Appendix B

RF Test Data for BT LE (Conducted Measurement)

Product Name: Personal Mobile Alarm System

Test Model: PAL 4

Environmental Conditions

Temperature:	23.9° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Ling Zhu
Supervised by:	Li huan

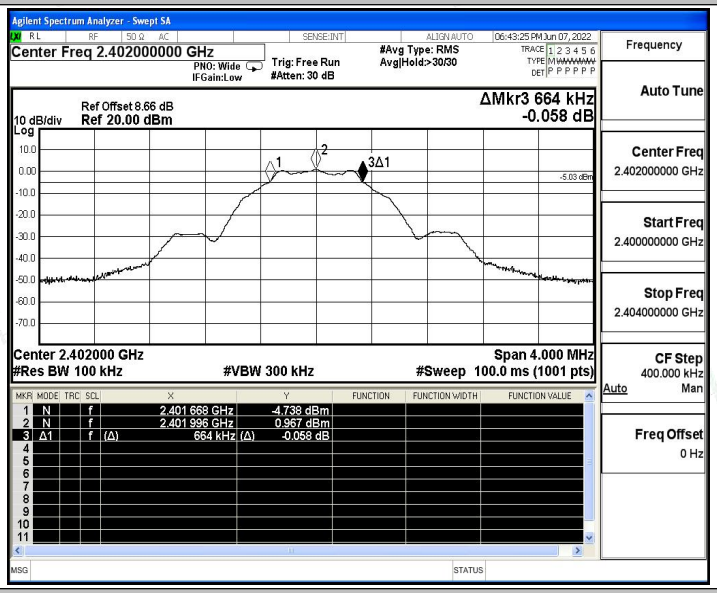
B.1 6dB Bandwidth

Test Result

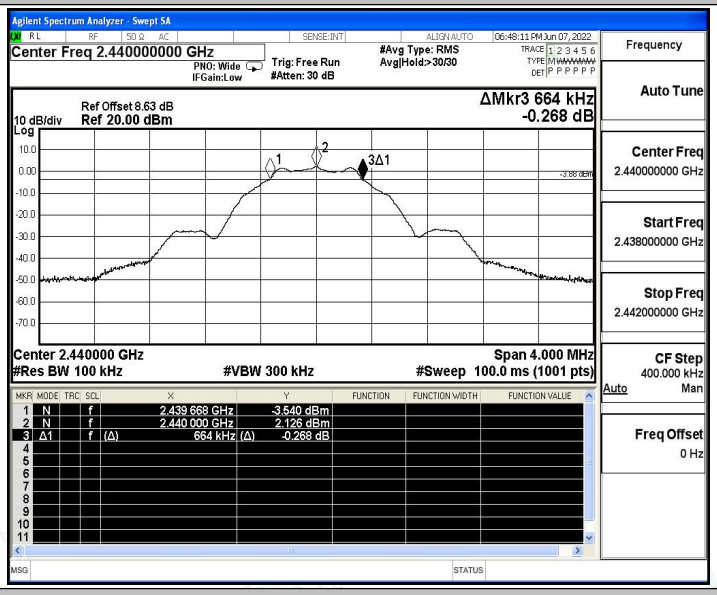
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.664	2401.668	2402.332	0.5	PASS
		2440	0.664	2439.668	2440.332	0.5	PASS
		2480	0.668	2479.664	2480.332	0.5	PASS

Test Graphs

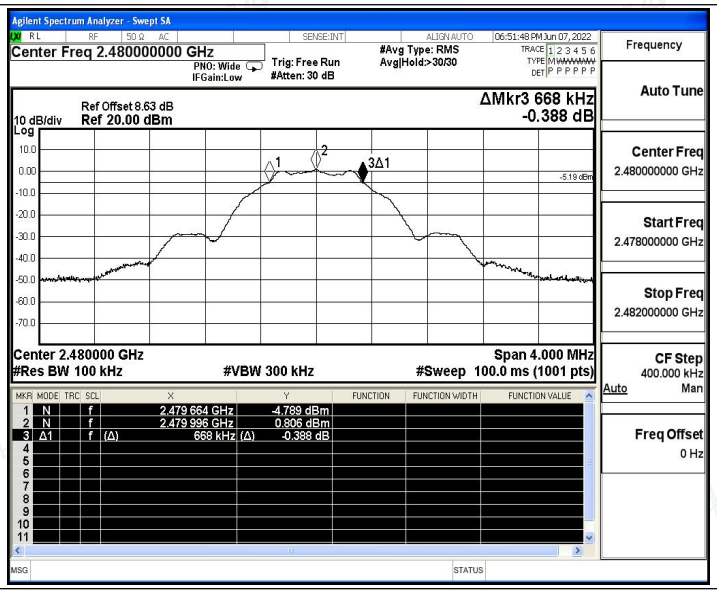
BLE_1M_Ant1_2402



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
06:51:48 PM Jun 07, 2022
Ref Offset 8.63 dB
10 dB/div Ref 20.00 dBm
Log
ΔMkr3 668 kHz
-0.388 dB
-5.19 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 2.479 664 GHz -4.789 dBm
2 N f 2.479 996 GHz 0.806 dBm
3 Δ1 f (Δ) 668 kHz (Δ) -0.388 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

