

Appendix RF test data for WIFI2.4G- Module1

1. Duty Cycle

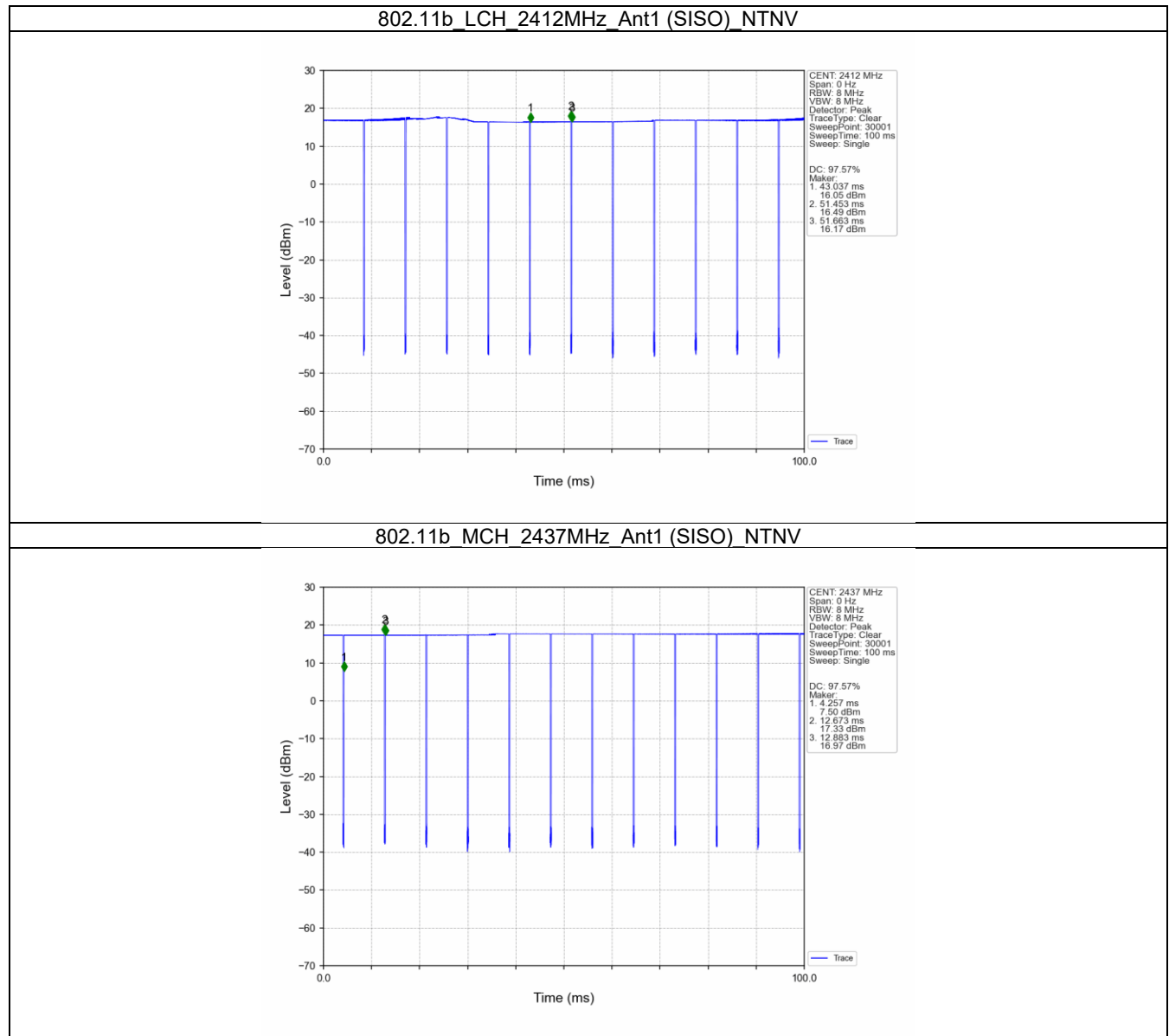
1.1 Test Result

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	8.416	8.626	97.57	0.11	0.04
		2437	8.416	8.626	97.57	0.11	0.04
		2462	8.416	8.626	97.57	0.11	0.04
802.11g	SISO	2412	1.396	1.606	86.92	0.61	0.03
		2437	1.396	1.605	86.98	0.61	0.03
		2462	1.397	1.605	87.04	0.60	0.07
802.11n (HT20)	MIMO	2412	1.309	1.518	86.23	0.64	0.07
		2437	1.309	1.516	86.35	0.64	0.03
		2462	1.309	1.517	86.29	0.64	0.03
802.11n (HT40)	MIMO	2422	0.649	0.858	75.64	1.21	0.06
		2437	0.650	0.857	75.85	1.20	0.04
		2452	0.649	0.857	75.73	1.21	0.04

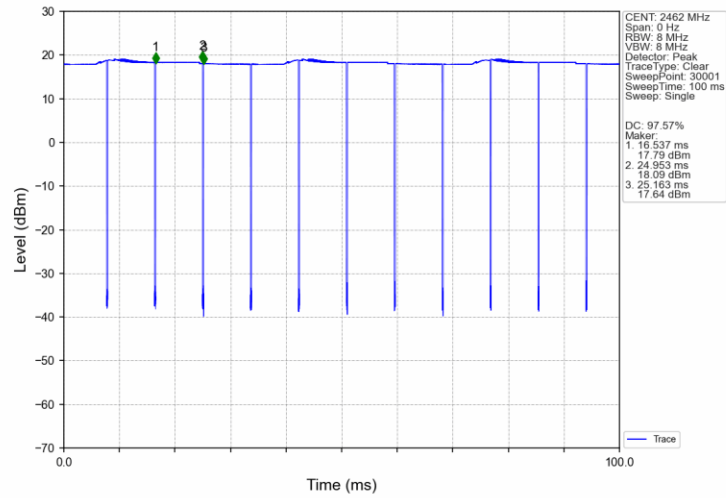
1.2 Test Graph

1.2.1 Ant1

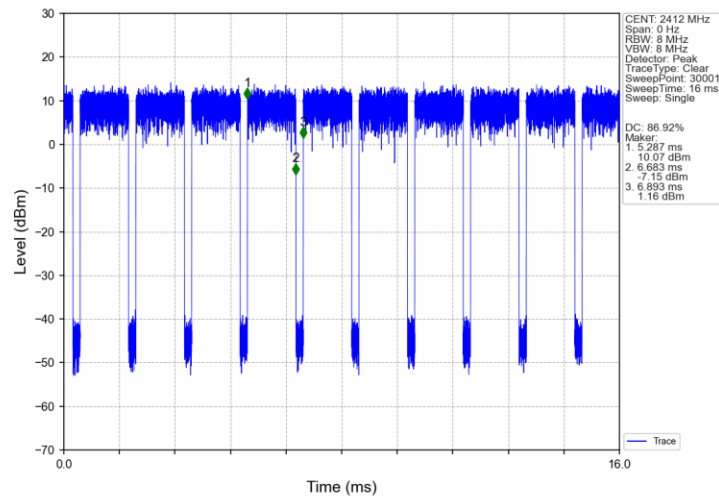




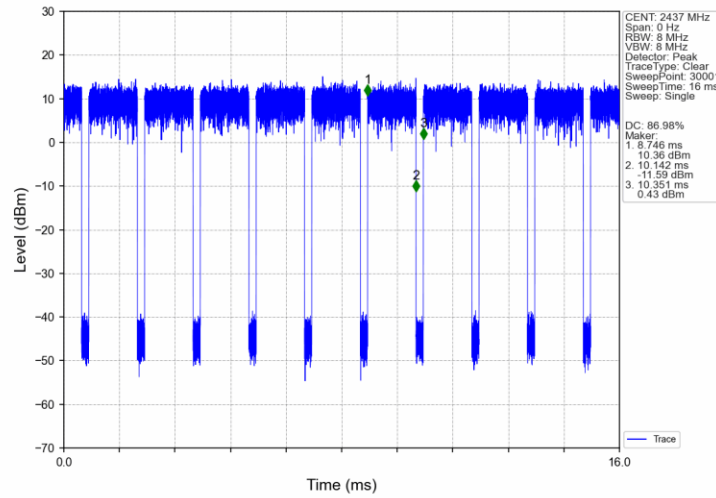
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



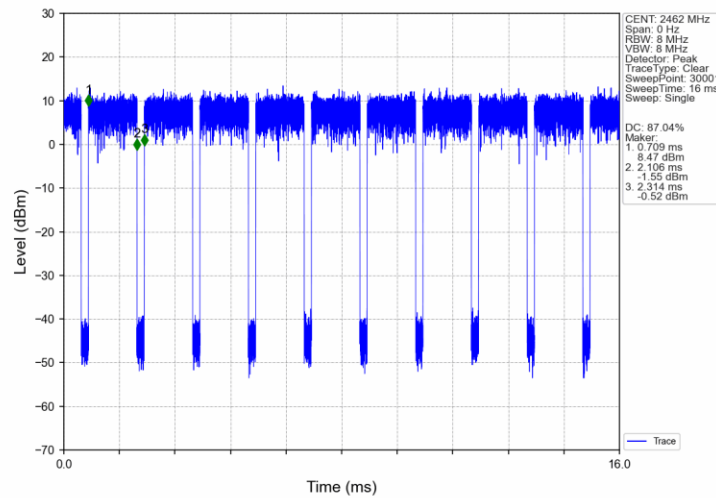
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



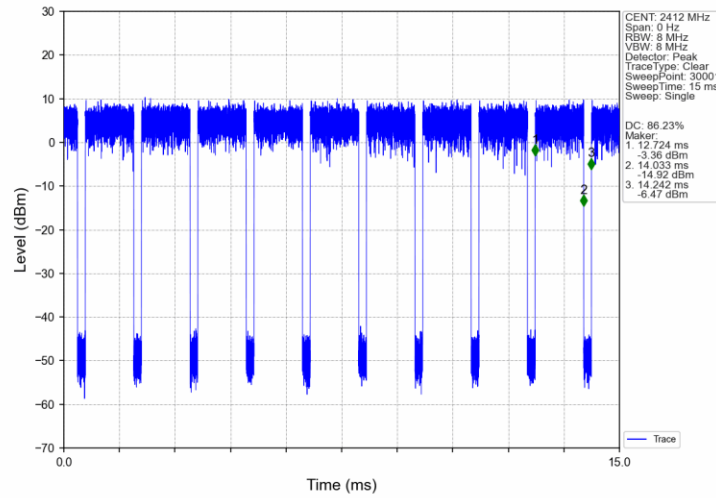
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



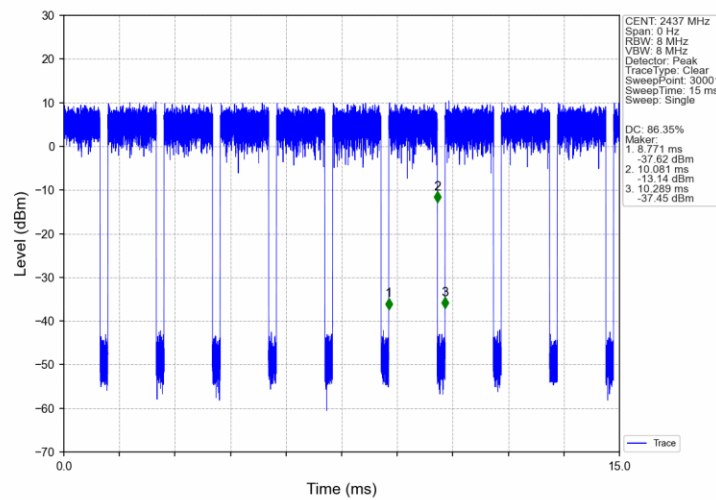
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



