

ANNEX TEST DATA WIFI2.4G

FCC ID: 2BWUK-X9

Applicant: SHENZHEN TWHALE ROBOT CO.,LTD

Address: ROOM 303-1,Jinhu Building,Mingzhi Street,Longhua District,Shenzhen City, Guangdong Province,China

Manufacturer: SHENZHEN TWHALE ROBOT CO.,LTD

Address: ROOM 303-1,Jinhu Building,Mingzhi Street,Longhua District,Shenzhen City, Guangdong Province,China

Product Name: cleaning window robot

Trade Mark: N/A

Model Number: X9, X11pro, S9, X21

Date of Receipt: Jul. 06, 2026

Test Date: Jul. 06, 2026 - Jul. 13, 2026

Date of Report: Jul. 13, 2026

Prepared By: Shenzhen DL Testing Technology Co., Ltd.

Address: 101-201, Comprehensive Building, Tongzhou Electronics Longgang Factory Area, No.1 Baolong Fifth Road, Baolong Community, Baolong Street, Longgang District, Shenzhen, China

Applicable Standards: FCC PART 15 C 15.247
ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024+Errata to C63.10a-2024

Test Result: Pass

Report Number: DLE-260627001R

1. Duty Cycle

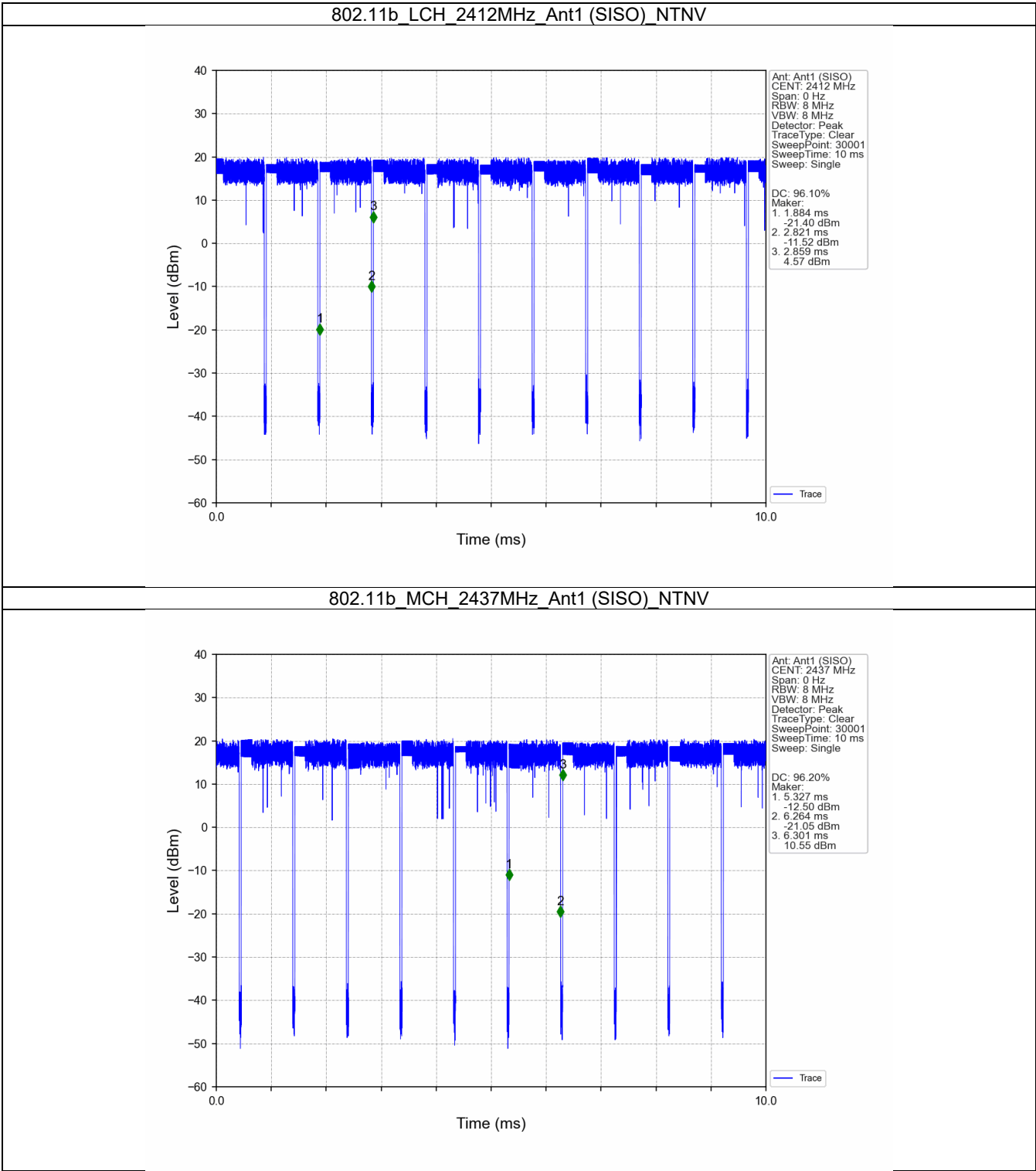
1.1 Test Result

1.1.1 Ant1

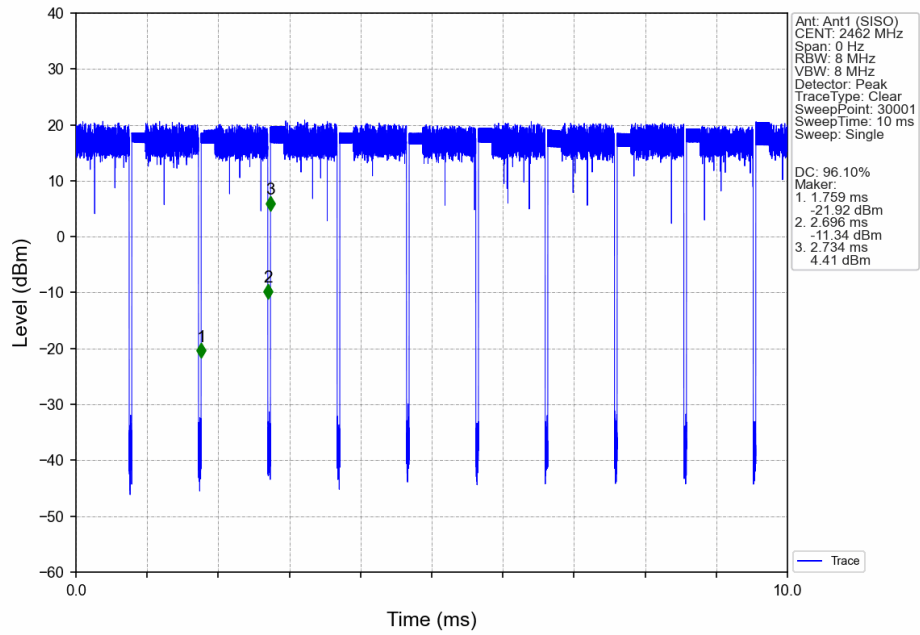
Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
802.11b	SISO	2412	0.937	0.975	96.10	0.17	0.03
		2437	0.937	0.974	96.20	0.17	0.03
		2462	0.937	0.975	96.10	0.17	0.03
802.11g	SISO	2412	0.176	0.221	79.64	0.99	0.15
		2437	0.176	0.221	79.64	0.99	0.06
		2462	0.176	0.220	80.00	0.97	0.12
802.11n (HT20)	SISO	2412	0.164	0.208	78.85	1.03	0.10
		2437	0.164	0.208	78.85	1.03	0.15
		2462	0.165	0.209	78.95	1.03	0.04
802.11n (HT40)	SISO	2422	0.101	0.144	70.14	1.54	0.08
		2437	0.101	0.144	70.14	1.54	0.10
		2452	0.100	0.144	69.44	1.58	0.06

1.2 Test Graph

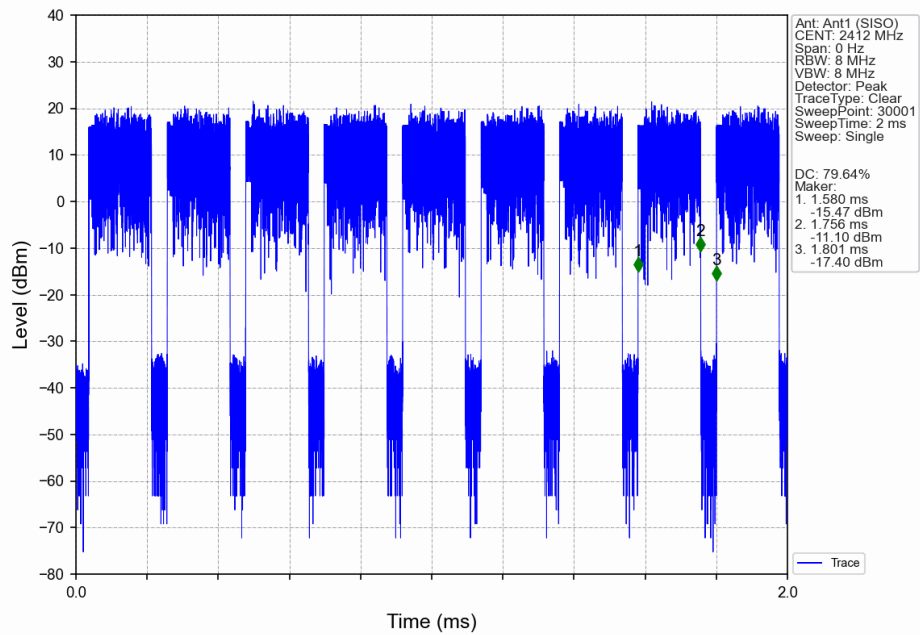
1.2.1 Ant1



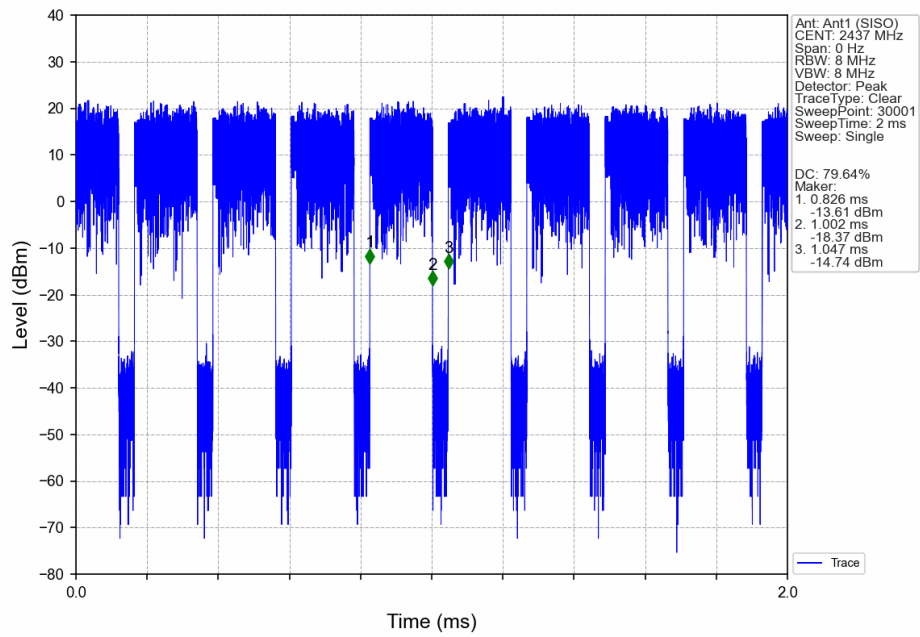
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



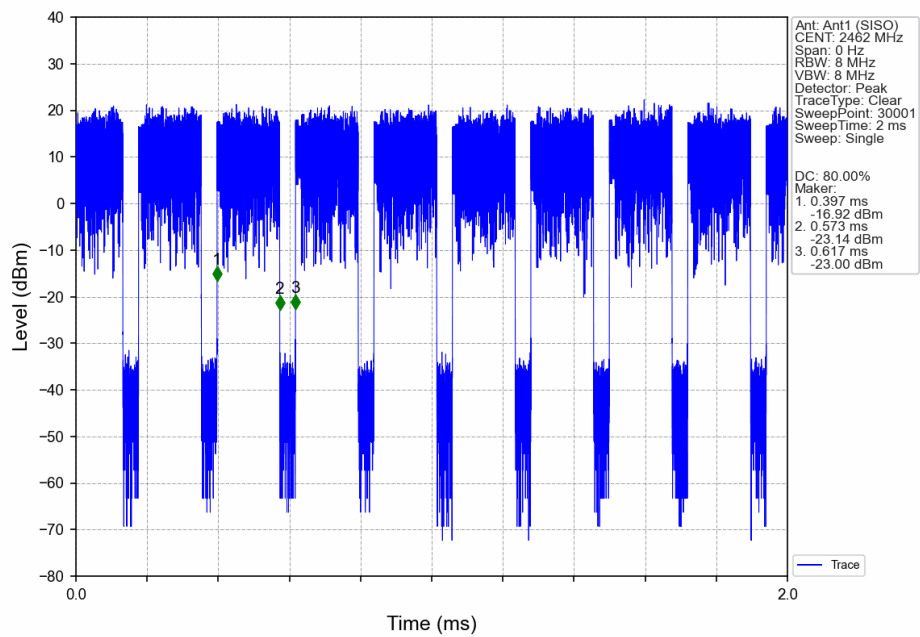
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



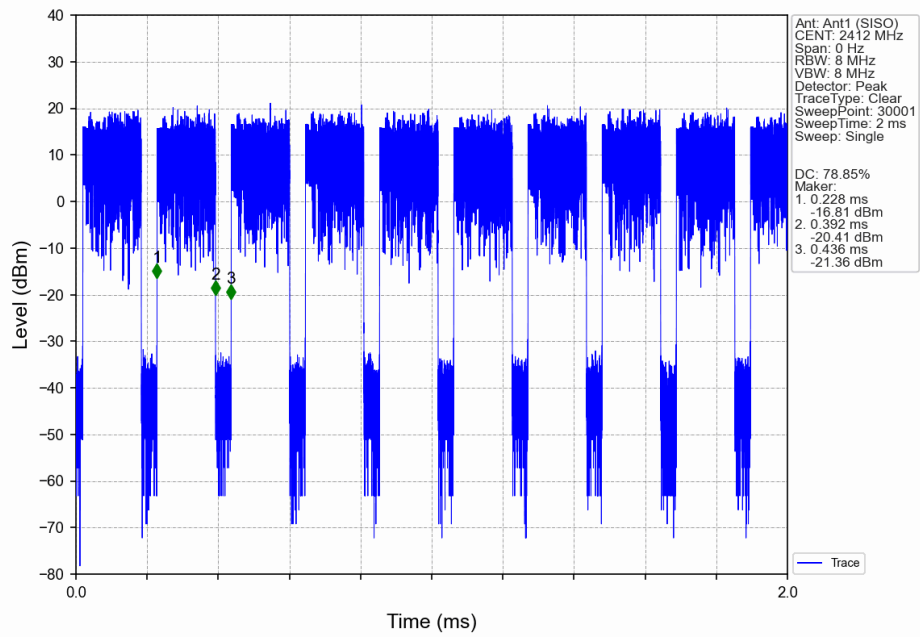
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



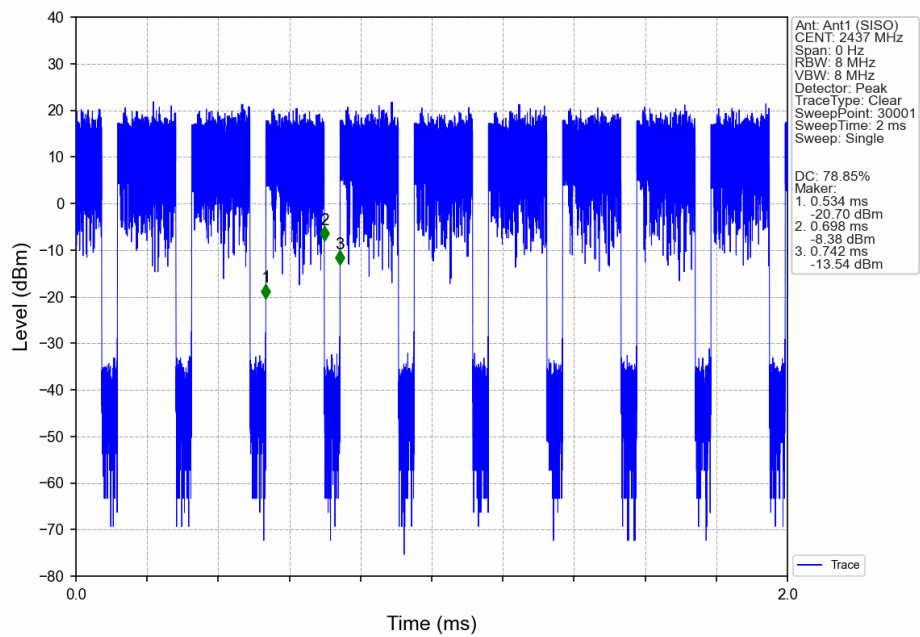
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



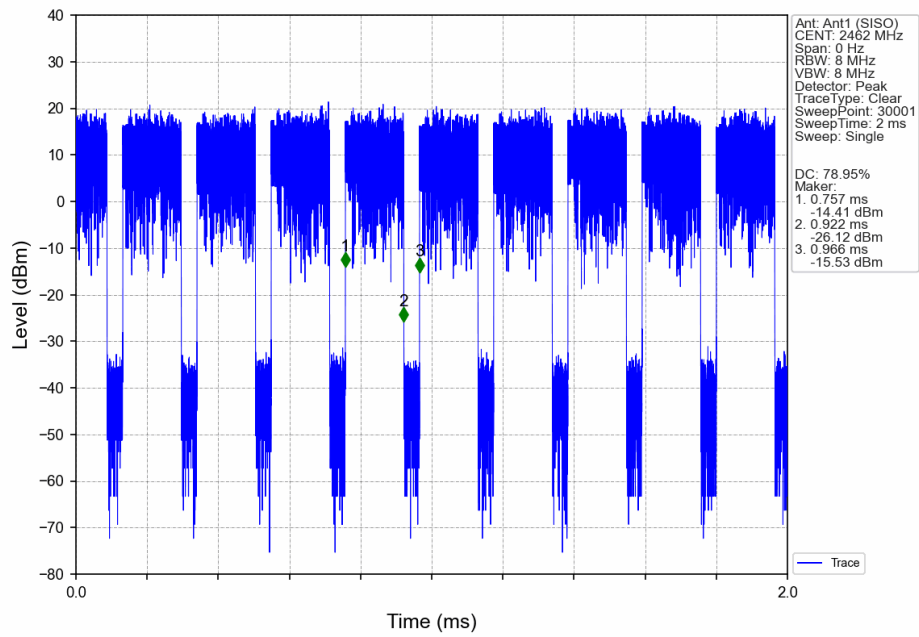
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



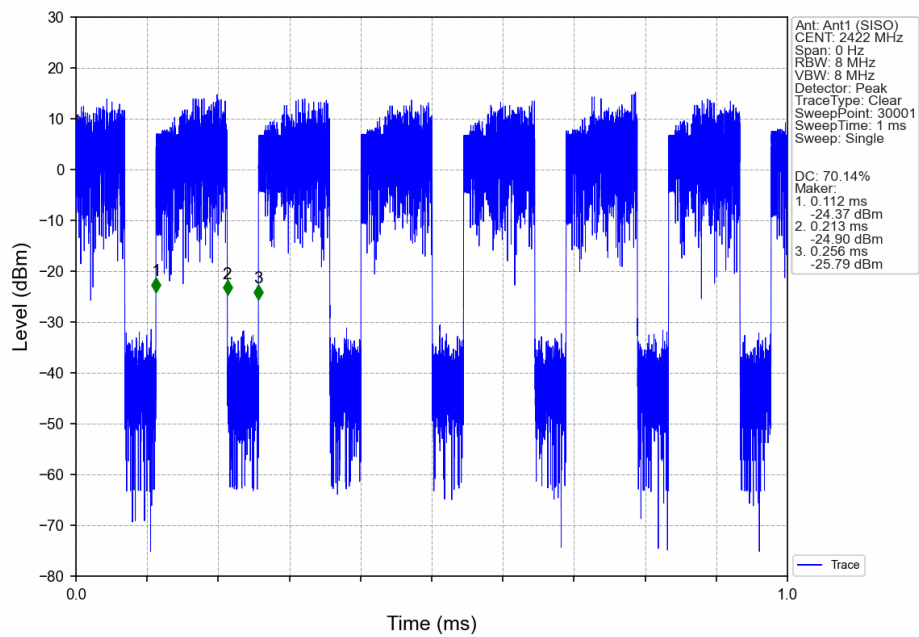
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



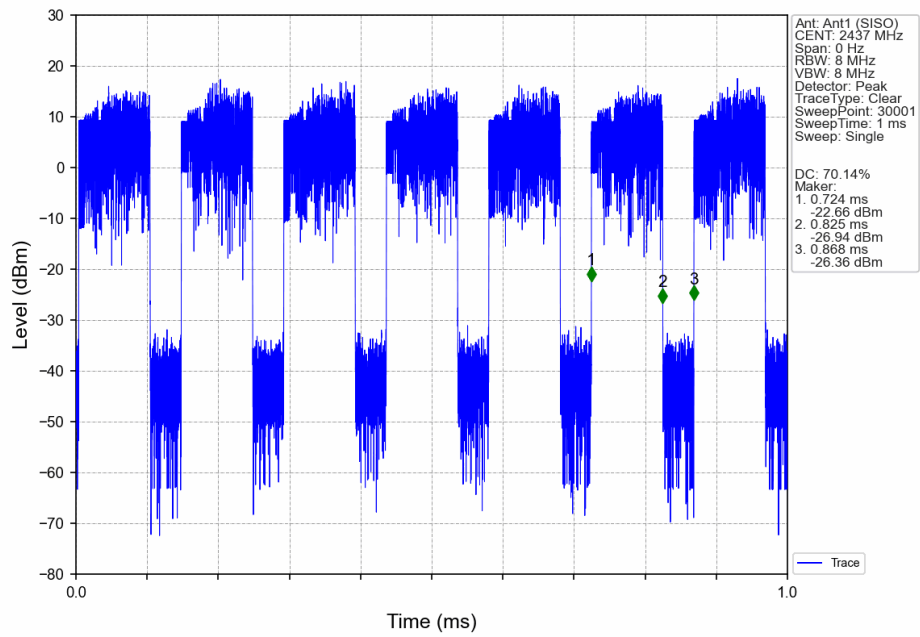
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



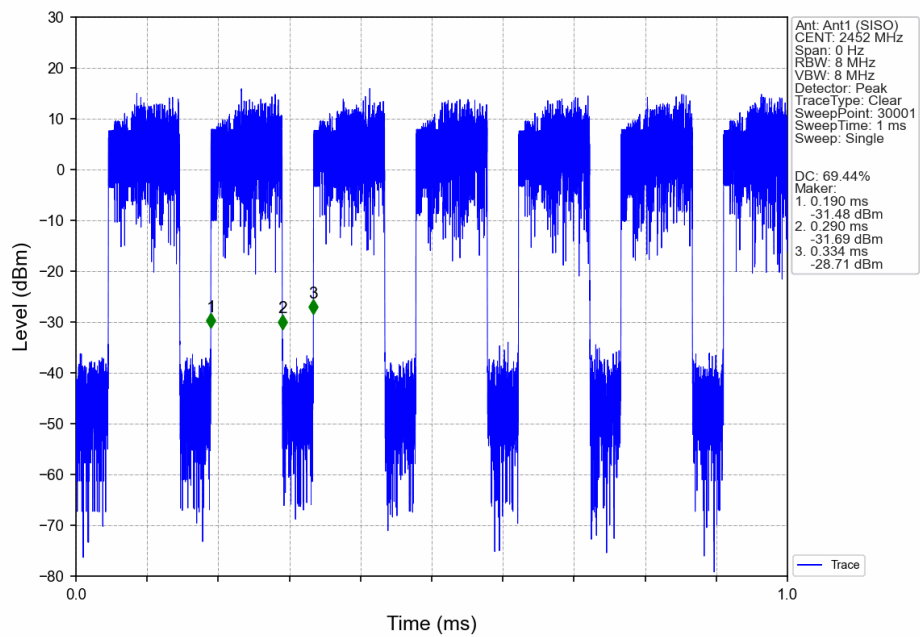
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

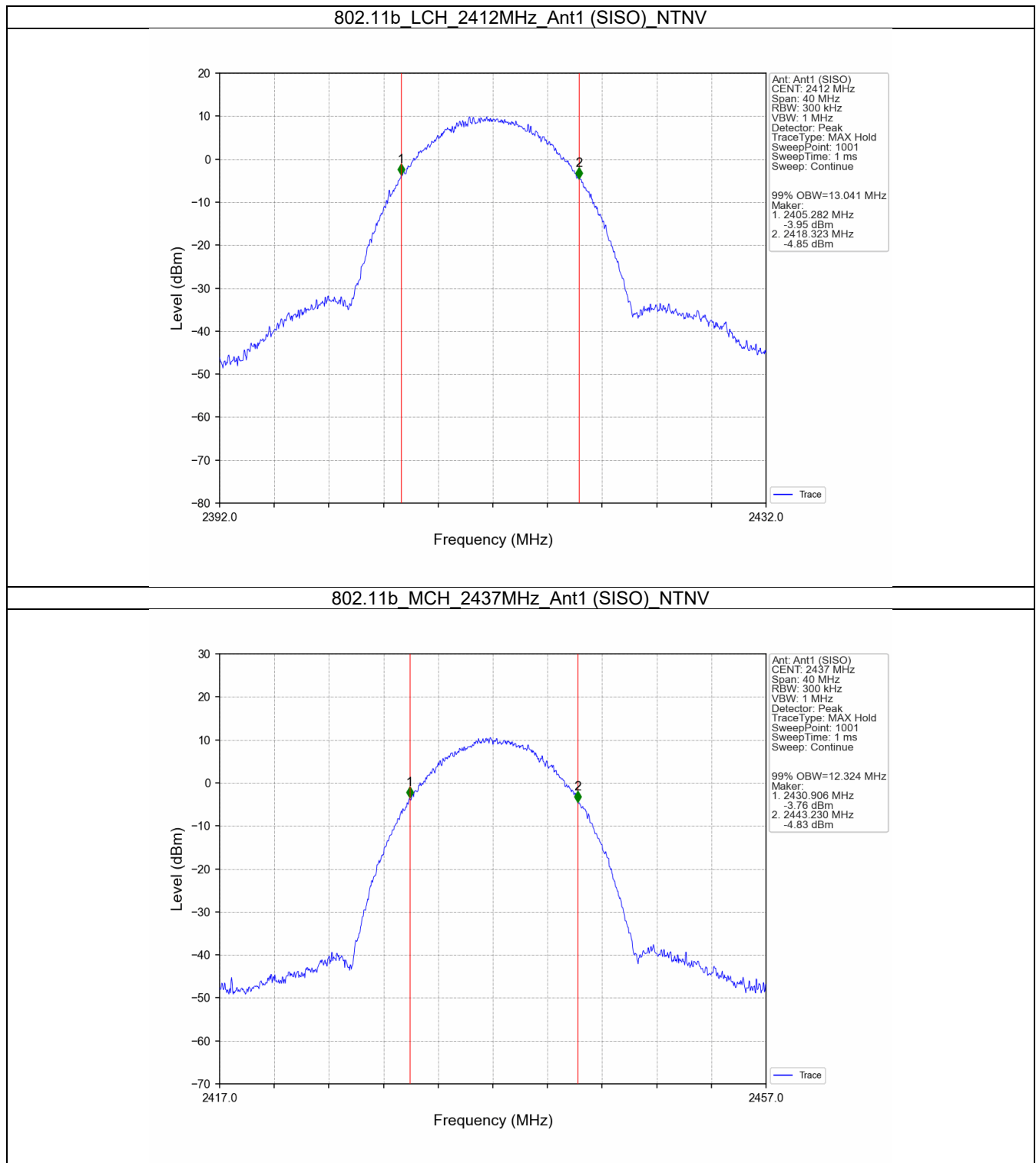
Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	13.041	/	Pass
		2437	1	12.324	/	Pass
		2462	1	12.890	/	Pass
802.11g	SISO	2412	1	16.776	/	Pass
		2437	1	16.423	/	Pass
		2462	1	16.678	/	Pass
802.11n (HT20)	SISO	2412	1	17.814	/	Pass
		2437	1	17.528	/	Pass
		2462	1	17.744	/	Pass
802.11n (HT40)	SISO	2422	1	36.794	/	Pass
		2437	1	35.762	/	Pass
		2452	1	36.393	/	Pass

2.1.2 6dB BW

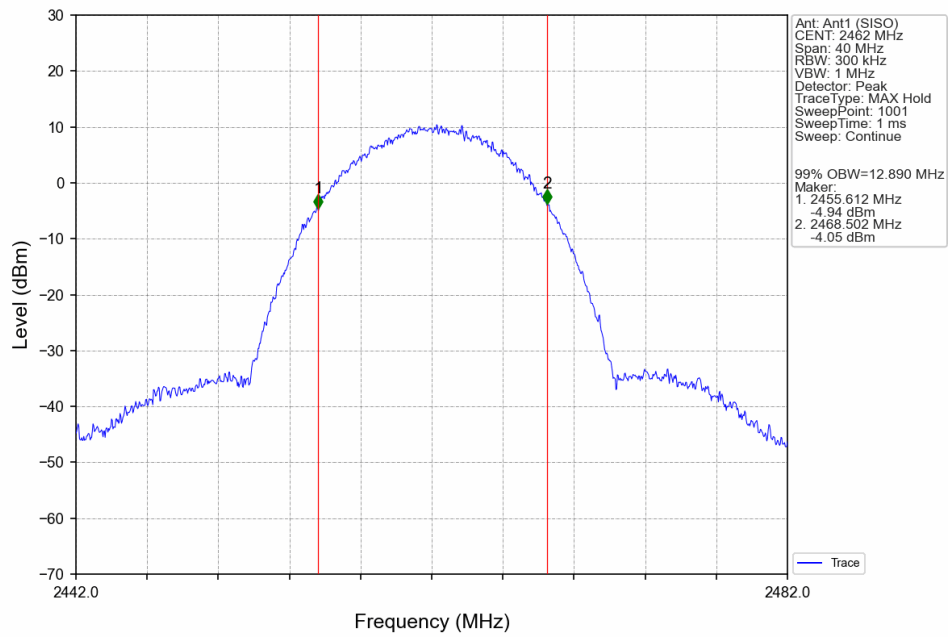
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	8.728	≥ 0.5	Pass
		2437	1	7.517	≥ 0.5	Pass
		2462	1	7.882	≥ 0.5	Pass
802.11g	SISO	2412	1	16.382	≥ 0.5	Pass
		2437	1	15.839	≥ 0.5	Pass
		2462	1	16.438	≥ 0.5	Pass
802.11n (HT20)	SISO	2412	1	17.663	≥ 0.5	Pass
		2437	1	16.906	≥ 0.5	Pass
		2462	1	17.589	≥ 0.5	Pass
802.11n (HT40)	SISO	2422	1	36.387	≥ 0.5	Pass
		2437	1	30.600	≥ 0.5	Pass
		2452	1	35.494	≥ 0.5	Pass

2.2 Test Graph

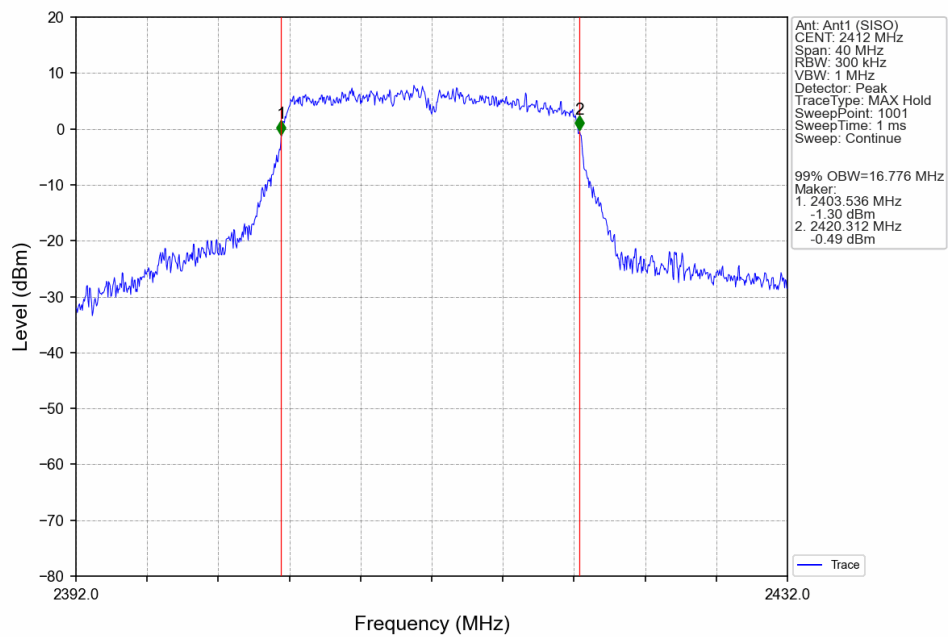
2.2.1 OBW



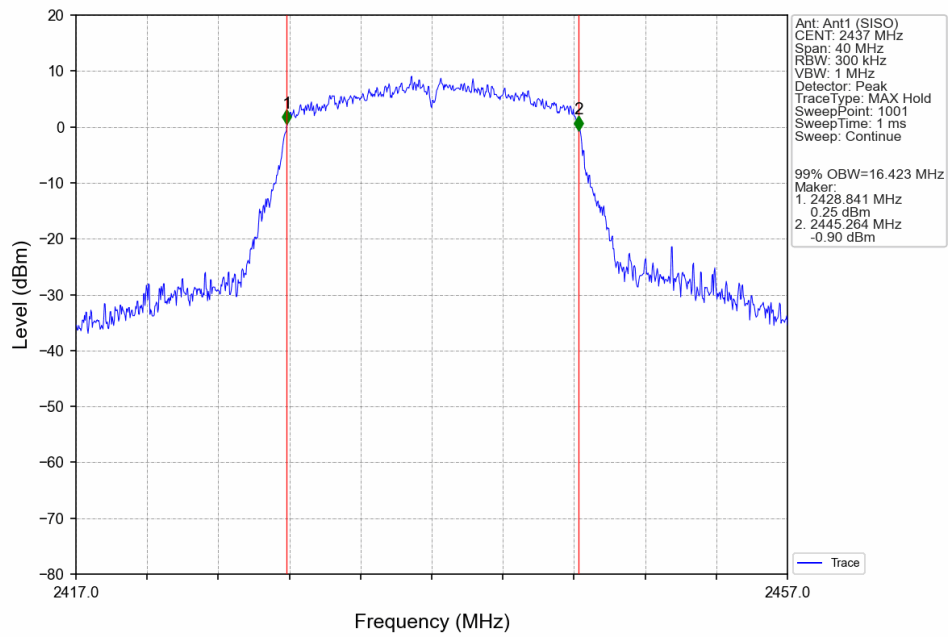
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



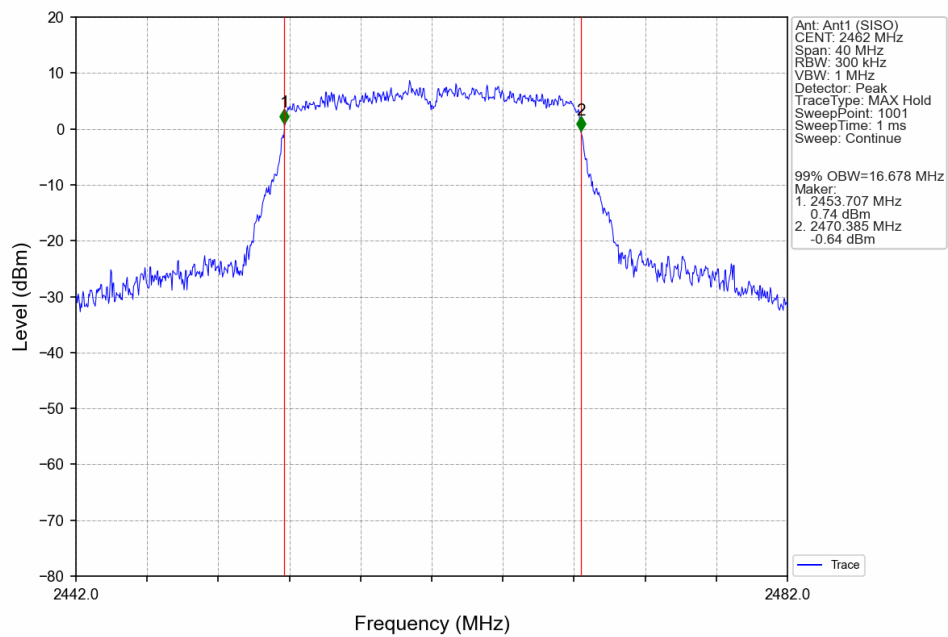
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



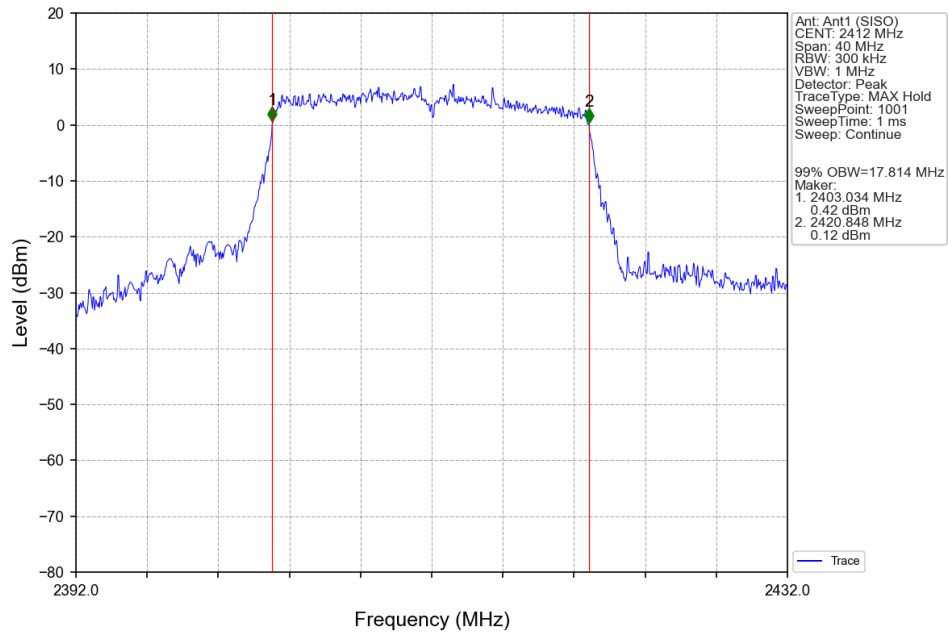
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



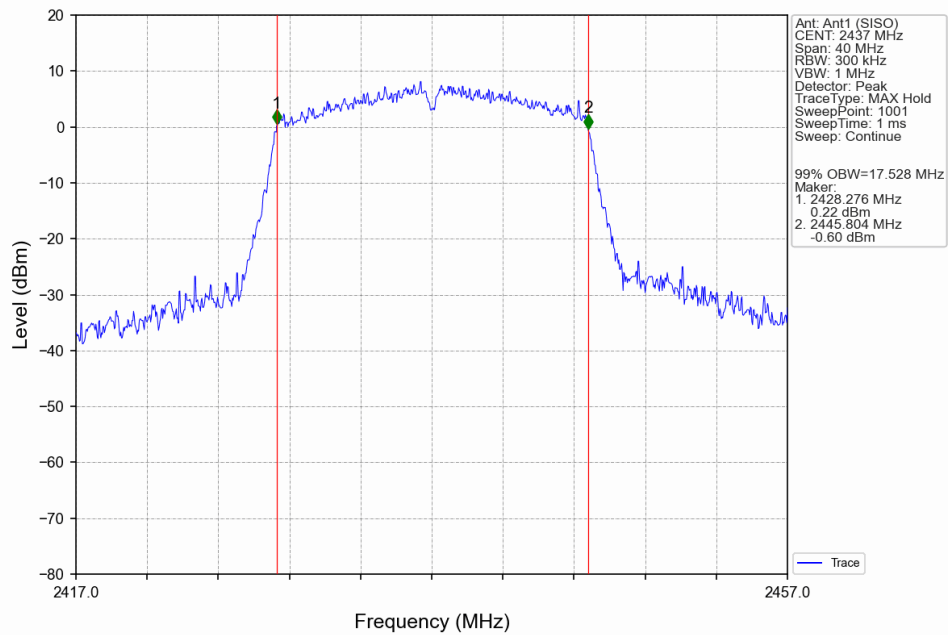
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



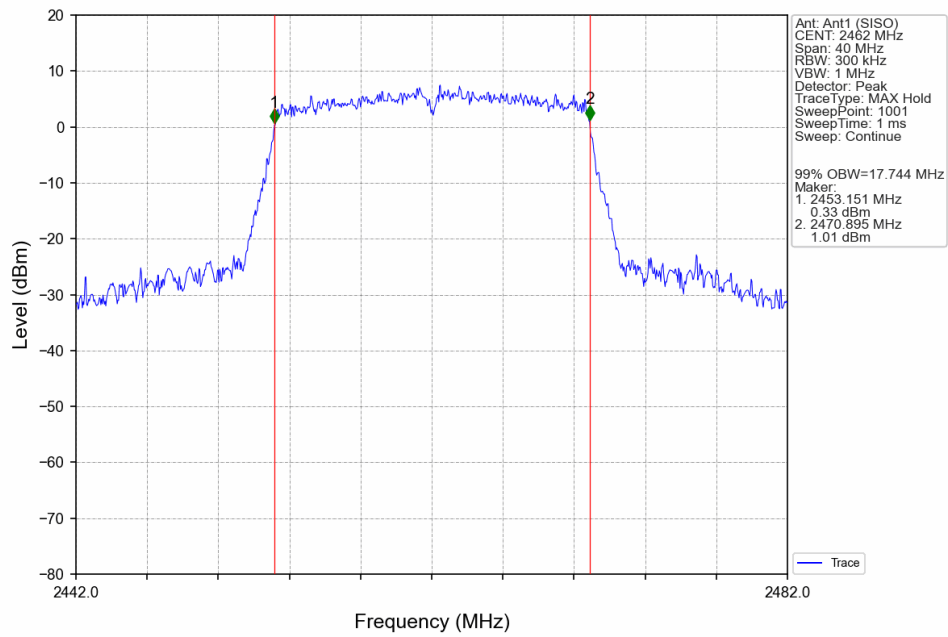
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



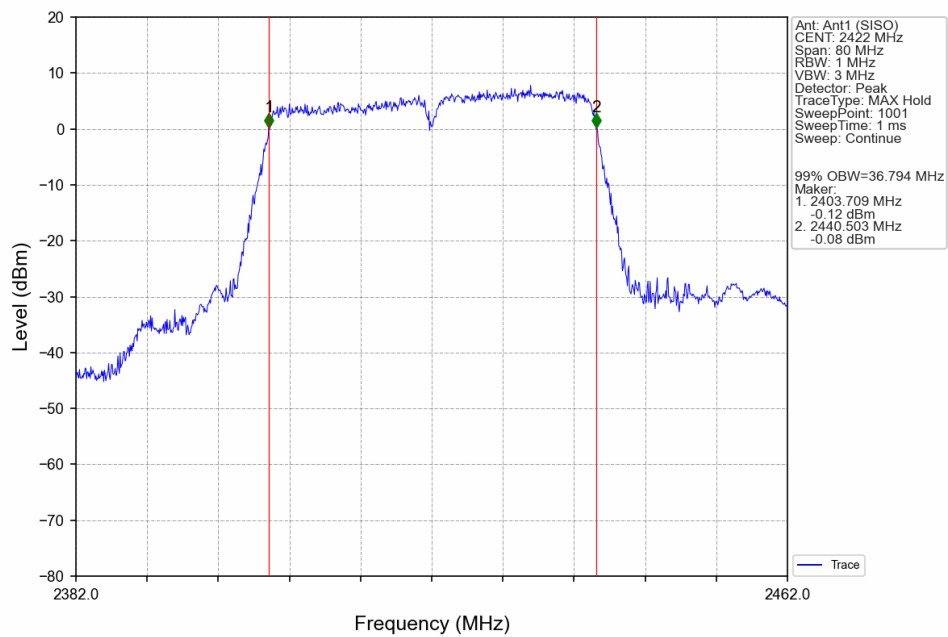
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



