

Appendix Test Data for BLE (Conducted Measurement)

Product Name: Bluetooth low-power BLE 5.4 Module

Trade Mark: 宏佳 HJSIP™

Test Model: HJ-528IMH

FCC ID: 2AGPMHJ-528IMH

Environmental Conditions

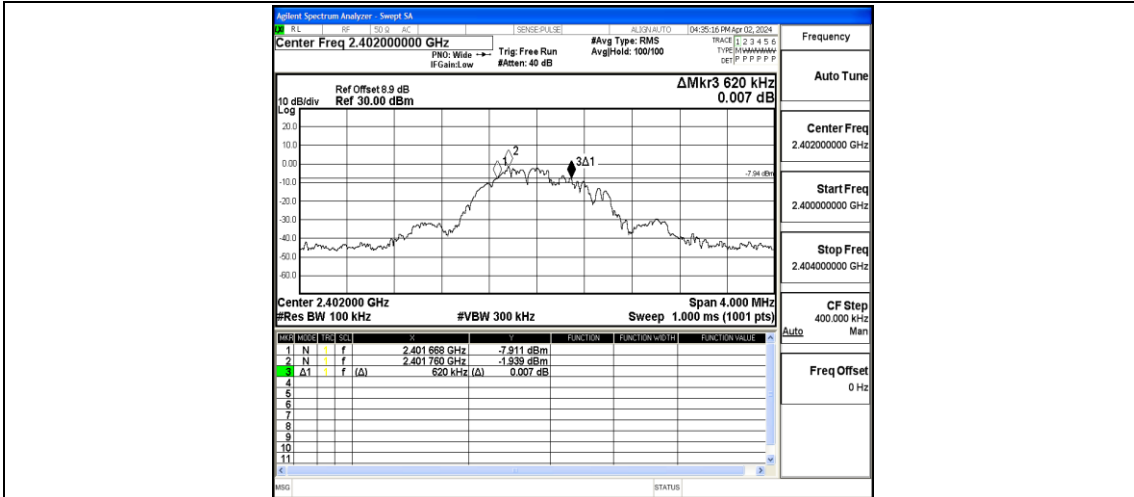
Temperature:	23.8℃
Relative Humidity:	58%
ATM Pressure:	100.0 kPa
Test Engineer:	Allen Lai
Supervised by:	Hugo Chen
NOTE	N/A

Appendix A: DTS Bandwidth

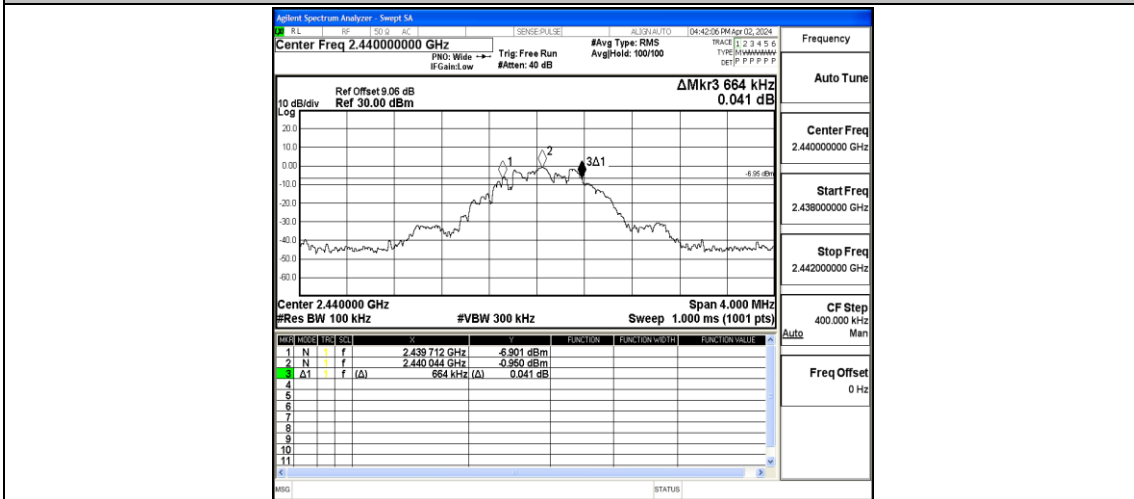
Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.620	2401.668	2402.288	0.5	PASS
BLE_1M	Ant1	2440	0.664	2439.712	2440.376	0.5	PASS
BLE_1M	Ant1	2480	0.676	2479.696	2480.372	0.5	PASS
BLE_2M	Ant1	2402	1.152	2401.428	2402.580	0.5	PASS
BLE_2M	Ant1	2440	1.168	2439.408	2440.576	0.5	PASS
BLE_2M	Ant1	2480	1.136	2479.452	2480.588	0.5	PASS

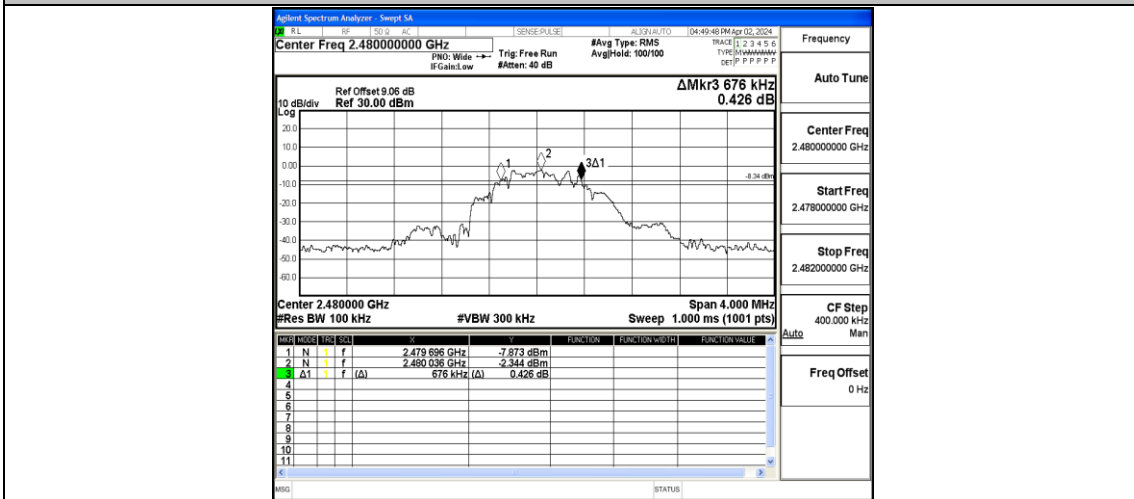
Test Graphs



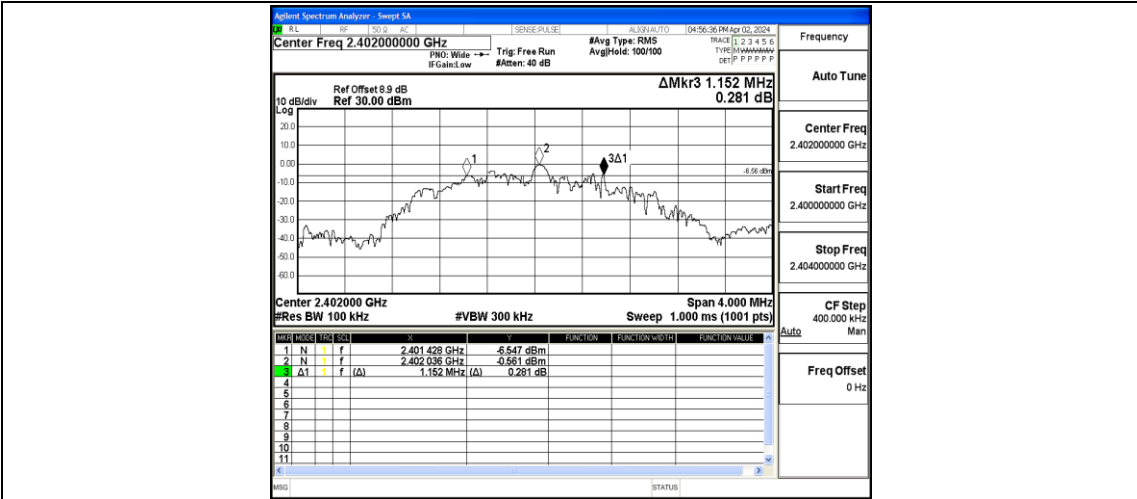
BLE_1M-Ant1-240-PASS



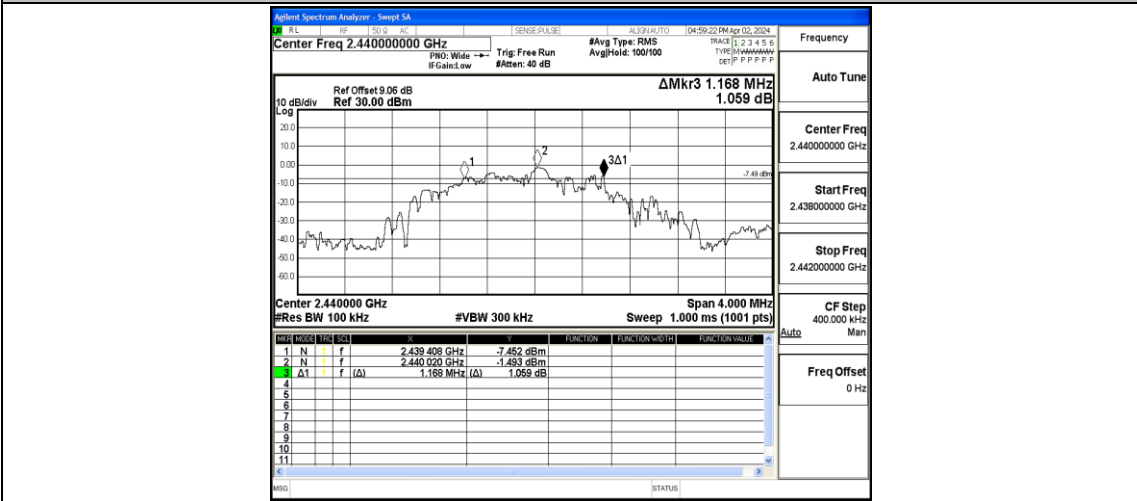
BLE_1M-Ant1-244-PASS



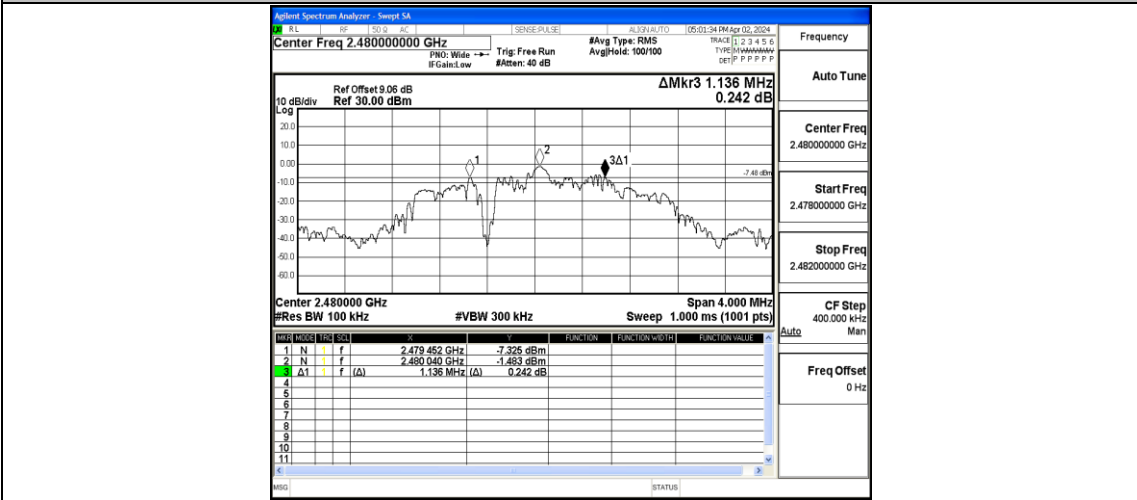
BLE_1M-Ant1-2480-PASS



BLE_2M-Ant1-240-PASS



BLE_2M-Ant1-244-PASS



BLE_2M-Ant1-248-PASS

Appendix B: Occupied Channel Bandwidth

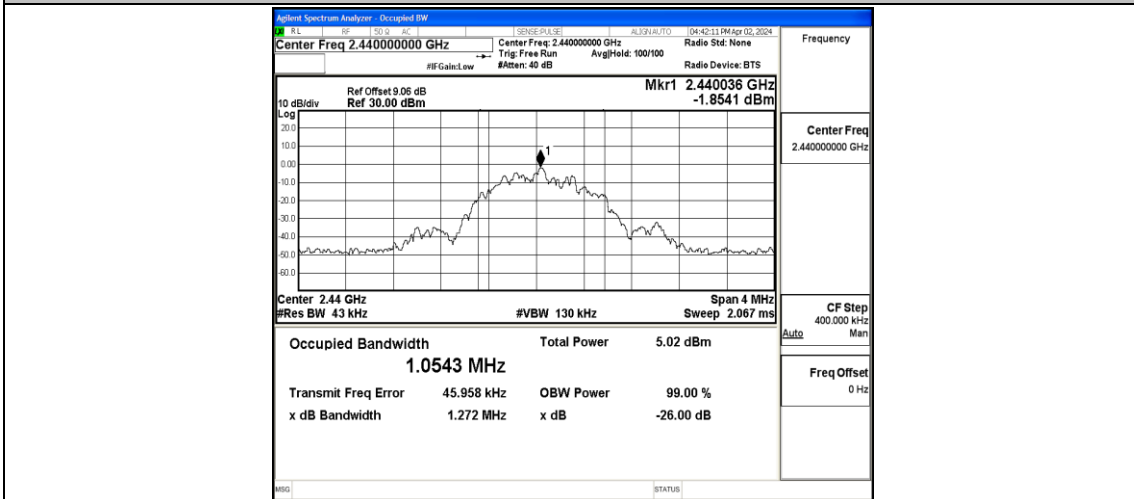
Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0451	2401.5276	2402.5727	---	---
BLE_1M	Ant1	2440	1.0543	2439.5188	2440.5731	---	---
BLE_1M	Ant1	2480	1.0614	2479.5170	2480.5784	---	---
BLE_2M	Ant1	2402	2.0569	2401.0271	2403.0840	---	---
BLE_2M	Ant1	2440	2.0449	2439.0363	2441.0812	---	---
BLE_2M	Ant1	2480	2.0593	2479.0307	2481.0900	---	---

Test Graphs



BLE_1M-Ant1-2402



BLE_1M-Ant1-2440



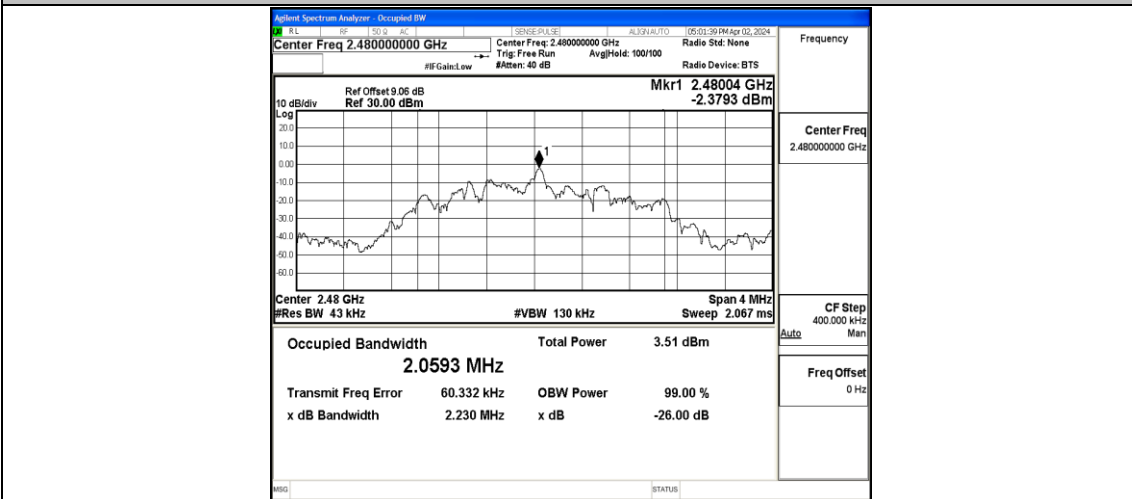
BLE_1M-Ant1-2480



BLE_2M-Ant1-2402



BLE_2M-Ant1-2440



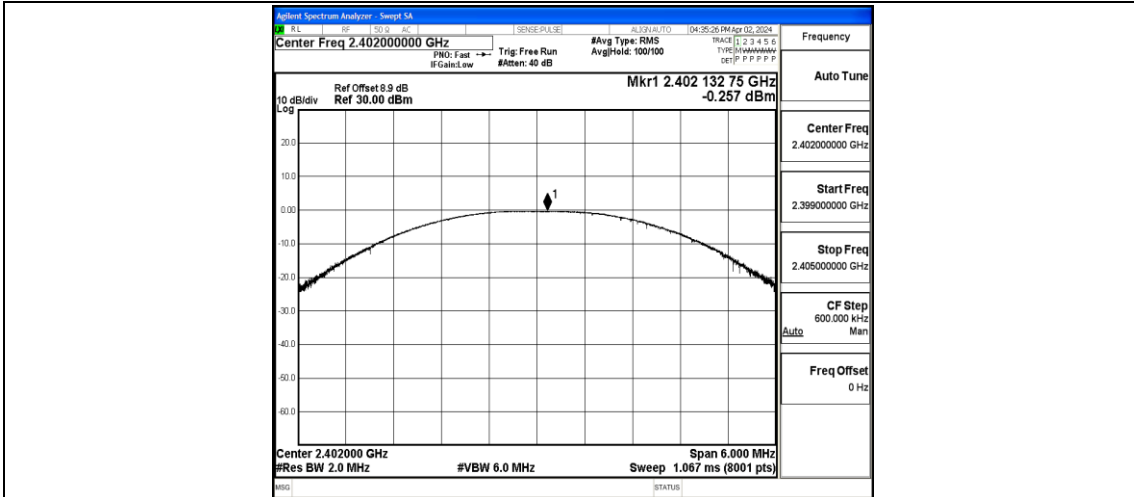
BLE_2M-Ant1-2480

Appendix C: Maximum peak conducted output power

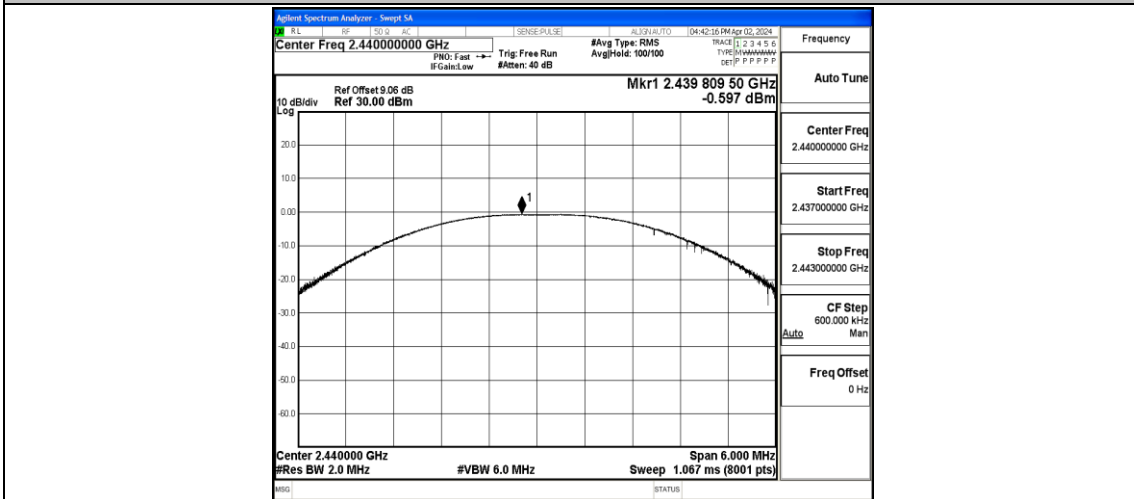
Test Result Peak

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-0.26	≤30	PASS
BLE_1M	Ant1	2440	-0.60	≤30	PASS
BLE_1M	Ant1	2480	-1.19	≤30	PASS
BLE_2M	Ant1	2402	-0.27	≤30	PASS
BLE_2M	Ant1	2440	-0.63	≤30	PASS
BLE_2M	Ant1	2480	-1.17	≤30	PASS

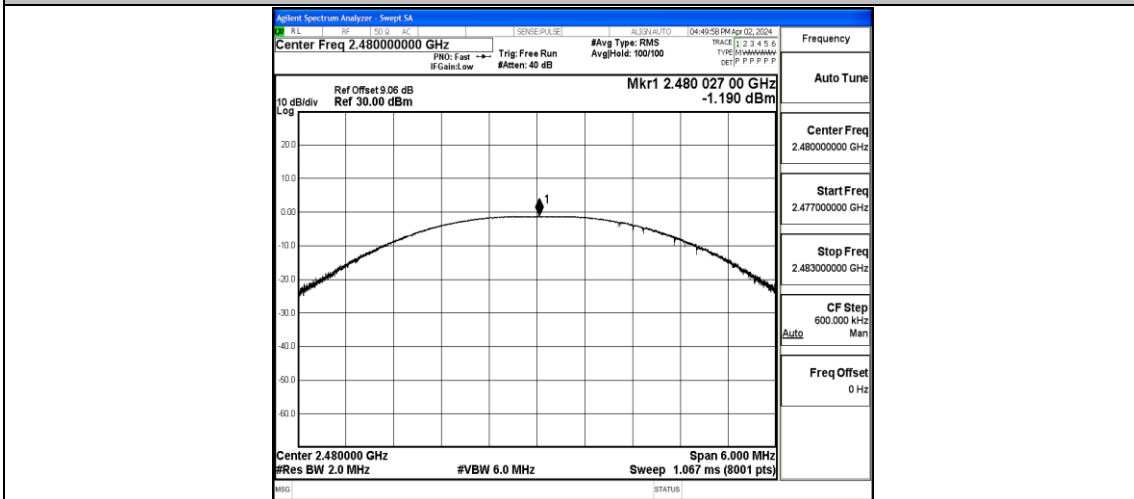
Test Graphs Peak



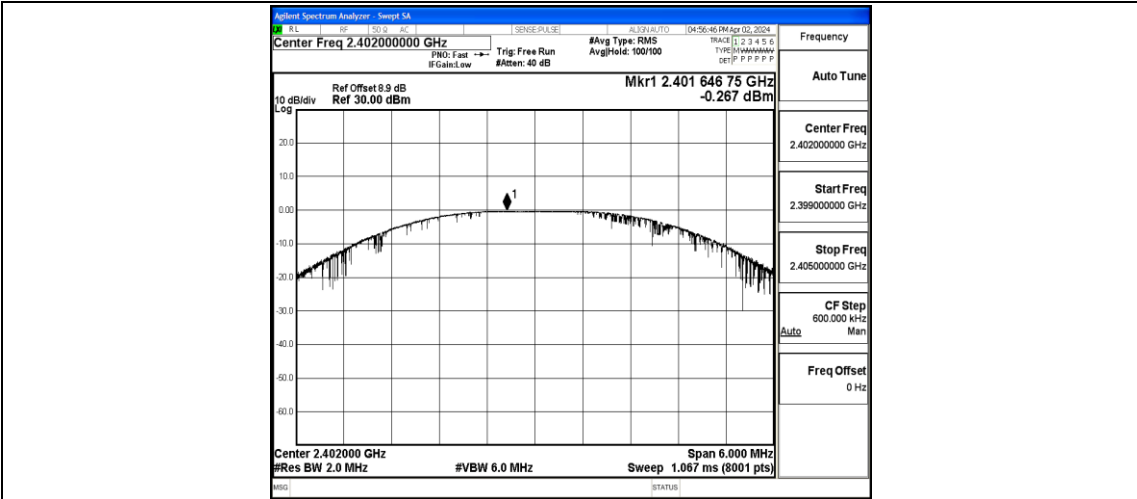
BLE_1M-Ant1-240-PASS



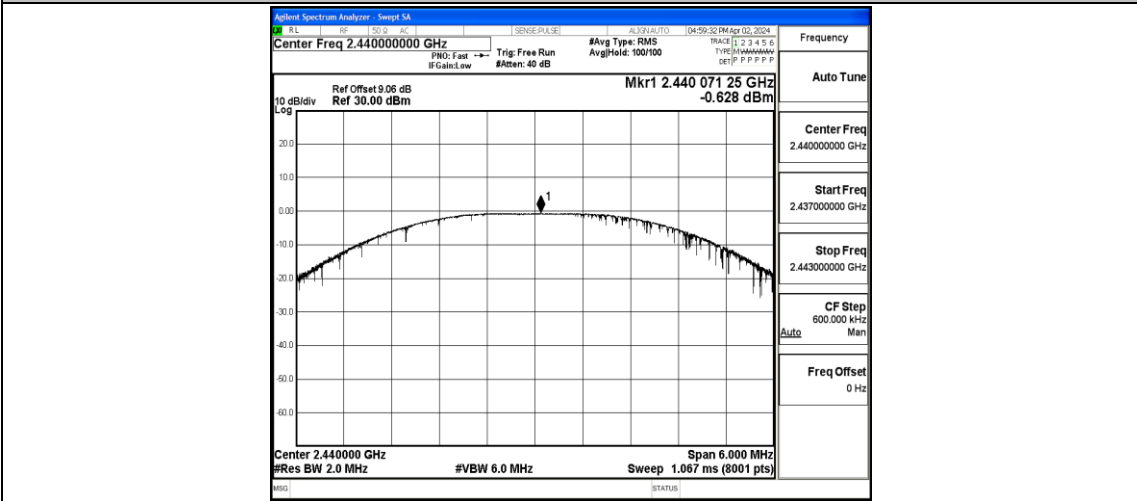
BLE_1M-Ant1-244-PASS



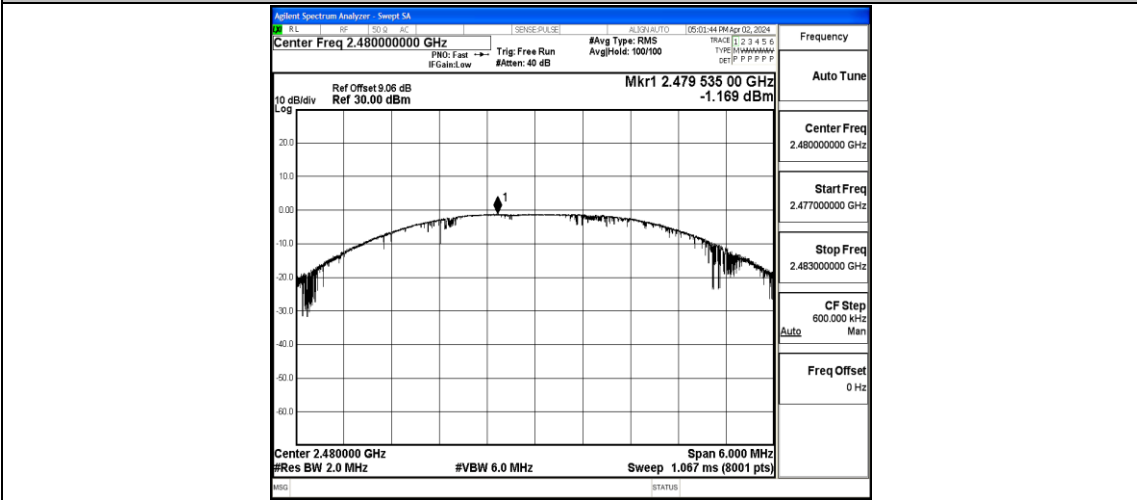
BLE_1M-Ant1-248-PASS



BLE_2M-Ant1-240-PASS



BLE_2M-Ant1-244-PASS



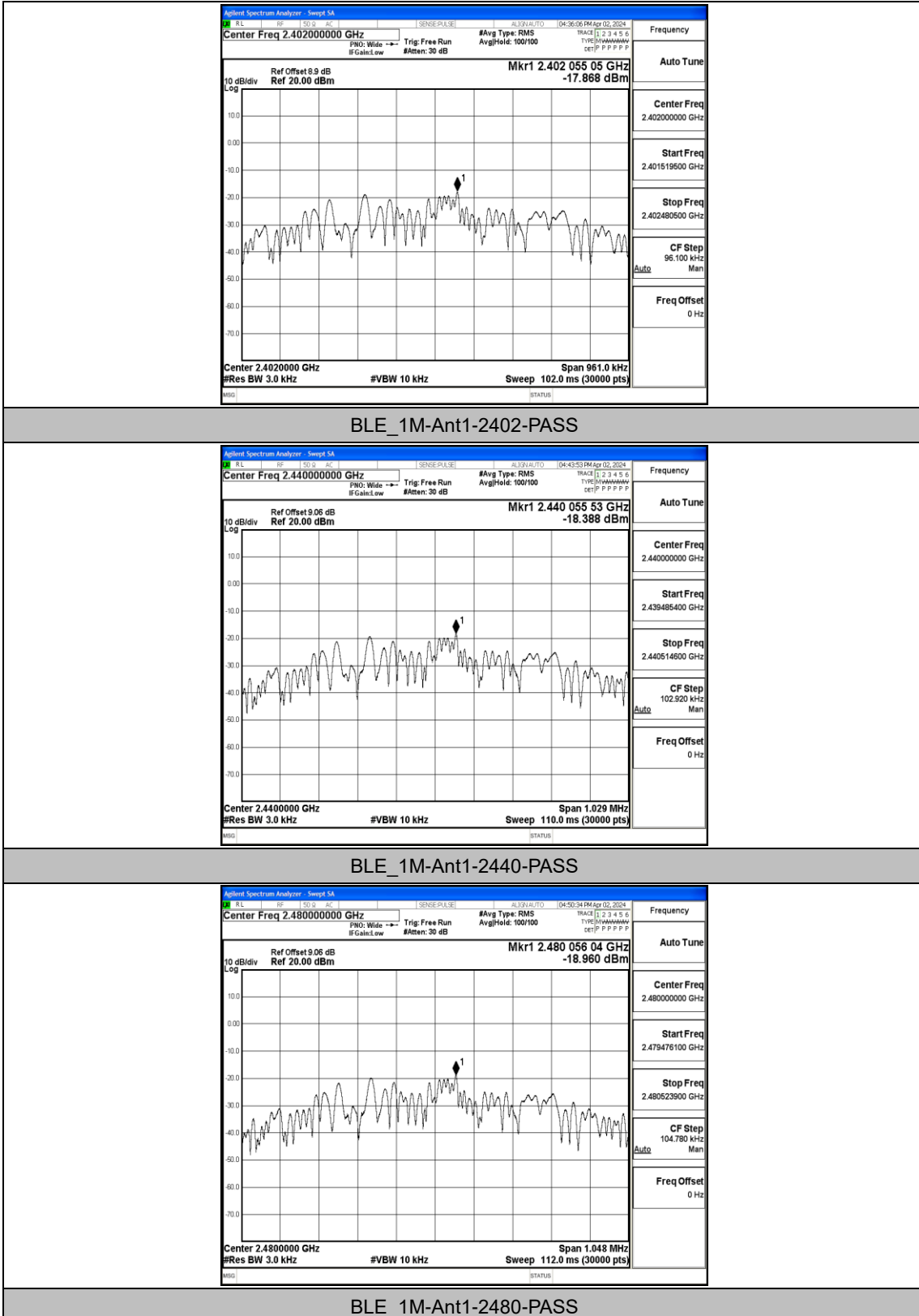
BLE_2M-Ant1-248-PASS

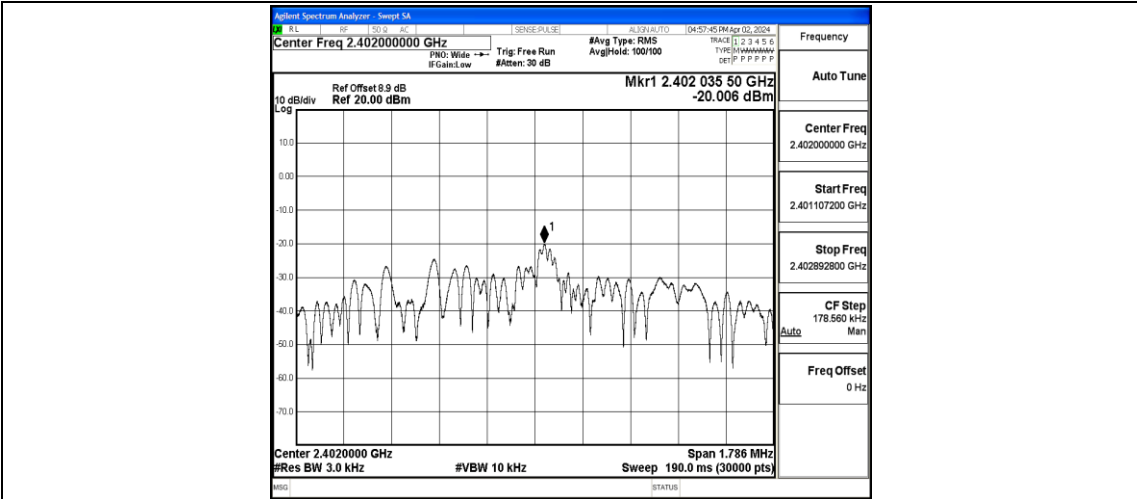
Appendix D: Maximum peak power spectral density

Test Result

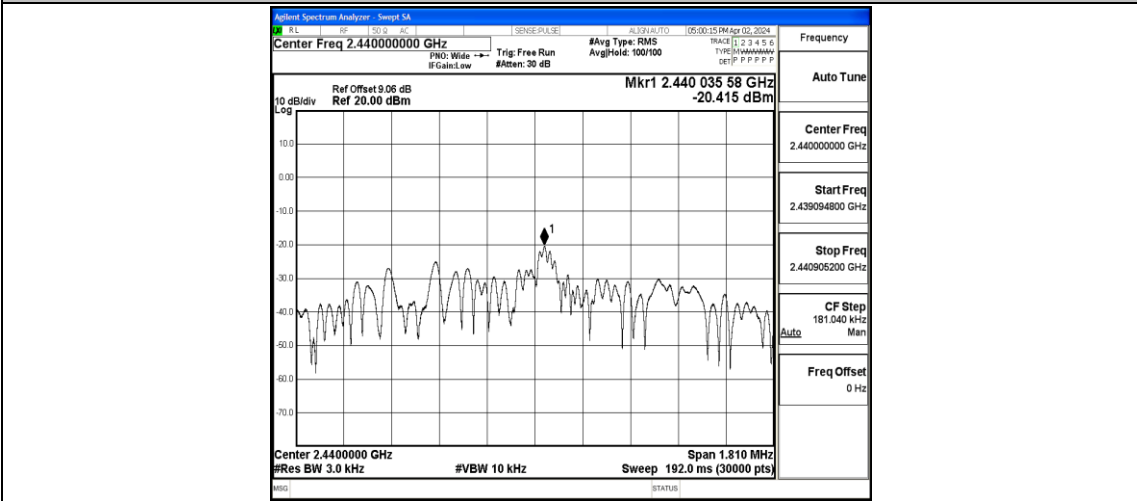
TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-17.87	≤8.00	PASS
BLE_1M	Ant1	2440	-18.39	≤8.00	PASS
BLE_1M	Ant1	2480	-18.96	≤8.00	PASS
BLE_2M	Ant1	2402	-20.01	≤8.00	PASS
BLE_2M	Ant1	2440	-20.42	≤8.00	PASS
BLE_2M	Ant1	2480	-20.95	≤8.00	PASS

Test Graphs

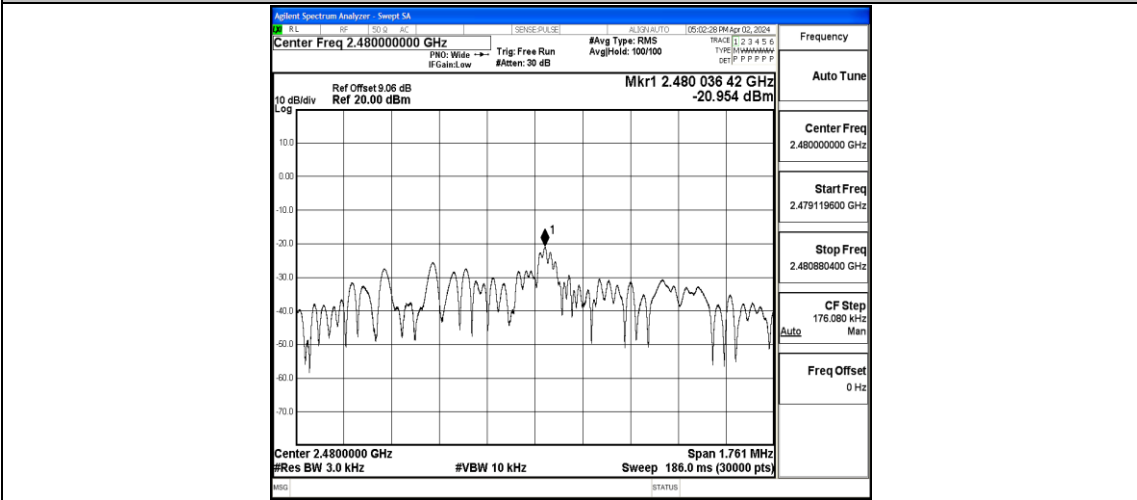




BLE_2M-Ant1-2402-PASS



BLE_2M-Ant1-2440-PASS



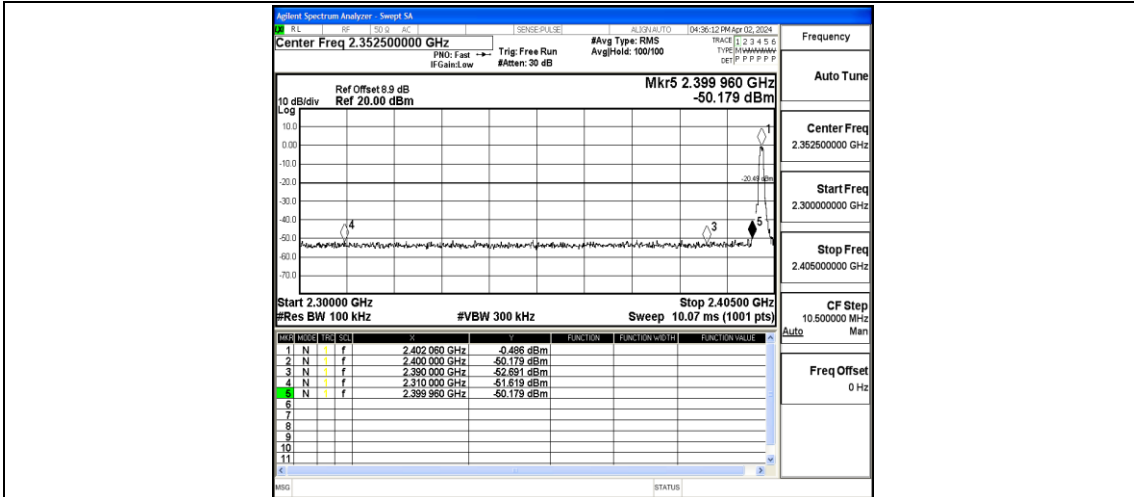
BLE_2M-Ant1-2480-PASS

Appendix E: Band edge measurements

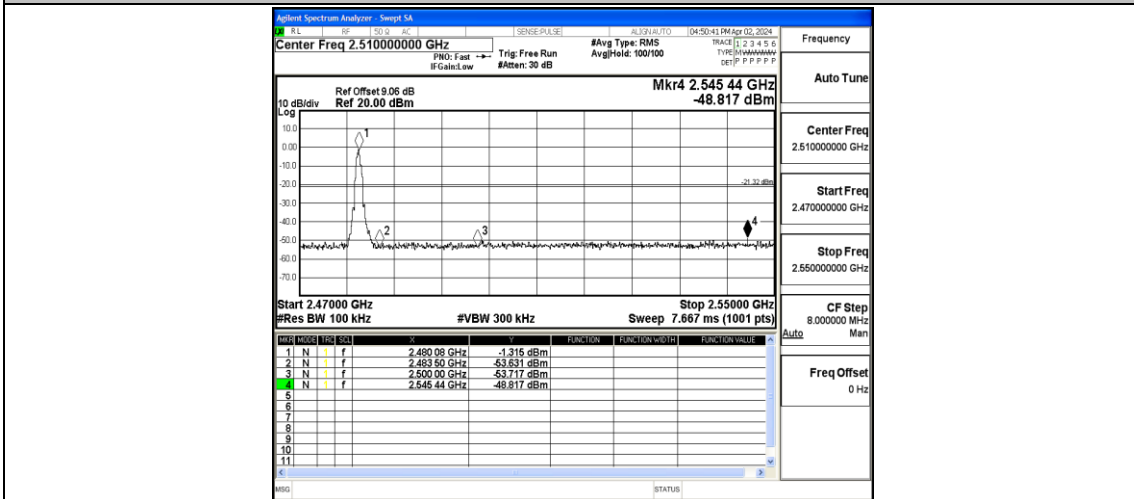
Test Result

TestMode	Antenna	Channel	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-0.49	-50.18	≤-20.49	PASS
BLE_1M	Ant1	High	2480	-1.32	-48.82	≤-21.32	PASS
BLE_2M	Ant1	Low	2402	-0.40	-32.8	≤-20.4	PASS
BLE_2M	Ant1	High	2480	-1.36	-49.29	≤-21.36	PASS

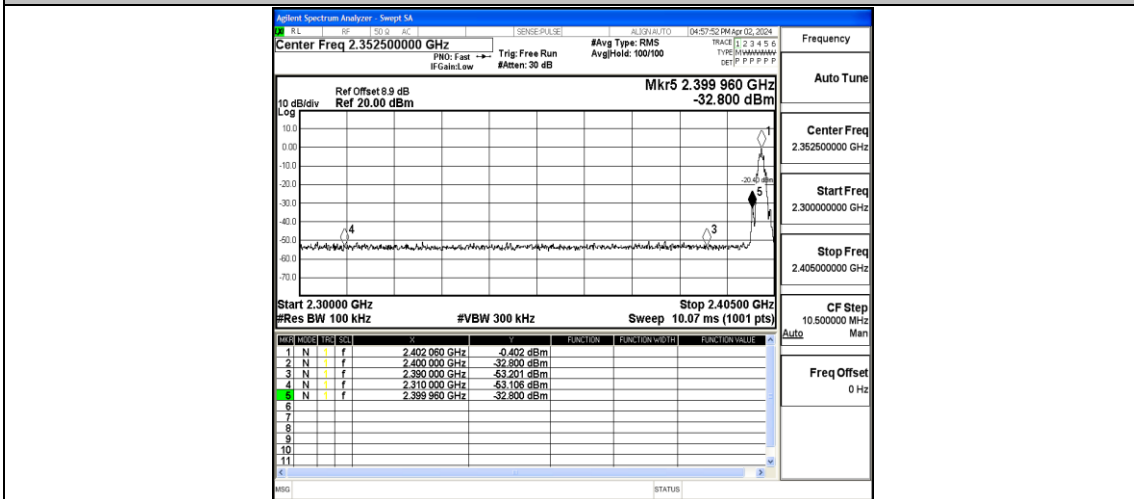
Test Graphs



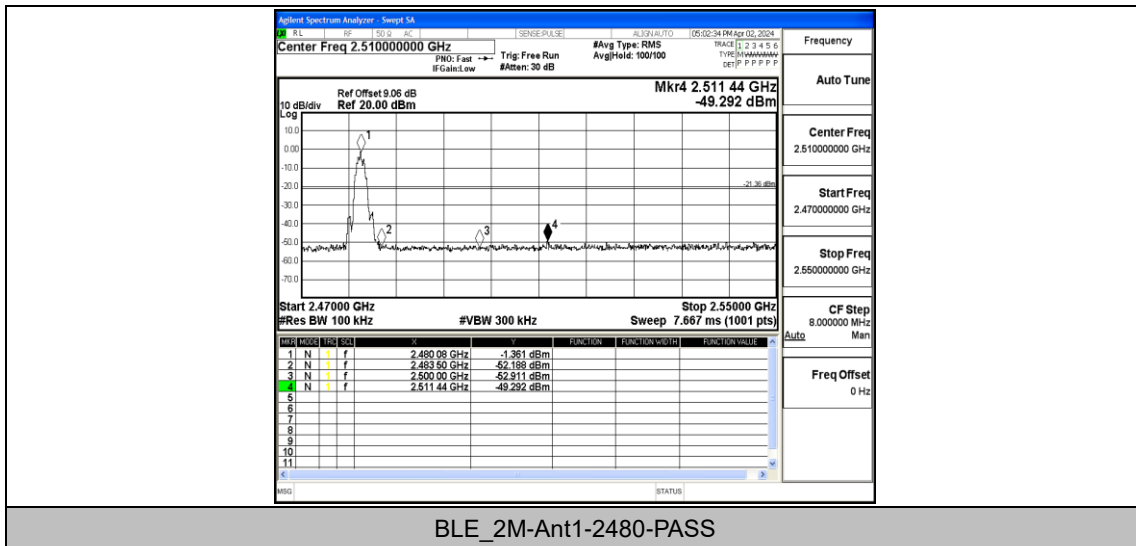
BLE_1M-Ant1-240-PASS



BLE_1M-Ant1-2480-PASS



BLE_2M-Ant1-240-PASS



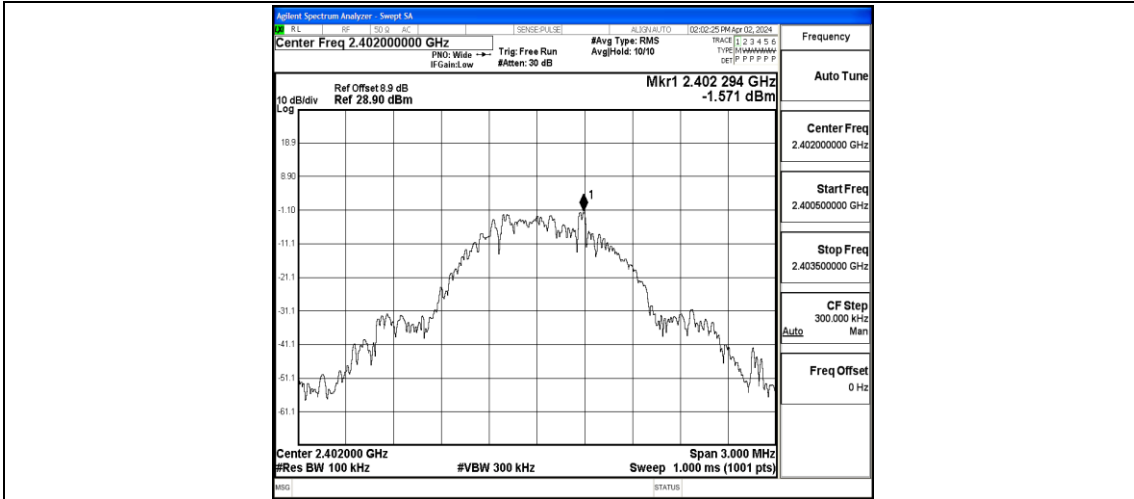
BLE_2M-Ant1-2480-PASS

Appendix F: Conducted Spurious Emission

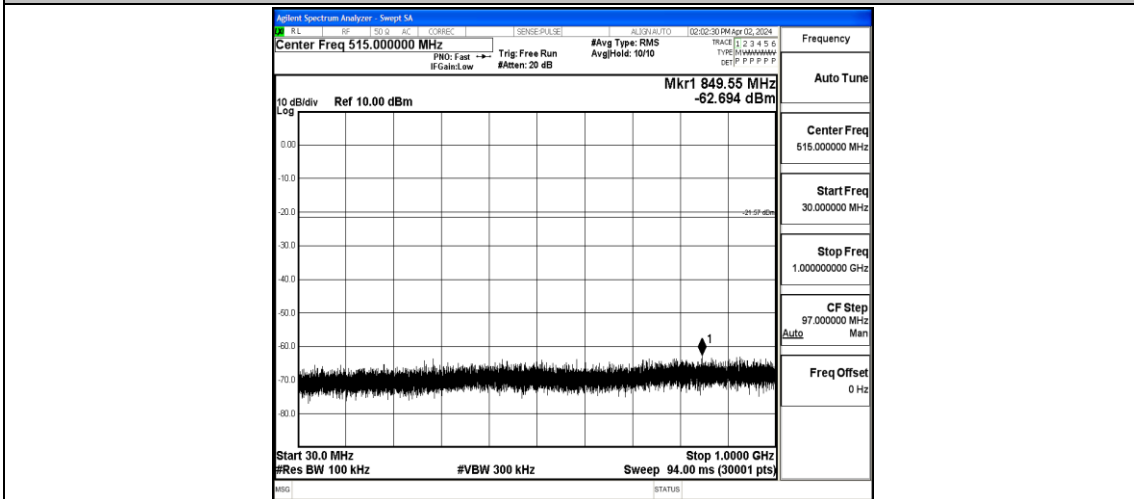
Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	0~Reference	-1.57	-1.57	---	PASS
BLE_1M	Ant1	2402	30~1000	-1.57	-62.69	≤-21.57	PASS
BLE_1M	Ant1	2402	1000~26500	-1.57	-46.64	≤-21.57	PASS
BLE_1M	Ant1	2440	0~Reference	-2.79	-2.79	---	PASS
BLE_1M	Ant1	2440	30~1000	-2.79	-62.58	≤-22.79	PASS
BLE_1M	Ant1	2440	1000~26500	-2.79	-47.09	≤-22.79	PASS
BLE_1M	Ant1	2480	0~Reference	-1.59	-1.59	---	PASS
BLE_1M	Ant1	2480	30~1000	-1.59	-63.18	≤-21.59	PASS
BLE_1M	Ant1	2480	1000~26500	-1.59	-47.03	≤-21.59	PASS
BLE_2M	Ant1	2402	0~Reference	-1.12	-1.12	---	PASS
BLE_2M	Ant1	2402	30~1000	-1.12	-62.26	≤-21.12	PASS
BLE_2M	Ant1	2402	1000~26500	-1.12	-49.43	≤-21.12	PASS
BLE_2M	Ant1	2440	0~Reference	-1.83	-1.83	---	PASS
BLE_2M	Ant1	2440	30~1000	-1.83	-62.64	≤-21.83	PASS
BLE_2M	Ant1	2440	1000~26500	-1.83	-49.17	≤-21.83	PASS
BLE_2M	Ant1	2480	0~Reference	-3.35	-3.35	---	PASS
BLE_2M	Ant1	2480	30~1000	-3.35	-62.4	≤-23.35	PASS
BLE_2M	Ant1	2480	1000~26500	-3.35	-49.99	≤-23.35	PASS

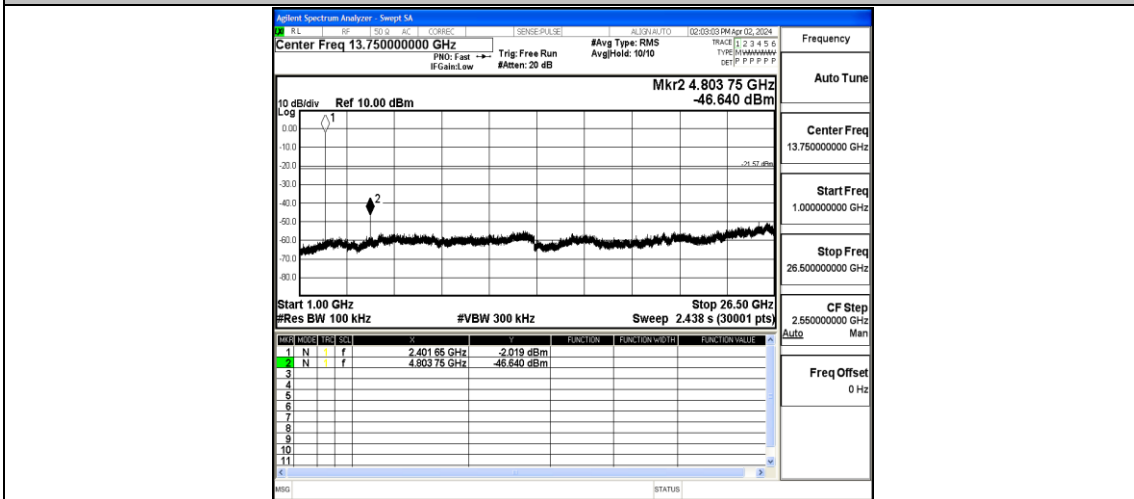
Test Graphs



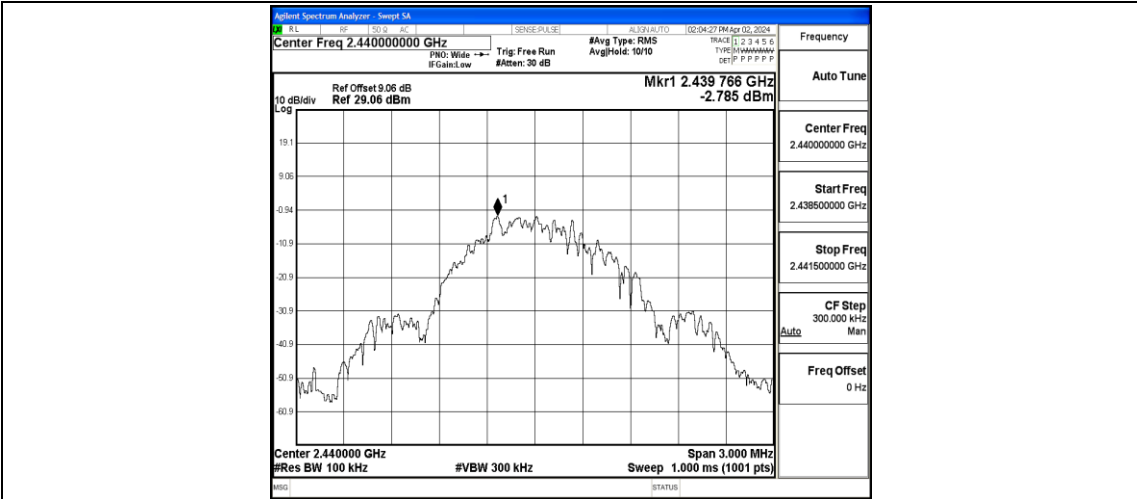
BLE_1M-Ant1-2402-0~Reference-PASS



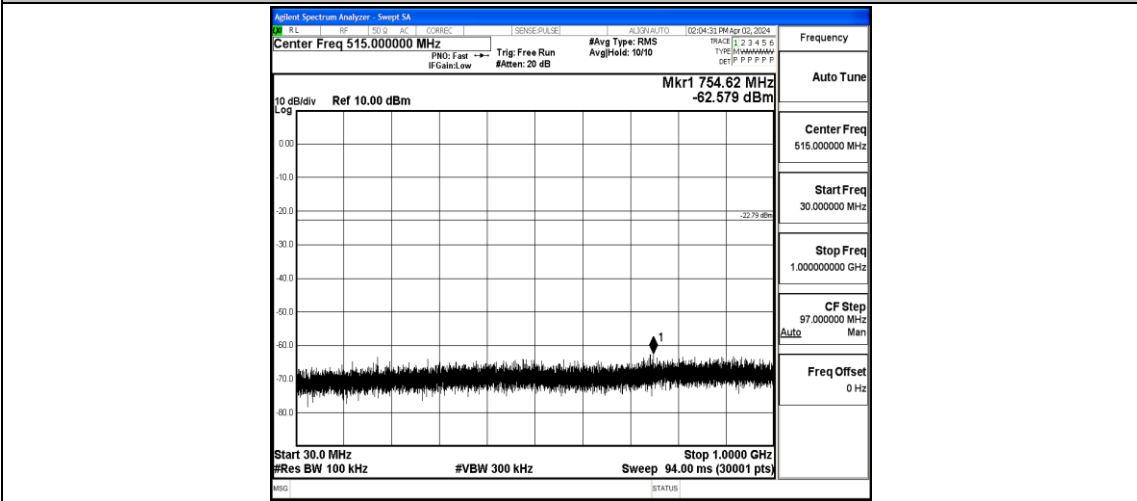
BLE_1M-Ant1-2402-30~1000-PASS



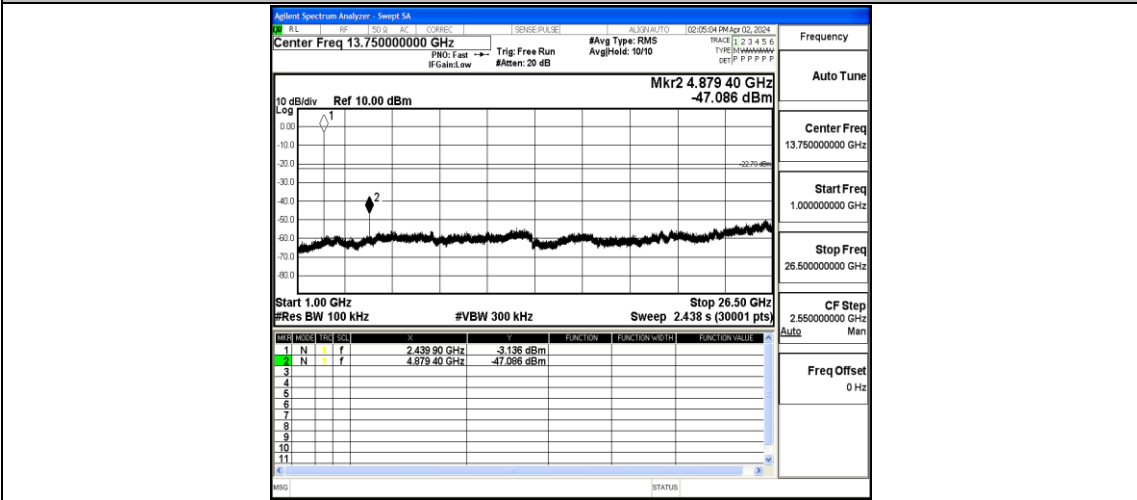
BLE_1M-Ant1-2402-1000~26500-PASS



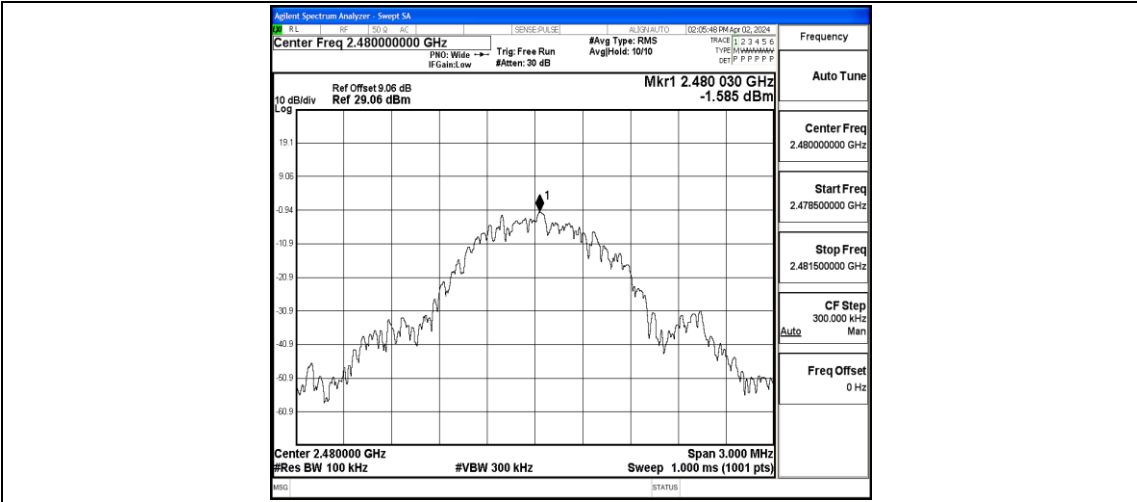
BLE_1M-Ant1-2440-0~Reference-PASS



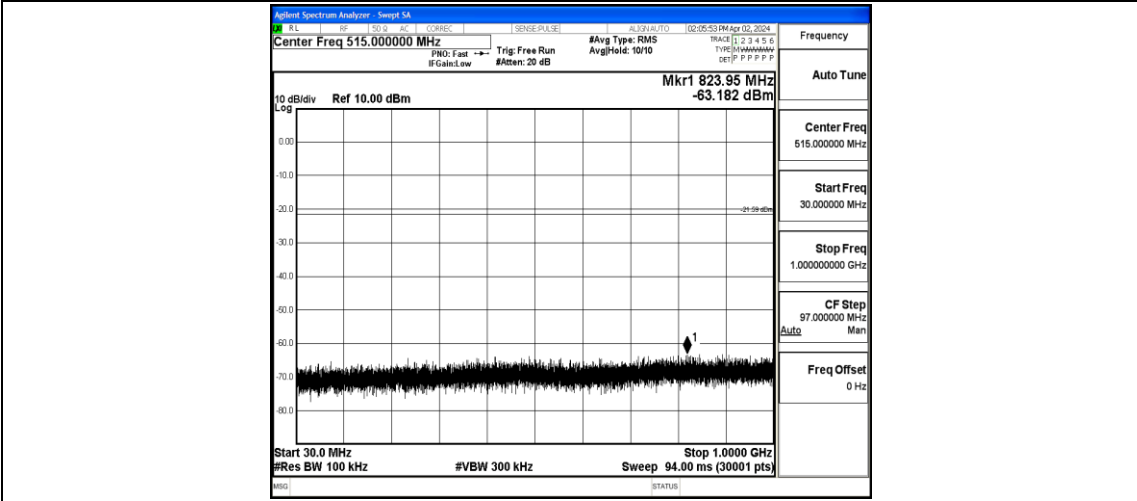
BLE_1M-Ant1-2440-30~1000-PASS



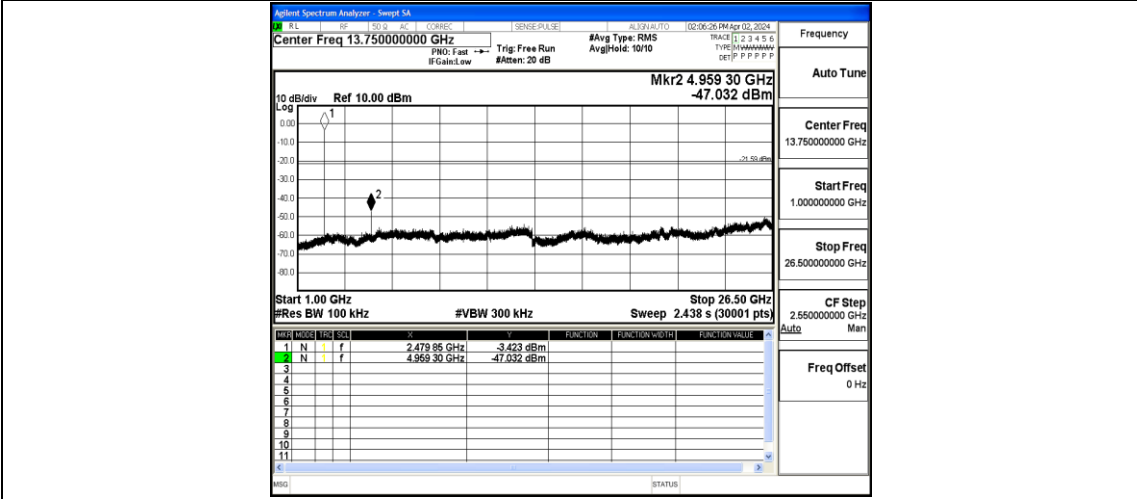
BLE_1M-Ant1-2440-1000~26500-PASS



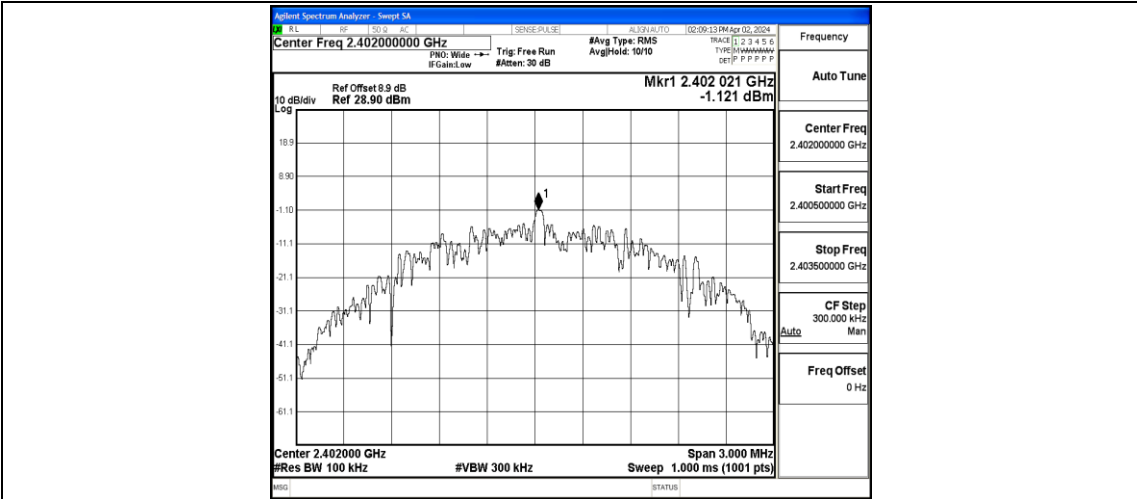
BLE_1M-Ant1-2480-0~Reference-PASS



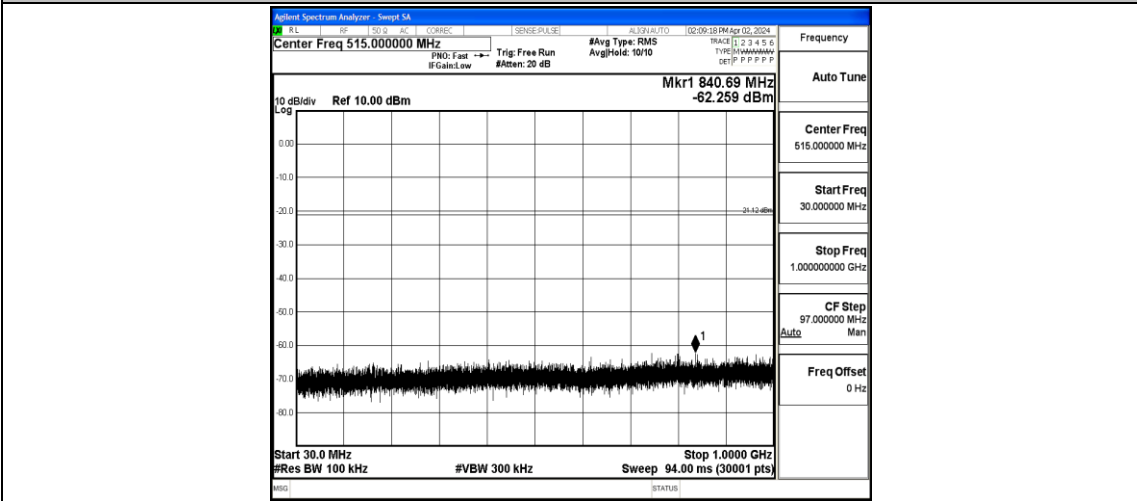
BLE_1M-Ant1-2480-30~1000-PASS



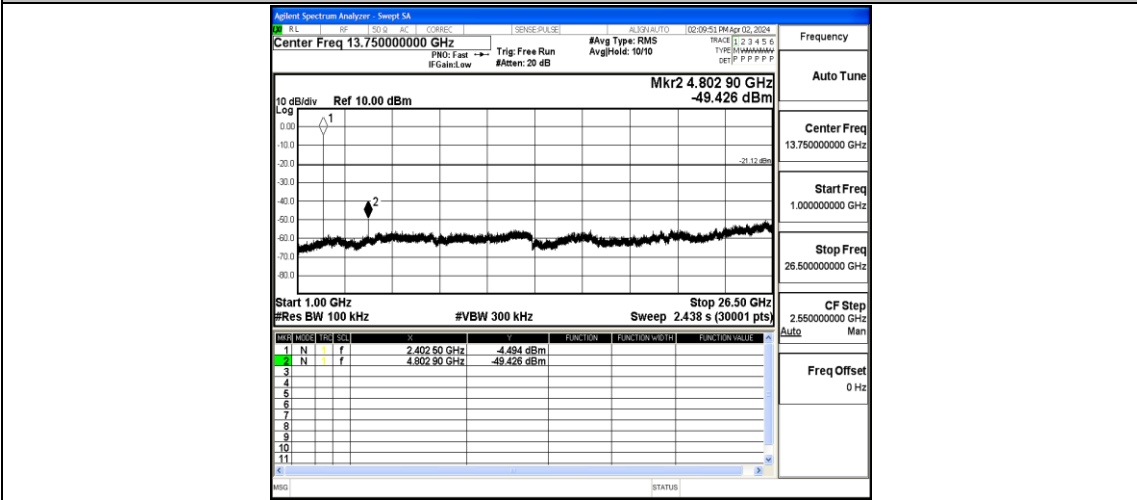
BLE_1M-Ant1-2480-1000~26500-PASS



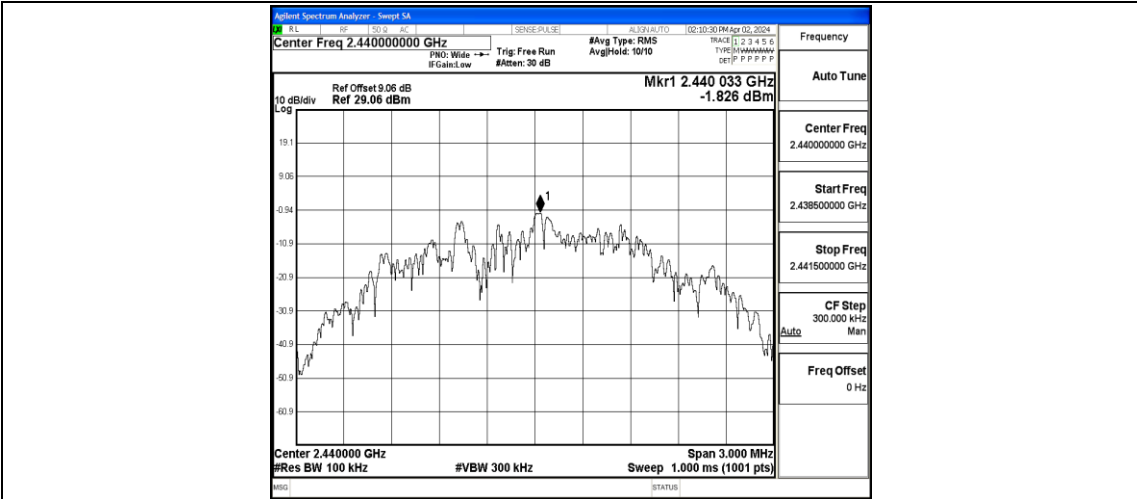
BLE_2M-Ant1-2402-0~Reference-PASS



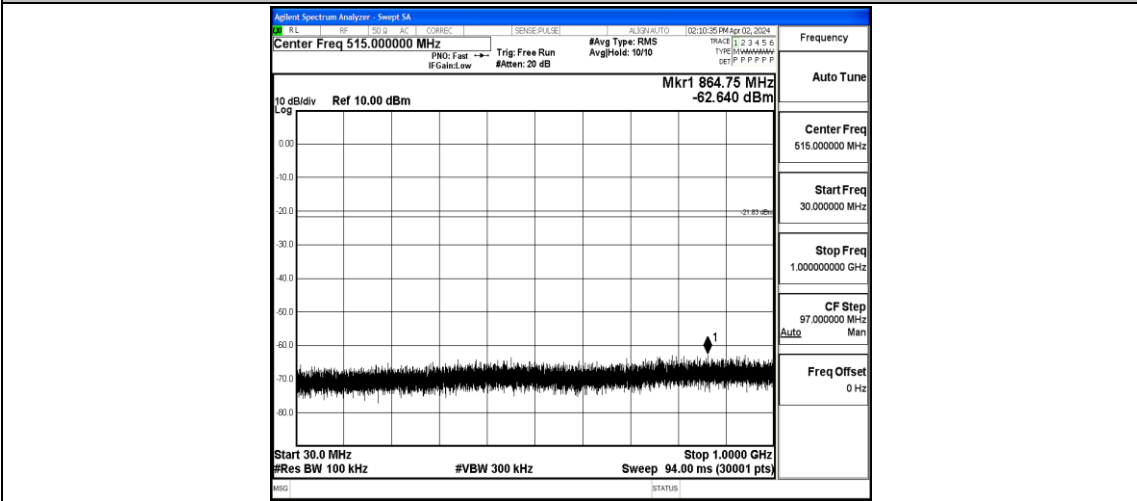
BLE_2M-Ant1-2402-30~1000-PASS



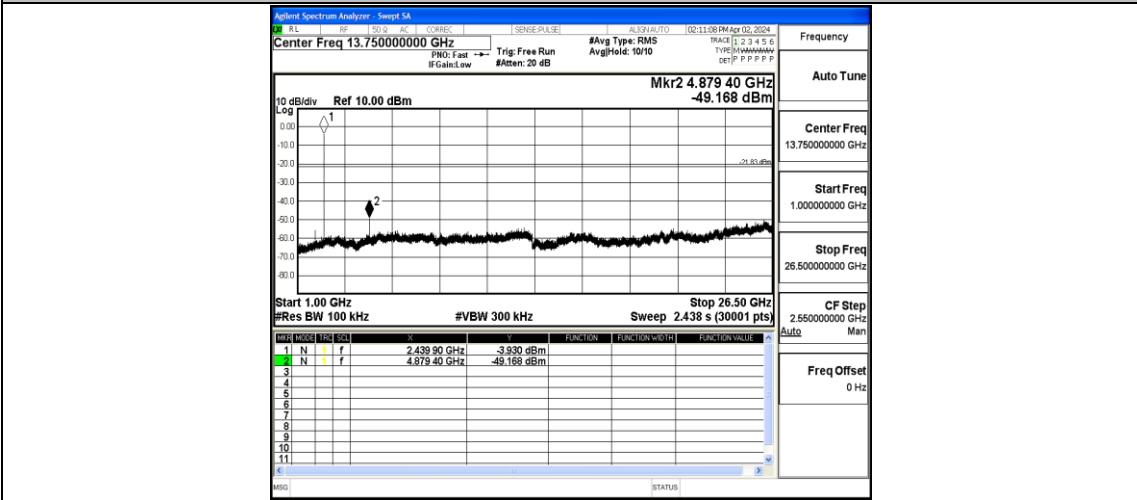
BLE_2M-Ant1-2402-1000~26500-PASS



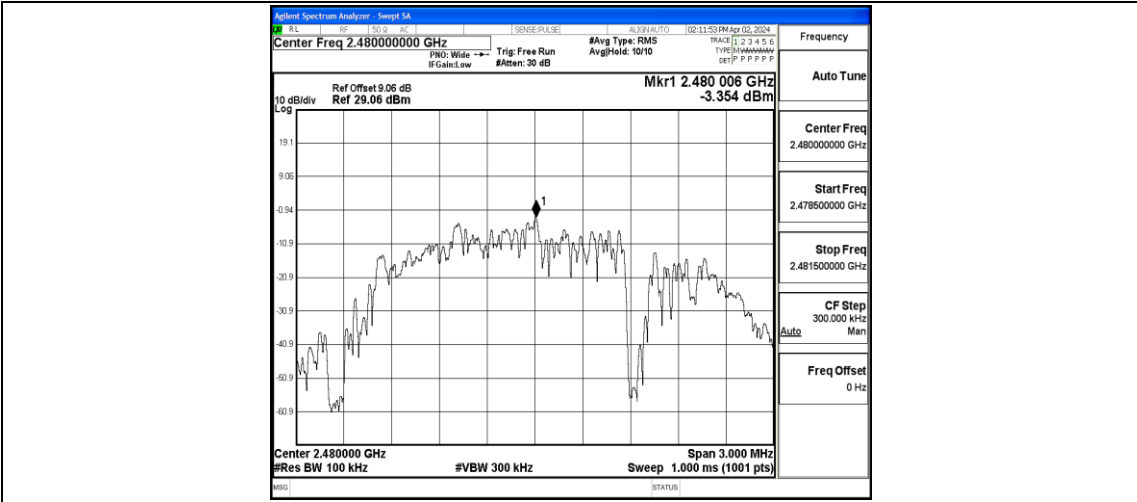
BLE_2M-Ant1-2440-0~Reference-PASS



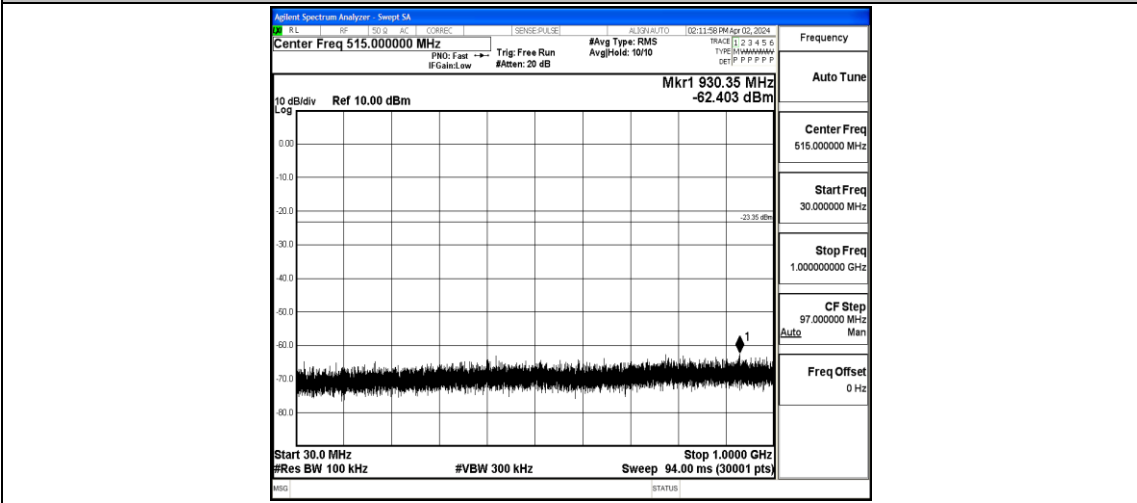
BLE_2M-Ant1-2440-30~1000-PASS



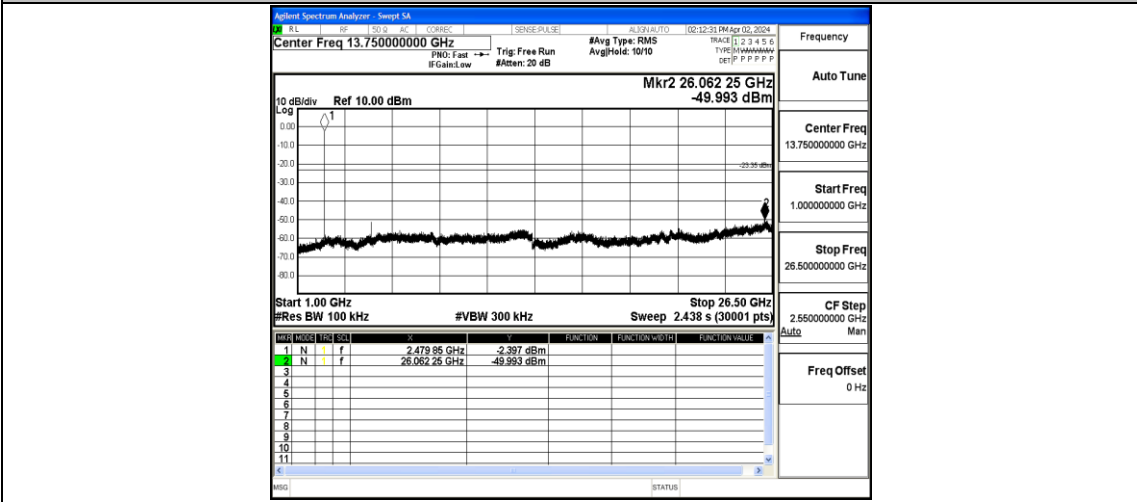
BLE_2M-Ant1-2440-1000~26500-PASS



BLE_2M-Ant1-2480-0~Reference-PASS



BLE_2M-Ant1-2480-30~1000-PASS



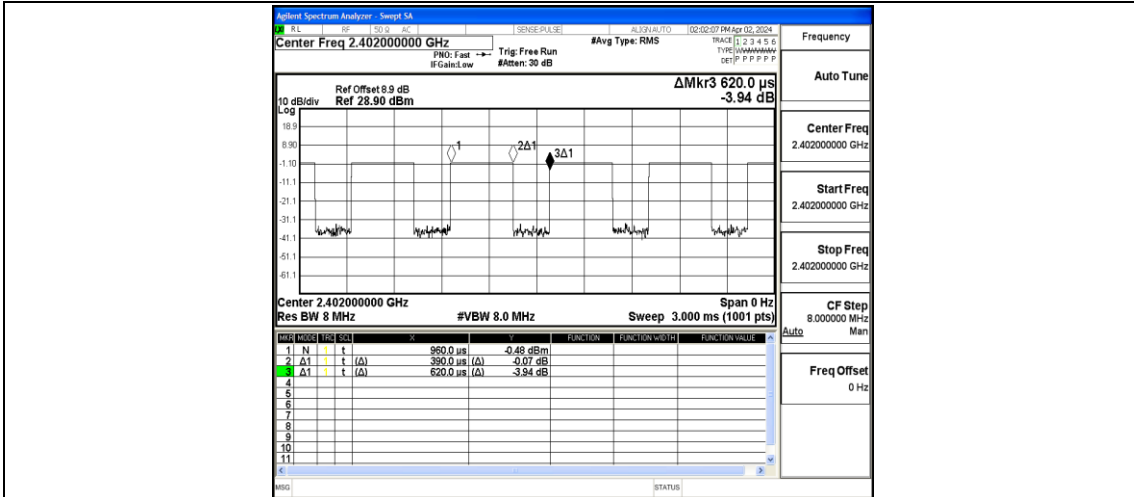
BLE_2M-Ant1-2480-1000~26500-PASS

Appendix G: Duty Cycle

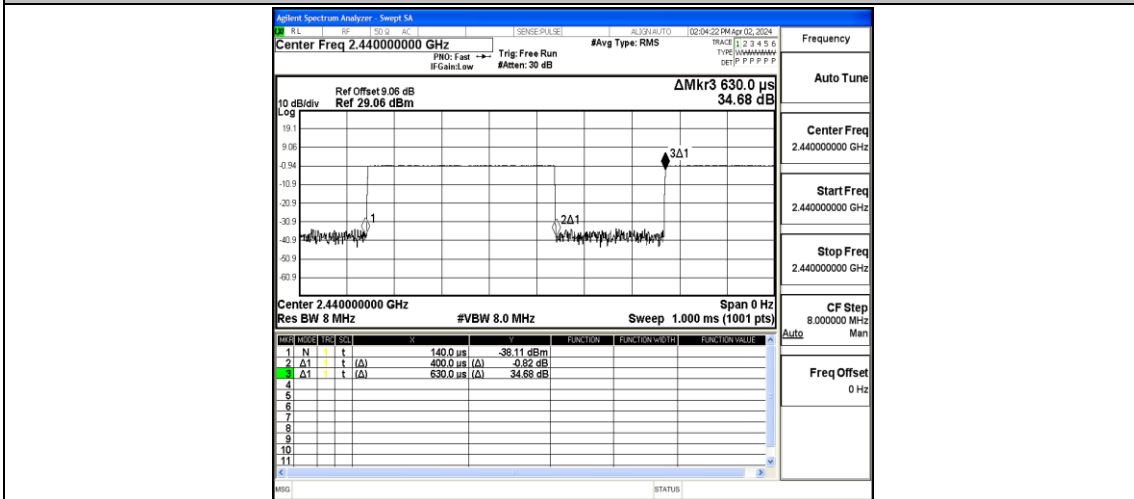
Test Result

TestMode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	Ant1	2402	0.39	0.62	62.90	2.01
BLE_1M	Ant1	2440	0.40	0.63	63.49	1.97
BLE_1M	Ant1	2480	0.40	0.63	63.49	1.97
BLE_2M	Ant1	2402	0.21	0.62	33.87	4.70
BLE_2M	Ant1	2440	0.21	0.62	33.87	4.70
BLE_2M	Ant1	2480	0.21	0.63	33.33	4.77

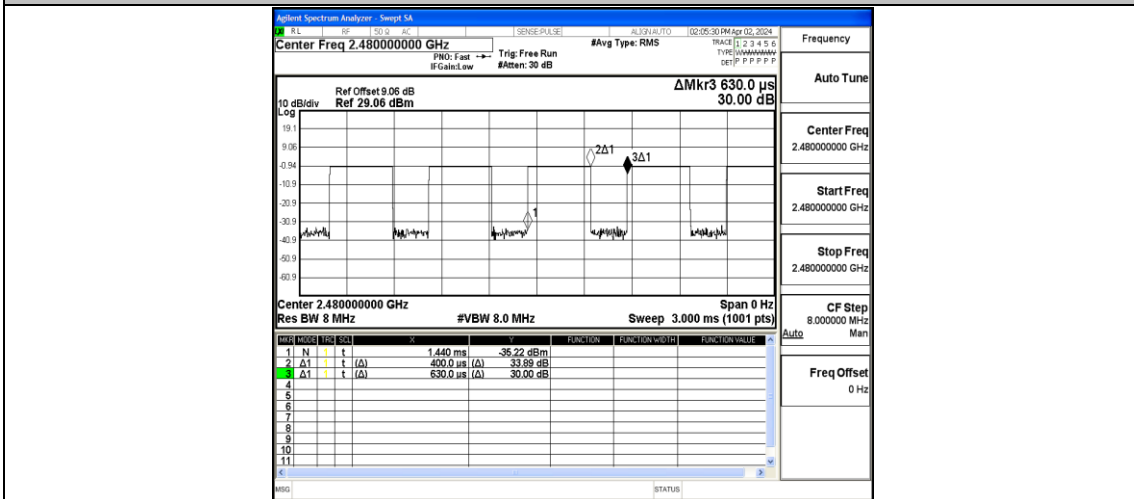
Test Graphs



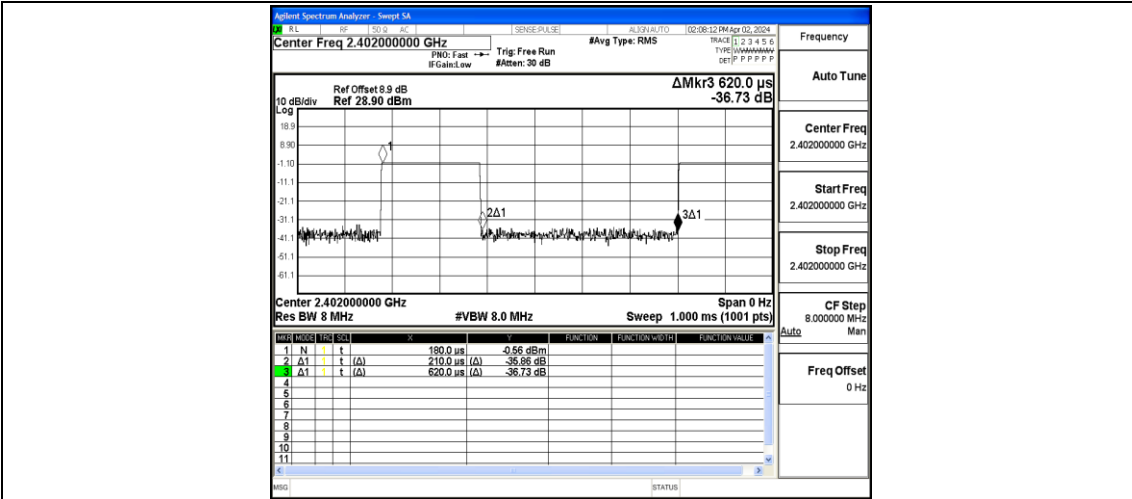
NTNV-BLE_1M-Ant1-2402



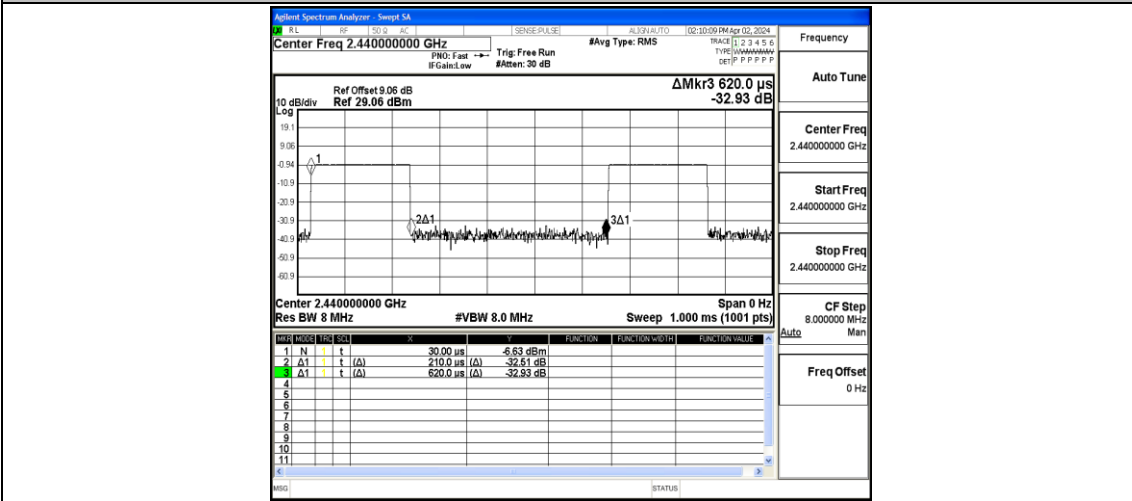
NTNV-BLE_1M-Ant1-2440



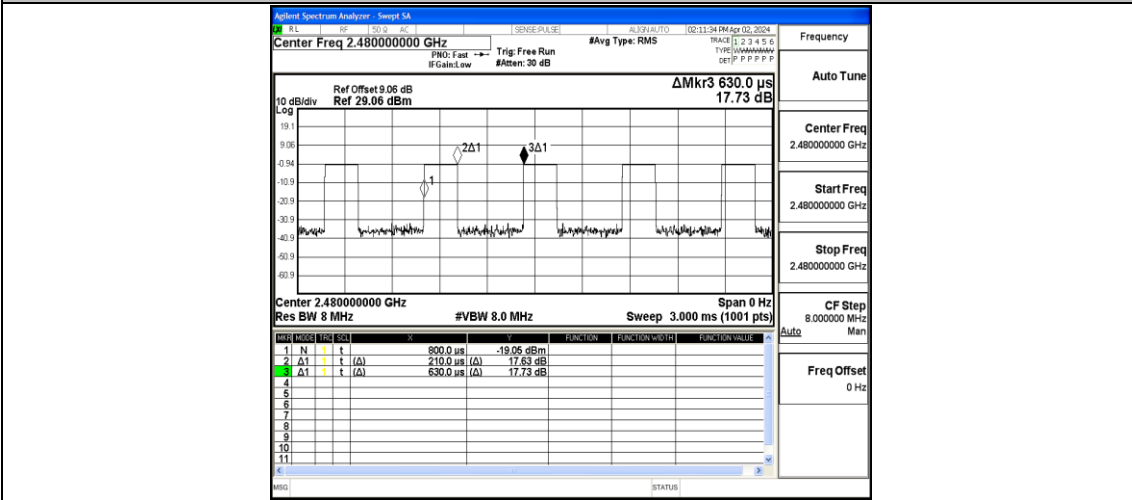
NTNV-BLE_1M-Ant1-2480



NTNV-BLE_2M-Ant1-2402



NTNV-BLE_2M-Ant1-2440



NTNV-BLE_2M-Ant1-2480

Appendix H: Emissions in Restricted Bands

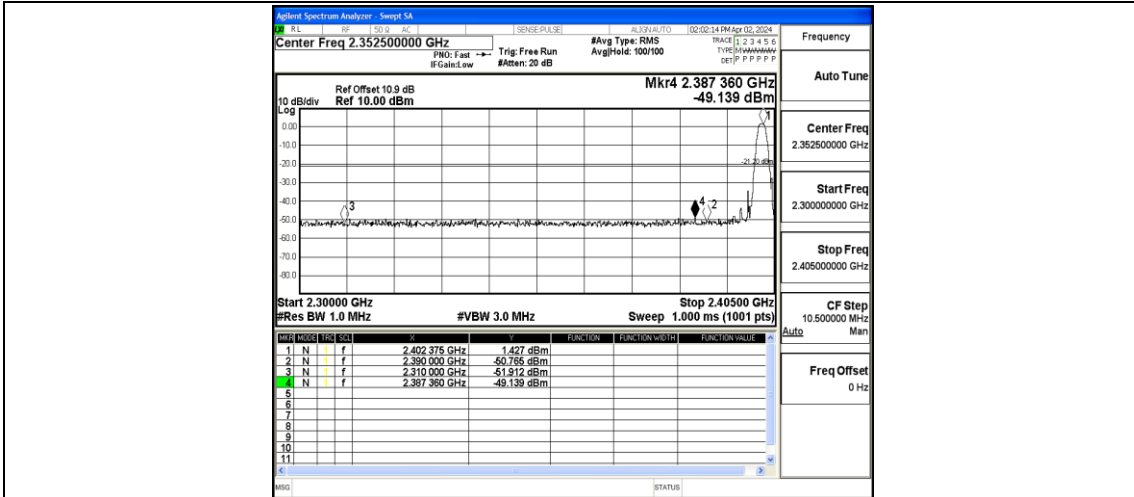
Test Result

TestMode	Antenna	ChName	Frequency [MHz]	Detector	Freq [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	Peak	2390.000	-50.77	≤-21.20	44.43	≤74	PASS
BLE_1M	Ant1	Low	2402	Peak	2310.000	-51.91	≤-21.20	43.29	≤74	PASS
BLE_1M	Ant1	Low	2402	Peak	2387.360	-49.14	≤-21.20	46.06	≤74	PASS
BLE_1M	Ant1	Low	2402	AV	2390.000	-57.74	≤-41.20	37.46	≤54	PASS
BLE_1M	Ant1	Low	2402	AV	2310.000	-57.76	≤-41.20	37.44	≤54	PASS
BLE_1M	Ant1	Low	2402	AV	2338.010	-57.04	≤-41.20	38.16	≤54	PASS
BLE_1M	Ant1	High	2480	Peak	2483.500	-35.41	≤-21.20	59.79	≤74	PASS
BLE_1M	Ant1	High	2480	Peak	2500.000	-49.88	≤-21.20	45.32	≤74	PASS
BLE_1M	Ant1	High	2480	Peak	2483.520	-35.41	≤-21.20	59.79	≤74	PASS
BLE_1M	Ant1	High	2480	AV	2483.500	-56.38	≤-41.20	38.82	≤54	PASS
BLE_1M	Ant1	High	2480	AV	2500.000	-57.14	≤-41.20	38.06	≤54	PASS
BLE_1M	Ant1	High	2480	AV	2484.160	-54.12	≤-41.20	41.08	≤54	PASS
BLE_2M	Ant1	Low	2402	Peak	2390.000	-51.82	≤-21.20	43.38	≤74	PASS
BLE_2M	Ant1	Low	2402	Peak	2310.000	-52.41	≤-21.20	42.79	≤74	PASS
BLE_2M	Ant1	Low	2402	Peak	2337.170	-48.84	≤-21.20	46.36	≤74	PASS
BLE_2M	Ant1	Low	2402	AV	2390.000	-55.44	≤-41.20	39.76	≤54	PASS
BLE_2M	Ant1	Low	2402	AV	2310.000	-55.71	≤-41.20	39.49	≤54	PASS
BLE_2M	Ant1	Low	2402	AV	2362.475	-54.69	≤-41.20	40.51	≤54	PASS
BLE_2M	Ant1	High	2480	Peak	2483.500	-45.2	≤-21.20	50.00	≤74	PASS
BLE_2M	Ant1	High	2480	Peak	2500.000	-49.97	≤-21.20	45.23	≤74	PASS
BLE_2M	Ant1	High	2480	Peak	2484.160	-39.82	≤-21.20	55.38	≤74	PASS
BLE_2M	Ant1	High	2480	AV	2483.500	-50.12	≤-41.20	45.08	≤54	PASS
BLE_2M	Ant1	High	2480	AV	2500.000	-55.01	≤-41.20	40.19	≤54	PASS
BLE_2M	Ant1	High	2480	AV	2483.520	-50.12	≤-41.20	45.08	≤54	PASS

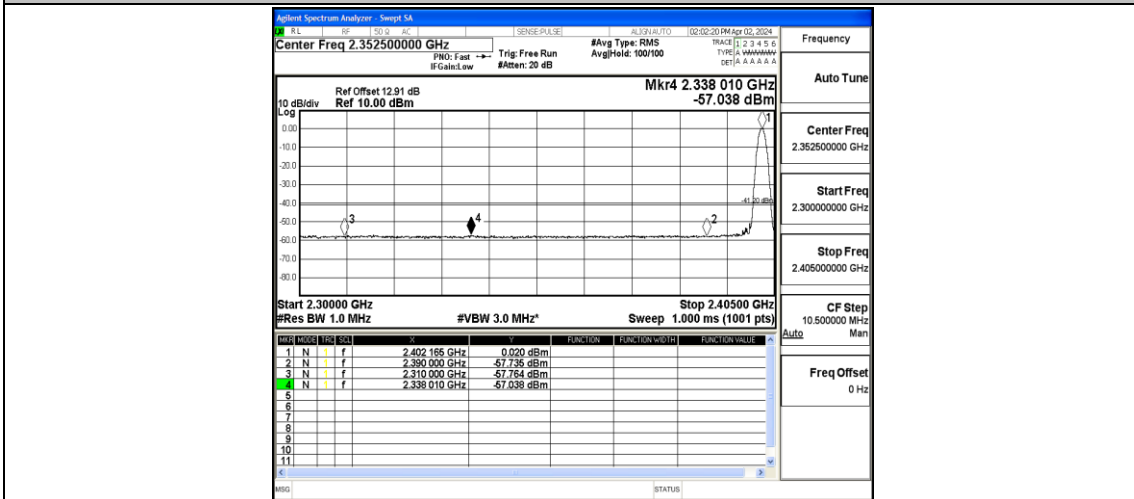
Note:

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

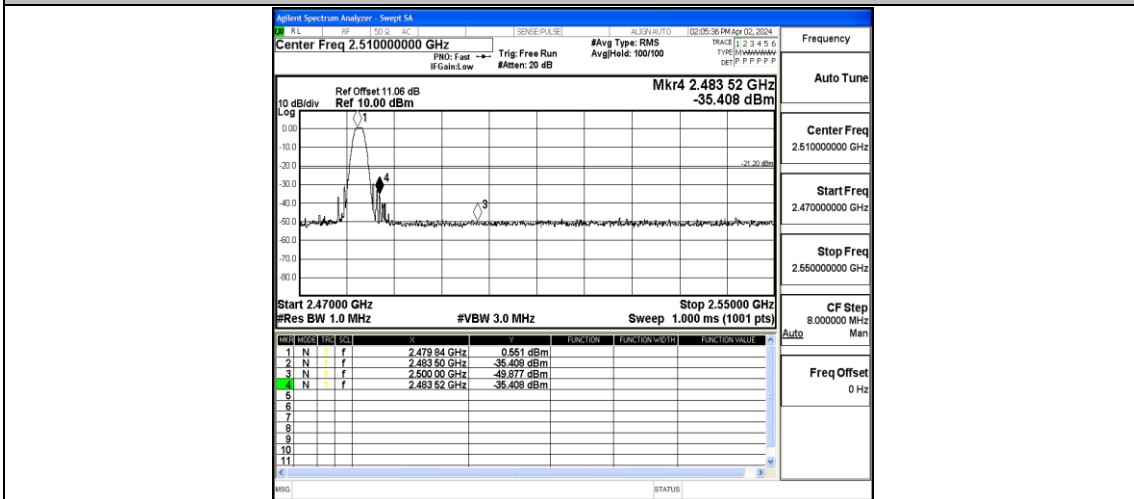
Test Graphs



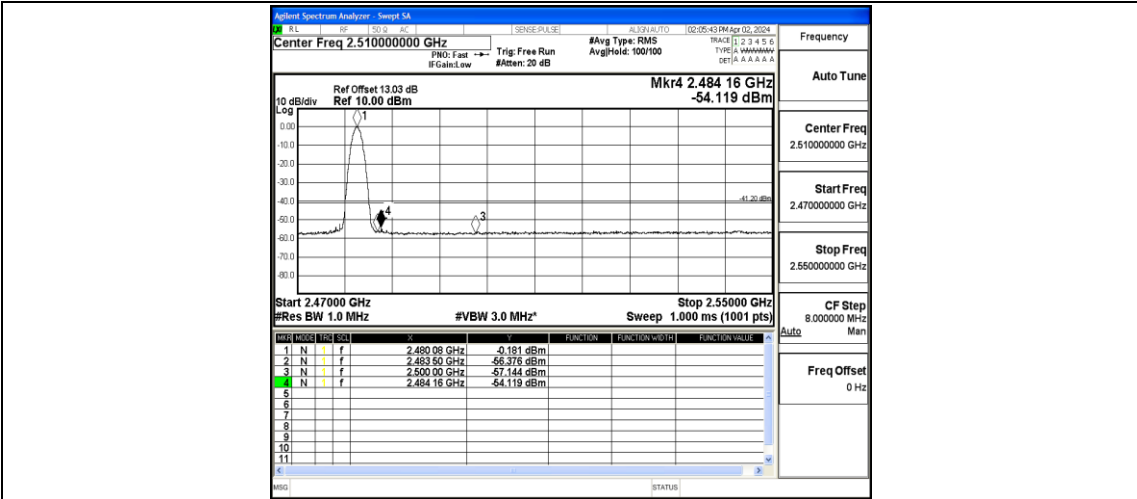
BLE_1M-Ant1-240-PASS



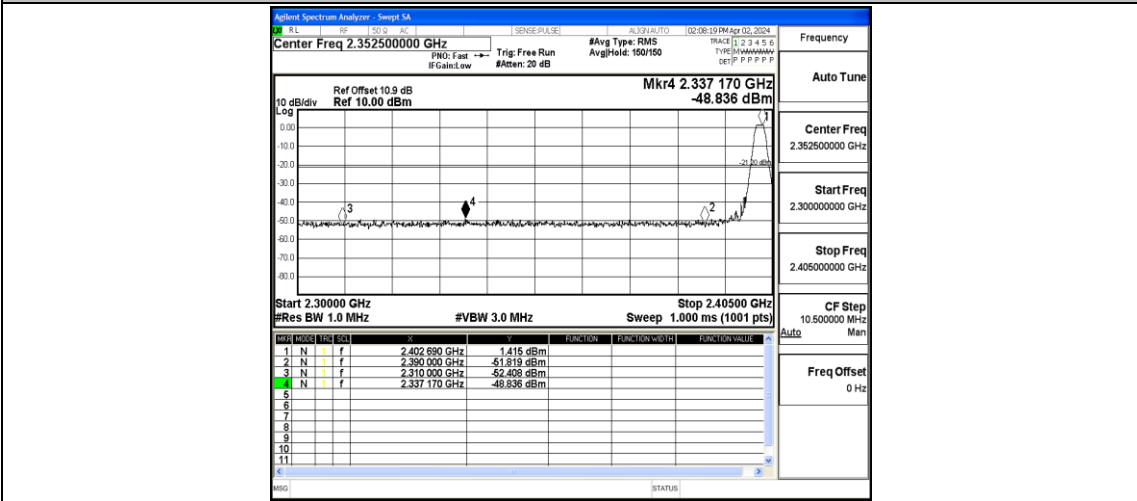
BLE_1M-Ant1-240-PASS



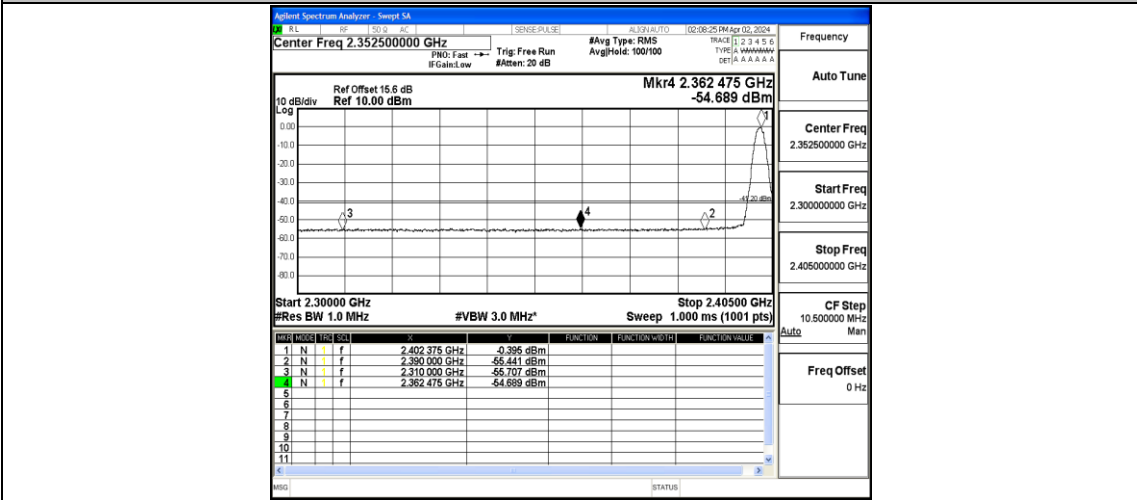
BLE_1M-Ant1-2480-PASS



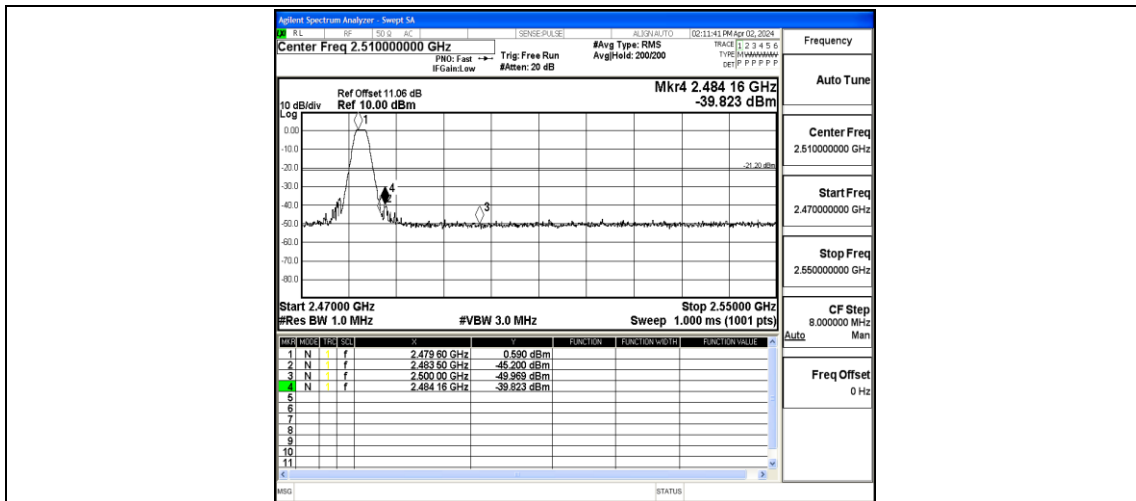
BLE_1M-Ant1-2480-PASS



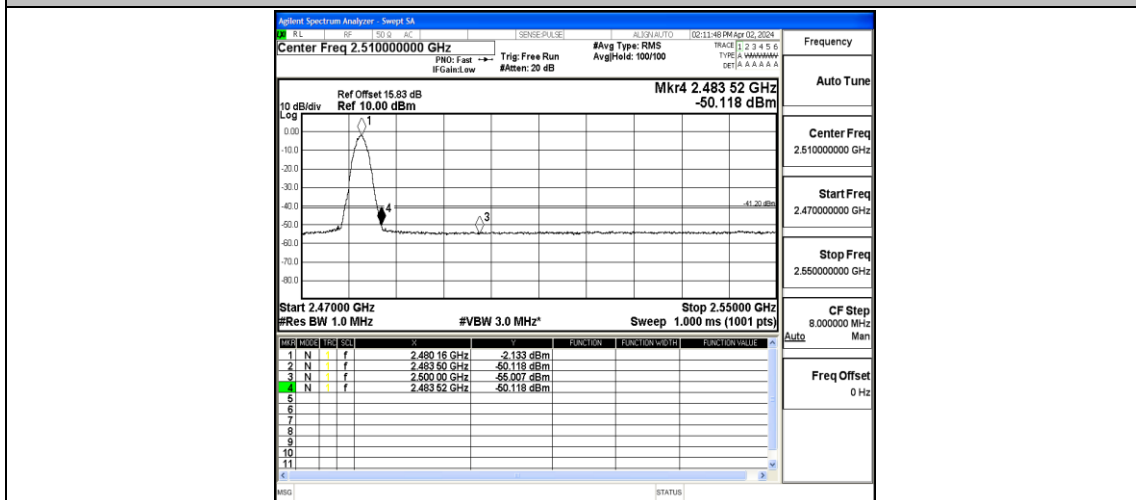
BLE_2M-Ant1-2402-PASS



BLE_2M-Ant1-2402-PASS



BLE_2M-Ant1-2480-PASS



BLE_2M-Ant1-2480-PASS