Appendix A

RF Test Data for BT (Conducted Measurement)

Product Name: TWS Earbuds With Screen Case

Test Model: TTY95

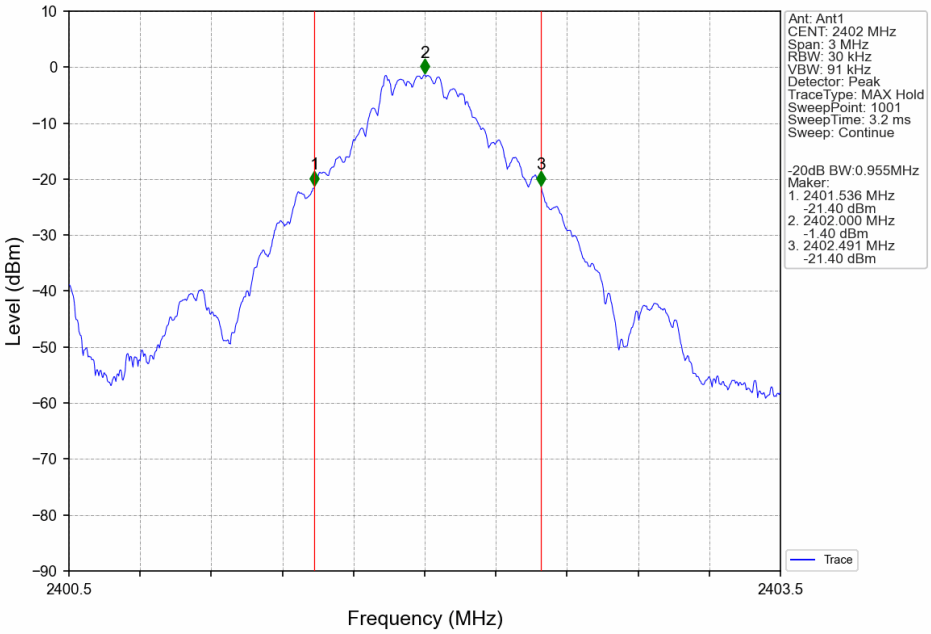
Environmental Conditions

Temperature:	23.8°C
Relative Humidity:	52.5%
ATM Pressure:	100.0 kPa
Test Engineer:	Jerry Chu
Supervised by:	Nick Peng

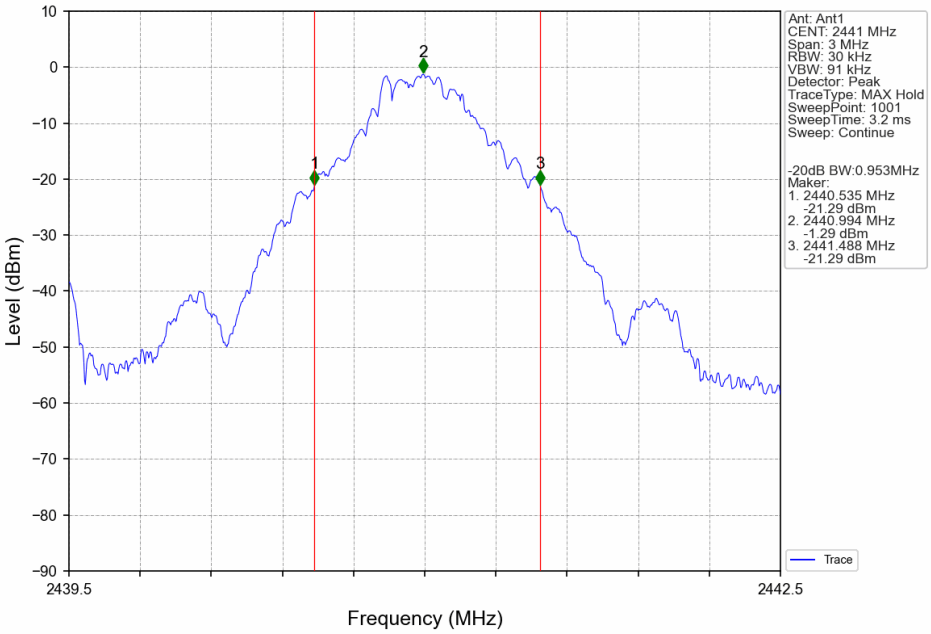
A.1 -20dB Bandwidth

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	0.953	/	Pass
		2480	DH5	1	0.953	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.285	/	Pass
		2441	2DH5	1	1.285	/	Pass
		2480	2DH5	1	1.286	/	Pass
8DPSK	SISO	2402	3DH5	1	1.304	/	Pass
		2441	3DH5	1	1.306	/	Pass
		2480	3DH5	1	1.305	/	Pass

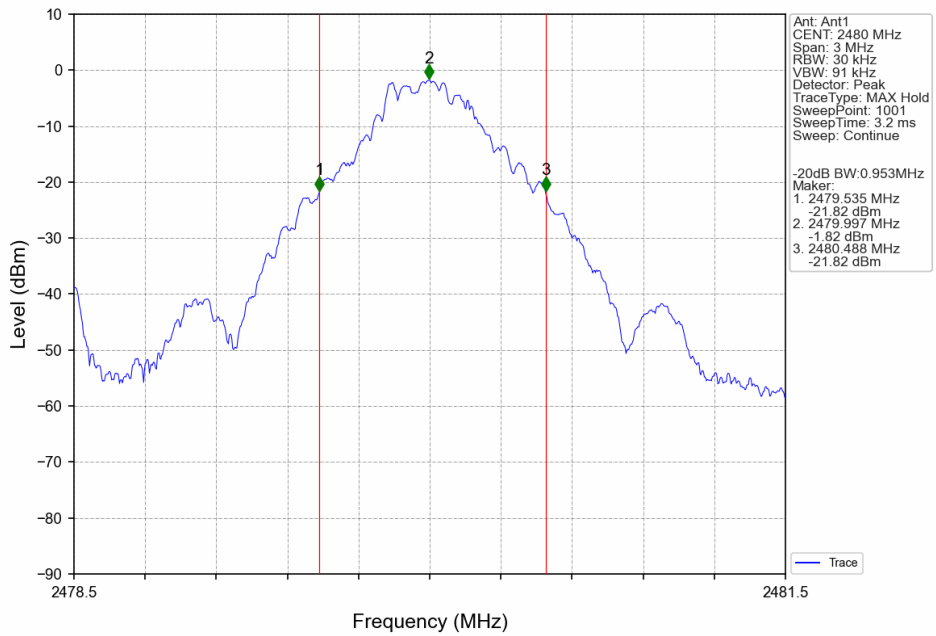
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



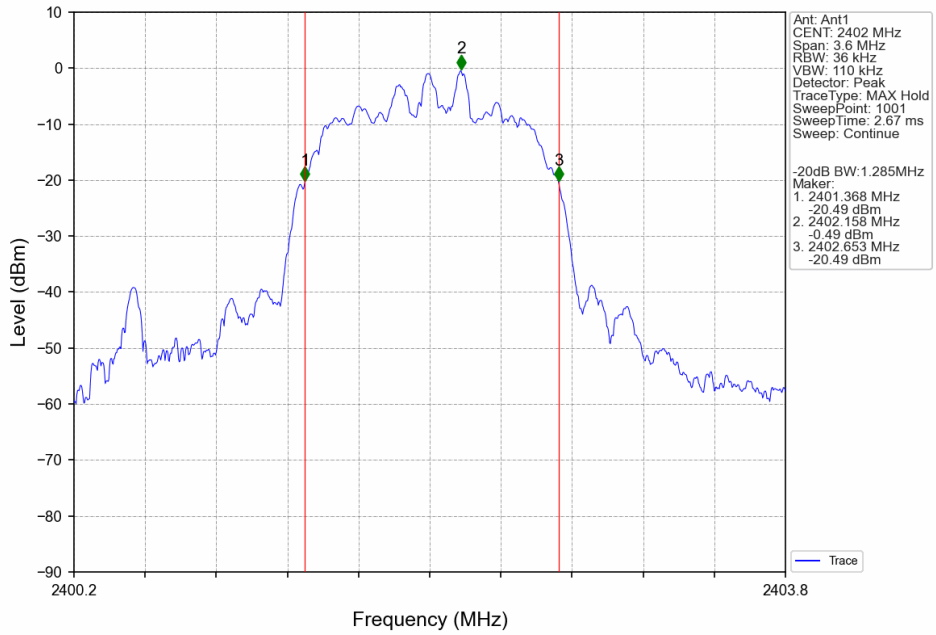
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



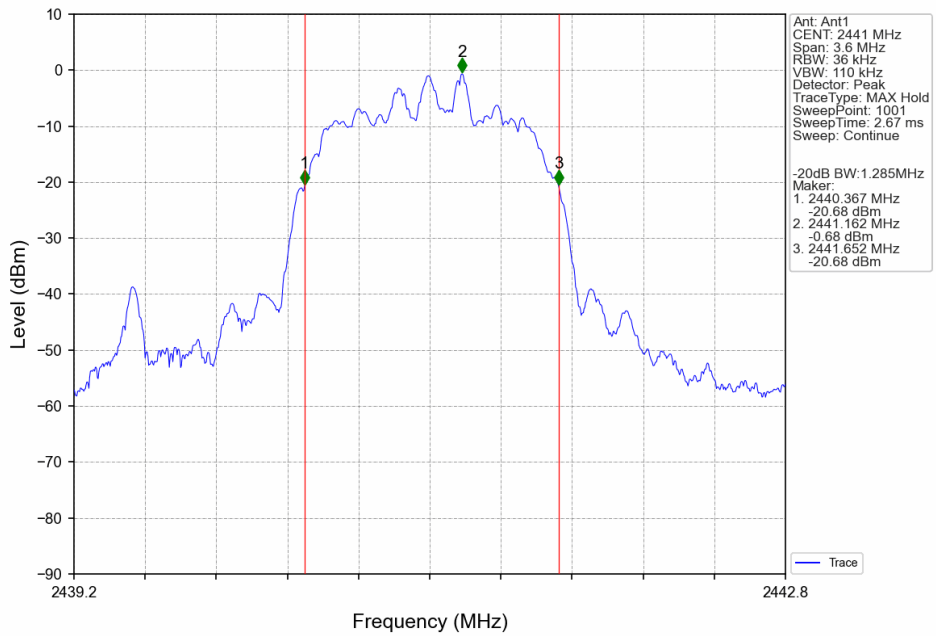
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



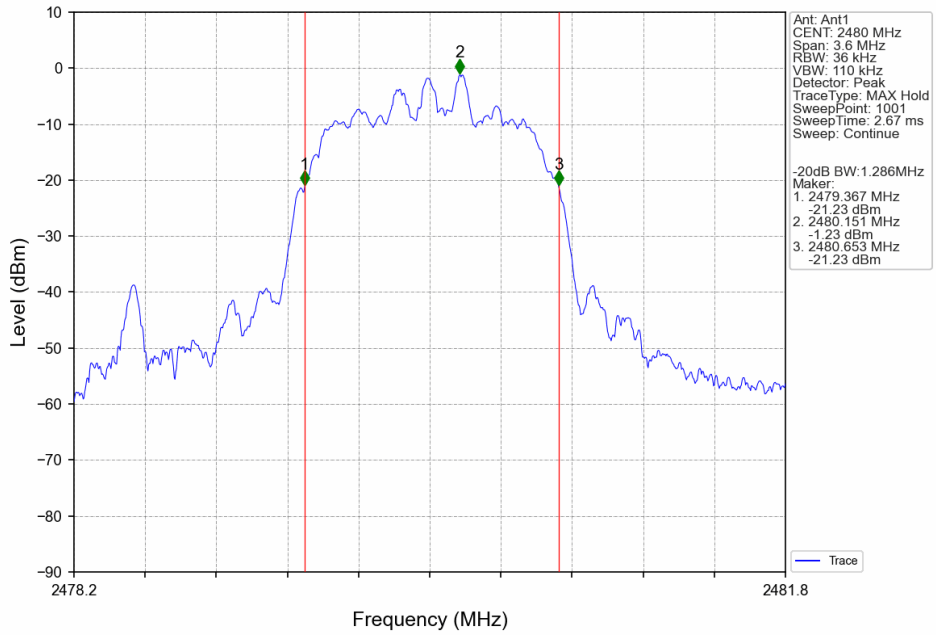
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



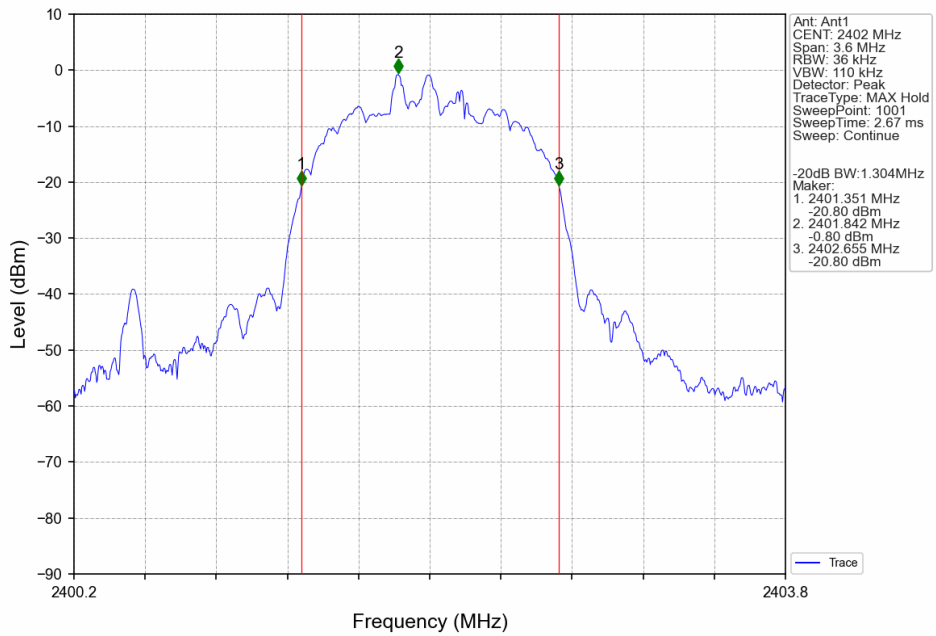
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



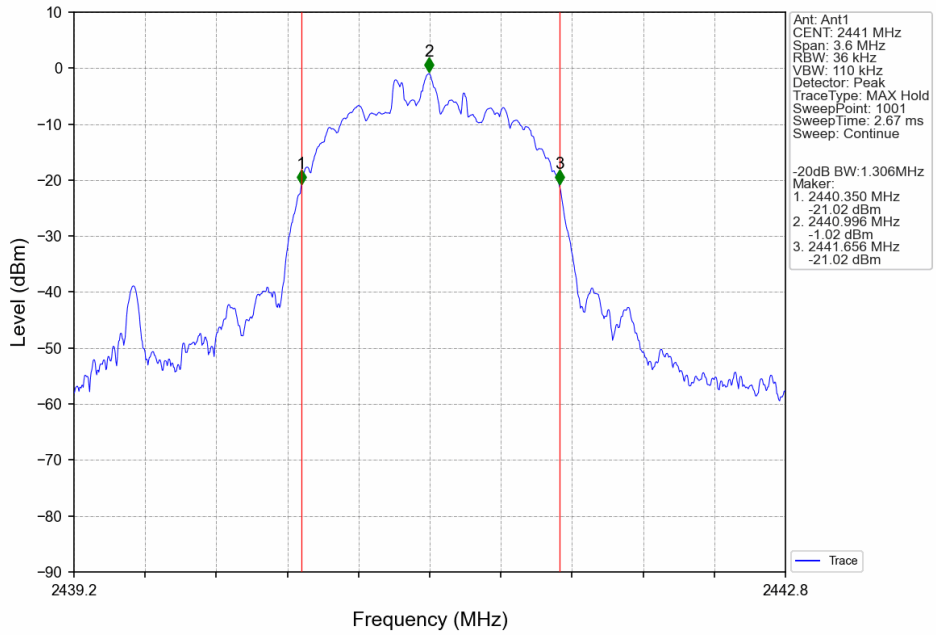
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



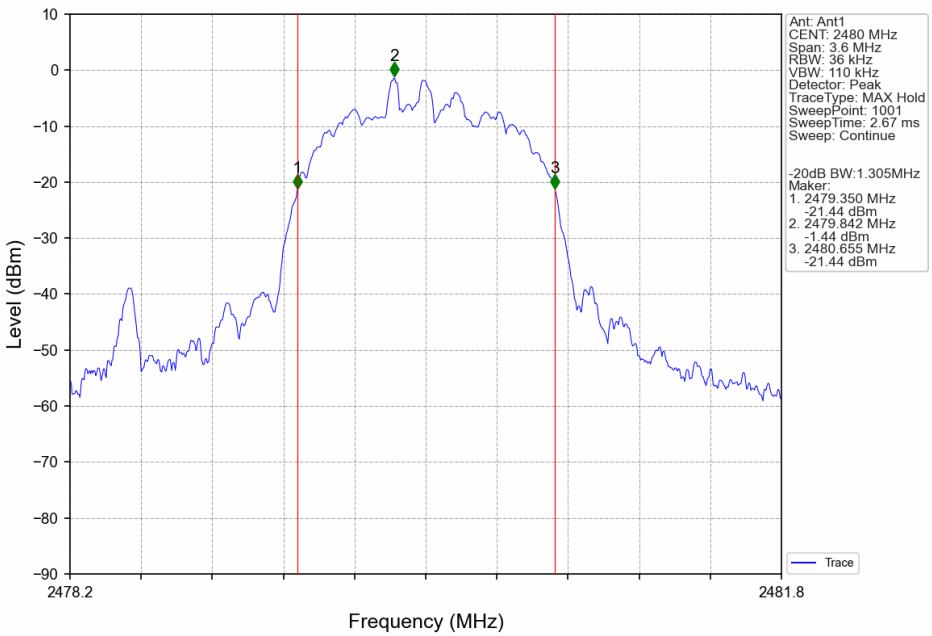
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



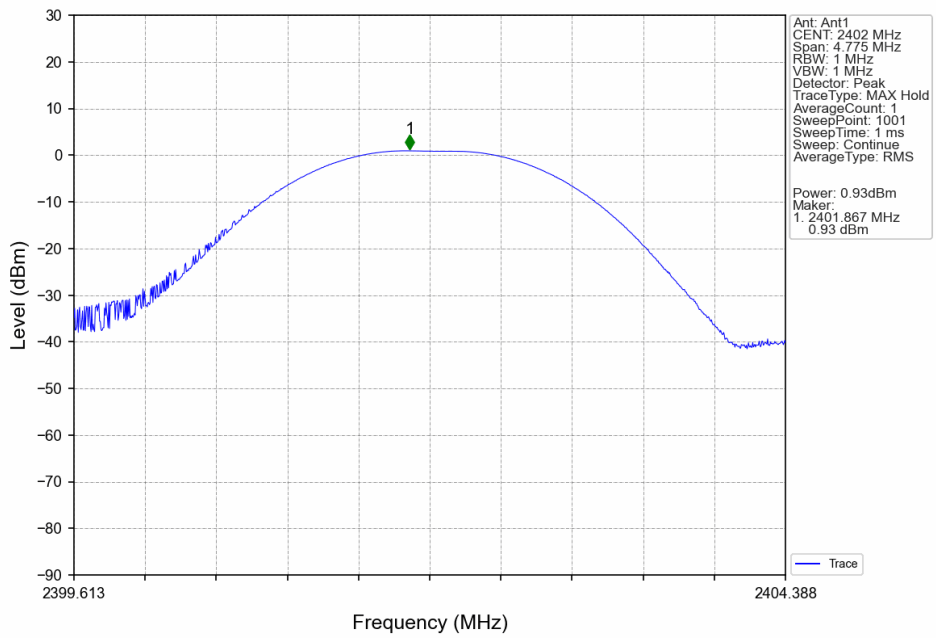
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV


Ant: Ant1
CENT: 2480 MHz
Span: 3.6 MHz
RBW: 36 kHz
VBW: 110 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 1001
SweepTime: 2.67 ms
Sweep: Continue
-20dB BW:1.305MHz
Maker:
1. 2479.350 MHz
-21.44 dBm
2. 2479.842 MHz
-1.44 dBm
3. 2480.655 MHz
-21.44 dBm
Trace
Level (dBm)
Frequency (MHz)
2478.2
2481.8
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
1
2
3

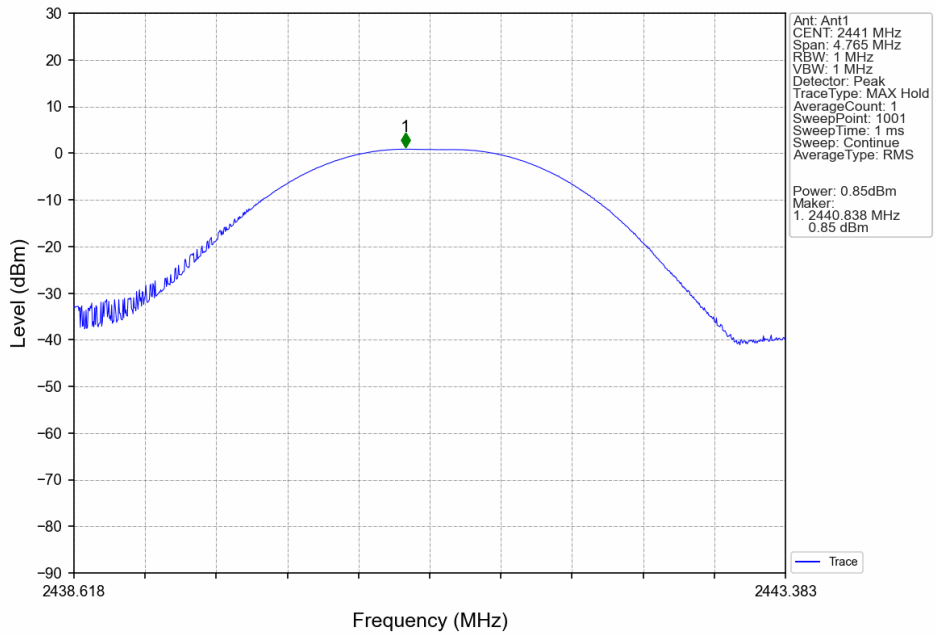
A.2 Maximum Peak Conducted Output Power

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	0.93	<=30	Pass
		2441	DH5	0.85	<=30	Pass
		2480	DH5	0.40	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	1.94	<=30	Pass
		2441	2DH5	1.79	<=30	Pass
		2480	2DH5	1.34	<=30	Pass
8DPSK	SISO	2402	3DH5	2.35	<=30	Pass
		2441	3DH5	2.19	<=30	Pass
		2480	3DH5	1.76	<=30	Pass

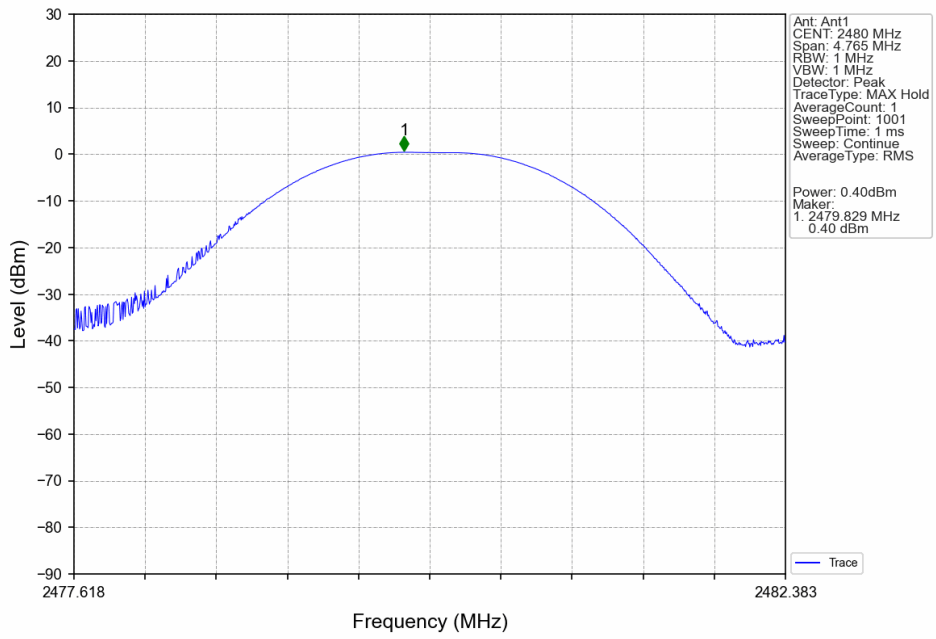
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



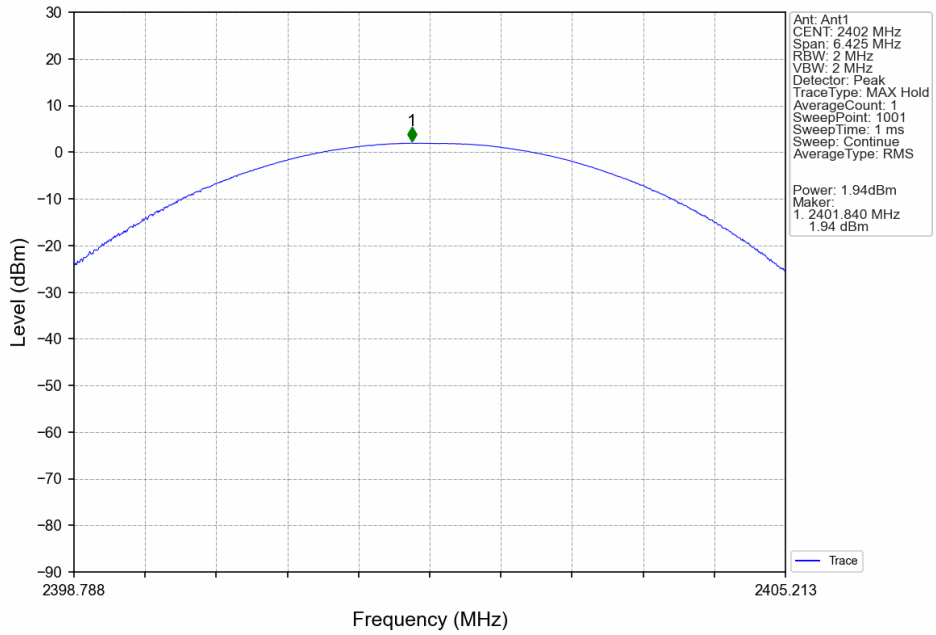
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



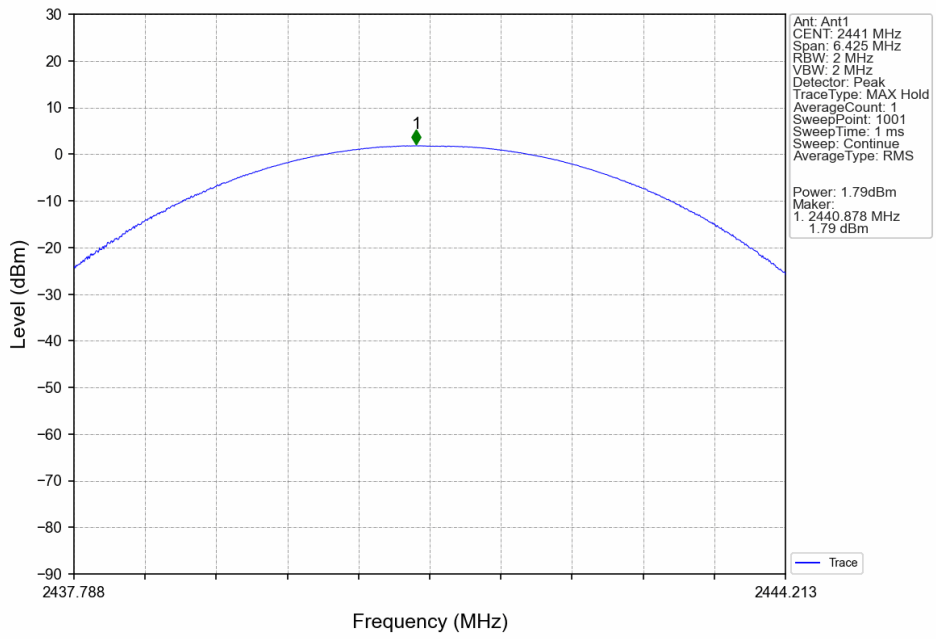
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



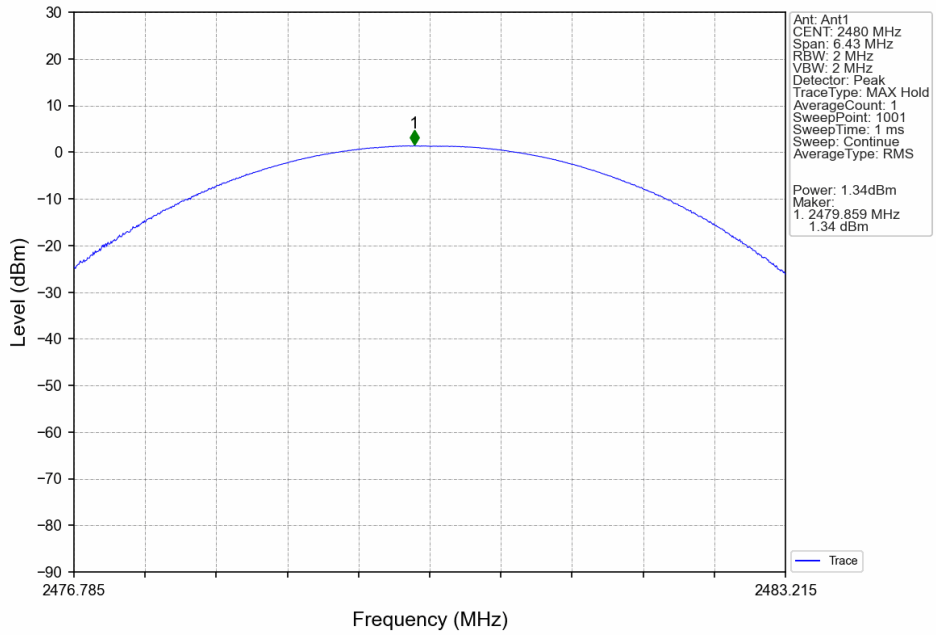
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



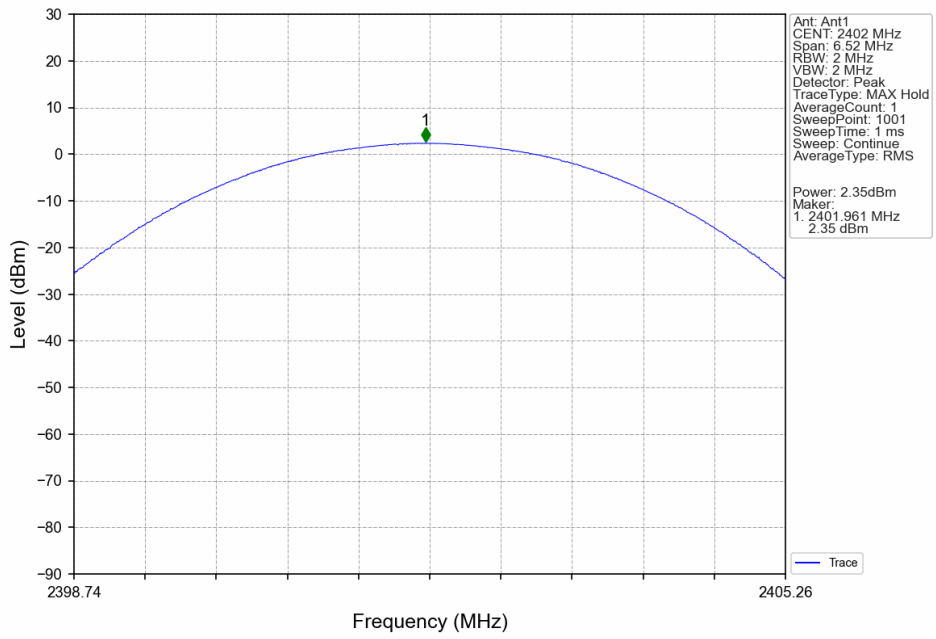
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



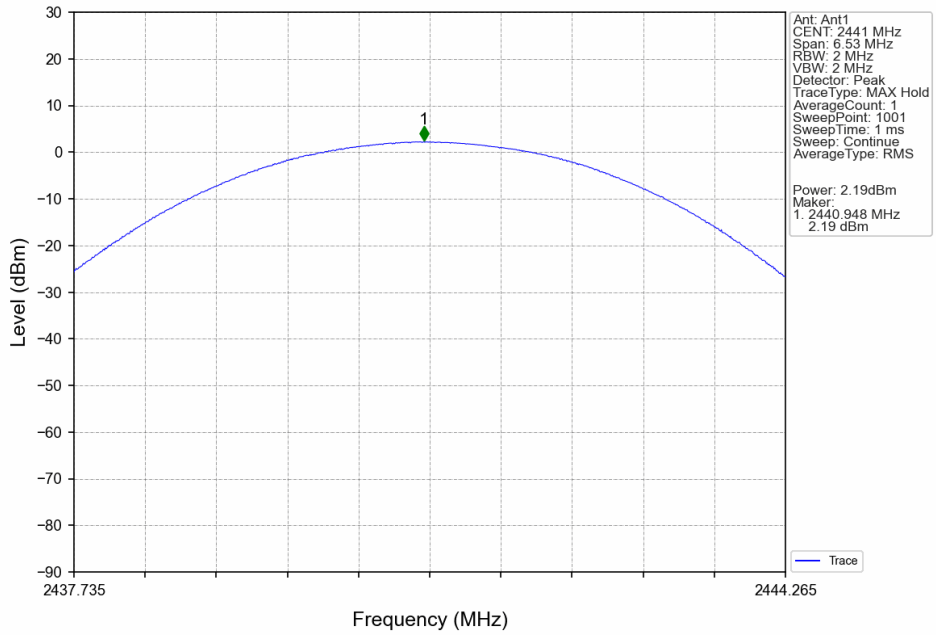
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



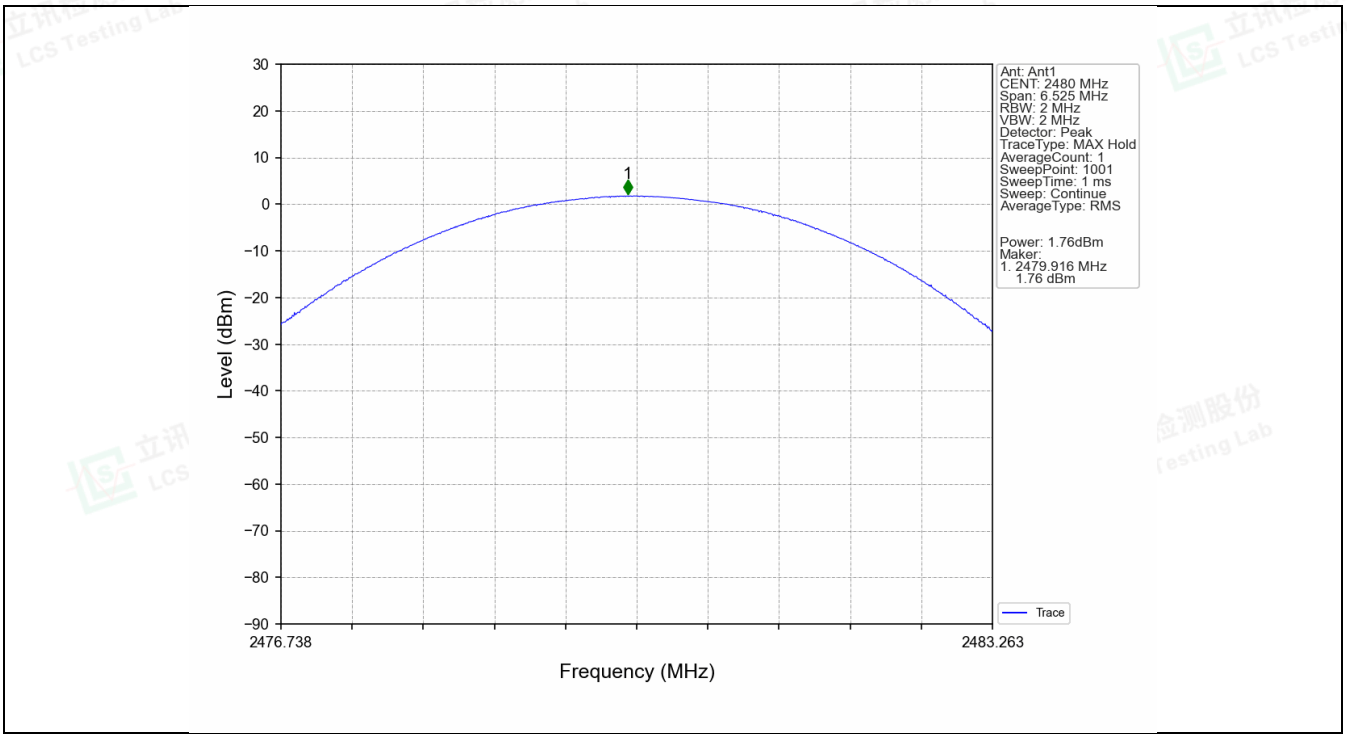
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



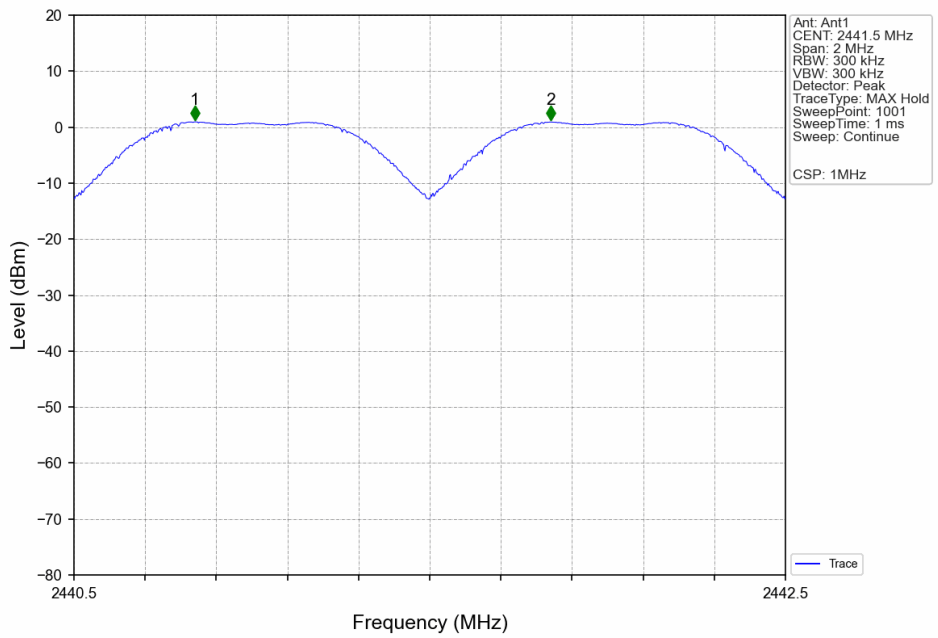
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV


Ant: Ant1
CENT: 2480 MHz
Span: 6.525 MHz
RBW: 2 MHz
VBW: 2 MHz
Detector: Peak
TraceType: MAX Hold
AverageCount: 1
SweepPoint: 1001
SweepTime: 1 ms
Sweep: Continue
AverageType: RMS
Power: 1.76dBm
Maker:
1. 2479.916 MHz
1.76 dBm
Trace
Level (dBm)
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
1
2476.738
2483.263
Frequency (MHz)

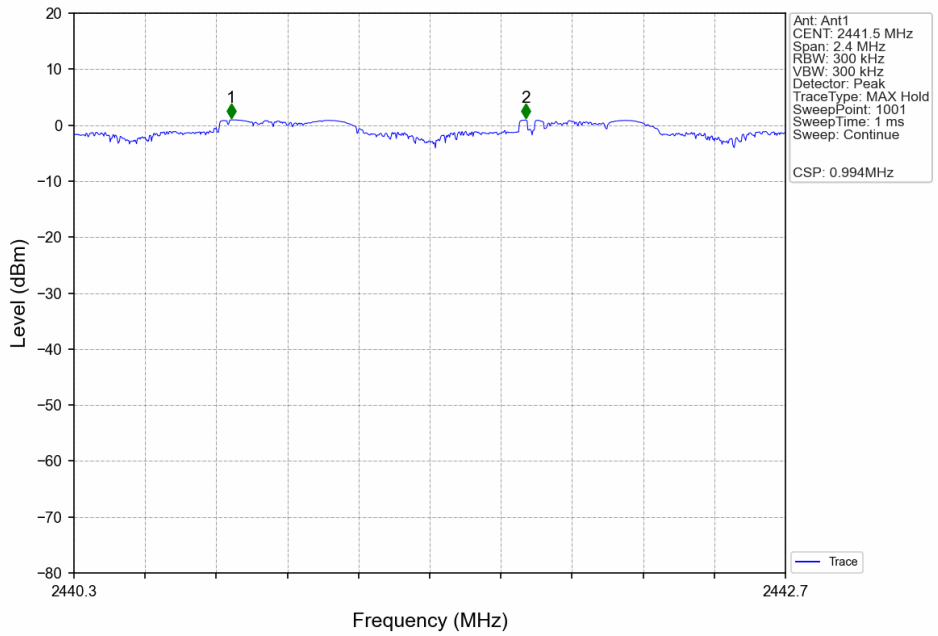
A.3 Carrier Frequencies Separation

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.000	0.955	>=0.637	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	0.994	1.286	>=0.857	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.306	>=0.871	Pass

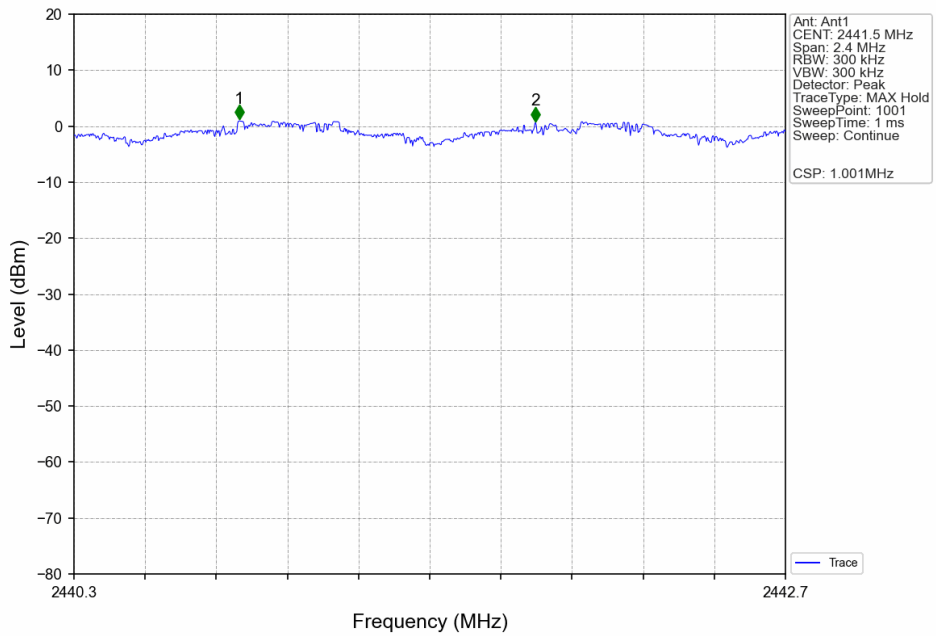
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



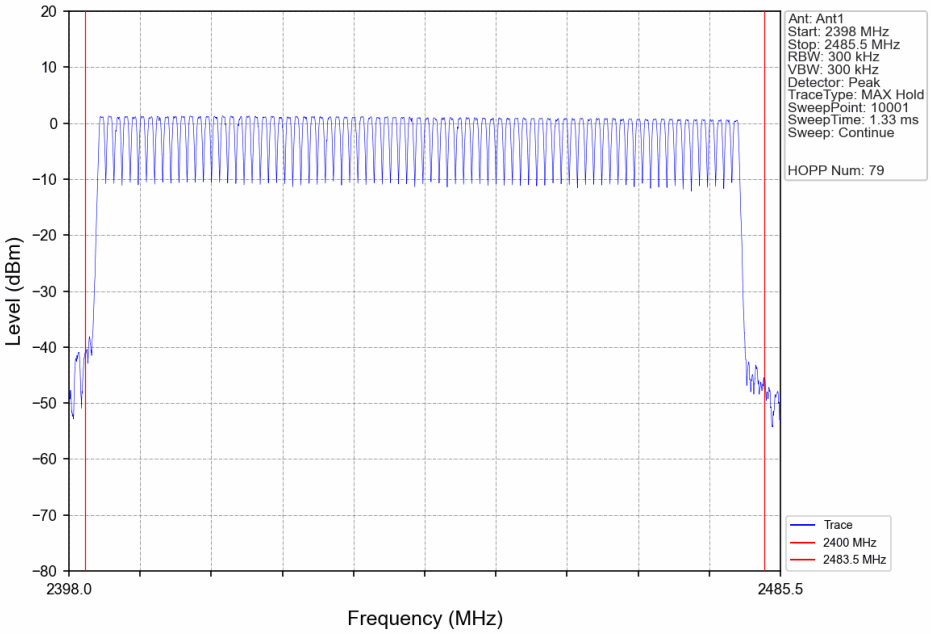
8DPSK_3DH5_HOPP_Ant1_NTNV


Ant: Ant1
CENT: 2441.5 MHz
Span: 2.4 MHz
RBW: 300 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 1001
SweepTime: 1 ms
Sweep: Continue
CSP: 1.001MHz
Trace
1
2
Level (dBm)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
2440.3
2442.7
Frequency (MHz)

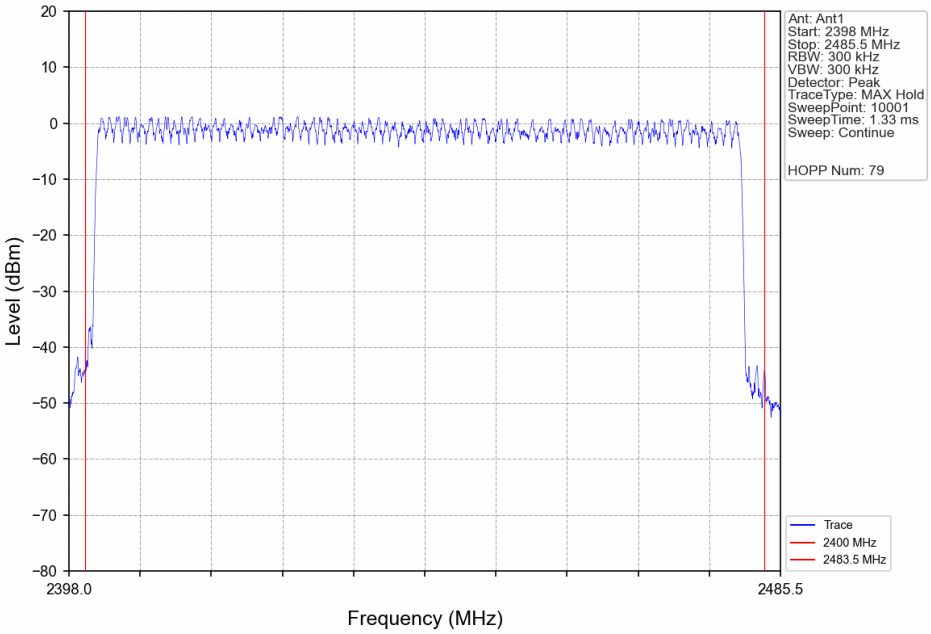
A.5 Number of Hopping Channel

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

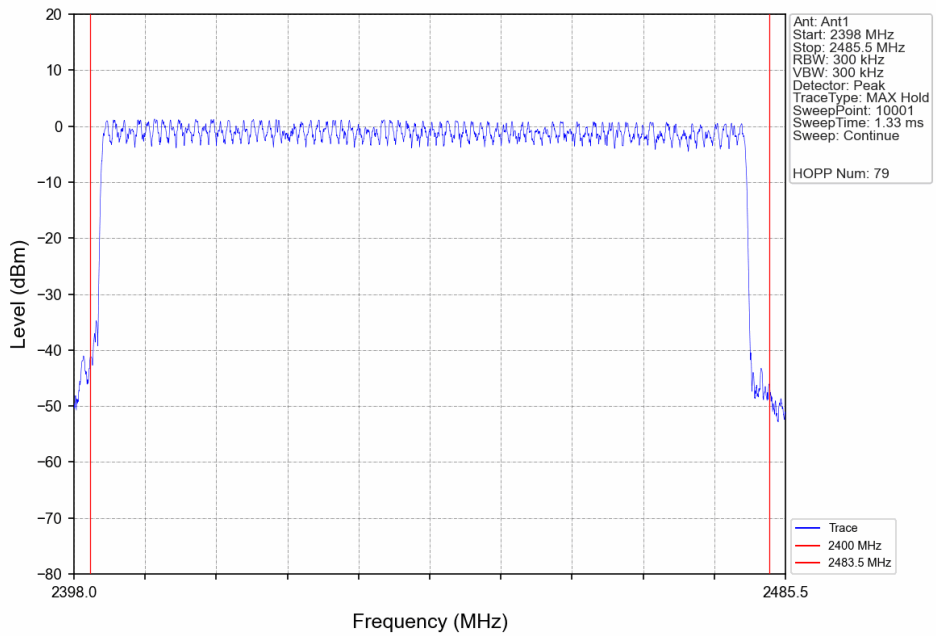
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