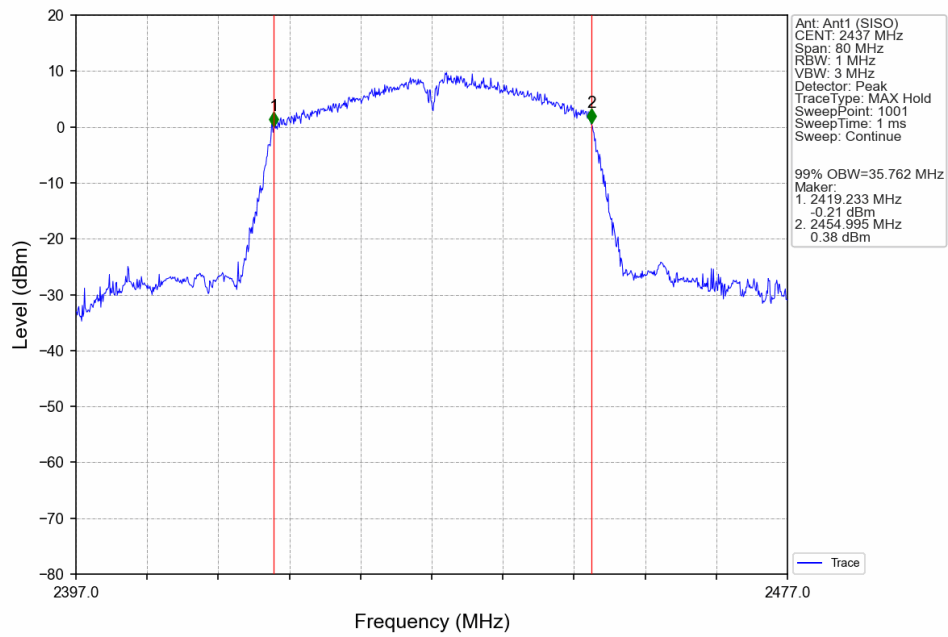
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



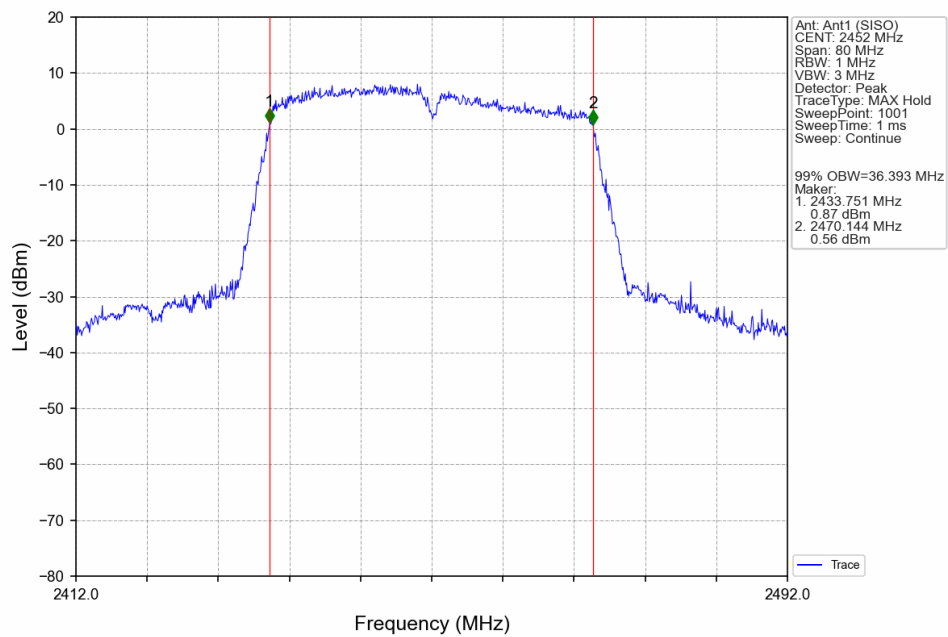
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



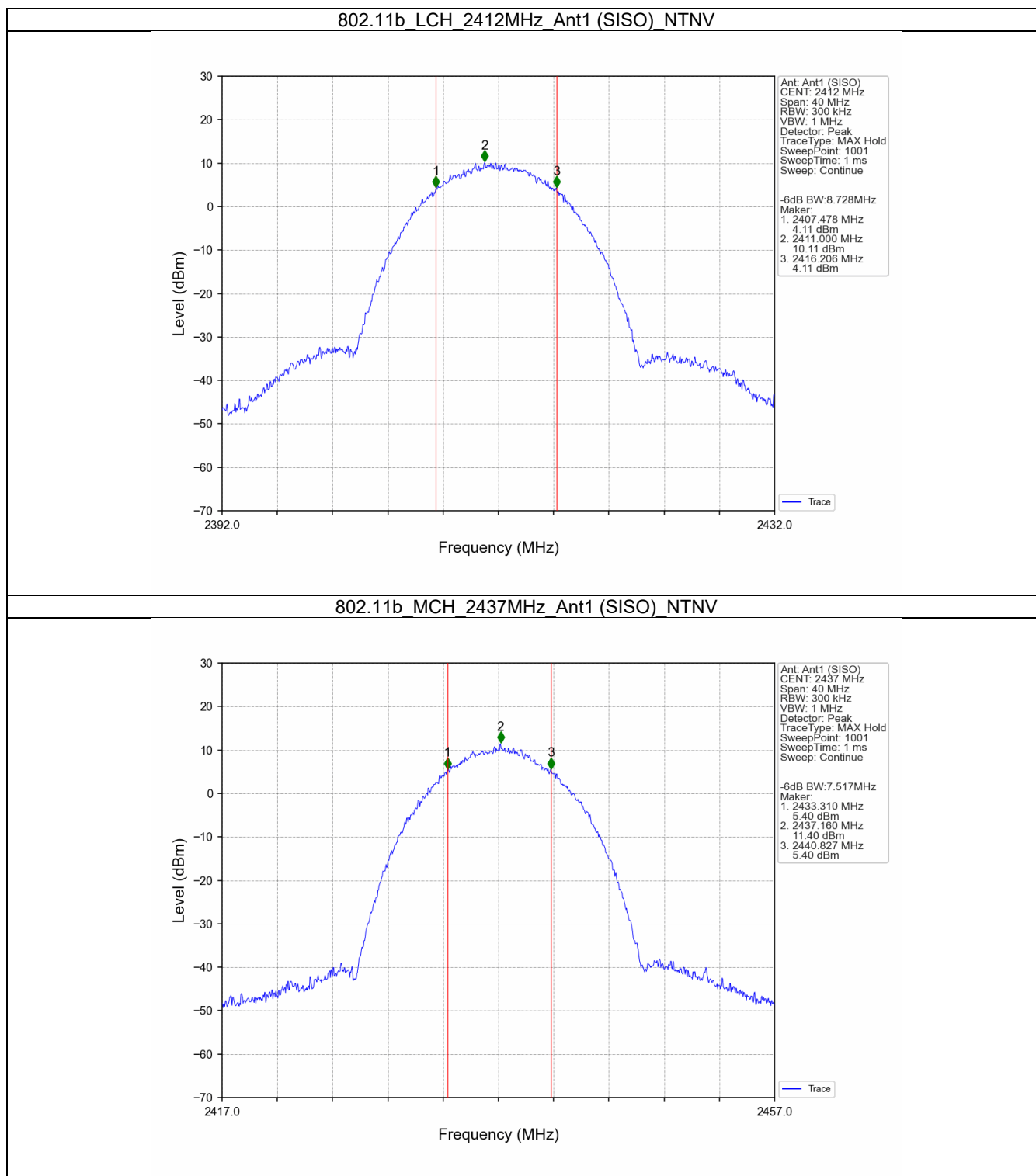
802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



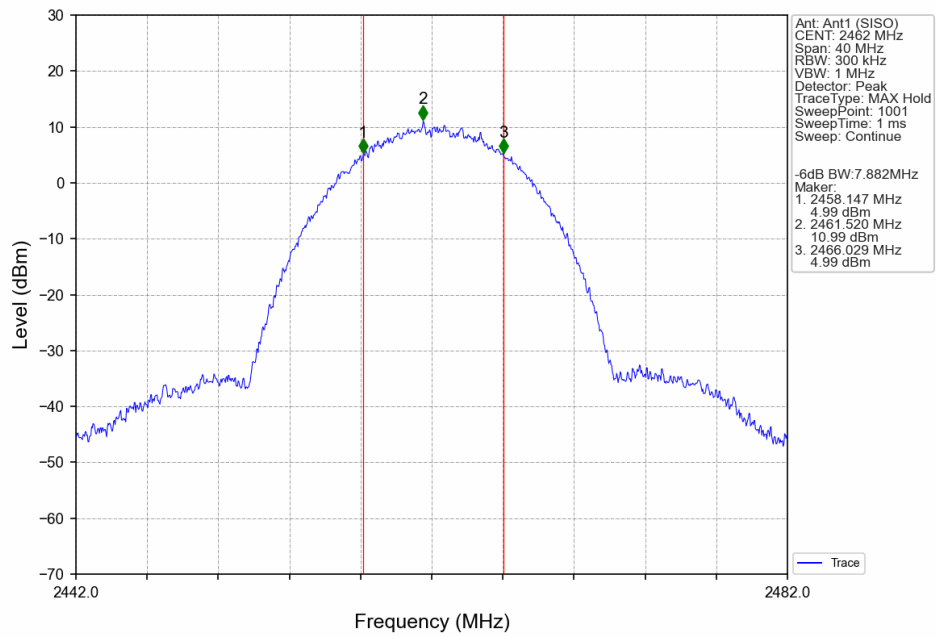
802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



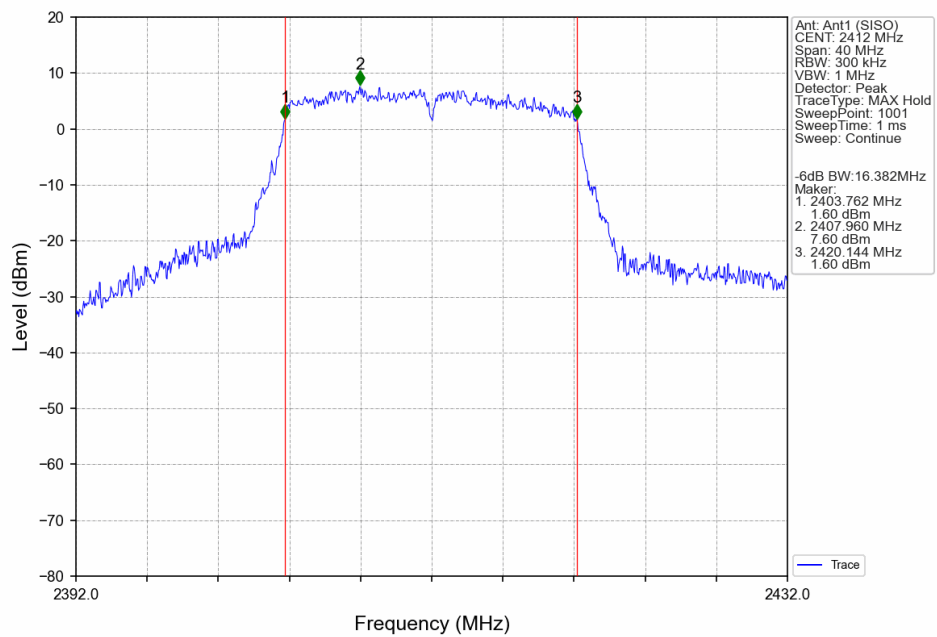
2.2.2 6dB BW



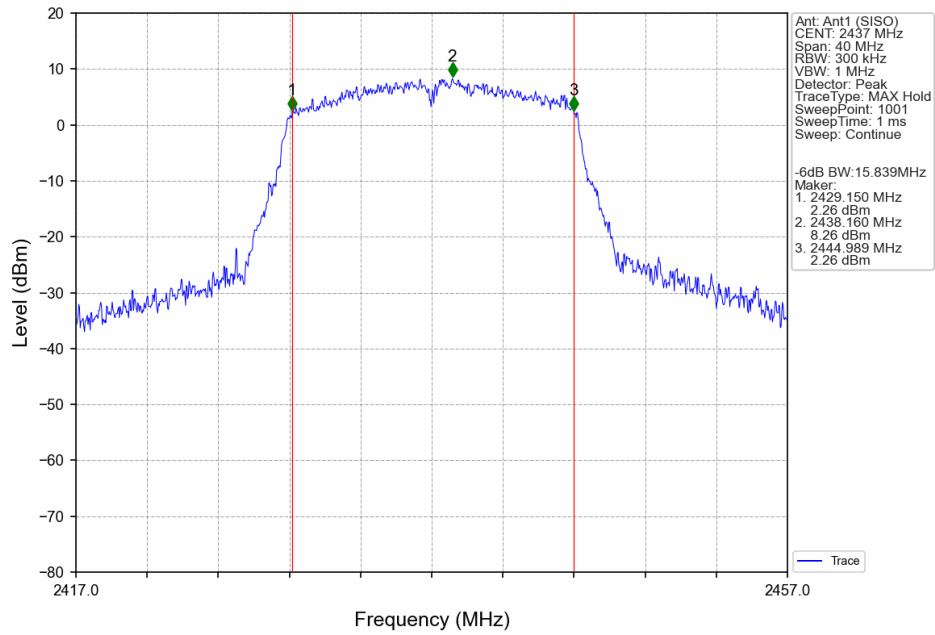
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



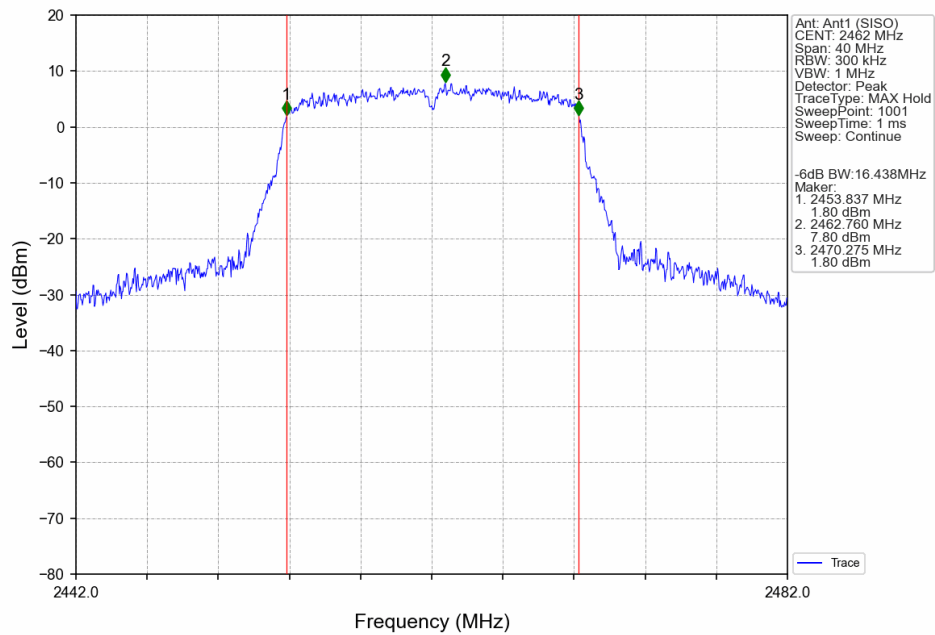
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



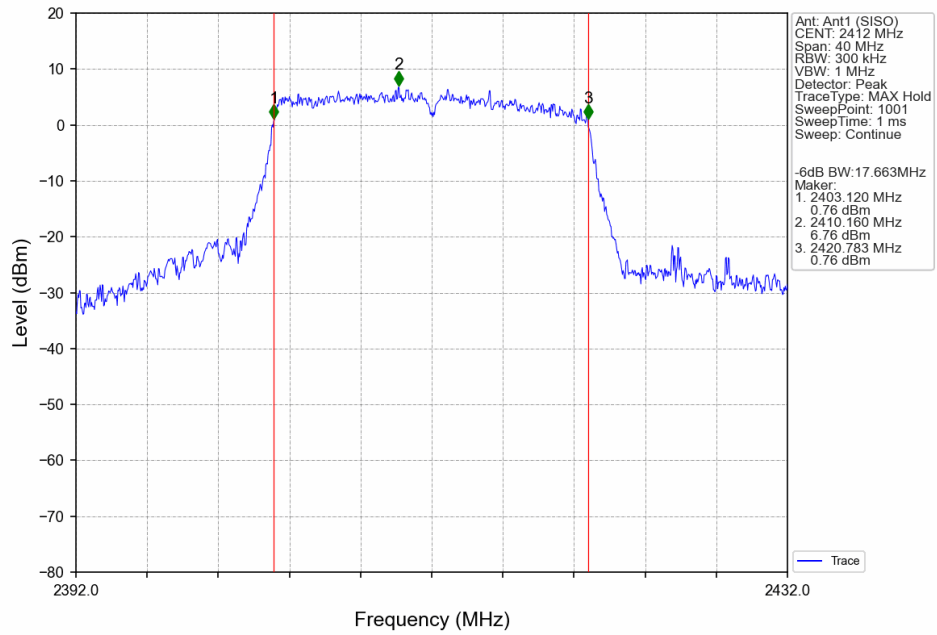
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



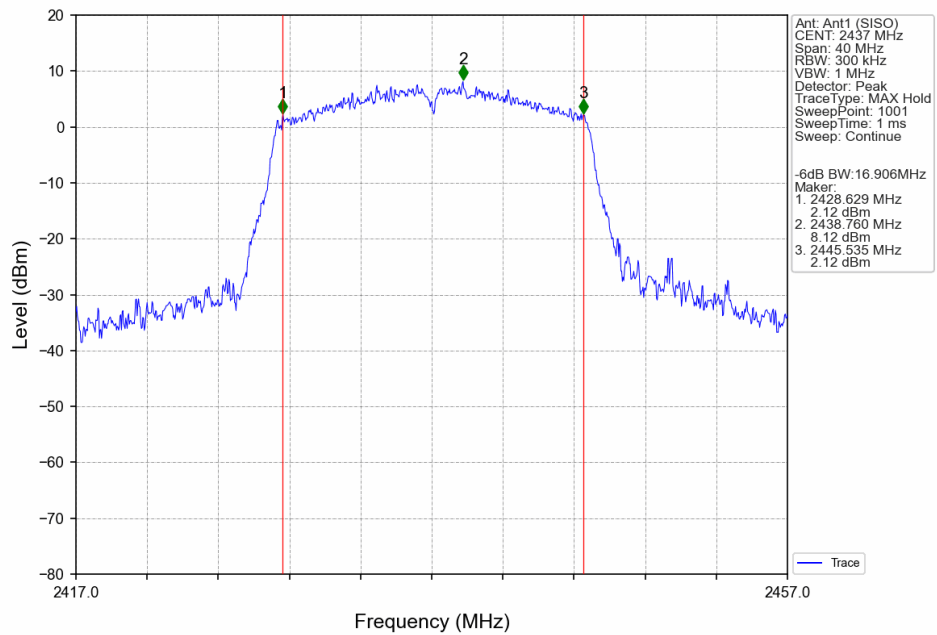
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



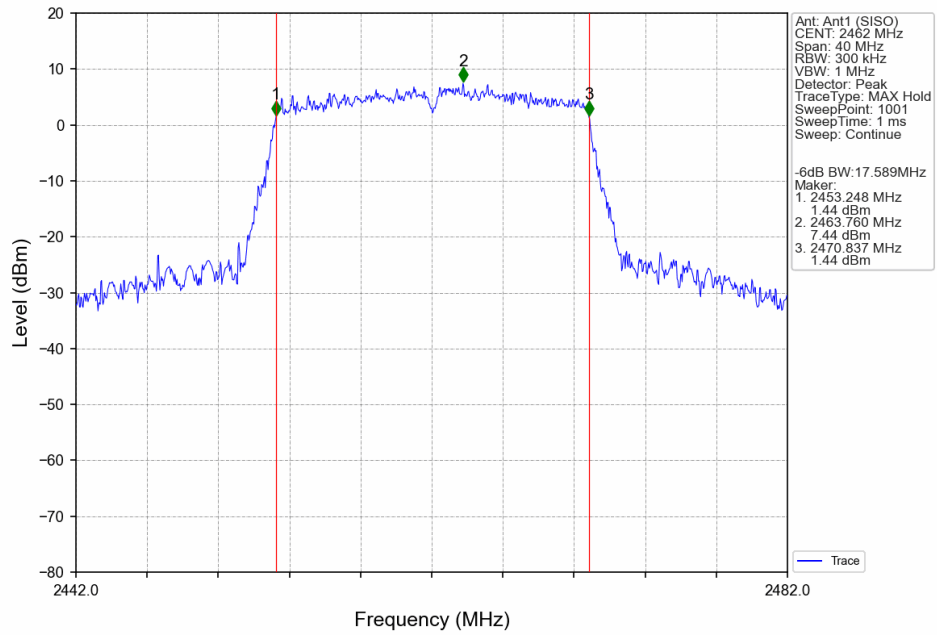
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



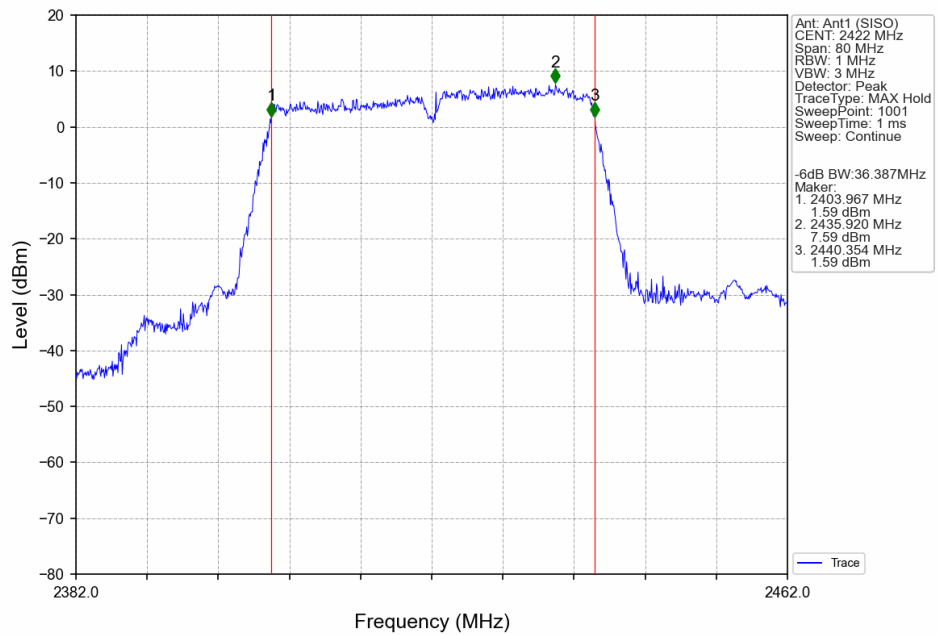
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



