

FCC Appendix RF Test Data for BLE

FCC ID : 2BP5V-ZK501

Company : Dong Guan Zhen Ke Technology Co., LTD

EUT : Weather Station

Model Number : WS-SA8-PLUS

Report No. : CTA26082701101

Reviewed By : Eric Wang

Appendix A: DTS Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.640	2401.696	2402.336	0.5	PASS
		2440	0.628	2439.696	2440.324	0.5	PASS
		2480	0.644	2479.692	2480.336	0.5	PASS
BLE_2M	Ant1	2402	1.124	2401.448	2402.572	0.5	PASS
		2440	1.120	2439.444	2440.564	0.5	PASS
		2480	1.096	2479.440	2480.536	0.5	PASS

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.40200000 GHz

Ref Offset 0.4 dB
Ref 30.00 dBm

Trig: Free Run
#Atten: 40 dB

#Avg Type: RMS
AvgHold: 100/100

Span 4.000 MHz
Sweep 1.000 ms (1001 pts)

#Res BW 100 kHz
#VBW 300 kHz

ΔMkr3 640 kHz
0.080 dB

10 dB/div
Log

Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)

MNR	MODE	TRIG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.401696 GHz	-9.379 dBm			
2	N	1	f	2.402018 GHz	-3.532 dBm			
3	Δ	1	f (Δ)	640 kHz (Δ)	0.080 dB			

Frequency

Auto Tune

Center Freq
2.402000000 GHz

Start Freq
2.400000000 GHz

Stop Freq
2.404000000 GHz

CF Step
400.000 kHz
Man

Freq Offset
0 Hz

MSO

BLE_1M_Ant1_2402

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.440000000 GHz

Ref Offset 0.4 dB
Ref 30.00 dBm

Trig: Free Run
#Atten: 40 dB

#Avg Type: RMS
AvgHold: 100/100

Span 4.000 MHz
Sweep 1.000 ms (1001 pts)

#Res BW 100 kHz
#VBW 300 kHz

ΔMkr3 628 kHz
-0.100 dB

10 dB/div
Log

Center 2.440000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)

MNR	MODE	TRIG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.439696 GHz	-9.787 dBm			
2	N	1	f	2.439788 GHz	-4.148 dBm			
3	Δ	1	f (Δ)	628 kHz (Δ)	-0.100 dB			

Frequency

Auto Tune

Center Freq
2.440000000 GHz

Start Freq
2.438000000 GHz

Stop Freq
2.442000000 GHz

CF Step
400.000 kHz
Man

Freq Offset
0 Hz

MSO

BLE_1M_Ant1_2440



BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480

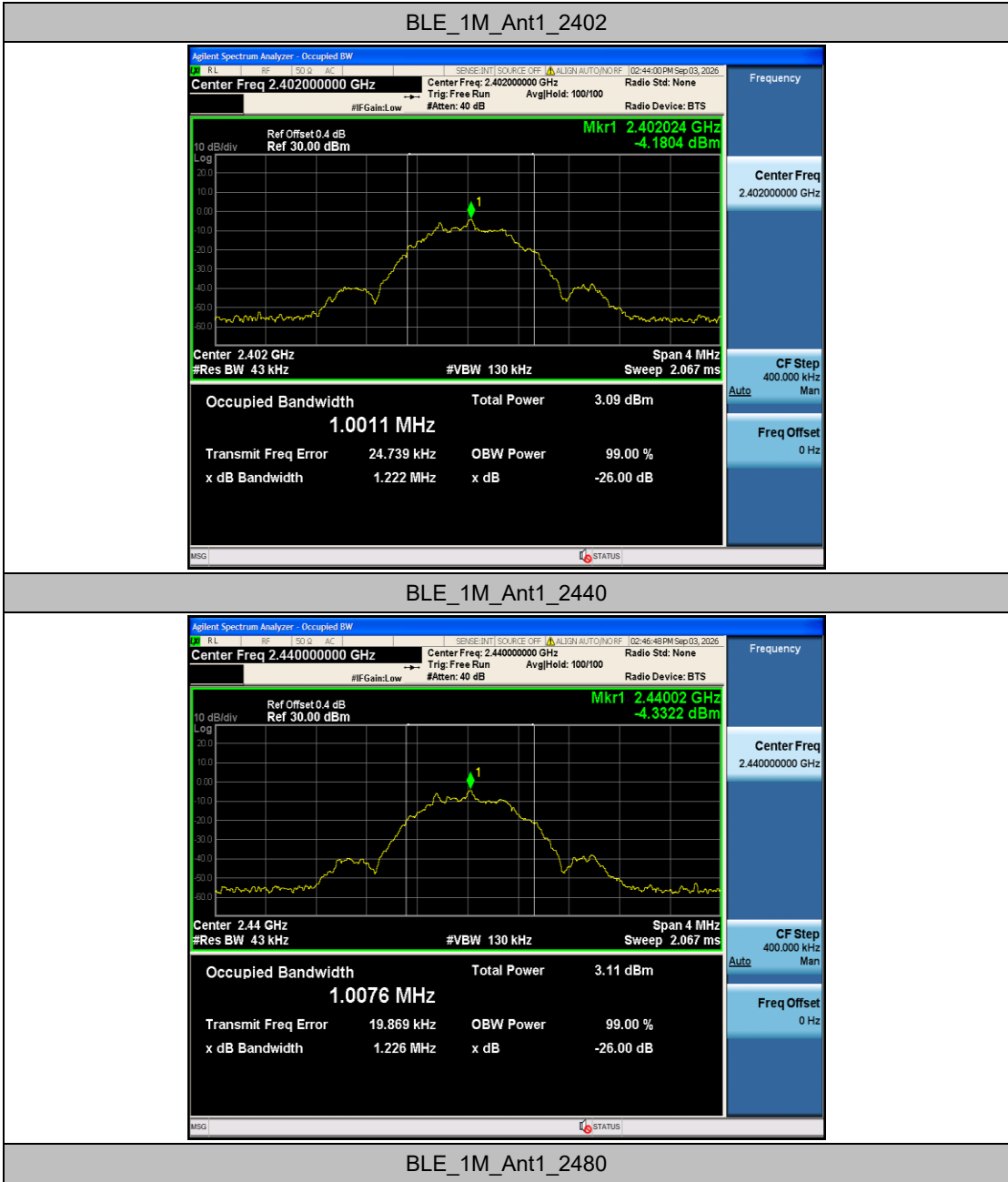


Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0011	2401.5242	2402.5253	---	---
		2440	1.0076	2439.5161	2440.5237	---	---
		2480	1.0097	2479.5180	2480.5277	---	---
BLE_2M	Ant1	2402	1.9978	2401.0357	2403.0335	---	---
		2440	2.0109	2439.0285	2441.0394	---	---
		2480	2.0051	2479.0313	2481.0364	---	---

Test Graphs





BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix C: Maximum conducted output power

Test Result Peak

TestMode	Antenna	Freq(MHz)	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-3.41	≤30	PASS
		2440	-3.56	≤30	PASS
		2480	-3.75	≤30	PASS
BLE_2M	Ant1	2402	-3.44	≤30	PASS
		2440	-3.48	≤30	PASS
		2480	-3.74	≤30	PASS

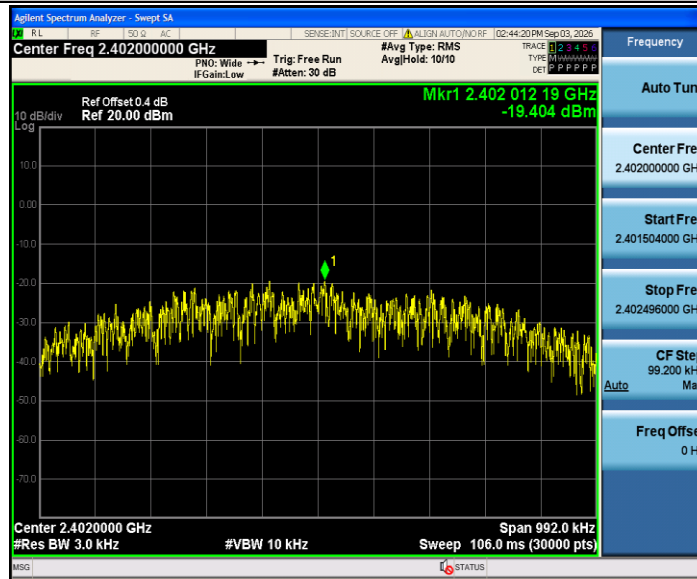
Appendix D: Maximum power spectral density

Test Result

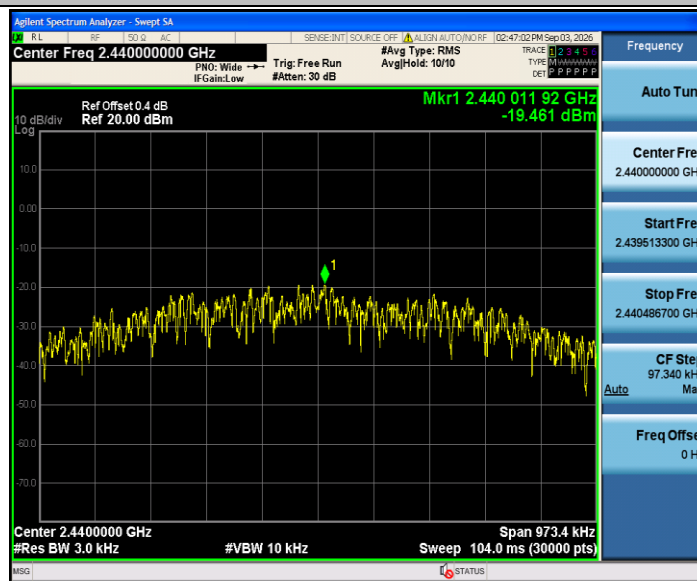
TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-19.40	≤8.00	PASS
		2440	-19.46	≤8.00	PASS
		2480	-19.77	≤8.00	PASS
BLE_2M	Ant1	2402	-20.32	≤8.00	PASS
		2440	-20.87	≤8.00	PASS
		2480	-20.58	≤8.00	PASS

Test Graphs

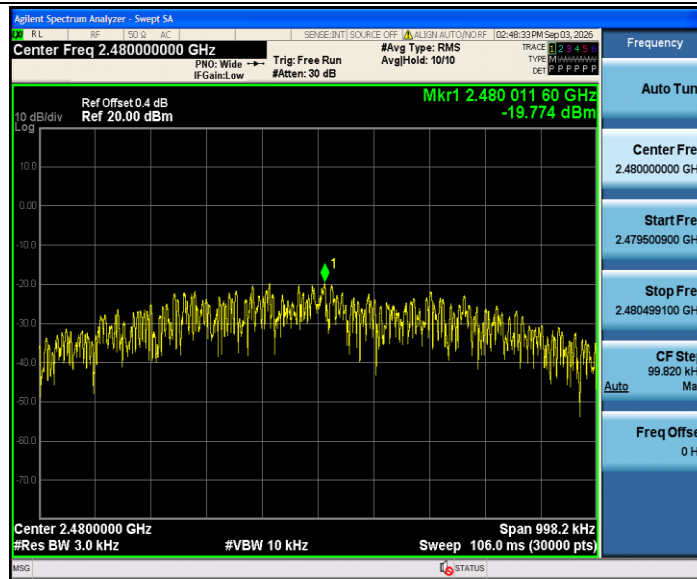
BLE_1M_Ant1_2402



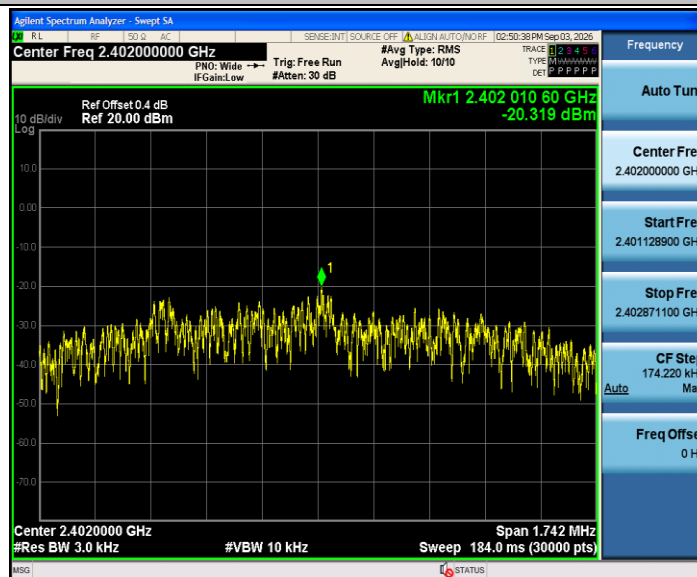
BLE_1M_Ant1_2440



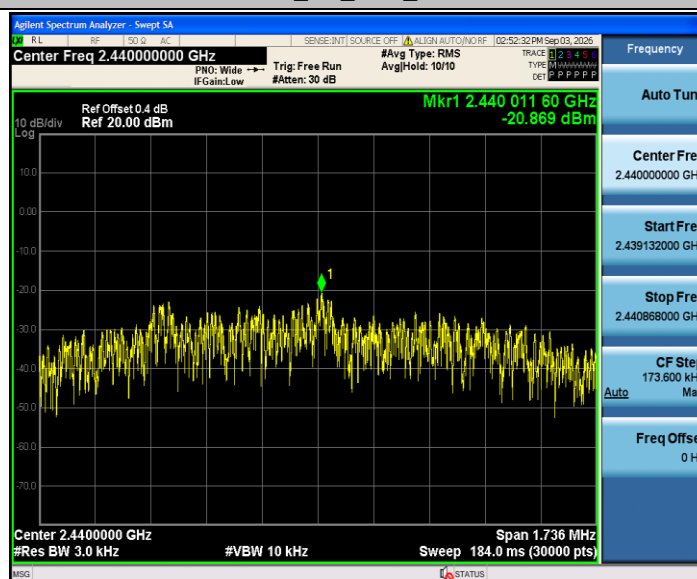
BLE_1M_Ant1_2480



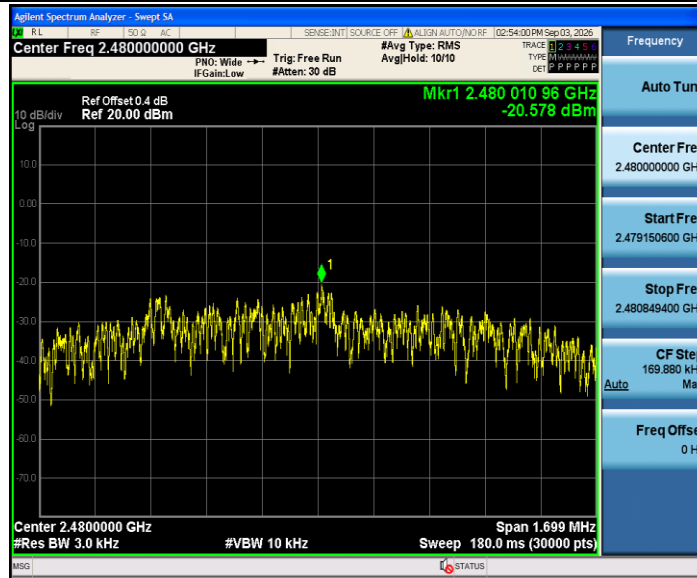
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480

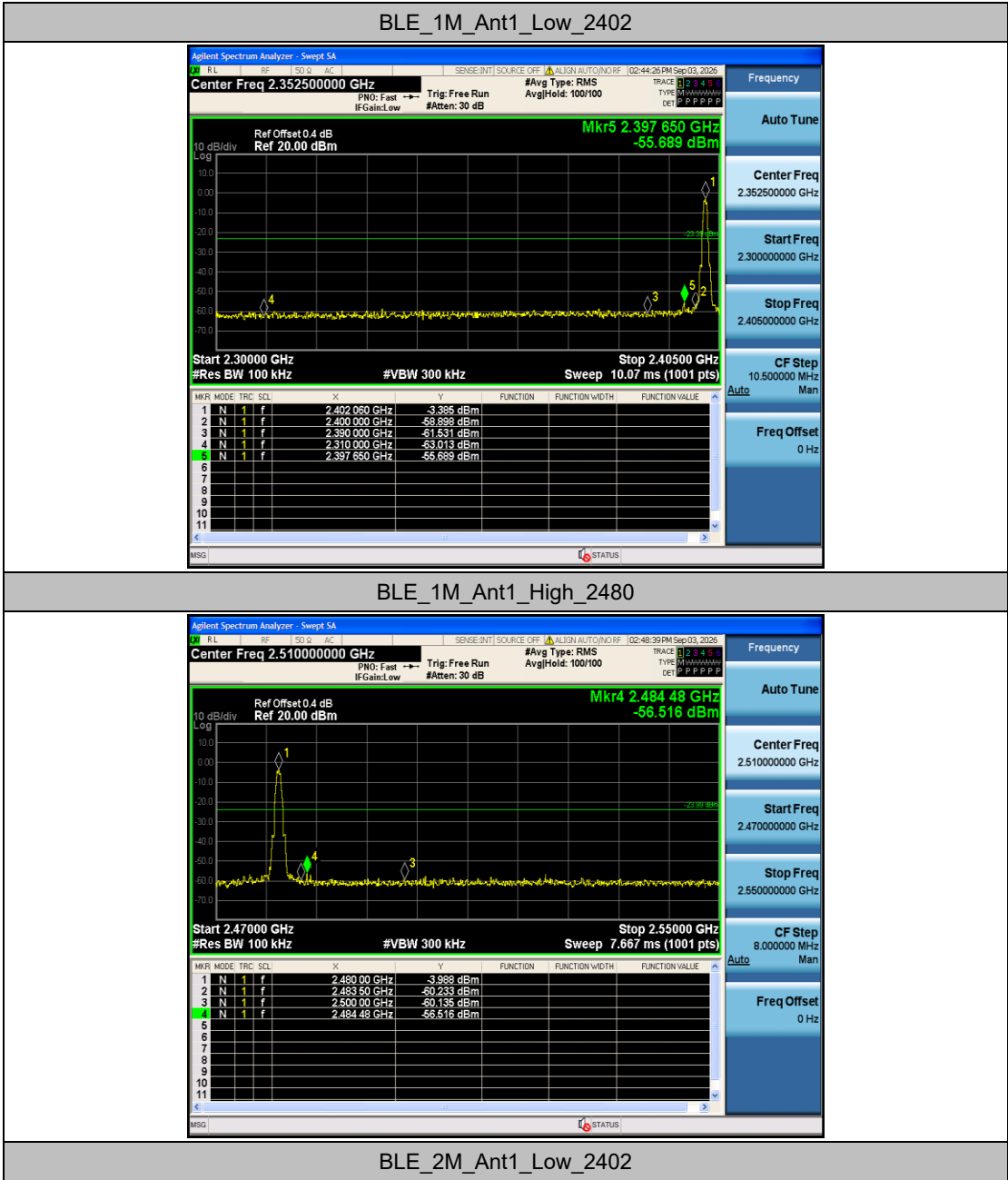


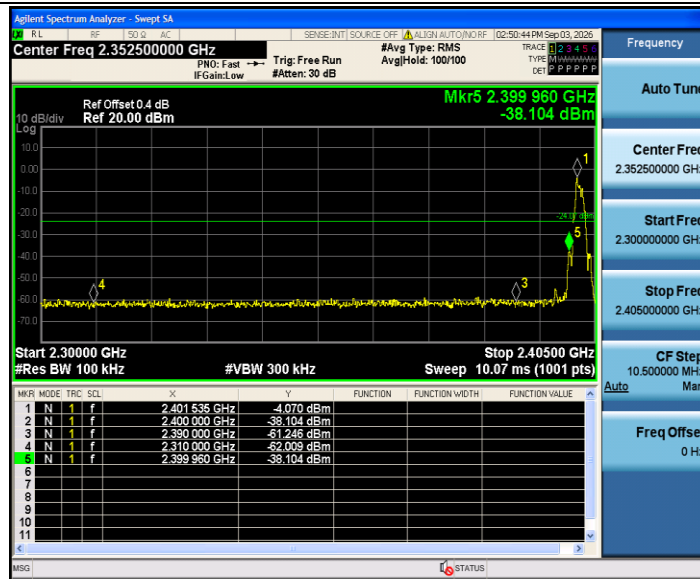
Appendix E: Band edge measurements

Test Result

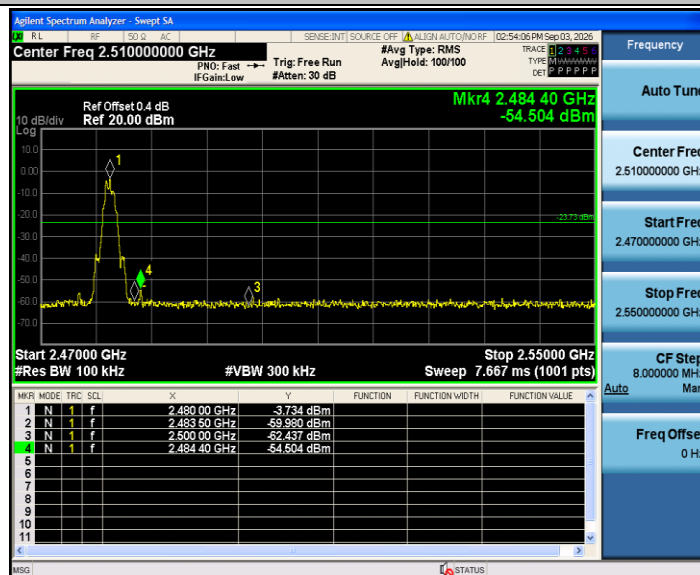
TestMode	Antenna	Channel	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-3.39	-55.69	≤-23.39	PASS
		High	2480	-3.99	-56.52	≤-23.99	PASS
BLE_2M	Ant1	Low	2402	-4.07	-38.1	≤-24.07	PASS
		High	2480	-3.73	-54.5	≤-23.73	PASS

Test Graphs





BLE_2M_Ant1_High_2480

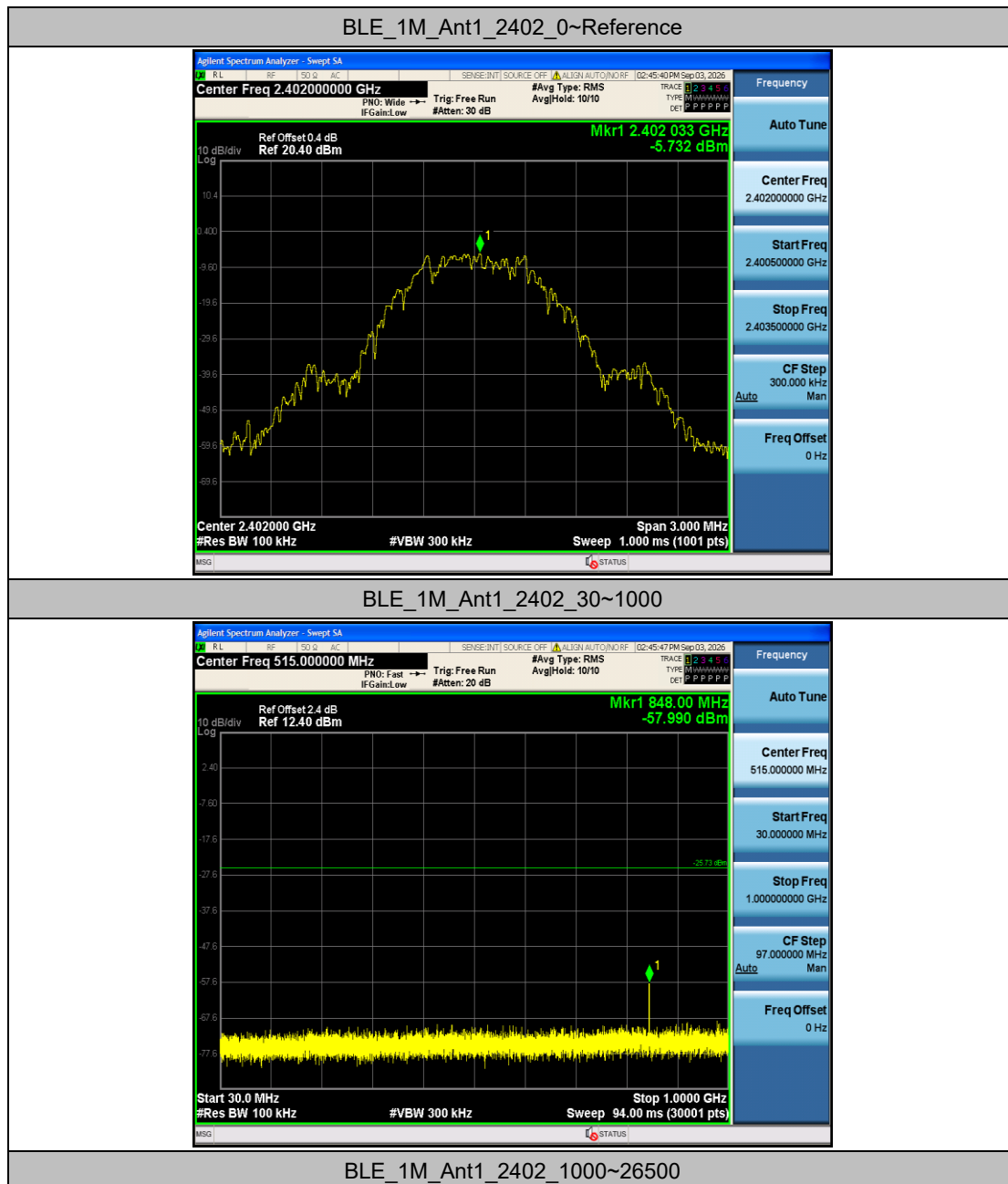


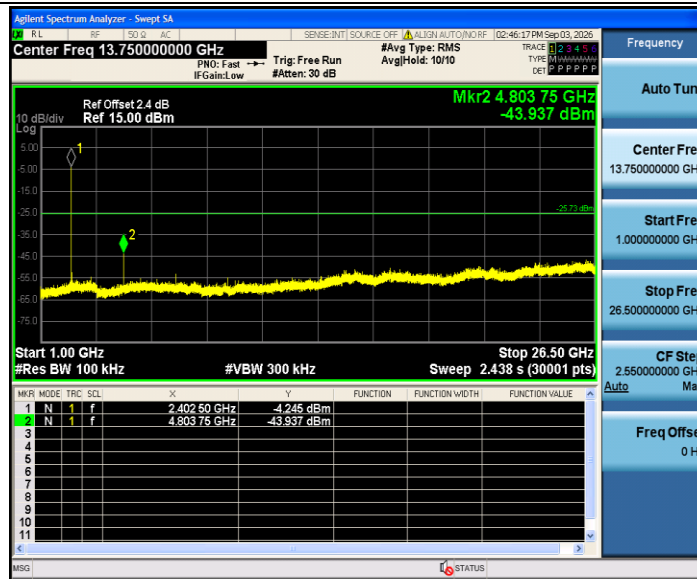
Appendix F: Conducted Spurious Emission

Test Result

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-5.73	-5.73	---	PASS
			30~1000	-5.73	-57.99	≤-25.73	PASS
			1000~26500	-5.73	-43.94	≤-25.73	PASS
		2440	Reference	-4.20	-4.20	---	PASS
			30~1000	-4.20	-62.09	≤-24.2	PASS
			1000~26500	-4.20	-46.95	≤-24.2	PASS
		2480	Reference	-4.43	-4.43	---	PASS
			30~1000	-4.43	-68.29	≤-24.43	PASS
			1000~26500	-4.43	-45.61	≤-24.43	PASS
BLE_2M	Ant1	2402	Reference	-5.34	-5.34	---	PASS
			30~1000	-5.34	-56.82	≤-25.34	PASS
			1000~26500	-5.34	-46.22	≤-25.34	PASS
		2440	Reference	-3.87	-3.87	---	PASS
			30~1000	-3.87	-65.86	≤-23.87	PASS
			1000~26500	-3.87	-46.36	≤-23.87	PASS
		2480	Reference	-4.22	-4.22	---	PASS
			30~1000	-4.22	-67.58	≤-24.22	PASS
			1000~26500	-4.22	-46.84	≤-24.22	PASS

Test Graphs

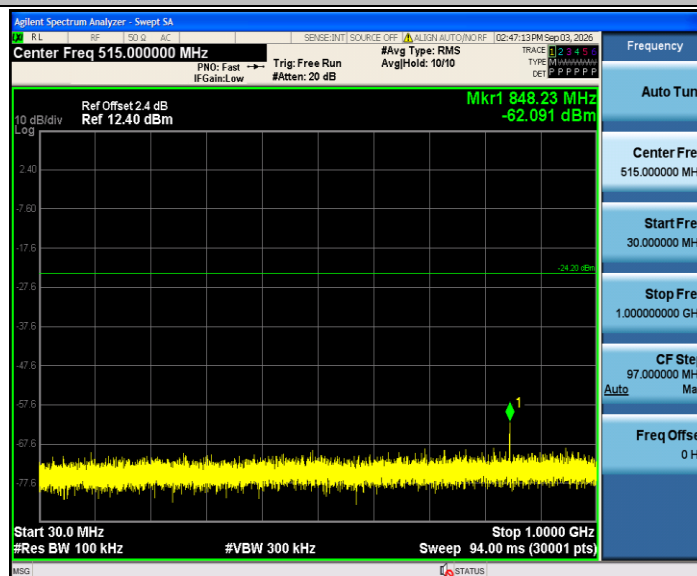




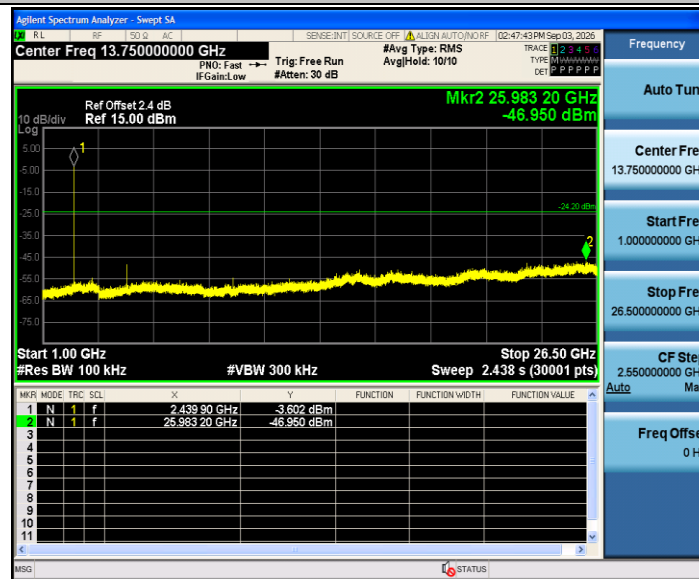
BLE_1M_Ant1_2440_0~Reference



BLE_1M_Ant1_2440_30~1000



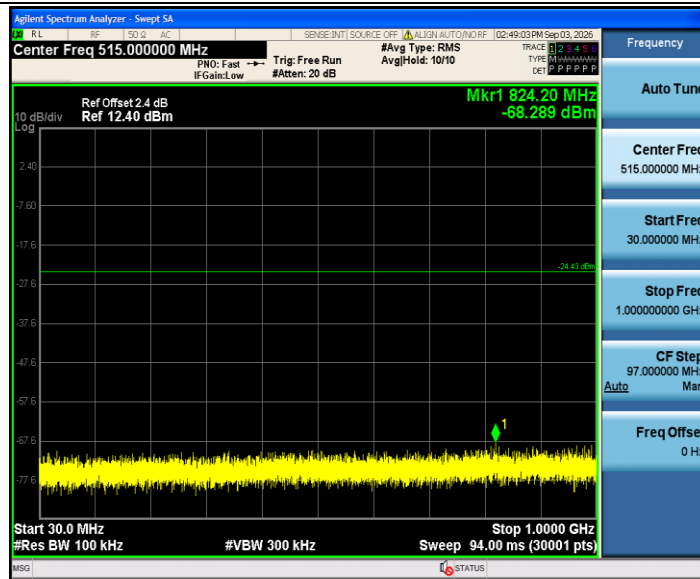
BLE_1M_Ant1_2440_1000~26500



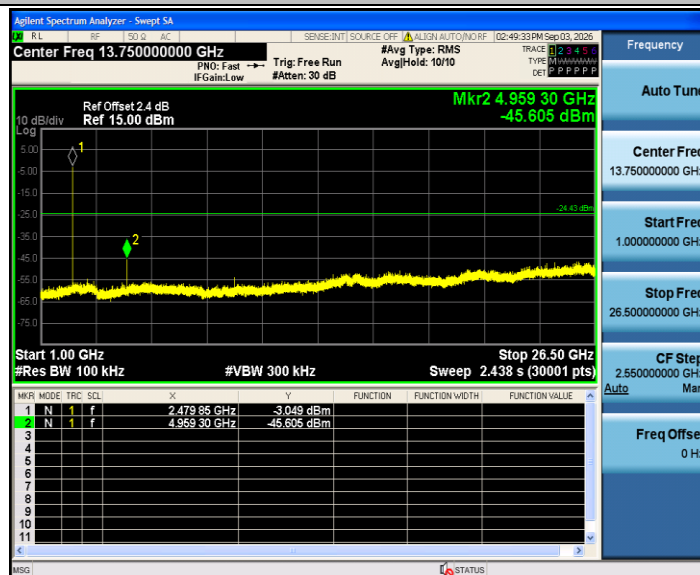
BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



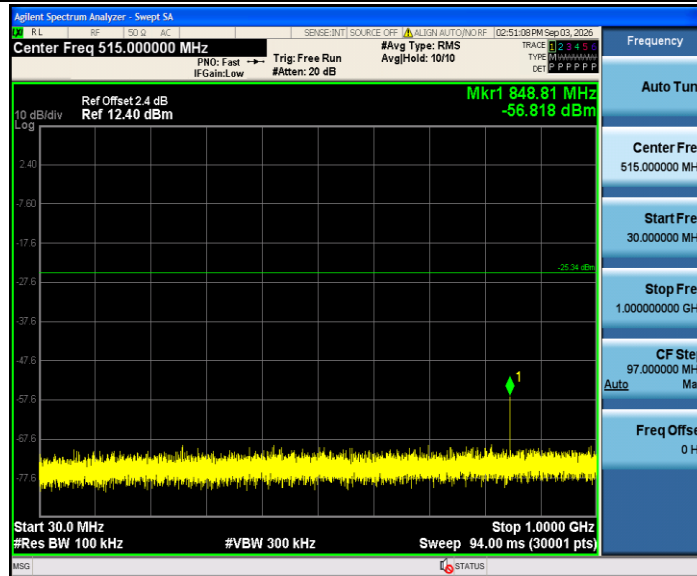
BLE_1M_Ant1_2480_1000~26500



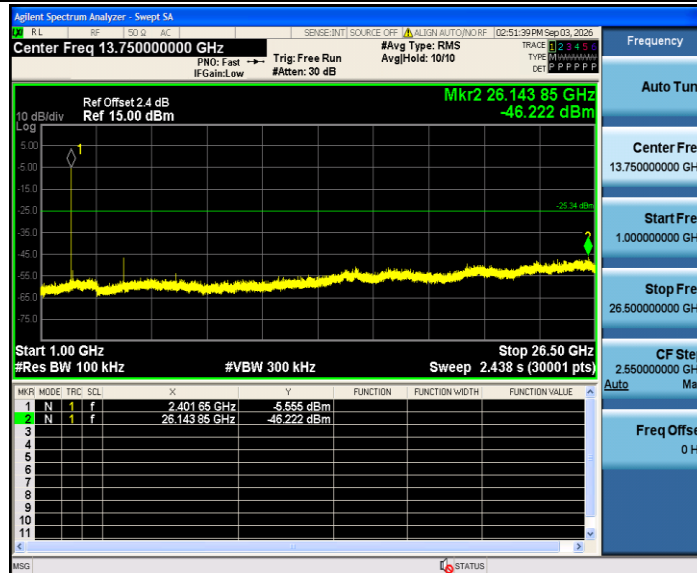
BLE_2M_Ant1_2402_0~Reference



BLE_2M_Ant1_2402_30~1000



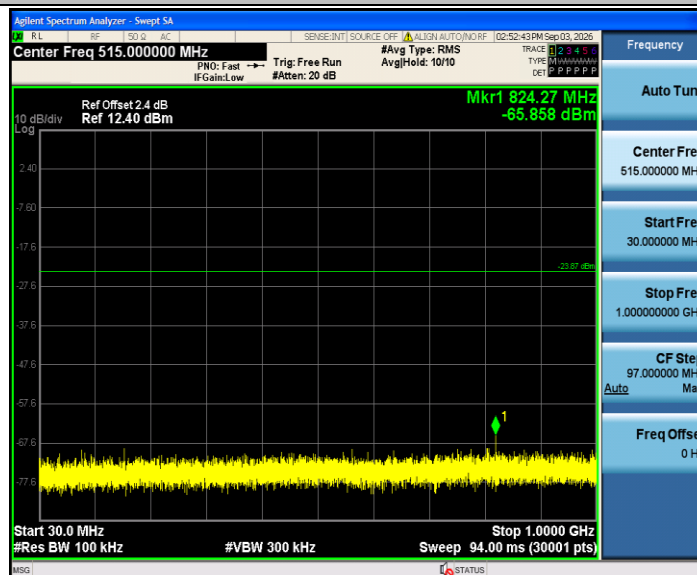
BLE_2M_Ant1_2402_1000~26500



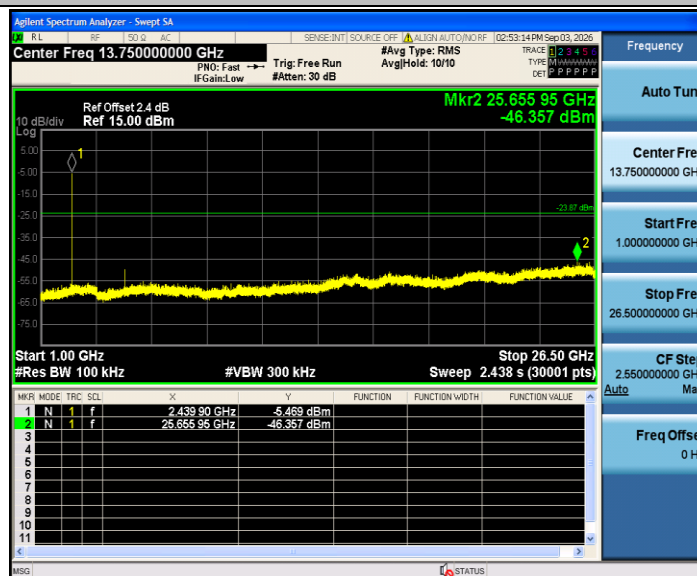
BLE_2M_Ant1_2440_0~Reference



BLE_2M_Ant1_2440_30~1000



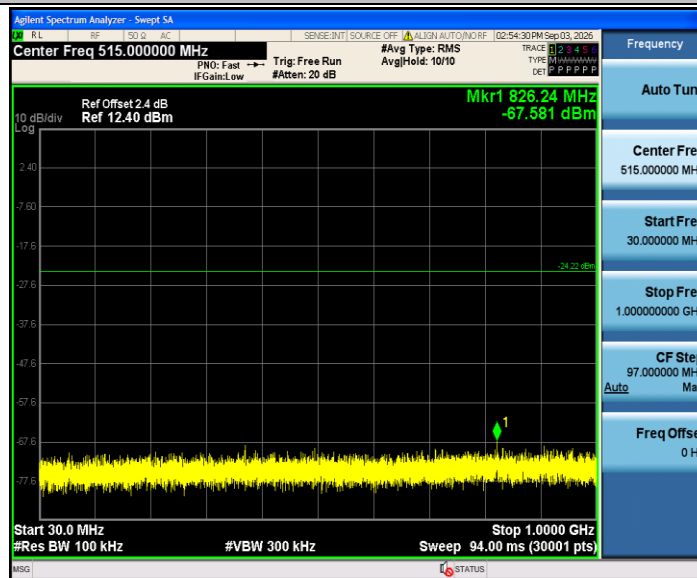
BLE_2M_Ant1_2440_1000~26500



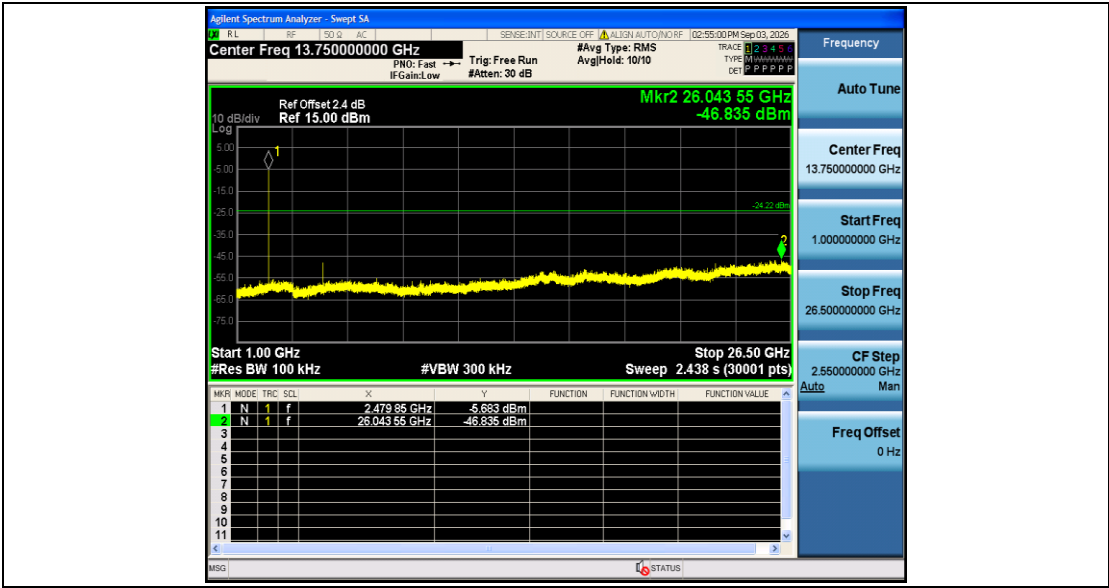
BLE_2M_Ant1_2480_0~Reference



BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500

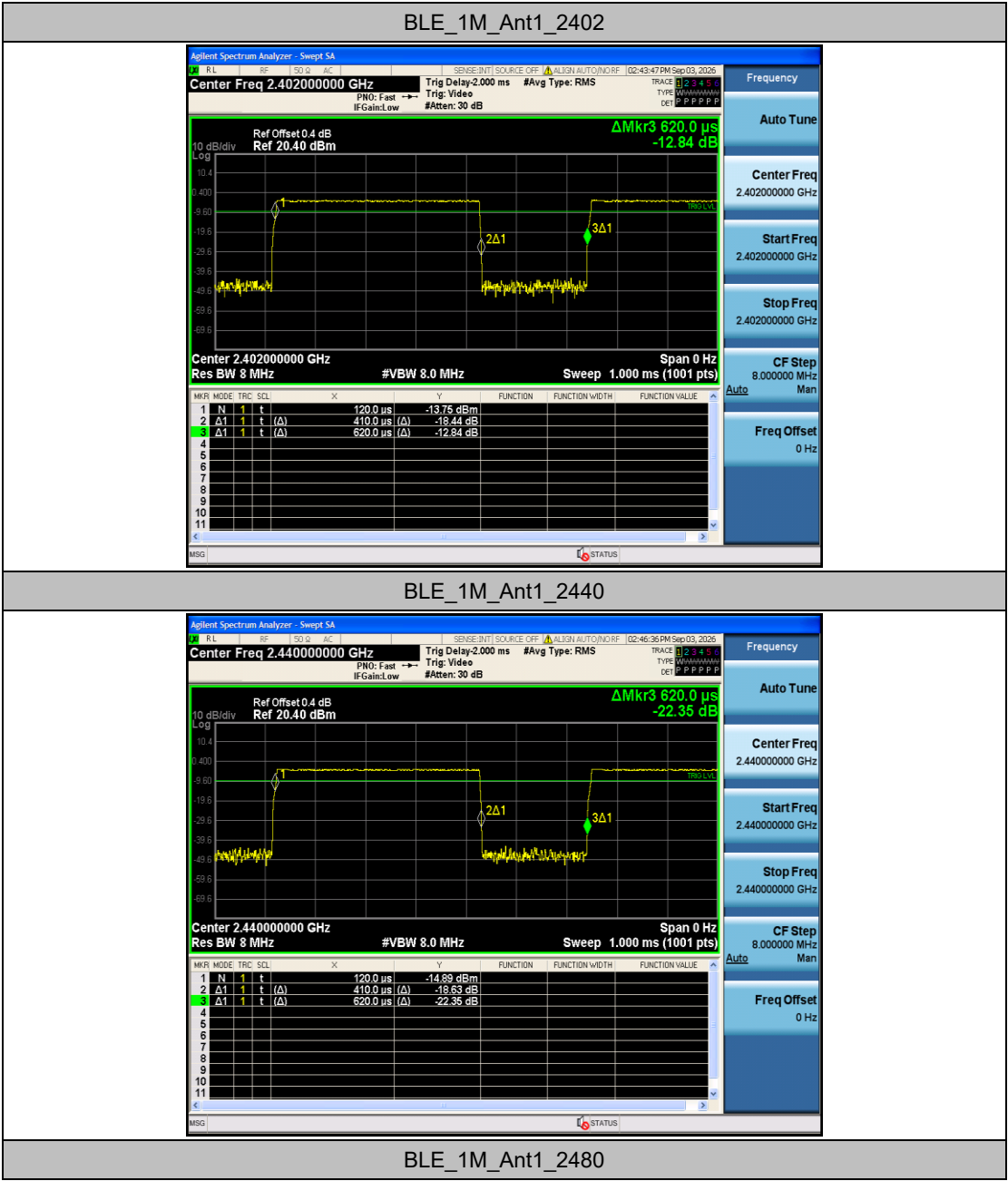


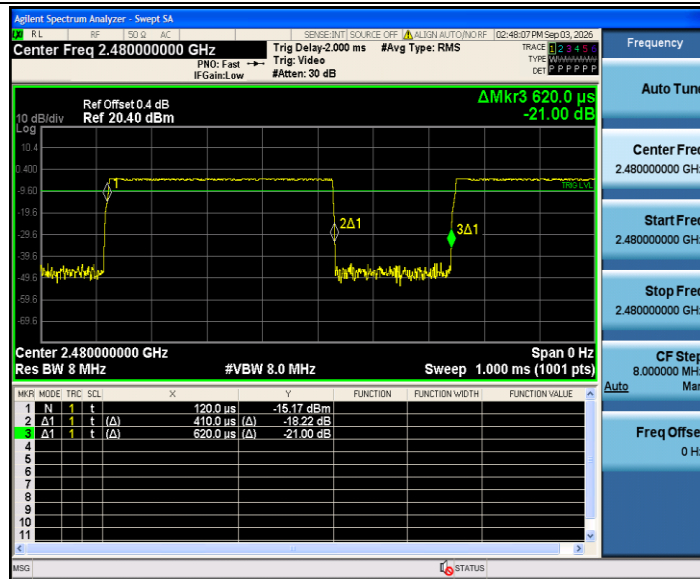
Appendix G: Duty Cycle

Test Result

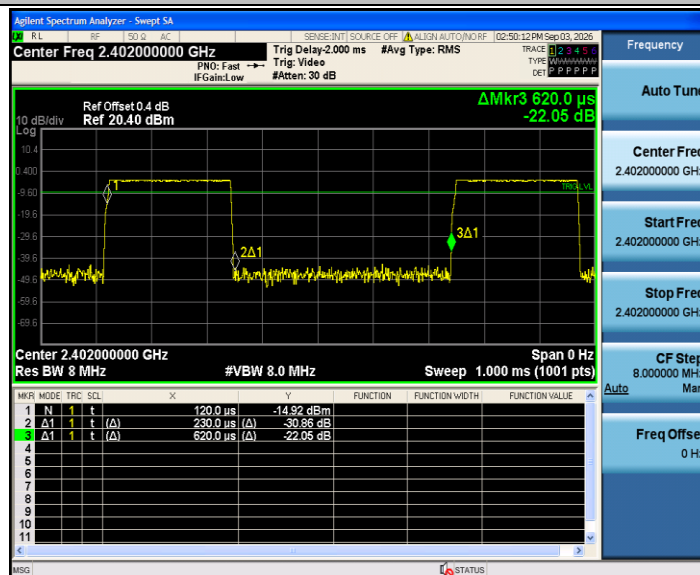
TestMode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	0.41	0.62	0.6613	66.13	1.80	---	---
		2440	0.41	0.62	0.6613	66.13	1.80	---	---
		2480	0.41	0.62	0.6613	66.13	1.80	---	---
BLE_2M	Ant1	2402	0.23	0.62	0.3710	37.10	4.31	---	---
		2440	0.23	0.62	0.3710	37.10	4.31	---	---
		2480	0.23	0.62	0.3710	37.10	4.31	---	---

Test Graphs

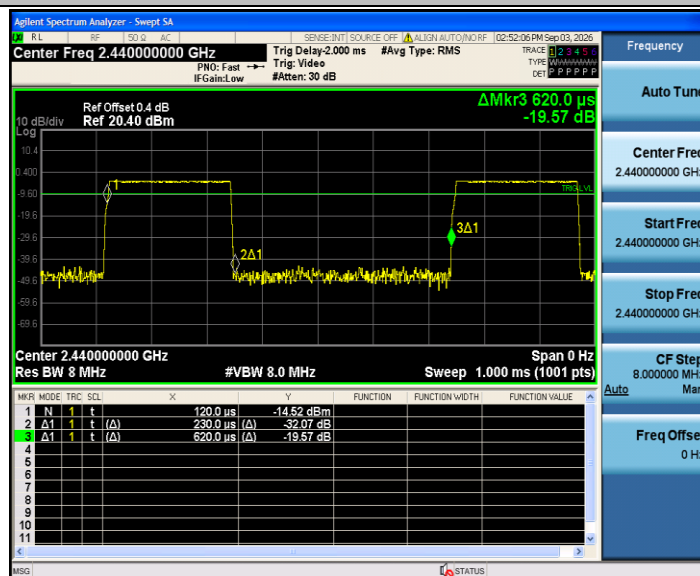




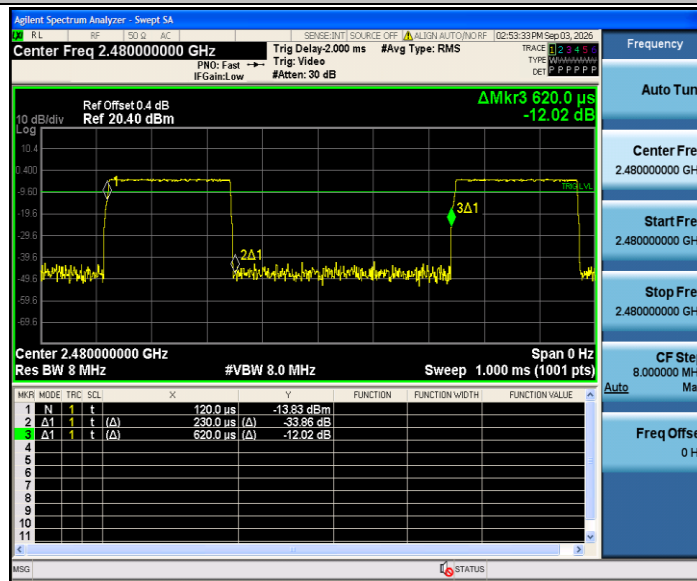
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix H: Emissions in Restricted Bands

Test Result

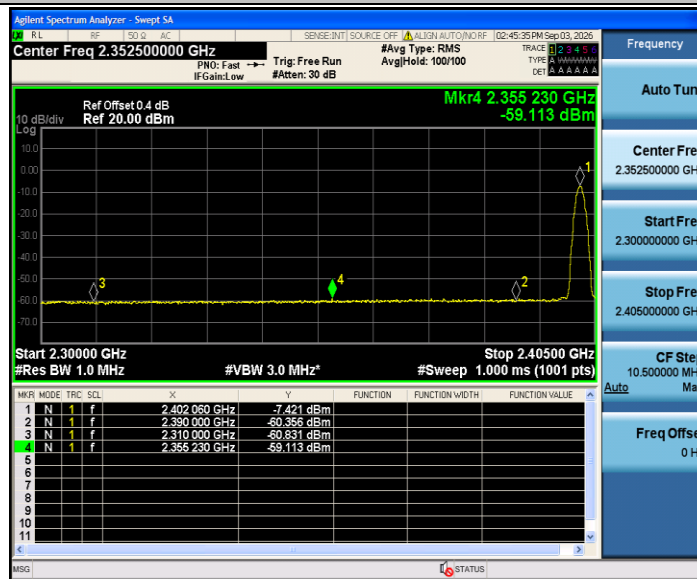
TestMod e	Antenn a	ChNam e	Freq(MH z)	Detector	Freq [MHz]	Result [dBm]	Gain [dB]	DC Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-60.83	3.43	1.80	39.60	≤54	PASS
				AV	2355.230	-59.11	3.43	1.80	41.32	≤54	PASS
				AV	2390.000	-60.36	3.43	1.80	40.07	≤54	PASS
				Peak	2310.000	-52.71	3.43	0.00	45.92	≤74	PASS
				Peak	2374.025	-49.22	3.43	0.00	49.41	≤74	PASS
				Peak	2390.000	-52.39	3.43	0.00	46.24	≤74	PASS
		High	2480	AV	2483.500	-59	3.43	1.80	41.43	≤54	PASS
				AV	2484.720	-58.43	3.43	1.80	42.00	≤54	PASS
				AV	2500.000	-59.81	3.43	1.80	40.62	≤54	PASS
				Peak	2483.500	-52.13	3.43	0.00	46.50	≤74	PASS
				Peak	2484.720	-48.08	3.43	0.00	50.55	≤74	PASS
				Peak	2500.000	-51.64	3.43	0.00	46.99	≤74	PASS
BLE_2M	Ant1	Low	2402	AV	2310.000	-60.94	3.43	4.31	42.00	≤54	PASS
				AV	2369.405	-59.41	3.43	4.31	43.53	≤54	PASS
				AV	2390.000	-60.38	3.43	4.31	42.56	≤54	PASS
				Peak	2310.000	-51.88	3.43	0.00	46.75	≤74	PASS
				Peak	2361.845	-48.97	3.43	0.00	49.66	≤74	PASS
				Peak	2390.000	-51.3	3.43	0.00	47.33	≤74	PASS
		High	2480	AV	2483.500	-58.69	3.43	4.31	44.25	≤54	PASS
				AV	2483.520	-58.69	3.43	4.31	44.25	≤54	PASS
				AV	2500.000	-59.34	3.43	4.31	43.60	≤54	PASS
				Peak	2483.500	-50.33	3.43	0.00	48.30	≤74	PASS
				Peak	2483.840	-46.57	3.43	0.00	52.06	≤74	PASS
				Peak	2500.000	-51.31	3.43	0.00	47.32	≤74	PASS

Note:

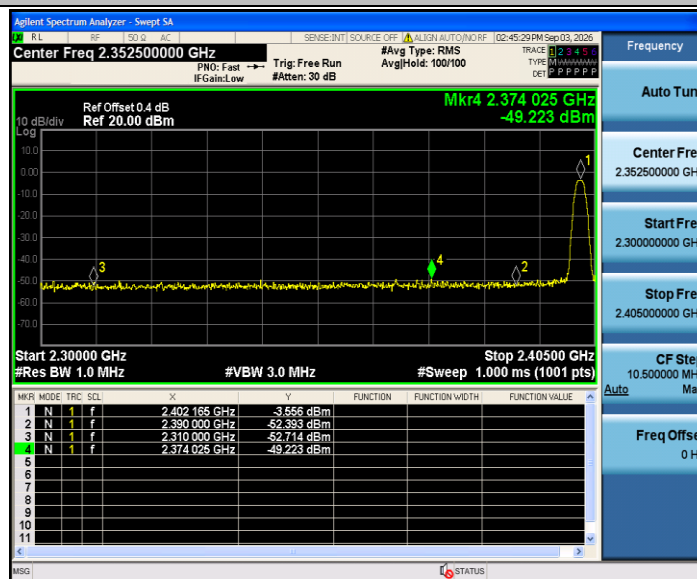
The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

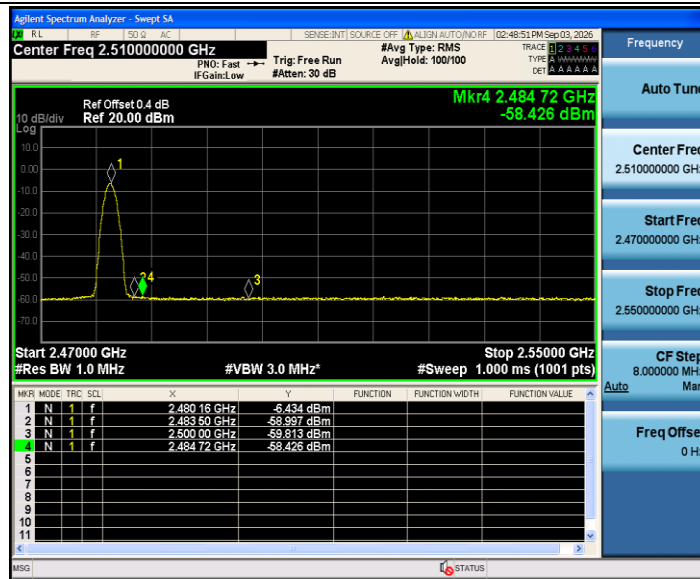
BLE_1M_Ant1_Low_2402_AV



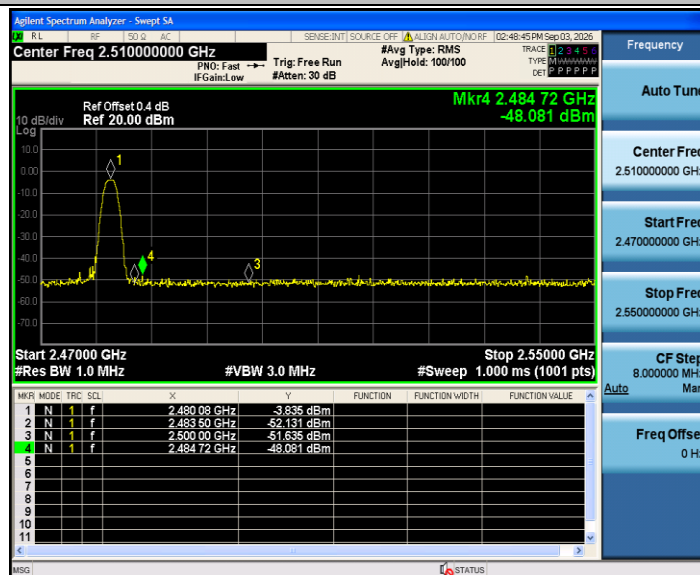
BLE_1M_Ant1_Low_2402_Peak



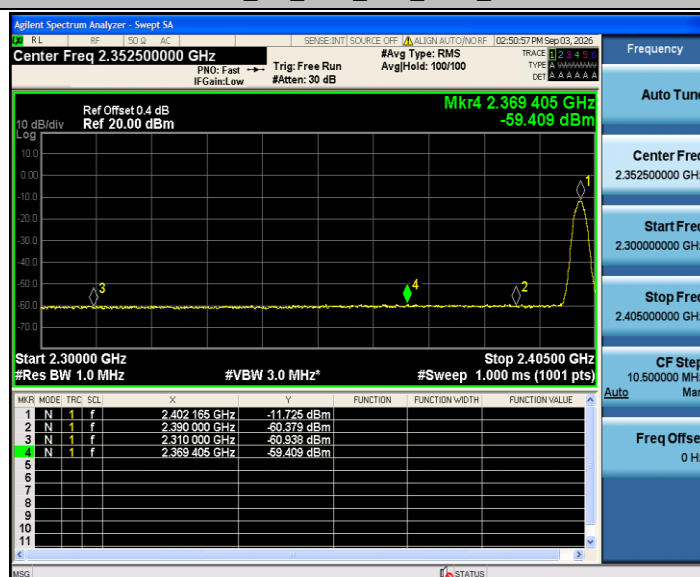
BLE_1M_Ant1_High_2480_AV



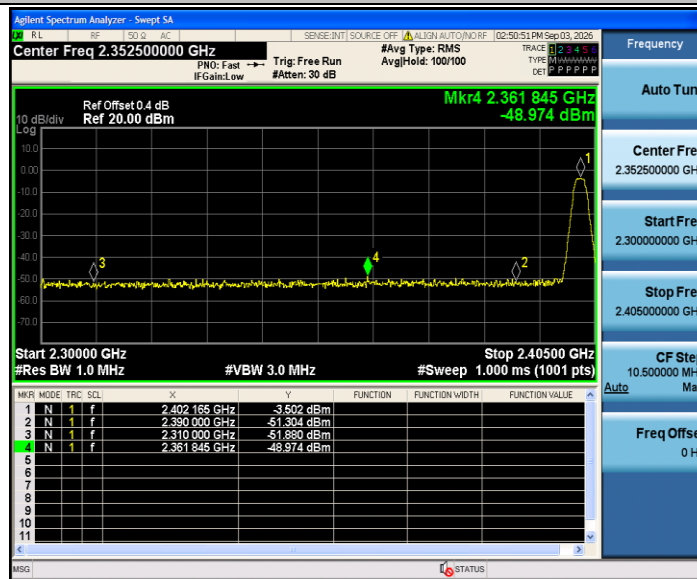
BLE_1M_Ant1_High_2480_Peak



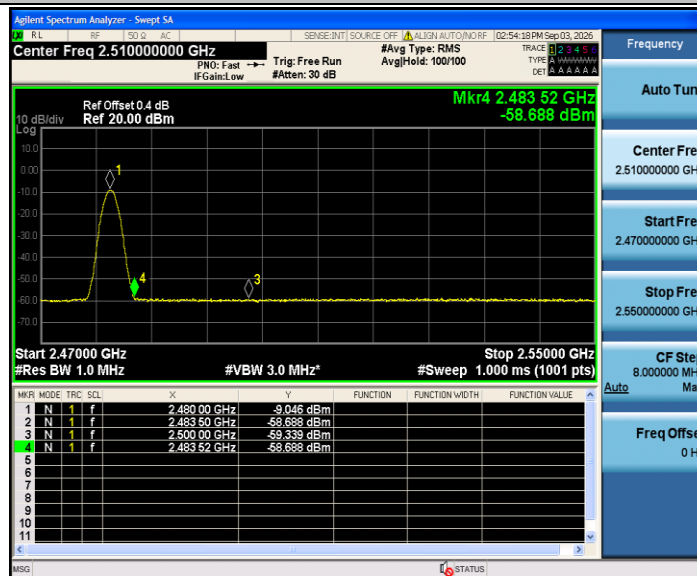
BLE_2M_Ant1_Low_2402_AV



BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV



BLE_2M_Ant1_High_2480_Peak