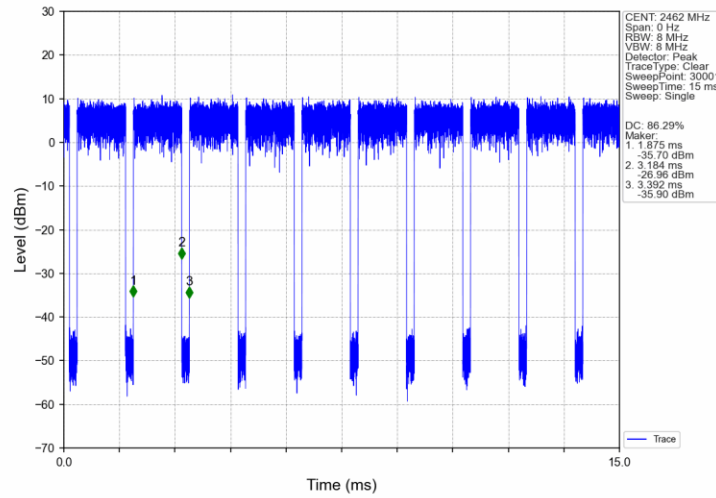
802.11n(HT20)_LCH_2412MHz_Ant1 (MIMO)_NTNV



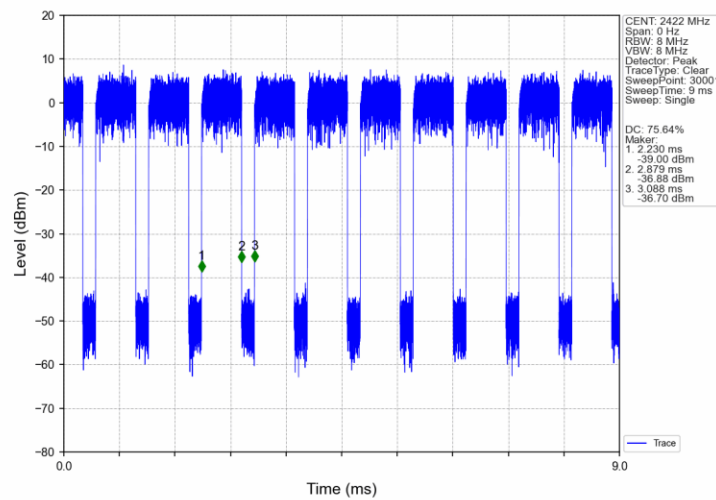
802.11n(HT20)_MCH_2437MHz_Ant1 (MIMO)_NTNV



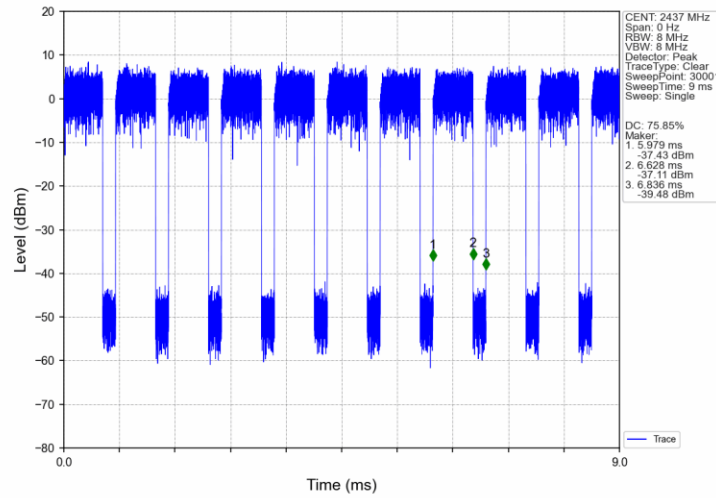
802.11n(HT20)_HCH_2462MHz_Ant1 (MIMO)_NTNV



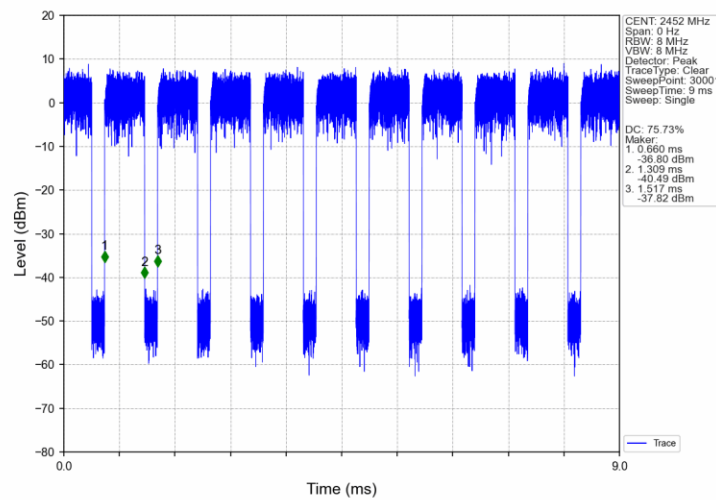
802.11n(HT40)_LCH_2422MHz_Ant1 (MIMO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (MIMO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (MIMO)_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	12.340	/	Pass
		2437	1	12.379	/	Pass
		2462	1	12.418	/	Pass
802.11g	SISO	2412	1	17.405	/	Pass
		2437	1	17.372	/	Pass
		2462	1	17.441	/	Pass
802.11n (HT20)	MIMO	2412	1	18.211	/	Pass
		2437	1	18.397	/	Pass
		2462	1	18.483	/	Pass
802.11n (HT40)	MIMO	2422	1	36.543	/	Pass
		2437	1	36.628	/	Pass
		2452	1	36.578	/	Pass

Remark: All modes have been tested, and only the worst data is displayed

2.1.2 6dB BW

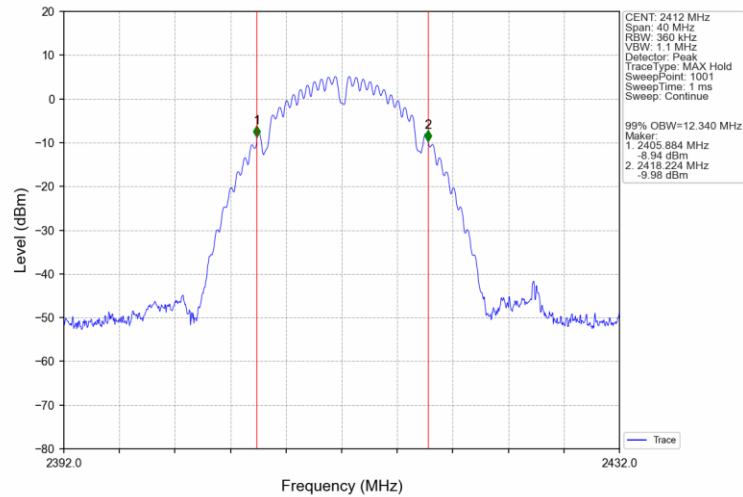
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
802.11b	SISO	2412	1	8.179	≥ 0.5	Pass
		2437	1	8.185	≥ 0.5	Pass
		2462	1	8.188	≥ 0.5	Pass
802.11g	SISO	2412	1	15.740	≥ 0.5	Pass
		2437	1	15.786	≥ 0.5	Pass
		2462	1	15.896	≥ 0.5	Pass
802.11n (HT20)	MIMO	2412	1	17.157	≥ 0.5	Pass
		2437	1	16.723	≥ 0.5	Pass
		2462	1	17.015	≥ 0.5	Pass
802.11n (HT40)	MIMO	2422	1	35.484	≥ 0.5	Pass
		2437	1	35.043	≥ 0.5	Pass
		2452	1	35.522	≥ 0.5	Pass

Remark: All modes have been tested, and only the worst data is displayed

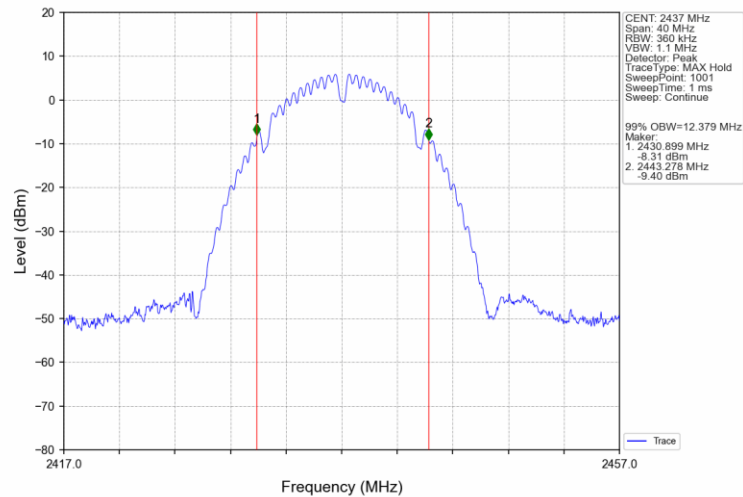
2.2 Test Graph

2.2.1 OBW

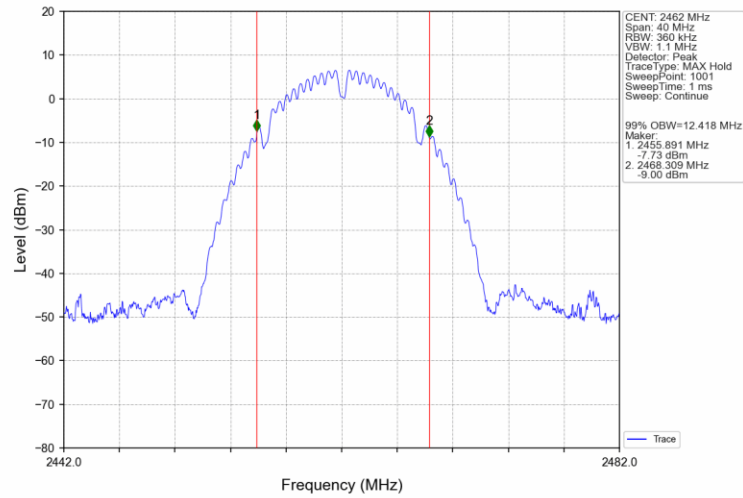
802.11b LCH 2412MHz_Ant1 (SISO) NTN



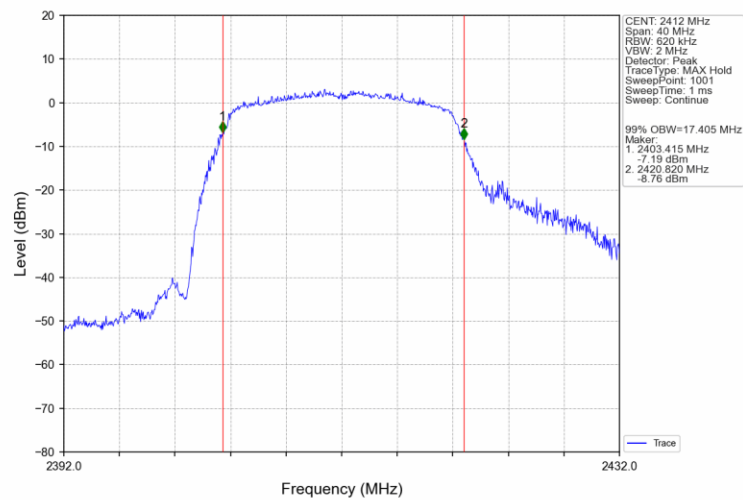
802.11b MCH 2437MHz_Ant1 (SISO) NTN



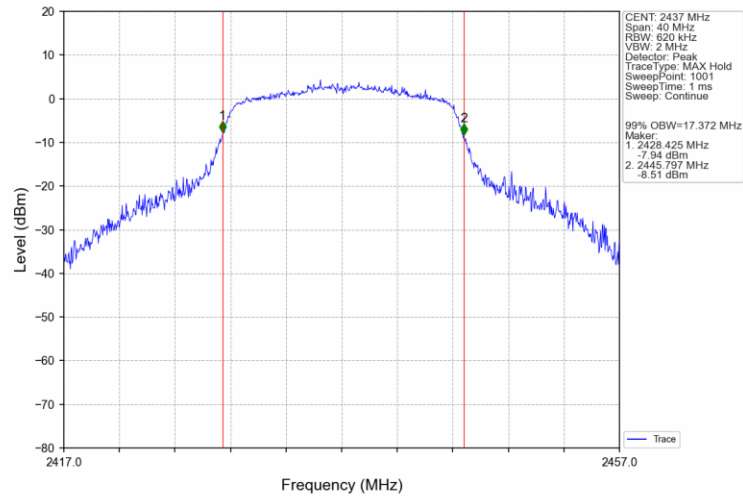
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