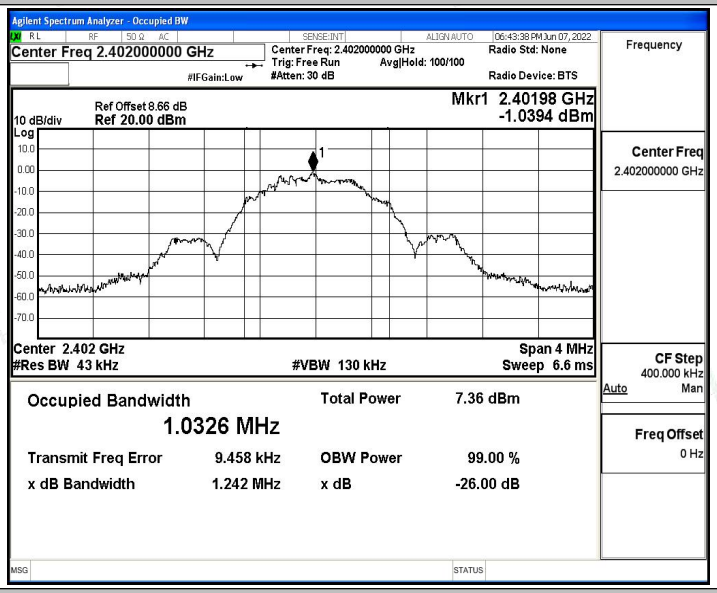
B.2 Occupied Channel Bandwidth

Test Result

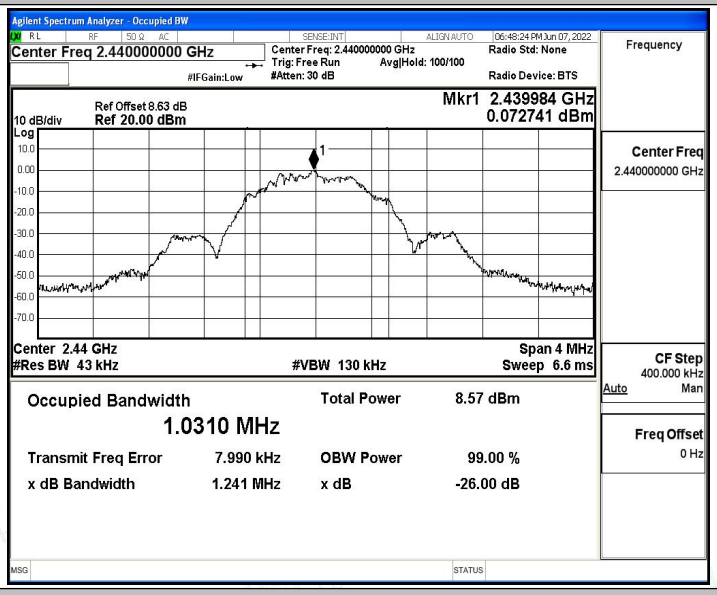
TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0326	2401.493	2402.526	---	---
		2440	1.0310	2439.492	2440.523	---	---
		2480	1.0265	2479.491	2480.518	---	---

Test Graphs

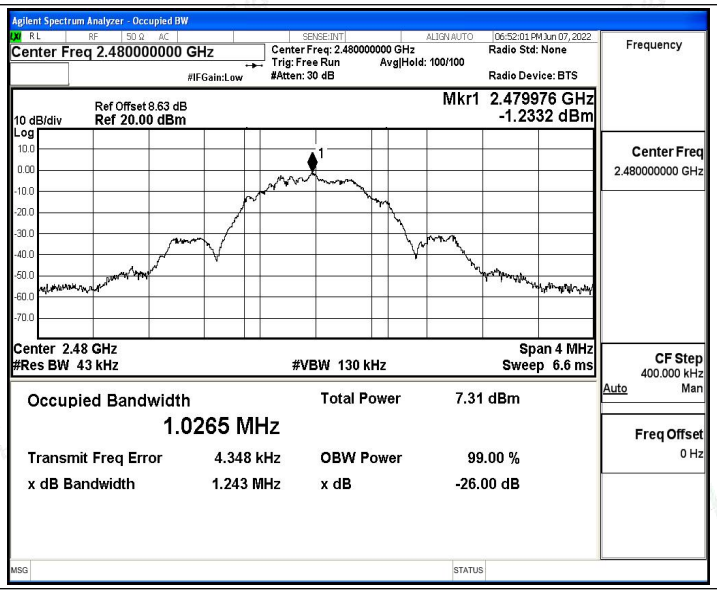
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.479976 GHz
-1.2332 dBm
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 43 kHz
#VBW 130 kHz
Span 4 MHz
Sweep 6.6 ms
CF Step
400.000 kHz
Auto
Man
Occupied Bandwidth
1.0265 MHz
Total Power 7.31 dBm
Transmit Freq Error 4.348 kHz
OBW Power 99.00 %
x dB Bandwidth 1.243 MHz
x dB -26.00 dB
Freq Offset
0 Hz
MSG
STATUS

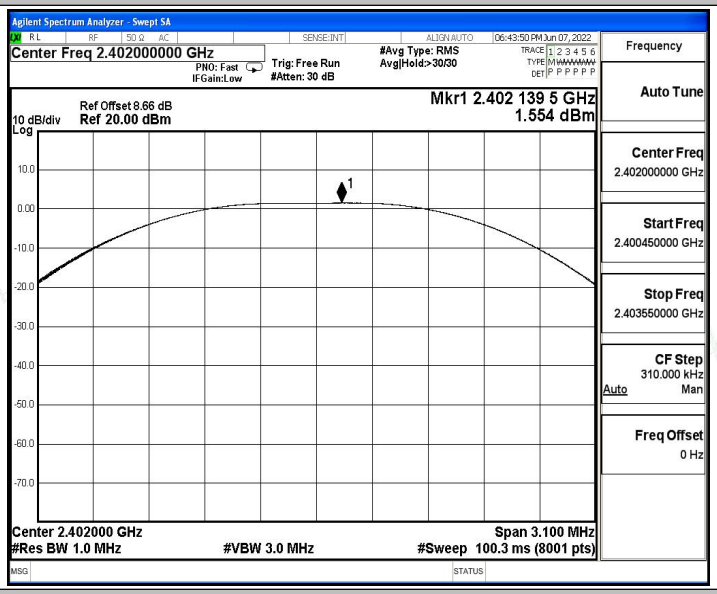
B.3 Maximum conducted output power

Test Result

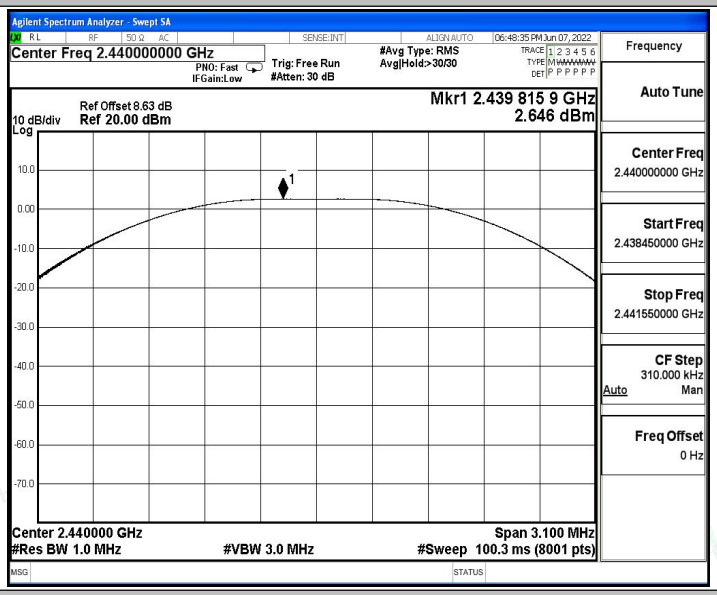
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	1.55	≤30	PASS
		2440	2.65	≤30	PASS
		2480	1.35	≤30	PASS

Test Graphs

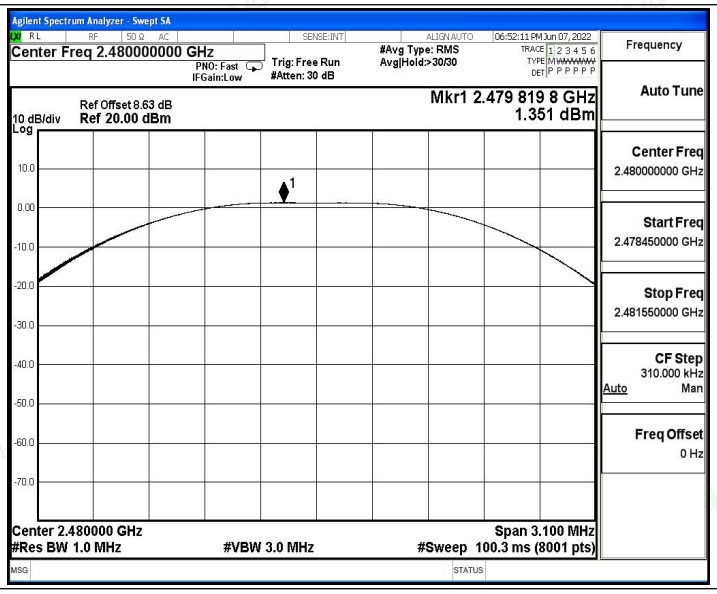
BLE_1M_Ant1_2402



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
06:52:11 PM Jun 07, 2022
Ref Offset 8.63 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.479 819 8 GHz
1.351 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

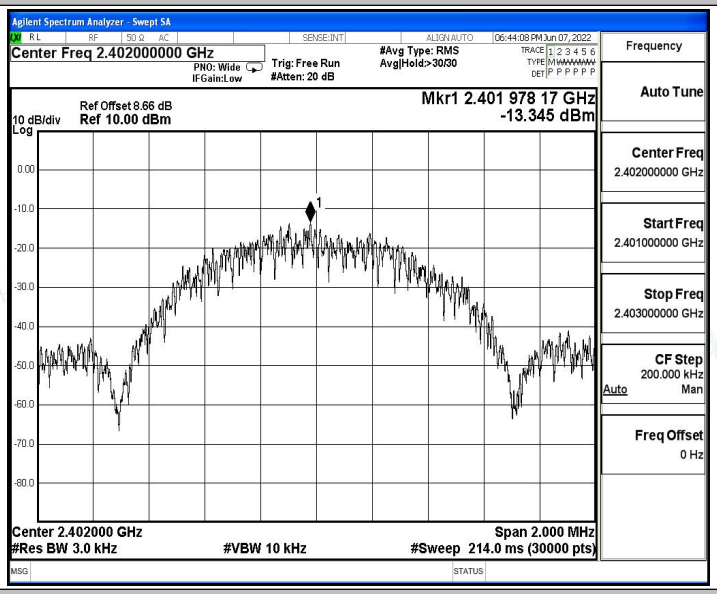
B.4 Maximum power spectral density

Test Result

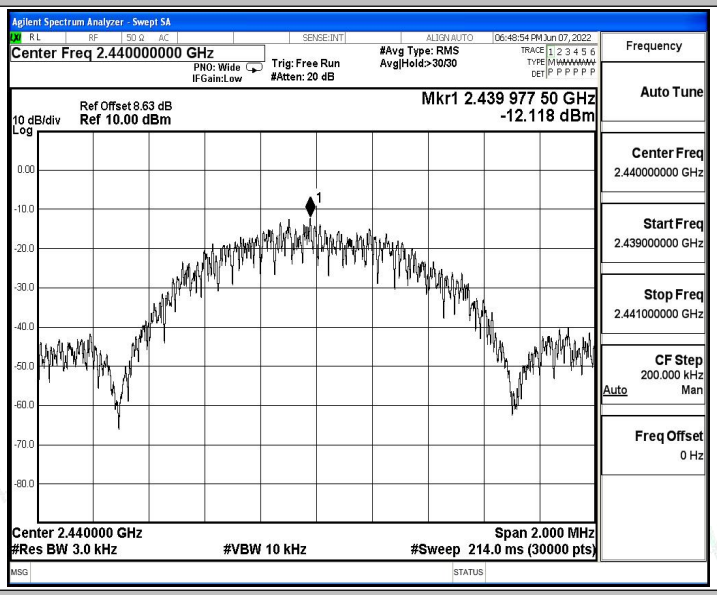
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-13.35	≤8.00	PASS
		2440	-12.12	≤8.00	PASS
		2480	-13.49	≤8.00	PASS

Test Graphs

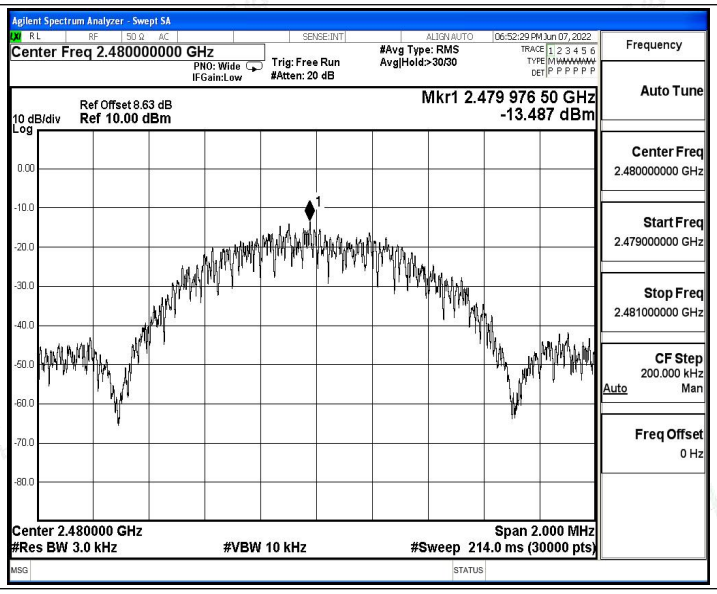
BLE_1M_Ant1_2402



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
06:52:29 PM Jun 07, 2022
Ref Offset 8.63 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 976 50 GHz
-13.487 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

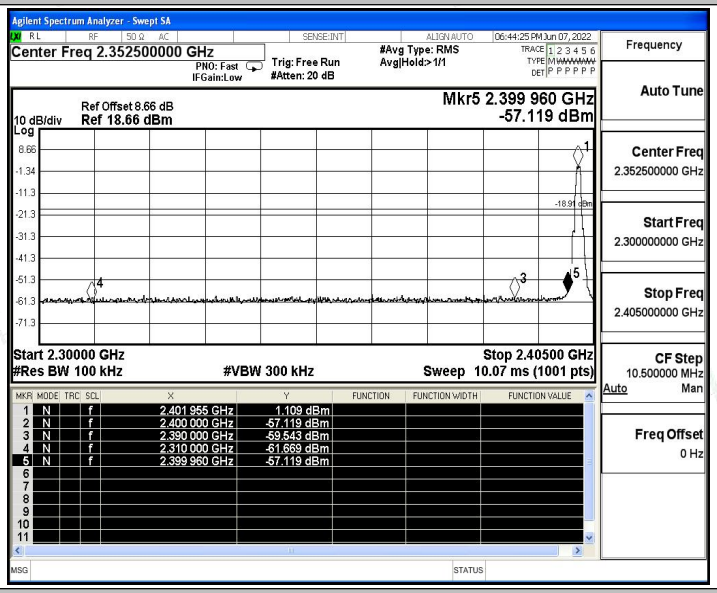
B.5 Band edge measurements

Test Result

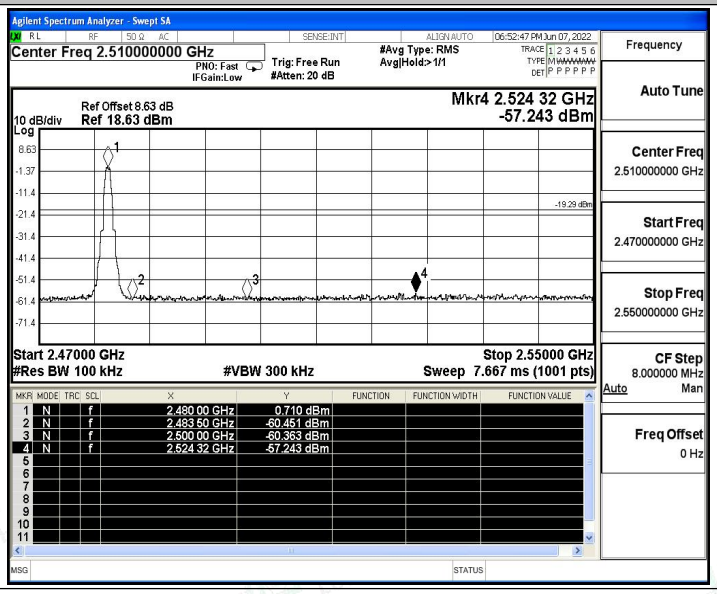
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.09	-57.12	≤-18.91	PASS
		High	2480	0.71	-57.24	≤-19.29	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



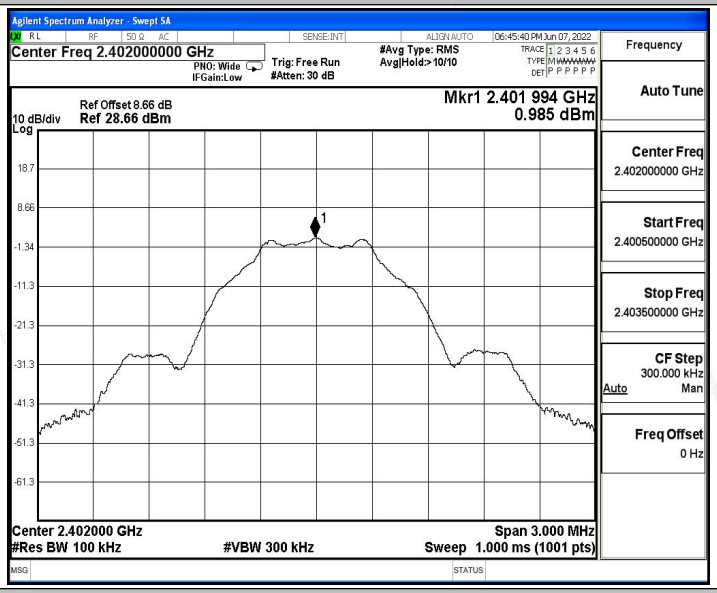
B.6 Conducted Spurious Emission

Test Result

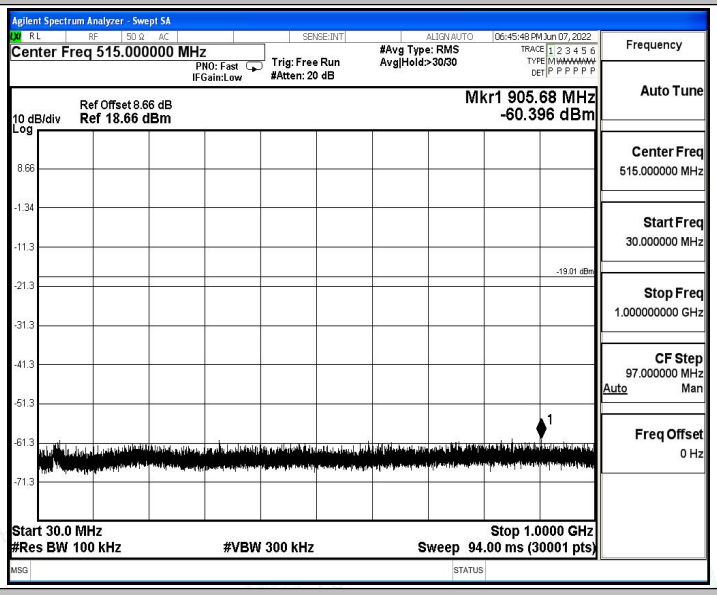
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	0.99	0.99	---	PASS
			30~1000	0.99	-60.4	≤-19.01	PASS
			1000~26500	0.99	-45.57	≤-19.01	PASS
		2440	Reference	2.13	2.13	---	PASS
			30~1000	2.13	-59.72	≤-17.87	PASS
			1000~26500	2.13	-46.16	≤-17.87	PASS
		2480	Reference	0.58	0.58	---	PASS
			30~1000	0.58	-60.17	≤-19.42	PASS
			1000~26500	0.58	-45.69	≤-19.42	PASS

Test Graphs

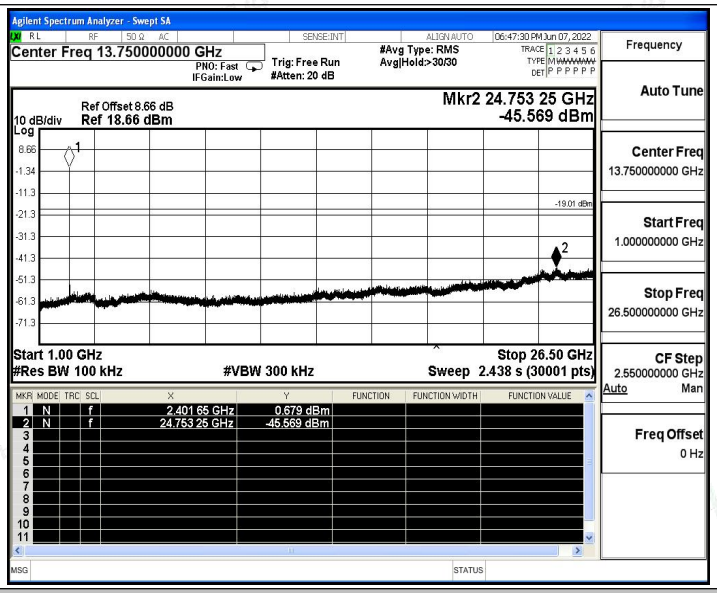
BLE_1M_Ant1_2402_0~Reference



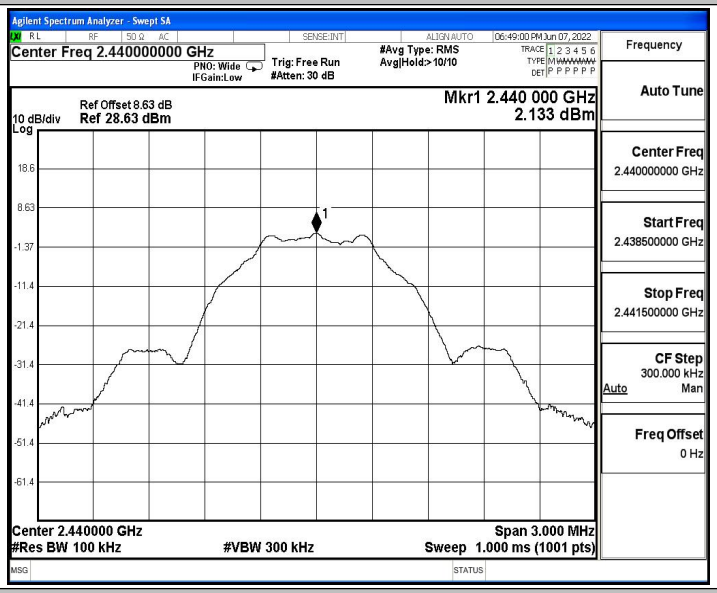
BLE_1M_Ant1_2402_30~1000



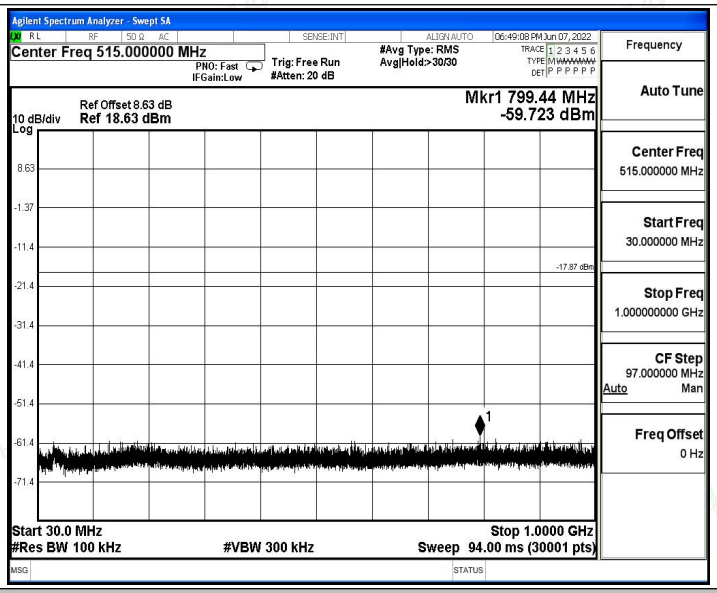
BLE_1M_Ant1_2402_1000~26500



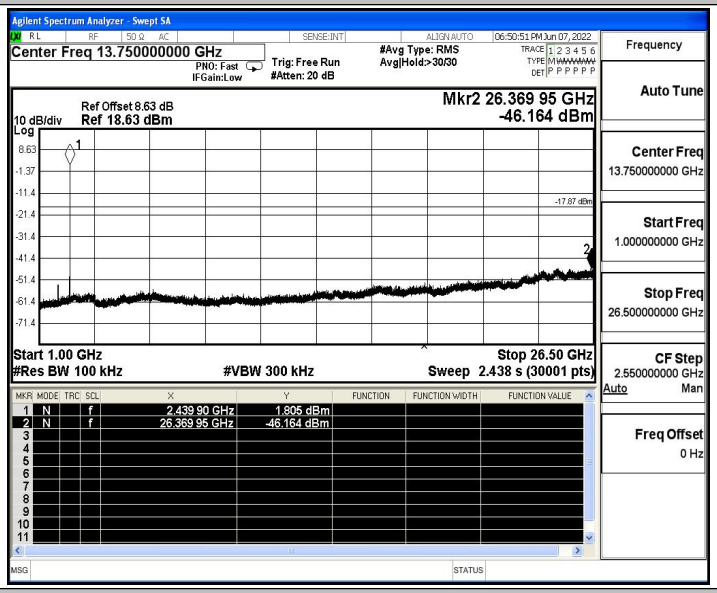
BLE_1M_Ant1_2440_0~Reference



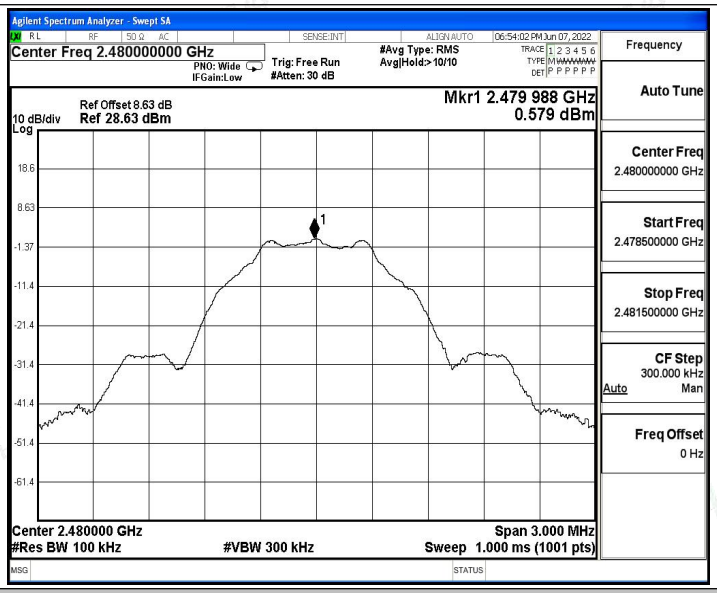
BLE_1M_Ant1_2440_30~1000



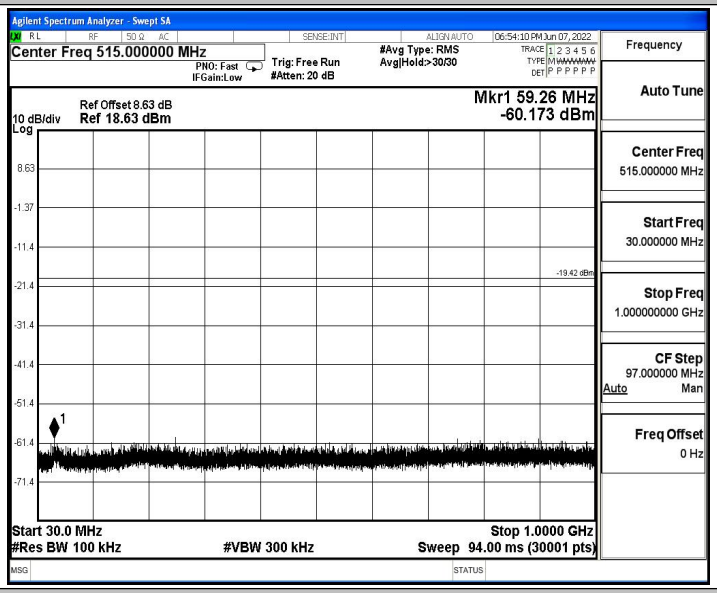
BLE_1M_Ant1_2440_1000~26500



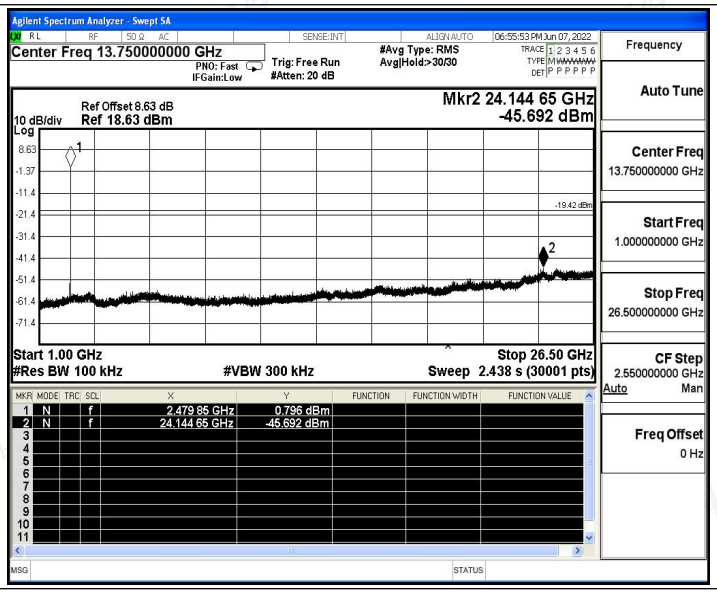
BLE_1M_Ant1_2480_0~Reference



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:>30/30
06:55:53 PM Jun 07, 2022
Ref Offset 8.63 dB
10 dB/div Ref 18.63 dBm
Log
Mkr2 24.144 65 GHz
-45.692 dBm
-19.42 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 0.796 dBm
2 N f 24.144 65 GHz -45.692 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

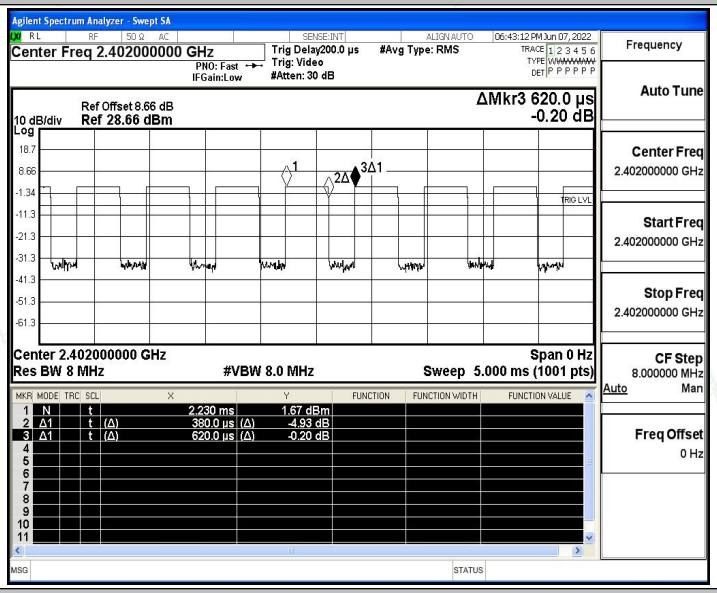
B.7 Duty Cycle

Test Result

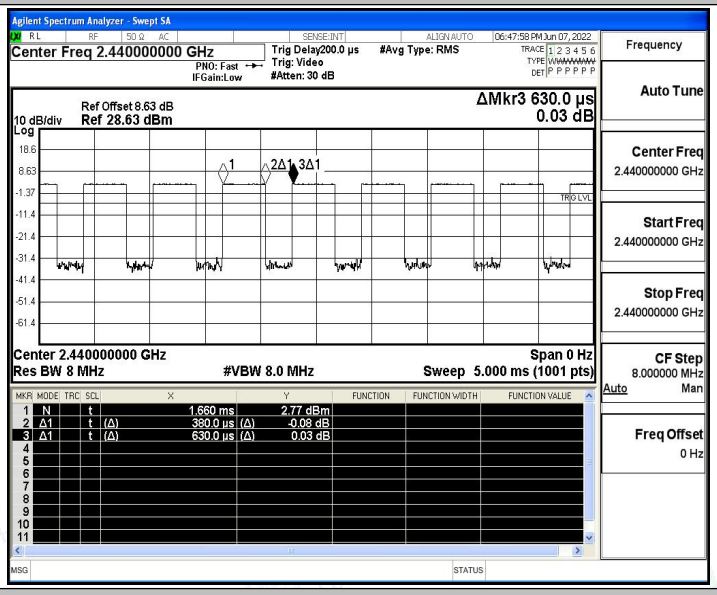
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T	Limit	Verdict
BLE_1M	Ant1	2402	0.38	0.62	0.6129	61.29	2.13	2.63	---	---
		2440	0.38	0.63	0.6032	60.32	2.20	2.63	---	---
		2480	0.38	0.63	0.6032	60.32	2.20	2.63	---	---

Test Graphs

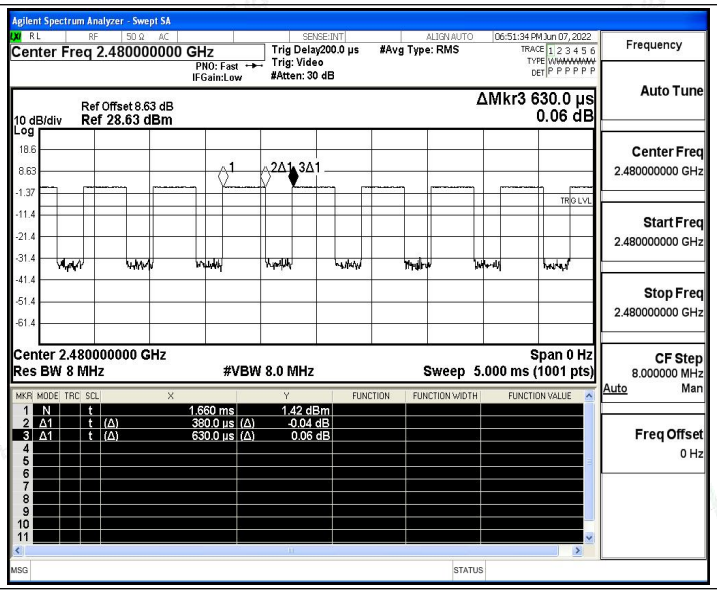
BLE_1M_Ant1_2402



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
06:51:34 PM Jun 07, 2022
Ref Offset 8.63 dB
10 dB/div Ref 28.63 dBm
Log
ΔMkr3 630.0 µs
0.06 dB
Center 2.480000000 GHz
Res BW 8 MHz
#VBW 8.0 MHz
Span 0 Hz
Sweep 5.000 ms (1001 pts)
1 N t 1.660 ms 1.42 dBm
2 Δ1 t (Δ) 380.0 µs (Δ) -0.04 dB
3 Δ1 t (Δ) 630.0 µs (Δ) 0.06 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

B.8 Emissions in Restricted Bands

Test Result

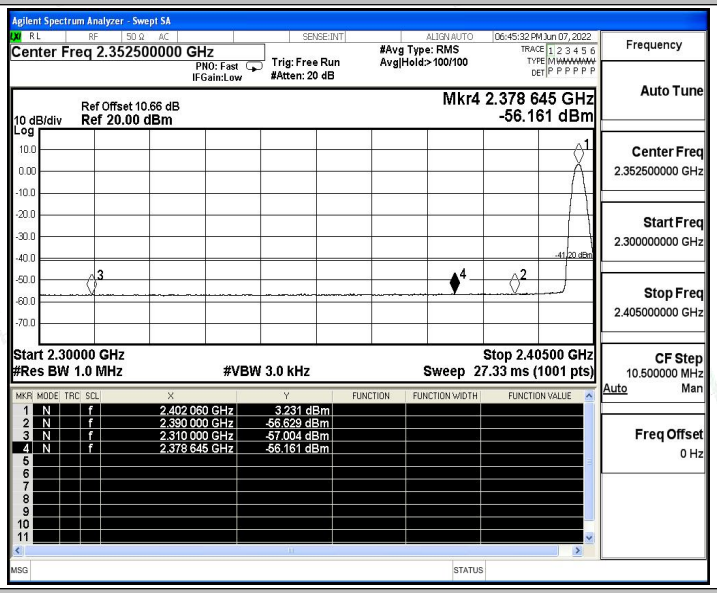
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-57	≤-41.20	38.20	≤54	PASS
				AV	2378.645	-56.16	≤-41.20	39.04	≤54	PASS
				AV	2390.000	-56.63	≤-41.20	38.57	≤54	PASS
				Peak	2310.000	-48.8	≤-21.20	46.40	≤74	PASS
				Peak	2360.270	-46.3	≤-21.20	48.90	≤74	PASS
				Peak	2390.000	-48.02	≤-21.20	47.18	≤74	PASS
		High	2480	AV	2483.500	-52.5	≤-41.20	42.70	≤54	PASS
				AV	2483.520	-52.5	≤-41.20	42.70	≤54	PASS
				AV	2500.000	-55.99	≤-41.20	39.21	≤54	PASS
				Peak	2483.500	-46.36	≤-21.20	48.84	≤74	PASS
				Peak	2483.600	-45.62	≤-21.20	49.58	≤74	PASS
				Peak	2500.000	-47.47	≤-21.20	47.73	≤74	PASS

Note:

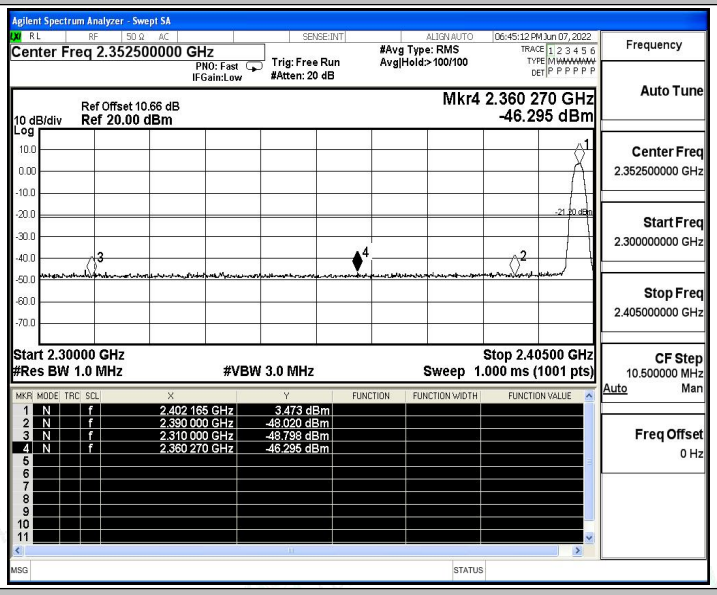
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

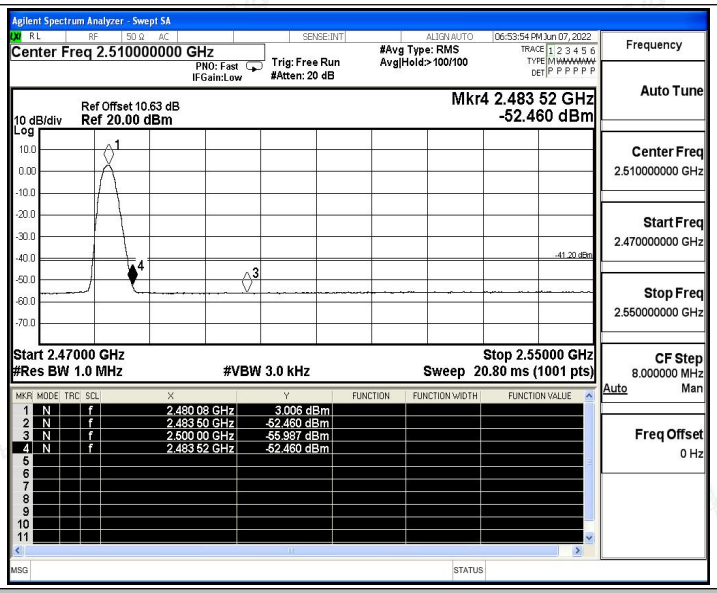
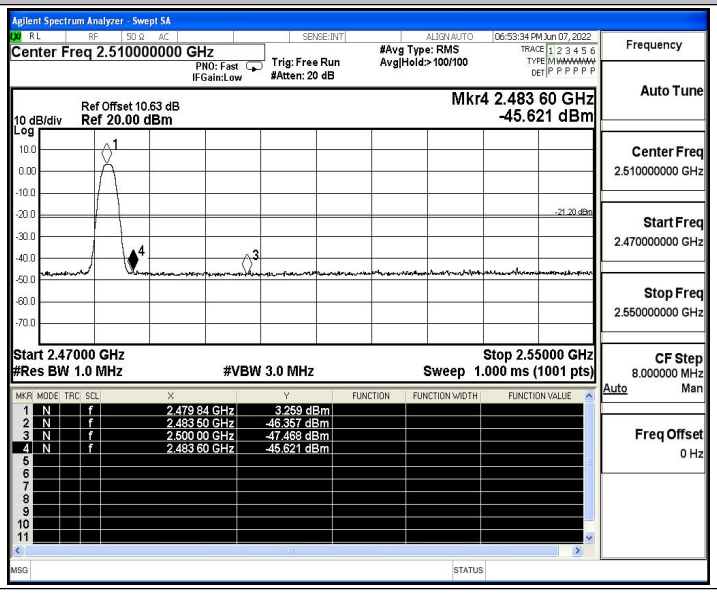
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak