

Appendix D

RF Test Data for 2.4G WIFI (Conducted Measurement)

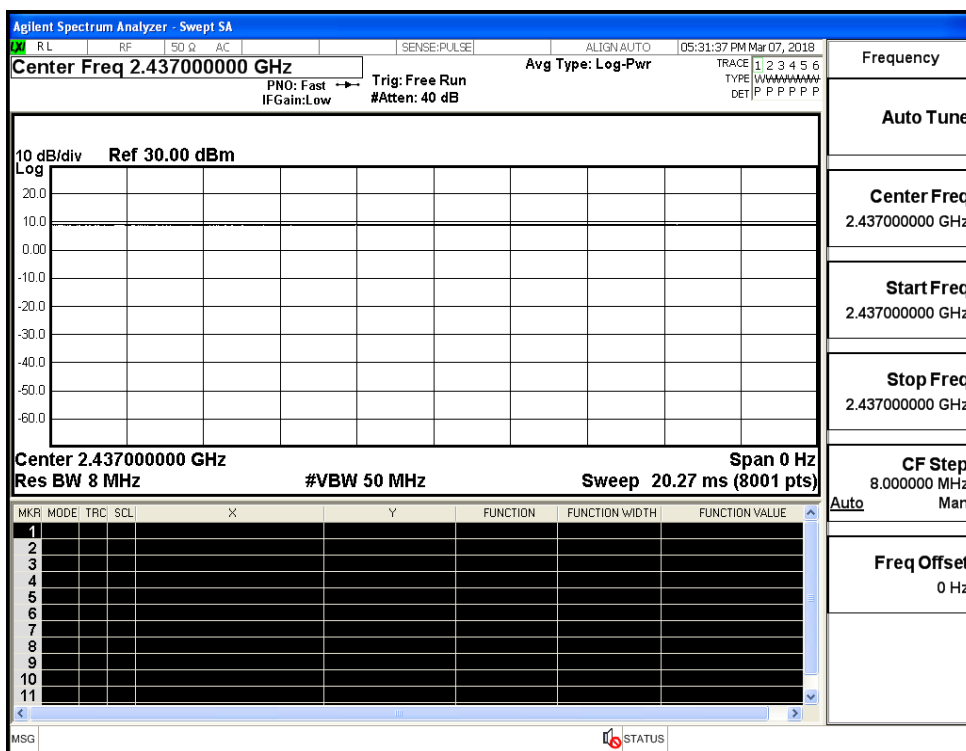
Environmental Conditions

Temperature:	23.5 °C
Relative Humidity:	51.6%
ATM Pressure:	100.0 kPa
Test Engineer:	Mina.xu
Supervised by:	Tom.Liu

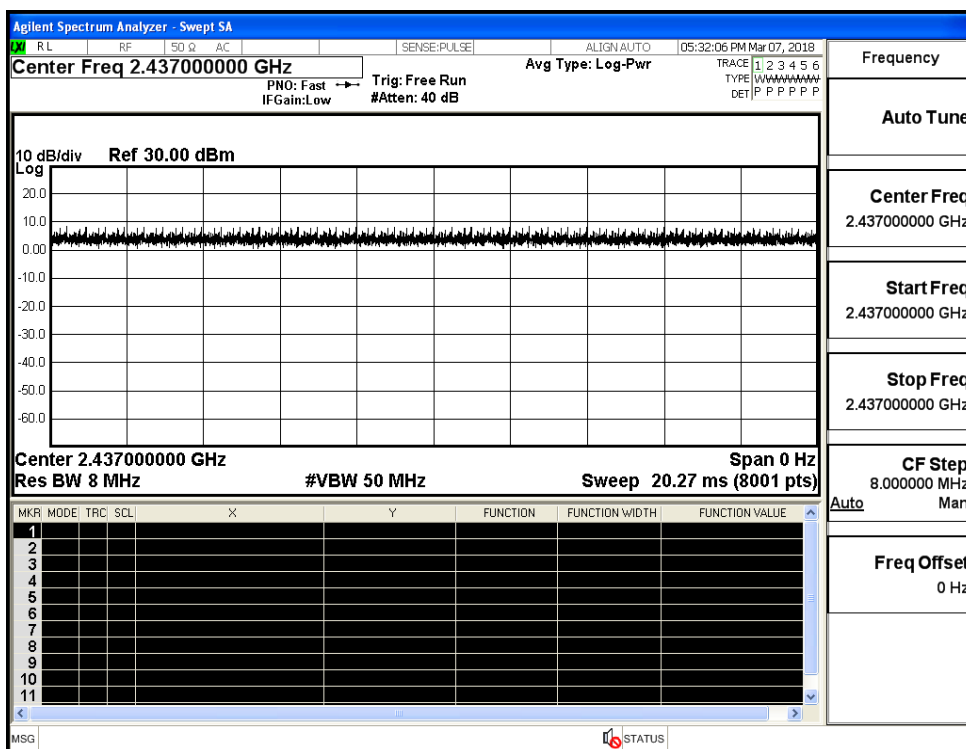
1 Duty Cycle

Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
11B	2437	Ant1	100	PASS
11G	2437	Ant1	100	PASS
11N20SISO	2437	Ant1	100	PASS
11N40SISO	2437	Ant1	100	PASS

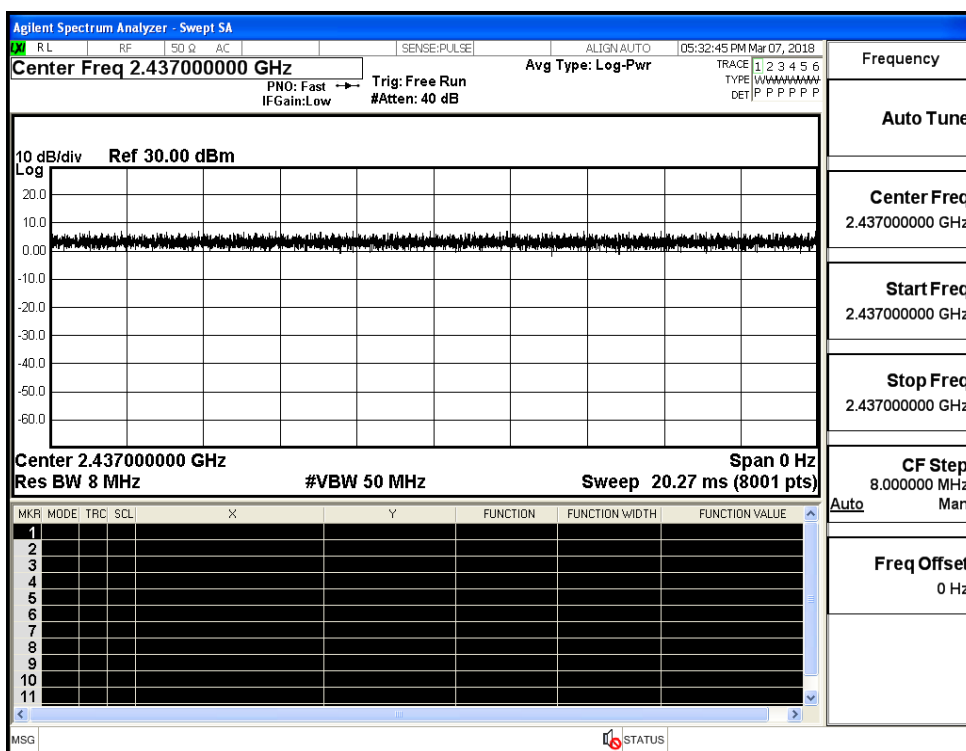
Duty Cycle_11B_2437_Ant1



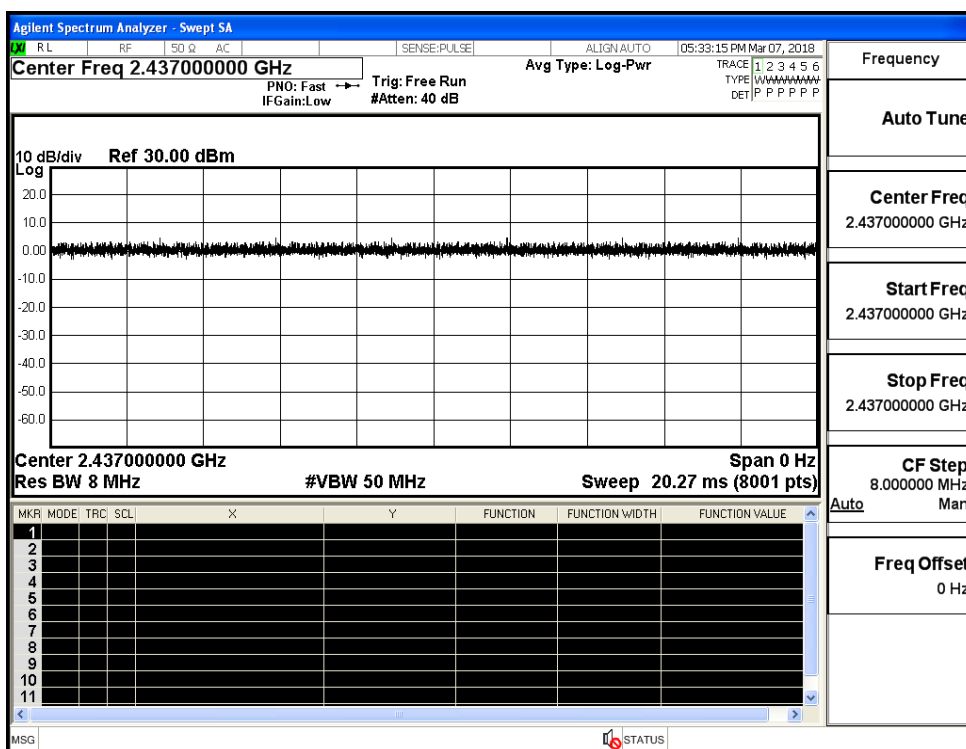
Duty Cycle_11G_2437_Ant1



Duty Cycle_11N20SISO_2437_Ant1



Duty Cycle_11N40SISO_2437_Ant1



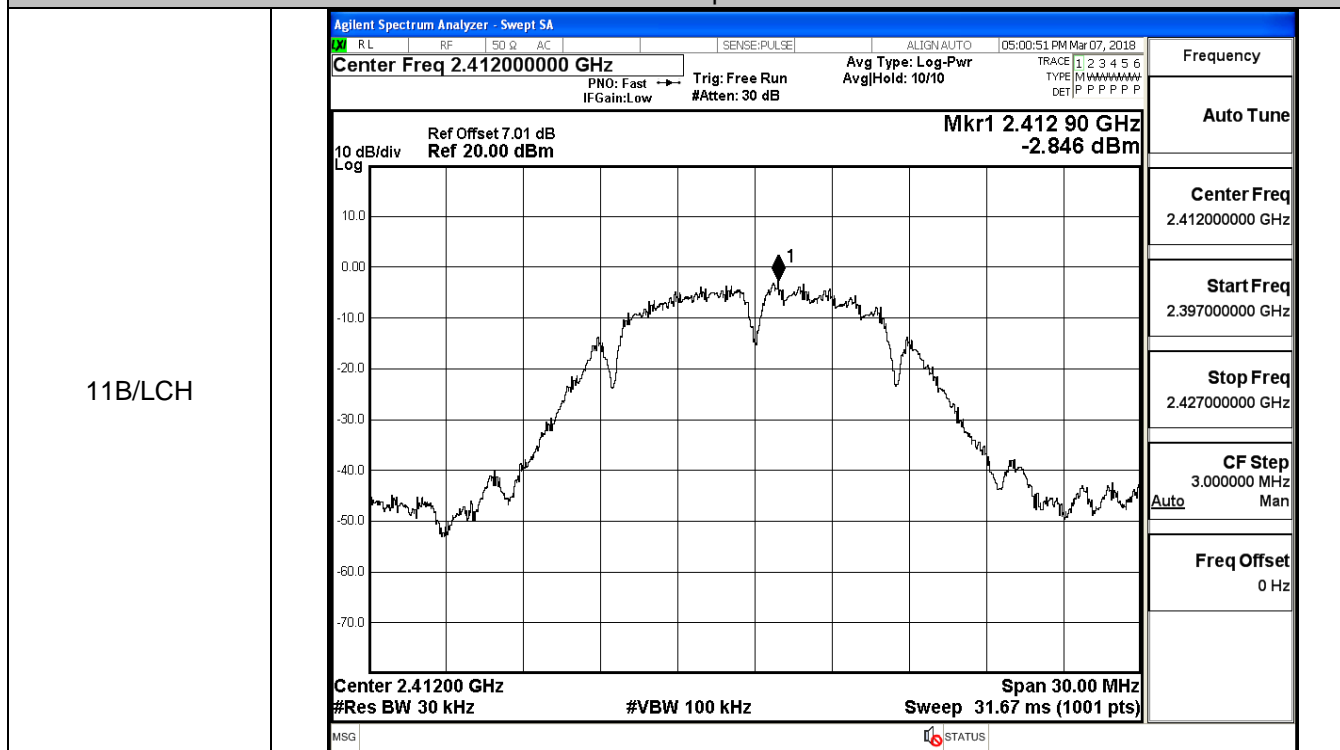
2 Maximum Conducted Output Power

Mode	Channel	Meas.Level [dBm]	Limit [dBm]	Verdict
11B	LCH	15.11	30	PASS
	MCH	15.77	30	PASS
	HCH	16.17	30	PASS
11G	LCH	15.39	30	PASS
	MCH	15.40	30	PASS
	HCH	16.09	30	PASS
11N20SISO	LCH	15.07	30	PASS
	MCH	15.99	30	PASS
	HCH	15.73	30	PASS
11N40SISO	LCH	15.69	30	PASS
	MCH	15.69	30	PASS
	HCH	16.11	30	PASS

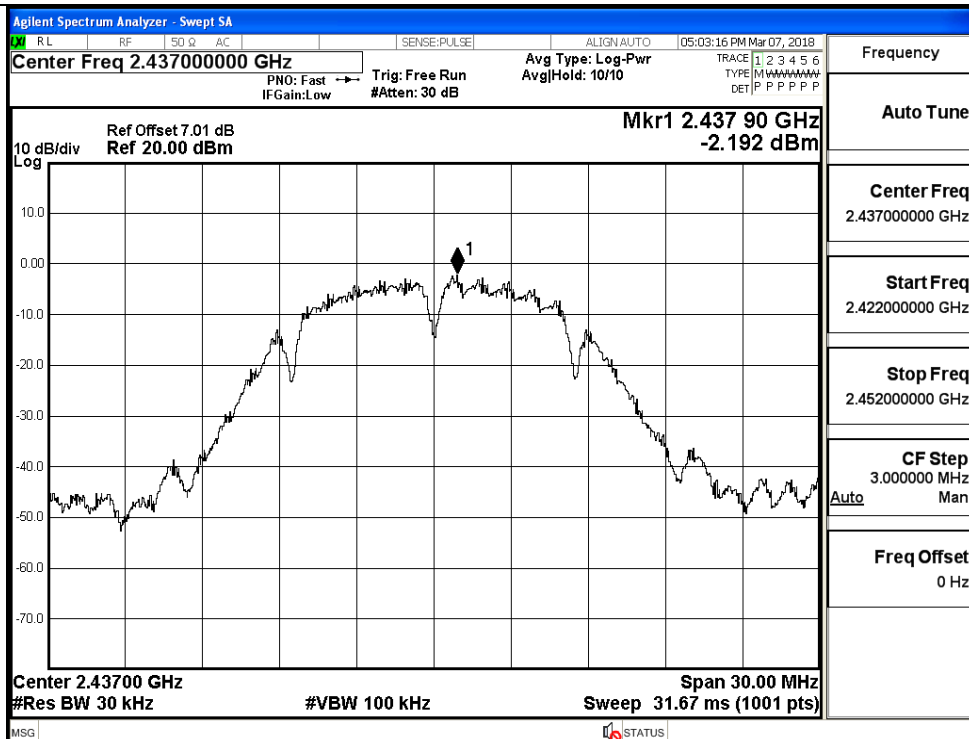
3 Maximum Power Spectral Density

Mode	Channel	Meas.Level [dBm/30KHz]	Limit [dBm/3KHz]	Verdict
11B	LCH	-2.846	8	PASS
	MCH	-2.192	8	PASS
	HCH	-1.958	8	PASS
11G	LCH	-9.330	8	PASS
	MCH	-9.323	8	PASS
	HCH	-8.862	8	PASS
11N20SISO	LCH	-9.251	8	PASS
	MCH	-8.337	8	PASS
	HCH	-8.678	8	PASS
11N40SISO	LCH	-12.018	8	PASS
	MCH	-11.933	8	PASS
	HCH	-11.818	8	PASS

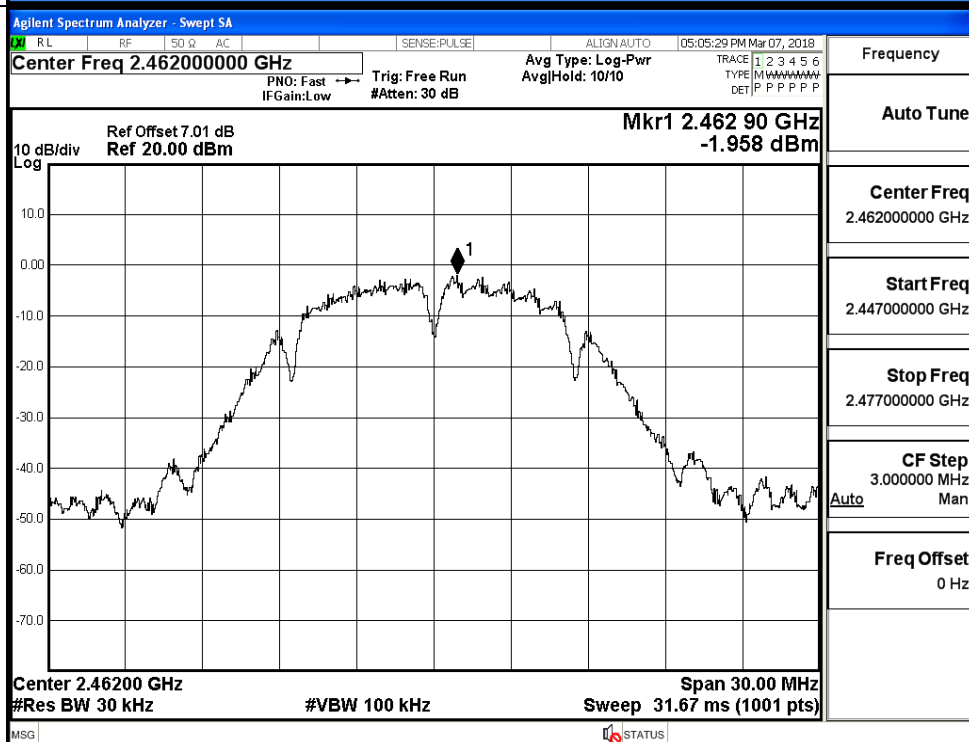
Test Graphs



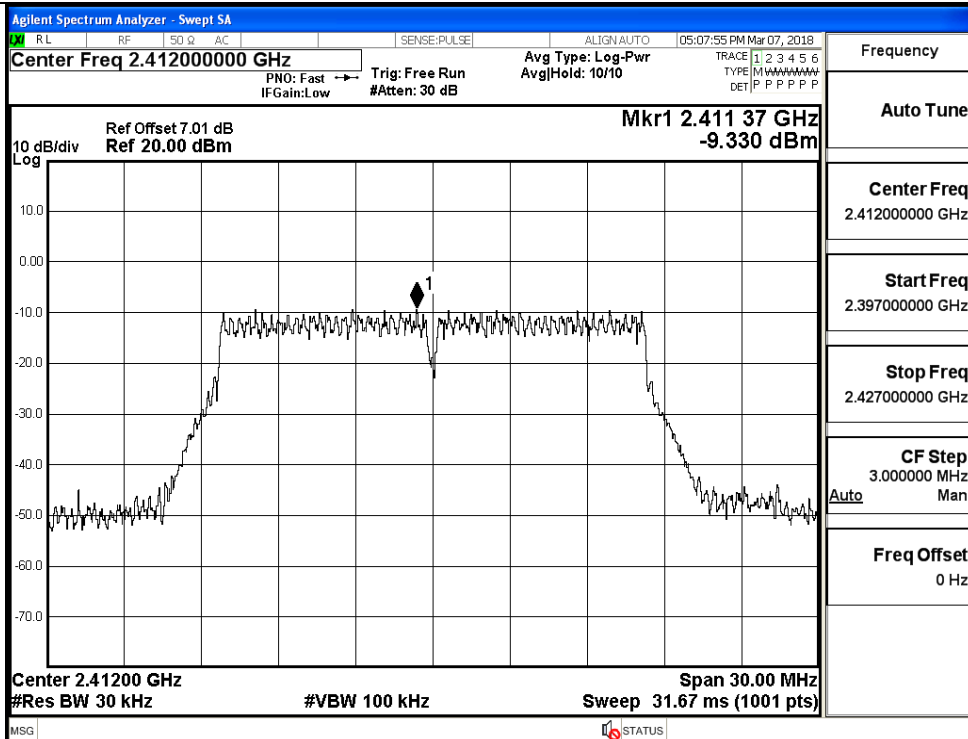
11B/MCH



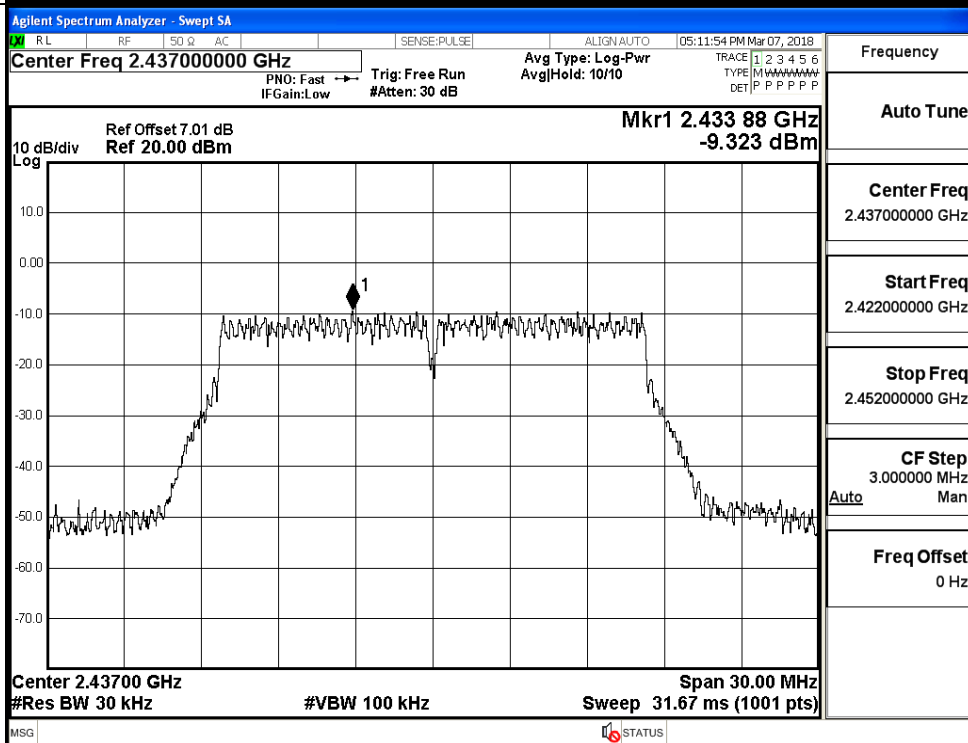
11B/HCH



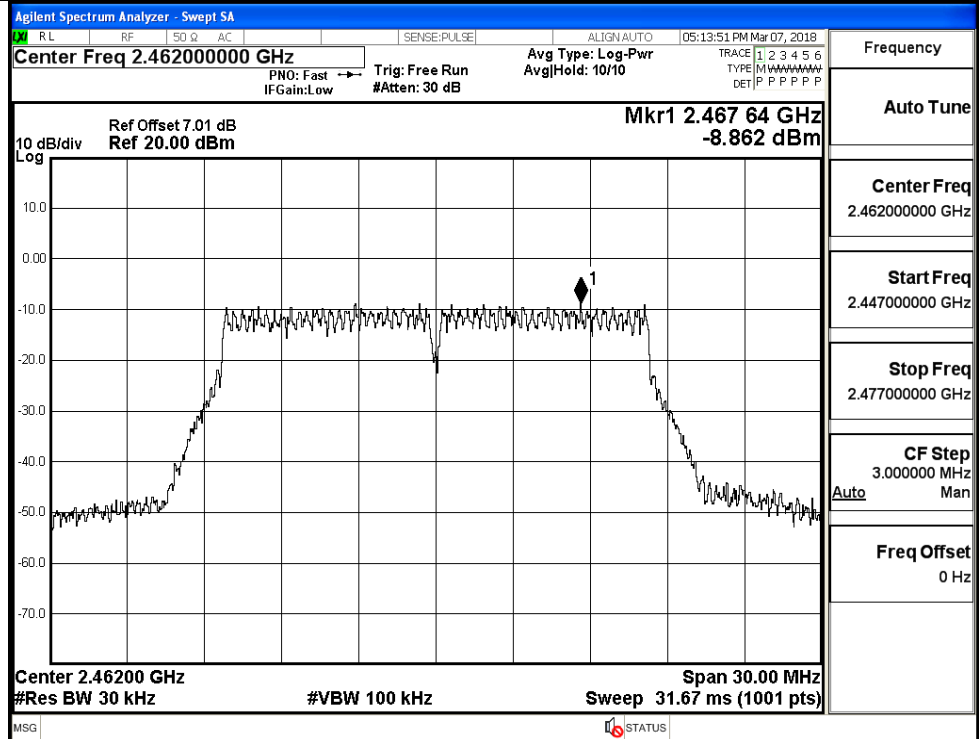
11G/LCH



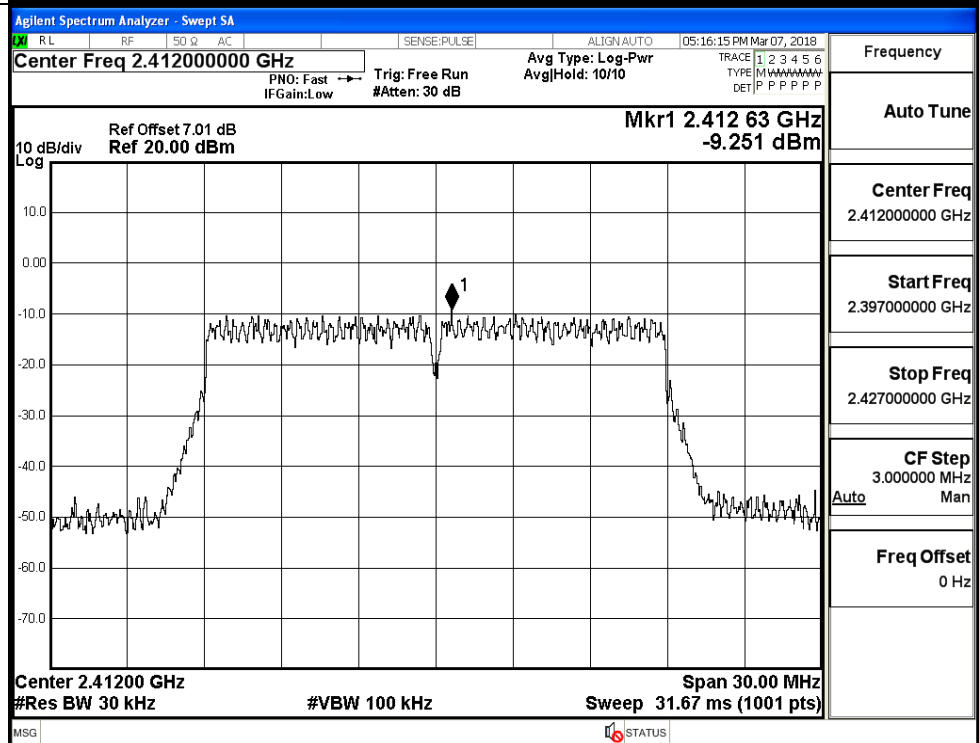
11G/MCH

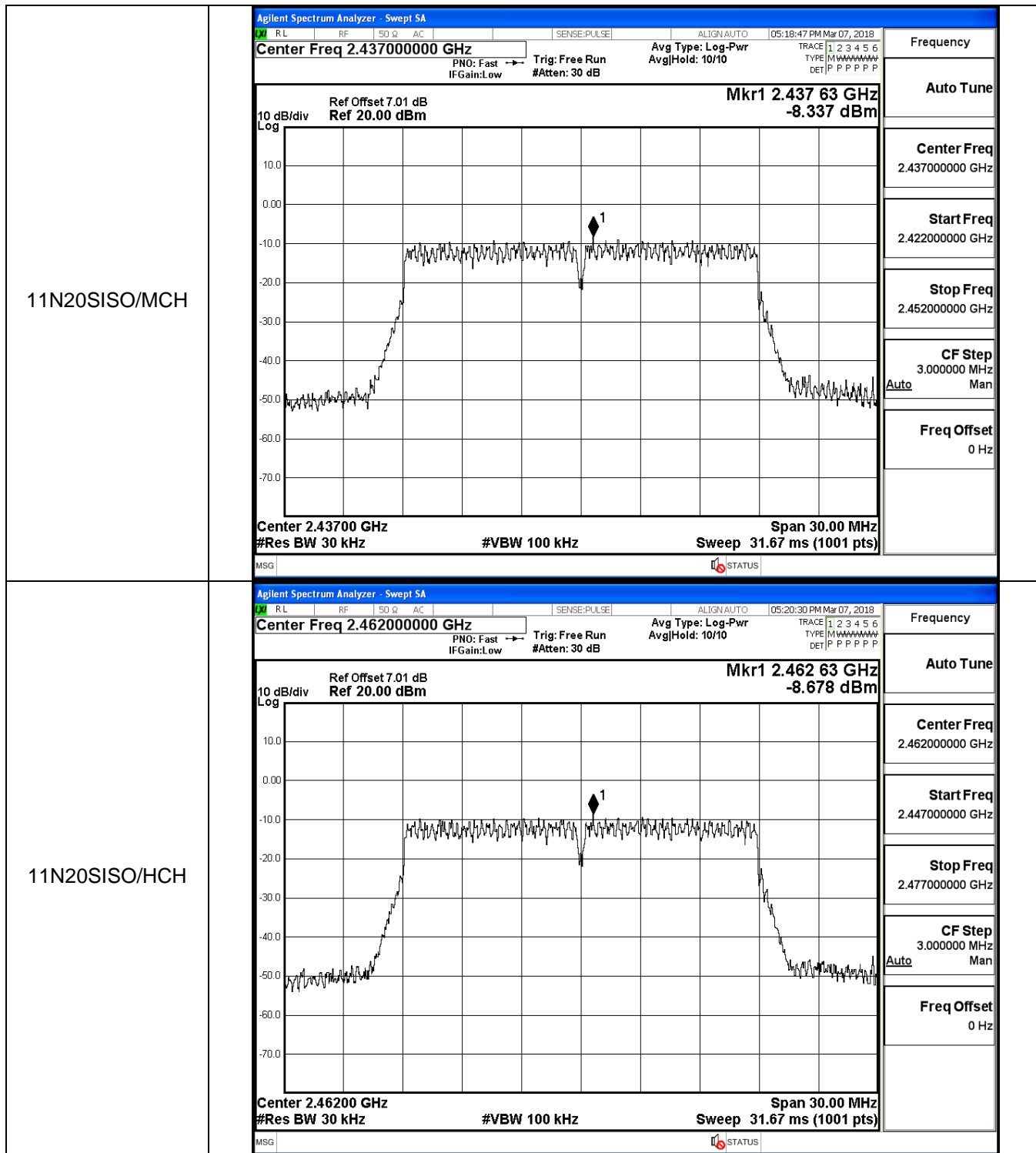


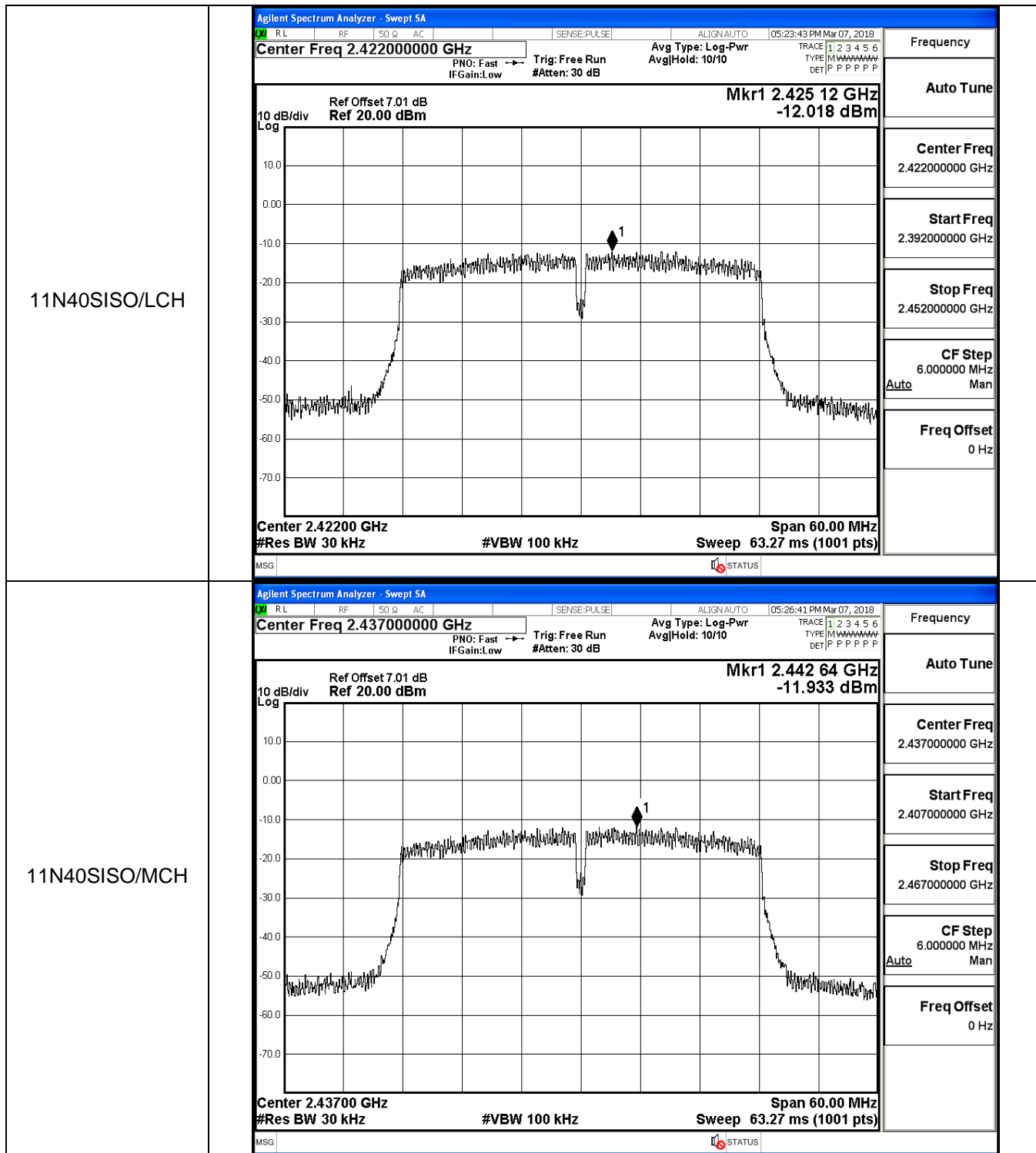
11G/HCH

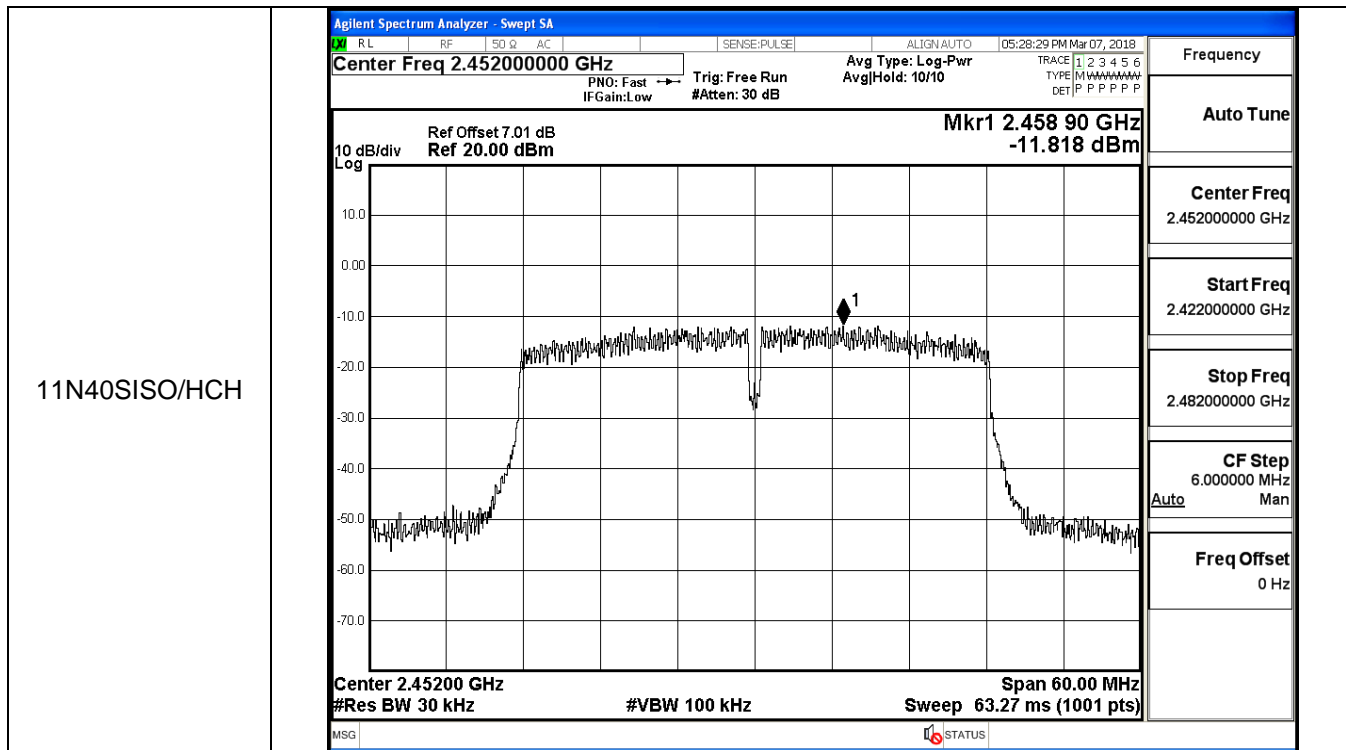


11N20SISO/LCH





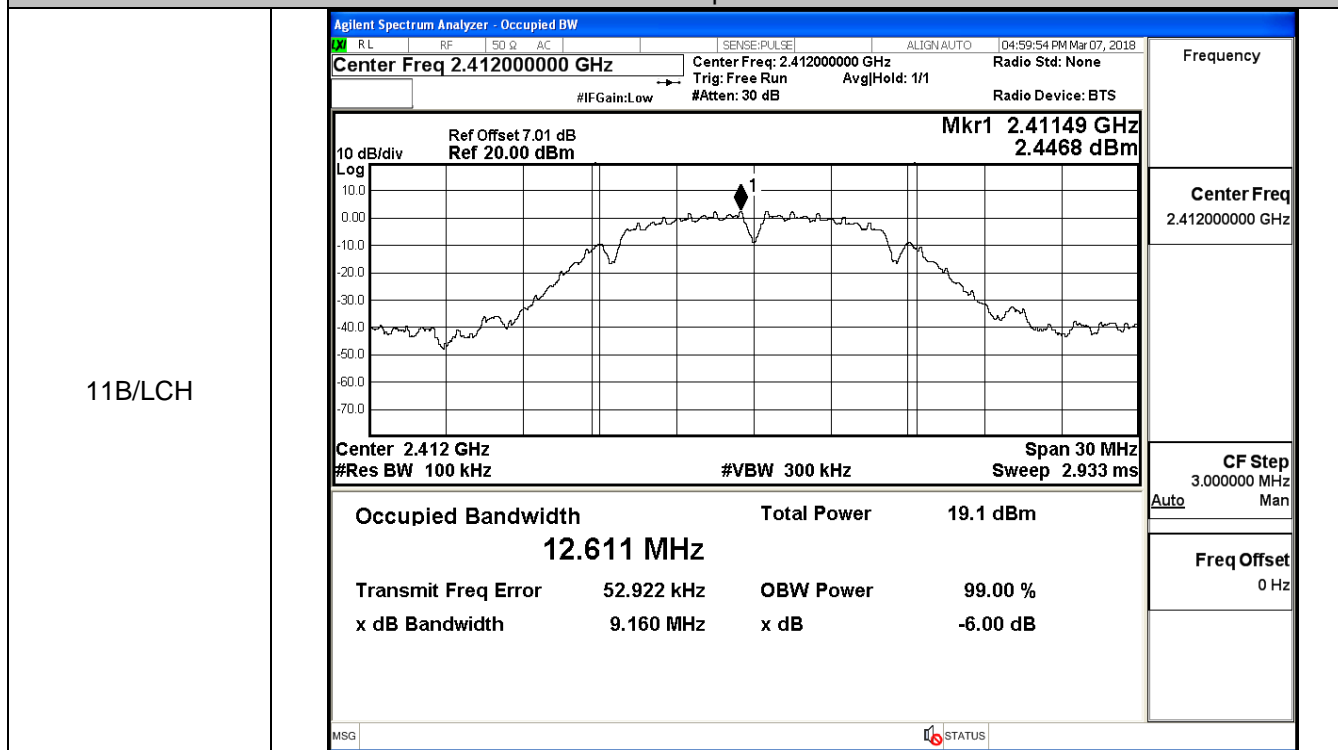




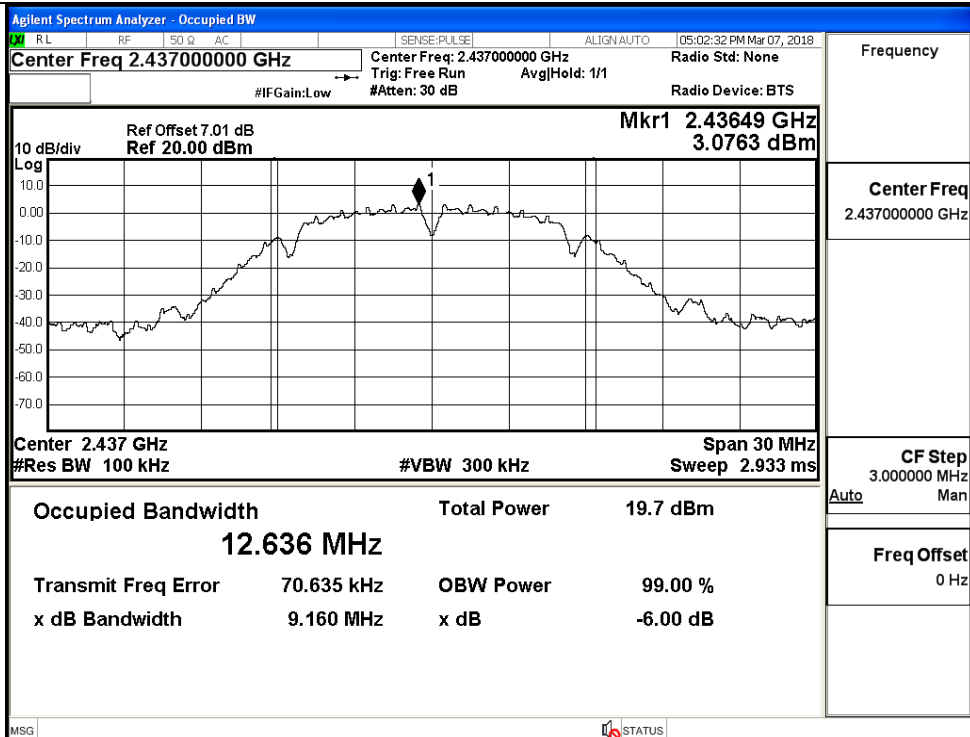
4 6dB Bandwidth

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
11B	LCH	9.160	≥ 0.5	PASS
	MCH	9.160	≥ 0.5	PASS
	HCH	9.159	≥ 0.5	PASS
11G	LCH	16.60	≥ 0.5	PASS
	MCH	16.62	≥ 0.5	PASS
	HCH	16.62	≥ 0.5	PASS
11N20SISO	LCH	17.82	≥ 0.5	PASS
	MCH	17.83	≥ 0.5	PASS
	HCH	17.85	≥ 0.5	PASS
11N40SISO	LCH	36.21	≥ 0.5	PASS
	MCH	36.14	≥ 0.5	PASS
	HCH	36.34	≥ 0.5	PASS

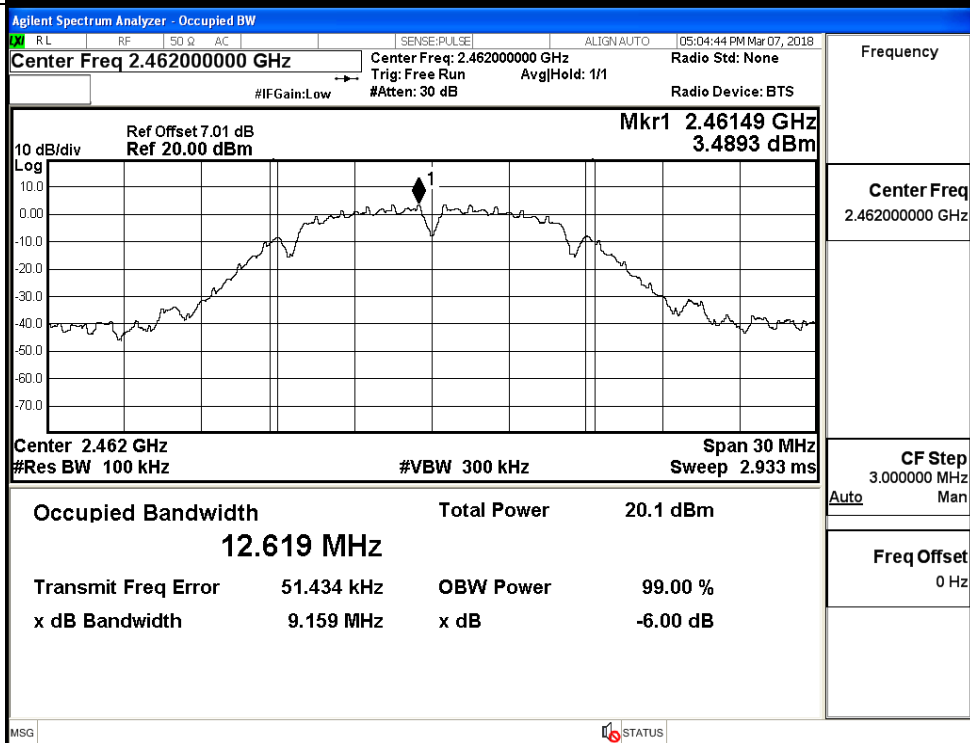
Test Graphs



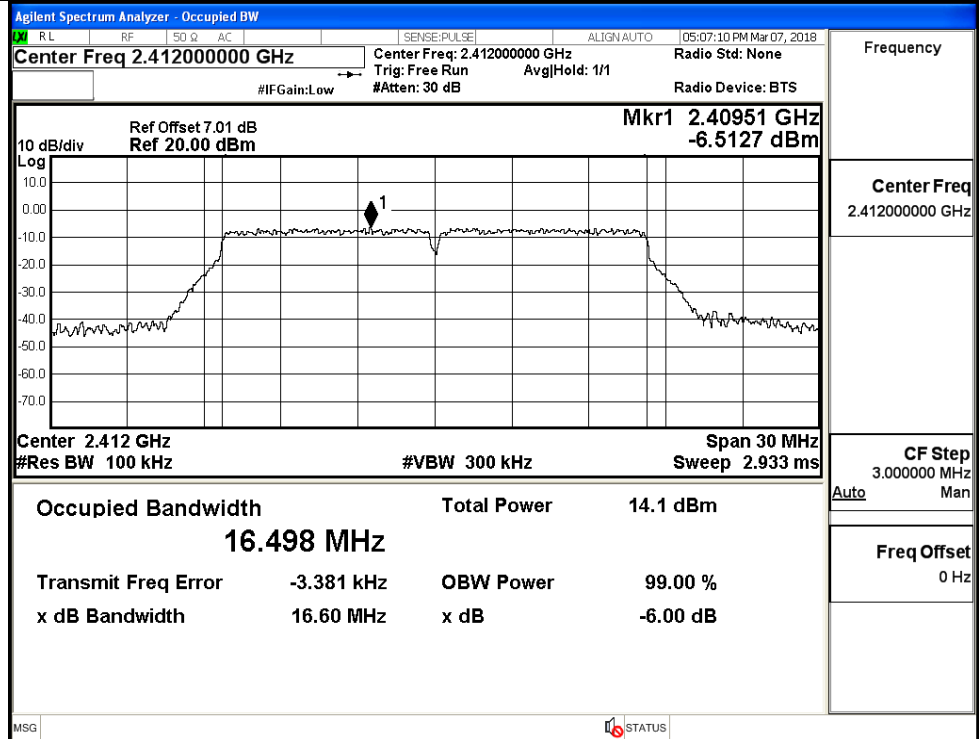
11B/MCH



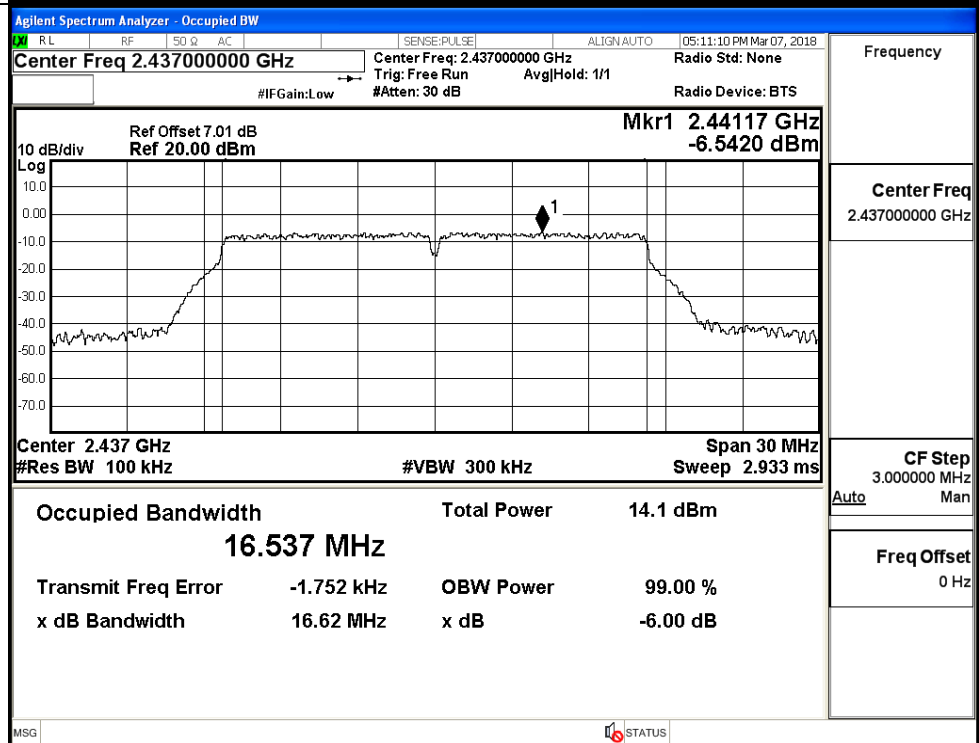
11B/HCH



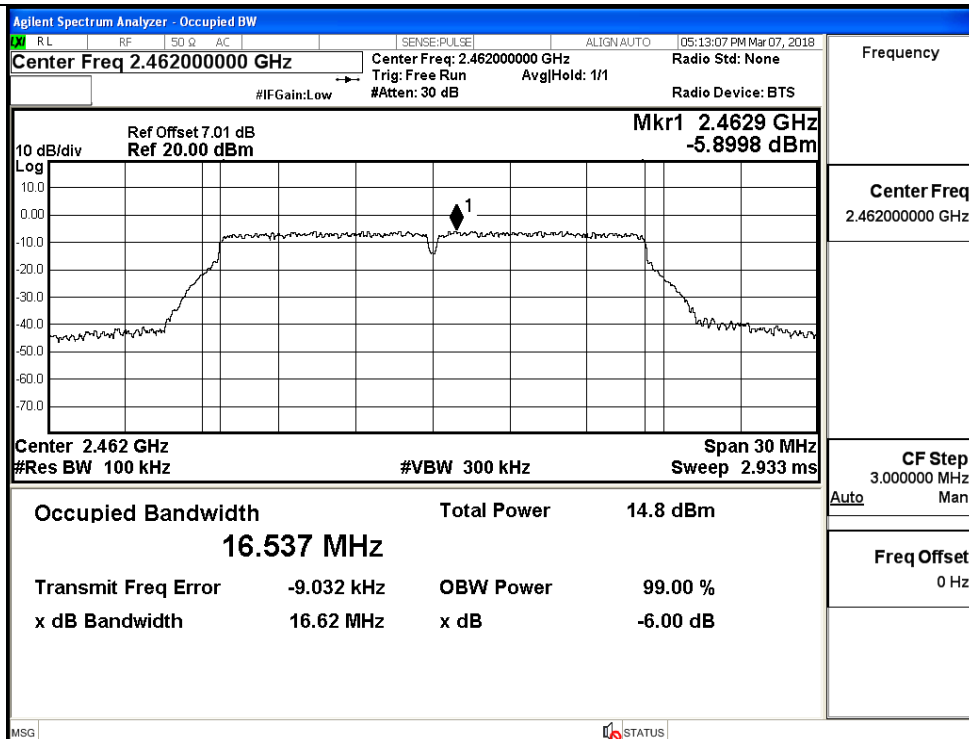
11G/LCH



11G/MCH



11G/HCH



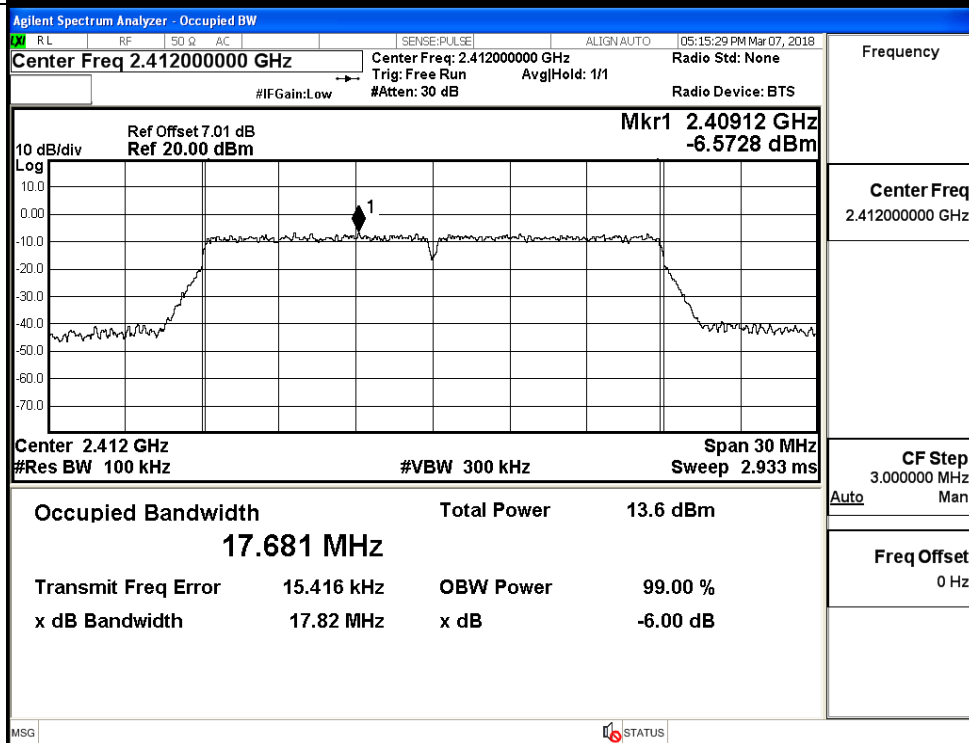
Frequency

Center Freq
2.462000000 GHz

CF Step
3.000000 MHz
Auto Man

Freq Offset
0 Hz

11N20SISO/LCH

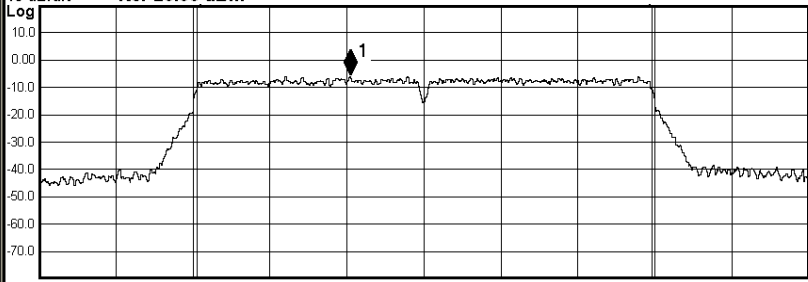
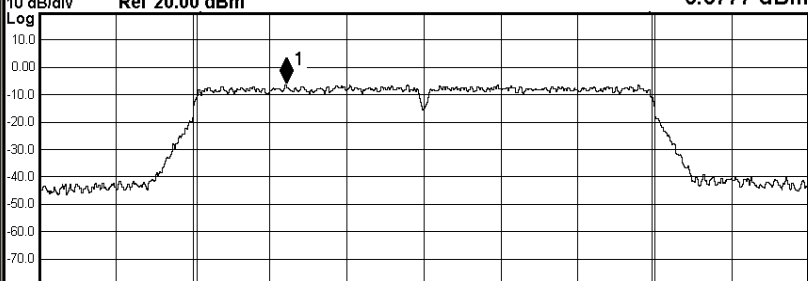


Frequency

Center Freq
2.412000000 GHz

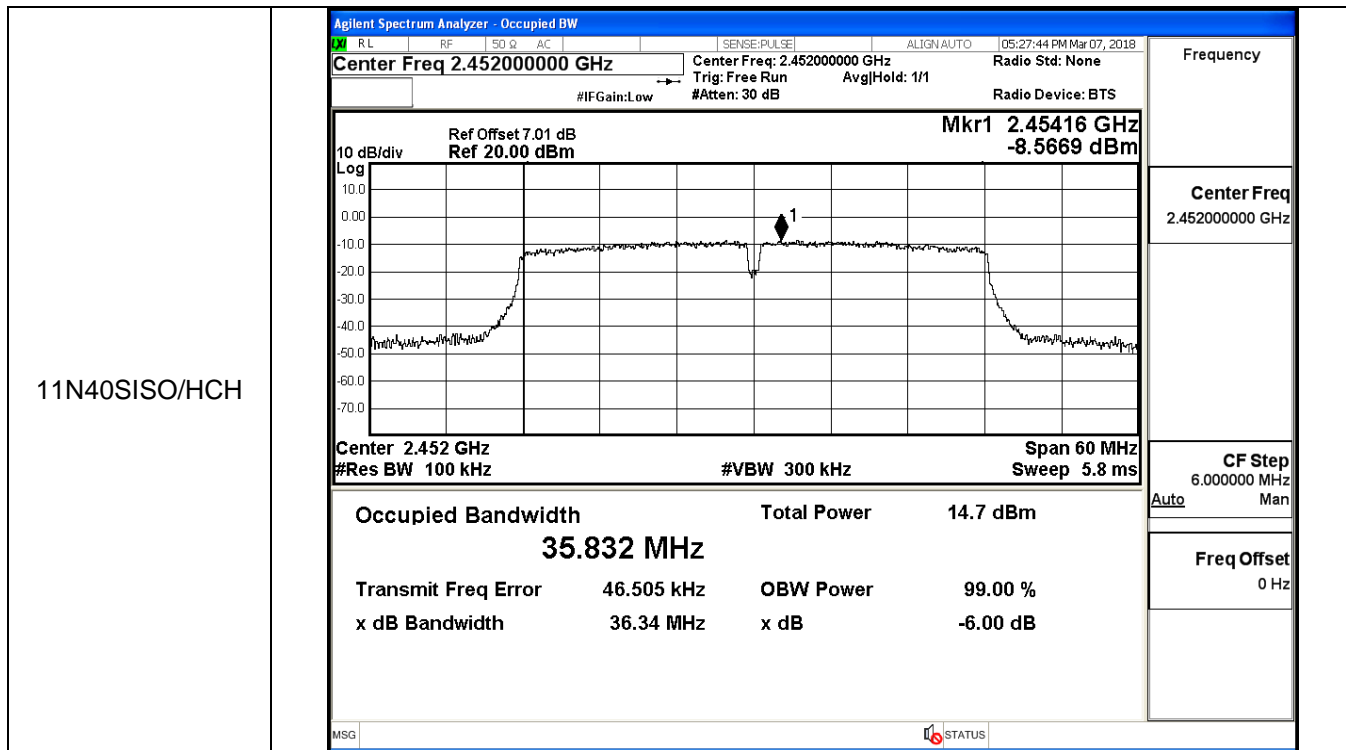
CF Step
3.000000 MHz
Auto Man

Freq Offset
0 Hz

11N20SISO/MCH	<div> <div>Agilent Spectrum Analyzer - Occupied BW</div> <div> <div> <div> <div> <div>RL</div> <div>RF</div> <div>50 Ω</div> <div>AC</div> </div> <div>SENSE:PULSE</div> <div>ALIGN: AUTO</div> <div>05:18:02 PM Mar 07, 2018</div> </div> <div> <div>Center Freq 2.437000000 GHz</div> <div>Center Freq: 2.437000000 GHz</div> <div>Trig: Free Run</div> <div>Avg Hold: 1/1</div> <div>Radio Std: None</div> </div> <div> <div>#IFGain: Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div> </div> </div> <div> <div>10 dB/div</div> <div>Ref Offset 7.01 dB</div> <div>Ref 20.00 dBm</div> <div>Mkr1 2.43415 GHz</div> <div>-5.8842 dBm</div> </div>  <div> <div>Center 2.437 GHz</div> <div>#Res BW 100 kHz</div> <div>#VBW 300 kHz</div> <div>Span 30 MHz</div> <div>Sweep 2.933 ms</div> </div> <div> <div>Occupied Bandwidth</div> <div>17.674 MHz</div> <div>Total Power</div> <div>14.5 dBm</div> </div> <div> <div>Transmit Freq Error</div> <div>22.759 kHz</div> <div>OBW Power</div> <div>99.00 %</div> </div> <div> <div>x dB Bandwidth</div> <div>17.83 MHz</div> <div>x dB</div> <div>-6.00 dB</div> </div> </div> <div> <div>MSG</div> <div>STATUS</div> </div> </div>	<div>Frequency</div> <div>Center Freq</div> <div>2.437000000 GHz</div> <div>CF Step</div> <div>3.000000 MHz</div> <div>Auto</div> <div>Man</div> <div>Freq Offset</div> <div>0 Hz</div>
11N20SISO/HCH	<div> <div>Agilent Spectrum Analyzer - Occupied BW</div> <div> <div> <div> <div>RL</div> <div>RF</div> <div>50 Ω</div> <div>AC</div> </div> <div>SENSE:PULSE</div> <div>ALIGN: AUTO</div> <div>05:19:45 PM Mar 07, 2018</div> </div> <div> <div>Center Freq 2.462000000 GHz</div> <div>Center Freq: 2.462000000 GHz</div> <div>Trig: Free Run</div> <div>Avg Hold: 1/1</div> <div>Radio Std: None</div> </div> <div> <div>#IFGain: Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div> </div> </div> <div> <div>10 dB/div</div> <div>Ref Offset 7.01 dB</div> <div>Ref 20.00 dBm</div> <div>Mkr1 2.45663 GHz</div> <div>-6.3777 dBm</div> </div>  <div> <div>Center 2.462 GHz</div> <div>#Res BW 100 kHz</div> <div>#VBW 300 kHz</div> <div>Span 30 MHz</div> <div>Sweep 2.933 ms</div> </div> <div> <div>Occupied Bandwidth</div> <div>17.681 MHz</div> <div>Total Power</div> <div>14.2 dBm</div> </div> <div> <div>Transmit Freq Error</div> <div>20.575 kHz</div> <div>OBW Power</div> <div>99.00 %</div> </div> <div> <div>x dB Bandwidth</div> <div>17.85 MHz</div> <div>x dB</div> <div>-6.00 dB</div> </div> </div> <div> <div>MSG</div> <div>STATUS</div> </div>	<div>Frequency</div> <div>Center Freq</div> <div>2.462000000 GHz</div> <div>CF Step</div> <div>3.000000 MHz</div> <div>Auto</div> <div>Man</div> <div>Freq Offset</div> <div>0 Hz</div>

11N40SISO/LCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>05:22:57 PM Mar 07, 2018</div></div></div> <div>Center Freq 2.422000000 GHz</div> <div>Center Freq: 2.422000000 GHz</div> <div>Trig: Free Run</div> <div>Avg/Hold: 1/1</div> <div>Radio Std: None</div> <div>#IFGain:Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div>			Frequency
	<div>10 dB/div</div> <div>Ref Offset 7.01 dB</div> <div>Ref 20.00 dBm</div> <div>Mkr1 2.42548 GHz</div> <div>-8.7728 dBm</div> <div></div>			Center Freq 2.422000000 GHz
	<div>Center 2.422 GHz</div> <div>#Res BW 100 kHz</div> <div>#VBW 300 kHz</div> <div>Span 60 MHz</div> <div>Sweep 5.8 ms</div>			CF Step 6.000000 MHz Auto Man
	<div>Occupied Bandwidth</div> <div>35.858 MHz</div> <div>Total Power</div> <div>14.3 dBm</div> <div>Transmit Freq Error</div> <div>44.500 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>36.21 MHz</div> <div>x dB</div> <div>-6.00 dB</div>			Freq Offset 0 Hz
	<div>MSG</div> <div>STATUS</div>			

11N40SISO/MCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>05:25:56 PM Mar 07, 2018</div></div></div> <div>Center Freq 2.437000000 GHz</div> <div>Center Freq: 2.437000000 GHz</div> <div>Trig: Free Run</div> <div>Avg/Hold: 1/1</div> <div>Radio Std: None</div> <div>#IFGain:Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div>			Frequency
	<div>10 dB/div</div> <div>Ref Offset 7.01 dB</div> <div>Ref 20.00 dBm</div> <div>Mkr1 2.44048 GHz</div> <div>-8.7813 dBm</div> <div></div>			Center Freq 2.437000000 GHz
	<div>Center 2.437 GHz</div> <div>#Res BW 100 kHz</div> <div>#VBW 300 kHz</div> <div>Span 60 MHz</div> <div>Sweep 5.8 ms</div>			CF Step 6.000000 MHz Auto Man
	<div>Occupied Bandwidth</div> <div>35.836 MHz</div> <div>Total Power</div> <div>14.3 dBm</div> <div>Transmit Freq Error</div> <div>60.023 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>36.14 MHz</div> <div>x dB</div> <div>-6.00 dB</div>			Freq Offset 0 Hz
	<div>MSG</div> <div>STATUS</div>			

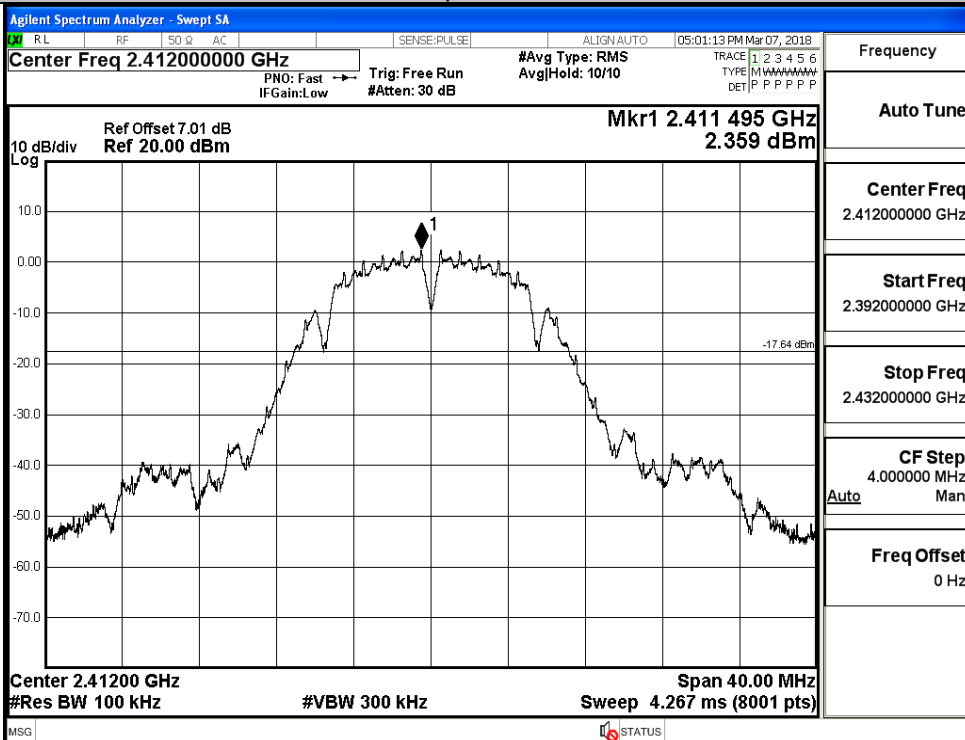


5 RF Conducted Spurious Emissions

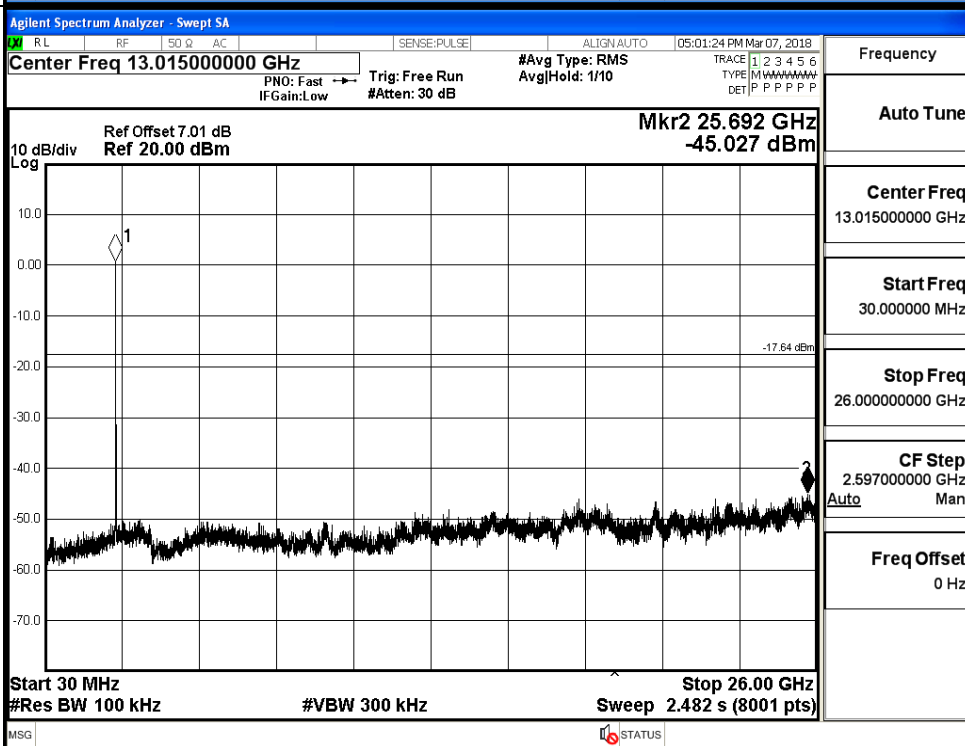
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
11B	LCH	2.359	-45.027	-17.641	PASS
	MCH	3.026	-44.545	-16.974	PASS
	HCH	3.291	-43.994	-16.709	PASS
11G	LCH	-6.77	-43.601	-26.770	PASS
	MCH	-6.759	-43.937	-26.759	PASS
	HCH	-5.95	-44.346	-25.950	PASS
11N20 SISO	LCH	-7.167	-45.381	-27.167	PASS
	MCH	-5.881	-44.057	-25.881	PASS
	HCH	-6.358	-44.791	-26.358	PASS
11N40 SISO	LCH	-9.024	-44.932	-29.024	PASS
	MCH	-8.797	-45.126	-28.797	PASS
	HCH	-8.277	-44.019	-28.277	PASS

11B_LCH_Graphs

Pref/11B/LCH

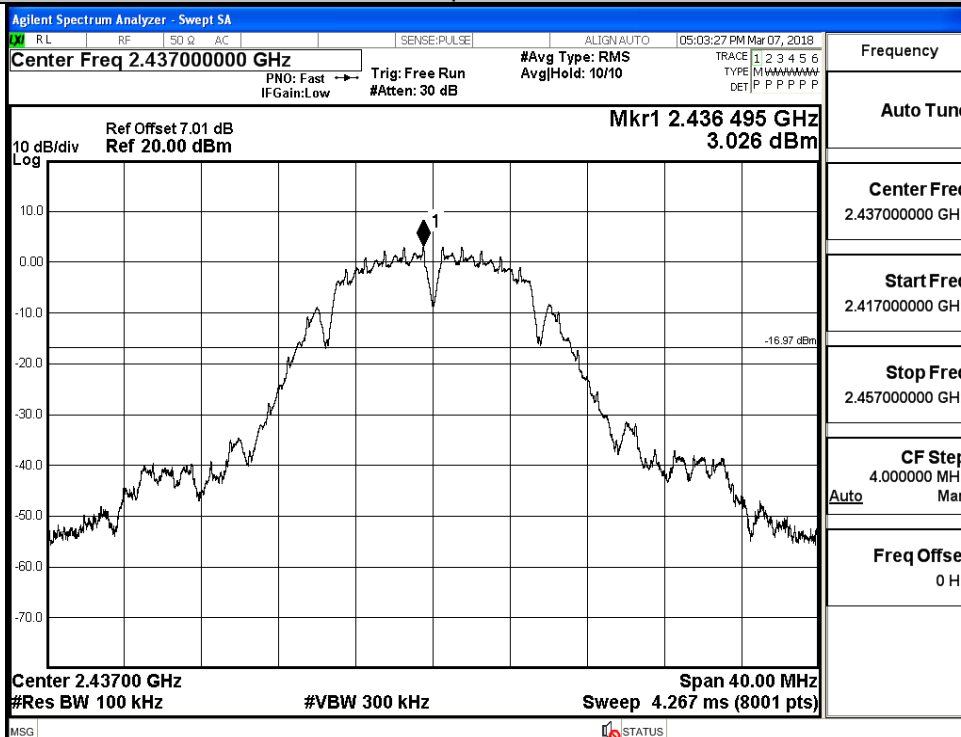


Puw/11B/LCH

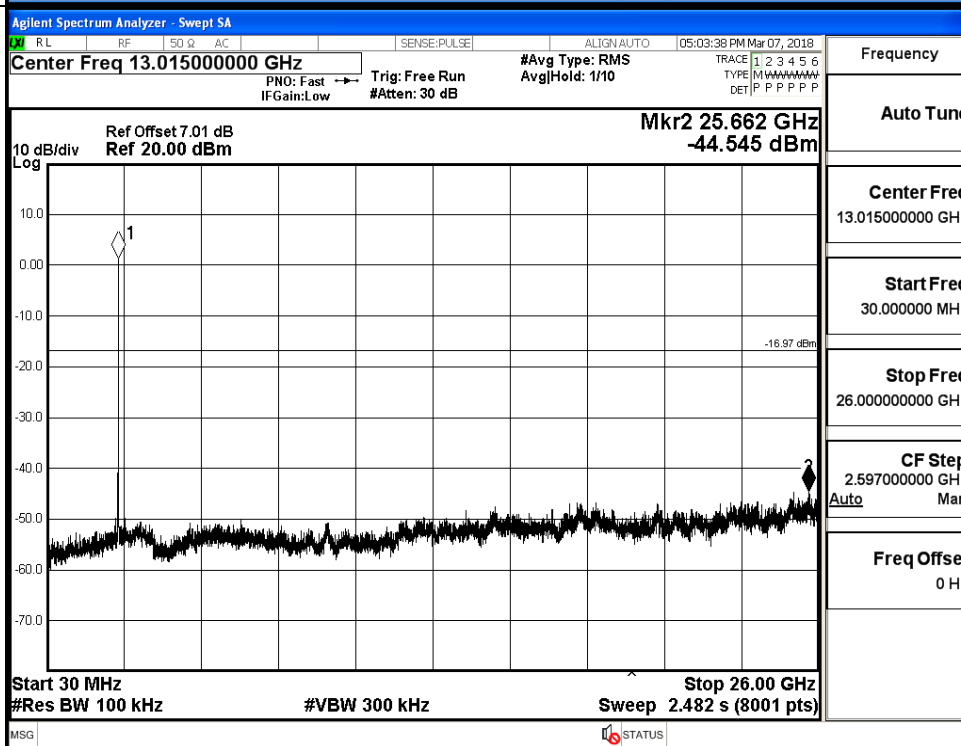


11B_MCH_Graphs

Pref/11B/MCH

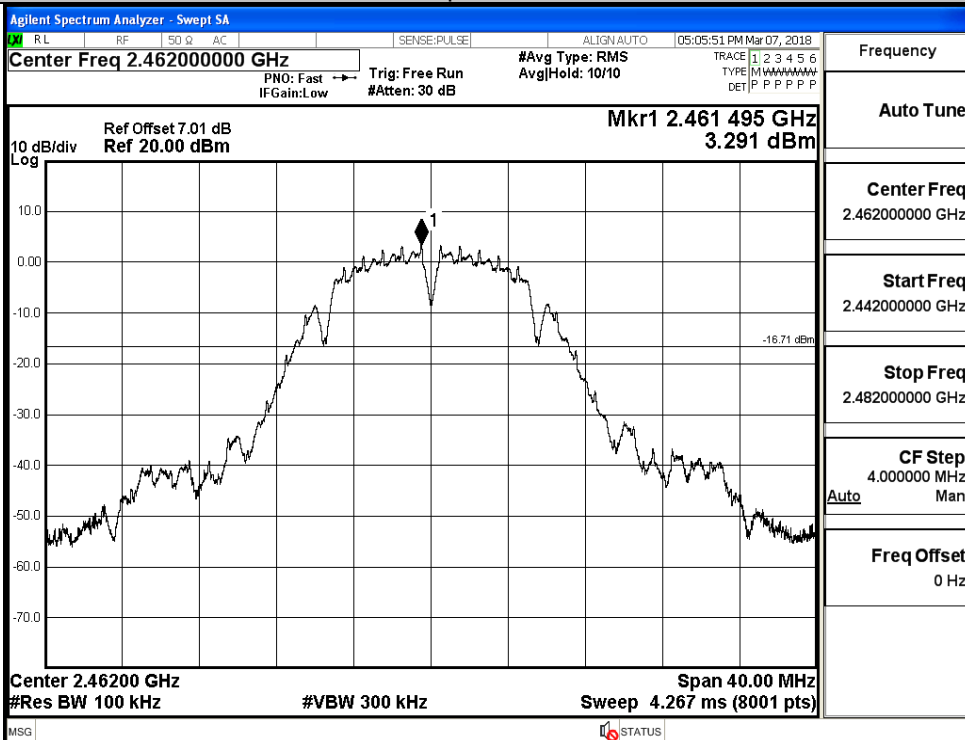


Puw/11B/MCH

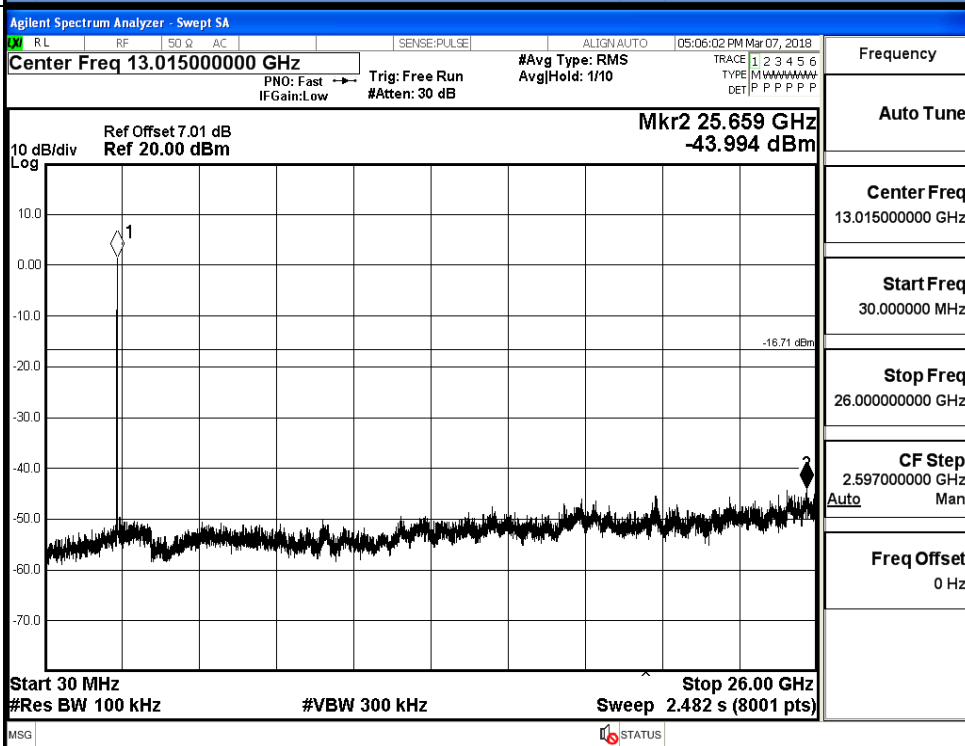


11B_HCH_Graphs

Pref/11B/HCH

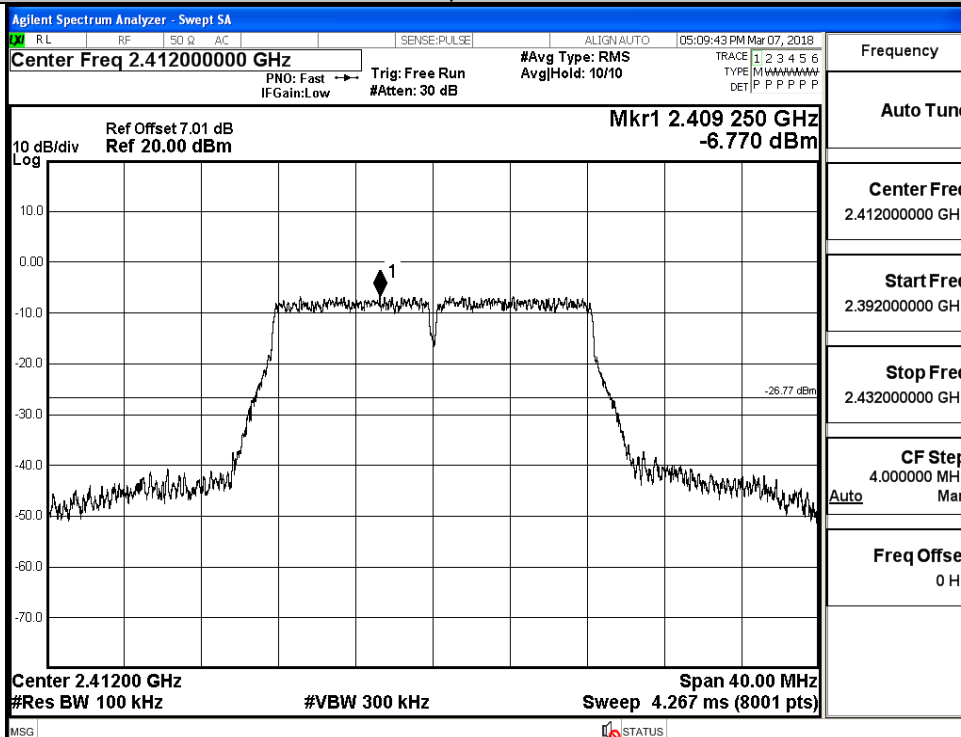


Puw/11B/HCH

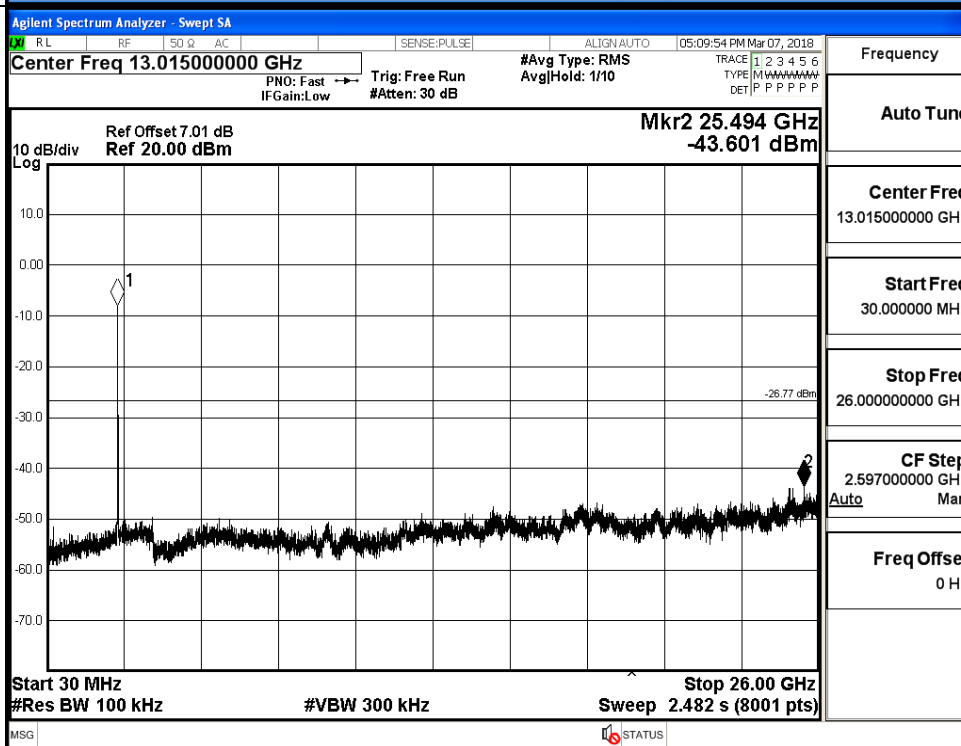


11G_LCH_Graphs

Pref/11G/LCH

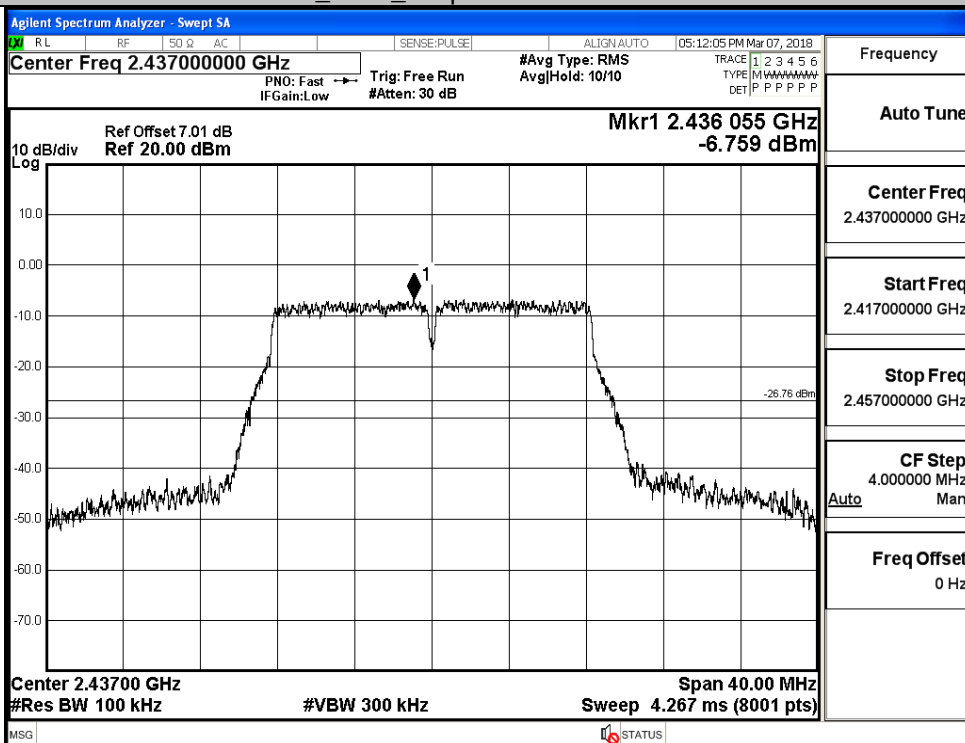


Puw/11G/LCH

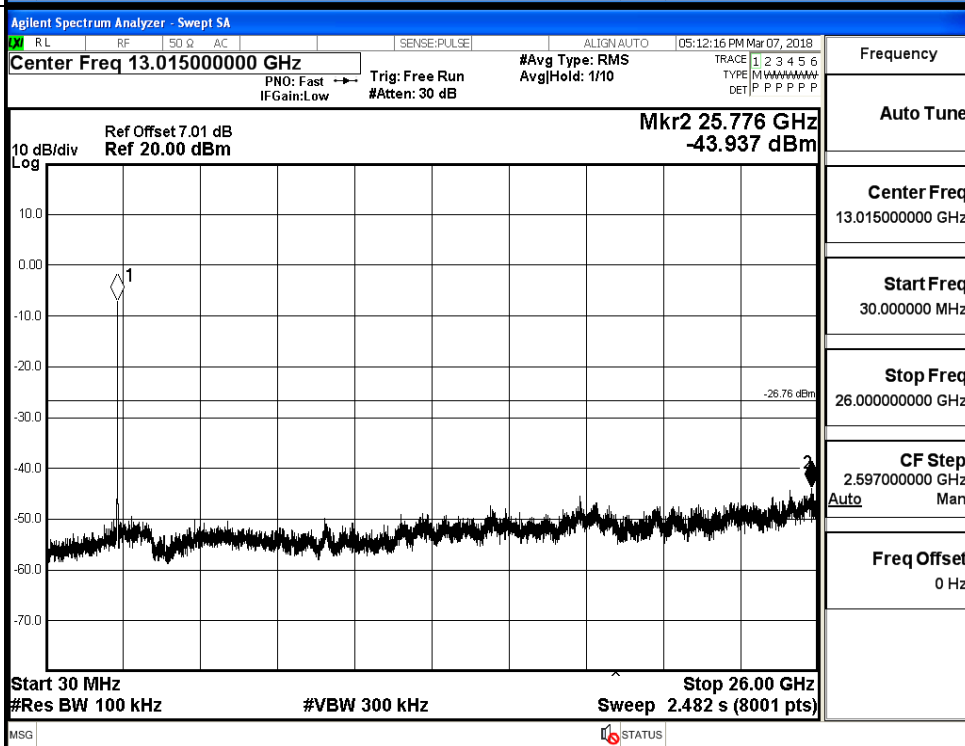


11G_MCH_Graphs

Pref/11G/MCH

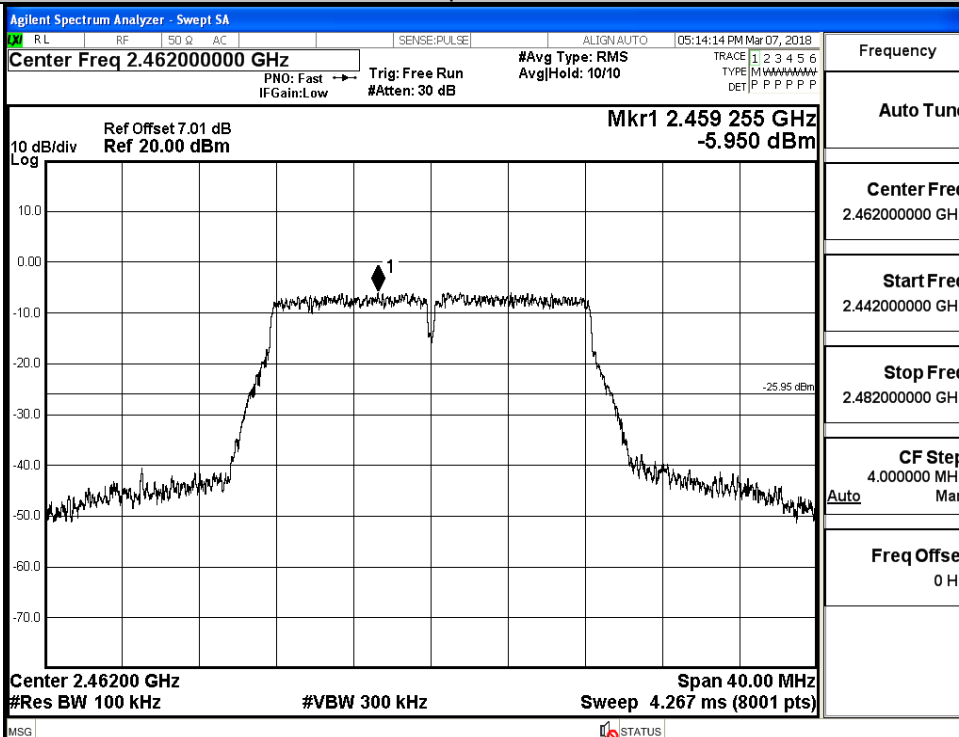


Puw/11G/MCH

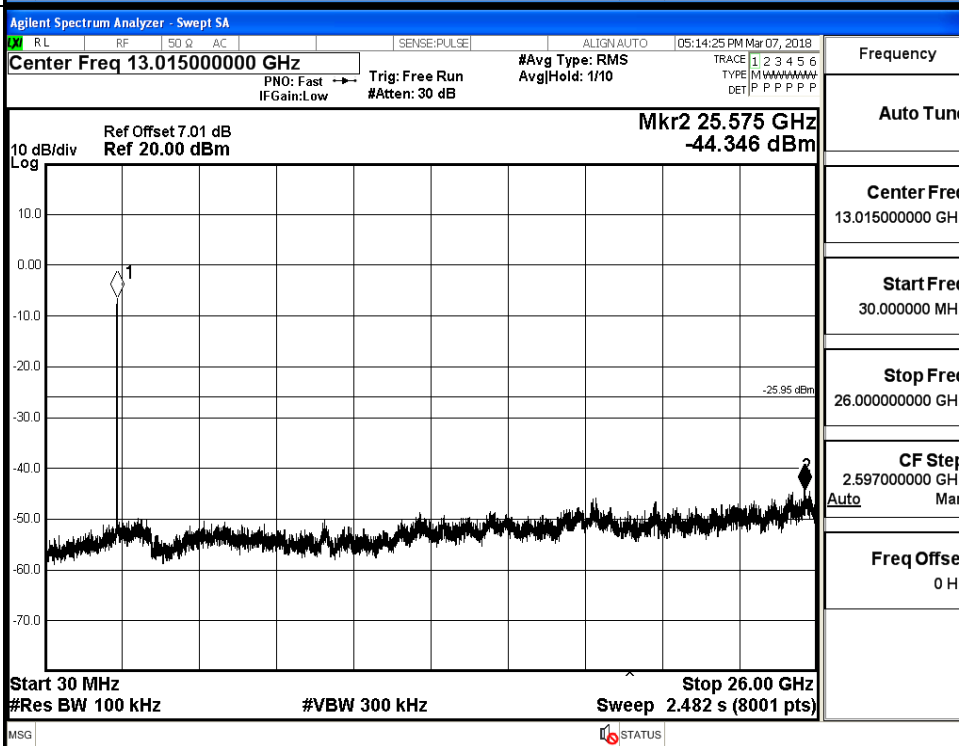


11G_HCH_Graphs

Pref/11G/HCH

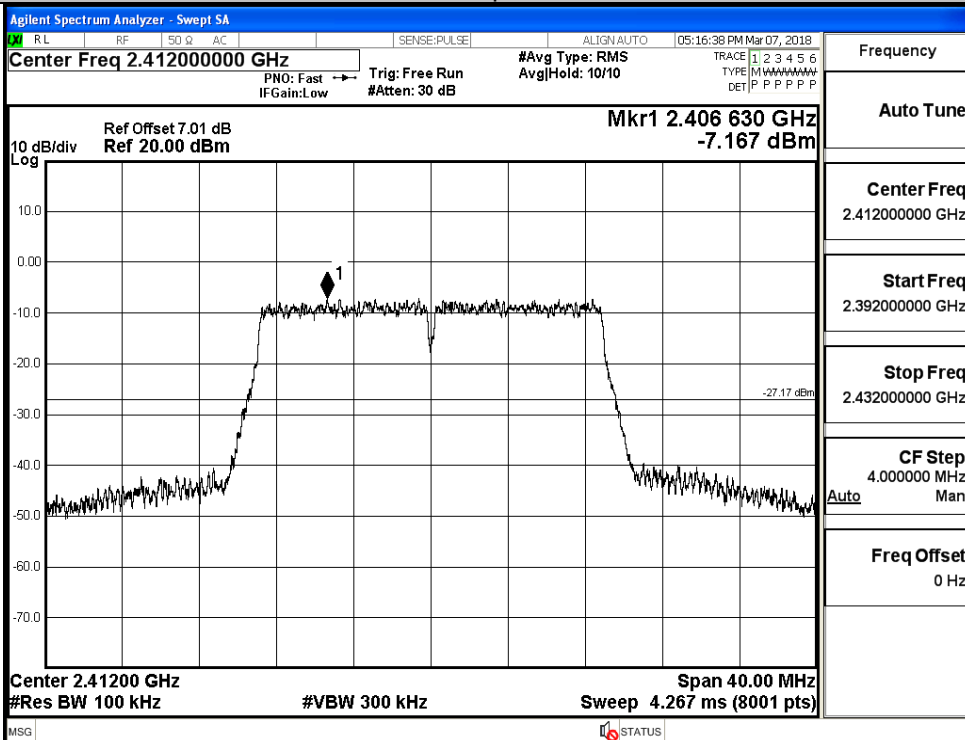


Puw/11G/HCH

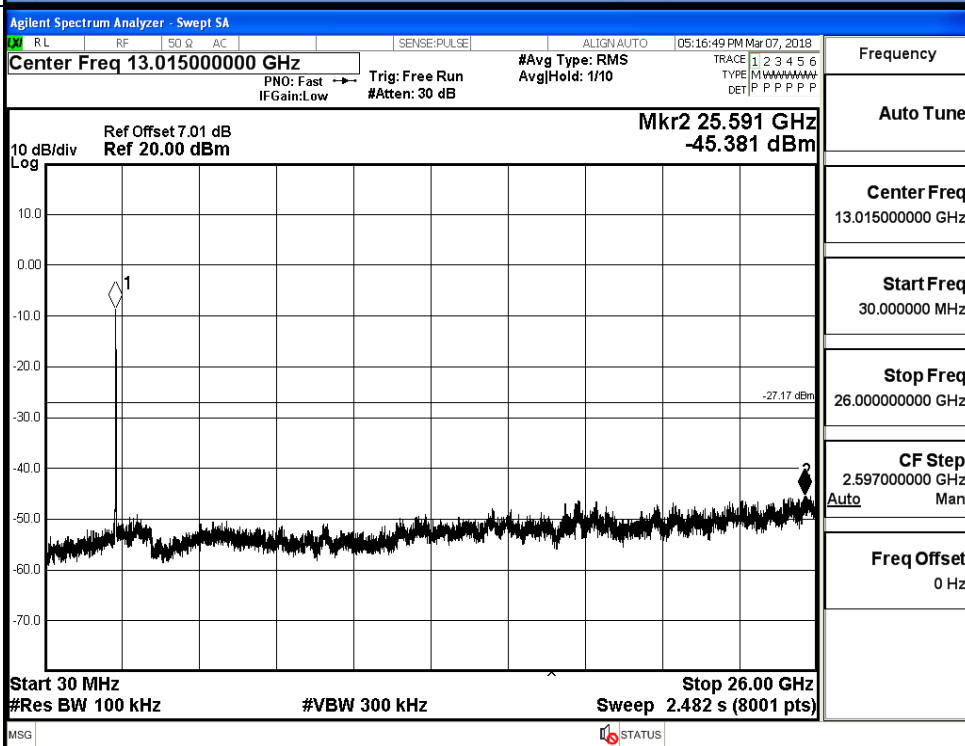


11N20SISO_LCH_Graphs

Pref/11N20SIS
O/LCH

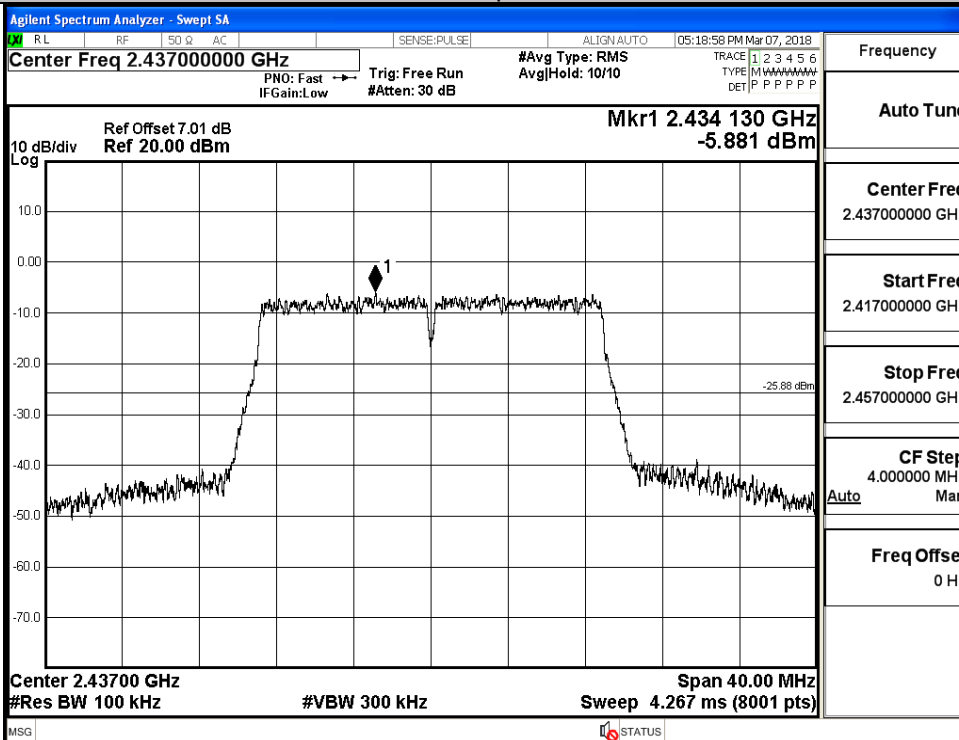


Puw/11N20
SISO/LCH

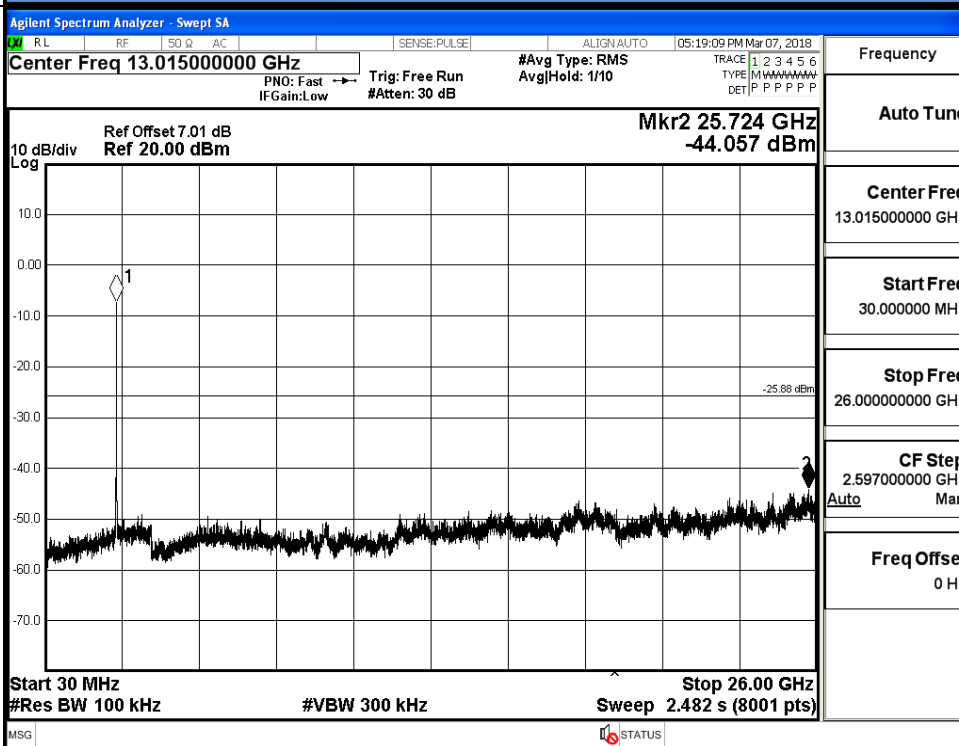


11N20SISO_MCH_Graphs

Pref/11N20
SISO/MCH

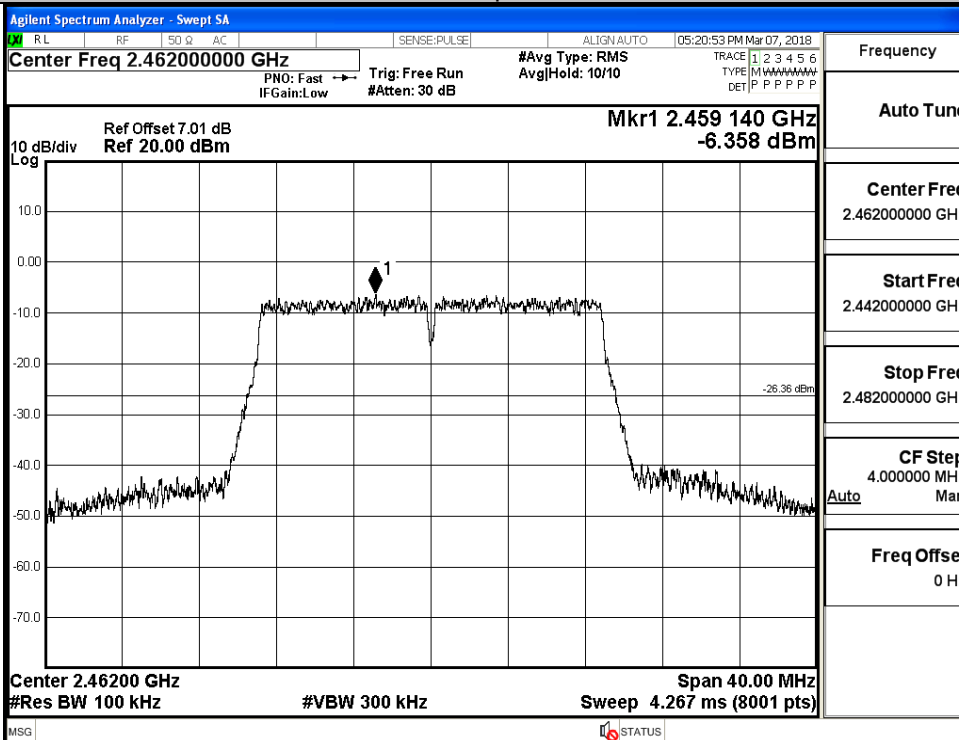


Puw/11N20
SISO/MCH

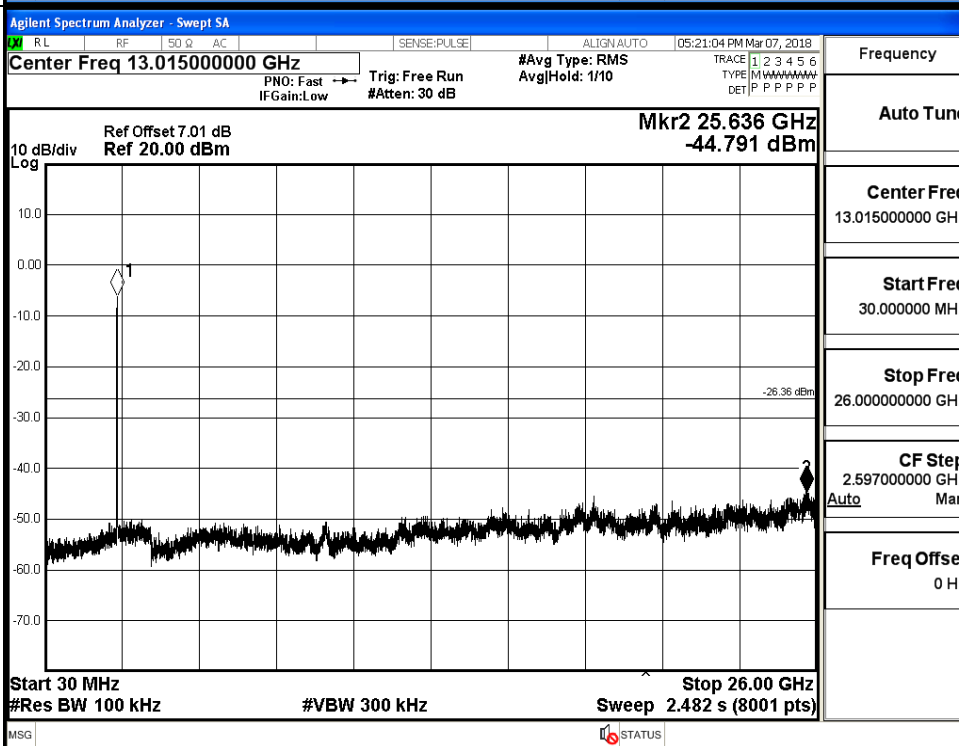


11N20ISO_HCH_Graphs

Pref/11N20
SISO/HCH

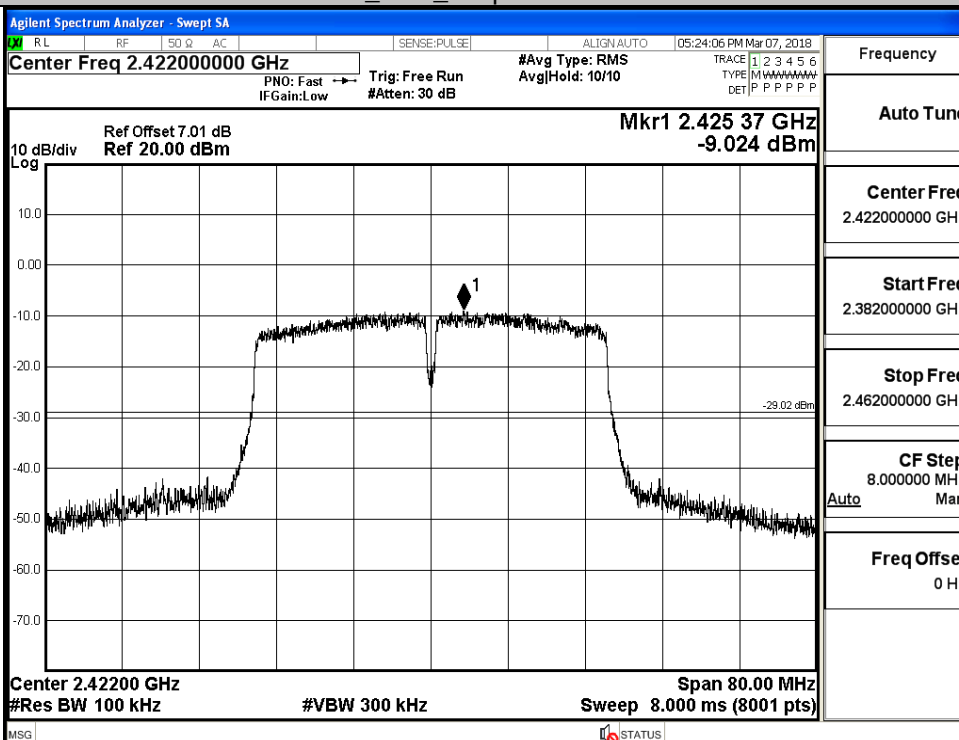


Puw/11N20
SISO/HCH

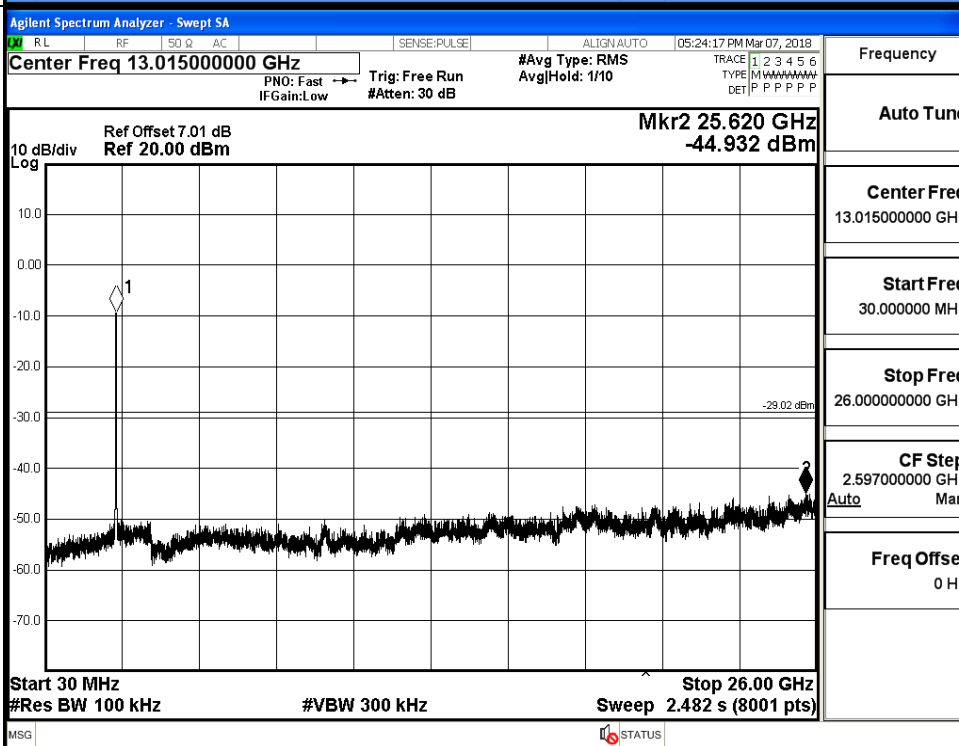


11N40SISO_LCH_Graphs

Pref/11N40
SISO/LCH

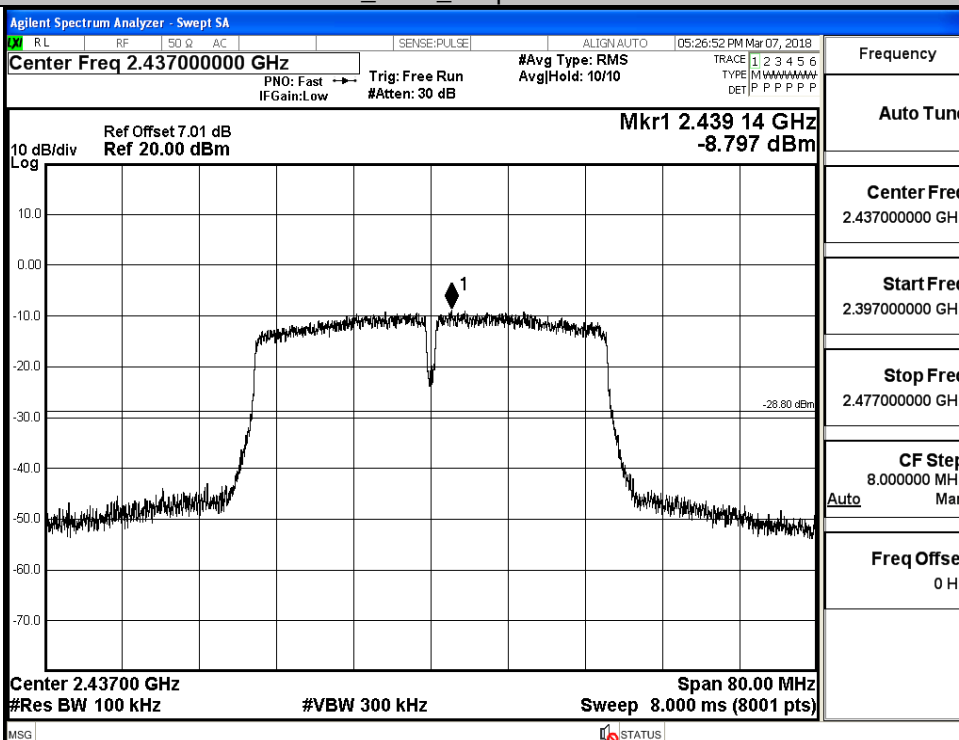


Puw/11N40
SISO/LCH

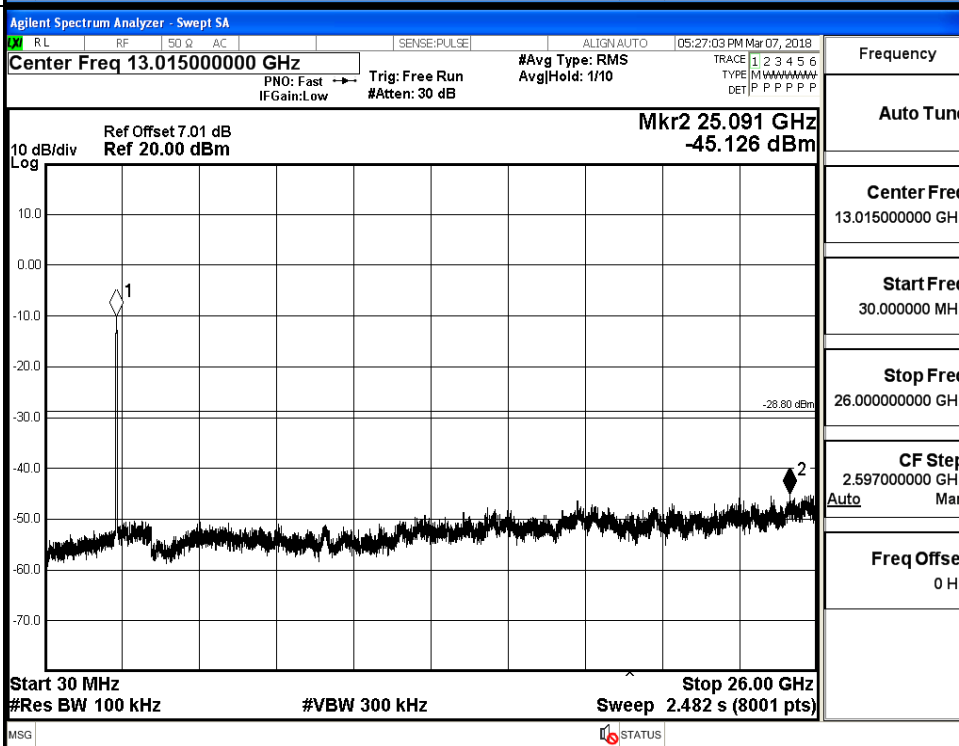


11N40SISO_MCH_Graphs

Pref/11N40
SISO/MCH

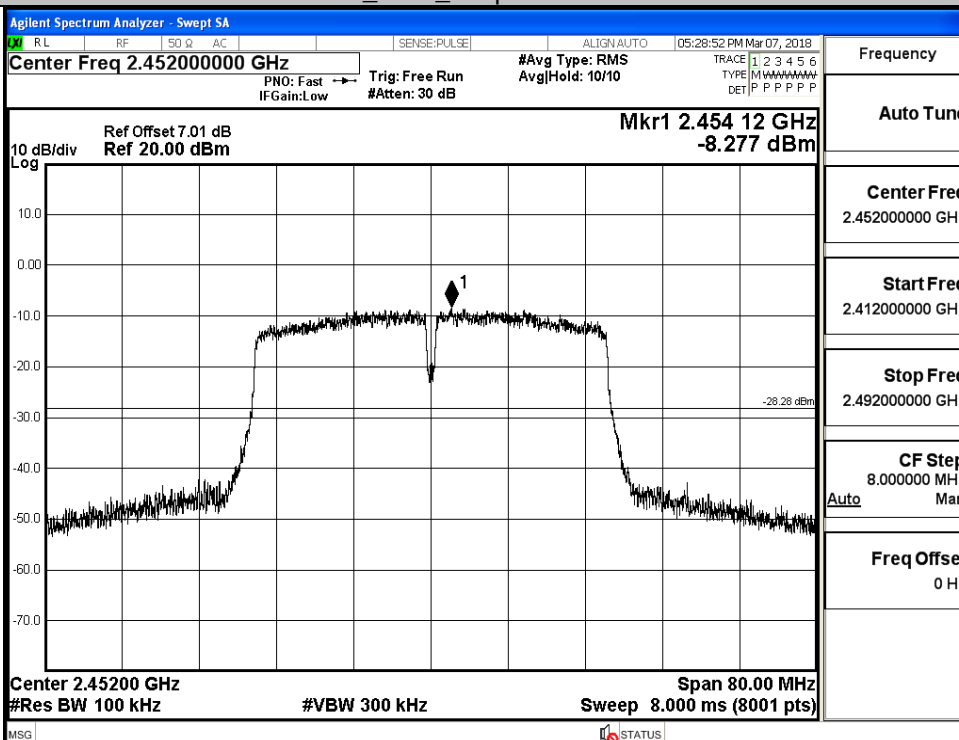


Puw/11N40
SISO/MCH

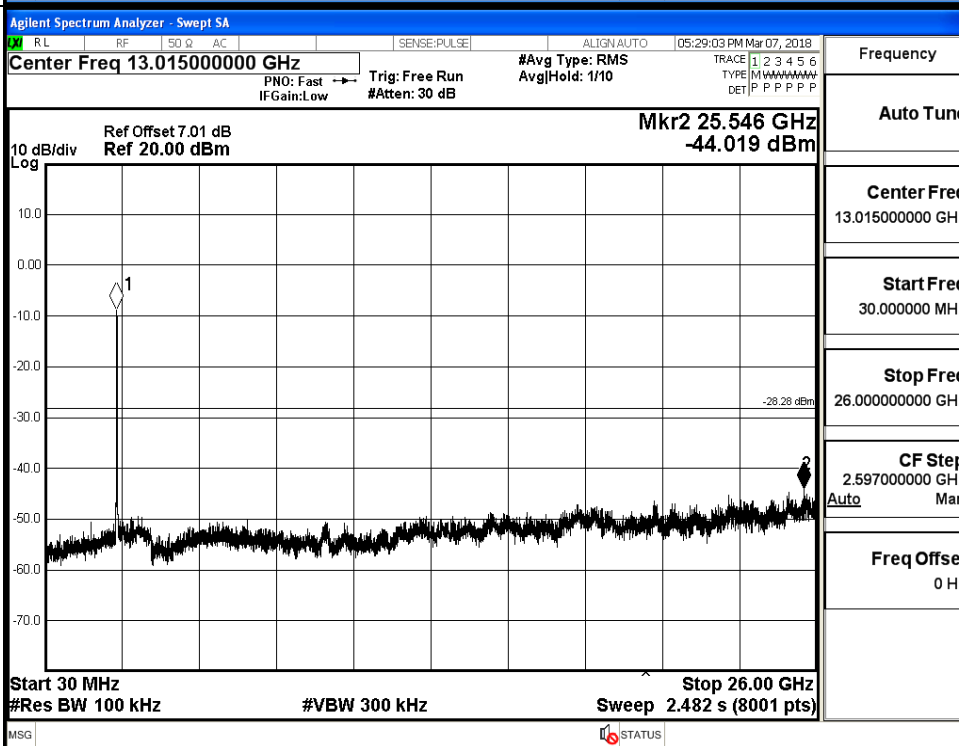


11N40SISO_HCH_Graphs

Pref/11N40
SISO/HCH



Puw/11N40
SISO/HCH

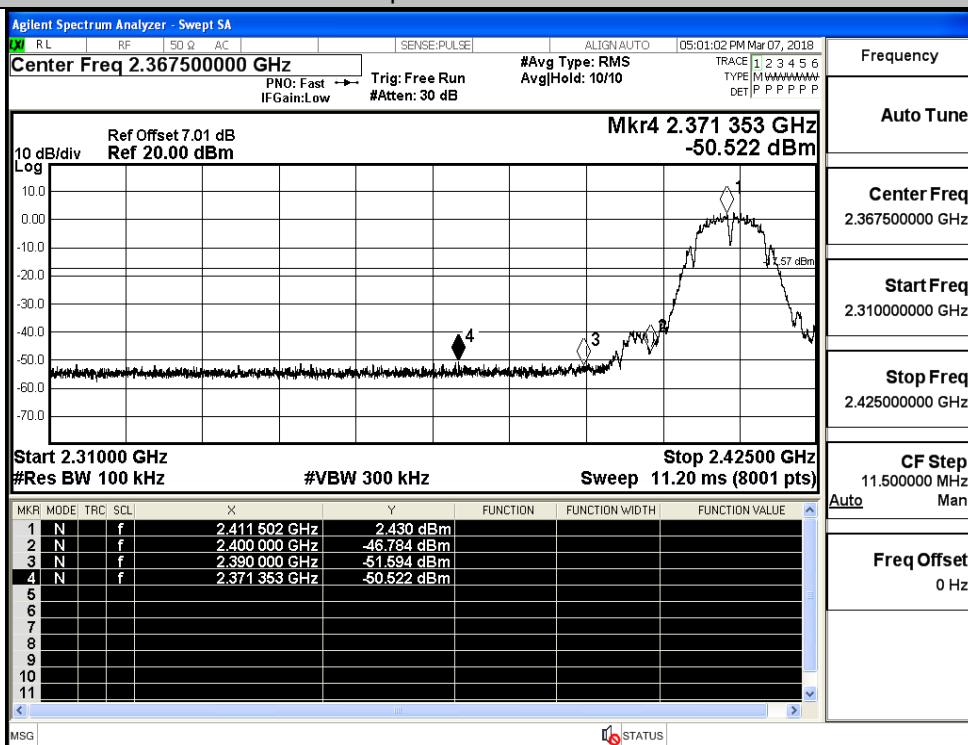


6 Band-edge for RF Conducted Emissions

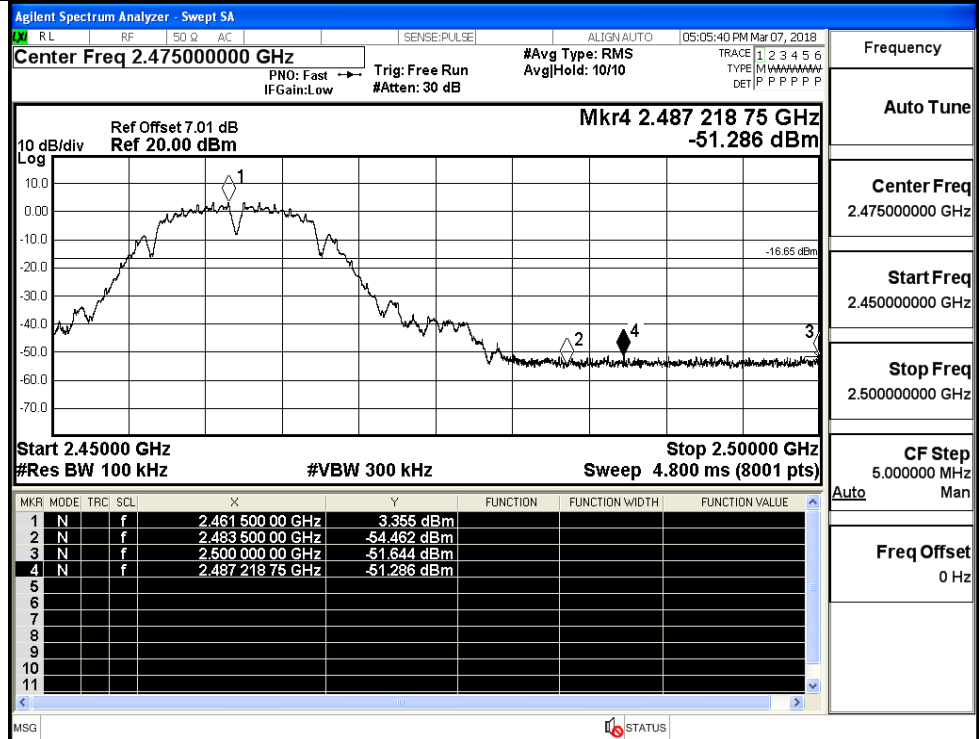
Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	2.430	-50.522	-17.57	PASS
	HCH	3.355	-51.286	-16.65	PASS
11G	LCH	-6.522	-45.797	-26.52	PASS
	HCH	-5.857	-47.330	-25.86	PASS
11N20SISO	LCH	-6.964	-47.773	-26.96	PASS
	HCH	-6.089	-47.042	-26.09	PASS
11N40SISO	LCH	-8.847	-43.680	-28.85	PASS
	HCH	-8.454	-46.286	-28.45	PASS

Test Graphs

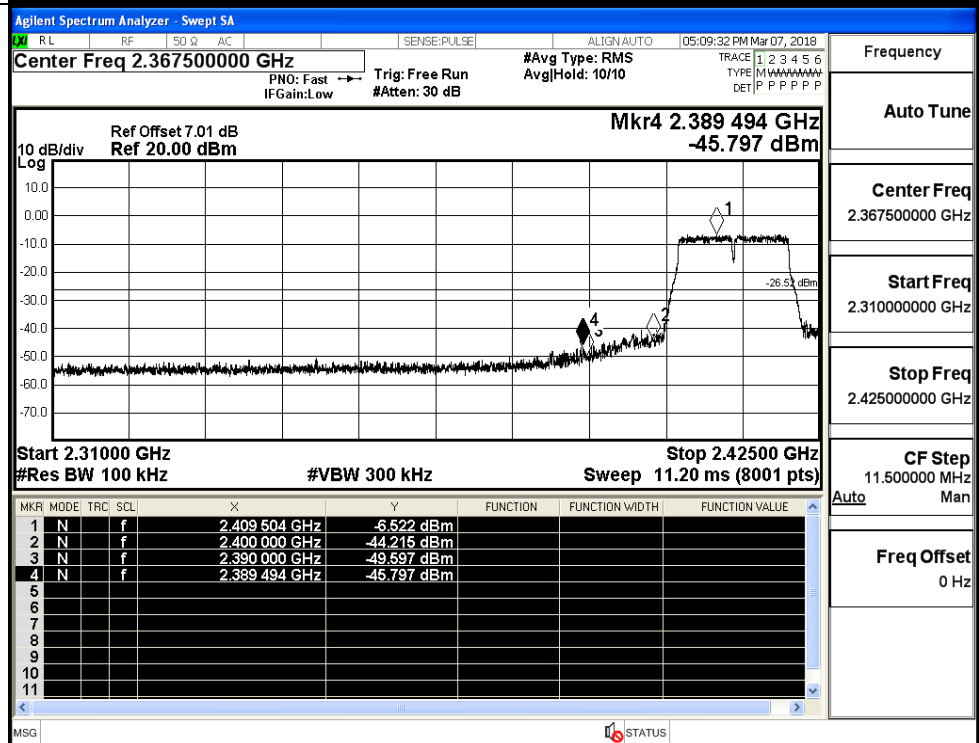
11B/LCH



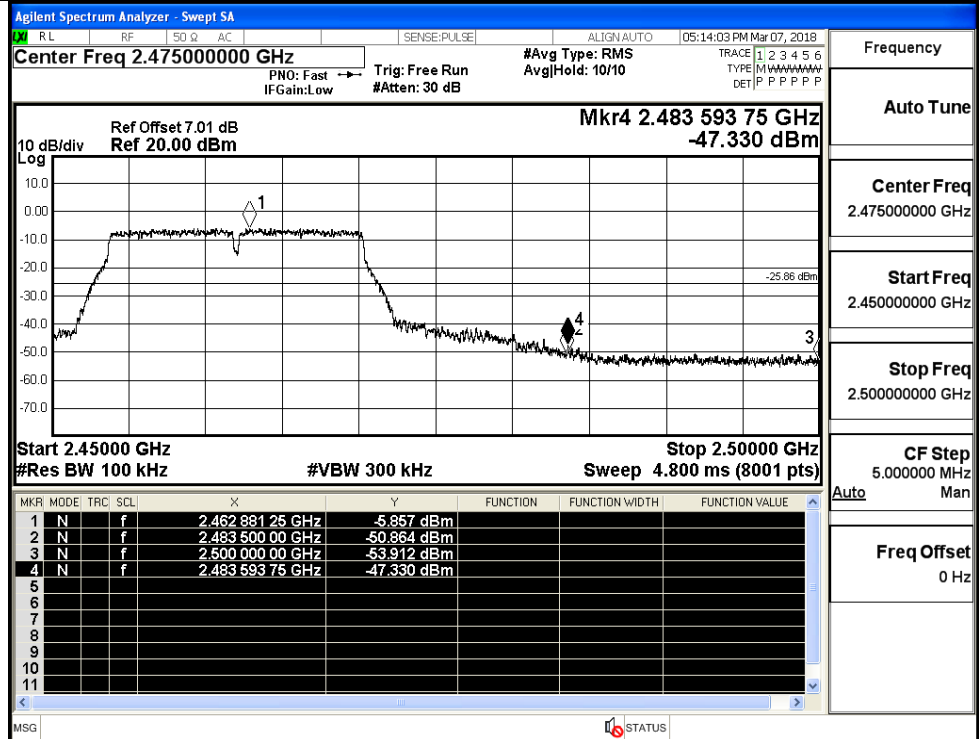
11B/HCH



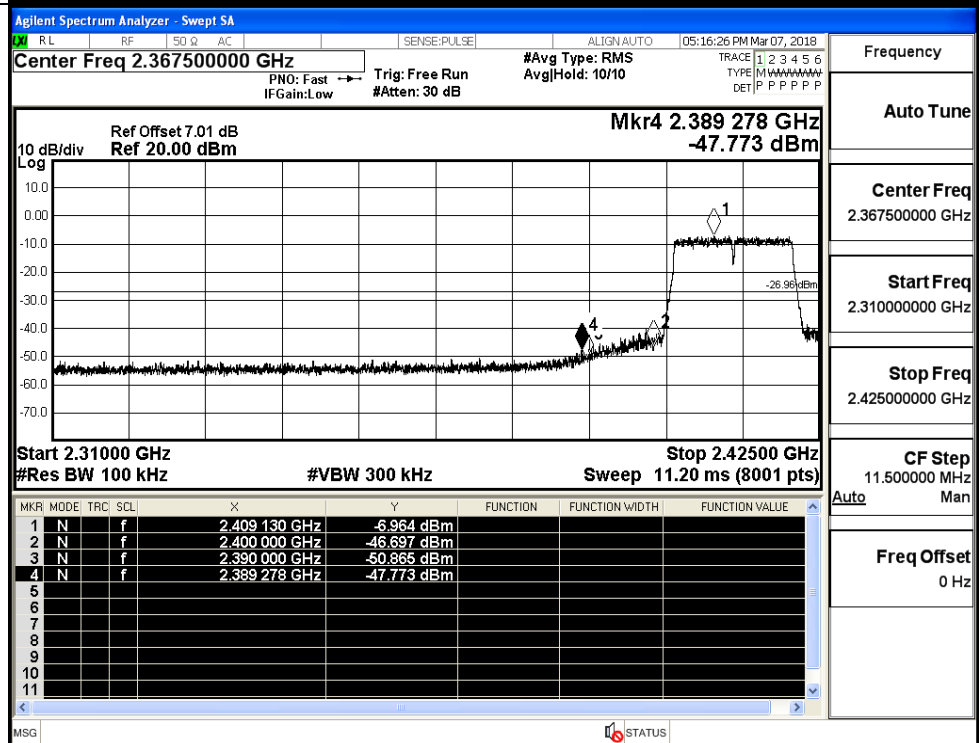
11G/LCH



11G/HCH



11N20SISO/LCH



11N20SISO/HCH

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Q AC SENSE:PULSE ALIGN AUTO 05:20:42 PM Mar 07, 2018

Center Freq 2.475000000 GHz

PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS AvgHld: 10/10

Ref Offset 7.01 dB Ref 20.00 dBm

Mkr4 2.483 512 50 GHz -47.042 dBm

10 dB/div Log

Start 2.45000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.50000 GHz Sweep 4.800 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.459 125 00 GHz	-6.089 dBm			
2	N	f		2.483 500 00 GHz	-47.272 dBm			
3	N	f		2.500 000 00 GHz	-53.078 dBm			
4	N	f		2.483 512 50 GHz	-47.042 dBm			

MSG STATUS

11N40SISO/LCH

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Q AC SENSE:PULSE ALIGN AUTO 05:23:54 PM Mar 07, 2018

Center Freq 2.377500000 GHz

PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS AvgHld: 10/10

Ref Offset 7.01 dB Ref 20.00 dBm

Mkr4 2.389 481 GHz -43.680 dBm

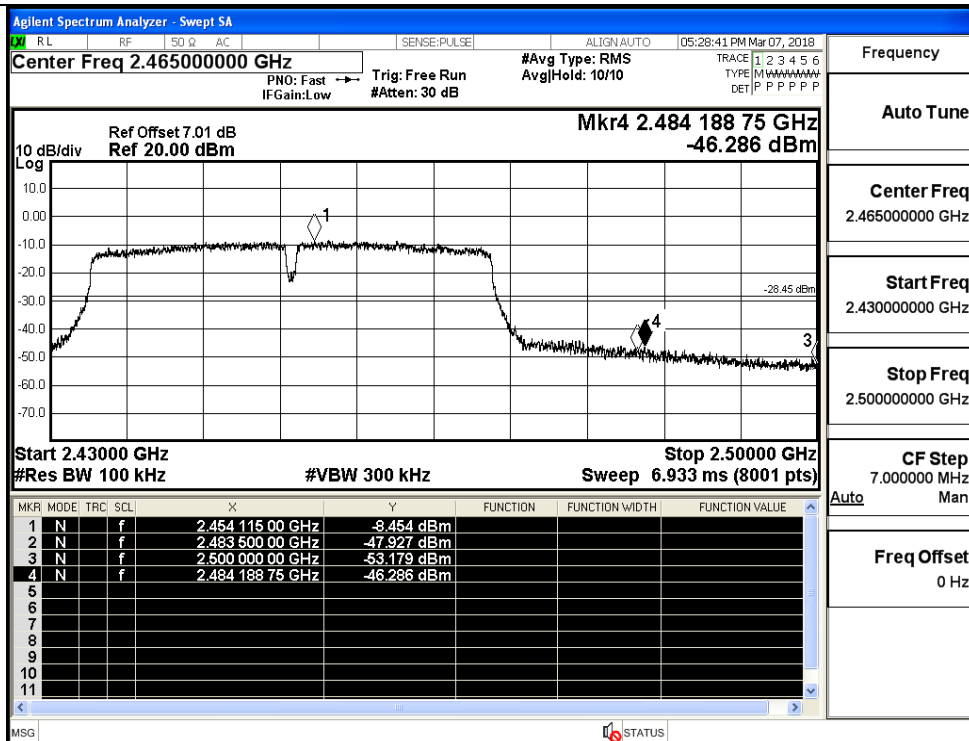
10 dB/div Log

Start 2.31000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.44500 GHz Sweep 13.33 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.425 476 GHz	-8.847 dBm			
2	N	f		2.400 000 GHz	-46.308 dBm			
3	N	f		2.390 000 GHz	-48.850 dBm			
4	N	f		2.389 481 GHz	-43.680 dBm			

MSG STATUS

11N40SISO/HCH



Frequency

Auto Tune

Center Freq
2.465000000 GHz

Start Freq
2.430000000 GHz

Stop Freq
2.500000000 GHz

CF Step
7.000000 MHz
Auto Man

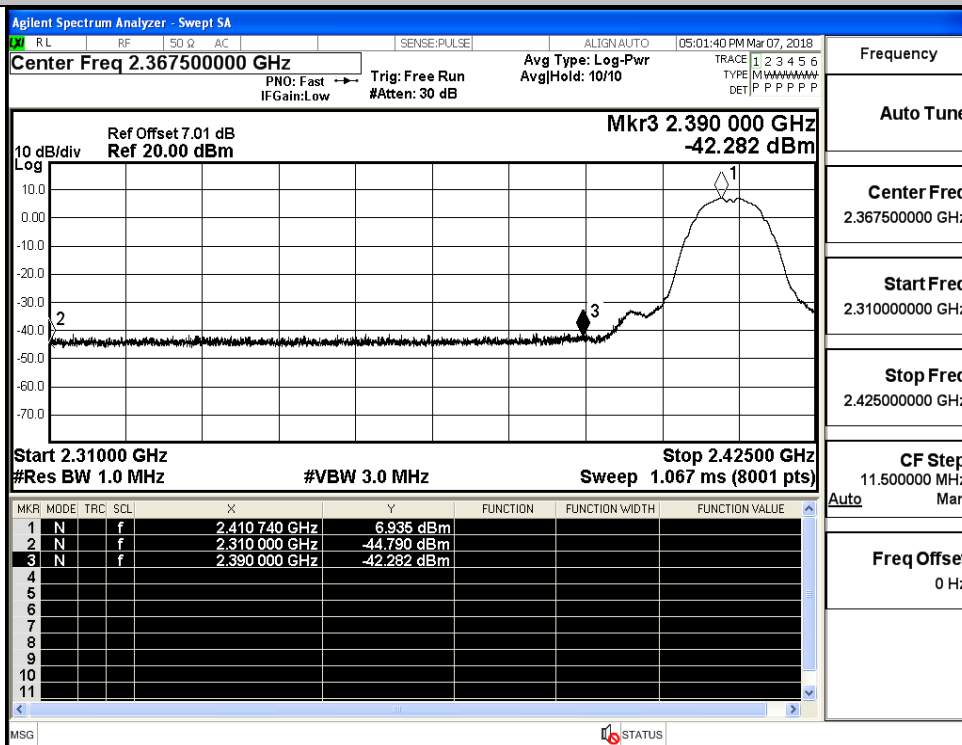
Freq Offset
0 Hz

7 Restrict-band band-edge measurements

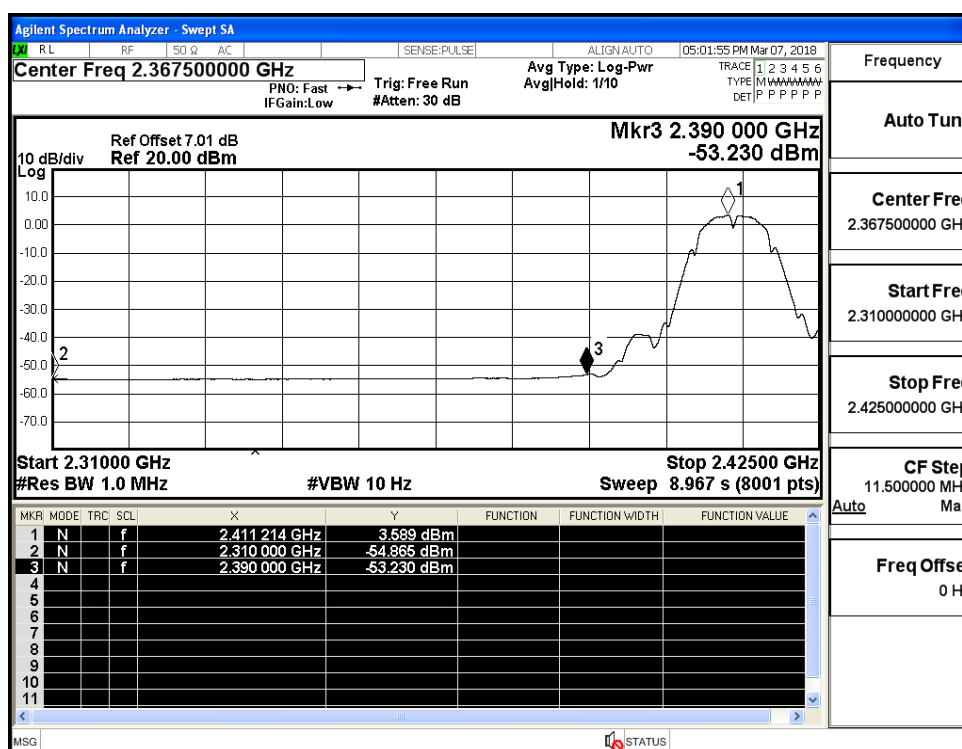
Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
11B	2412	Ant1	2310.0	-44.79	2.0	0	52.44	PEAK	74	PASS
	2412	Ant1	2310.0	-54.87	2.0	0	42.36	AV	54	PASS
	2412	Ant1	2390.0	-42.28	2.0	0	54.95	PEAK	74	PASS
	2412	Ant1	2390.0	-53.23	2.0	0	44.00	AV	54	PASS
	2462	Ant1	2483.5	-44.02	2.0	0	53.21	PEAK	74	PASS
	2462	Ant1	2483.5	-54.19	2.0	0	43.04	AV	54	PASS
	2462	Ant1	2500.0	-44.46	2.0	0	52.77	PEAK	74	PASS
	2462	Ant1	2500.0	-53.99	2.0	0	43.24	AV	54	PASS
11G	2412	Ant1	2310.0	-44.95	2.0	0	52.28	PEAK	74	PASS
	2412	Ant1	2310.0	-55.00	2.0	0	42.23	AV	54	PASS
	2412	Ant1	2390.0	-37.57	2.0	0	59.66	PEAK	74	PASS
	2412	Ant1	2390.0	-51.81	2.0	0	45.42	AV	54	PASS
	2462	Ant1	2483.5	-39.65	2.0	0	57.58	PEAK	74	PASS
	2462	Ant1	2483.5	-51.08	2.0	0	46.15	AV	54	PASS
	2462	Ant1	2500.0	-42.77	2.0	0	54.46	PEAK	74	PASS
	2462	Ant1	2500.0	-53.46	2.0	0	43.77	AV	54	PASS
11N20 SISO	2412	Ant1	2310.0	-44.83	2.0	0	52.40	PEAK	74	PASS
	2412	Ant1	2310.0	-54.99	2.0	0	42.24	AV	54	PASS
	2412	Ant1	2390.0	-37.18	2.0	0	60.05	PEAK	74	PASS
	2412	Ant1	2390.0	-51.02	2.0	0	46.21	AV	54	PASS
	2462	Ant1	2483.5	-35.70	2.0	0	61.53	PEAK	74	PASS
	2462	Ant1	2483.5	-50.75	2.0	0	46.48	AV	54	PASS
	2462	Ant1	2500.0	-42.73	2.0	0	54.50	PEAK	74	PASS
	2462	Ant1	2500.0	-53.46	2.0	0	43.77	AV	54	PASS
11N40 SISO	2422	Ant1	2310.0	-44.20	2.0	0	52.28	PEAK	74	PASS
	2422	Ant1	2310.0	-55.06	2.0	0	42.23	AV	54	PASS

	2422	Ant1	2390.0	-37.79	2.0	0	59.66	PEAK	74	PASS
	2422	Ant1	2390.0	-48.45	2.0	0	45.42	AV	54	PASS
	2452	Ant1	2483.5	-38.72	2.0	0	57.58	PEAK	74	PASS
	2452	Ant1	2483.5	-48.88	2.0	0	46.15	AV	54	PASS
	2452	Ant1	2500.0	-42.41	2.0	0	54.46	PEAK	74	PASS
	2452	Ant1	2500.0	-53.21	2.0	0	43.77	AV	54	PASS

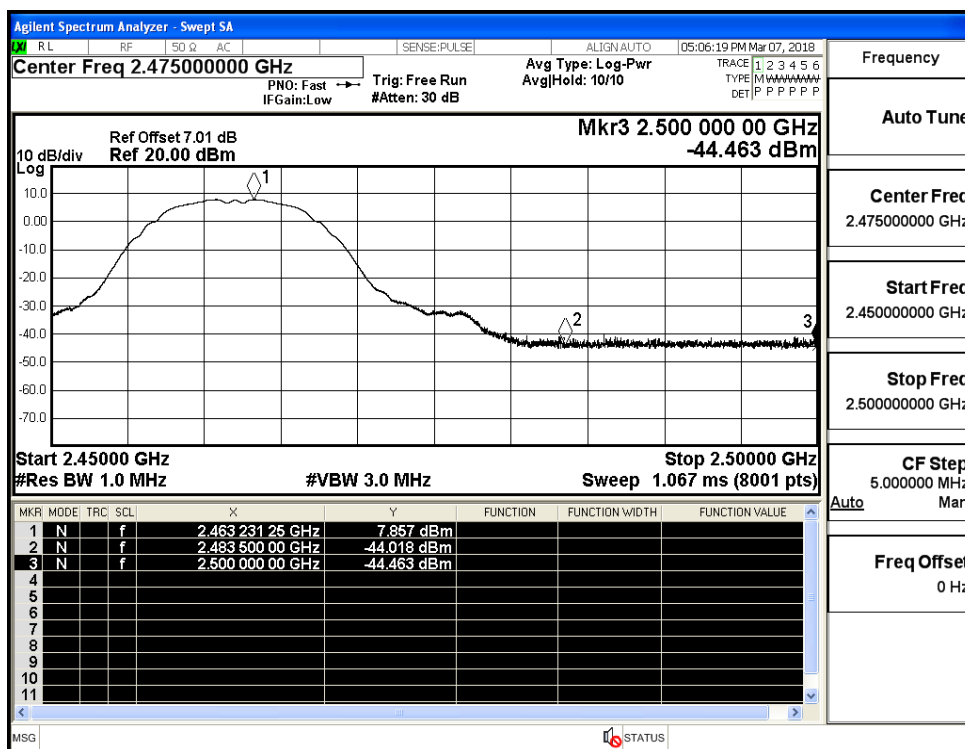
Restrict-band band-edge measurements_11B_2412_Ant1_PEAK



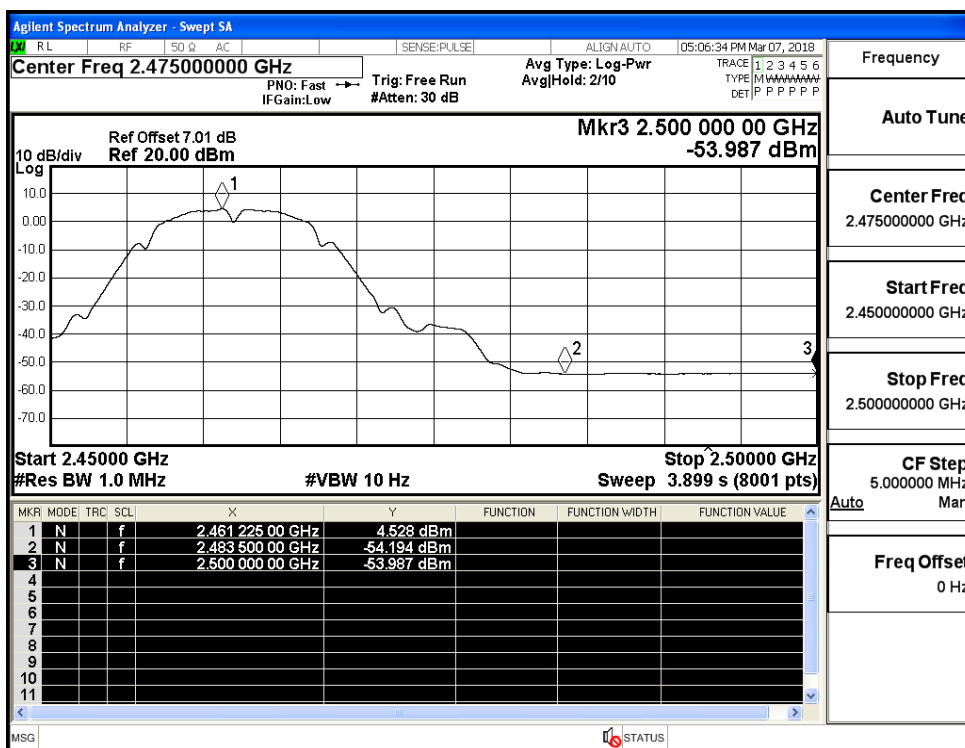
Restrict-band band-edge measurements_11B_2412_Ant1_AV



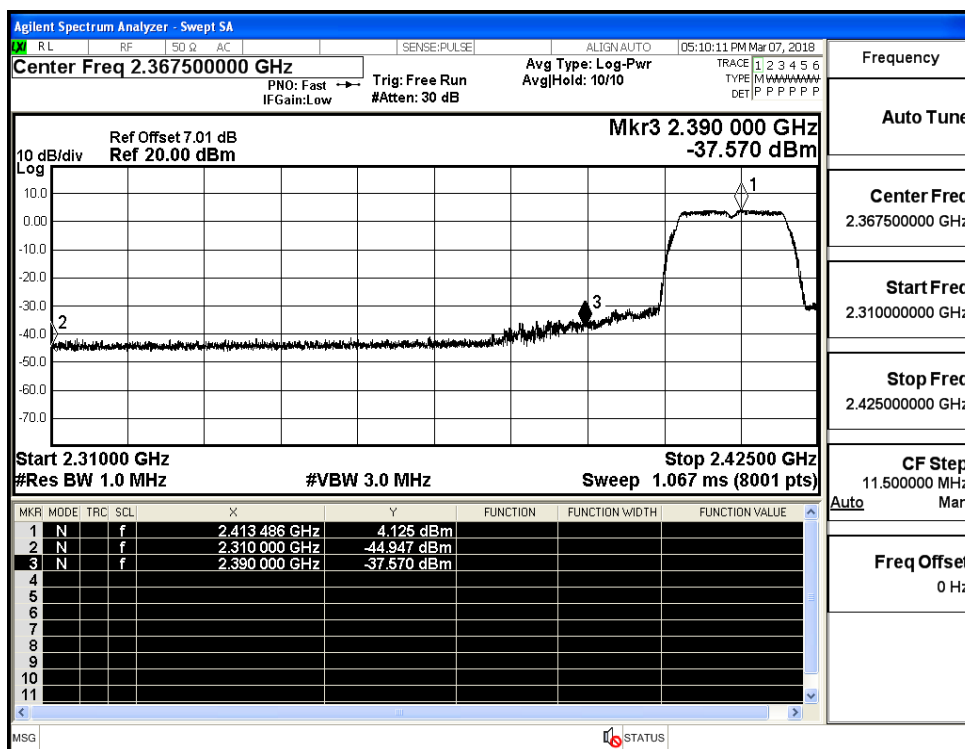
Restrict-band band-edge measurements_11B_2462_Ant1_PEAK



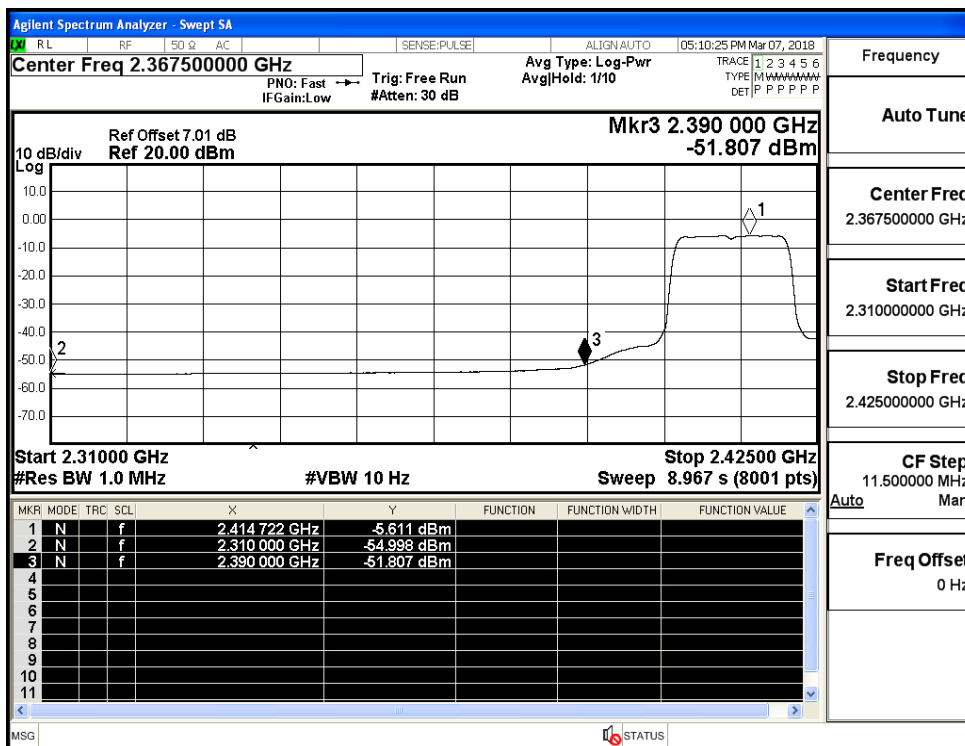
Restrict-band band-edge measurements_11B_2462_Ant1_AV



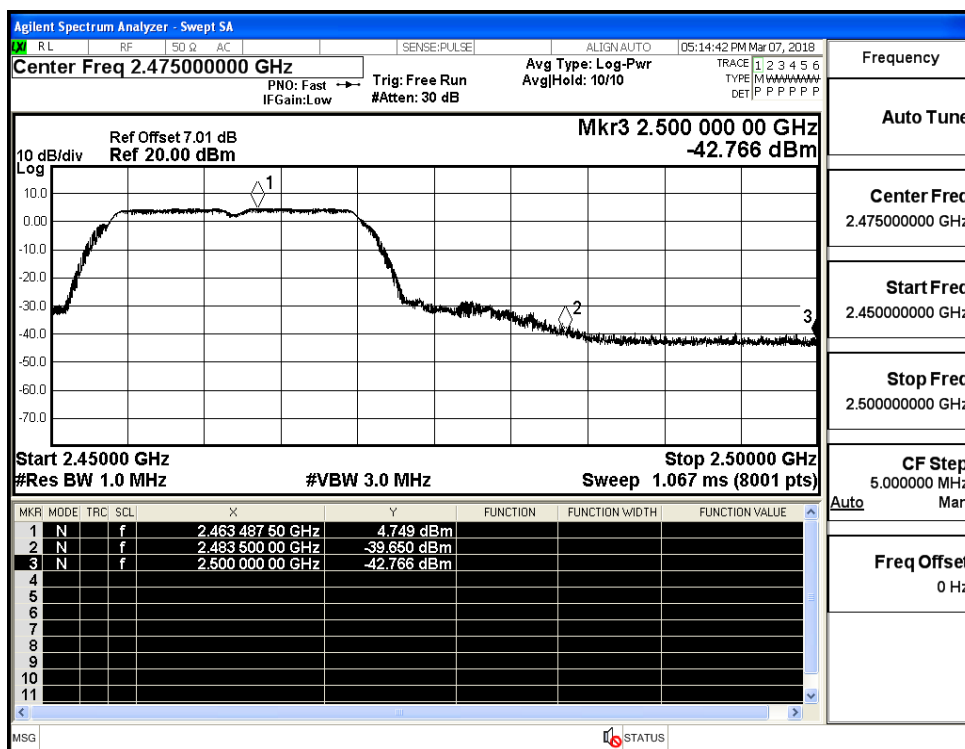
Restrict-band band-edge measurements_11G_2412_Ant1_PEAK



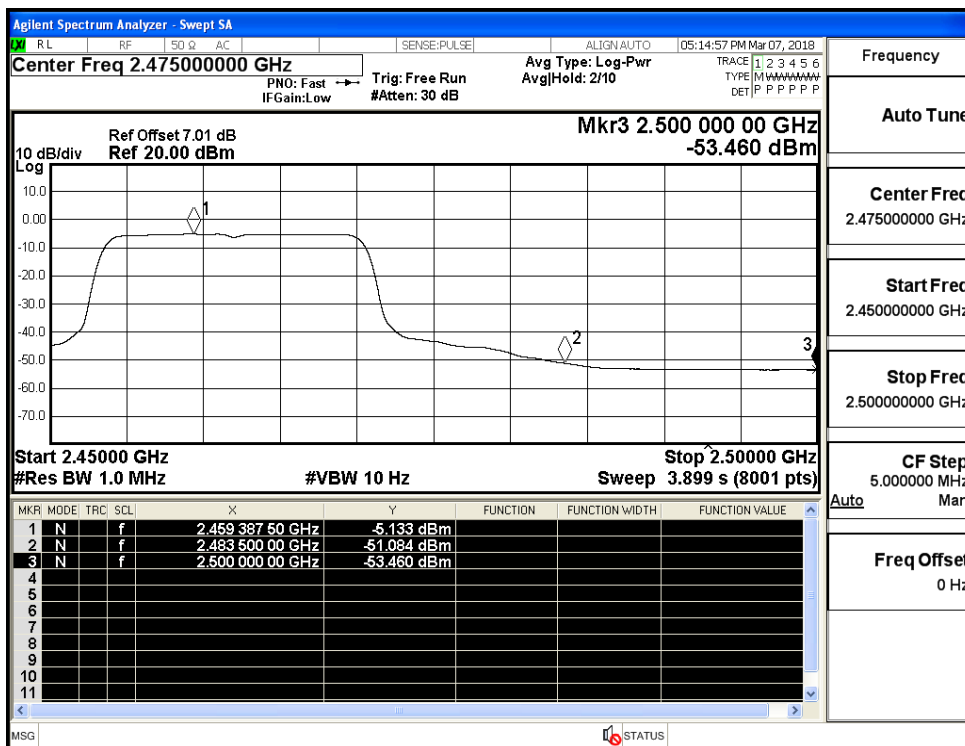
Restrict-band band-edge measurements_11G_2412_Ant1_AV



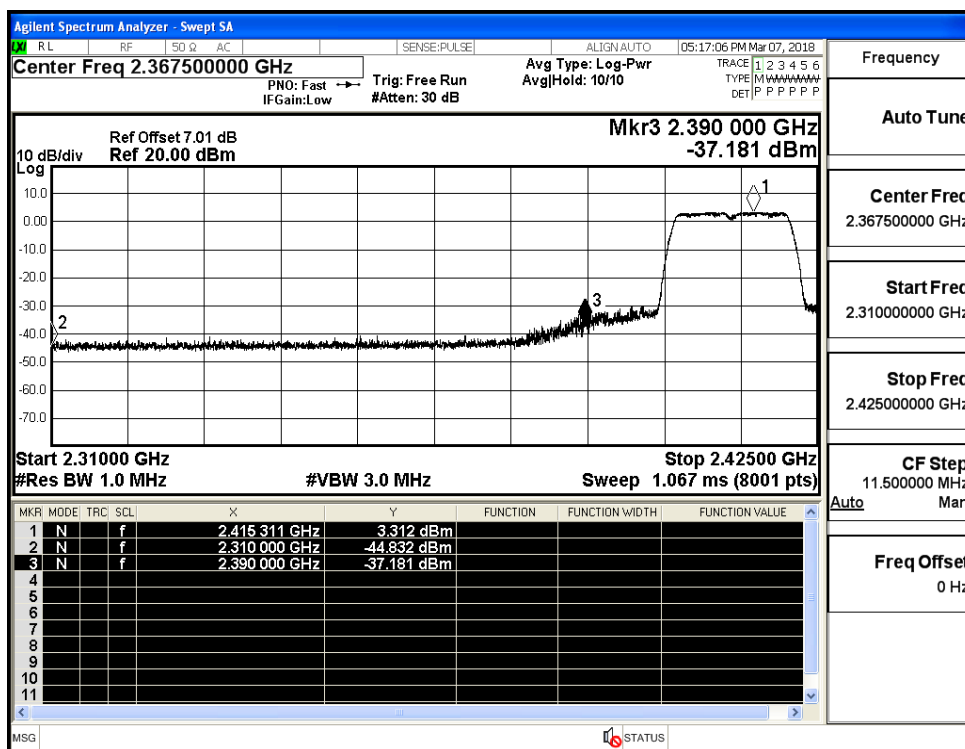
Restrict-band band-edge measurements_11G_2462_Ant1_PEAK



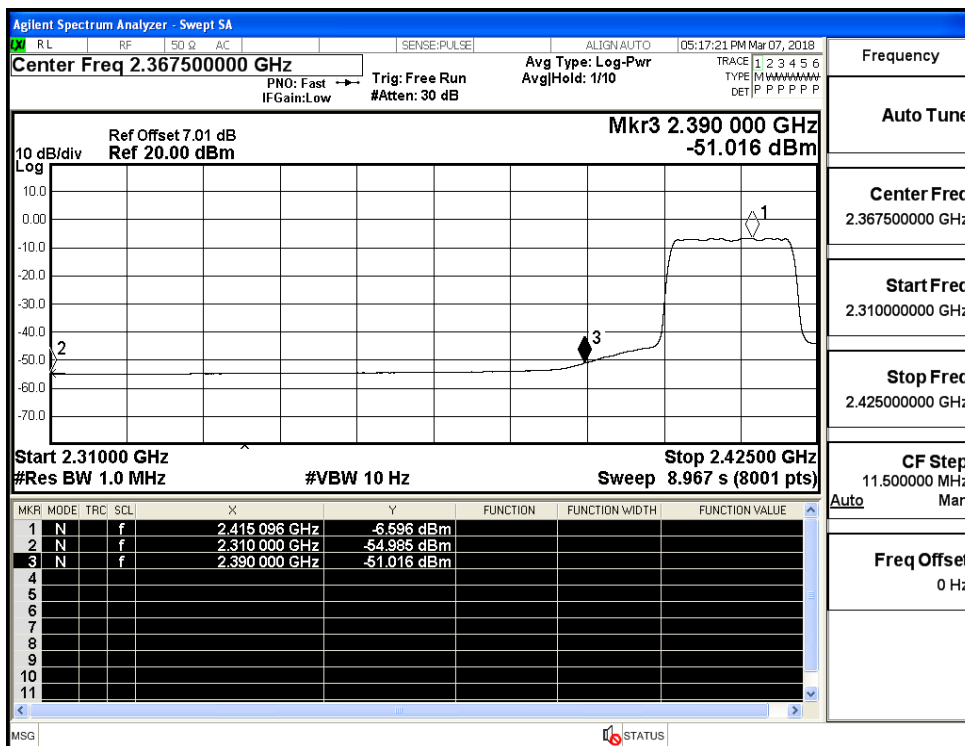
Restrict-band band-edge measurements_11G_2462_Ant1_AV



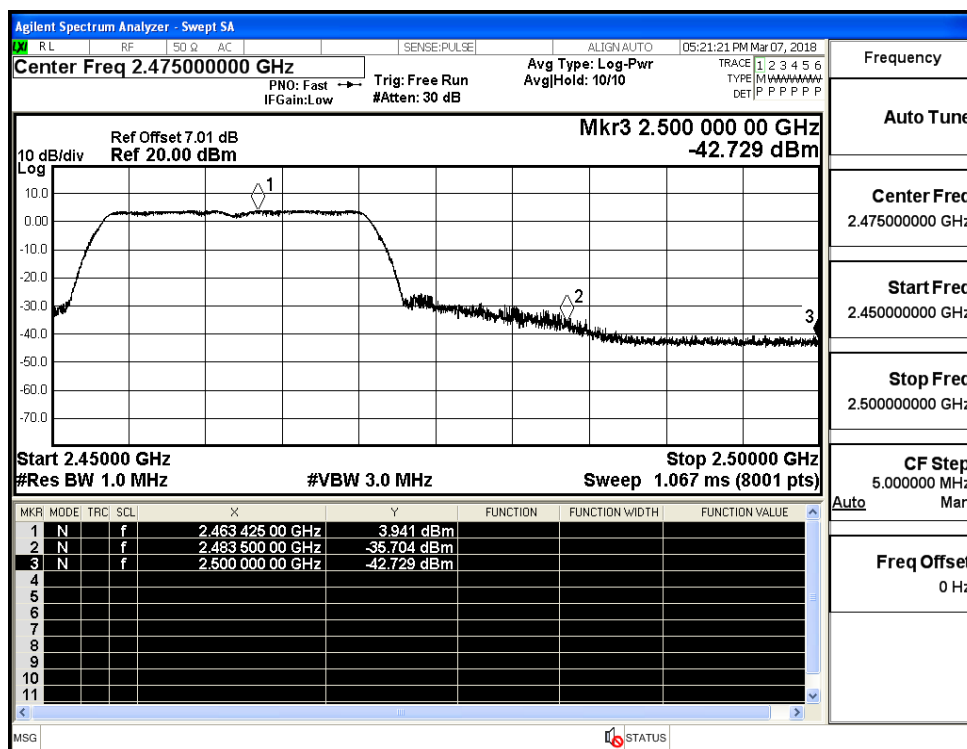
Restrict-band band-edge measurements_11N20SISO_2412_Ant1_PEAK



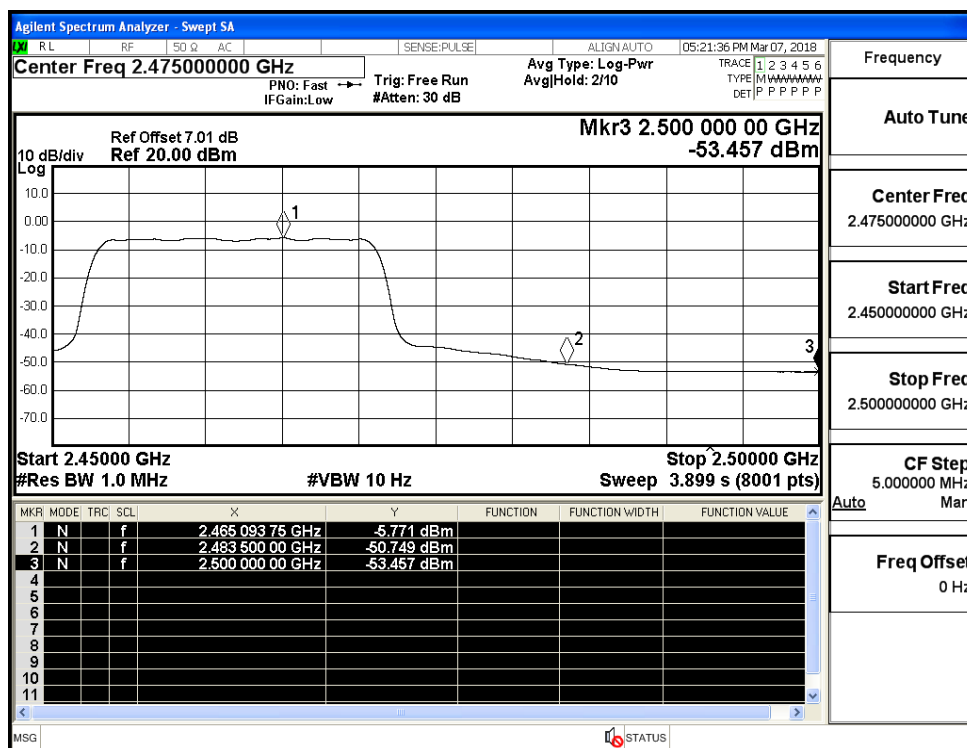
Restrict-band band-edge measurements_11N20SISO_2412_Ant1_AV



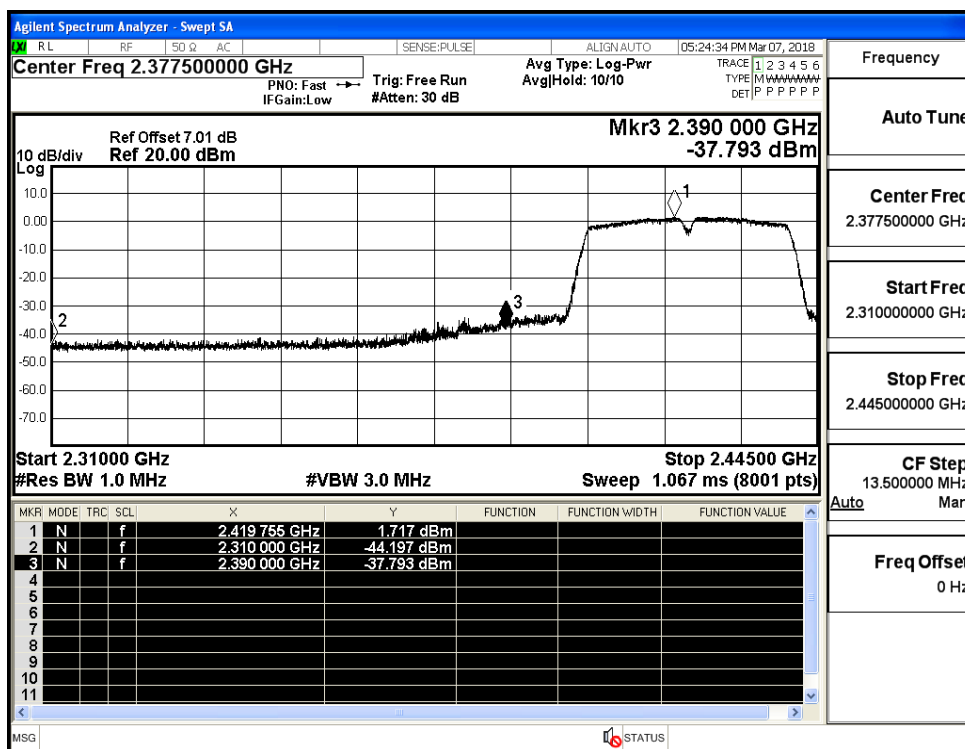
Restrict-band band-edge measurements_11N20SISO_2462_Ant1_PEAK



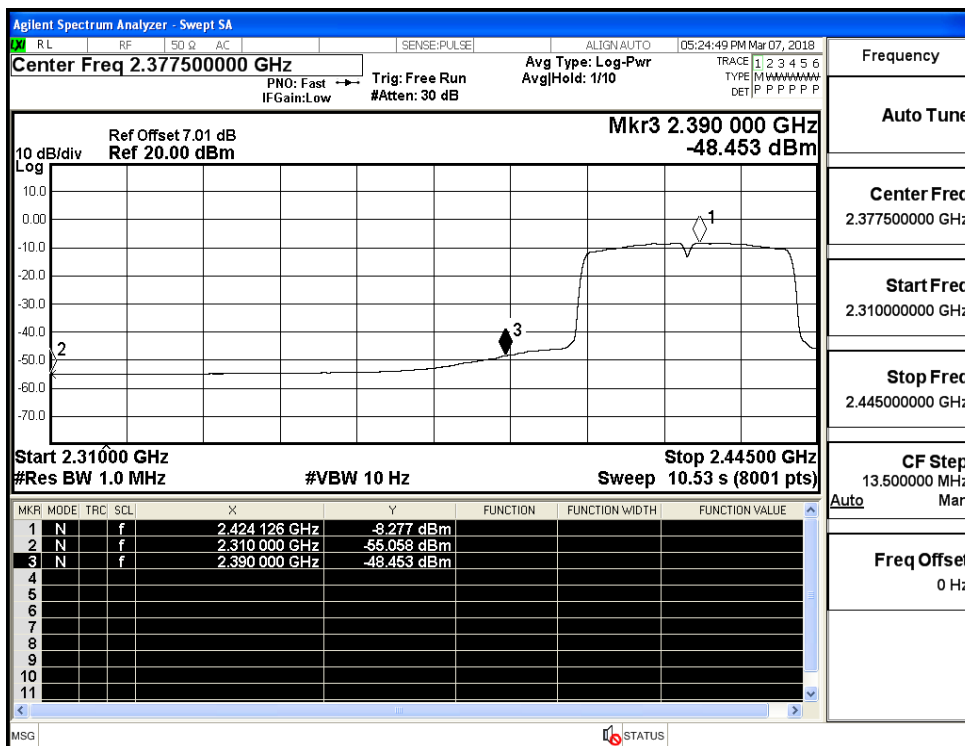
Restrict-band band-edge measurements_11N20SISO_2462_Ant1_AV



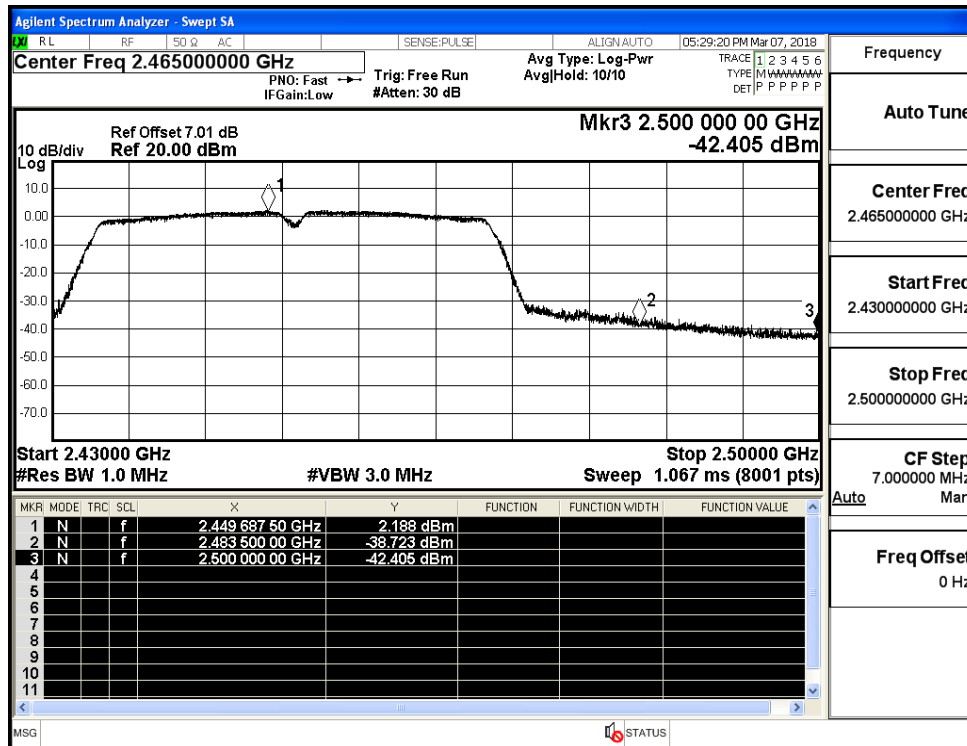
Restrict-band band-edge measurements_11N40SISO_2422_Ant1_PEAK



Restrict-band band-edge measurements_11N40SISO_2422_Ant1_AV



Restrict-band band-edge measurements_11N40SISO_2452_Ant1_PEAK



Restrict-band band-edge measurements_11N40SISO_2452_Ant1_AV

