# Test Report

| | | |
|---|---|---|
| Report No. | : | MTi260317014-0101E1 |
| Date of issue | : | 2026-04-07 |
| Applicant | : | Sanwa Supply Inc |
| Product | : | USB Audio Dongle |
| Model(s) | : | MM-BTMH76BK |

Issued by:

Shenzhen Microtest Co., Ltd.

# TEST REPORT

Report No.: MTi260317014-0101E1

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# TEST REPORT

Report No.: MTi260317014-0101E1

| 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 | USB Audio Dongle |
| Trademark | Sanwa Supply |
| Model name | MM-BTMH76BK |
| Series Model(s) | N/A |
| Standards | Article 2-1, Item 19-MIC Notice No. 88 Appendix No. 43 |
| **Testing Information** | |
| Date of test | 2026-03-30 to 2026-04-02 |
| 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: | USB Audio Dongle |
| Model name: | MM-BTMH76BK |
| Series Model(s): | N/A |
| Model difference: | N/A |
| Electrical rating: | Input: DC 5V |
| Accessories: | Bluetooth Headset*1 |
| Hardware version: | V02 |
| Software version: | V001 |
| Test sample(s) number: | MTi260317014-01-R001 |
| **RF specification** | |
| Bluetooth version: | V5.0 |
| Operating frequency range: | 2402-2480MHz |
| Channel number: | 79 |
| Modulation type: | GFSK, π/4-DQPSK, 8DPSK |
| Antenna(s) type: | PCB |
| Antenna(s) gain: | 1.8dBi |

## 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 V1.1.2**
For power setting, refer to below table.

| Mode | 2402MHz | 2441MHz | 2480MHz |
|---|---|---|---|
| GFSK | 7 | 7 | 7 |
| π/4-DQPSK | 7 | 7 | 7 |
| 8DPSK | 7 | 7 | 7 |

## 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 ($V_{normal}$) | / | 5 | 3.3 |
| NTHV ($V_{max.}$) | +10% | 5.5 | 3.3 |
| NTLV ($V_{min.}$) | -10% | 4.5 | 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 | N/A |
| 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 | Pass |

**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 |
|---|---|---|---|---|---|---|---|
| Tolerance of Frequency<br>Occupied Bandwidth (99%)<br>Spread Bandwidth (90%)<br>Antenna Power and Tolerance<br>Spurious Emission Intensity<br>Secondary Radiated Emissions<br>Dwell Time | | | | | | | |
| 1 | Wideband Radio Communication Tester | Rohde&schwarz | CMW500 | 149155 | 2026-03-09 | 2027-03-08 | C |
| 2 | ESG Series Analog Ssignal Generator | Agilent | E4421B | GB40051240 | 2026-03-09 | 2027-03-08 | C |
| 3 | PXA Signal Analyzer | Agilent | N9030A | MY51350296 | 2026-03-10 | 2027-03-09 | C |
| 4 | Synthesized Sweeper | Agilent | 83752A | 3610A01957 | 2026-03-10 | 2027-03-09 | C |
| 5 | MXA Signal Analyzer | Agilent | N9020A | MY50143483 | 2026-03-09 | 2027-03-08 | C |
| 6 | RF Control Unit | Tonscend | JS0806-1 | 19D8060152 | 2026-03-11 | 2027-03-10 | C |
| 7 | Band Reject Filter Group | Tonscend | JS0806-F | 19D8060160 | 2026-03-11 | 2027-03-10 | C |
| 8 | ESG Vector Signal Generator | Agilent | N5182A | MY50143762 | 2026-03-10 | 2027-03-09 | C |
| 9 | DC Power Supply | Agilent | E3632A | MY40027695 | 2026-03-09 | 2027-03-08 | 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:<br>- Automatic identification transmission<br>- Automatic identification reception |
| Test Method: | Notification No.88 of MIC, 2004 |
| Procedure: | (1) For EUTs capable of automatically transmitting identification data<br>a. Transmit identification data from EUT to Demodulator<br>b. Confirm identification data is correctly received by Demodulator<br>(2) For EUTs capable of automatically receiving identification data<br>a. Transmit identification data from Link Partner to EUT<br>b. Confirm communication link is established<br>c. Link Partner shall respond by transmitting different identification data back to the EUT<br>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: BC:98:29:EE:B8:E9<br><br>Test result: The device meet the requirements<br>PASS |

## 6 Radio Spectrum Matter Test Results (RF)

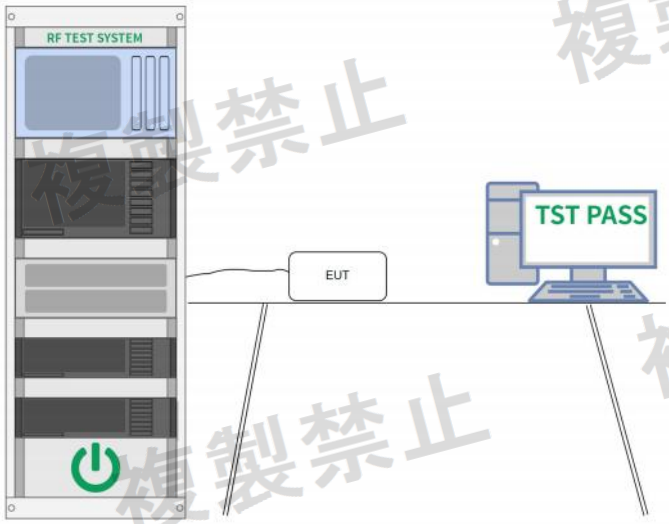
### 6.1 Tolerance of Frequency

| | |
|---|---|
| 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<br>Span: 1 MHz<br>RBW: 10 kHz (unmodulated)<br>VBW: 10 kHz (unmodulated)<br>Sweep data points: 1001 or greater<br>Sweep time: Auto<br>Detector mode: Positive peak<br>Indication mode: Max hold<br>(1) Find the peak carrier signal and measure its frequency<br><br>(2) For multiple antenna systems each antenna shall be measured<br>(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:<br>a) The frequency of all antenna transmissions are phase-synchronized to a common (fundamental) oscillator<br>b) The antenna transmissions share a common clock signal |

#### 6.1.1 E.U.T. Operation:

| | | | | | |
|---|---|---|---|---|---|
| Operating Environment: | | | | | |
| Temperature: | 22.8 °C | Humidity: | 56 % | 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:<br>The measured bandwidth at the low and high channels shall meet the following requirements:<br>- The lowest frequency of the measured bandwidth shall not be less than 2400 MHz<br>- The highest frequency of the measured bandwidth shall not be greater than 2483.5 MHz<br>[Occupied Bandwidth]<br>83.5 MHz or less |
| Test Method: | Notification No.88 of MIC, 2004 |
| Procedure: | |

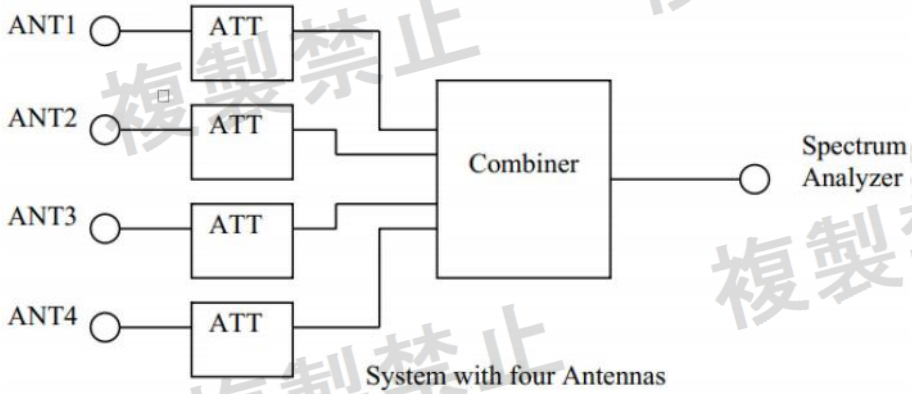
| | |
|---|---|
| Center Frequency: | Test frequency |
| Span: | 2 - 3.5 times the technical standard |
| RBW: | Within 3% of the technical standard |
| VBW: | Same as RBW |
| Sweep time: | Auto |
| Sweep data points: | 1001 or greater |
| Detector mode: | Positive peak |
| Indication mode: | Max hold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

(1) Measure the signal bandwidth using a spectrum analyzer

(2) For multiple antenna systems:

a) Each antenna shall be individually measured

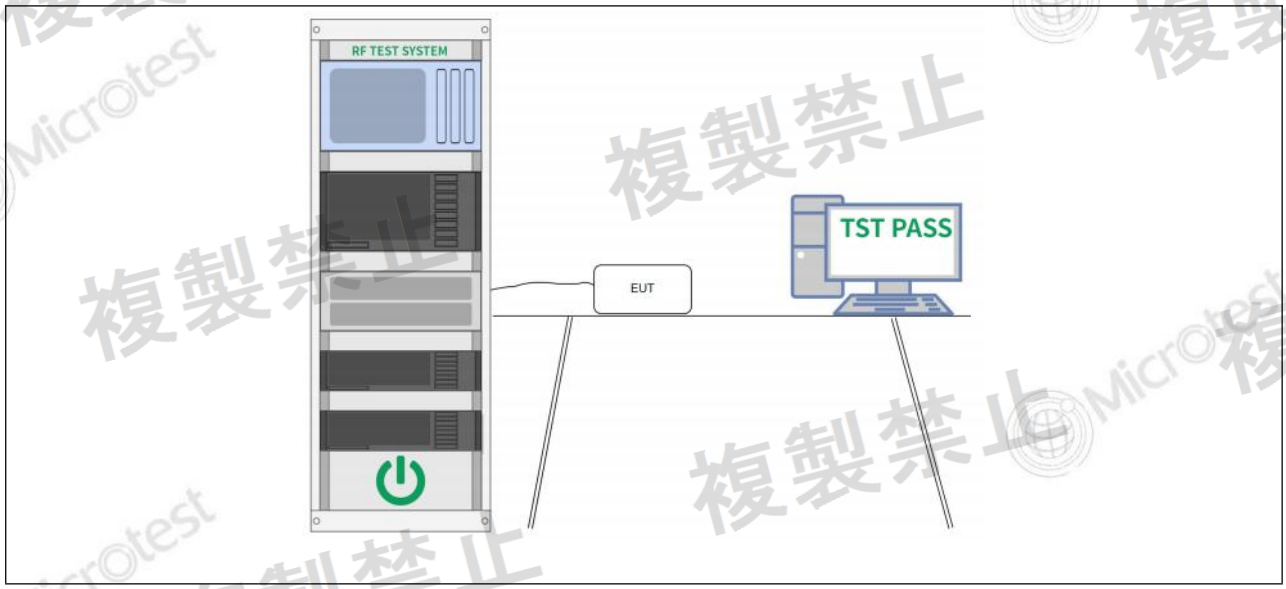
b) If the measured occupied bandwidth for any antenna exceeds [(Occupied Bandwidth Limit) – 100kHz] then, in addition, the occupied bandwidth shall be measured with all antennas combined – see diagram below:




### 6.2.1 E.U.T. Operation:

| | | | | | |
|---|---|---|---|---|---|
| Operating Environment: | | | | | |
| Temperature: | 22.8 °C | Humidity: | 56 % | 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:

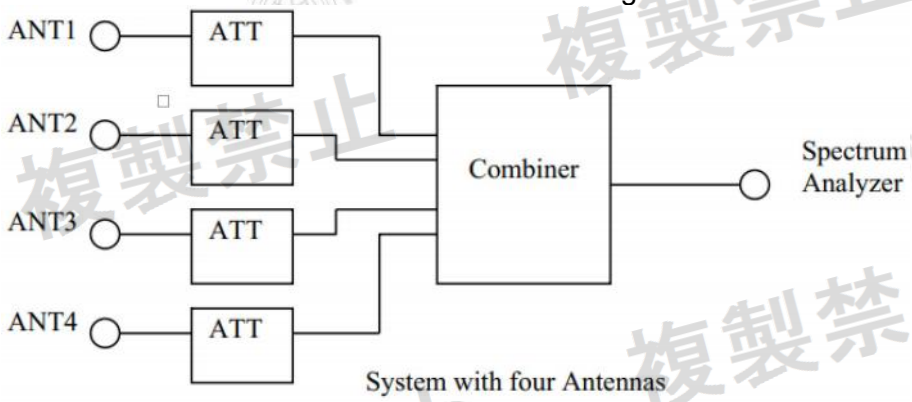
Please Refer to Appendix for Details.

## 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:

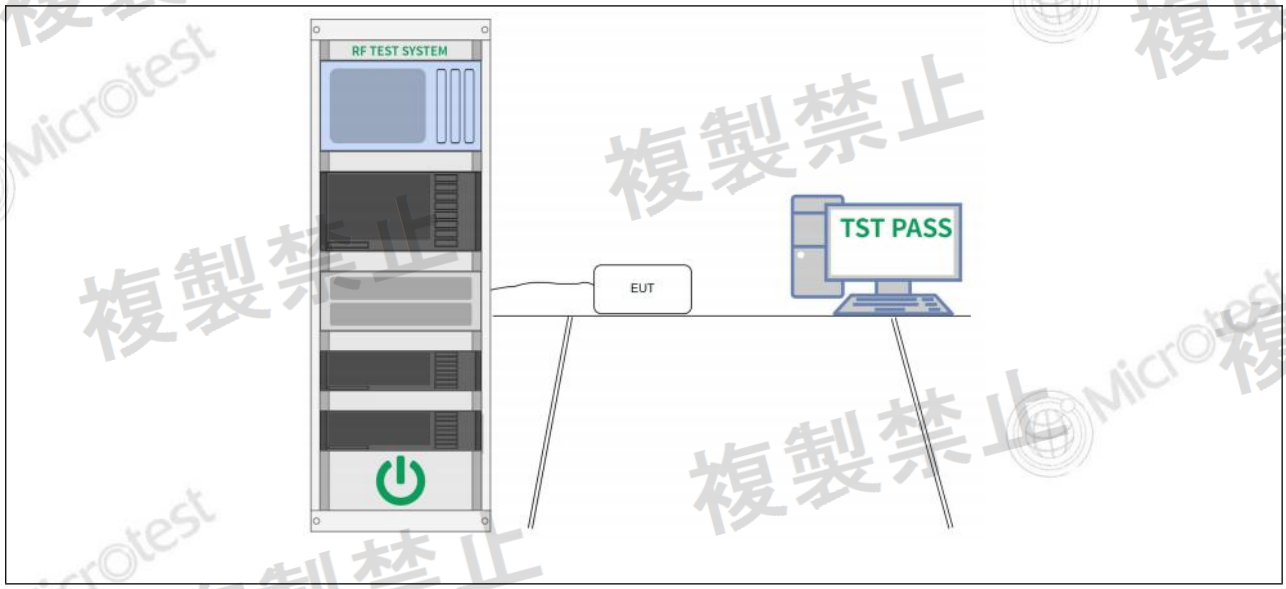



System with four Antennas

### 6.3.1 E.U.T. Operation:

| | | | | | |
|---|---|---|---|---|---|
| Operating Environment: | | | | | |
| Temperature: | 22.8 °C | Humidity: | 56 % | Atmospheric Pressure: | 101 kPa |
| Pre test mode: | Mode1, Mode2, Mode3 | | | | |
| Final test mode: | Mode1, Mode2, Mode3 | | | | |

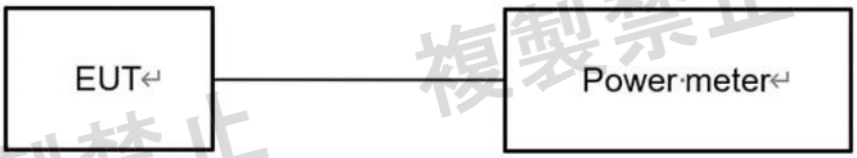
### 6.3.2 Test Setup Diagram:




### 6.3.3 Test Data:

Please Refer to Appendix for Details.

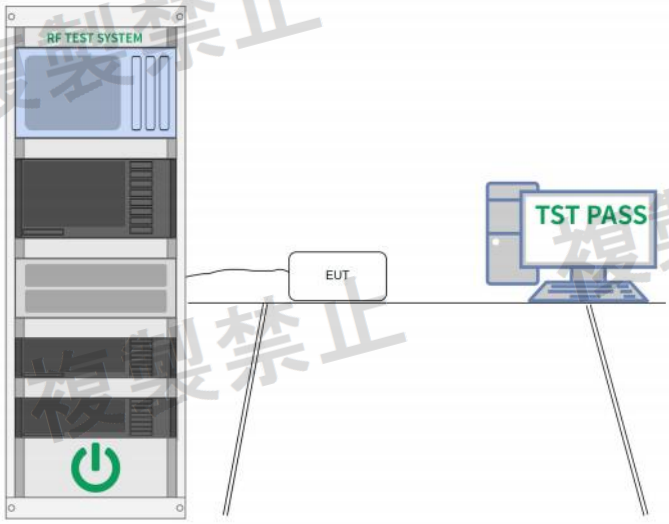
## 6.4 Antenna Power and Tolerance

| | |
|---|---|
| Test Requirement: | Article 2-1, Item 19 |
| Test Limit: | Antenna Power:<br>3 mW/MHz or less<br>Tolerance: +20% or less<br><br>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.<br>  <br> |

### 6.4.1 E.U.T. Operation:

| Operating Environment: | | | | | |
|---|---|---|---|---|---|
| Temperature: | 22.8 °C | Humidity: | 56 % | 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<br>(2) 2387 to 2400 MHz: 25.0 μW (-16 dBm)/MHz or less<br>(3) 2483.5 to 2496.5 MHz: 25.0 μW (-16 dBm)/MHz or less<br>(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:<br>-FHSS, FHSS+DSSS, FHSS+OFDM:2374 MHz to 2509.5 MHz<br>-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.<br>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

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

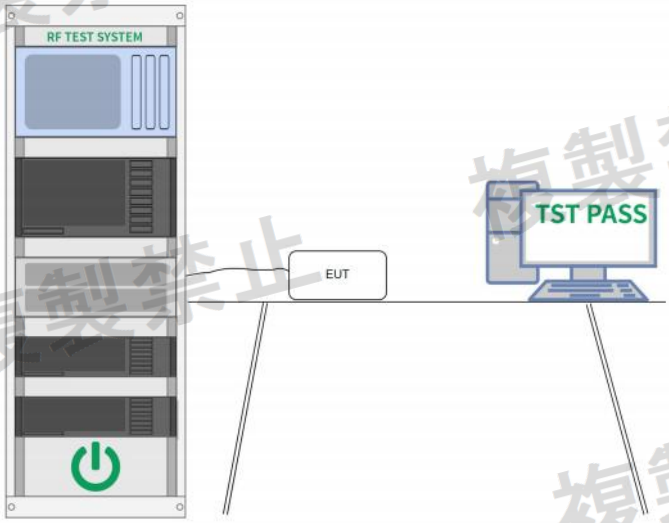
Ps: Sum (Watts)
Ei: Measured value at each point in the Span (Watts) Sw: Span (1MHz)
n: Number of measurement points in the Span
k: Correction factor for Equivalent Noise Bandwidth, specific to each spectrum analyzer, check the instrument user guide
RBW: Resolution Bandwidth (MHz).

