



RF Test Report

For

Project No.:	ZKT-240801L9141E-4
Model:	EF6-2
Client:	Autel Robotics Co., Ltd.
Manufacturer:	Autel Robotics Co., Ltd.
Product Description:	Autel Smart Controller SE V2
Test Engineer:	Jim Liu
Test Date:	2024-05-28

Test Summary

Item	Result
Duty Cycle	Pass
Bandwidth	Pass
Maximum Conducted Output Power	Pass
Maximum Power Spectral Density	Pass
Unwanted Emissions In Non-restricted Frequency Bands	Pass
Frequency Error	Pass
Form731	Pass



1. Duty Cycle

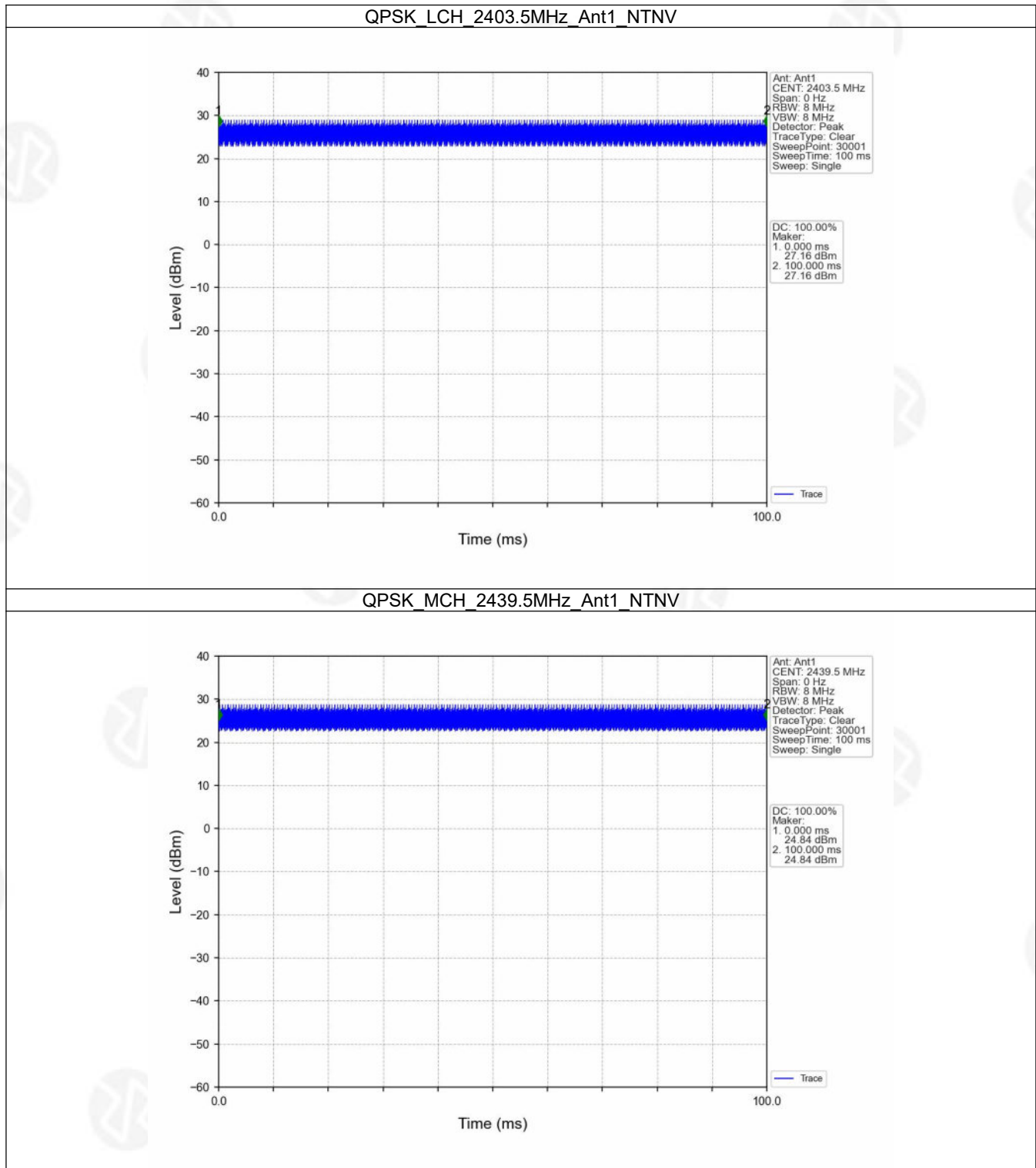
1.1 Ant1

1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
QPSK	MIMO	2403.5	100.000	100.000	100.00	0.00	0.00
		2439.5	100.000	100.000	100.00	0.00	0.00
		2475.5	100.000	100.000	100.00	0.00	0.00
16QAM	MIMO	2403.5	100.000	100.000	100.00	0.00	0.00
		2439.5	100.000	100.000	100.00	0.00	0.00
		2475.5	100.000	100.000	100.00	0.00	0.00

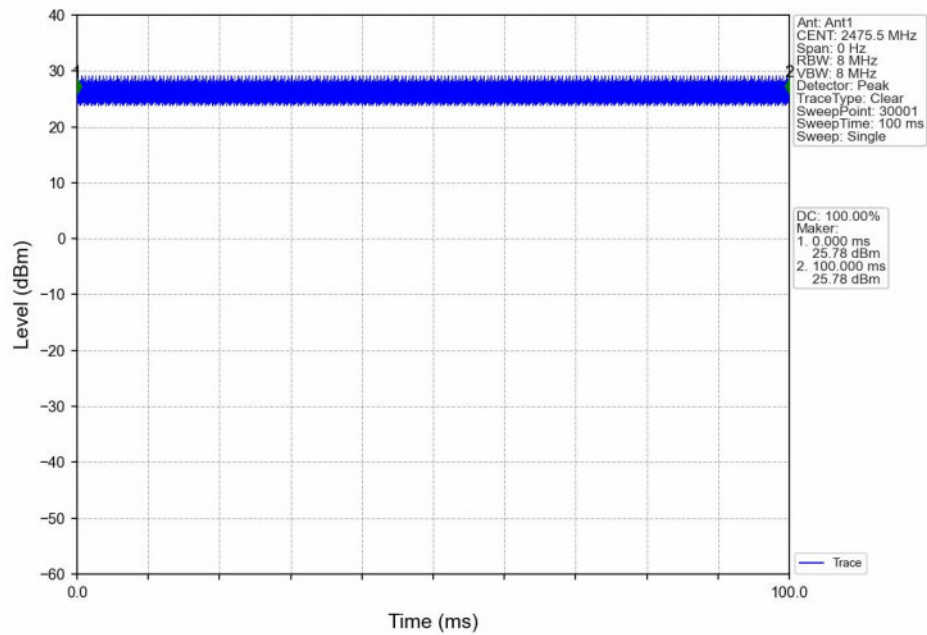


1.1.2 Test Graph

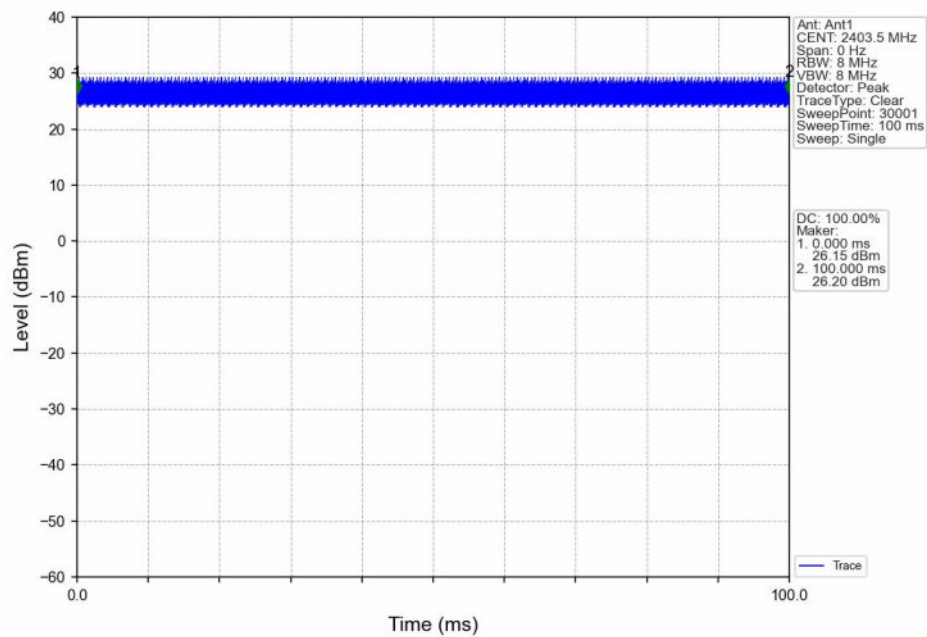




QPSK_HCH_2475.5MHz_Ant1_NTNV

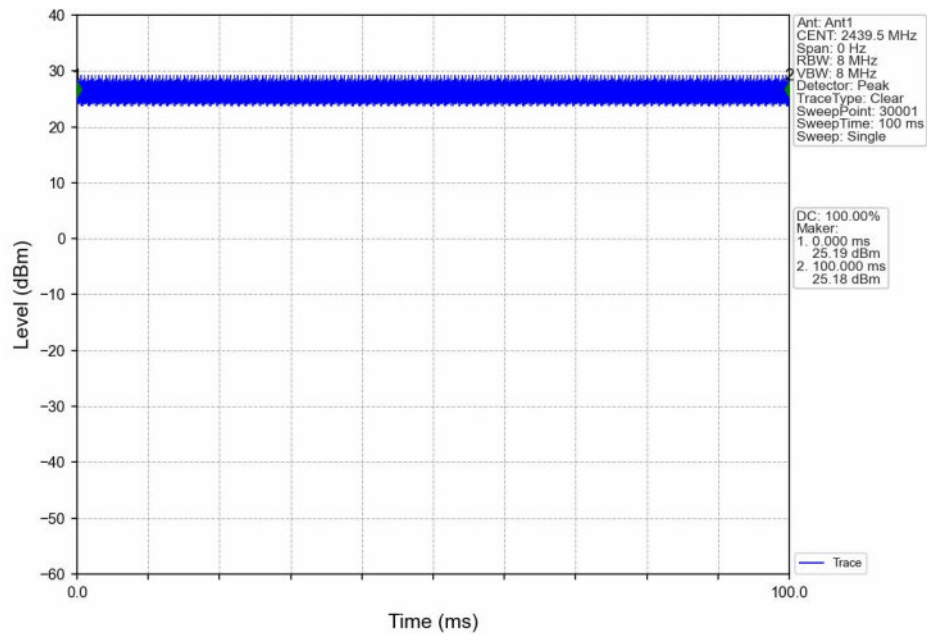


16QAM_LCH_2403.5MHz_Ant1_NTNV

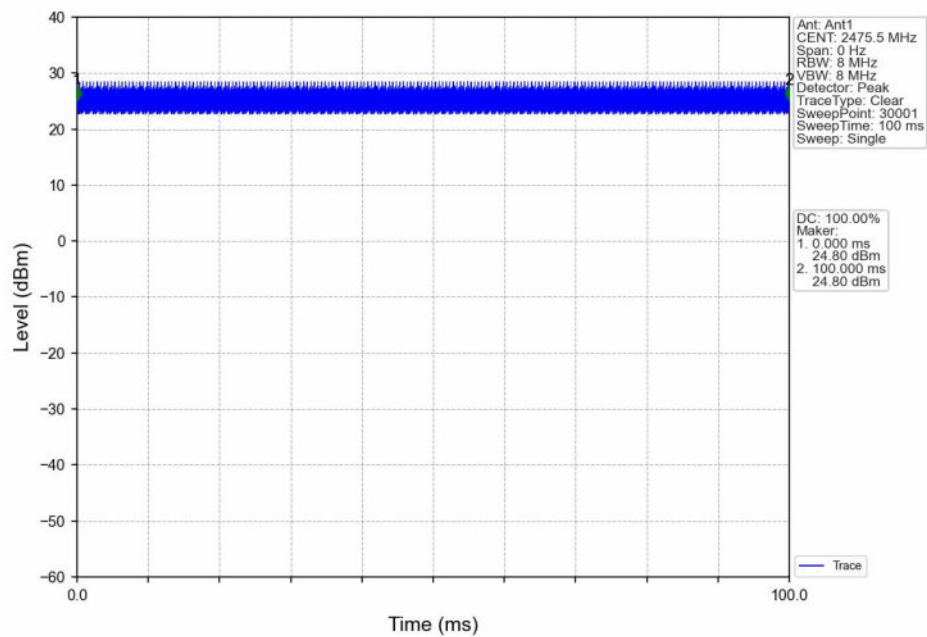




16QAM_MCH_2439.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant1_NTNV





2. Bandwidth

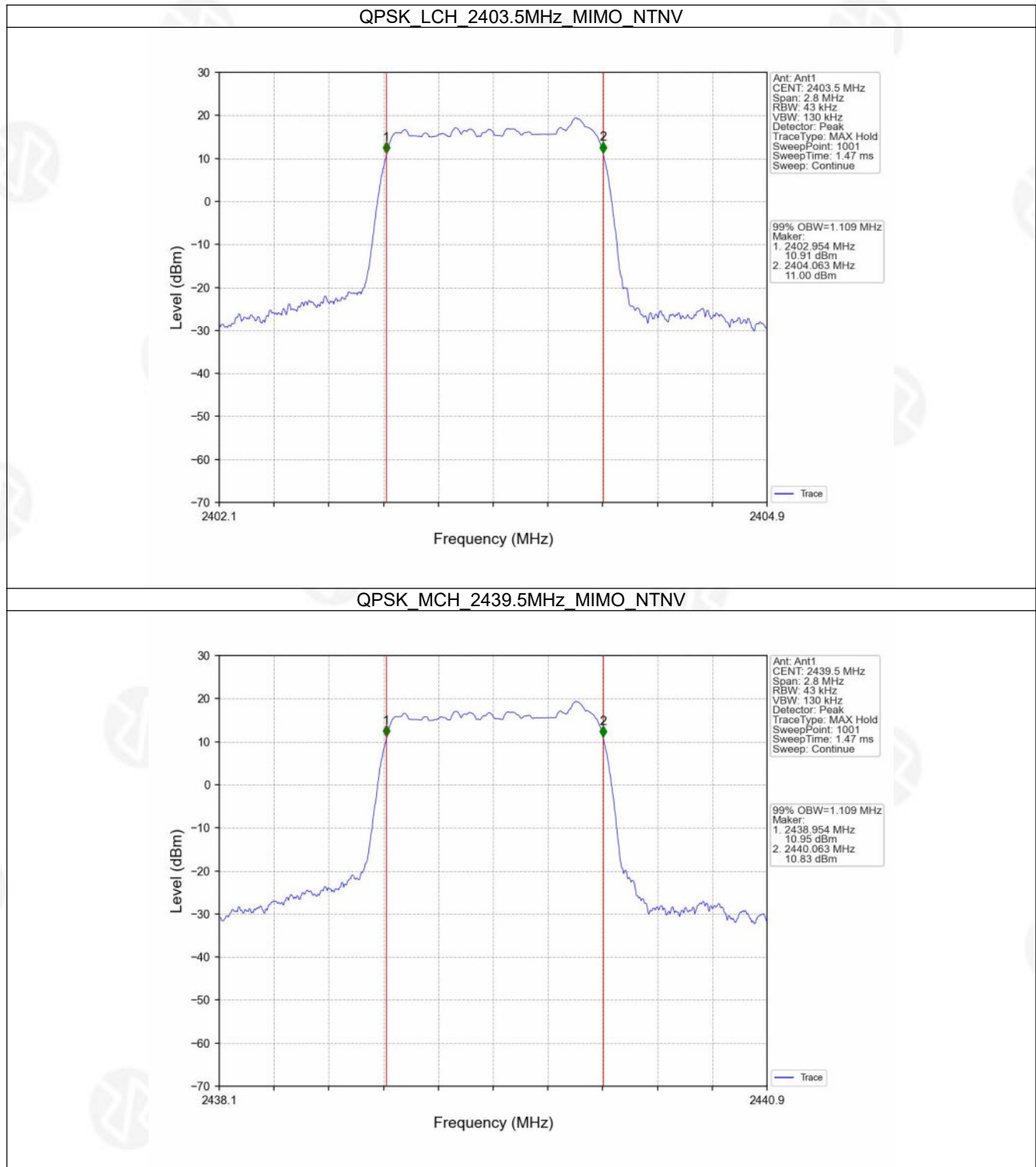
2.1 OBW

2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
QPSK	MIMO	2403.5	MIMO	1.109	/	Pass
		2439.5	MIMO	1.109	/	Pass
		2475.5	MIMO	1.101	/	Pass
16QAM	MIMO	2403.5	MIMO	1.100	/	Pass
		2439.5	MIMO	1.101	/	Pass
		2475.5	MIMO	1.109	/	Pass

