Appendix B

RF Test Data for BLE (Conducted Measurement)

Product Name: Rugged Handheld Computer

Test Model: EA520

Environmental Conditions

Temperature:	21.2° C
Relative Humidity:	52.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Kay Hu
Supervised by:	Li Huan

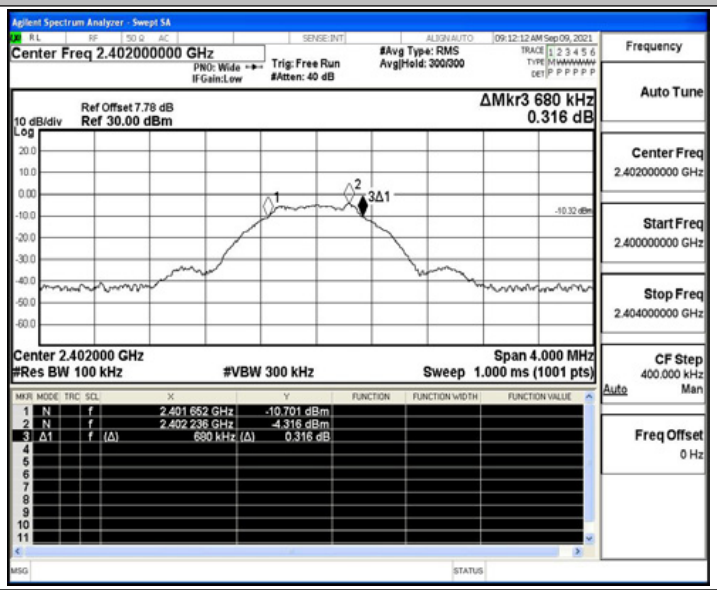
B.1 6dB Bandwidth

Test Result

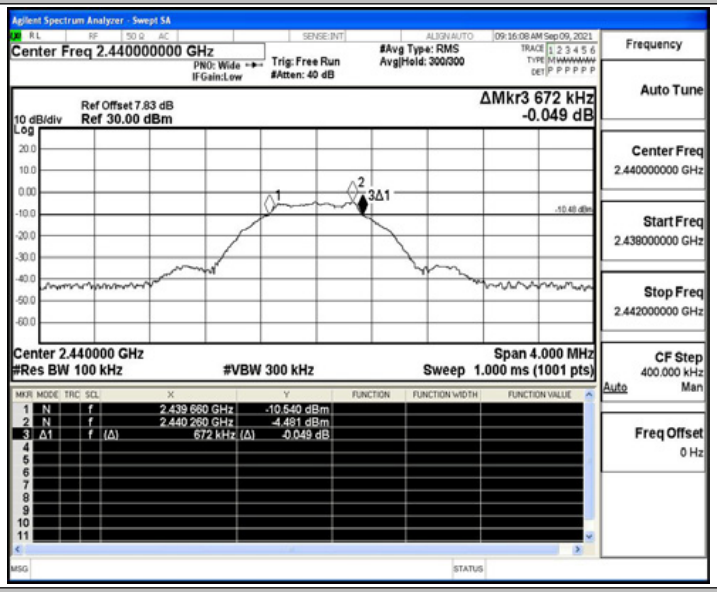
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.680	2401.652	2402.332	≥0.5	PASS
		2440	0.672	2439.660	2440.332	≥0.5	PASS
		2480	0.704	2479.644	2480.348	≥0.5	PASS

Test Graphs

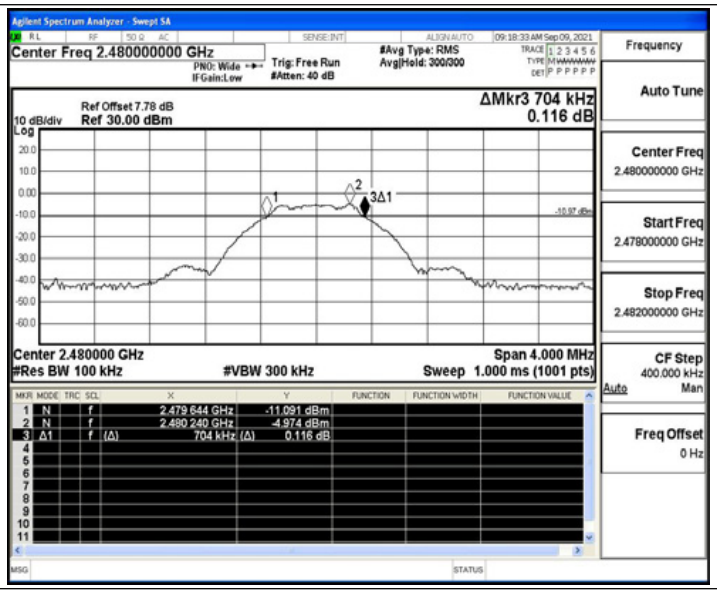
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



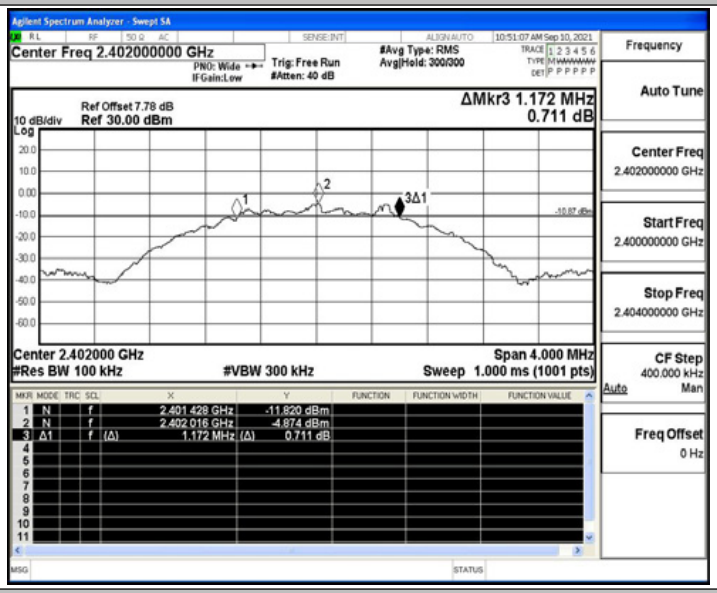
BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
09:18:33 AM Sep 09, 2021
Frequency
Auto Tune
Ref Offset 7.78 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 704 kHz
0.116 dB
Center Freq
2.480000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.482000000 GHz
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
1 N 1 f 2.479 644 GHz -11.091 dBm
2 N 1 f 2.480 240 GHz -4.974 dBm
3 Δ1 f (Δ) 704 kHz (Δ) 0.116 dB

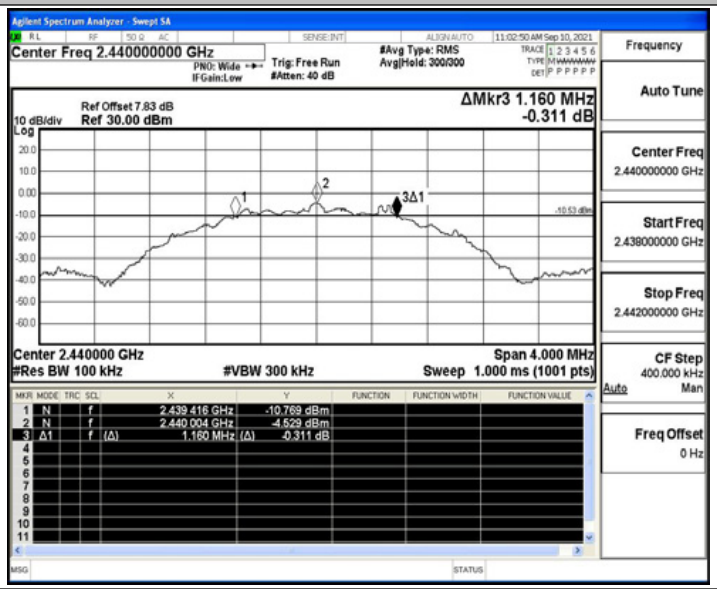
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_2M	Ant1	2402	1.172	2401.428	2402.600	≥0.5	PASS
		2440	1.160	2439.416	2440.576	≥0.5	PASS
		2480	1.388	2479.308	2480.696	≥0.5	PASS

Test Graphs

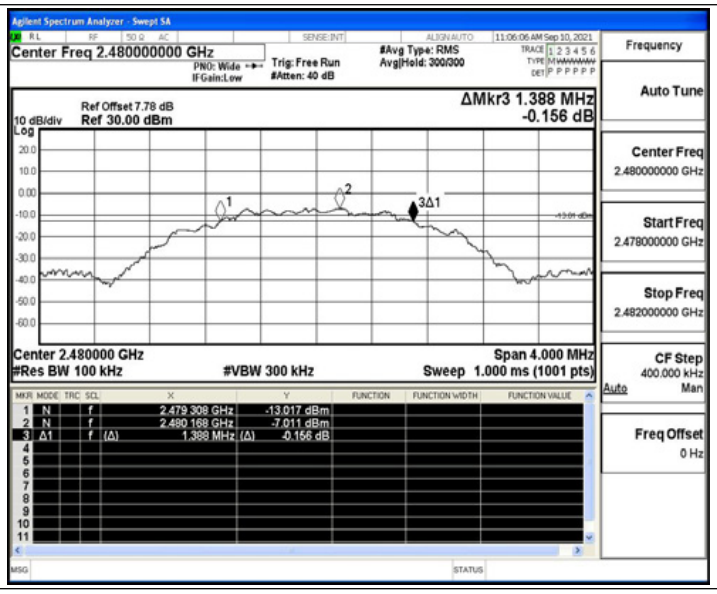
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
11:06:06 AM Sep 10, 2021
Frequency
Auto Tune
Ref Offset 7.78 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 1.388 MHz
-0.156 dB
Center Freq
2.480000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.482000000 GHz
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
1 N 1 f 2.479 308 GHz -13.017 dBm
2 N 1 f 2.480 168 GHz -7.011 dBm
3 Δ1 f (Δ) 1.388 MHz (Δ) -0.156 dB
MSG
STATUS

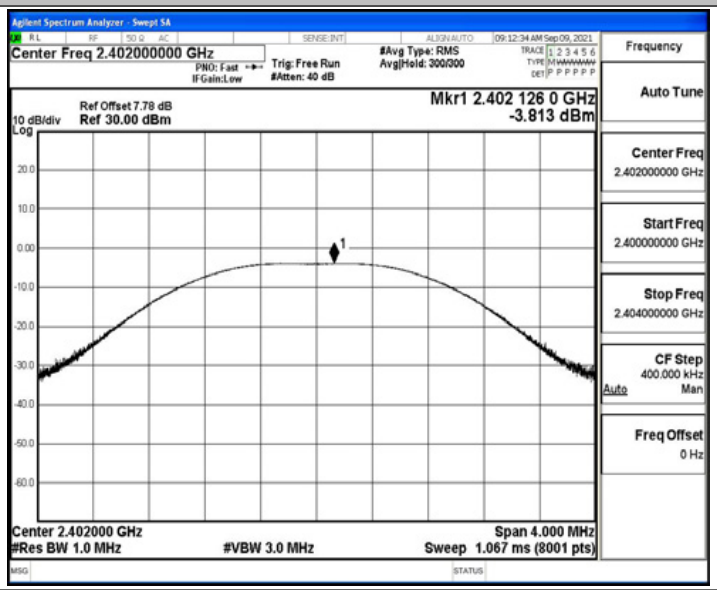
B.2 Maximum conducted output power

Test Result

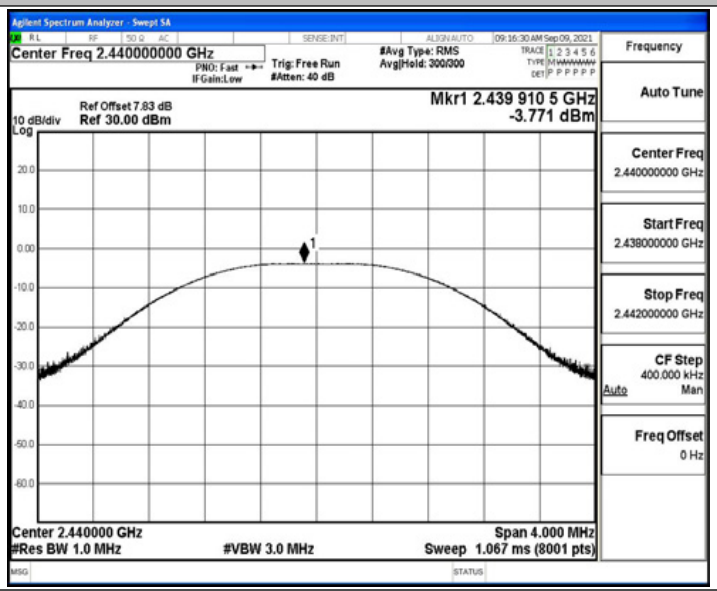
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-3.81	≤30	PASS
		2440	-3.77	≤30	PASS
		2480	-3.88	≤30	PASS

Test Graphs

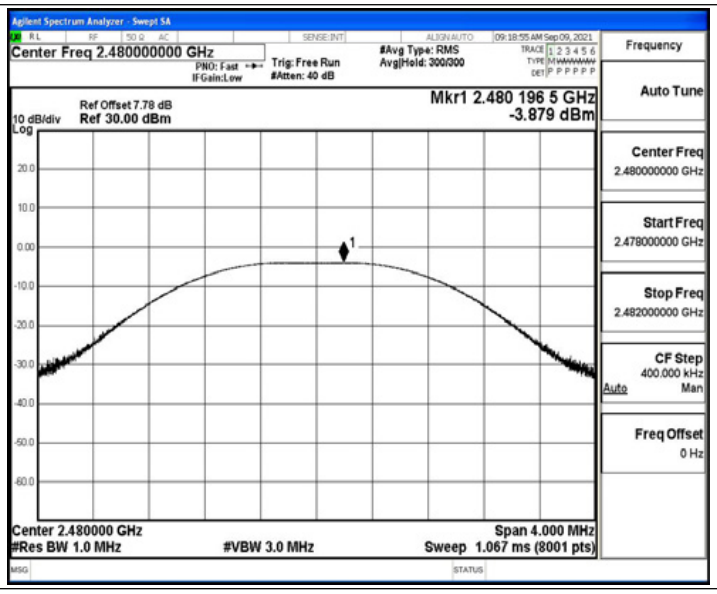
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



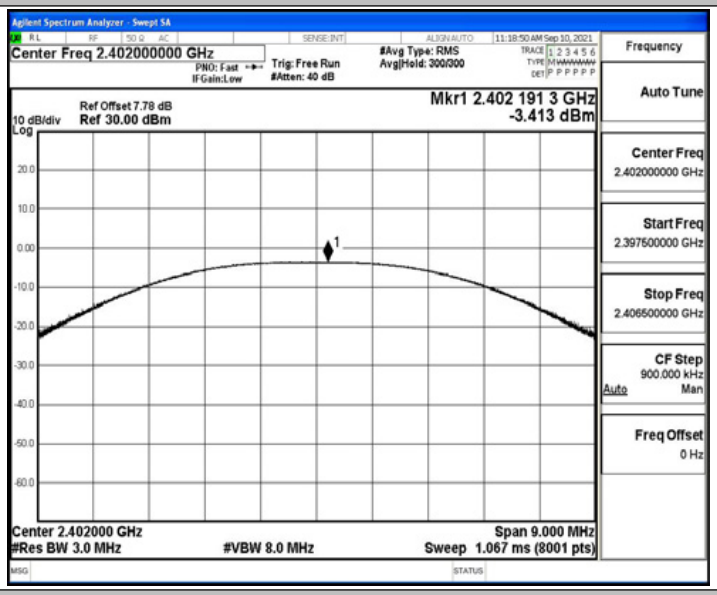
BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
09:18:55 AM Sep 09, 2021
Frequency
Auto Tune
Ref Offset 7.78 dB
10 dB/div Ref 30.00 dBm
Log
Mkr1 2.480 196 5 GHz
-3.879 dBm
Center Freq
2.480000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.482000000 GHz
CF Step
400.000 kHz
Auto Man
Freq Offset
0 Hz
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 4.000 MHz
Sweep 1.067 ms (8001 pts)

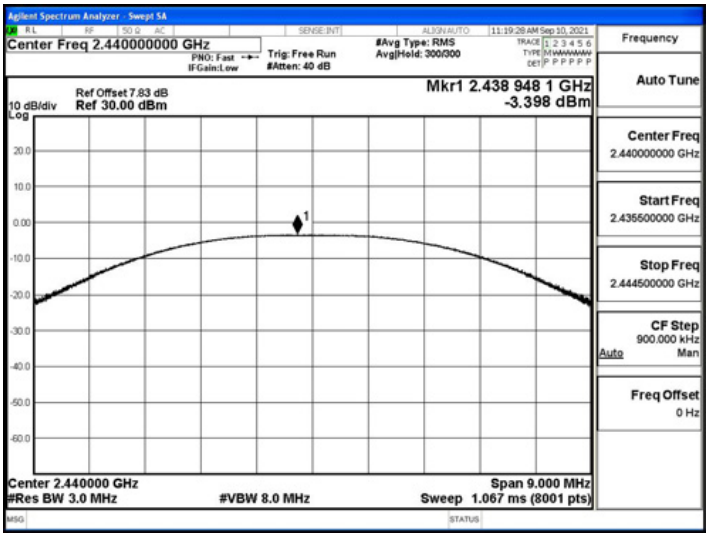
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	-3.41	≤30	PASS
		2440	-3.40	≤30	PASS
		2480	-3.38	≤30	PASS

Test Graphs

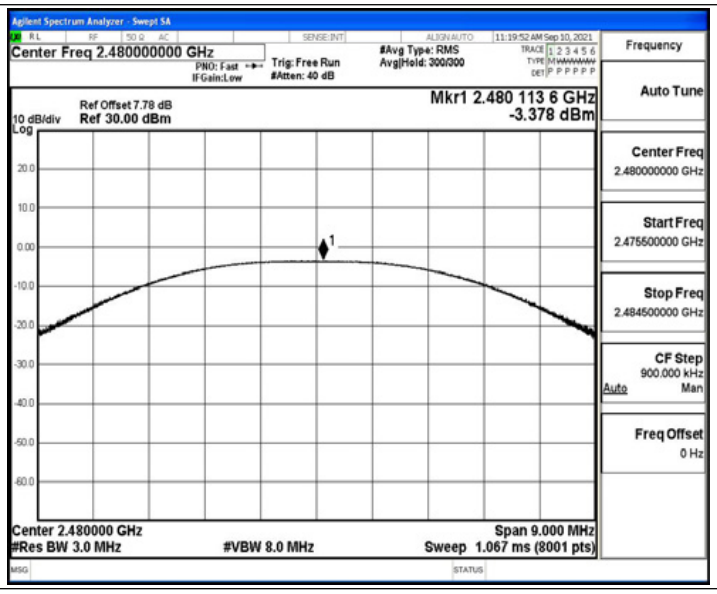
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
11:19:52 AM Sep 10, 2021
Ref Offset 7.78 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 2.480 113 6 GHz
-3.378 dBm
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 9.000 MHz
Sweep 1.067 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.475500000 GHz
Stop Freq
2.484500000 GHz
CF Step
900.000 kHz
Auto
Man
Freq Offset
0 Hz

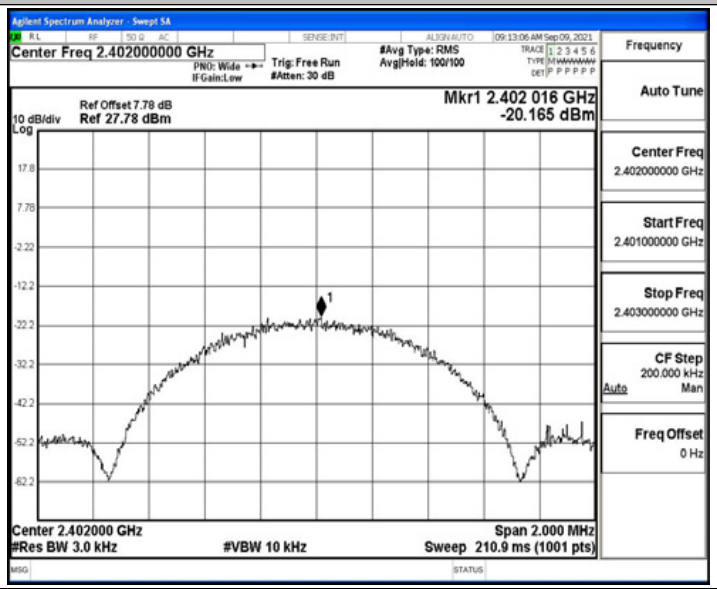
B.3 Maximum power spectral density

Test Result

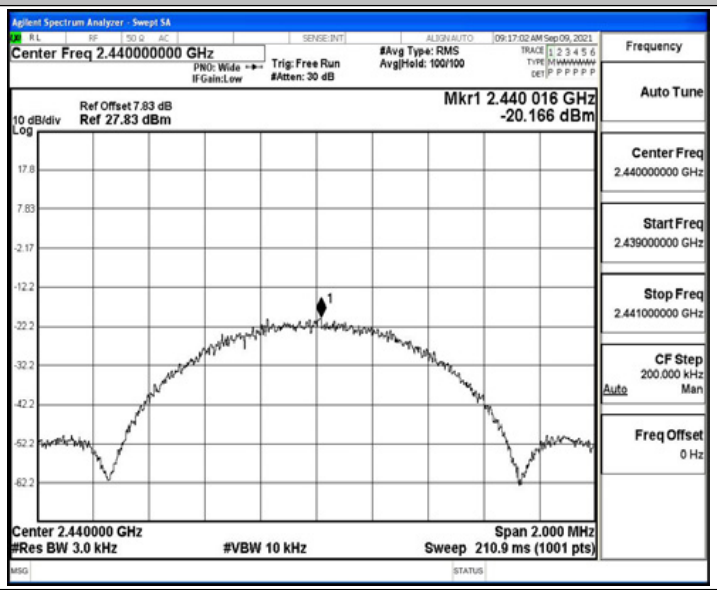
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-20.17	≤8	PASS
		2440	-20.17	≤8	PASS
		2480	-20.35	≤8	PASS

Test Graphs

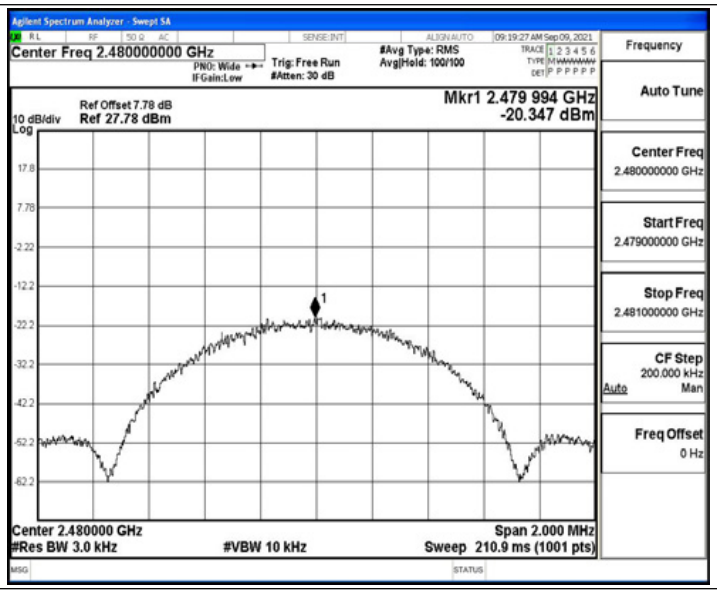
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



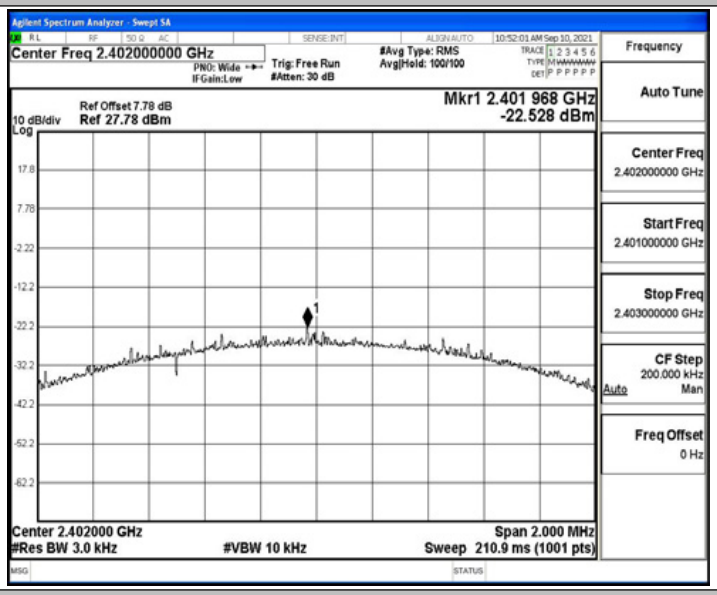
BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:19:27 AM Sep 09, 2021
Ref Offset 7.78 dB
10 dB/div
Log
Ref 27.78 dBm
Mkr1 2.479 994 GHz
-20.347 dBm
17.8
7.78
-2.22
-12.2
-22.2
-32.2
-42.2
-52.2
-62.2
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479000000 GHz
Stop Freq
2.481000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

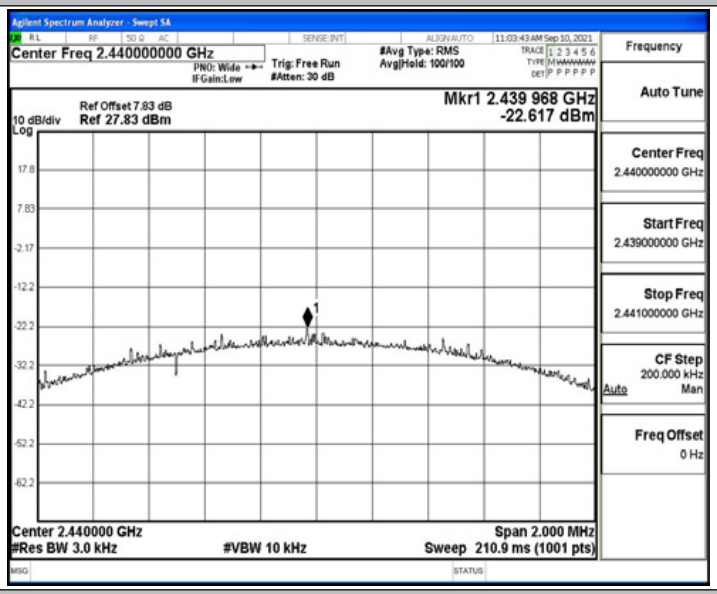
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_2M	Ant1	2402	-22.53	≤8	PASS
		2440	-22.62	≤8	PASS
		2480	-22.57	≤8	PASS

Test Graphs

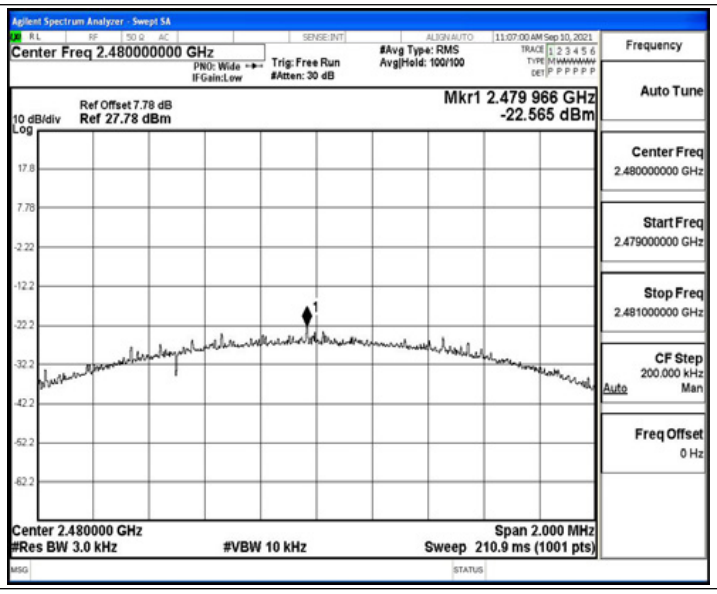
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:07:00 AM Sep 10, 2021
Frequency
Auto Tune
Ref Offset 7.78 dB
10 dB/div Ref 27.78 dBm
Log
Mkr1 2.479 966 GHz
-22.565 dBm
17.8
7.78
-2.22
-12.2
-22.2
-32.2
-42.2
-52.2
-62.2
Center Freq
2.480000000 GHz
Start Freq
2.479000000 GHz
Stop Freq
2.481000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
MSG
STATUS

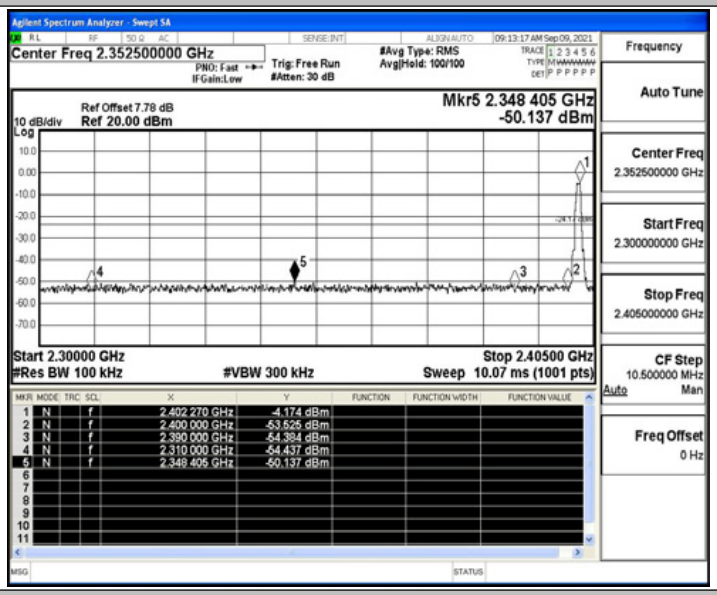
B.4 Band edge measurements

Test Result

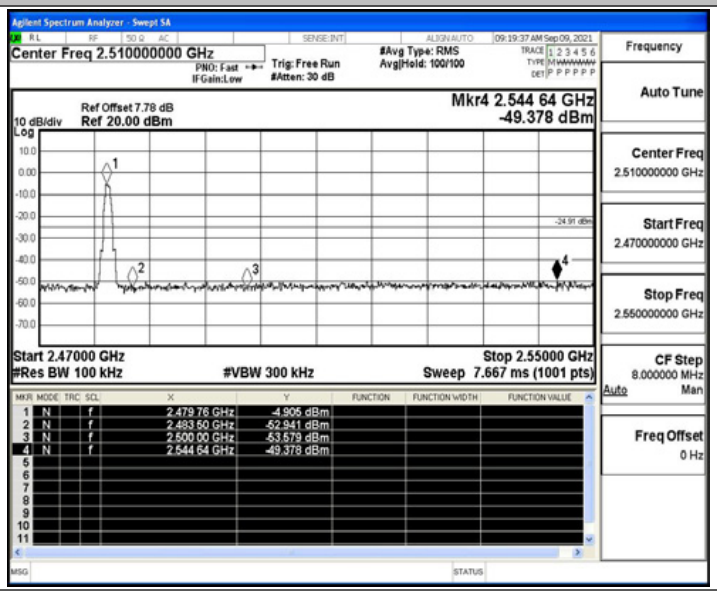
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-4.17	-50.14	≤-24.17	PASS
		High	2480	-4.91	-49.38	≤-24.91	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



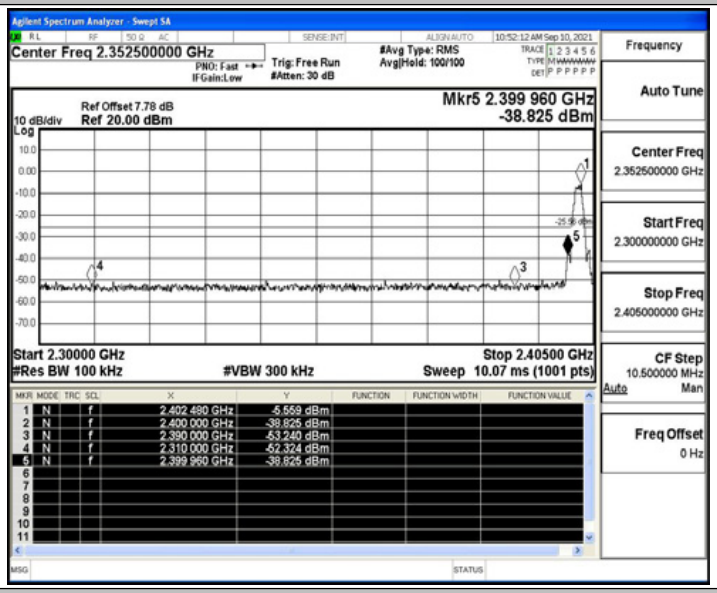
BLE_1M_Ant1_High_2480



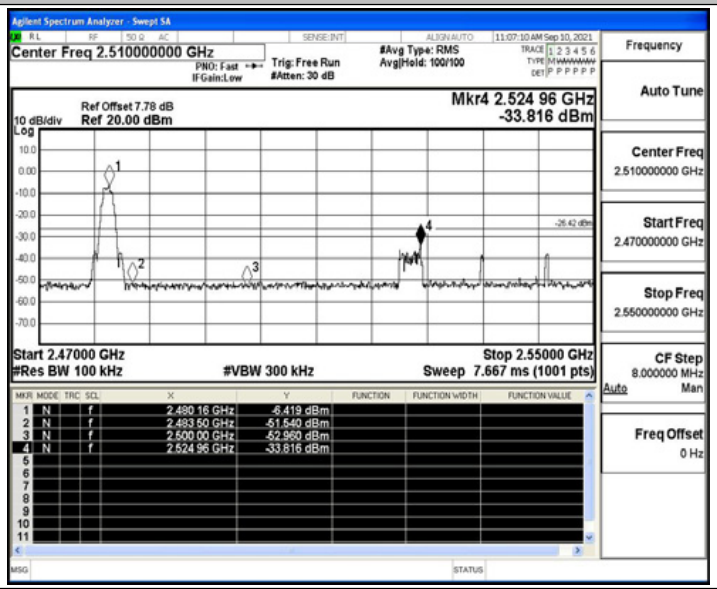
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	Low	2402	-5.56	-38.83	≤-25.56	PASS
		High	2480	-6.42	-33.82	≤-26.42	PASS

Test Graphs

BLE_2M_Ant1_Low_2402



BLE_2M_Ant1_High_2480



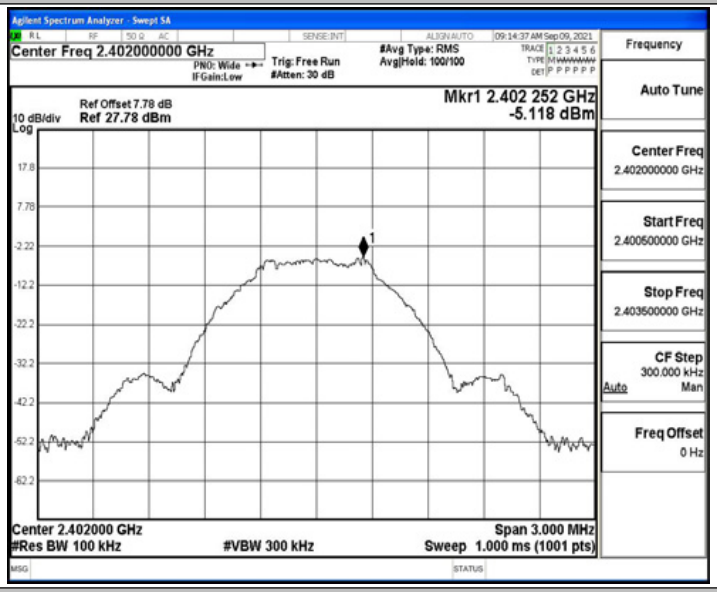
B.5 Conducted Spurious Emission

Test Result

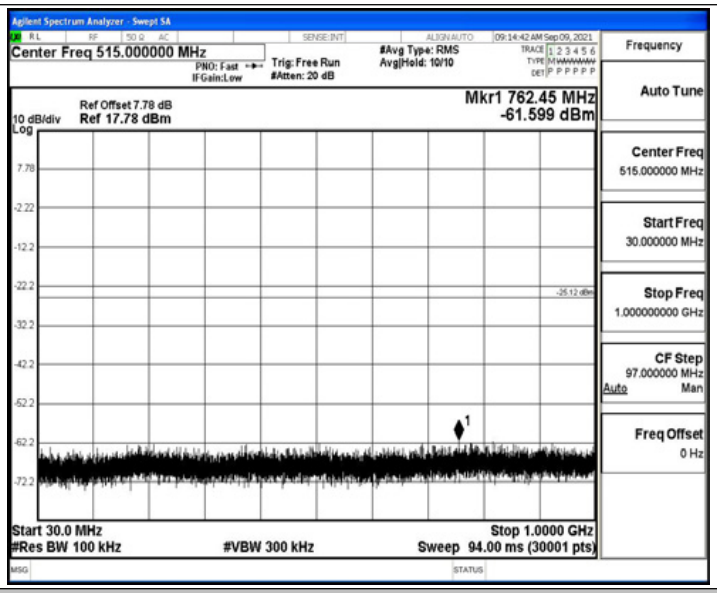
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-5.12	-5.12	---	PASS
			30~1000	-5.12	-61.6	≤-25.12	PASS
			1000~26500	-5.12	-47.52	≤-25.12	PASS
		2440	Reference	-4.30	-4.30	---	PASS
			30~1000	-4.30	-61.94	≤-24.3	PASS
			1000~26500	-4.30	-47.8	≤-24.3	PASS
		2480	Reference	-4.69	-4.69	---	PASS
			30~1000	-4.69	-60.39	≤-24.69	PASS
			1000~26500	-4.69	-39.31	≤-24.69	PASS

Test Graphs

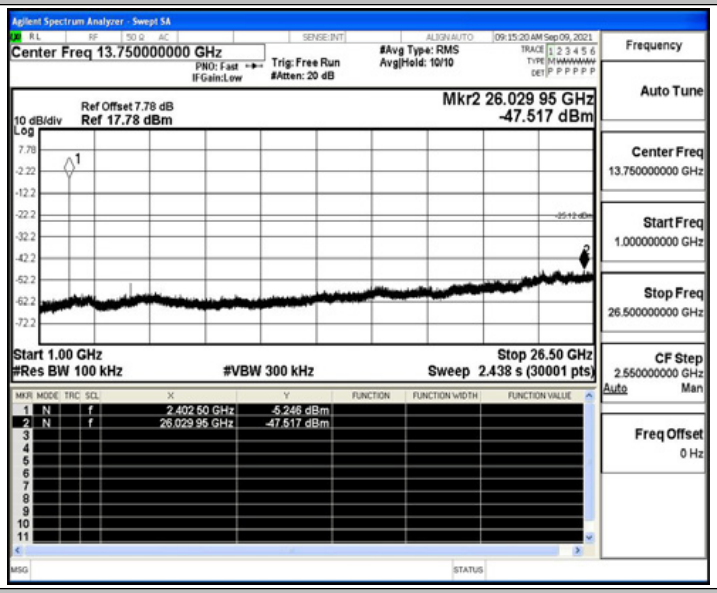
BLE_1M_Ant1_2402_0~Reference



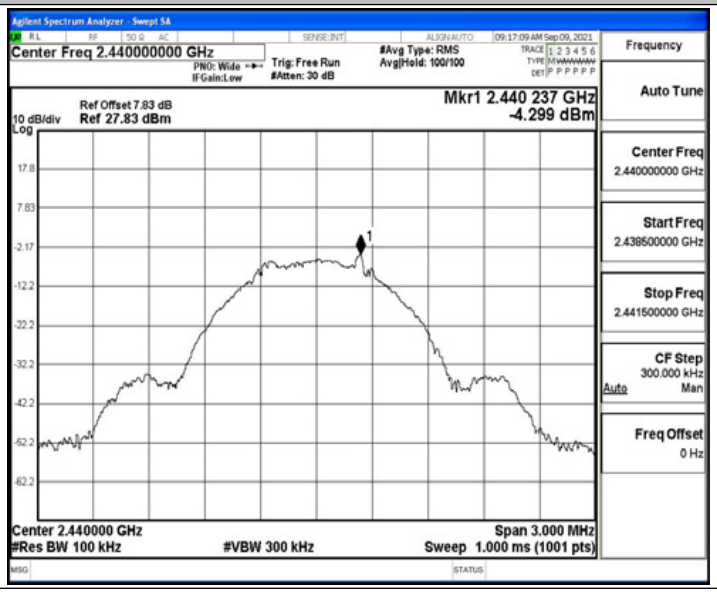
BLE_1M_Ant1_2402_30~1000

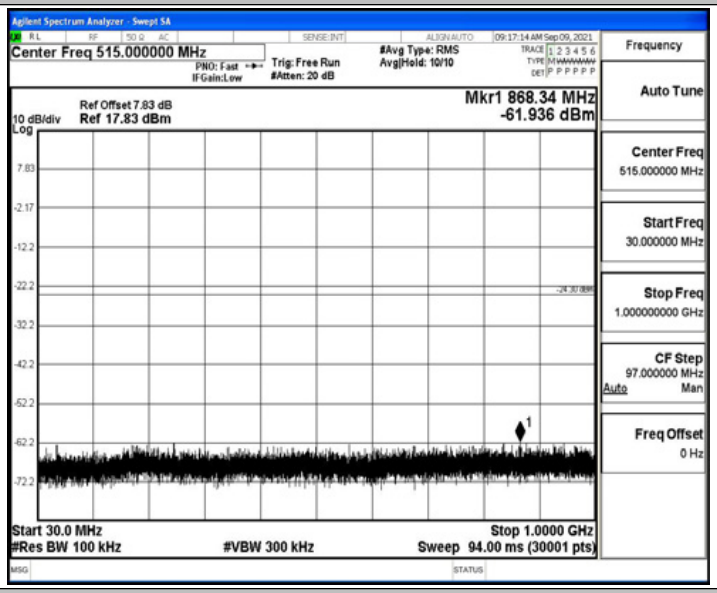
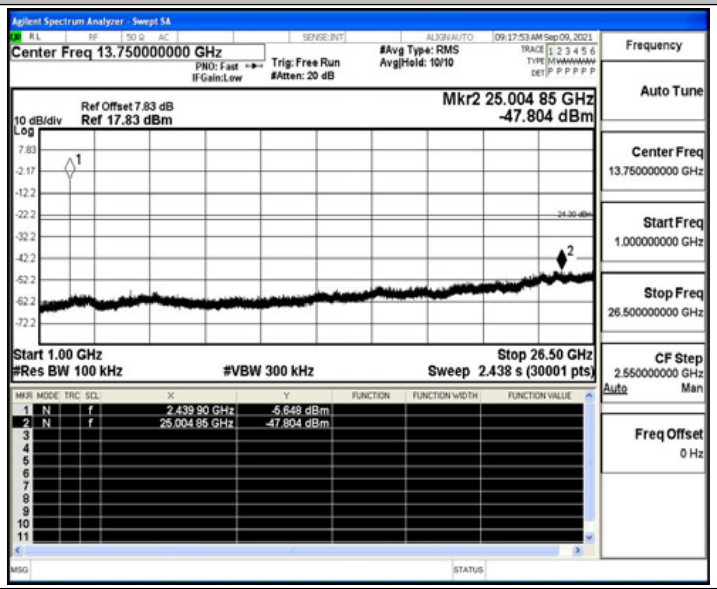


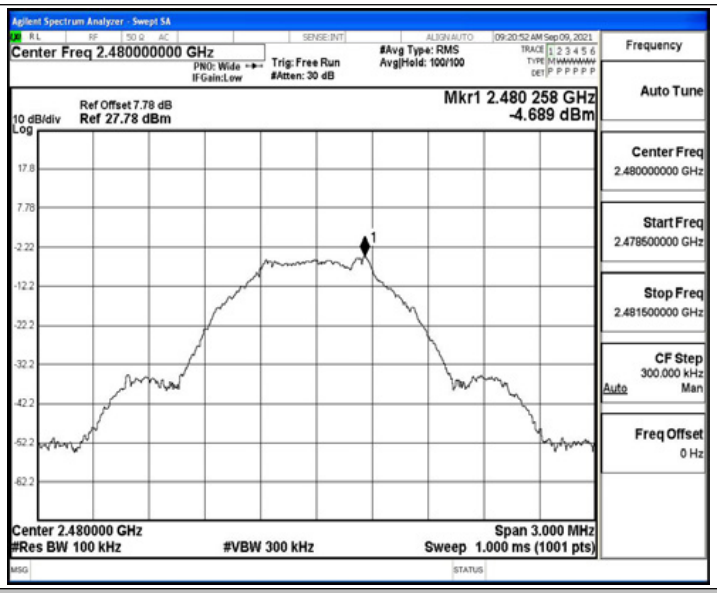
BLE_1M_Ant1_2402_1000~26500



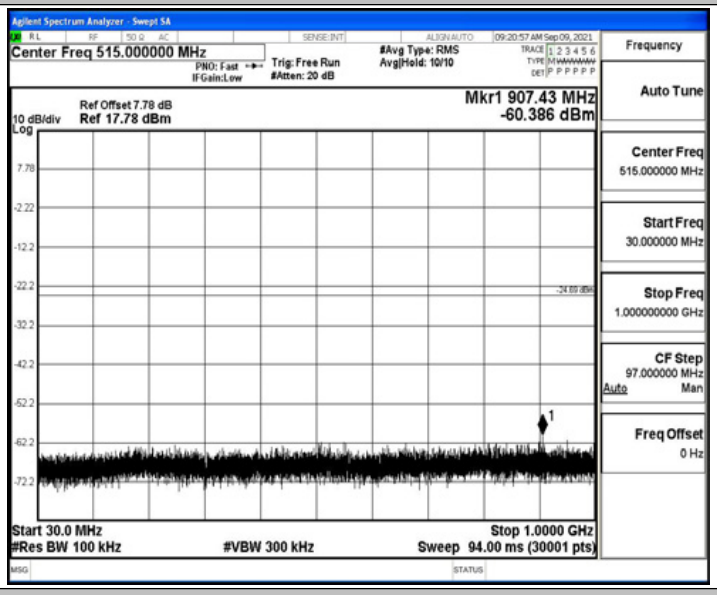
BLE_1M_Ant1_2440_0~Reference



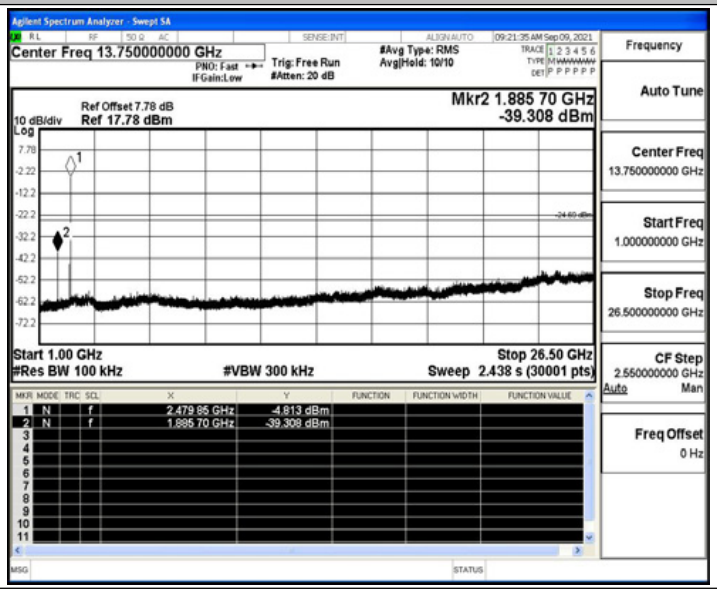
BLE_1M_Ant1_2440_30~1000

BLE_1M_Ant1_2440_1000~26500

BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000

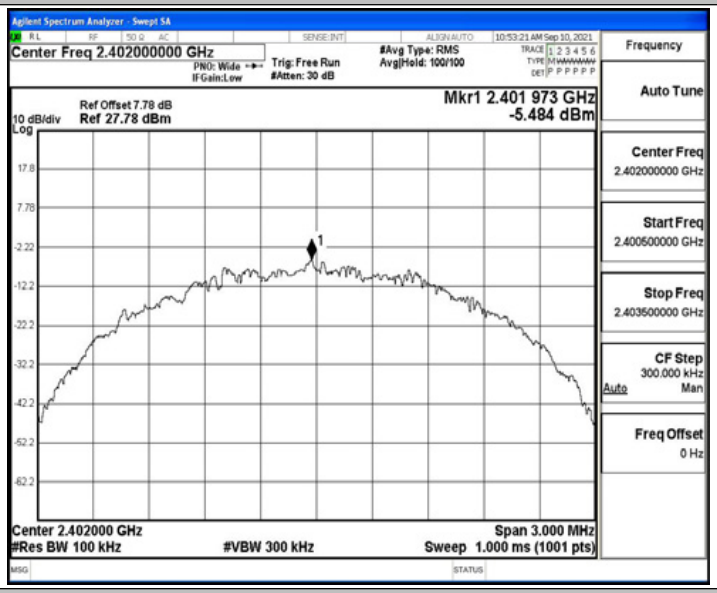
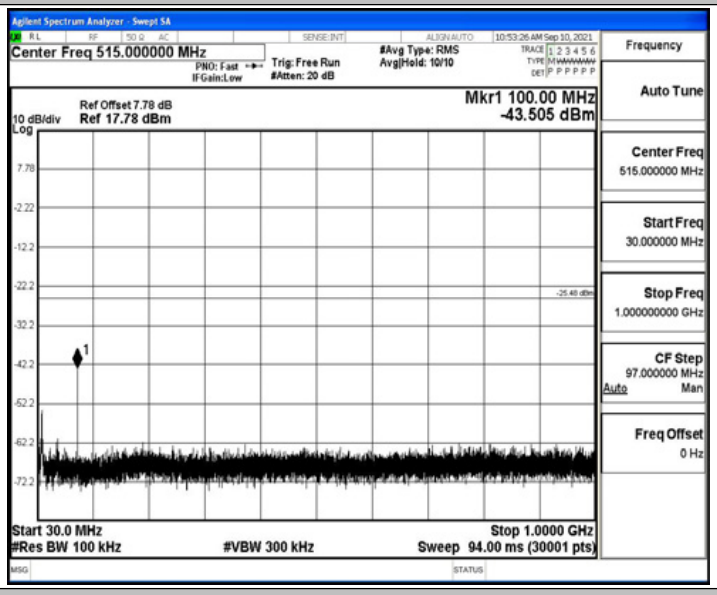


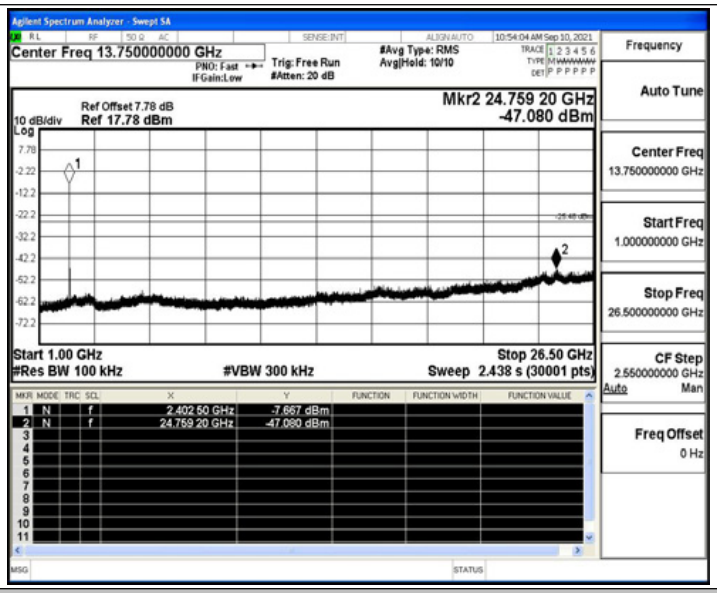
BLE_1M_Ant1_2480_1000~26500



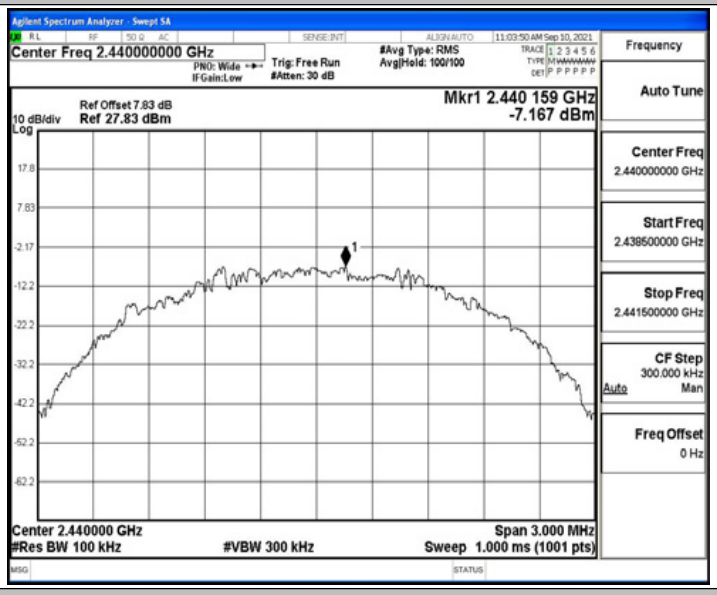
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	Reference	-5.48	-5.48	---	PASS
			30~1000	-5.48	-43.51	≤-25.48	PASS
			1000~26500	-5.48	-47.08	≤-25.48	PASS
		2440	Reference	-7.17	-7.17	---	PASS
			30~1000	-7.17	-43.41	≤-27.17	PASS
			1000~26500	-7.17	-47.1	≤-27.17	PASS
		2480	Reference	-4.77	-4.77	---	PASS
			30~1000	-4.77	-43.32	≤-24.77	PASS
			1000~26500	-4.77	-44.15	≤-24.77	PASS

Test Graphs

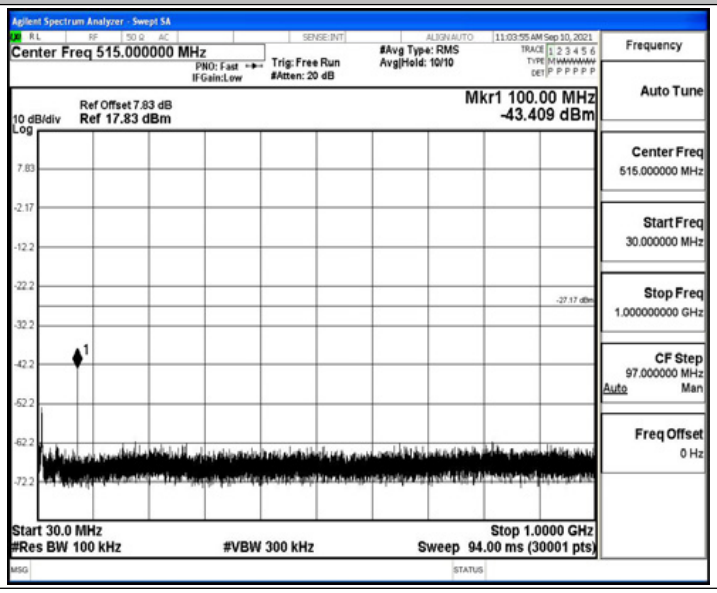
BLE_2M_Ant1_2402_0~Reference

BLE_2M_Ant1_2402_30~1000

BLE_2M_Ant1_2402_1000~26500

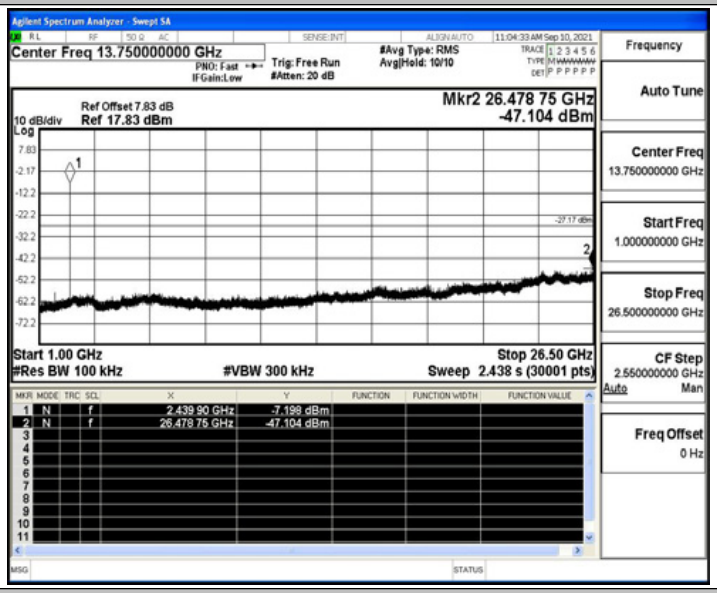
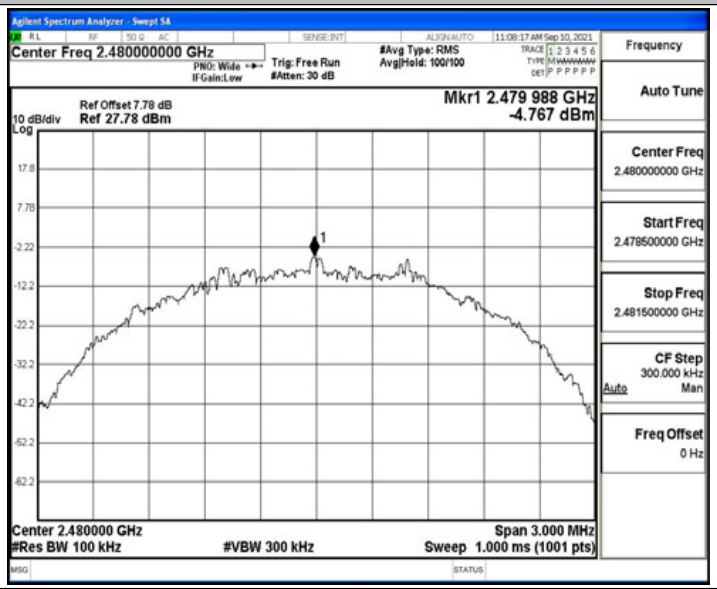


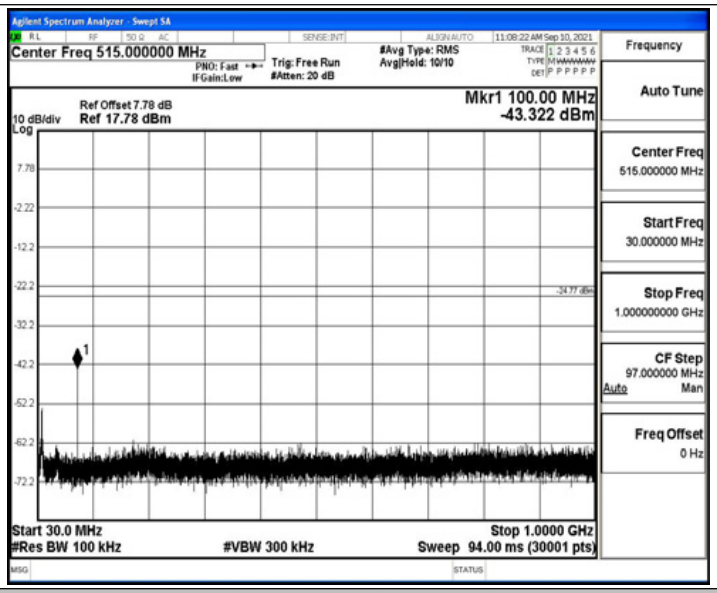
BLE_2M_Ant1_2440_0~Reference



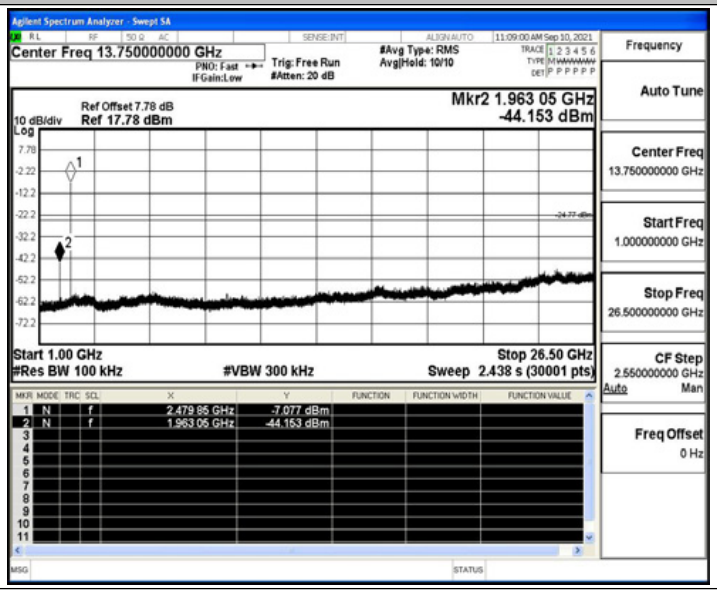
BLE_2M_Ant1_2440_30~1000



BLE_2M_Ant1_2440_1000~26500

BLE_2M_Ant1_2480_0~Reference

BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500



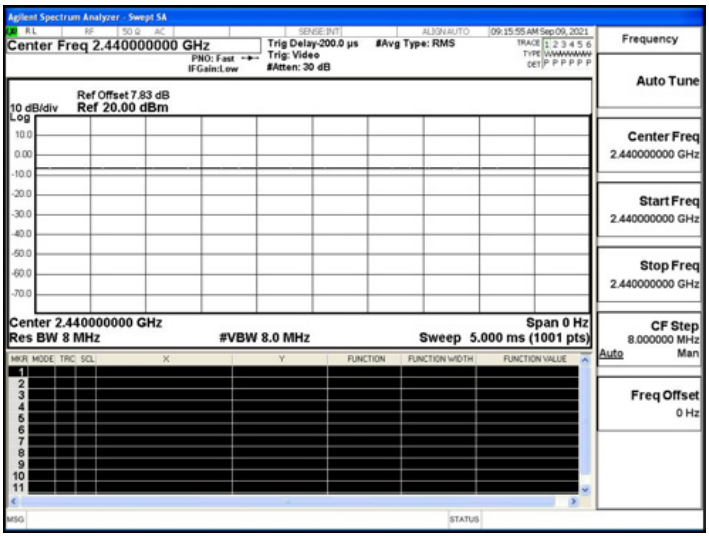
B.6 Duty Cycle

Test Result

Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BLE_1M	2440	Ant1	100	PASS

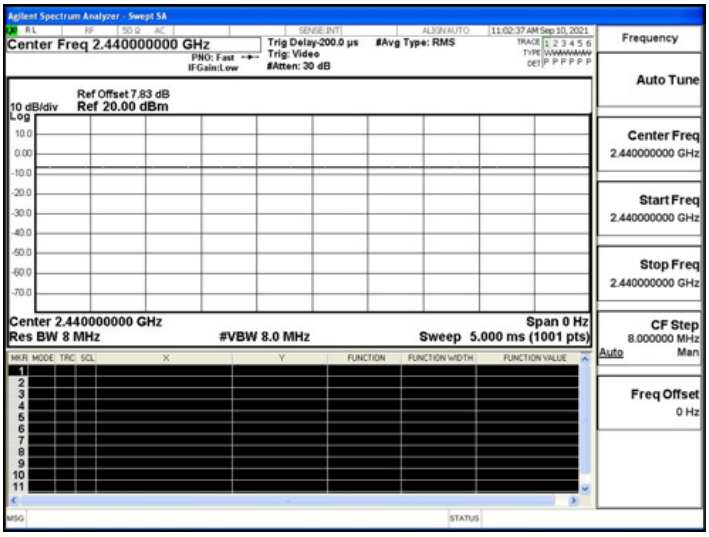
Test Graphs

BLE_1M_Ant1_2440



Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BLE_2M	2440	Ant1	100	PASS

Test Graphs

BLE_2M_Ant1_2440


B.7 Emissions in Restricted Bands

Test Result

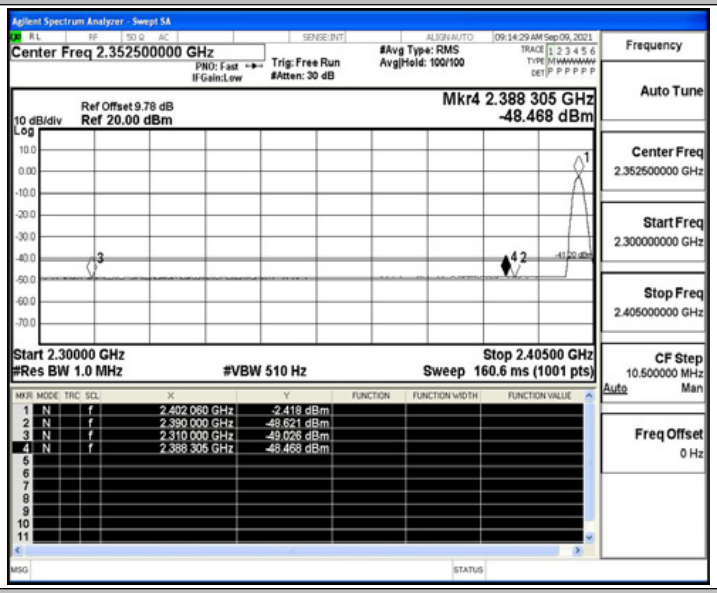
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-49.03	≤-41.20	46.17	≤54	PASS
				AV	2388.305	-48.47	≤-41.20	46.73	≤54	PASS
				AV	2390.000	-48.62	≤-41.20	46.58	≤54	PASS
				Peak	2310.000	-41.78	≤-21.20	53.42	≤74	PASS
				Peak	2358.275	-38.24	≤-21.20	56.96	≤74	PASS
				Peak	2390.000	-41.62	≤-21.20	53.58	≤74	PASS
		High	2480	AV	2483.500	-48.05	≤-41.20	47.15	≤54	PASS
				AV	2493.200	-47.89	≤-41.20	47.31	≤54	PASS
				AV	2500.000	-47.93	≤-41.20	47.27	≤54	PASS
				Peak	2483.500	-40.67	≤-21.20	54.53	≤74	PASS
				Peak	2488.320	-38.13	≤-21.20	57.07	≤74	PASS
				Peak	2500.000	-40.46	≤-21.20	54.74	≤74	PASS

Note：

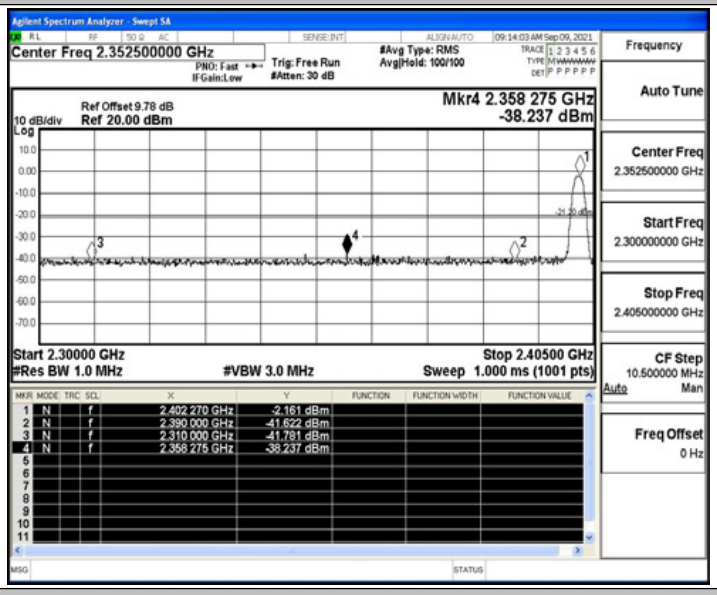
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

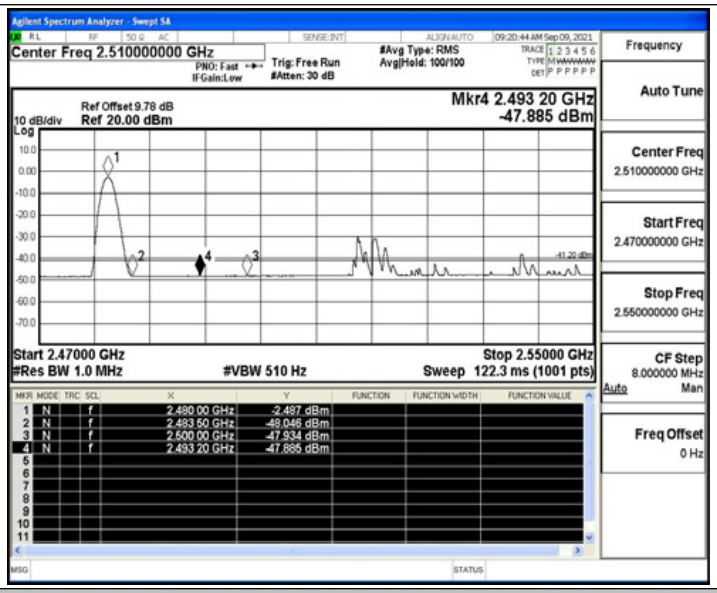
BLE_1M_Ant1_Low_2402_AV



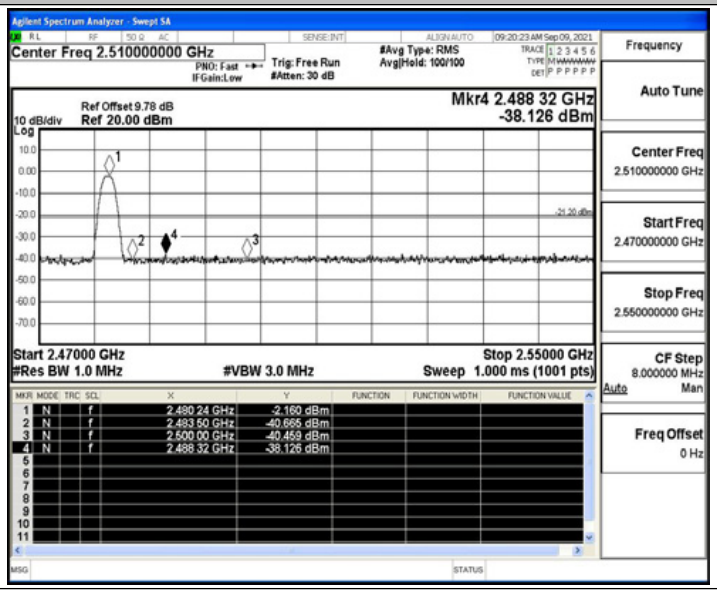
BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak



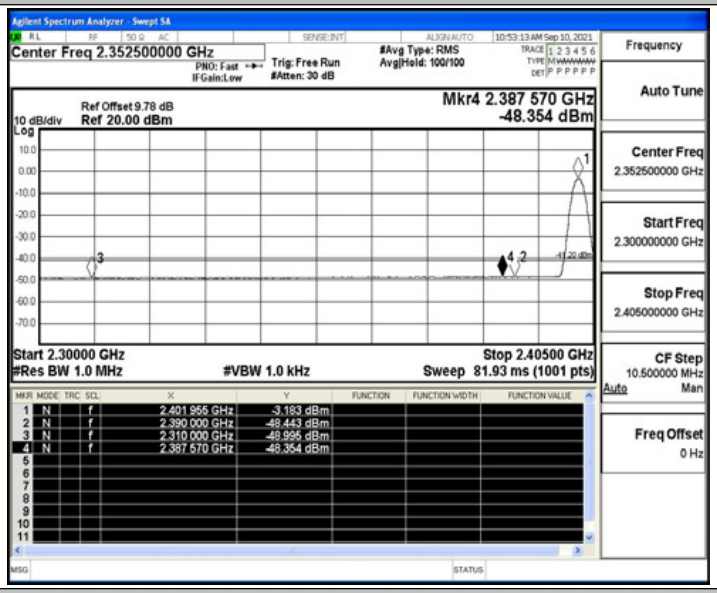
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_2M	Ant1	Low	2402	AV	2310.000	-49	≤-41.20	46.20	≤54	PASS
				AV	2387.570	-48.35	≤-41.20	46.85	≤54	PASS
				AV	2390.000	-48.44	≤-41.20	46.76	≤54	PASS
				Peak	2310.000	-42.15	≤-21.20	53.05	≤74	PASS
				Peak	2362.265	-39.17	≤-21.20	56.03	≤74	PASS
				Peak	2390.000	-41.6	≤-21.20	53.60	≤74	PASS
		High	2480	AV	2483.500	-47.36	≤-41.20	47.84	≤54	PASS
				AV	2483.520	-47.36	≤-41.20	47.84	≤54	PASS
				AV	2500.000	-48.09	≤-41.20	47.11	≤54	PASS
				Peak	2483.500	-39.96	≤-21.20	55.24	≤74	PASS
				Peak	2485.680	-38.97	≤-21.20	56.23	≤74	PASS
				Peak	2500.000	-41.83	≤-21.20	53.37	≤74	PASS

Note：

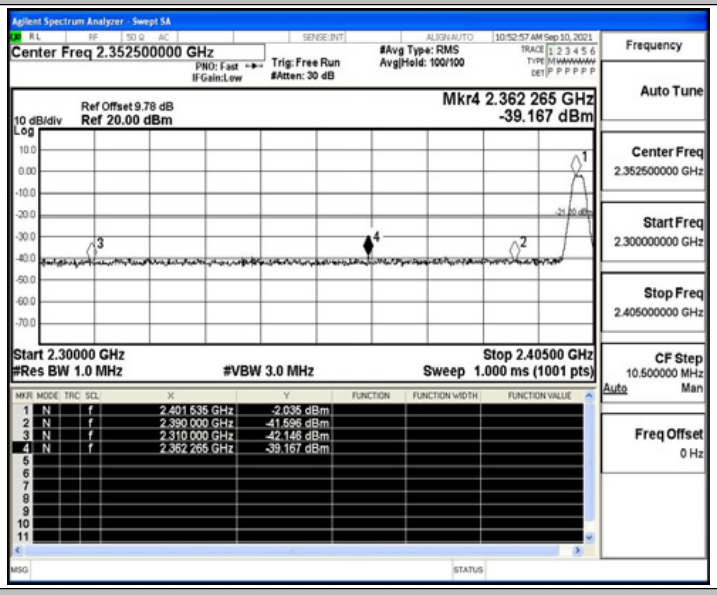
3. The Antenna Gain is compensated in the graph.
4. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

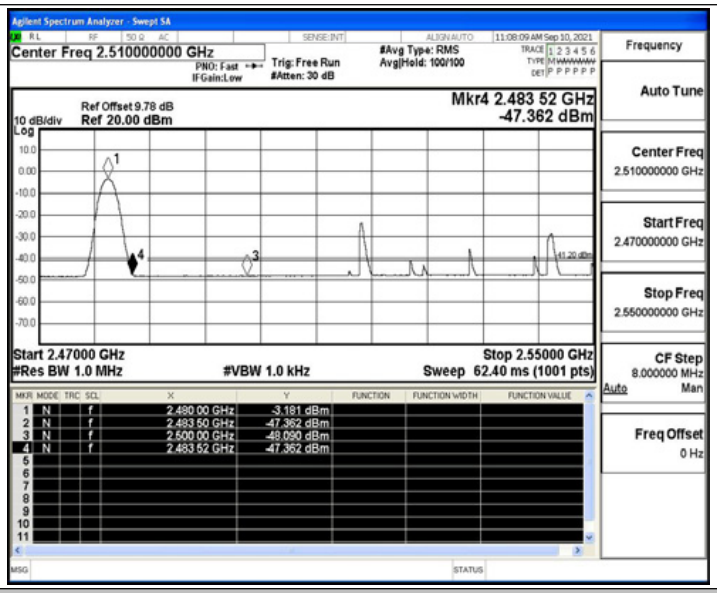
BLE_2M_Ant1_Low_2402_AV



BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV



BLE_2M_Ant1_High_2480_Peak