



Appendix C

RF Test Data for 2.4G WIFI (Conducted Measurement)

Product Name: Firewalla Purple

Trade Mark: Firewalla

Test Model: Firewalla Purple

Environmental Conditions

Temperature:	21.6° C
Relative Humidity:	52.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Carl Fu
Supervised by:	Li Huan

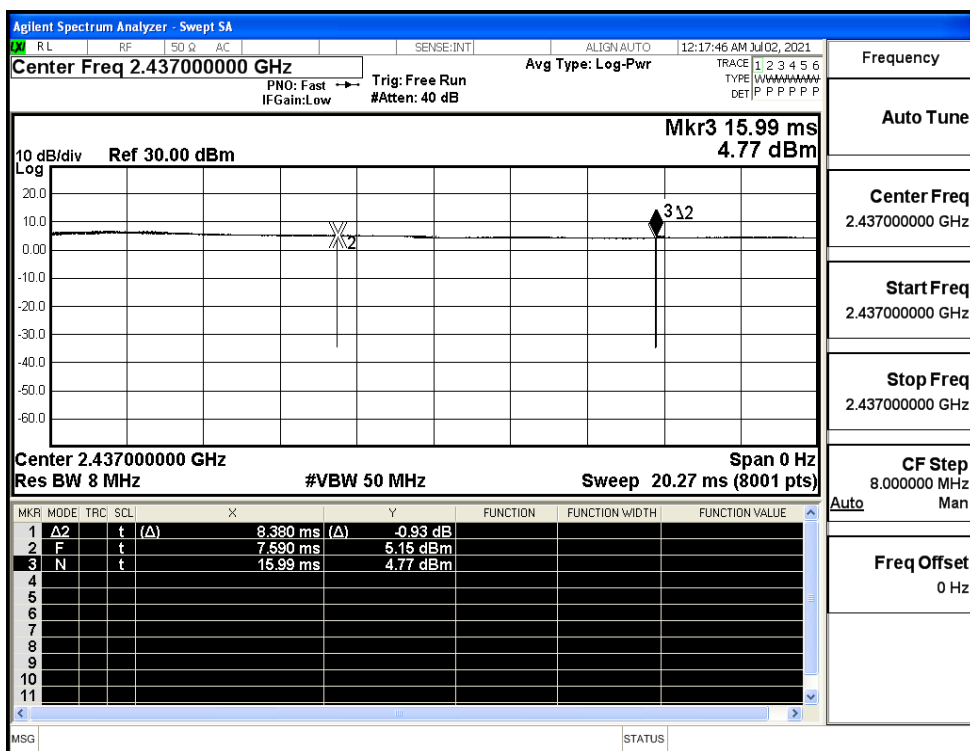
C.1 Duty Cycle

ANT0

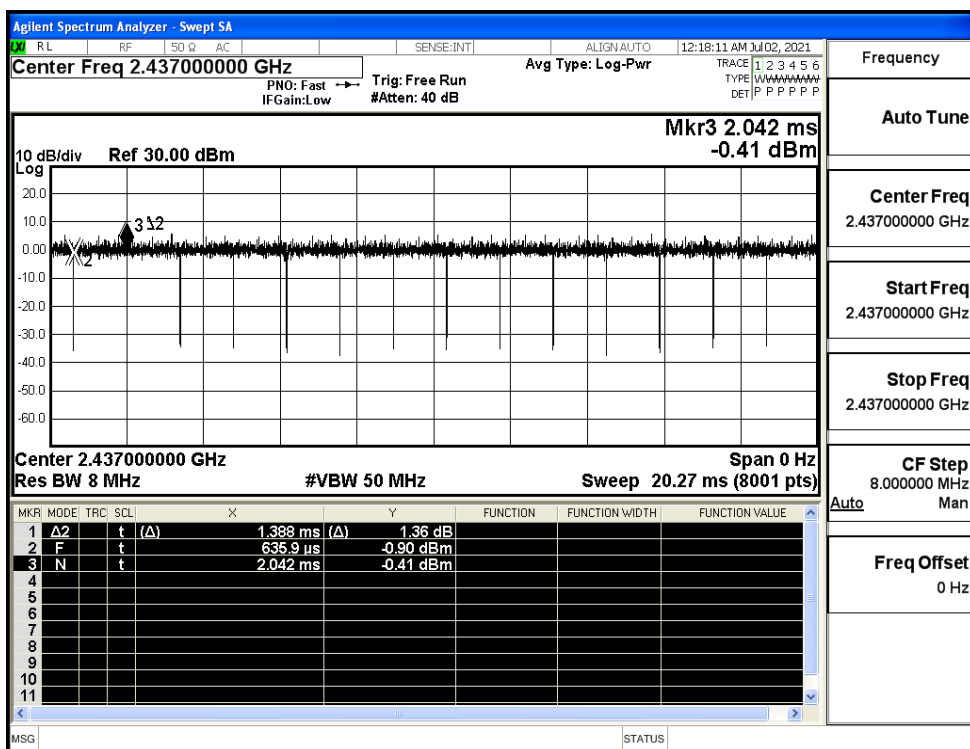
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
11B	2437	Ant1	99.79	PASS
11G	2437	Ant1	98.74	PASS
11N20SISO	2437	Ant1	98.46	PASS
11N40SISO	2437	Ant1	98.18	PASS



Duty Cycle_11B_2437_Ant1

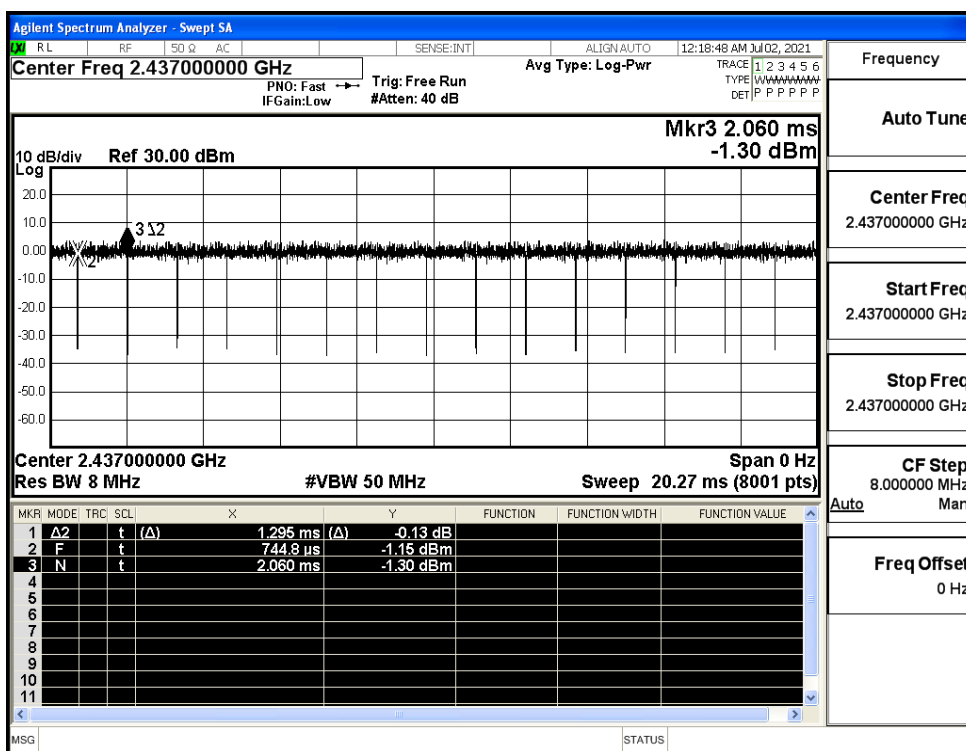


Duty Cycle_11G_2437_Ant1

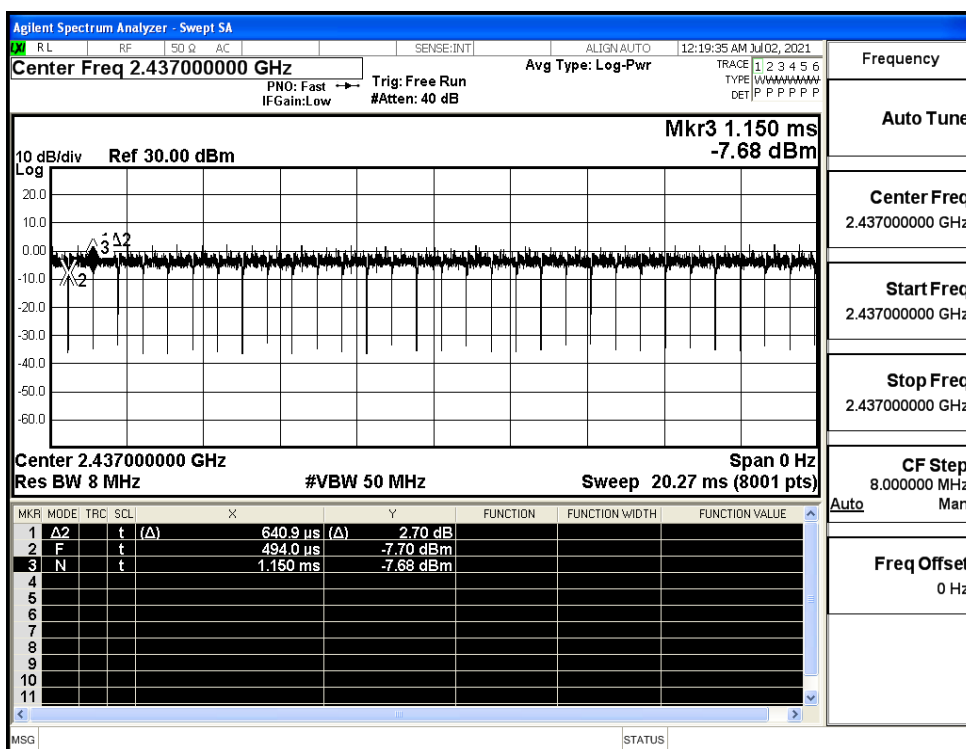




Duty Cycle_11N20SISO_2437_Ant1



Duty Cycle_11N40SISO_2437_Ant1



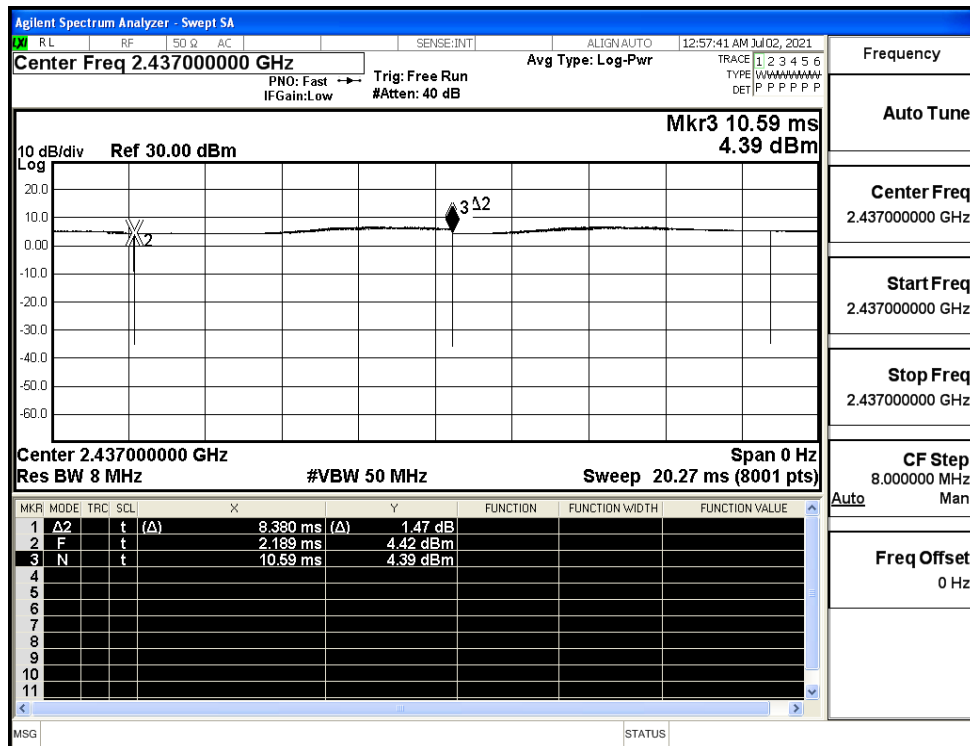


ANT1

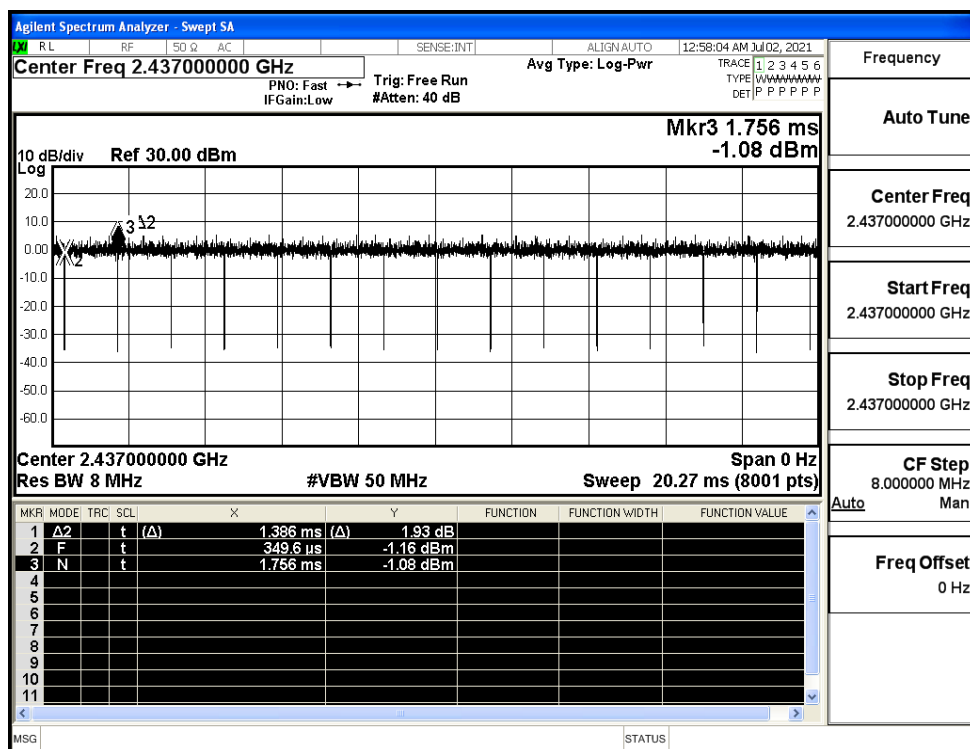
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
11B	2437	Ant1	99.79	PASS
11G	2437	Ant1	98.56	PASS
11N20SISO	2437	Ant1	98.65	PASS
11N40SISO	2437	Ant1	98.07	PASS



Duty Cycle_11B_2437_Ant1

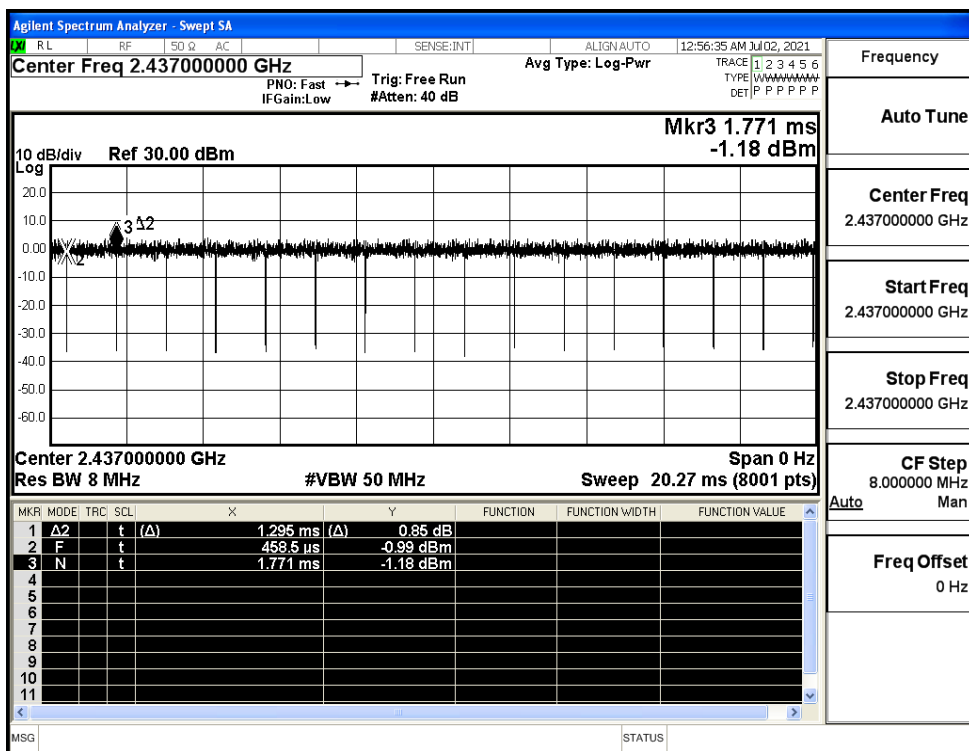


Duty Cycle_11G_2437_Ant1

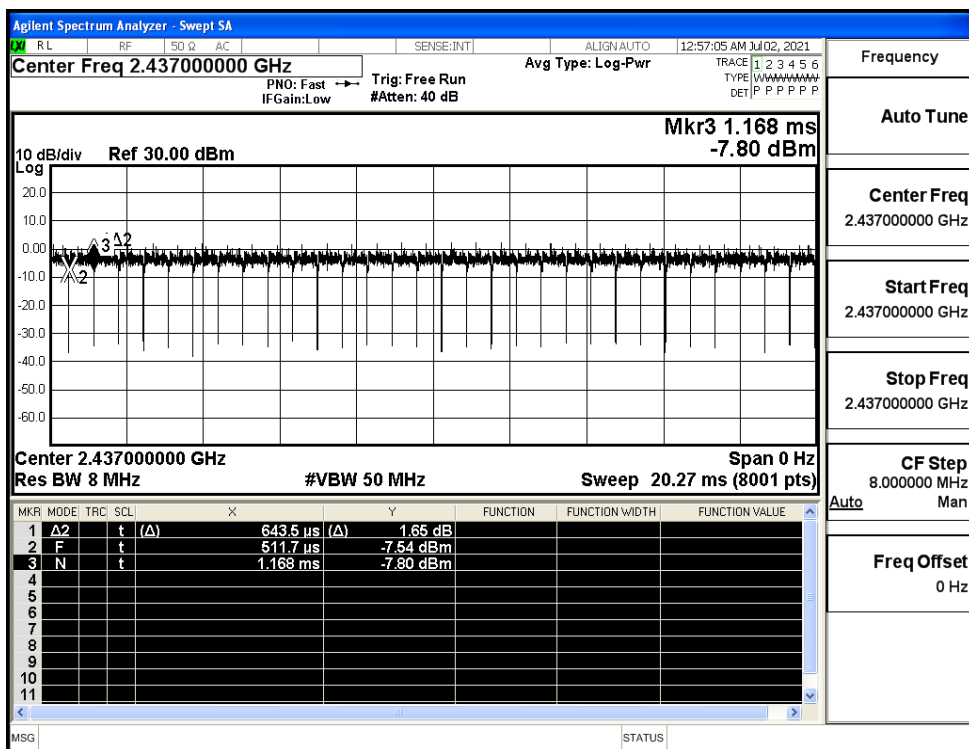




Duty Cycle_11N20SISO_2437_Ant1



Duty Cycle_11N40SISO_2437_Ant1





C.2 Maximum Conducted Output Power

ANT0

Mode	Channel	Meas.Level [dBm]	Limit [dBm]	Verdict
11B	LCH	11.61	30	PASS
	MCH	12.4	30	PASS
	HCH	12.91	30	PASS
11G	LCH	9.52	30	PASS
	MCH	11.49	30	PASS
	HCH	12.72	30	PASS
11N20SISO	LCH	9.23	30	PASS
	MCH	11.05	30	PASS
	HCH	12.26	30	PASS
11N40SISO	LCH	10.44	30	PASS
	MCH	11.29	30	PASS
	HCH	12.32	30	PASS

ANT1

Mode	Channel	Meas.Level [dBm]	Limit [dBm]	Verdict
11B	LCH	11.51	30	PASS
	MCH	12.43	30	PASS
	HCH	12.91	30	PASS
11G	LCH	9.94	30	PASS
	MCH	10.95	30	PASS
	HCH	12.88	30	PASS
11N20SISO	LCH	9	30	PASS
	MCH	11.01	30	PASS
	HCH	12.24	30	PASS
11N40SISO	LCH	10.46	30	PASS
	MCH	11.41	30	PASS
	HCH	12.17	30	PASS

MIMO

Mode	Channel	ANT 0 [dBm]	ANT 1 [dBm]	MIMO [dBm]	Limit [dBm]	Verdict
11N20	LCH	9.23	9.00	12.13	30	PASS
	MCH	11.05	11.01	14.04	30	PASS
	HCH	12.26	12.24	15.26	30	PASS
11N40	LCH	10.44	10.46	13.46	30	PASS
	MCH	11.29	11.41	14.36	30	PASS
	HCH	12.32	12.17	15.26	30	PASS

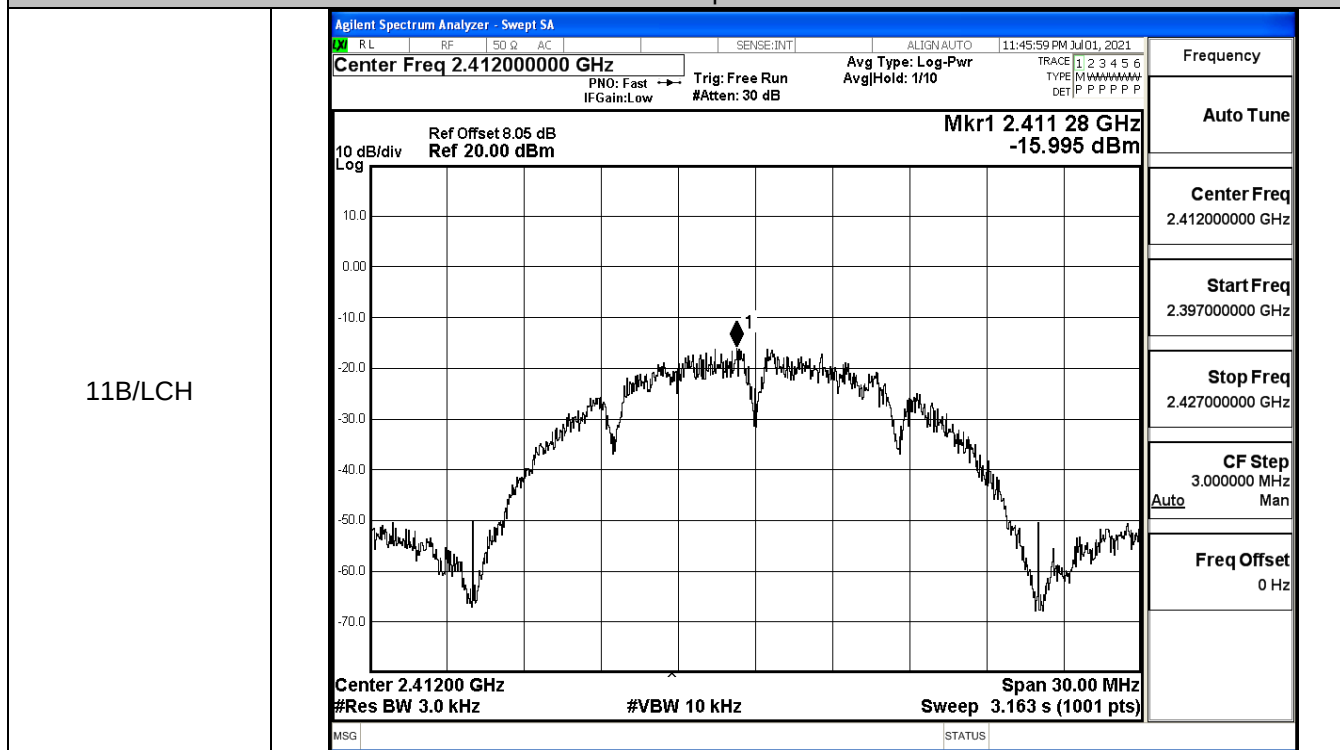


C.3 Maximum Power Spectral Density

ANTO

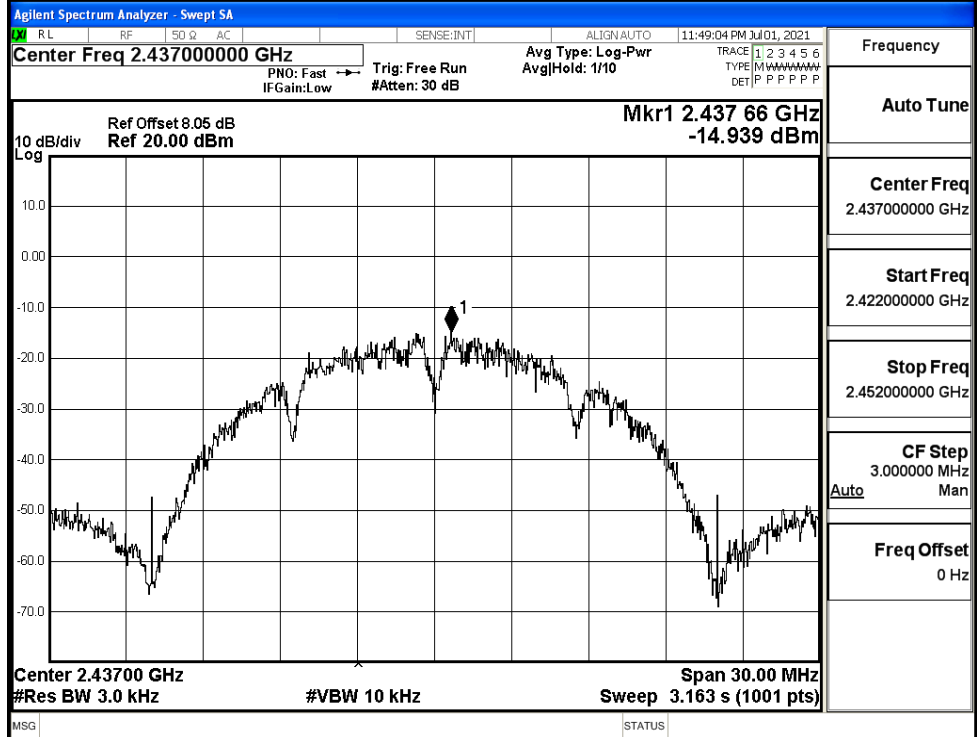
Mode	Channel	Meas.Level [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
11B	LCH	-15.995	8	PASS
	MCH	-14.939	8	PASS
	HCH	-14.426	8	PASS
11G	LCH	-23.020	8	PASS
	MCH	-20.911	8	PASS
	HCH	-19.774	8	PASS
11N20SISO	LCH	-21.786	8	PASS
	MCH	-21.682	8	PASS
	HCH	-19.937	8	PASS
11N40SISO	LCH	-23.103	8	PASS
	MCH	-21.257	8	PASS
	HCH	-20.212	8	PASS

Test Graphs

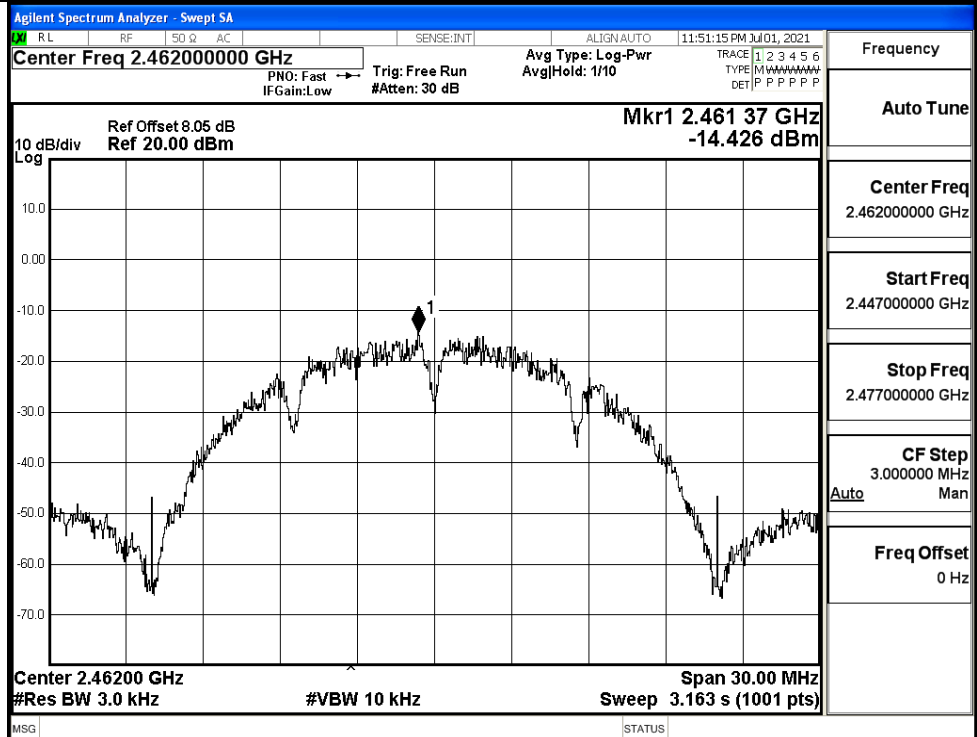




11B/MCH

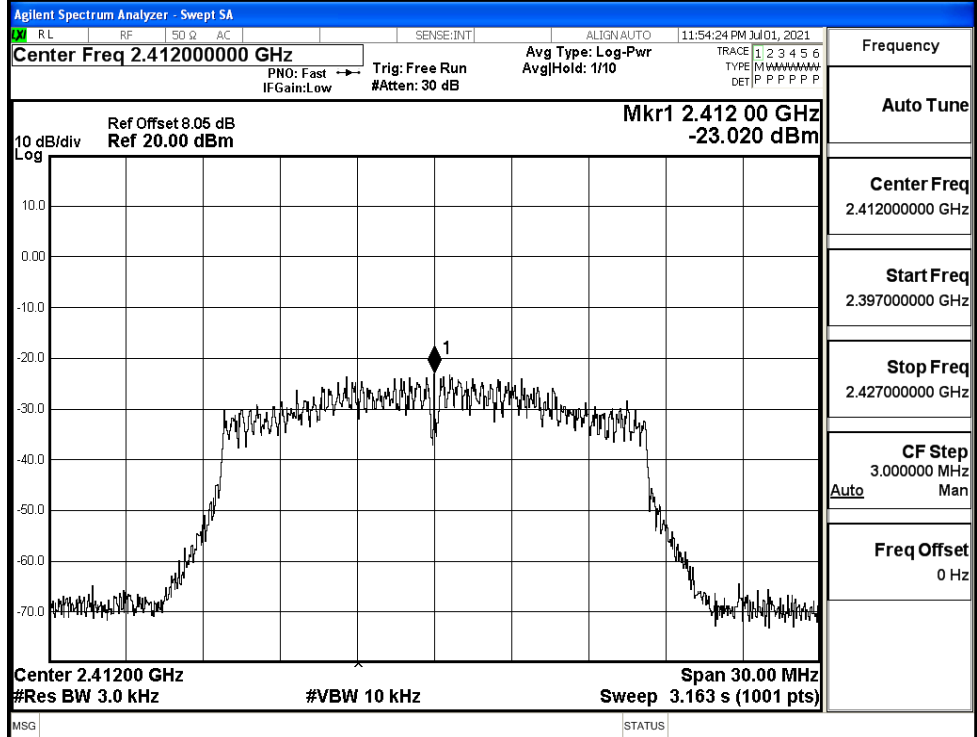


11B/HCH

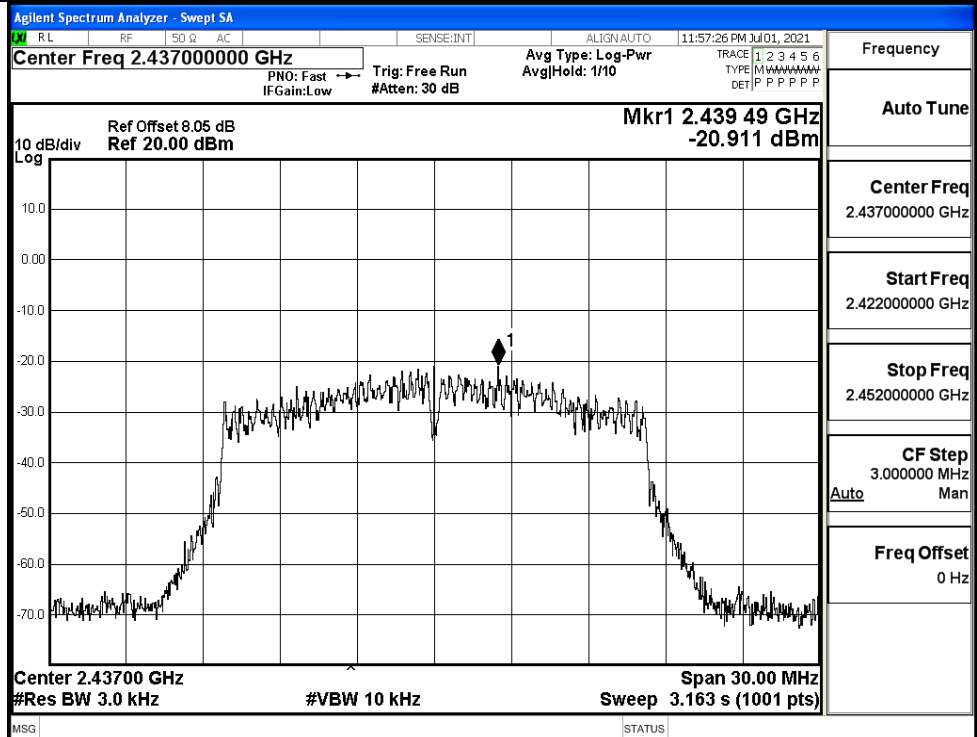




11G/LCH

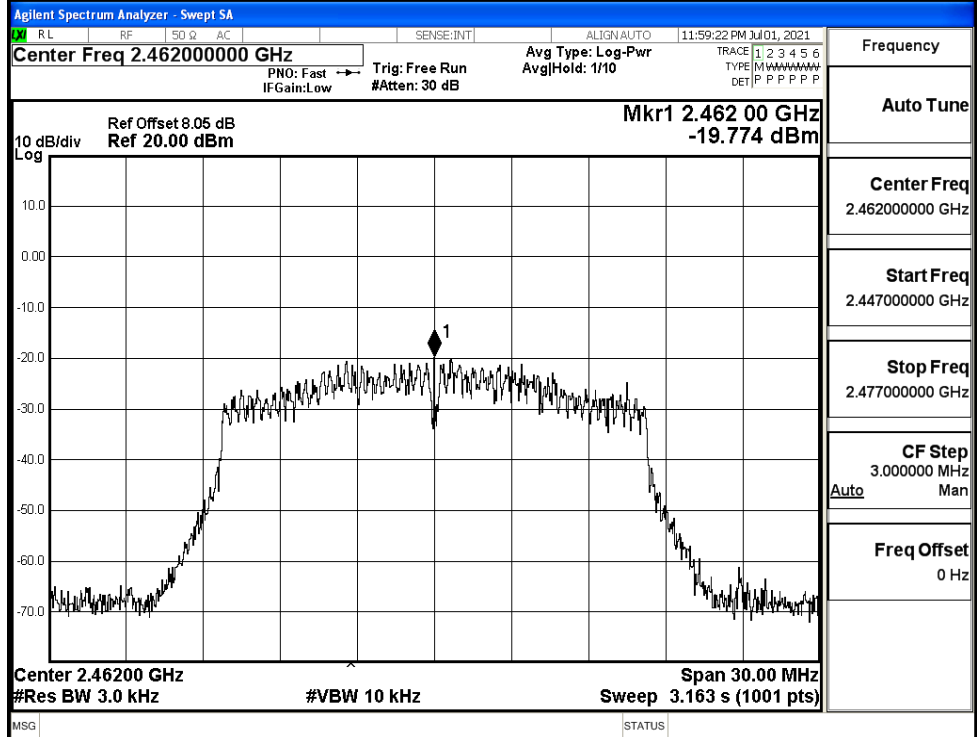


11G/MCH

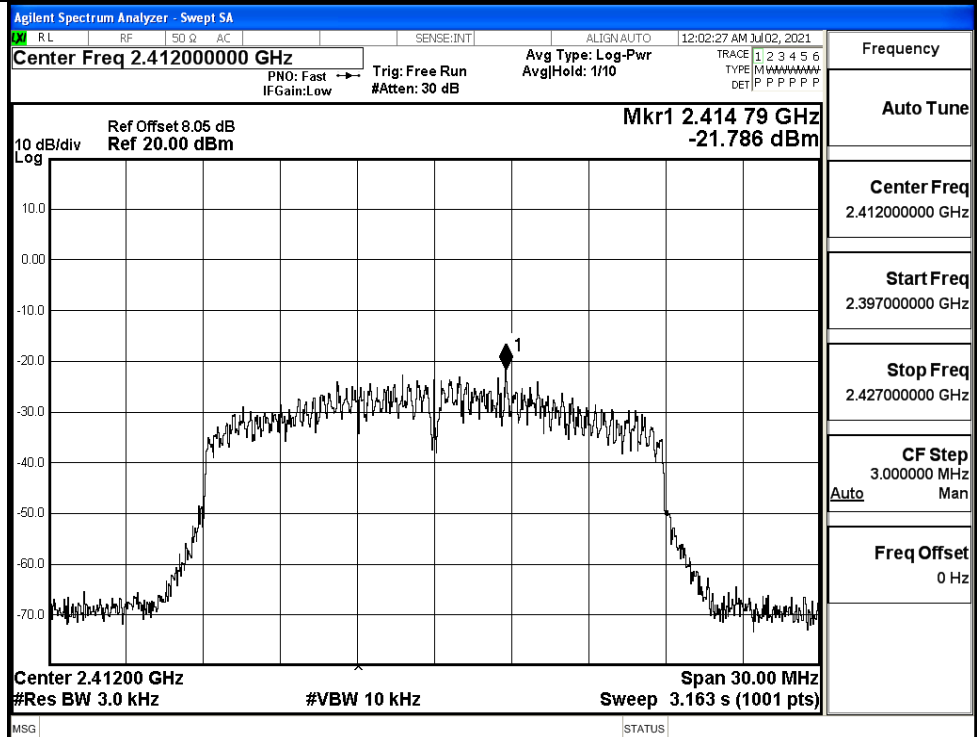


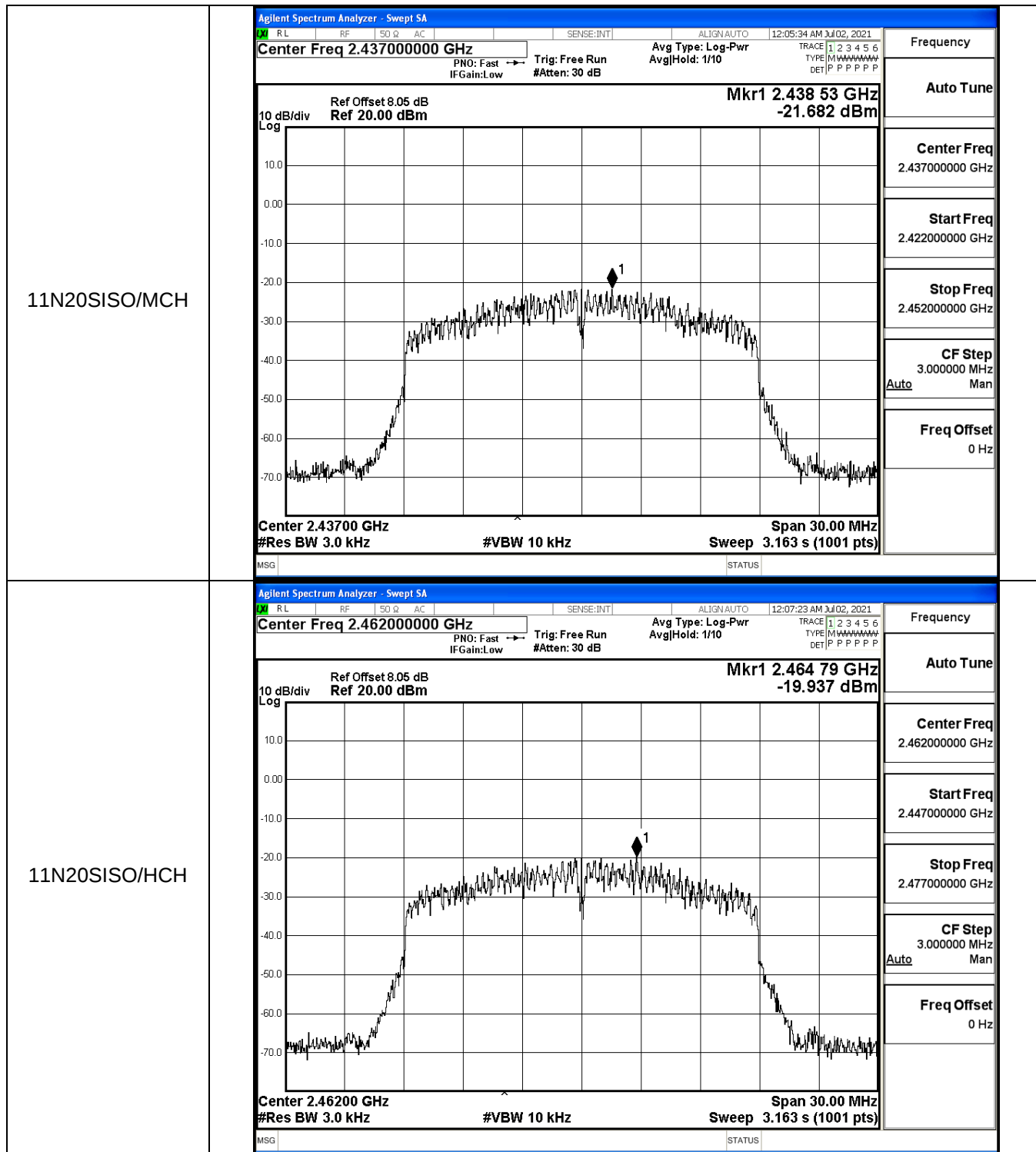


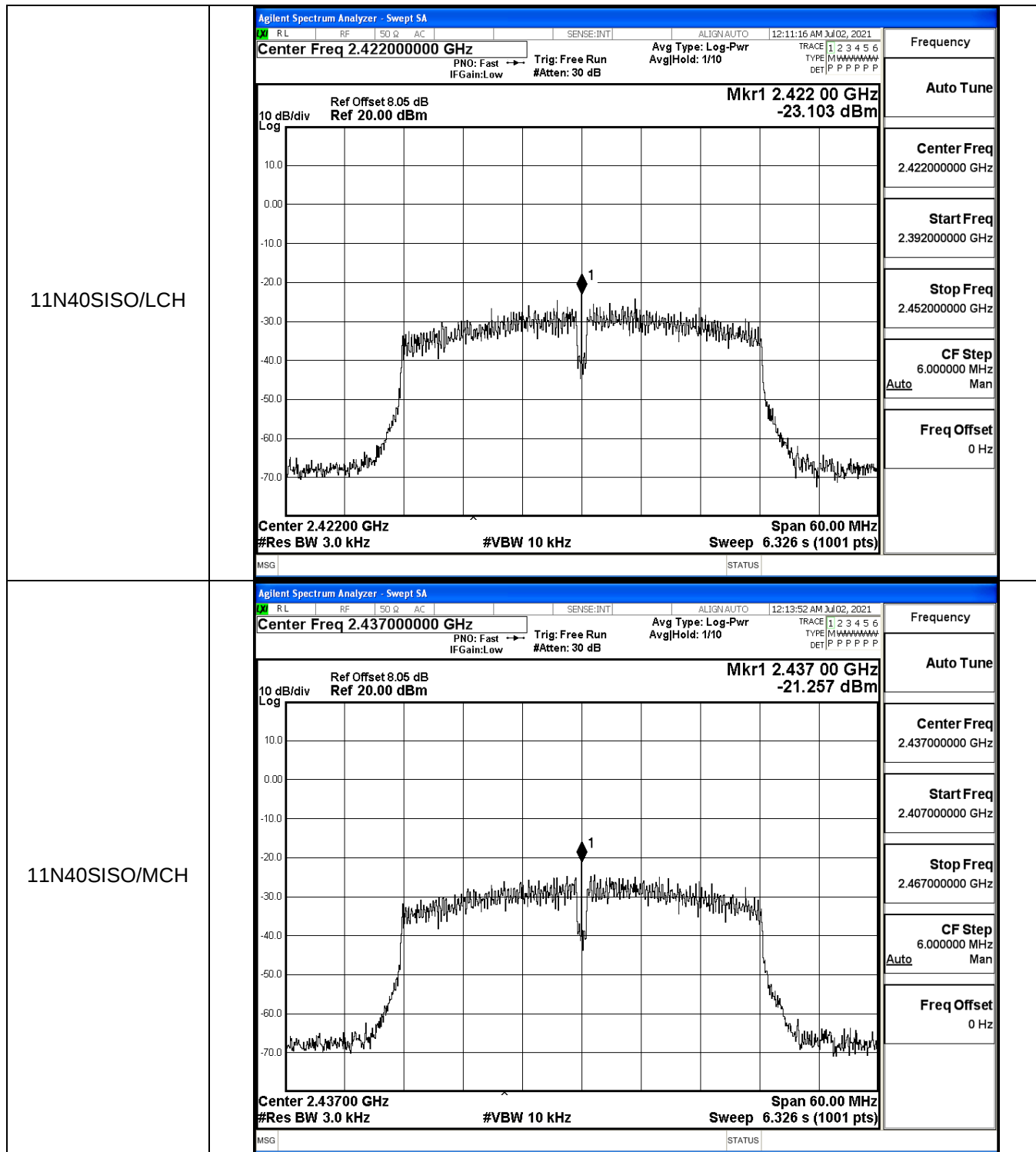
11G/HCH



11N20SISO/LCH

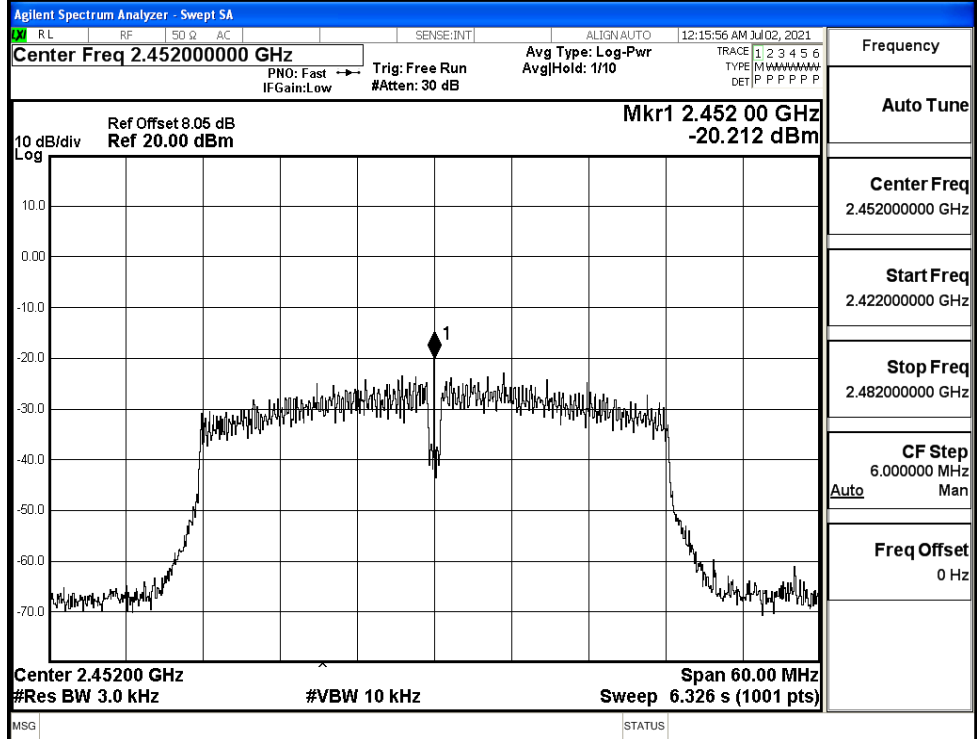








11N40SISO/HCH



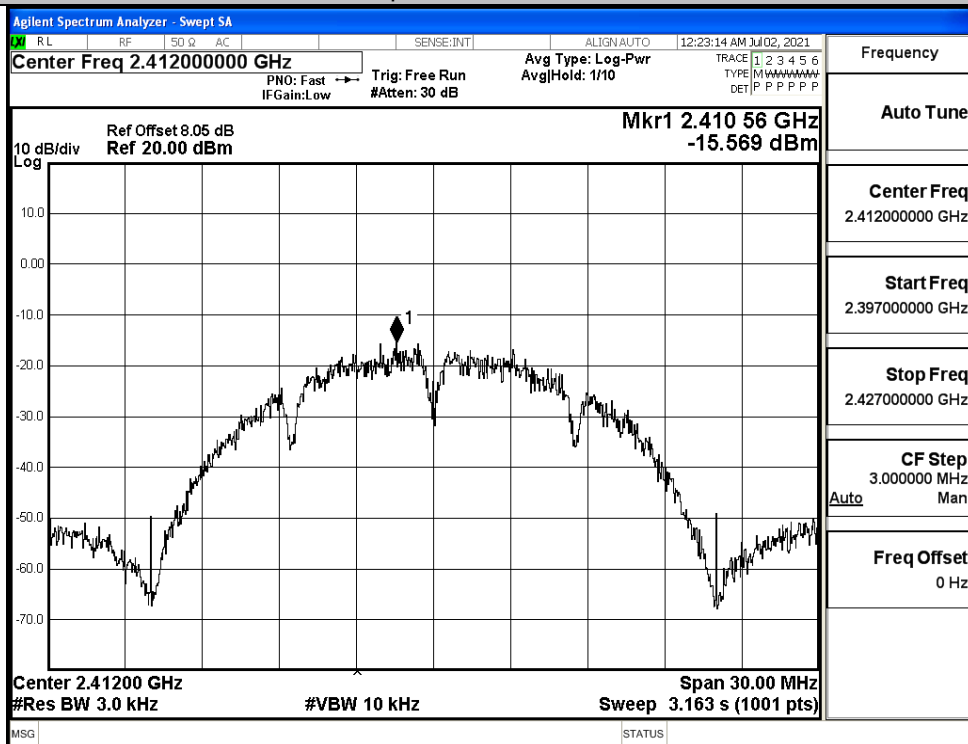


ANT1

Mode	Channel	Meas.Level [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
11B	LCH	-15.569	8	PASS
	MCH	-15.202	8	PASS
	HCH	-13.888	8	PASS
11G	LCH	-22.518	8	PASS
	MCH	-21.467	8	PASS
	HCH	-18.785	8	PASS
11N20SISO	LCH	-22.376	8	PASS
	MCH	-21.663	8	PASS
	HCH	-20.259	8	PASS
11N40SISO	LCH	-22.369	8	PASS
	MCH	-22.736	8	PASS
	HCH	-21.858	8	PASS

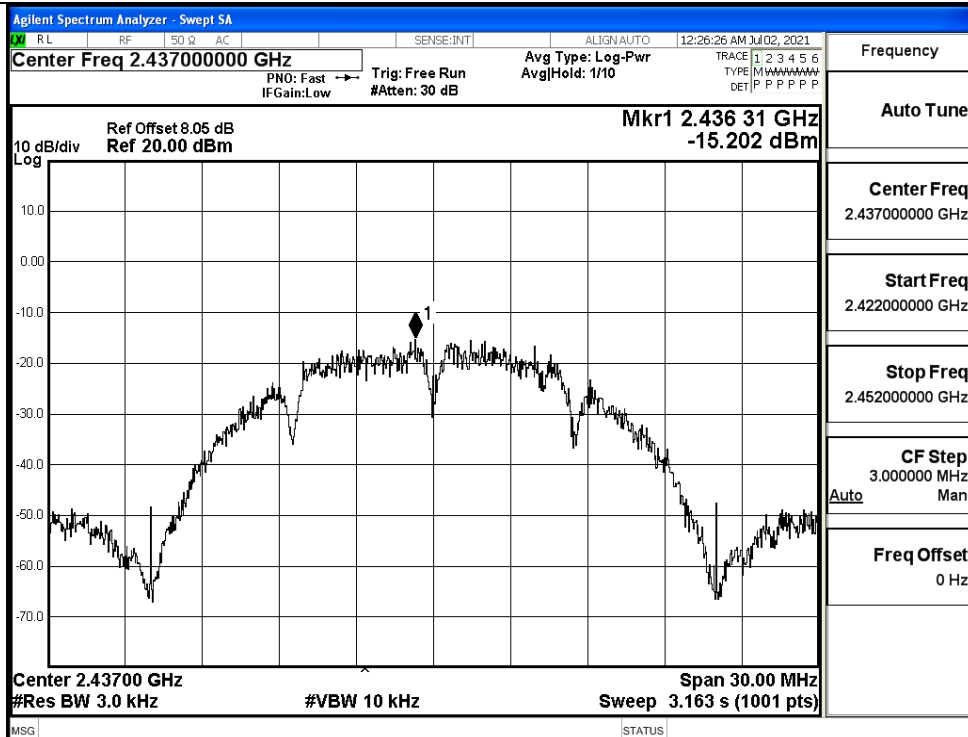
Test Graphs

11B/LCH

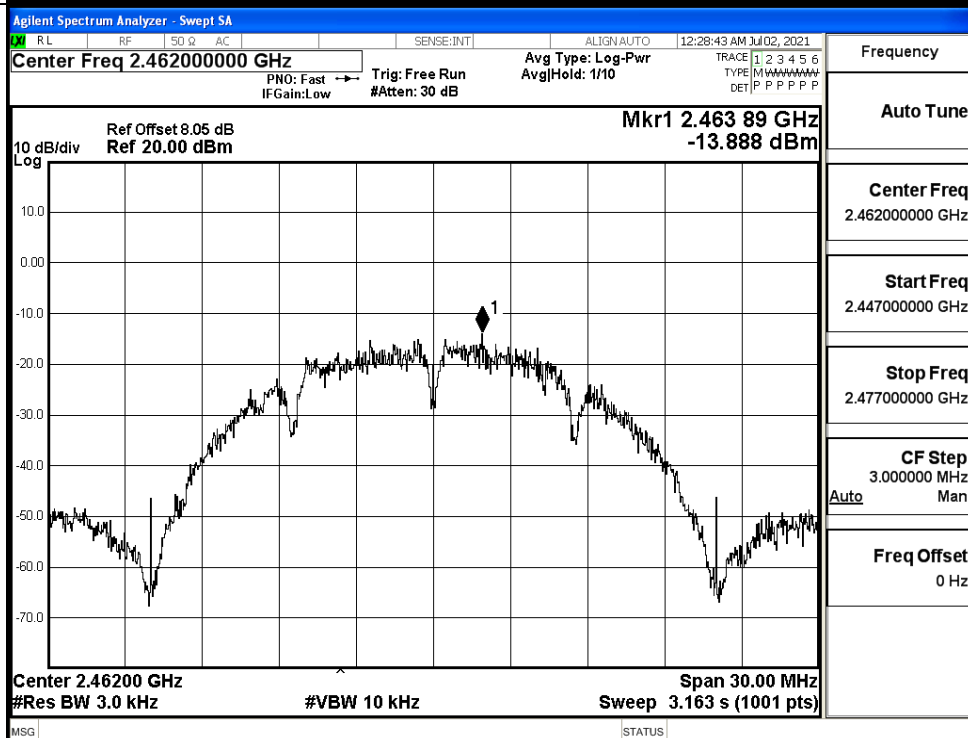




11B/MCH



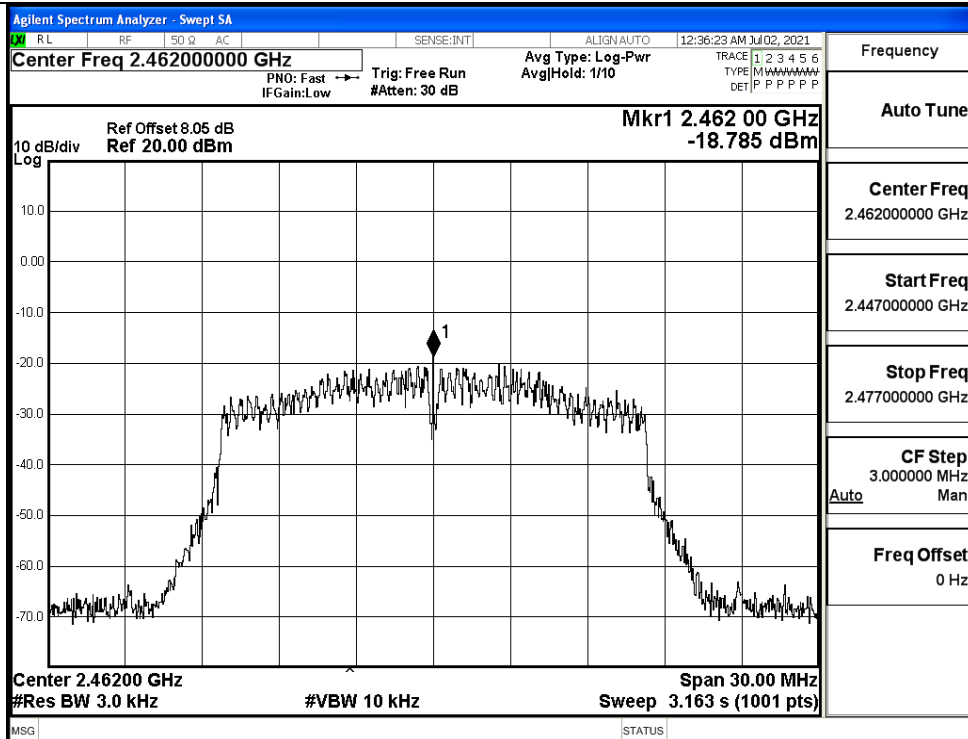
11B/HCH



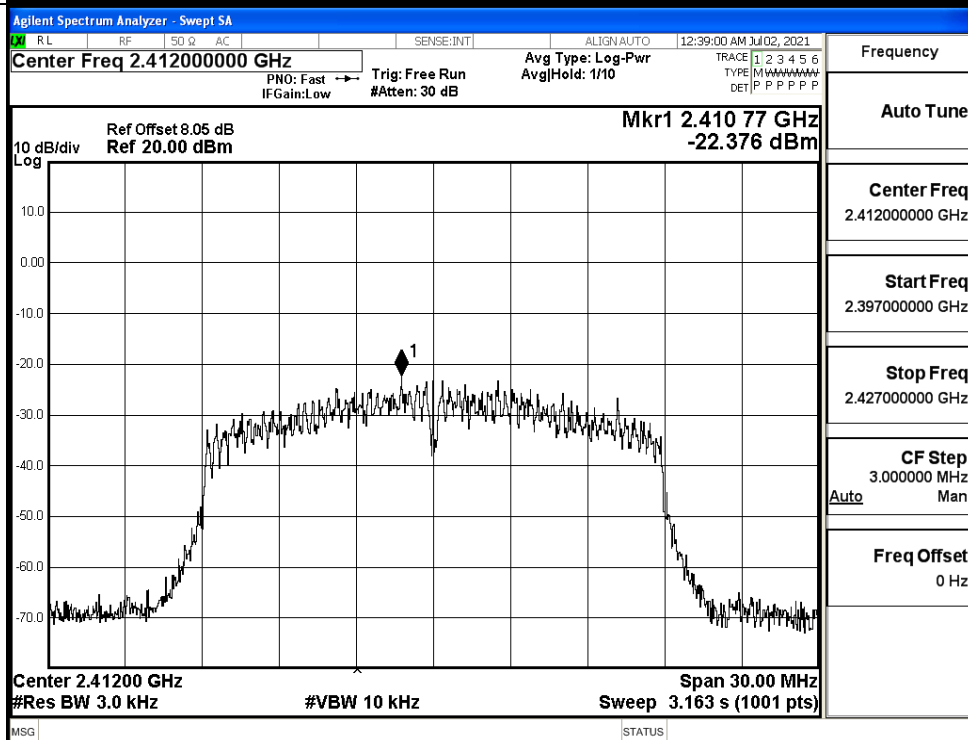
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11G/HCH

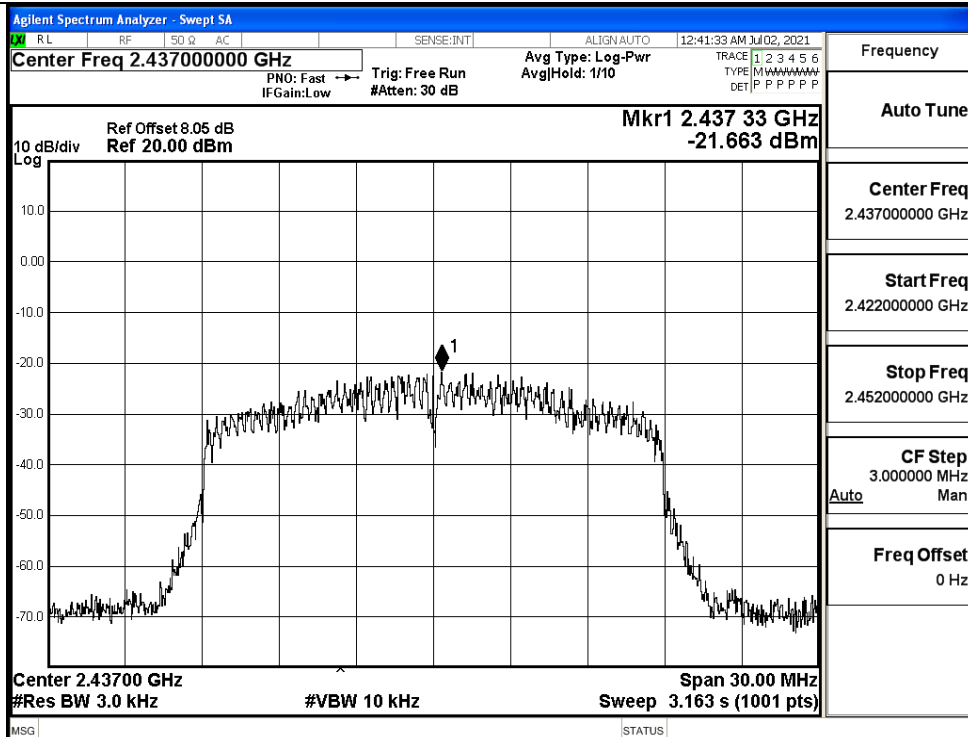


11N20SISO/LCH

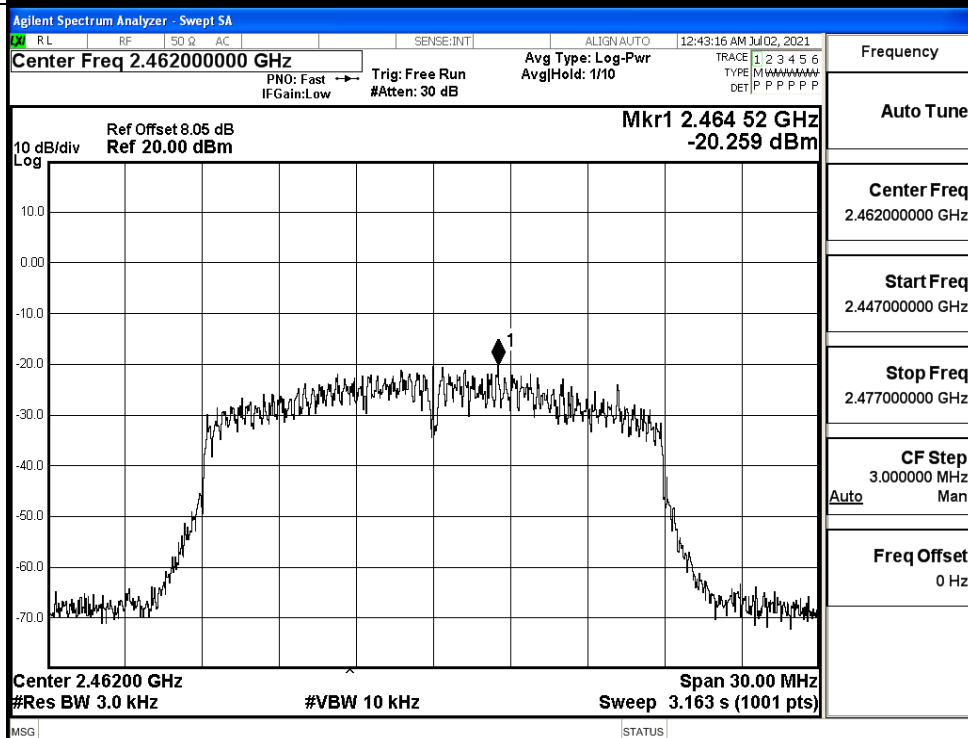


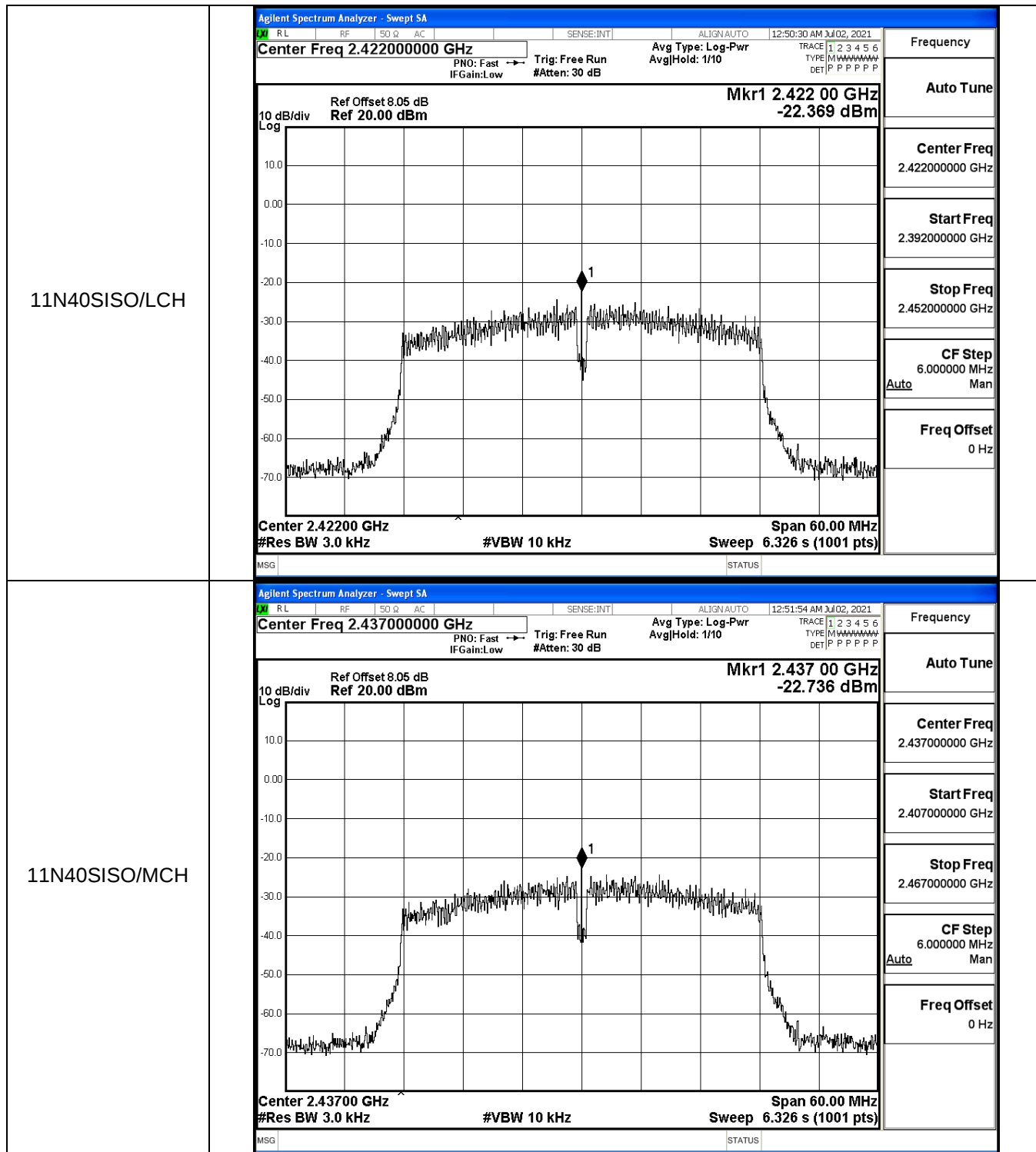


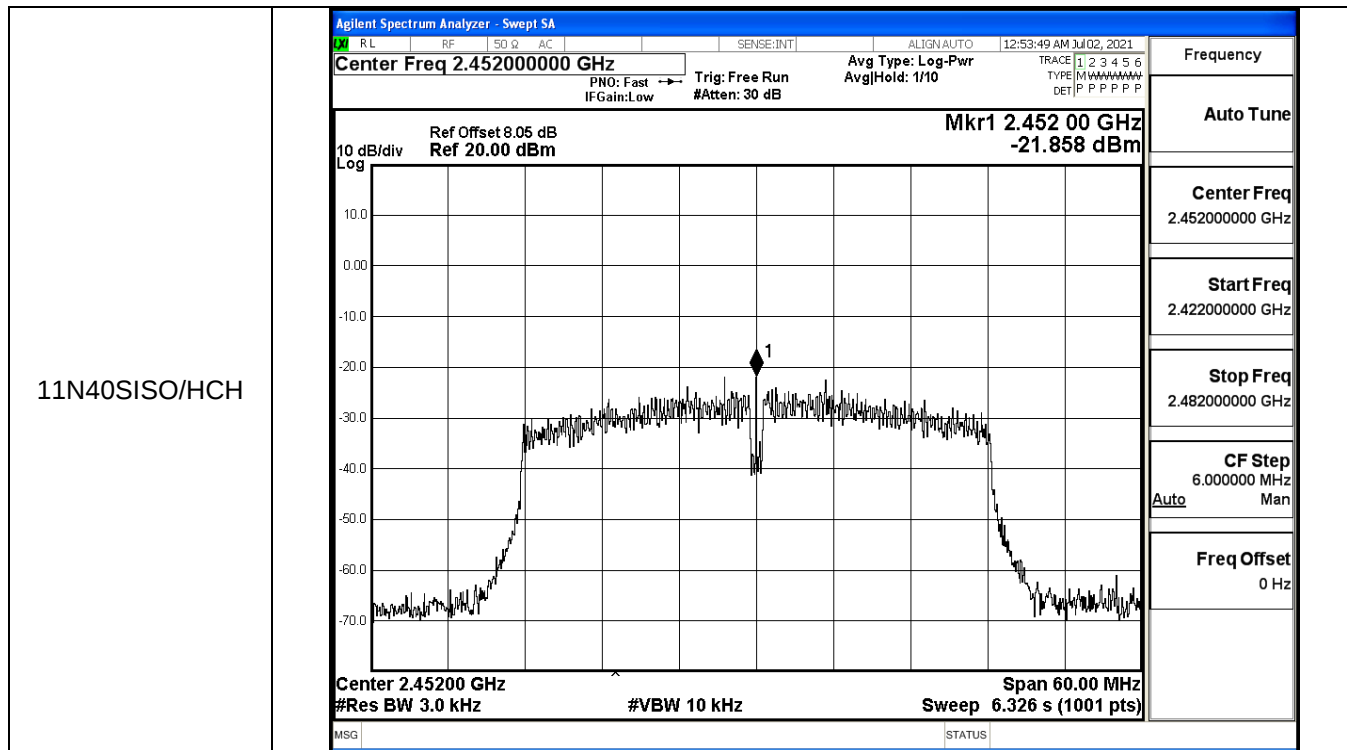
11N20SISO/MCH



11N20SISO/HCH







MIMO

Mode	Channel	ANT 0 [dBm/3KHz]	ANT 1 [dBm/3KHz]	MIMO [dBm/3KHz]	10log(N-3) dB	Meas.Level [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
11N20	LCH	-21.786	-22.376	-19.06	3.01	-16.05	8	PASS
	MCH	-21.682	-21.663	-18.66	3.01	-15.65	8	PASS
	HCH	-19.937	-20.259	-17.08	3.01	-14.07	8	PASS
11N40	LCH	-23.103	-22.369	-19.71	3.01	-16.70	8	PASS
	MCH	-21.257	-22.736	-18.92	3.01	-15.91	8	PASS
	HCH	-20.212	-21.858	-17.95	3.01	-14.94	8	PASS



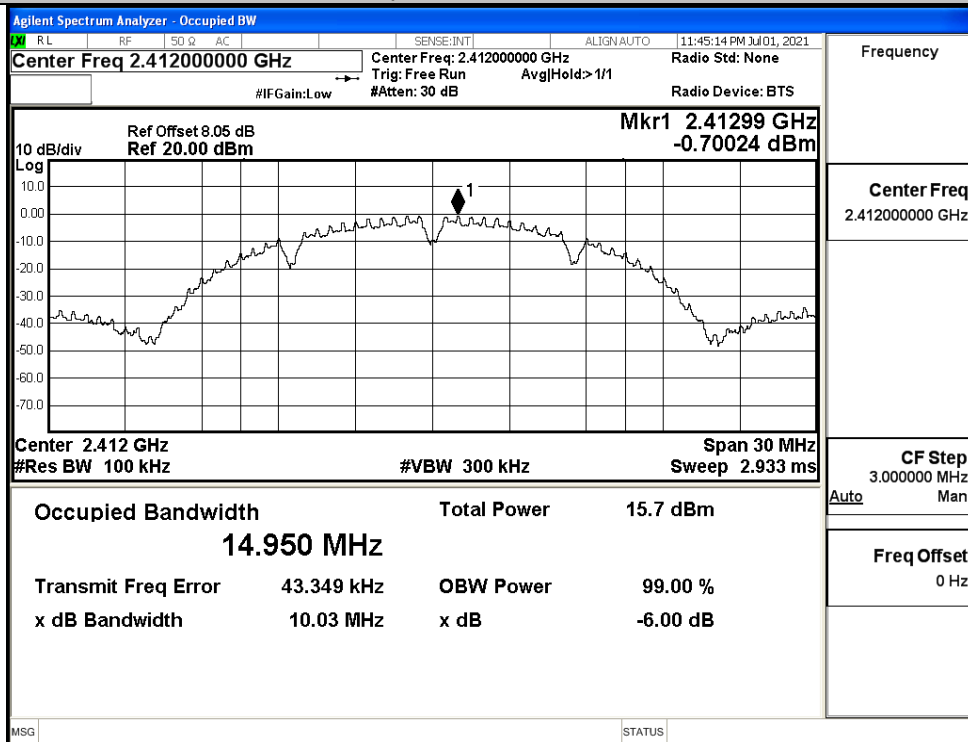
C.4 6dB Bandwidth

ANT0

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
11B	LCH	10.03	≥ 0.5	PASS
	MCH	10.06	≥ 0.5	PASS
	HCH	9.567	≥ 0.5	PASS
11G	LCH	11.33	≥ 0.5	PASS
	MCH	13.81	≥ 0.5	PASS
	HCH	12.58	≥ 0.5	PASS
11N20SISO	LCH	12.56	≥ 0.5	PASS
	MCH	13.83	≥ 0.5	PASS
	HCH	12.56	≥ 0.5	PASS
11N40SISO	LCH	32.60	≥ 0.5	PASS
	MCH	31.35	≥ 0.5	PASS
	HCH	33.85	≥ 0.5	PASS

