

7.8 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
RSS-247 Section 6.2.3.1(b)

Test Method: ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024
Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

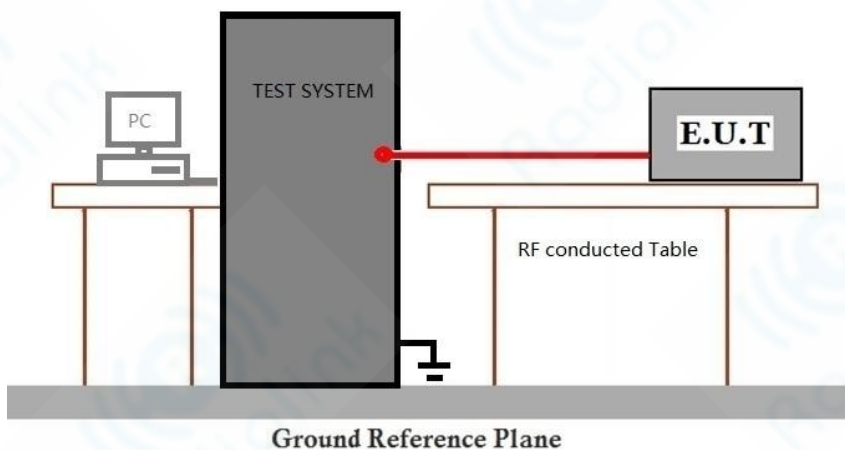
7.8.1 E.U.T. Operation

Operating Environment:
Temperature: 20.2 °C Humidity: 52.0 % RH Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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7.9 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
RSS-247 Section 6.2.3.1(b)

Test Method: ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024
Section 7.8.4

Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

7.9.1 E.U.T. Operation

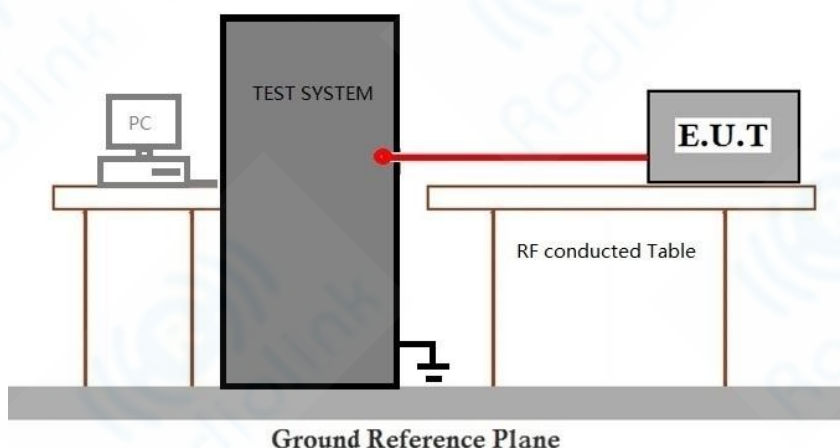
Operating Environment:
Temperature: 20.2 °C Humidity: 52.0 % RH Atmospheric Pressure: 1020 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

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7.10 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d) RSS-247 Section 6.6
Test Method:	ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024 Section 6.10.4

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.10.1 E.U.T. Operation

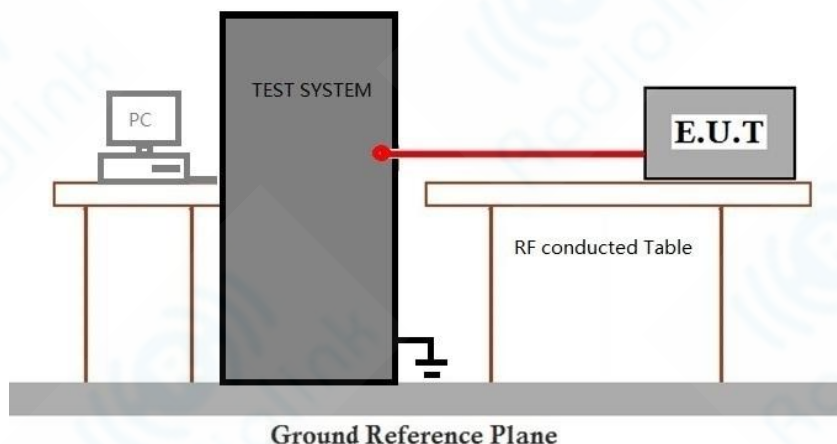
Operating Environment:

Temperature: 22.2 °C Humidity: 40.0 % RH Atmospheric Pressure: 1020 mbar

7.10.2 Test Mode Description

Mode Code	Description
1	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.10.3 Test Setup Diagram



7.10.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.11 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d) RSS-247 Section 6.6
Test Method:	ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024 Section 11.11

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.11.1 E.U.T. Operation

Operating Environment:

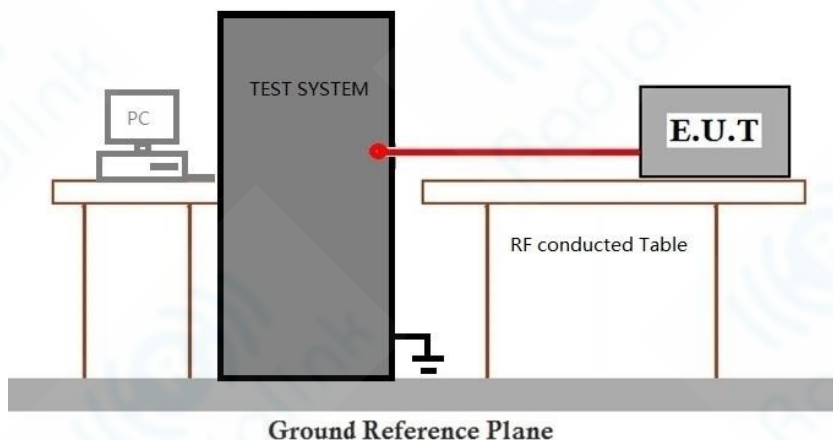
Temperature: 22.2 °C Humidity: 40.0 % RH Atmospheric Pressure: 1020 mbar

7.11.2 Test Mode Description

Mode Code	Description
1	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.11.3 Test Setup Diagram



7.11.4 Measurement Procedure and Data

Please Refer to Appendix for Details

8 Test Setup Photo

Refer to Appendix A_Setup Photo (1.4)



9 Appendix

1. Bandwidth

1.1 Test Result

1.1.1 OBW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.840	/	Pass
				2	0.822	/	Pass
		2441	DH5	1	0.841	/	Pass
				2	0.821	/	Pass
		2480	DH5	1	0.834	/	Pass
				2	0.830	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.185	/	Pass
				2	1.182	/	Pass
		2441	2DH5	1	1.184	/	Pass
				2	1.180	/	Pass
		2480	2DH5	1	1.185	/	Pass
				2	1.181	/	Pass
8DPSK	SISO	2402	3DH5	1	1.192	/	Pass
				2	1.181	/	Pass
		2441	3DH5	1	1.193	/	Pass
				2	1.181	/	Pass
		2480	3DH5	1	1.187	/	Pass
				2	1.183	/	Pass

1.1.2 20dB BW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.883	/	Pass
				2	0.882	/	Pass
		2441	DH5	1	0.919	/	Pass
				2	0.878	/	Pass
		2480	DH5	1	0.920	/	Pass
				2	0.882	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.318	/	Pass
				2	1.319	/	Pass
		2441	2DH5	1	1.313	/	Pass
				2	1.335	/	Pass
		2480	2DH5	1	1.313	/	Pass
				2	1.308	/	Pass
8DPSK	SISO	2402	3DH5	1	1.274	/	Pass
				2	1.275	/	Pass
		2441	3DH5	1	1.277	/	Pass

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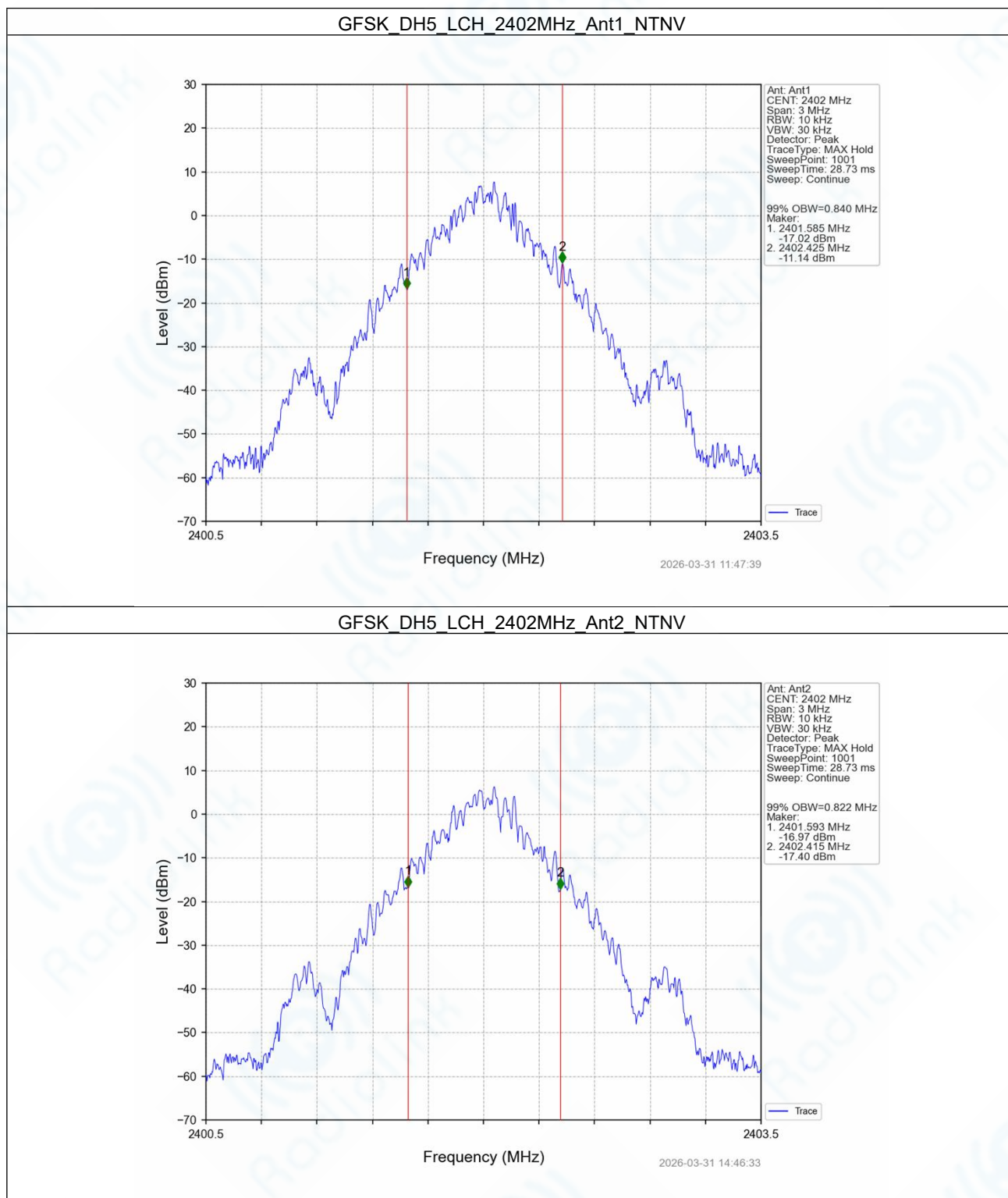
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				2	1.274	/	Pass
		2480	3DH5	1	1.279	/	Pass
				2	1.273	/	Pass



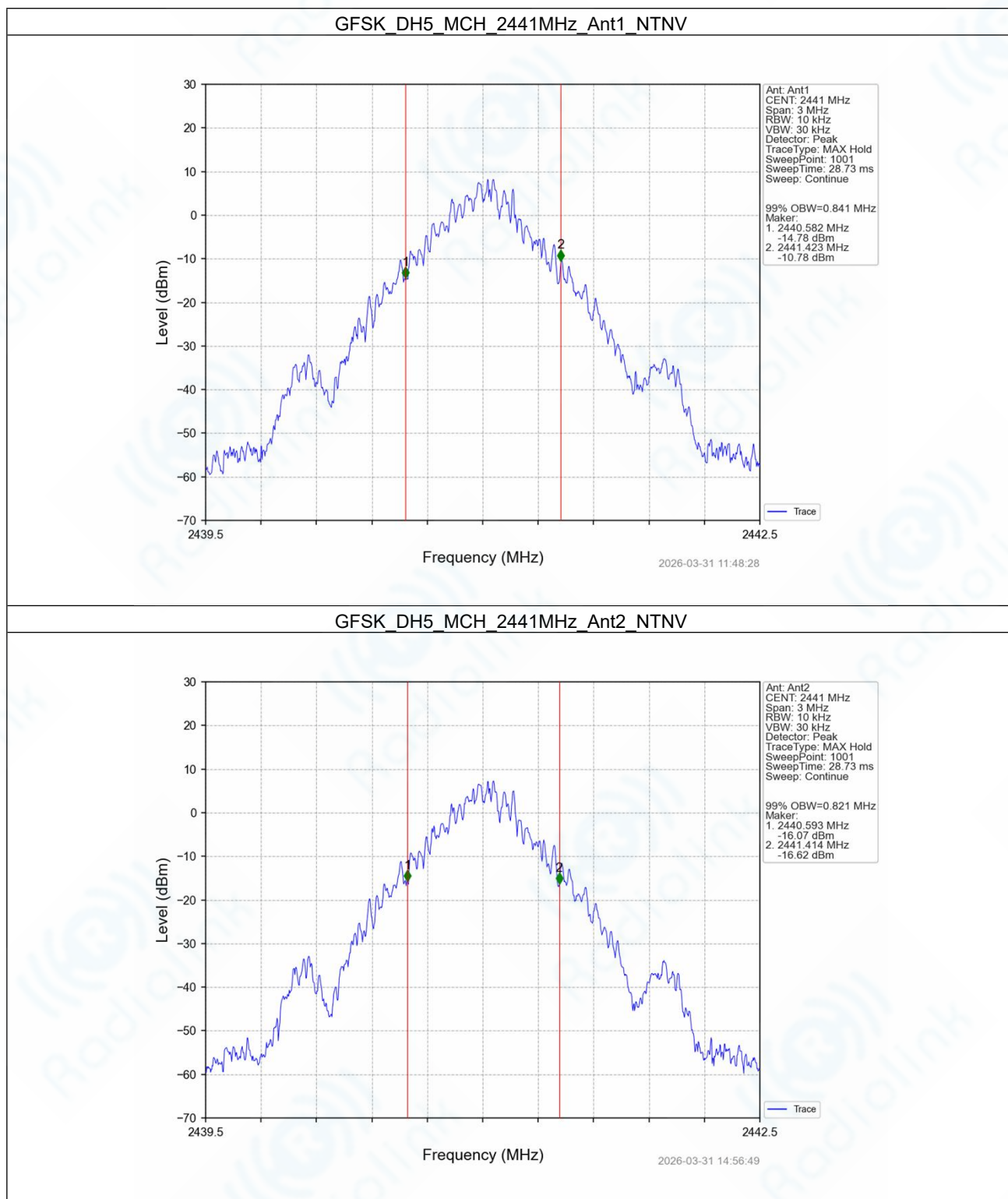
1.2 Test Graph

1.2.1 OBW



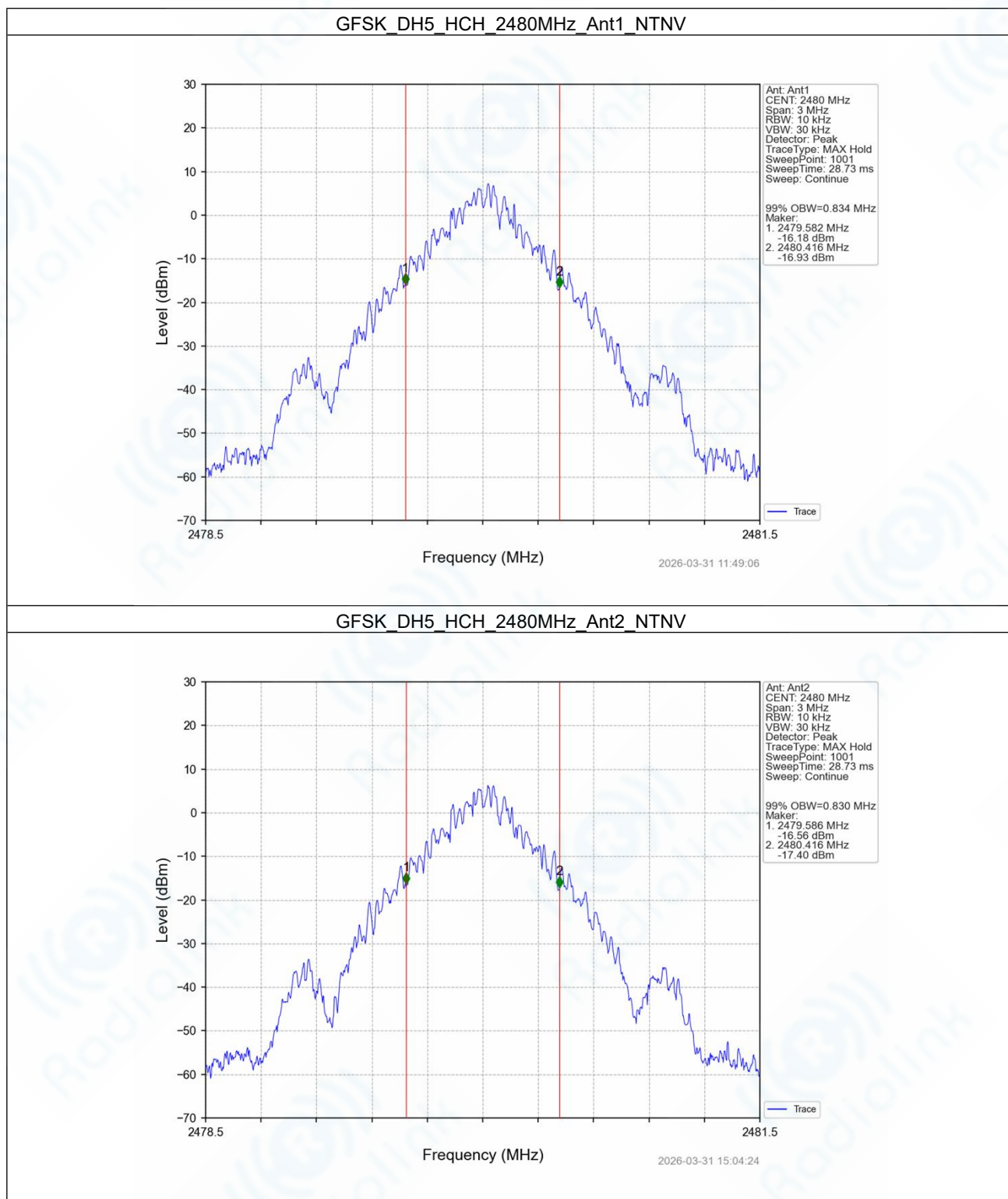
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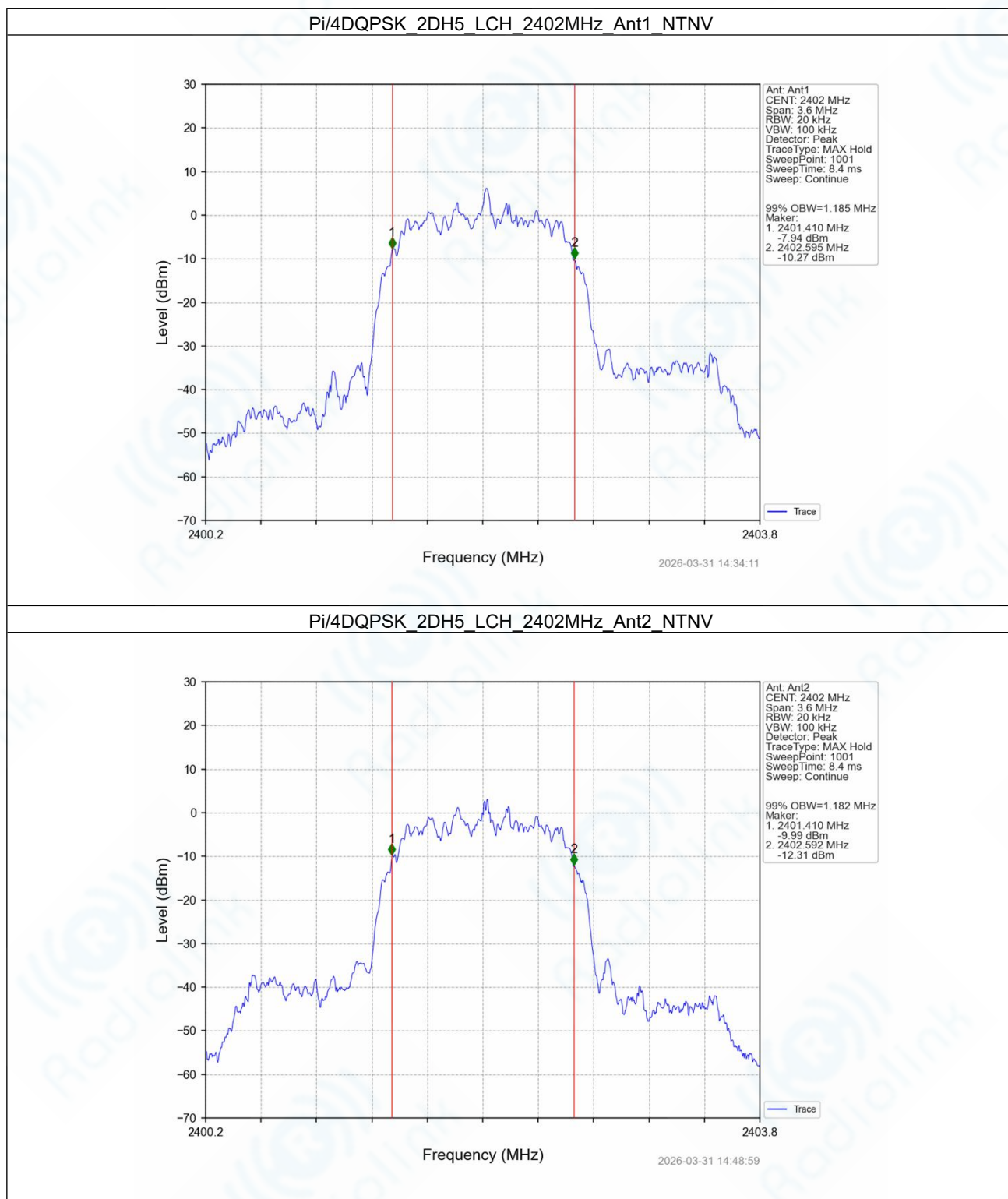
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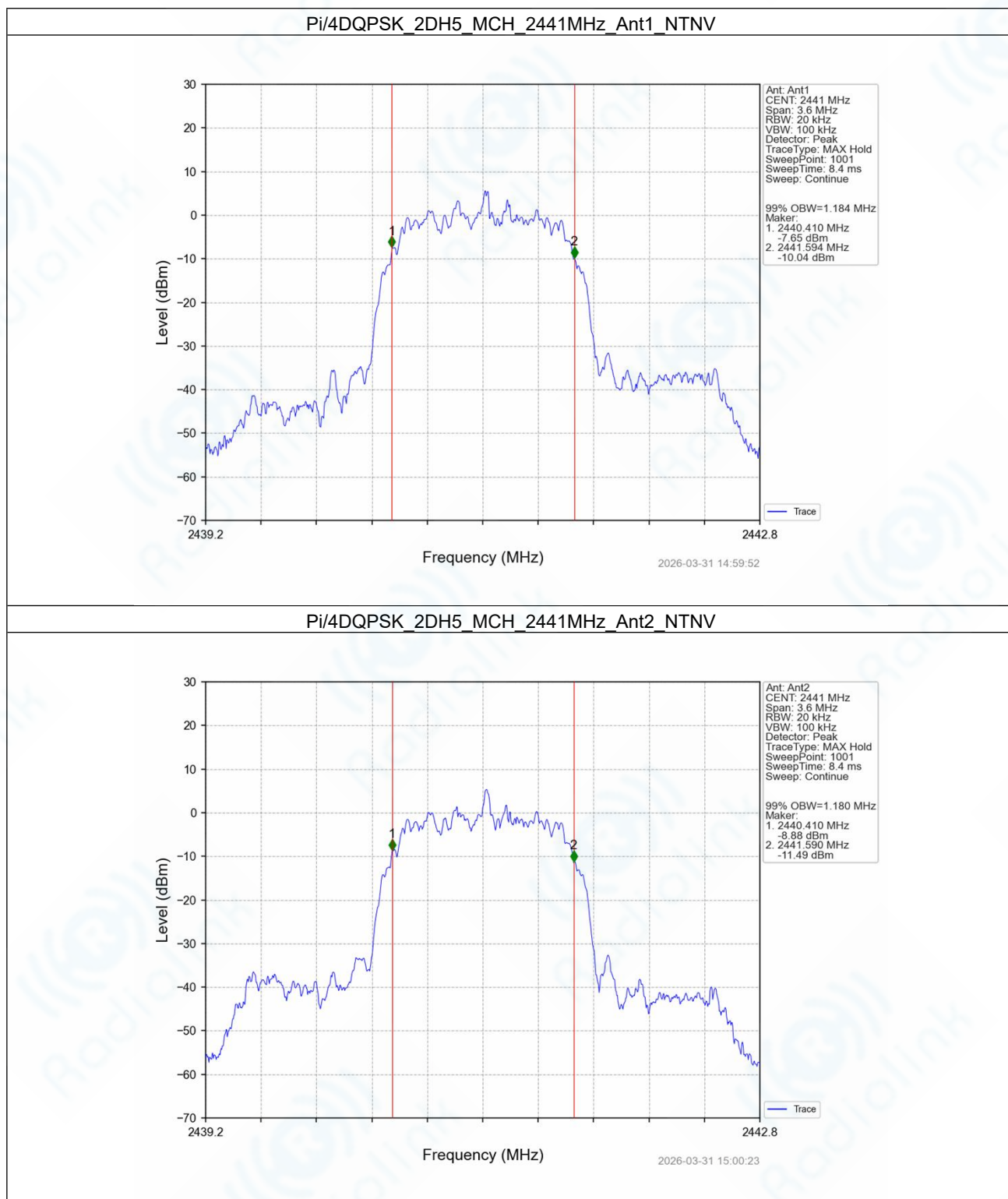




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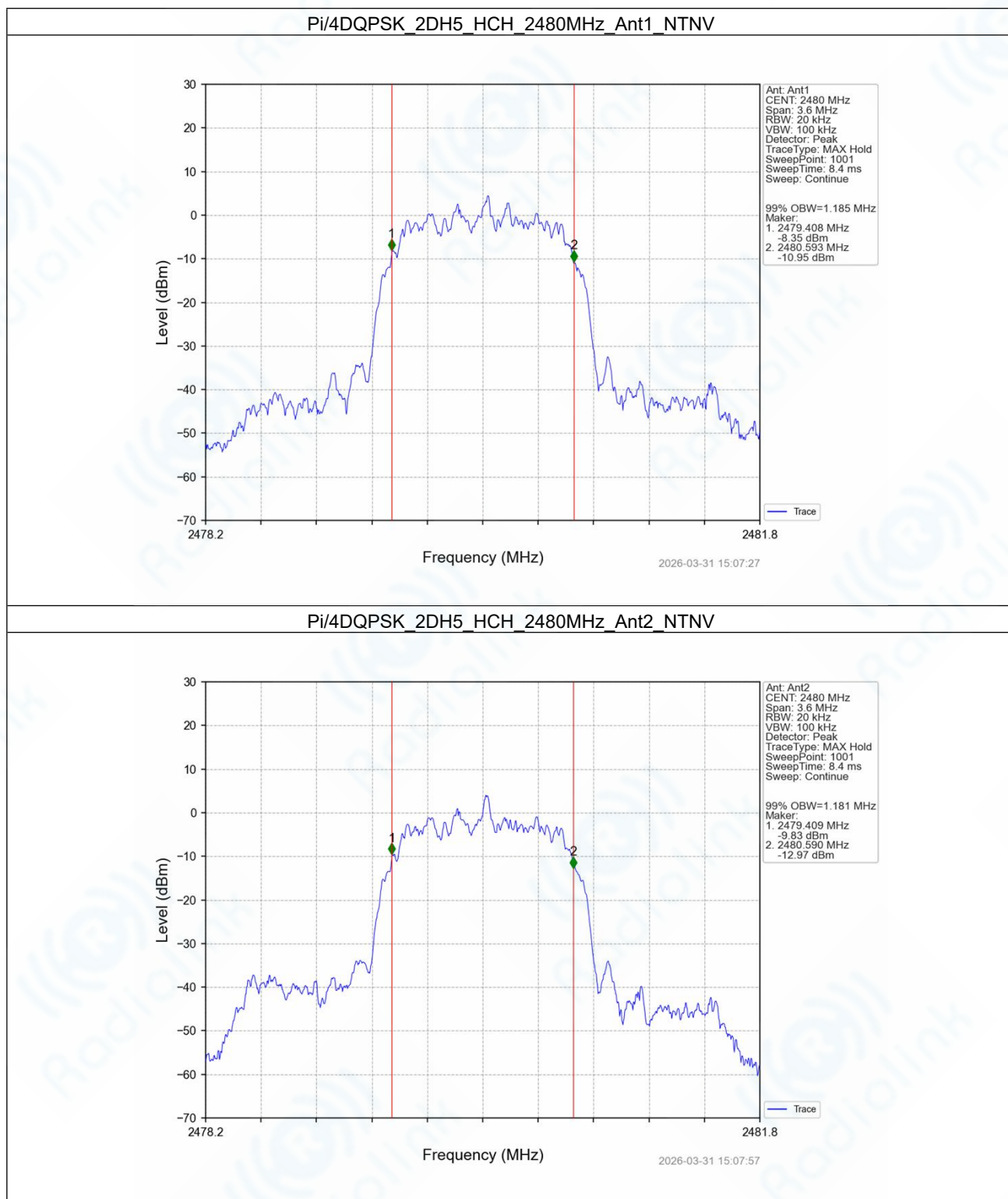
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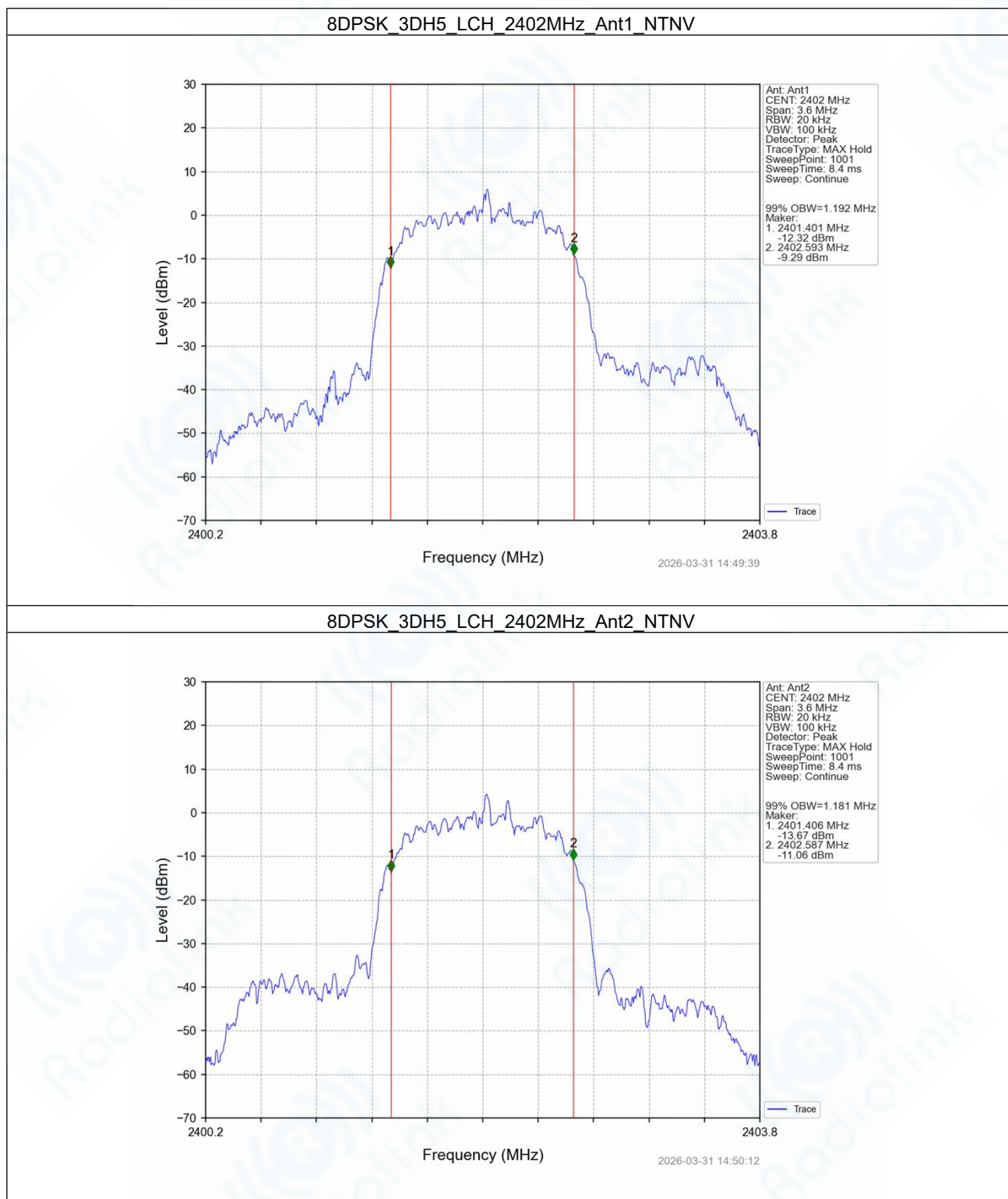
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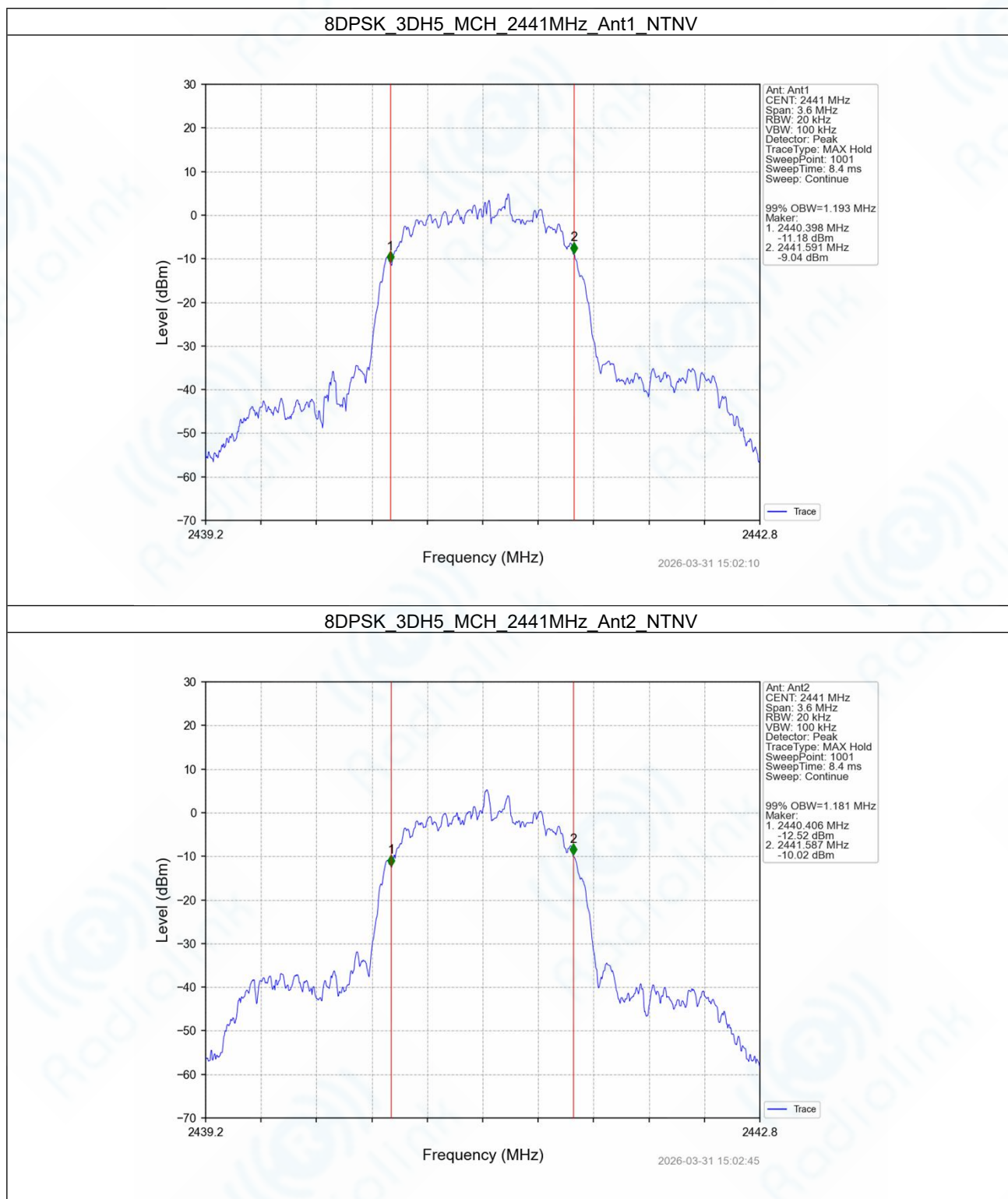




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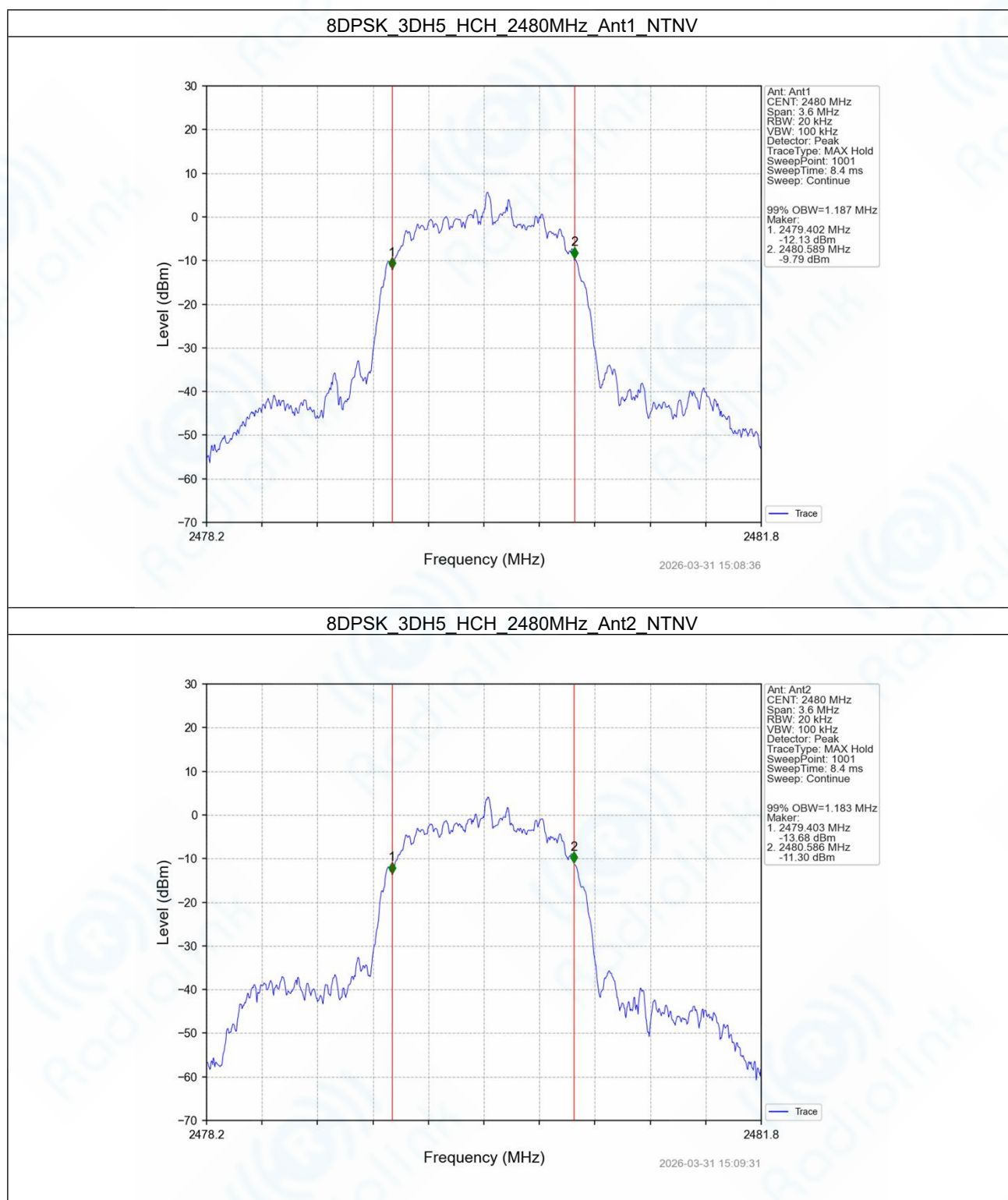
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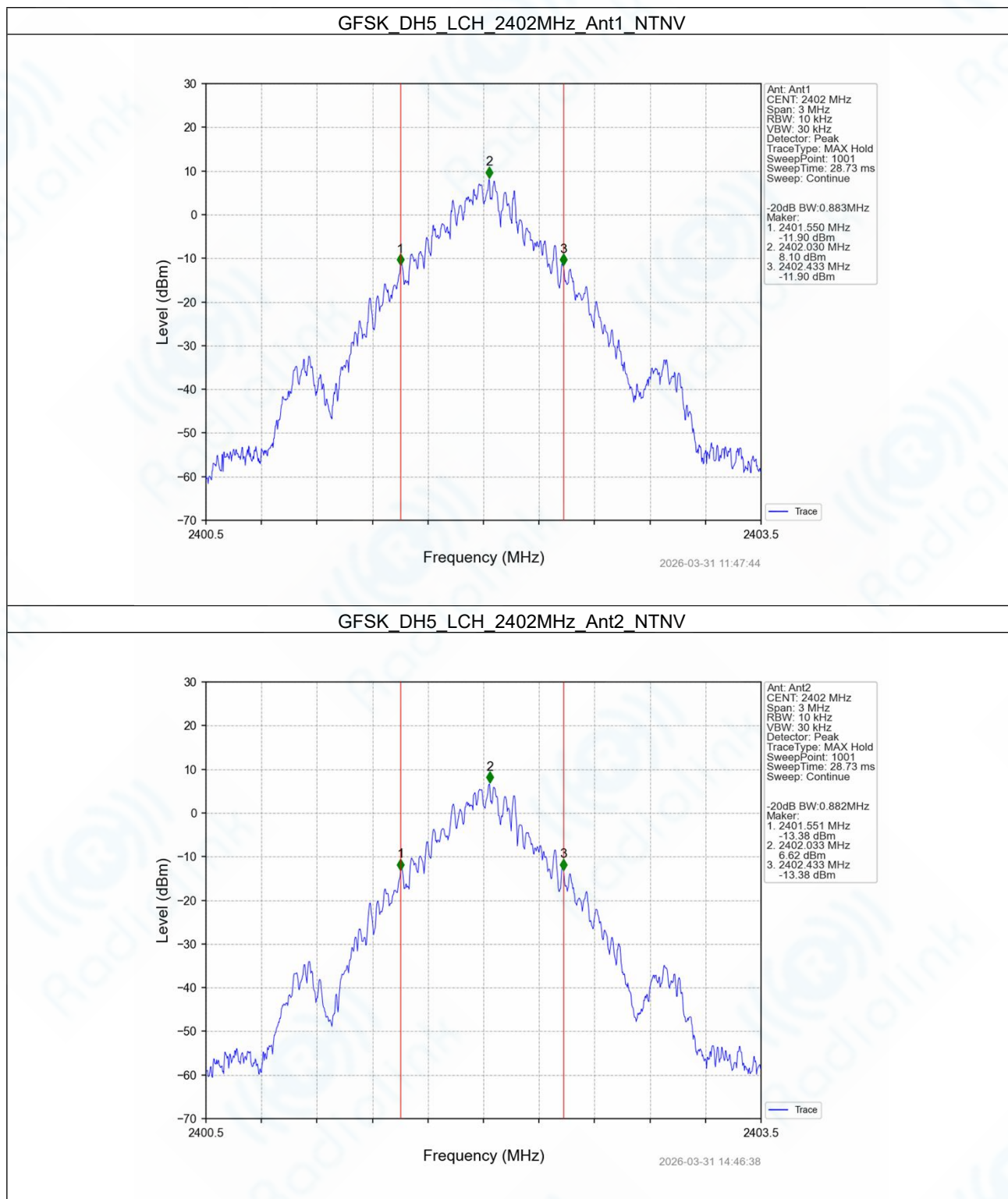
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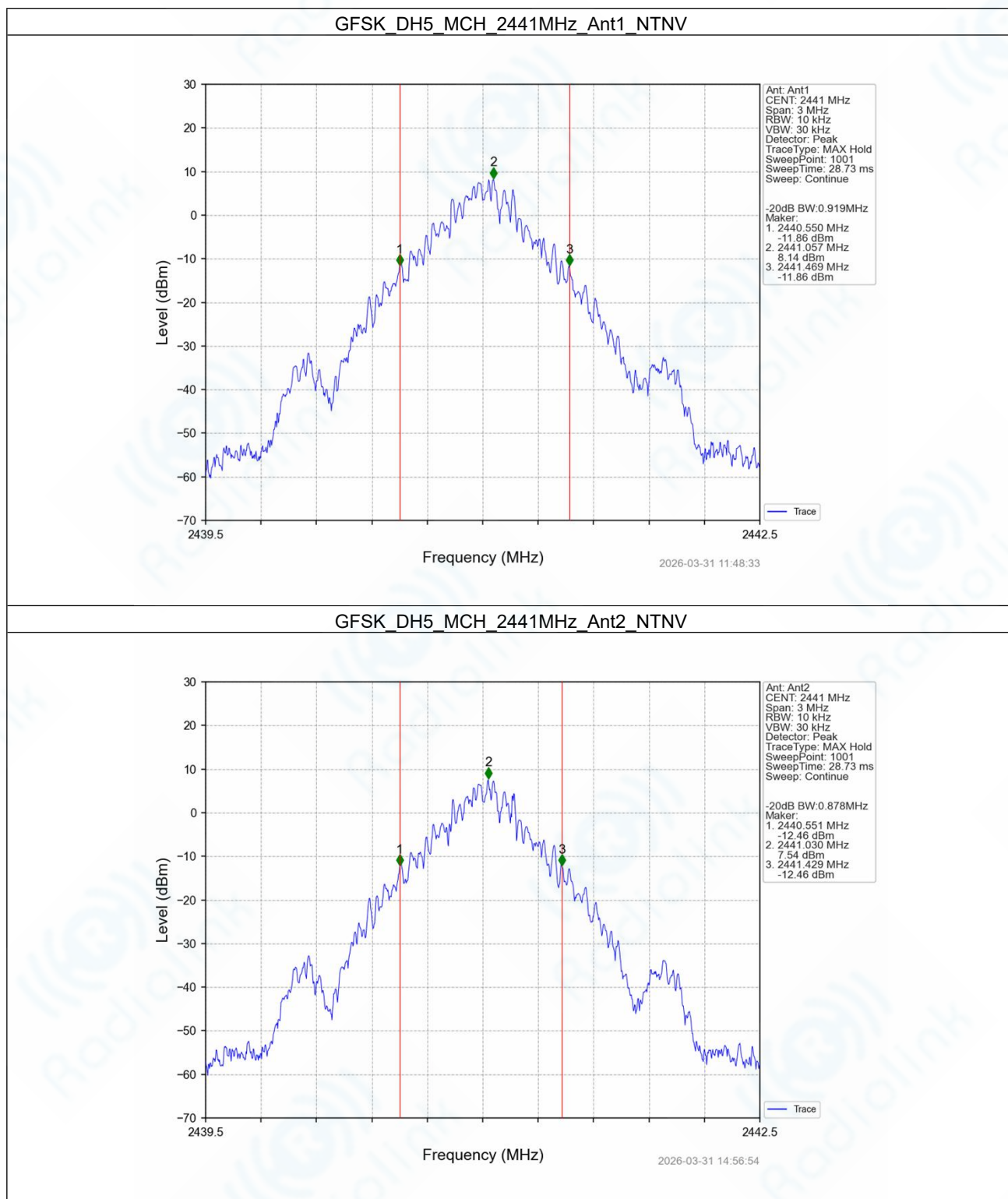
1.2.2 20dB BW



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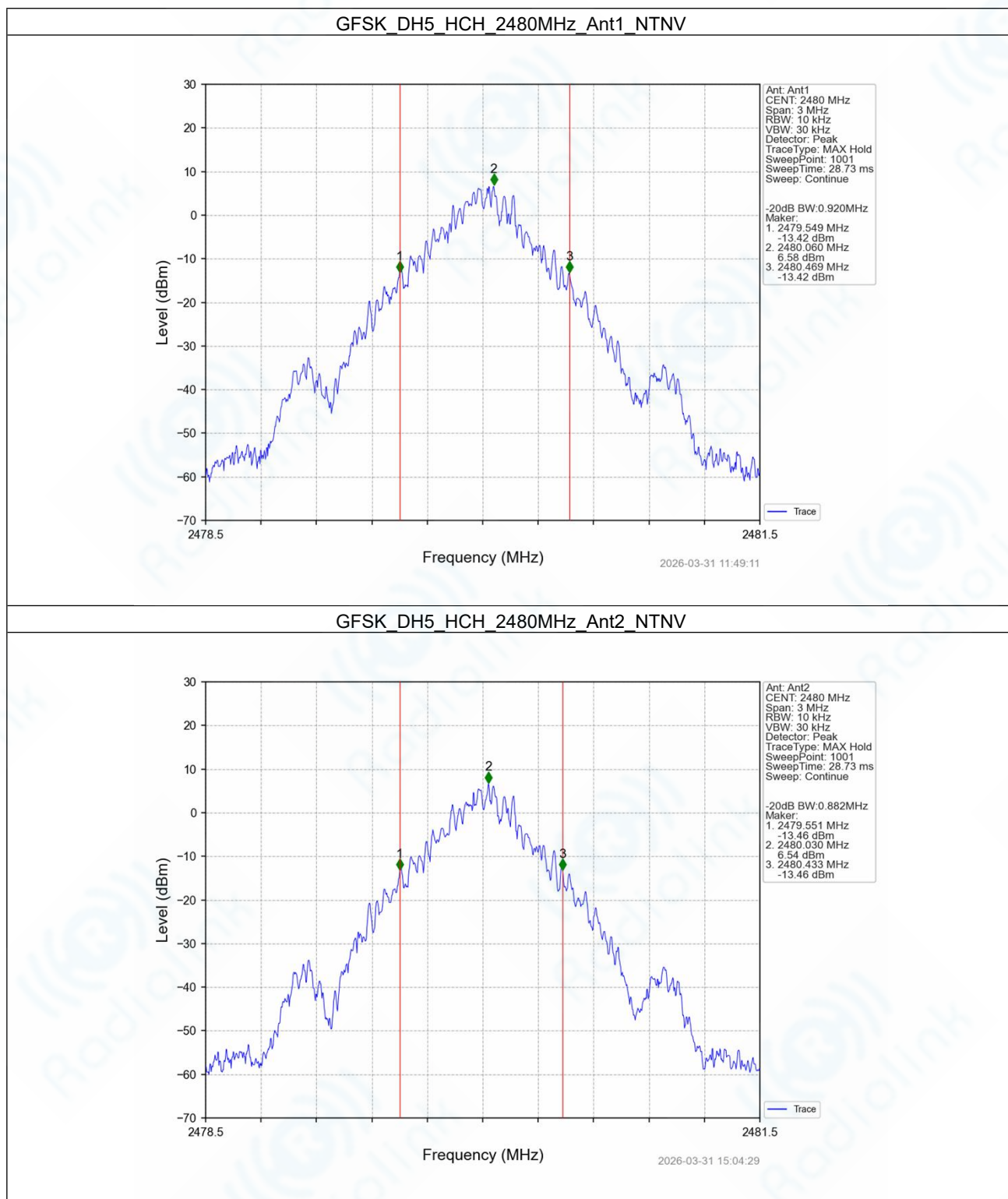
Tel: +86 0755 23080694

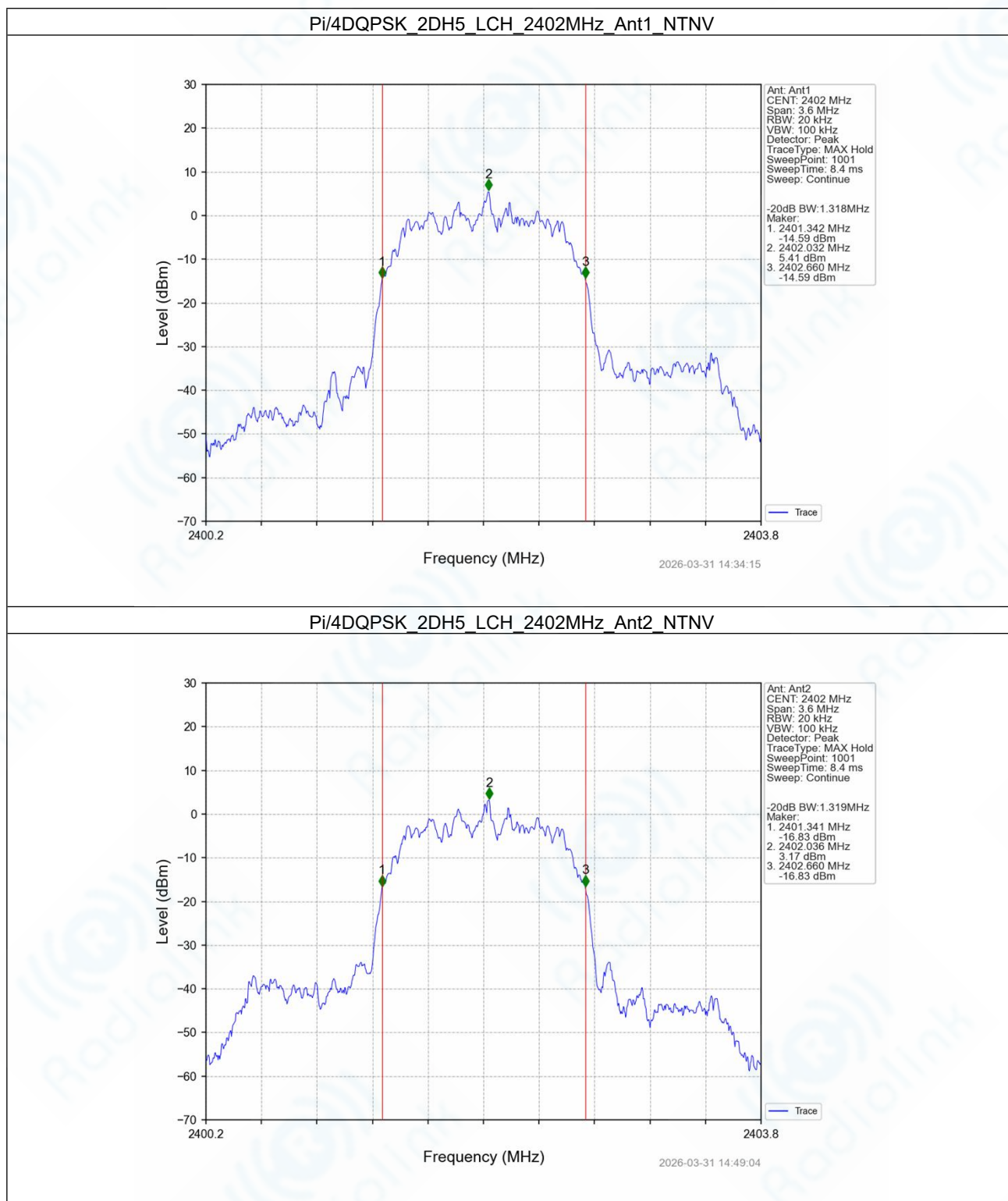


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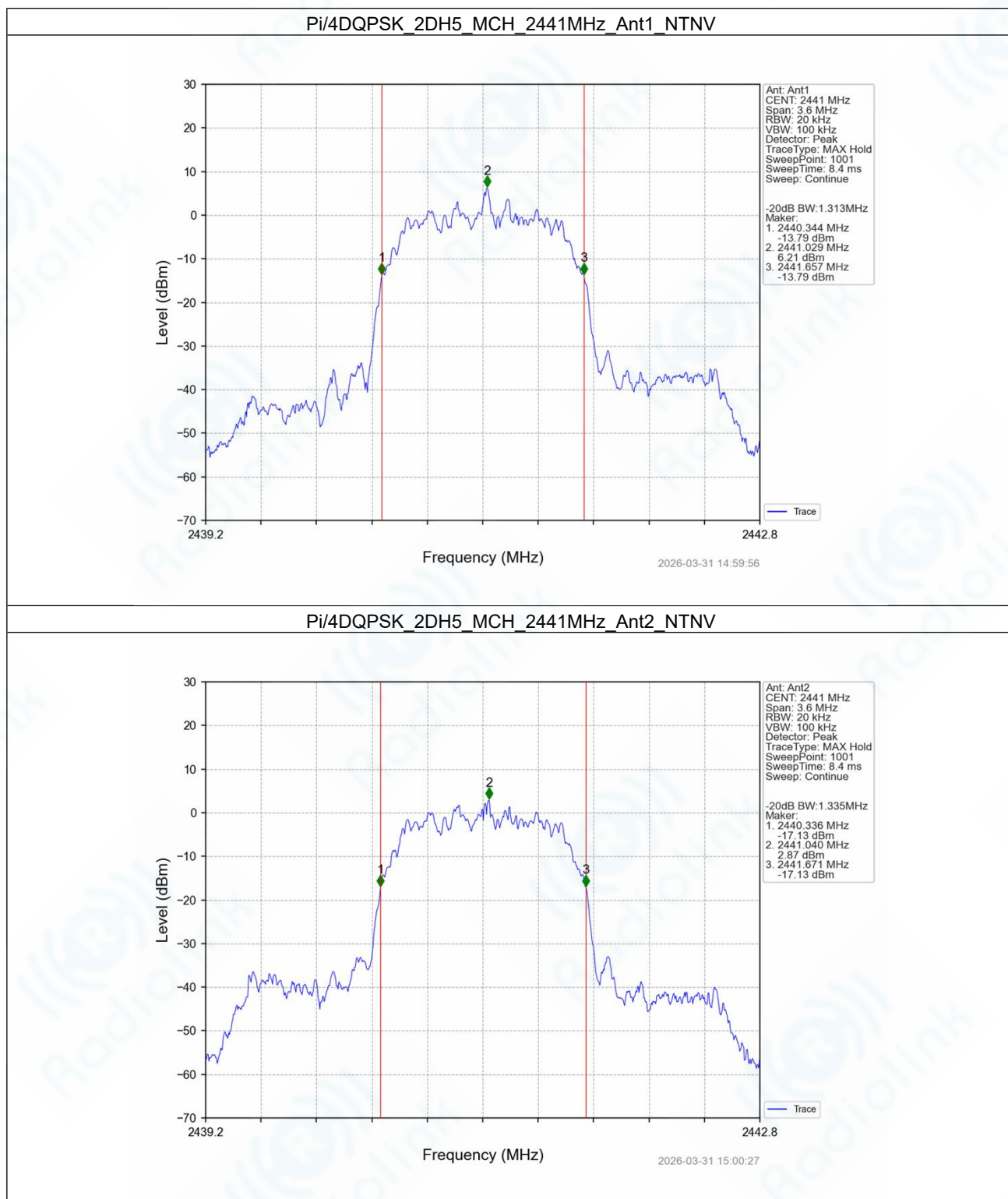




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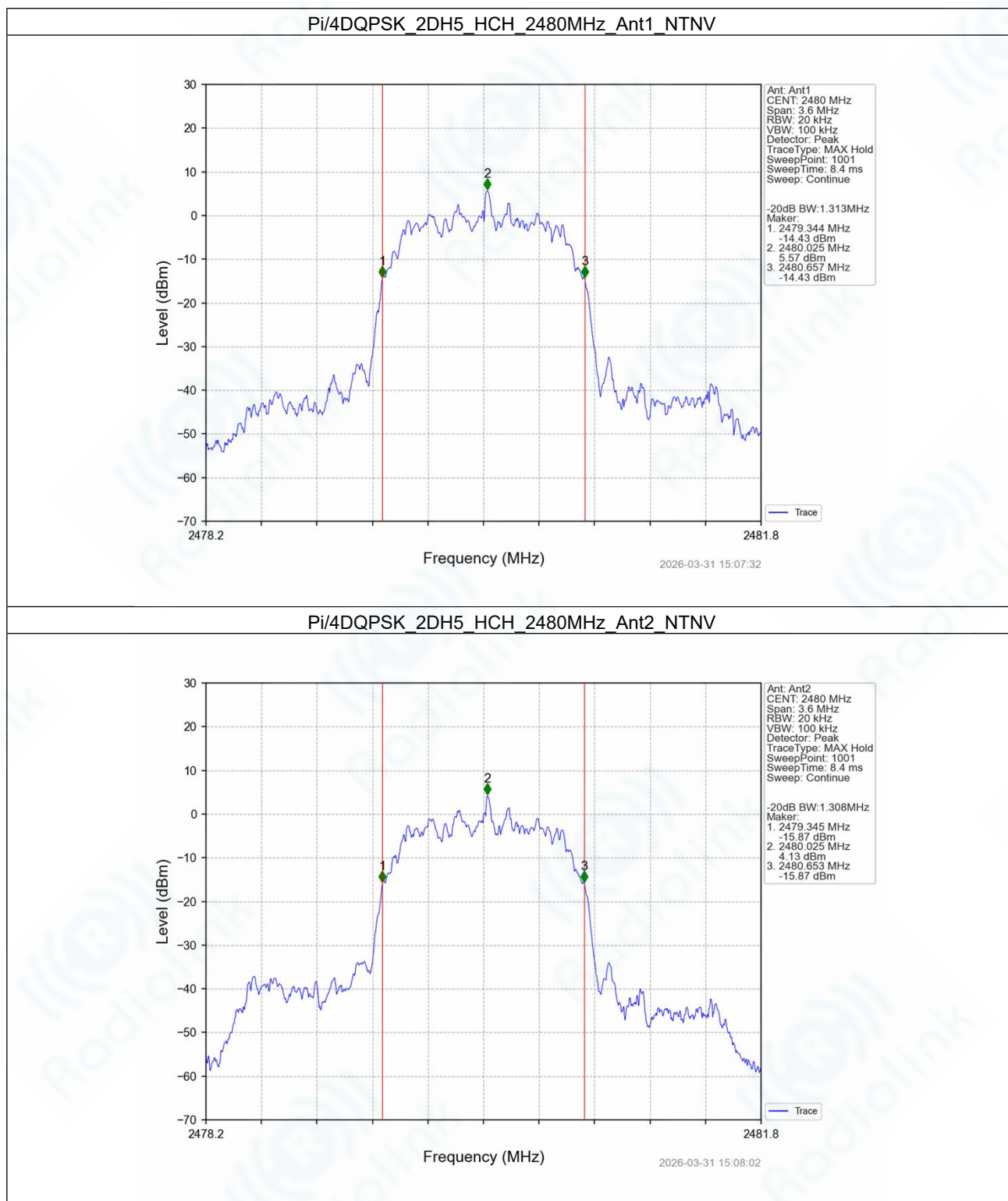
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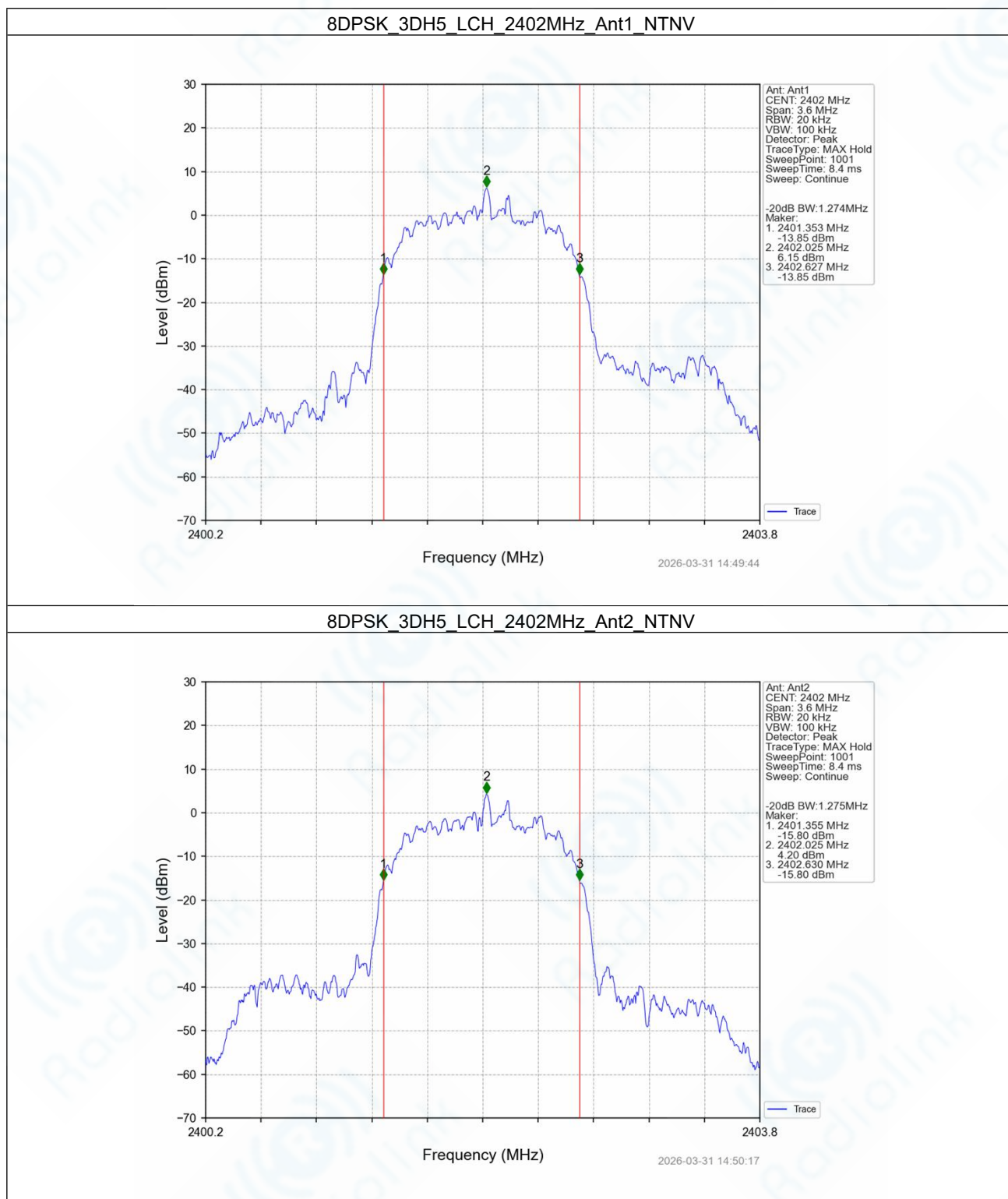


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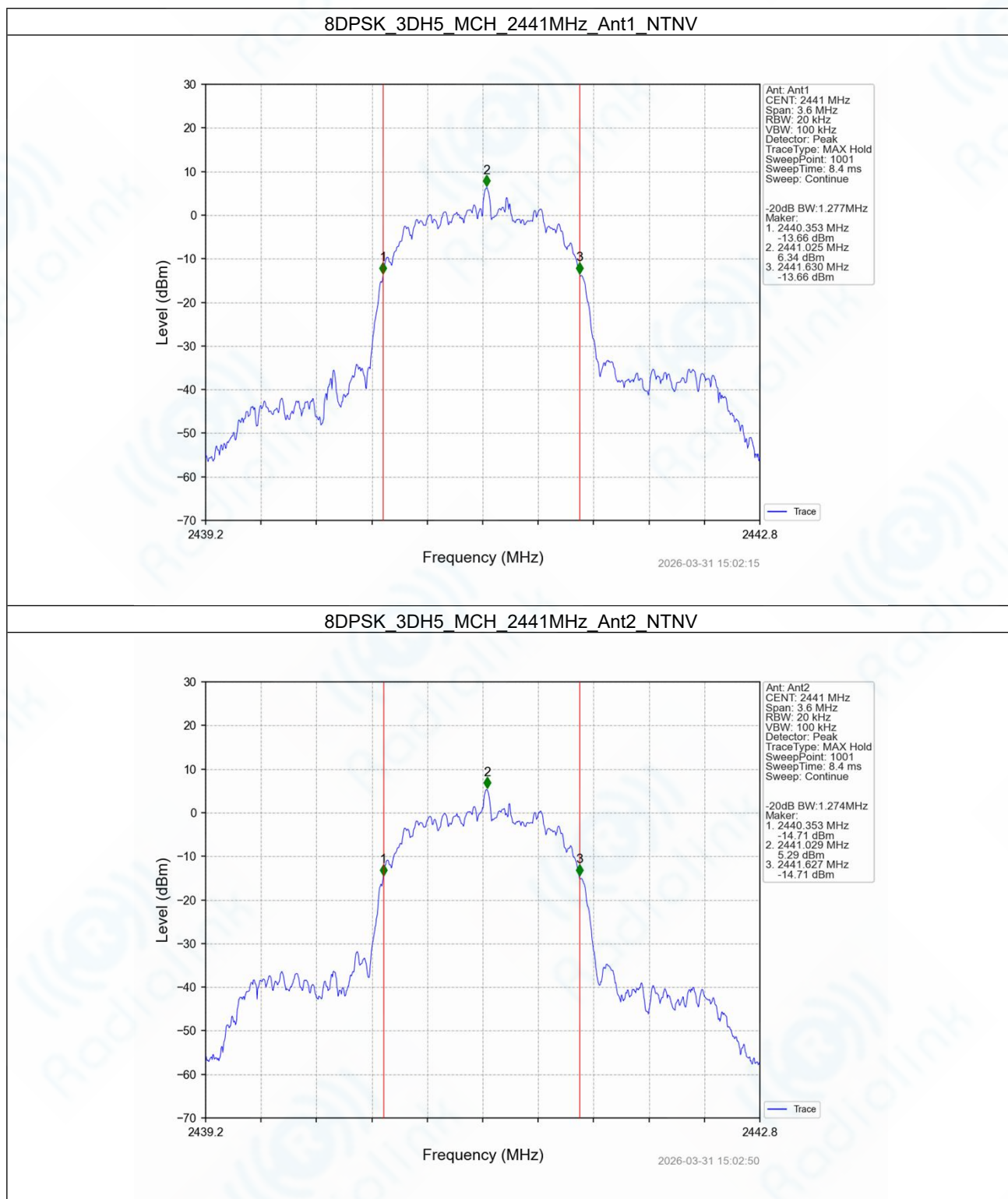




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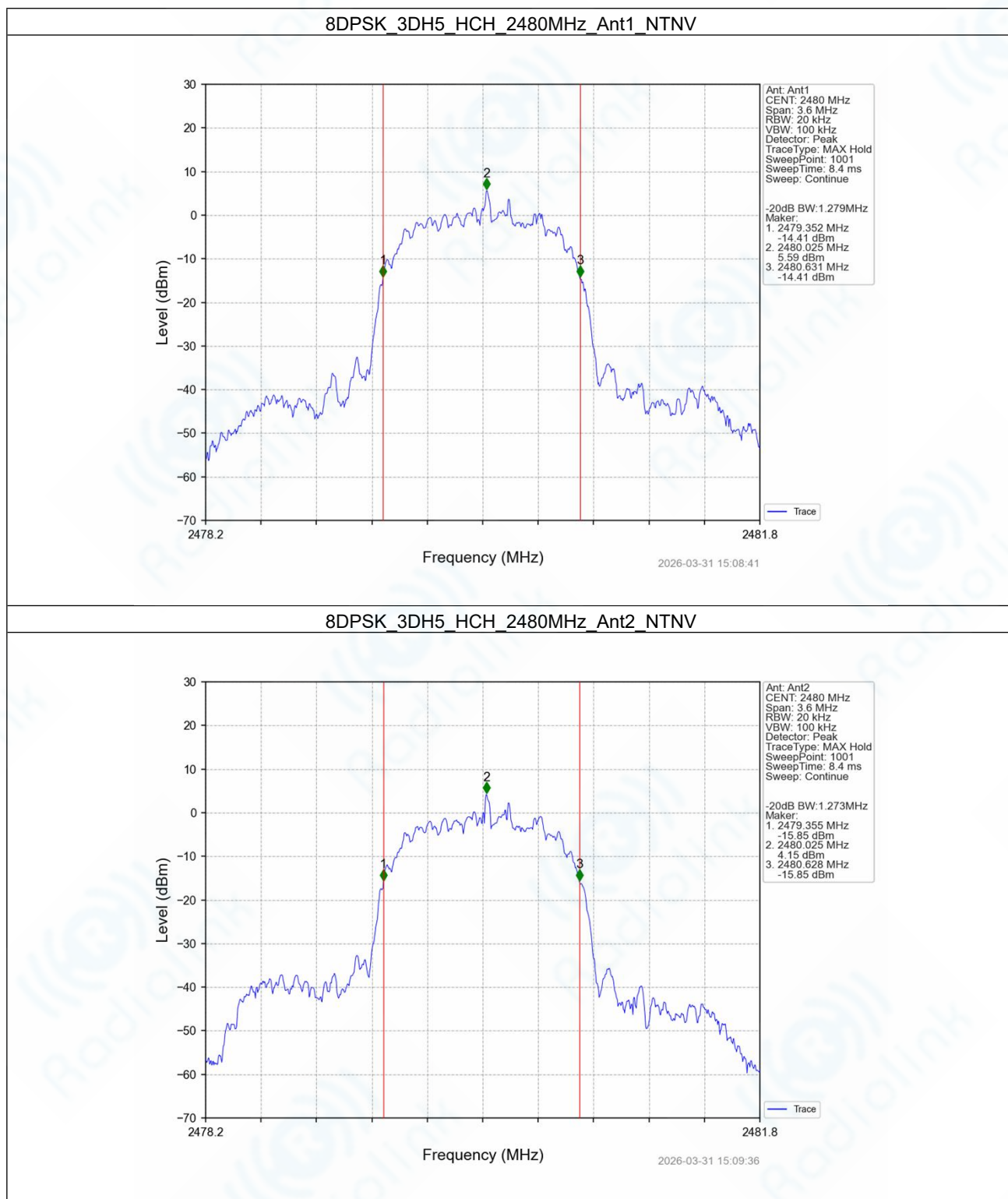
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2. Maximum Conducted Output Power

2.1 Test Result

2.1.1 Power

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)			Verdict
				ANT1	ANT2	Limit	
GFSK	SISO	2402	DH5	13.13	11.69	<=30	Pass
		2441	DH5	13.57	12.70	<=30	Pass
		2480	DH5	12.29	11.59	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	11.57	9.97	<=20.97	Pass
		2441	2DH5	11.89	11.05	<=20.97	Pass
		2480	2DH5	11.13	9.90	<=20.97	Pass
8DPSK	SISO	2402	3DH5	11.96	10.51	<=20.97	Pass
		2441	3DH5	12.32	11.57	<=20.97	Pass
		2480	3DH5	11.53	10.45	<=20.97	Pass

Note1: Antenna Gain: Ant1: -1.70dBi; Ant2: -3.70dBi;



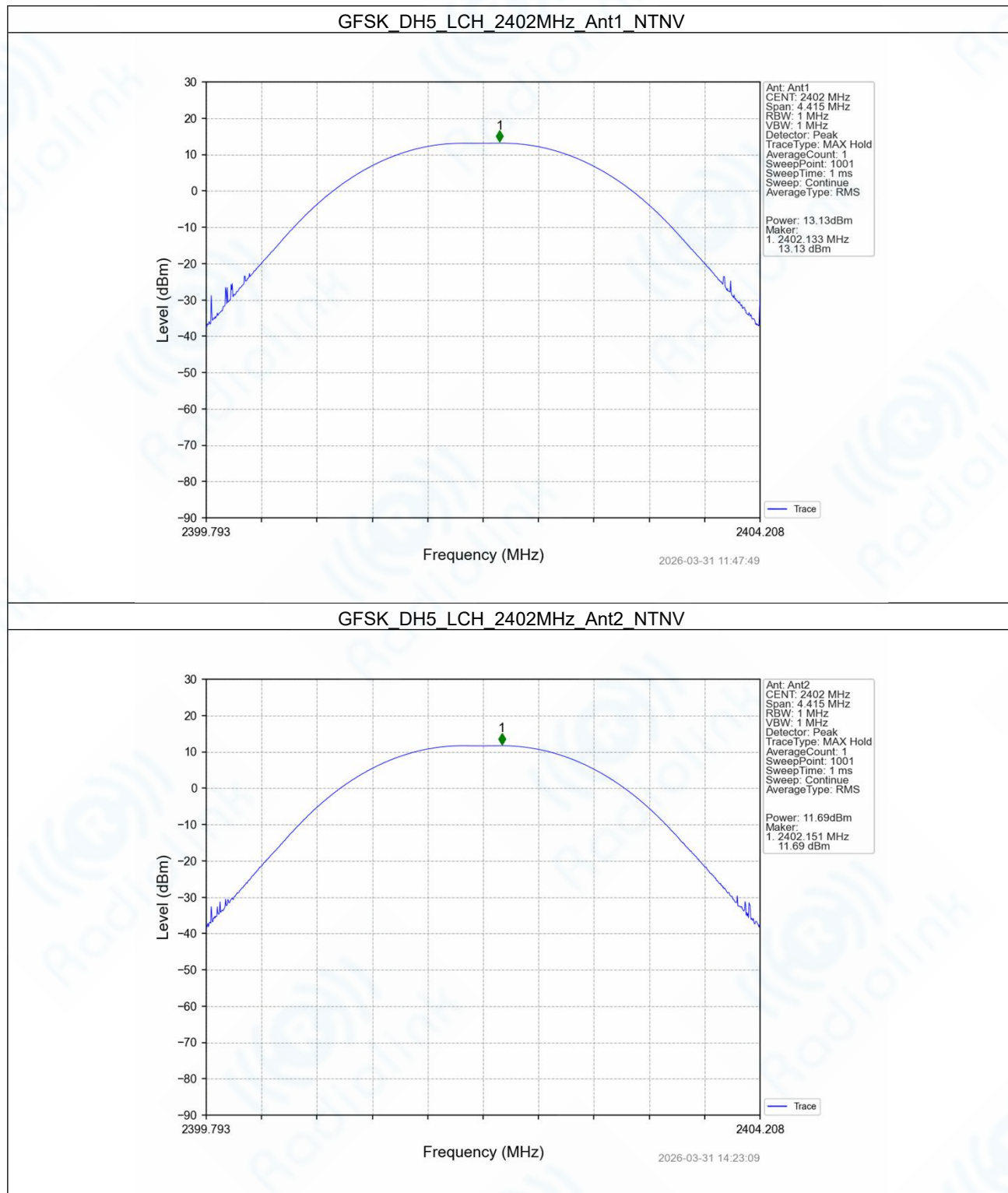
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2.2 Test Graph

2.2.1 Power

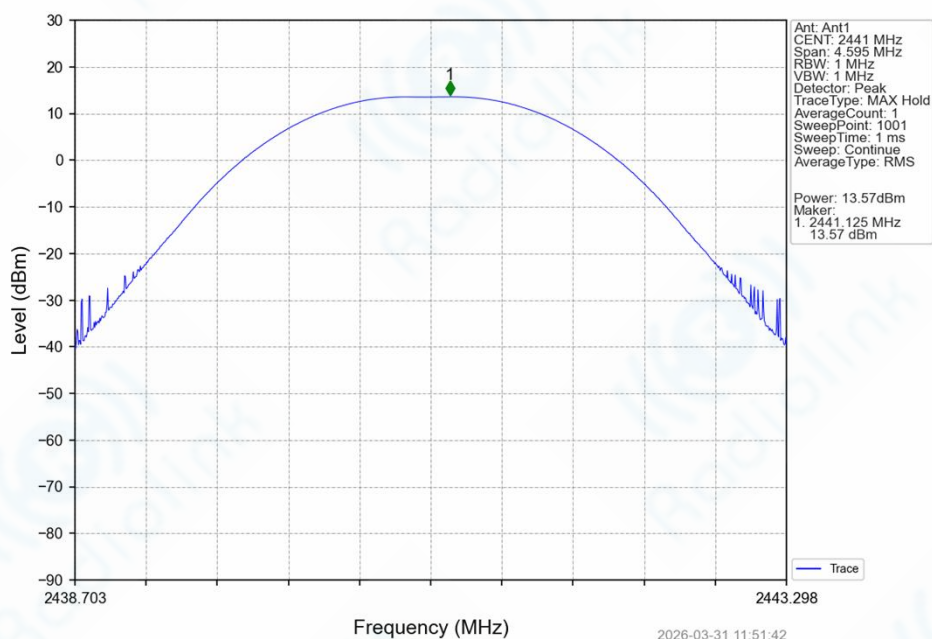


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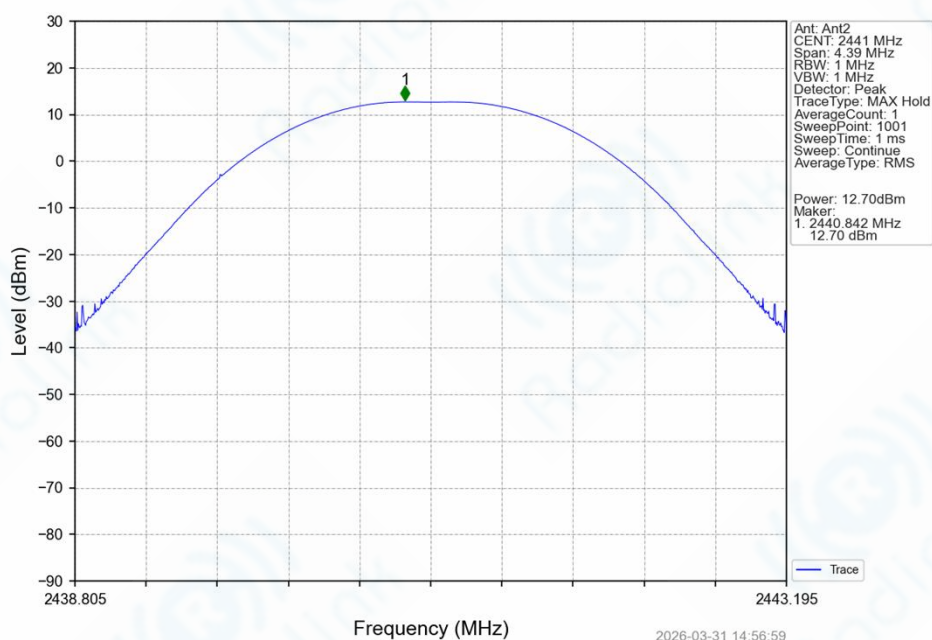
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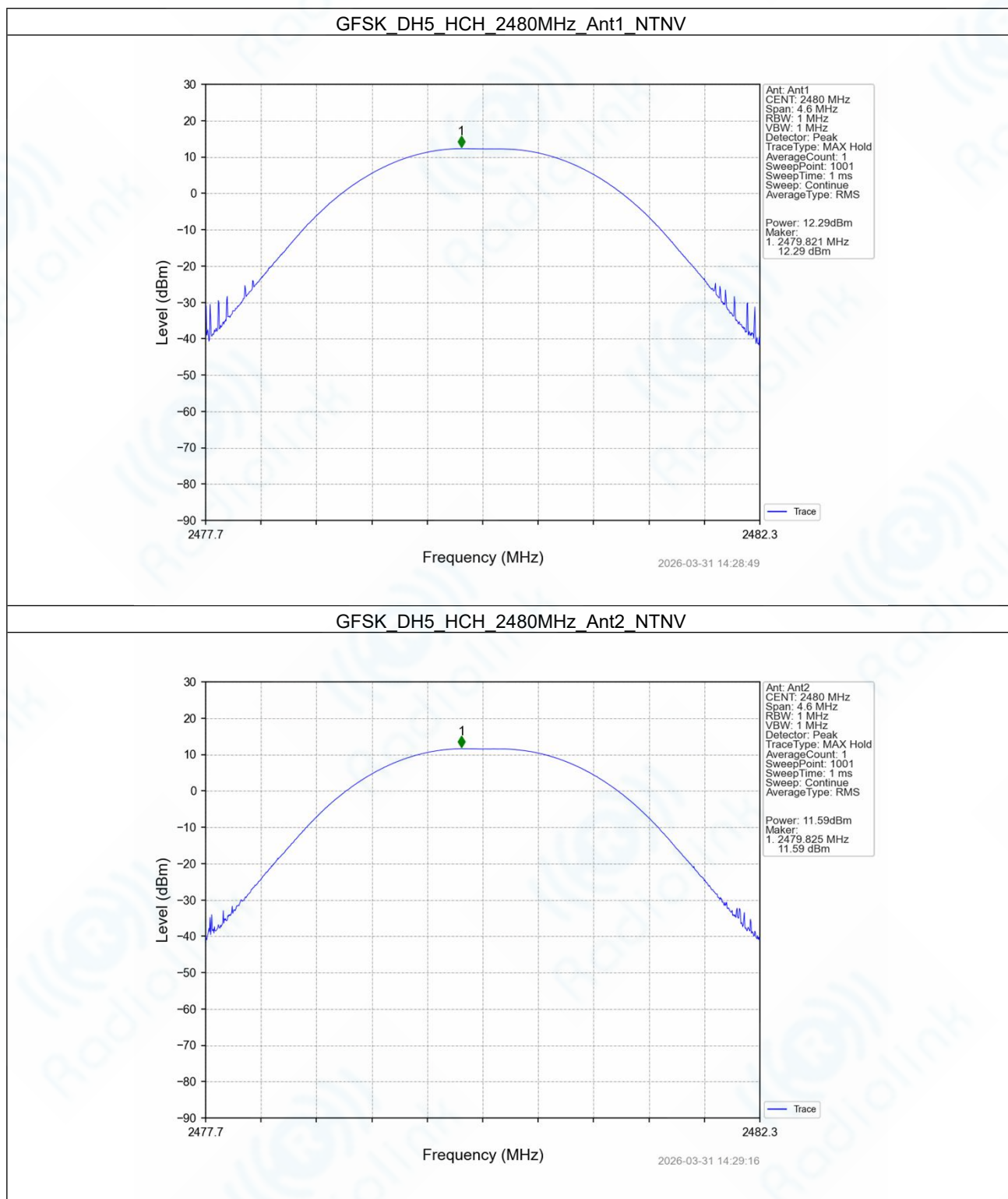
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GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant2_NTNV

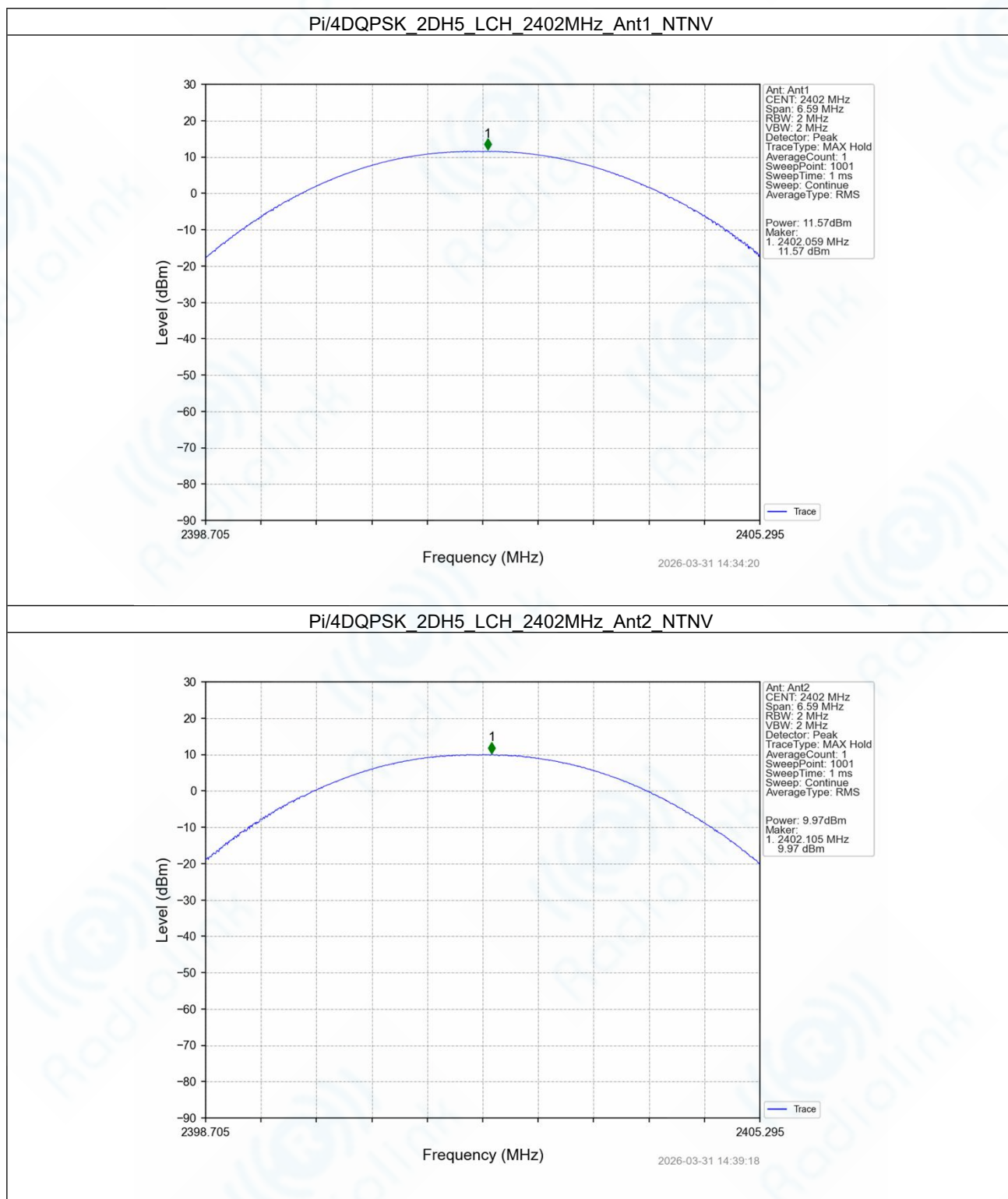




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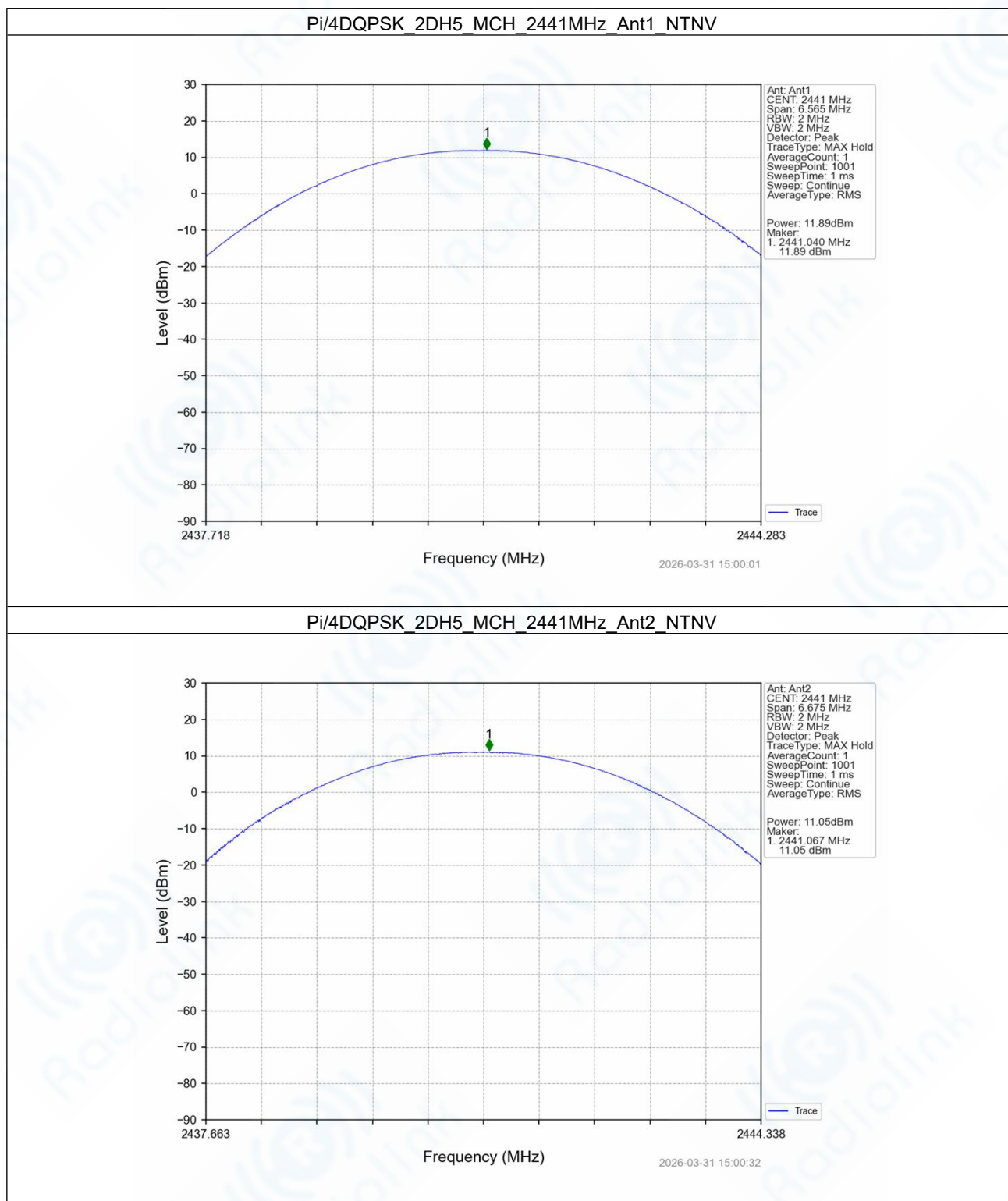
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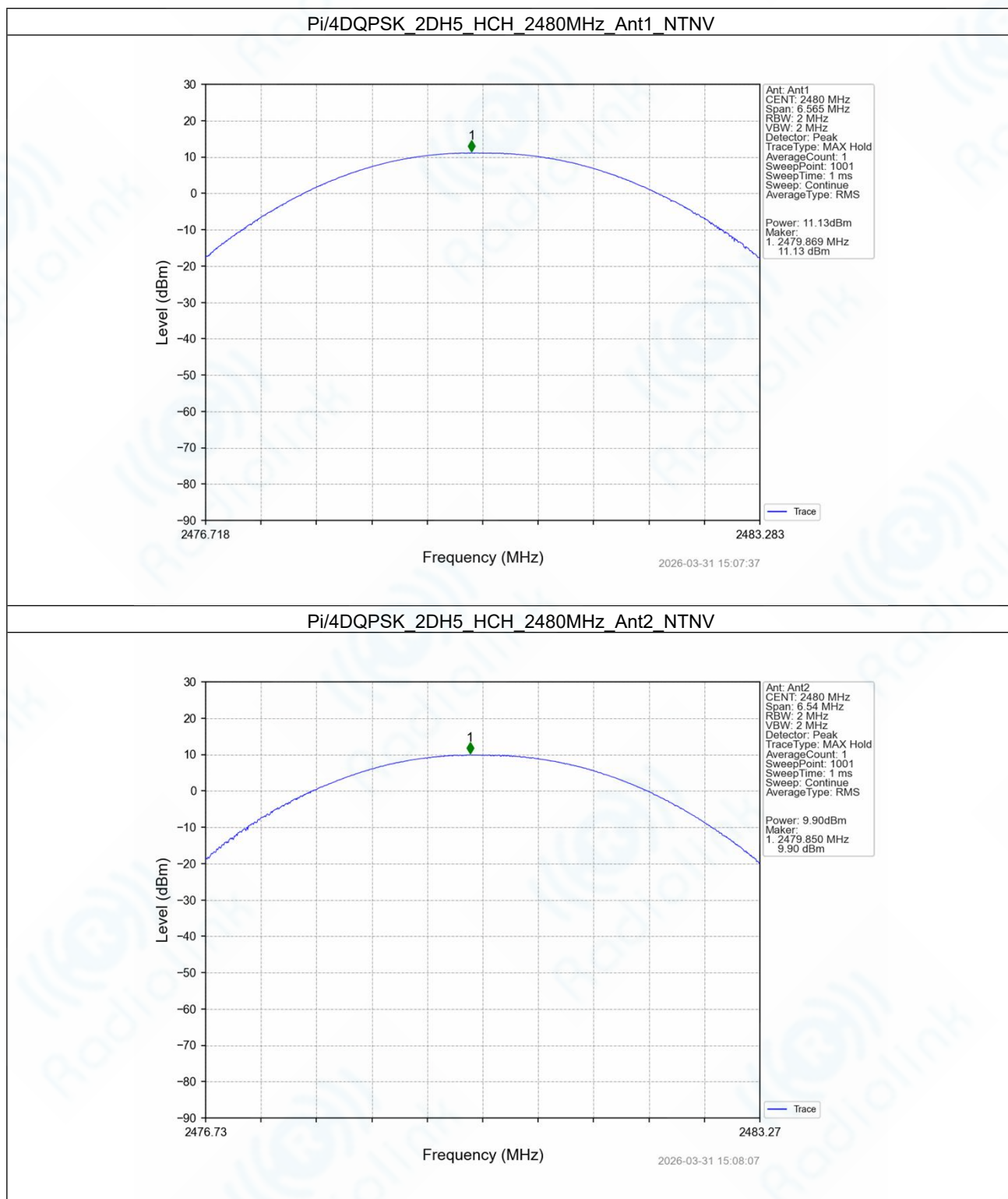
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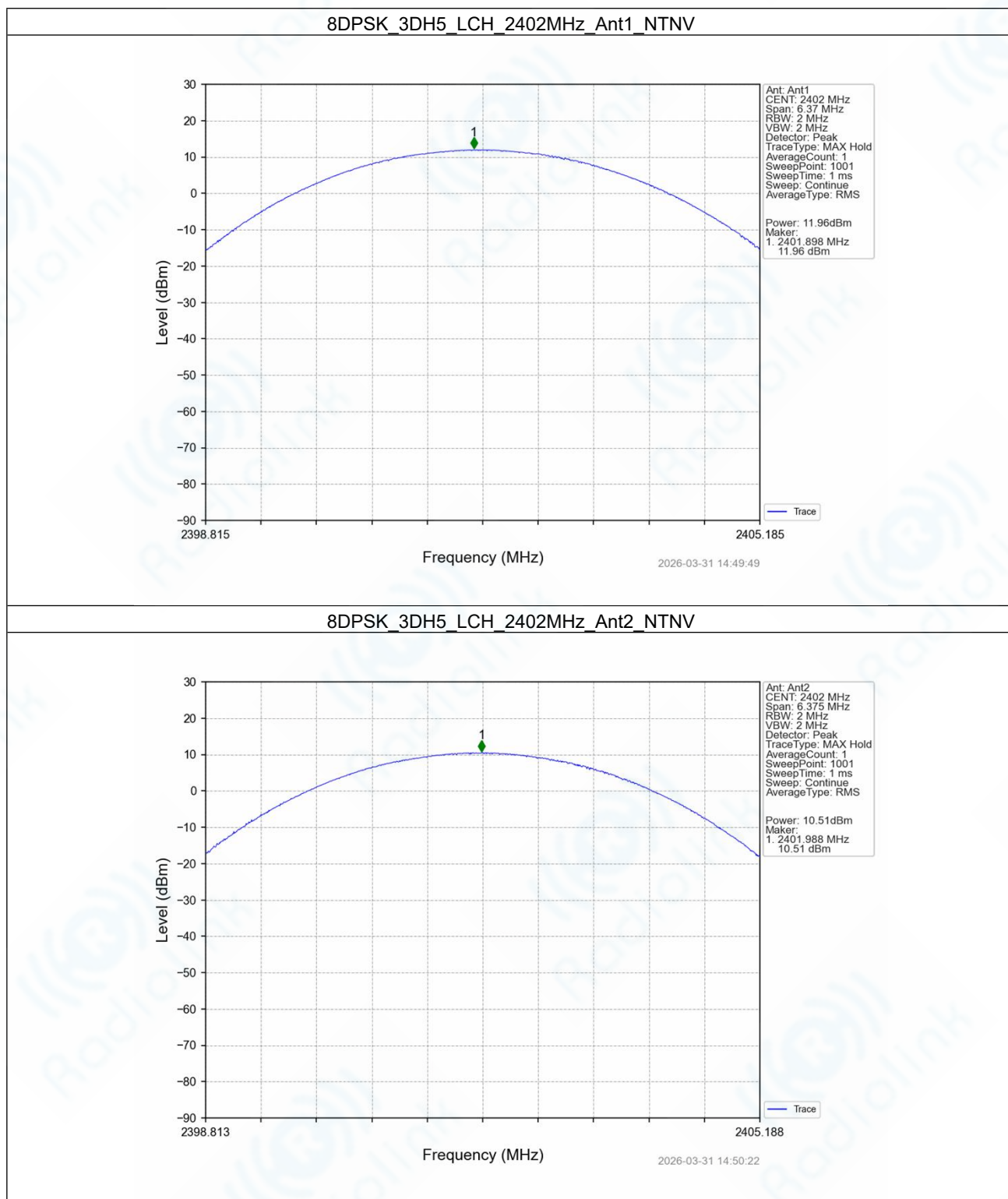
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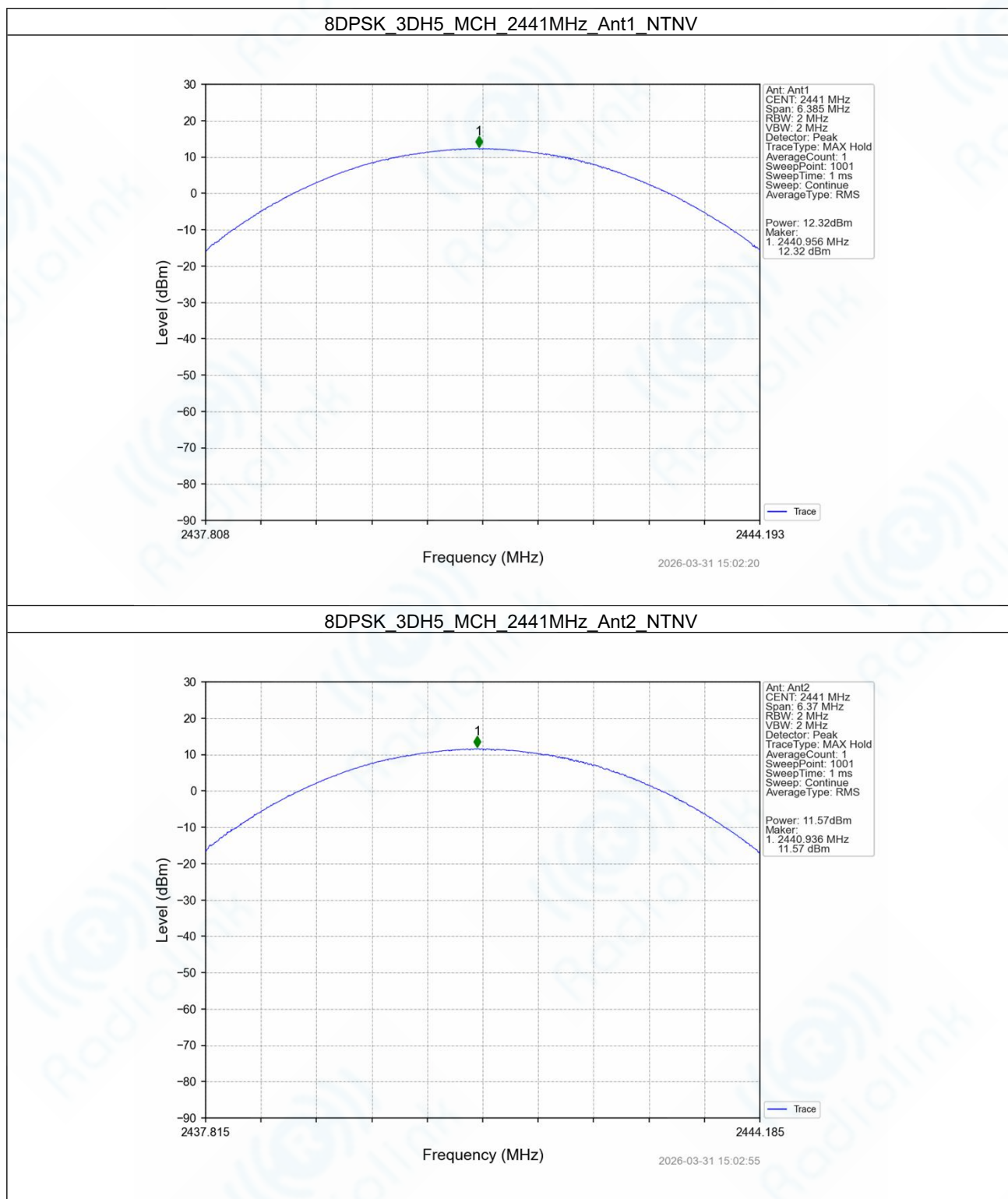
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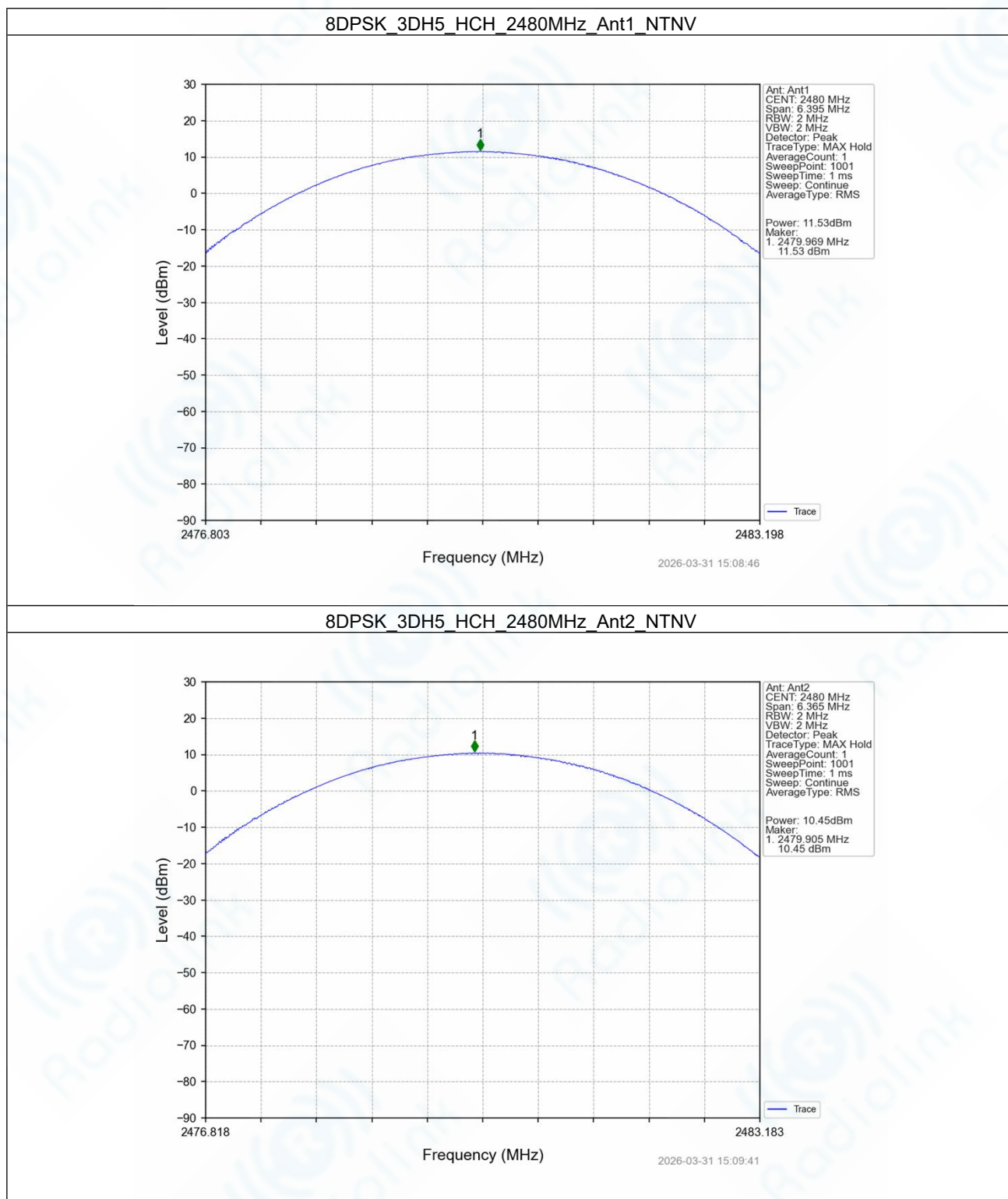
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3. Carrier Frequency Separation

3.1 Test Result

3.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.006	0.920	≥ 0.92	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.335	≥ 0.89	Pass
8DPSK	SISO	HOPP	3DH5	0.982	1.279	≥ 0.853	Pass



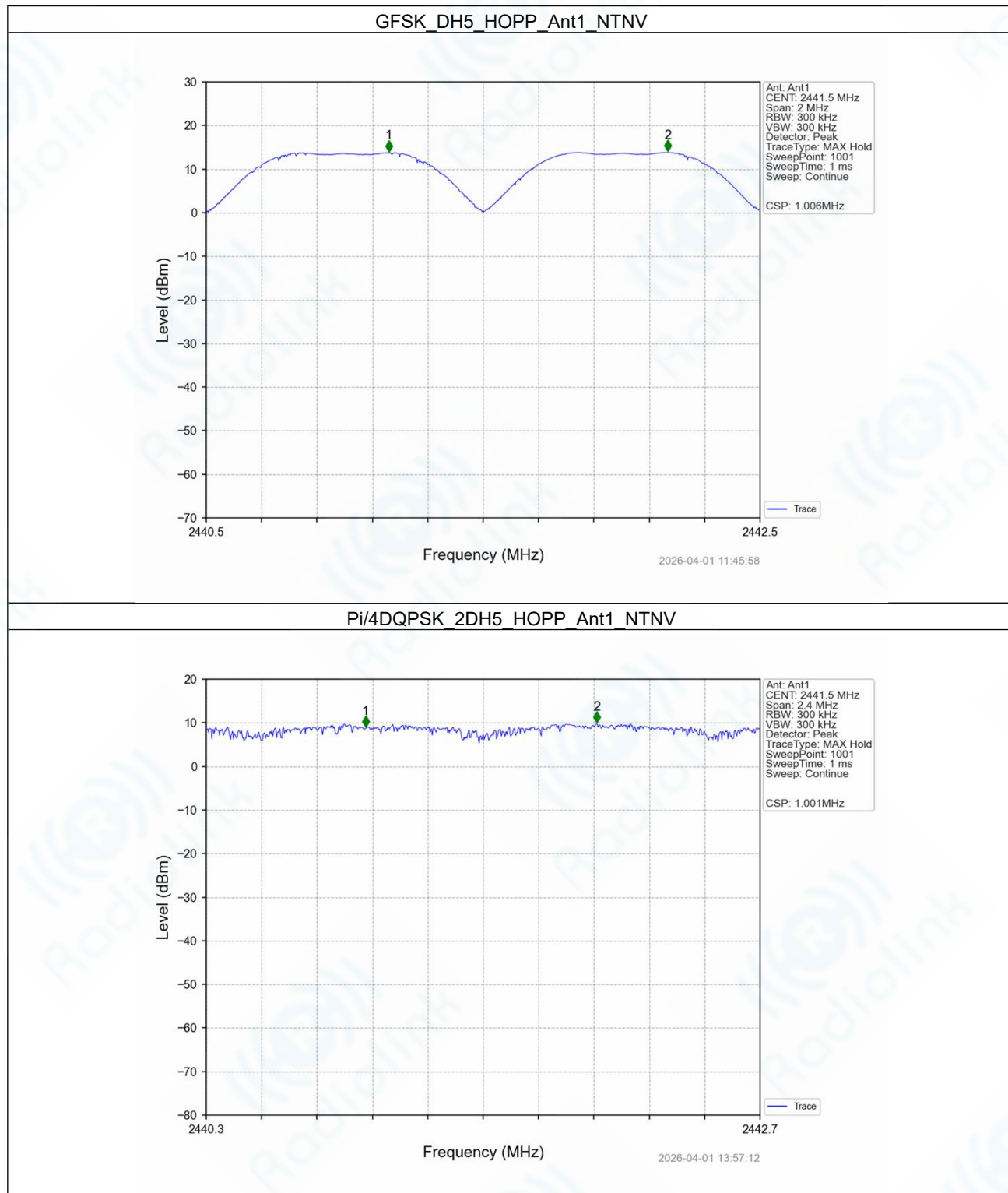
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3.2 Test Graph

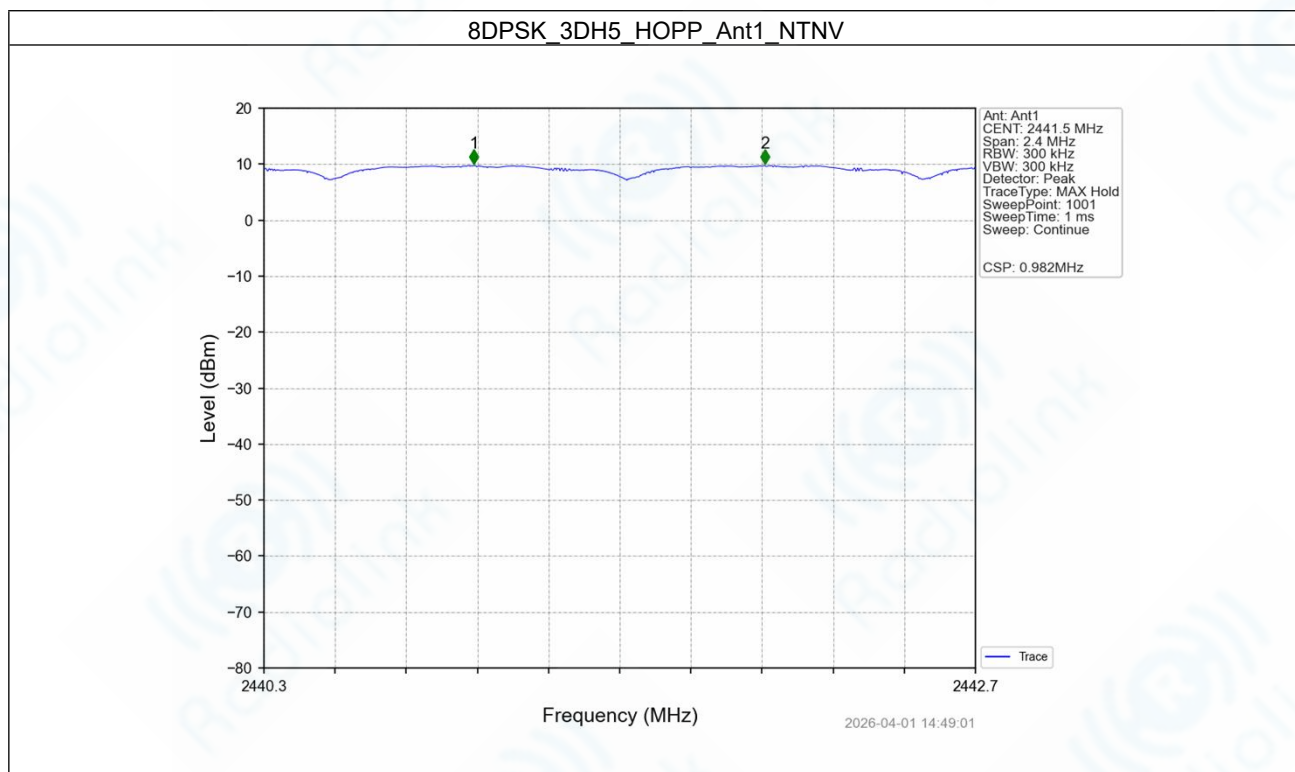
3.2.1 Ant1



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4. Number of Hopping Frequencies

4.1 Test Result

4.1.1 HoppNum

Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT1	Limit	
GFSK	SISO	HOPP	DH5	79	≥ 15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	≥ 15	Pass
8DPSK	SISO	HOPP	3DH5	79	≥ 15	Pass



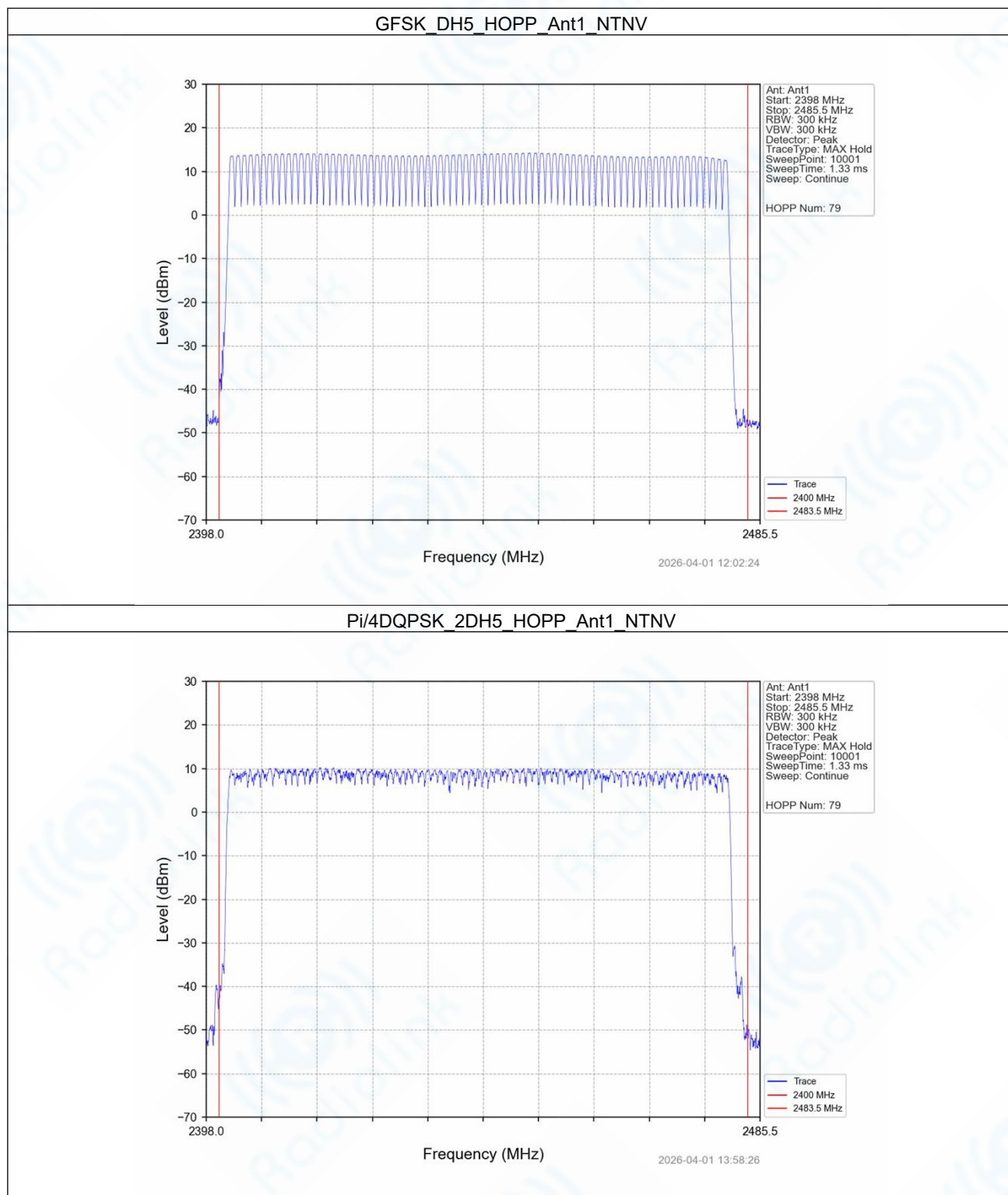
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4.2 Test Graph

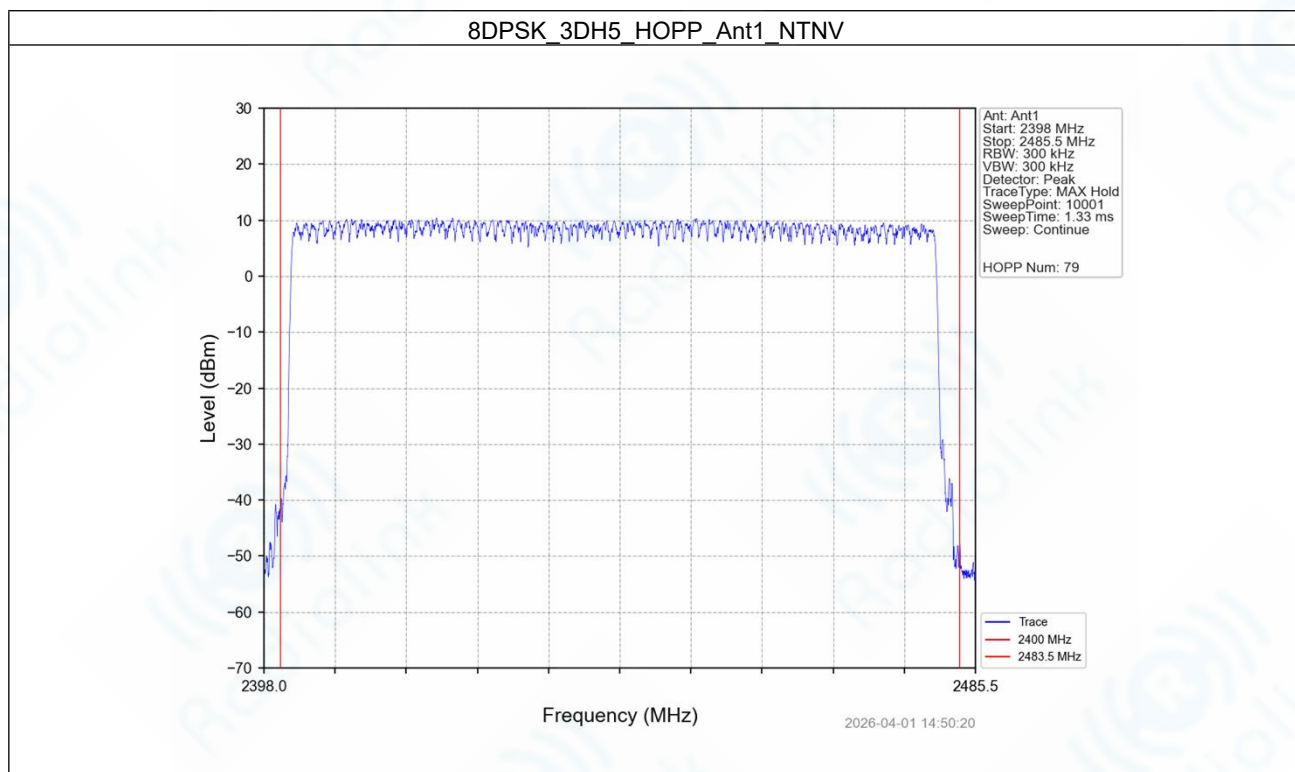
4.2.1 HoppNum



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