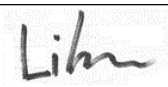
Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: LED Controller

Test Model: SP621E

Environmental Conditions

Temperature:	23.5℃
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	 Bill Zhu
Supervised by:	 Li Huan

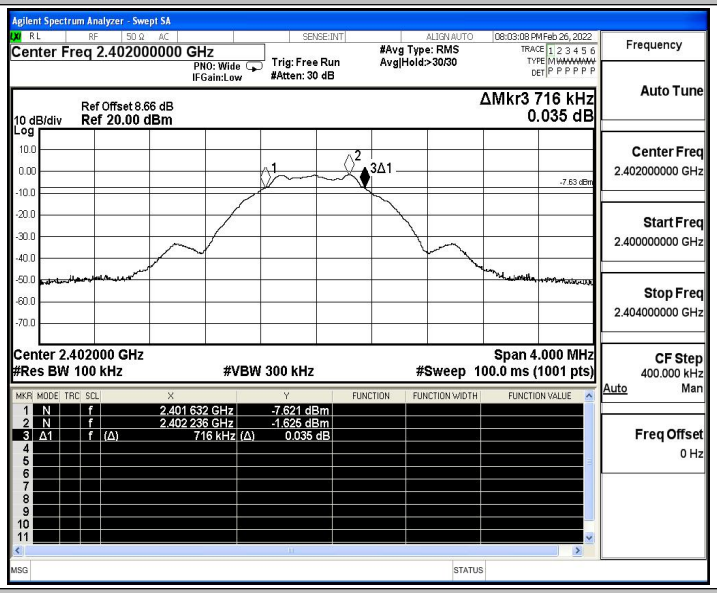
A.1 DTS Bandwidth

Test Result

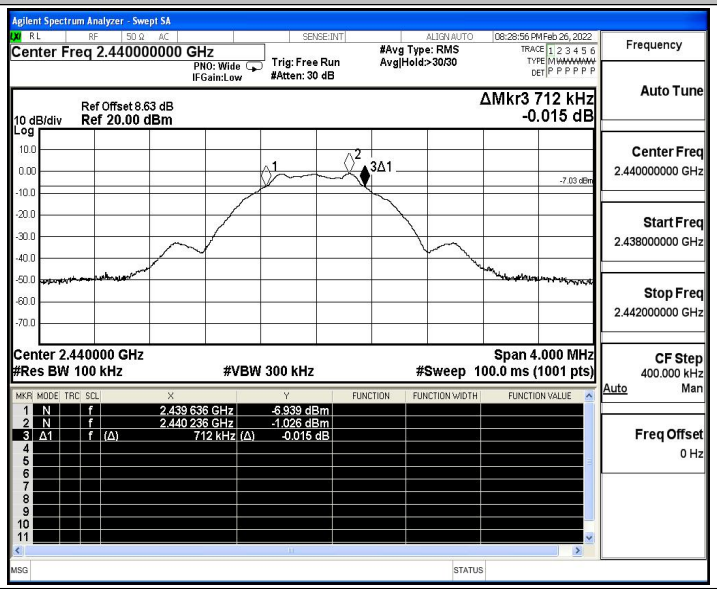
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.716	2401.632	2402.348	0.5	PASS
		2440	0.712	2439.636	2440.348	0.5	PASS
		2480	0.716	2479.636	2480.352	0.5	PASS

Test Graphs

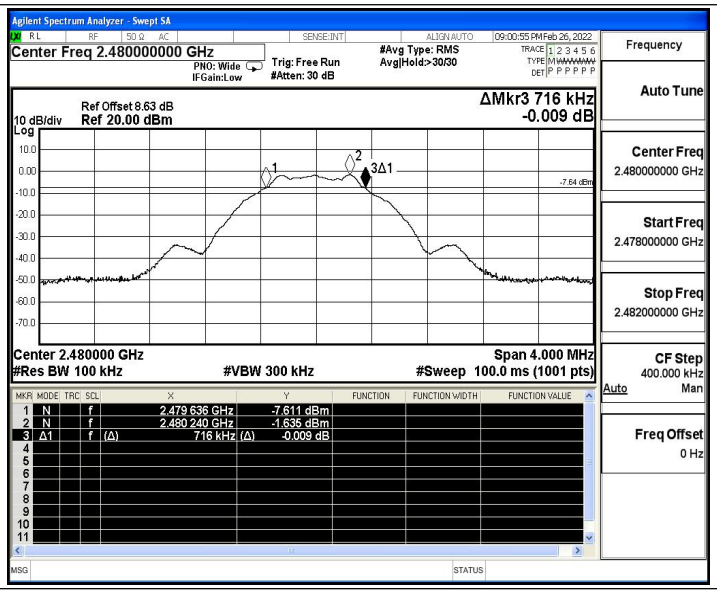
BLE_1M_Ant1_2402



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: 30 dB
#Avg Type: RMS
Avg|Hold:>30/30
09:00:55 PM Feb 26, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr3 716 kHz
-0.009 dB
-7.64 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
#Sweep 100.0 ms (1001 pts)
1 N 1 f 2.479 636 GHz -7.611 dBm
2 N 1 f 2.480 240 GHz -1.635 dBm
3 Δ1 f (Δ) 716 kHz (Δ) -0.009 dB
Frequency
Auto Tune
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

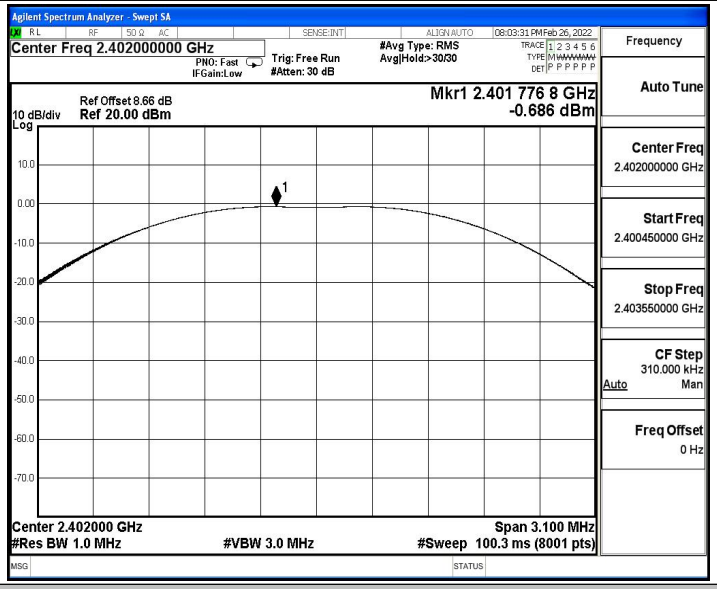
A.2 Maximum peak conducted output power

Test Result

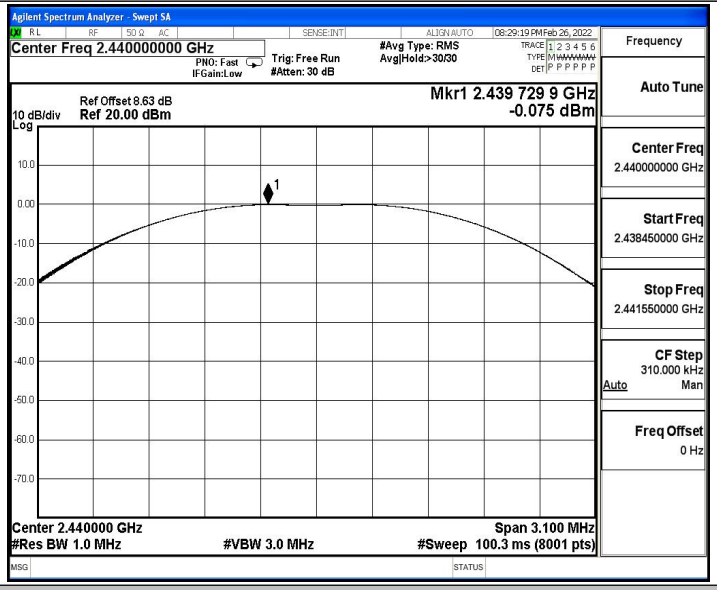
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-0.69	≤30	PASS
		2440	-0.08	≤30	PASS
		2480	-0.68	≤30	PASS

Test Graphs

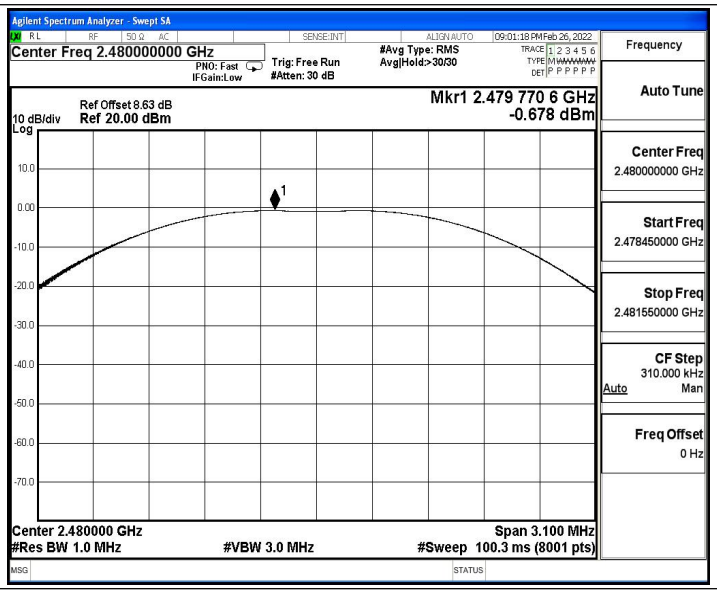
BLE_1M_Ant1_2402



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: 30 dB
#Avg Type: RMS
Avg|Hold:>30/30
09:01:18 PM Feb 26, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 770 6 GHz
-0.678 dBm
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 3.100 MHz
#Sweep 100.3 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478450000 GHz
Stop Freq
2.481550000 GHz
CF Step
310.000 kHz
Auto
Man
Freq Offset
0 Hz

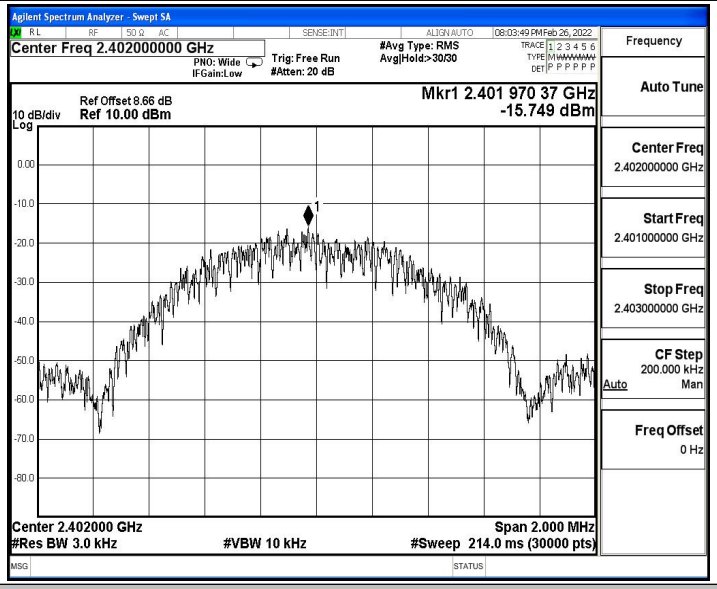
A.3 Maximum power spectral density

Test Result

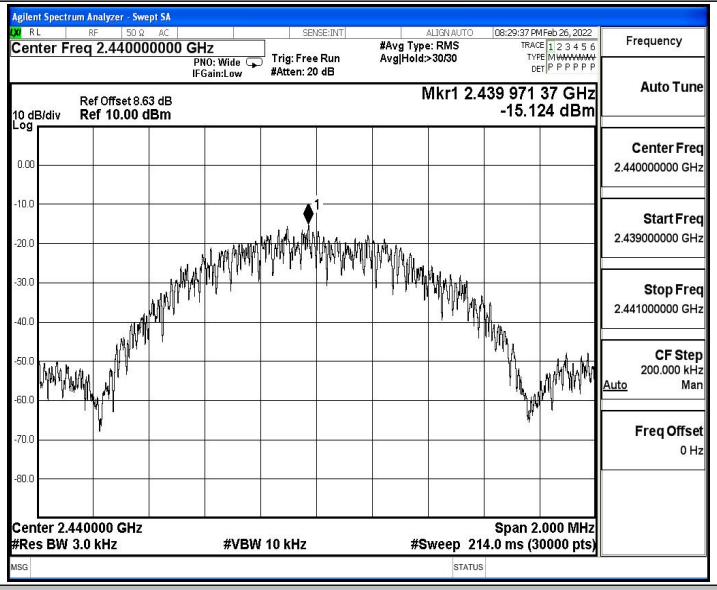
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-15.75	≤8.00	PASS
		2440	-15.12	≤8.00	PASS
		2480	-15.47	≤8.00	PASS

Test Graphs

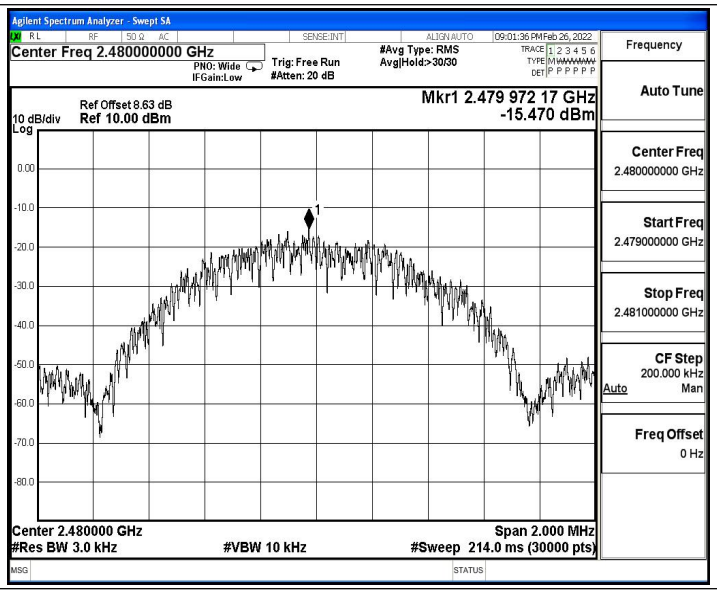
BLE_1M_Ant1_2402



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: 20 dB
#Avg Type: RMS
Avg|Hold:>30/30
09:01:36 PM Feb 26, 2022
Frequency
Auto Tune
Ref Offset 8.63 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 972 17 GHz
-15.470 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
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 214.0 ms (30000 pts)
MSG
STATUS

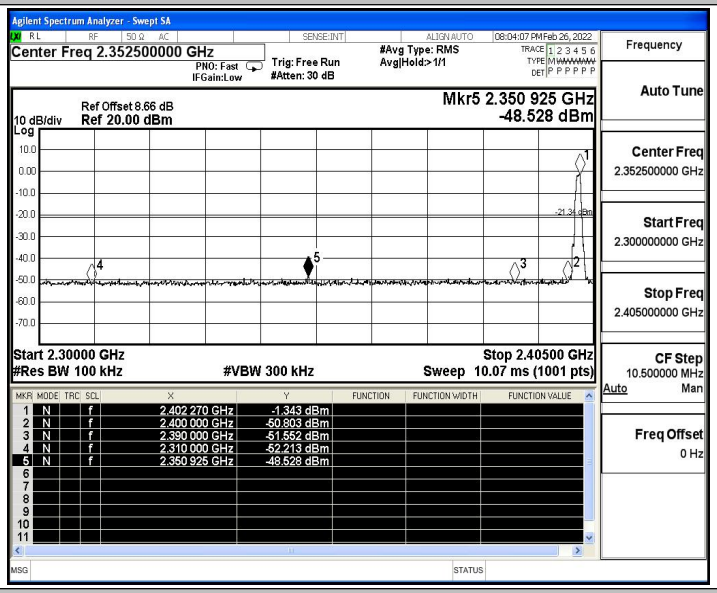
A.4 Band edge measurements

Test Result

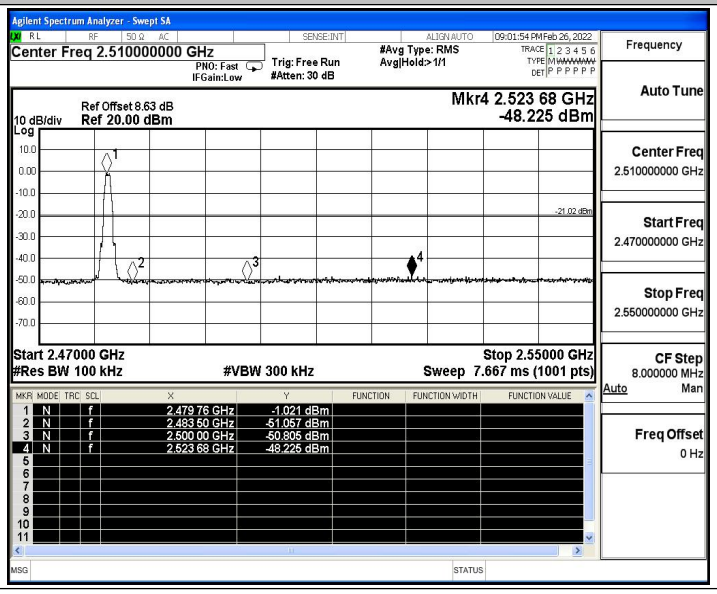
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-1.34	-48.53	≤-21.34	PASS
		High	2480	-1.02	-48.23	≤-21.02	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



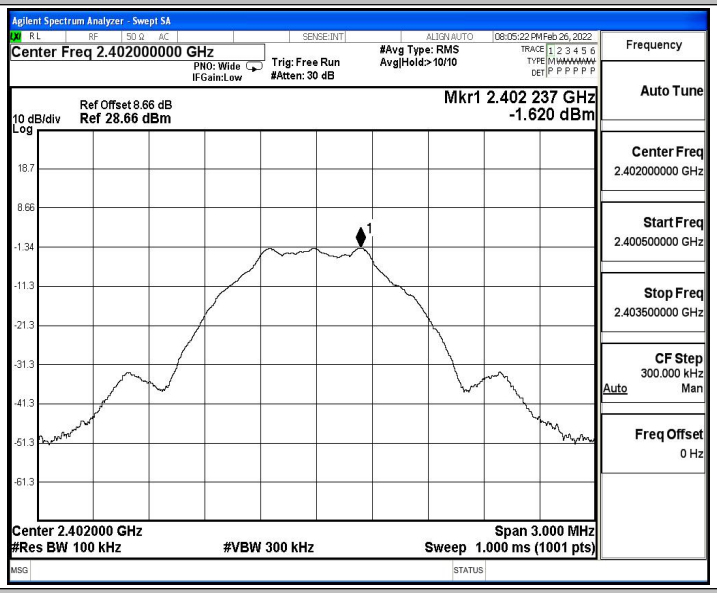
A.5 Conducted Spurious Emission

Test Result

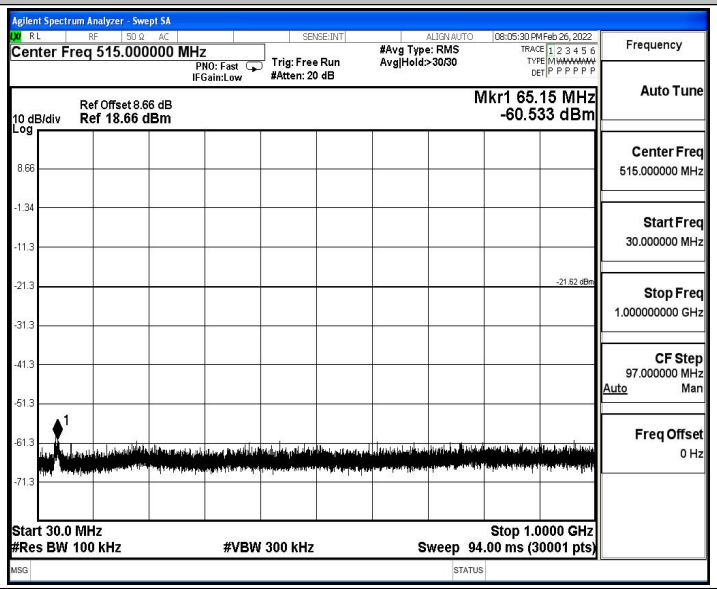
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-1.62	-1.62	---	PASS
			30~1000	-1.62	-60.53	≤-21.62	PASS
			1000~26500	-1.62	-45.9	≤-21.62	PASS
		2440	Reference	-1.01	-1.01	---	PASS
			30~1000	-1.01	-61.04	≤-21.01	PASS
			1000~26500	-1.01	-46.73	≤-21.01	PASS
		2480	Reference	-1.27	-1.27	---	PASS
			30~1000	-1.27	-59.55	≤-21.27	PASS
			1000~26500	-1.27	-46.49	≤-21.27	PASS

Test Graphs

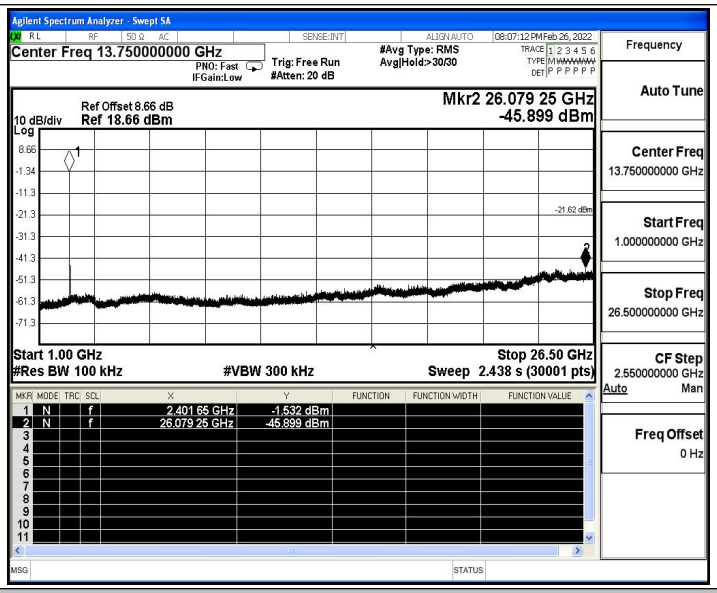
BLE_1M_Ant1_2402_0~Reference



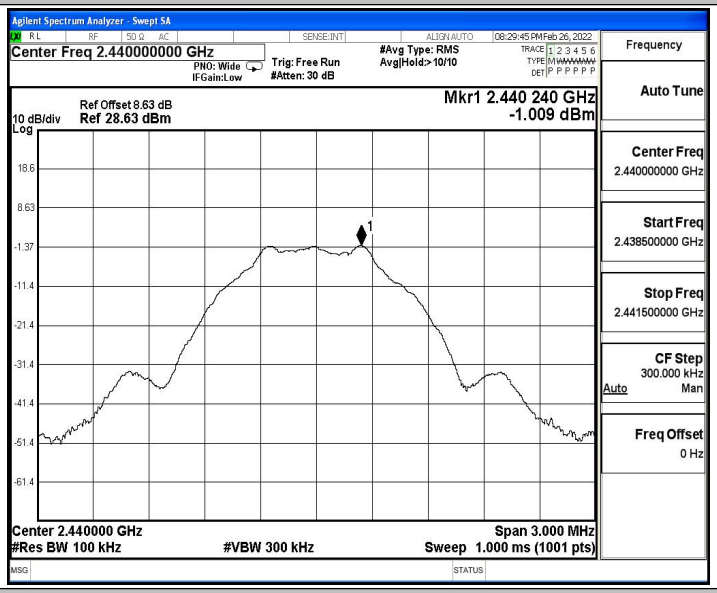
BLE_1M_Ant1_2402_30~1000



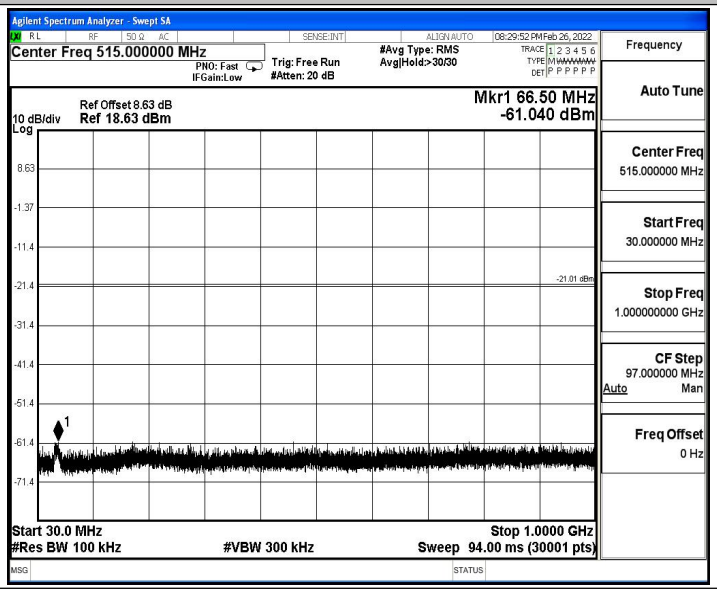
BLE_1M_Ant1_2402_1000~26500



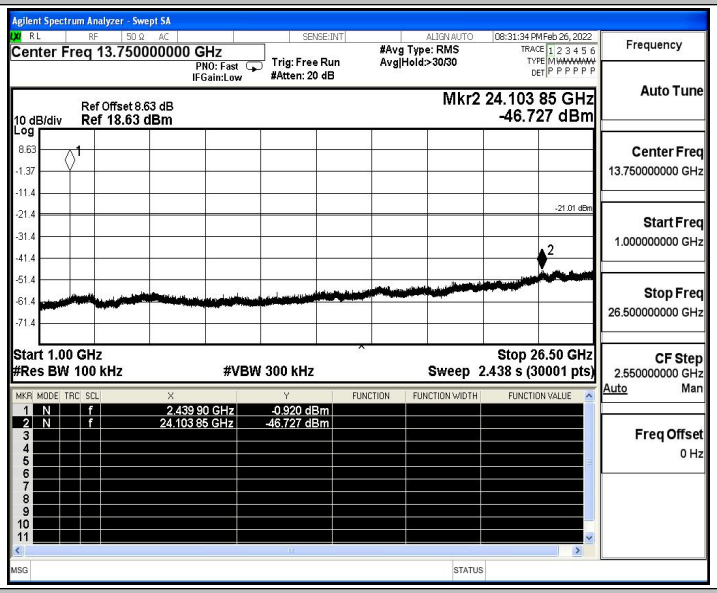
BLE_1M_Ant1_2440_0~Reference



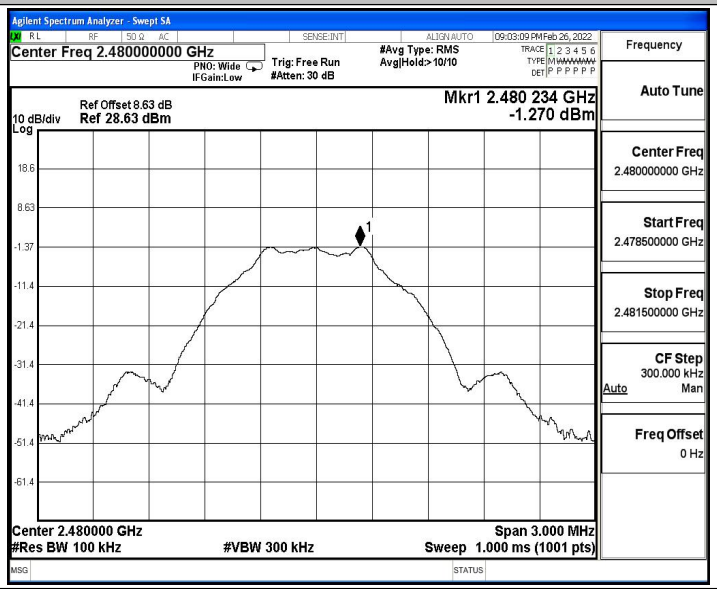
BLE_1M_Ant1_2440_30~1000



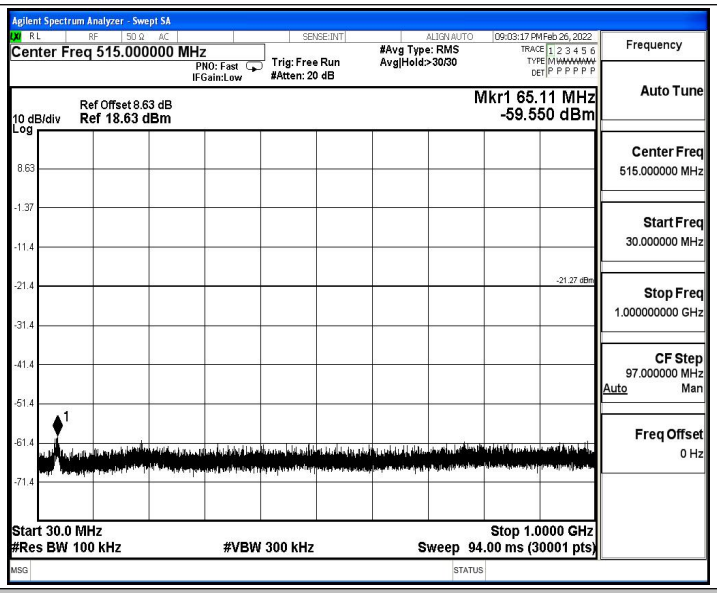
BLE_1M_Ant1_2440_1000~26500



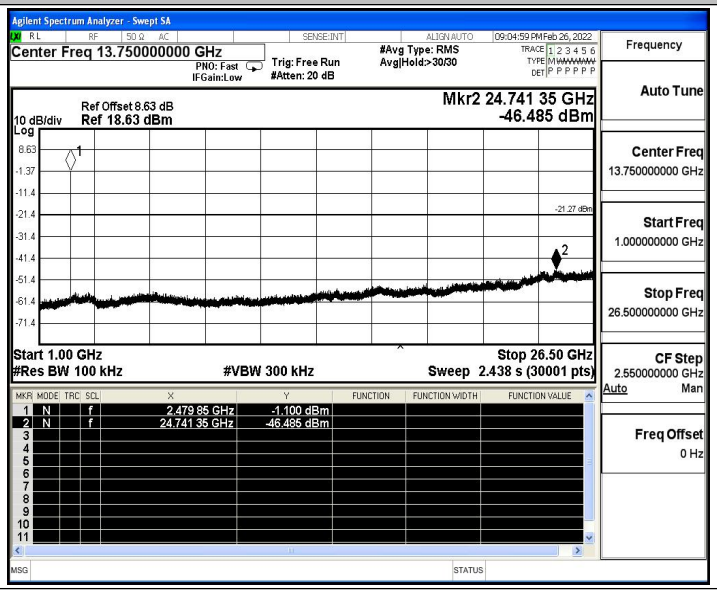
BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



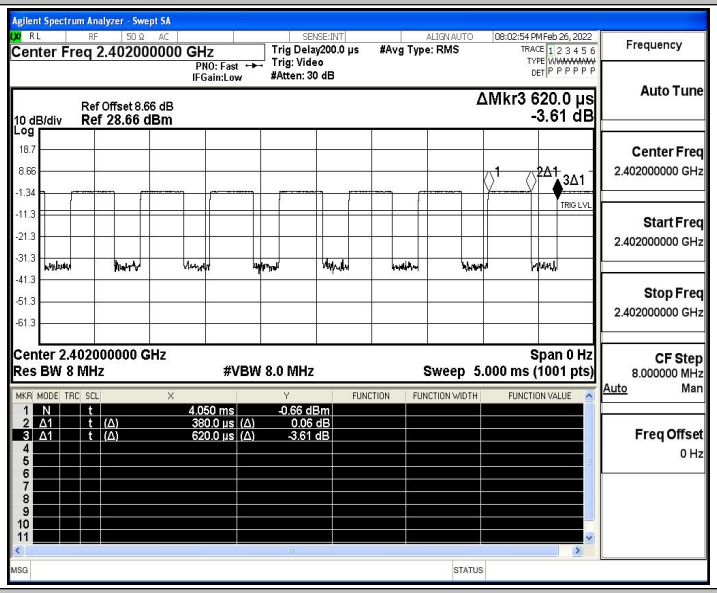
A.6 Duty Cycle

Test Result

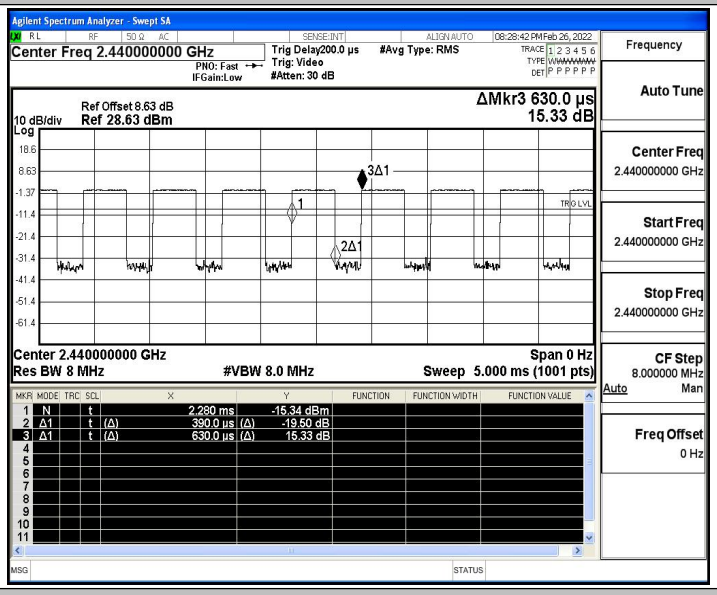
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T[kHz]
BLE_1M	Ant1	2402	0.38	0.62	0.6129	61.29	2.13	2.63
		2440	0.39	0.63	0.6190	61.90	2.08	2.63
		2480	0.39	0.63	0.6190	61.90	2.08	2.63

Test Graphs

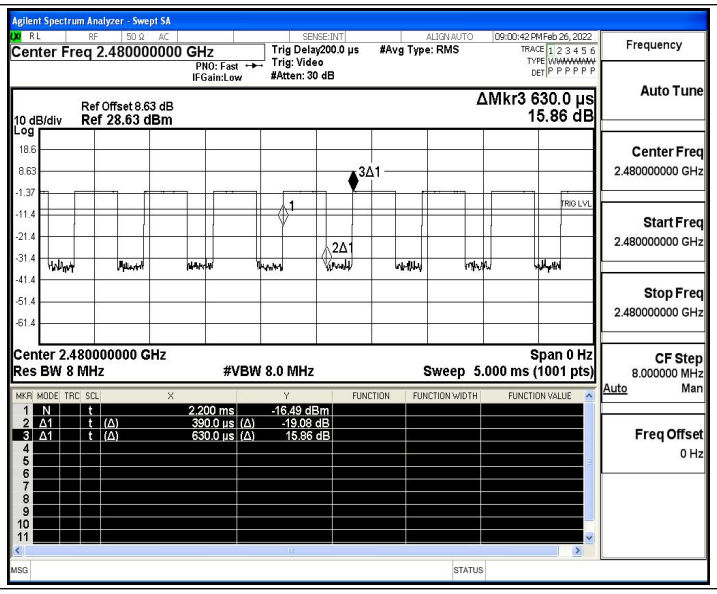
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig Delay200.0 µs
Trig: Video
#Avg Type: RMS
#Atten: 30 dB
09:00:42 PM Feb 26, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 28.63 dBm
ΔMkr3 630.0 µs
15.86 dB
Center 2.480000000 GHz
Res BW 8 MHz
#VBW 8.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 N 1 t 2.200 ms -16.49 dBm
2 Δ1 t (Δ) 390.0 µs (Δ) -19.08 dB
3 Δ1 t (Δ) 630.0 µs (Δ) 15.86 dB
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.480000000 GHz
Stop Freq
2.480000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz

A.7 Emissions in Restricted Bands

Test Result

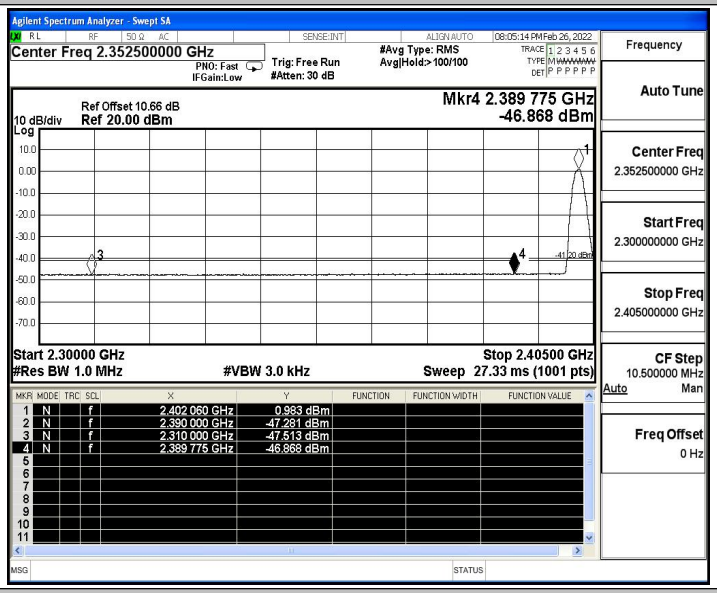
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-47.51	≤-41.20	47.69	≤54	PASS
				AV	2389.775	-46.87	≤-41.20	48.33	≤54	PASS
				AV	2390.000	-47.28	≤-41.20	47.92	≤54	PASS
				Peak	2310.000	-38.84	≤-21.20	56.36	≤74	PASS
				Peak	2388.935	-36.98	≤-21.20	58.22	≤74	PASS
				Peak	2390.000	-37.83	≤-21.20	57.37	≤74	PASS
		High	2480	AV	2483.500	-46.79	≤-41.20	48.41	≤54	PASS
				AV	2495.600	-46.45	≤-41.20	48.75	≤54	PASS
				AV	2500.000	-46.66	≤-41.20	48.54	≤54	PASS
				Peak	2483.500	-38.57	≤-21.20	56.63	≤74	PASS
				Peak	2492.240	-36.32	≤-21.20	58.88	≤74	PASS
				Peak	2500.000	-38.47	≤-21.20	56.73	≤74	PASS

Note：

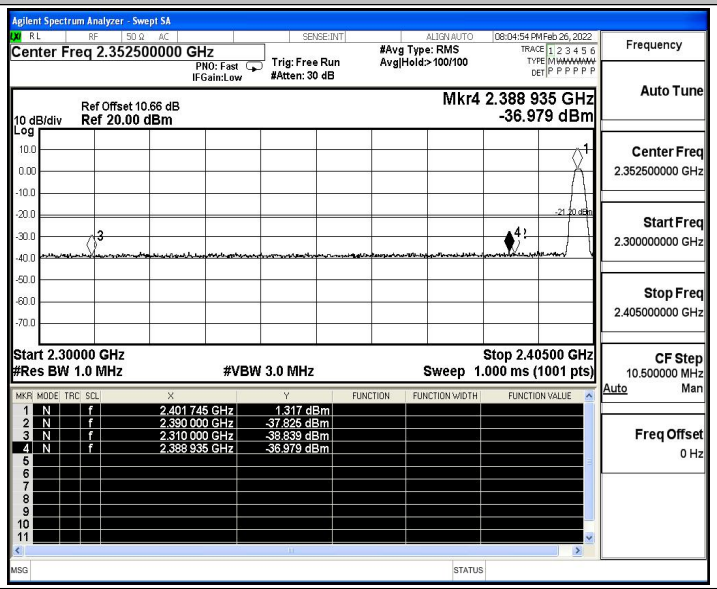
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

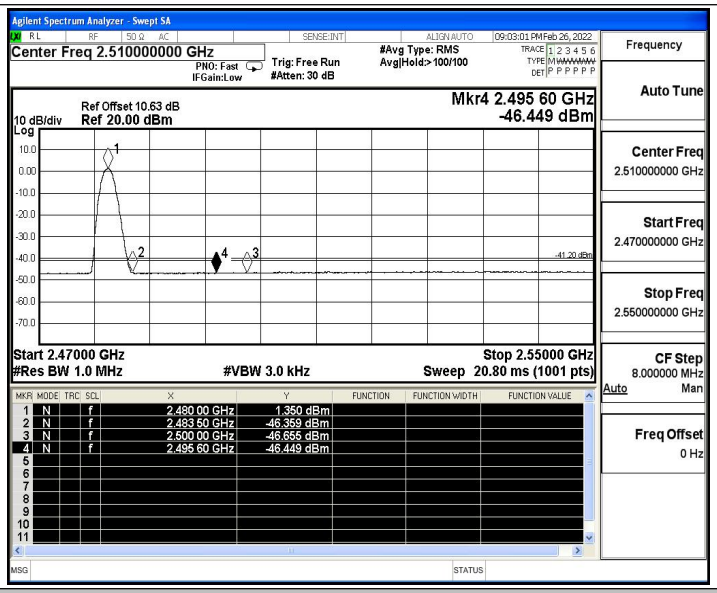
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak