

Appendix A

RF Test Data for 2.4G WIFI (Conducted Measurement)

Product Name: Cellular Wi-Fi Router

Trade Mark:  *Connecting things*
Hongdian
 Test Model: H8959-4GSPT

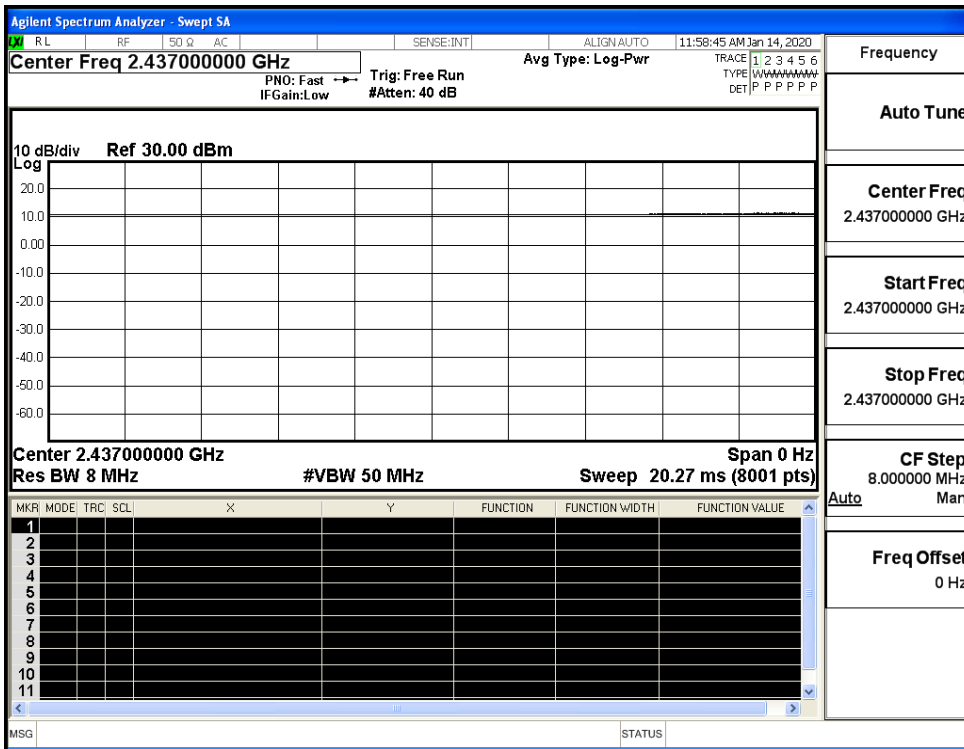
Environmental Conditions

Temperature:	22.9 ° C
Relative Humidity:	54.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Alisa Huang
Supervised by:	Tom.Liu

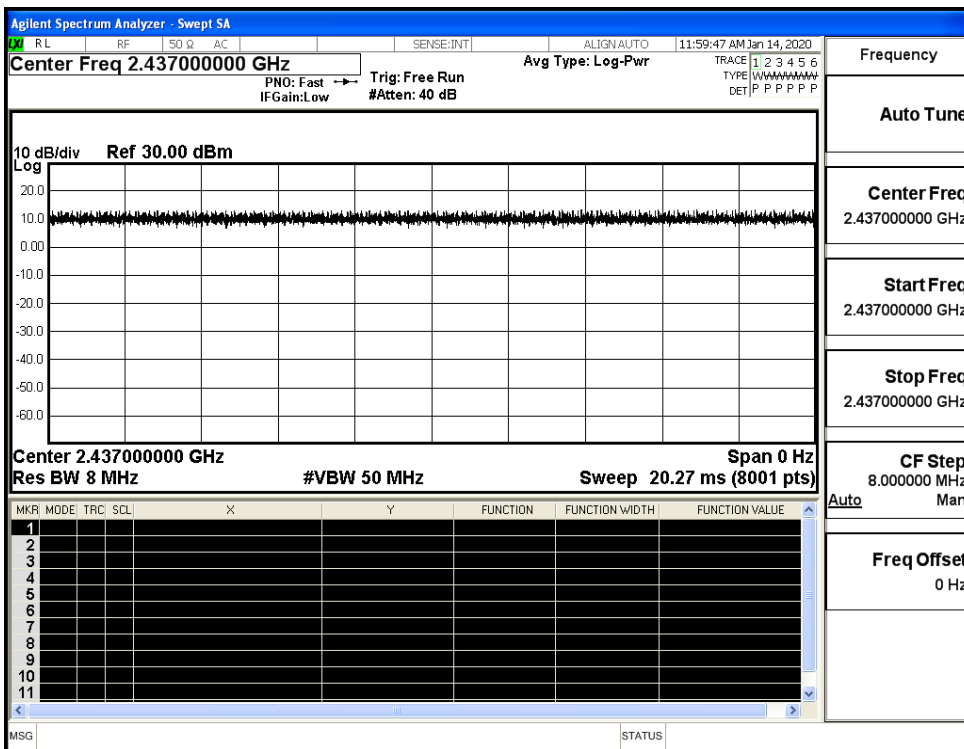
A.1 Duty Cycle

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

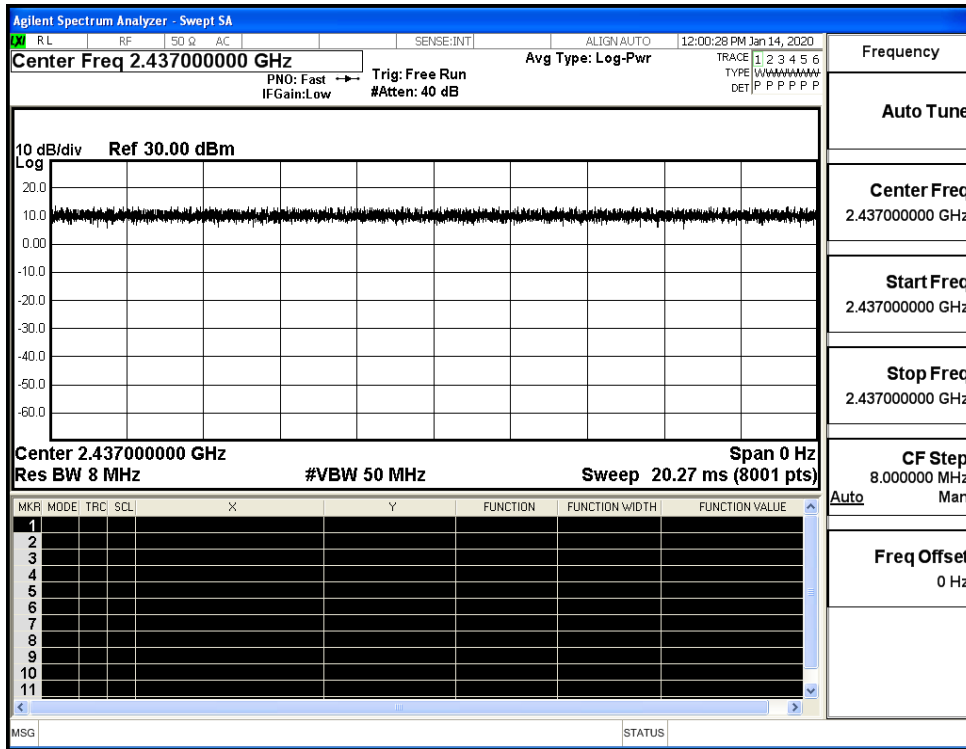
Duty Cycle_11B_2437_Ant1



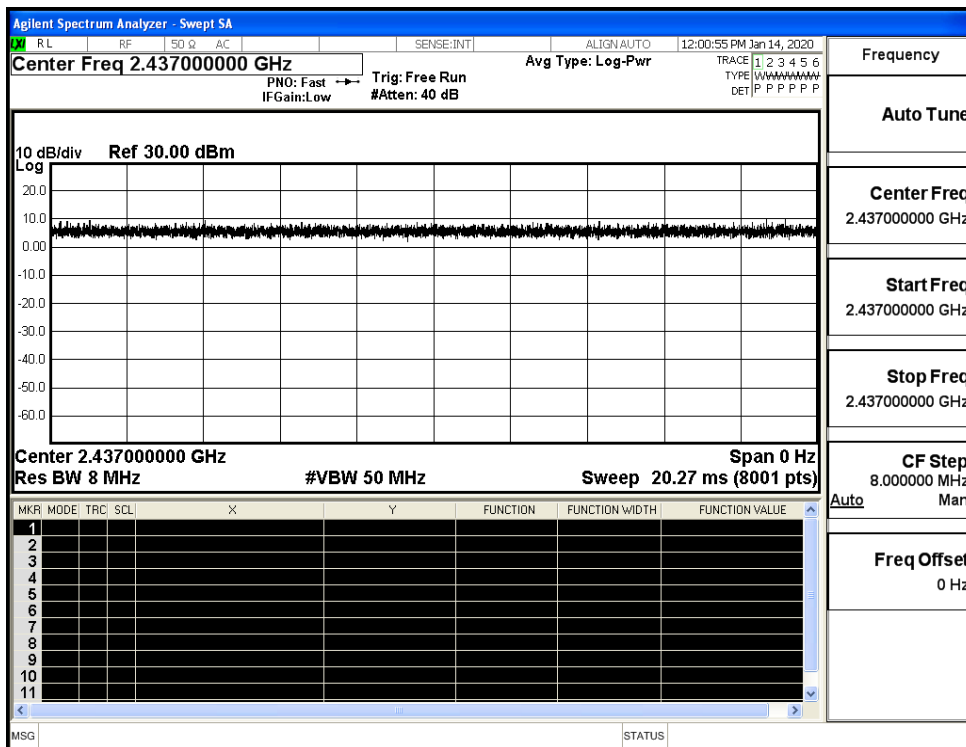
Duty Cycle_11G_2437_Ant1



Duty Cycle_11N20SISO_2437_Ant1



Duty Cycle_11N40SISO_2437_Ant1

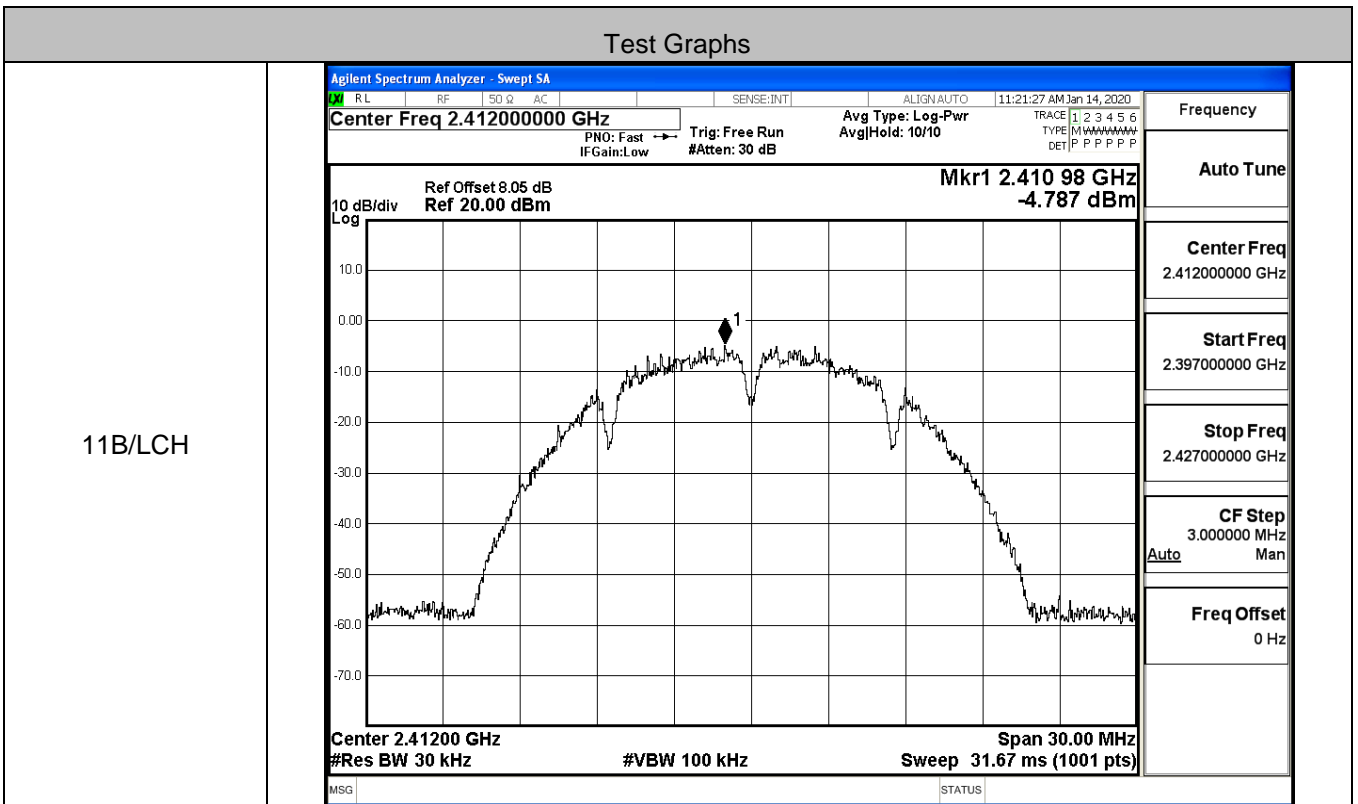


A.2 Maximum Conducted Output Power

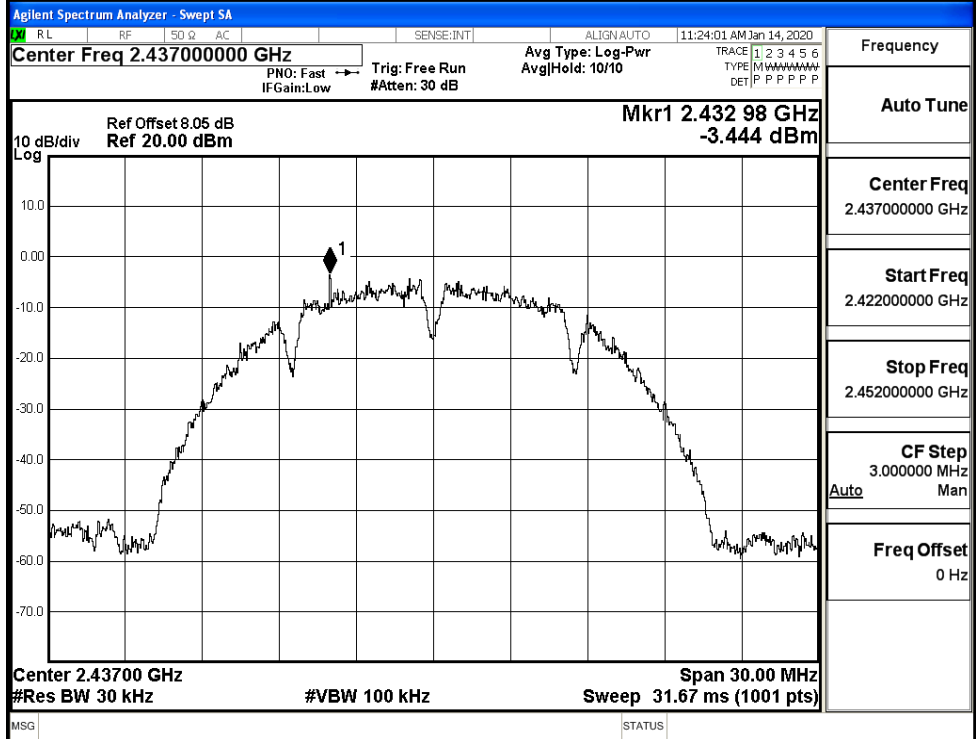
Mode	Channel	Meas.Level [dBm]	Limit [dBm]	Verdict
11B	LCH	11.06	30	PASS
	MCH	12.08	30	PASS
	HCH	11.31	30	PASS
11G	LCH	11.12	30	PASS
	MCH	11.66	30	PASS
	HCH	11.07	30	PASS
11N20SISO	LCH	11.21	30	PASS
	MCH	11.38	30	PASS
	HCH	10.95	30	PASS
11N40SISO	LCH	11.72	30	PASS
	MCH	11.57	30	PASS
	HCH	11.82	30	PASS

A.3 Maximum Power Spectral Density

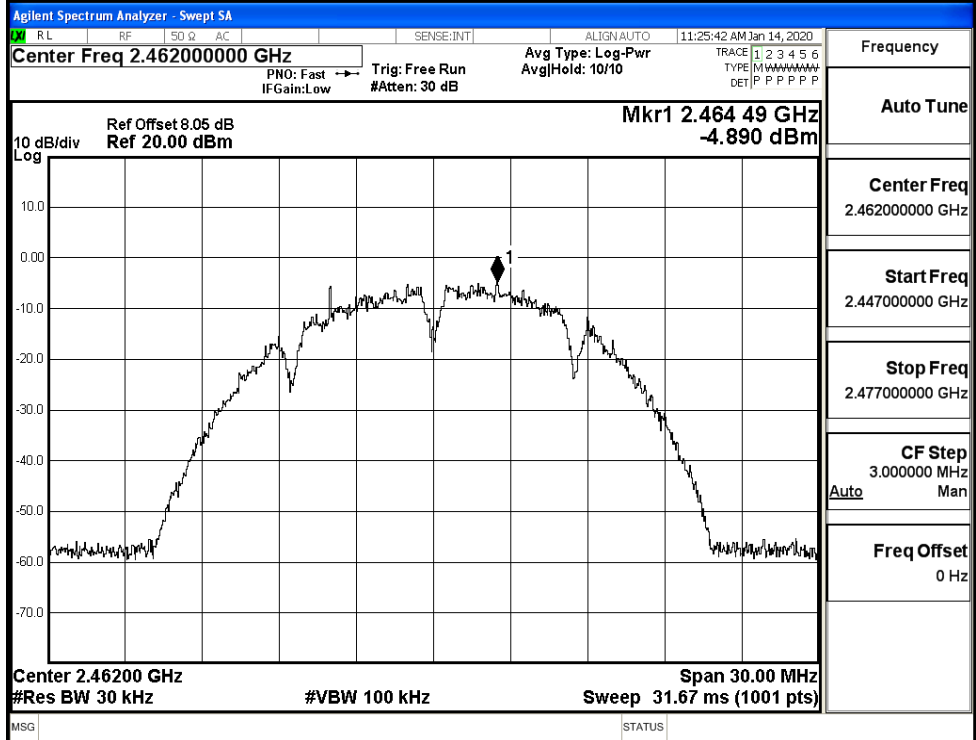
Mode	Channel	Meas.Level [dBm/30KHz]	Convert Factor	Result [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
11B	LCH	-4.787	-10	-14.787	8	PASS
	MCH	-3.444	-10	-13.444	8	PASS
	HCH	-4.890	-10	-14.890	8	PASS
11G	LCH	-11.942	-10	-21.942	8	PASS
	MCH	-12.203	-10	-22.203	8	PASS
	HCH	-11.826	-10	-21.826	8	PASS
11N20SISO	LCH	-11.218	-10	-21.218	8	PASS
	MCH	-12.947	-10	-22.947	8	PASS
	HCH	-12.094	-10	-22.094	8	PASS
11N40SISO	LCH	-13.904	-10	-23.904	8	PASS
	MCH	-14.626	-10	-24.626	8	PASS
	HCH	-10.365	-10	-20.365	8	PASS



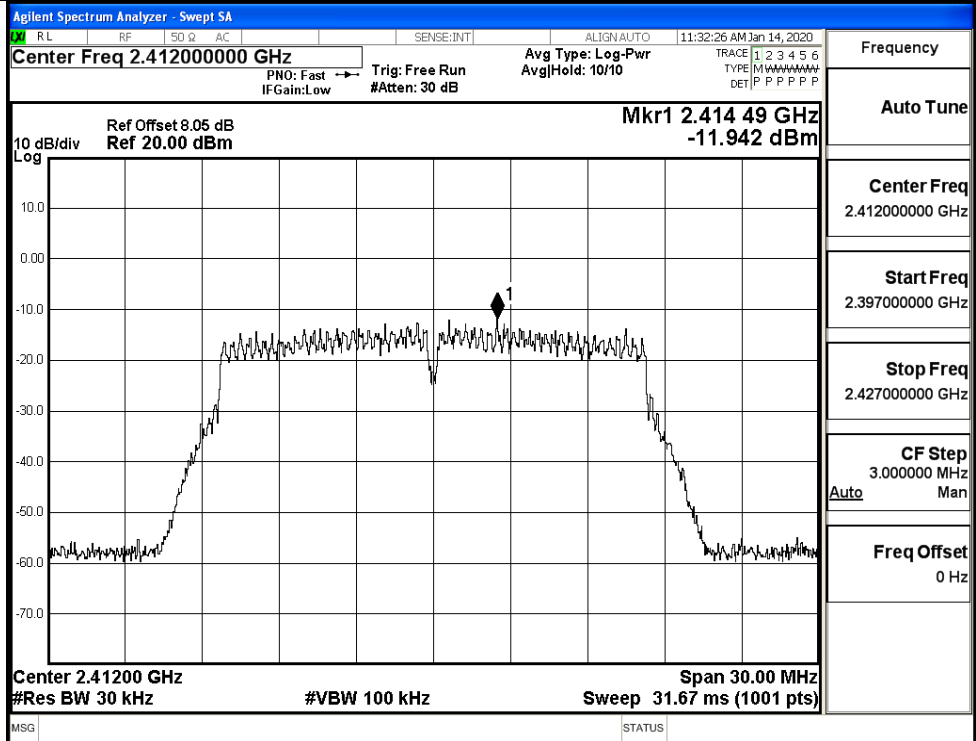
11B/MCH



11B/HCH

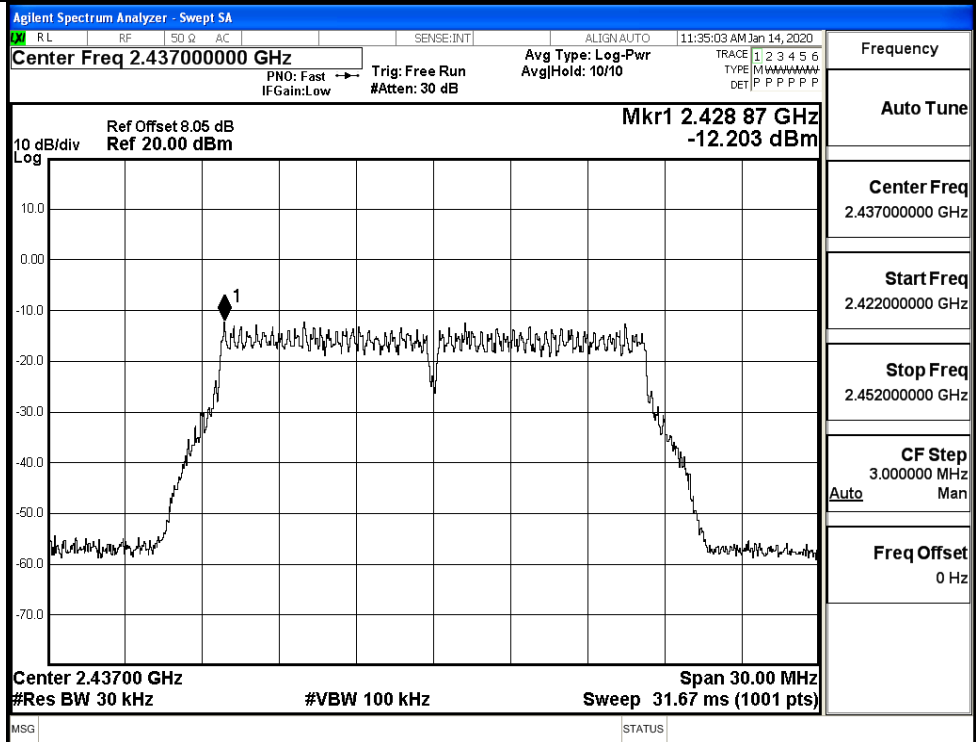


11G/LCH



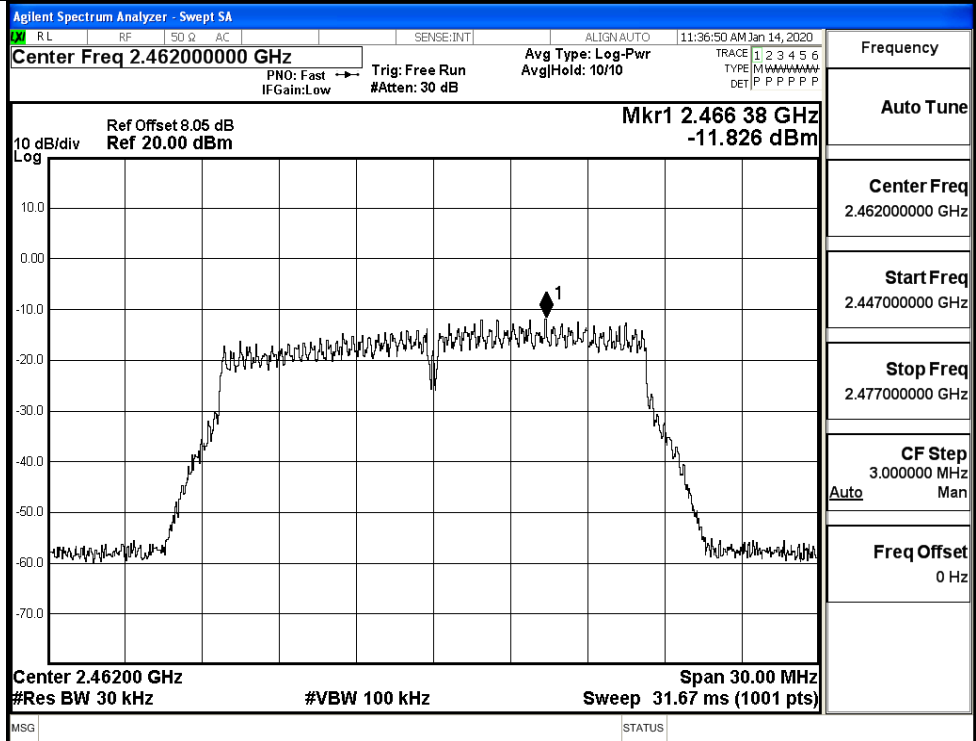
Frequency	2.41200000 GHz
Auto Tune	
Center Freq	2.41200000 GHz
Start Freq	2.397000000 GHz
Stop Freq	2.427000000 GHz
CF Step	3.000000 MHz
Auto	Man
Freq Offset	0 Hz

11G/MCH

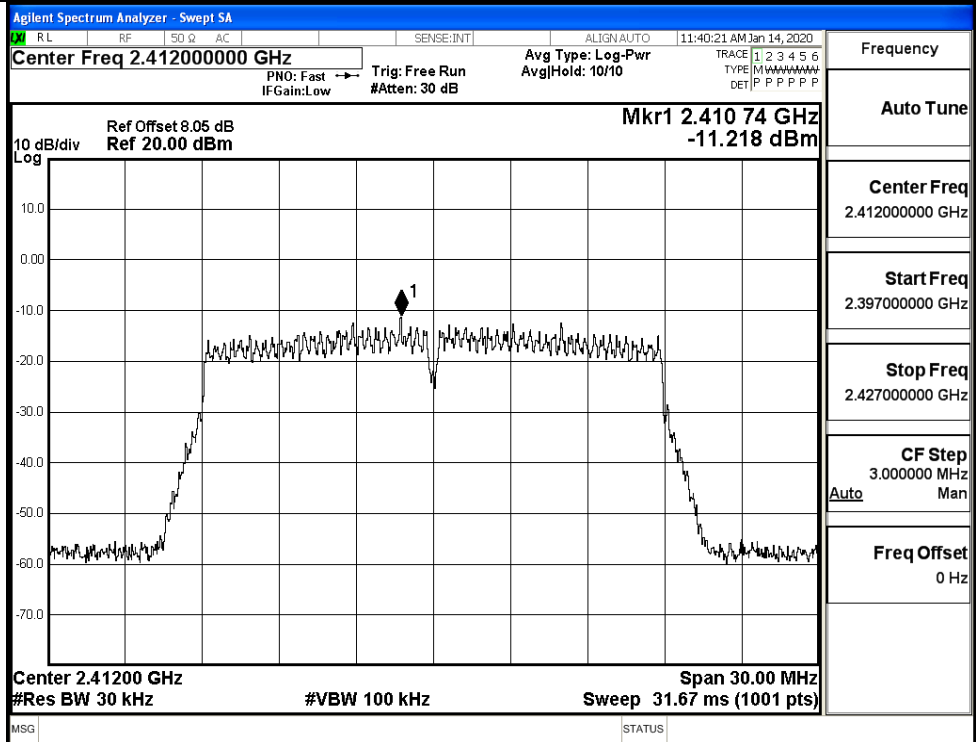


Frequency	2.43700000 GHz
Auto Tune	
Center Freq	2.43700000 GHz
Start Freq	2.422000000 GHz
Stop Freq	2.452000000 GHz
CF Step	3.000000 MHz
Auto	Man
Freq Offset	0 Hz

11G/HCH

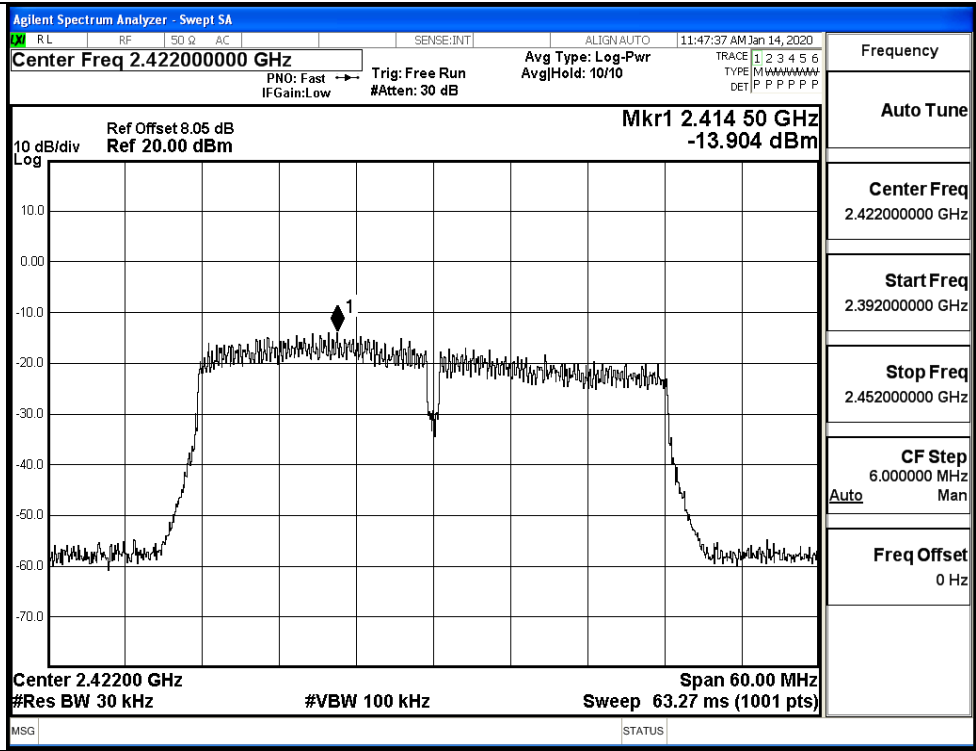


11N20SISO/LCH

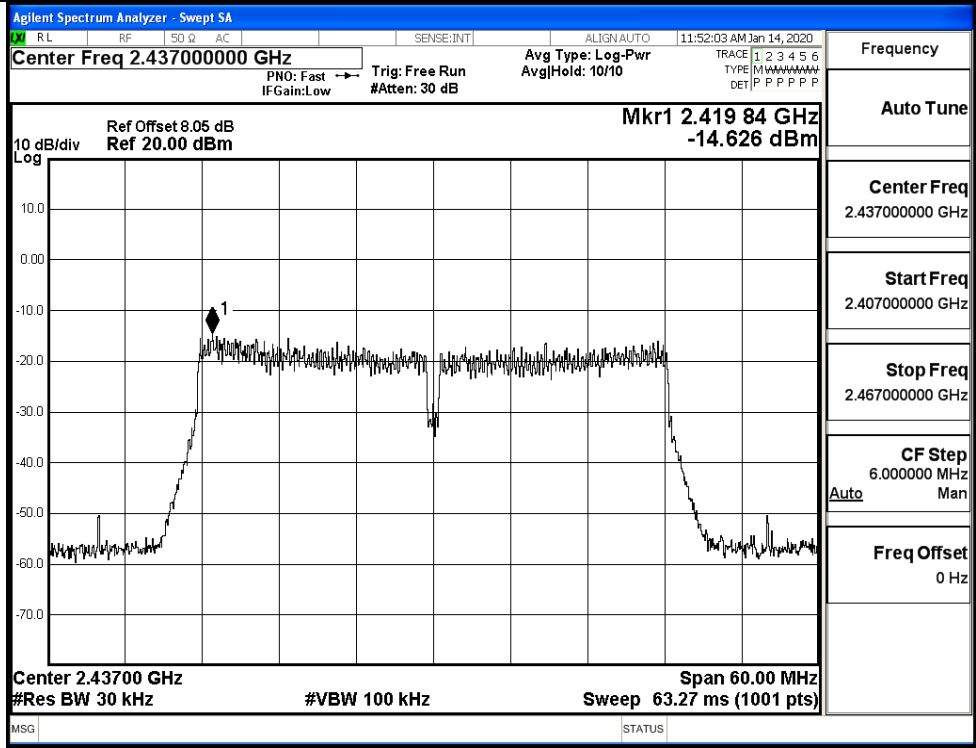


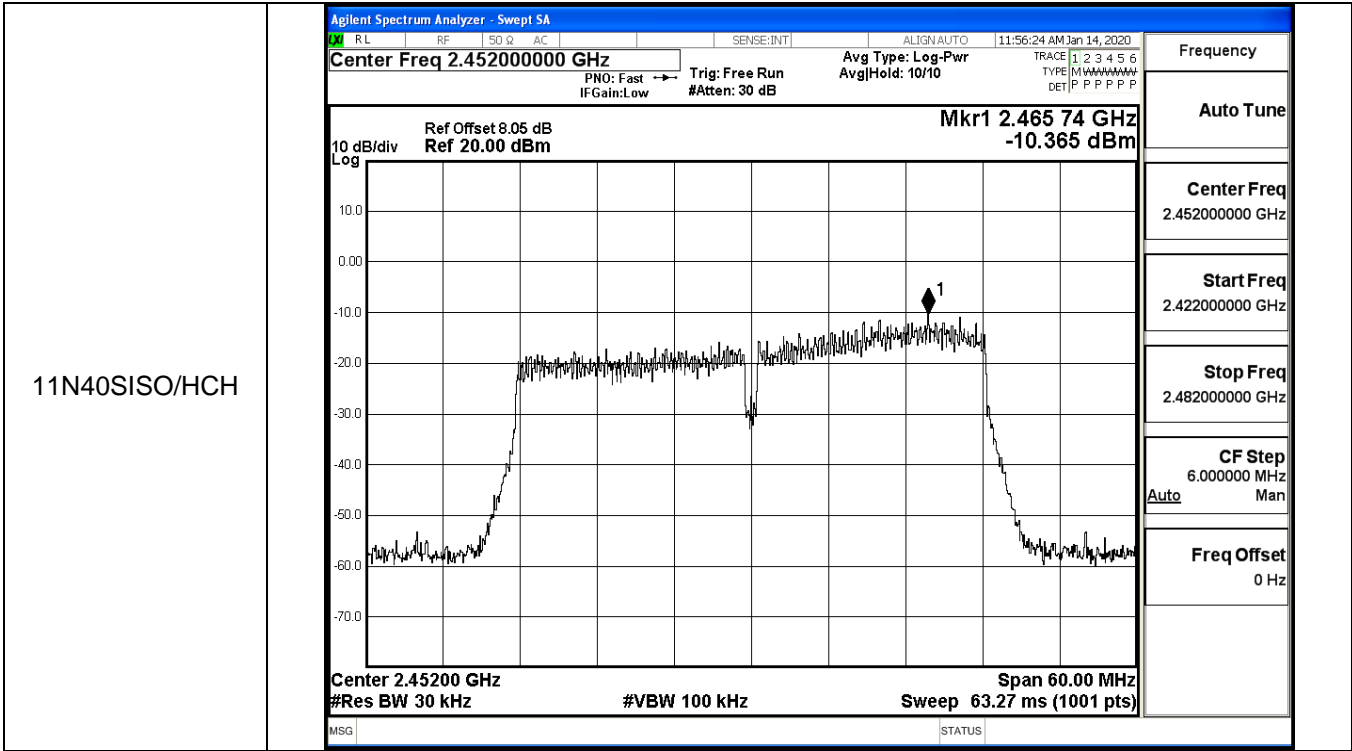
<p>11N20SISO/MCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.43700000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>Mkr1 2.428 24 GHz -12.947 dBm</p> <p>Center 2.43700 GHz #Res BW 30 kHz #VBW 100 kHz Span 30.00 MHz Sweep 31.67 ms (1001 pts)</p>	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.437000000 GHz</p> <p>Start Freq 2.422000000 GHz</p> <p>Stop Freq 2.452000000 GHz</p> <p>CF Step 3.000000 MHz Auto Man</p> <p>Freq Offset 0 Hz</p>
<p>11N20SISO/HCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.46200000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>Mkr1 2.464 49 GHz -12.094 dBm</p> <p>Center 2.46200 GHz #Res BW 30 kHz #VBW 100 kHz Span 30.00 MHz Sweep 31.67 ms (1001 pts)</p>	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.462000000 GHz</p> <p>Start Freq 2.447000000 GHz</p> <p>Stop Freq 2.477000000 GHz</p> <p>CF Step 3.000000 MHz Auto Man</p> <p>Freq Offset 0 Hz</p>

11N40SISO/LCH



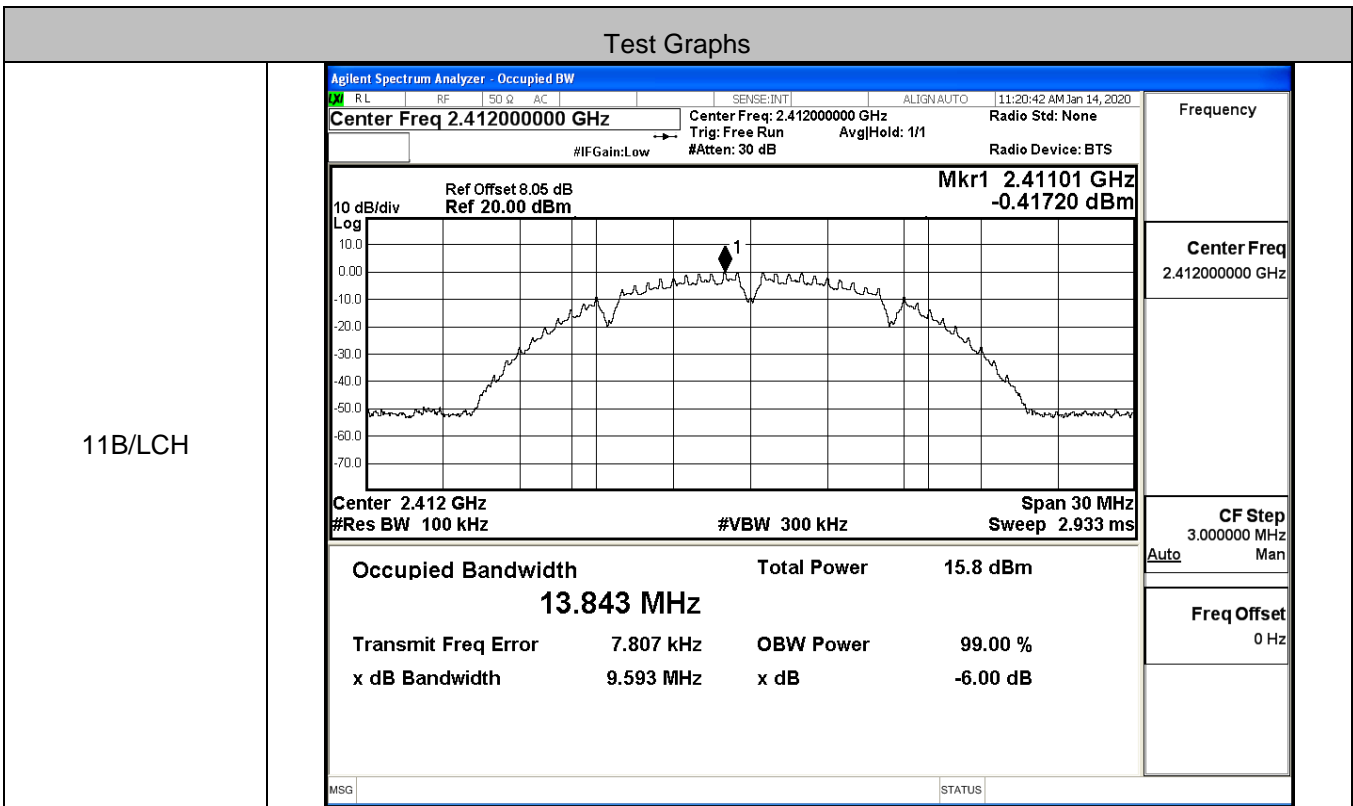
11N40SISO/MCH



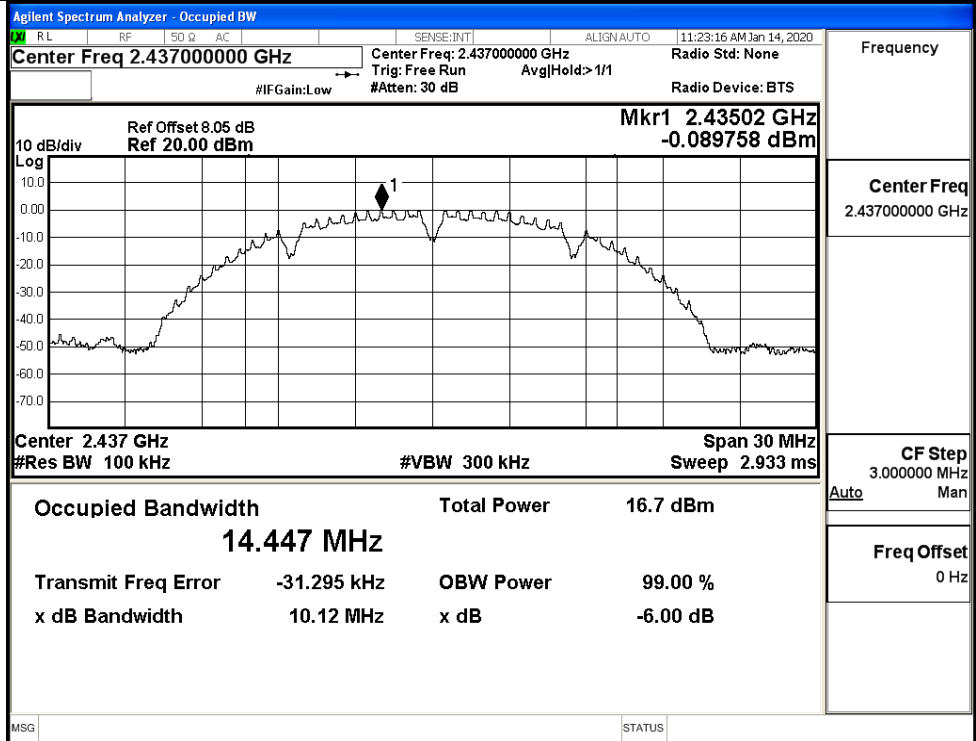


A.4 6dB Bandwidth

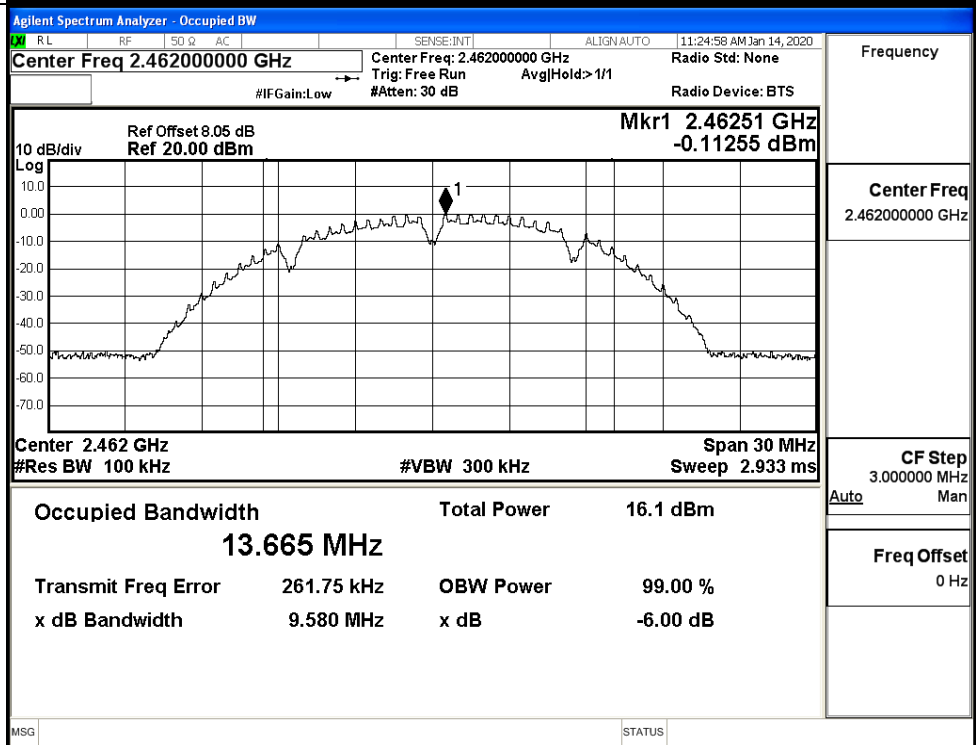
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
11B	LCH	9.593	≥0.5	PASS
	MCH	10.12	≥0.5	PASS
	HCH	9.580	≥0.5	PASS
11G	LCH	15.60	≥0.5	PASS
	MCH	16.51	≥0.5	PASS
	HCH	15.74	≥0.5	PASS
11N20SISO	LCH	15.67	≥0.5	PASS
	MCH	17.66	≥0.5	PASS
	HCH	16.28	≥0.5	PASS
11N40SISO	LCH	35.12	≥0.5	PASS
	MCH	36.17	≥0.5	PASS
	HCH	24.22	≥0.5	PASS



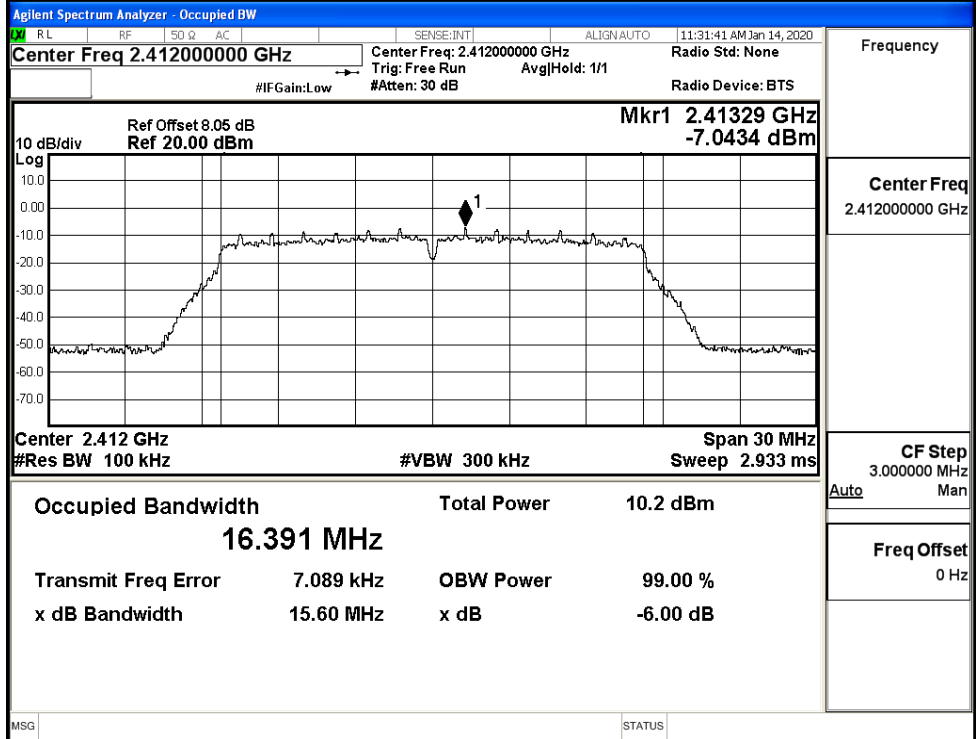
11B/MCH



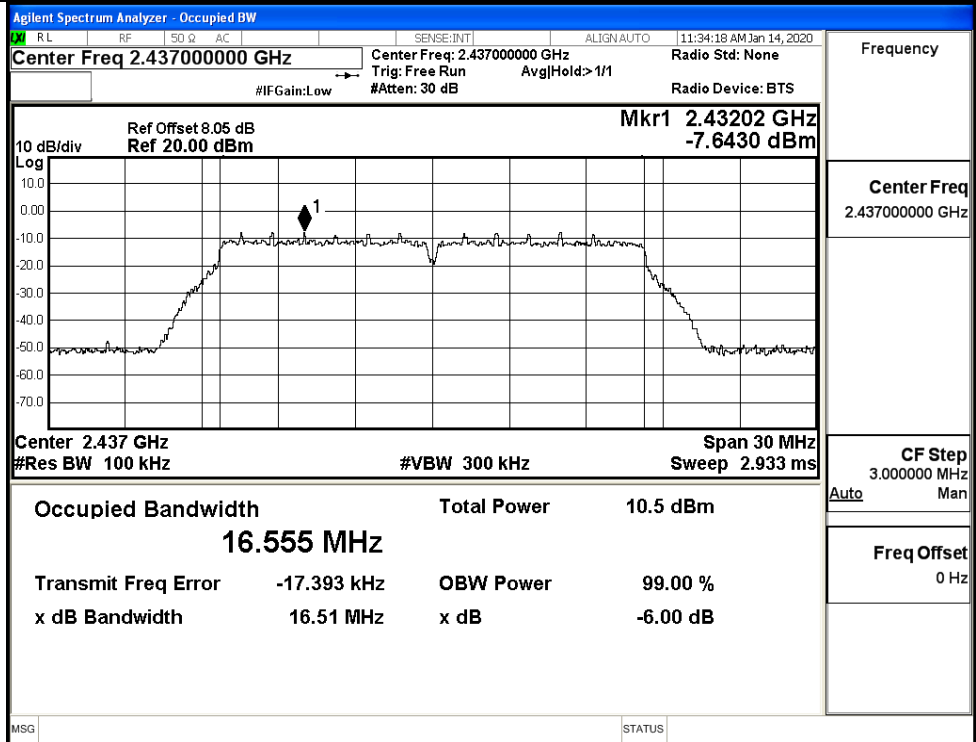
11B/HCH



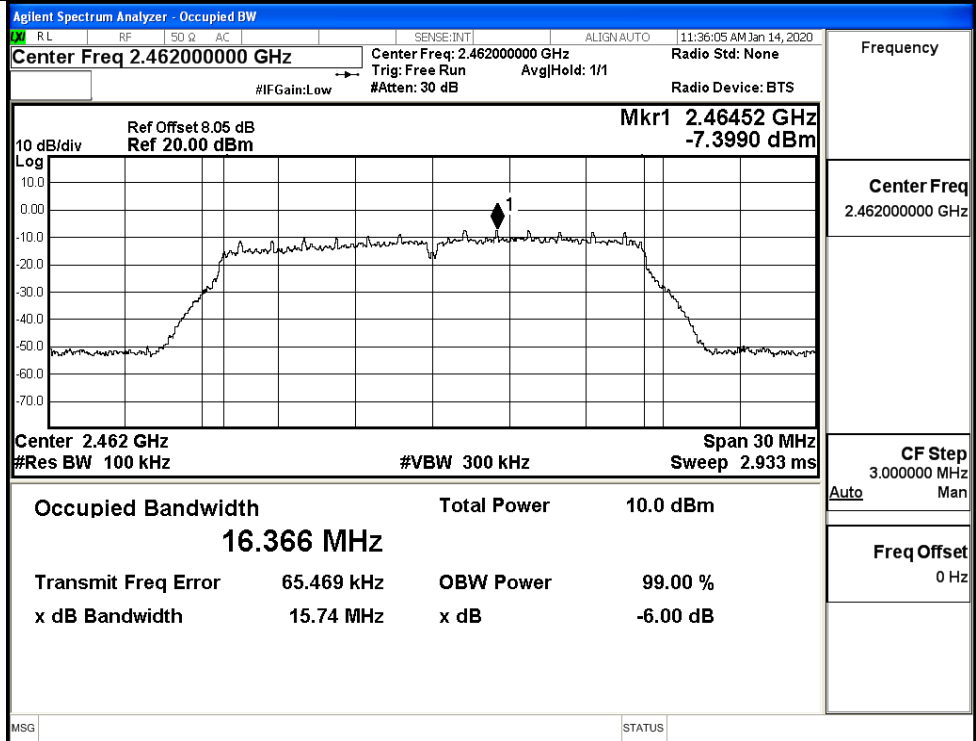
11G/LCH



11G/MCH

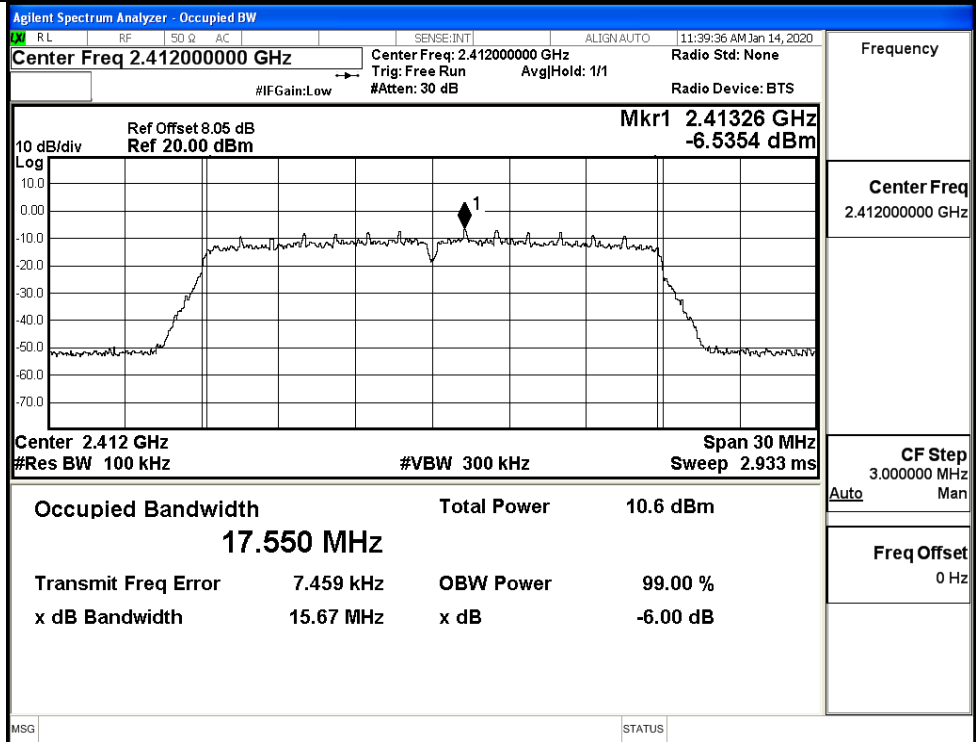


11G/HCH



Frequency	2.46200000 GHz
Center Freq	2.46200000 GHz
CF Step	3.000000 MHz
Auto	Man
Freq Offset	0 Hz

11N20SISO/LCH



Frequency	2.41200000 GHz
Center Freq	2.41200000 GHz
CF Step	3.000000 MHz
Auto	Man
Freq Offset	0 Hz

<p>11N20SISO/MCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.43700000 GHz</p> <p>Center Freq: 2.43700000 GHz Trig: Free Run #IFGain:Low #Atten: 30 dB</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>Mkr1 2.4295 GHz -7.5905 dBm</p> <p>Center 2.437 GHz #Res BW 100 kHz</p> <p>Span 30 MHz Sweep 2.933 ms</p> <p>Occupied Bandwidth 17.681 MHz</p> <p>Total Power 10.6 dBm</p> <p>Transmit Freq Error -18.451 kHz</p> <p>x dB Bandwidth 17.66 MHz</p> <p>OBW Power 99.00 %</p> <p>x dB -6.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.43700000 GHz</p> <p>CF Step 3.000000 MHz</p> <p>Freq Offset 0 Hz</p>
<p>11N20SISO/HCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.46200000 GHz</p> <p>Center Freq: 2.46200000 GHz Trig: Free Run #IFGain:Low #Atten: 30 dB</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>Mkr1 2.46575 GHz -6.5782 dBm</p> <p>Center 2.462 GHz #Res BW 100 kHz</p> <p>Span 30 MHz Sweep 2.933 ms</p> <p>Occupied Bandwidth 17.513 MHz</p> <p>Total Power 10.2 dBm</p> <p>Transmit Freq Error 61.631 kHz</p> <p>x dB Bandwidth 16.28 MHz</p> <p>OBW Power 99.00 %</p> <p>x dB -6.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.46200000 GHz</p> <p>CF Step 3.000000 MHz</p> <p>Freq Offset 0 Hz</p>

<p>11N40SISO/LCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>RL RF 50 Ω AC SENSE:INT ALIGN AUTO 11:46:52 AM Jan 14, 2020</p> <p>Center Freq 2.42200000 GHz Center Freq: 2.42200000 GHz Radio Std: None Trig: Free Run AvgHold: 1/1 #IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <p>10 dB/div Ref Offset 8.05 dB Mkr1 2.41324 GHz Ref 20.00 dBm -8.2685 dBm</p> <p>Center 2.422 GHz Span 60 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 5.8 ms</p> <p>Occupied Bandwidth Total Power 11.0 dBm 35.756 MHz</p> <p>Transmit Freq Error -127.58 kHz OBW Power 99.00 % x dB Bandwidth 35.12 MHz x dB -6.00 dB</p> <p>MSG STATUS</p>	<p>Frequency</p> <p>Center Freq 2.42200000 GHz</p> <p>CF Step 6.000000 MHz Auto Man</p> <p>Freq Offset 0 Hz</p>
<p>11N40SISO/MCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>RL RF 50 Ω AC SENSE:INT ALIGN AUTO 11:51:17 AM Jan 14, 2020</p> <p>Center Freq 2.43700000 GHz Center Freq: 2.43700000 GHz Radio Std: None Trig: Free Run AvgHold: 1/1 #IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <p>10 dB/div Ref Offset 8.05 dB Mkr1 2.42074 GHz Ref 20.00 dBm -9.0505 dBm</p> <p>Center 2.437 GHz Span 60 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 5.8 ms</p> <p>Occupied Bandwidth Total Power 10.8 dBm 36.272 MHz</p> <p>Transmit Freq Error -22.780 kHz OBW Power 99.00 % x dB Bandwidth 36.17 MHz x dB -6.00 dB</p> <p>MSG STATUS</p>	<p>Frequency</p> <p>Center Freq 2.43700000 GHz</p> <p>CF Step 6.000000 MHz Auto Man</p> <p>Freq Offset 0 Hz</p>

11N40SISO/HCH

Agilent Spectrum Analyzer - Occupied BW			
RL	RF	50 Ω	AC
SENSE:INT	ALIGN:AUTO	11:55:39 AM Jan 14, 2020	
Center Freq 2.45200000 GHz		Center Freq: 2.45200000 GHz	Radio Std: None
	Trig: Free Run	Avg Hold: 1/1	Radio Device: BTS
	#IFGain:Low	#Atten: 30 dB	
10 dB/div		Ref Offset 8.05 dB	Mkr1 2.46574 GHz
Log		Ref 20.00 dBm	-5.7210 dBm
Center 2.452 GHz		#VBW 300 kHz	Span 60 MHz
#Res BW 100 kHz			Sweep 5.8 ms
Occupied Bandwidth		Total Power	13.0 dBm
35.881 MHz			
Transmit Freq Error	191.97 kHz	OBW Power	99.00 %
x dB Bandwidth	24.22 MHz	x dB	-6.00 dB
MSG		STATUS	

Frequency

Center Freq
2.45200000 GHz

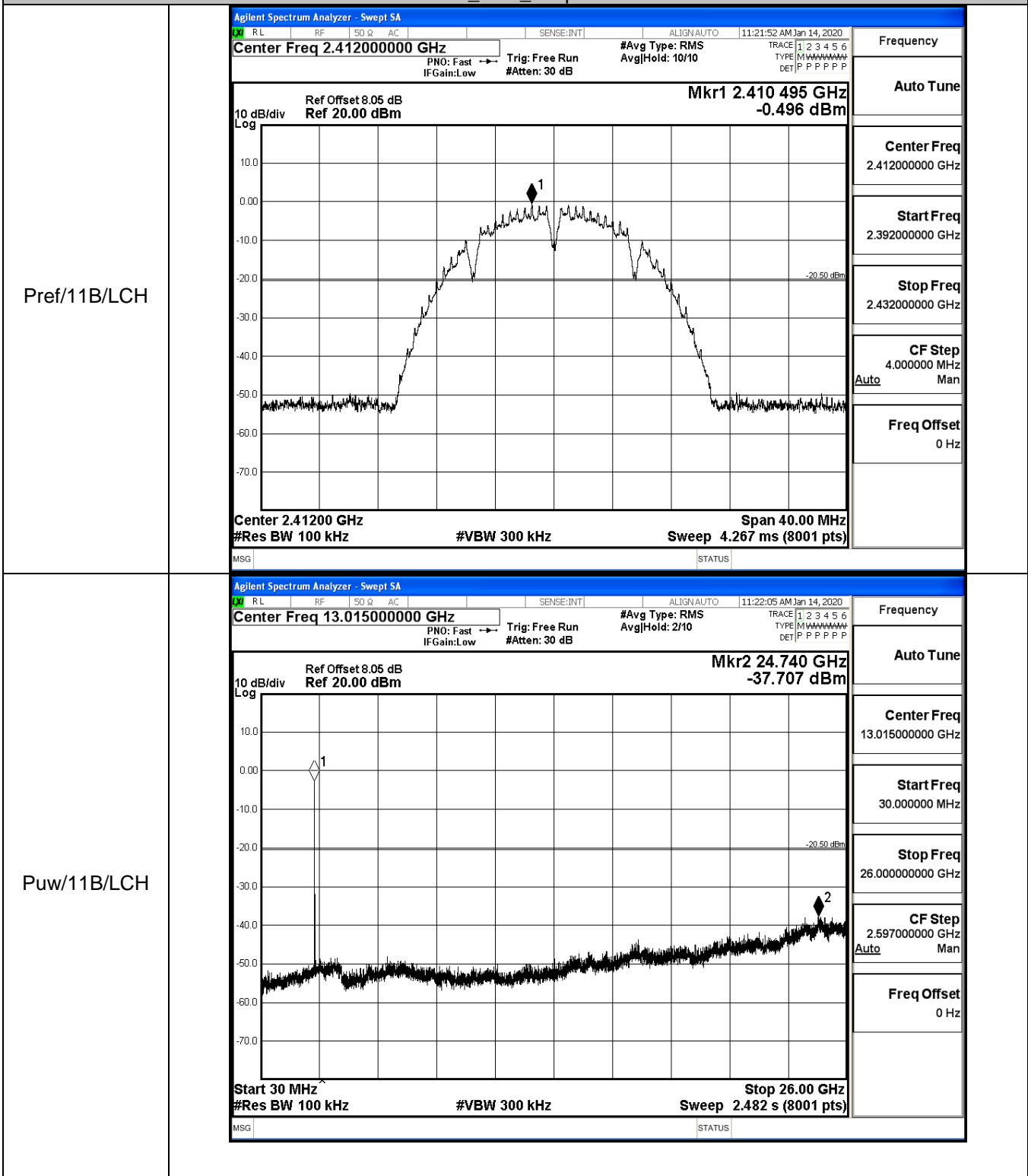
CF Step
6.000000 MHz
Auto Man

Freq Offset
0 Hz

A.5 RF Conducted Spurious Emissions

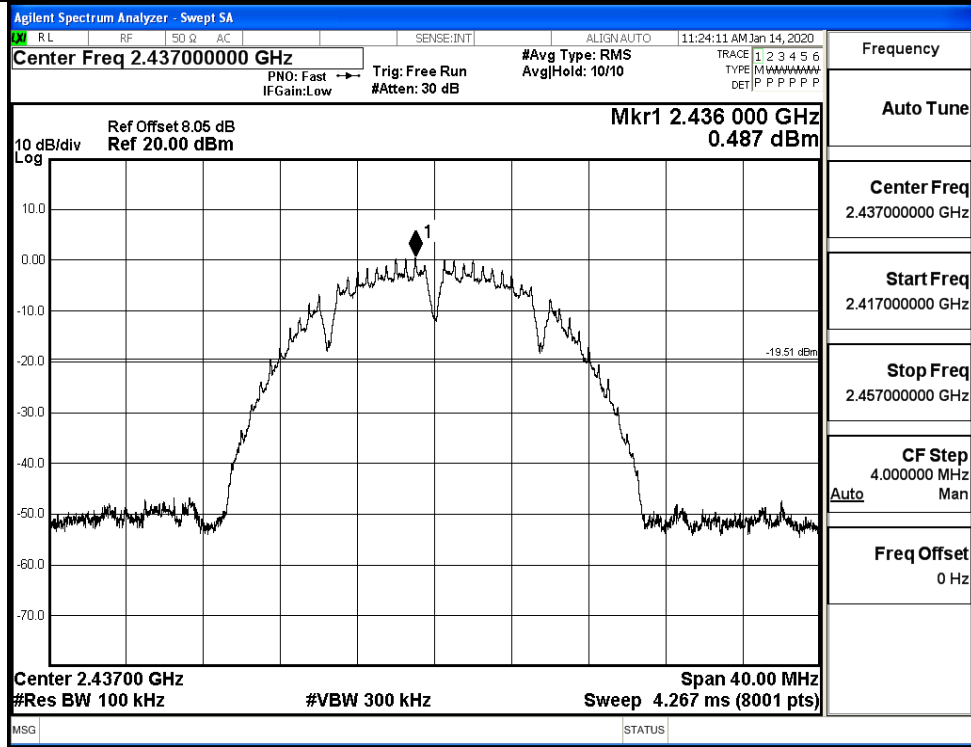
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
11B	LCH	-0.496	-37.707	-20.496	PASS
	MCH	0.487	-38.006	-19.513	PASS
	HCH	0.035	-37.659	-19.965	PASS
11G	LCH	-7.614	-37.277	-27.614	PASS
	MCH	-7.358	-37.489	-27.358	PASS
	HCH	-6.856	-36.502	-26.856	PASS
11N20 SISO	LCH	-6.735	-38.543	-26.735	PASS
	MCH	-7.674	-37.702	-27.674	PASS
	HCH	-7.145	-37.168	-27.145	PASS
11N40 SISO	LCH	-8.392	-38.057	-28.392	PASS
	MCH	-9.331	-36.632	-29.331	PASS
	HCH	-5.415	-38.417	-25.415	PASS

11B_LCH_Graphs

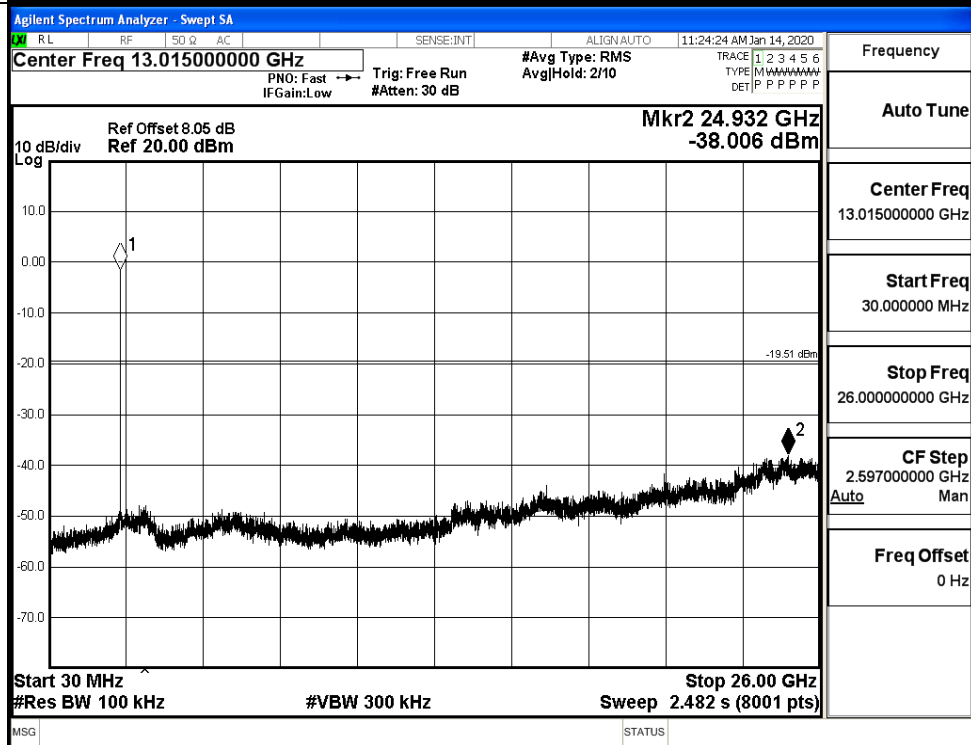


11B_MCH_Graphs

Pref/11B/MCH

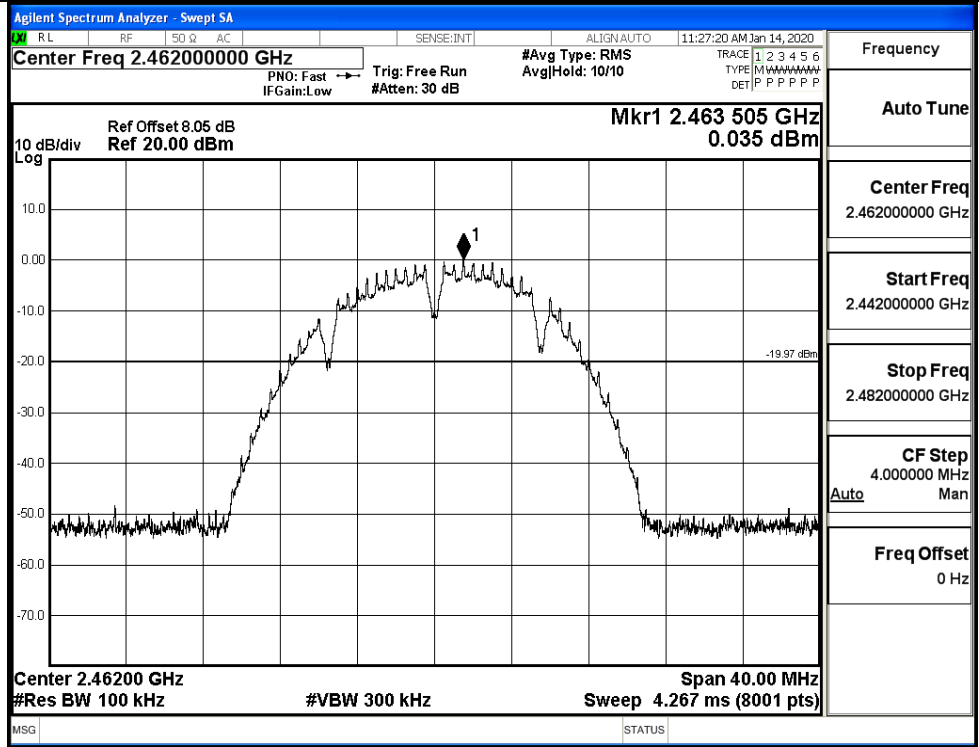


Puw/11B/MCH



11B_HCH_Graphs

Pref/11B/HCH

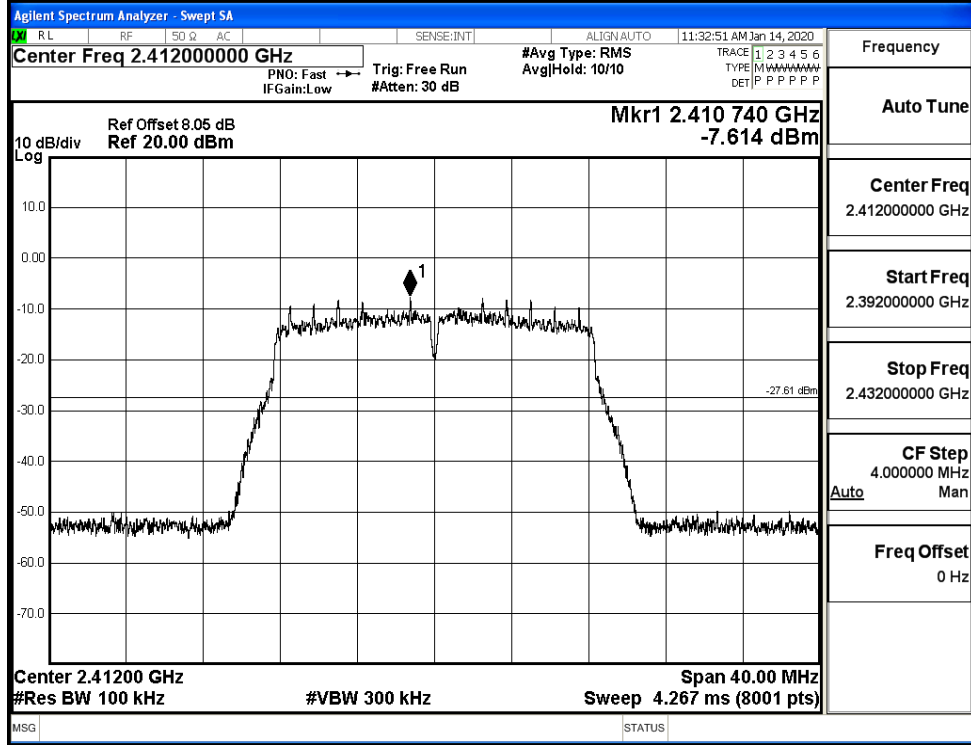


Puw/11B/HCH

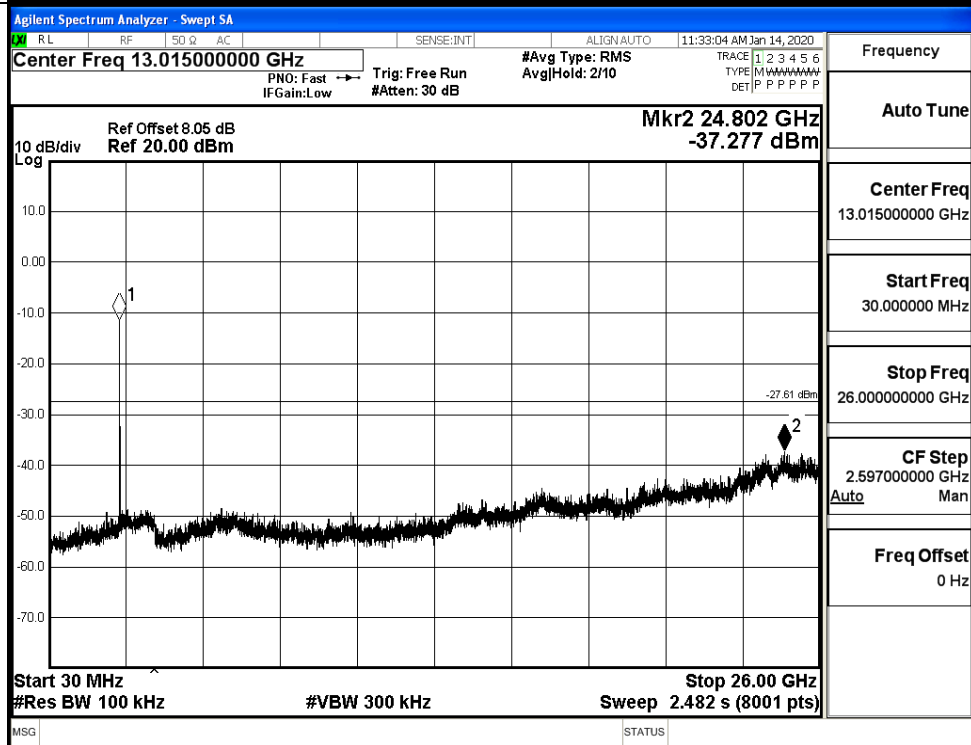


11G_LCH_Graphs

Pref/11G/LCH

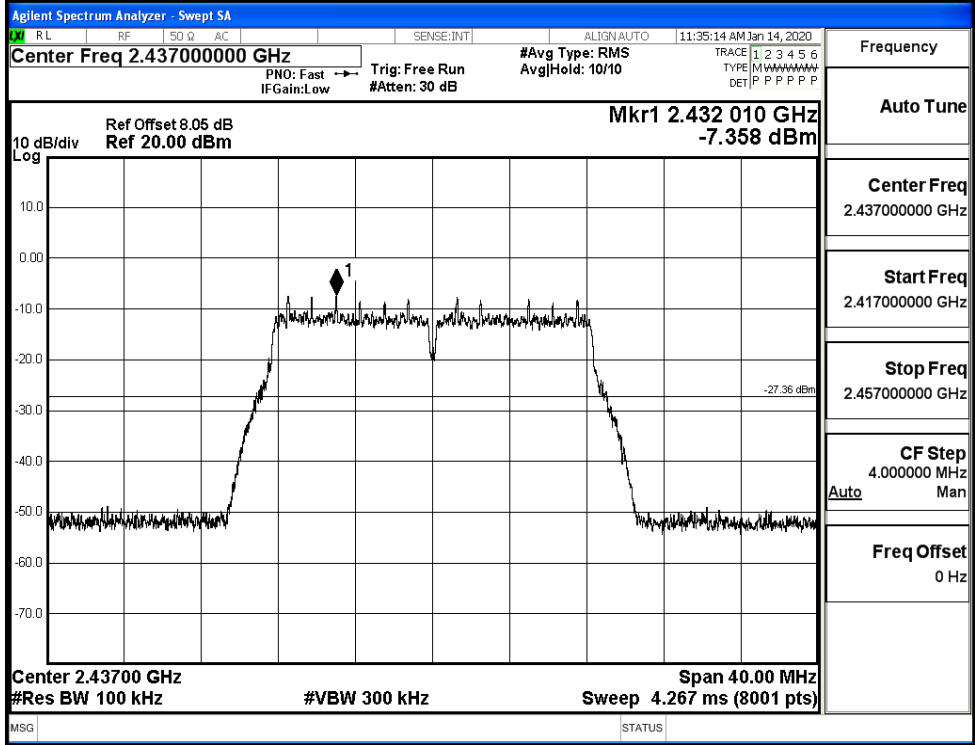


Puw/11G/LCH

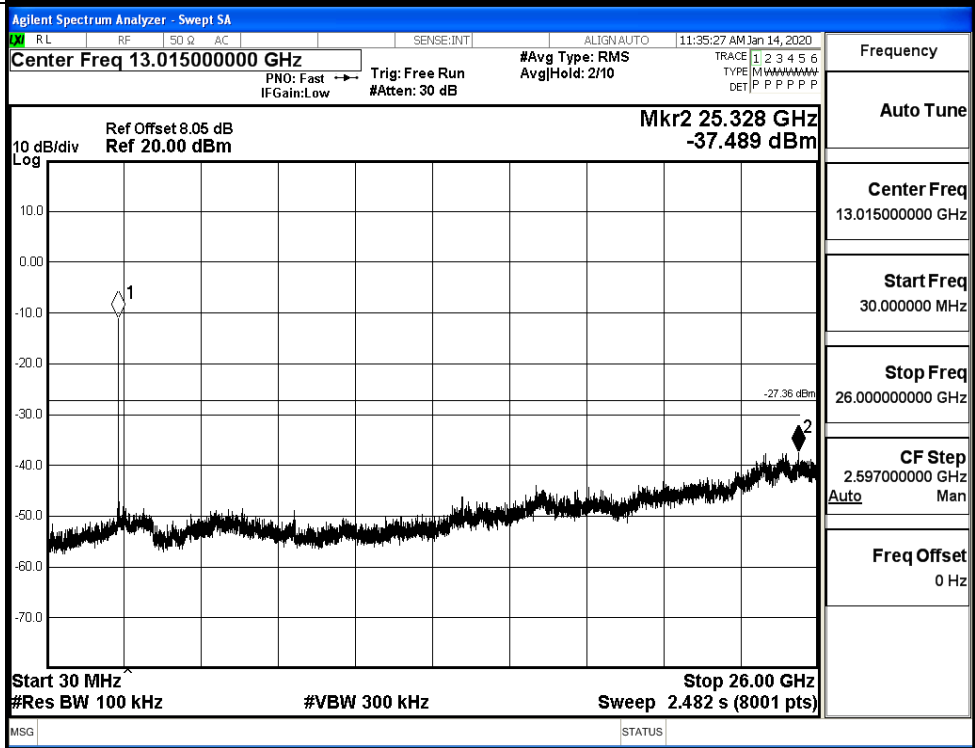


11G_MCH_Graphs

Pref/11G/MCH

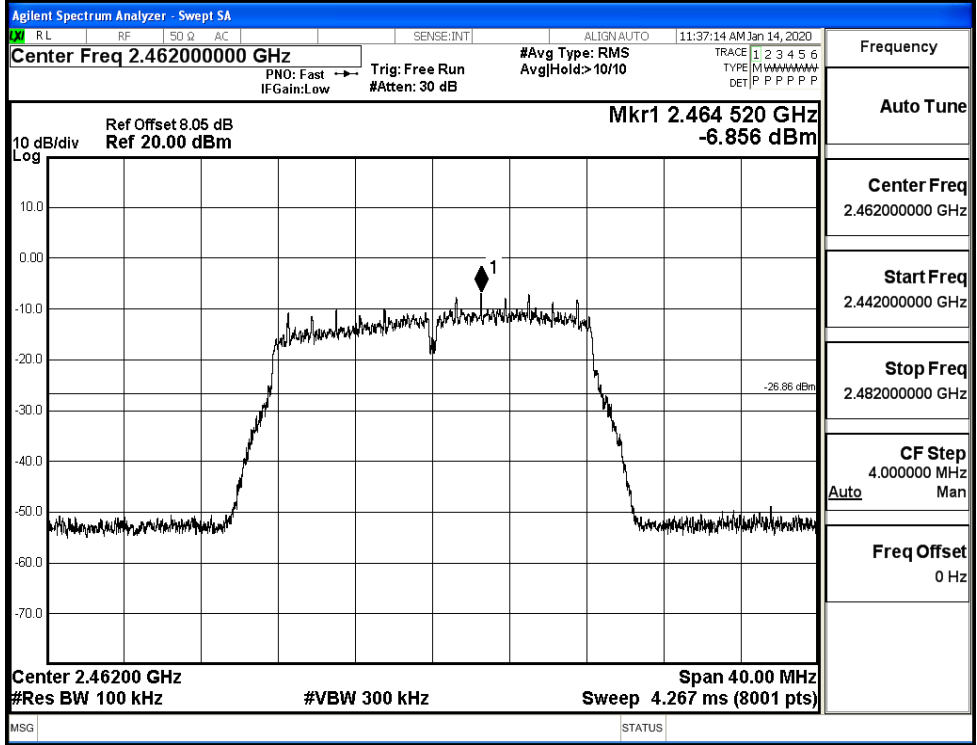


Puw/11G/MCH

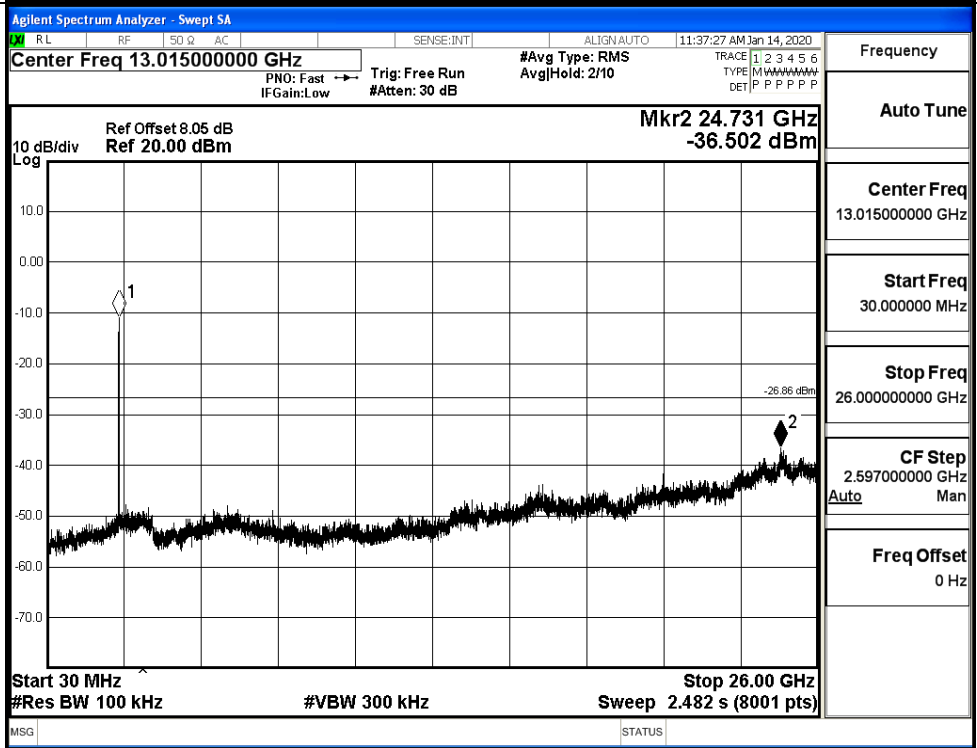


11G_HCH_Graphs

Pref/11G/HCH

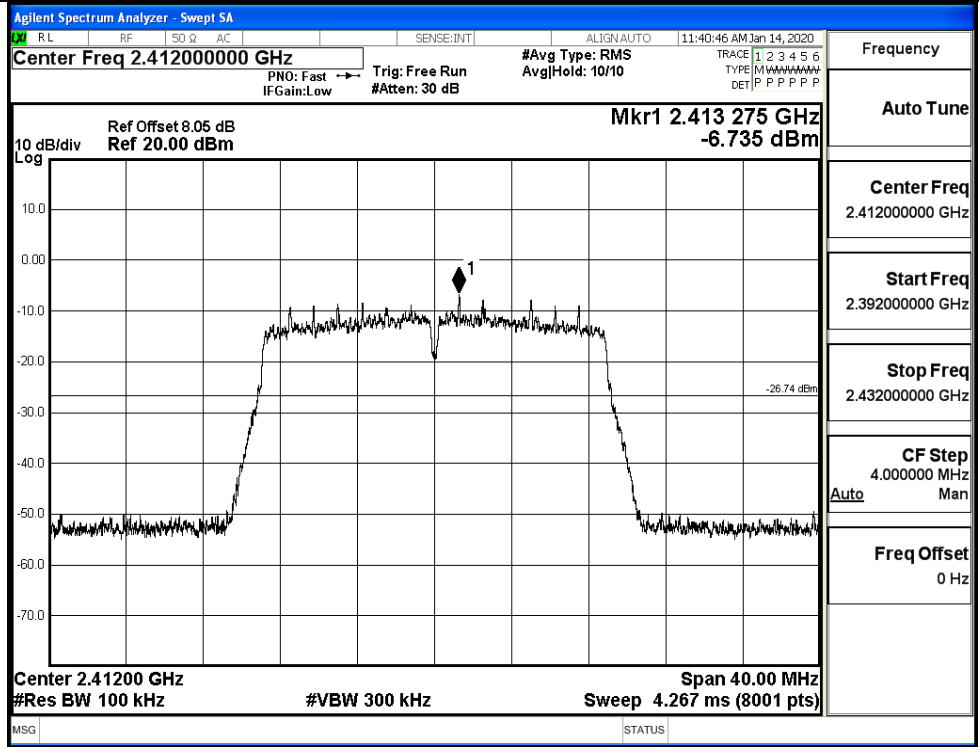


Puw/11G/HCH

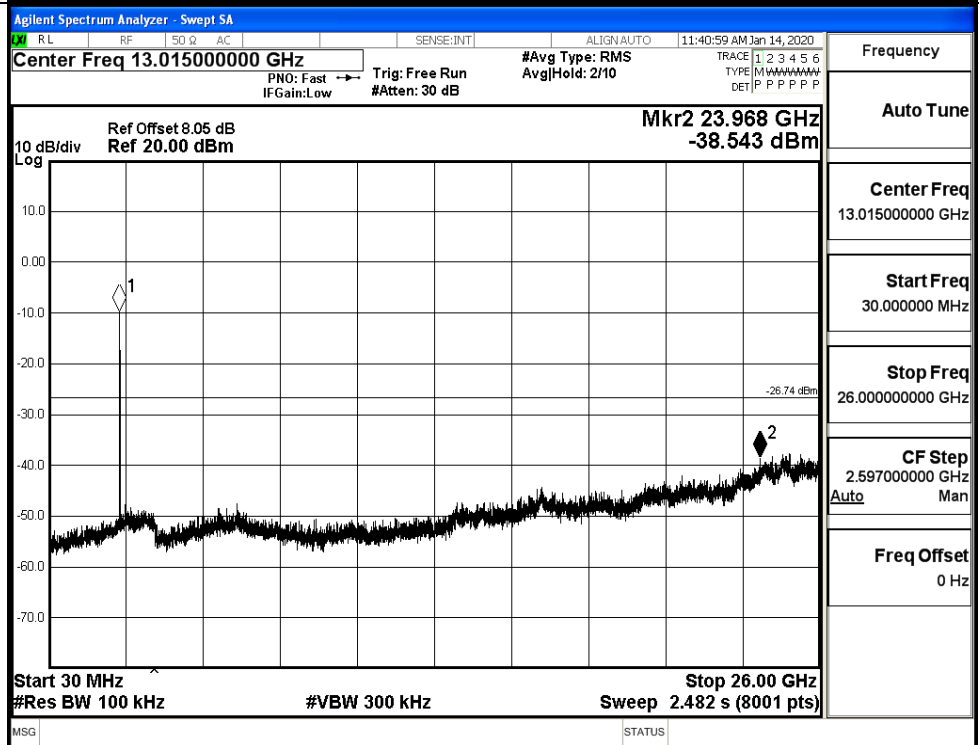


11N20SISO_LCH_Graphs

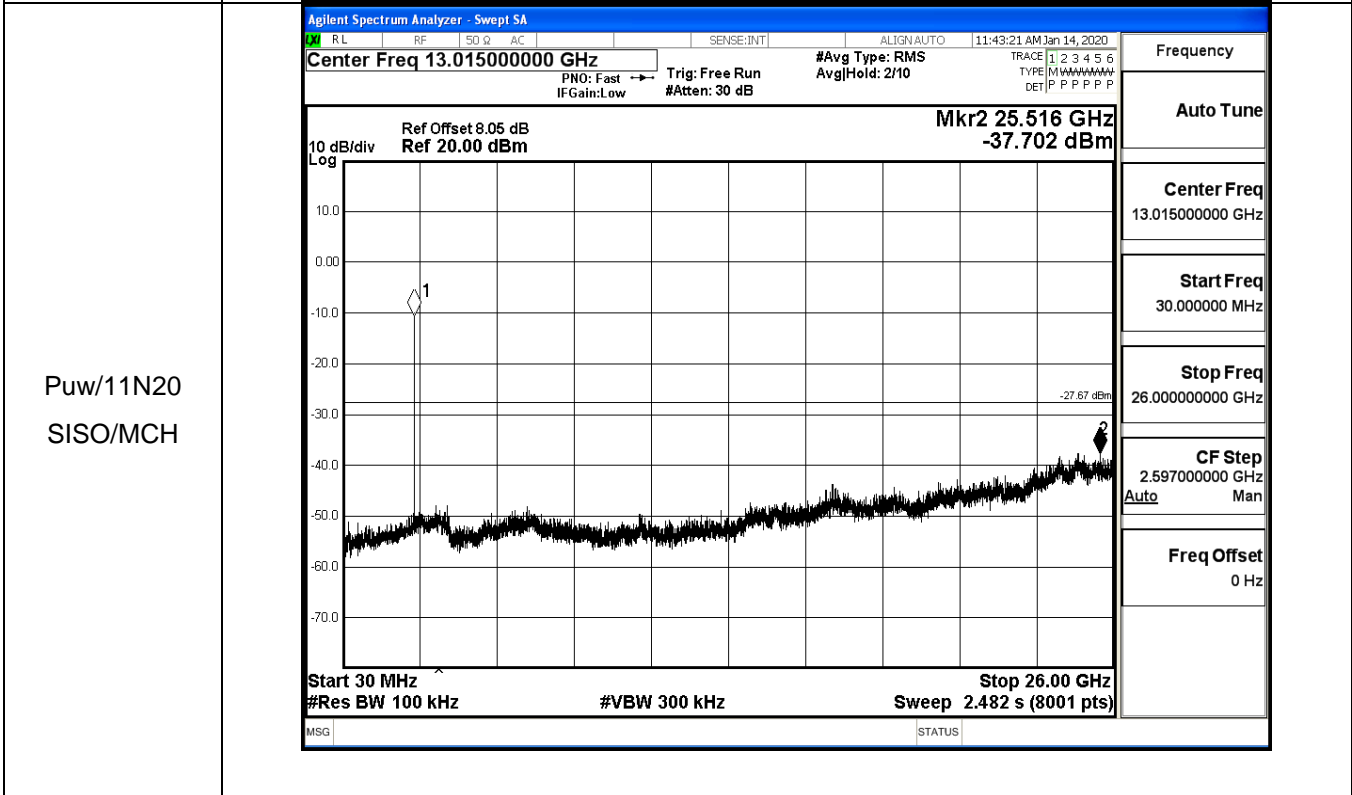
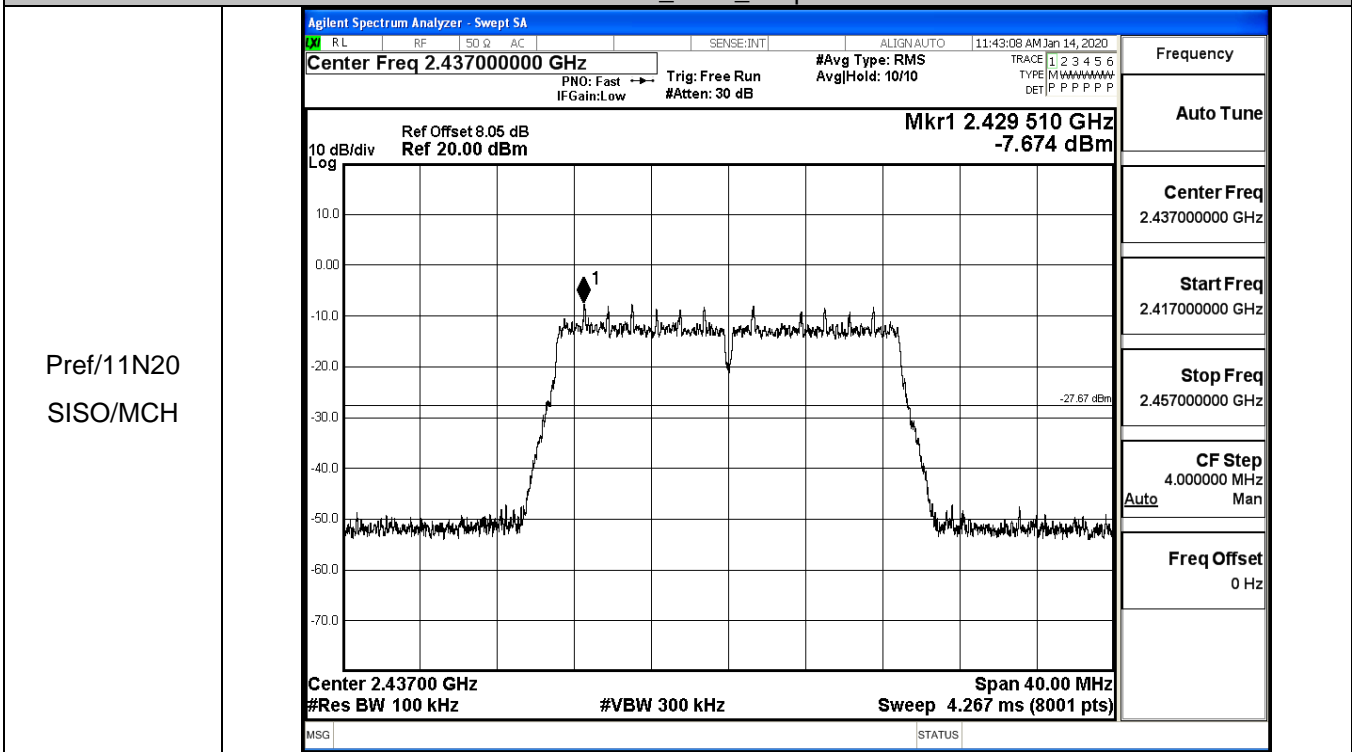
Pref/11N20SIS
O/LCH



Puw/11N20
SISO/LCH



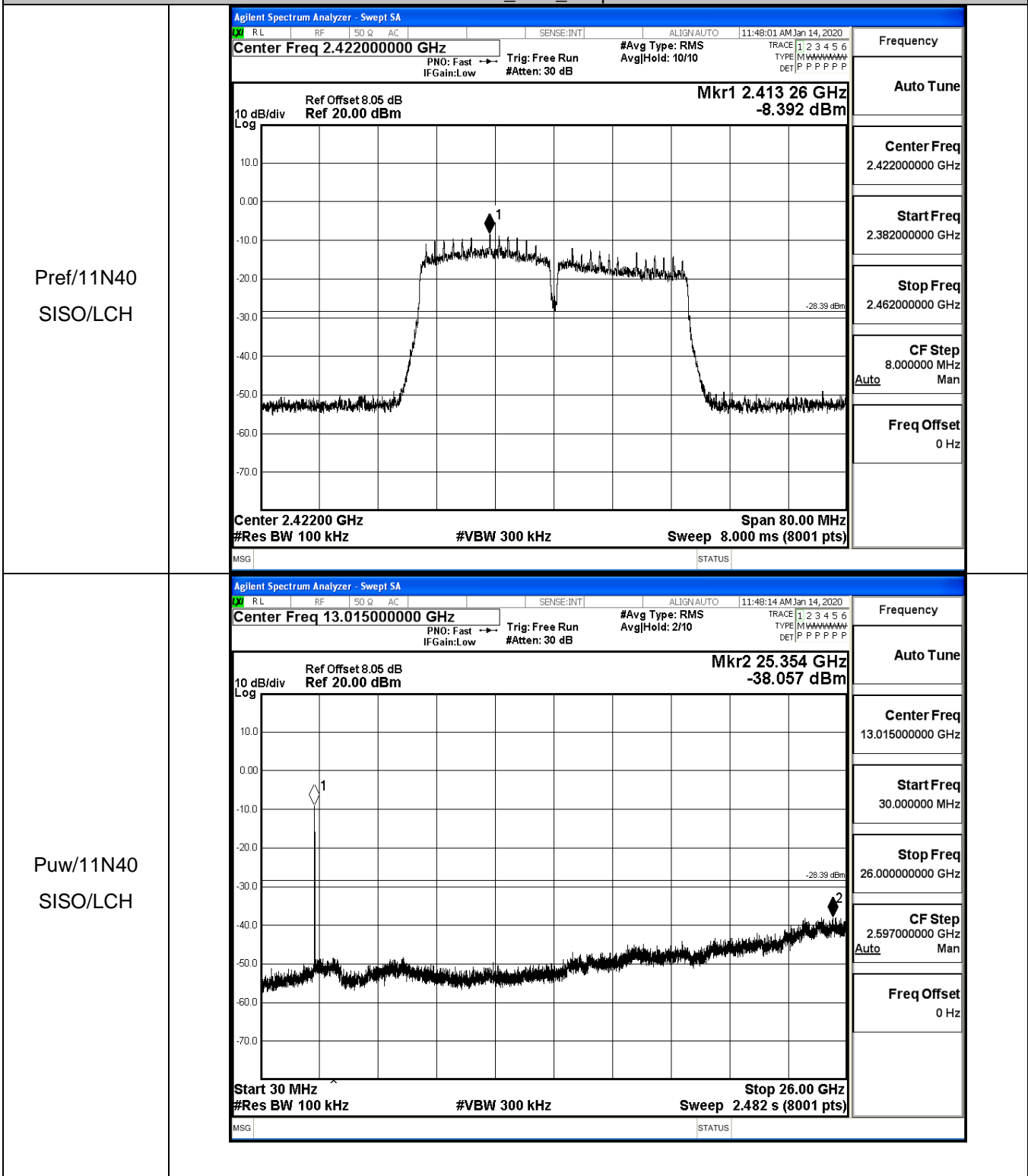
11N20SISO_MCH_Graphs



11N20SISO_HCH_Graphs

Pref/11N20 SISO/HCH		Agilent Spectrum Analyzer - Swept SA Center Freq 2.46200000 GHz #Avg Type: RMS AvgHold: 10/10 Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.466 990 GHz -7.145 dBm Frequency Auto Tune Center Freq 2.462000000 GHz Start Freq 2.442000000 GHz Stop Freq 2.482000000 GHz CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz
	Center 2.46200 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 4.267 ms (8001 pts)	
Puw/11N20 SISO/HCH		Agilent Spectrum Analyzer - Swept SA Center Freq 13.01500000 GHz #Avg Type: RMS AvgHold: 2/10 Ref Offset 8.05 dB Ref 20.00 dBm Mkr2 24.740 GHz -37.168 dBm Frequency Auto Tune Center Freq 13.015000000 GHz Start Freq 30.000000 MHz Stop Freq 26.000000000 GHz CF Step 2.597000000 GHz Auto Man Freq Offset 0 Hz
	Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8001 pts)	

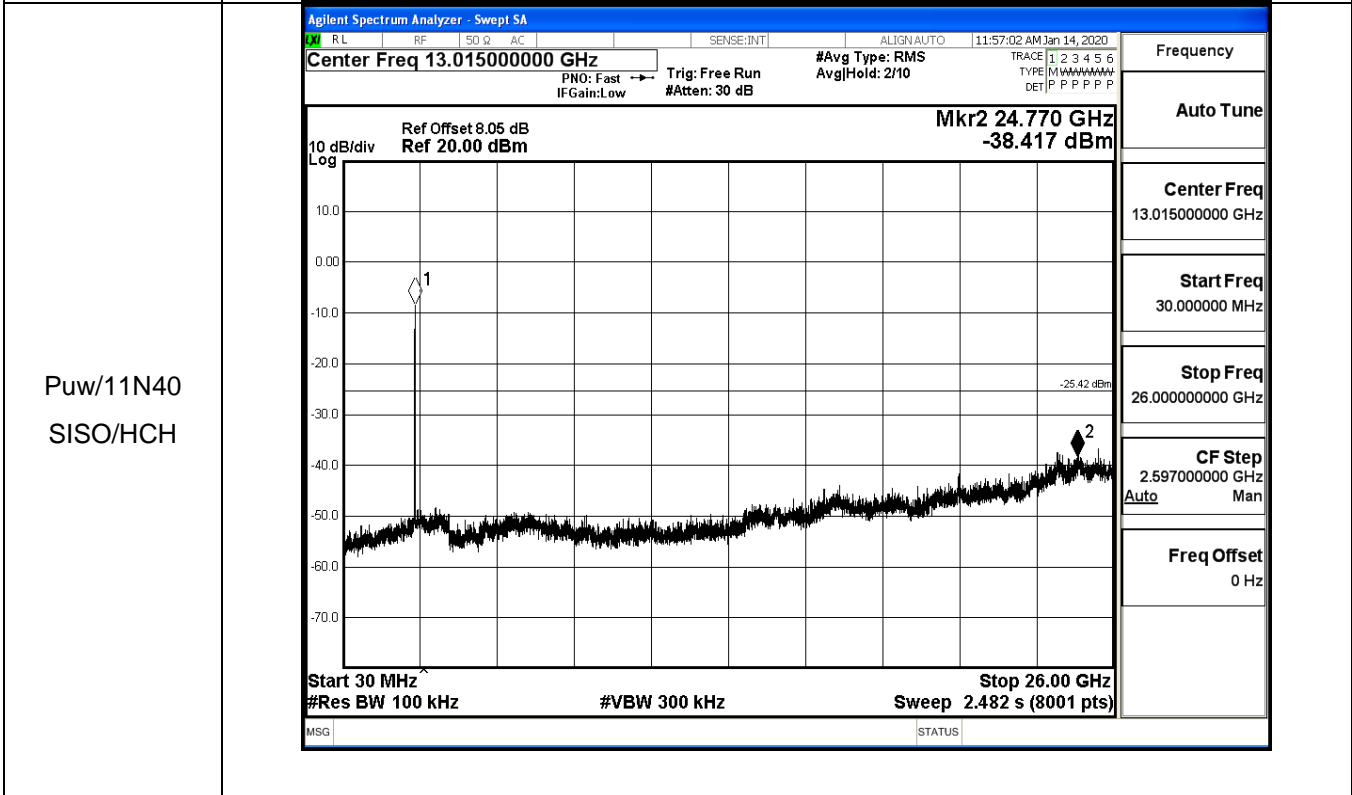
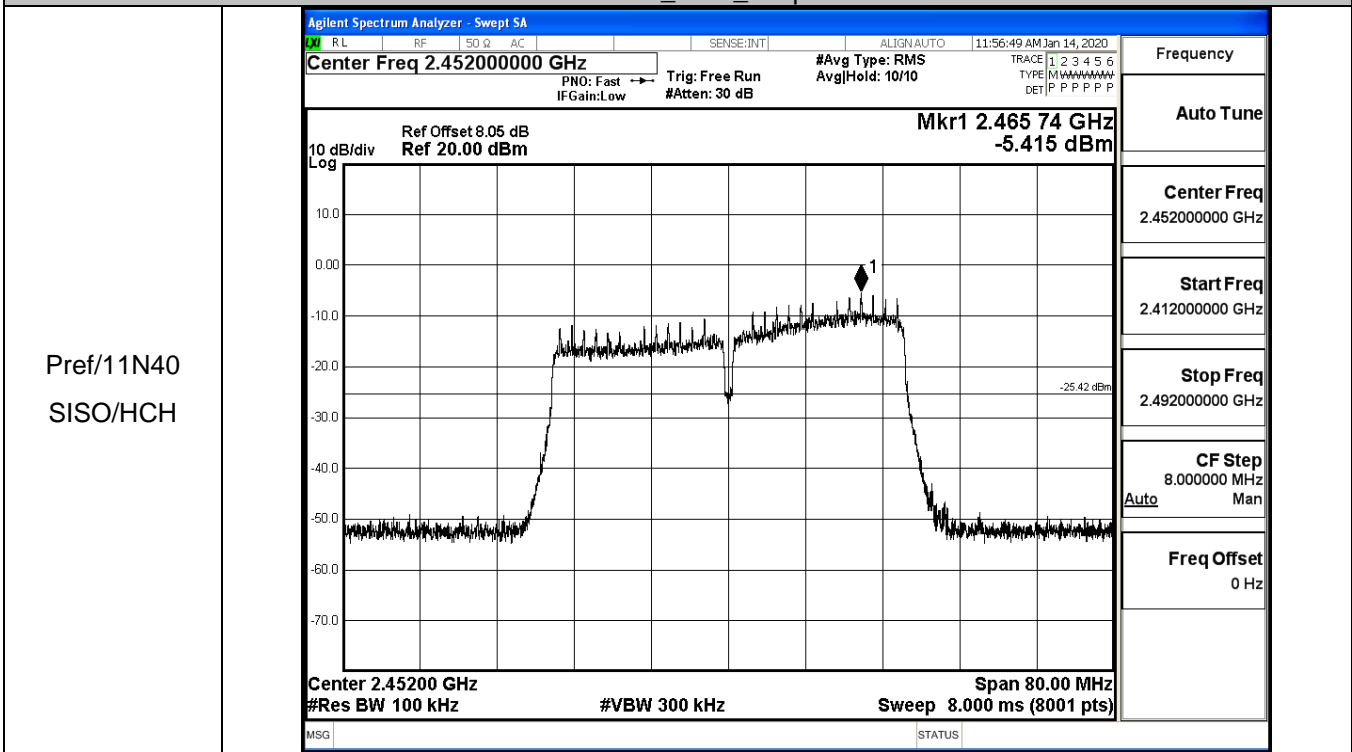
11N40SISO_LCH_Graphs



11N40SISO_MCH_Graphs

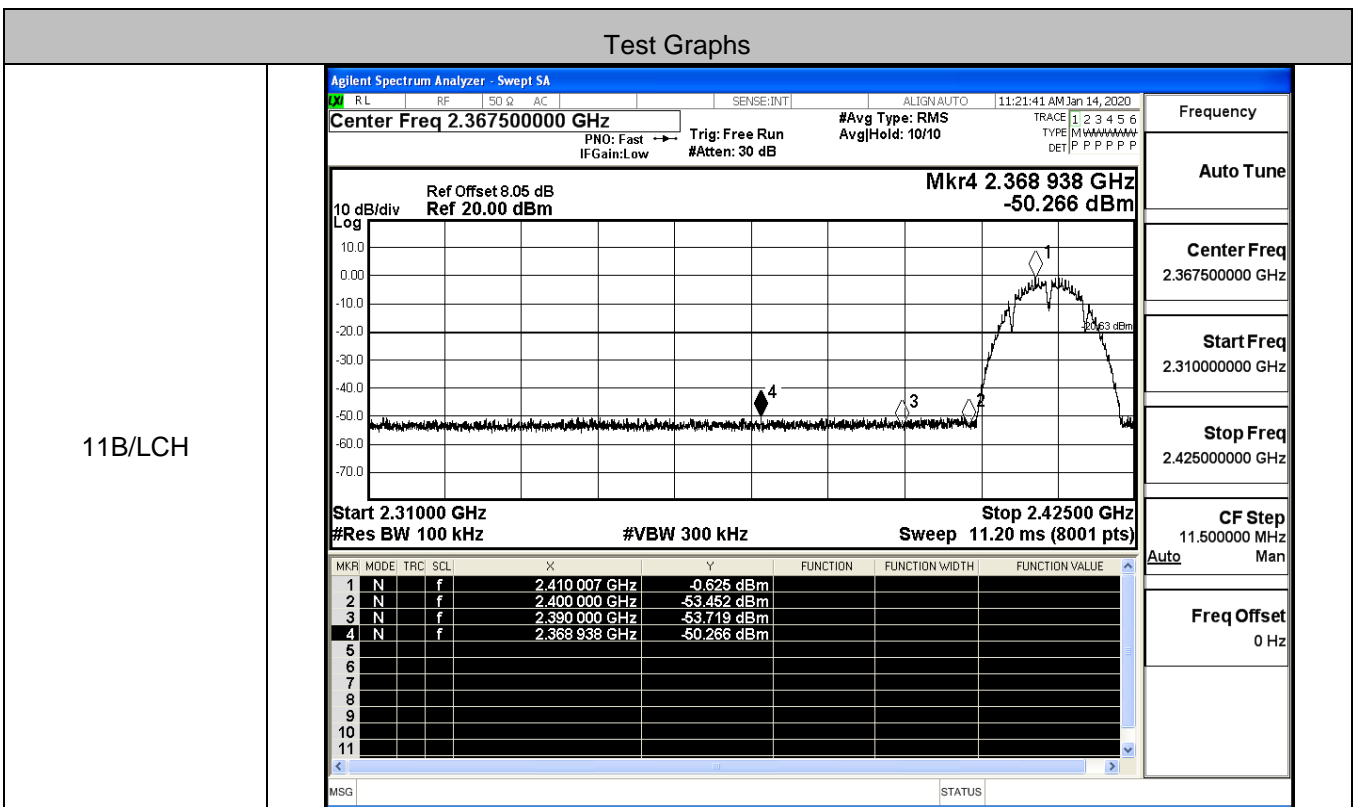
<p>Pref/11N40 SISO/MCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.43700000 GHz</p> <p>Mkr1 2.420 73 GHz -9.331 dBm</p> <p>Center 2.43700 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</p>	<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.437000000 GHz</p> <p>Start Freq 2.397000000 GHz</p> <p>Stop Freq 2.477000000 GHz</p> <p>CF Step 8.000000 MHz Auto Man</p> <p>Freq Offset 0 Hz</p>
	<p>Puw/11N40 SISO/MCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 13.015000000 GHz</p> <p>Mkr2 24.906 GHz -36.632 dBm</p> <p>Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (8001 pts)</p>

11N40SISO_HCH_Graphs

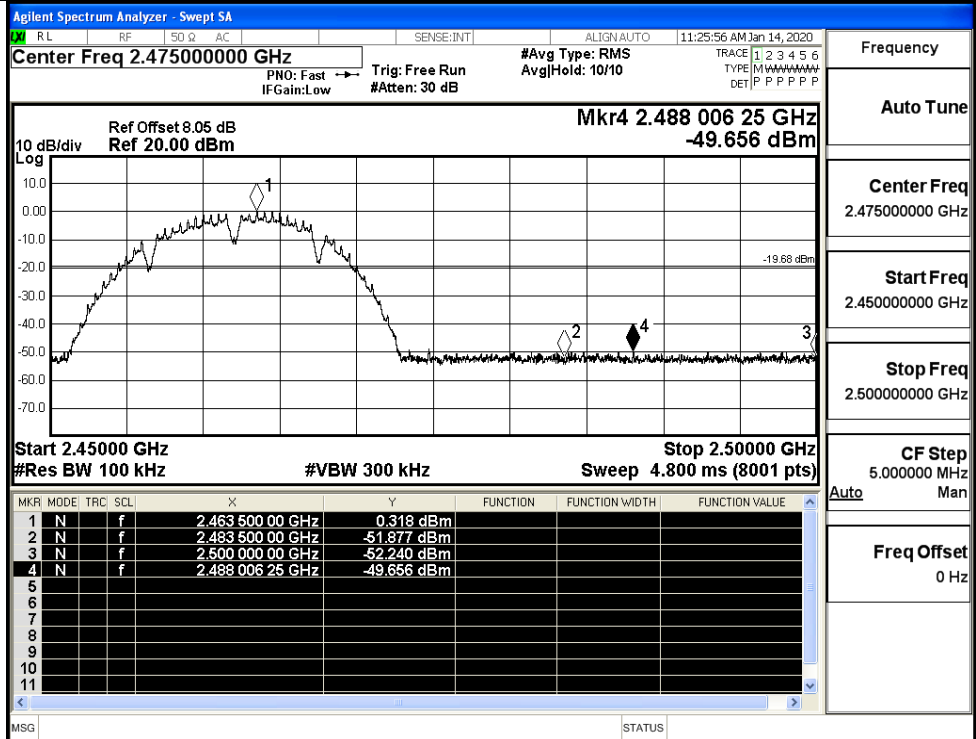


A.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	-0.625	-50.266	-20.63	PASS
	HCH	0.318	-49.656	-19.68	PASS
11G	LCH	-6.927	-50.122	-26.93	PASS
	HCH	-7.170	-49.435	-27.17	PASS
11N20SISO	LCH	-6.625	-48.966	-26.63	PASS
	HCH	-7.379	-49.602	-27.38	PASS
11N40SISO	LCH	-8.881	-50.226	-28.88	PASS
	HCH	-6.017	-49.078	-26.02	PASS



11B/HCH



Frequency

Auto Tune

Center Freq
2.47500000 GHz

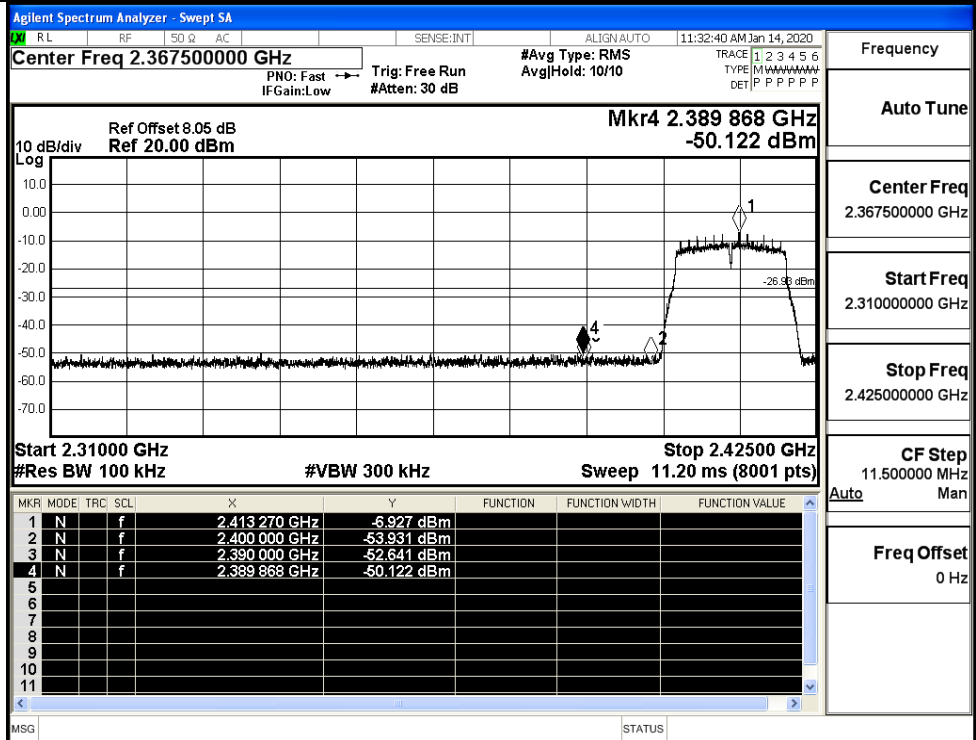
Start Freq
2.45000000 GHz

Stop Freq
2.50000000 GHz

CF Step
5.000000 MHz

Freq Offset
0 Hz

11G/LCH



Frequency

Auto Tune

Center Freq
2.36750000 GHz

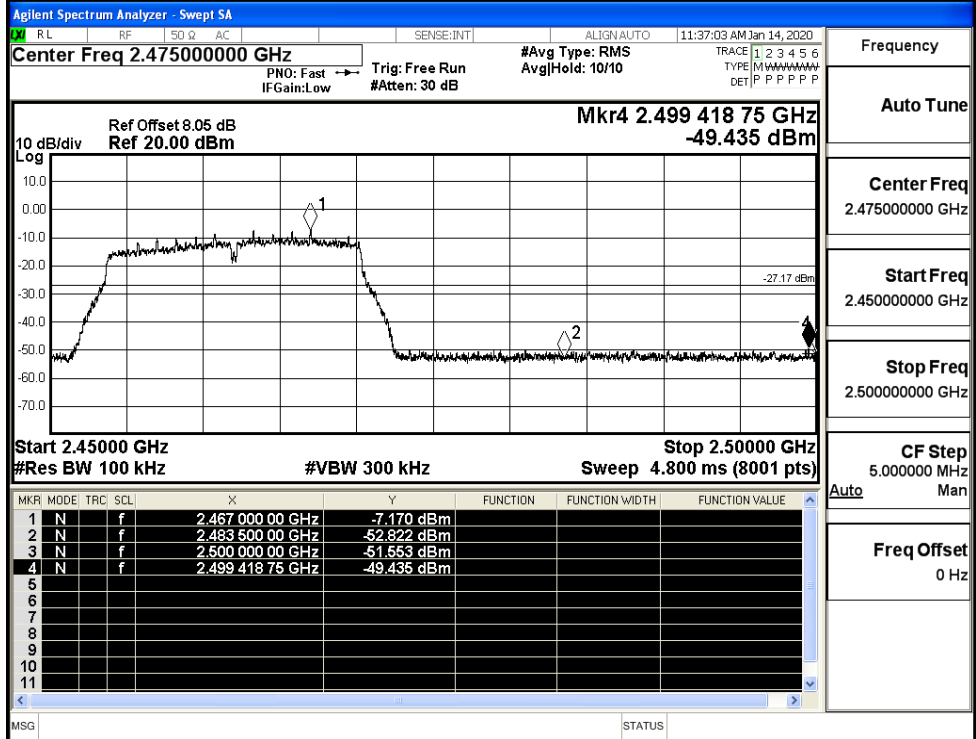
Start Freq
2.31000000 GHz

Stop Freq
2.42500000 GHz

CF Step
11.500000 MHz

Freq Offset
0 Hz

11G/HCH



Frequency

Auto Tune

Center Freq
2.475000000 GHz

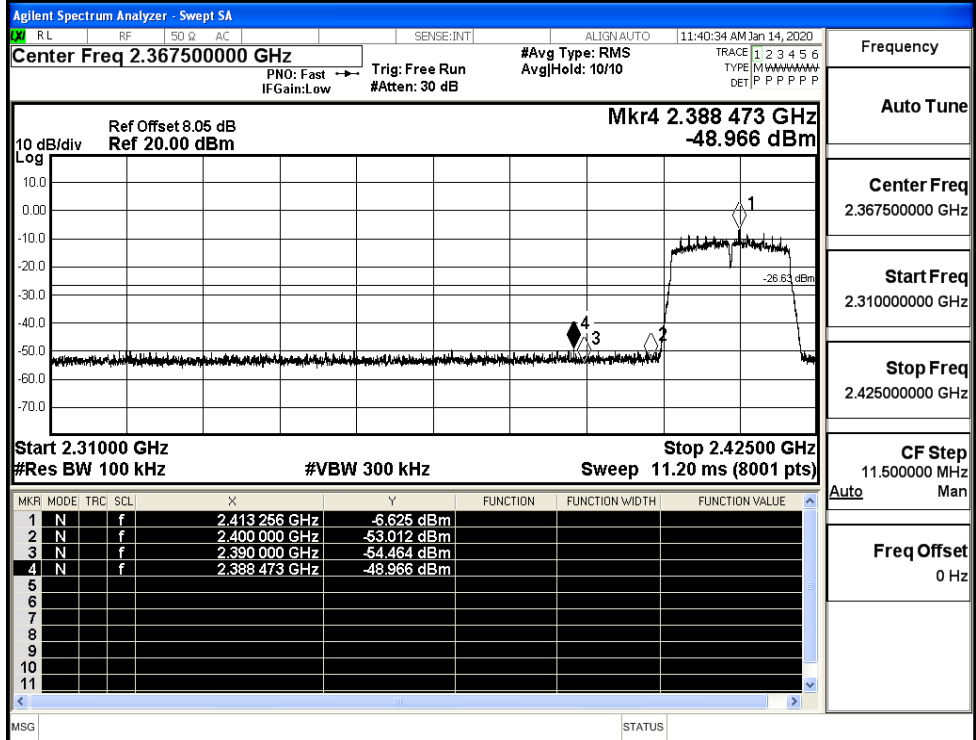
Start Freq
2.450000000 GHz

Stop Freq
2.500000000 GHz

CF Step
5.000000 MHz

Freq Offset
0 Hz

11N20SISO/LCH



Frequency

Auto Tune

Center Freq
2.367500000 GHz

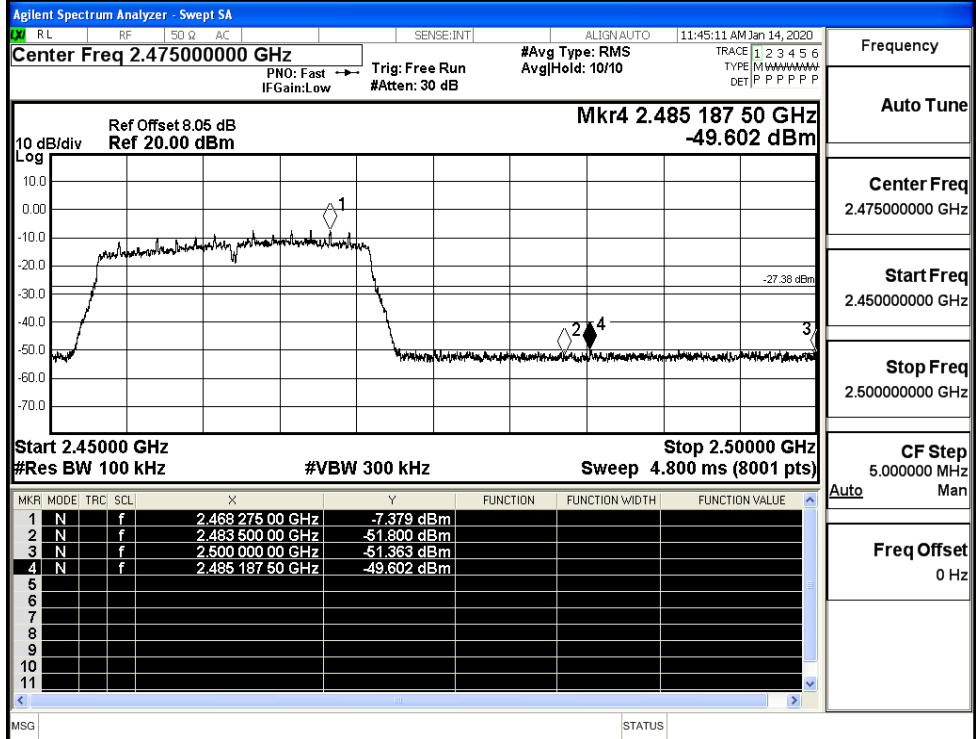
Start Freq
2.310000000 GHz

Stop Freq
2.425000000 GHz

CF Step
11.500000 MHz

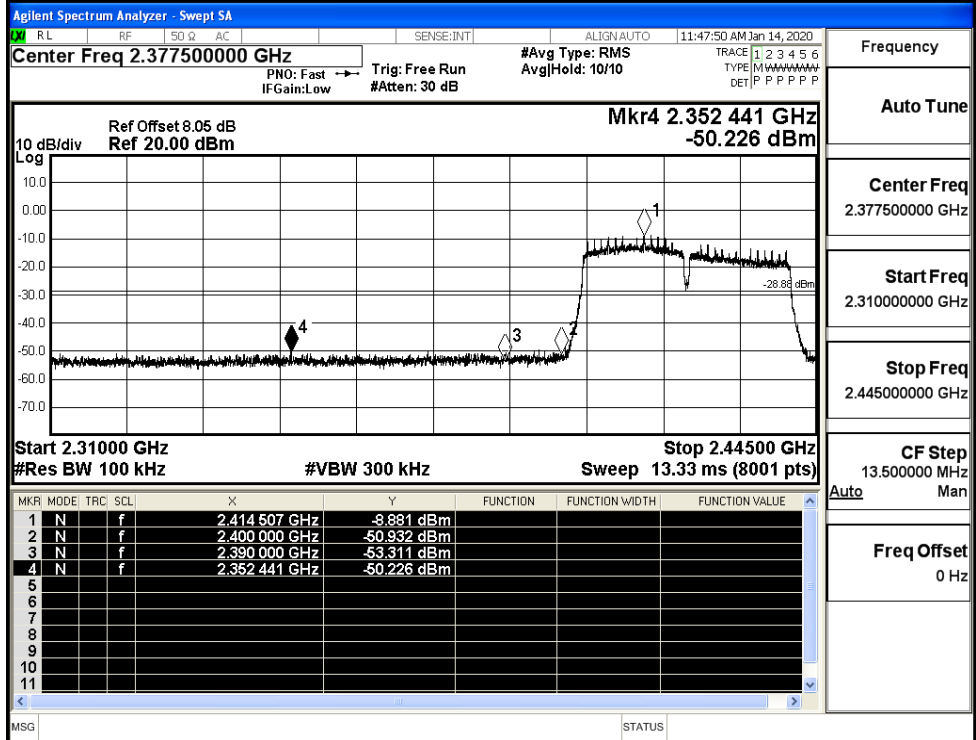
Freq Offset
0 Hz

11N20SISO/HCH



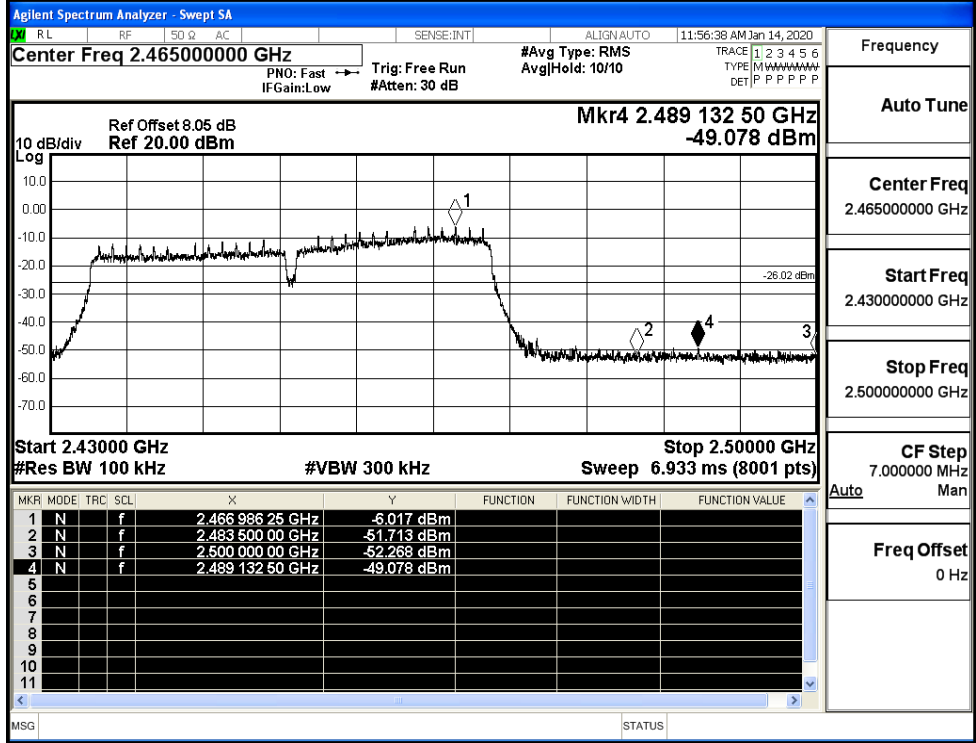
Frequency	2.475000000 GHz
Auto Tune	
Center Freq	2.475000000 GHz
Start Freq	2.450000000 GHz
Stop Freq	2.500000000 GHz
CF Step	5.000000 MHz
Freq Offset	0 Hz

11N40SISO/LCH



Frequency	2.377500000 GHz
Auto Tune	
Center Freq	2.377500000 GHz
Start Freq	2.310000000 GHz
Stop Freq	2.445000000 GHz
CF Step	13.500000 MHz
Freq Offset	0 Hz

11N40SISO/HCH

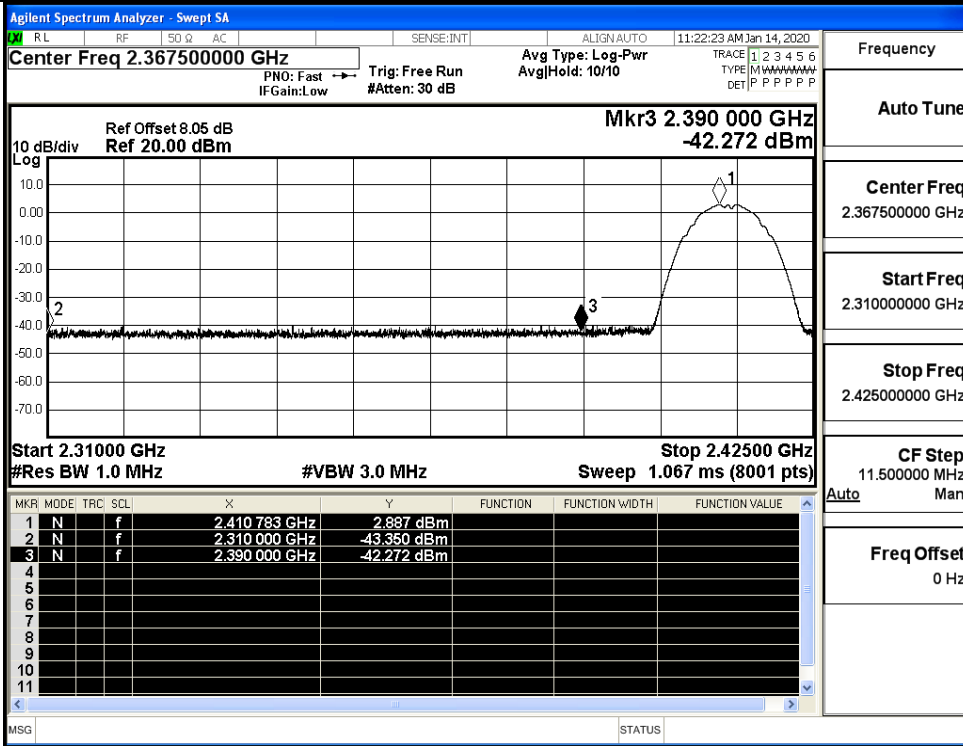


C.7 Restrict-band band-edge measurements

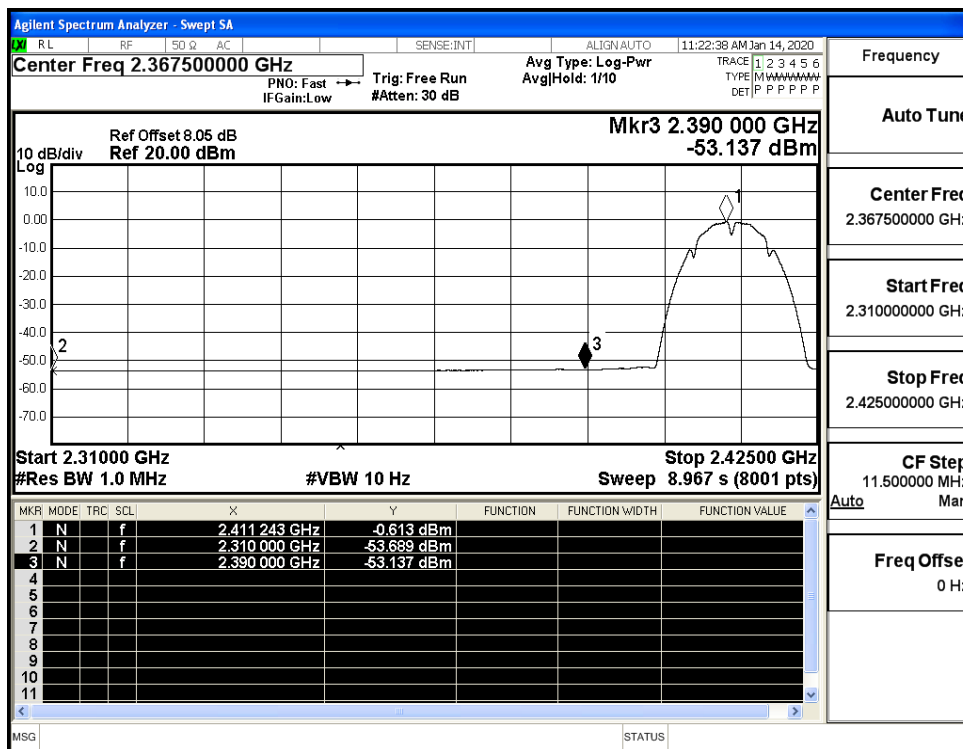
Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBu V/m]	Verdict
11B	2412	Ant1	2310.0	-43.35	5.0	0	56.88	PEAK	74	PASS
	2412	Ant1	2310.0	-53.69	5.0	0	46.54	AV	54	PASS
	2412	Ant1	2390.0	-42.27	5.0	0	57.96	PEAK	74	PASS
	2412	Ant1	2390.0	-53.14	5.0	0	47.09	AV	54	PASS
	2462	Ant1	2483.5	-41.39	5.0	0	58.84	PEAK	74	PASS
	2462	Ant1	2483.5	-52.69	5.0	0	47.54	AV	54	PASS
	2462	Ant1	2500.0	-42.03	5.0	0	58.2	PEAK	74	PASS
	2462	Ant1	2500.0	-52.67	5.0	0	47.56	AV	54	PASS
11G	2412	Ant1	2310.0	-42.56	5.0	0	57.67	PEAK	74	PASS
	2412	Ant1	2310.0	-53.64	5.0	0	46.59	AV	54	PASS
	2412	Ant1	2390.0	-41.79	5.0	0	58.44	PEAK	74	PASS
	2412	Ant1	2390.0	-53.09	5.0	0	47.14	AV	54	PASS
	2462	Ant1	2483.5	-41.18	5.0	0	59.05	PEAK	74	PASS
	2462	Ant1	2483.5	-52.79	5.0	0	47.44	AV	54	PASS
	2462	Ant1	2500.0	-42.58	5.0	0	57.65	PEAK	74	PASS
	2462	Ant1	2500.0	-52.73	5.0	0	47.5	AV	54	PASS
11N20 SISO	2412	Ant1	2310.0	-43.50	5.0	0	56.73	PEAK	74	PASS
	2412	Ant1	2310.0	-53.70	5.0	0	46.53	AV	54	PASS
	2412	Ant1	2390.0	-42.96	5.0	0	57.27	PEAK	74	PASS
	2412	Ant1	2390.0	-53.12	5.0	0	47.11	AV	54	PASS
	2462	Ant1	2483.5	-43.34	5.0	0	56.89	PEAK	74	PASS
	2462	Ant1	2483.5	-52.81	5.0	0	47.42	AV	54	PASS
	2462	Ant1	2500.0	-42.20	5.0	0	58.03	PEAK	74	PASS
	2462	Ant1	2500.0	-52.70	5.0	0	47.53	AV	54	PASS
11N40 SISO	2422	Ant1	2310.0	-43.28	5.0	0	56.95	PEAK	74	PASS
	2422	Ant1	2310.0	-53.67	5.0	0	46.56	AV	54	PASS

	2422	Ant1	2390.0	-43.39	5.0	0	56.84	PEAK	74	PASS
	2422	Ant1	2390.0	-53.00	5.0	0	47.23	AV	54	PASS
	2452	Ant1	2483.5	-42.72	5.0	0	57.51	PEAK	74	PASS
	2452	Ant1	2483.5	-52.26	5.0	0	47.97	AV	54	PASS
	2452	Ant1	2500.0	-41.68	5.0	0	58.55	PEAK	74	PASS
	2452	Ant1	2500.0	-52.68	5.0	0	47.55	AV	54	PASS

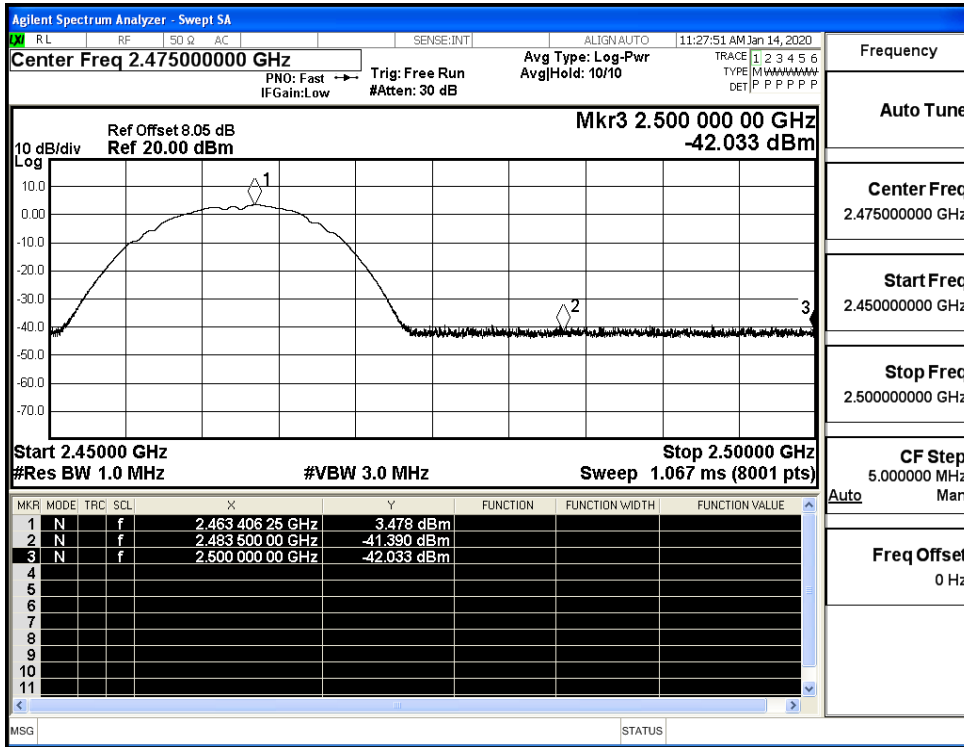
Restrict-band band-edge measurements_11B_2412_Ant1_PEAK



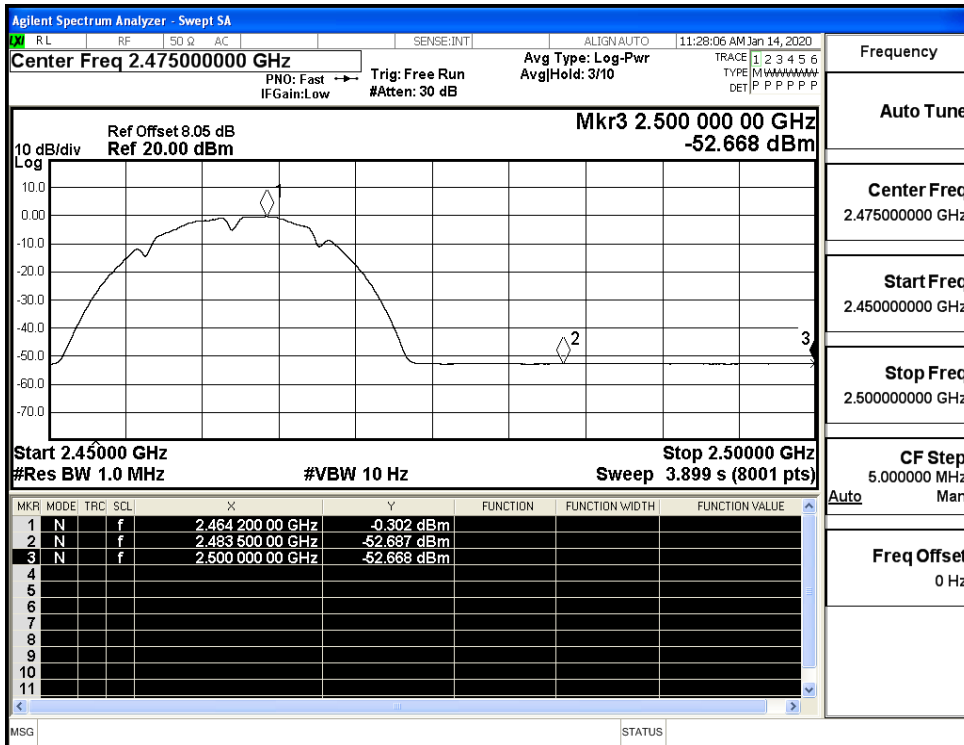
Restrict-band band-edge measurements_11B_2412_Ant1_AV



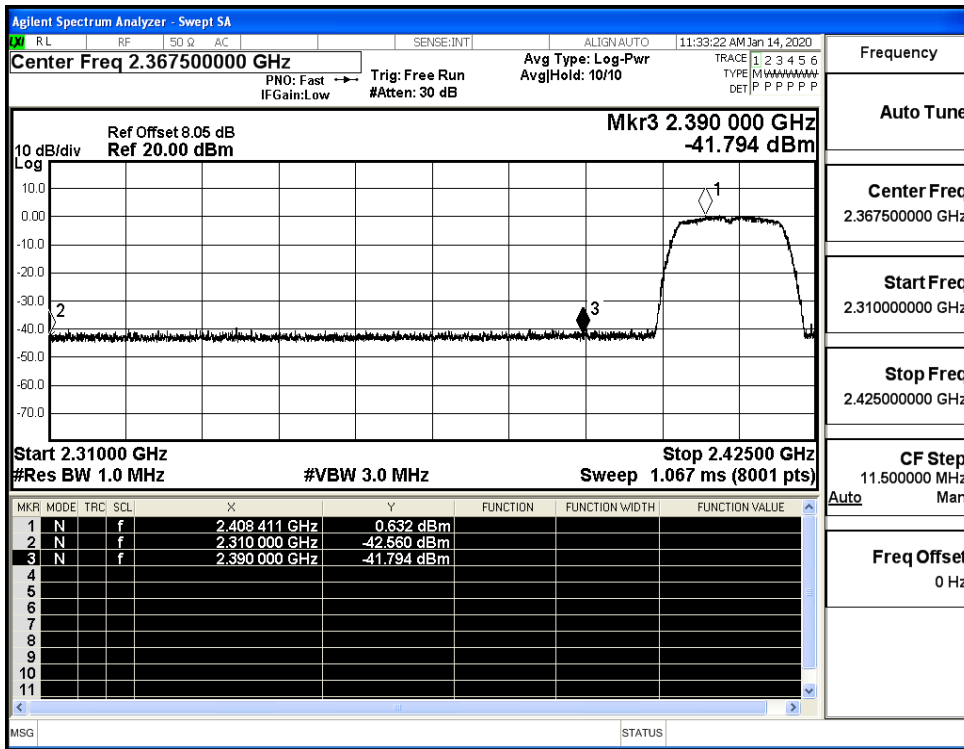
Restrict-band band-edge measurements_11B_2462_Ant1_PEAK



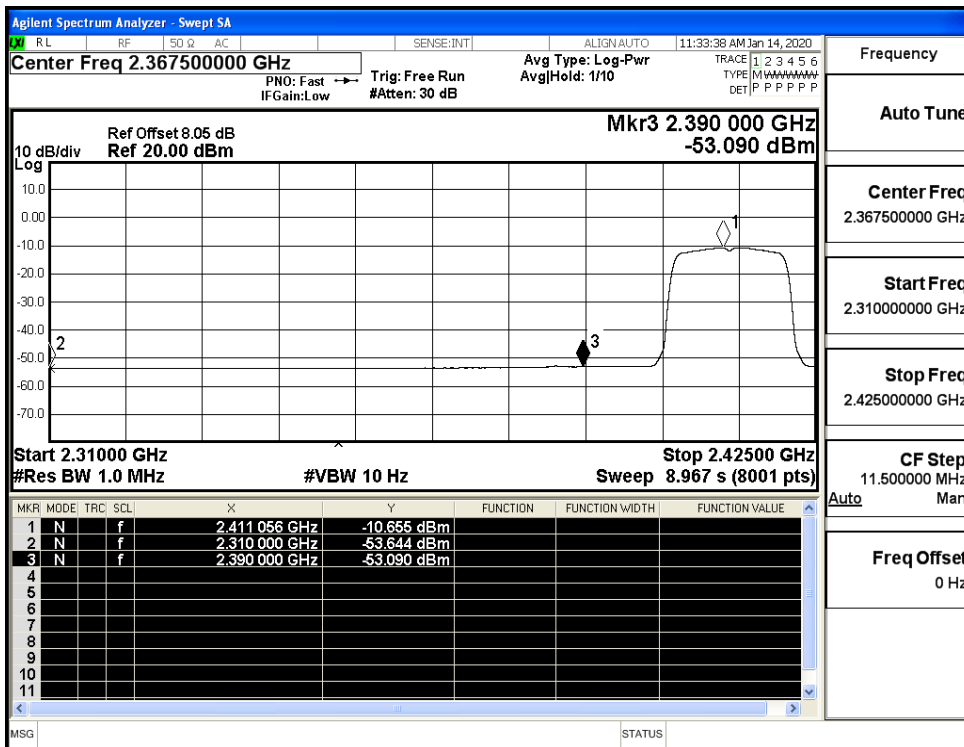
Restrict-band band-edge measurements_11B_2462_Ant1_AV



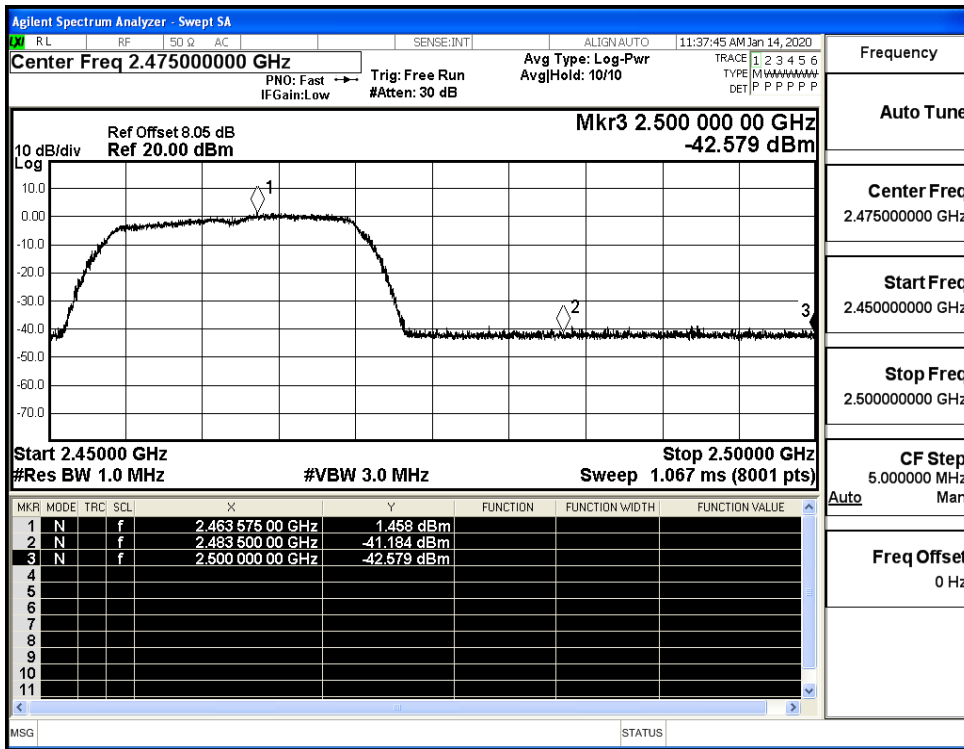
Restrict-band band-edge measurements_11G_2412_Ant1_PEAK



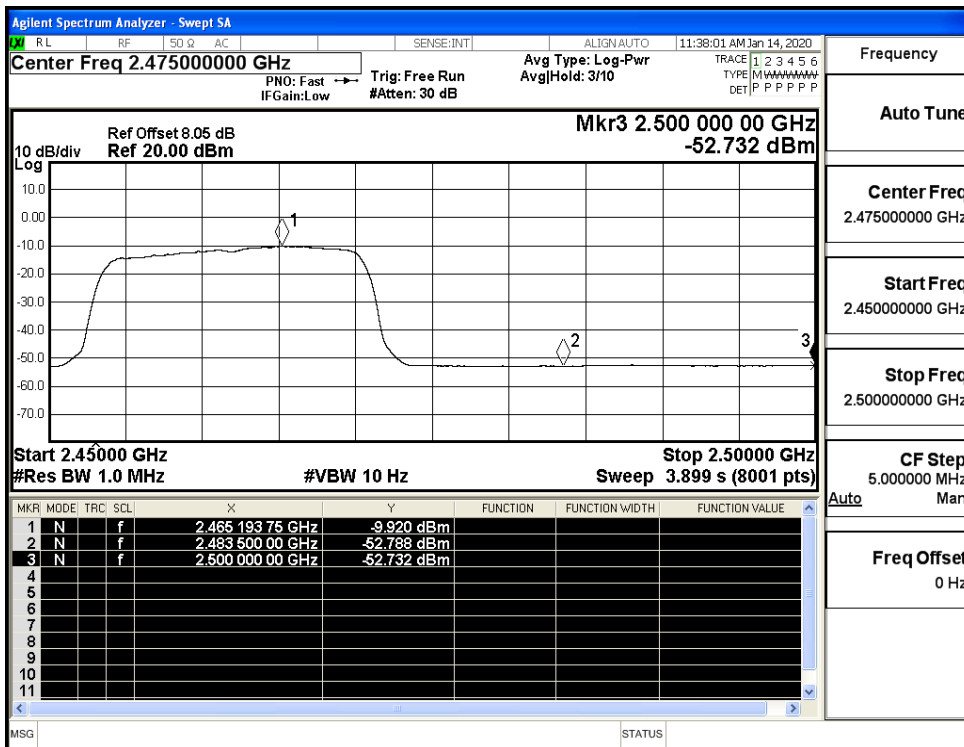
Restrict-band band-edge measurements_11G_2412_Ant1_AV



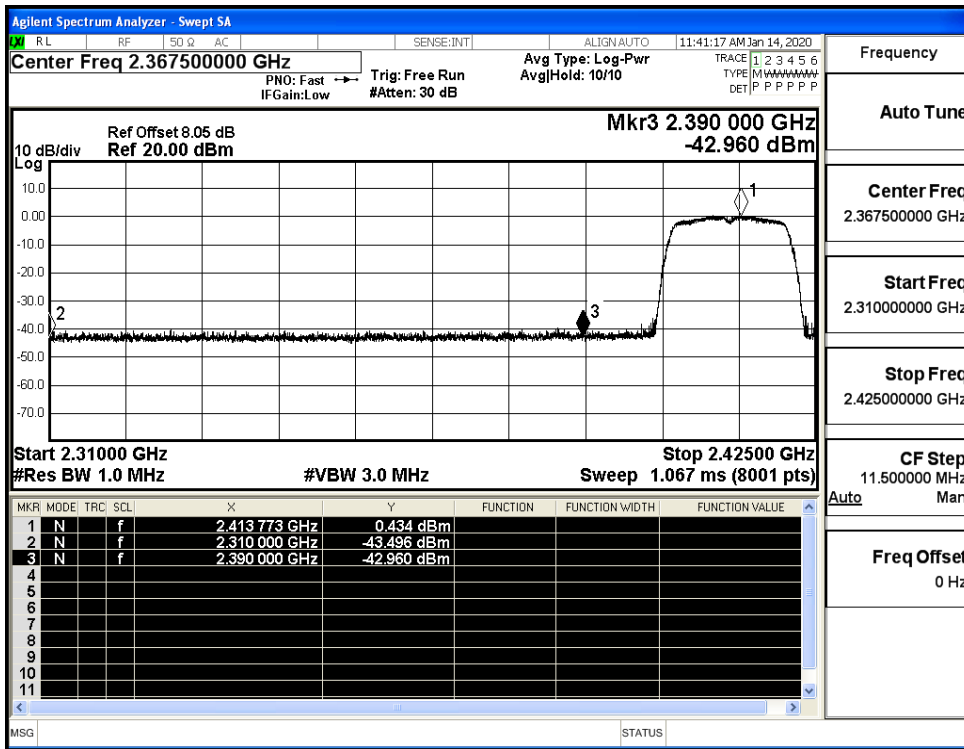
Restrict-band band-edge measurements_11G_2462_Ant1_PEAK



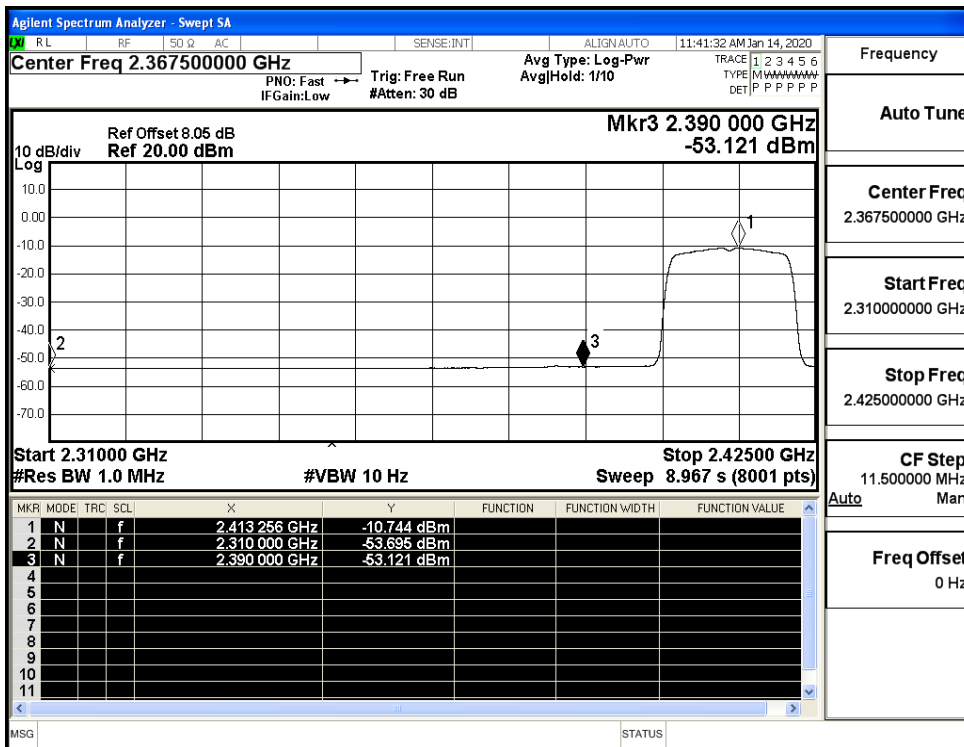
Restrict-band band-edge measurements_11G_2462_Ant1_AV



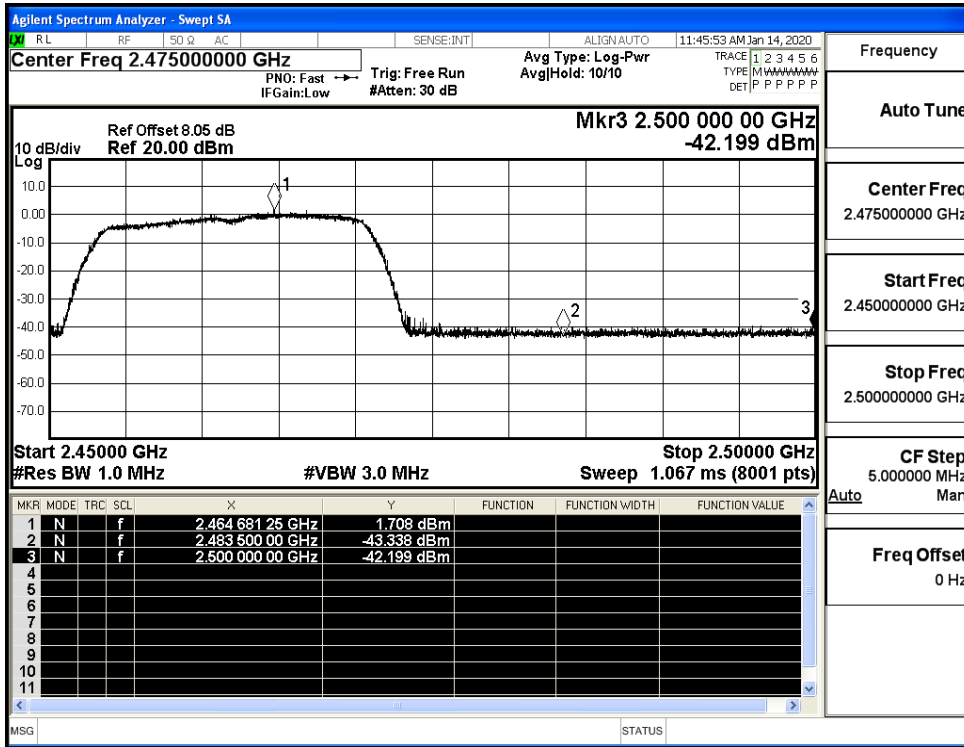
Restrict-band band-edge measurements_11N20SISO_2412_Ant1_PEAK



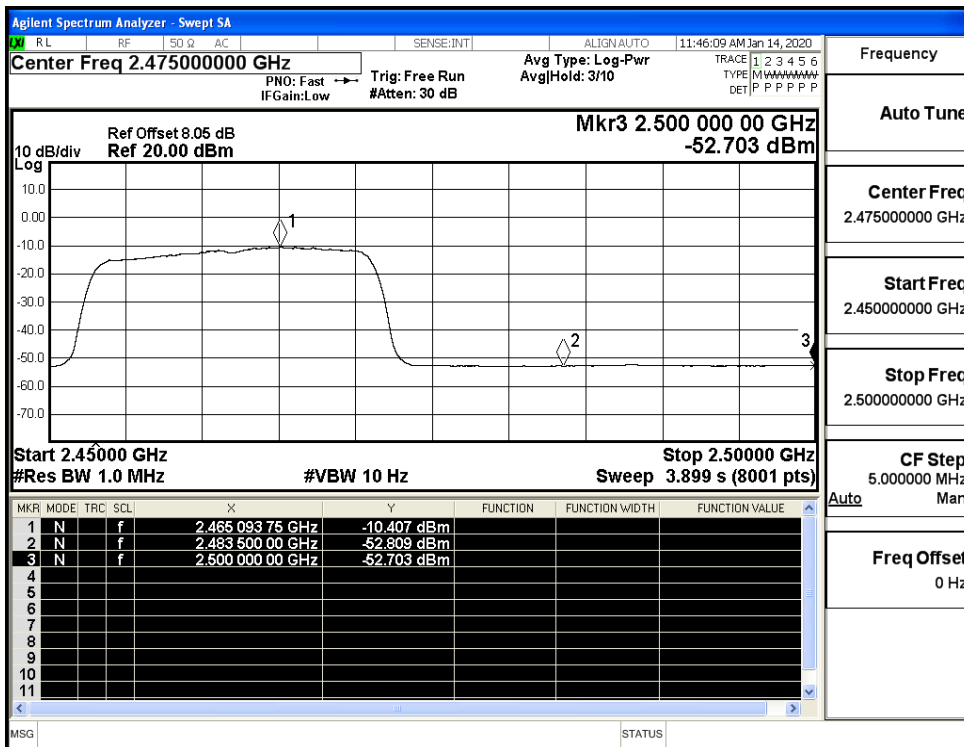
Restrict-band band-edge measurements_11N20SISO_2412_Ant1_AV



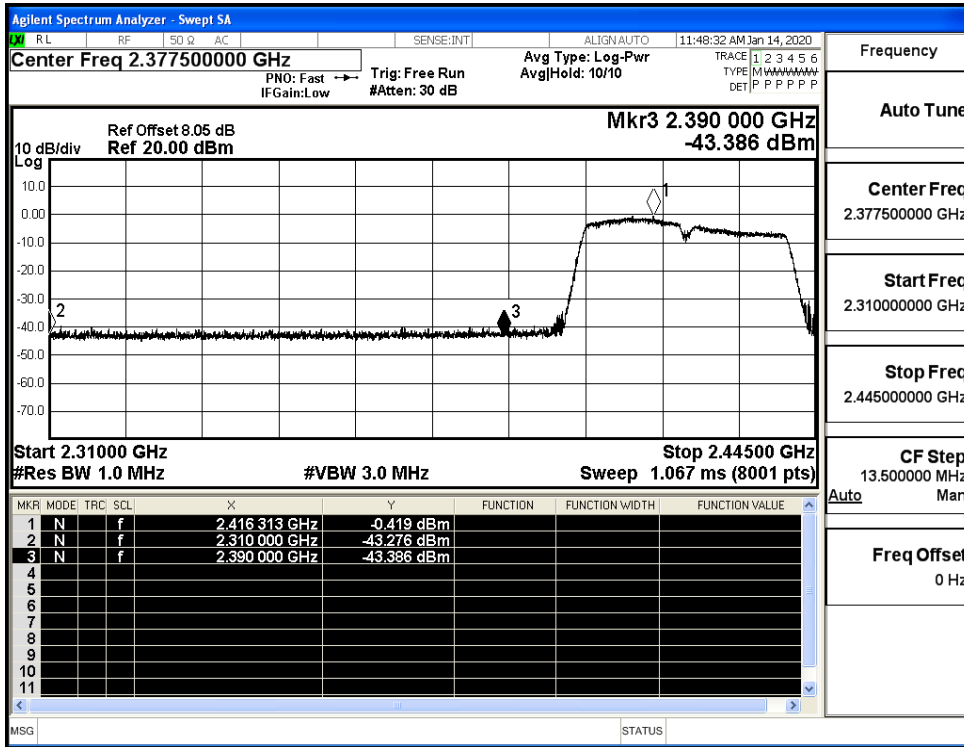
Restrict-band band-edge measurements_11N20SISO_2462_Ant1_PEAK



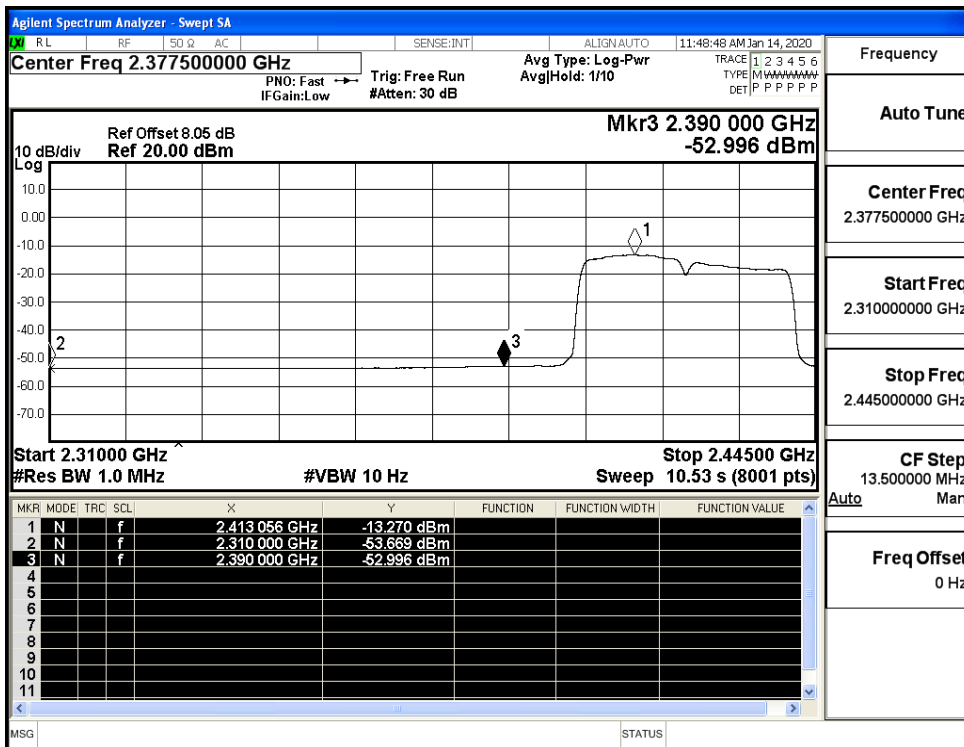
Restrict-band band-edge measurements_11N20SISO_2462_Ant1_AV



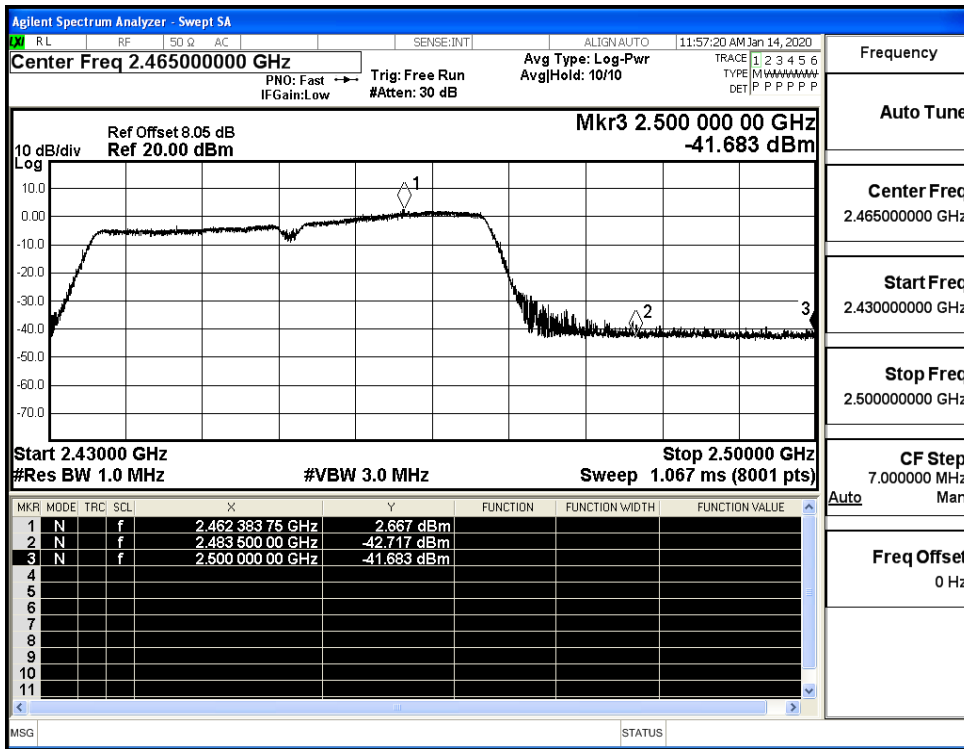
Restrict-band band-edge measurements_11N40SISO_2422_Ant1_PEAK



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