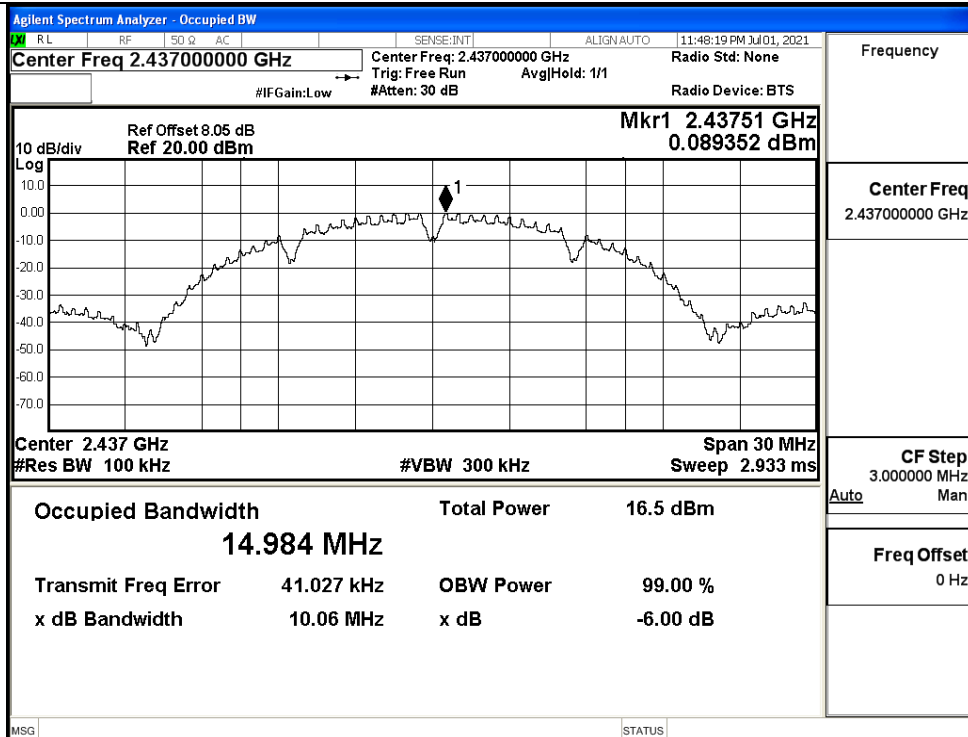
Test Graphs

11B/LCH

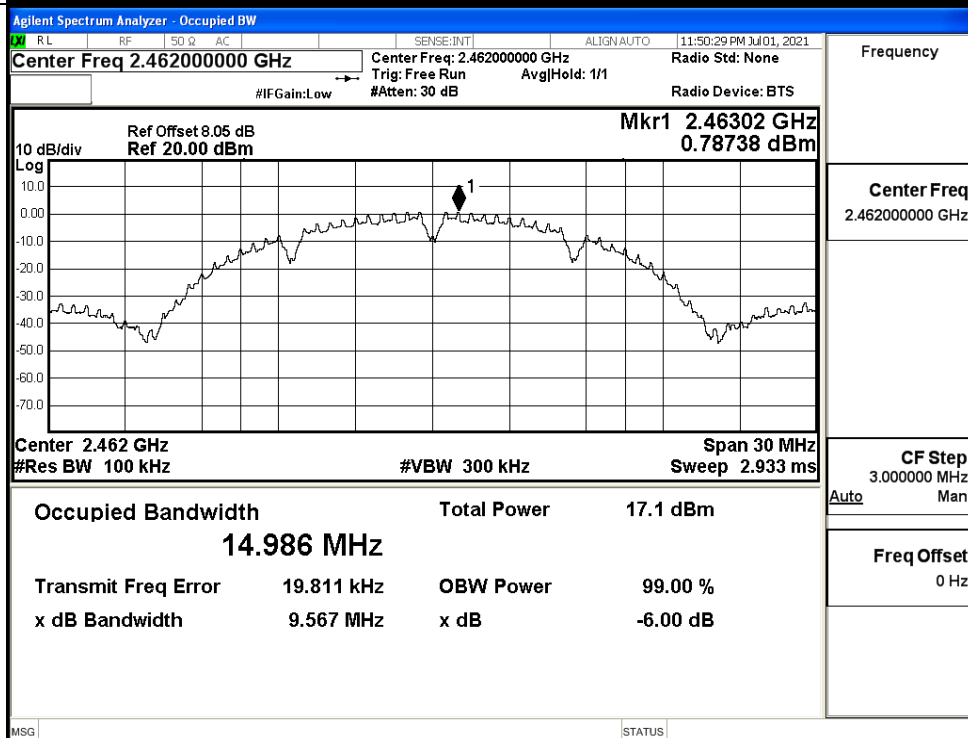




11B/MCH

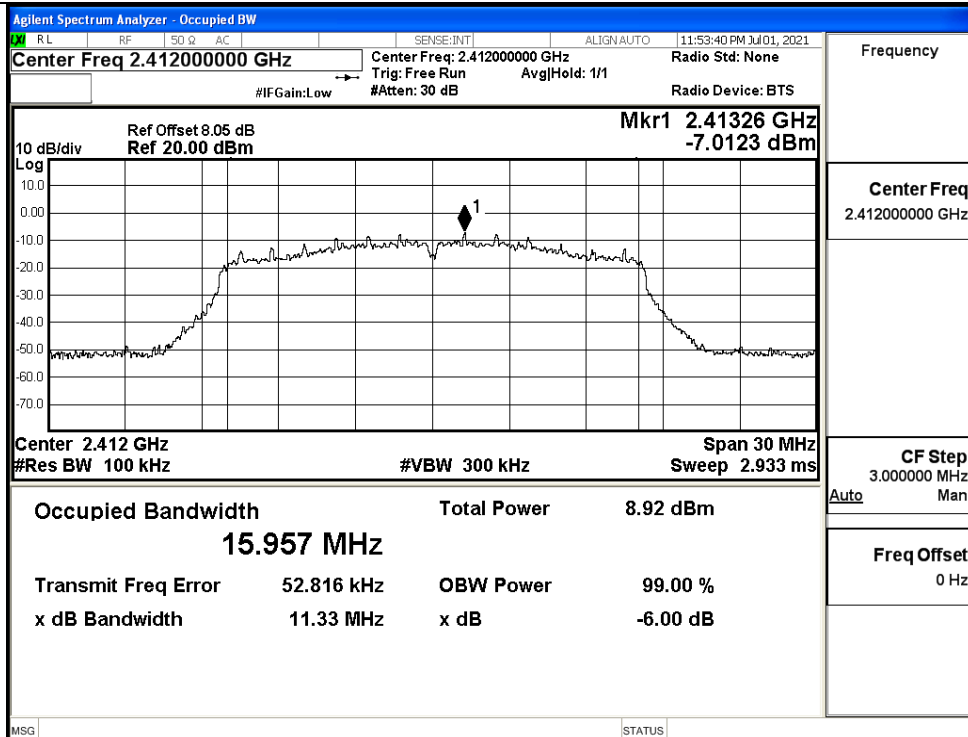


11B/HCH

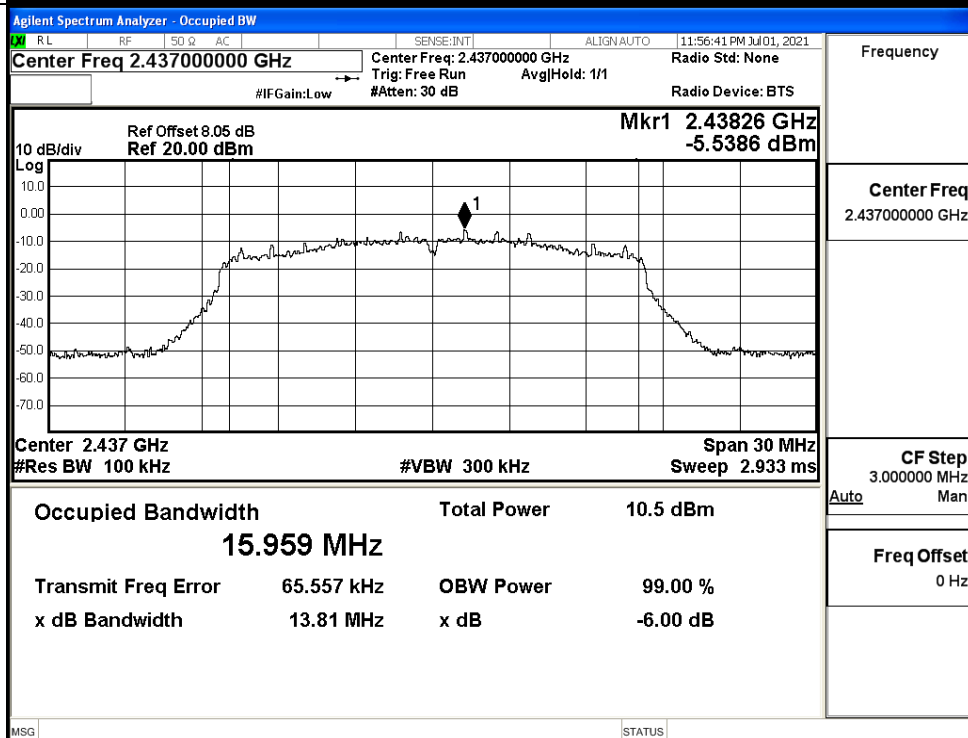




11G/LCH

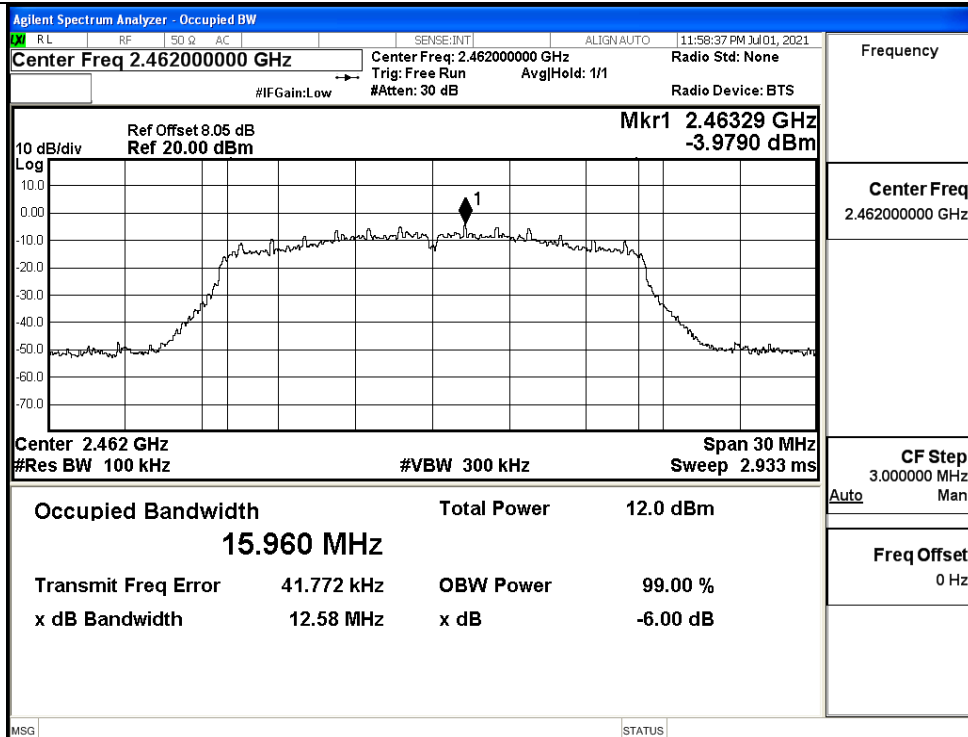


11G/MCH

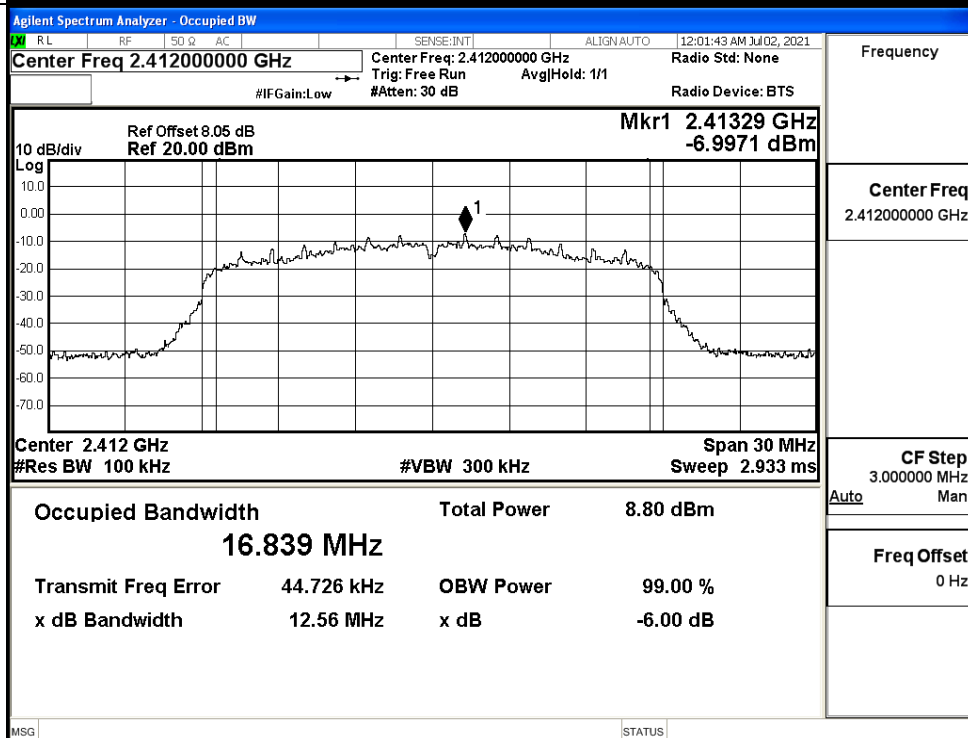




11G/HCH

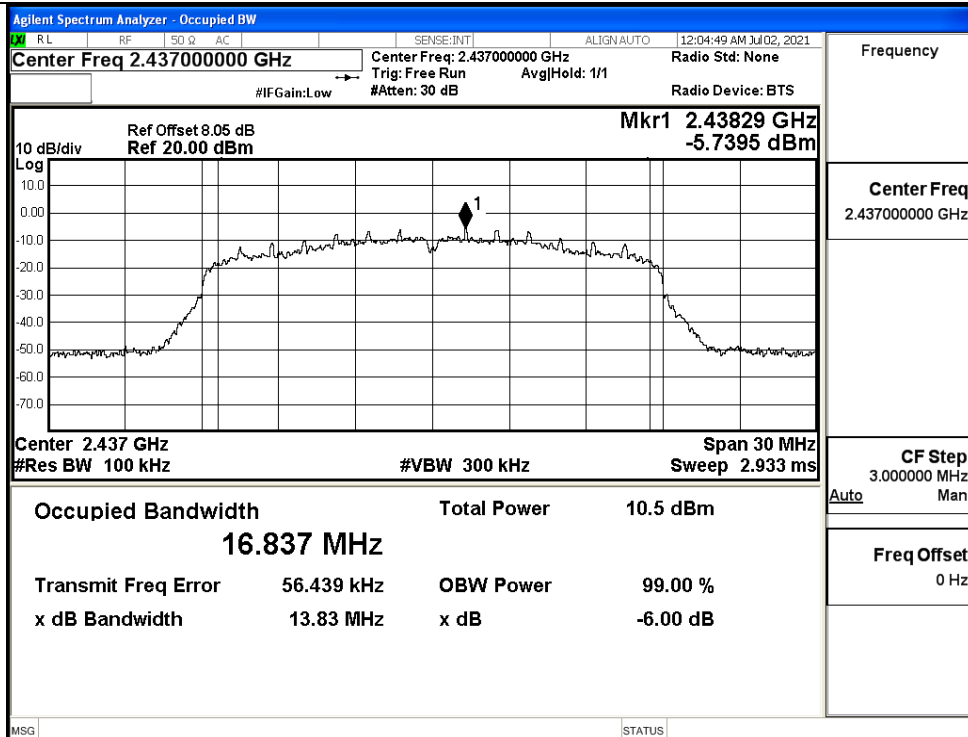


11N20SISO/LCH

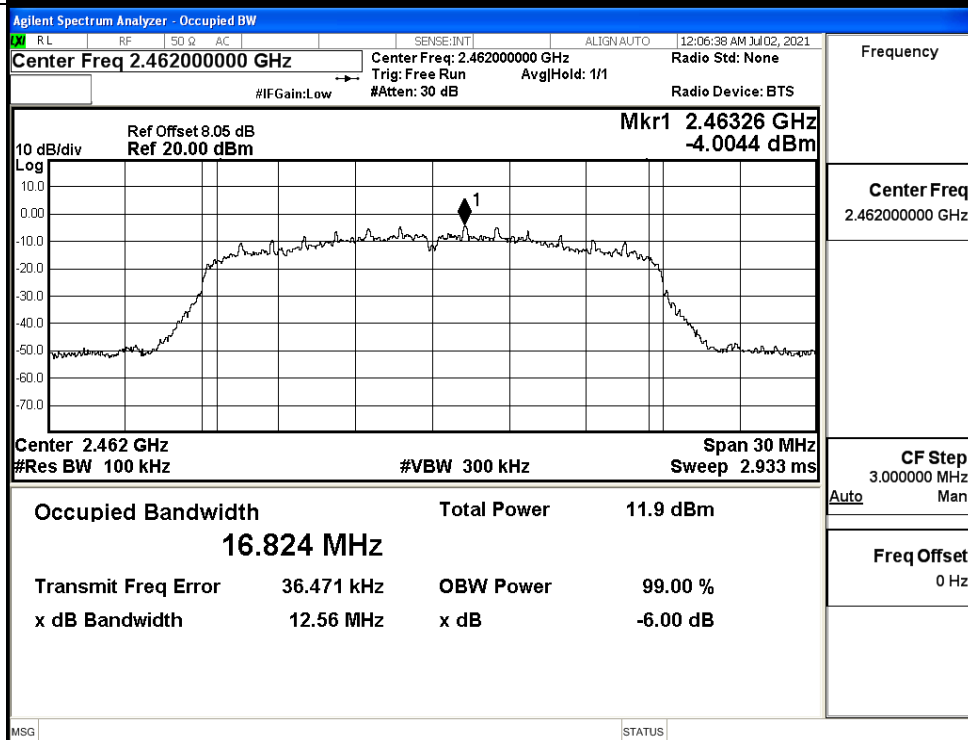




11N20SISO/MCH

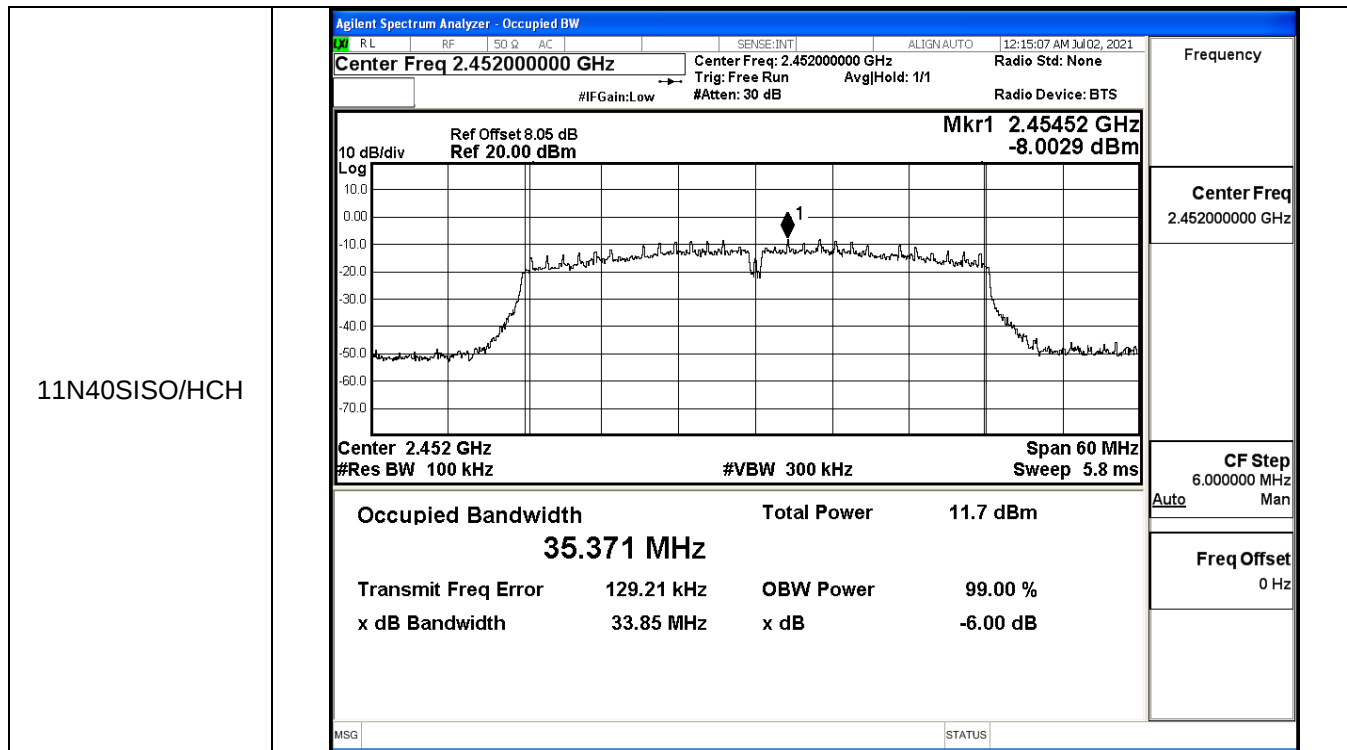


11N20SISO/HCH





11N40SISO/LCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:09:45 AM Jul 02, 2021 Center Freq 2.422000000 GHz Center Freq: 2.422000000 GHz Trig: Free Run #IFGain: Low #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.42452 GHz -9.8844 dBm Center 2.422 GHz #Res BW 100 kHz #VBW 300 kHz Span 60 MHz Sweep 5.8 ms Occupied Bandwidth Total Power 9.88 dBm 35.404 MHz Transmit Freq Error 133.40 kHz OBW Power 99.00 % x dB Bandwidth 32.60 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.422000000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz
11N40SISO/MCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:13:03 AM Jul 02, 2021 Center Freq 2.437000000 GHz Center Freq: 2.437000000 GHz Trig: Free Run #IFGain: Low #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.43952 GHz -8.9129 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 60 MHz Sweep 5.8 ms Occupied Bandwidth Total Power 10.8 dBm 35.390 MHz Transmit Freq Error 128.79 kHz OBW Power 99.00 % x dB Bandwidth 31.35 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.437000000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz



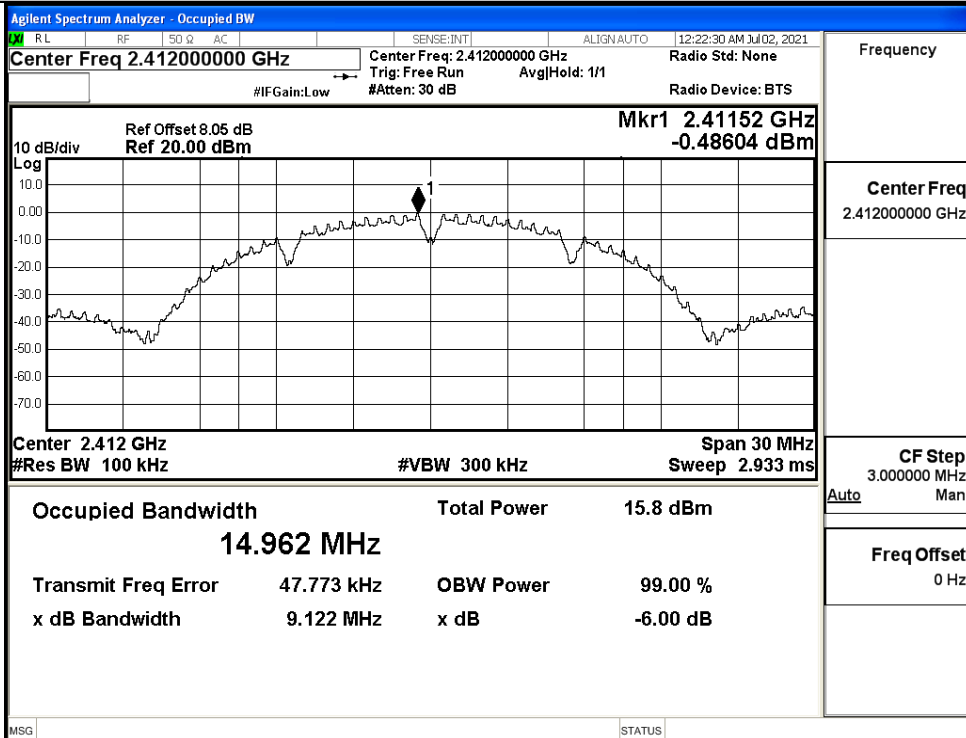
ANT1

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
11B	LCH	9.122	≥ 0.5	PASS
	MCH	9.568	≥ 0.5	PASS
	HCH	9.136	≥ 0.5	PASS
11G	LCH	13.79	≥ 0.5	PASS
	MCH	10.12	≥ 0.5	PASS
	HCH	13.76	≥ 0.5	PASS
11N20SISO	LCH	11.35	≥ 0.5	PASS
	MCH	13.77	≥ 0.5	PASS
	HCH	12.58	≥ 0.5	PASS
11N40SISO	LCH	33.85	≥ 0.5	PASS
	MCH	32.61	≥ 0.5	PASS
	HCH	31.34	≥ 0.5	PASS

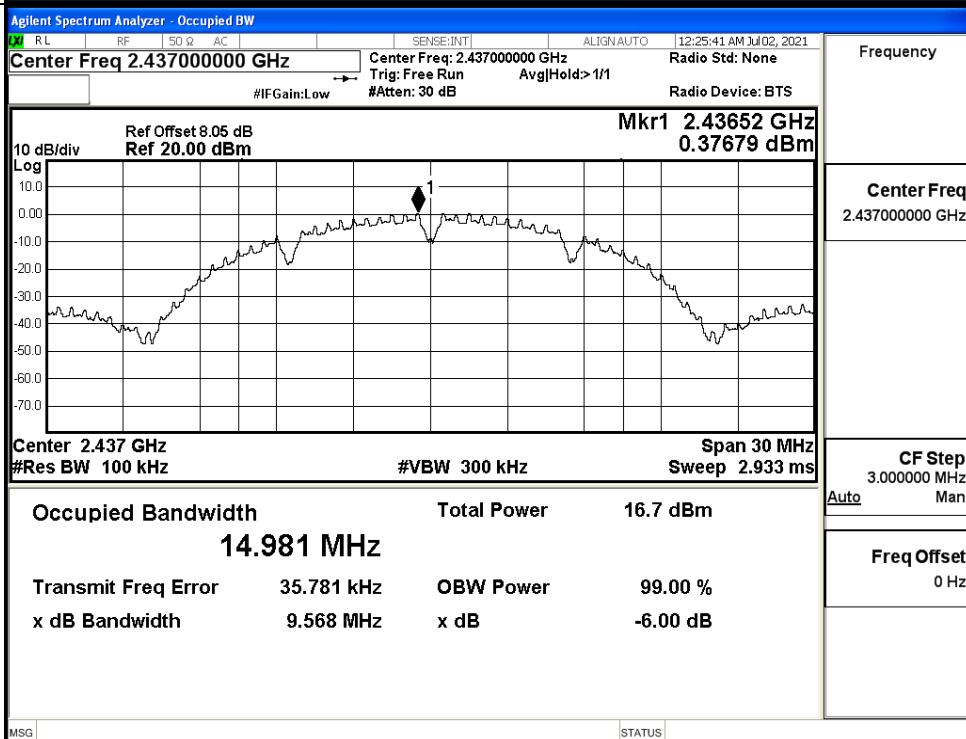


Test Graphs

11B/LCH

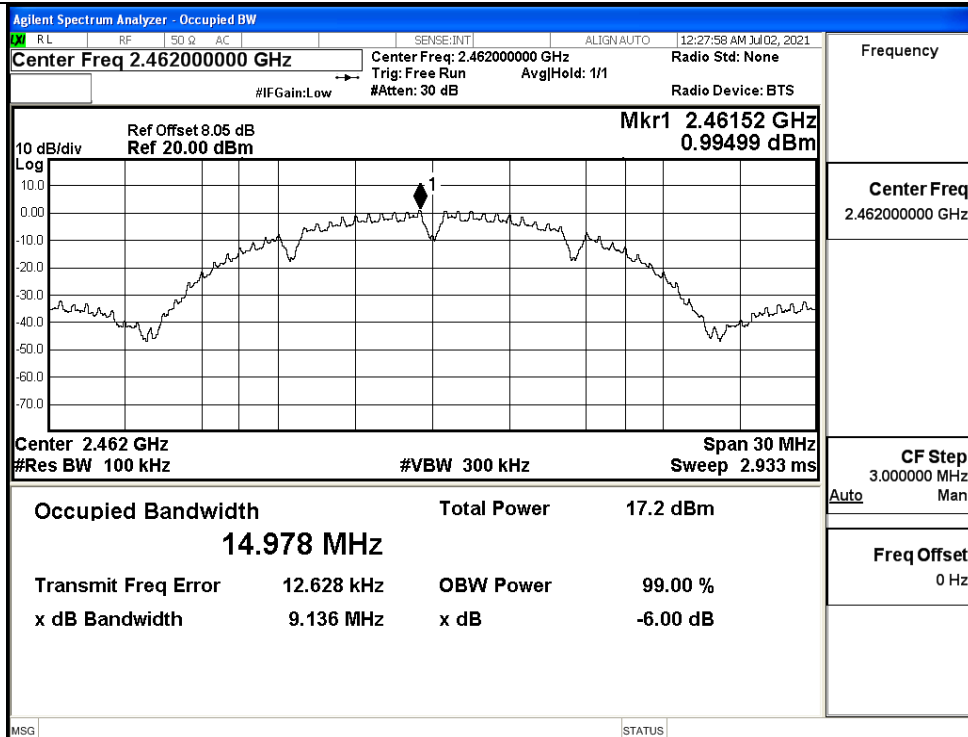


11B/MCH

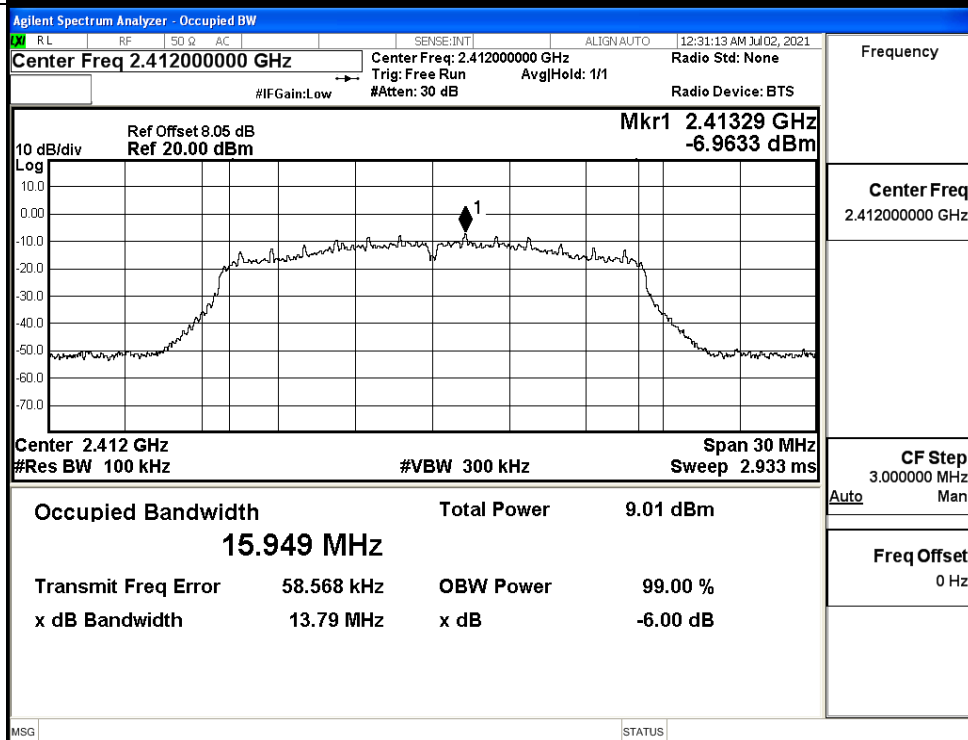




11B/HCH

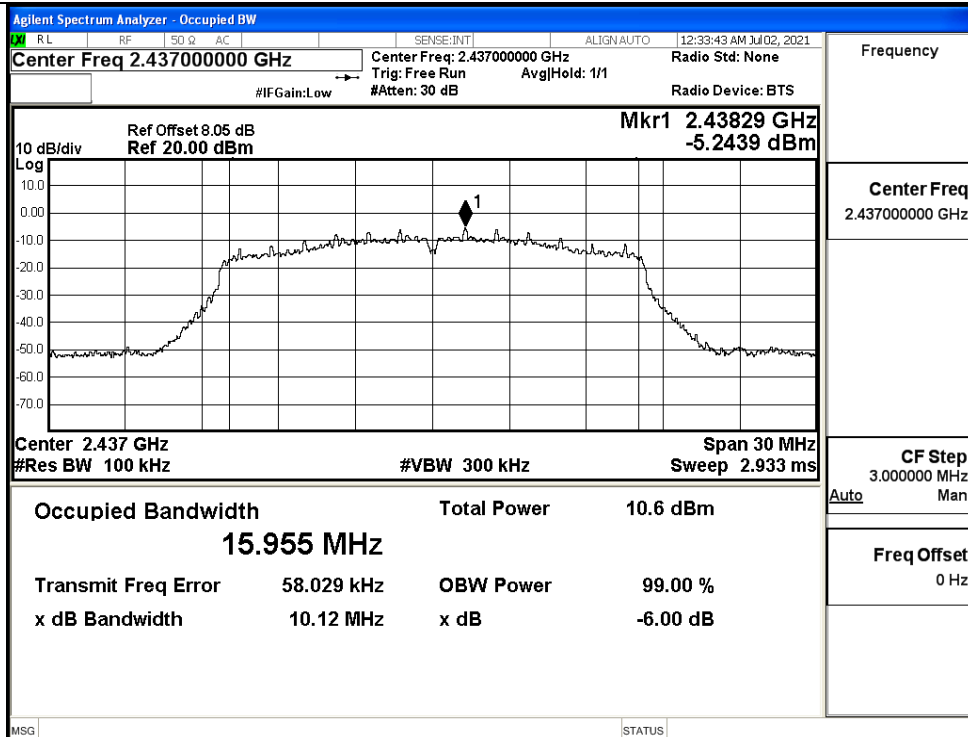


11G/LCH

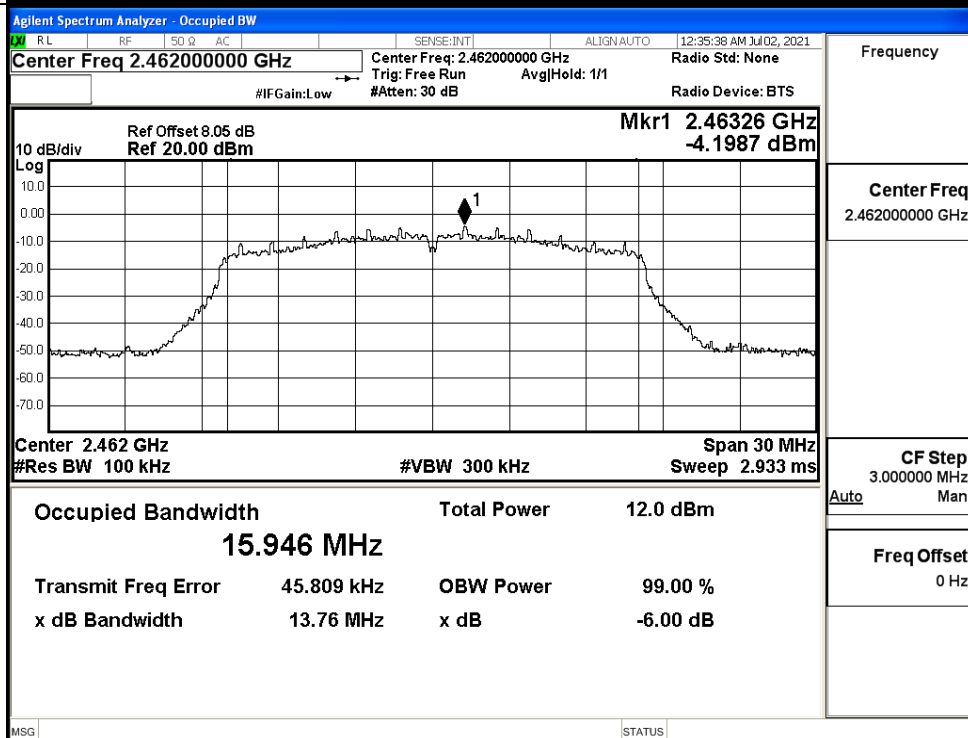




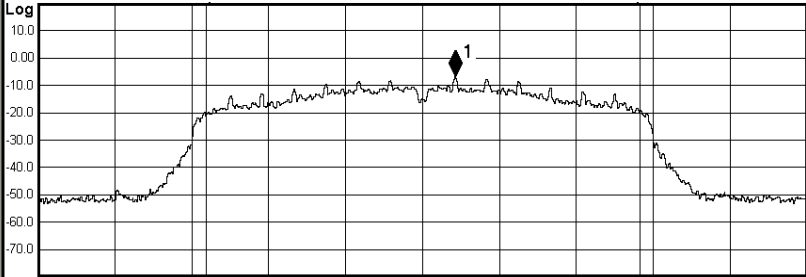
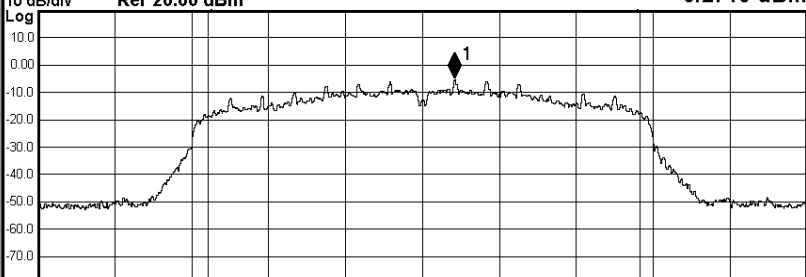
11G/MCH



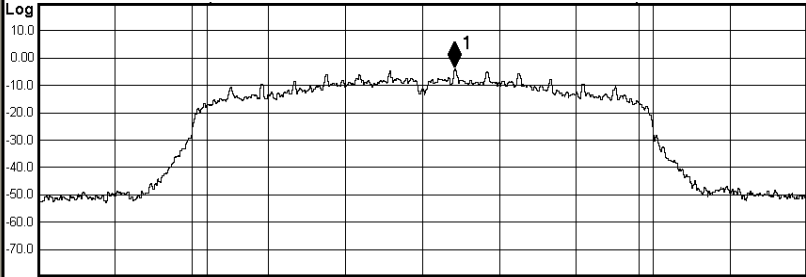
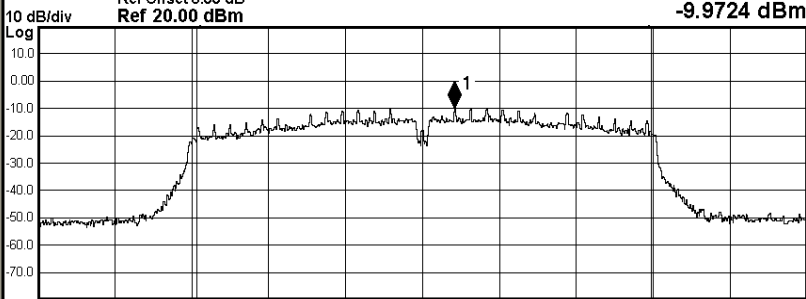
11G/HCH



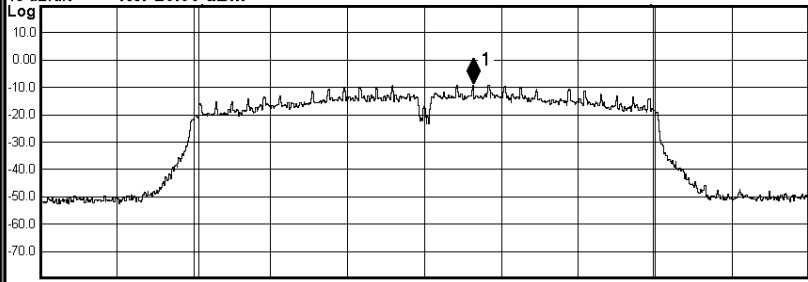
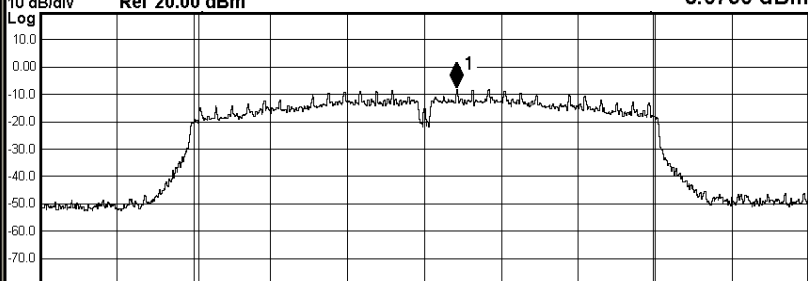


11N20SISO/LCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:38:15 AM Jul 02, 2021 Center Freq 2.41200000 GHz Center Freq: 2.41200000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.41329 GHz -6.9243 dBm  Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth 16.837 MHz Total Power 8.86 dBm Transmit Freq Error 48.715 kHz OBW Power 99.00 % x dB Bandwidth 11.35 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.41200000 GHz CF Step 3.000000 MHz Auto Man Freq Offset 0 Hz
11N20SISO/MCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:40:48 AM Jul 02, 2021 Center Freq 2.43700000 GHz Center Freq: 2.43700000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.43826 GHz -5.2710 dBm  Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth 16.845 MHz Total Power 10.5 dBm Transmit Freq Error 57.359 kHz OBW Power 99.00 % x dB Bandwidth 13.77 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.43700000 GHz CF Step 3.000000 MHz Auto Man Freq Offset 0 Hz



11N20SISO/HCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:42:31 AM Jul 02, 2021 Center Freq 2.462000000 GHz Center Freq: 2.462000000 GHz Trig: Free Run #IFGain: Low #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Log Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.46326 GHz -3.8935 dBm  Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth Total Power 11.8 dBm 16.826 MHz Transmit Freq Error 33.981 kHz OBW Power 99.00 % x dB Bandwidth 12.58 MHz x dB -6.00 dB MSG STATUS Frequency Center Freq 2.462000000 GHz CF Step 3.000000 MHz Auto Man Freq Offset 0 Hz
11N40SISO/LCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:47:51 AM Jul 02, 2021 Center Freq 2.422000000 GHz Center Freq: 2.422000000 GHz Trig: Free Run #IFGain: Low #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Log Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.42452 GHz -9.9724 dBm  Center 2.422 GHz #Res BW 100 kHz #VBW 300 kHz Span 60 MHz Sweep 5.8 ms Occupied Bandwidth Total Power 9.84 dBm 35.407 MHz Transmit Freq Error 146.71 kHz OBW Power 99.00 % x dB Bandwidth 33.85 MHz x dB -6.00 dB MSG STATUS Frequency Center Freq 2.422000000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz



11N40SISO/MCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:51:06 AM Jul 02, 2021 Center Freq 2.437000000 GHz Center Freq: 2.437000000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.44078 GHz -9.2167 dBm  Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 60 MHz Sweep 5.8 ms Occupied Bandwidth Total Power 10.8 dBm 35.393 MHz Transmit Freq Error 141.06 kHz OBW Power 99.00 % x dB Bandwidth 32.61 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.437000000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz
11N40SISO/HCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 12:53:01 AM Jul 02, 2021 Center Freq 2.452000000 GHz Center Freq: 2.452000000 GHz Trig: Free Run #Atten: 30 dB Radio Std: None Avg Hold: 1/1 Radio Device: BTS 10 dB/div Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.45452 GHz -8.0790 dBm  Center 2.452 GHz #Res BW 100 kHz #VBW 300 kHz Span 60 MHz Sweep 5.8 ms Occupied Bandwidth Total Power 11.7 dBm 35.351 MHz Transmit Freq Error 112.42 kHz OBW Power 99.00 % x dB Bandwidth 31.34 MHz x dB -6.00 dB MSG STATUS	Frequency Center Freq 2.452000000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz



C.6 RF Conducted Spurious Emissions

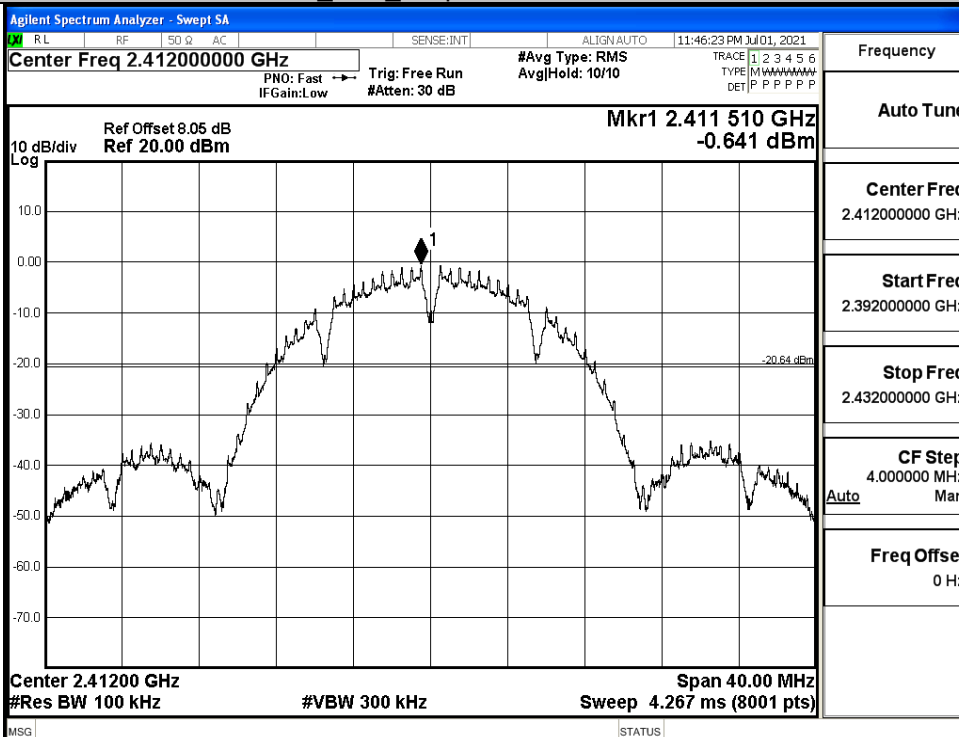
ANT0

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
11B	LCH	-0.641	-37.444	-20.641	PASS
	MCH	0.185	-38.488	-19.815	PASS
	HCH	0.704	-37.411	-19.296	PASS
11G	LCH	-7.3	-38.357	-27.300	PASS
	MCH	-6.431	-37.864	-26.431	PASS
	HCH	-4.001	-37.659	-24.001	PASS
11N20 SISO	LCH	-7.895	-37.086	-27.895	PASS
	MCH	-5.787	-38.132	-25.787	PASS
	HCH	-4.07	-38.347	-24.070	PASS
11N40 SISO	LCH	-10.135	-38.406	-30.135	PASS
	MCH	-8.9	-38.762	-28.900	PASS
	HCH	-8.082	-38.007	-28.082	PASS

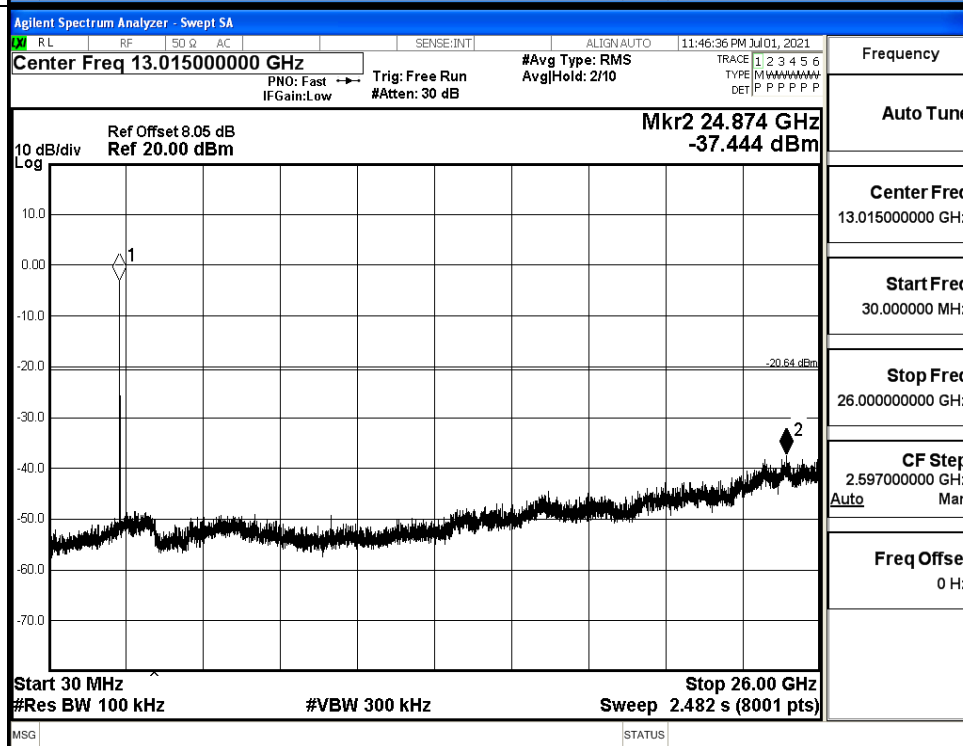


11B LCH Graphs

Pref/11B/LCH



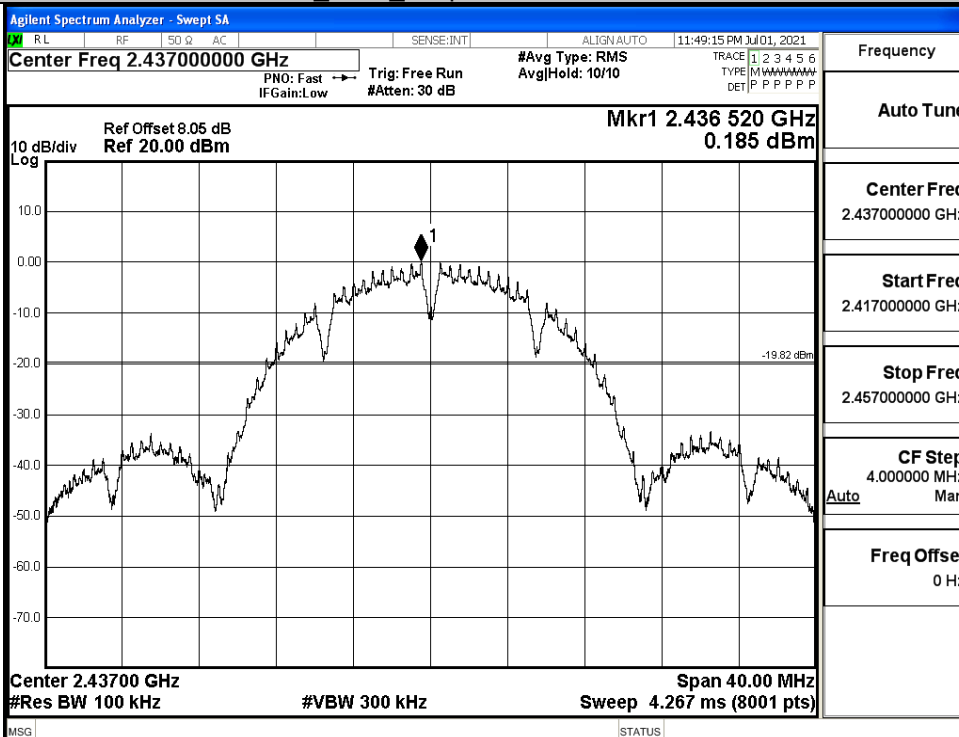
Puw/11B/LCH



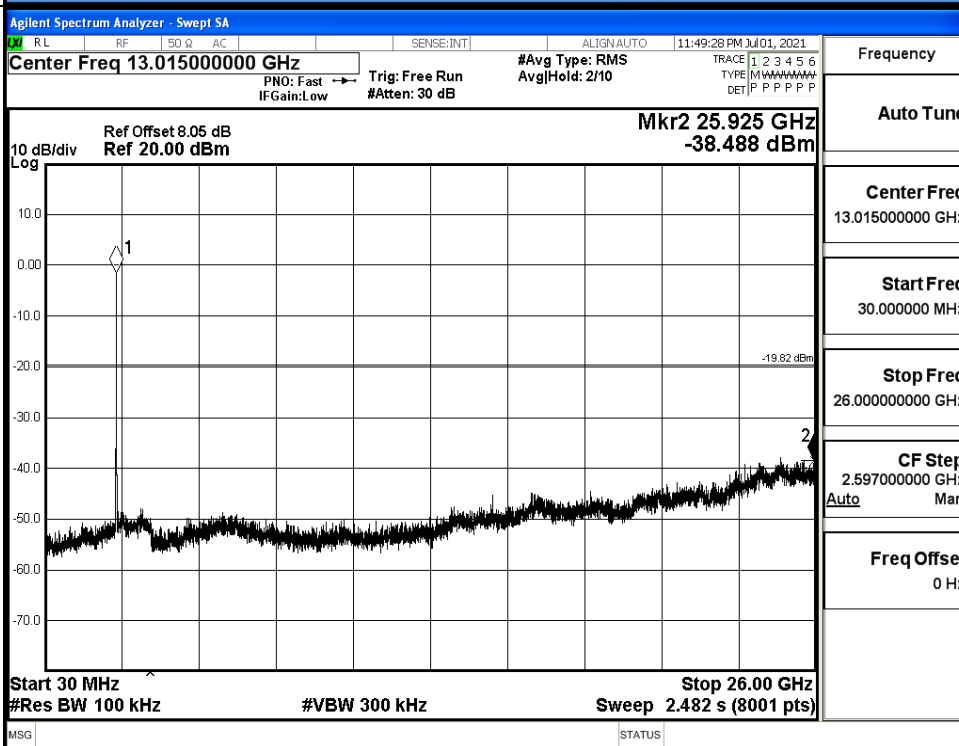


11B MCH Graphs

Pref/11B/MCH



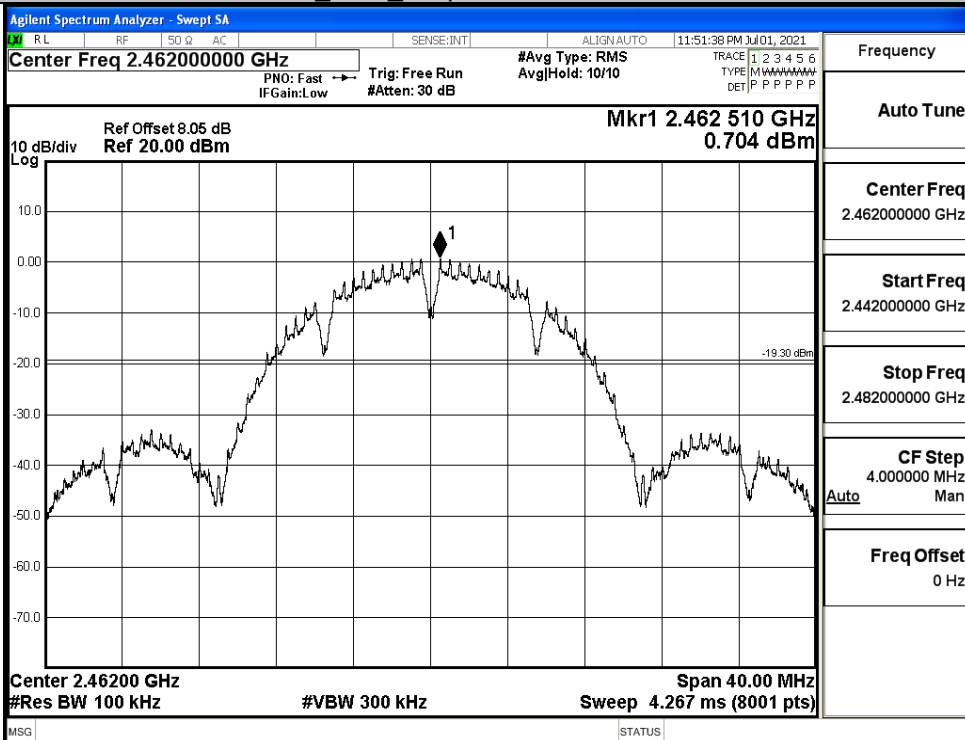
Puw/11B/MCH



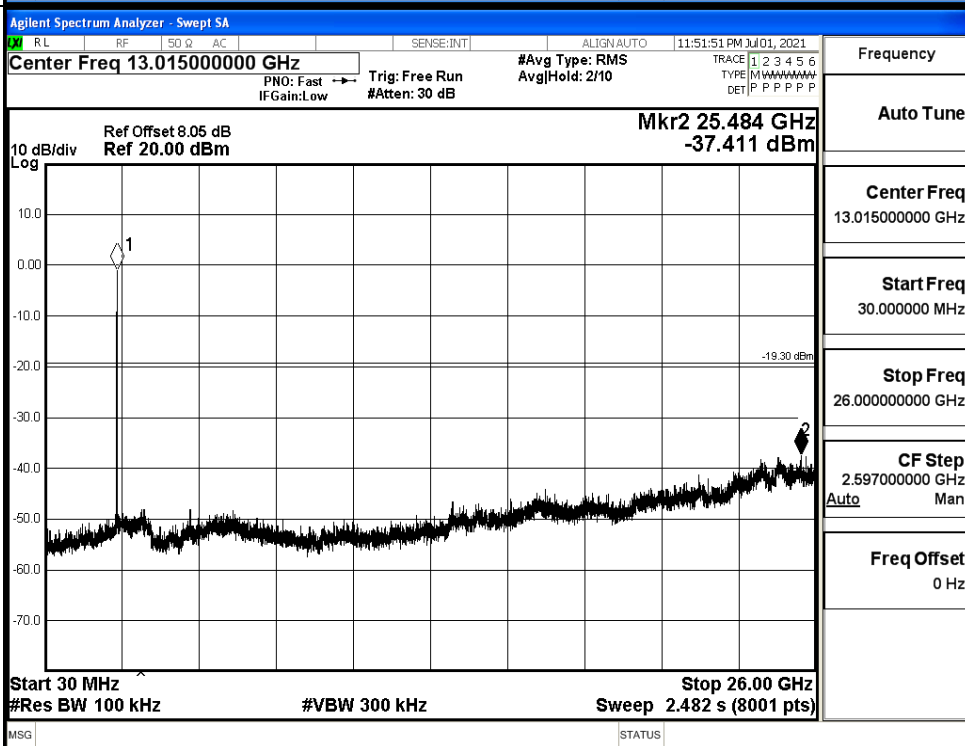


11B HCH Graphs

Pref/11B/HCH



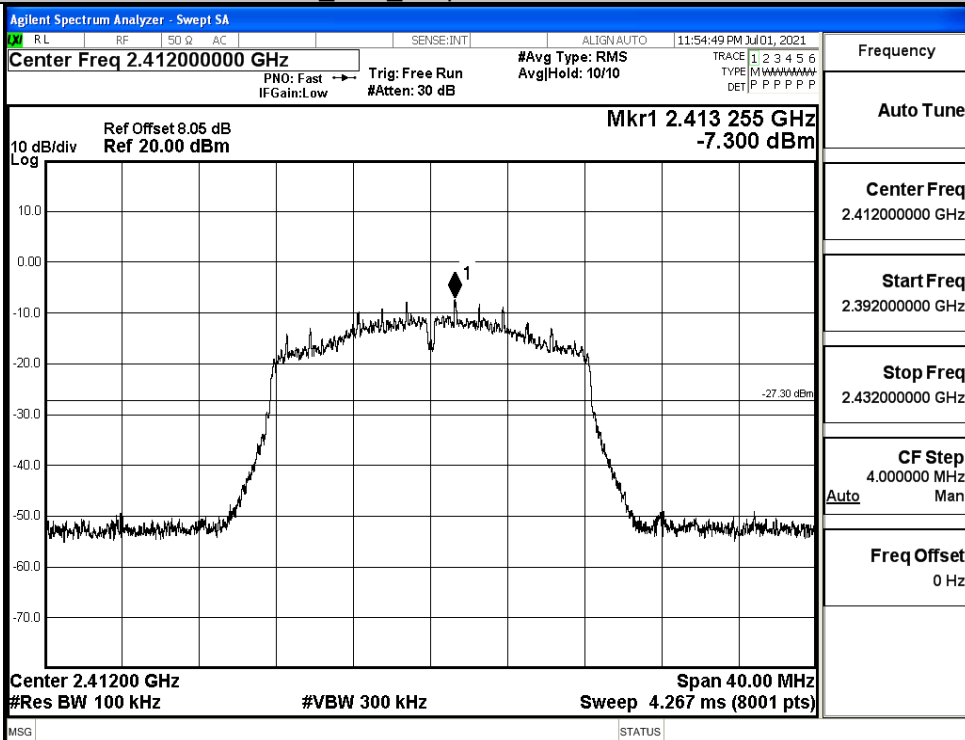
Puw/11B/HCH



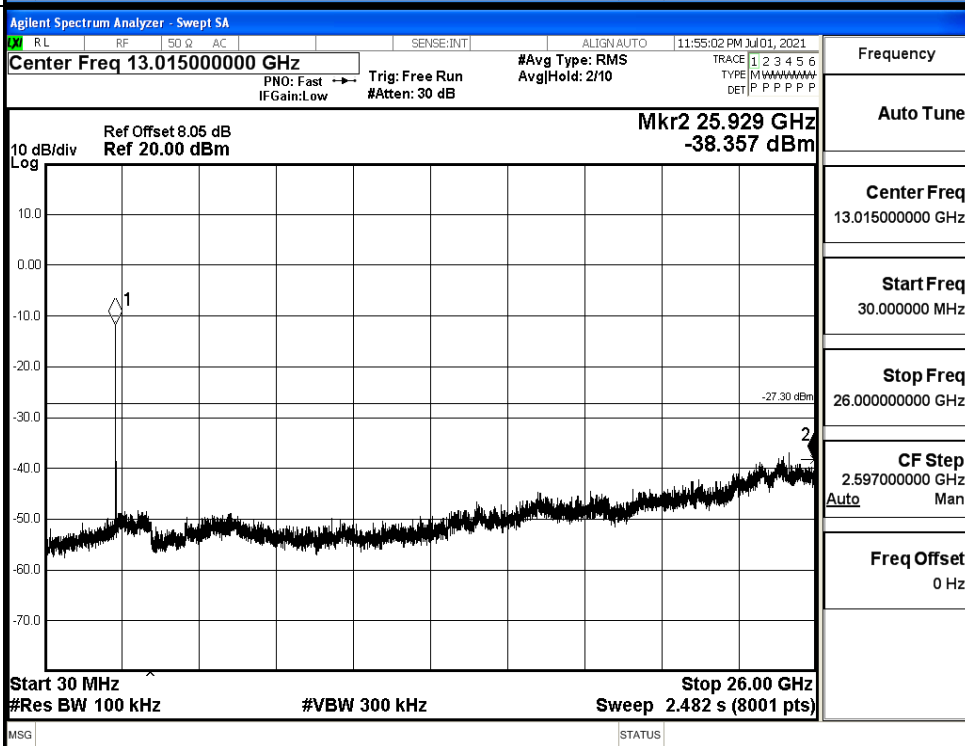


11G_LCH_Graphs

Pref/11G/LCH



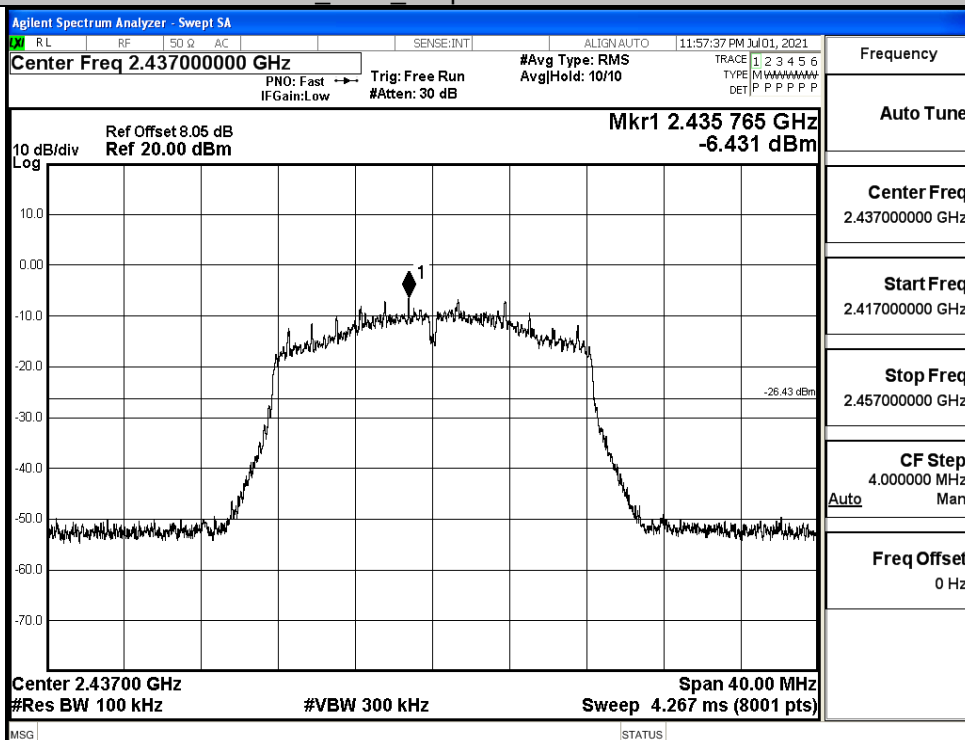
Puw/11G/LCH



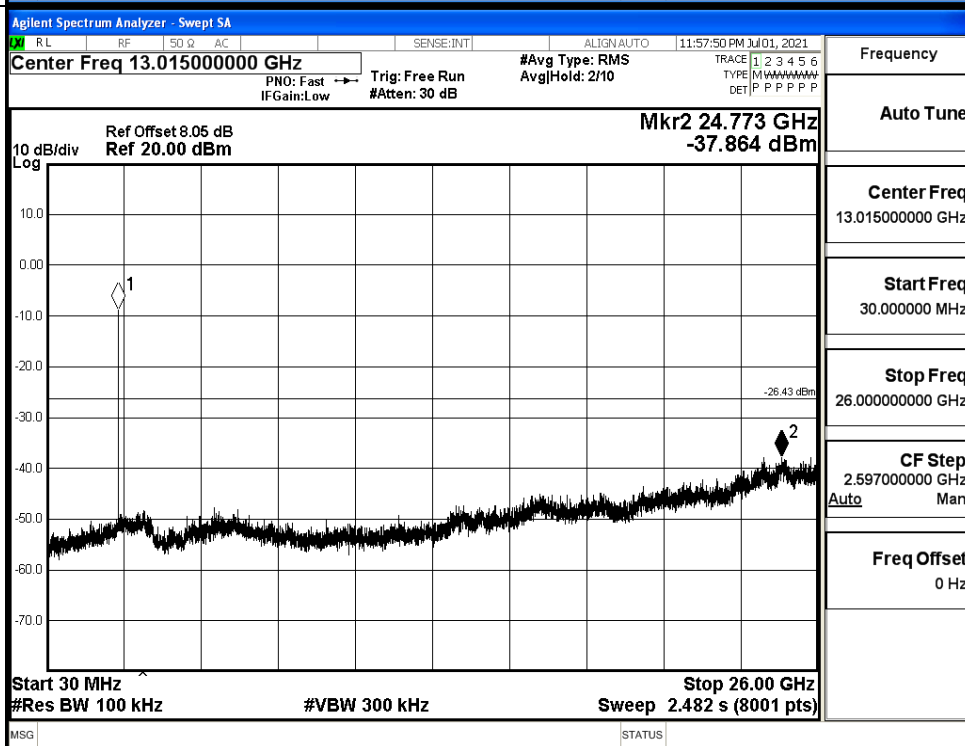


11G MCH Graphs

Pref/11G/MCH



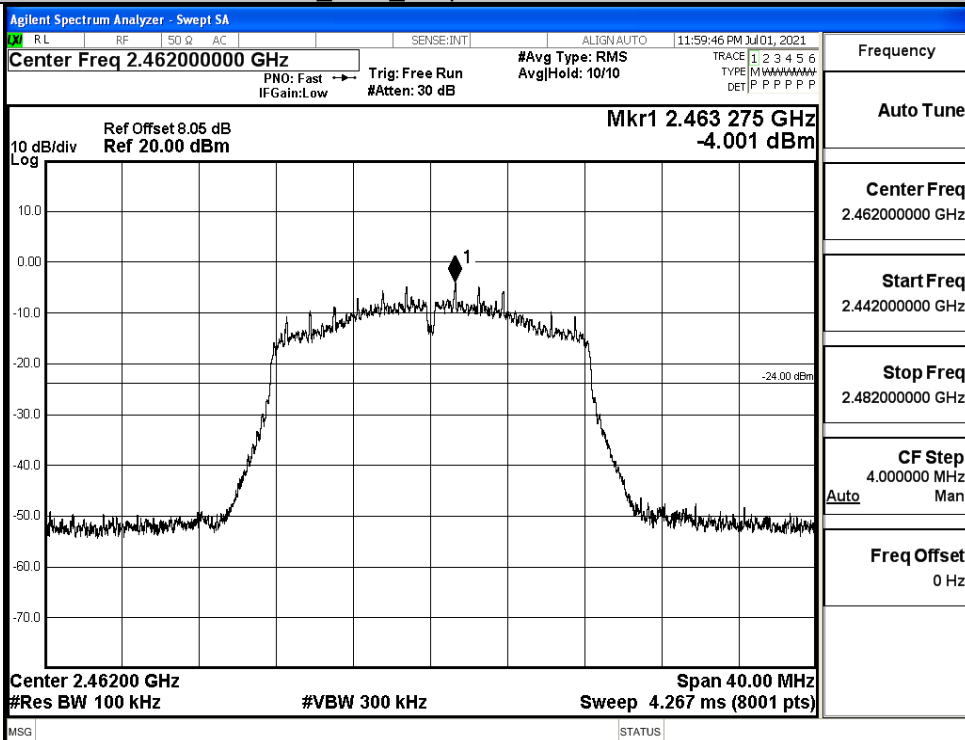
Puw/11G/MCH



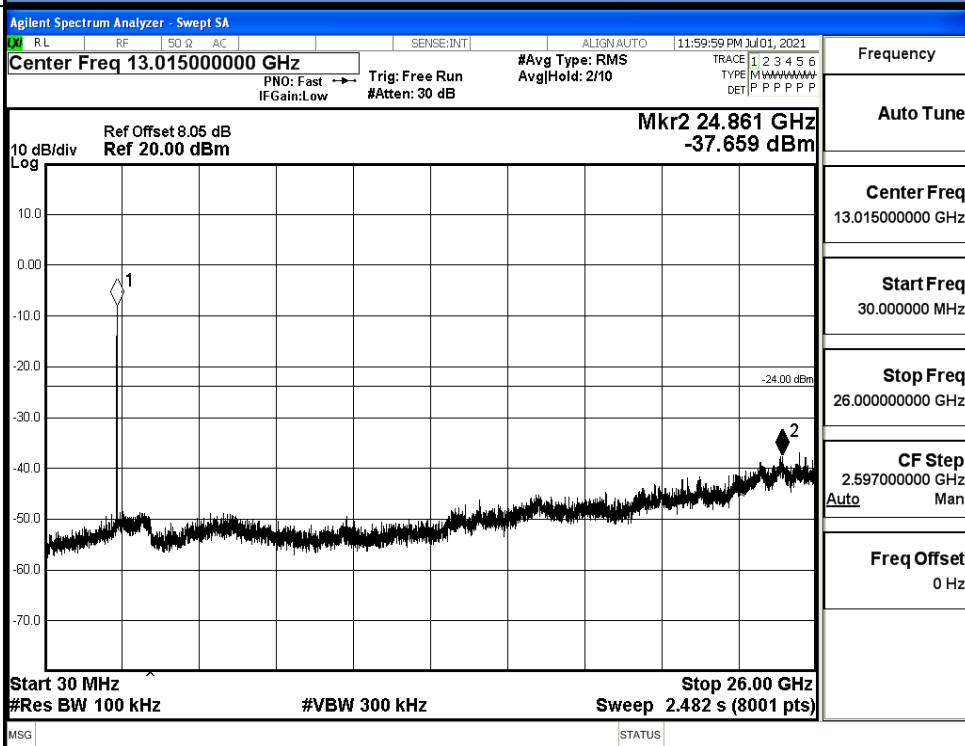


11G HCH Graphs

Pref/11G/HCH

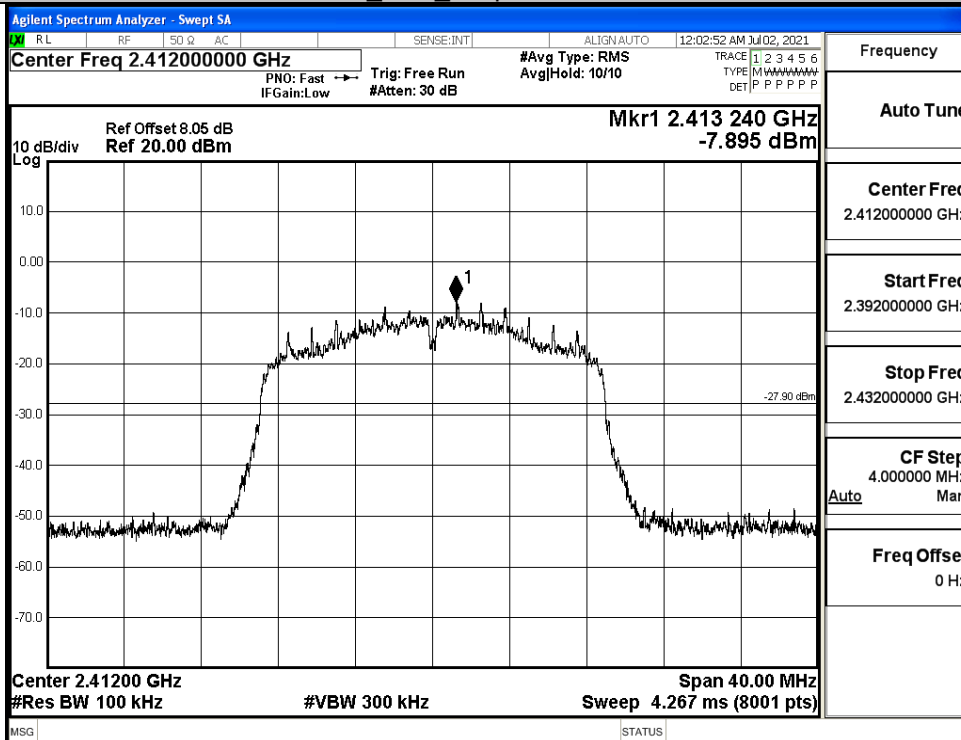
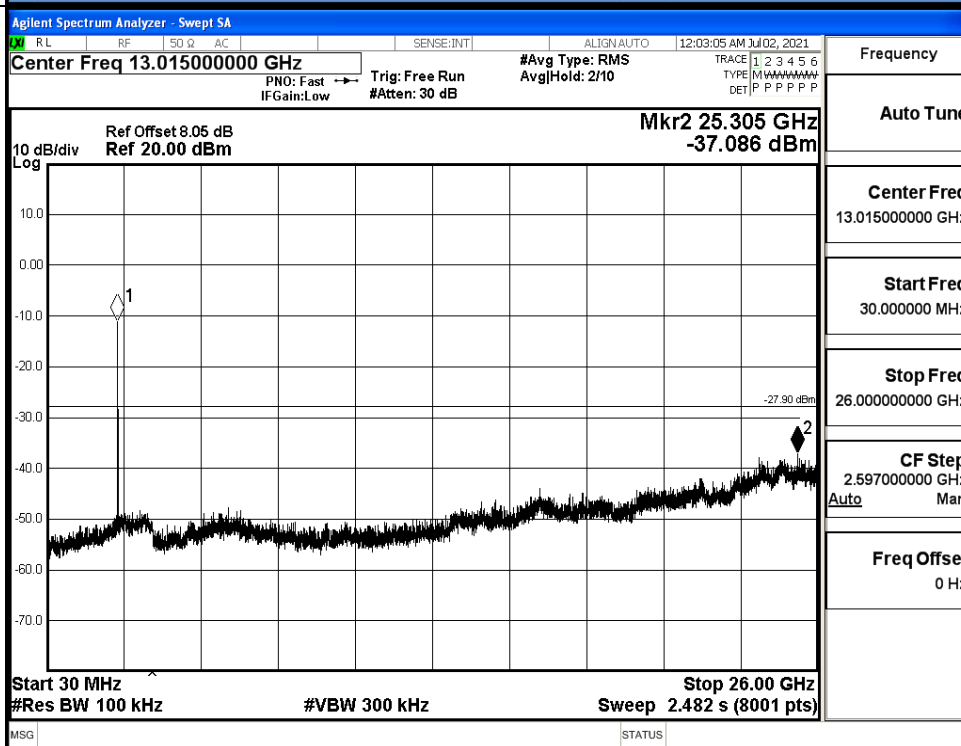


Puw/11G/HCH



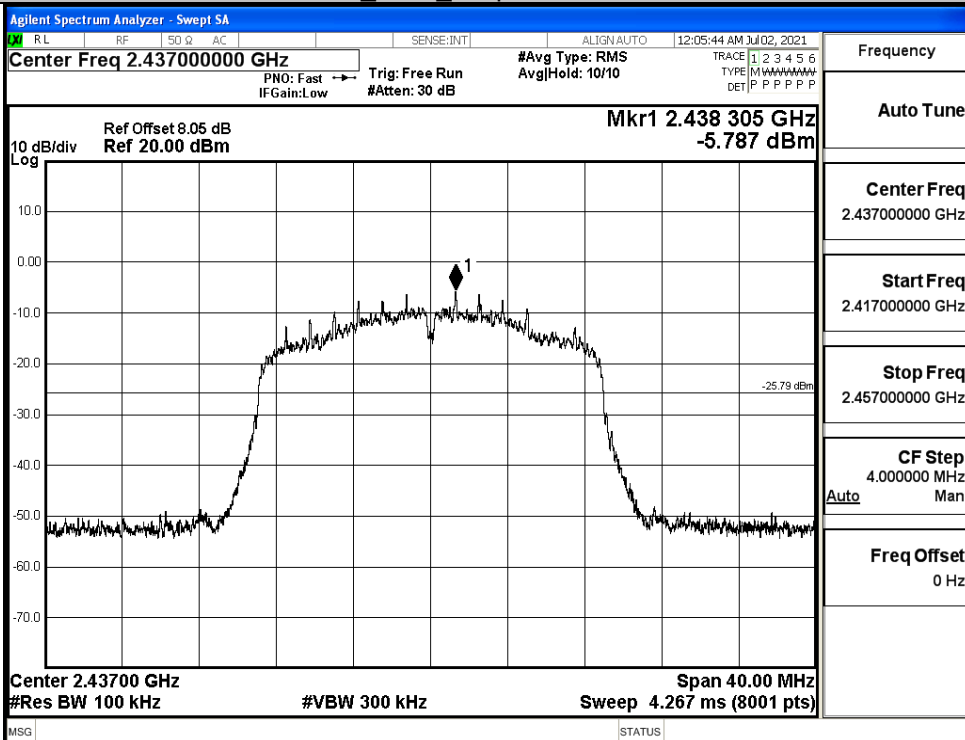
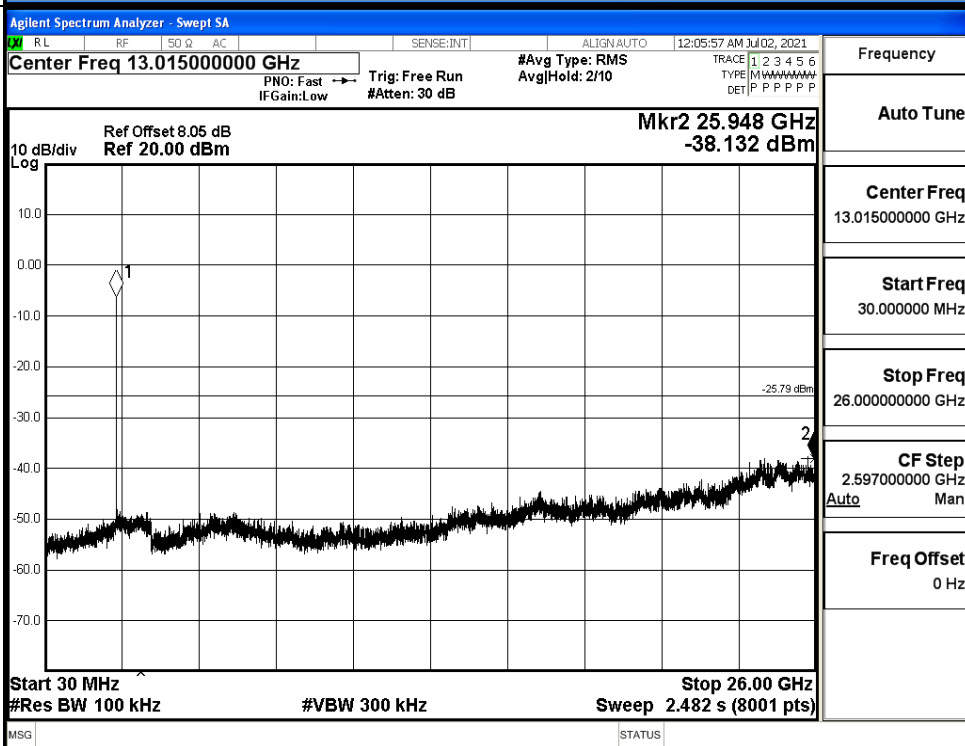


11N20SISO LCH Graphs

Pref/11N20SIS
O/LCHPuw/11N20
SISO/LCH

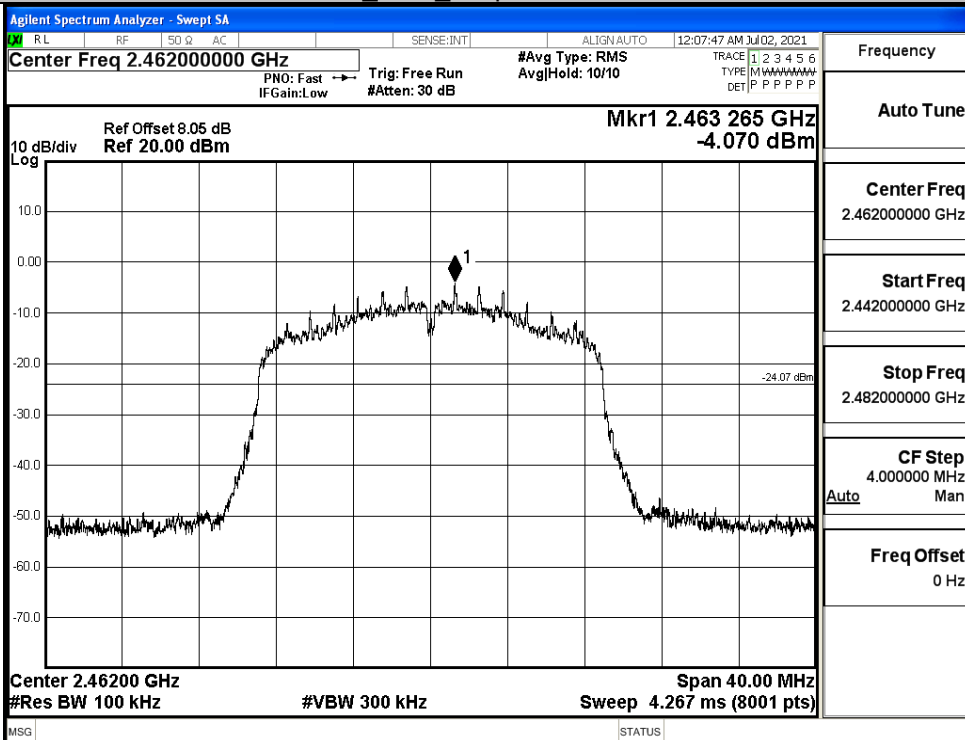
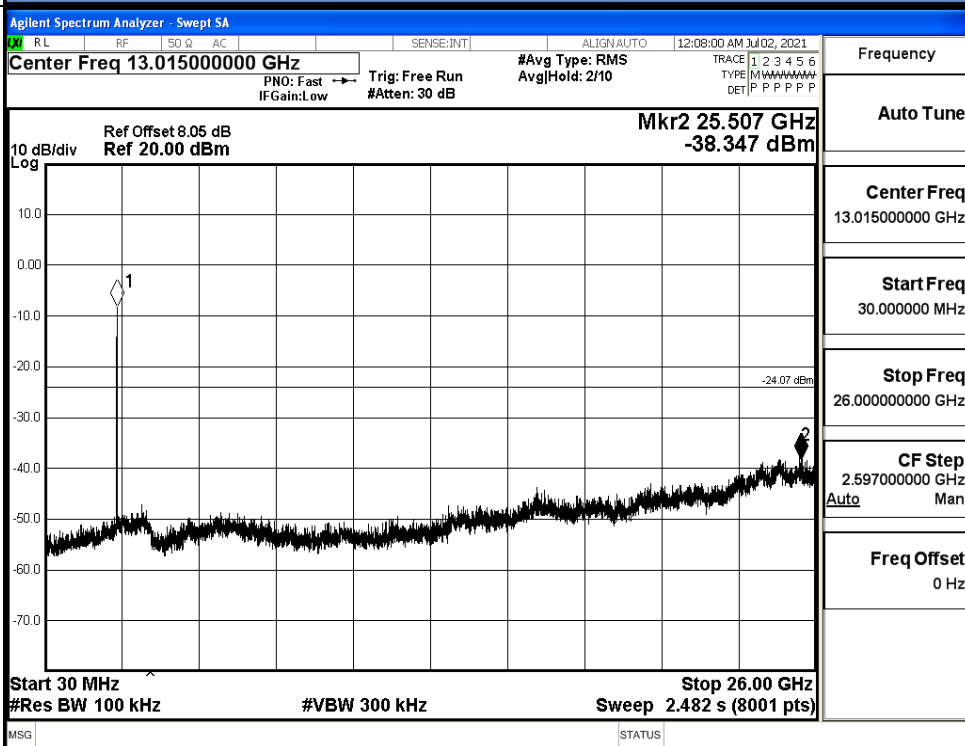


11N20SISO_MCH_Graphs

Pref/11N20
SISO/MCHPuw/11N20
SISO/MCH

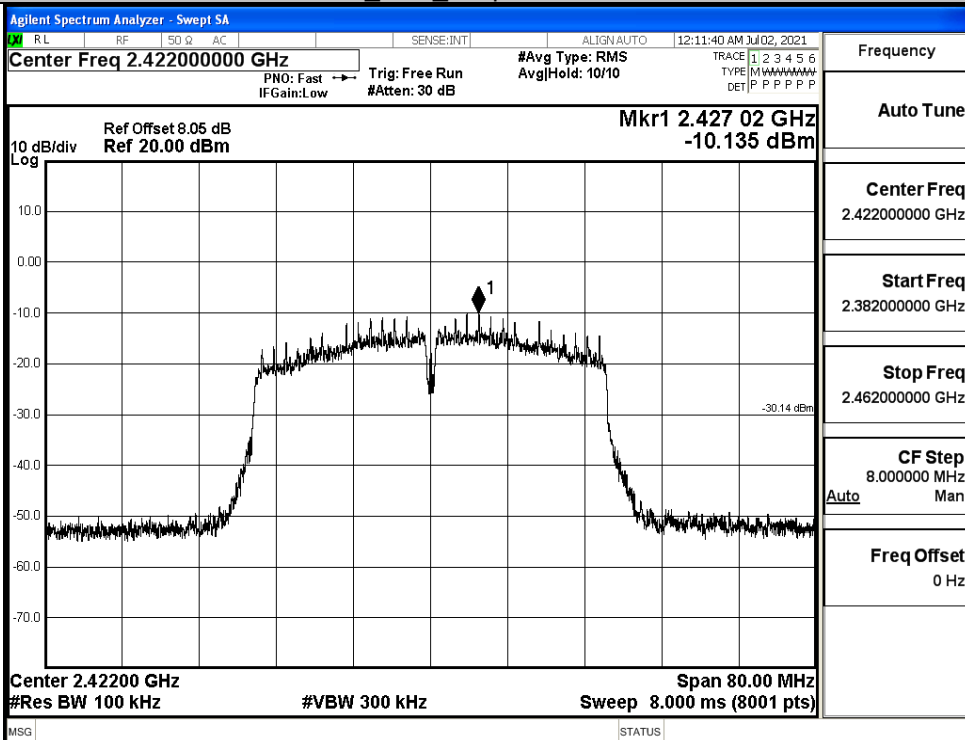
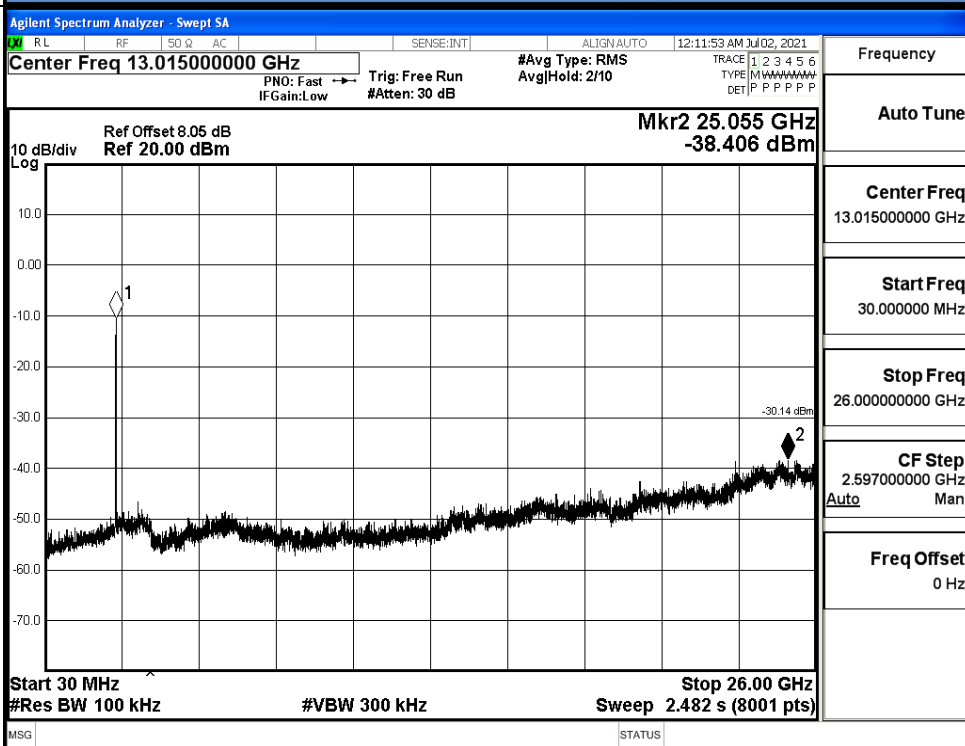


11N20SISO HCH Graphs

Pref/11N20
SISO/HCHPuw/11N20
SISO/HCH

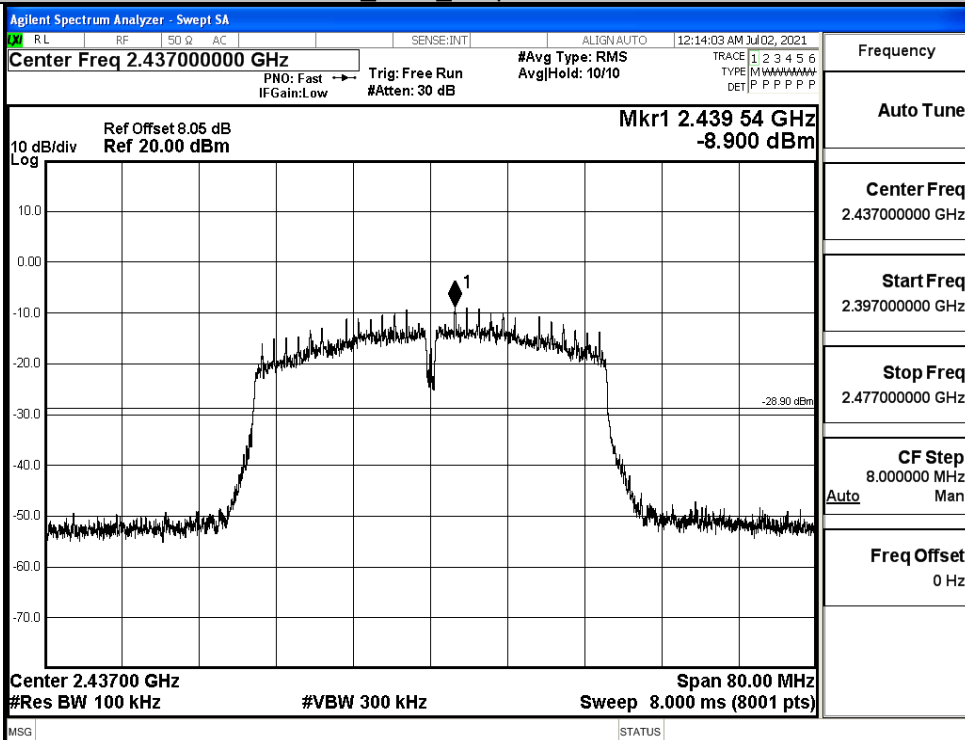
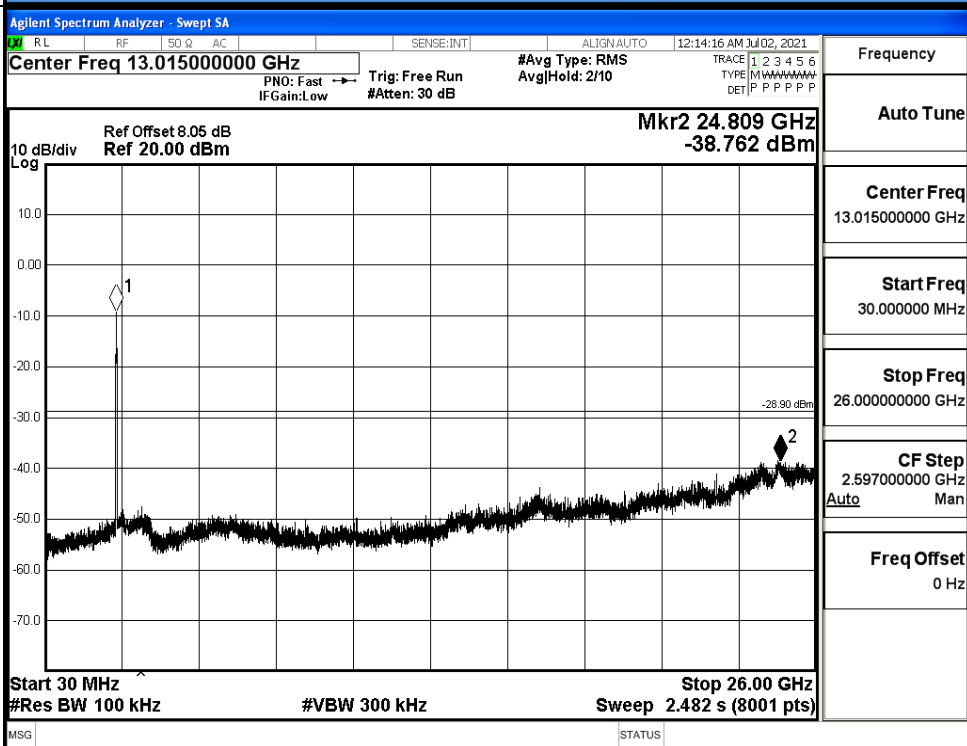


11N40SISO LCH Graphs

Pref/11N40
SISO/LCHPuw/11N40
SISO/LCH

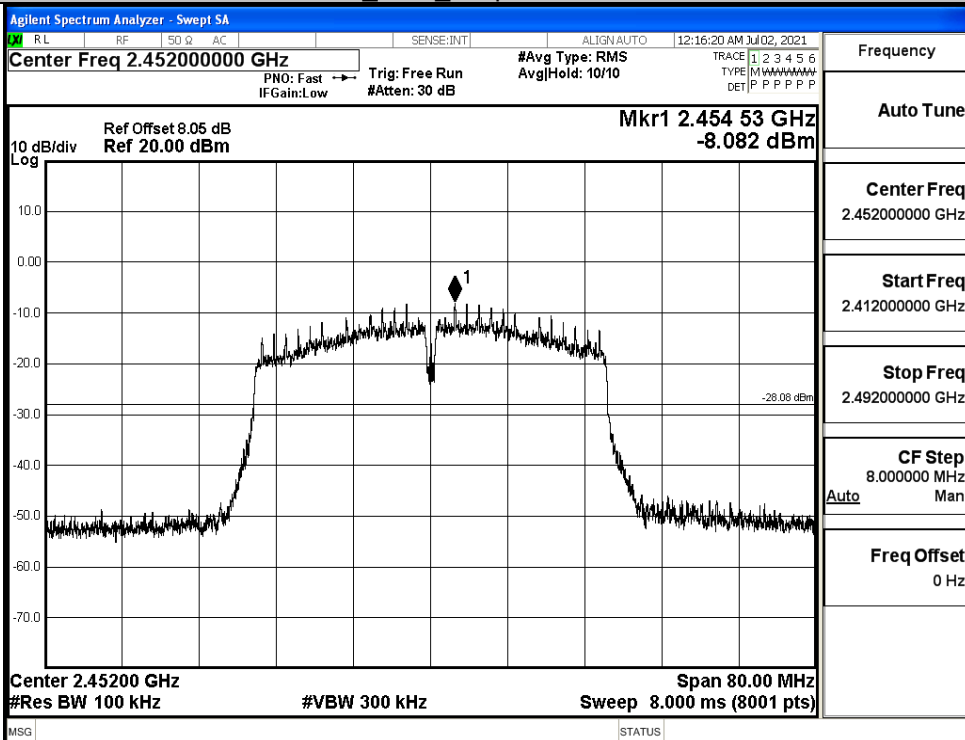
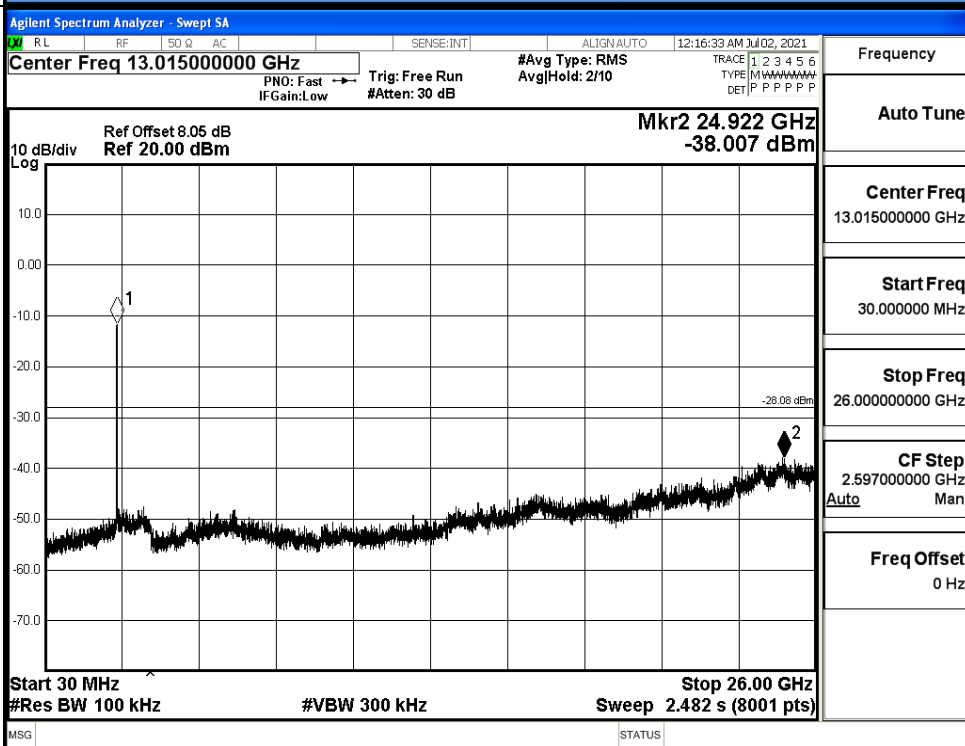


11N40SISO_MCH_Graphs

Pref/11N40
SISO/MCHPuw/11N40
SISO/MCH



11N40SISO HCH Graphs

Pref/11N40
SISO/HCHPuw/11N40
SISO/HCH



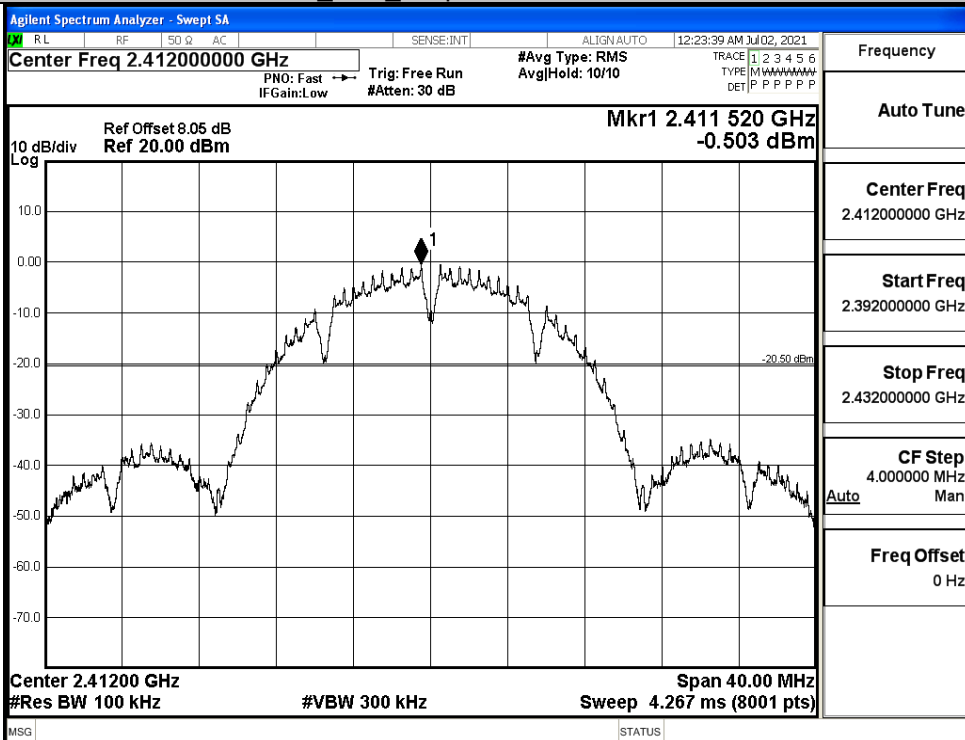
ANT1

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
11B	LCH	-0.503	-38.402	-20.503	PASS
	MCH	-0.002	-38.261	-20.002	PASS
	HCH	0.887	-37.753	-19.113	PASS
11G	LCH	-7.009	-37.916	-27.009	PASS
	MCH	-5.809	-38.020	-25.809	PASS
	HCH	-4.018	-37.818	-24.018	PASS
11N20 SISO	LCH	-7.039	-38.075	-27.039	PASS
	MCH	-6.184	-37.986	-26.184	PASS
	HCH	-4.806	-36.612	-24.806	PASS
11N40 SISO	LCH	-10.139	-37.970	-30.139	PASS
	MCH	-9.203	-36.786	-29.203	PASS
	HCH	-8.149	-37.883	-28.149	PASS

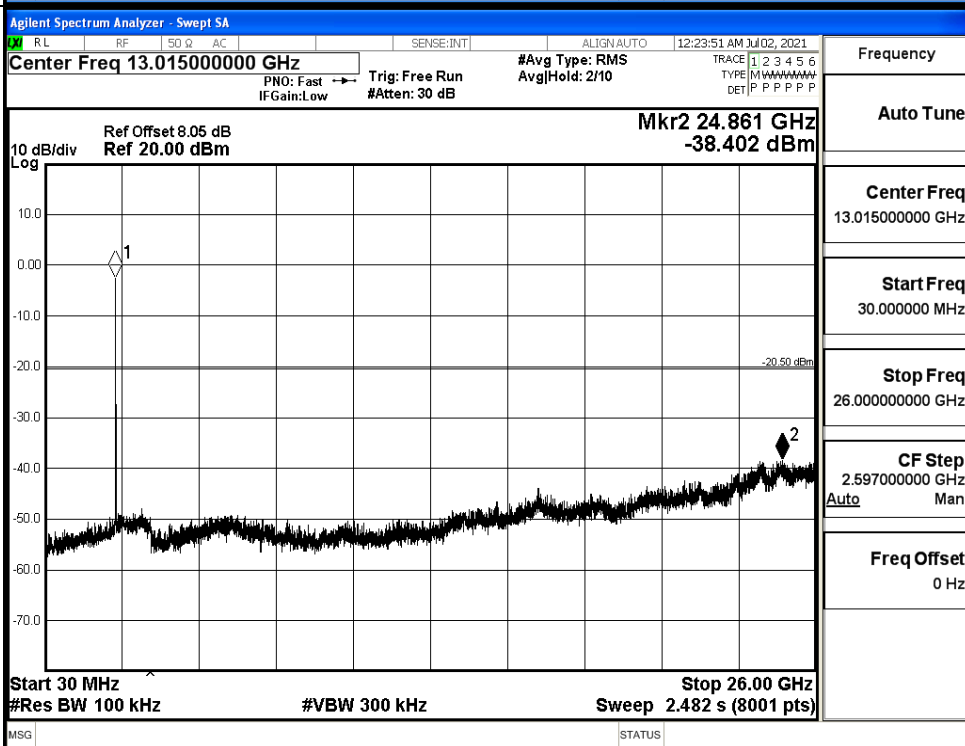


11B LCH Graphs

Pref/11B/LCH



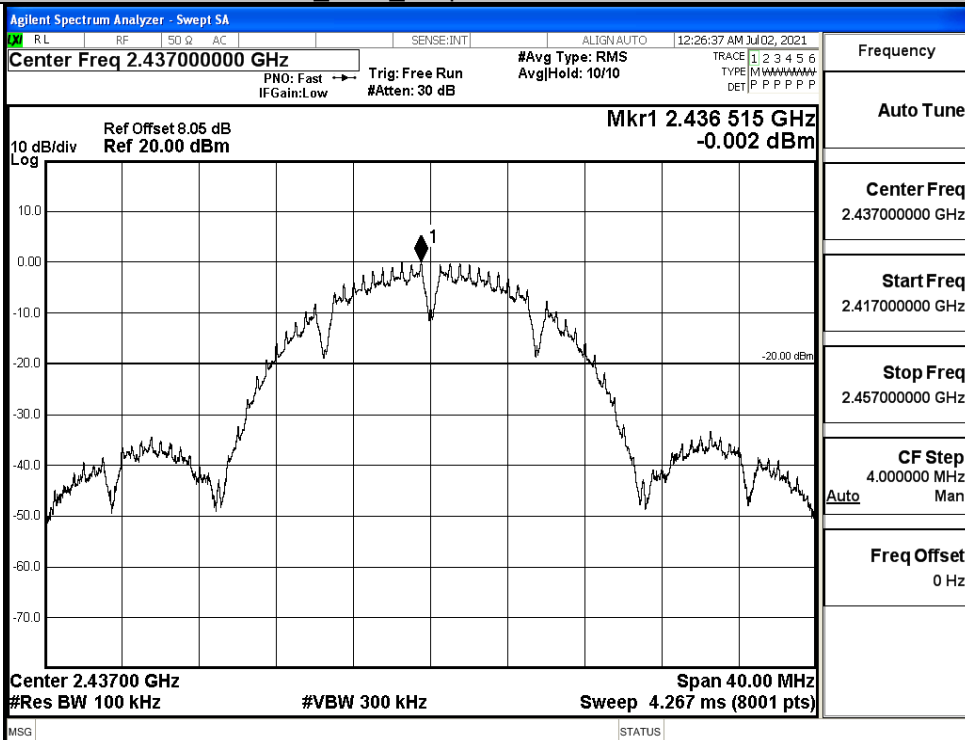
Puw/11B/LCH



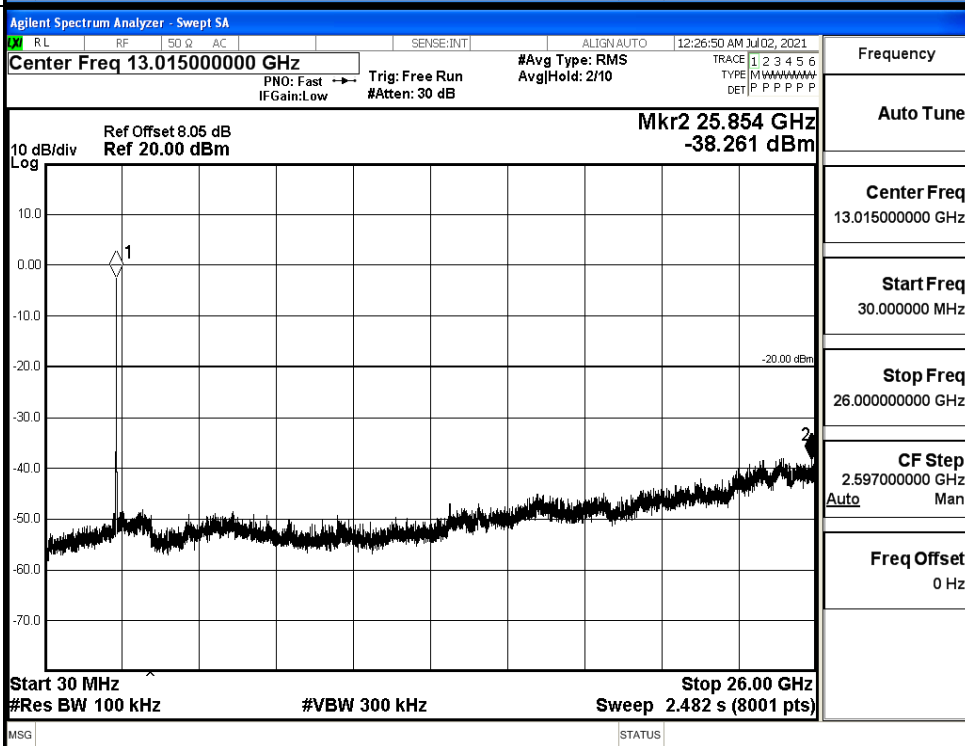


11B MCH Graphs

Pref/11B/MCH



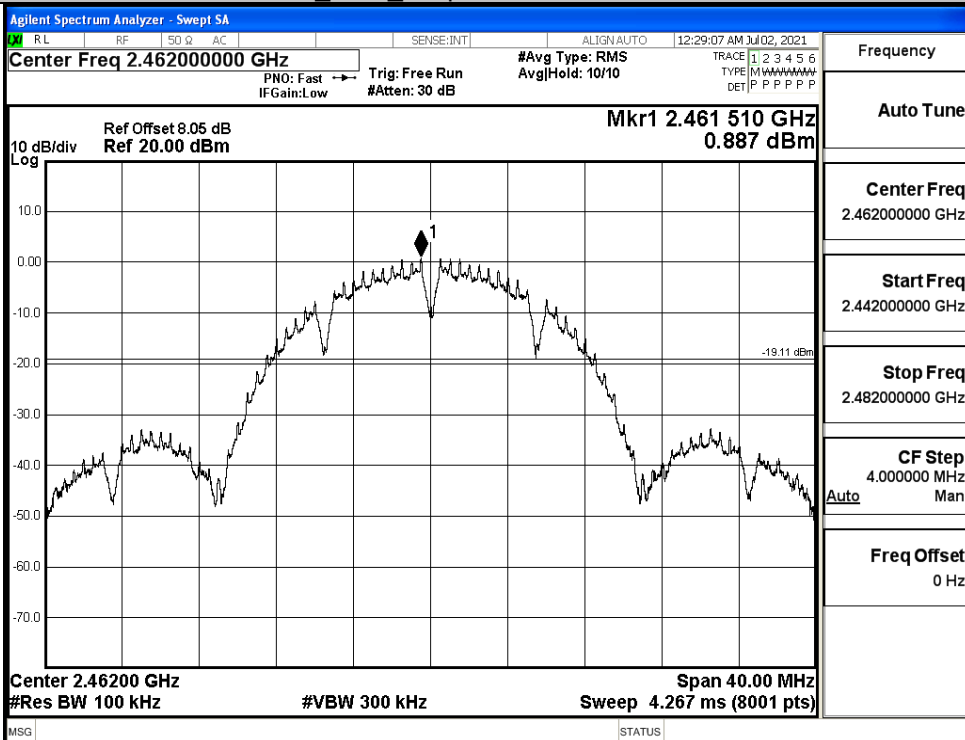
Puw/11B/MCH



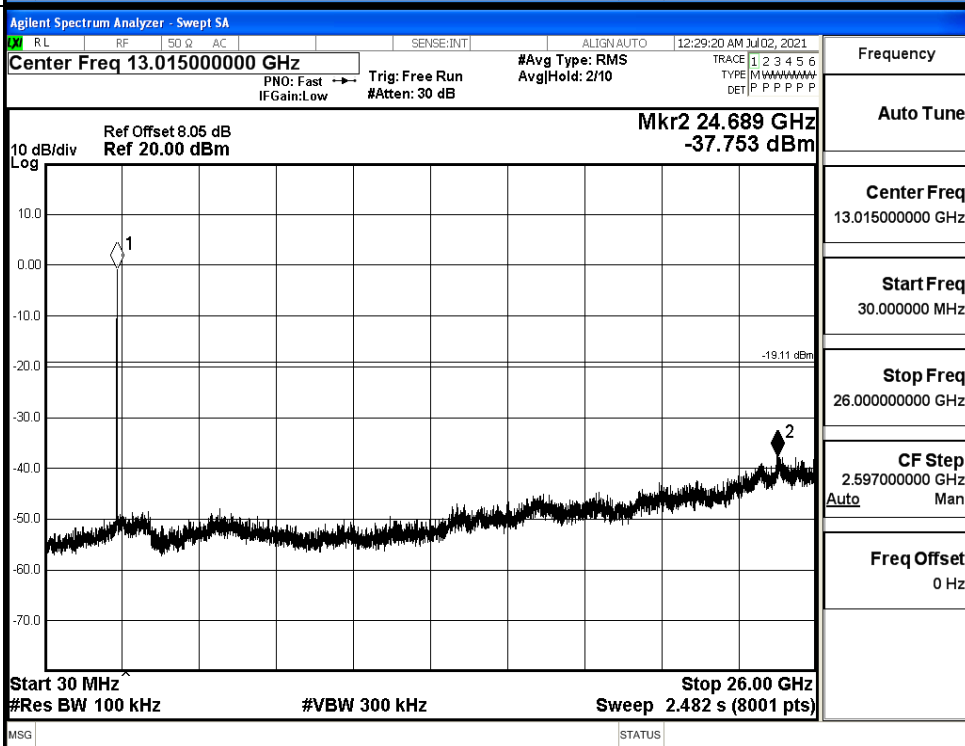


11B HCH Graphs

Pref/11B/HCH



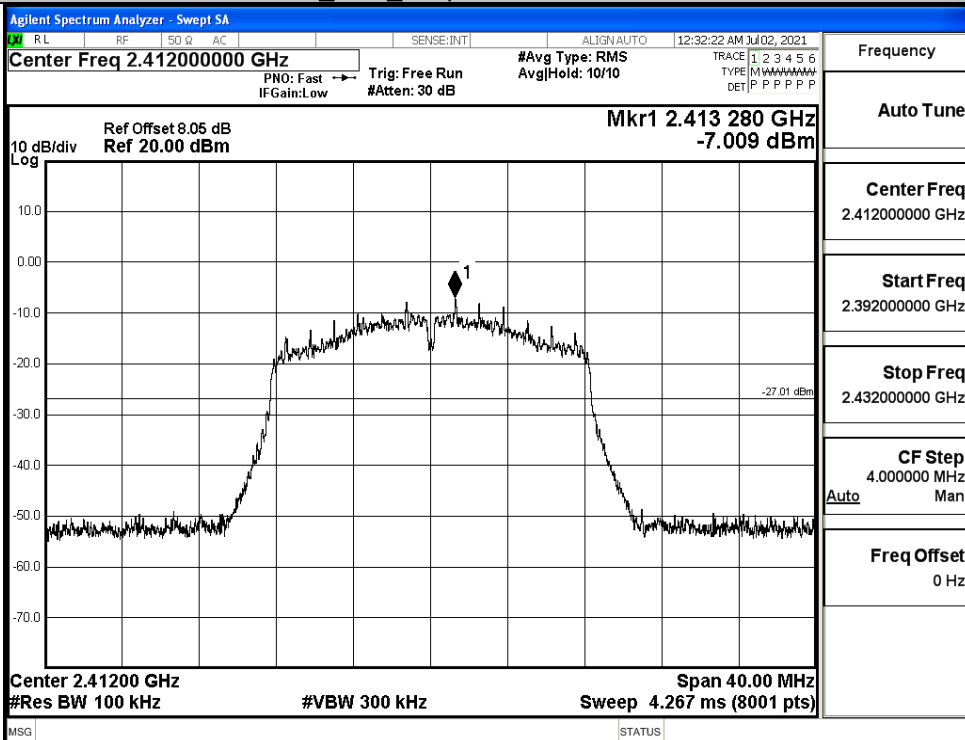
Puw/11B/HCH



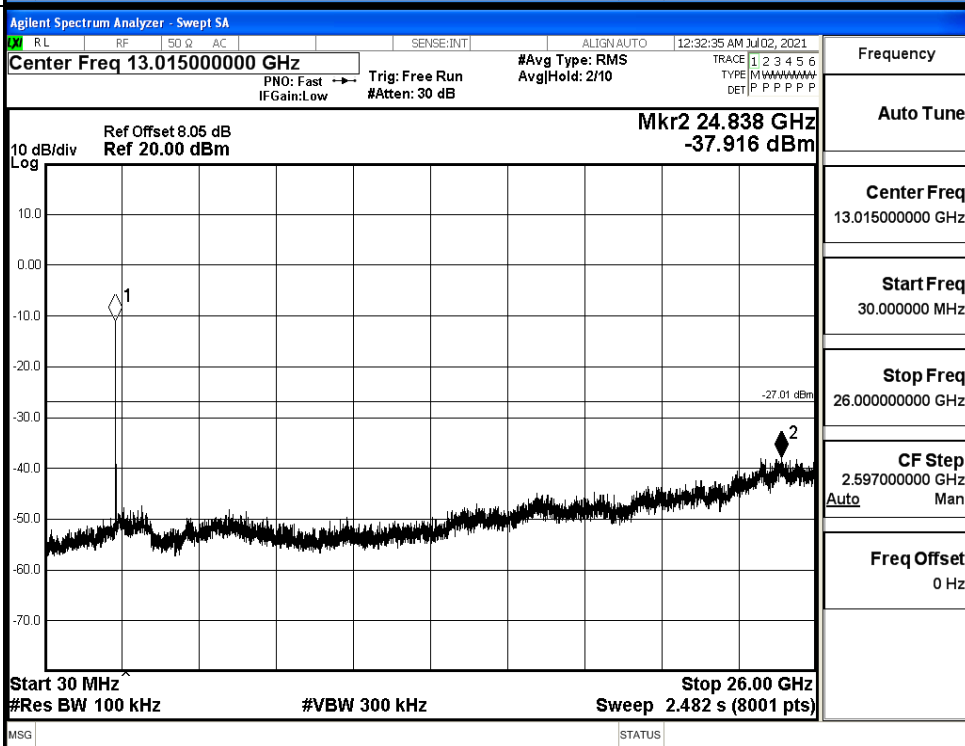


11G LCH Graphs

Pref/11G/LCH



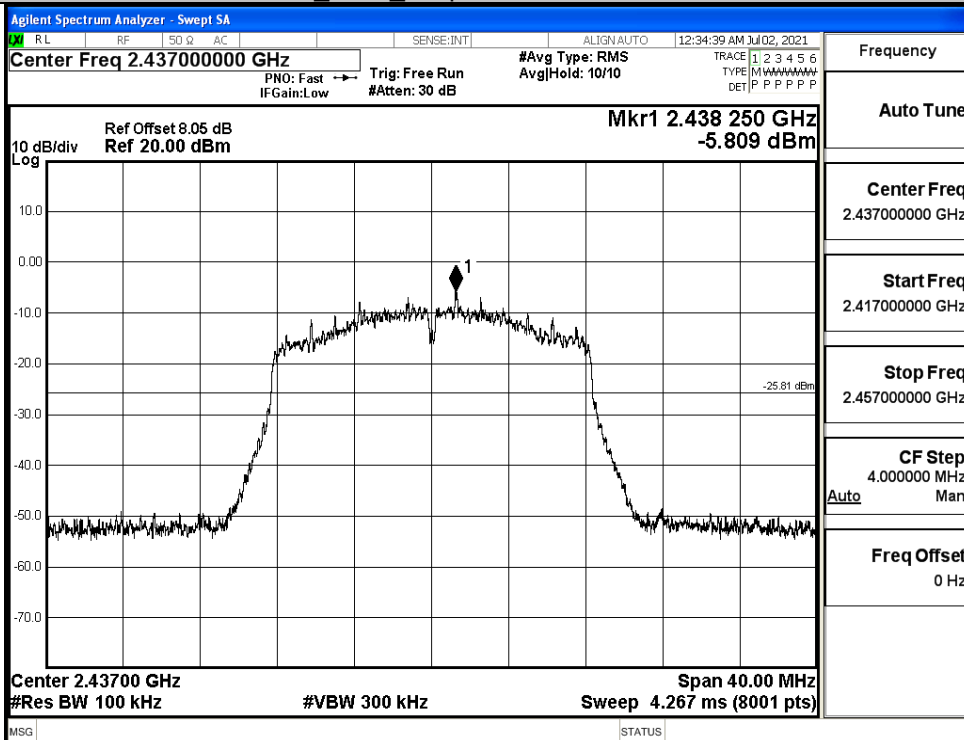
Puw/11G/LCH



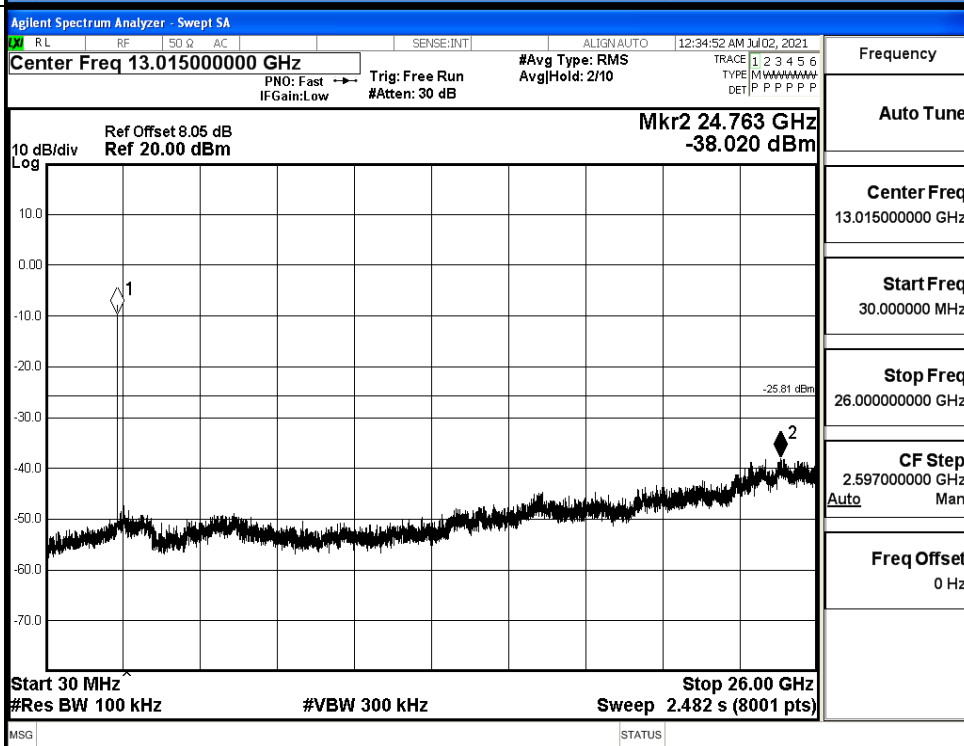


11G MCH Graphs

Pref/11G/MCH



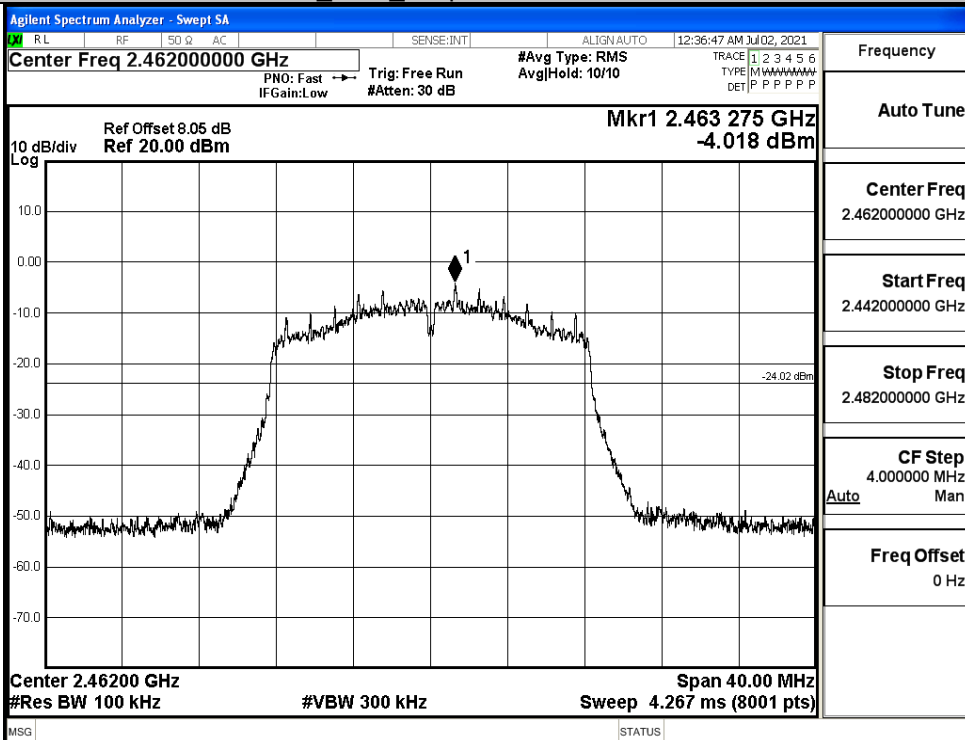
Puw/11G/MCH



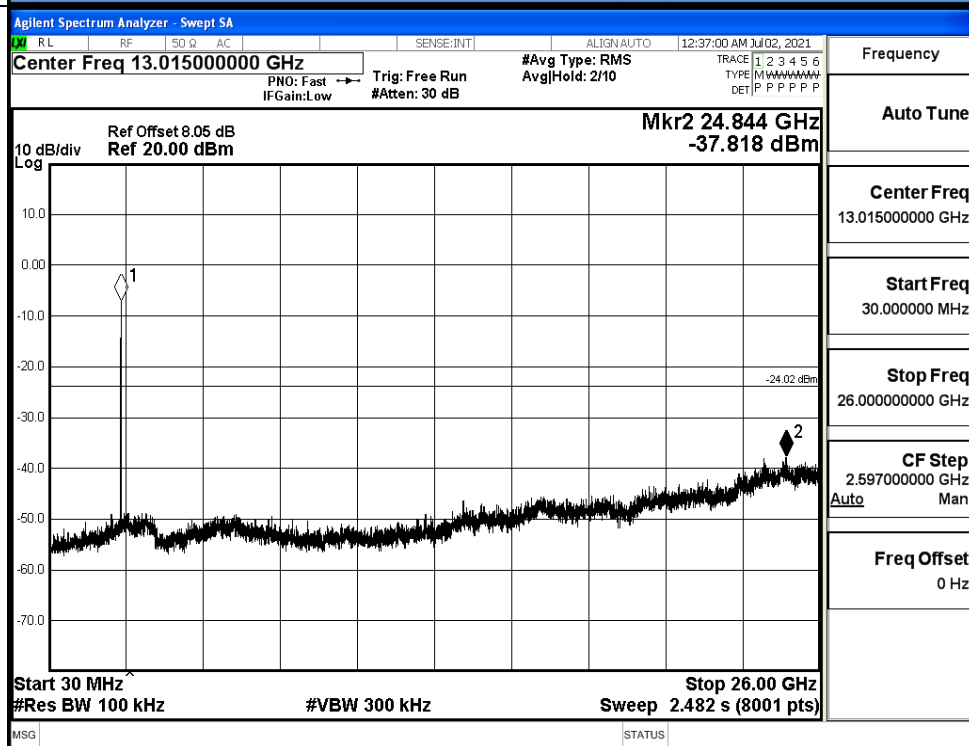


11G HCH Graphs

Pref/11G/HCH

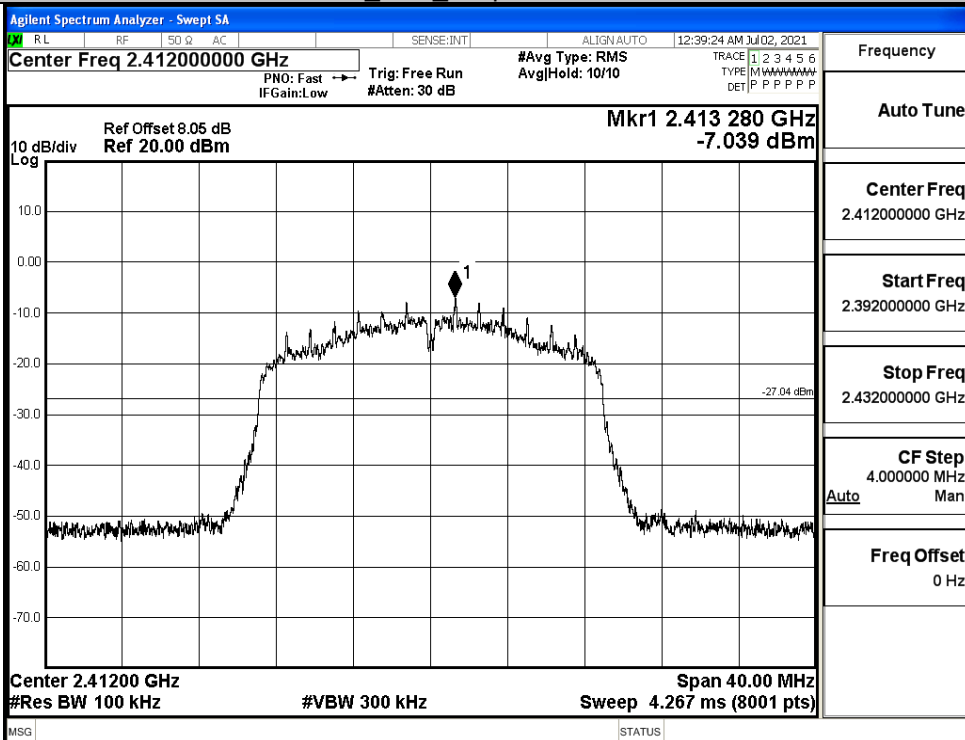
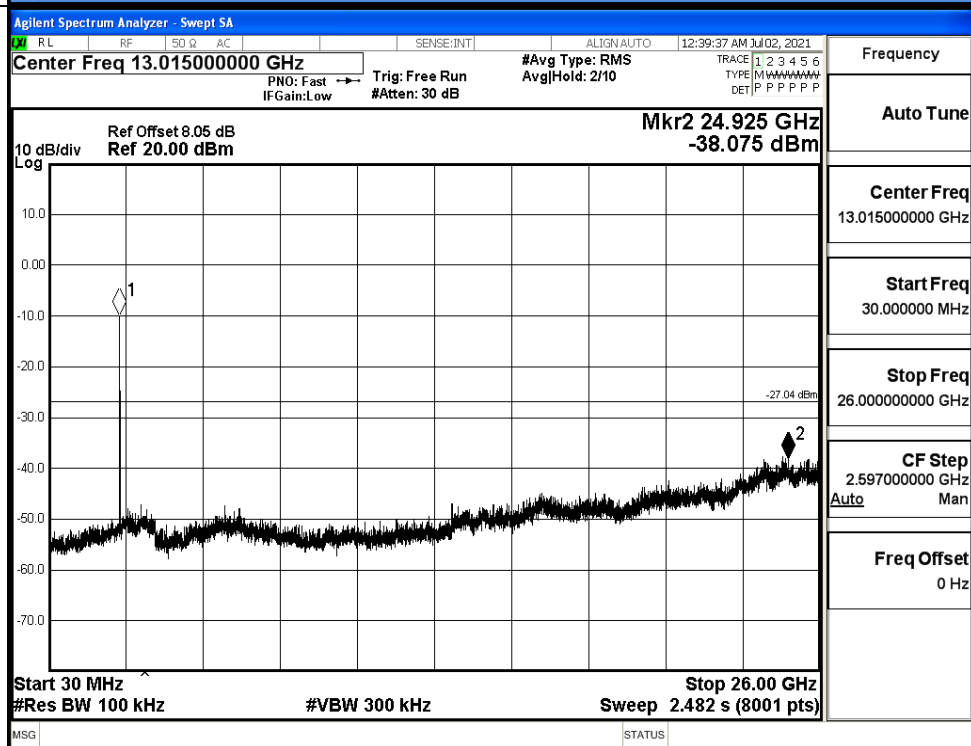


Puw/11G/HCH



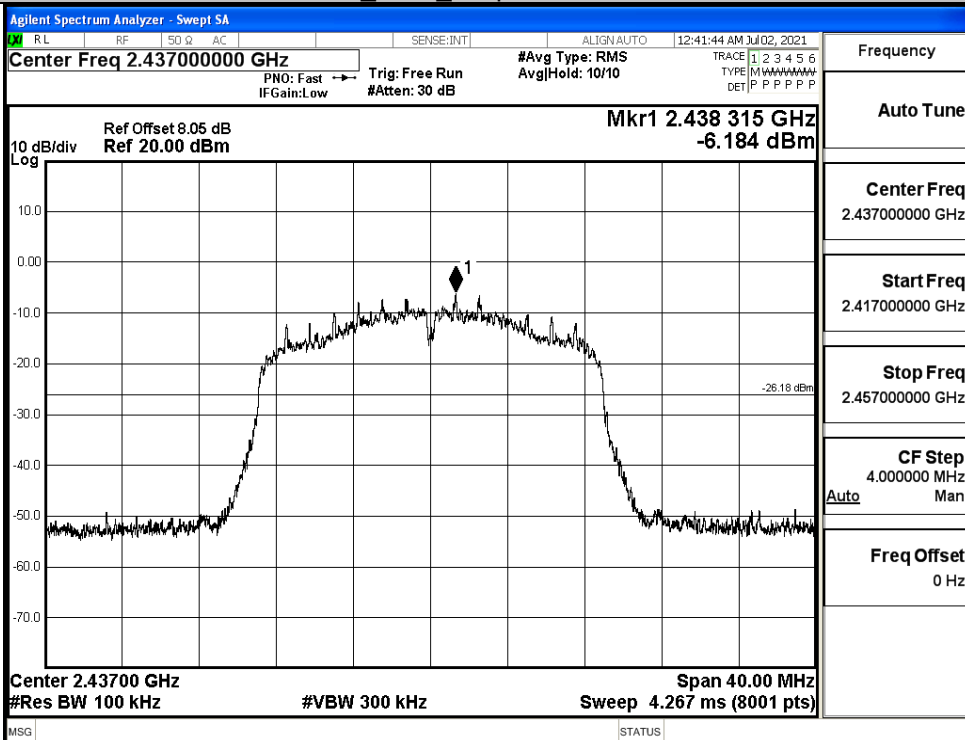
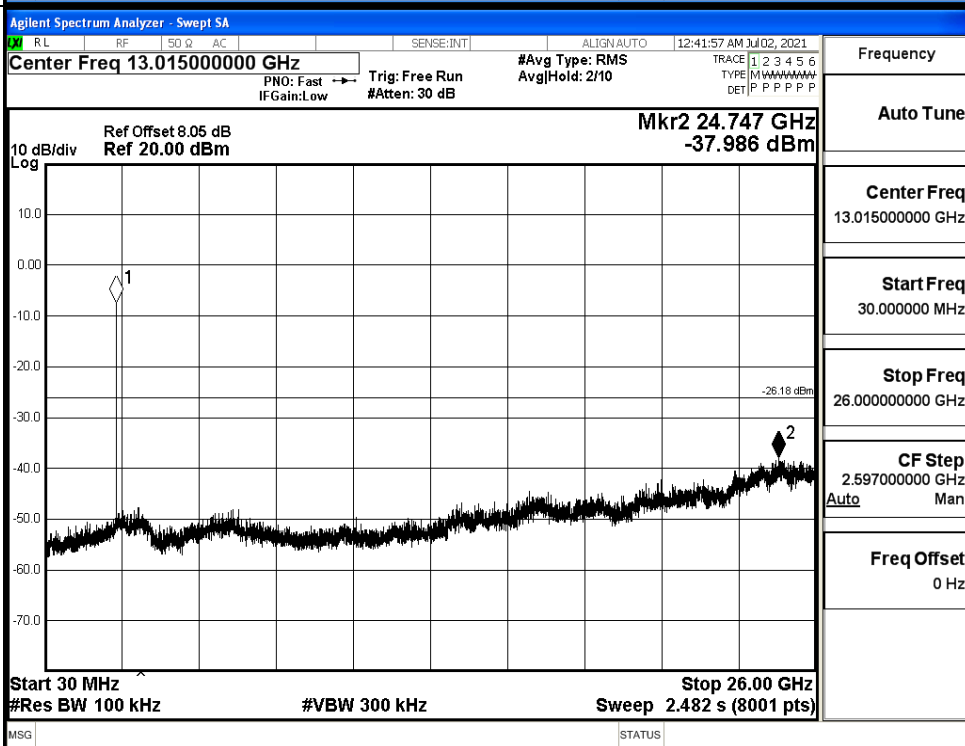


11N20SISO LCH Graphs

Pref/11N20SIS
O/LCHPuw/11N20
SISO/LCH

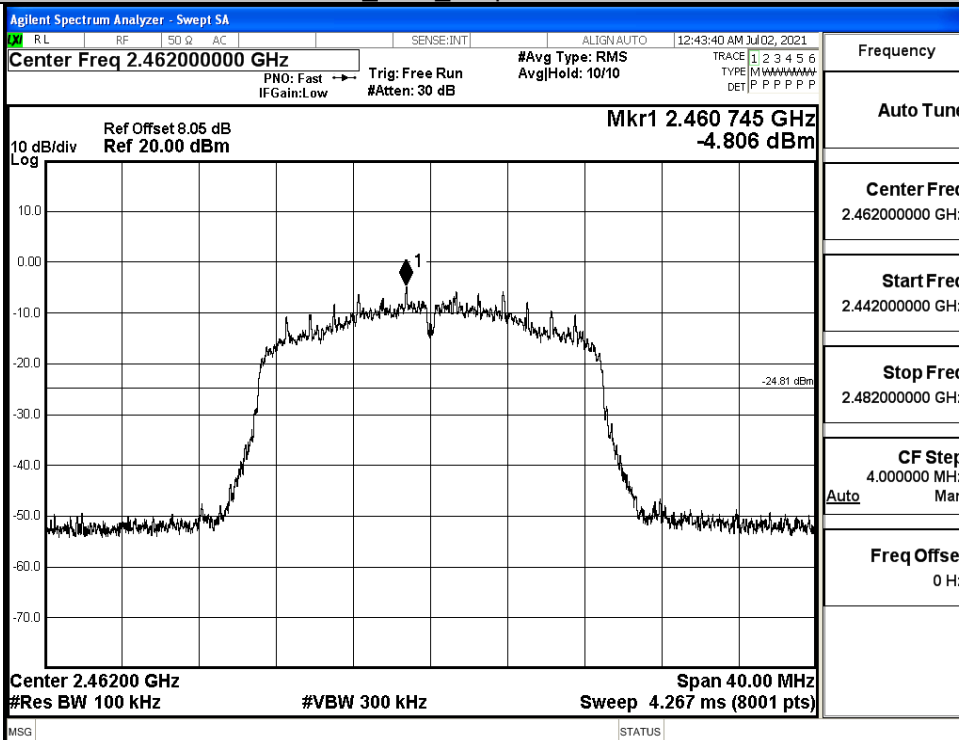
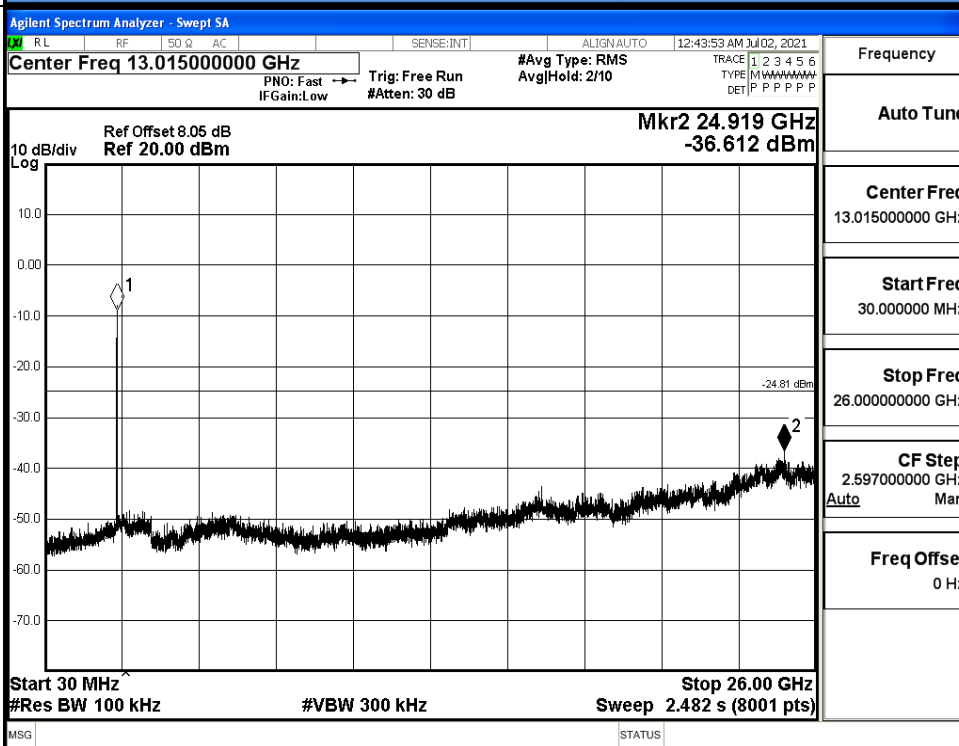


11N20SISO_MCH_Graphs

Pref/11N20
SISO/MCHPuw/11N20
SISO/MCH

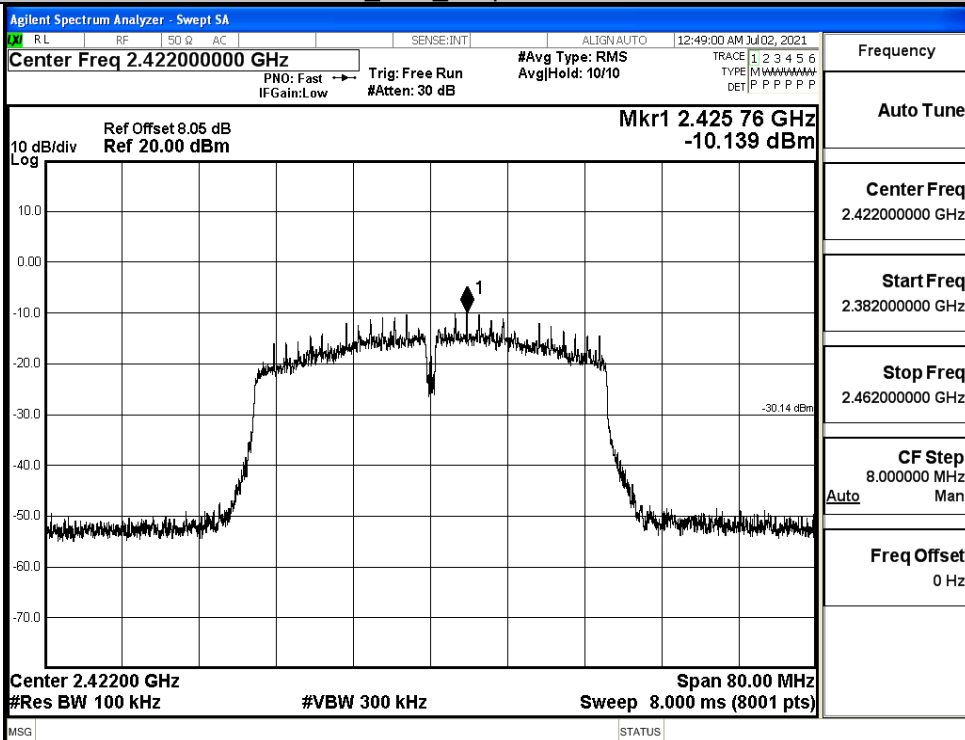
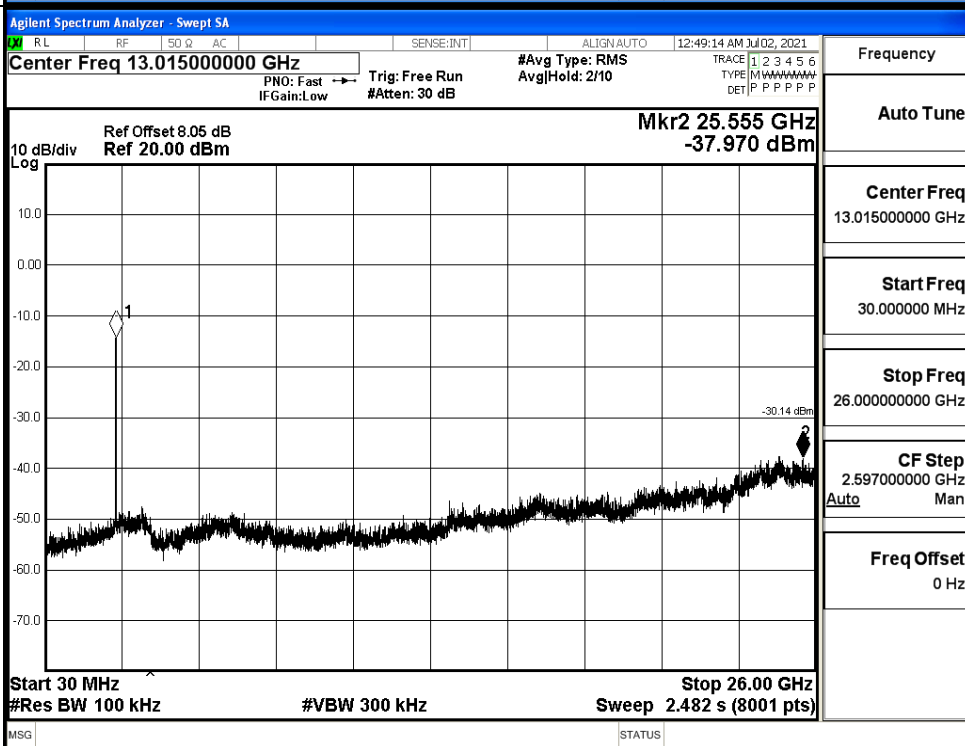


11N20SISO HCH Graphs

Pref/11N20
SISO/HCHPuw/11N20
SISO/HCH

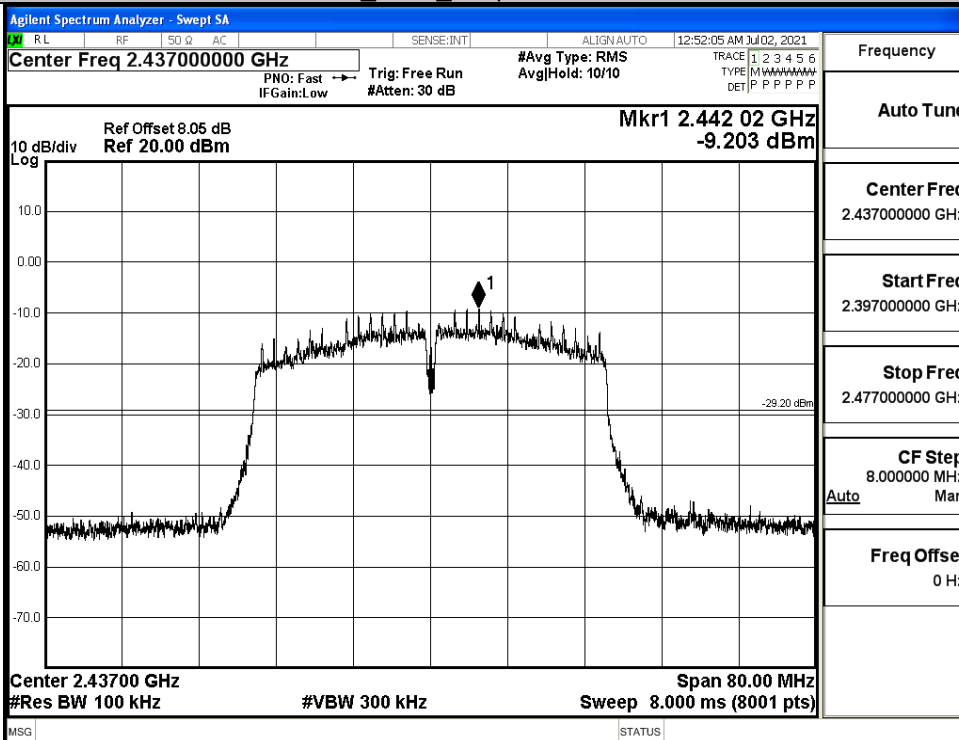
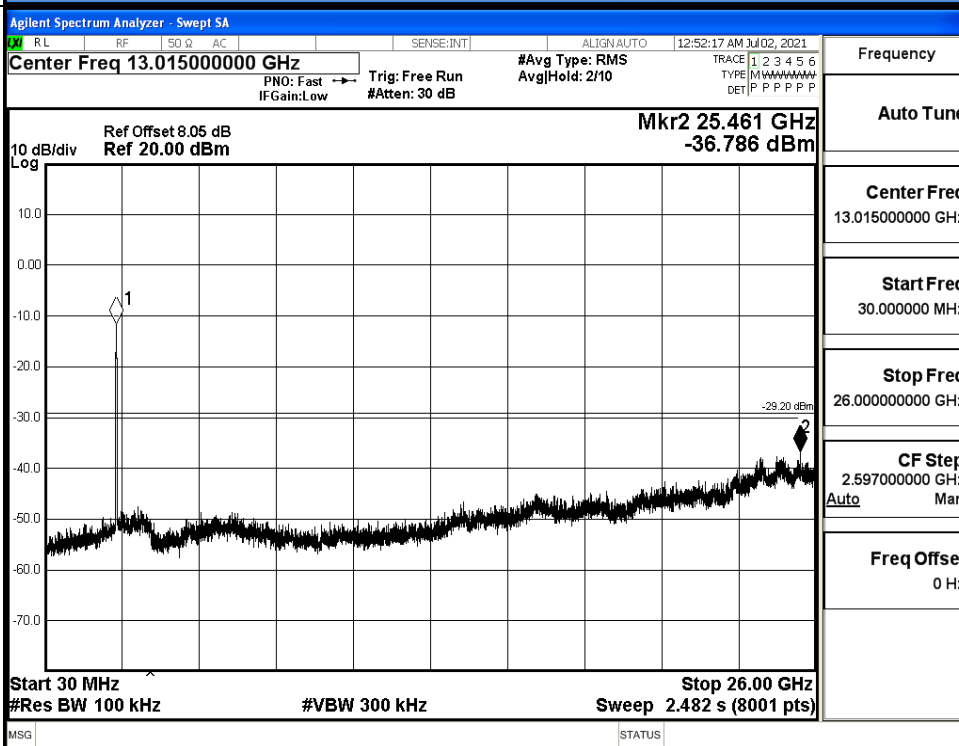


11N40SISO LCH Graphs

Pref/11N40
SISO/LCHPuw/11N40
SISO/LCH

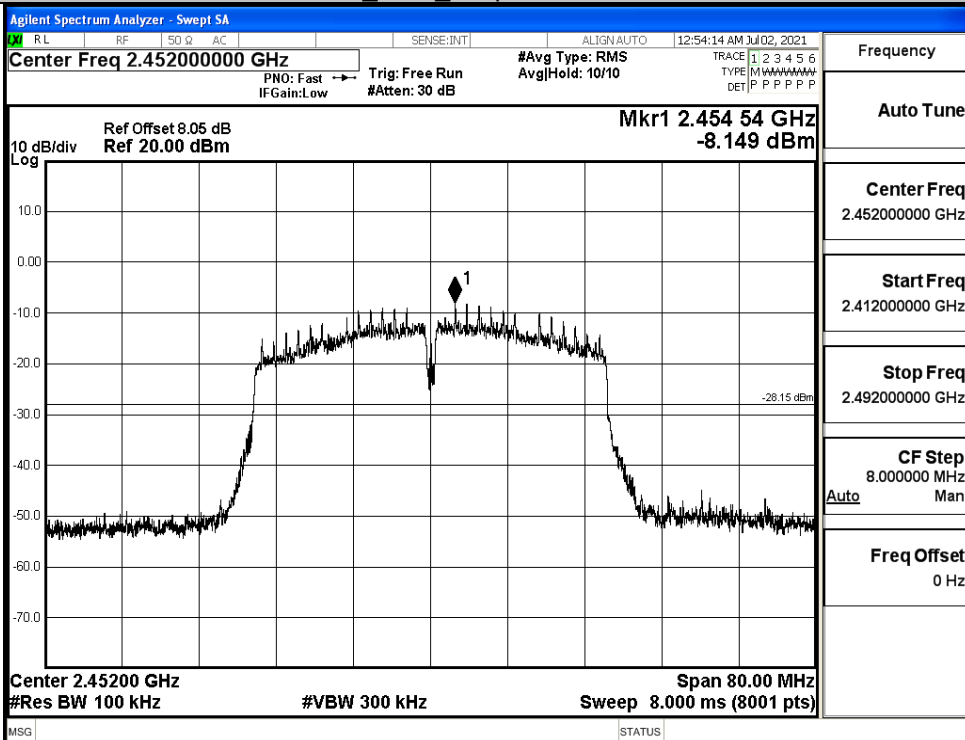


11N40SISO_MCH_Graphs

Pref/11N40
SISO/MCHPuw/11N40
SISO/MCH



11N40SISO HCH Graphs

Pref/11N40
SISO/HCHPuw/11N40
SISO/HCH