Appendix C

RF Test Data for 2.4GWIFI (Conducted Measurement)

Product Name: Wi-Fi Module

Trade Mark: LawMate

Test Model: LM-RTL8189FTV

Environmental Conditions

Temperature:	20.6° C
Relative Humidity:	52.4%
ATM Pressure:	100.0 kPa
Test Engineer:	Simba Huang
Supervised by:	Seal Chen

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1 Duty Cycle

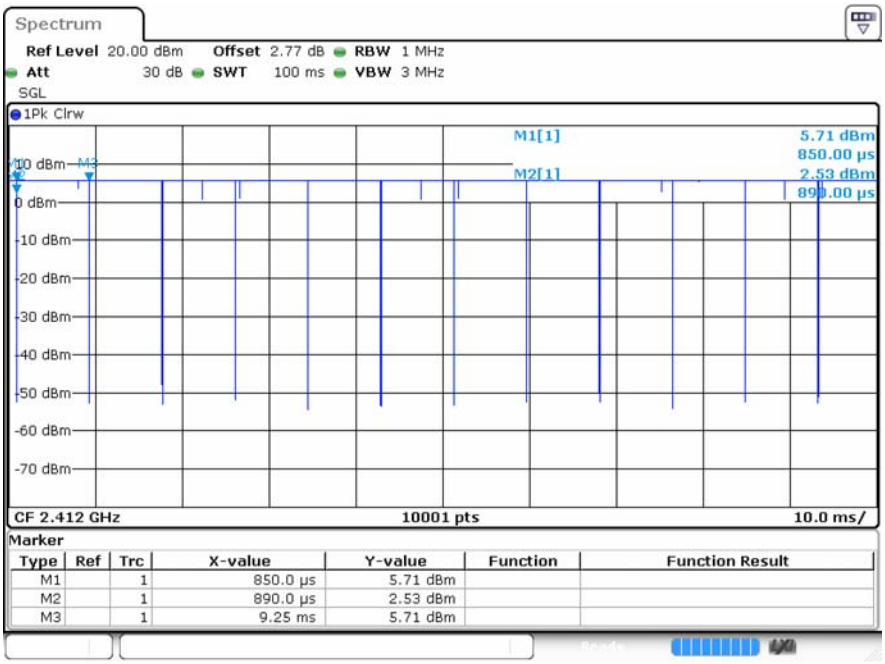
1.1 Test Result

Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	1/T (kHz)
b	2412	Ant1	99.6	0.12
b	2437	Ant1	99.59	0
b	2462	Ant1	99.61	0.12
g	2412	Ant1	86.89	4.55
g	2437	Ant1	86.93	4.76
g	2462	Ant1	86.98	4.76
n20	2412	Ant1	87.58	4.35
n20	2437	Ant1	87.67	4.17
n20	2462	Ant1	87.55	4.35
n40	2422	Ant1	88.06	4.17
n40	2437	Ant1	88.26	4
n40	2452	Ant1	88.02	4.17

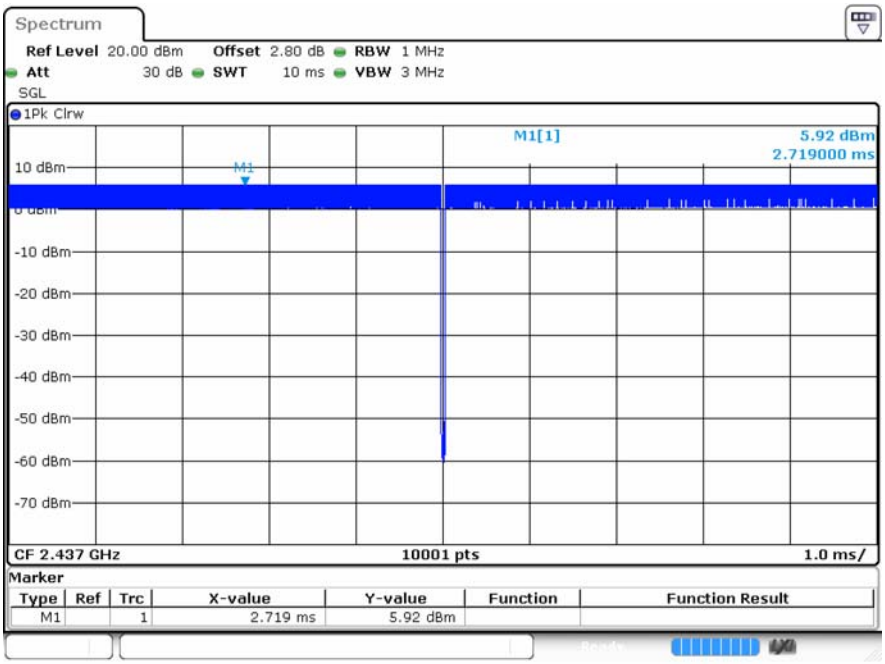
1.2 Test Graphs

Test Graphs

b 2412MHz Ant1

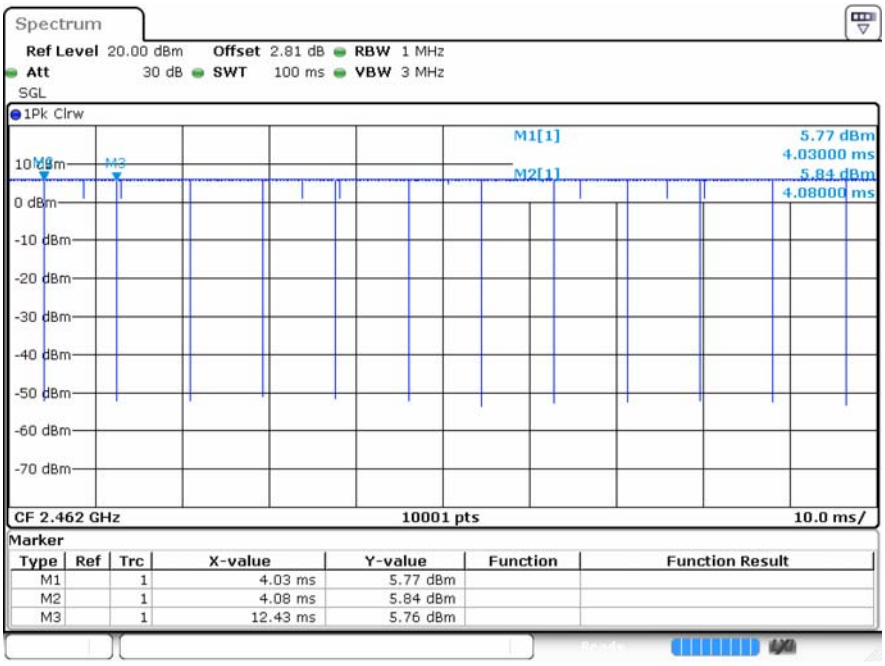


b 2437MHz Ant1

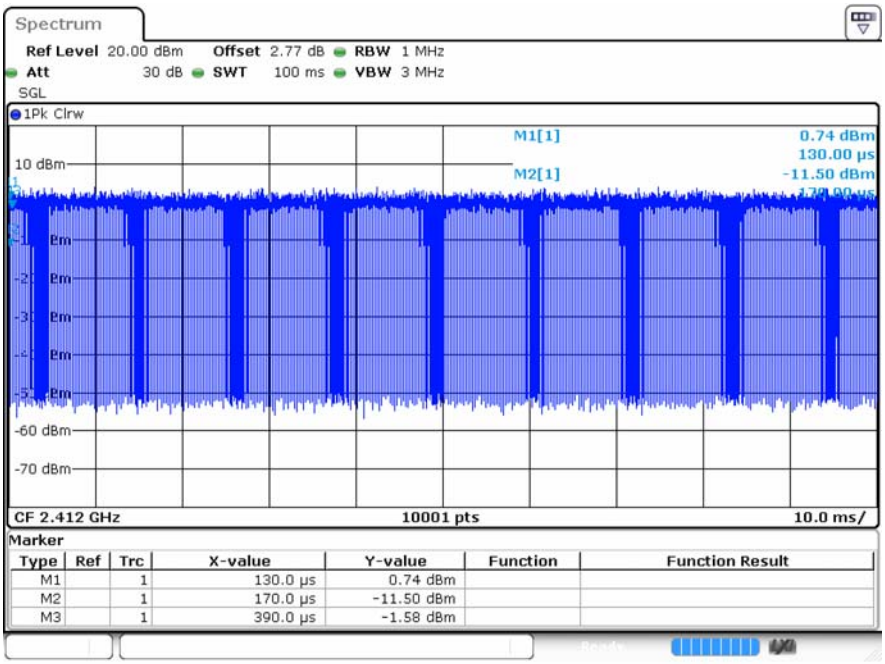


Test Graphs

b 2462MHz Ant1

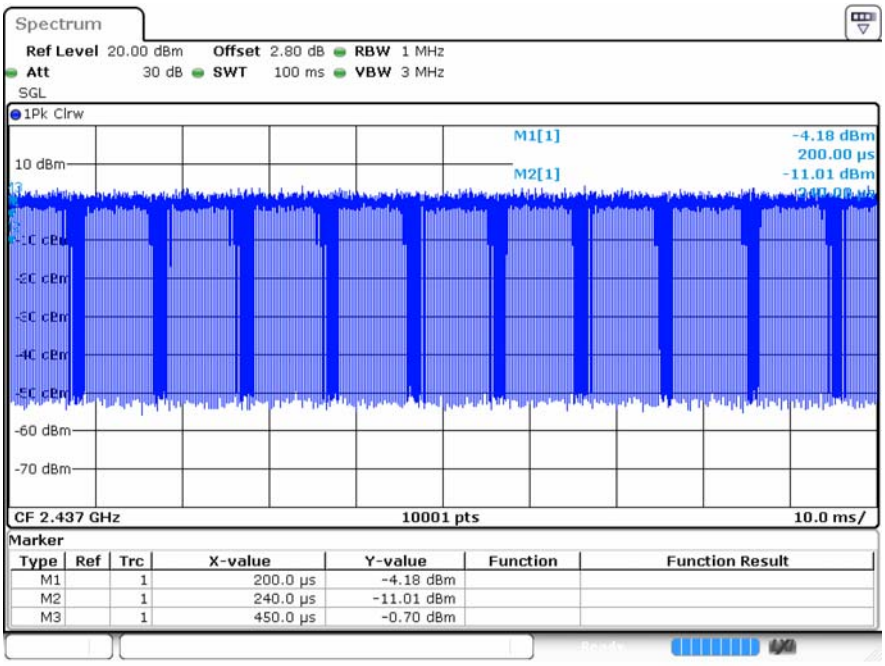


g 2412MHz Ant1

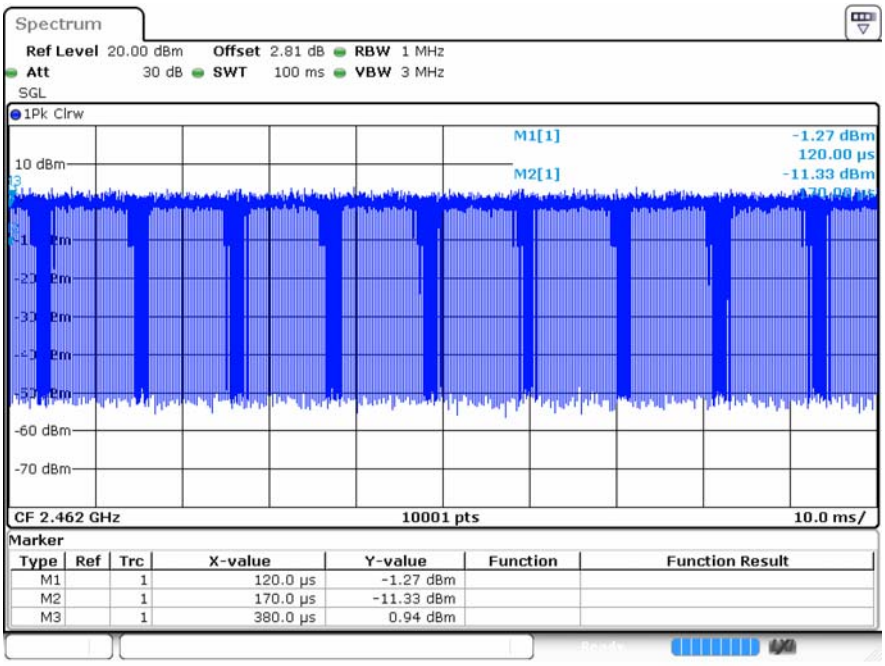


Test Graphs

g 2437MHz Ant1

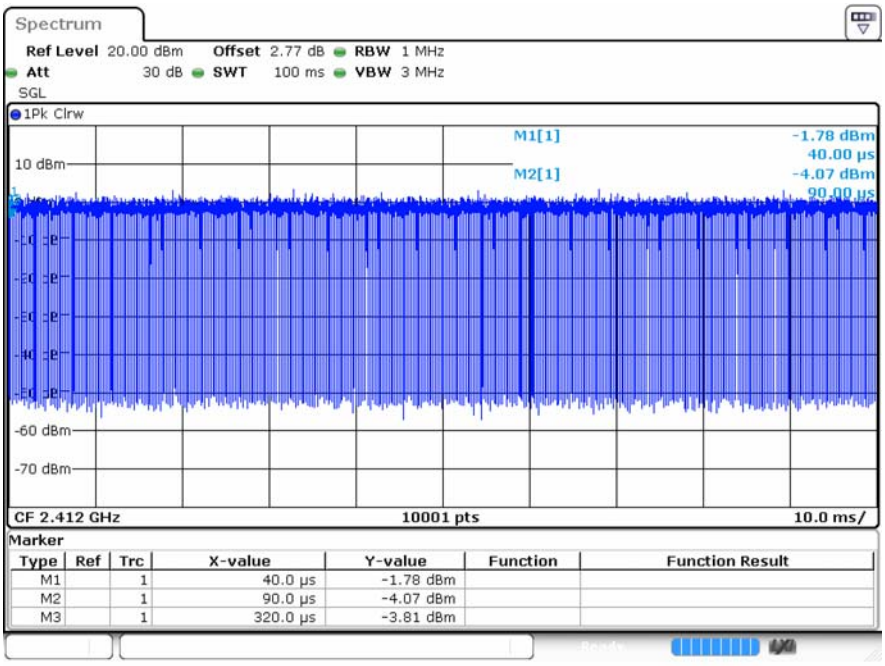


g 2462MHz Ant1

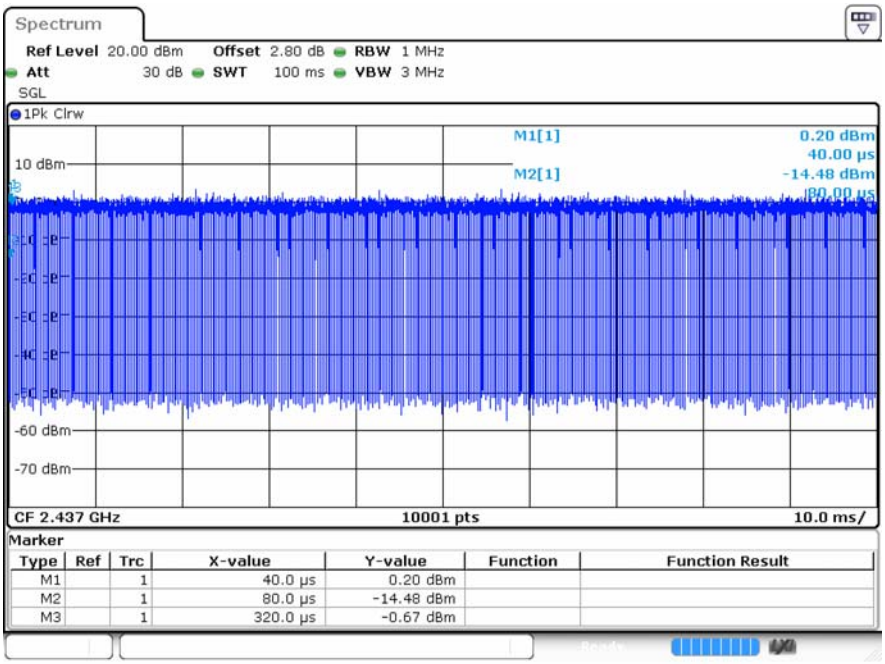


Test Graphs

n20 2412MHz Ant1

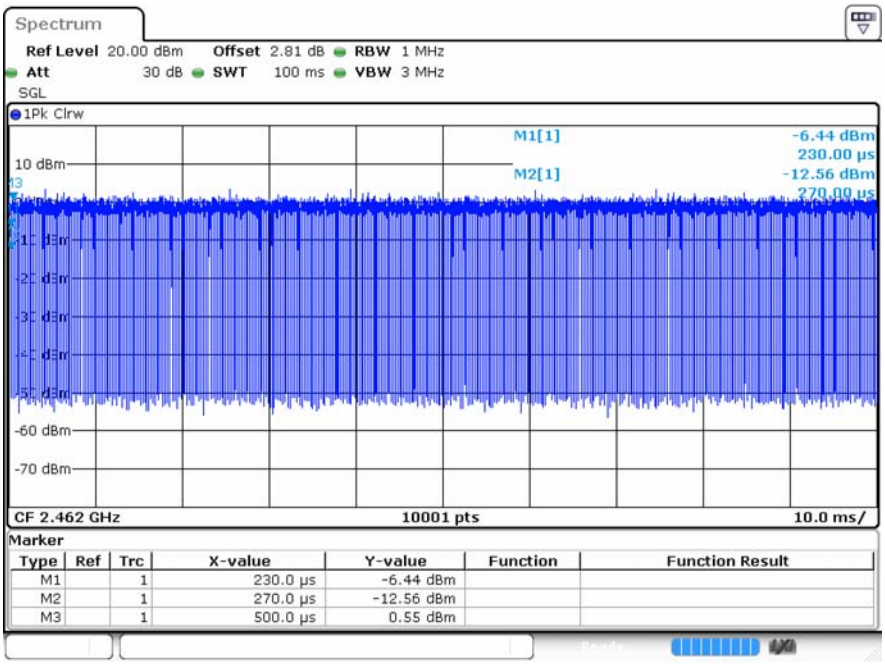


n20 2437MHz Ant1

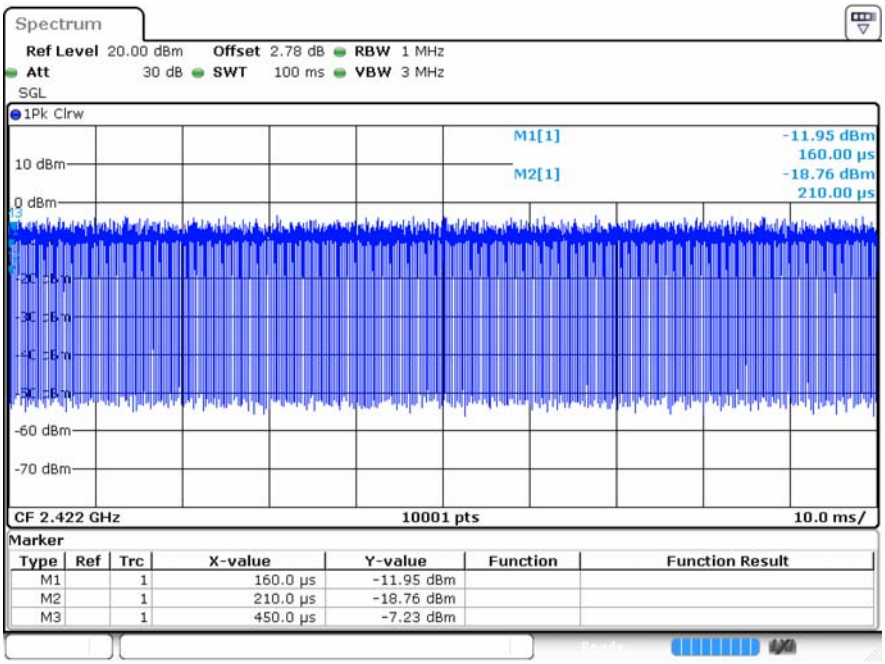


Test Graphs

n20 2462MHz Ant1

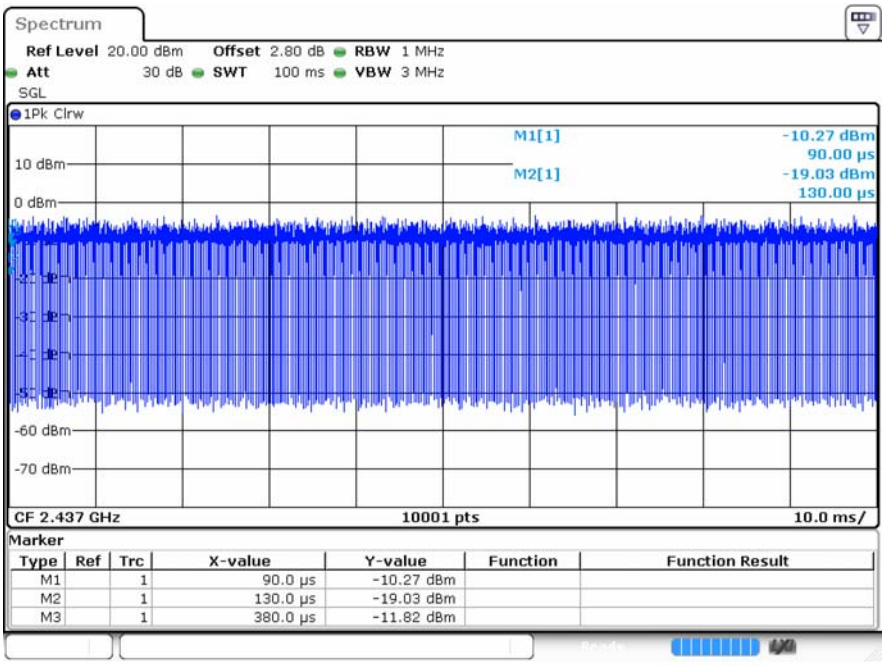


n40 2422MHz Ant1

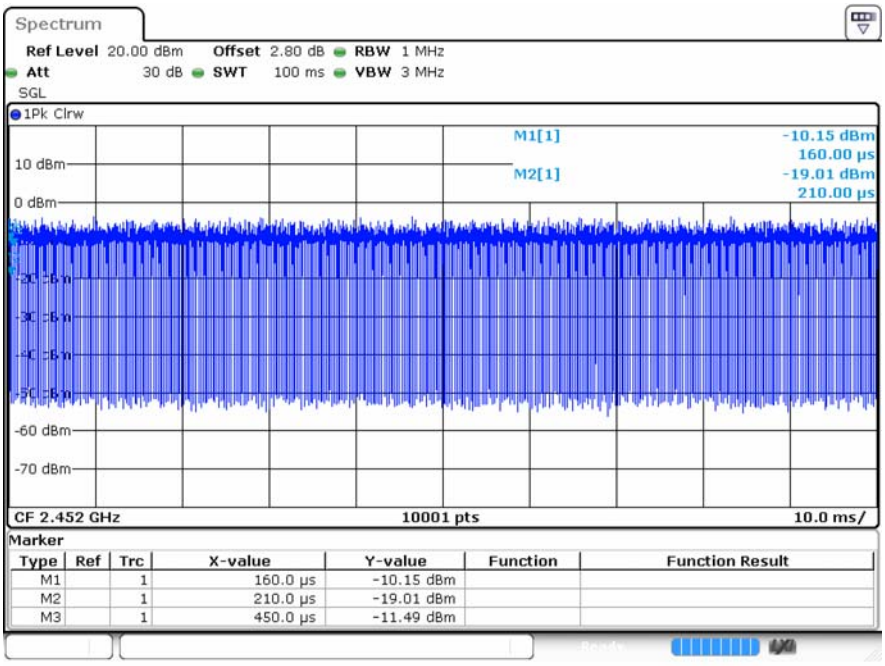


Test Graphs

n40 2437MHz Ant1



n40 2452MHz Ant1



2 Maximum Conducted Output Power

2.1 Test Result

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
b	2412	Ant1	16.26	30	Pass
b	2437	Ant1	16.36	30	Pass
b	2462	Ant1	16.3	30	Pass
g	2412	Ant1	13.35	30	Pass
g	2437	Ant1	13.29	30	Pass
g	2462	Ant1	13.19	30	Pass
n20	2412	Ant1	12.45	30	Pass
n20	2437	Ant1	12.26	30	Pass
n20	2462	Ant1	12.2	30	Pass
n40	2422	Ant1	12.69	30	Pass
n40	2437	Ant1	12.69	30	Pass
n40	2452	Ant1	12.65	30	Pass

3 -6dB Bandwidth

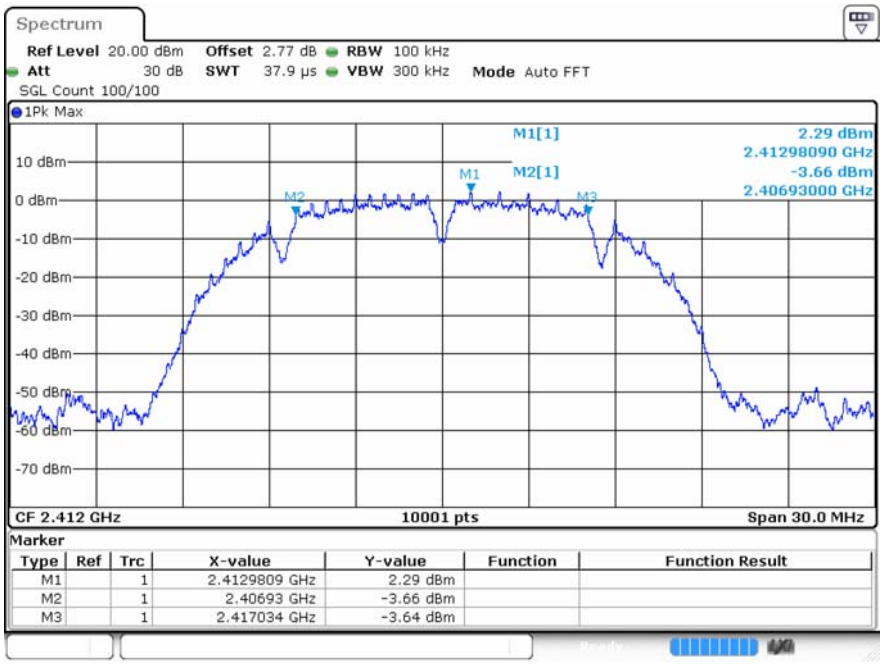
3.1 Test Result

Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
b	2412	Ant1	10.104	0.5	Pass
b	2437	Ant1	10.098	0.5	Pass
b	2462	Ant1	10.095	0.5	Pass
g	2412	Ant1	14.439	0.5	Pass
g	2437	Ant1	15.12	0.5	Pass
g	2462	Ant1	15.105	0.5	Pass
n20	2412	Ant1	15.114	0.5	Pass
n20	2437	Ant1	15.114	0.5	Pass
n20	2462	Ant1	15.087	0.5	Pass
n40	2422	Ant1	32.538	0.5	Pass
n40	2437	Ant1	35.058	0.5	Pass
n40	2452	Ant1	35.088	0.5	Pass

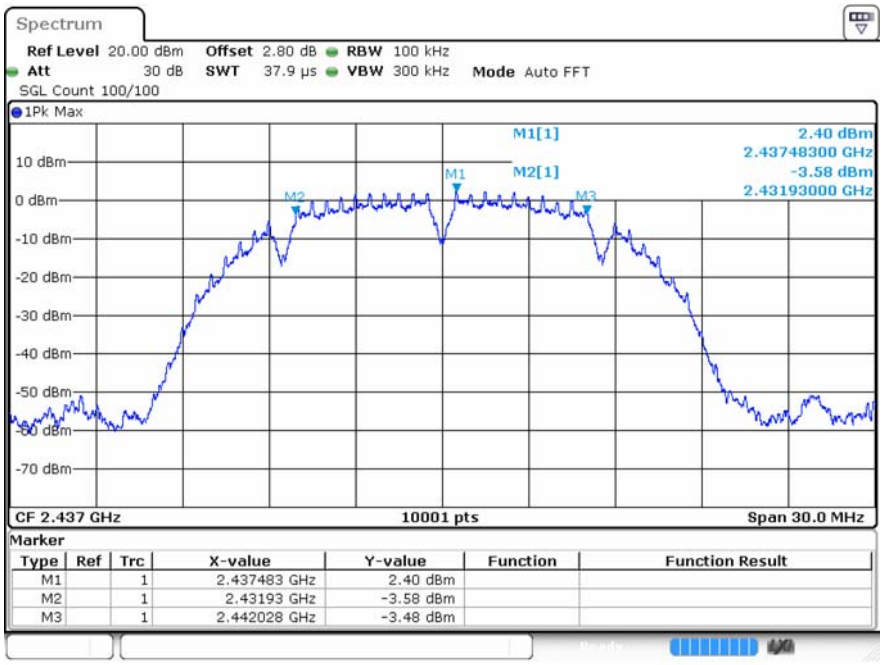
3.2 Test Graphs

Test Graphs

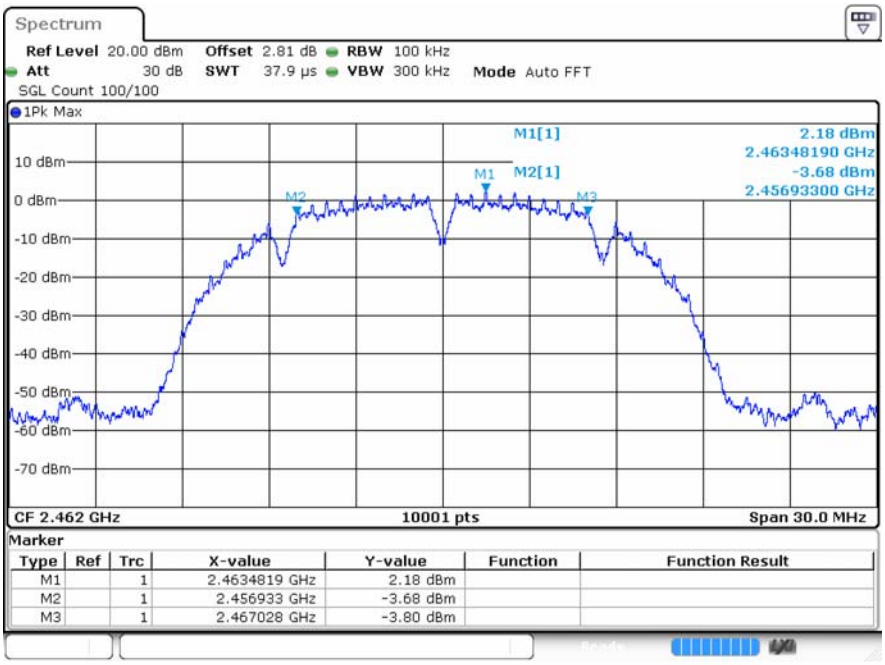
b 2412MHz Ant1



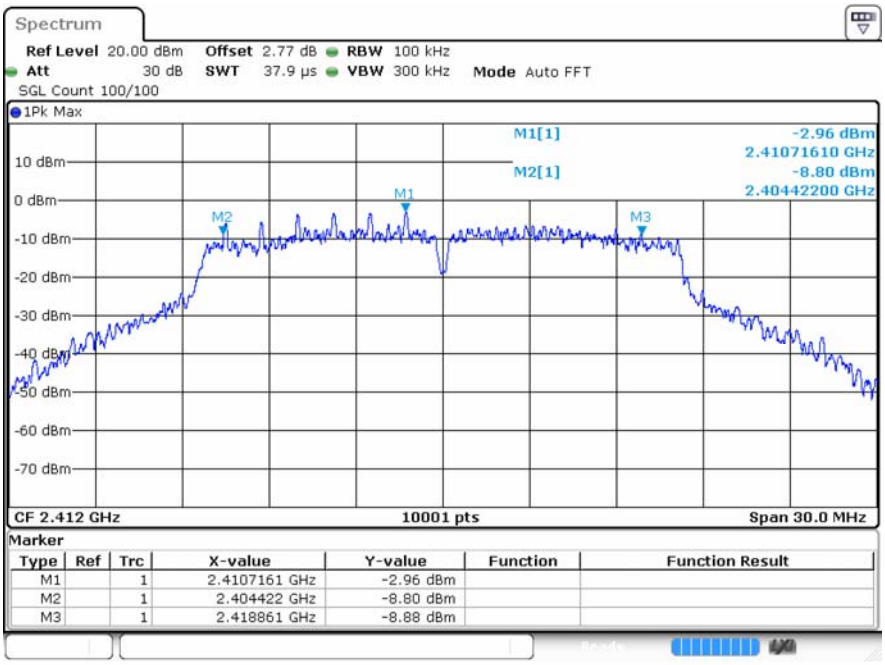
b 2437MHz Ant1



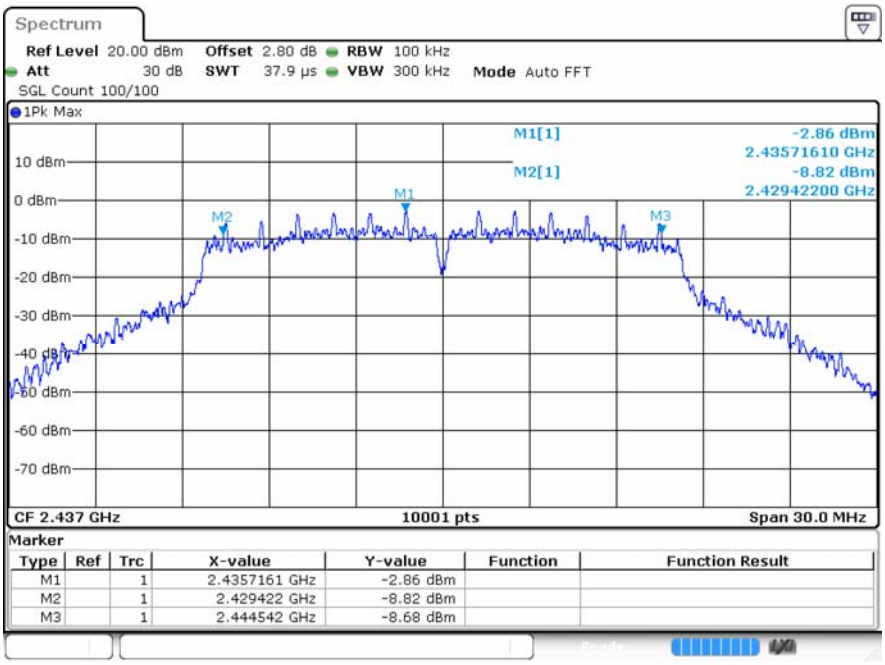
b 2462MHz Ant1



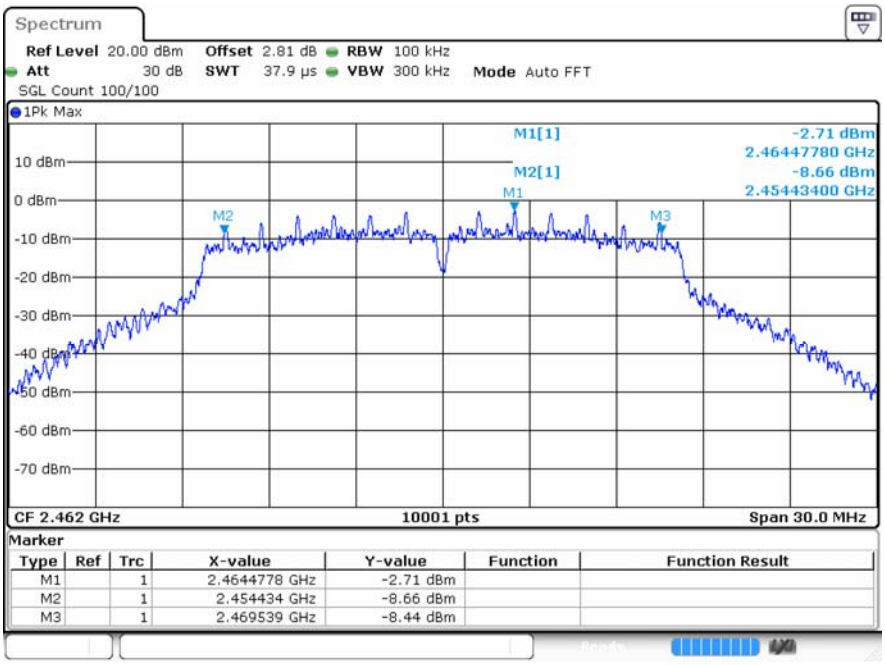
g 2412MHz Ant1



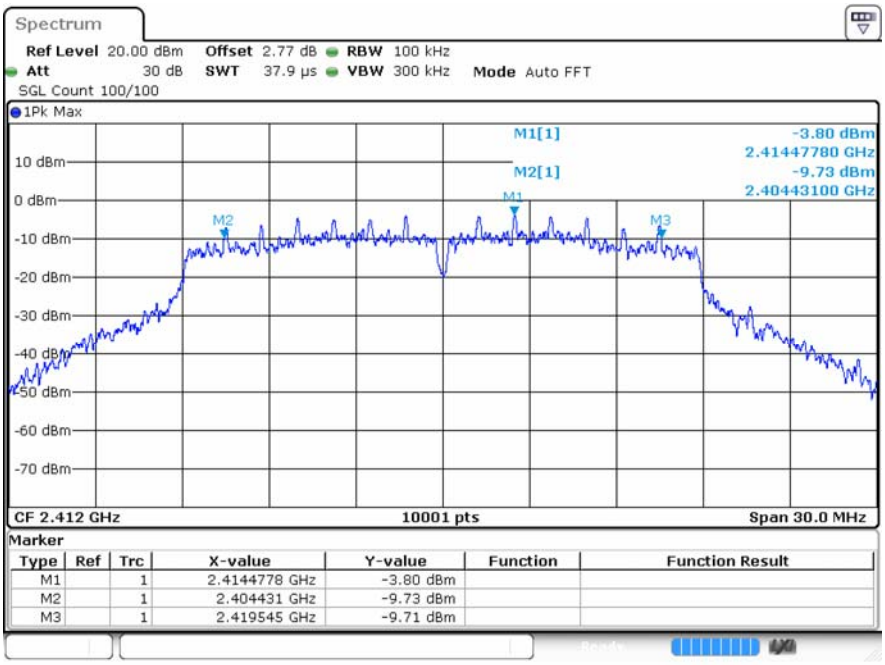
g 2437MHz Ant1



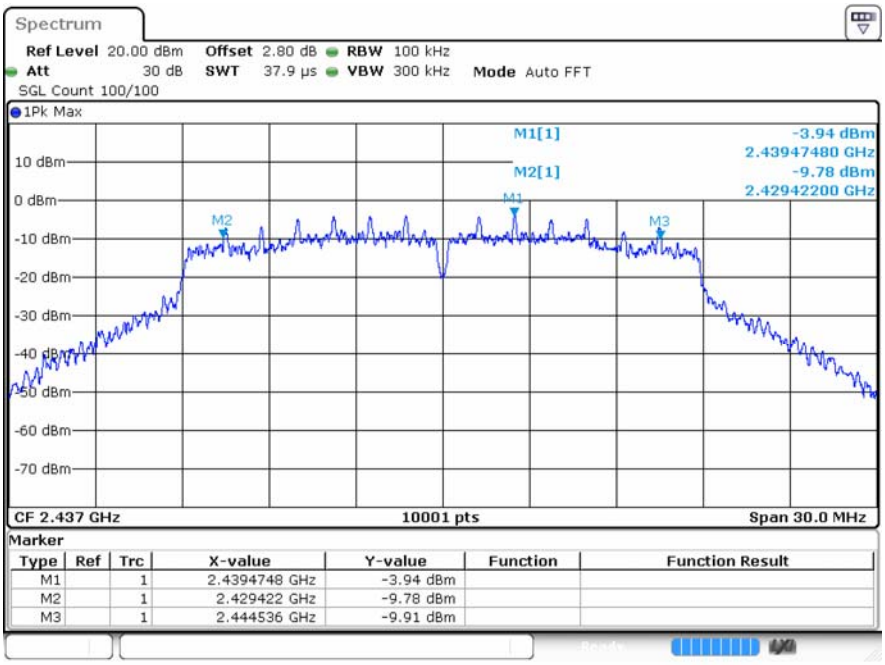
g 2462MHz Ant1



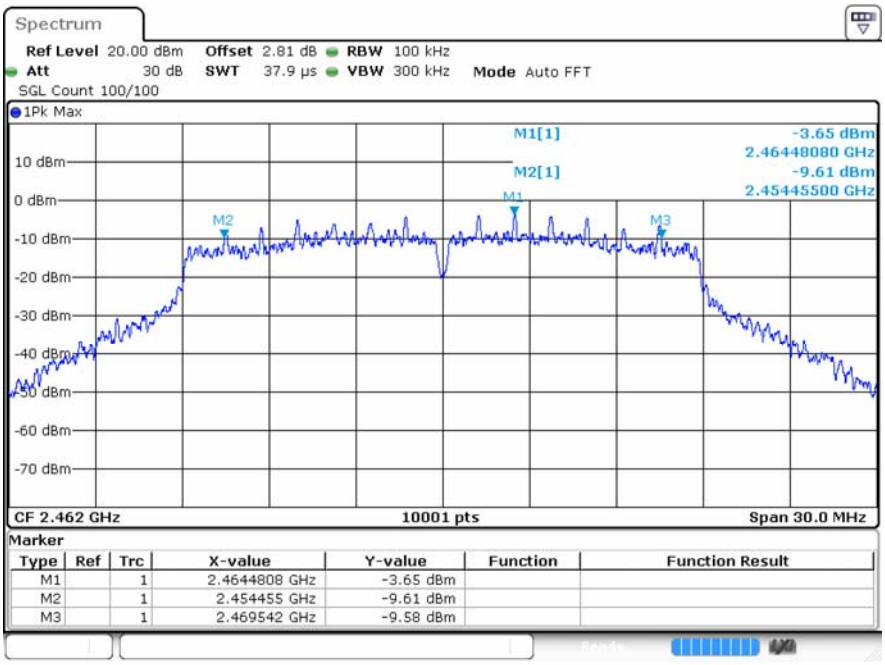
n20 2412MHz Ant1



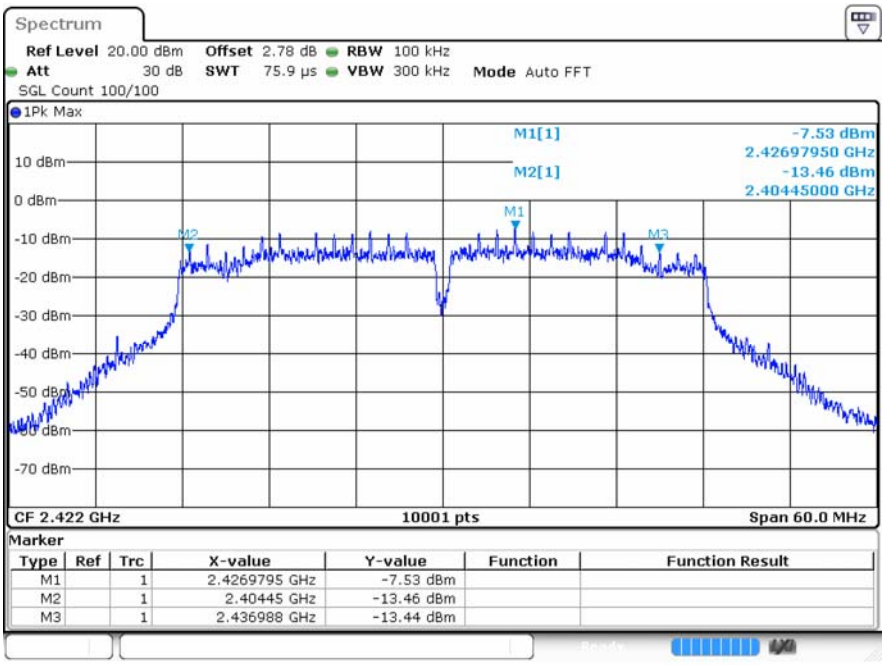
n20 2437MHz Ant1



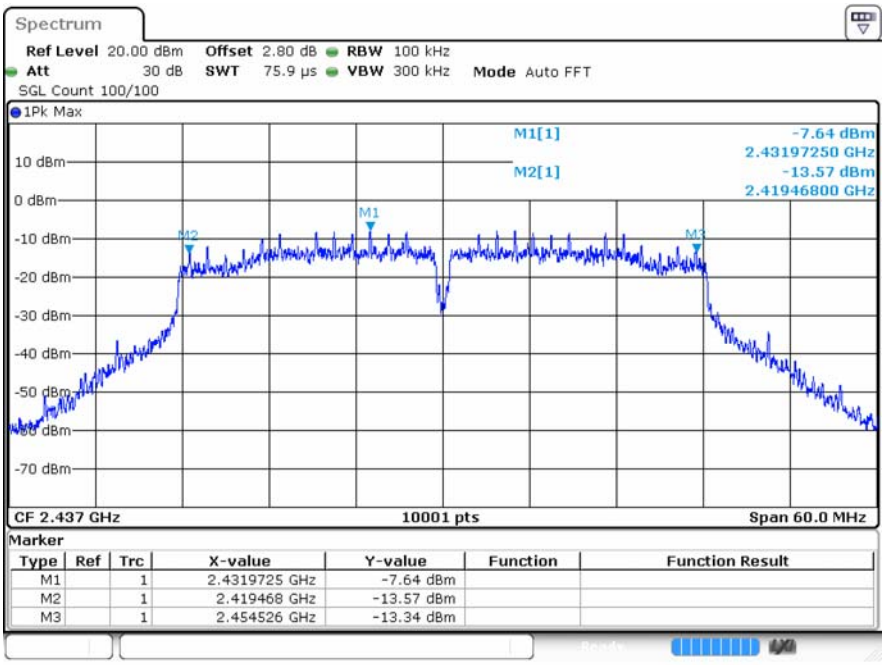
n20 2462MHz Ant1



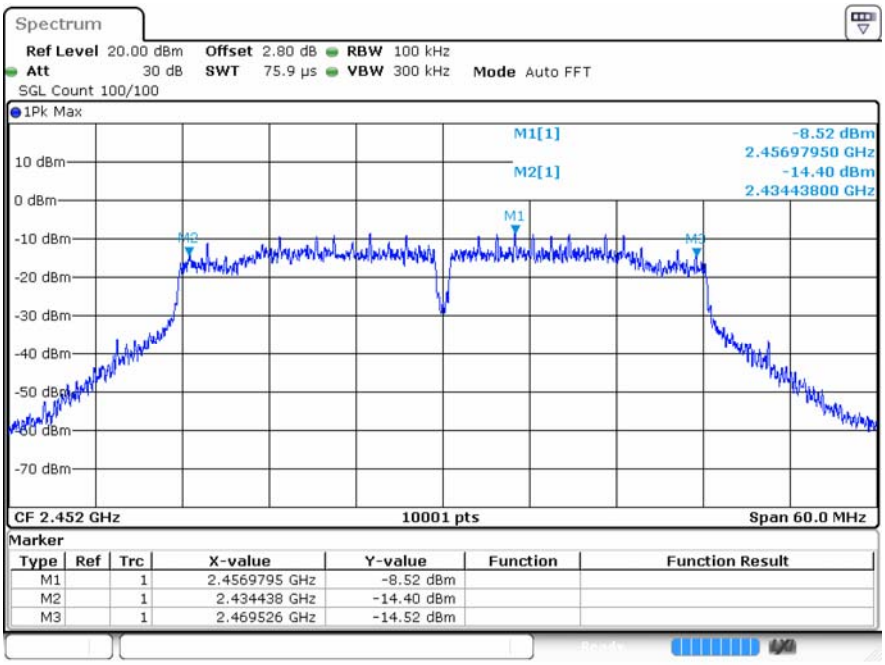
n40 2422MHz Ant1



n40 2437MHz Ant1



n40 2452MHz Ant1

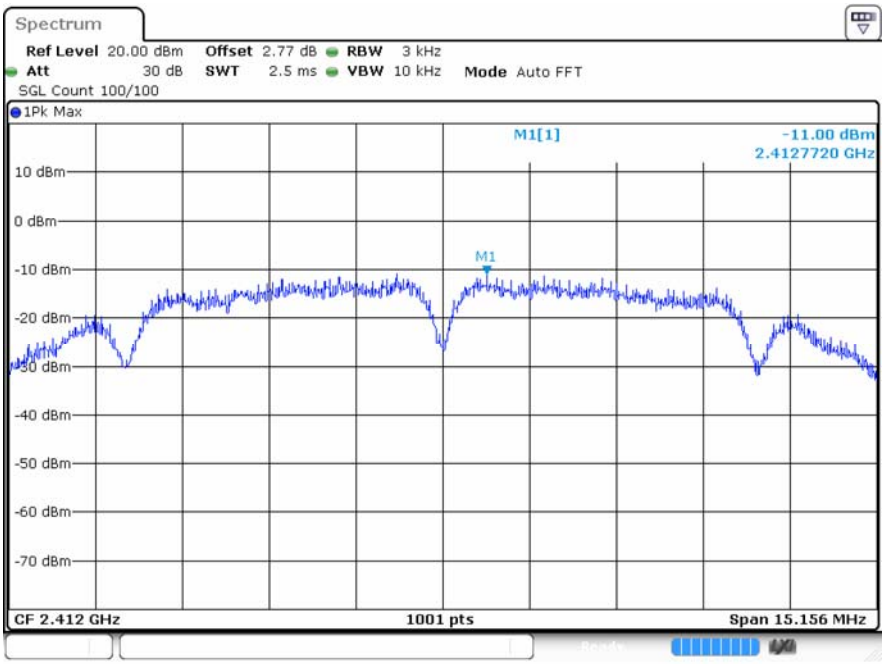
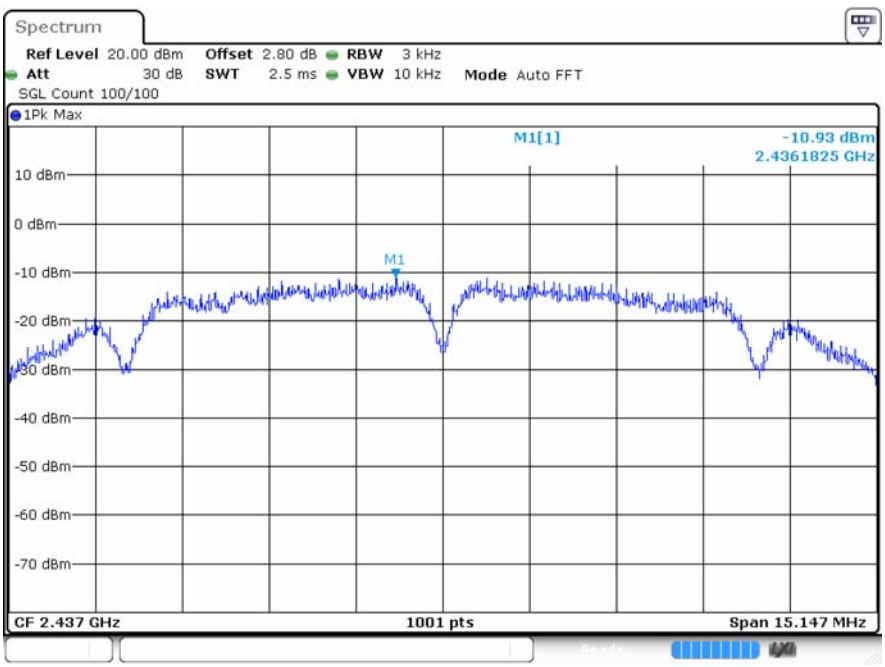


4 Maximum Power Spectral Density Level

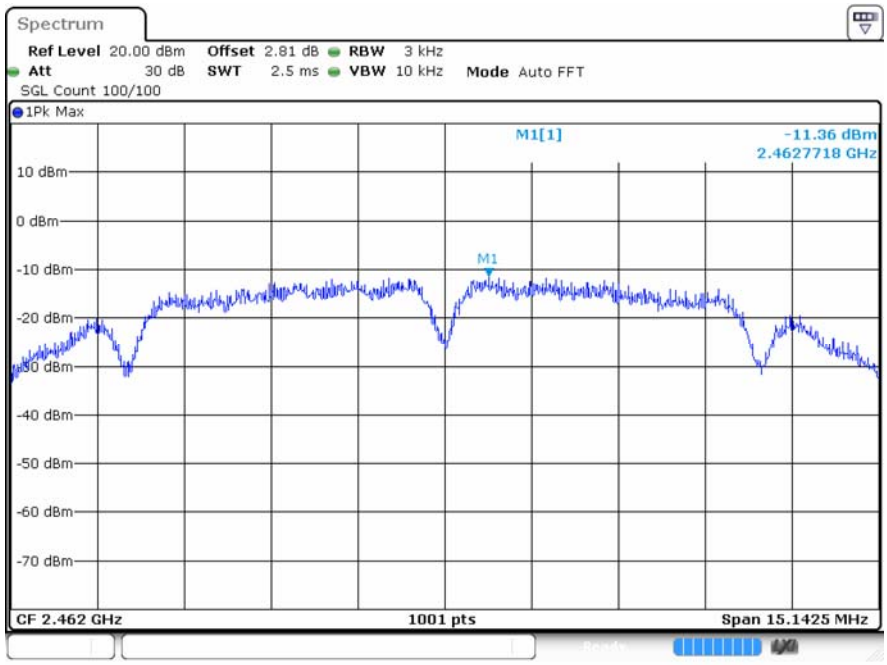
4.1 Test Result

Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3-100kHz)	Limit (dBm/3kHz)	Verdict
b	2412	Ant1	-11	≤8	Pass
b	2437	Ant1	-10.93	≤8	Pass
b	2462	Ant1	-11.36	≤8	Pass
g	2412	Ant1	-17.61	≤8	Pass
g	2437	Ant1	-17.83	≤8	Pass
g	2462	Ant1	-16.97	≤8	Pass
n20	2412	Ant1	-17.44	≤8	Pass
n20	2437	Ant1	-17.85	≤8	Pass
n20	2462	Ant1	-18.44	≤8	Pass
n40	2422	Ant1	-22.44	≤8	Pass
n40	2437	Ant1	-22.02	≤8	Pass
n40	2452	Ant1	-22.42	≤8	Pass

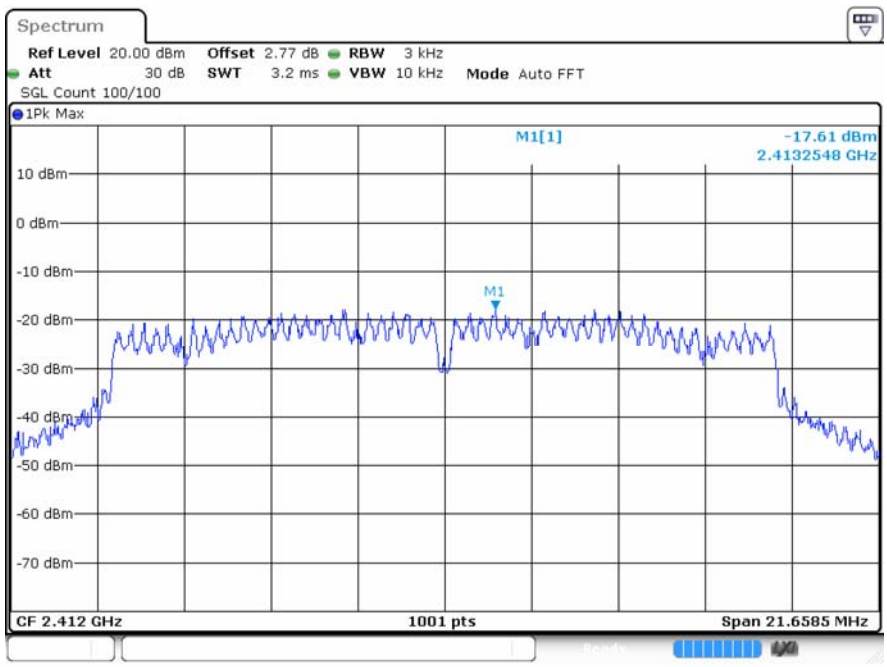
4.2 Test Graphs

Test Graphs
b 2412MHz Ant1

b 2437MHz Ant1


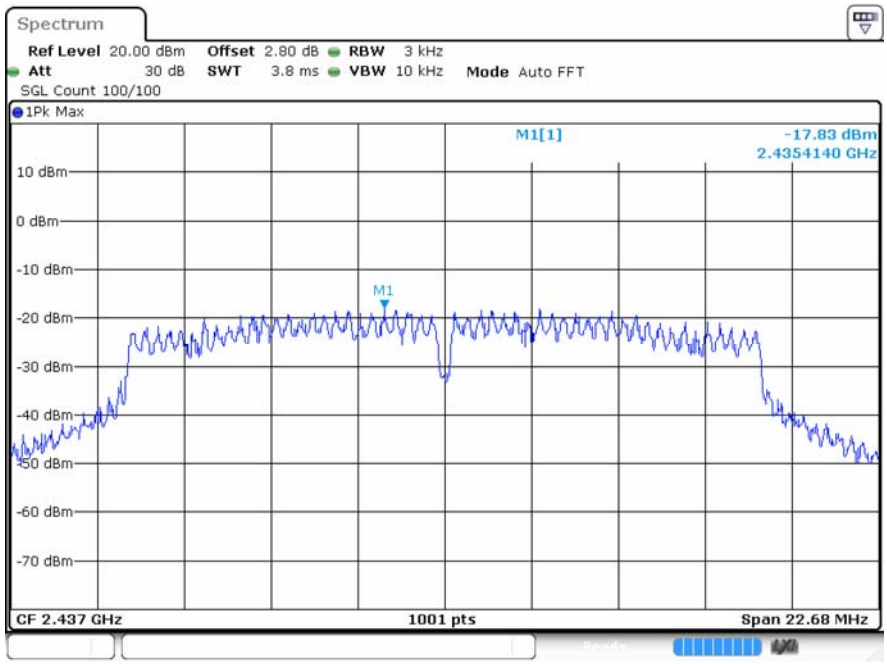
b 2462MHz Ant1



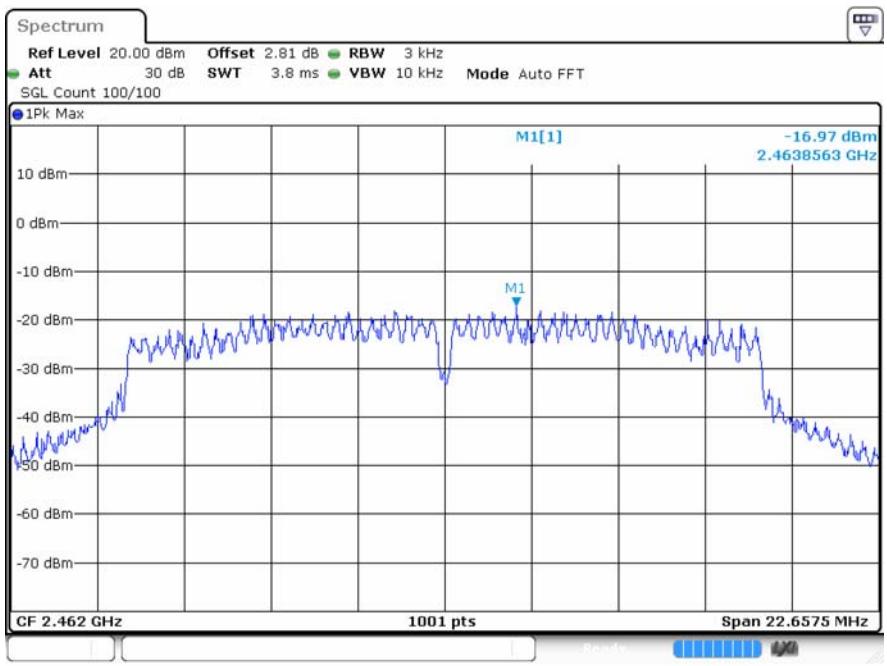
g 2412MHz Ant1



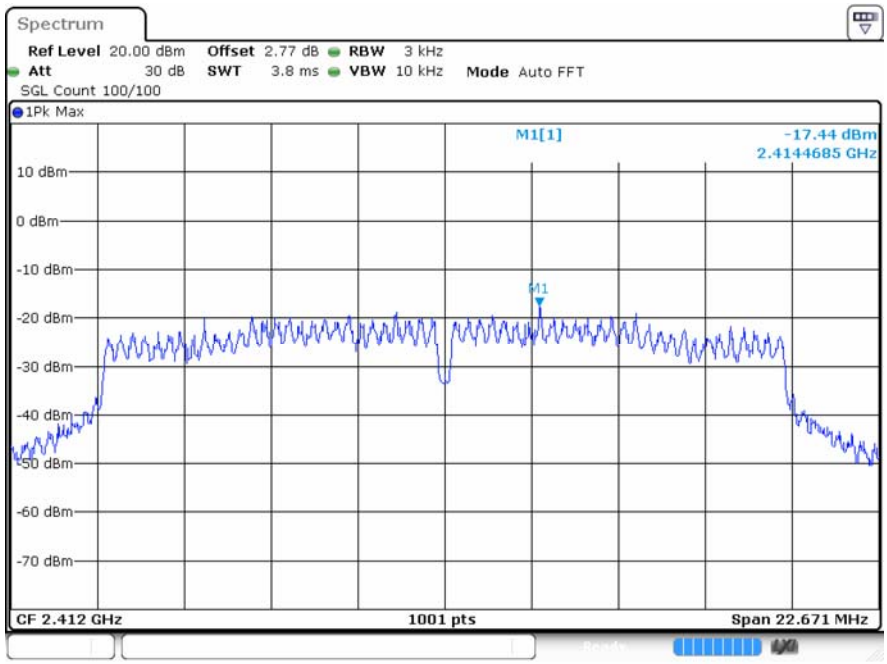
g 2437MHz Ant1



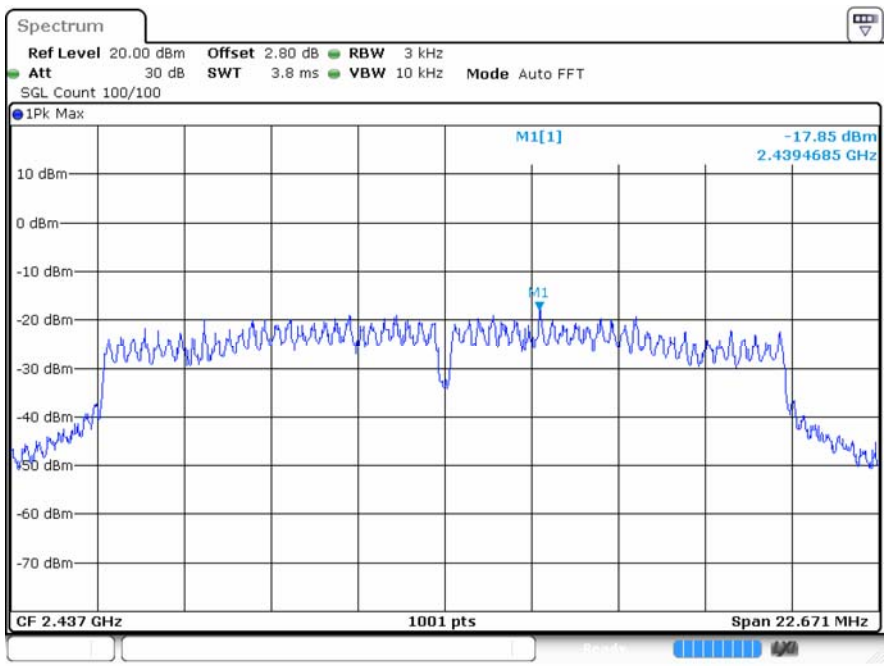
g 2462MHz Ant1



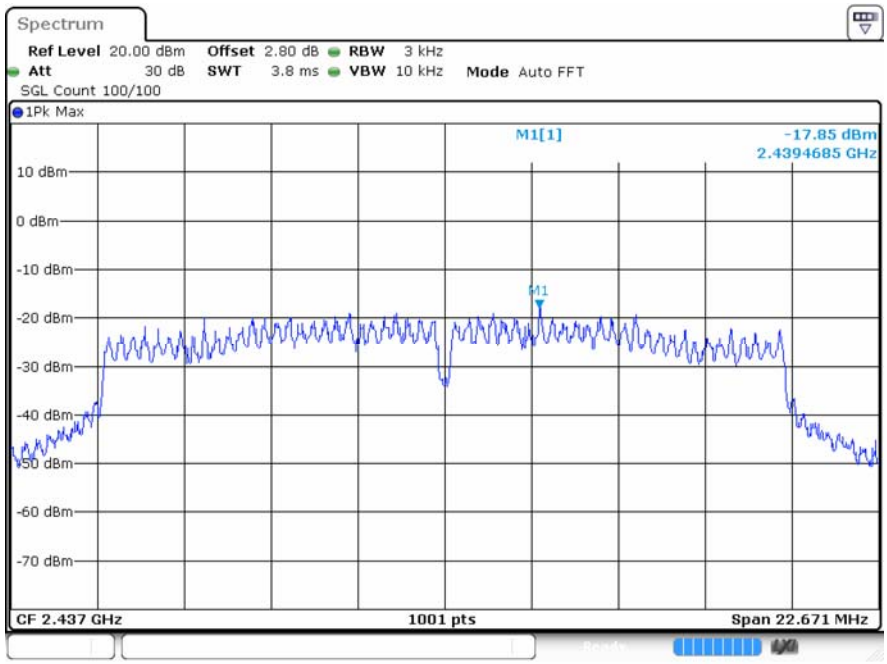
n20 2412MHz Ant1



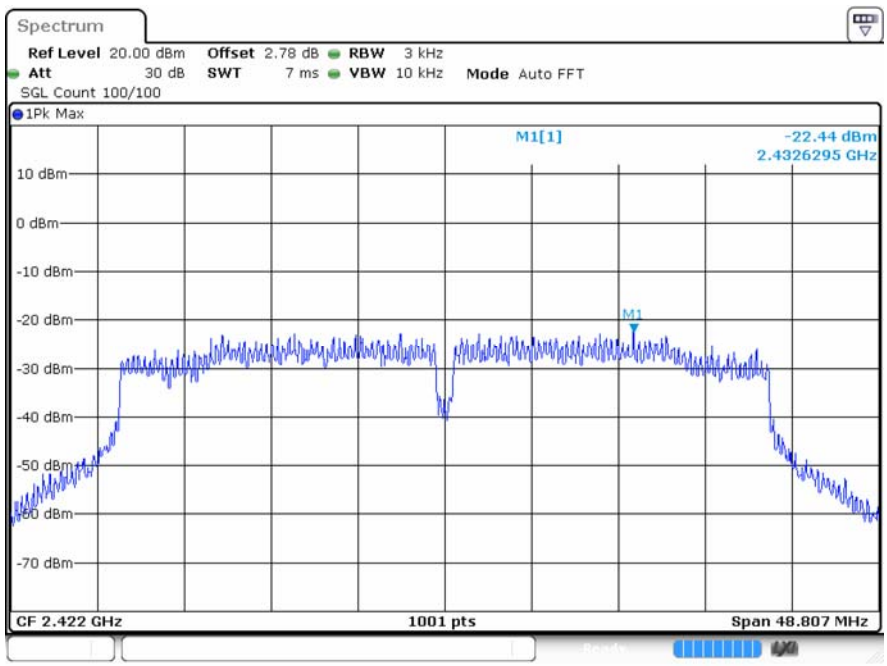
n20 2437MHz Ant1



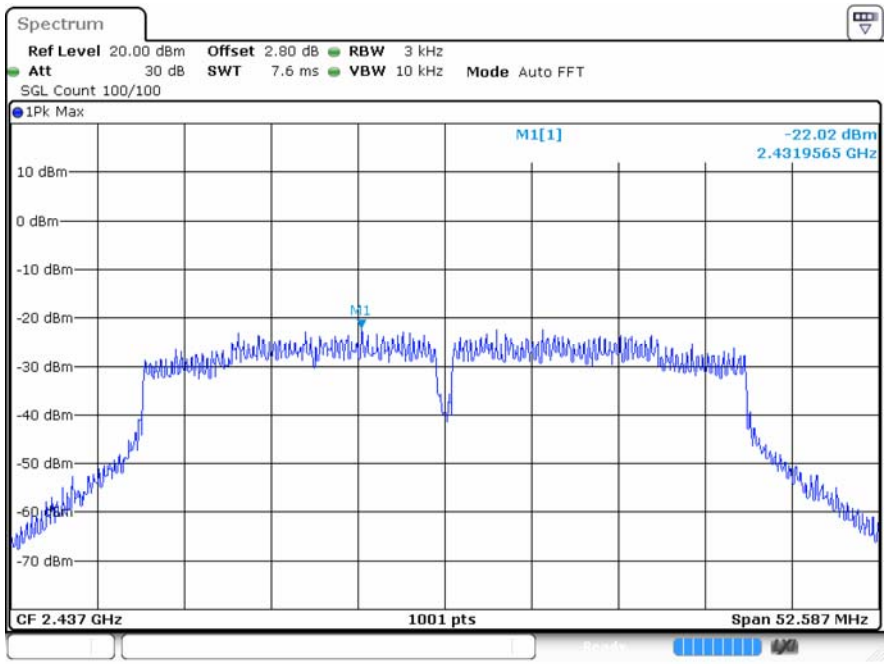
n20 2462MHz Ant1



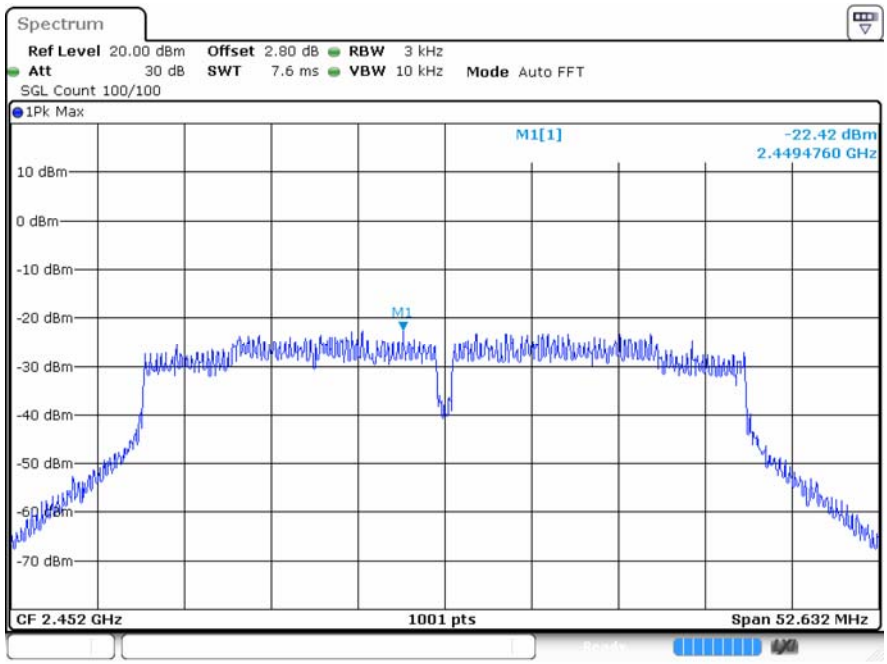
n40 2422MHz Ant1



n40 2437MHz Ant1



n40 2452MHz Ant1



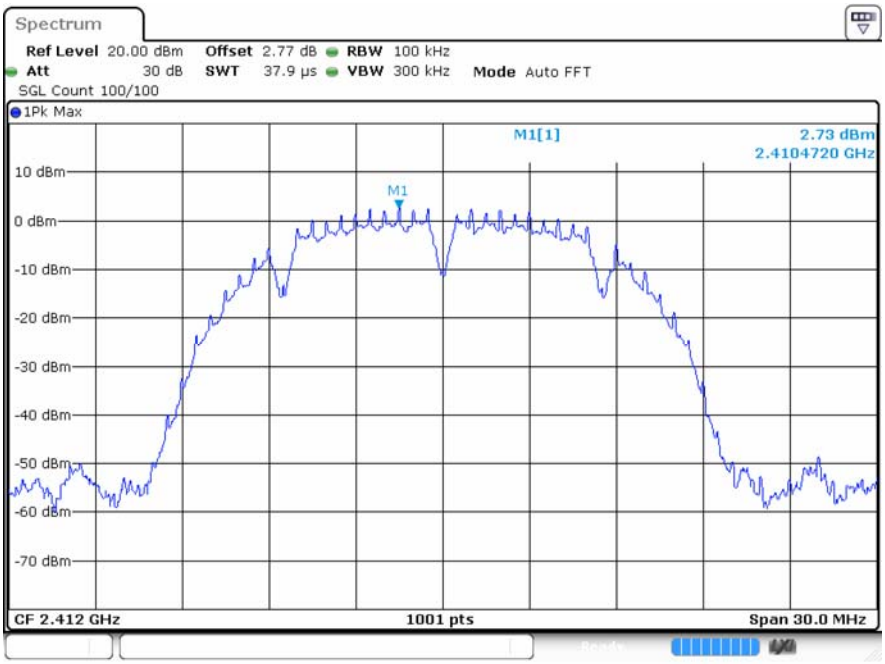
5 Band Edge

5.1 Test Result

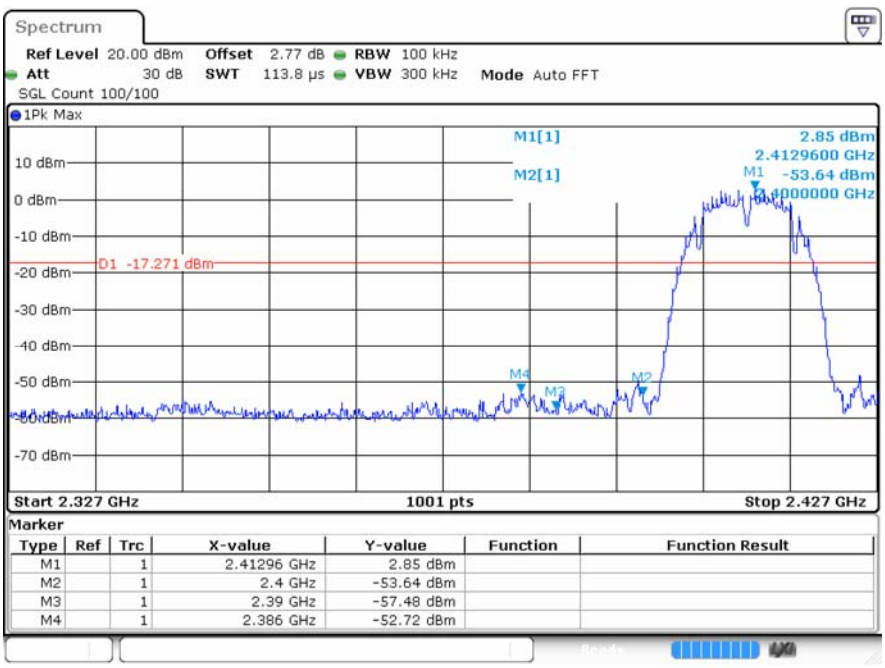
Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
b	2412	Ant1	-55.45	-20	-55.45
b	2462	Ant1	-56.6	-20	Pass
g	2412	Ant1	-52.04	-20	Pass
g	2462	Ant1	-52.45	-20	Pass
n20	2412	Ant1	-51.68	-20	Pass
n20	2462	Ant1	-51.35	-20	Pass
n40	2422	Ant1	-48.89	-20	Pass
n40	2452	Ant1	-47.36	-20	Pass

5.2 Test Graphs

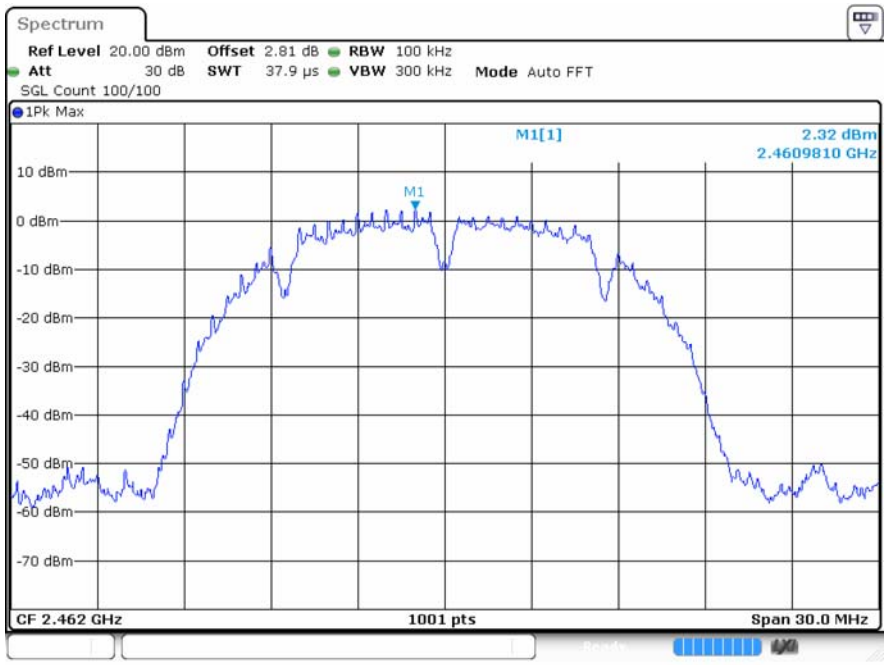
Test Graphs
b 2412MHz Ant1 Ref



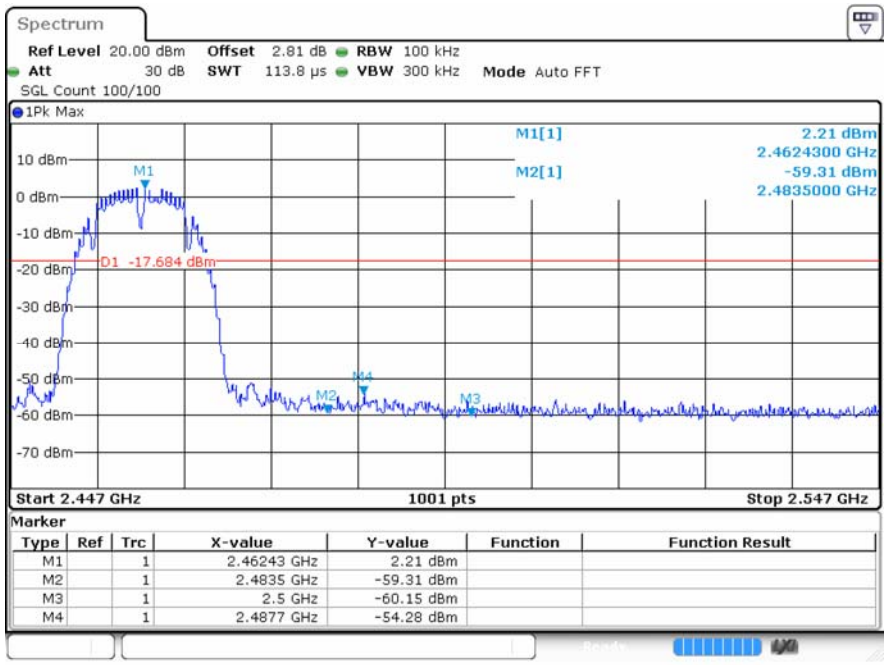
b 2412MHz Ant1 Emission



b 2462MHz Ant1 Ref



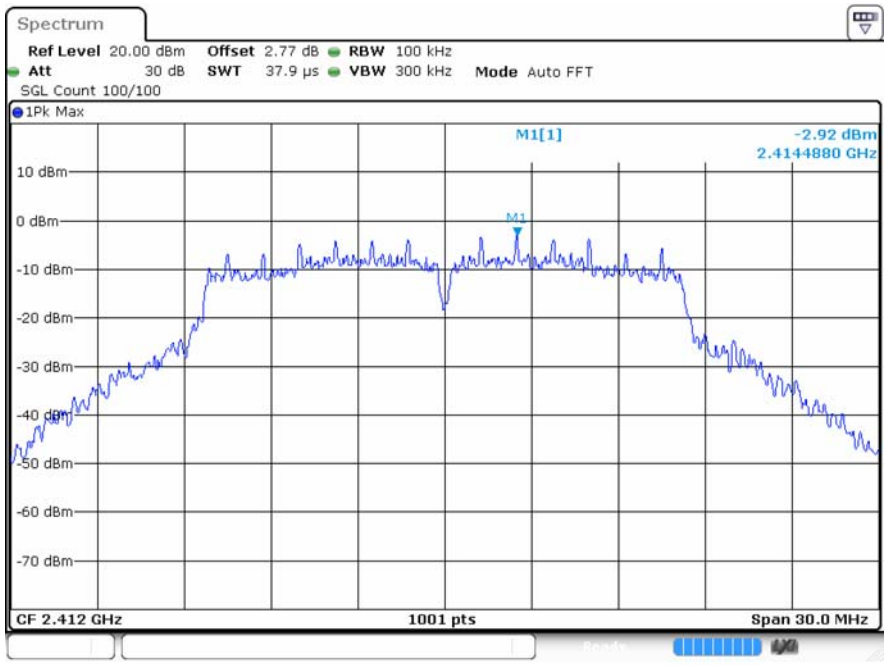
b 2462MHz Ant1 Emission



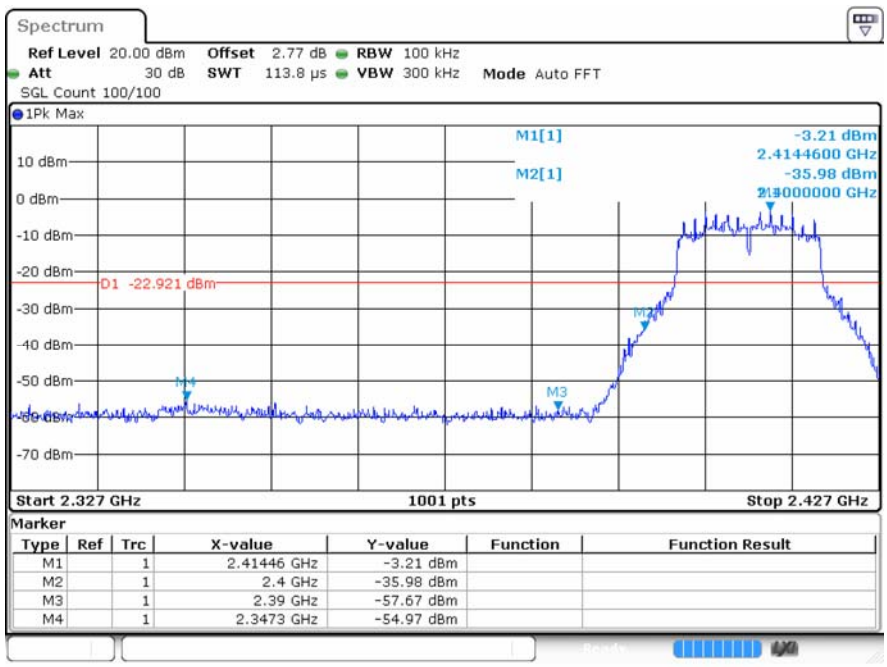
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46243 GHz	2.21 dBm		
M2		1	2.4835 GHz	-59.31 dBm		
M3		1	2.5 GHz	-60.15 dBm		
M4		1	2.4877 GHz	-54.28 dBm		

g 2412MHz Ant1 Ref



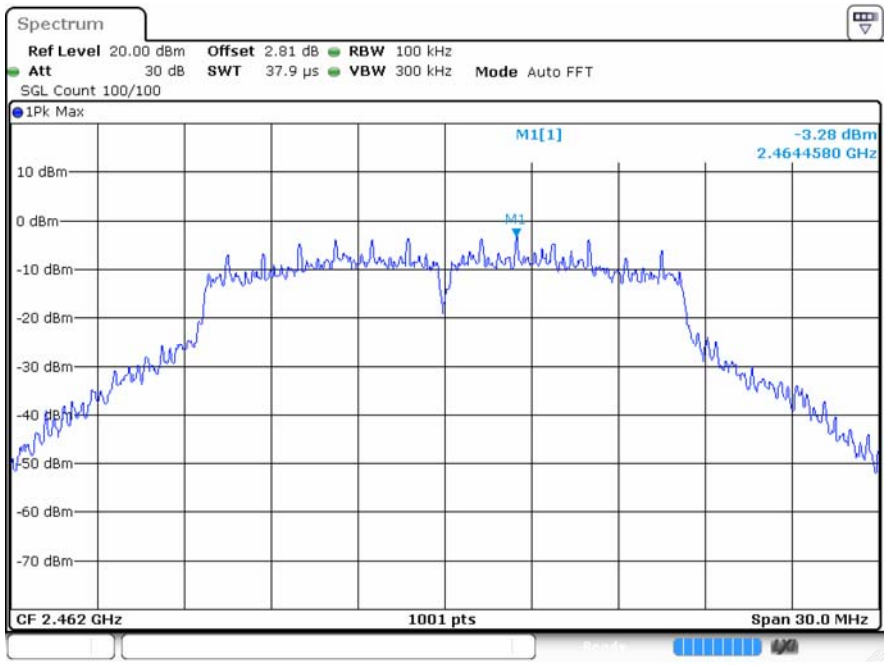
g 2412MHz Ant1 Emission



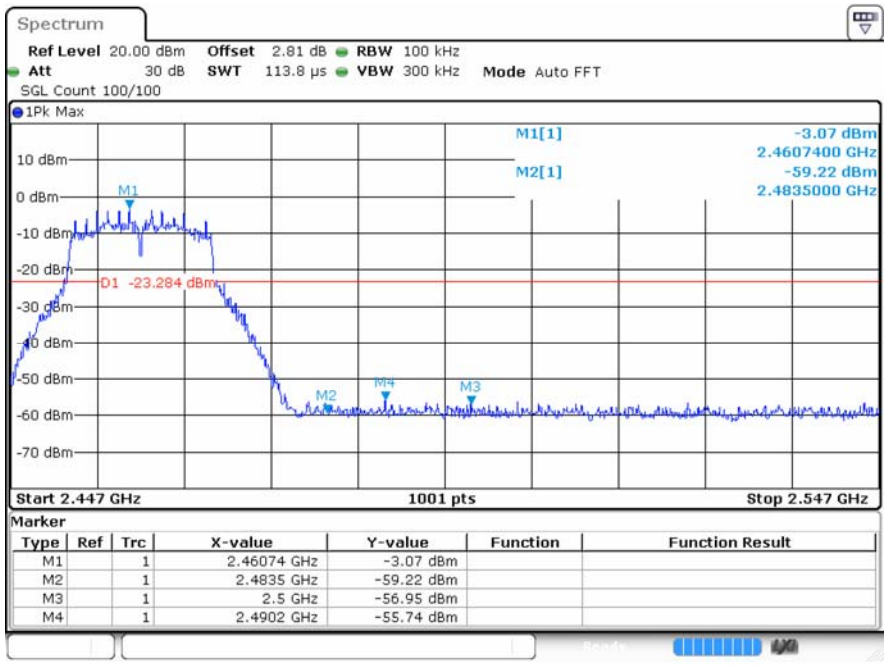
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41446 GHz	-3.21 dBm		
M2		1	2.4 GHz	-35.98 dBm		
M3		1	2.39 GHz	-57.67 dBm		
M4		1	2.3473 GHz	-54.97 dBm		

g 2462MHz Ant1 Ref



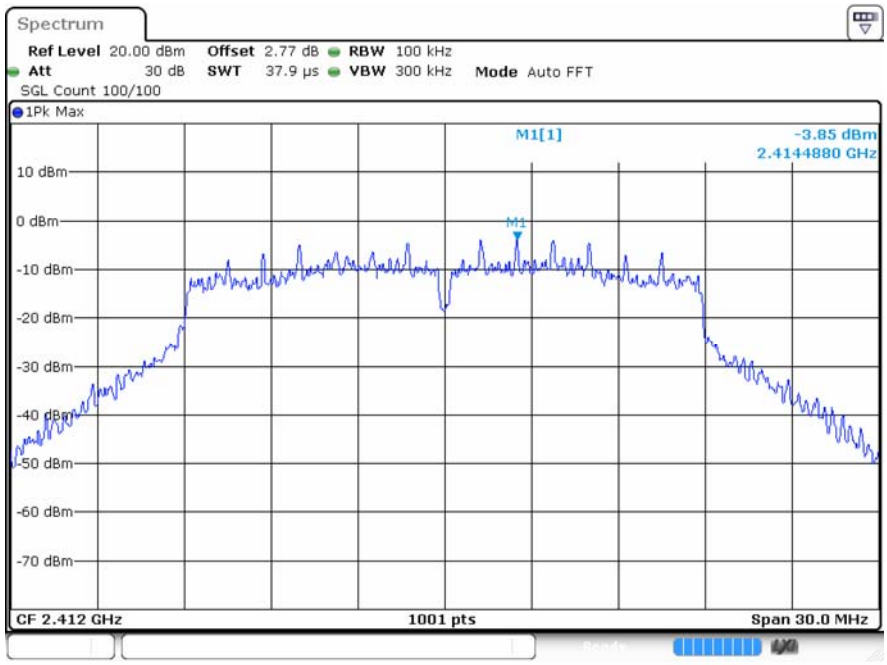
g 2462MHz Ant1 Emission



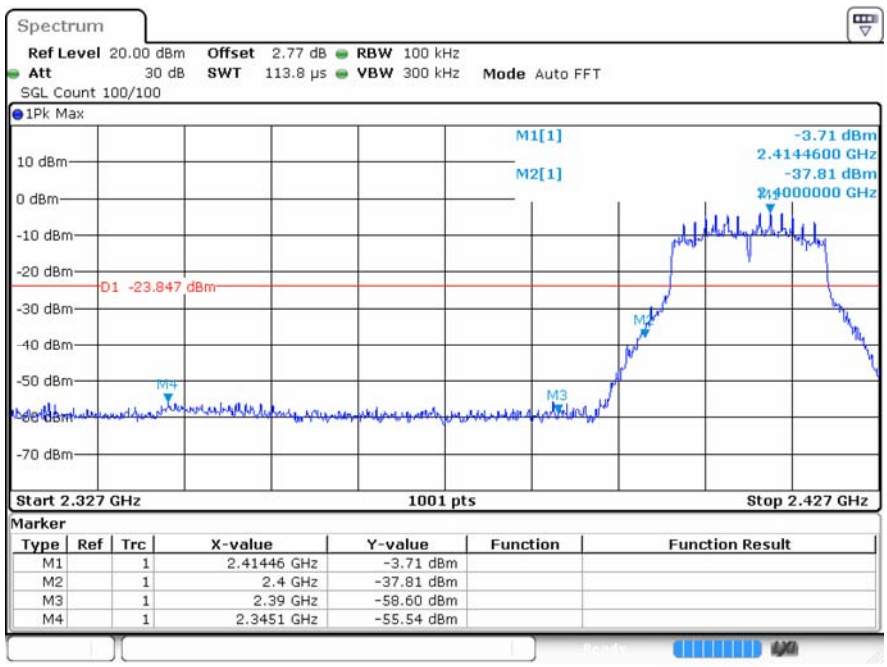
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46074 GHz	-3.07 dBm		
M2		1	2.4835 GHz	-59.22 dBm		
M3		1	2.5 GHz	-56.95 dBm		
M4		1	2.4902 GHz	-55.74 dBm		

n20 2412MHz Ant1 Ref



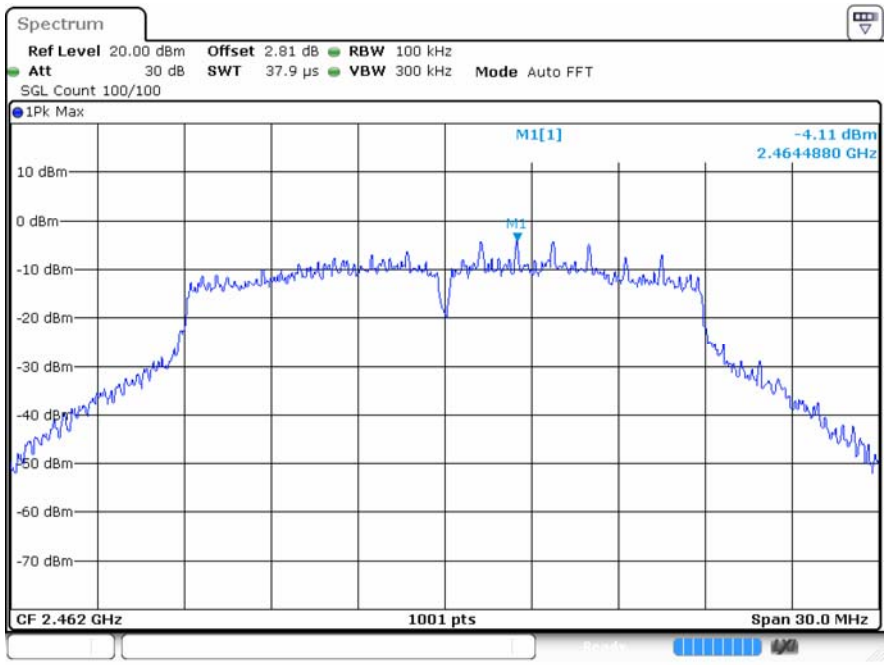
n20 2412MHz Ant1 Emission



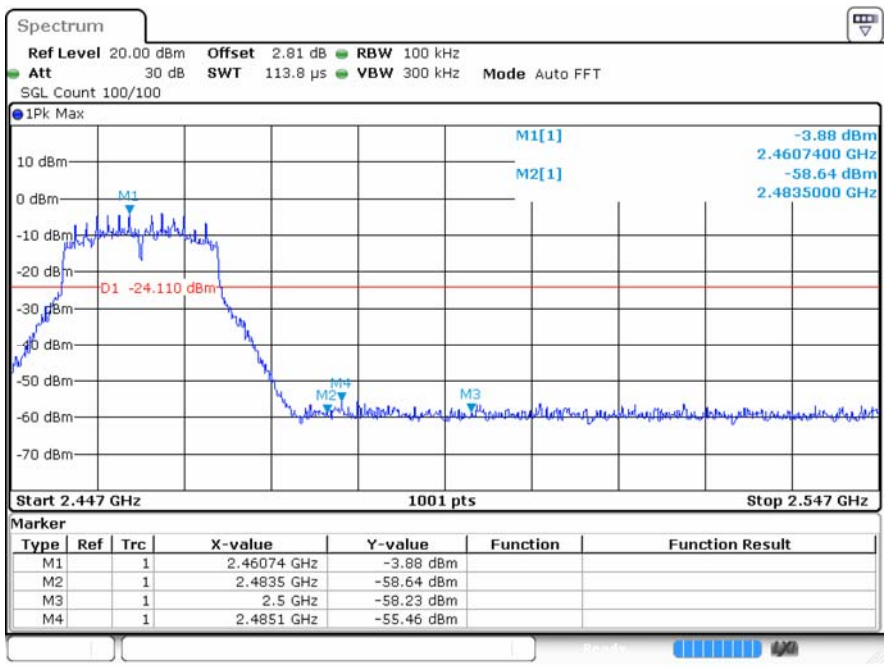
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41446 GHz	-3.71 dBm		
M2		1	2.4 GHz	-37.81 dBm		
M3		1	2.39 GHz	-58.60 dBm		
M4		1	2.3451 GHz	-55.54 dBm		

n20 2462MHz Ant1 Ref



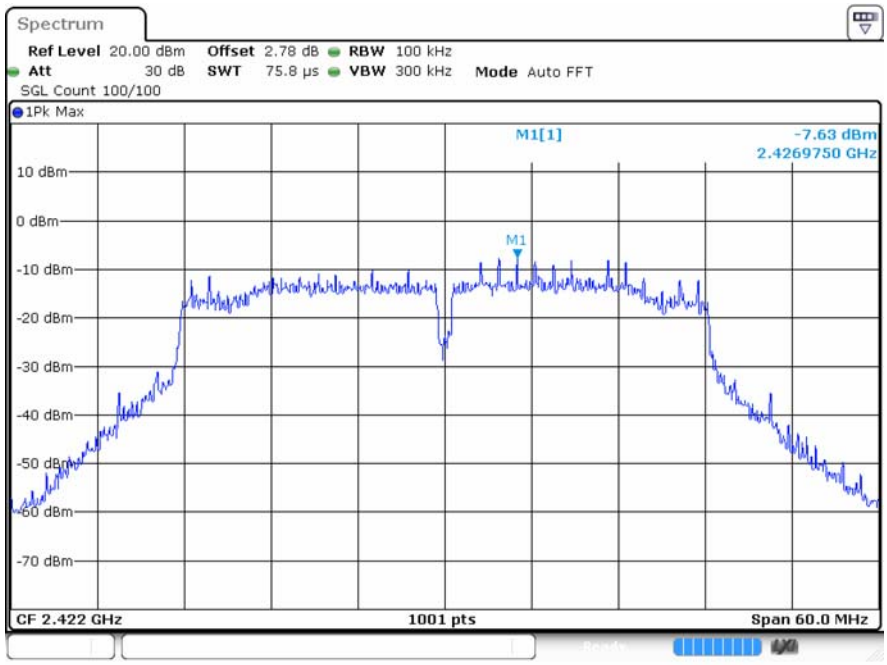
n20 2462MHz Ant1 Emission



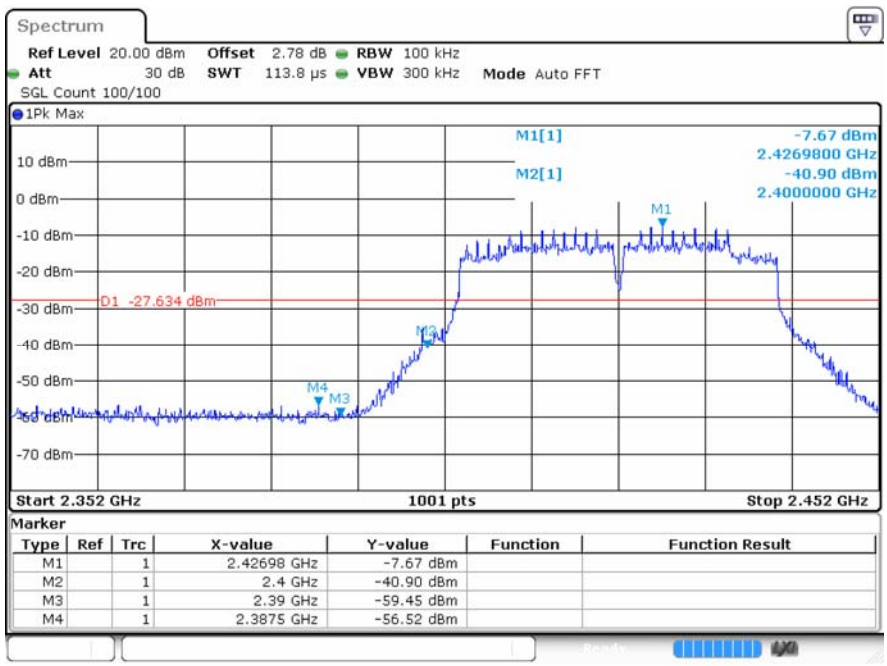
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46074 GHz	-3.88 dBm		
M2		1	2.4835 GHz	-58.64 dBm		
M3		1	2.5 GHz	-58.23 dBm		
M4		1	2.4851 GHz	-55.46 dBm		

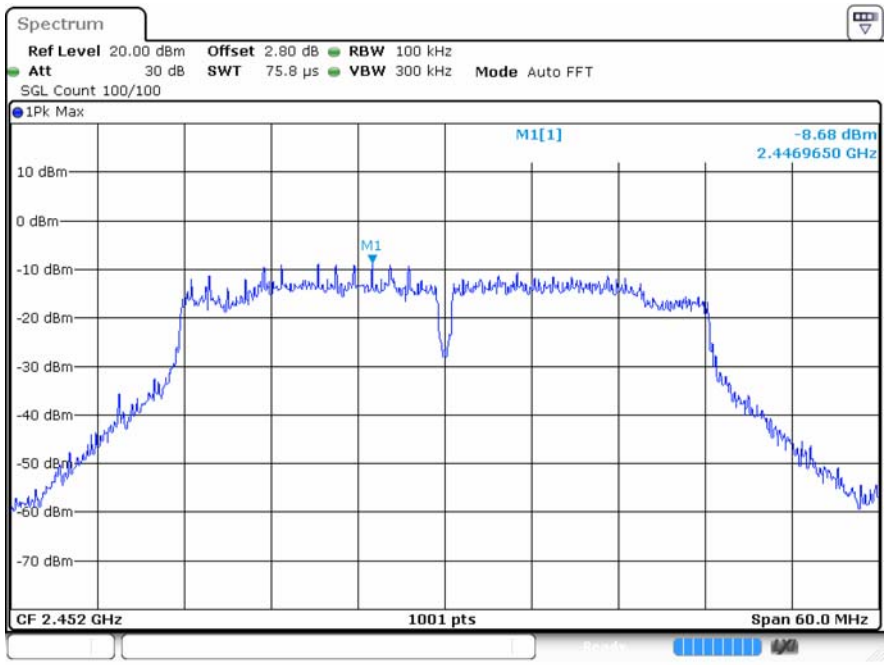
n40 2422MHz Ant1 Ref



n40 2422MHz Ant1 Emission



n40 2452MHz Ant1 Ref



n40 2452MHz Ant1 Emission

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44693 GHz	-8.01 dBm		
M2		1	2.4835 GHz	-56.39 dBm		
M3		1	2.5 GHz	-57.86 dBm		
M4		1	2.4932 GHz	-56.05 dBm		

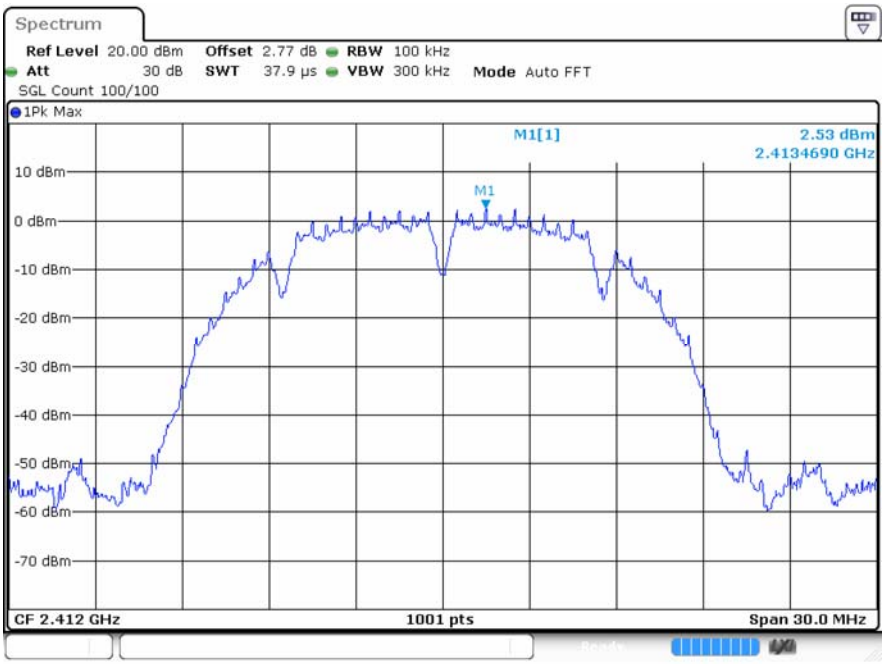
6 Conducted RF Spurious Emission

6.1 Test Result

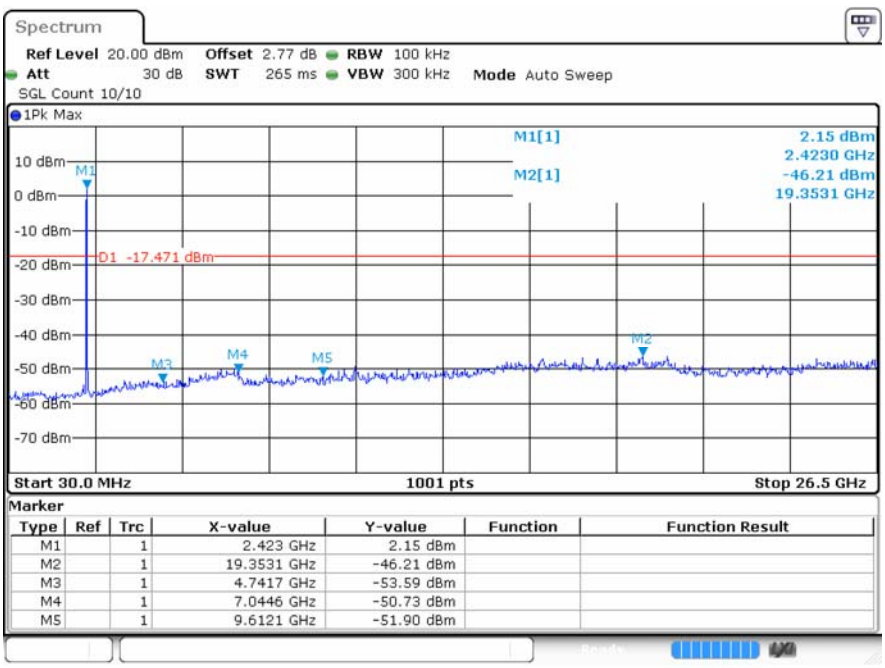
Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
b	2412	Ant1	-48.74	-20	Pass
b	2437	Ant1	-48.46	-20	Pass
b	2462	Ant1	-48.73	-20	Pass
g	2412	Ant1	-43.44	-20	Pass
g	2437	Ant1	-42.94	-20	Pass
g	2462	Ant1	-43.06	-20	Pass
n20	2412	Ant1	-42.27	-20	Pass
n20	2437	Ant1	-42	-20	Pass
n20	2462	Ant1	-42.36	-20	Pass
n40	2422	Ant1	-38.57	-20	Pass
n40	2437	Ant1	-38.34	-20	Pass
n40	2452	Ant1	-36.44	-20	Pass

6.2 Test Graphs

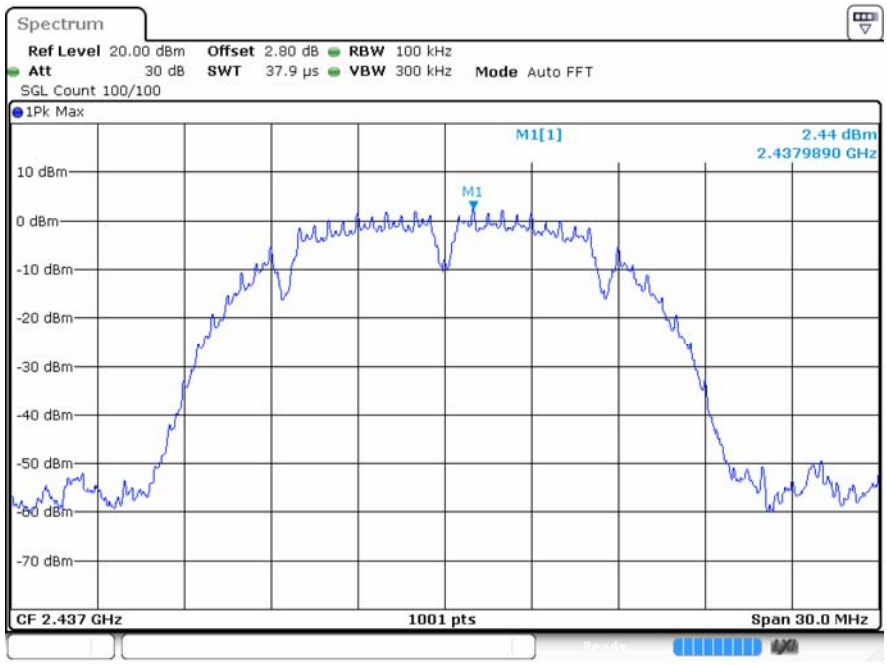
Test Graphs
b 2412MHz Ant1 Ref



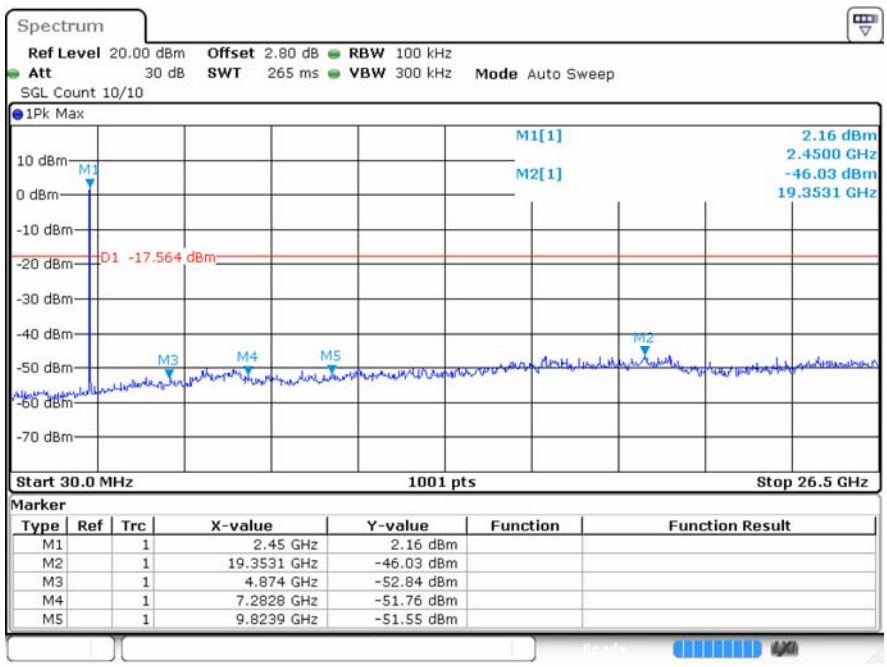
b 2412MHz Ant1 Emission



b 2437MHz Ant1 Ref



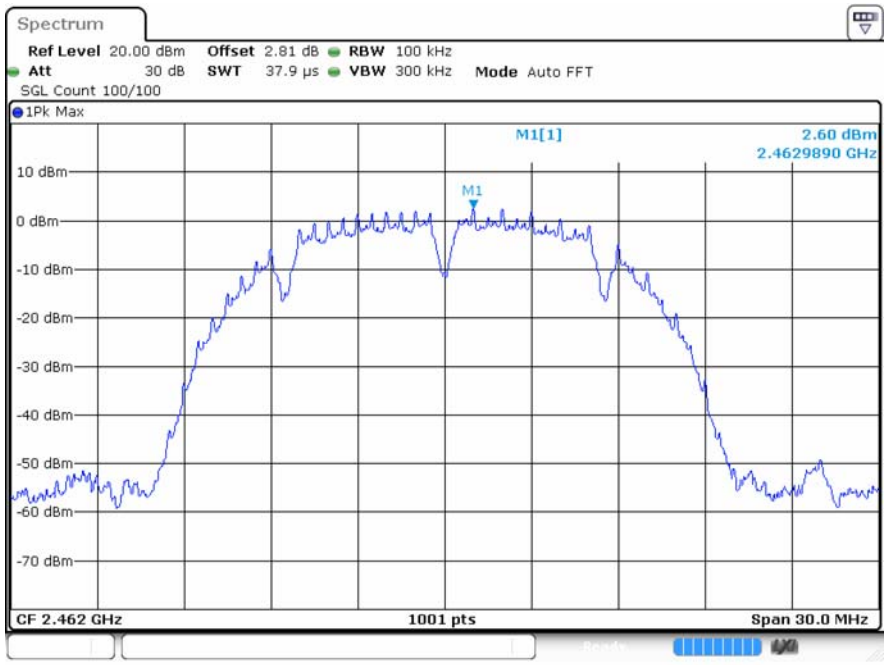
b 2437MHz Ant1 Emission



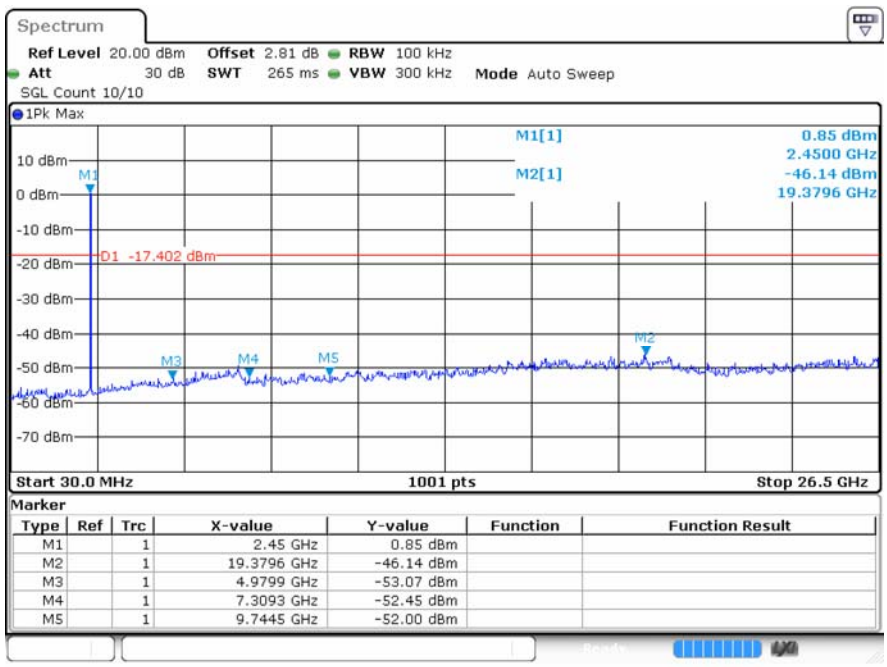
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	2.16 dBm		
M2		1	19.3531 GHz	-46.03 dBm		
M3		1	4.874 GHz	-52.84 dBm		
M4		1	7.2828 GHz	-51.76 dBm		
M5		1	9.8239 GHz	-51.55 dBm		

b 2462MHz Ant1 Ref



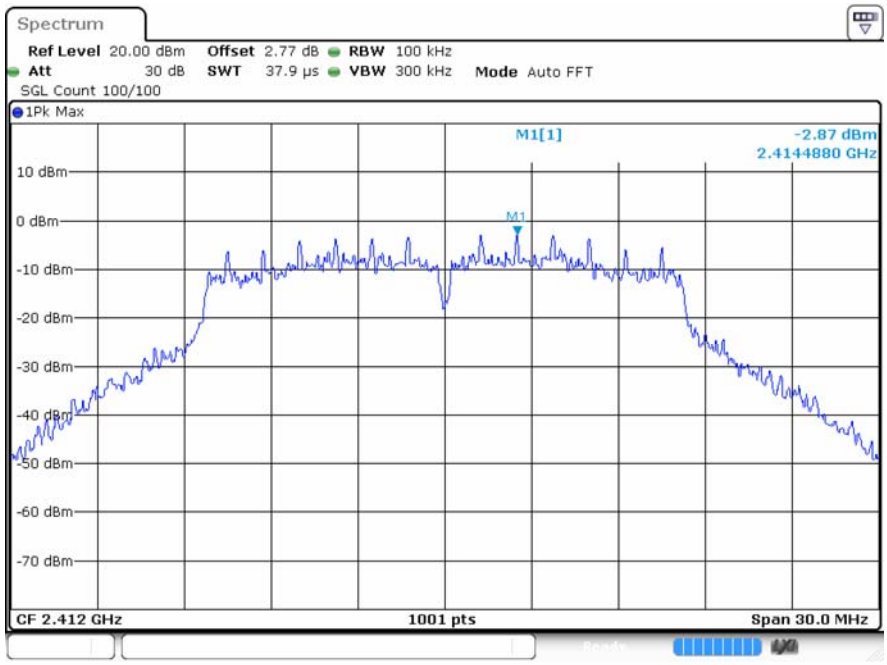
b 2462MHz Ant1 Emission



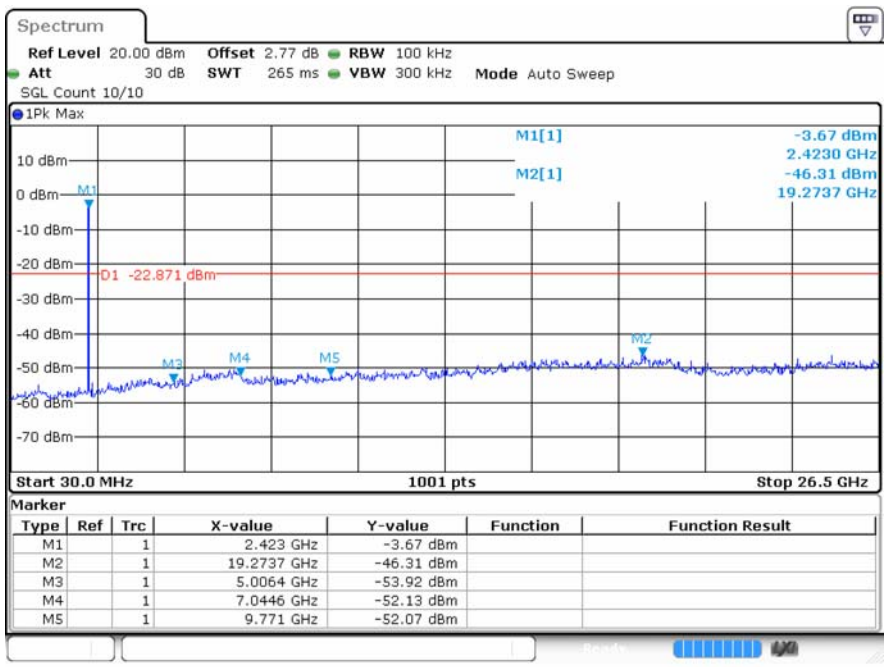
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	0.85 dBm		
M2		1	19.3796 GHz	-46.14 dBm		
M3		1	4.9799 GHz	-53.07 dBm		
M4		1	7.3093 GHz	-52.45 dBm		
M5		1	9.7445 GHz	-52.00 dBm		

g 2412MHz Ant1 Ref



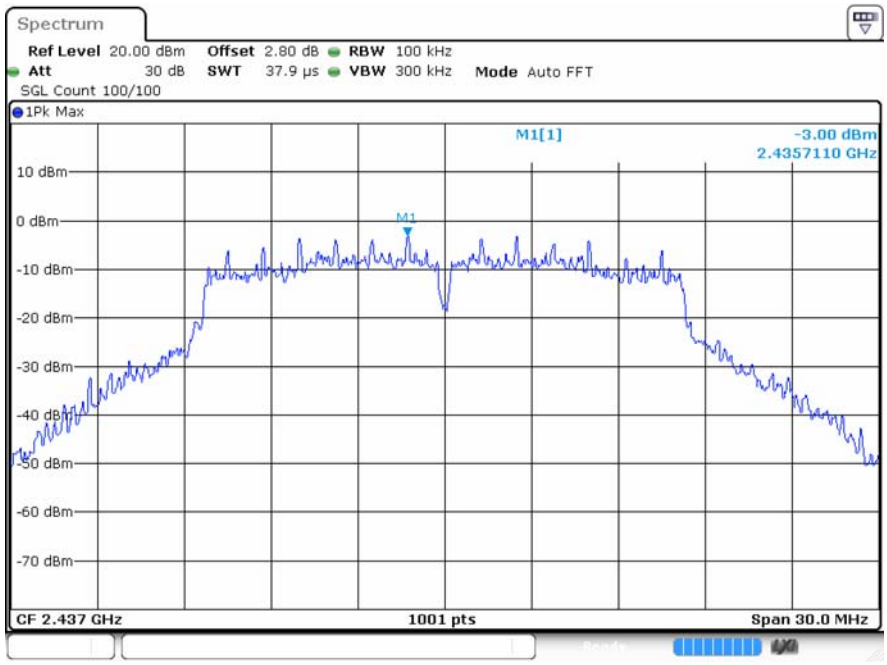
g 2412MHz Ant1 Emission



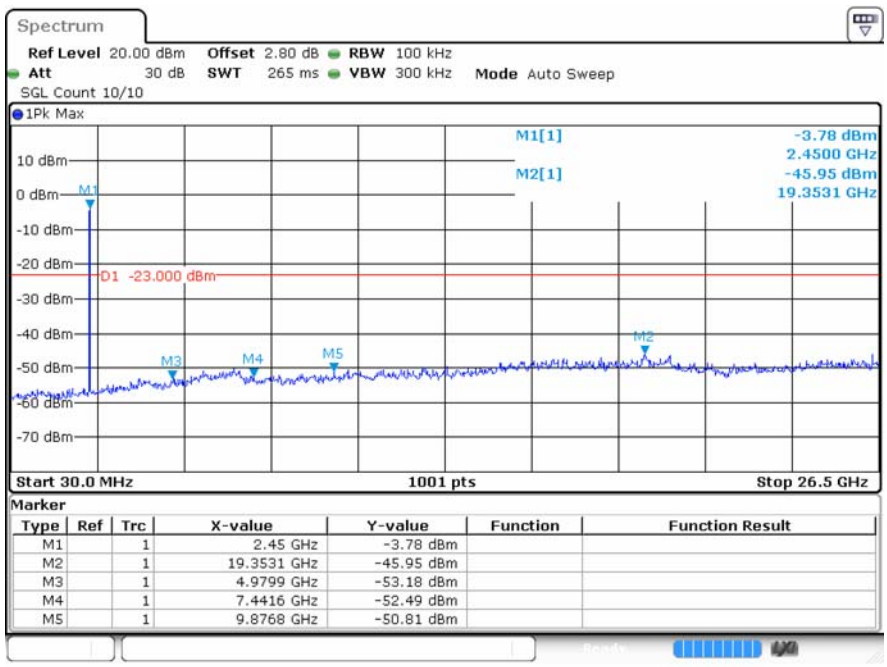
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-3.67 dBm		
M2		1	19.2737 GHz	-46.31 dBm		
M3		1	5.0064 GHz	-53.92 dBm		
M4		1	7.0446 GHz	-52.13 dBm		
M5		1	9.771 GHz	-52.07 dBm		

g 2437MHz Ant1 Ref



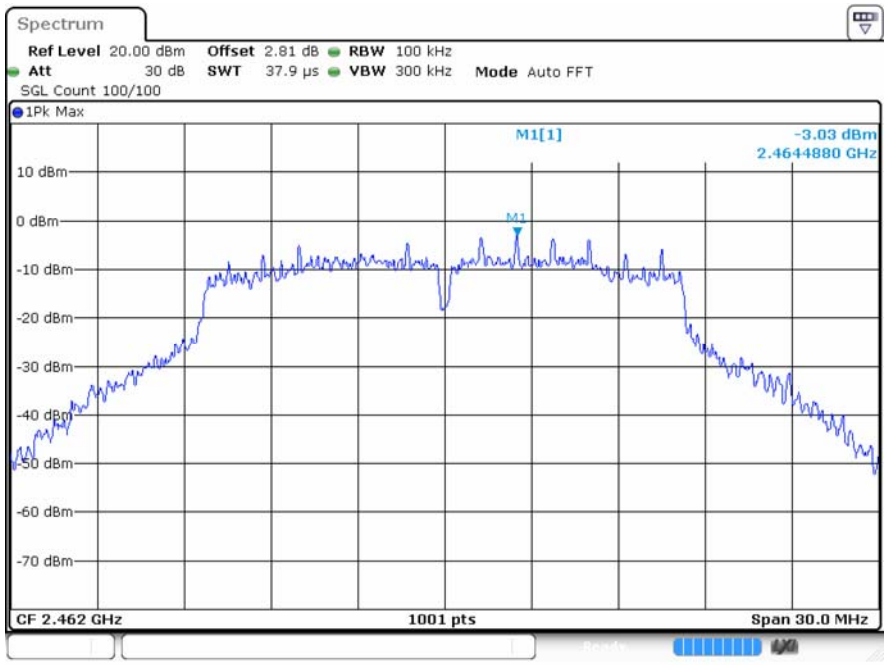
g 2437MHz Ant1 Emission



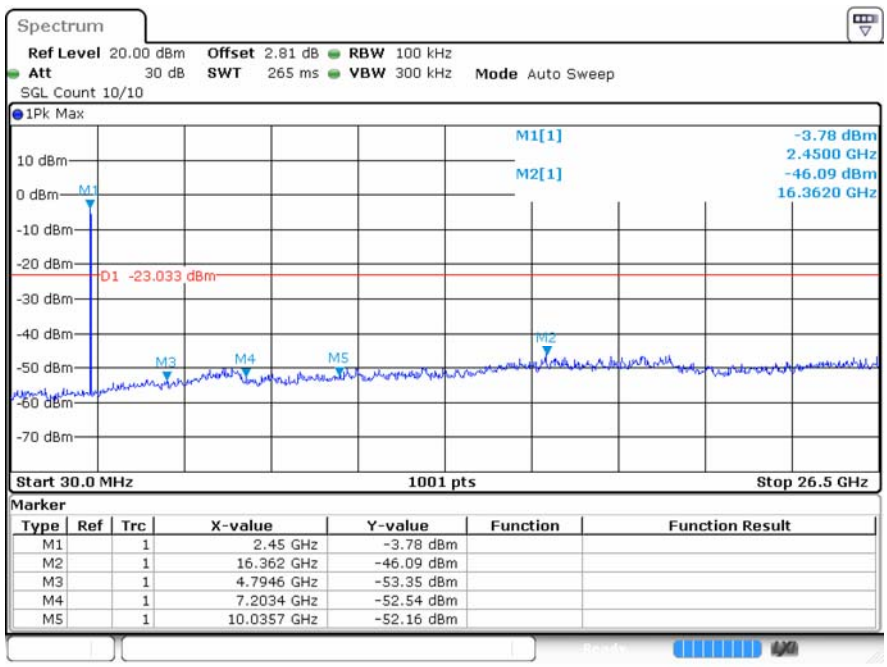
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-3.78 dBm		
M2		1	19.3531 GHz	-45.95 dBm		
M3		1	4.9799 GHz	-53.18 dBm		
M4		1	7.4416 GHz	-52.49 dBm		
M5		1	9.8768 GHz	-50.81 dBm		

g 2462MHz Ant1 Ref



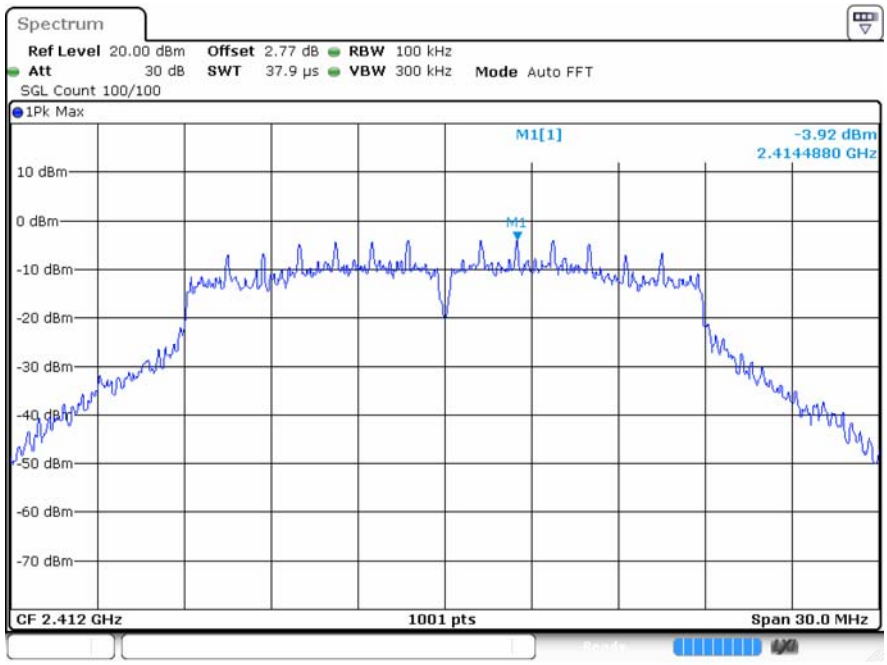
g 2462MHz Ant1 Emission



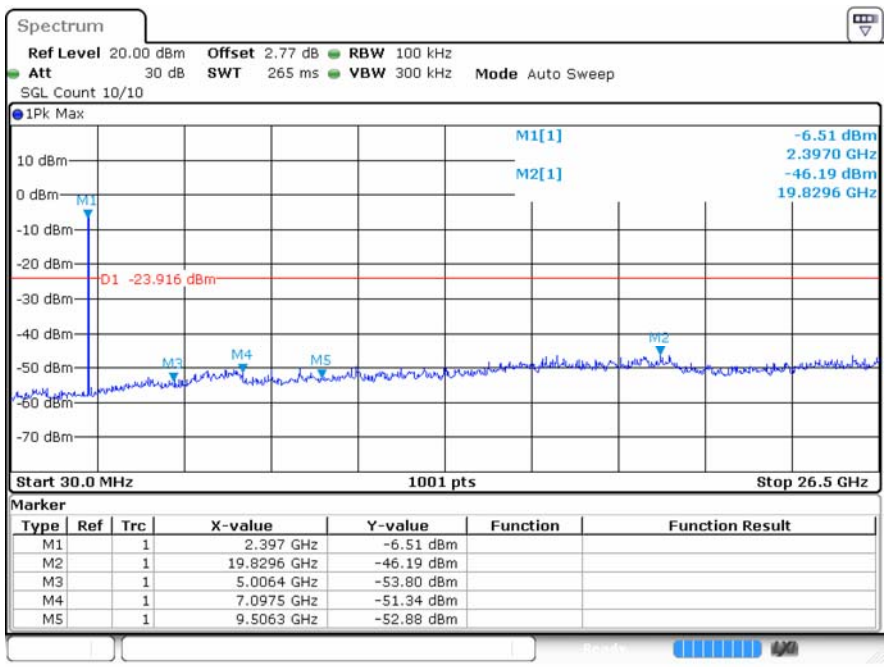
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-3.78 dBm		
M2		1	16.362 GHz	-46.09 dBm		
M3		1	4.7946 GHz	-53.35 dBm		
M4		1	7.2034 GHz	-52.54 dBm		
M5		1	10.0357 GHz	-52.16 dBm		

n20 2412MHz Ant1 Ref



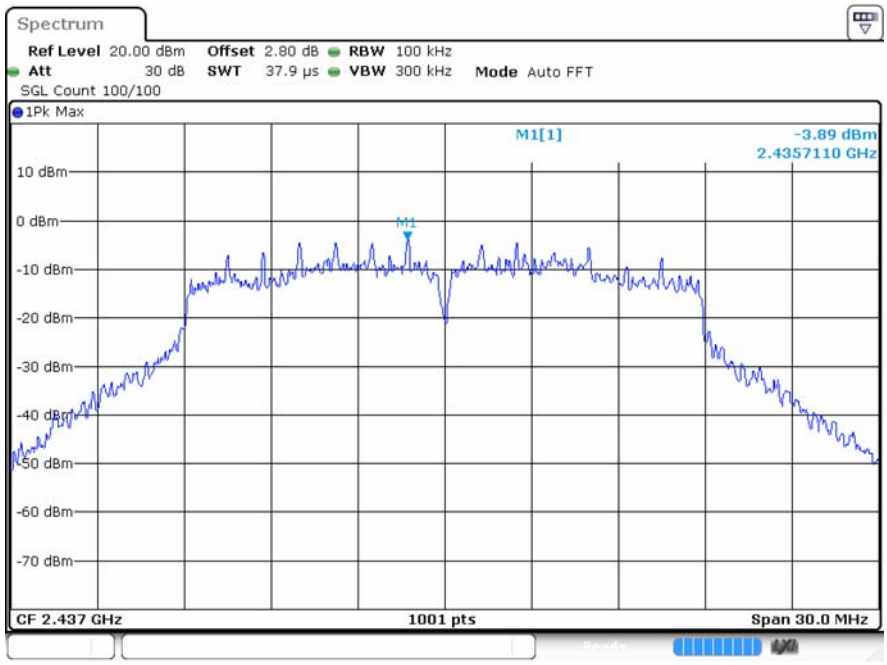
n20 2412MHz Ant1 Emission



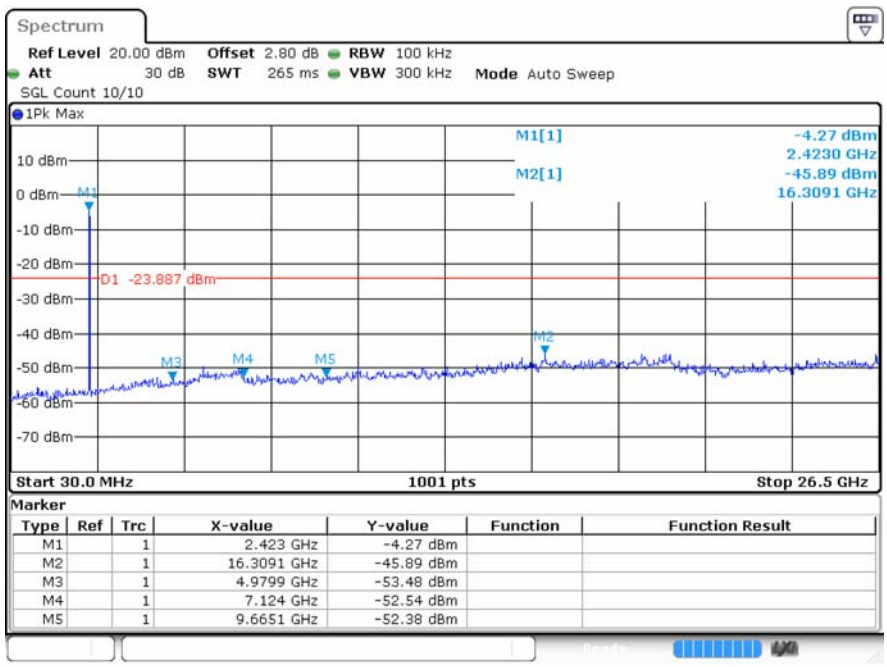
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.397 GHz	-6.51 dBm		
M2		1	19.8296 GHz	-46.19 dBm		
M3		1	5.0064 GHz	-53.80 dBm		
M4		1	7.0975 GHz	-51.34 dBm		
M5		1	9.5063 GHz	-52.88 dBm		

n20 2437MHz Ant1 Ref



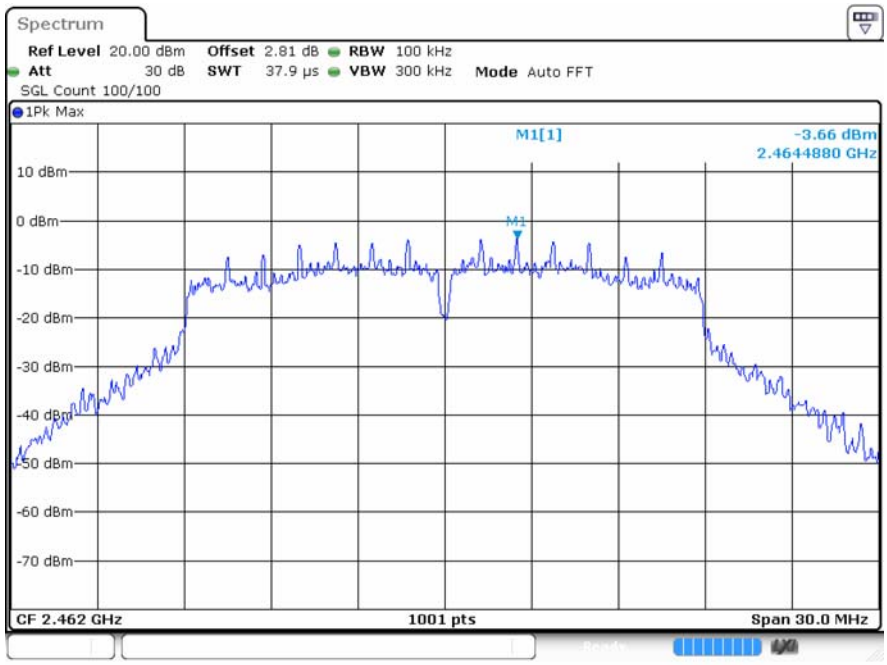
n20 2437MHz Ant1 Emission



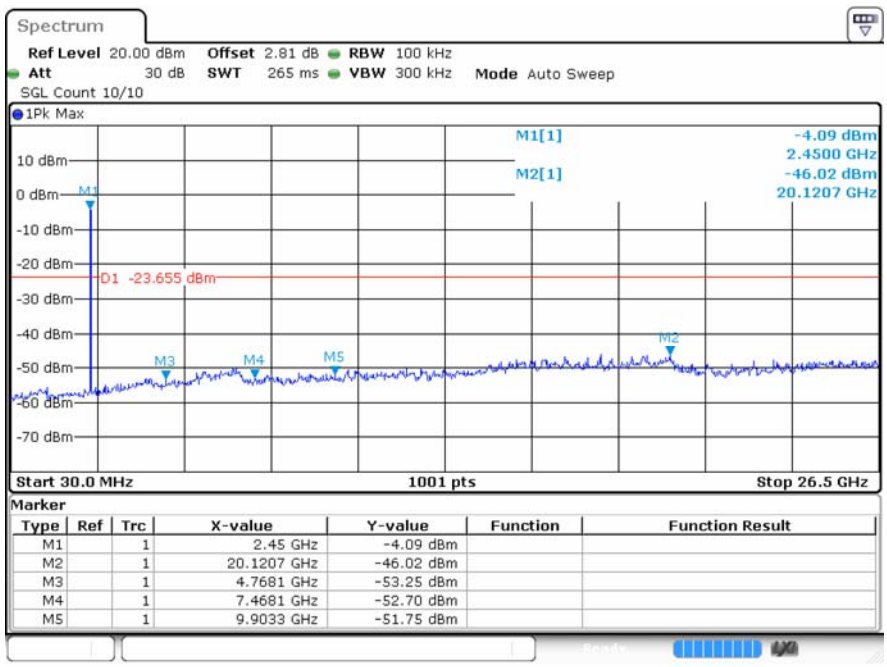
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-4.27 dBm		
M2		1	16.3091 GHz	-45.89 dBm		
M3		1	4.9799 GHz	-53.48 dBm		
M4		1	7.124 GHz	-52.54 dBm		
M5		1	9.6651 GHz	-52.38 dBm		

n20 2462MHz Ant1 Ref



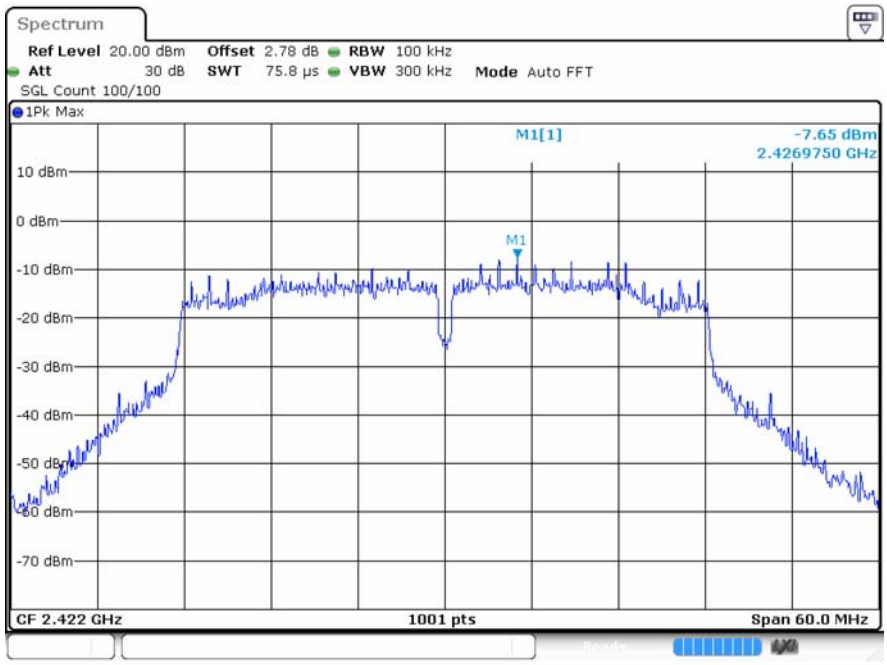
n20 2462MHz Ant1 Emission



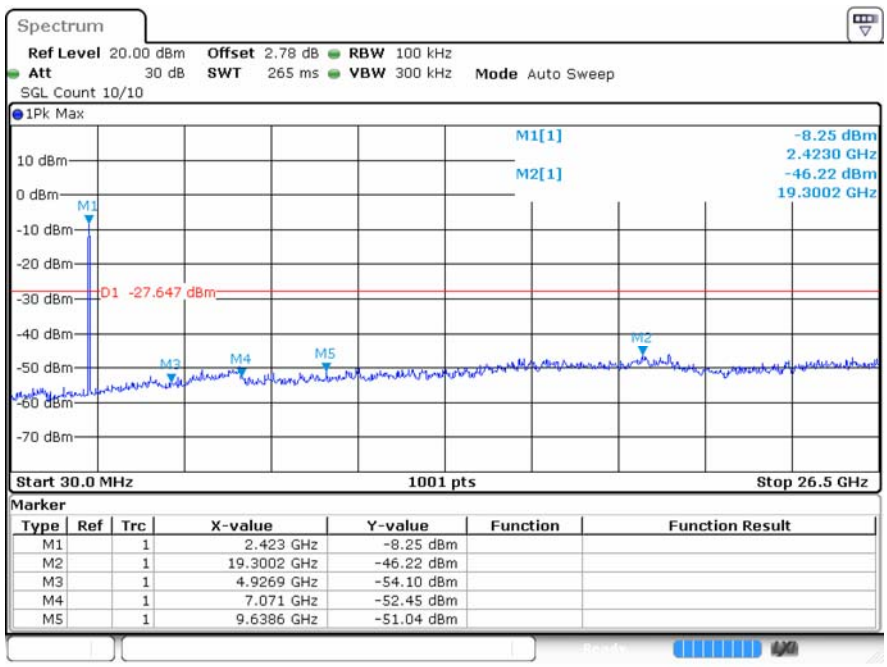
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-4.09 dBm		
M2		1	20.1207 GHz	-46.02 dBm		
M3		1	4.7681 GHz	-53.25 dBm		
M4		1	7.4681 GHz	-52.70 dBm		
M5		1	9.9033 GHz	-51.75 dBm		

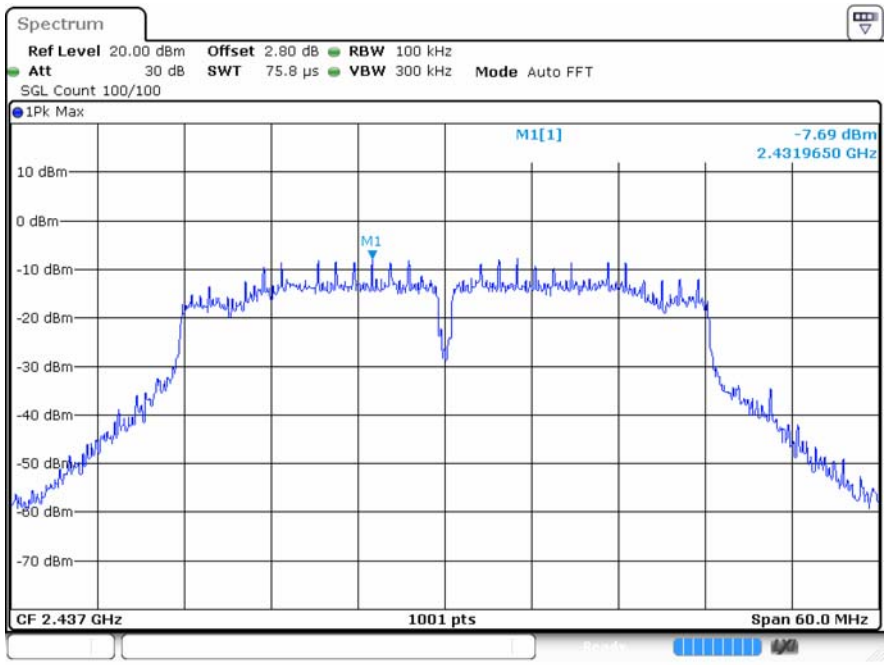
n40 2422MHz Ant1 Ref



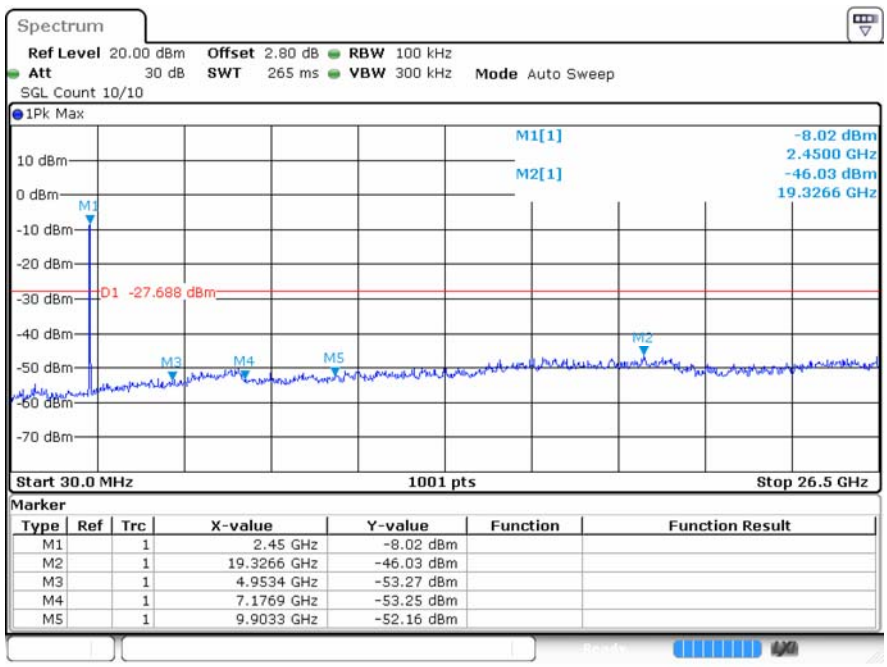
n40 2422MHz Ant1 Emission



n40 2437MHz Ant1 Ref



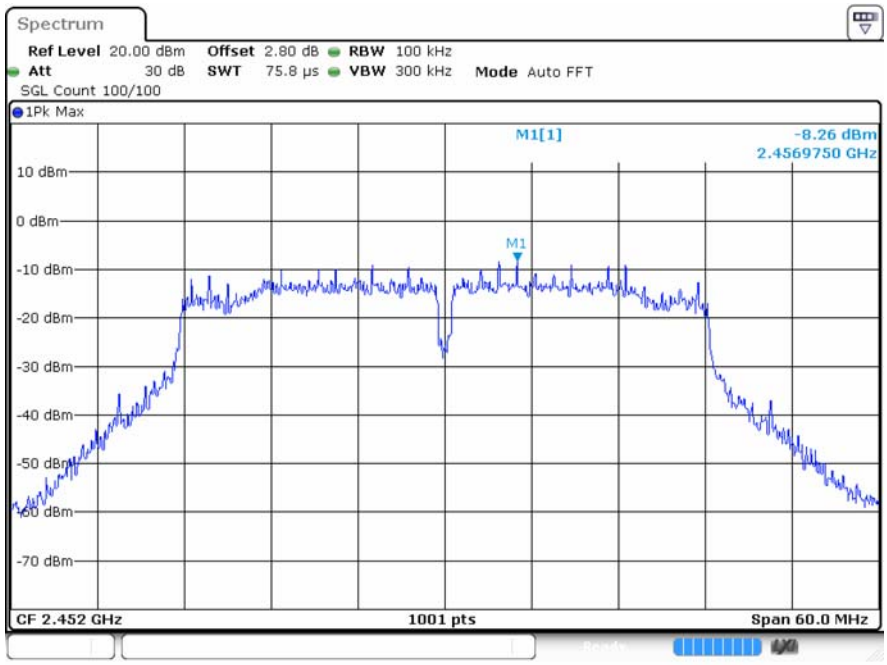
n40 2437MHz Ant1 Emission



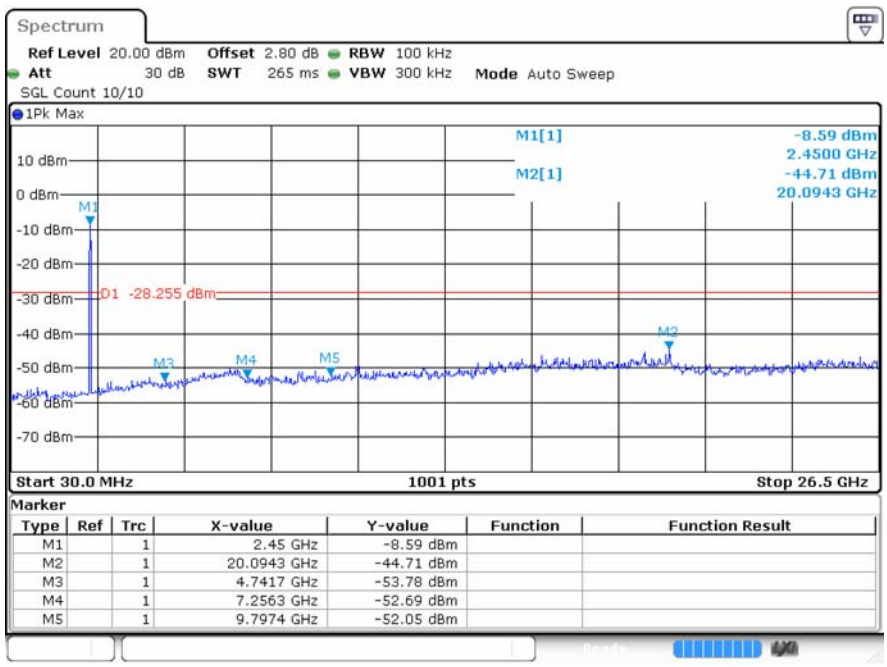
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-8.02 dBm		
M2		1	19.3266 GHz	-46.03 dBm		
M3		1	4.9534 GHz	-53.27 dBm		
M4		1	7.1769 GHz	-53.25 dBm		
M5		1	9.9033 GHz	-52.16 dBm		

n40 2452MHz Ant1 Ref



n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-8.59 dBm		
M2		1	20.0943 GHz	-44.71 dBm		
M3		1	4.7417 GHz	-53.78 dBm		
M4		1	7.2563 GHz	-52.69 dBm		
M5		1	9.7974 GHz	-52.05 dBm		

7 Restrict Band

7.1 Test Result

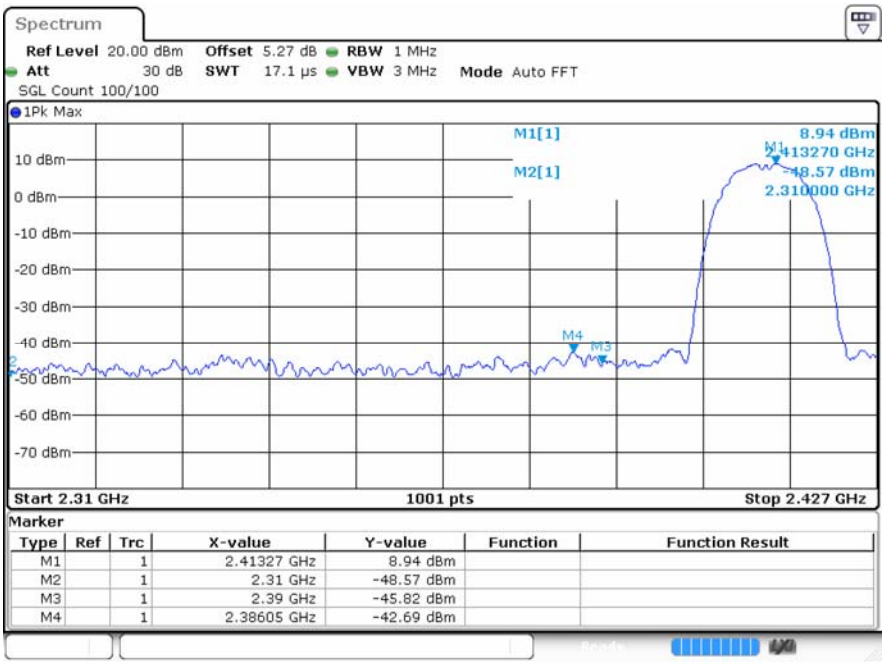
Mode	Frequency (MHz)	Antenna	Spur Freq (MHz)	Power (dBm)	Gain (dBi)	E (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
b	2412	Ant1	2310	-48.57	2.5	49.19	Peak	74	Pass
b	2412	Ant1	2310	-56.91	2.5	40.85	Average	54	Pass
b	2412	Ant1	2386.05	-42.68	2.5	55.08	Peak	74	Pass
b	2412	Ant1	2385.699	-50.54	2.5	47.22	Average	54	Pass
b	2412	Ant1	2390	-45.81	2.5	51.95	Peak	74	Pass
b	2412	Ant1	2390	-54.87	2.5	42.89	Average	54	Pass
b	2462	Ant1	2483.5	-44.5	2.5	53.26	Peak	74	53.26
b	2462	Ant1	2483.5	-55.28	2.5	42.48	Average	54	Pass
b	2462	Ant1	2489.4	-43.59	2.5	54.17	Peak	74	Pass
b	2462	Ant1	2488.446	-53.96	2.5	43.8	Average	54	Pass
b	2462	Ant1	2500	-46.33	2.5	51.43	Peak	74	Pass
b	2462	Ant1	2500	-56.07	2.5	41.69	Average	54	Pass
g	2412	Ant1	2310	-46.78	2.5	50.98	Peak	74	Pass
g	2412	Ant1	2310	-54.78	2.5	42.98	Average	54	Pass
g	2412	Ant1	2340.303	-44.45	2.5	53.31	Peak	74	Pass
g	2412	Ant1	2338.08	-53.37	2.5	44.39	Average	54	Pass
g	2412	Ant1	2390	-47.63	2.5	51.95	Peak	74	Pass
g	2412	Ant1	2390	-55.51	2.5	42.25	Average	54	Pass
g	2462	Ant1	2483.5	-46.54	2.5	51.22	Peak	74	Pass
g	2462	Ant1	2483.5	-54.81	2.5	42.95	Average	54	Pass
g	2462	Ant1	2489.4	-45.36	2.5	52.4	Peak	74	Pass
g	2462	Ant1	2489.453	-54.15	2.5	43.61	Average	54	Pass
g	2462	Ant1	2500	-47.6	2.5	51.43	Peak	74	Pass
g	2462	Ant1	2500	-54.77	2.5	42.99	Average	54	Pass
n20	2412	Ant1	2310	-46.22	2.5	51.54	Peak	74	Pass
n20	2412	Ant1	2310	-54.8	2.5	42.96	Average	54	Pass
n20	2412	Ant1	2337.963	-44.38	2.5	53.38	Peak	74	Pass
n20	2412	Ant1	2336.676	-53.03	2.5	44.73	Average	54	Pass
n20	2412	Ant1	2390	-48.09	2.5	49.67	Peak	74	Pass
n20	2412	Ant1	2390	-54.76	2.5	43	Average	54	Pass
n20	2462	Ant1	2483.5	-45.82	2.5	51.94	Peak	74	Pass
n20	2462	Ant1	2483.5	-54.91	2.5	42.85	Average	54	Pass
n20	2462	Ant1	2499.046	-44.33	2.5	53.43	Peak	74	Pass
n20	2462	Ant1	2487.386	-53.77	2.5	43.99	Average	54	Pass

n20	2462	Ant1	2500	-46.65	2.5	51.11	Peak	74	Pass
n20	2462	Ant1	2500	-54.72	2.5	43.04	Average	54	Pass
n40	2422	Ant1	2310	-47.68	2.5	50.08	Peak	74	Pass
n40	2422	Ant1	2310	-55.12	2.5	42.64	Average	54	Pass
n40	2422	Ant1	2329.738	-44.52	2.5	53.24	Peak	74	Pass
n40	2422	Ant1	2347.204	-53.5	2.5	44.26	Average	54	Pass
n40	2422	Ant1	2390	-46.37	2.5	51.39	Peak	74	Pass
n40	2422	Ant1	2390	-55.45	2.5	42.31	Average	54	Pass
n40	2452	Ant1	2483.5	-48.4	2.5	49.36	Peak	74	Pass
n40	2452	Ant1	2483.5	-54.37	2.5	43.39	Average	54	Pass
n40	2452	Ant1	2498.83	-44.7	2.5	53.06	Peak	74	Pass
n40	2452	Ant1	2492.746	-53.94	2.5	43.82	Average	54	Pass
n40	2452	Ant1	2500	-47.81	2.5	49.95	Peak	74	Pass
n40	2452	Ant1	2500	-55.11	2.5	42.65	Average	54	Pass

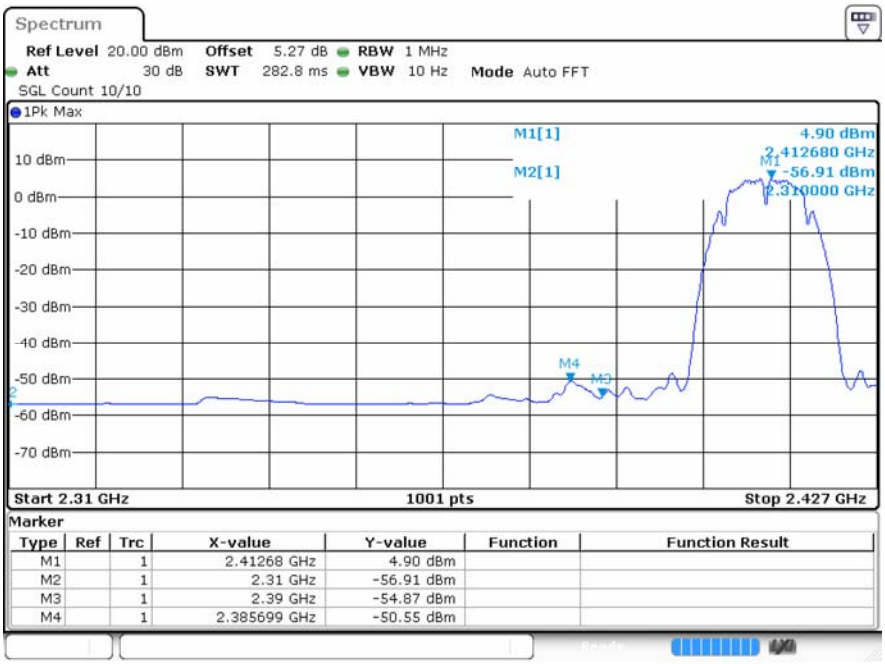
7.2 Test Graphs

Test Graphs

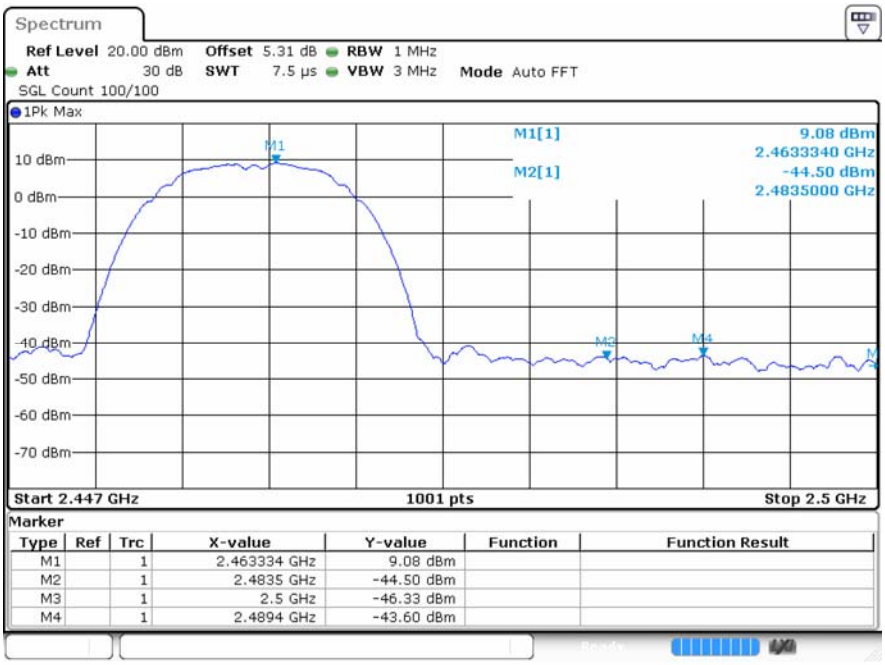
b 2412MHz Ant1 Peak



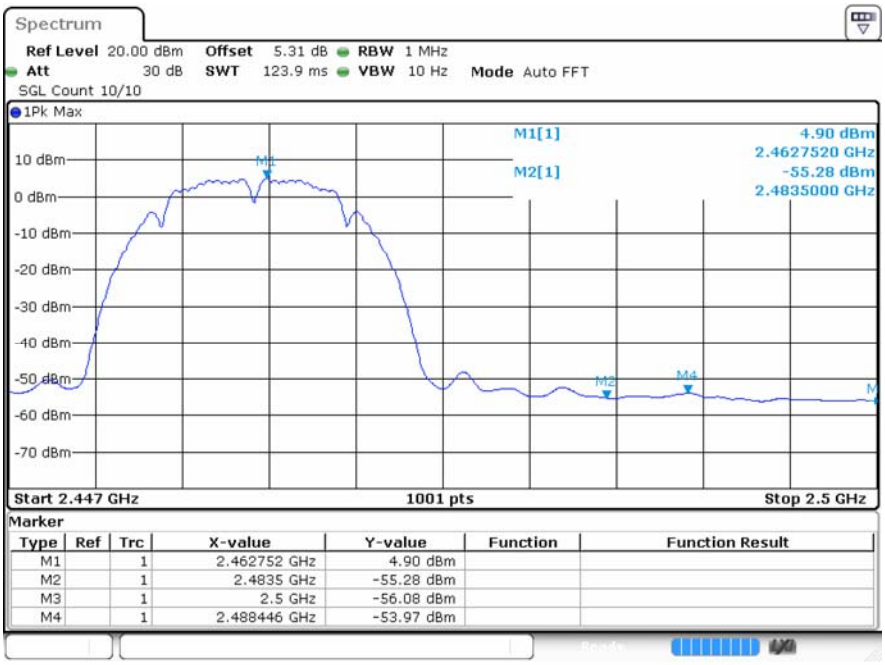
b 2412MHz Ant1 Average



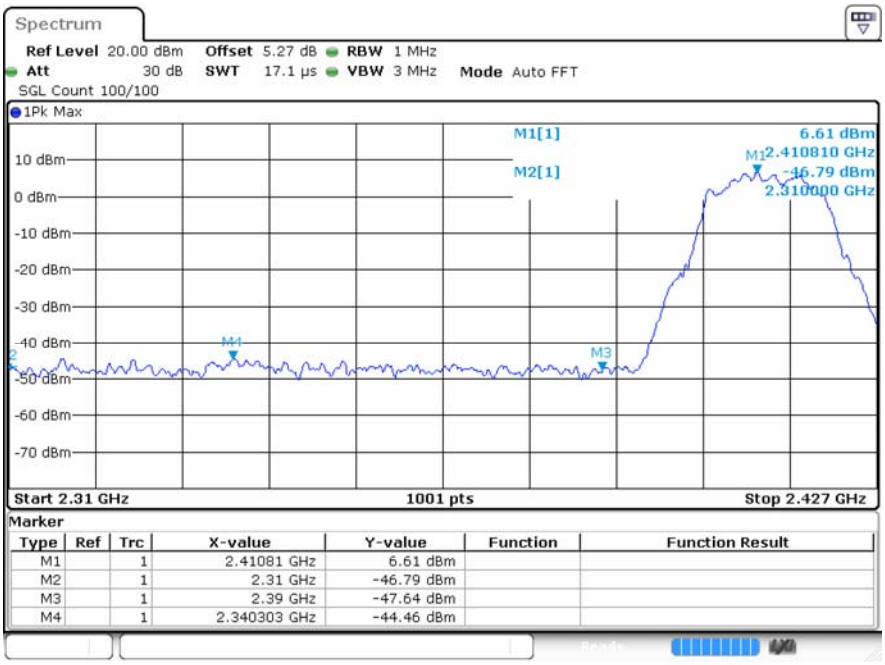
b 2462MHz Ant1 Peak



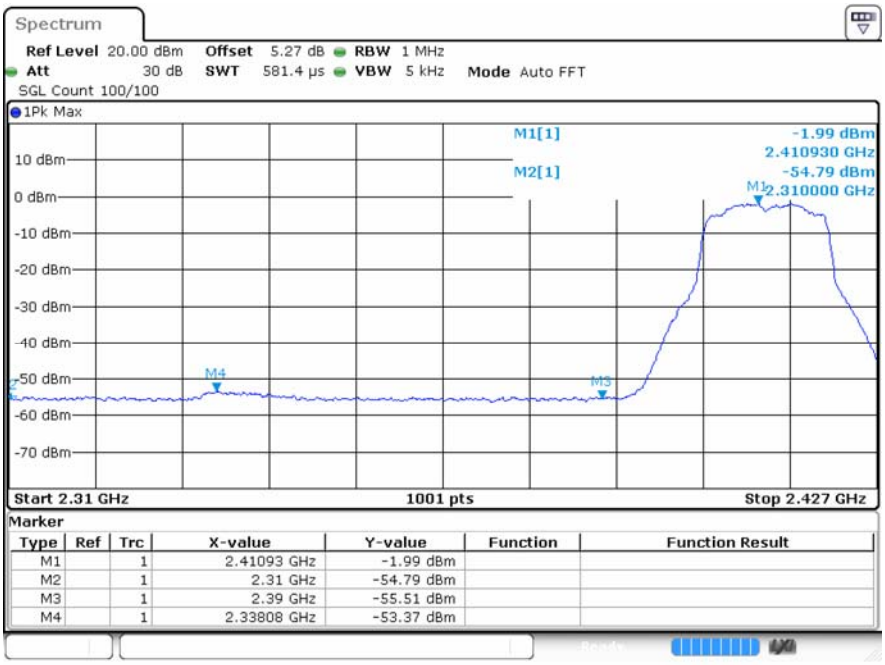
b 2462MHz Ant1 Average



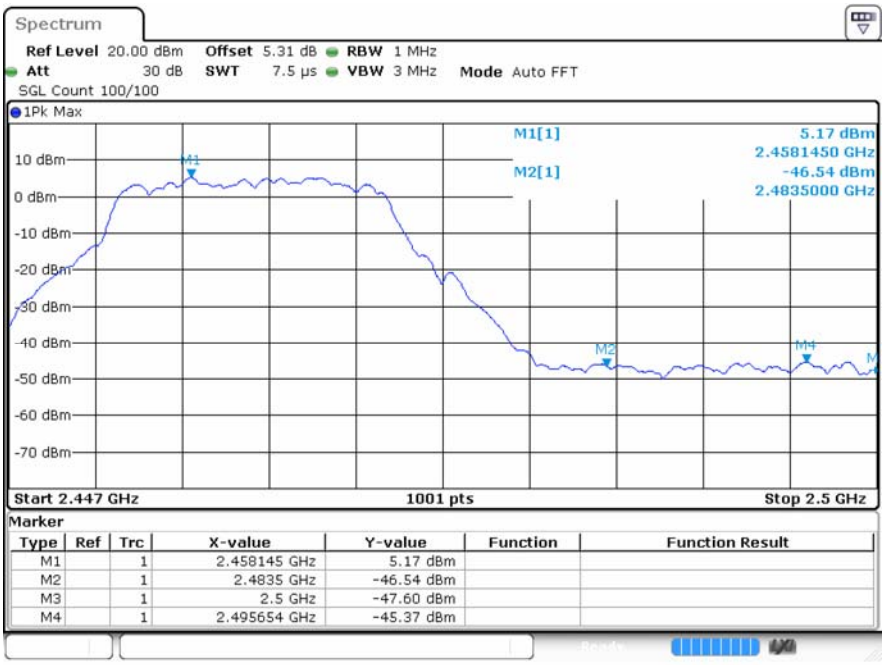
g 2412MHz Ant1 Peak



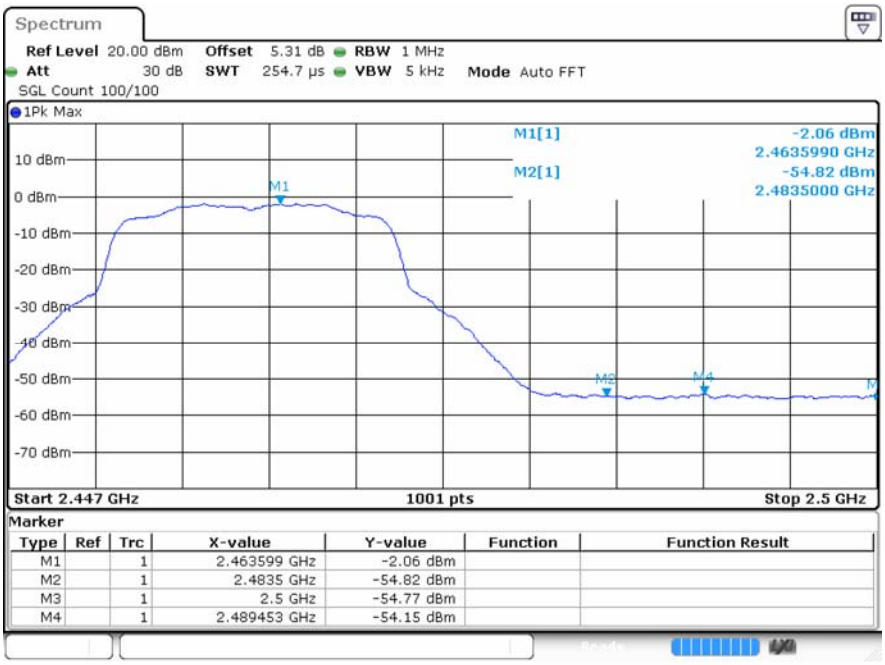
g 2412MHz Ant1 Average



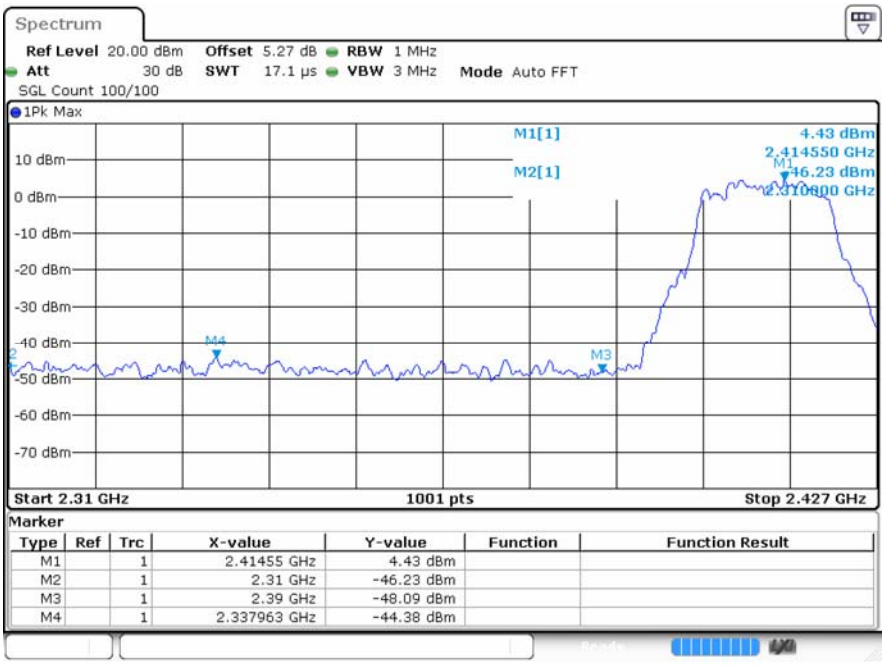
g 2462MHz Ant1 Peak



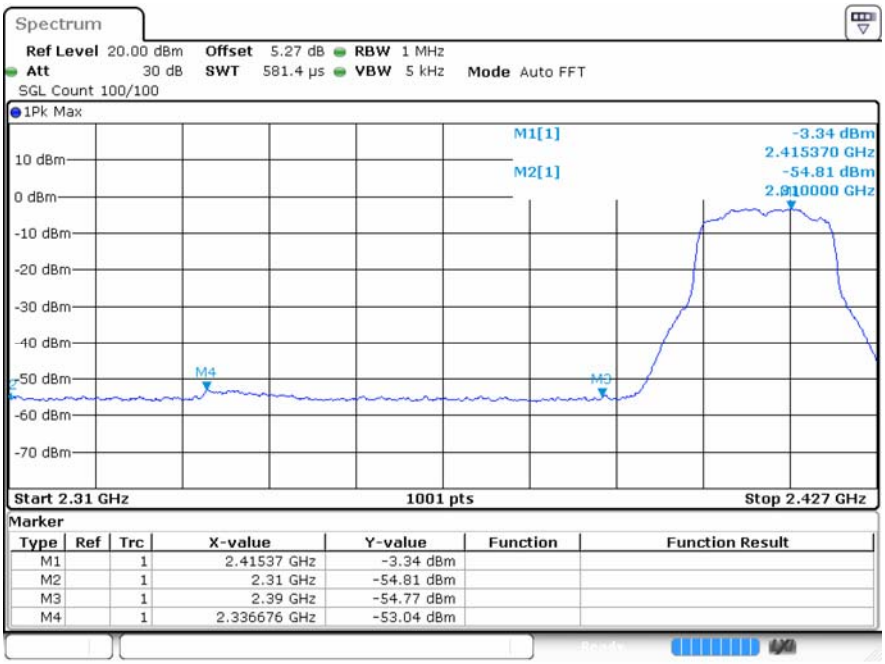
g 2462MHz Ant1 Average



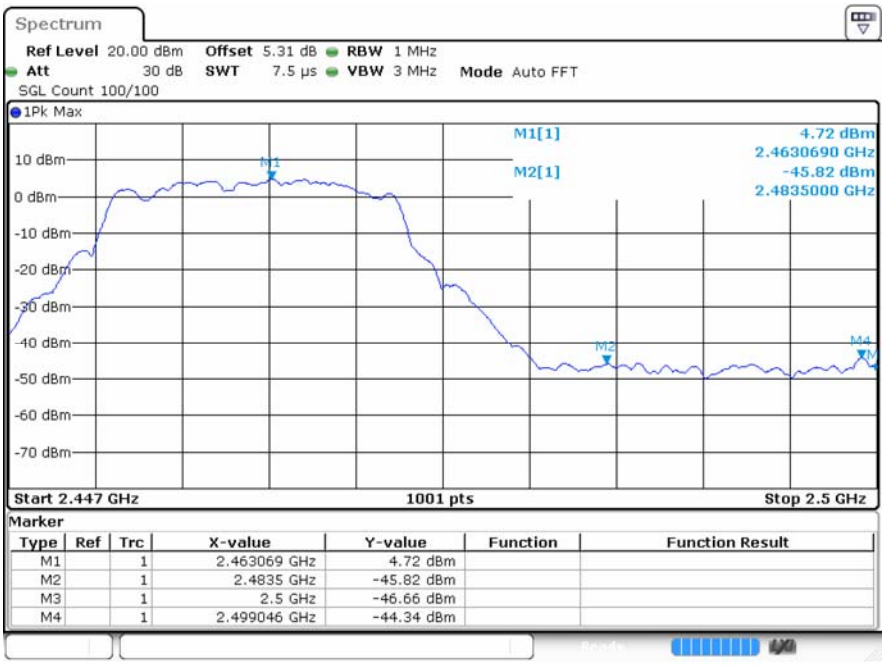
n20 2412MHz Ant1 Peak



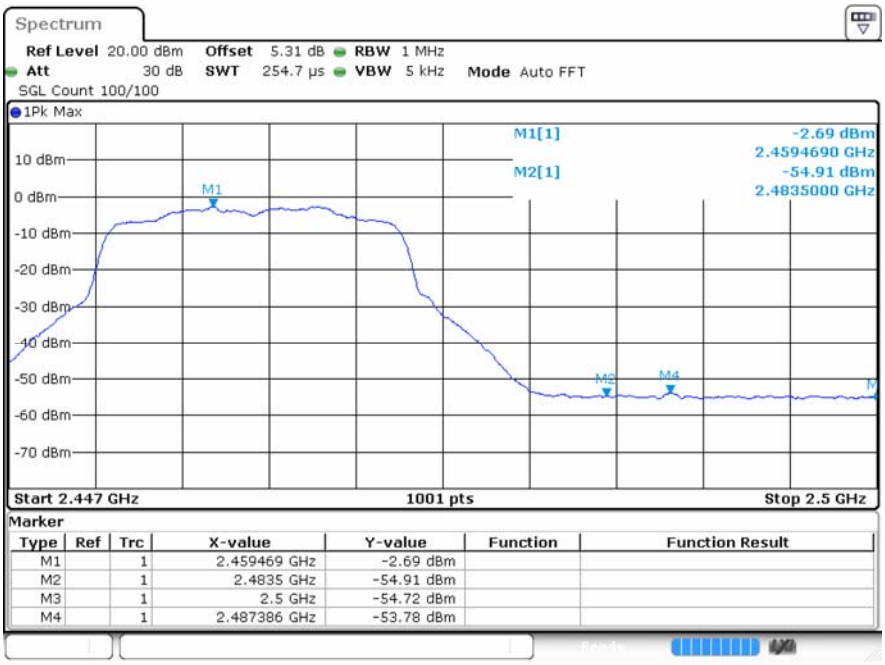
n20 2412MHz Ant1 Average



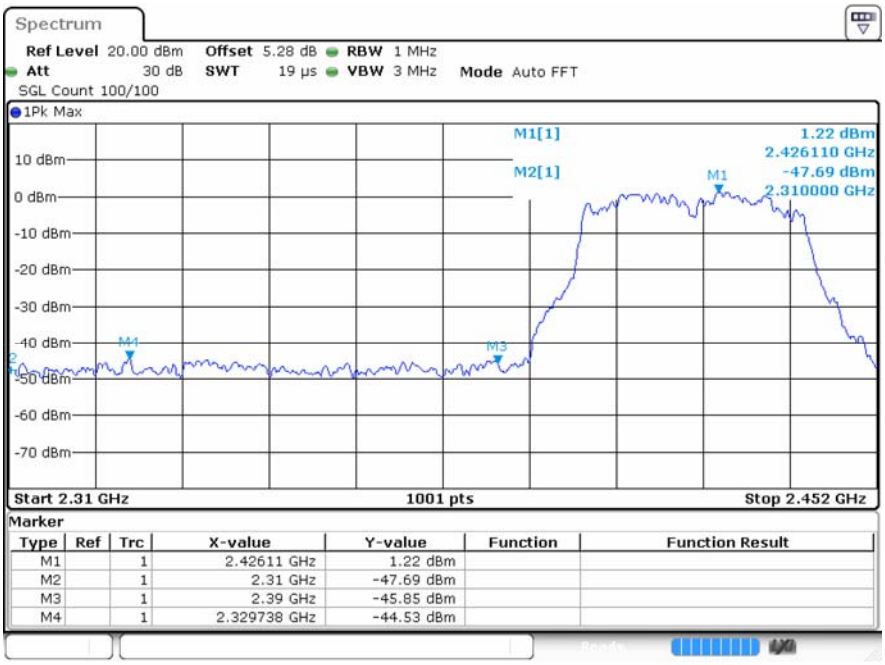
n20 2462MHz Ant1 Peak



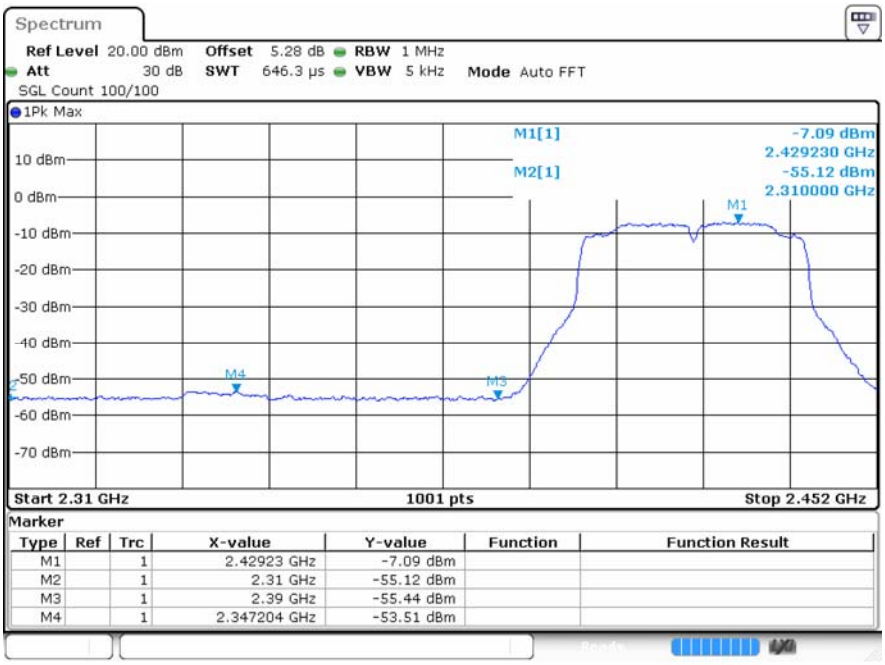
n20 2462MHz Ant1 Average



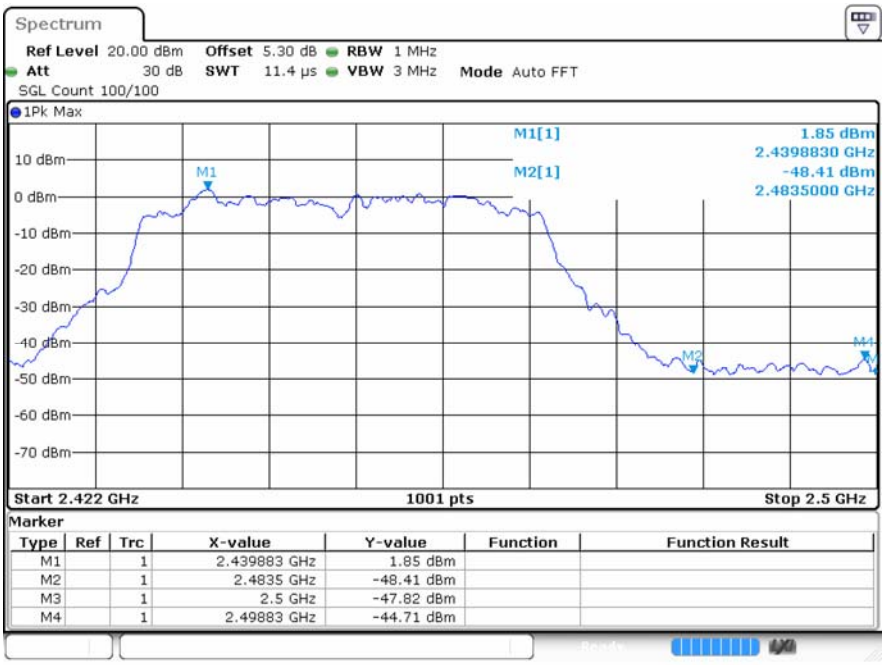
n40 2422MHz Ant1 Peak



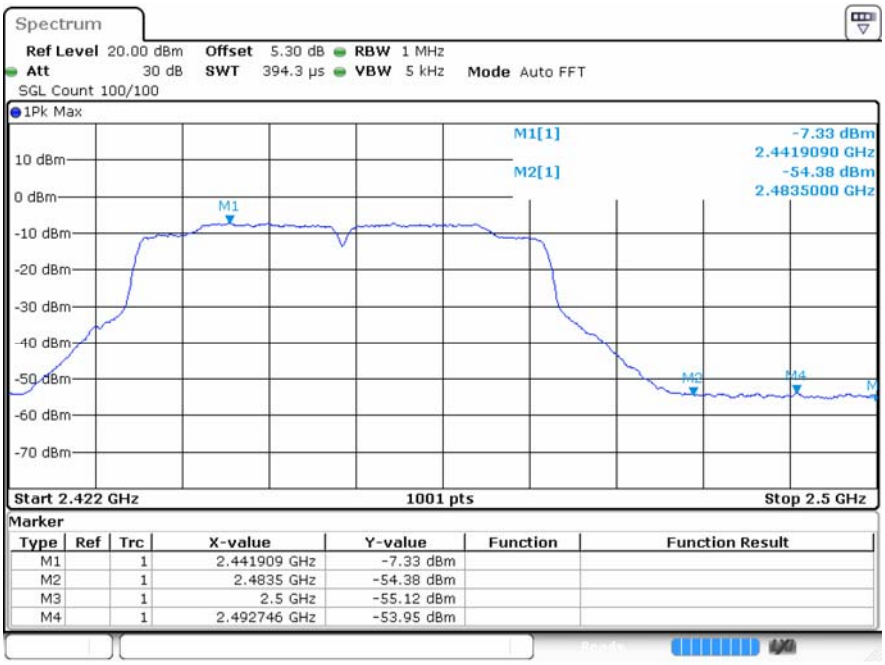
n40 2422MHz Ant1 Average



n40 2452MHz Ant1 Peak



n40 2452MHz Ant1 Average



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