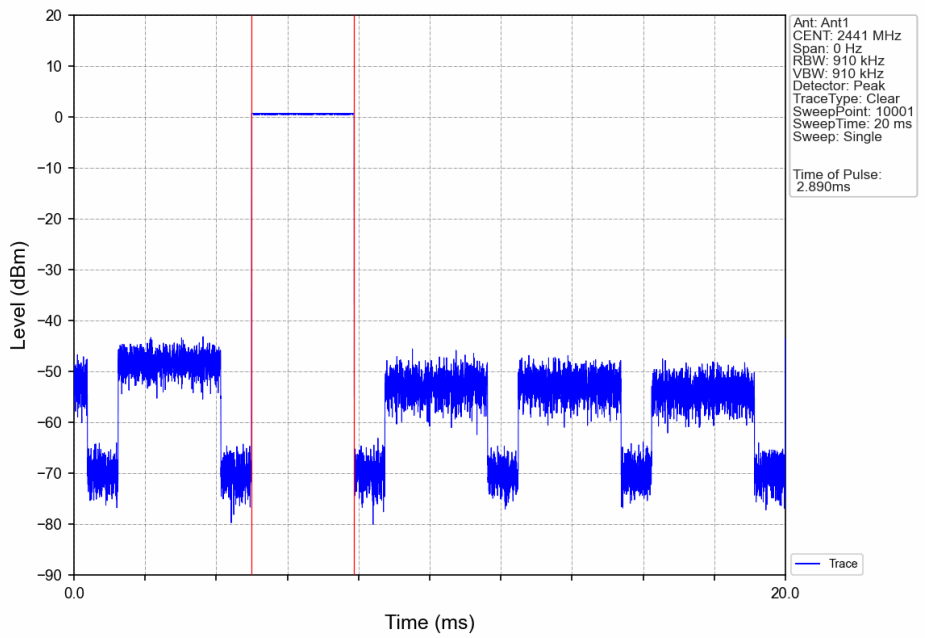
8DPSK_3DH5_HOPP_Ant1_NTNV


Ant: Ant1
Start: 2398 MHz
Stop: 2485.5 MHz
RBW: 300 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 10001
SweepTime: 1.33 ms
Sweep: Continue
HOPP Num: 79
Trace
2400 MHz
2483.5 MHz
Level (dBm)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
2398.0
2485.5
Frequency (MHz)

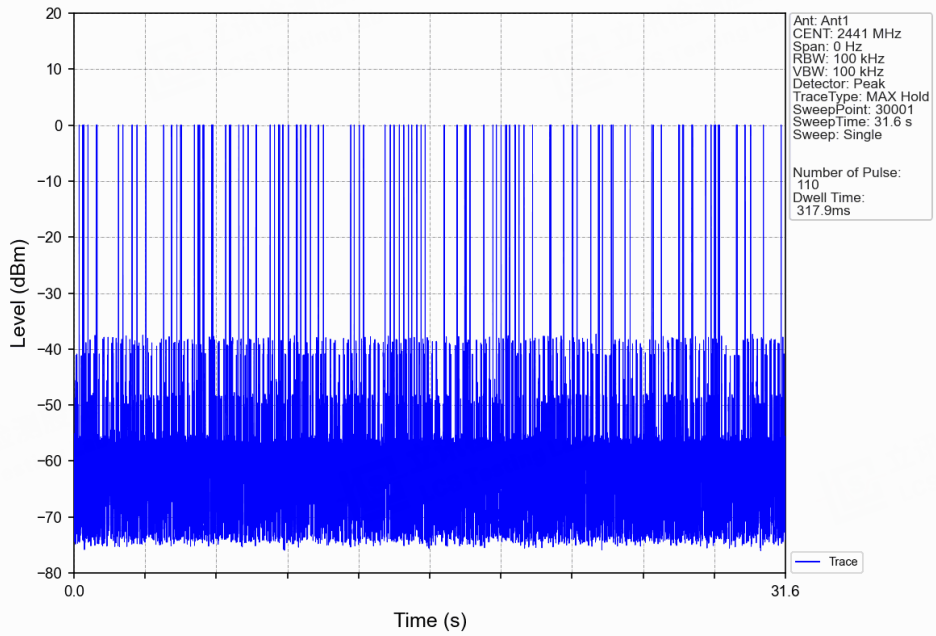
A.4 Dwell Time

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	DH5	2.890	31.600	110	317.900	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	2.894	31.600	106	306.764	<=400	Pass
8DPSK	SISO	HOPP	3DH5	2.894	31.600	110	318.340	<=400	Pass

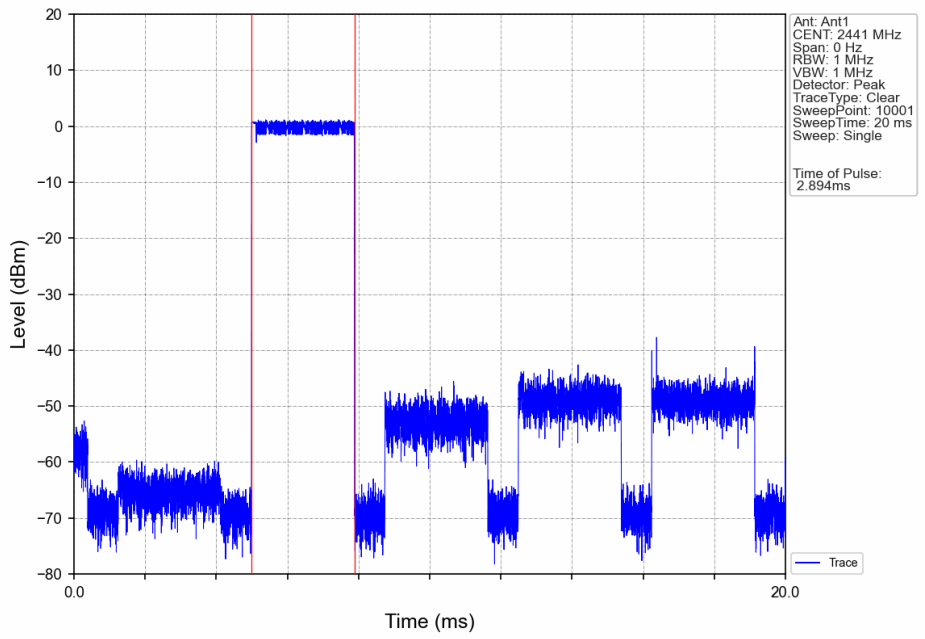
GFSK_DH5_HOPP_Ant1_NTNV



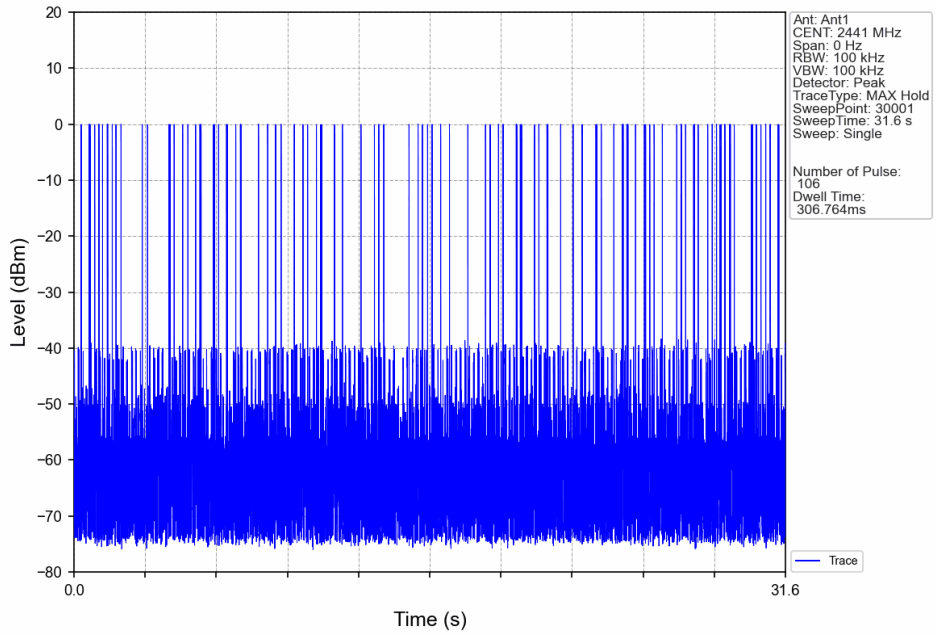
GFSK_DH5_HOPP_Ant1_NTNV



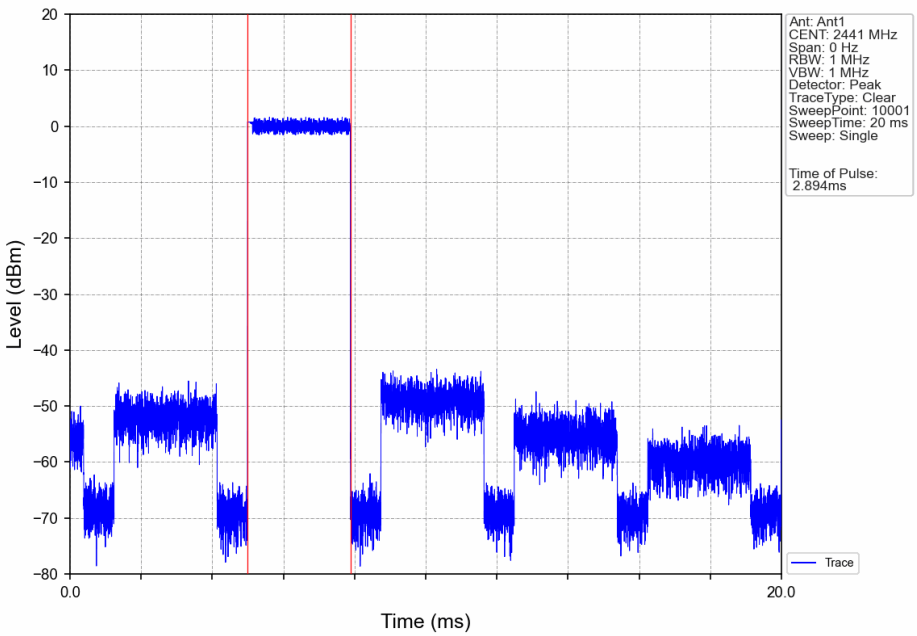
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



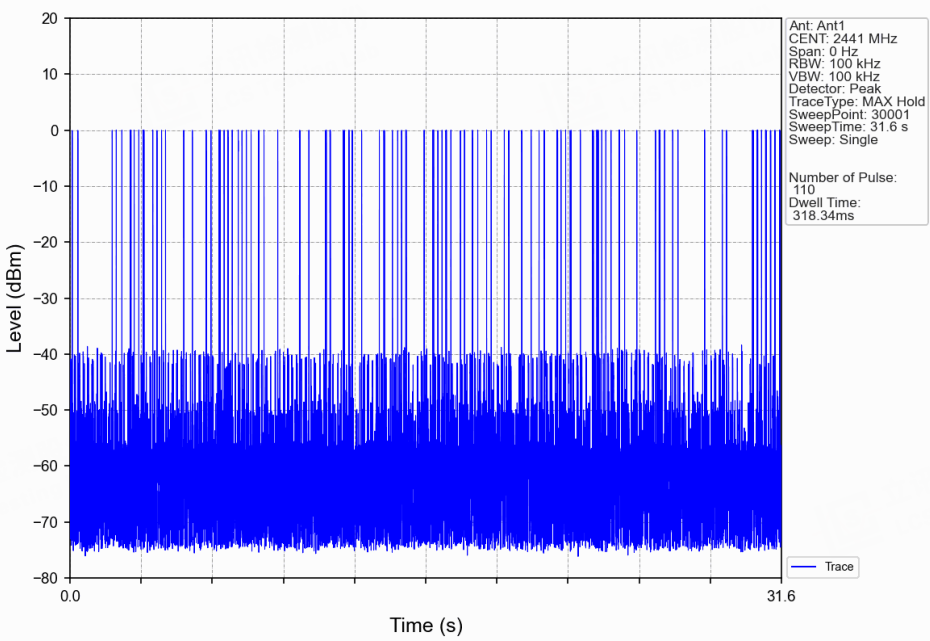
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV

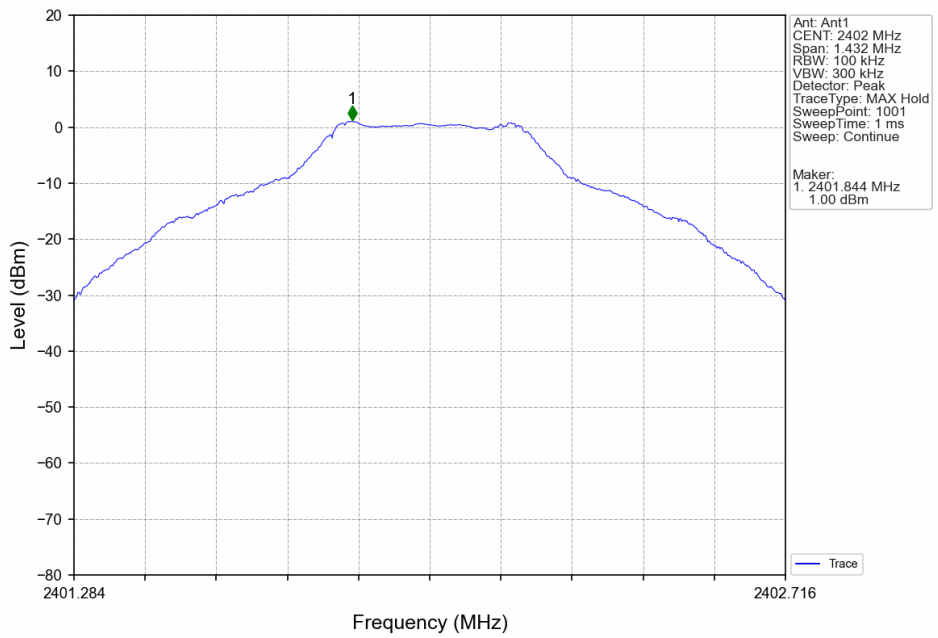


A.6 Band Edge

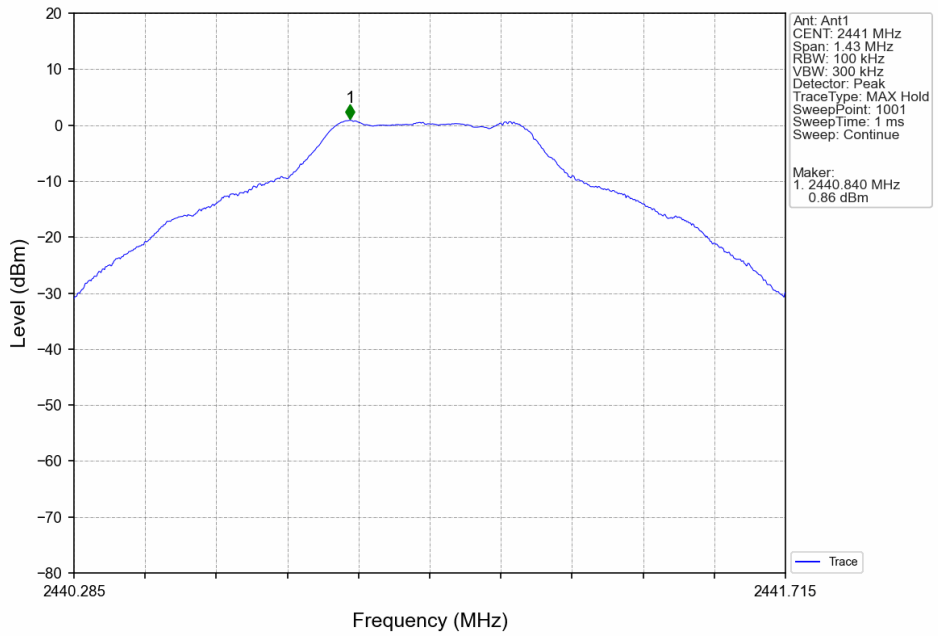
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	1.00	-19.00	Pass
		2441	DH5	1	1.00	-19.00	Pass
		2480	DH5	1	1.00	-19.00	Pass
		HOPP	DH5	1	1.00	-19.00	Pass
					1.00	-19.00	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	0.91	-19.09	Pass
		2441	2DH5	1	0.91	-19.09	Pass
		2480	2DH5	1	0.91	-19.09	Pass
		HOPP	2DH5	1	0.91	-19.09	Pass
					0.91	-19.09	Pass
8DPSK	SISO	2402	3DH5	1	0.97	-19.03	Pass
		2441	3DH5	1	0.97	-19.03	Pass
		2480	3DH5	1	0.97	-19.03	Pass
		HOPP	3DH5	1	0.97	-19.03	Pass
					0.97	-19.03	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.

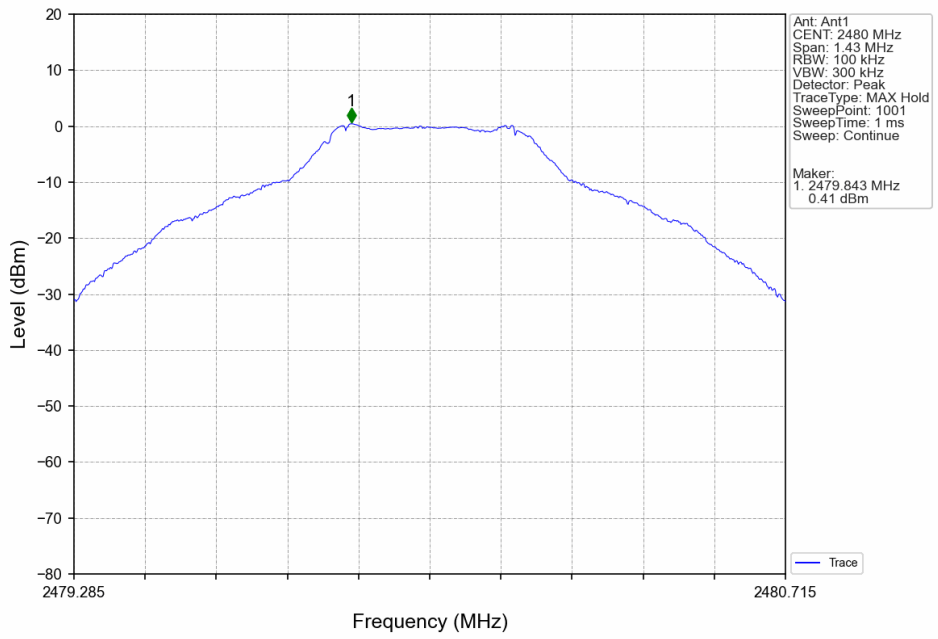
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



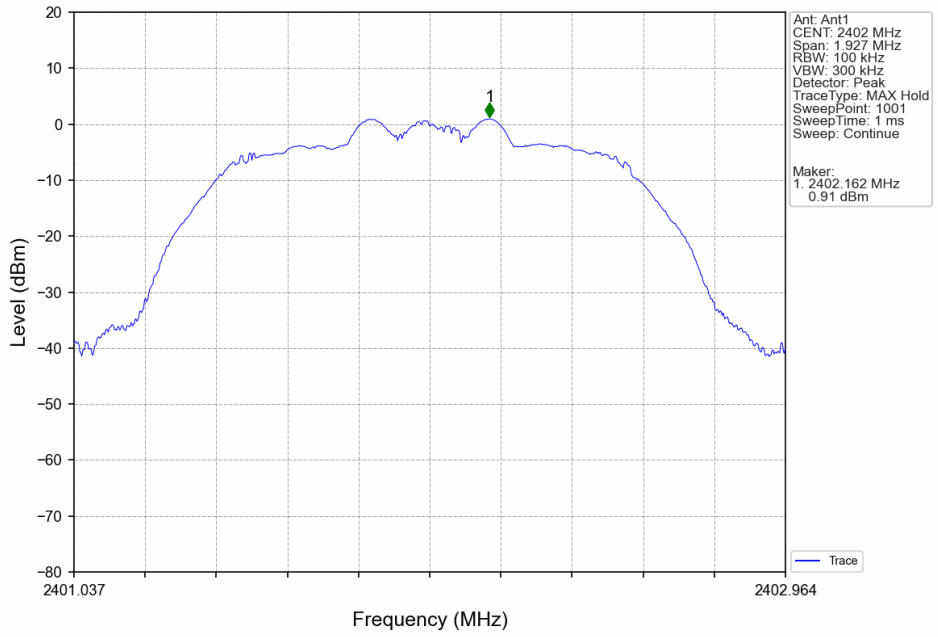
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



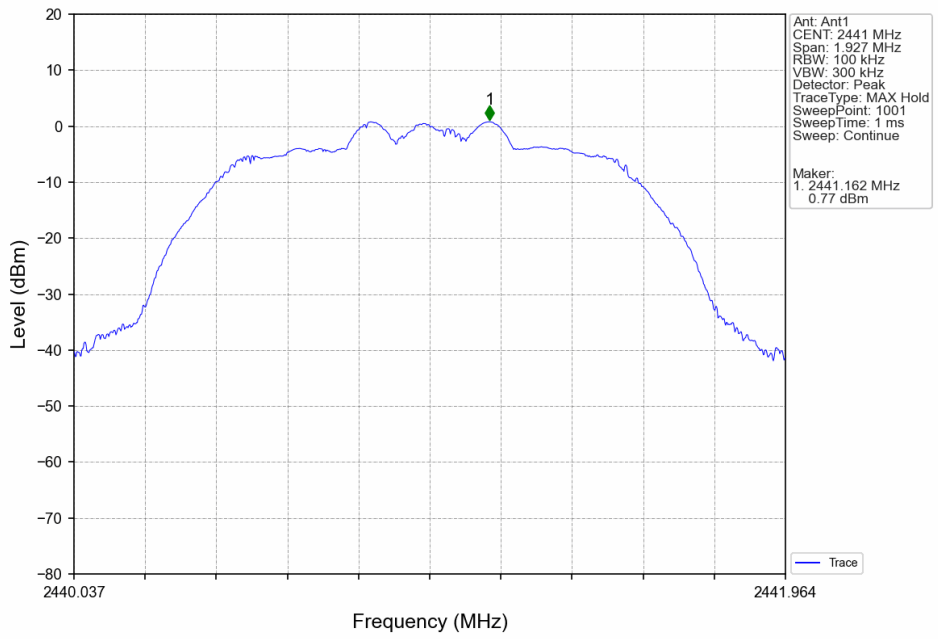
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



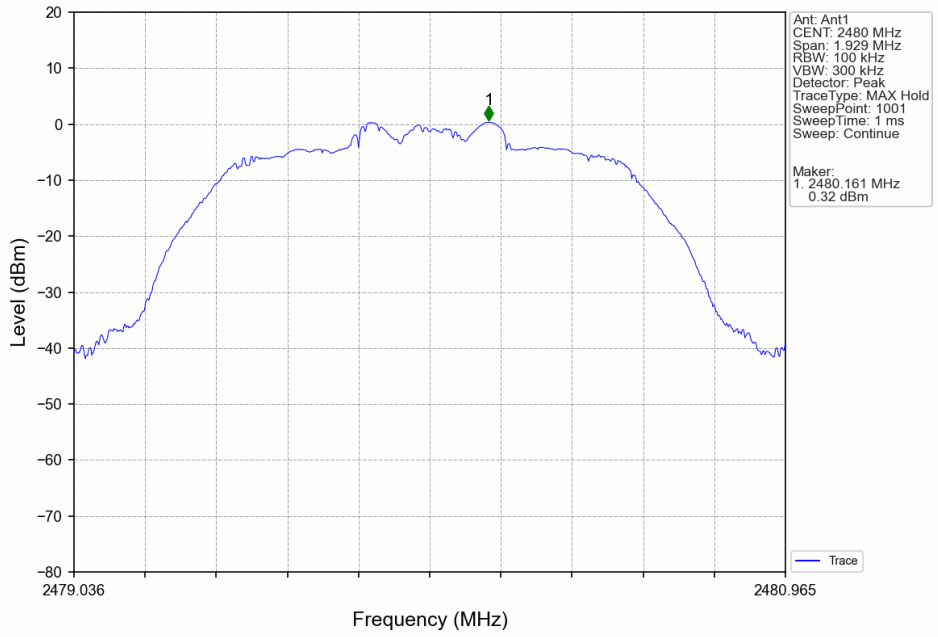
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



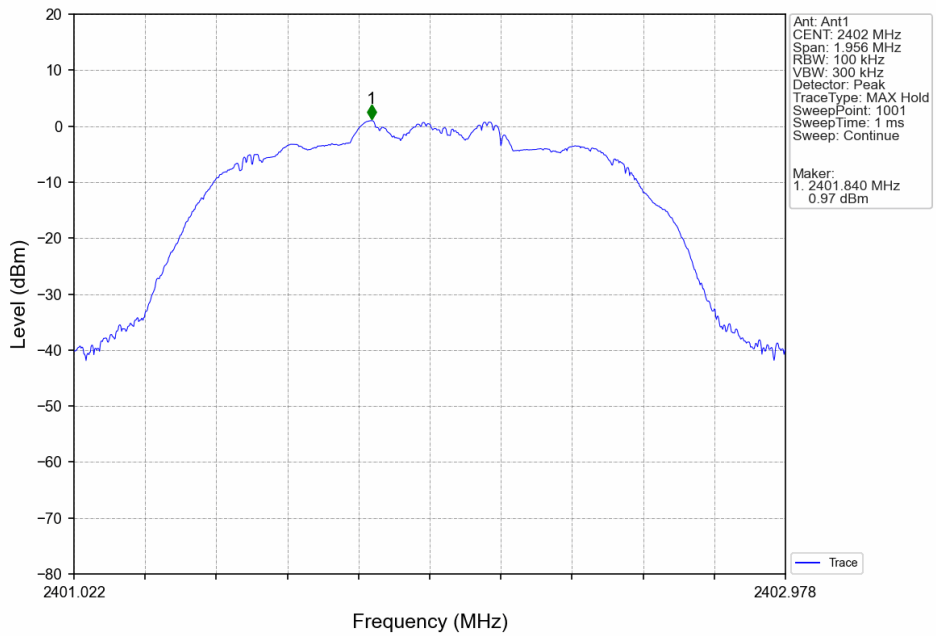
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



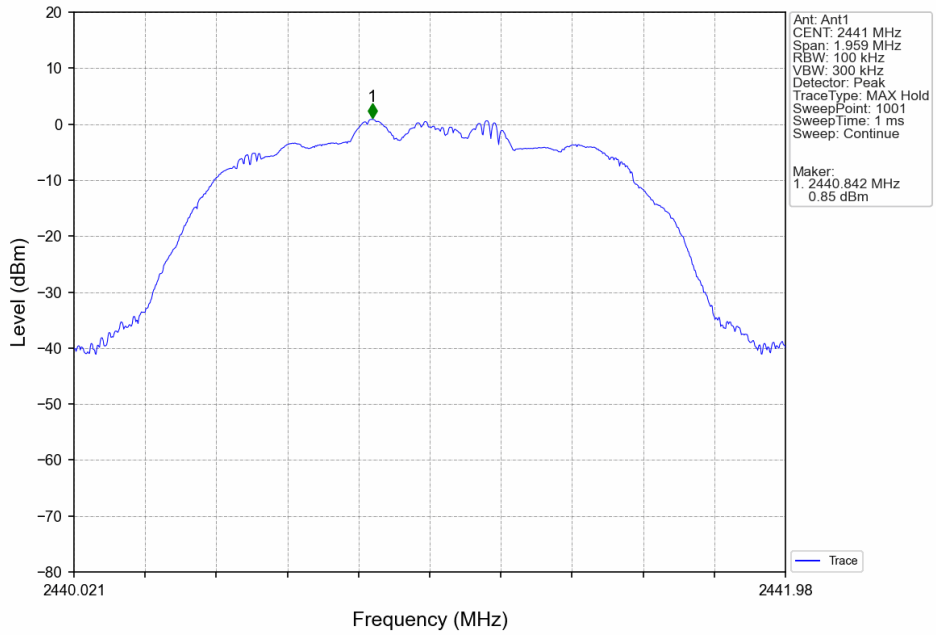
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



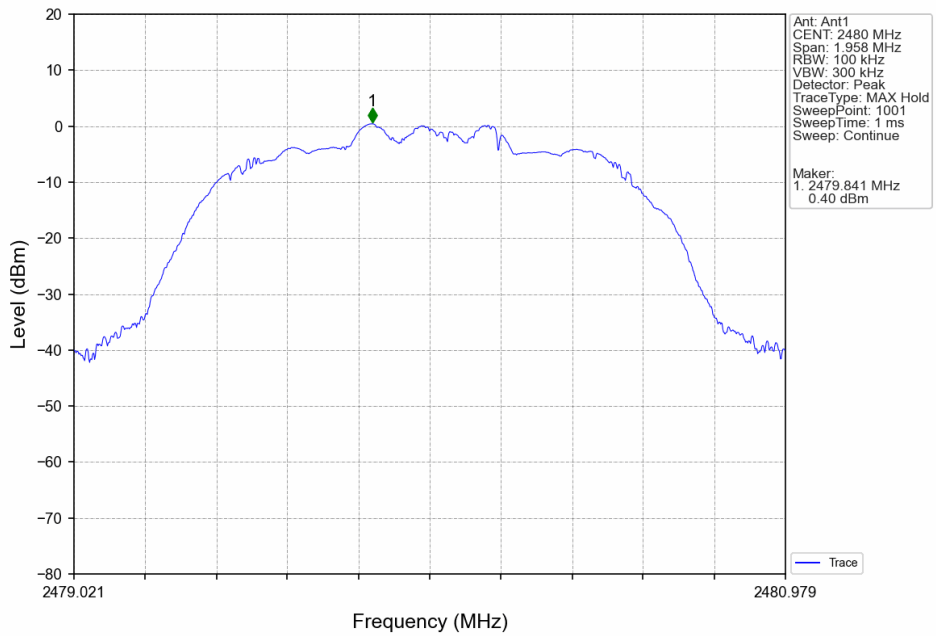
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



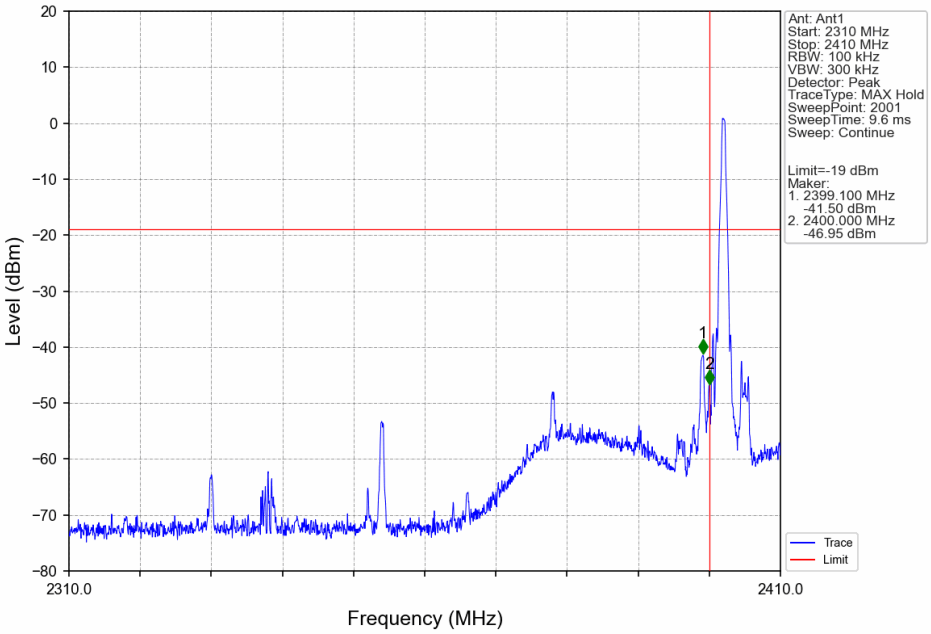
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



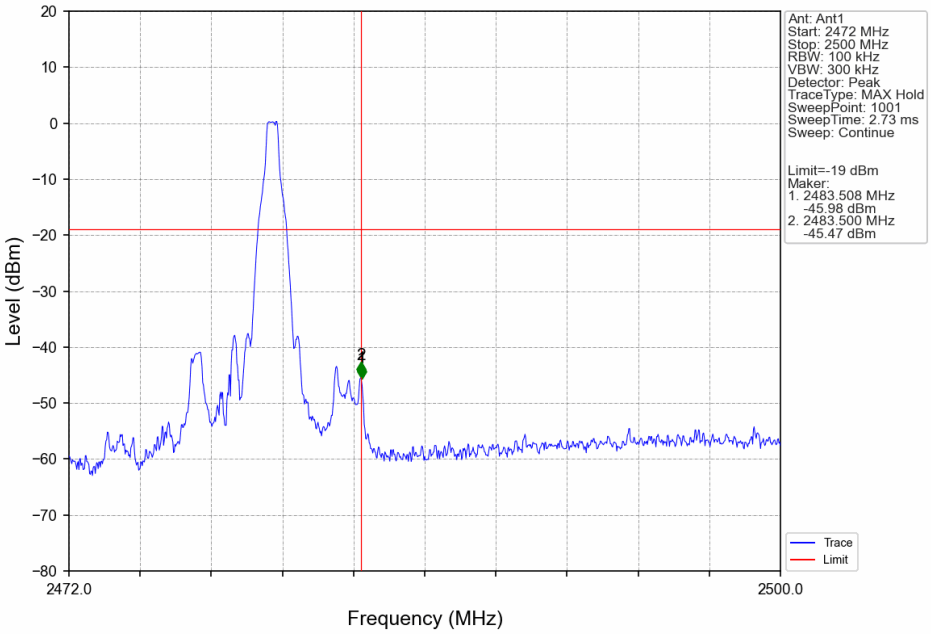
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV


Ant: Ant1
CENT: 2480 MHz
Span: 1.958 MHz
RBW: 100 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 1001
SweepTime: 1 ms
Sweep: Continue
Maker:
1. 2479.841 MHz
0.40 dBm
Level (dBm)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
1
2479.021
2480.979
Frequency (MHz)
Trace

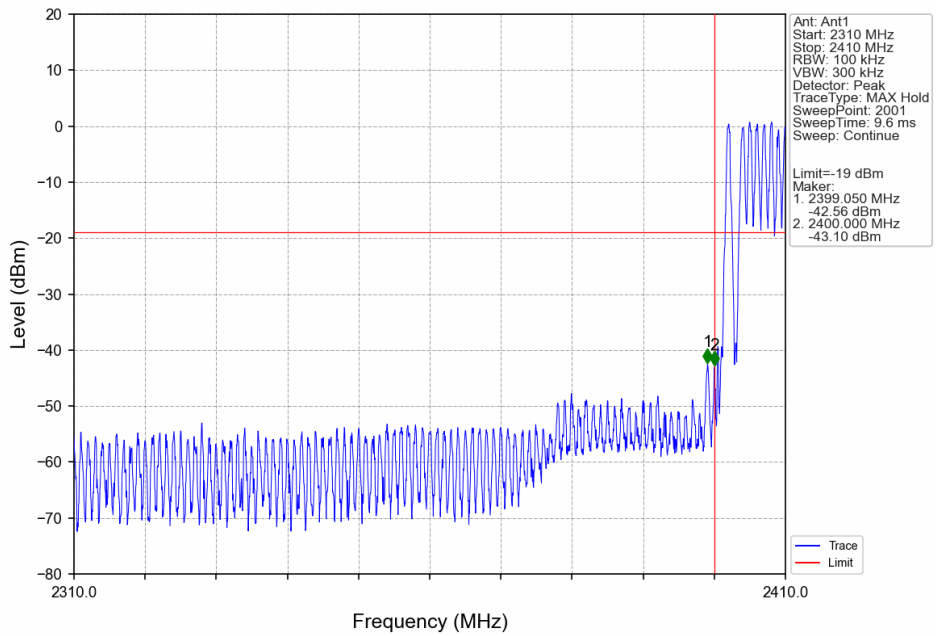
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



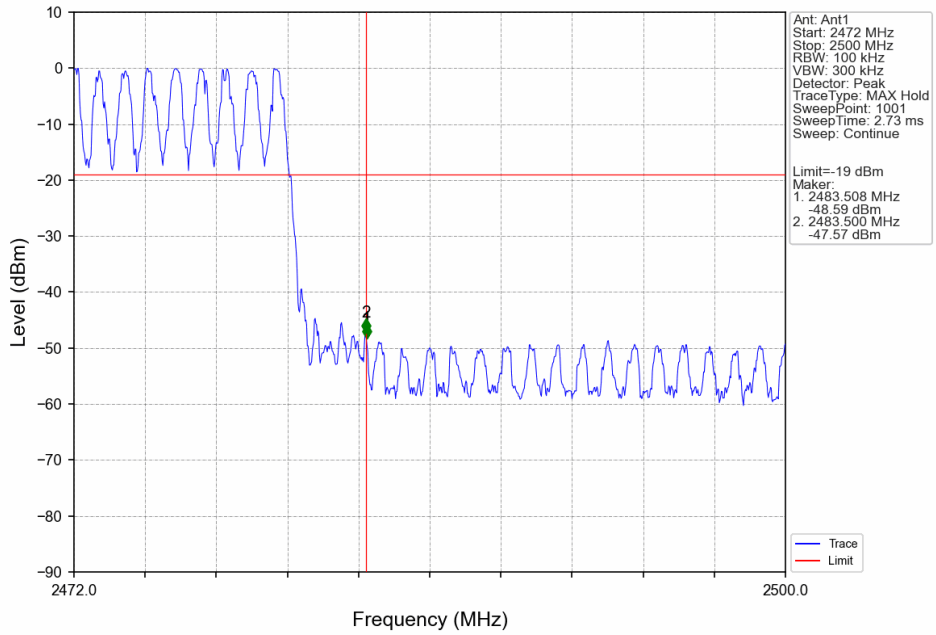
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



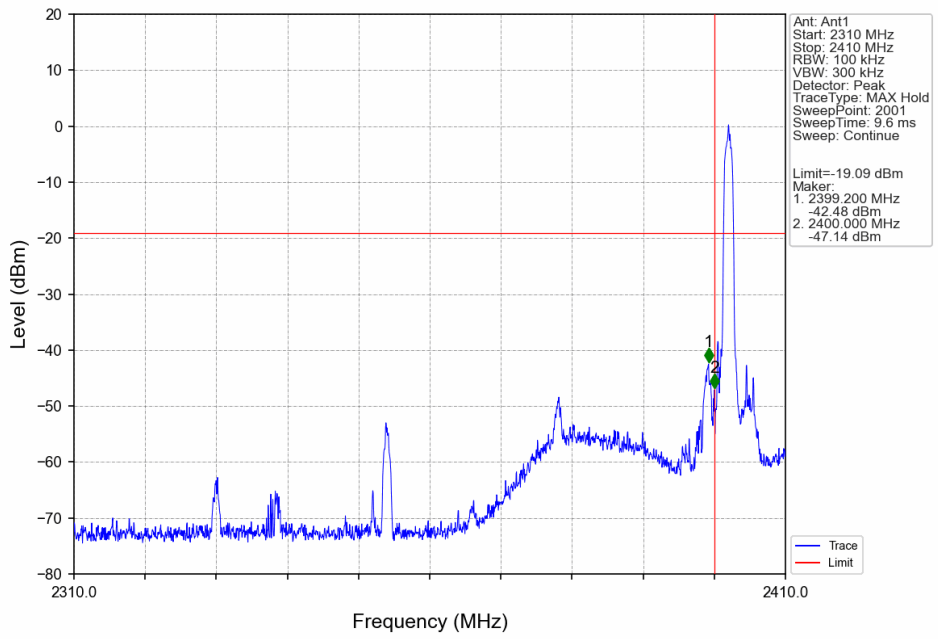
GFSK_DH5_HOPP_Ant1_NTNV



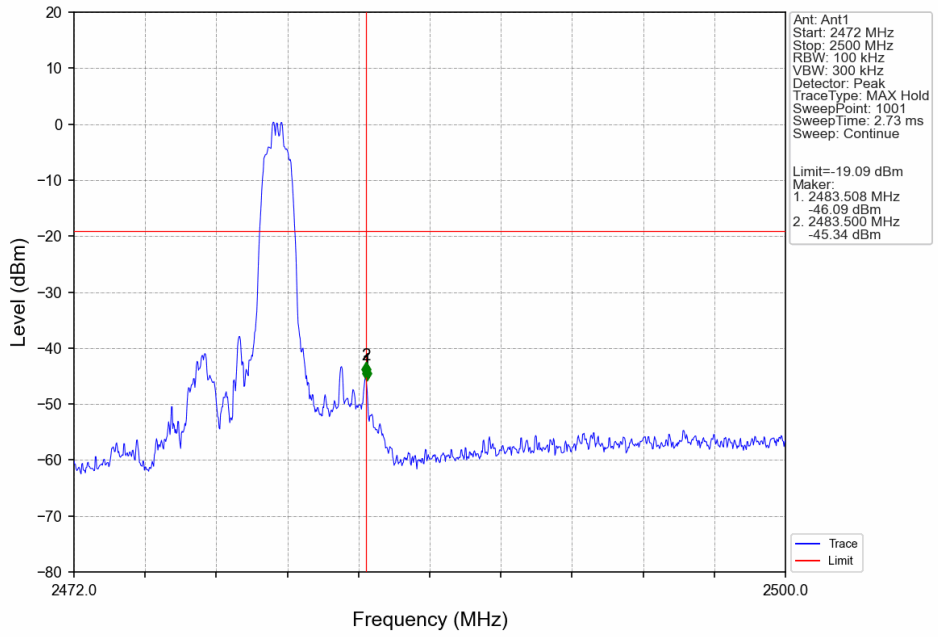
GFSK_DH5_HOPP_Ant1_NTNV



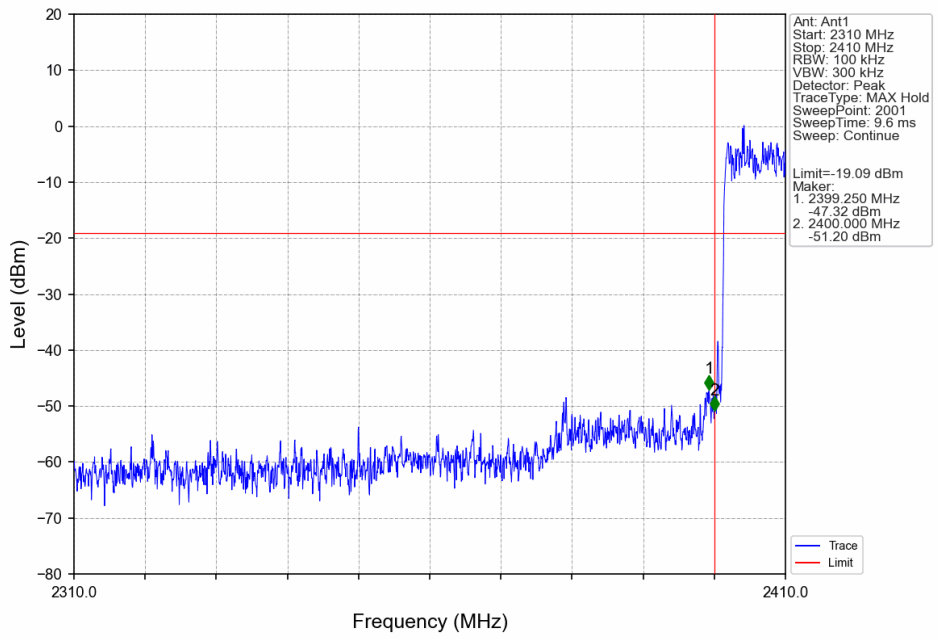
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



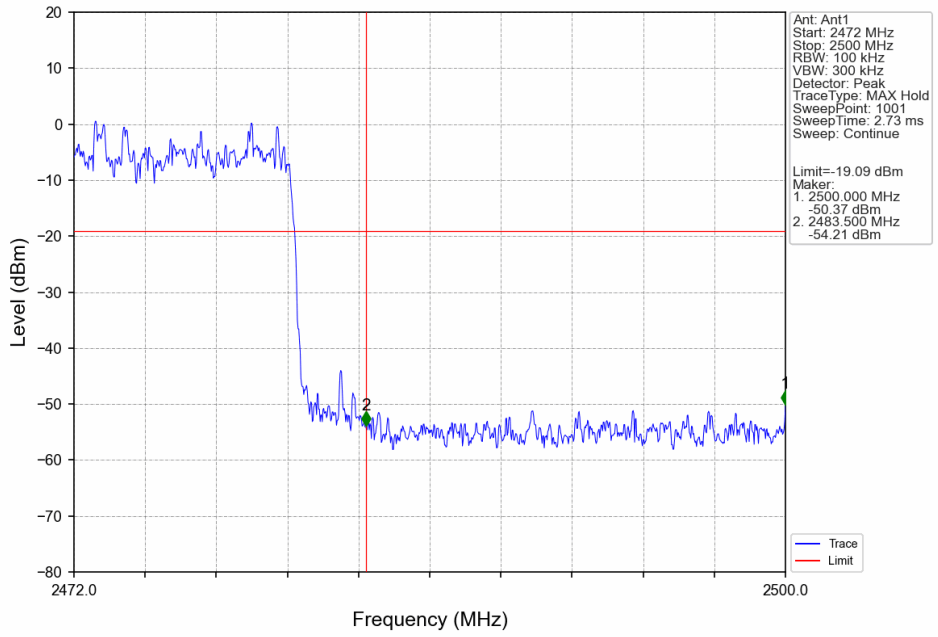
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



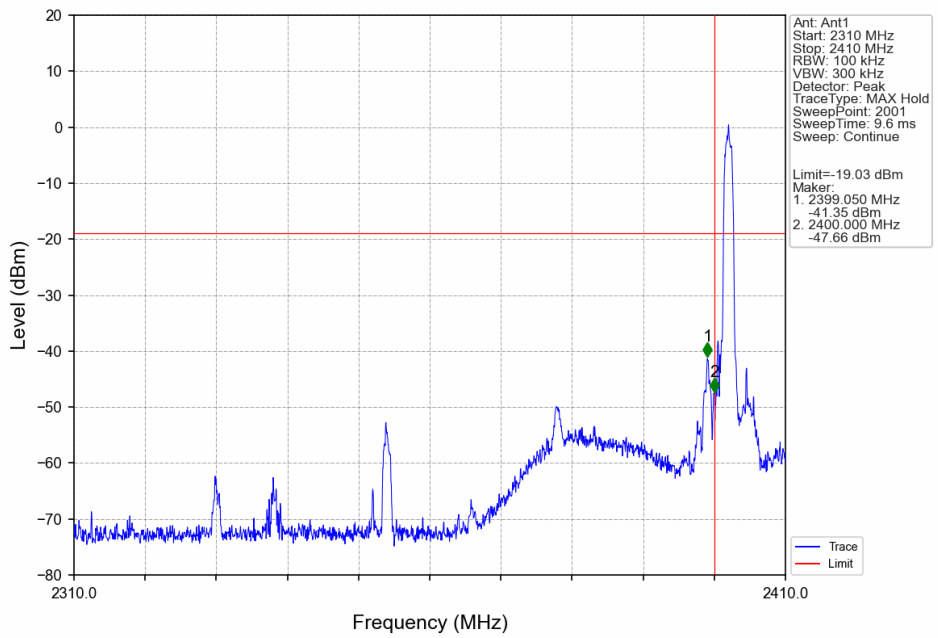
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



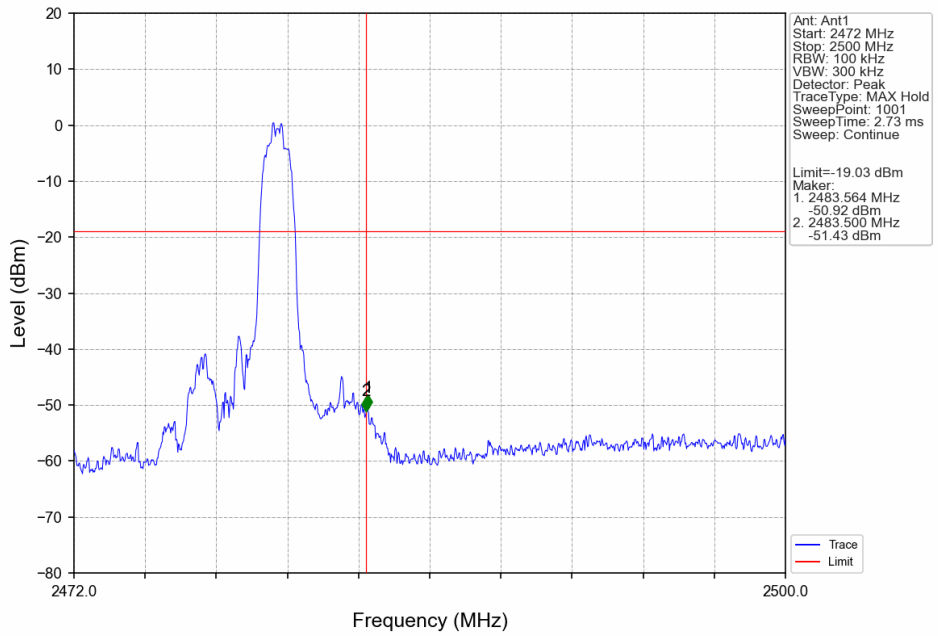
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



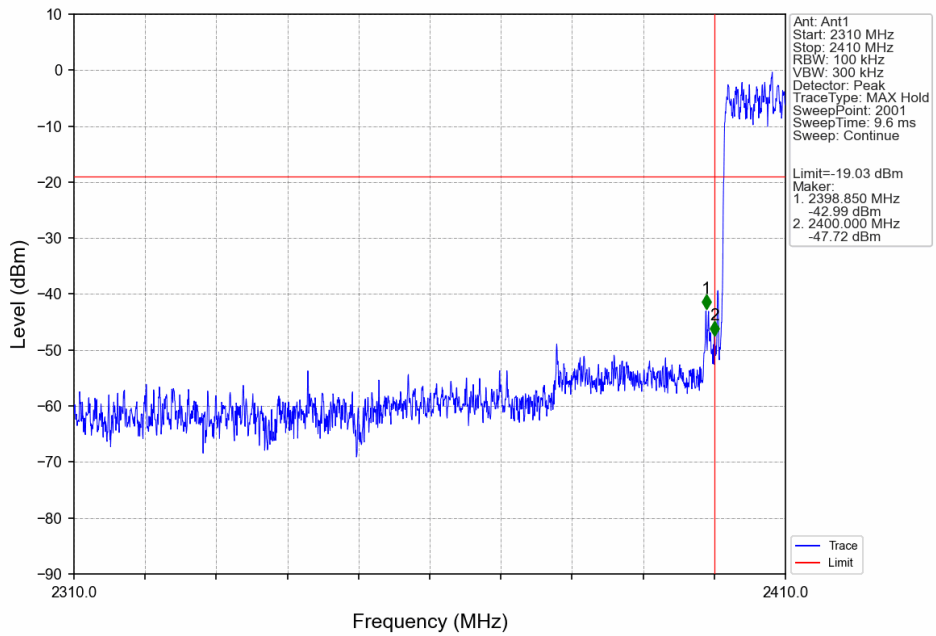
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



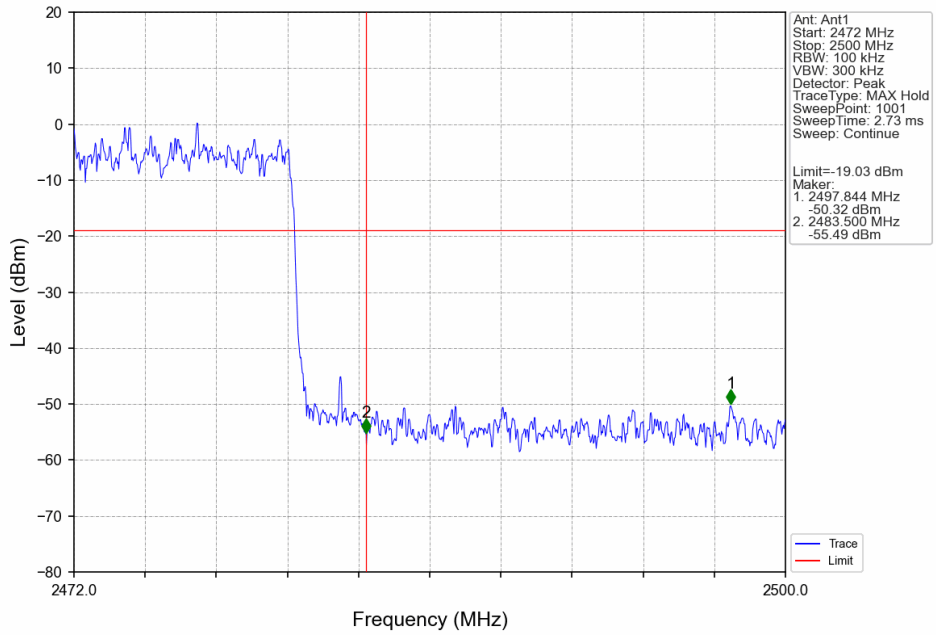
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



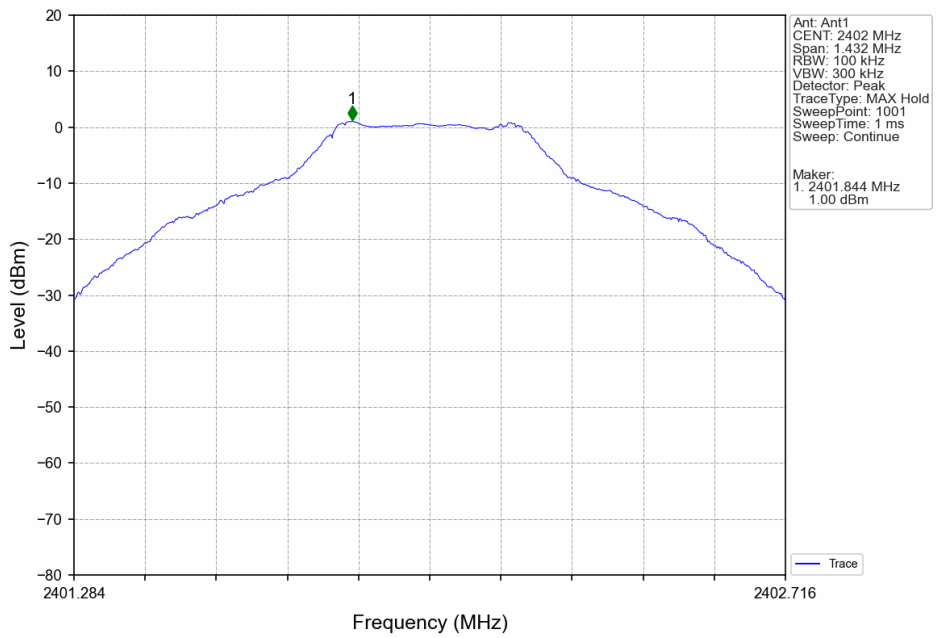
8DPSK_3DH5_HOPP_Ant1_NTNV



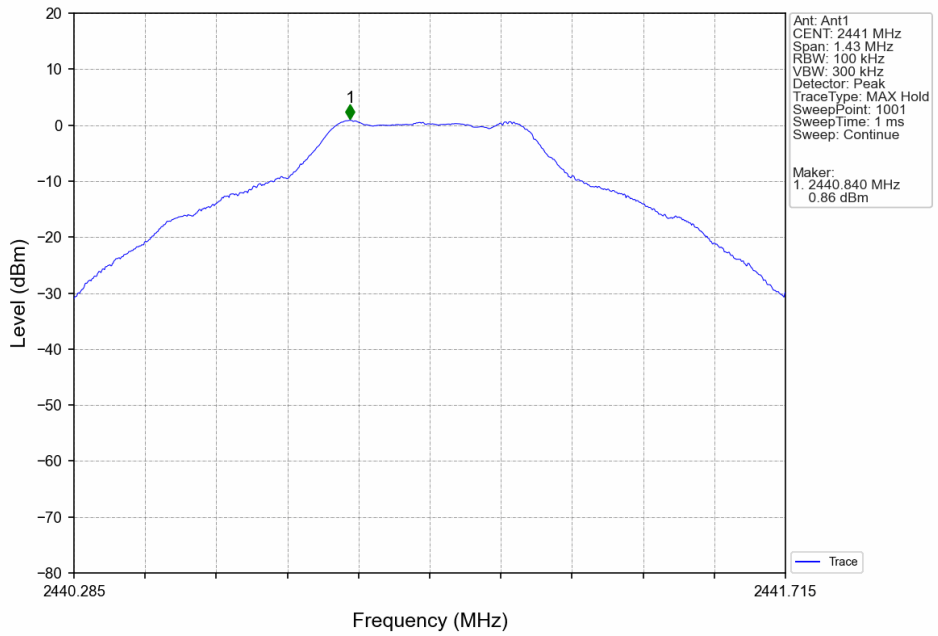
A.7 Conducted RF Spurious Emission

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	1.00
		2441	DH5	1	0.86
		2480	DH5	1	0.41
Pi/4DQPSK	SISO	2402	2DH5	1	0.91
		2441	2DH5	1	0.77
		2480	2DH5	1	0.32
8DPSK	SISO	2402	3DH5	1	0.97
		2441	3DH5	1	0.85
		2480	3DH5	1	0.40
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.					

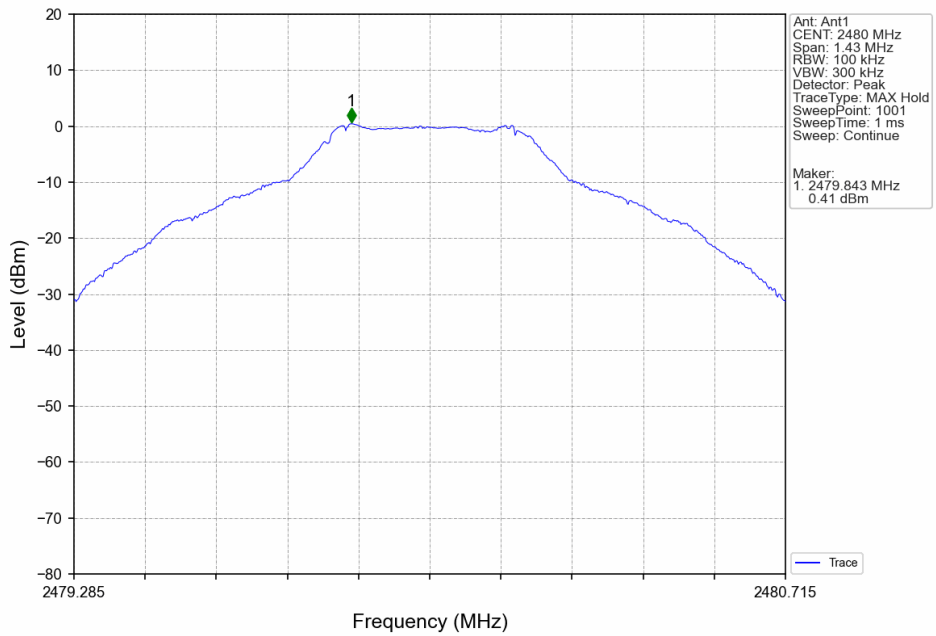
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



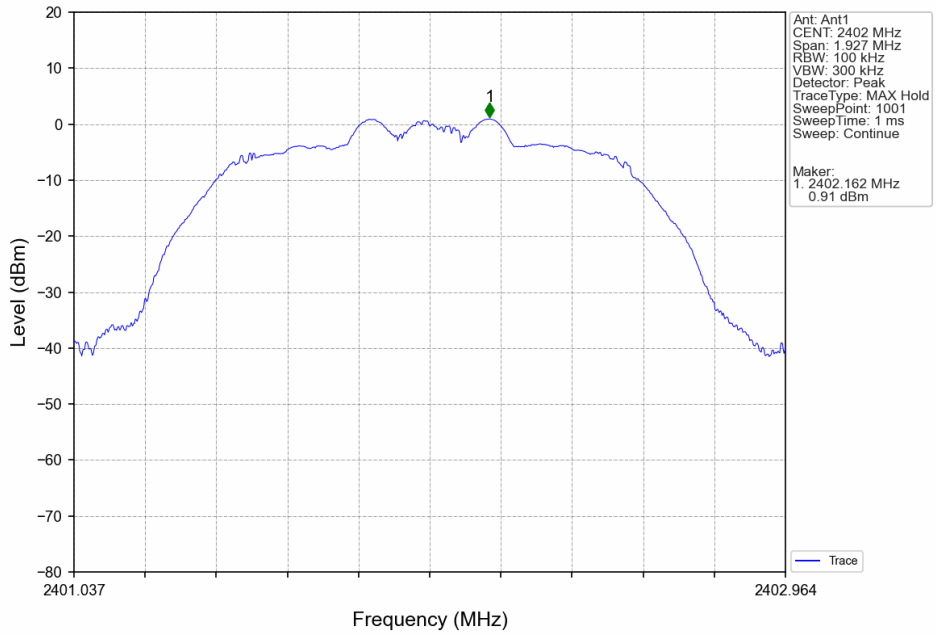
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



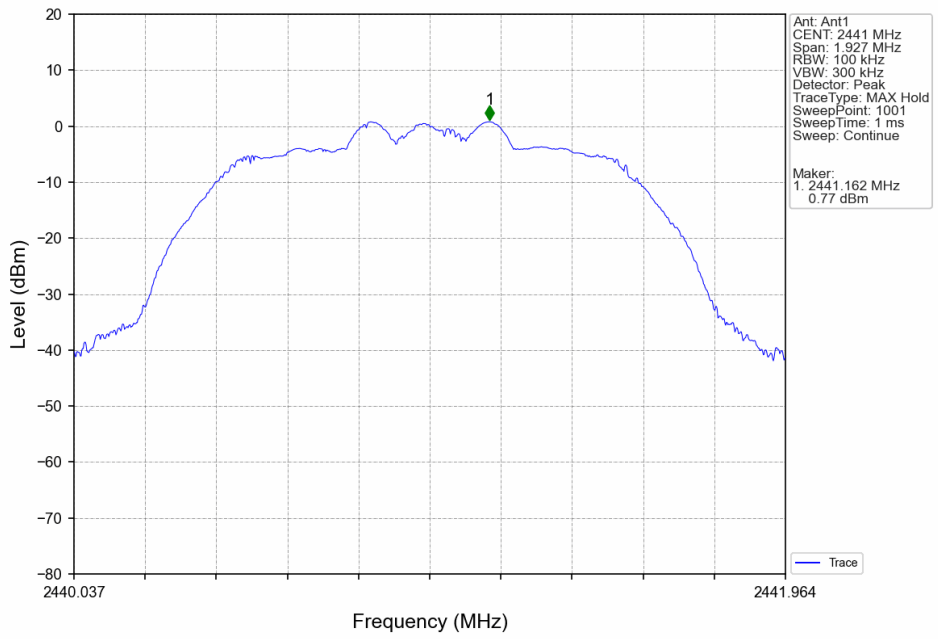
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



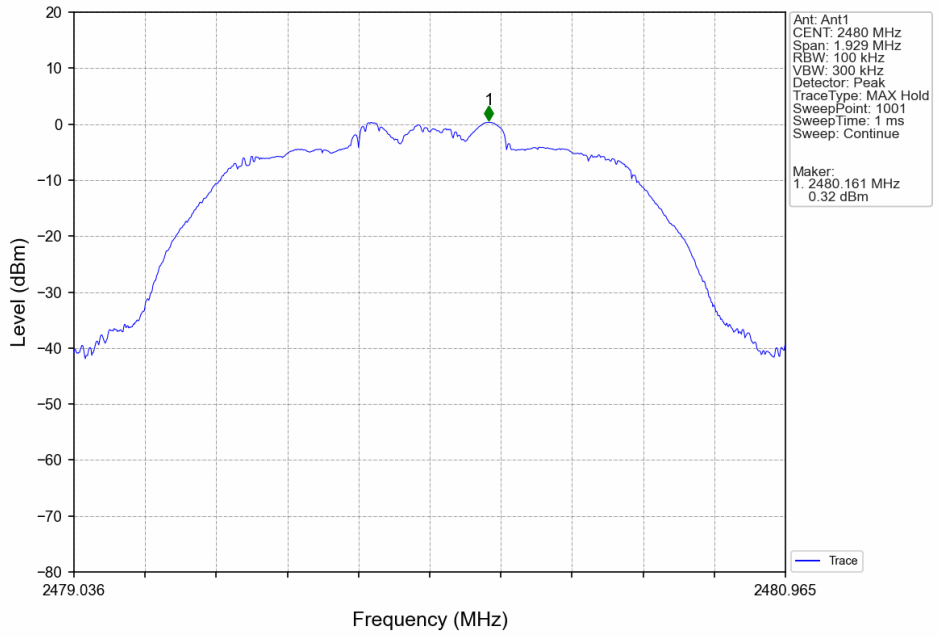
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



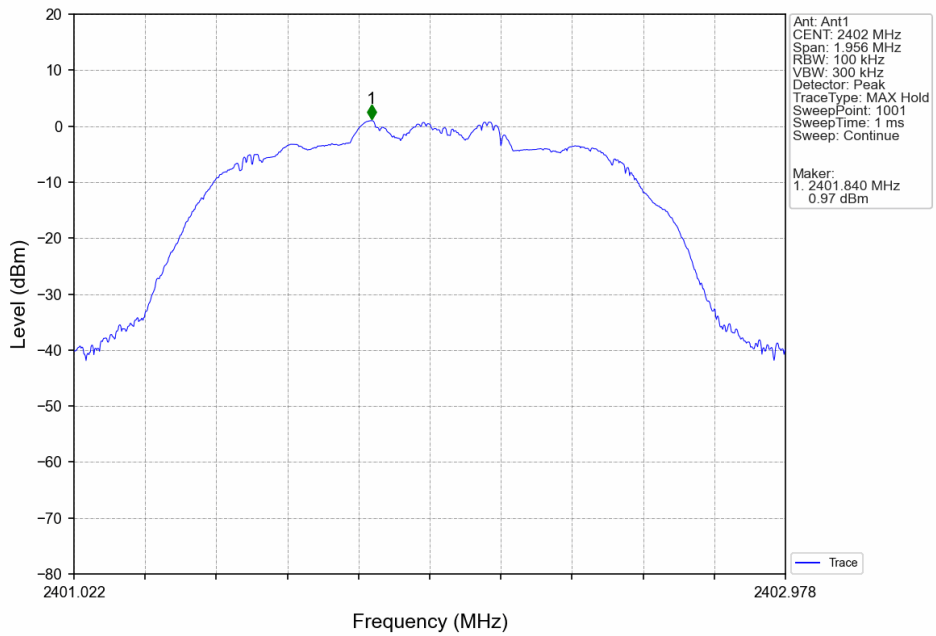
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



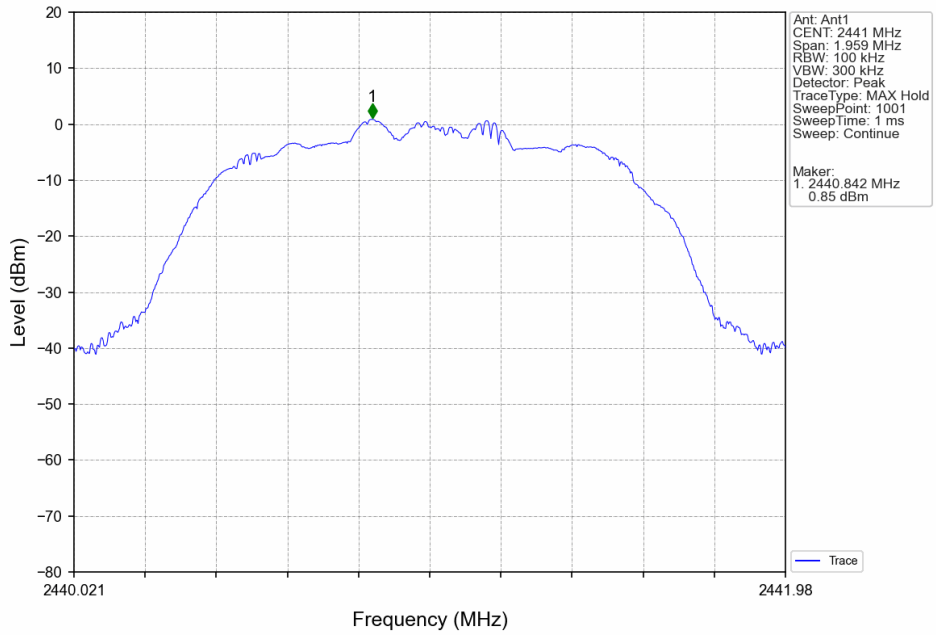
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



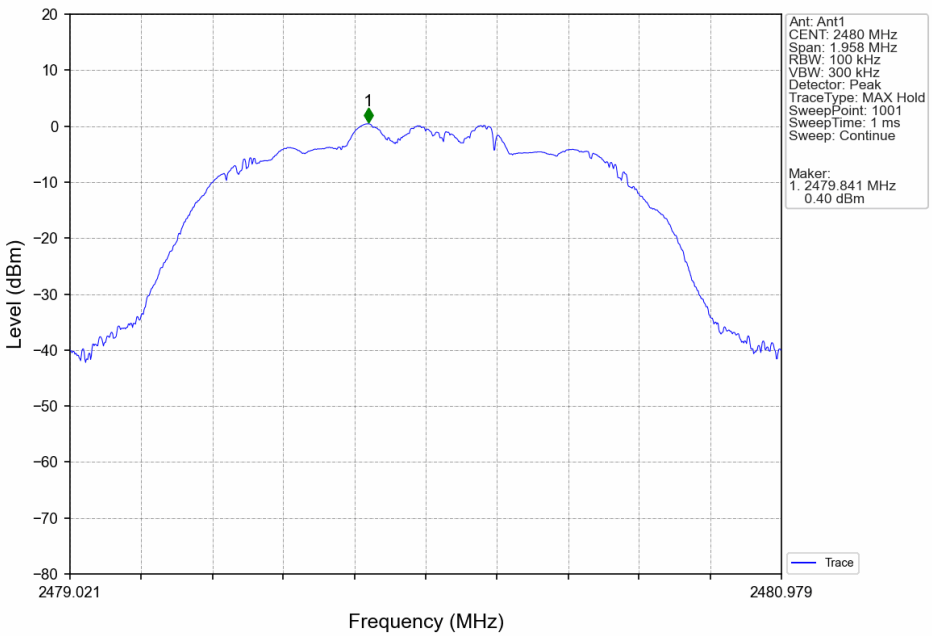
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



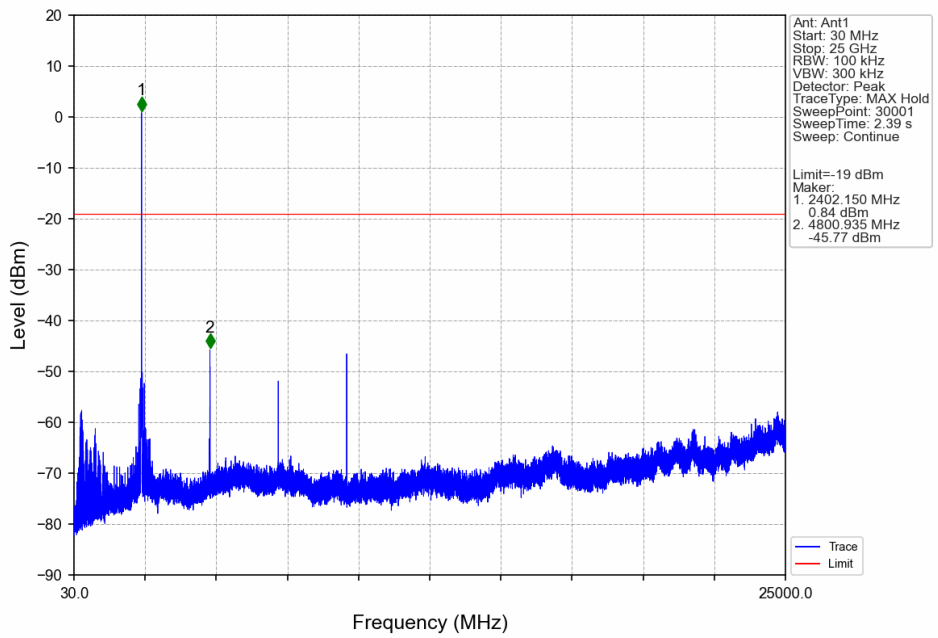
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



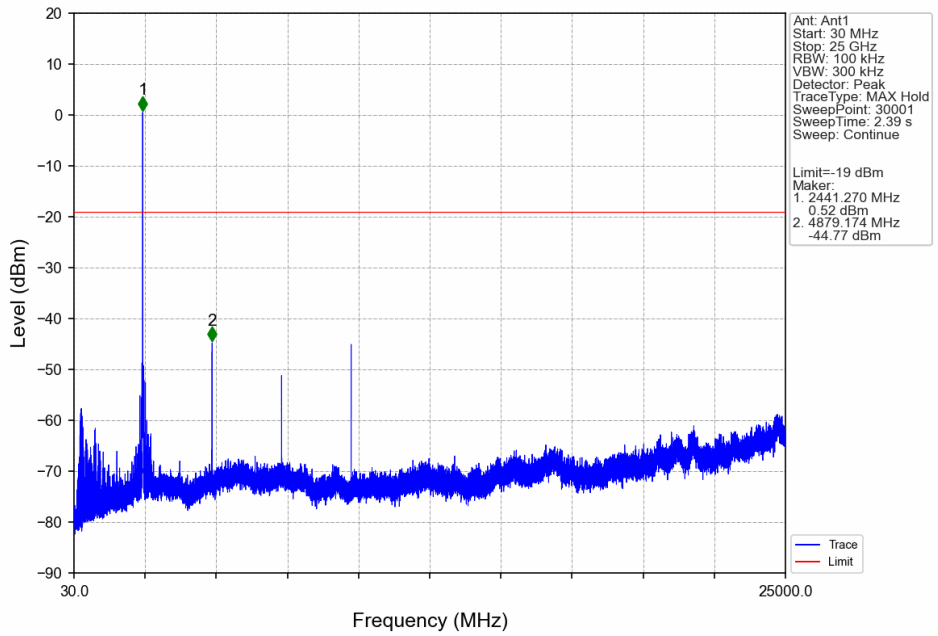
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV


Ant: Ant1
CENT: 2480 MHz
Span: 1.958 MHz
RBW: 100 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 1001
SweepTime: 1 ms
Sweep: Continue
Maker:
1. 2479.841 MHz
0.40 dBm
Level (dBm)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
1
2479.021
2480.979
Frequency (MHz)
Trace

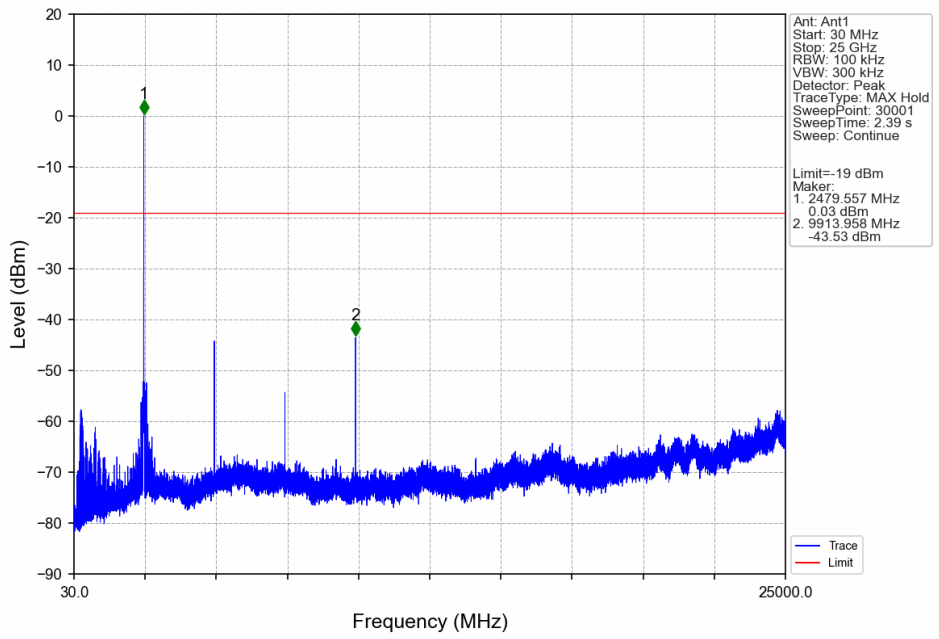
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



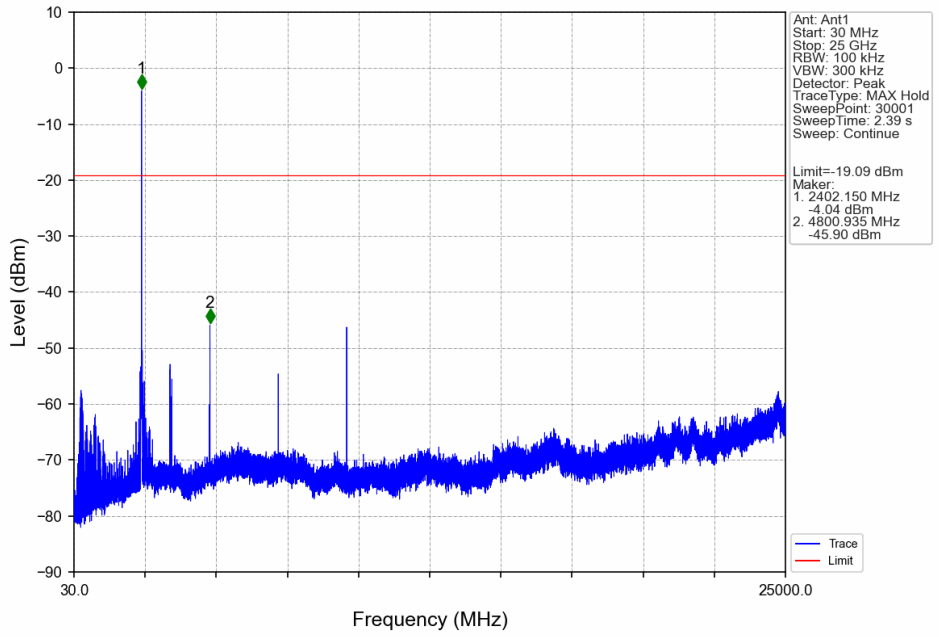
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



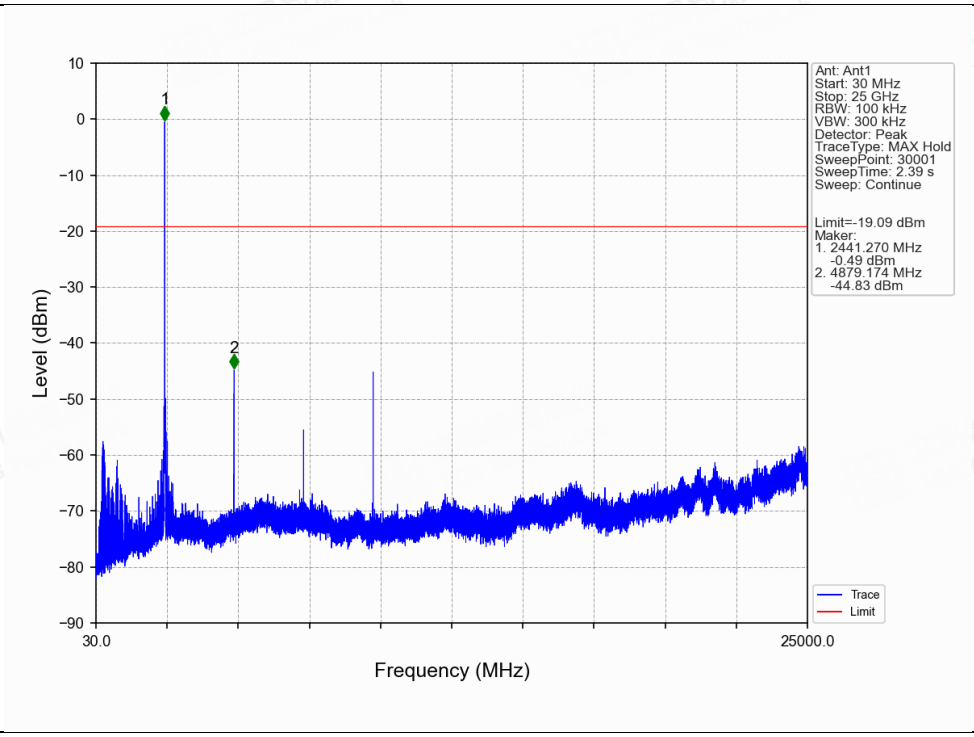
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



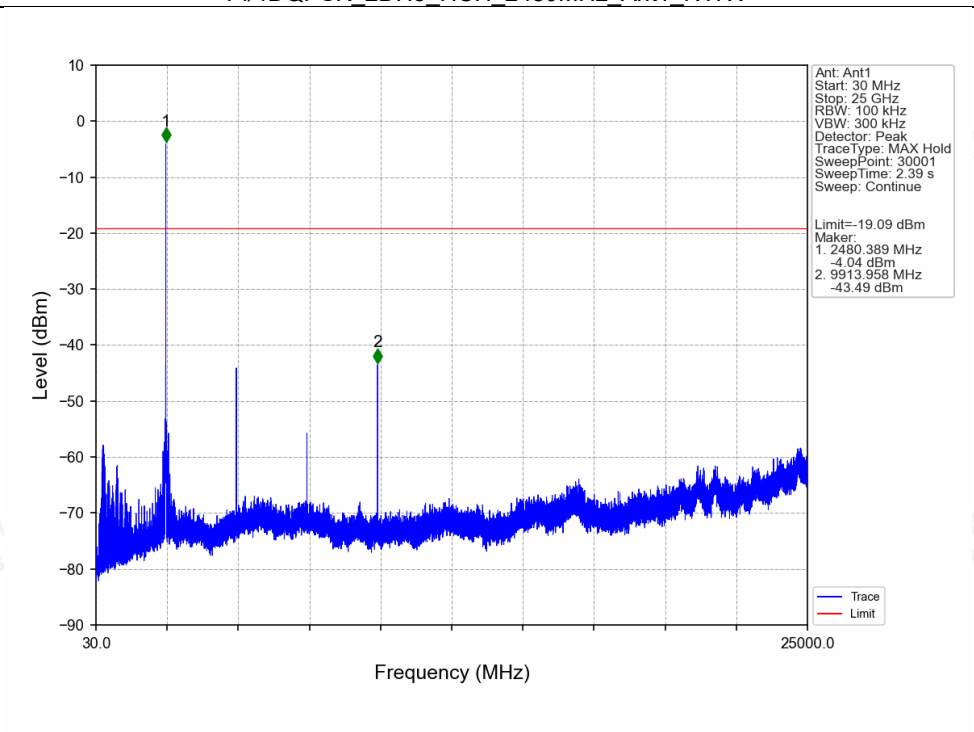
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



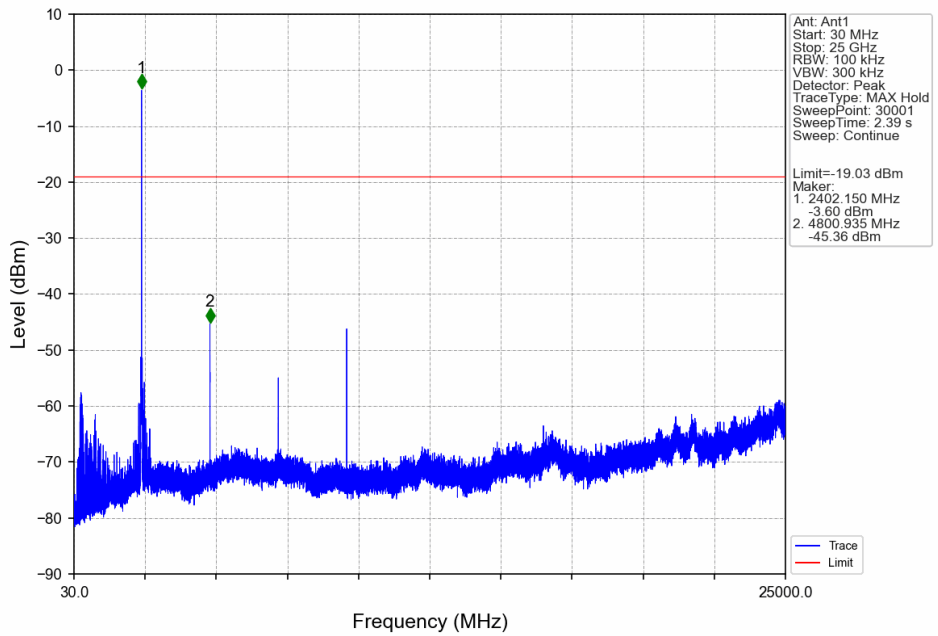
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



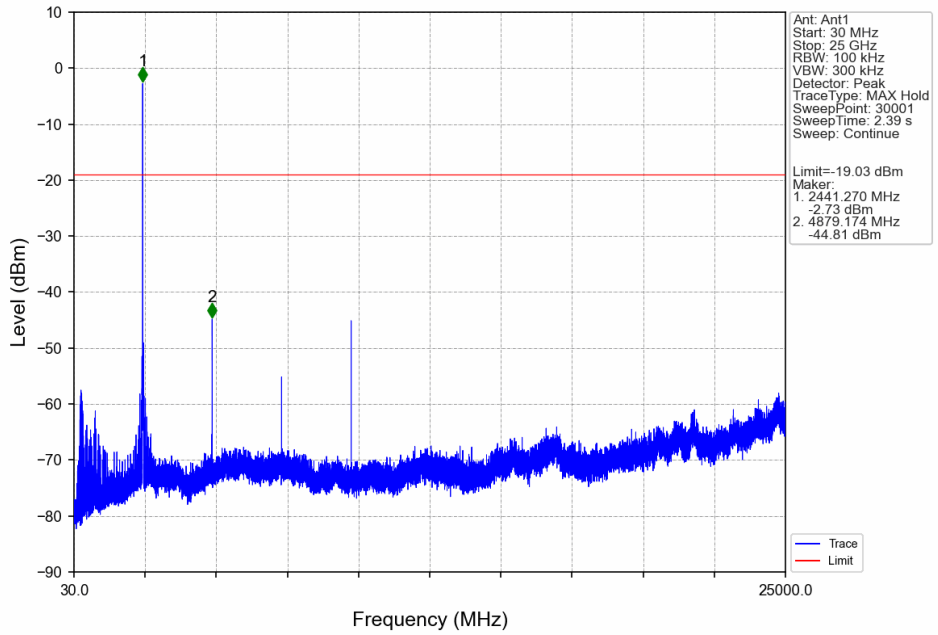
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



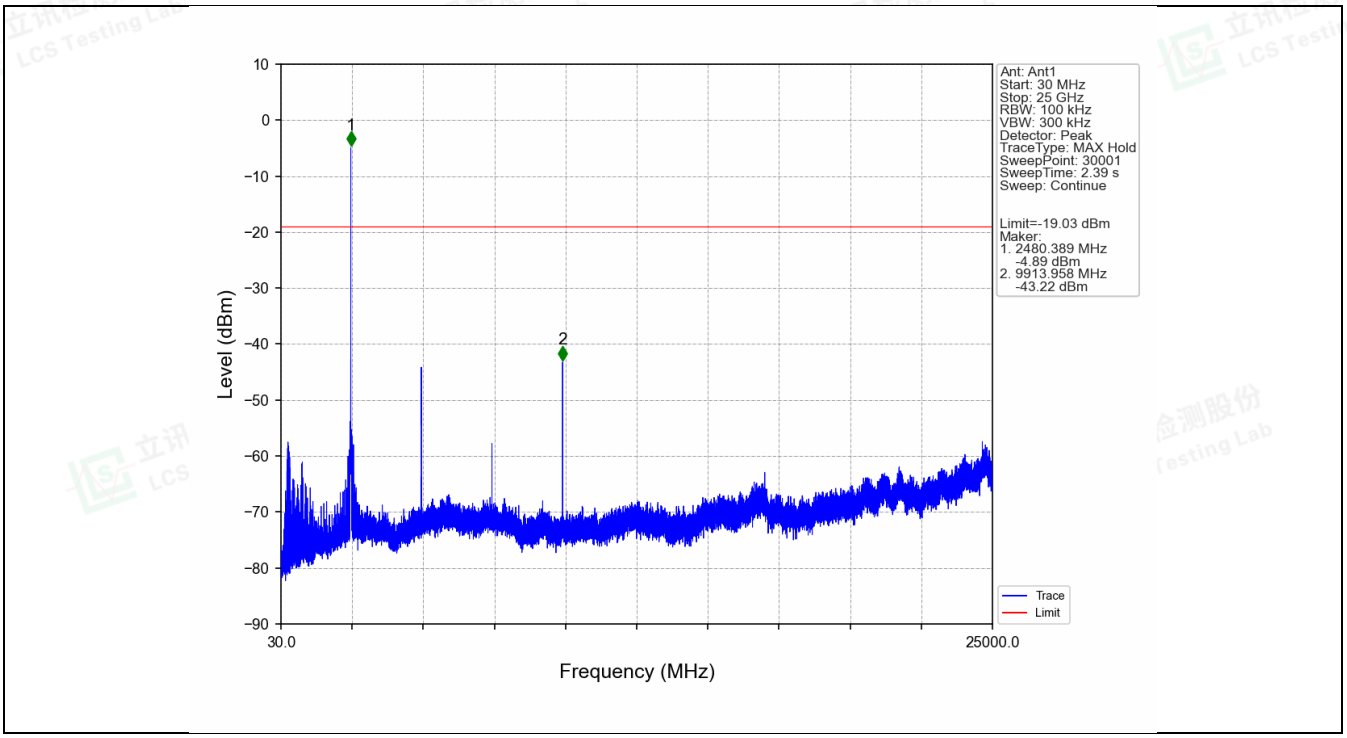
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



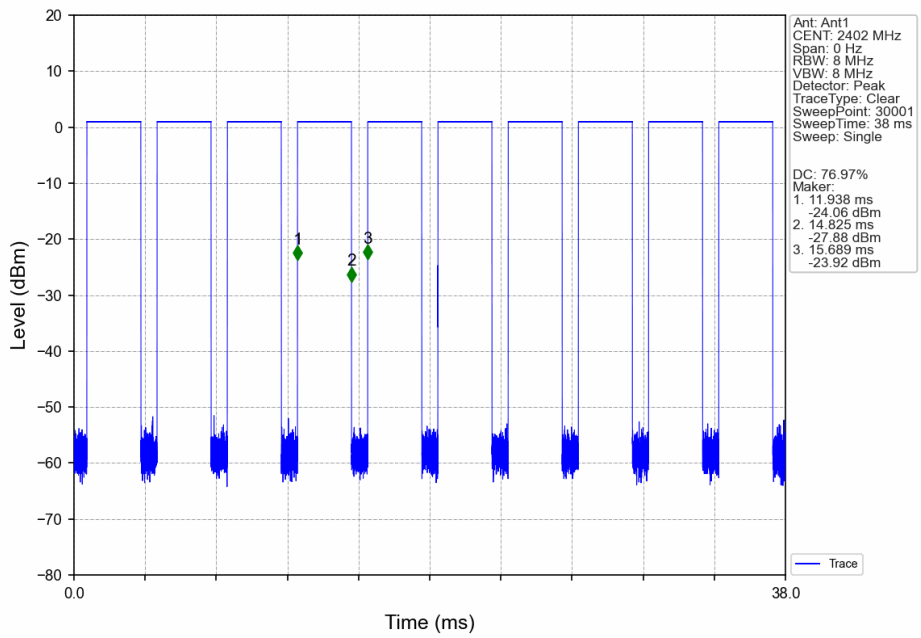
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV


Ant: Ant1
Start: 30 MHz
Stop: 25 GHz
RBW: 100 kHz
VBW: 300 kHz
Detector: Peak
TraceType: MAX Hold
SweepPoint: 30001
SweepTime: 2.39 s
Sweep: Continue
Limit=-19.03 dBm
Maker:
1. 2480.389 MHz
-4.89 dBm
2. 9913.958 MHz
-43.22 dBm
Trace
Limit
Level (dBm)
Frequency (MHz)
30.0
25000.0
10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
1
2

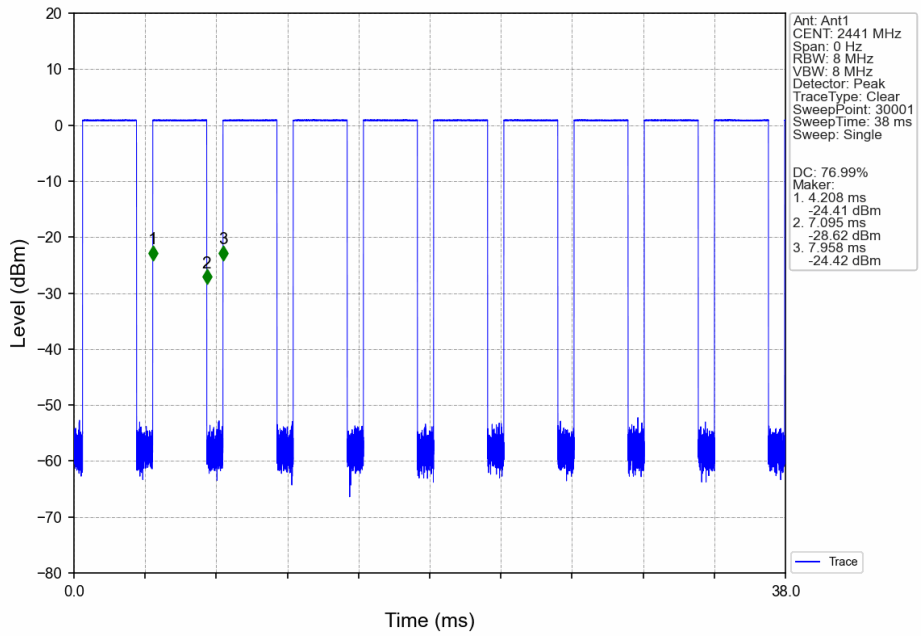
A.8 Duty Cycle

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	3.751	76.97	1.14	0.03
		2441	DH5	2.887	3.750	76.99	1.14	0.03
		2480	DH5	2.886	3.750	76.96	1.14	0.03
Pi/4DQPSK	SISO	2402	2DH5	2.893	3.751	77.13	1.13	0.03
		2441	2DH5	2.892	3.749	77.14	1.13	0.04
		2480	2DH5	2.892	3.750	77.12	1.13	0.01
8DPSK	SISO	2402	3DH5	2.896	3.750	77.23	1.12	0.03
		2441	3DH5	2.896	3.751	77.21	1.12	0.03
		2480	3DH5	2.896	3.751	77.21	1.12	0.03

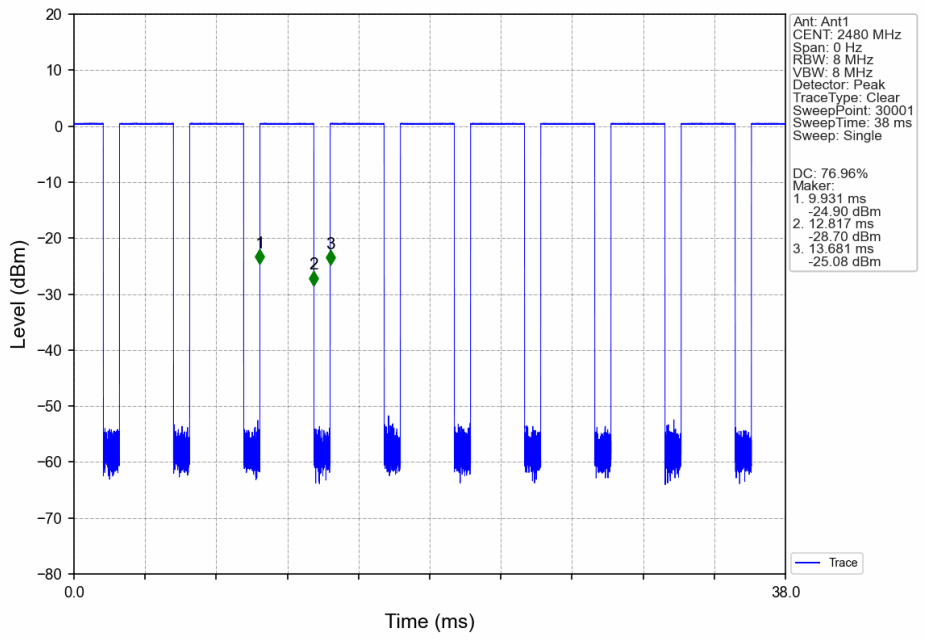
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



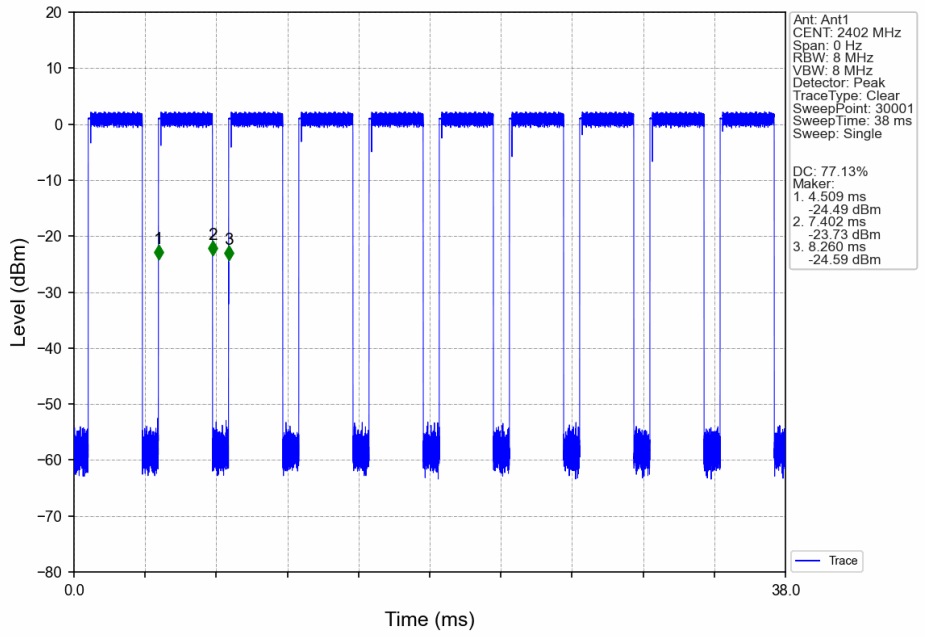
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



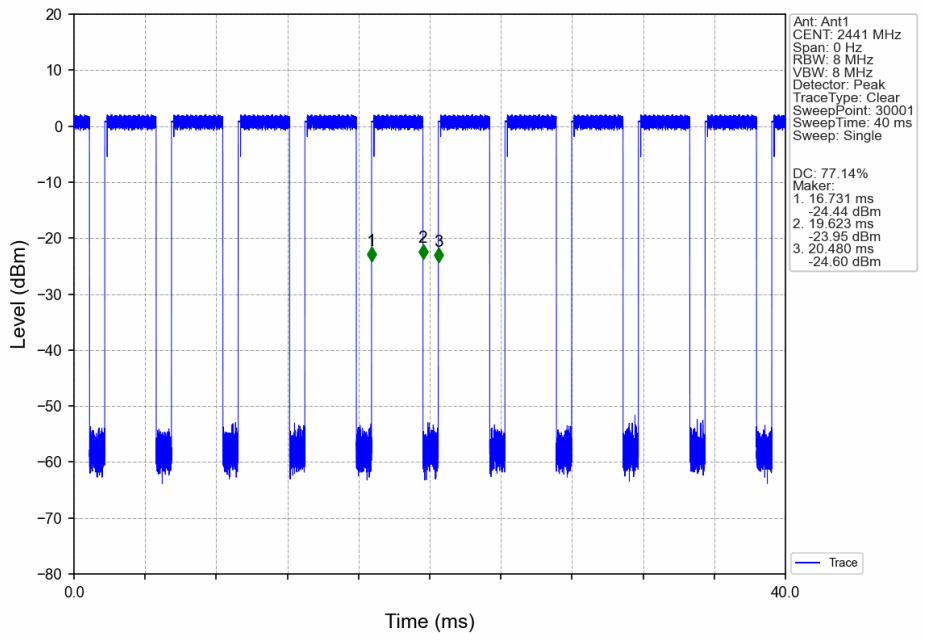
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



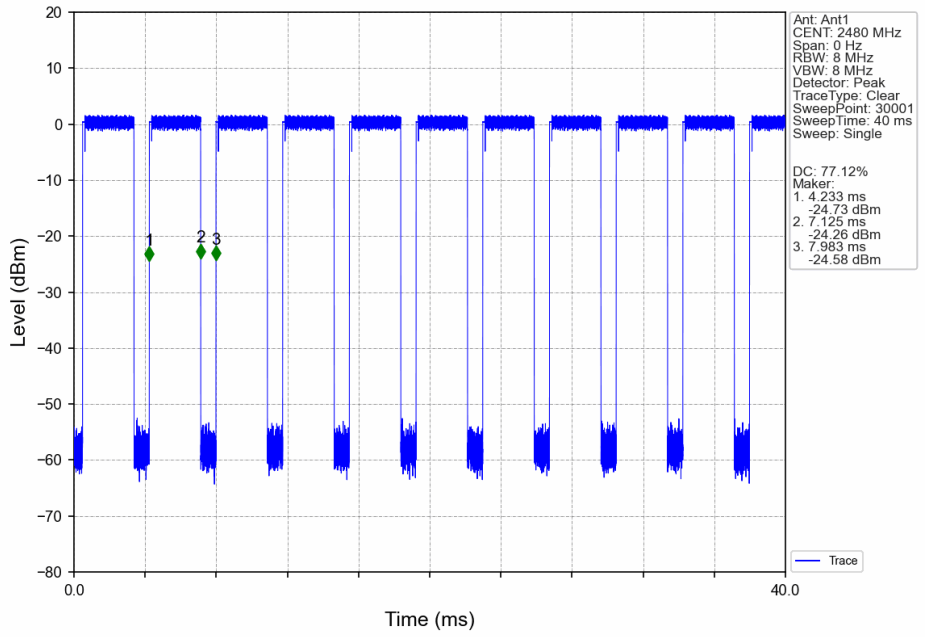
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



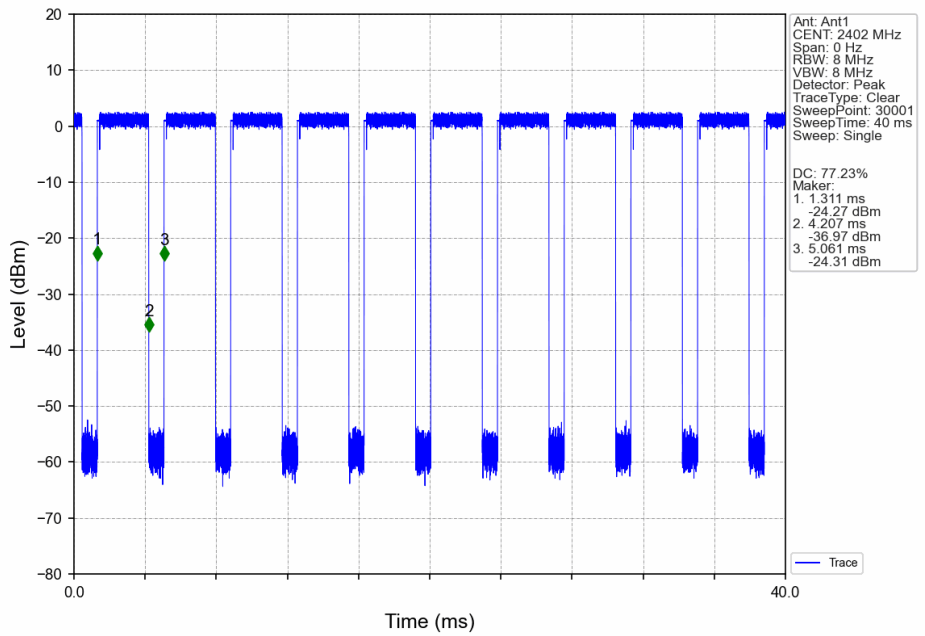
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



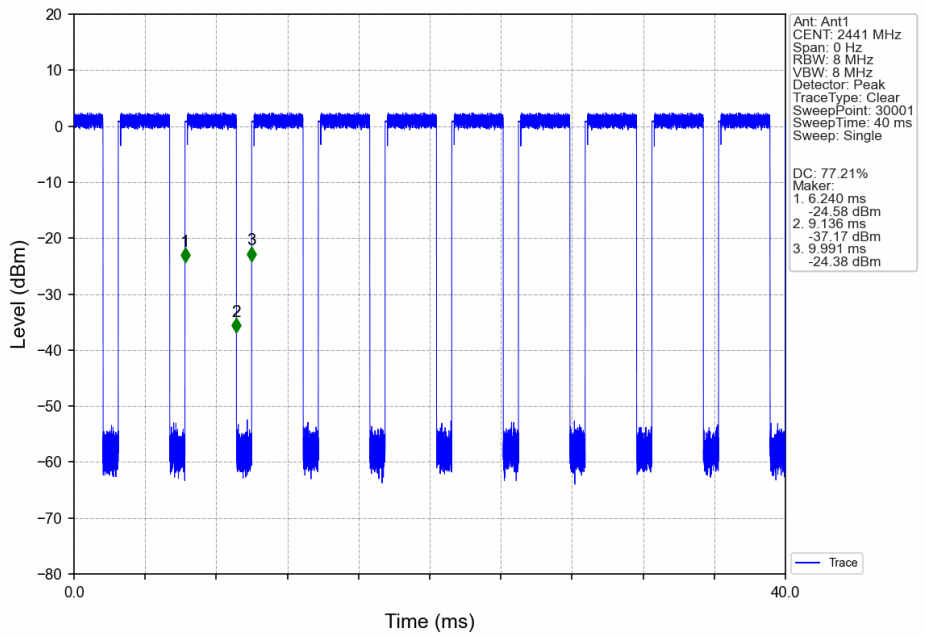
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



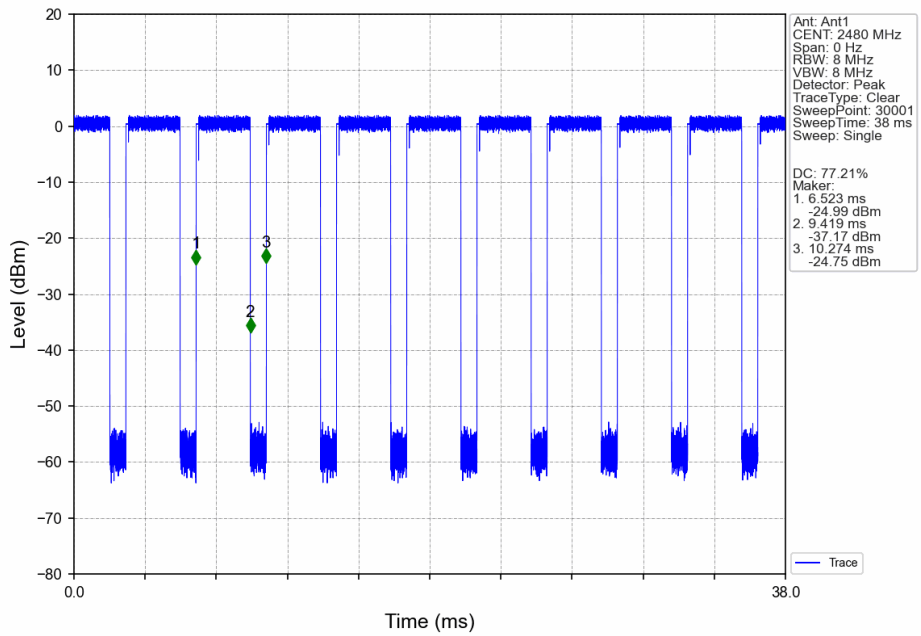
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV

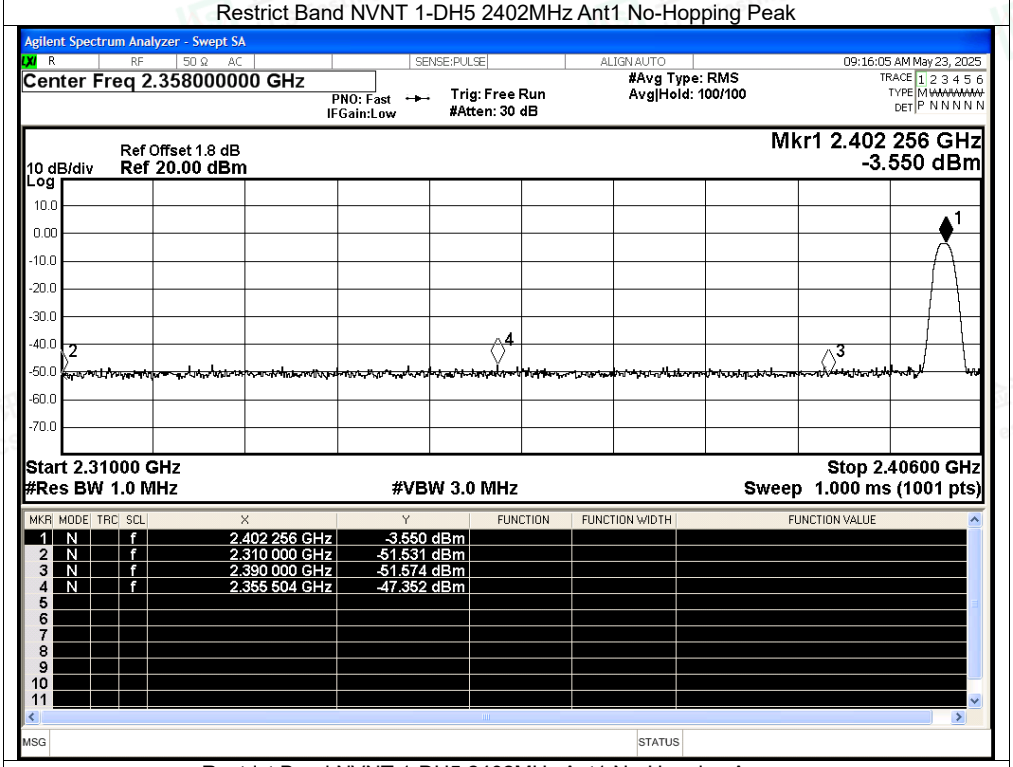

Ant: Ant1
CENT: 2480 MHz
Span: 0 Hz
RBW: 8 MHz
VBW: 8 MHz
Detector: Peak
TraceType: Clear
SweepPoint: 30001
SweepTime: 38 ms
Sweep: Single
DC: 77.21%
Maker:
1. 6.523 ms
-24.99 dBm
2. 9.419 ms
-37.17 dBm
3. 10.274 ms
-24.75 dBm
Trace
Level (dBm)
Time (ms)
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
0.0
38.0
1
2
3

A.9 Restrict Band

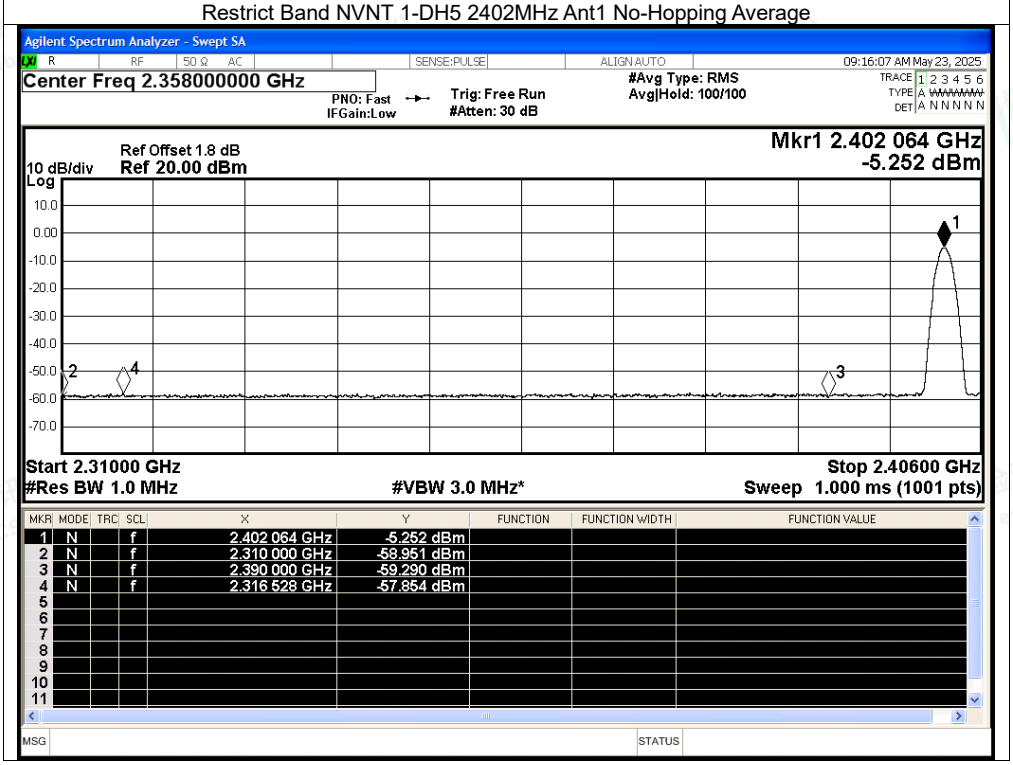
Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Spur Freq (MHz)	Power (dBm)	Gain (dBi)	Duty Factor (dB)	E (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
NVNT	1-DH5	2402	Ant1	No-Hopping	2310	-51.53	2	-	45.73	Peak	74	Pass
NVNT	1-DH5	2402	Ant1	No-Hopping	2310	-58.95	2	1.14	39.45	Average	54	Pass
NVNT	1-DH5	2402	Ant1	No-Hopping	2355.504	-47.35	2	-	49.91	Peak	74	Pass
NVNT	1-DH5	2402	Ant1	No-Hopping	2316.528	-57.85	2	1.14	40.55	Average	54	Pass
NVNT	1-DH5	2402	Ant1	No-Hopping	2390	-51.57	2	-	45.69	Peak	74	Pass
NVNT	1-DH5	2402	Ant1	No-Hopping	2390	-59.29	2	1.14	39.11	Average	54	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2483.5	-50.13	2	-	47.13	Peak	74	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2483.5	-57.72	2	1.14	40.68	Average	54	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2484.112	-47.27	2	-	49.99	Peak	74	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2497.72	-57.28	2	1.14	41.12	Average	54	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2500	-49.45	2	-	47.81	Peak	74	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	2500	-58.51	2	1.14	39.89	Average	54	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2310	-51.23	2	-	46.03	Peak	74	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2310	-59.24	2	1.13	39.15	Average	54	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2365.392	-46.85	2	-	50.41	Peak	74	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2381.328	-57.55	2	1.13	40.84	Average	54	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2390	-50.88	2	-	46.38	Peak	74	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	2390	-58.7	2	1.13	39.69	Average	54	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2483.5	-51.37	2	-	45.89	Peak	74	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2483.5	-57.68	2	1.13	40.71	Average	54	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2483.704	-46.3	2	-	50.96	Peak	74	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2484.16	-57.22	2	1.13	41.17	Average	54	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2500	-48.83	2	-	48.43	Peak	74	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	2500	-58.48	2	1.13	39.91	Average	54	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2310	-49.71	2	-	47.55	Peak	74	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2310	-59.19	2	1.12	39.19	Average	54	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2378.832	-47.99	2	-	49.27	Peak	74	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2378.64	-57.82	2	1.12	40.56	Average	54	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2390	-50.03	2	-	47.23	Peak	74	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	2390	-59.03	2	1.12	39.35	Average	54	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2483.5	-48.87	2	-	48.39	Peak	74	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2483.5	-57.98	2	1.12	40.40	Average	54	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2487.136	-46.5	2	-	50.76	Peak	74	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2483.608	-57.04	2	1.12	41.34	Average	54	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2500	-50.3	2	-	46.96	Peak	74	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	2500	-58.44	2	1.12	39.94	Average	54	Pass

Test Graphs

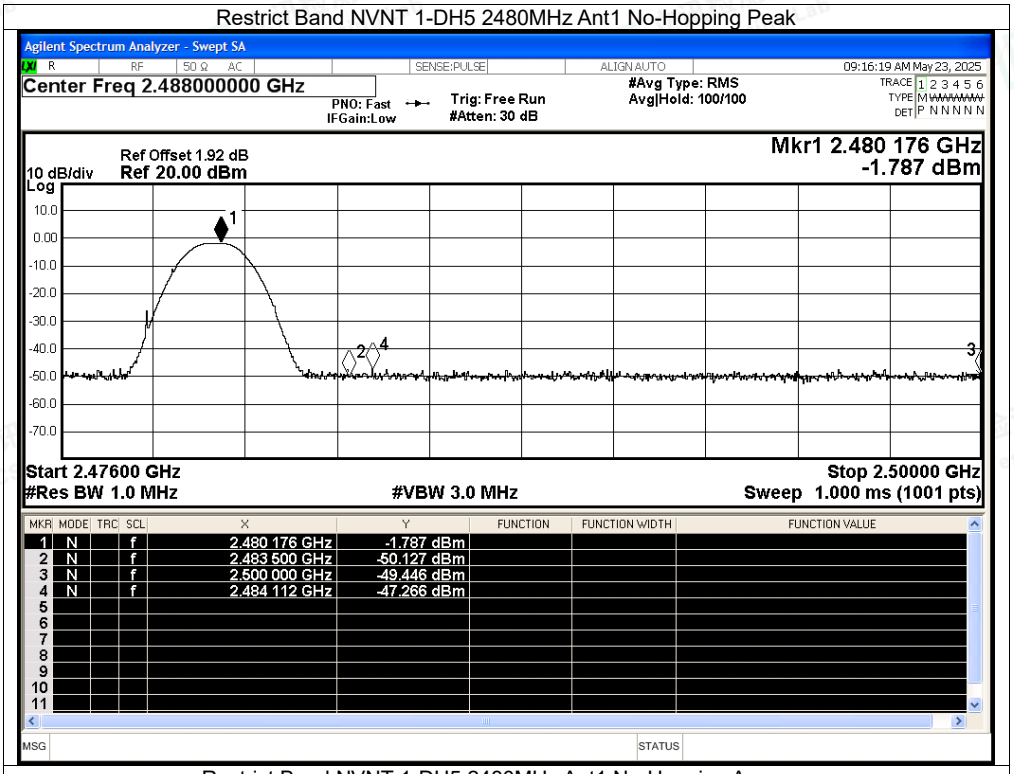
Restrict Band NVNT 1-DH5 2402MHz Ant1 No-Hopping Peak



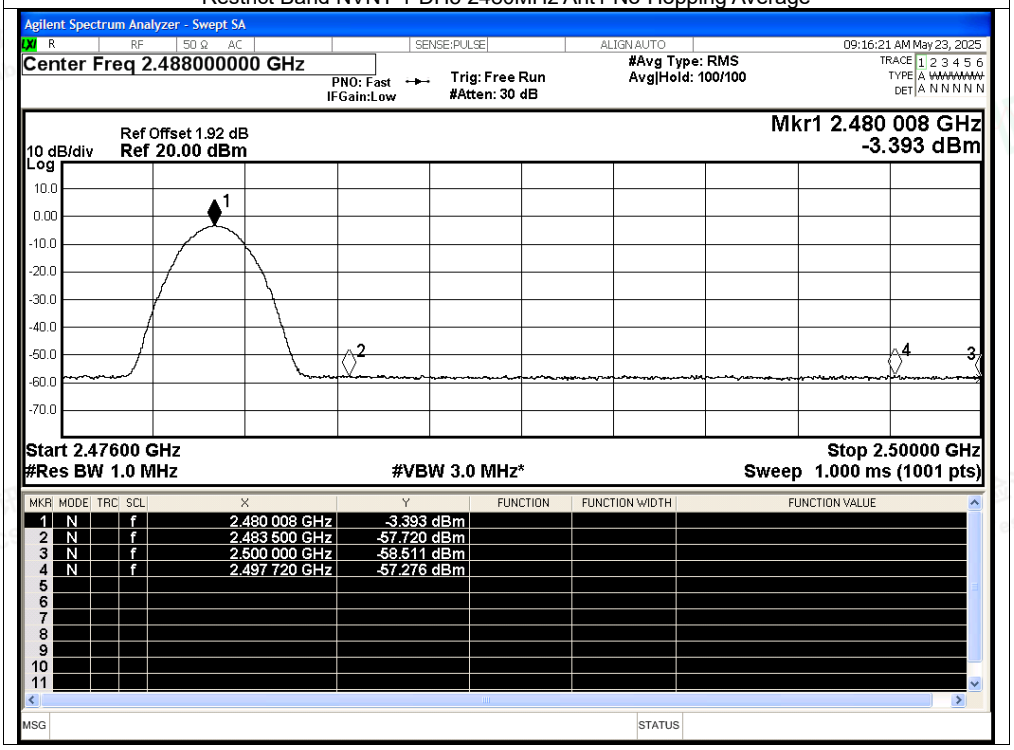
Restrict Band NVNT 1-DH5 2402MHz Ant1 No-Hopping Average



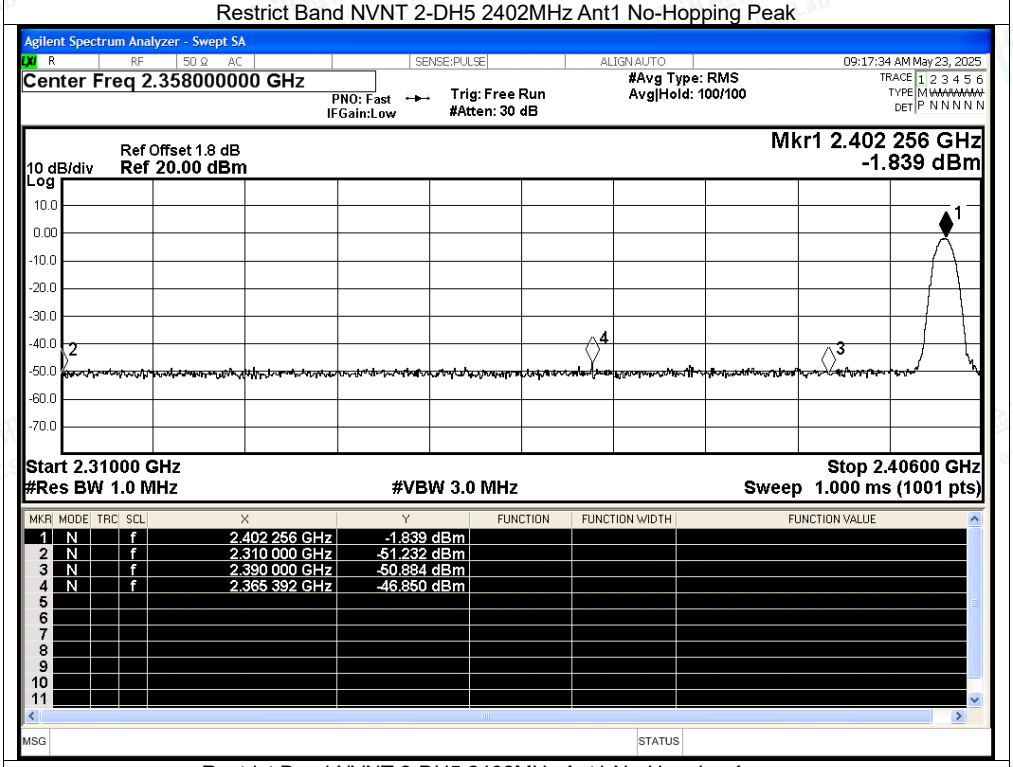
Restrict Band NVNT 1-DH5 2480MHz Ant1 No-Hopping Peak



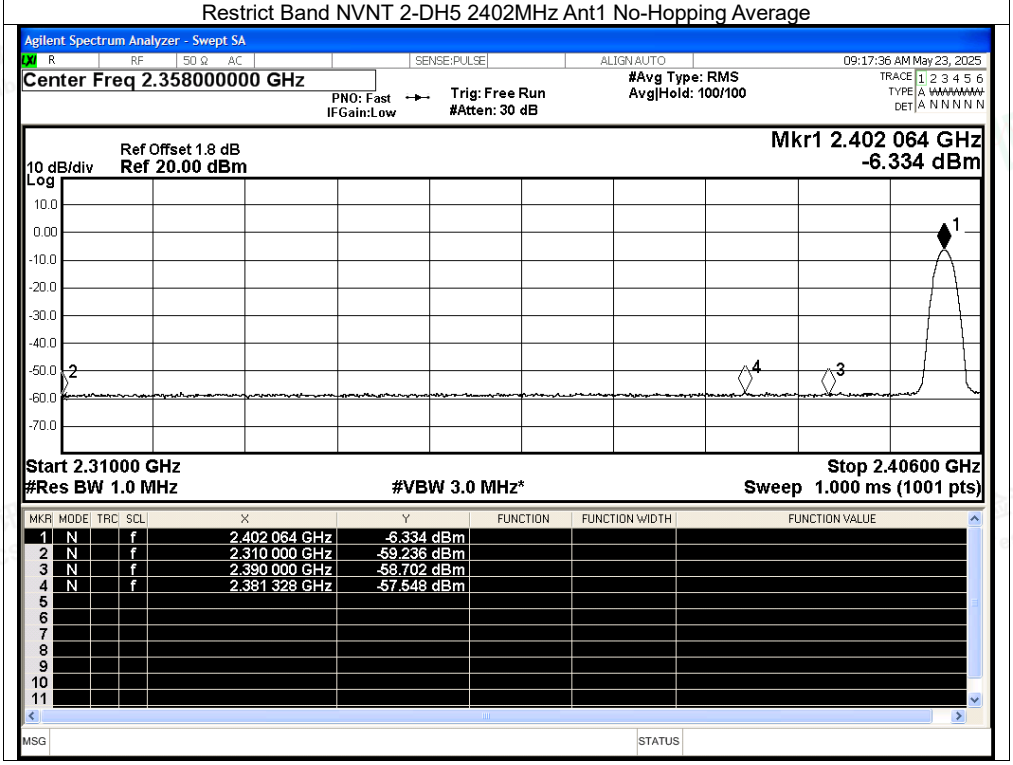
Restrict Band NVNT 1-DH5 2480MHz Ant1 No-Hopping Average



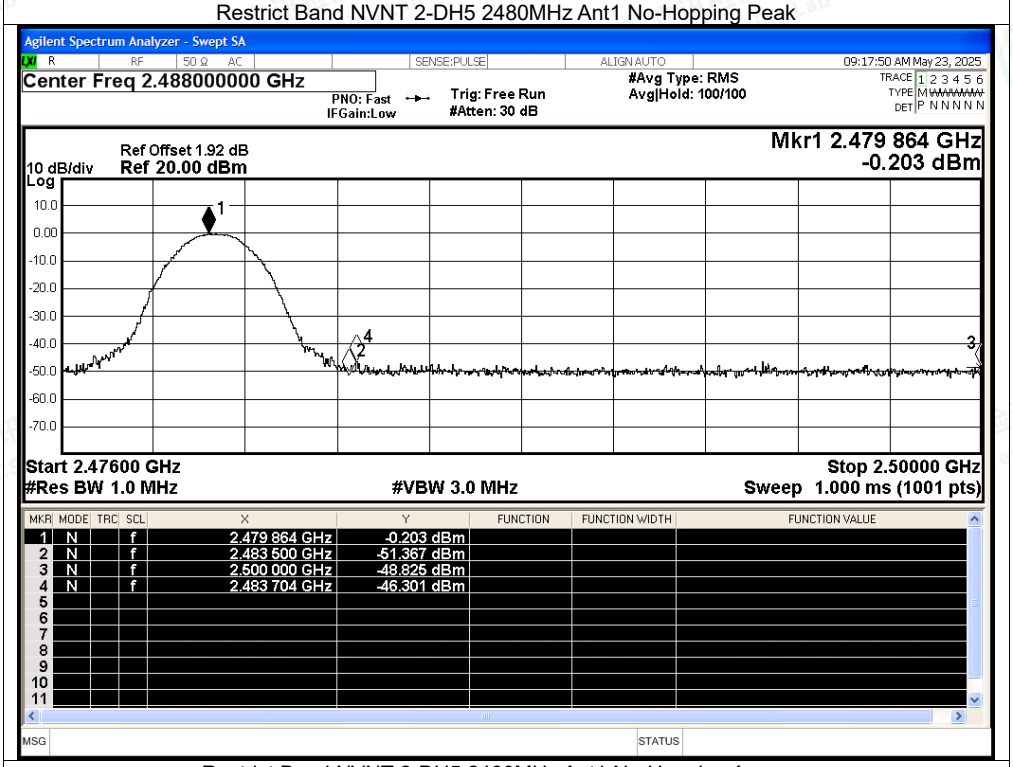
Restrict Band NVNT 2-DH5 2402MHz Ant1 No-Hopping Peak



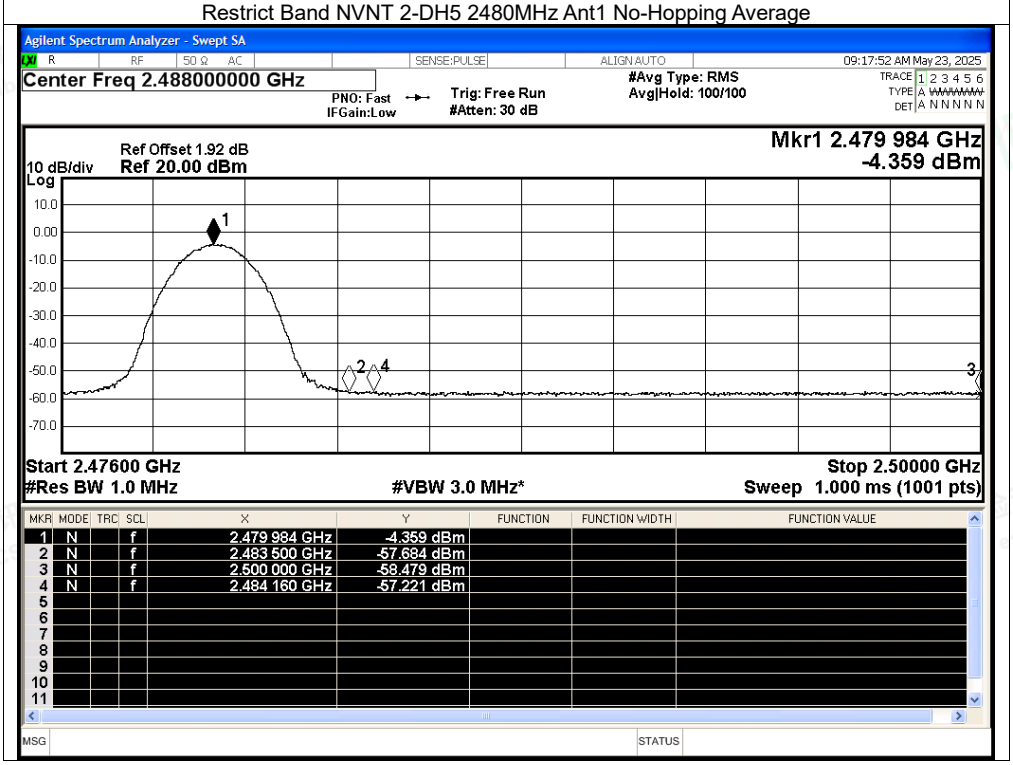
Restrict Band NVNT 2-DH5 2402MHz Ant1 No-Hopping Average



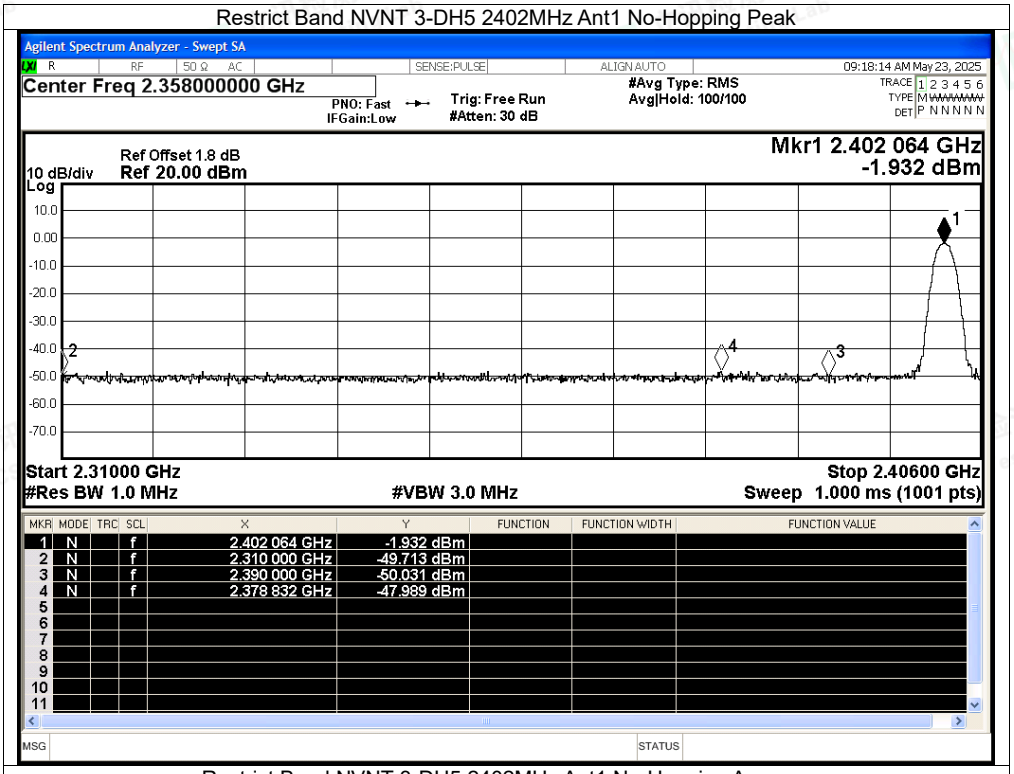
Restrict Band NVNT 2-DH5 2480MHz Ant1 No-Hopping Peak



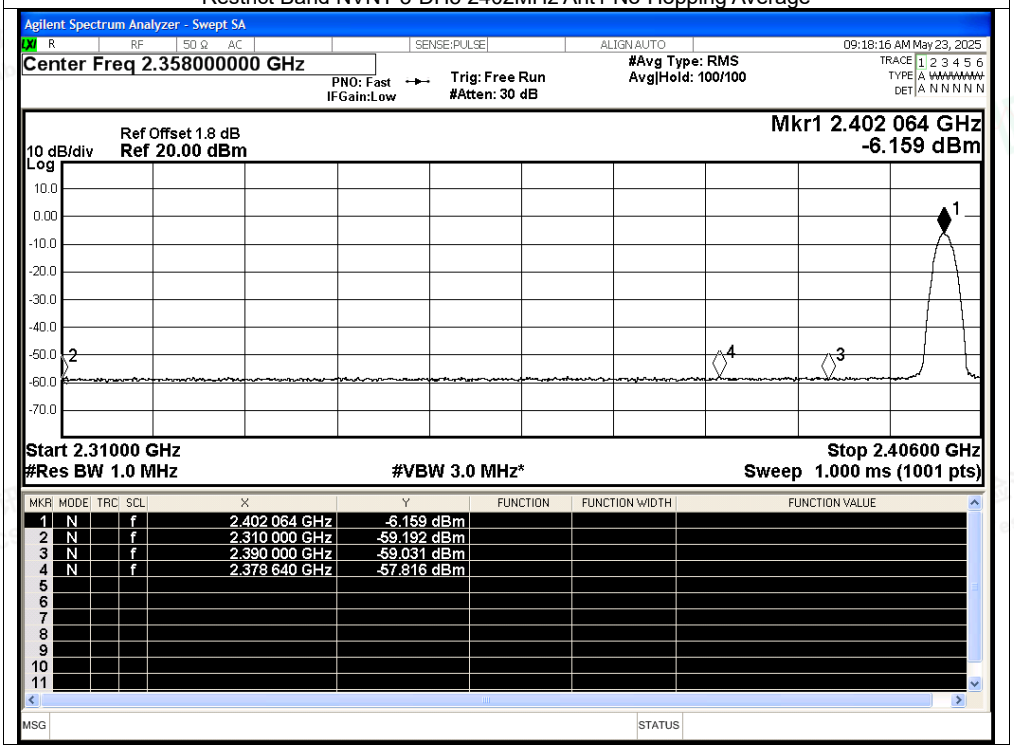
Restrict Band NVNT 2-DH5 2480MHz Ant1 No-Hopping Average



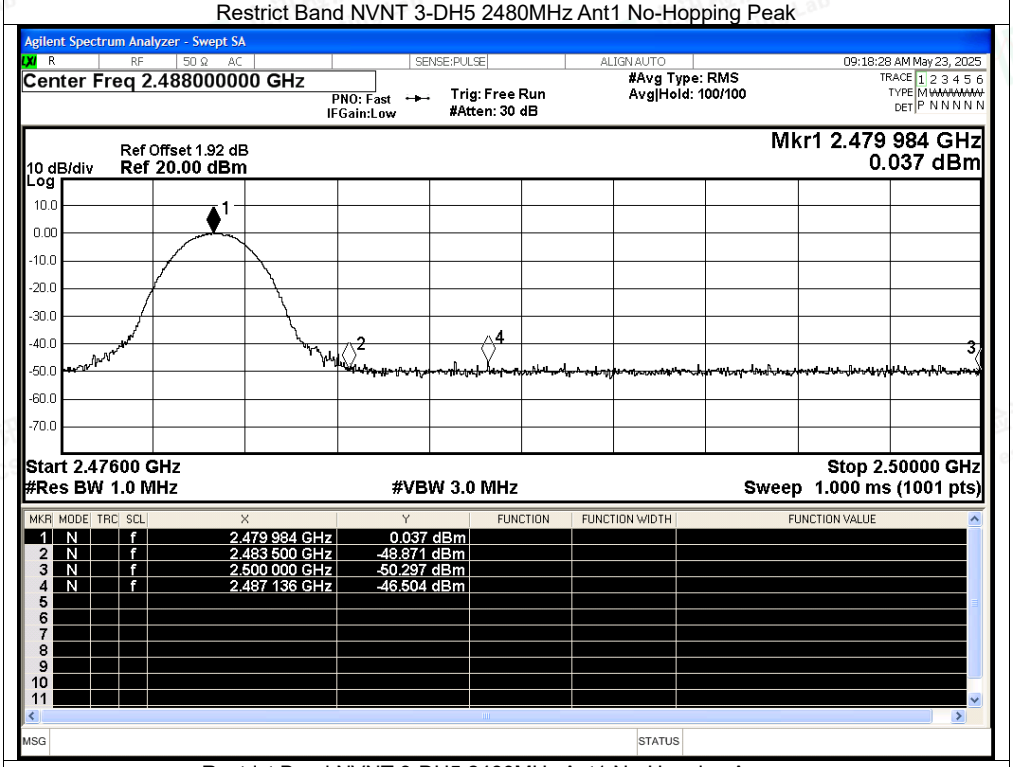
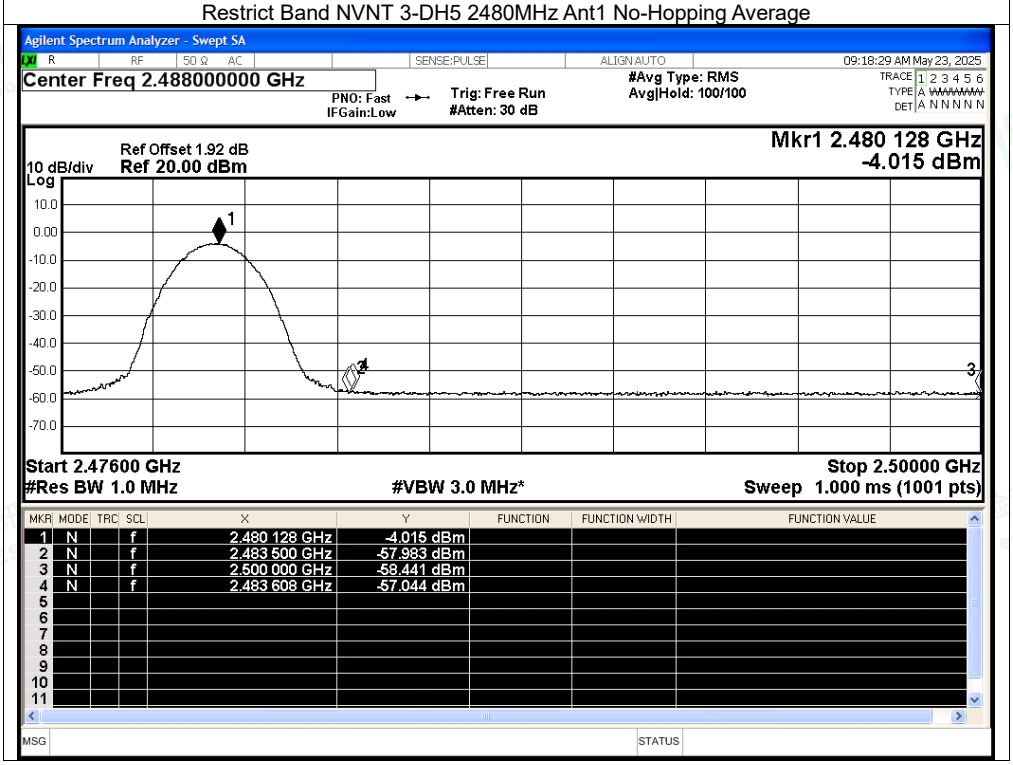
Restrict Band NVNT 3-DH5 2402MHz Ant1 No-Hopping Peak



Restrict Band NVNT 3-DH5 2402MHz Ant1 No-Hopping Average



Restrict Band NVNT 3-DH5 2480MHz Ant1 No-Hopping Peak



Restrict Band NVNT 3-DH5 2480MHz Ant1 No-Hopping Average