Appendix A

RF Test Data for BLE (Conducted Measurement)

Product Name: Pearl River Intelligent System

Test Model: QU1

Environmental Conditions

Temperature:	23.5 ° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Nick Peng
	Nick Peng
Supervised by:	Jack Cheng
	Jack Cheng

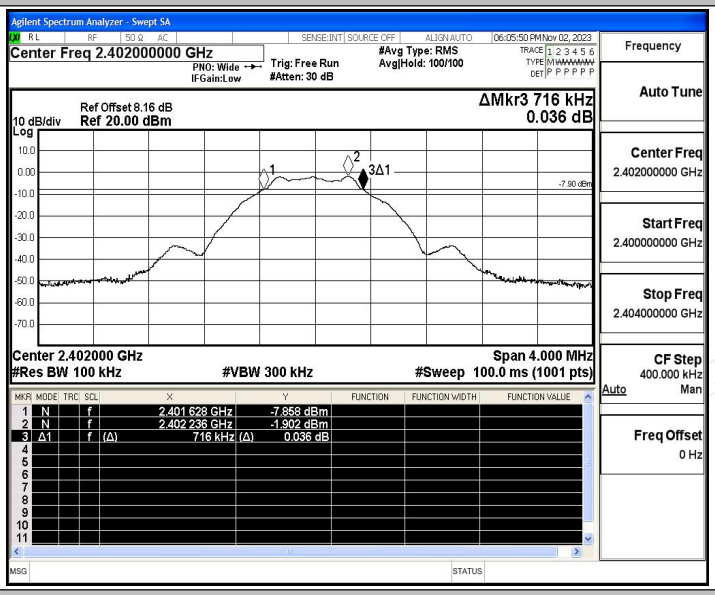
A.1 DTS Bandwidth

Test Result

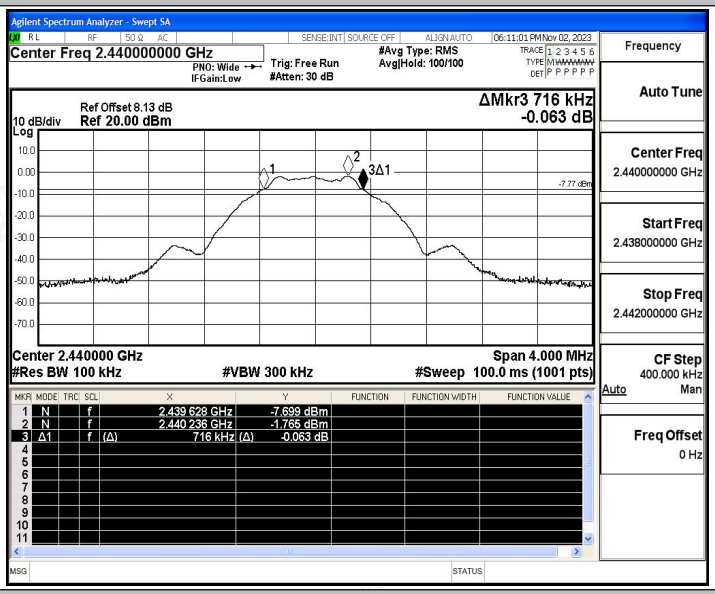
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.716	2401.628	2402.344	0.5	PASS
		2440	0.716	2439.628	2440.344	0.5	PASS
		2480	0.712	2479.628	2480.340	0.5	PASS

Test Graphs

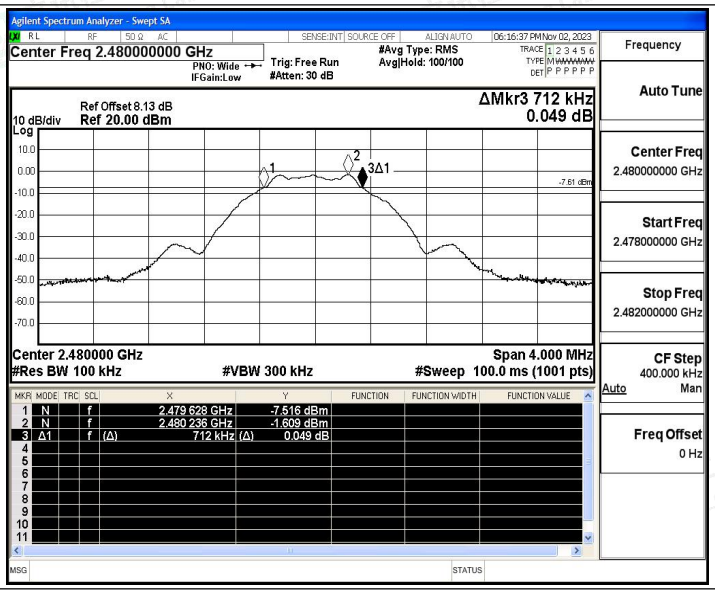
BLE_1M_Ant1_2402



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: 100/100
06:16:37 PM Nov 02, 2023
Ref Offset 8.13 dB
10 dB/div Ref 20.00 dBm
Log
ΔMkr3 712 kHz
0.049 dB
-7.61 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
#Sweep 100.0 ms (1001 pts)
1 N f 2.479 628 GHz -7.516 dBm
2 N f 2.480 236 GHz -1.609 dBm
3 Δ1 f (Δ) 712 kHz (Δ) 0.049 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

