

Appendix RF Test Data for BT

Company: : Lithium Revolution LLC

EUT : Rhino LCD Instrument

FCC ID: : 2BM2U-RHINOSCREEN

Model Number : Rhino screen

Report No. : HTT202512147F02

Reviewed By : Heber He

Bluetooth Module 1:

1. Duty Cycle

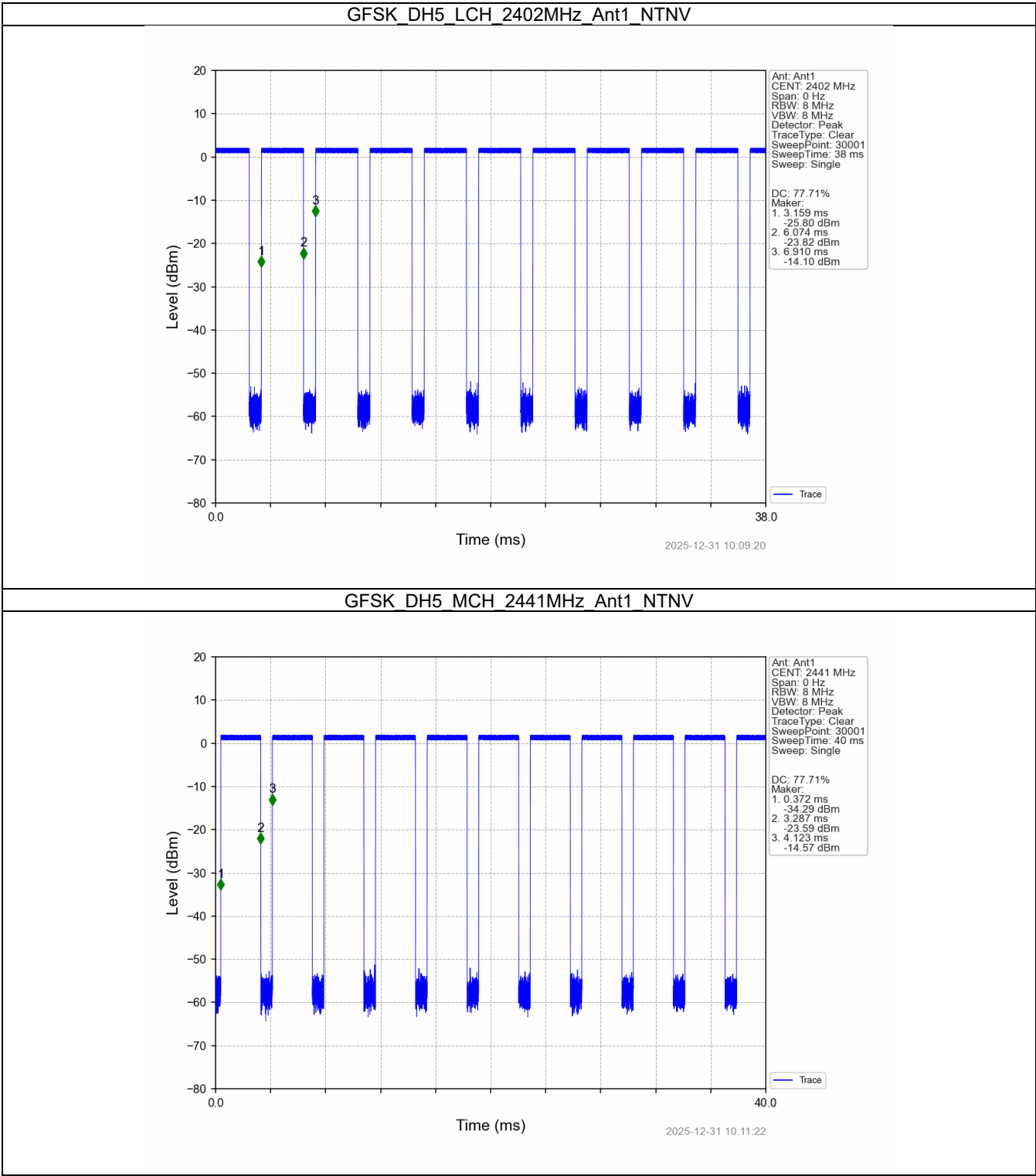
1.1 Test Result

1.1.1 Ant1

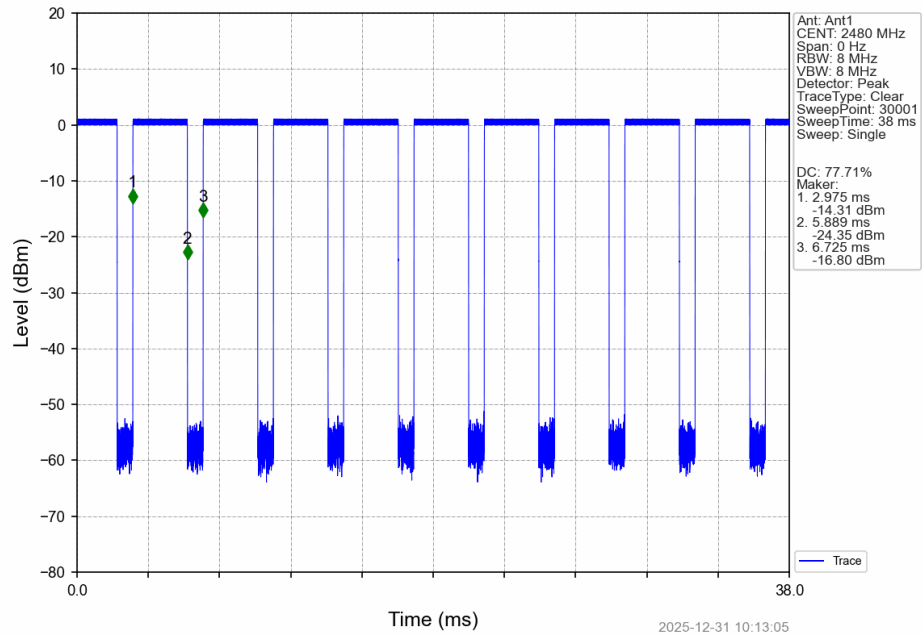
Ant1								
Mode	TX Type	Frequency (MHz)	Packet Type	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.915	3.751	77.71	1.10	0.03
		2441	DH5	2.915	3.751	77.71	1.10	0.03
		2480	DH5	2.914	3.750	77.71	1.10	0.03
Pi/4DQPSK	SISO	2402	2DH5	2.919	3.749	77.86	1.09	0.01
		2441	2DH5	2.921	3.751	77.87	1.09	0.03
		2480	2DH5	2.920	3.749	77.89	1.09	0.01

1.2 Test Graph

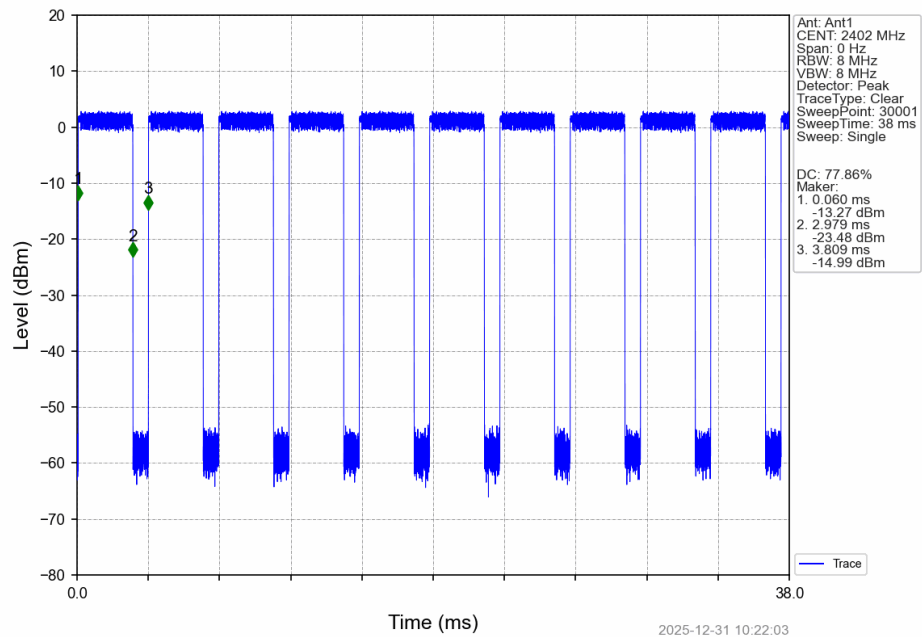
1.2.1 Ant1



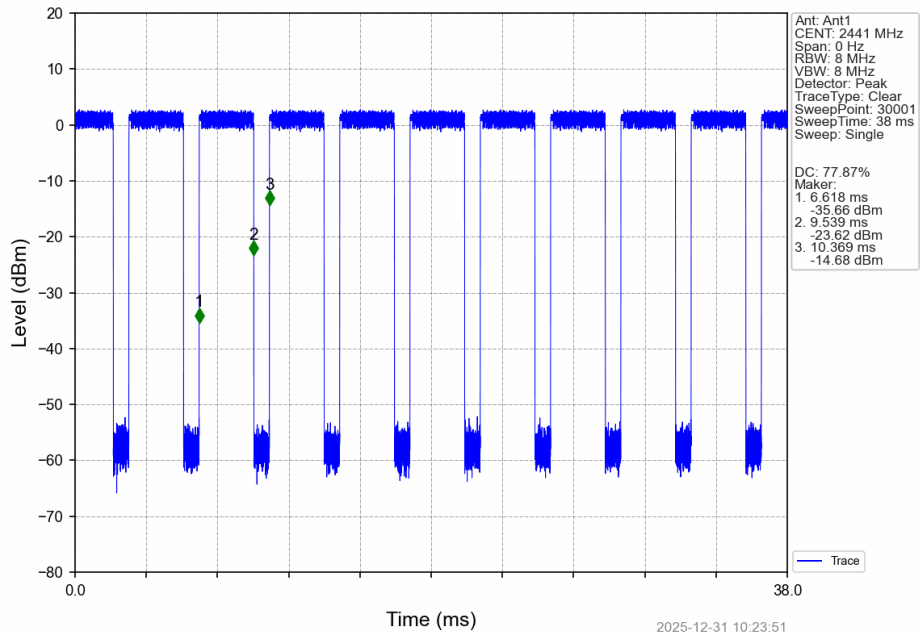
GFSK DH5_HCH_2480MHz_Ant1_NTNV



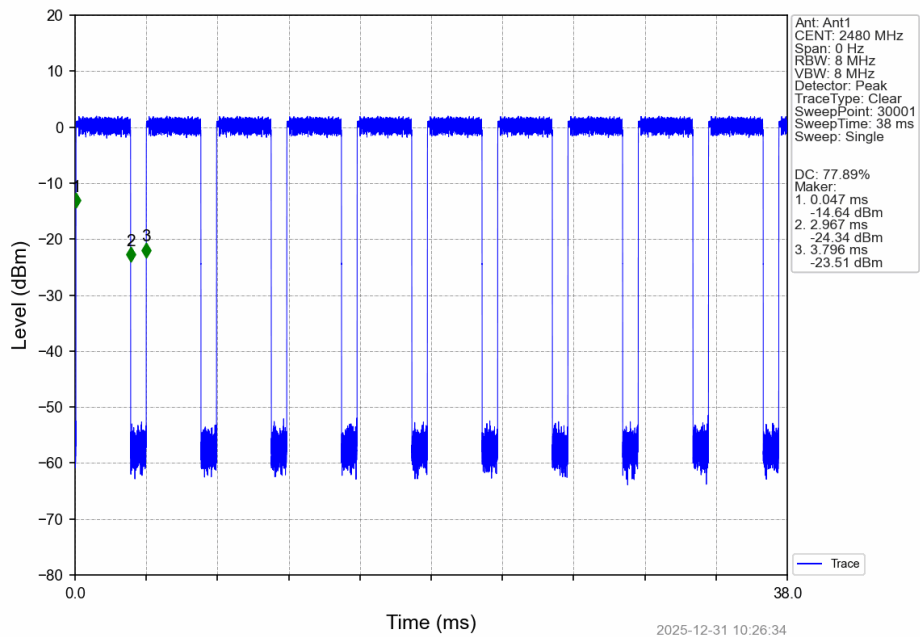
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

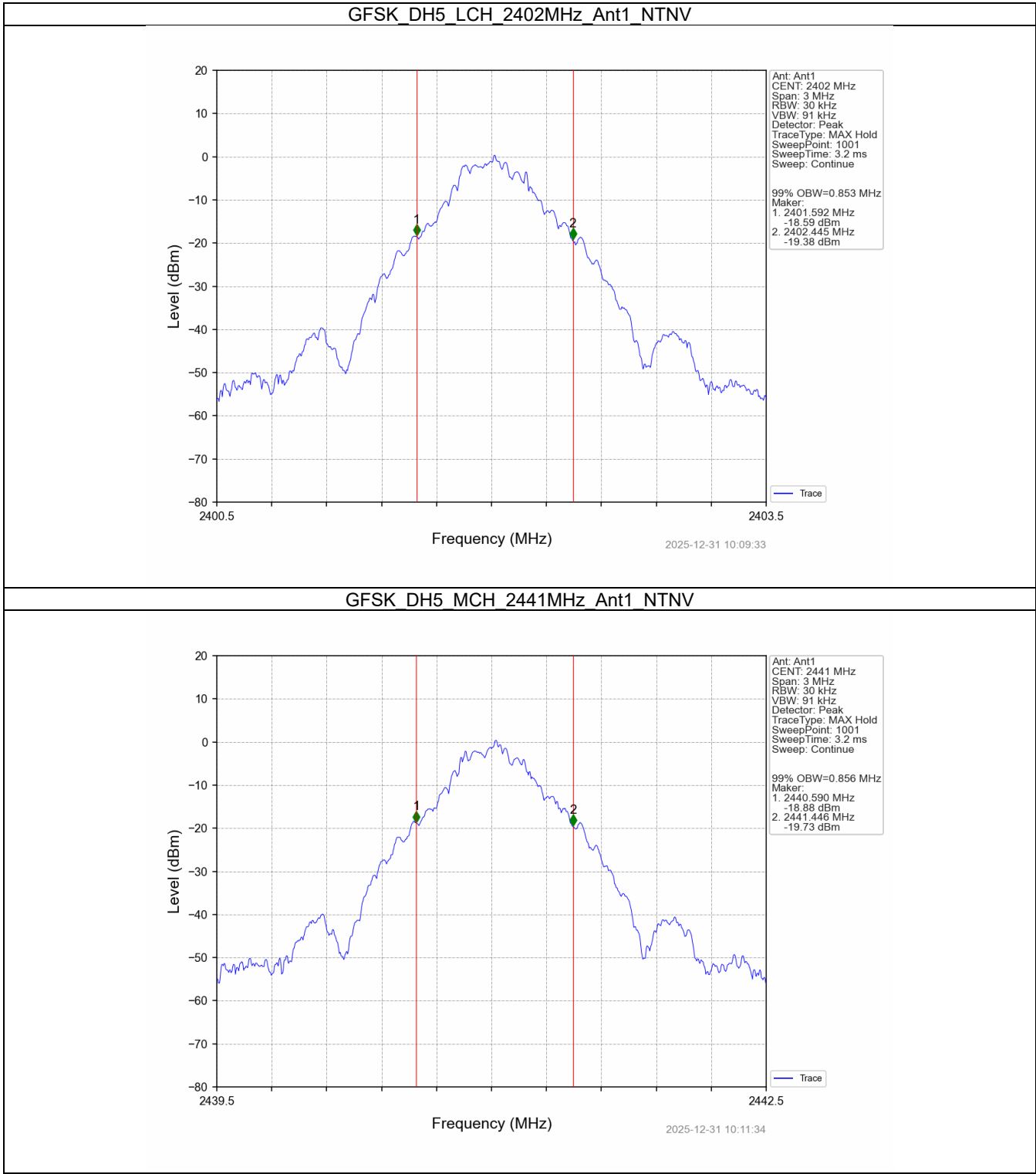
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.853	/	Pass
		2441	DH5	1	0.856	/	Pass
		2480	DH5	1	0.849	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.150	/	Pass
		2441	2DH5	1	1.146	/	Pass
		2480	2DH5	1	1.152	/	Pass

2.1.2 20dB BW

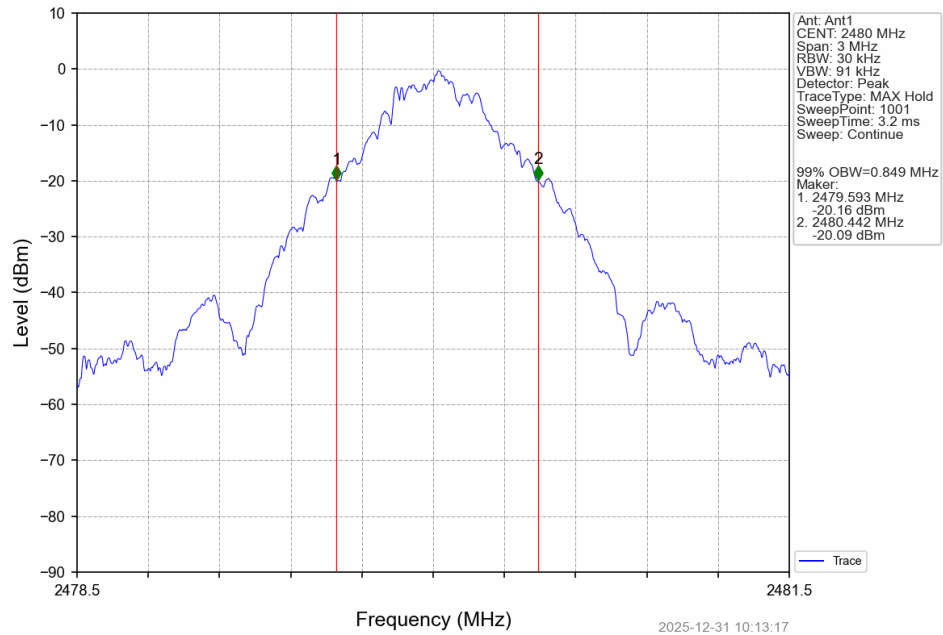
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.957	/	Pass
		2441	DH5	1	0.954	/	Pass
		2480	DH5	1	0.937	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.251	/	Pass
		2441	2DH5	1	1.316	/	Pass
		2480	2DH5	1	1.258	/	Pass

2.2 Test Graph

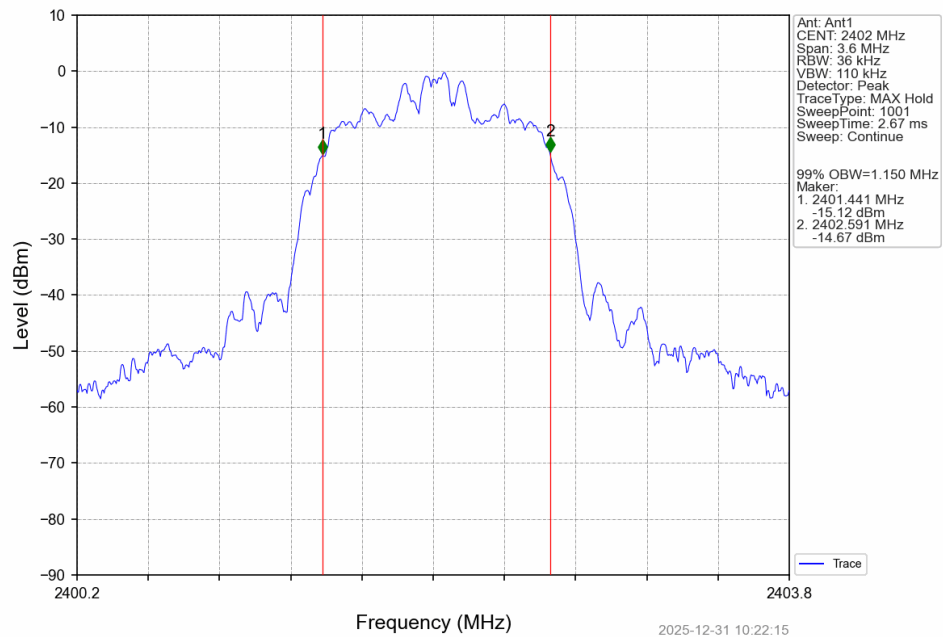
2.2.1 OBW



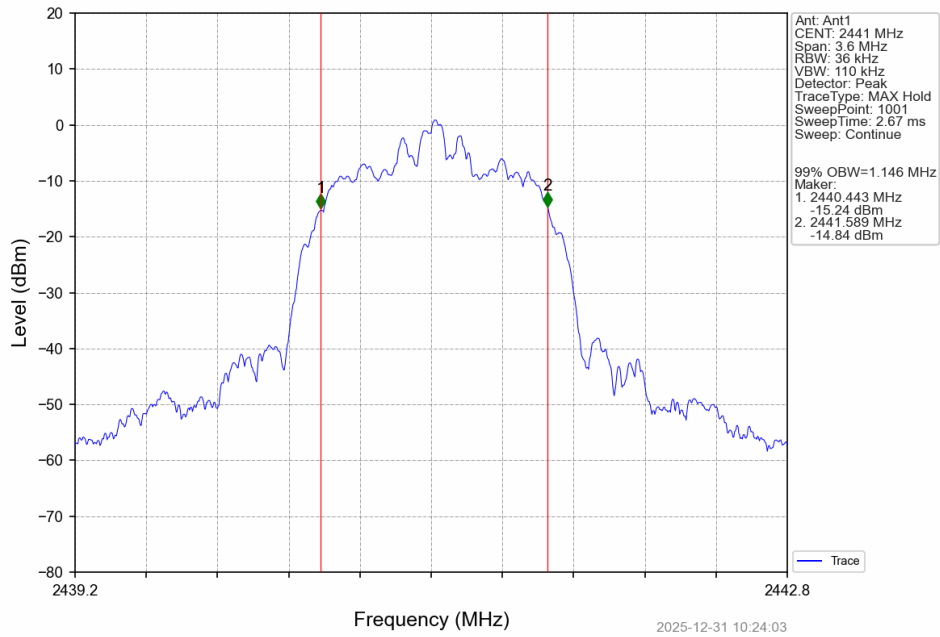
GFSK DH5_HCH_2480MHz_Ant1_NTNV



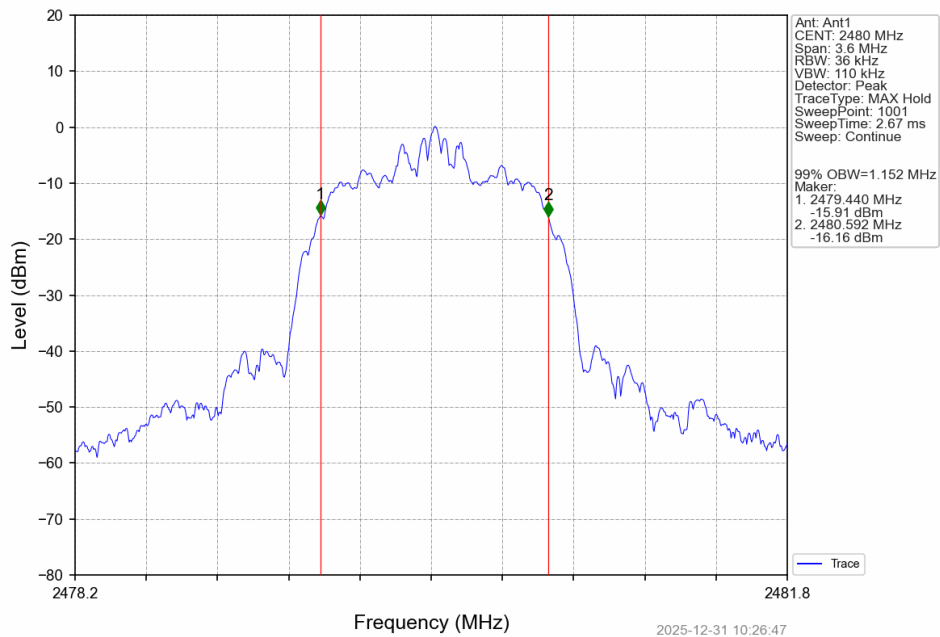
PI/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



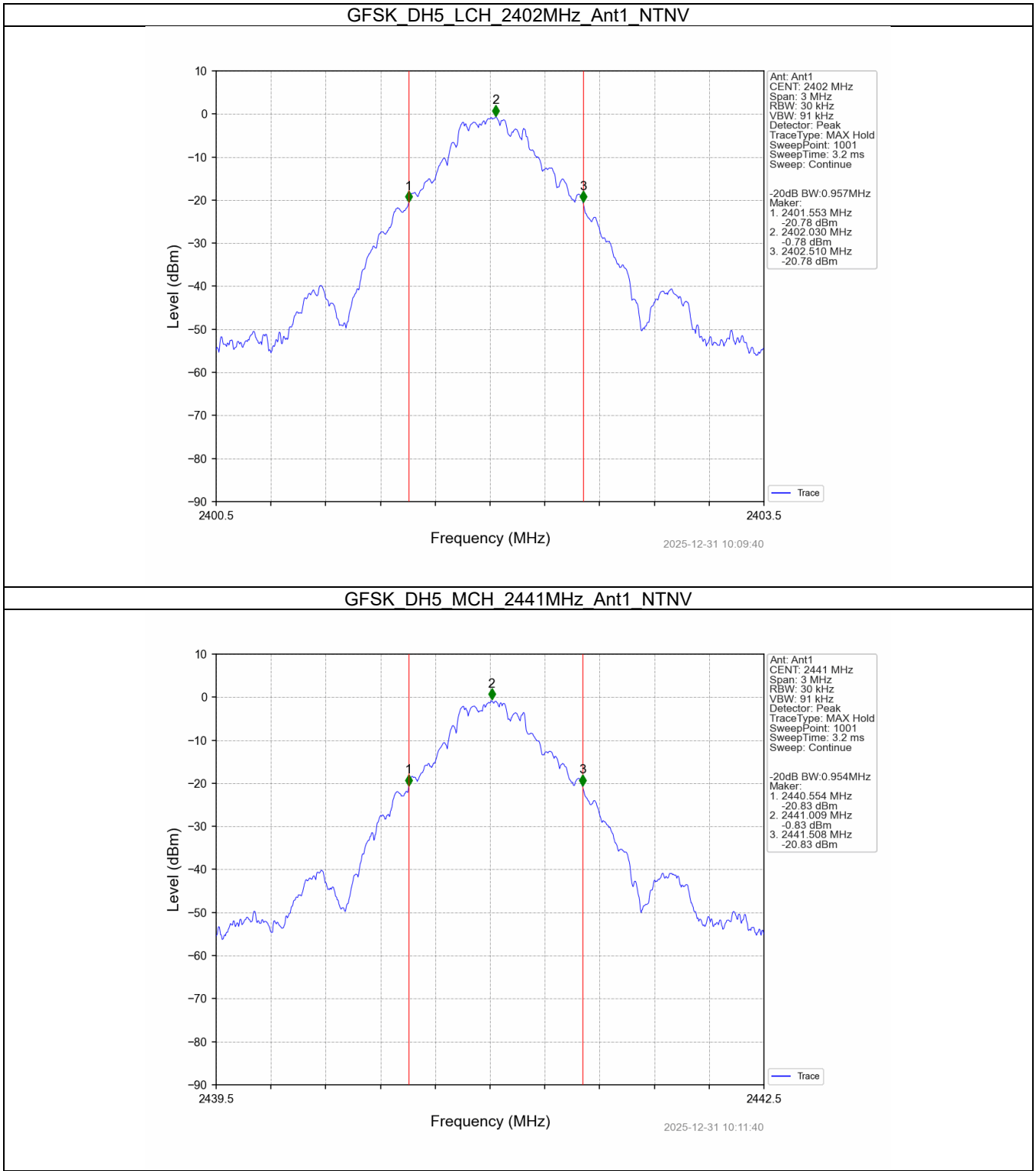
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



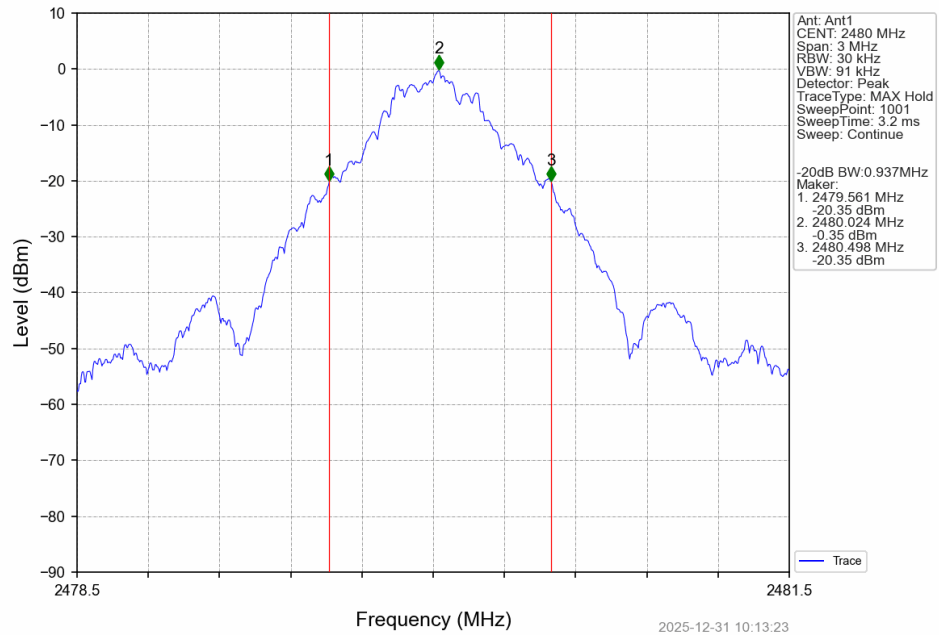
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



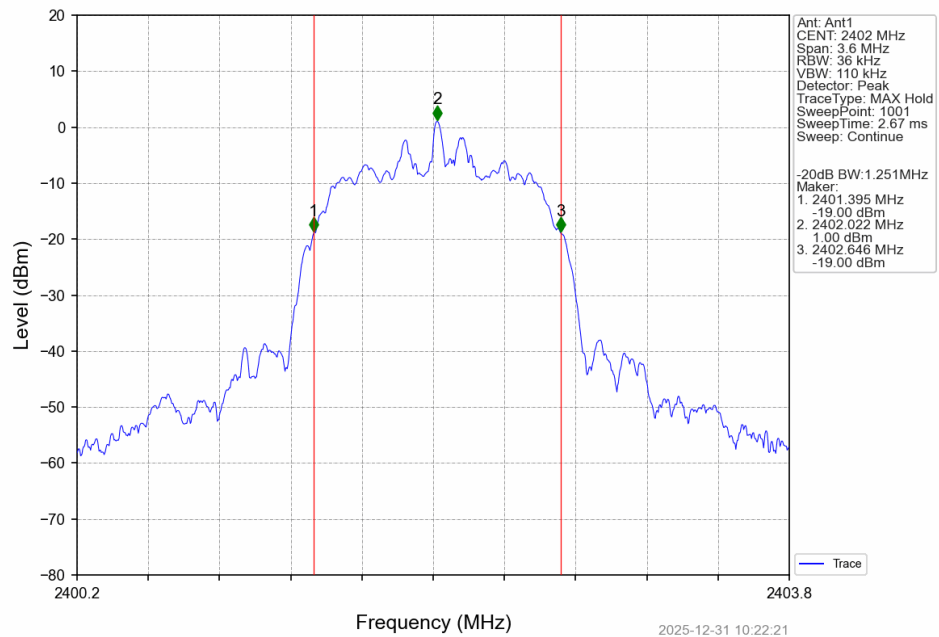
2.2.2 20dB BW



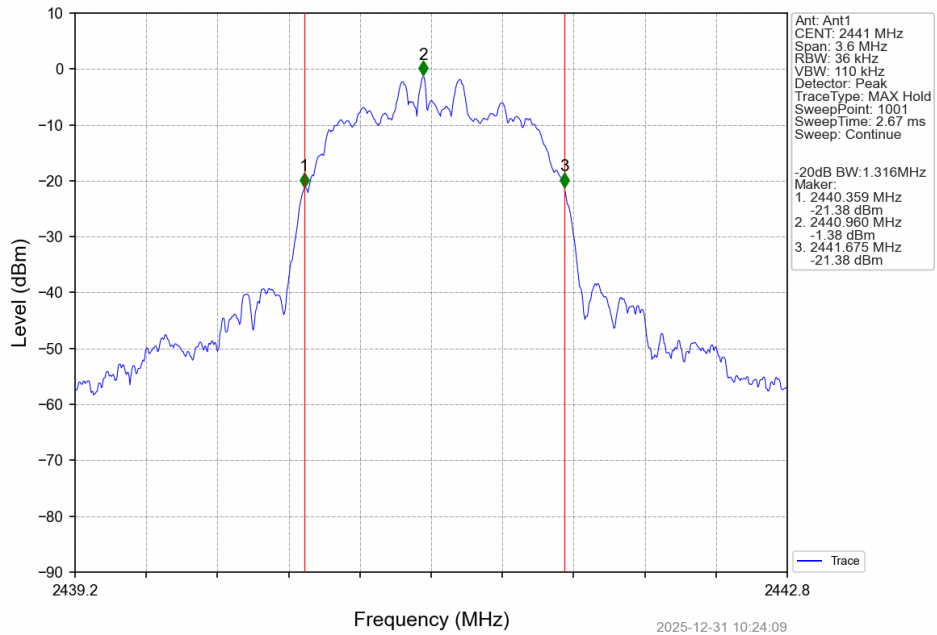
GFSK DH5_HCH_2480MHz_Ant1_NTNV



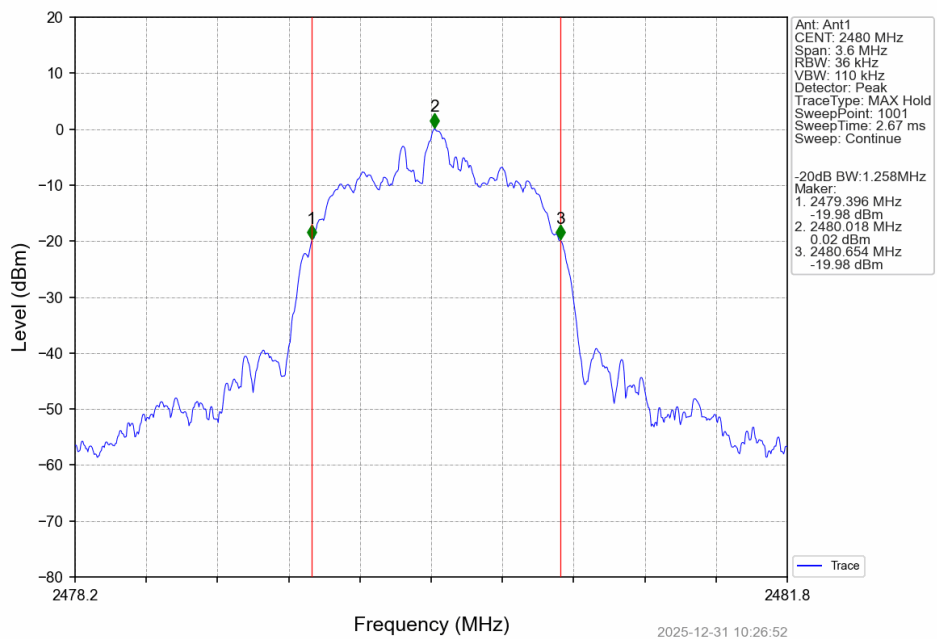
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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	1.92	<=30	Pass
		2441	DH5	1.76	<=30	Pass
		2480	DH5	0.99	<=30	Pass
PI/4DQPSK	SISO	2402	2DH5	2.70	<=20.97	Pass
		2441	2DH5	2.57	<=20.97	Pass
		2480	2DH5	1.82	<=20.97	Pass

4. Carrier Frequency Separation

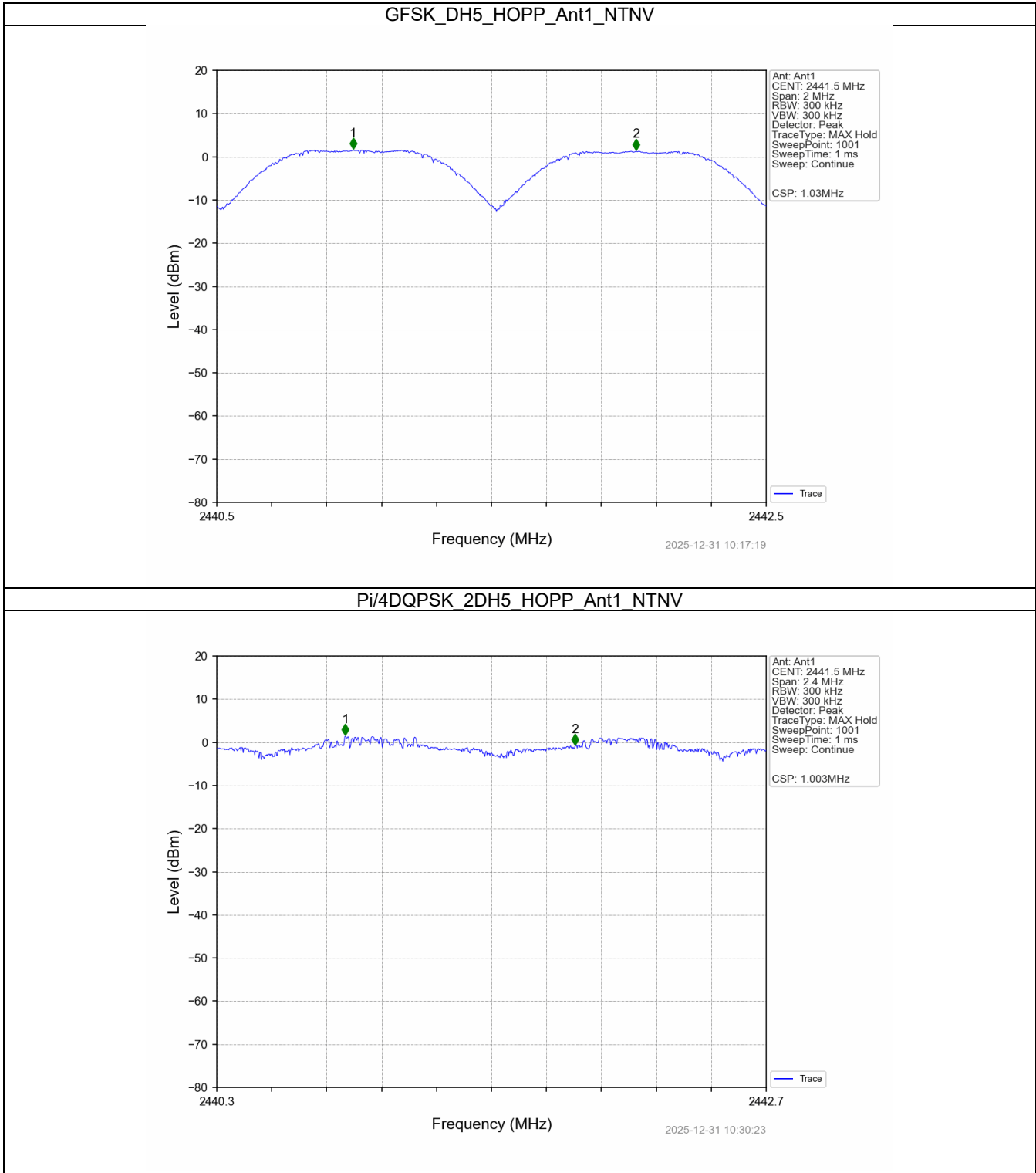
4.1 Test Result

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	1.030	0.957	≥ 0.957	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.003	1.316	≥ 0.877	Pass

4.2 Test Graph

4.2.1 Ant1



5. Number of Hopping Frequencies

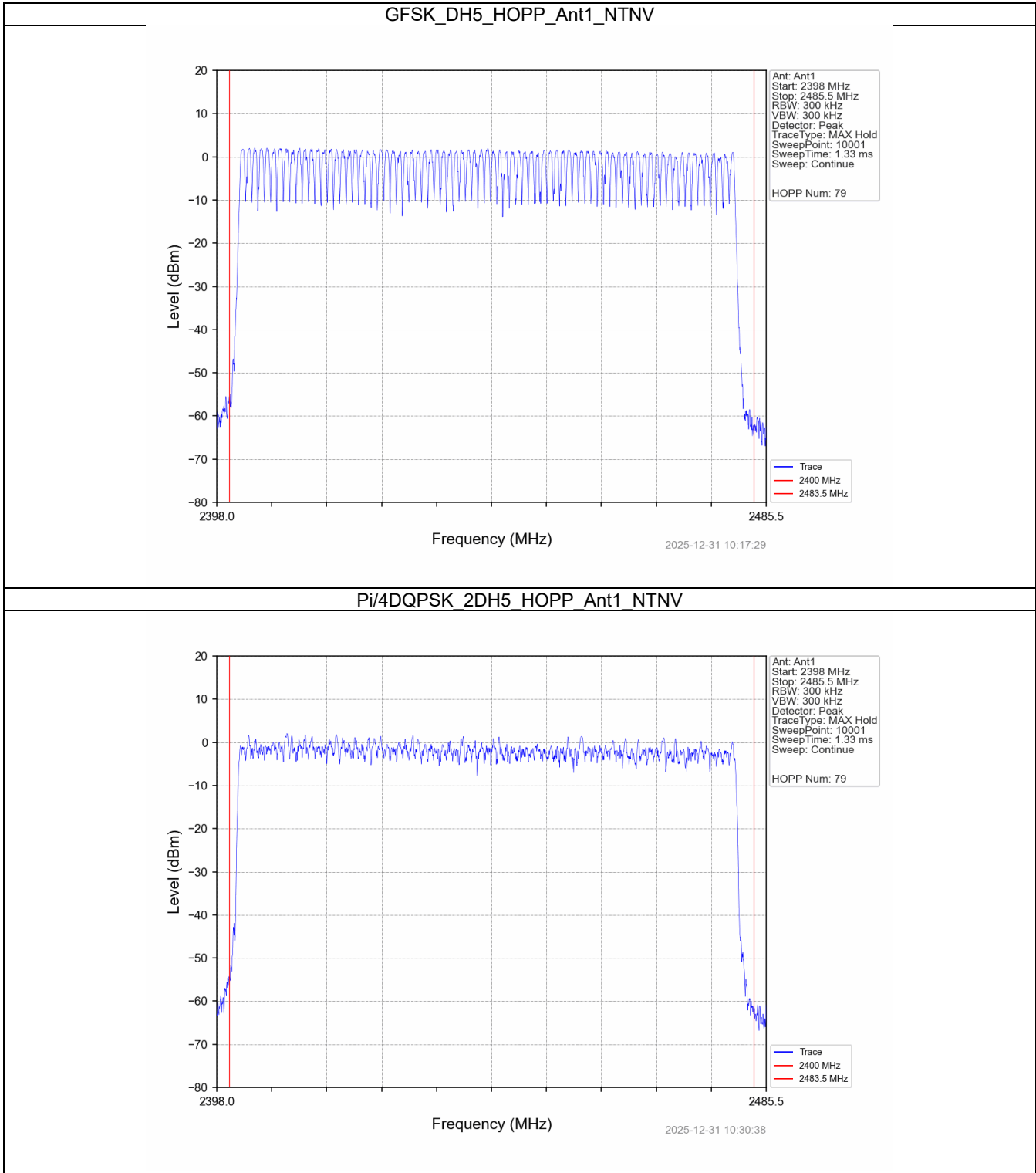
5.1 Test Result

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/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass

5.2 Test Graph

5.2.1 HoppNum



6. Time of Occupancy (Dwell Time)

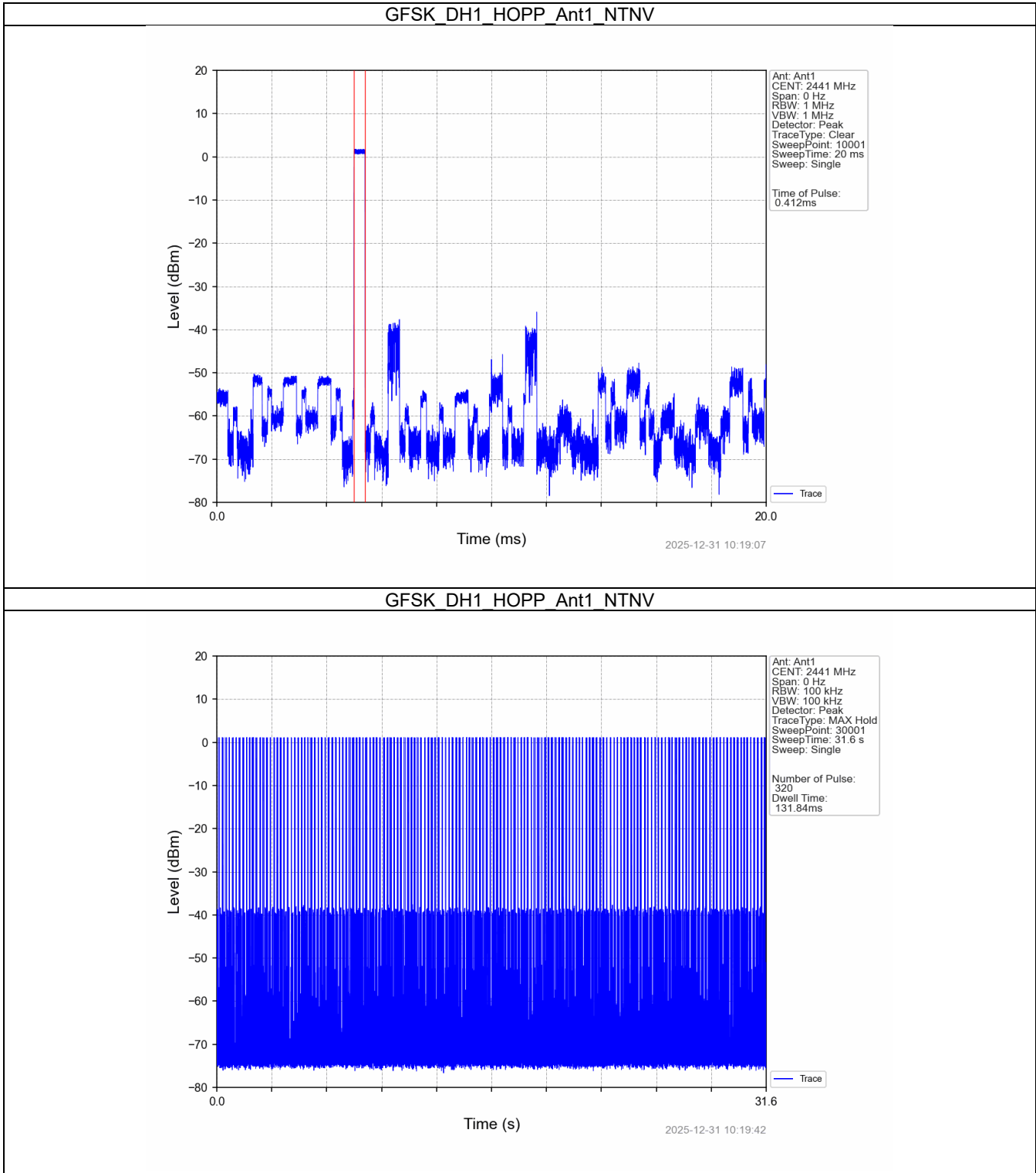
6.1 Test Result

6.1.1 Ant1

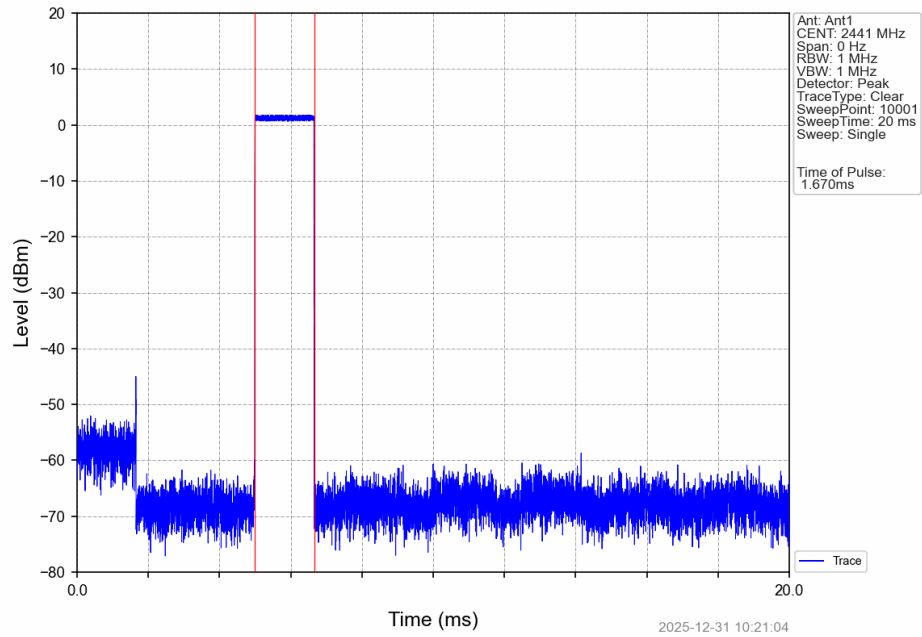
Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.412	31.600	320	131.840	<=400	Pass
			DH3	1.670	31.600	160	267.200	<=400	Pass
			DH5	2.918	31.600	116	338.488	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.422	31.600	319	134.618	<=400	Pass
			2DH3	1.674	31.600	160	267.840	<=400	Pass
			2DH5	2.924	31.600	105	307.020	<=400	Pass

6.2 Test Graph

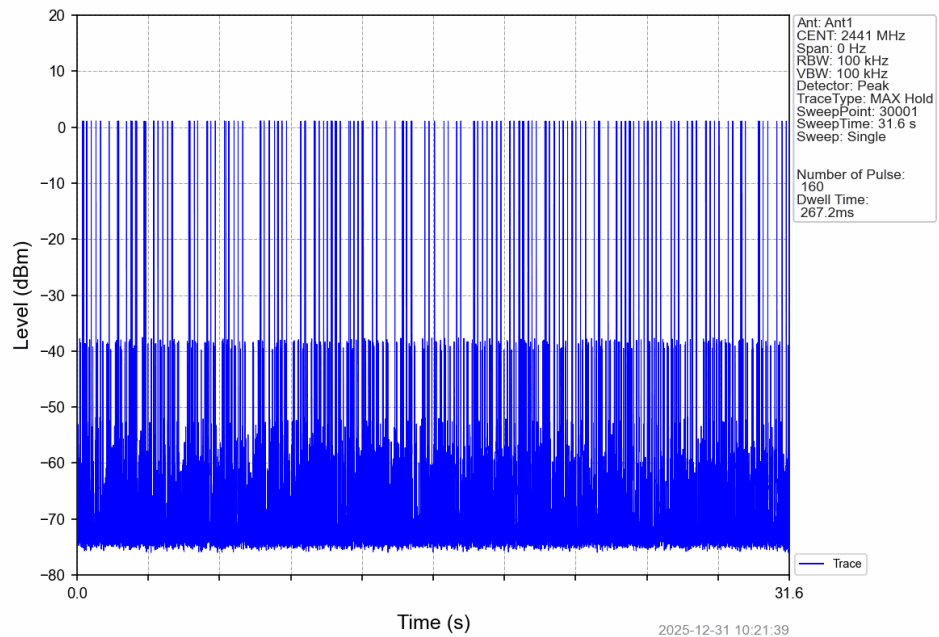
6.2.1 Ant1



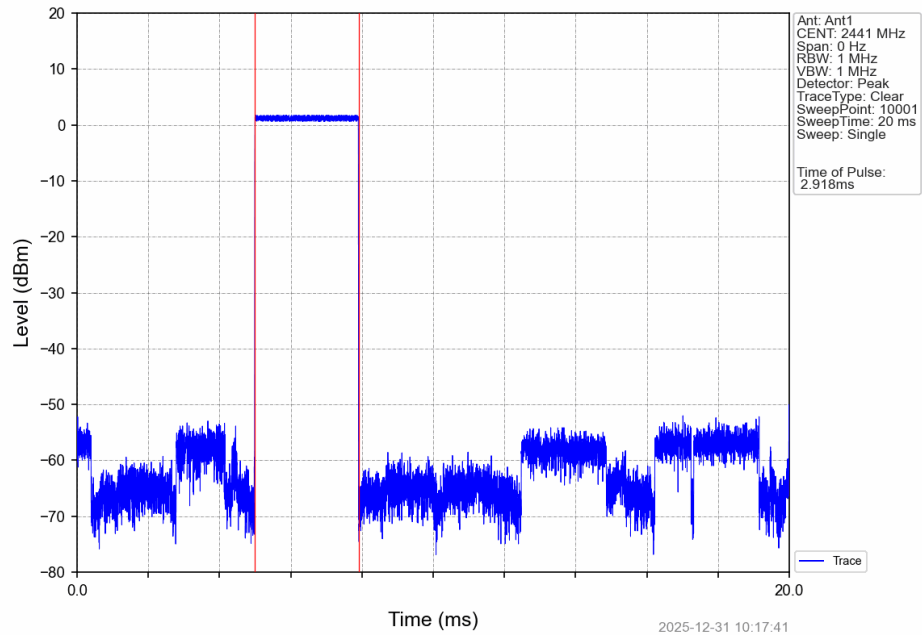
GFSK_DH3_HOPP_Ant1_NTNV



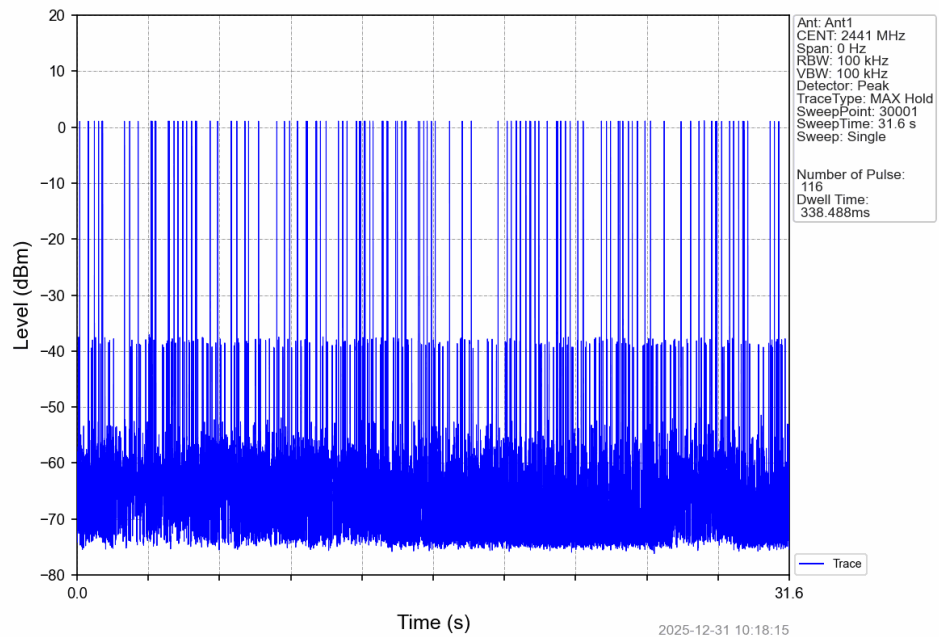
GFSK_DH3_HOPP_Ant1_NTNV



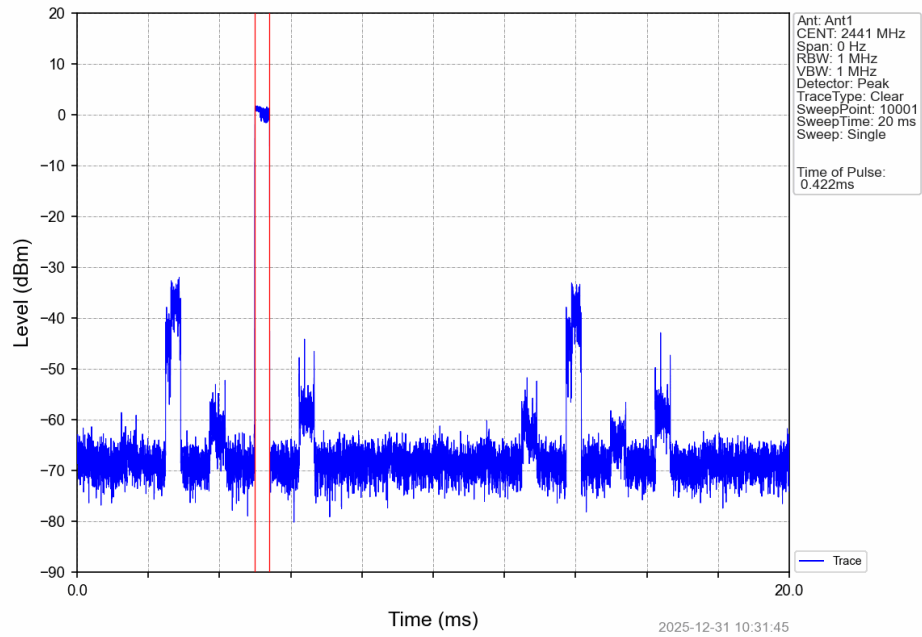
GFSK_DH5_HOPP_Ant1_NTNV



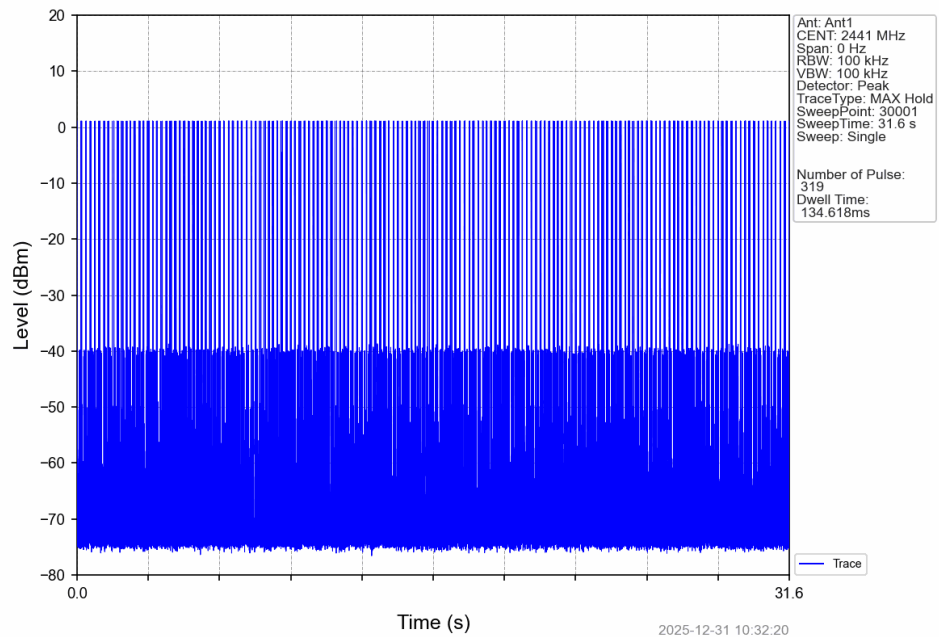
GFSK_DH5_HOPP_Ant1_NTNV



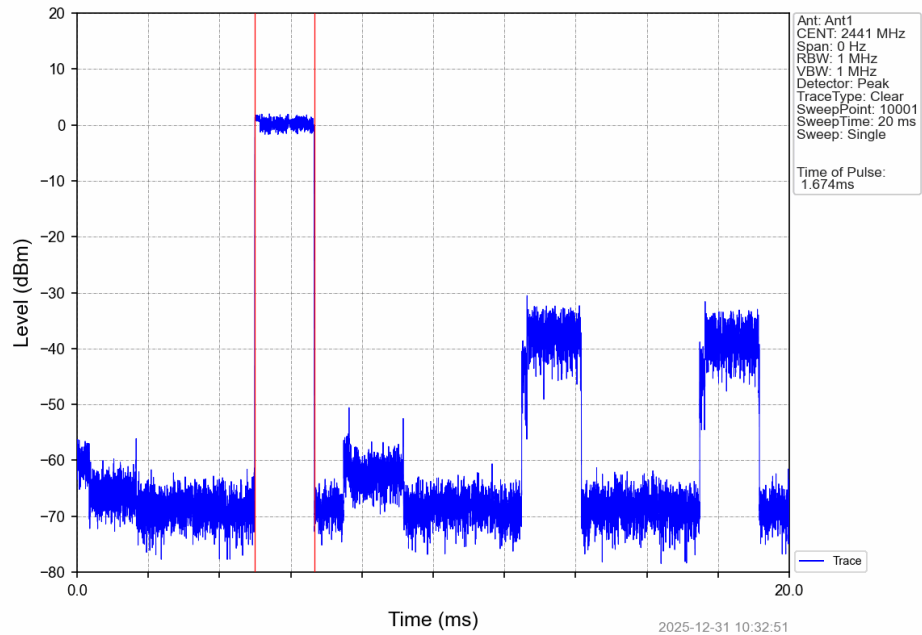
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



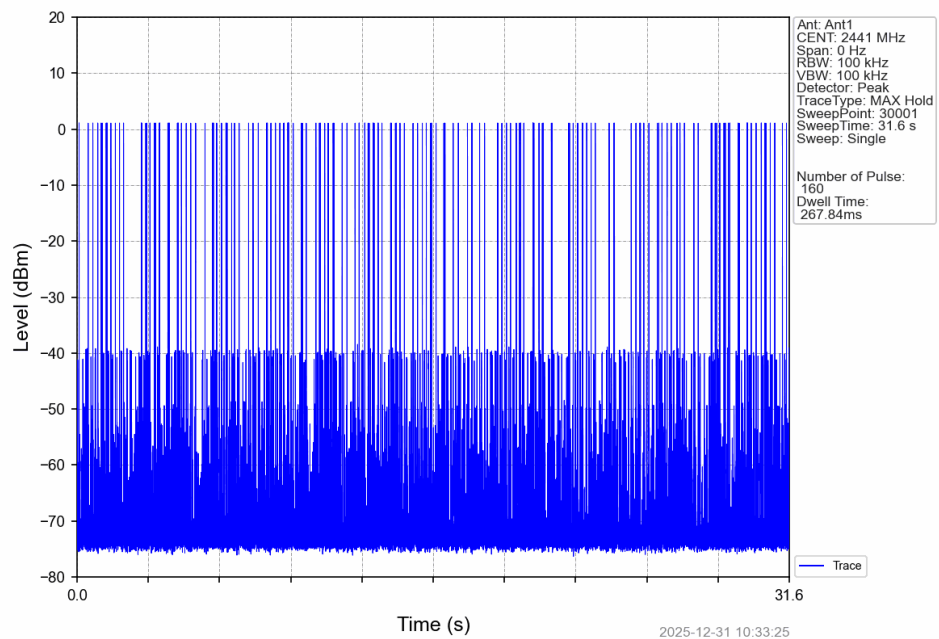
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



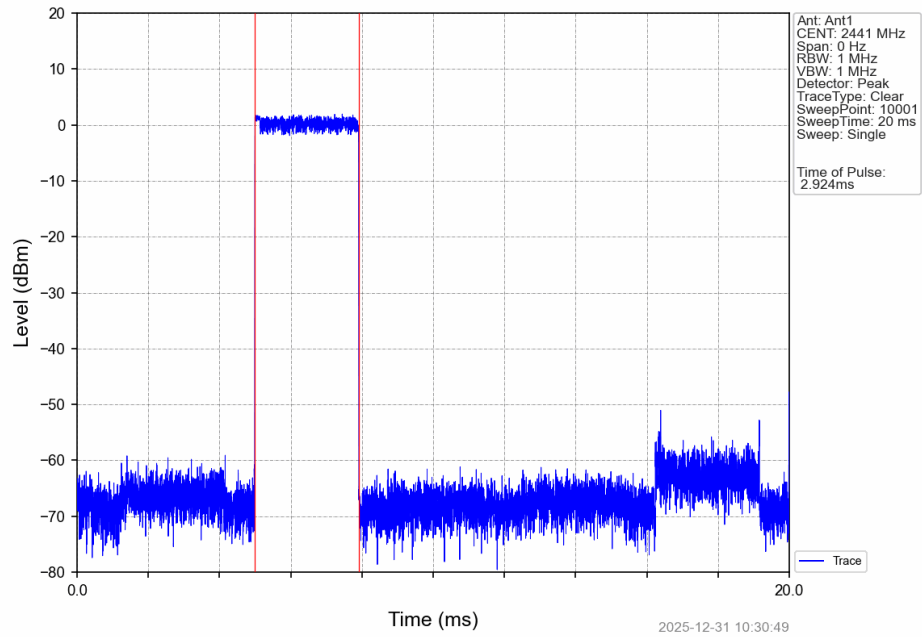
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



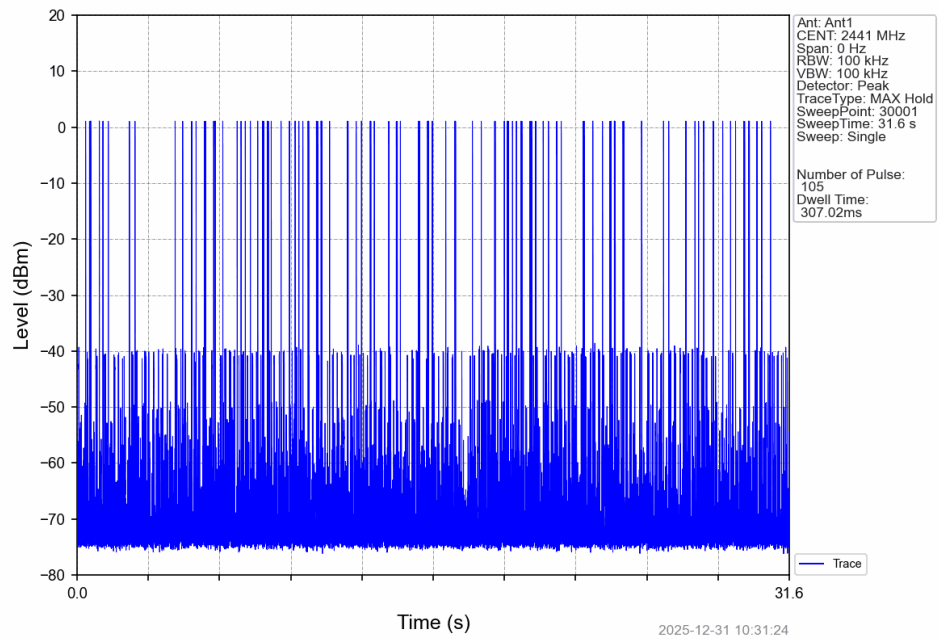
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

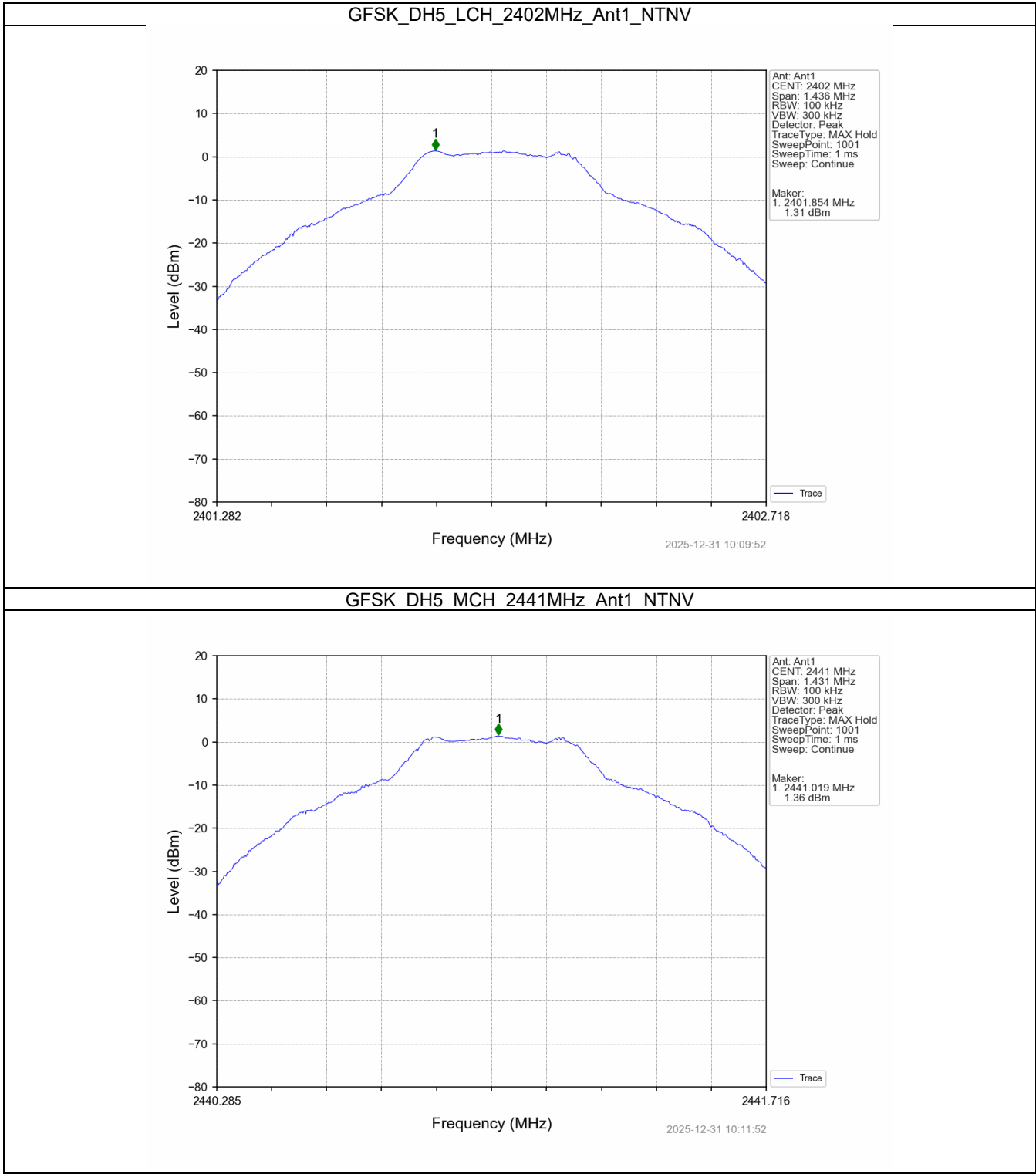
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	1.31
		2441	DH5	1	1.36
		2480	DH5	1	0.38
		HOPP	DH5	1	1.22
					1.22
Pi/4DQPSK	SISO	2402	2DH5	1	1.48
		2441	2DH5	1	1.35
		2480	2DH5	1	0.39
		HOPP	2DH5	1	1.47
					1.47
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.					

7.1.2 CSE

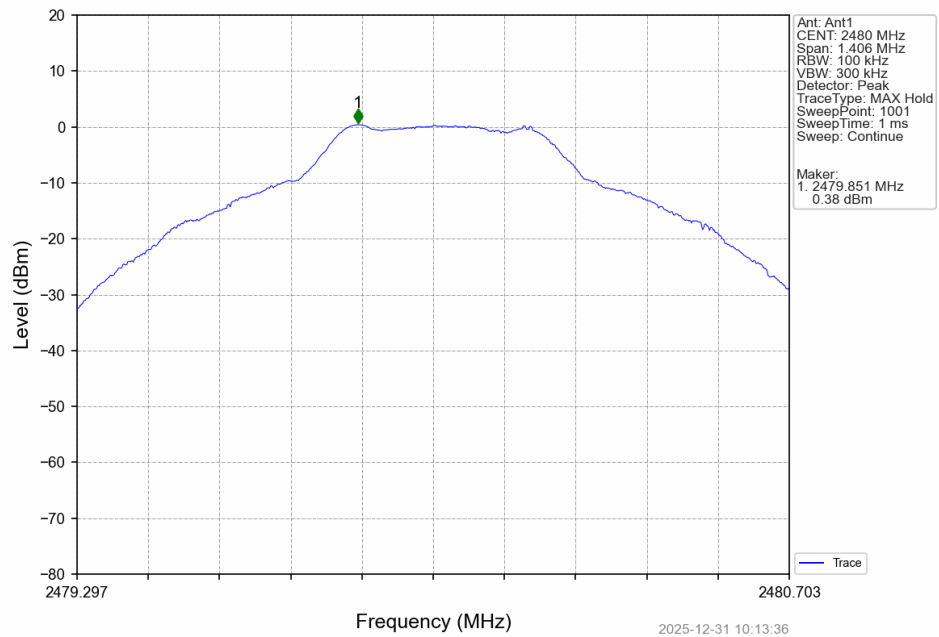
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	1.31	-18.69	Pass
		2441	DH5	1	1.36	-18.64	Pass
		2480	DH5	1	0.38	-19.62	Pass
		HOPP	DH5	1	1.22	-18.78	Pass
					1.22	-18.78	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.48	-18.52	Pass
		2441	2DH5	1	1.35	-18.65	Pass
		2480	2DH5	1	0.39	-19.61	Pass
		HOPP	2DH5	1	1.47	-18.53	Pass
					1.47	-18.53	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

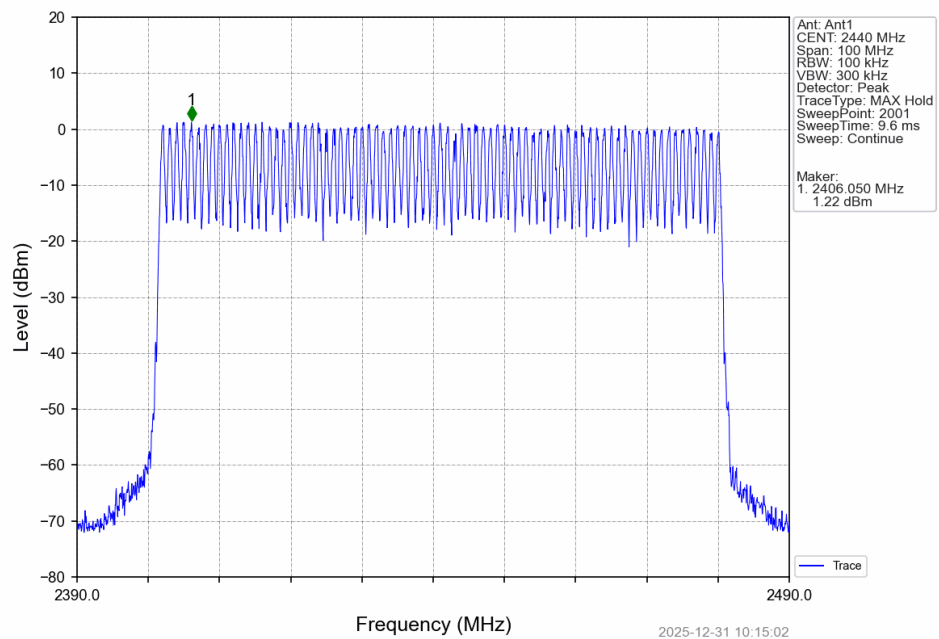
7.2.1 Ref



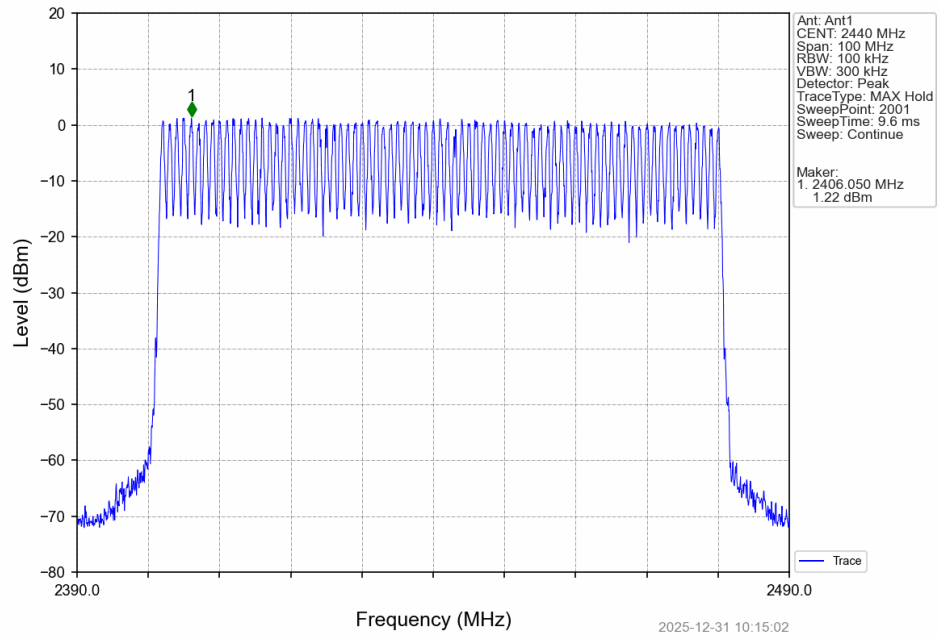
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



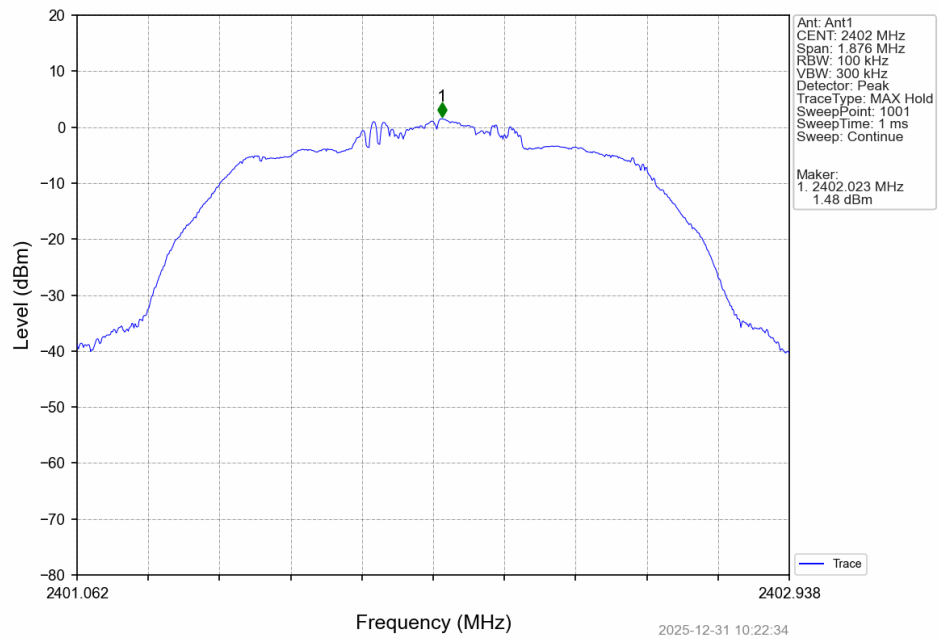
GFSK_DH5_HOPP_Ant1_NTNV



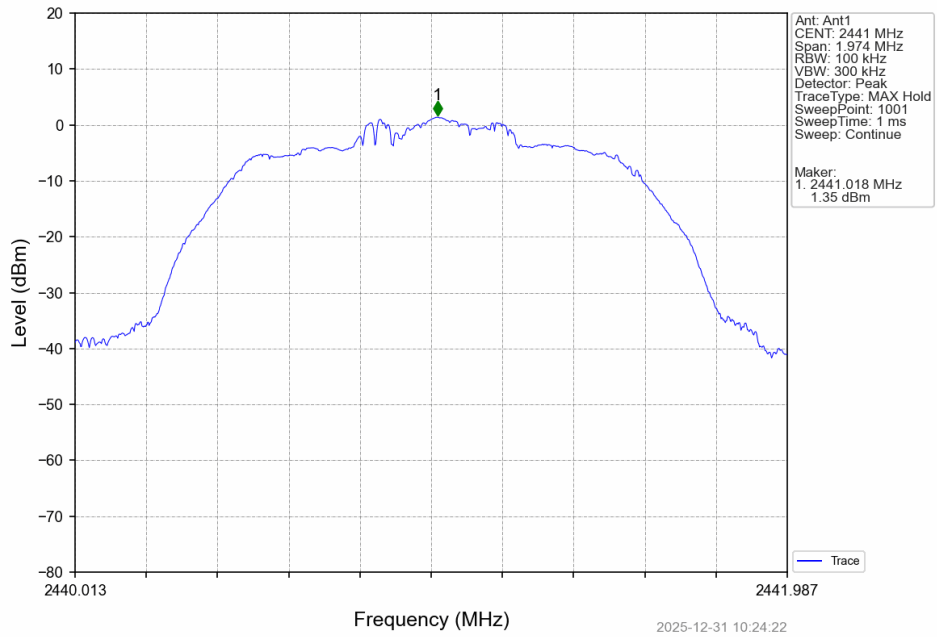
GFSK_DH5_HOPP_Ant1_NTNV



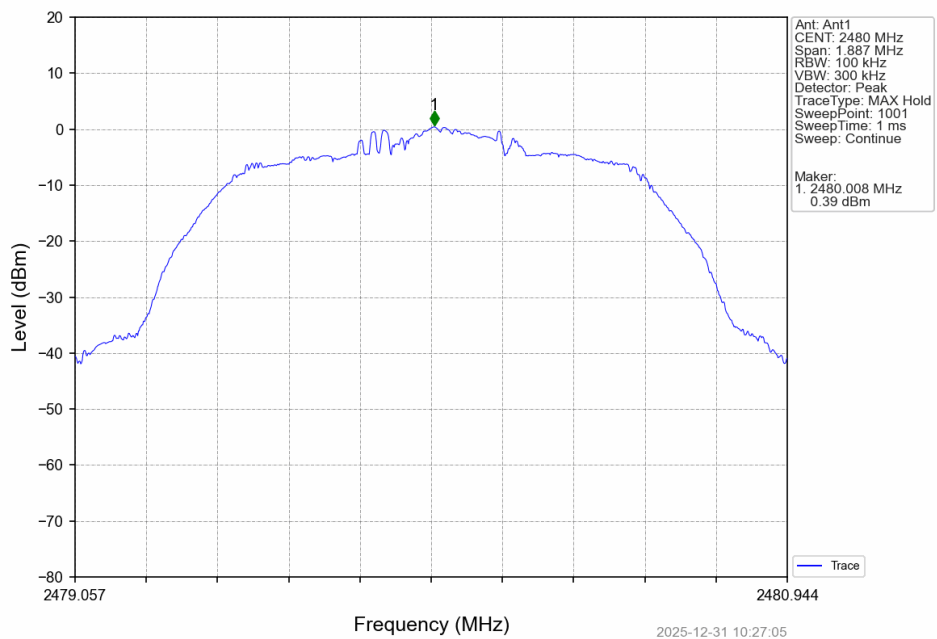
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



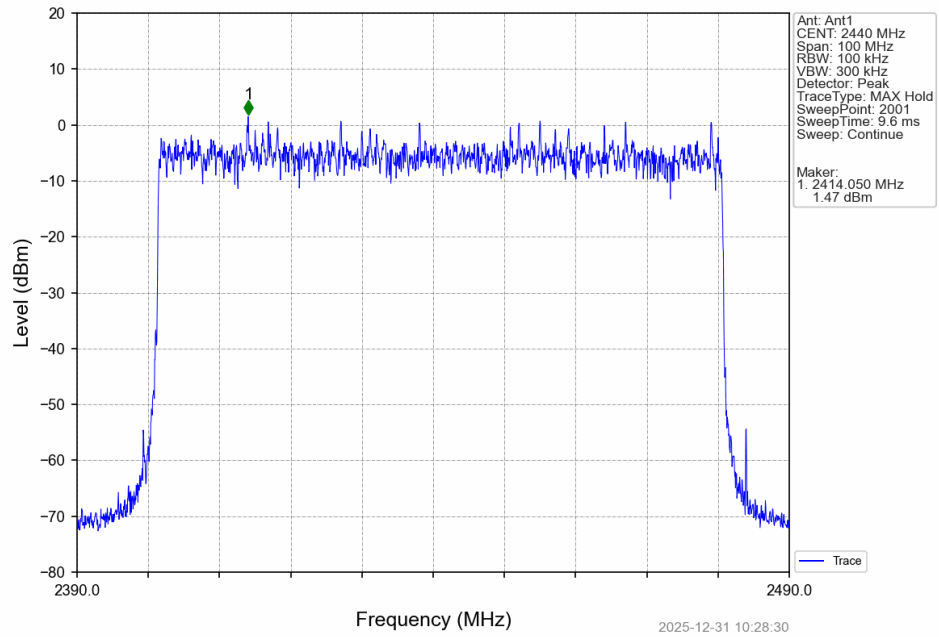
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



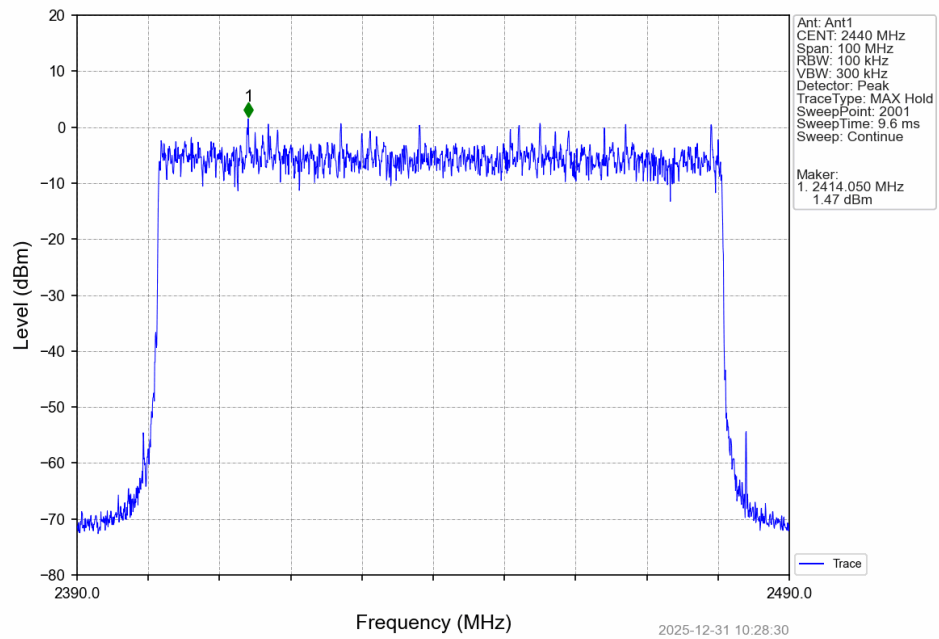
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



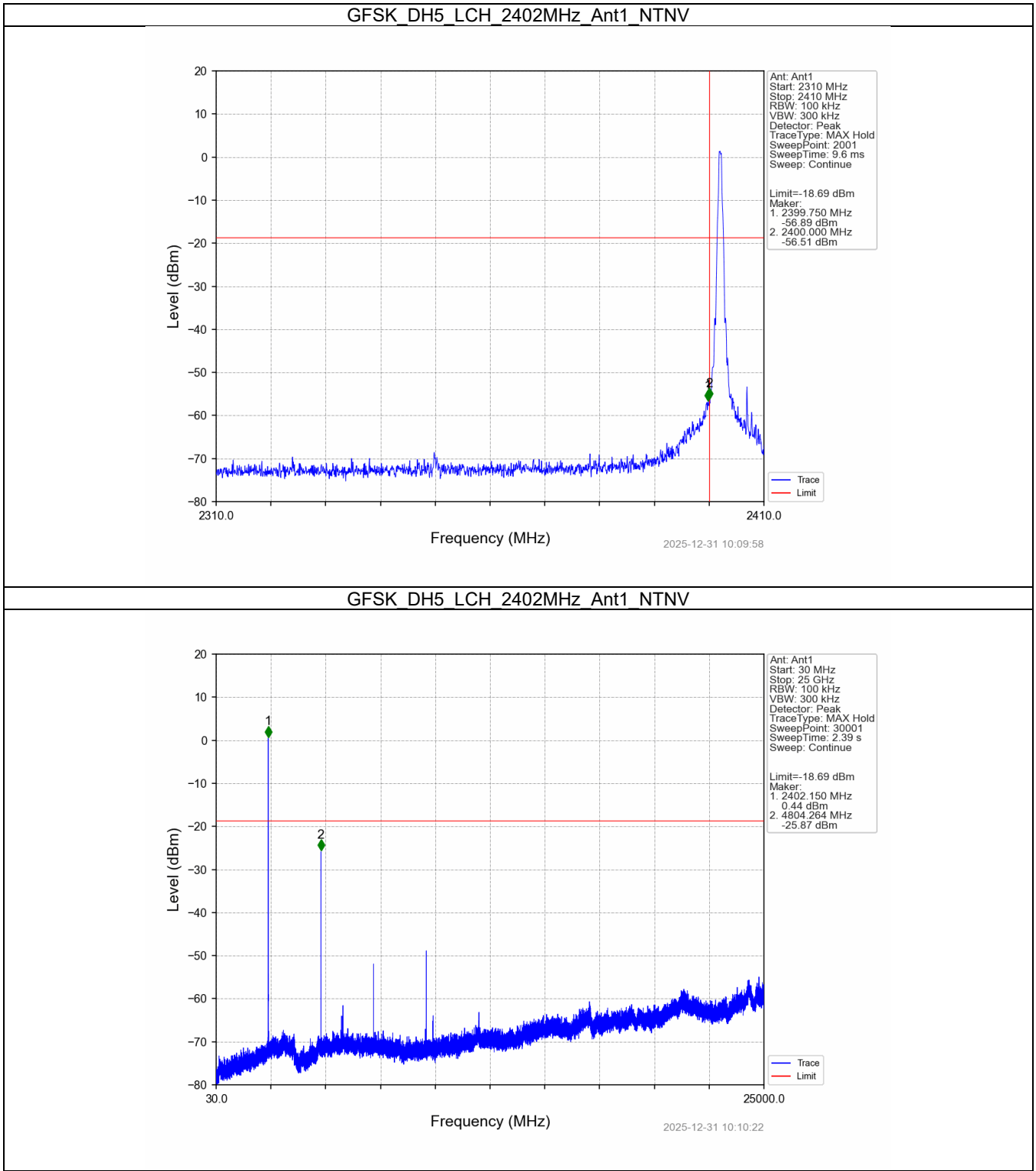
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



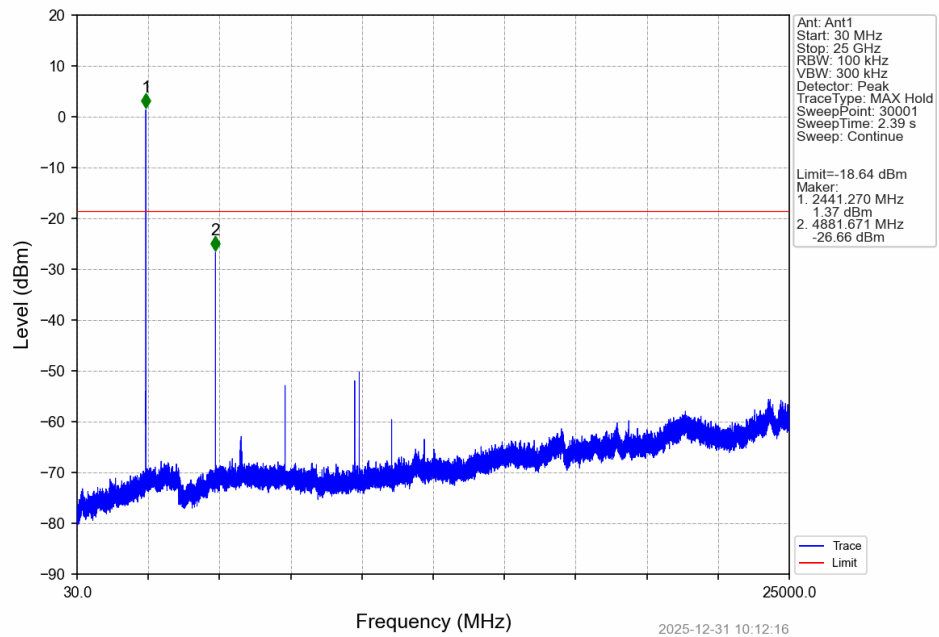
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



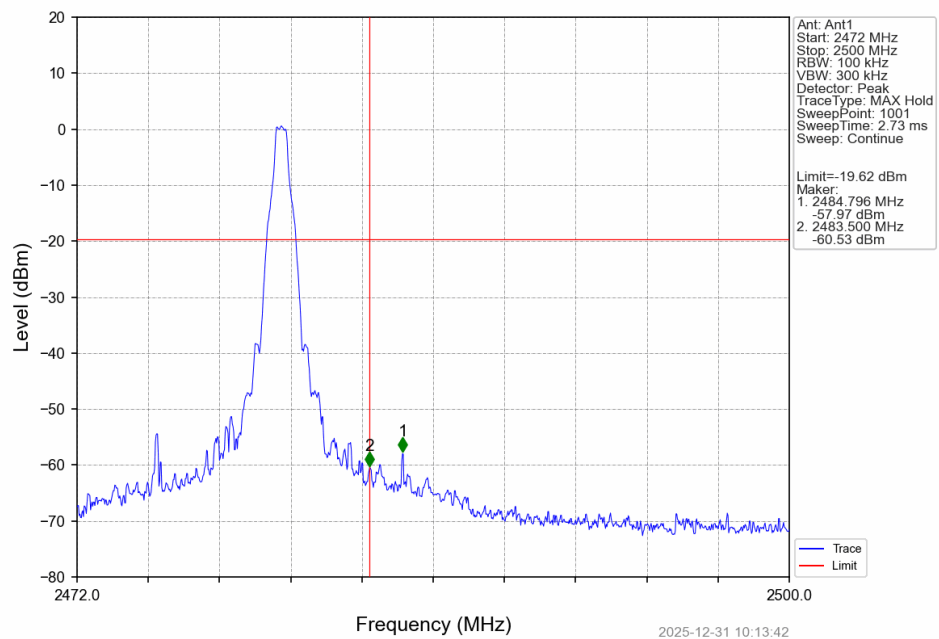
7.2.2 CSE



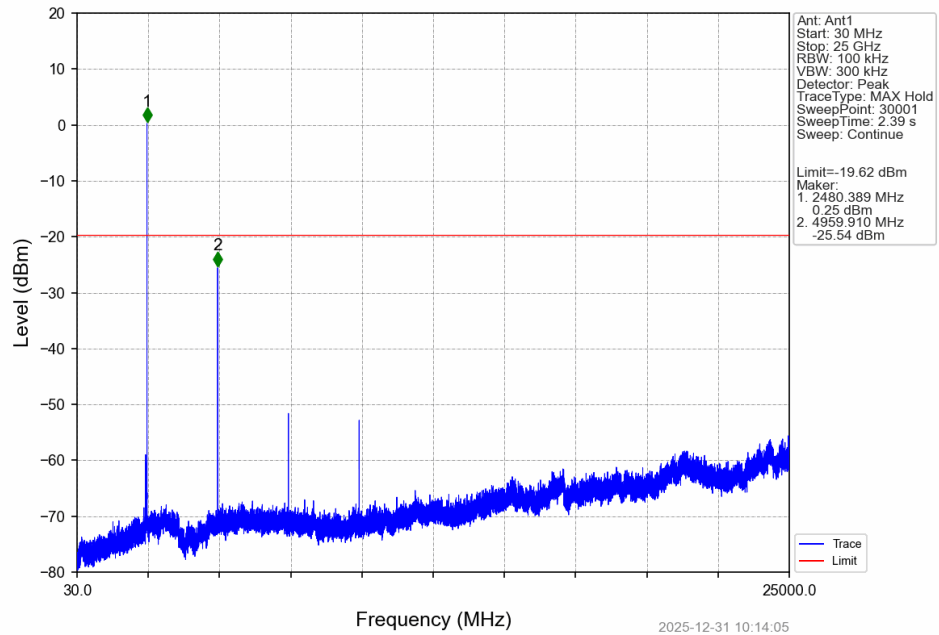
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



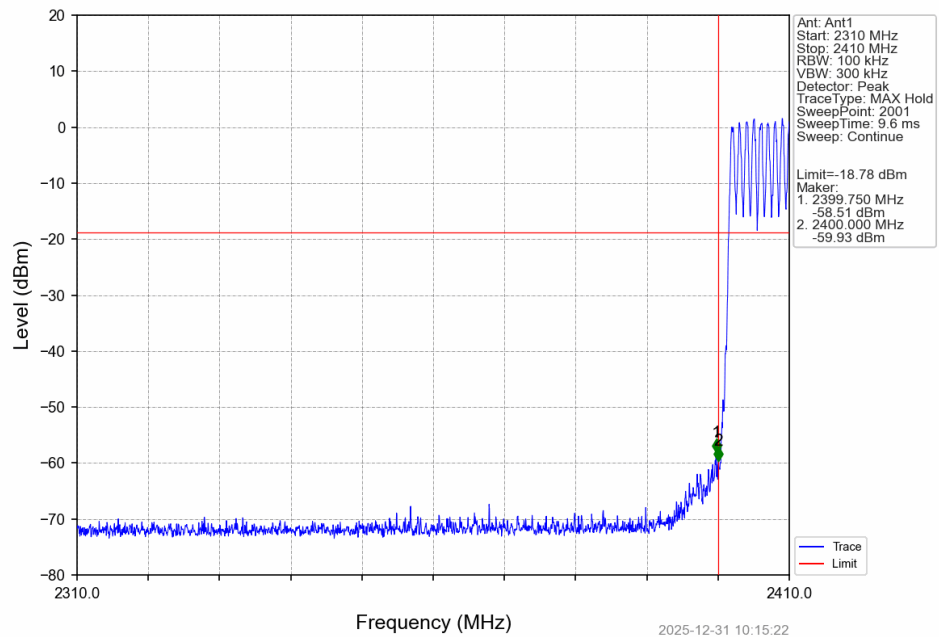
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



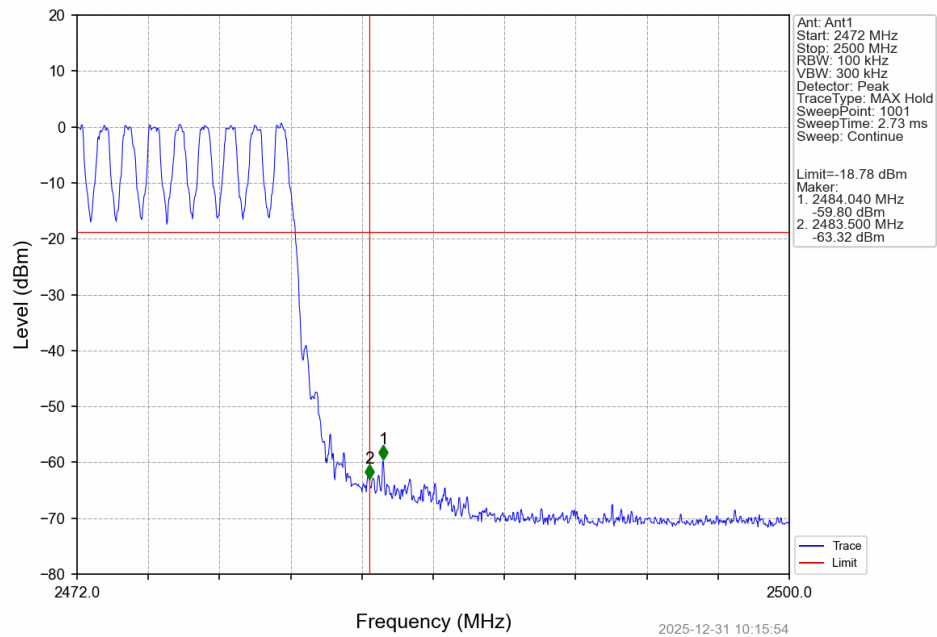
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



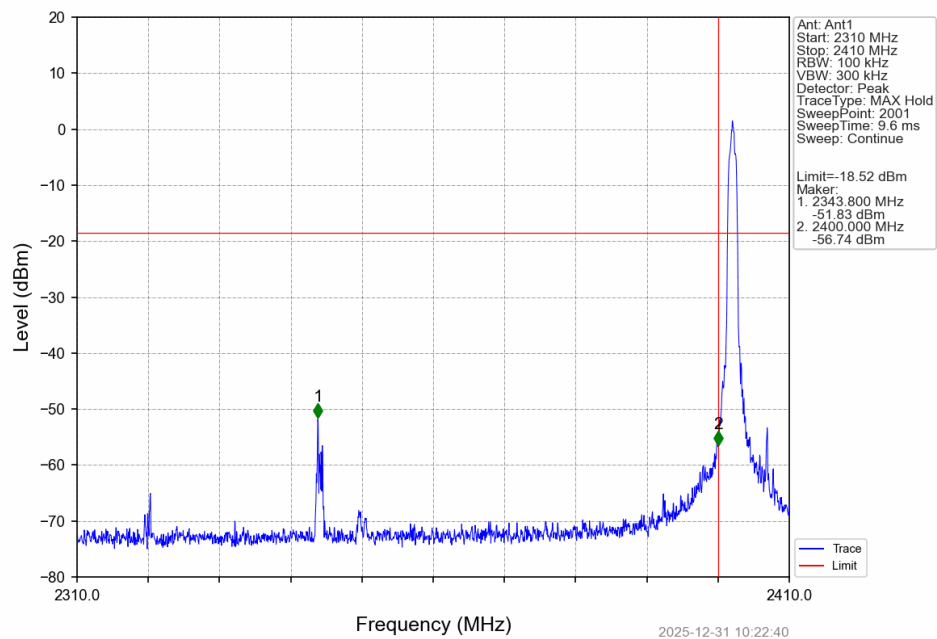
GFSK_DH5_HOPP_Ant1_NTNV



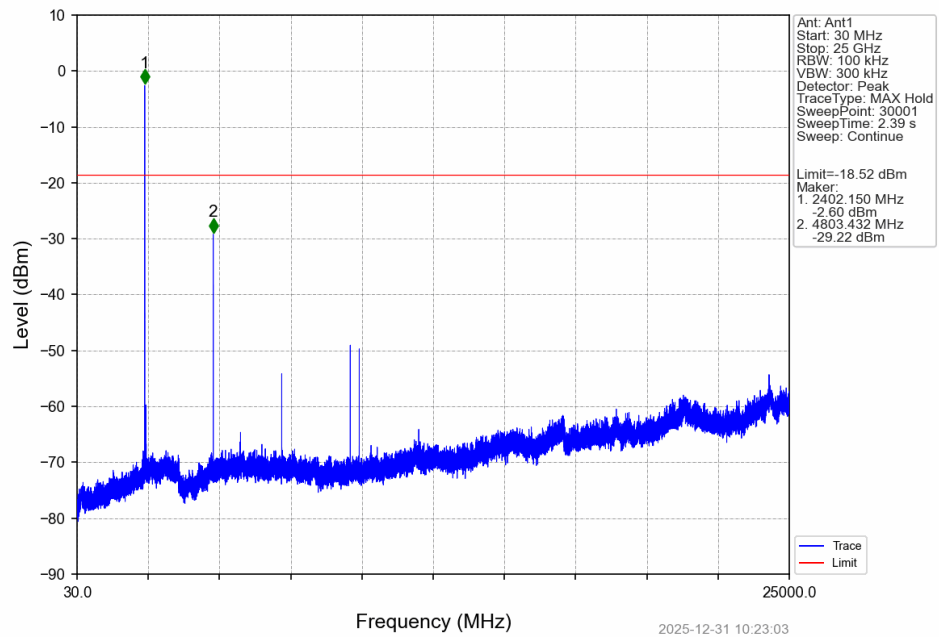
GFSK_DH5_HOPP_Ant1_NTNV



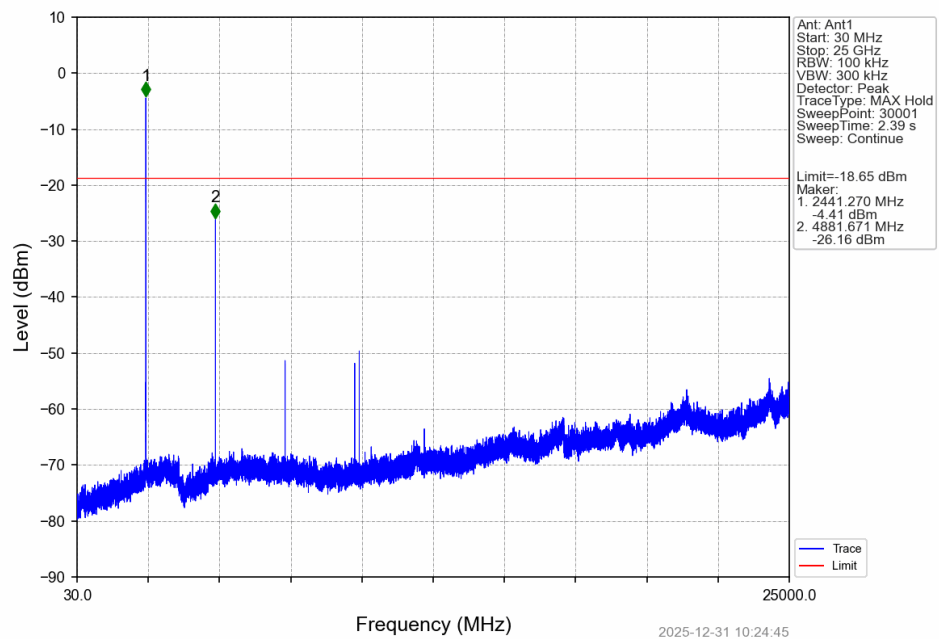
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



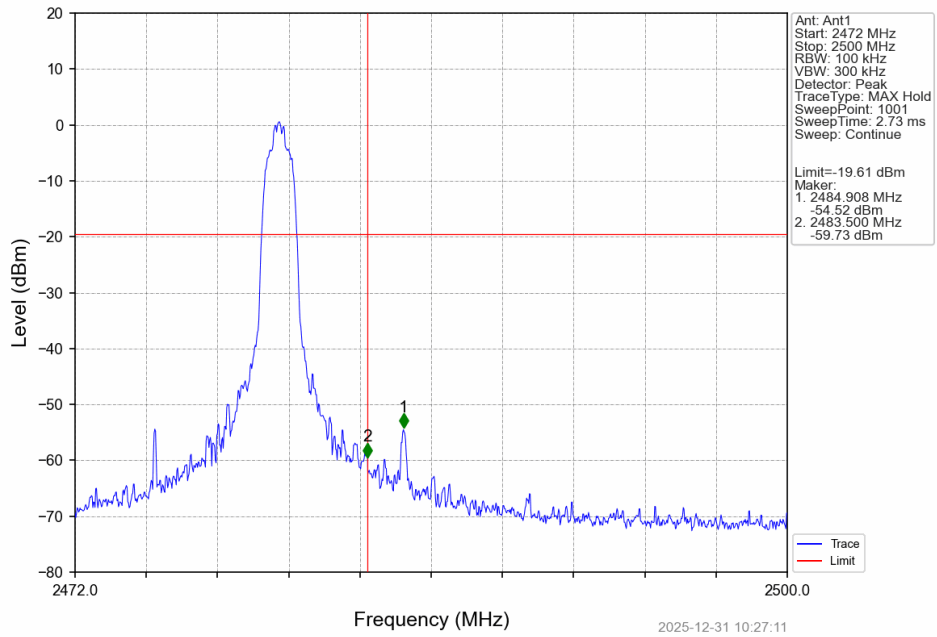
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



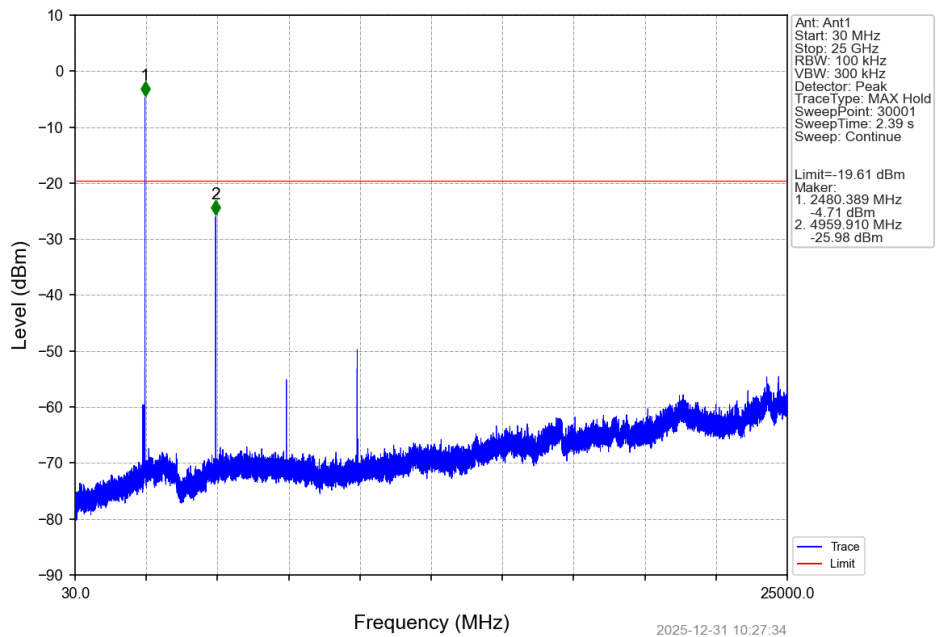
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



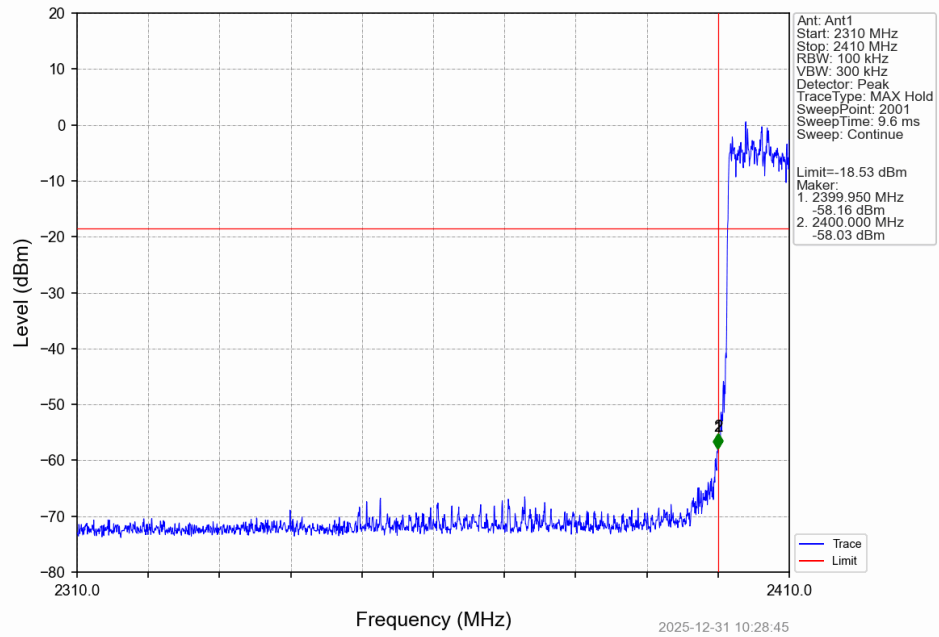
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



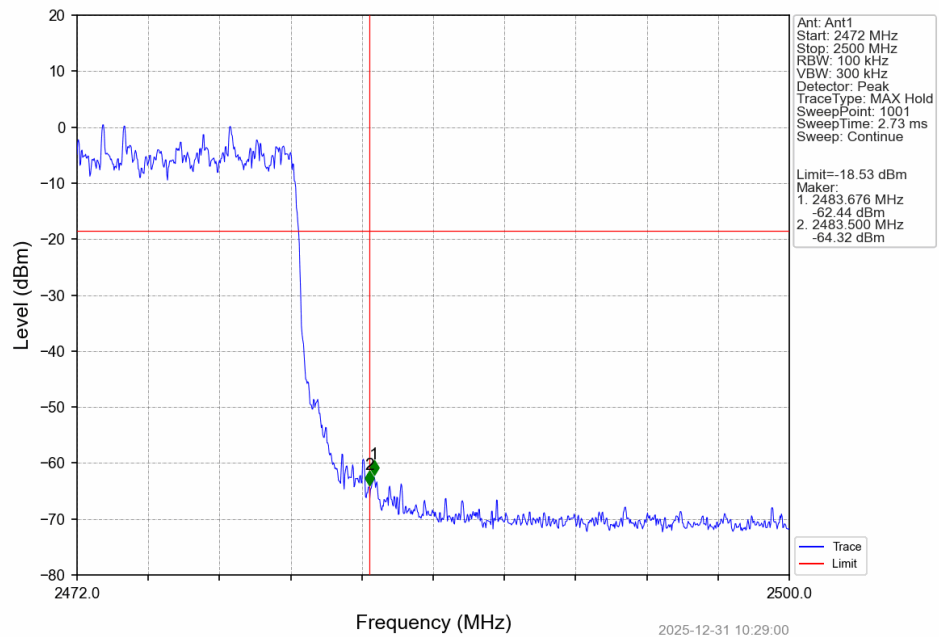
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



Bluetooth Module 2:

1. Duty Cycle

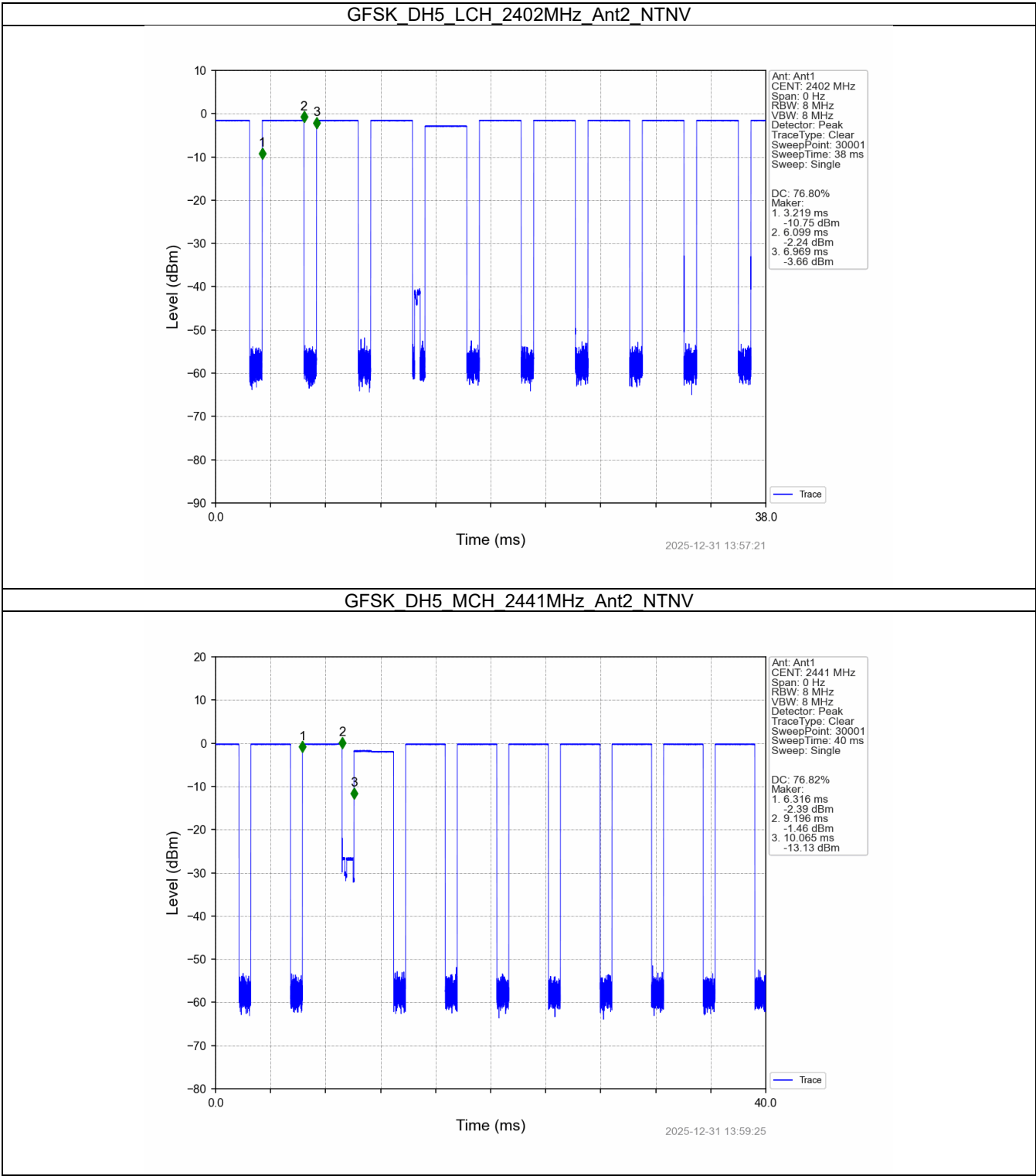
1.1 Test Result

1.1.1 Ant2

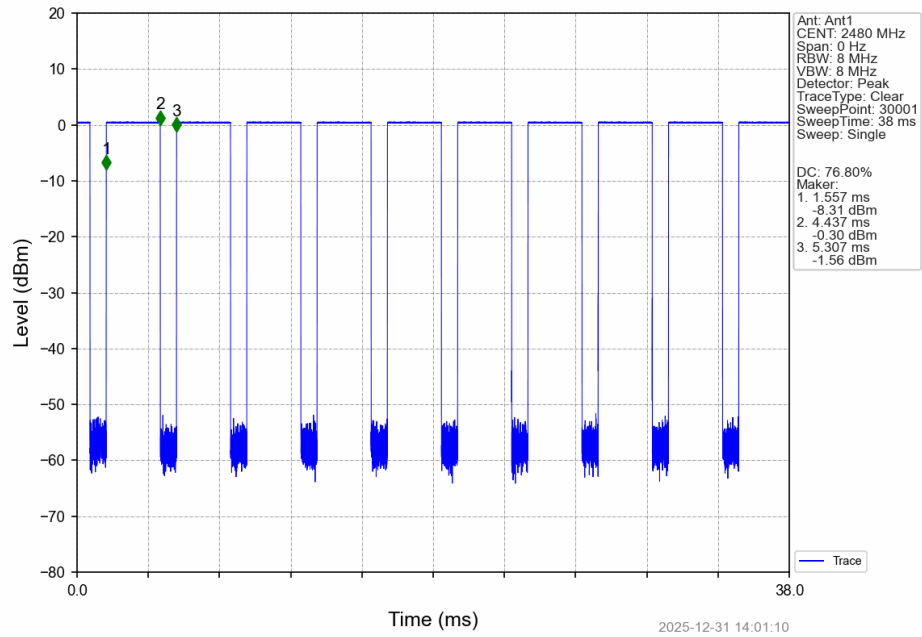
Ant2								
Mode	TX Type	Frequency (MHz)	Packet Type	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.880	3.750	76.80	1.15	0.03
		2441	DH5	2.880	3.749	76.82	1.15	0.01
		2480	DH5	2.880	3.750	76.80	1.15	0.03
Pi/4DQPSK	SISO	2402	2DH5	2.885	3.749	76.95	1.14	0.03
		2441	2DH5	2.886	3.749	76.98	1.14	0.03
		2480	2DH5	2.893	3.751	77.13	1.13	0.03

1.2 Test Graph

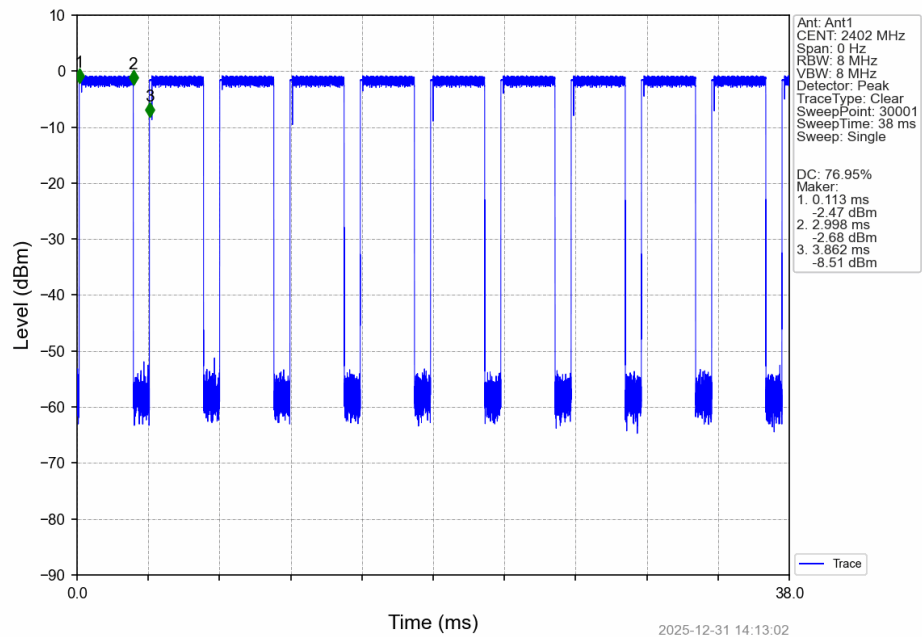
1.2.1 Ant2



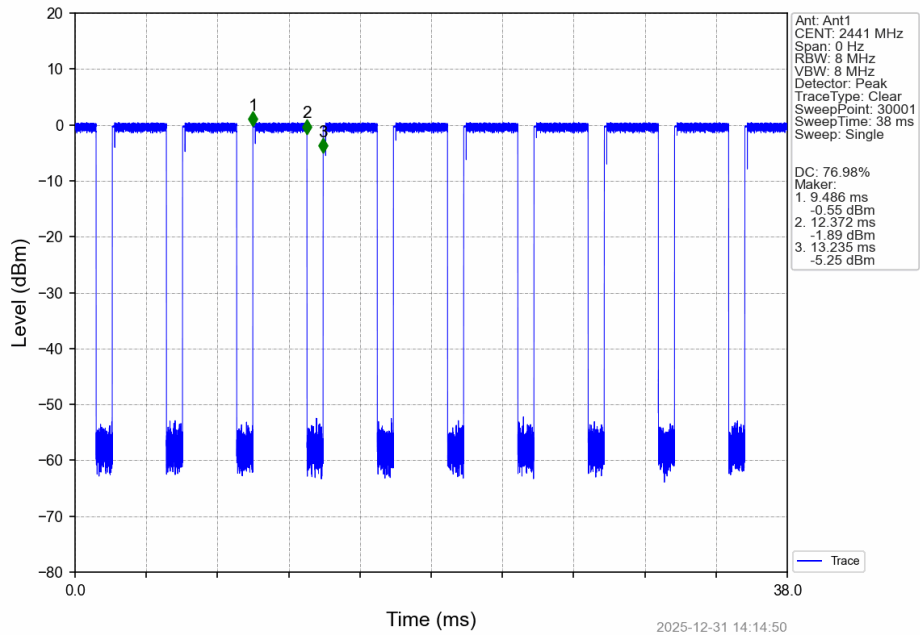
GFSK DH5_HCH_2480MHz_Ant2_NTNV



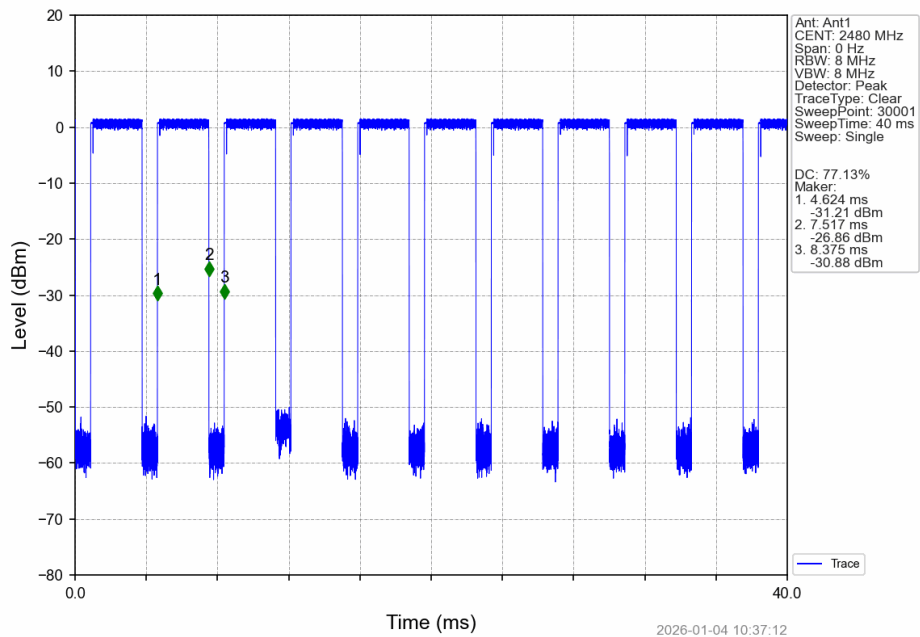
PI/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

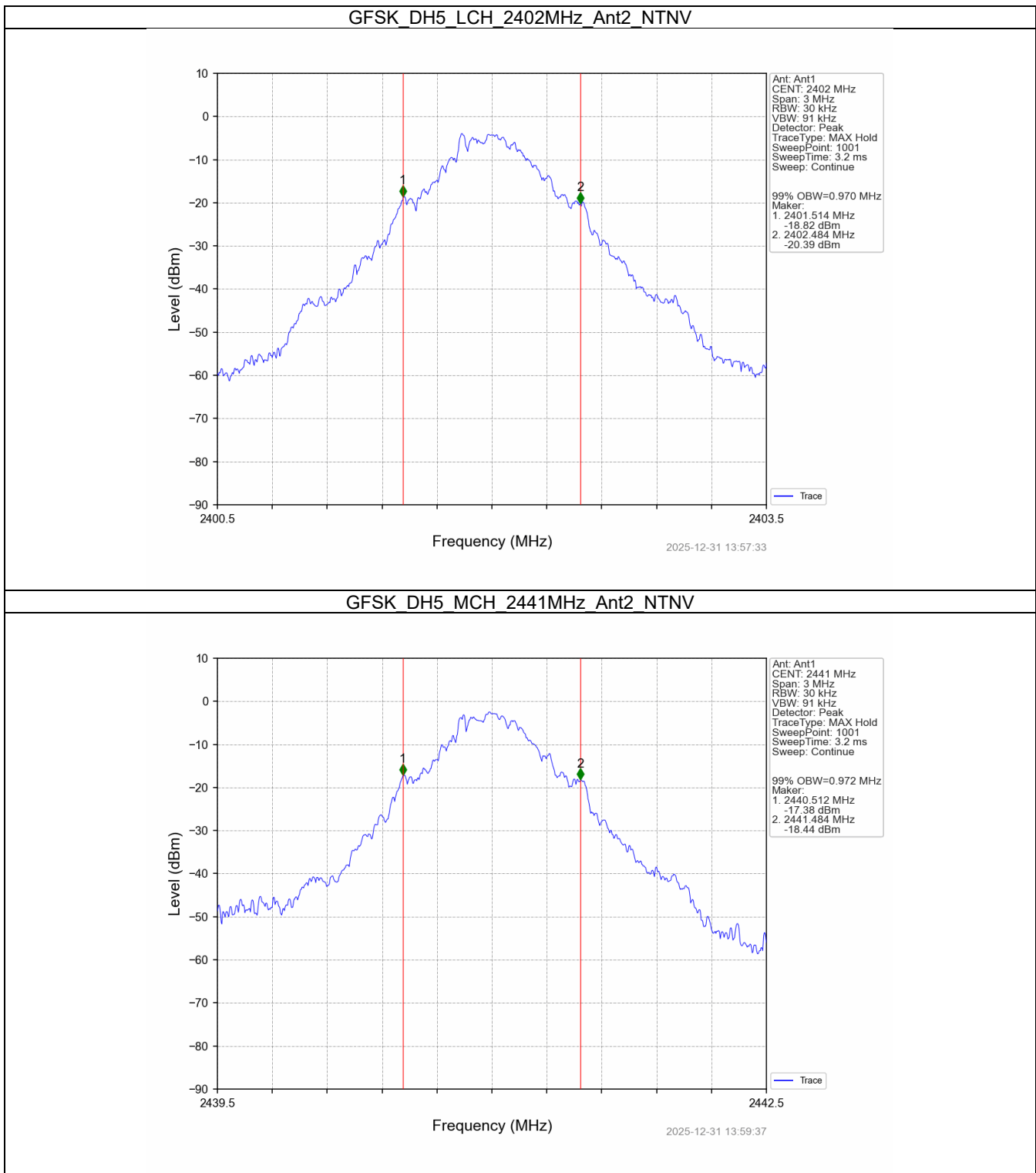
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.970	/	Pass
		2441	DH5	1	0.972	/	Pass
		2480	DH5	1	0.978	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.240	/	Pass
		2441	2DH5	1	1.252	/	Pass
		2480	2DH5	1	1.269	/	Pass

2.1.2 20dB BW

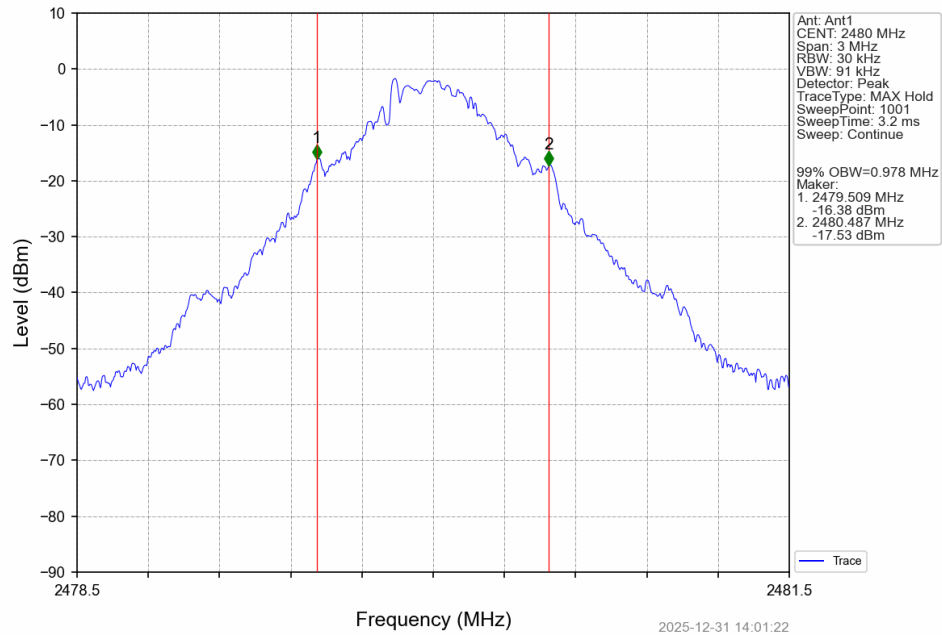
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	1.057	/	Pass
		2441	DH5	1	1.053	/	Pass
		2480	DH5	1	1.059	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.334	/	Pass
		2441	2DH5	1	1.363	/	Pass
		2480	2DH5	1	1.376	/	Pass

2.2 Test Graph

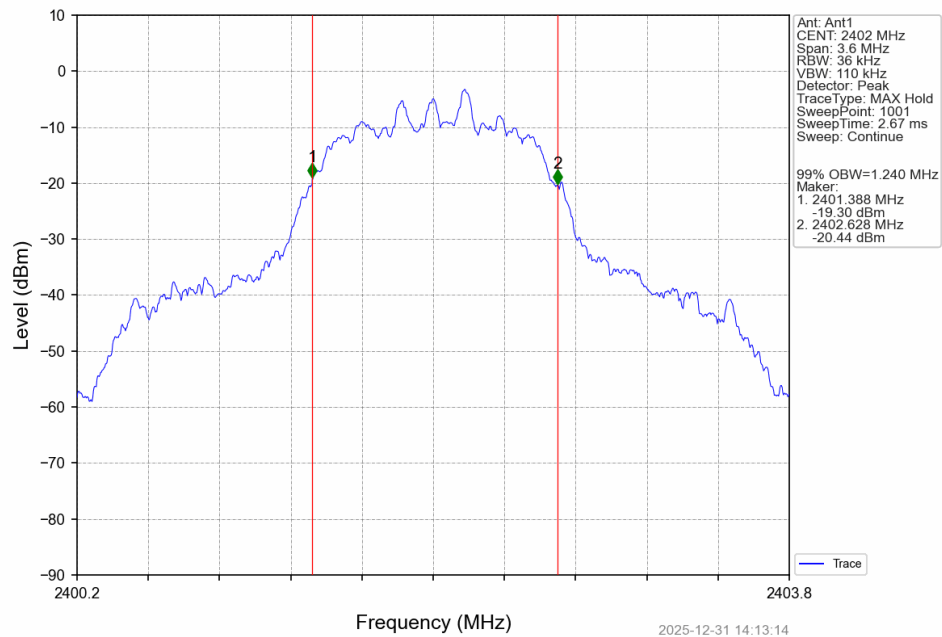
2.2.1 OBW



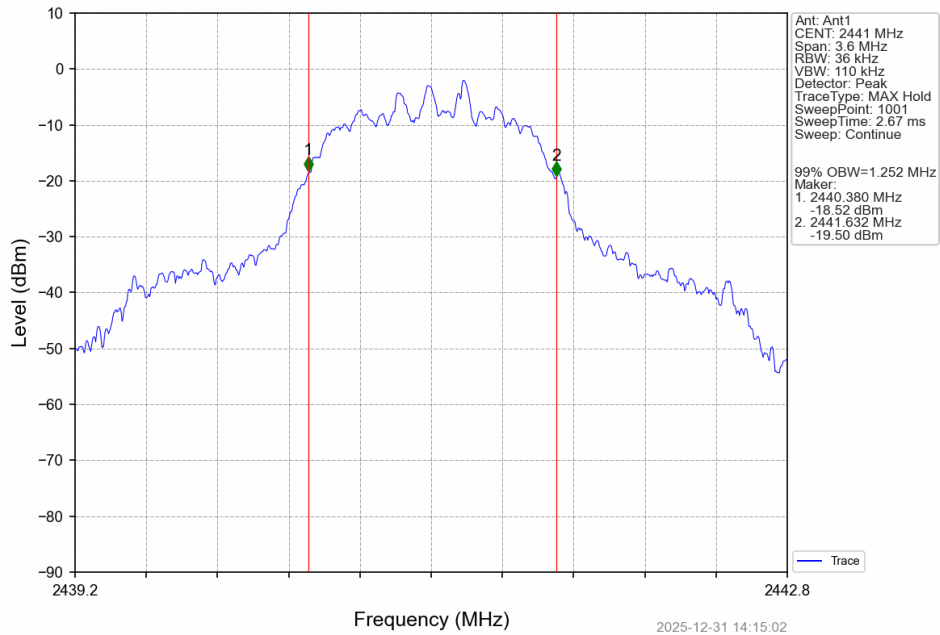
GFSK DH5_HCH_2480MHz_Ant2_NTNV



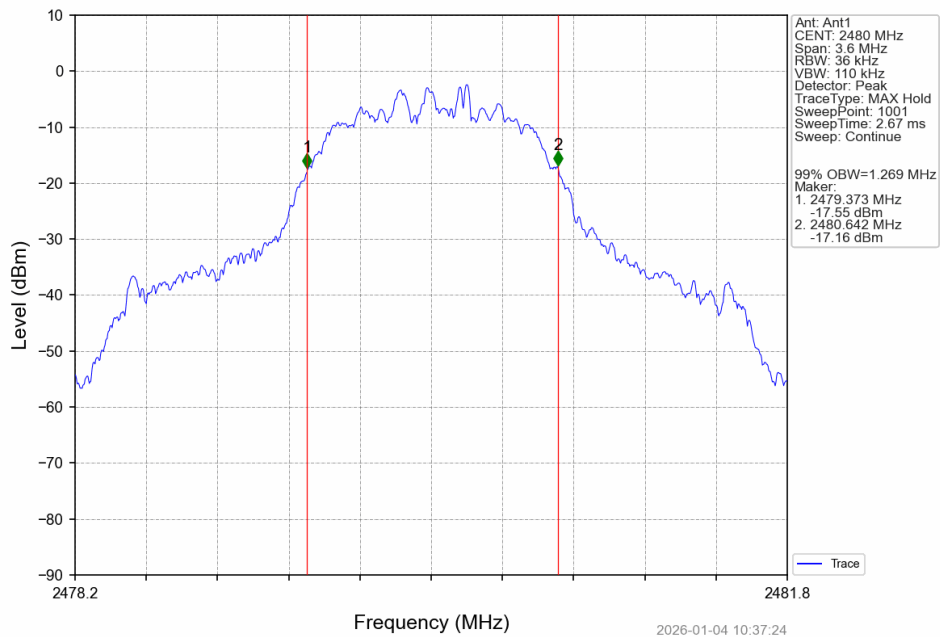
PI/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



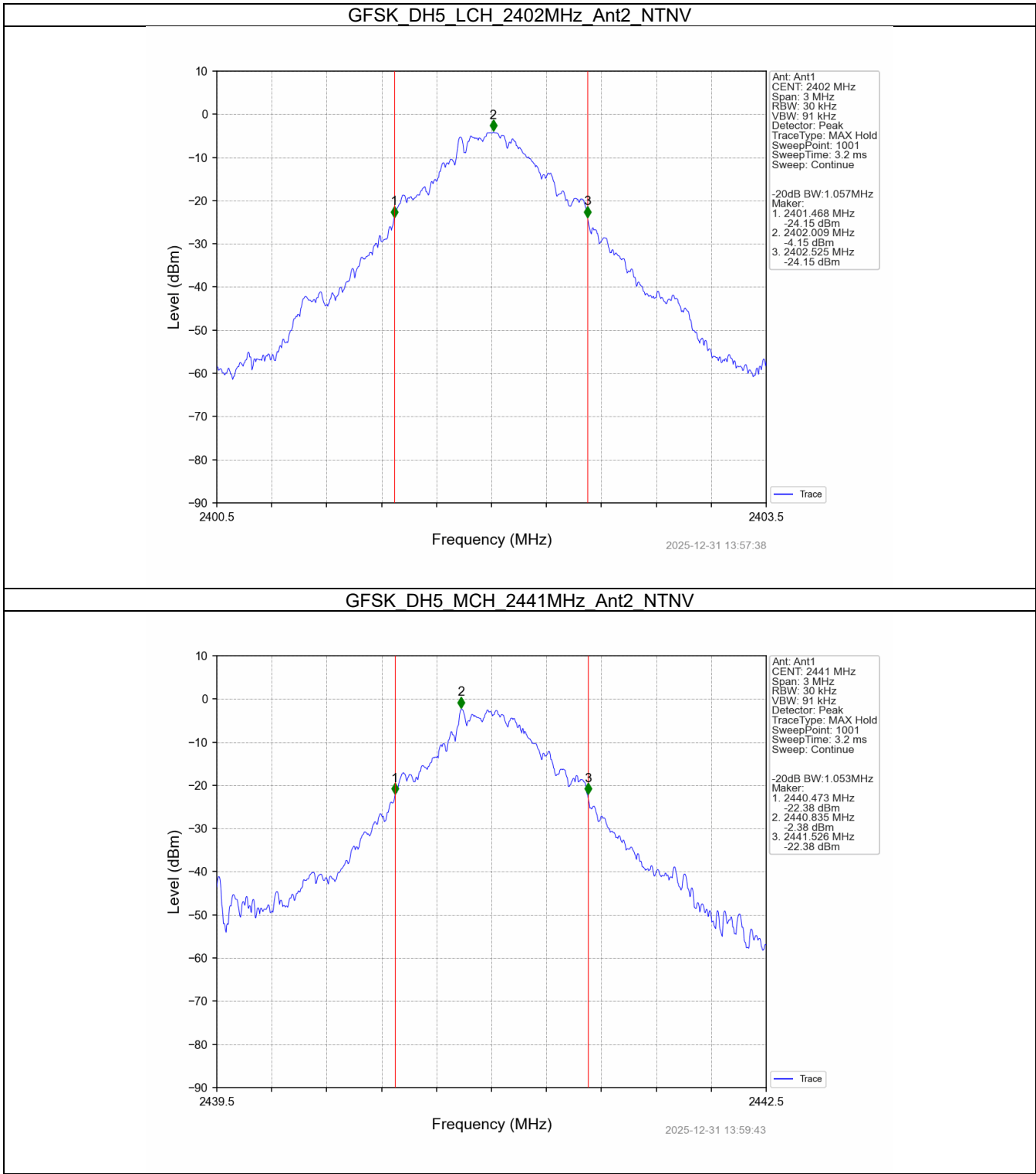
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



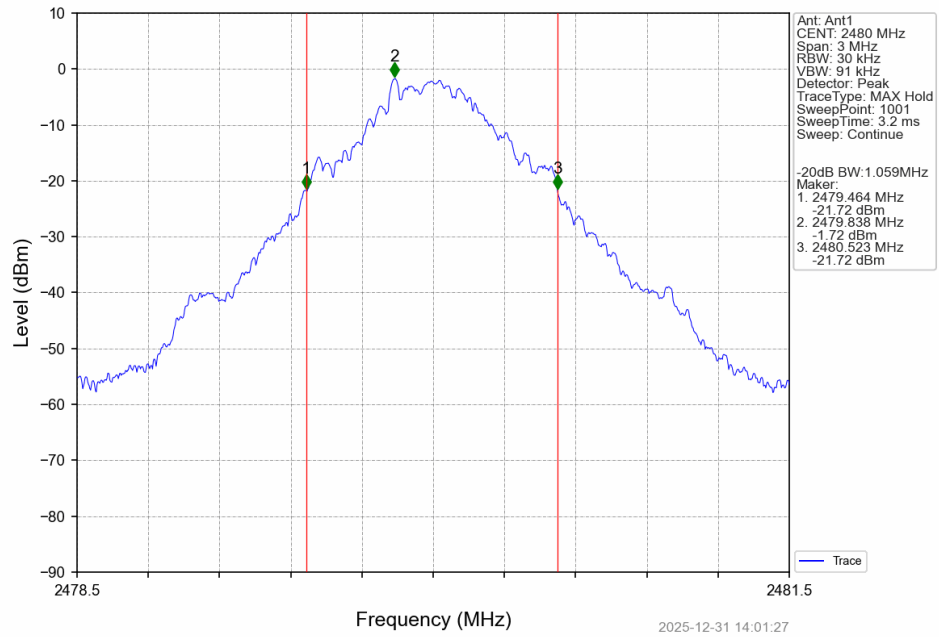
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_NTNV



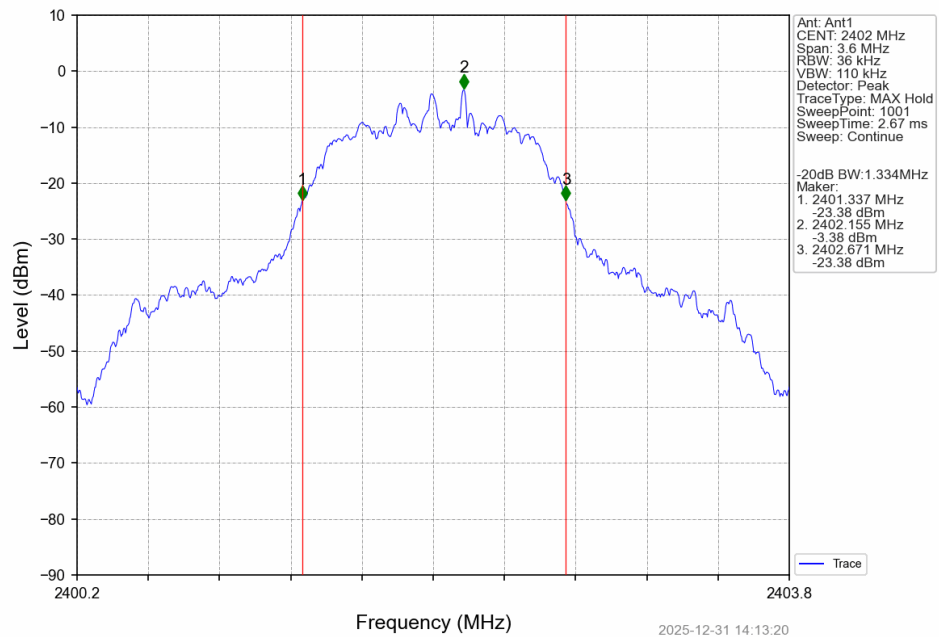
2.2.2 20dB BW



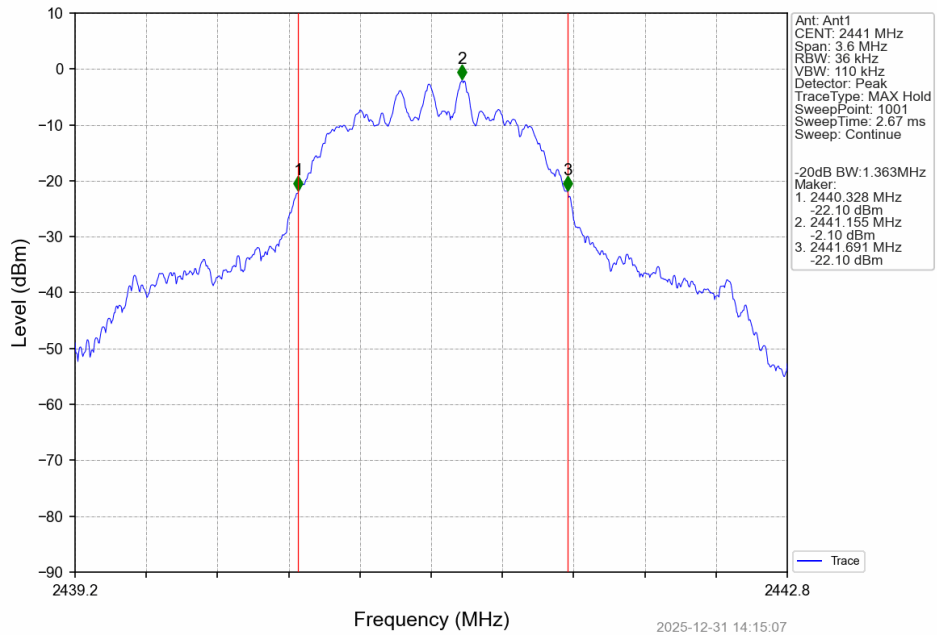
GFSK DH5_HCH_2480MHz_Ant2_NTNV



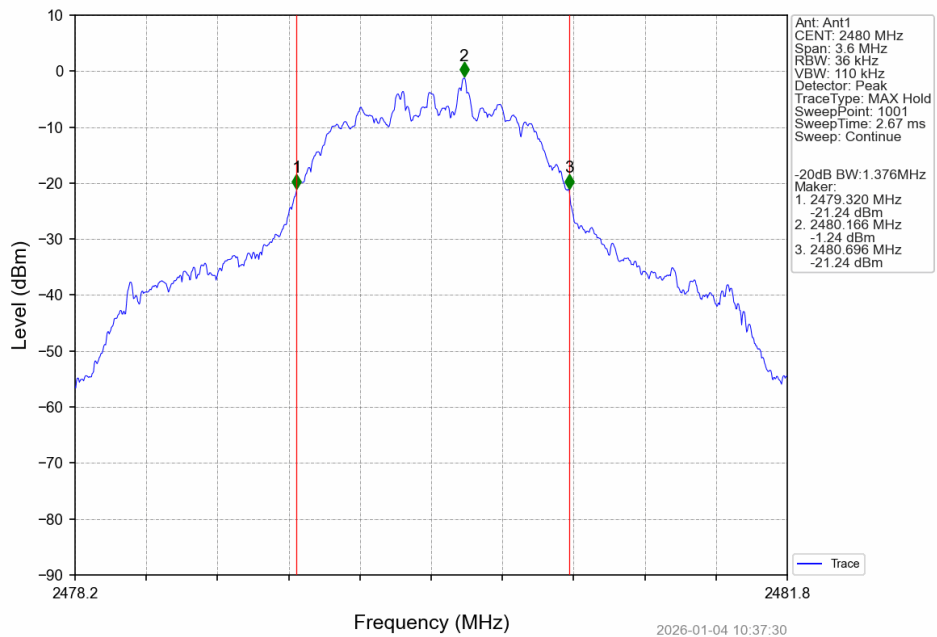
PI/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_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
				Ant2	Limit	
GFSK	SISO	2402	DH5	-1.54	<=20.97	Pass
		2441	DH5	-0.04	<=20.97	Pass
		2480	DH5	0.48	<=20.97	Pass
Pi/4DQPSK	SISO	2402	2DH5	-0.97	<=20.97	Pass
		2441	2DH5	0.28	<=20.97	Pass
		2480	2DH5	1.38	<=20.97	Pass

4. Carrier Frequency Separation

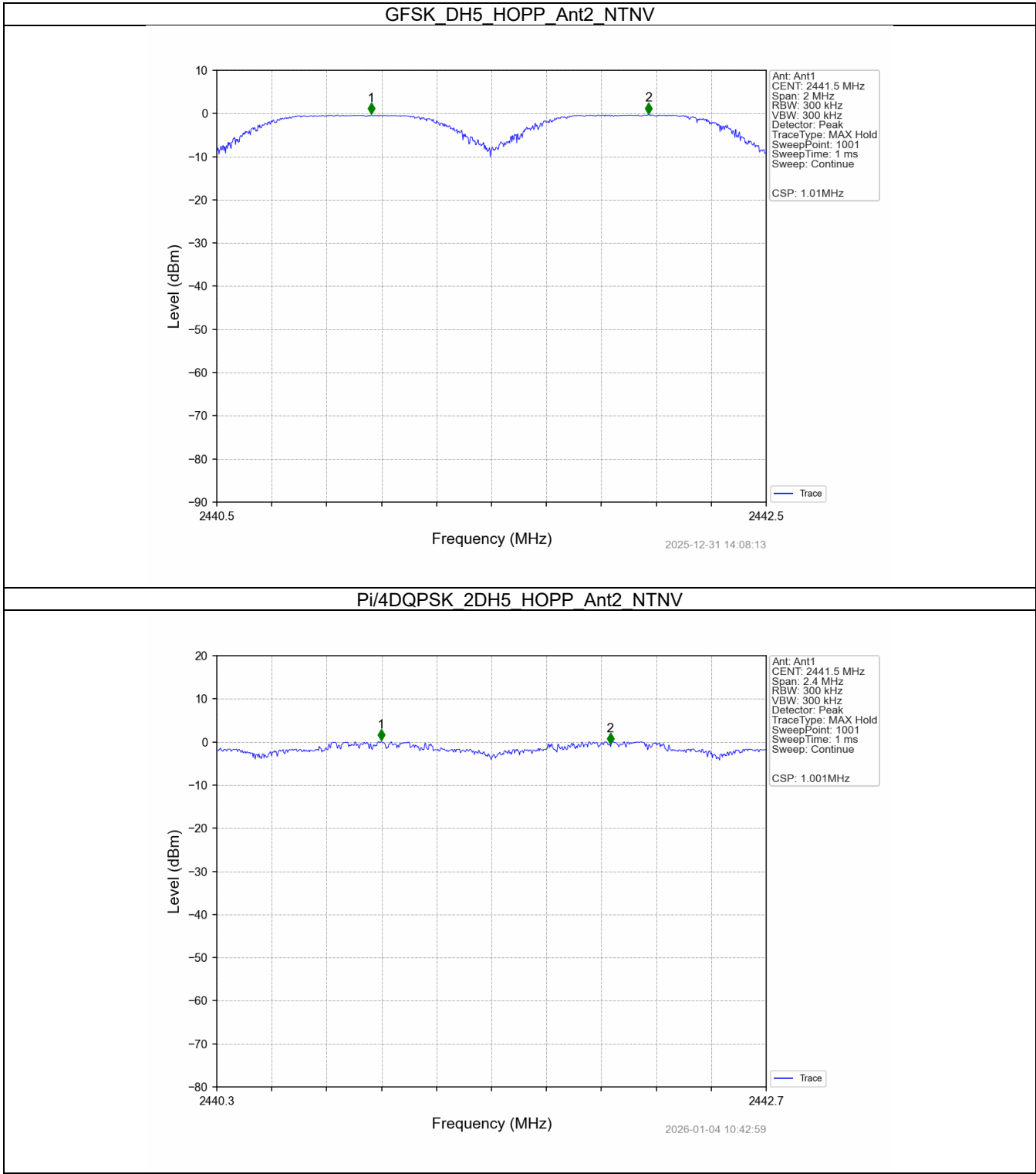
4.1 Test Result

4.1.1 Ant2

Ant2							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.010	1.059	≥ 0.706	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.376	≥ 0.917	Pass

4.2 Test Graph

4.2.1 Ant2



5. Number of Hopping Frequencies

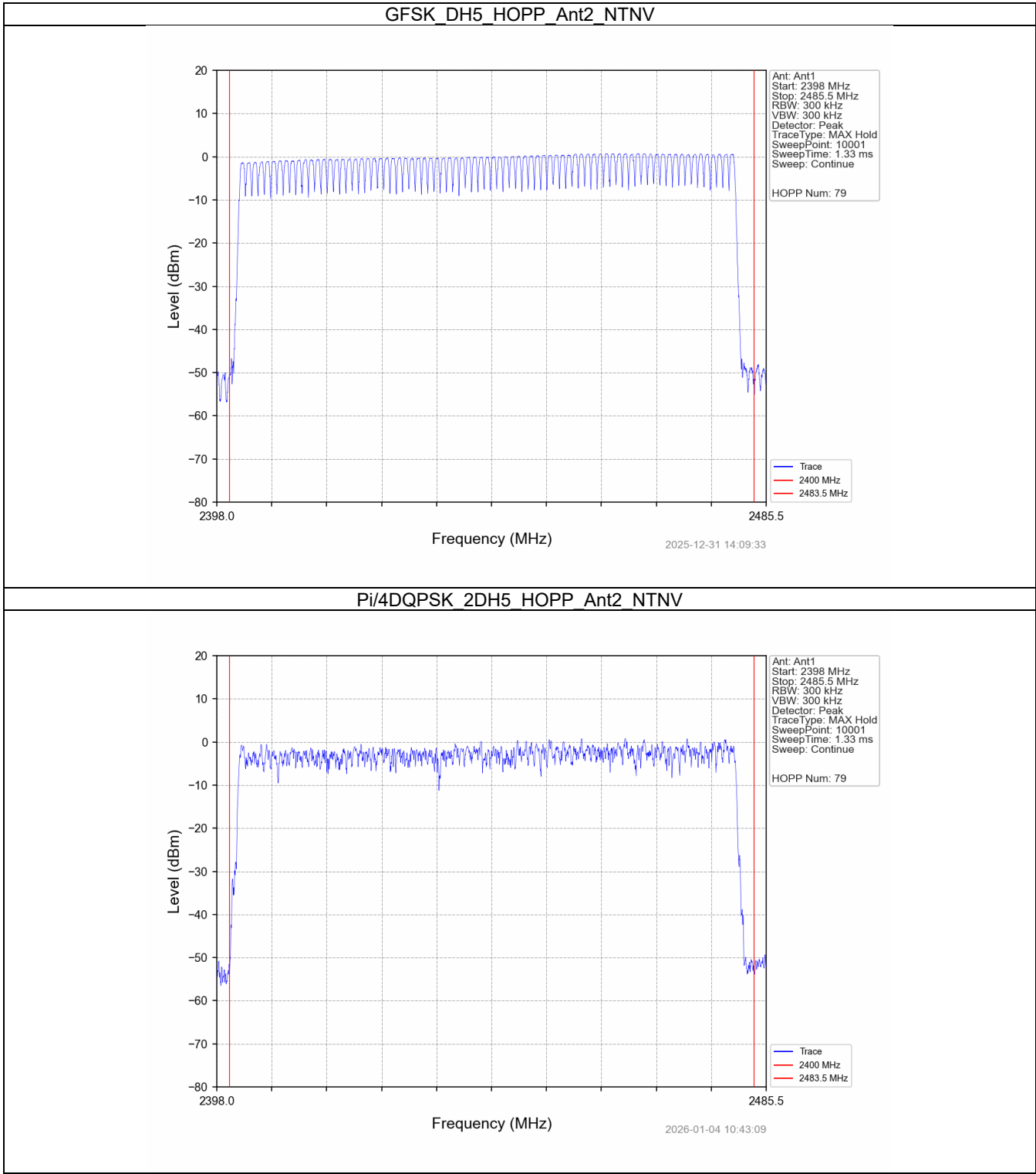
5.1 Test Result

5.1.1 HoppNum

Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				Ant2	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass

5.2 Test Graph

5.2.1 HoppNum



6. Time of Occupancy (Dwell Time)

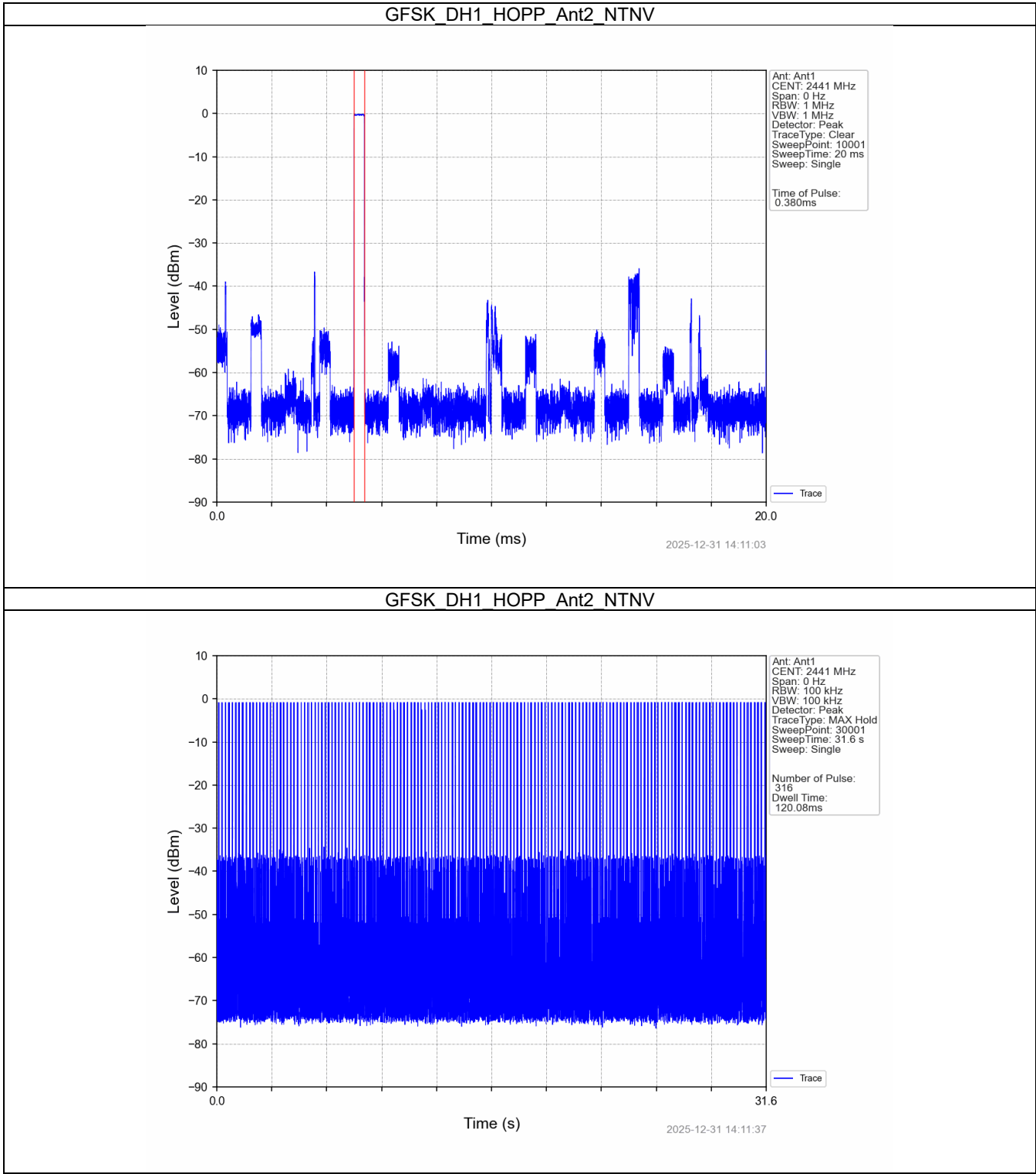
6.1 Test Result

6.1.1 Ant2

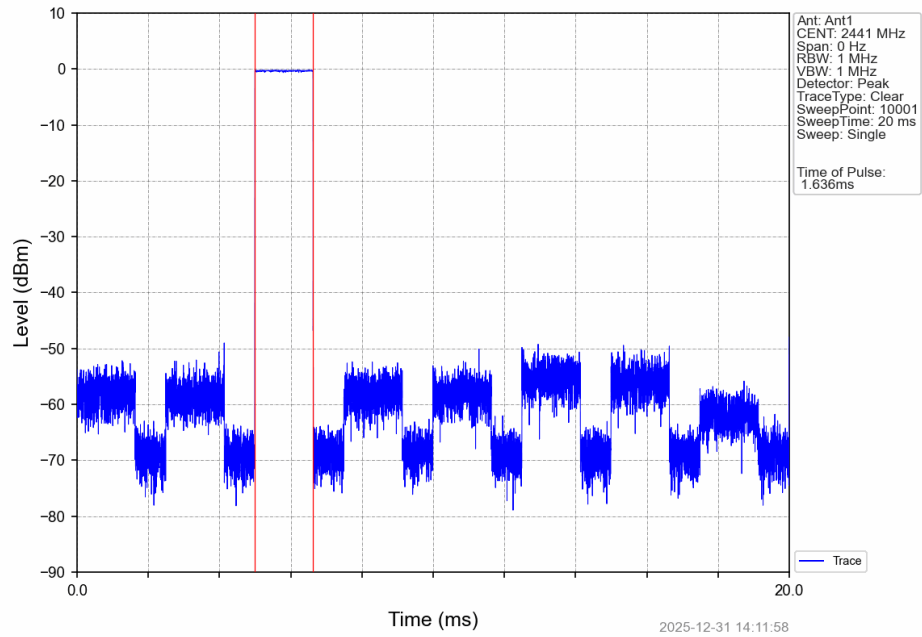
Ant2									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.380	31.600	316	120.080	<=400	Pass
			DH3	1.636	31.600	169	276.484	<=400	Pass
			DH5	2.890	31.600	101	291.890	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.388	31.600	315	122.220	<=400	Pass
			2DH3	1.648	31.600	165	271.920	<=400	Pass
			2DH5	2.892	31.600	105	303.660	<=400	Pass

6.2 Test Graph

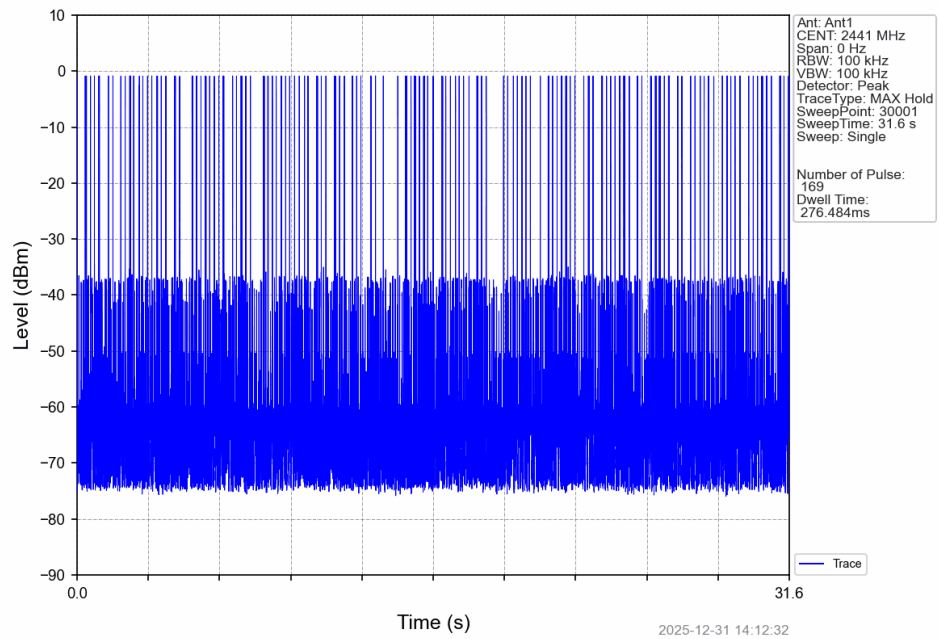
6.2.1 Ant2



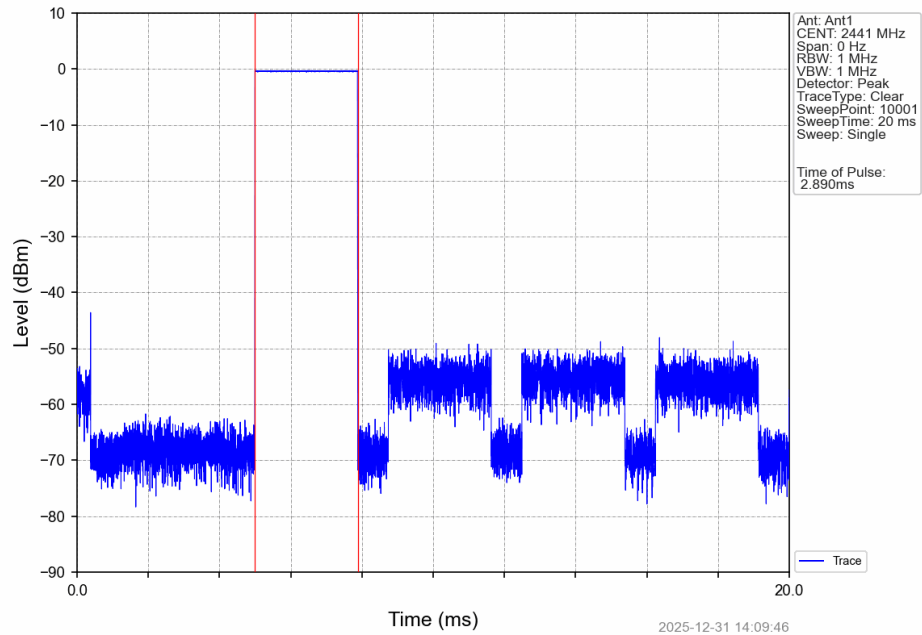
GFSK_DH3_HOPP_Ant2_NTNV



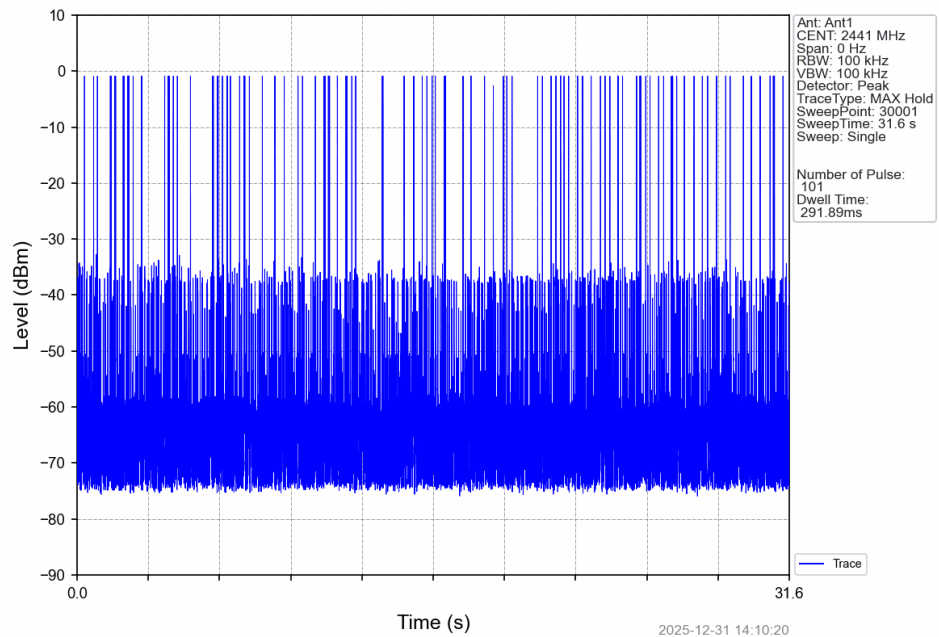
GFSK_DH3_HOPP_Ant2_NTNV



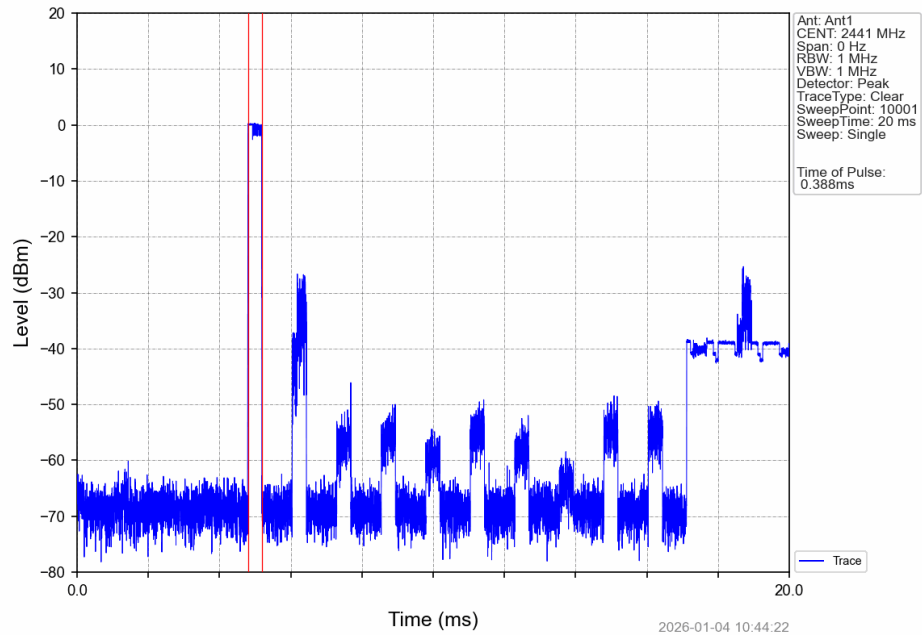
GFSK_DH5_HOPP_Ant2_NTNV



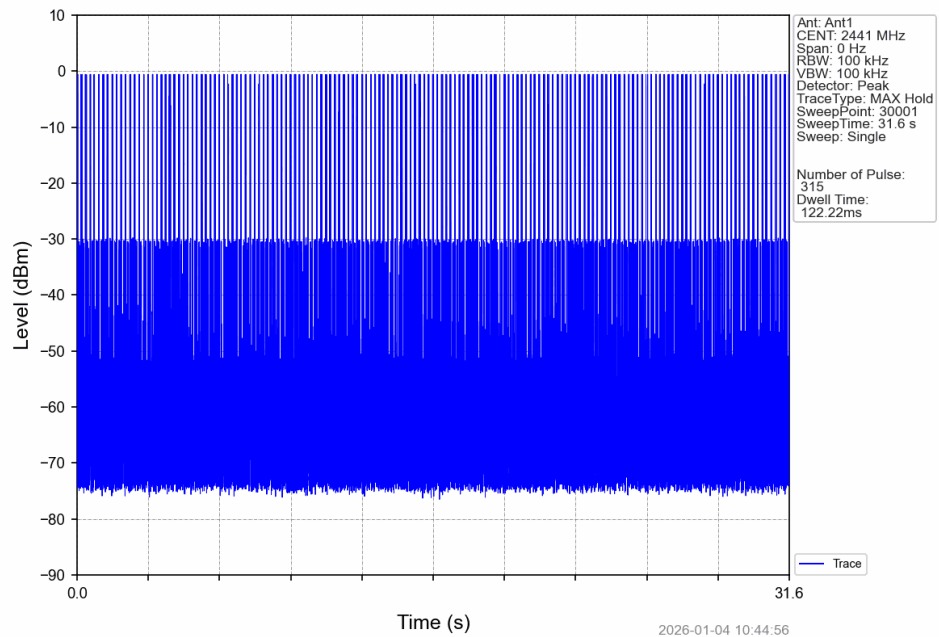
GFSK_DH5_HOPP_Ant2_NTNV



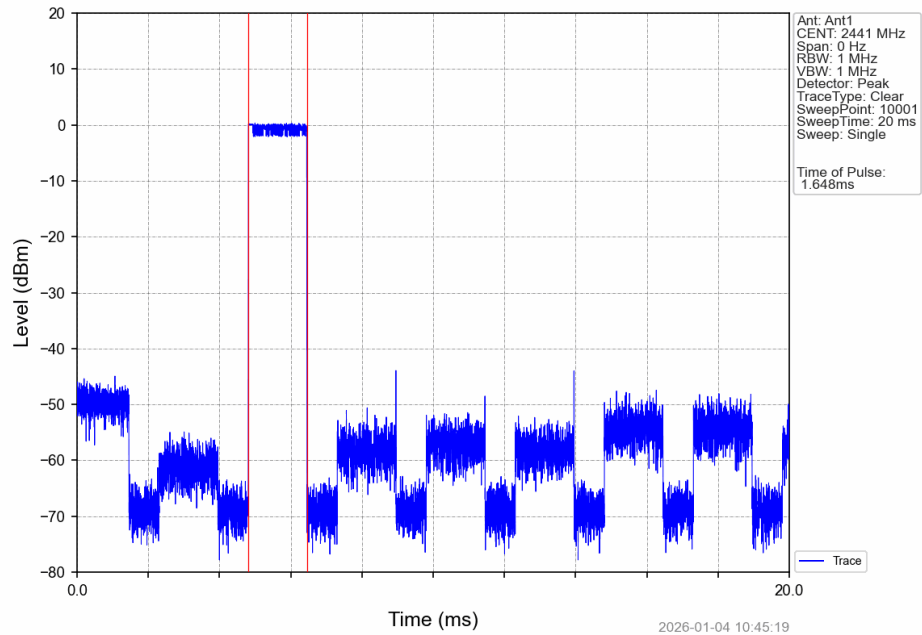
Pi/4DQPSK_2DH1_HOPP_Ant2_NTNV



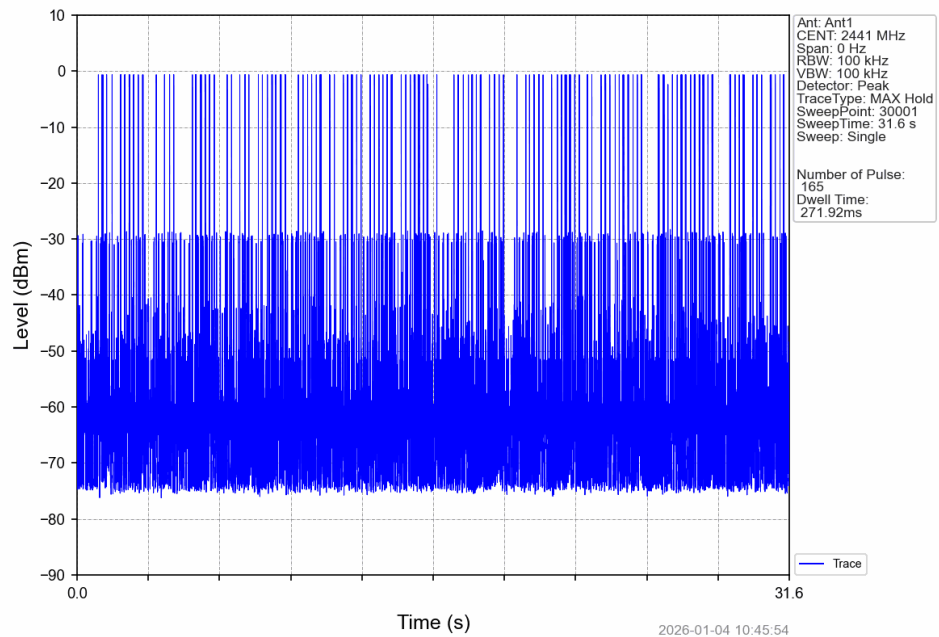
Pi/4DQPSK_2DH1_HOPP_Ant2_NTNV



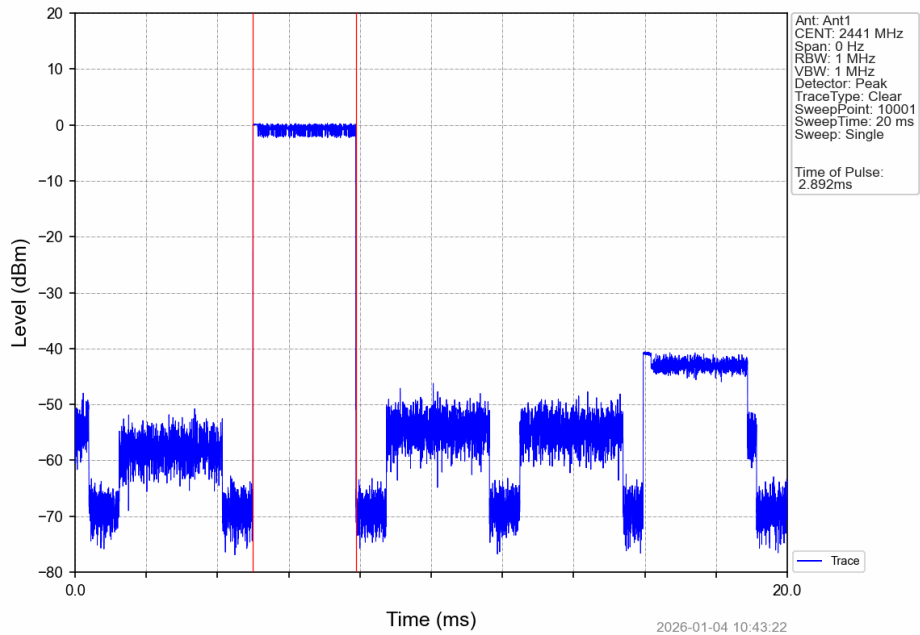
Pi/4DQPSK_2DH3_HOPP_Ant2_NTNV



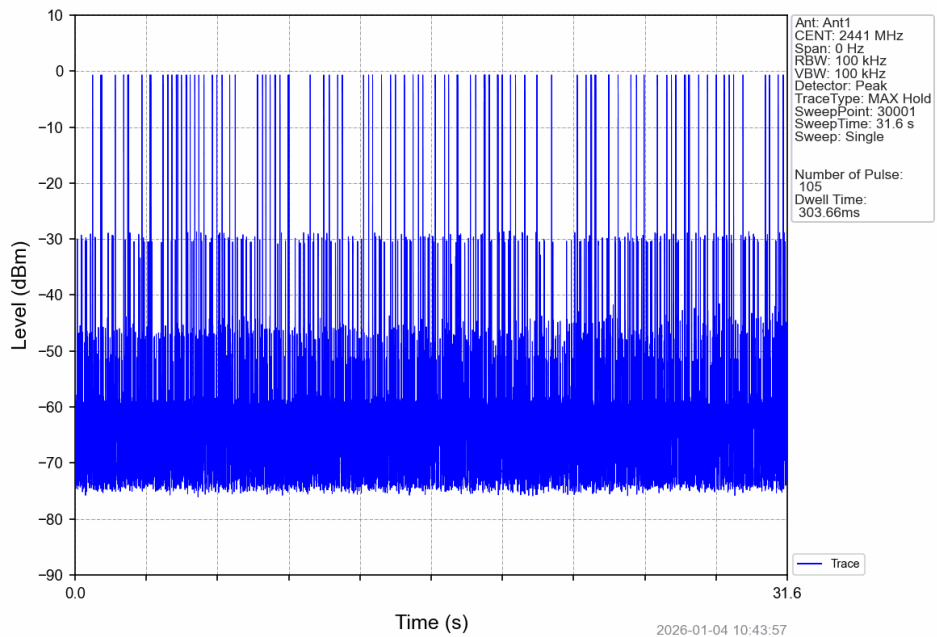
Pi/4DQPSK_2DH3_HOPP_Ant2_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

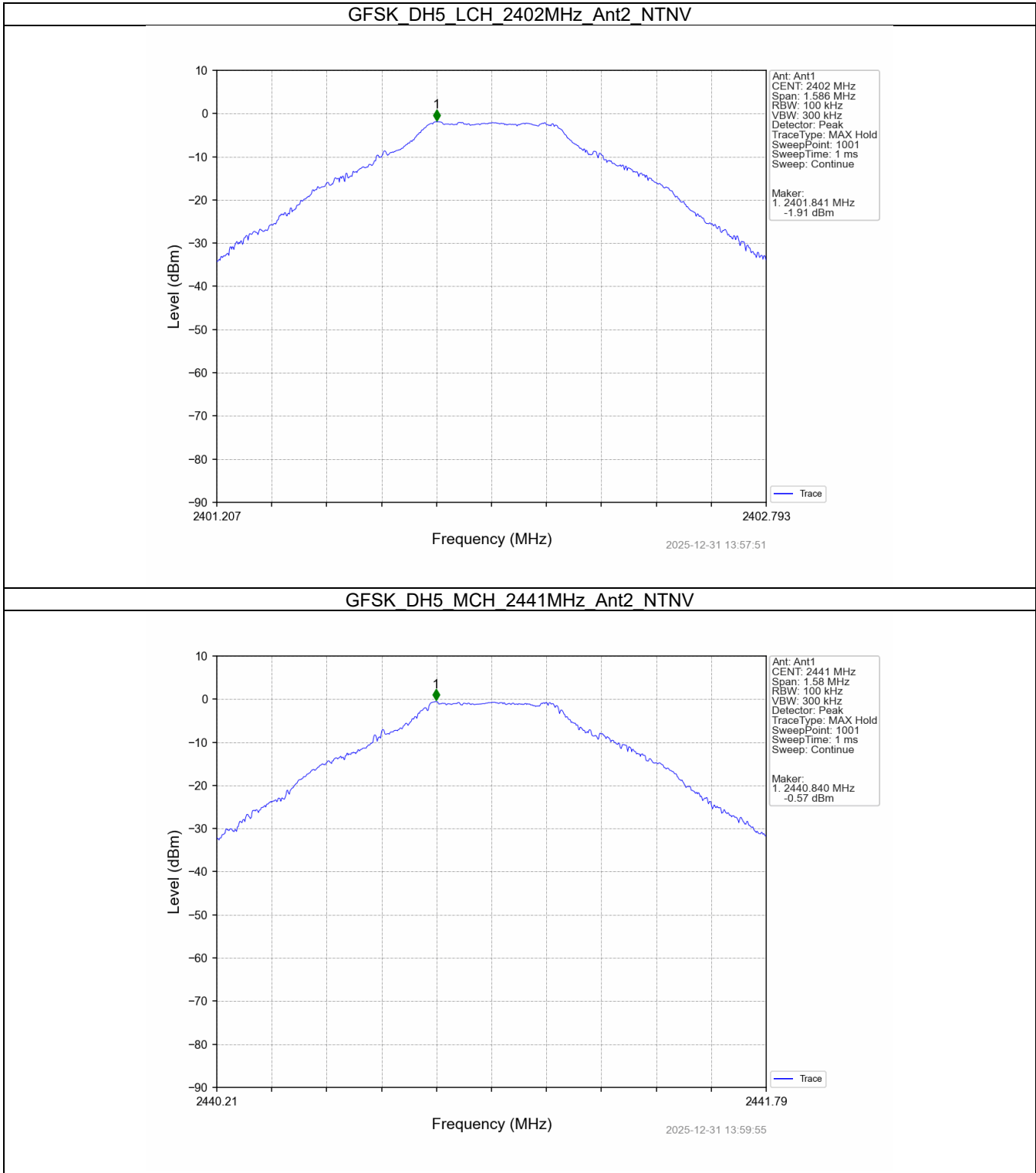
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	-1.91
		2441	DH5	1	-0.57
		2480	DH5	1	-0.04
		HOPP	DH5	1	0.45
					0.45
Pi/4DQPSK	SISO	2402	2DH5	1	-2.05
		2441	2DH5	1	-0.58
		2480	2DH5	1	0.12
		HOPP	2DH5	1	0.33
					0.33
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.					

7.1.2 CSE

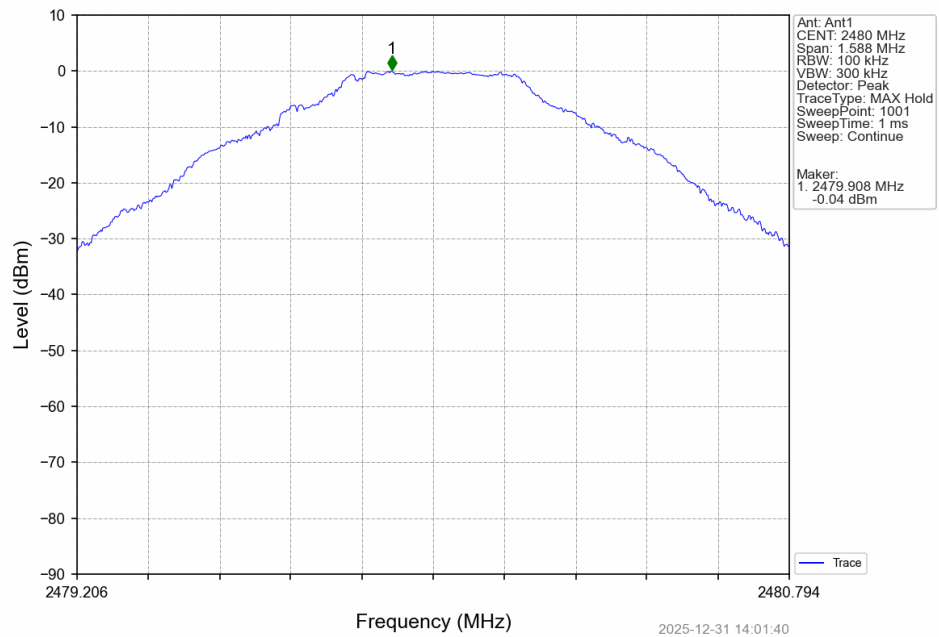
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	-1.91	-21.91	Pass
		2441	DH5	1	-0.57	-20.57	Pass
		2480	DH5	1	-0.04	-20.04	Pass
		HOPP	DH5	1	0.45	-19.55	Pass
					0.45	-19.55	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	-2.05	-22.05	Pass
		2441	2DH5	1	-0.58	-20.58	Pass
		2480	2DH5	1	0.12	-19.88	Pass
		HOPP	2DH5	1	0.33	-19.67	Pass
					0.33	-19.67	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

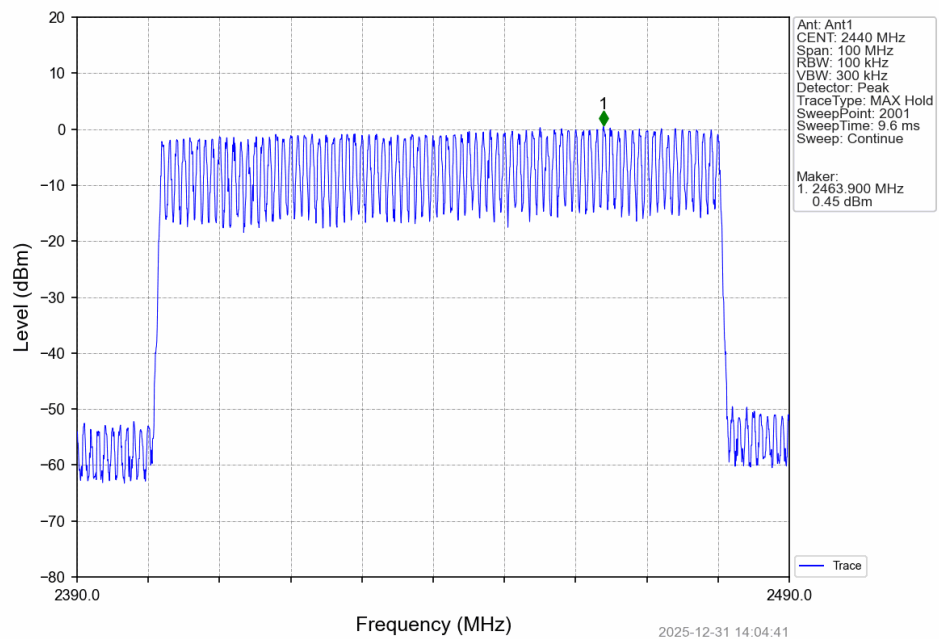
7.2.1 Ref



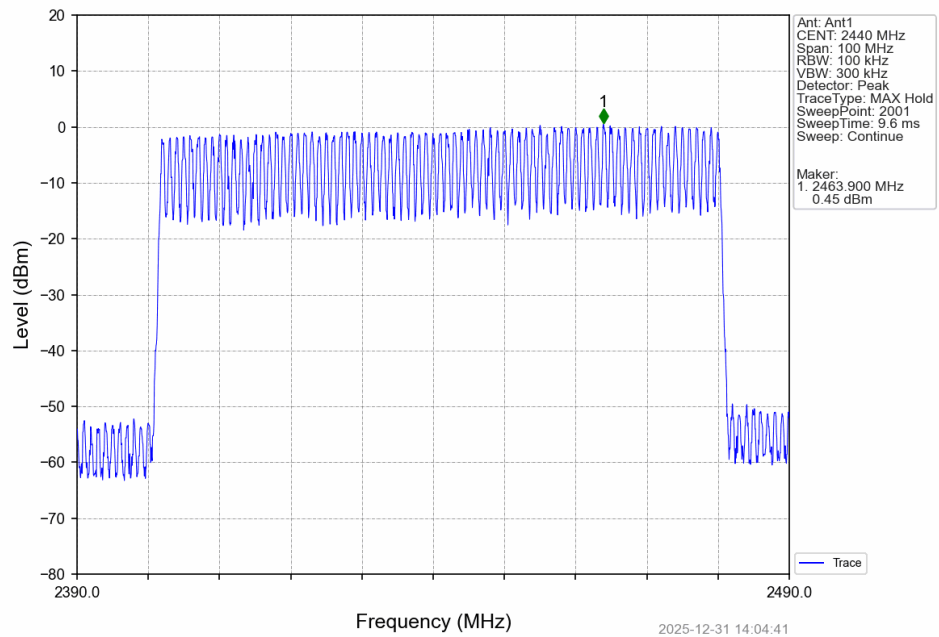
GFSK_DH5_HCH_2480MHz_Ant2_NTNV



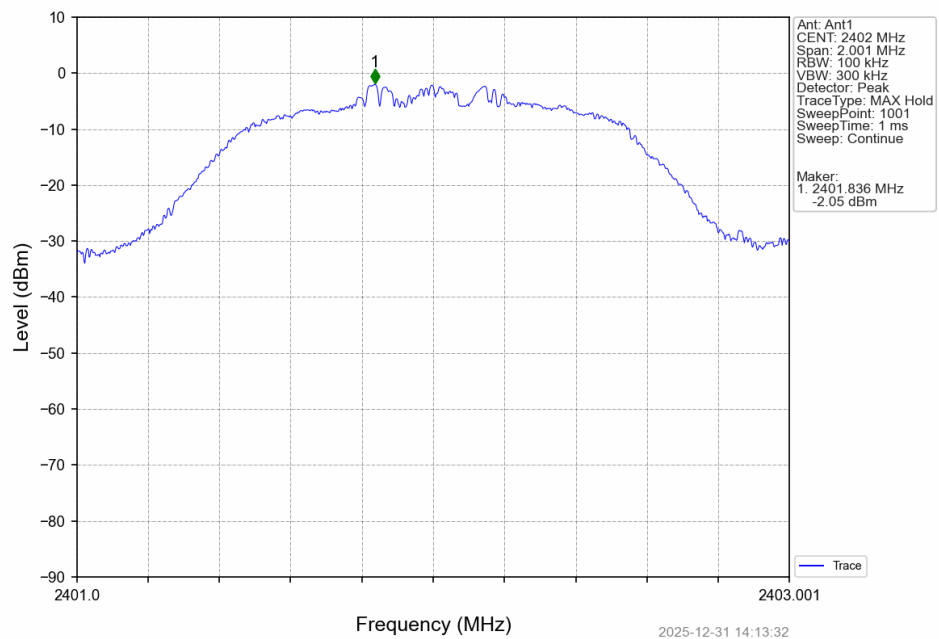
GFSK_DH5_HOPP_Ant2_NTNV



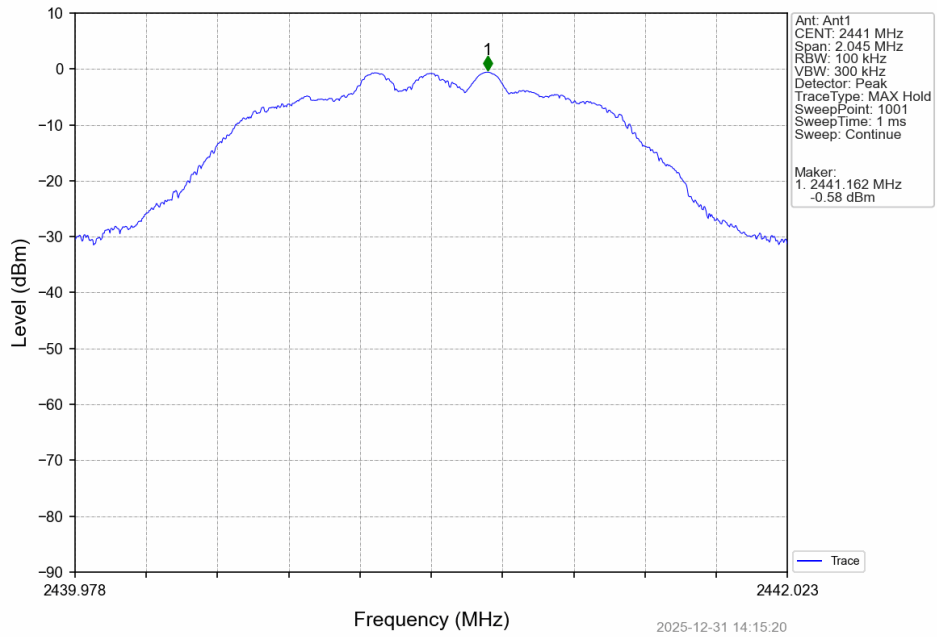
GFSK_DH5_HOPP_Ant2_NTNV



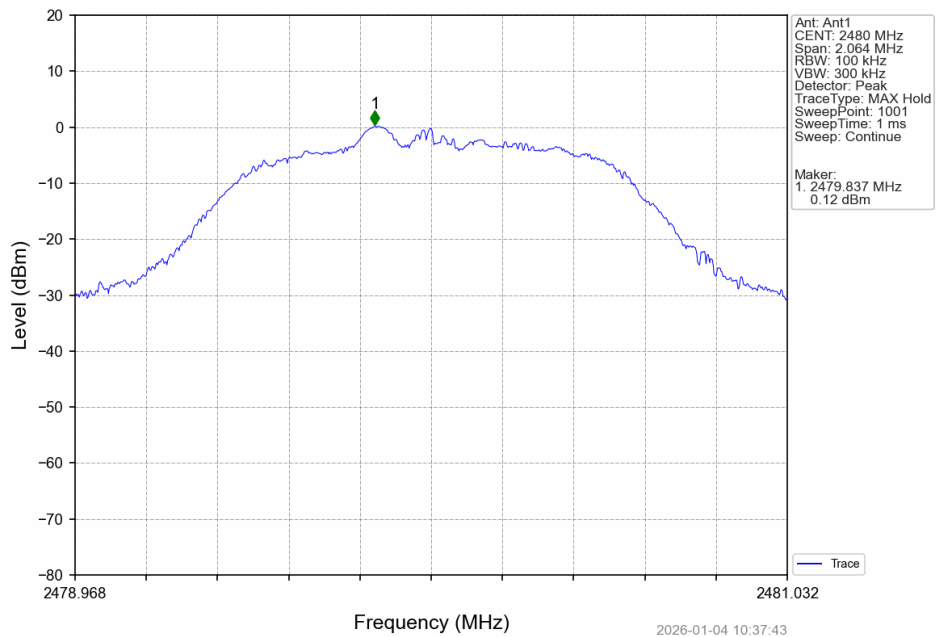
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



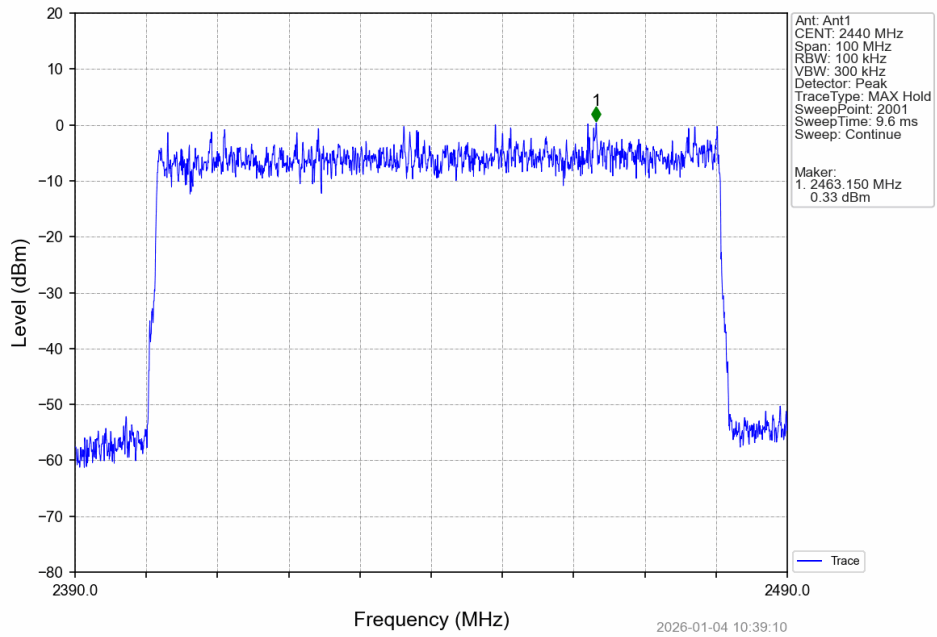
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



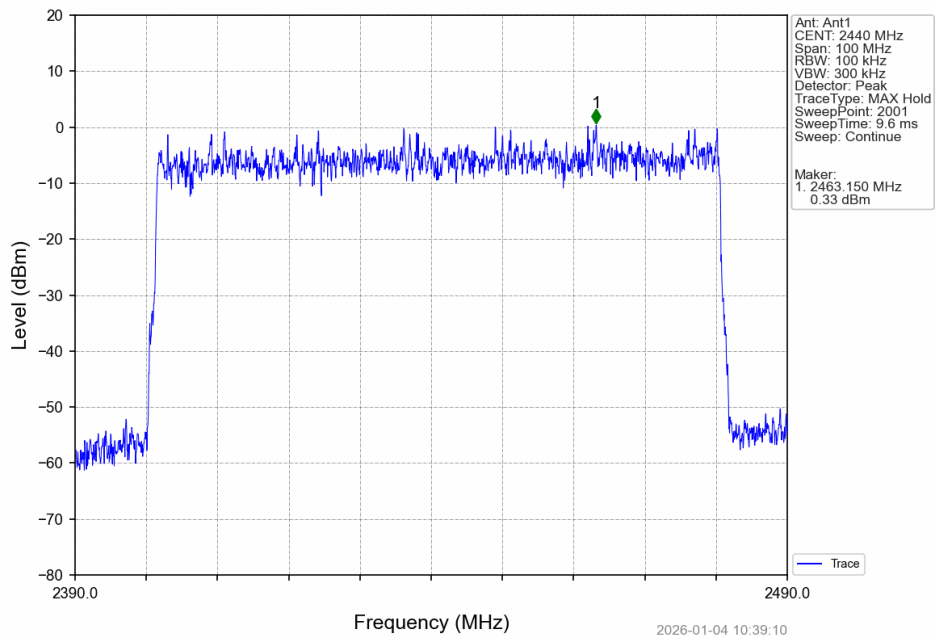
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_NTNV



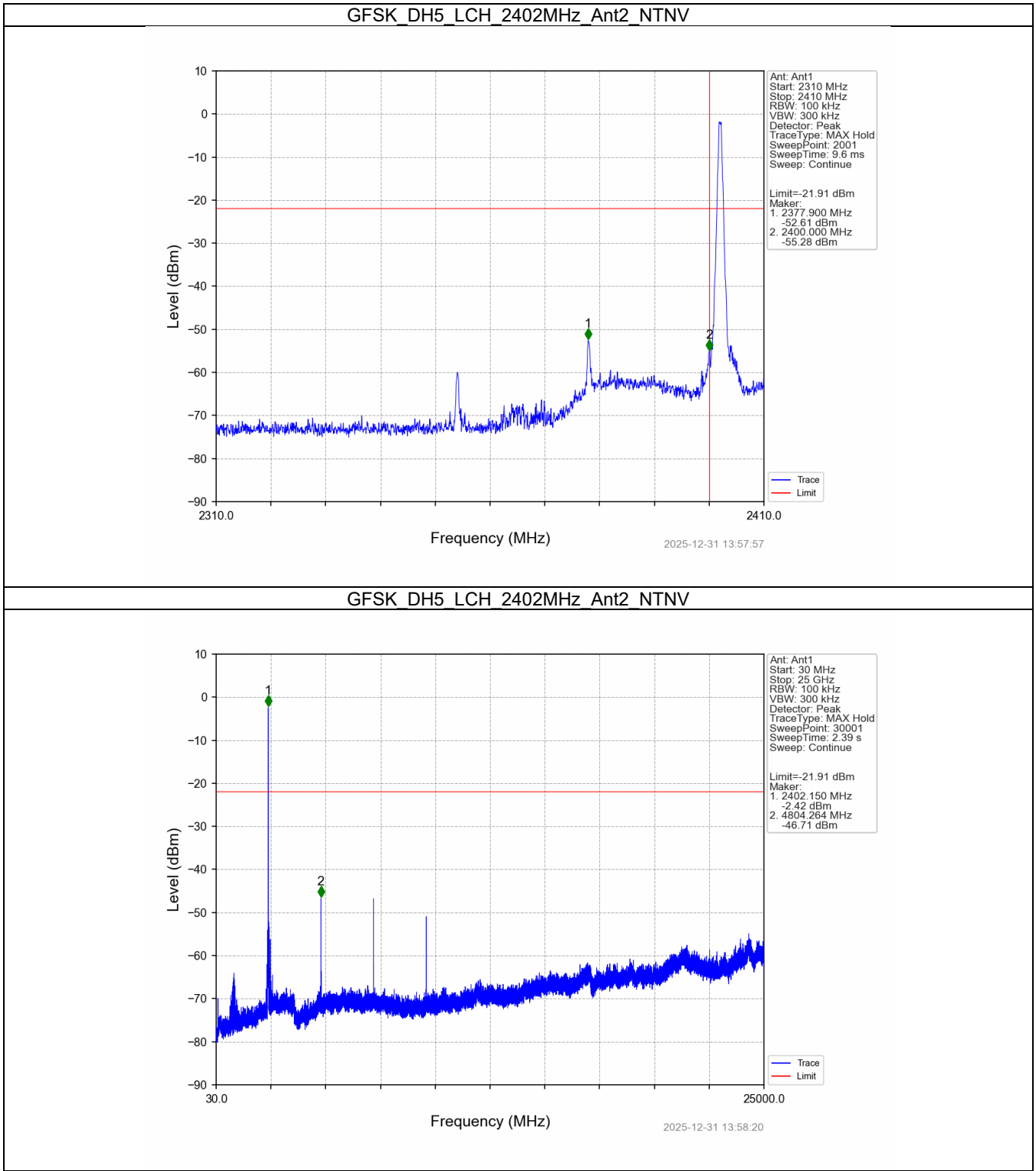
Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



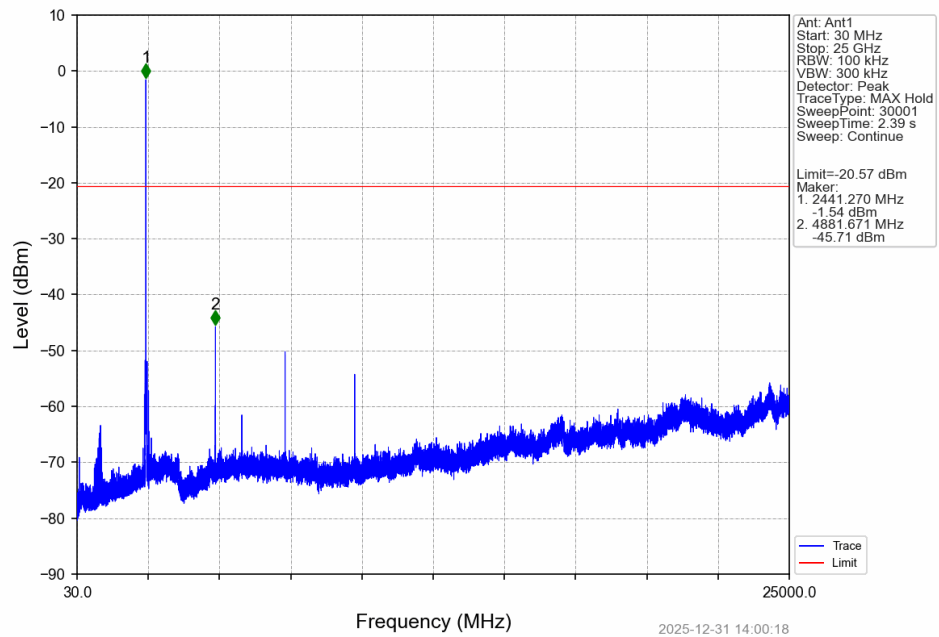
Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



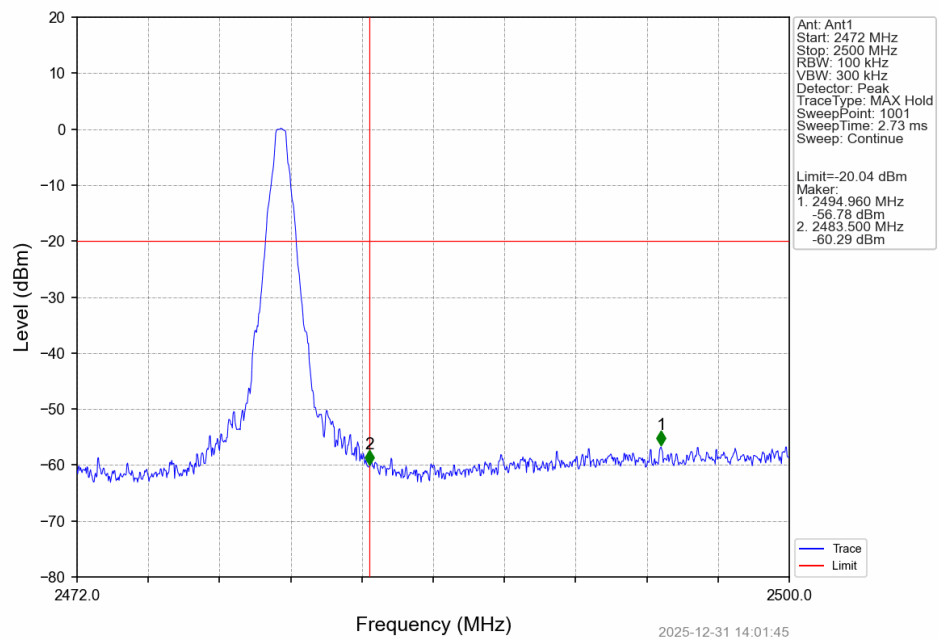
7.2.2 CSE



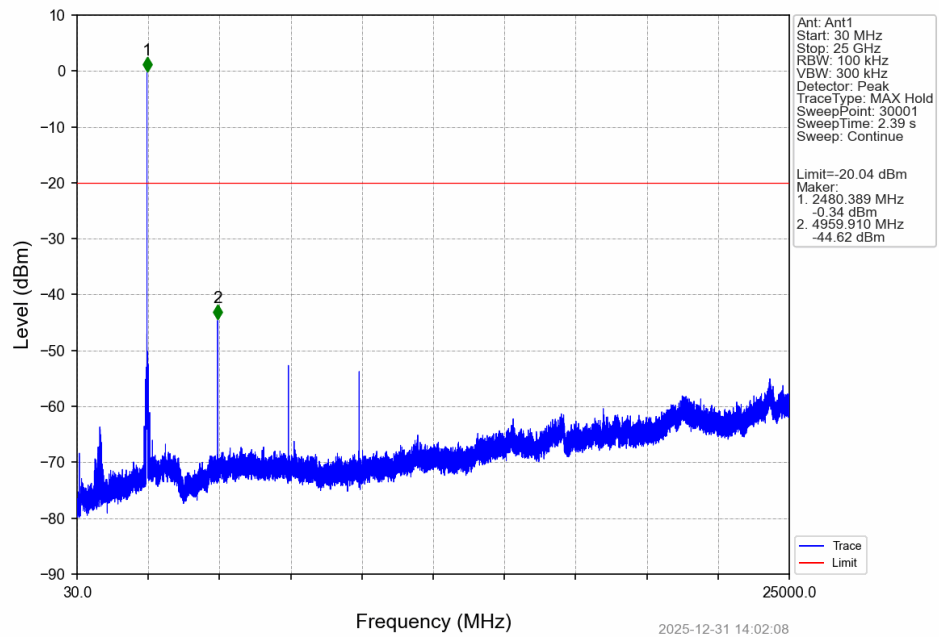
GFSK_DH5_MCH_2441MHz_Ant2_NTNV



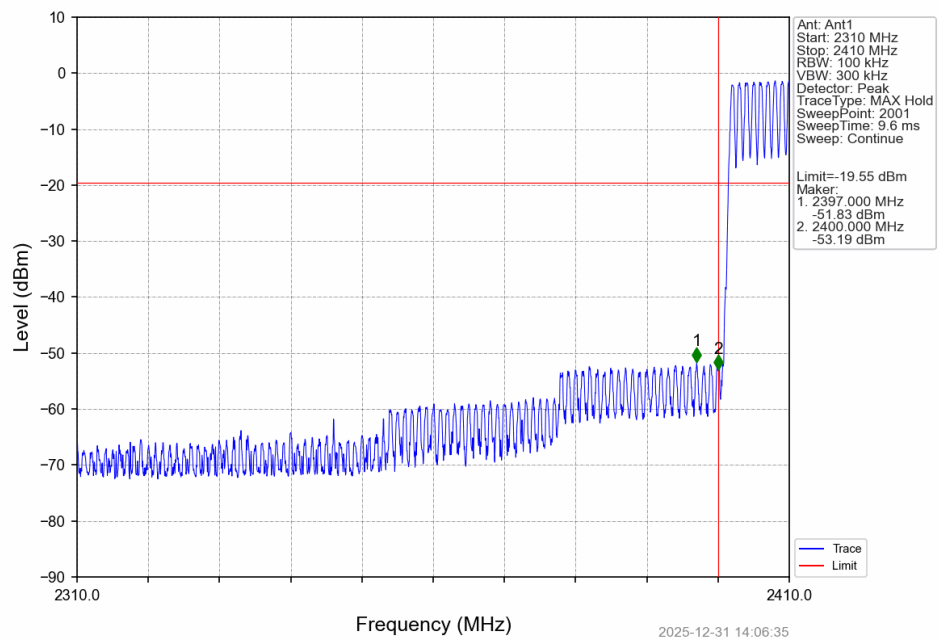
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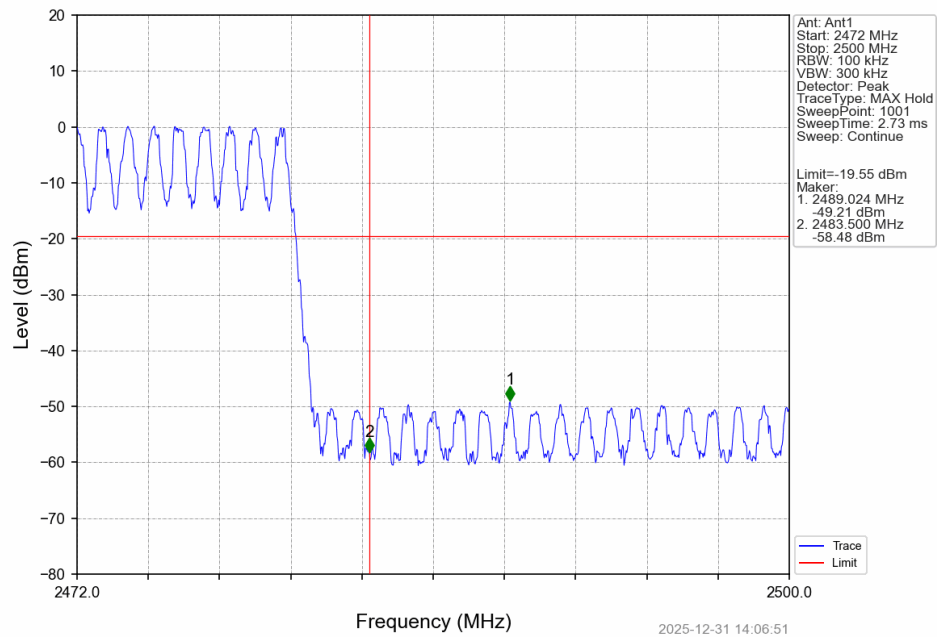
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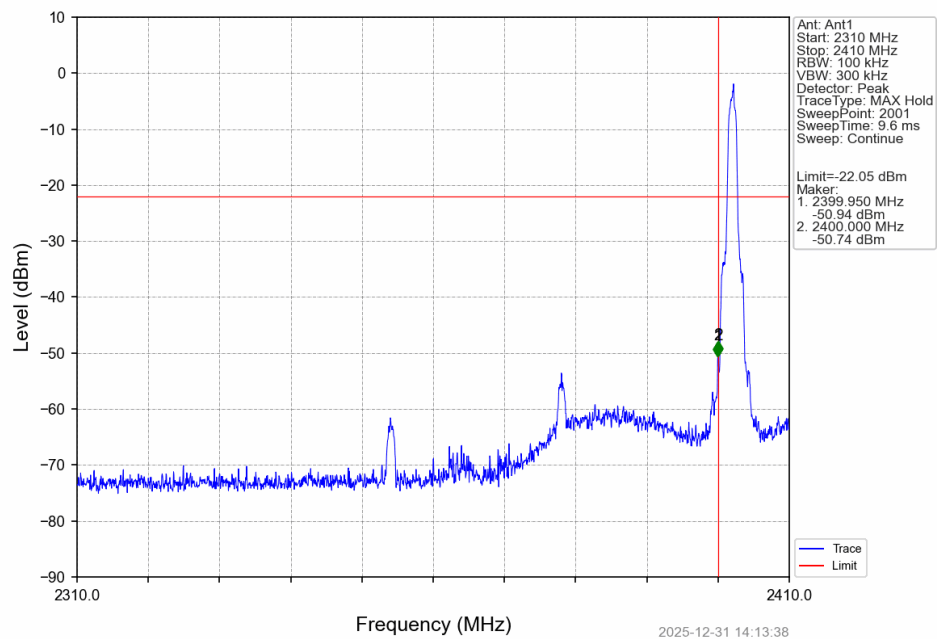
GFSK_DH5_HOPP_Ant2_NTNV



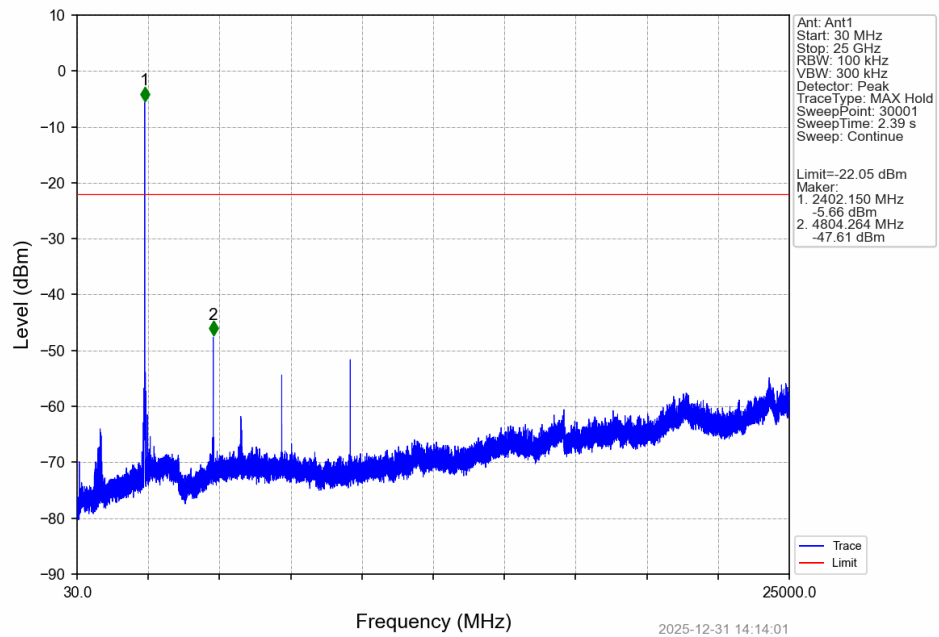
GFSK_DH5_HOPP_Ant2_NTNV



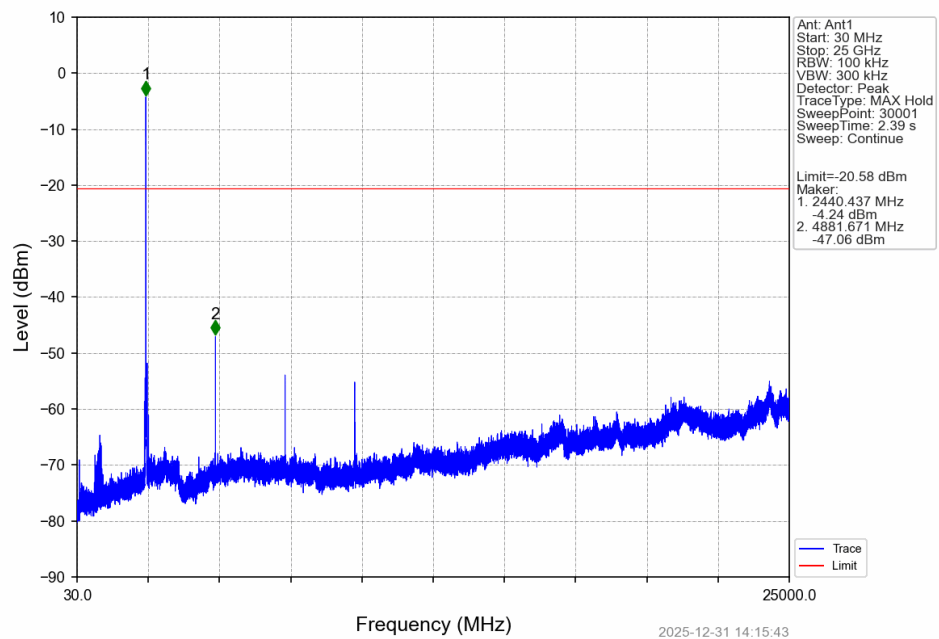
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



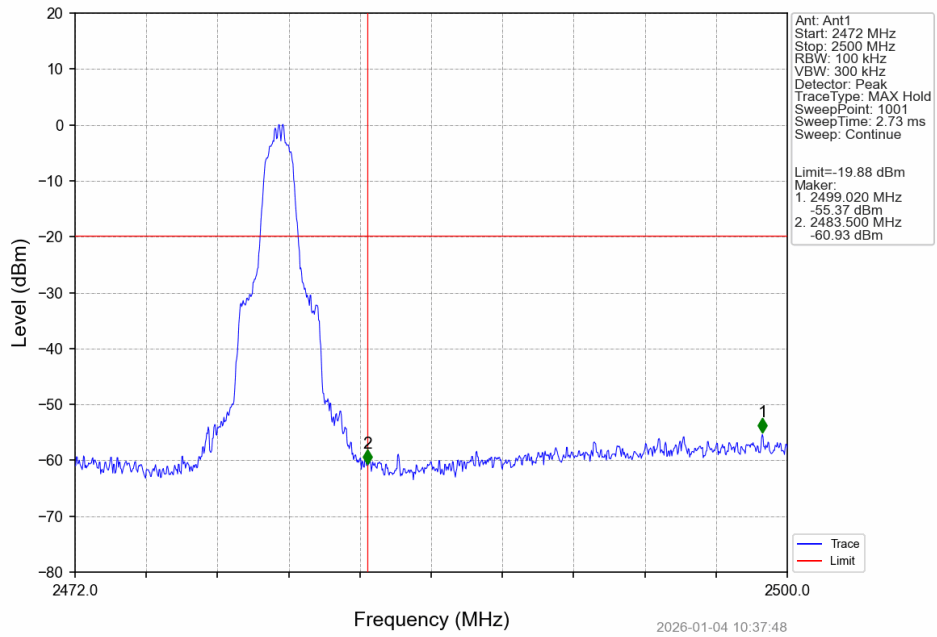
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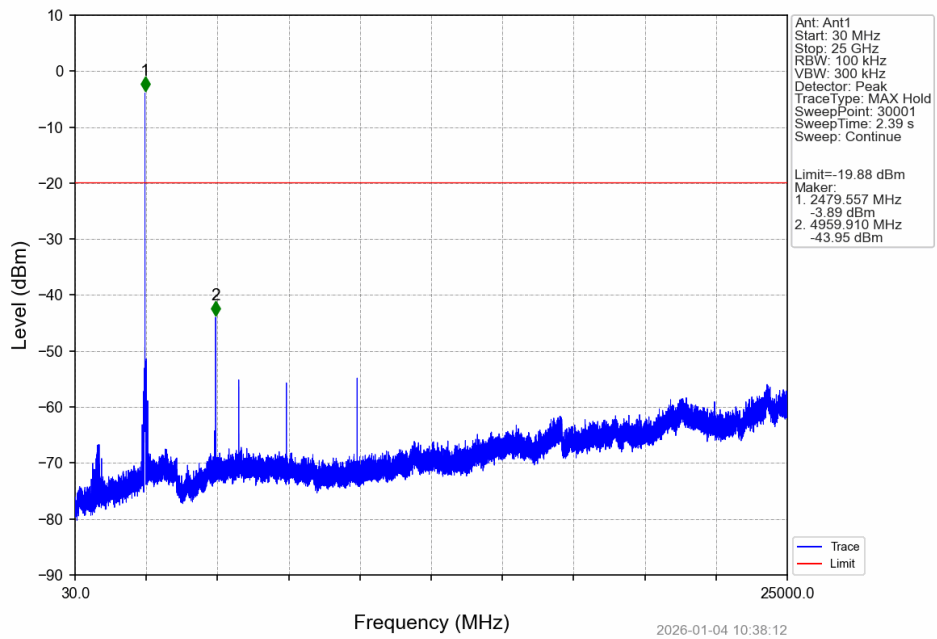
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



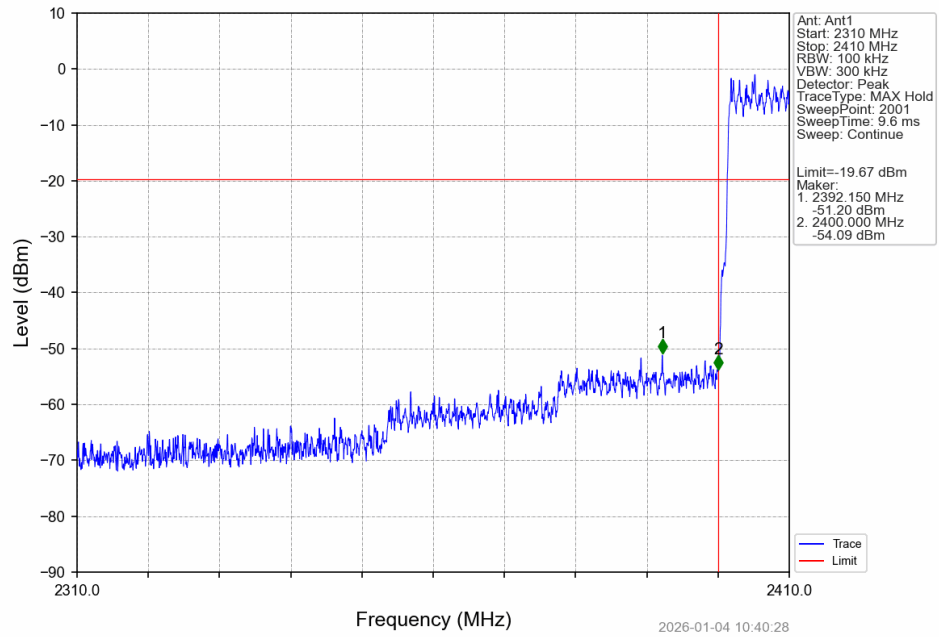
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant2_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV