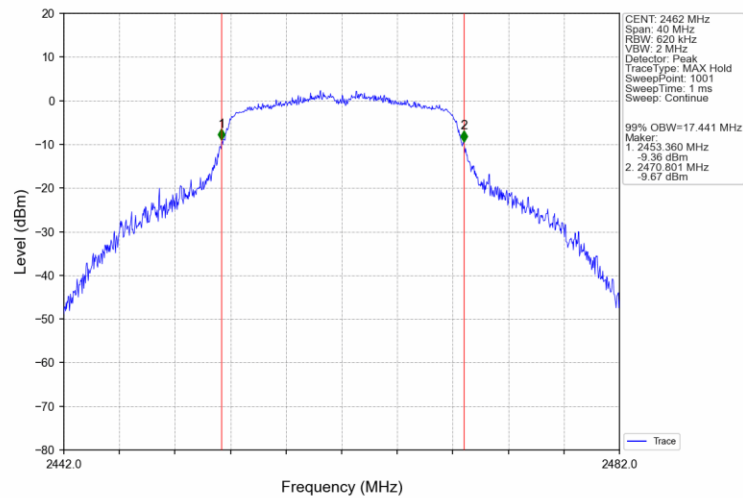
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



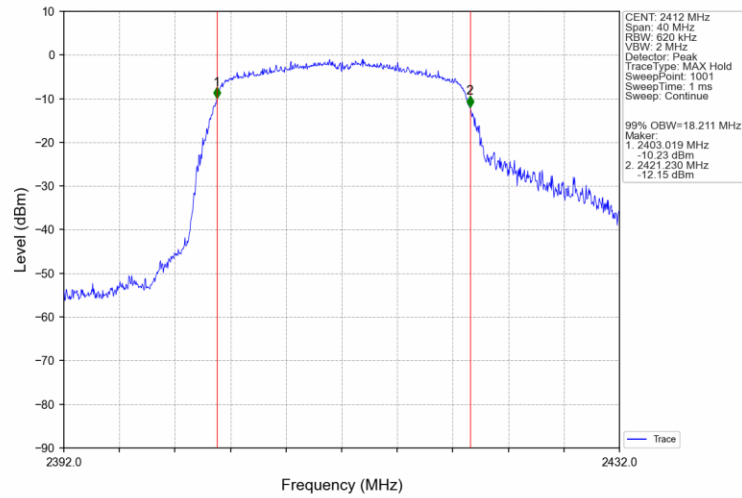
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



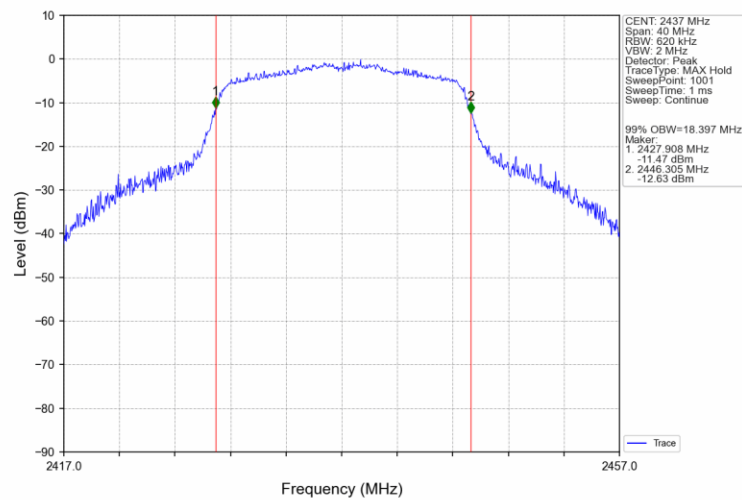
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



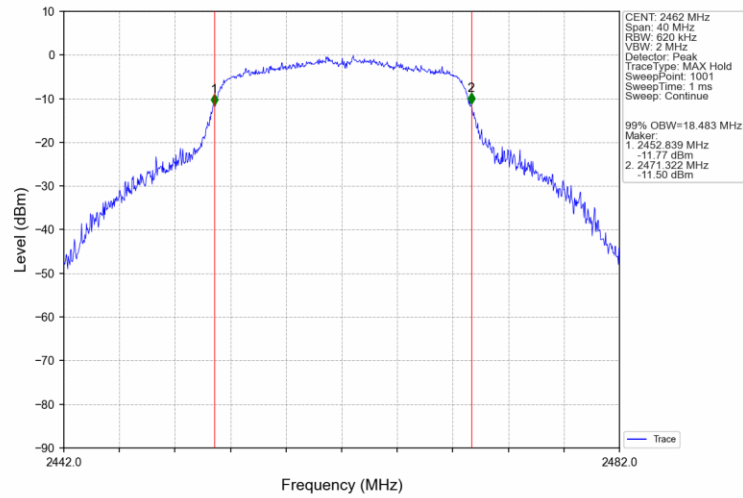
802.11n(HT20)_LCH_2412MHz_Ant1 (MIMO)_NTNV



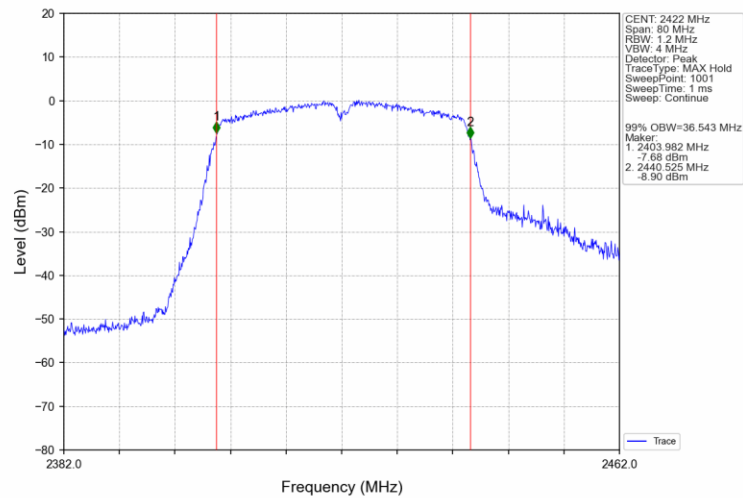
802.11n(HT20)_MCH_2437MHz_Ant1 (MIMO)_NTNV



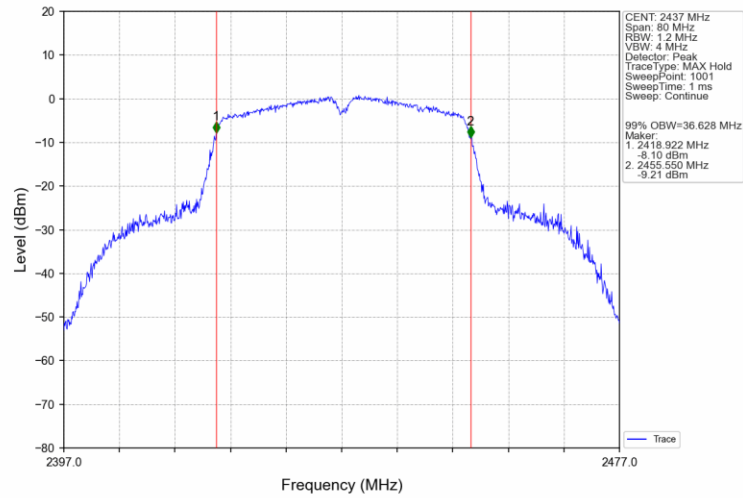
802.11n(HT20)_HCH_2462MHz_Ant1 (MIMO)_NTNV



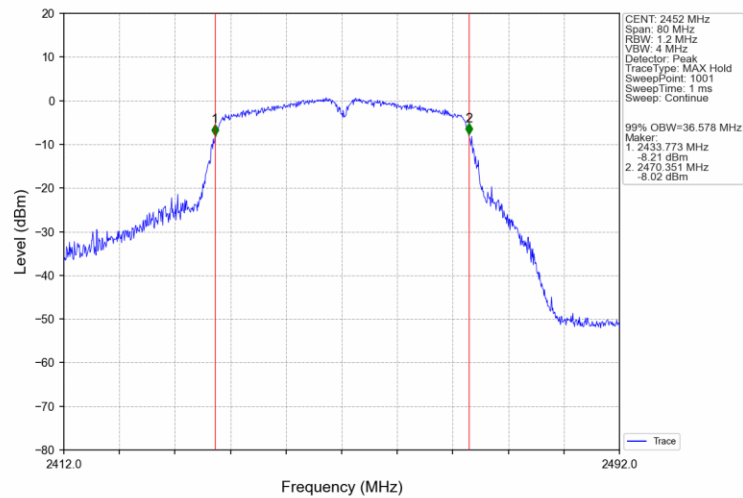
802.11n(HT40)_LCH_2422MHz_Ant1 (MIMO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (MIMO)_NTNV

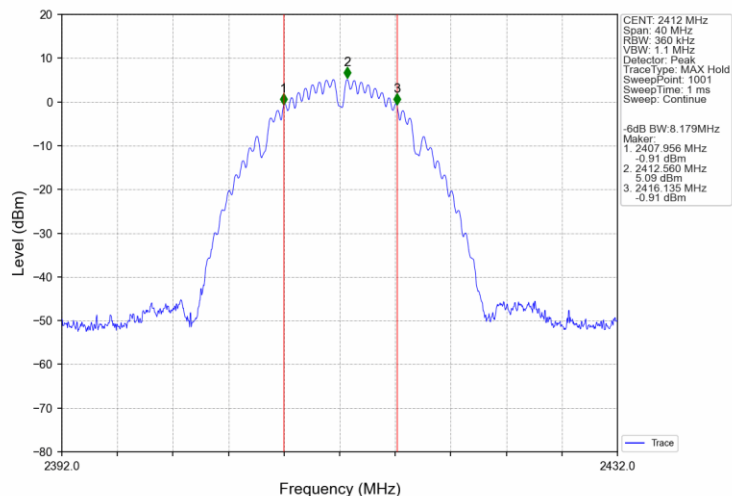


802.11n(HT40)_HCH_2452MHz_Ant1 (MIMO)_NTNV

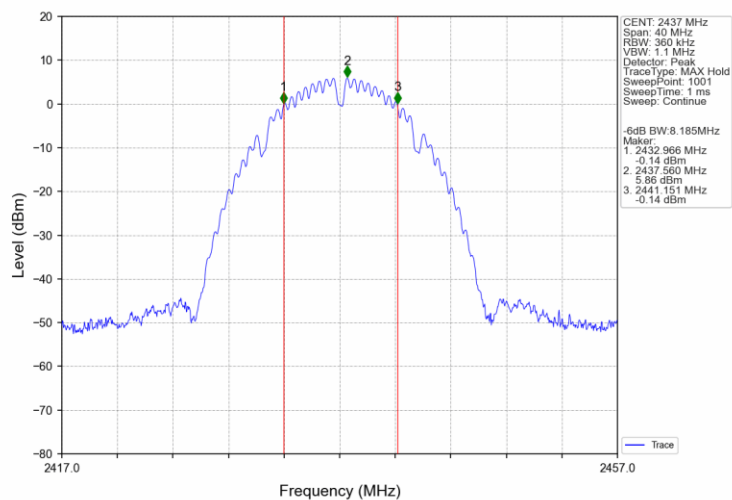


2.2.2 6dB BW

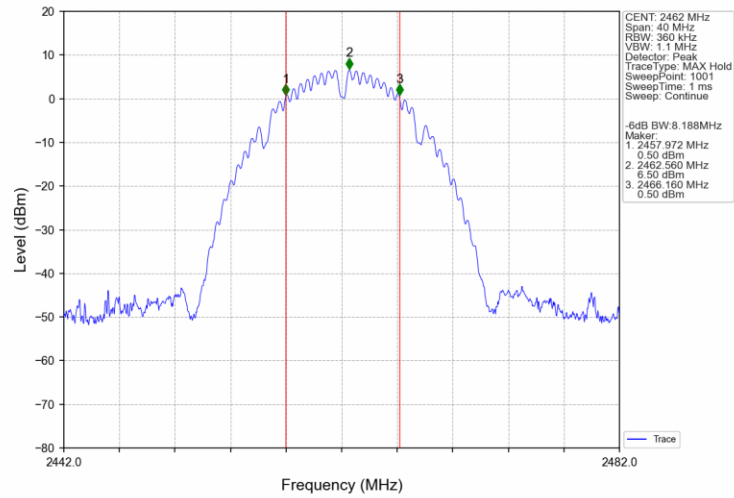
802.11b_LCH_2412MHz_Ant1 (SISO)_NTNV



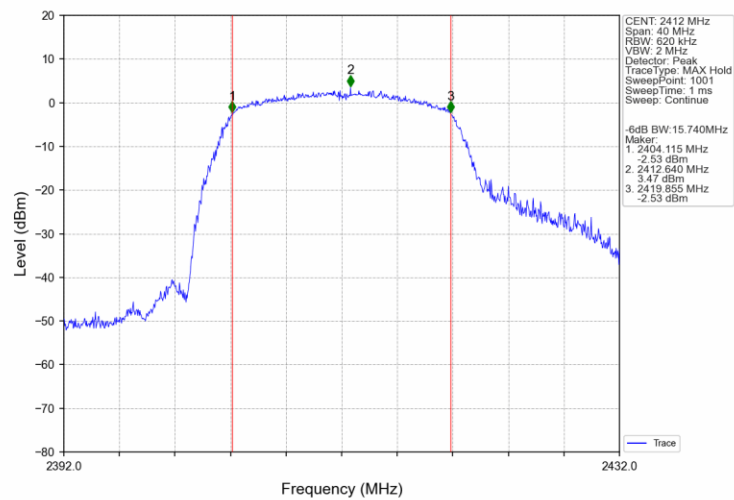
802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV



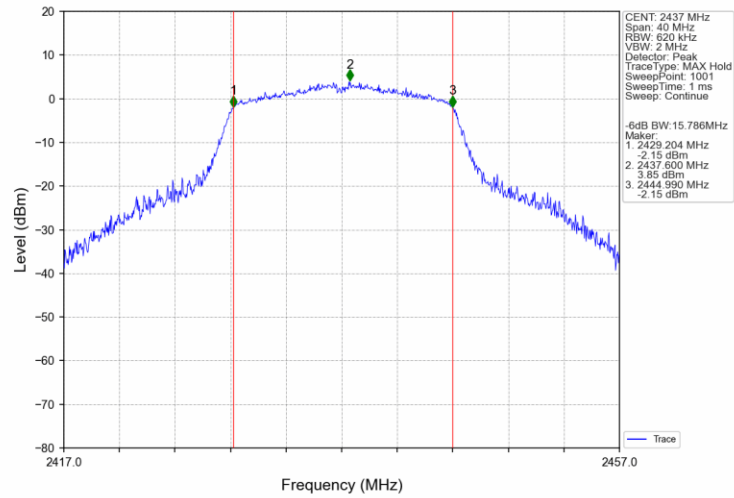
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



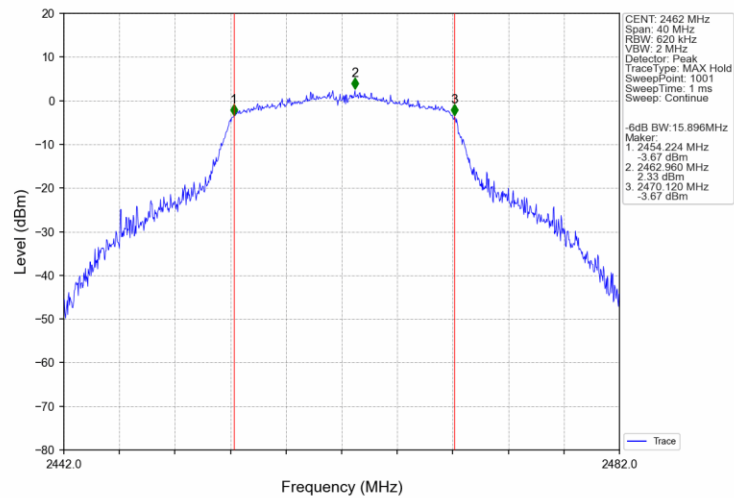
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



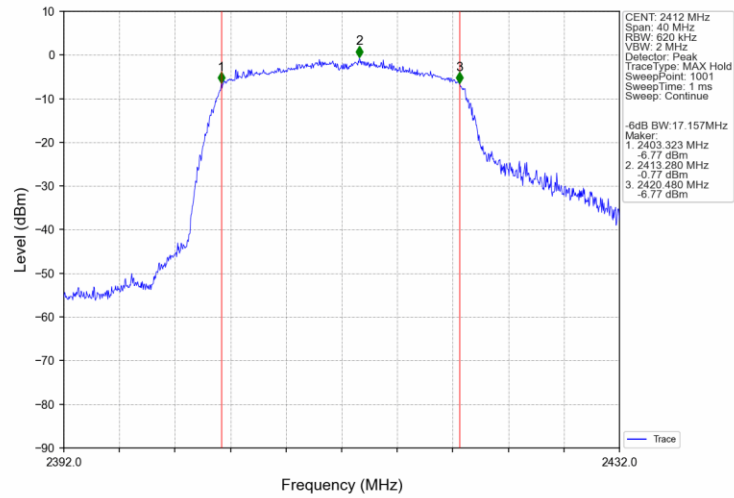
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



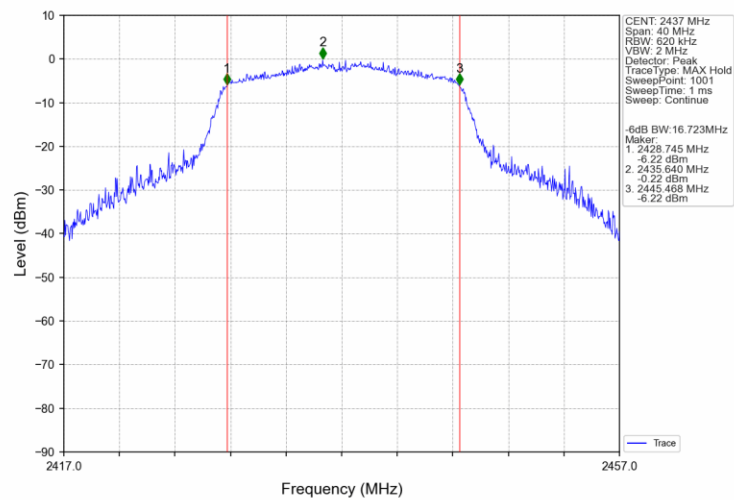
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



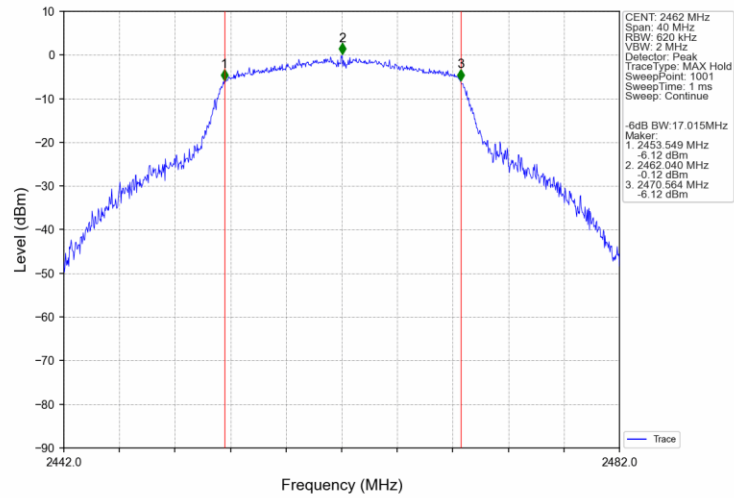
802.11n(HT20)_LCH_2412MHz_Ant1 (MIMO)_NTNV



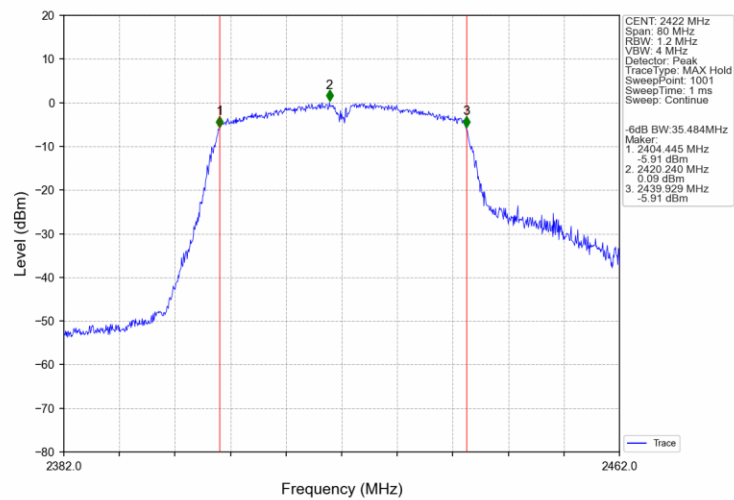
802.11n(HT20)_MCH_2437MHz_Ant1 (MIMO)_NTNV



