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Annex for Bluetooth

Test Report No.: CTL2412028012-WF

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FCC ID: Q8WD8

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	0.909	/	Pass
		2441	DH5	1	0.918	/	Pass
		2480	DH5	1	0.913	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.180	/	Pass
		2441	2DH5	1	1.179	/	Pass
		2480	2DH5	1	1.178	/	Pass
8DPSK	SISO	2402	3DH5	1	1.176	/	Pass
		2441	3DH5	1	1.172	/	Pass
		2480	3DH5	1	1.172	/	Pass

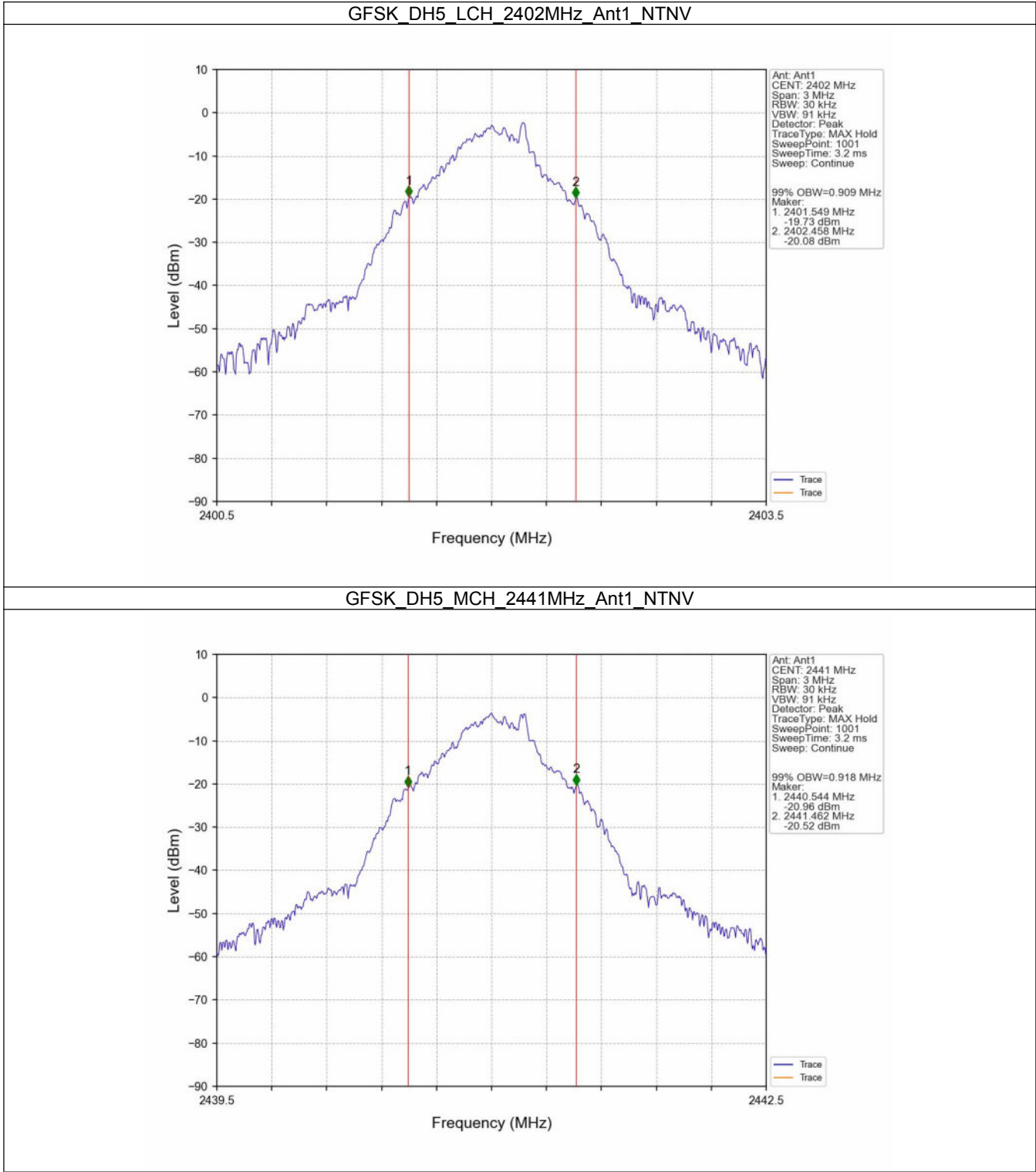
1.1.2 20dB BW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.990	/	Pass
		2441	DH5	1	0.991	/	Pass
		2480	DH5	1	0.992	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.287	/	Pass
		2441	2DH5	1	1.299	/	Pass
		2480	2DH5	1	1.303	/	Pass
8DPSK	SISO	2402	3DH5	1	1.295	/	Pass
		2441	3DH5	1	1.293	/	Pass
		2480	3DH5	1	1.294	/	Pass

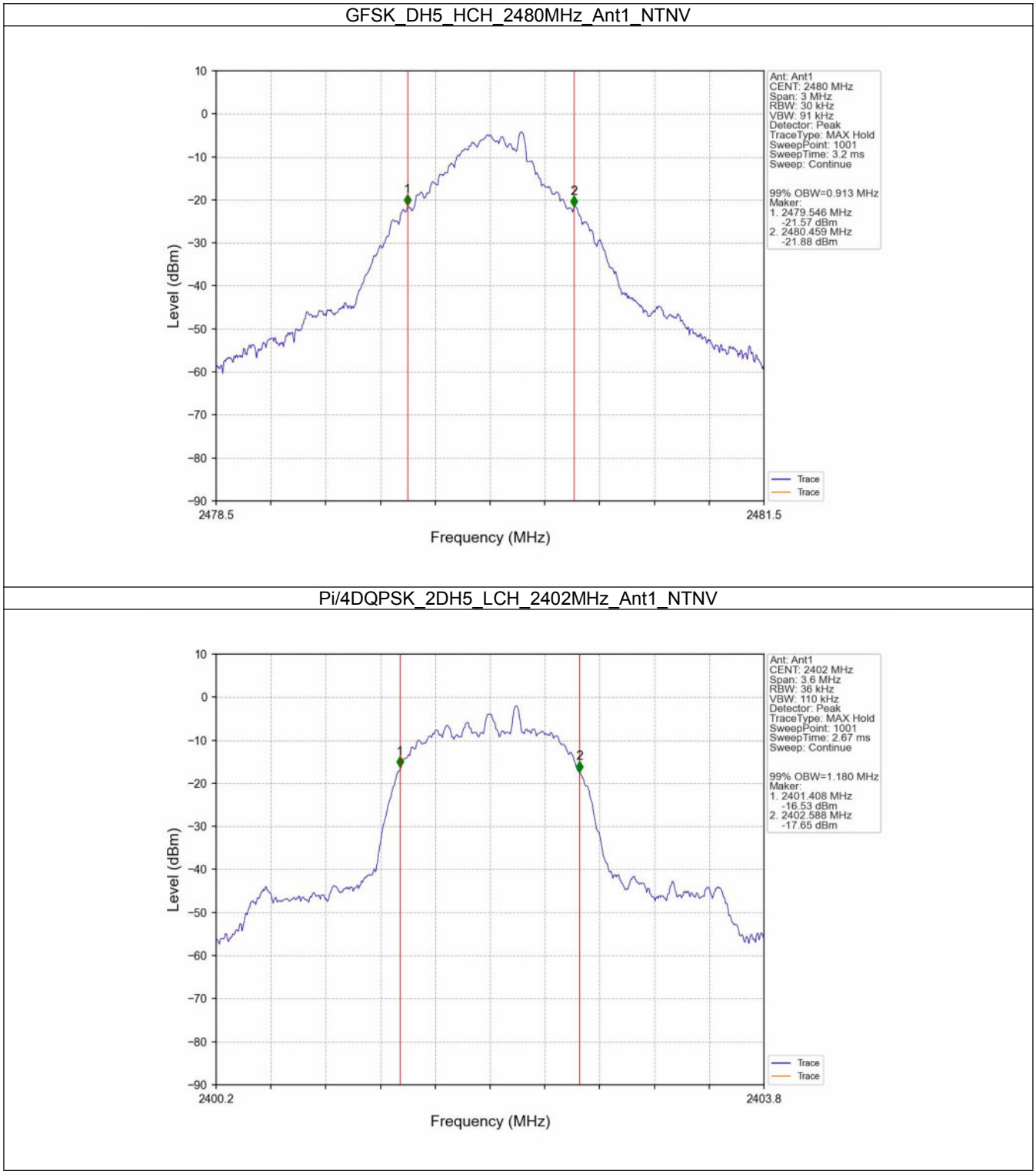
FCC ID: Q8WD8

1.2 Test Graph

1.2.1 OBW

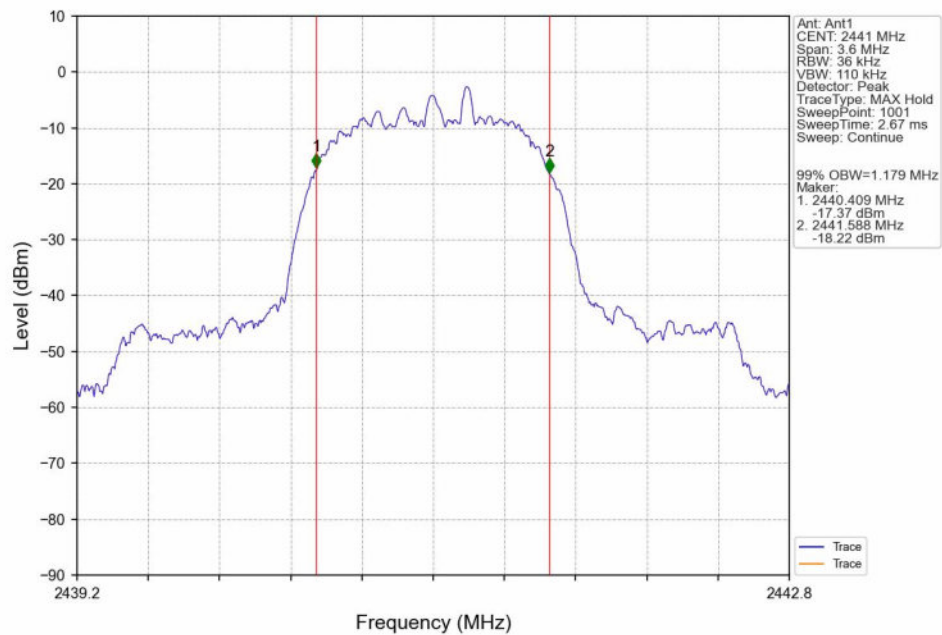


FCC ID: Q8WD8

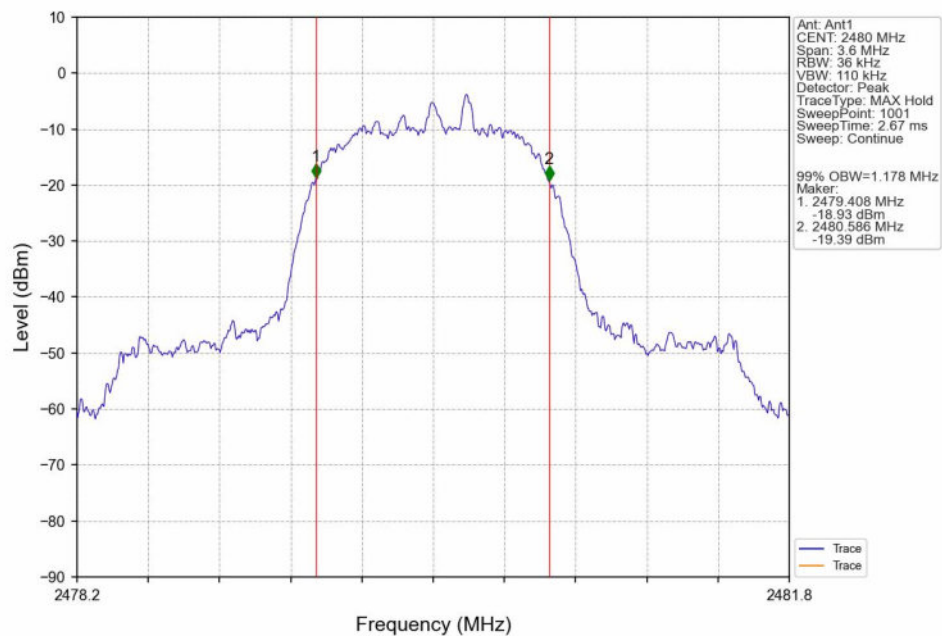


FCC ID: Q8WD8

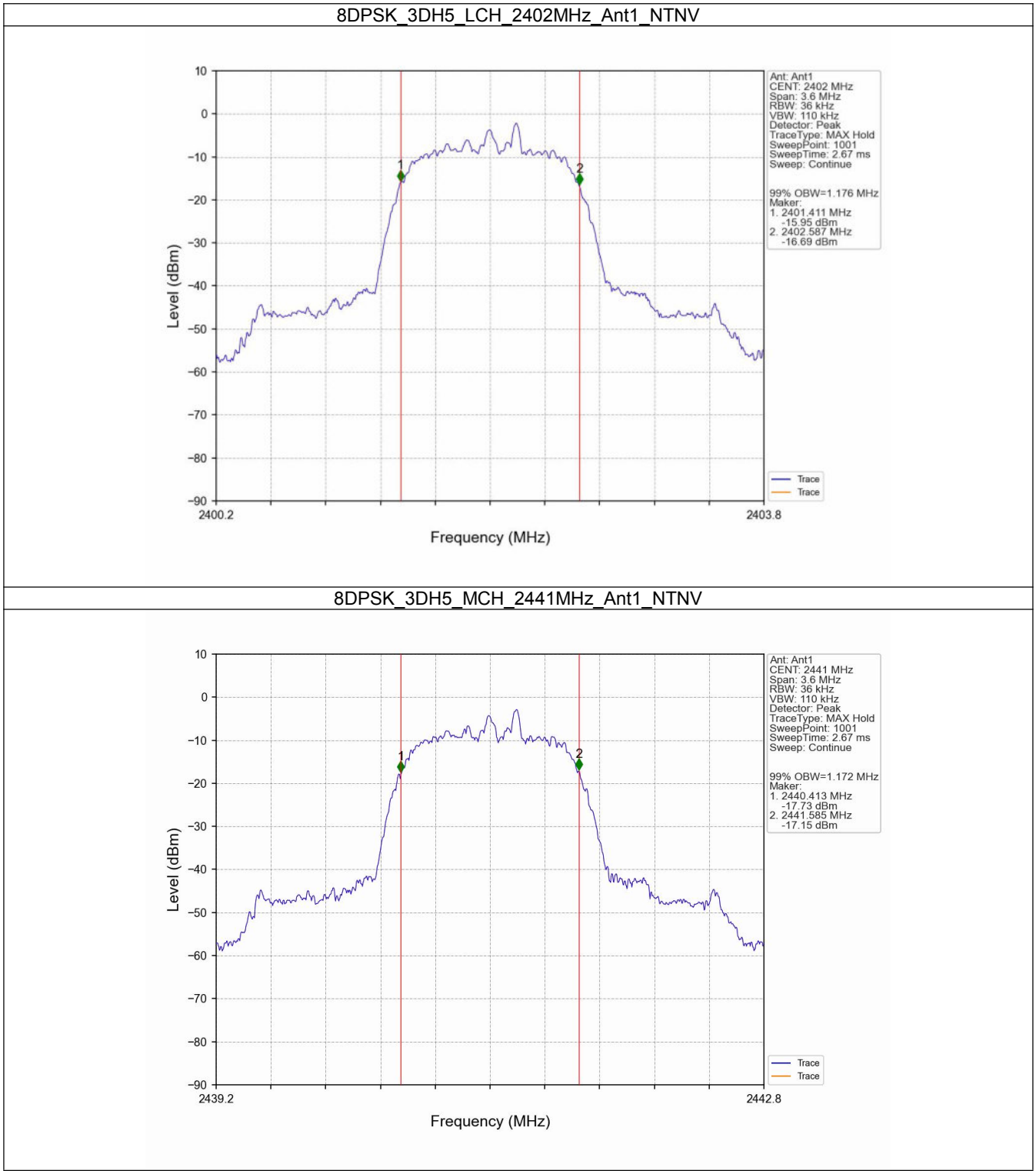
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



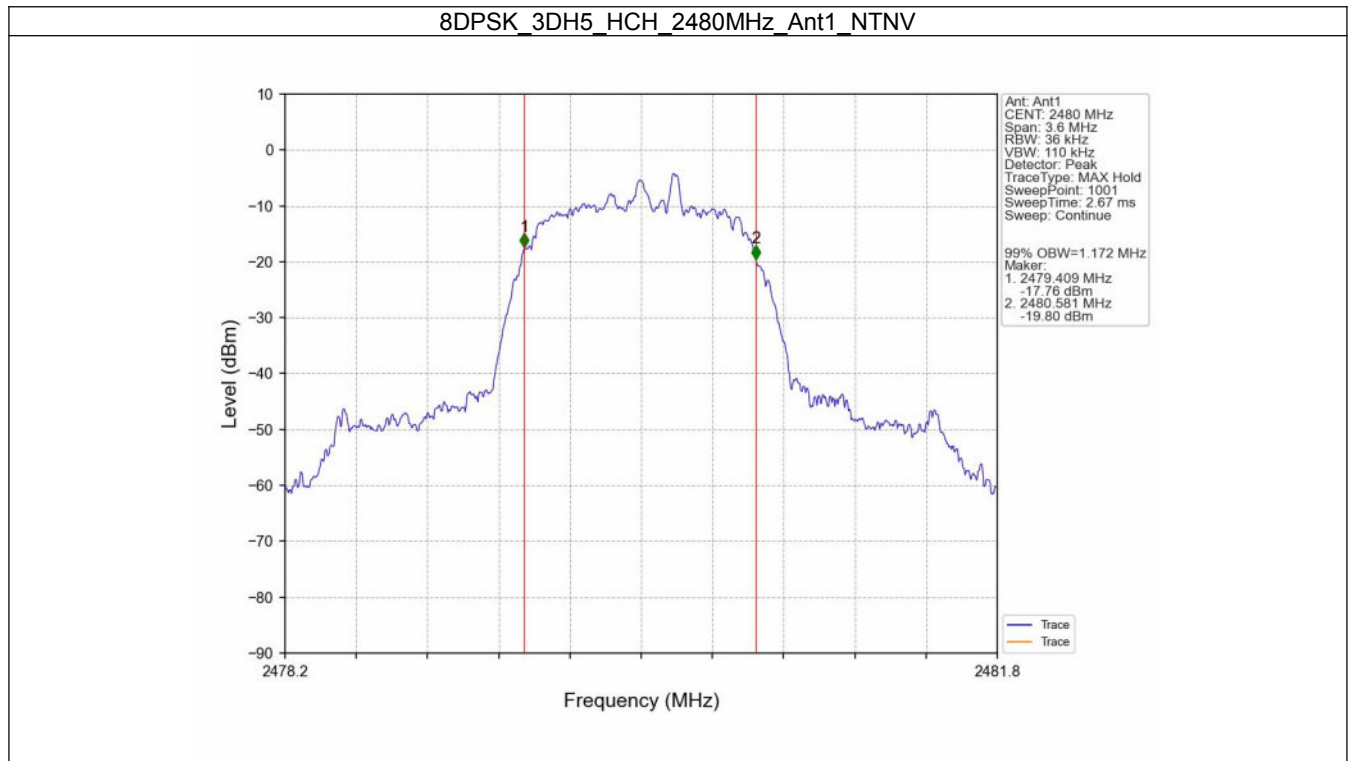
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



FCC ID: Q8WD8

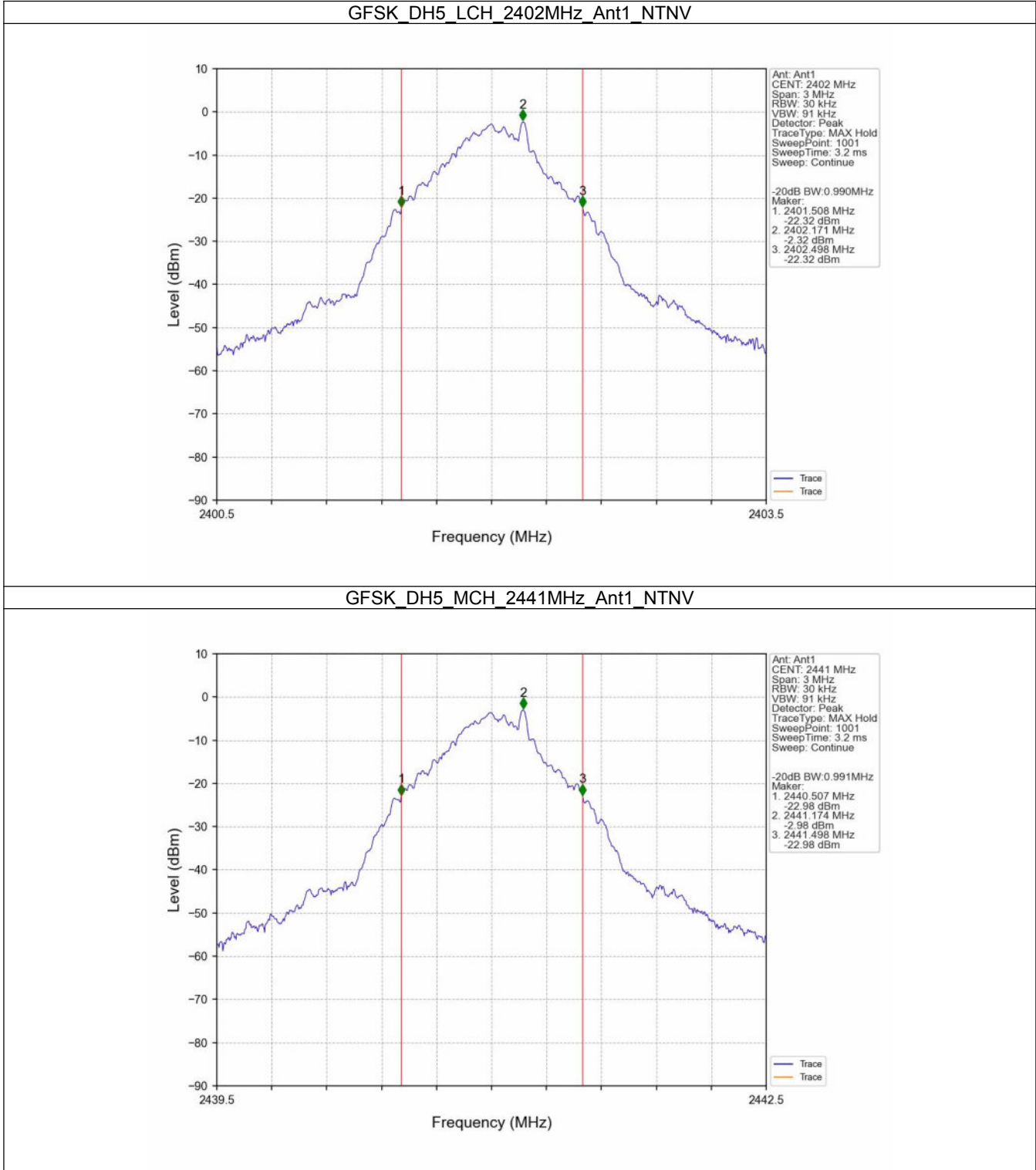


FCC ID: Q8WD8



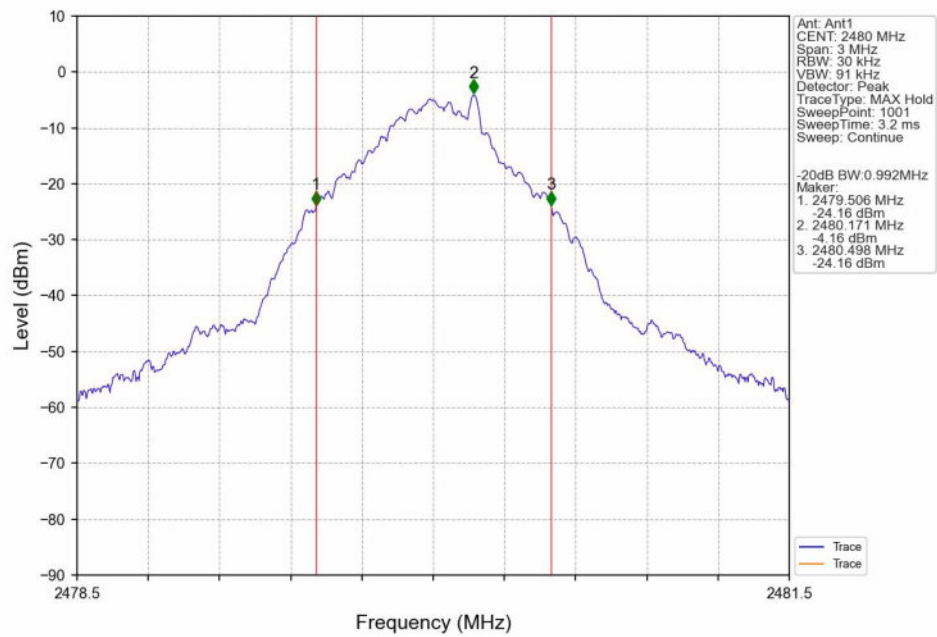
FCC ID: Q8WD8

1.2.2 20dB BW

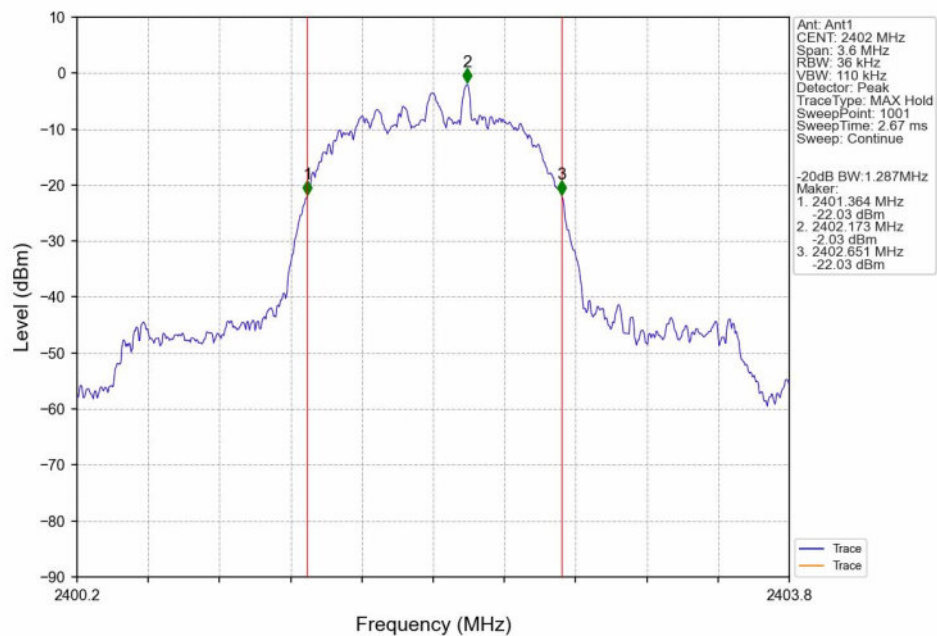


FCC ID: Q8WD8

GFSK_DH5_HCH_2480MHz_Ant1_NTNV

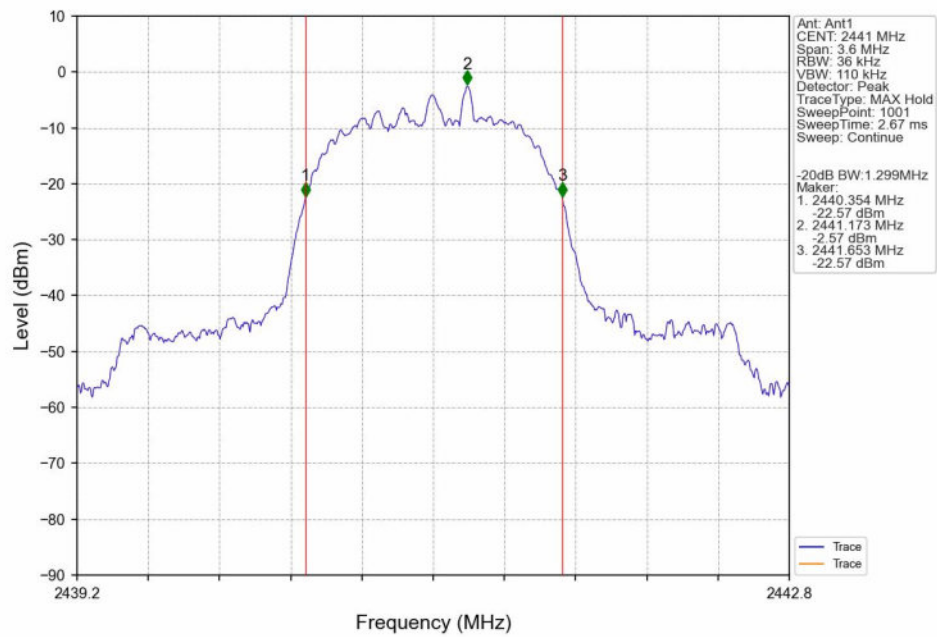


Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV

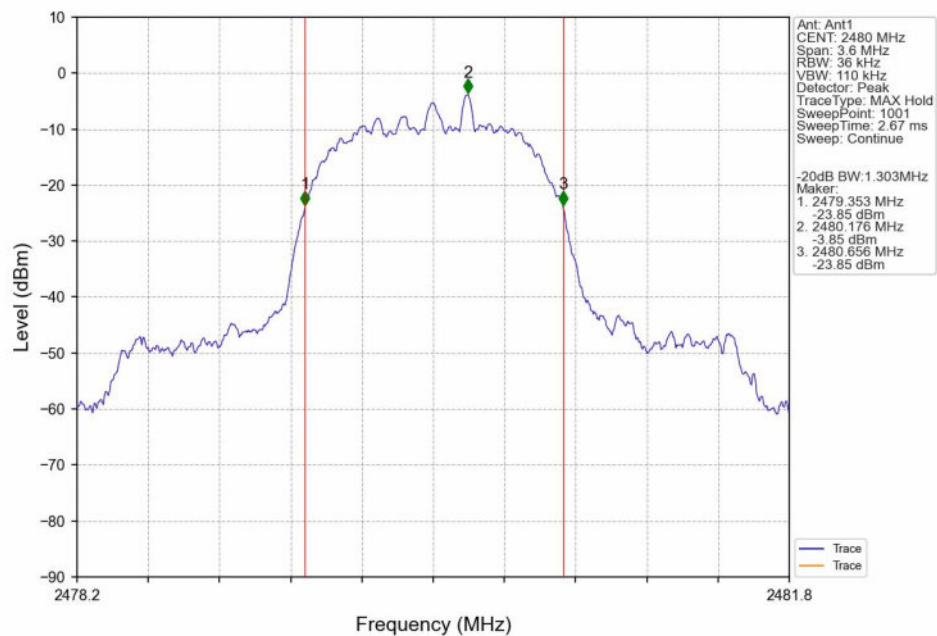


FCC ID: Q8WD8

Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV

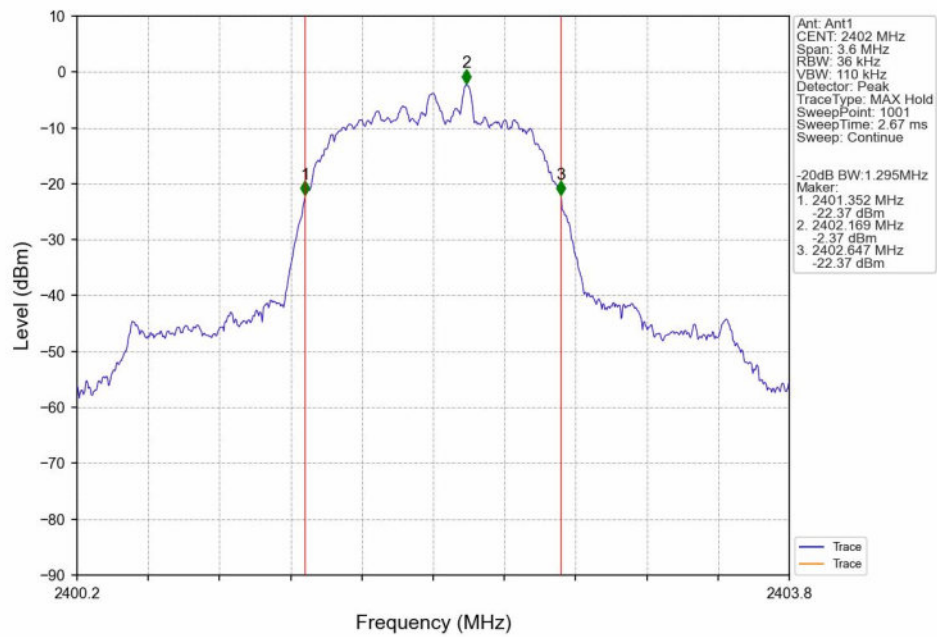


Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

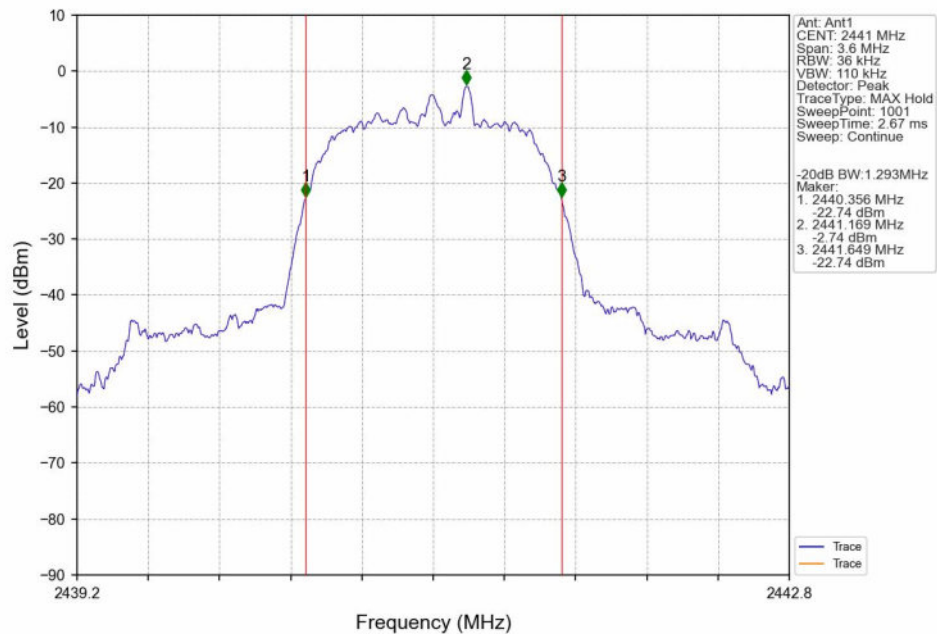


FCC ID: Q8WD8

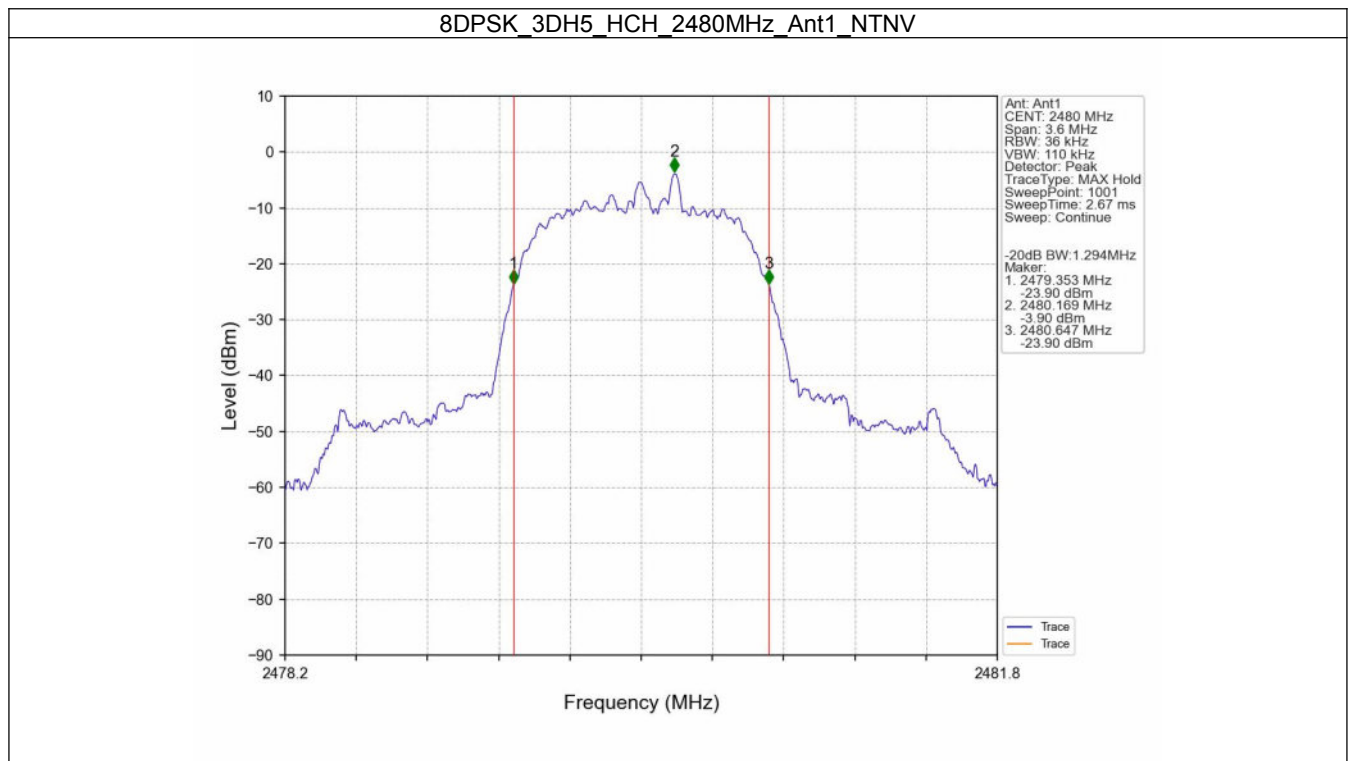
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



FCC ID: Q8WD8



FCC ID: Q8WD8

2. Maximum Conducted Output Power

2.1 Test Result

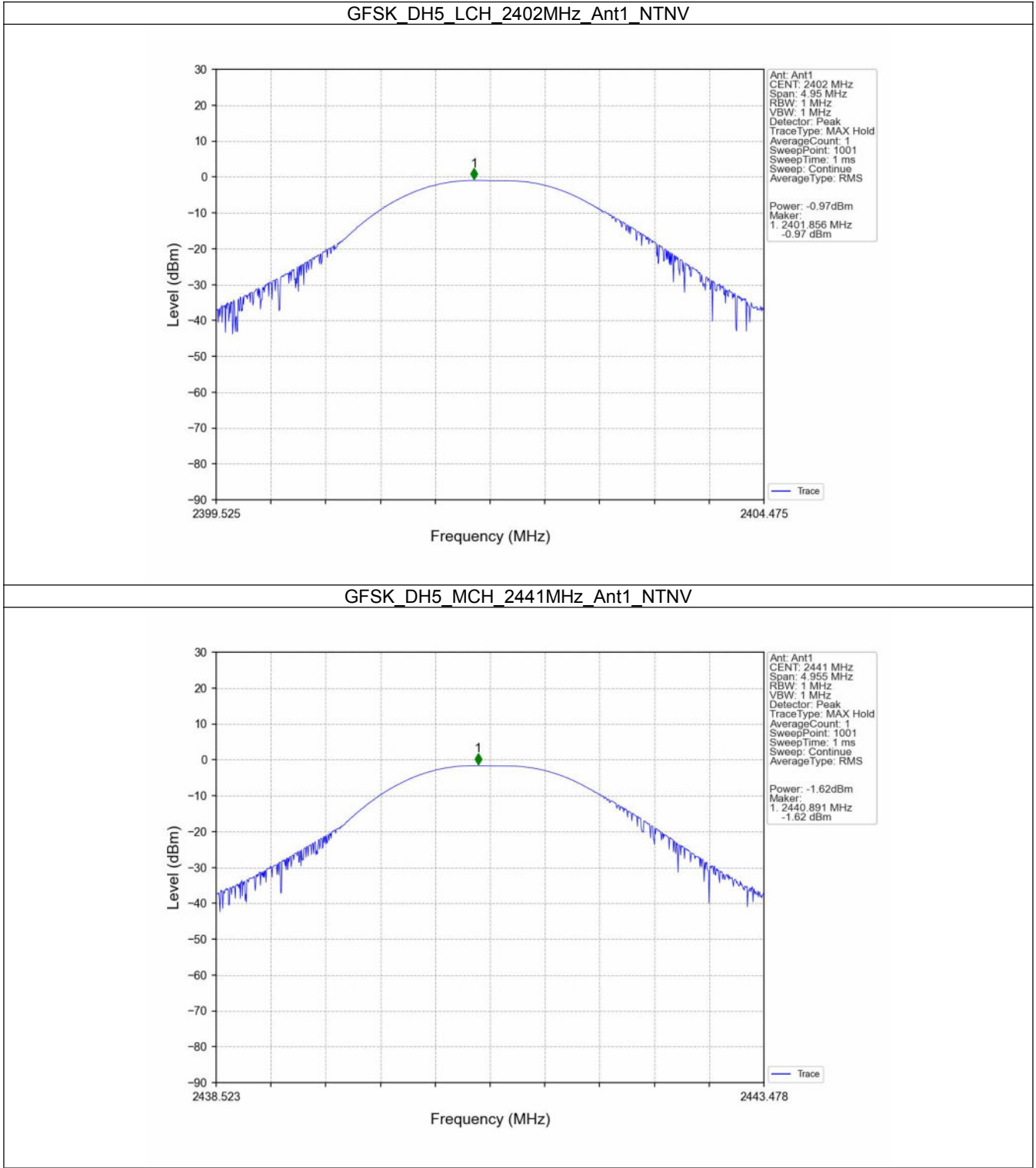
2.1.1 Power

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	-0.97	<=30	Pass
		2441	DH5	-1.62	<=30	Pass
		2480	DH5	-2.79	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	0.22	<=20.97	Pass
		2441	2DH5	-0.29	<=20.97	Pass
		2480	2DH5	-1.41	<=20.97	Pass
8DPSK	SISO	2402	3DH5	0.39	<=20.97	Pass
		2441	3DH5	-0.15	<=20.97	Pass
		2480	3DH5	-1.27	<=20.97	Pass
Note1: Antenna Gain: Ant1: 2.39dBi;						

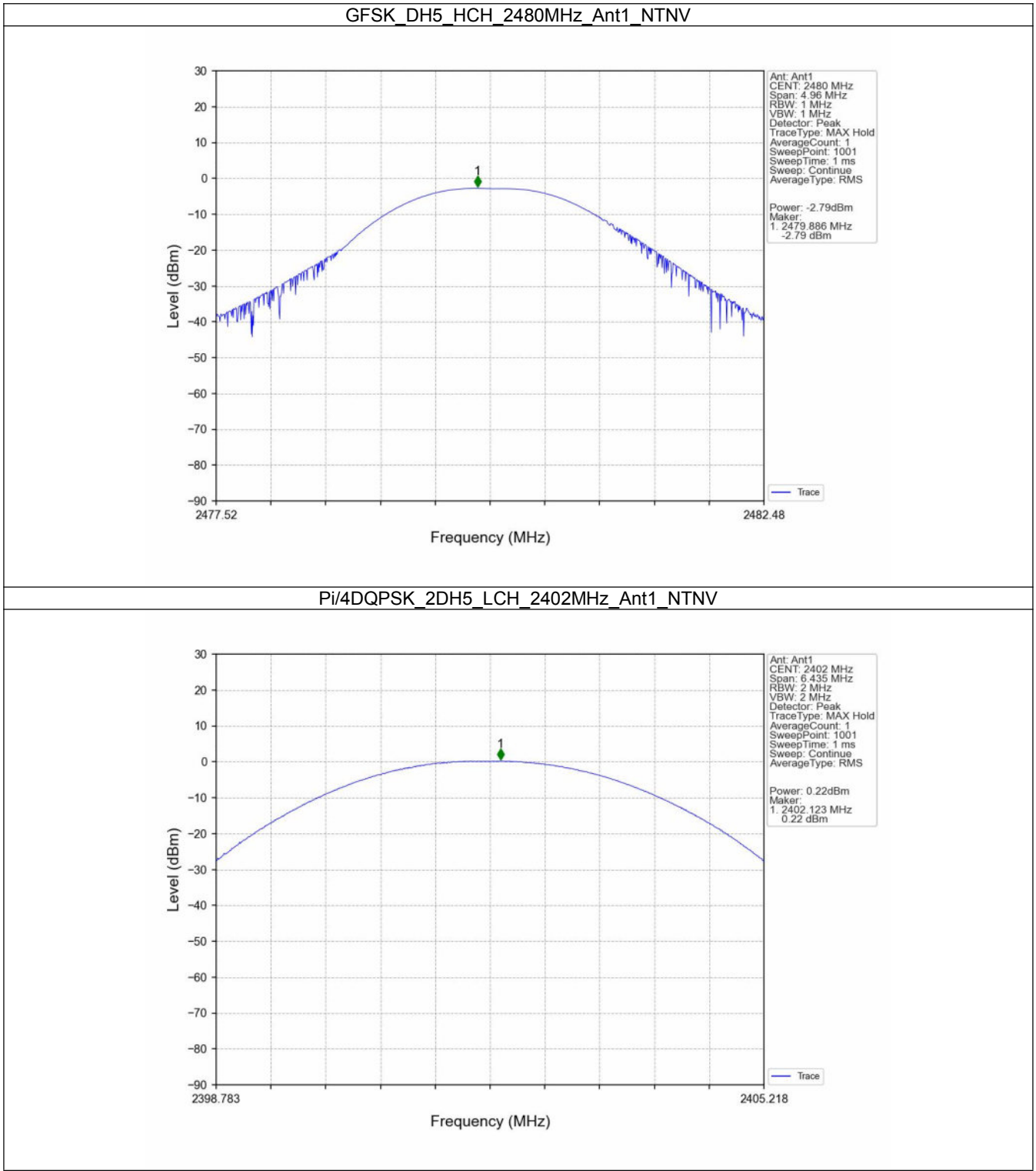
FCC ID: Q8WD8

2.2 Test Graph

2.2.1 Power

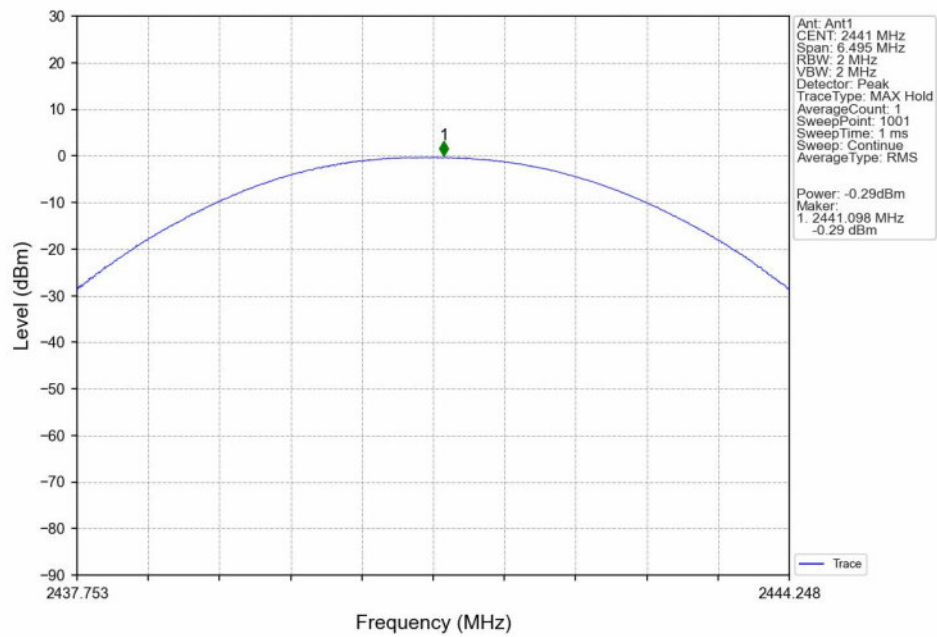


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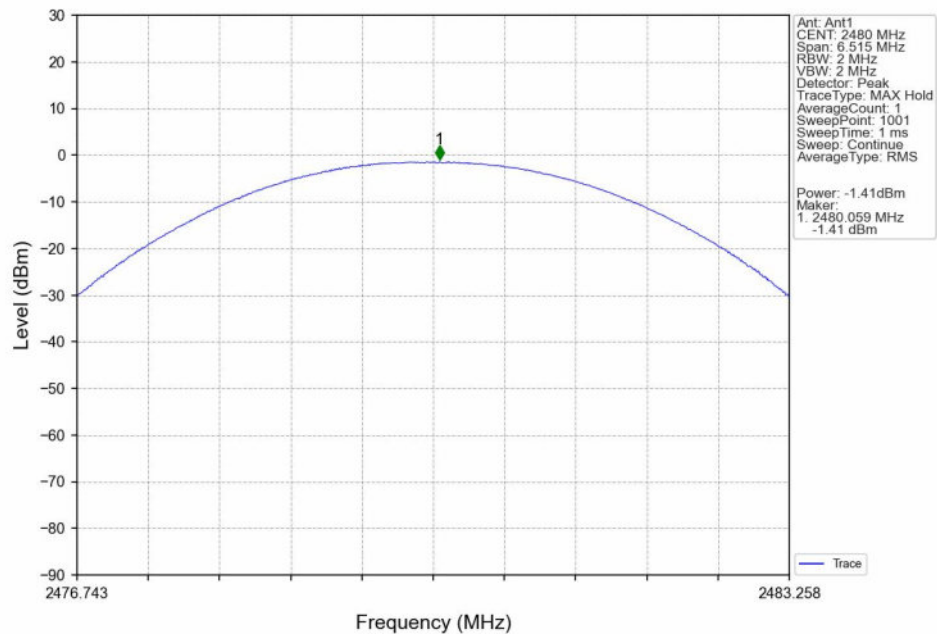


FCC ID: Q8WD8

Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV

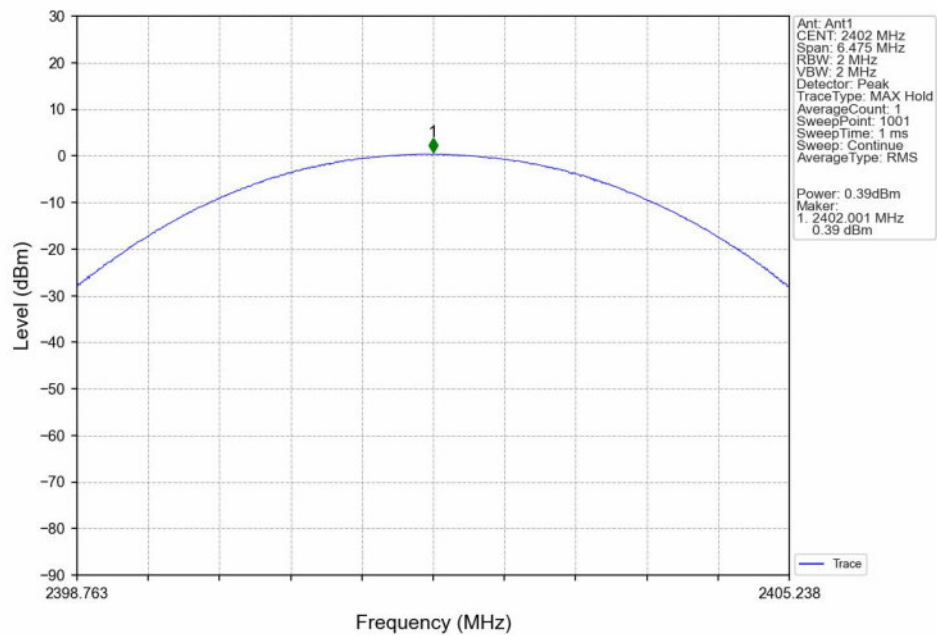


Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

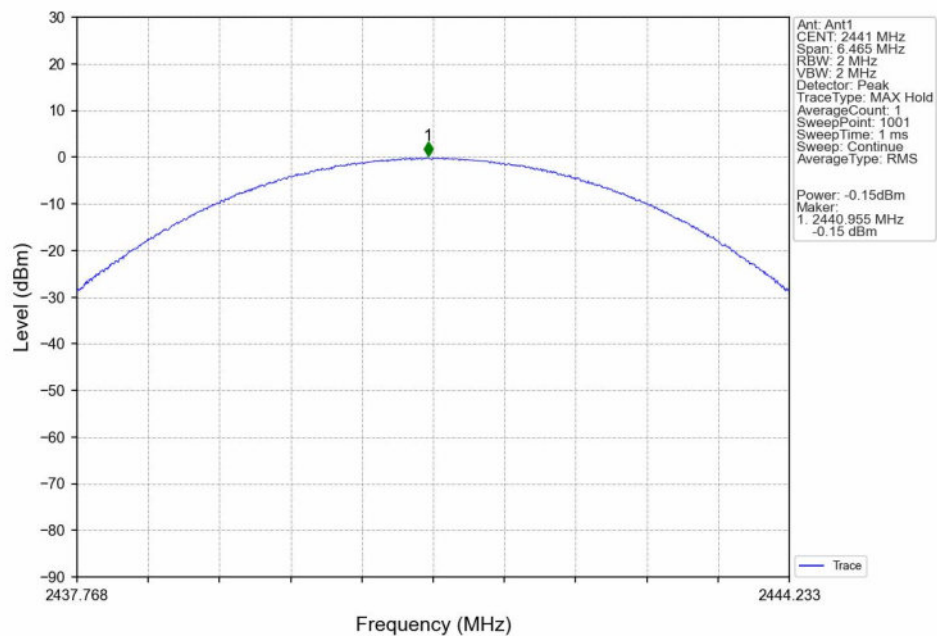


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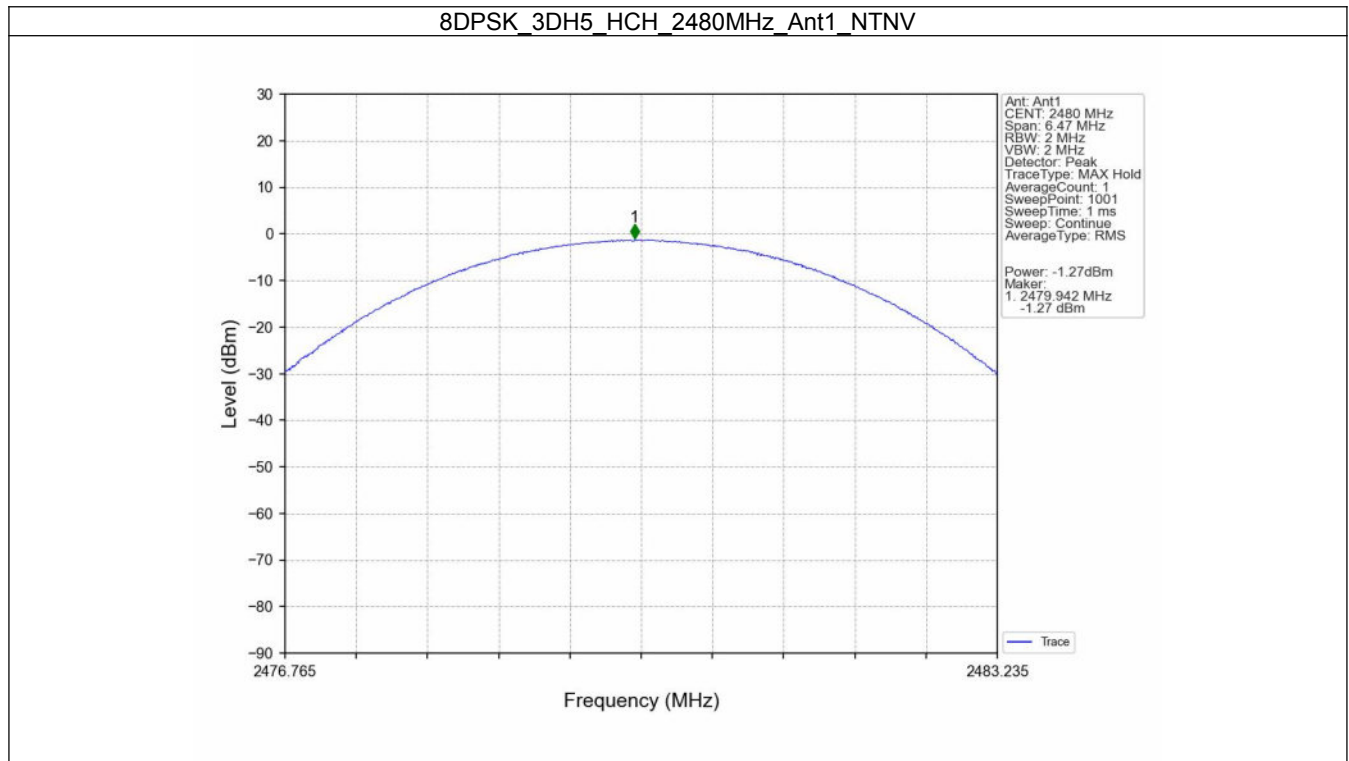
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



FCC ID: Q8WD8



FCC ID: Q8WD8

3. Carrier Frequency Separation

3.1 Test Result

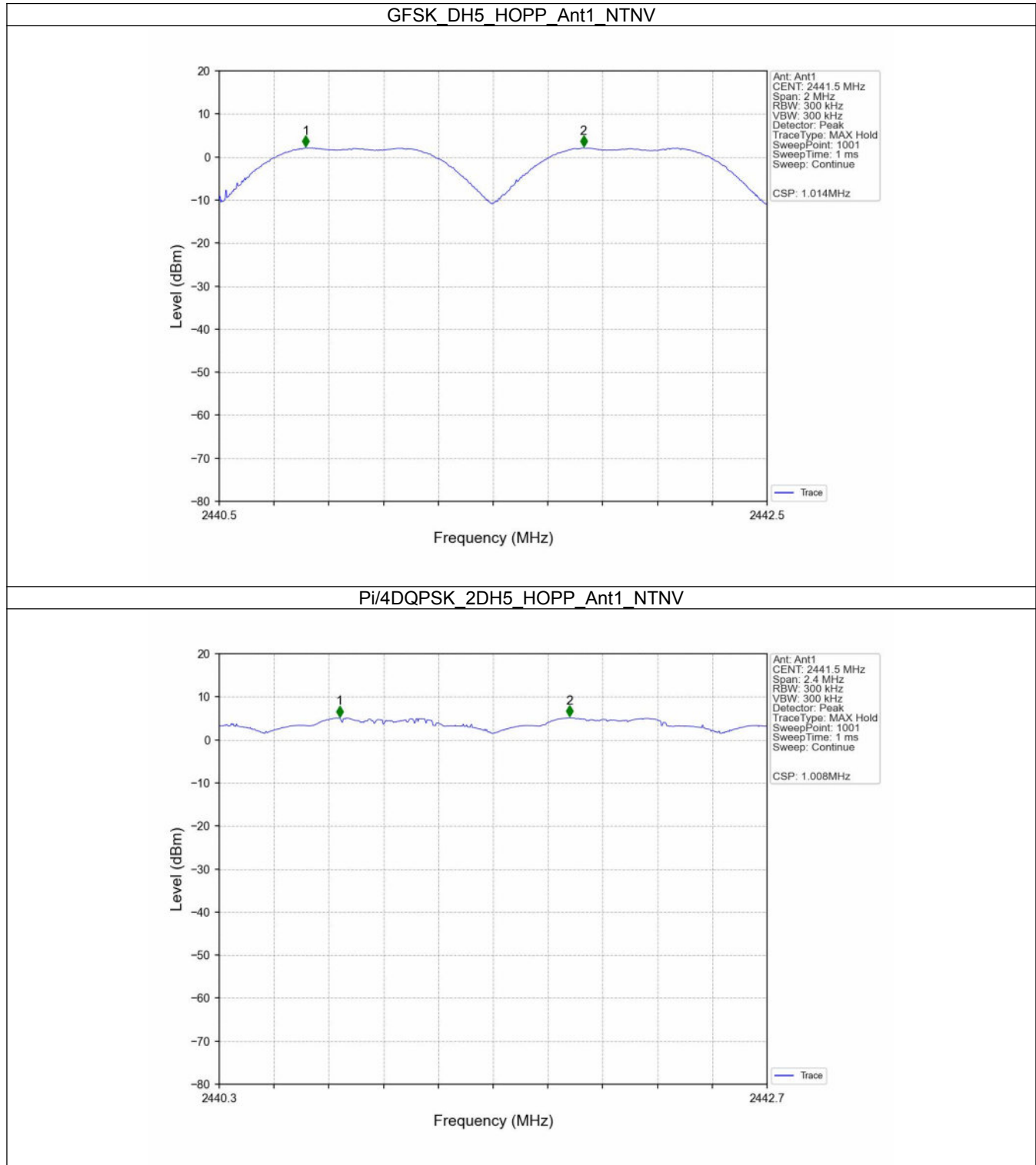
3.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.014	0.992	≥ 0.992	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.008	1.303	≥ 0.869	Pass
8DPSK	SISO	HOPP	3DH5	1.008	1.295	≥ 0.863	Pass

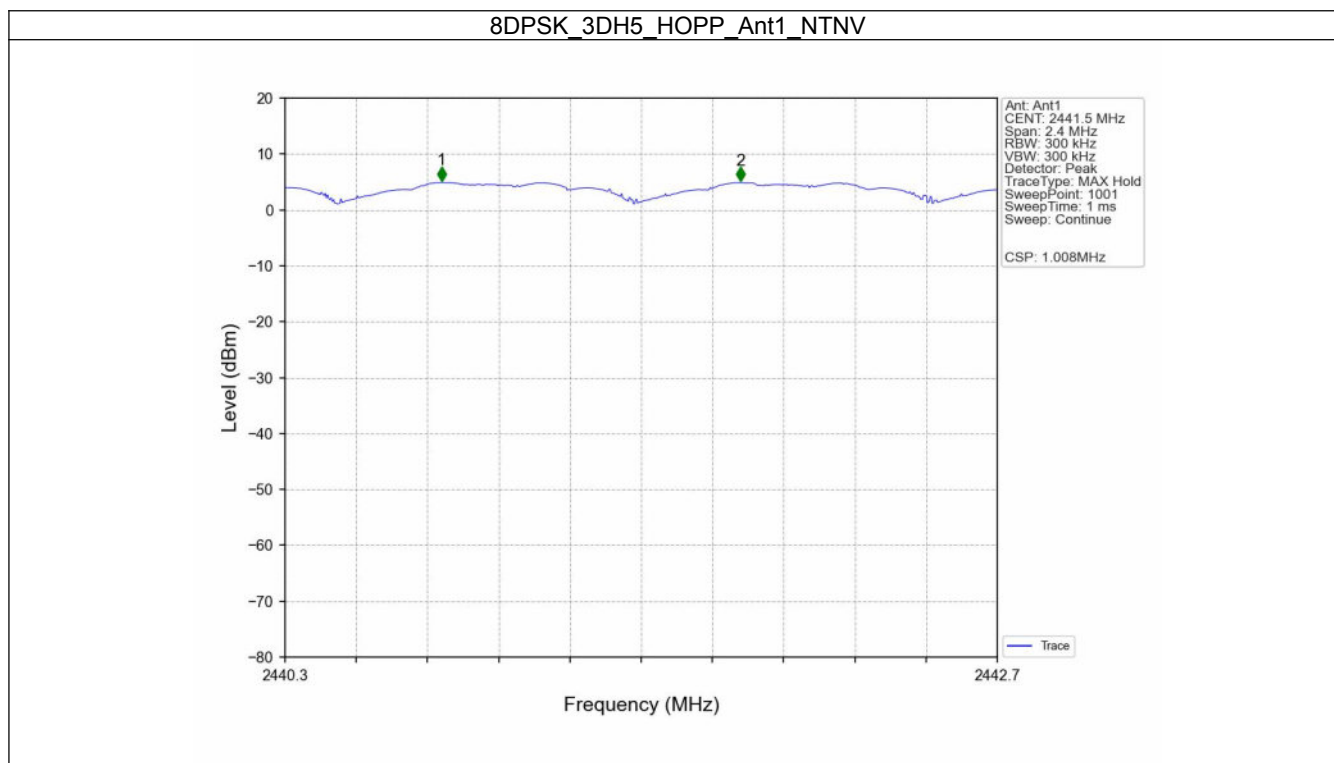
FCC ID: Q8WD8

3.2 Test Graph

3.2.1 Ant1



FCC ID: Q8WD8



FCC ID: Q8WD8

4. Number of Hopping Frequencies

4.1 Test Result

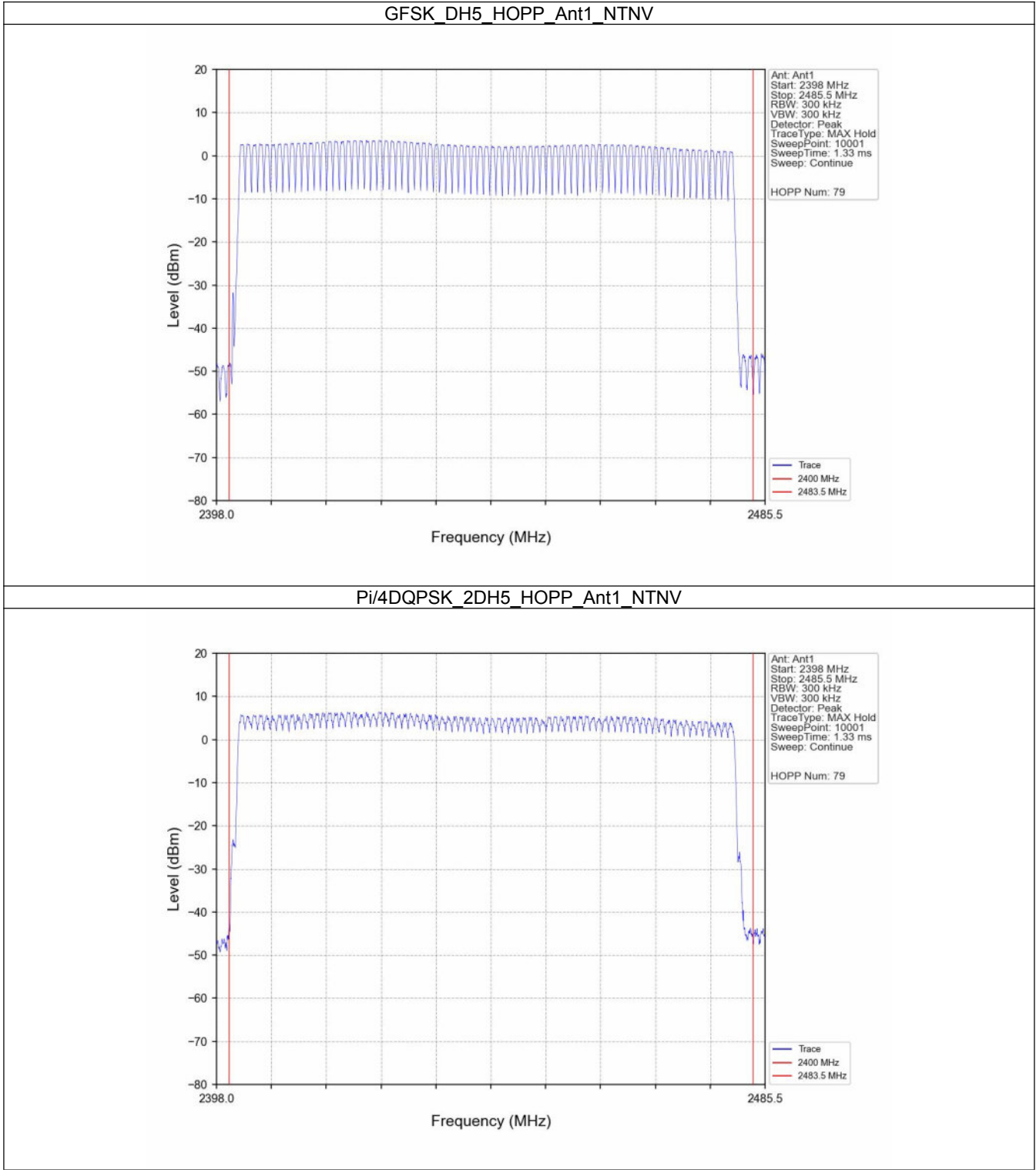
4.1.1 HoppNum

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

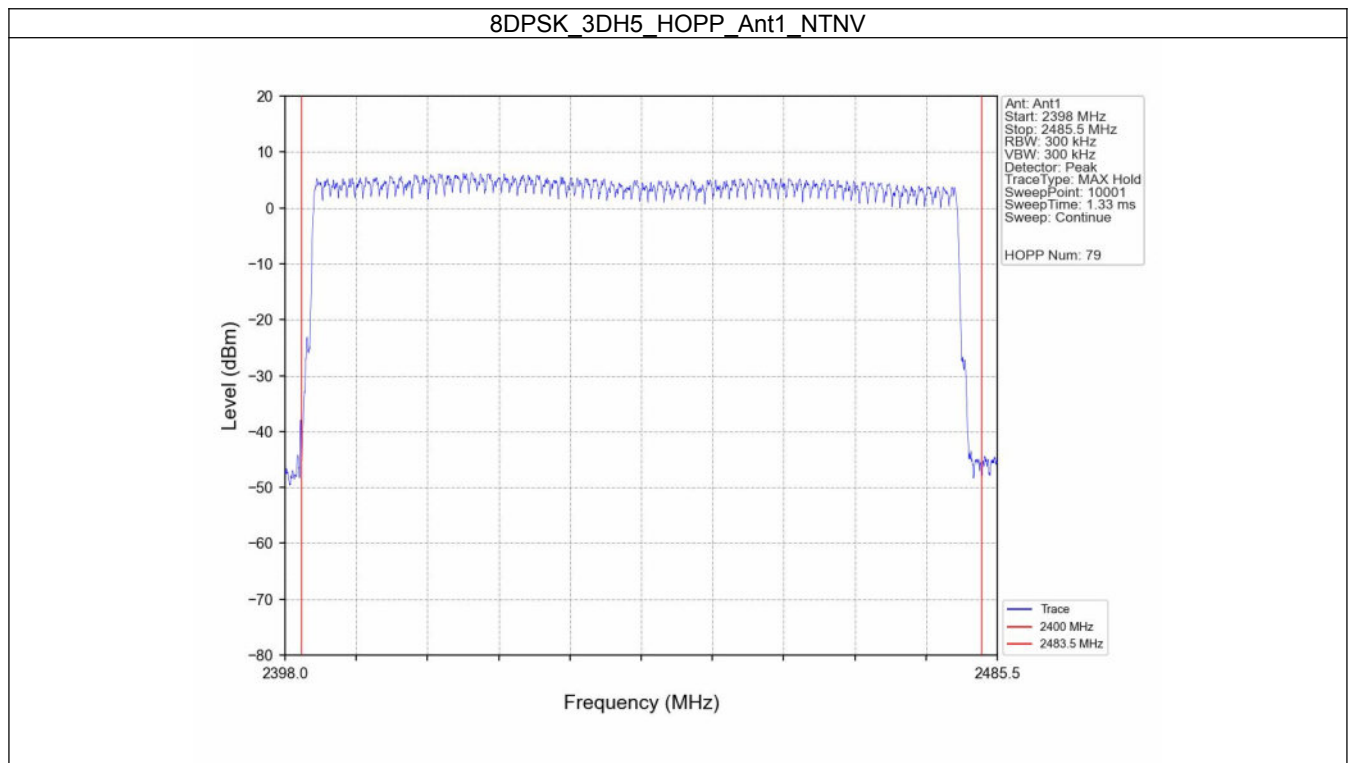
FCC ID: Q8WD8

4.2 Test Graph

4.2.1 HoppNum



FCC ID: Q8WD8



FCC ID: Q8WD8

5. Time of Occupancy (Dwell Time)

5.1 Test Result

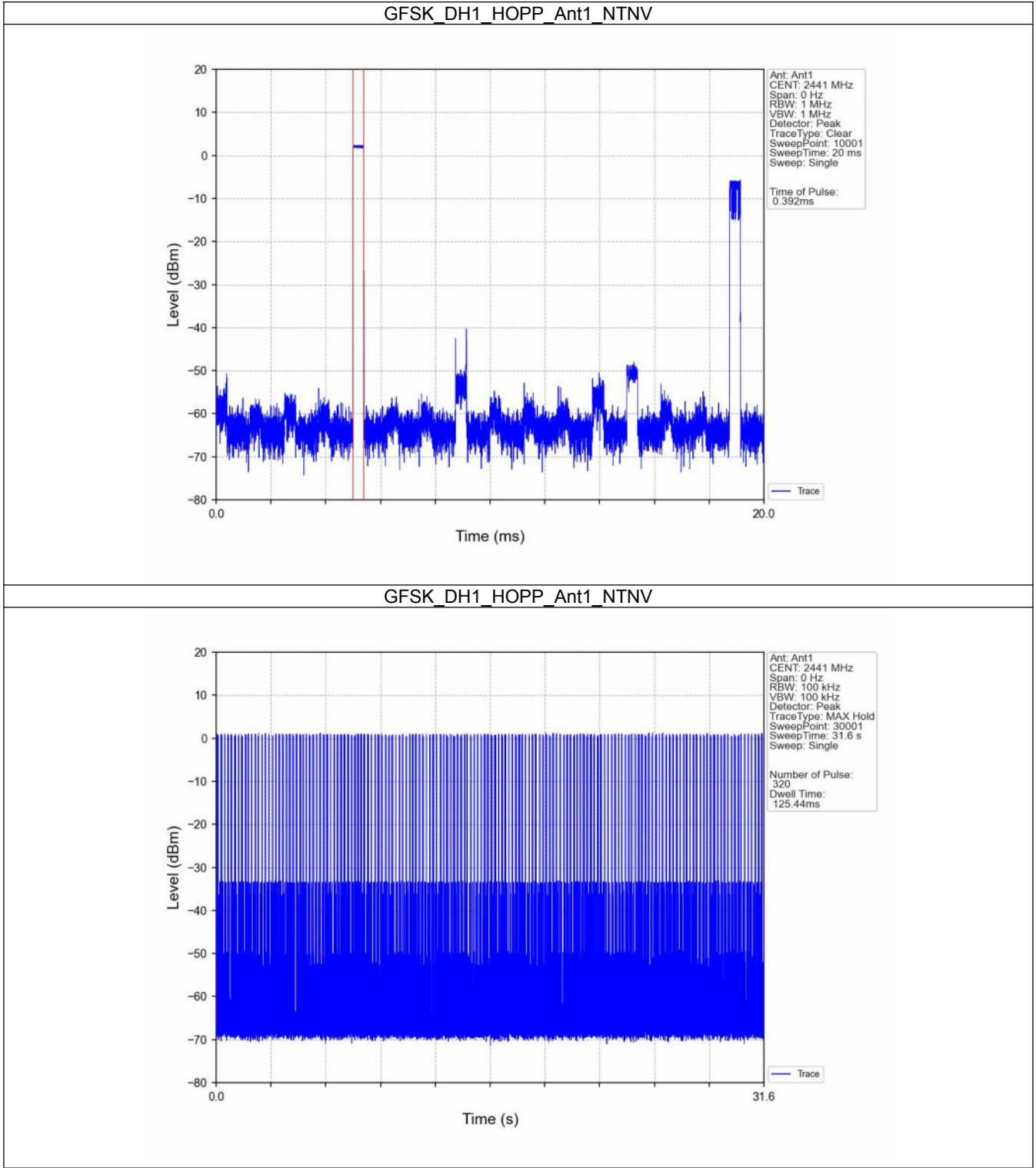
5.1.1 Ant1

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	0.392	31.600	320	125.440	<=400	Pass
			DH3	1.662	31.600	162	269.244	<=400	Pass
			DH5	2.912	31.600	116	337.792	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.404	31.600	319	128.876	<=400	Pass
			2DH3	1.654	31.600	153	253.062	<=400	Pass
			2DH5	2.918	31.600	115	335.570	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.404	31.600	319	128.876	<=400	Pass
			3DH3	1.654	31.600	151	249.754	<=400	Pass
			3DH5	2.918	31.600	95	277.210	<=400	Pass

FCC ID: Q8WD8

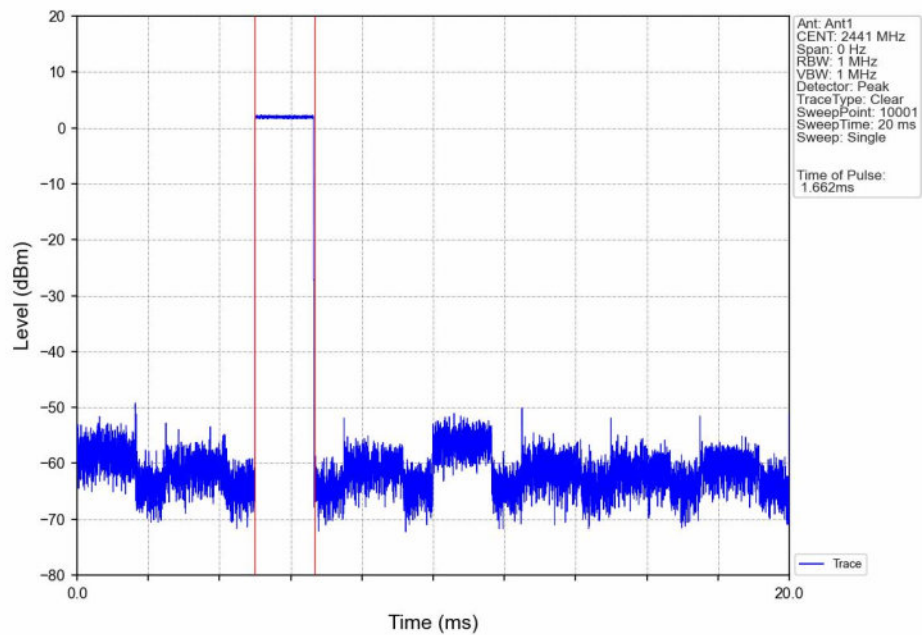
5.2 Test Graph

5.2.1 Ant1

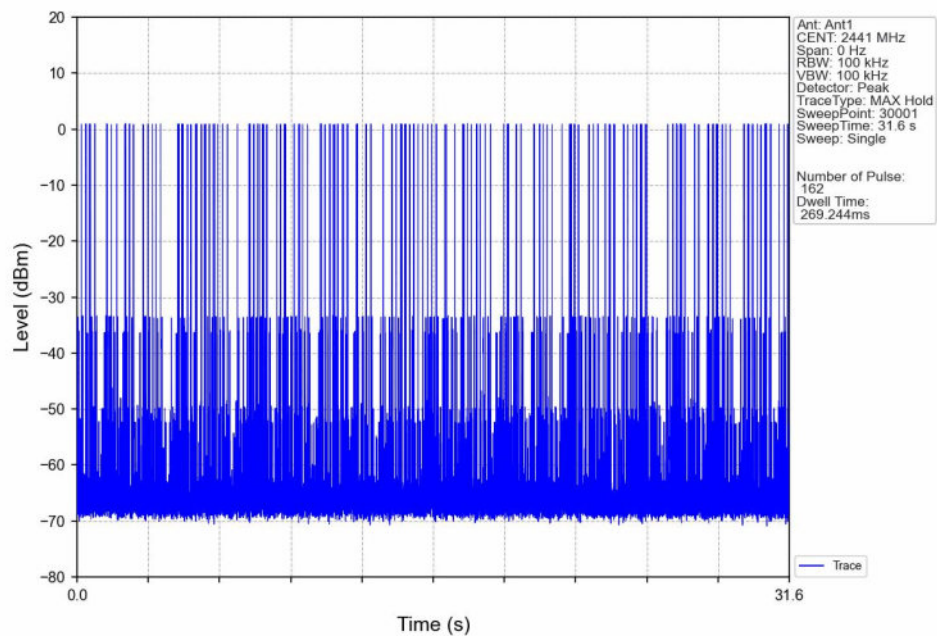


FCC ID: Q8WD8

GFSK_DH3_HOPP_Ant1_NTNV

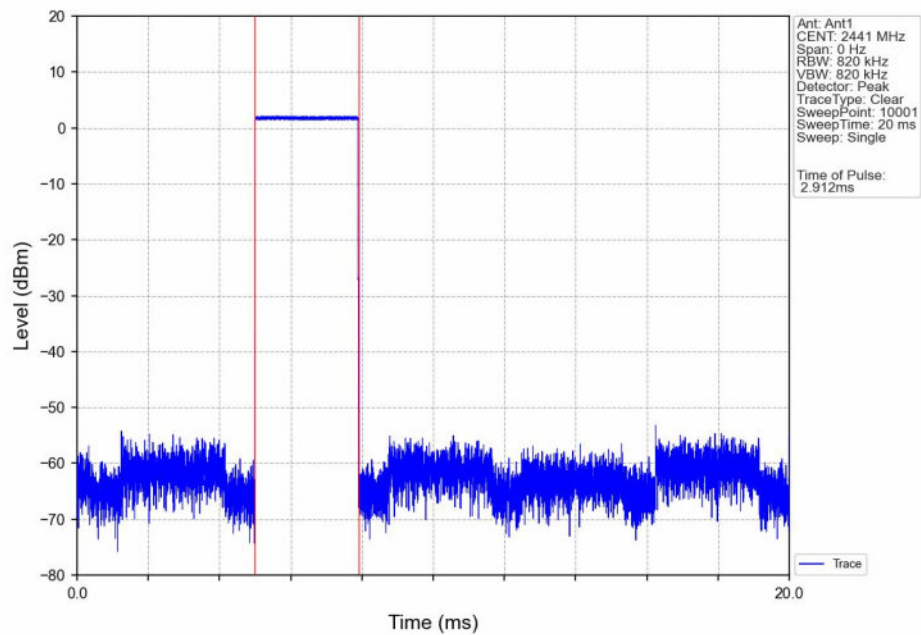


GFSK_DH3_HOPP_Ant1_NTNV

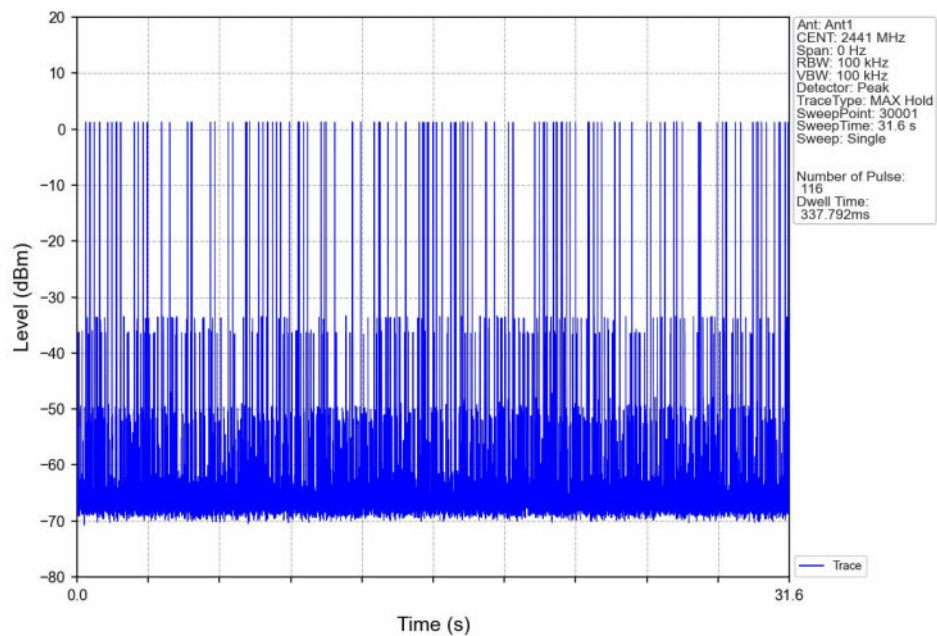


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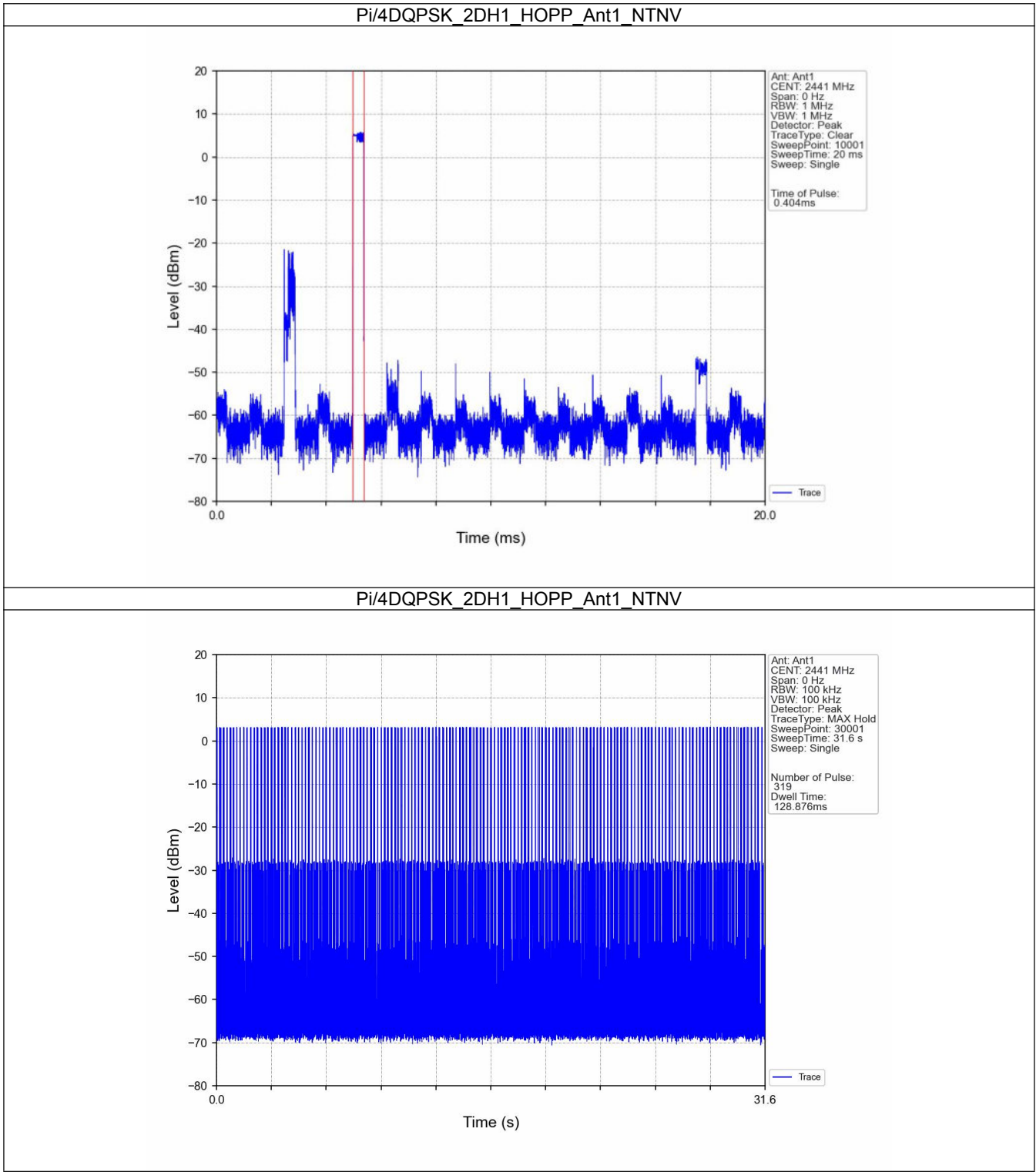
GFSK_DH5_HOPP_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV

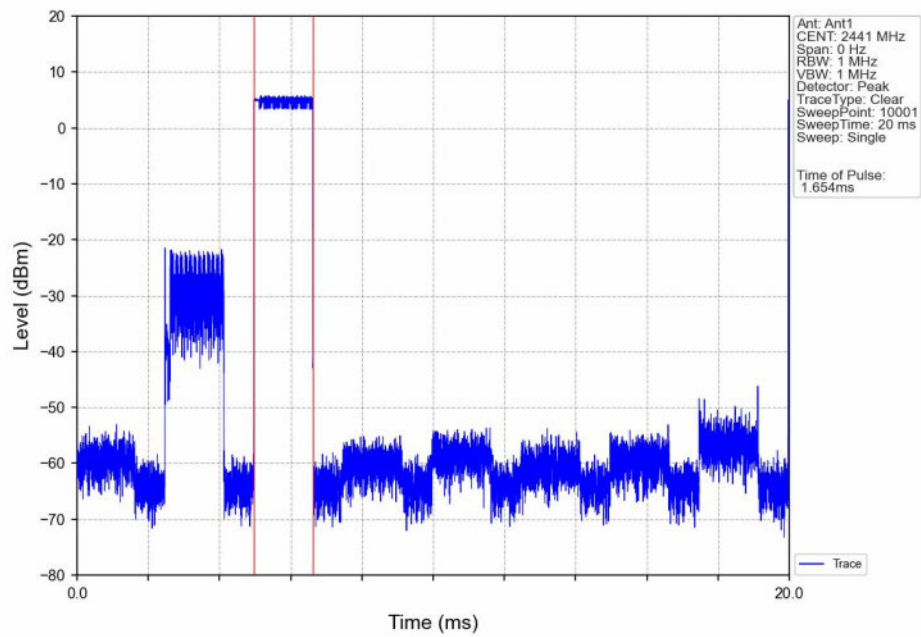


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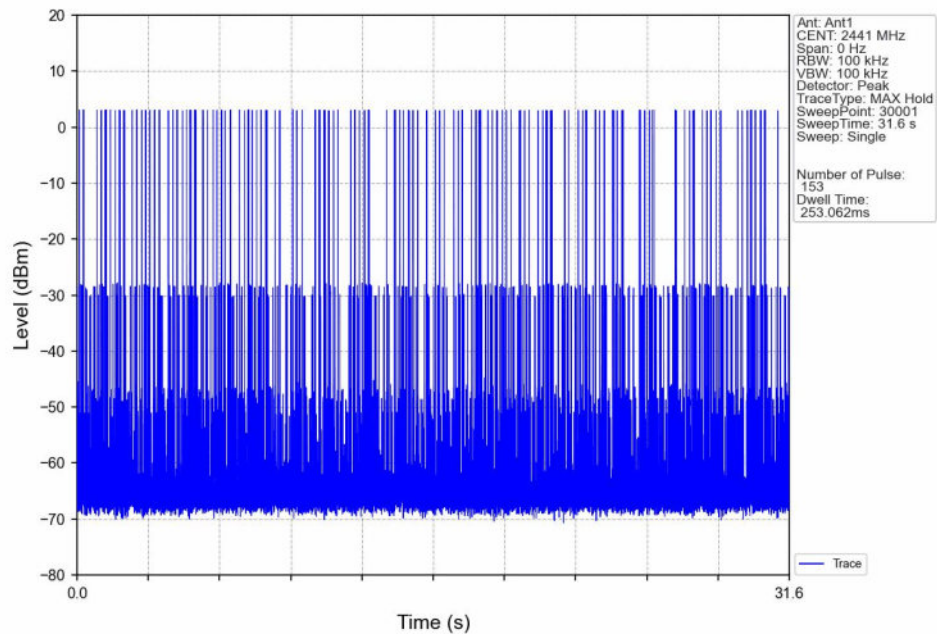


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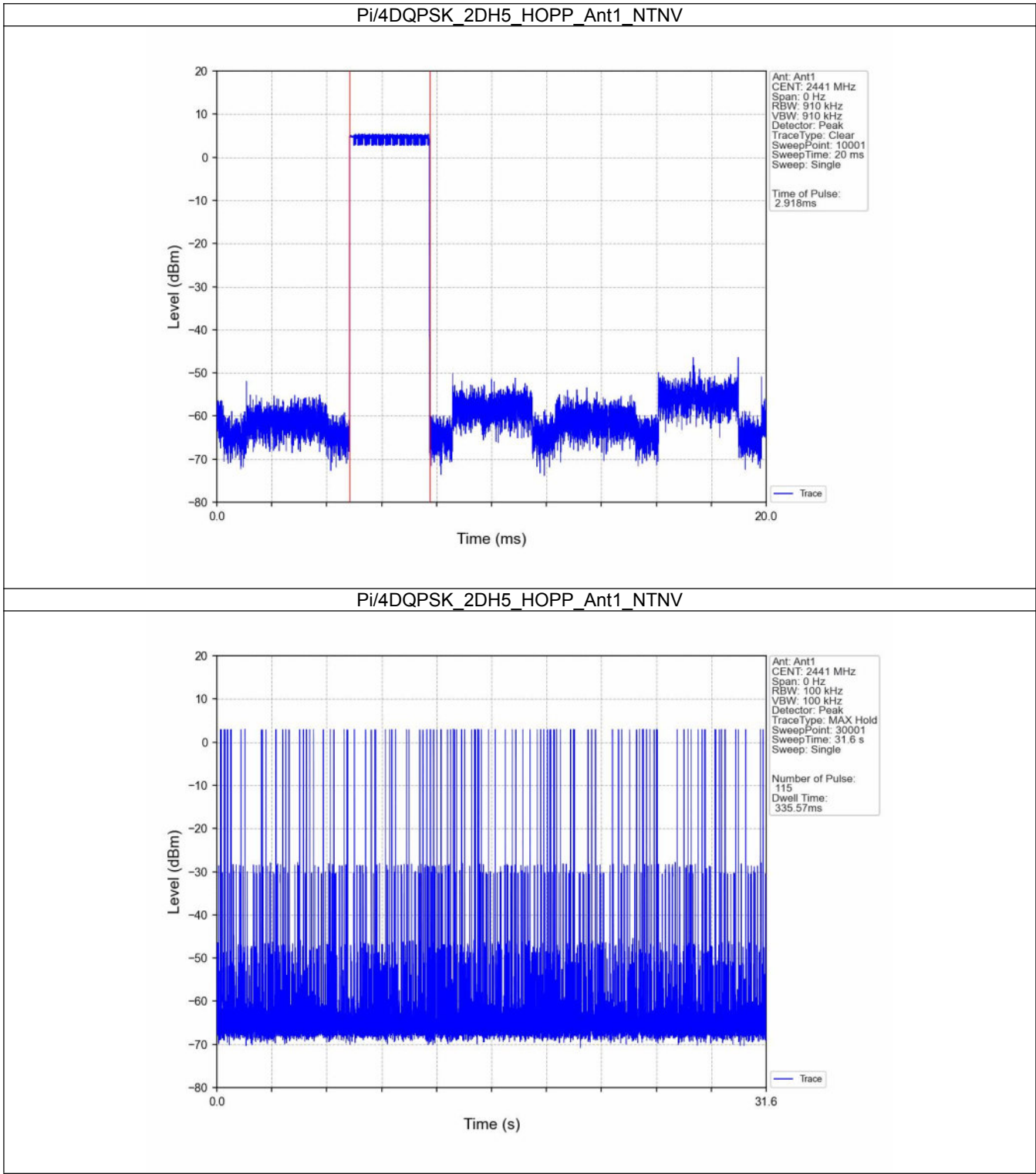
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



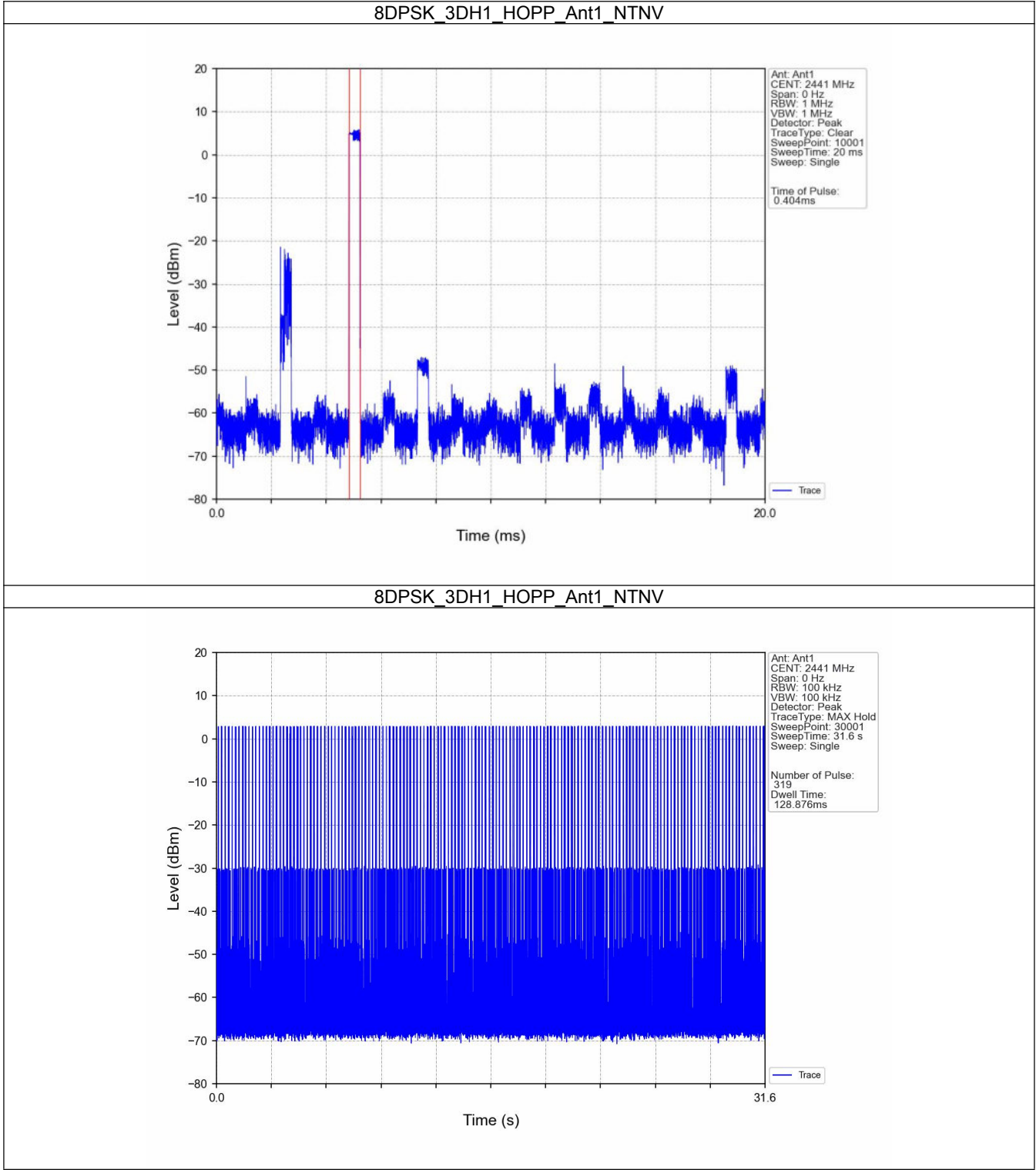
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



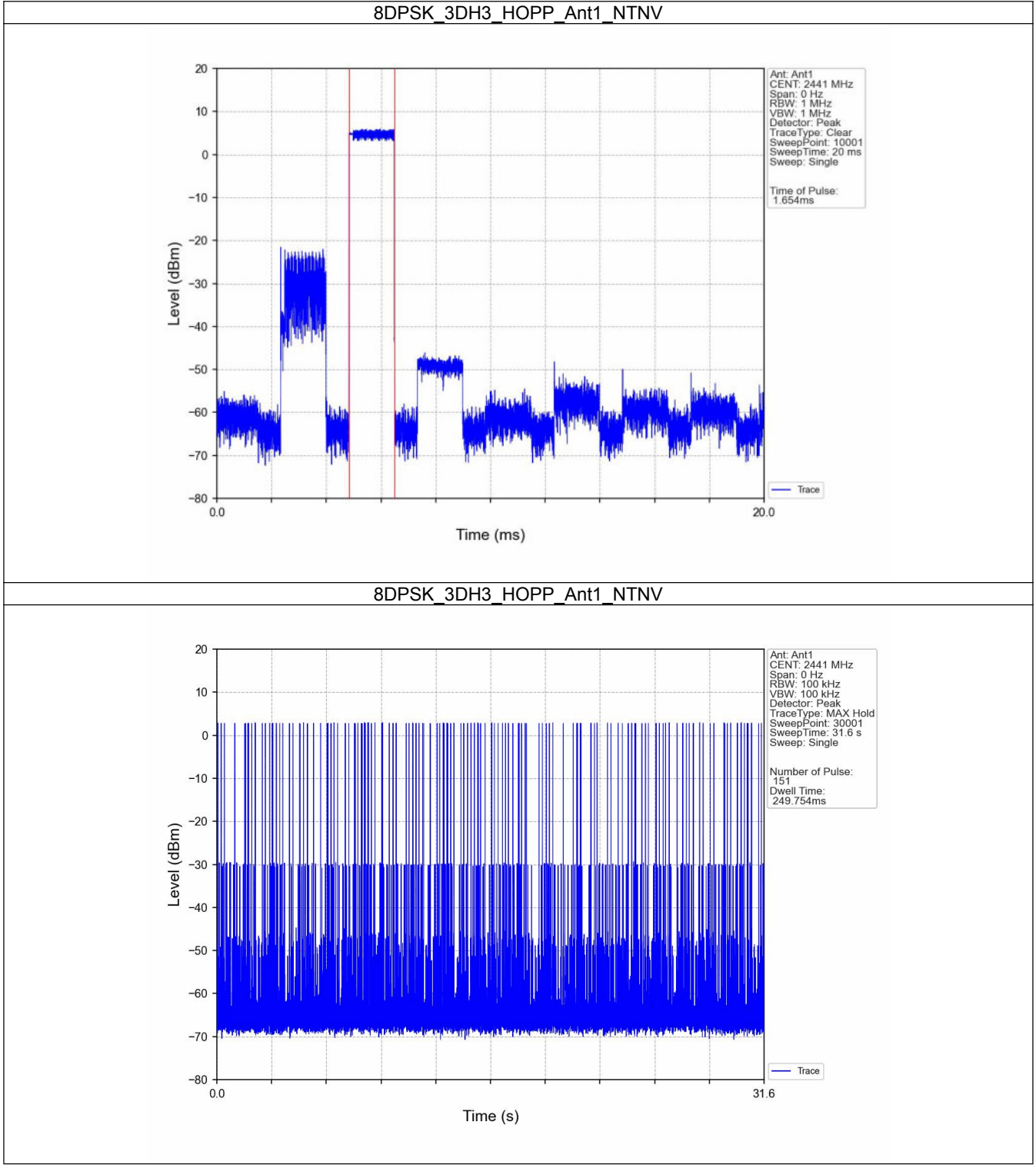
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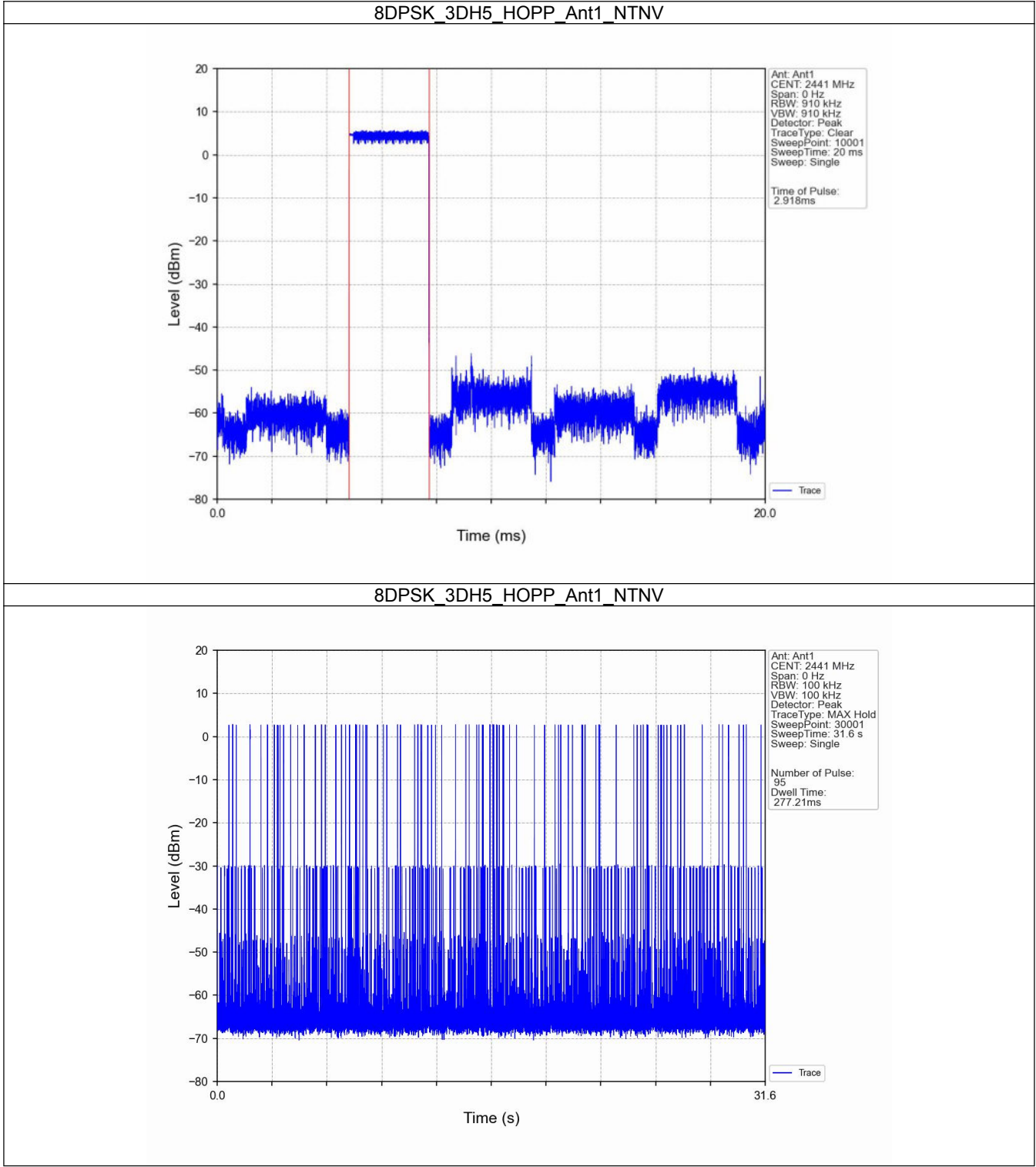
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FCC ID: Q8WD8



FCC ID: Q8WD8



FCC ID: Q8WD8

6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Test Result

6.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	-1.49
		2441	DH5	1	-2.12
		2480	DH5	1	-3.30
Pi/4DQPSK	SISO	2402	2DH5	1	-1.64
		2441	2DH5	1	-2.18
		2480	2DH5	1	-3.30
8DPSK	SISO	2402	3DH5	1	-1.79
		2441	3DH5	1	-2.29
		2480	3DH5	1	-3.45

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

6.1.2 CSE

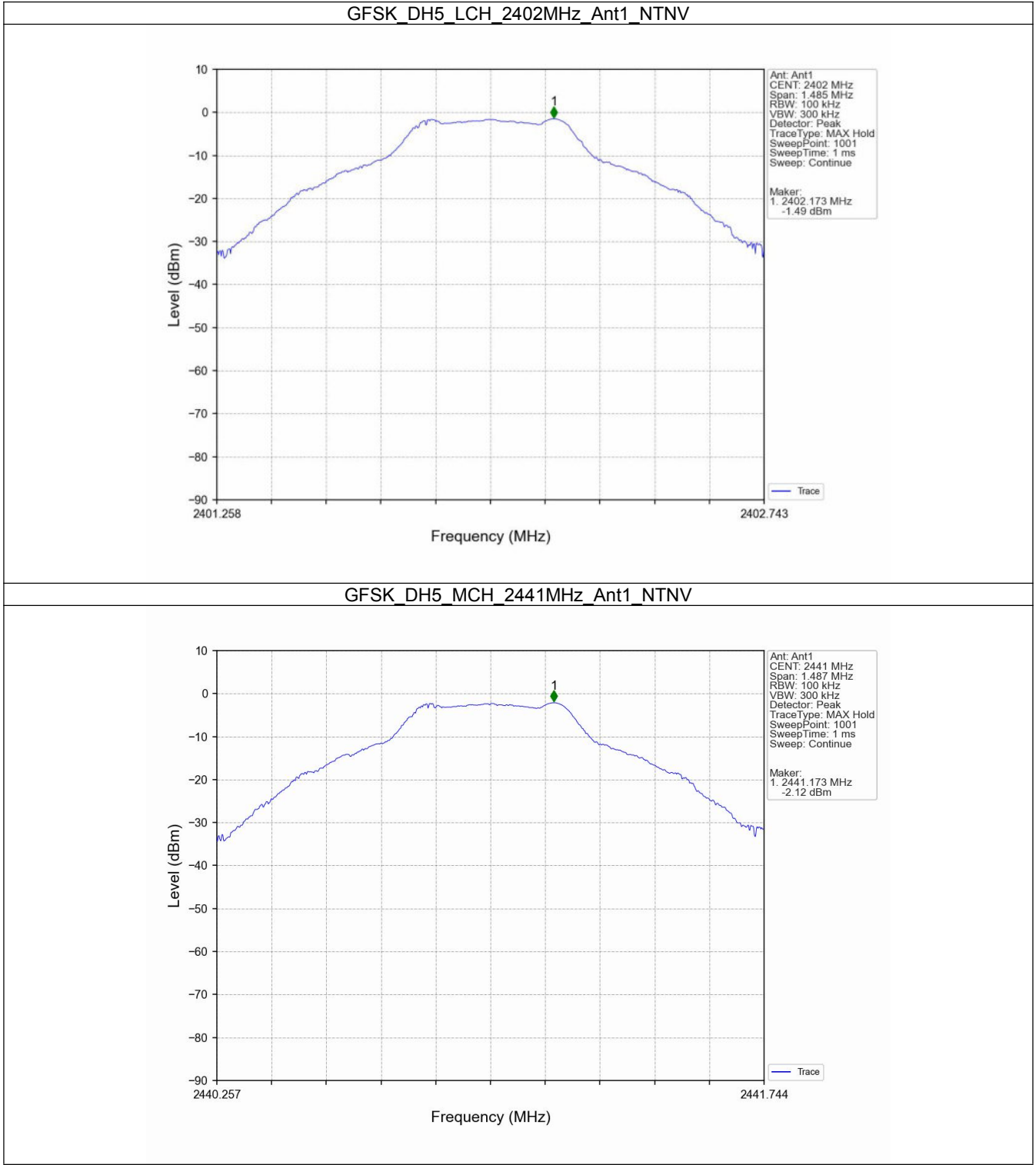
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	-1.49	-21.49	Pass
		2441	DH5	1	-1.49	-21.49	Pass
		2480	DH5	1	-1.49	-21.49	Pass
		HOPP	DH5	1	-1.49	-21.49	Pass
					-1.49	-21.49	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	-1.64	-21.64	Pass
		2441	2DH5	1	-1.64	-21.64	Pass
		2480	2DH5	1	-1.64	-21.64	Pass
		HOPP	2DH5	1	-1.64	-21.64	Pass
					-1.64	-21.64	Pass
8DPSK	SISO	2402	3DH5	1	-1.79	-21.79	Pass
		2441	3DH5	1	-1.79	-21.79	Pass
		2480	3DH5	1	-1.79	-21.79	Pass
		HOPP	3DH5	1	-1.79	-21.79	Pass
					-1.79	-21.79	Pass

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

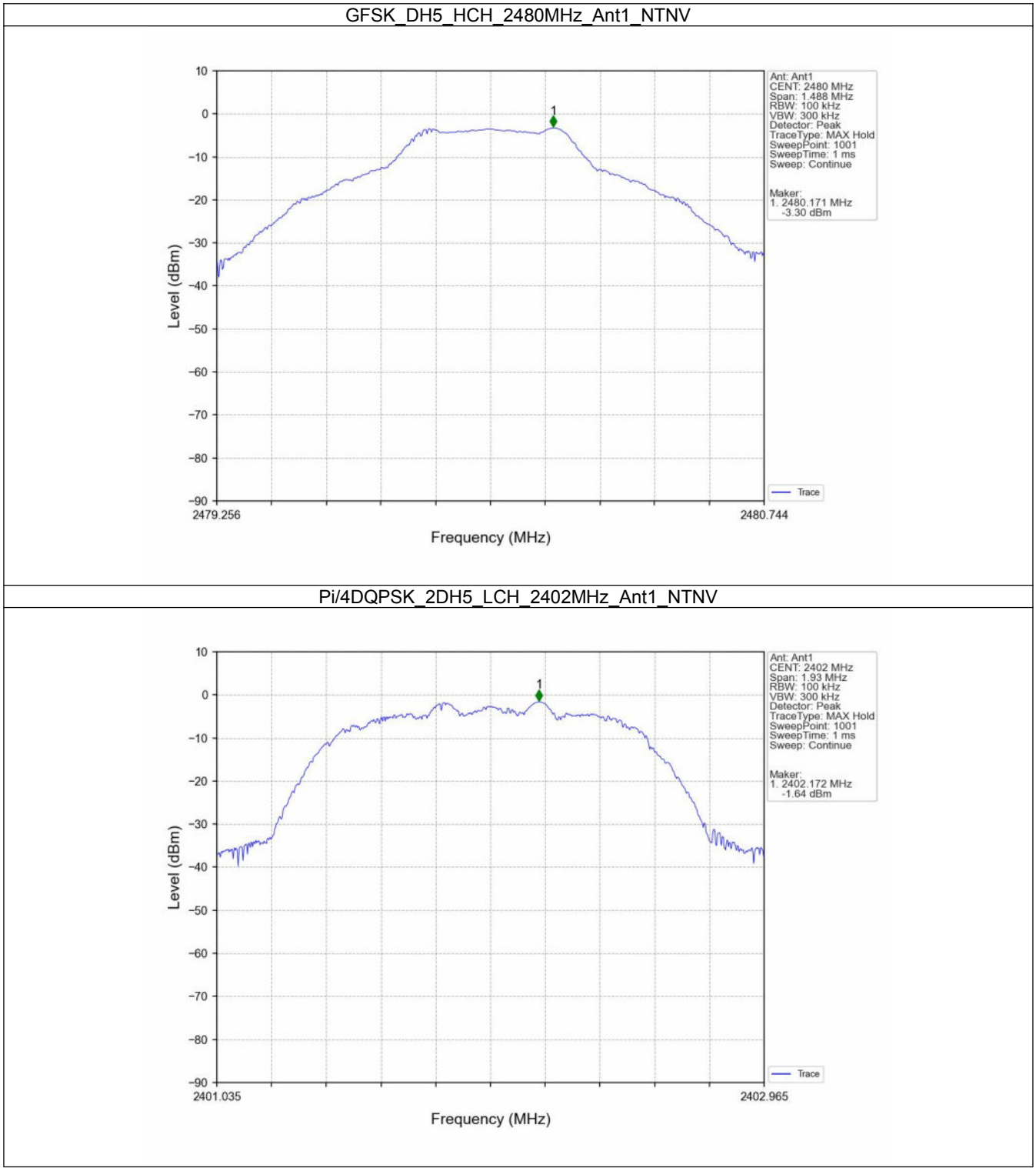
FCC ID: Q8WD8

6.2 Test Graph

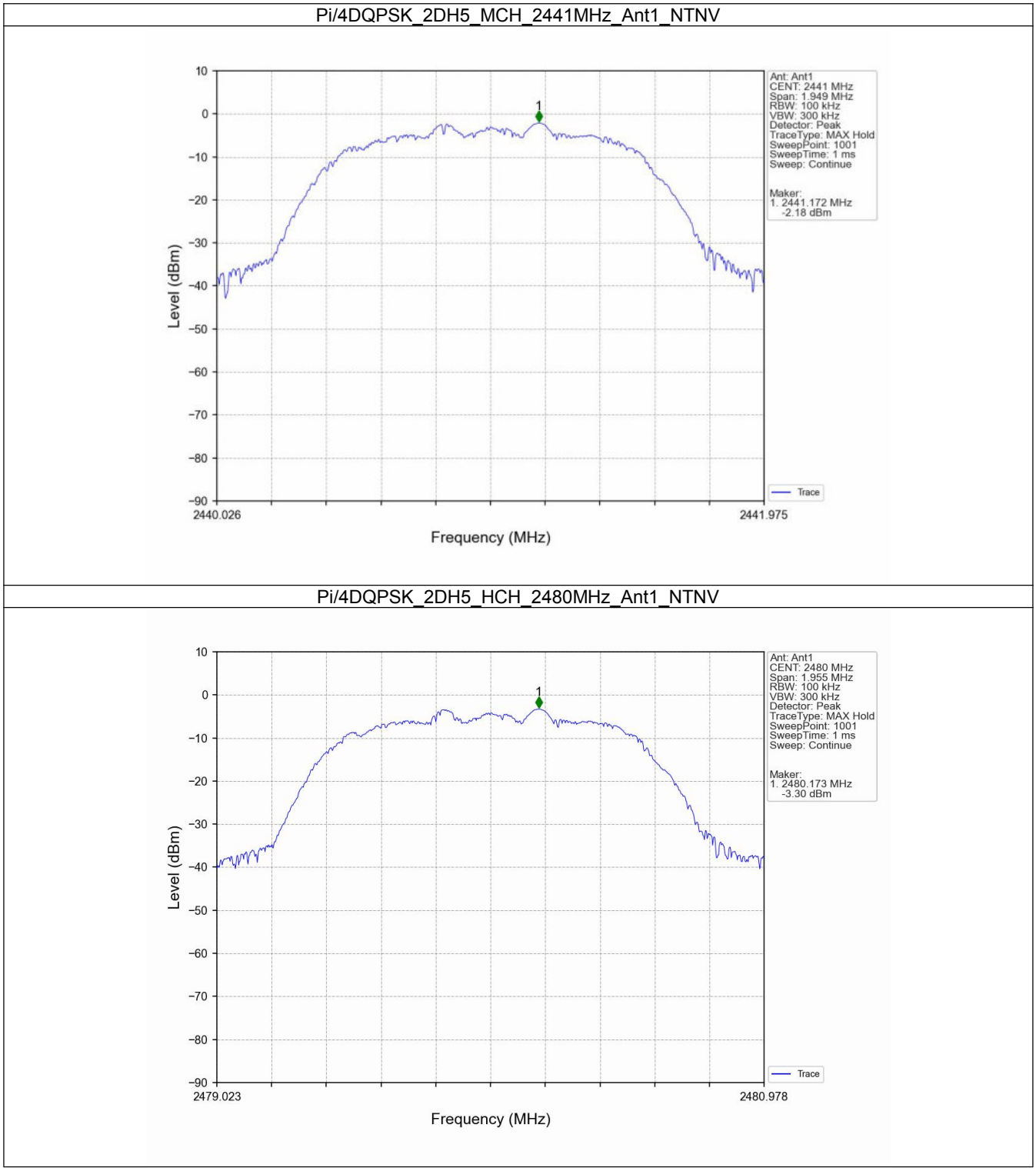
6.2.1 Ref



FCC ID: Q8WD8

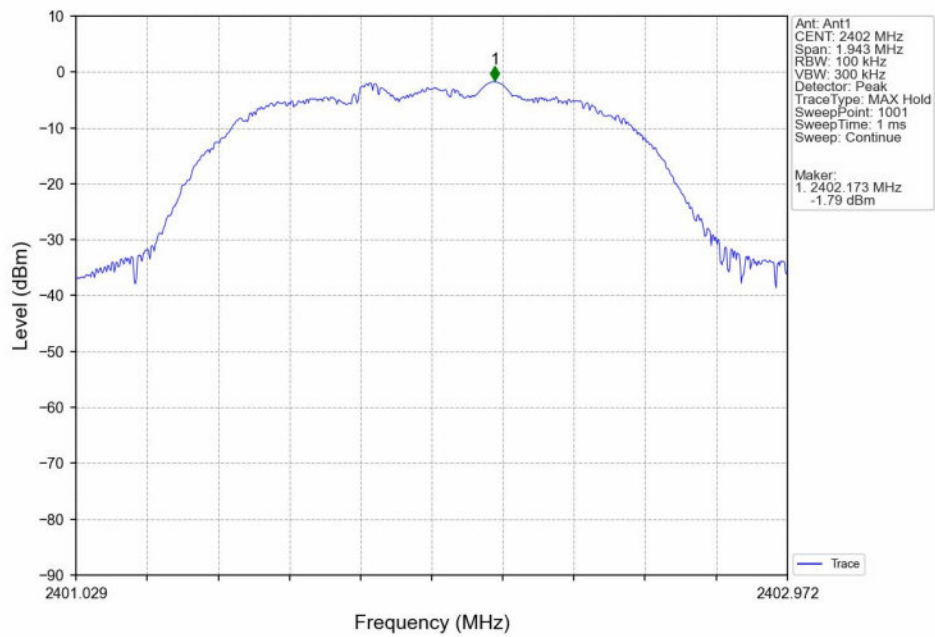


FCC ID: Q8WD8

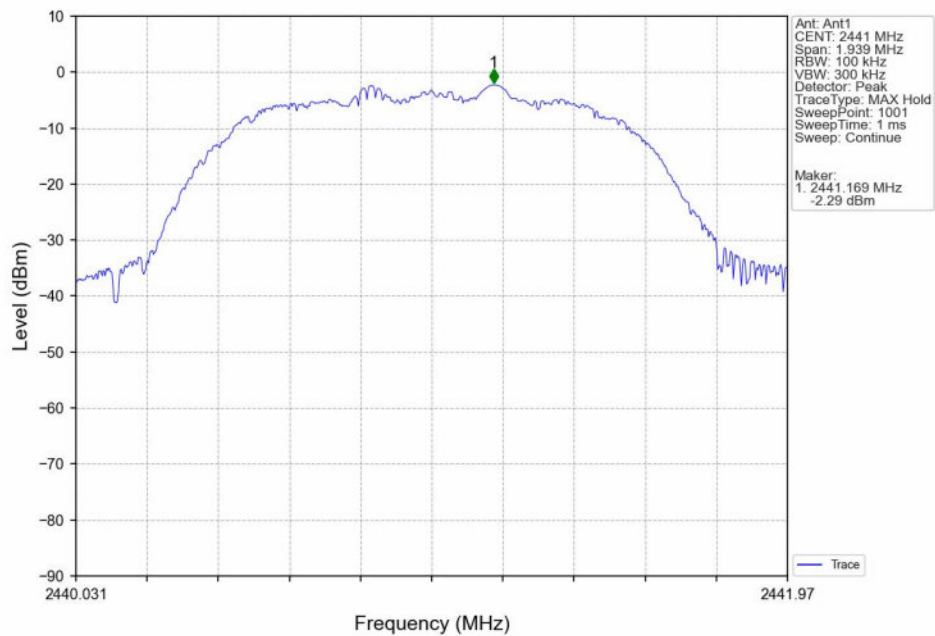


FCC ID: Q8WD8

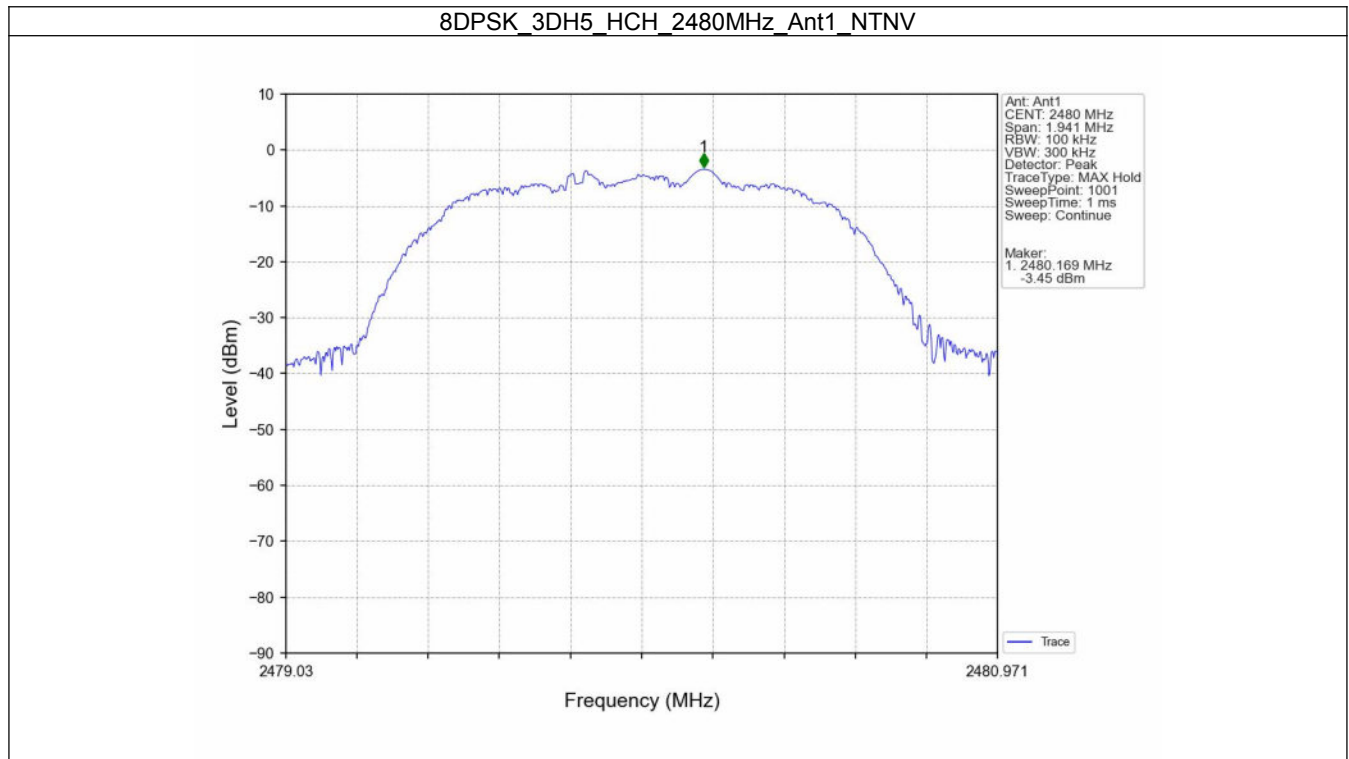
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV

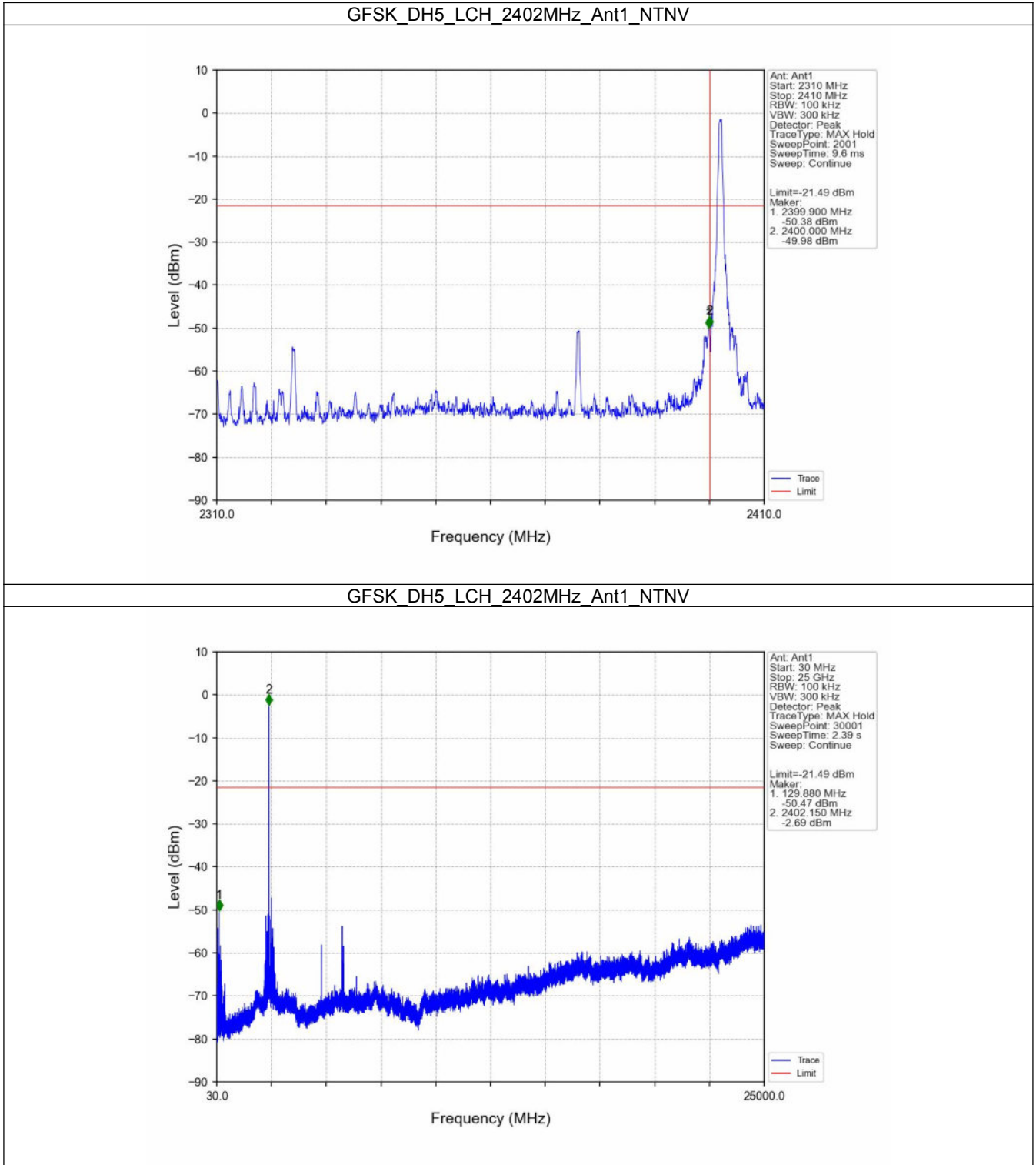


FCC ID: Q8WD8

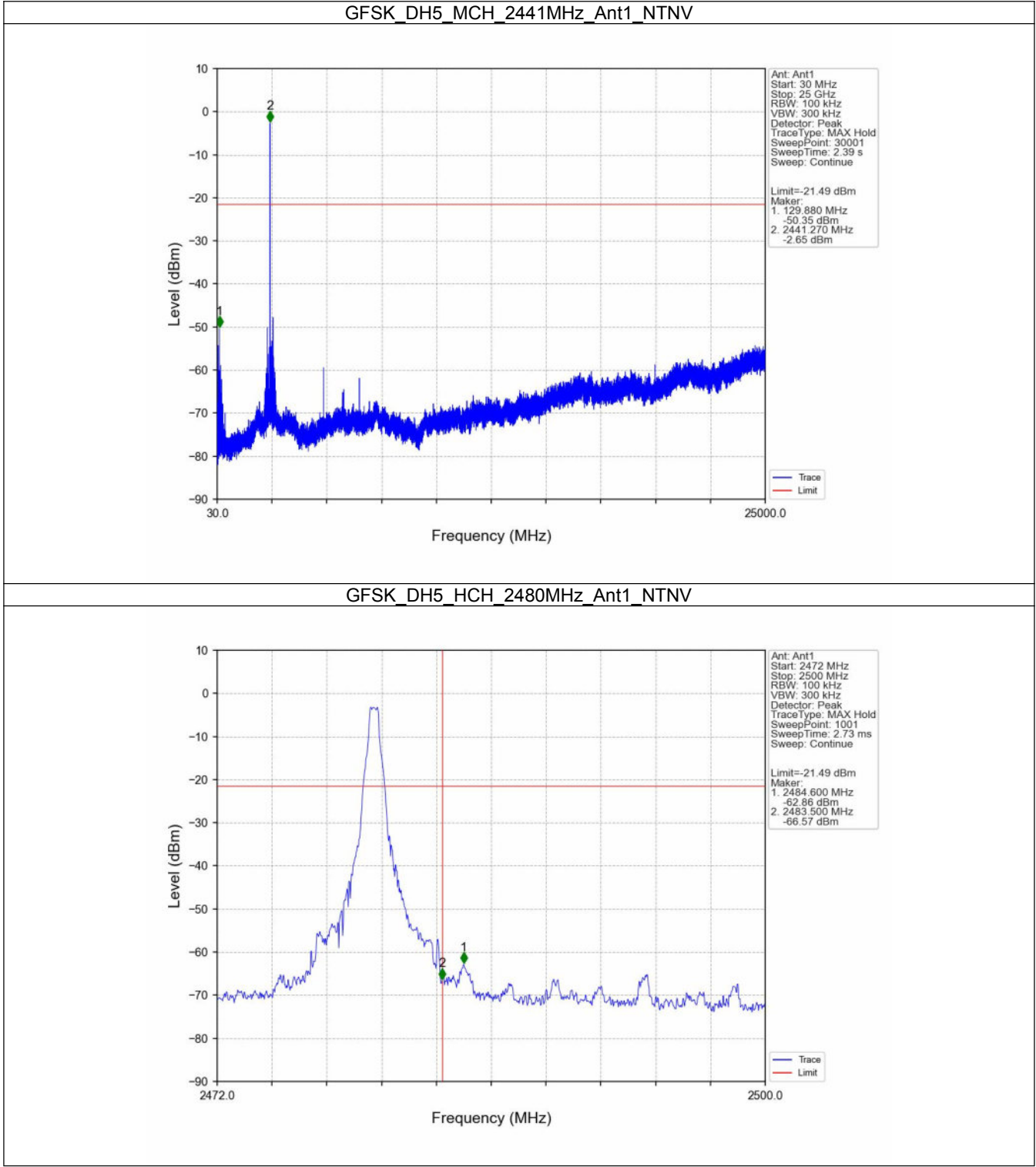


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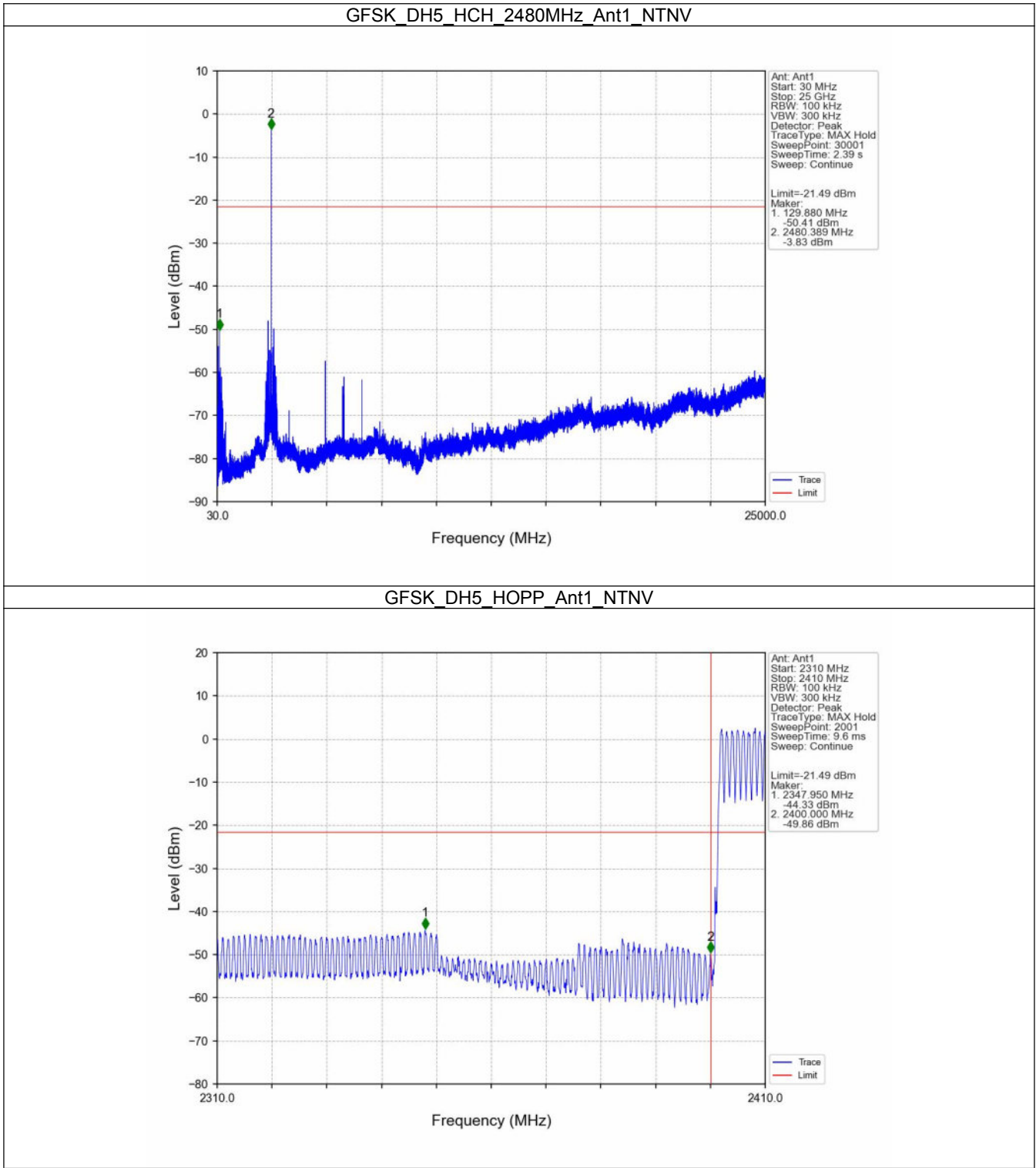
6.2.2 CSE



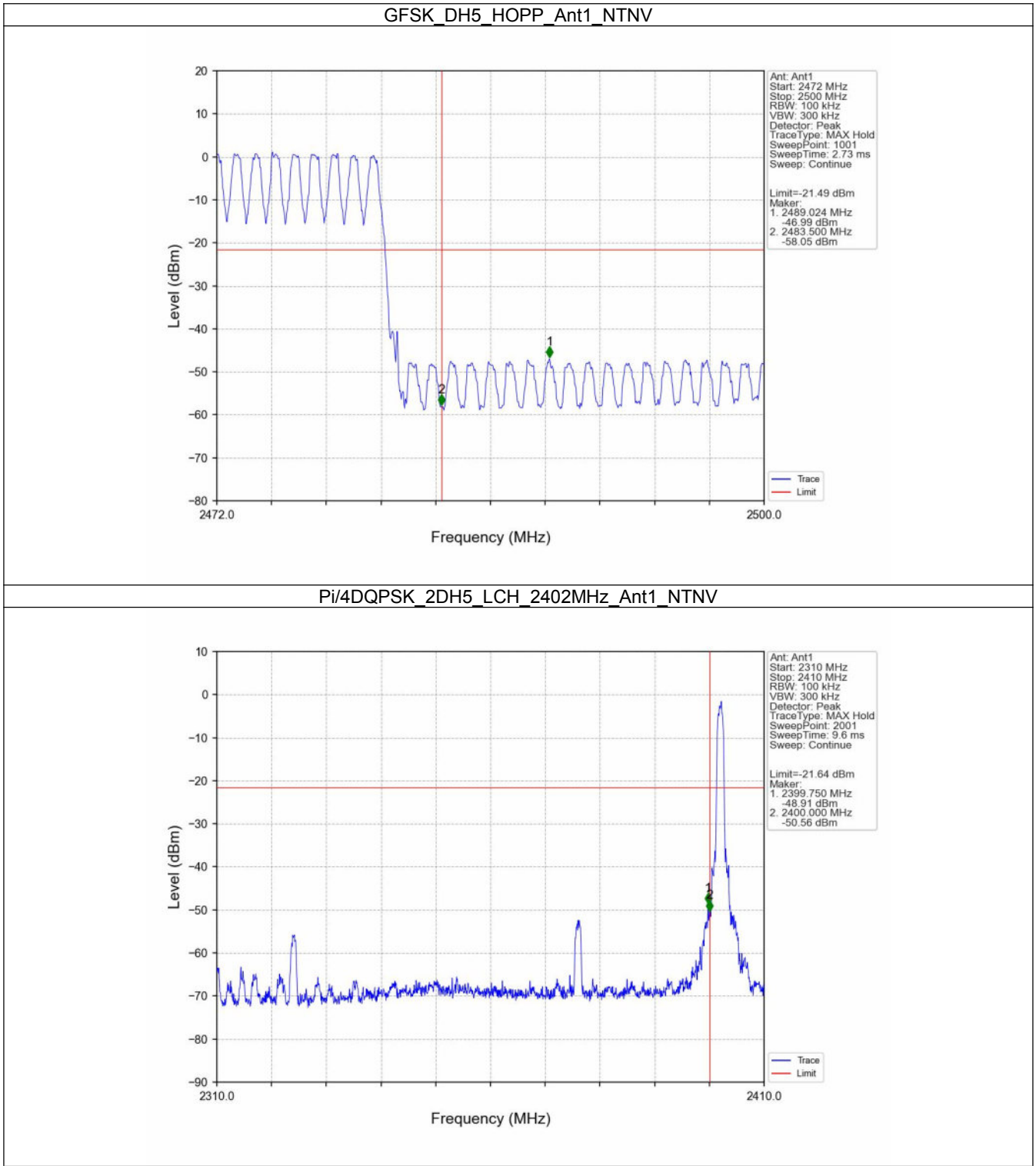
FCC ID: Q8WD8



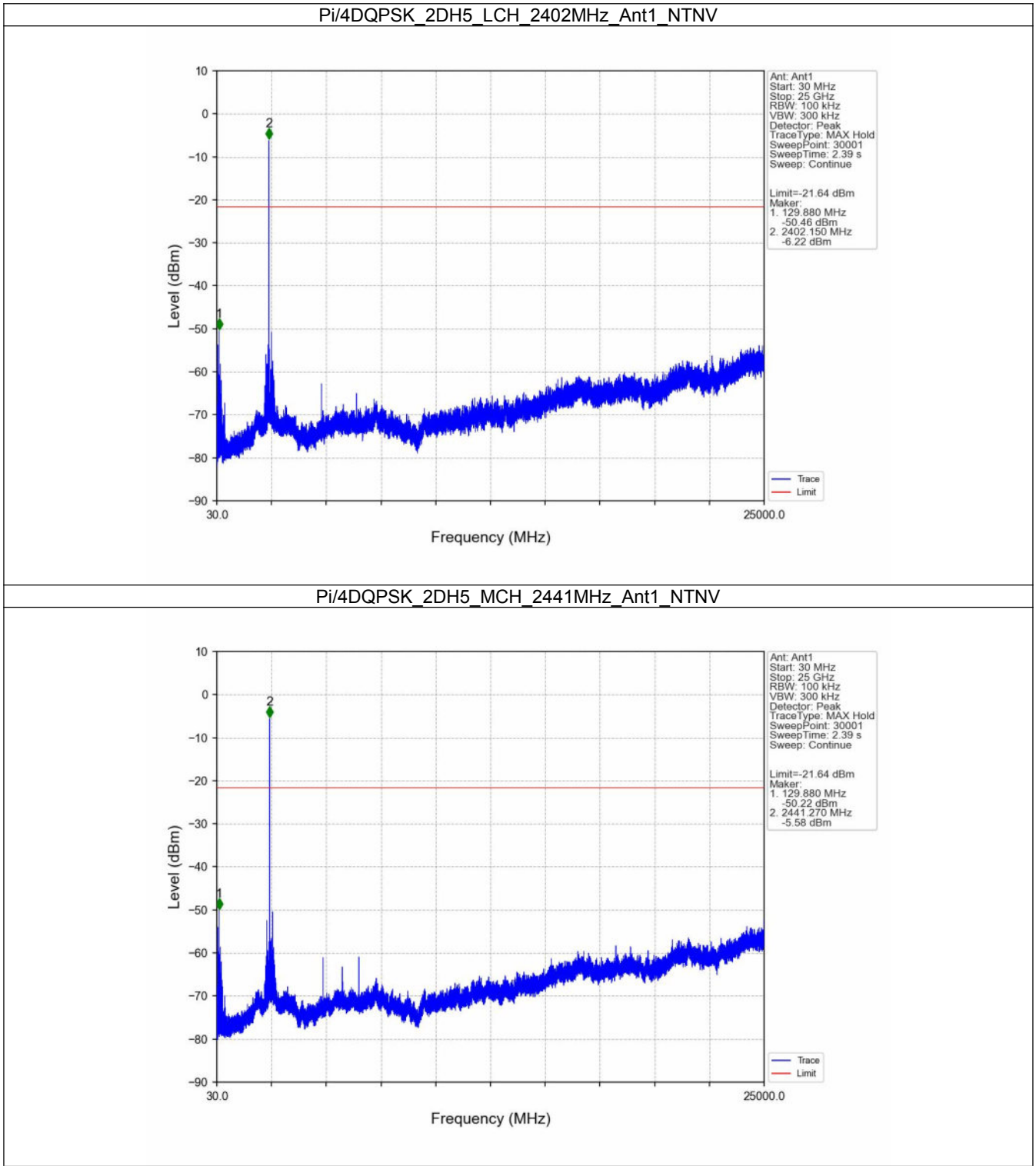
FCC ID: Q8WD8



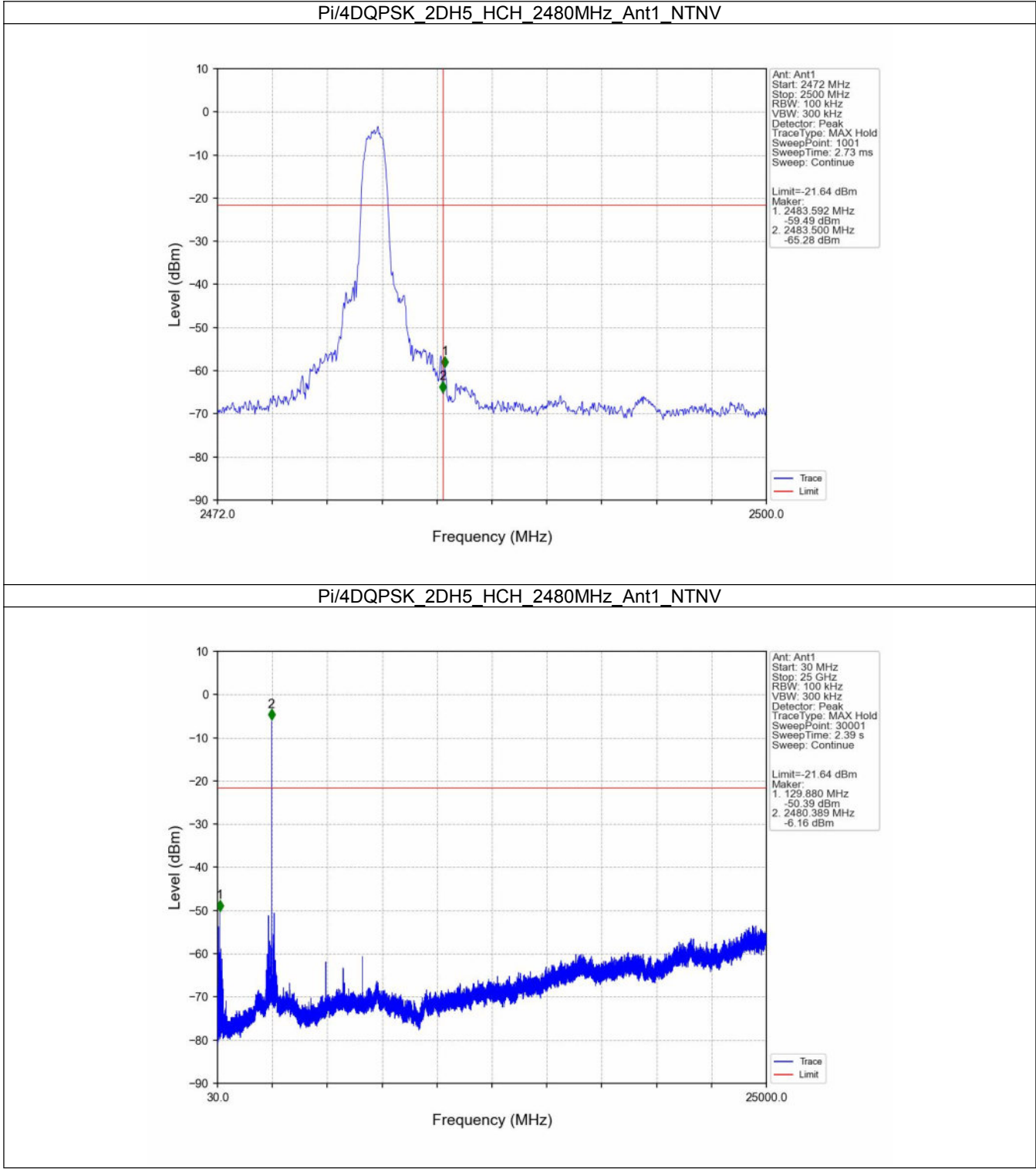
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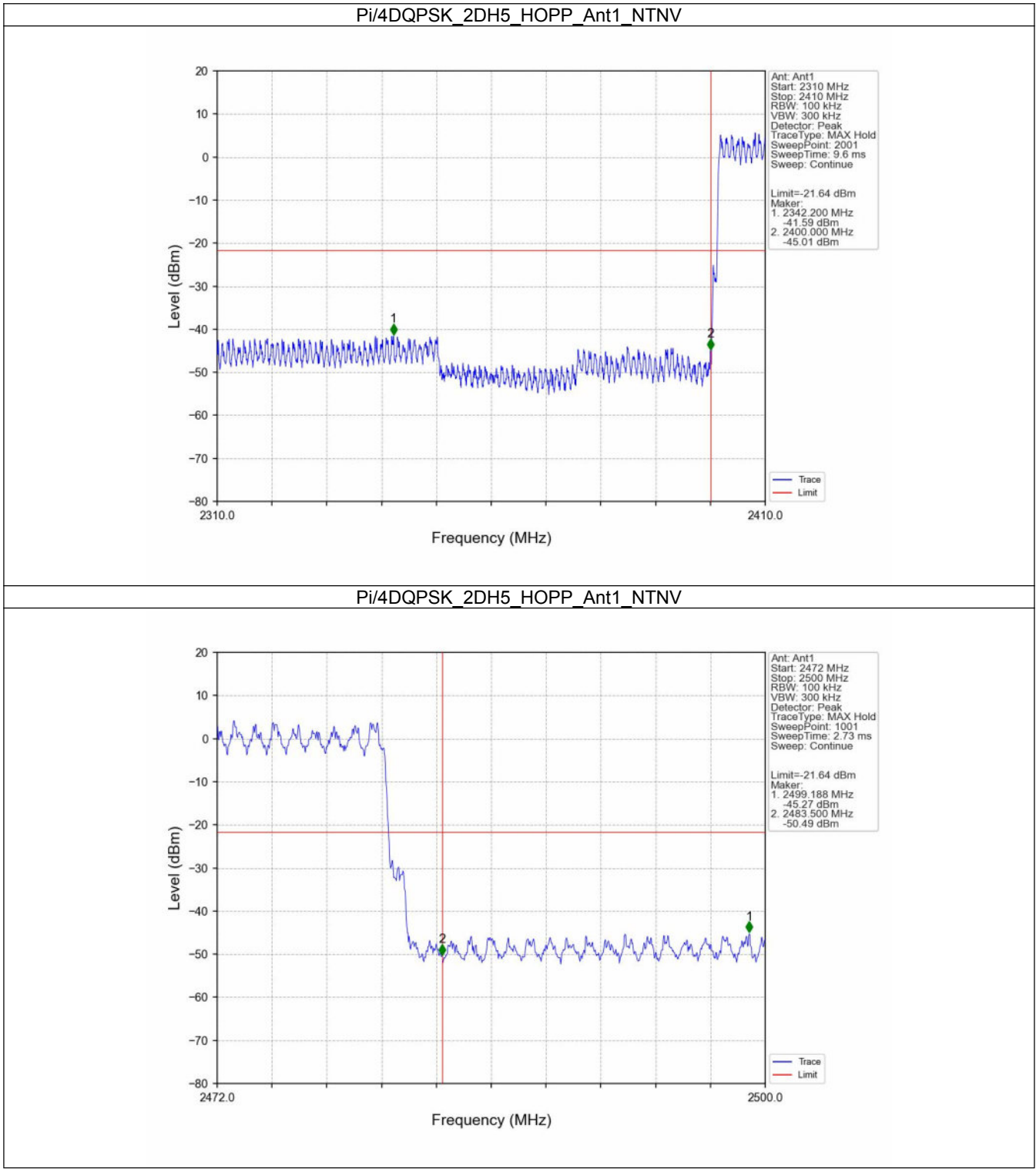
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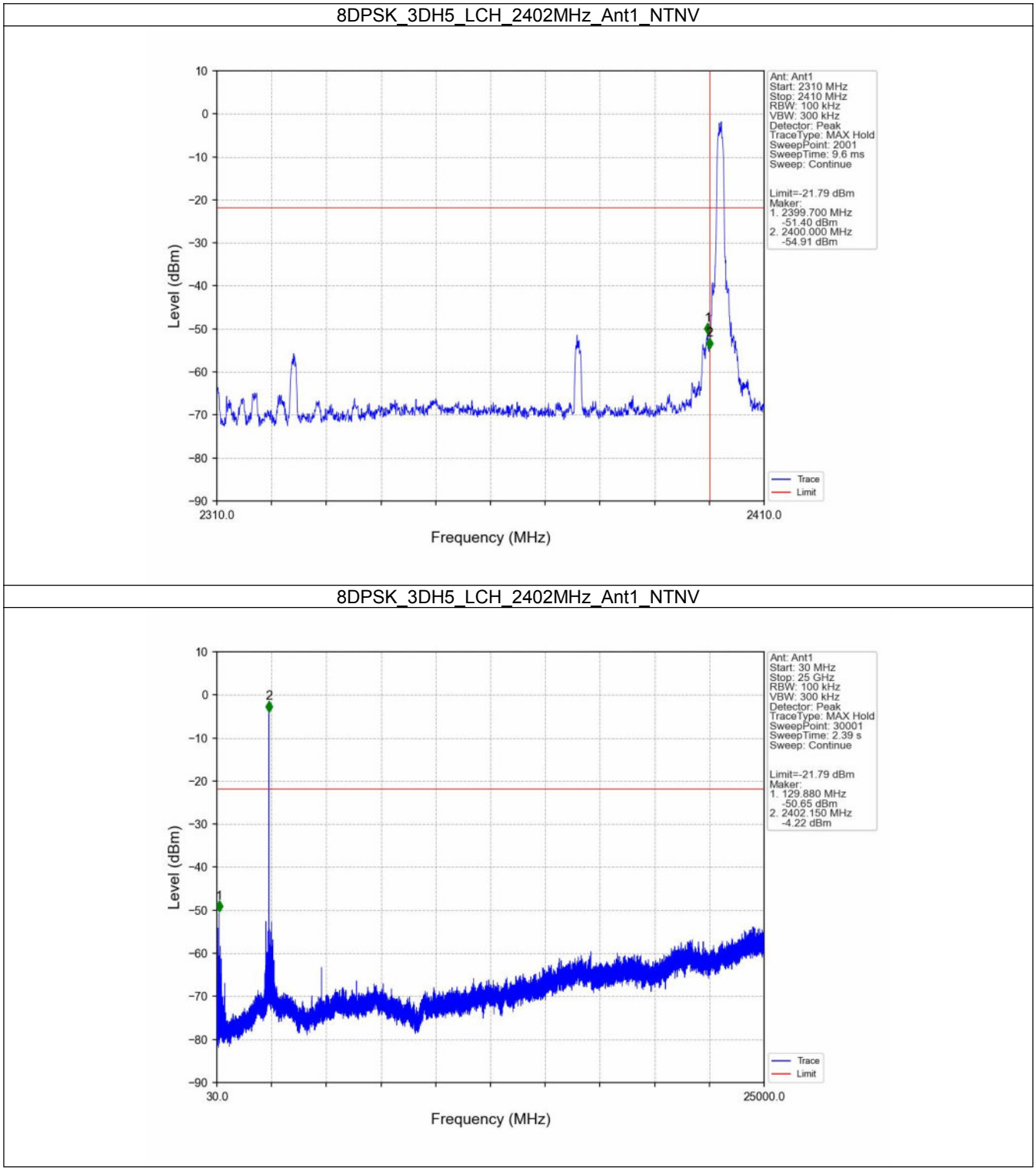
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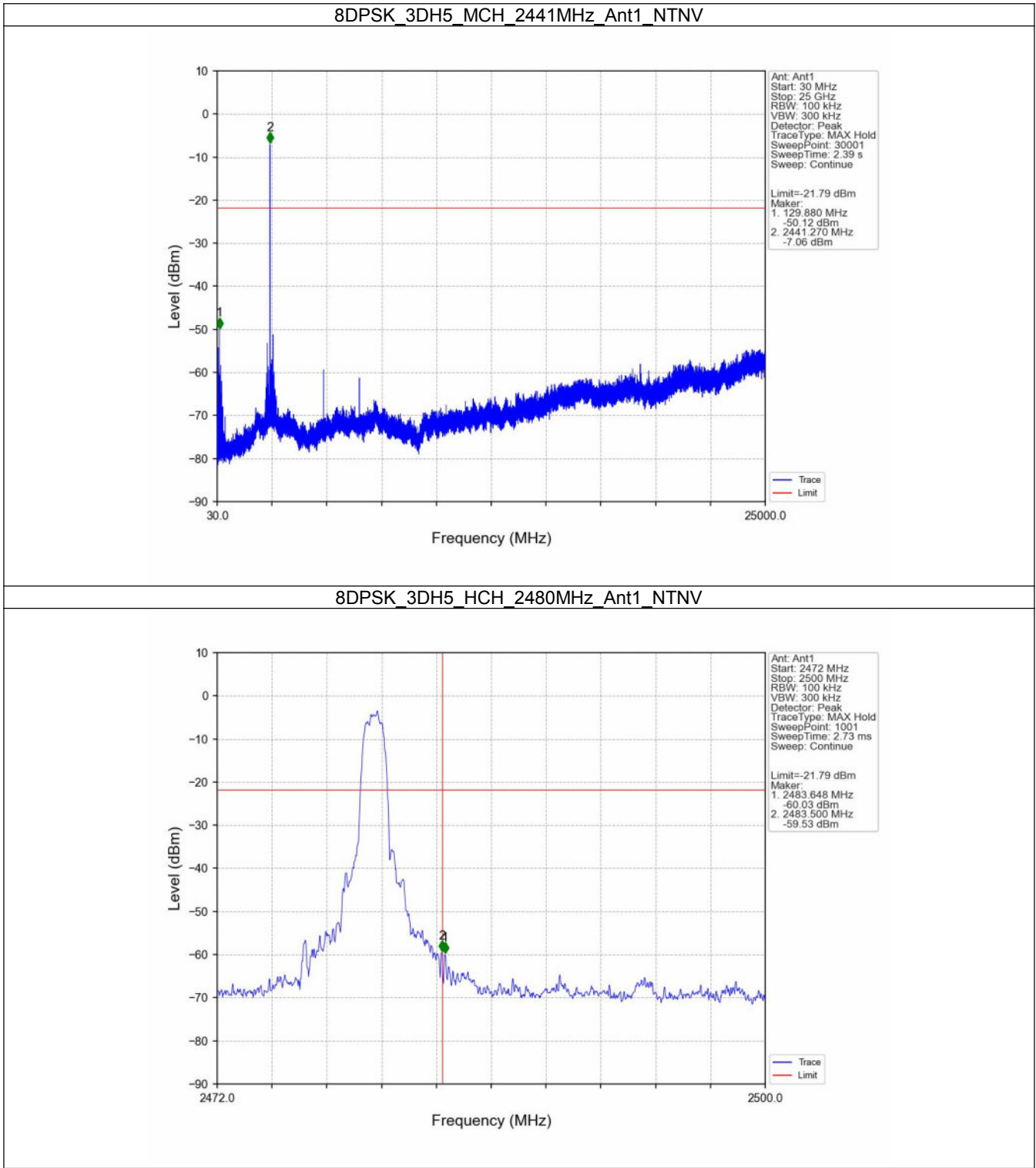
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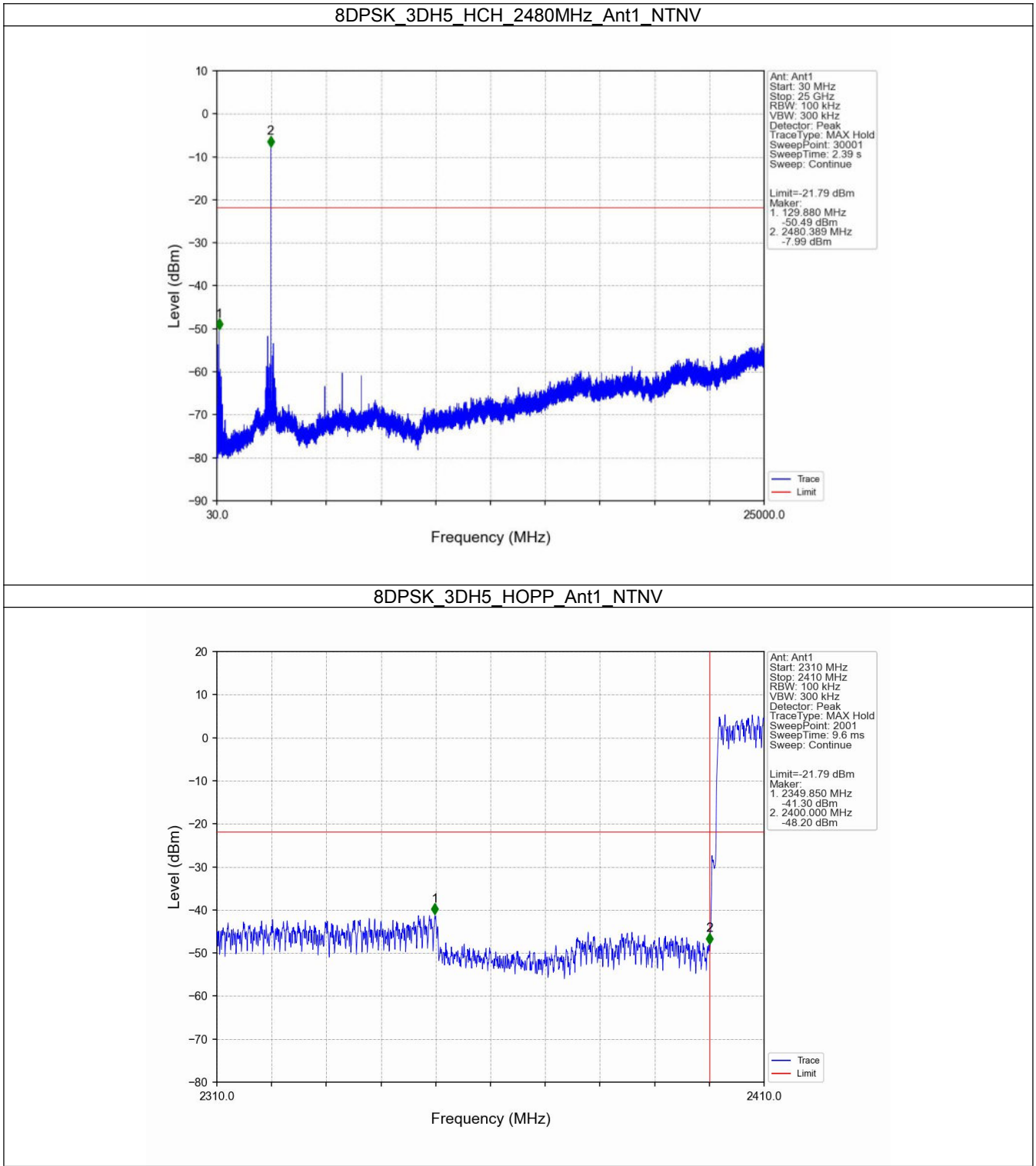
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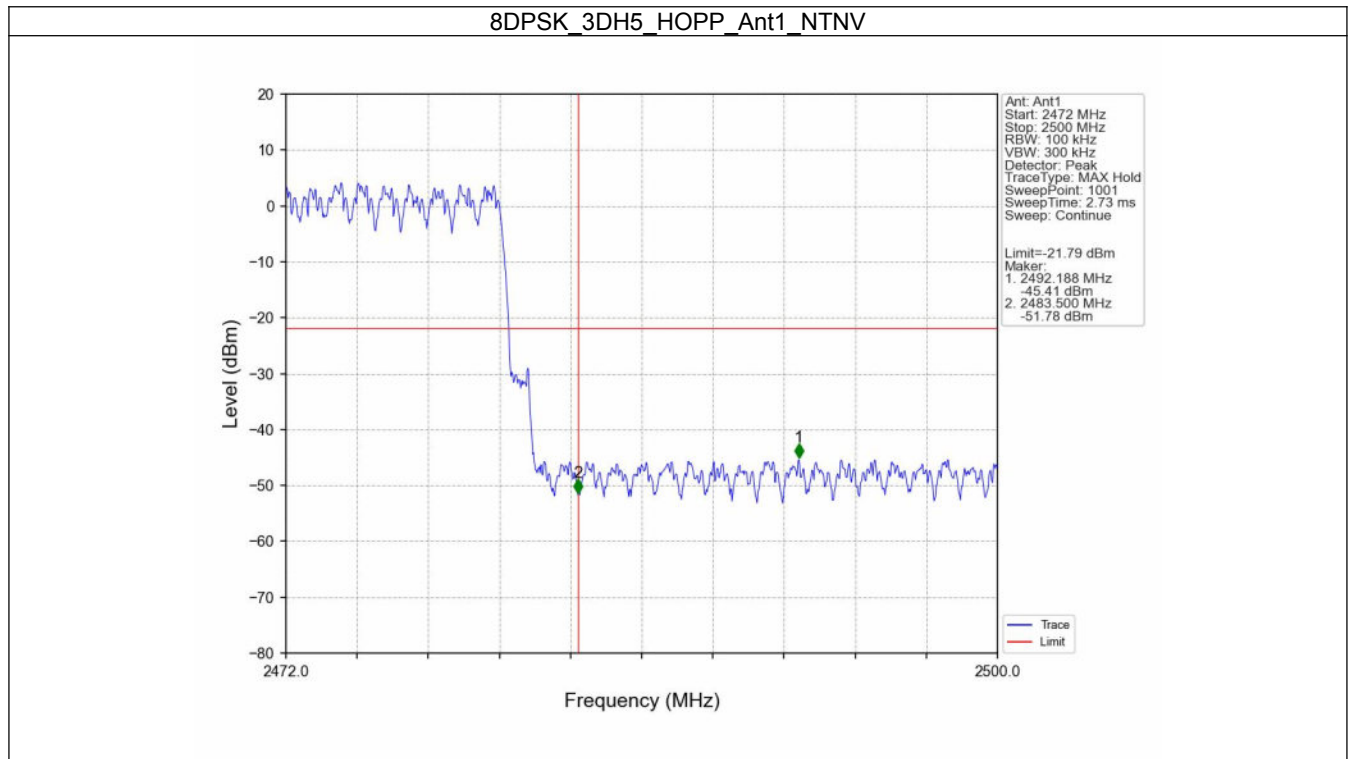
FCC ID: Q8WD8



FCC ID: Q8WD8



FCC ID: Q8WD8



FCC ID: Q8WD8

7. Form731

7.1 Test Result

7.1.1 Form731

Lower Freq (MHz)	High Freq (MHz)	MAX Power (W)	MAX Power (dBm)
2402	2480	0.0011	0.39