

ANNEX D TEST DATA**For**

Project No.:	8225EU011901W
Client:	Hong Kong Etech Groups Ltd.
Product Description.	True Wireless Earbuds
Model No..	EB5615
FCC ID:	2A3ZO-21943
Technology:	Bluetooth BDR+EDR
Test Engineer:	<i>Mikey zhu</i>
Test Date:	2024-01-26

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

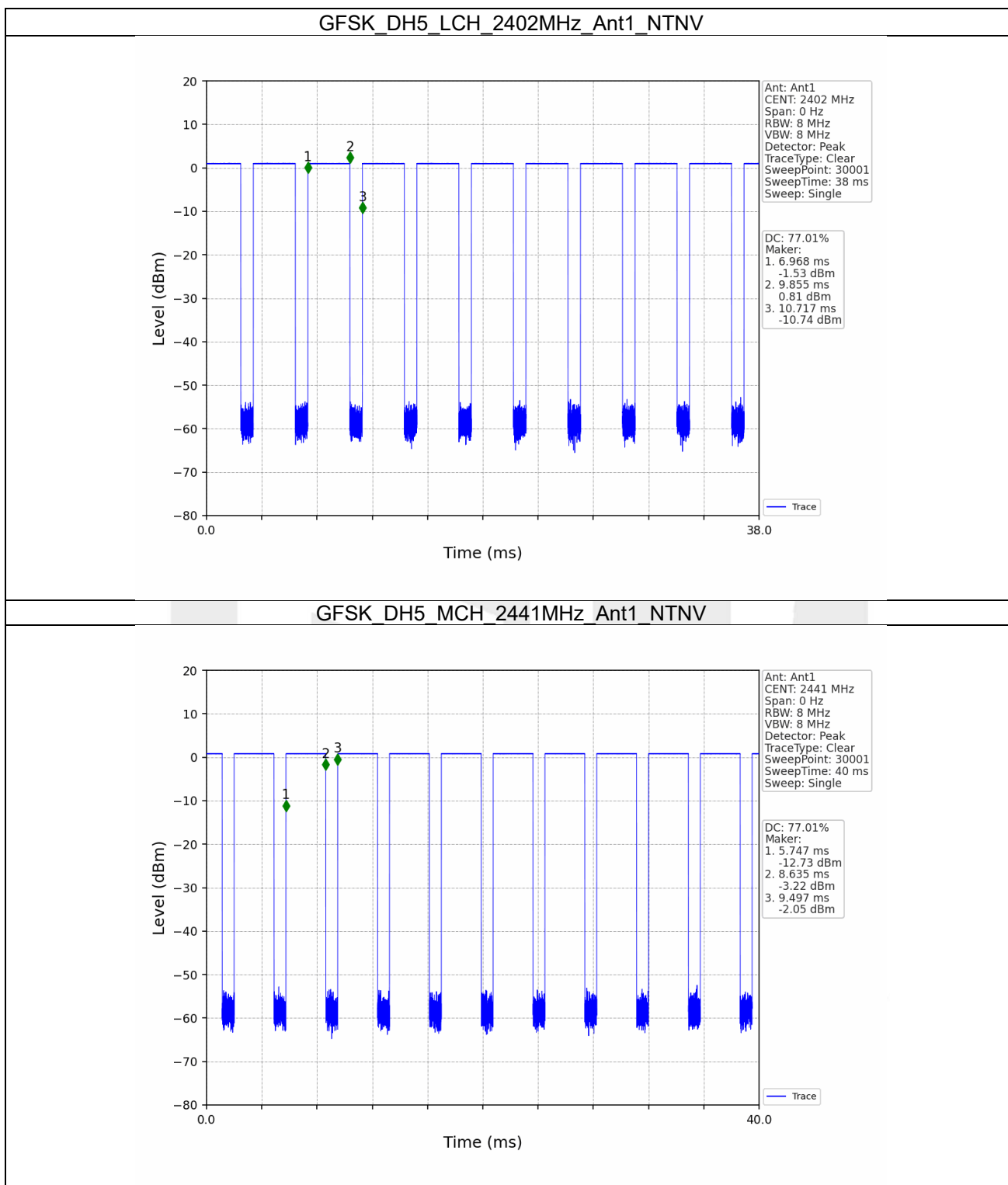
1. Duty Cycle

1.1 Ant1

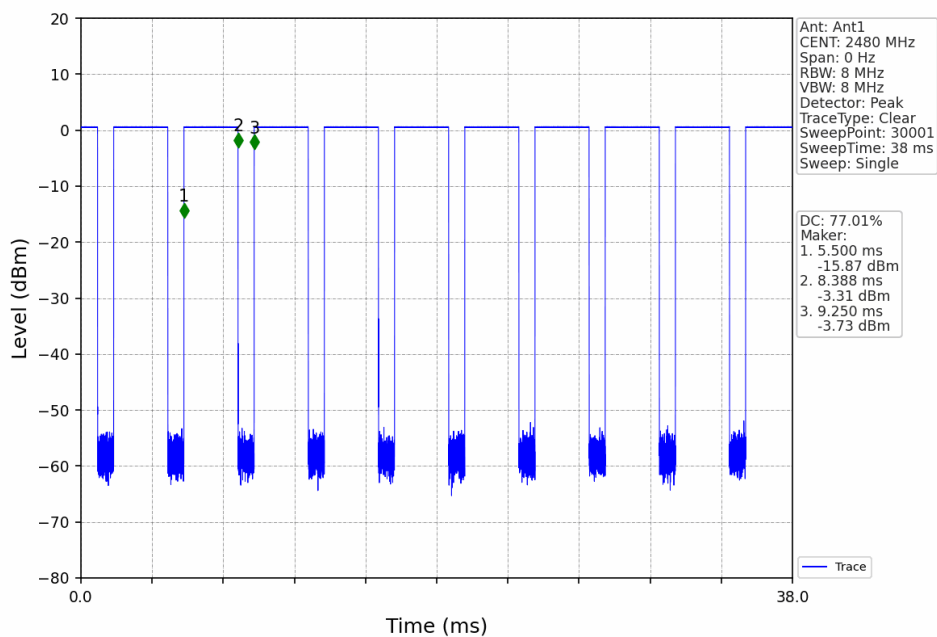
1.1.1 Test Result

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	2.887	3.749	77.01	1.13	0.03
		2441	DH5	2.888	3.750	77.01	1.13	0.03
		2480	DH5	2.888	3.750	77.01	1.13	0.03
π/4DQPSK	SISO	2402	2DH5	2.892	3.749	77.14	1.13	0.01
		2441	2DH5	2.892	3.751	77.10	1.13	0.03
		2480	2DH5	2.892	3.750	77.12	1.13	0.01
8DPSK	SISO	2402	3DH5	0.896	3.750	23.89	6.22	0.01
		2441	3DH5	0.895	3.749	23.87	6.22	0.03
		2480	3DH5	0.896	3.749	23.90	6.22	0.03

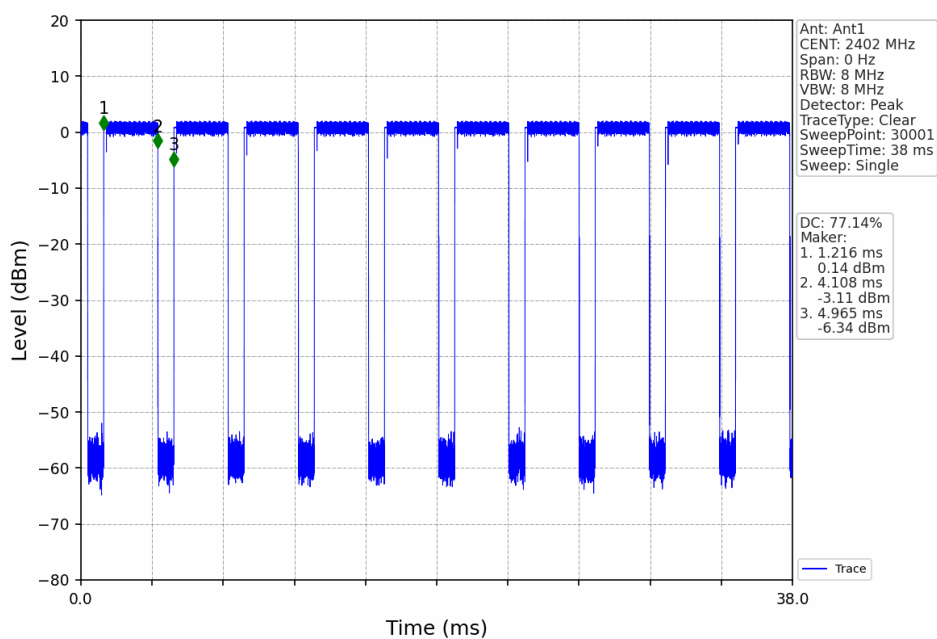
1.1.2 Test Graph



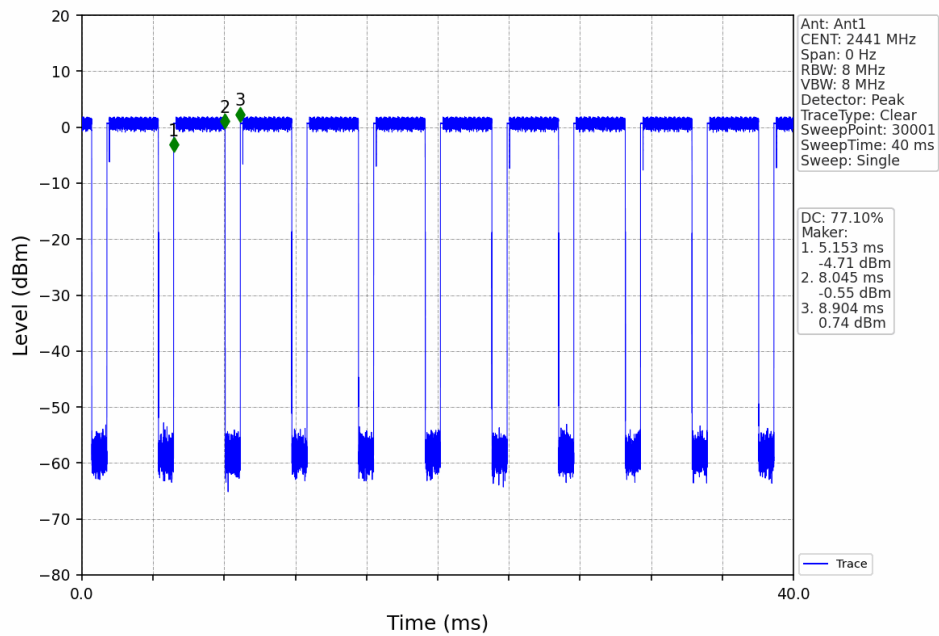
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



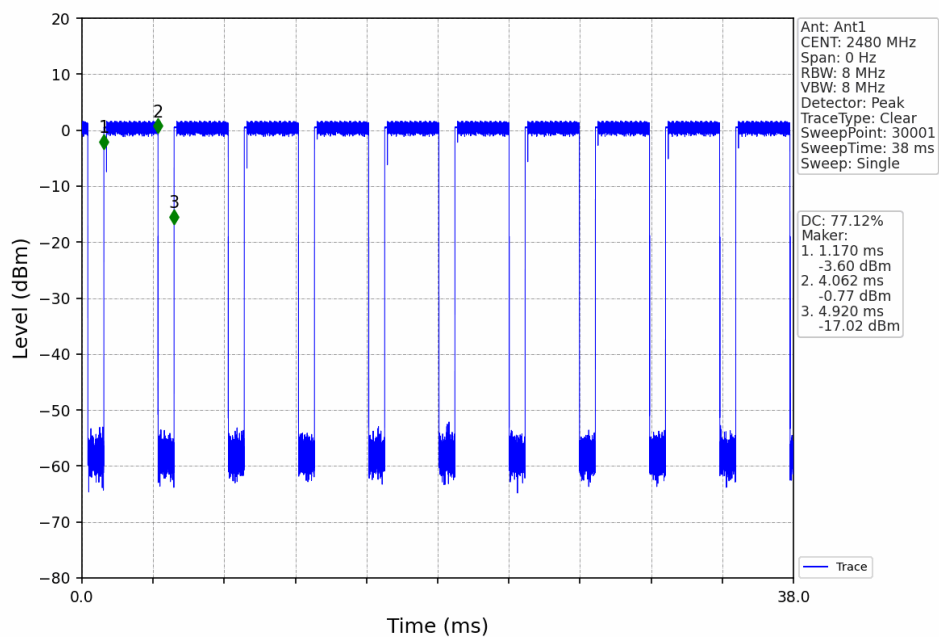
$\pi/4$ DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



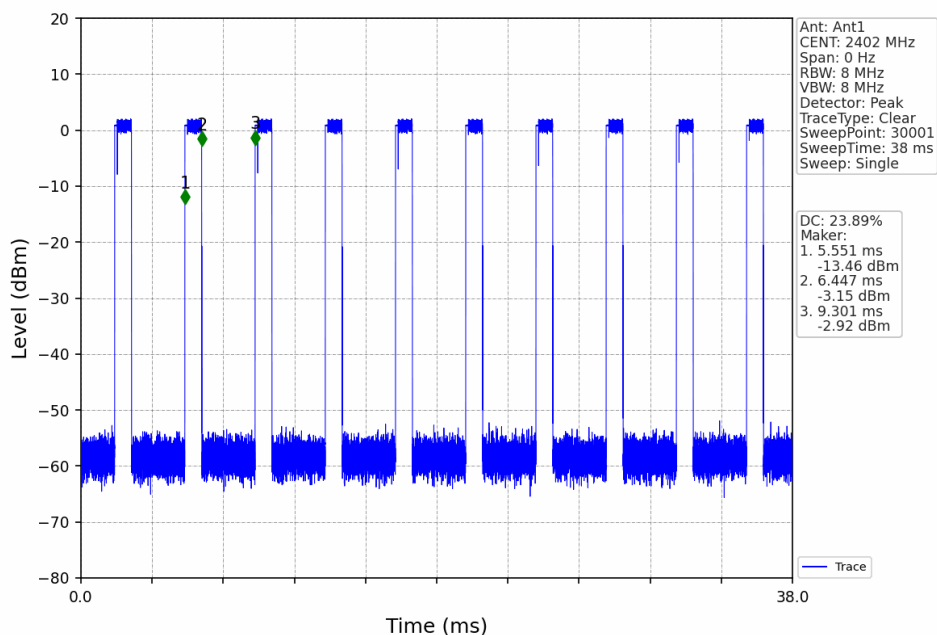
$\pi/4$ DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



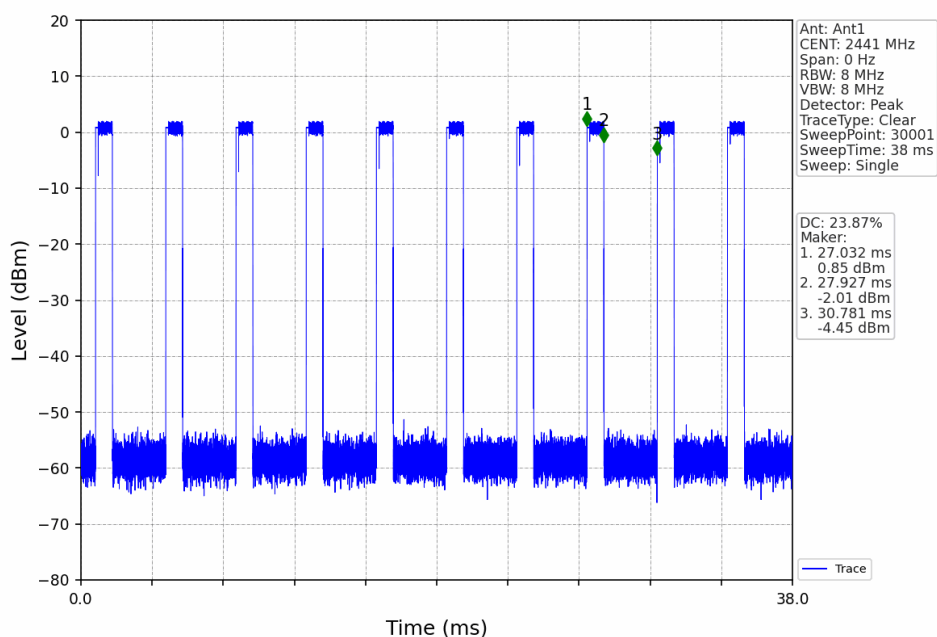
$\pi/4$ DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

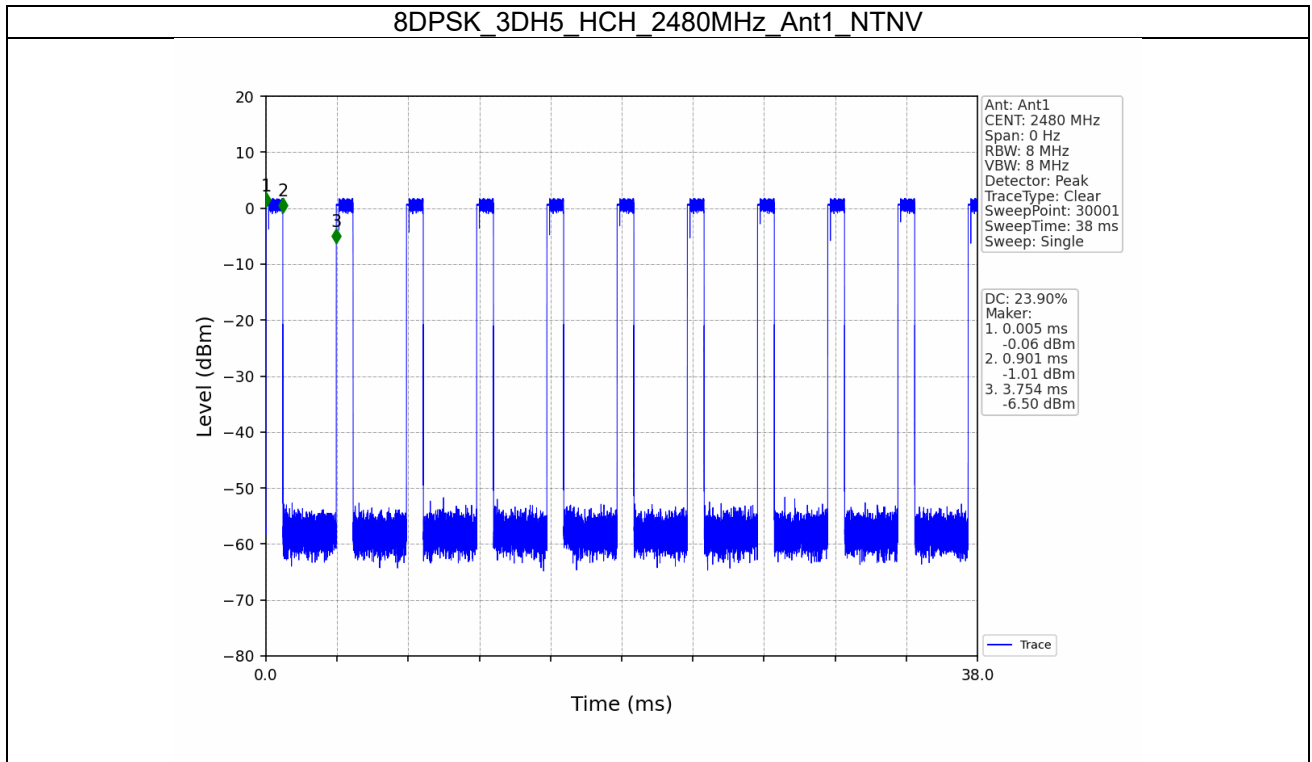


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV





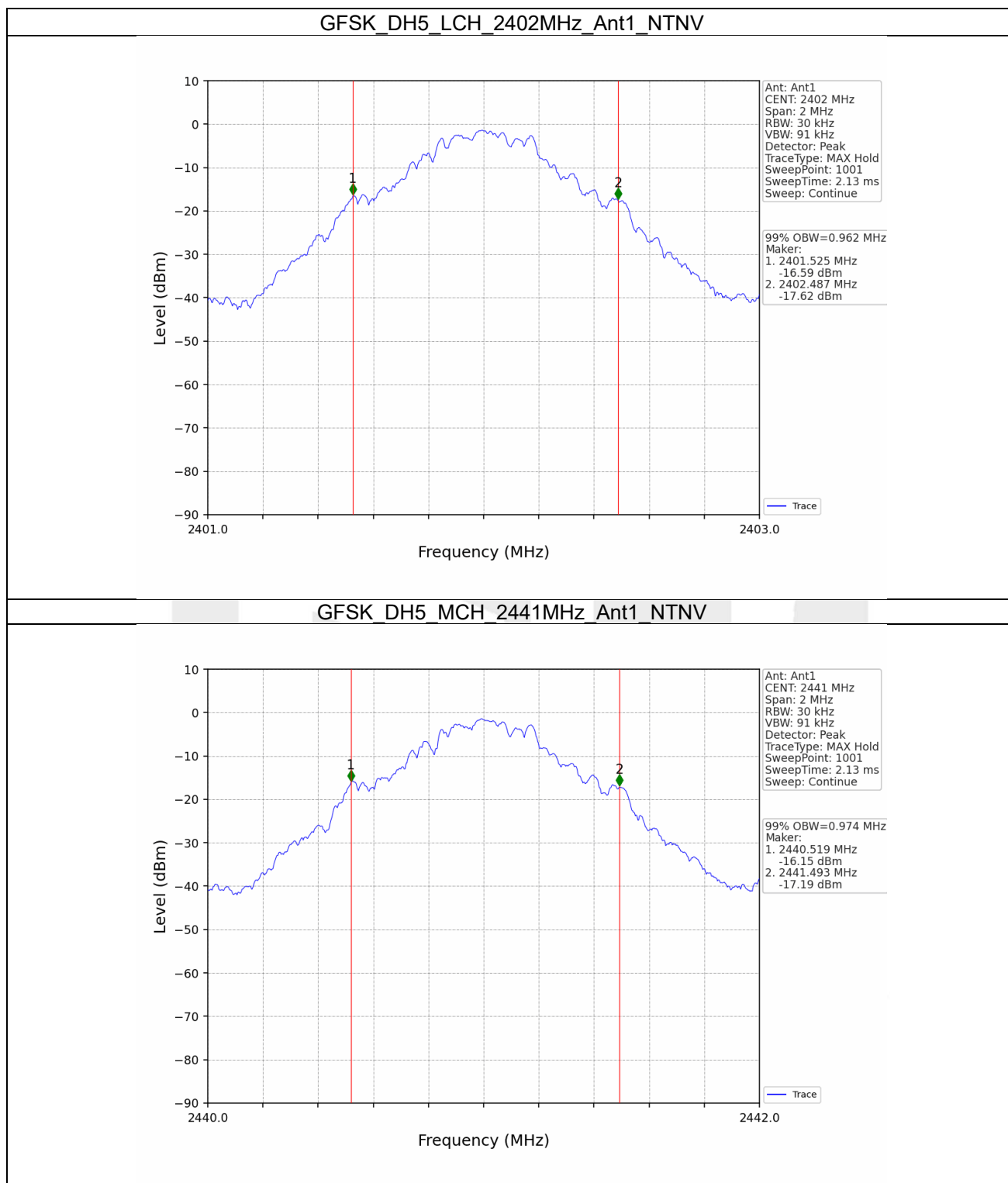
2. Bandwidth

2.1 OBW

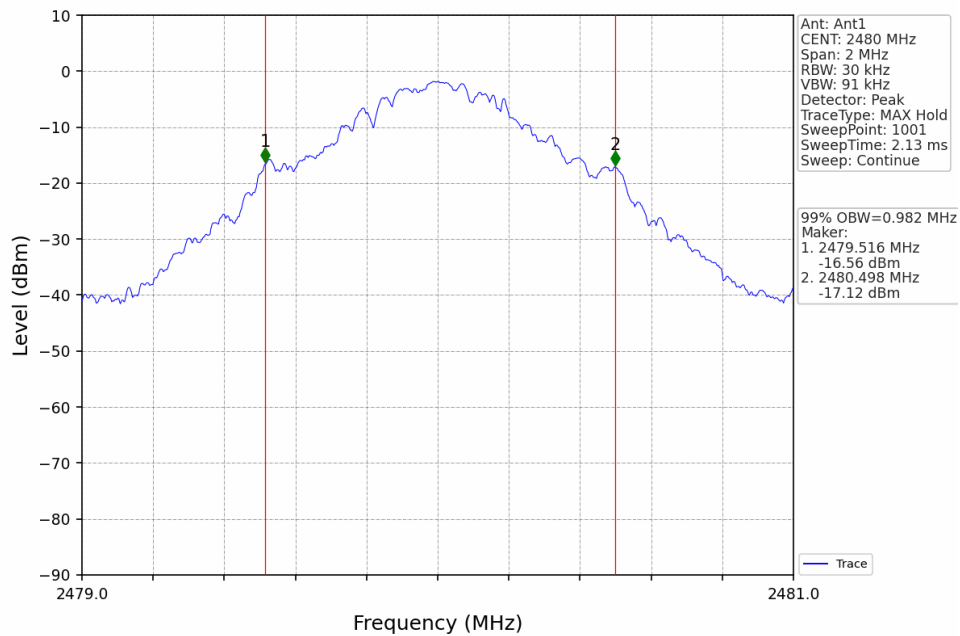
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)	Verdict
					Result	
GFSK	SISO	2402	DH5	1	0.962	Pass
		2441	DH5	1	0.974	Pass
		2480	DH5	1	0.982	Pass
$\pi/4$ DQPSK	SISO	2402	2DH5	1	1.214	Pass
		2441	2DH5	1	1.225	Pass
		2480	2DH5	1	1.223	Pass
8DPSK	SISO	2402	3DH5	1	1.199	Pass
		2441	3DH5	1	1.218	Pass
		2480	3DH5	1	1.216	Pass