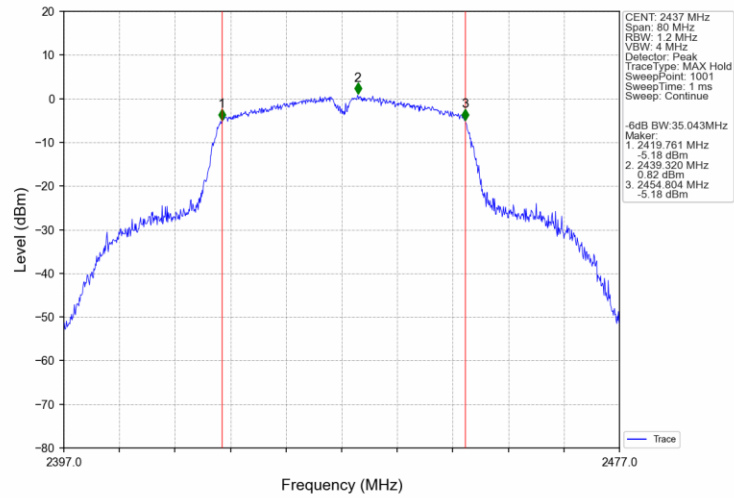
802.11n(HT20)_HCH_2462MHz_Ant1 (MIMO)_NTNV



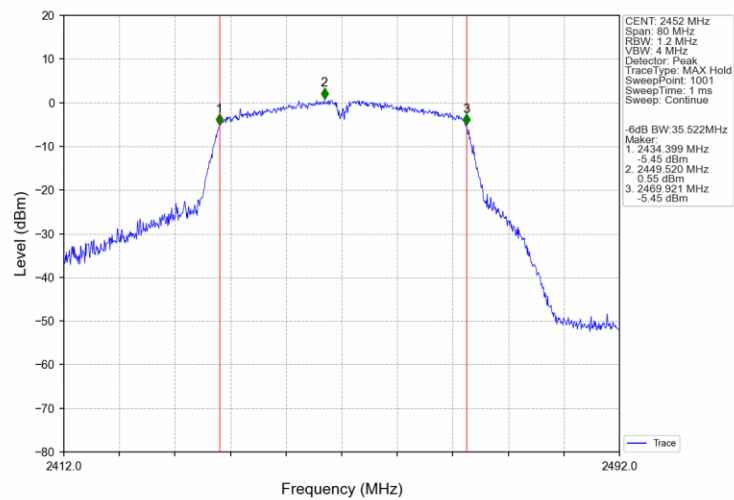
802.11n(HT40)_LCH_2422MHz_Ant1 (MIMO)_NTNV



802.11n(HT40)_MCH_2437MHz_Ant1 (MIMO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant1 (MIMO)_NTNV



3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)				Verdict
			ANT1	ANT2	MIMO	Limit	
802.11b	SISO	2412	15.18	12.62	/	<=28.76	Pass
		2437	15.96	13.14	/	<=28.76	Pass
		2462	16.59	13.17	/	<=28.76	Pass
802.11g	SISO	2412	15.45	16.34	/	<=28.76	Pass
		2437	15.91	16.00	/	<=28.76	Pass
		2462	14.25	14.59	/	<=28.76	Pass
802.11n (HT20)	MIMO	2412	11.53	12.58	15.10	<=28.76	Pass
		2437	11.83	12.94	15.43	<=28.76	Pass
		2462	12.15	13.13	15.68	<=28.76	Pass
802.11n (HT40)	MIMO	2422	11.89	12.55	15.24	<=28.76	Pass
		2437	12.21	12.74	15.49	<=28.76	Pass
		2452	12.48	12.70	15.60	<=28.76	Pass

Note1: Antenna Gain: Ant1: 4.48dBi; Ant2: 3.97dBi; Directional gain : 7.24dBi
Note2: Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})^2 / NANT]$, where G is the antenna gain in dBi, NANT it's the number of antennas.
Note3: Average Power Limit (dBm) = 30 dBm - (7.24 dBi - 6 dBi) = 28.76dBm.

4. Maximum Power Spectral Density

4.1 Test Result

4.1.1 PSD

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm)				Verdict
			ANT1	ANT2	MIMO	Limit	
802.11b	SISO	2412	4.90	2.39	/	<=6.76	Pass
		2437	5.28	2.88	/	<=6.76	Pass
		2462	6.39	2.90	/	<=6.76	Pass
802.11g	SISO	2412	-1.96	-2.17	/	<=6.76	Pass
		2437	-1.34	-2.35	/	<=6.76	Pass
		2462	-3.86	-3.59	/	<=6.76	Pass
802.11n (HT20)	MIMO	2412	-5.95	-5.36	-2.64	<=6.76	Pass
		2437	-5.44	-5.32	-2.37	<=6.76	Pass
		2462	-5.05	-5.25	-2.14	<=6.76	Pass
802.11n (HT40)	MIMO	2422	-9.26	-8.75	-6.10	<=6.76	Pass
		2437	-8.64	-8.56	-5.65	<=6.76	Pass
		2452	-8.56	-8.59	-5.66	<=6.76	Pass

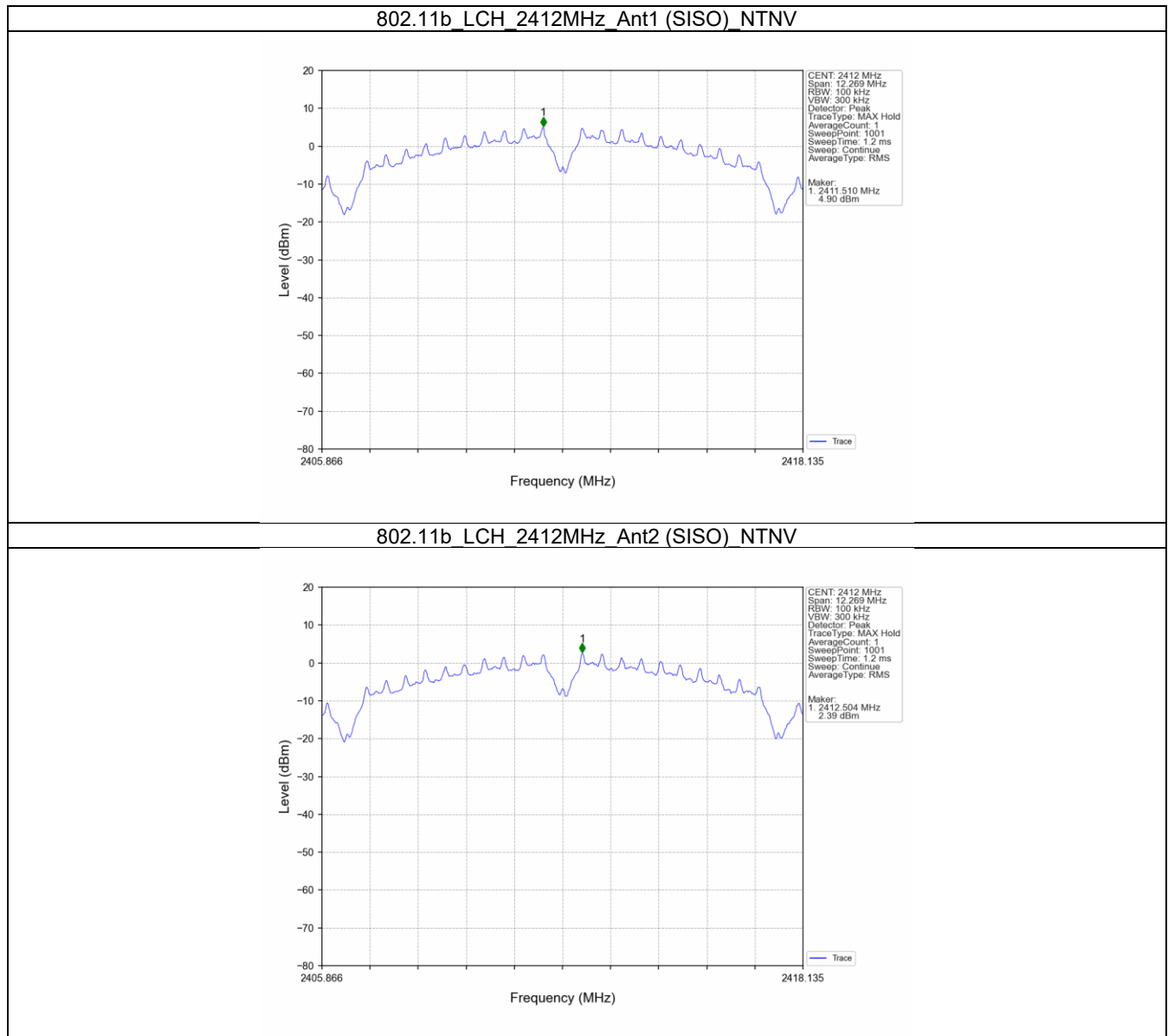
Note1: Antenna Gain: Ant1: 4.48dBi; Ant2: 3.97dBi; Directional gain : 7.24dBi

Note2: Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10})^2 / NANT]$, where G is the antenna gain in dBi, NANT it's the number of antennas.

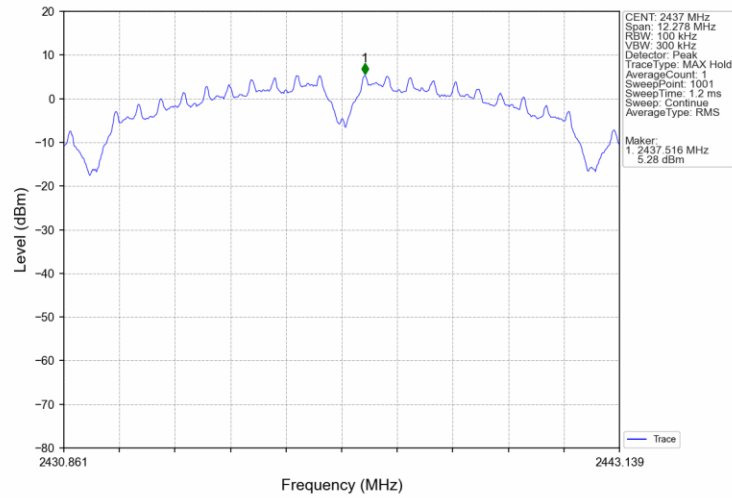
Note3: Note3: PSD Limit (dBm) = 8 dBm - (7.24 dBi - 6 dBi) = 6.76dBm.

4.2 Test Graph

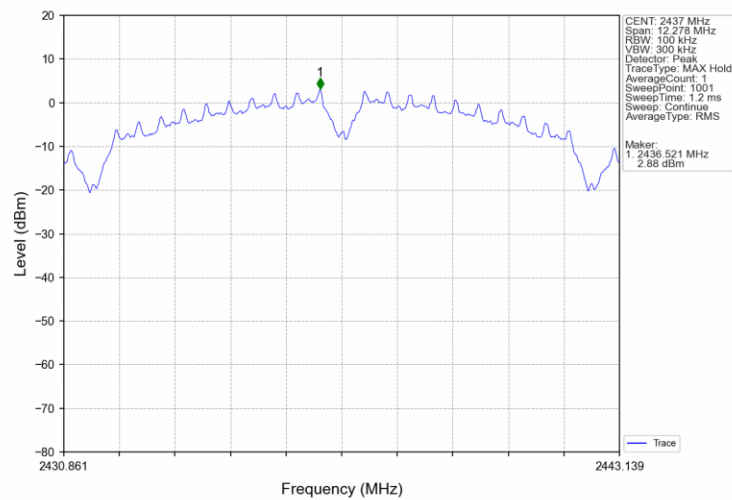
4.2.1 PSD



802.11b_MCH_2437MHz_Ant1 (SISO)_NTNV

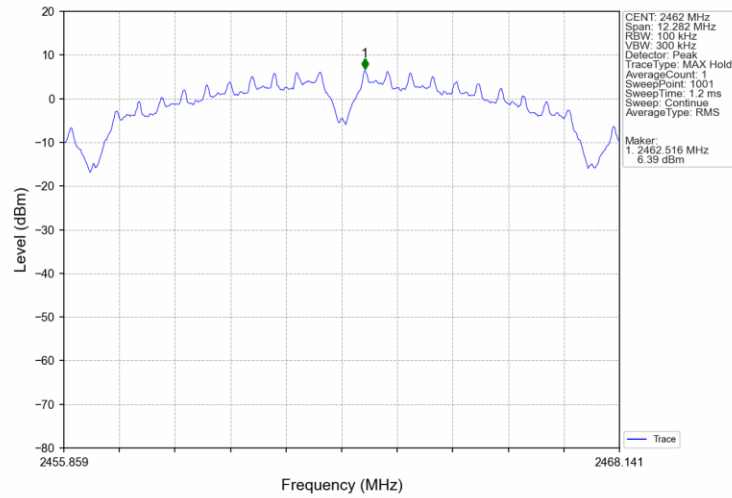


802.11b_MCH_2437MHz_Ant2 (SISO)_NTNV

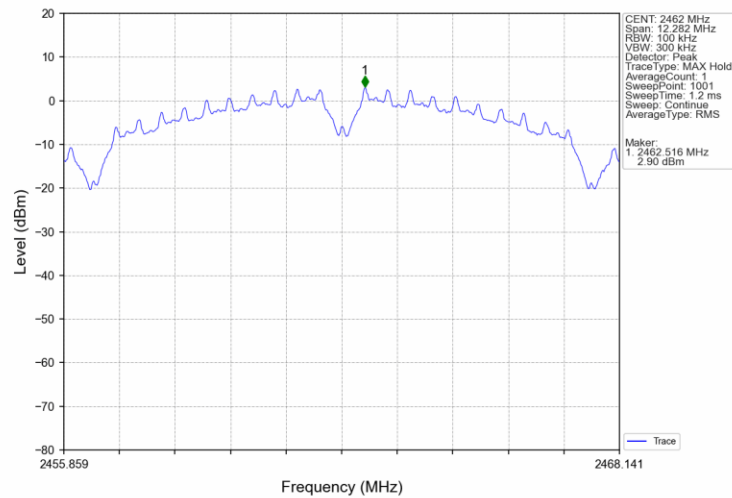




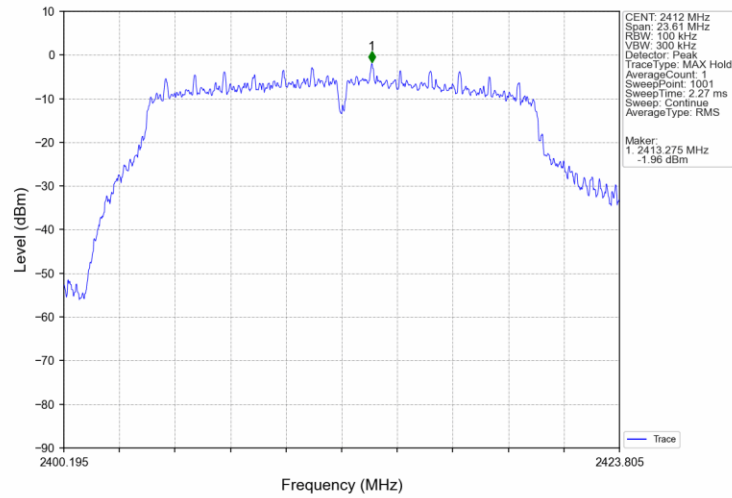
802.11b_HCH_2462MHz_Ant1 (SISO)_NTNV



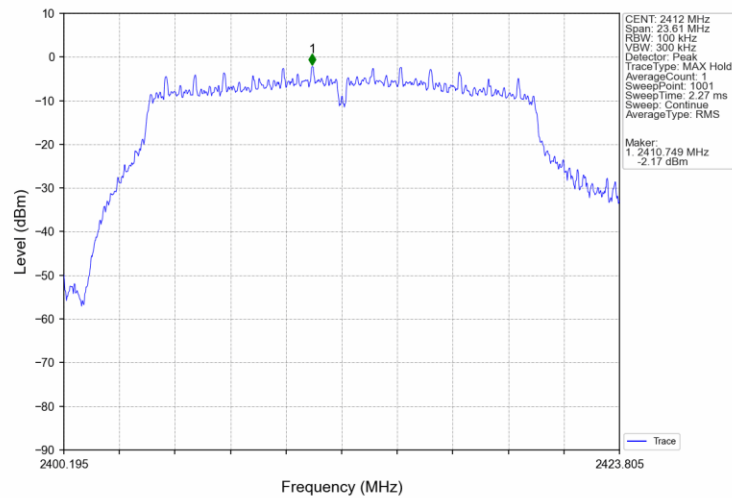
802.11b_HCH_2462MHz_Ant2 (SISO)_NTNV



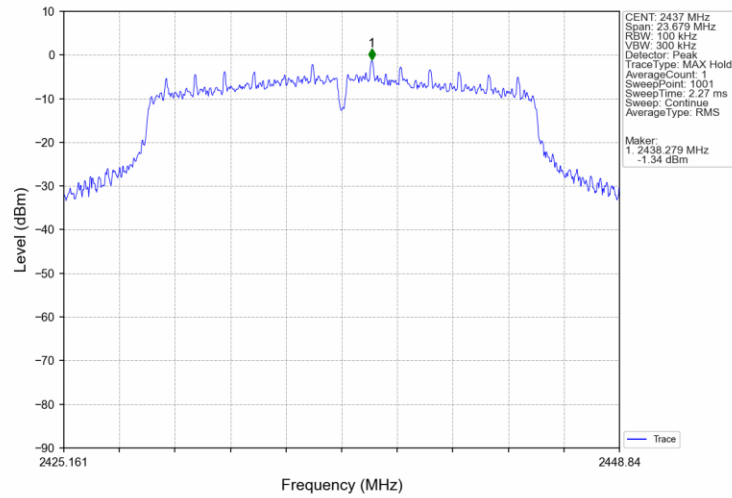
802.11g_LCH_2412MHz_Ant1 (SISO)_NTNV



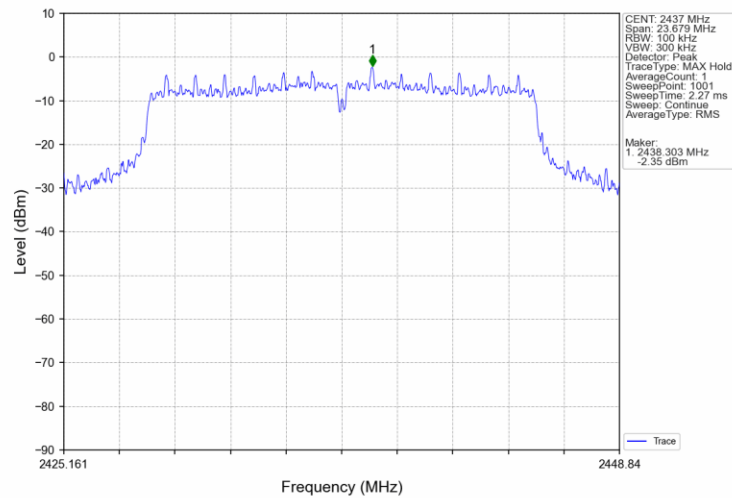
802.11g_LCH_2412MHz_Ant2 (SISO)_NTNV



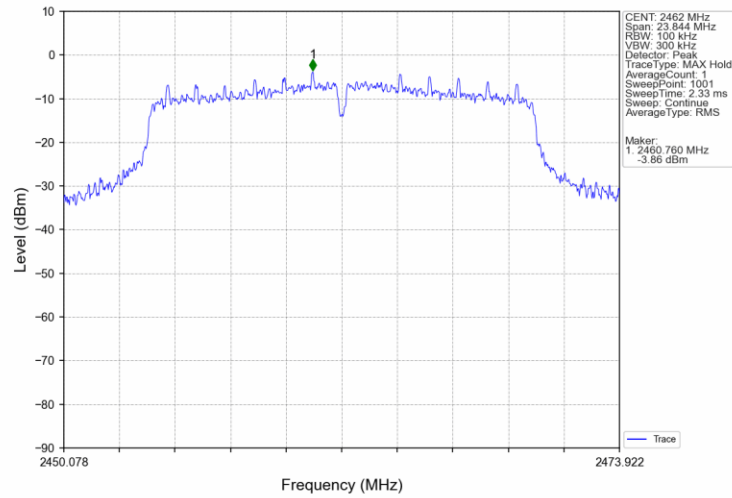
802.11g_MCH_2437MHz_Ant1 (SISO)_NTNV



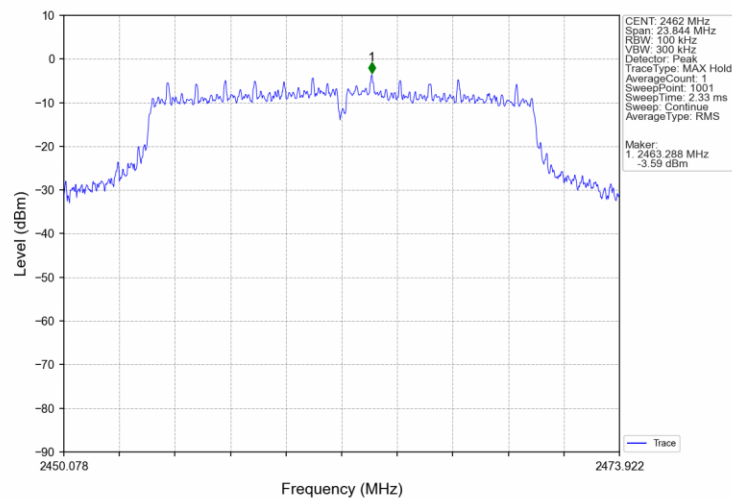
802.11g_MCH_2437MHz_Ant2 (SISO)_NTNV



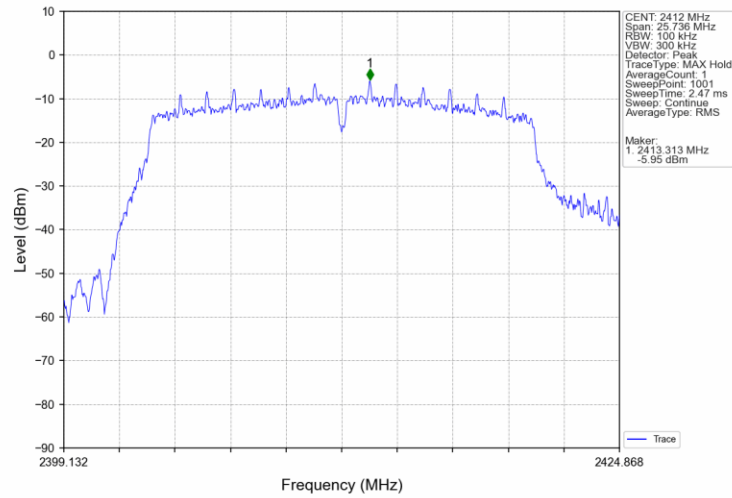
802.11g_HCH_2462MHz_Ant1 (SISO)_NTNV



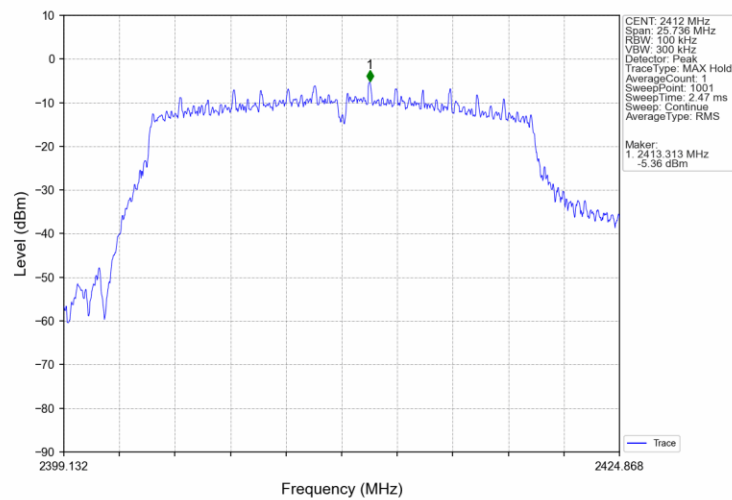
802.11g_HCH_2462MHz_Ant2 (SISO)_NTNV



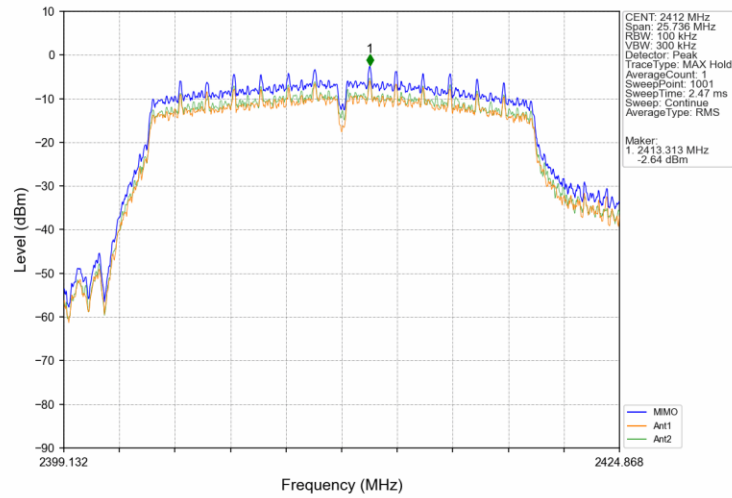
802.11n(HT20)_LCH_2412MHz_Ant1 (MIMO)_NTNV



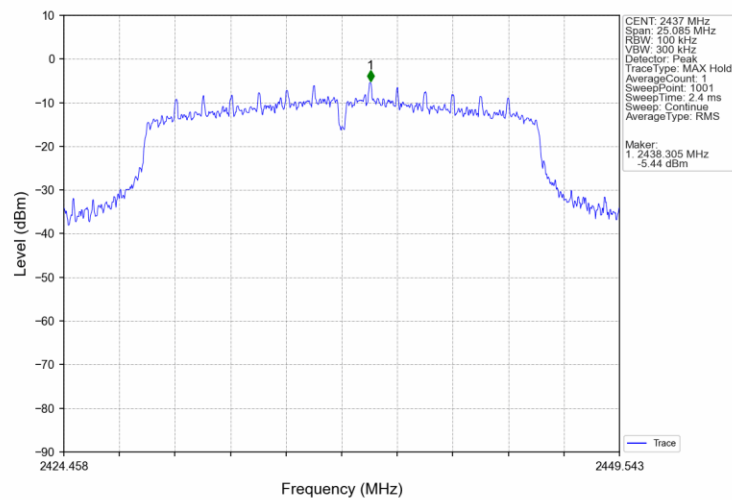
802.11n(HT20)_LCH_2412MHz_Ant2 (MIMO)_NTNV



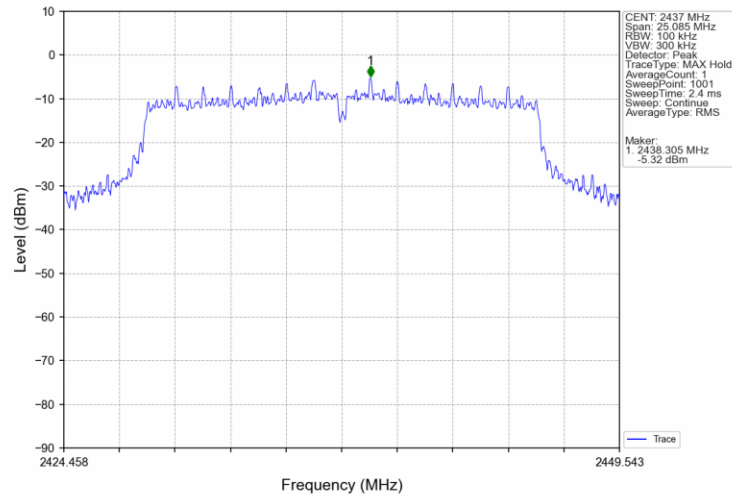
802.11n(HT20)_LCH_2412MHz_MIMO_NTNV



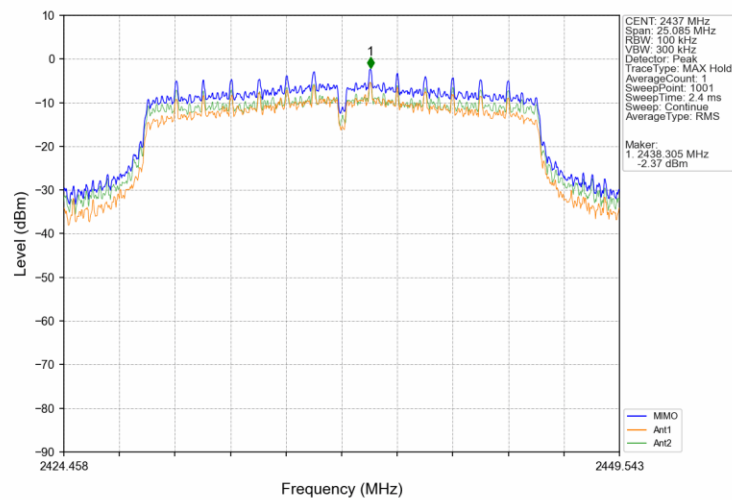
802.11n(HT20)_MCH_2437MHz_Ant1(MIMO)_NTNV



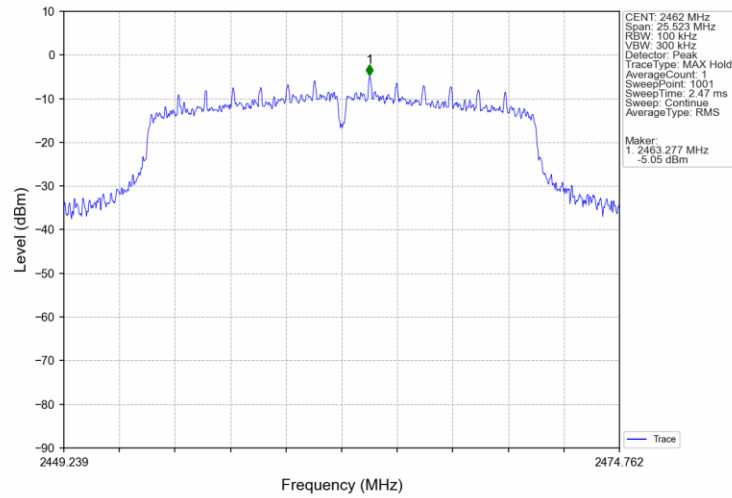
802.11n(HT20)_MCH_2437MHz_Ant2 (MIMO)_NTNV



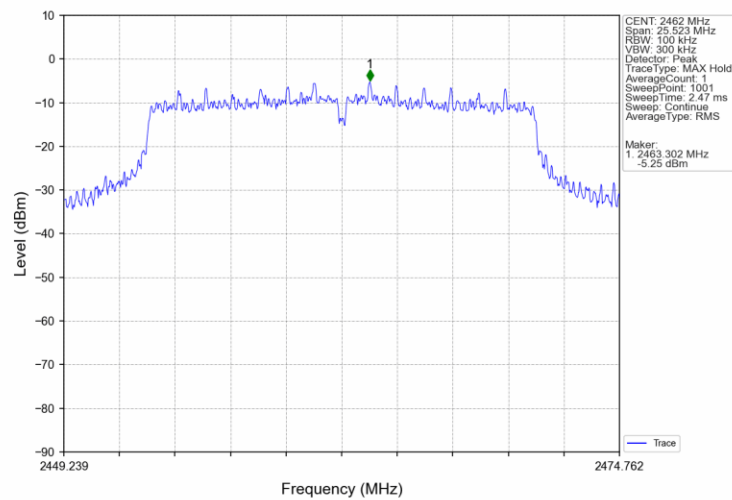
802.11n(HT20)_MCH_2437MHz MIMO NTV



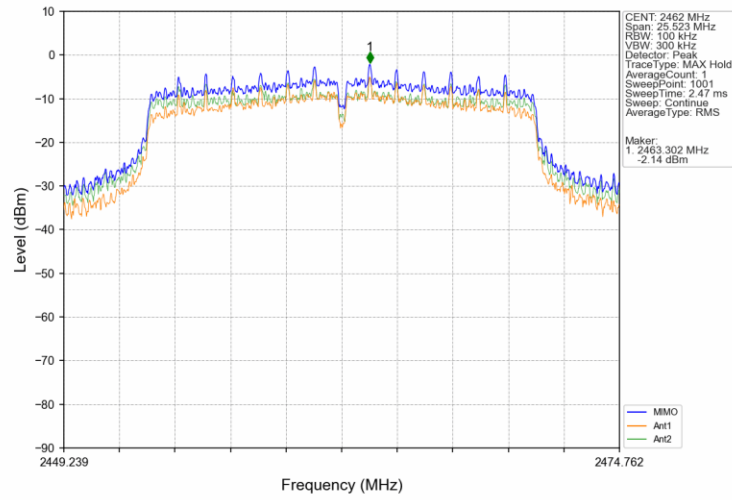
802.11n(HT20)_HCH_2462MHz_Ant1 (MIMO)_NTNV



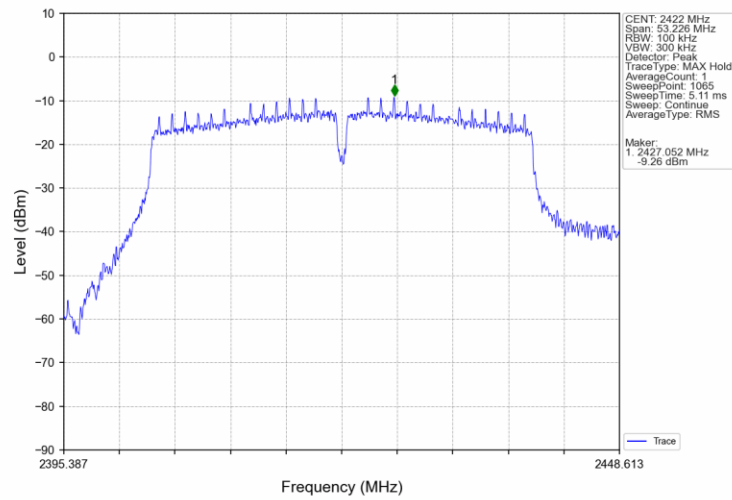
802.11n(HT20)_HCH_2462MHz_Ant2 (MIMO)_NTNV



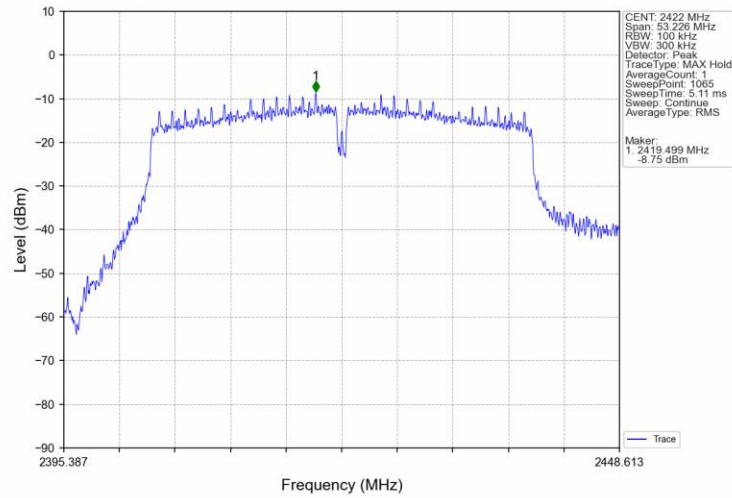
802.11n(HT20)_HCH_2462MHz_MIMO_NTNV



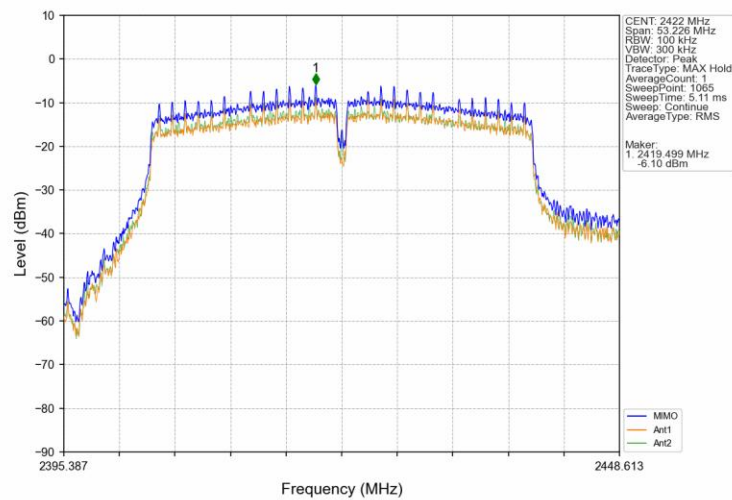
802.11n(HT40)_LCH_2422MHz_Ant1(MIMO)NTNV



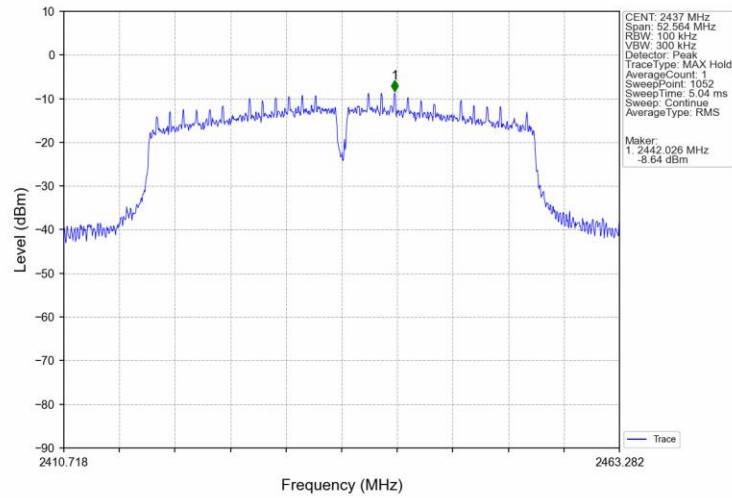
802.11n(HT40)_LCH_2422MHz_Ant2 (MIMO)_NTNV



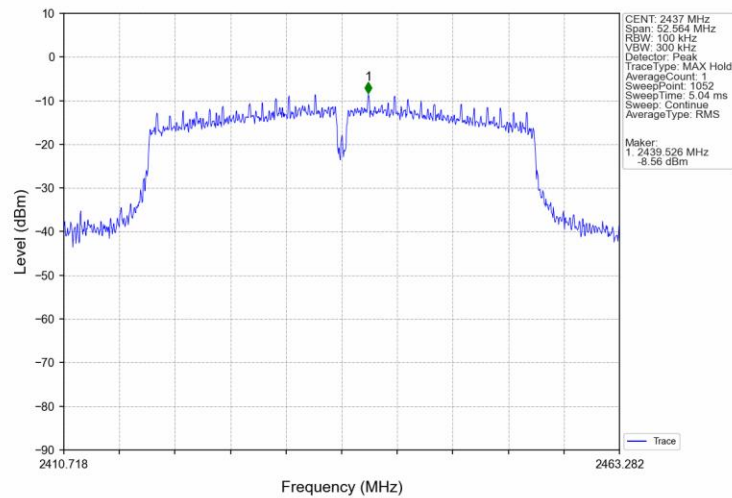
802.11n(HT40)_LCH_2422MHz MIMO NTV



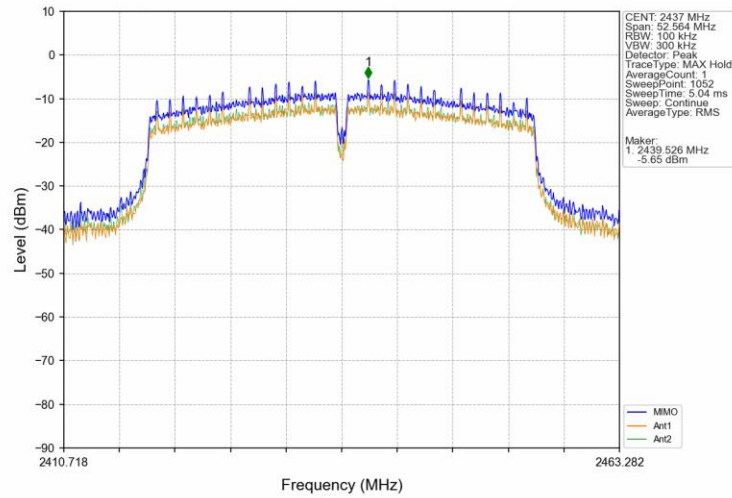
802.11n(HT40)_MCH_2437MHz_Ant1 (MIMO)_NTNV



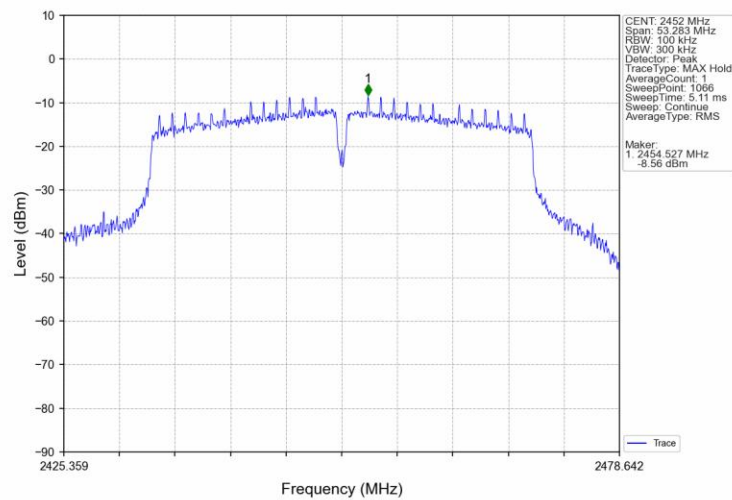
802.11n(HT40)_MCH_2437MHz_Ant2 (MIMO)_NTNV



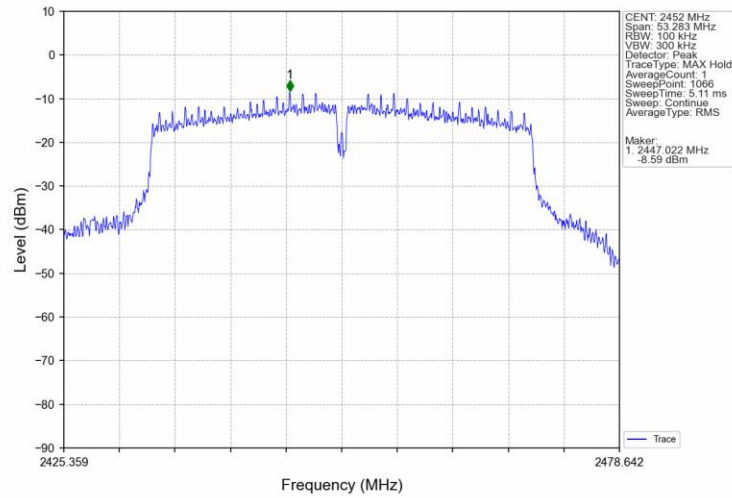
802.11n(HT40)_MCH_2437MHz_MIMO_NTNV



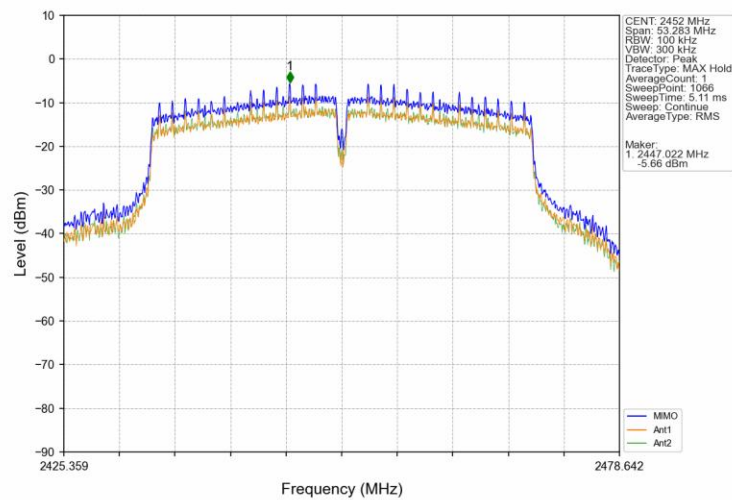
802.11n(HT40)_HCH_2452MHz_Ant1(MIMO)_NTNV



802.11n(HT40)_HCH_2452MHz_Ant2 (MIMO)_NTNV



802.11n(HT40)_HCH_2452MHz MIMO NTV



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	5.05
		2437	1	5.68
		2462	1	6.51
802.11g	SISO	2412	1	-2.56
		2437	1	-1.68
		2462	1	-3.66
802.11n (HT20)	MIMO	2412	1	-5.83
		2437	1	-5.42
		2462	1	-5.07
802.11n (HT40)	MIMO	2422	1	-9.24
		2437	1	-8.68
		2452	1	-8.45

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.

Remark: All modes have been tested, and only the worst data is displayed

5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
802.11b	SISO	2412	1	5.05	-14.95	Pass
		2437	1	5.68	-14.32	Pass
		2462	1	6.51	-13.49	Pass
802.11g	SISO	2412	1	-2.56	-22.56	Pass
		2437	1	-1.68	-21.68	Pass
		2462	1	-3.66	-23.66	Pass
802.11n (HT20)	MIMO	2412	1	-5.83	-25.83	Pass
		2437	1	-5.42	-25.42	Pass
		2462	1	-5.07	-25.07	Pass
802.11n (HT40)	MIMO	2422	1	-9.24	-29.24	Pass
		2437	1	-8.68	-28.68	Pass
		2452	1	-8.45	-28.45	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.

Remark: All modes have been tested, and only the worst data is displayed