| | |
|---|---|
| | (10) If the EUT has multiple antennas, measure the spurious emission form each individual antenna using steps (1) through (9)<br>(11) Convert the individual antenna spurious level measurements (step (10)) from dB to absolute values<br>(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)<br>(13) Ensure that the composite spectrum does not exceed the Limit defined in 6.7 (Technical Standard)<br>(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: | 22.8 °C | Humidity: | 56 % | 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<br>(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 |

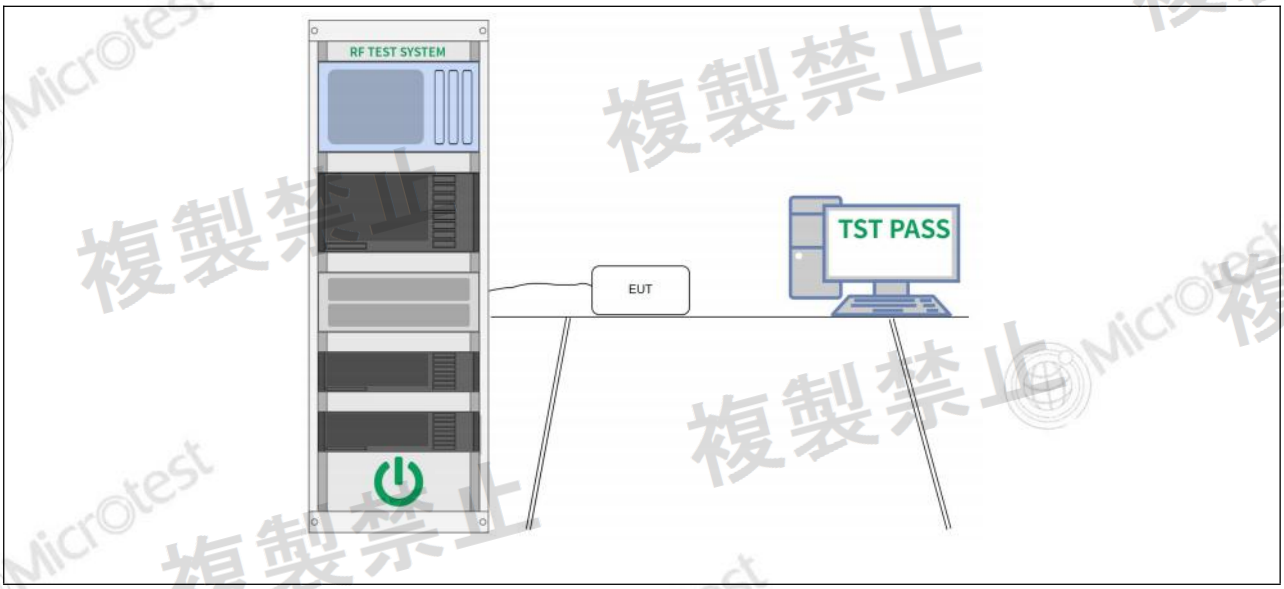
(1) Configure the spectrum analyzer to [Setting 1] and then search for spurious emissions in the range 30 MHz to 12.5GHz. If the sweep range does not cover the required measurement frequency range then the measurement range will need to be divided into sufficient sections of size [RBW x Sweep Data Points].
(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: | 22.8 °C | Humidity: | 56 % | 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.

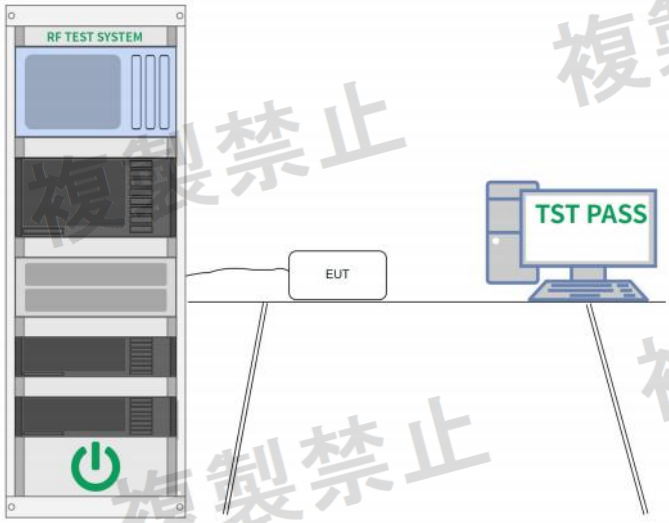
## 6.7 Dwell Time

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

### 6.7.1 E.U.T. Operation:

| | | | | | |
|---|---|---|---|---|---|
| Operating Environment: | | | | | |
| Temperature: | 22.8 °C | Humidity: | 56 % | 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

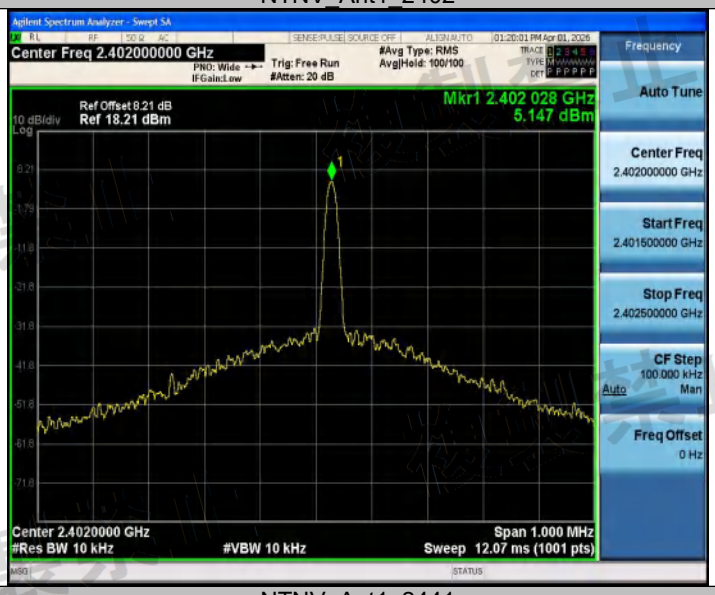
### Test Result

| Test Condition | Test Mode | Antenna | Freq. [MHz] | CenterFreq [MHz] | Result [ppm] | Limit [ppm] | Verdict |
|---|---|---|---|---|---|---|---|
| NTNV | unmodulated carrier | Ant1 | 2402 | 2402.028 | 11.65695 | ±50 | PASS |
| | | | 2441 | 2441.025 | 10.24170 | ±50 | PASS |
| | | | 2480 | 2480.023 | 9.27419 | ±50 | PASS |

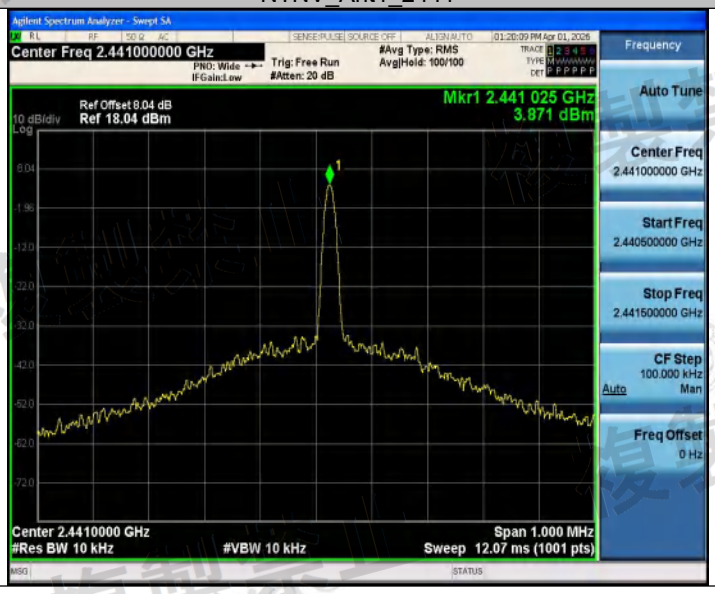
**Note:** Result [ppm] = (CenterFreq [MHz] – Freq. [MHz]) / Freq. [MHz] * 1000000

## Test Graphs

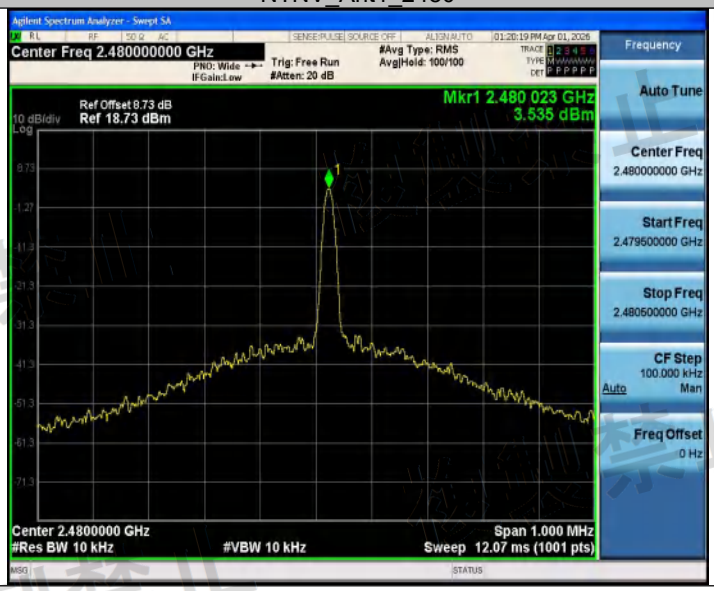
NTNV_Ant1_2402




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 | 2.26 | 1.6827 | 70.773 | 0.0238 | ≤3 | PASS |
| | 2DH5 | Ant1 | Hop | 1.71 | 1.4825 | 70.882 | 0.0209 | ≤3 | PASS |
| | 3DH5 | Ant1 | Hop | 1.89 | 1.5453 | 71.279 | 0.0217 | ≤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: 76.53%,
Duty cycle of 2DH5: 76.53%
Duty cycle of 3DH5: 76.53%

| Tolerance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Condition | Test Mode | Antenna | Freq [MHz] | Power [mW/MHz] | RatedPower [mW/MHz] | Result [%] | Limit [%] | Verdict |
| NTNV | DH5 | Ant1 | Hop | 0.0238 | 0.05 | -52.45 | ≤20 | PASS |
| | 2DH5 | Ant1 | Hop | 0.0209 | 0.05 | -58.17 | ≤20 | PASS |
| | 3DH5 | Ant1 | Hop | 0.0217 | 0.05 | -56.64 | ≤20 | PASS |

**Notes:**
Result = (Power [mW] – RatedPower [mW]) / RatedPower [mW] * 100
The rated power is 0.05 mW/MHz for DH5 mode, which is declared by the manufacturer.
The rated power is 0.05 mW/MHz for 2DH5 mode, which is declared by the manufacturer.
The rated power is 0.05 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 | -16.24 | -14.44 | ≤6.91 | PASS |
| | 2DH5 | Ant1 | Hop | -16.80 | -15.00 | ≤6.91 | PASS |
| | 3DH5 | Ant1 | Hop | -16.64 | -14.84 | ≤6.91 | PASS |

**Notes:**
The antenna gain is 1.8 dBi.
EIRP= Conducted Peak Power+ antenna gain.

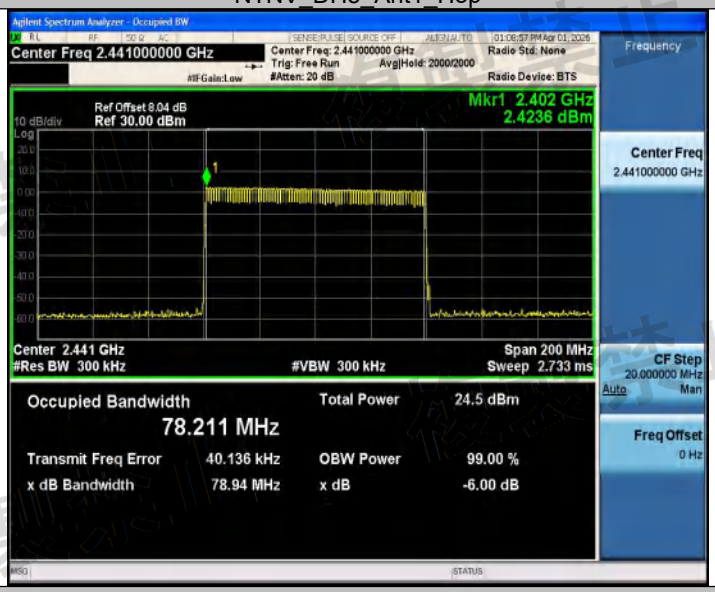
## Appendix C: Occupied Bandwidth

### Test Result

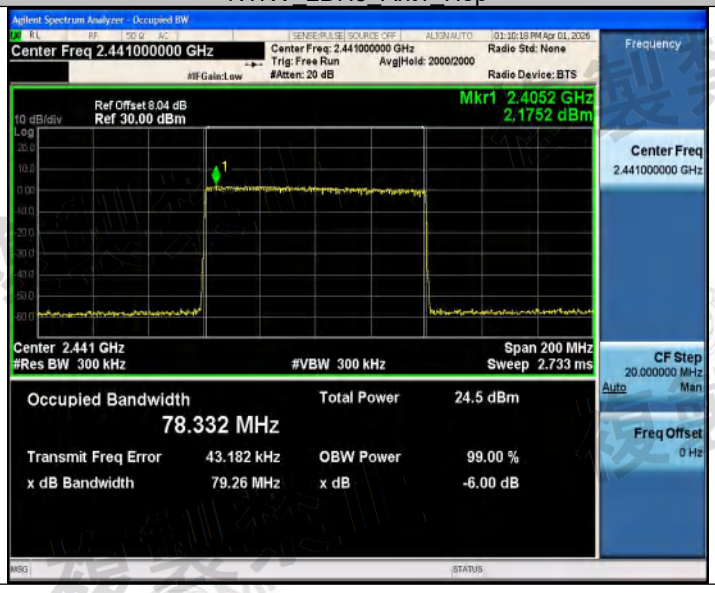
| Test Condition | Test Mode | Antenna | Freq. [MHz] | Result [MHz] | Limit [MHz] | Verdict |
|---|---|---|---|---|---|---|
| NTNV | DH5 | Ant1 | Hop | 78.211 | ≤83.5 | PASS |
| | 2DH5 | Ant1 | Hop | 78.332 | ≤83.5 | PASS |
| | 3DH5 | Ant1 | Hop | 78.432 | ≤83.5 | PASS |

## Test Graphs

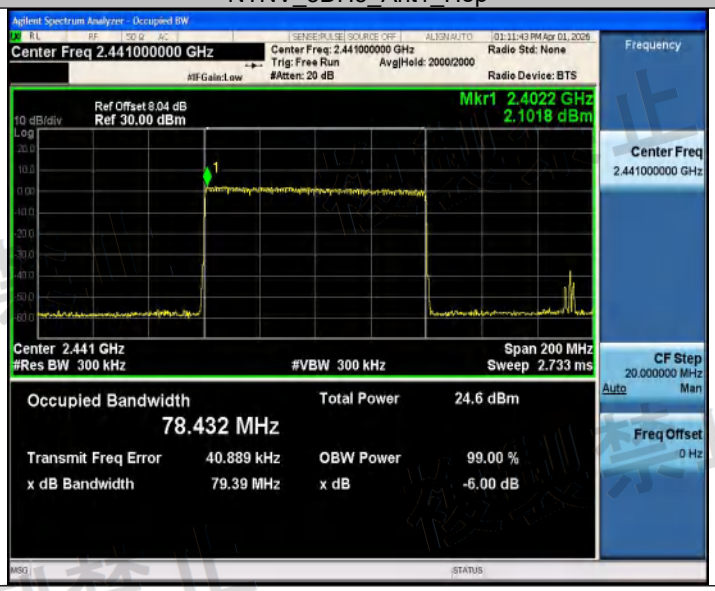
NTNV_DH5_Ant1_Hop




NTNV_2DH5_Ant1_Hop



NTNV_3DH5_Ant1_Hop



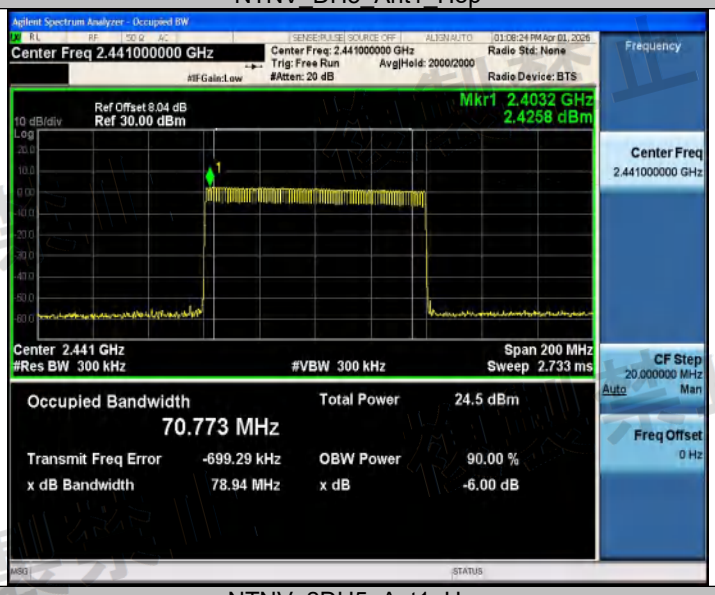
## Appendix D: Spread Bandwidth

### Test Result

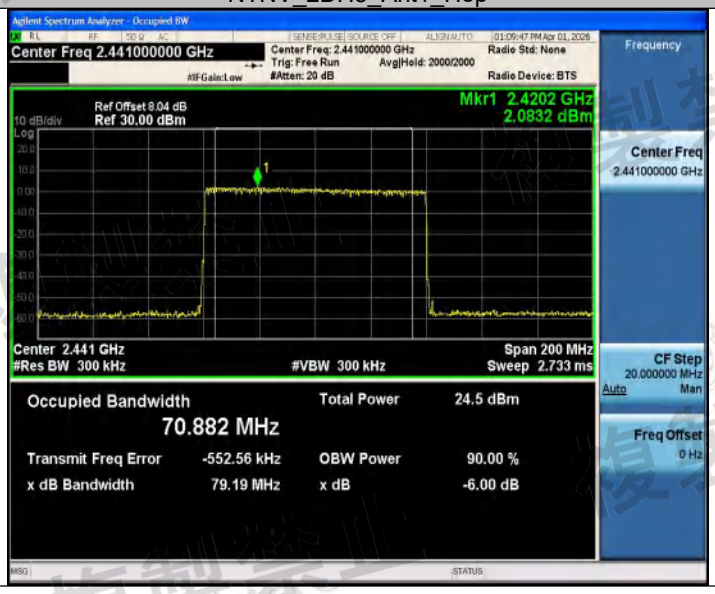
| Test Condition | Test Mode | Antenna | Freq. [MHz] | Result [MHz] | Limit [MHz] | Spread Factor | Limit | Verdict |
|---|---|---|---|---|---|---|---|---|
| NTNV | DH5 | Ant1 | Hop | 70.773 | ≥0.5 | 70.773 | >5 | PASS |
| | 2DH5 | Ant1 | Hop | 70.882 | ≥0.5 | 70.882 | >5 | PASS |
| | 3DH5 | Ant1 | Hop | 71.279 | ≥0.5 | 71.279 | >5 | PASS |

## Test Graphs

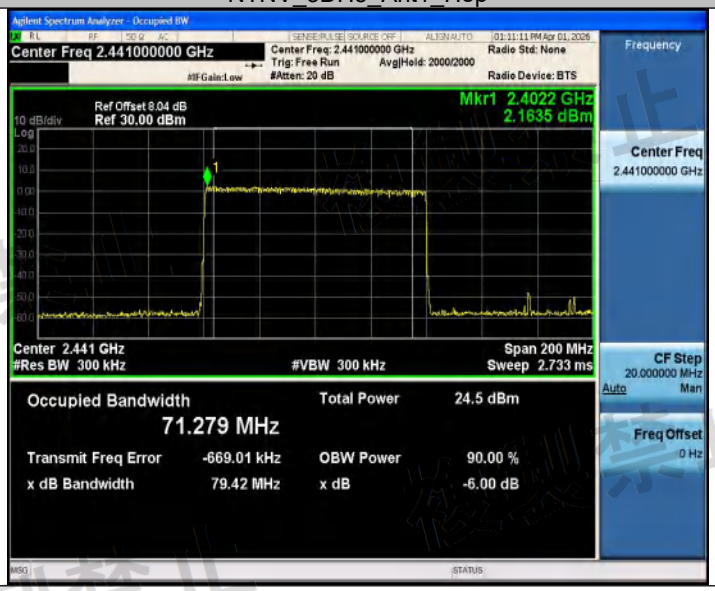
NTNV_DH5_Ant1_Hop




NTNV_2DH5_Ant1_Hop



NTNV_3DH5_Ant1_Hop



## Appendix E: Spurious and unwanted emission intensity

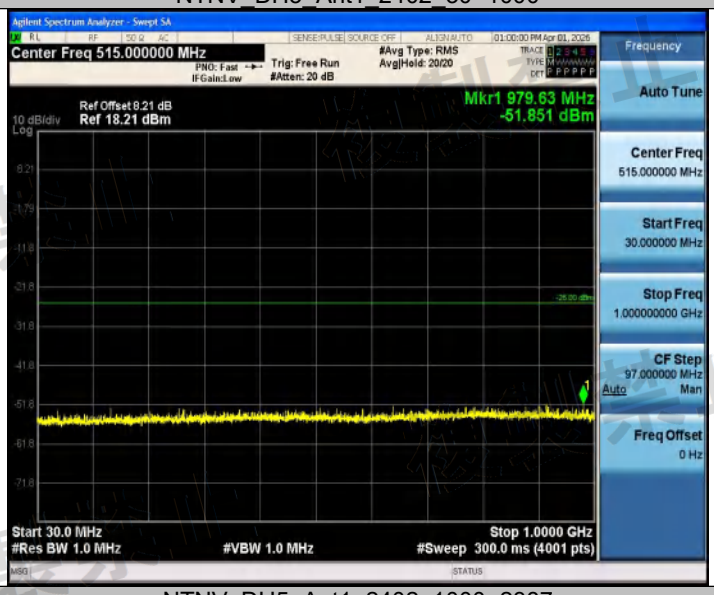
### Test Result

| 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 | -51.85 | ≤-26 | 0.00653 | ≤2.5 | PASS |
| | | | | 1000~2387 | -51.18 | ≤-26 | 0.00762 | ≤2.5 | PASS |
| | | | | 2387~2400 | -27.53 | ≤-16 | 1.76604 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.95 | ≤-16 | 0.08035 | ≤25 | PASS |
| | | | | 2496.5~13000 | -36.11 | ≤-26 | 0.24491 | ≤2.5 | PASS |
| | | | 2441 | 30~1000 | -51.57 | ≤-26 | 0.00697 | ≤2.5 | PASS |
| | | | | 1000~2387 | -51.26 | ≤-26 | 0.00748 | ≤2.5 | PASS |
| | | | | 2387~2400 | -41.51 | ≤-16 | 0.07063 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.97 | ≤-16 | 0.07998 | ≤25 | PASS |
| | | | | 2496.5~13000 | -37.34 | ≤-26 | 0.18450 | ≤2.5 | PASS |
| | | | 2480 | 30~1000 | -51.52 | ≤-26 | 0.00705 | ≤2.5 | PASS |
| | | | | 1000~2387 | -50.57 | ≤-26 | 0.00877 | ≤2.5 | PASS |
| | | | | 2387~2400 | -40.46 | ≤-16 | 0.08995 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -39.85 | ≤-16 | 0.10351 | ≤25 | PASS |
| | | | | 2496.5~13000 | -37.13 | ≤-26 | 0.19364 | ≤2.5 | PASS |
| | 2DH5 | Ant1 | 2402 | 30~1000 | -52.07 | ≤-26 | 0.00621 | ≤2.5 | PASS |
| | | | | 1000~2387 | -49.84 | ≤-26 | 0.01038 | ≤2.5 | PASS |
| | | | | 2387~2400 | -27.13 | ≤-16 | 1.93642 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.91 | ≤-16 | 0.08110 | ≤25 | PASS |
| | | | | 2496.5~13000 | -33.92 | ≤-26 | 0.40551 | ≤2.5 | PASS |
| | | | 2441 | 30~1000 | -51.65 | ≤-26 | 0.00684 | ≤2.5 | PASS |
| | | | | 1000~2387 | -51.66 | ≤-26 | 0.00682 | ≤2.5 | PASS |
| | | | | 2387~2400 | -41.04 | ≤-16 | 0.07870 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.86 | ≤-16 | 0.08204 | ≤25 | PASS |
| | | | | 2496.5~13000 | -35.21 | ≤-26 | 0.30130 | ≤2.5 | PASS |
| | | | 2480 | 30~1000 | -51.25 | ≤-26 | 0.00750 | ≤2.5 | PASS |
| | | | | 1000~2387 | -50.57 | ≤-26 | 0.00877 | ≤2.5 | PASS |
| | | | | 2387~2400 | -40.36 | ≤-16 | 0.09204 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -39.63 | ≤-16 | 0.10889 | ≤25 | PASS |
| | | | | 2496.5~13000 | -35.45 | ≤-26 | 0.28510 | ≤2.5 | PASS |
| | 3DH5 | Ant1 | 2402 | 30~1000 | -51.73 | ≤-26 | 0.00671 | ≤2.5 | PASS |
| | | | | 1000~2387 | -50.29 | ≤-26 | 0.00935 | ≤2.5 | PASS |
| | | | | 2387~2400 | -26.62 | ≤-16 | 2.17771 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.37 | ≤-16 | 0.09183 | ≤25 | PASS |
| | | | | 2496.5~13000 | -34.23 | ≤-26 | 0.37757 | ≤2.5 | PASS |
| | | | 2441 | 30~1000 | -52.42 | ≤-26 | 0.00573 | ≤2.5 | PASS |
| | | | | 1000~2387 | -50.93 | ≤-26 | 0.00807 | ≤2.5 | PASS |
| | | | | 2387~2400 | -41.53 | ≤-16 | 0.07031 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -40.99 | ≤-16 | 0.07962 | ≤25 | PASS |
| | | | | 2496.5~1300 | -36.07 | ≤-26 | 0.24717 | ≤2.5 | PASS |

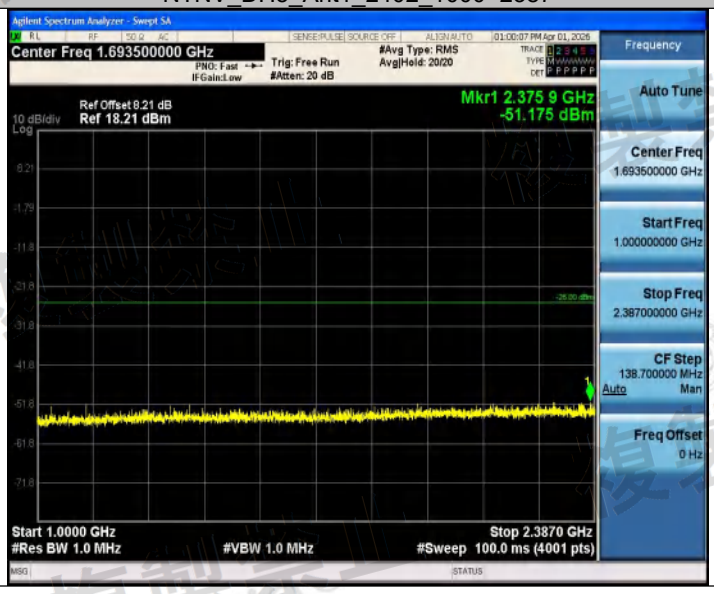
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | | |
| | | | 2480 | 30~1000 | -51.56 | ≤-26 | 0.00698 | ≤2.5 | PASS |
| | | | | 1000~2387 | -49.37 | ≤-26 | 0.01156 | ≤2.5 | PASS |
| | | | | 2387~2400 | -41.15 | ≤-16 | 0.07674 | ≤25 | PASS |
| | | | | 2483.5~2496.5 | -39.93 | ≤-16 | 0.10162 | ≤25 | PASS |
| | | | | 2496.5~13000 | -35.44 | ≤-26 | 0.28576 | ≤2.5 | PASS |

## Test Graphs

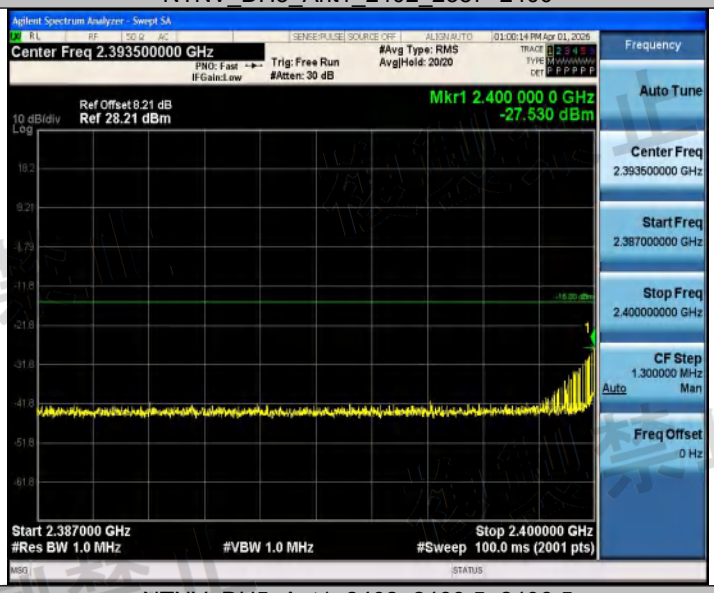
NTNV_DH5_Ant1_2402_30~1000



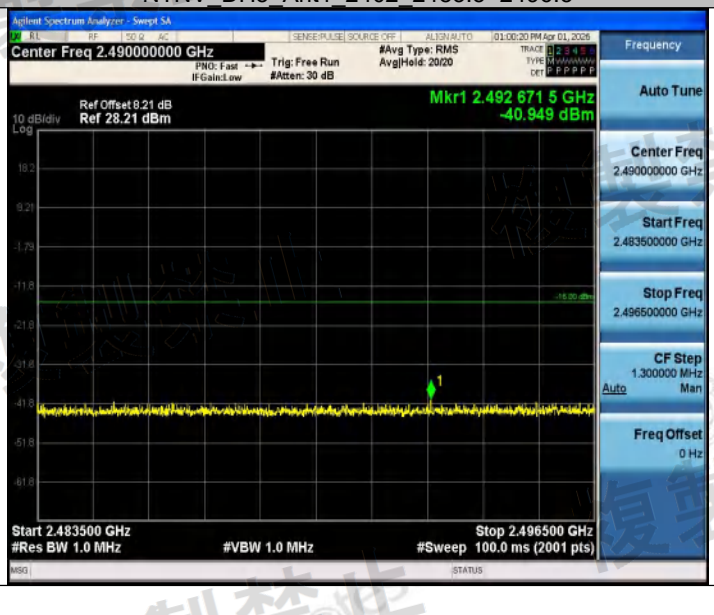

NTNV_DH5_Ant1_2402_1000~2387



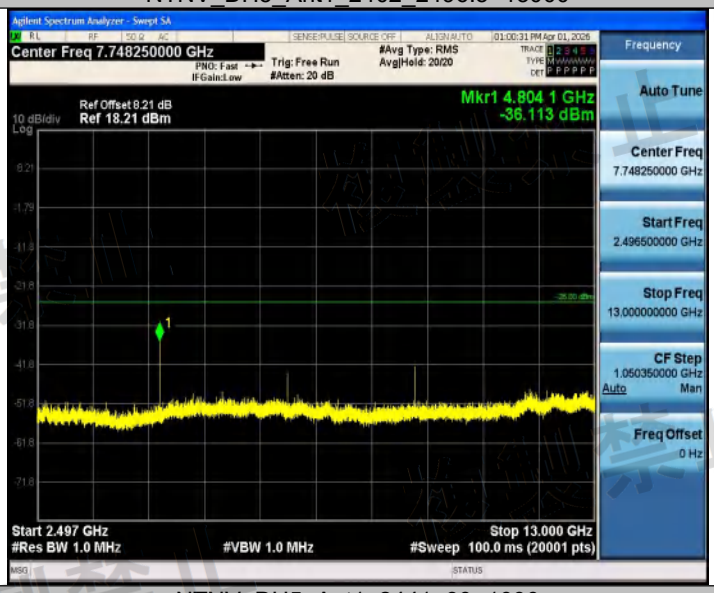
NTNV_DH5_Ant1_2402_2387~2400



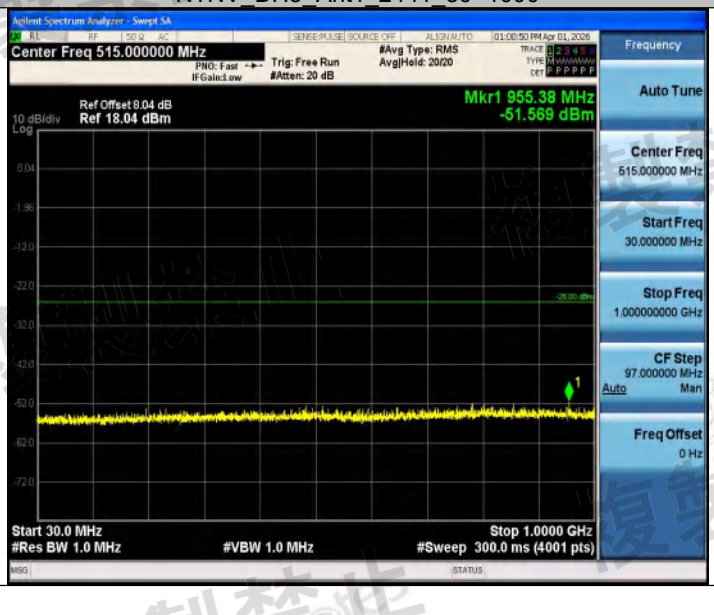

NTNV_DH5_Ant1_2402_2483.5~2496.5



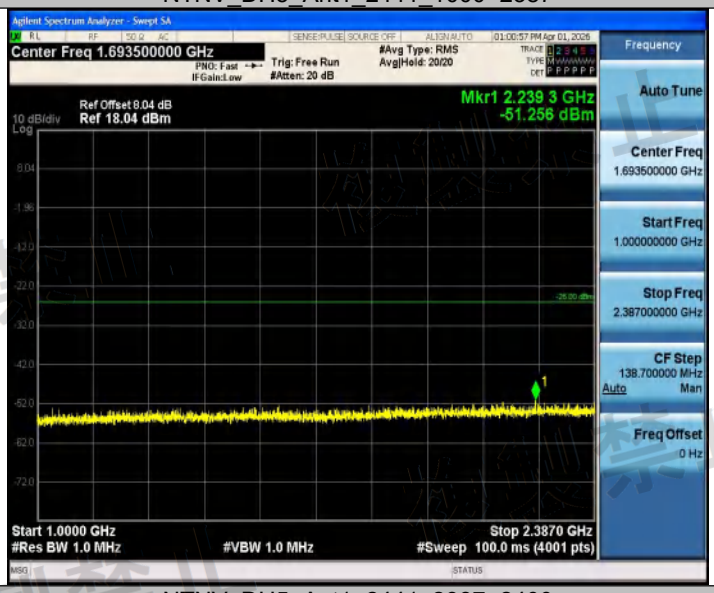
NTNV_DH5_Ant1_2402_2496.5~13000



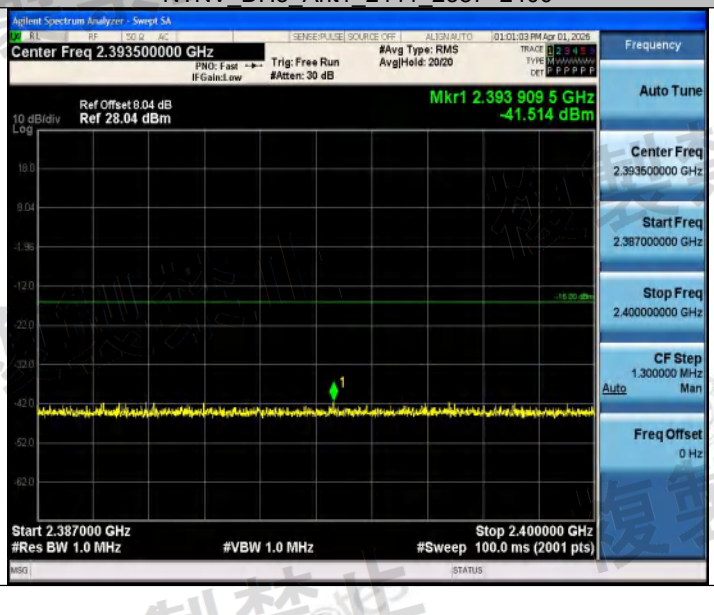

NTNV_DH5_Ant1_2441_30~1000



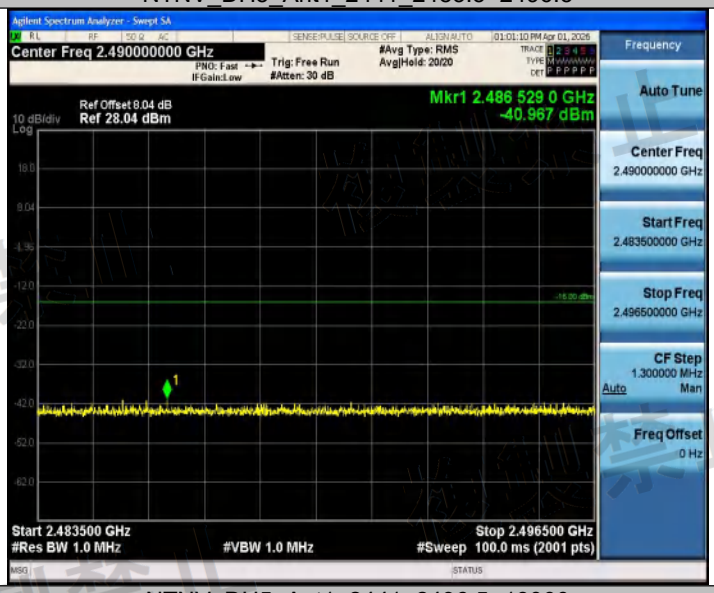
NTNV_DH5_Ant1_2441_1000~2387



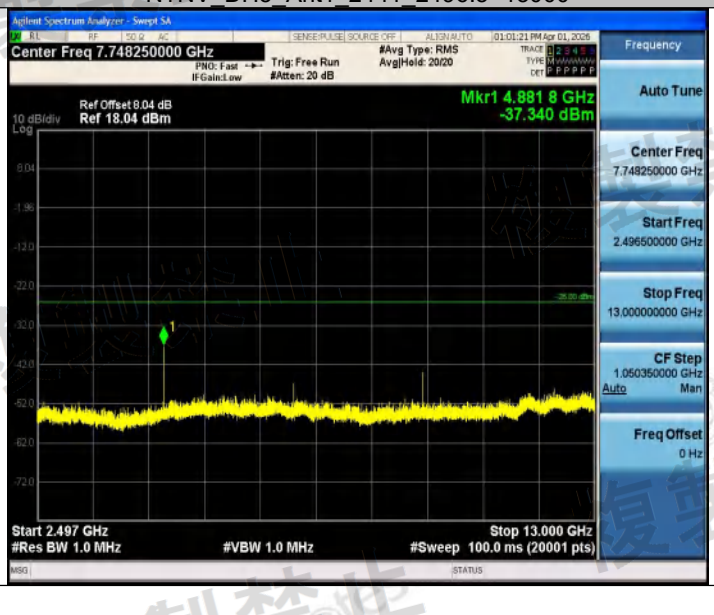

NTNV_DH5_Ant1_2441_2387~2400



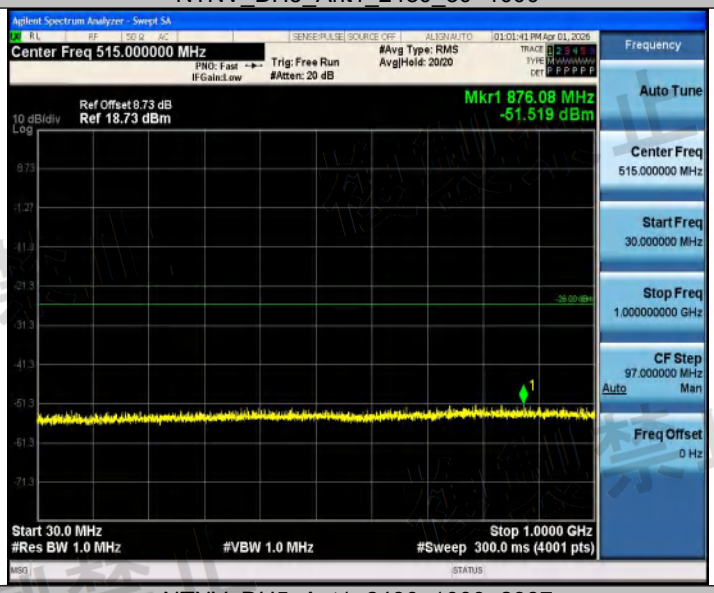
NTNV_DH5_Ant1_2441_2483.5~2496.5



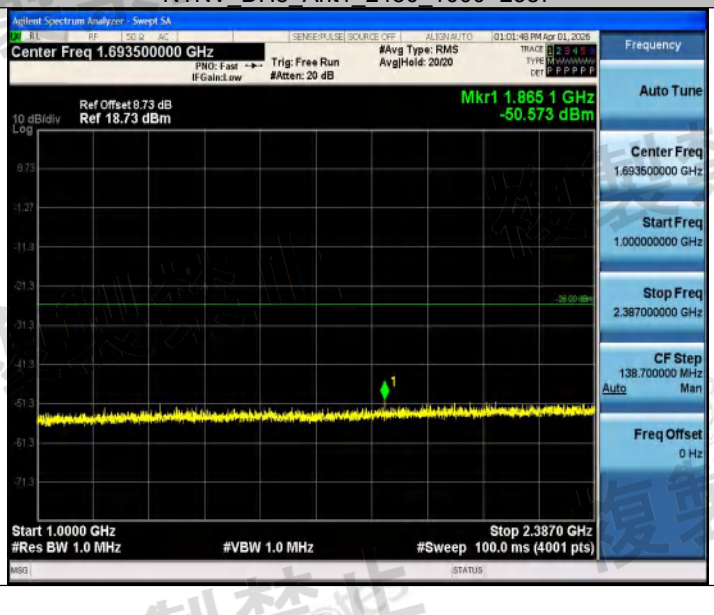

NTNV_DH5_Ant1_2441_2496.5~13000



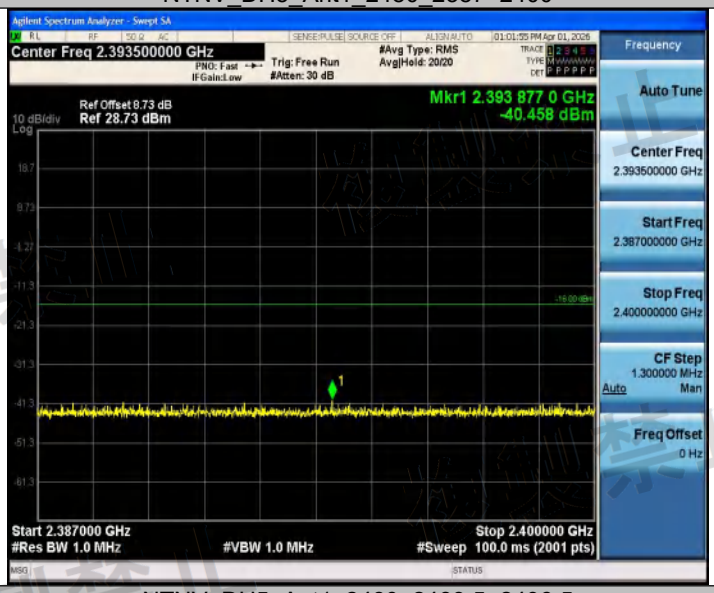
NTNV_DH5_Ant1_2480_30~1000



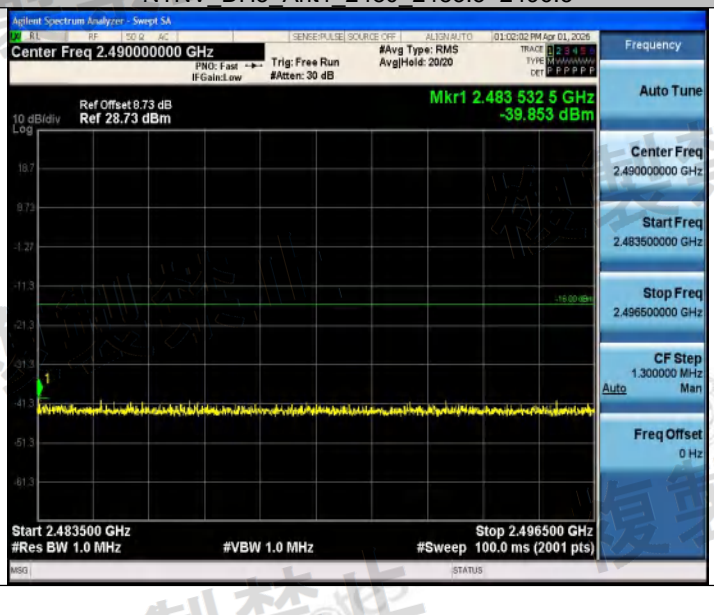

NTNV_DH5_Ant1_2480_1000~2387



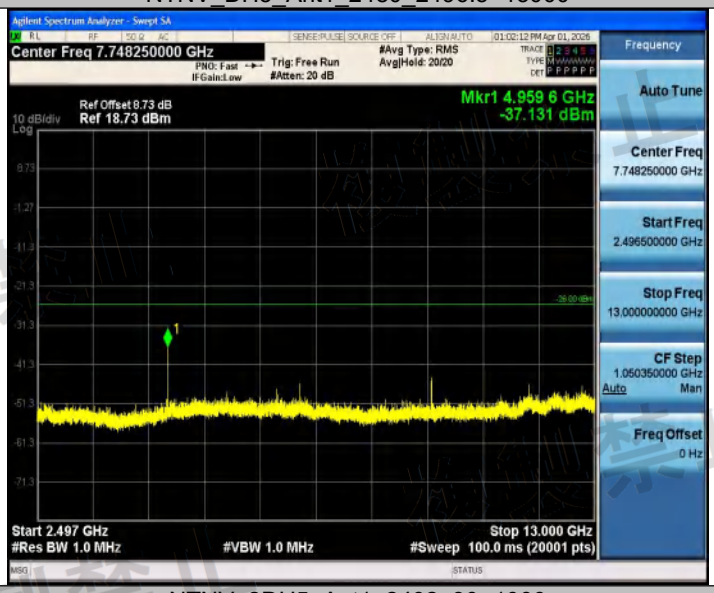
NTNV_DH5_Ant1_2480_2387~2400



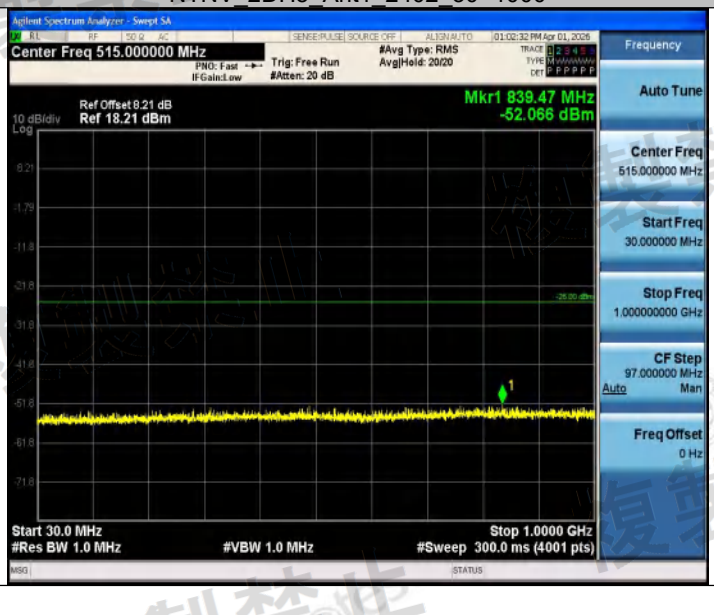

NTNV_DH5_Ant1_2480_2483.5~2496.5



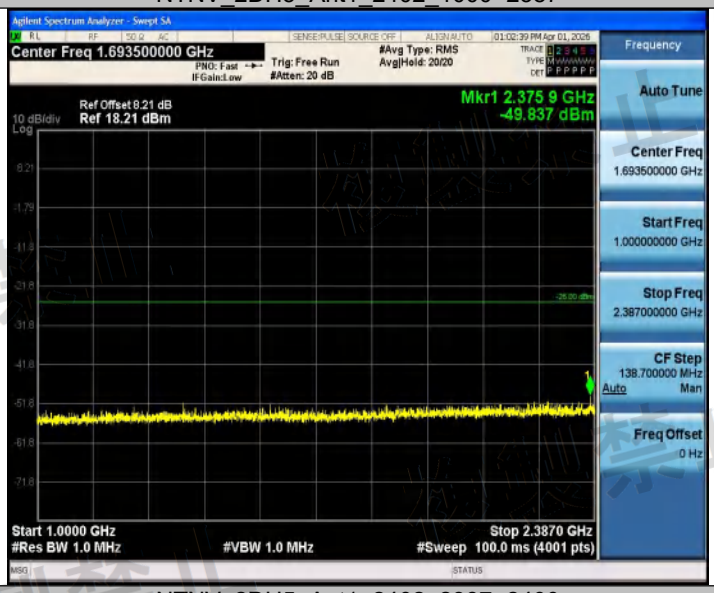
NTNV_DH5_Ant1_2480_2496.5~13000



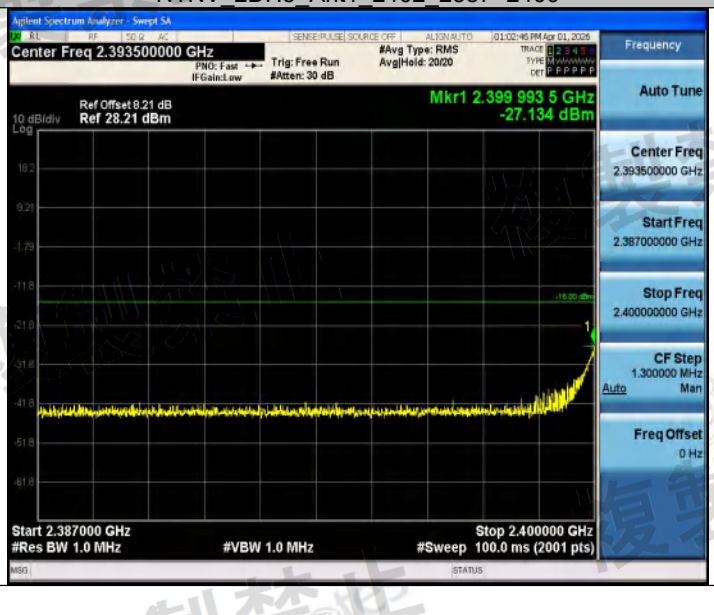

NTNV_2DH5_Ant1_2402_30~1000



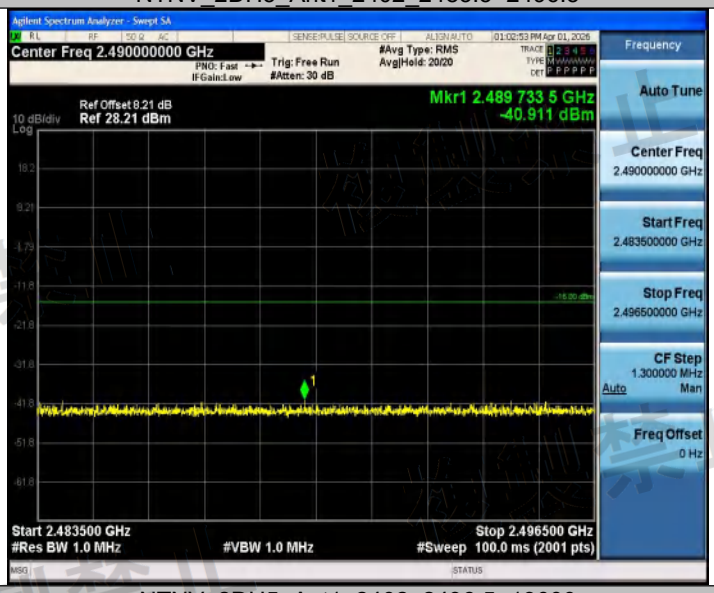
NTNV_2DH5_Ant1_2402_1000~2387



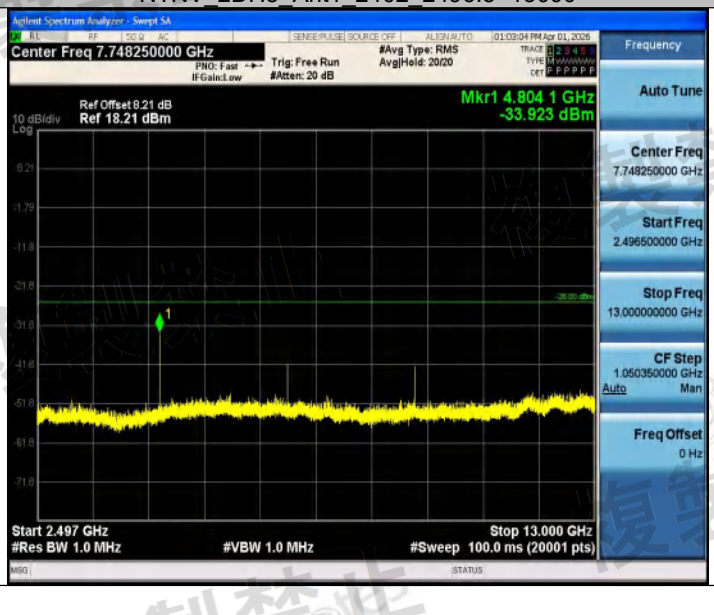

NTNV_2DH5_Ant1_2402_2387~2400



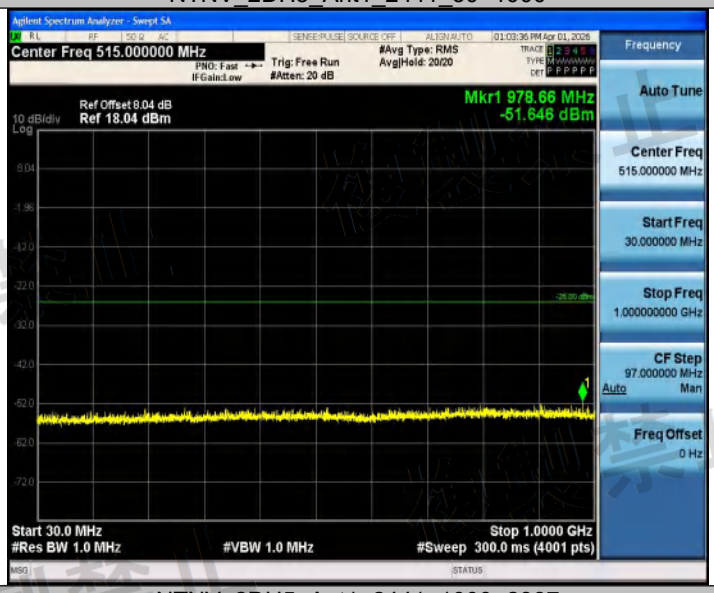
NTNV_2DH5_Ant1_2402_2483.5~2496.5



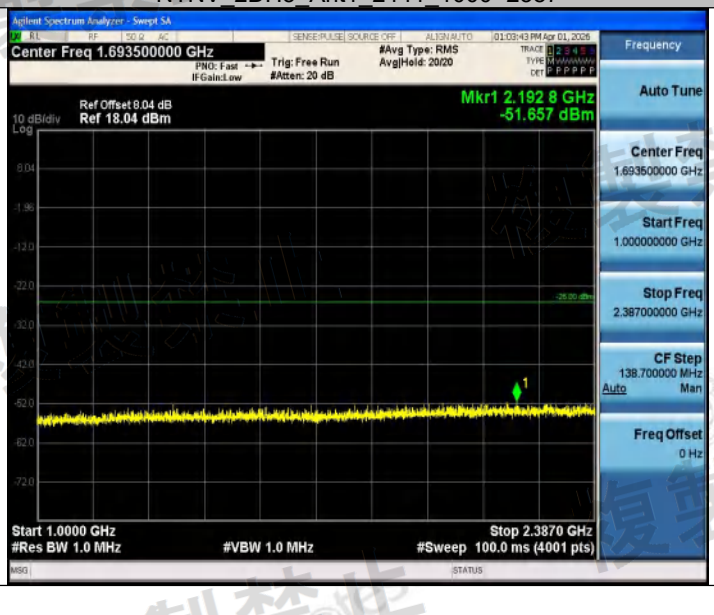

NTNV_2DH5_Ant1_2402_2496.5~13000



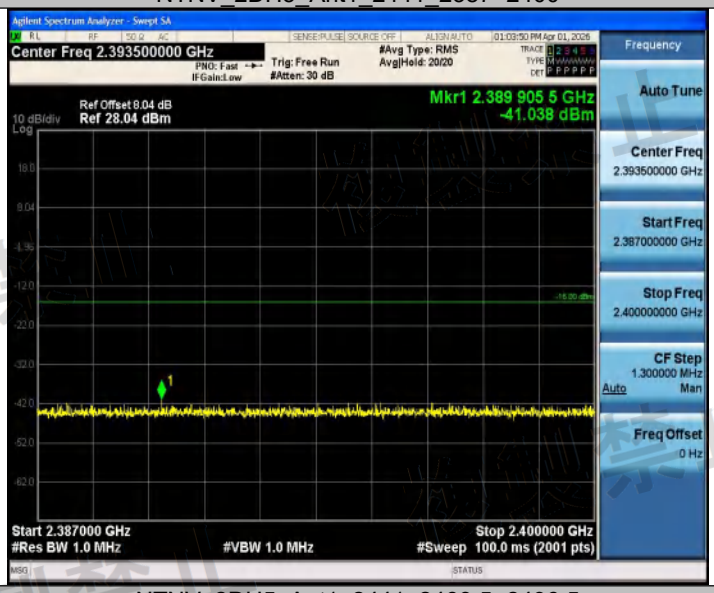
NTNV_2DH5_Ant1_2441_30~1000



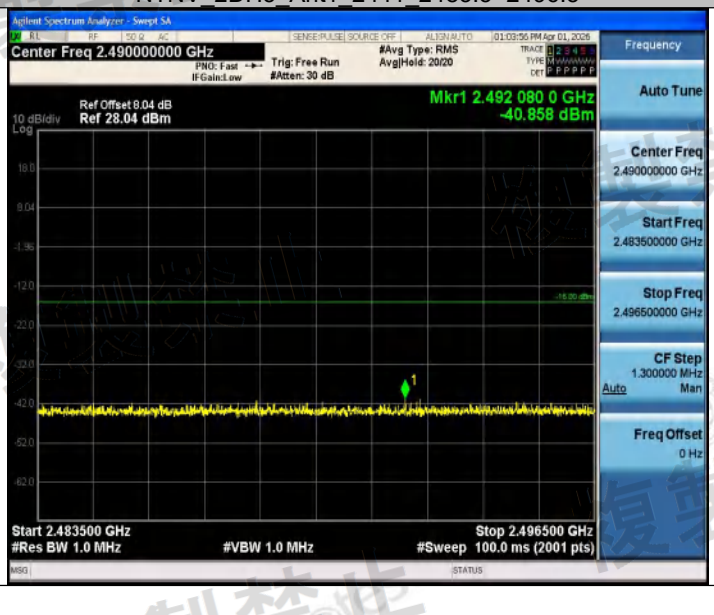

NTNV_2DH5_Ant1_2441_1000~2387



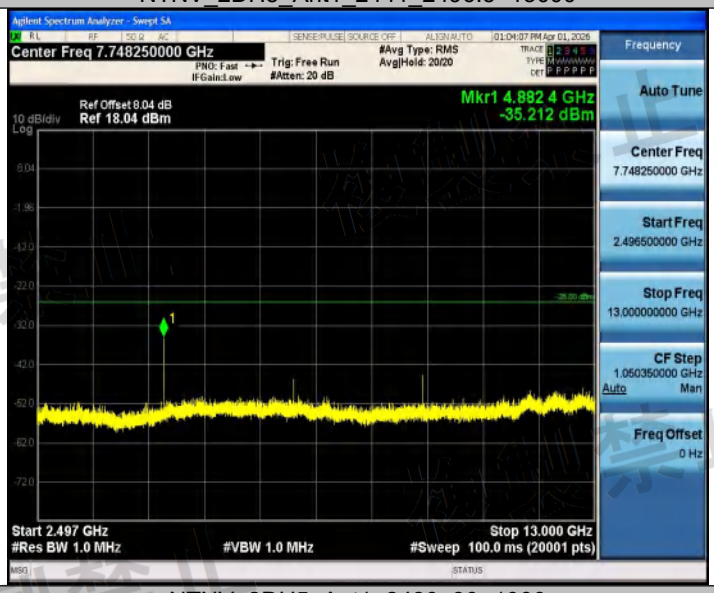
NTNV_2DH5_Ant1_2441_2387~2400



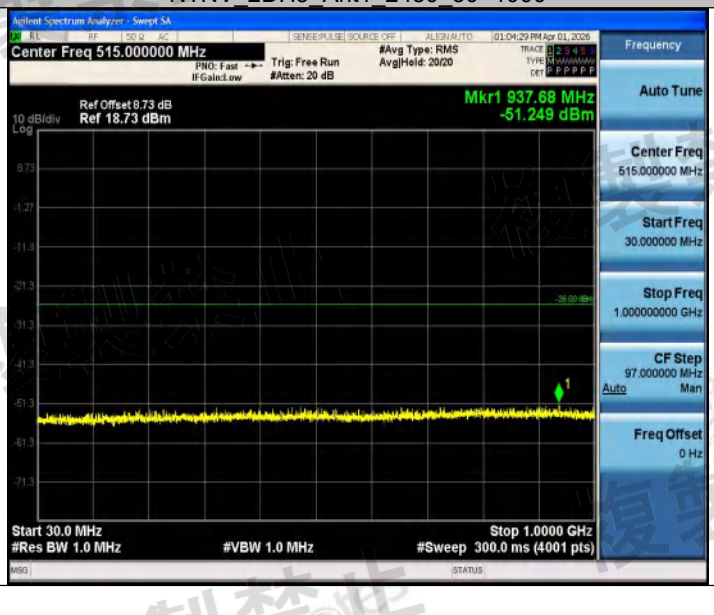

NTNV_2DH5_Ant1_2441_2483.5~2496.5



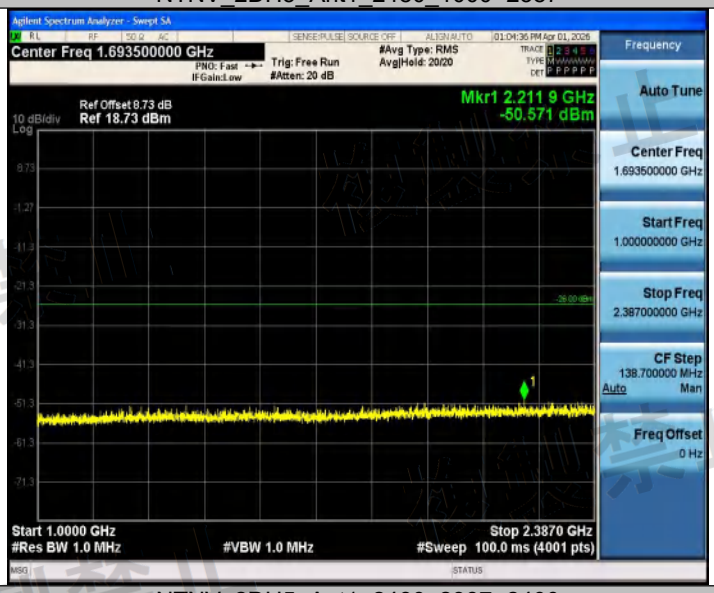
NTNV_2DH5_Ant1_2441_2496.5~13000



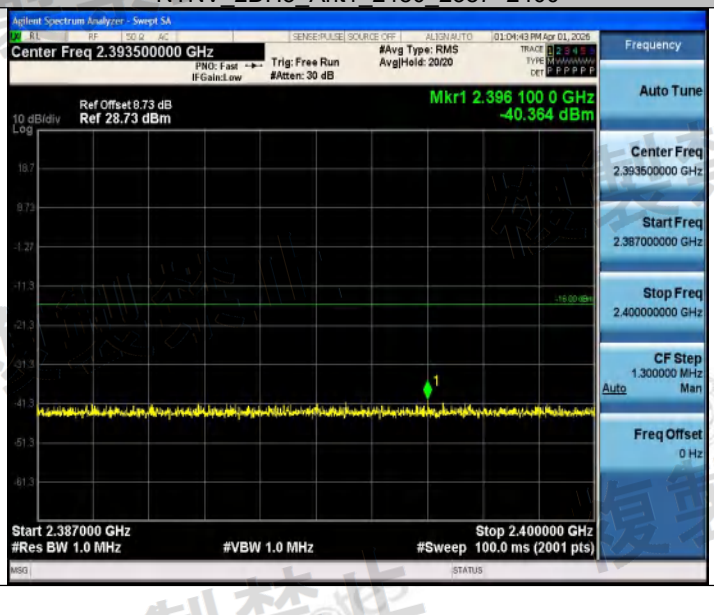

NTNV_2DH5_Ant1_2480_30~1000



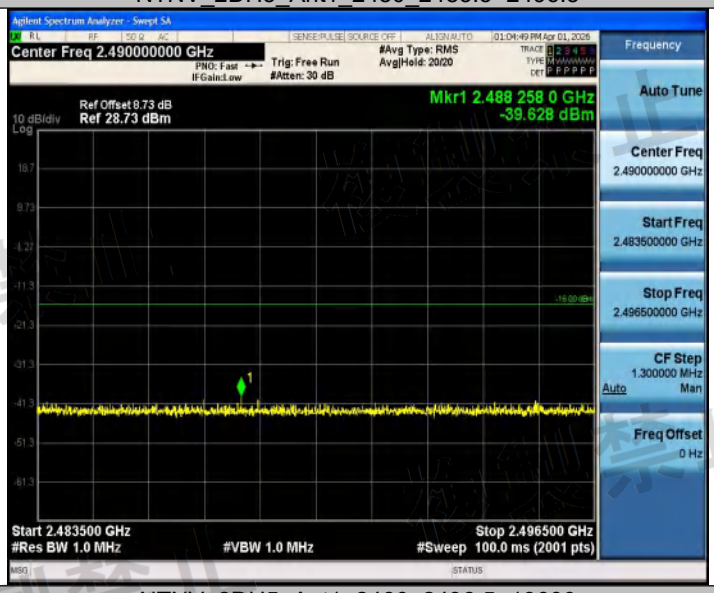
NTNV_2DH5_Ant1_2480_1000~2387



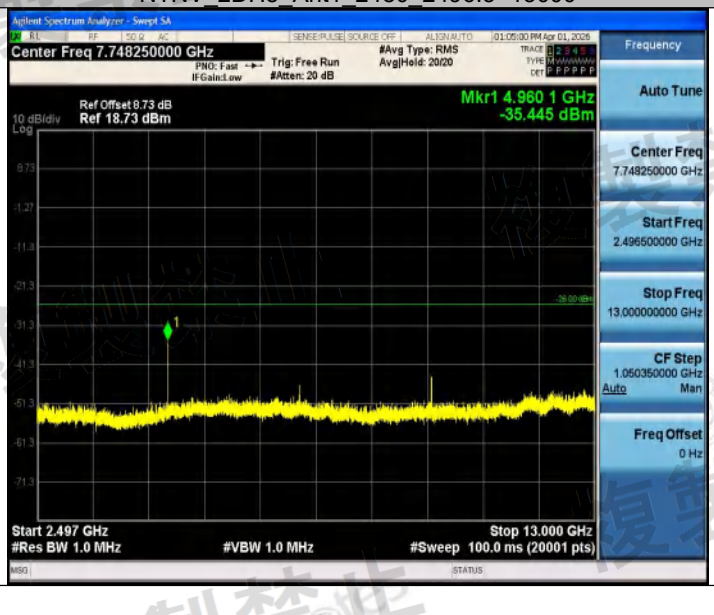

NTNV_2DH5_Ant1_2480_2387~2400



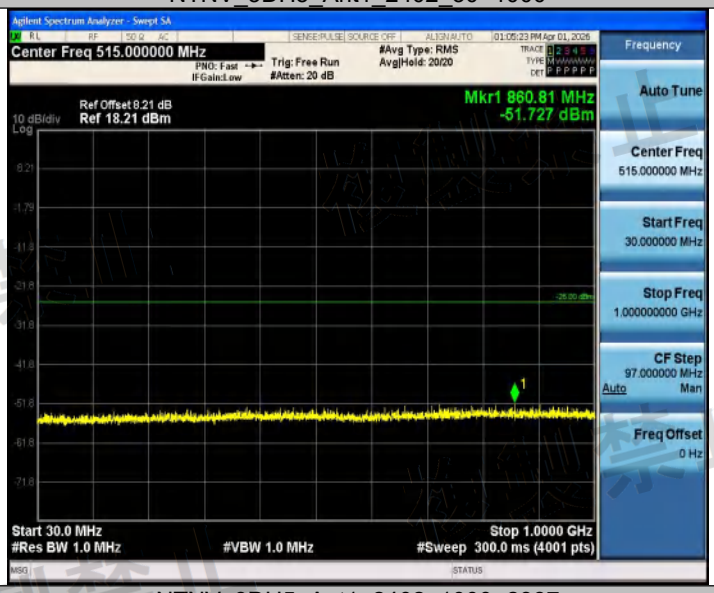
NTNV_2DH5_Ant1_2480_2483.5~2496.5



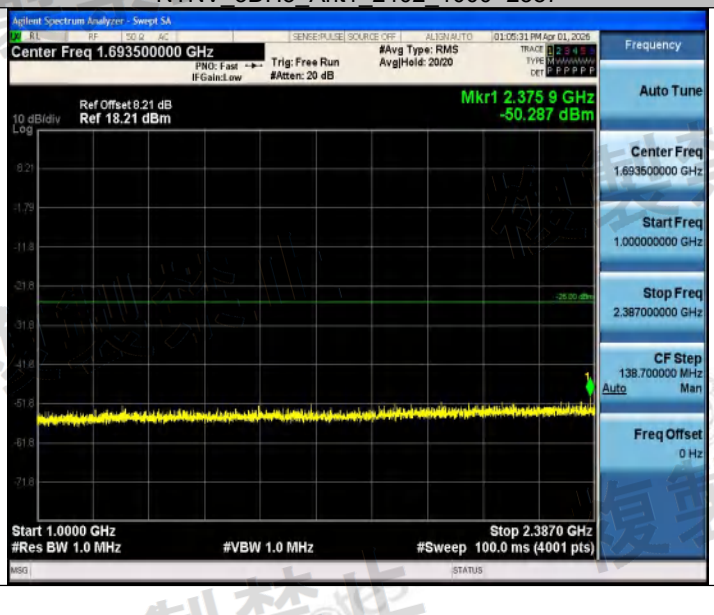

NTNV_2DH5_Ant1_2480_2496.5~13000



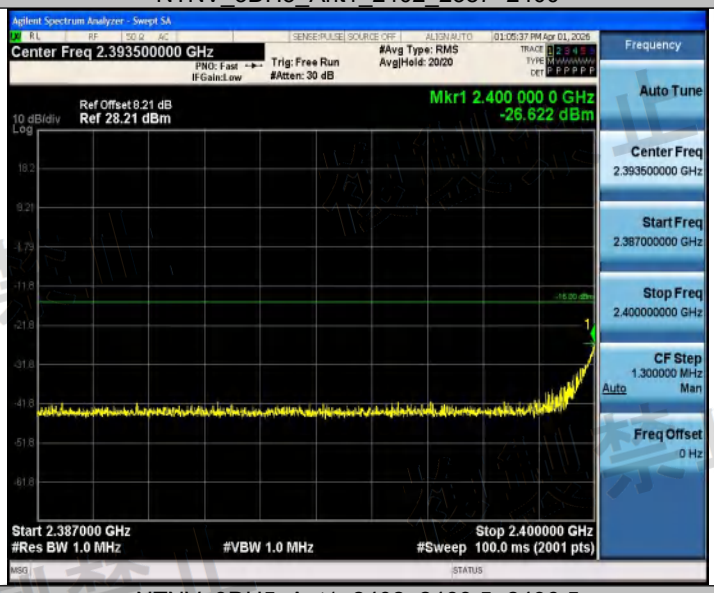
NTNV_3DH5_Ant1_2402_30~1000



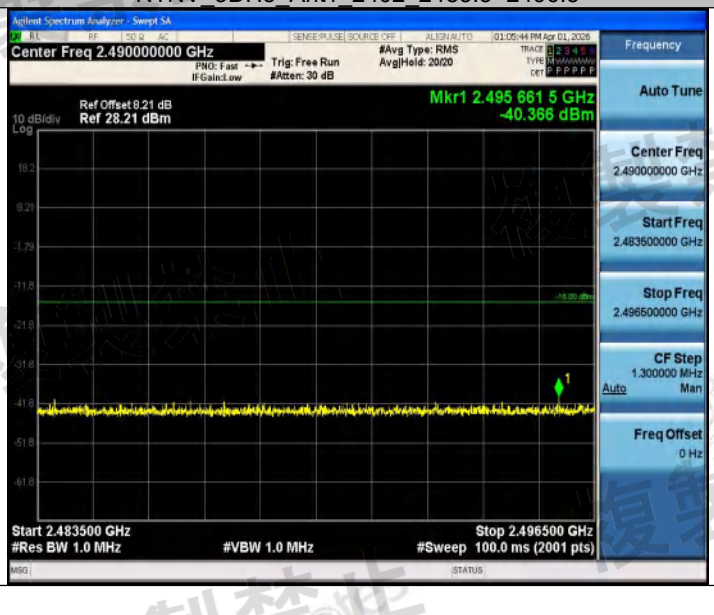

NTNV_3DH5_Ant1_2402_1000~2387



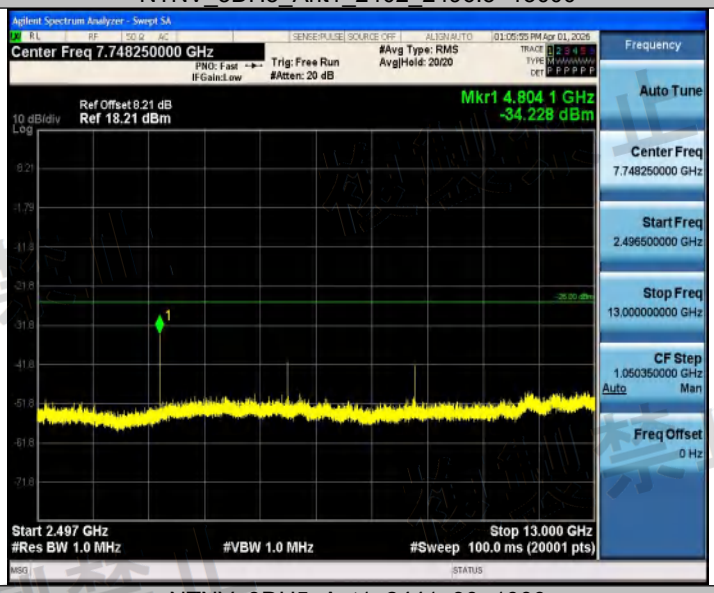
NTNV_3DH5_Ant1_2402_2387~2400



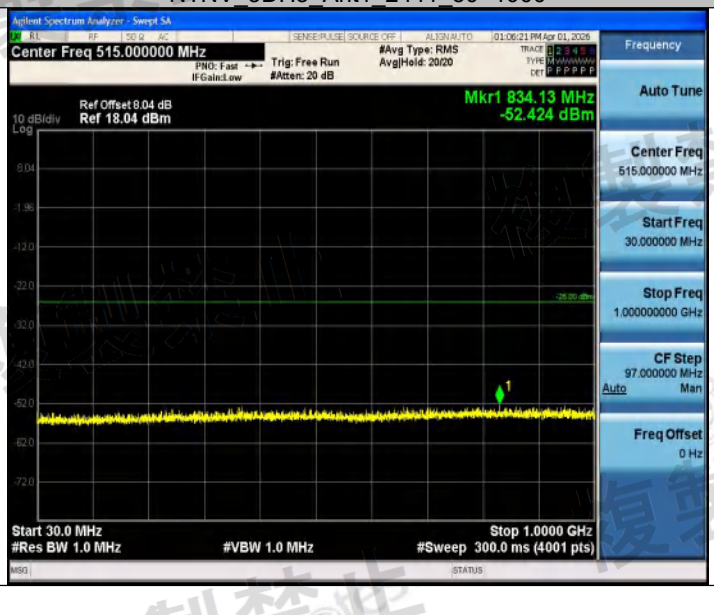

NTNV_3DH5_Ant1_2402_2483.5~2496.5



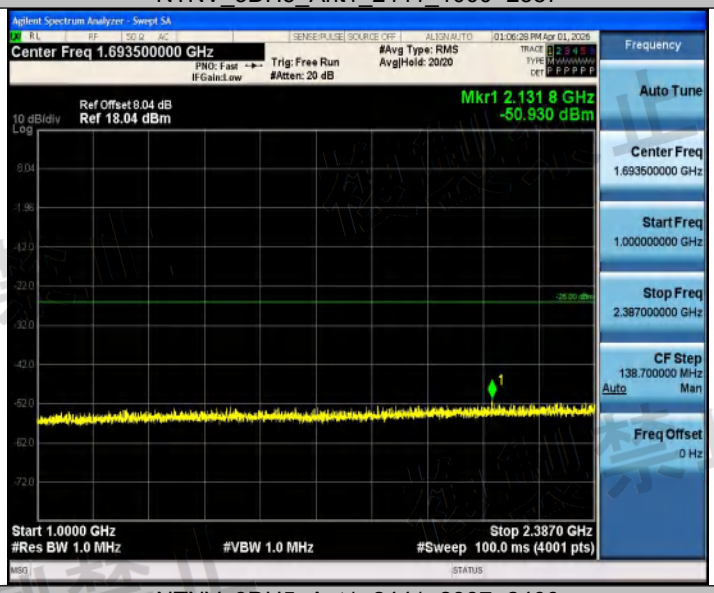
NTNV_3DH5_Ant1_2402_2496.5~13000



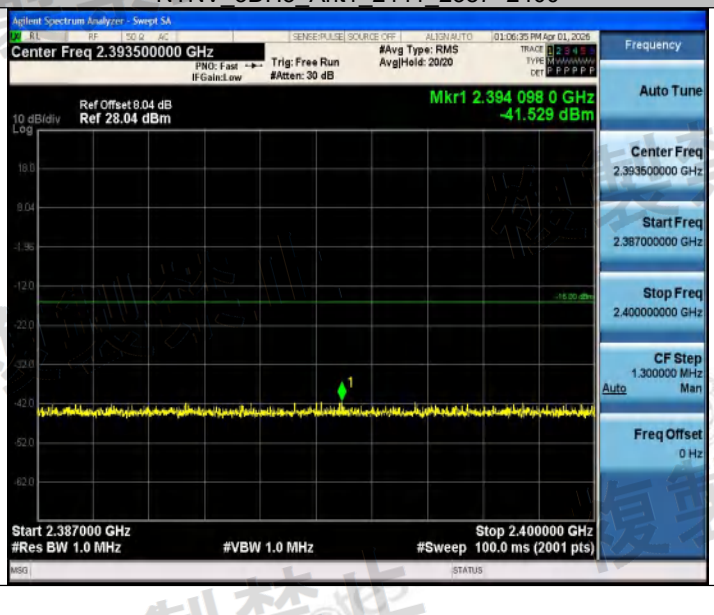

NTNV_3DH5_Ant1_2441_30~1000



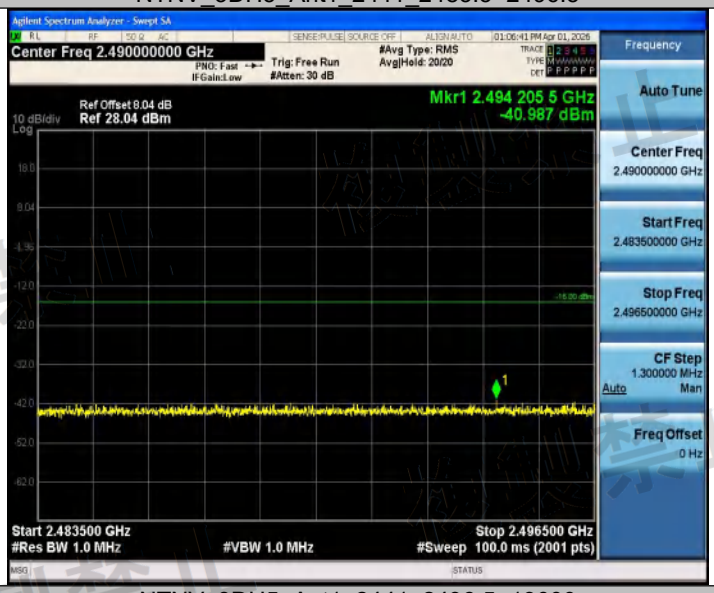
NTNV_3DH5_Ant1_2441_1000~2387



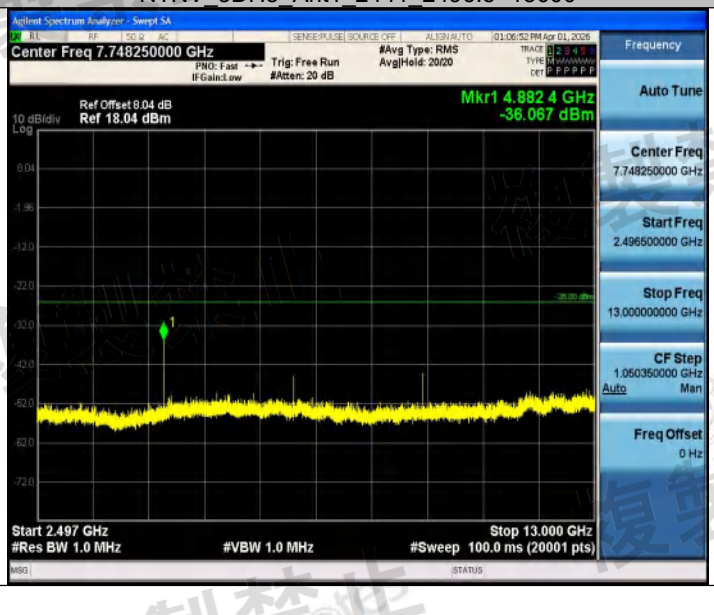

NTNV_3DH5_Ant1_2441_2387~2400



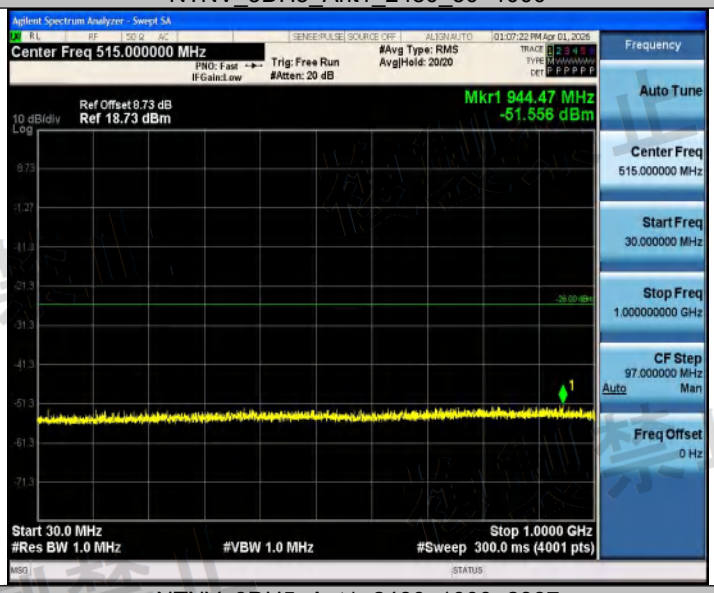
NTNV_3DH5_Ant1_2441_2483.5~2496.5



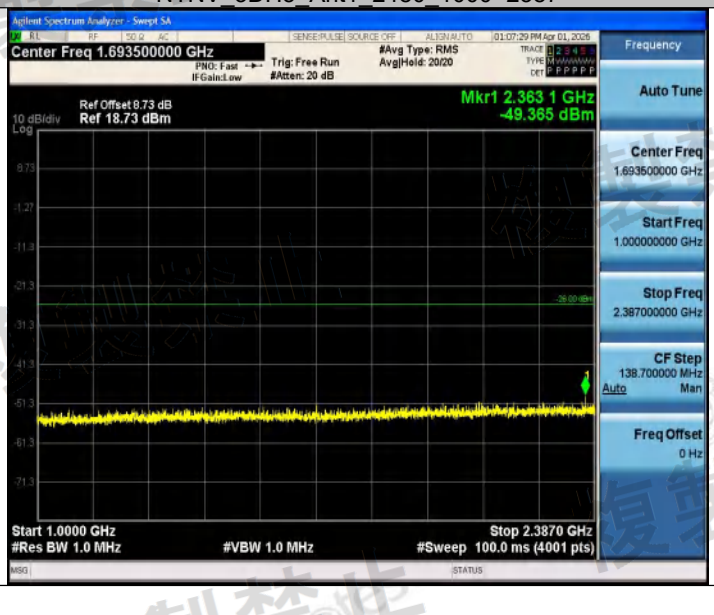

NTNV_3DH5_Ant1_2441_2496.5~13000



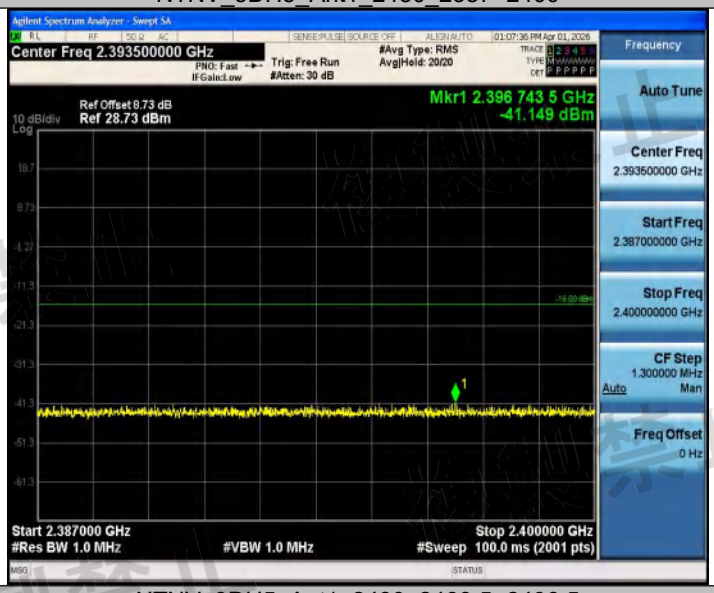
NTNV_3DH5_Ant1_2480_30~1000



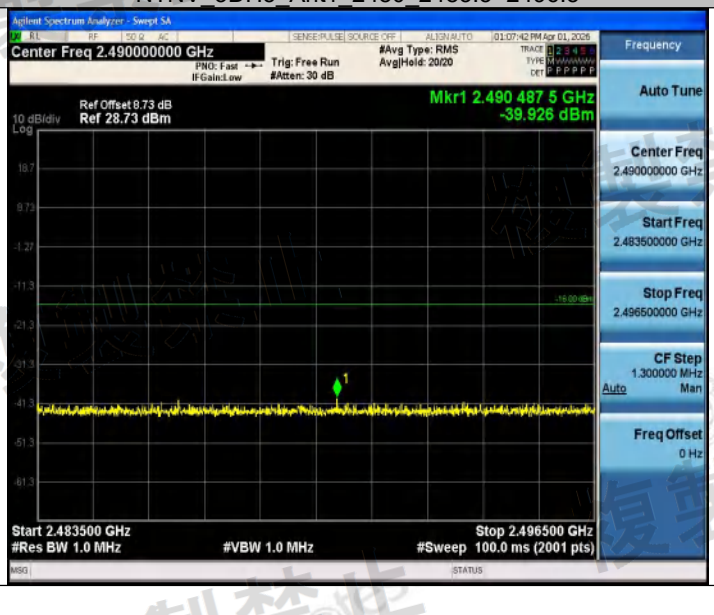

NTNV_3DH5_Ant1_2480_1000~2387



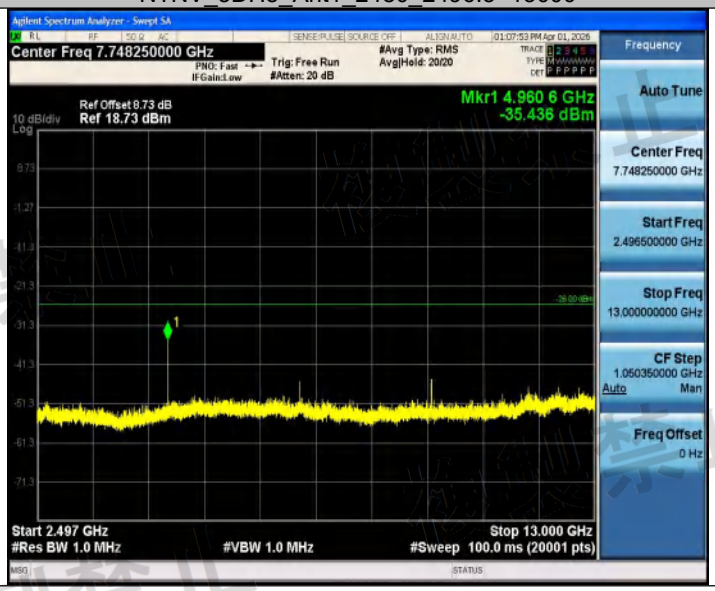
NTNV_3DH5_Ant1_2480_2387~2400




NTNV_3DH5_Ant1_2480_2483.5~2496.5



NTNV_3DH5_Ant1_2480_2496.5~13000



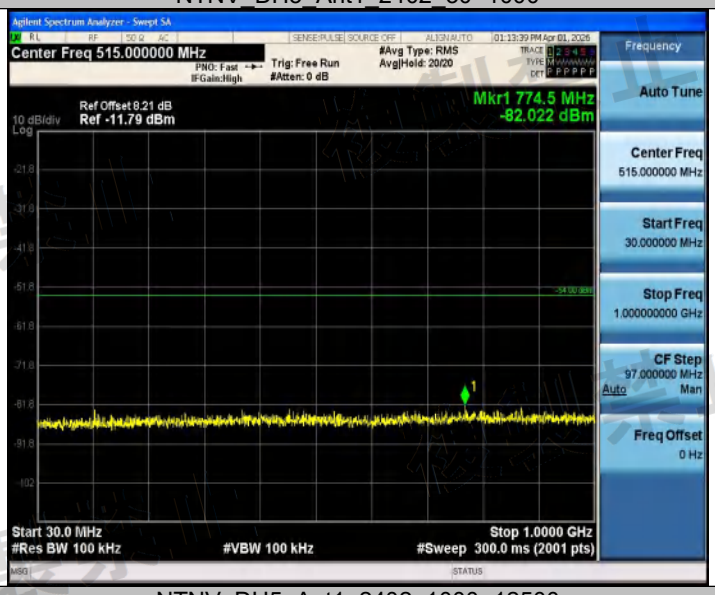
## Appendix F: Secondary radiated emissions

### Test Result

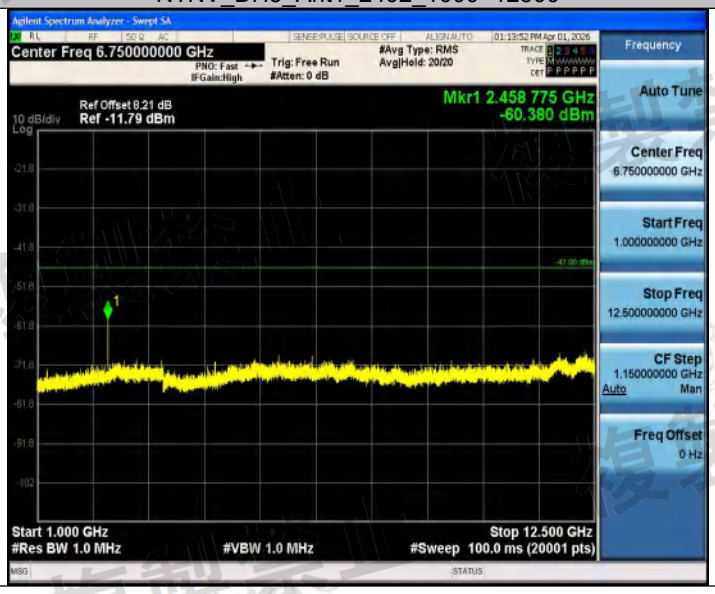
| Test Condition | Test Mode | Antenna | Freq. [MHz] | Freq.Range [MHz] | Result [dBm] | Limit [dBm] | Result [nW] | Limit [nW] | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| NTNV | DH5 | Ant1 | 2402 | 30~1000 | -82.02 | ≤-54 | 0.00628 | ≤4 | PASS |
| | | | | 1000~12500 | -60.38 | ≤-47 | 0.91622 | ≤20 | PASS |
| | | | 2441 | 30~1000 | -83.28 | ≤-54 | 0.00470 | ≤4 | PASS |
| | | | | 1000~12500 | -68.21 | ≤-47 | 0.15101 | ≤20 | PASS |
| | | | 2480 | 30~1000 | -81.63 | ≤-54 | 0.00687 | ≤4 | PASS |
| | | | | 1000~12500 | -58.82 | ≤-47 | 1.31220 | ≤20 | PASS |
| | 2DH5 | Ant1 | 2402 | 30~1000 | -83.04 | ≤-54 | 0.00497 | ≤4 | PASS |
| | | | | 1000~12500 | -67.07 | ≤-47 | 0.19634 | ≤20 | PASS |
| | | | 2441 | 30~1000 | -82.94 | ≤-54 | 0.00508 | ≤4 | PASS |
| | | | | 1000~12500 | -68.97 | ≤-47 | 0.12677 | ≤20 | PASS |
| | | | 2480 | 30~1000 | -81.78 | ≤-54 | 0.00664 | ≤4 | PASS |
| | | | | 1000~12500 | -66.85 | ≤-47 | 0.20654 | ≤20 | PASS |
| | 3DH5 | Ant1 | 2402 | 30~1000 | -82.47 | ≤-54 | 0.00566 | ≤4 | PASS |
| | | | | 1000~12500 | -67.6 | ≤-47 | 0.17378 | ≤20 | PASS |
| | | | 2441 | 30~1000 | -82.91 | ≤-54 | 0.00512 | ≤4 | PASS |
| | | | | 1000~12500 | -67.51 | ≤-47 | 0.17742 | ≤20 | PASS |
| | | | 2480 | 30~1000 | -81.63 | ≤-54 | 0.00687 | ≤4 | PASS |
| | | | | 1000~12500 | -68.21 | ≤-47 | 0.15101 | ≤20 | PASS |

## Test Graphs

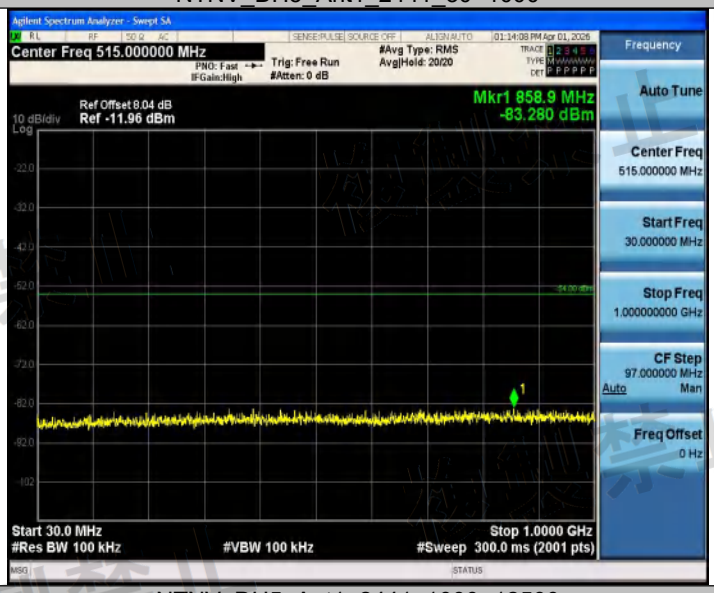
NTNV_DH5_Ant1_2402_30~1000



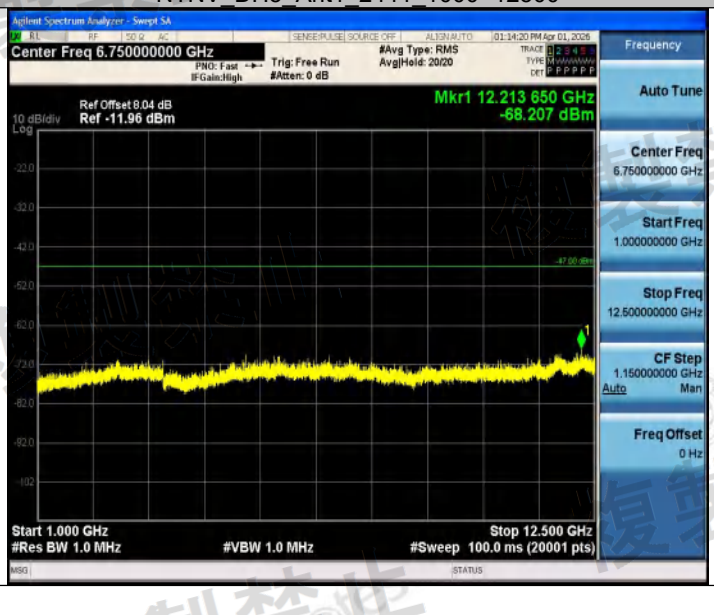

NTNV_DH5_Ant1_2402_1000~12500



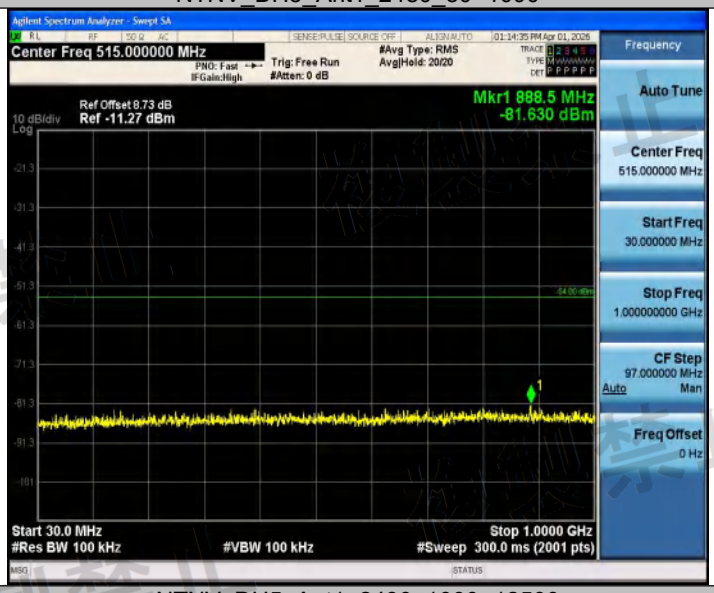
NTNV_DH5_Ant1_2441_30~1000



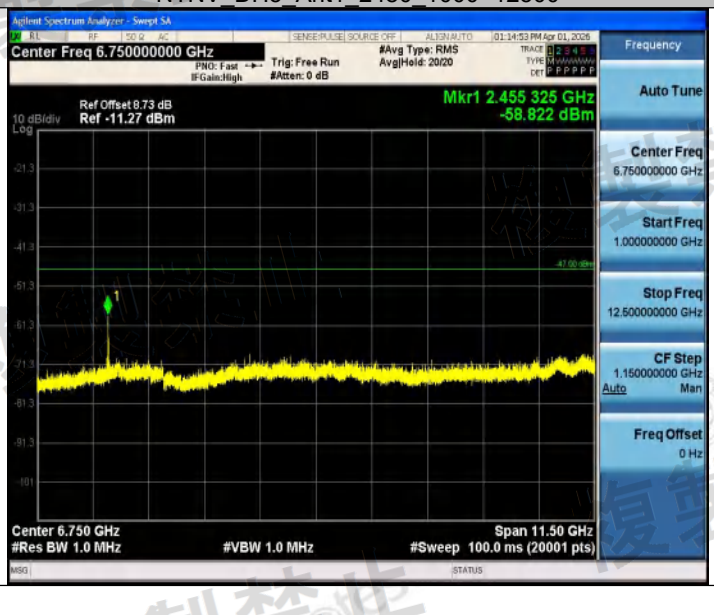

NTNV_DH5_Ant1_2441_1000~12500



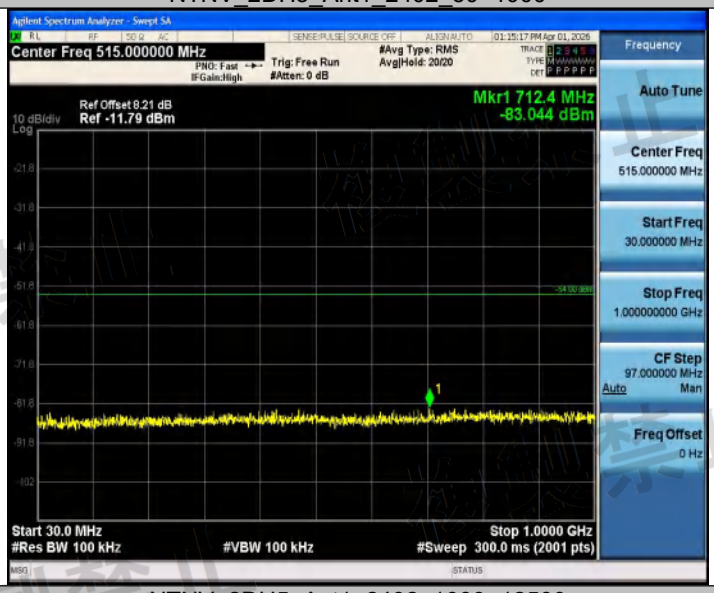
NTNV_DH5_Ant1_2480_30~1000



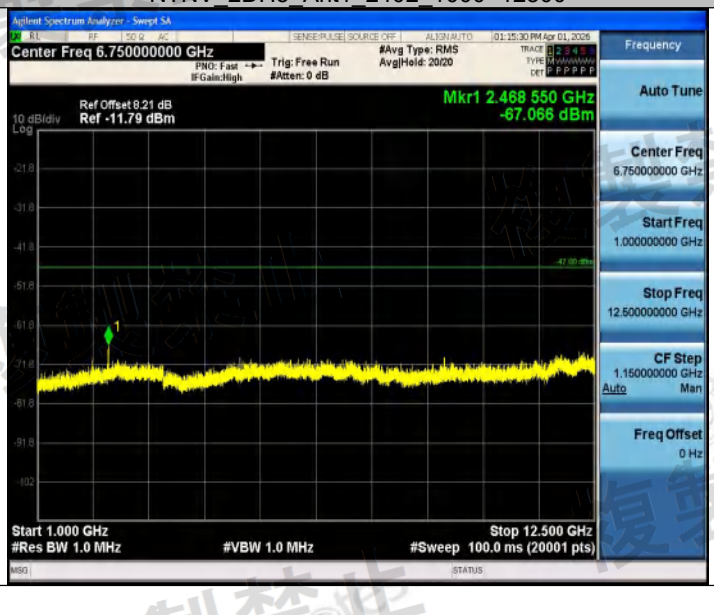

NTNV_DH5_Ant1_2480_1000~12500



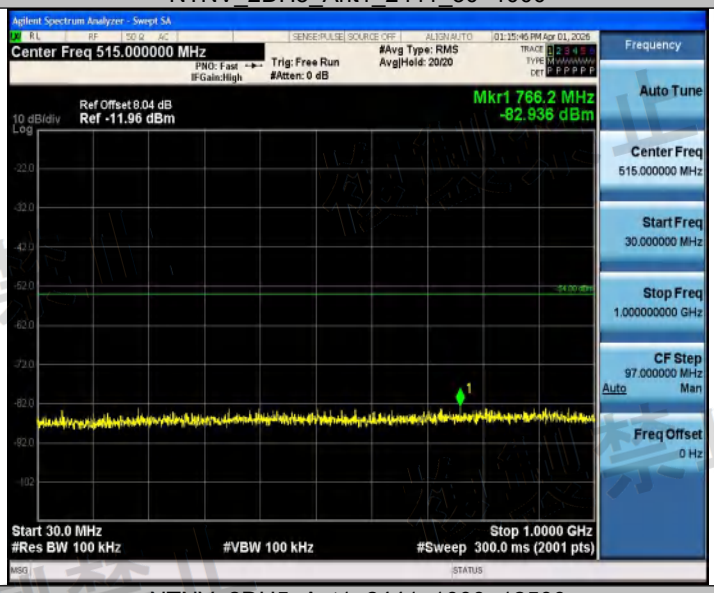
NTNV_2DH5_Ant1_2402_30~1000



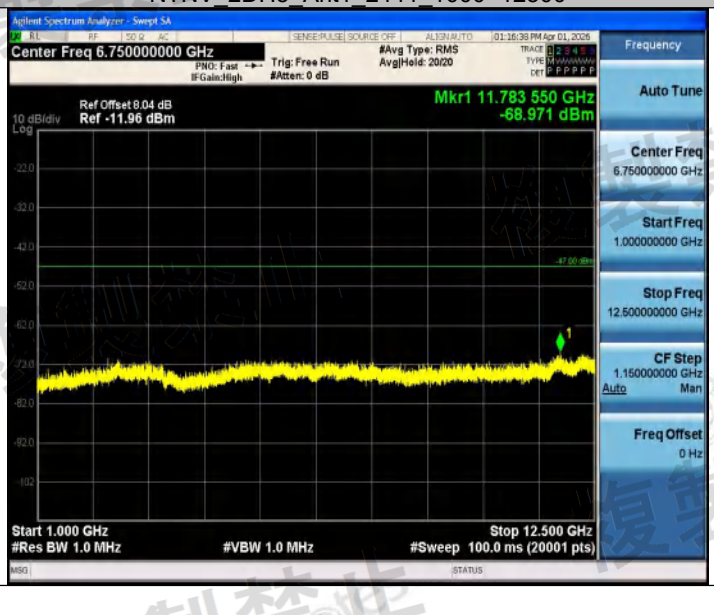

NTNV_2DH5_Ant1_2402_1000~12500



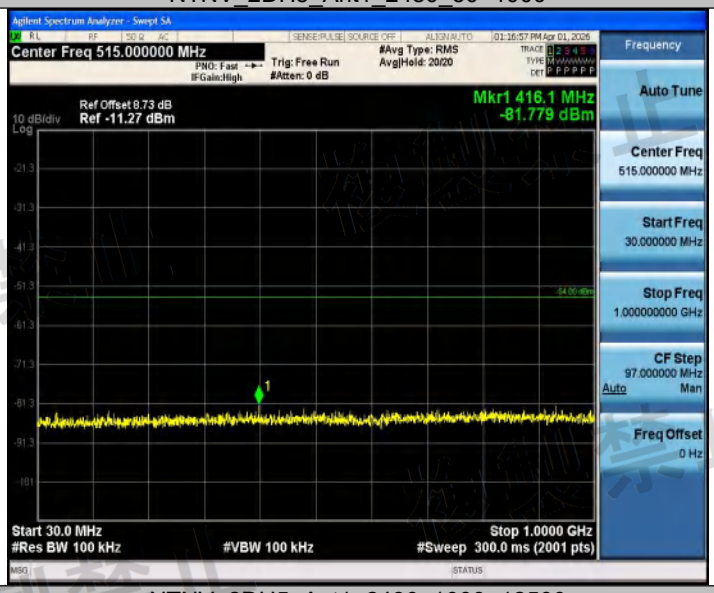
NTNV_2DH5_Ant1_2441_30~1000



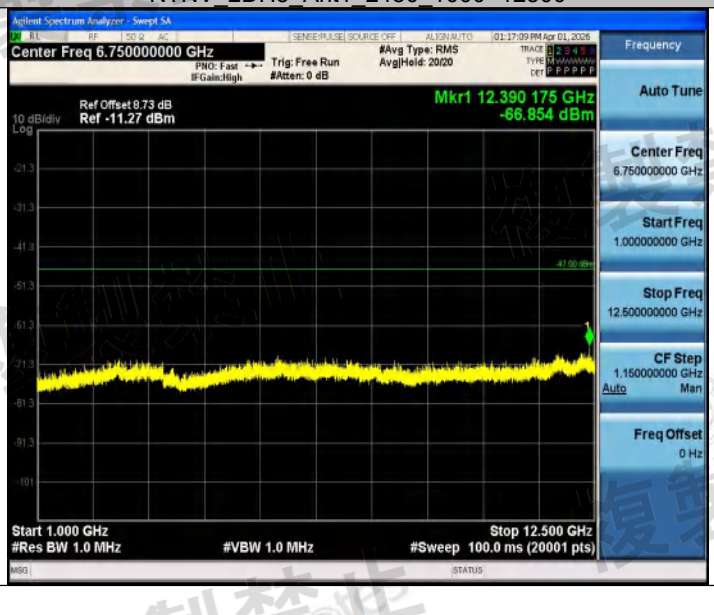

NTNV_2DH5_Ant1_2441_1000~12500



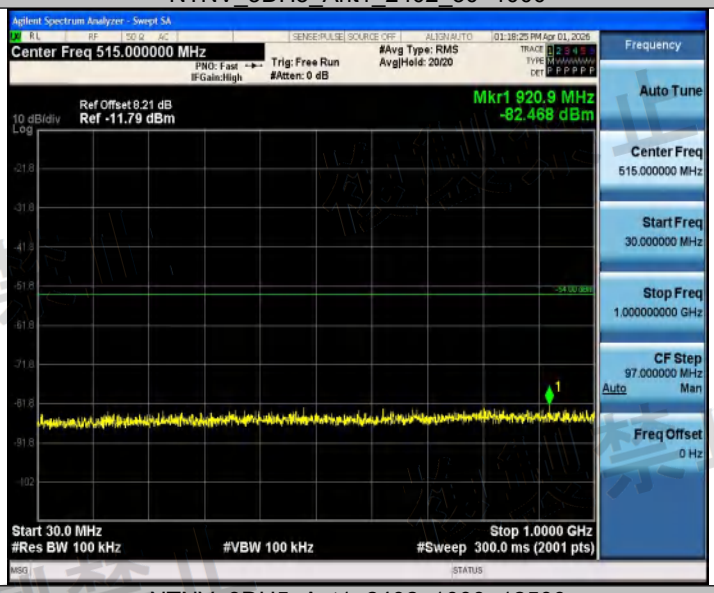
NTNV_2DH5_Ant1_2480_30~1000



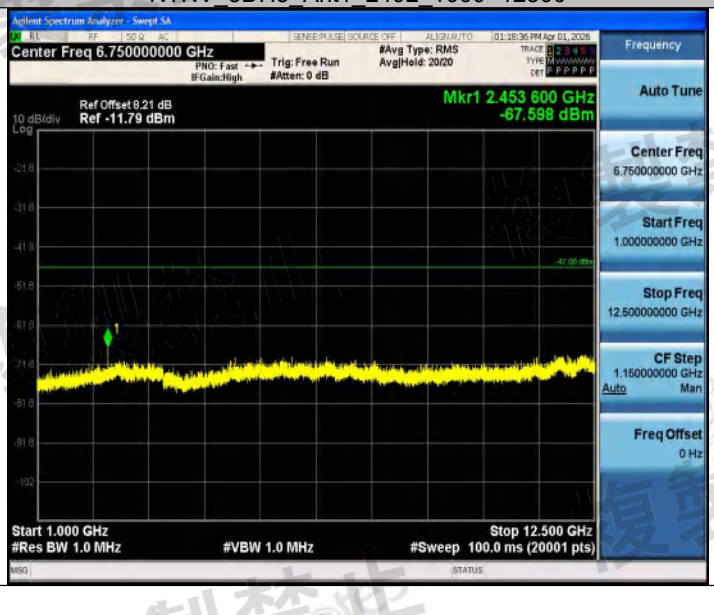

NTNV_2DH5_Ant1_2480_1000~12500



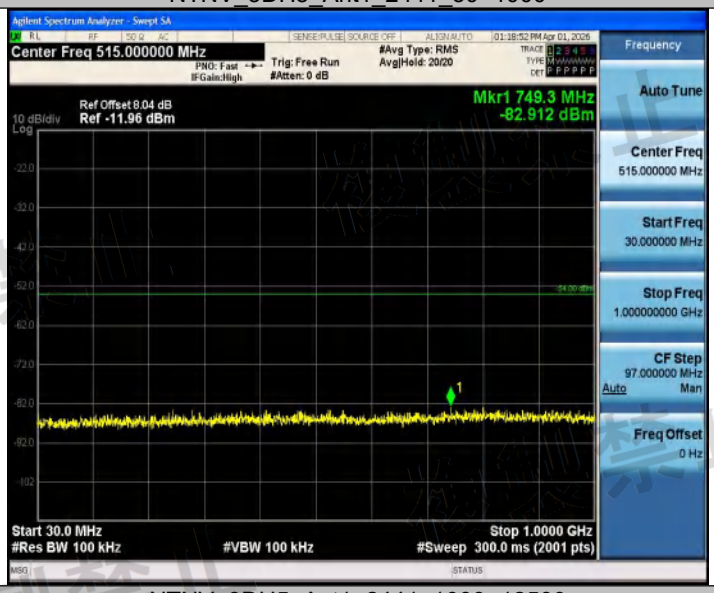
NTNV_3DH5_Ant1_2402_30~1000



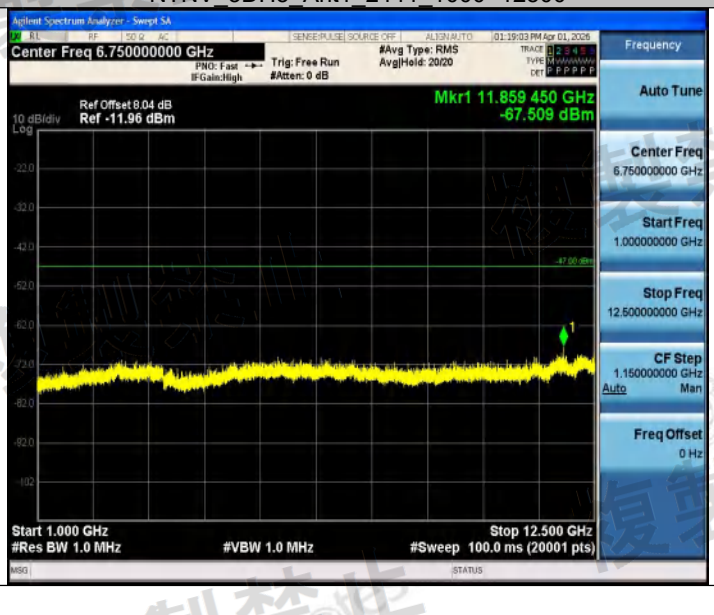

NTNV_3DH5_Ant1_2402_1000~12500



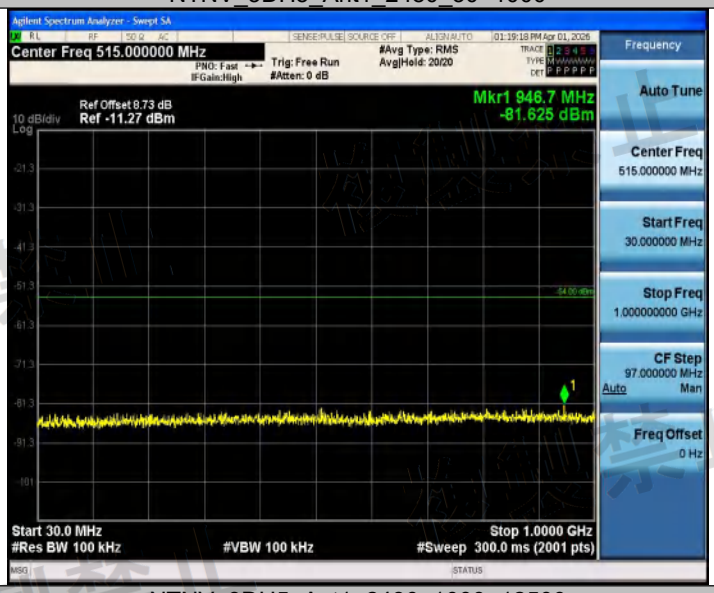
NTNV_3DH5_Ant1_2441_30~1000



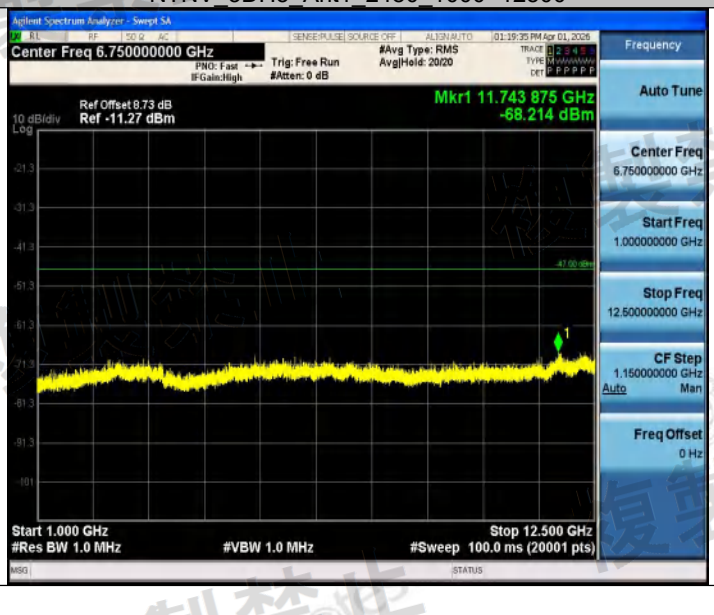

NTNV_3DH5_Ant1_2441_1000~12500



NTNV_3DH5_Ant1_2480_30~1000




NTNV_3DH5_Ant1_2480_1000~12500



## Appendix G: Hopping frequency holding time

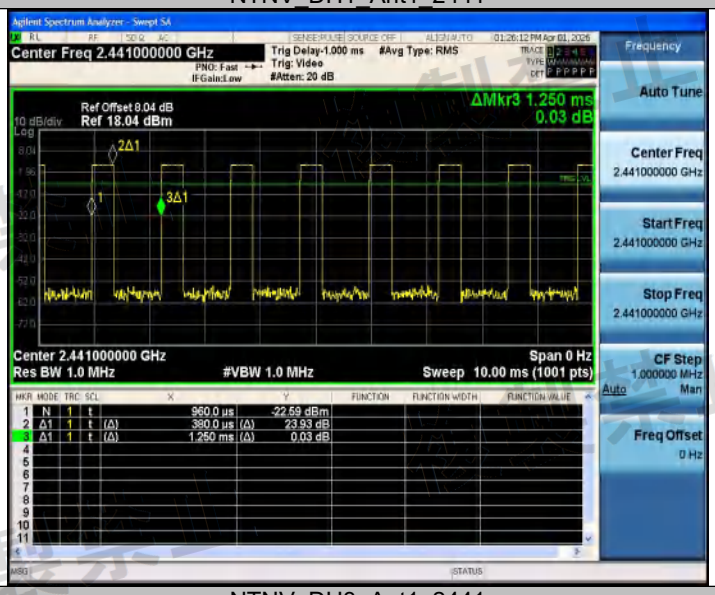
### Test Result

| Test Condition | Test Mode | Antenna | Freq. [MHz] | T_ON [ms] | Period [ms] | Result [s] | Limit [s] | Verdict |
|---|---|---|---|---|---|---|---|---|
| NTNV | DH1 | Ant1 | 2441 | 0.38 | 1.25 | 0.109 | ≤0.4 | PASS |
| | DH3 | Ant1 | 2441 | 1.63 | 2.50 | 0.234 | ≤0.4 | PASS |
| | DH5 | Ant1 | 2441 | 2.88 | 3.75 | 0.275 | ≤0.4 | PASS |
| | 2DH1 | Ant1 | 2441 | 0.39 | 1.25 | 0.112 | ≤0.4 | PASS |
| | 2DH3 | Ant1 | 2441 | 1.64 | 2.50 | 0.235 | ≤0.4 | PASS |
| | 2DH5 | Ant1 | 2441 | 2.89 | 3.75 | 0.277 | ≤0.4 | PASS |
| | 3DH1 | Ant1 | 2441 | 0.39 | 1.25 | 0.113 | ≤0.4 | PASS |
| | 3DH3 | Ant1 | 2441 | 1.63 | 2.50 | 0.235 | ≤0.4 | PASS |
| | 3DH5 | Ant1 | 2441 | 2.89 | 3.75 | 0.278 | ≤0.4 | PASS |

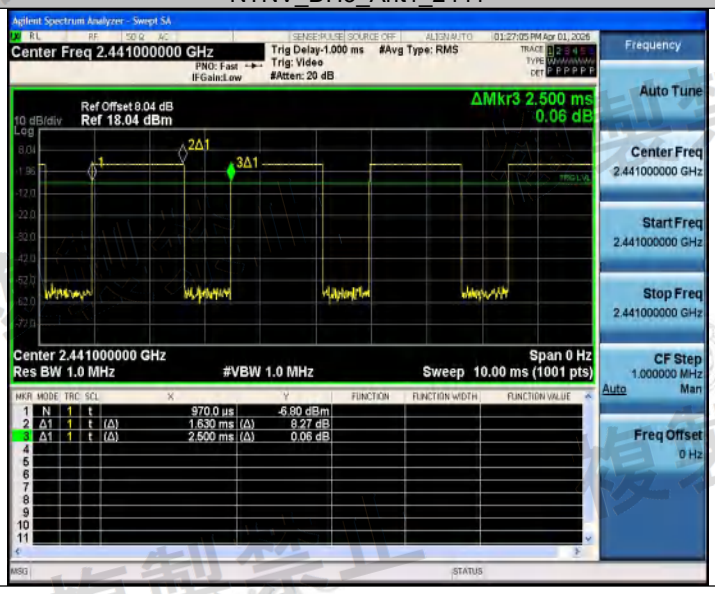
**Note:** Result [ms] = 0.4 [s] * Spread ratio * T_ON [ms] / Period [ms] / Number of hopping [79]

## Test Graphs

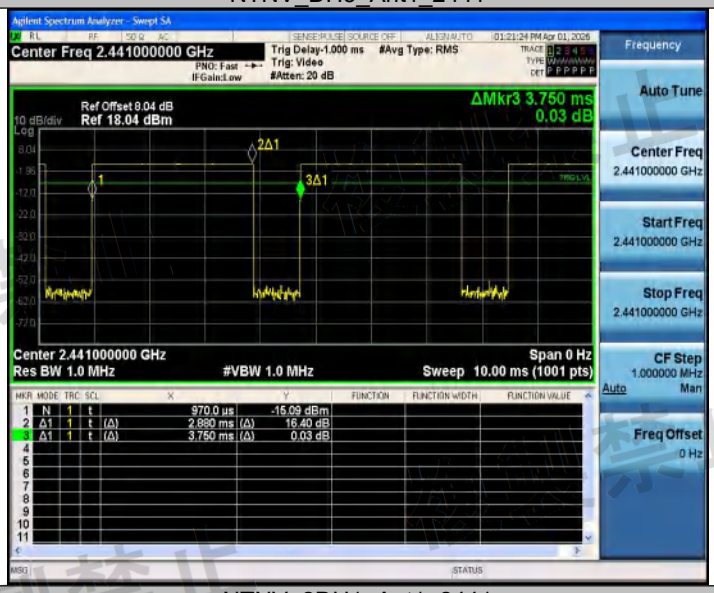
NTNV_DH1_Ant1_2441



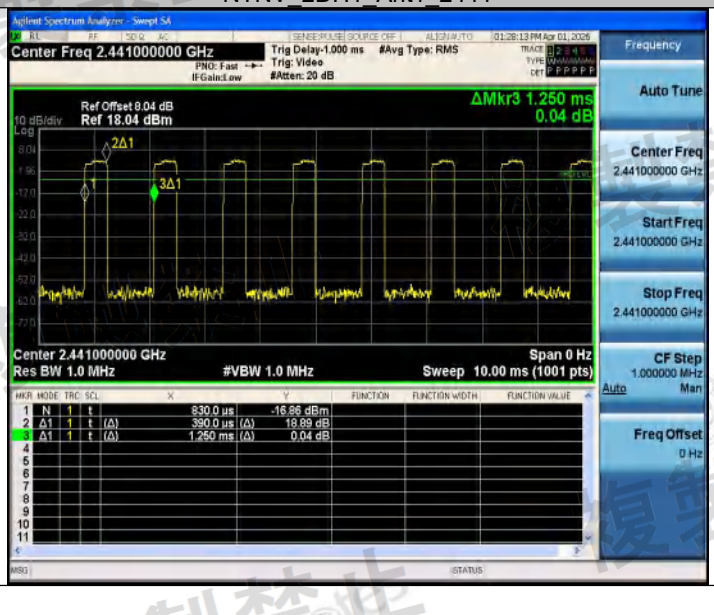

NTNV_DH3_Ant1_2441



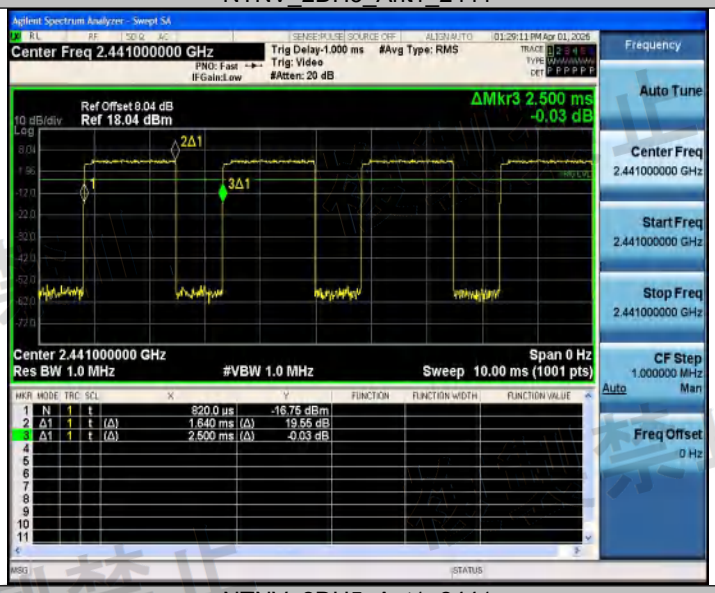
NTNV_DH5_Ant1_2441



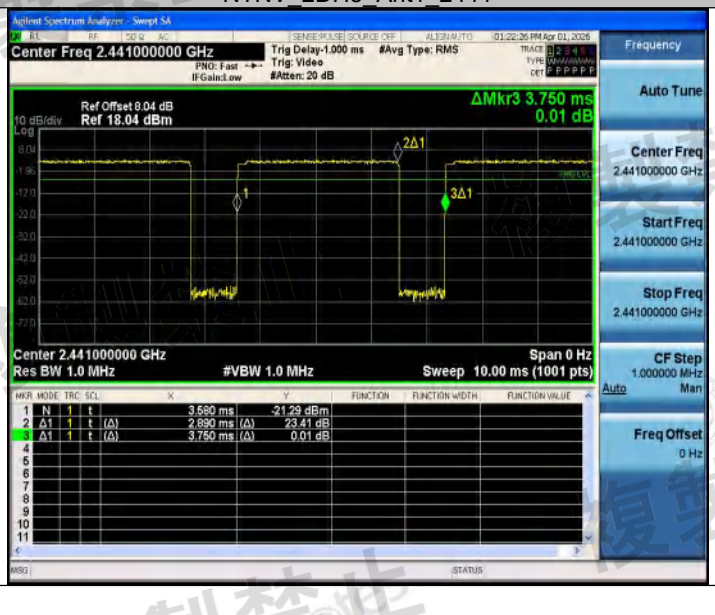

NTNV_2DH1_Ant1_2441



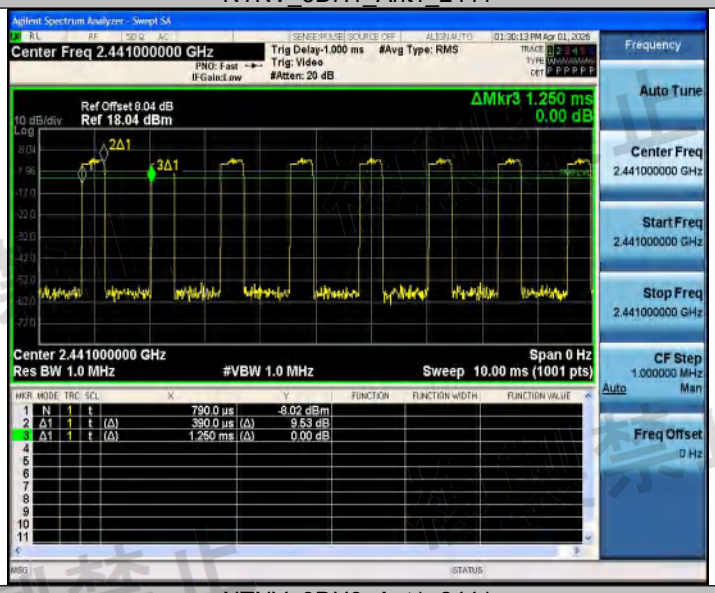
NTNV_2DH3_Ant1_2441



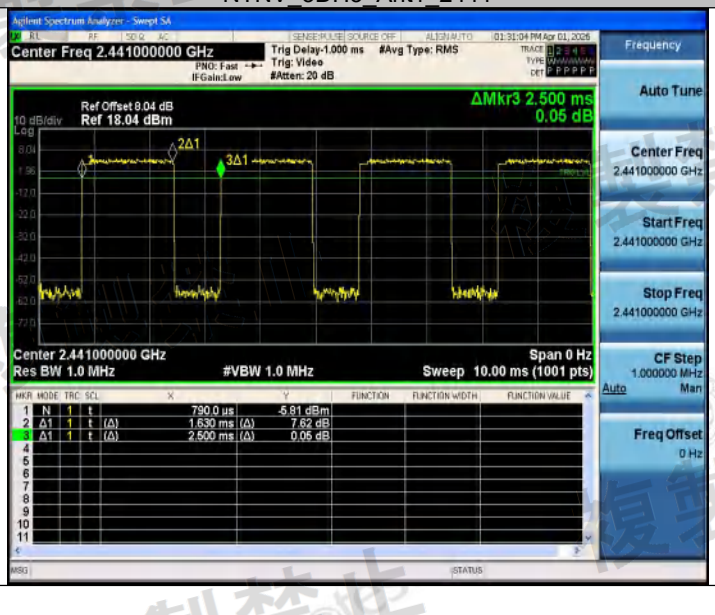

NTNV_2DH5_Ant1_2441



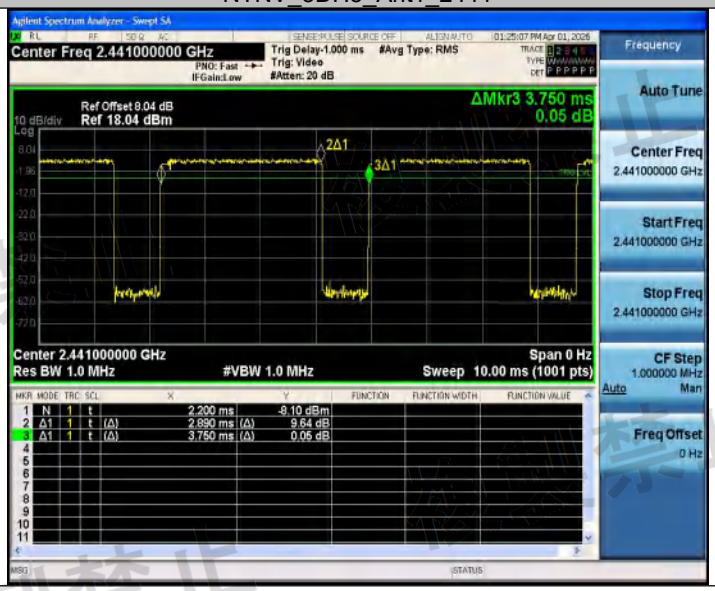
NTNV_3DH1_Ant1_2441




NTNV_3DH3_Ant1_2441



NTNV_3DH5_Ant1_2441



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