	DH3	Ant1	2441	1.64	2.50	0.234	≤0.4	PASS
	DH5	Ant1	2441	2.90	3.75	0.276	≤0.4	PASS
	2DH1	Ant1	2441	0.40	1.25	0.114	≤0.4	PASS
	2DH3	Ant1	2441	1.65	2.50	0.236	≤0.4	PASS
	2DH5	Ant1	2441	2.90	3.75	0.276	≤0.4	PASS
	3DH1	Ant1	2441	0.40	1.25	0.114	≤0.4	PASS
	3DH3	Ant1	2441	1.65	2.50	0.235	≤0.4	PASS
	3DH5	Ant1	2441	2.91	3.75	0.276	≤0.4	PASS

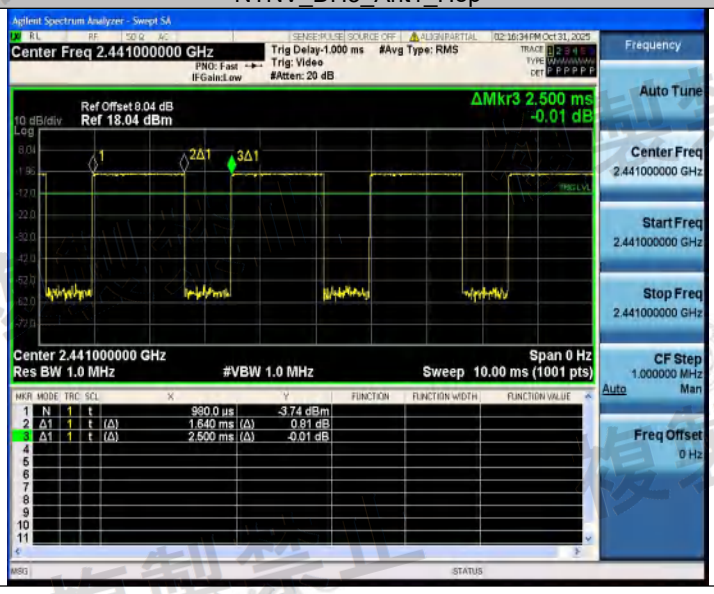
Note: Result [ms] = 0.4 [s] * Spread ratio * T_ON [ms] / Period [ms] / Number of hopping [79]

Test Graphs

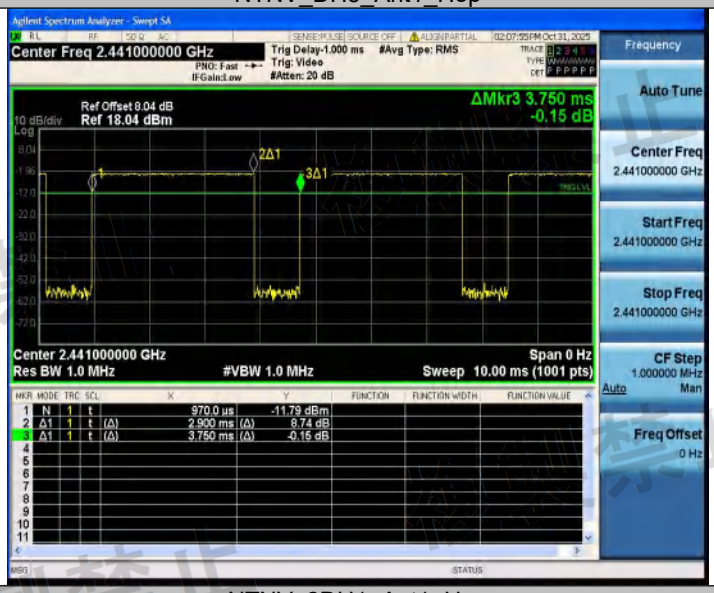
NTNV_DH1_Ant1_Hop



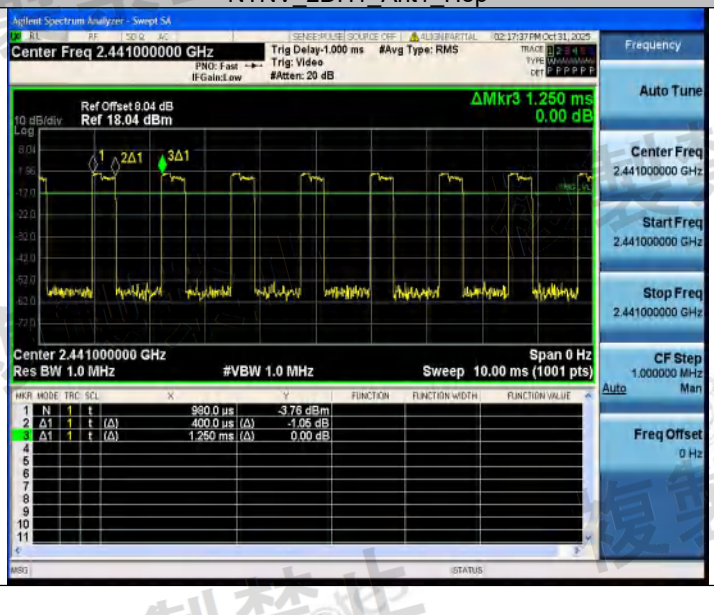
NTNV_DH3_Ant1_Hop



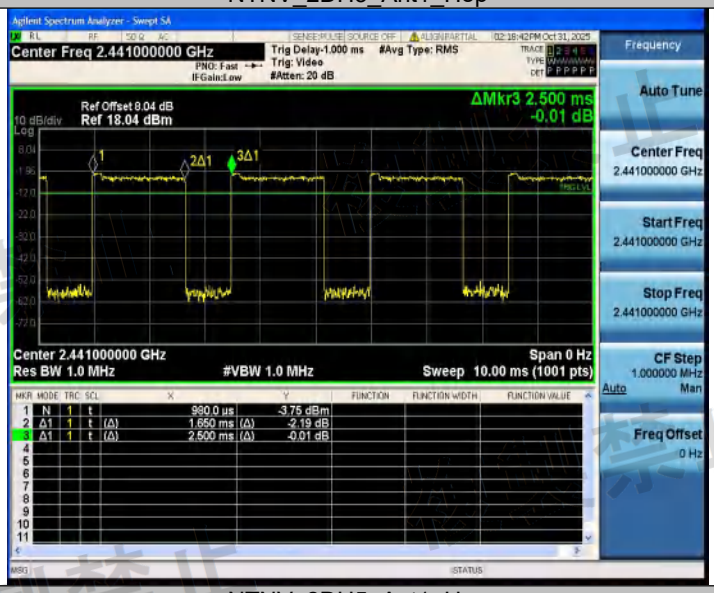
NTNV_DH5_Ant1_Hop



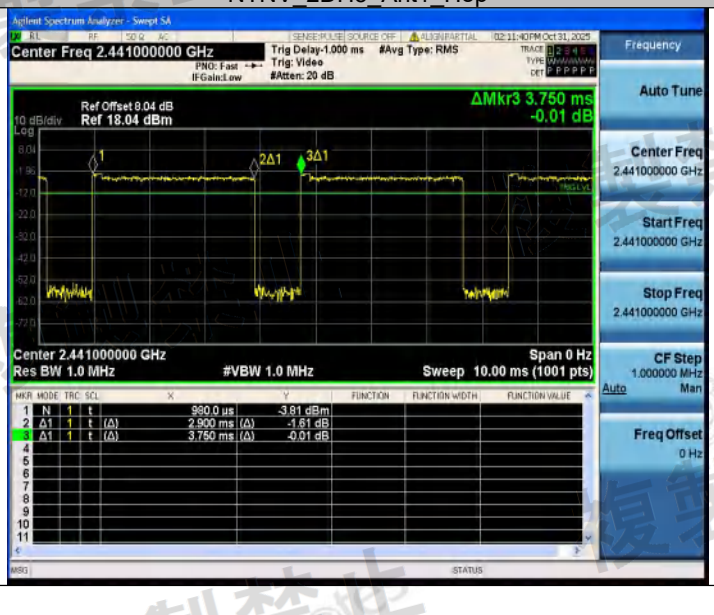
NTNV_2DH1_Ant1_Hop



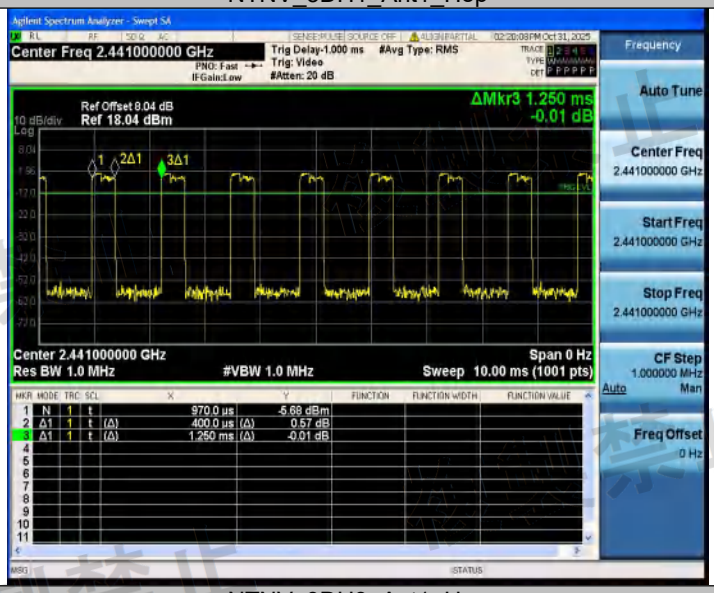
NTNV_2DH3_Ant1_Hop



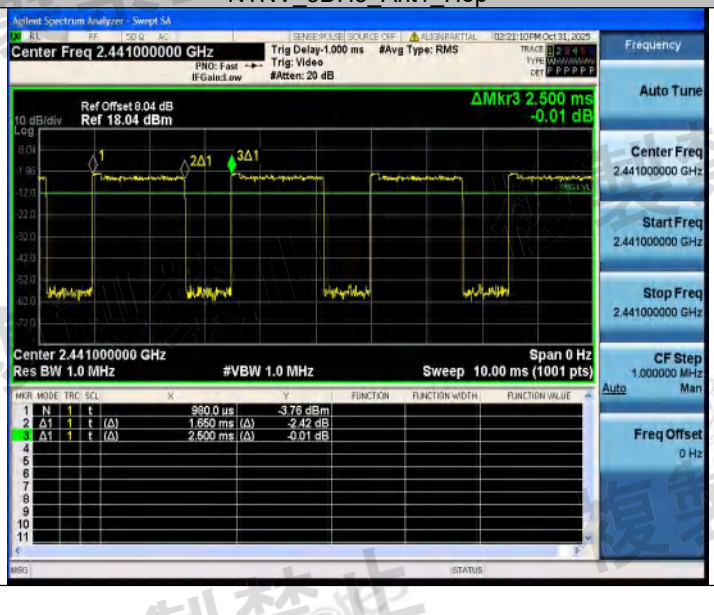
NTNV_2DH5_Ant1_Hop



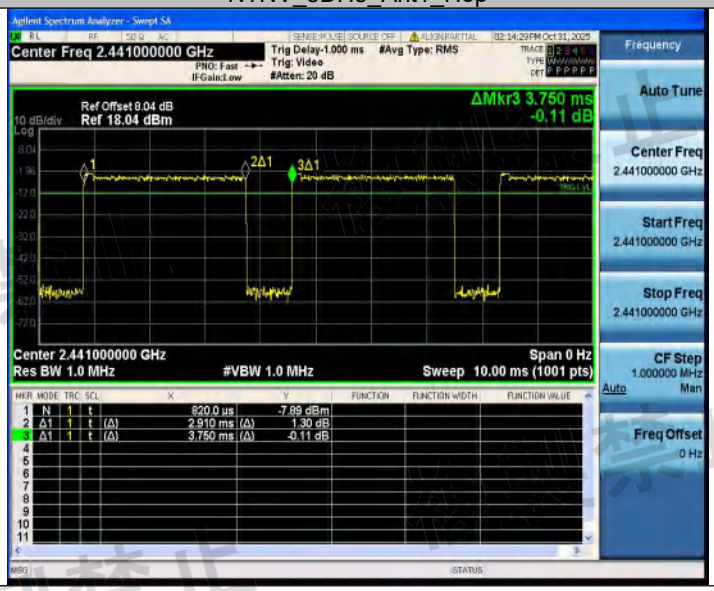
NTNV_3DH1_Ant1_Hop



NTNV_3DH3_Ant1_Hop



NTNV_3DH5_Ant1_Hop



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****** END OF REPORT ******