

TEST REPORT

Product Name: Bluetooth voice remote control

Trade Mark: msi

Model No.: F23G30MNT2

Add. Model No.: N/A

Report Number: 24122415418RFC-1

Specified Categories: Item 19 of Article 2 Paragraph 1

Standard: ARIB STD-T66 Version 3.7

MIC Notification No. 88 Appendix No.43

Test Result: PASS

Date of Issue: January 8, 2025

Prepared for:

Micro-Star Int'l Co., Ltd.

No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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January 8, 2025

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UTTR-RF-STDT66-V1.1

Version

Version No.	Date	Description
V1.0	January 8, 2025	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Micro-Star Int'l Co., Ltd.
Address of Applicant:	No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan
Manufacturer:	Micro-Star Int'l Co., Ltd.
Address of Manufacturer:	No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan
Factory:	ShenZhen Firstrich Electronics co., LTD
Address of Factory:	7th Floor, Building B, No. 107 Hongyin Road, Loucun Community, Xinhua Street, Guangming District, Shenzhen

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Bluetooth voice remote control	
Model No.:	F23G30MNT2	
Add. Model No.:	N/A	
Trade Mark:	msi	
DUT Stage:	Identical Prototype	
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	Bluetooth V5.2
Software Version:	V1.2.1 (Provided by the customer)	
Hardware Version:	V1.1 (Provided by the customer)	
Sample Received Date:	December 24, 2024	
Sample Tested Date:	December 28, 2024 to December 28, 2024	
Remark:	The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.	

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Radio Technique:	Bluetooth LE
Modulation Technique:	DTS
Type of Modulation:	GFSK
Number of Channels:	40 (Please see NOTE 1)
Channel Separation:	2 MHz
RF Output Power:	Please see NOTE 2
Antenna Type: (Provided by the customer)	PCB Antenna
Antenna Gain: (Provided by the customer)	+3.59 dBi
Test Voltage:	3.0 V $\pm$ 10%

NOTE:

1. Operation frequency each of channel

Operation Frequency Each of Channel	
$f = 2402 + 2k \text{ MHz}, k = 0, \dots, 39$	
Note:	
f	is the operating frequency (MHz);
k	is the operating channel.

2. The RF output power as below table:

	Rated output power (mW)	Conducted RF output power (mW)	Radiated RF output power (mW)
Normal mode			
LE	1.00	1.0423	2.3823

1.4 OTHER INFORMATION

None.

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

Item 19 of Article 2 Paragraph 1,
ARIB STD-T66 Version 3.7,
MIC Notification No. 88 Appendix No.43

All test items have been performed and recorded as per the above standards

1.6 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Inspiron 5593	N/A	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.2 Meter	Applicant

1.7 TEST LOCATION

All tests were performed at:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

1.8 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.9 DEVIATION FROM STANDARDS

None.

1.10 ABNORMALITIES FROM STANDARD CONDITIONS

None.

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1.11 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.12 MEASUREMENT UNCERTAINTY

No.	Item	Measurement Uncertainty
1	Radio frequency	$\pm 6.5 \times 10^{-8}$
2	Occupied Channel Bandwidth	$\pm 1.86 \%$
3	RF output power, conducted	$\pm 0.68 \text{ dB}$
4	Power Spectral Density	$\pm 0.6 \text{ dB}$
5	Spurious emissions, conducted	$\pm 2.7 \text{ dB}$
6	Supply voltages	$\pm 0.68 \%$
7	Time	$\pm 0.19 \%$
Remark: 95% Confidence Levels, k=2.		

2. TEST SUMMARY

Item	Notice 88 Appendix 43 Reference	ARIB STD-T66 Reference	Report reference	Result
GENERAL PROVISIONS				
Frequency Tolerance	C	3.2 (4)	5.3	PASS
Occupied bandwidth	D	3.2 (7)	5.4	PASS
Spurious emissions	E	3.2 (6)	5.6	PASS
TRANSMITTING EQUIPMENT				
Antenna power	F	3.2 (1)	5.7	PASS
SAR	--	--	--	N/A
TRANSMITTING ANTENNA				
Type, configuration, etc. of transmitting antenna	--	--	1.3, 5.2	PASS
Direction pattern of transmitting antenna	--	--	5.2	PASS
RECEIVING EQUIPMENT				
Spurious emissions of receiver	H	3.3 (1)	5.8	PASS
Refer to all articles for transmitting antenna	--	--	5.2	PASS
OPERATING FREQUENCY 2402 TO 2480MHZ				
High Frequency/modulation section cannot be opened easily	--	3.7 (1)	5.11	PASS
Communication method	--	3.1 (1)	1.3	PASS
Modulation method	--	3.2 (1)a	1.3	PASS
Spread spectrum method	--	3.2 (1)a	5.5	PASS
Antenna power	--	3.2 (2)	5.7	PASS
Absolute gain of transmitting antenna	--	3.6 (2)	5.7	PASS
Angular width of principal radiation (AWPR)	--	3.6 (2)	5.7	PASS
Number of carriers within 1 MHz bandwidth in OFDM	--	3.2 (10)	--	N/A
Diffusion bandwidth	--	3.2 (8)	5.5	PASS
Spreading factor	--	3.2 (9)	5.5	PASS
Interference Prevention Function	--	3.4.1 (1)	5.10	PASS
Carrier Sense Capability	--	3.4.1 (3)	5.9	N/A
Note:				
1) N/A: In this whole report not applicable.				
Disclaimer and Explanations:				
The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.				

3. EQUIPMENT LIST

Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY51286807	25-Oct-2024	24-Oct-2025
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	25-Oct-2024	24-Oct-2025
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	25-Oct-2024	24-Oct-2025
☐	Wideband Radio Communication Tester	R&S	CMW500	120932	29-Mar-2024	28-Mar-2025
☐	DC Source	KIKUSUI	PWR400L	LK003024	19-July-2024	18-July-2025
☒	Digital multimeter	FLUKE	15B+	30701460WS 15	29-Oct-2024	28-Oct-2025

Note 1: Calibration Method

- Calibration conducted by the National Institute of Information and Communications Technology [NICT](#) or a designated calibration agency under Article 102-18 paragraph
- Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the [NICT](#) or a designated calibration agency under Article 102-18 paragraph
- 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

The all calibration corresponds to c) described above.

Note 2: Calibration information

Calibration Agency: Guangzhou LiSai Metrology & Test Co., Ltd.

Address: No.8, South Street Shi Ji Institute Guangzhou, Guangdong, China

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.0	20 to 75
TN/VL		3.24	
TN/VH		3.96	
Remark: 1) VN: Normal Voltage; TN: Normal Temperature; 2) VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Frequency Tolerance	19.7	44.3	100.7	S202412244936-PJA02	Lucas Ouyang
Occupied bandwidth & Spreading bandwidth					
Spurious emissions					
Antenna power					
Spurious emissions of receiver					

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
GFSK	2402 MHz to 2480 MHz	Lowest(L)	Middle(M)	Highest(H)
		Channel 0	Channel 19	Channel 39
		2402 MHz	2440 MHz	2480 MHz

4.3 EUT TEST STATUS

Type of Modulation	Tx/Rx Function	Description
GFSK	1Tx/1Rx	1. Keep the EUT in continuously transmitting with modulation or un-modulation test single. 2. Keep the EUT in continuously receiving.

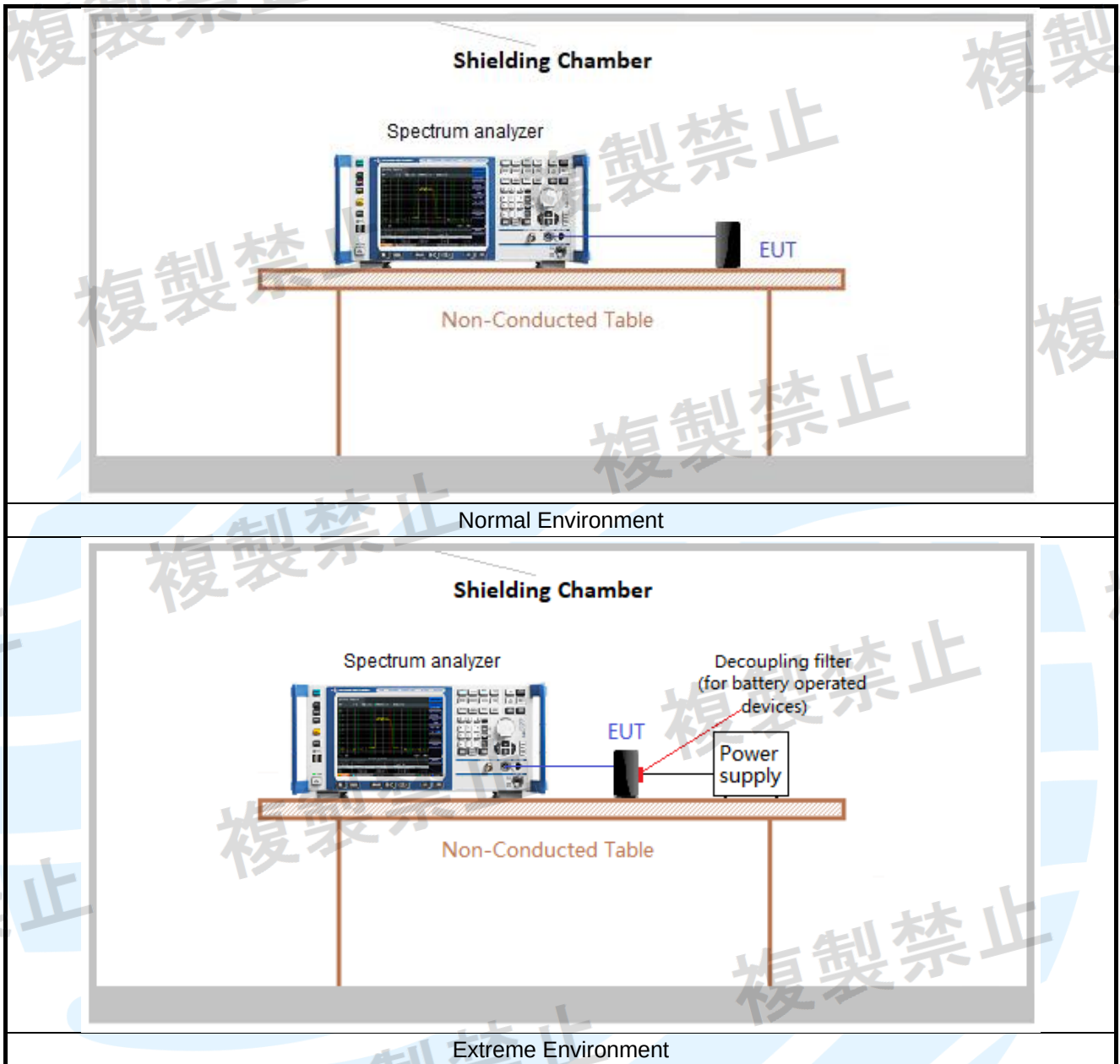
Power Setting (Provided by the customer)

Power Setting: not applicable, test used software default power level.

Test Software (Provided by the customer)

RTL8762x RFTestTool v1.0.2.4

4.4 TEST SETUP



5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

Item 19 of Article 2 Paragraph 1: Low power data communications system in the 2.4GHz band

ARIB STD-T66 Version 3.7: Second generation low power data communication system/ wireless LAN system

MIC Notification No. 88 Appendix No.43 (2004) of the Ordinance Concerning Technical Regulations
Conformity Certification of Specified Radio Equipment

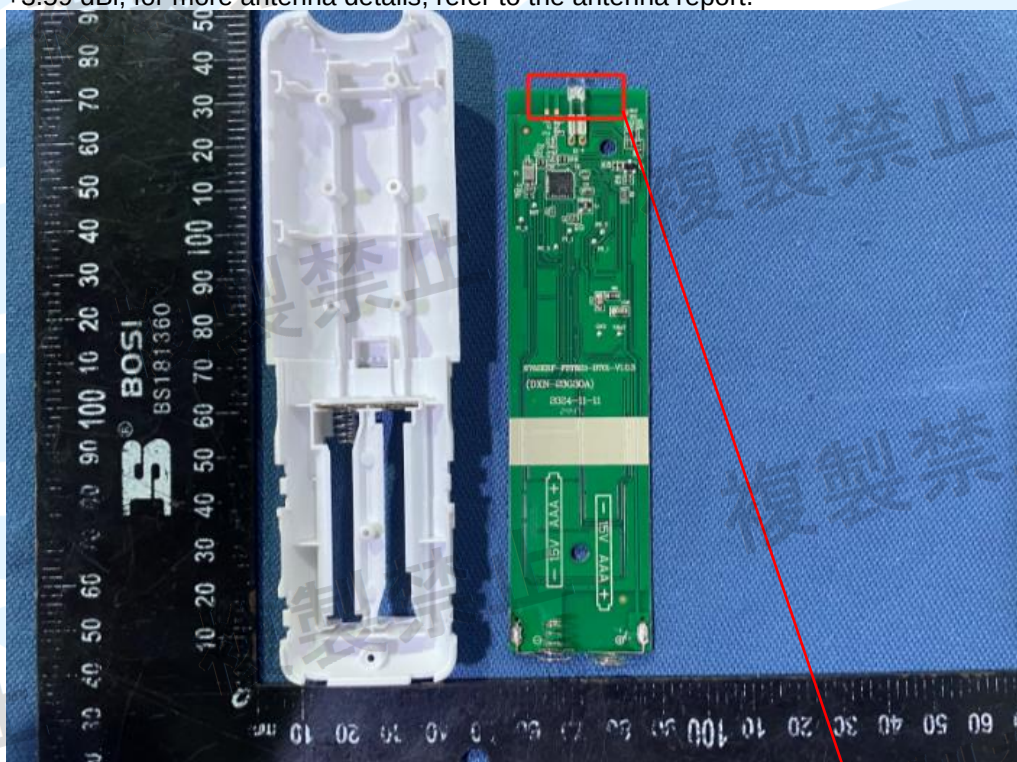
5.2 ANTENNA REQUIREMENT

Standard Requirement

Applicable for equipment with an antenna terminal, including testing terminals) If an antenna connector is available, all relevant tests will be carried out conducted. If not, tests will be carried out in an anechoic room or with a suitable test-fixture.

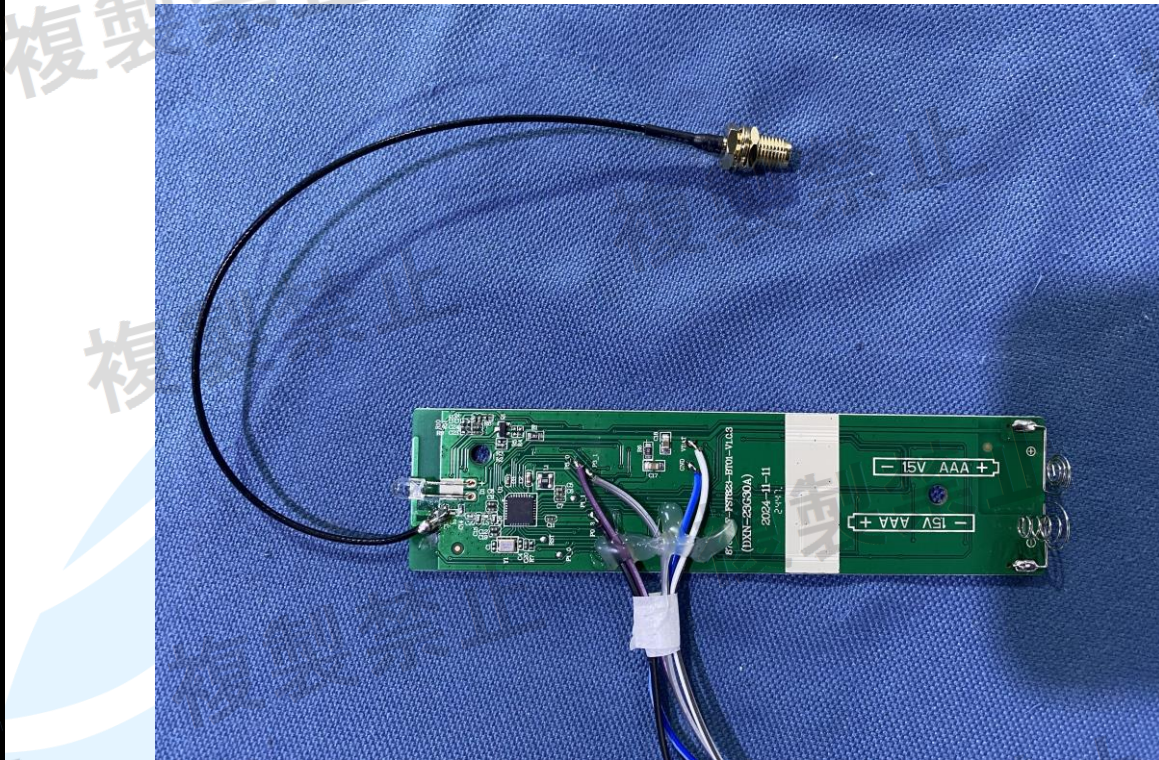
EUT Antenna

The antenna is installed inside the EUT and no consideration of replacement. The best-case gain of the antenna is +3.59 dBi, for more antenna details, refer to the antenna report.



Antenna

Result: An antenna connector is available, all relevant tests will be carried out conducted.



5.3 FREQUENCY TOLERANCE

5.3.1 Limit

Tolerance of frequency shall be +/- 50ppm.

5.3.2 Test Setup

Refer to section 4.4 for details.

5.3.3 Instruments Used

Refer to section 3 for details

5.3.4 Test Procedures

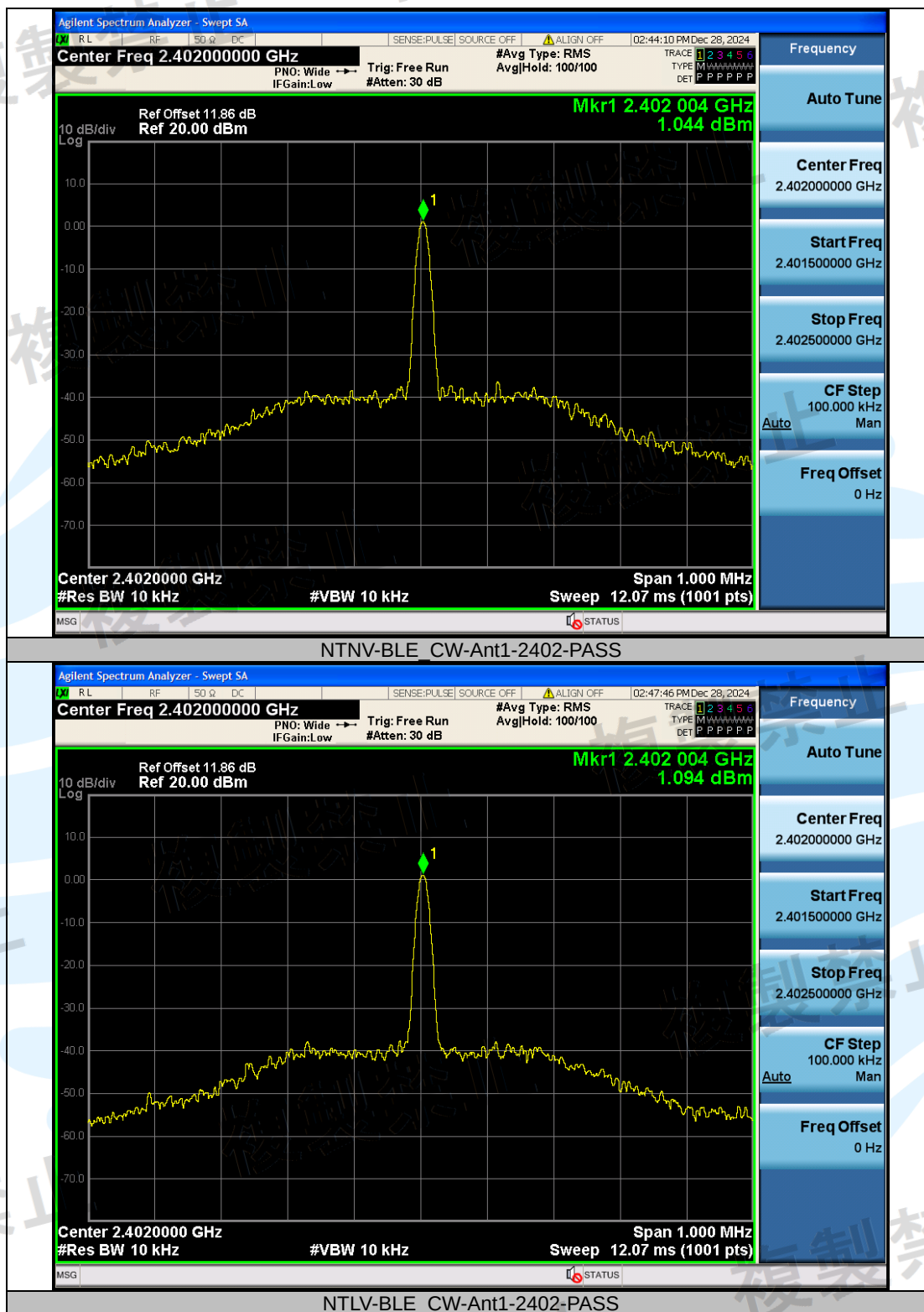
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

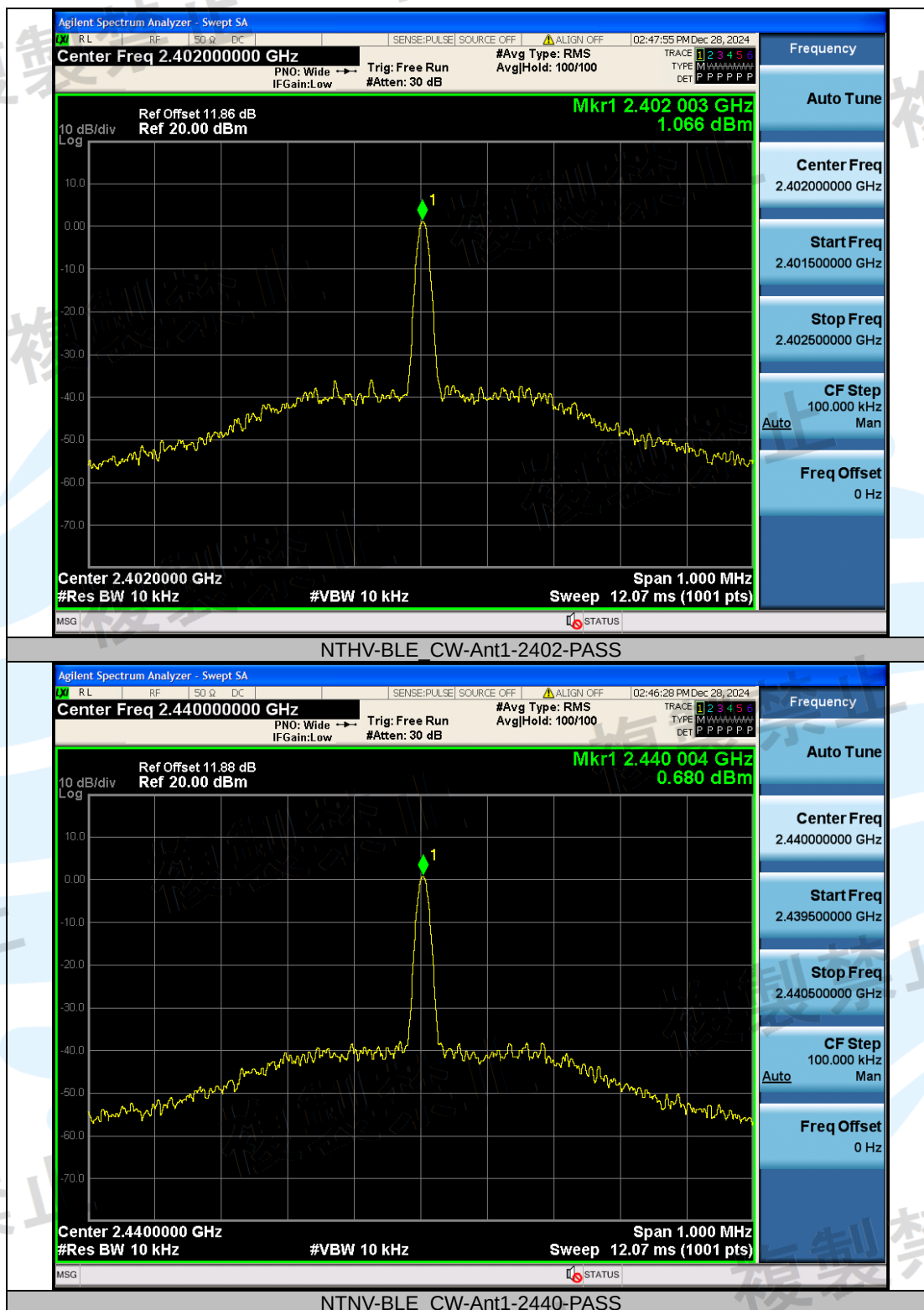
Use the following spectrum analyzer settings:

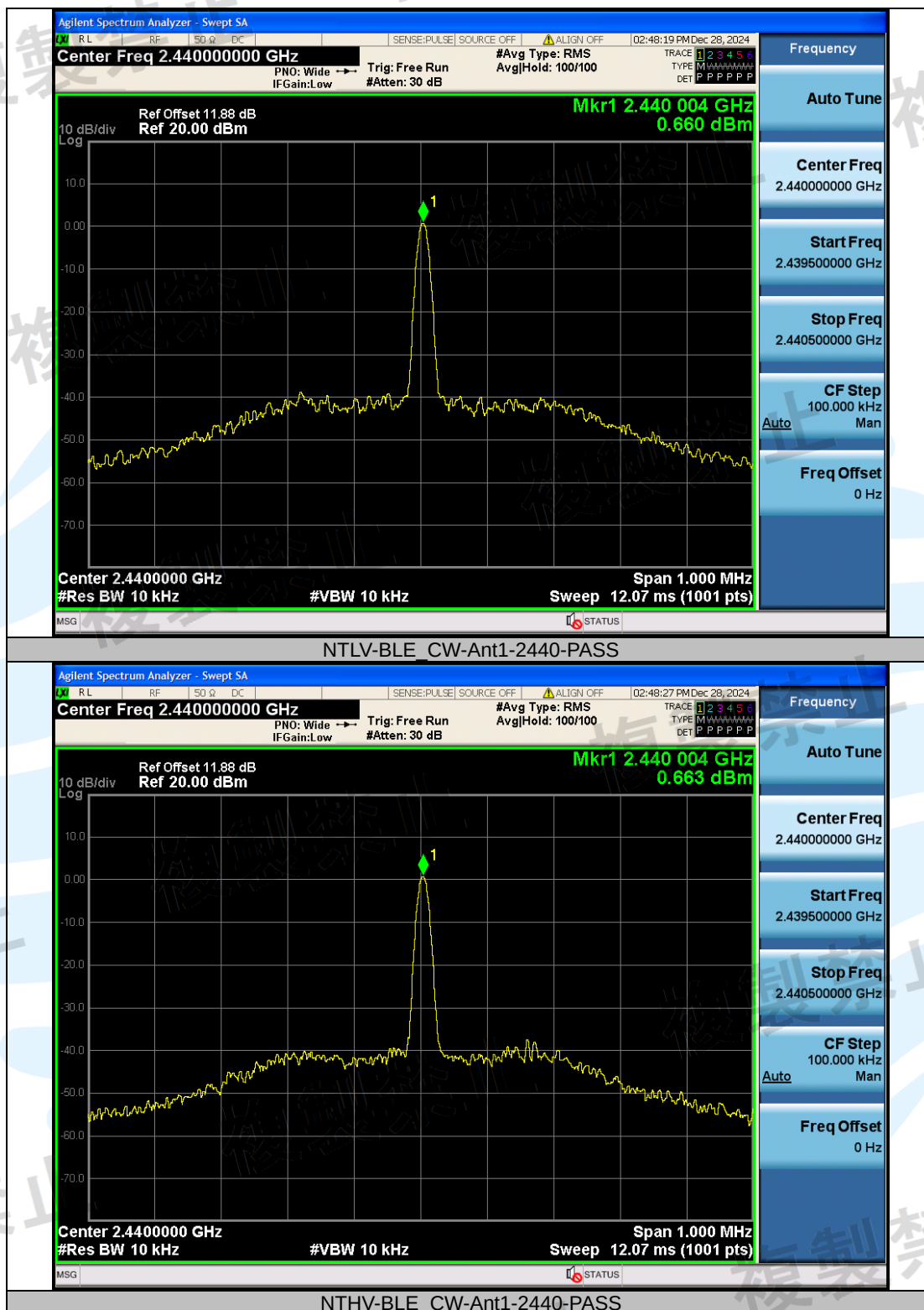
1. Center Frequency = test frequency
2. RBW = 10kHz, VBW = 10kHz;
3. Sweep = auto;
4. Detector function = peak
5. Trace = max hold
6. The frequency tolerance test case is directly measured using spectrum analyzer. Then the frequency error formula is $(f-f_c)/f_c \times 10^6$ ppm and the limit is less than ± 50 ppm.

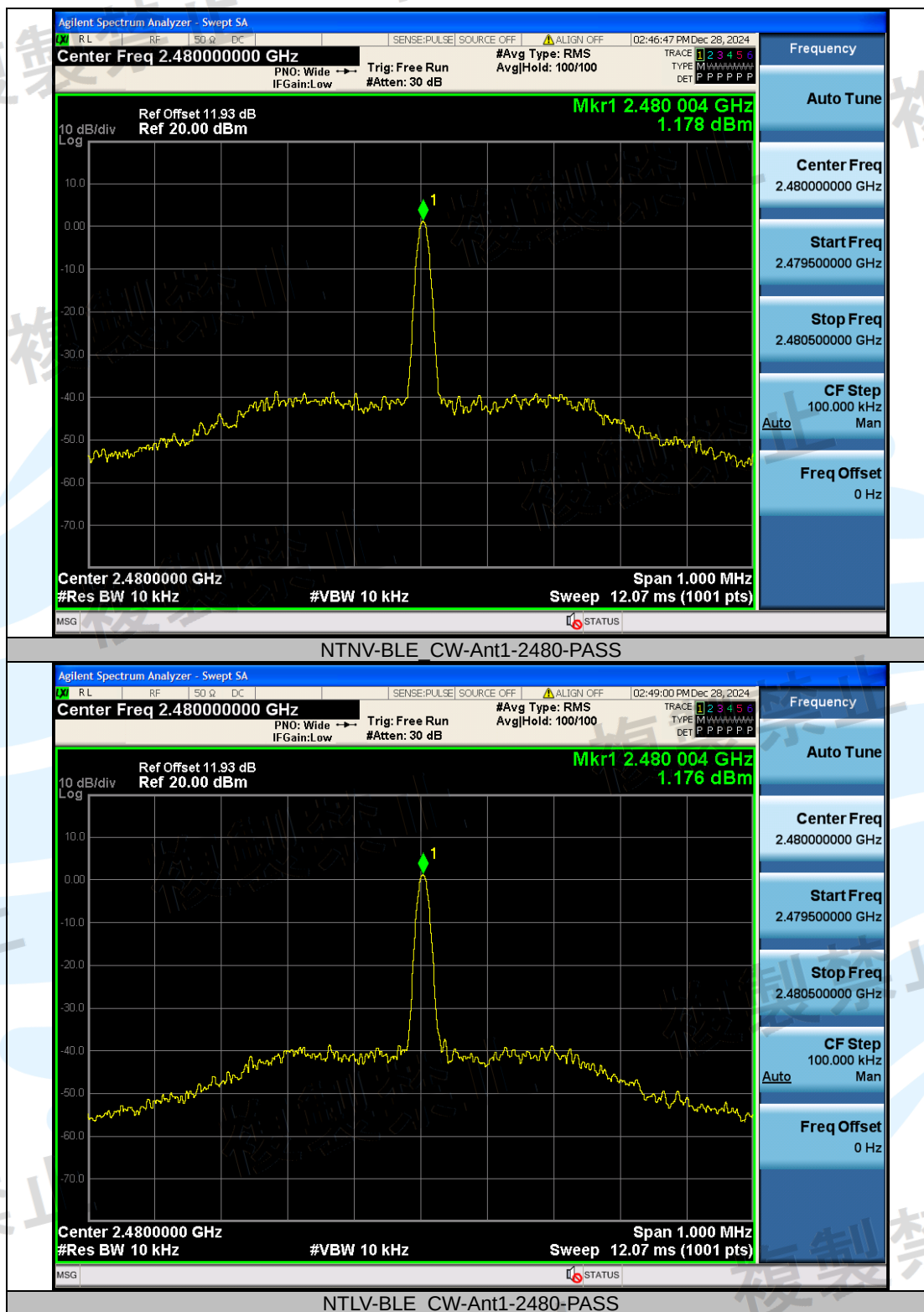
5.3.5 Test Result

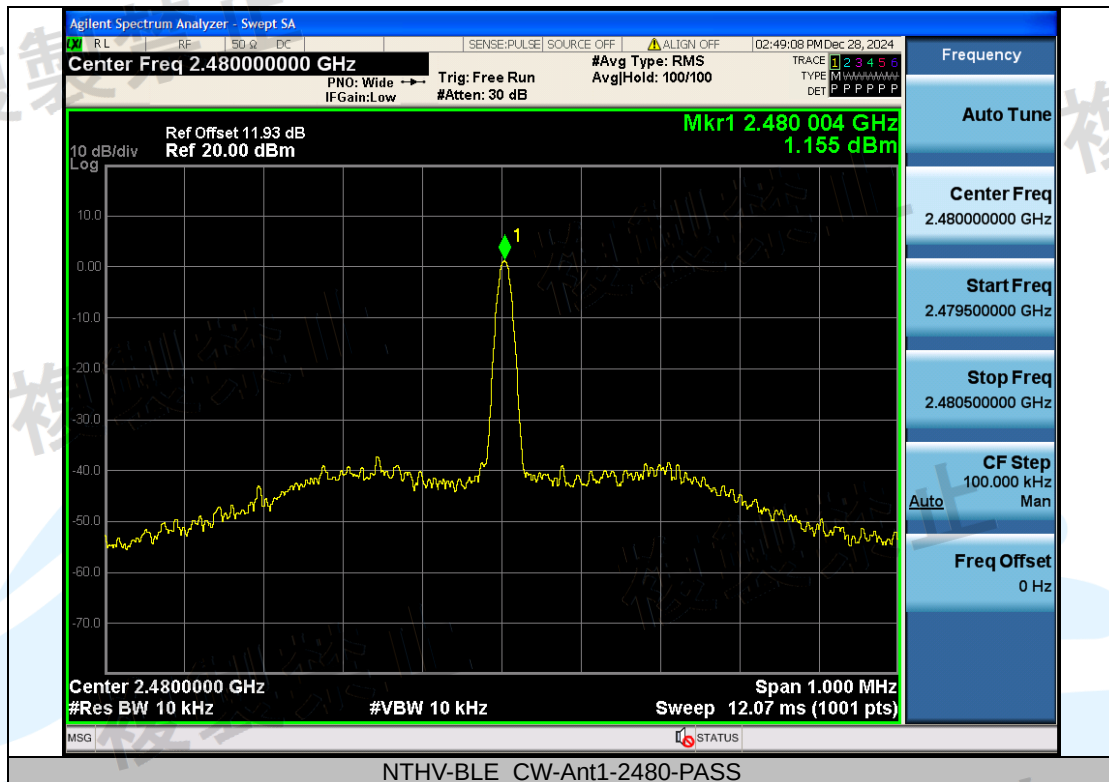
Test Condition	Test Mode	Antenna	Freq (MHz)	Center Freq [MHz]	Result [ppm]	Limit [ppm]	Verdict
NTNV	BLE CW	Ant1	2402	2402.004	+1.66528	±50	PASS
NTLV	BLE CW	Ant1	2402	2402.004	+1.66528	±50	PASS
NTHV	BLE CW	Ant1	2402	2402.003	+1.24896	±50	PASS
NTNV	BLE CW	Ant1	2440	2440.004	+1.63934	±50	PASS
NTLV	BLE CW	Ant1	2440	2440.004	+1.63934	±50	PASS
NTHV	BLE CW	Ant1	2440	2440.004	+1.63934	±50	PASS
NTNV	BLE CW	Ant1	2480	2480.004	+1.61290	±50	PASS
NTLV	BLE CW	Ant1	2480	2480.004	+1.61290	±50	PASS
NTHV	BLE CW	Ant1	2480	2480.004	+1.61290	±50	PASS











5.4 OCCUPIED BANDWIDTH (99% BW)

5.4.1 Limit

Occupied bandwidth shall be less than 26MHz.

5.4.2 Test Setup

Refer to section 4.4 for details.

5.4.3 Instruments Used

Refer to section 3 for details

5.4.4 Test Procedures

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

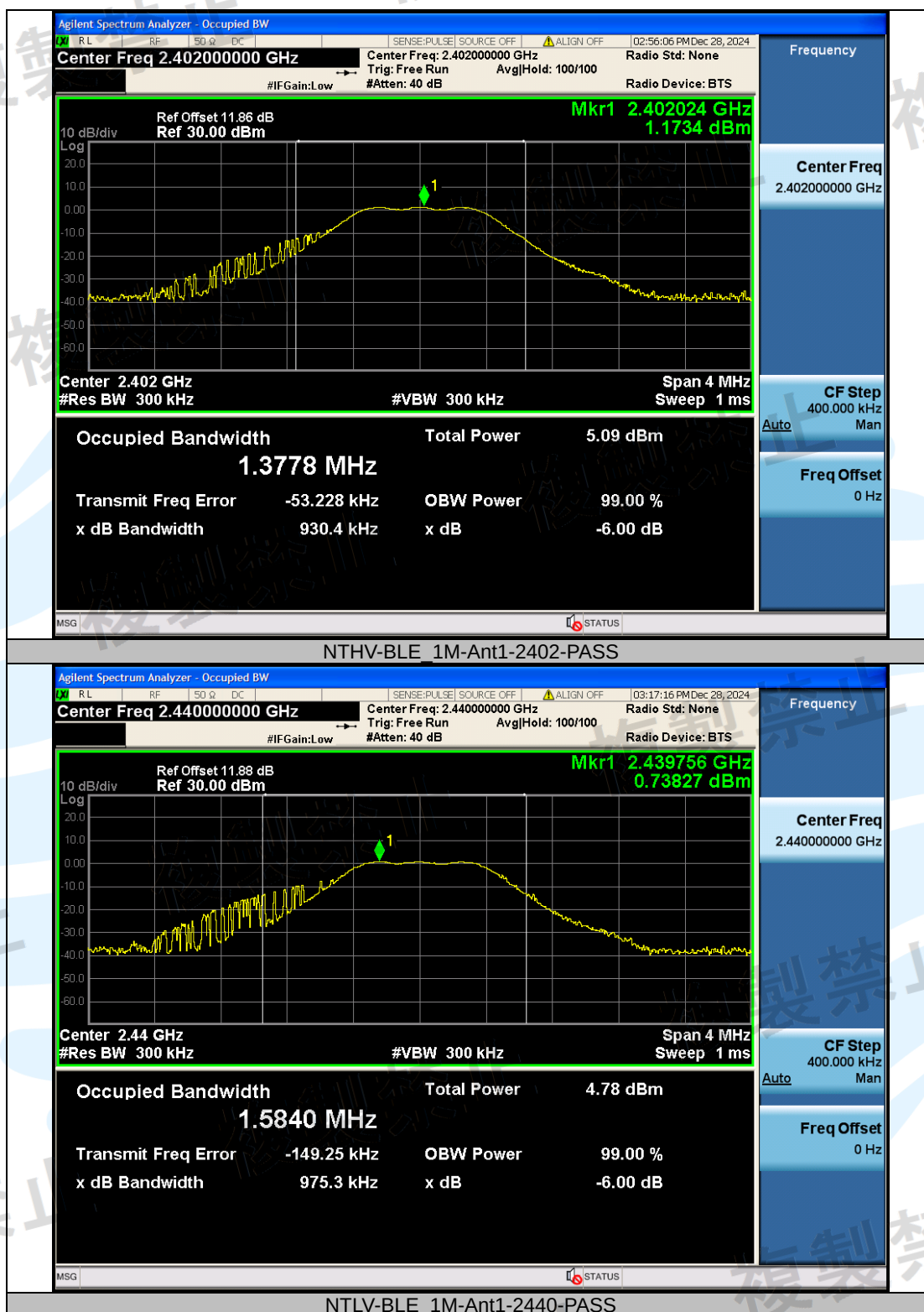
Use the following spectrum analyzer settings:

1. Center Frequency = test frequency
2. Span = 2 to 3.5 times BW
3. RBW = 300kHz, VBW = 300kHz;
4. Sweep = auto;
5. Trace = max hold
6. Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

5.4.5 Test Result

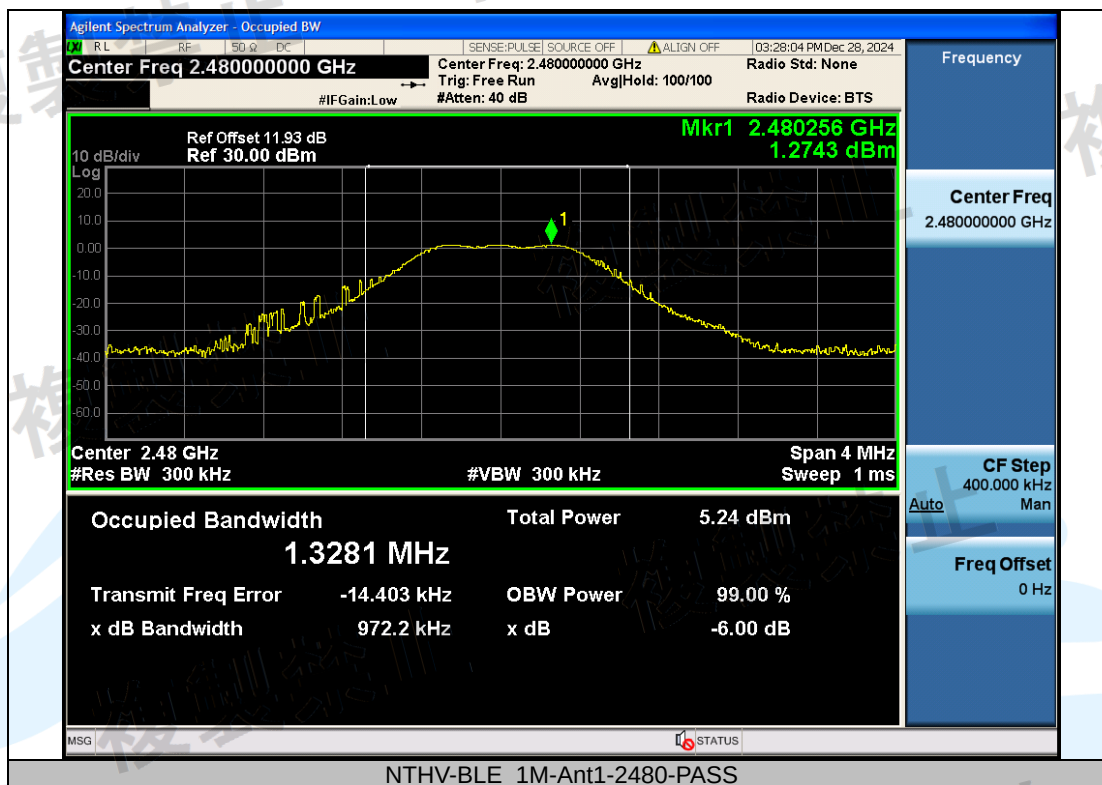
Test Condition	Test Mode	Antenna	Freq (MHz)	Result [MHz]	Limit [MHz]	Verdict
NTLV	BLE 1M	Ant1	2402	1.353	≤26	PASS
NTNV	BLE 1M	Ant1	2402	1.374	≤26	PASS
NTHV	BLE 1M	Ant1	2402	1.378	≤26	PASS
NTLV	BLE 1M	Ant1	2440	1.584	≤26	PASS
NTNV	BLE 1M	Ant1	2440	1.514	≤26	PASS
NTHV	BLE 1M	Ant1	2440	1.519	≤26	PASS
NTLV	BLE 1M	Ant1	2480	1.330	≤26	PASS
NTNV	BLE 1M	Ant1	2480	1.298	≤26	PASS
NTHV	BLE 1M	Ant1	2480	1.328	≤26	PASS











5.5 SPREADING BANDWIDTH (90% BW)

5.5.1 Limit

Spreading bandwidth ≥ 500 kHz.
Spreading factor ≥ 5 .

5.5.2 Test Setup

Refer to section 4.4 for details.

5.5.3 Instruments Used

Refer to section 3 for details

5.5.4 Test Procedures

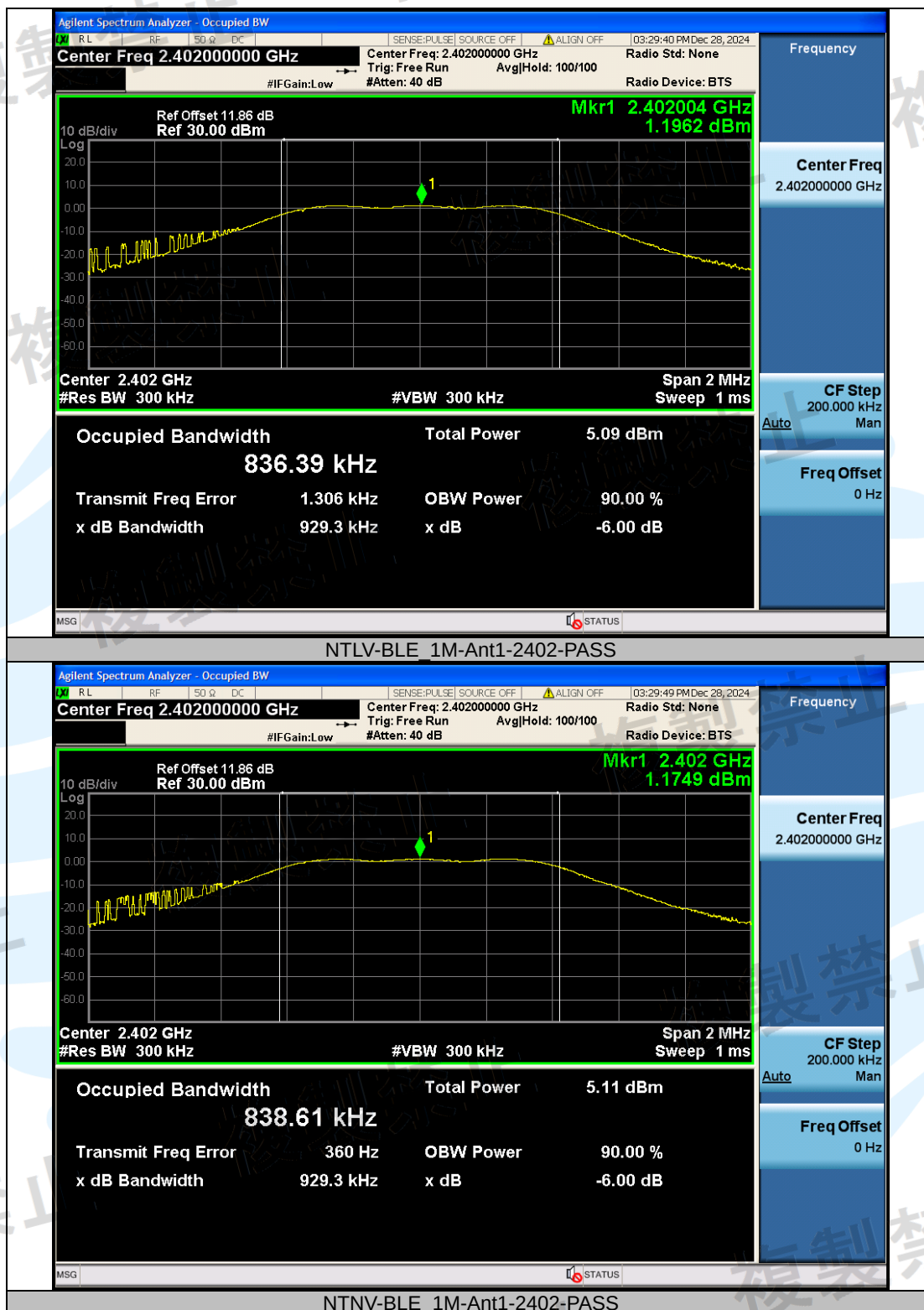
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

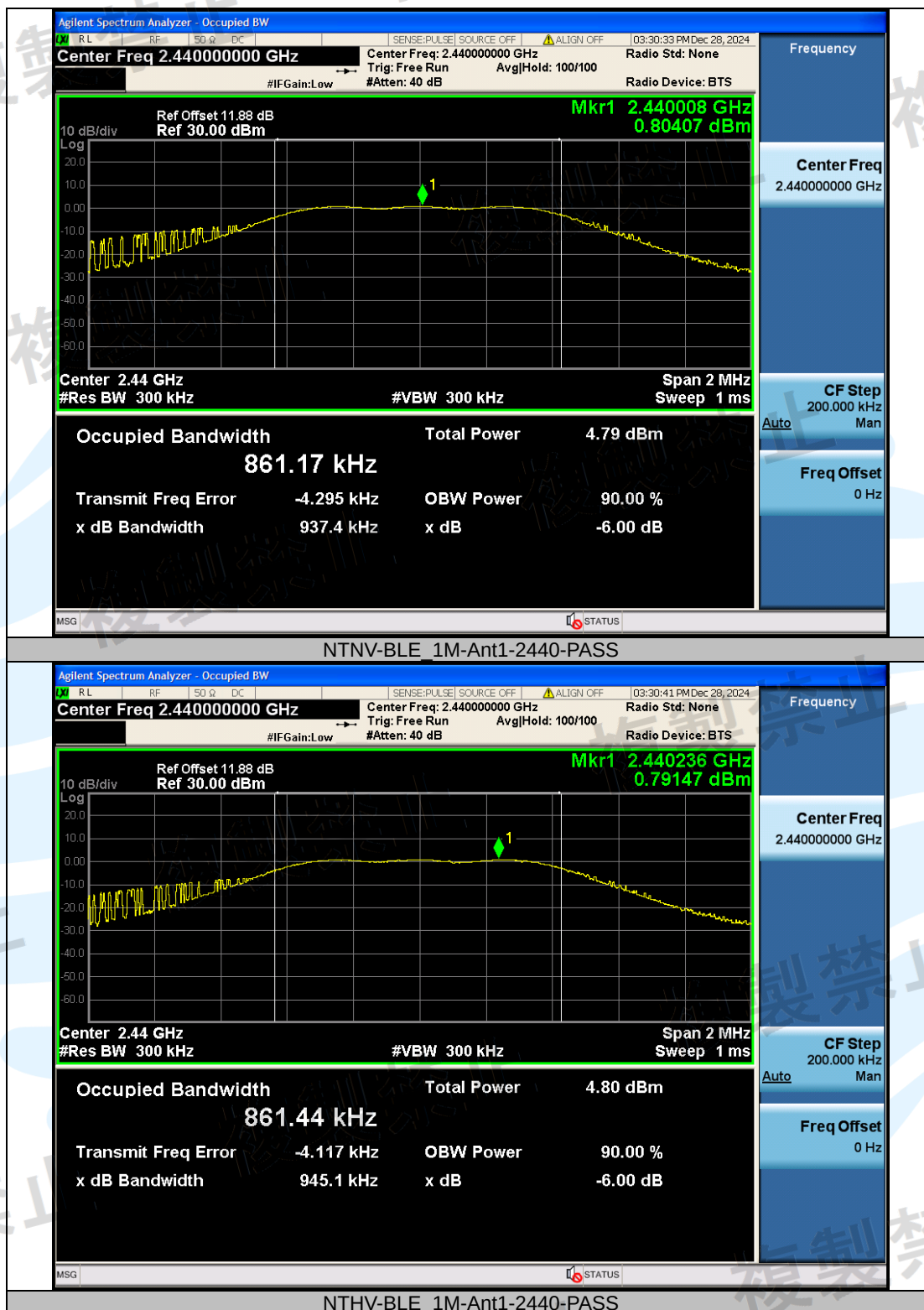
1. Center Frequency = test frequency
2. Span = 2 to 3.5 times BW
3. RBW = 300kHz, VBW = 300kHz;
4. Sweep = auto;
5. Trace = max hold
6. Use the 90 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

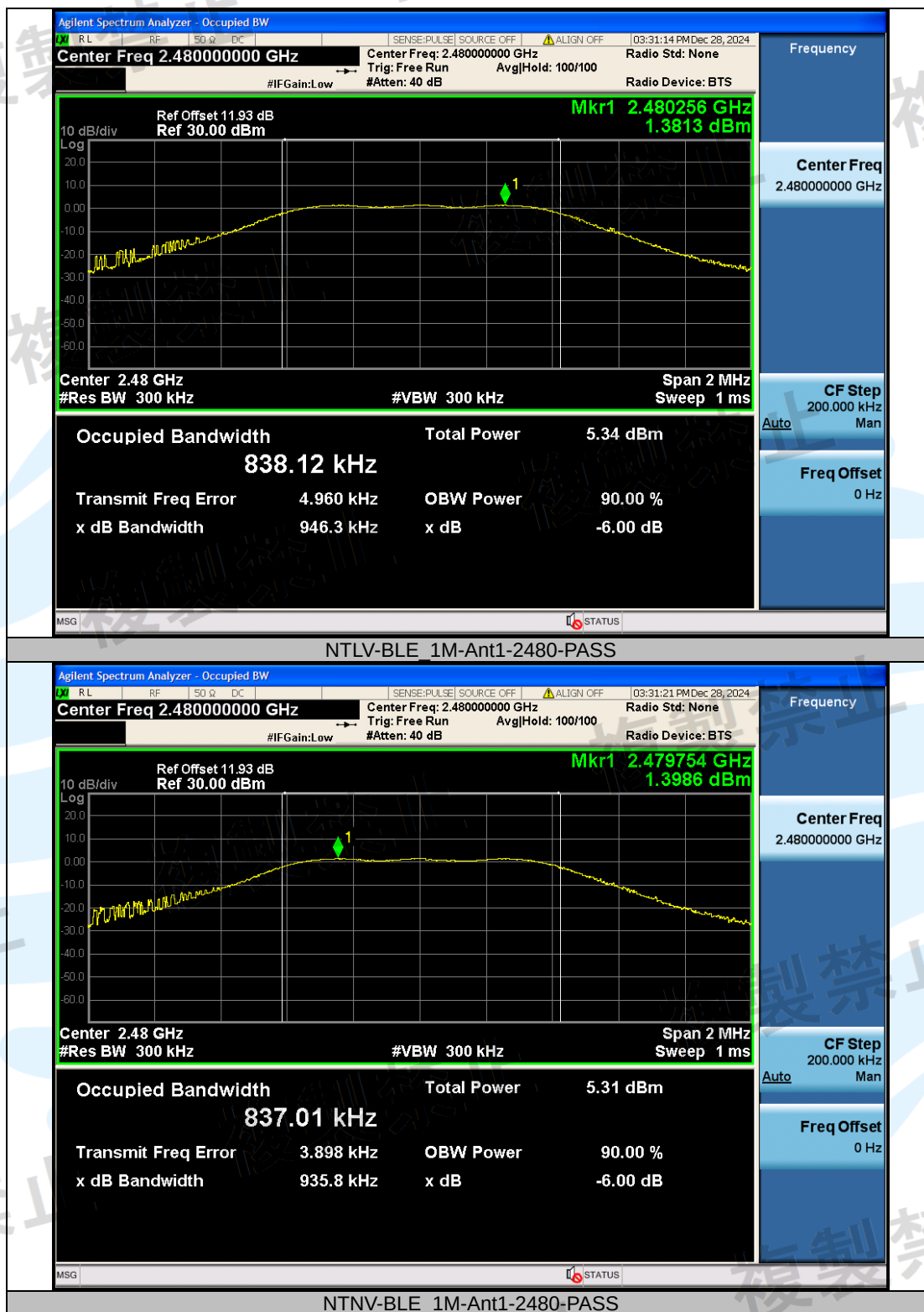
5.5.5 Test Result

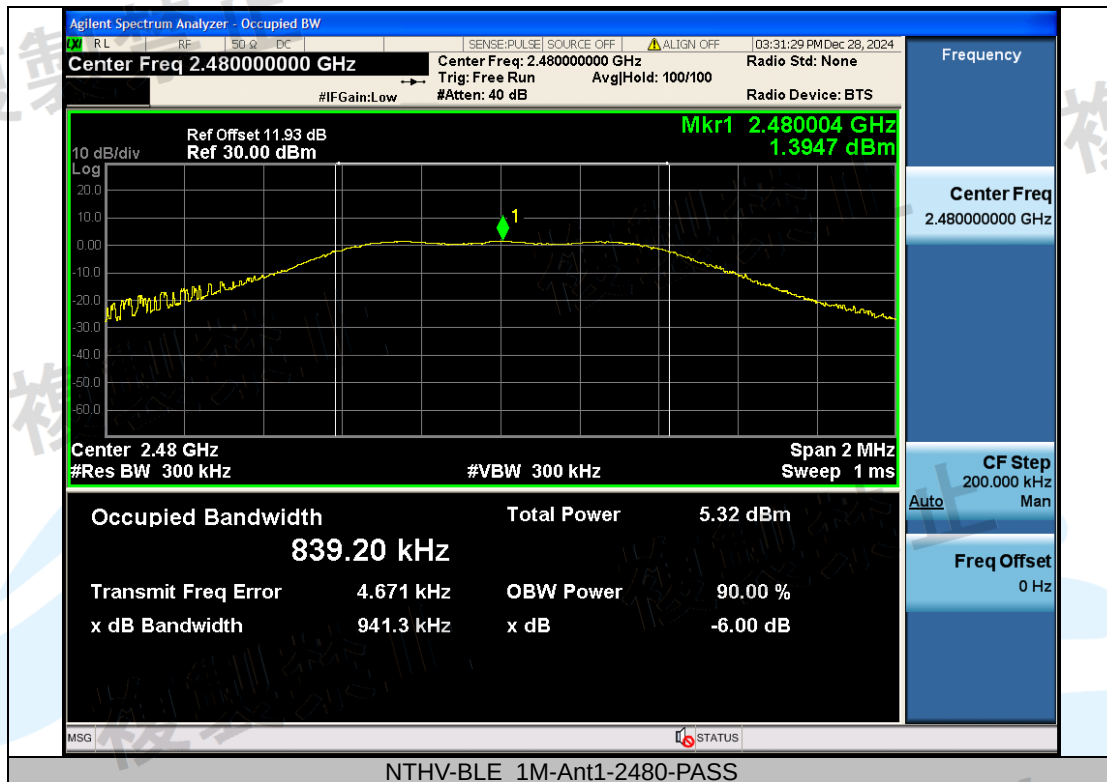
Test Condition	Test Mode	Antenna	Freq (MHz)	Result [MHz]	Limit [MHz]	Verdict
NTLV	BLE 1M	Ant1	2402	0.836	≥ 0.5	PASS
NTNV	BLE 1M	Ant1	2402	0.839	≥ 0.5	PASS
NTHV	BLE 1M	Ant1	2402	0.837	≥ 0.5	PASS
NTLV	BLE 1M	Ant1	2440	0.860	≥ 0.5	PASS
NTNV	BLE 1M	Ant1	2440	0.861	≥ 0.5	PASS
NTHV	BLE 1M	Ant1	2440	0.861	≥ 0.5	PASS
NTLV	BLE 1M	Ant1	2480	0.838	≥ 0.5	PASS
NTNV	BLE 1M	Ant1	2480	0.837	≥ 0.5	PASS
NTHV	BLE 1M	Ant1	2480	0.839	≥ 0.5	PASS











5.6 SPURIOUS EMISSIONS

5.6.1 Limit

Frequency (MHz)	Limit	
	uW/MHz	dBm/MHz
Operating frequency 2400 to 2483.5MHz		
$2387 \leq f < 2400$	≤ 25	-16
$2483.5 < f \leq 2496.5$	≤ 25	-16
All other frequencies	≤ 2.5	-26 (-36@RBW=100KHz)

5.6.2 Test Setup

Refer to section 4.4 for details.

5.6.3 Instruments Used

Refer to section 3 for details

5.6.4 Test Procedures

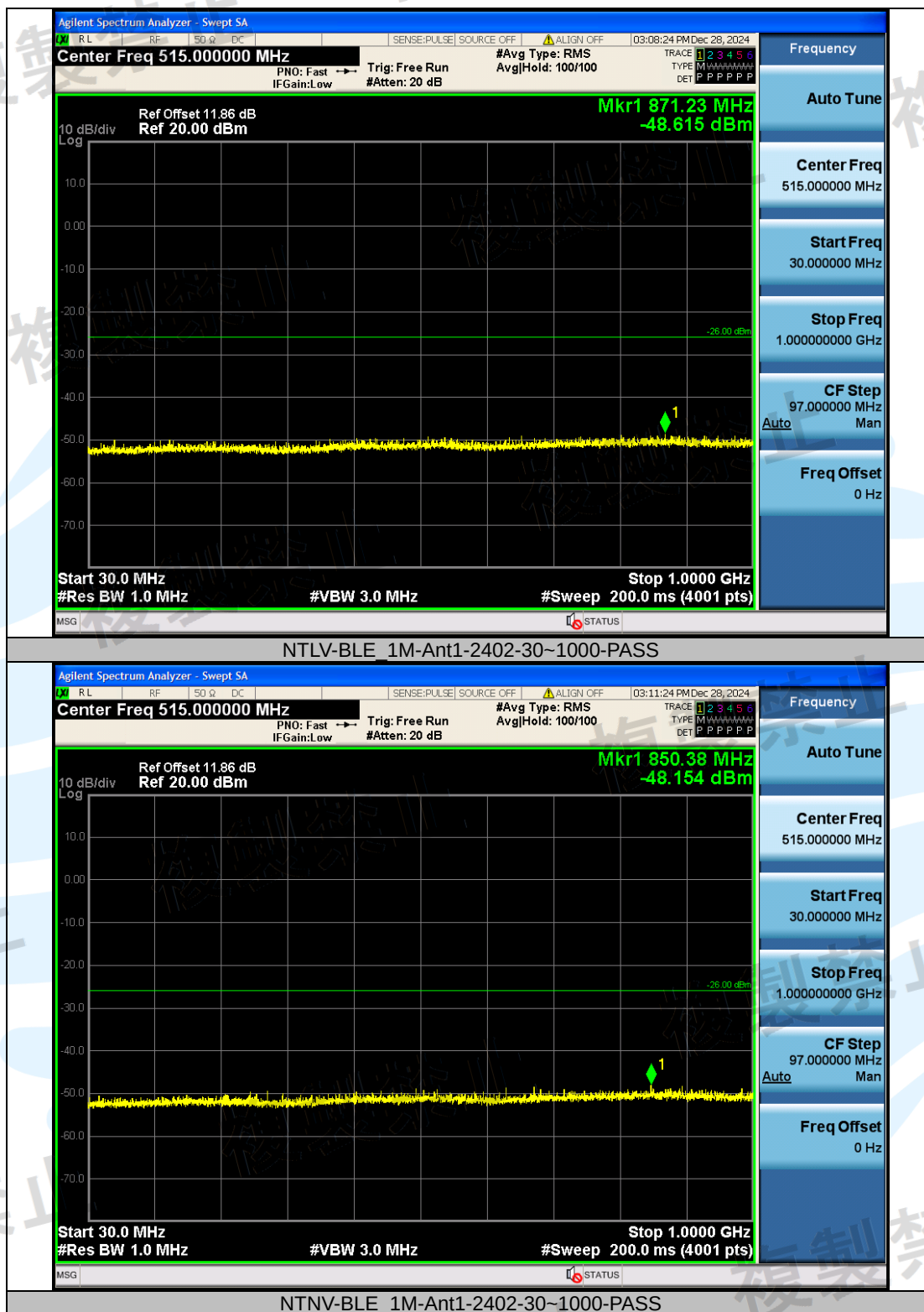
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

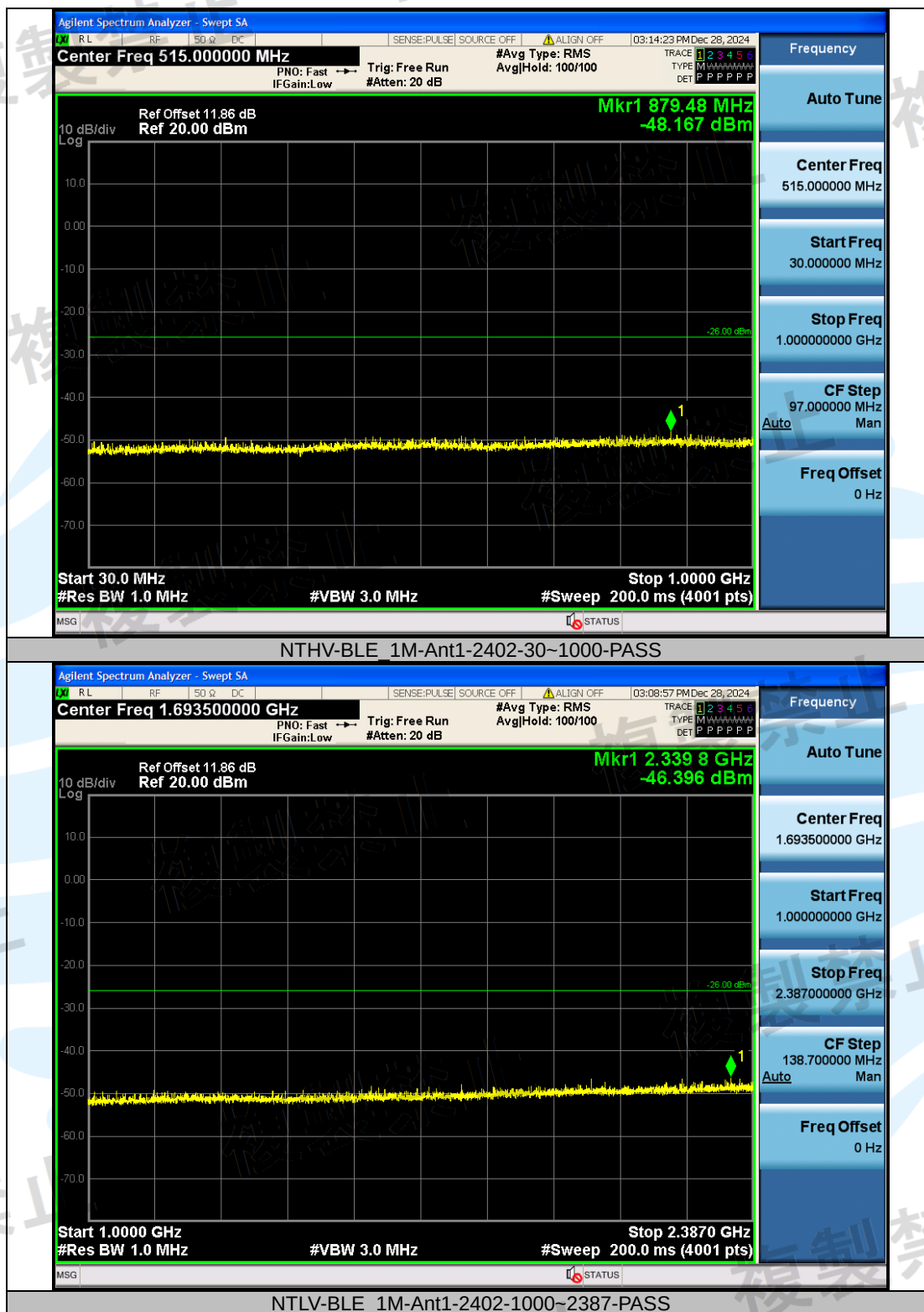
Use the following spectrum analyzer settings:

- a) Below 1GHz
 1. Set RBW = VBW = 100 kHz.
 2. Detector = peak.
 3. Sweep = auto couple.
 4. Trace Mode = max hold.
 5. Allow trace to fully stabilize.
 6. Use the peak marker function to determine the maximum amplitude level.
- b) Above 1GHz
 1. Set RBW = VBW = 1 MHz.
 2. Detector = peak.
 3. Sweep = auto couple.
 4. Trace Mode = max hold.
 5. Allow trace to fully stabilize.
 6. Use the peak marker function to determine the maximum amplitude level.

5.6.5 Test Result

Test Condition	Test Mode	Antenna	Freq (MHz)	Freq. Range [MHz]	Freq. [MHz]	Result [dBm]	Limit [dBm/MHz]	Result [μW/MHz]	Limit [μW/MHz]	Verdict
NTLV	BLE 1M	Ant1	2402	30~1000	871.23	-48.62	≤-26	0.01374	≤2.5	PASS
NTNV	BLE 1M	Ant1	2402	30~1000	850.38	-48.15	≤-26	0.01531	≤2.5	PASS
NTHV	BLE 1M	Ant1	2402	30~1000	879.48	-48.17	≤-26	0.01524	≤2.5	PASS
NTLV	BLE 1M	Ant1	2402	1000~2387	2339.84	-46.40	≤-26	0.02291	≤2.5	PASS
NTNV	BLE 1M	Ant1	2402	1000~2387	2049.96	-47.18	≤-26	0.01914	≤2.5	PASS
NTHV	BLE 1M	Ant1	2402	1000~2387	2238.59	-46.71	≤-26	0.02133	≤2.5	PASS
NTLV	BLE 1M	Ant1	2402	2387~2400	2399.99	-23.83	≤-16	4.14000	≤25	PASS
NTNV	BLE 1M	Ant1	2402	2387~2400	2399.98	-23.59	≤-16	4.37522	≤25	PASS
NTHV	BLE 1M	Ant1	2402	2387~2400	2400.00	-23.08	≤-16	4.92040	≤25	PASS
NTLV	BLE 1M	Ant1	2402	2483.5~2496.5	2487.16	-36.84	≤-16	0.20701	≤25	PASS
NTNV	BLE 1M	Ant1	2402	2483.5~2496.5	2486.96	-36.87	≤-16	0.20559	≤25	PASS
NTHV	BLE 1M	Ant1	2402	2483.5~2496.5	2488.36	-36.68	≤-16	0.21478	≤25	PASS
NTLV	BLE 1M	Ant1	2402	2496.5~13000	2613.09	-41.25	≤-26	0.07499	≤2.5	PASS
NTNV	BLE 1M	Ant1	2402	2496.5~13000	2526.43	-40.84	≤-26	0.08241	≤2.5	PASS
NTHV	BLE 1M	Ant1	2402	2496.5~13000	3748.52	-42.87	≤-26	0.05164	≤2.5	PASS
NTLV	BLE 1M	Ant1	2440	30~1000	926.28	-48.22	≤-26	0.01507	≤2.5	PASS
NTNV	BLE 1M	Ant1	2440	30~1000	869.05	-48.52	≤-26	0.01406	≤2.5	PASS
NTHV	BLE 1M	Ant1	2440	30~1000	843.35	-48.48	≤-26	0.01419	≤2.5	PASS
NTLV	BLE 1M	Ant1	2440	1000~2387	2170.63	-46.85	≤-26	0.02065	≤2.5	PASS
NTNV	BLE 1M	Ant1	2440	1000~2387	2361.34	-46.71	≤-26	0.02133	≤2.5	PASS
NTHV	BLE 1M	Ant1	2440	1000~2387	2344.00	-46.78	≤-26	0.02099	≤2.5	PASS
NTLV	BLE 1M	Ant1	2440	2387~2400	2387.05	-37.15	≤-16	0.19275	≤25	PASS
NTNV	BLE 1M	Ant1	2440	2387~2400	2388.98	-36.98	≤-16	0.20045	≤25	PASS
NTHV	BLE 1M	Ant1	2440	2387~2400	2398.90	-37.00	≤-16	0.19953	≤25	PASS
NTLV	BLE 1M	Ant1	2440	2483.5~2496.5	2487.74	-37.09	≤-16	0.19543	≤25	PASS
NTNV	BLE 1M	Ant1	2440	2483.5~2496.5	2487.35	-37.02	≤-16	0.19861	≤25	PASS
NTHV	BLE 1M	Ant1	2440	2483.5~2496.5	2488.32	-37.15	≤-16	0.19275	≤25	PASS
NTLV	BLE 1M	Ant1	2440	2496.5~13000	2520.66	-42.53	≤-26	0.05585	≤2.5	PASS
NTNV	BLE 1M	Ant1	2440	2496.5~13000	3805.76	-42.13	≤-26	0.06124	≤2.5	PASS
NTHV	BLE 1M	Ant1	2440	2496.5~13000	9857.88	-42.49	≤-26	0.05636	≤2.5	PASS
NTLV	BLE 1M	Ant1	2480	30~1000	568.84	-48.25	≤-26	0.01496	≤2.5	PASS
NTNV	BLE 1M	Ant1	2480	30~1000	906.64	-48.65	≤-26	0.01365	≤2.5	PASS
NTHV	BLE 1M	Ant1	2480	30~1000	757.02	-48.23	≤-26	0.01503	≤2.5	PASS
NTLV	BLE 1M	Ant1	2480	1000~2387	2379.37	-46.49	≤-26	0.02244	≤2.5	PASS
NTNV	BLE 1M	Ant1	2480	1000~2387	2238.94	-47.11	≤-26	0.01945	≤2.5	PASS
NTHV	BLE 1M	Ant1	2480	1000~2387	2238.59	-46.38	≤-26	0.02301	≤2.5	PASS
NTLV	BLE 1M	Ant1	2480	2387~2400	2390.91	-37.03	≤-16	0.19815	≤25	PASS
NTNV	BLE 1M	Ant1	2480	2387~2400	2387.42	-37.48	≤-16	0.17865	≤25	PASS
NTHV	BLE 1M	Ant1	2480	2387~2400	2390.10	-37.41	≤-16	0.18155	≤25	PASS
NTLV	BLE 1M	Ant1	2480	2483.5~2496.5	2488.75	-36.76	≤-16	0.21086	≤25	PASS
NTNV	BLE 1M	Ant1	2480	2483.5~2496.5	2490.99	-36.37	≤-16	0.23067	≤25	PASS
NTHV	BLE 1M	Ant1	2480	2483.5~2496.5	2487.97	-36.28	≤-16	0.23550	≤25	PASS
NTLV	BLE 1M	Ant1	2480	2496.5~13000	2533.79	-39.35	≤-26	0.11614	≤2.5	PASS
NTNV	BLE 1M	Ant1	2480	2496.5~13000	9680.37	-42.62	≤-26	0.05470	≤2.5	PASS
NTHV	BLE 1M	Ant1	2480	2496.5~13000	2521.18	-35.50	≤-26	0.28184	≤2.5	PASS



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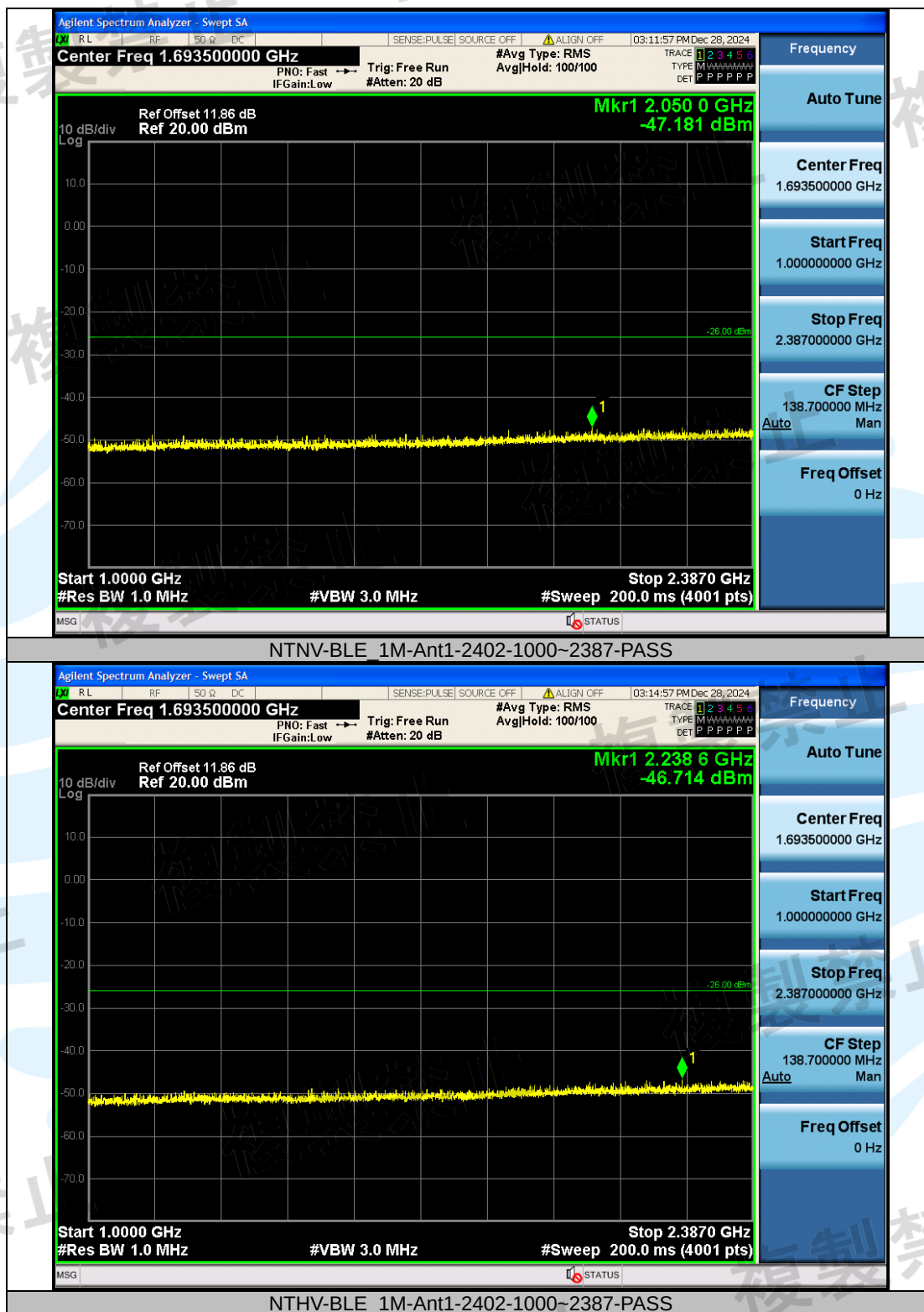
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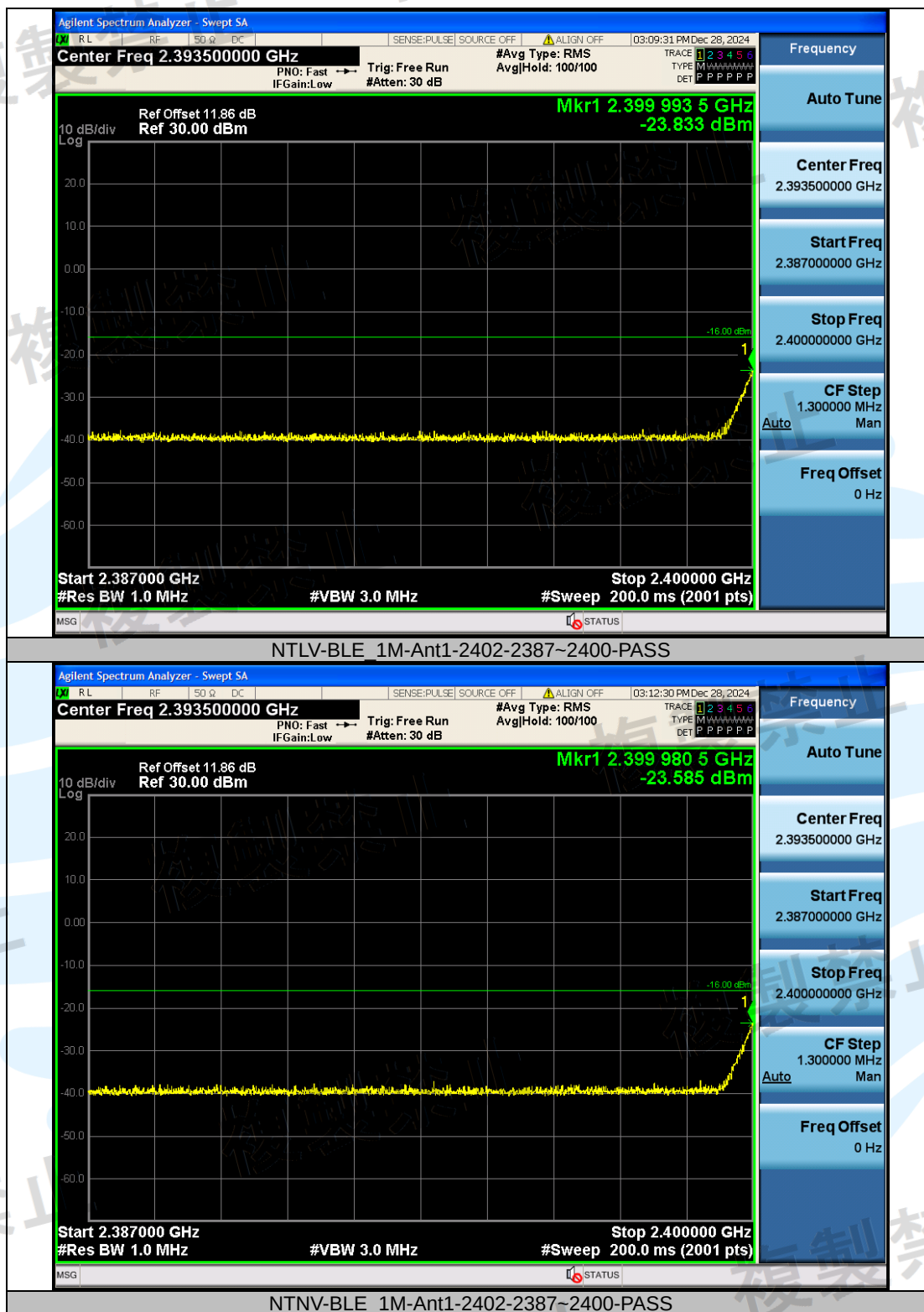
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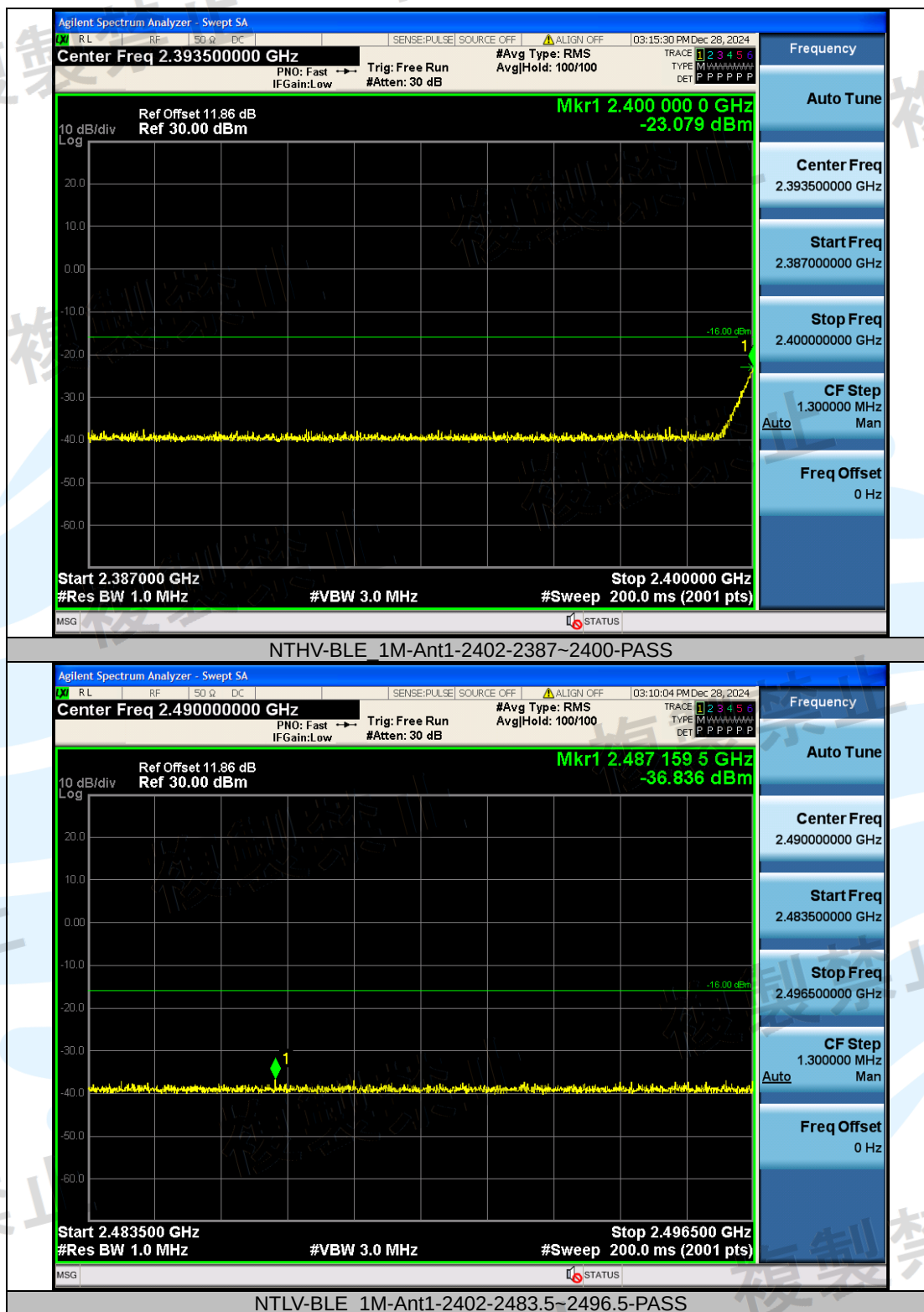
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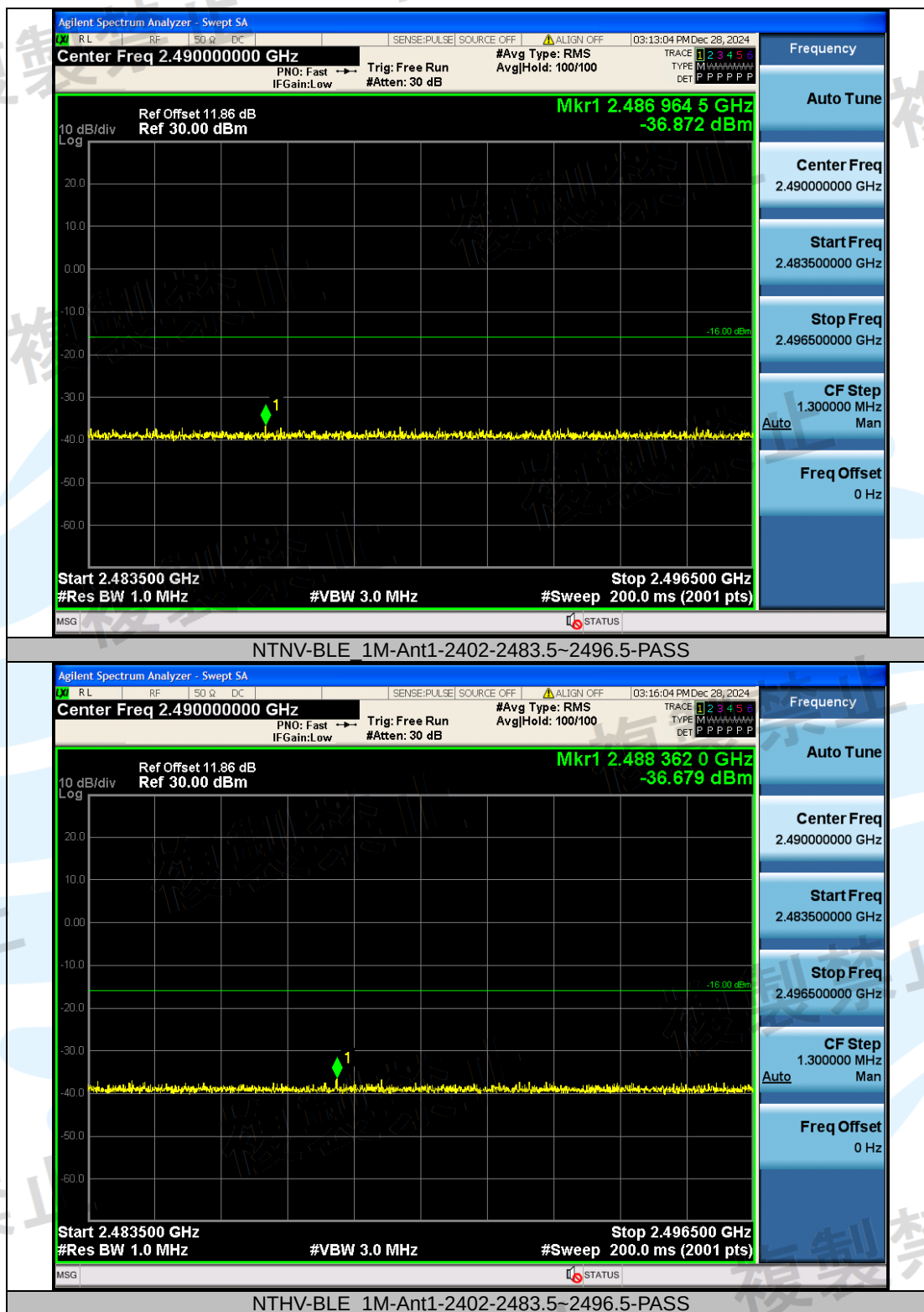
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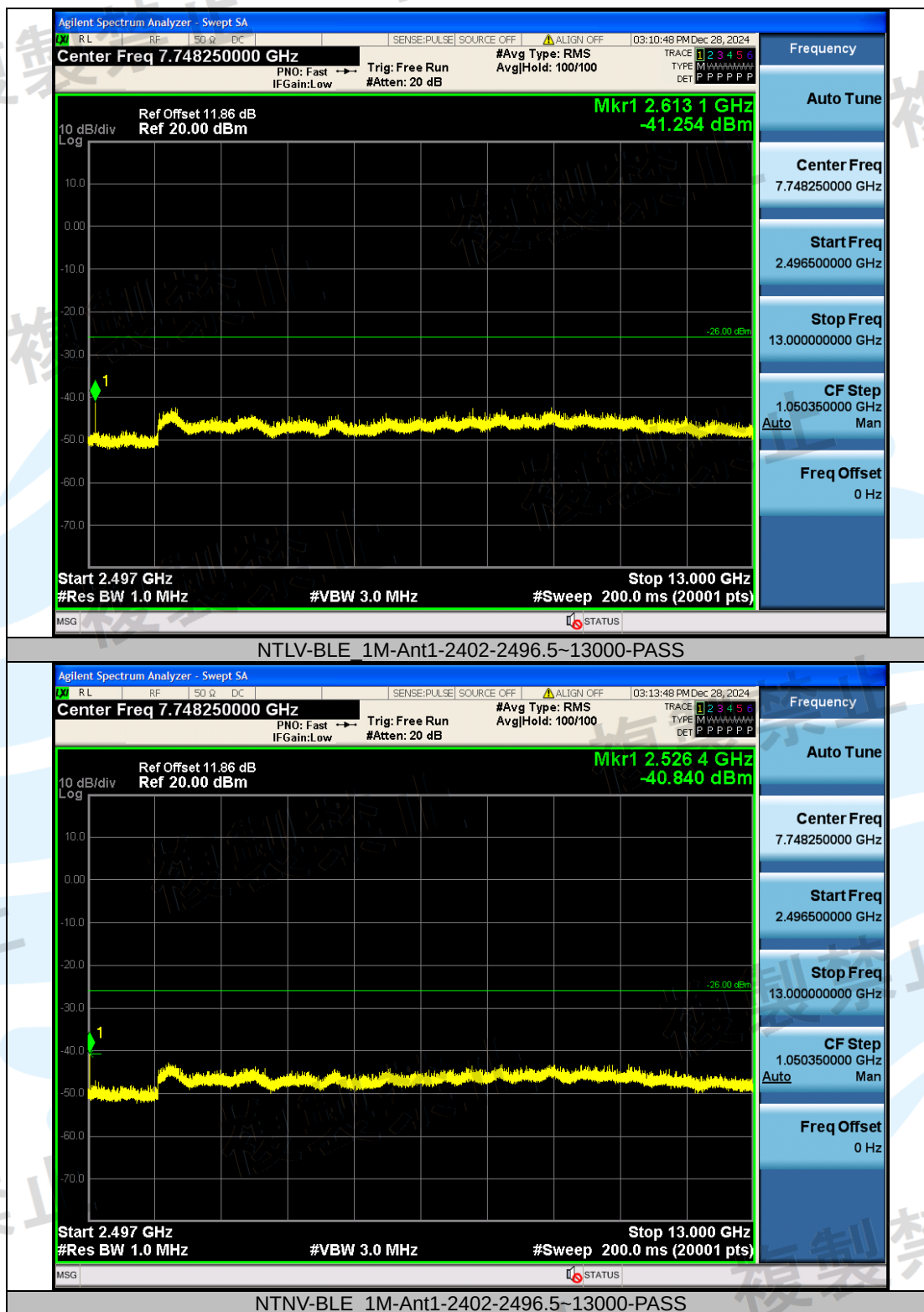
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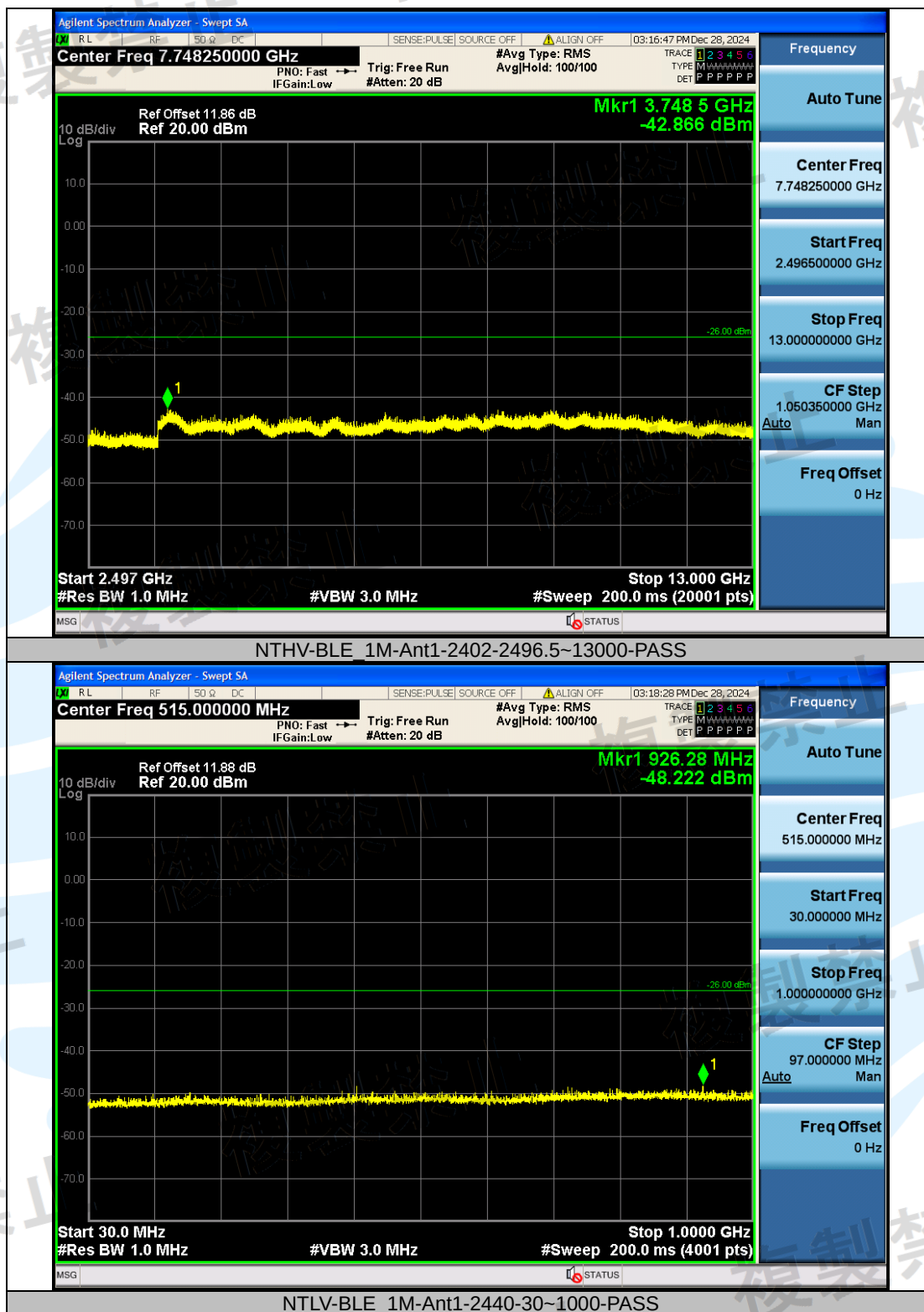
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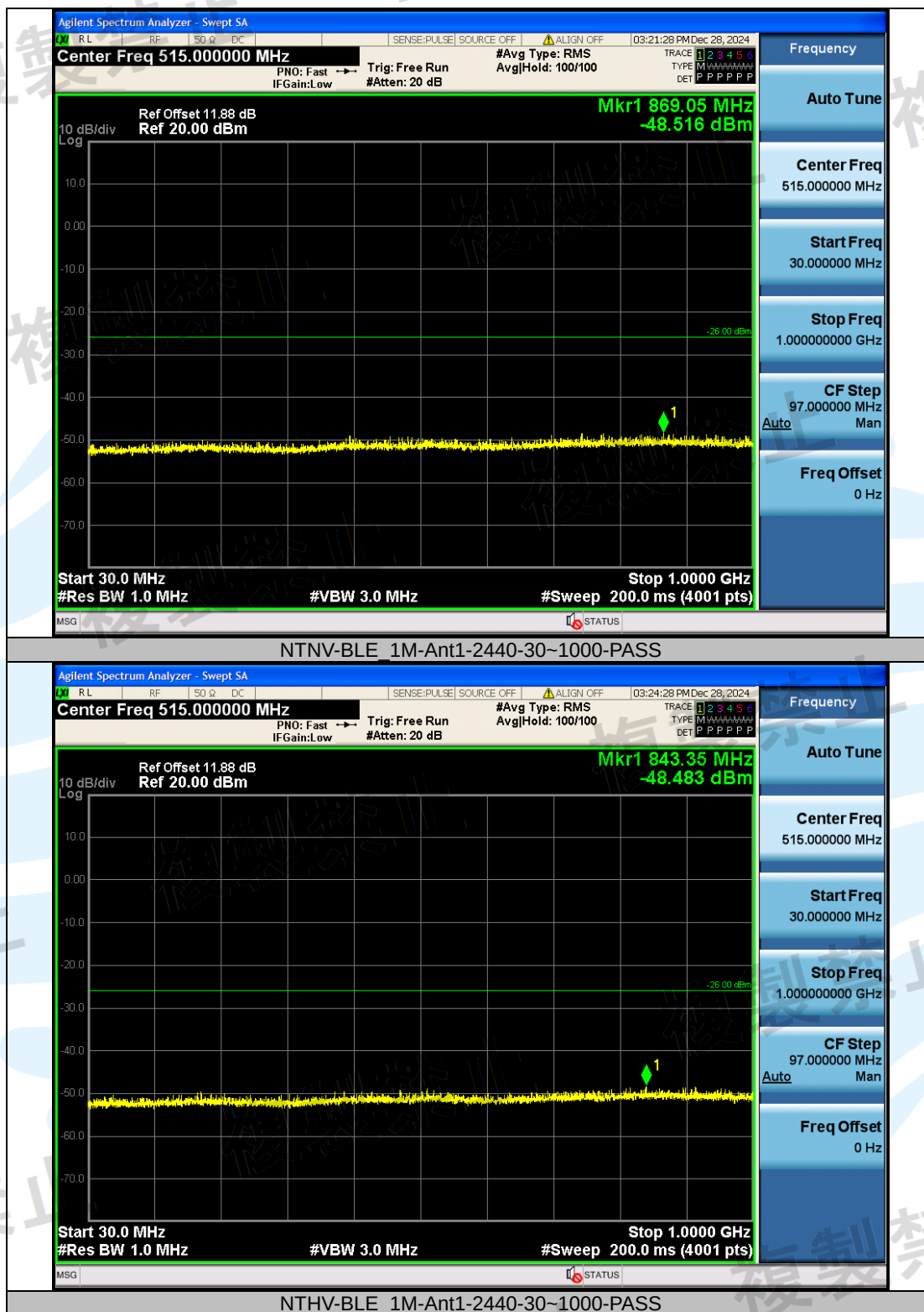
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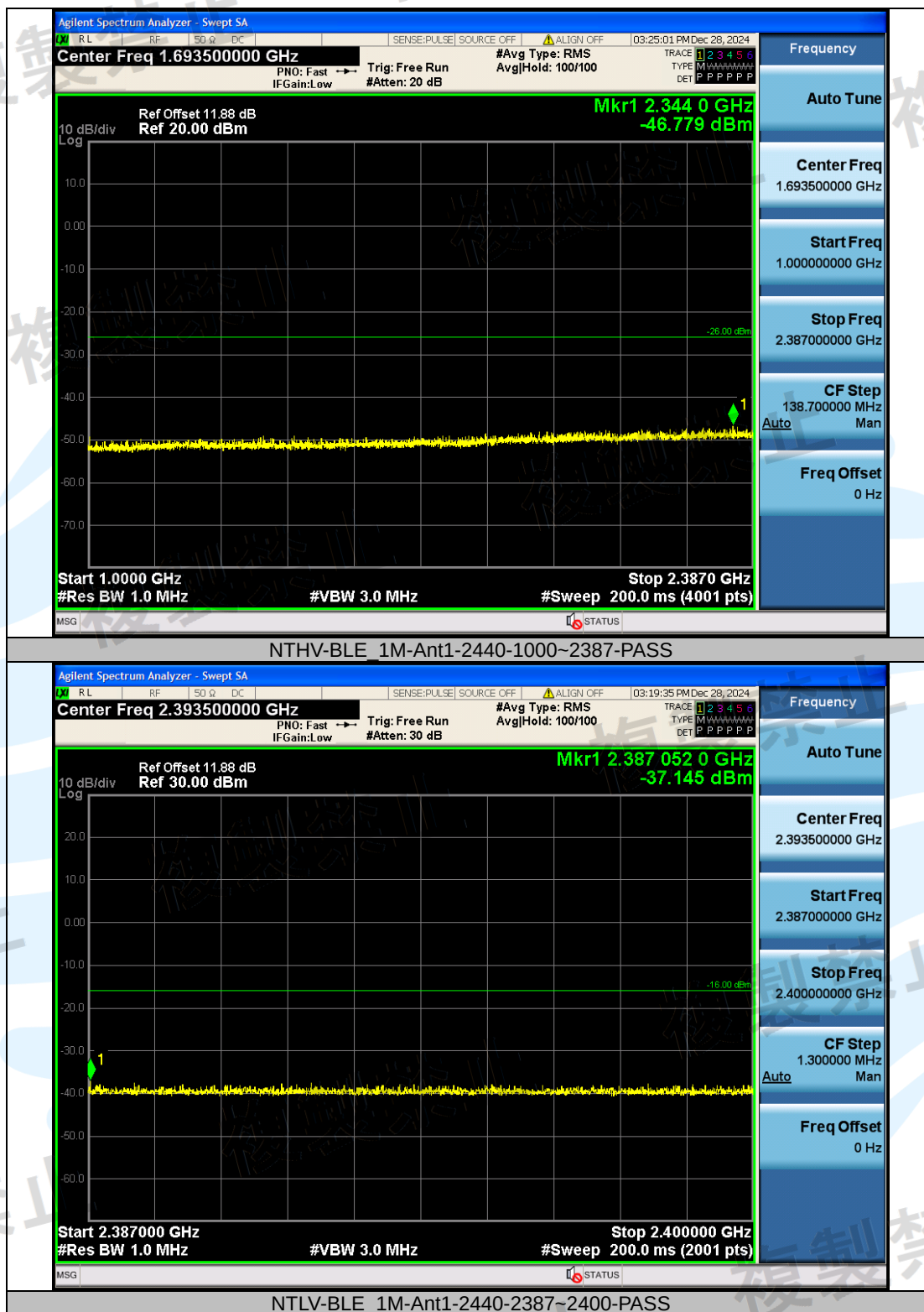
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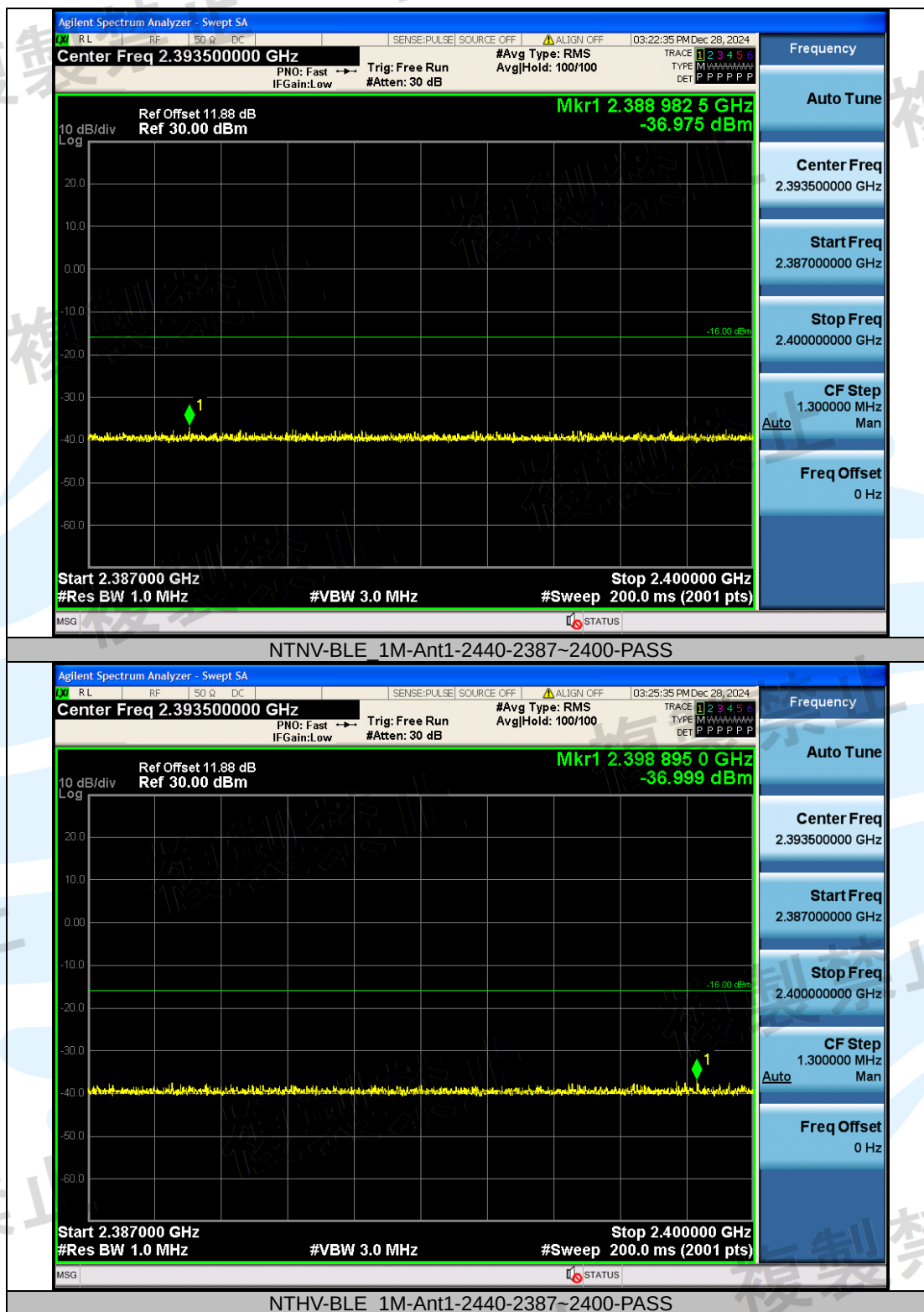
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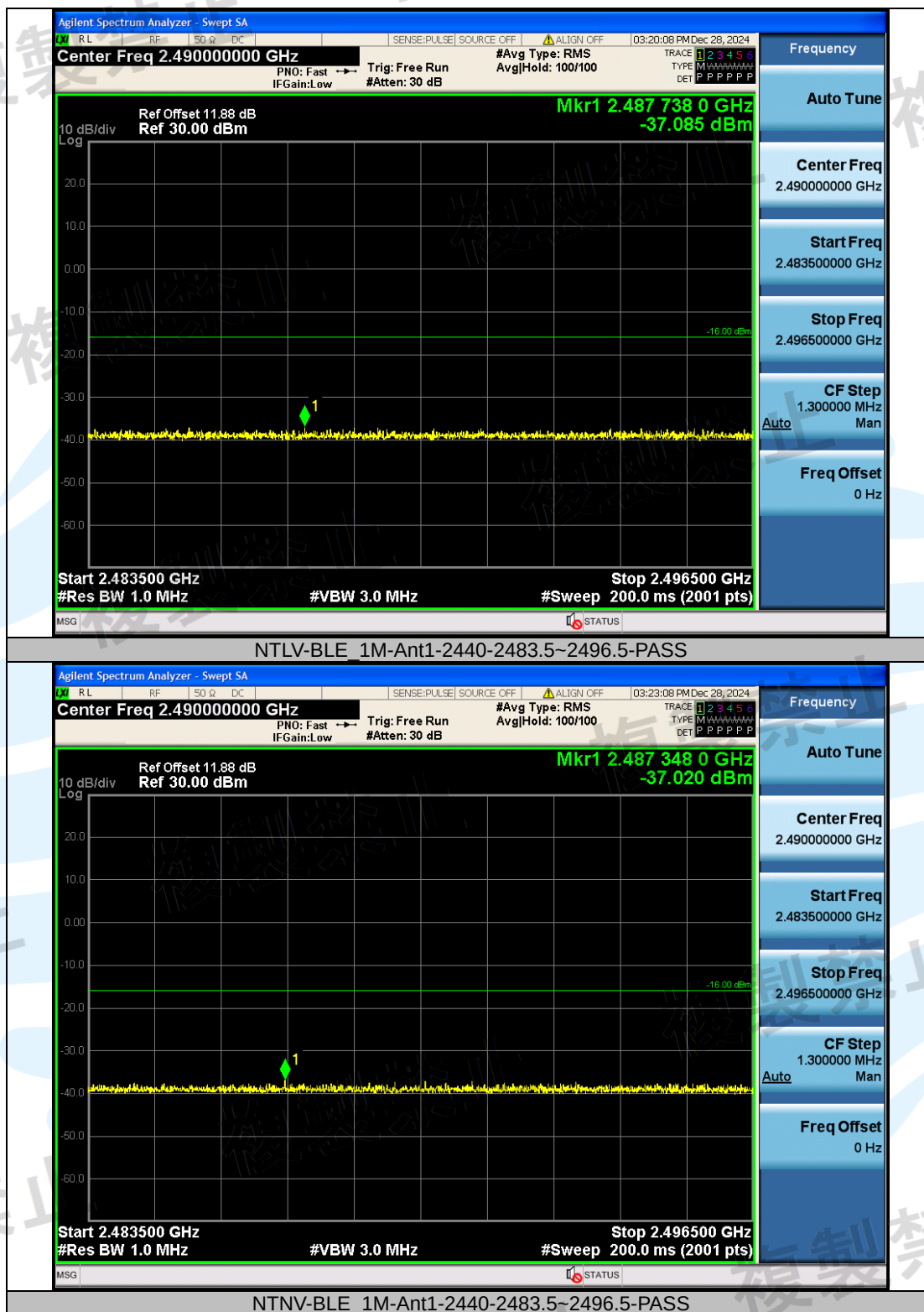
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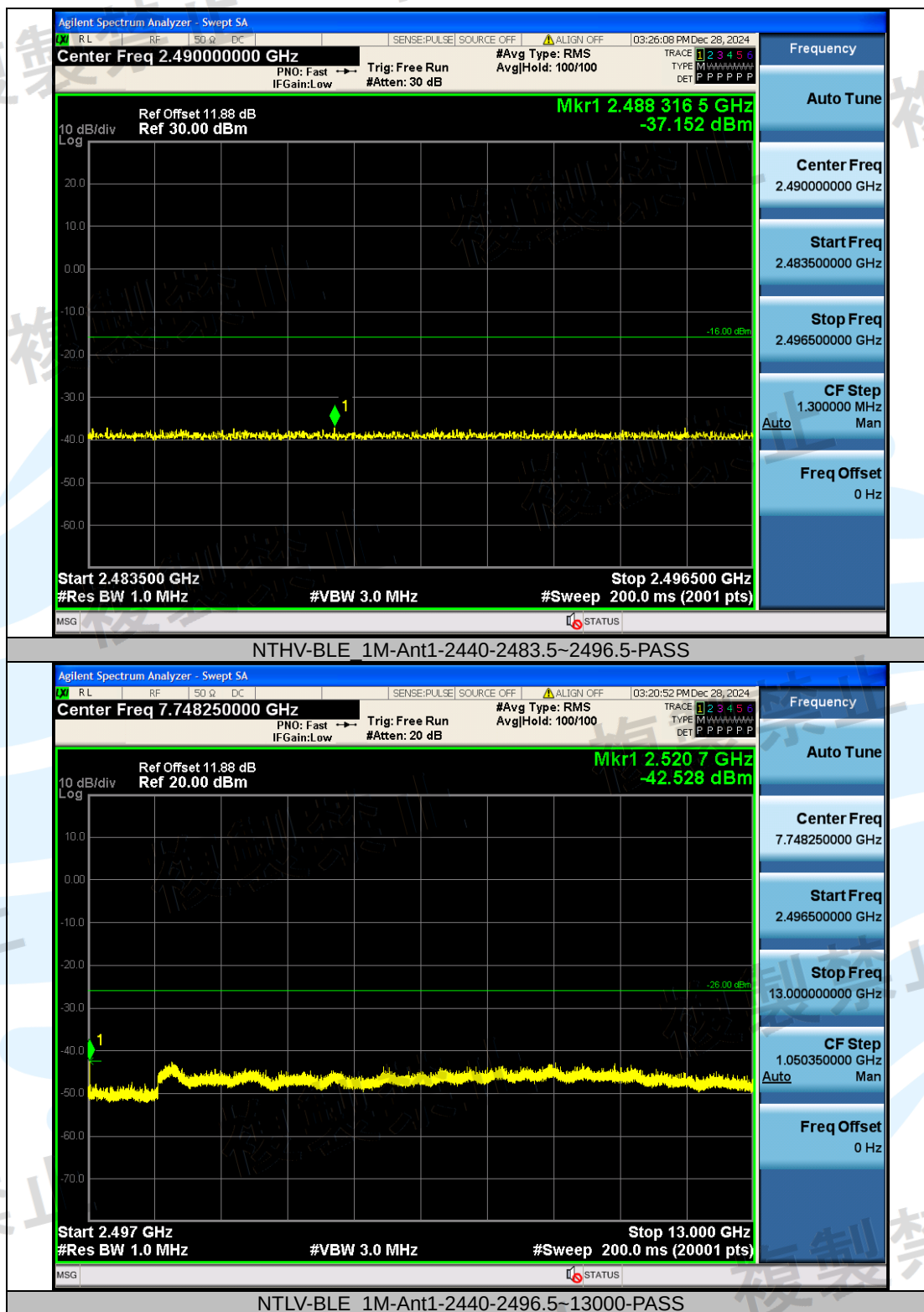
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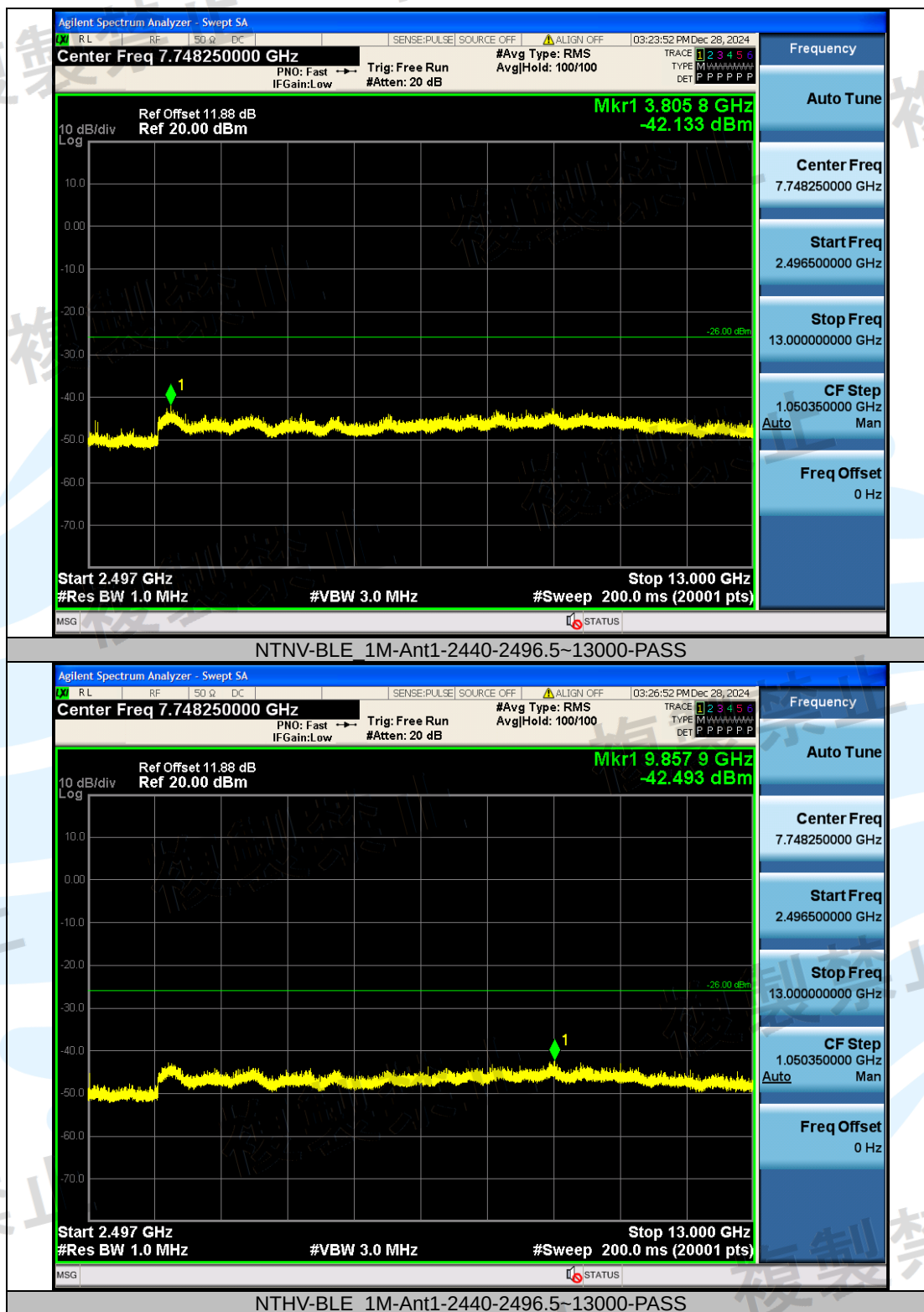
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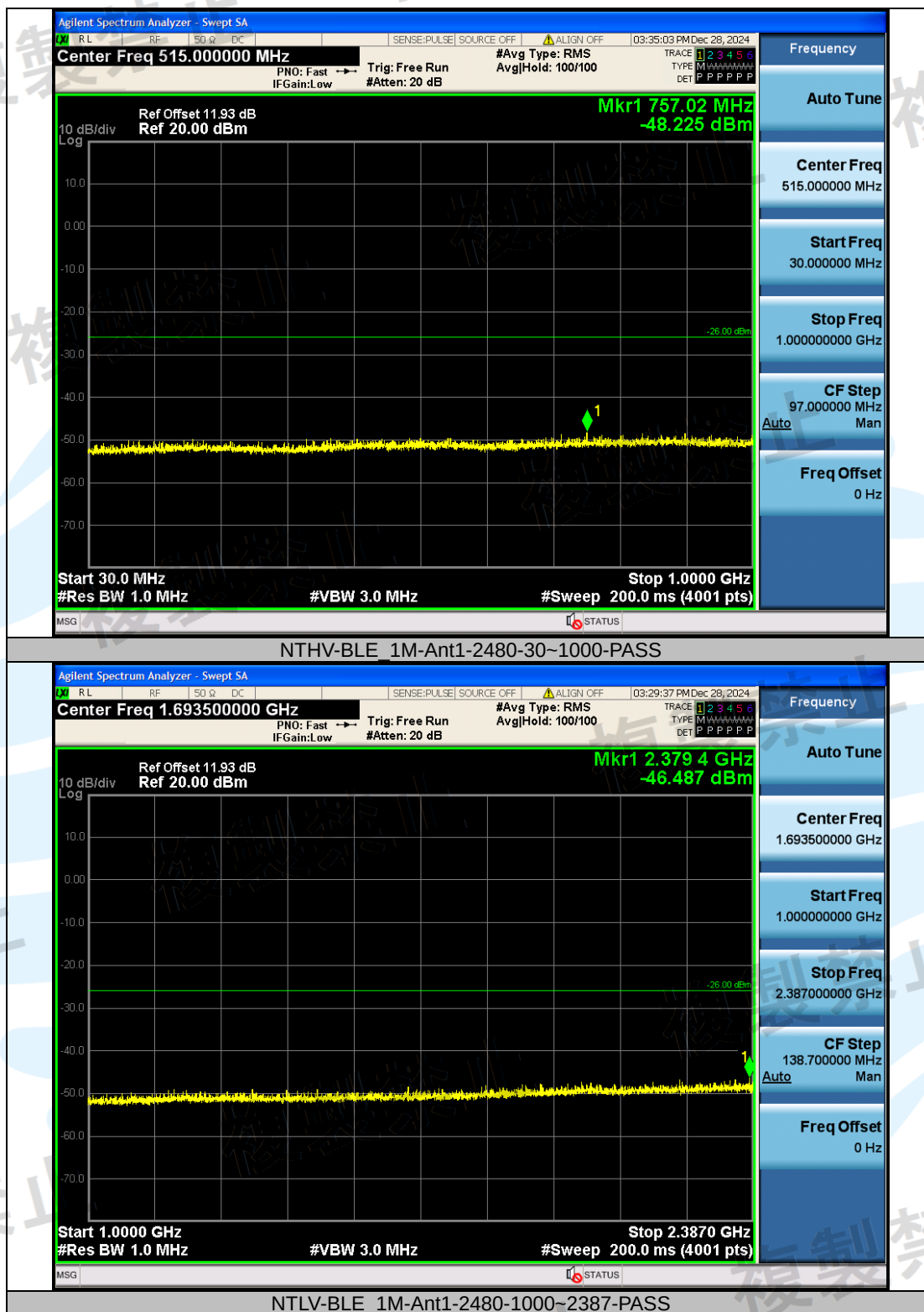
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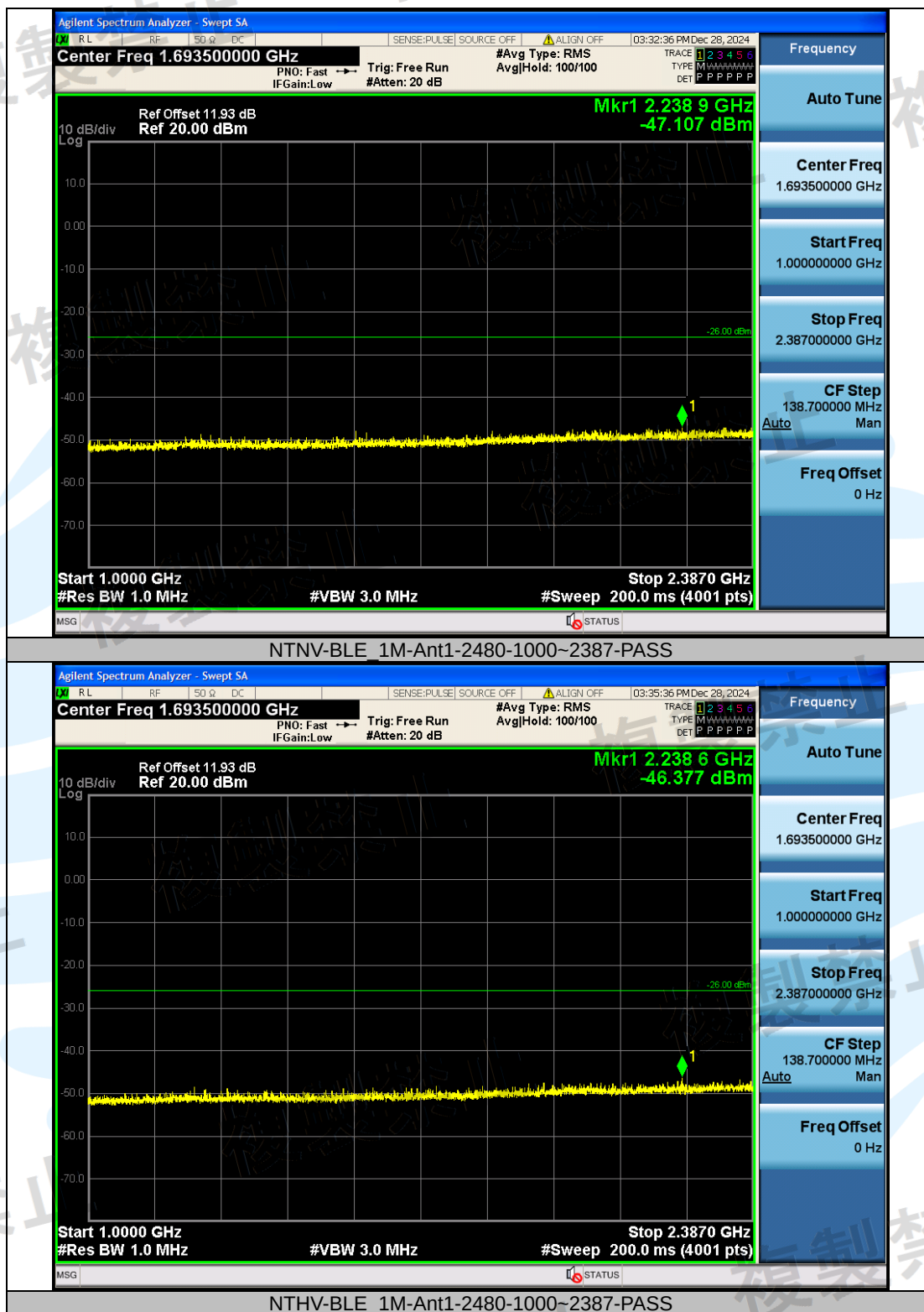
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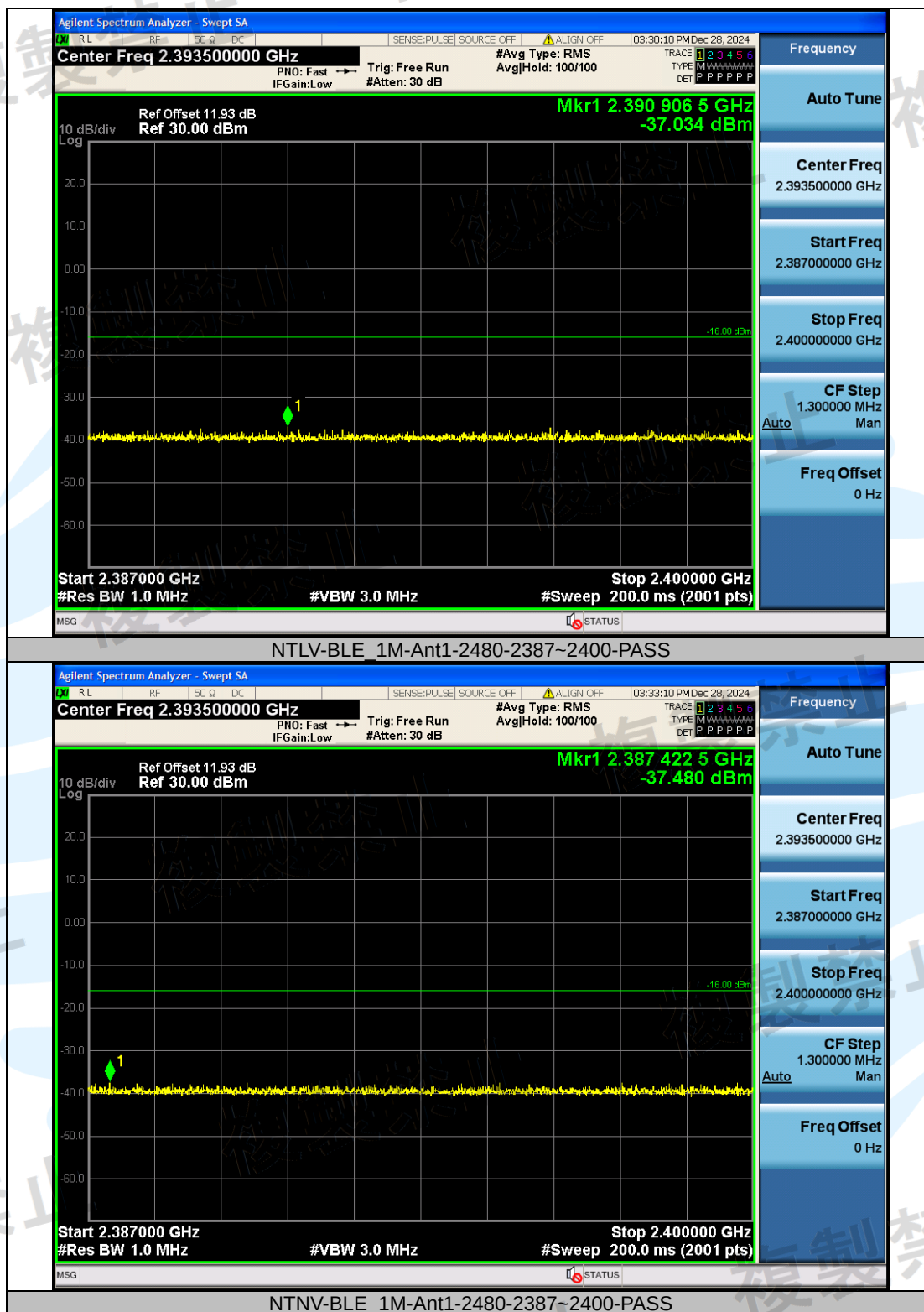
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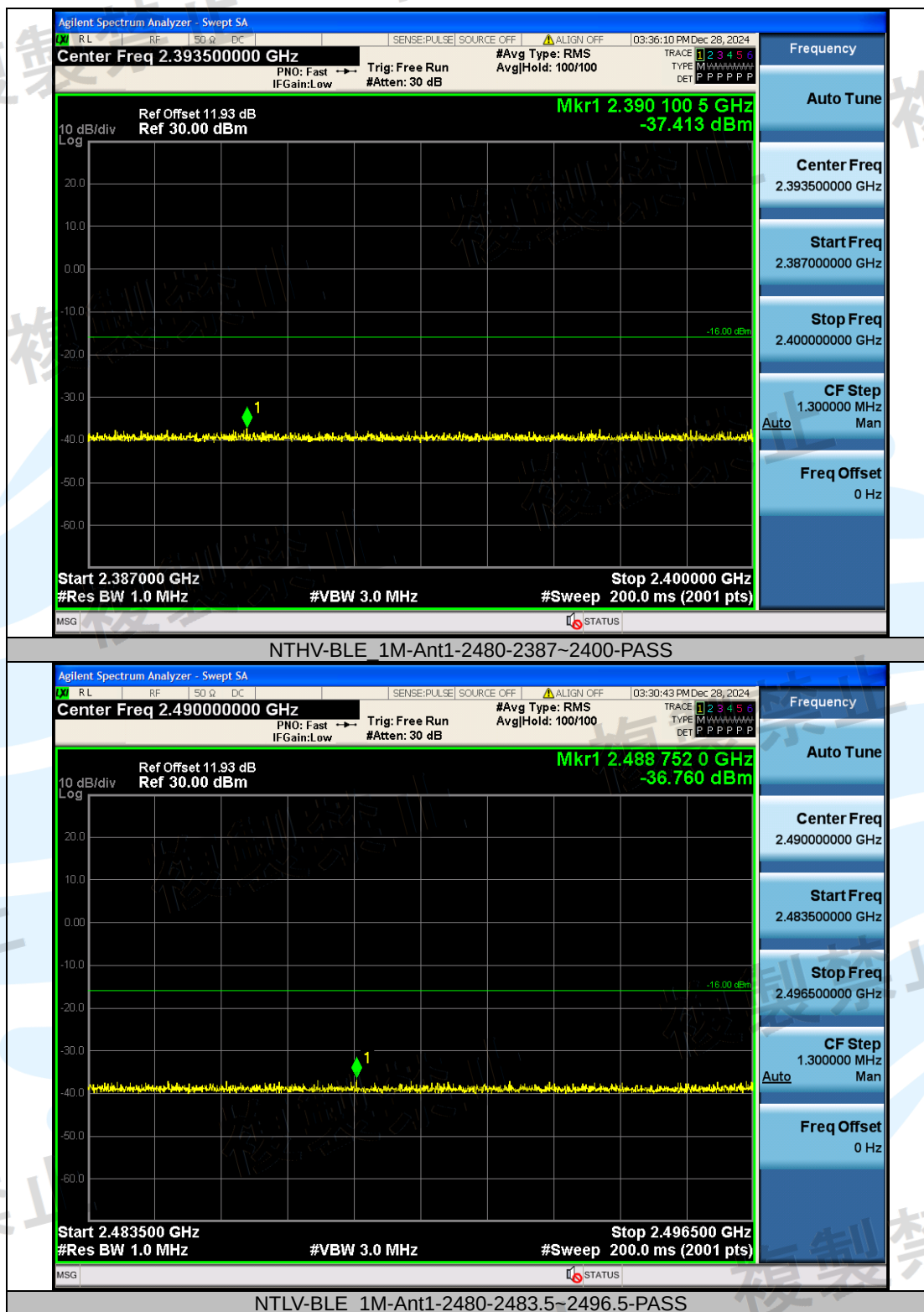
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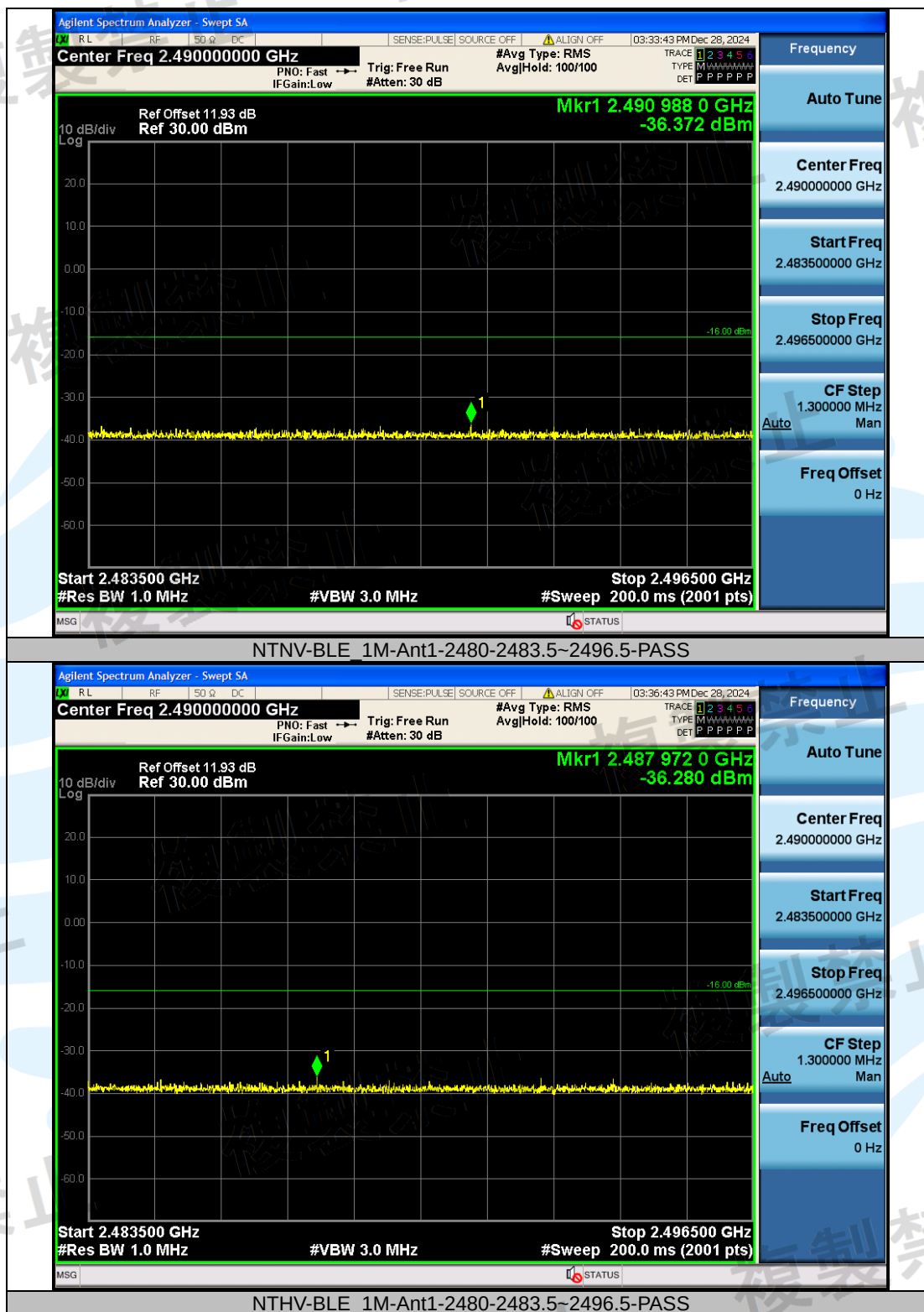
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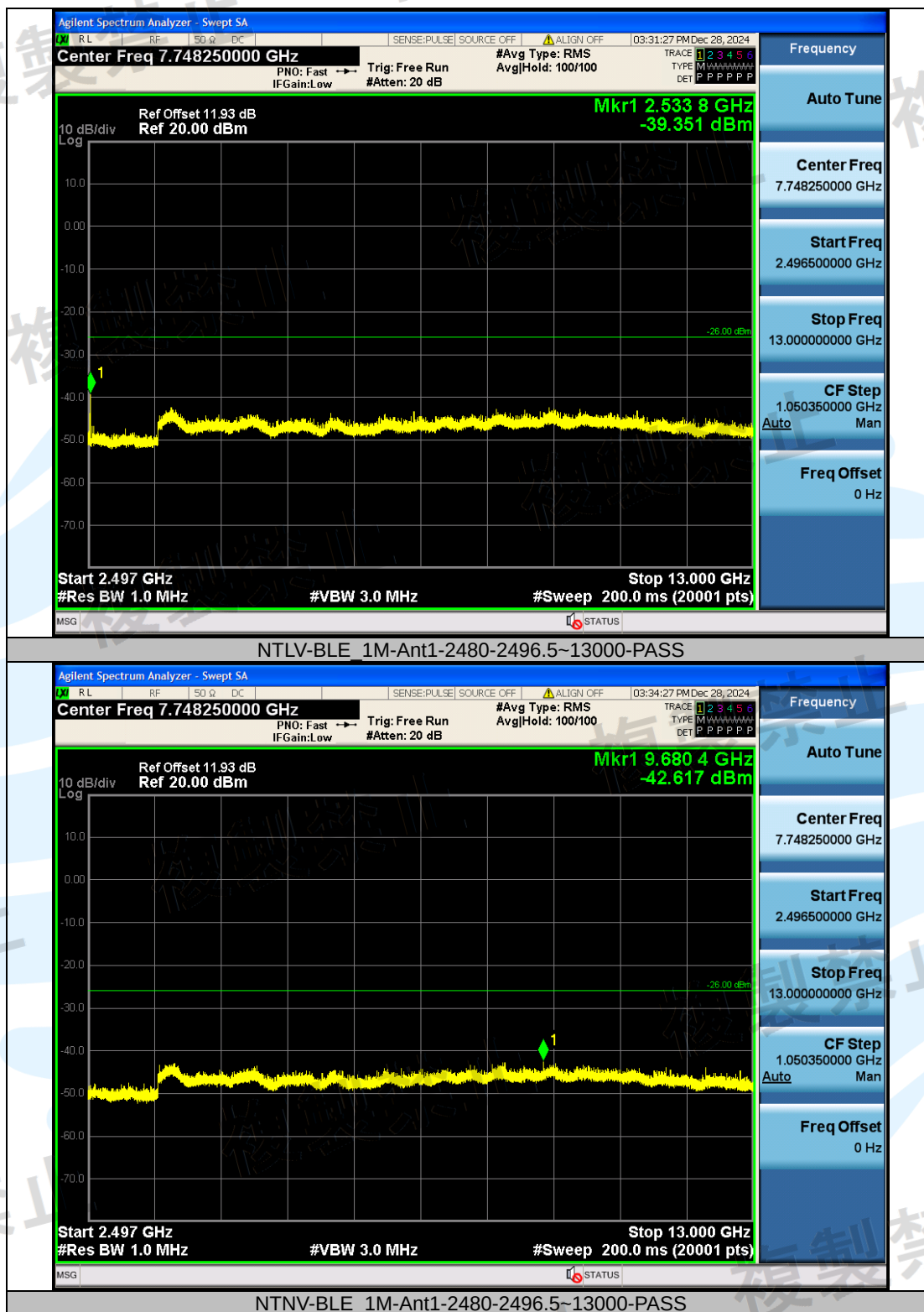
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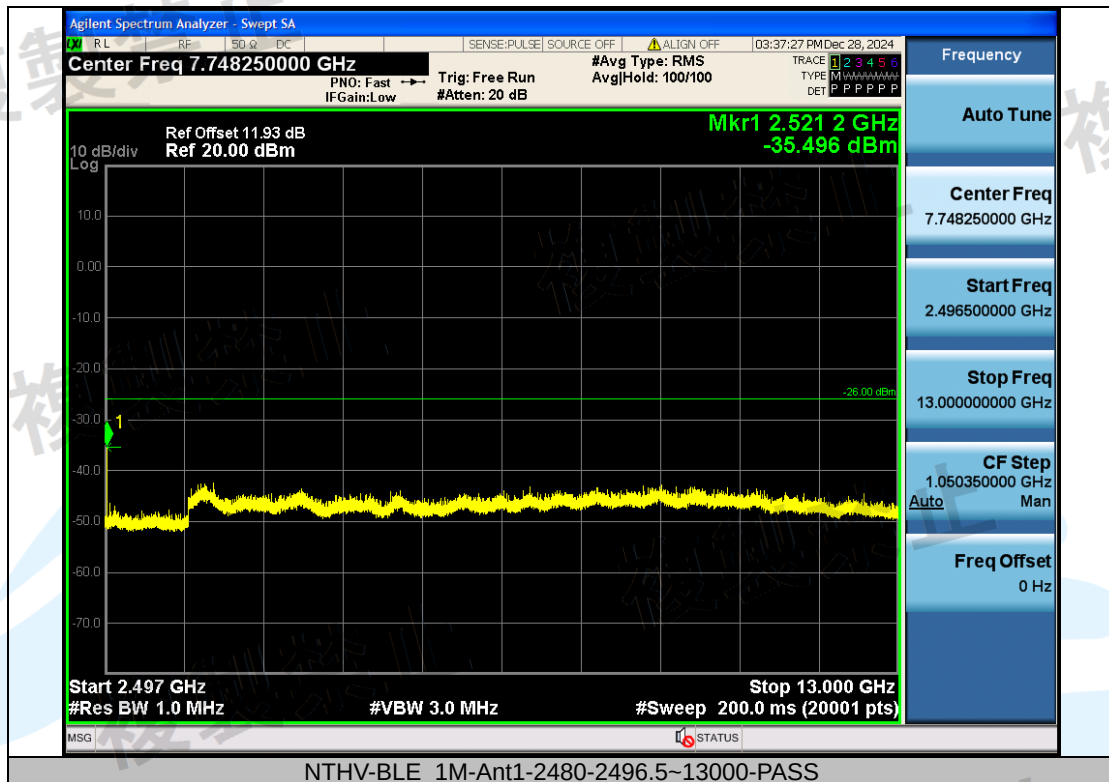
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5.7 ANTENNA POWER

5.7.1 Limit

Antenna power	EIRP (max)	
	Omni-directional case	Directional case
10mW	12.14 dBm	22.14 dBm
	16.367 mW	163.682 mW

Tolerance of antenna power shall be +20% (upper value) and -80% (lower value).

According article 49.20 f(2) The angular width of the principal radiation in the horizontal and vertical planes of the transmitting antenna shall not exceed the value obtained by the following expression. $360/A$ degree A represents the value determined by dividing an equivalent isotropically radiated power by the value obtained by applying an antenna power with the mean power of 10 mW to the transmitting antenna with its absolute gain being 2.14 dB, and shall be 1 when it is lower than 1

5.7.2 Test Setup

Refer to section 4.4 for details.

5.7.3 Instruments Used

Refer to section 3 for details

5.7.4 Test Procedures

1. A power meter is connected on the IF output port of the spectrum analyzer.
2. Adjust the spectrum analyzer to have the center frequency the same with the measured carrier. RBW=VBW=1MHz, detector mode is positive peak. Turn off the averaging function and use zero span.
3. The calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB.
4. Connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope: center frequency equal to operating frequency; RBW & VBW: 1 MHz; detector mode: positive peak; averaging: off; span: 3 times the spectrum width; amplitude: adjust for middle of the instrument's range. The frequency found shall be recorded.
5. Set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density "E".
6. Remove the EUT and put the replacing standard signal generator (SSG). Set the standard signal generator (SSG) at same frequency and transmit on, then set SSG output power at P_t to give the equivalent output level of "E".
7. Calculate antenna power density by the formula below $PD = P_t + 10 \cdot \log(1/x)$.
x: The duty cycle of the EUT in continuously transmitting mode
 P_t : Output power of the SSG
8. Antenna Power Error is definition that actual measure antenna power tolerance between + 20% to - 80% power range that base on manufacturer declare the conducted power density.

5.7.5 Test Result

Conducted antenna power

Test Voltage	Mode	Channel / Frequency (MHz)	Antenna power (dBm)	Antenna power density (mW)	Tolerance (%)	Rated power (mW)	Result
VN	LE	0/ 2402	-0.17	0.9616	-3.84	1.0 (-80%~+20%)	PASS
		19/ 2440	-0.38	0.9162	-8.38		PASS
		39/ 2480	-0.05	0.9886	-1.14		PASS
VL	LE	0/ 2402	0.09	1.0209	+2.09	1.0 (-80%~+20%)	PASS
		19/ 2440	-0.34	0.9247	-7.53		PASS
		39/ 2480	0.18	1.0423	+4.23		PASS
VH	LE	0/ 2402	-0.06	0.9863	-1.37	1.0 (-80%~+20%)	PASS
		19/ 2440	0.17	1.0399	+3.99		PASS
		39/ 2480	0.12	1.0280	+2.80		PASS

Radiated antenna power

Test Voltage	Mode	Channel / Frequency (MHz)	Antenna Gain (dBi)	Radiated RF output power (mW)	Radiated RF output power (dBm)
VN	LE	0/ 2402	+3.59	2.1979	3.42
		19/ 2440		2.0941	3.21
		39/ 2480		2.2594	3.54
VL	LE	0/ 2402		2.3335	3.68
		19/ 2440		2.1135	3.25
		39/ 2480		2.3823	3.77
VH	LE	0/ 2402		2.2542	3.53
		19/ 2440		2.3768	3.76
		39/ 2480		2.3496	3.71

Note: 1. The maximum EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

2. The EIRP is less than Limit, HBPA is not necessary.

5.8 SPURIOUS EMISSIONS OF RECEIVER

5.8.1 Limit

Frequency (MHz)	Limit	
	nW	dBm
Below 1GHz	≤ 4	-54
Above 1GHz	≤ 20	-47

5.8.2 Test Setup

Refer to section 4.4 for details.

5.8.3 Instruments Used

Refer to section 3 for details

5.8.4 Test Procedures

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

- c) Below 1GHz
 - 7. Set RBW = VBW = 100 kHz.
 - 8. Detector = peak.
 - 9. Sweep = auto couple.
 - 10. Trace Mode = max hold.
 - 11. Allow trace to fully stabilize.
 - 12. Use the peak marker function to determine the maximum amplitude level.
- d) Above 1GHz
 - 7. Set RBW = VBW = 1 MHz.
 - 8. Detector = peak.
 - 9. Sweep = auto couple.
 - 10. Trace Mode = max hold.
 - 11. Allow trace to fully stabilize.
 - 12. Use the peak marker function to determine the maximum amplitude level.

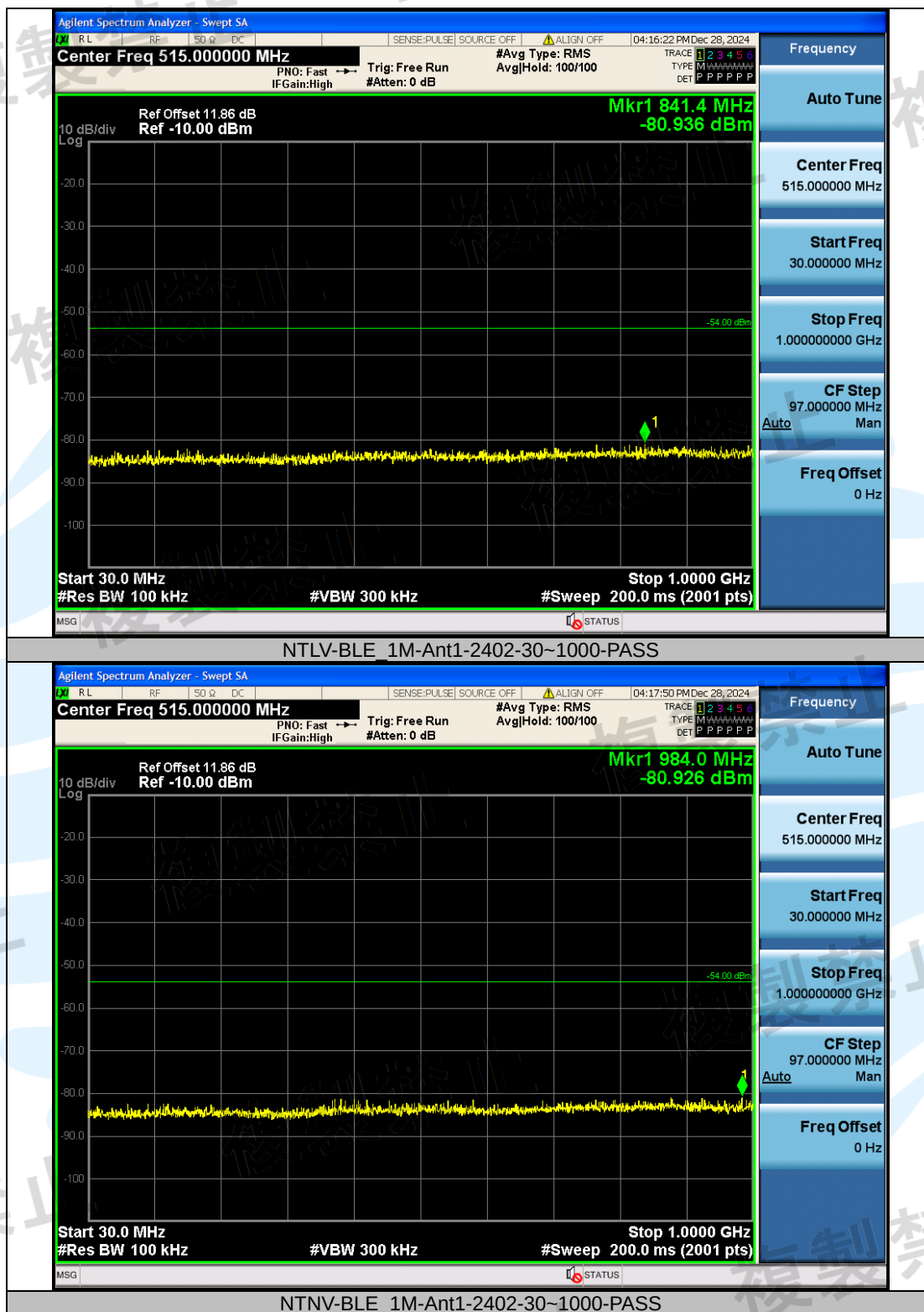
5.8.5 Test Result

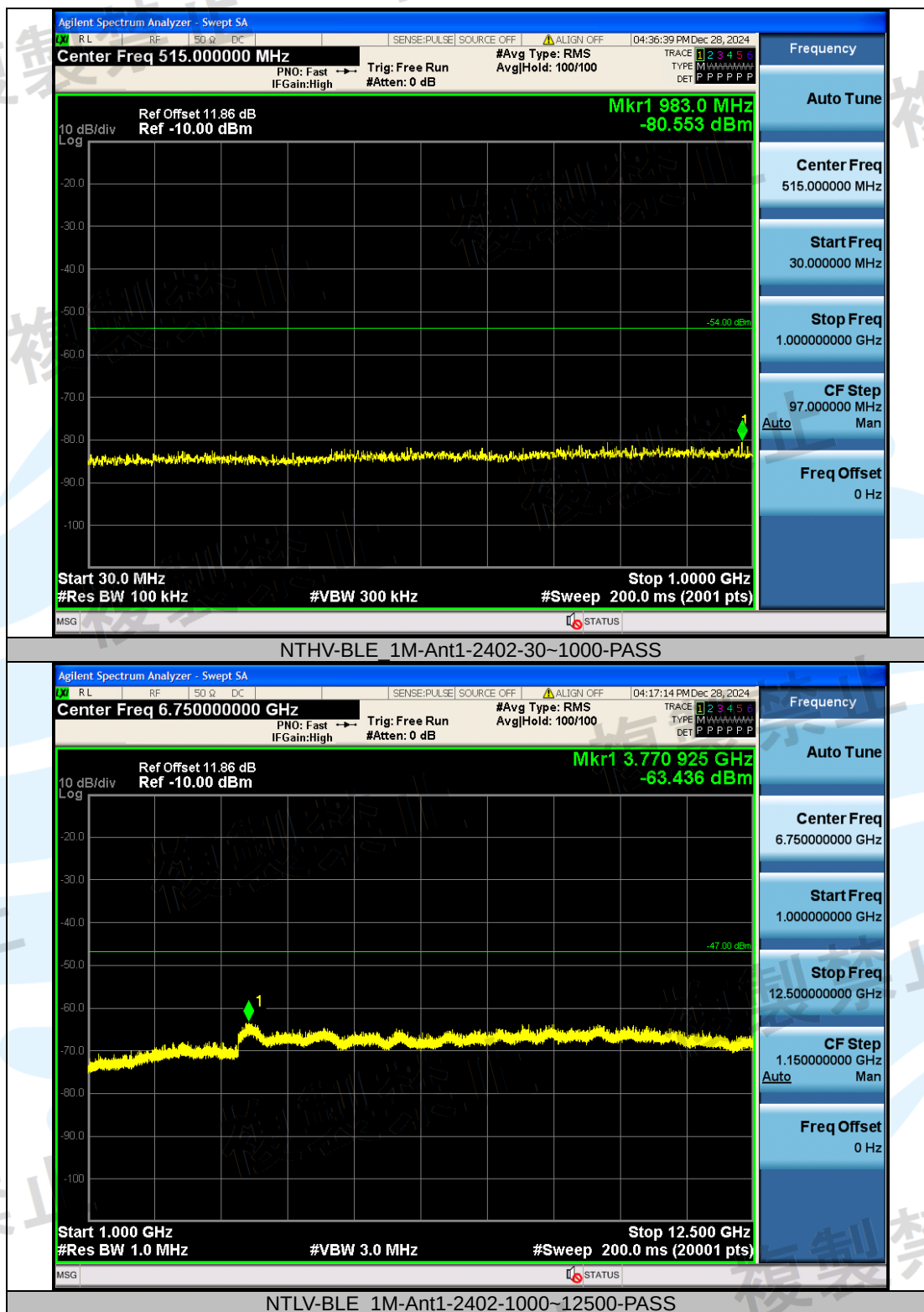
Test Condition	Test Mode	Antenna	Freq (MHz)	Freq. Range [MHz]	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [nW]	Limit [nW]	Verdict
NTLV	BLE_1M	Ant1	2402	30~1000	841.41	-80.94	≤-54	0.00805	≤4	PASS
NTNV	BLE_1M	Ant1	2402	30~1000	984.00	-80.93	≤-54	0.00807	≤4	PASS
NTHV	BLE_1M	Ant1	2402	30~1000	983.03	-80.55	≤-54	0.00881	≤4	PASS
NTLV	BLE_1M	Ant1	2402	1000~12500	3770.93	-63.44	≤-47	0.45290	≤20	PASS
NTNV	BLE_1M	Ant1	2402	1000~12500	3810.60	-61.73	≤-47	0.67143	≤20	PASS
NTHV	BLE_1M	Ant1	2402	1000~12500	2465.68	-59.68	≤-47	1.07647	≤20	PASS
NTLV	BLE_1M	Ant1	2440	30~1000	816.19	-80.70	≤-54	0.00851	≤4	PASS
NTNV	BLE_1M	Ant1	2440	30~1000	907.85	-80.43	≤-54	0.00906	≤4	PASS
NTHV	BLE_1M	Ant1	2440	30~1000	790.48	-81.30	≤-54	0.00741	≤4	PASS
NTLV	BLE_1M	Ant1	2440	1000~12500	2415.65	-54.03	≤-47	3.95367	≤20	See table below
NTNV	BLE_1M	Ant1	2440	1000~12500	3781.28	-63.10	≤-47	0.48978	≤20	PASS
NTHV	BLE_1M	Ant1	2440	1000~12500	2401.85	-51.56	≤-47	6.98232	≤20	See table below
NTLV	BLE_1M	Ant1	2480	30~1000	903.00	-80.54	≤-54	0.00883	≤4	PASS
NTNV	BLE_1M	Ant1	2480	30~1000	823.95	-80.59	≤-54	0.00873	≤4	PASS
NTHV	BLE_1M	Ant1	2480	30~1000	881.18	-80.77	≤-54	0.00838	≤4	PASS
NTLV	BLE_1M	Ant1	2480	1000~12500	2426	-47.03	≤-47	19.81527	≤20	See table below
NTNV	BLE_1M	Ant1	2480	1000~12500	3838.78	-62.84	≤-47	0.52000	≤20	PASS
NTHV	BLE_1M	Ant1	2480	1000~12500	2465.68	-55.57	≤-47	2.77332	≤20	See table below

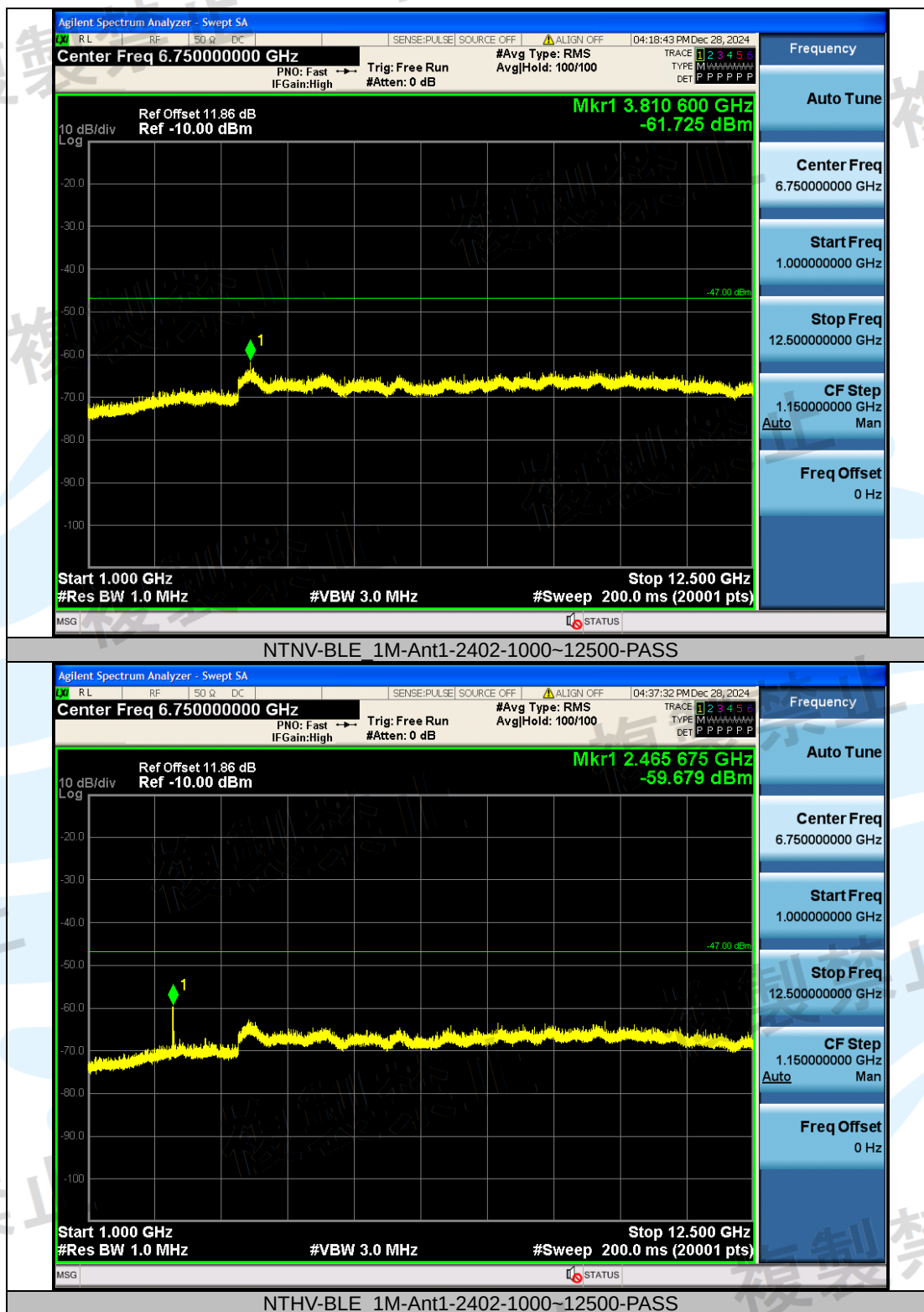
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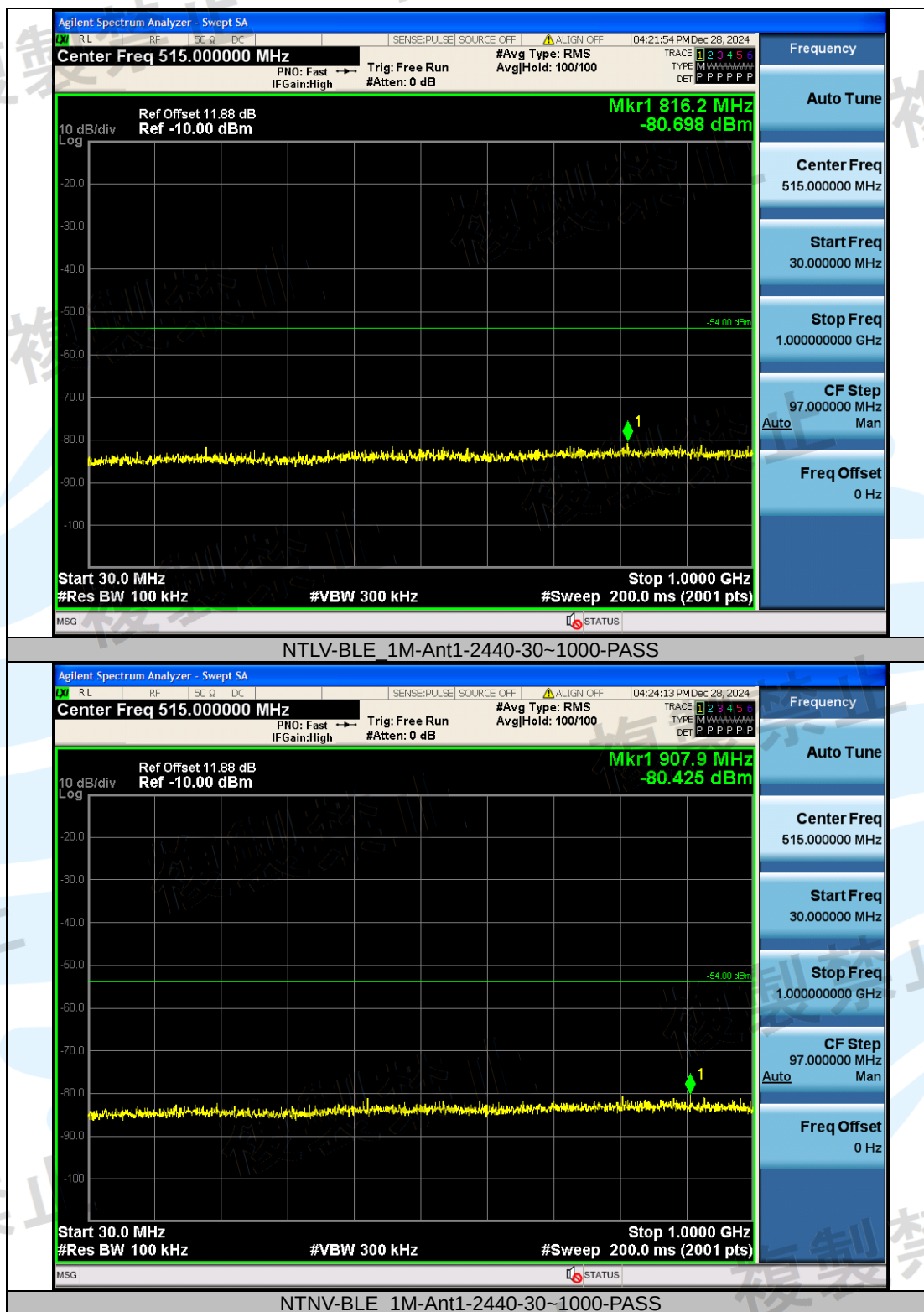
Test Condition	Test Mode	Antenna	Freq (MHz)	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [nW]	Limit [nW]	Verdict
NTLV	BLE_1M	Ant1	2440	2415.65	-71.31	≤-47	0.07396	≤20	PASS
NTHV	BLE_1M	Ant1	2440	2401.85	-71.83	≤-47	0.06561	≤20	PASS
NTLV	BLE_1M	Ant1	2480	2426.00	-73.84	≤-47	0.04130	≤20	PASS
NTHV	BLE_1M	Ant1	2480	2465.68	-70.69	≤-47	0.08531	≤20	PASS

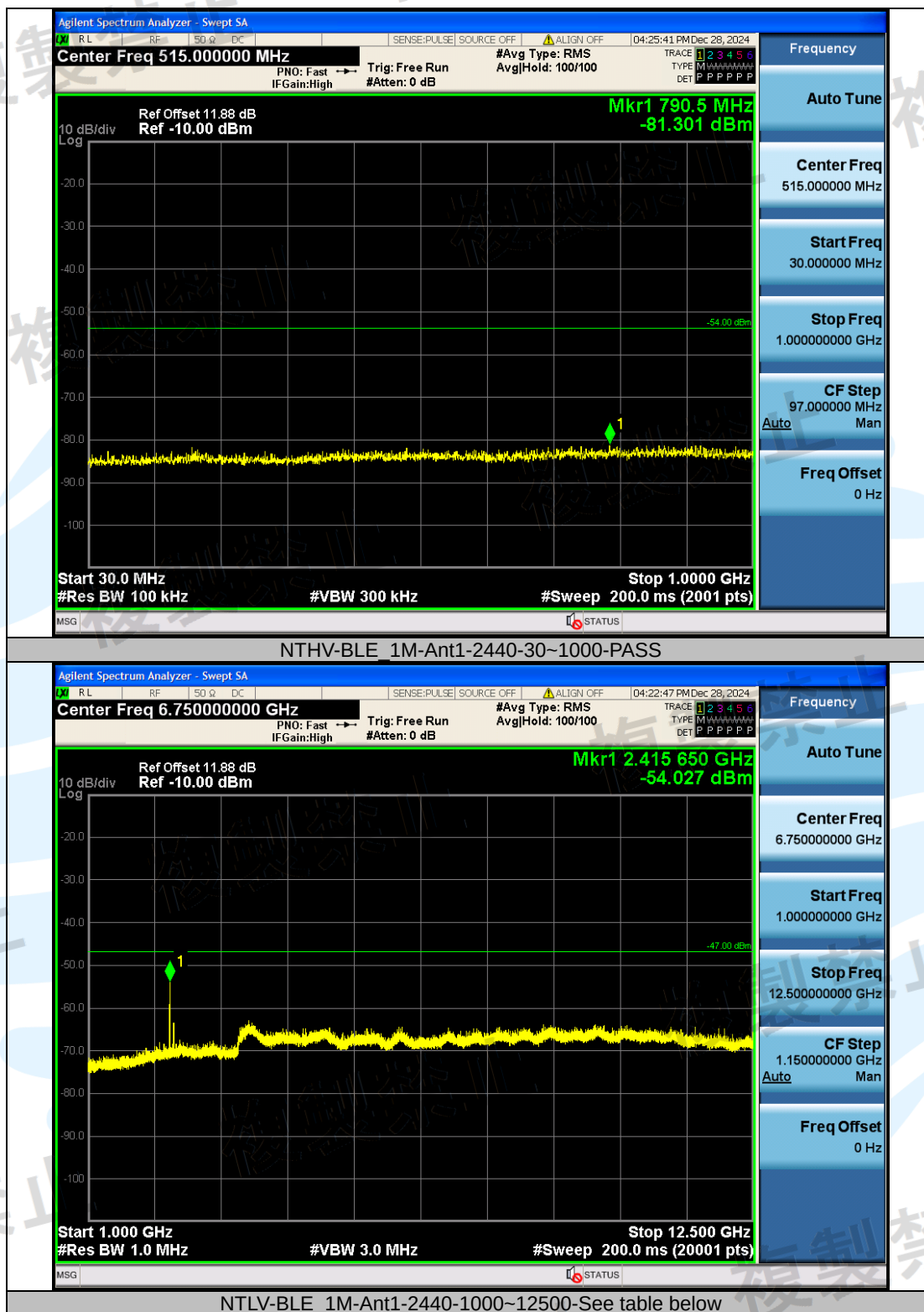
Note: For 30MHz-1GHz, Due to measurement RBW is 100 kHz, so add $10 \cdot \log(1 \text{ MHz}/0.1 \text{ MHz})$ to the Measured Value.









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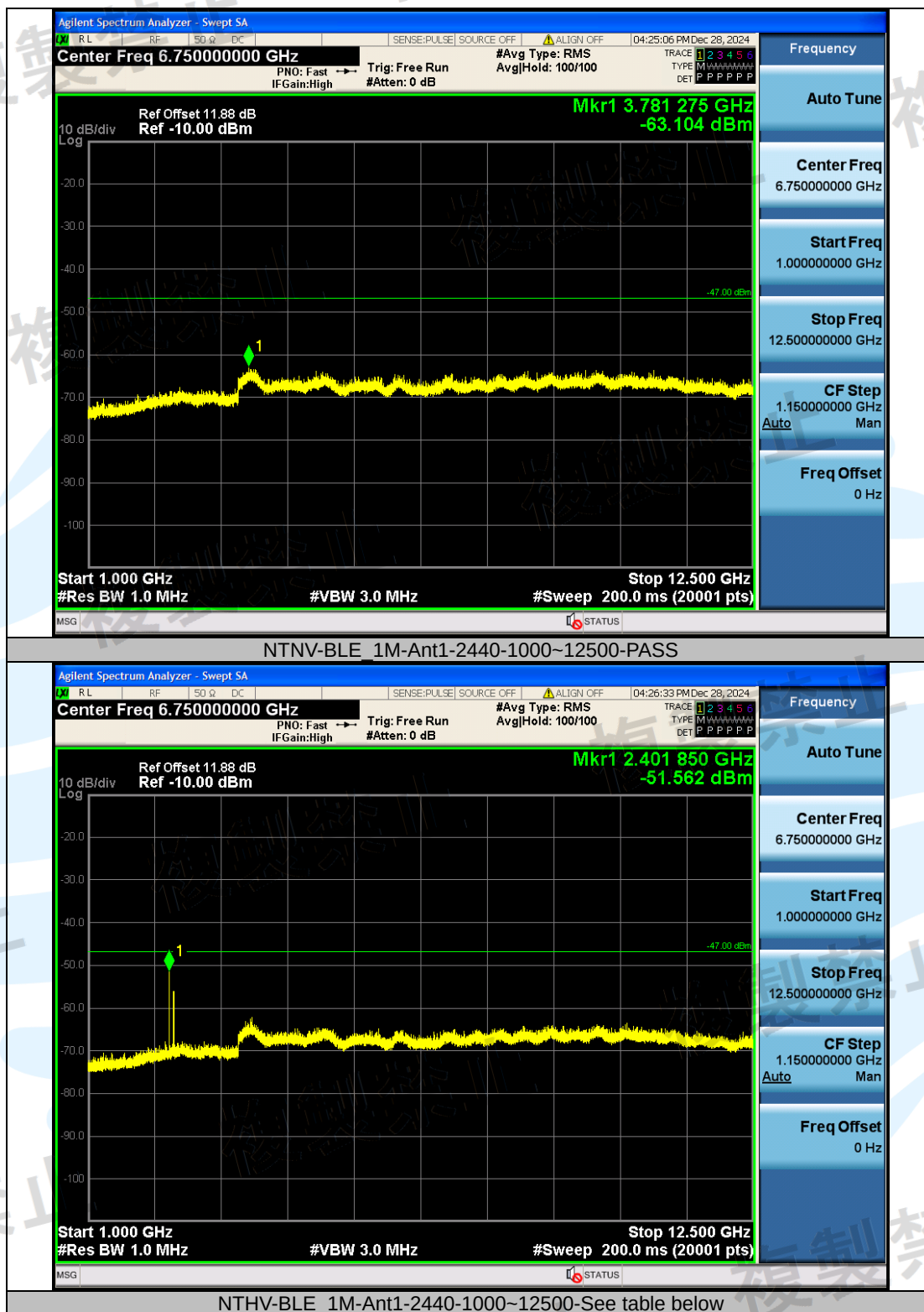
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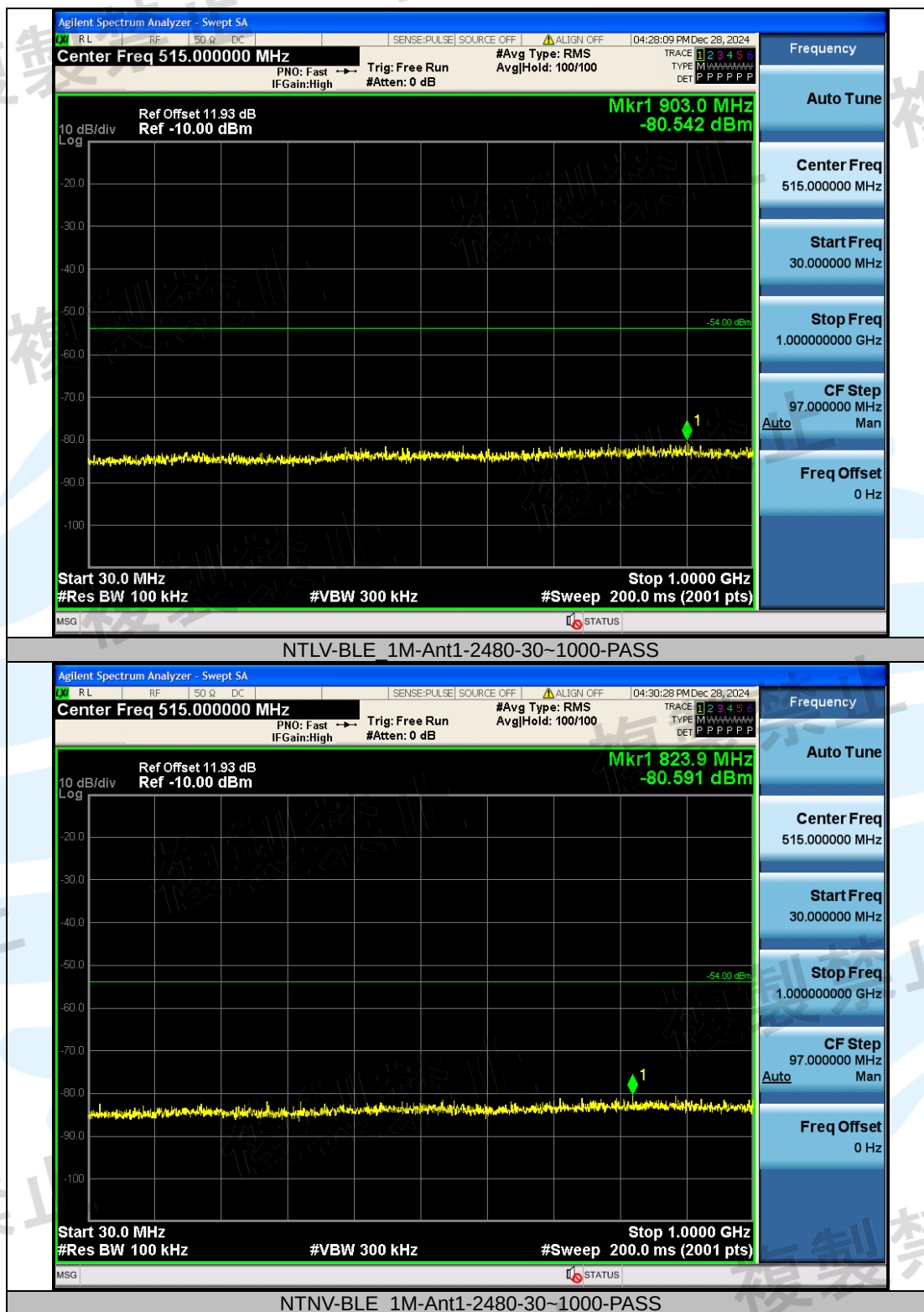
Fax: +86-755-28230886

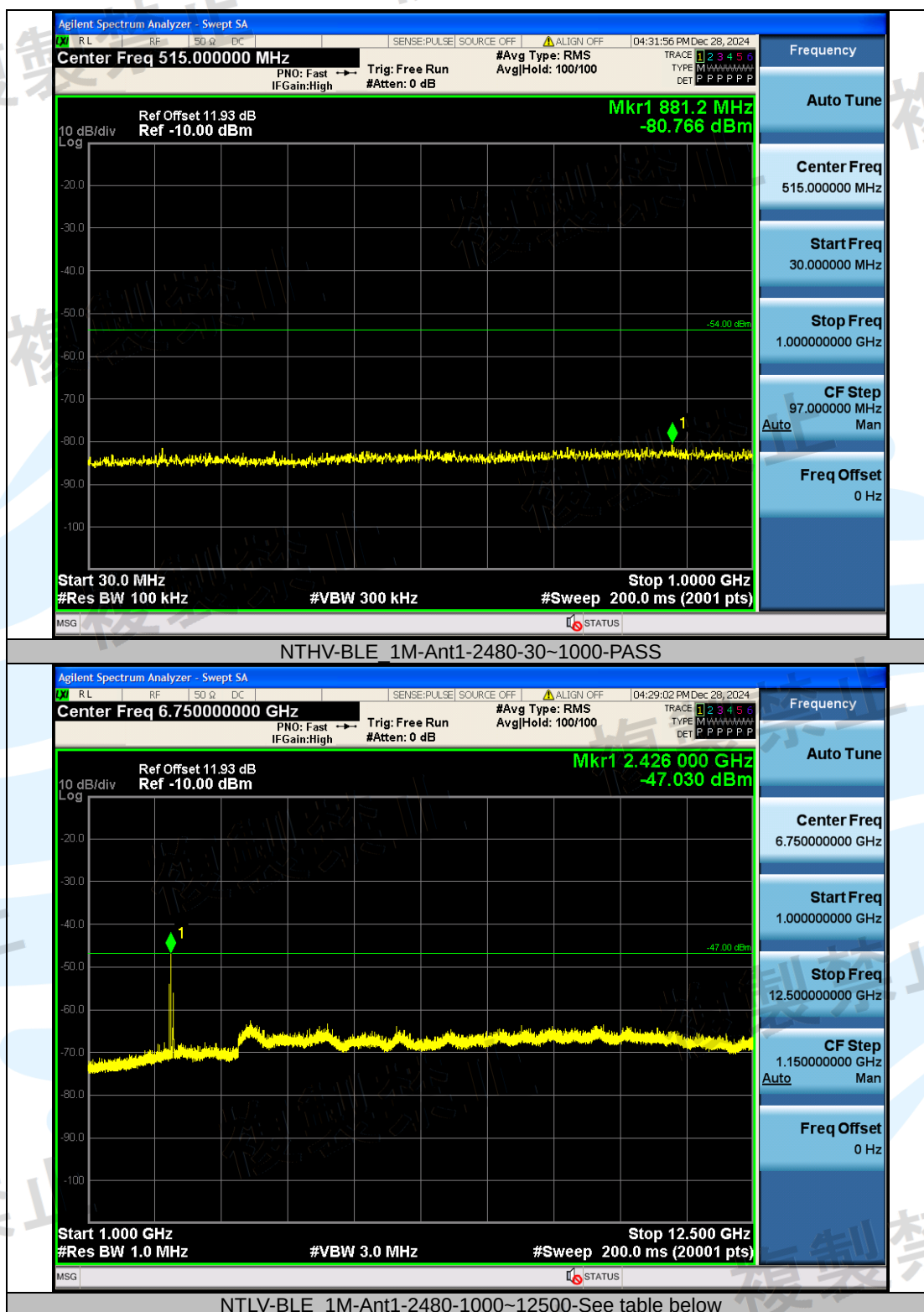
E-mail: info@uttlab.com

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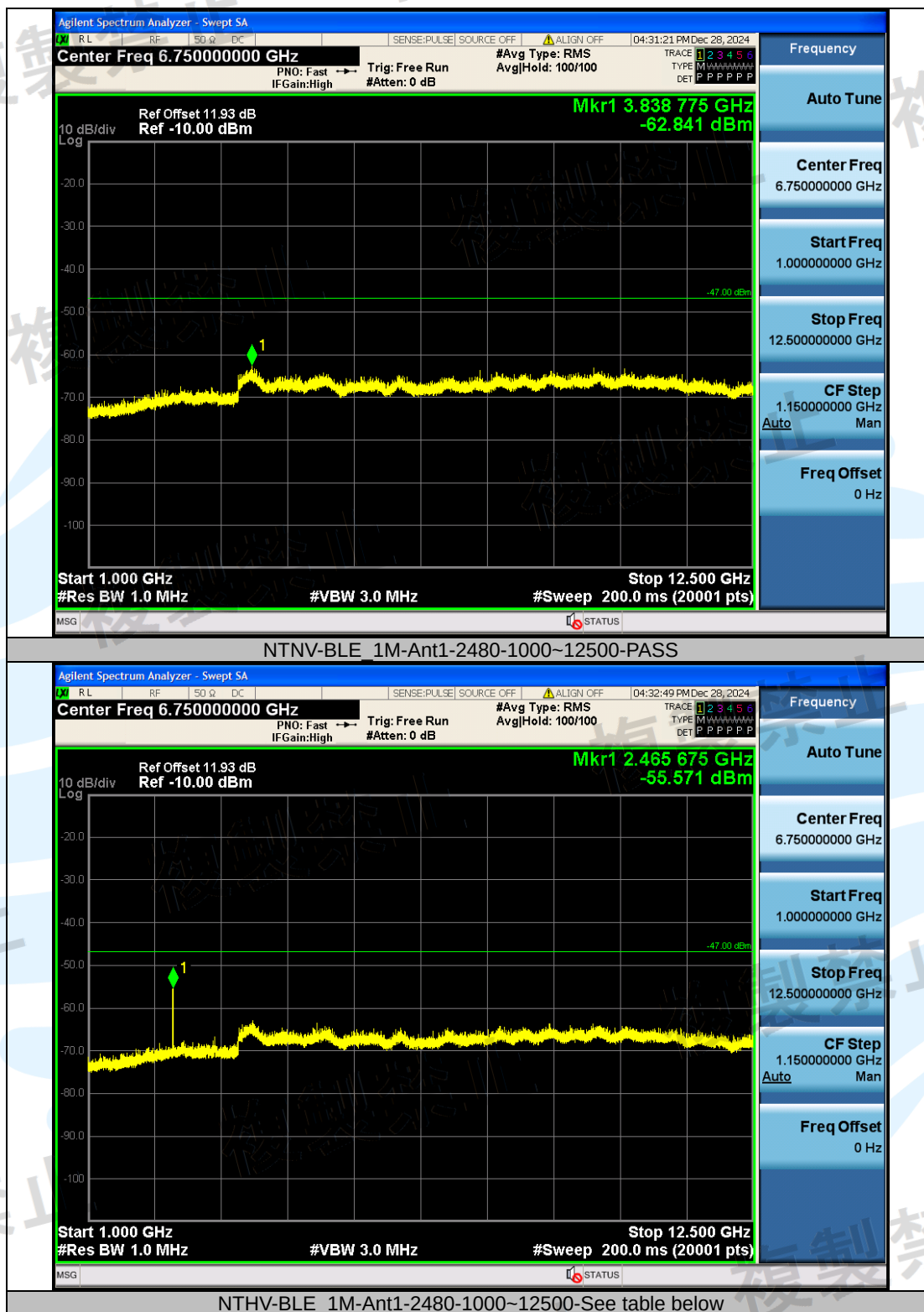
Tel: +86-755-28230886

Fax: +86-755-28230886

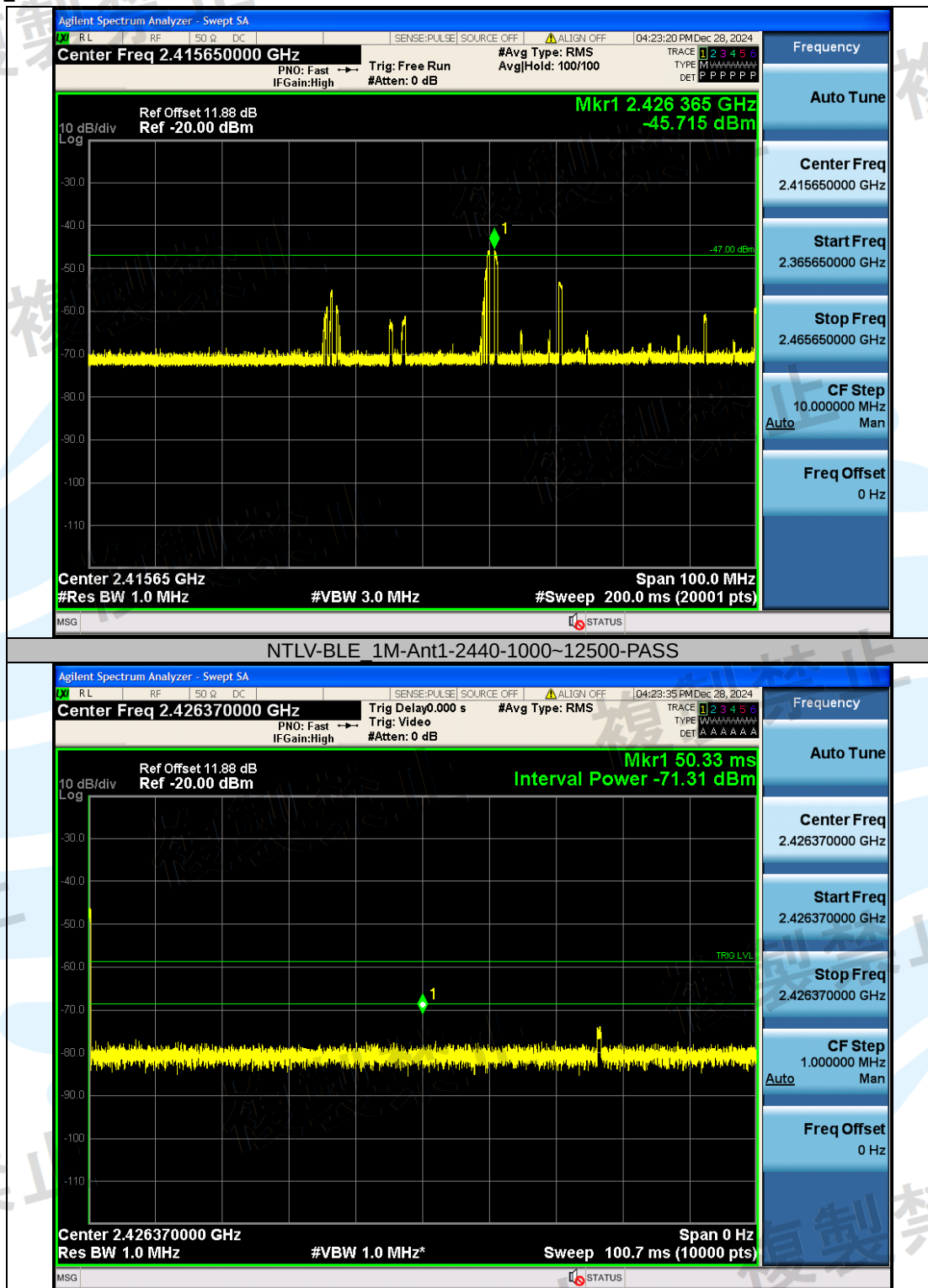
E-mail: info@uttlab.com

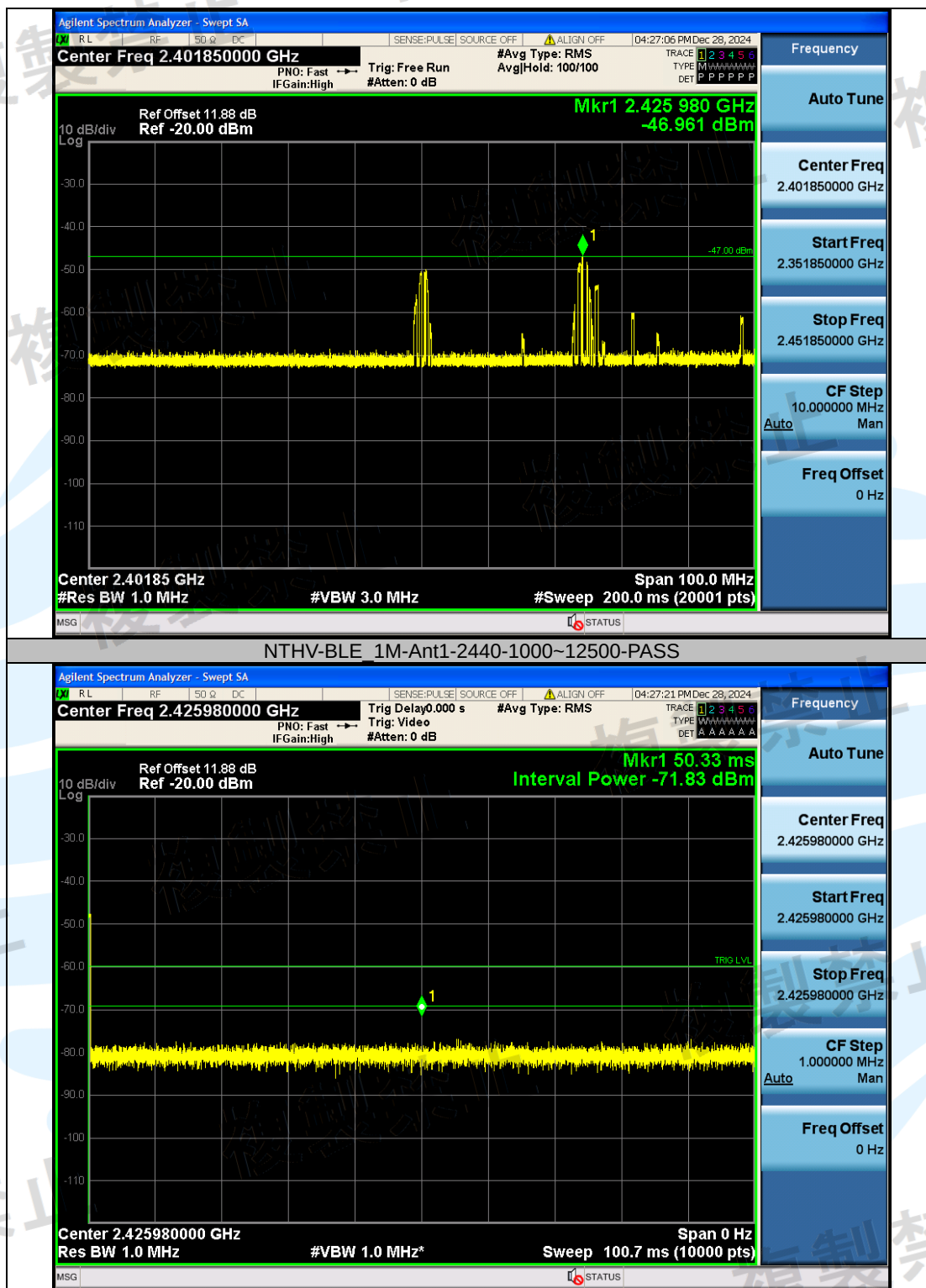
<http://www.uttlab.com>

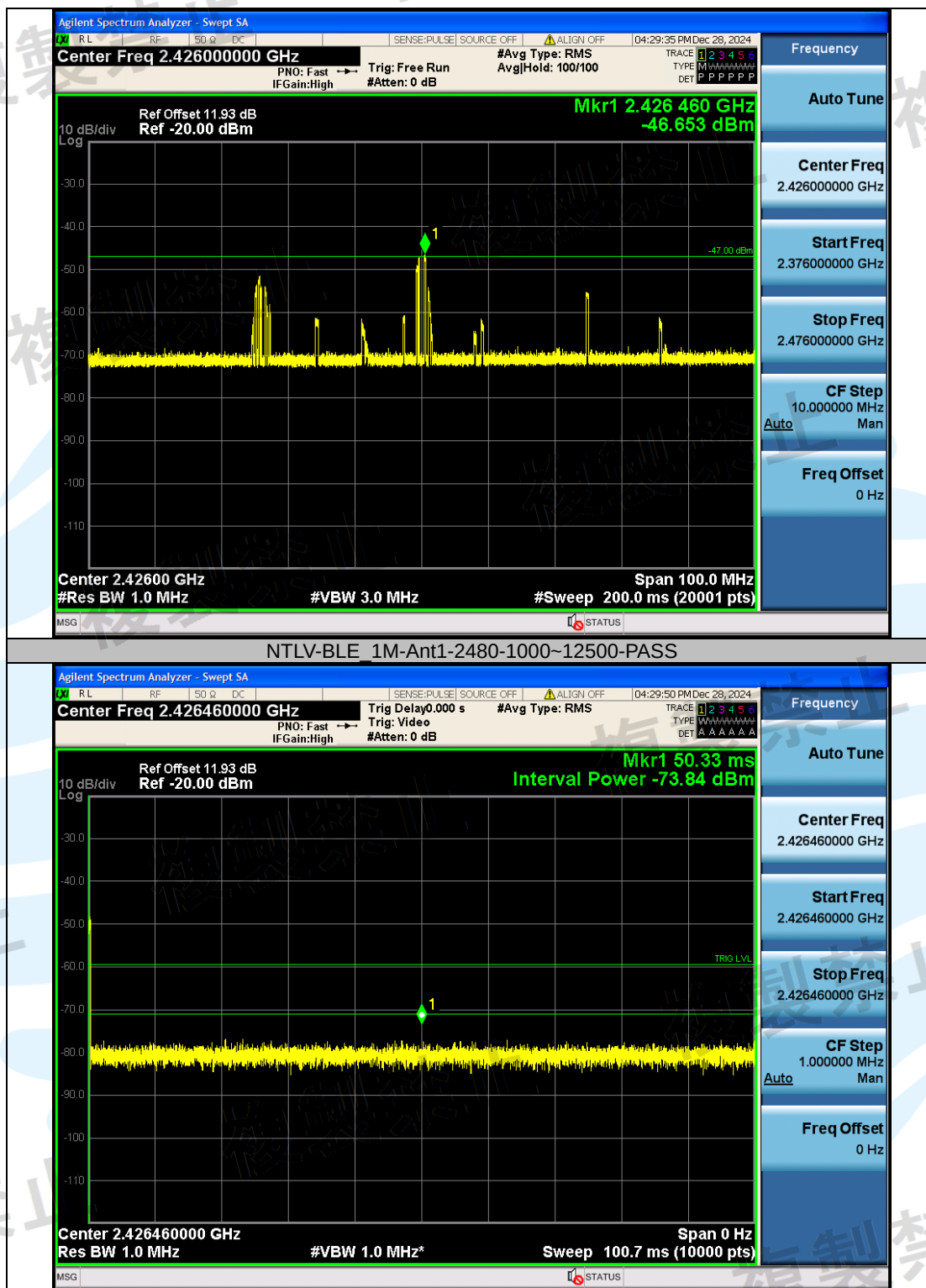
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Step 2





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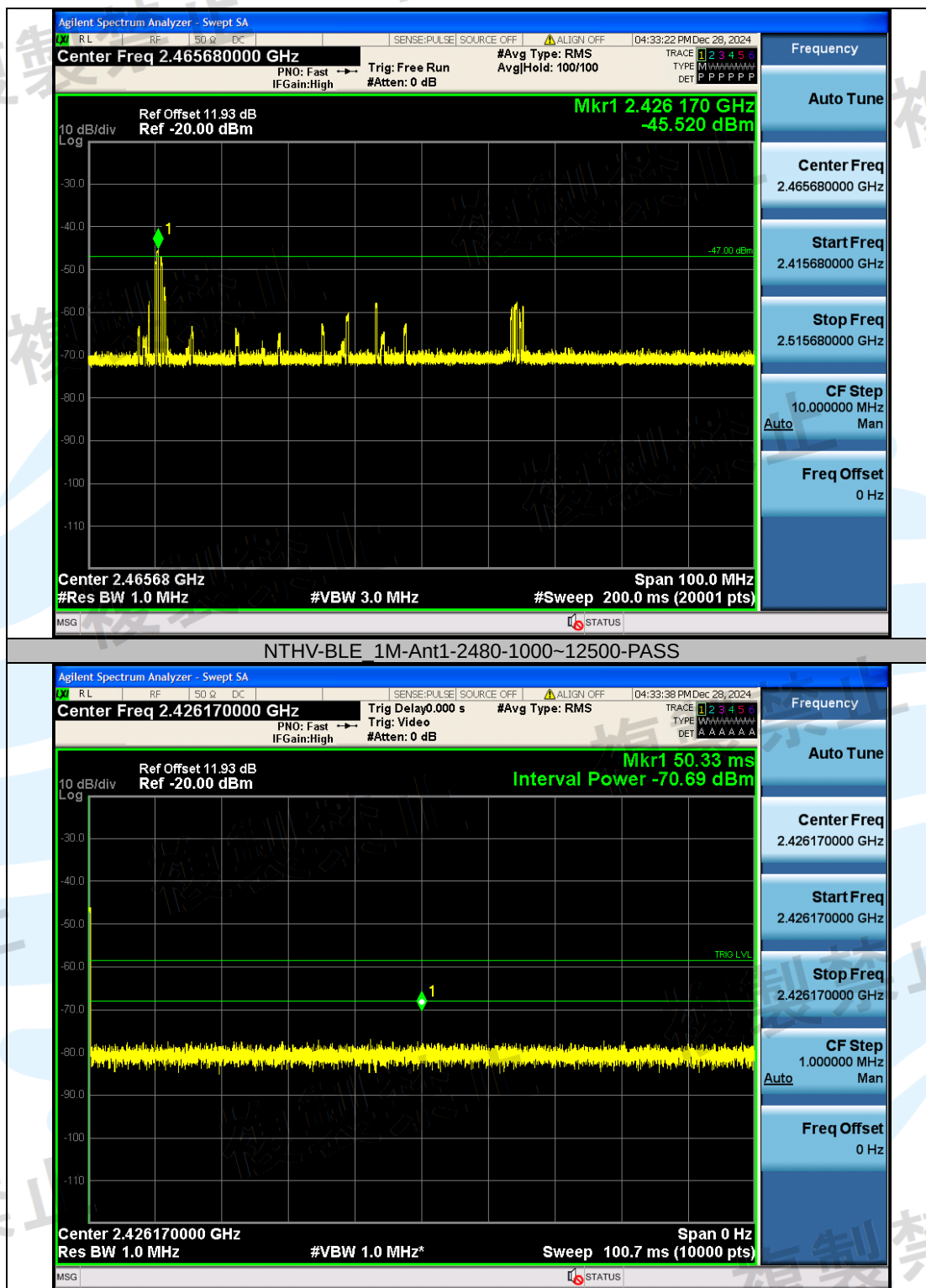
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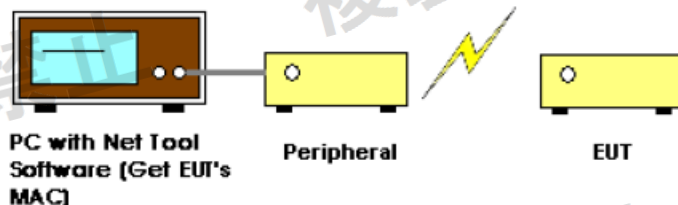
UTTR-RF-STDT66-V1.1

5.9 CARRIER SENSE CAPABILITY

5.9.1 Limit

The radio equipment connected to telecommunication circuit equipment shall be equipped with a device which detects emissions radiated from another radio station and prevents interference, or a device which prevents interference by operation on a receive signal and a signal for diffusion for signal level detection.

5.9.2 Test Setup



5.9.3 Instruments Used

Refer to section 3 for details

5.9.4 Test Procedures

1. Turn the standard signal generator output OFF. Leave the equipment under test to be ready for transmission and verify the transmission with the spectrum analyzer.
2. Set the equipment under test to the receiving state.
3. Turn the standard signal generator ON and leave the equipment under test to be ready for transmission and verify with the spectrum analyzer that no transmission is being made.

5.9.5 Result

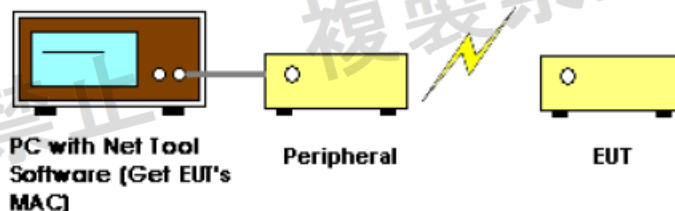
This test will not be applied to EUTs which are not for wireless control of model airplanes used outdoors and whose occupied bandwidths are 26MHz or narrower.

5.10 INTERFERENCE PREVENTION FUNCTION

5.10.1 Limit

Identification code $\geq$ 48 bits

5.10.2 Test Setup



5.10.3 Test Procedures

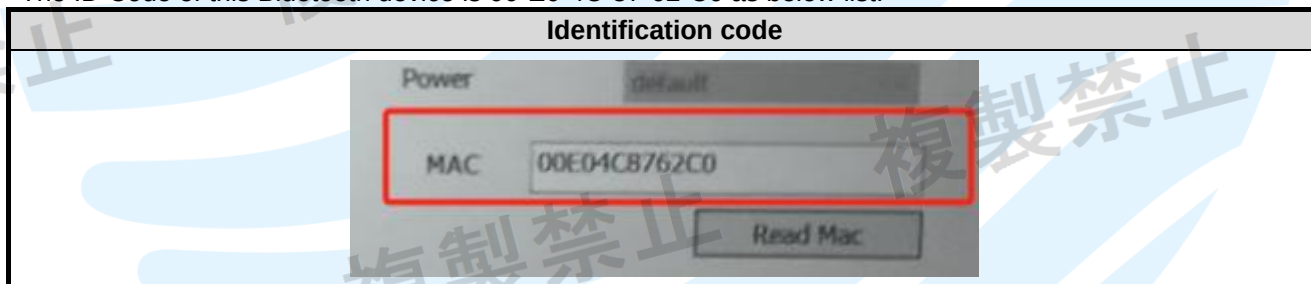
1. In the case that the EUT has the function of automatically transmitting the identification code:
 - a. Transmit the predetermined identification codes from EUT.
 - b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification code:
 - a. Transmit the predetermined identification codes from the counterpart.
 - b. Check if communication is normal.
 - c. Transmit the signals other than predetermined ID codes from the counterpart.
 - d. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

5.10.4 Test Result

TX: The transmitting mode of EUT is on normal operating, the interference prevention function is okay.

RX: The receiving mode of EUT is on normal operating, the interference prevention function is okay.

The ID Code of this Bluetooth device is 00-E0-4C-87-62-C0 as below list:



5.11 CONSTRUCTION PROTECTION

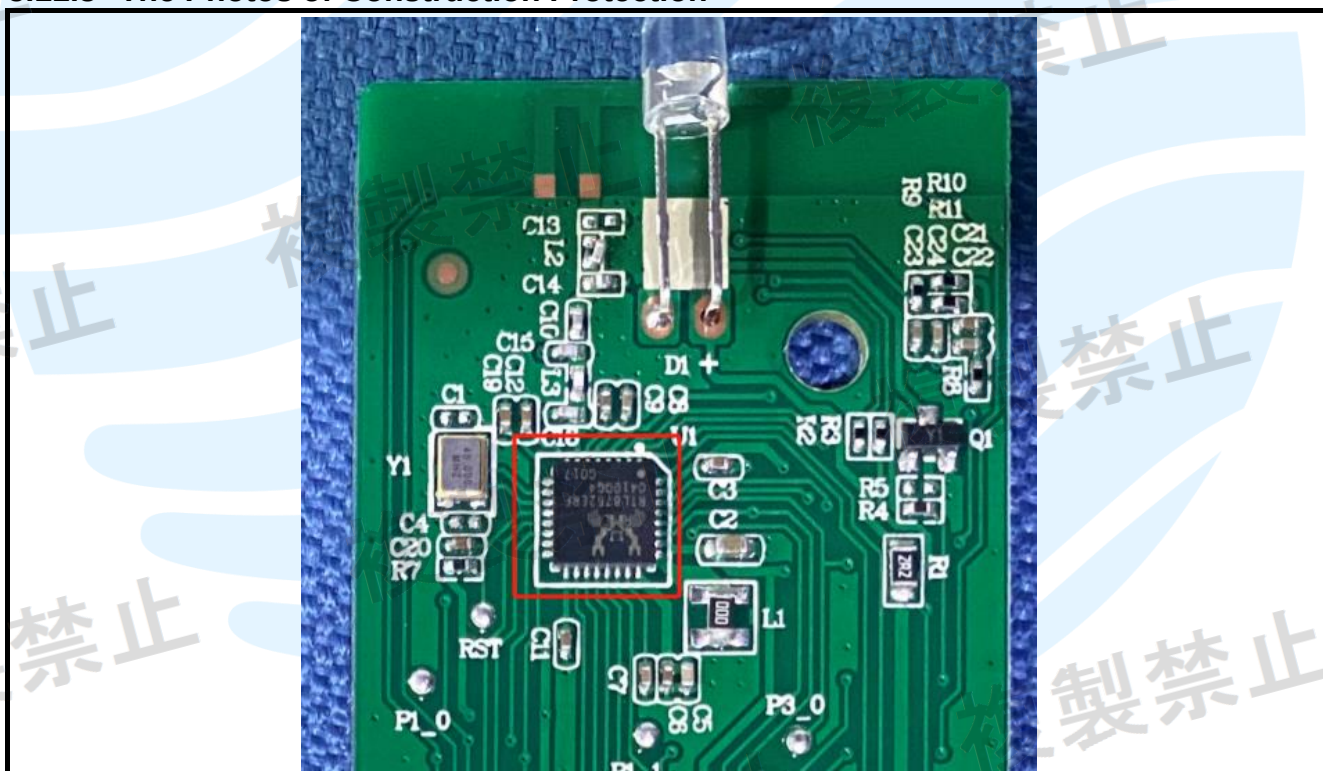
5.11.1 Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

5.11.2 Confirmation Method

☐	Sealed with special screws.
☐	Plastic chassis is being welded using ultrasonic waves.
☐	Chassis is glued using a special adhesive.
☐	Metal covers are spot-fused.
☐	Cover is specially interlocked.
☐	RF and Modulation components are covered with shielding case and this shielding case is soldered.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is welded using the BGA Method.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is glued at its lead with a special adhesive.
☐	Shield case is welded at RF and modulation parts, and ID-ROM is glued with a non-transparent laminating agent.
☒	Other: RF and Modulation parts are mounted on PCB with surface mount technology. RF and modulation components are coated by welding, which cannot be disassembled and modified

5.11.3 The Photos of Construction Protection



APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Refer to Appendix 1 for Test Setup photos.

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix for EUT photos.

*** End of Report ***

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