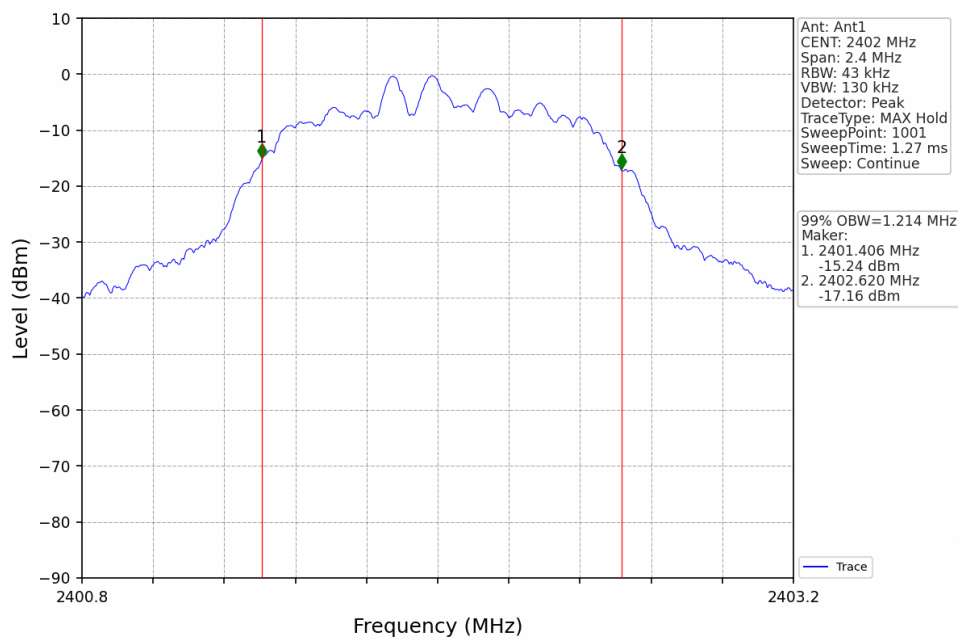
2.1.2 Test Graph



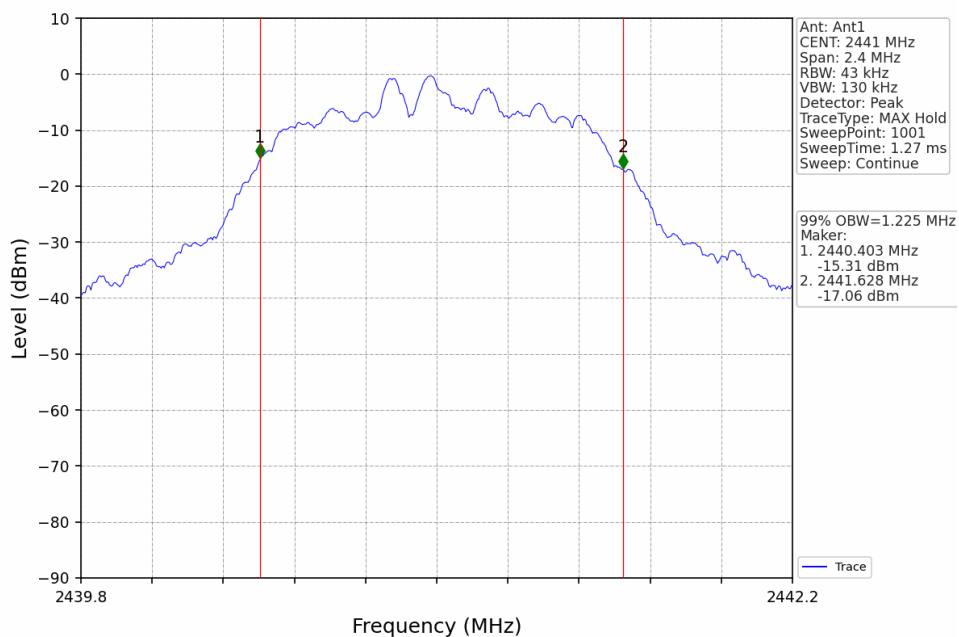
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



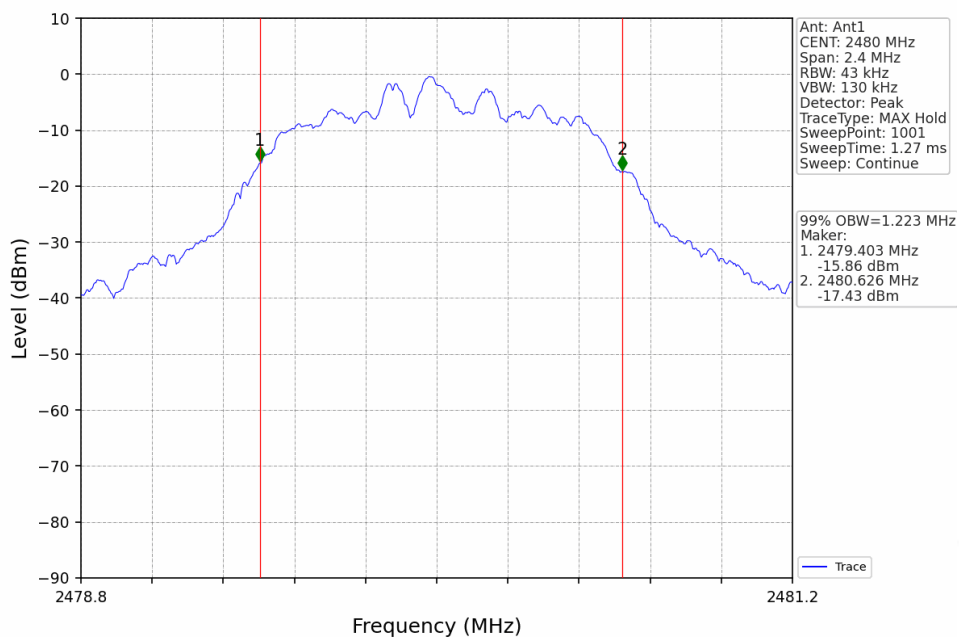
$\pi/4$ DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



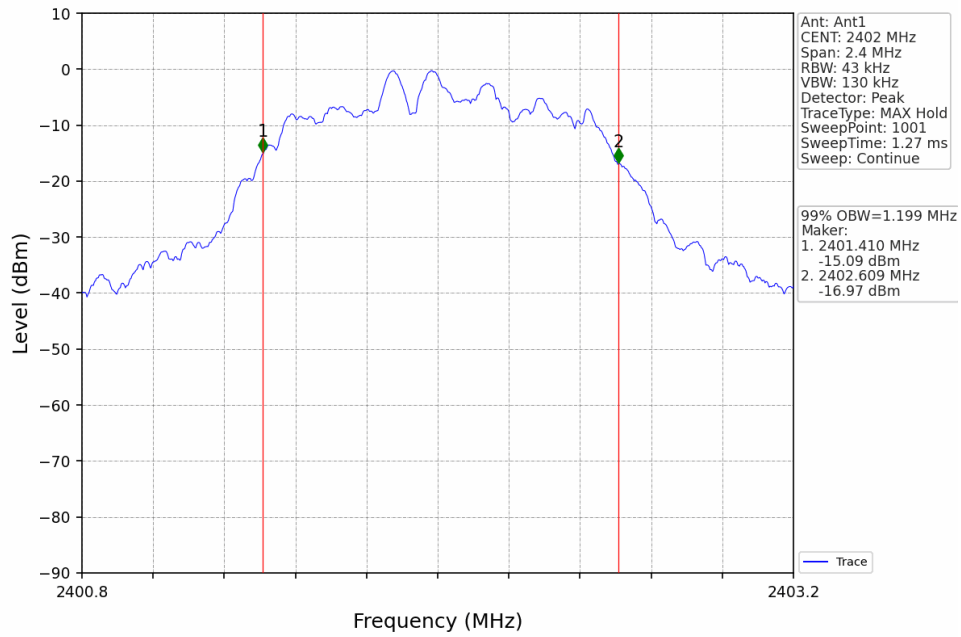
$\pi/4$ DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



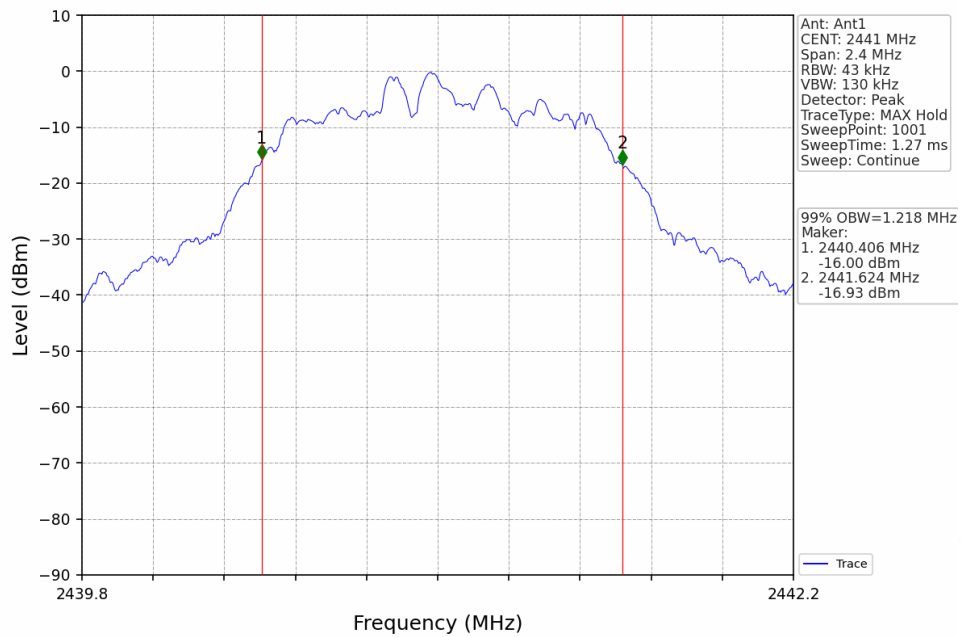
$\pi/4$ DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

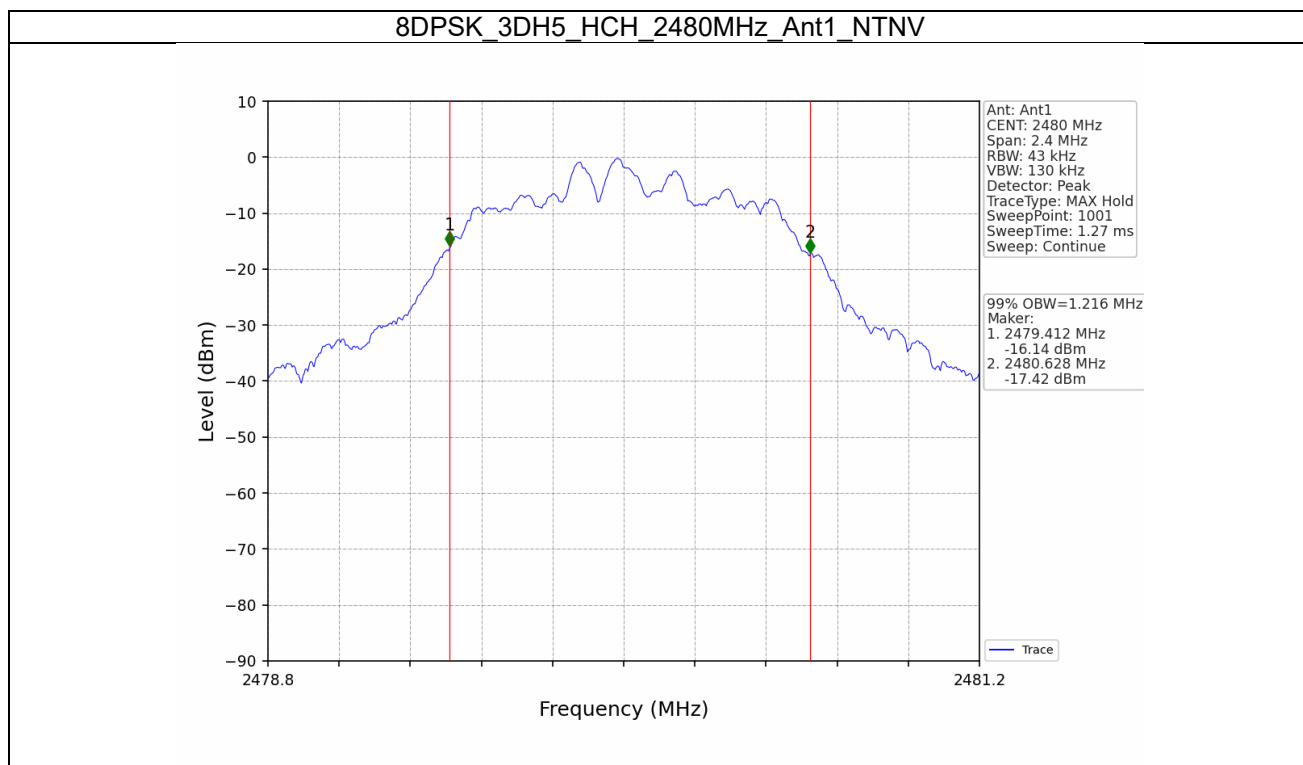


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



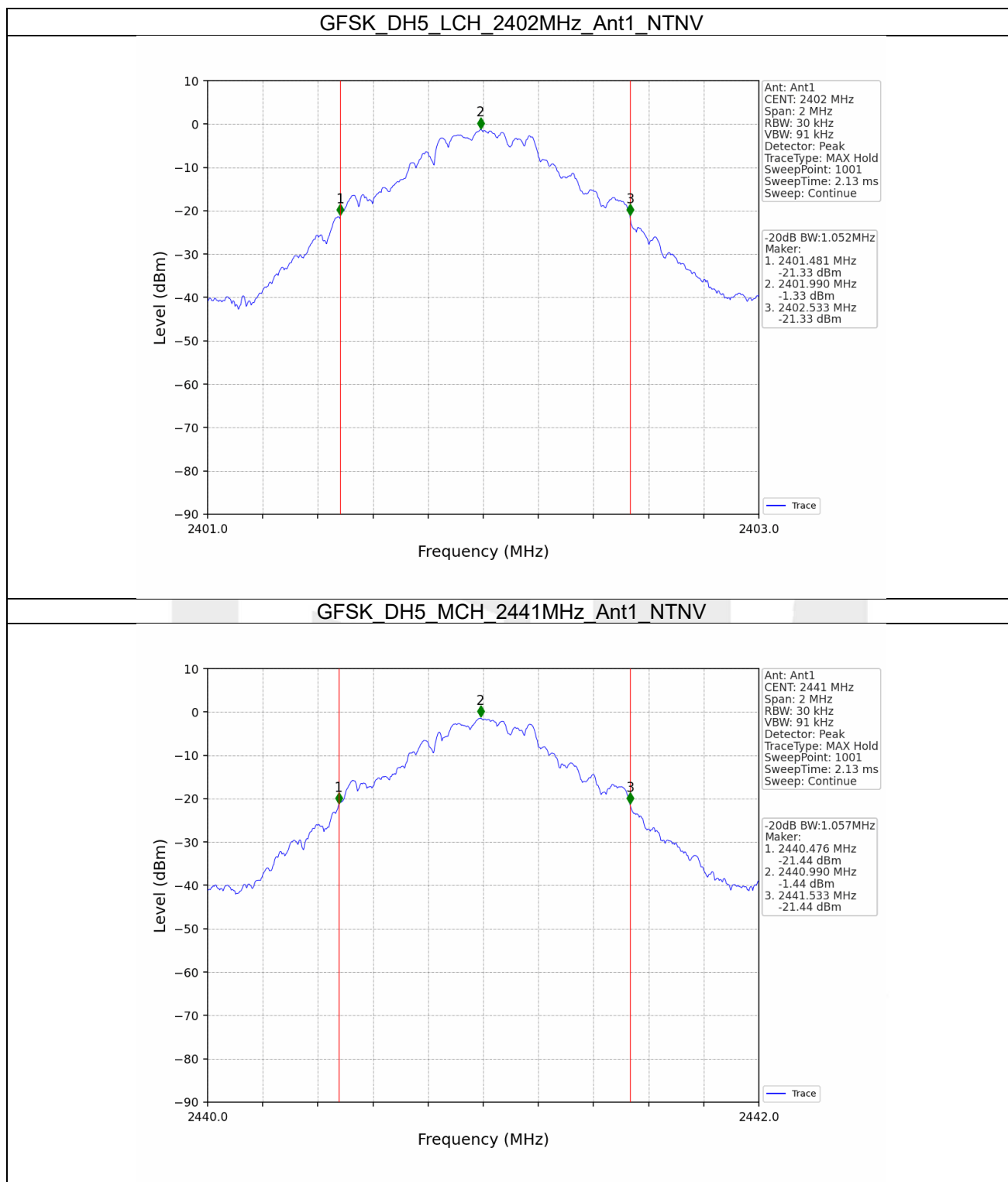


2.2 20dB BW

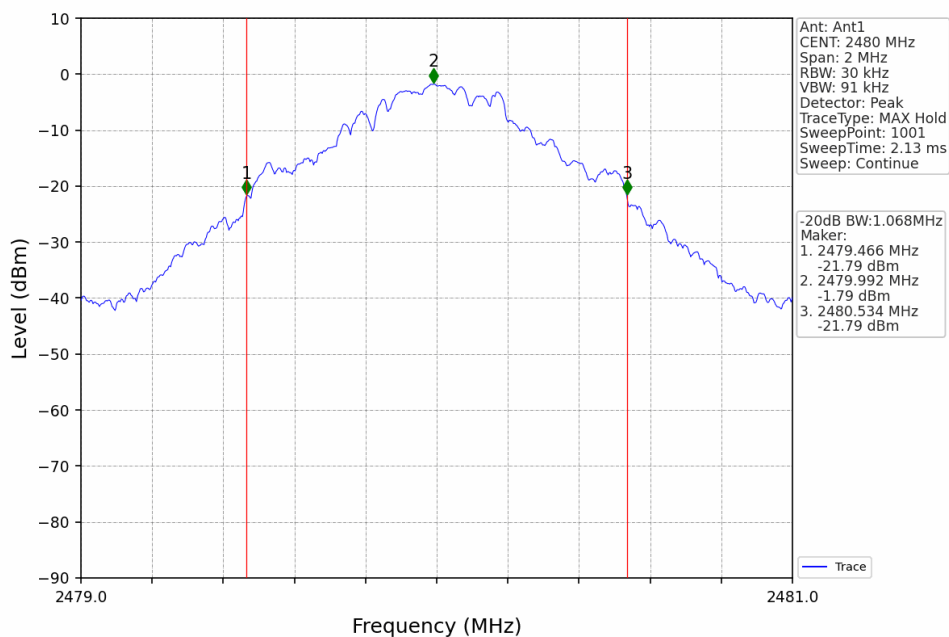
2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)	Verdict
					Result	
GFSK	SISO	2402	DH5	1	1.052	Pass
		2441	DH5	1	1.057	Pass
		2480	DH5	1	1.068	Pass
$\pi/4$ DQPSK	SISO	2402	2DH5	1	1.348	Pass
		2441	2DH5	1	1.343	Pass
		2480	2DH5	1	1.360	Pass
8DPSK	SISO	2402	3DH5	1	1.338	Pass
		2441	3DH5	1	1.341	Pass
		2480	3DH5	1	1.325	Pass

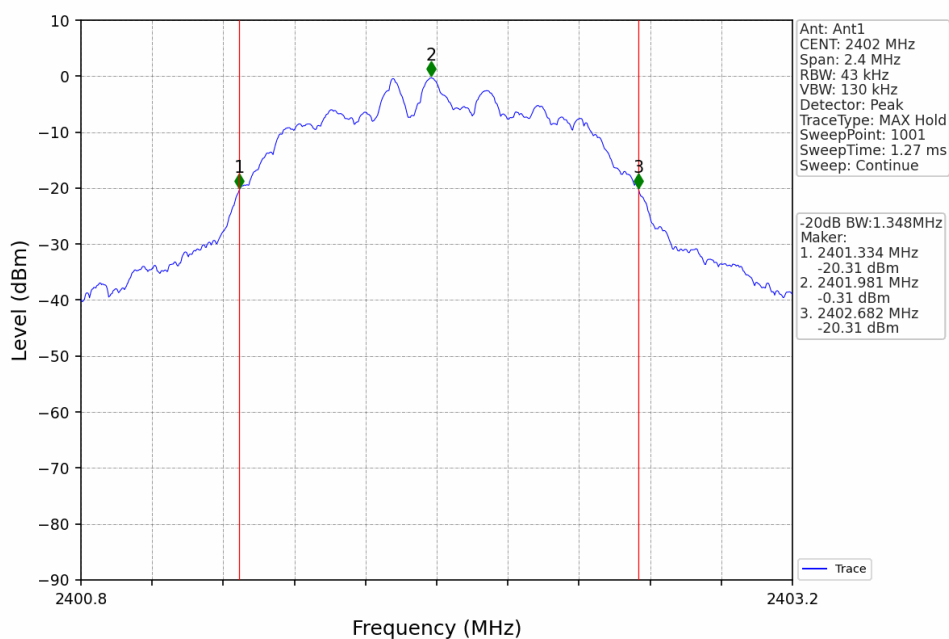
2.2.2 Test Graph



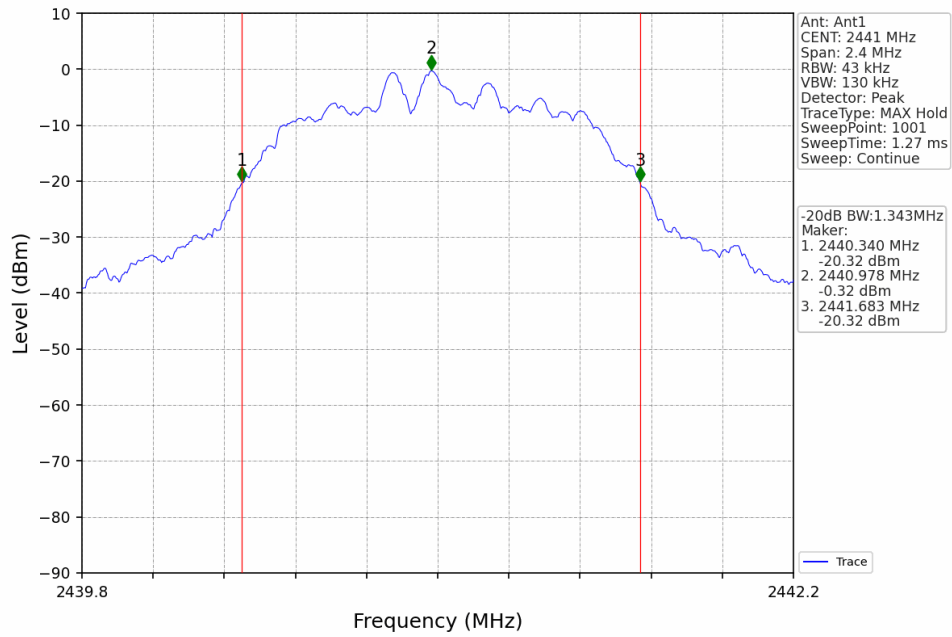
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



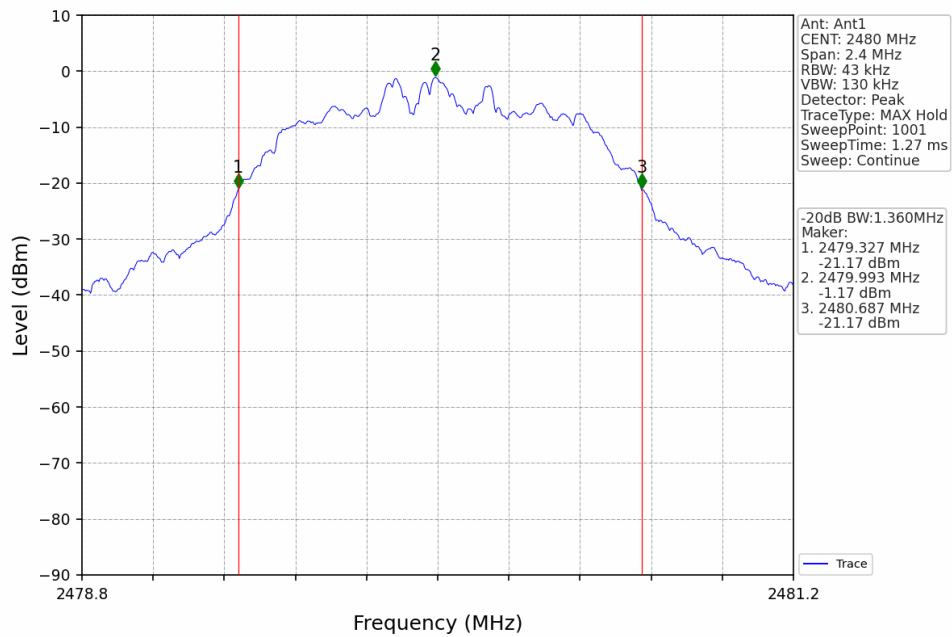
$\pi/4$ QPSK_2DH5_LCH_2402MHz_Ant1_NTNV



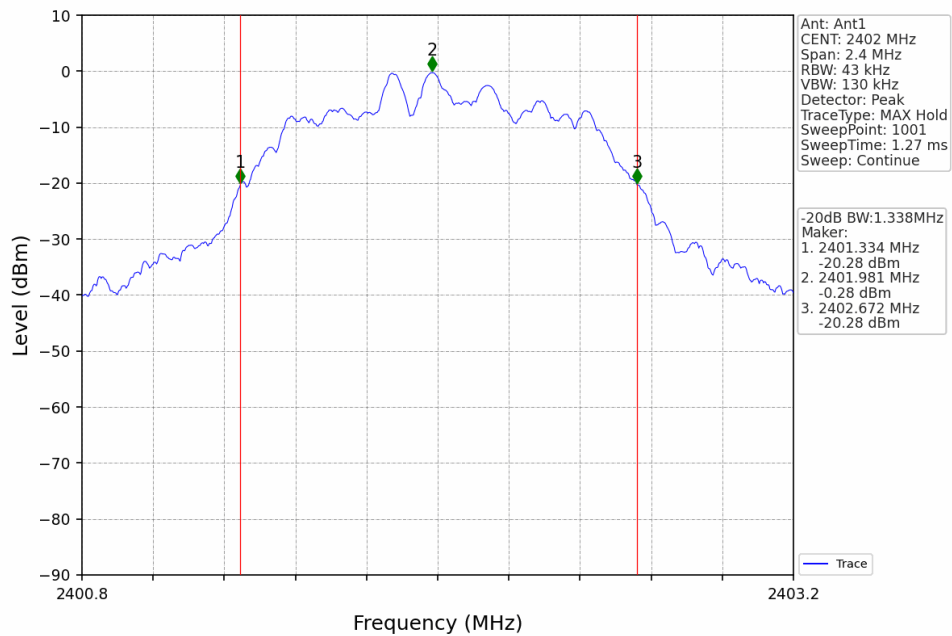
$\pi/4$ DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



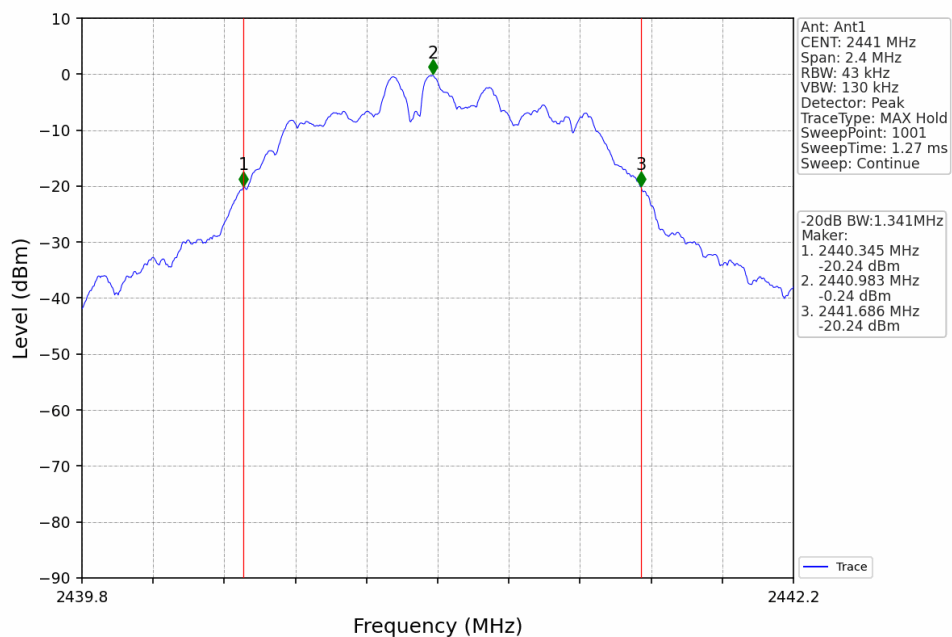
$\pi/4$ DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

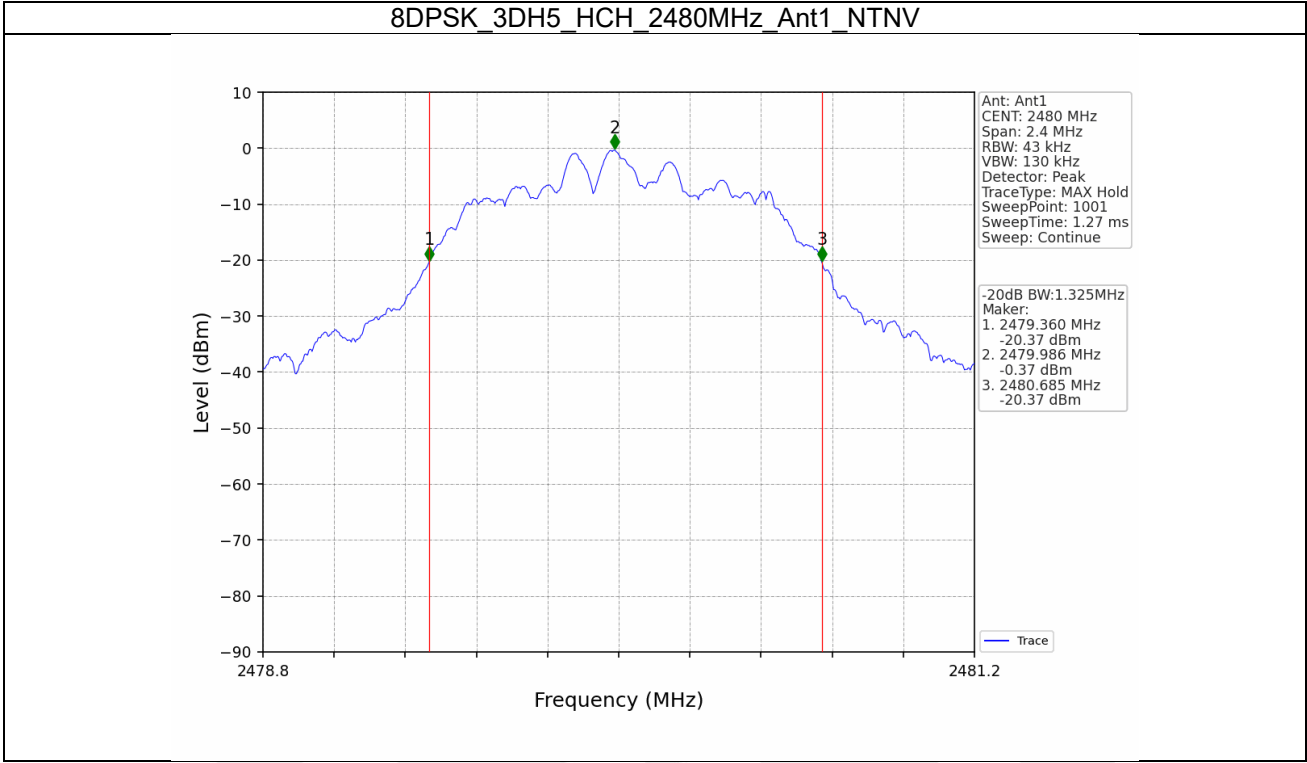


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV





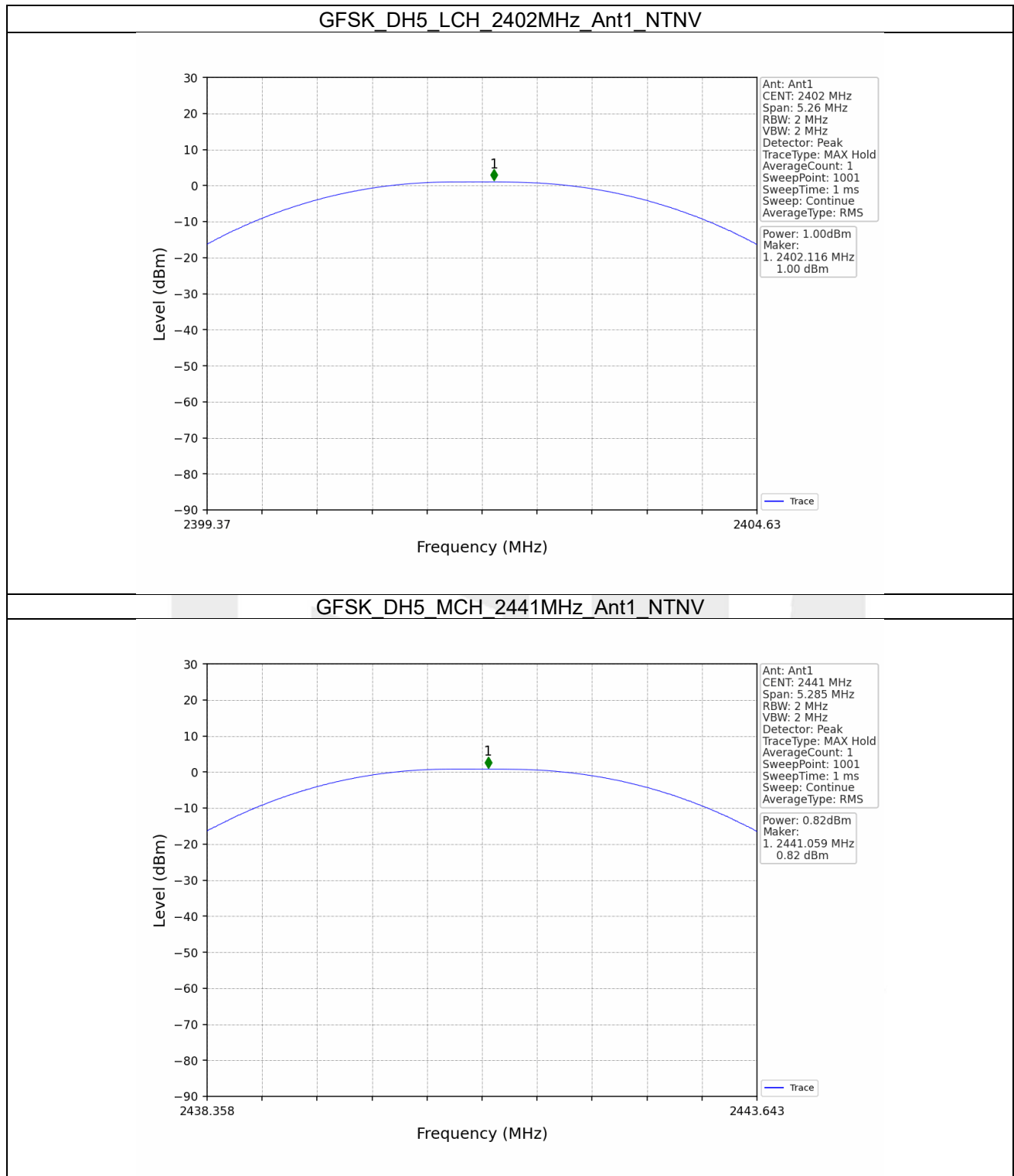
3. Maximum Conducted Output Power

3.1 Power

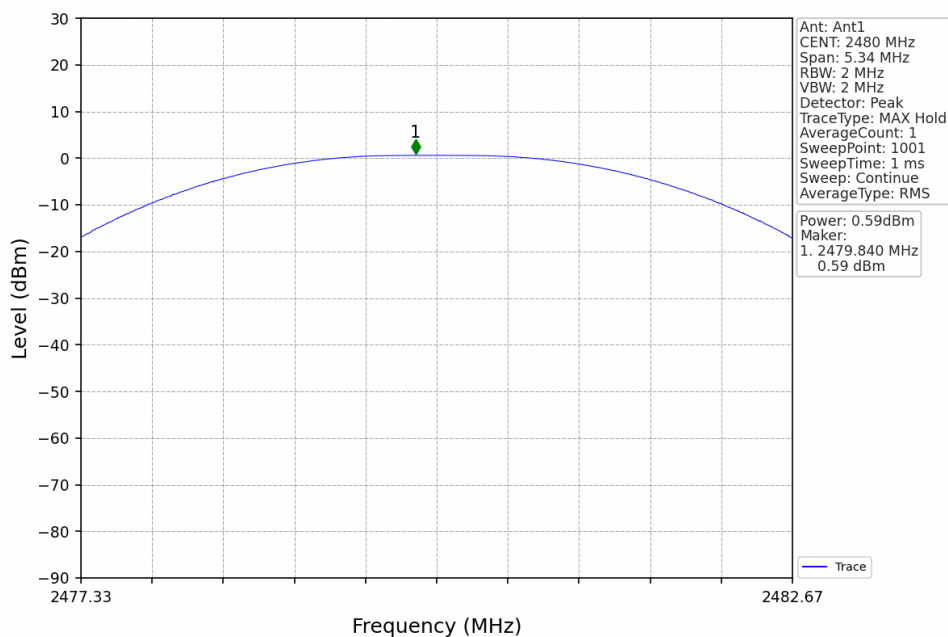
3.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	1.00	≤ 20.97	Pass
		2441	DH5	0.82	≤ 20.97	Pass
		2480	DH5	0.59	≤ 20.97	Pass
$\pi/4$ DQPSK	SISO	2402	2DH5	1.77	≤ 20.97	Pass
		2441	2DH5	1.66	≤ 20.97	Pass
		2480	2DH5	1.43	≤ 20.97	Pass
8DPSK	SISO	2402	3DH5	1.79	≤ 20.97	Pass
		2441	3DH5	1.76	≤ 20.97	Pass
		2480	3DH5	1.53	≤ 20.97	Pass

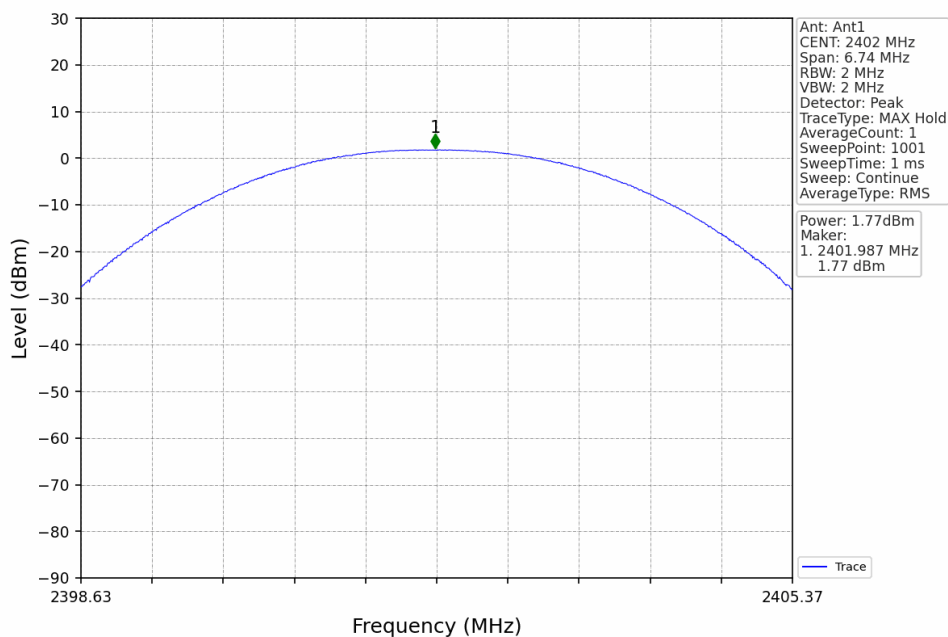
3.1.2 Test Graph



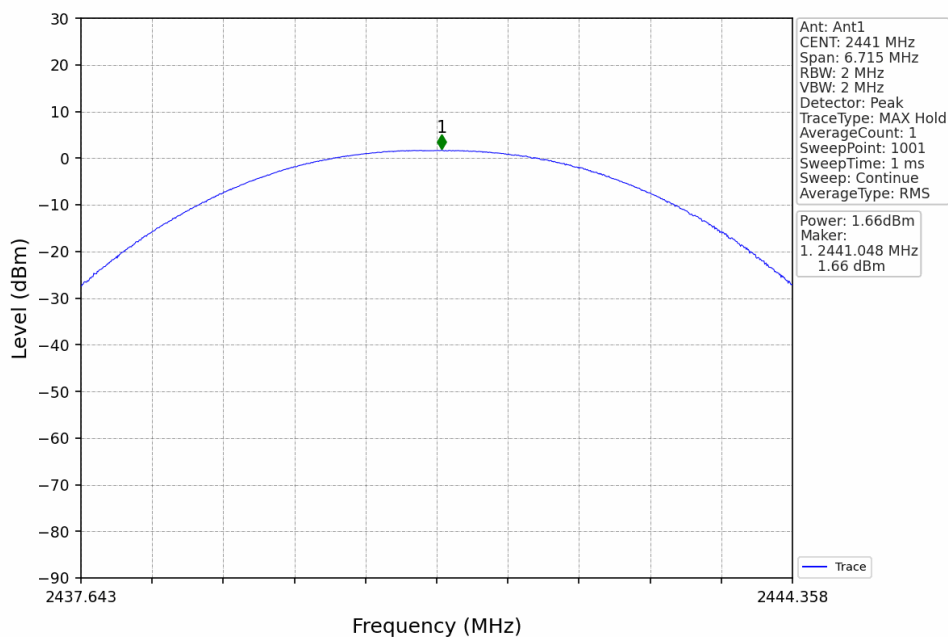
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



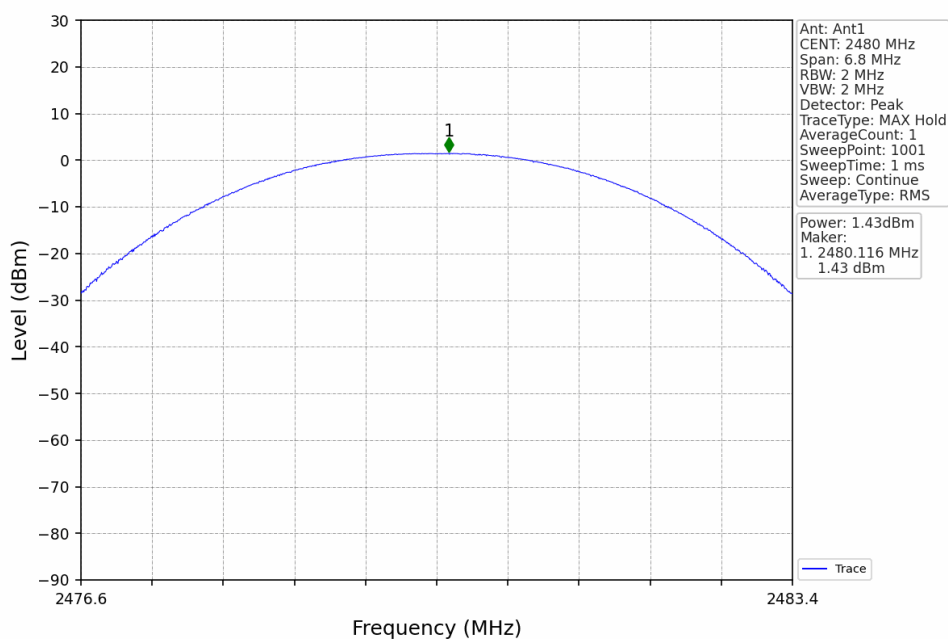
$\pi/4$ DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



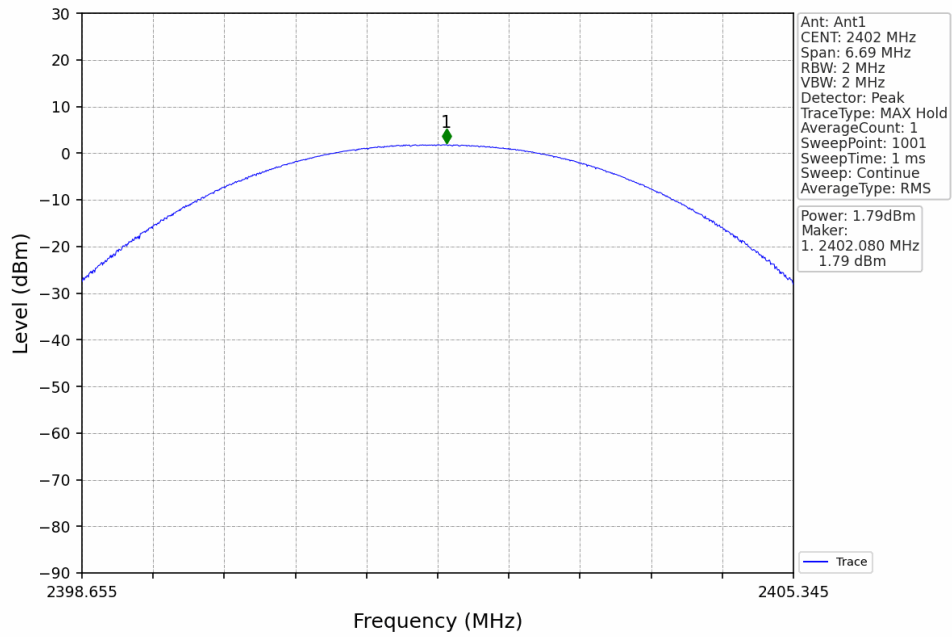
$\pi/4$ DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



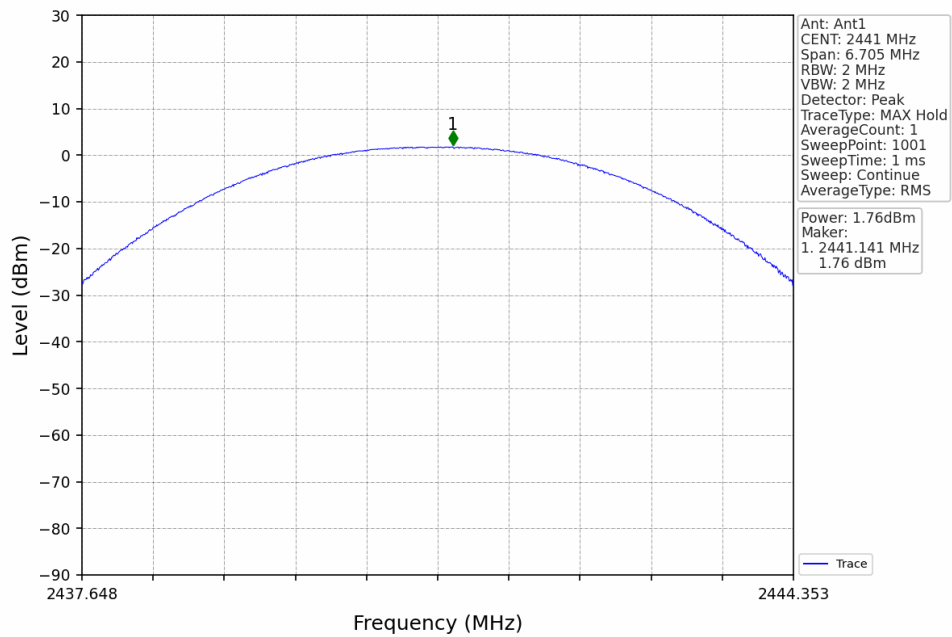
$\pi/4$ DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

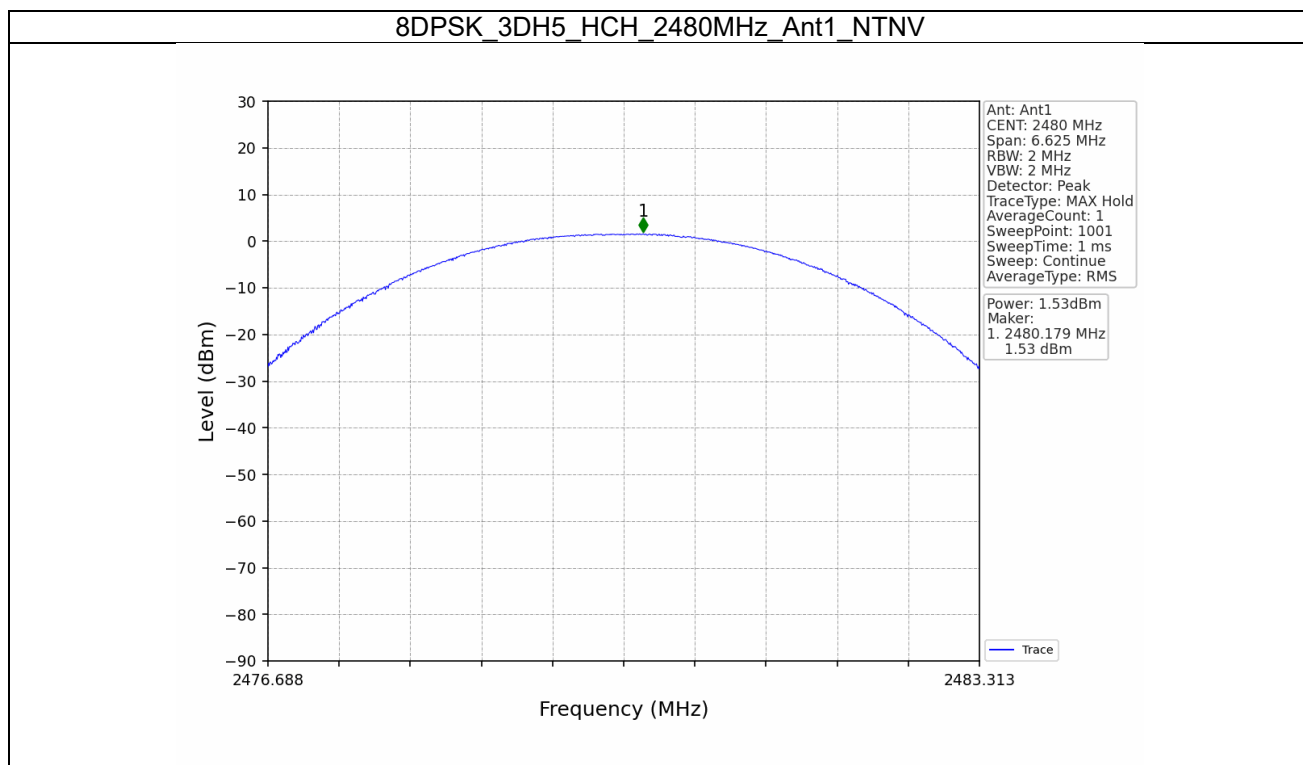


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV





4. Carrier Frequency Separation

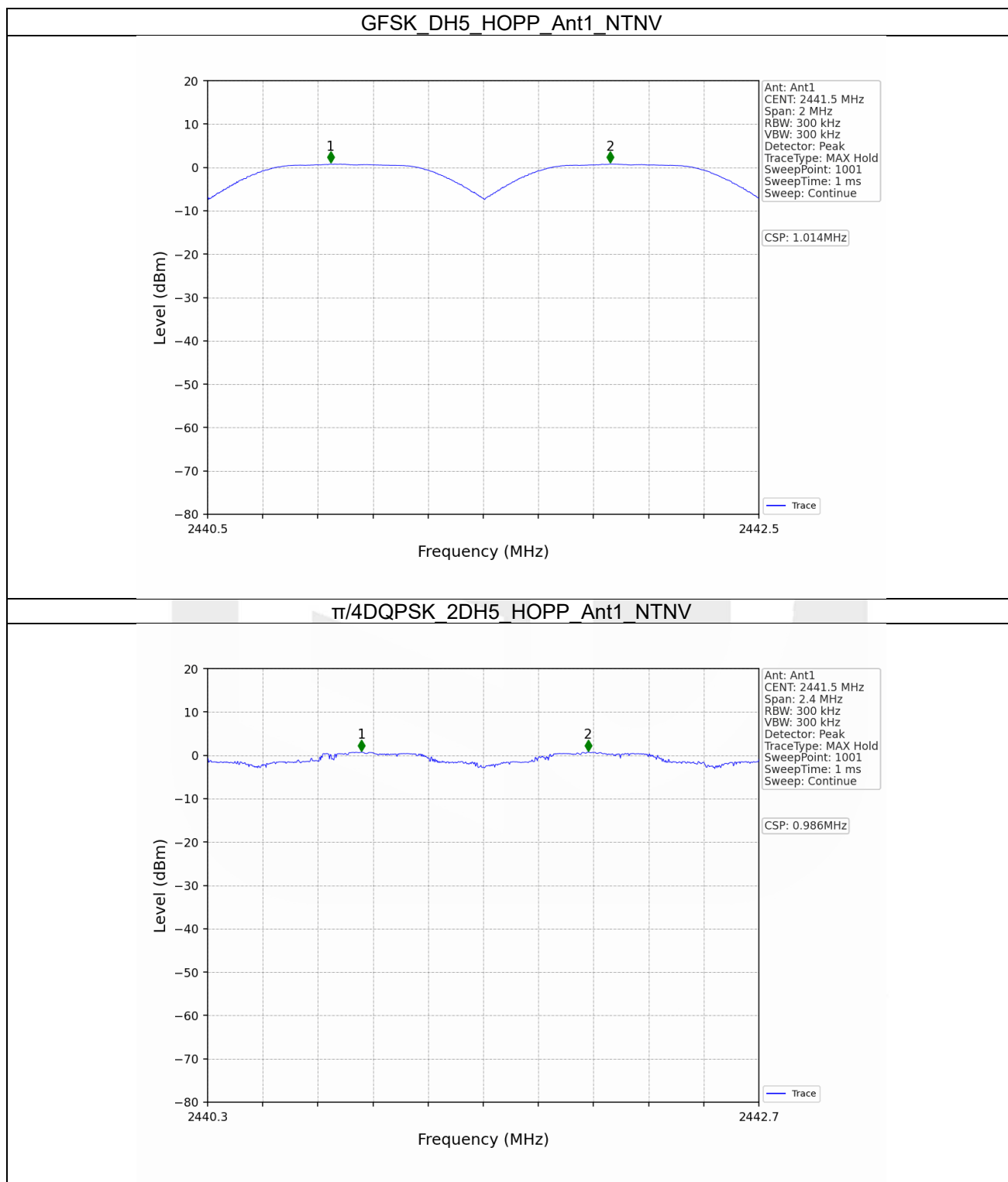
4.1 Ant1

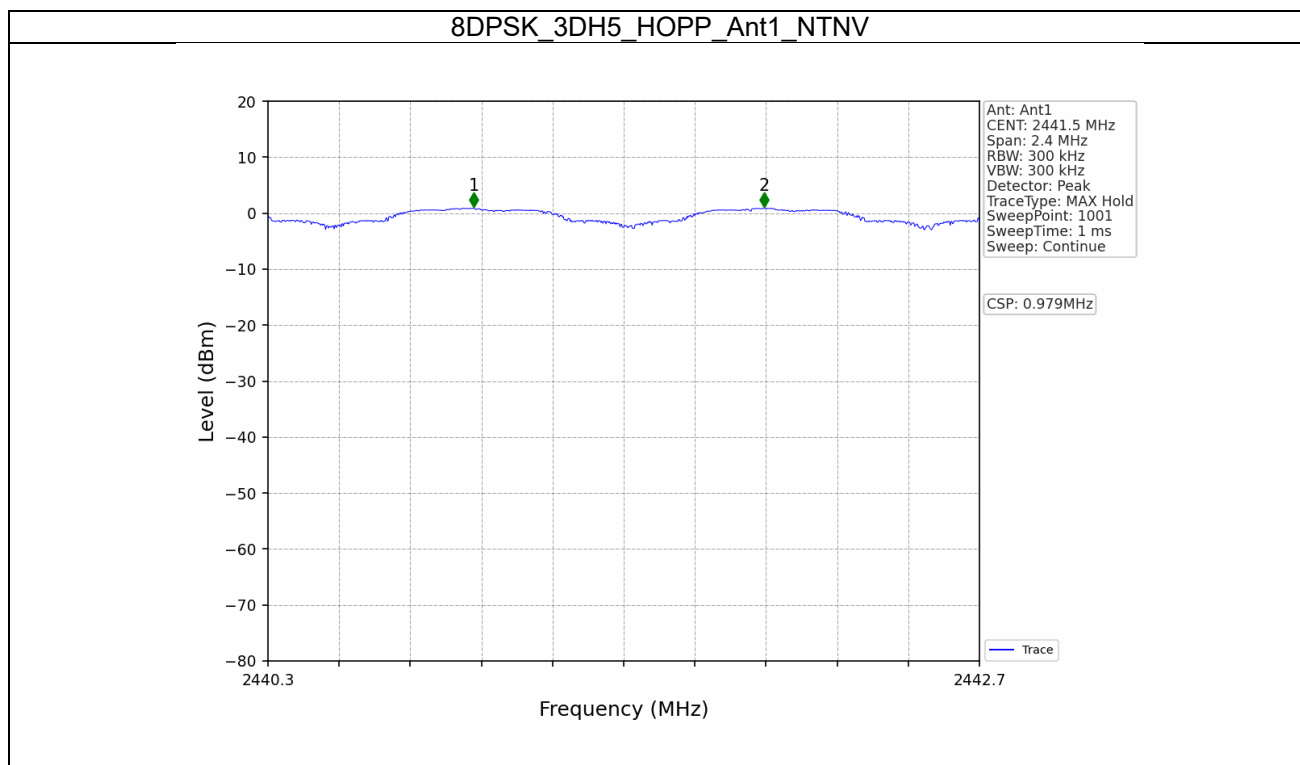
4.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.014	1.068	≥ 0.712	Pass
$\pi/4$ DQPSK	SISO	HOPP	2DH5	0.986	1.360	≥ 0.907	Pass
8DPSK	SISO	HOPP	3DH5	0.979	1.341	≥ 0.894	Pass



4.1.2 Test Graph





5. Number of Hopping Frequencies

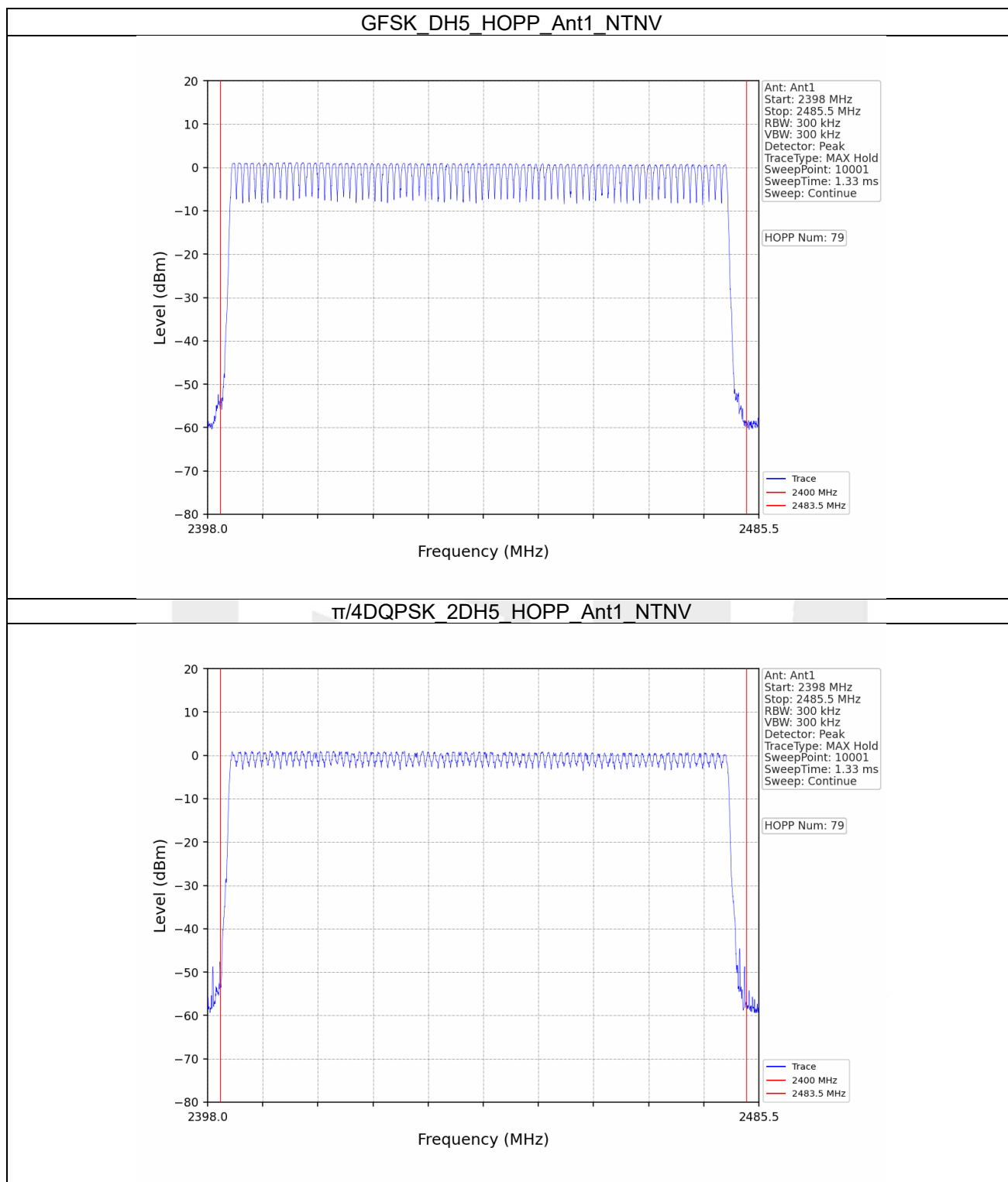
5.1 HoppNum

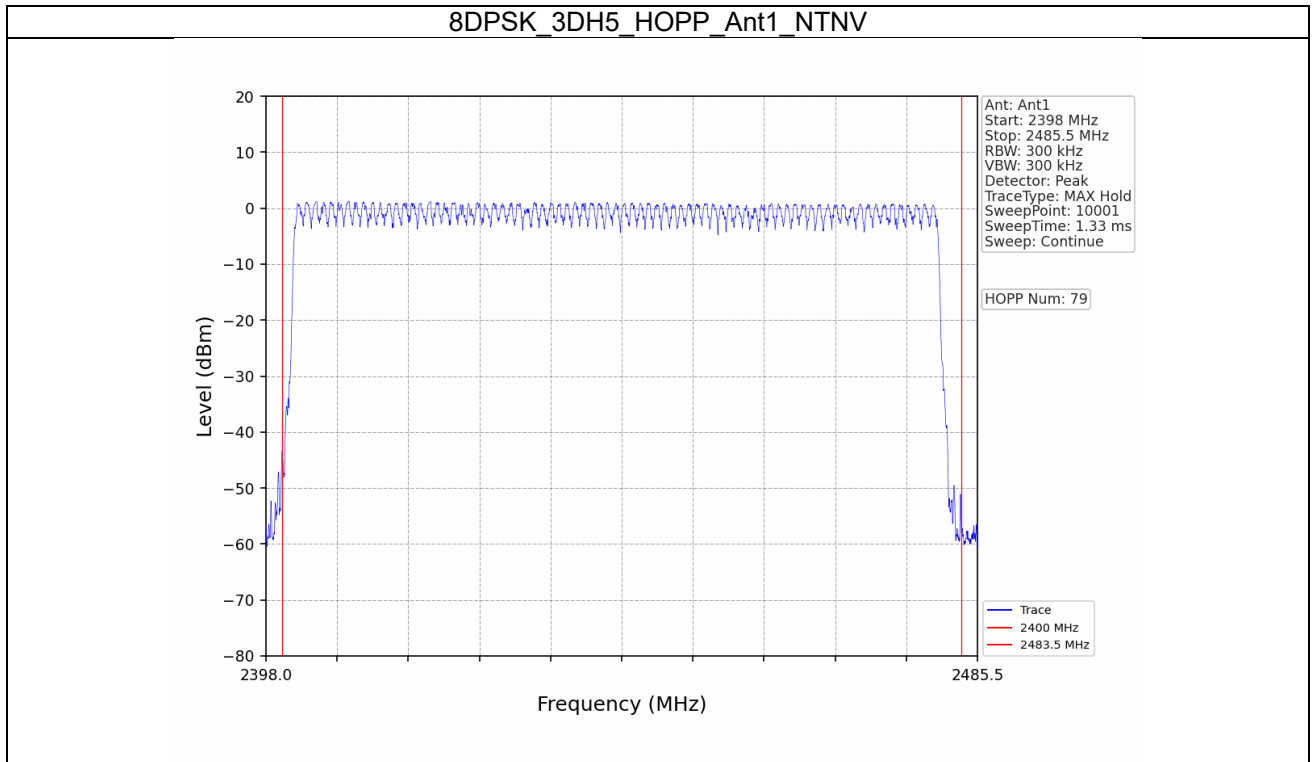
5.1.1 Test Result

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



5.1.2 Test Graph





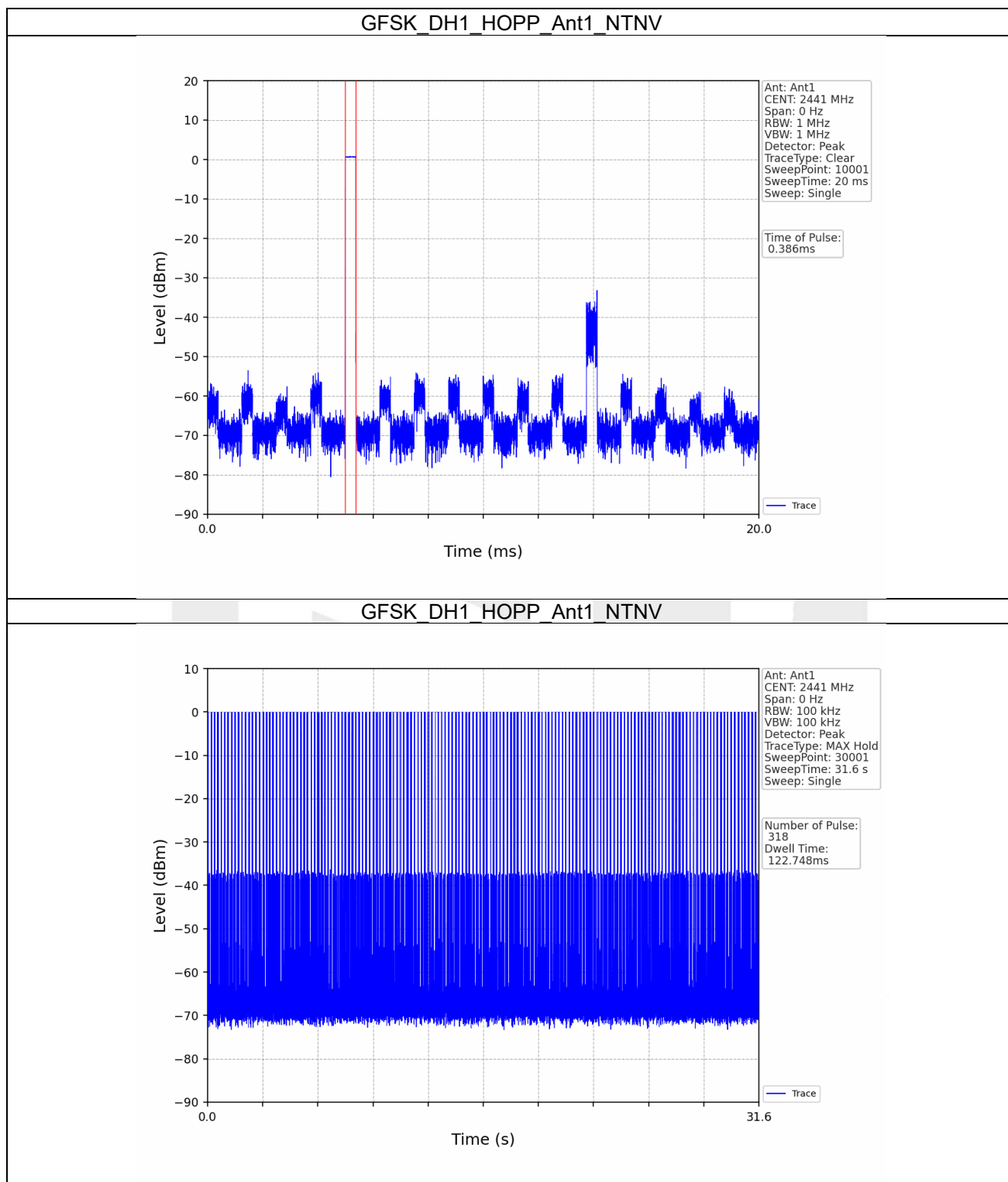
6. Time of Occupancy (Dwell Time)

6.1 Ant1

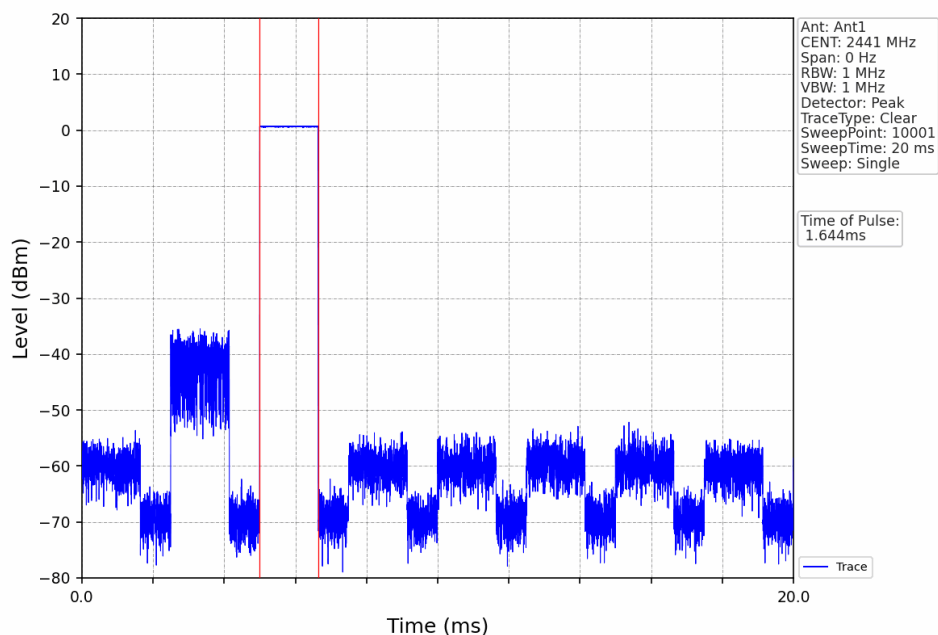
6.1.1 Test Result

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	0.386	31.600	318	122.748	<=400	Pass
			DH3	1.644	31.600	161	264.684	<=400	Pass
			DH5	2.890	31.600	109	315.010	<=400	Pass
$\pi/4$ DQPSK	SISO	HOPP	2DH1	0.396	31.600	320	126.720	<=400	Pass
			2DH3	1.648	31.600	159	262.032	<=400	Pass
			2DH5	2.900	31.600	116	336.400	<=400	Pass
8DPSK	SISO	HOPP	3DH1	6.678	31.600	57	380.646	<=400	Pass
			3DH3	0.654	31.600	159	103.986	<=400	Pass
			3DH5	0.898	31.600	109	97.882	<=400	Pass

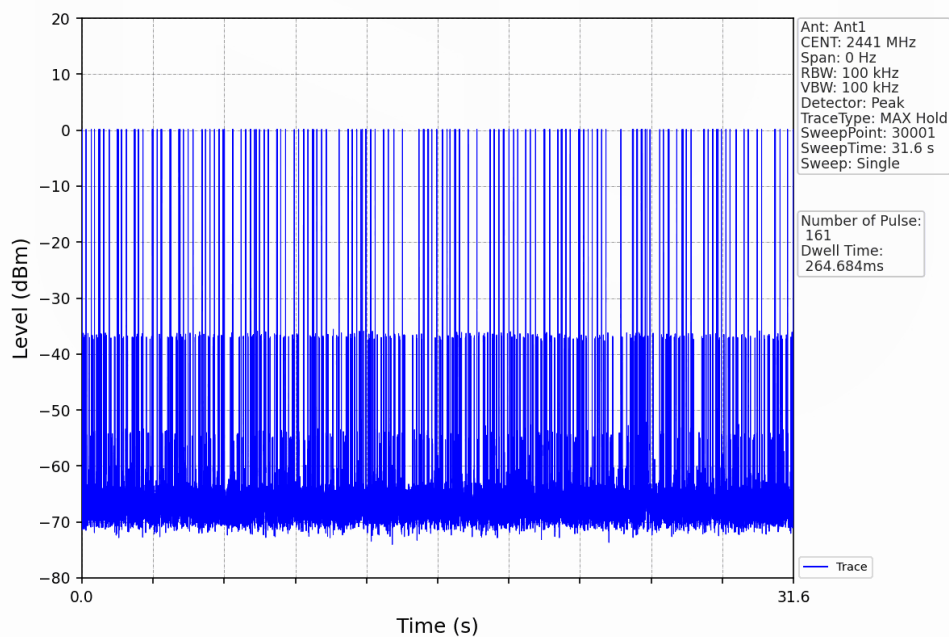
6.1.2 Test Graph



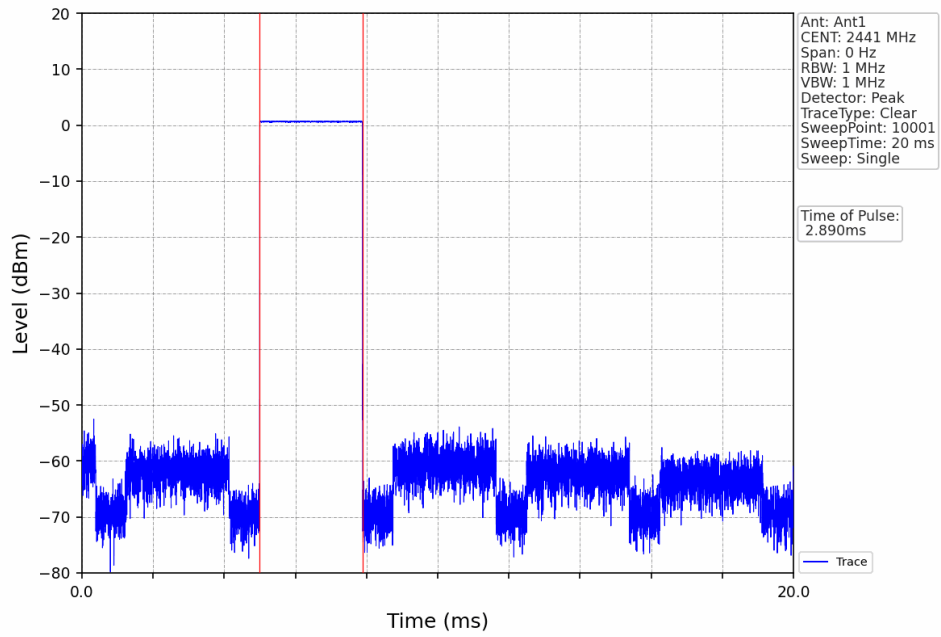
GFSK_DH3_HOPP_Ant1_NTNV



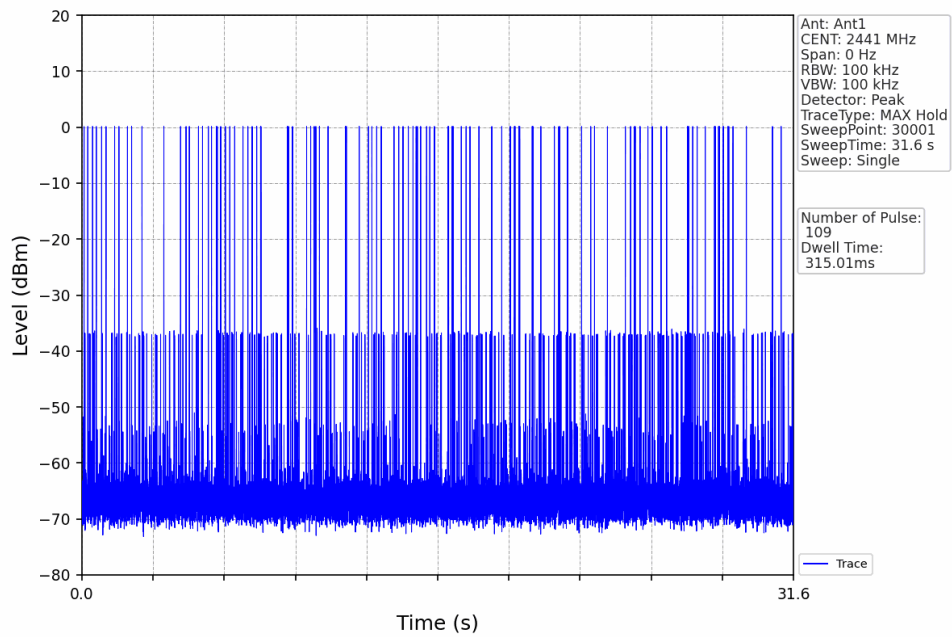
GFSK_DH3_HOPP_Ant1_NTNV



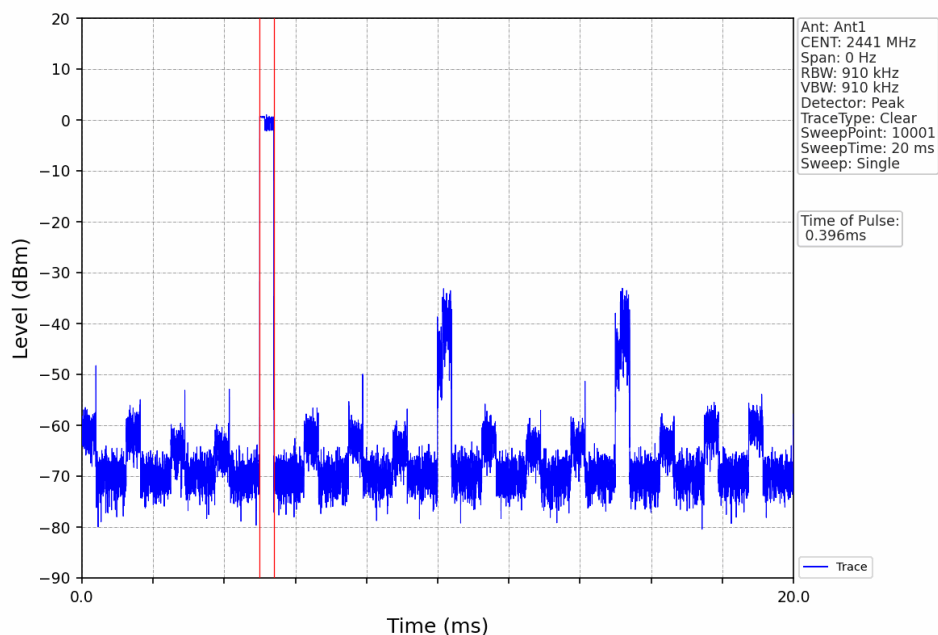
GFSK_DH5_HOPP_Ant1_NTNV



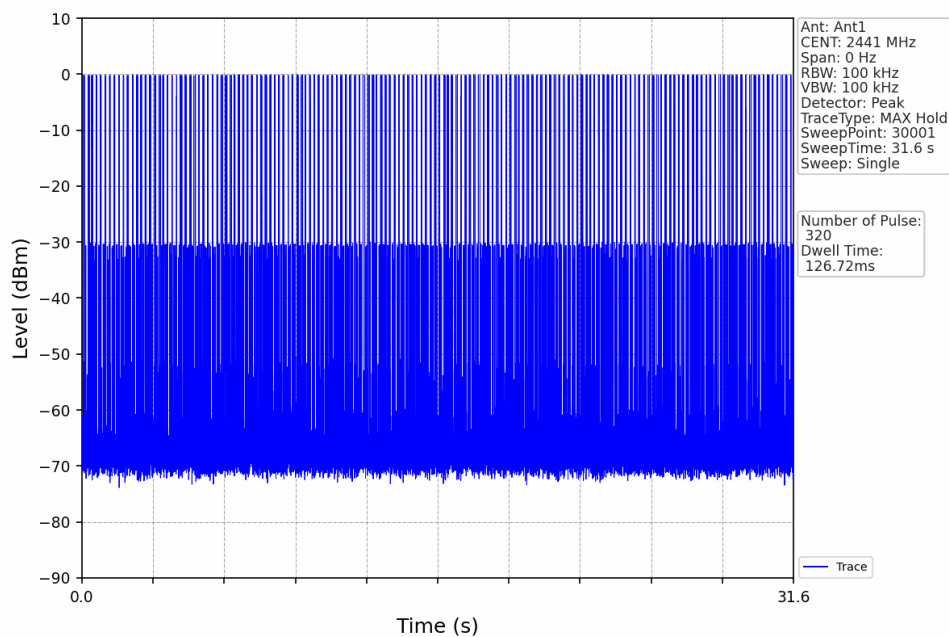
GFSK_DH5_HOPP_Ant1_NTNV

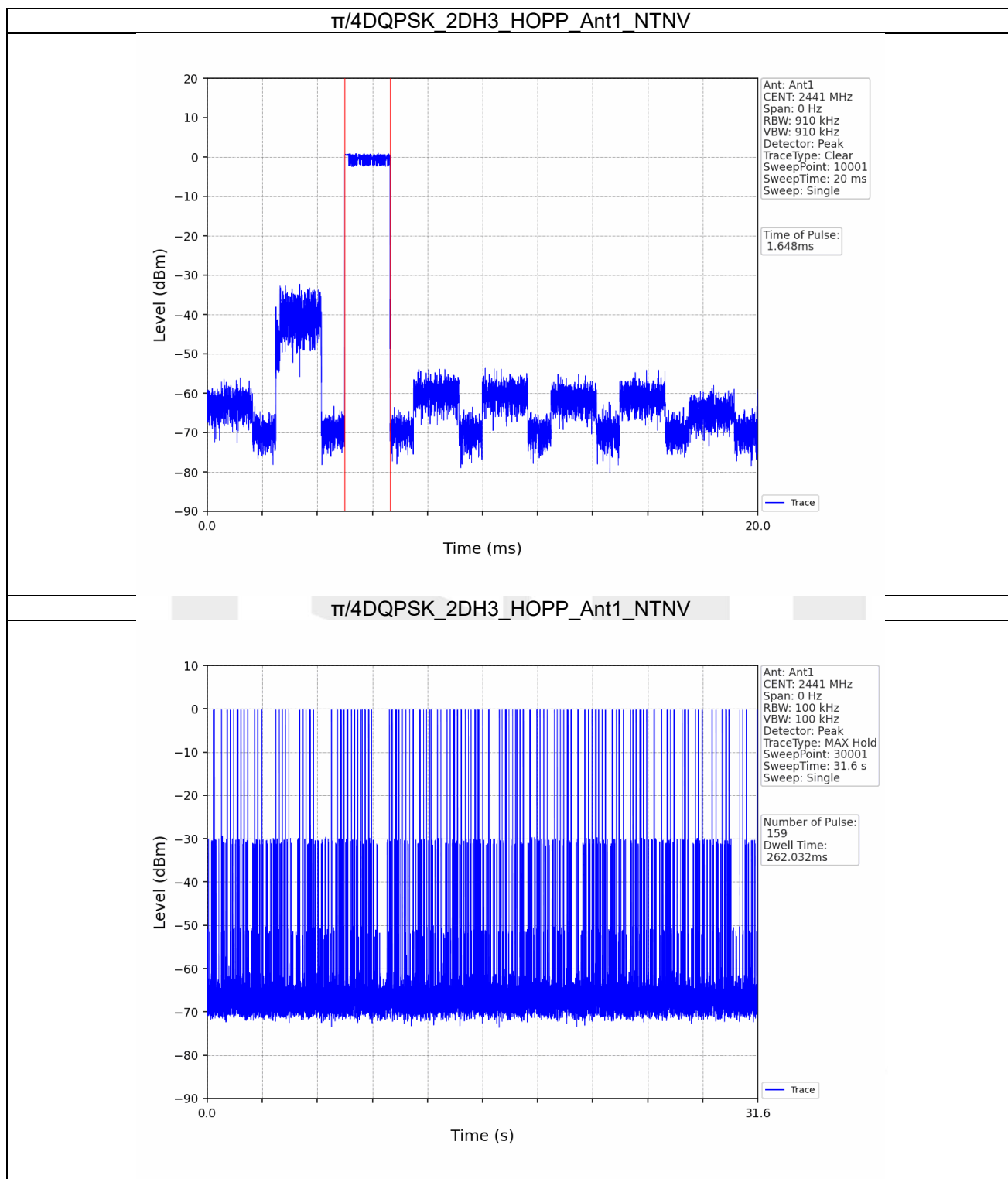


$\pi/4$ DQPSK_2DH1_HOPP_Ant1_NTNV

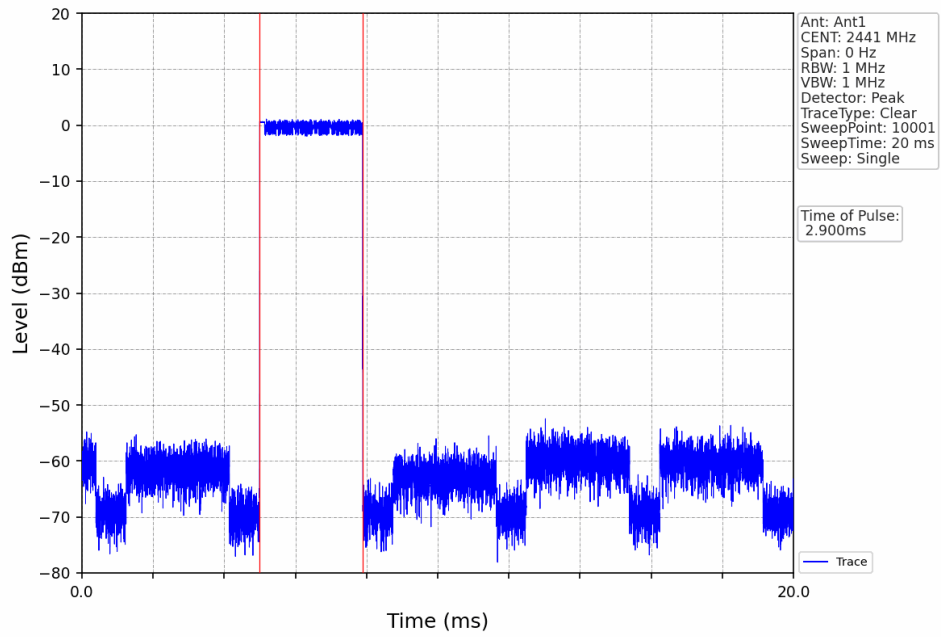


$\pi/4$ DQPSK_2DH1_HOPP_Ant1_NTNV

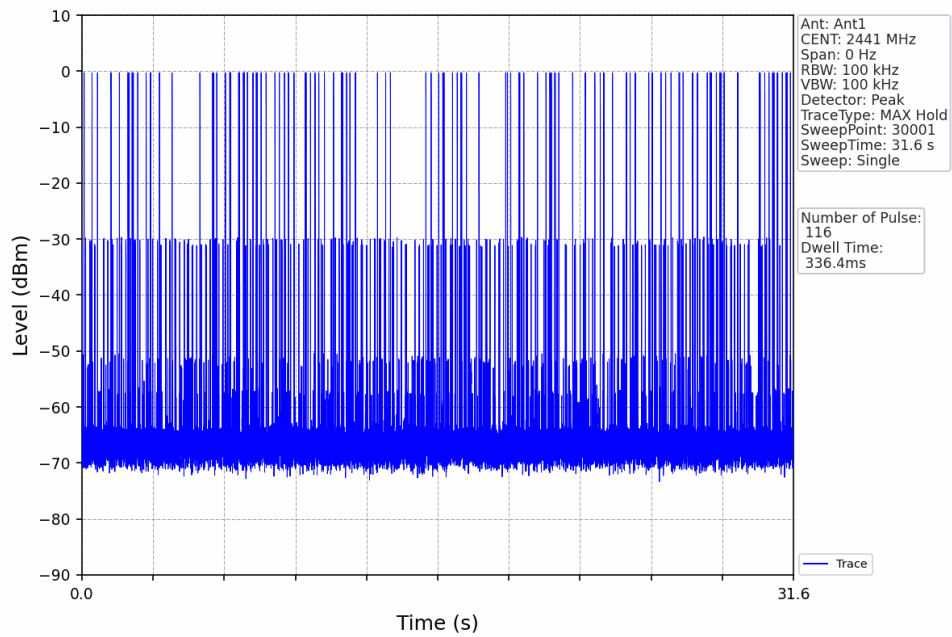




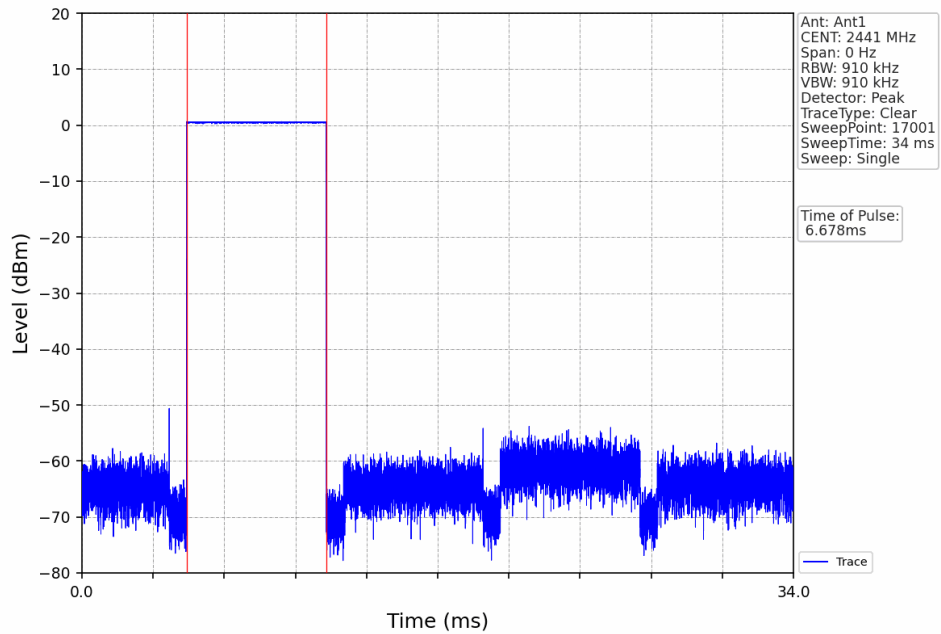
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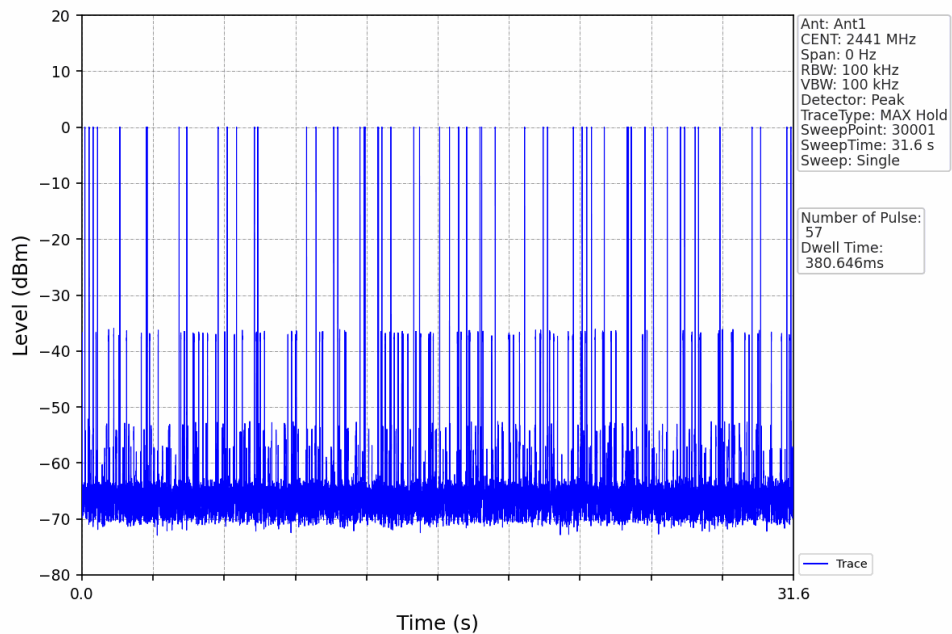
$\pi/4$ DQPSK_2DH5_HOPP_Ant1_NTNV



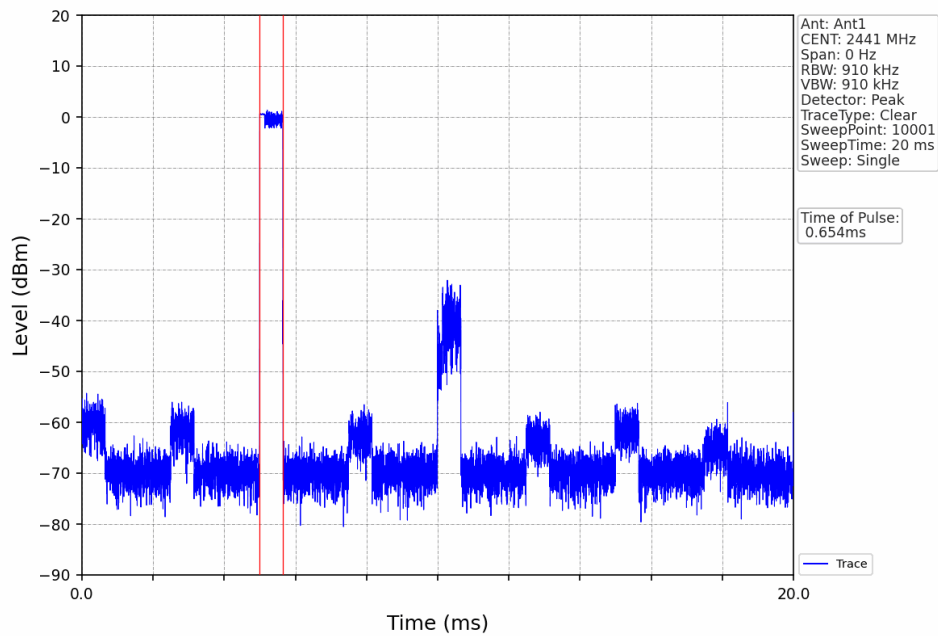
8DPSK_3DH1_HOPP_Ant1_NTNV



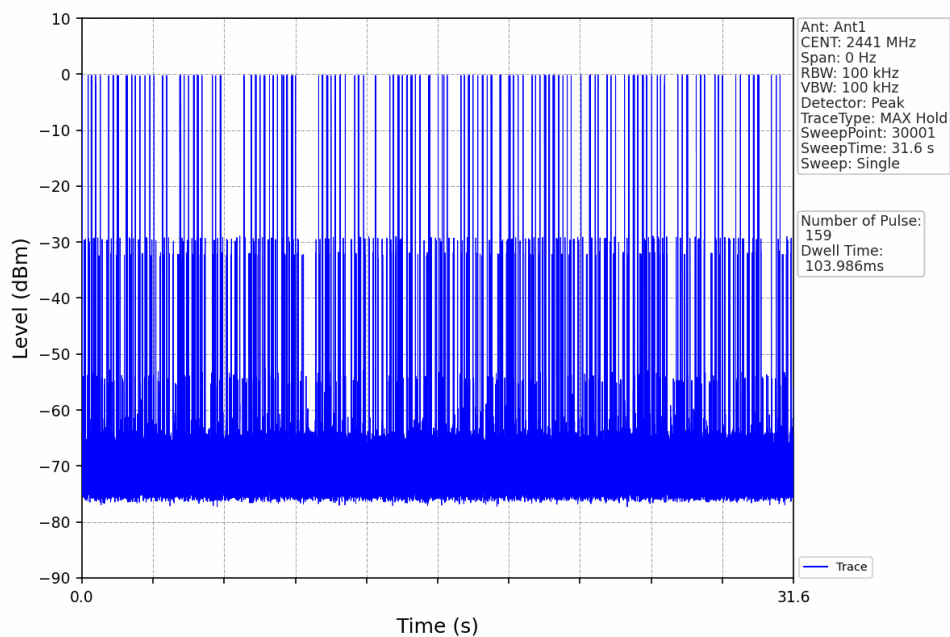
8DPSK_3DH1_HOPP_Ant1_NTNV



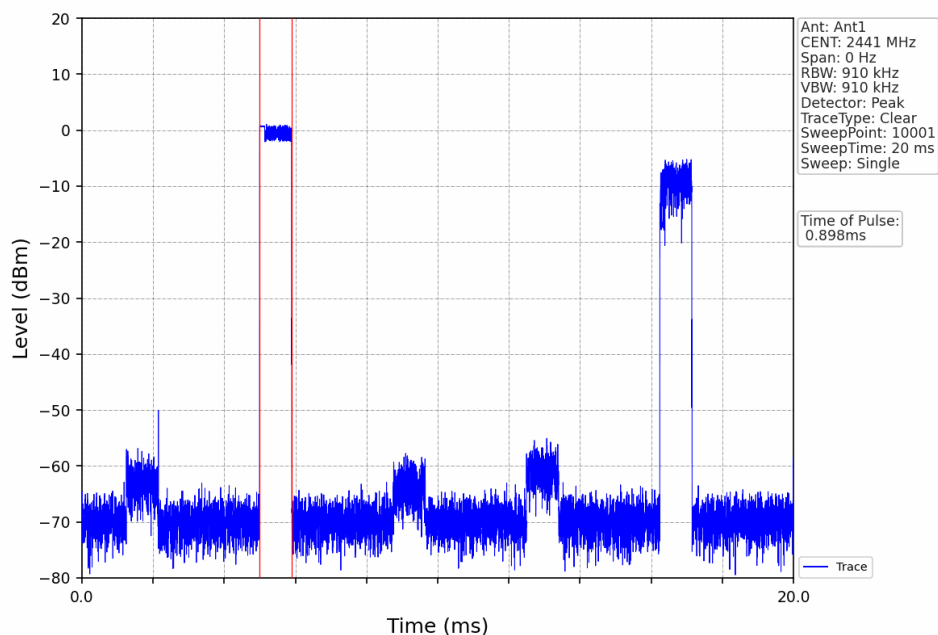
8DPSK_3DH3_HOPP_Ant1_NTNV



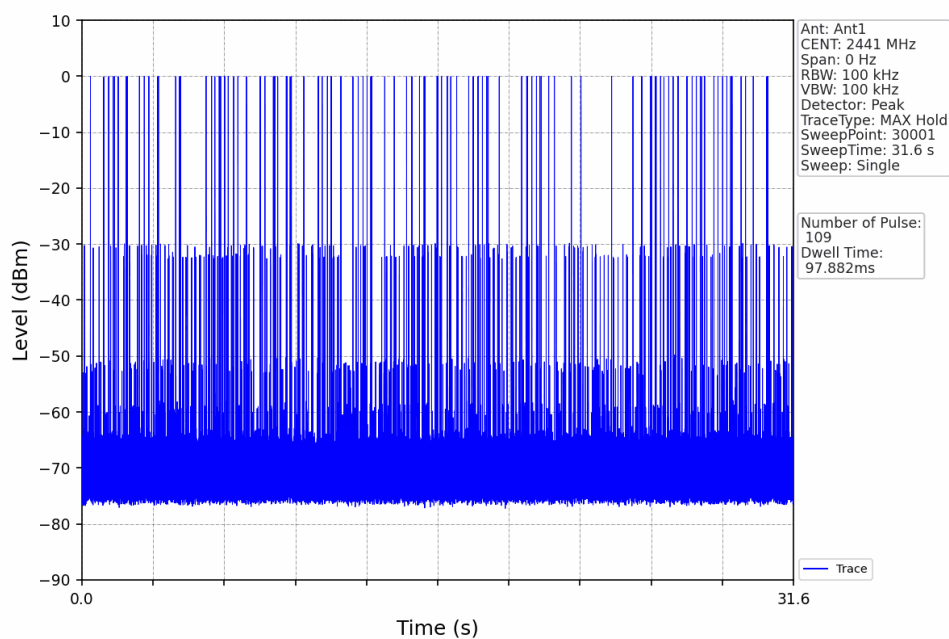
8DPSK_3DH3_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

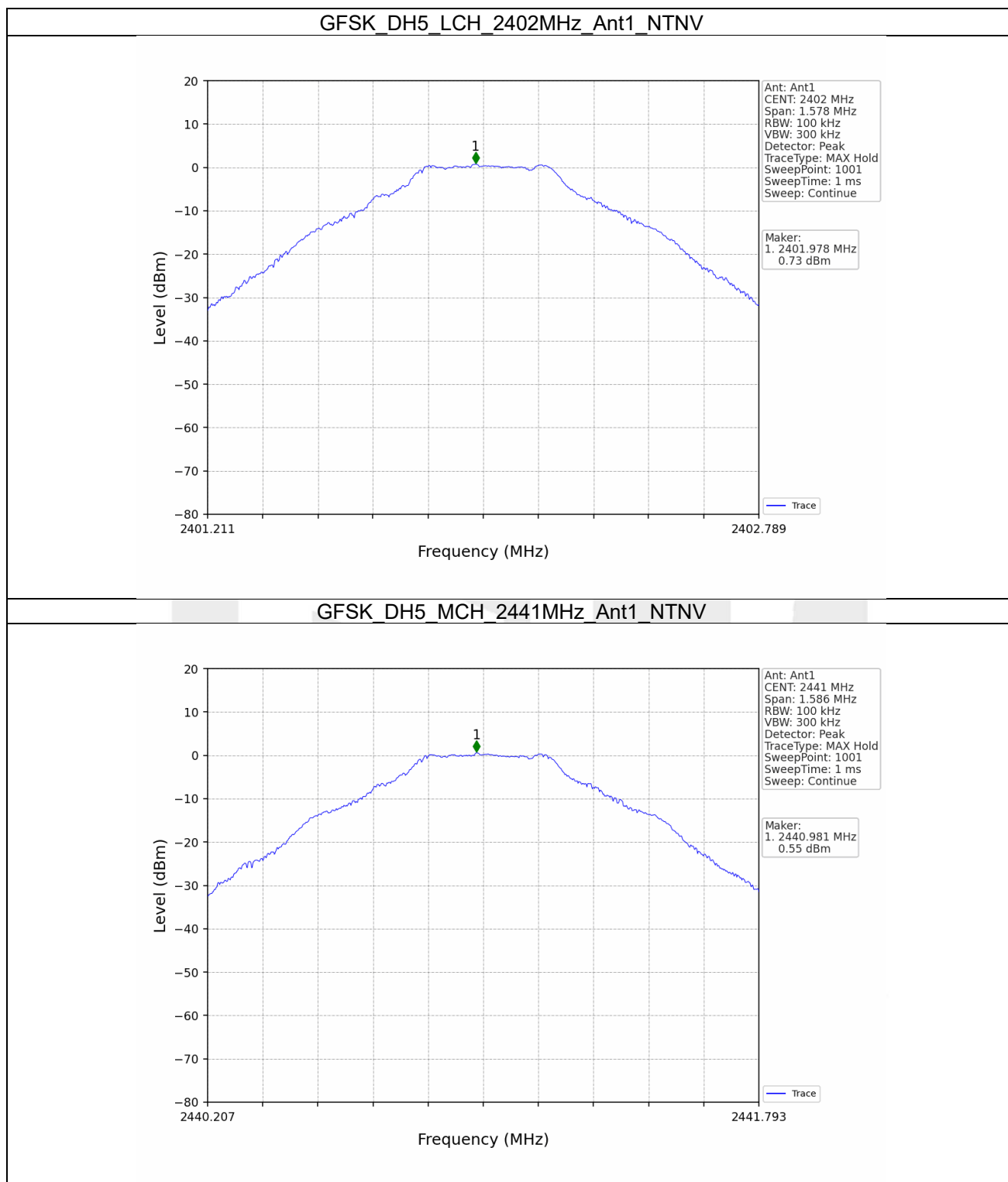
7.1 Ref

7.1.1 Test Result

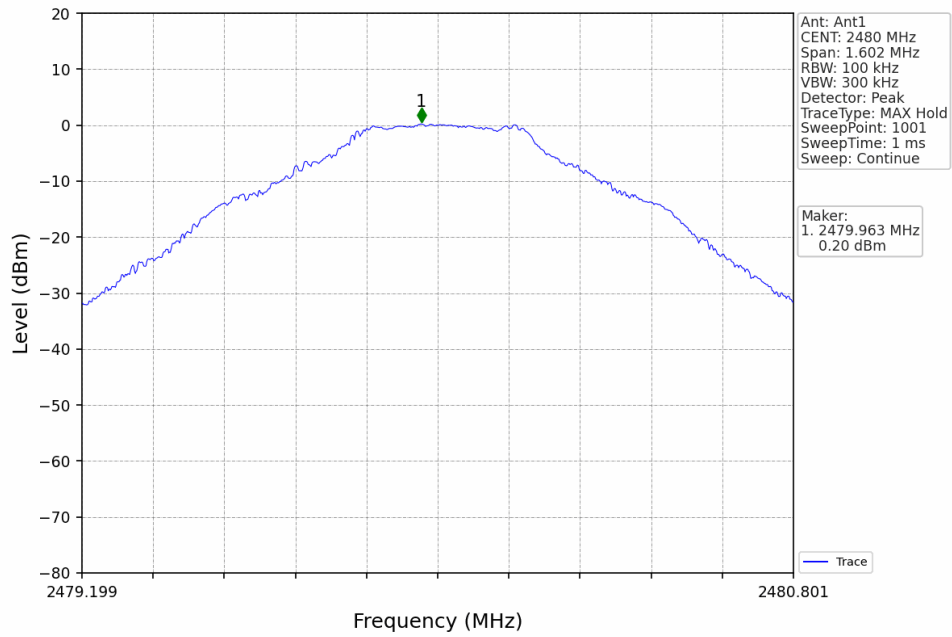
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	0.73
		2441	DH5	1	0.55
		2480	DH5	1	0.20
$\pi/4$ DQPSK	SISO	2402	2DH5	1	0.52
		2441	2DH5	1	0.51
		2480	2DH5	1	0.17
8DPSK	SISO	2402	3DH5	1	0.70
		2441	3DH5	1	0.65
		2480	3DH5	1	0.26

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.

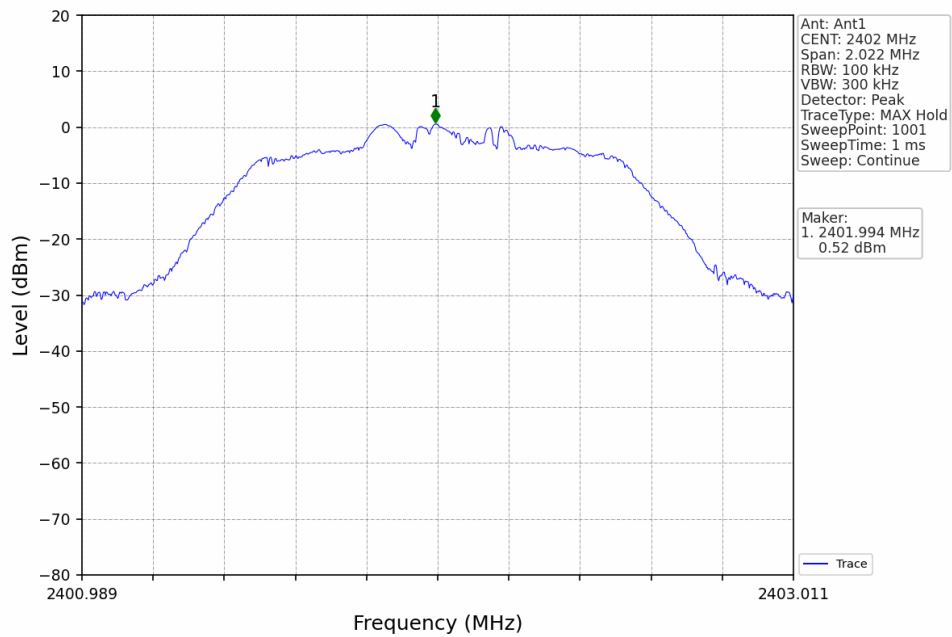
7.1.2 Test Graph



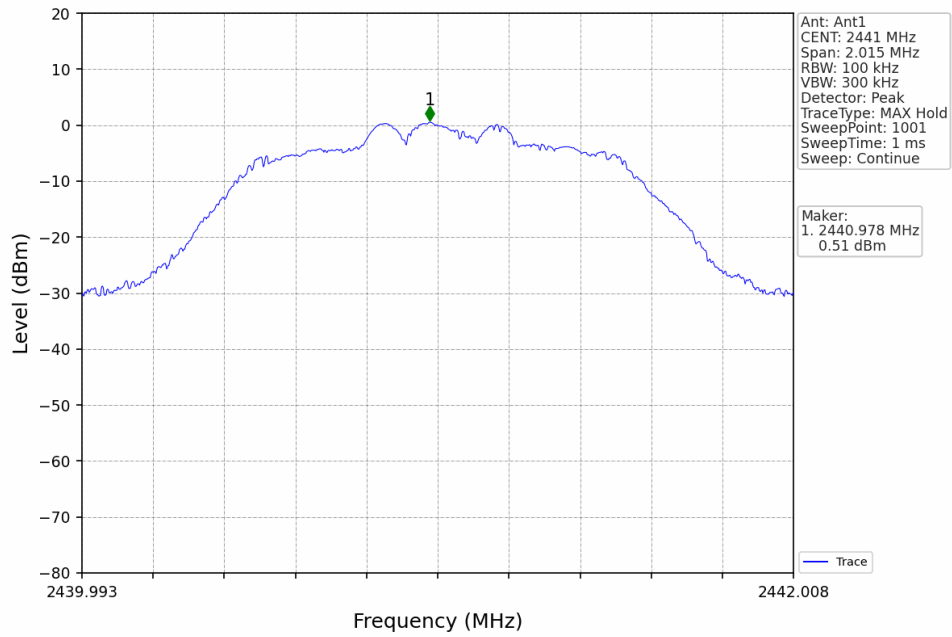
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



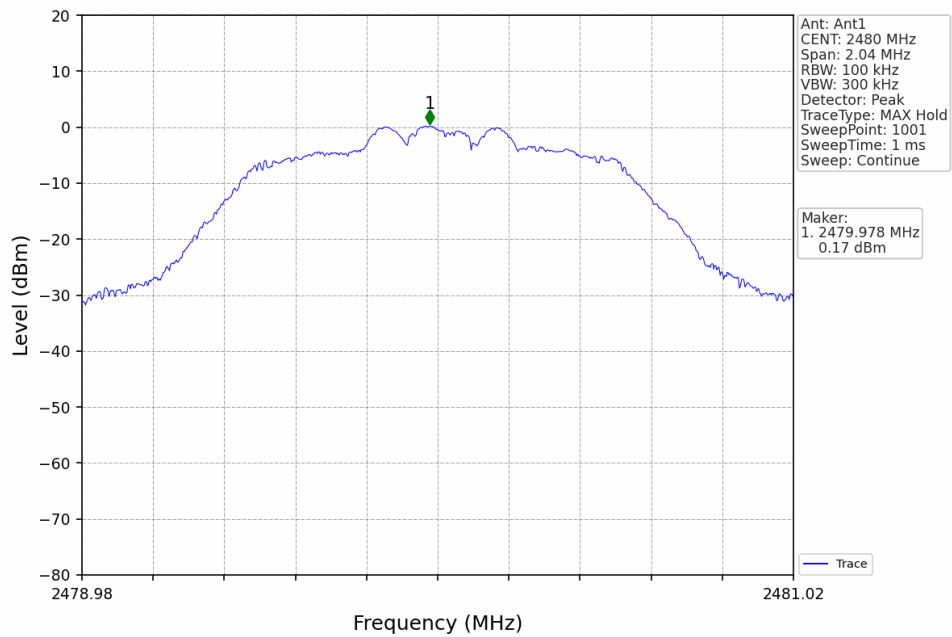
$\pi/4$ DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



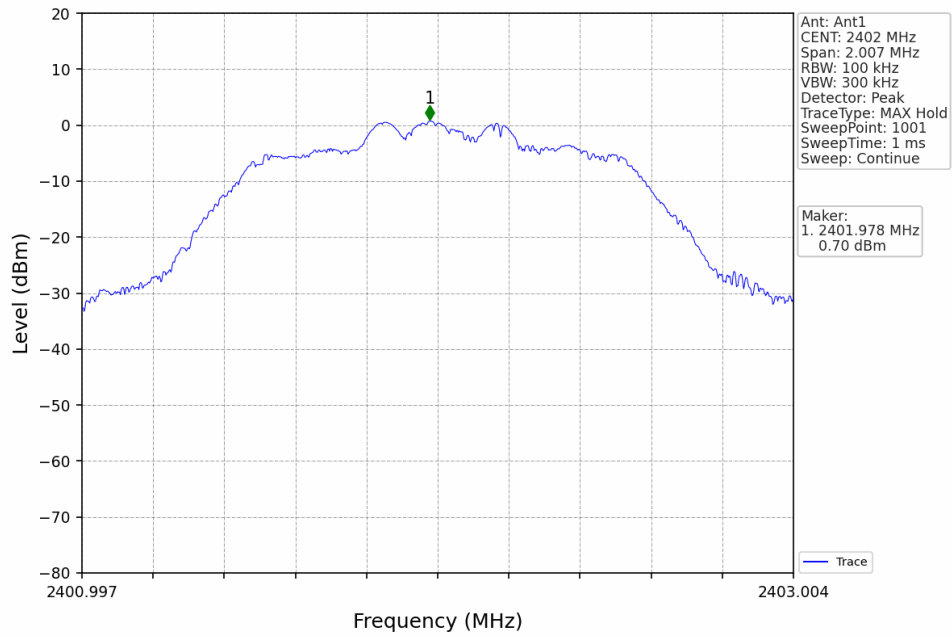
$\pi/4$ DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



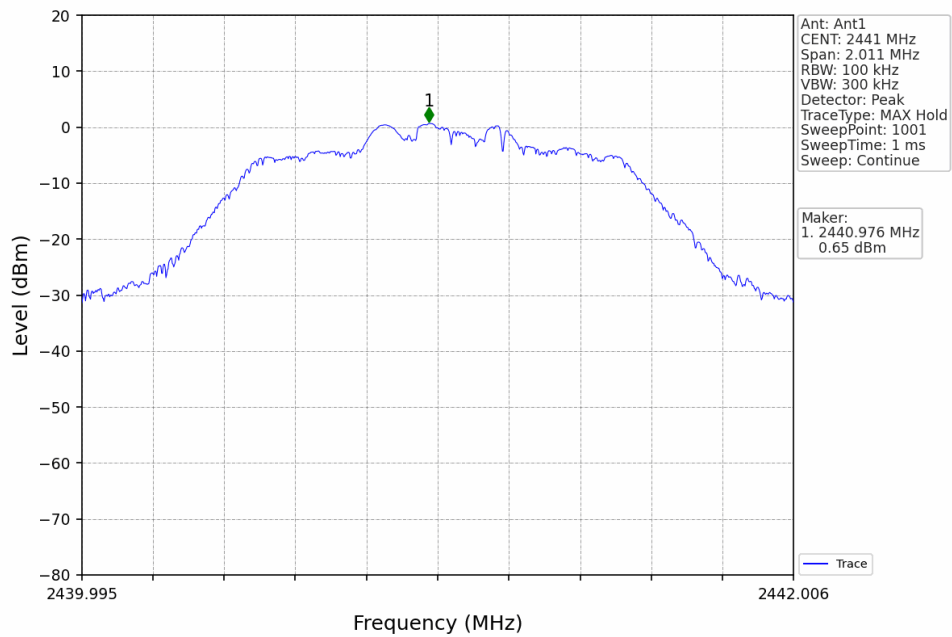
$\pi/4$ DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

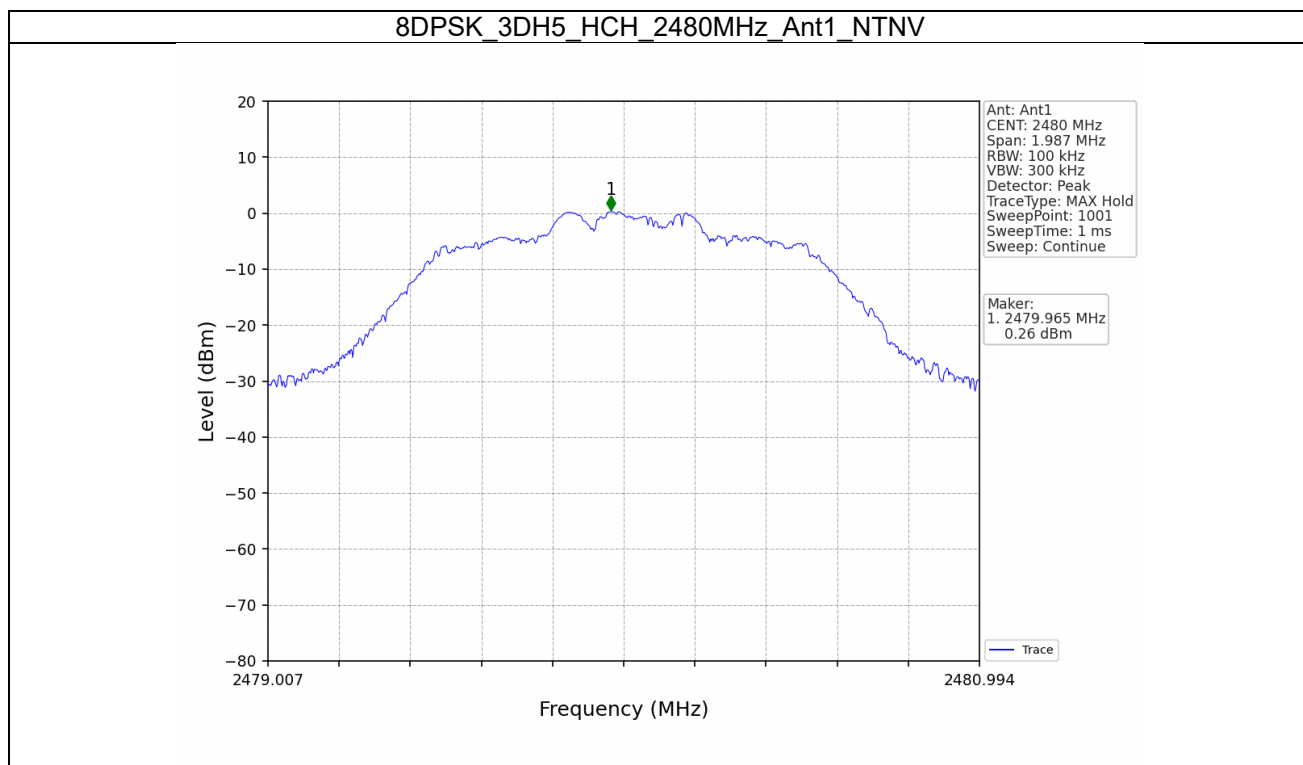


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



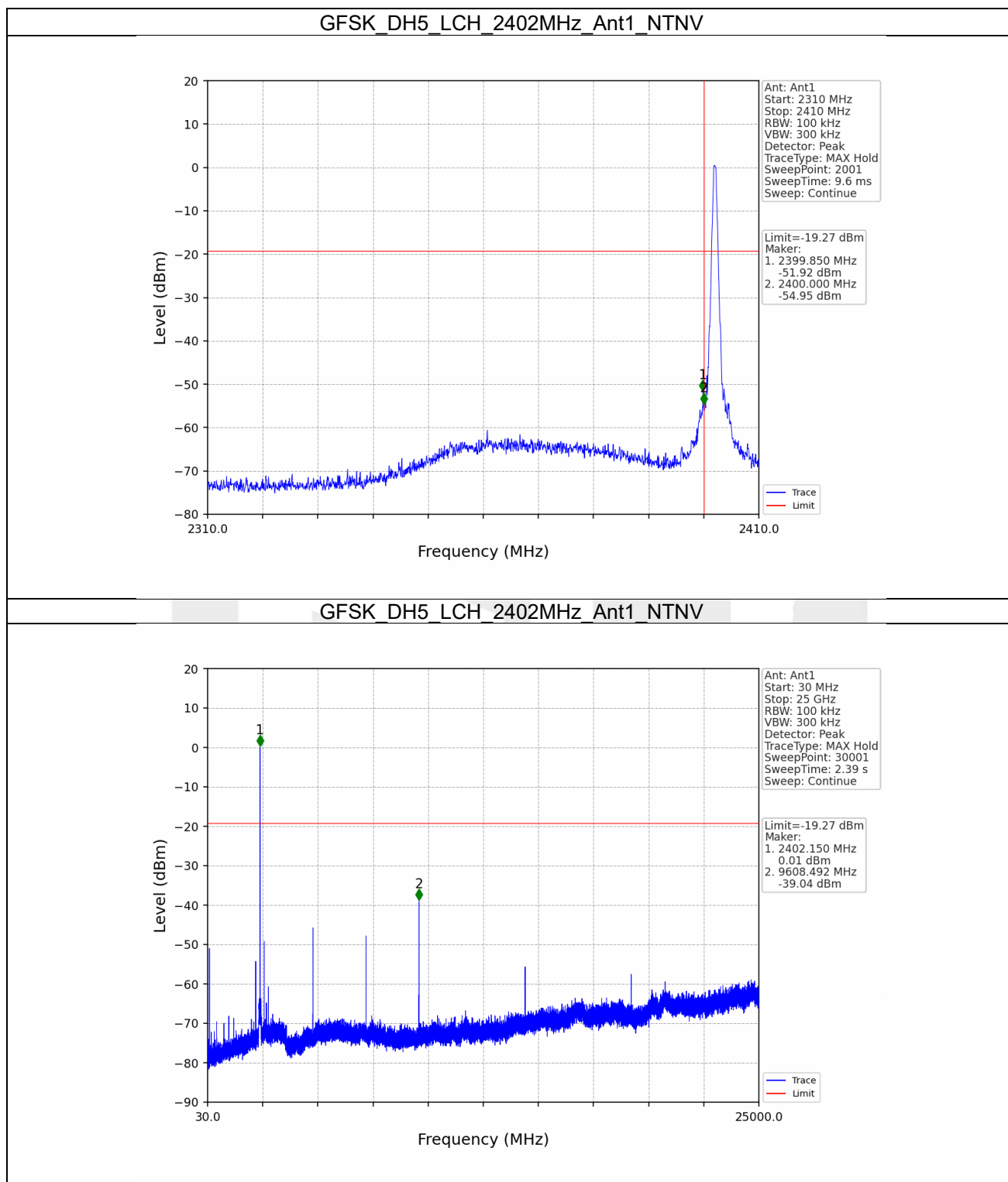


7.2 CSE

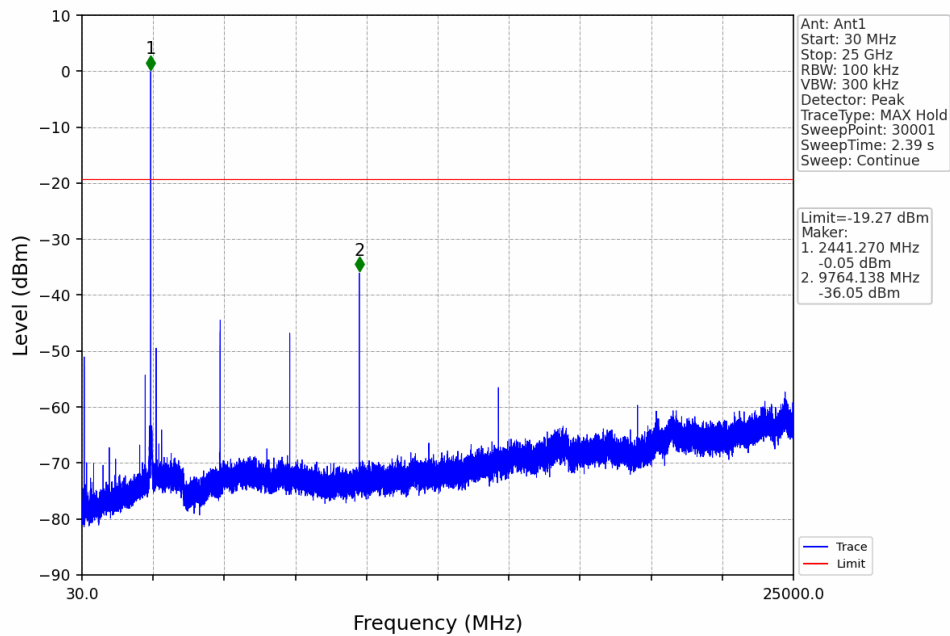
7.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	0.73	-19.27	Pass
		2441	DH5	1	0.73	-19.27	Pass
		2480	DH5	1	0.73	-19.27	Pass
		HOPP	DH5	1	0.73	-19.27	Pass
$\pi/4$ DQPSK	SISO	2402	2DH5	1	0.52	-19.48	Pass
		2441	2DH5	1	0.52	-19.48	Pass
		2480	2DH5	1	0.52	-19.48	Pass
		HOPP	2DH5	1	0.52	-19.48	Pass
8DPSK	SISO	2402	3DH5	1	0.70	-19.30	Pass
		2441	3DH5	1	0.70	-19.30	Pass
		2480	3DH5	1	0.70	-19.30	Pass
		HOPP	3DH5	1	0.70	-19.30	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.							

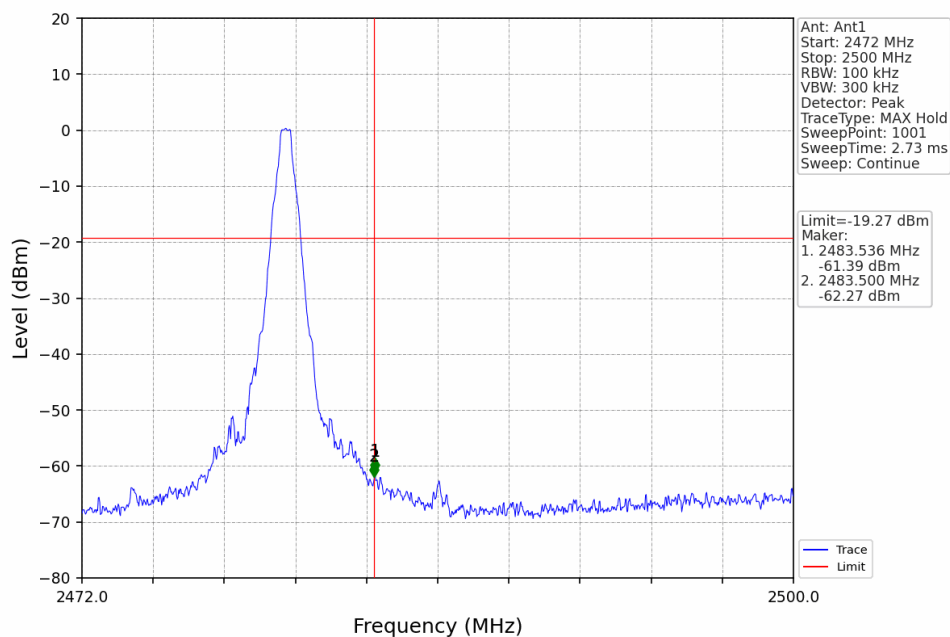
7.2.2 Test Graph



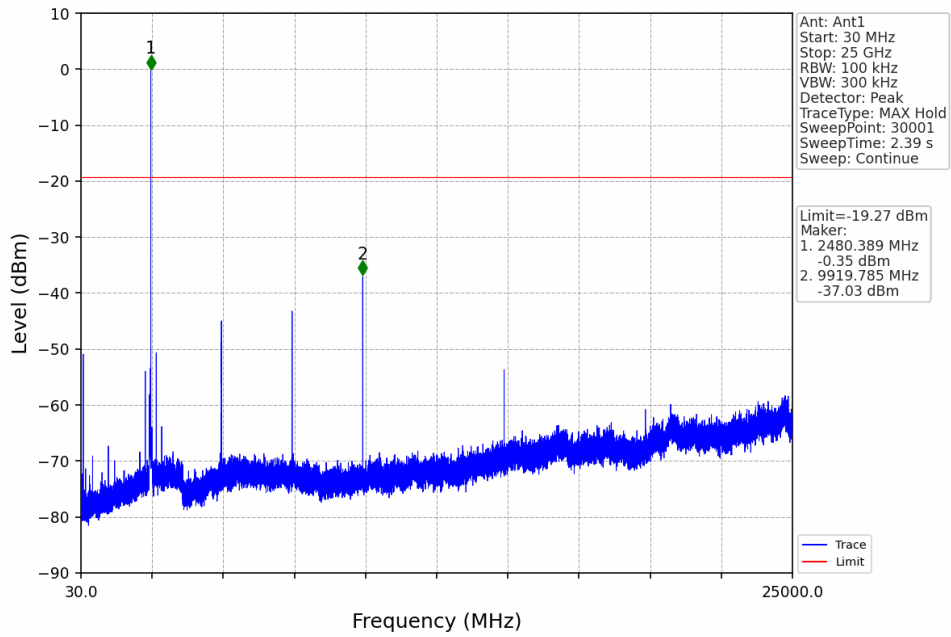
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



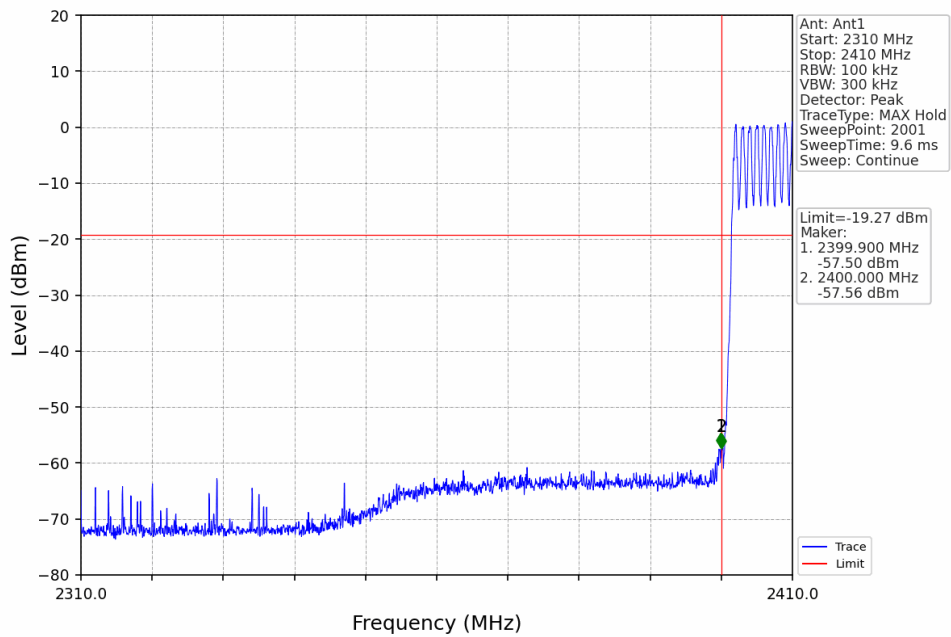
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



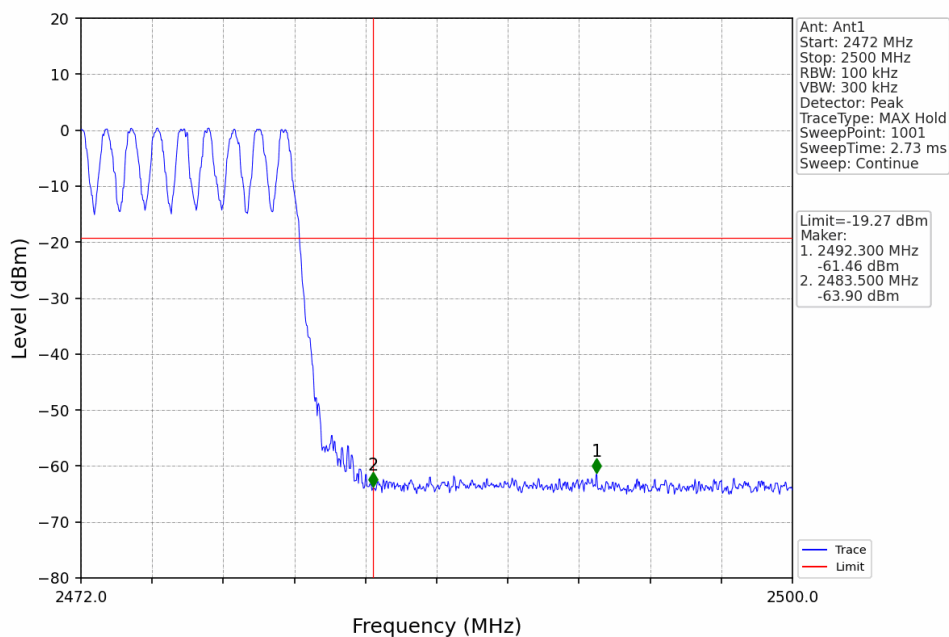
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



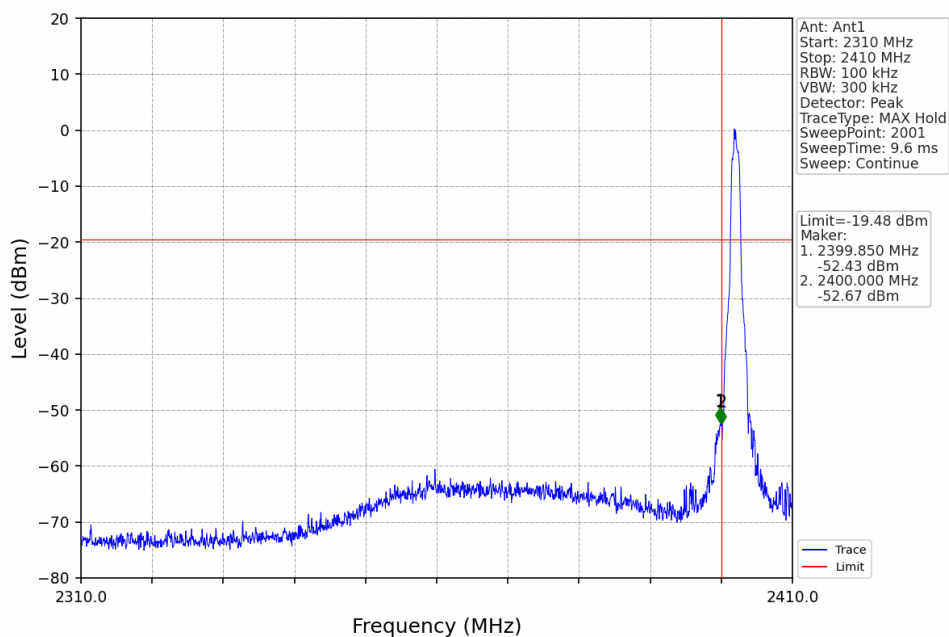
GFSK_DH5_HOPP_Ant1_NTNV



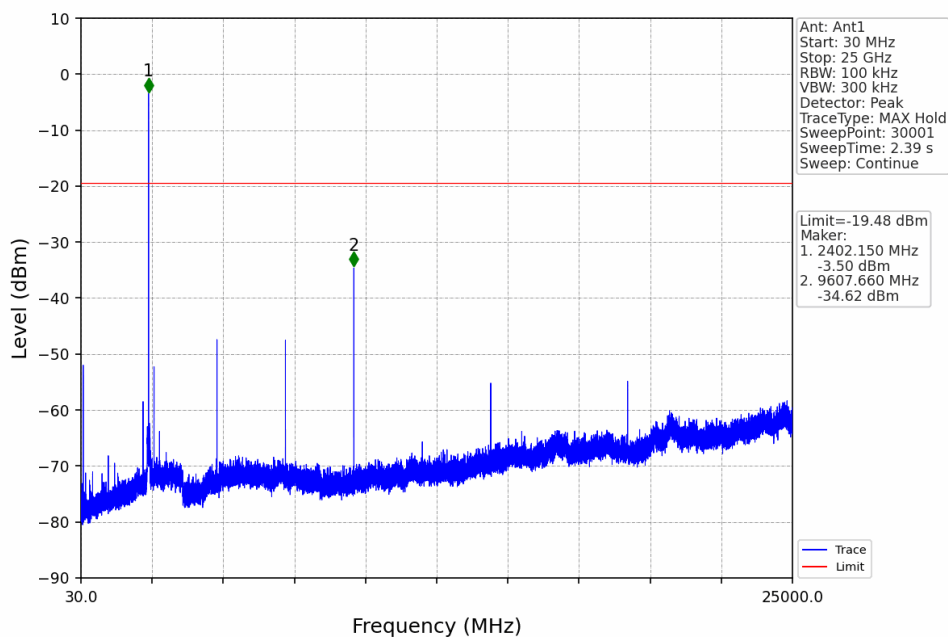
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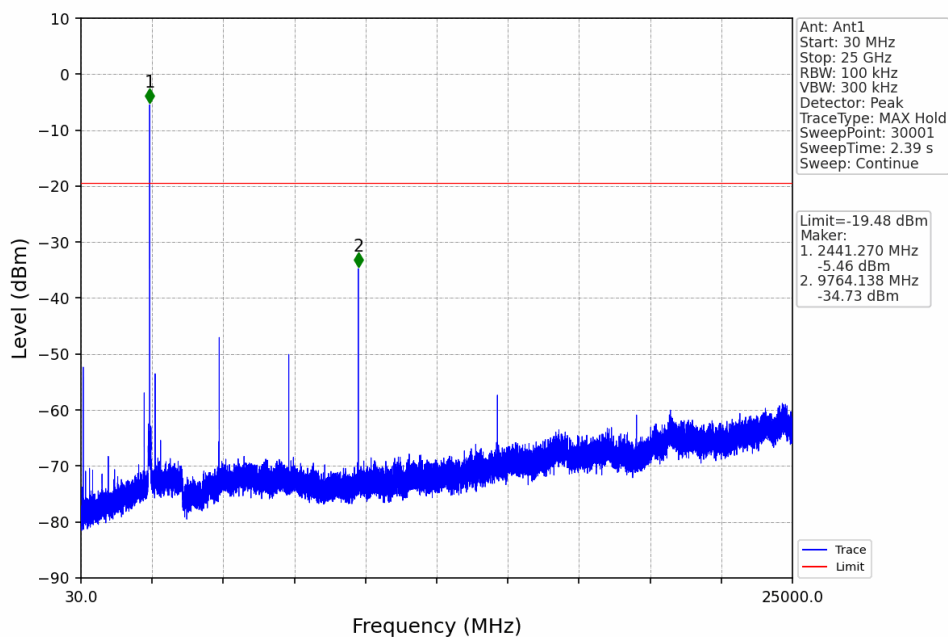
$\pi/4$ DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



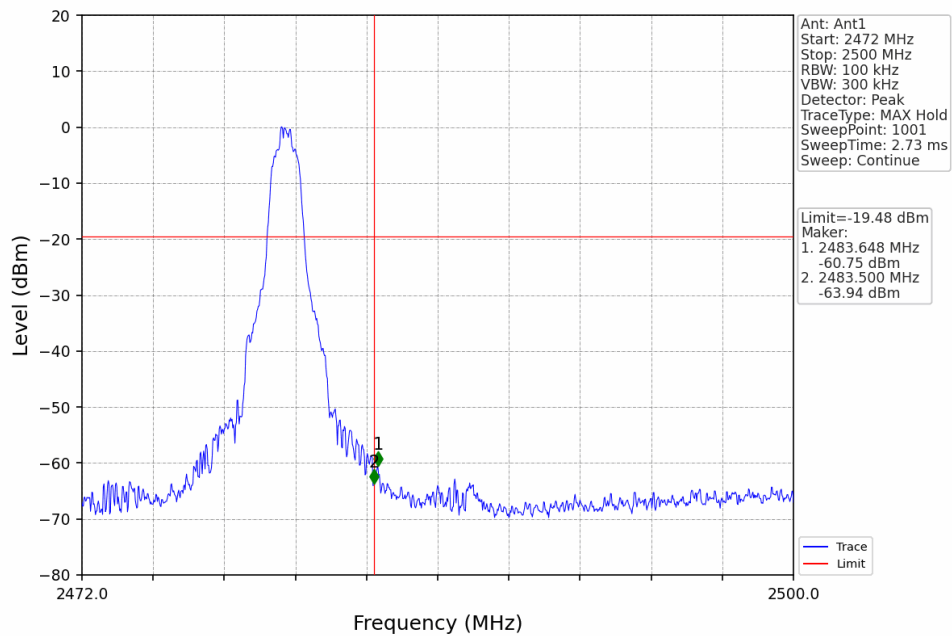
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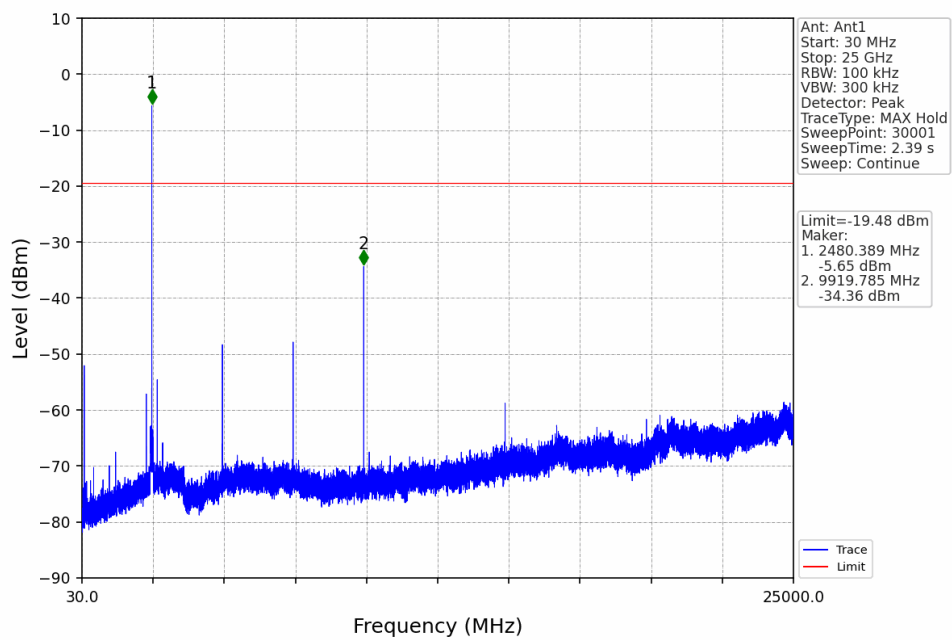
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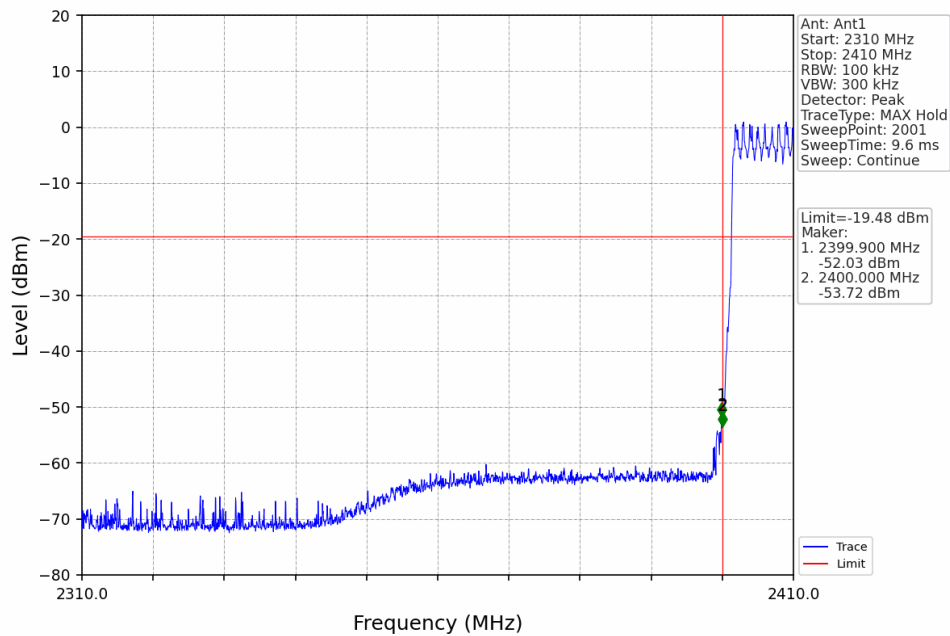
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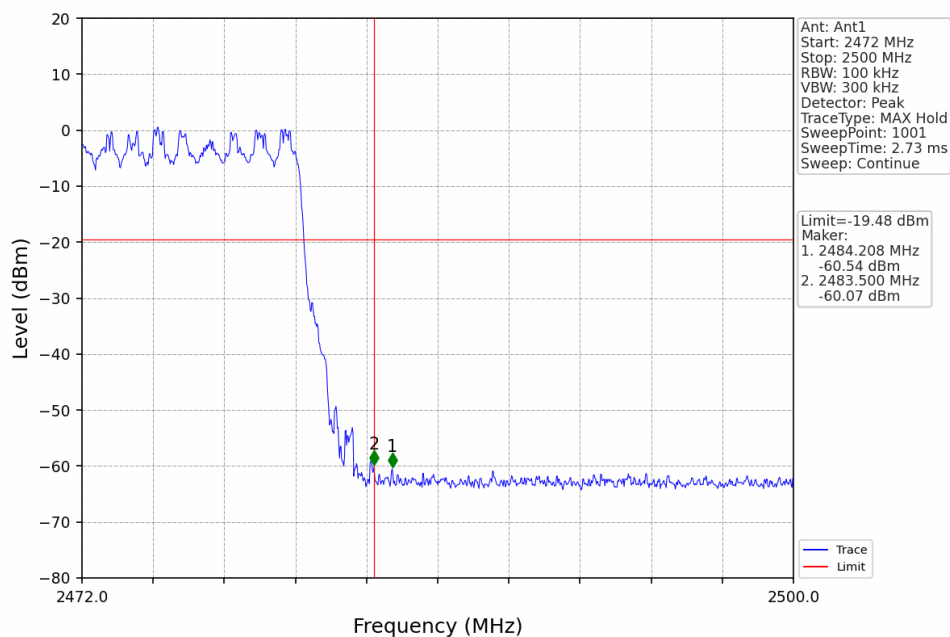
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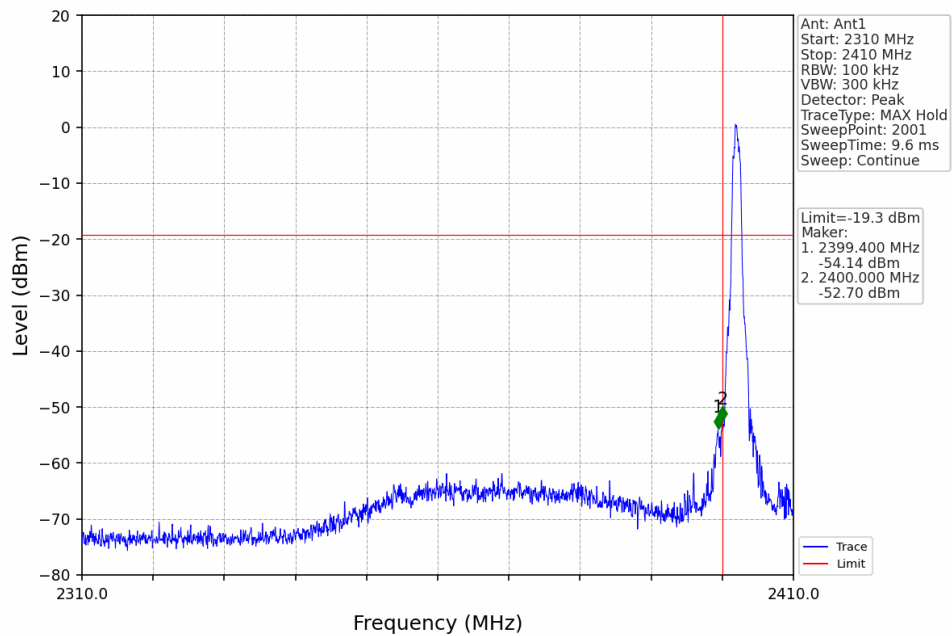
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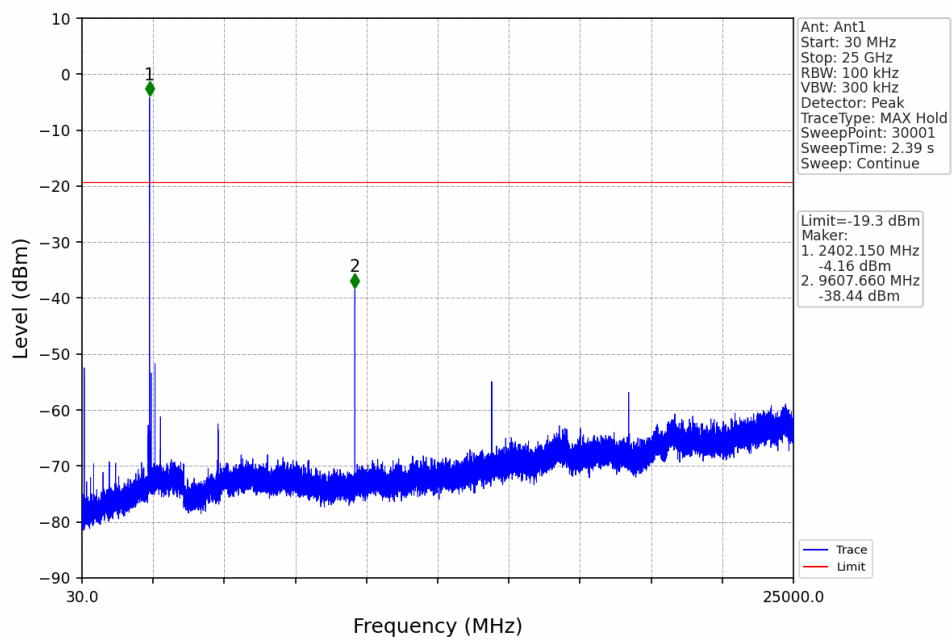
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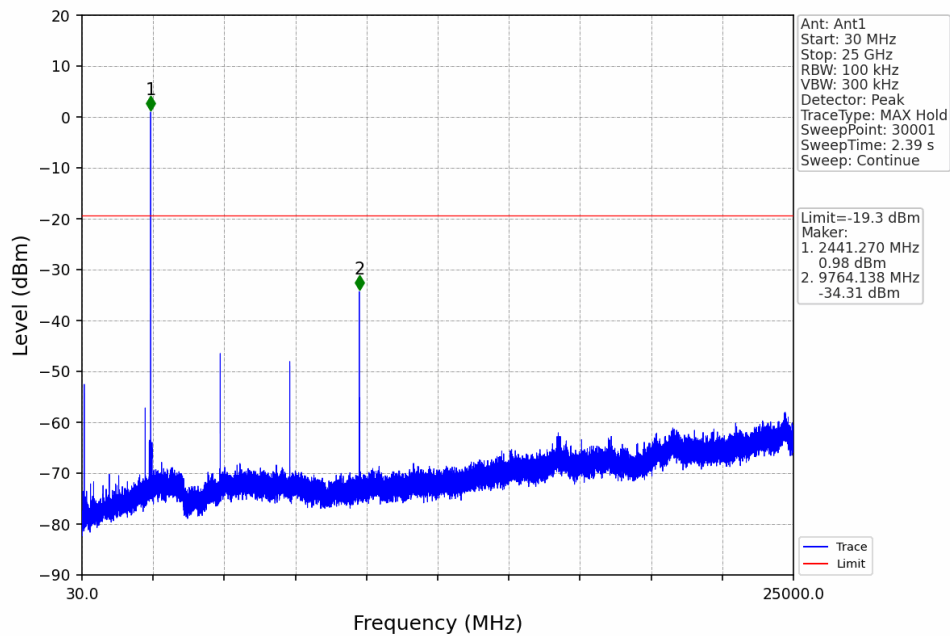
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



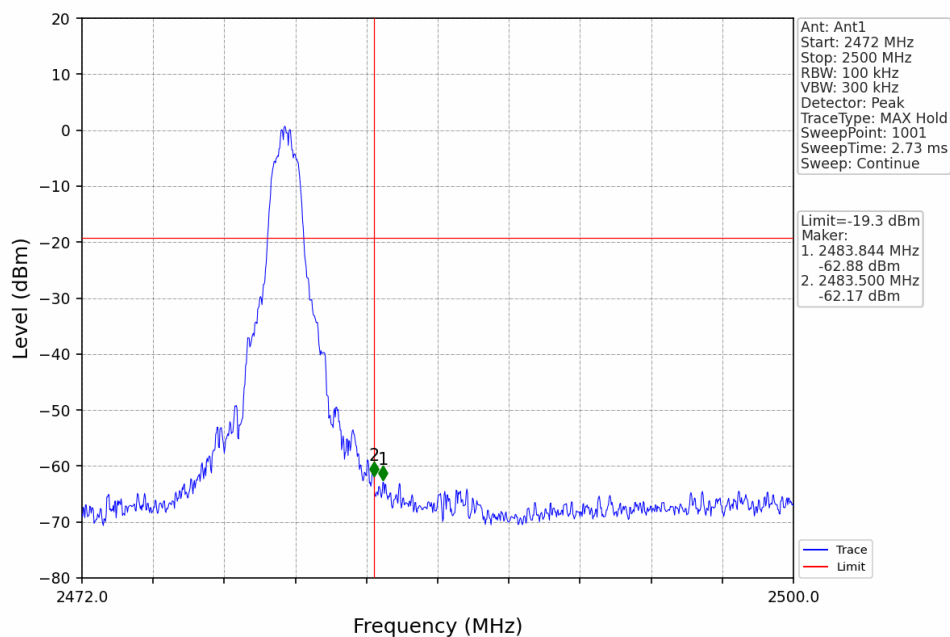
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



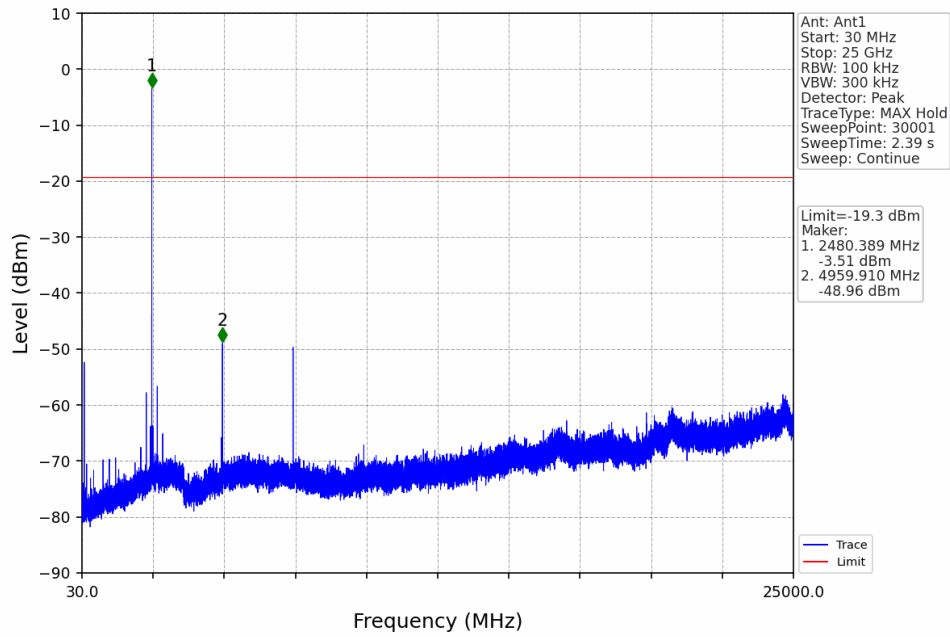
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



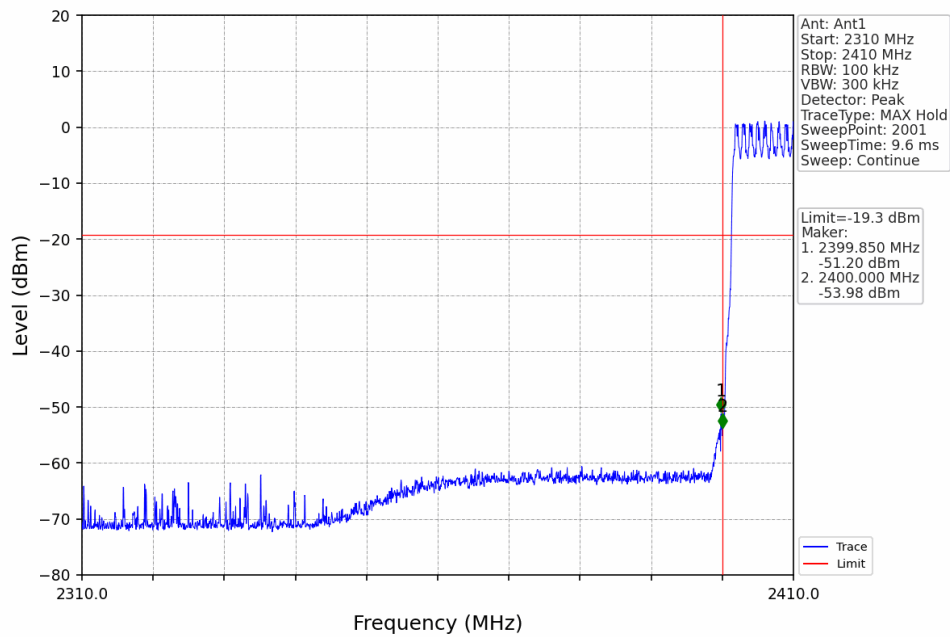
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV

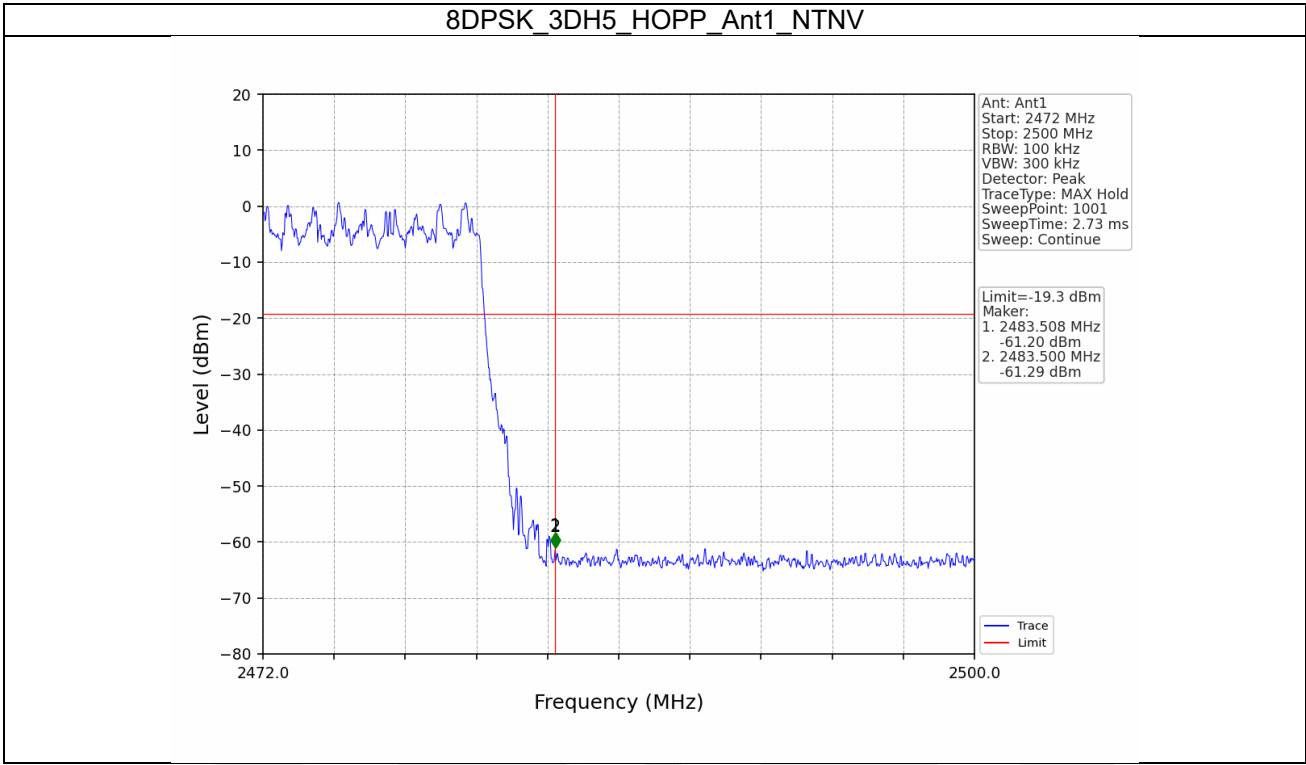


8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV





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