



Appendix B

RF Test Data for BT (BLE) (Conducted Measurement)

Product Name: M5 Atom EchoS3R



Trade Mark: M5STACK

Test Model: Atom EchoS3R

Environmental Conditions

Temperature:	24.6° C
Relative Humidity:	52.4%
ATM Pressure:	100.0 kPa
Test Engineer:	Emiya lin
Supervised by:	Simba Haung



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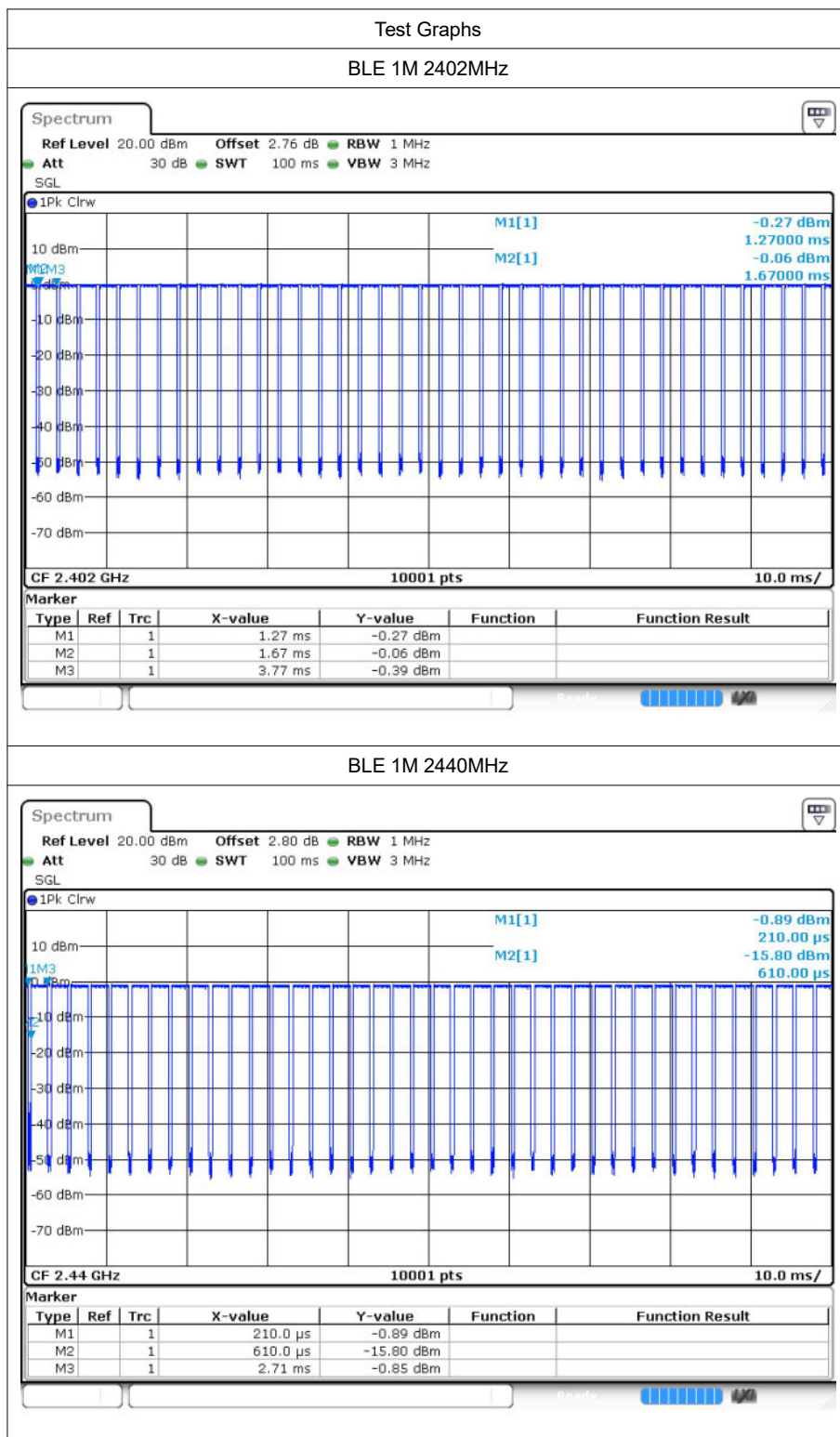


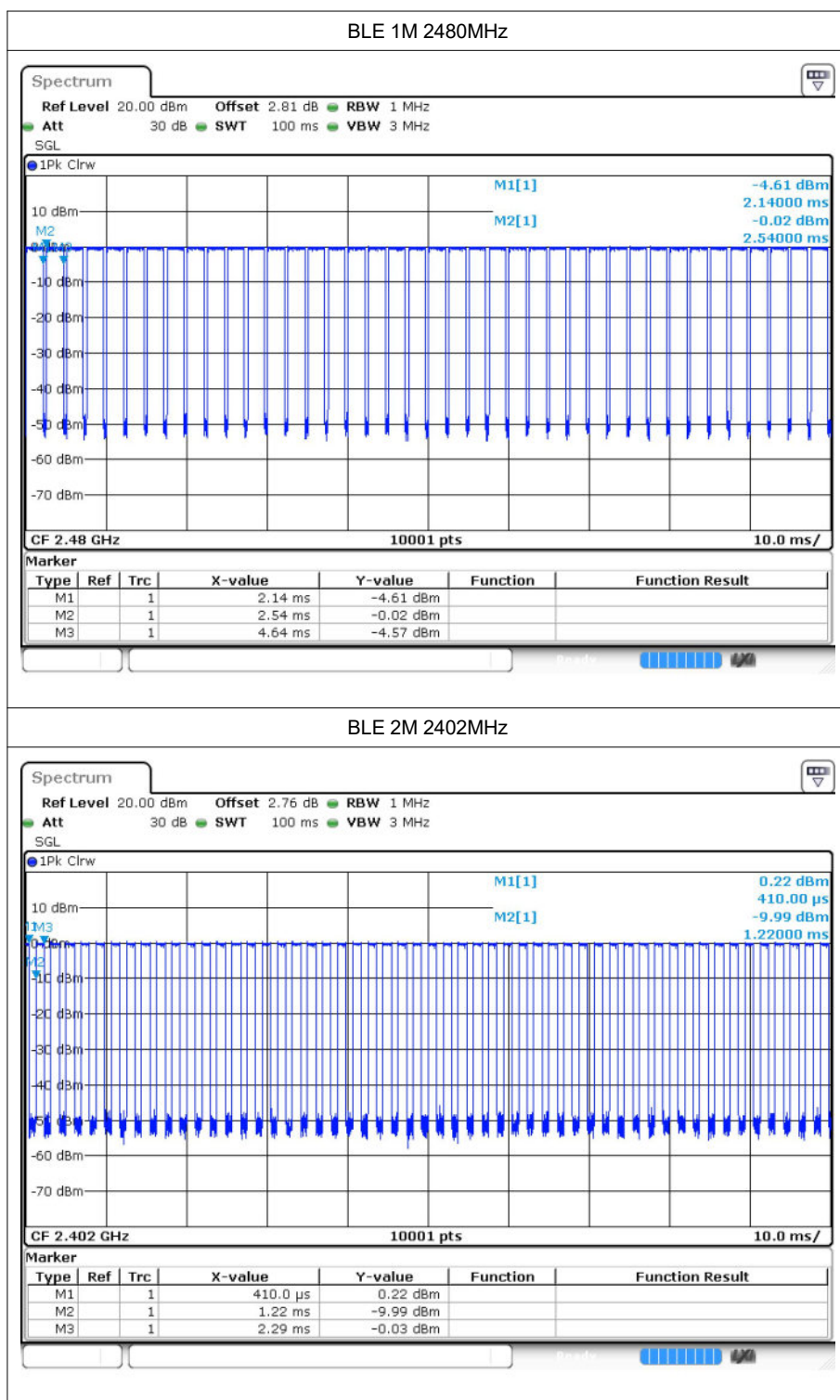
1 Duty Cycle

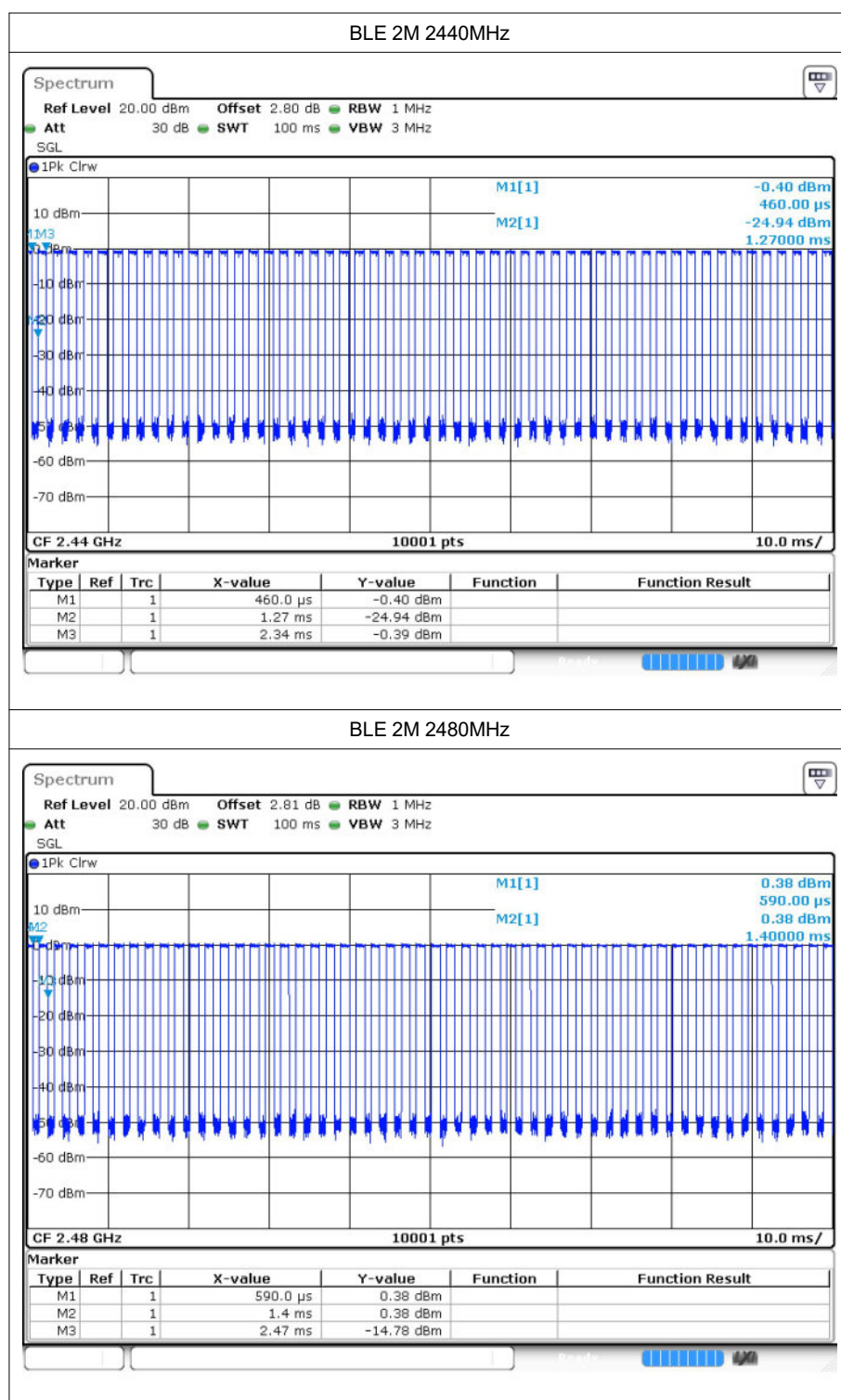
1.1 Test Result

Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor	1/T (kHz)
BLE 1M	2402	84.4	0.74	0.48
BLE 1M	2440	84.36	0.74	0.48
BLE 1M	2480	84.39	0.74	0.48
BLE 2M	2402	57.39	2.41	0.93
BLE 2M	2440	57.21	2.42	0.93
BLE 2M	2480	57.57	2.4	0.93

1.2 Test Graphs





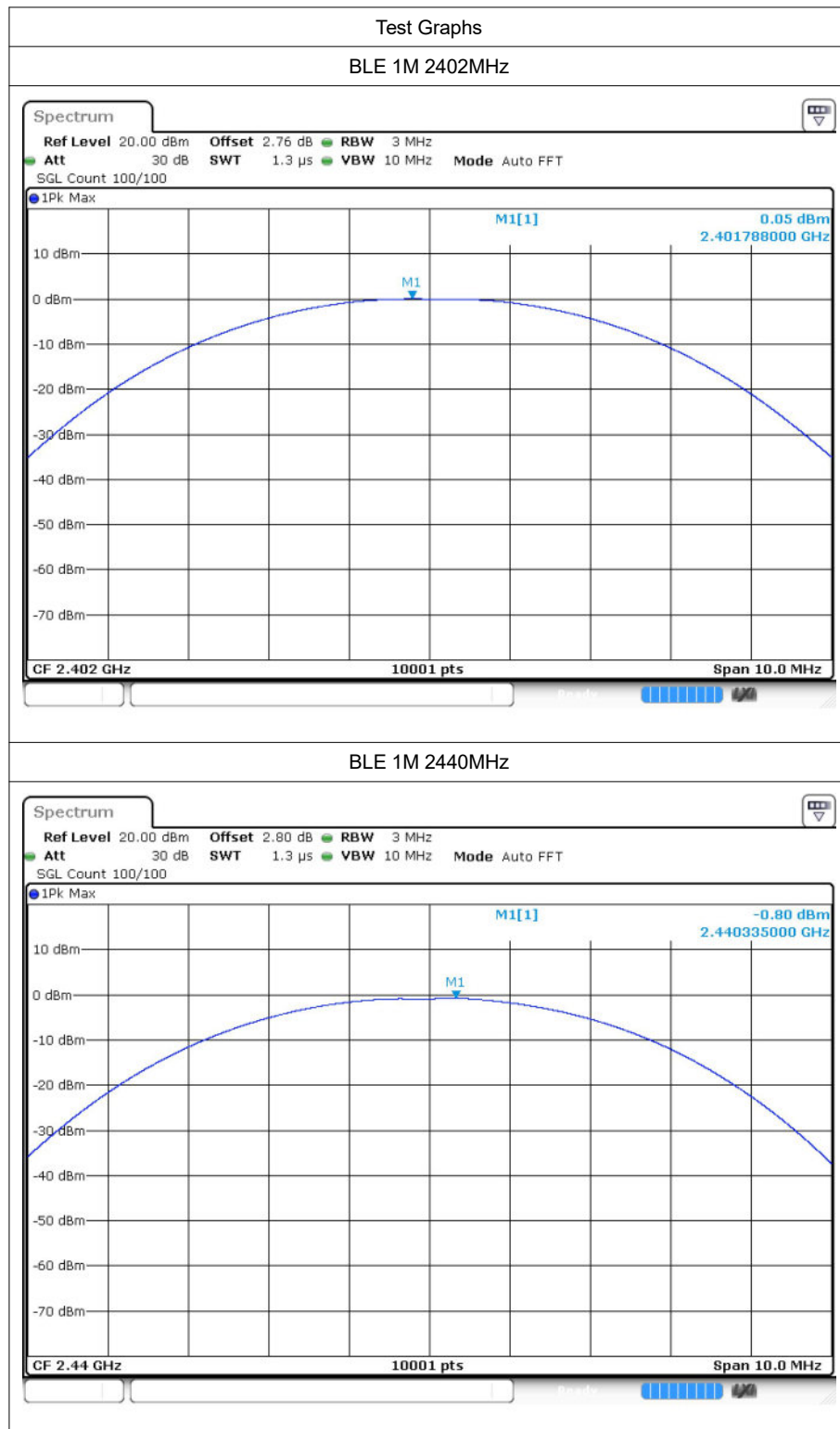


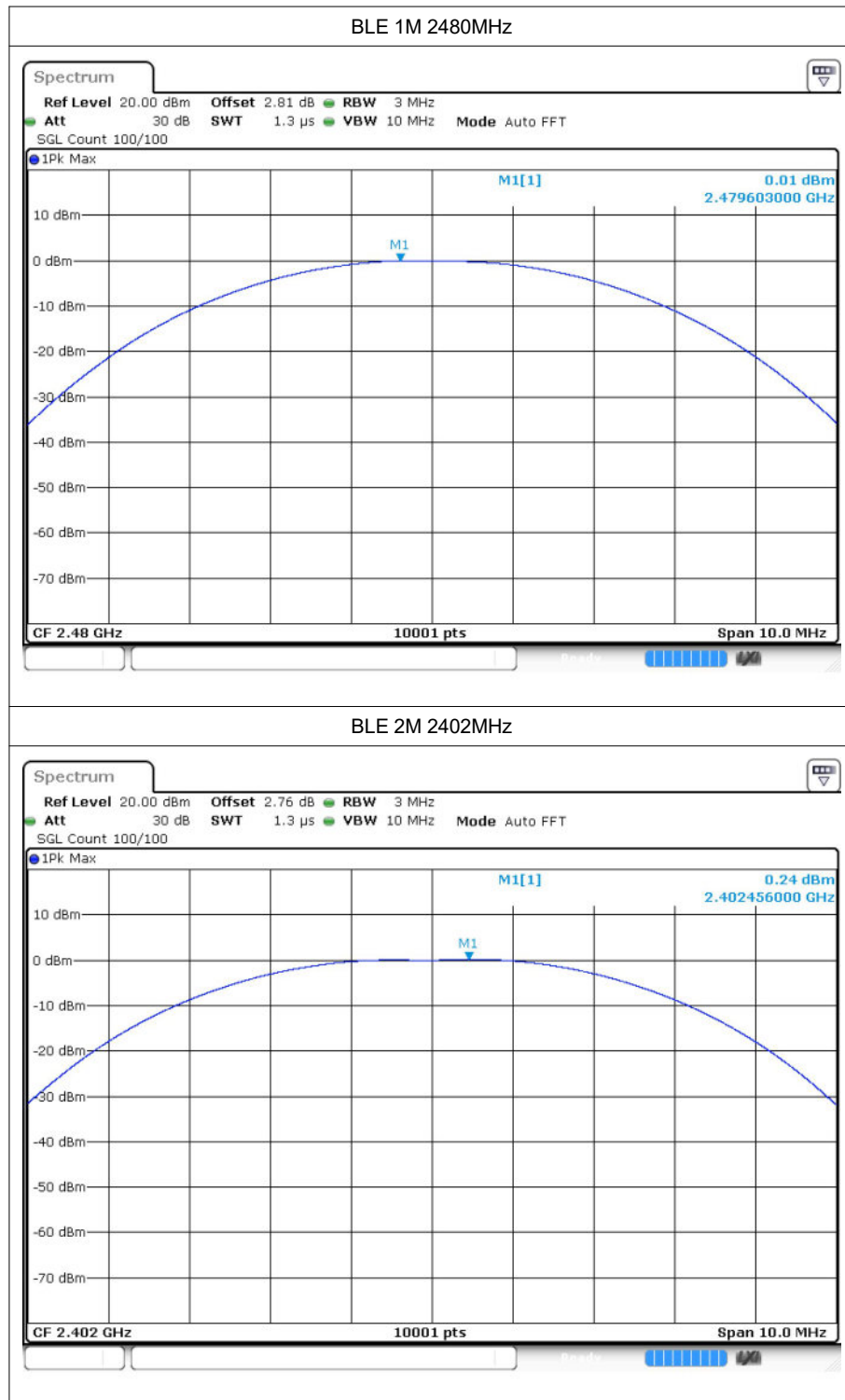
2 Maximum Conducted Output Power

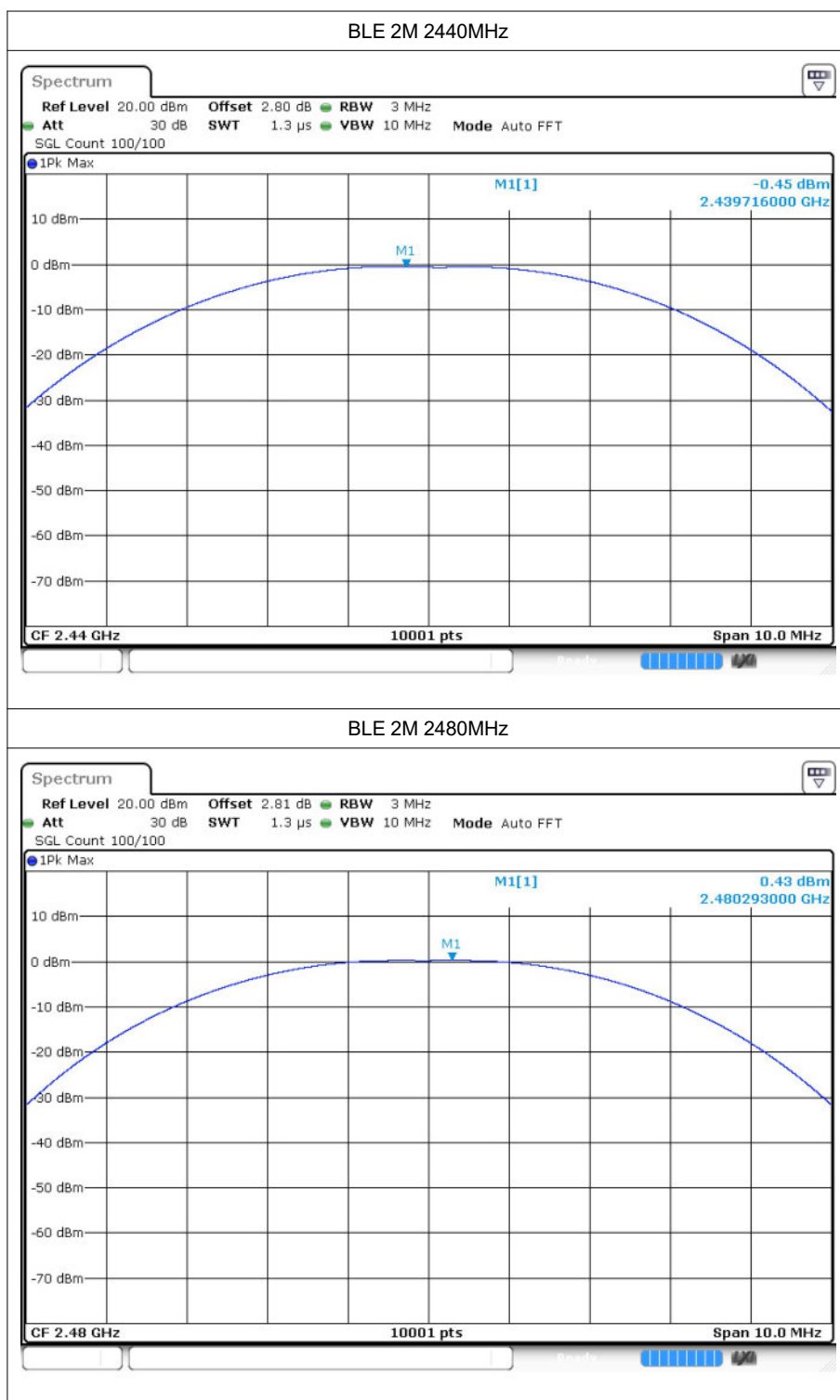
2.1 Test Result

Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
BLE 1M	2402	0.05	30	Pass
BLE 1M	2440	-0.8	30	Pass
BLE 1M	2480	0.01	30	Pass
BLE 2M	2402	0.24	30	Pass
BLE 2M	2440	-0.45	30	Pass
BLE 2M	2480	0.43	30	Pass

2.2 Test Graphs







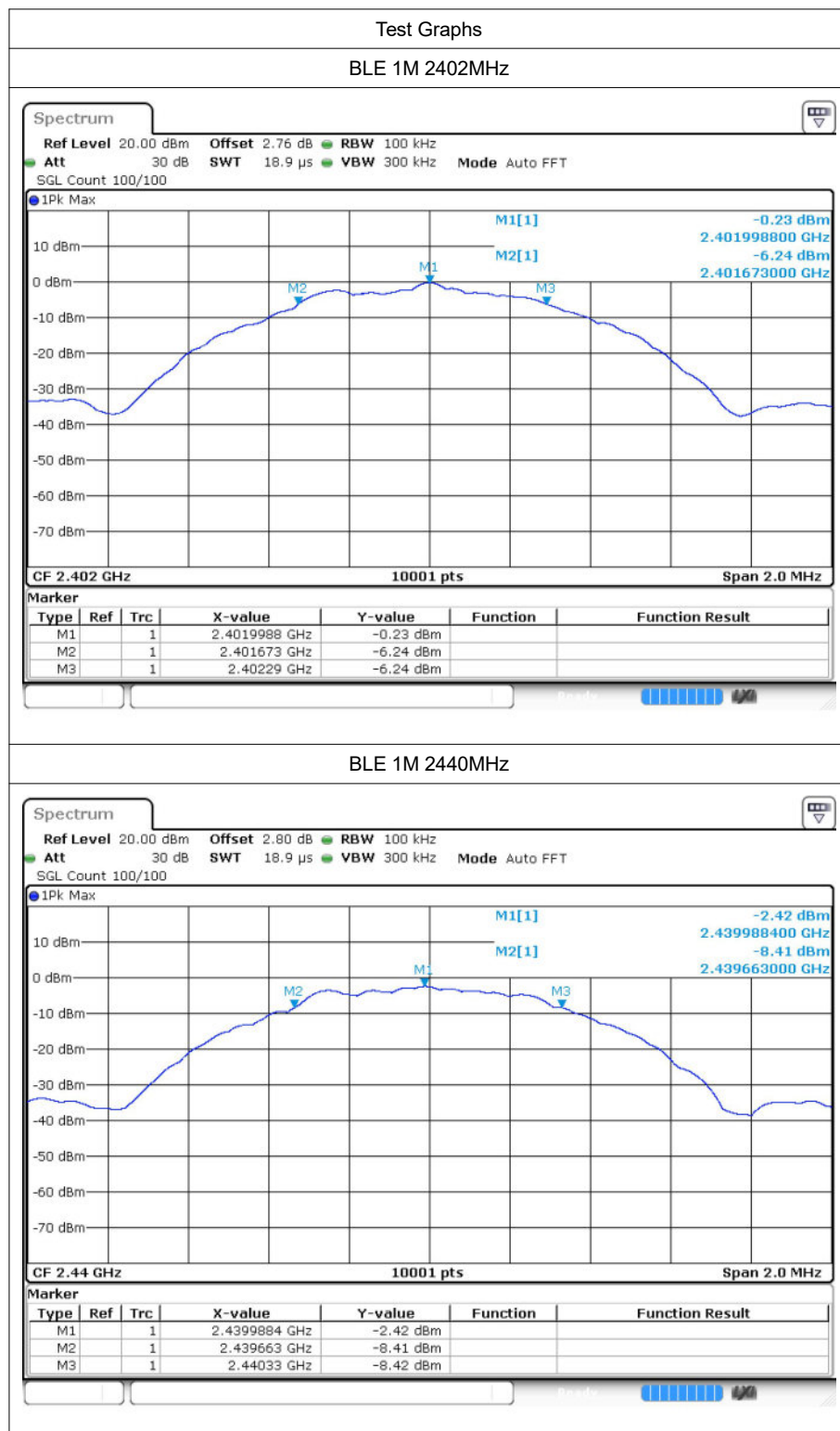


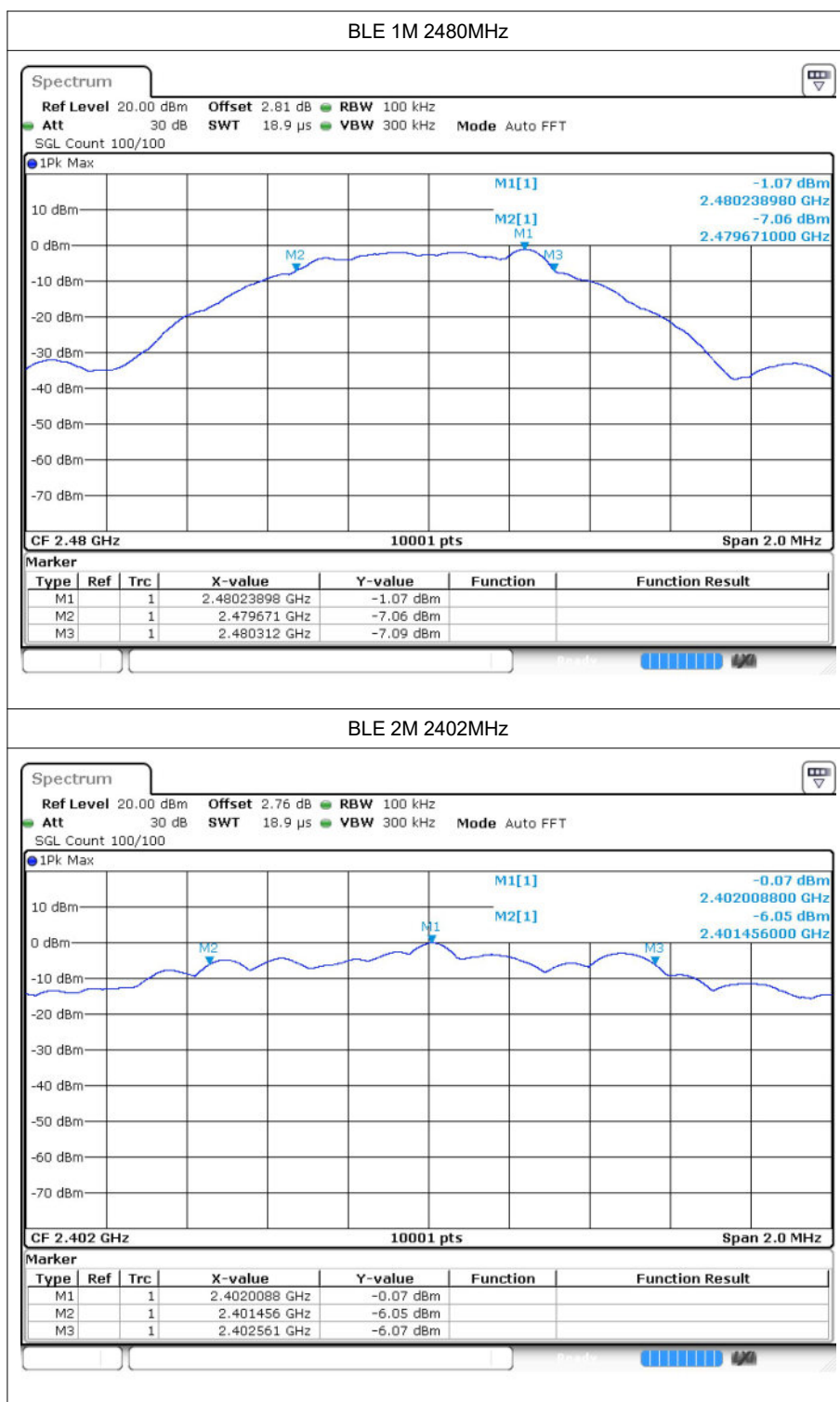
3 -6dB Bandwidth

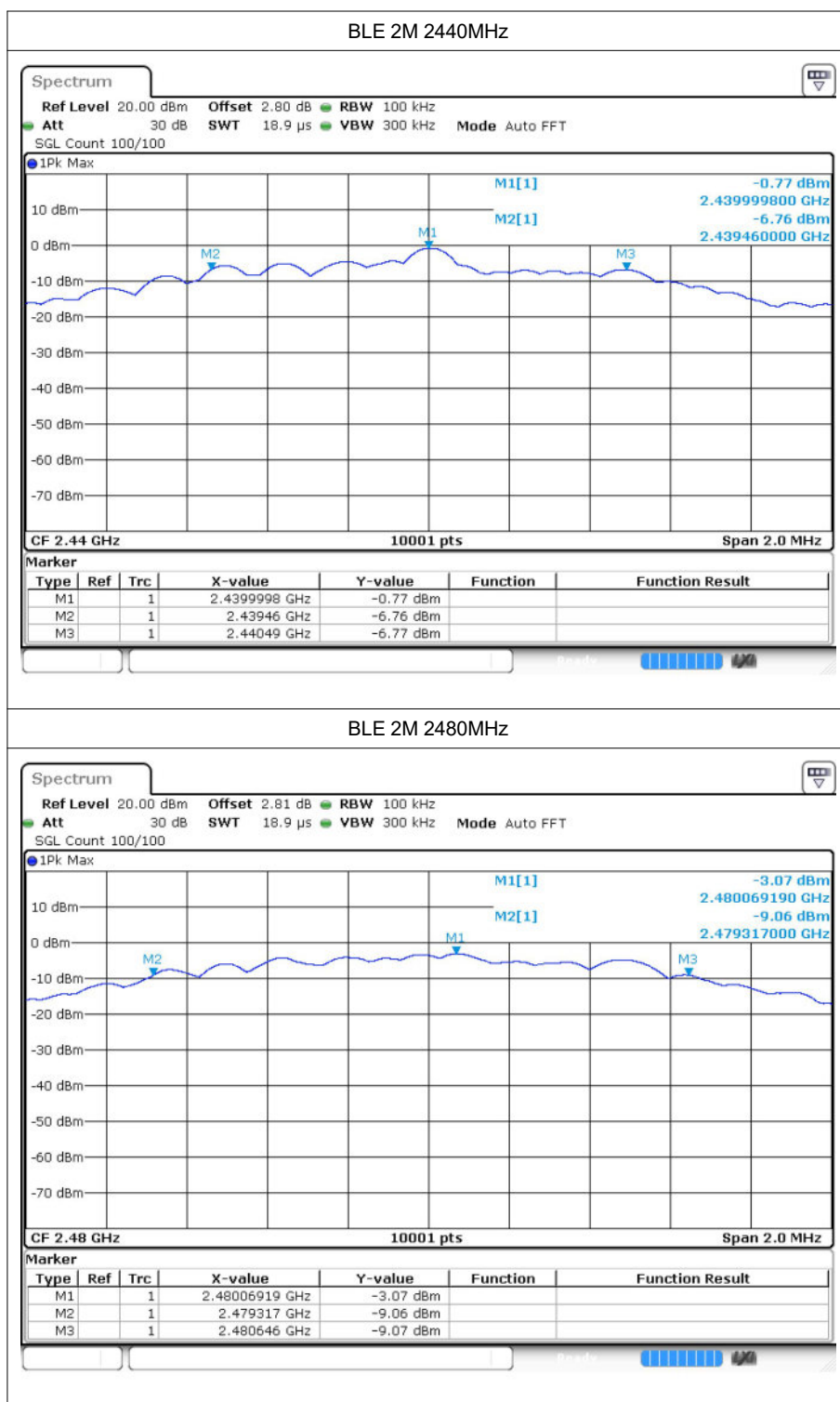
3.1 Test Result

Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
BLE 1M	2402	0.617	0.5	Pass
BLE 1M	2440	0.667	0.5	Pass
BLE 1M	2480	0.641	0.5	Pass
BLE 2M	2402	1.105	0.5	Pass
BLE 2M	2440	1.03	0.5	Pass
BLE 2M	2480	1.33	0.5	Pass

3.2 Test Graphs





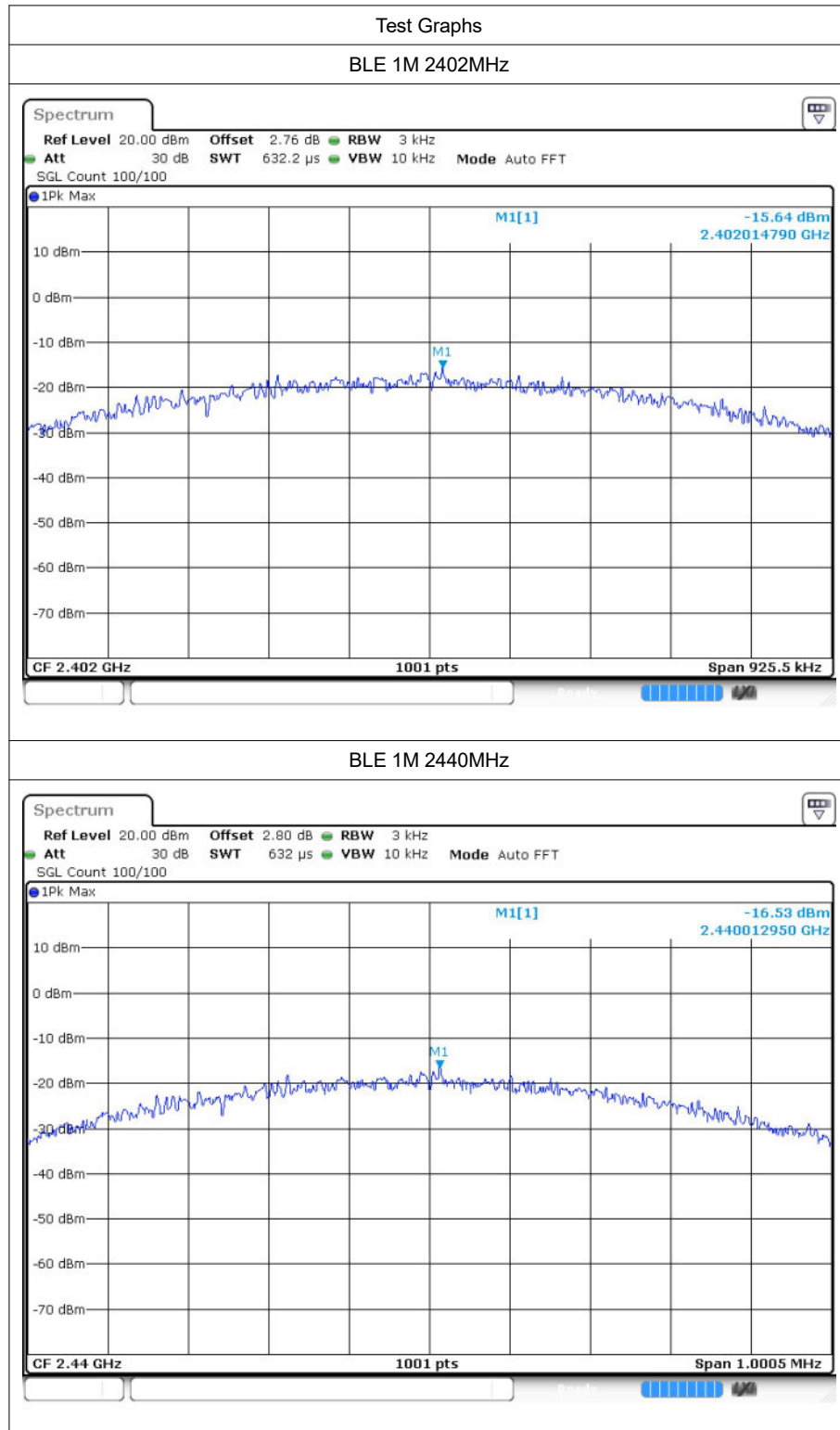


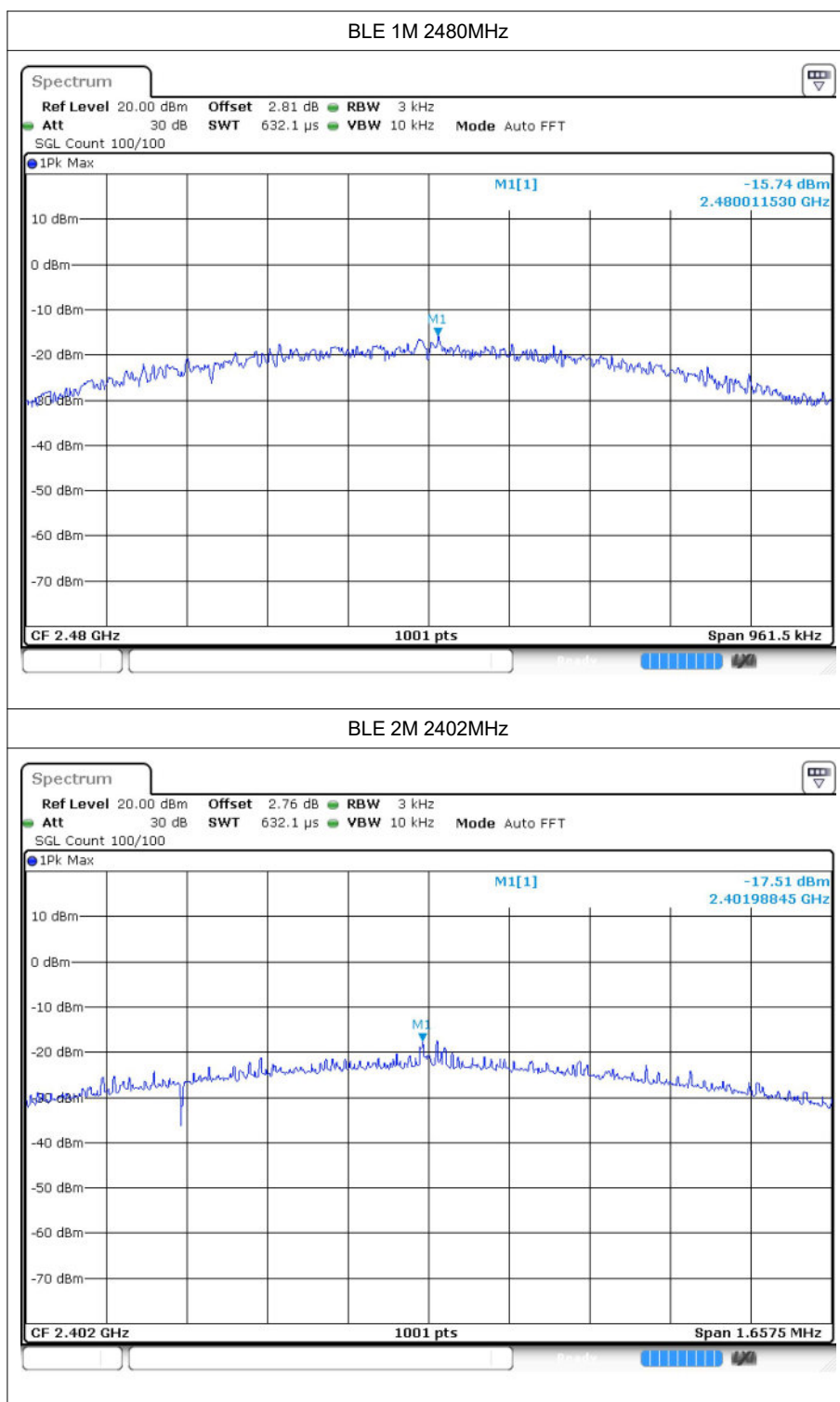
4 Maximum Power Spectral Density Level

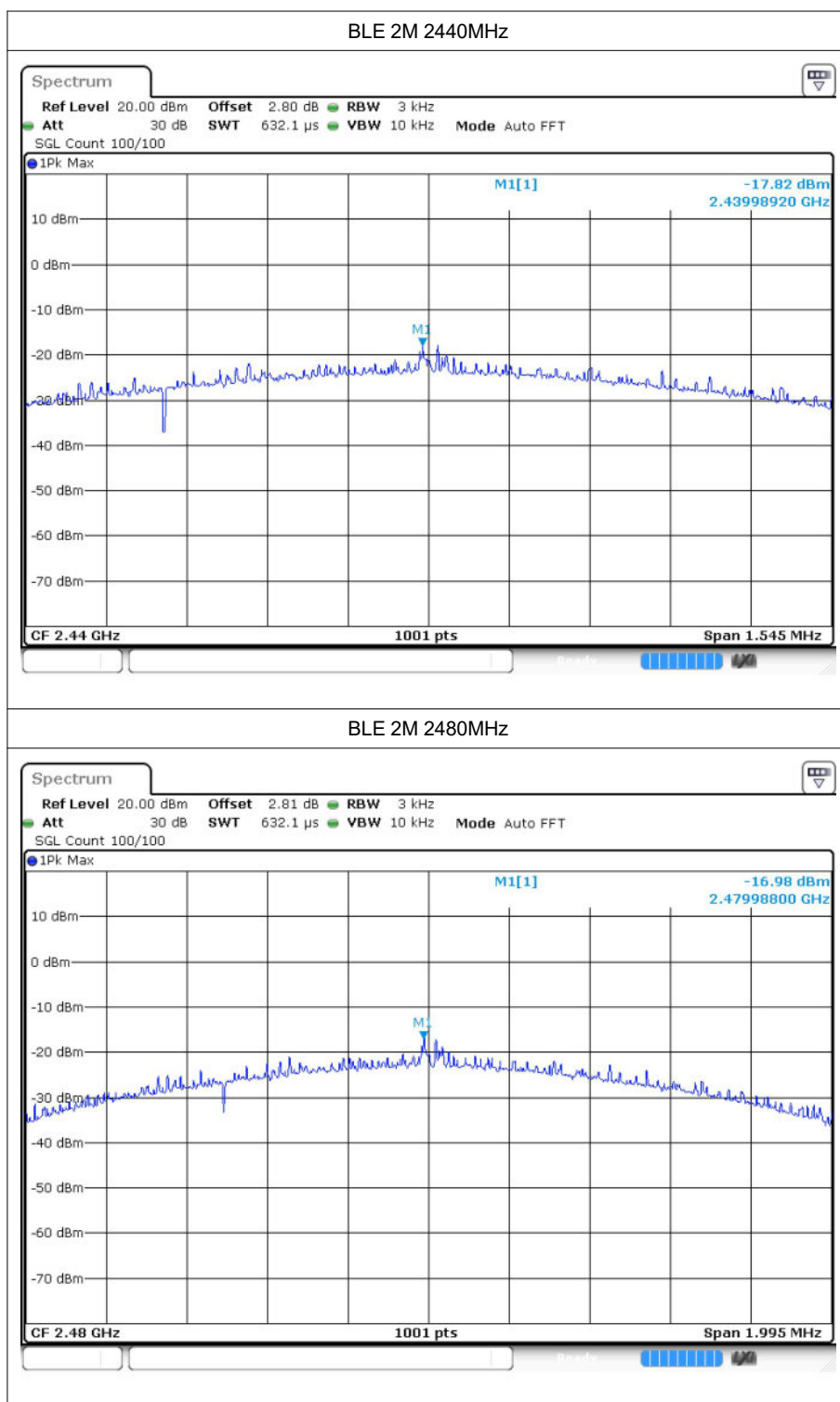
4.1 Test Result

Mode	Frequency (MHz)	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
BLE 1M	2402	-15.64	≤ 8	Pass
BLE 1M	2440	-16.53	≤ 8	Pass
BLE 1M	2480	-15.74	≤ 8	Pass
BLE 2M	2402	-17.51	≤ 8	Pass
BLE 2M	2440	-17.82	≤ 8	Pass
BLE 2M	2480	-16.98	≤ 8	Pass

4.2 Test Graphs







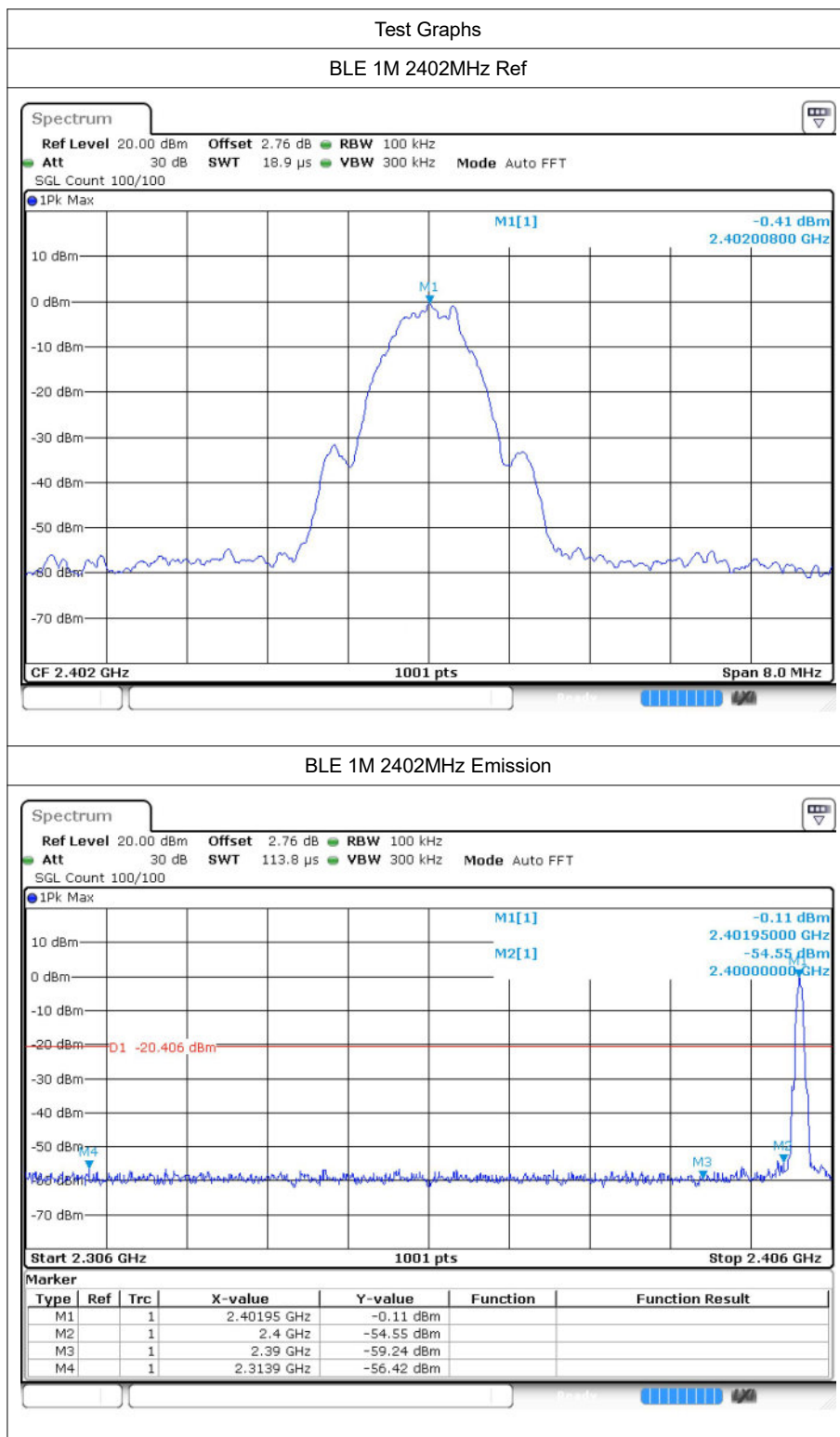


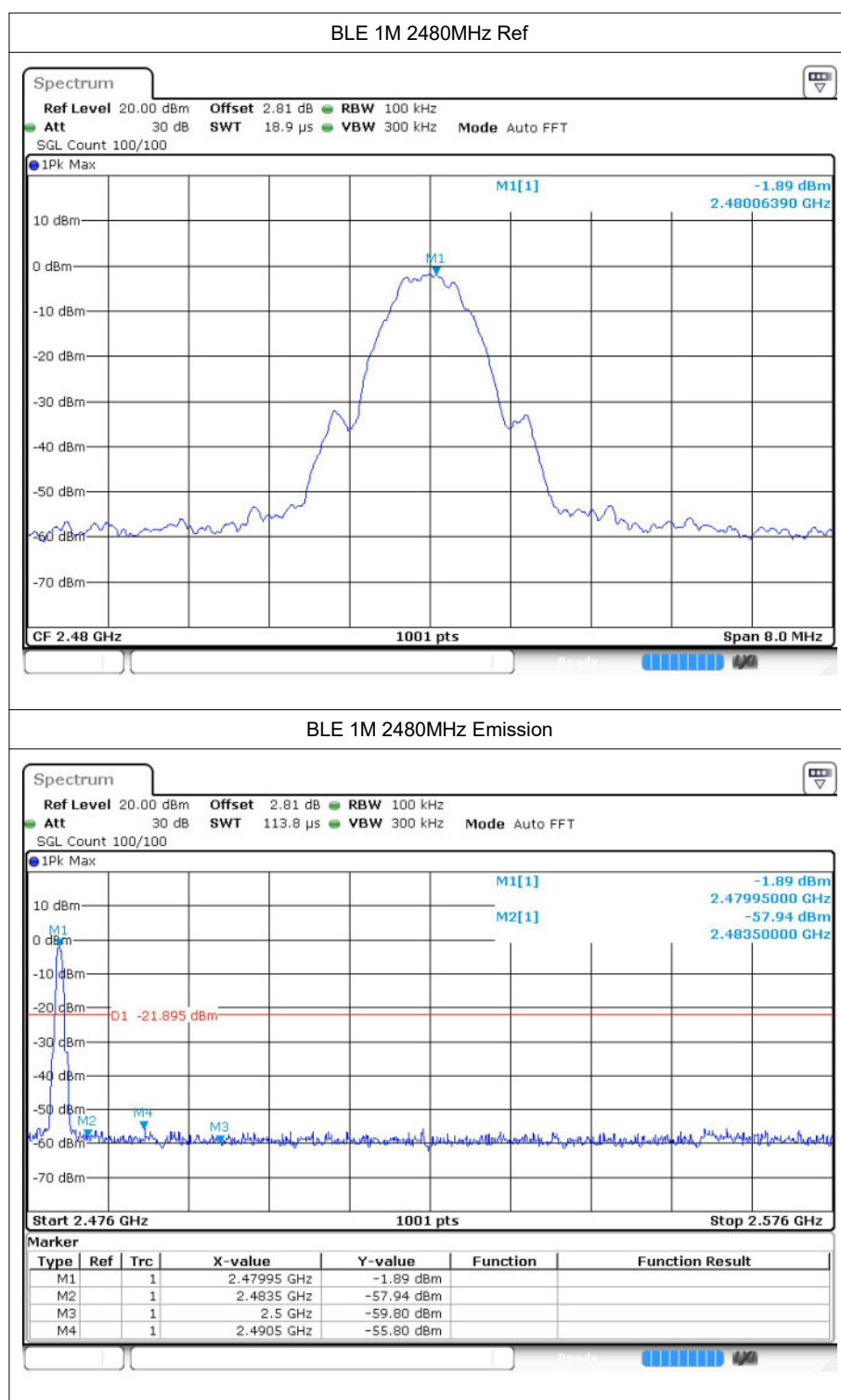
5 Band Edge

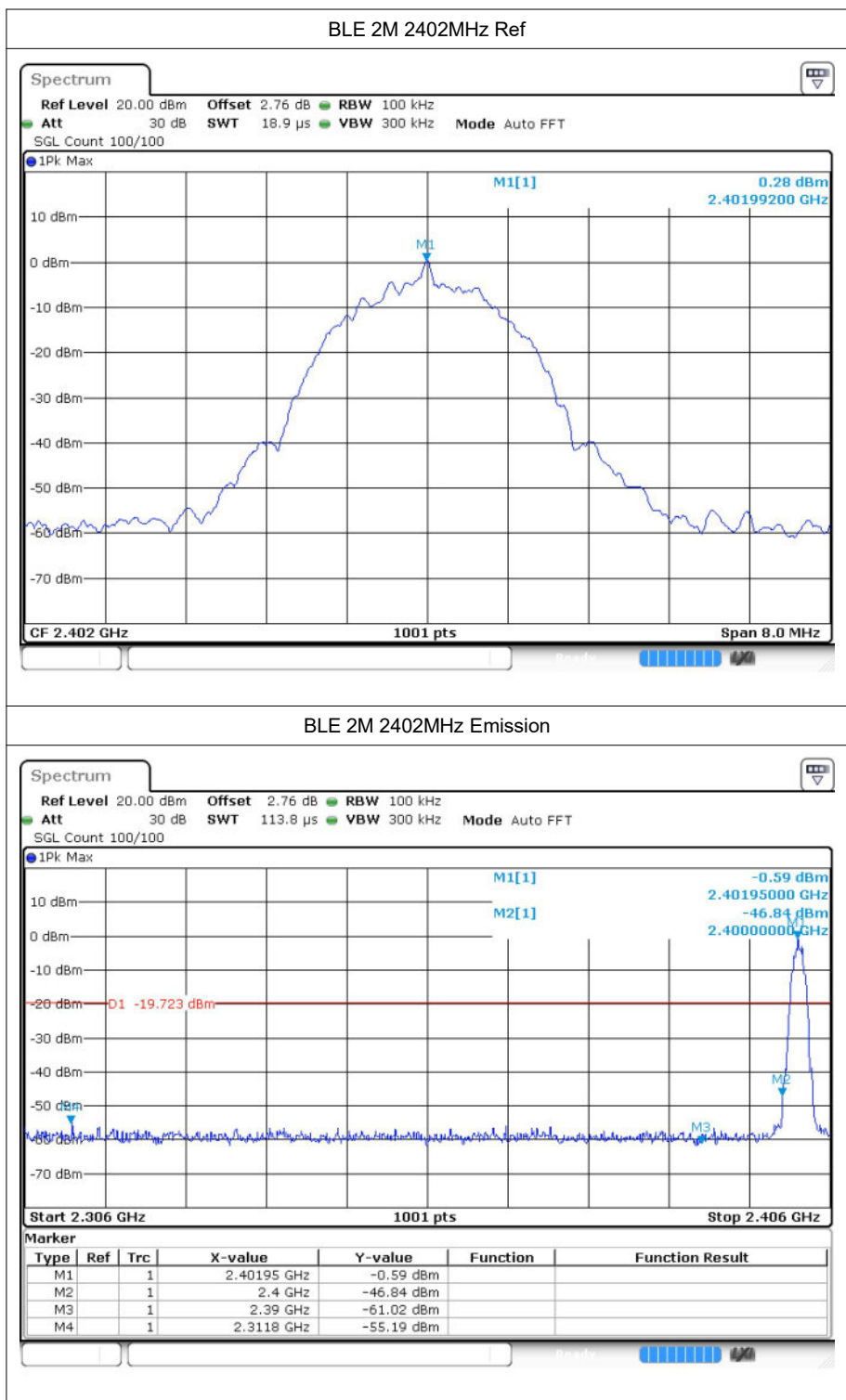
5.1 Test Result

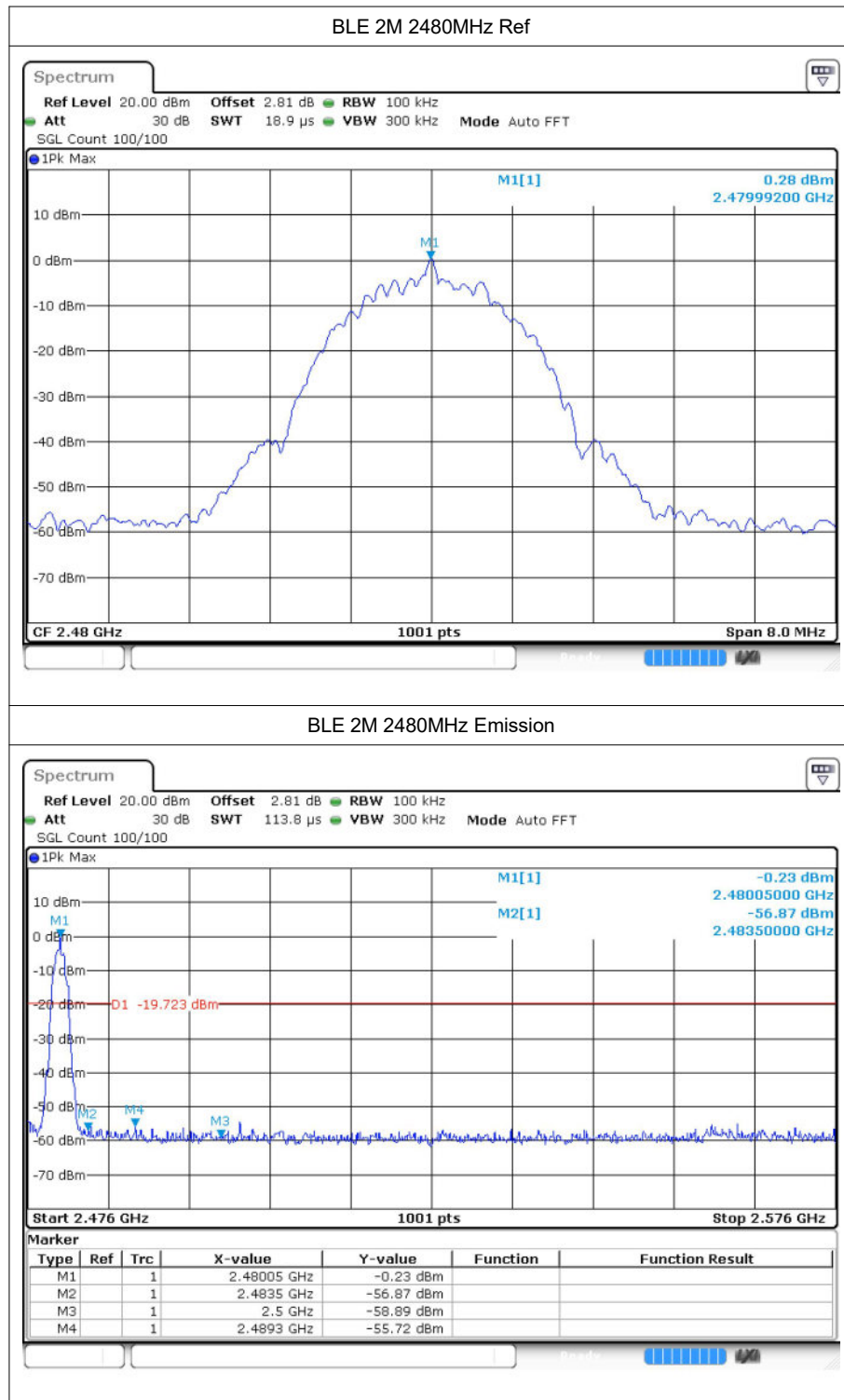
Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE 1M	2402	-56.01	-20	Pass
BLE 1M	2480	-53.9	-20	Pass
BLE 2M	2402	-55.47	-20	Pass
BLE 2M	2480	-56	-20	Pass

5.2 Test Graphs









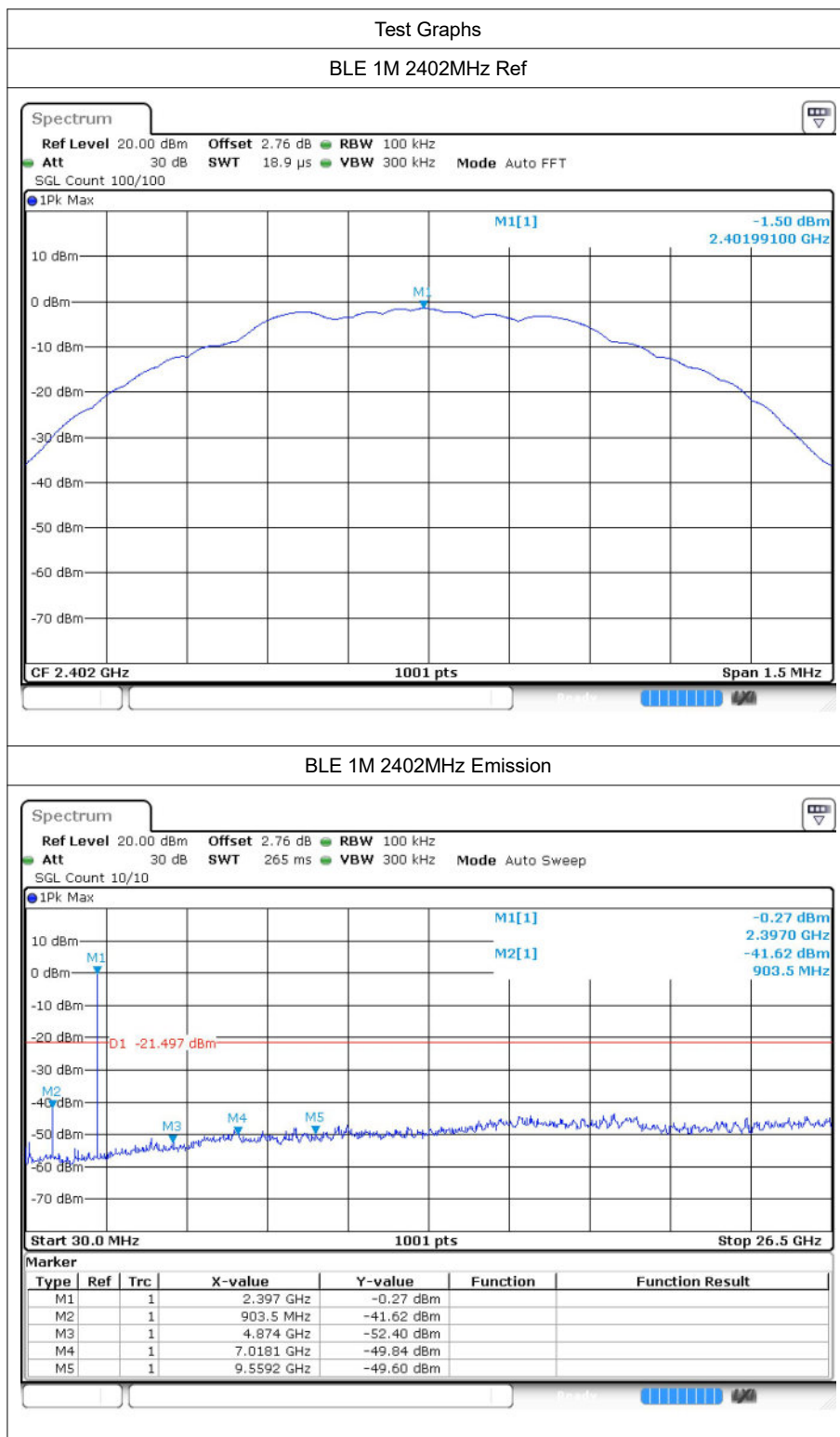


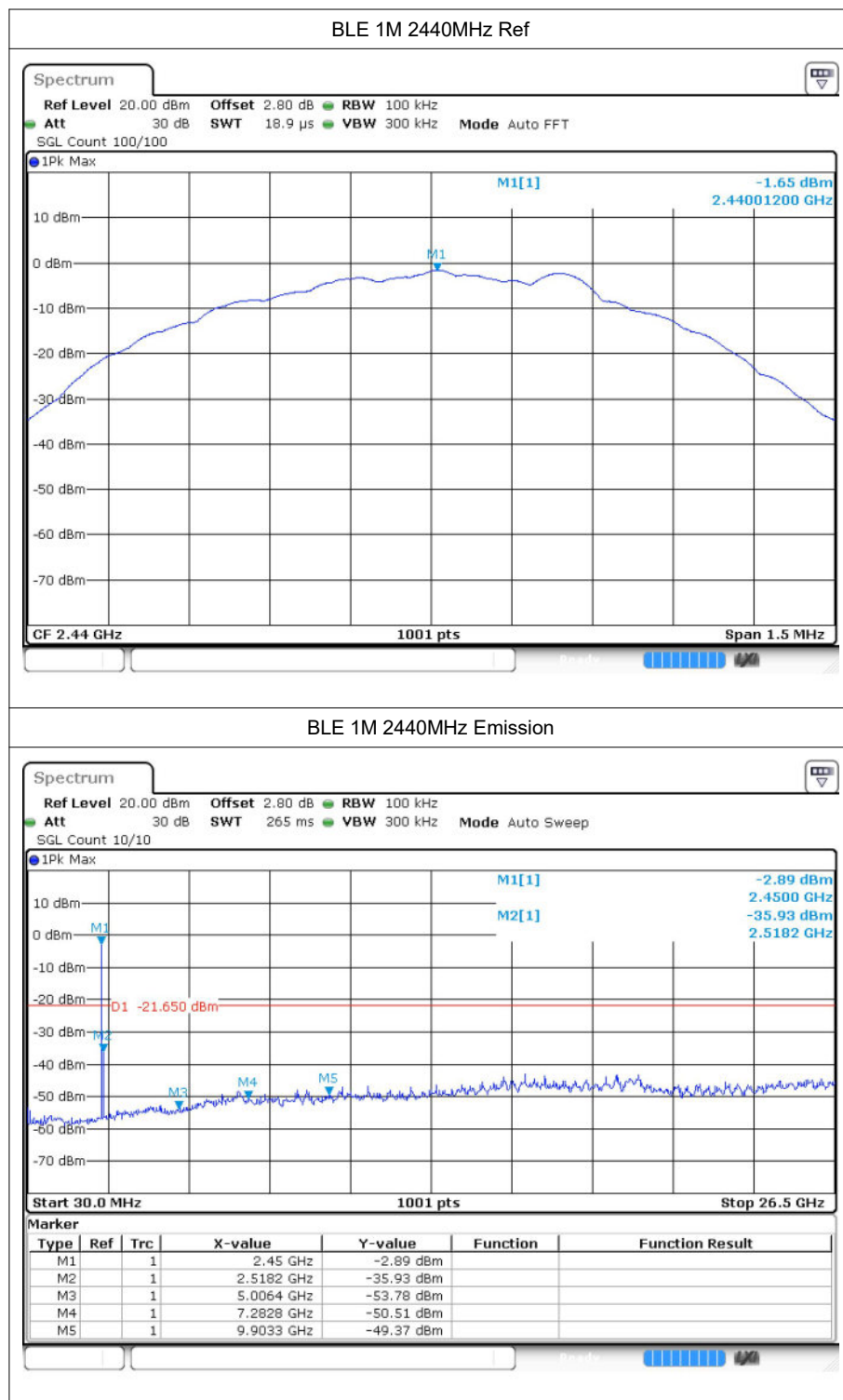
6 Conducted RF Spurious Emission

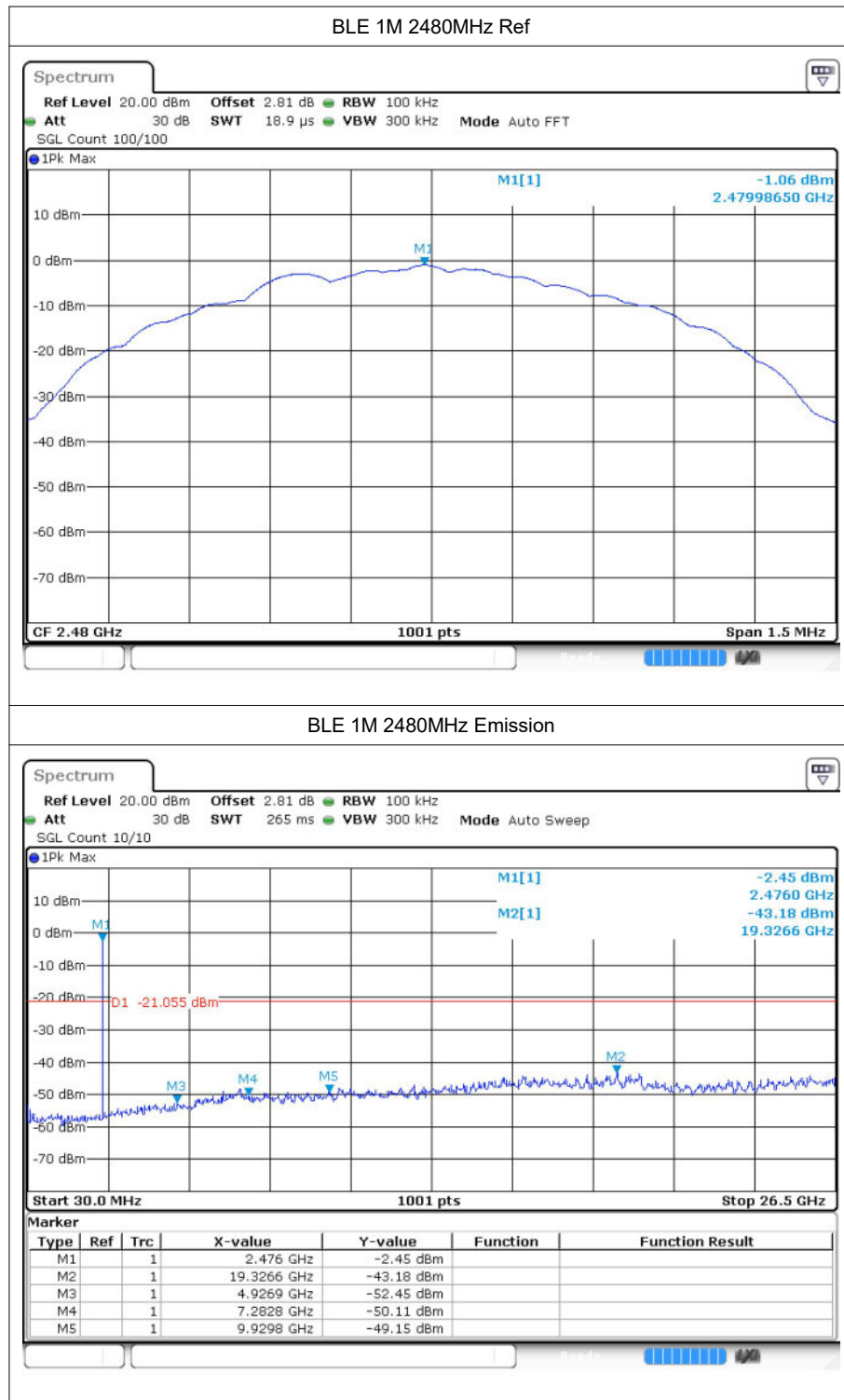
6.1 Test Result

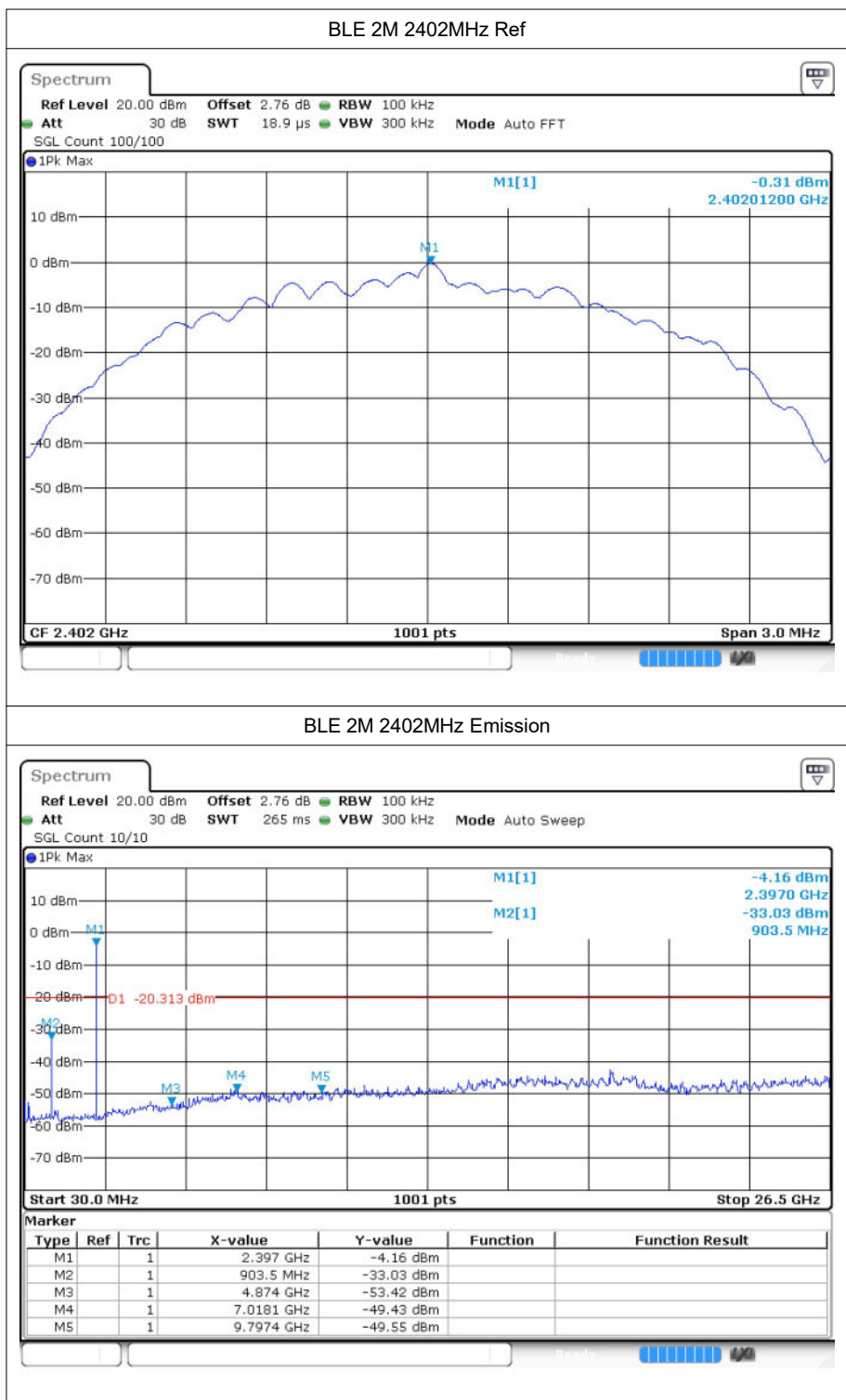
Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
BLE 1M	2402	-40.11	-20	Pass
BLE 1M	2440	-34.28	-20	Pass
BLE 1M	2480	-42.12	-20	Pass
BLE 2M	2402	-32.72	-20	Pass
BLE 2M	2440	-29.23	-20	Pass
BLE 2M	2480	-40.28	-20	Pass

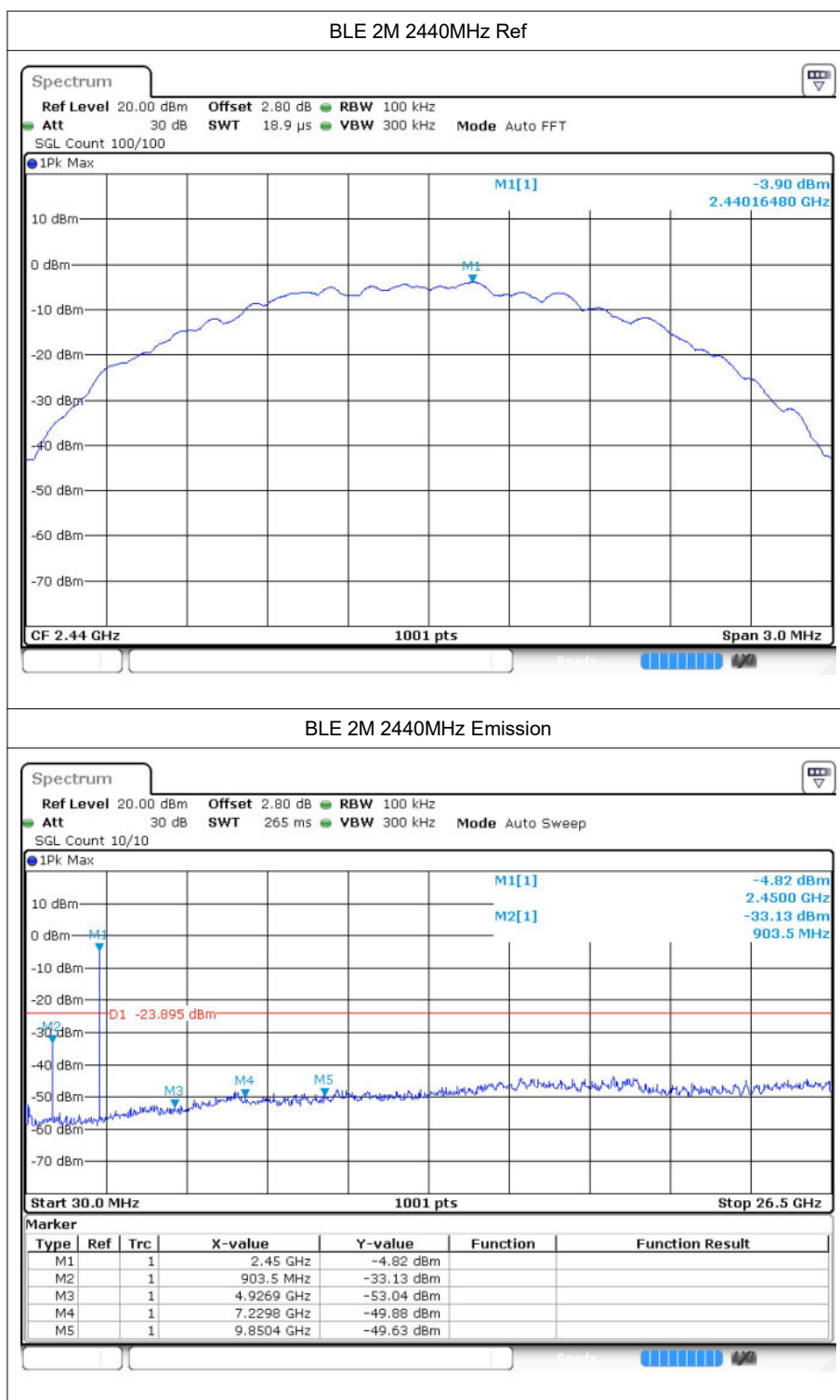
6.2 Test Graphs

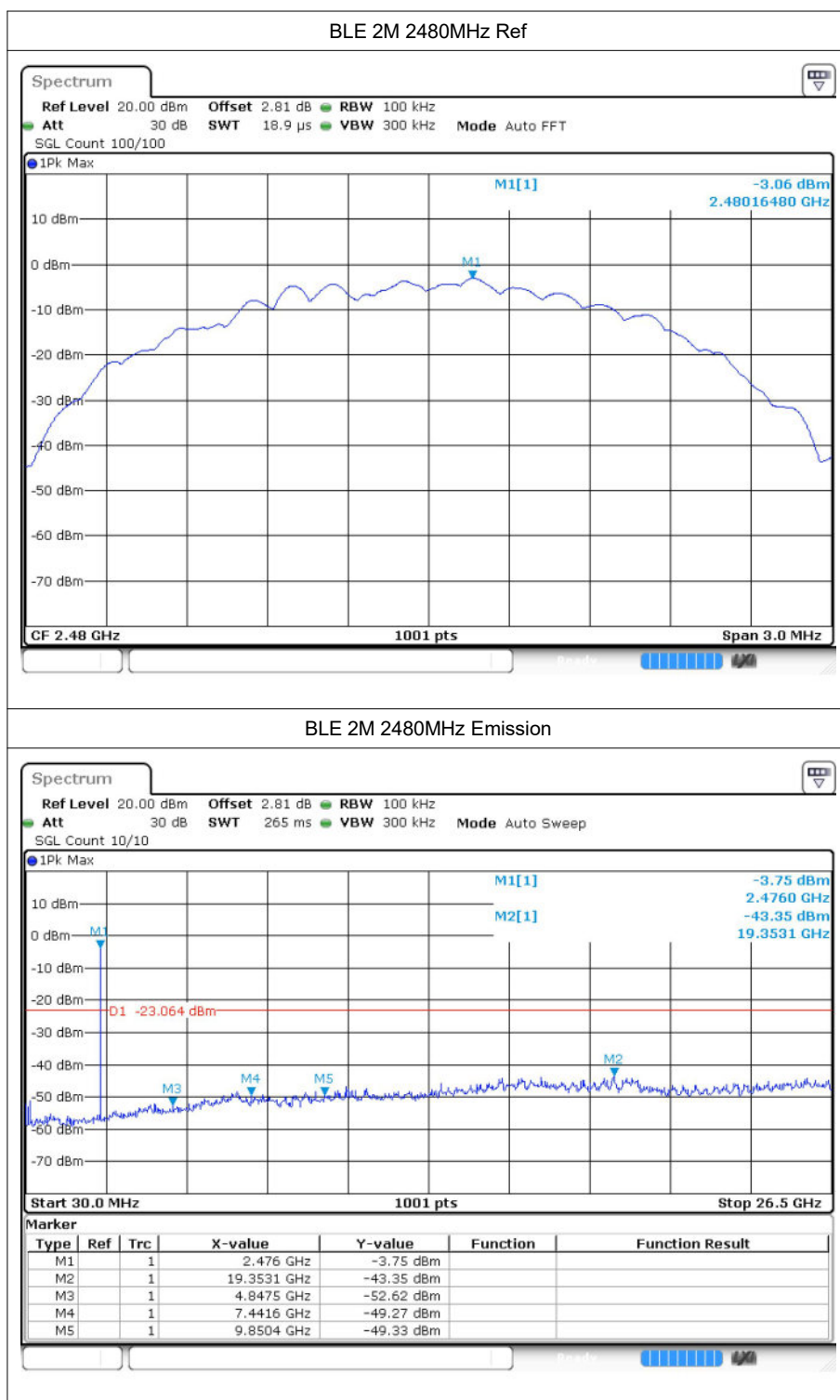












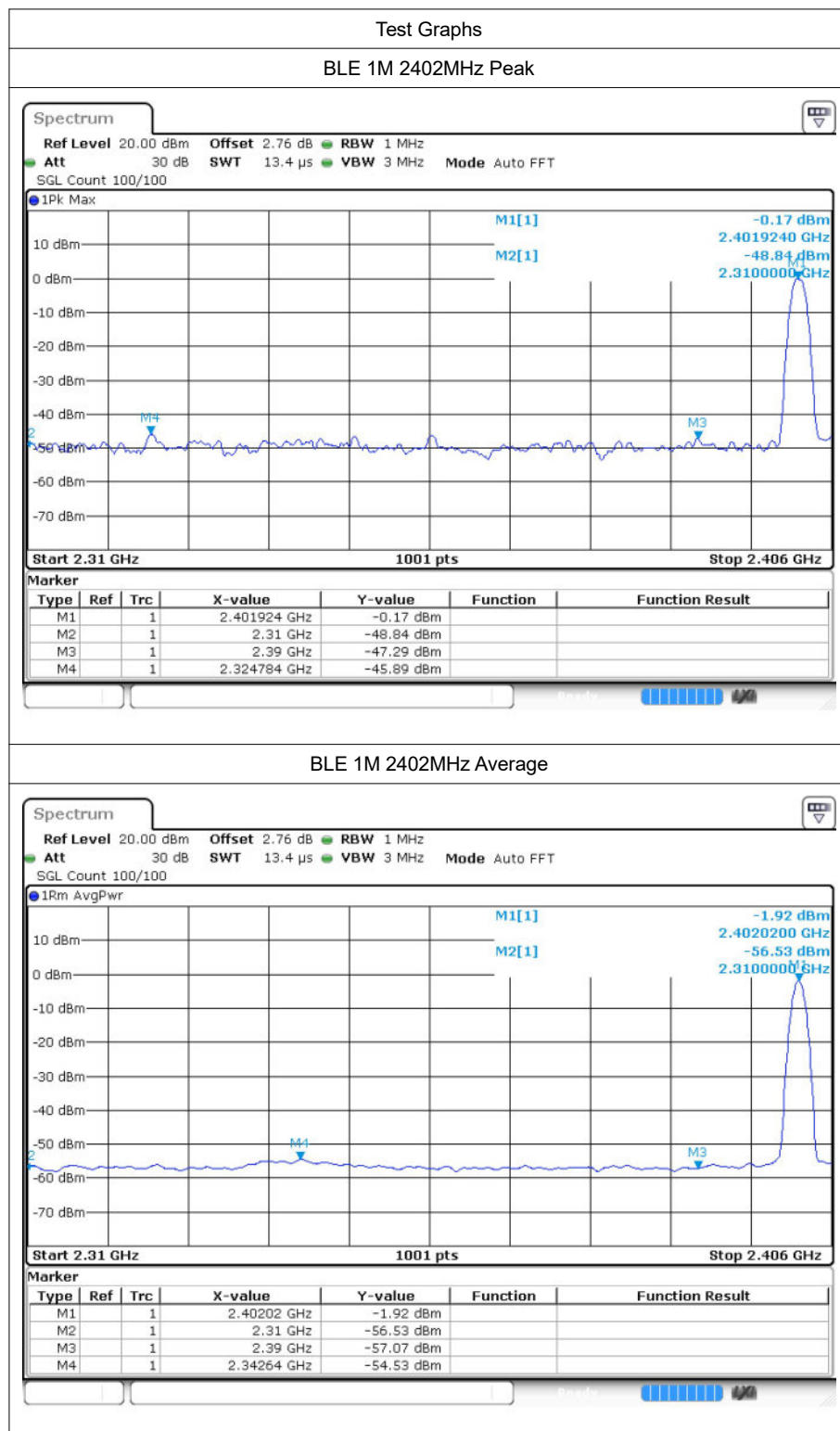


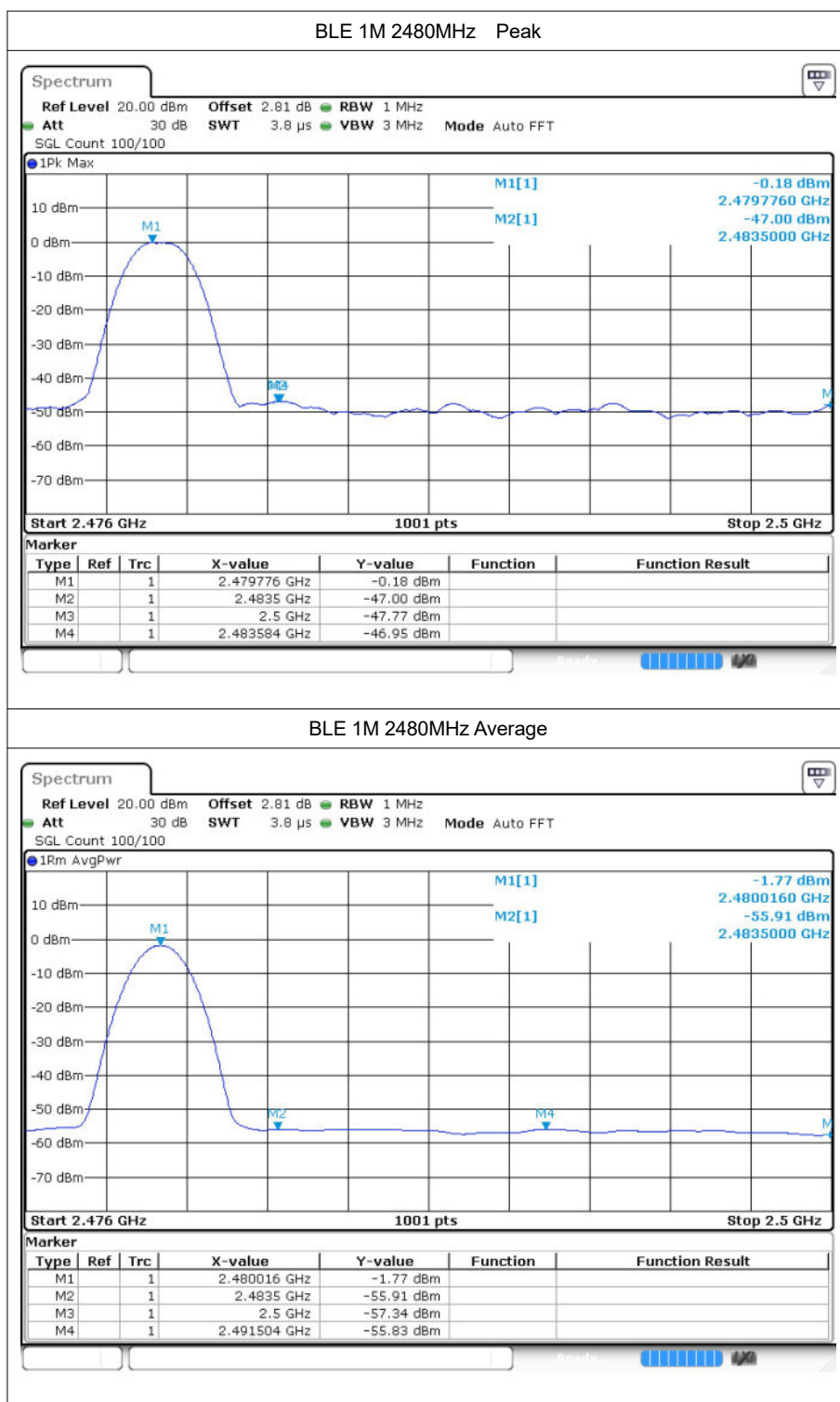
7 Restrict Band

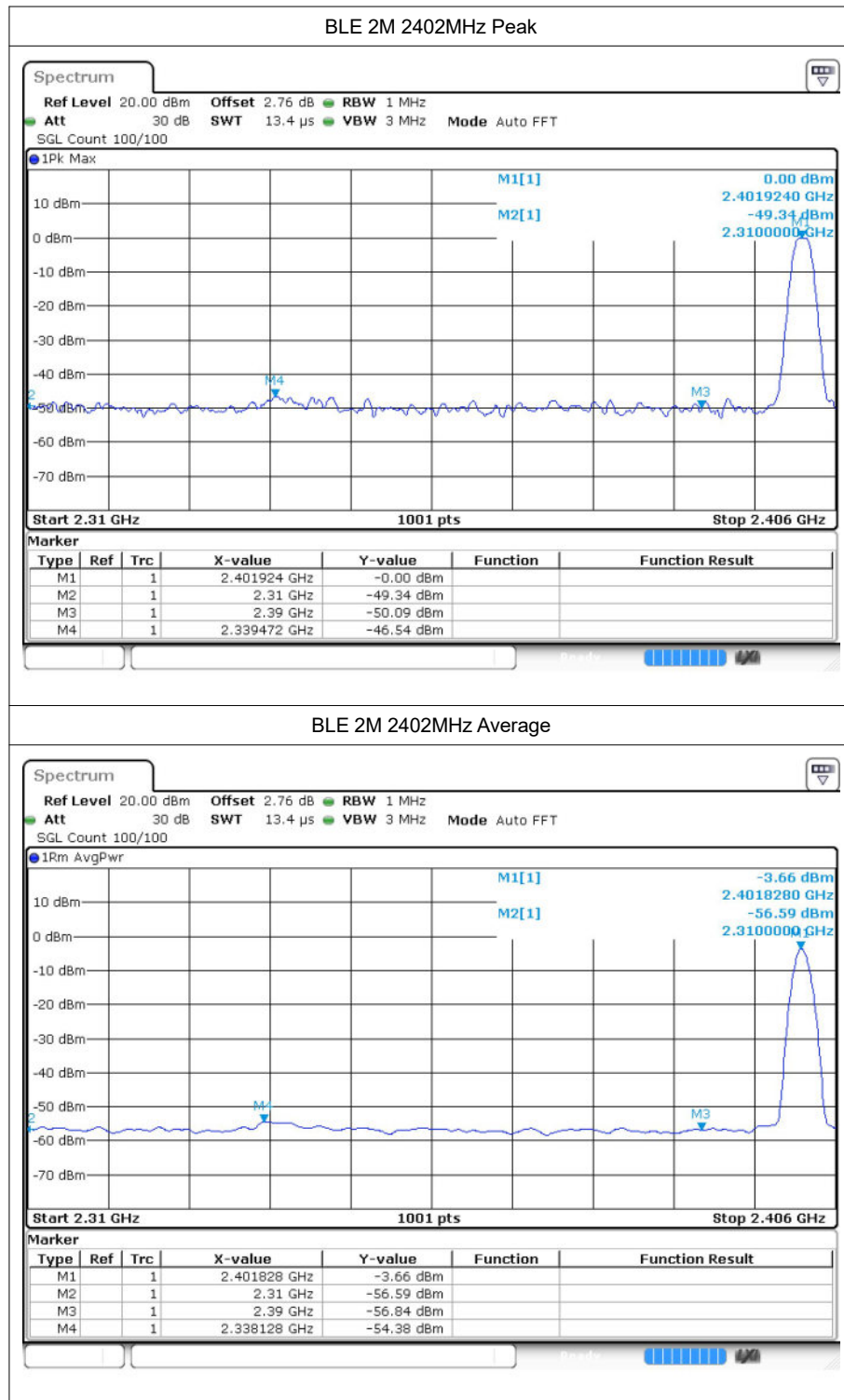
7.1 Test Result

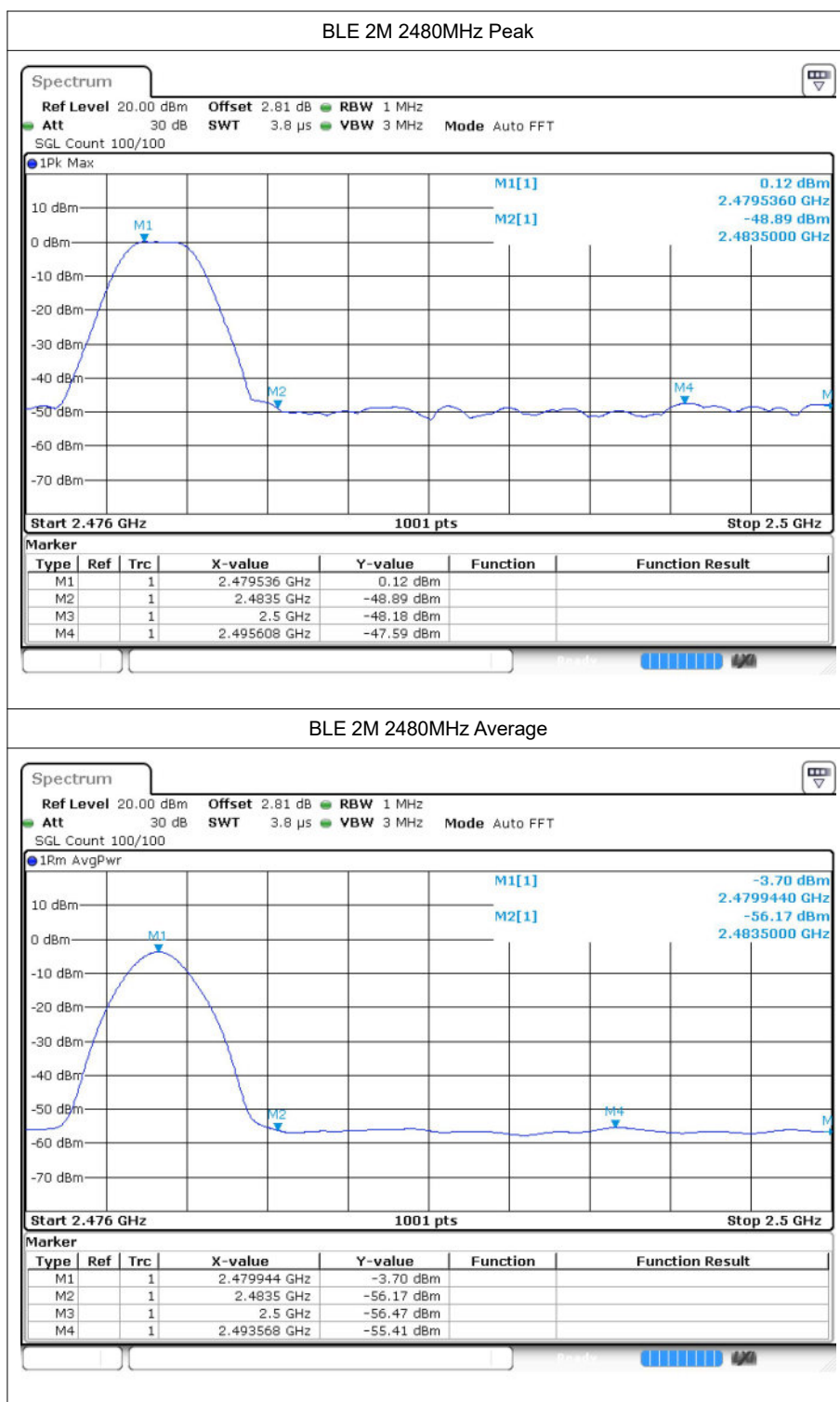
Mode	Frequency (MHz)	Spur Freq (MHz)	Power (dBm)	Gain (dBi)	Duty Factor	E (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
BLE 1M	2402	2310	-48.84	4.23	-	50.62	Peak	74	Pass
BLE 1M	2402	2310	-56.53	4.23	0.74	43.67	Average	54	Pass
BLE 1M	2402	2324.784	-45.88	4.23	-	53.58	Peak	74	Pass
BLE 1M	2402	2342.64	-54.53	4.23	0.74	45.67	Average	54	Pass
BLE 1M	2402	2390	-47.29	4.23	-	52.17	Peak	74	Pass
BLE 1M	2402	2390	-57.07	4.23	0.74	43.13	Average	54	Pass
BLE 1M	2480	2483.5	-47	4.23	-	52.46	Peak	74	Pass
BLE 1M	2480	2483.5	-55.91	4.23	0.74	44.29	Average	54	Pass
BLE 1M	2480	2483.584	-46.94	4.23	-	52.52	Peak	74	Pass
BLE 1M	2480	2491.504	-55.82	4.23	0.74	44.38	Average	54	Pass
BLE 1M	2480	2500	-47.77	4.23	-	51.69	Peak	74	Pass
BLE 1M	2480	2500	-57.34	4.23	0.74	42.86	Average	54	Pass
BLE 2M	2402	2310	-49.34	4.23	-	50.12	Peak	74	Pass
BLE 2M	2402	2310	-56.59	4.23	2.41	45.28	Average	54	Pass
BLE 2M	2402	2339.472	-46.53	4.23	-	52.93	Peak	74	Pass
BLE 2M	2402	2338.128	-54.38	4.23	2.41	47.49	Average	54	Pass
BLE 2M	2402	2390	-50.09	4.23	-	49.37	Peak	74	Pass
BLE 2M	2402	2390	-56.84	4.23	2.41	45.03	Average	54	Pass
BLE 2M	2480	2483.5	-48.89	4.23	-	50.57	Peak	74	Pass
BLE 2M	2480	2483.5	-56.17	4.23	2.4	45.69	Average	54	Pass
BLE 2M	2480	2495.608	-47.58	4.23	-	51.88	Peak	74	Pass
BLE 2M	2480	2493.568	-55.4	4.23	2.4	46.46	Average	54	Pass
BLE 2M	2480	2500	-48.18	4.23	-	51.28	Peak	74	Pass
BLE 2M	2480	2500	-56.47	4.23	2.4	45.39	Average	54	Pass

7.2 Test Graphs









---The End---