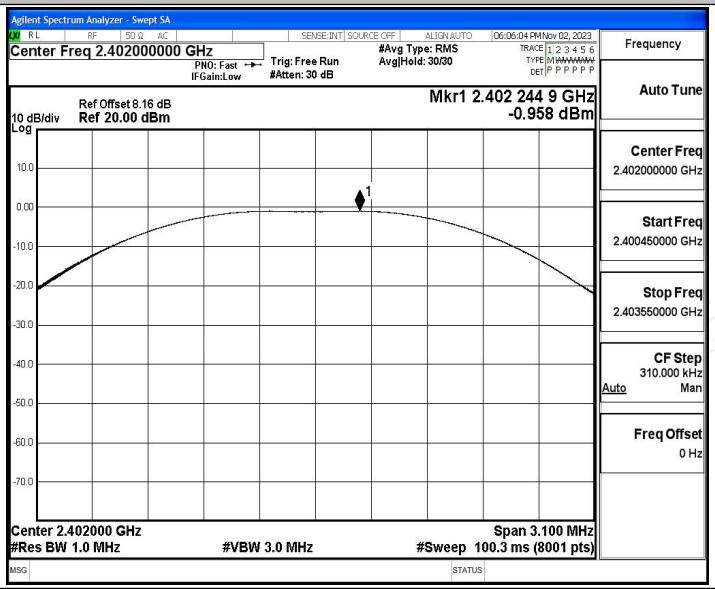
A.2 Maximum conducted output power

Test Result

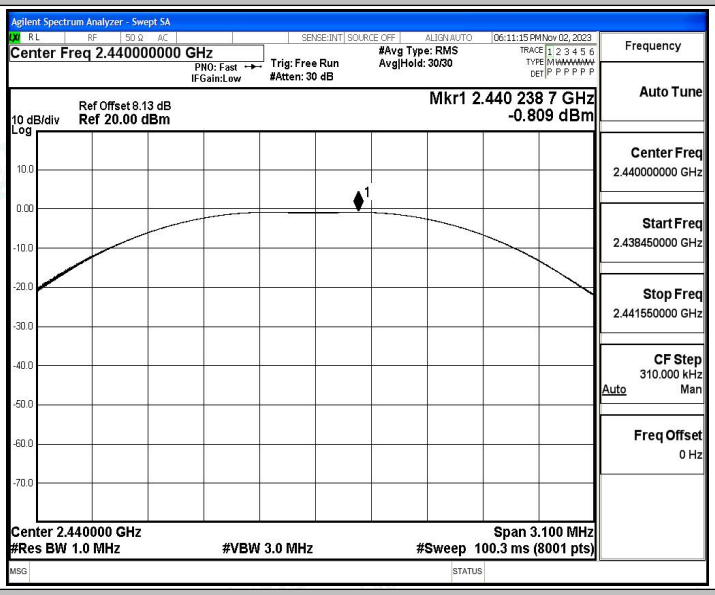
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-0.96	≤30	PASS
		2440	-0.81	≤30	PASS
		2480	-0.66	≤30	PASS

Test Graphs

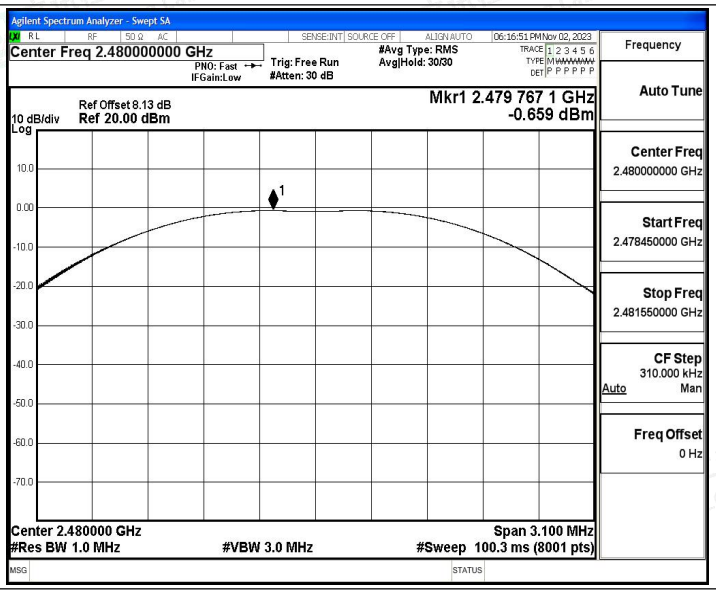
BLE_1M_Ant1_2402



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
06:16:51 PM Nov 02, 2023
Ref Offset 8.13 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 767 1 GHz
-0.659 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

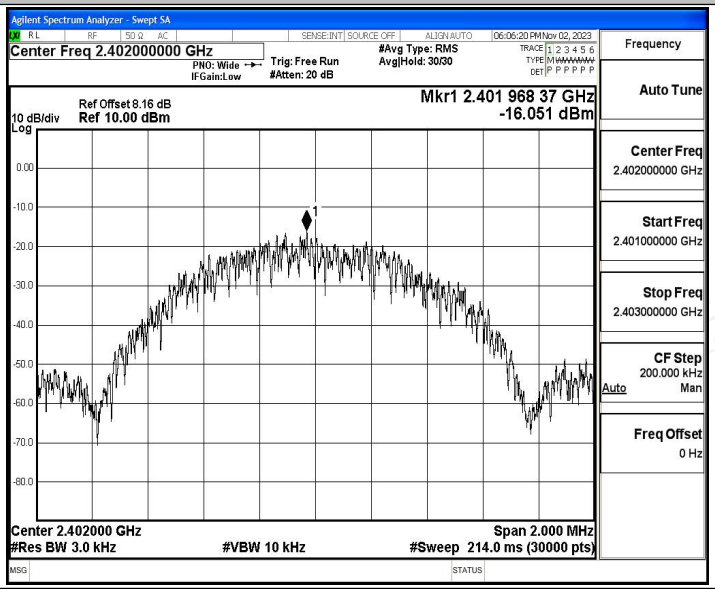
A.3 Maximum power spectral density

Test Result

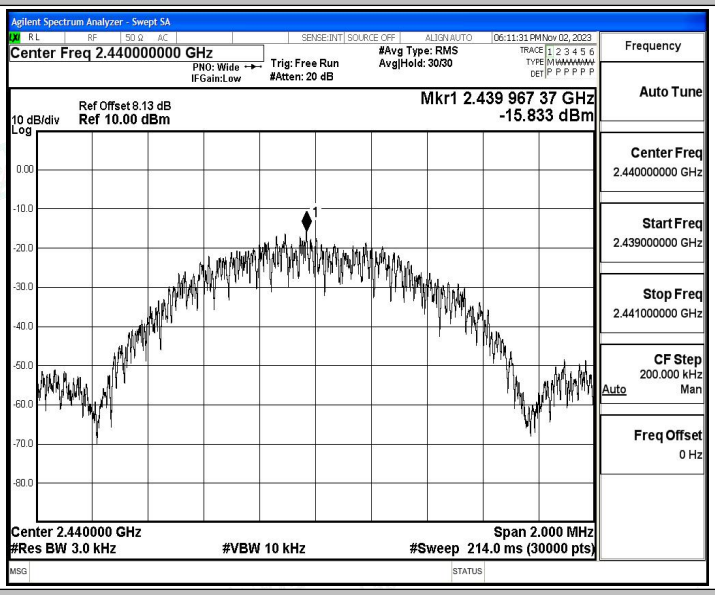
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-16.05	≤8.00	PASS
		2440	-15.83	≤8.00	PASS
		2480	-15.76	≤8.00	PASS

Test Graphs

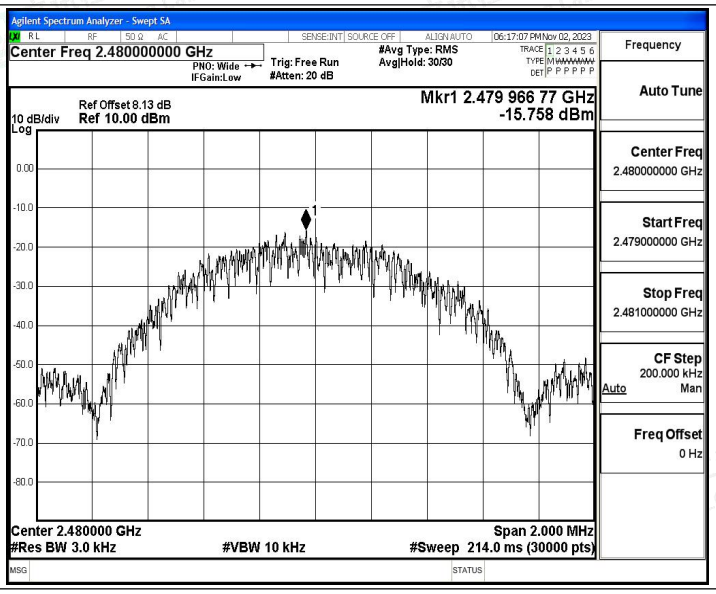
BLE_1M_Ant1_2402



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
06:17:07 PM Nov 02, 2023
Ref Offset 8.13 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 966 77 GHz
-15.758 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

