



Appendix A

RF Test Data for BLE (Conducted Measurement)

Product Name: Bicycle Computer

Test Model: TR280

Environmental Conditions

Temperature:	21.1° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Ken He
Supervised by:	Li Huan

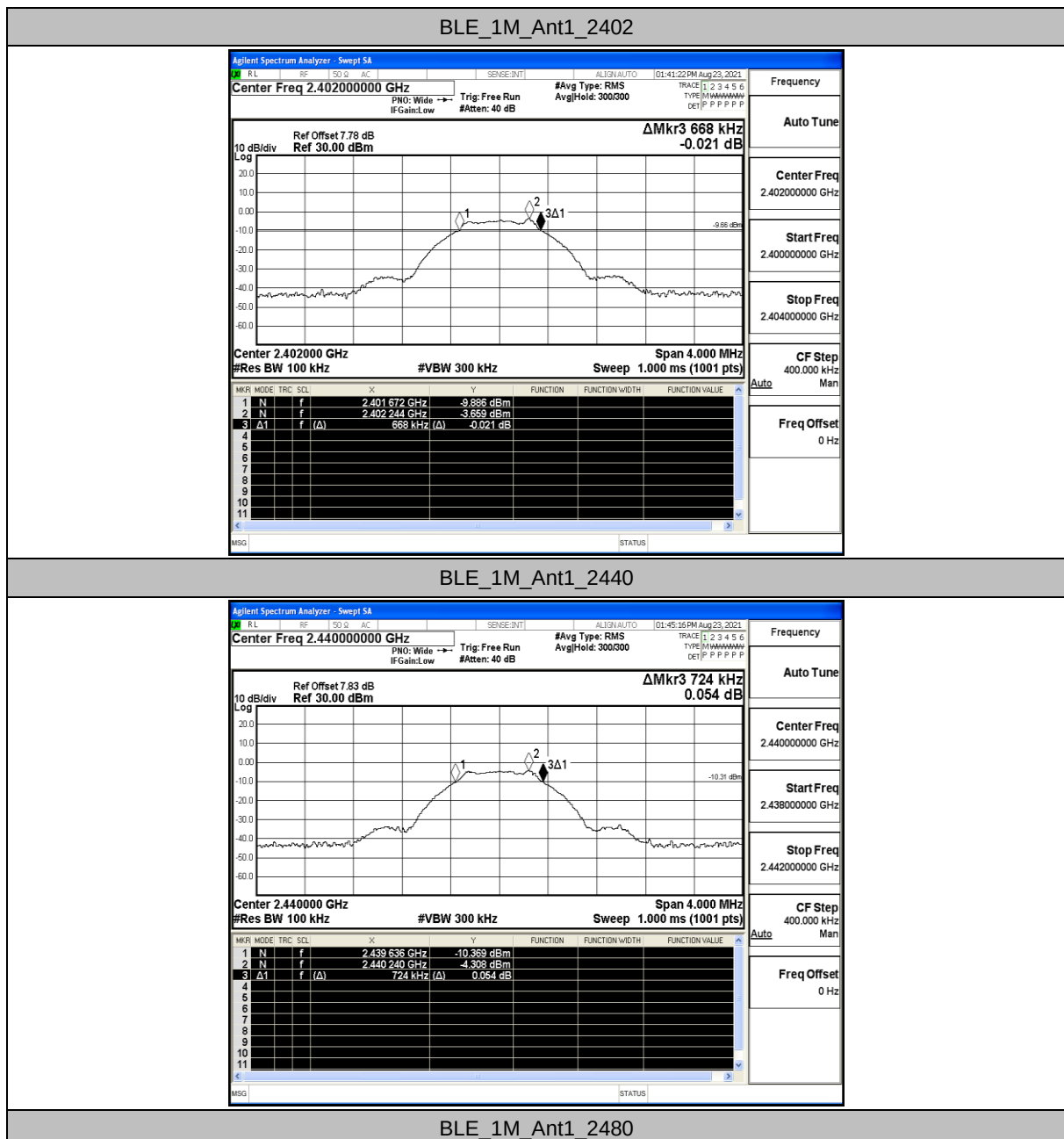


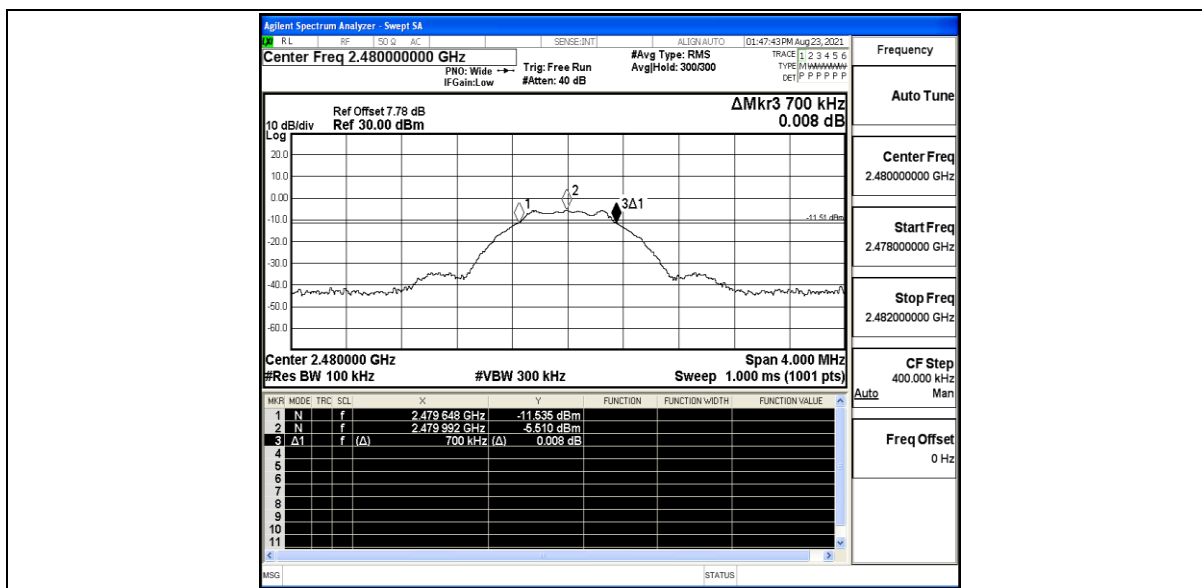
A.1 6dB Bandwidth

Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.668	2401.672	2402.340	≥0.5	PASS
		2440	0.724	2439.636	2440.360	≥0.5	PASS
		2480	0.700	2479.648	2480.348	≥0.5	PASS

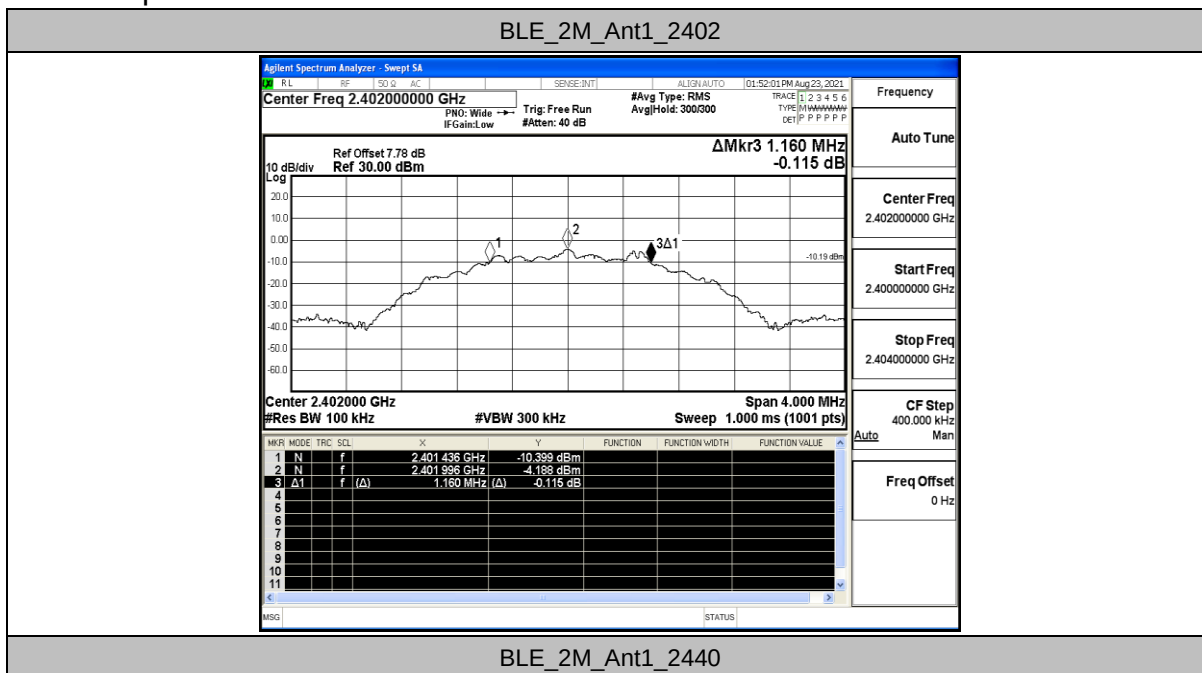
Test Graphs

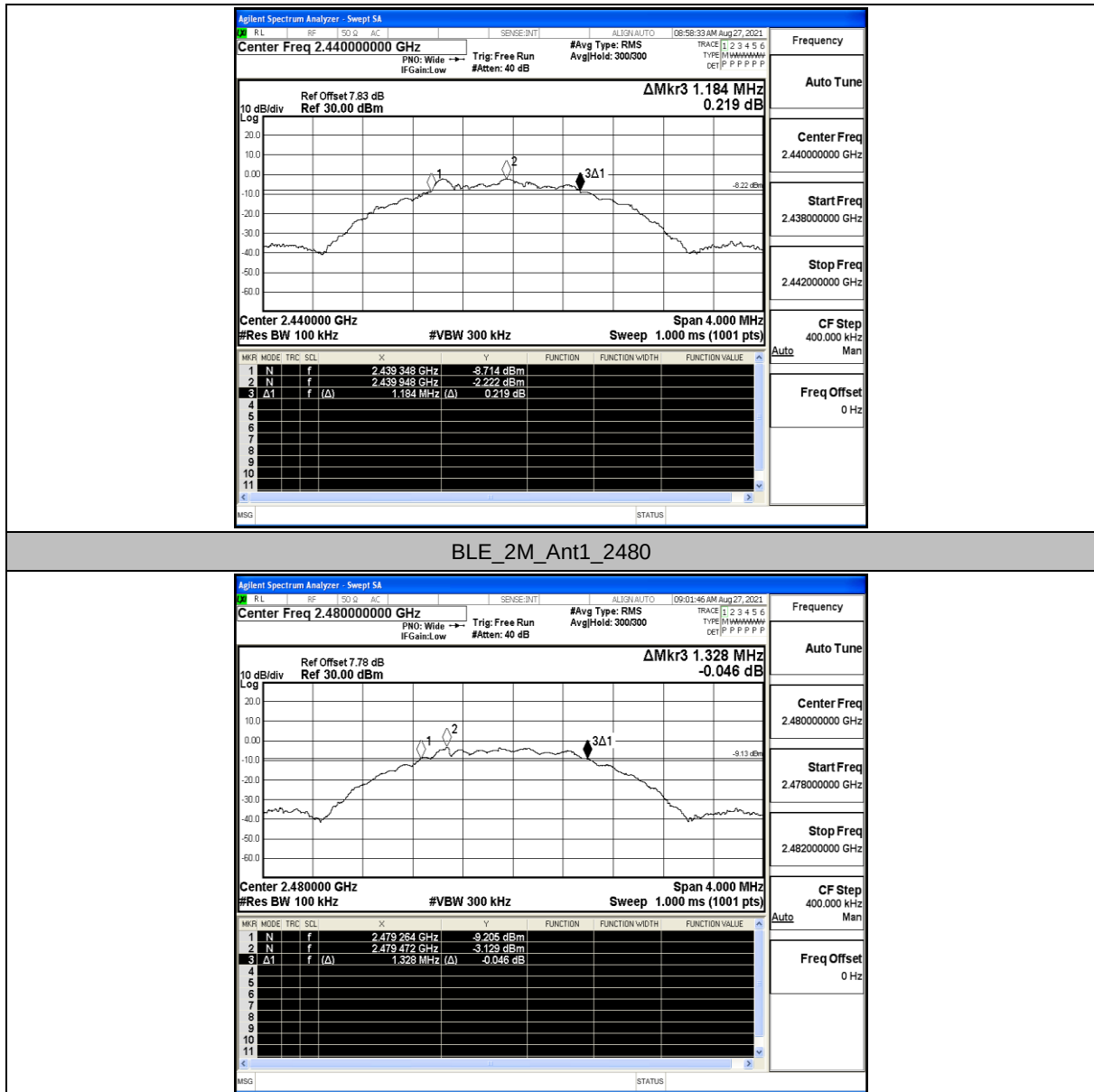




TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_2M	Ant1	2402	1.160	2401.436	2402.596	≥0.5	PASS
		2440	1.184	2439.348	2440.532	≥0.5	PASS
		2480	1.328	2479.264	2480.592	≥0.5	PASS

Test Graphs





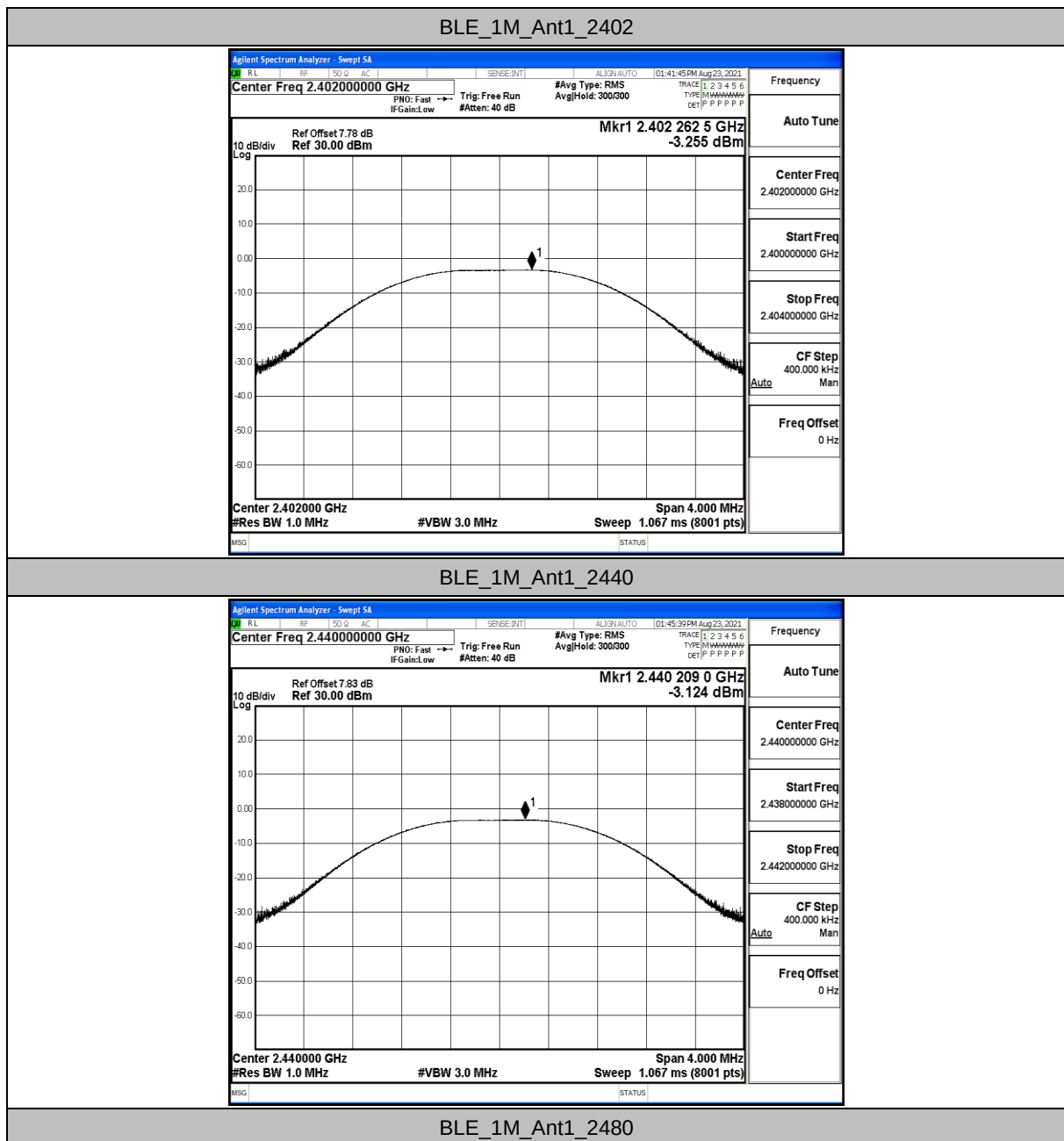


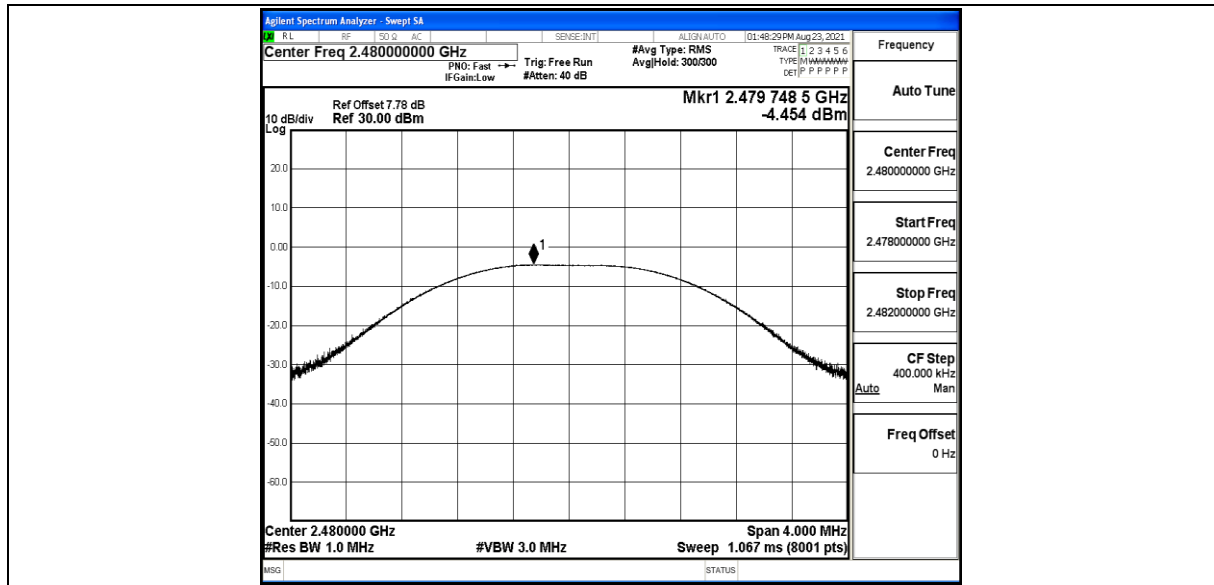
A.2 Maximum conducted output power

Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-3.26	≤30	PASS
		2440	-3.12	≤30	PASS
		2480	-4.45	≤30	PASS

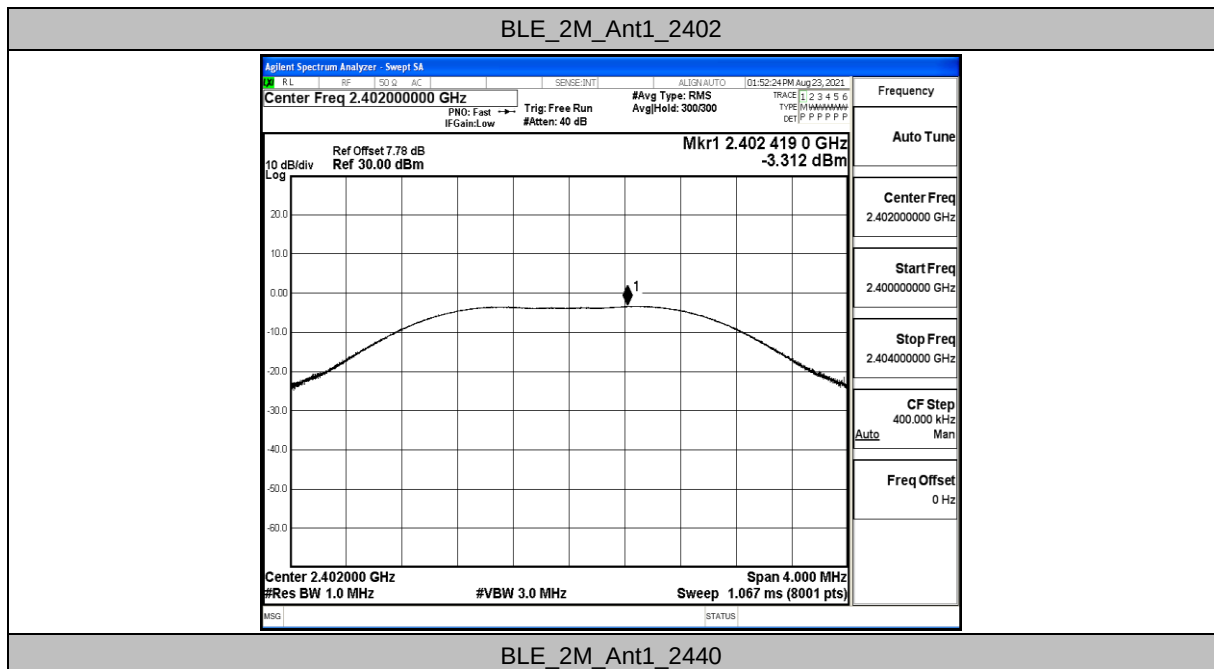
Test Graphs

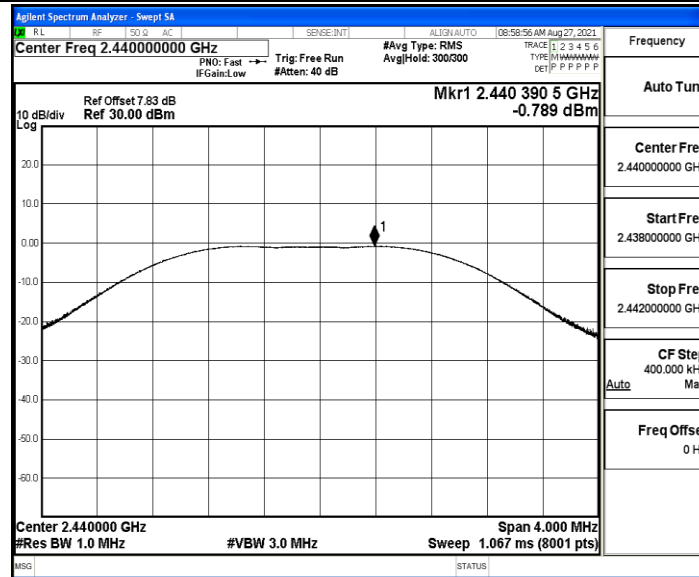




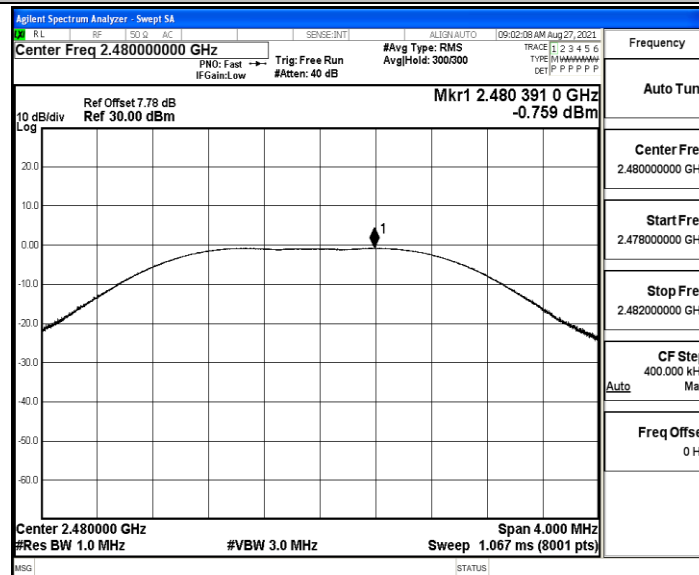
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	-3.31	≤30	PASS
		2440	-0.79	≤30	PASS
		2480	-0.76	≤30	PASS

Test Graphs





BLE_2M_Ant1_2480



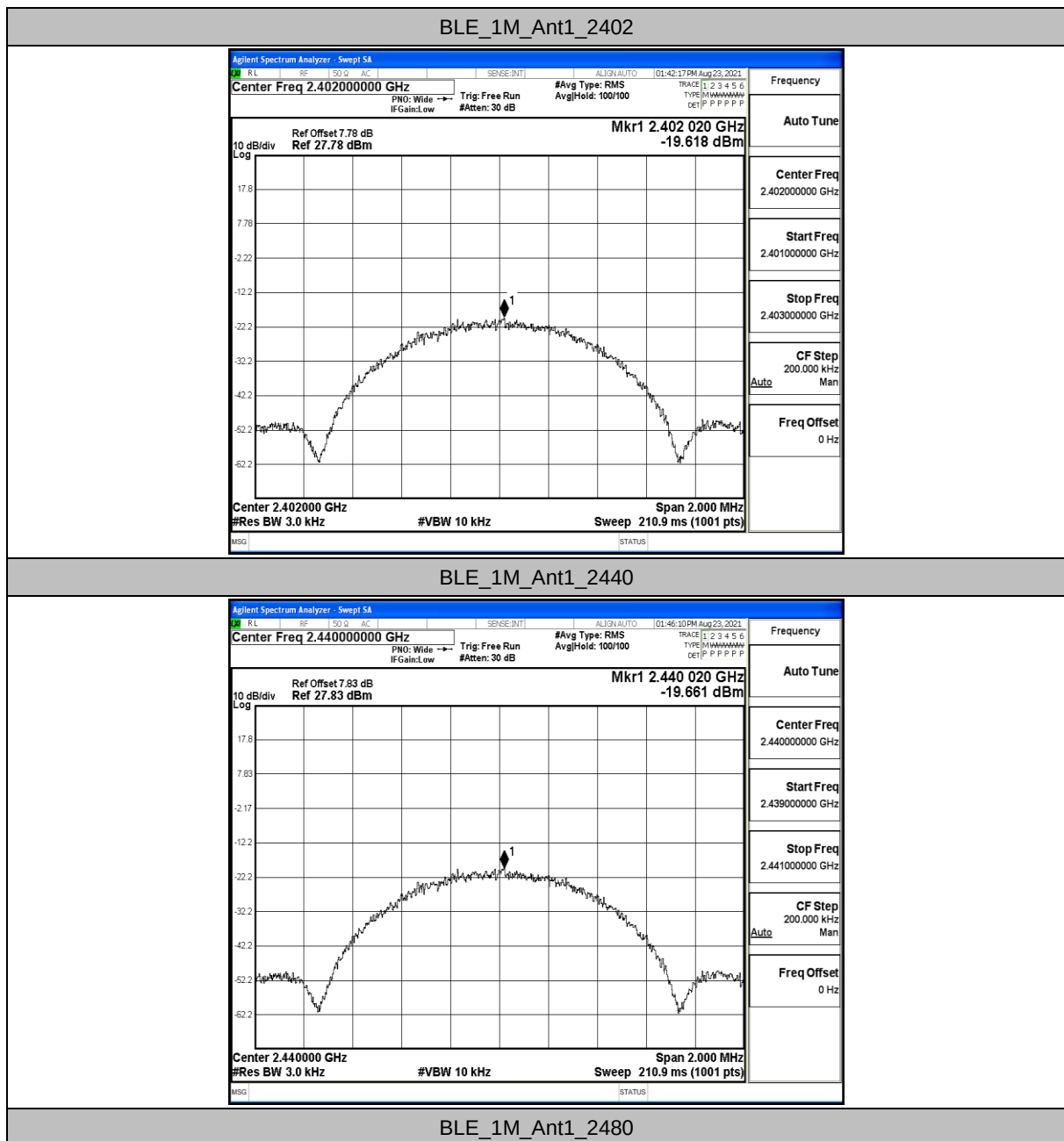


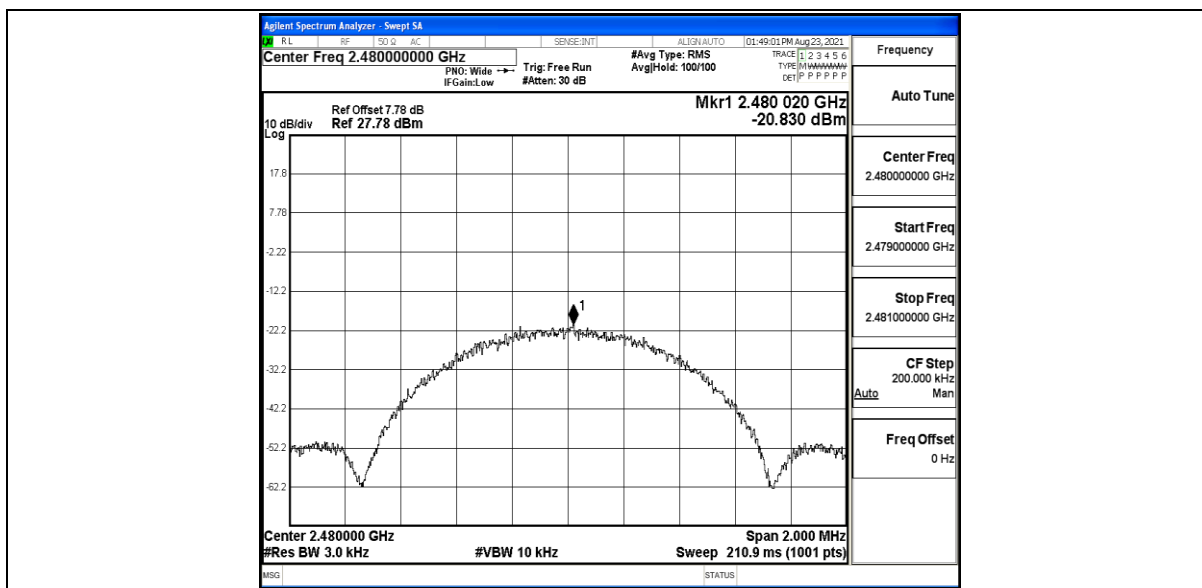
A.3 Maximum power spectral density

Test Result

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-19.62	≤8	PASS
		2440	-19.66	≤8	PASS
		2480	-20.83	≤8	PASS

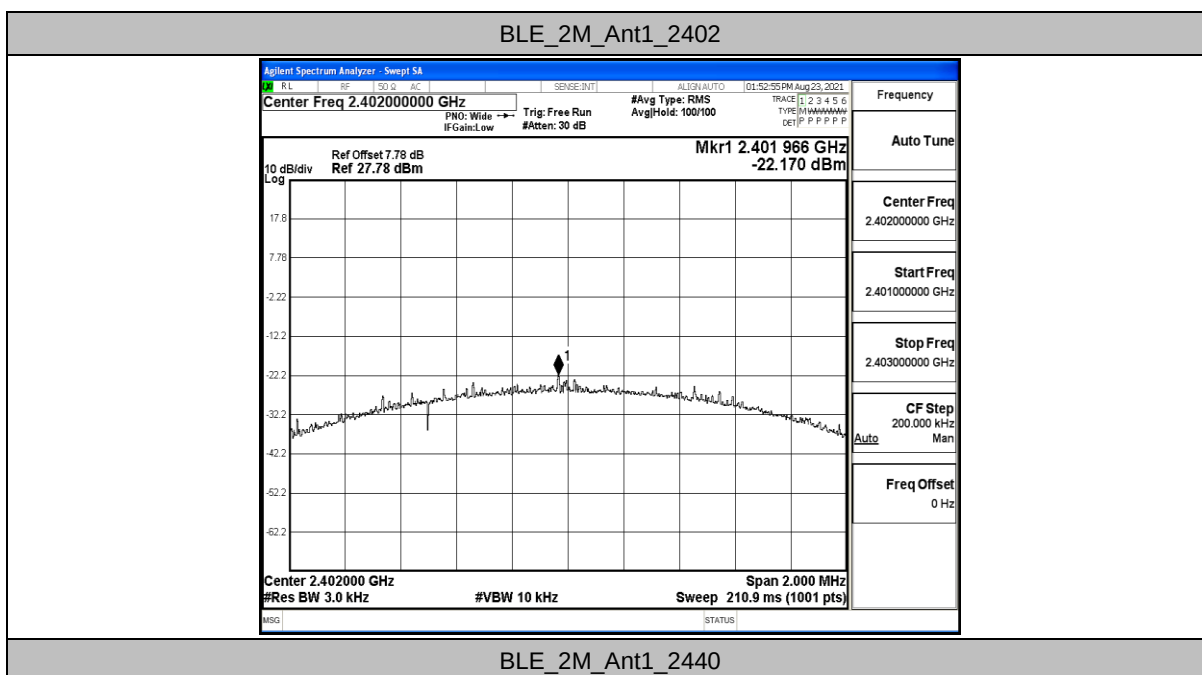
Test Graphs

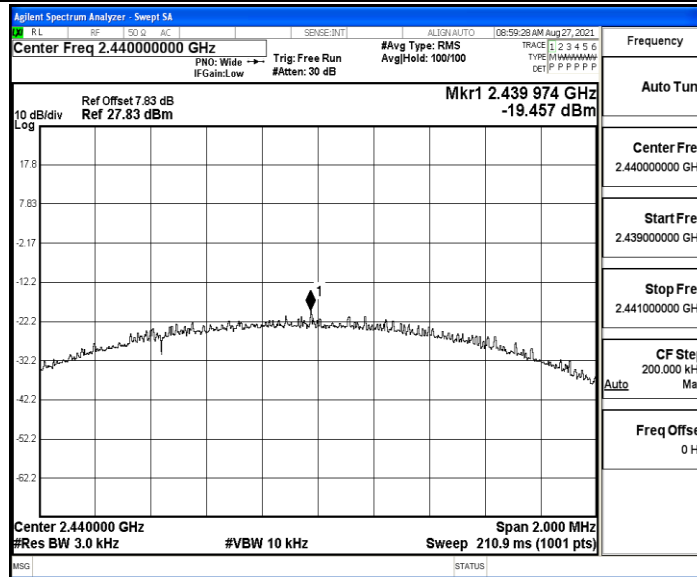




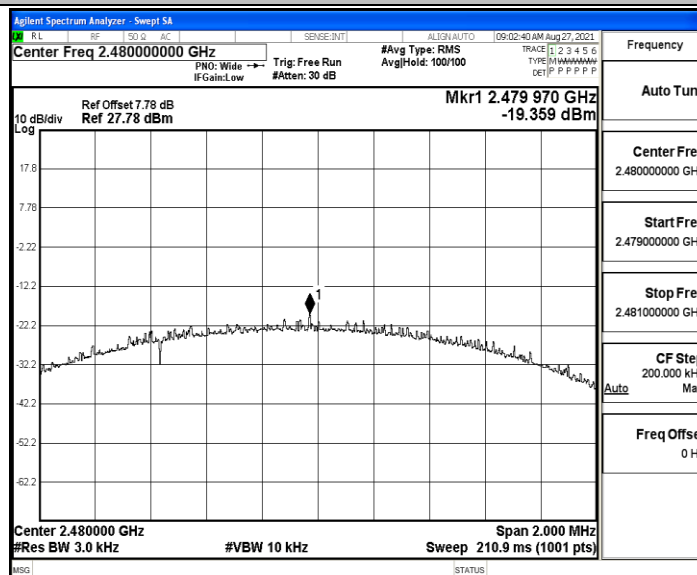
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_2M	Ant1	2402	-22.17	≤8	PASS
		2440	-19.46	≤8	PASS
		2480	-19.36	≤8	PASS

Test Graphs





BLE_2M_Ant1_2480



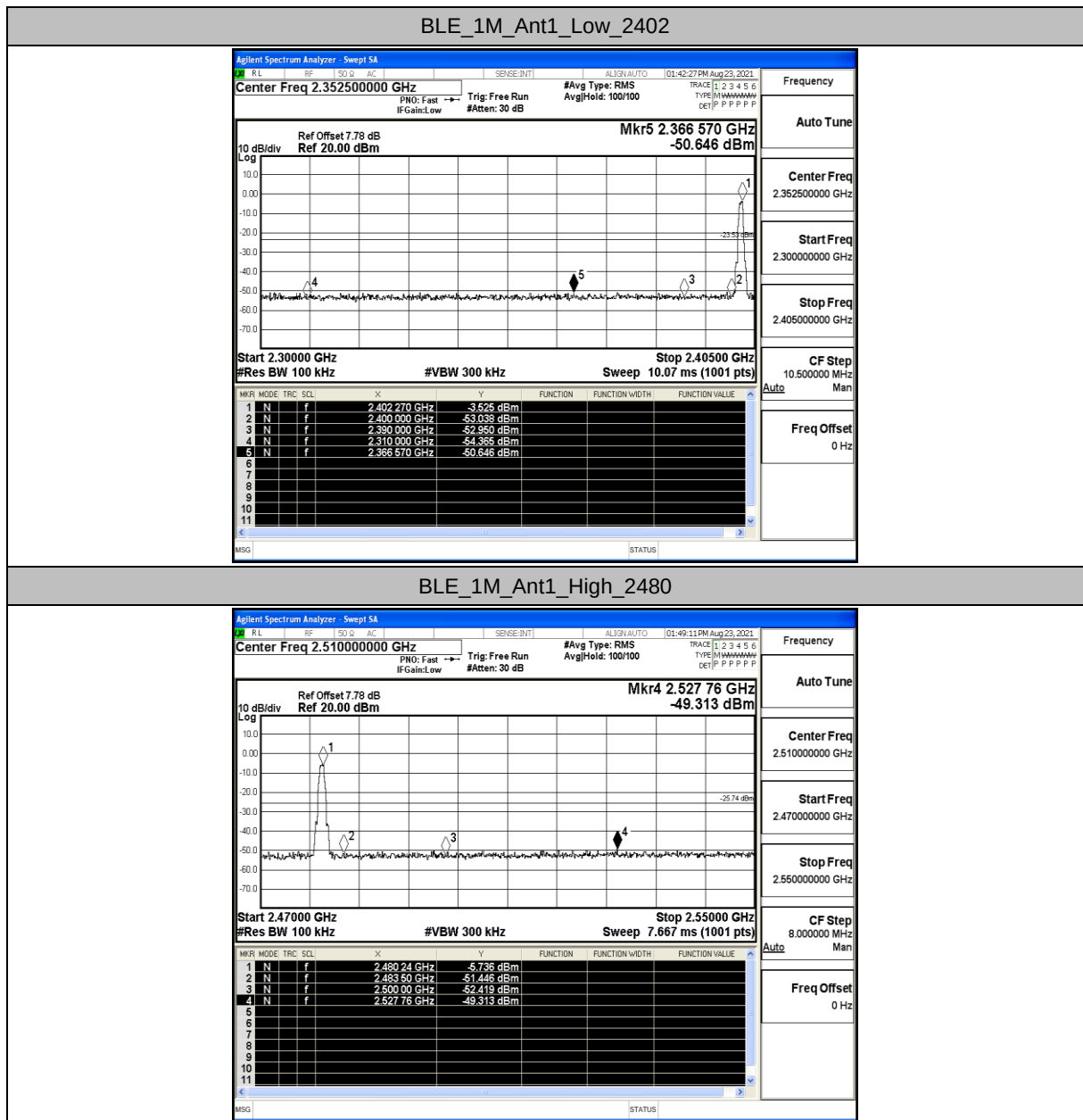


A.4 Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-3.53	-50.65	≤-23.53	PASS
		High	2480	-5.74	-49.31	≤-25.74	PASS

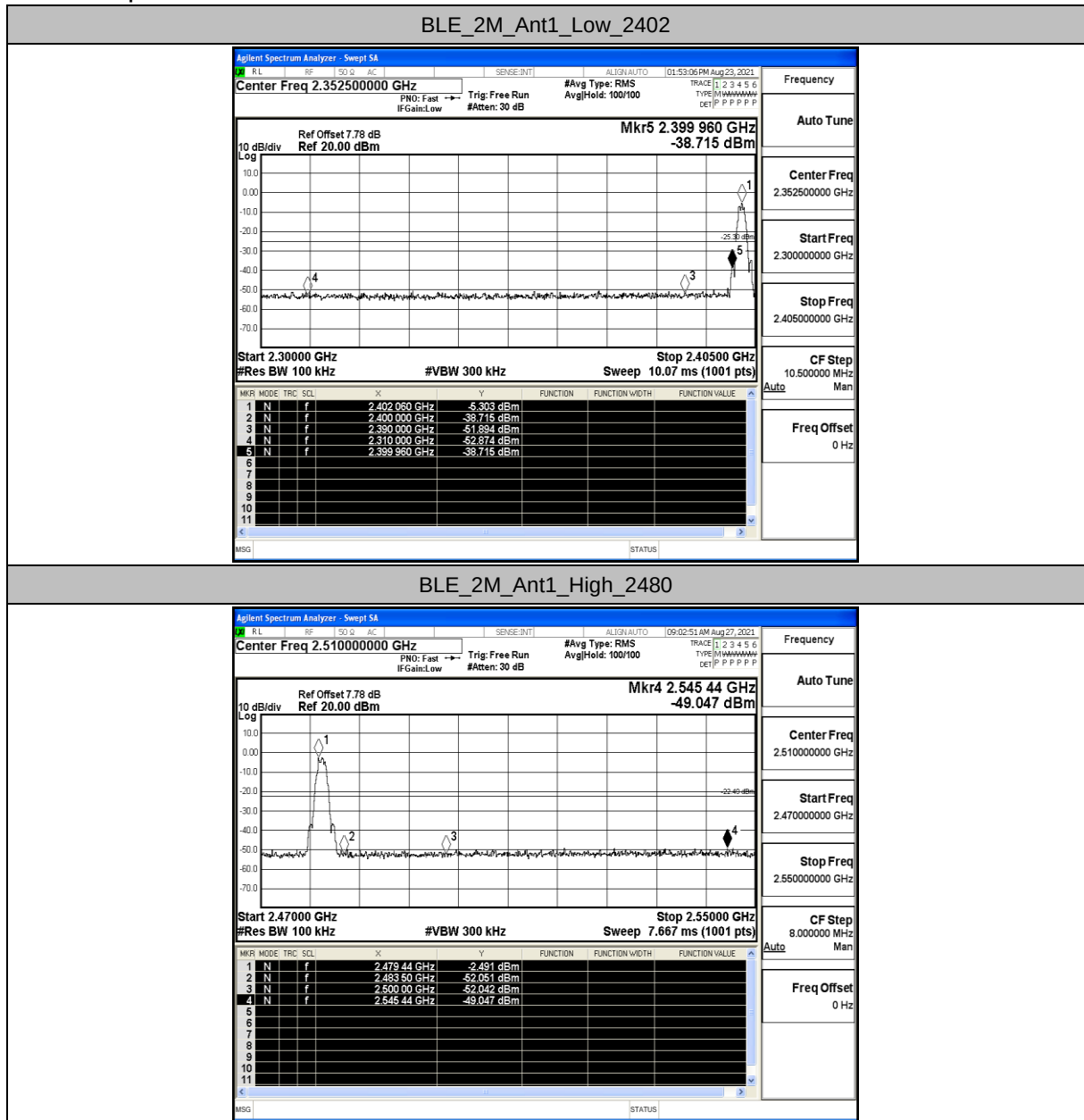
Test Graphs

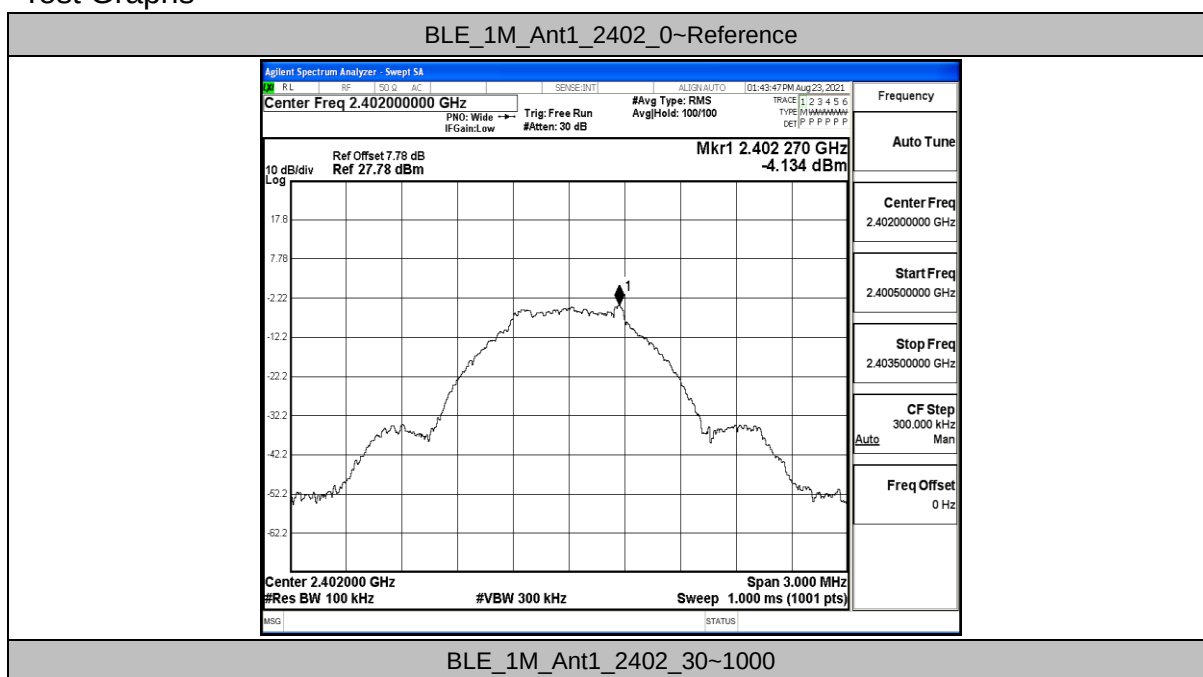


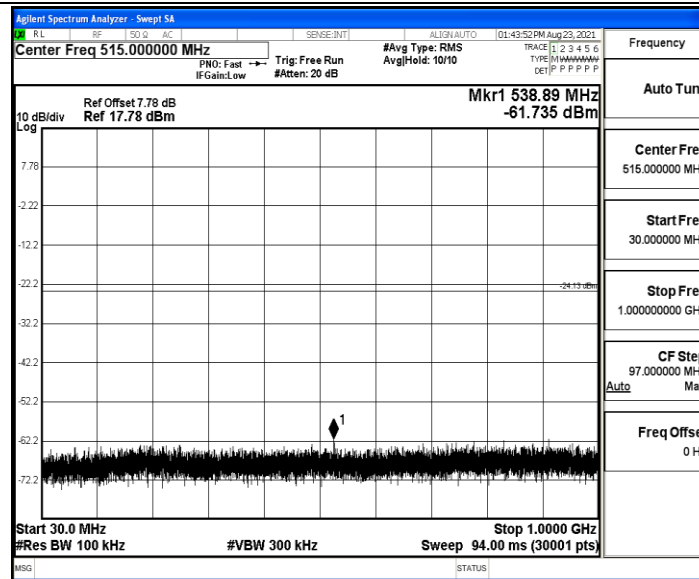


TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	Low	2402	-5.30	-38.72	≤-25.3	PASS
		High	2480	-2.49	-49.05	≤-22.49	PASS

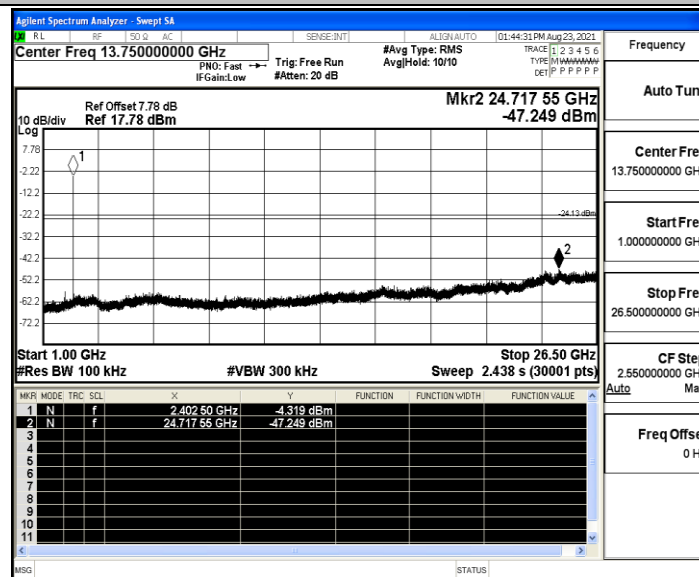
Test Graphs



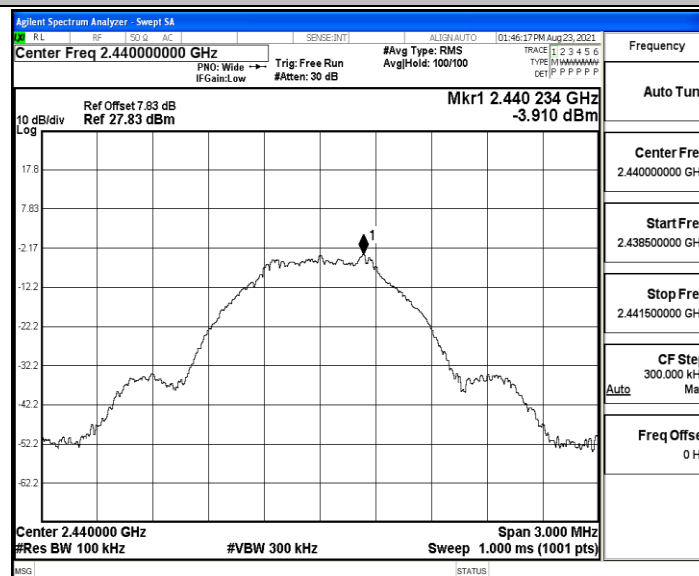




BLE_1M_Ant1_2402_1000~26500

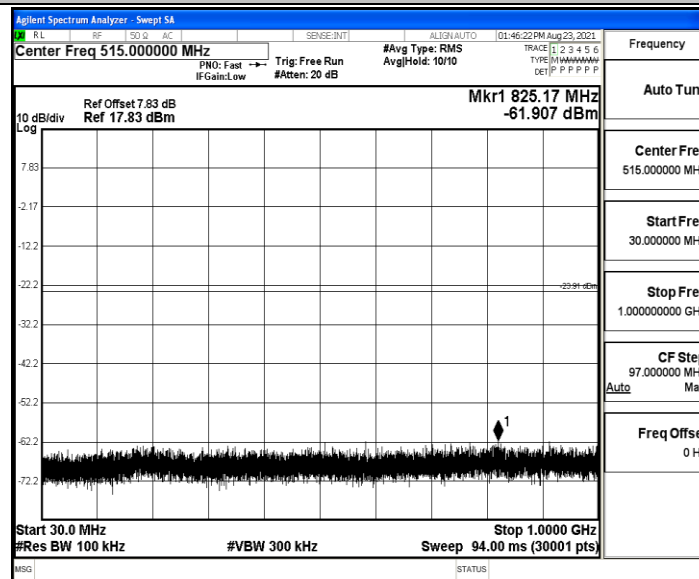


BLE_1M_Ant1_2440_0~Reference

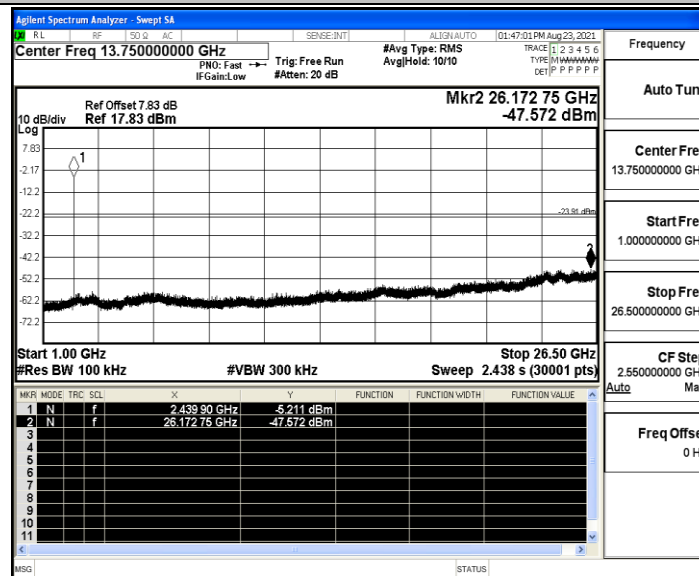




BLE_1M_Ant1_2440_30~1000



BLE_1M_Ant1_2440_1000~26500

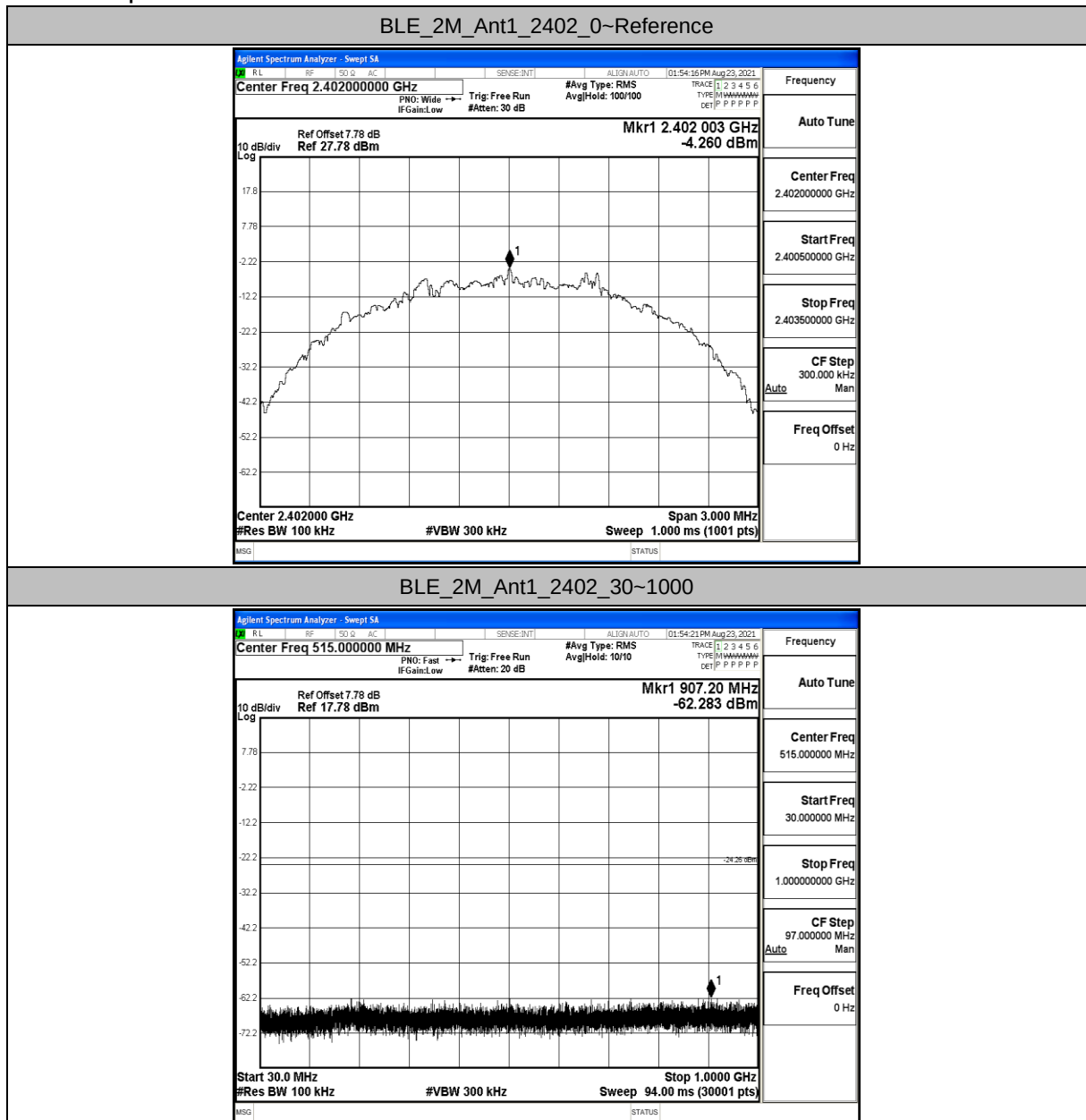


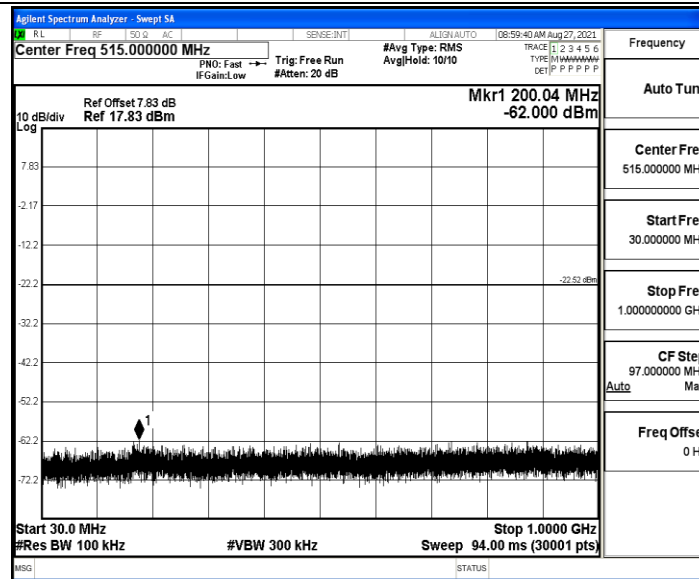
BLE_1M_Ant1_2480_0~Reference



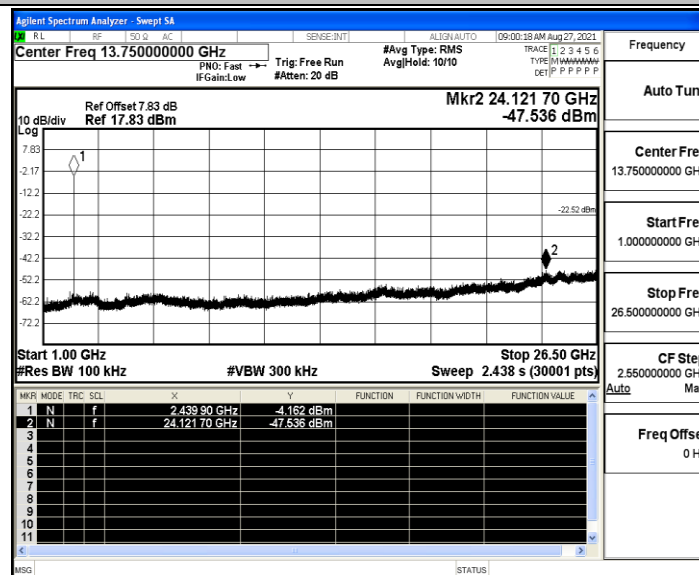
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	Reference	-4.26	-4.26	---	PASS
			30~1000	-4.26	-62.28	≤-24.26	PASS
			1000~26500	-4.26	-47.82	≤-24.26	PASS
		2440	Reference	-2.52	-2.52	---	PASS
			30~1000	-2.52	-62	≤-22.52	PASS
			1000~26500	-2.52	-47.54	≤-22.52	PASS
		2480	Reference	-2.34	-2.34	---	PASS
			30~1000	-2.34	-61.93	≤-22.34	PASS
			1000~26500	-2.34	-47.56	≤-22.34	PASS

Test Graphs

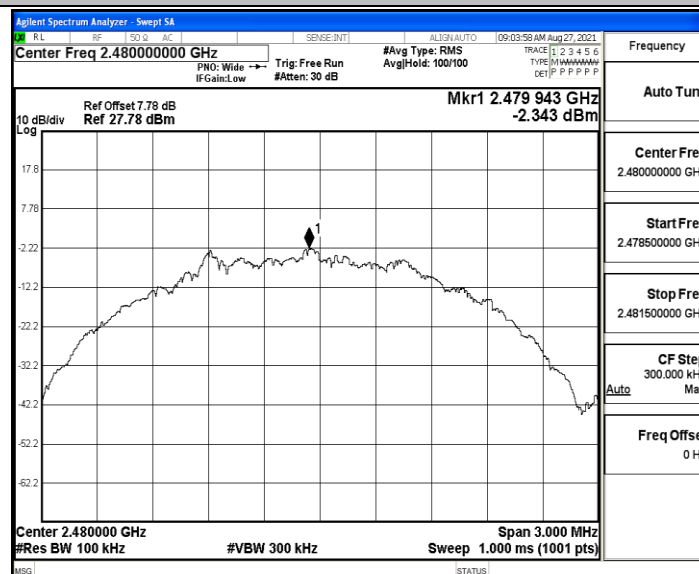




BLE_2M_Ant1_2440_1000~26500

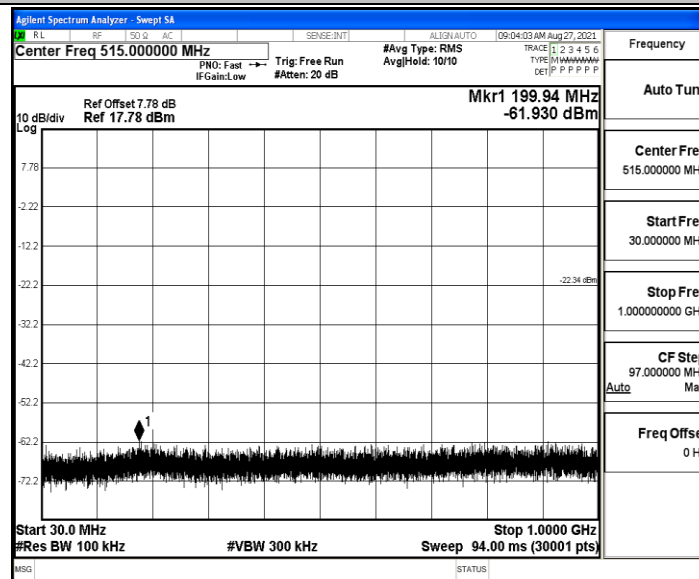


BLE_2M_Ant1_2480_0~Reference

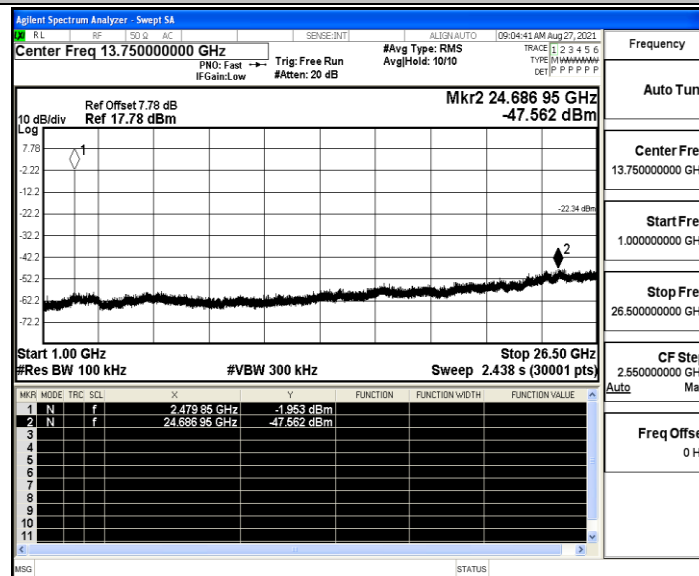




BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500



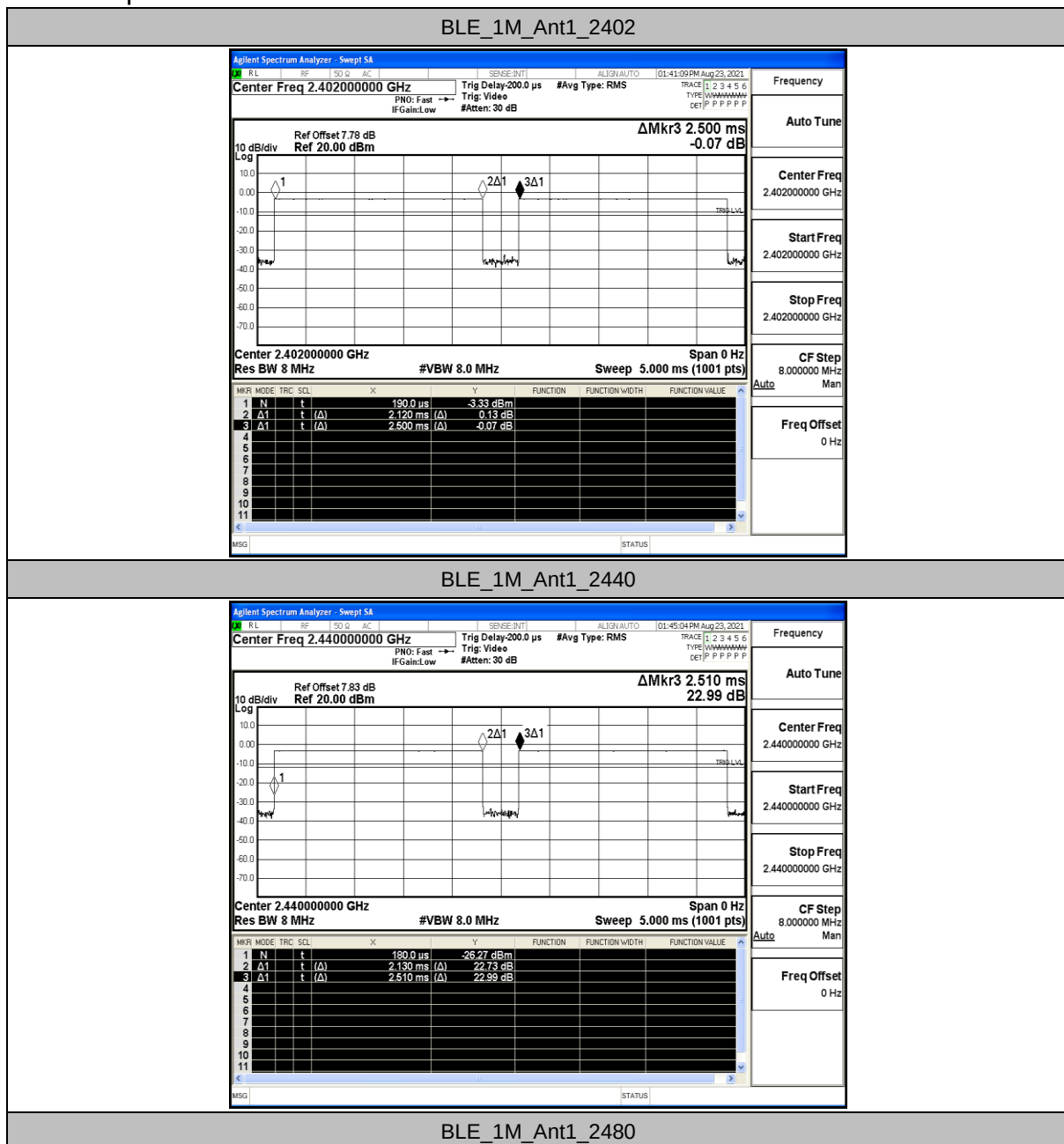


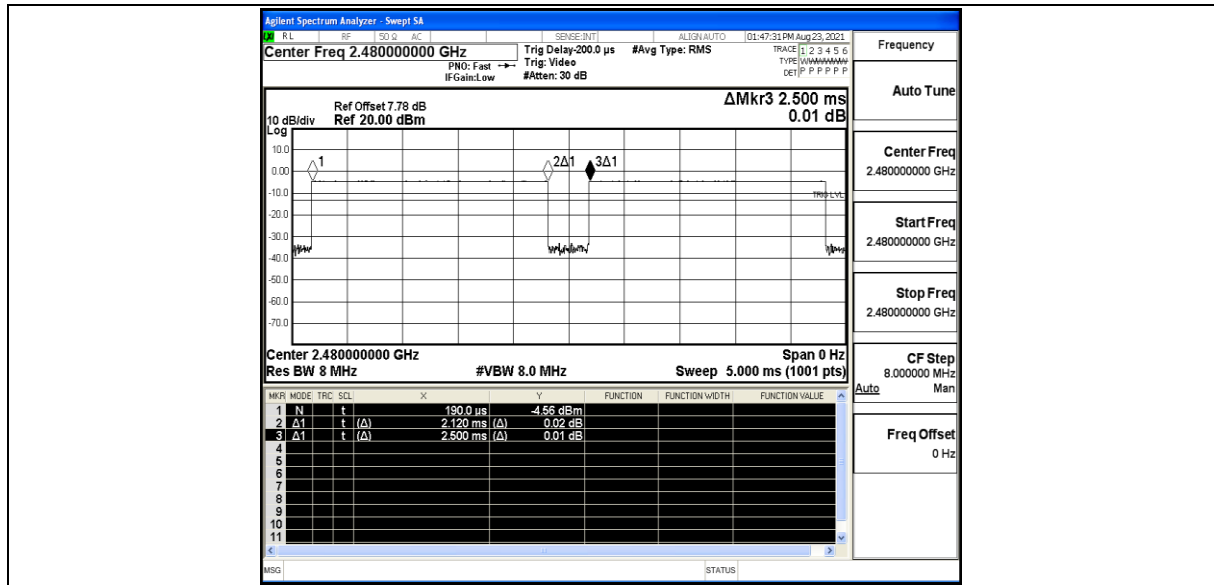
A.6 Duty Cycle

Test Result

TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.12	2.50	0.8480	84.80	0.72	---	PASS
		2440	2.13	2.51	0.8486	84.86	0.71	---	PASS
		2480	2.12	2.50	0.8480	84.80	0.72	---	PASS

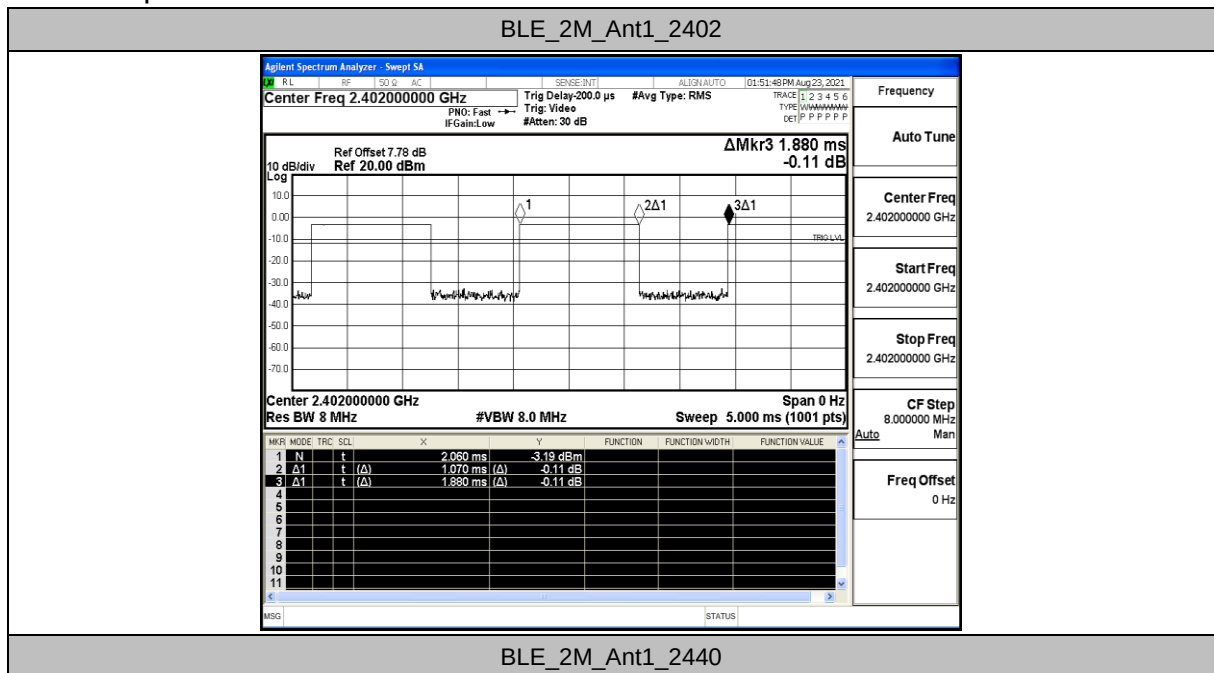
Test Graphs

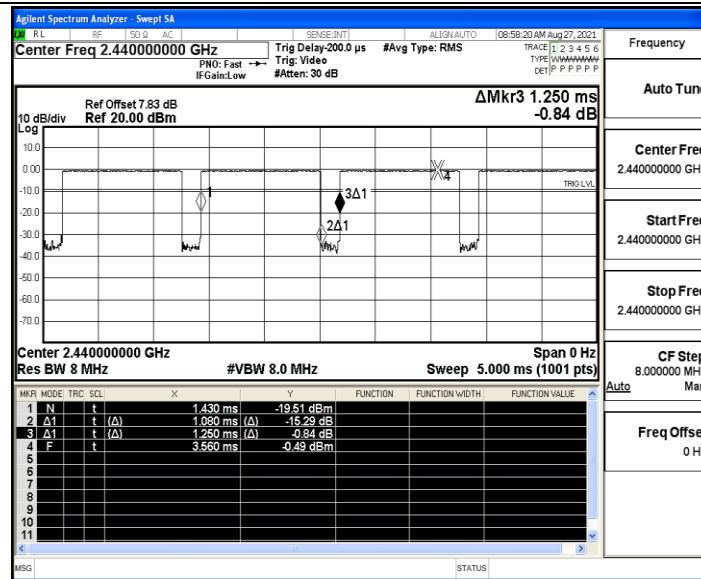




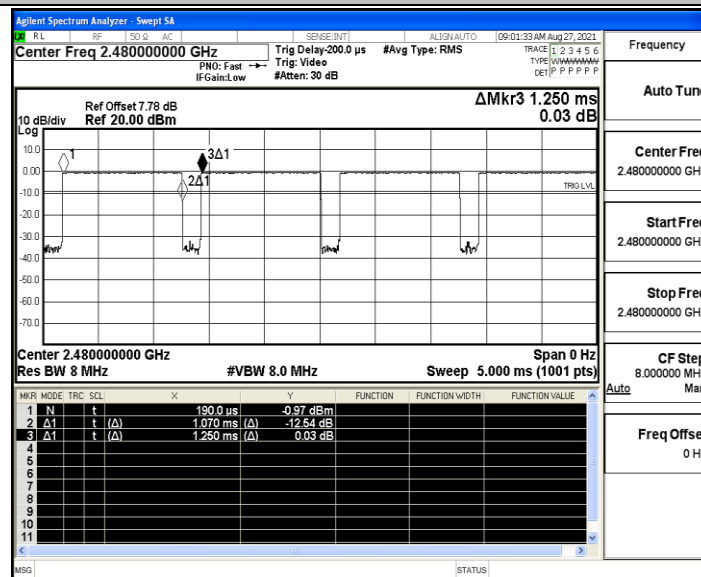
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_2M	Ant1	2402	1.07	1.88	0.5691	56.91	2.45	---	PASS
		2440	1.08	1.25	0.8640	86.40	0.63	---	PASS
		2480	1.07	1.25	0.8560	85.60	0.68	---	PASS

Test Graphs





BLE_2M_Ant1_2480





A.7 Emissions in Restricted Bands

Test Result

TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-48.95	≤-41.20	46.25	≤54	PASS
				AV	2379.485	-48.53	≤-41.20	46.67	≤54	PASS
				AV	2390.000	-48.69	≤-41.20	46.51	≤54	PASS
				Peak	2310.000	-41.63	≤-21.20	53.57	≤74	PASS
				Peak	2312.285	-39.32	≤-21.20	55.88	≤74	PASS
				Peak	2390.000	-41.11	≤-21.20	54.09	≤74	PASS
		High	2480	AV	2483.500	-48.12	≤-41.20	47.08	≤54	PASS
				AV	2498.160	-47.99	≤-41.20	47.21	≤54	PASS
				AV	2500.000	-48.07	≤-41.20	47.13	≤54	PASS
				Peak	2483.500	-38.95	≤-21.20	56.25	≤74	PASS
				Peak	2499.440	-38.55	≤-21.20	56.65	≤74	PASS
				Peak	2500.000	-40.97	≤-21.20	54.23	≤74	PASS

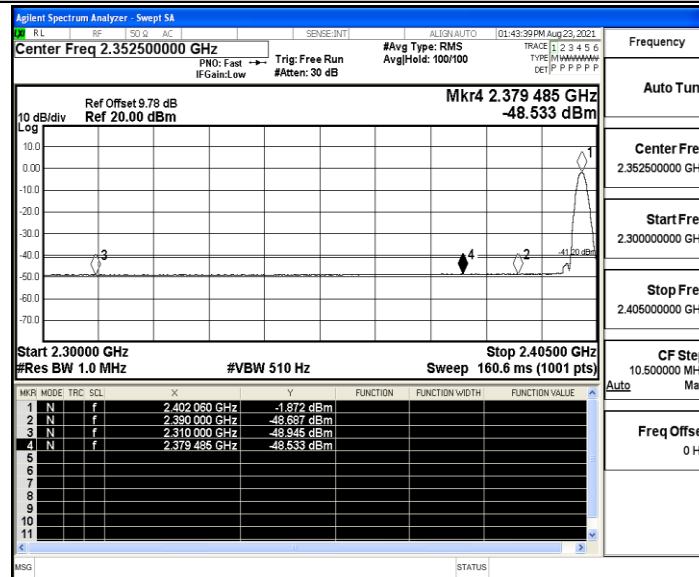
Note:

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.

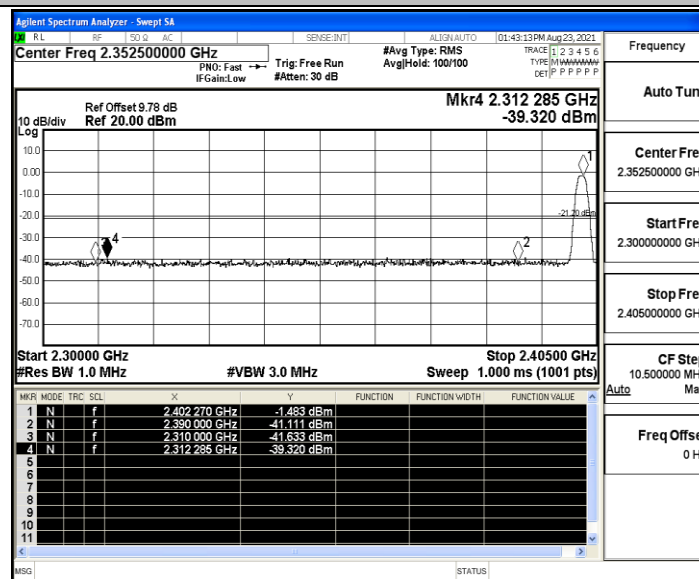


Test Graphs

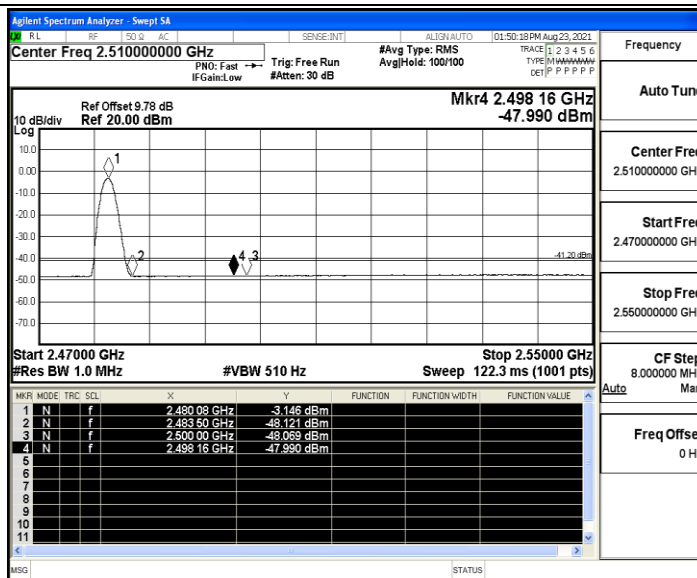
BLE_1M_Ant1_Low_2402_AV



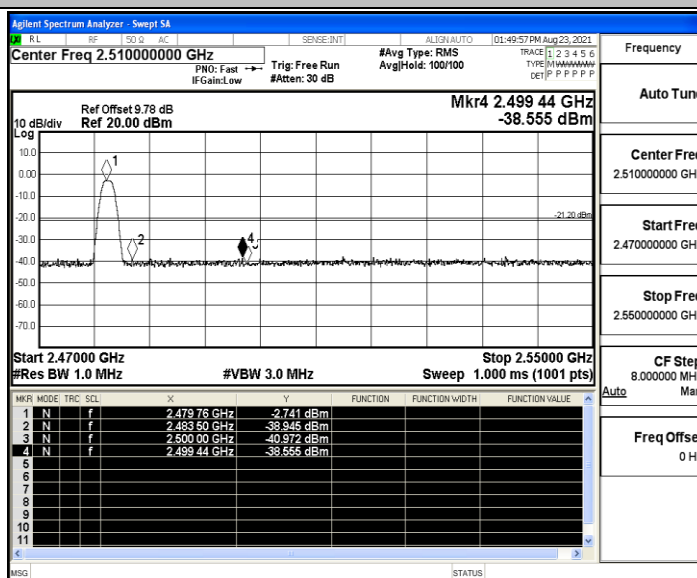
BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak





TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_2M	Ant1	Low	2402	AV	2310.000	-48.86	≤-41.20	46.34	≤54	PASS
				AV	2383.370	-48.31	≤-41.20	46.89	≤54	PASS
				AV	2390.000	-48.55	≤-41.20	46.65	≤54	PASS
				Peak	2310.000	-41.76	≤-21.20	53.44	≤74	PASS
				Peak	2374.130	-38.59	≤-21.20	56.61	≤74	PASS
				Peak	2390.000	-40.83	≤-21.20	54.37	≤74	PASS
		High	2480	AV	2483.500	-46.86	≤-41.20	48.34	≤54	PASS
				AV	2496.640	-46.86	≤-41.20	48.34	≤54	PASS
				AV	2500.000	-47.73	≤-41.20	47.47	≤54	PASS
				Peak	2483.500	-41.46	≤-21.20	53.74	≤74	PASS
				Peak	2486.720	-37.51	≤-21.20	57.69	≤74	PASS
				Peak	2500.000	-40.79	≤-21.20	54.41	≤74	PASS

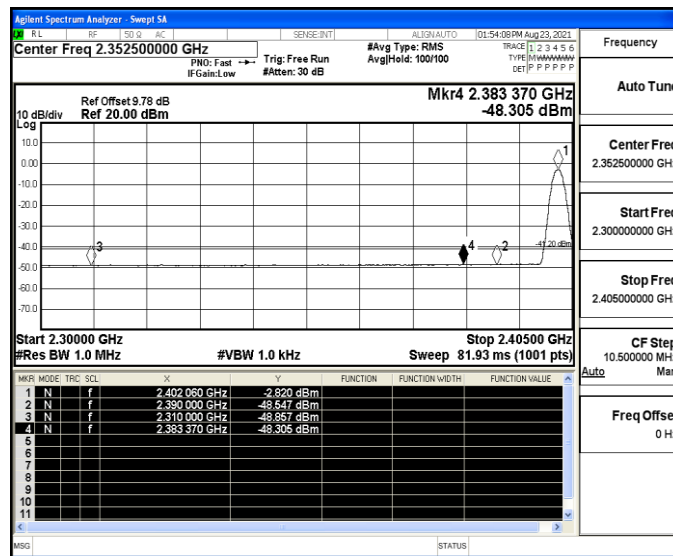
Note:

3. The Antenna Gain is compensated in the graph.
4. 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.

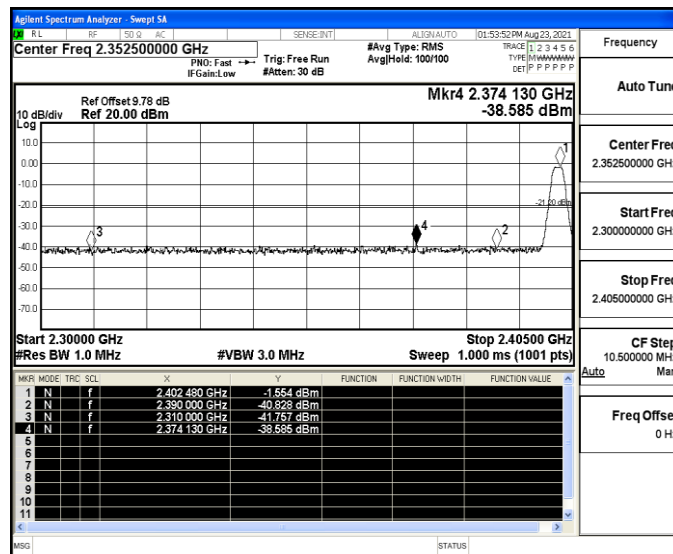


Test Graphs

BLE_2M_Ant1_Low_2402_AV



BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV

Agilent Spectrum Analyzer - Sweep 5A

RL 50 Q AC SENSE INT ALIGN AUTO 09:03:37 AM Aug 27, 2021

Center Freq 2.510000000 GHz #Avg Type: RMS
 PNO: Fast IF Gain Low Trig: Free Run AvgHold: 100/100
 #Atten: 30 dB TYPEN: HAWAIIAN
 DET: P P P P P P P

Ref Offset: 9.78 dB Mkr4 2.491 76 GHz
 Ref 20.00 dBm -37.515 dBm

10 dB/div
 Log

1
 2
 3
 4

Mkr4 2.491 76 GHz
 -37.515 dBm

Start 2.47000 GHz Stop 2.55000 GHz
 #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N		f	2.480 48 GHz	1.089 dBm			
2	N		f	2.483 50 GHz	-41.463 dBm			
3	N		f	2.500 00 GHz	-40.785 dBm			
4	N		f	2.491 76 GHz	-37.515 dBm			

MSO STATUS