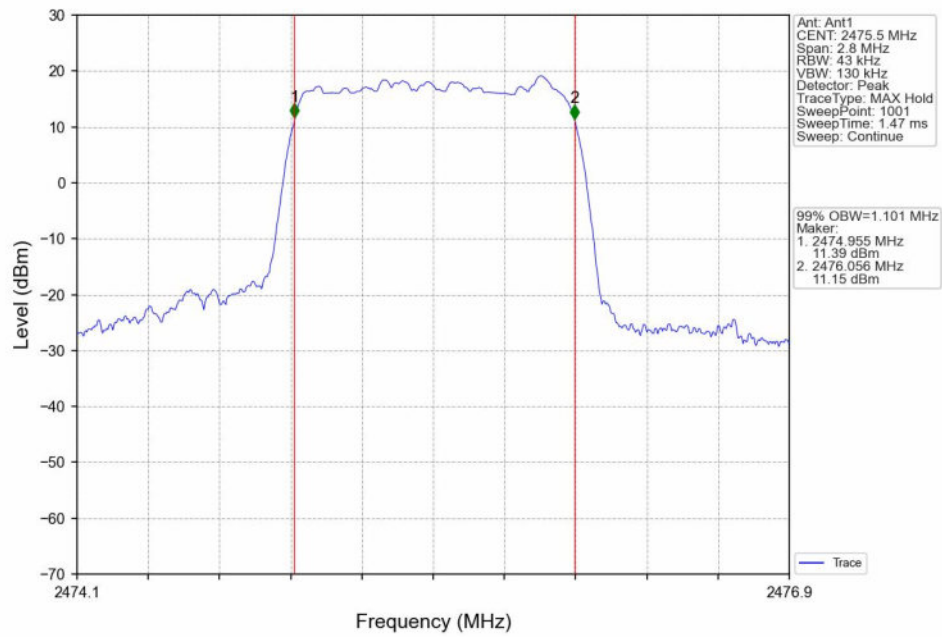


2.1.2 Test Graph

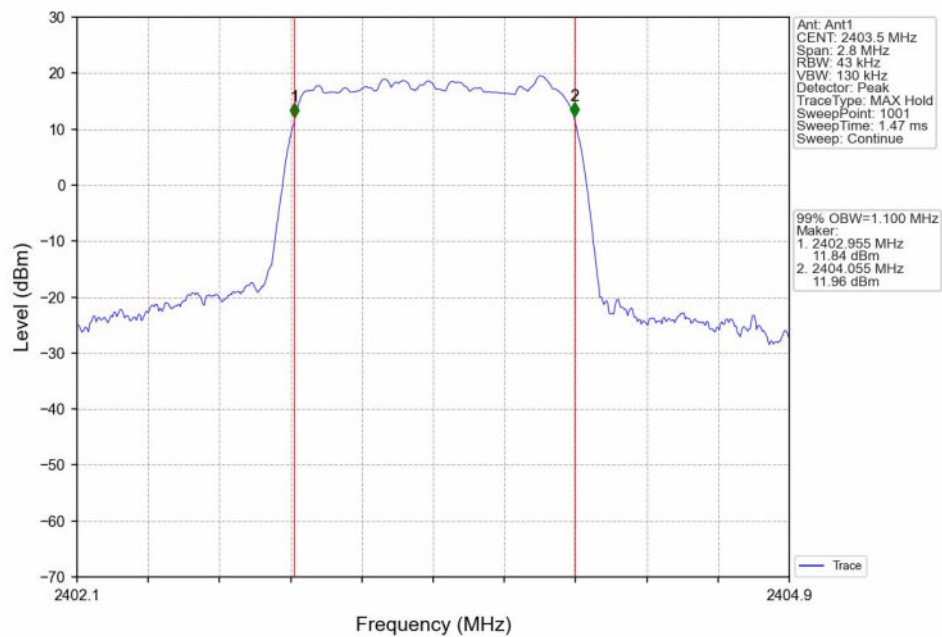




QPSK_HCH_2475.5MHz_MIMO_NTNV

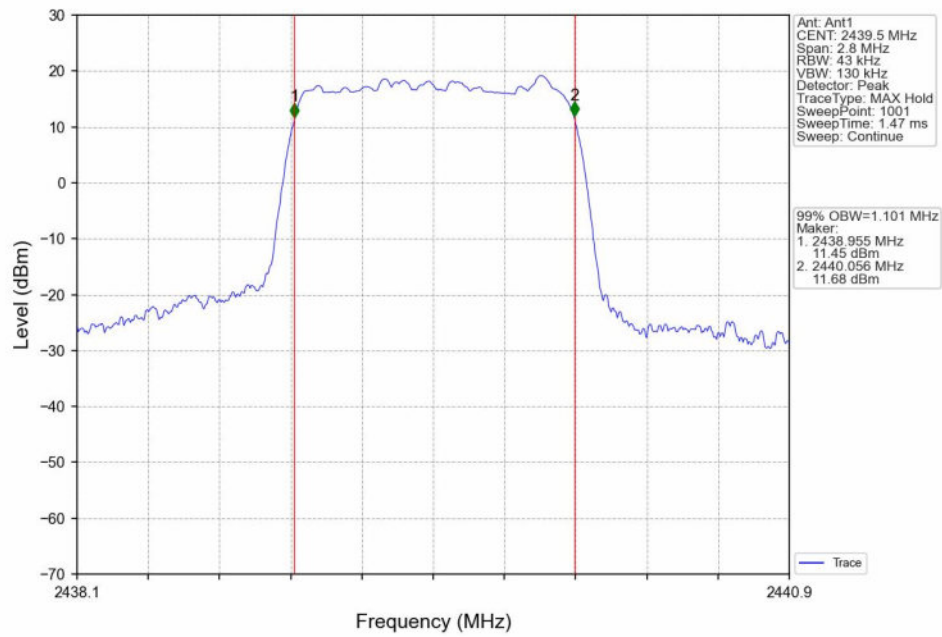


16QAM_LCH_2403.5MHz_MIMO_NTNV

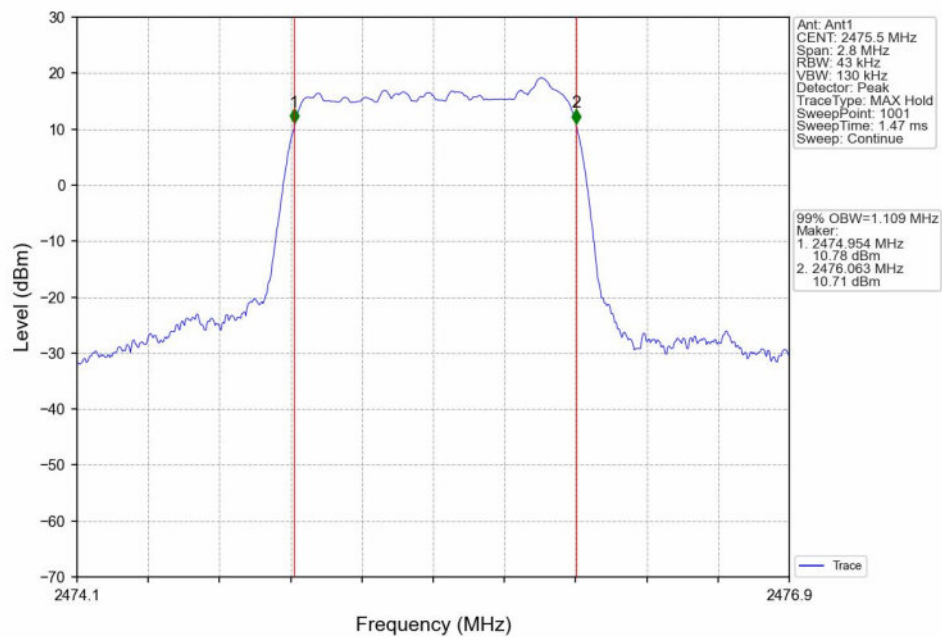




16QAM_MCH_2439.5MHz_MIMO_NTNV



16QAM_HCH_2475.5MHz_MIMO_NTNV





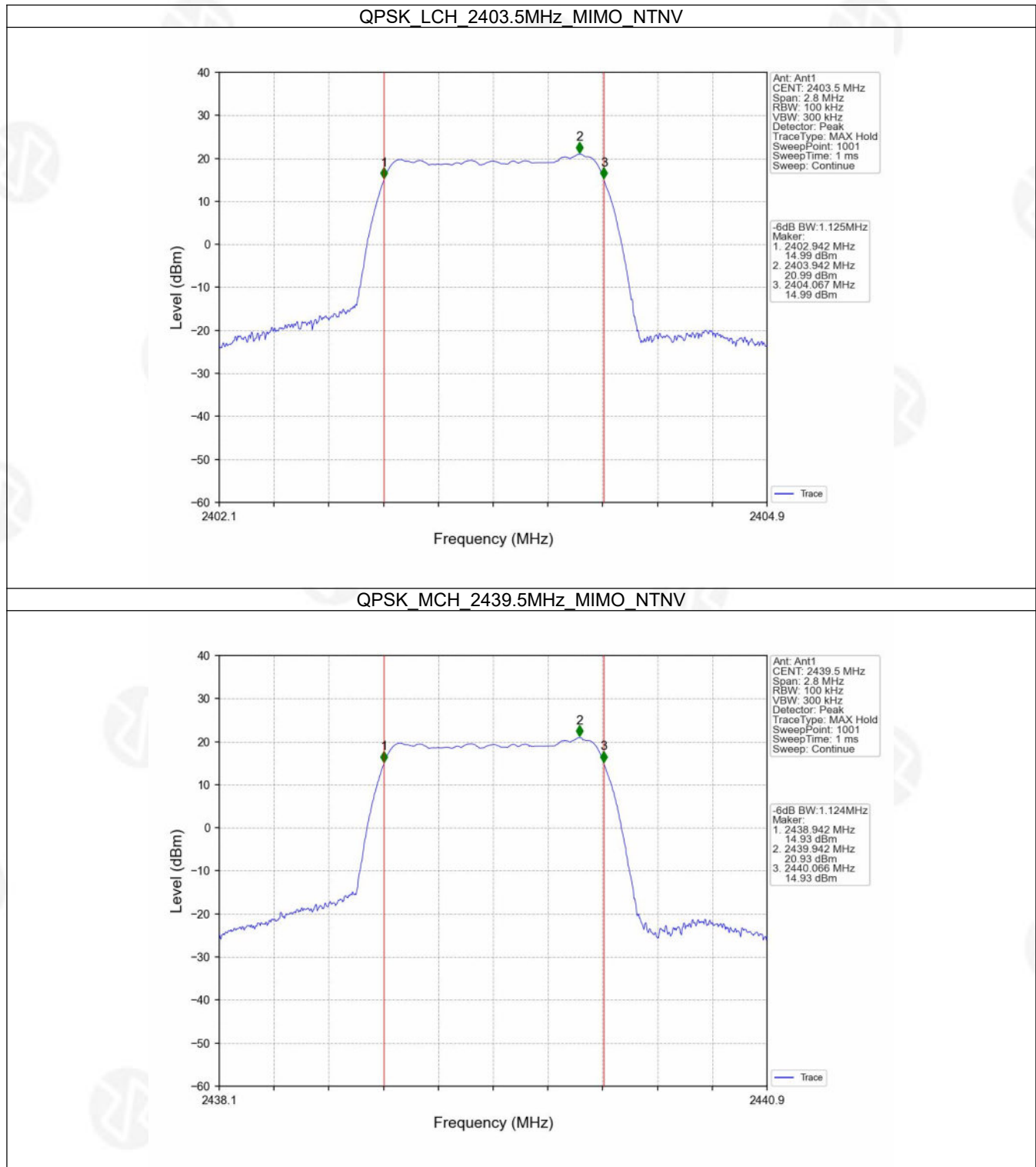
2.2 6dB BW

2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
QPSK	MIMO	2403.5	MIMO	1.125	≥ 0.5	Pass
		2439.5	MIMO	1.124	≥ 0.5	Pass
		2475.5	MIMO	1.123	≥ 0.5	Pass
16QAM	MIMO	2403.5	MIMO	1.121	≥ 0.5	Pass
		2439.5	MIMO	1.123	≥ 0.5	Pass
		2475.5	MIMO	1.124	≥ 0.5	Pass

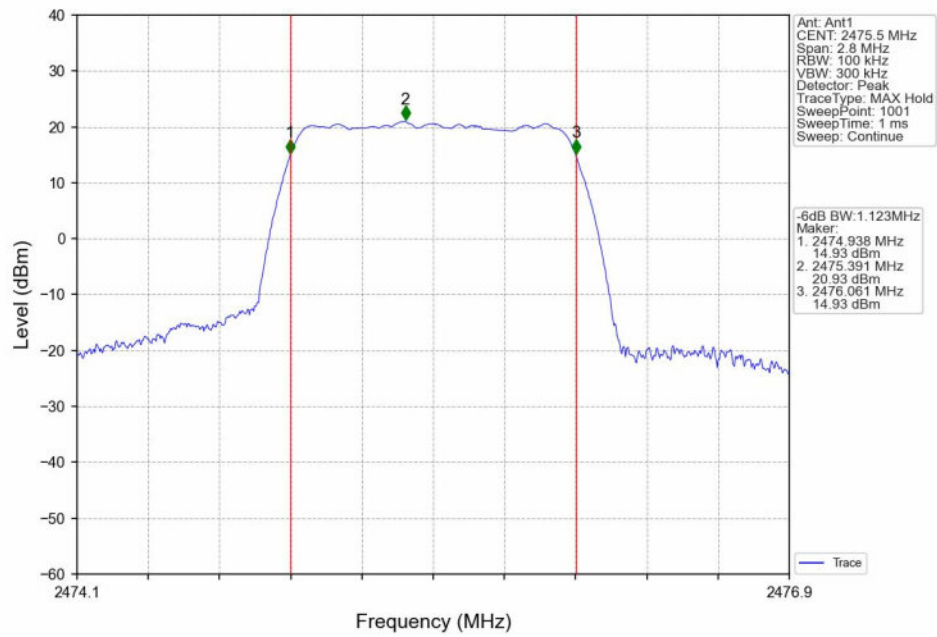


2.2.2 Test Graph

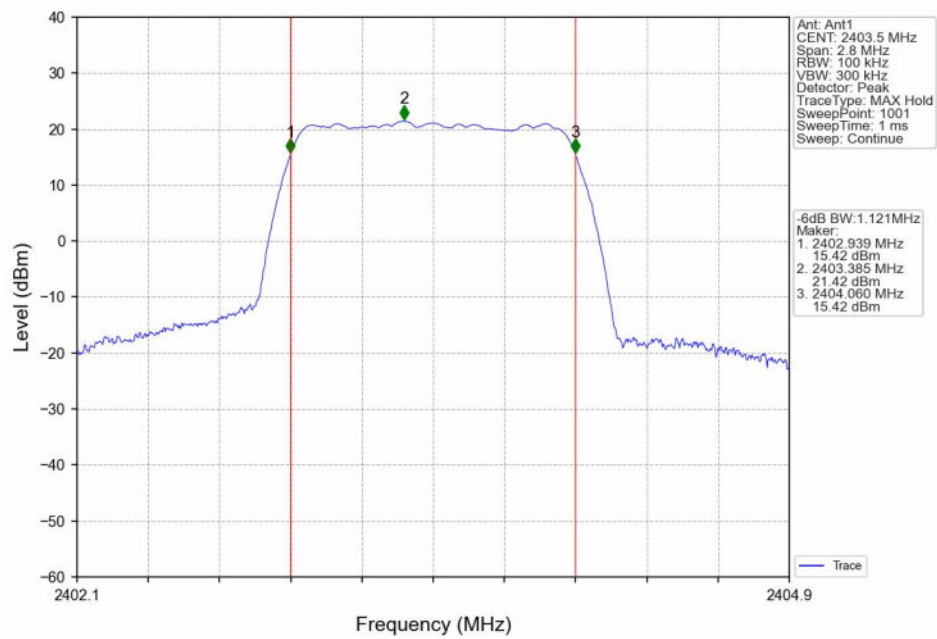




QPSK_HCH_2475.5MHz_MIMO_NTNV

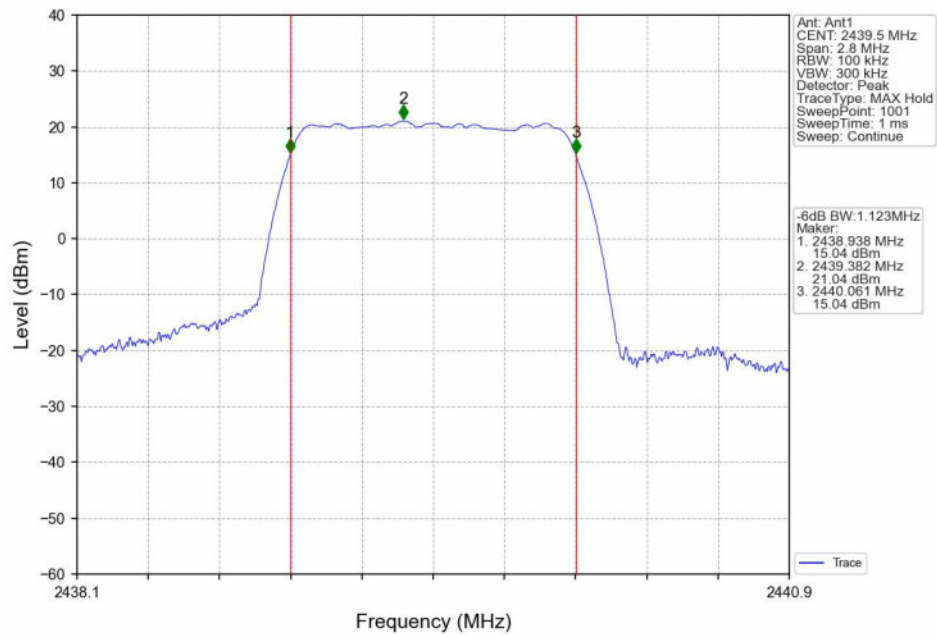


16QAM_LCH_2403.5MHz_MIMO_NTNV

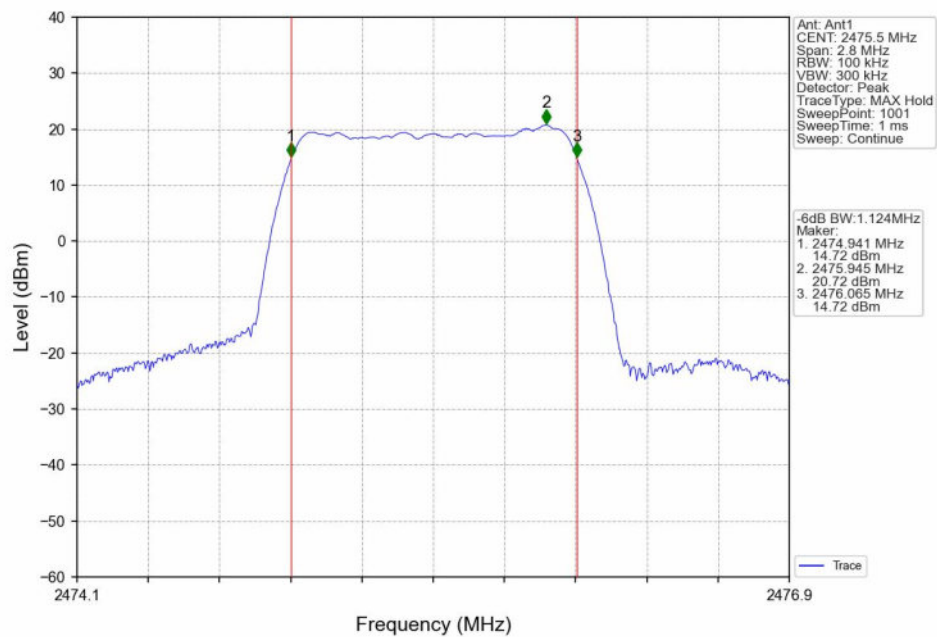




16QAM_MCH_2439.5MHz_MIMO_NTNV



16QAM_HCH_2475.5MHz_MIMO_NTNV





3. Maximum Conducted Output Power

3.1 Power

3.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)				Verdict
			ANT1	ANT2	MIMO	Limit	
QPSK	MIMO	2403.5	22.14	24.55	26.52	<=30	Pass
		2439.5	22.07	24.33	26.36	<=30	Pass
		2475.5	22.78	22.27	25.54	<=30	Pass
16QAM	MIMO	2403.5	23.25	23.42	26.35	<=30	Pass
		2439.5	22.91	22.84	25.89	<=30	Pass
		2475.5	21.93	23.66	25.89	<=30	Pass

Note1: Antenna Gain: Ant1: 2.40dBi; Ant2: 2.30dBi;
Note2: Directional Gain: Uncorrelated(Directional Gain = Ant Gain)

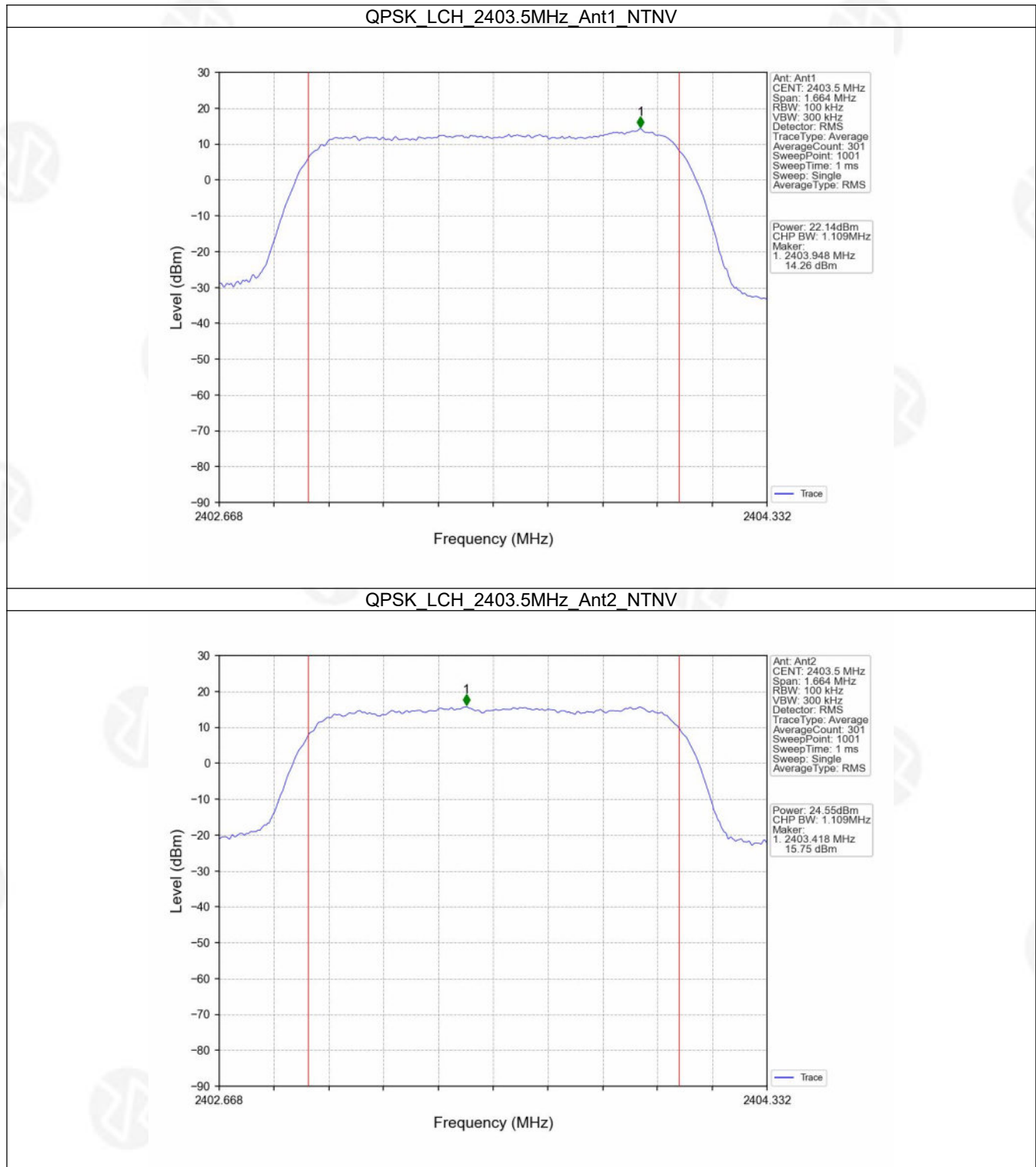
EIRP

Mode	TX Type	Frequency (MHz)	E.I.R.P (dBm)				Verdict
			ANT1	ANT2	MIMO	Limit	
QPSK	MIMO	2403.5	24.54	26.85	28.86	<=36.02	Pass
		2439.5	24.47	26.63	28.69	<=36.02	Pass
		2475.5	25.18	24.57	27.90	<=36.02	Pass
16QAM	MIMO	2403.5	25.65	25.72	28.70	<=36.02	Pass
		2439.5	25.31	25.14	28.24	<=36.02	Pass
		2475.5	24.33	25.96	28.23	<=36.02	Pass

Note1: Antenna Gain: Ant1: 2.40dBi; Ant2: 2.30dBi;
Note2: E.I.R.P = Measured Power + Antenna Gain
Note3: Directional Gain: Uncorrelated(Directional Gain = Ant Gain)

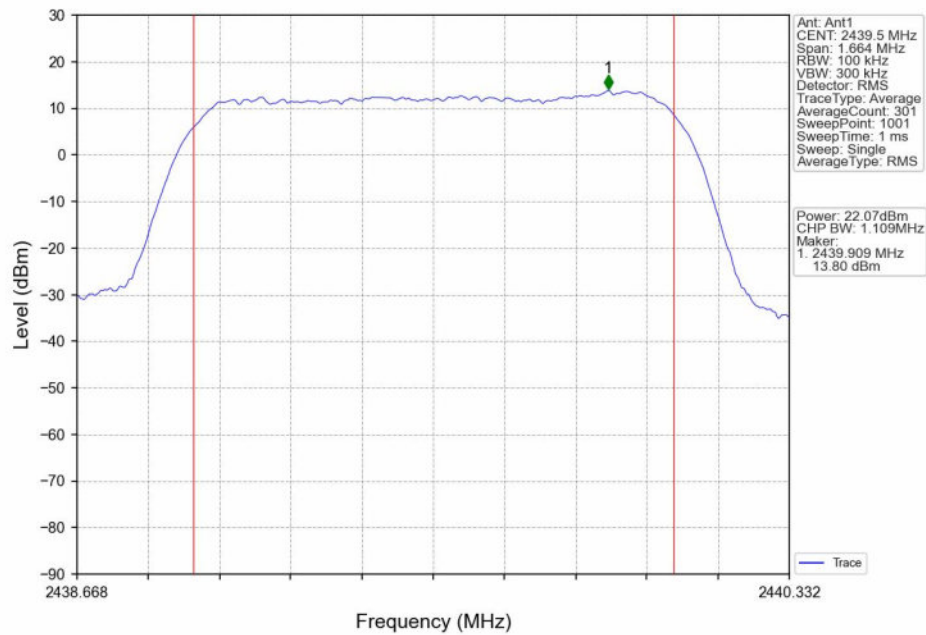


3.1.2 Test Graph

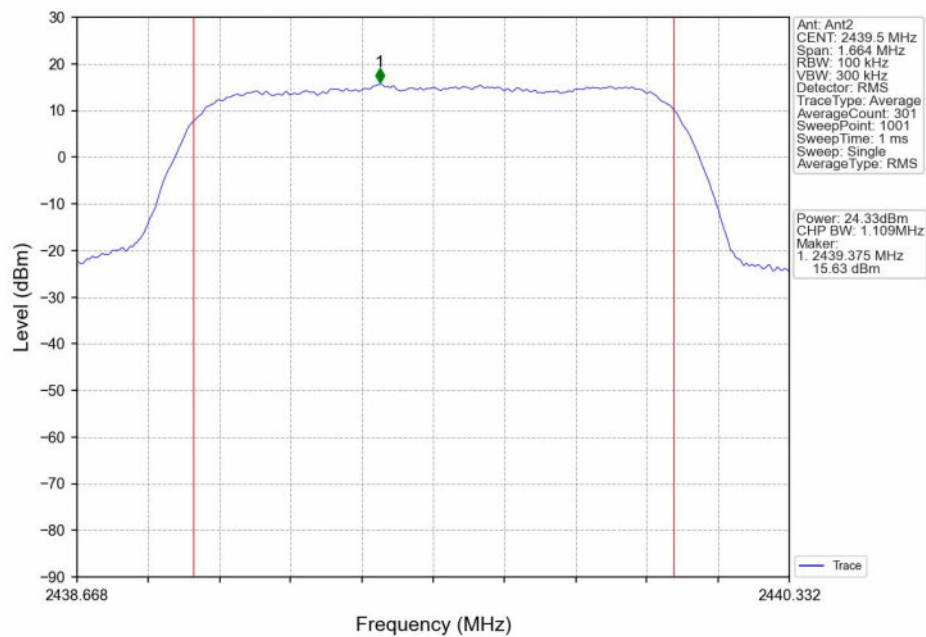




QPSK_MCH_2439.5MHz_Ant1_NTNV

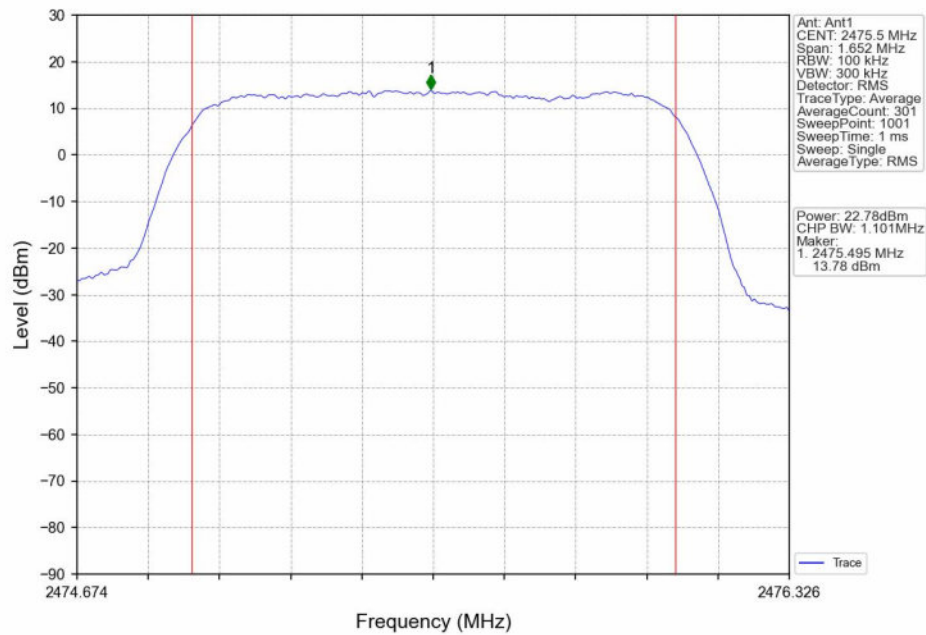


QPSK_MCH_2439.5MHz_Ant2_NTNV

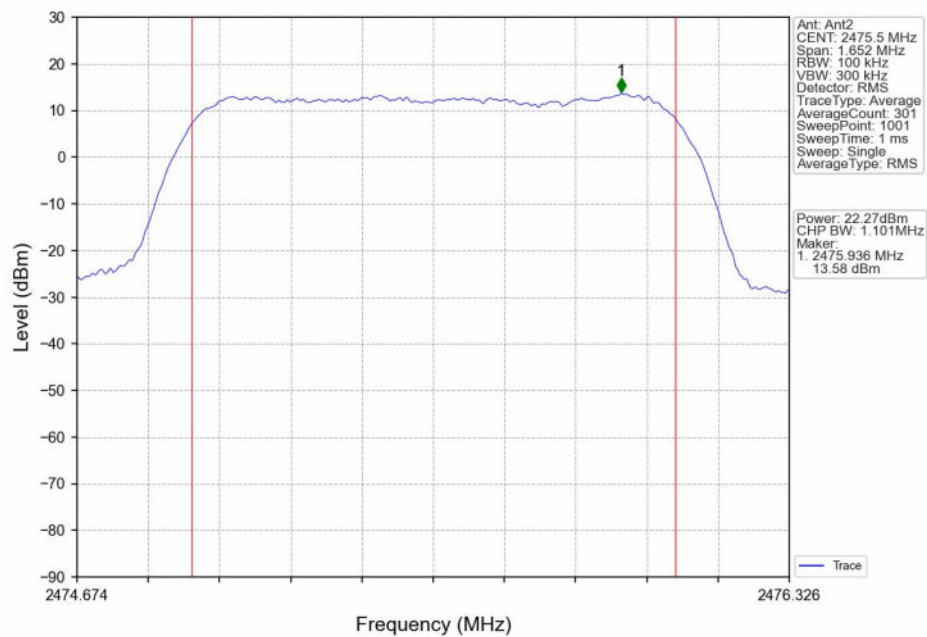




QPSK_HCH_2475.5MHz_Ant1_NTNV

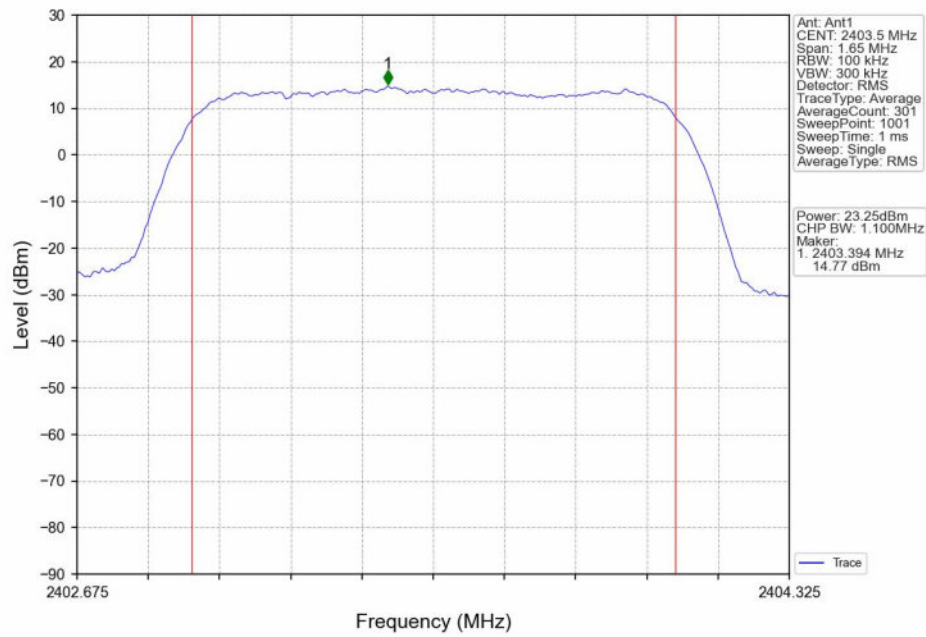


QPSK_HCH_2475.5MHz_Ant2_NTNV

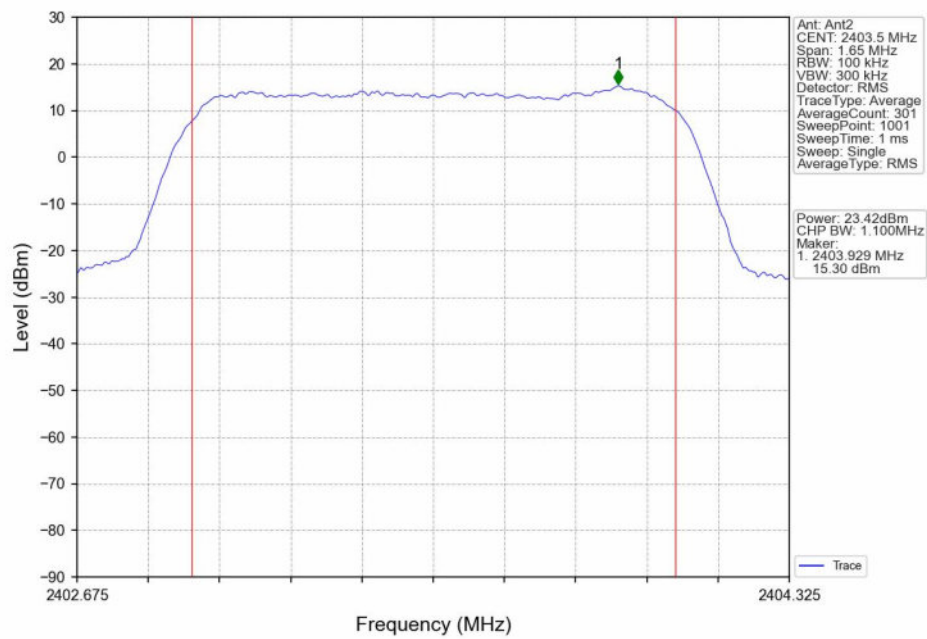




16QAM_LCH_2403.5MHz_Ant1_NTNV

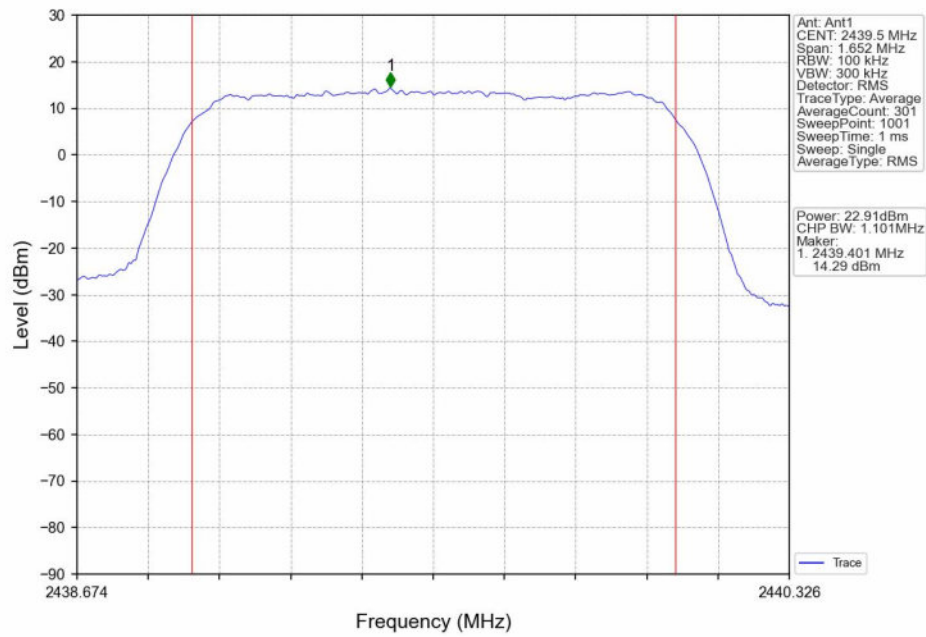


16QAM_LCH_2403.5MHz_Ant2_NTNV

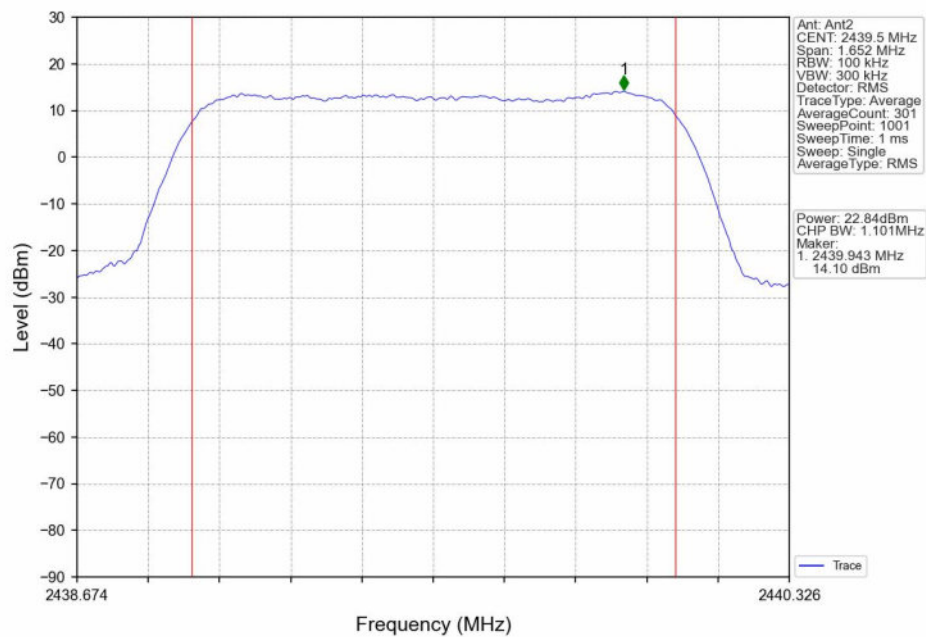




16QAM_MCH_2439.5MHz_Ant1_NTNV

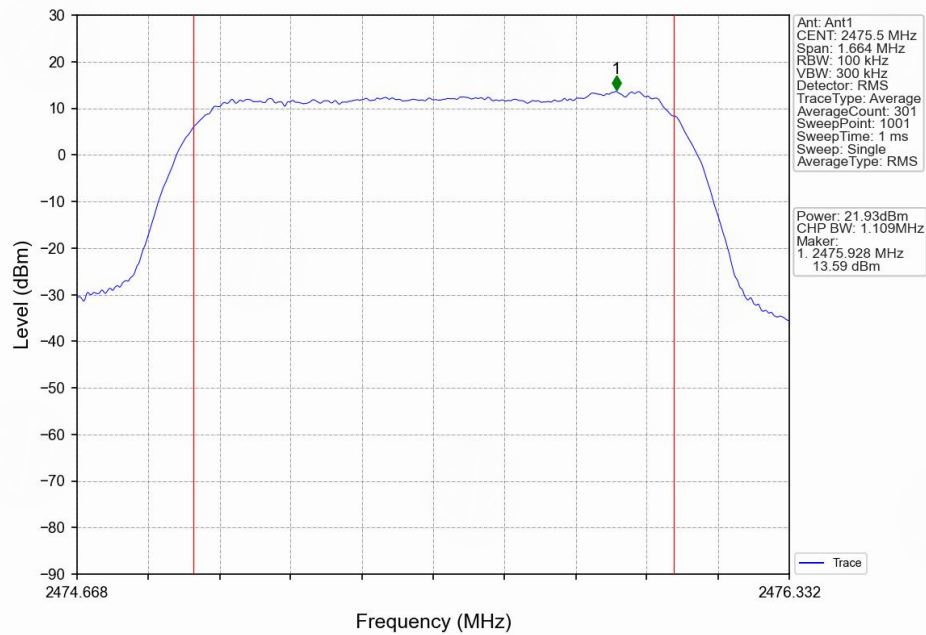


16QAM_MCH_2439.5MHz_Ant2_NTNV

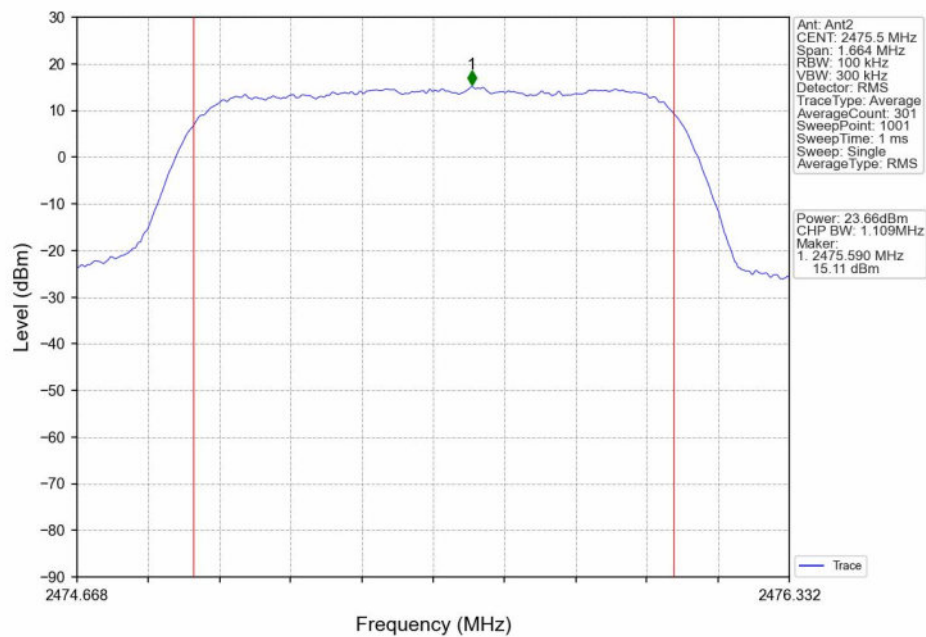




16QAM_HCH_2475.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant2_NTNV





4. Maximum Power Spectral Density

4.1 PSD

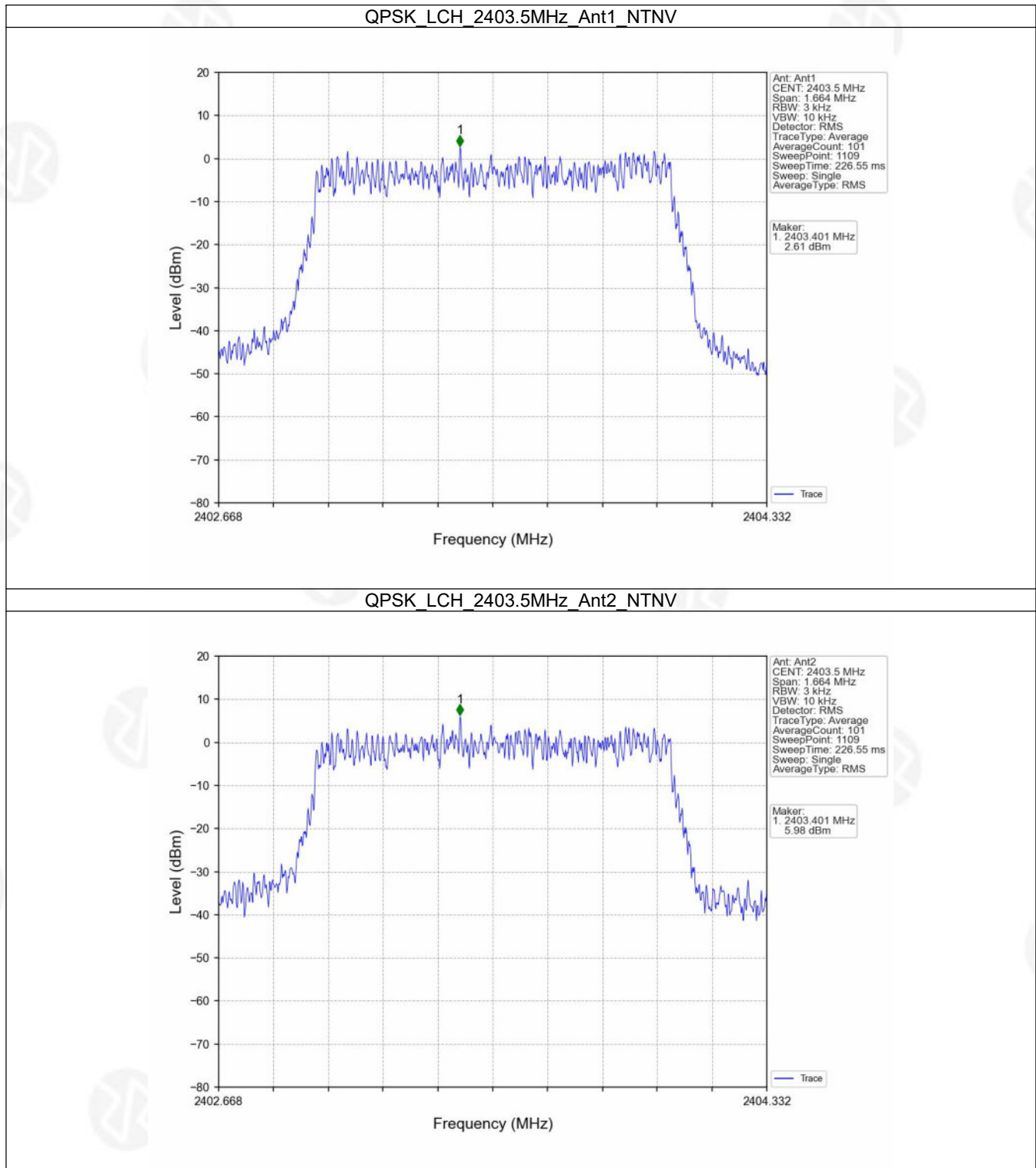
4.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)				Verdict
			ANT1	ANT2	MIMO	Limit	
QPSK	MIMO	2403.5	2.61	5.98	7.63	<=8	Pass
		2439.5	2.74	5.62	7.43	<=8	Pass
		2475.5	4.37	2.91	6.68	<=8	Pass
16QAM	MIMO	2403.5	4.79	4.52	7.67	<=8	Pass
		2439.5	4.54	3.76	7.18	<=8	Pass
		2475.5	2.78	4.93	7.00	<=8	Pass

Note1: Antenna Gain: Ant1: 2.40dBi; Ant2: 2.30dBi;
Note2: Directional Gain: Uncorrelated(Directional Gain = Ant Gain)

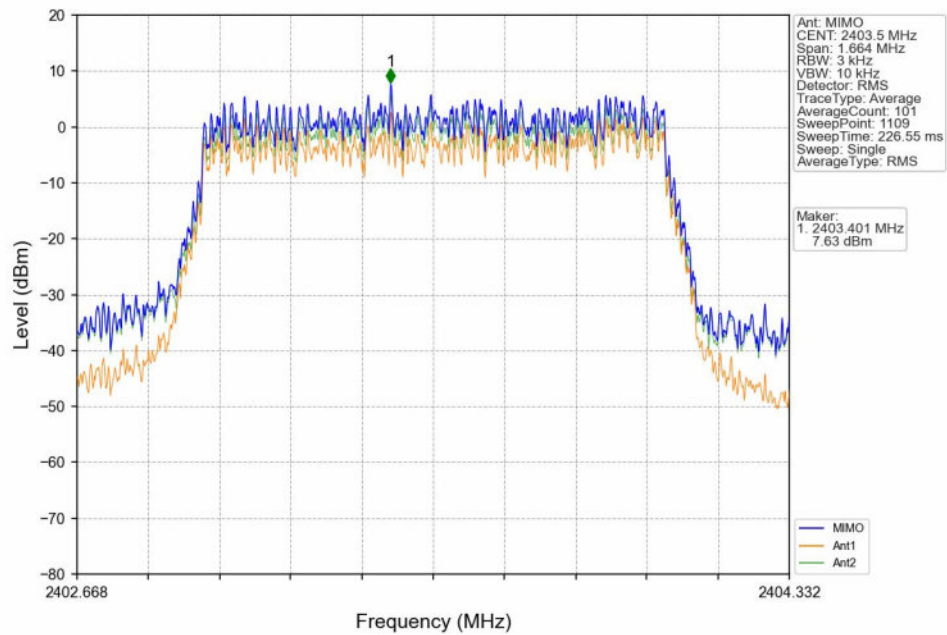


4.1.2 Test Graph

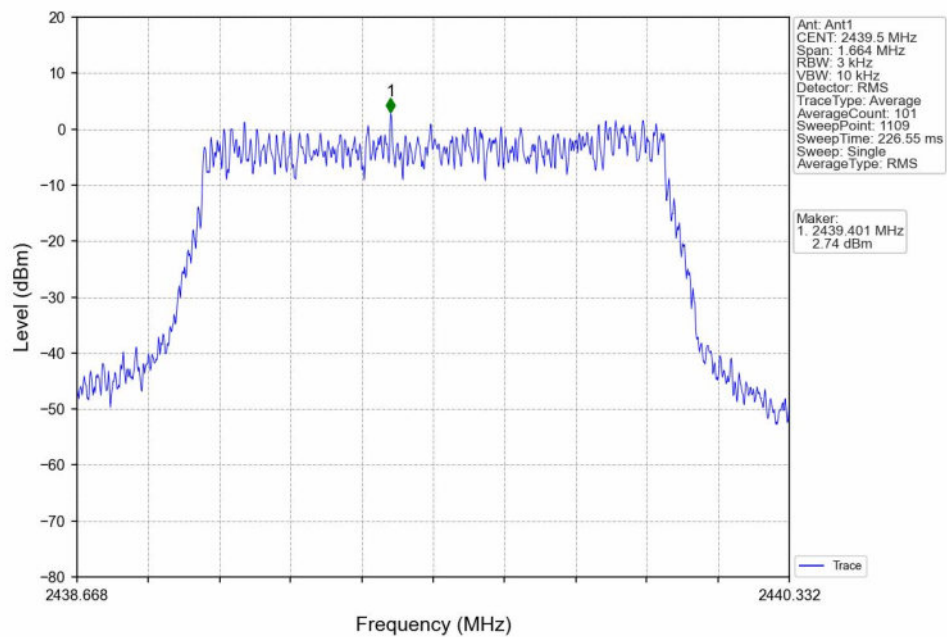




QPSK_LCH_2403.5MHz_MIMO_NTNV

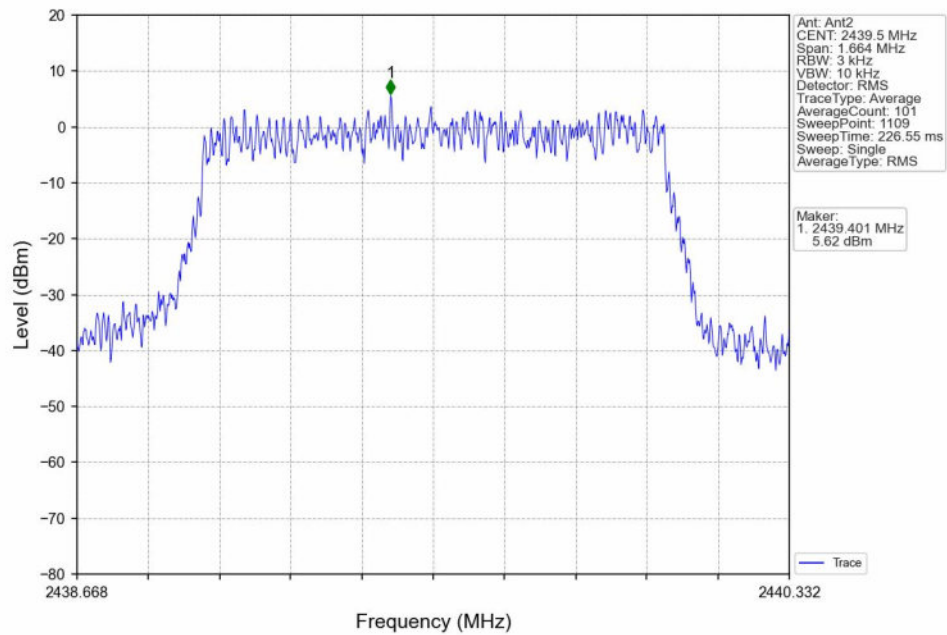


QPSK_MCH_2439.5MHz_Ant1_NTNV

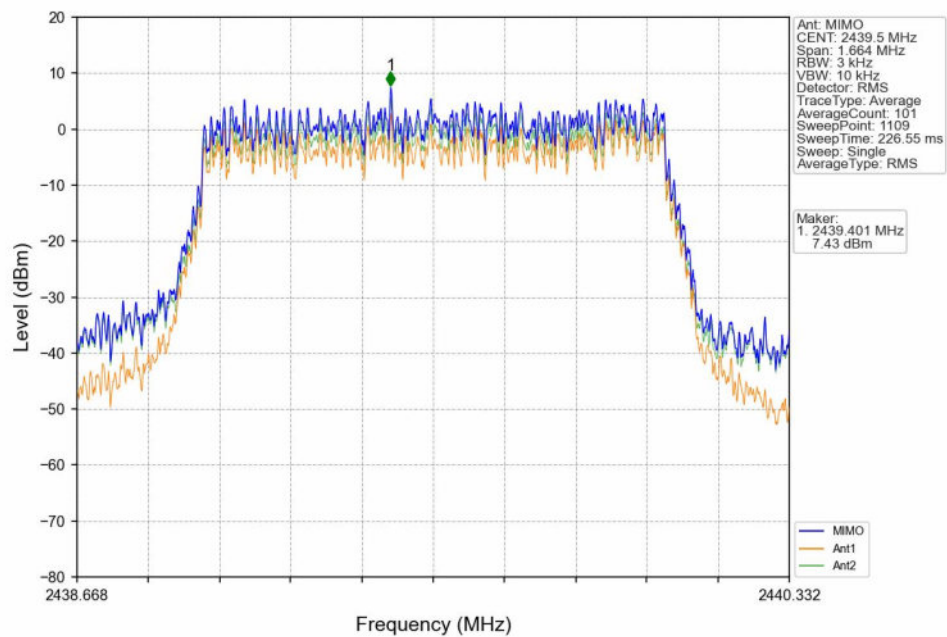




QPSK_MCH_2439.5MHz_Ant2_NTNV

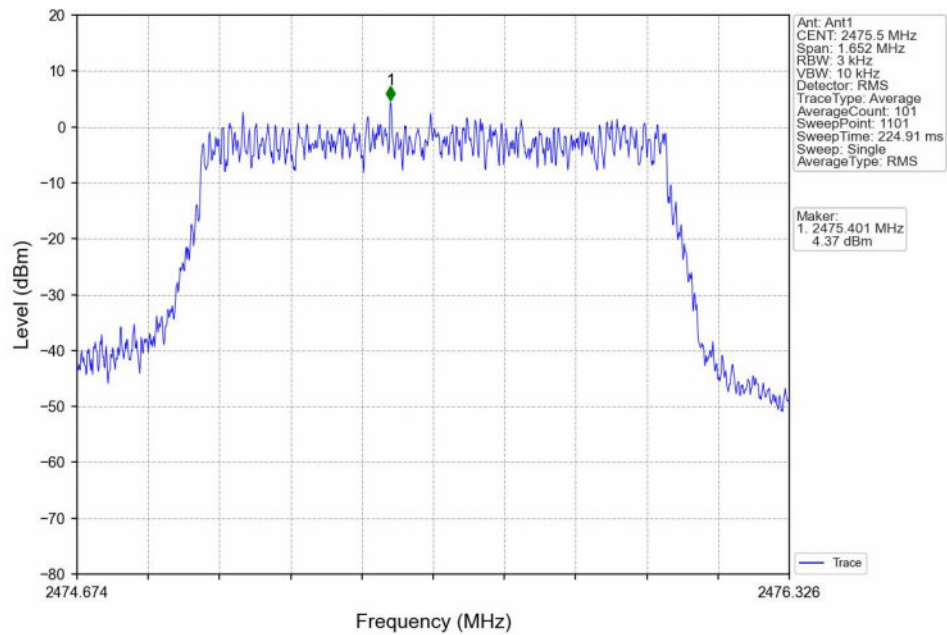


QPSK_MCH_2439.5MHz_MIMO_NTNV

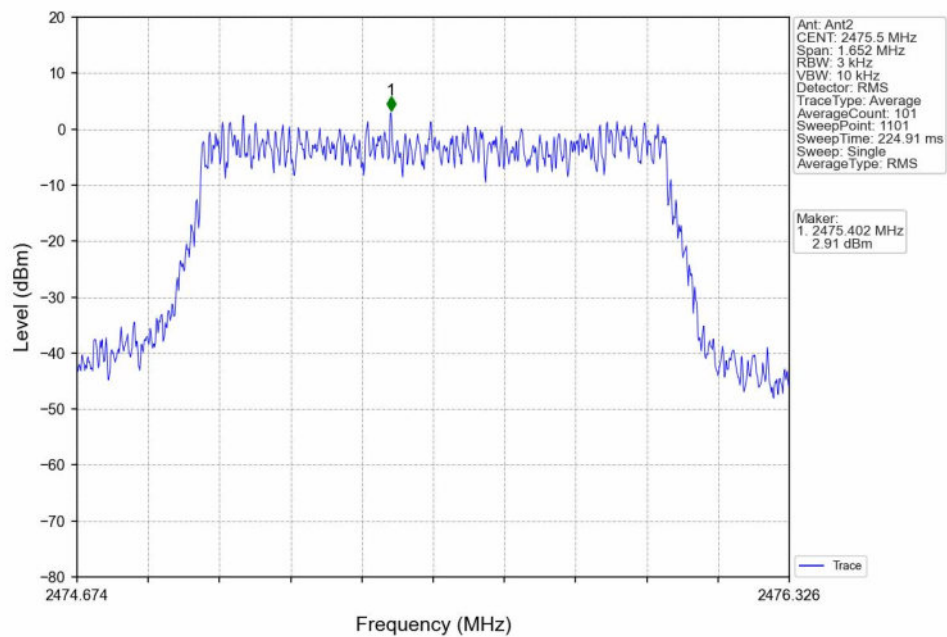




QPSK_HCH_2475.5MHz_Ant1_NTNV

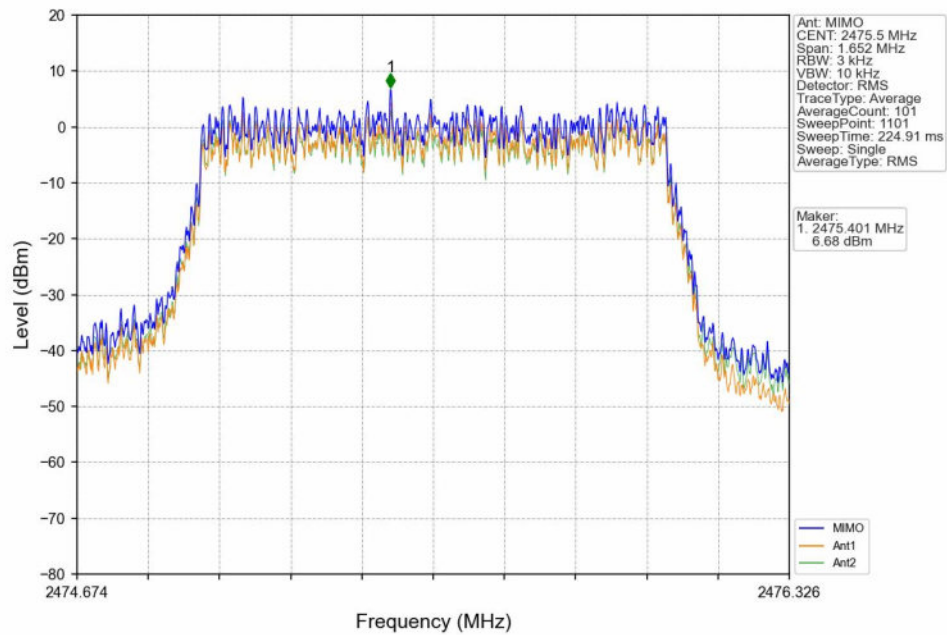


QPSK_HCH_2475.5MHz_Ant2_NTNV

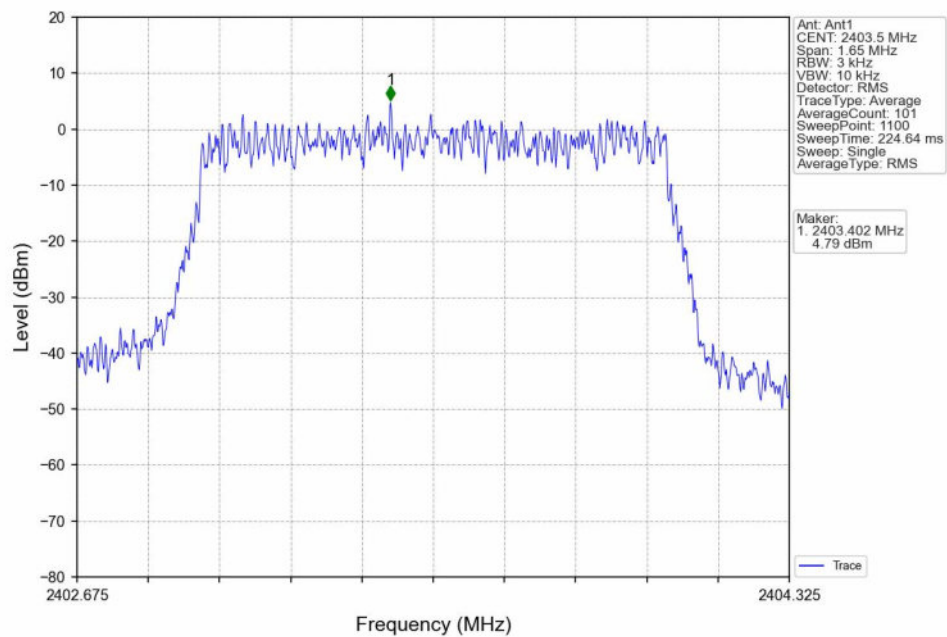




QPSK_HCH_2475.5MHz_MIMO_NTNV

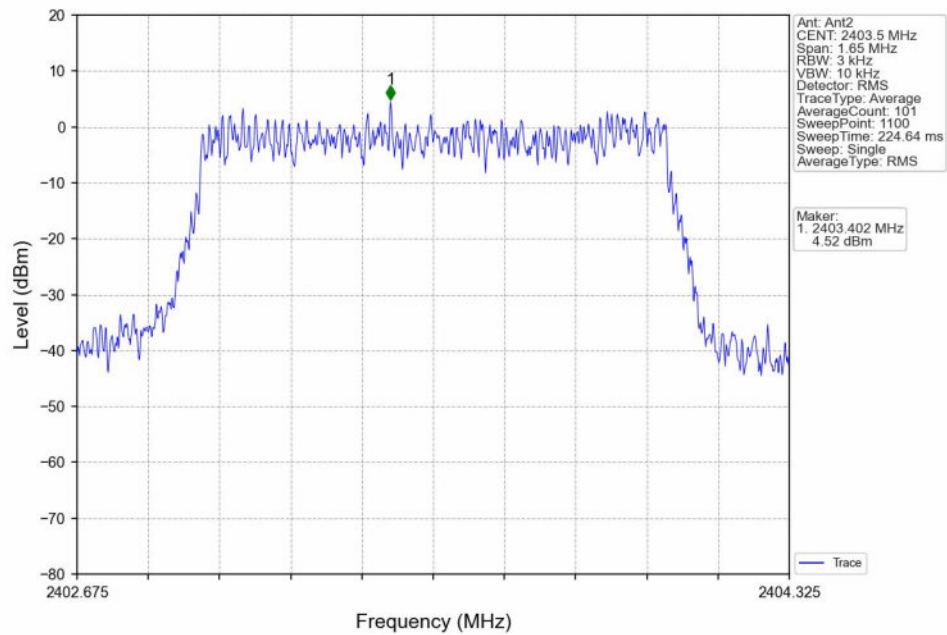


16QAM_LCH_2403.5MHz_Ant1_NTNV

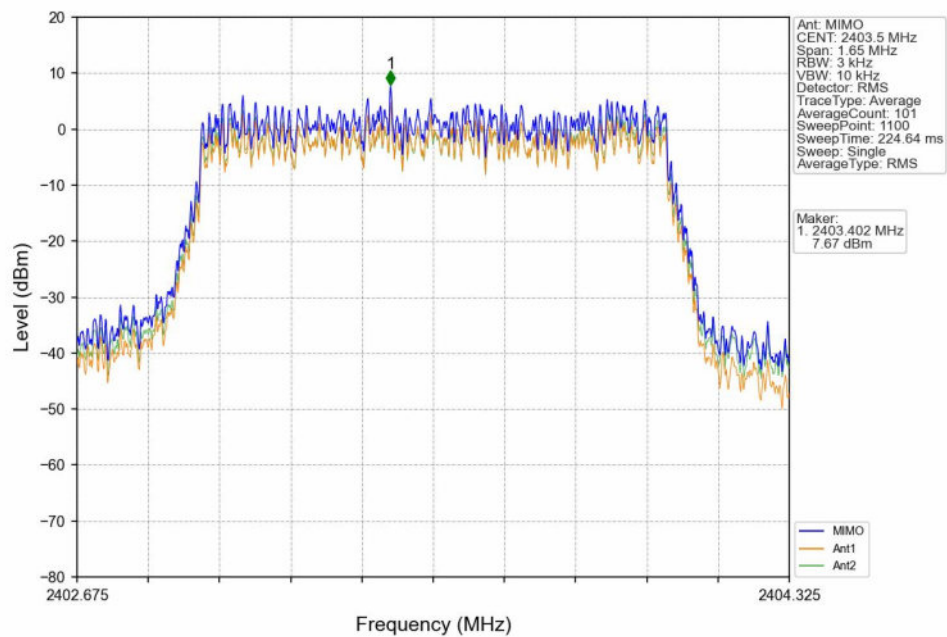




16QAM_LCH_2403.5MHz_Ant2_NTNV

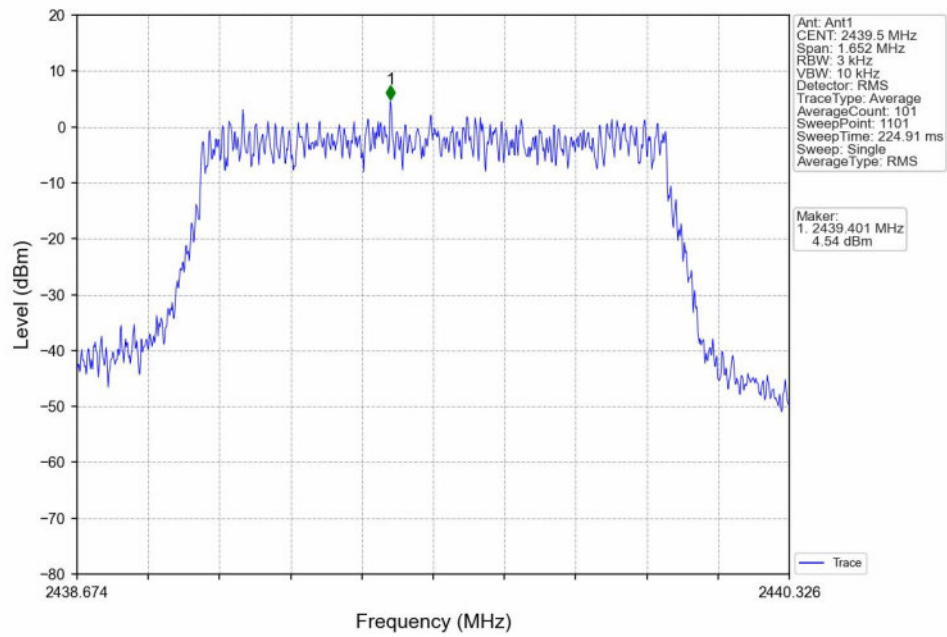


16QAM_LCH_2403.5MHz_MIMO_NTNV

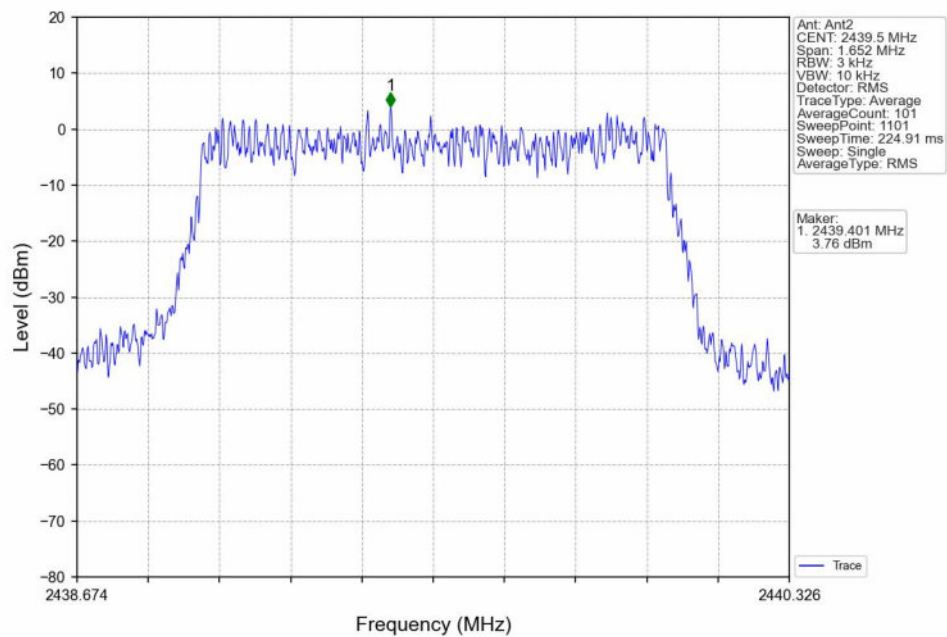




16QAM_MCH_2439.5MHz_Ant1_NTNV

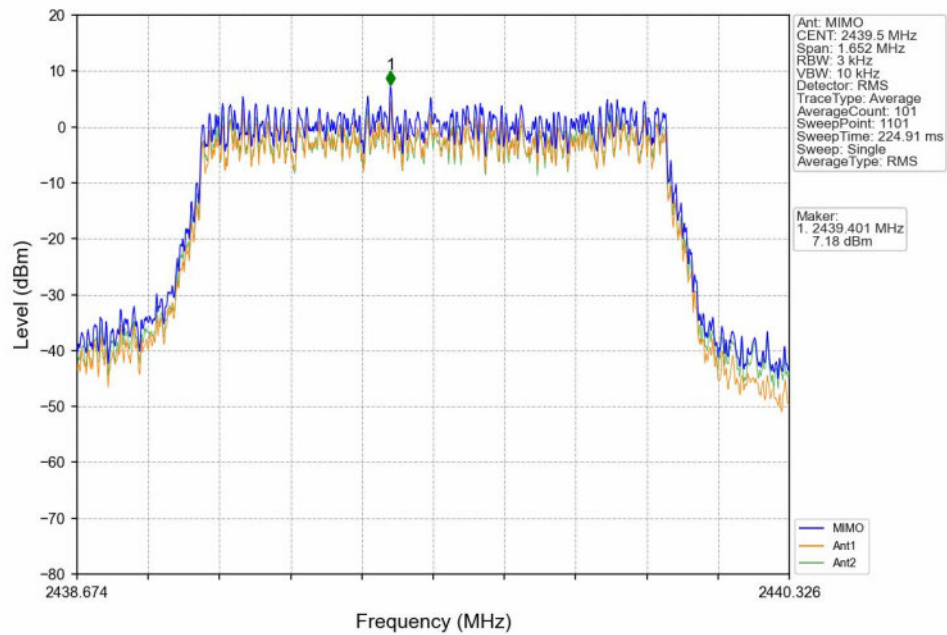


16QAM_MCH_2439.5MHz_Ant2_NTNV

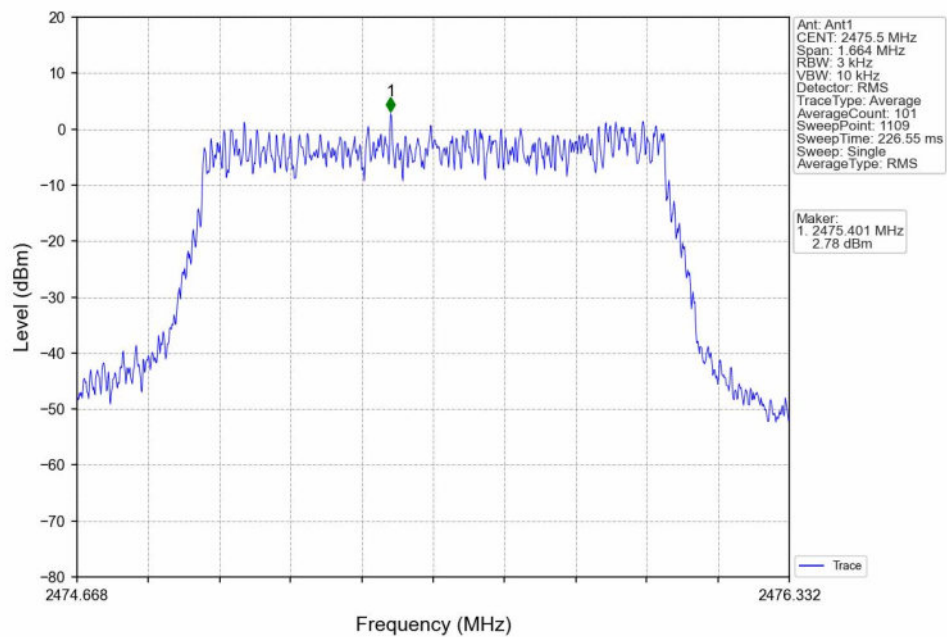




16QAM_MCH_2439.5MHz_MIMO_NTNV

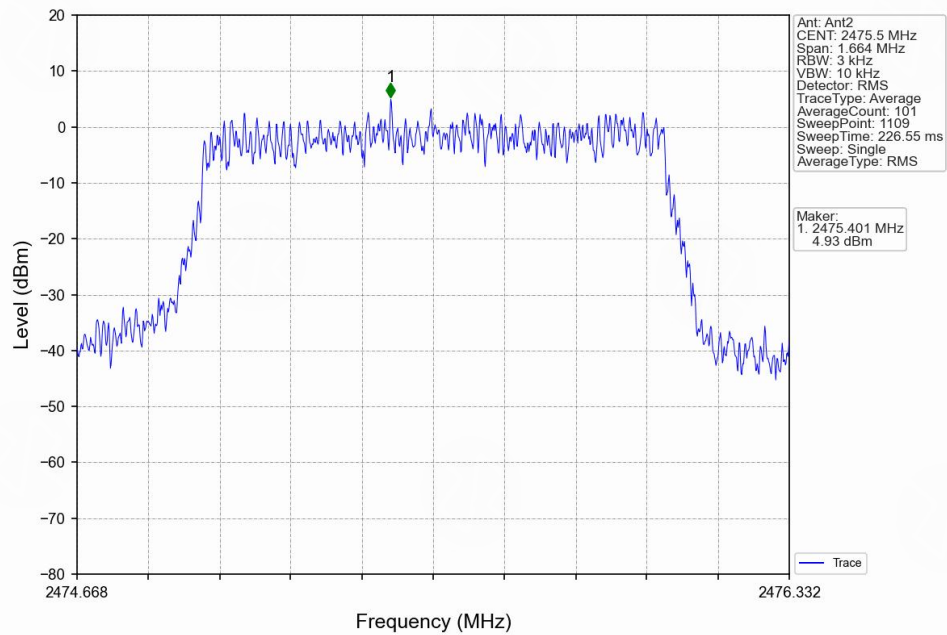


16QAM_HCH_2475.5MHz_Ant1_NTNV

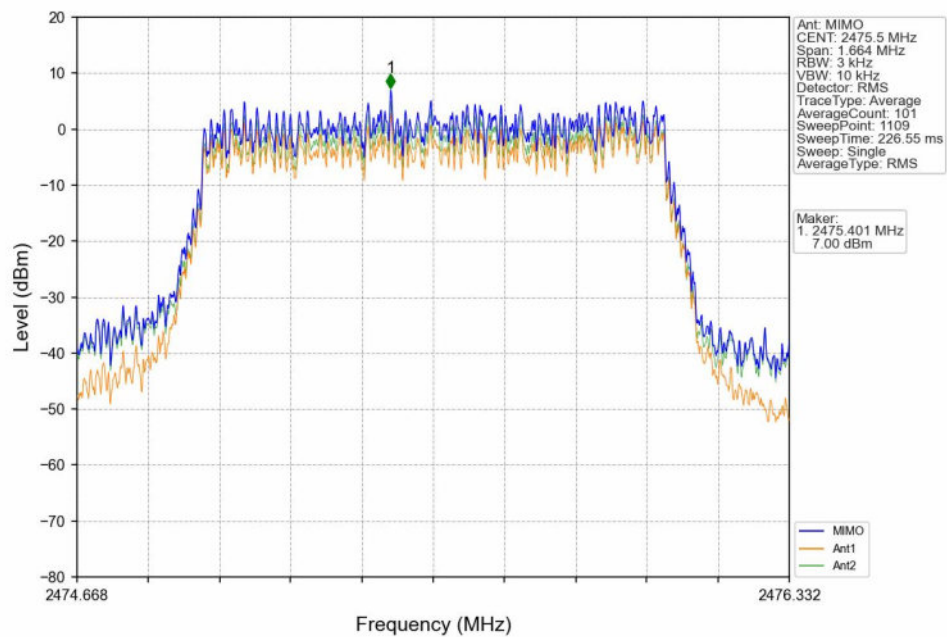




16QAM_HCH_2475.5MHz_Ant2_NTNV



16QAM_HCH_2475.5MHz_MIMO_NTNV





5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

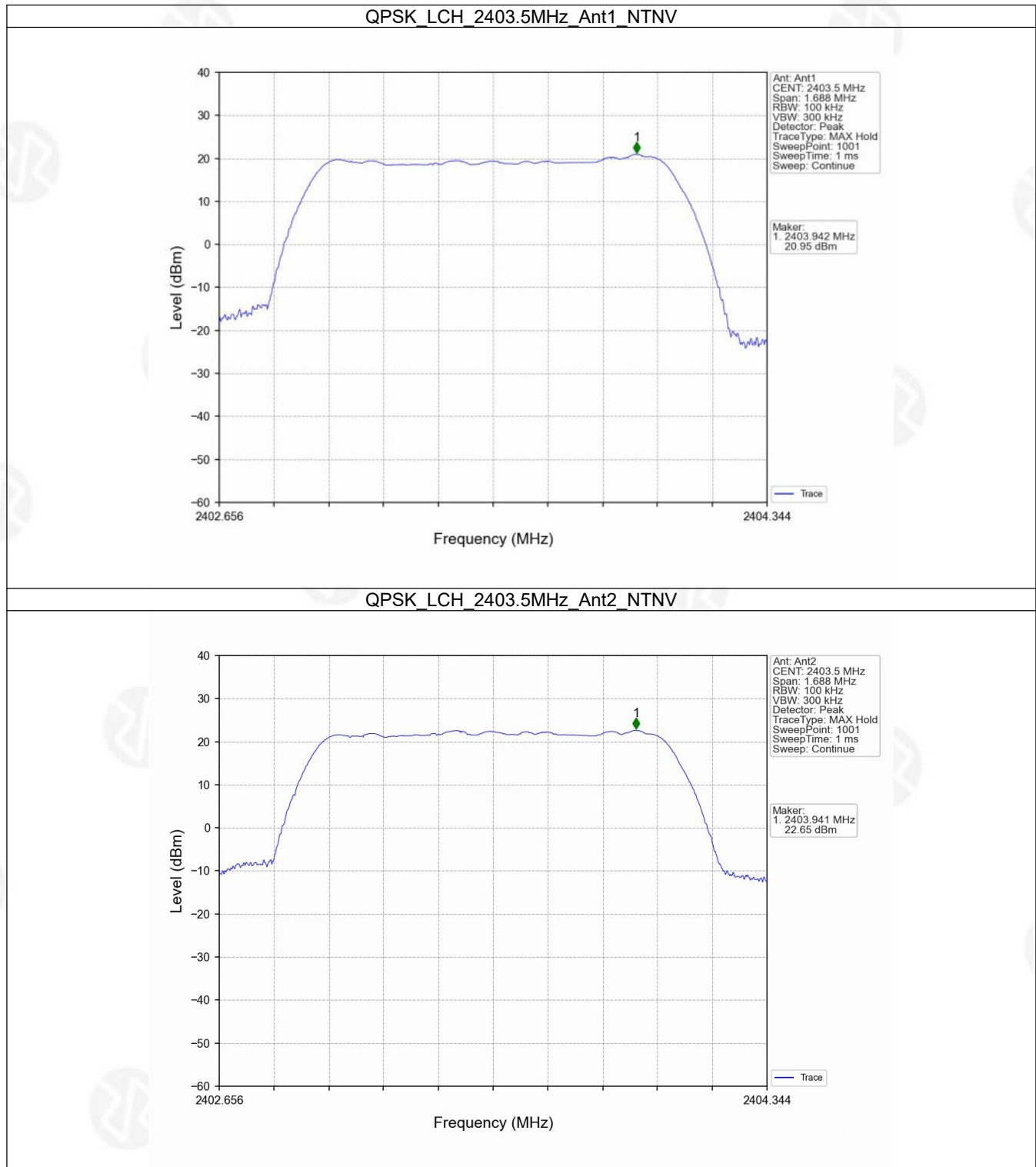
5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
QPSK	MIMO	2403.5	1	20.95
			2	22.65
		2439.5	1	20.87
			2	22.41
		2475.5	1	20.84
			2	20.57
16QAM	MIMO	2403.5	1	21.42
			2	21.89
		2439.5	1	21.03
			2	21.20
		2475.5	1	20.70
			2	21.87

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.

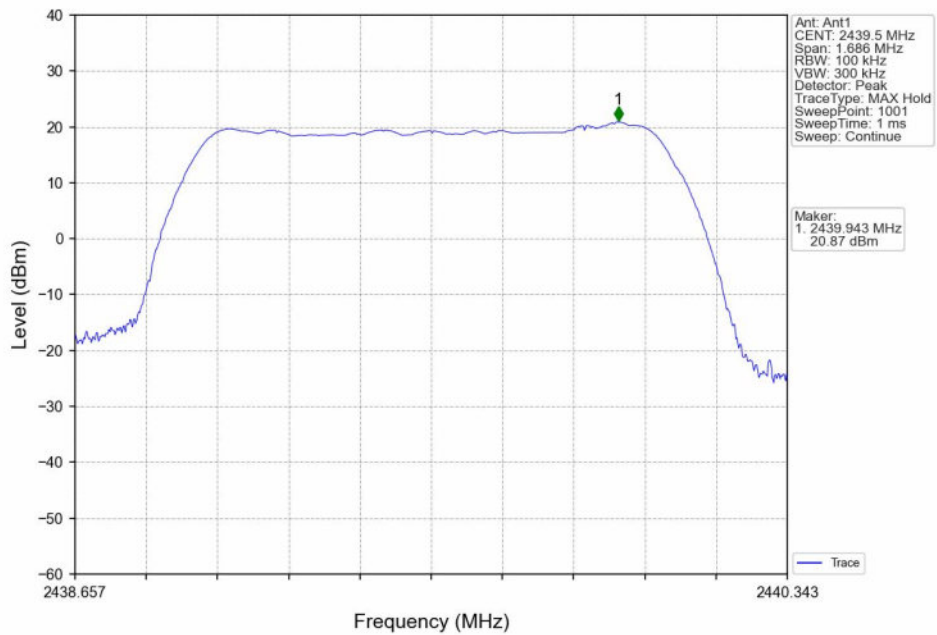


5.1.2 Test Graph

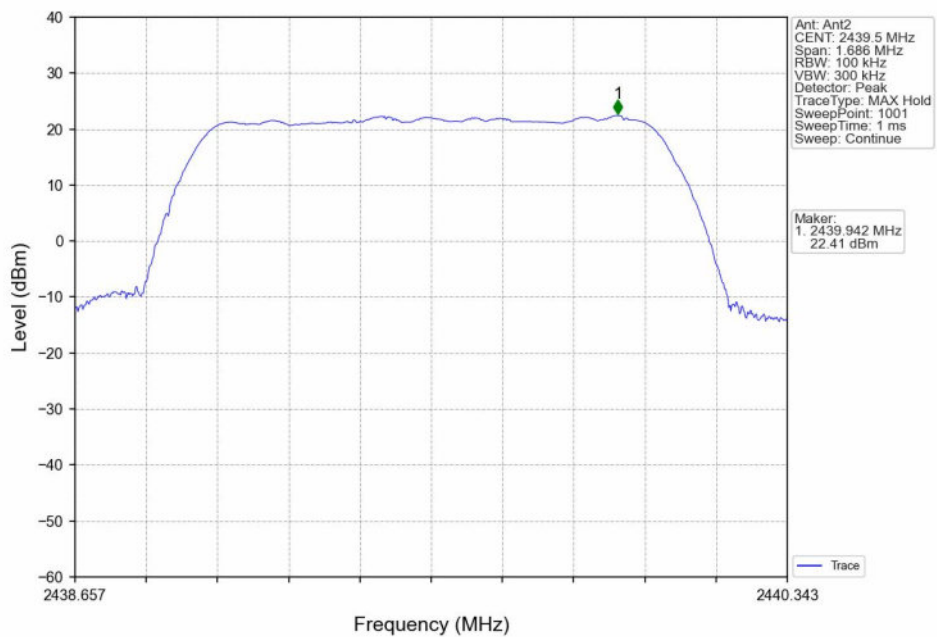




QPSK_MCH_2439.5MHz_Ant1_NTNV

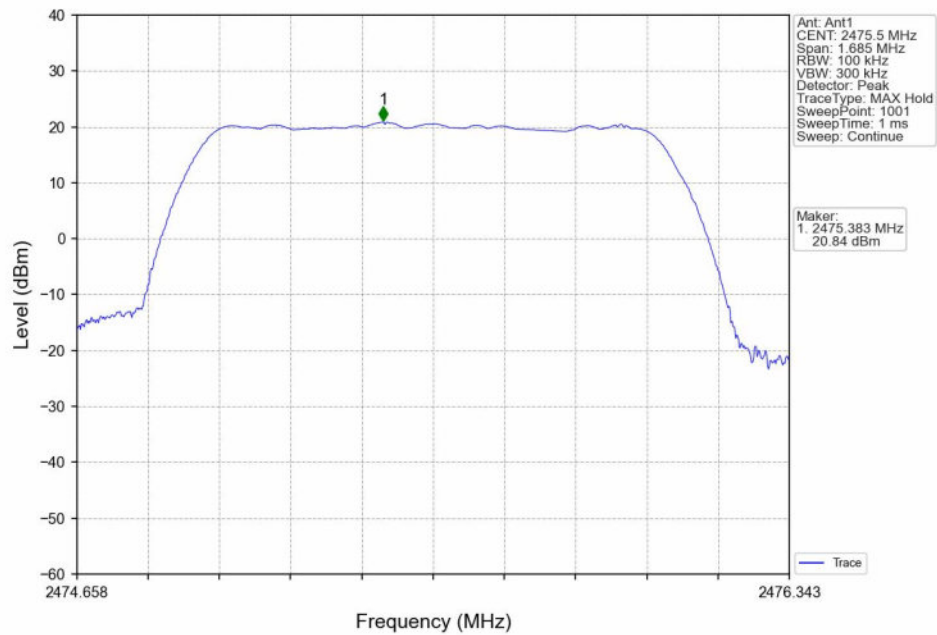


QPSK_MCH_2439.5MHz_Ant2_NTNV

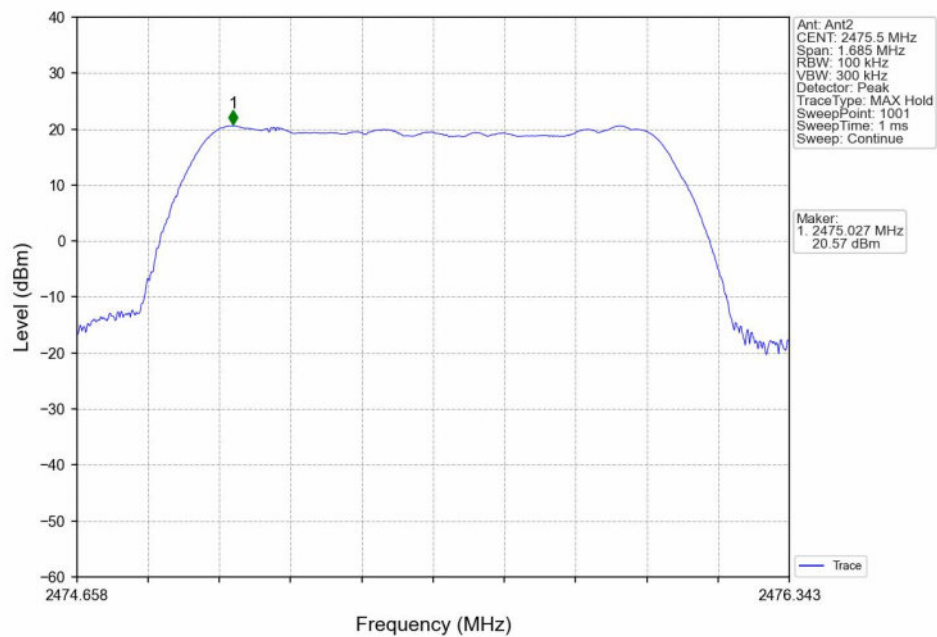




QPSK_HCH_2475.5MHz_Ant1_NTNV

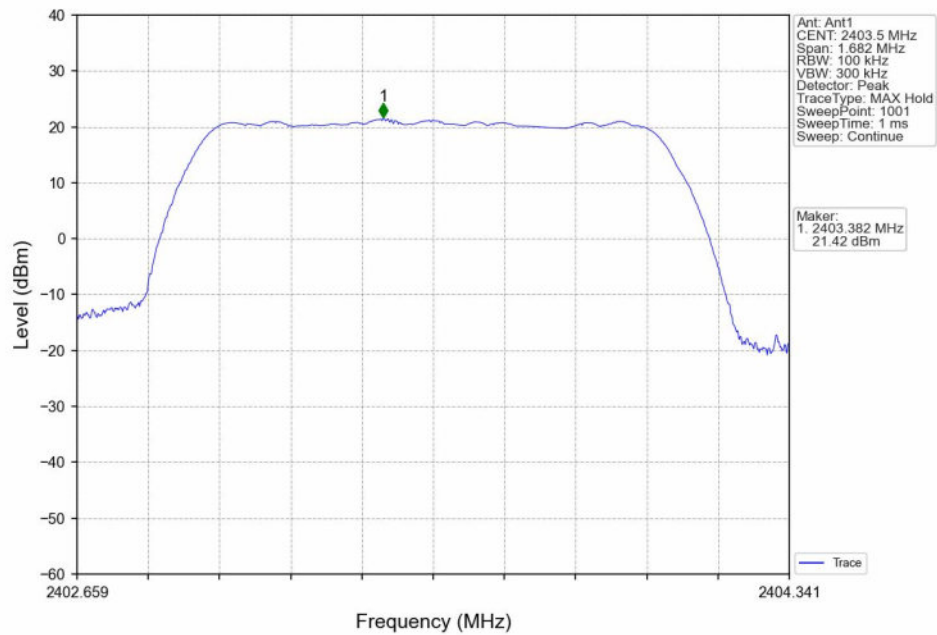


QPSK_HCH_2475.5MHz_Ant2_NTNV

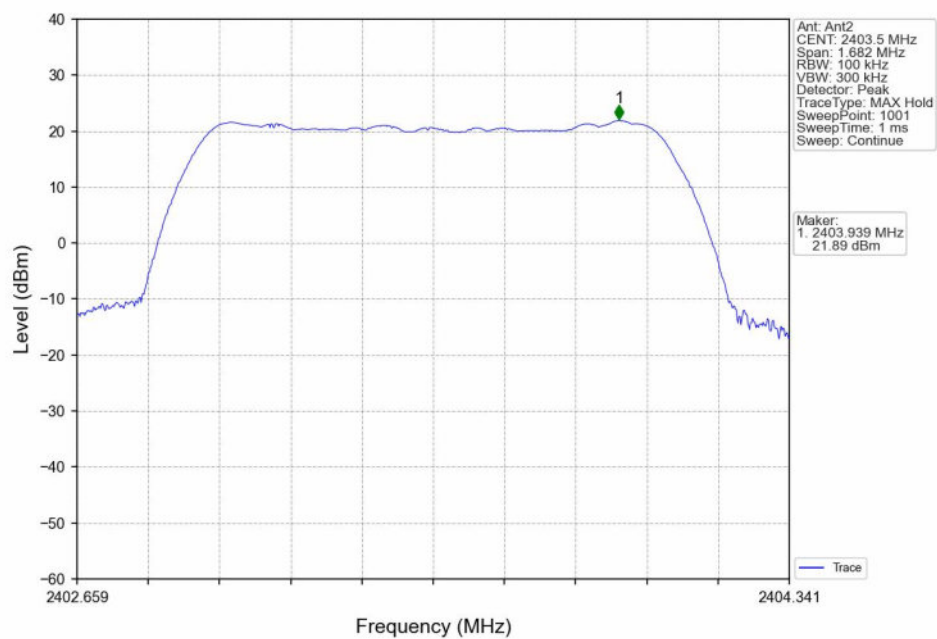




16QAM_LCH_2403.5MHz_Ant1_NTNV

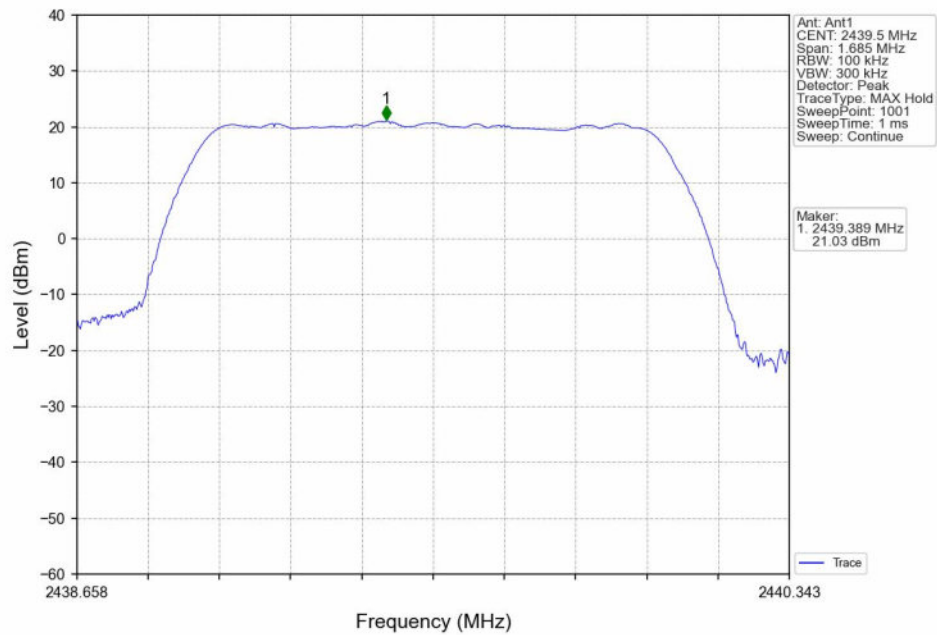


16QAM_LCH_2403.5MHz_Ant2_NTNV

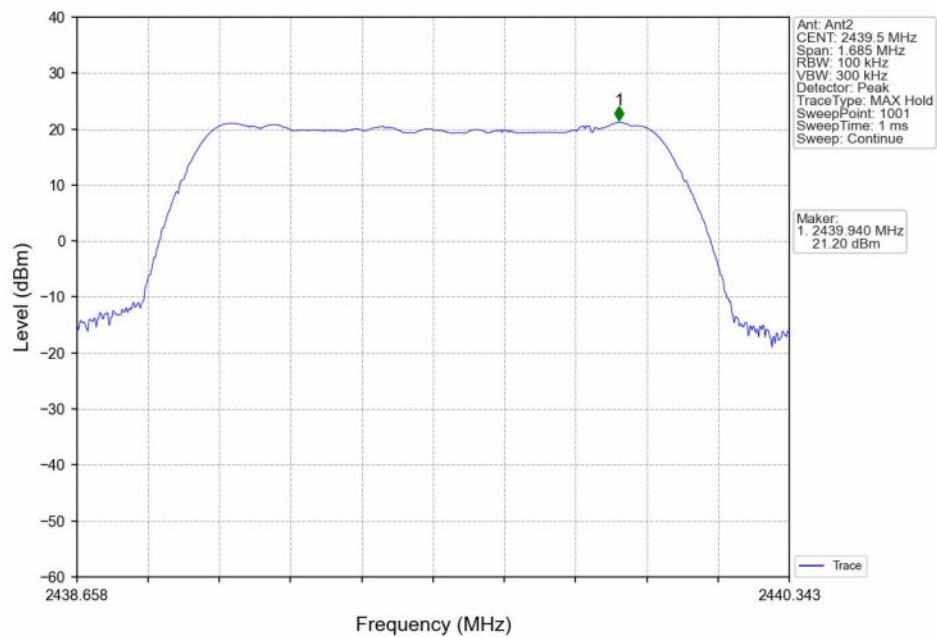




16QAM_MCH_2439.5MHz_Ant1_NTNV

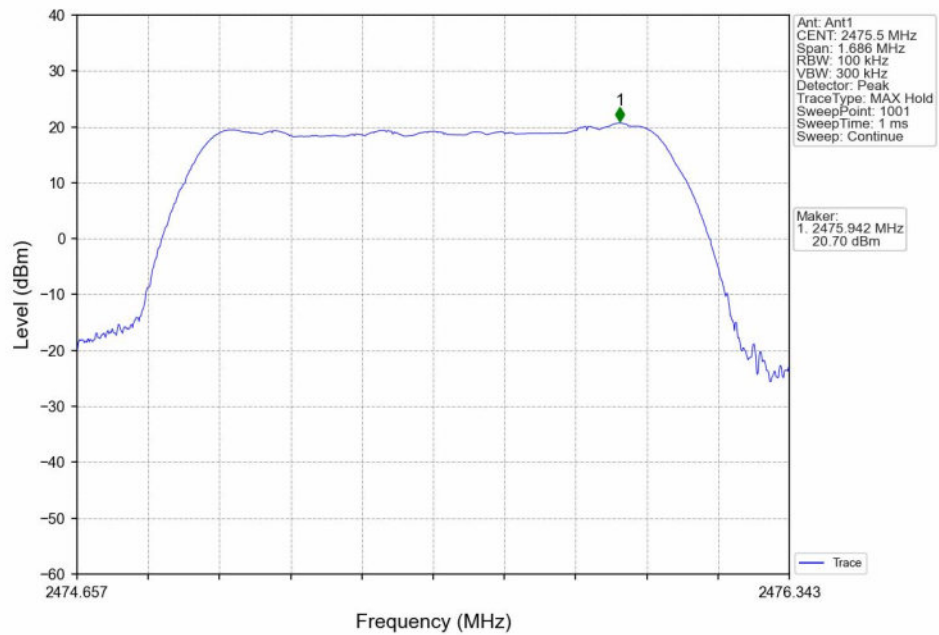


16QAM_MCH_2439.5MHz_Ant2_NTNV

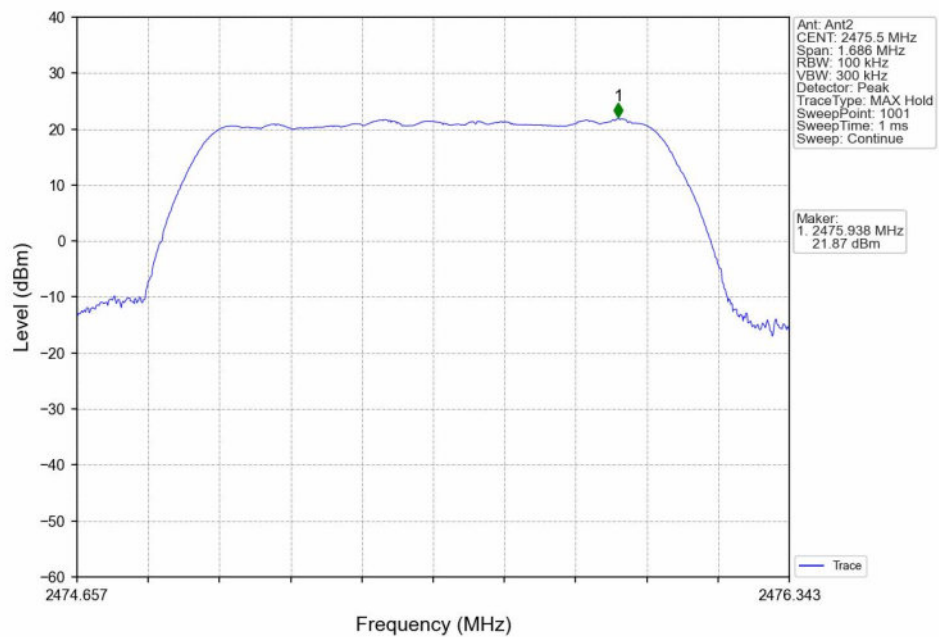




16QAM_HCH_2475.5MHz_Ant1_NTNV



16QAM_HCH_2475.5MHz_Ant2_NTNV





5.2 CSE

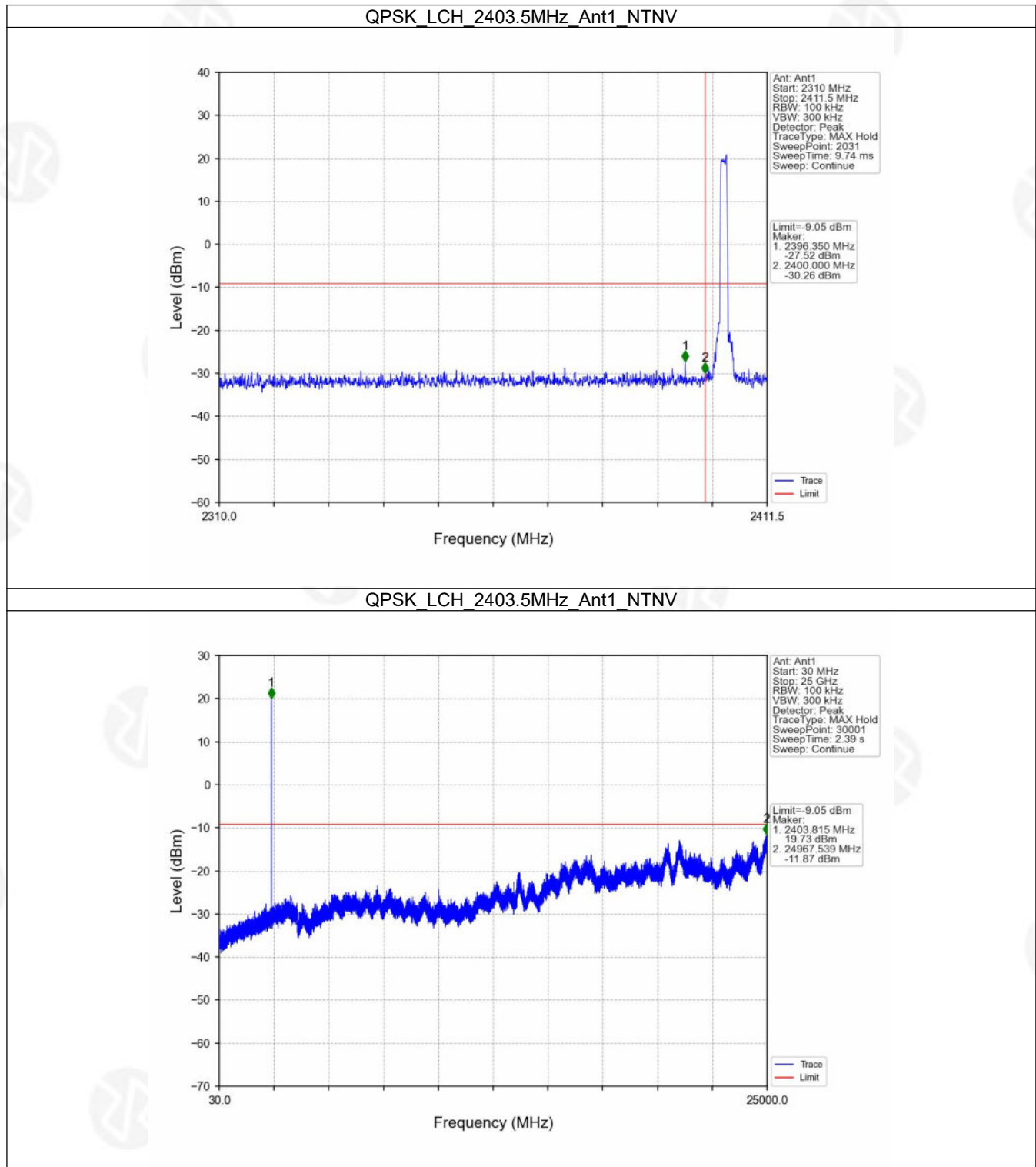
5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
QPSK	MIMO	2403.5	1	20.95	-9.05	Pass
			2	22.65	-7.35	Pass
		2439.5	1	20.95	-9.05	Pass
			2	22.65	-7.35	Pass
		2475.5	1	20.95	-9.05	Pass
			2	22.65	-7.35	Pass
16QAM	MIMO	2403.5	1	21.42	-8.58	Pass
			2	21.89	-8.11	Pass
		2439.5	1	21.42	-8.58	Pass
			2	21.89	-8.11	Pass
		2475.5	1	21.42	-8.58	Pass
			2	21.89	-8.11	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.

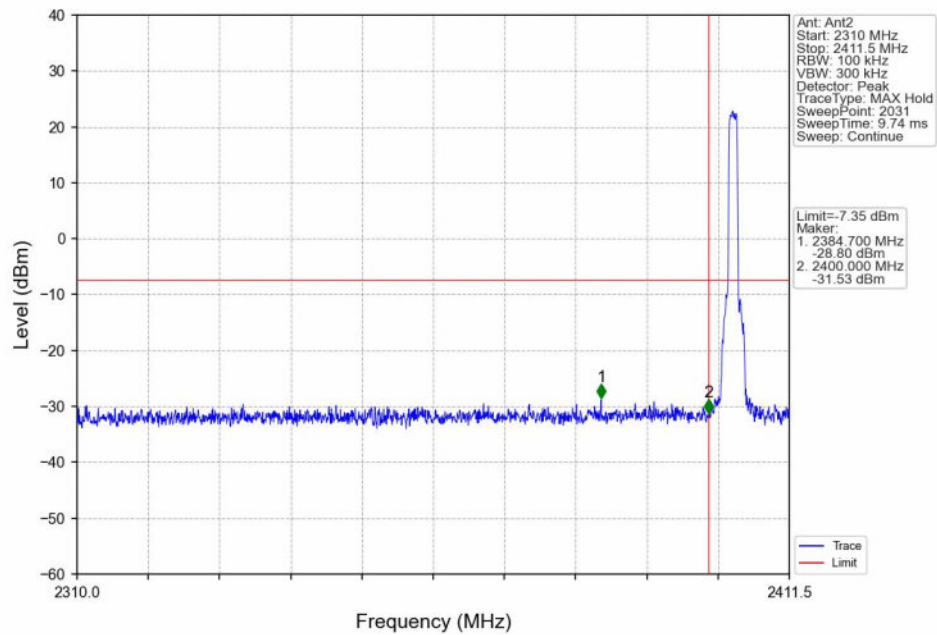


5.2.2 Test Graph

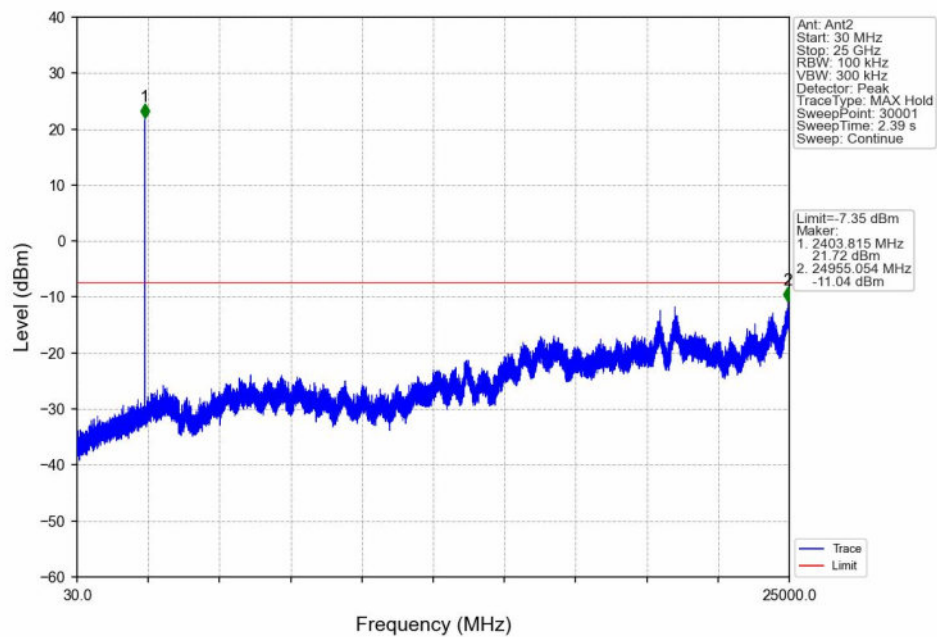




QPSK_LCH_2403.5MHz_Ant2_NTNV

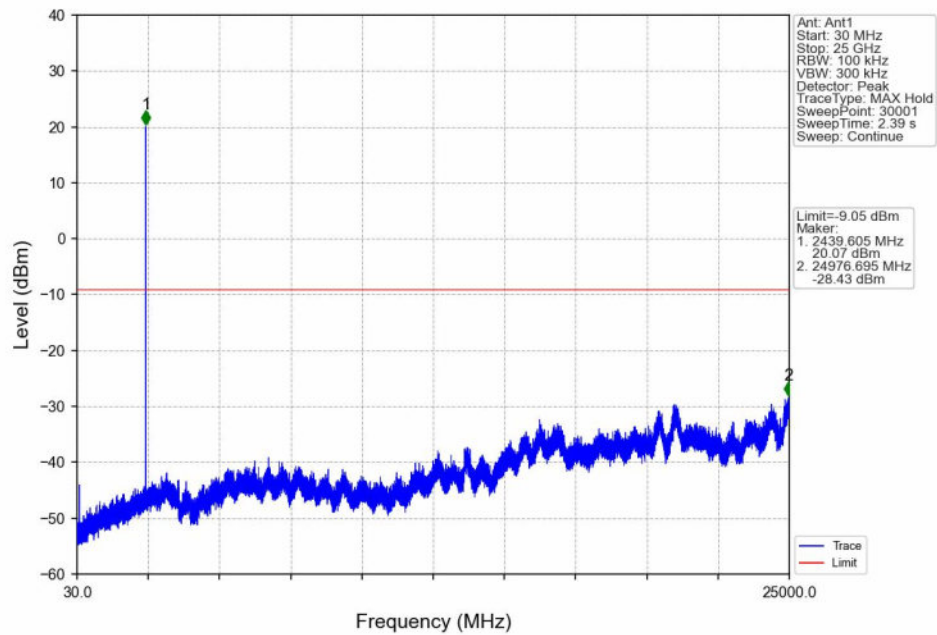


QPSK_LCH_2403.5MHz_Ant2_NTNV

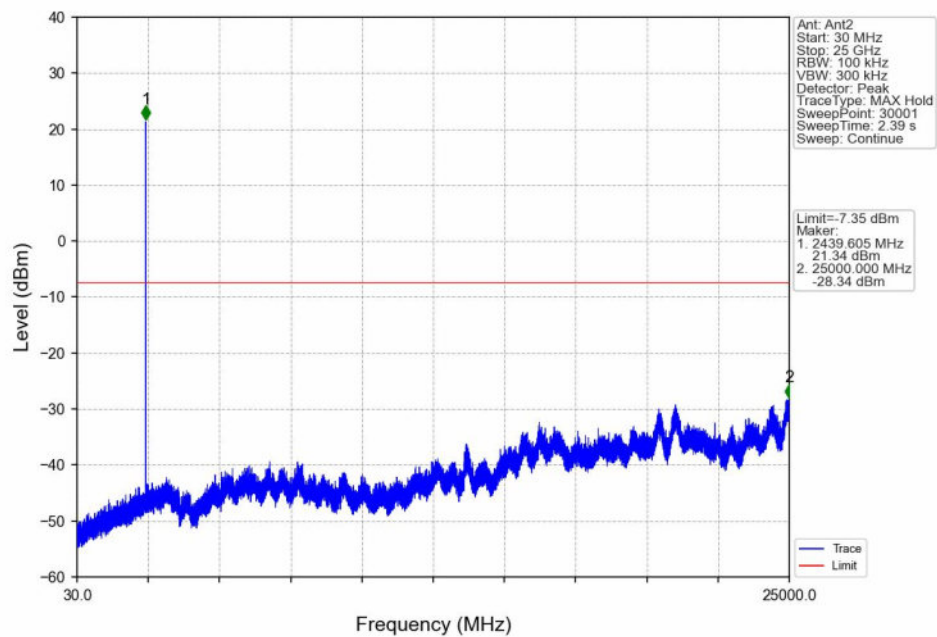




QPSK_MCH_2439.5MHz_Ant1_NTNV

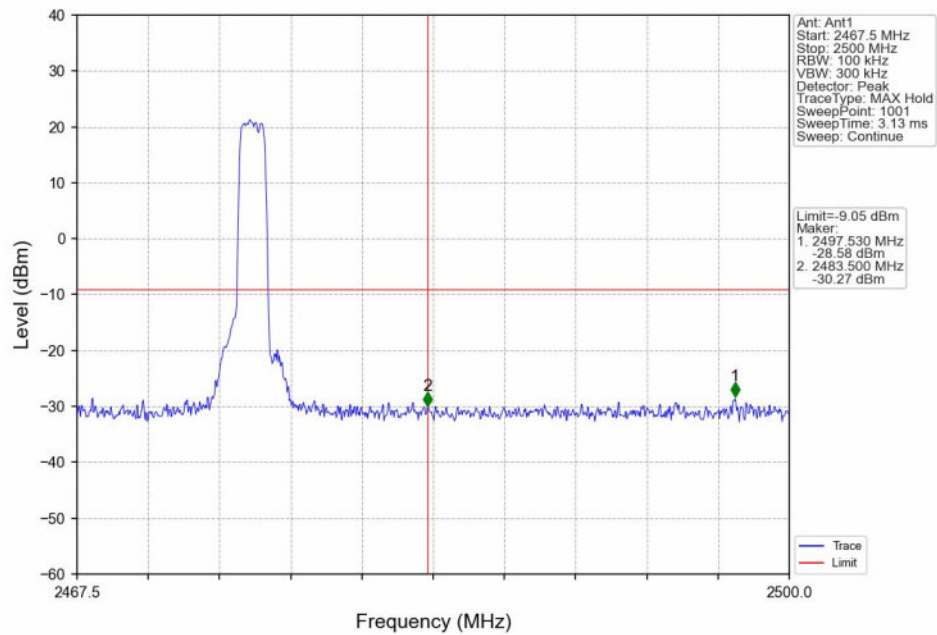


QPSK_MCH_2439.5MHz_Ant2_NTNV

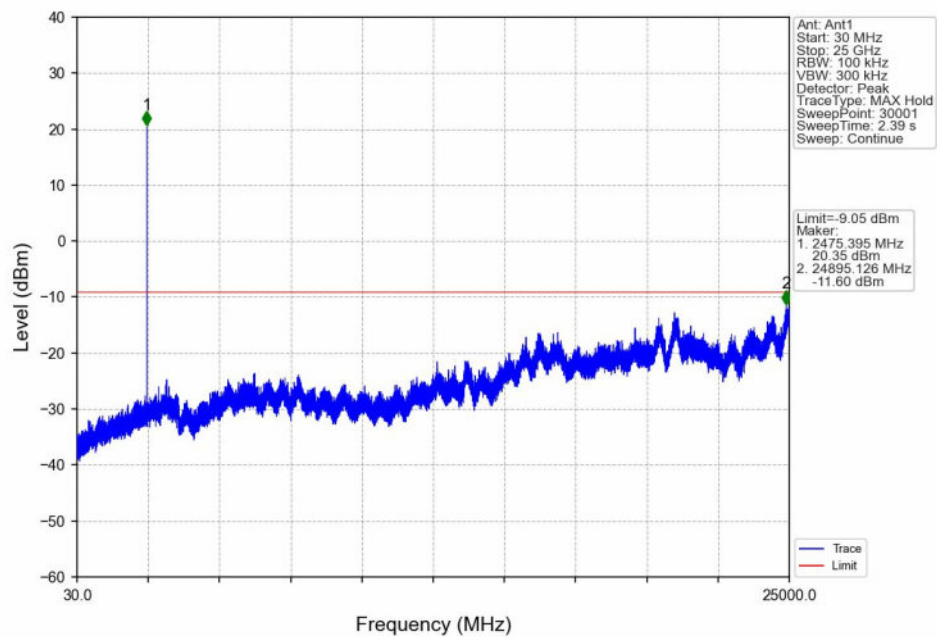




QPSK_HCH_2475.5MHz_Ant1_NTNV

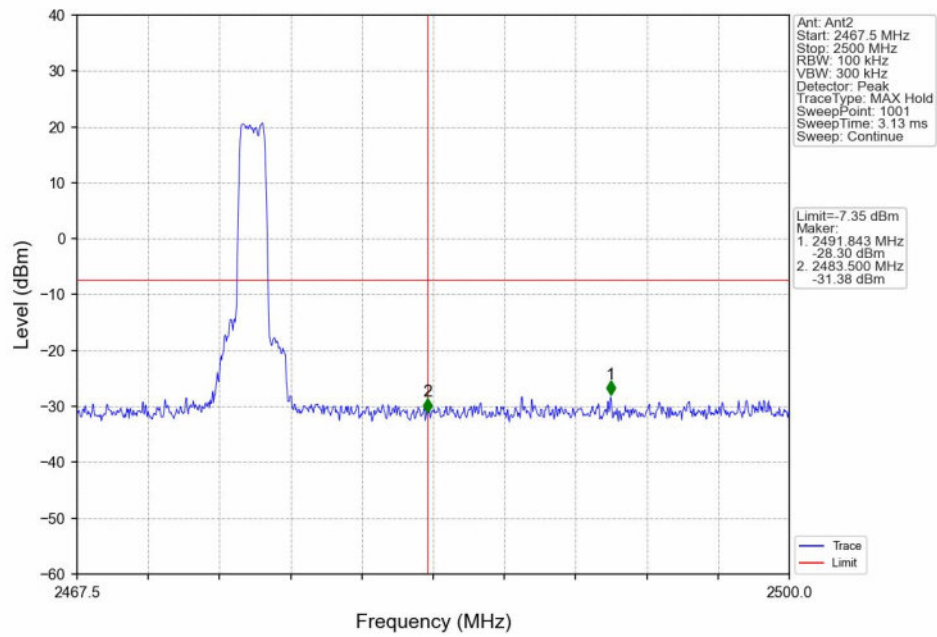


QPSK_HCH_2475.5MHz_Ant1_NTNV

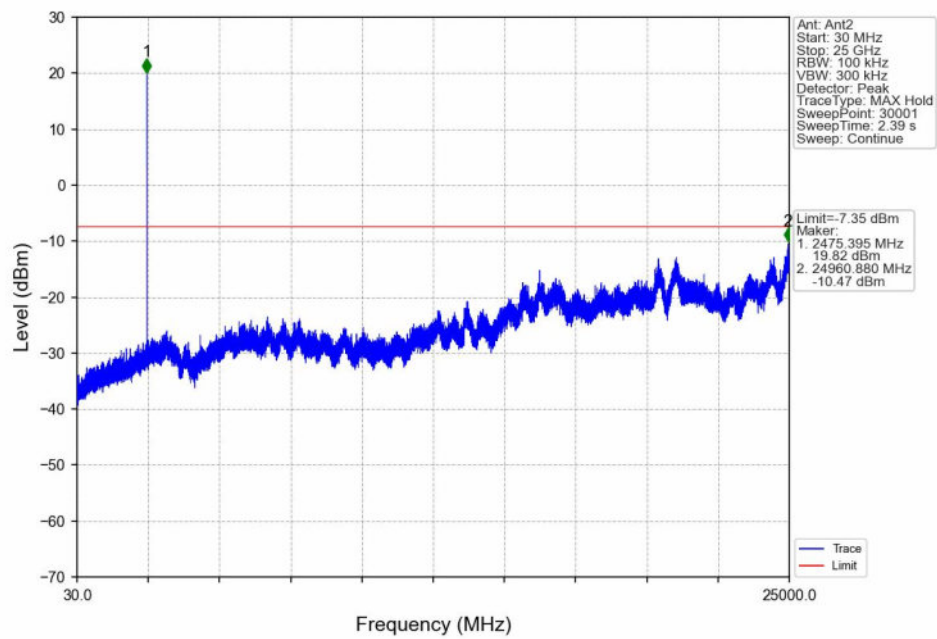




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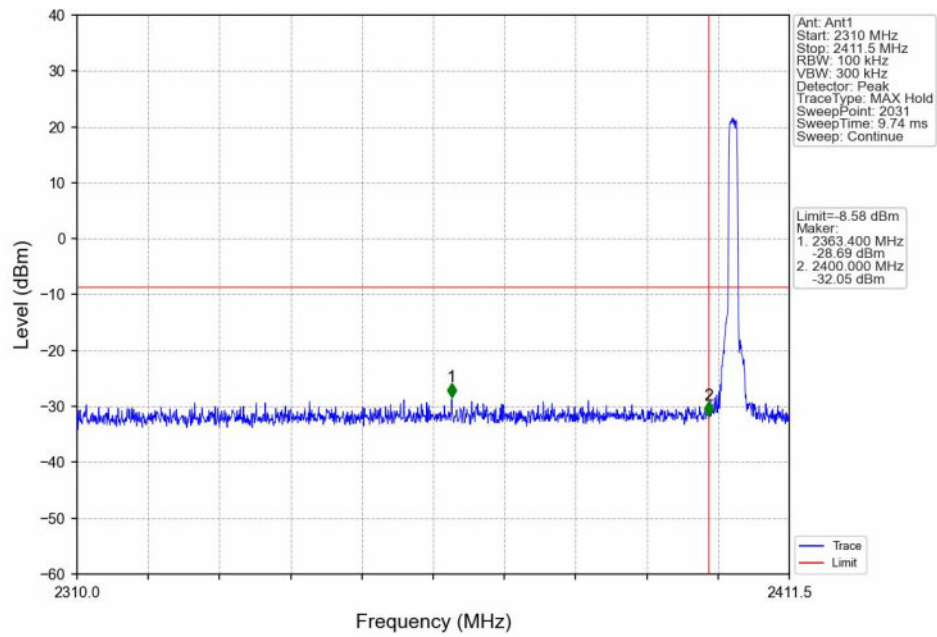


QPSK_HCH_2475.5MHz_Ant2_NTNV

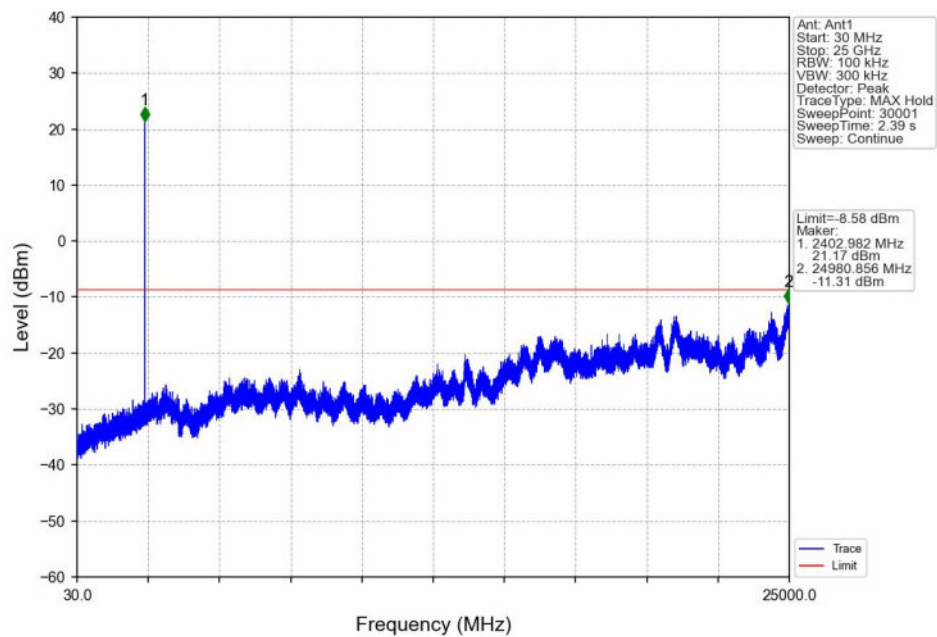




16QAM_LCH_2403.5MHz_Ant1_NTNV

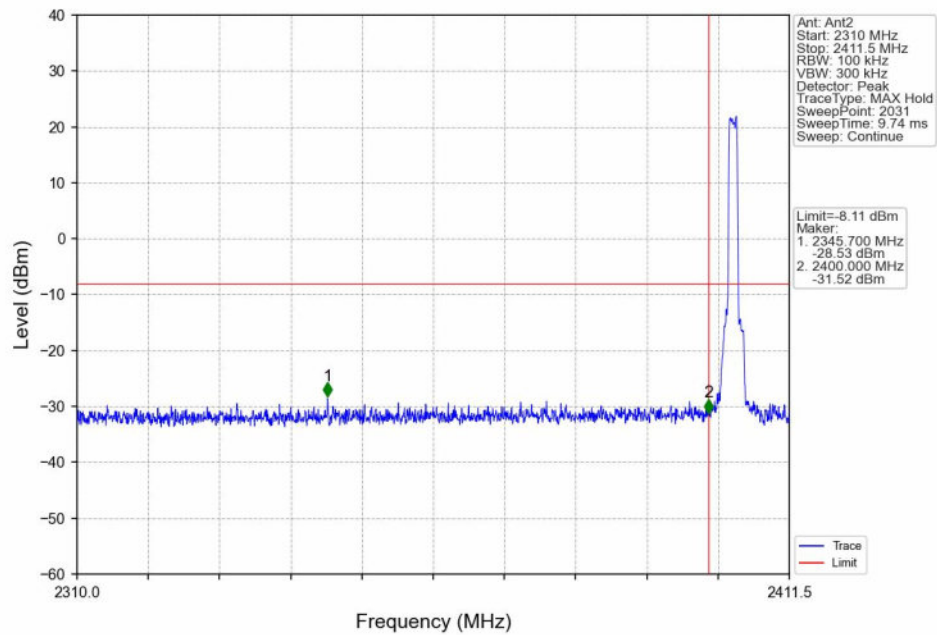


16QAM_LCH_2403.5MHz_Ant1_NTNV

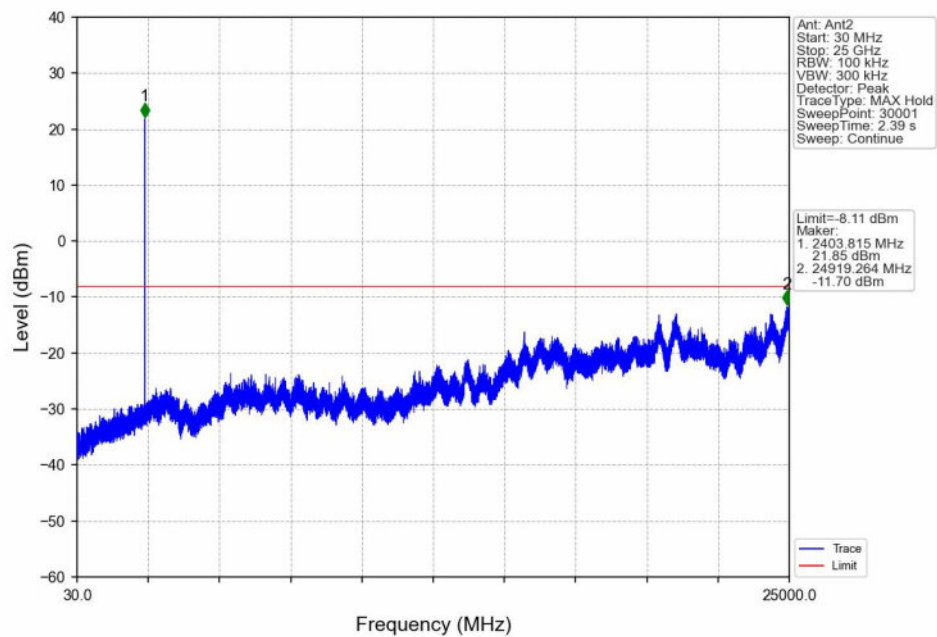




16QAM_LCH_2403.5MHz_Ant2_NTNV

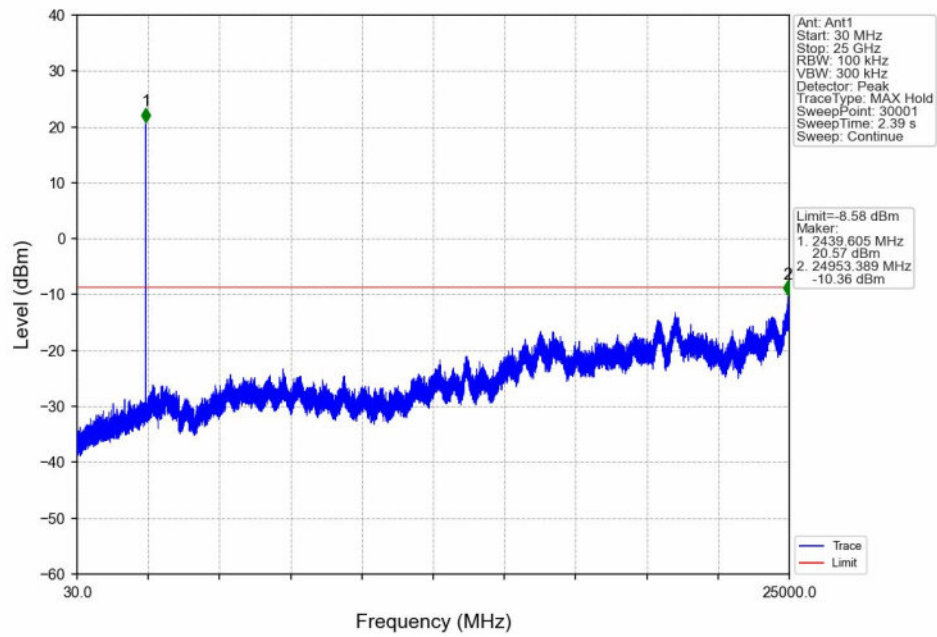


16QAM_LCH_2403.5MHz_Ant2_NTNV

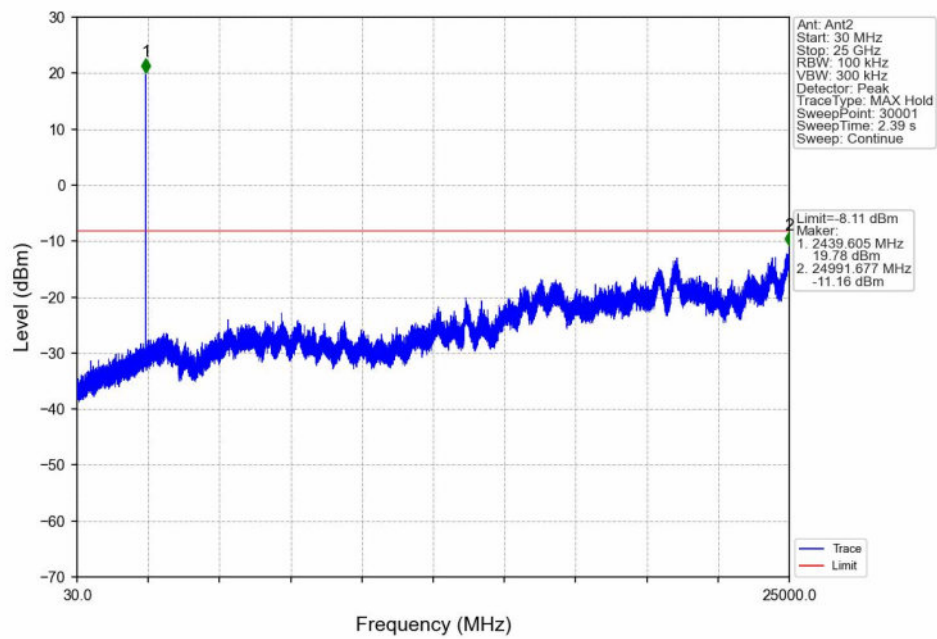




16QAM_MCH_2439.5MHz_Ant1_NTNV

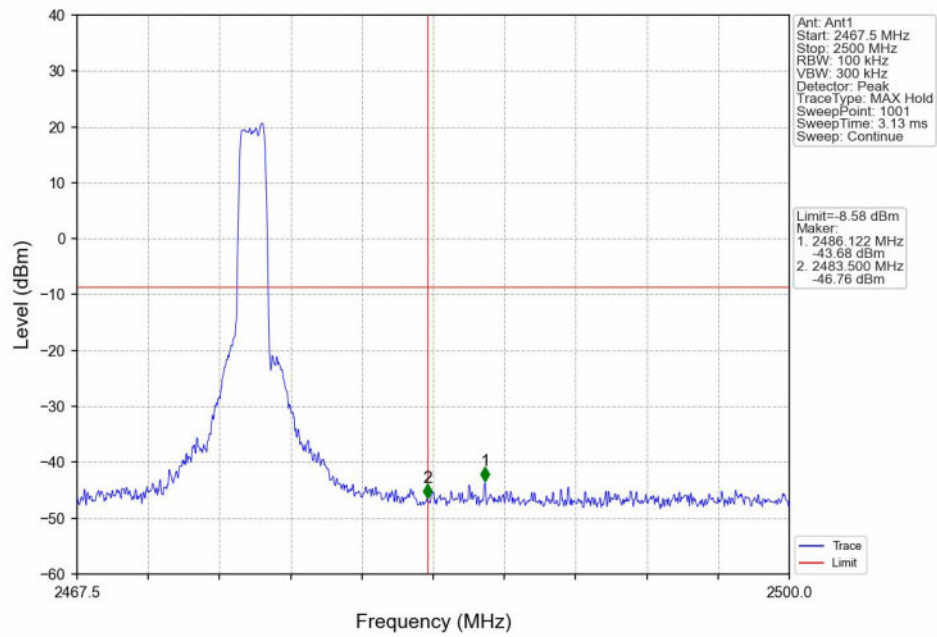


16QAM_MCH_2439.5MHz_Ant2_NTNV

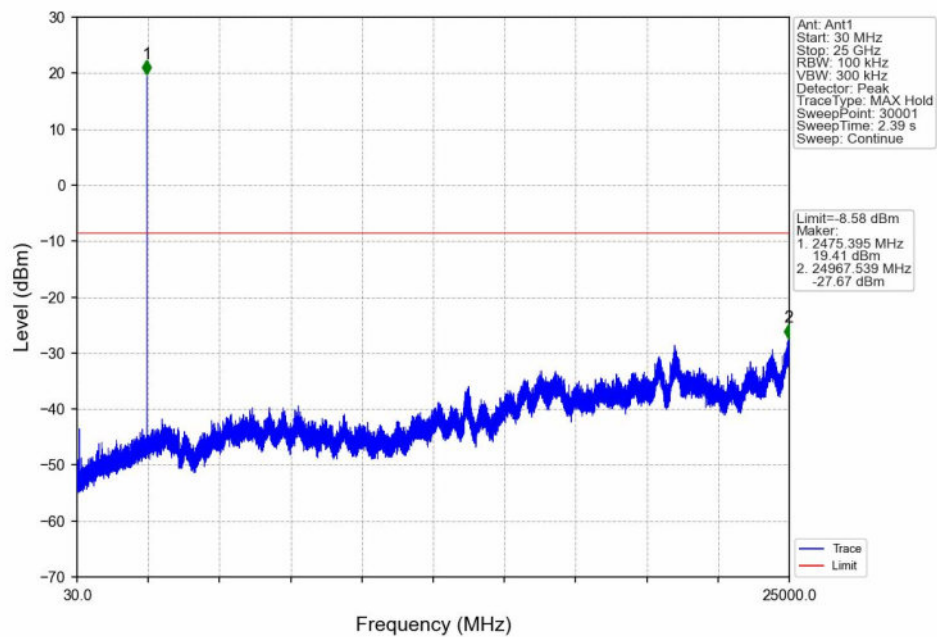




16QAM_HCH_2475.5MHz_Ant1_NTNV

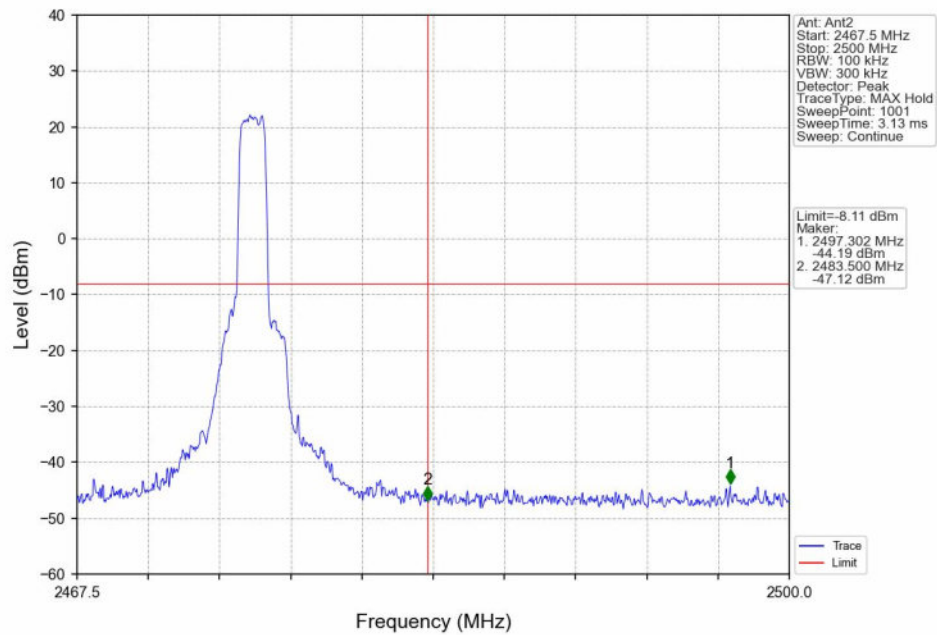


16QAM_HCH_2475.5MHz_Ant1_NTNV

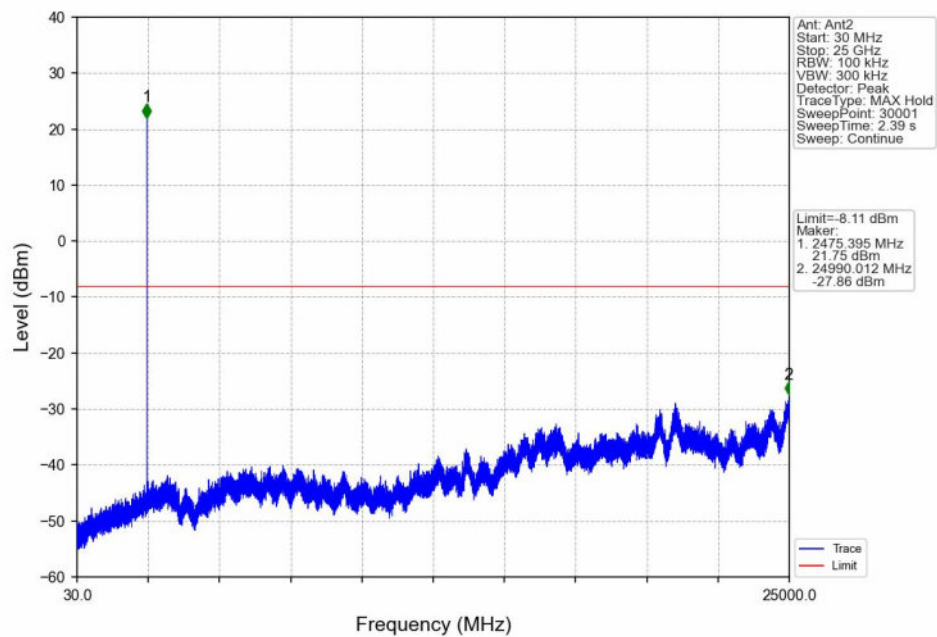




16QAM_HCH_2475.5MHz_Ant2_NTNV



16QAM_HCH_2475.5MHz_Ant2_NTNV





6. Form731

6.1 Form731

6.1.1 Test Result

Lower Freq (MHz)	High Freq (MHz)	MAX Power (W)	MAX Power (dBm)
2403.5	2475.5	0.4487	26.52