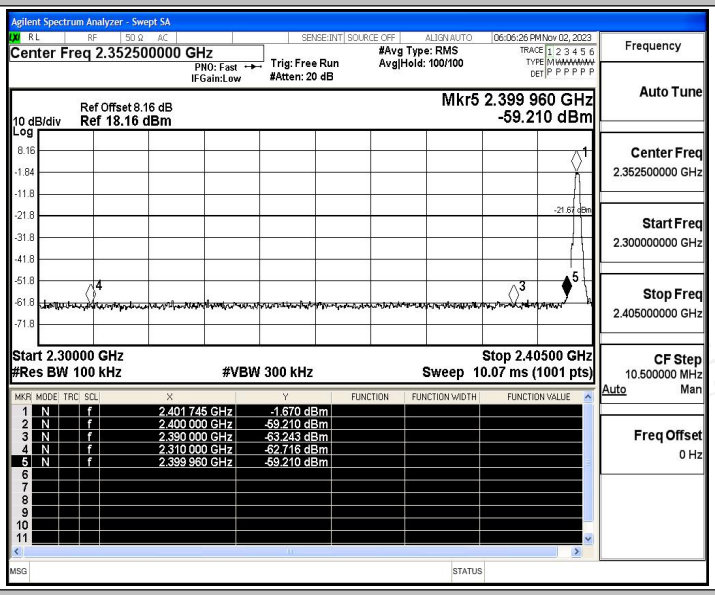
A.4 Band edge measurements

Test Result

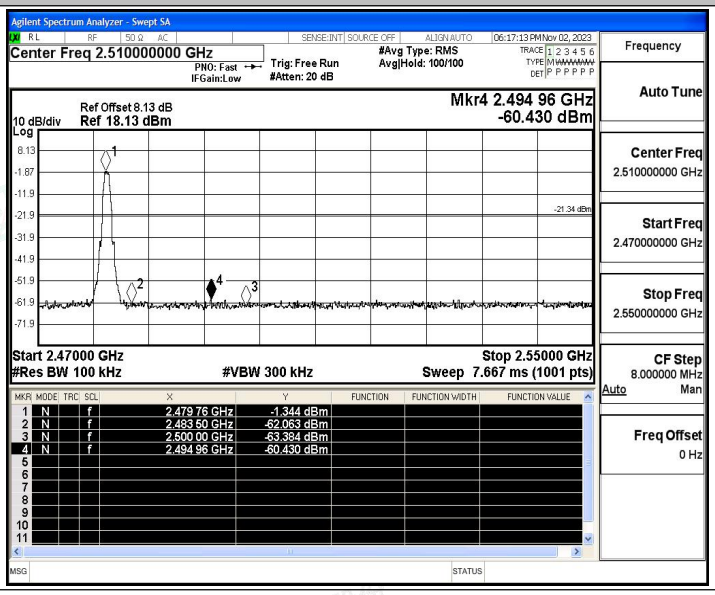
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-1.67	-59.21	≤-21.67	PASS
		High	2480	-1.34	-60.43	≤-21.34	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



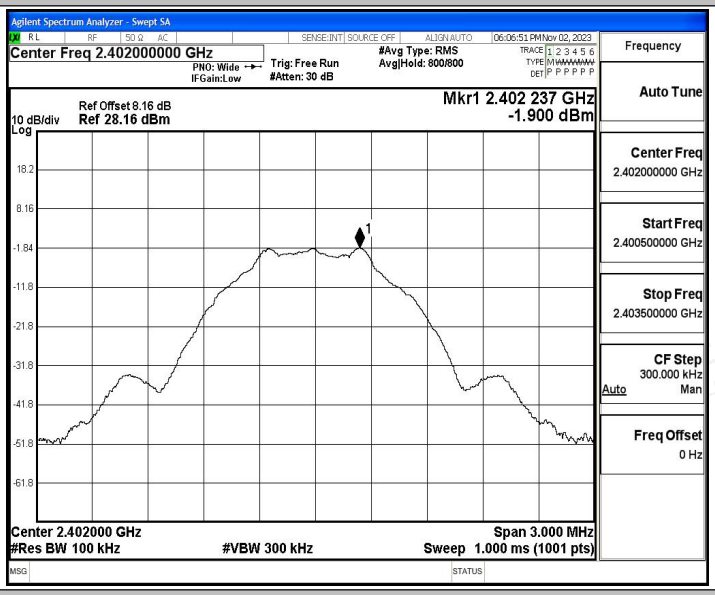
A.5 Conducted Spurious Emission

Test Result

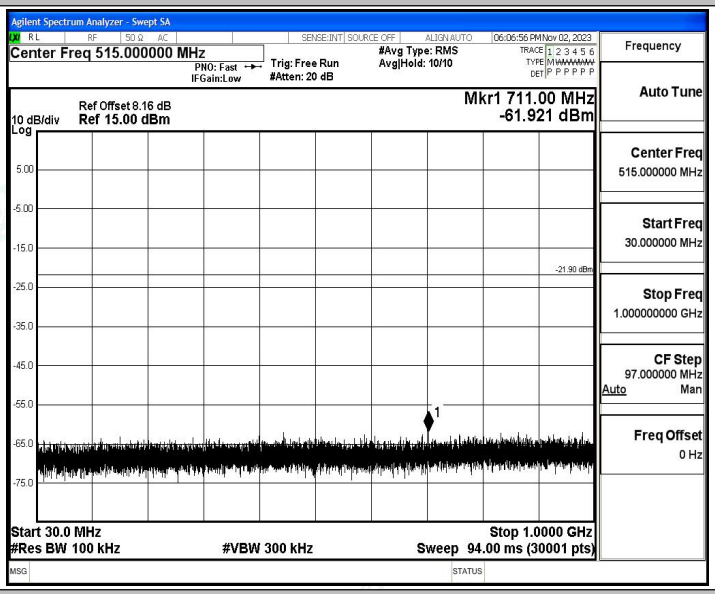
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-1.90	-1.90	---	PASS
			30~1000	-1.90	-61.92	≤-21.9	PASS
			1000~26500	-1.90	-49.17	≤-21.9	PASS
		2440	Reference	-1.74	-1.74	---	PASS
			30~1000	-1.74	-61.63	≤-21.74	PASS
			1000~26500	-1.74	-49.63	≤-21.74	PASS
		2480	Reference	-1.58	-1.58	---	PASS
			30~1000	-1.58	-60.96	≤-21.58	PASS
			1000~26500	-1.58	-49.67	≤-21.58	PASS

Test Graphs

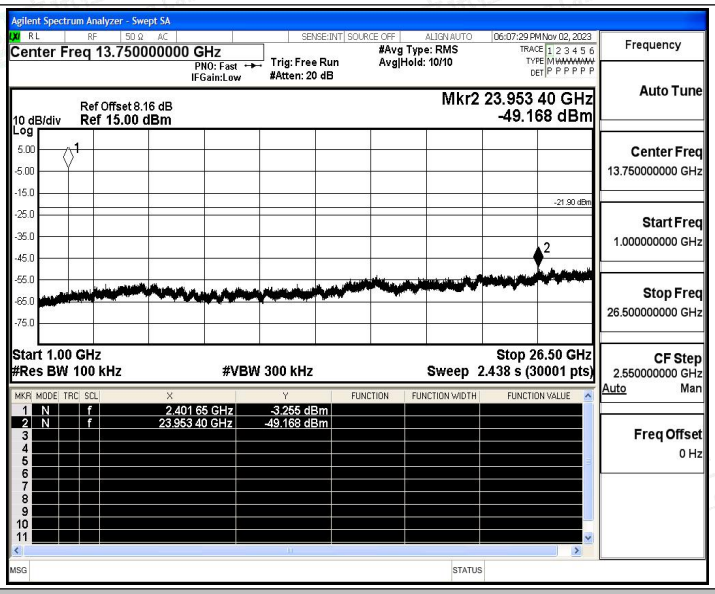
BLE_1M_Ant1_2402_0~Reference



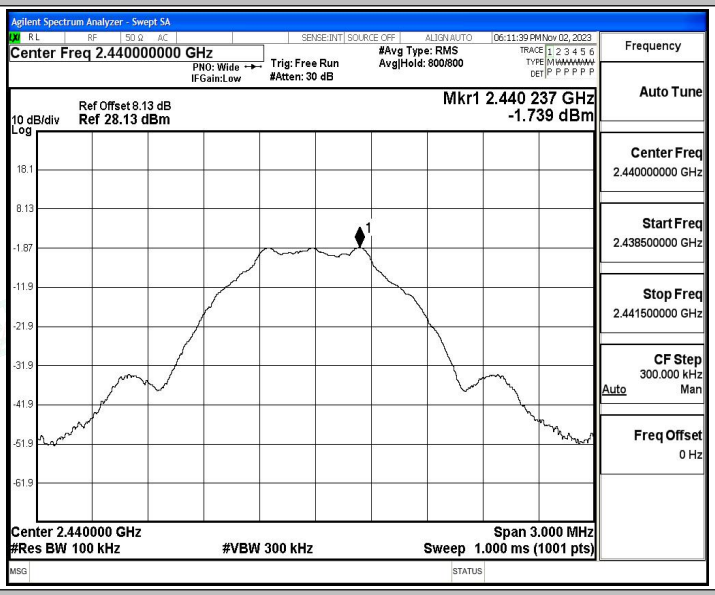
BLE_1M_Ant1_2402_30~1000



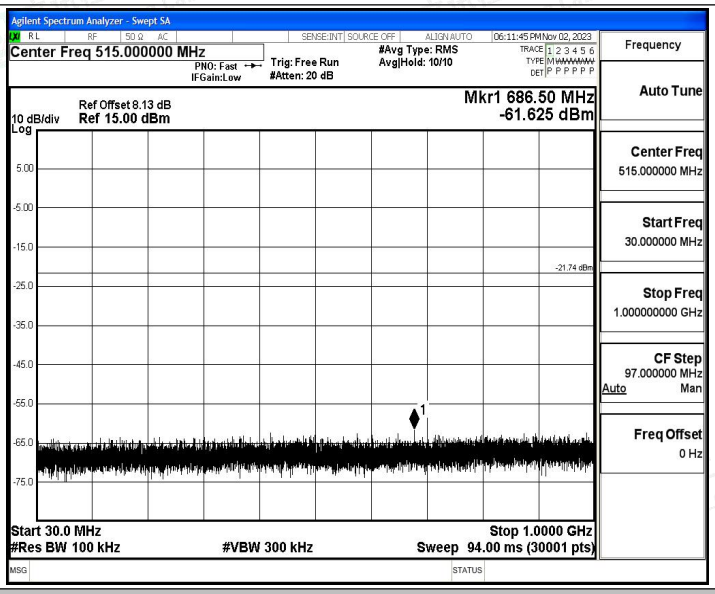
BLE_1M_Ant1_2402_1000~26500



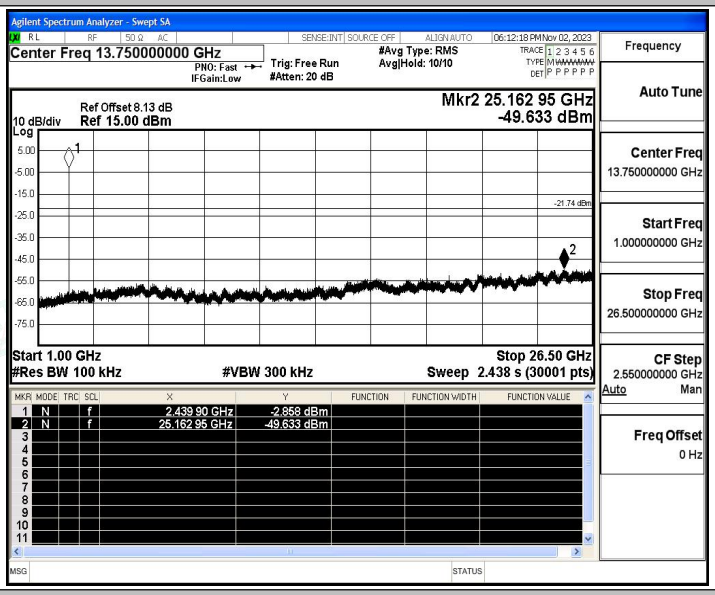
BLE_1M_Ant1_2440_0~Reference



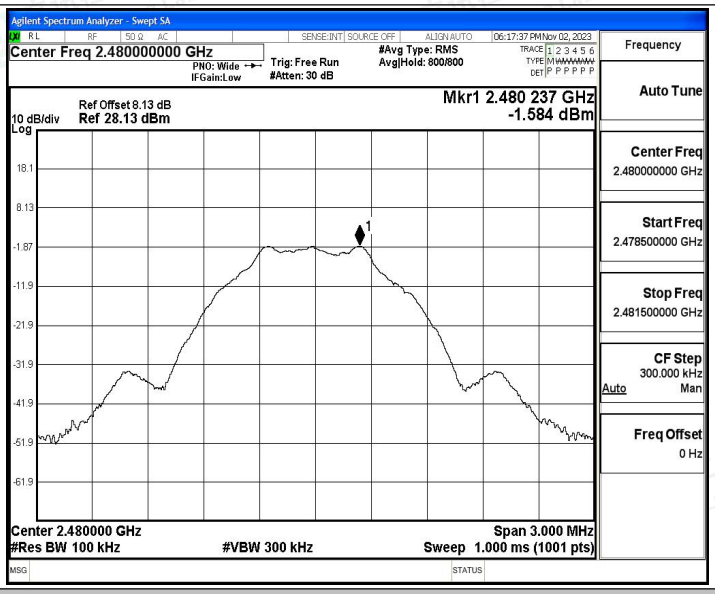
BLE_1M_Ant1_2440_30~1000



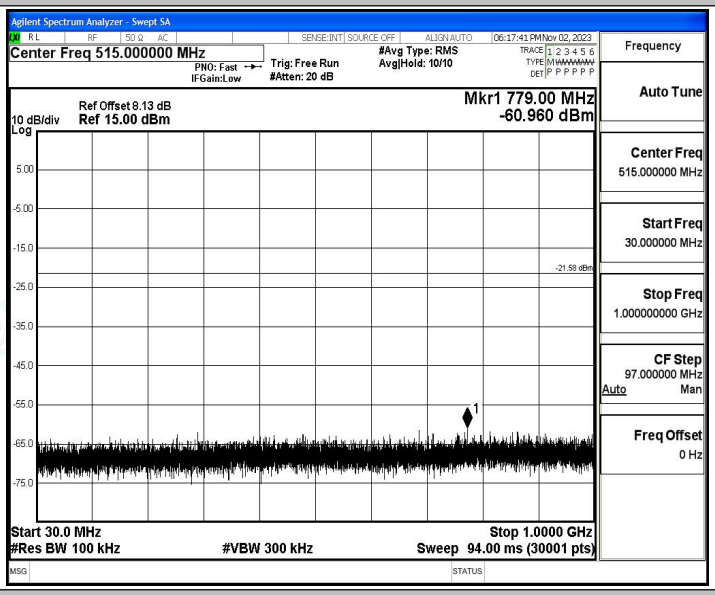
BLE_1M_Ant1_2440_1000~26500



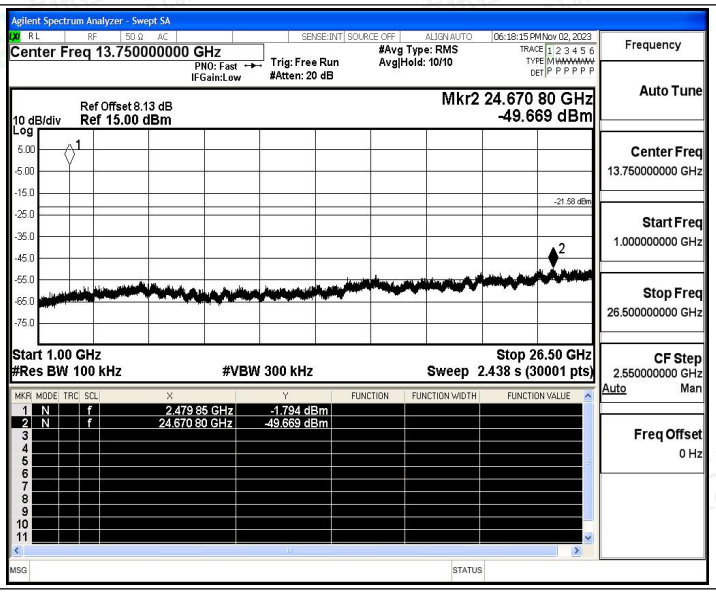
BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500


Agilent Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
06:18:15 PM Nov 02, 2023
Ref Offset 8.13 dB
10 dB/div Ref 15.00 dBm
Log
Mkr2 24.670 80 GHz
-49.669 dBm
-21.58 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
1 N f 2.479 85 GHz -1.794 dBm
2 N f 24.670 80 GHz -49.669 dBm
Frequency
Auto Tune
Center Freq
13.750000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
2.550000000 GHz
Auto Man
Freq Offset
0 Hz

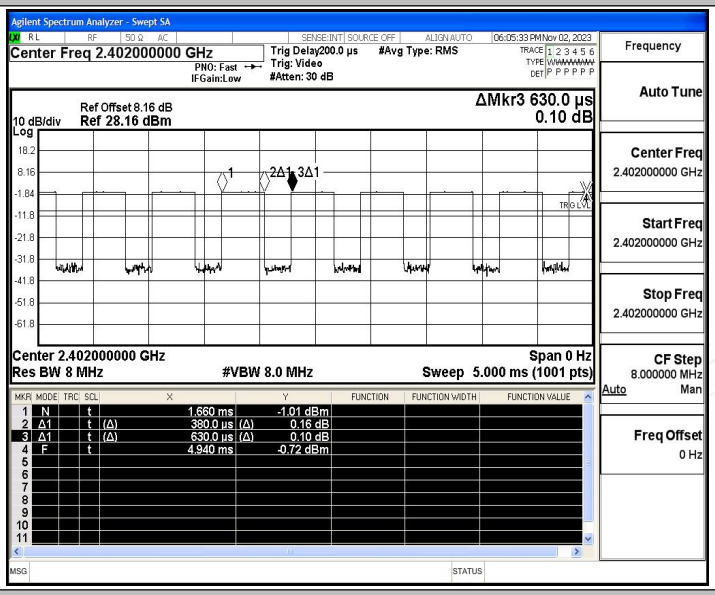
A.6 Duty Cycle

Test Result

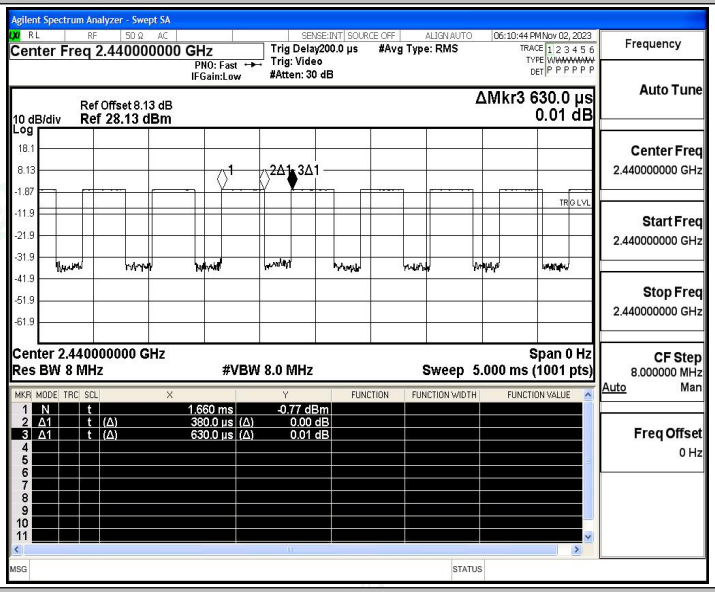
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T	Limit	Verdict
BLE_1M	Ant1	2402	0.38	0.63	0.6032	60.32	2.20	2.63	---	---
		2440	0.38	0.63	0.6032	60.32	2.20	2.63	---	---
		2480	0.38	0.63	0.6032	60.32	2.20	2.63	---	---

Test Graphs

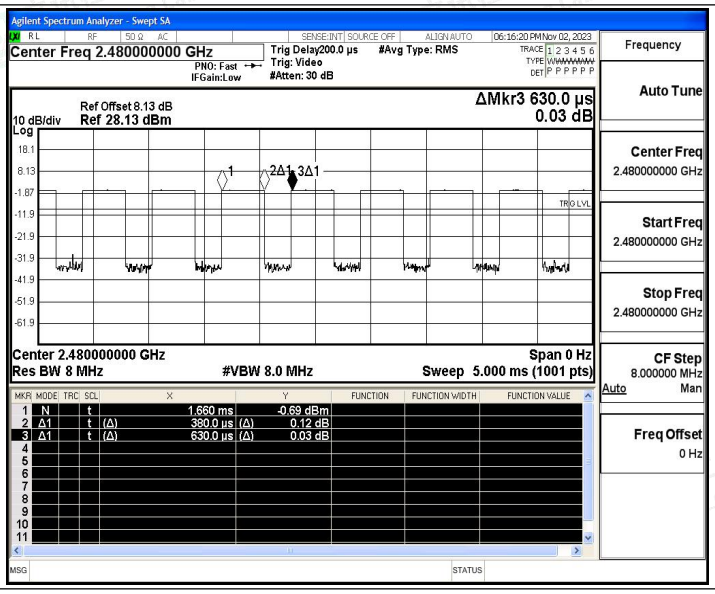
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
Trig Delay200.0 µs
Trig: Video
#Atten: 30 dB
#Avg Type: RMS
06:16:20 PM Nov 02, 2023
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
ΔMkr3 630.0 µs
0.03 dB
Ref Offset 8.13 dB
10 dB/div Ref 28.13 dBm
Log
Center 2.480000000 GHz
Res BW 8 MHz
#VBW 8.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 N 1.660 ms -0.69 dBm
2 Δ1 380.0 µs (Δ) 0.12 dB
3 Δ1 630.0 µs (Δ) 0.03 dB

A.7 Emissions in Restricted Bands

Test Result

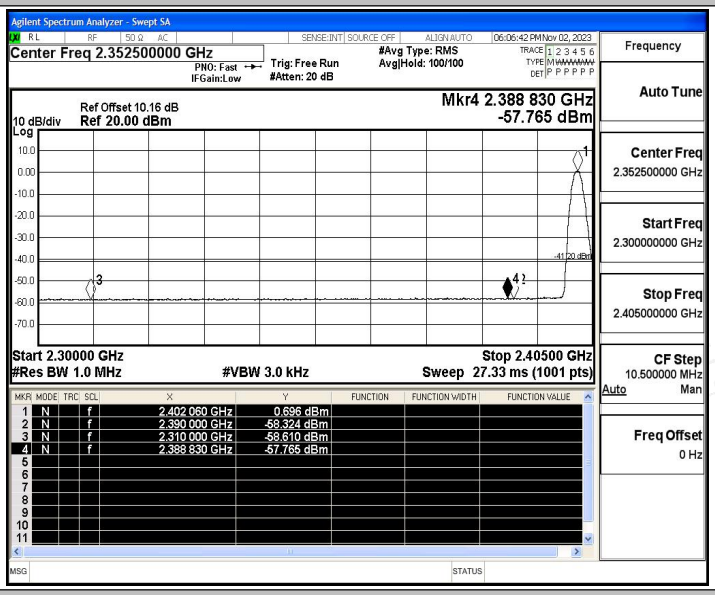
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-58.61	≤-41.20	36.59	≤54	PASS
				AV	2388.830	-57.76	≤-41.20	37.44	≤54	PASS
				AV	2390.000	-58.32	≤-41.20	36.88	≤54	PASS
				Peak	2310.000	-51.67	≤-21.20	43.53	≤74	PASS
				Peak	2341.790	-48.74	≤-21.20	46.46	≤74	PASS
				Peak	2390.000	-52.5	≤-21.20	42.70	≤74	PASS
		High	2480	AV	2483.500	-54.55	≤-41.20	40.65	≤54	PASS
				AV	2483.520	-54.55	≤-41.20	40.65	≤54	PASS
				AV	2500.000	-57.96	≤-41.20	37.24	≤54	PASS
				Peak	2483.500	-51.78	≤-21.20	43.42	≤74	PASS
				Peak	2484.160	-48.84	≤-21.20	46.36	≤74	PASS
				Peak	2500.000	-51.47	≤-21.20	43.73	≤74	PASS

Note:

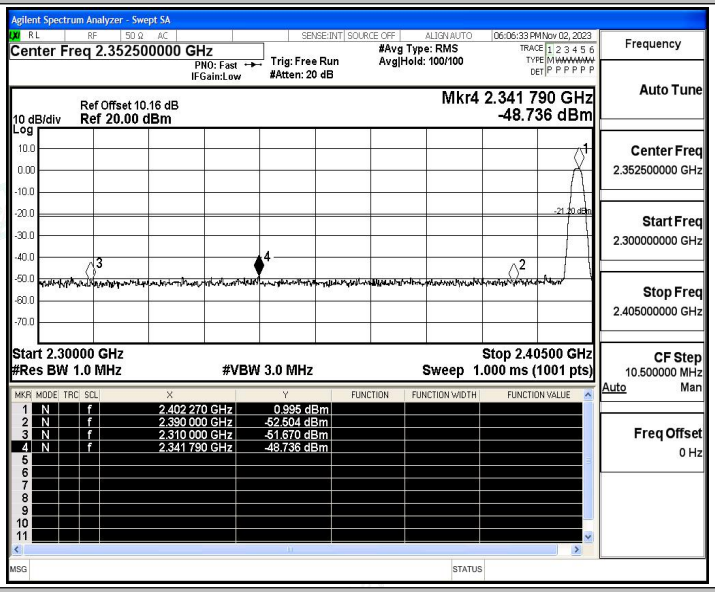
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

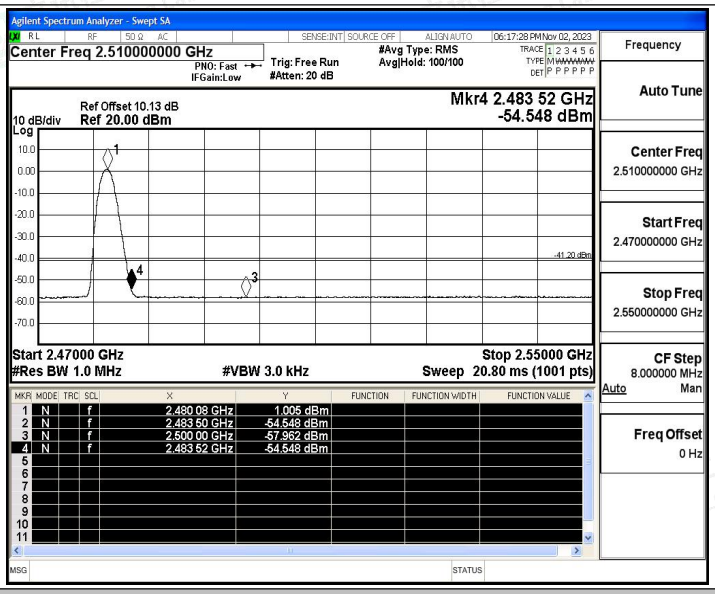
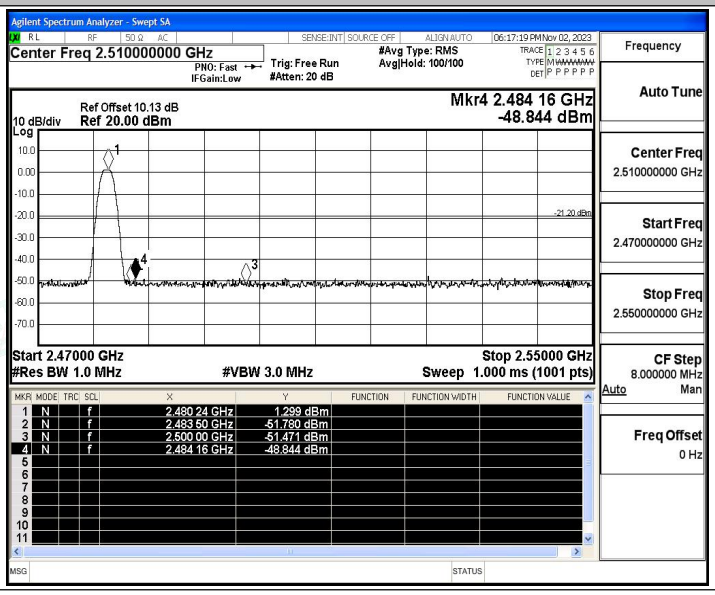
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak