

ANNEX D TEST DATA

For

Project No.:	8236EU013101W
Client:	Productech Corporation
Product Name:	Wireless Earbuds
Model No.:	X4
FCC ID:	2A889-X4
Technology:	Bluetooth BDR&EDR
Test Engineer:	<i>Mikoy zhu</i>
Test Date:	2025-01-03

Test Summary

Item	Result
Duty Cycle	Pass
Bandwidth	Pass
Maximum Conducted Output Power	Pass
Carrier Frequency Separation	Pass
Number of Hopping Frequencies	Pass
Time of Occupancy (Dwell Time)	Pass
Unwanted Emissions In Non-restricted Frequency Bands	Pass

1. Duty Cycle

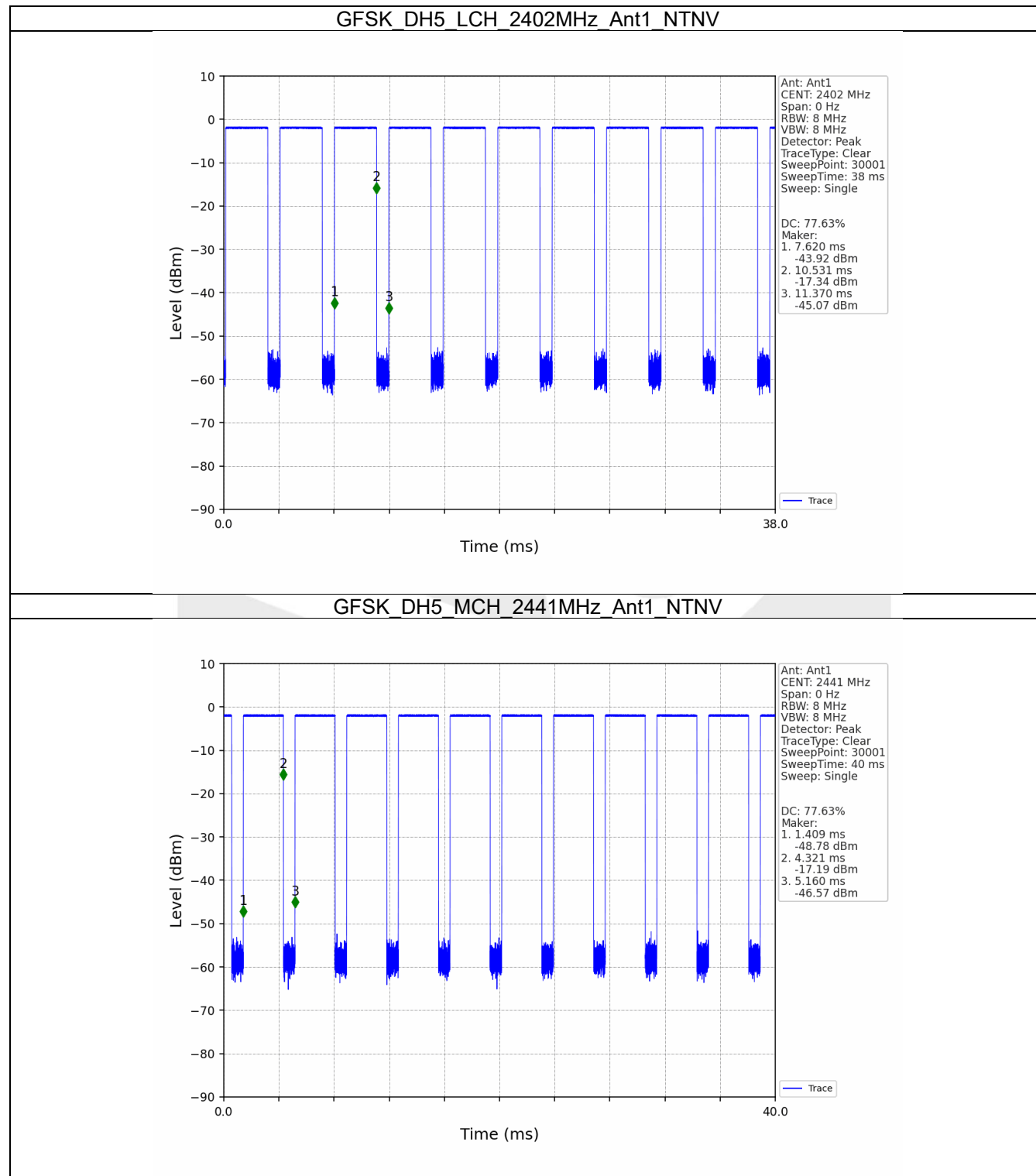
1.1 Test Result

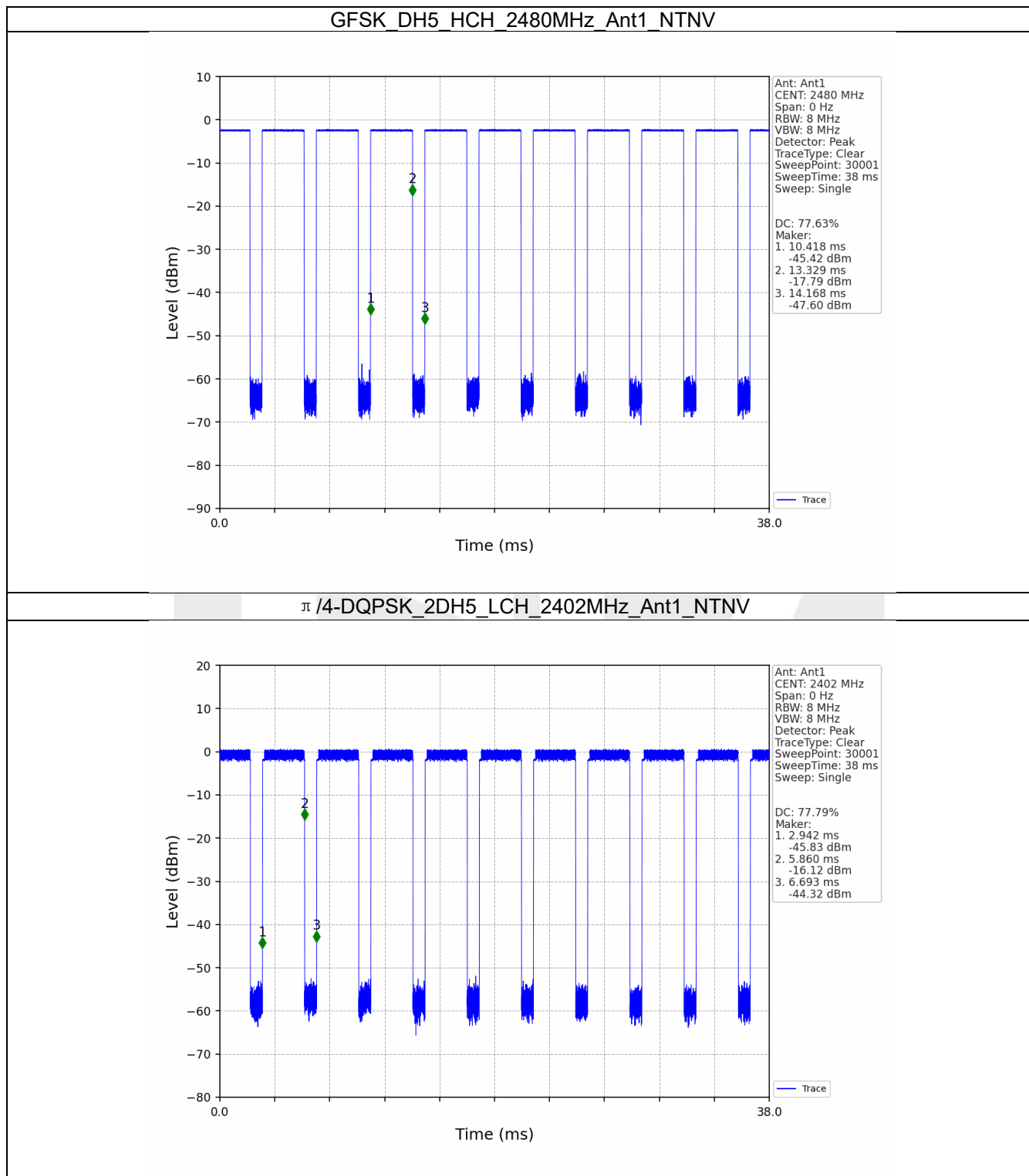
1.1.1 Ant1

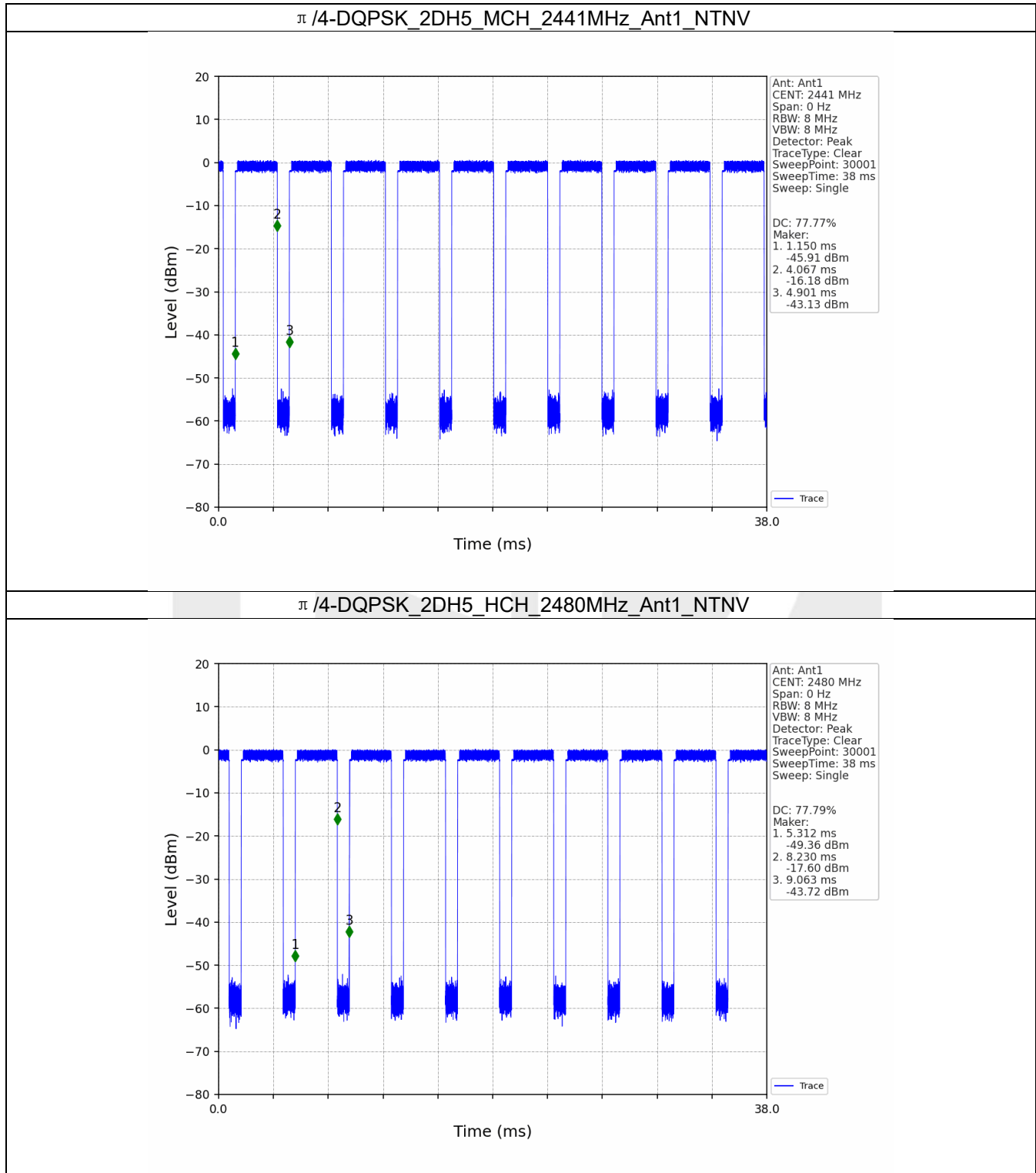
Ant1								
Mode	TX Type	Frequency (MHz)	Packet Type	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.911	3.750	77.63	1.10	0.01
		2441	DH5	2.912	3.751	77.63	1.10	0.03
		2480	DH5	2.911	3.750	77.63	1.10	0.01
$\pi/4$ -DQPSK	SISO	2402	2DH5	2.918	3.751	77.79	1.09	0.03
		2441	2DH5	2.917	3.751	77.77	1.09	0.03
		2480	2DH5	2.918	3.751	77.79	1.09	0.03
8DPSK	SISO	2402	3DH5	2.919	3.750	77.84	1.09	0.01
		2441	3DH5	2.919	3.751	77.82	1.09	0.03
		2480	3DH5	2.919	3.751	77.82	1.09	0.03

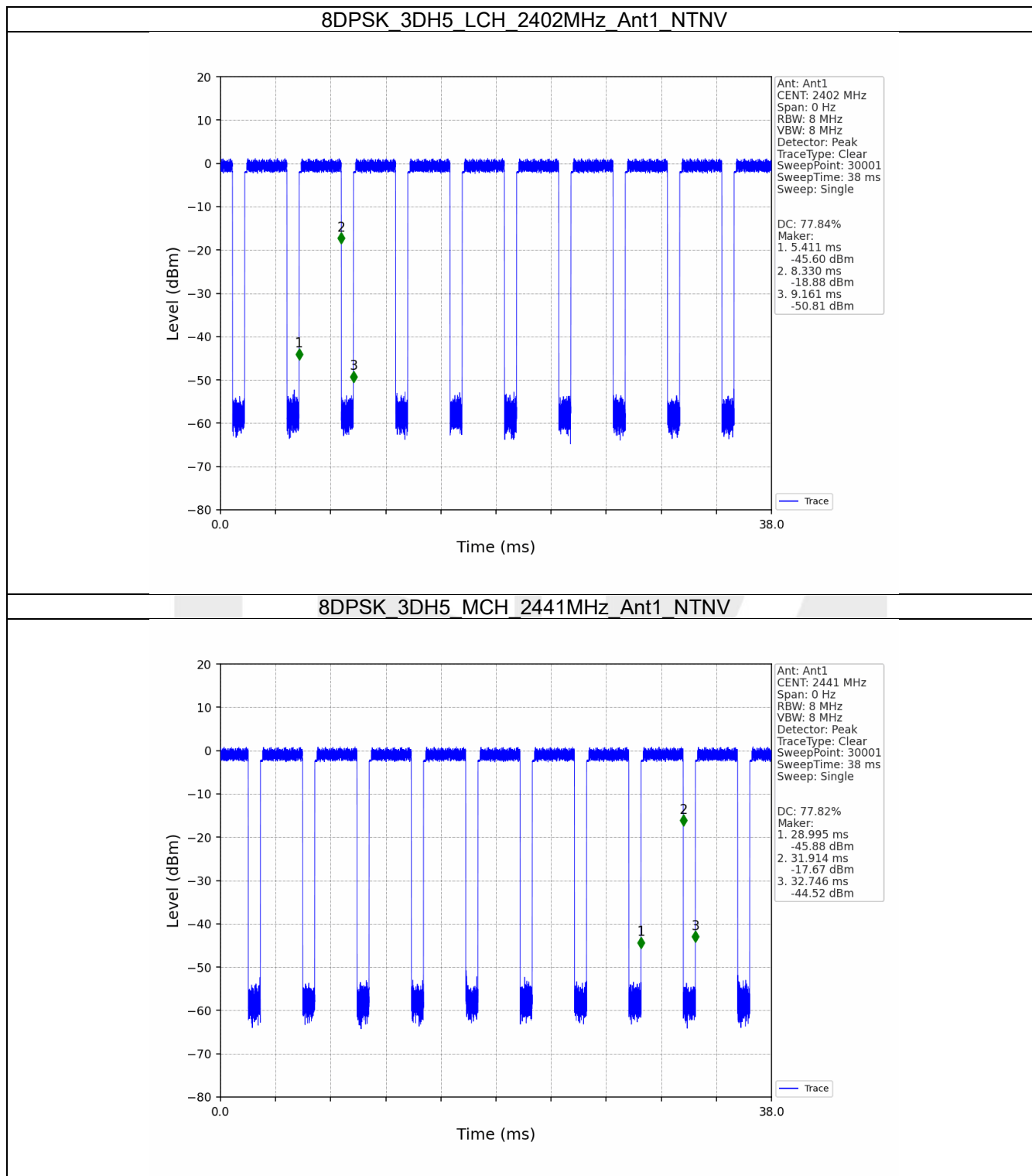
1.2 Test Graph

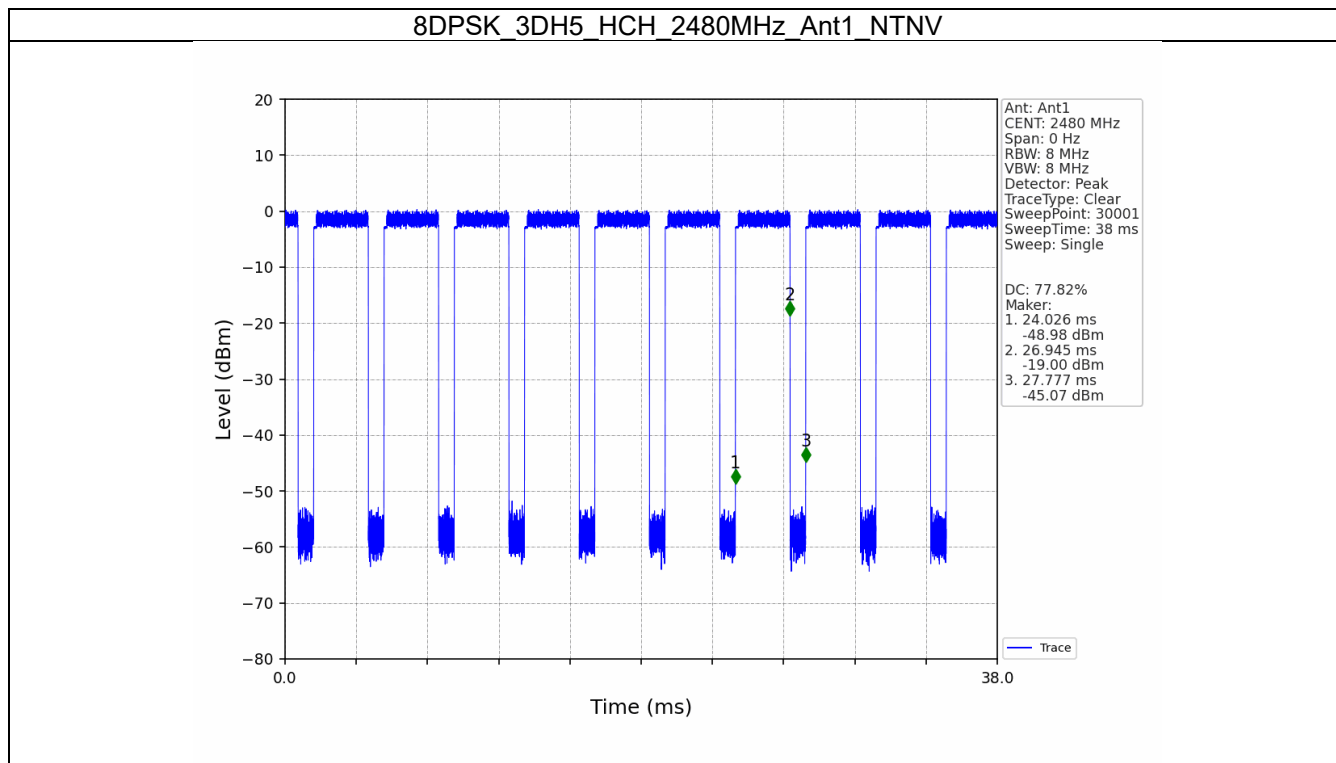
1.2.1 Ant1











2. Bandwidth

2.1 Test Result

2.1.1 OBW

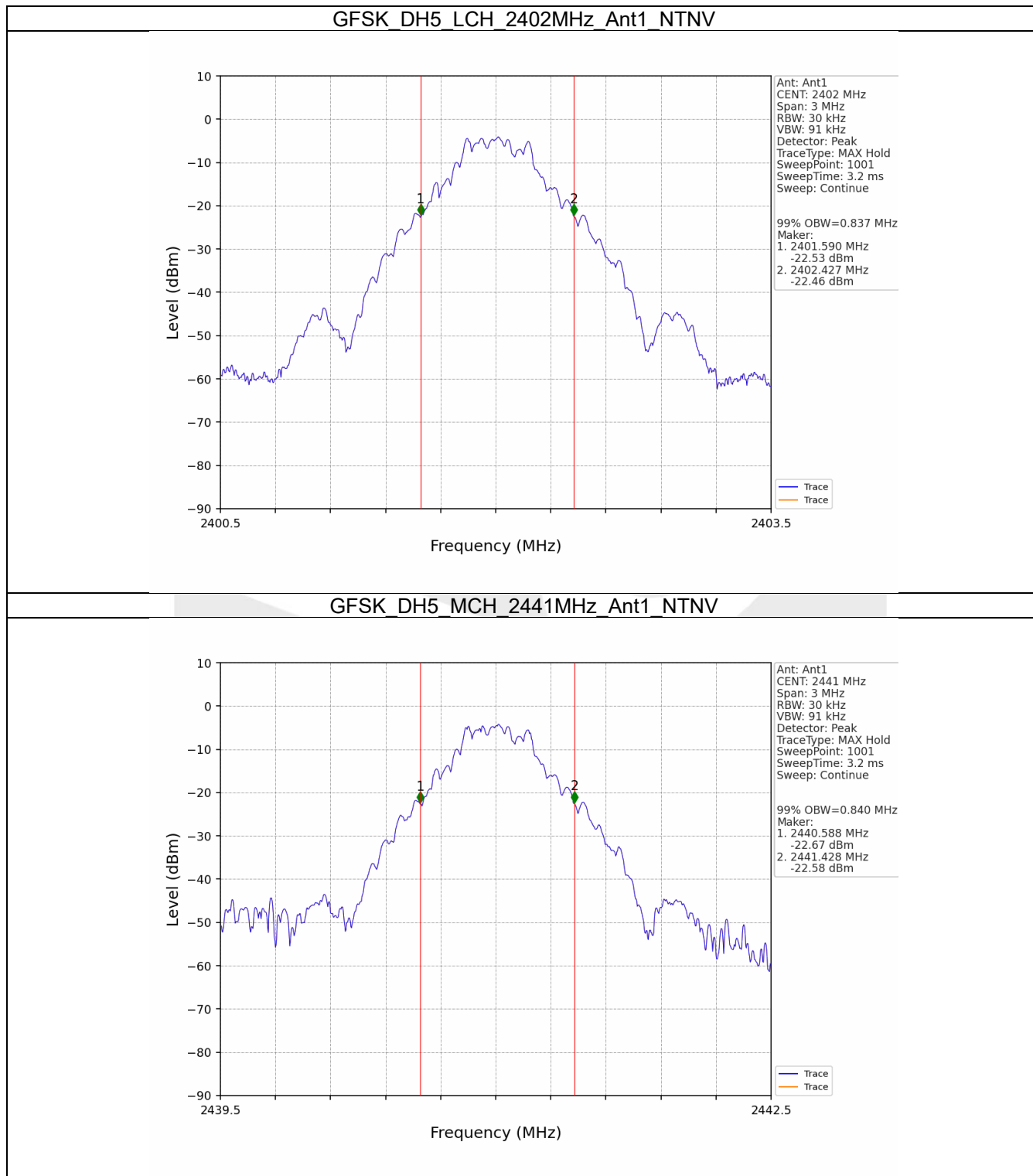
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.837	/	Pass
		2441	DH5	1	0.840	/	Pass
		2480	DH5	1	0.836	/	Pass
π /4-DQPSK	SISO	2402	2DH5	1	1.161	/	Pass
		2441	2DH5	1	1.160	/	Pass
		2480	2DH5	1	1.161	/	Pass
8DPSK	SISO	2402	3DH5	1	1.166	/	Pass
		2441	3DH5	1	1.180	/	Pass
		2480	3DH5	1	1.166	/	Pass

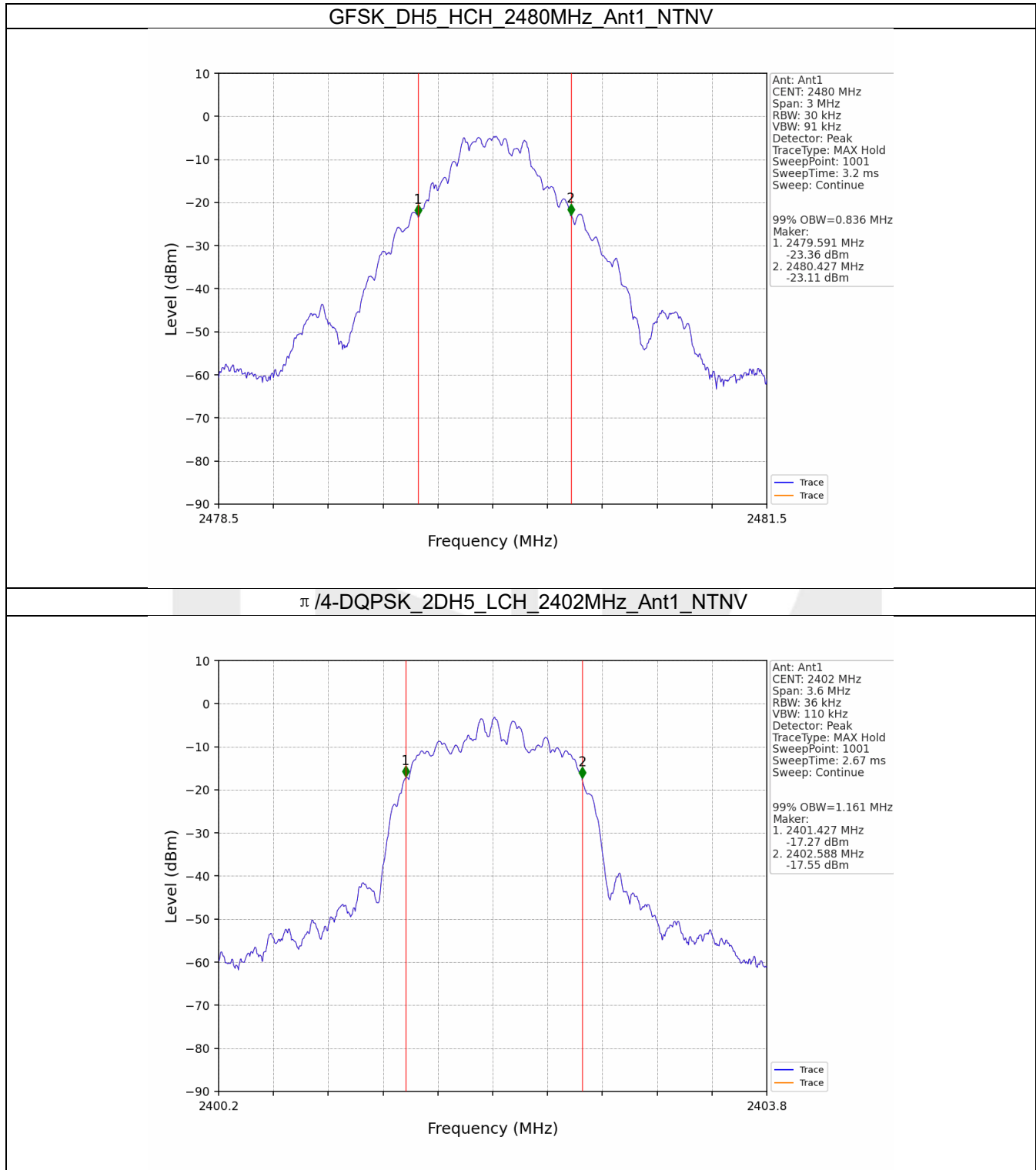
2.1.2 20dB BW

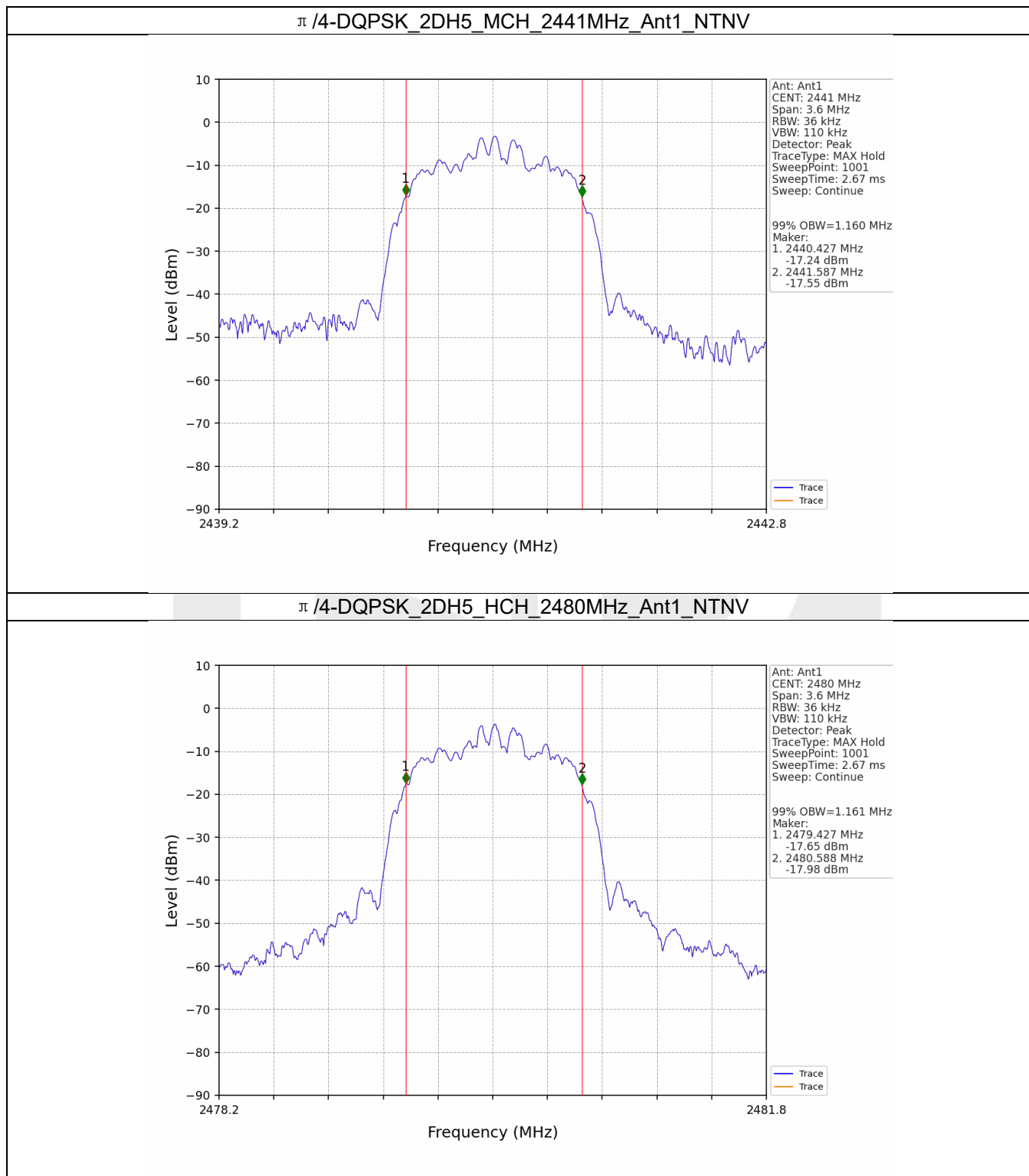
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.955	/	Pass
		2441	DH5	1	0.956	/	Pass
		2480	DH5	1	0.955	/	Pass
π /4-DQPSK	SISO	2402	2DH5	1	1.291	/	Pass
		2441	2DH5	1	1.290	/	Pass
		2480	2DH5	1	1.313	/	Pass
8DPSK	SISO	2402	3DH5	1	1.307	/	Pass
		2441	3DH5	1	1.307	/	Pass
		2480	3DH5	1	1.307	/	Pass

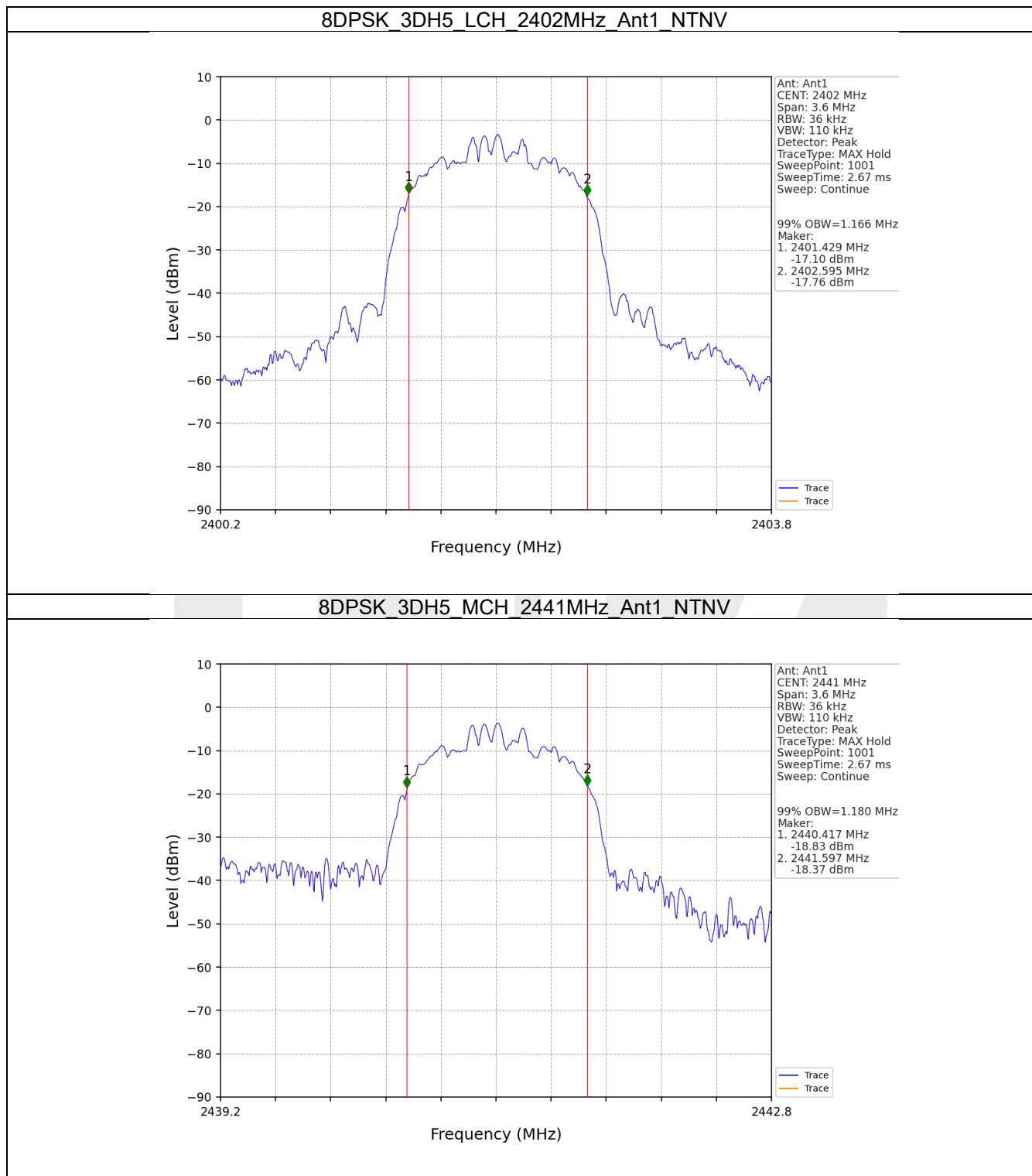
2.2 Test Graph

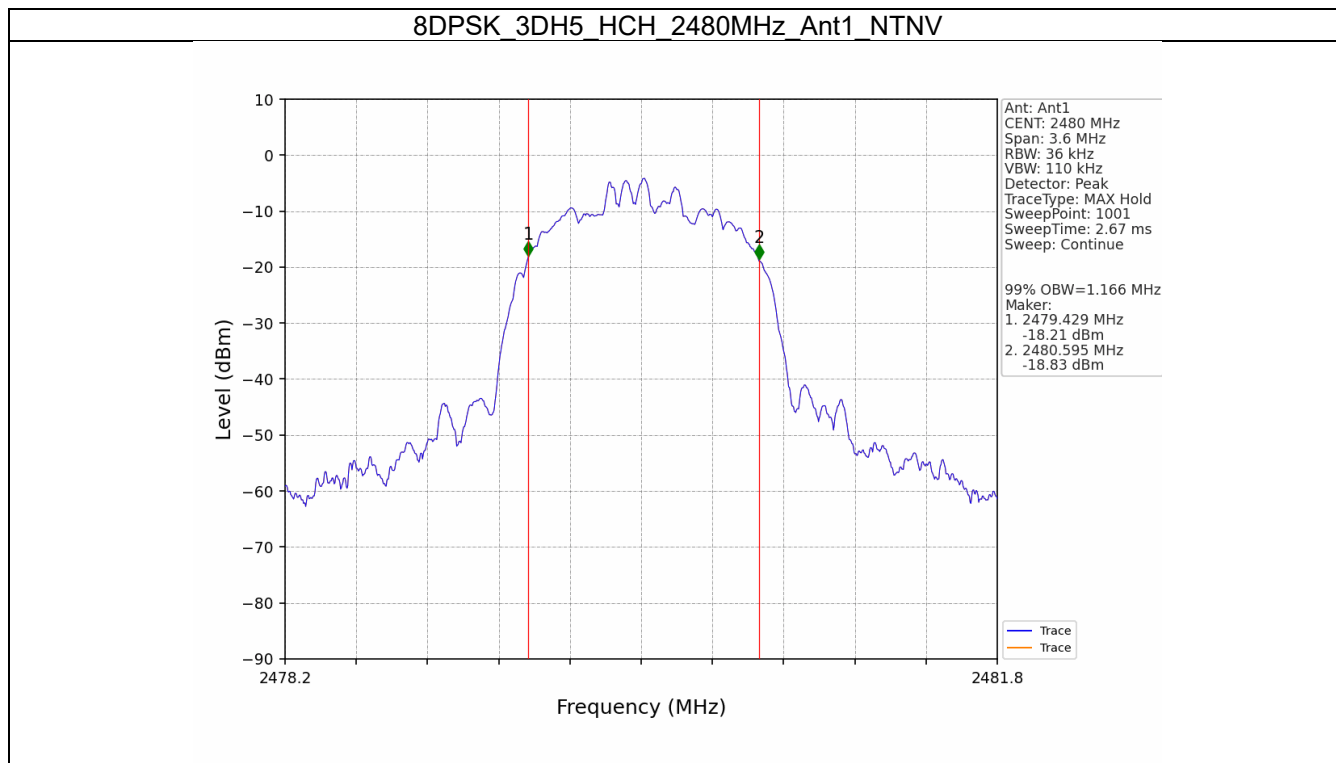
2.2.1 OBW



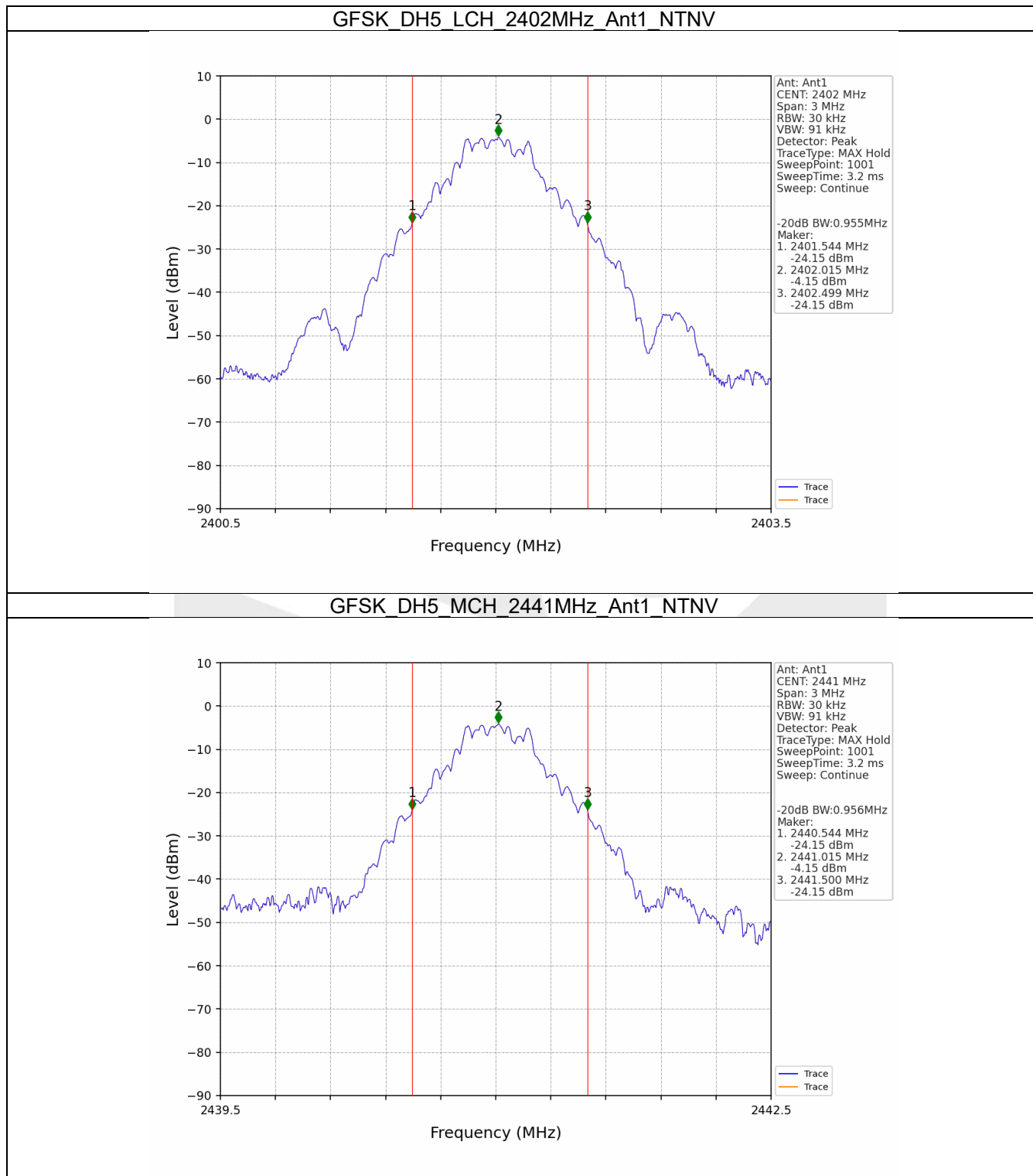


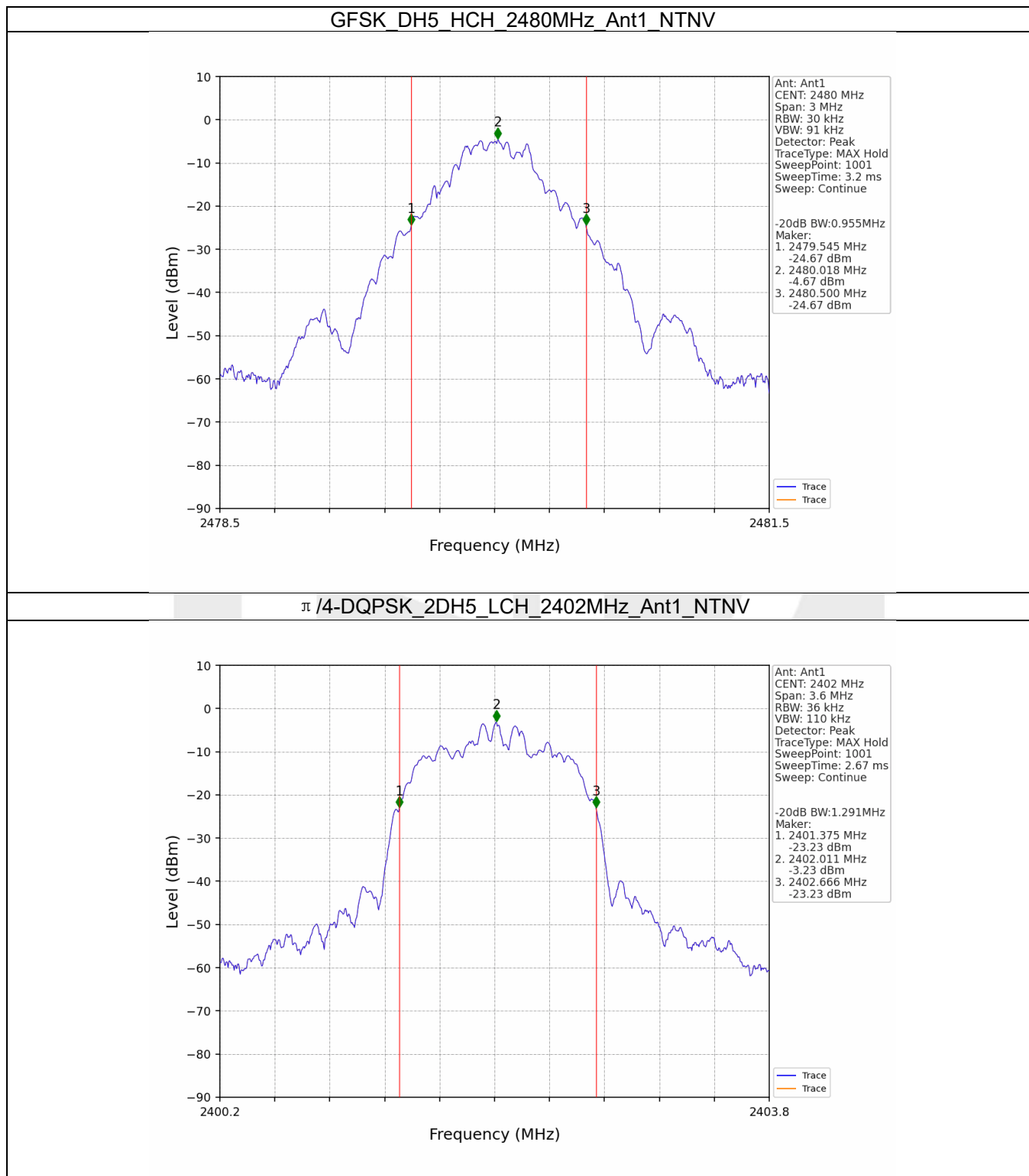


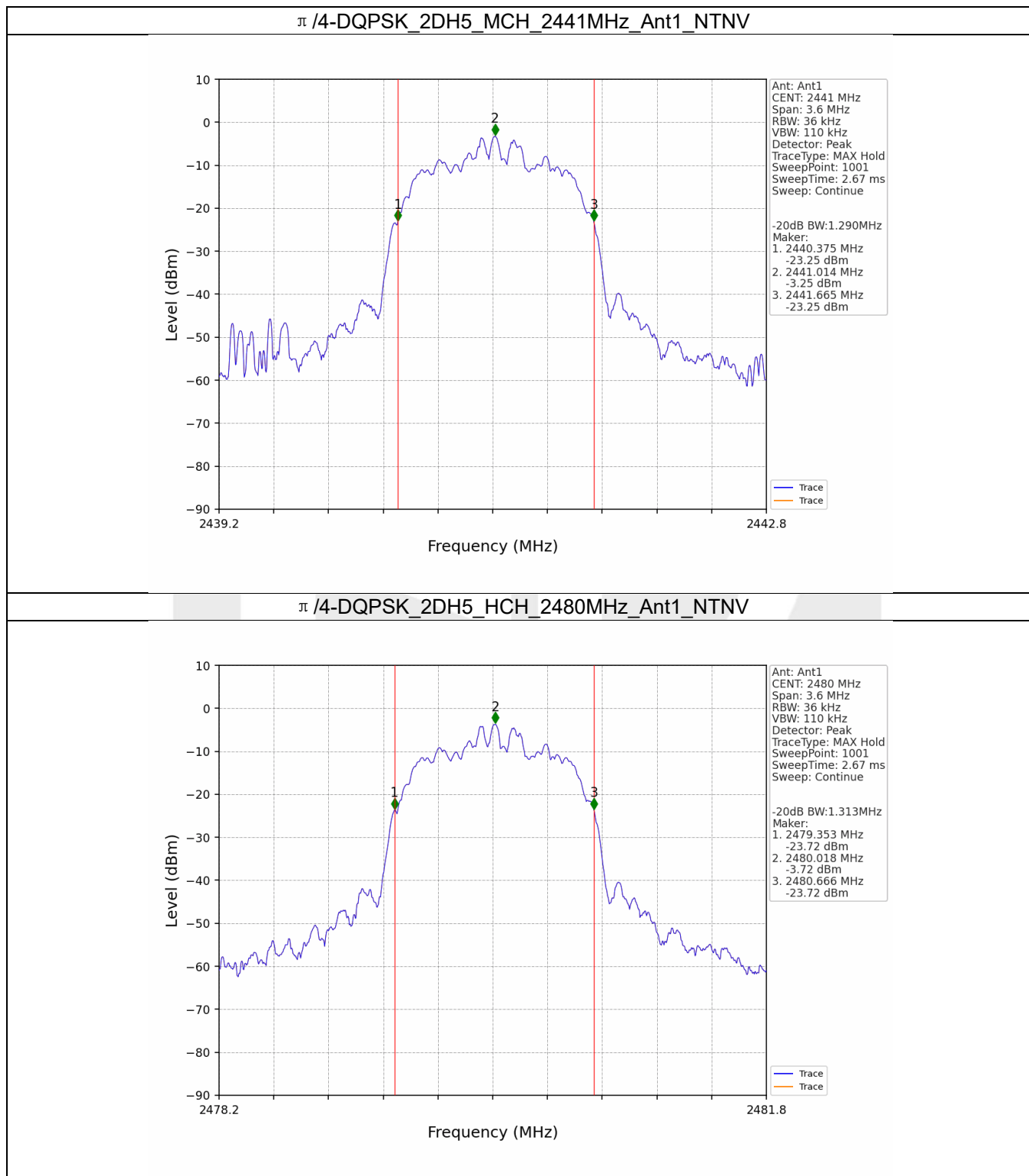


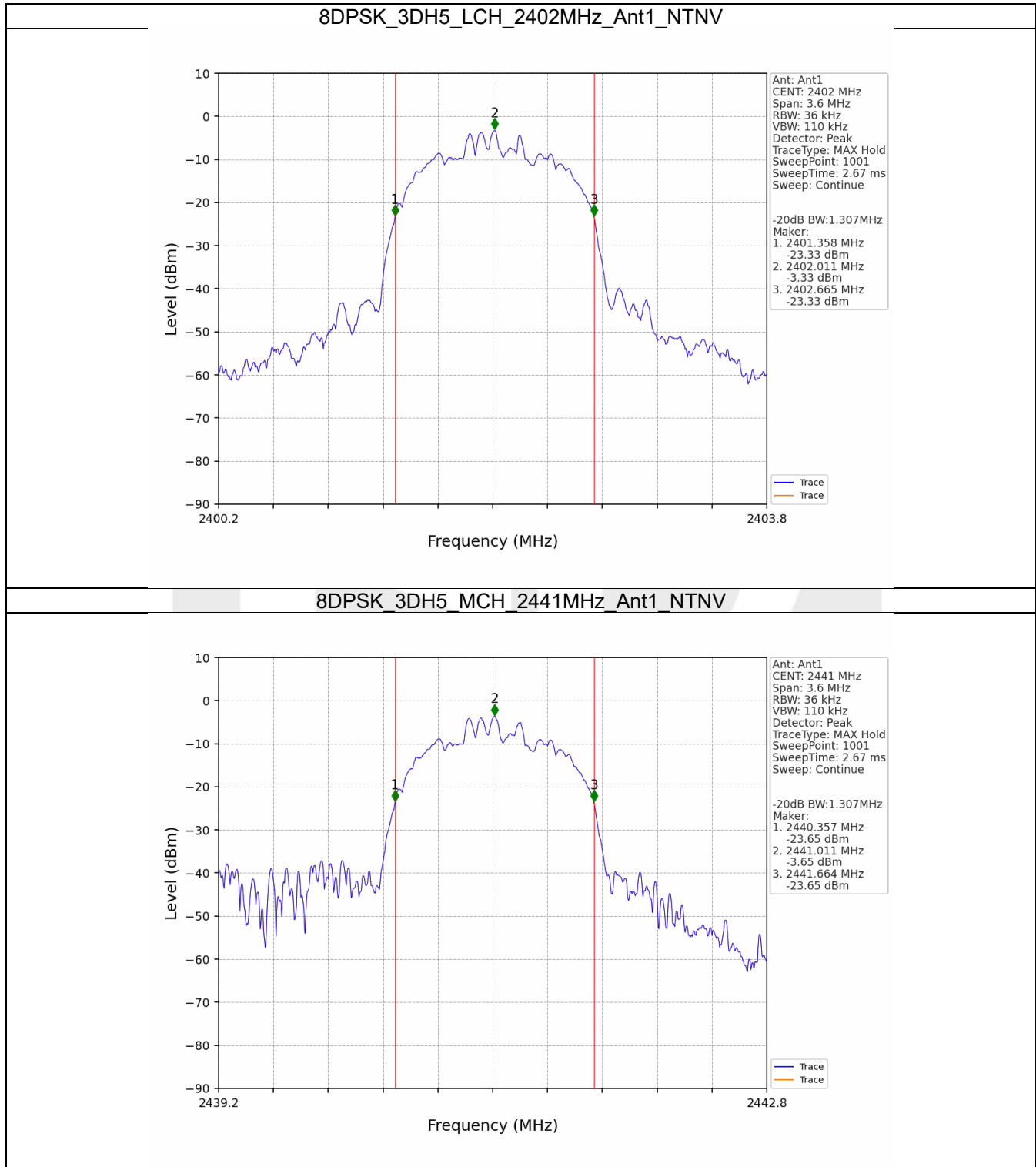


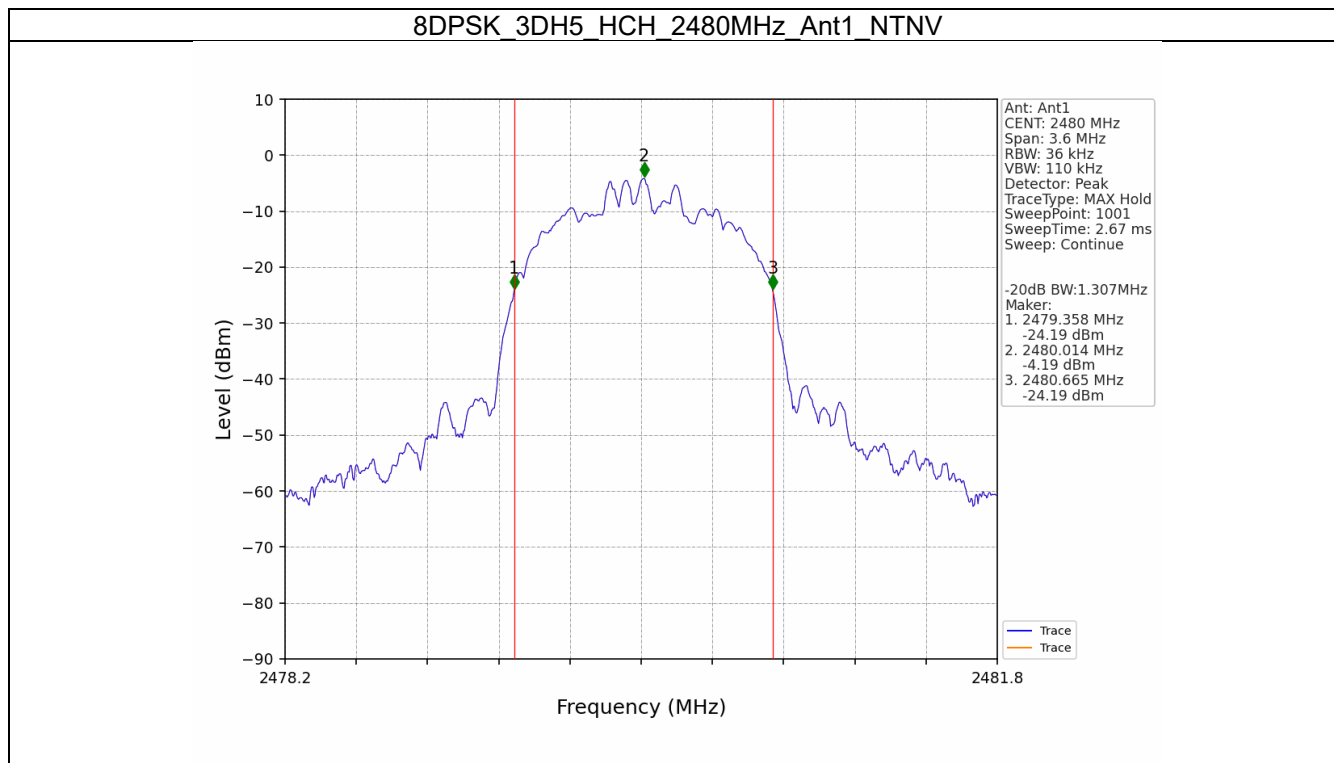
2.2.2 20dB BW











3. Maximum Conducted Output Power

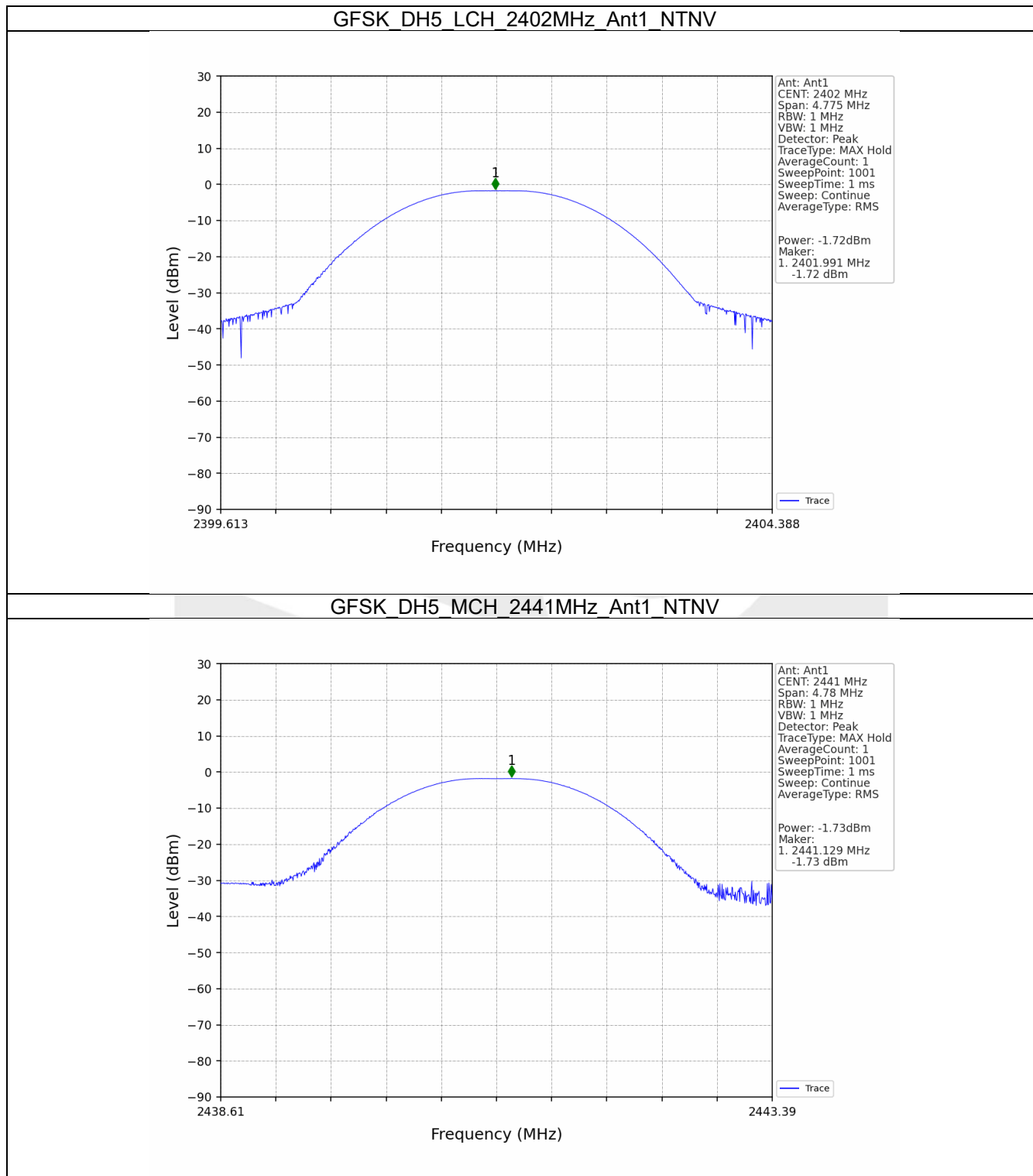
3.1 Test Result

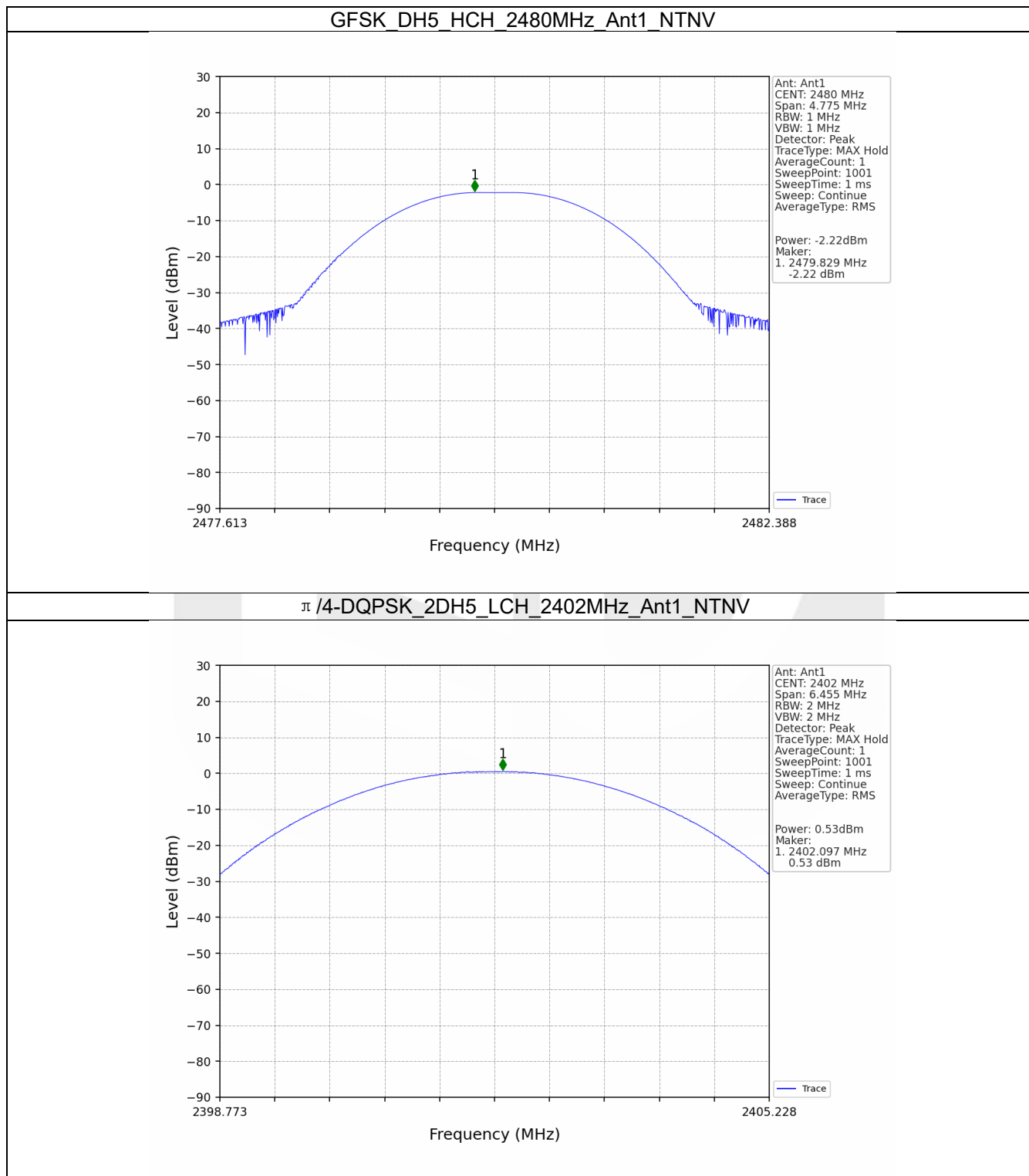
3.1.1 Power

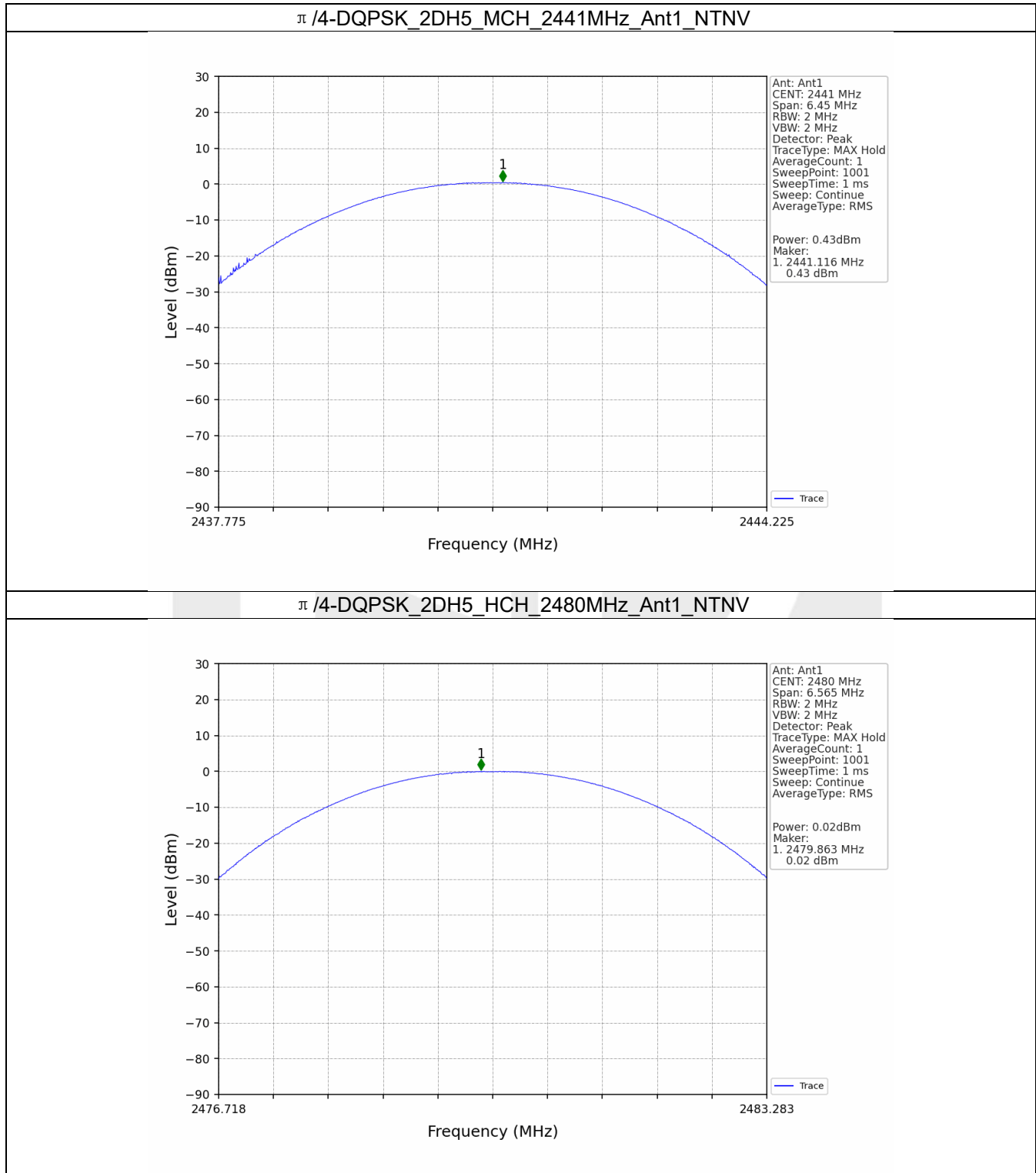
Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	-1.72	≤ 30	Pass
		2441	DH5	-1.73	≤ 30	Pass
		2480	DH5	-2.22	≤ 30	Pass
$\pi/4$ -DQPSK	SISO	2402	2DH5	0.53	≤ 20.97	Pass
		2441	2DH5	0.43	≤ 20.97	Pass
		2480	2DH5	0.02	≤ 20.97	Pass
8DPSK	SISO	2402	3DH5	1.04	≤ 20.97	Pass
		2441	3DH5	0.72	≤ 20.97	Pass
		2480	3DH5	0.13	≤ 20.97	Pass

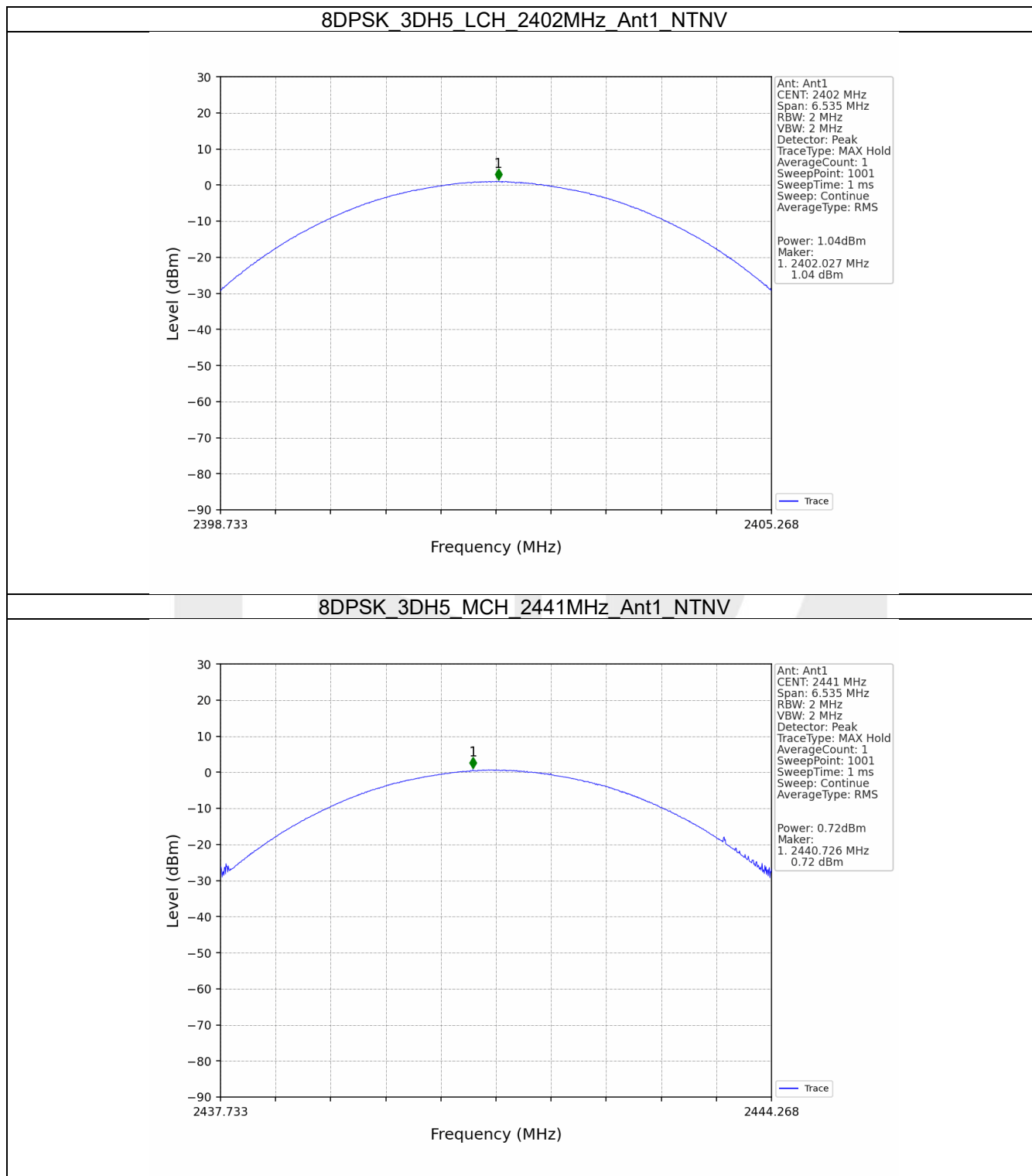
3.2 Test Graph

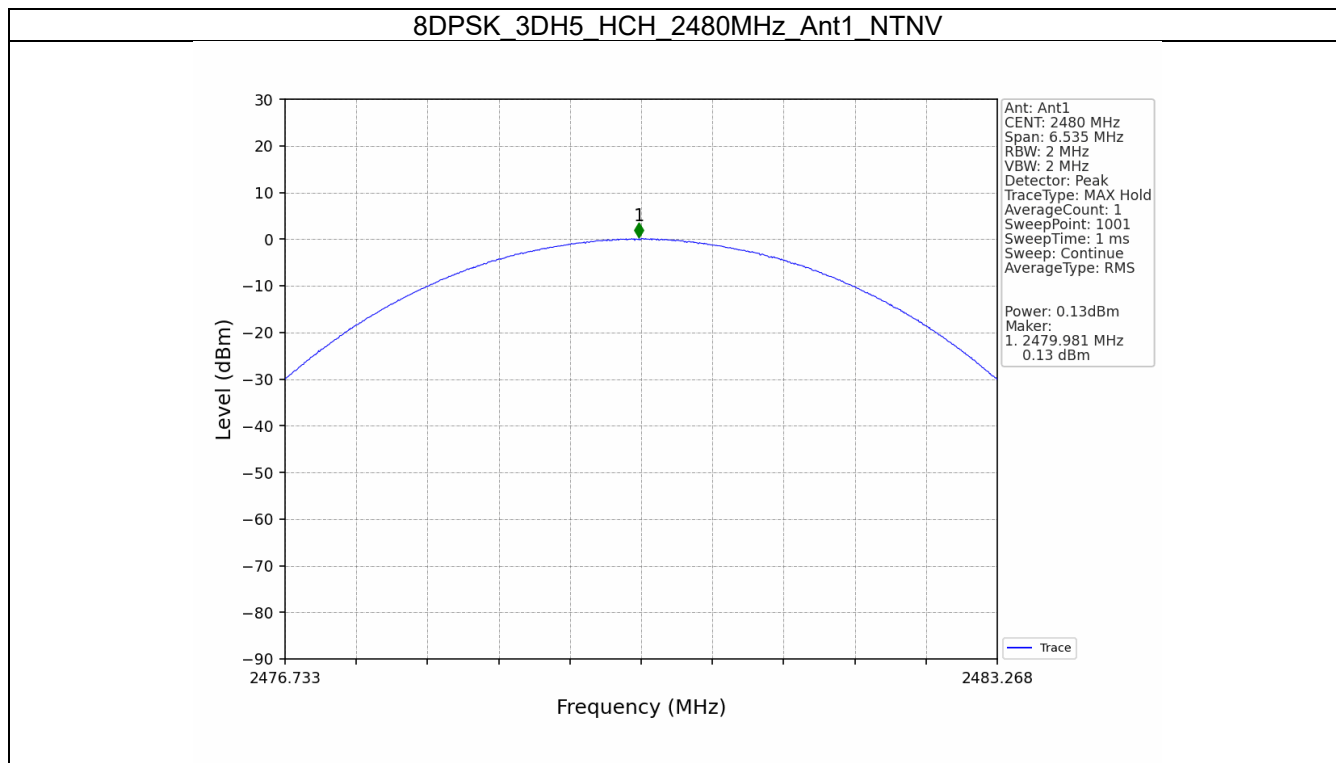
3.2.1 Power











4. Carrier Frequency Separation

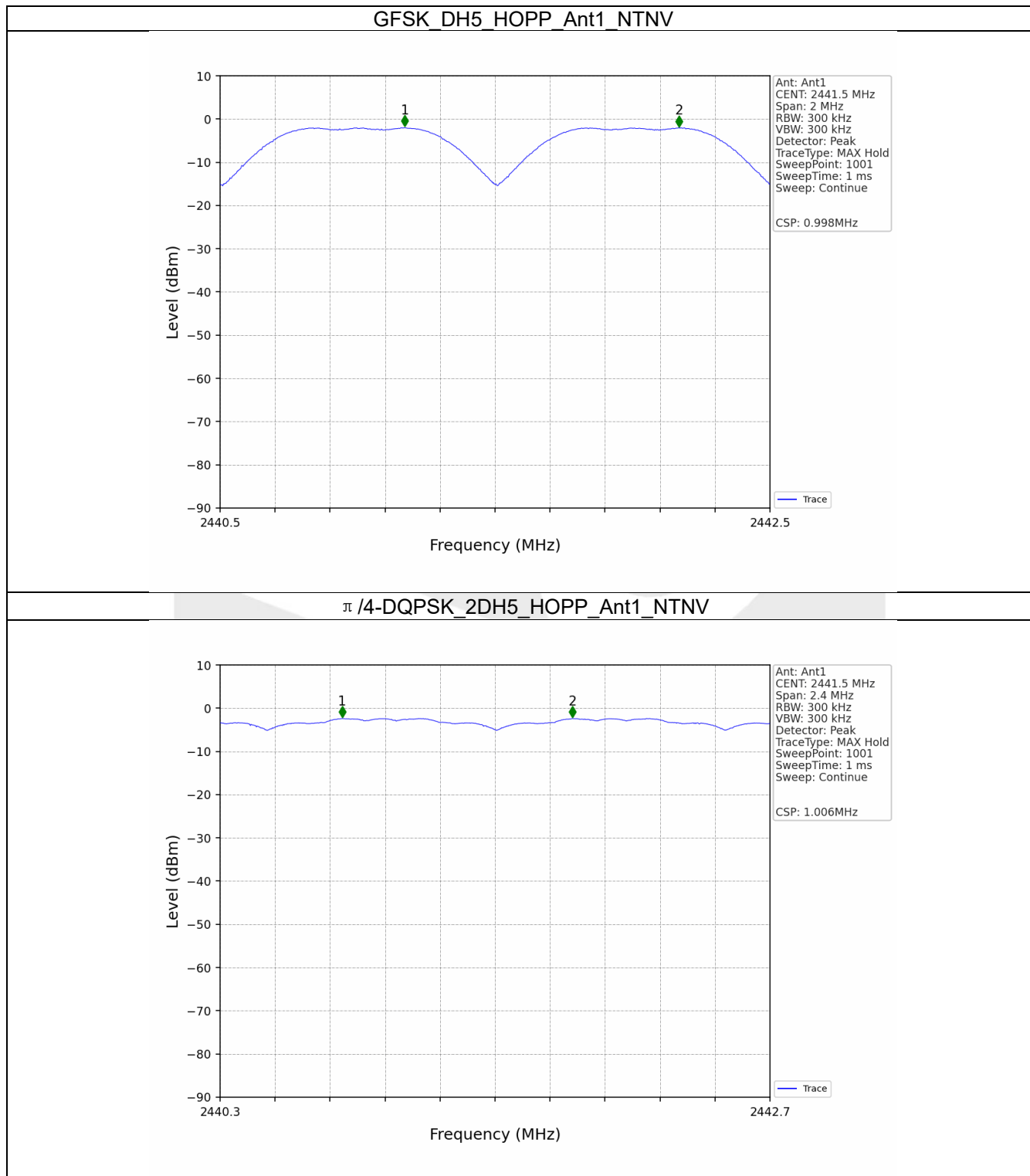
4.1 Test Result

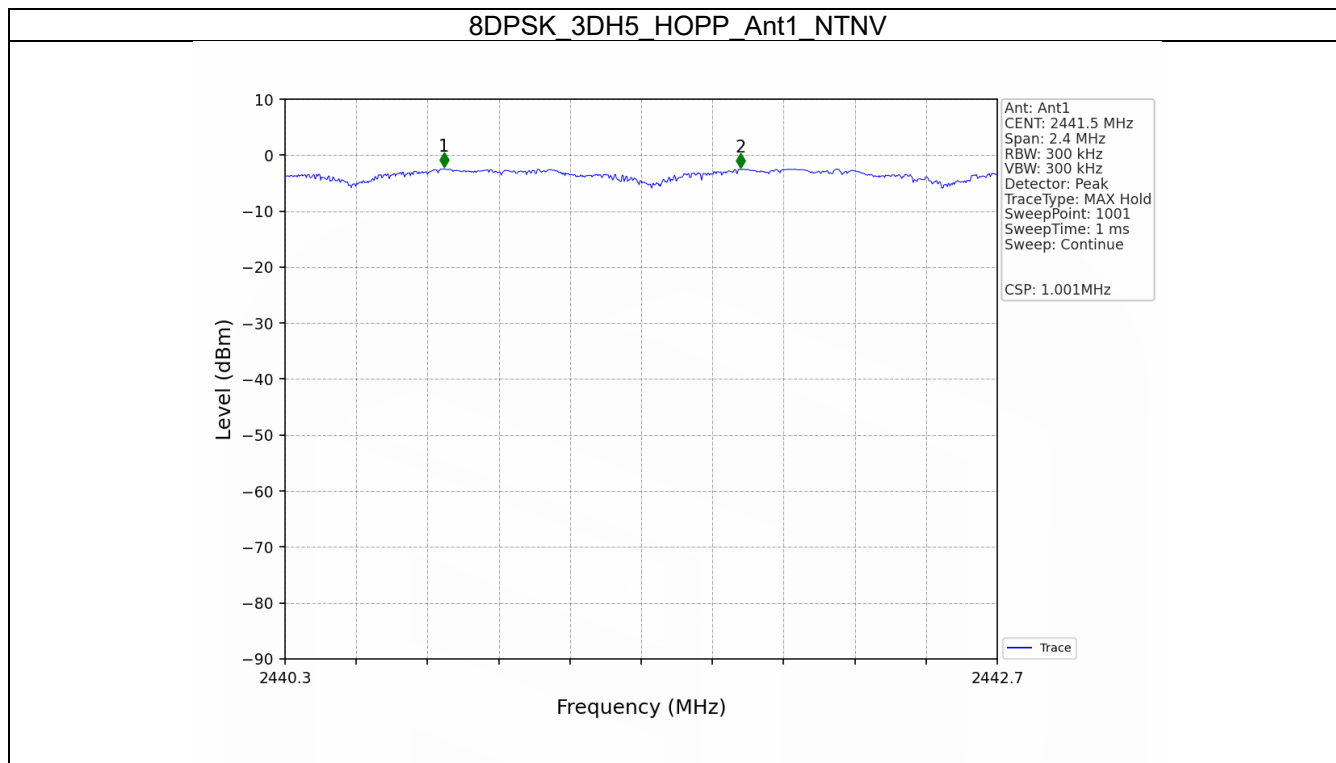
4.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	0.998	0.956	≥ 0.956	Pass
$\pi/4$ -DQPSK	SISO	HOPP	2DH5	1.006	1.313	≥ 0.875	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.307	≥ 0.871	Pass

4.2 Test Graph

4.2.1 Ant1





5. Number of Hopping Frequencies

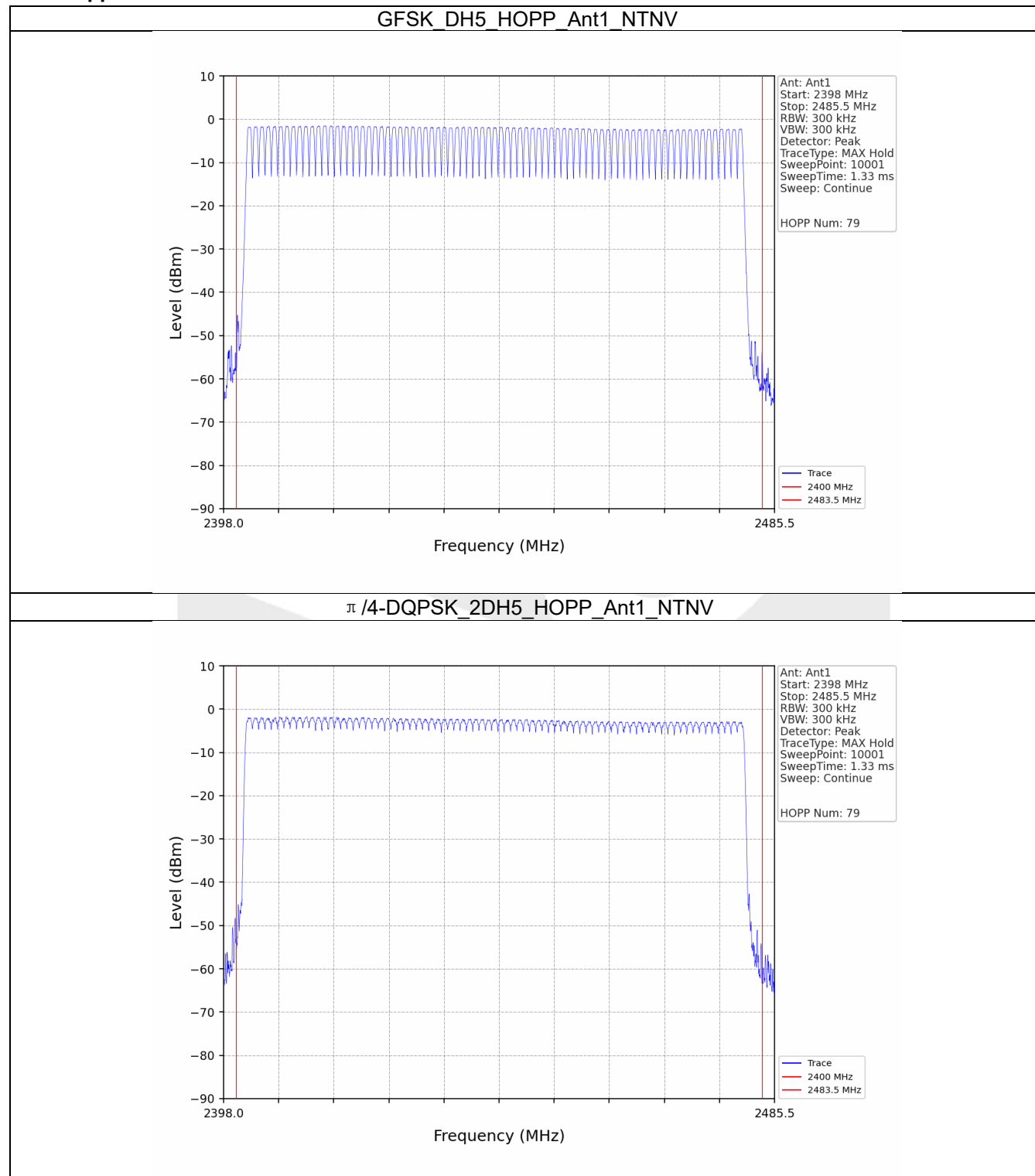
5.1 Test Result

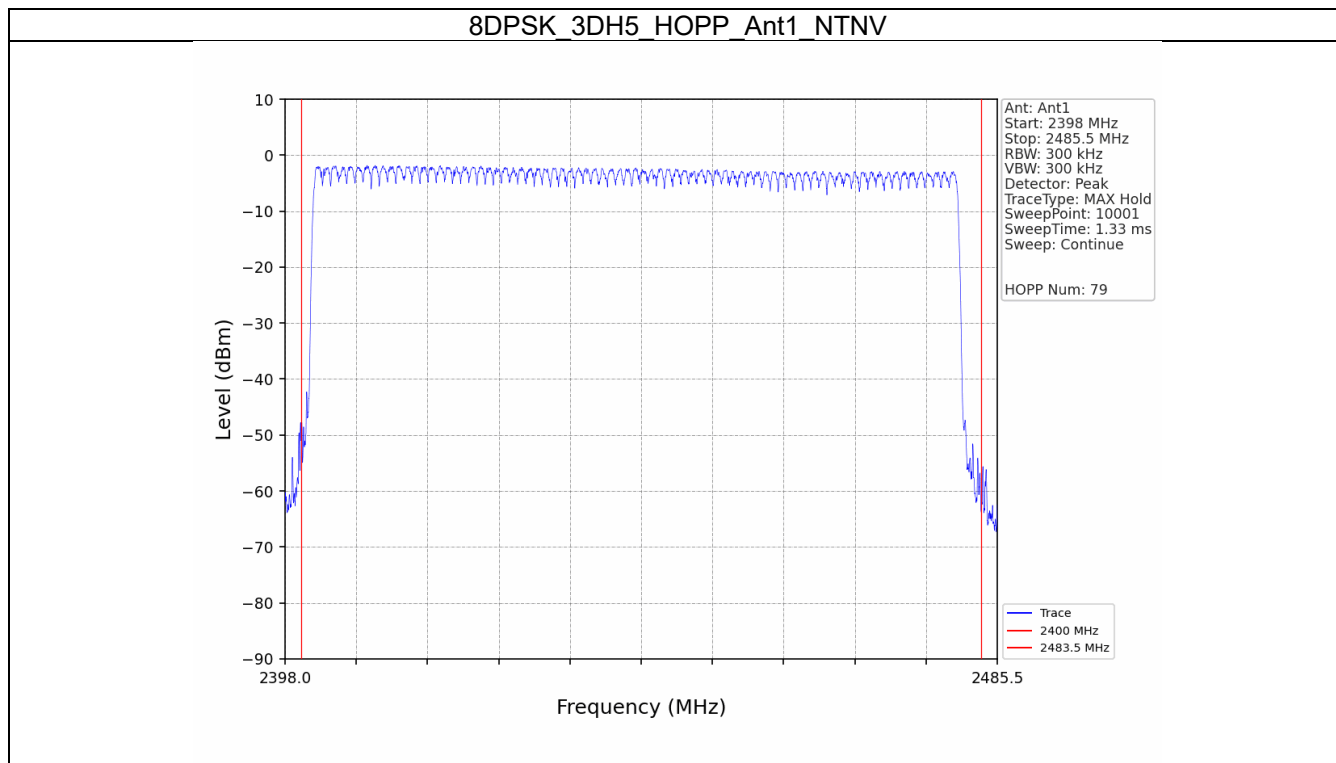
5.1.1 HoppNum

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

5.2 Test Graph

5.2.1 HoppNum





6. Time of Occupancy (Dwell Time)

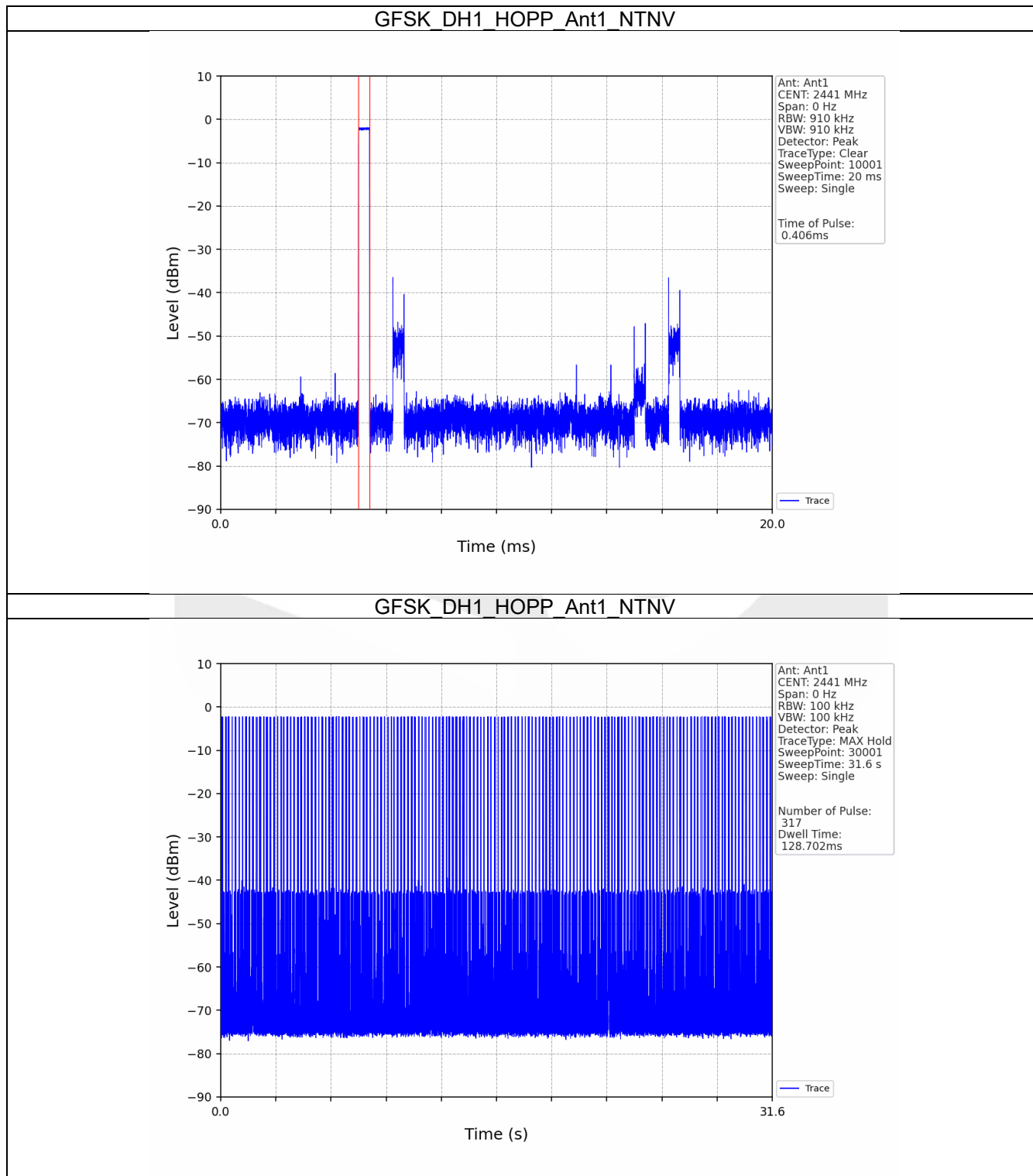
6.1 Test Result

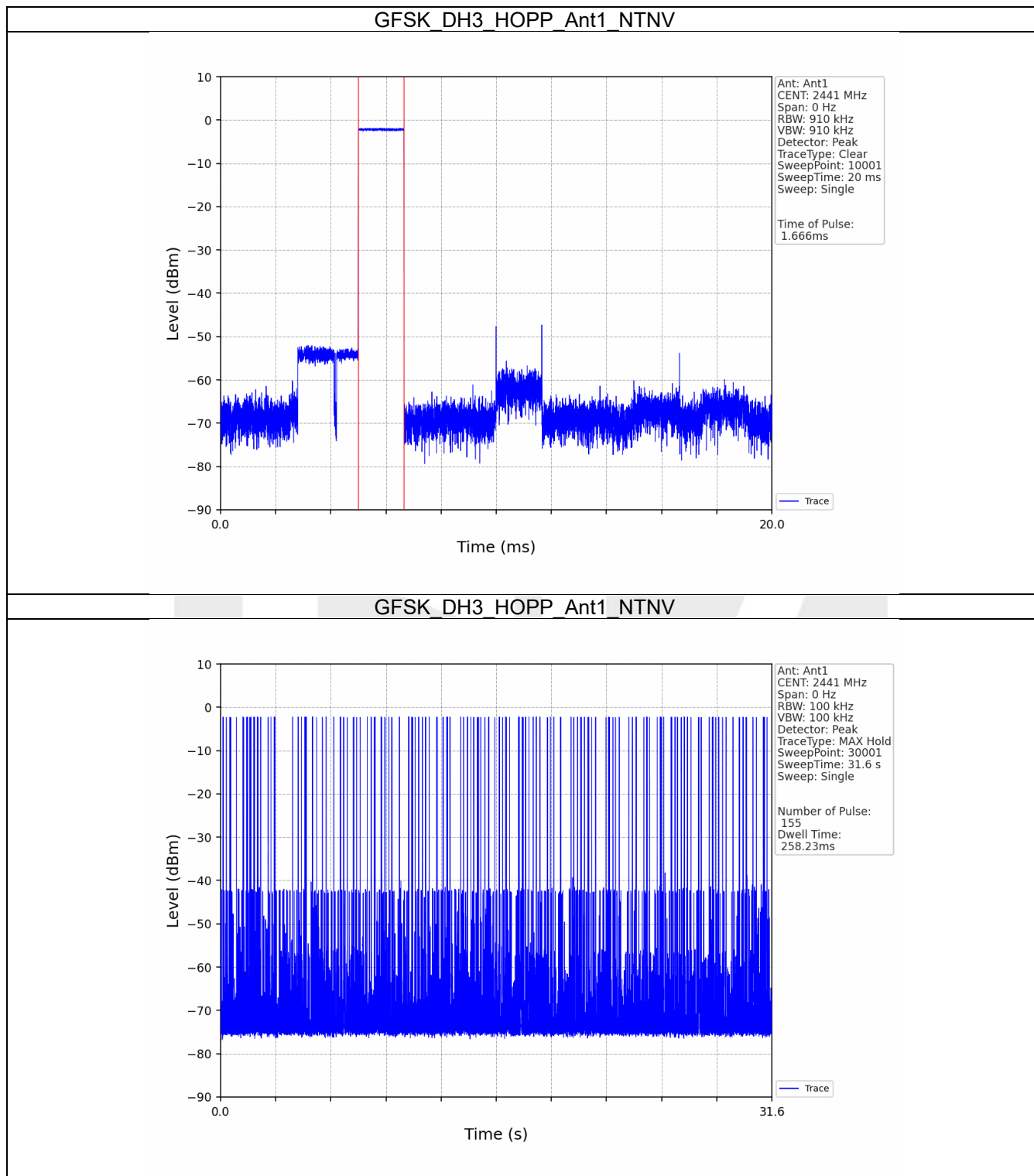
6.1.1 Ant1

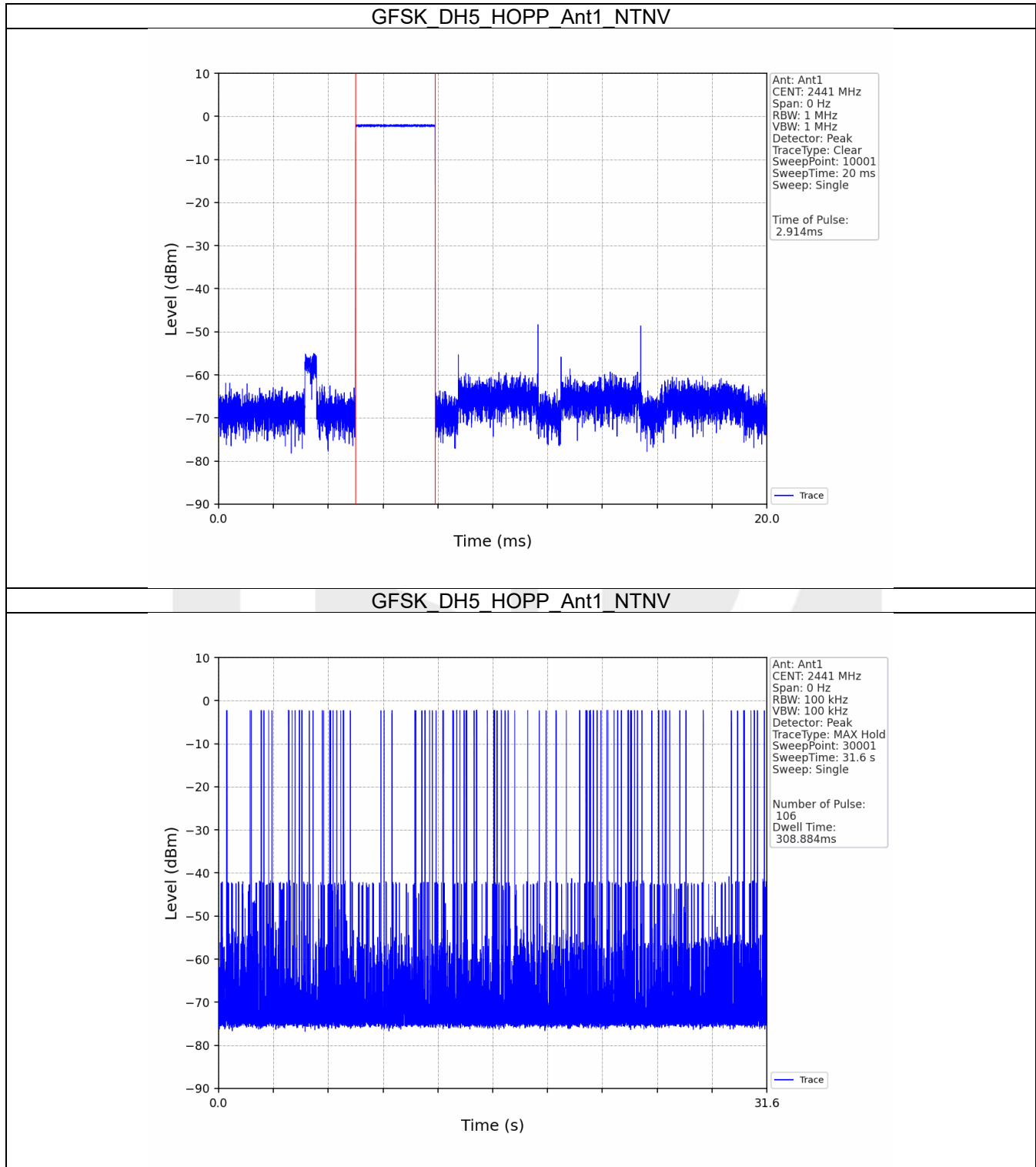
Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.406	31.600	317	128.702	<=400	Pass
			DH3	1.666	31.600	155	258.230	<=400	Pass
			DH5	2.914	31.600	106	308.884	<=400	Pass
$\pi/4$ -DQPSK	SISO	HOPP	2DH1	0.420	31.600	320	134.400	<=400	Pass
			2DH3	1.672	31.600	160	267.520	<=400	Pass
			2DH5	2.916	31.600	112	326.592	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.416	31.600	319	132.704	<=400	Pass
			3DH3	1.666	31.600	148	246.568	<=400	Pass
			3DH5	2.916	31.600	102	297.432	<=400	Pass

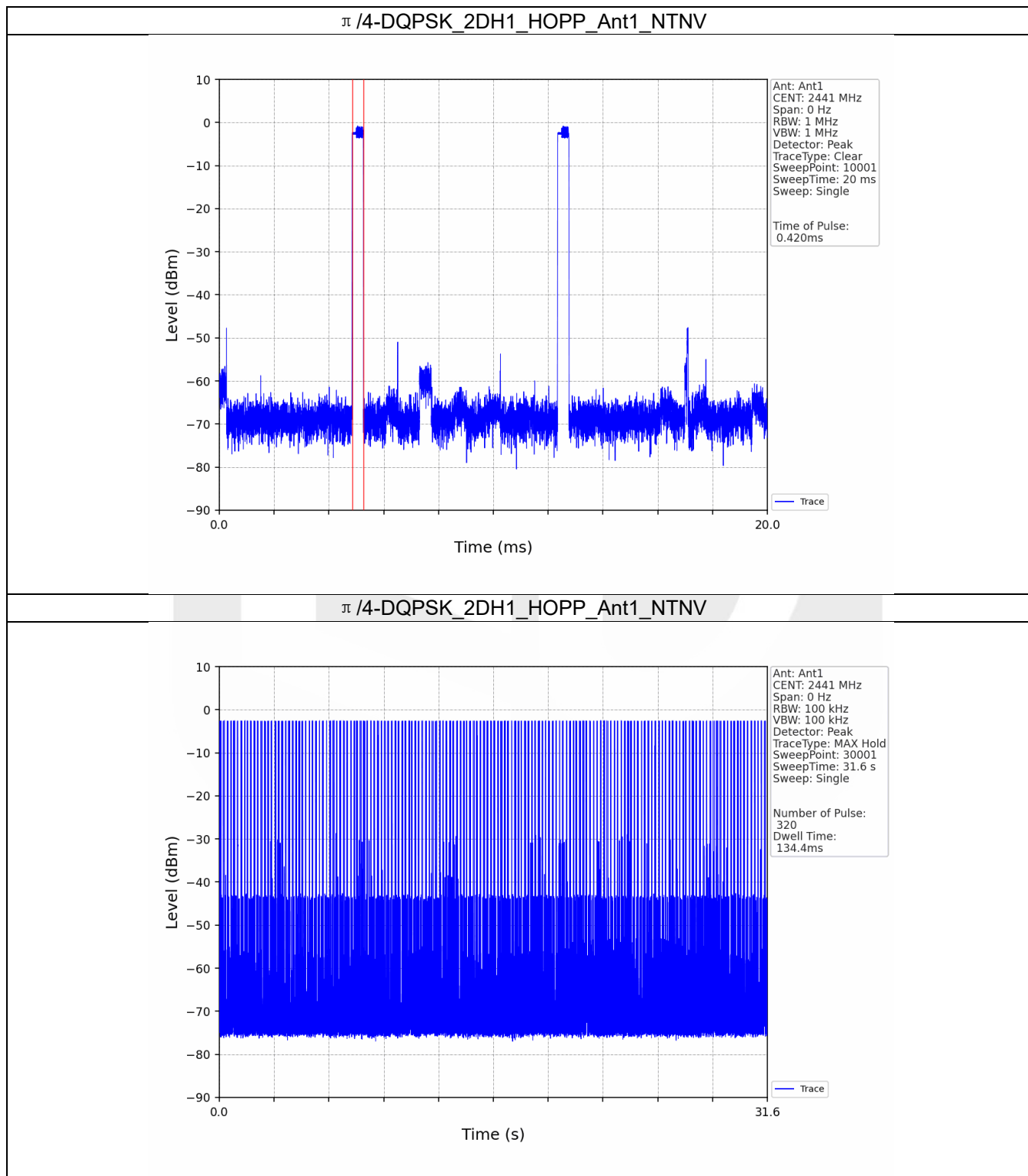
6.2 Test Graph

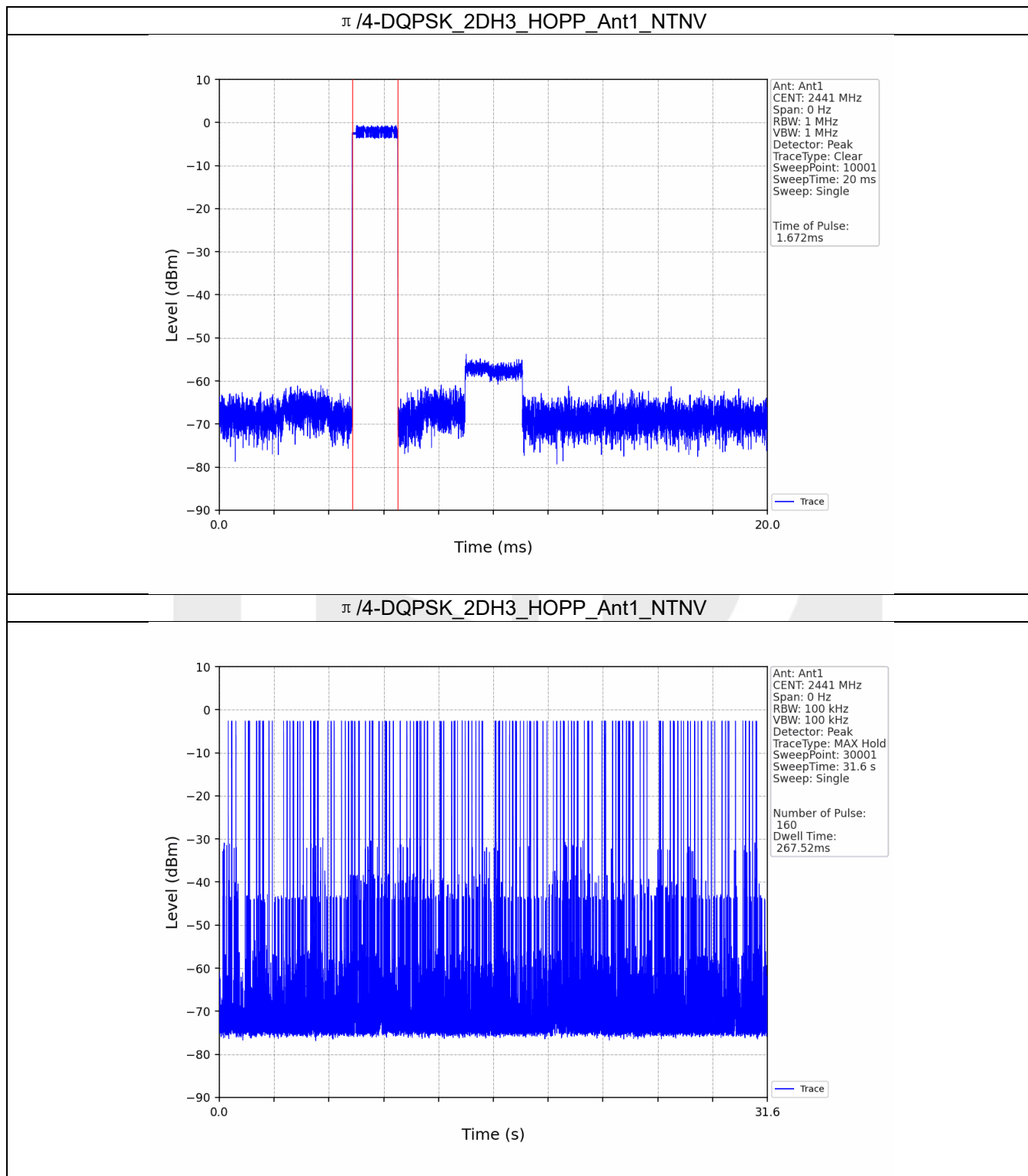
6.2.1 Ant1

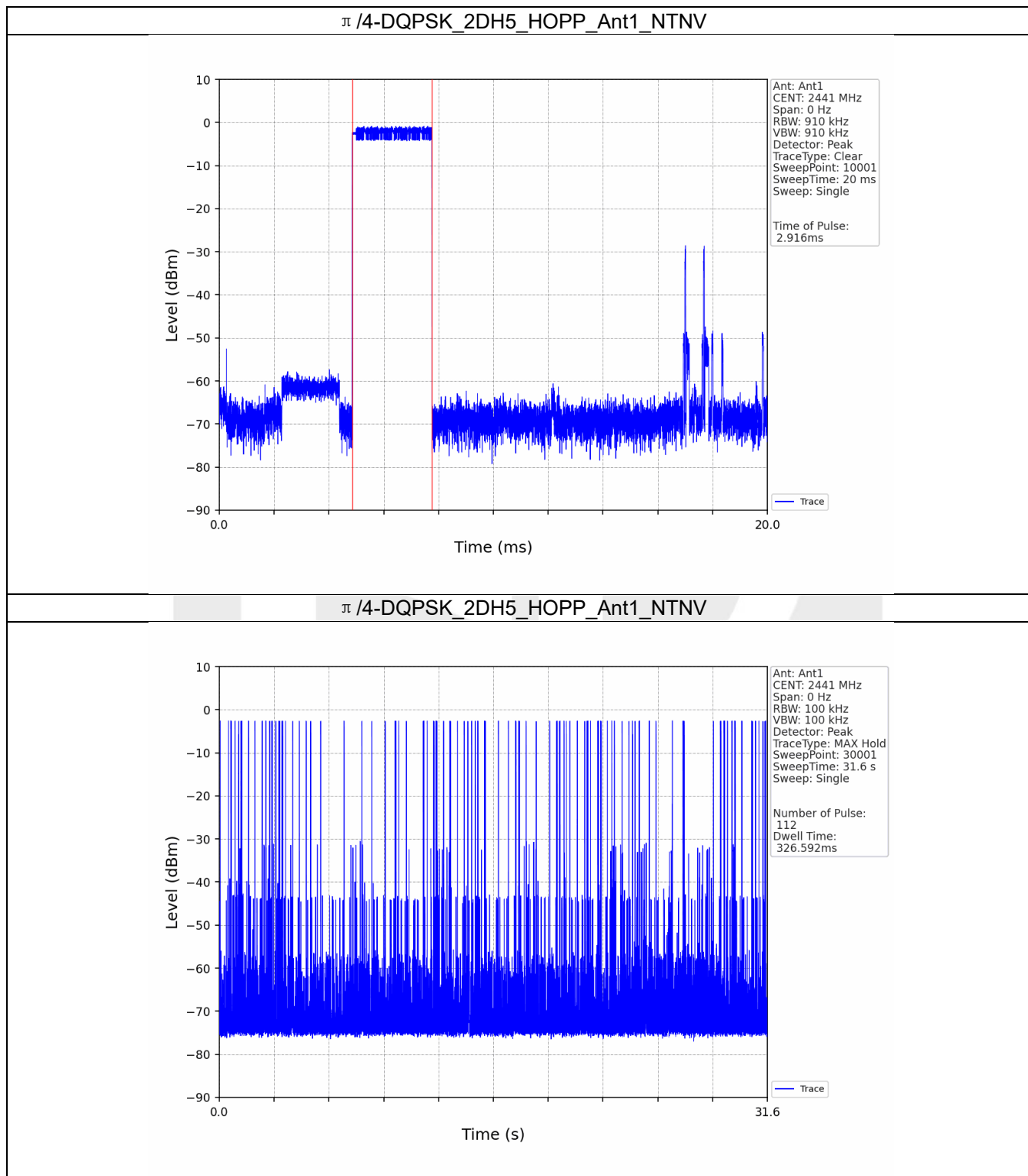


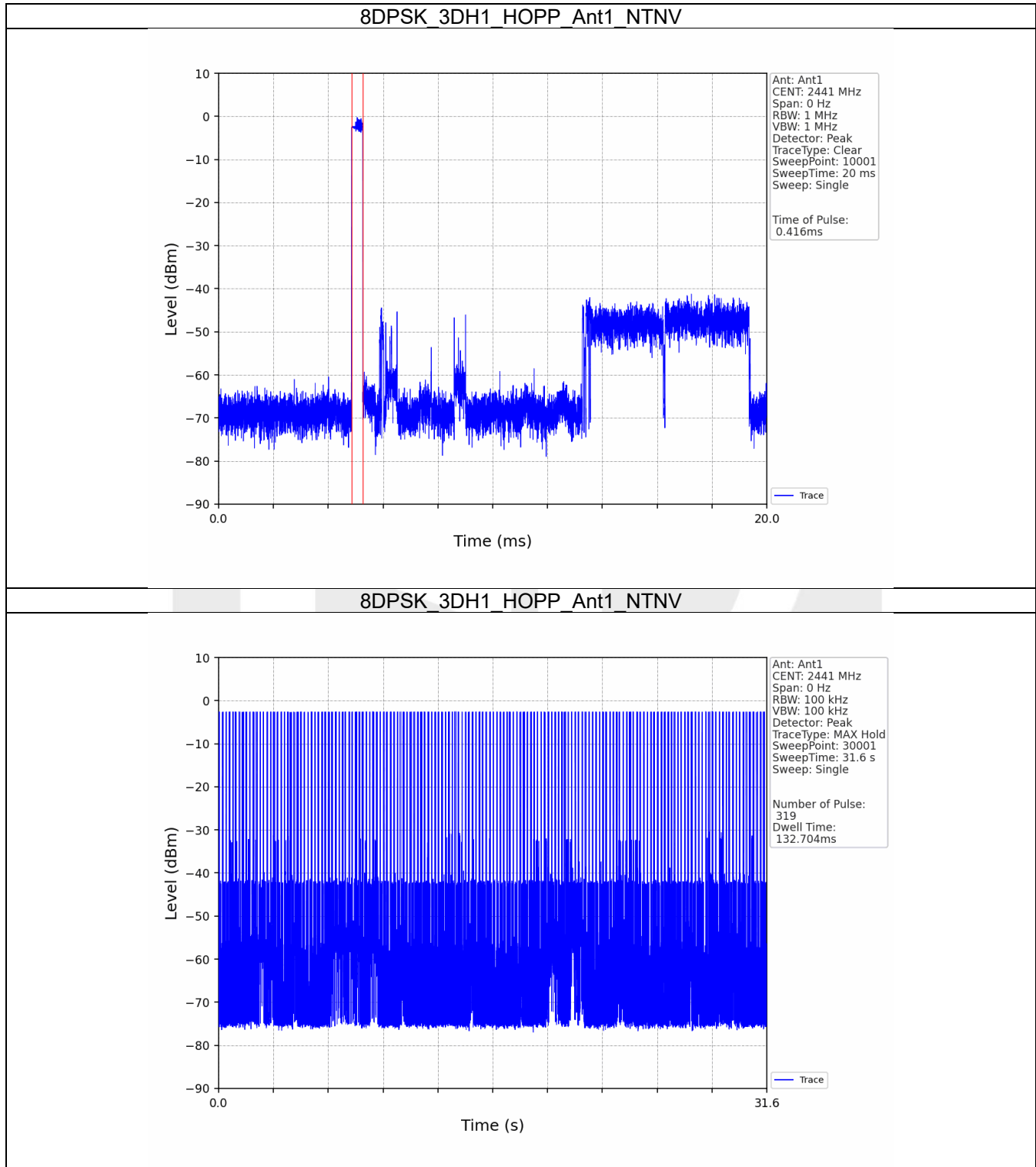


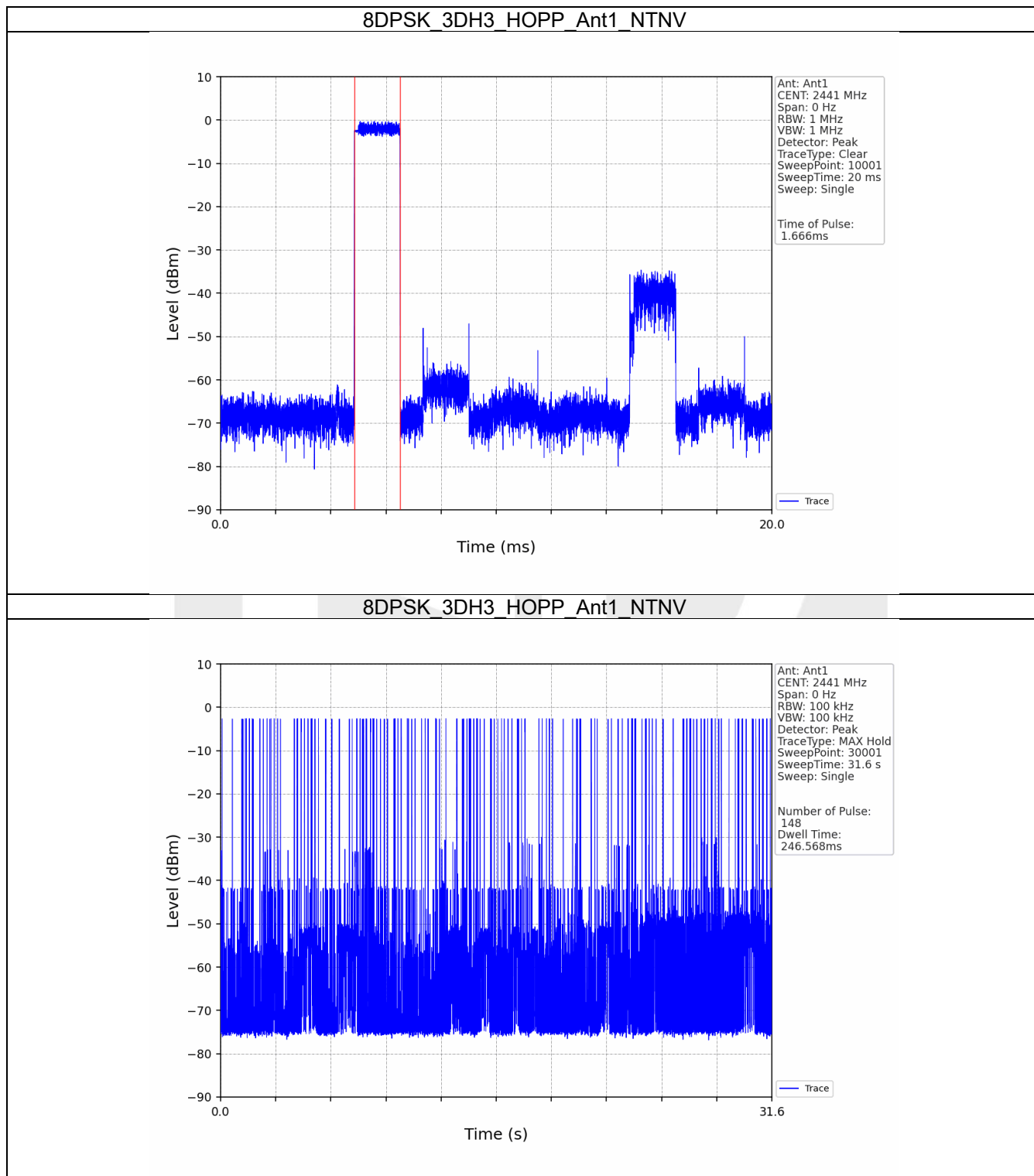


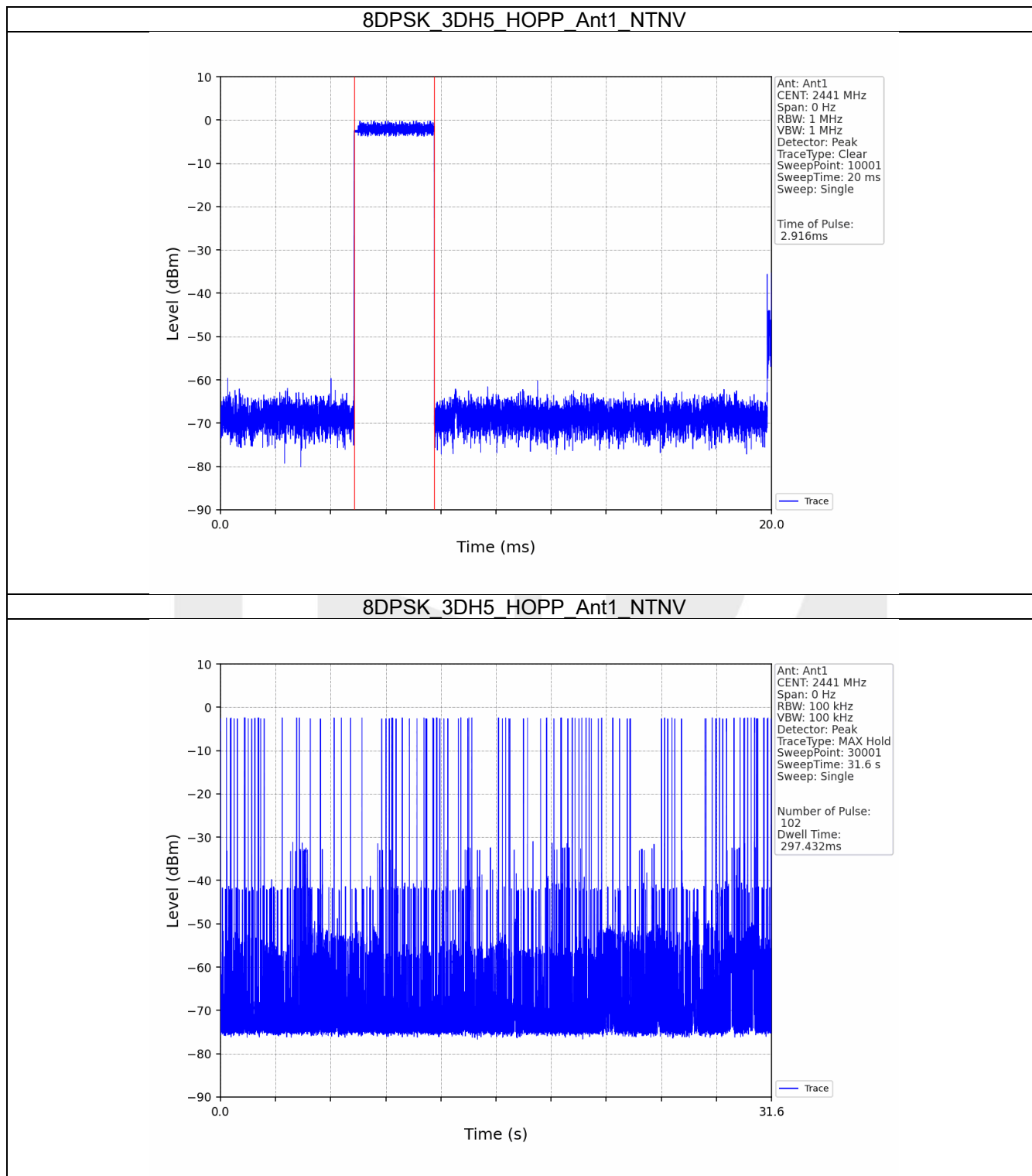












7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	-2.11
		2441	DH5	1	-2.12
		2480	DH5	1	-2.53
		HOPP	DH5	1	-1.90
					-1.90
$\pi/4$ -DQPSK	SISO	2402	2DH5	1	-2.12
		2441	2DH5	1	-2.31
		2480	2DH5	1	-2.62
		HOPP	2DH5	1	-2.02
					-2.02
8DPSK	SISO	2402	3DH5	1	-2.01
		2441	3DH5	1	-2.33
		2480	3DH5	1	-3.05
		HOPP	3DH5	1	-1.92
					-1.92

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

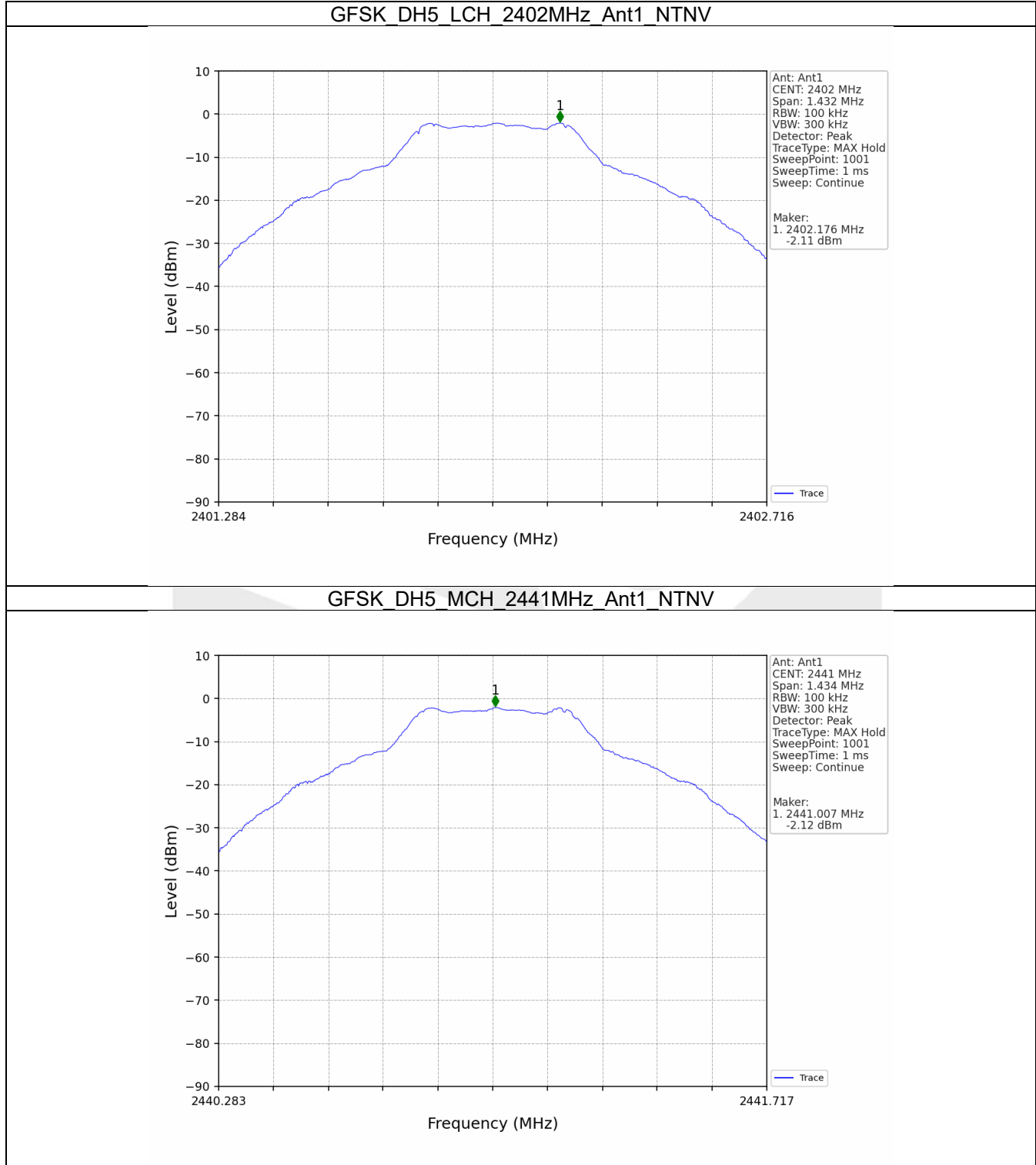
7.1.2 CSE

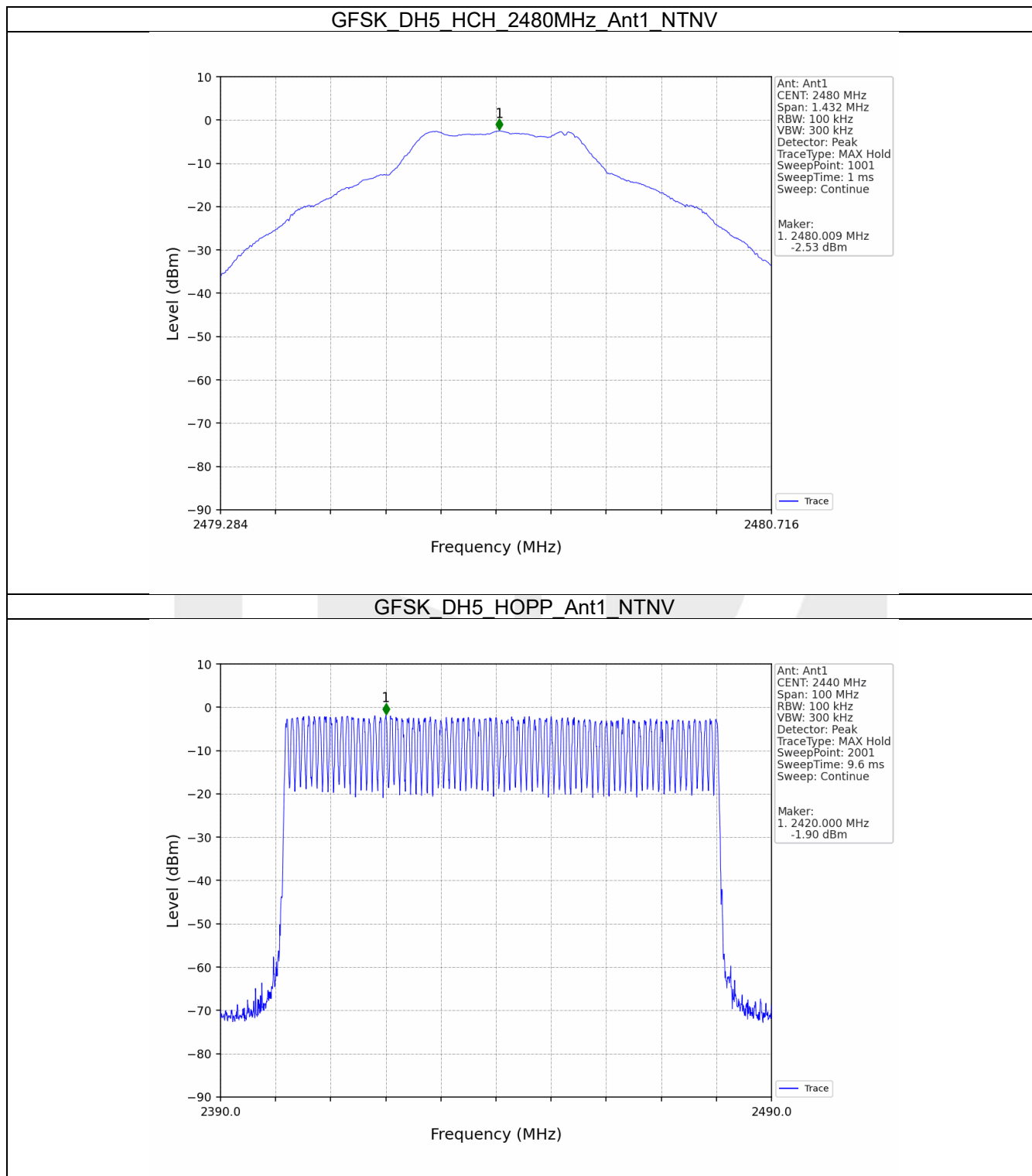
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	-2.11	-22.11	Pass
		2441	DH5	1	-2.12	-22.12	Pass
		2480	DH5	1	-2.53	-22.53	Pass
		HOPP	DH5	1	-1.90	-21.90	Pass
					-1.90	-21.90	Pass
$\pi/4$ -DQPSK	SISO	2402	2DH5	1	-2.12	-22.12	Pass
		2441	2DH5	1	-2.31	-22.31	Pass
		2480	2DH5	1	-2.62	-22.62	Pass
		HOPP	2DH5	1	-2.02	-22.02	Pass
					-2.02	-22.02	Pass
8DPSK	SISO	2402	3DH5	1	-2.01	-22.01	Pass
		2441	3DH5	1	-2.33	-22.33	Pass
		2480	3DH5	1	-3.05	-23.05	Pass
		HOPP	3DH5	1	-1.92	-21.92	Pass
					-1.92	-21.92	Pass

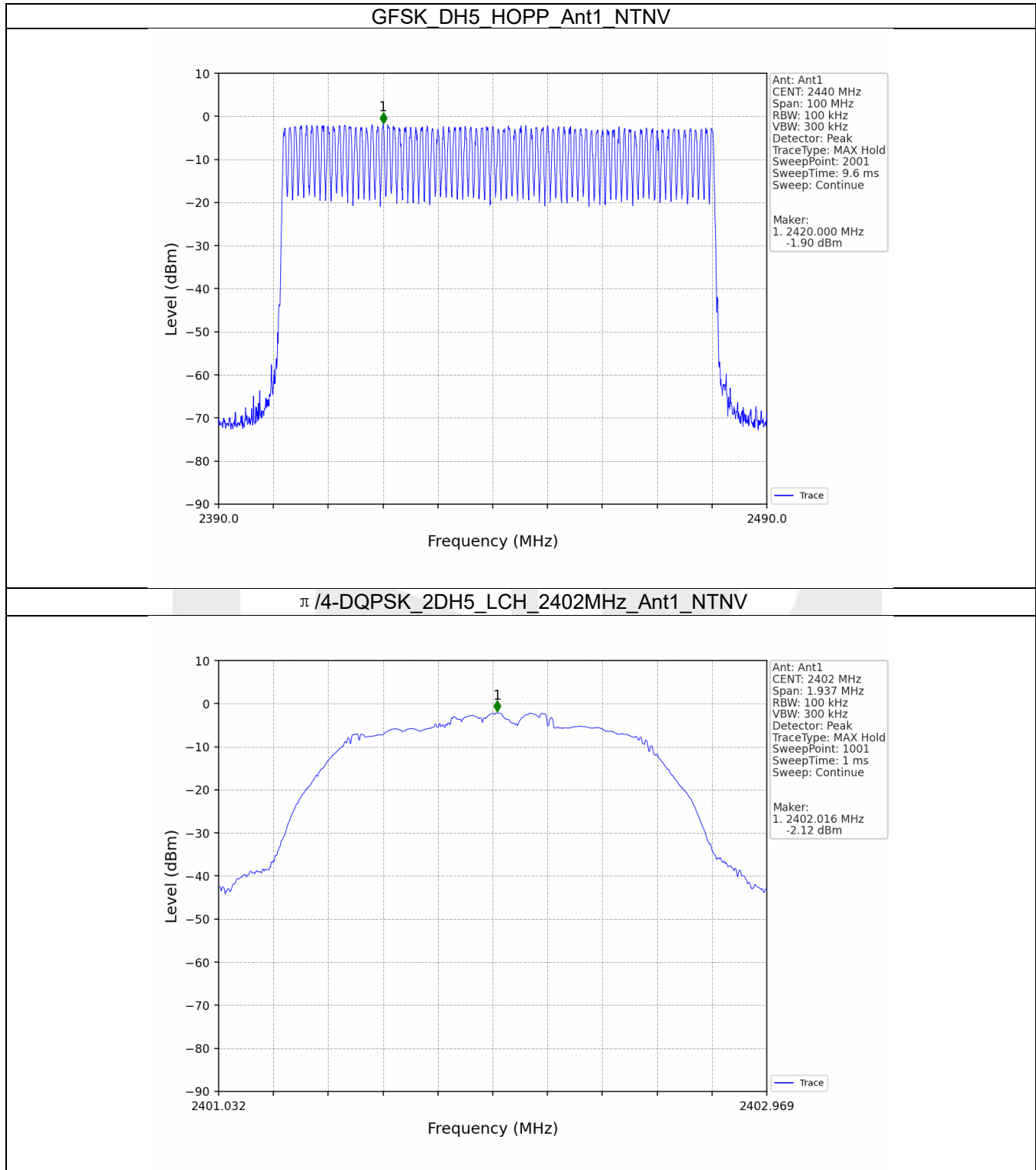
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

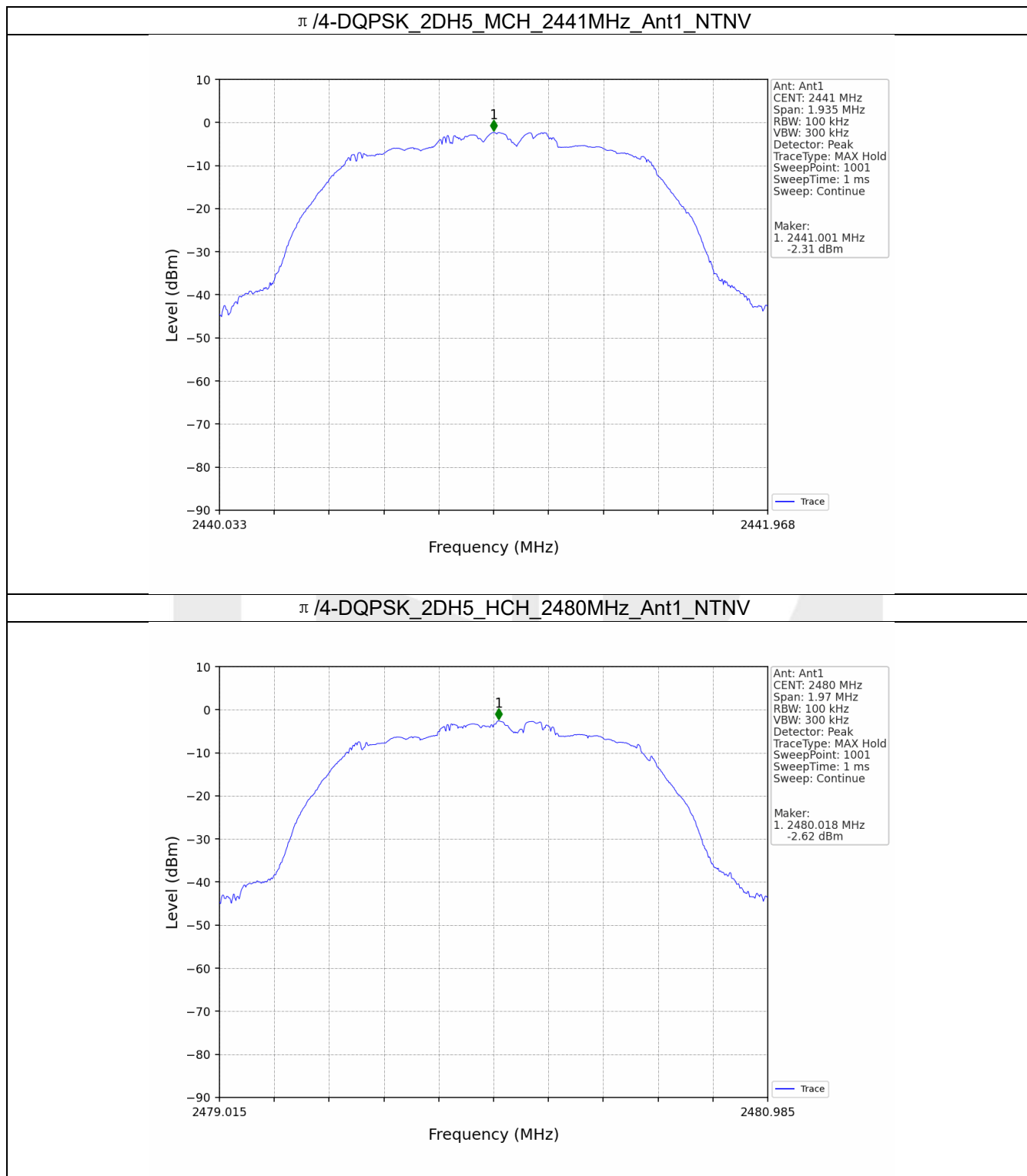
7.2 Test Graph

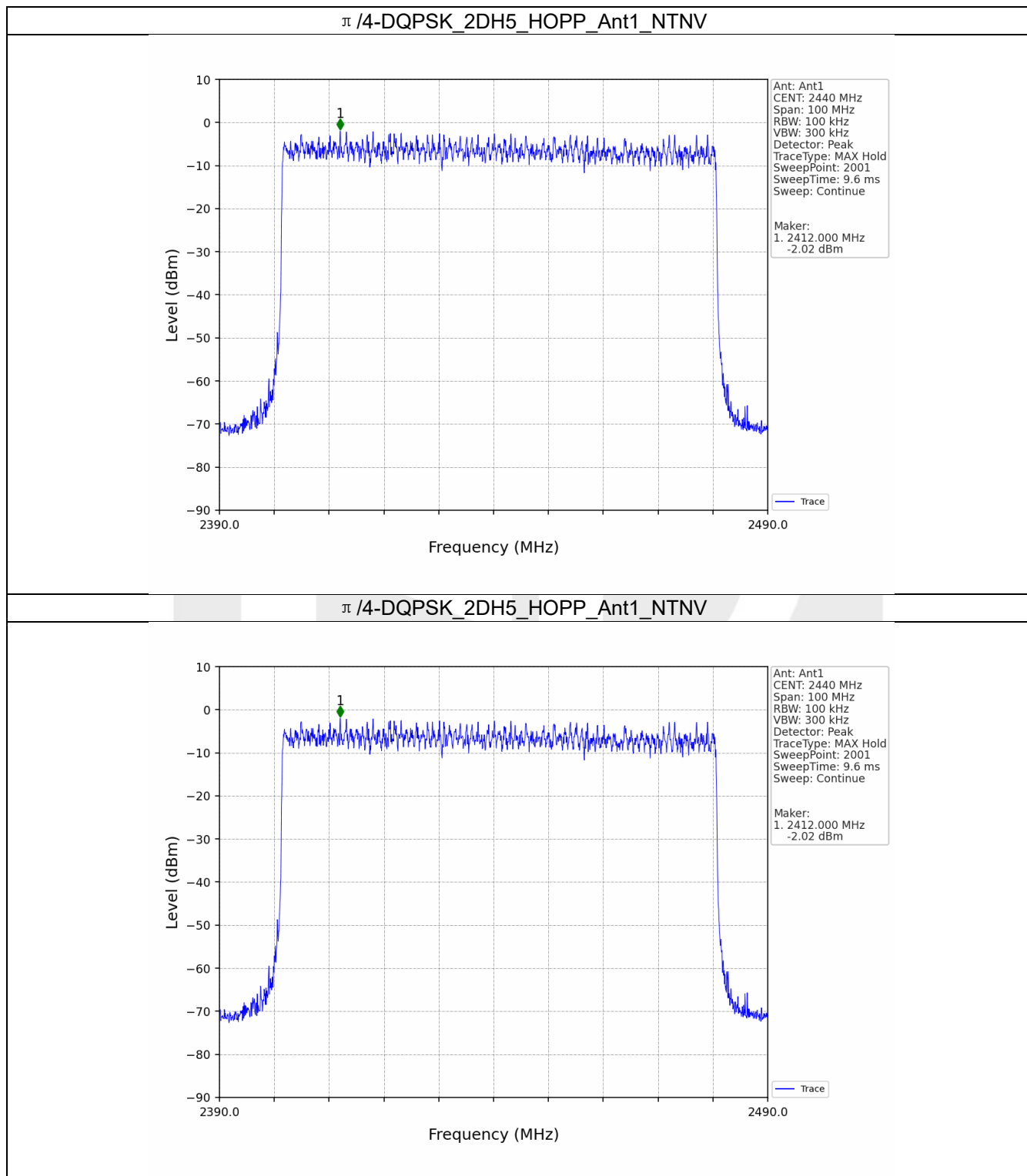
7.2.1 Ref

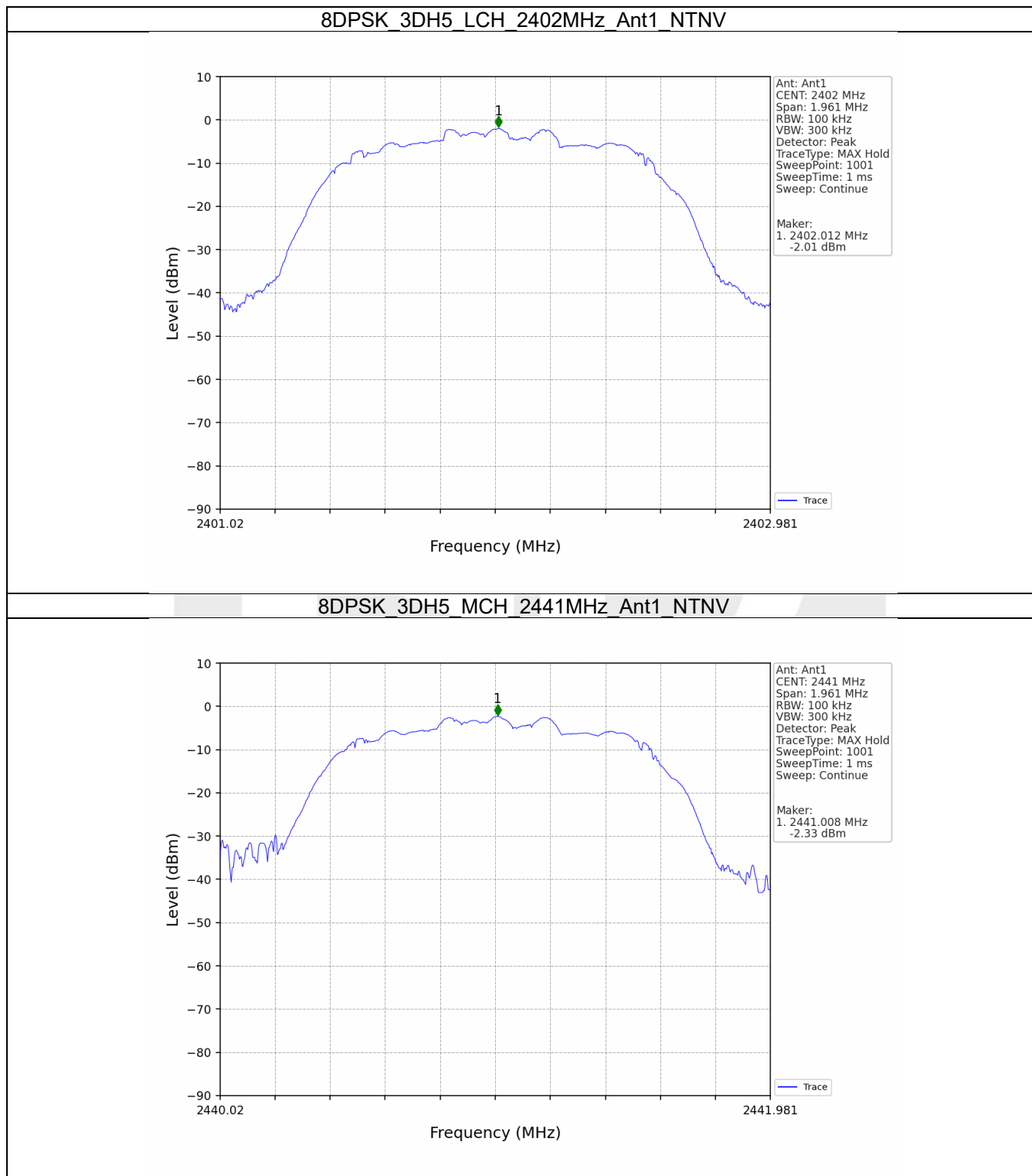


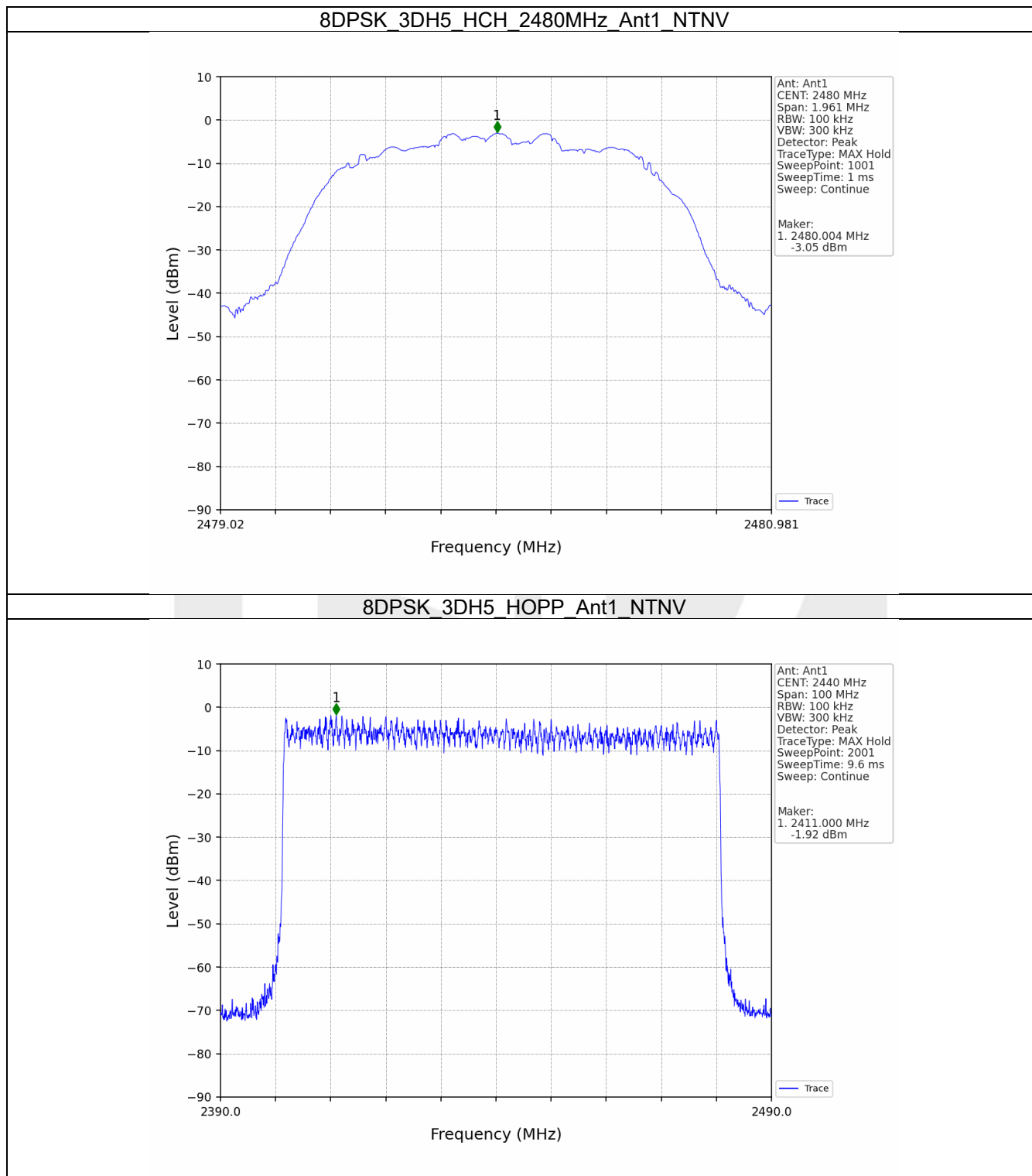


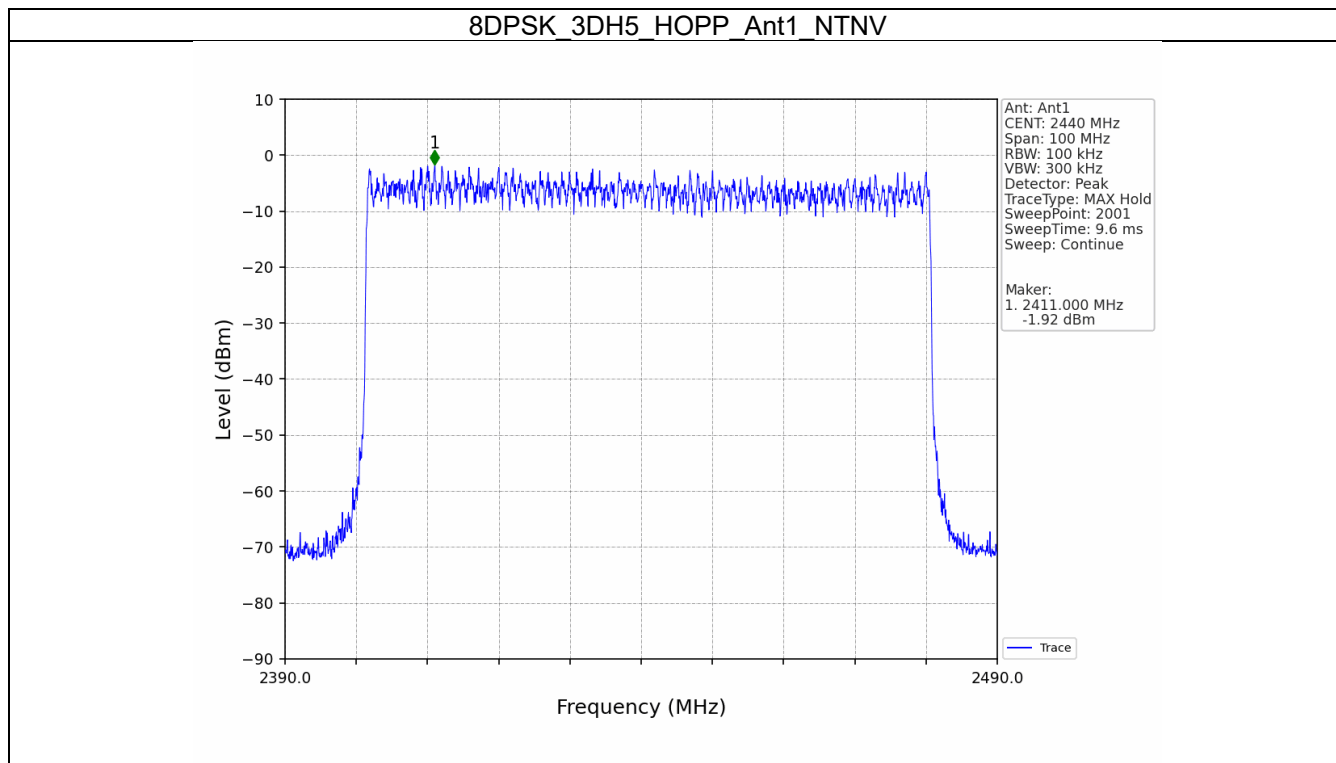




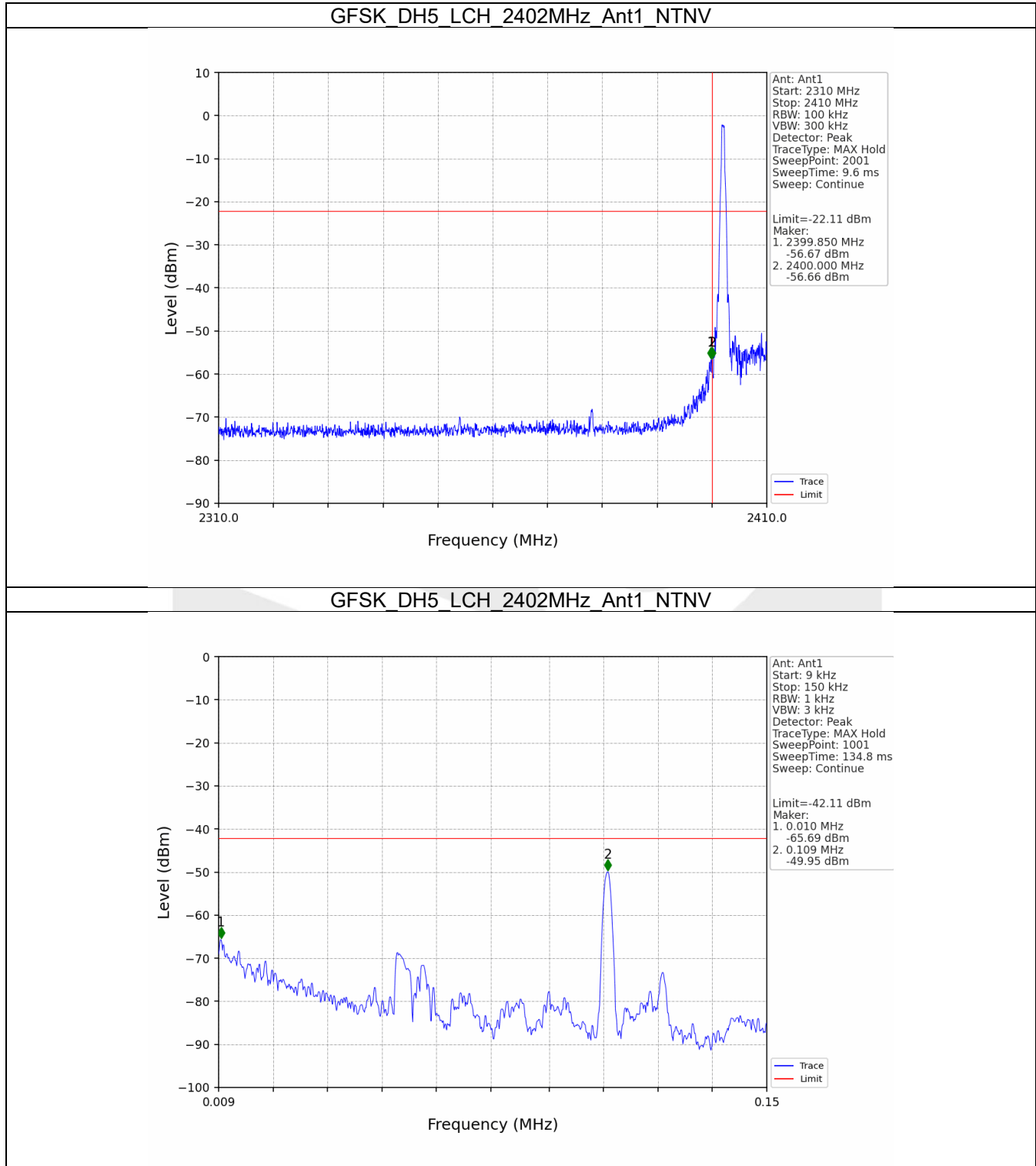


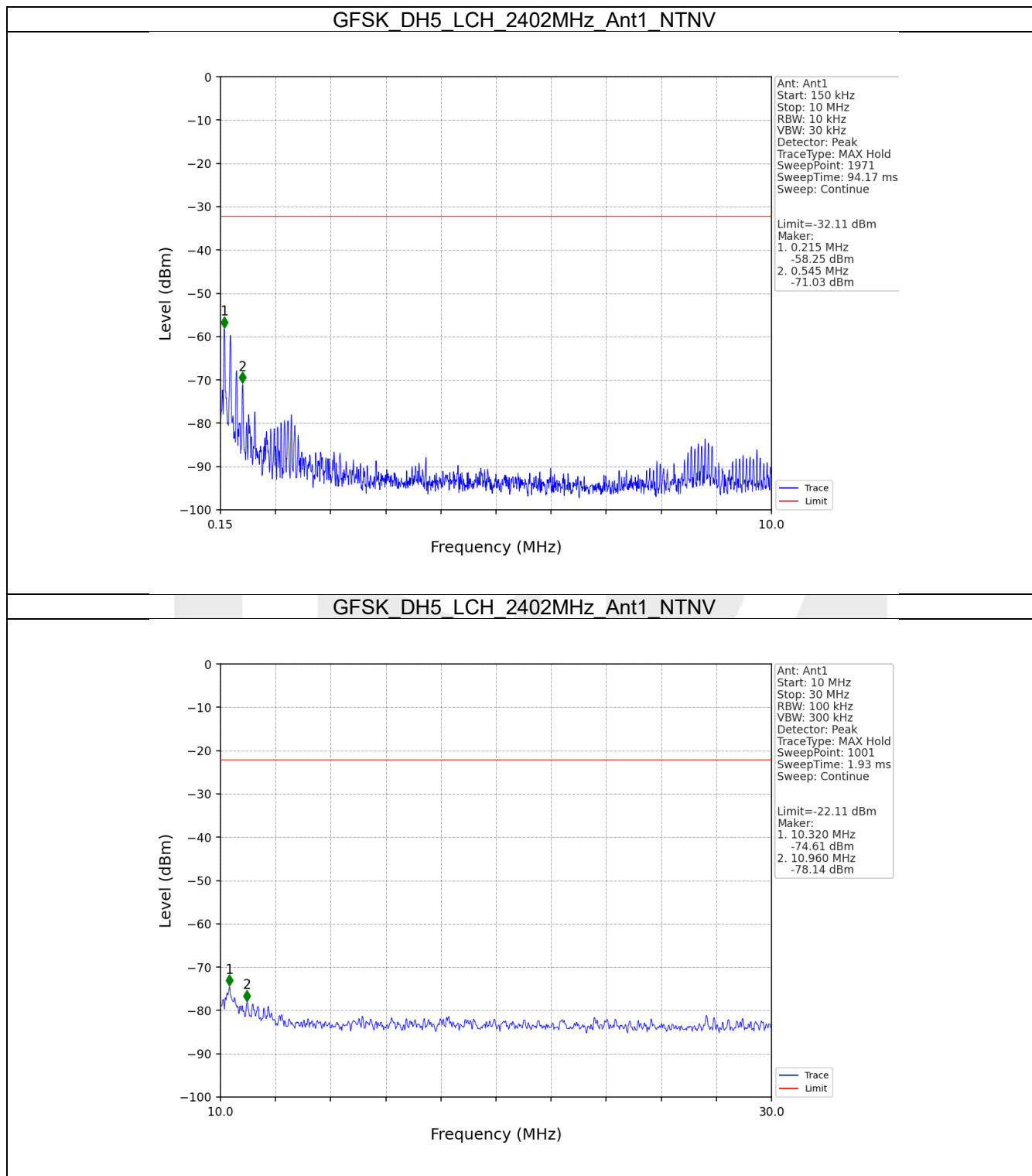


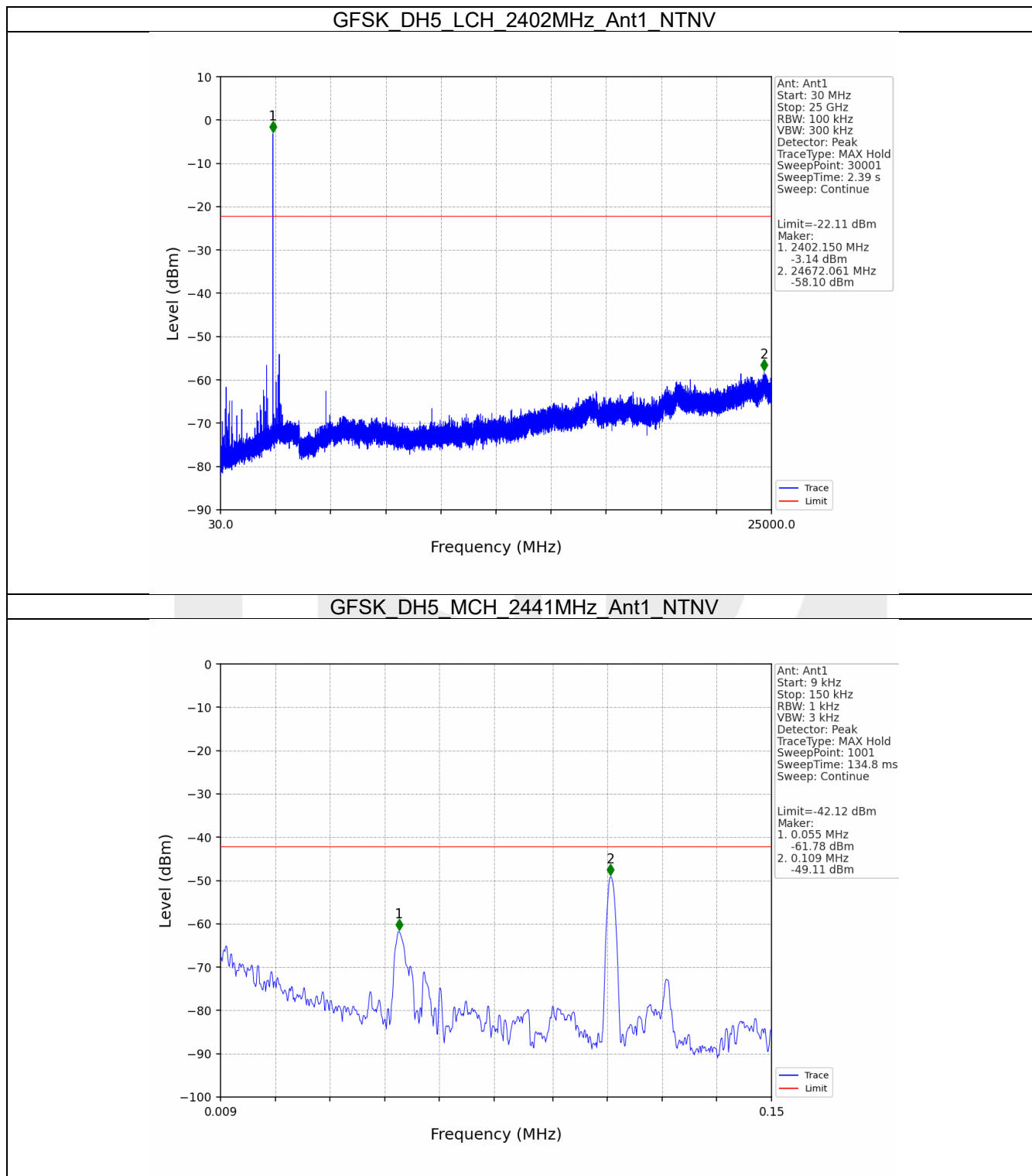


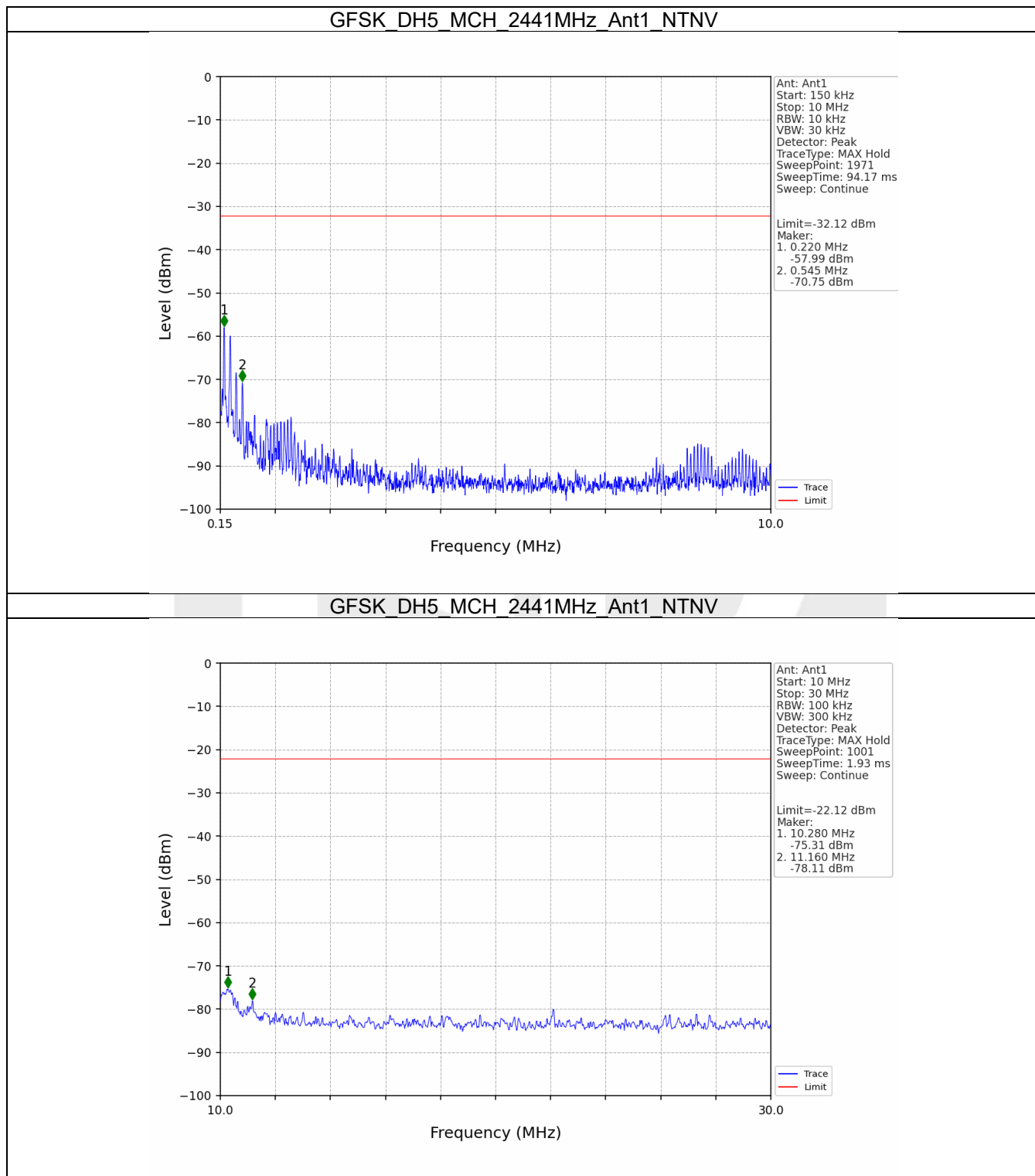


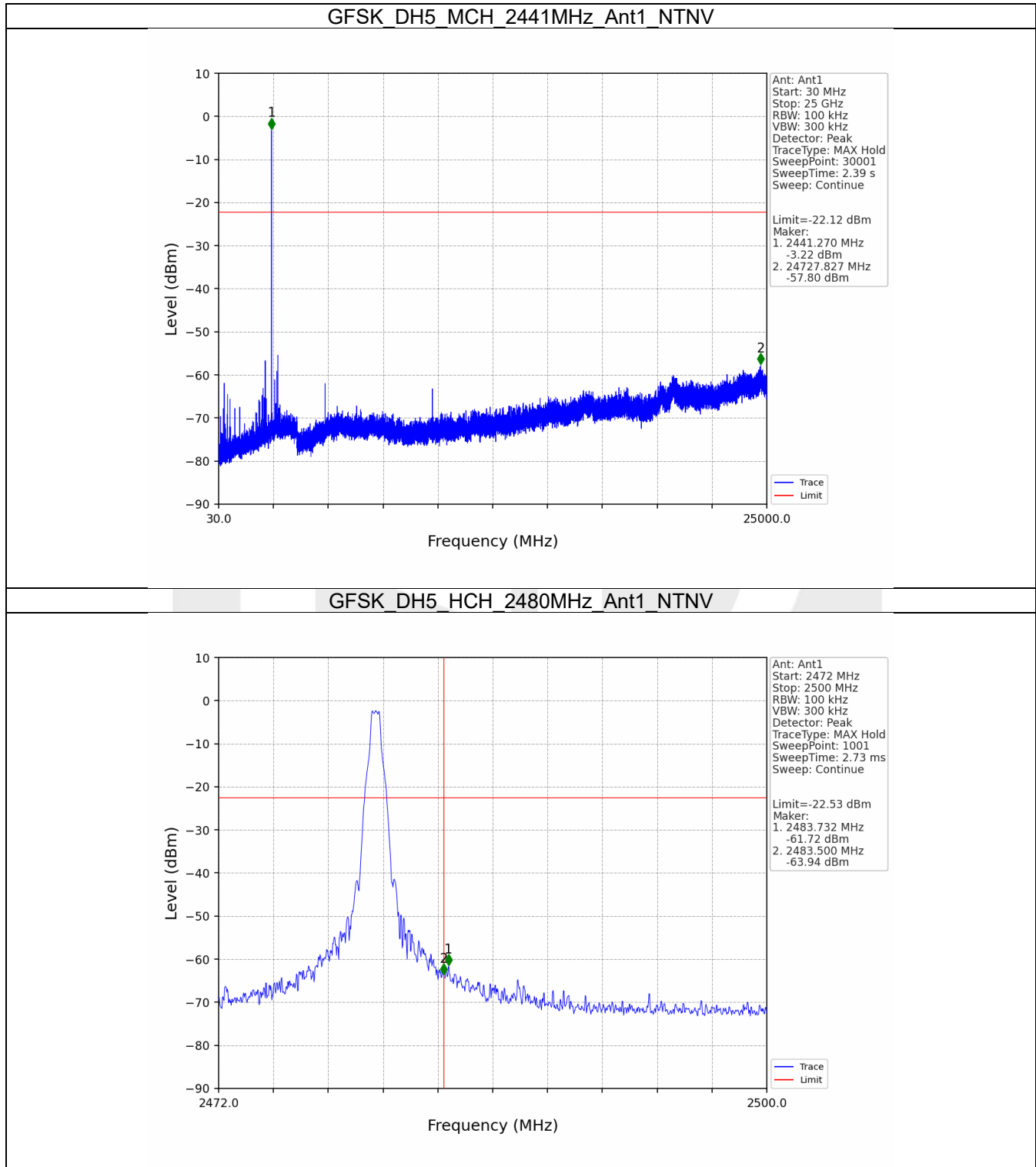
7.2.2 CSE

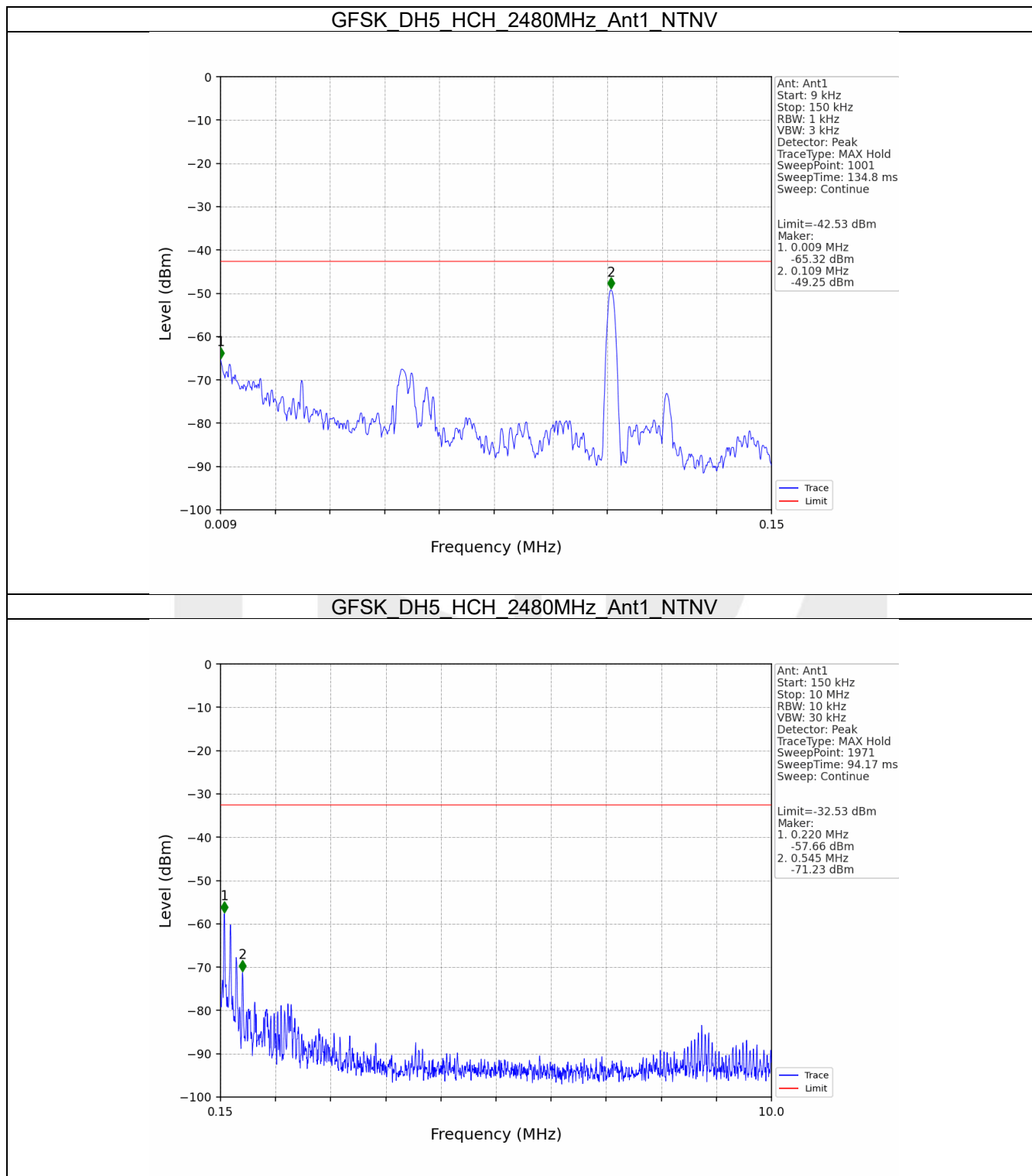


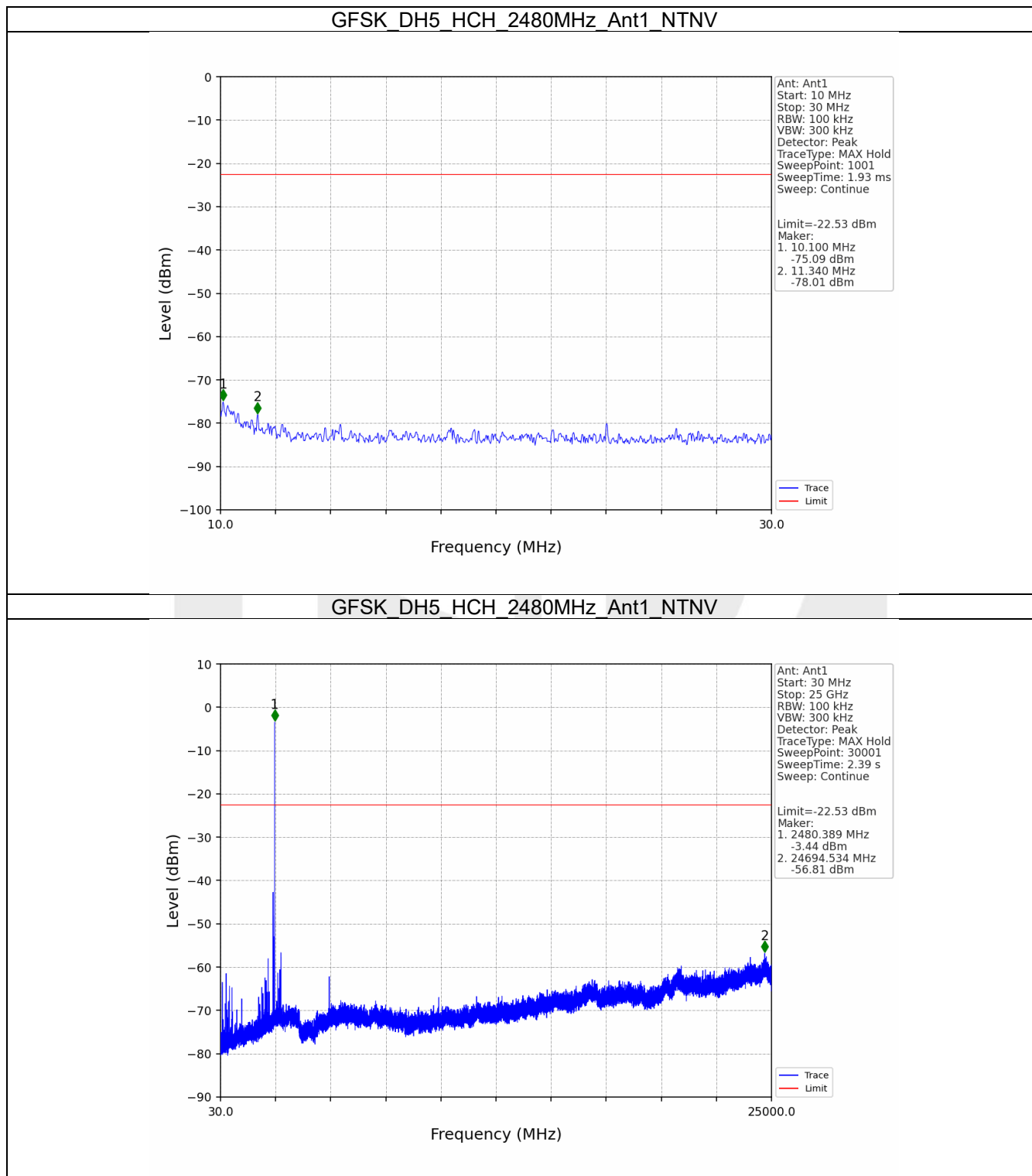


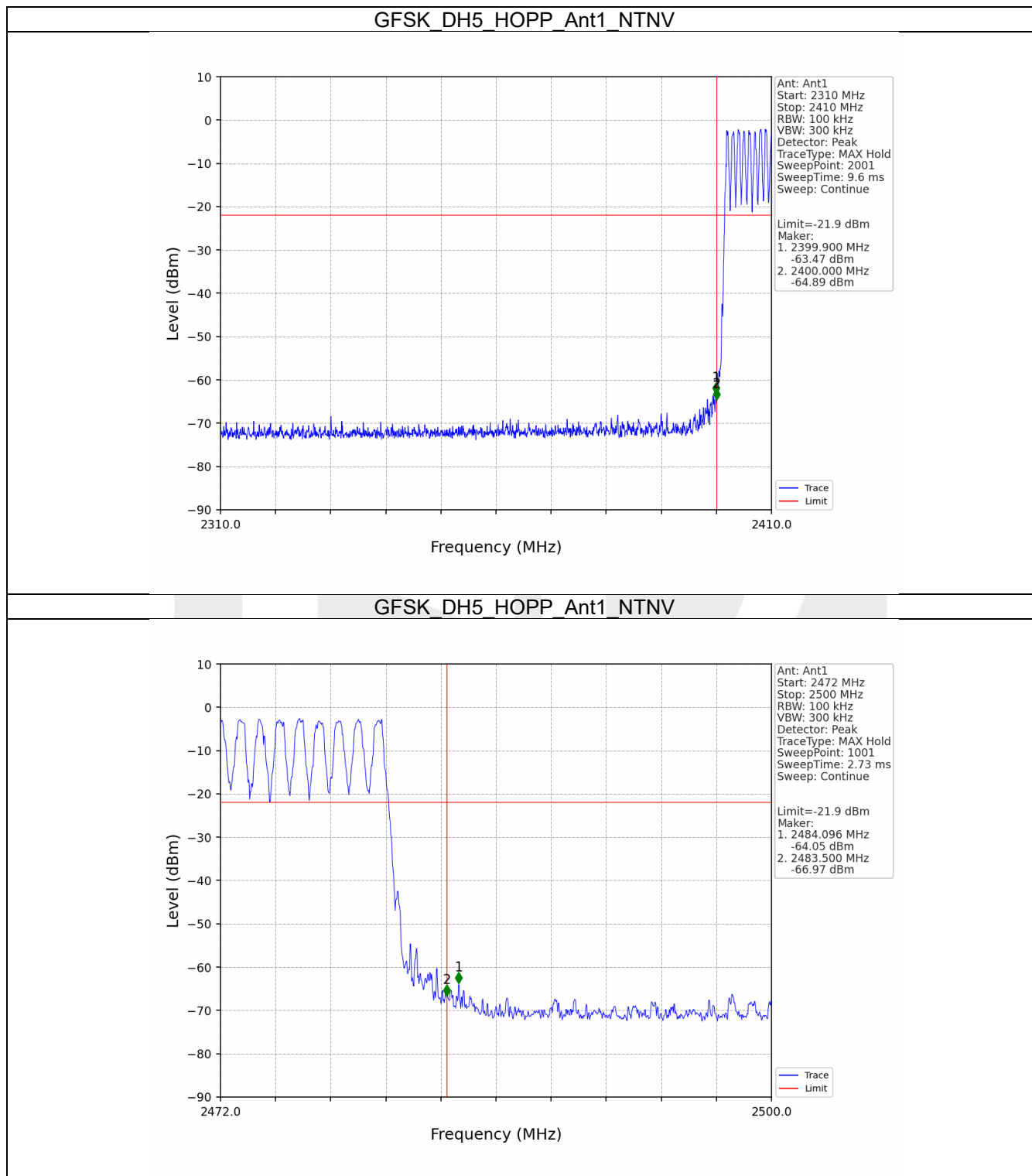


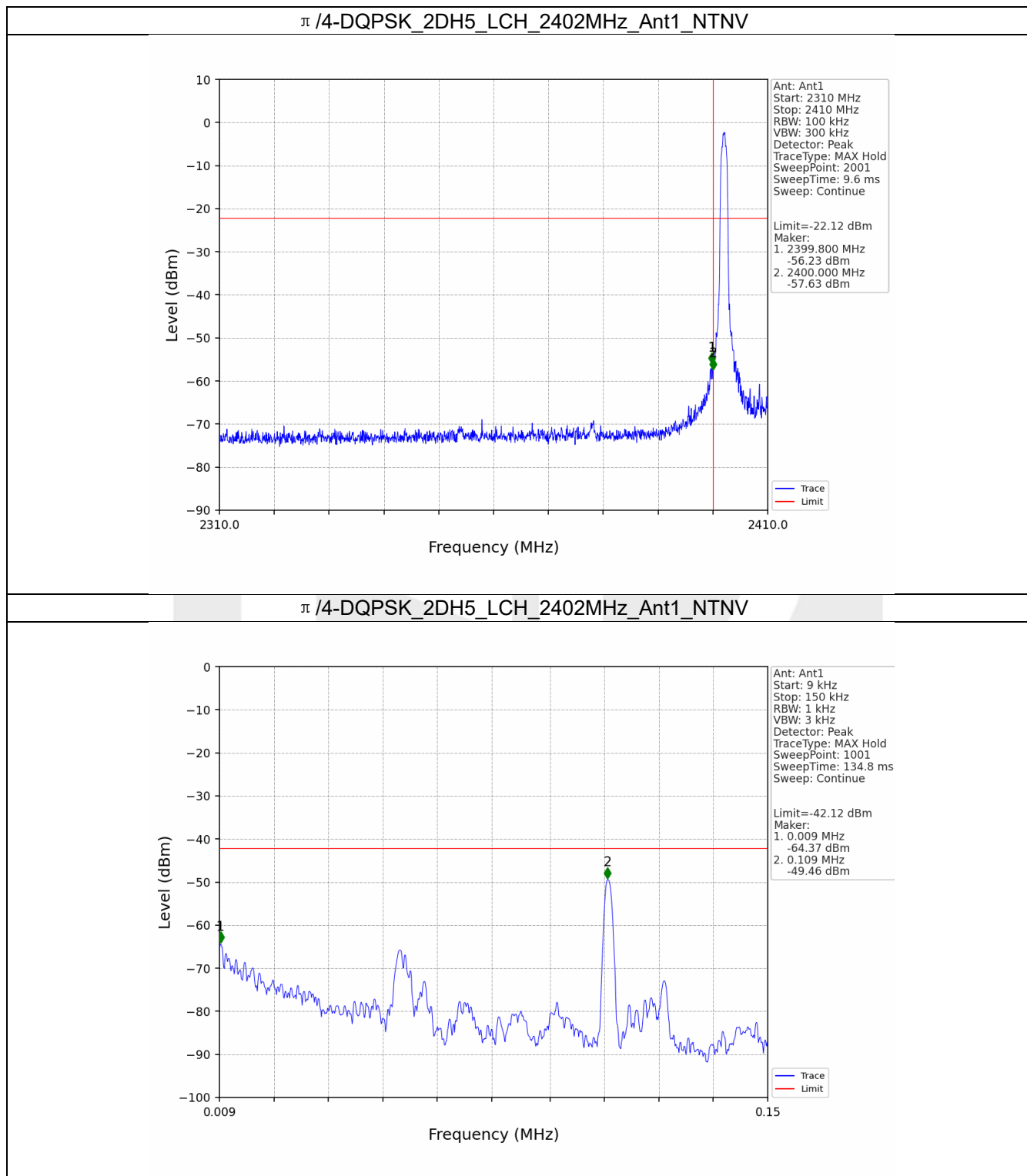


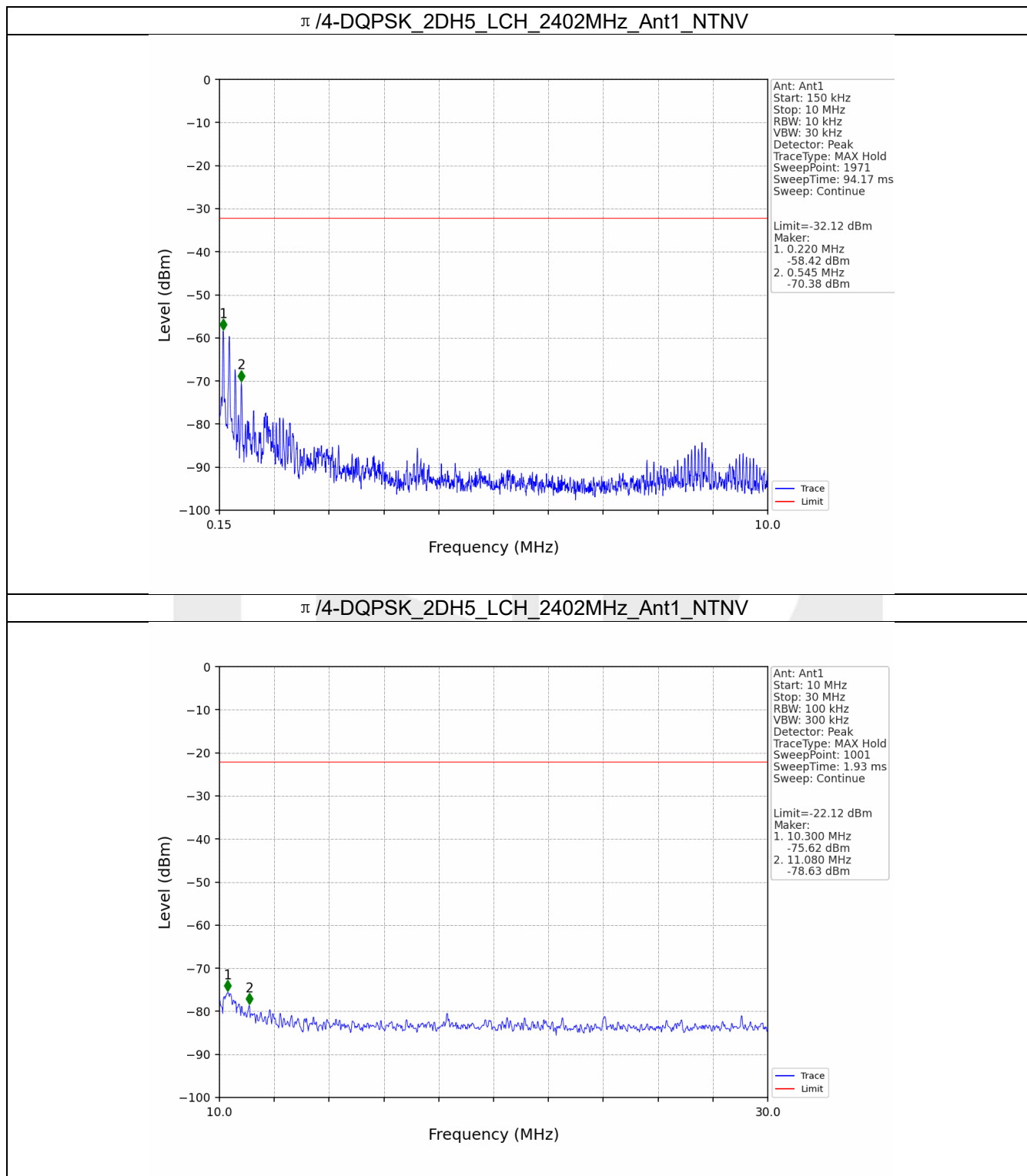


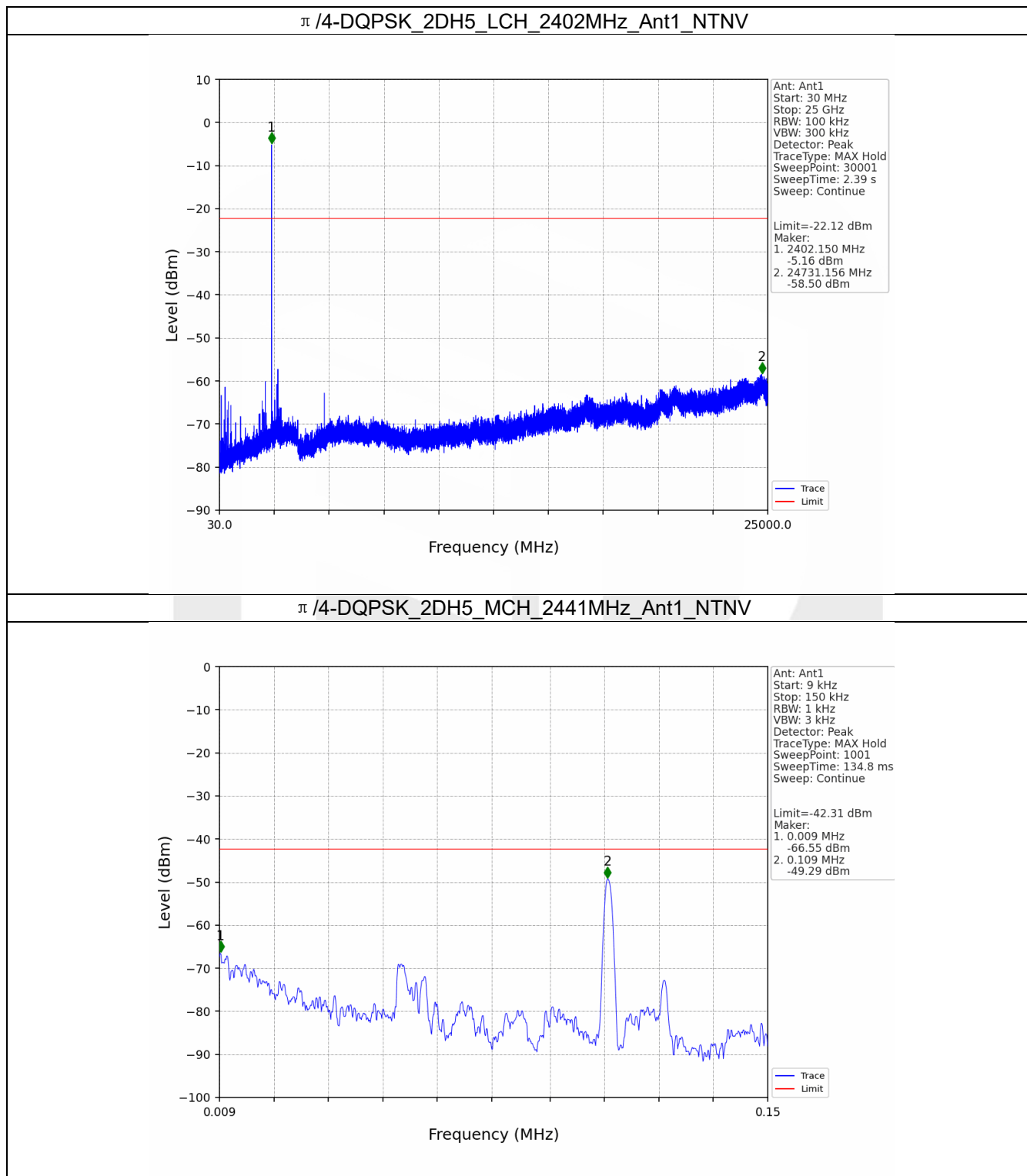


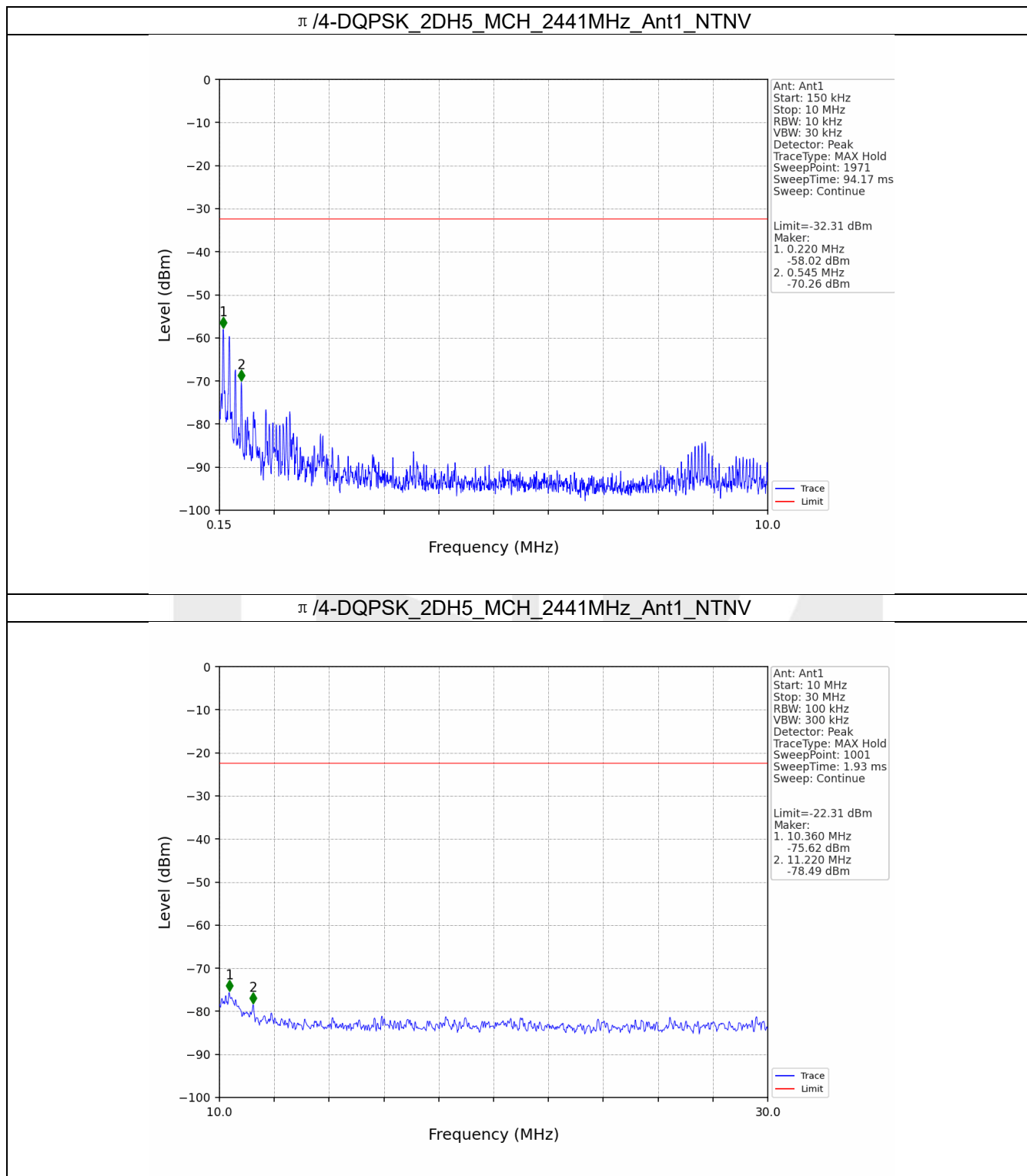


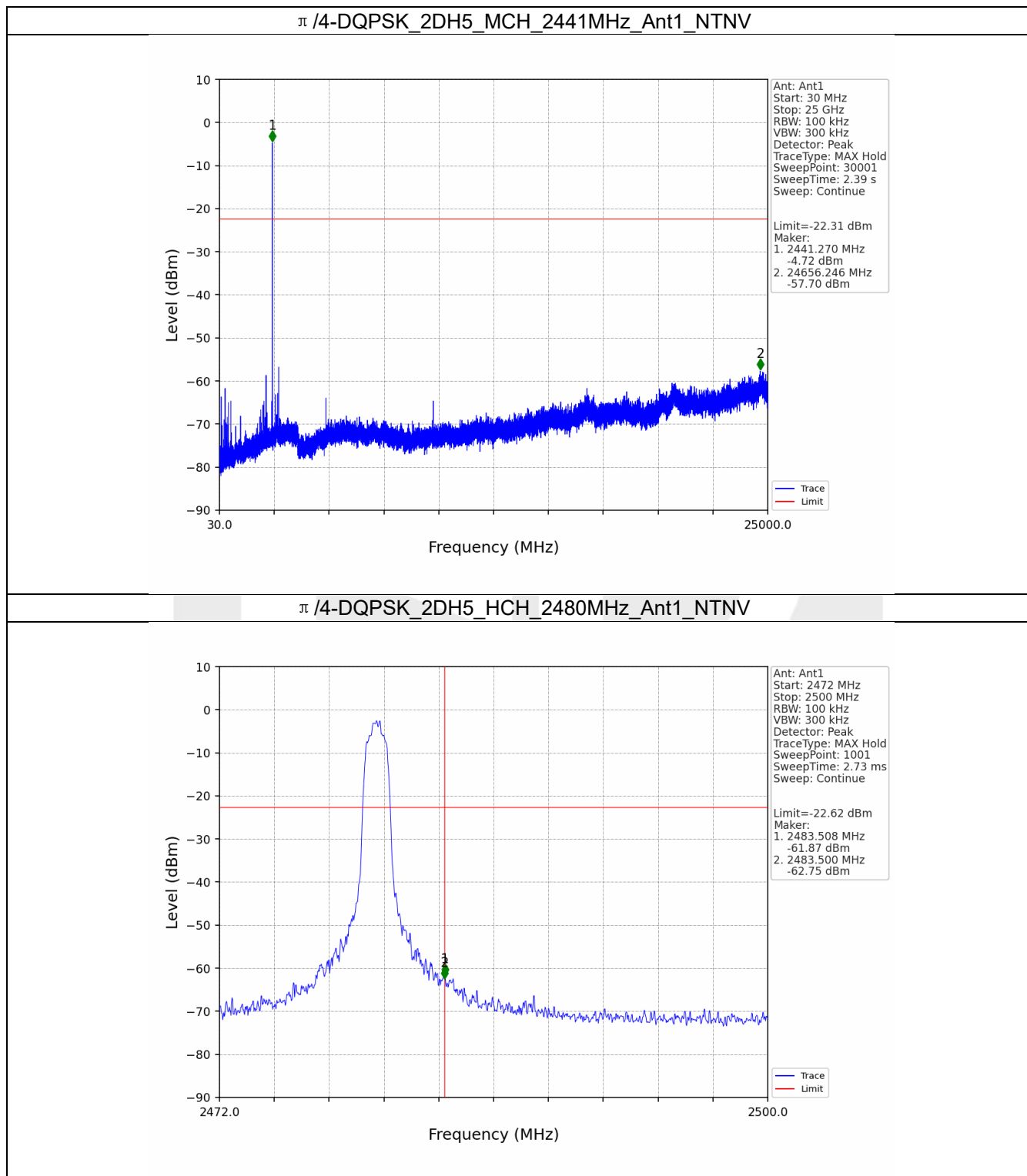


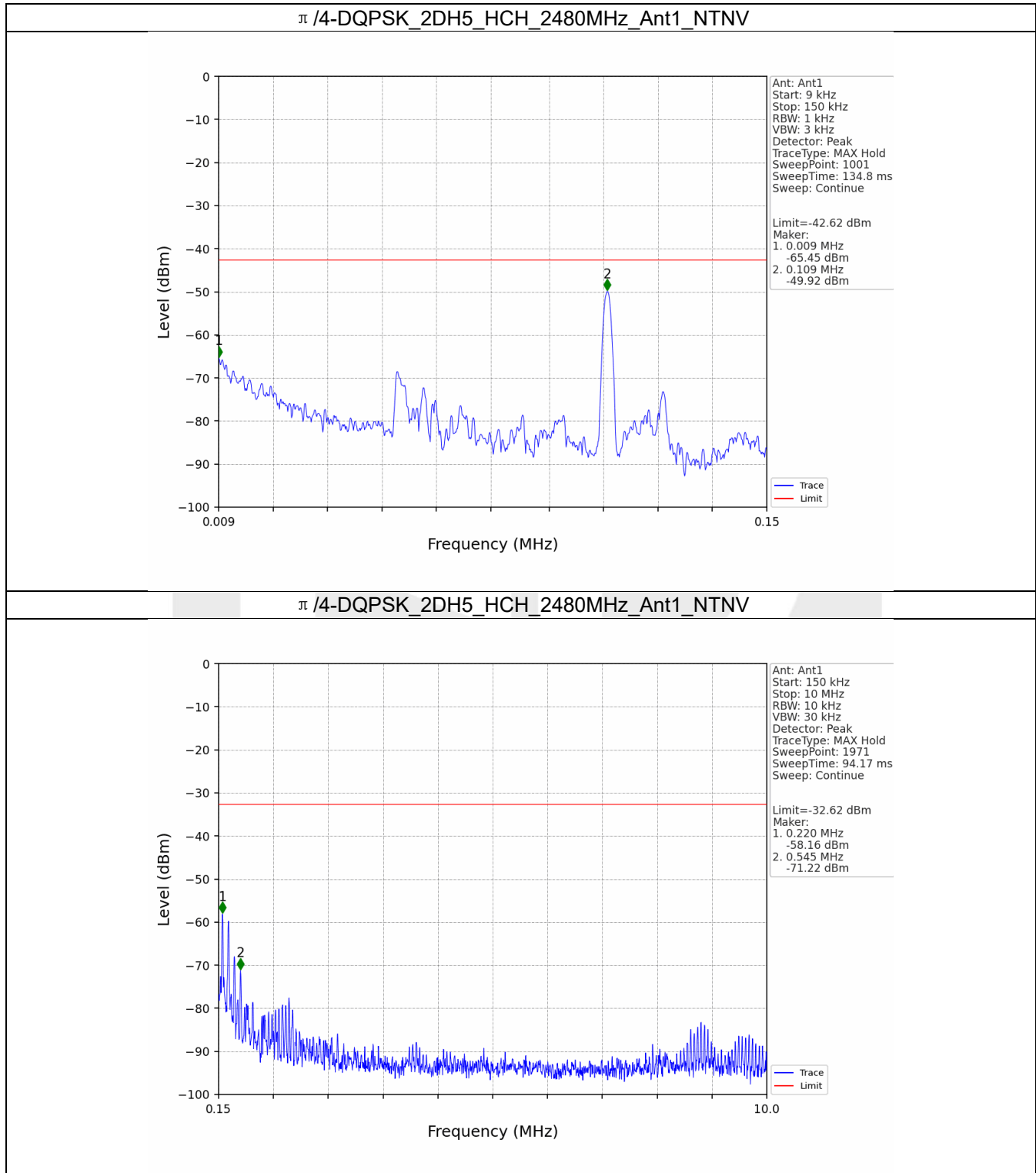


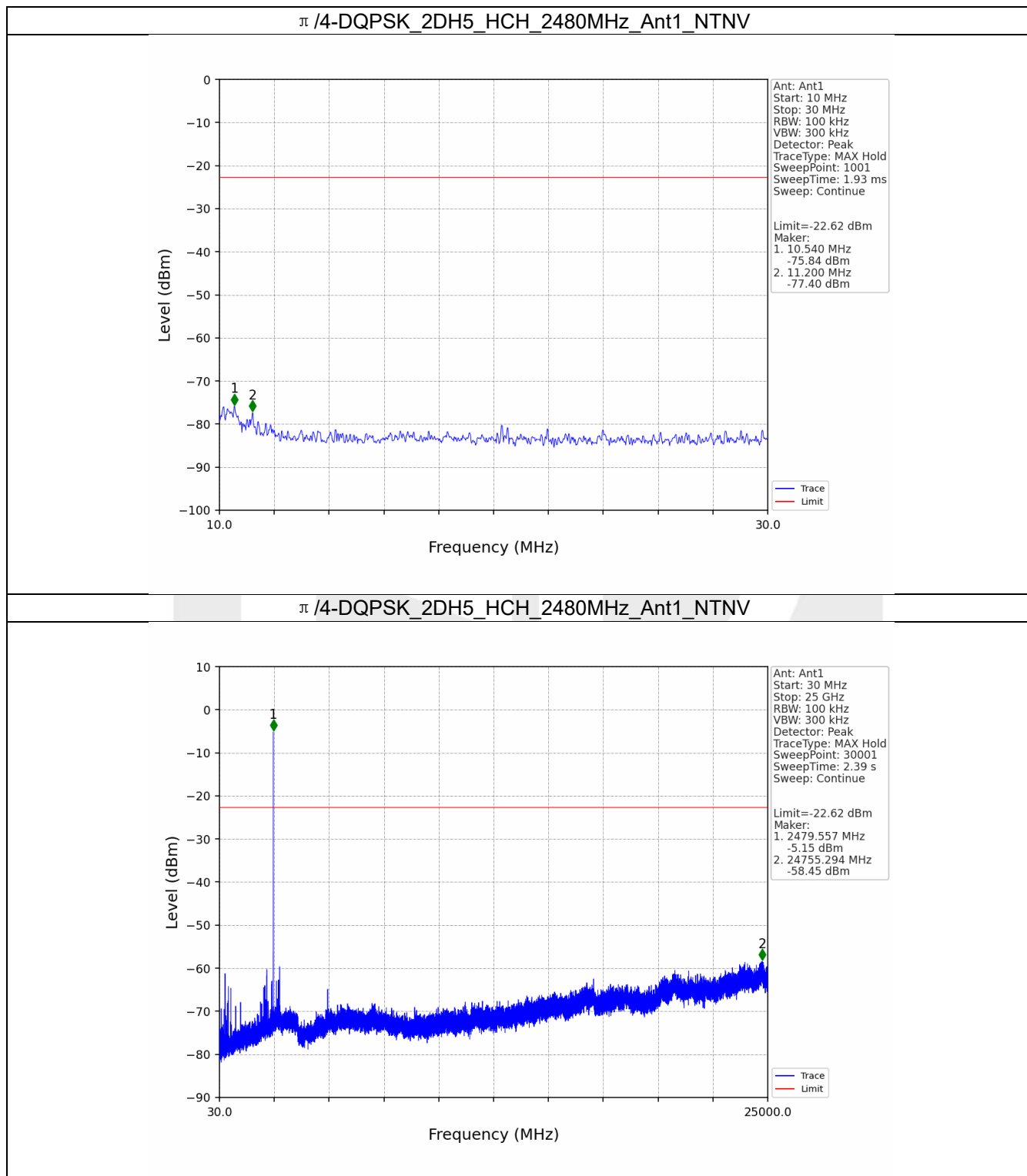


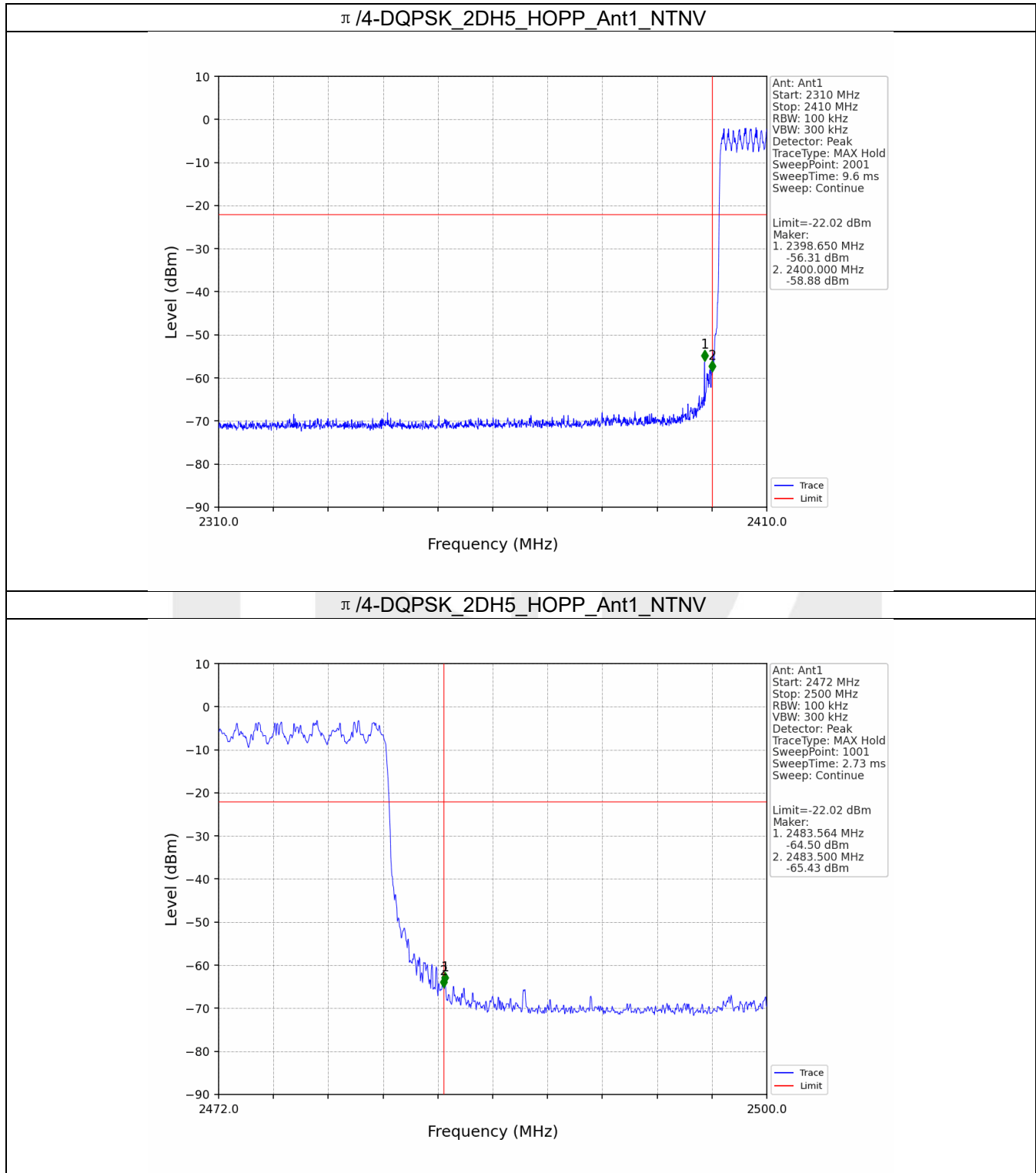


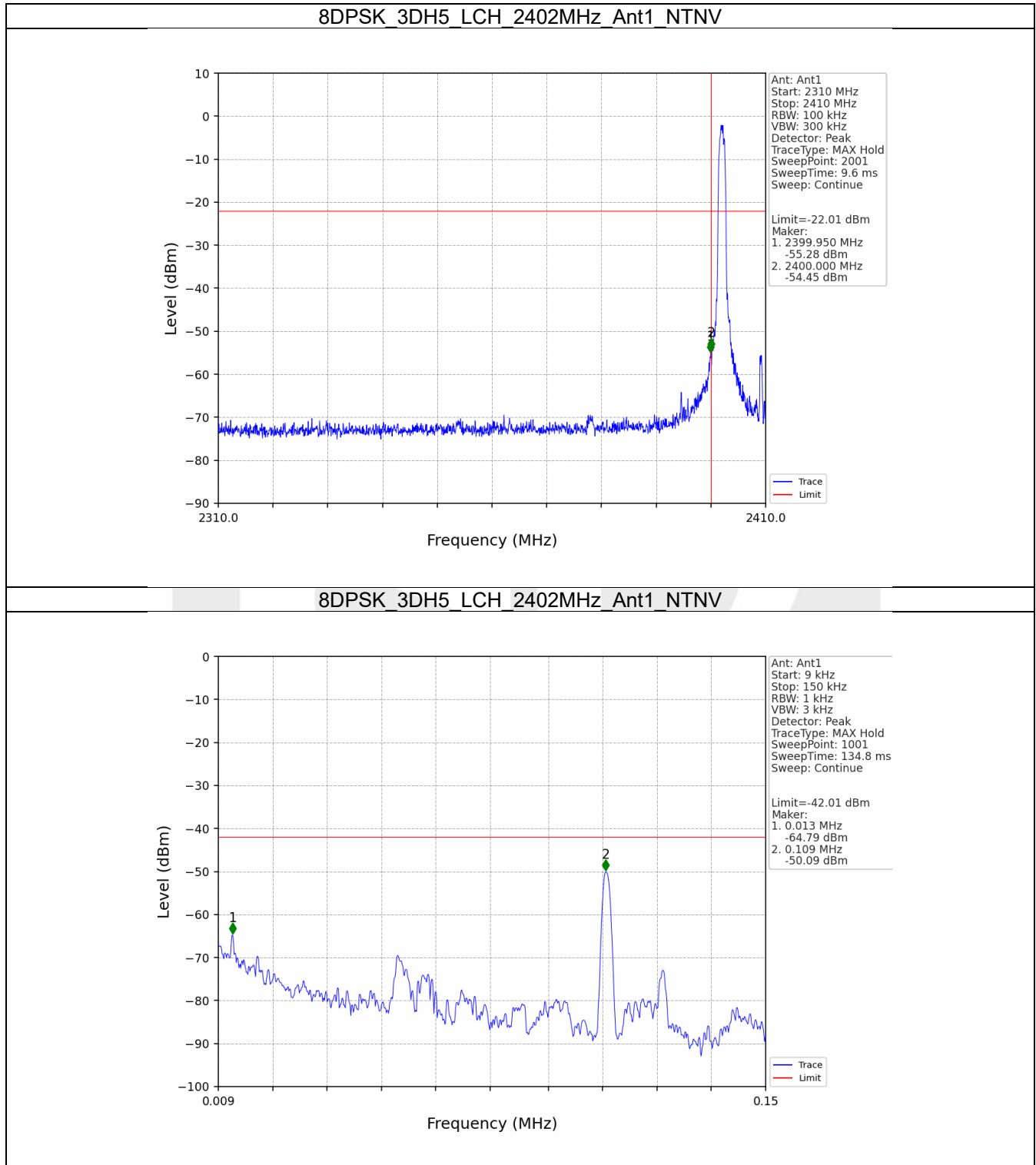


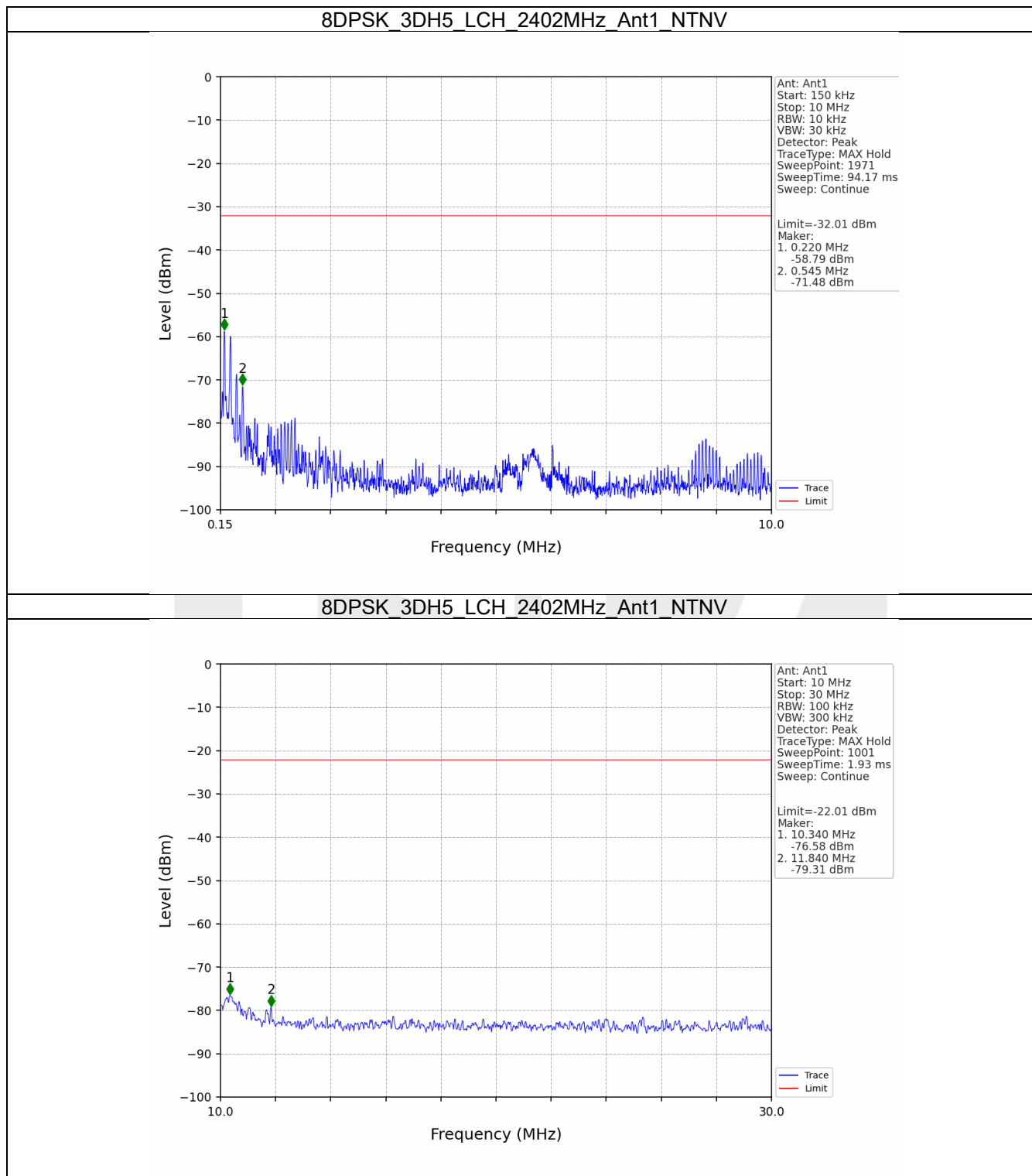


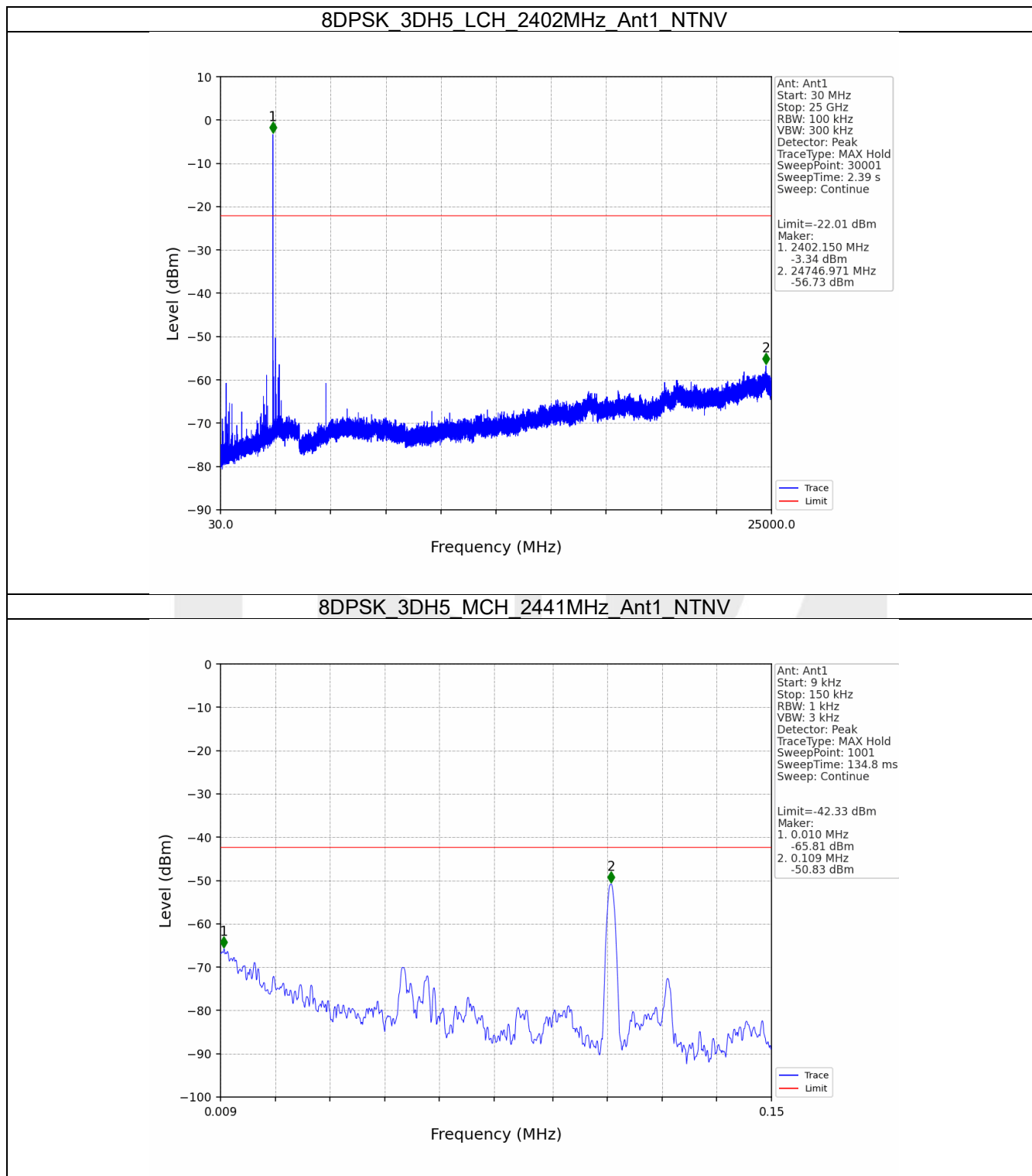


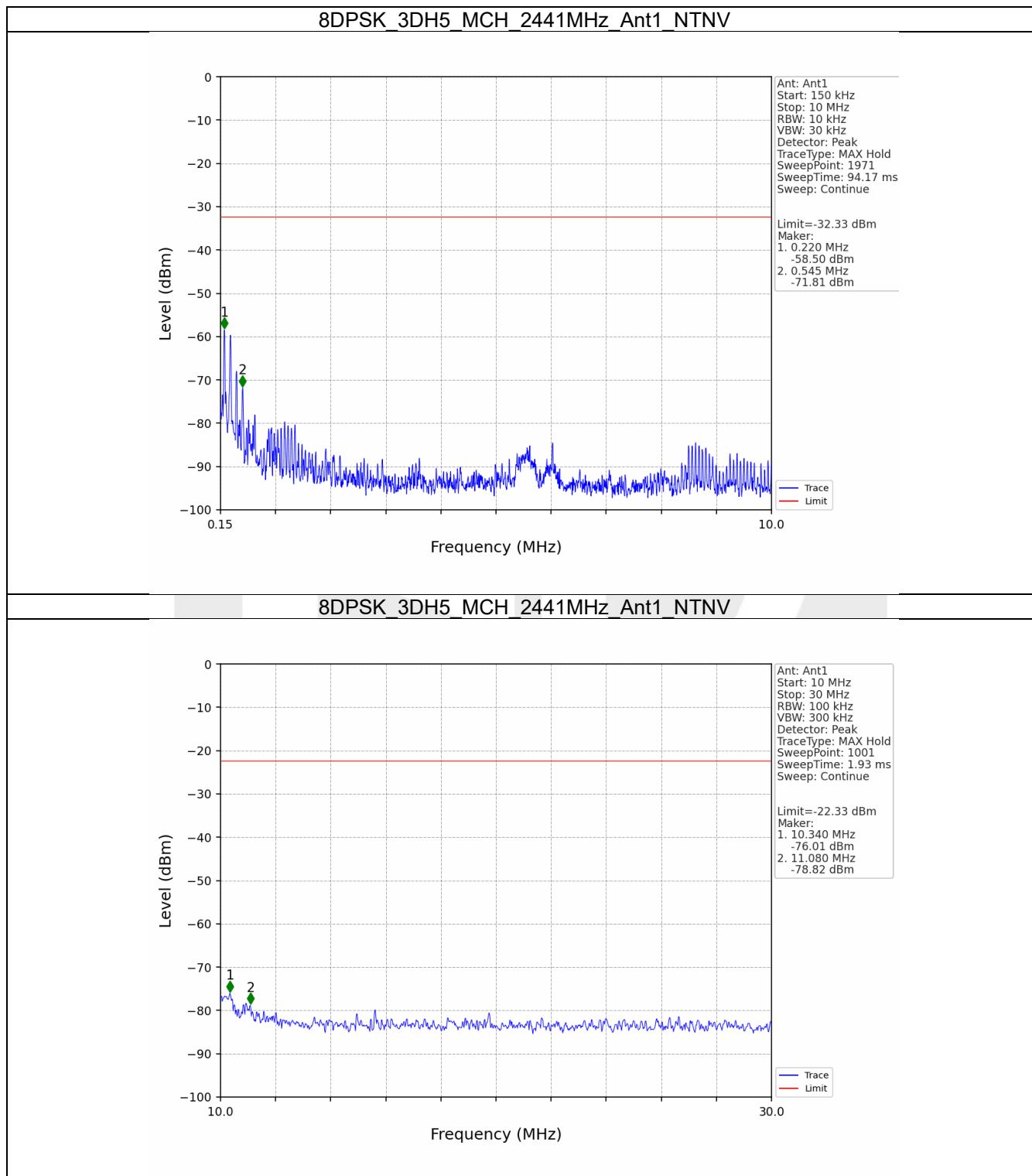


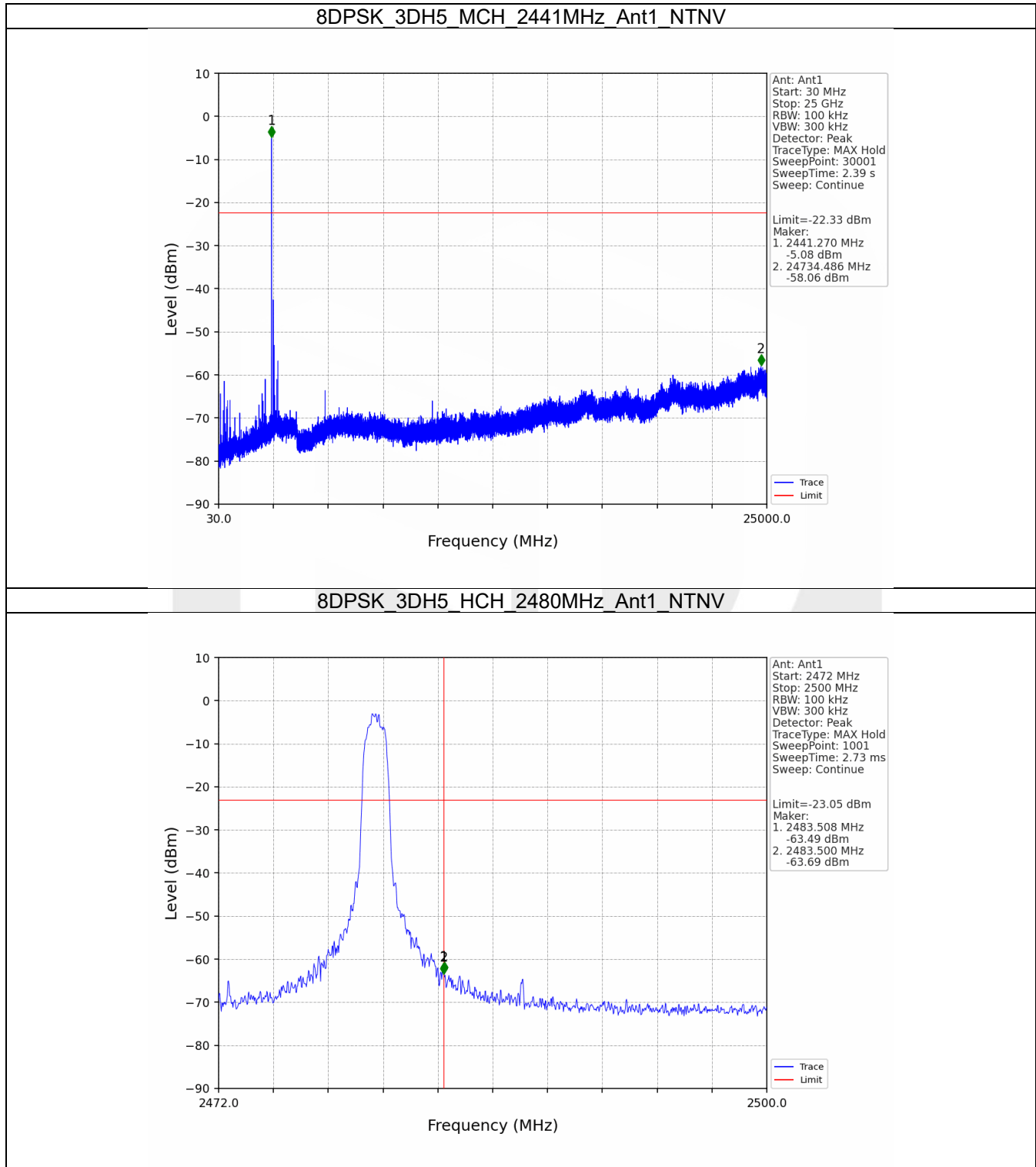


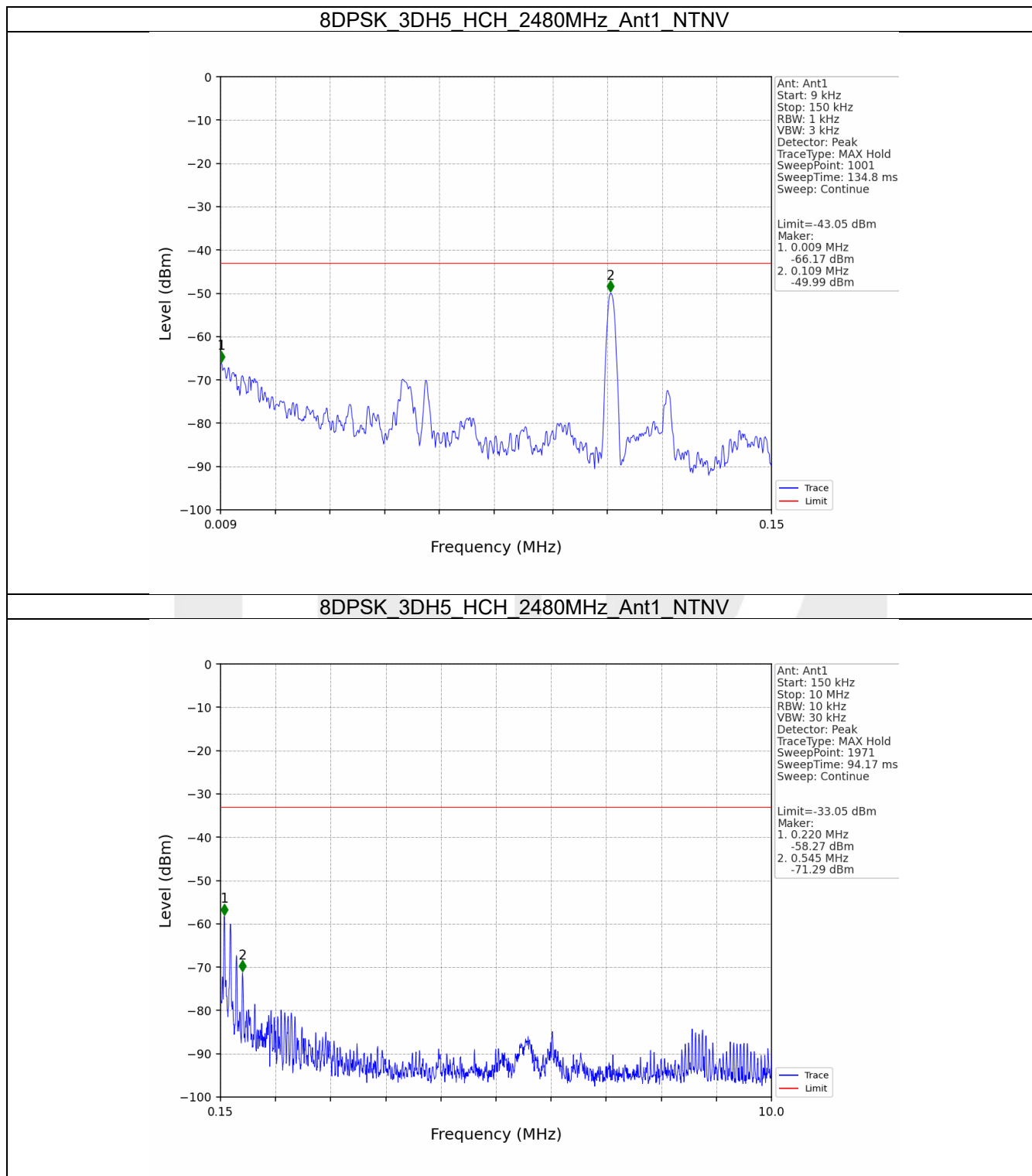


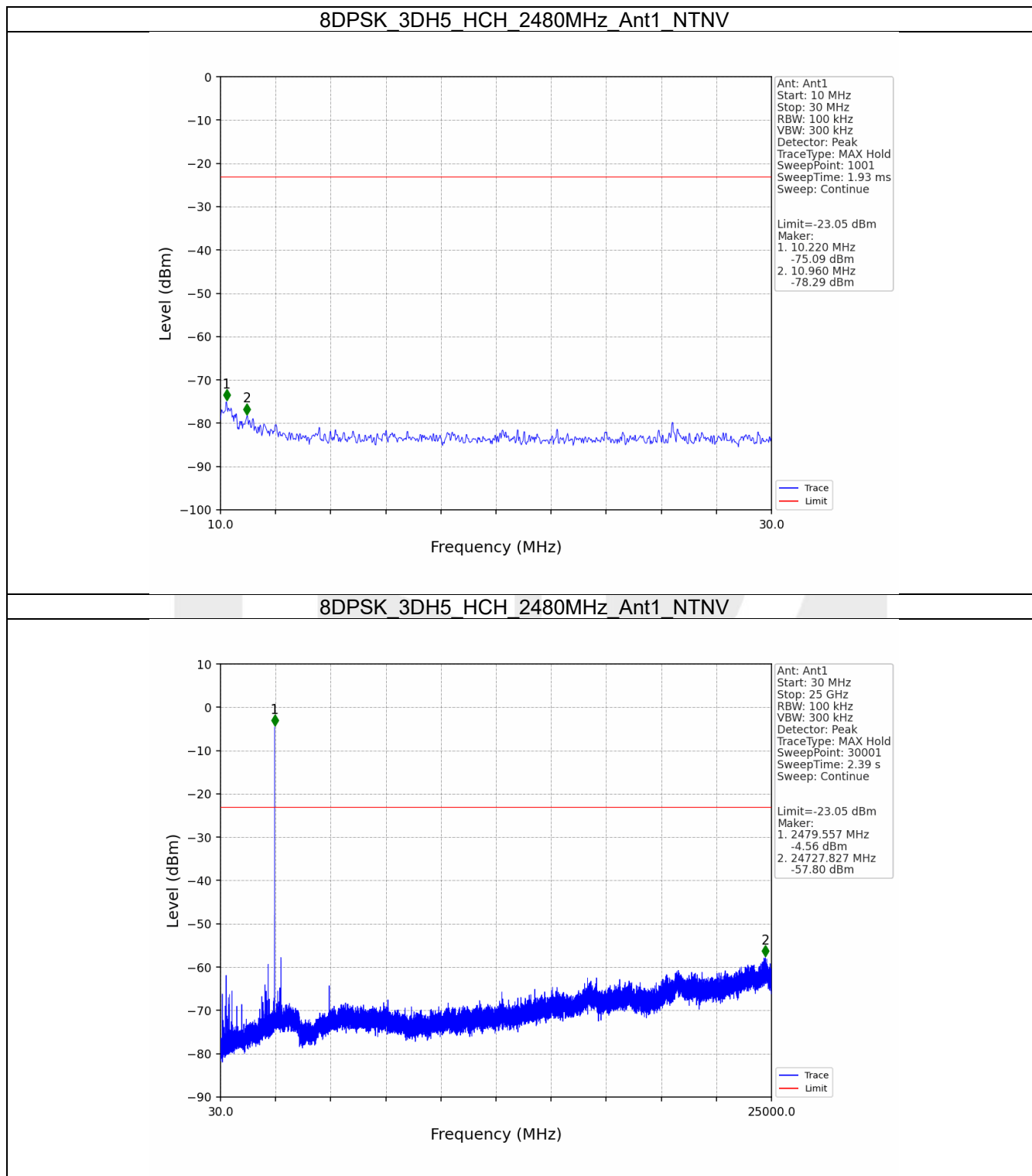


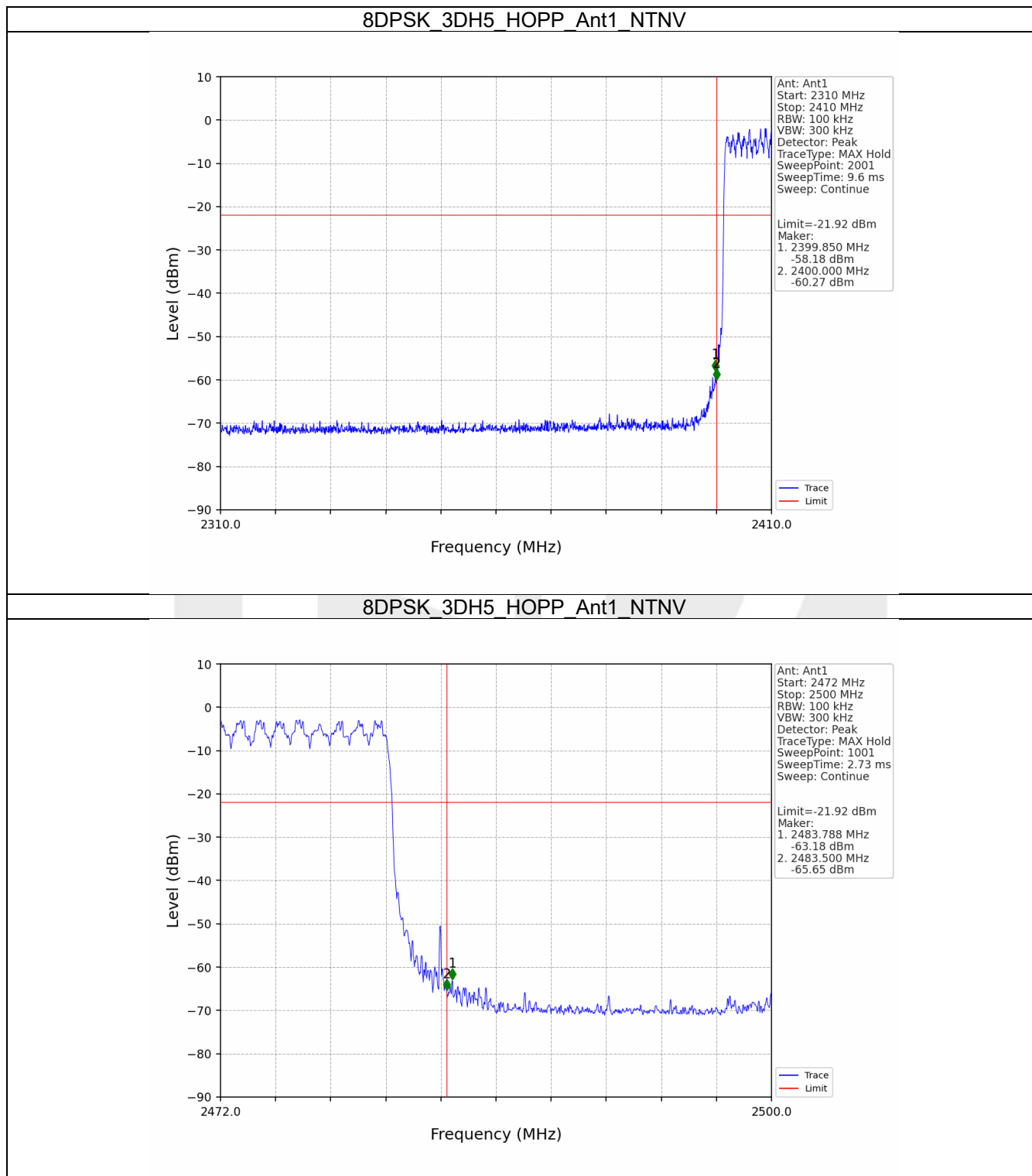












----- End of Report -----