

Appendix RF Test Data for BT

Company: : Dongguan Shanneng Electronic Technology Co., Ltd.

EUT : Q104 wireless controller

FCC ID: : 2BO2P-Q104

Model Number : Q104

Report No. : HTT202512698F02

Reviewed By : Heber He

1. Duty Cycle

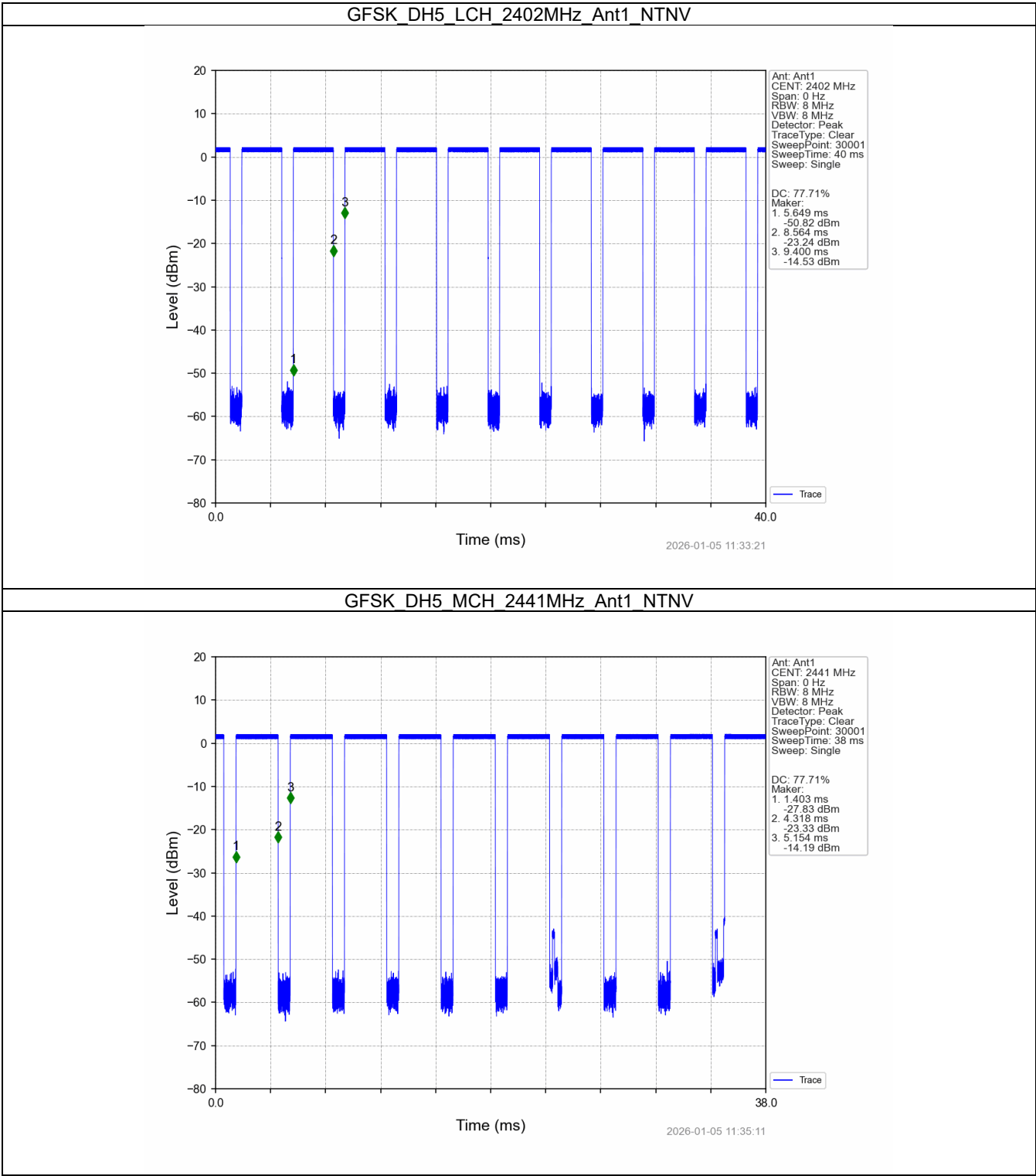
1.1 Test Result

1.1.1 Ant1

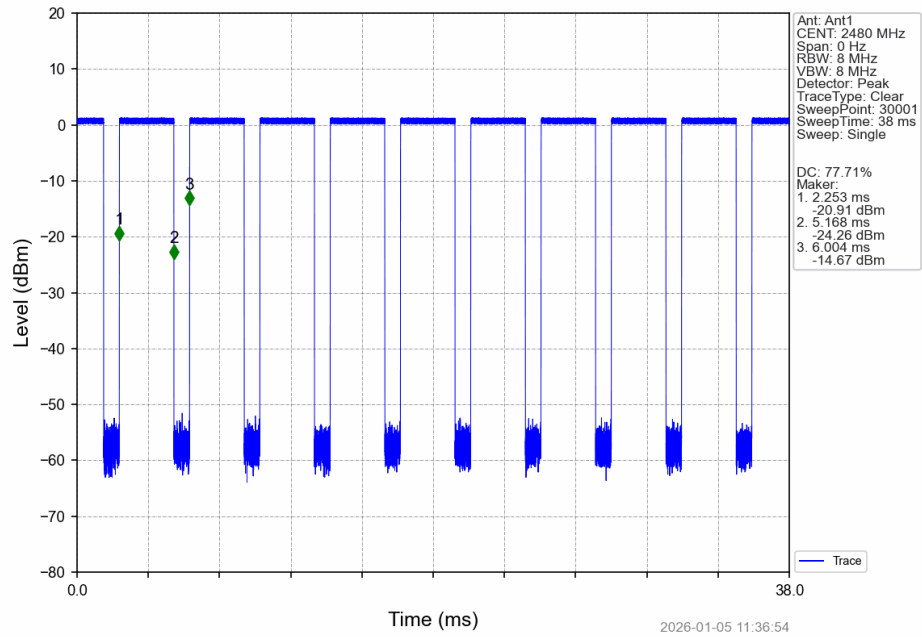
Ant1								
Mode	TX Type	Frequency (MHz)	Packet Type	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.915	3.751	77.71	1.10	0.03
		2441	DH5	2.915	3.751	77.71	1.10	0.03
		2480	DH5	2.915	3.751	77.71	1.10	0.03
Pi/4DQPSK	SISO	2402	2DH5	2.920	3.751	77.85	1.09	0.04
		2441	2DH5	2.919	3.749	77.86	1.09	0.01
		2480	2DH5	2.920	3.750	77.87	1.09	0.04
8DPSK	SISO	2402	3DH5	2.924	3.751	77.95	1.08	0.03
		2441	3DH5	2.922	3.749	77.94	1.08	0.03
		2480	3DH5	2.923	3.751	77.93	1.08	0.03

1.2 Test Graph

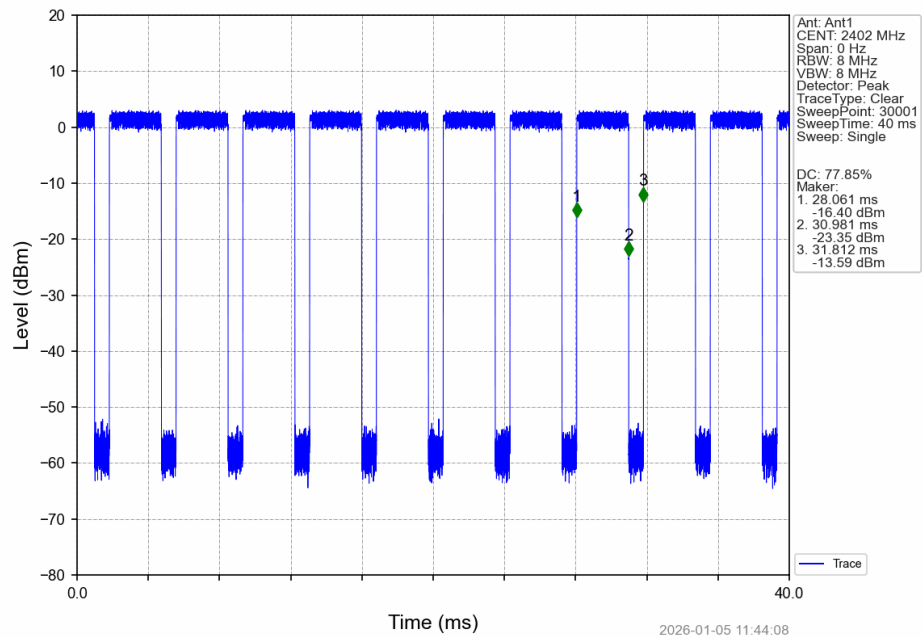
1.2.1 Ant1



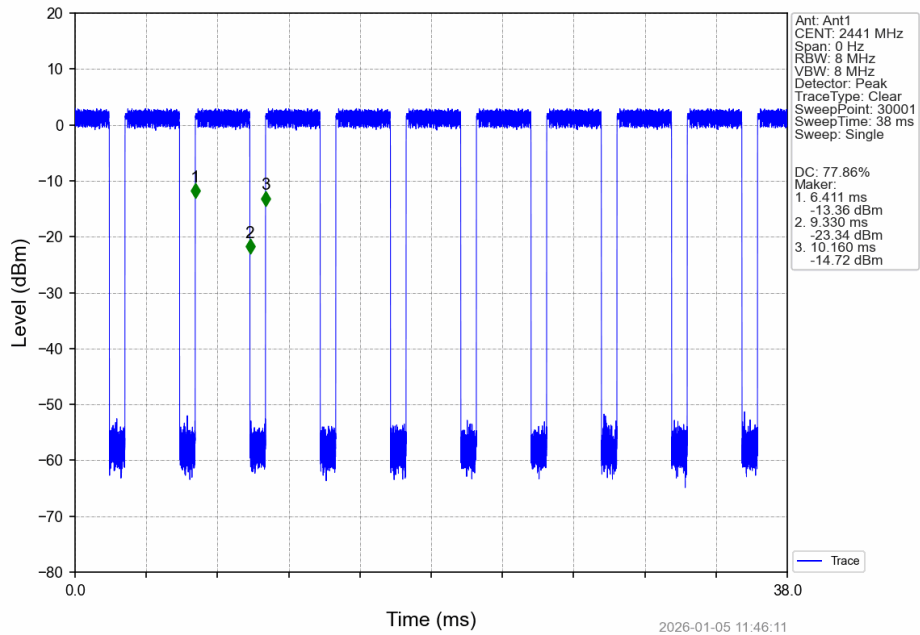
GFSK DH5_HCH_2480MHz_Ant1_NTNV



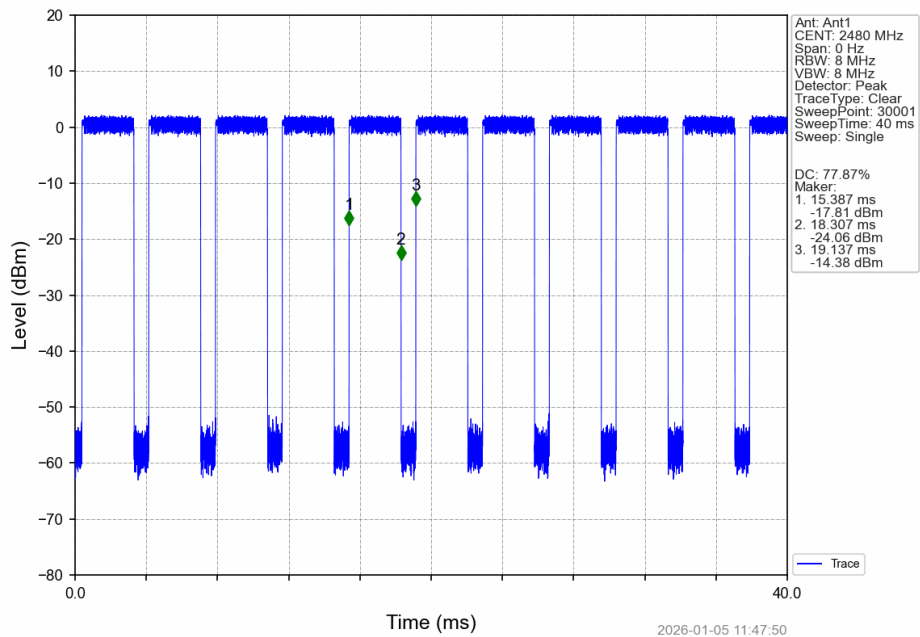
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



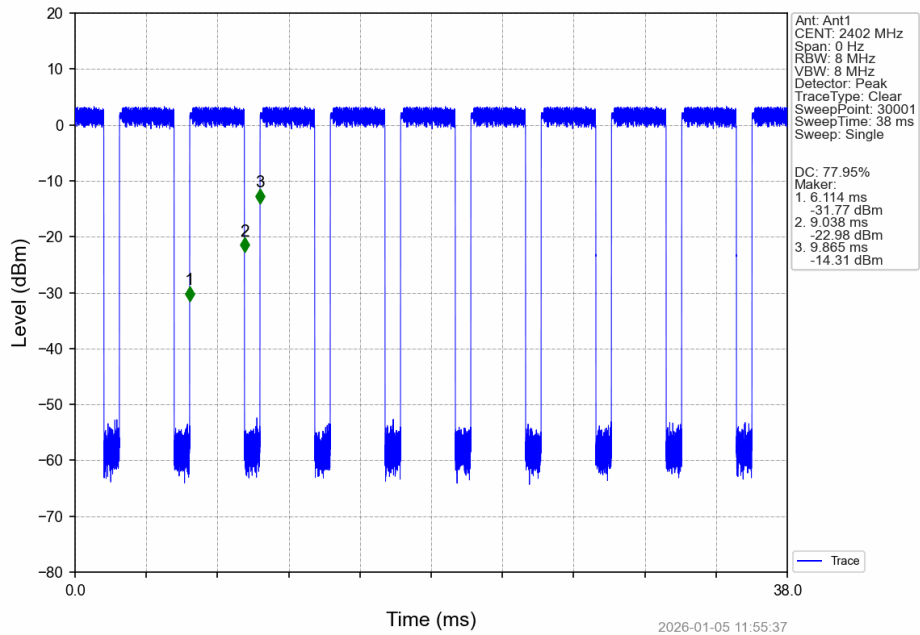
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



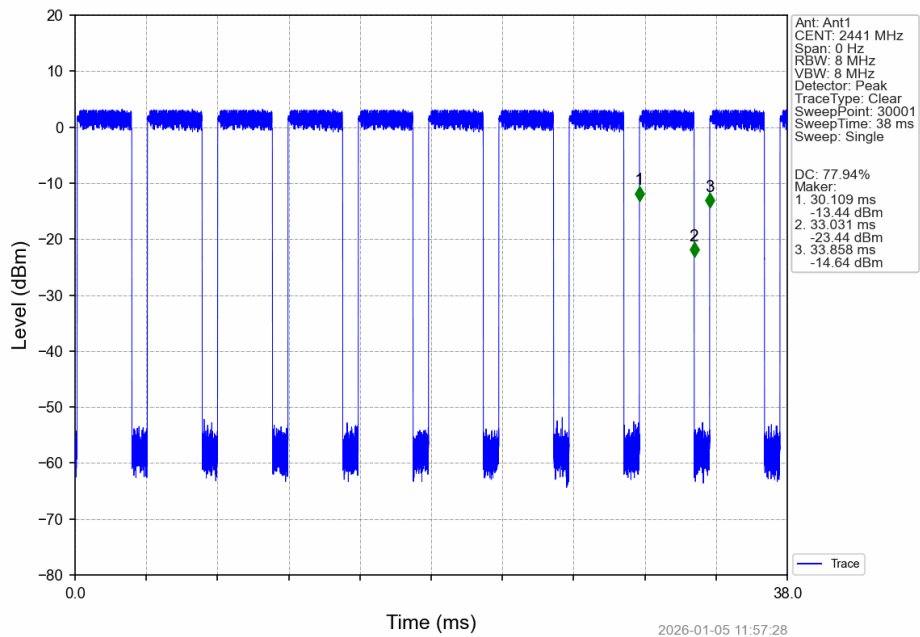
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



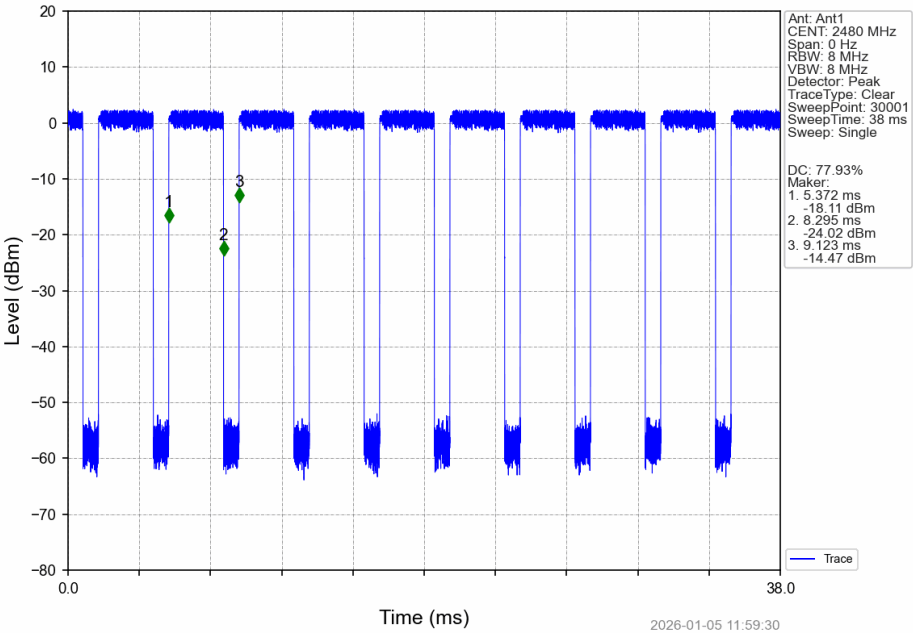
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

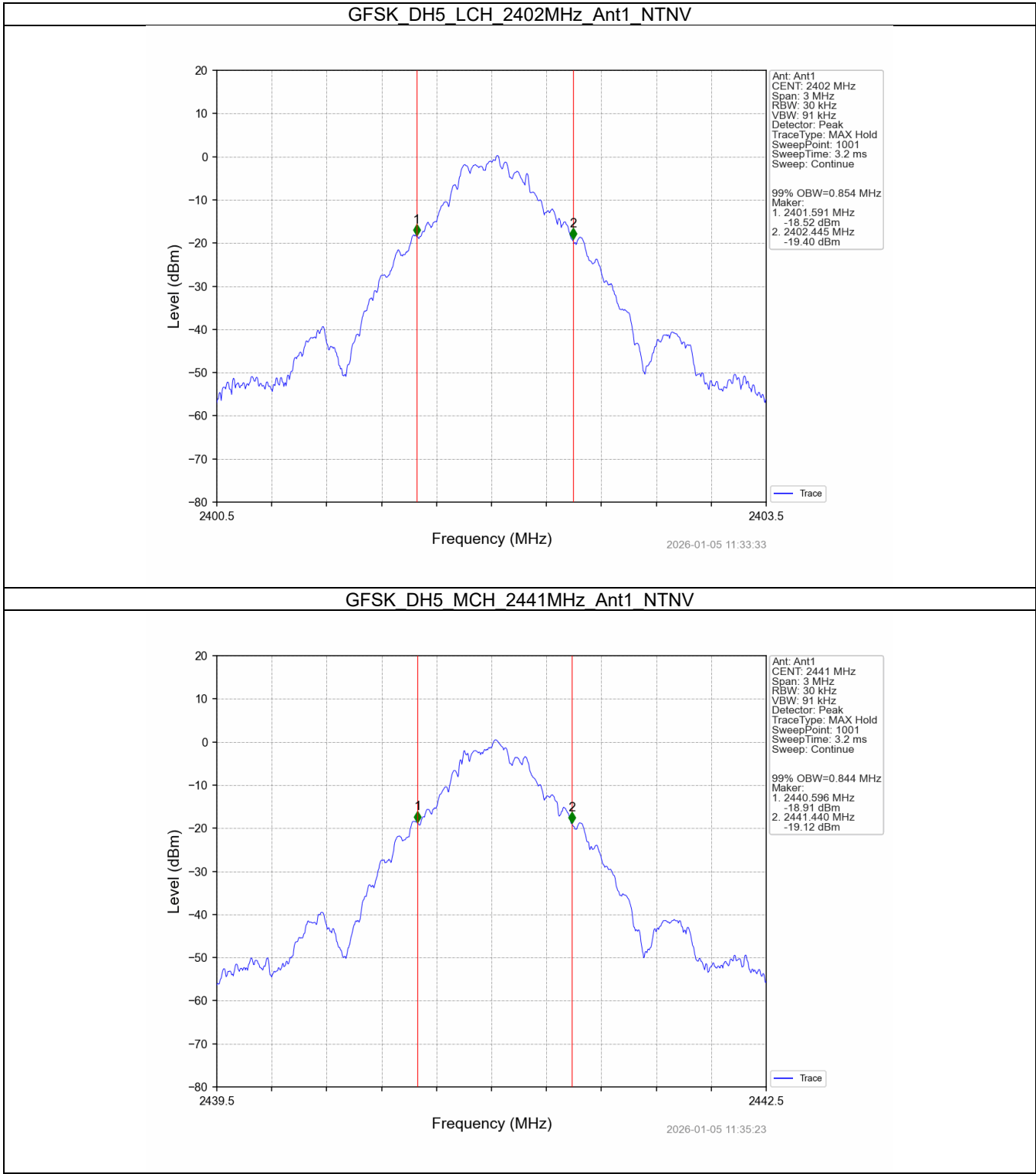
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.854	/	Pass
		2441	DH5	1	0.844	/	Pass
		2480	DH5	1	0.852	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.166	/	Pass
		2441	2DH5	1	1.143	/	Pass
		2480	2DH5	1	1.148	/	Pass
8DPSK	SISO	2402	3DH5	1	1.165	/	Pass
		2441	3DH5	1	1.155	/	Pass
		2480	3DH5	1	1.156	/	Pass

2.1.2 20dB BW

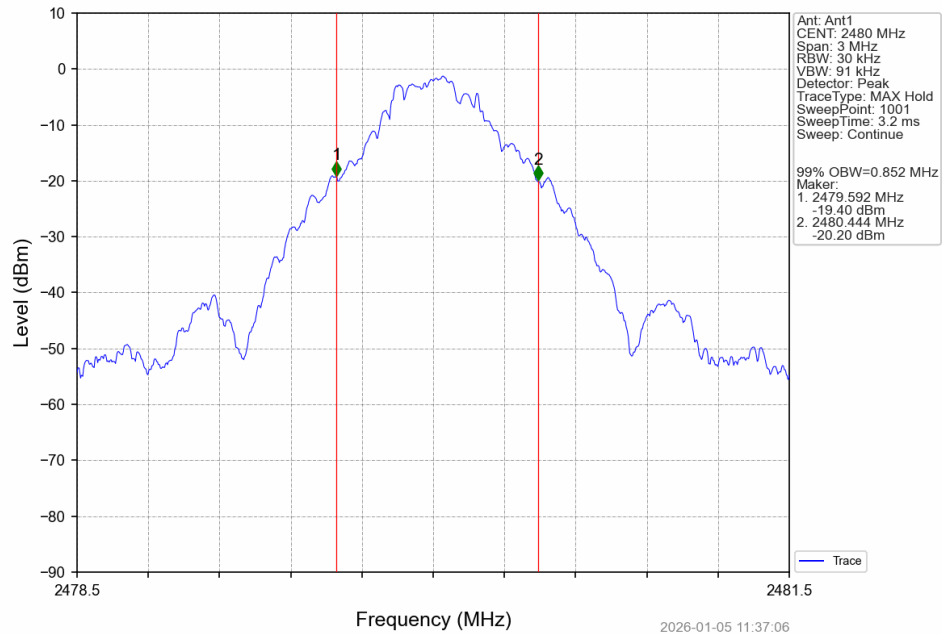
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.939	/	Pass
		2441	DH5	1	0.940	/	Pass
		2480	DH5	1	0.941	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.259	/	Pass
		2441	2DH5	1	1.263	/	Pass
		2480	2DH5	1	1.289	/	Pass
8DPSK	SISO	2402	3DH5	1	1.280	/	Pass
		2441	3DH5	1	1.275	/	Pass
		2480	3DH5	1	1.277	/	Pass

2.2 Test Graph

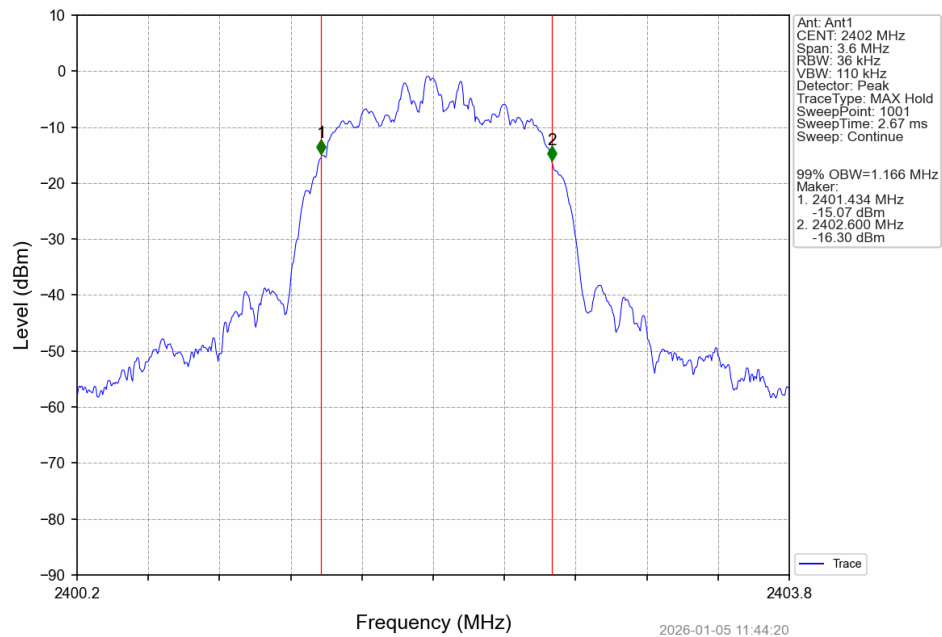
2.2.1 OBW



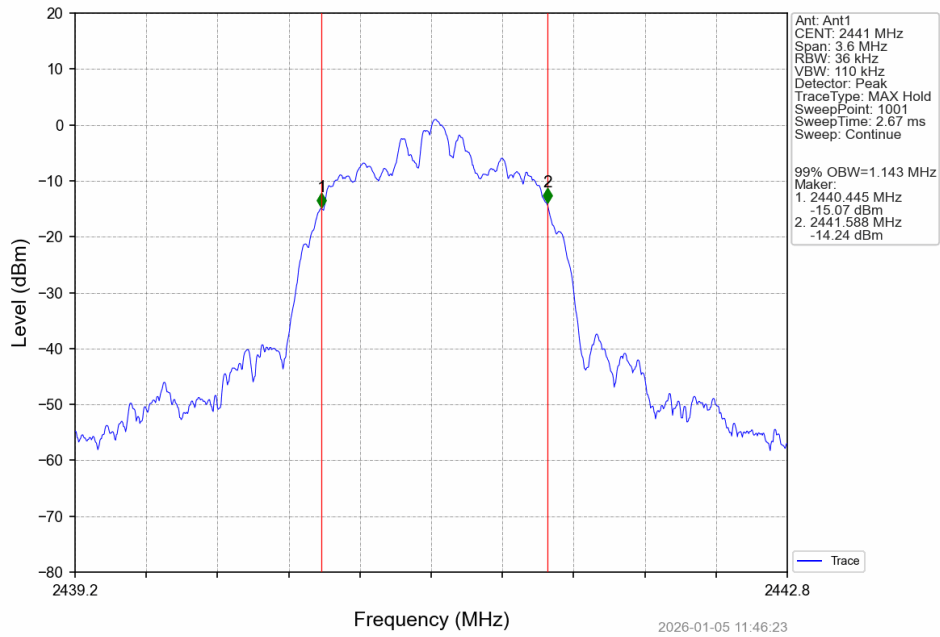
GFSK DH5_HCH_2480MHz_Ant1_NTNV



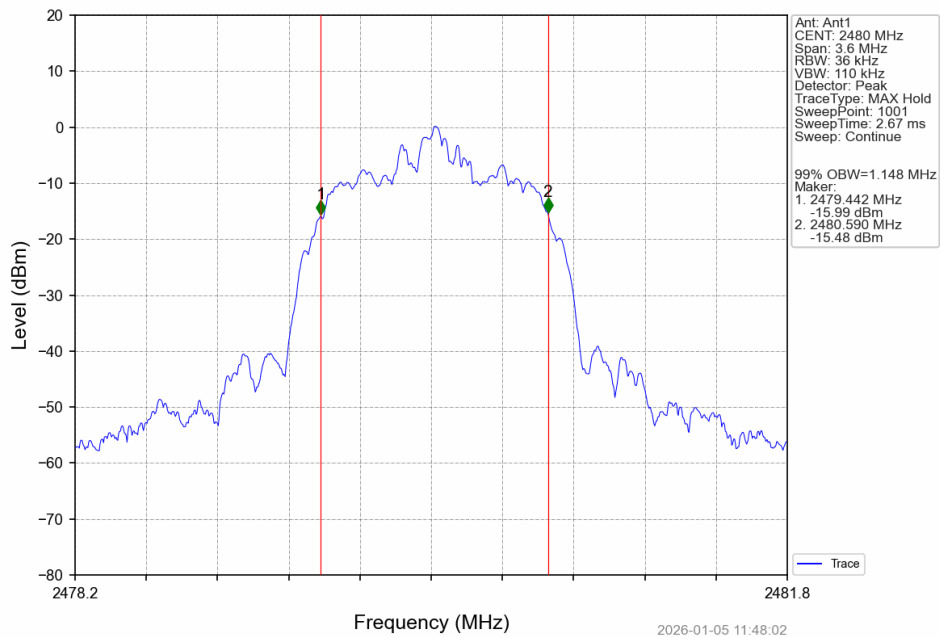
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



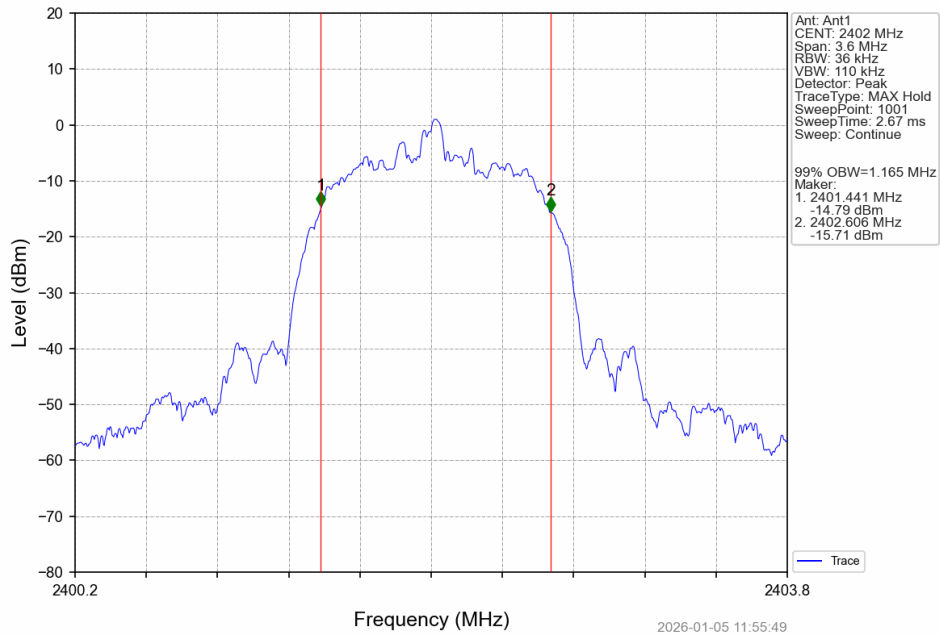
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



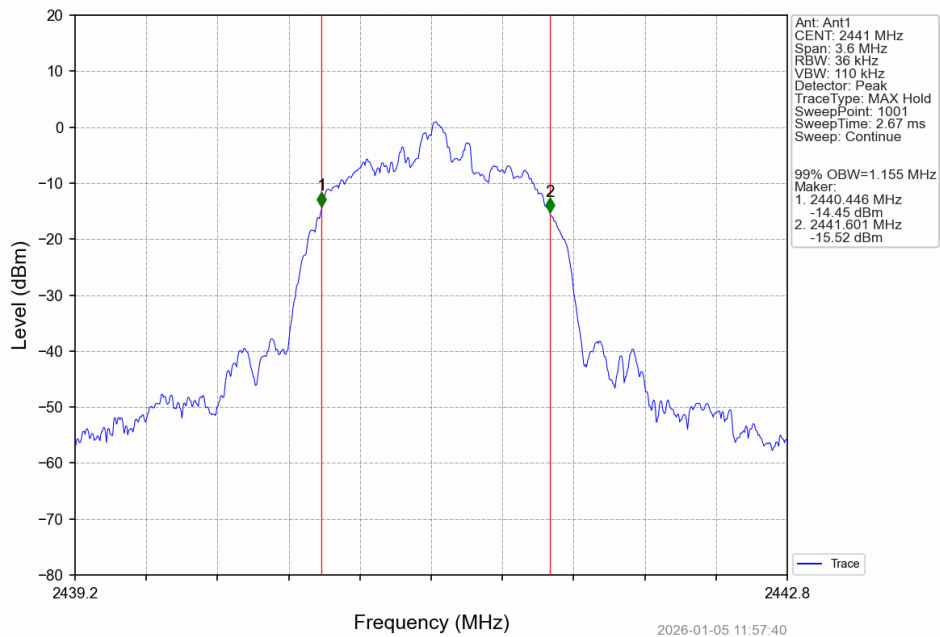
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



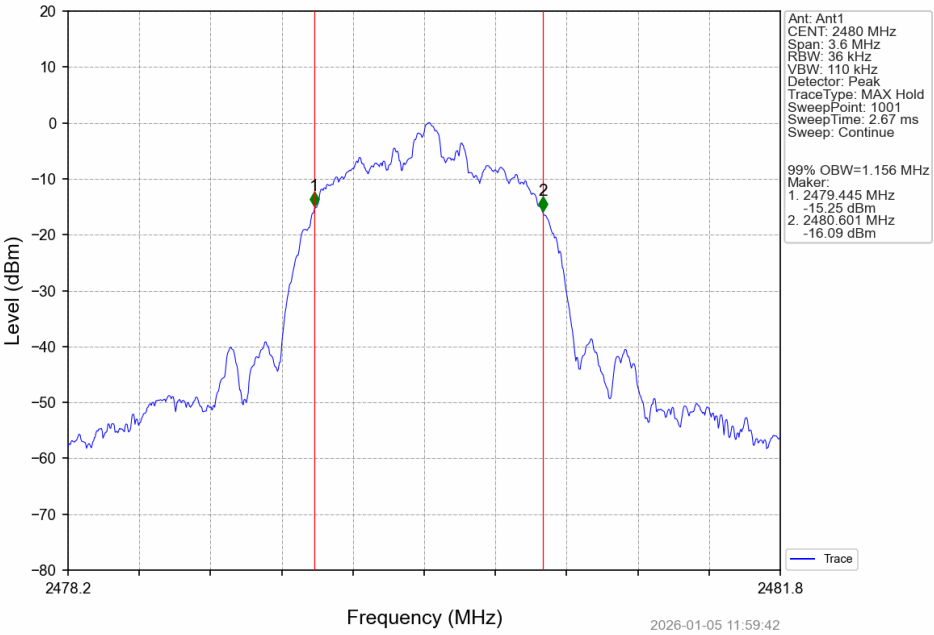
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



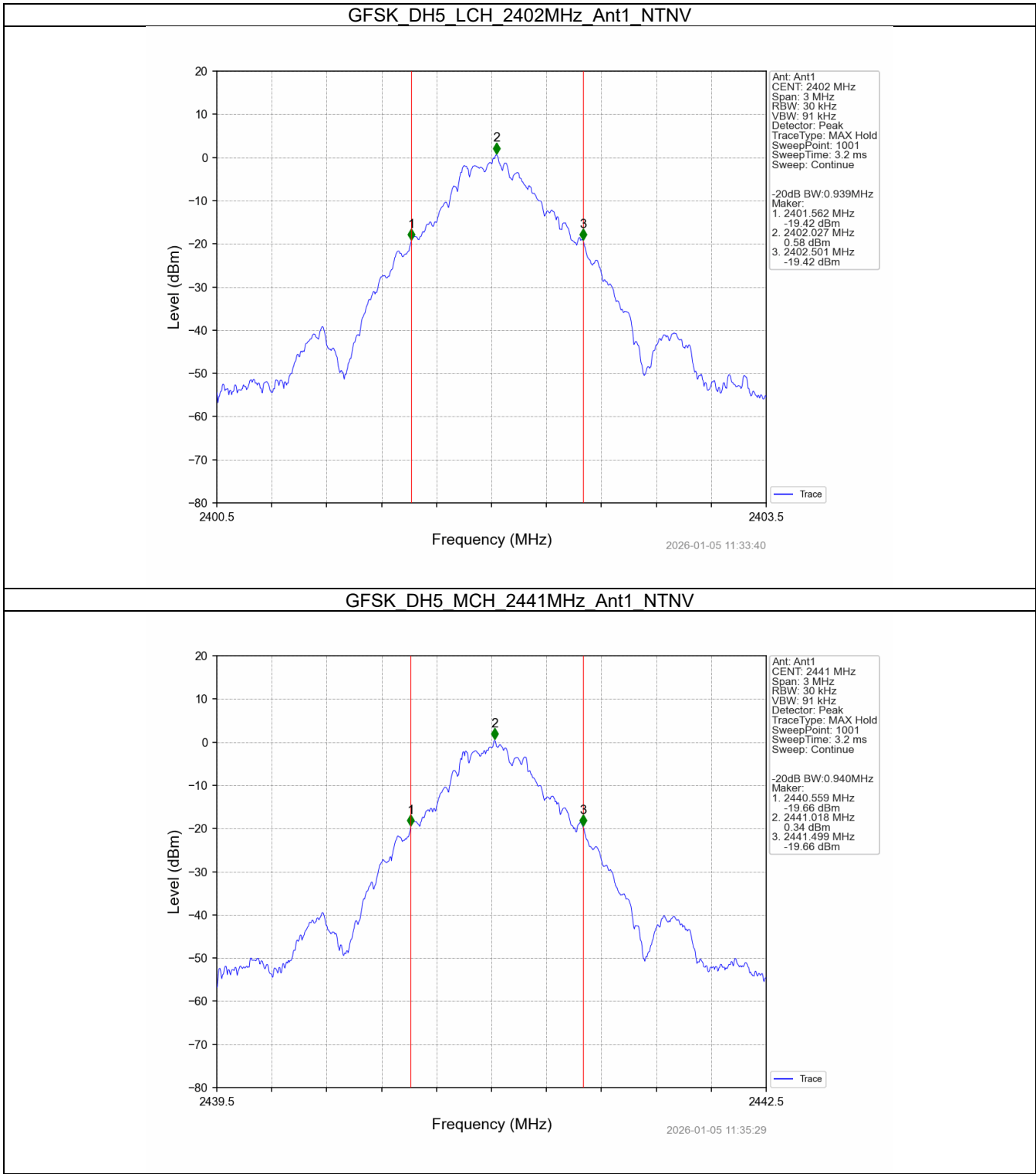
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



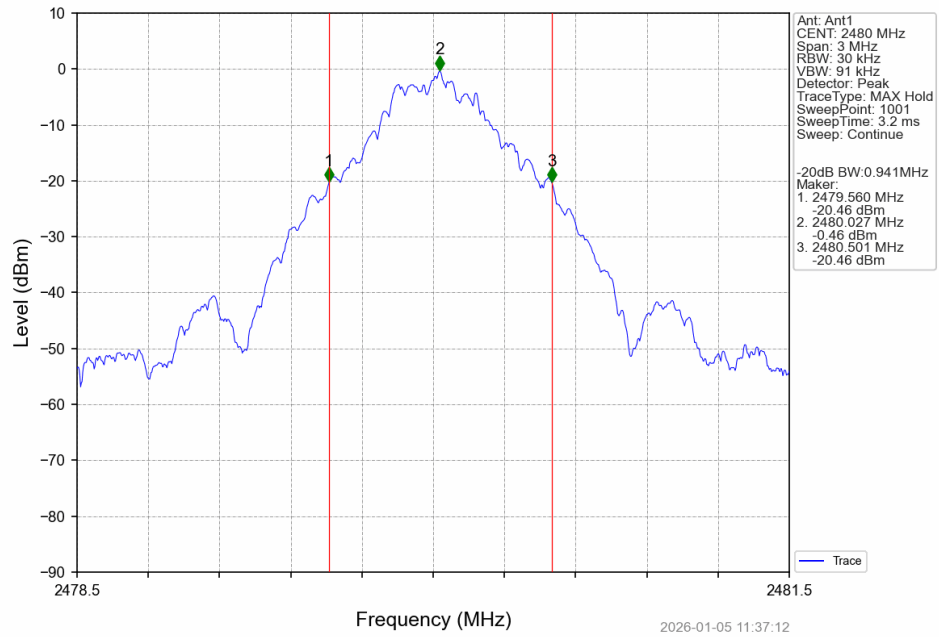
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



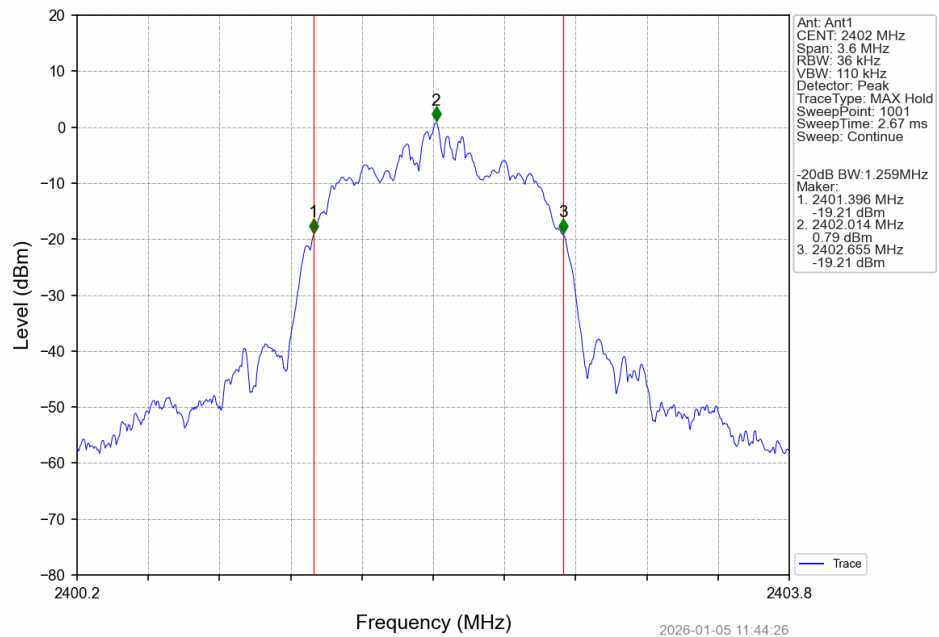
2.2.2 20dB BW



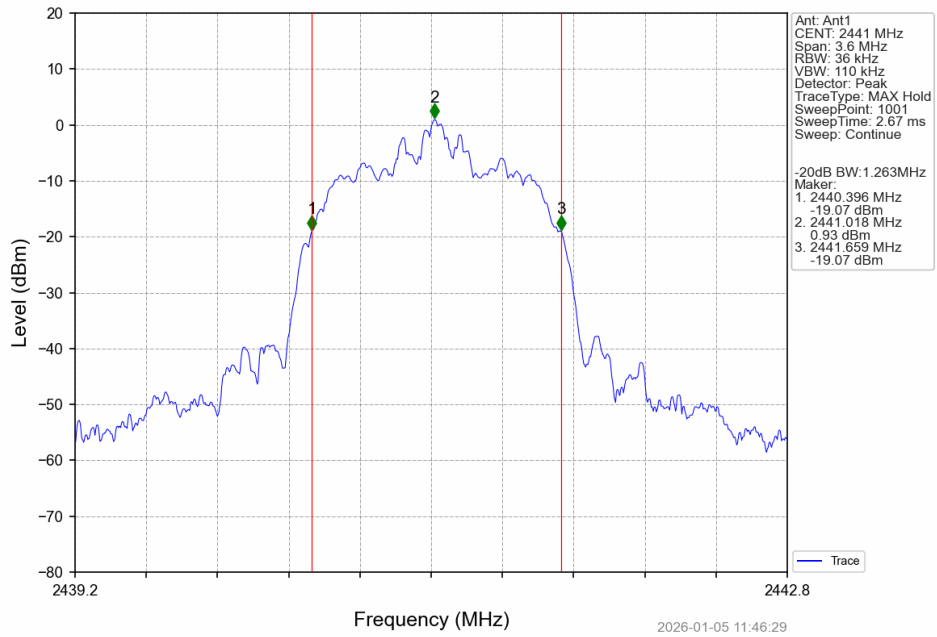
GFSK DH5_HCH_2480MHz_Ant1_NTNV



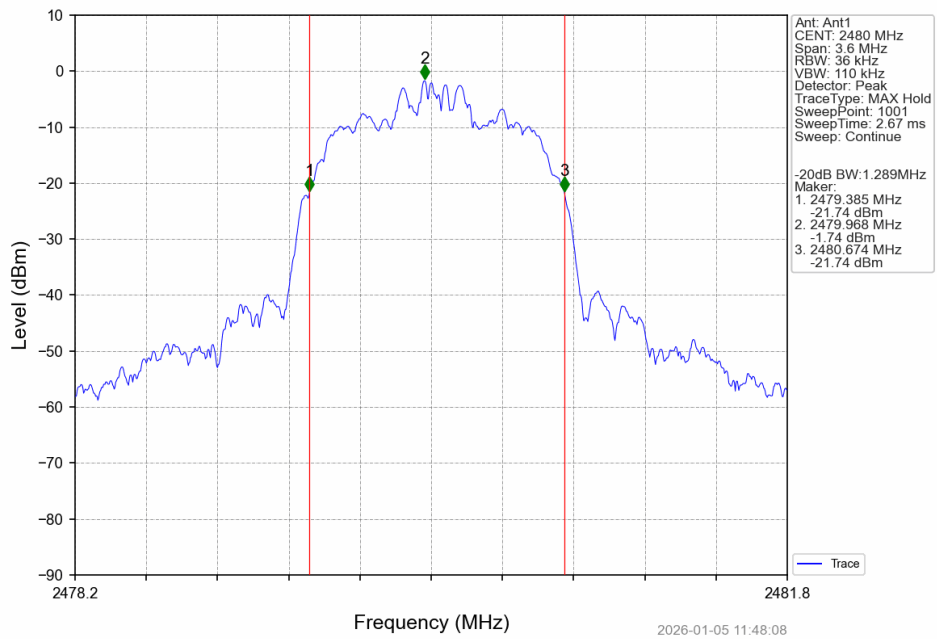
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



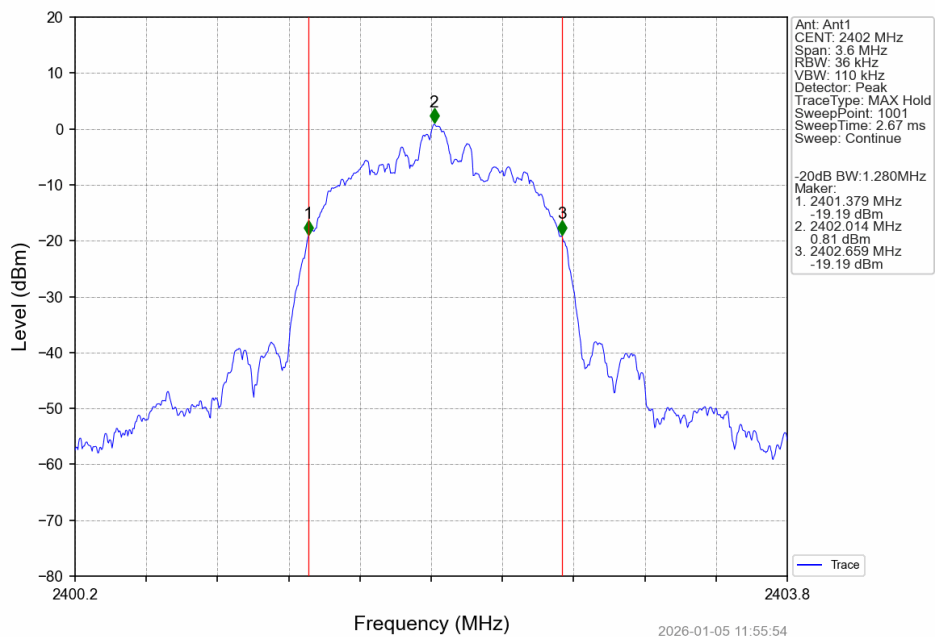
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



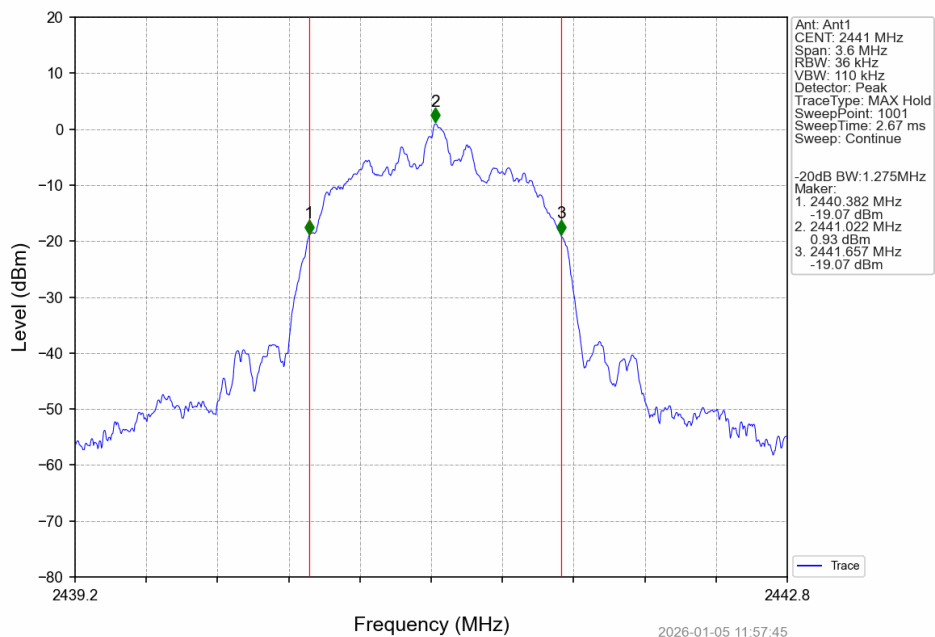
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



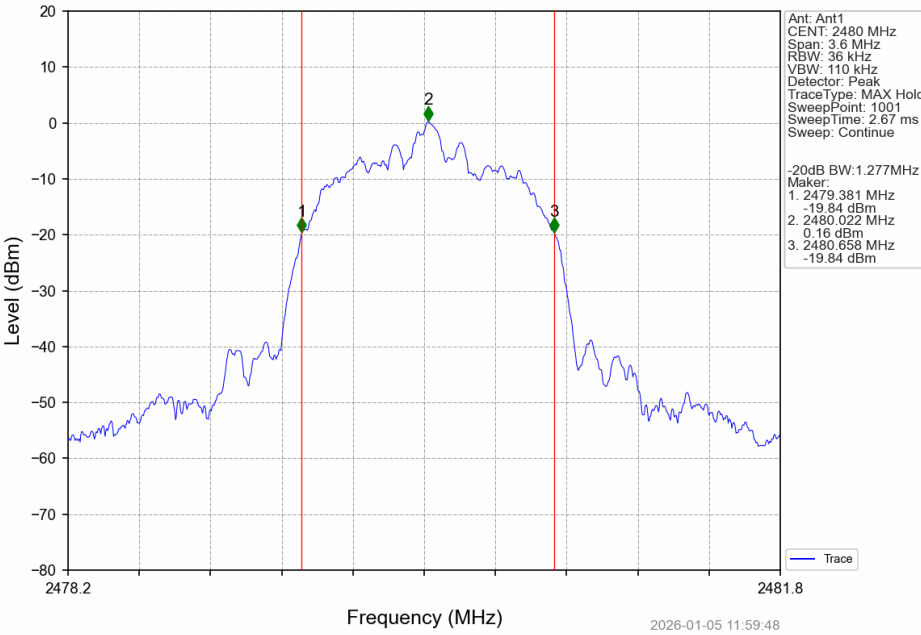
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



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	2.07	≤ 30	Pass
		2441	DH5	1.96	≤ 30	Pass
		2480	DH5	1.14	≤ 30	Pass
Pi/4DQPSK	SISO	2402	2DH5	2.85	≤ 20.97	Pass
		2441	2DH5	2.80	≤ 20.97	Pass
		2480	2DH5	1.98	≤ 20.97	Pass
8DPSK	SISO	2402	3DH5	3.12	≤ 20.97	Pass
		2441	3DH5	3.05	≤ 20.97	Pass
		2480	3DH5	2.28	≤ 20.97	Pass

4. Carrier Frequency Separation

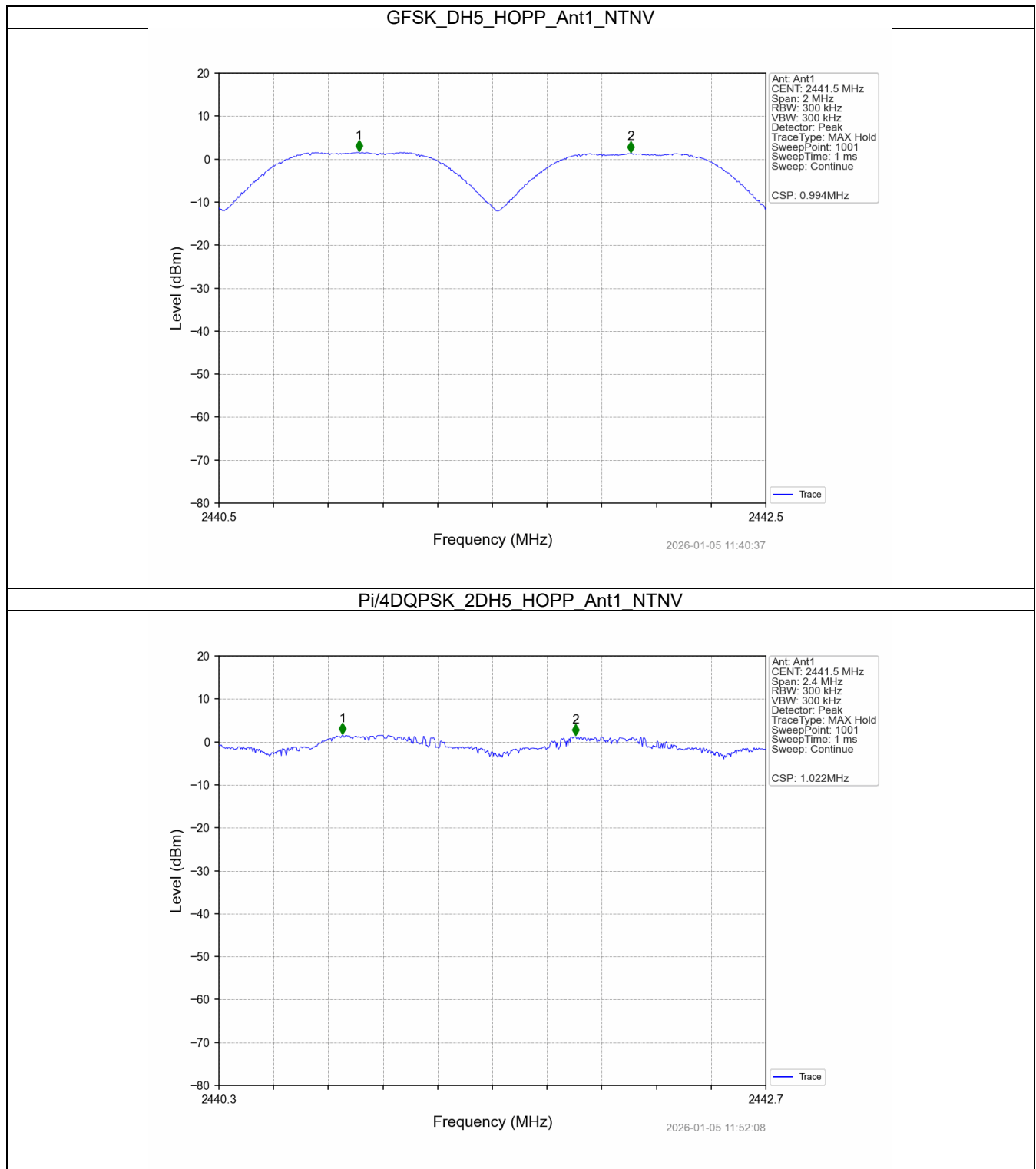
4.1 Test Result

4.1.1 Ant1

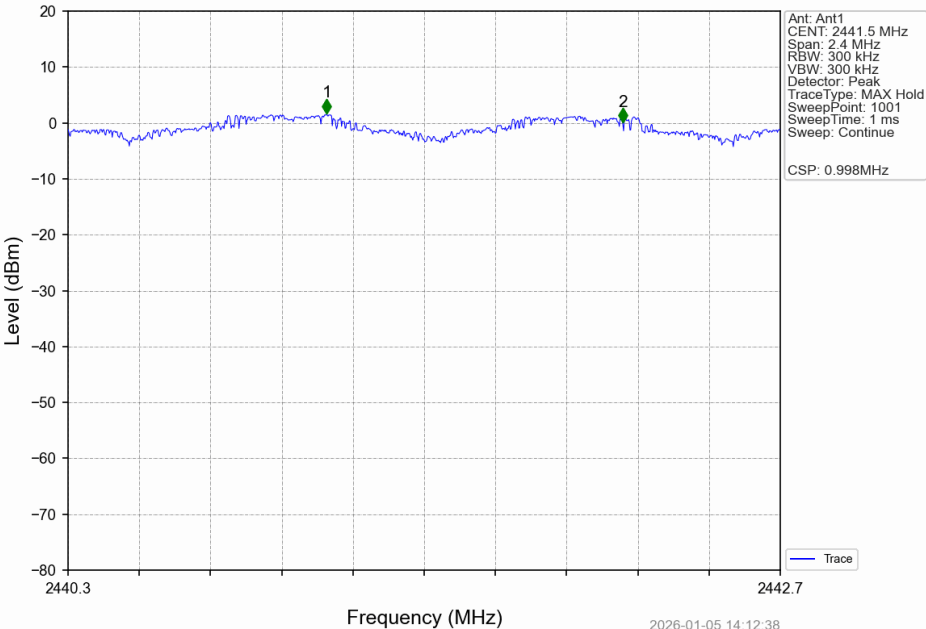
Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	0.994	0.941	≥ 0.941	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.022	1.289	≥ 0.859	Pass
8DPSK	SISO	HOPP	3DH5	0.998	1.280	≥ 0.853	Pass

4.2 Test Graph

4.2.1 Ant1



8DPSK_3DH5_HOPP_Ant1_NTNV



5. Number of Hopping Frequencies

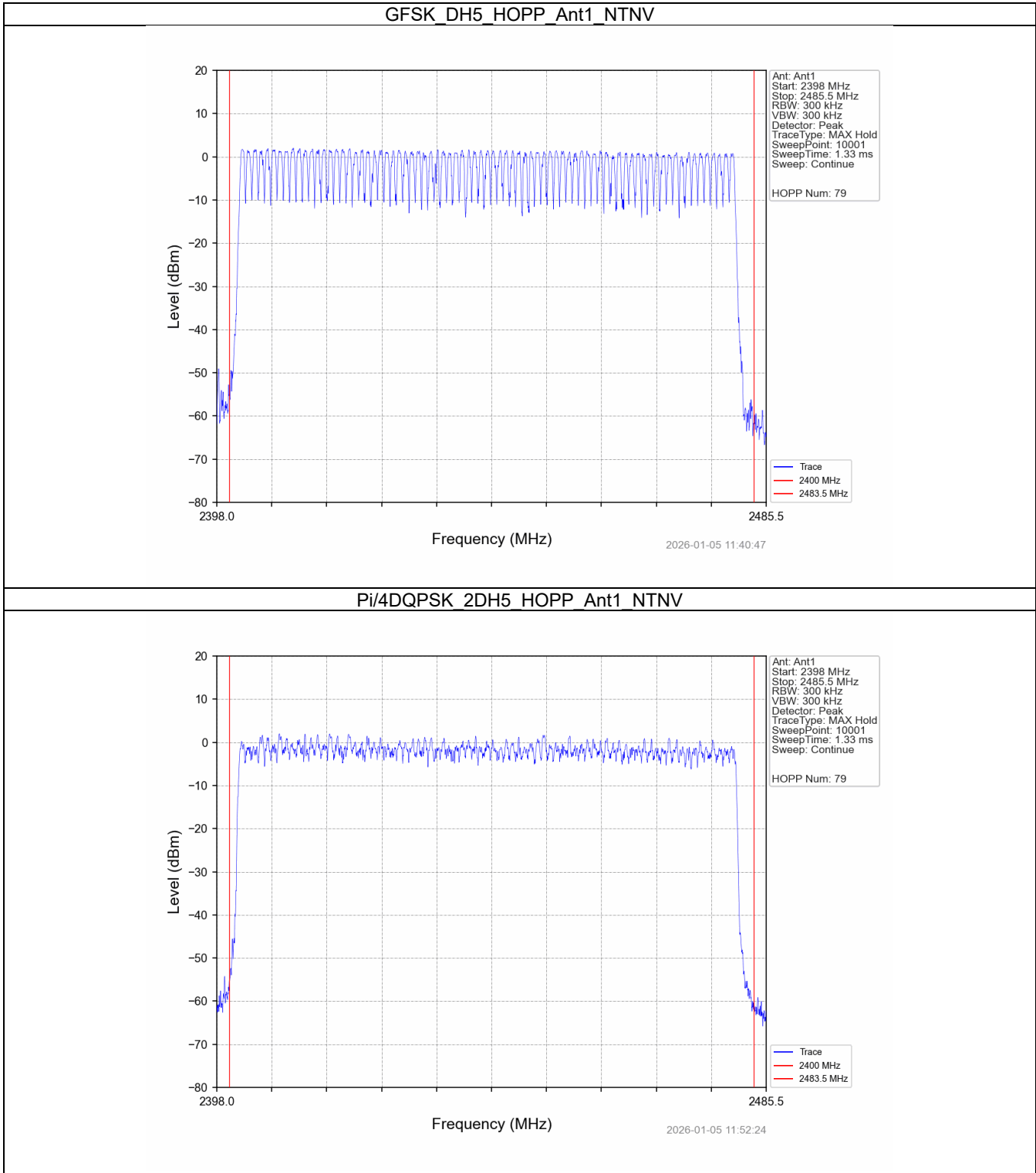
5.1 Test Result

5.1.1 HoppNum

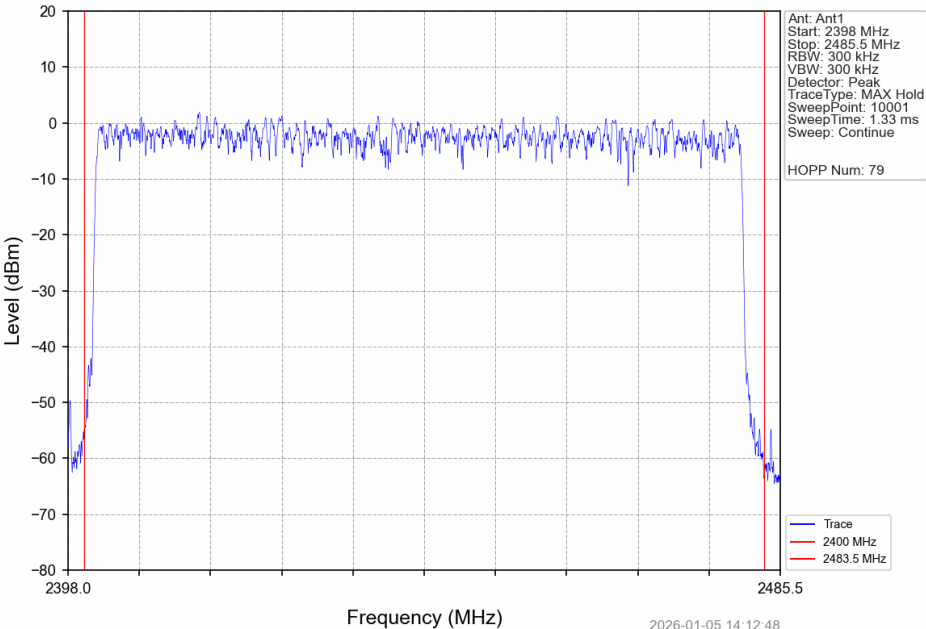
Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT1	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass

5.2 Test Graph

5.2.1 HoppNum



8DPSK_3DH5_HOPP_Ant1_NTNV



6. Time of Occupancy (Dwell Time)

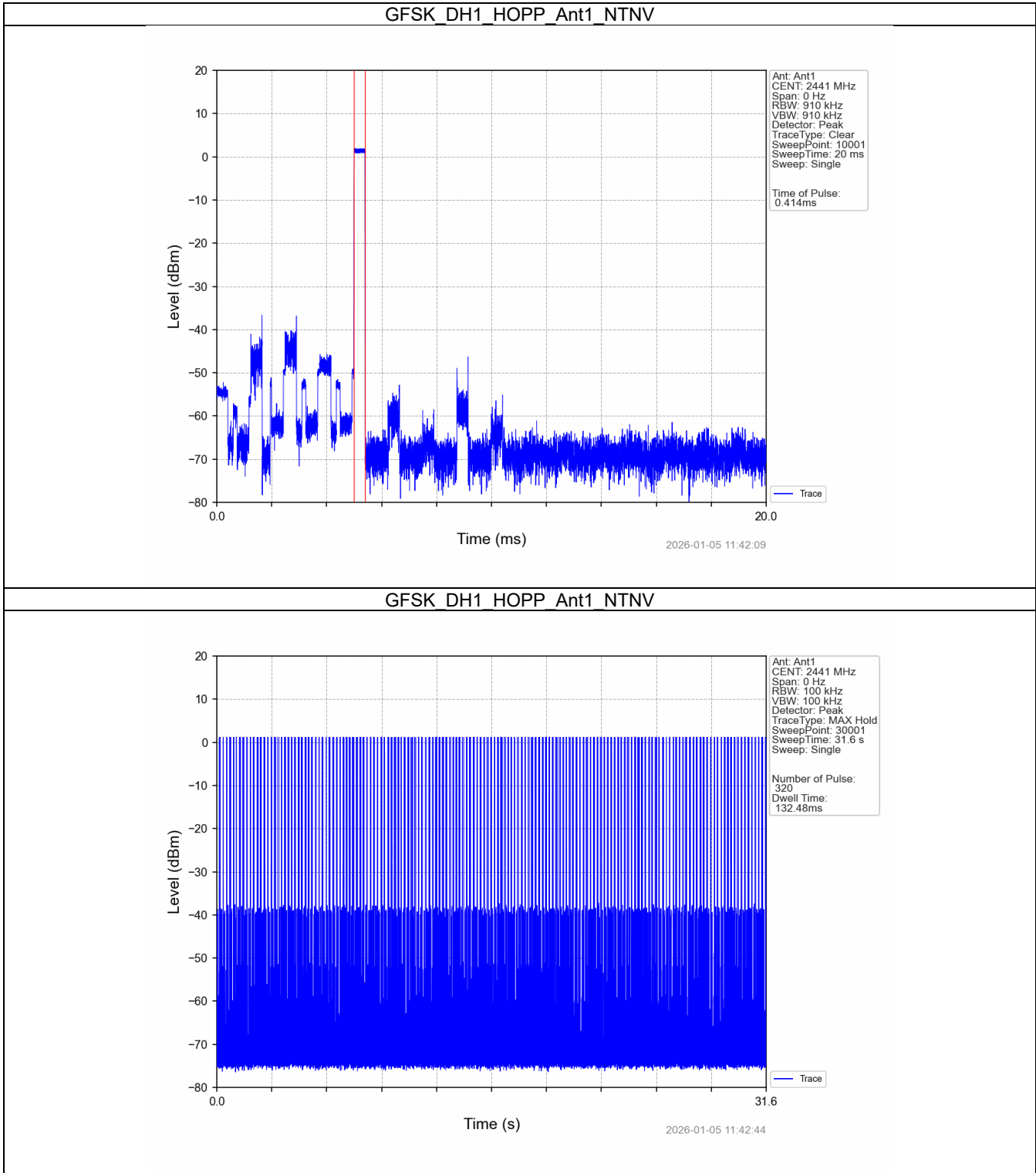
6.1 Test Result

6.1.1 Ant1

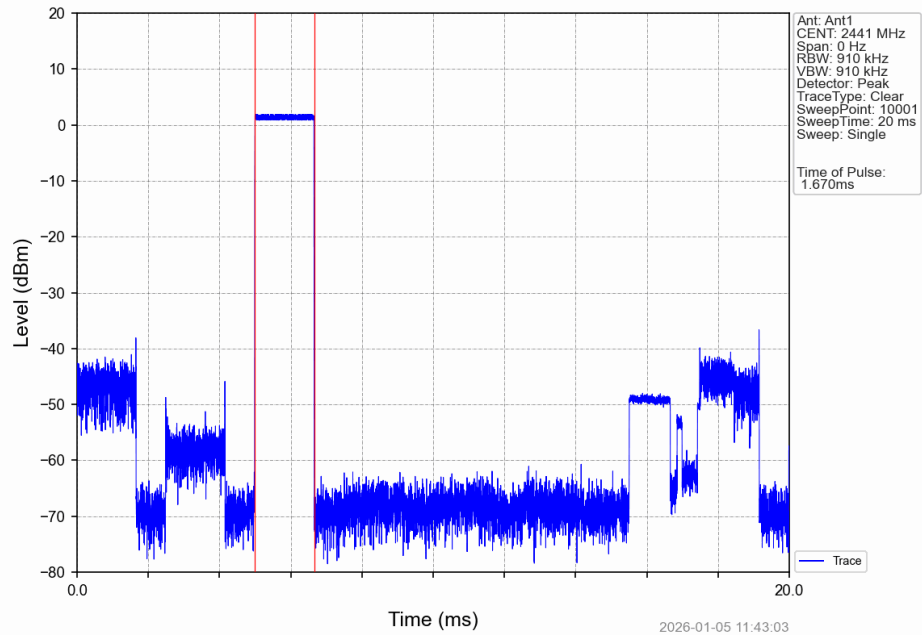
Ant1									
Mode	Tx Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.414	31.600	320	132.480	<=400	Pass
			DH3	1.670	31.600	160	267.200	<=400	Pass
			DH5	2.918	31.600	101	294.718	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.424	31.600	318	134.832	<=400	Pass
			2DH3	1.674	31.600	156	261.144	<=400	Pass
			2DH5	2.922	31.600	108	315.576	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.424	31.600	321	136.104	<=400	Pass
			3DH3	1.674	31.600	169	282.906	<=400	Pass
			3DH5	2.926	31.600	104	304.304	<=400	Pass

6.2 Test Graph

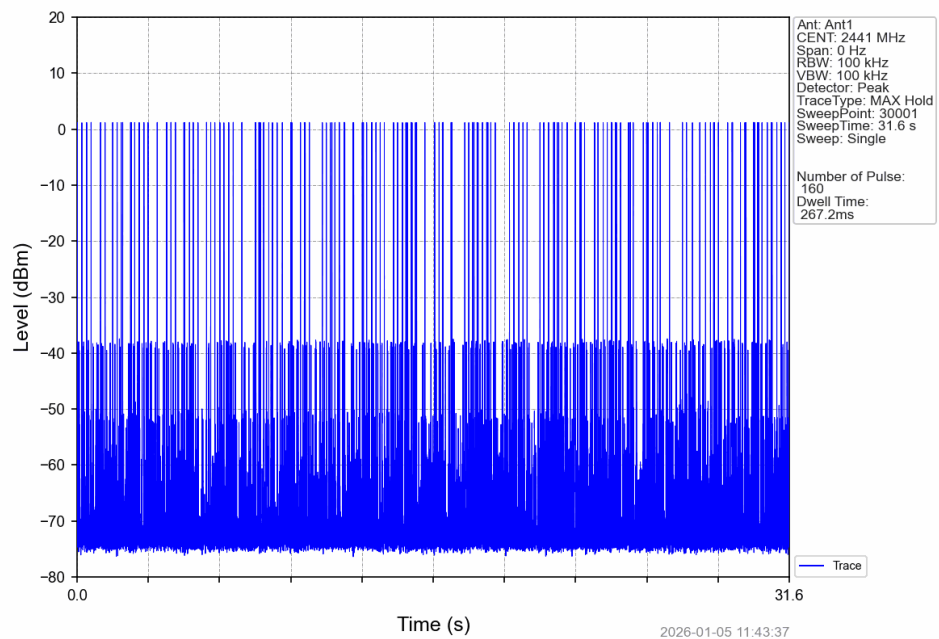
6.2.1 Ant1



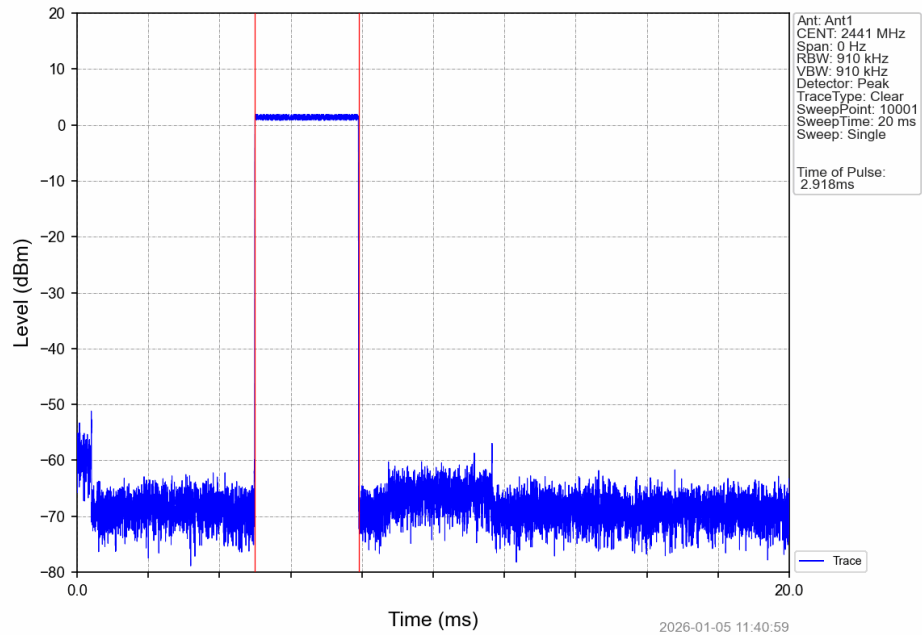
GFSK_DH3_HOPP_Ant1_NTNV



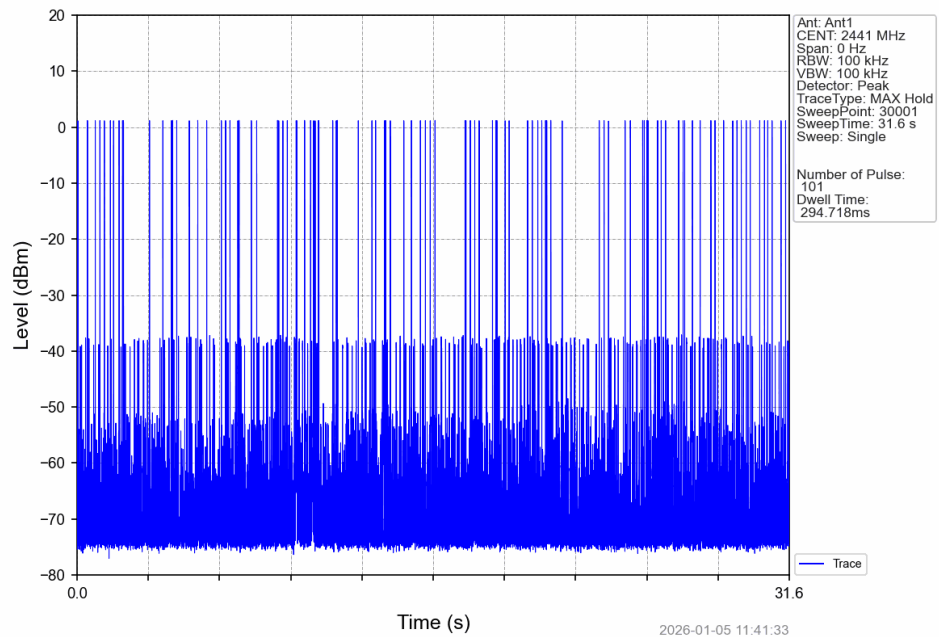
GFSK_DH3_HOPP_Ant1_NTNV



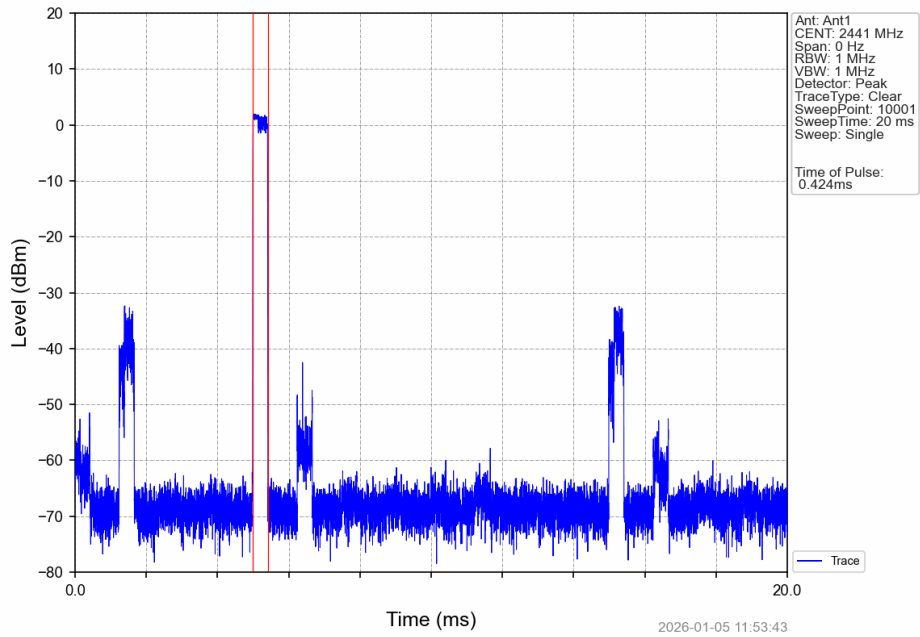
GFSK_DH5_HOPP_Ant1_NTNV



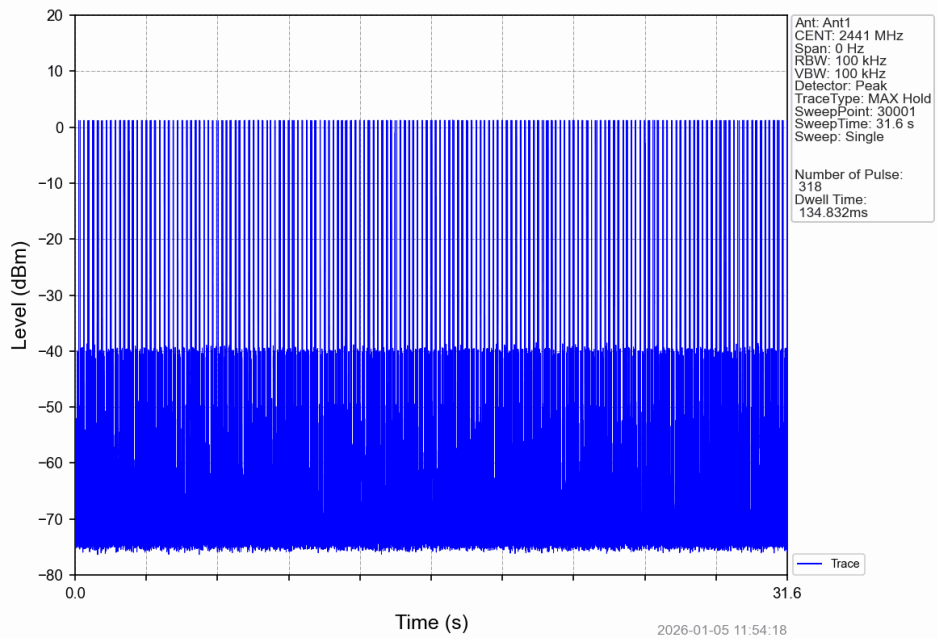
GFSK_DH5_HOPP_Ant1_NTNV



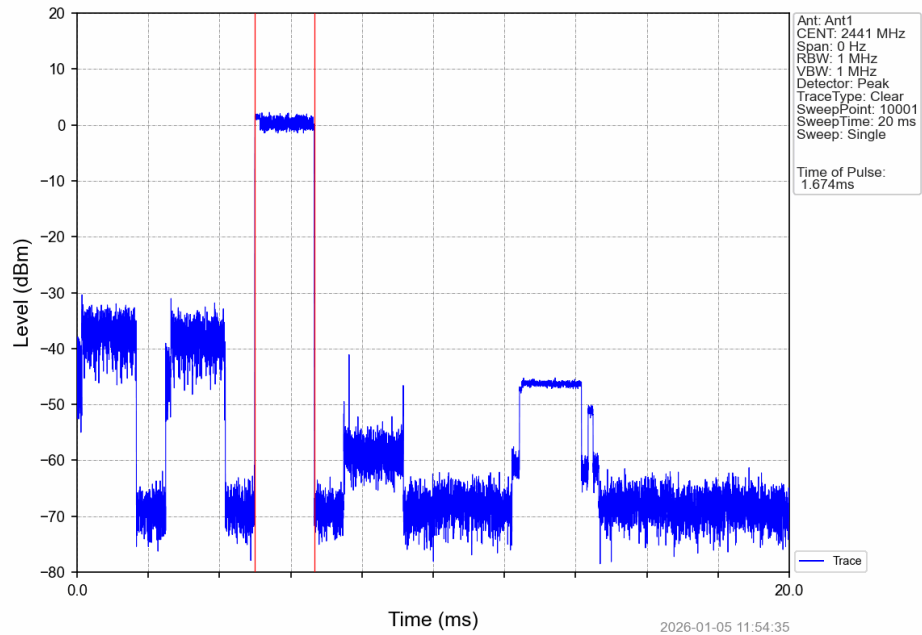
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



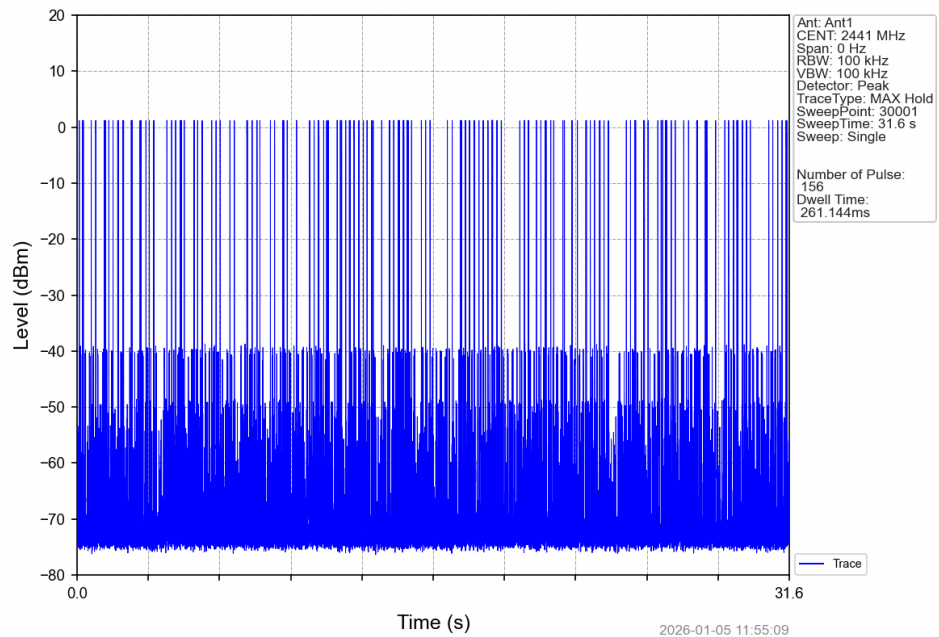
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



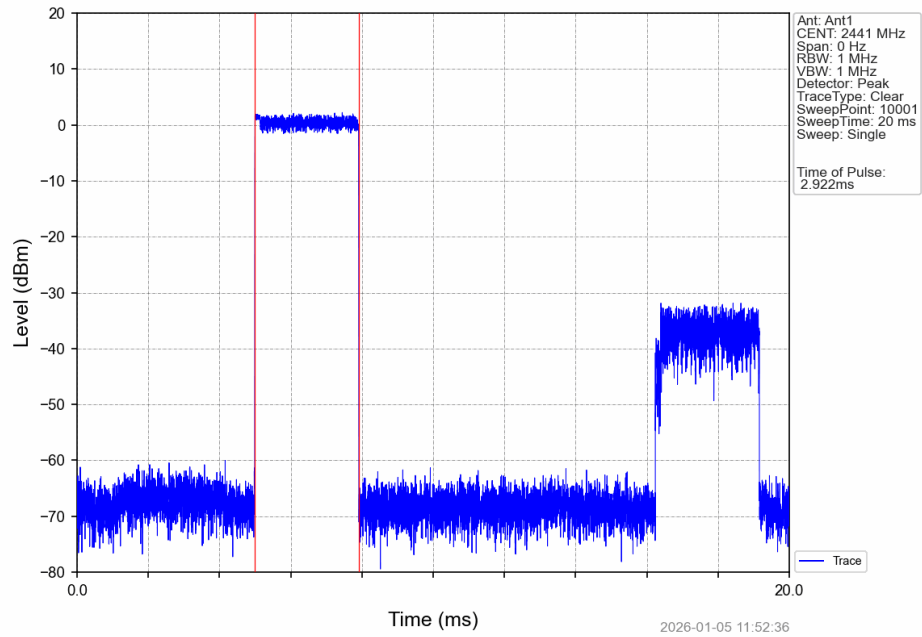
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



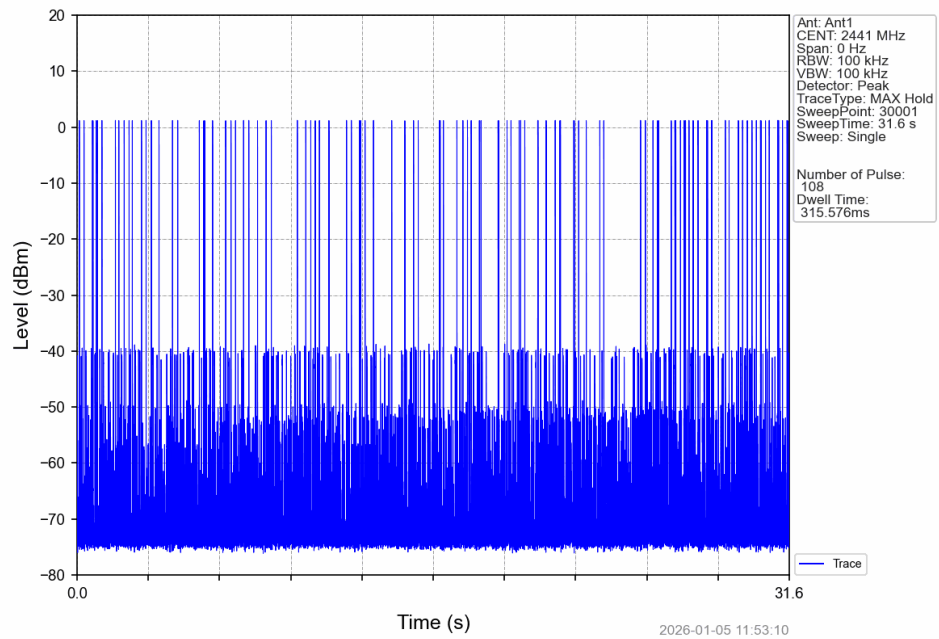
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



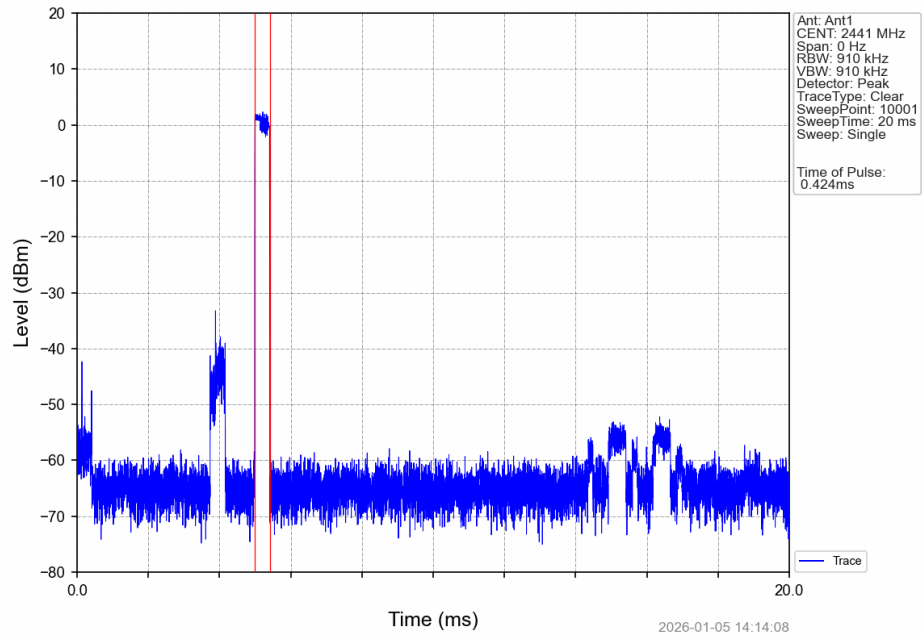
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



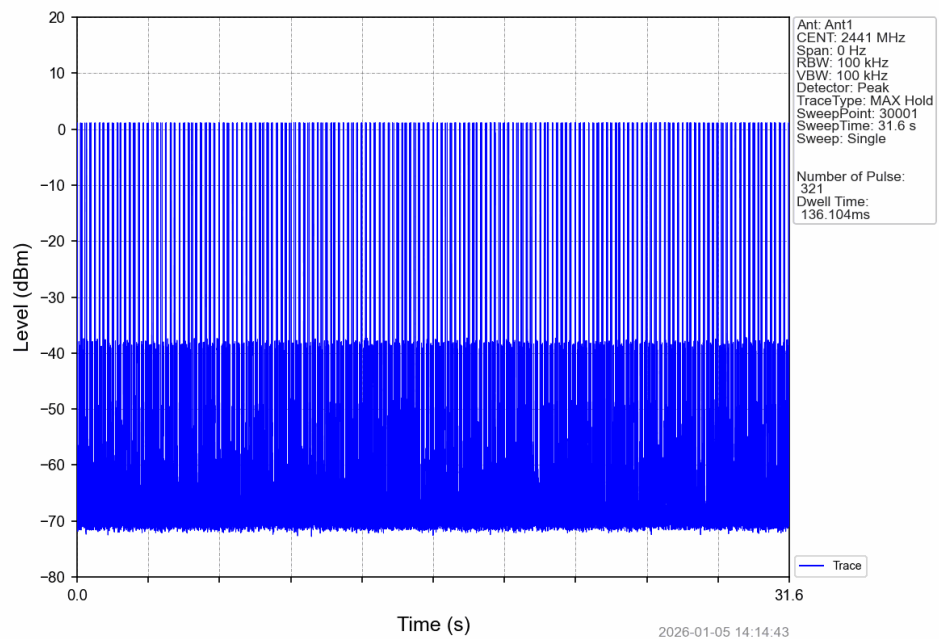
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



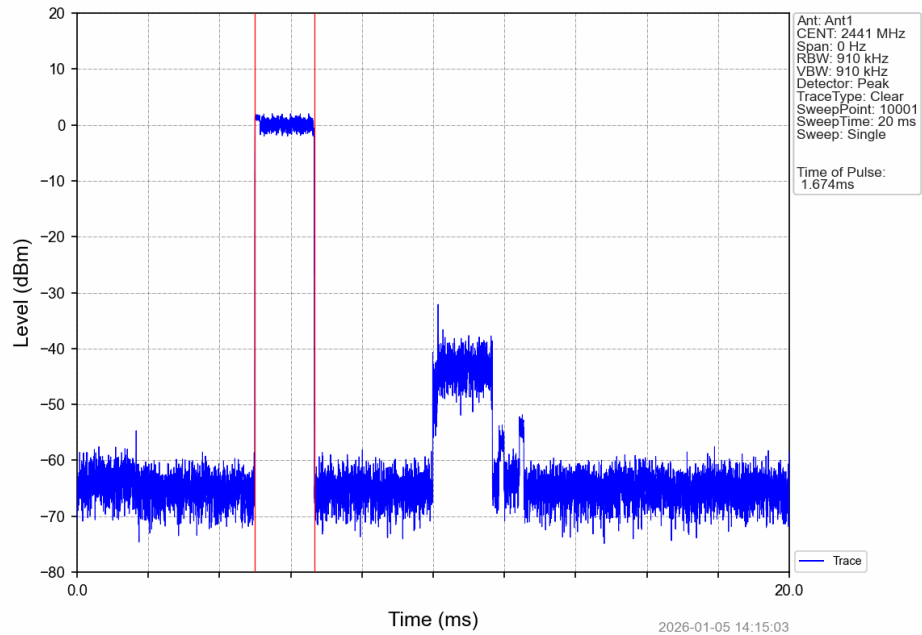
8DPSK_3DH1_HOPP_Ant1_NTNV



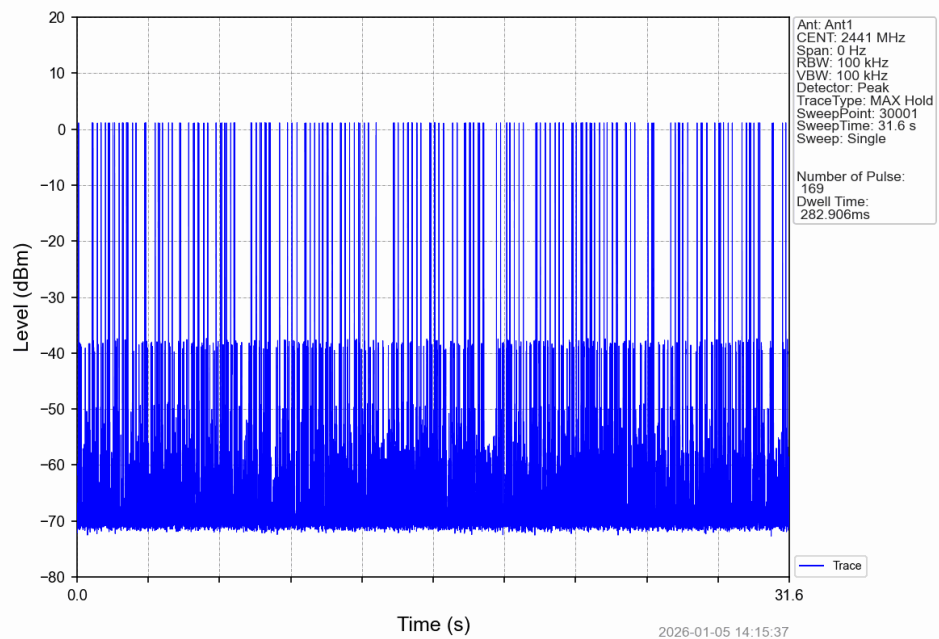
8DPSK_3DH1_HOPP_Ant1_NTNV



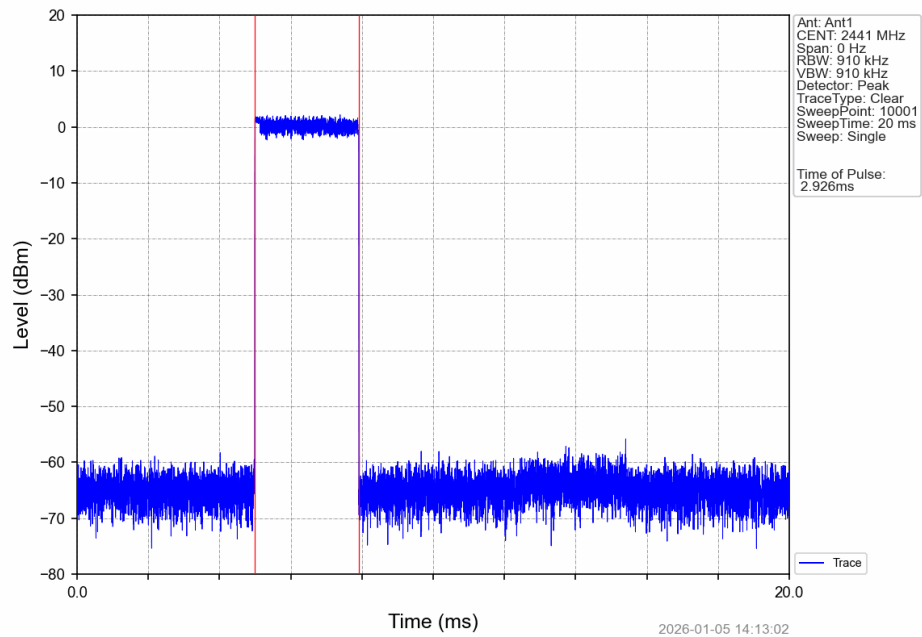
8DPSK_3DH3_HOPP_Ant1_NTNV



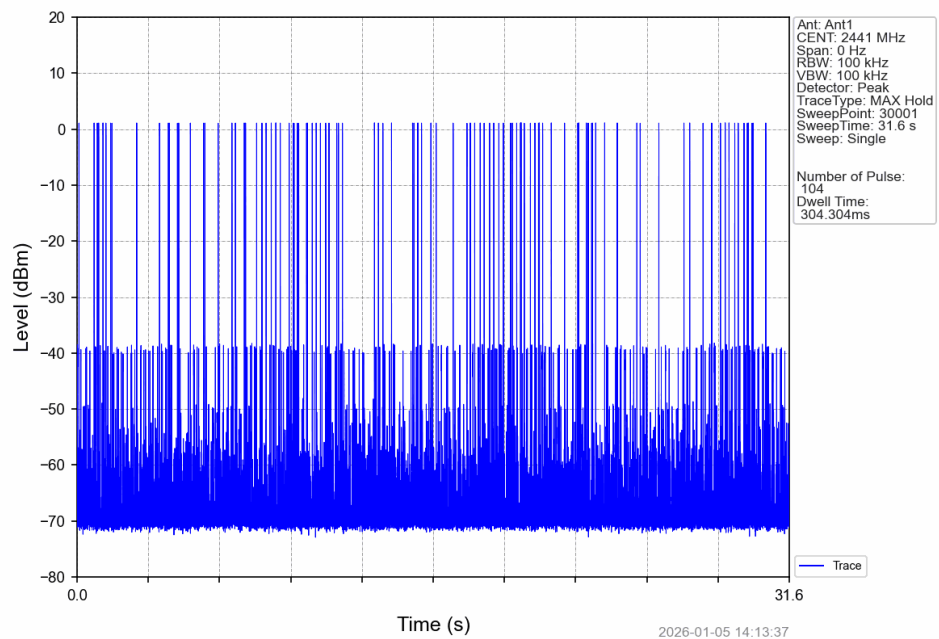
8DPSK_3DH3_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

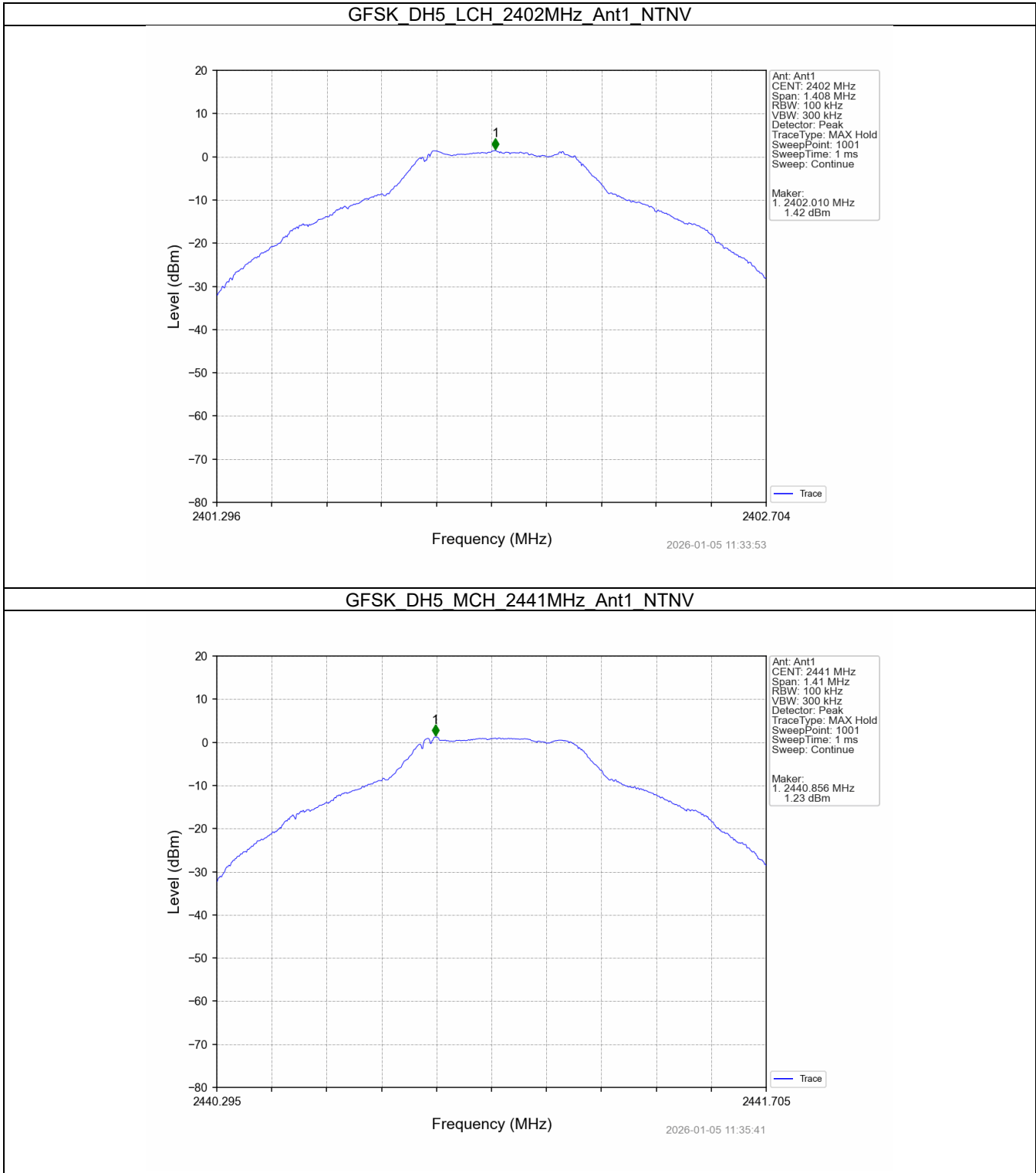
Mode	Tx Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	1.42
		2441	DH5	1	1.23
		2480	DH5	1	0.65
		HOPP	DH5	1	1.35
					1.35
Pi/4DQPSK	SISO	2402	2DH5	1	1.54
		2441	2DH5	1	1.49
		2480	2DH5	1	0.69
		HOPP	2DH5	1	1.30
					1.30
8DPSK	SISO	2402	3DH5	1	1.44
		2441	3DH5	1	1.42
		2480	3DH5	1	0.68
		HOPP	3DH5	1	1.48
					1.48
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

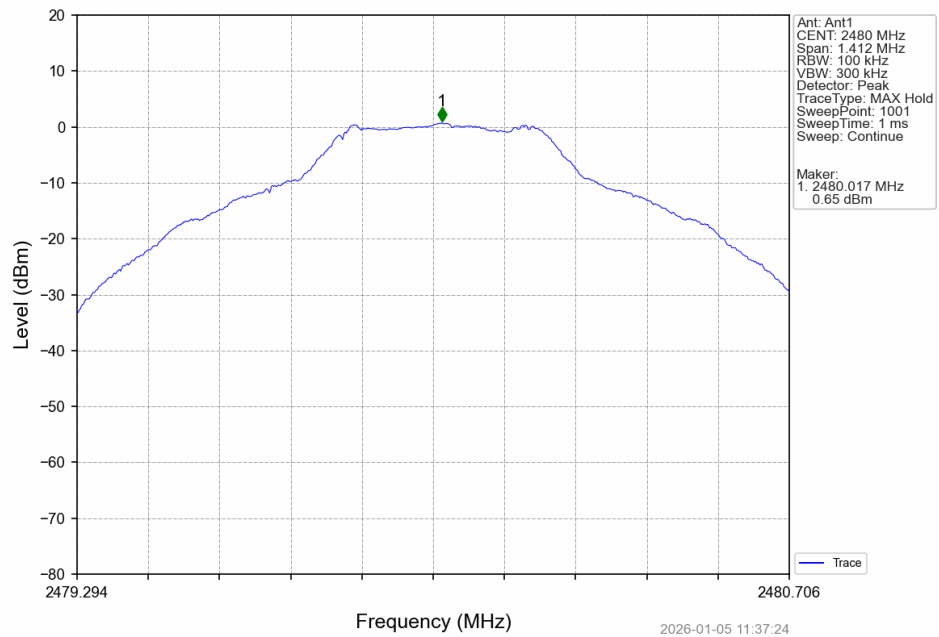
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	1.42	-18.58	Pass
		2441	DH5	1	1.23	-18.77	Pass
		2480	DH5	1	0.65	-19.35	Pass
		HOPP	DH5	1	1.35	-18.65	Pass
					1.35	-18.65	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.54	-18.46	Pass
		2441	2DH5	1	1.49	-18.51	Pass
		2480	2DH5	1	0.69	-19.31	Pass
		HOPP	2DH5	1	1.30	-18.70	Pass
					1.30	-18.70	Pass
8DPSK	SISO	2402	3DH5	1	1.44	-18.56	Pass
		2441	3DH5	1	1.42	-18.58	Pass
		2480	3DH5	1	0.68	-19.32	Pass
		HOPP	3DH5	1	1.48	-18.52	Pass
					1.48	-18.52	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

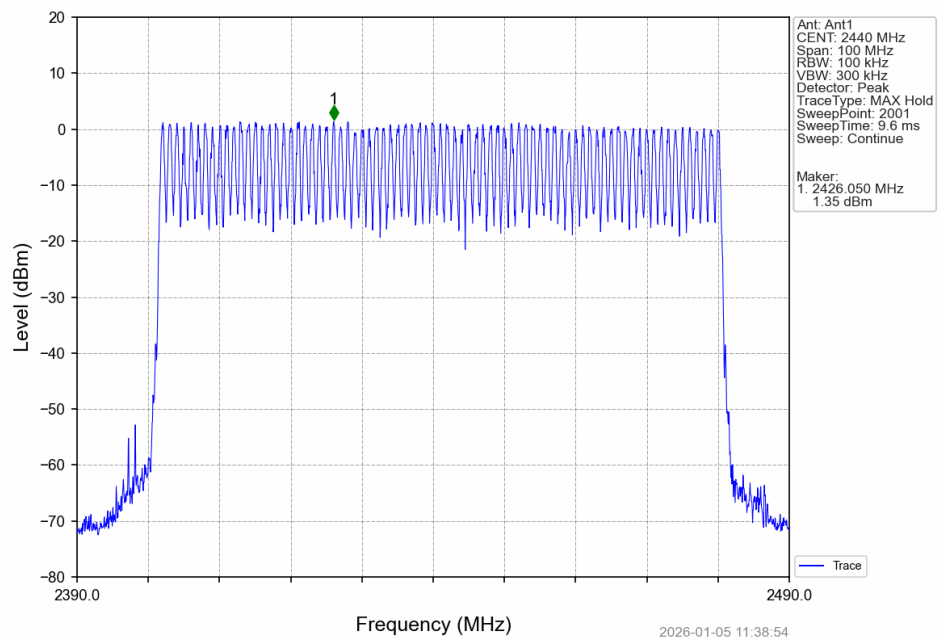
7.2.1 Ref



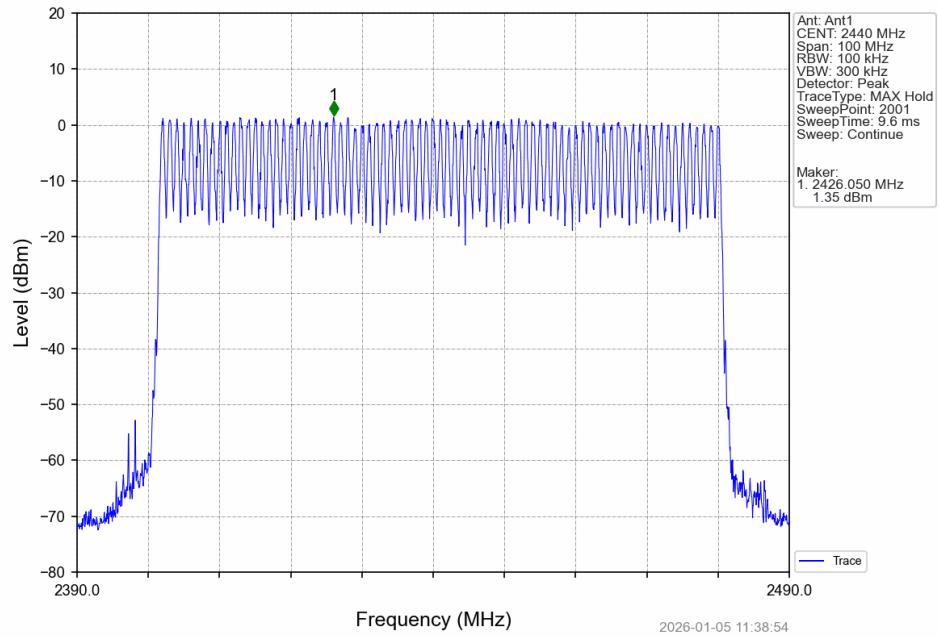
GFSK DH5_HCH_2480MHz_Ant1_NTNV



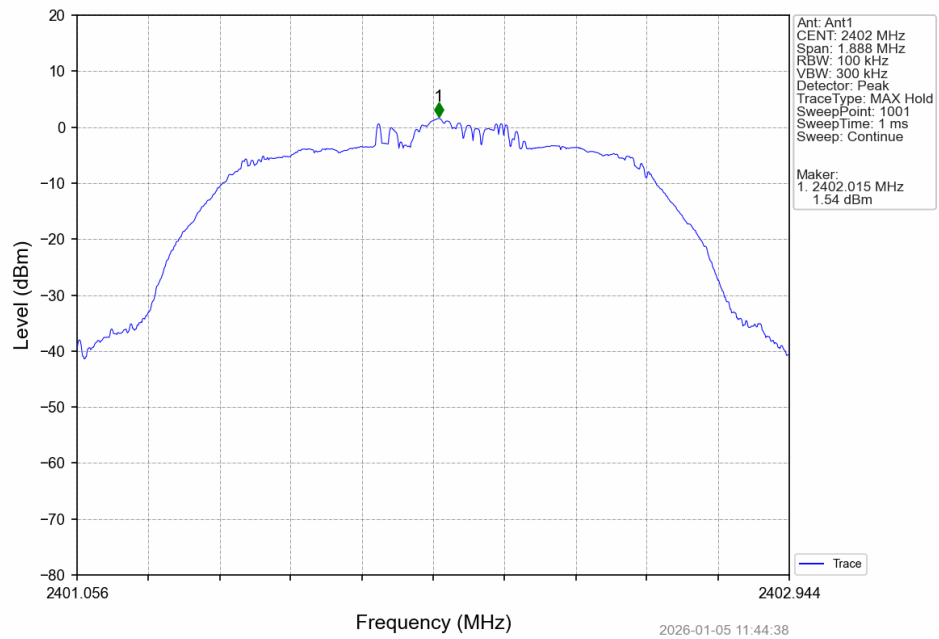
GFSK_DH5_HOPP_Ant1_NTNV



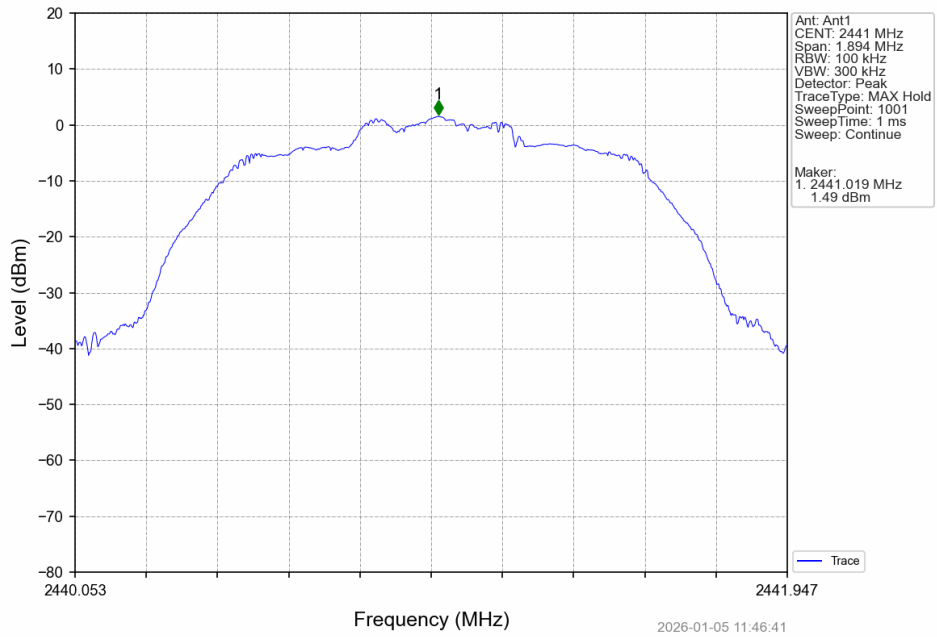
GFSK_DH5_HOPP_Ant1_NTNV



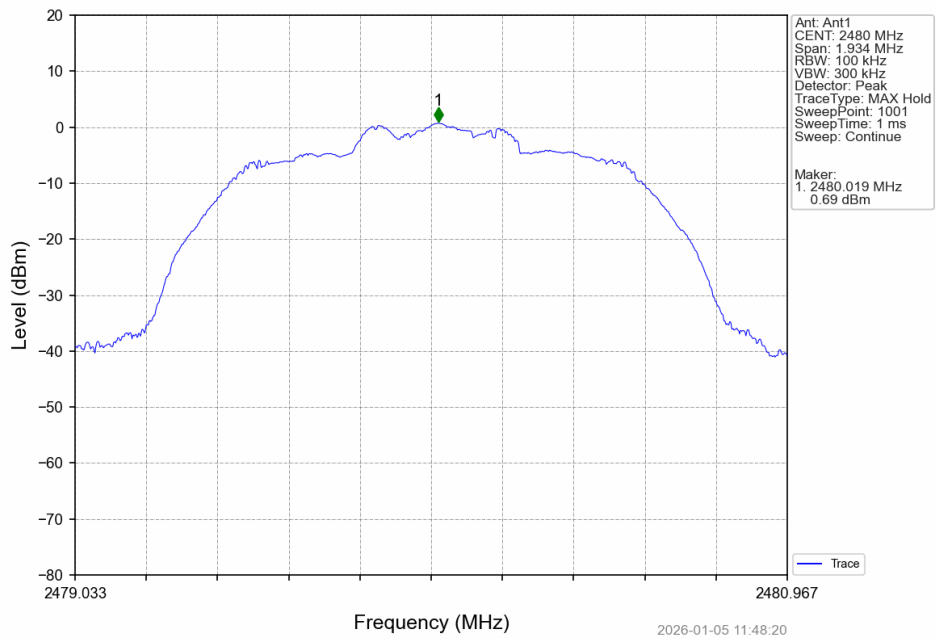
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



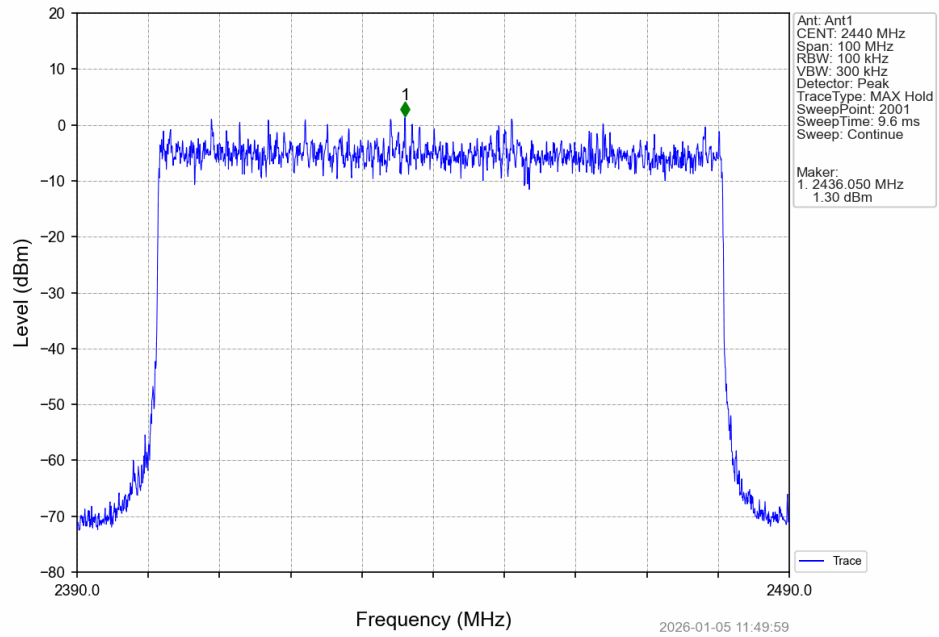
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



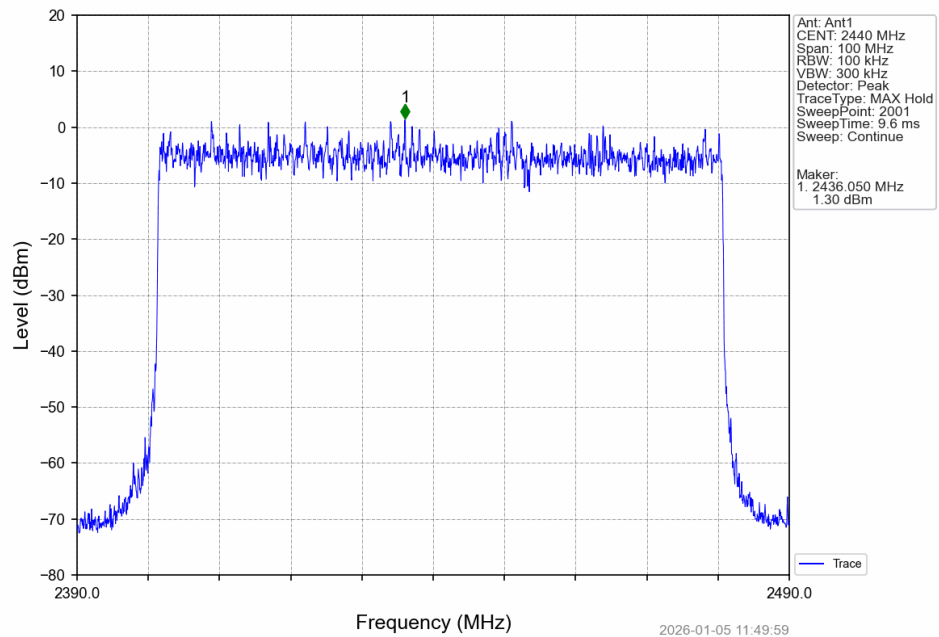
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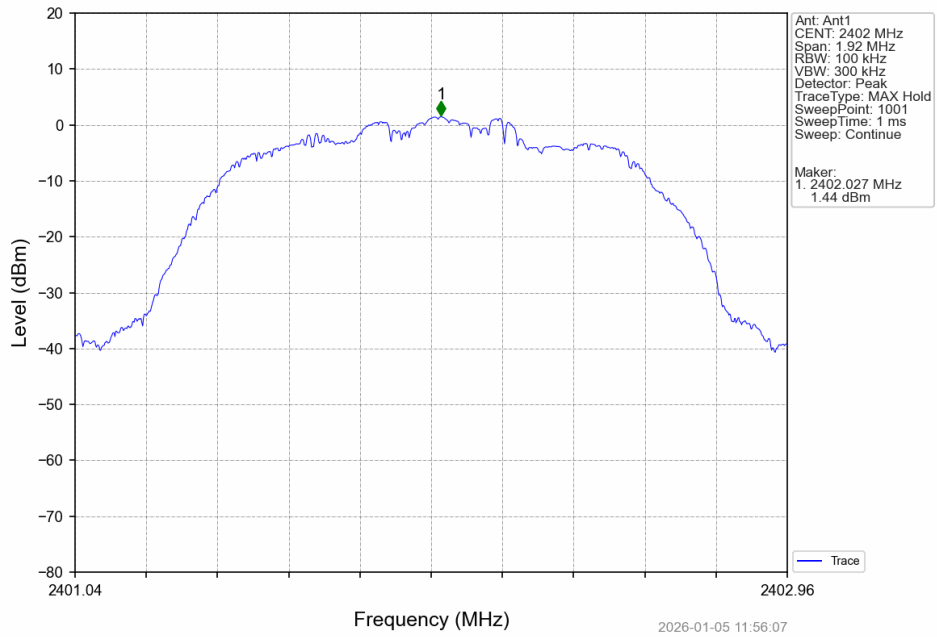
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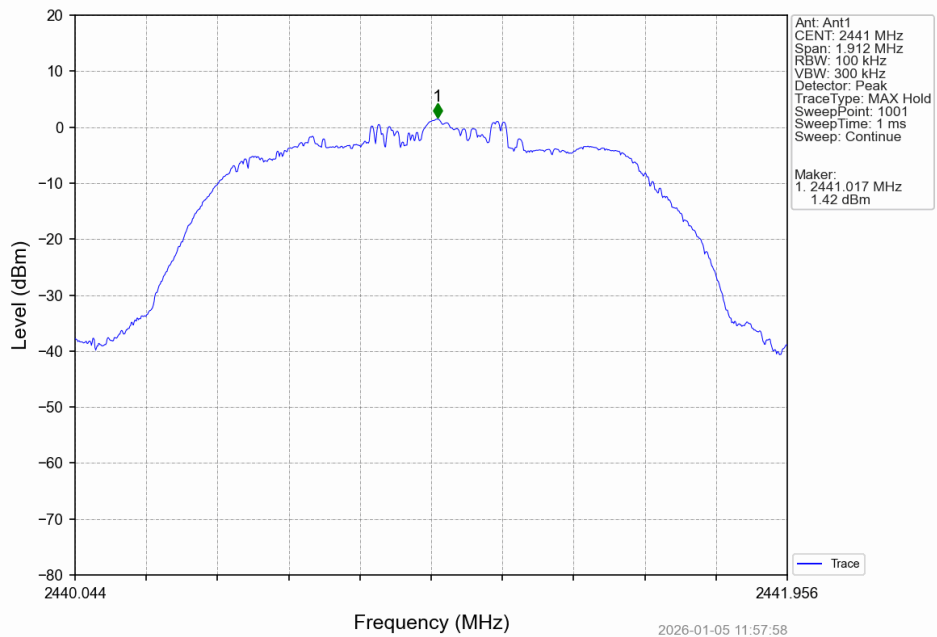
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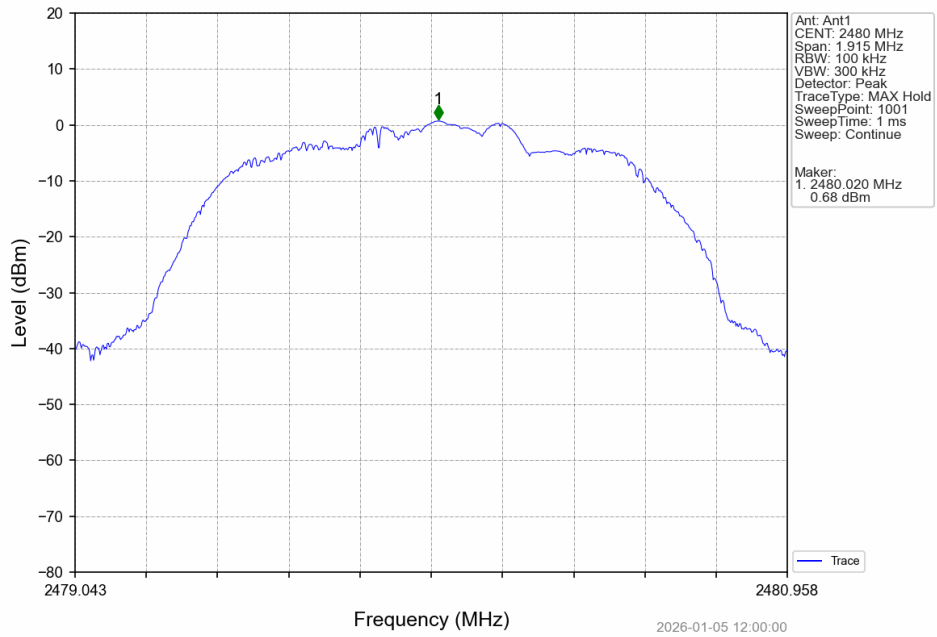
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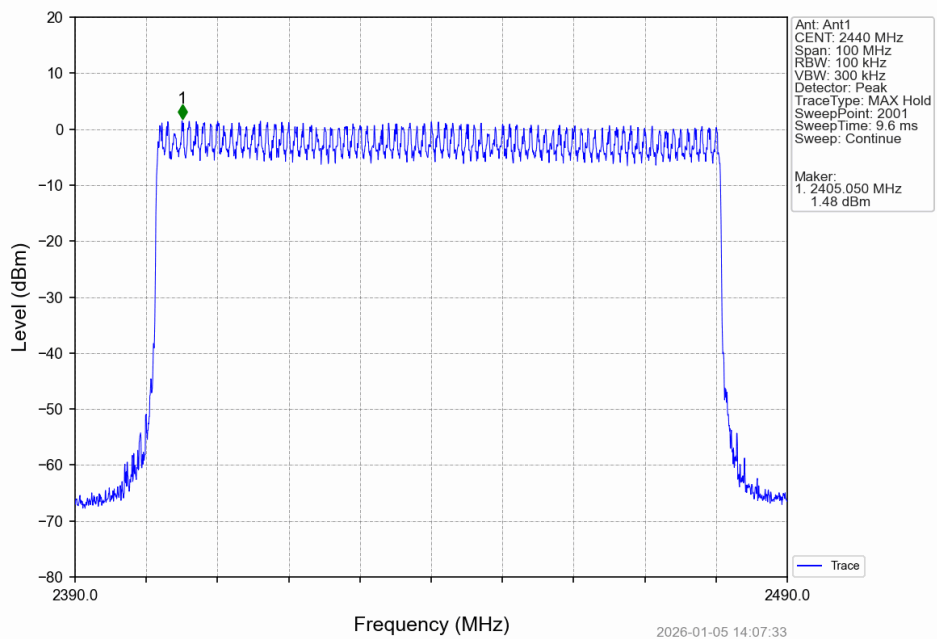
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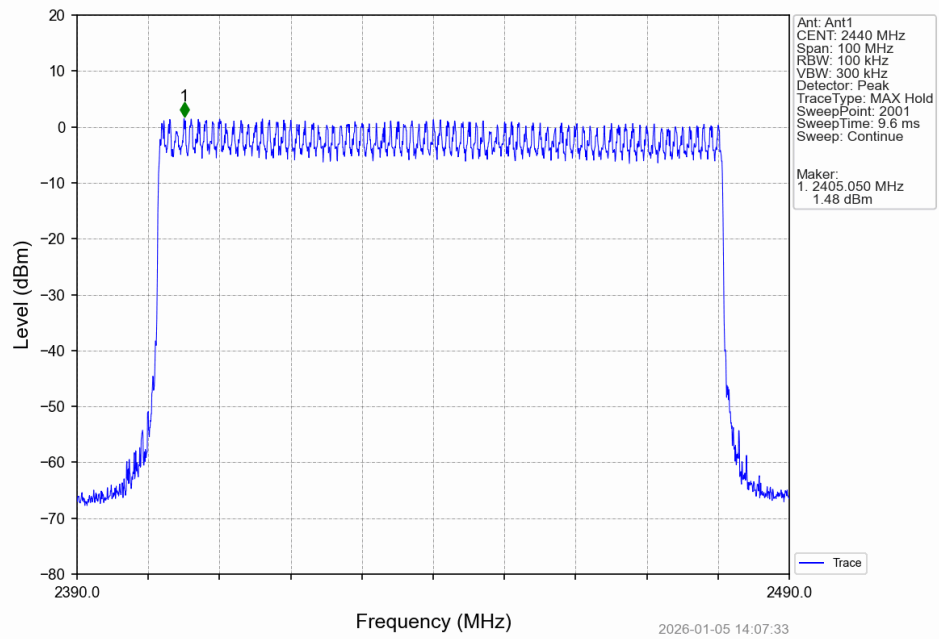
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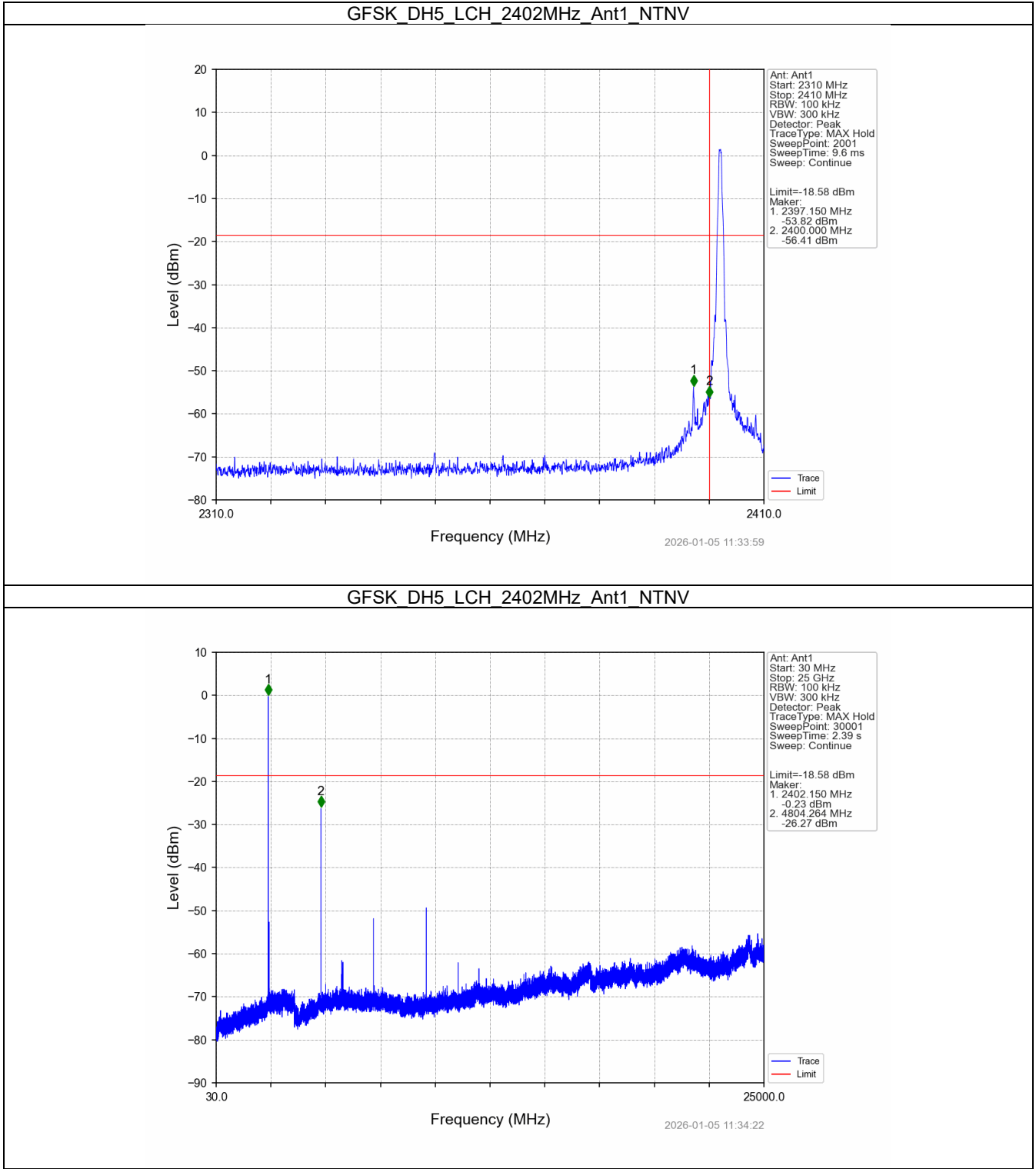
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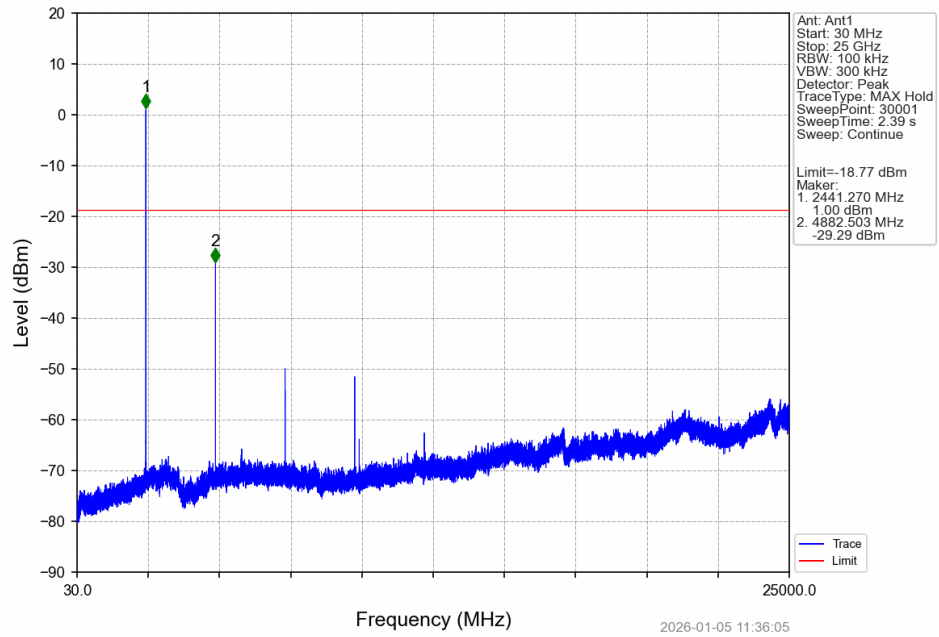
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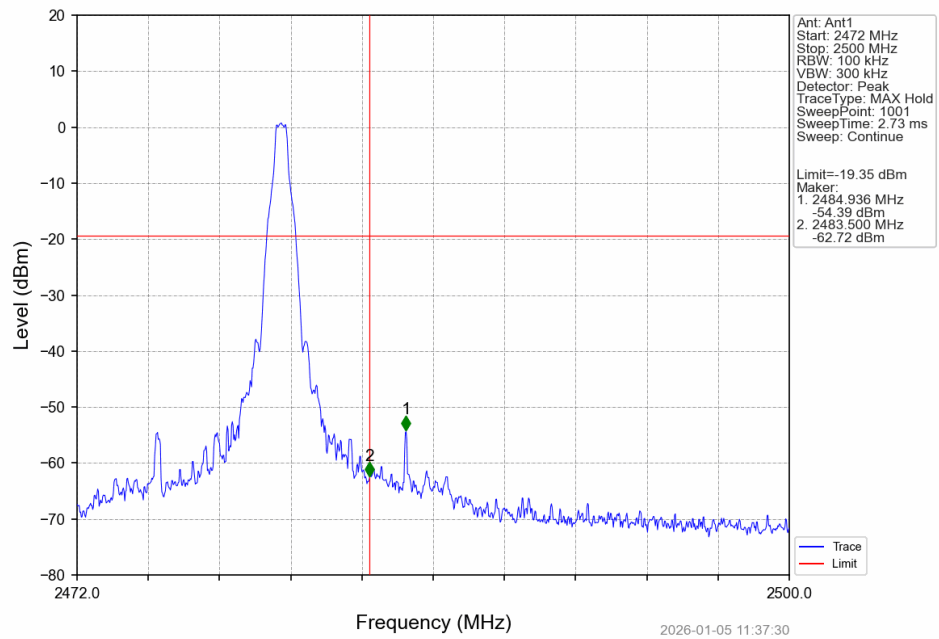
7.2.2 CSE



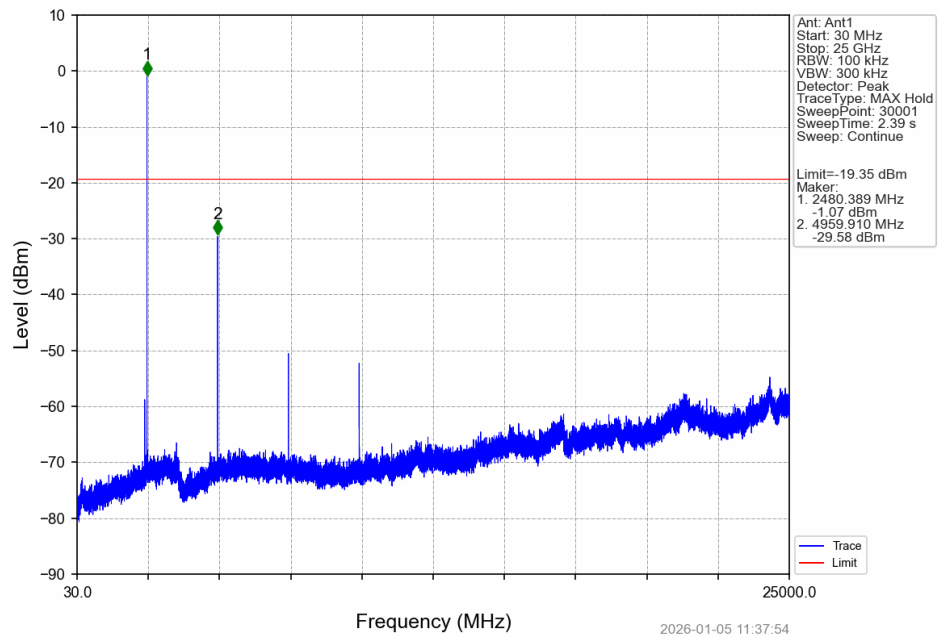
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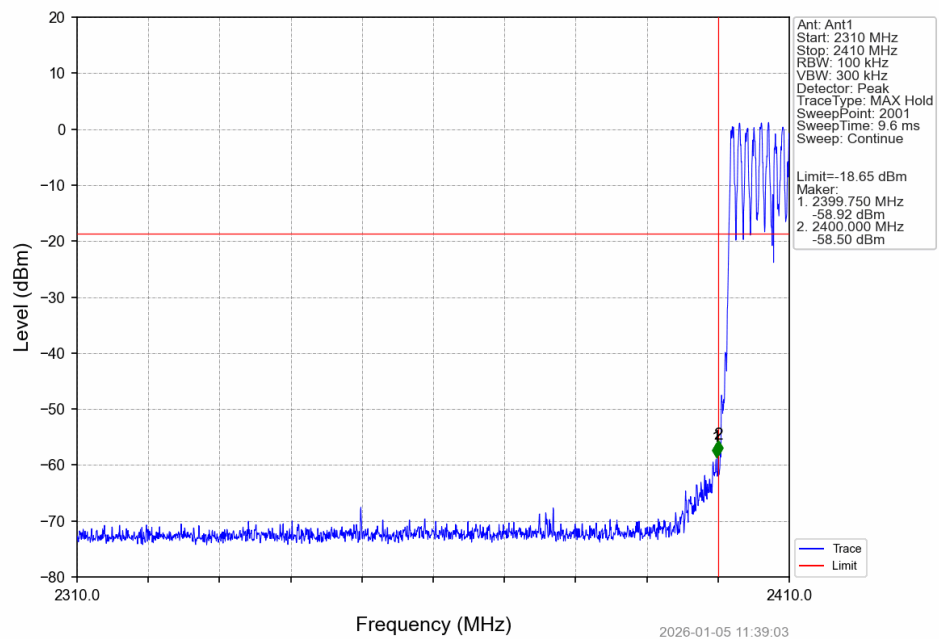
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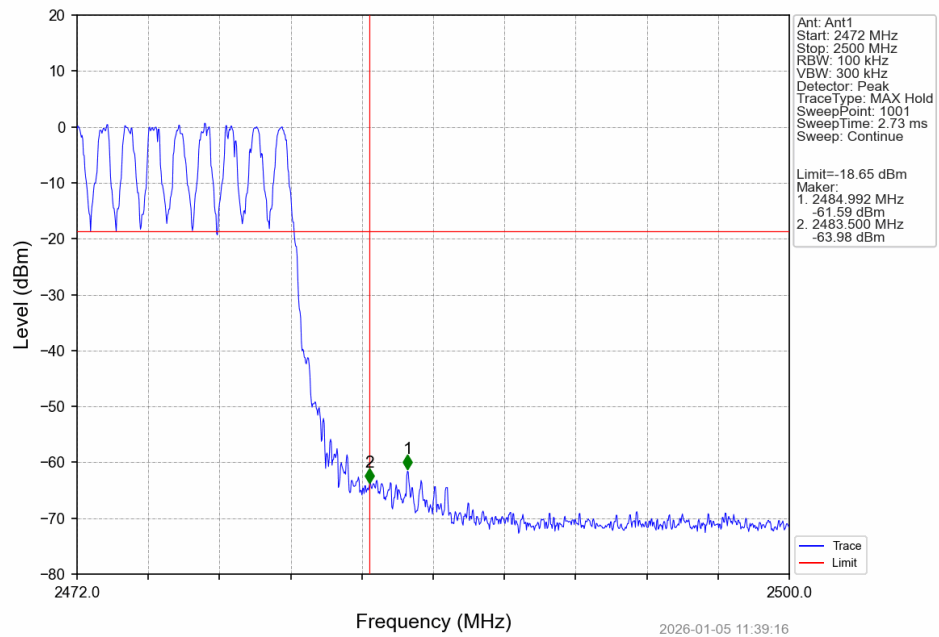
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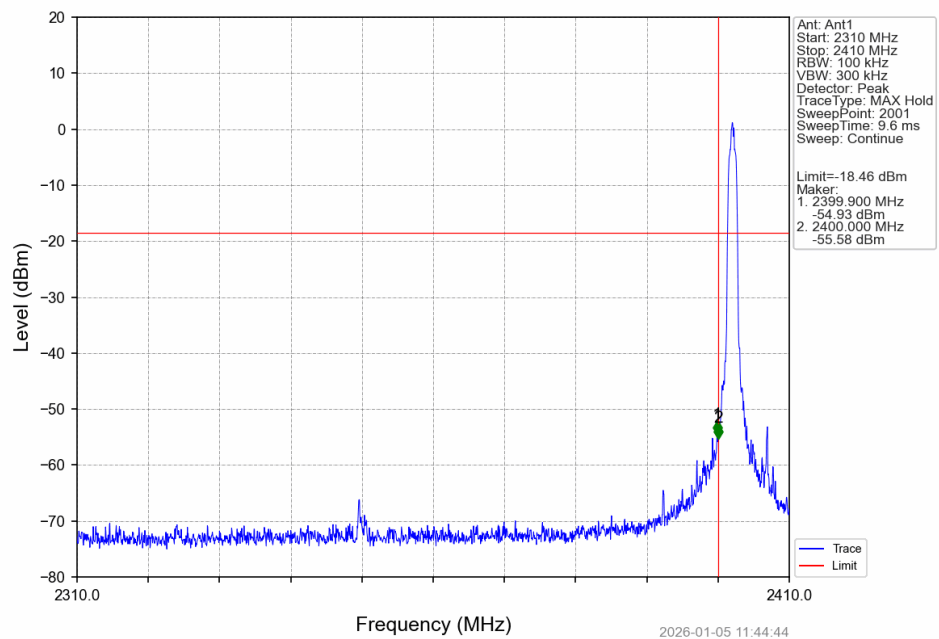
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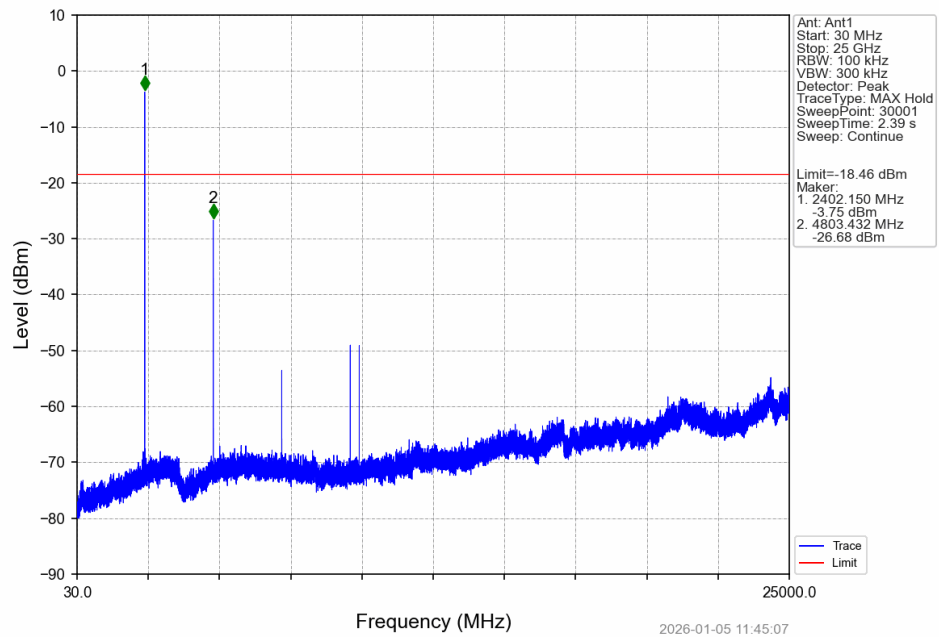
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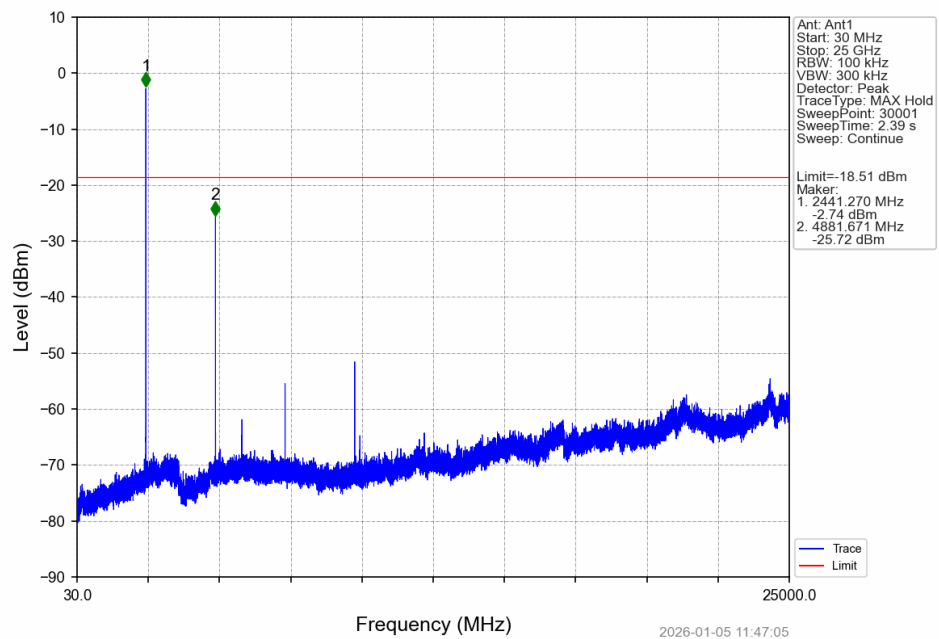
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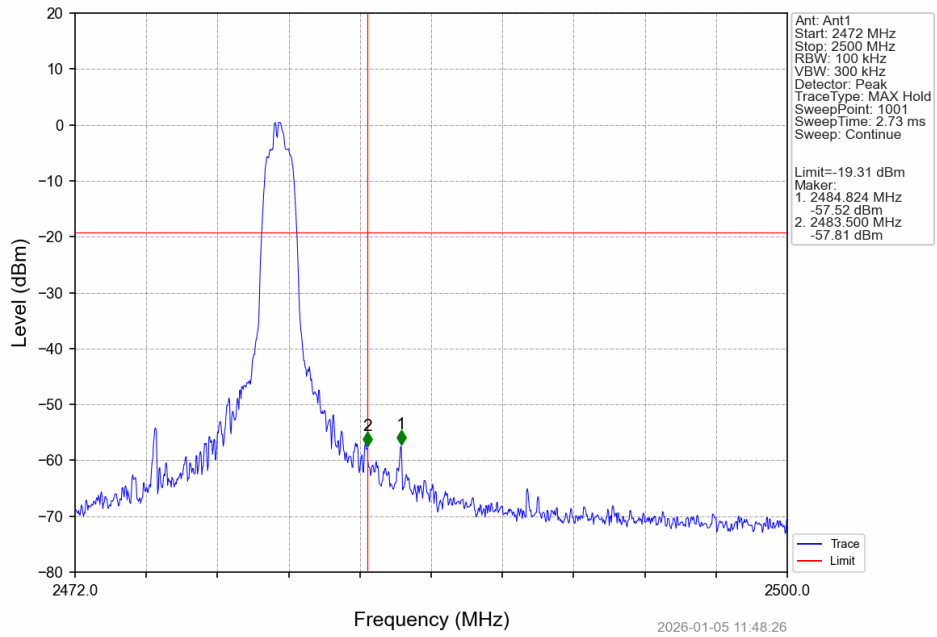
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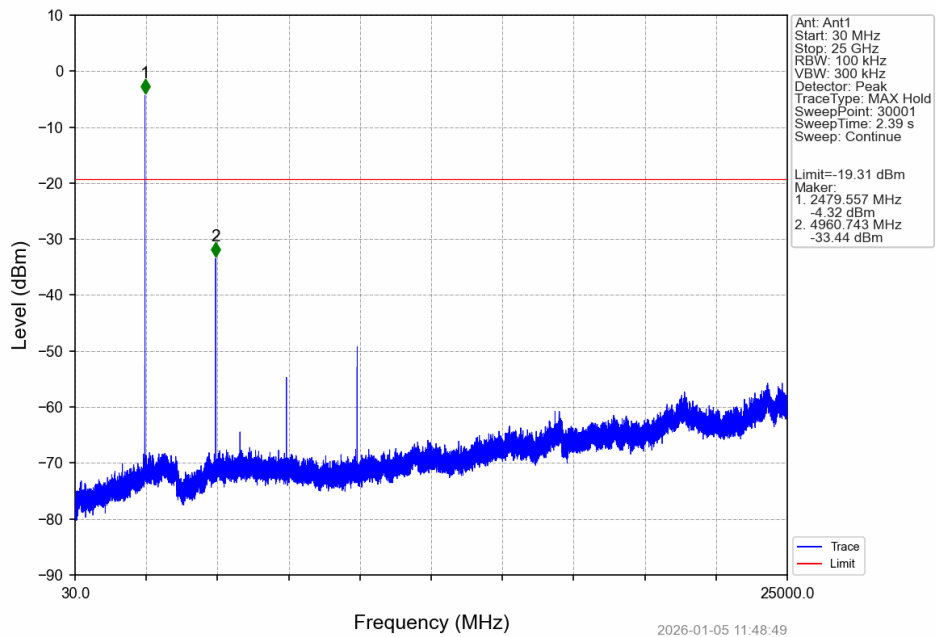
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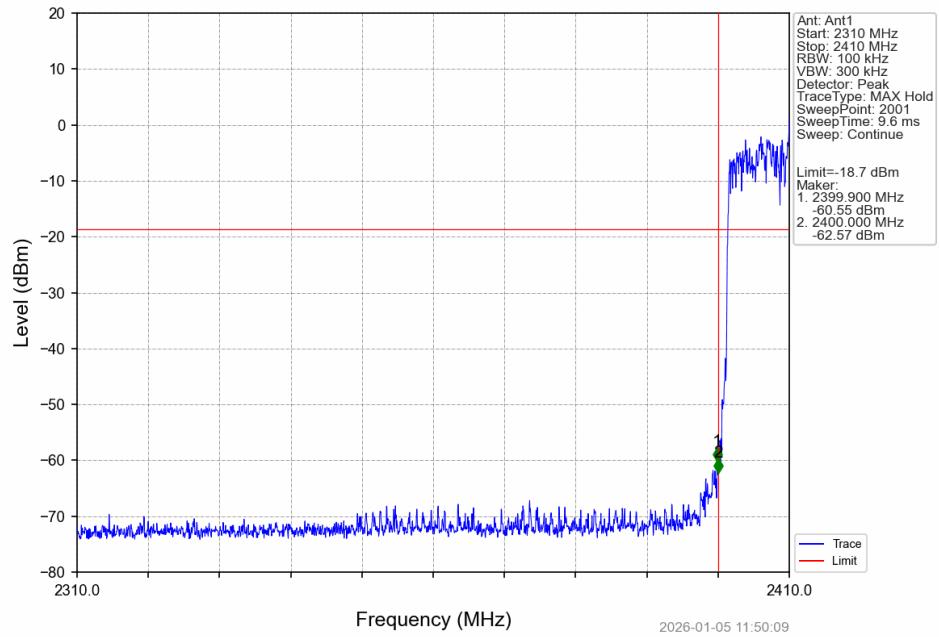
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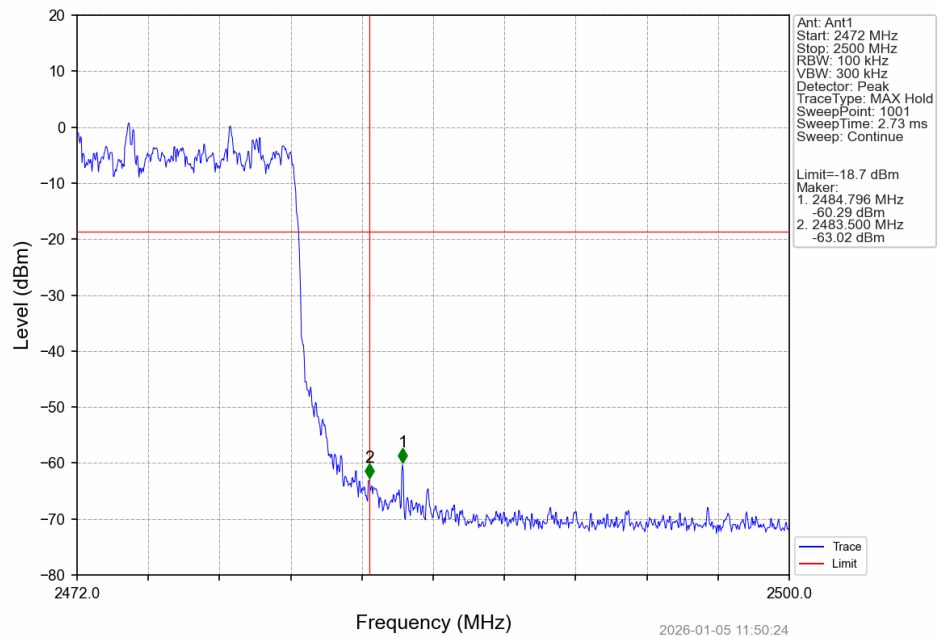
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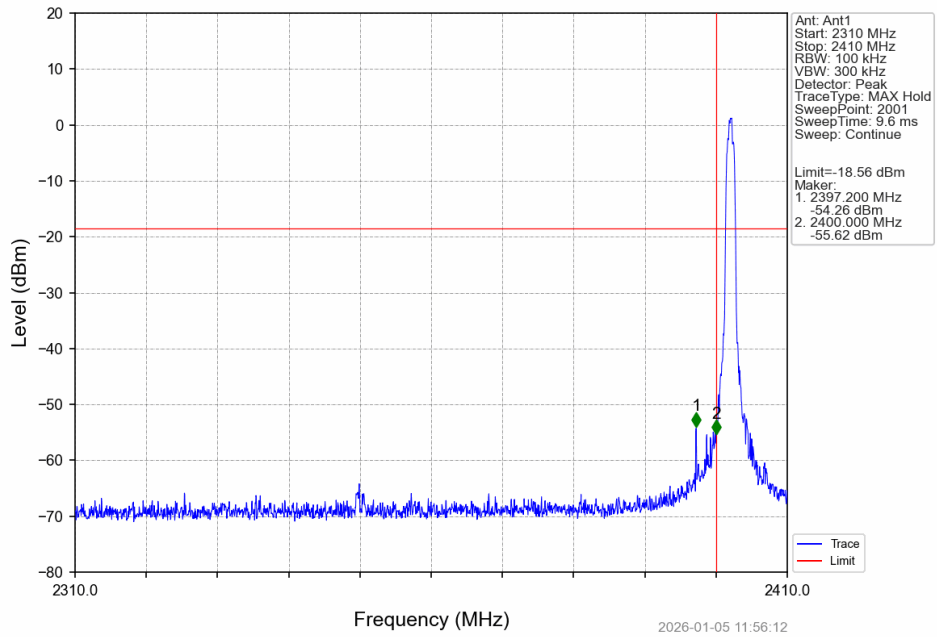
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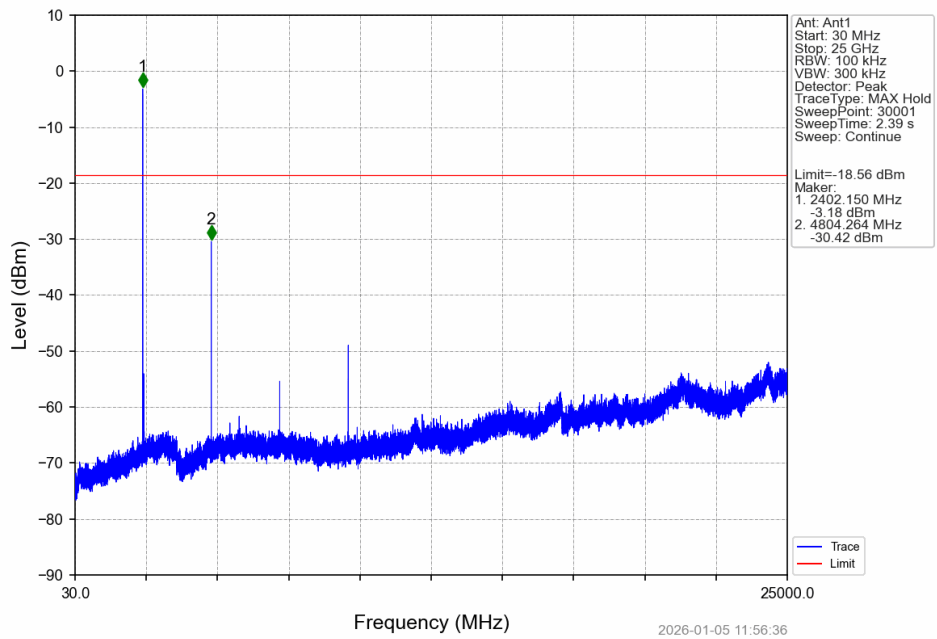
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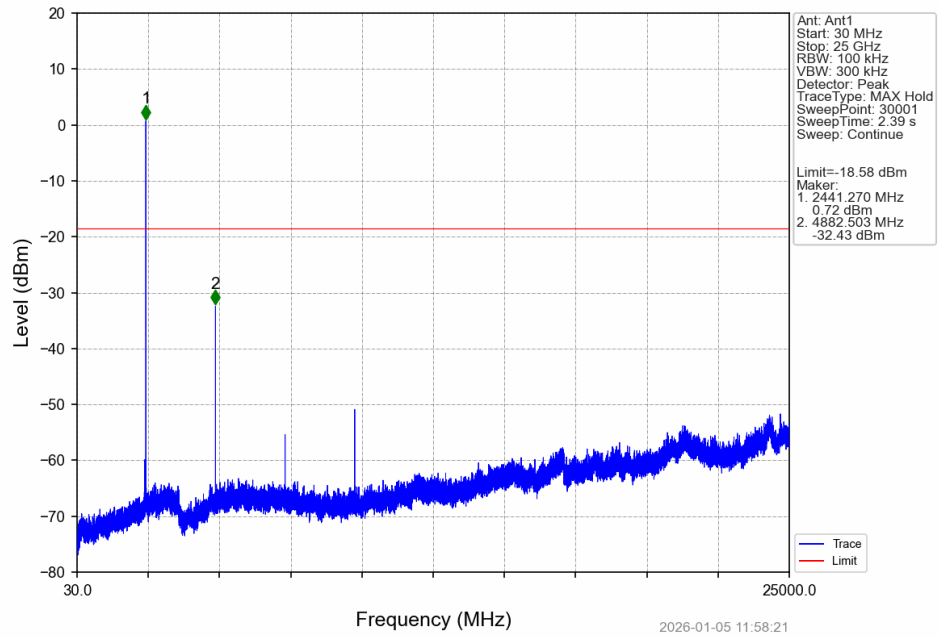
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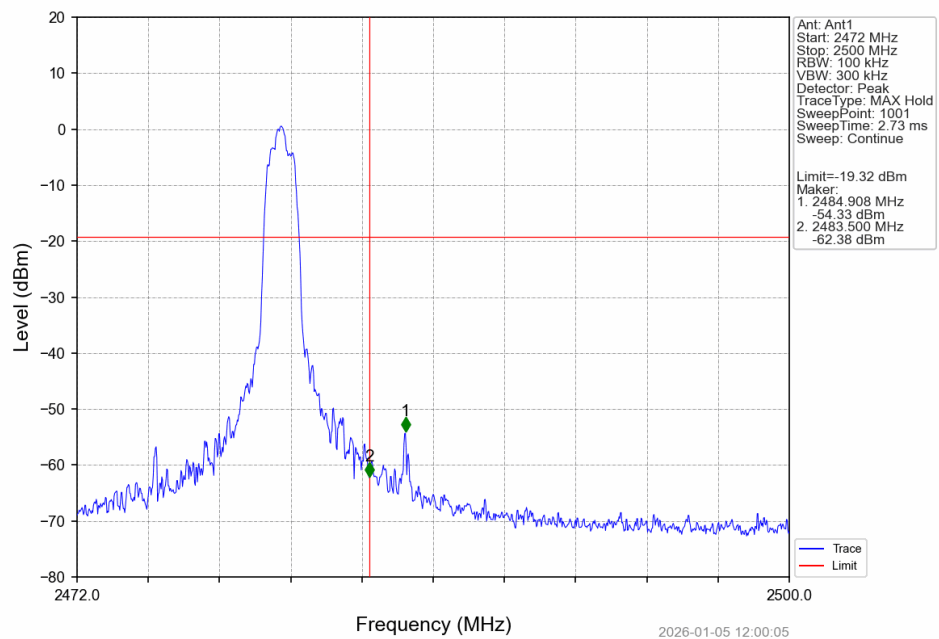
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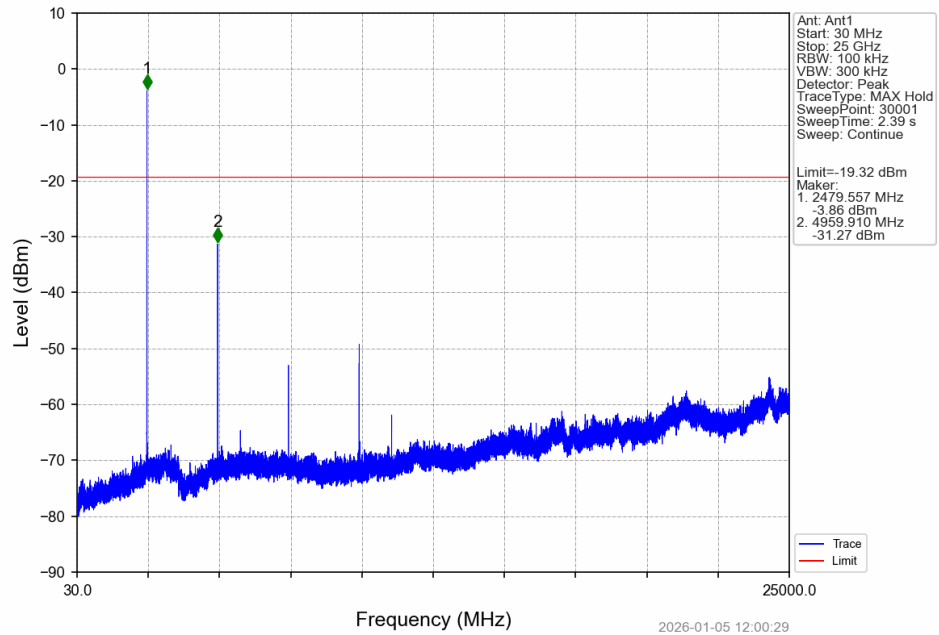
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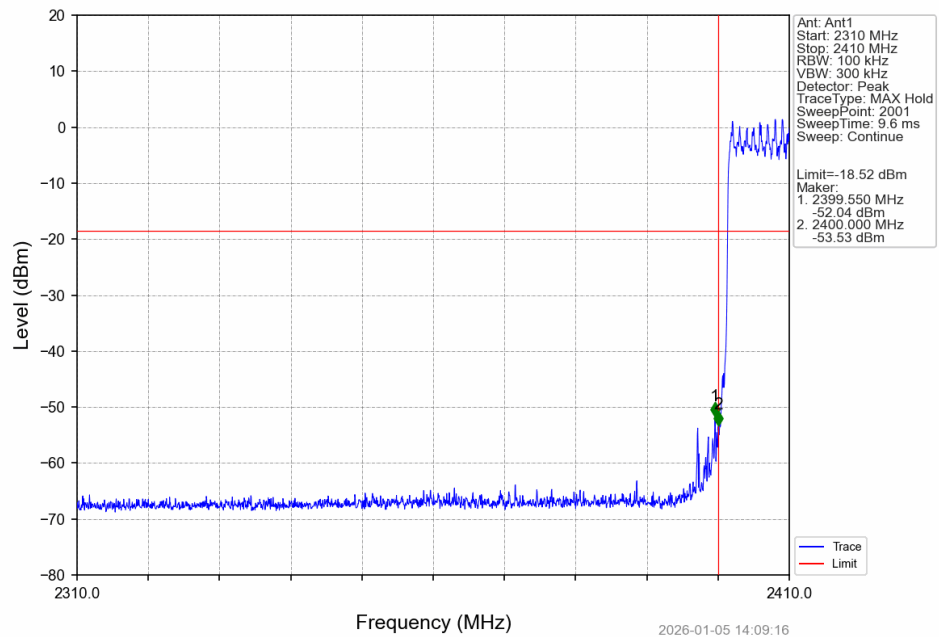
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8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV