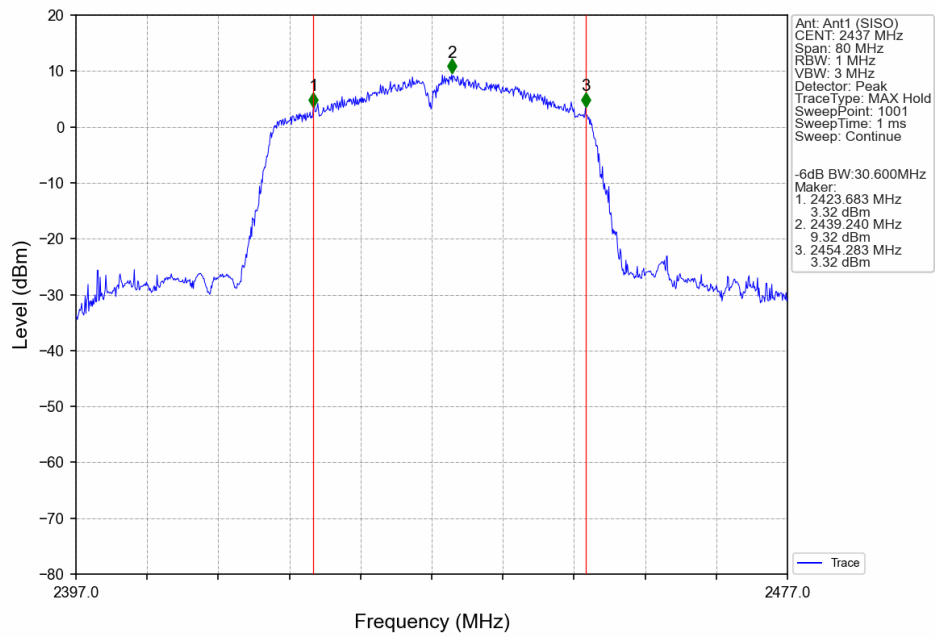
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



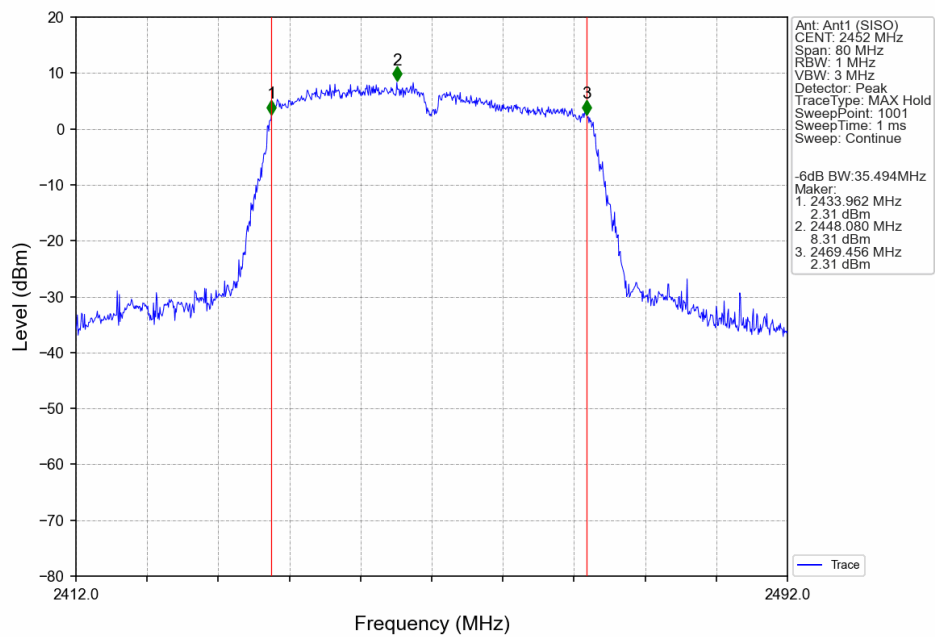
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



3. Maximum Conducted Output Power

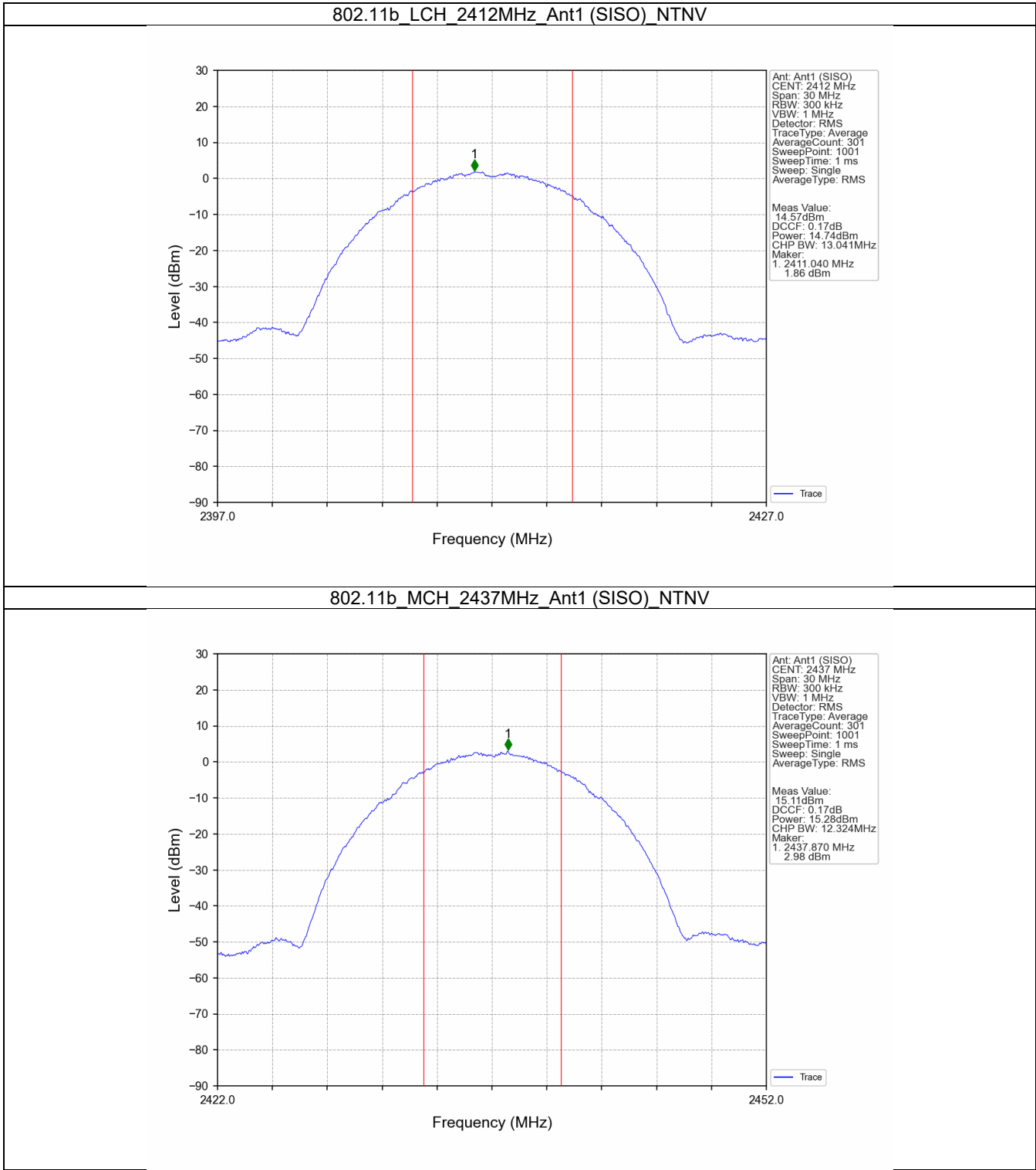
3.1 Test Result

3.1.1 Power

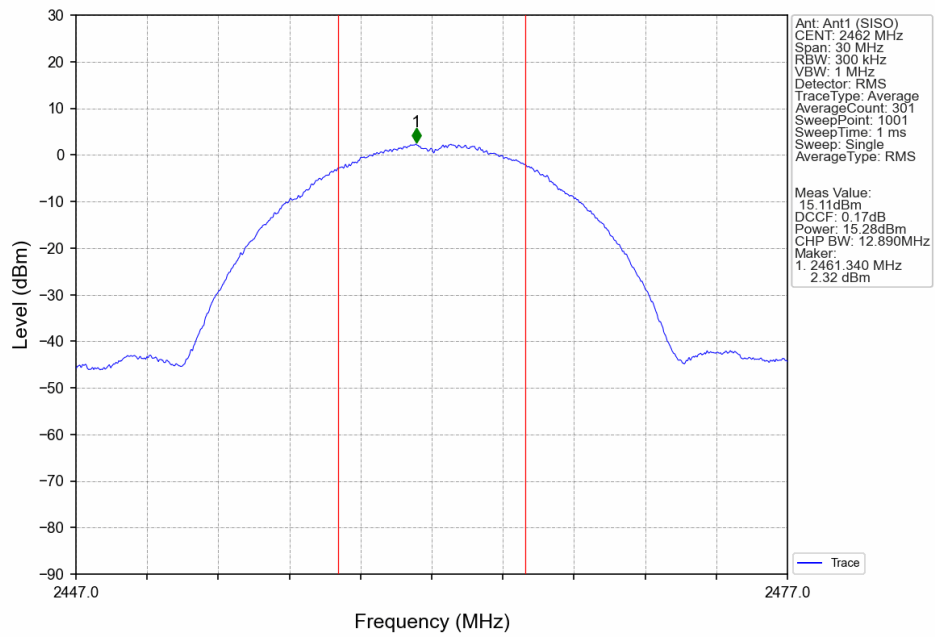
Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	14.74	<=30	Pass
		2437	15.28	<=30	Pass
		2462	15.28	<=30	Pass
802.11g	SISO	2412	14.90	<=30	Pass
		2437	15.31	<=30	Pass
		2462	15.32	<=30	Pass
802.11n (HT20)	SISO	2412	14.23	<=30	Pass
		2437	14.79	<=30	Pass
		2462	14.75	<=30	Pass
802.11n (HT40)	SISO	2422	12.04	<=30	Pass
		2437	12.40	<=30	Pass
		2452	12.97	<=30	Pass

3.2 Test Graph

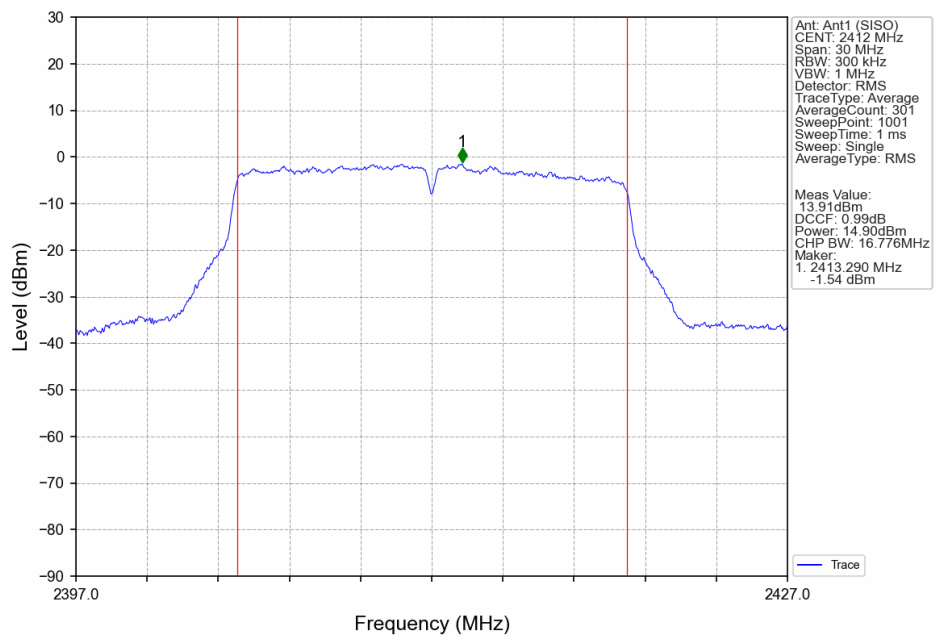
3.2.1 Power



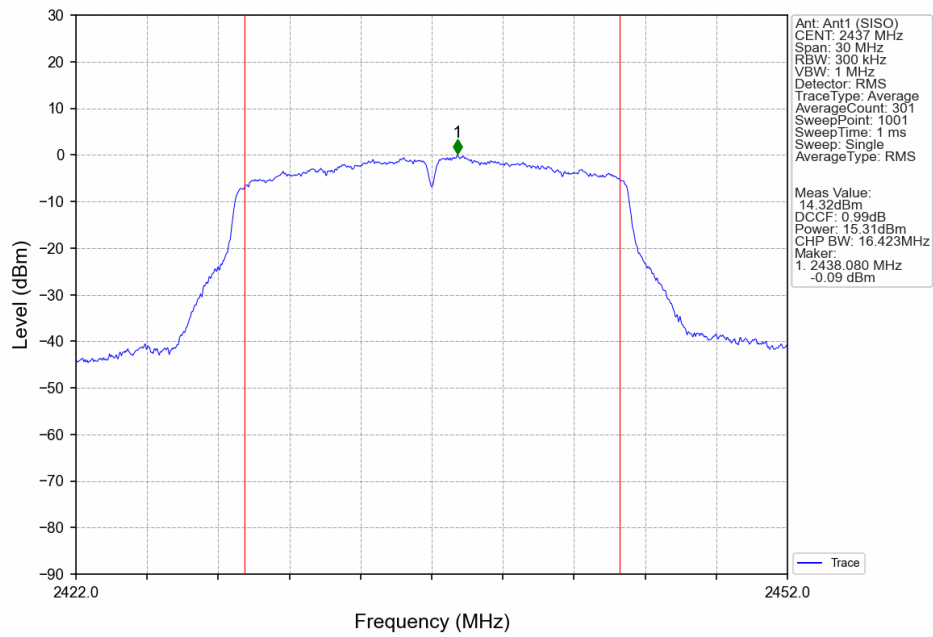
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



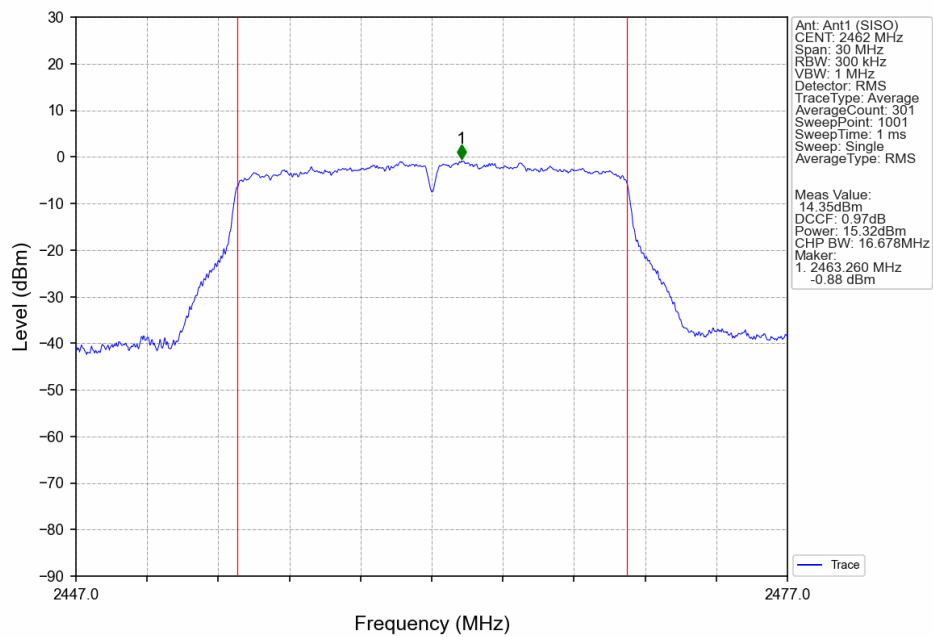
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



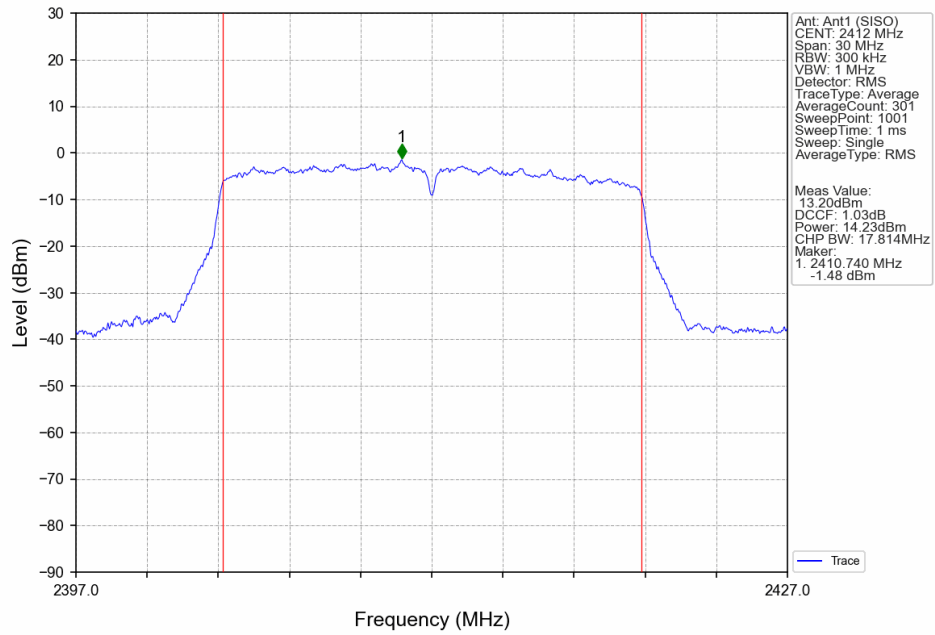
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



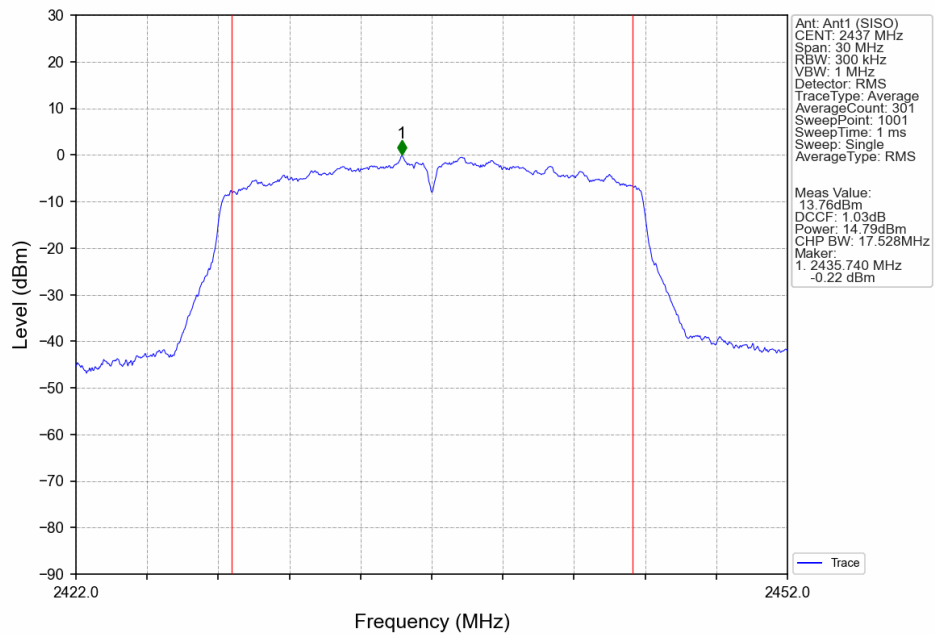
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



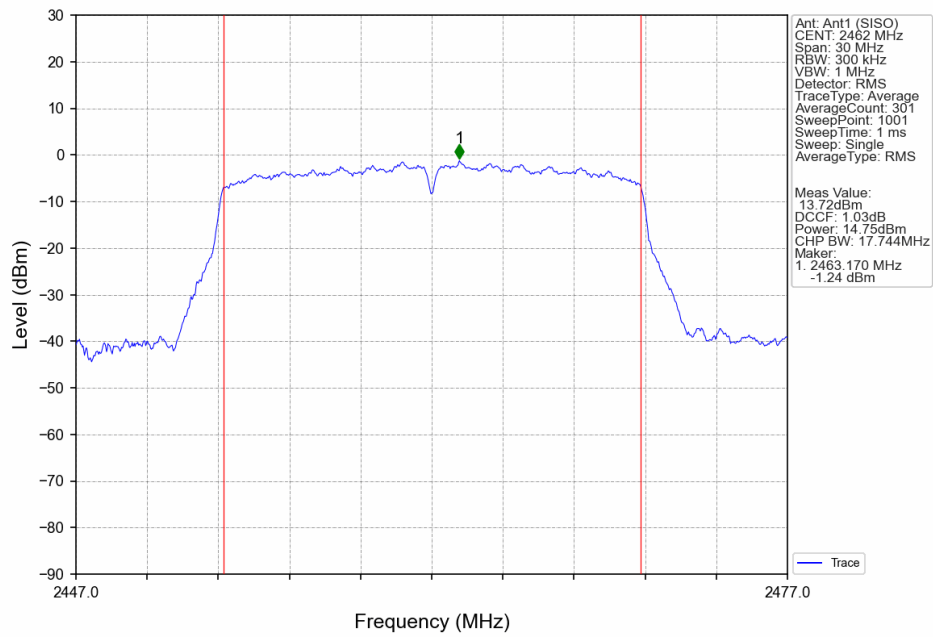
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



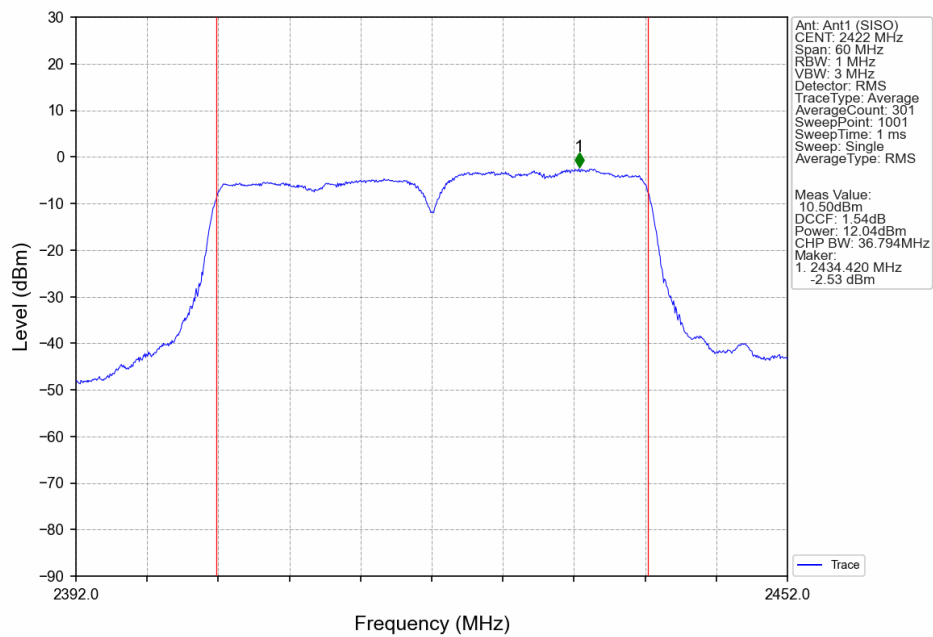
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



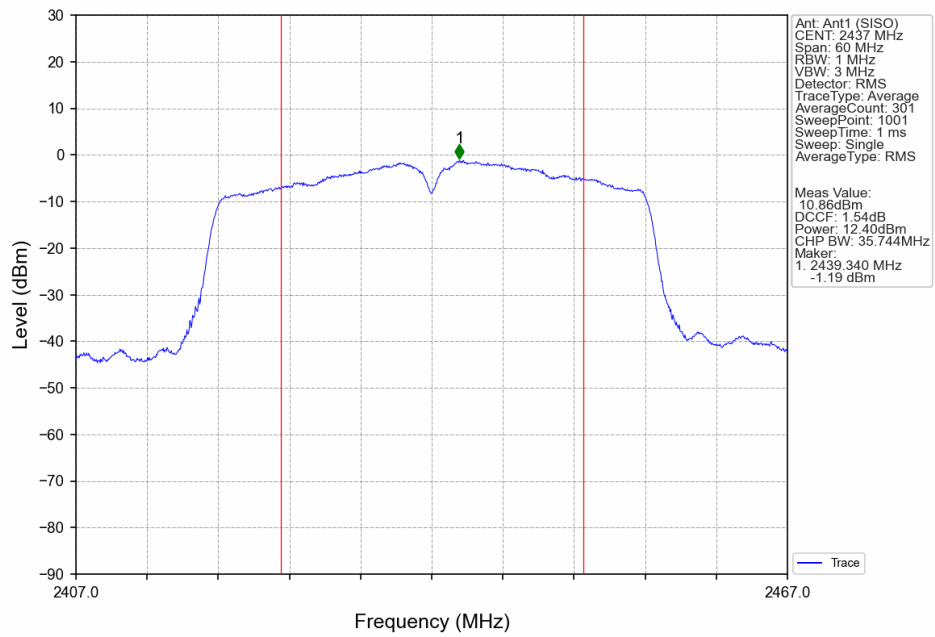
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



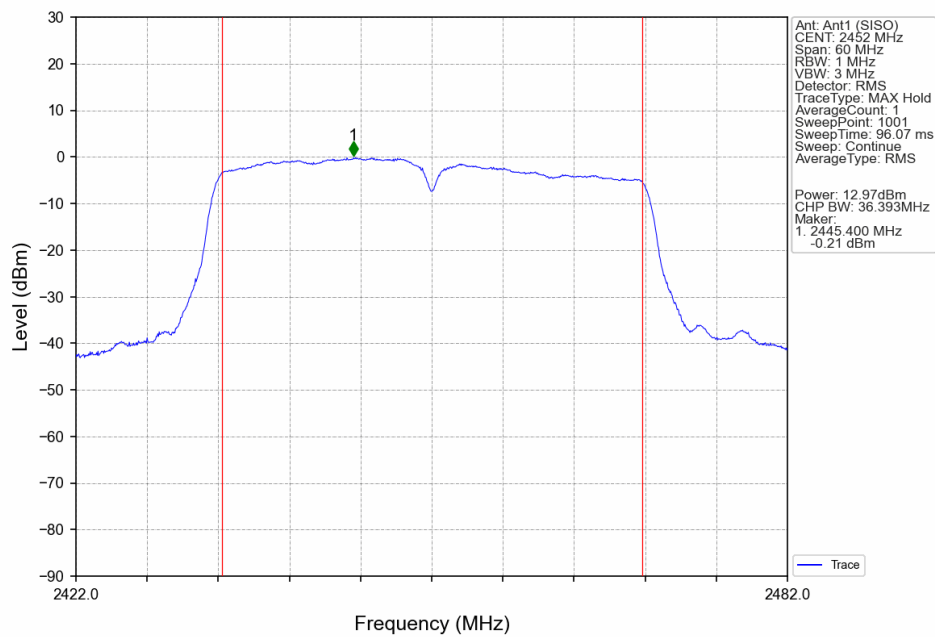
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



4. Maximum Power Spectral Density

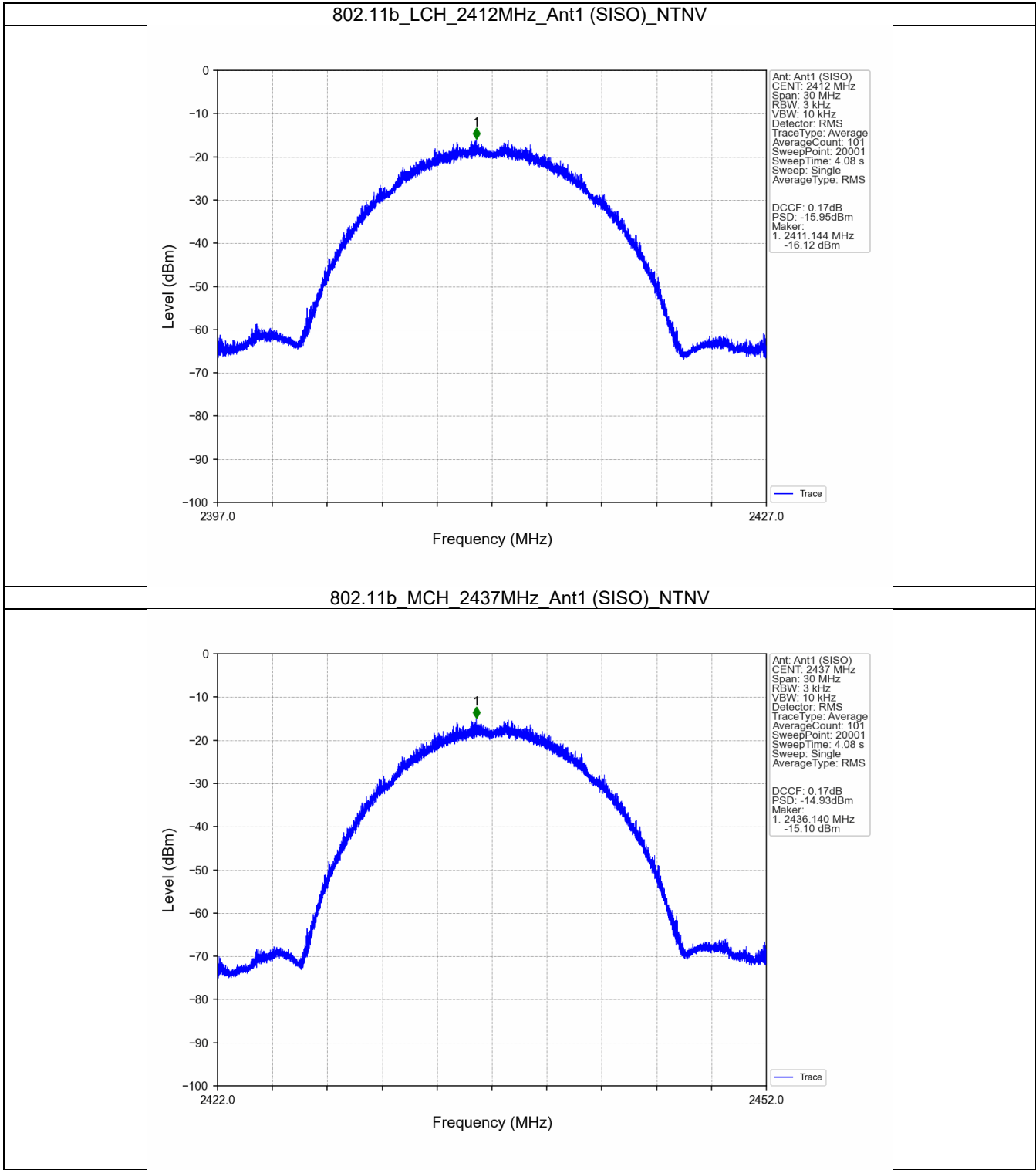
4.1 Test Result

4.1.1 PSD

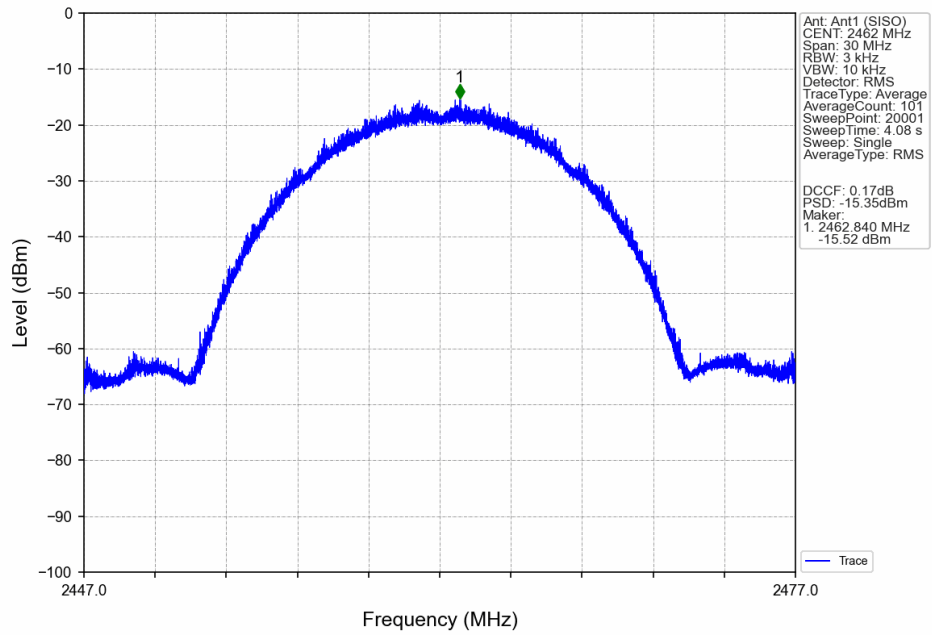
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm)		Verdict
			ANT1	Limit	
802.11b	SISO	2412	-15.95	<=8	Pass
		2437	-14.93	<=8	Pass
		2462	-15.35	<=8	Pass
802.11g	SISO	2412	-15.51	<=8	Pass
		2437	-14.50	<=8	Pass
		2462	-14.91	<=8	Pass
802.11n (HT20)	SISO	2412	-14.35	<=8	Pass
		2437	-13.51	<=8	Pass
		2462	-14.19	<=8	Pass
802.11n (HT40)	SISO	2422	-17.90	<=8	Pass
		2437	-16.47	<=8	Pass
		2452	-15.29	<=8	Pass

4.2 Test Graph

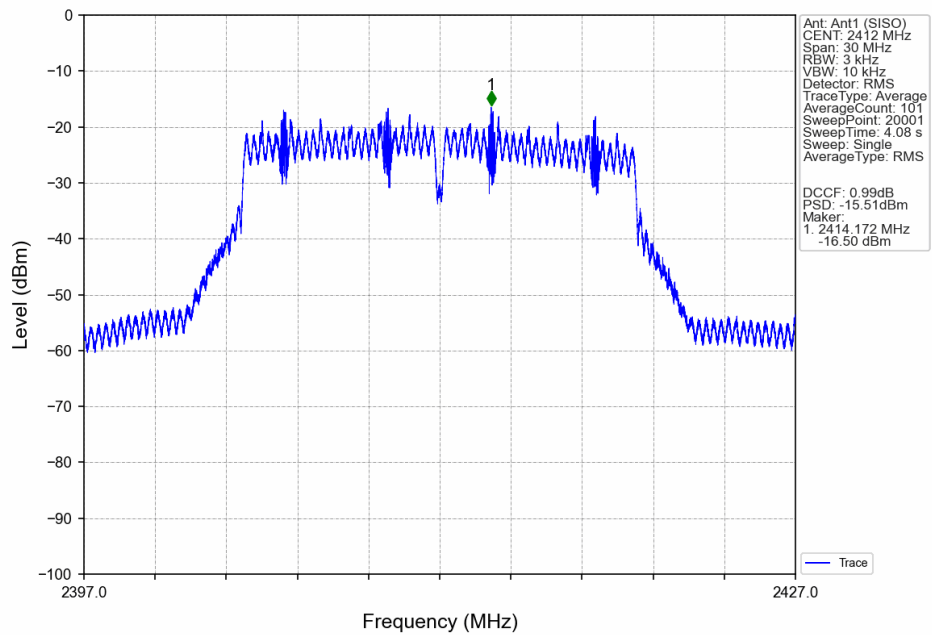
4.2.1 PSD



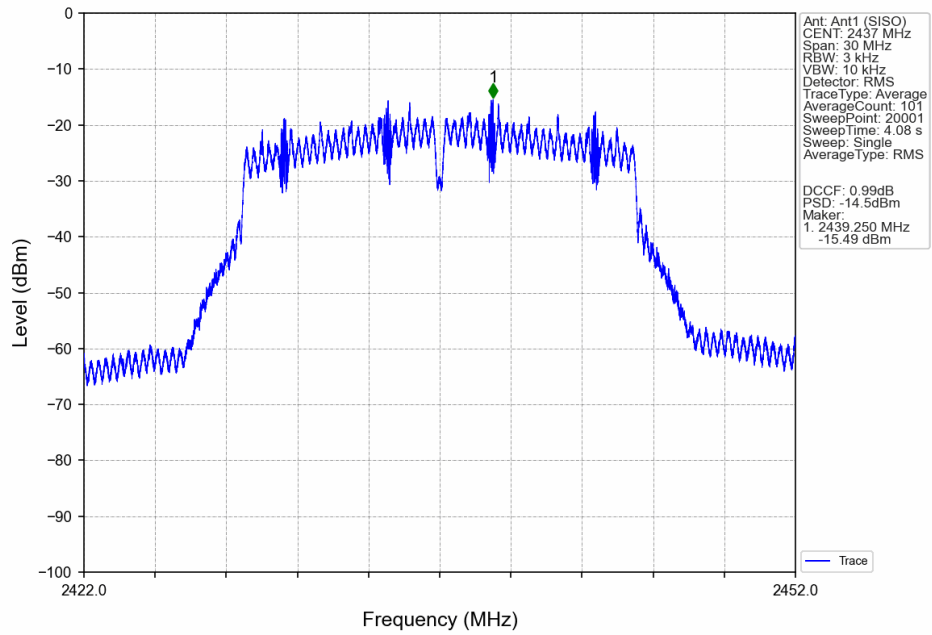
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



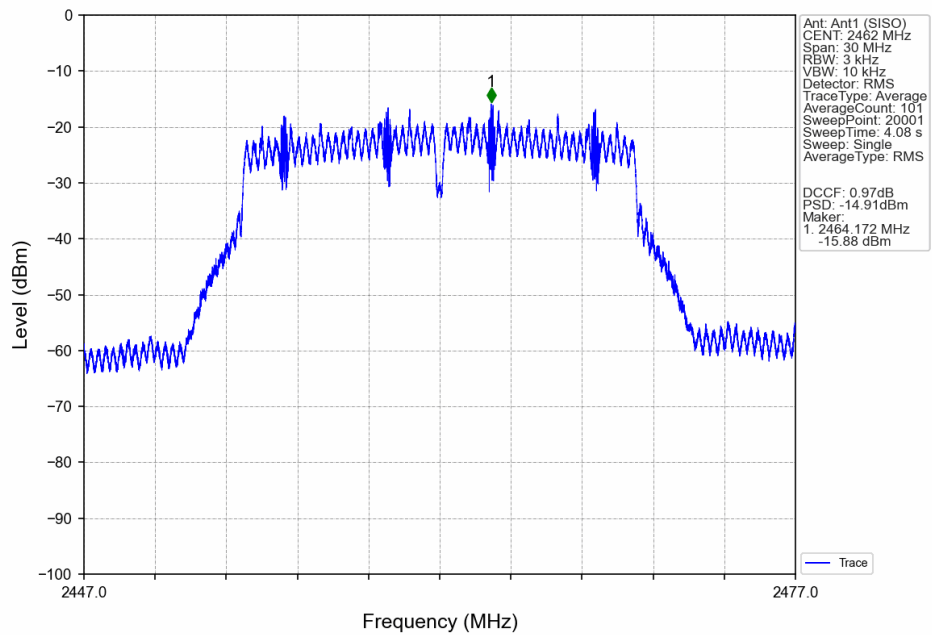
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



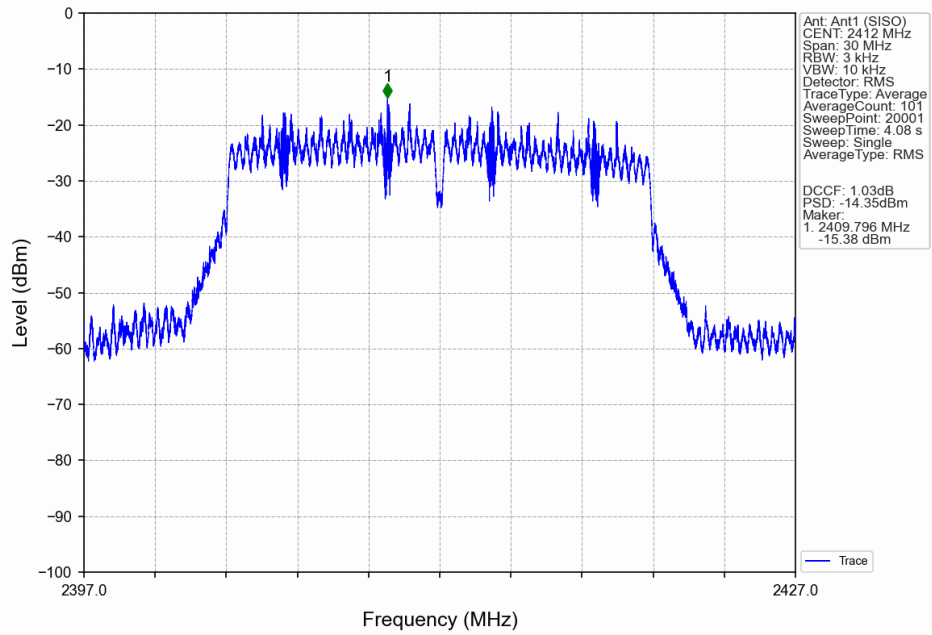
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



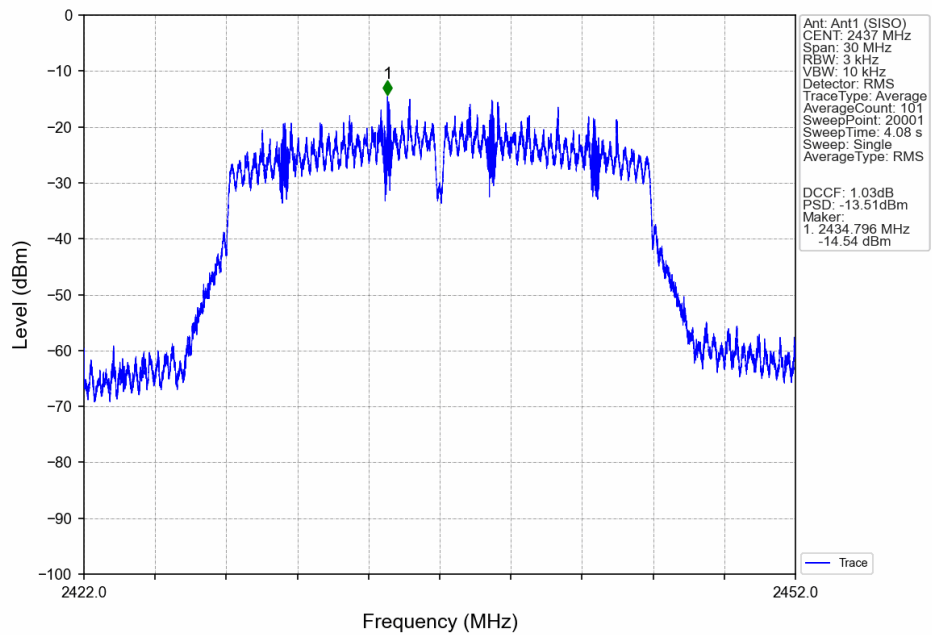
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



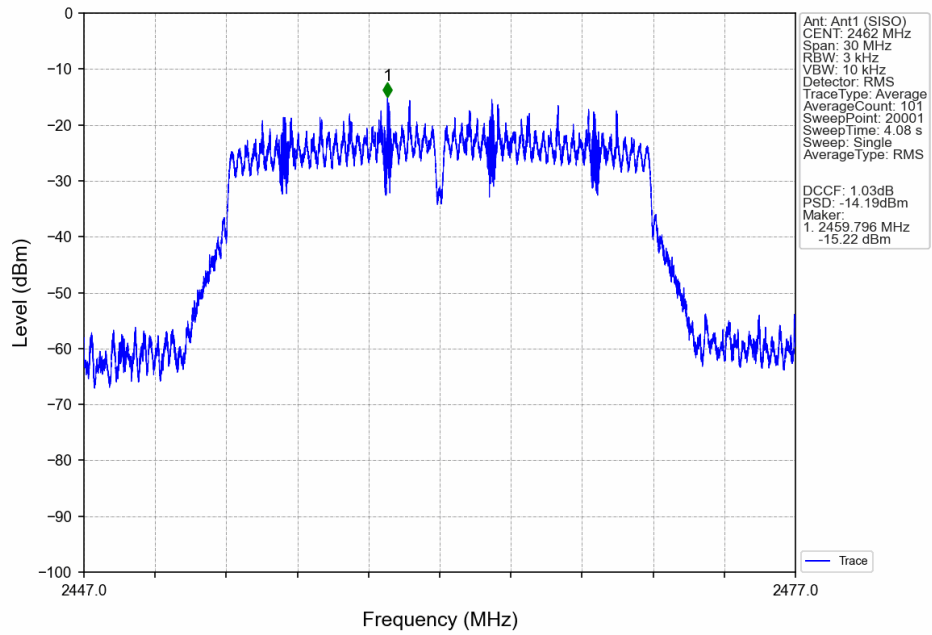
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



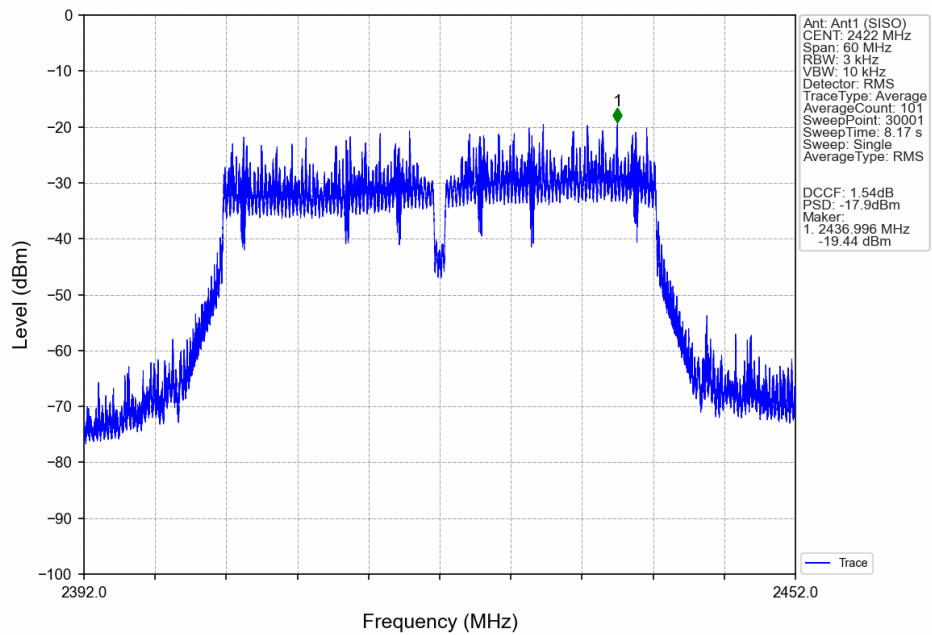
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



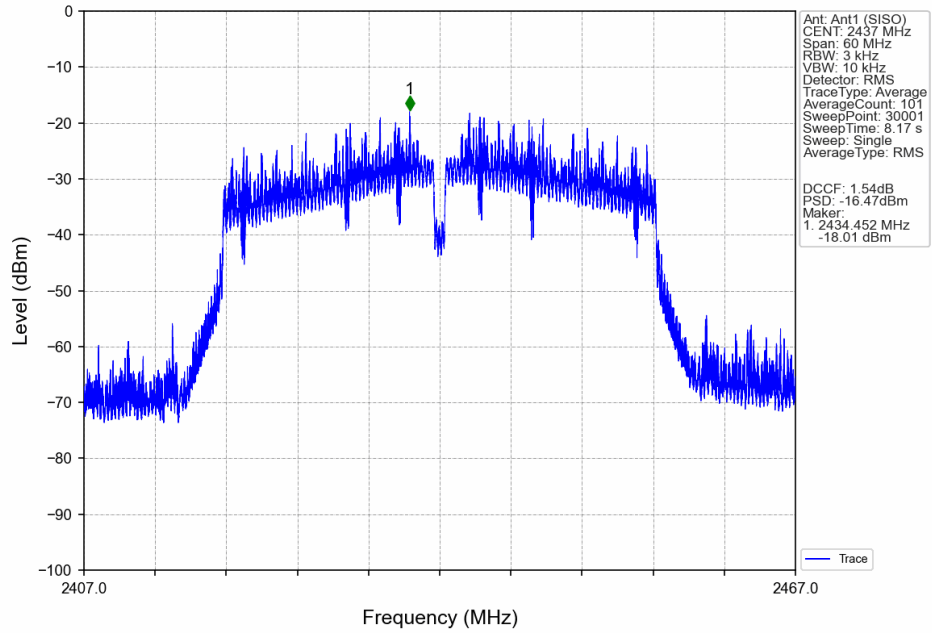
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



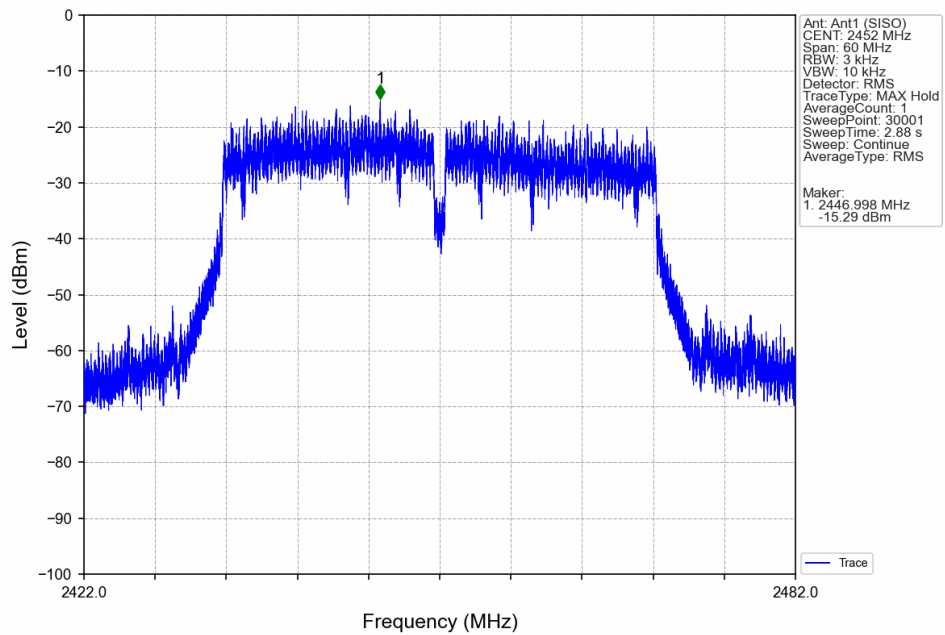
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

5.1.1 Ref

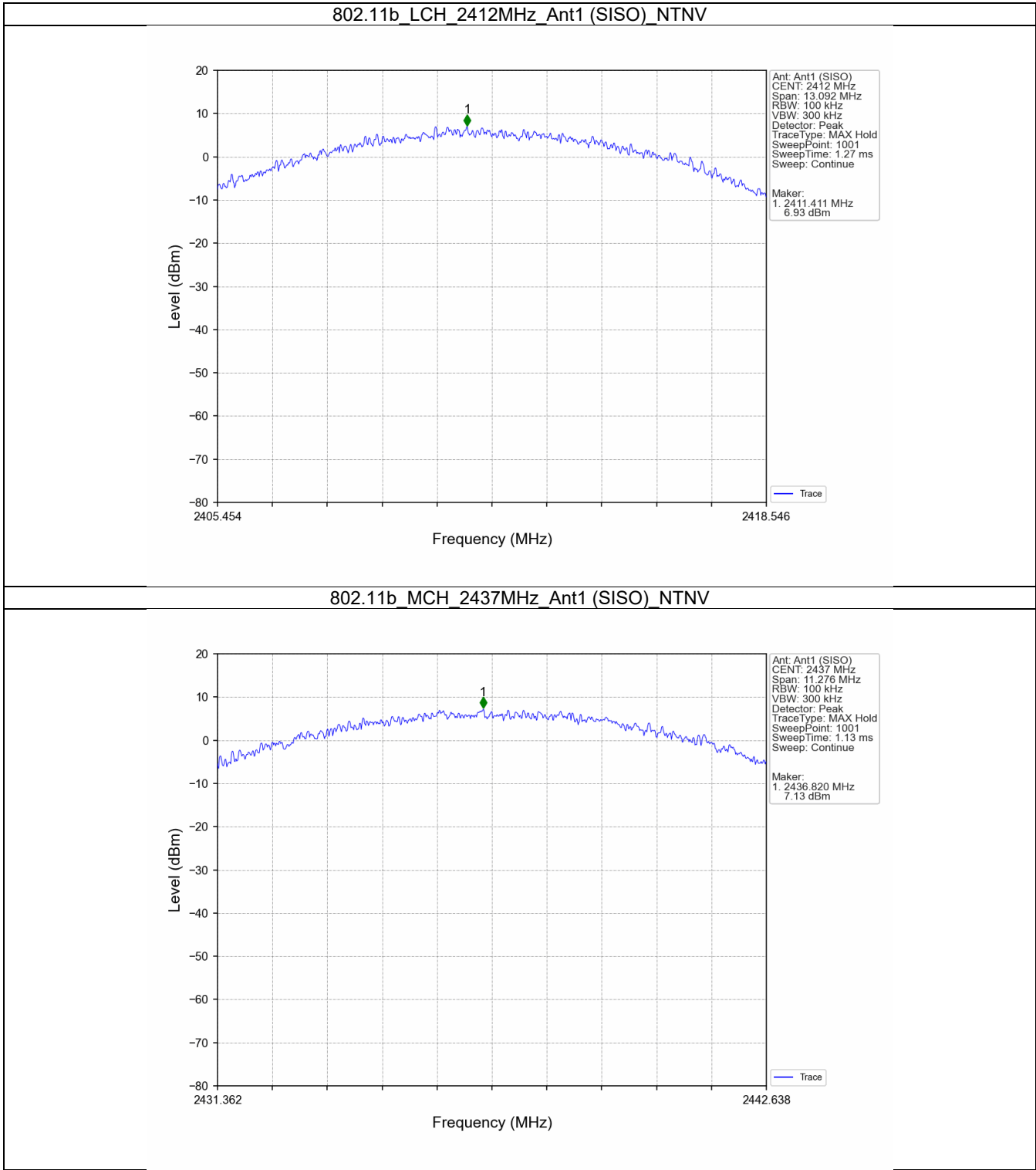
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
802.11b	SISO	2412	1	6.93
		2437	1	7.13
		2462	1	7.60
802.11g	SISO	2412	1	4.30
		2437	1	5.91
		2462	1	5.10
802.11n (HT20)	SISO	2412	1	2.42
		2437	1	5.49
		2462	1	4.60
802.11n (HT40)	SISO	2422	1	-0.95
		2437	1	1.10
		2452	1	-0.23

5.1.2 CSE

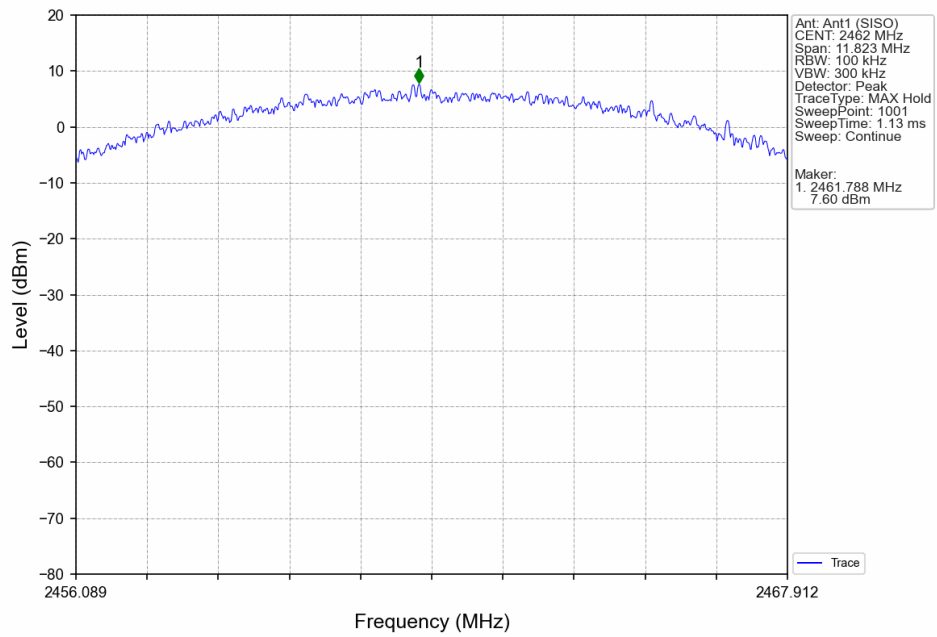
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
802.11b	SISO	2412	1	6.93	-23.07	Pass
		2437	1	7.13	-22.87	Pass
		2462	1	7.60	-22.40	Pass
802.11g	SISO	2412	1	4.30	-25.70	Pass
		2437	1	5.91	-24.09	Pass
		2462	1	5.10	-24.90	Pass
802.11n (HT20)	SISO	2412	1	2.42	-27.58	Pass
		2437	1	5.49	-24.51	Pass
		2462	1	4.60	-25.40	Pass
802.11n (HT40)	SISO	2422	1	-0.95	-30.95	Pass
		2437	1	1.10	-28.90	Pass
		2452	1	-0.23	-30.23	Pass

5.2 Test Graph

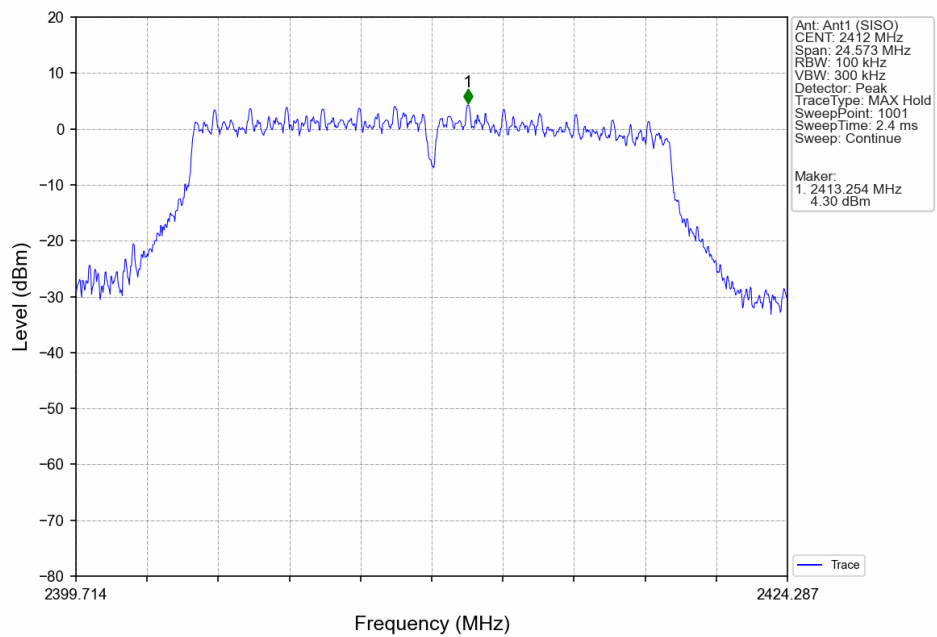
5.2.1 Ref



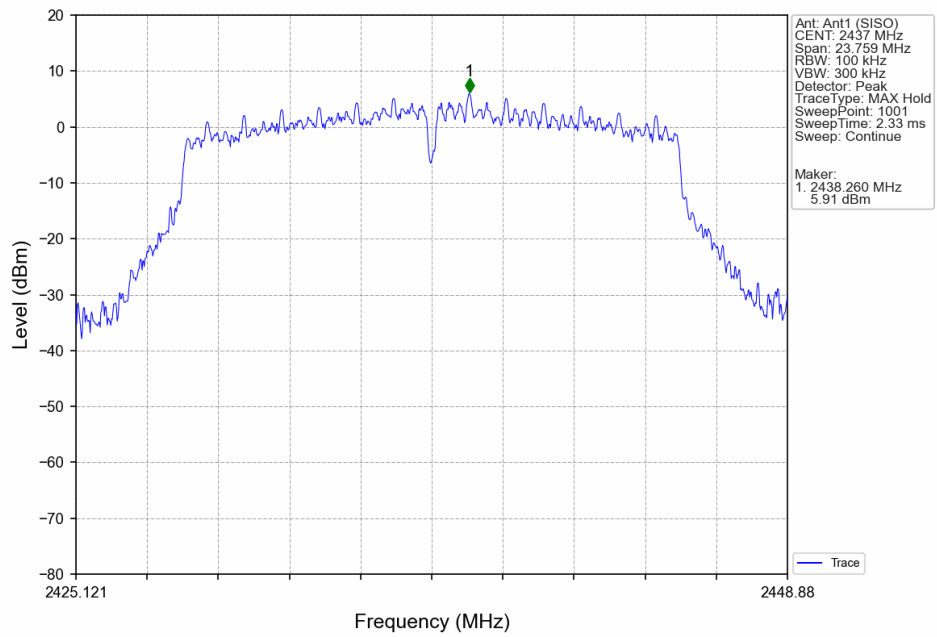
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



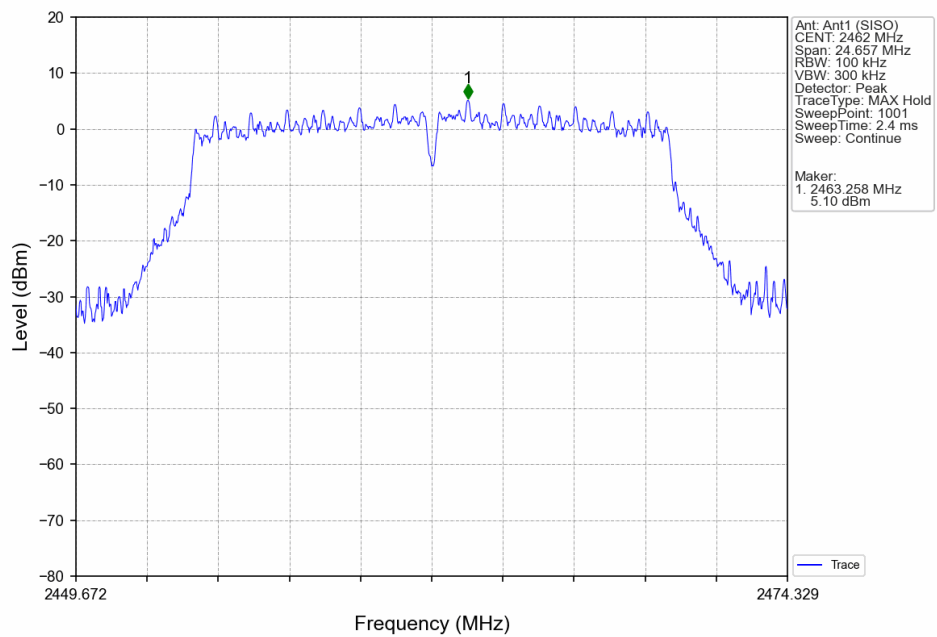
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



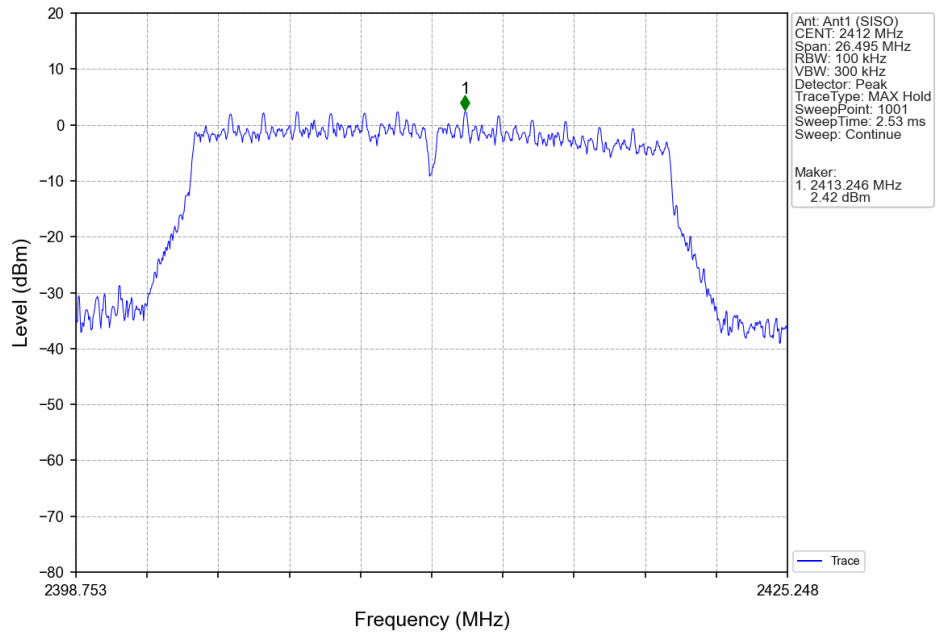
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



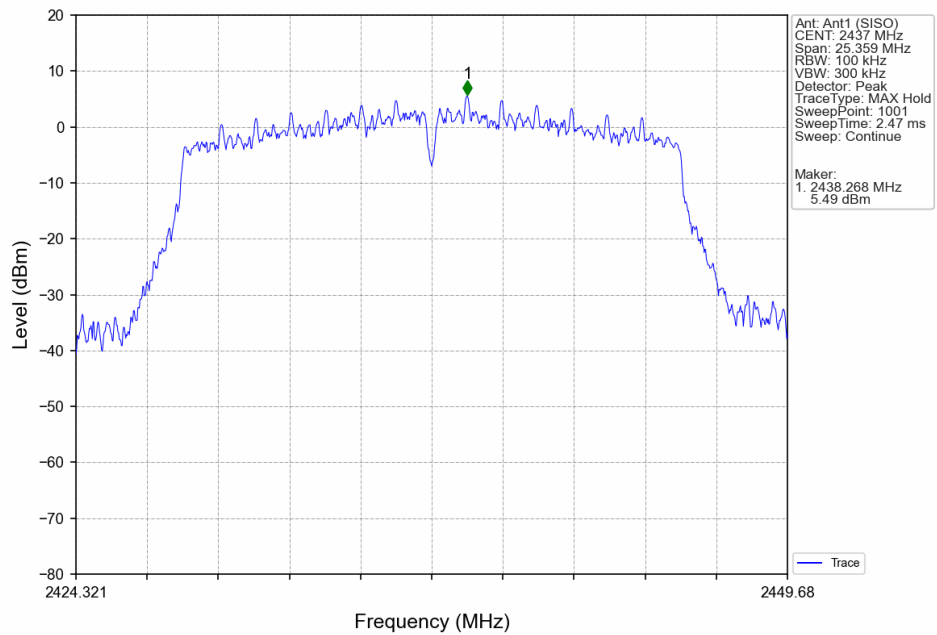
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



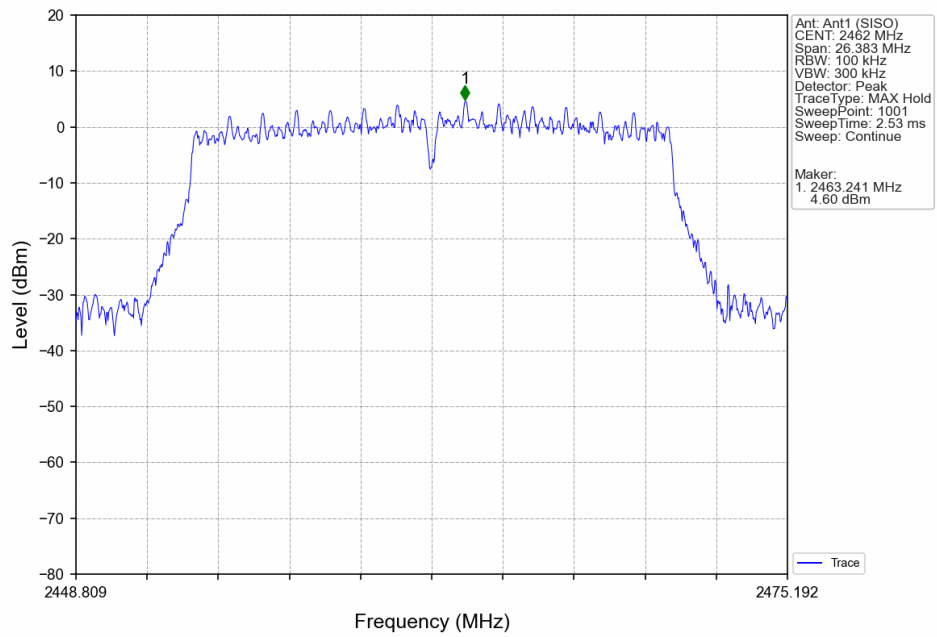
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



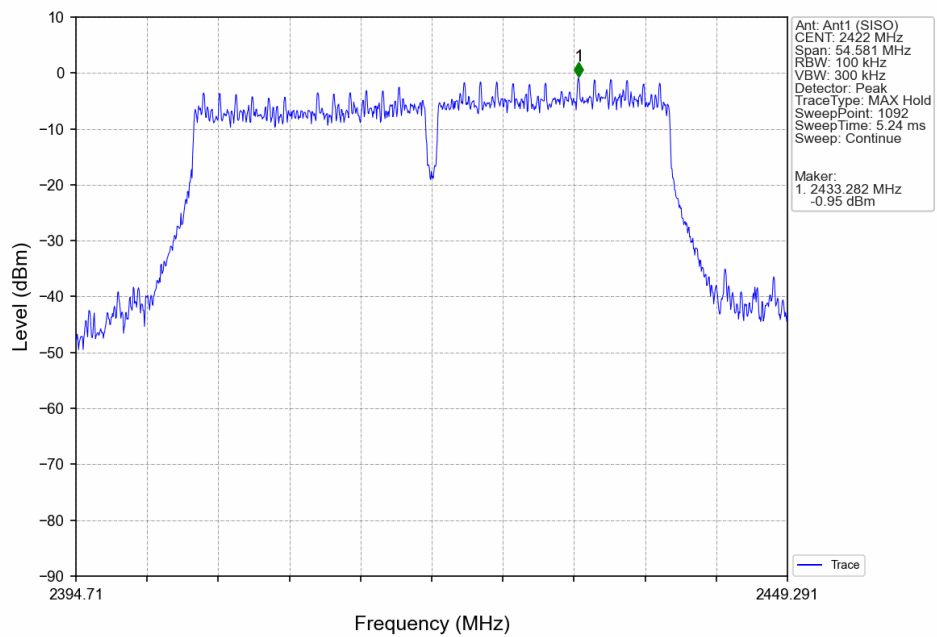
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



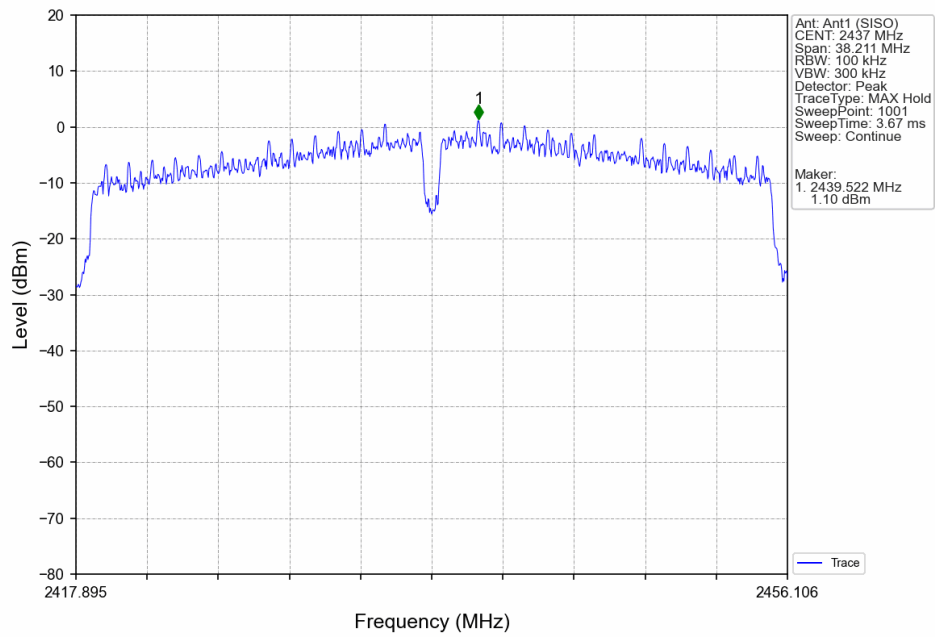
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



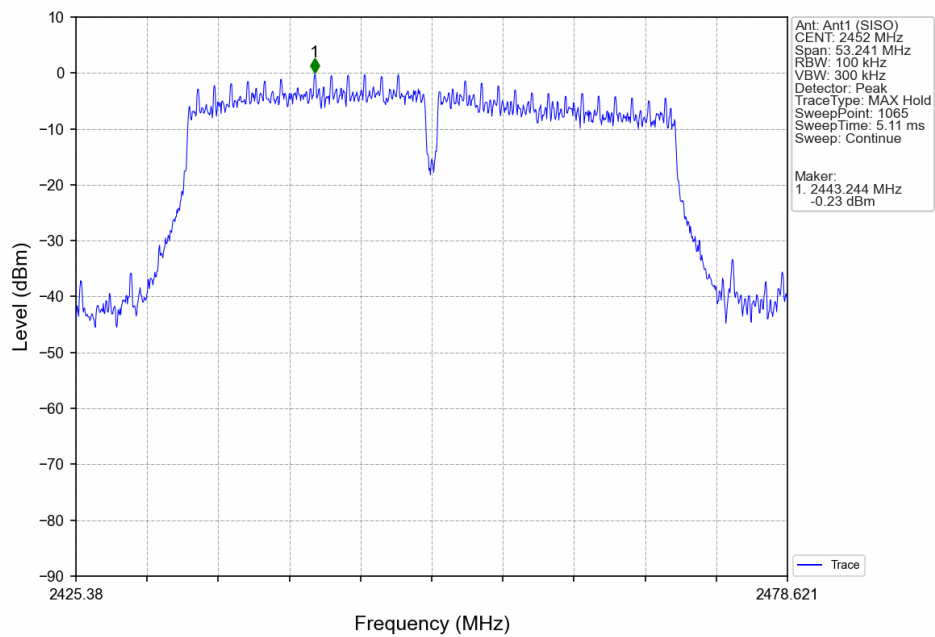
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



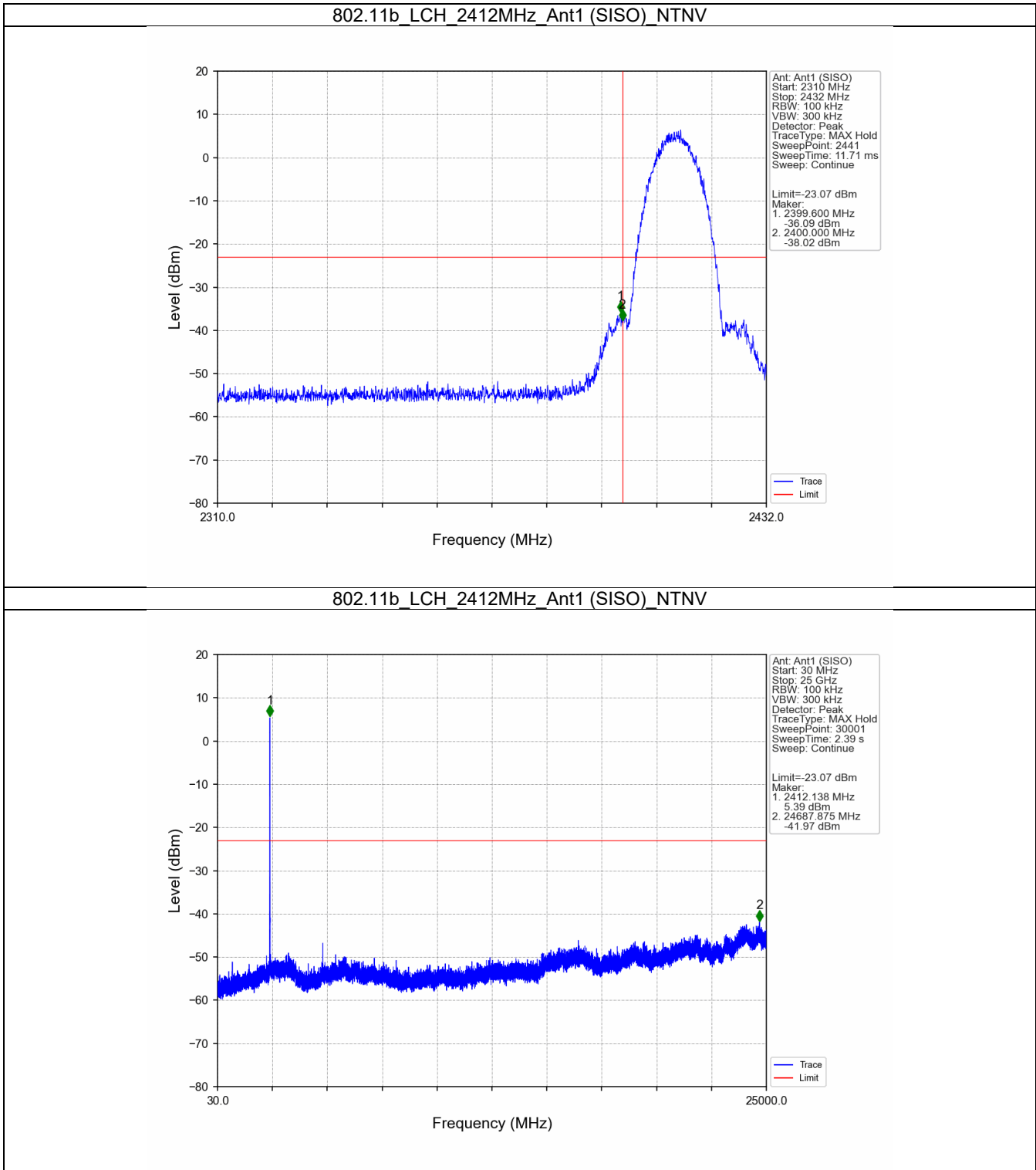
802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



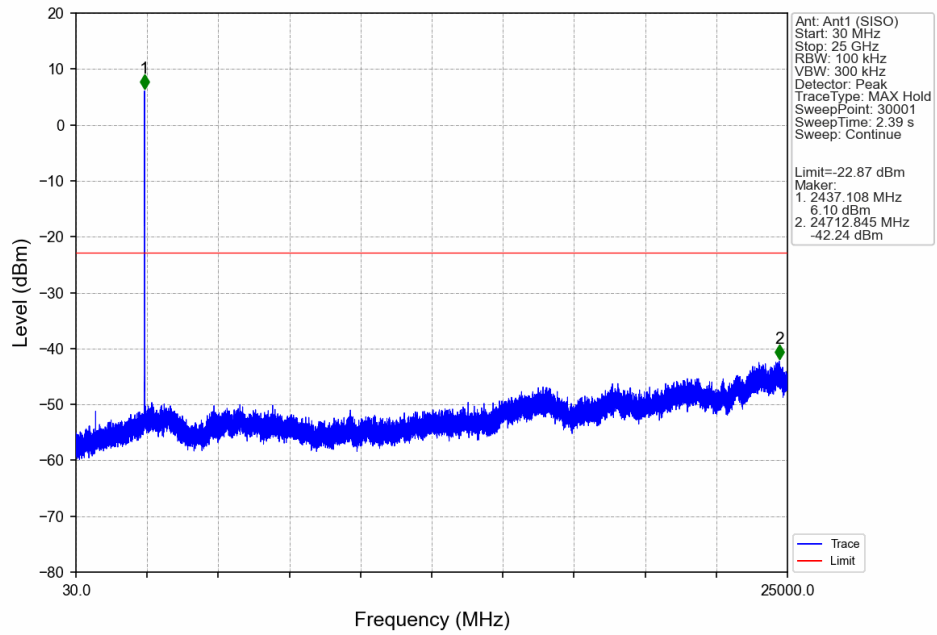
802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



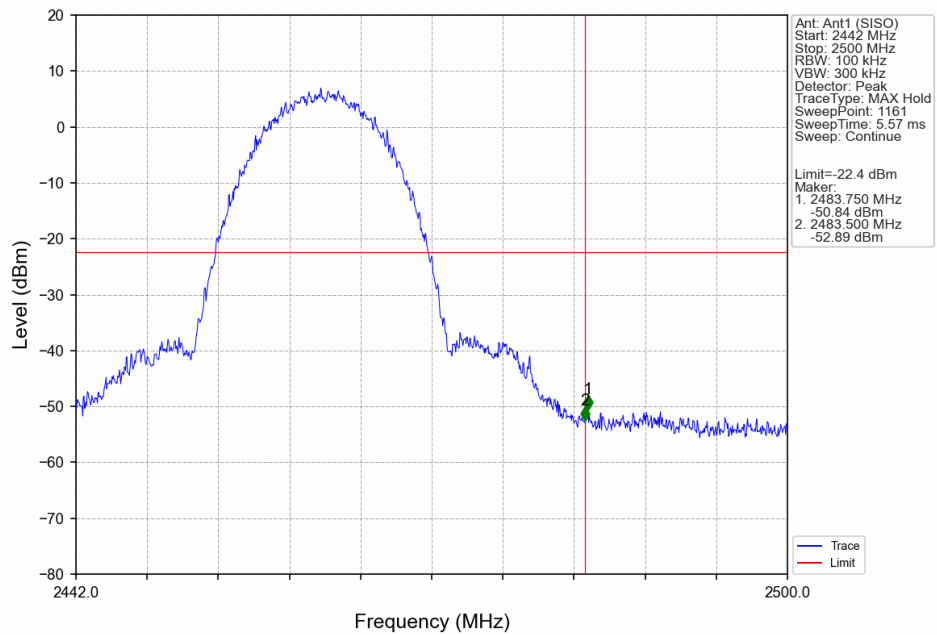
5.2.2 CSE



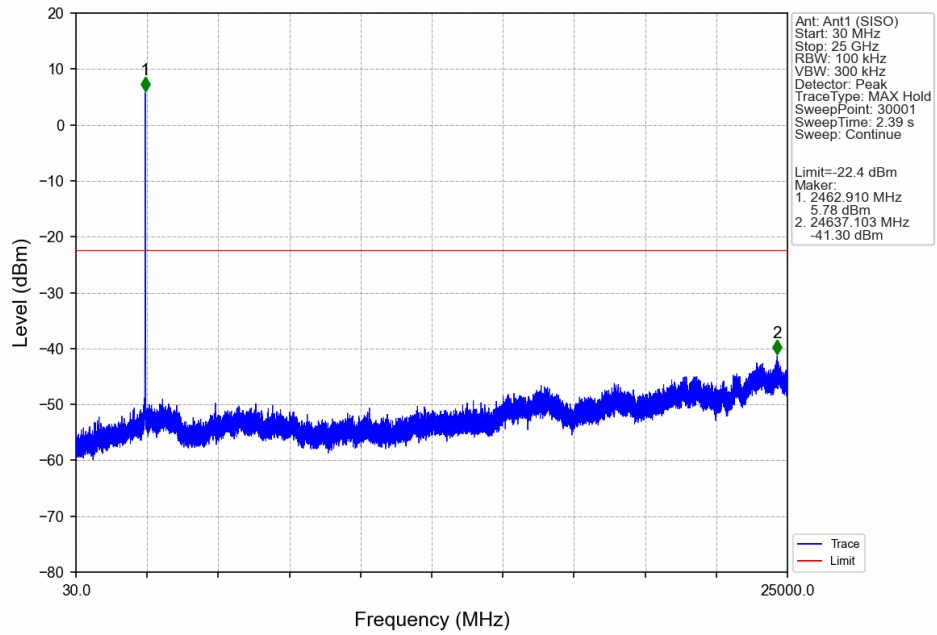
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



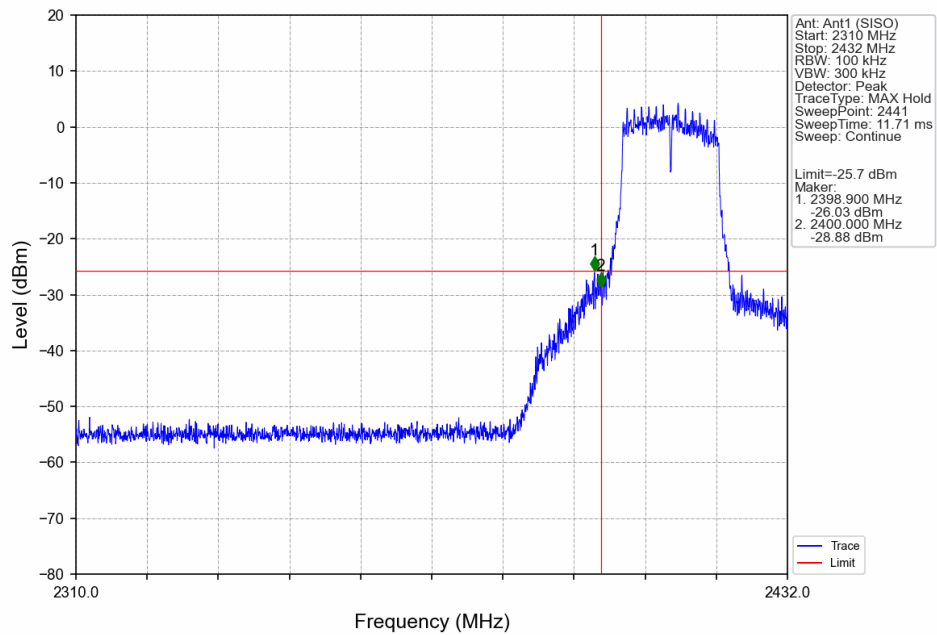
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



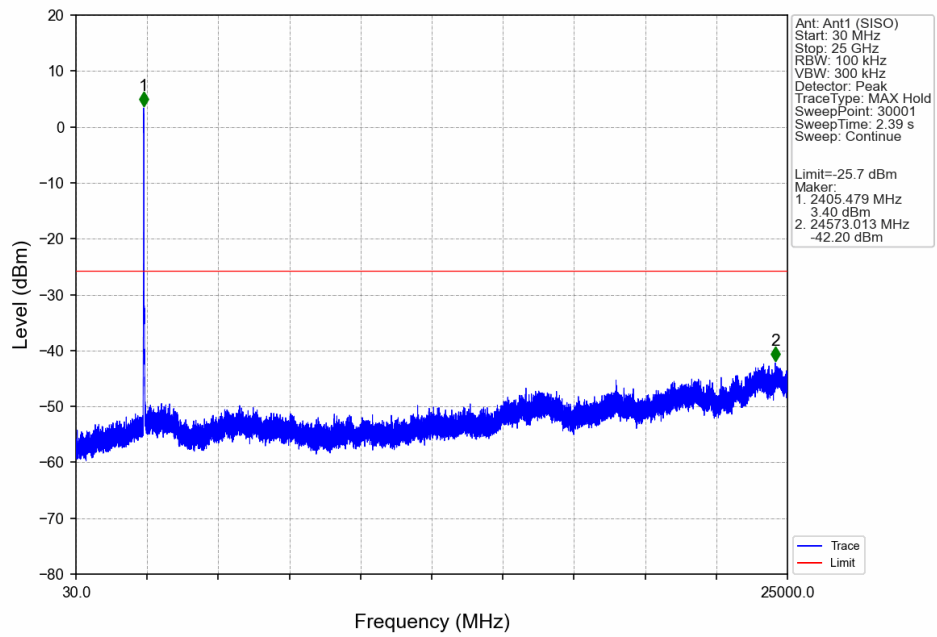
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



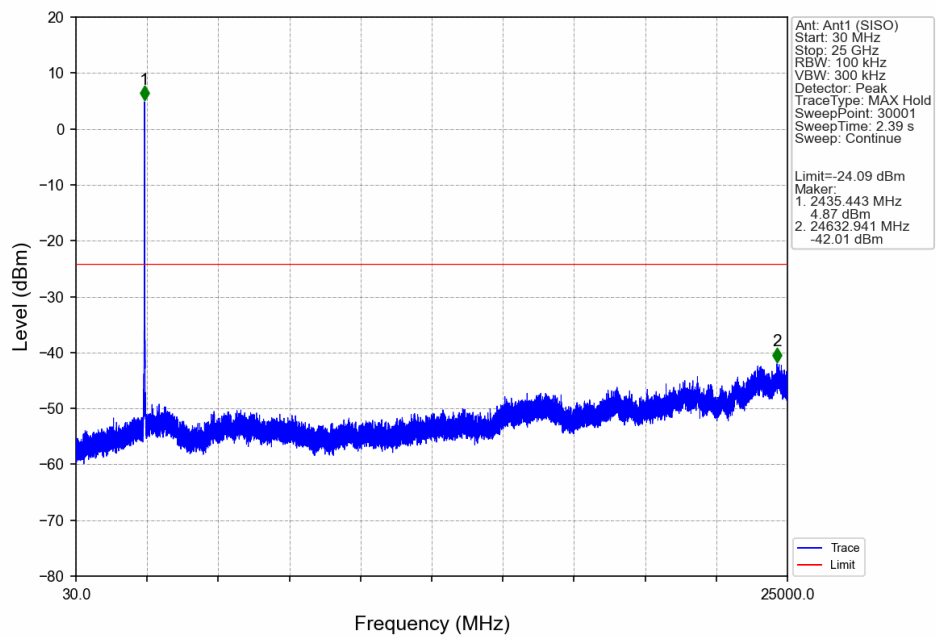
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



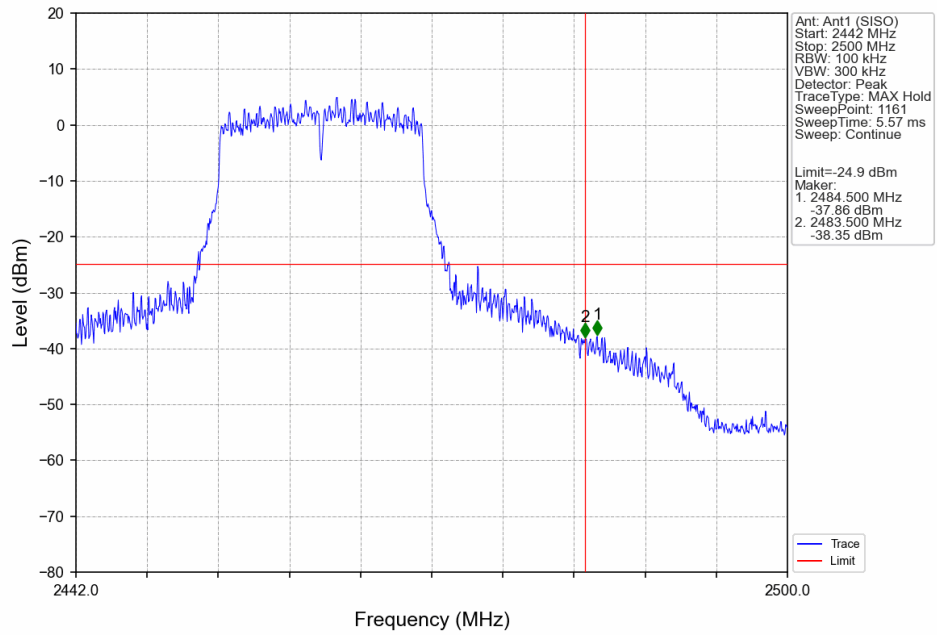
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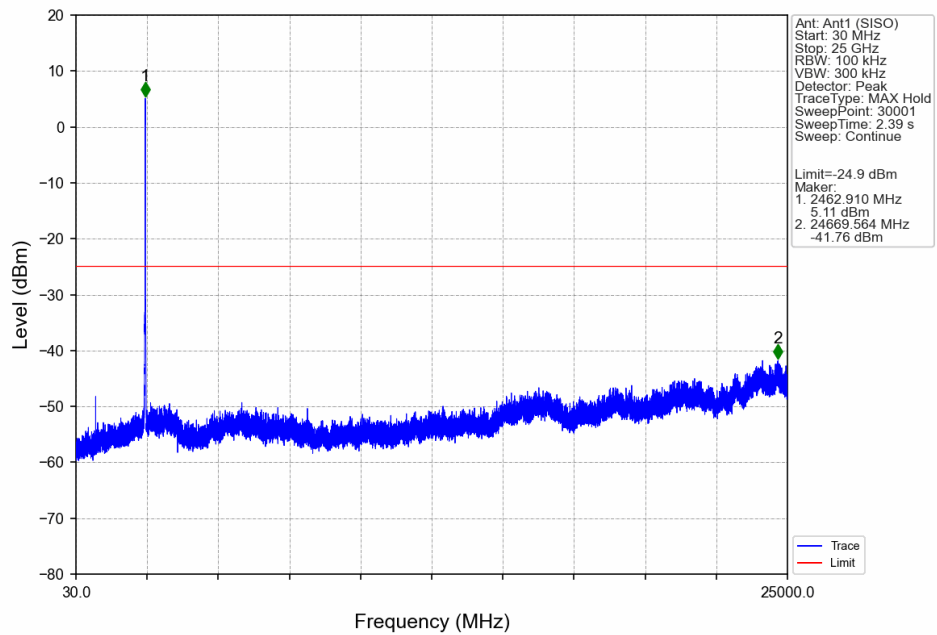
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



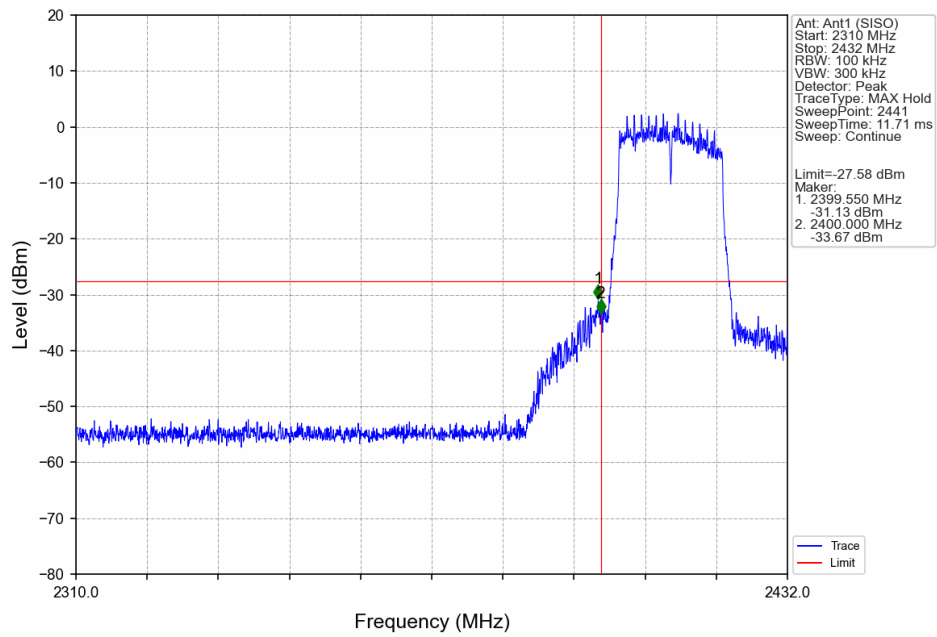
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



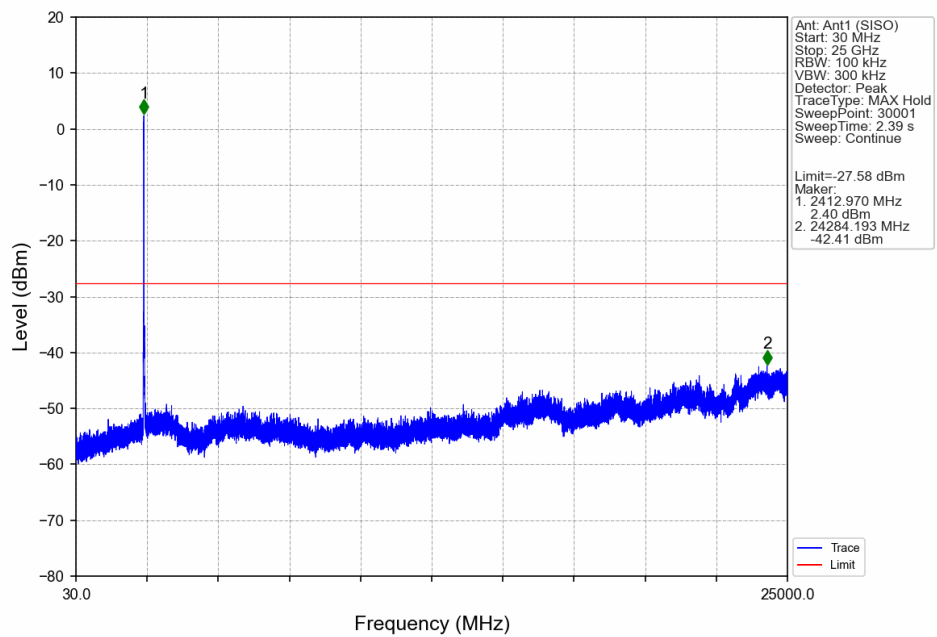
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



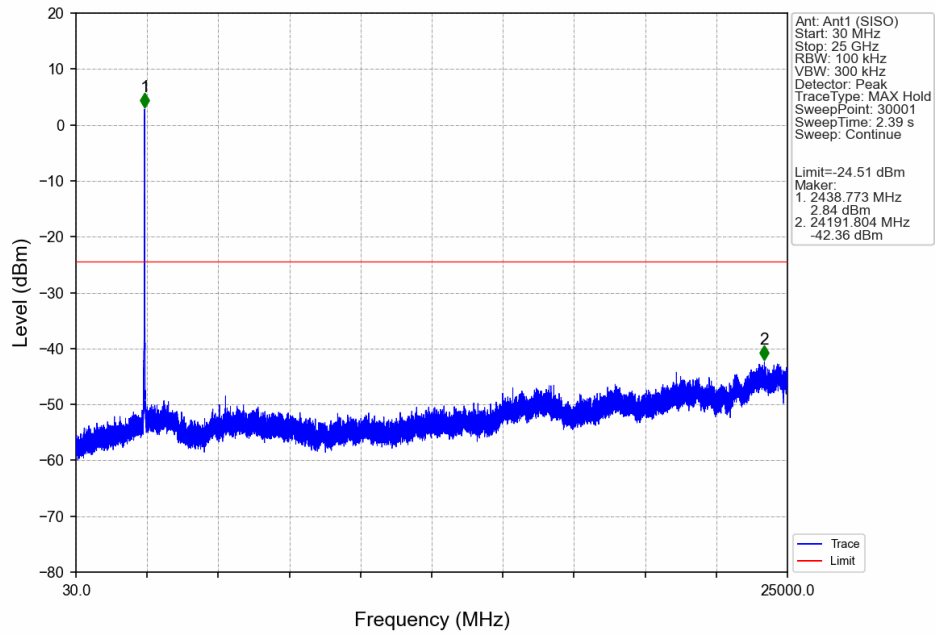
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



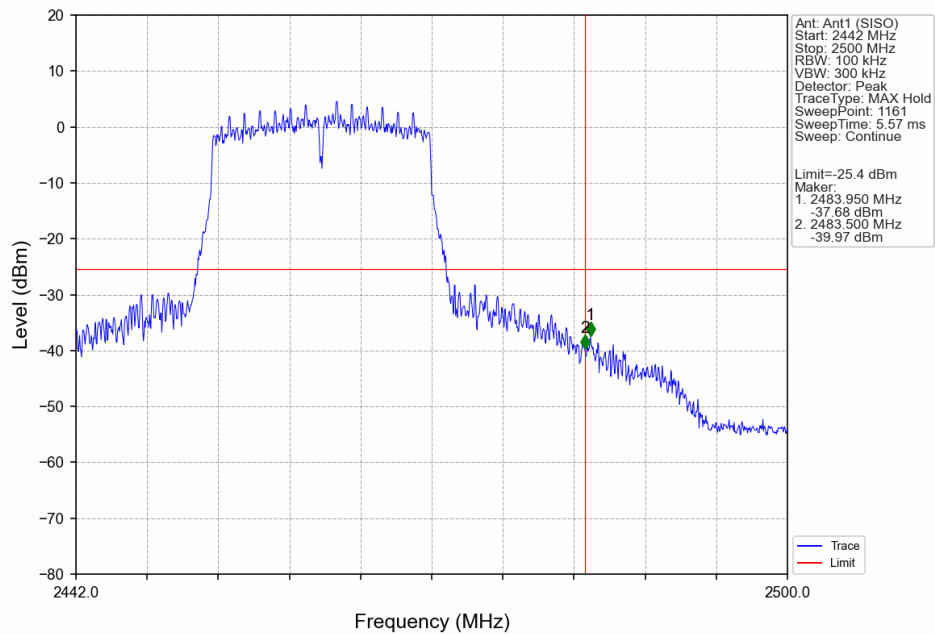
802.11n(HT20)_LCH_2412MHz_Ant1 (SISO)_NTNV



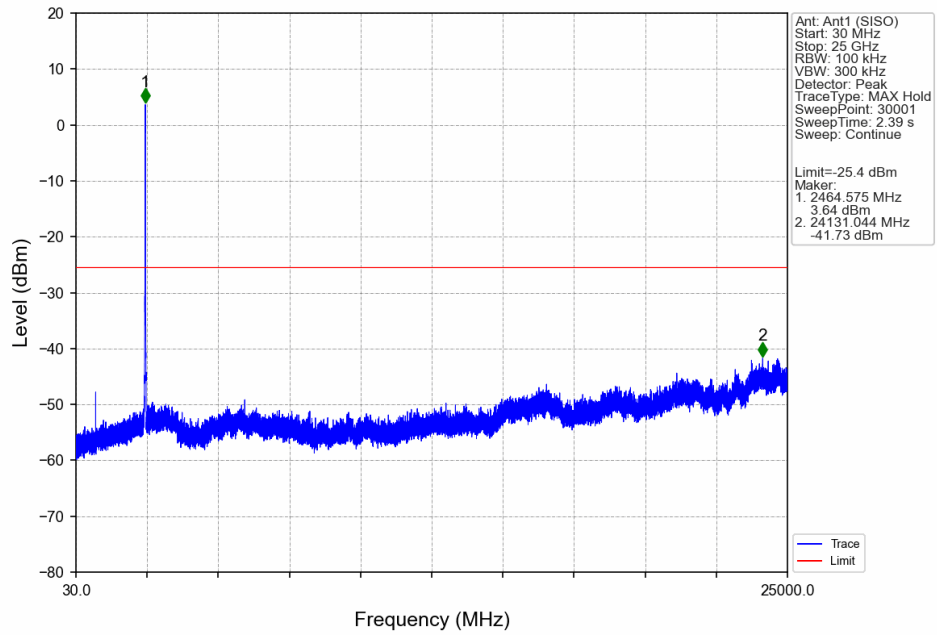
802.11n(HT20)_MCH_2437MHz_Ant1 (SISO)_NTNV



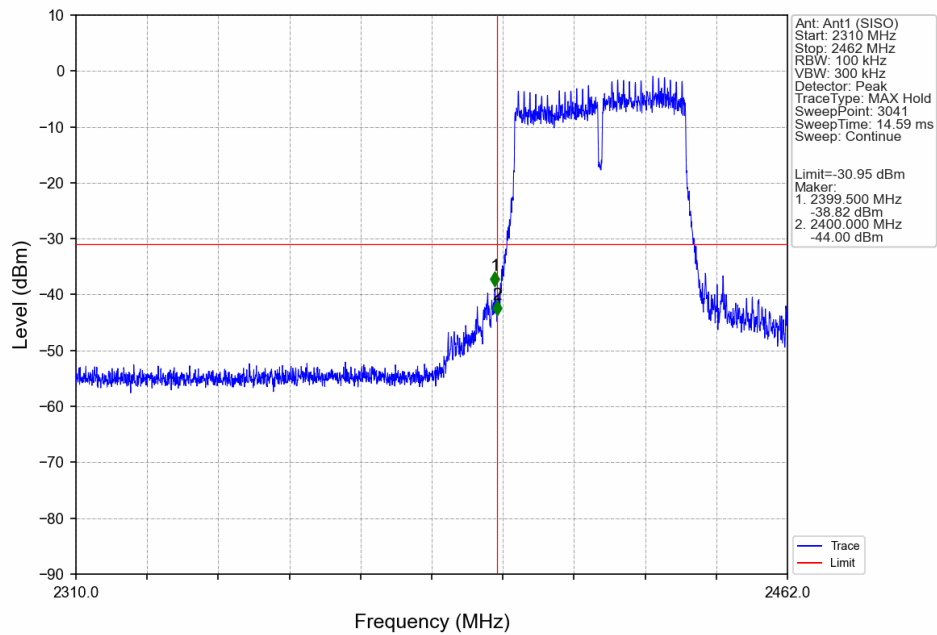
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



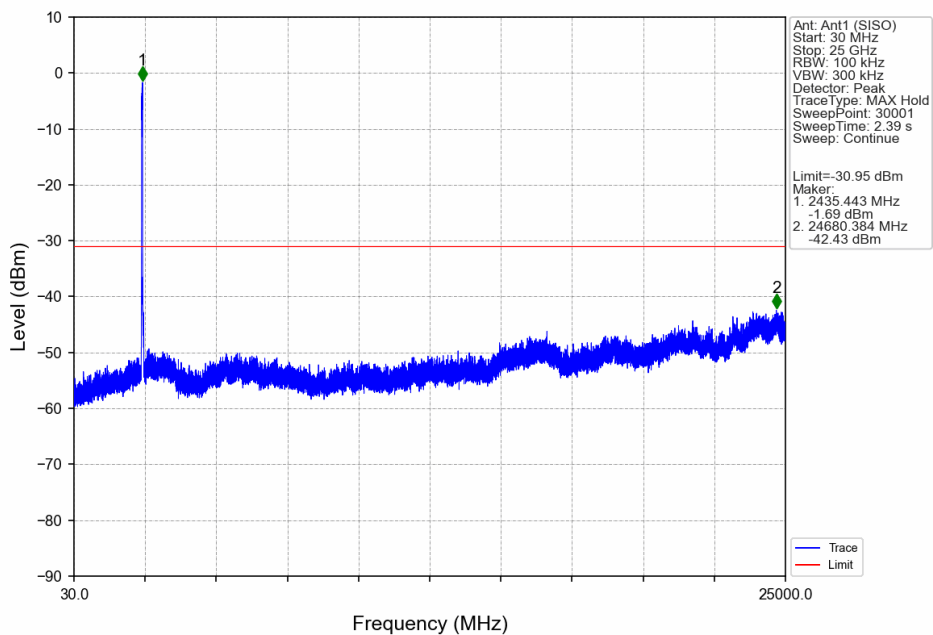
802.11n(HT20)_HCH_2462MHz_Ant1 (SISO)_NTNV



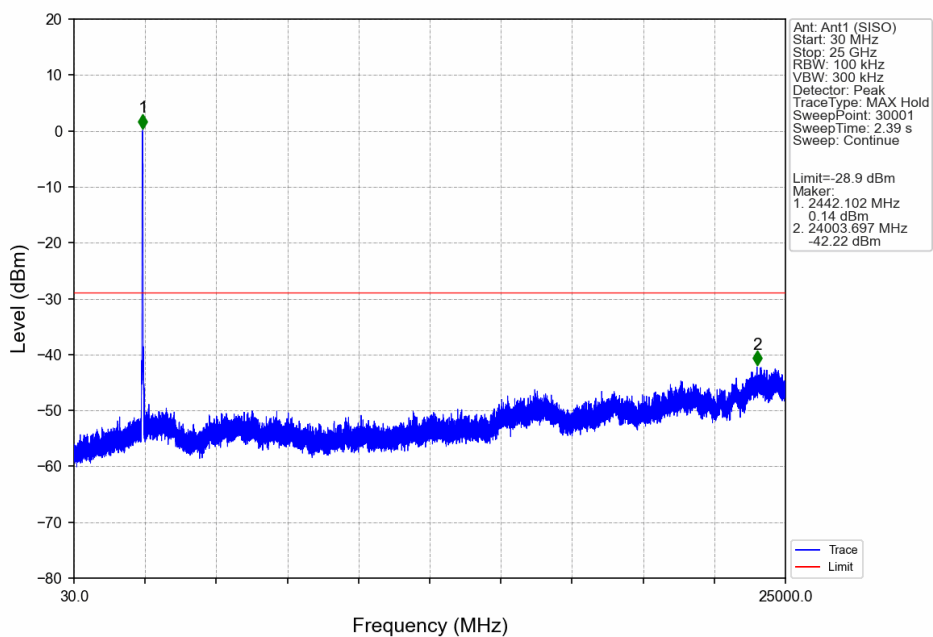
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



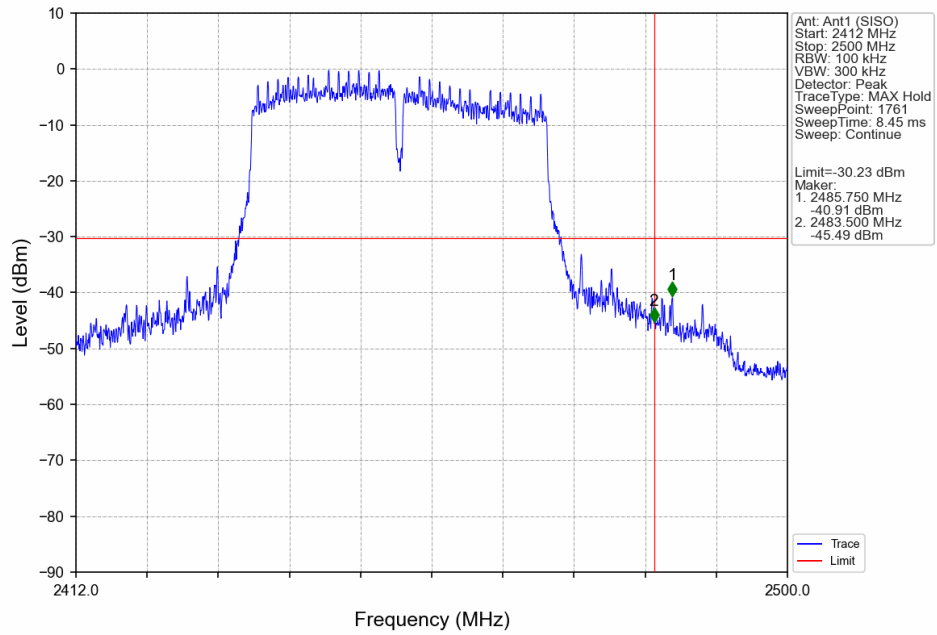
802.11n(HT40)_LCH_2422MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (SISO)_NTNV

