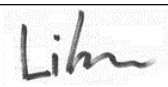
Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: LED Controller

Test Model: SP601E

Environmental Conditions

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

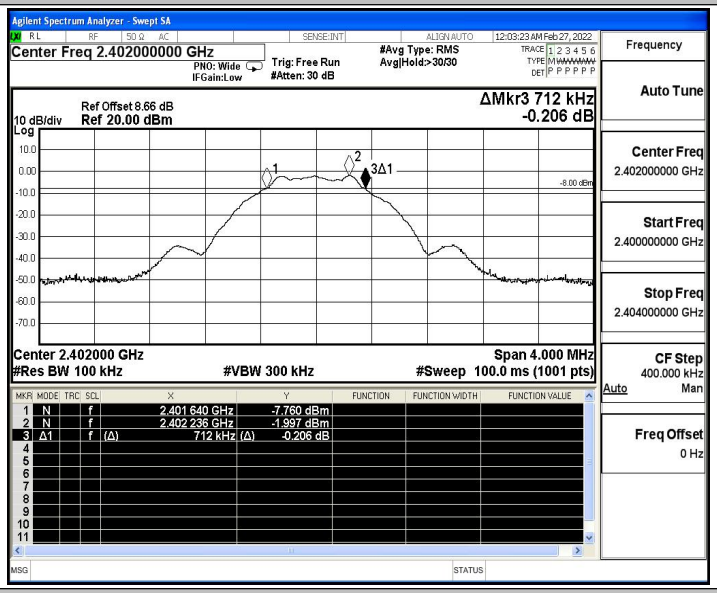
A.1 DTS Bandwidth

Test Result

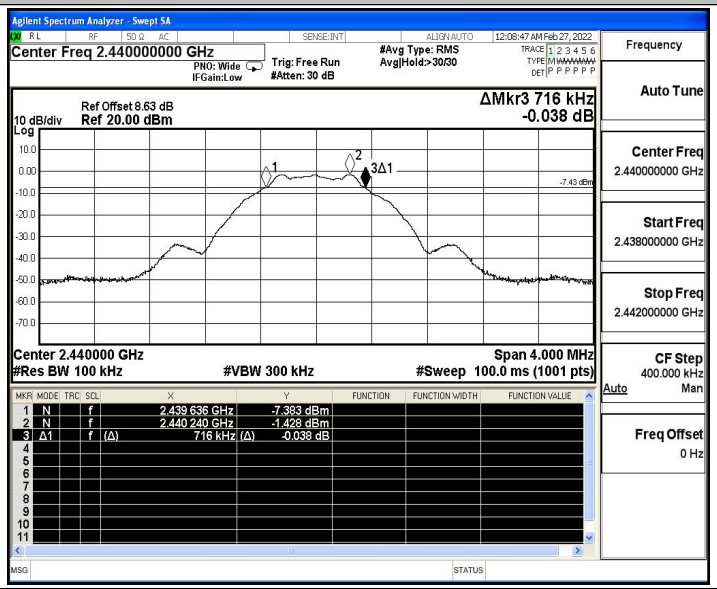
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.712	2401.640	2402.352	0.5	PASS
		2440	0.716	2439.636	2440.352	0.5	PASS
		2480	0.712	2479.636	2480.348	0.5	PASS

Test Graphs

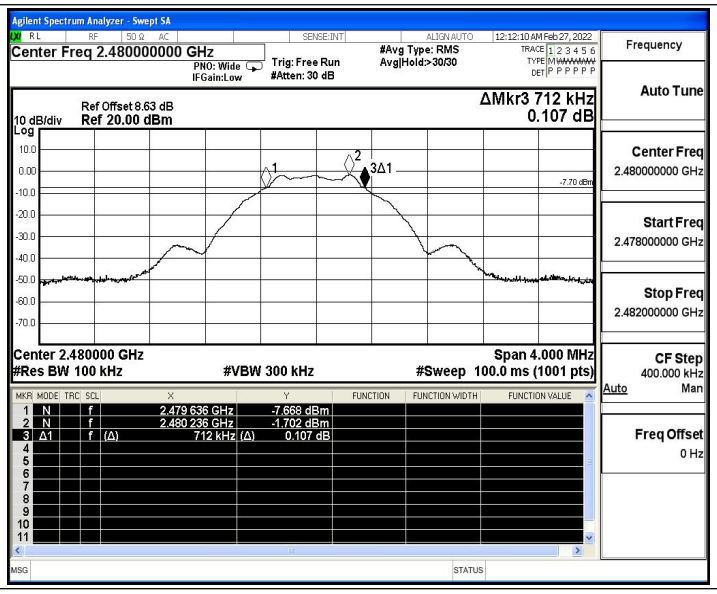
BLE_1M_Ant1_2402



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: 30 dB
#Avg Type: RMS
Avg|Hold:>30/30
12:12:10 AM Feb 27, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr3 712 kHz
0.107 dB
-7.70 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 -7.668 dBm
2 N 1 f 2.480 236 GHz -1.702 dBm
3 Δ1 f (Δ) 712 kHz (Δ) 0.107 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

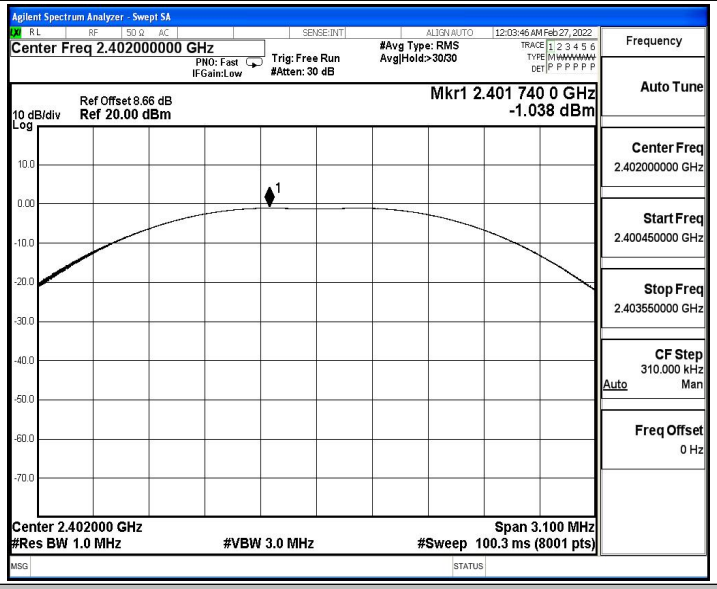
A.2 Maximum peak conducted output power

Test Result

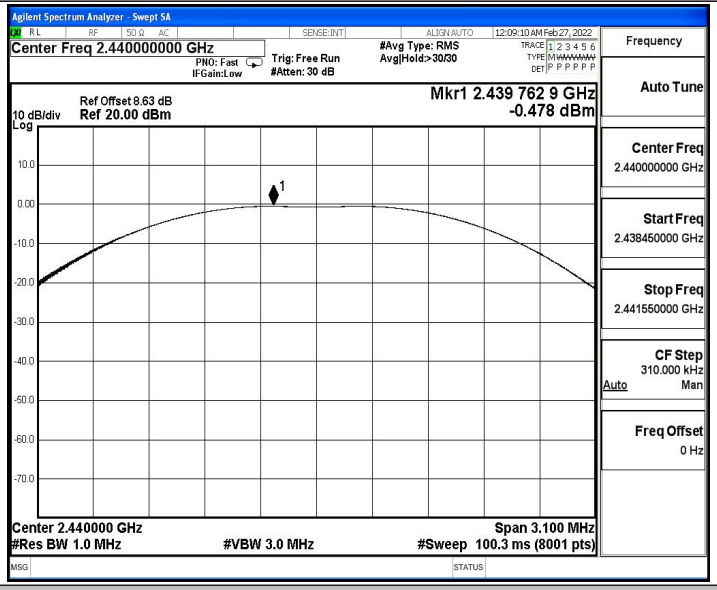
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-1.04	≤30	PASS
		2440	-0.48	≤30	PASS
		2480	-0.73	≤30	PASS

Test Graphs

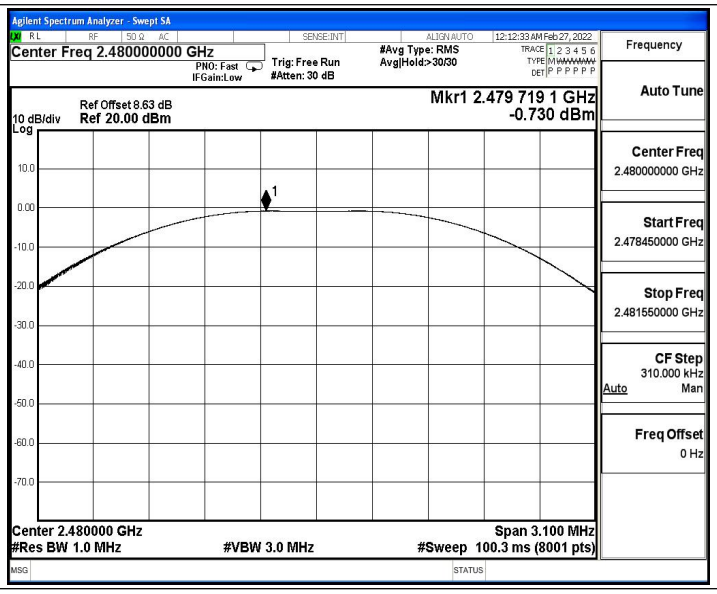
BLE_1M_Ant1_2402



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
12:12:33 AM Feb 27, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 719 1 GHz
-0.730 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

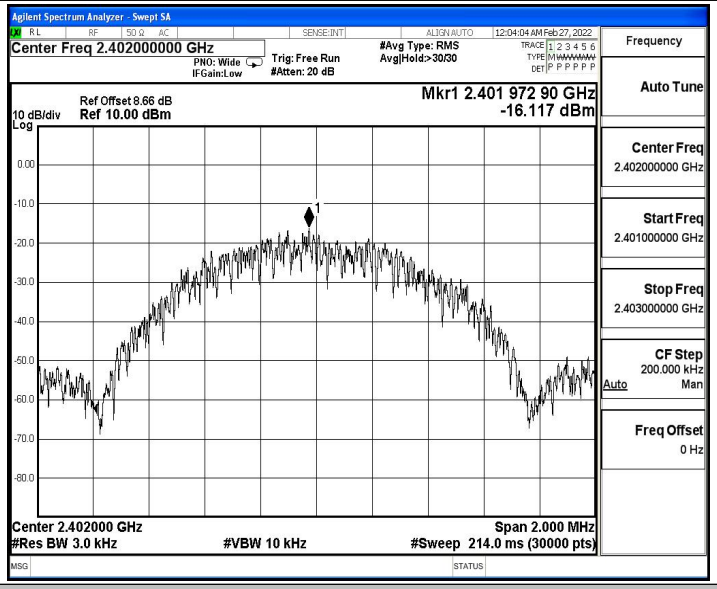
A.3 Maximum power spectral density

Test Result

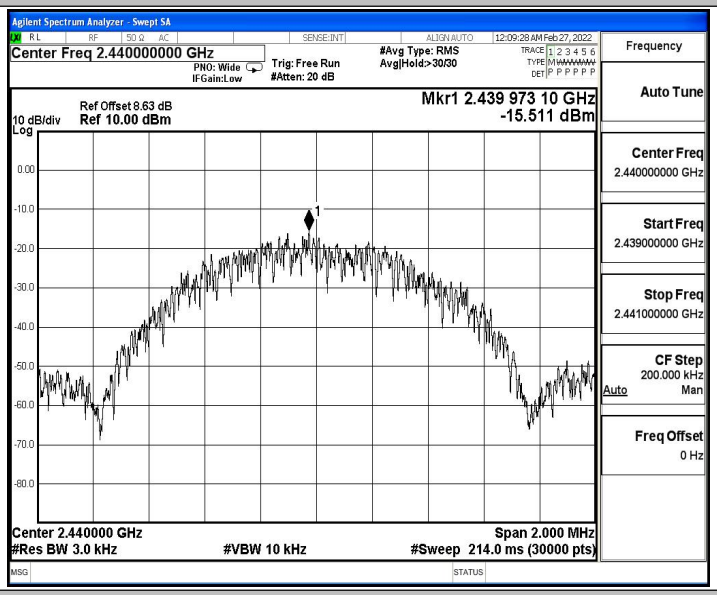
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-16.12	≤8.00	PASS
		2440	-15.59	≤8.00	PASS
		2480	-15.83	≤8.00	PASS

Test Graphs

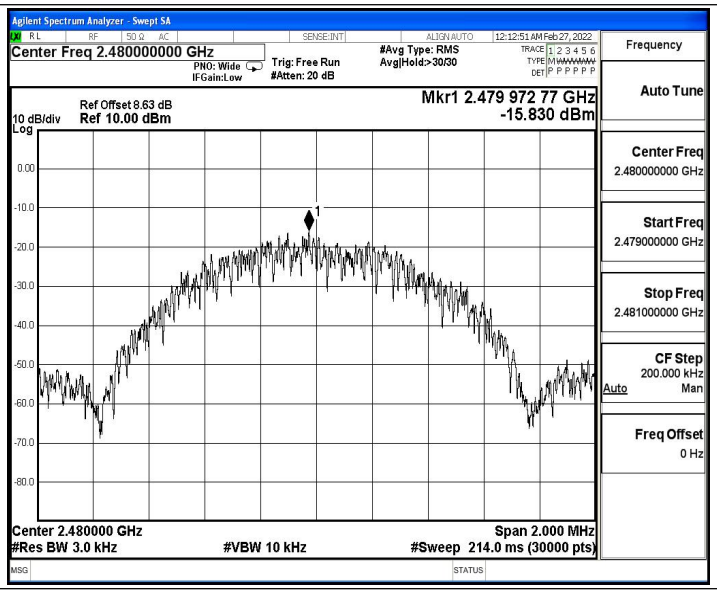
BLE_1M_Ant1_2402



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
12:12:51 AM Feb 27, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 972 77 GHz
-15.830 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
#Sweep 214.0 ms (30000 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

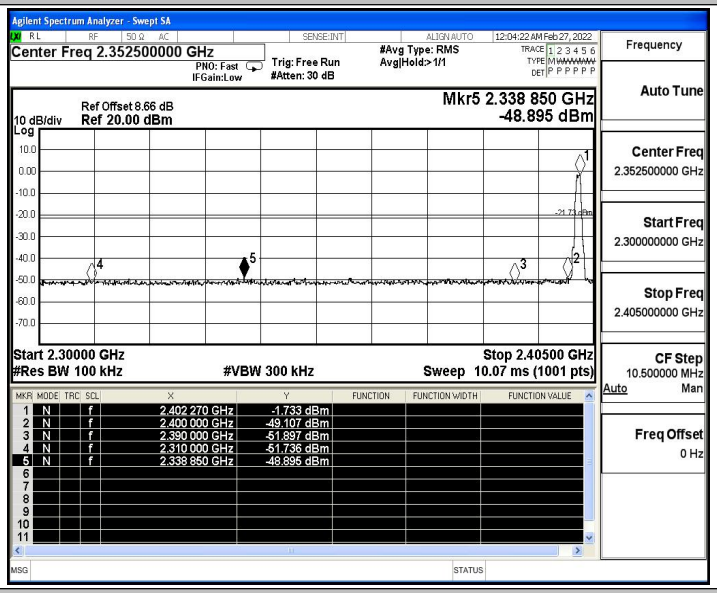
A.4 Band edge measurements

Test Result

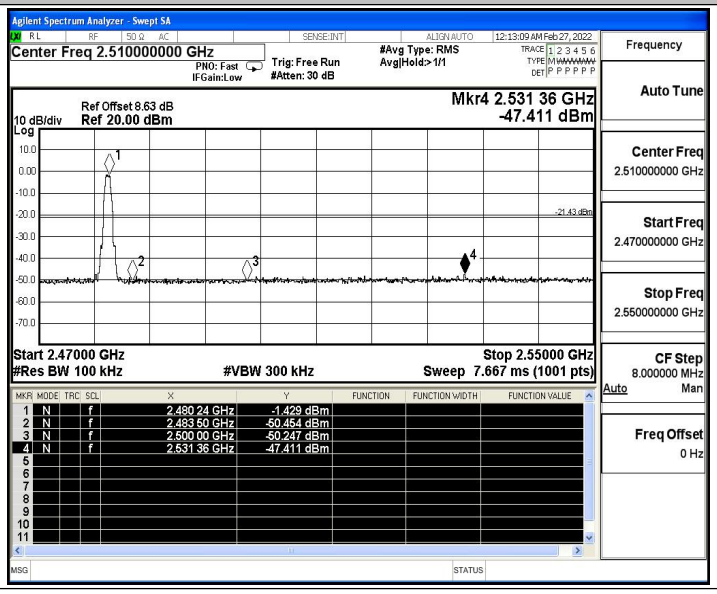
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-1.73	-48.9	≤-21.73	PASS
		High	2480	-1.43	-47.41	≤-21.43	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



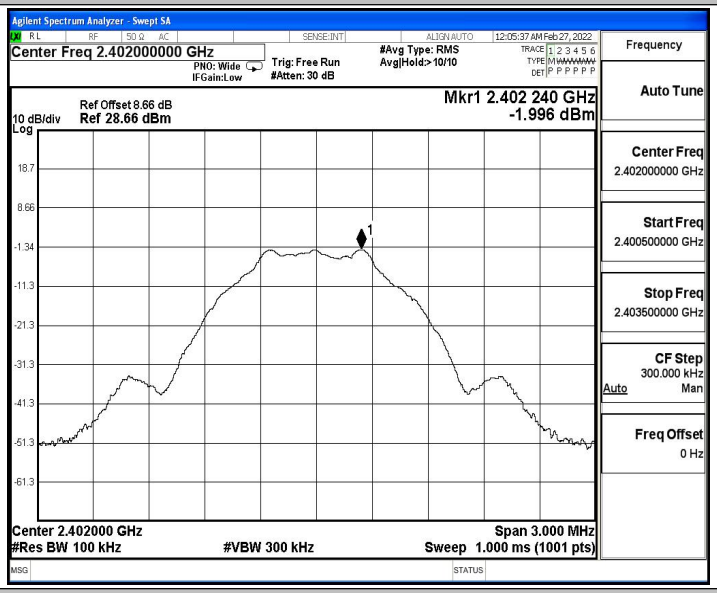
A.5 Conducted Spurious Emission

Test Result

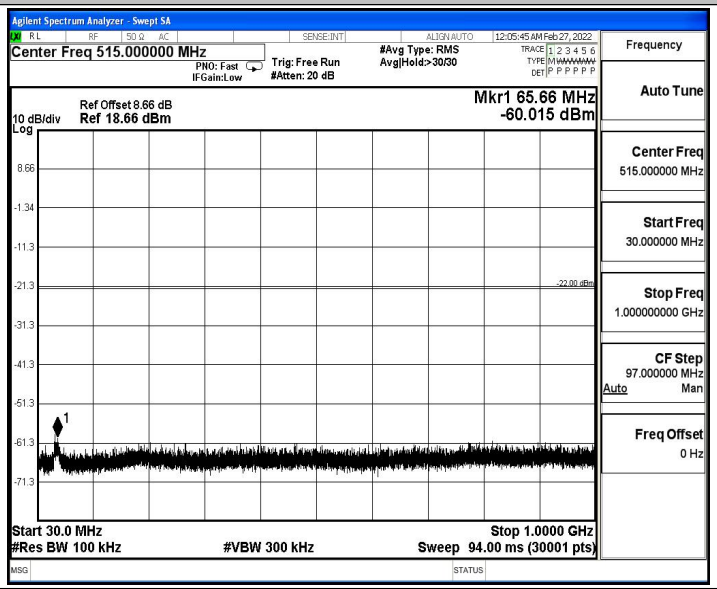
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-2.00	-2.00	---	PASS
			30~1000	-2.00	-60.02	≤-22	PASS
			1000~26500	-2.00	-46.2	≤-22	PASS
		2440	Reference	-1.41	-1.41	---	PASS
			30~1000	-1.41	-58.73	≤-21.41	PASS
			1000~26500	-1.41	-46.57	≤-21.41	PASS
		2480	Reference	-1.72	-1.72	---	PASS
			30~1000	-1.72	-59.81	≤-21.72	PASS
			1000~26500	-1.72	-45.89	≤-21.72	PASS

Test Graphs

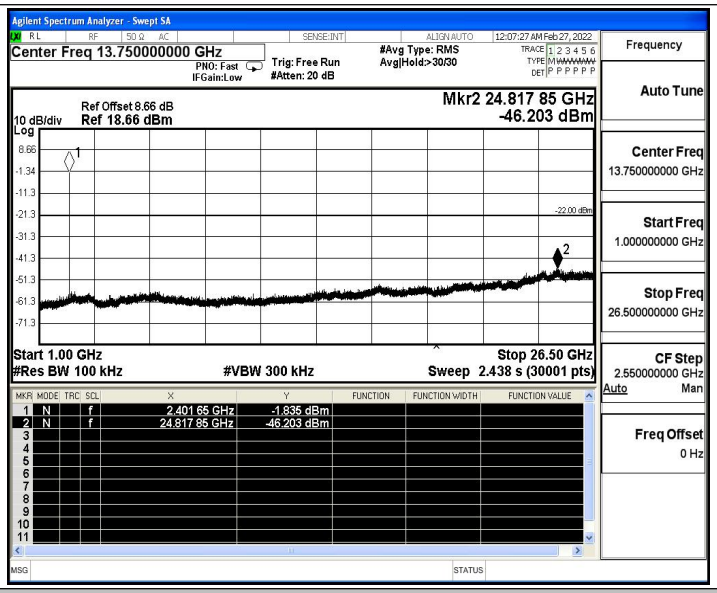
BLE_1M_Ant1_2402_0~Reference



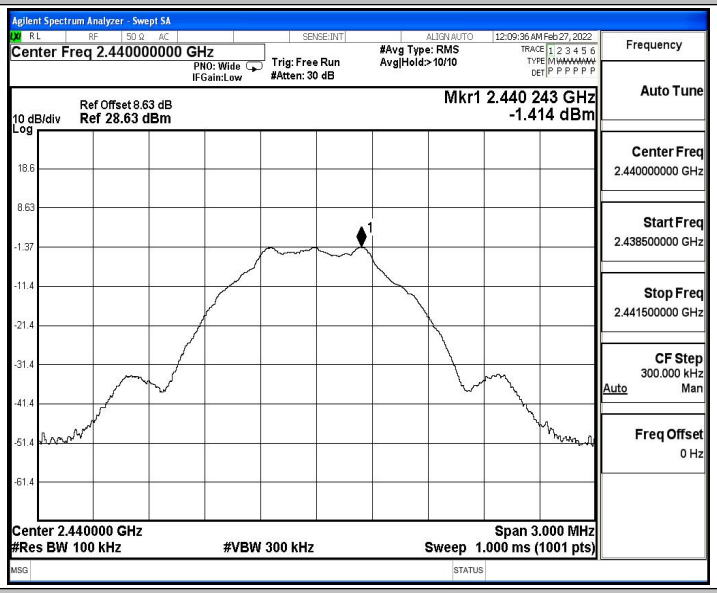
BLE_1M_Ant1_2402_30~1000



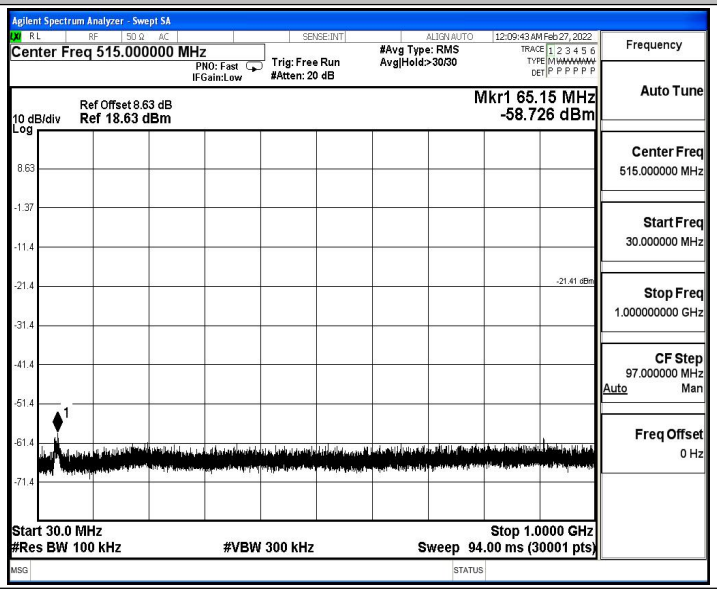
BLE_1M_Ant1_2402_1000~26500



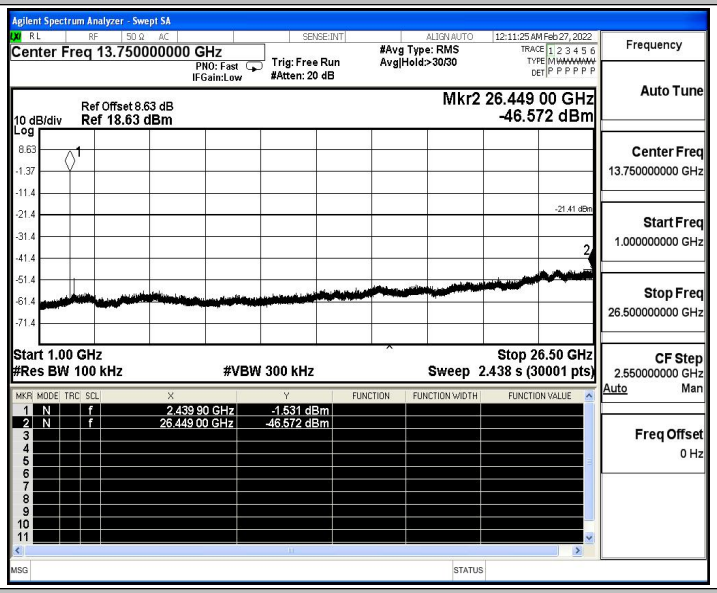
BLE_1M_Ant1_2440_0~Reference



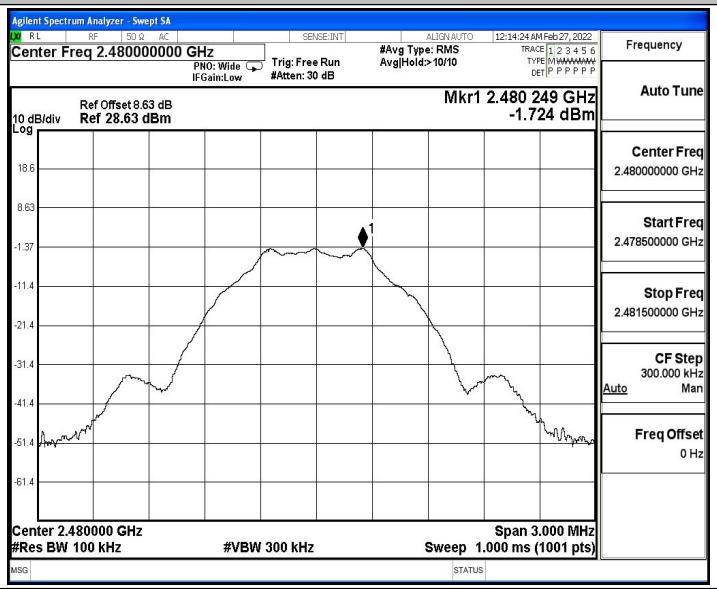
BLE_1M_Ant1_2440_30~1000



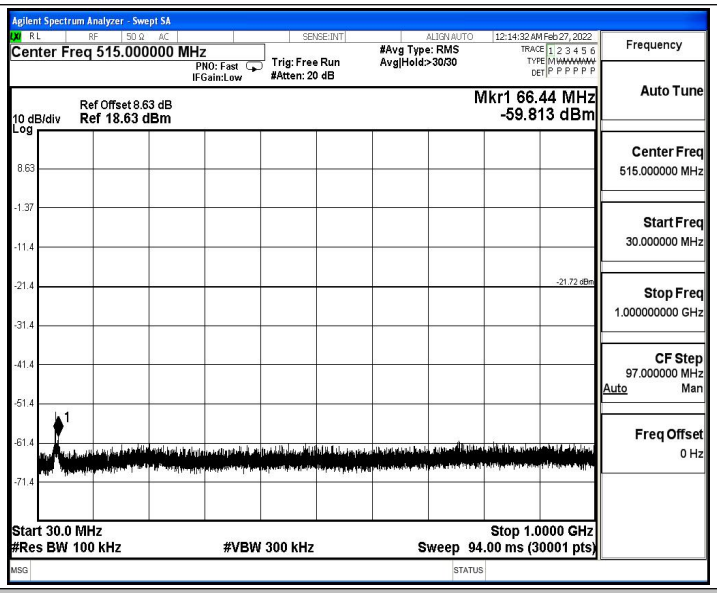
BLE_1M_Ant1_2440_1000~26500



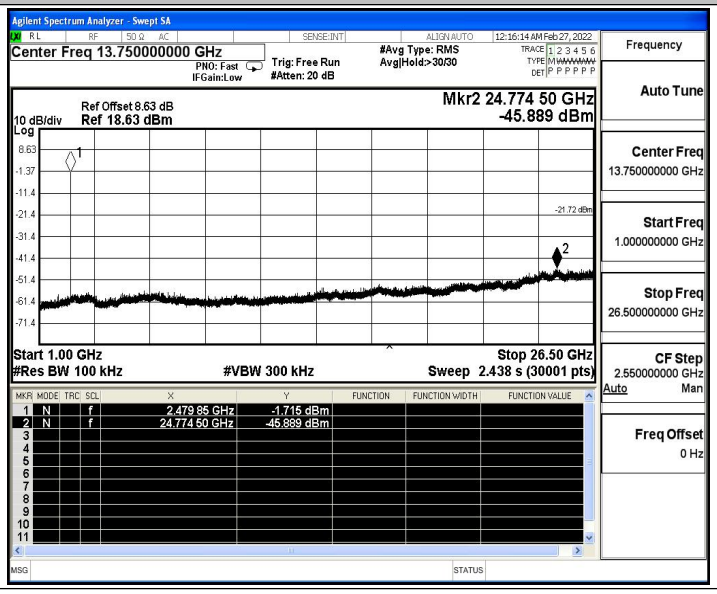
BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



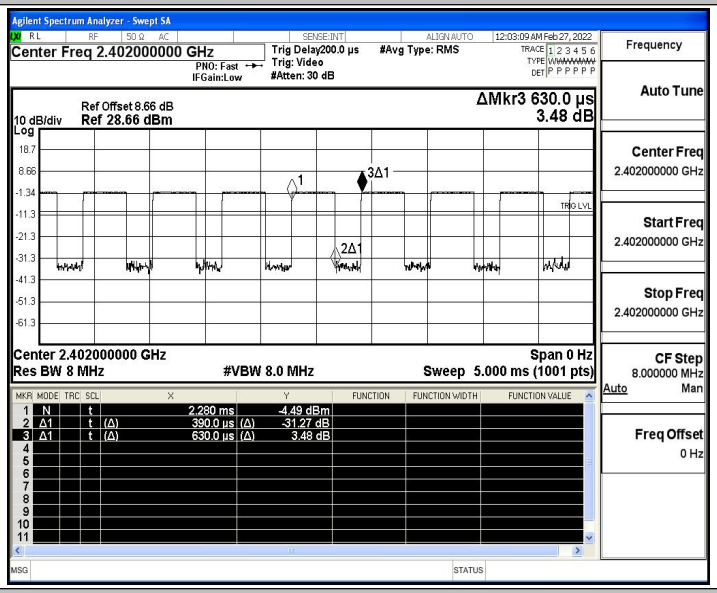
A.6 Duty Cycle

Test Result

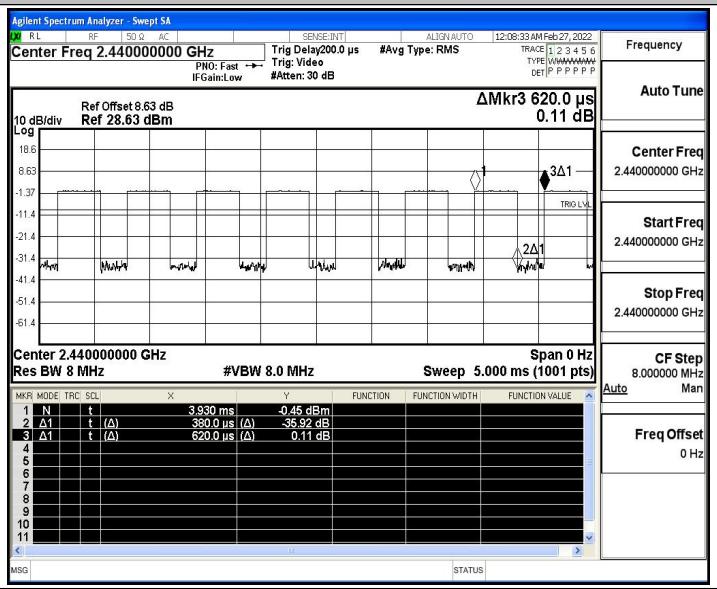
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T[kHz]
BLE_1M	Ant1	2402	0.39	0.63	0.6190	61.90	2.08	2.63
		2440	0.38	0.62	0.6129	61.29	2.13	2.63
		2480	0.39	0.63	0.6190	61.90	2.08	2.63

Test Graphs

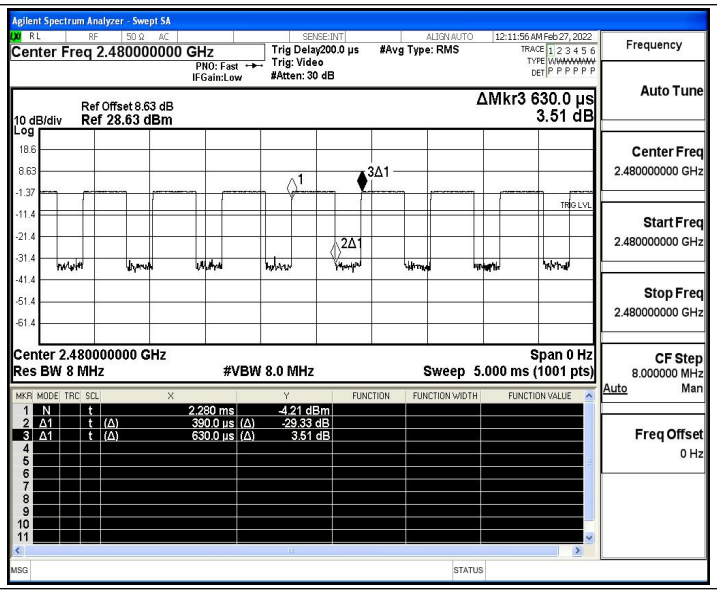
BLE_1M_Ant1_2402



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
12:11:56 AM Feb 27, 2022
Ref Offset 8.63 dB
10 dB/div
Ref 28.63 dBm
ΔMkr3 630.0 µs
3.51 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 2.280 ms -4.21 dBm
2 Δ1 t (Δ) 390.0 µs (Δ) -29.33 dB
3 Δ1 t (Δ) 630.0 µs (Δ) 3.51 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

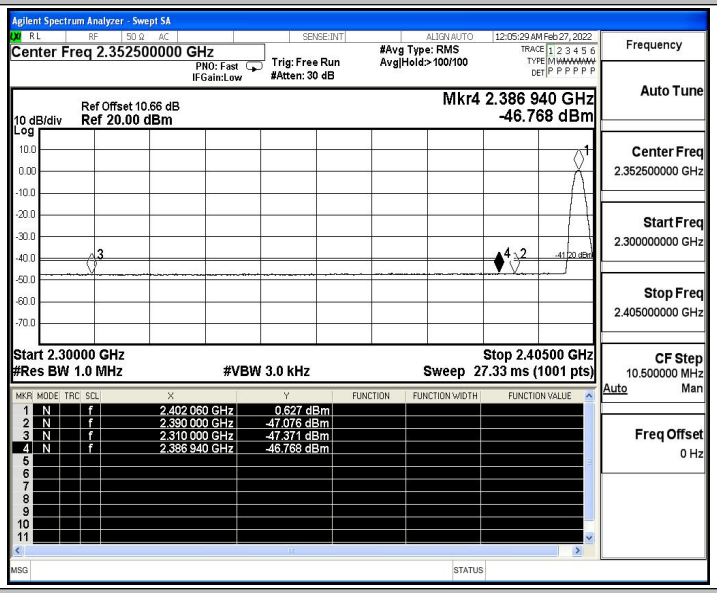
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-47.37	≤-41.20	47.83	≤54	PASS
				AV	2386.940	-46.77	≤-41.20	48.43	≤54	PASS
				AV	2390.000	-47.08	≤-41.20	48.12	≤54	PASS
				Peak	2310.000	-38.46	≤-21.20	56.74	≤74	PASS
				Peak	2376.860	-36.55	≤-21.20	58.65	≤74	PASS
				Peak	2390.000	-38.12	≤-21.20	57.08	≤74	PASS
		High	2480	AV	2483.500	-46.76	≤-41.20	48.44	≤54	PASS
				AV	2494.720	-46.4	≤-41.20	48.80	≤54	PASS
				AV	2500.000	-46.37	≤-41.20	48.83	≤54	PASS
				Peak	2483.500	-38.17	≤-21.20	57.03	≤74	PASS
				Peak	2492.400	-36.33	≤-21.20	58.87	≤74	PASS
				Peak	2500.000	-37.36	≤-21.20	57.84	≤74	PASS

Note：

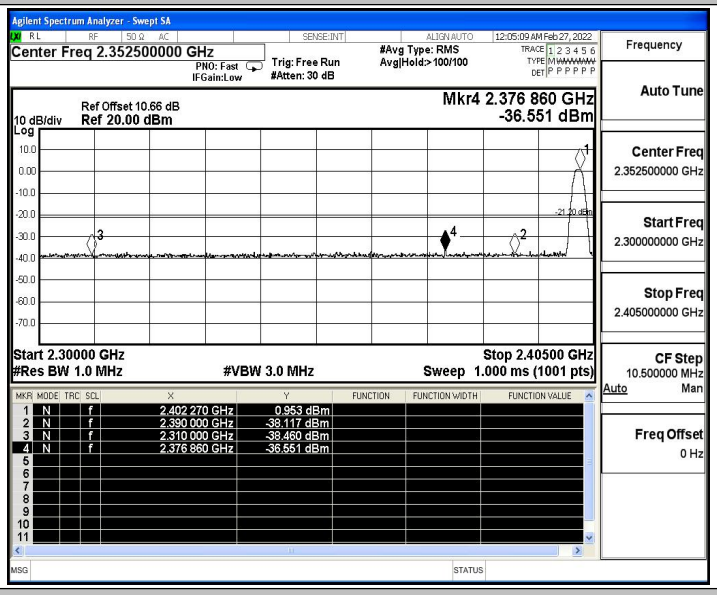
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

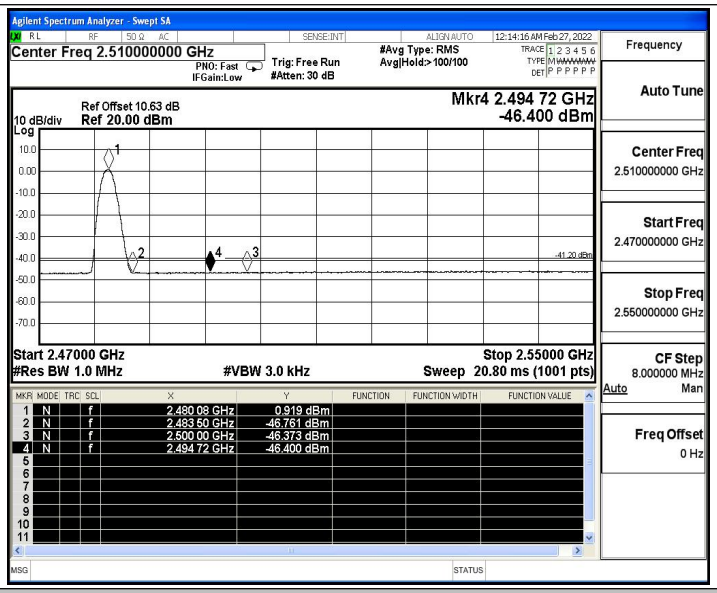
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak