Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: WORKPOINT SENSOR

Test Model: SW9123D

Environmental Conditions

Temperature:	23.5 ° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Ling Zhu
Supervised by:	Li Huan

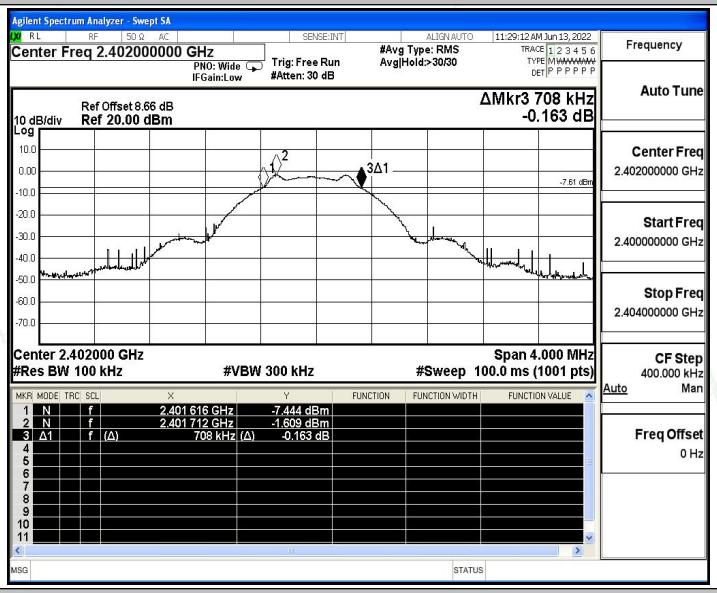
A.1 DTS Bandwidth

Test Result

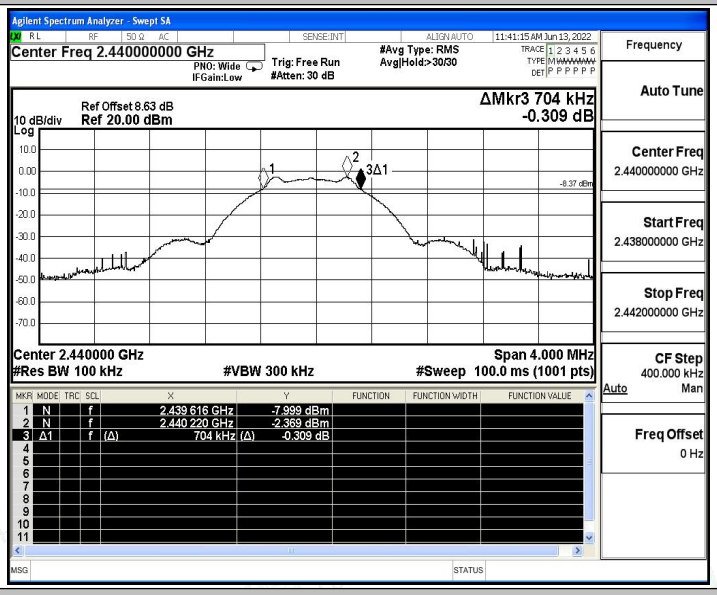
TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.708	2401.616	2402.324	0.5	PASS
		2440	0.704	2439.616	2440.320	0.5	PASS
		2480	0.732	2479.596	2480.328	0.5	PASS

Test Graphs

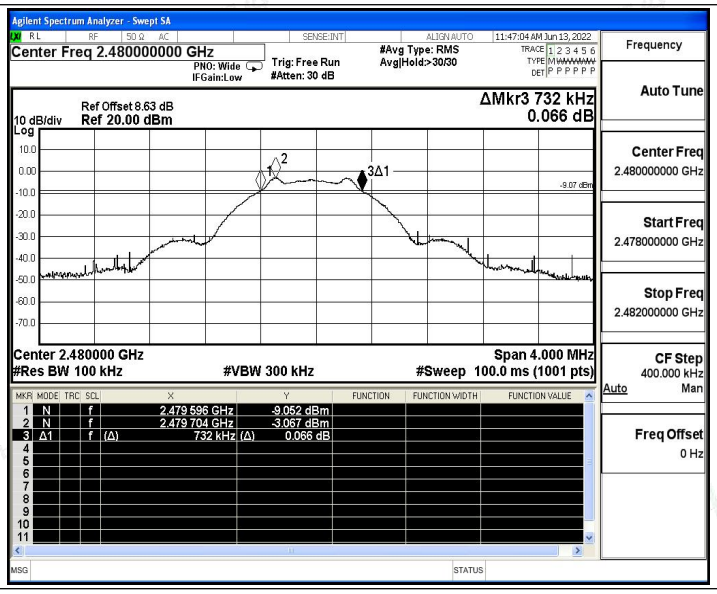
BLE_1M_Ant1_2402



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
11:47:04 AM Jun 13, 2022
Ref Offset 8.63 dB
10 dB/div Ref 20.00 dBm
Log
ΔMkr3 732 kHz
0.066 dB
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
#Sweep 100.0 ms (1001 pts)
1 N f 2.479 596 GHz -9.052 dBm
2 N f 2.479 704 GHz -3.067 dBm
3 Δ1 f (Δ) 732 kHz (Δ) 0.066 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

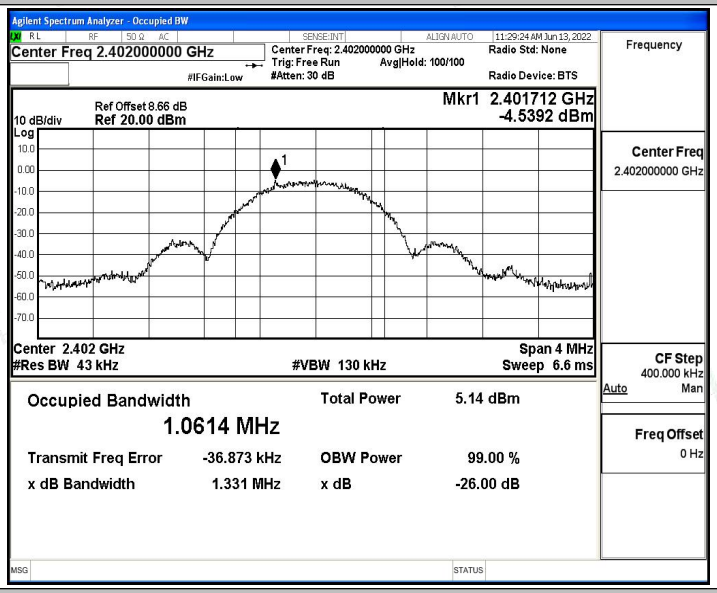
A.2 Occupied Channel Bandwidth

Test Result

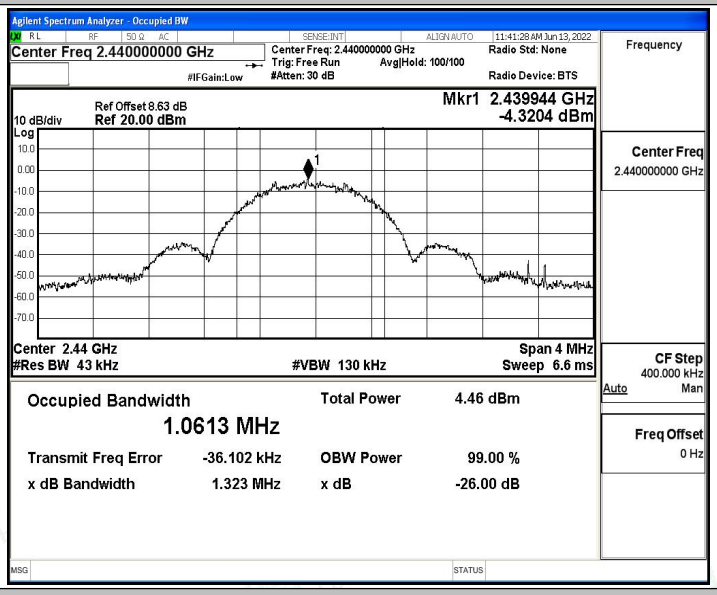
TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0614	2401.432	2402.494	---	---
		2440	1.0613	2439.433	2440.495	---	---
		2480	1.0718	2479.427	2480.499	---	---

Test Graphs

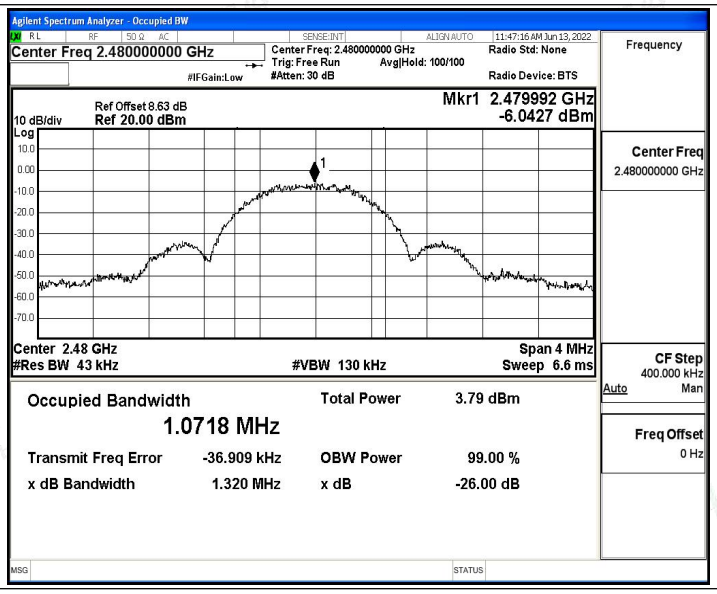
BLE_1M_Ant1_2402



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
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 8.63 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.479992 GHz
-6.0427 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
1.0718 MHz
Total Power 3.79 dBm
Transmit Freq Error -36.909 kHz
OBW Power 99.00 %
x dB Bandwidth 1.320 MHz
x dB -26.00 dB
Freq Offset
0 Hz

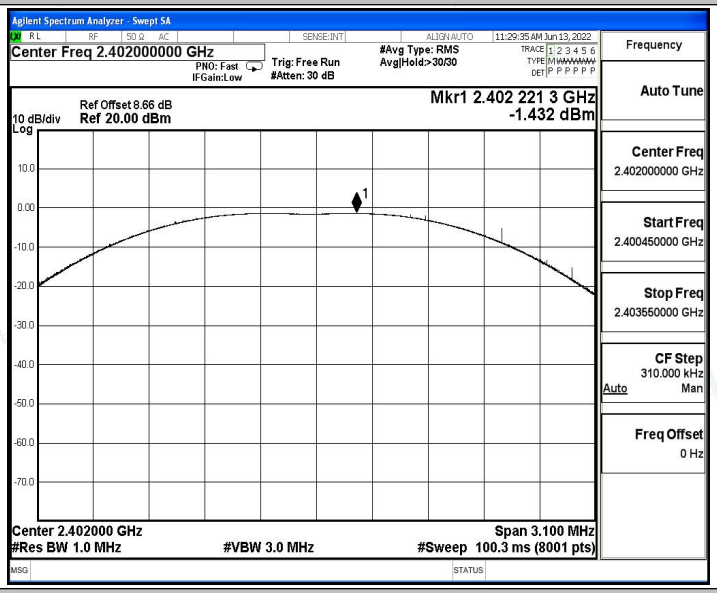
A.3 Maximum peak conducted output power

Test Result

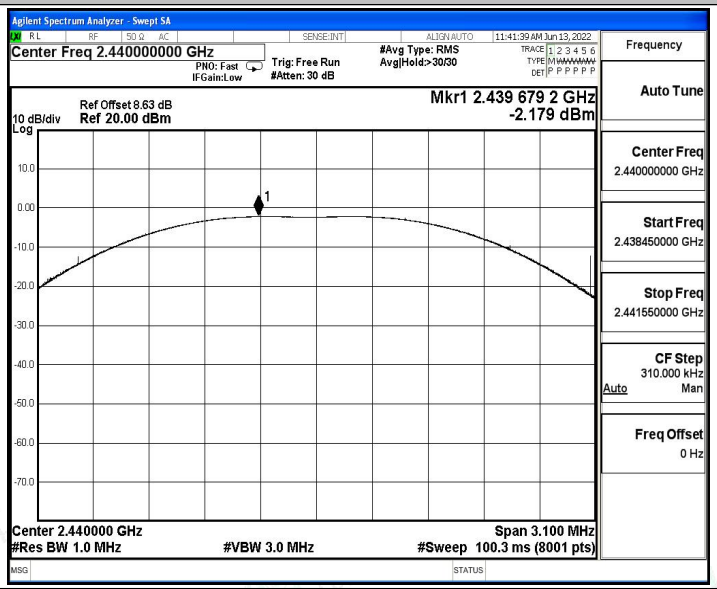
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-1.43	≤30	PASS
		2440	-2.18	≤30	PASS
		2480	-2.82	≤30	PASS

Test Graphs

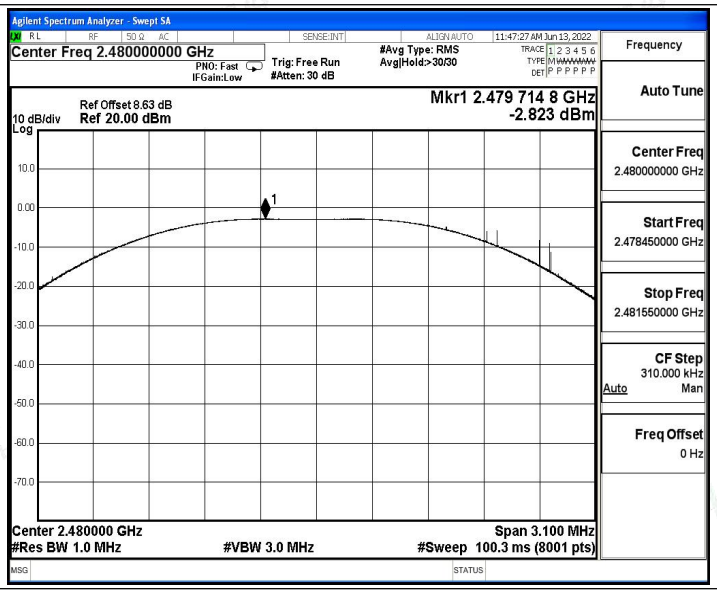
BLE_1M_Ant1_2402



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
11:47:27 AM Jun 13, 2022
Ref Offset 8.63 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.479 714 8 GHz
-2.823 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

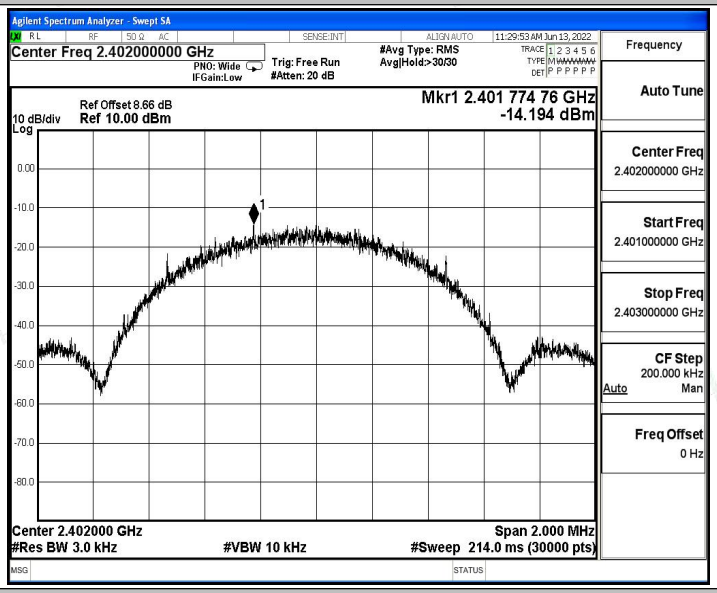
A.4 Maximum power spectral density

Test Result

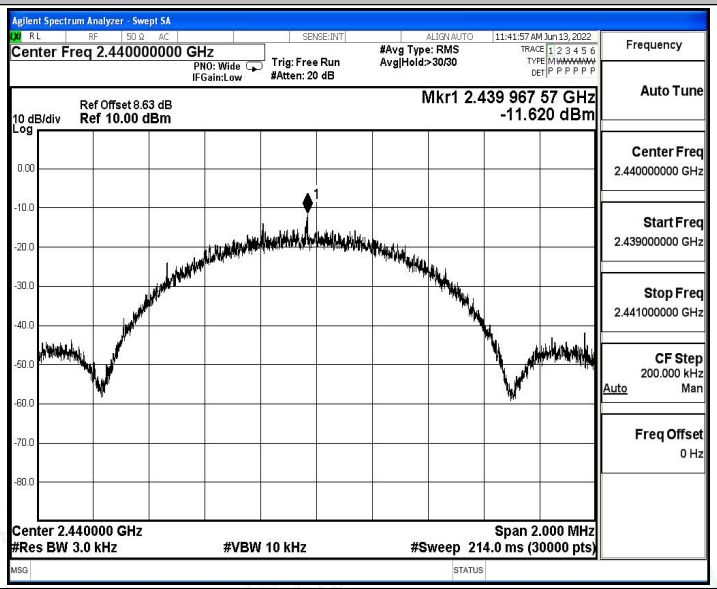
TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-14.19	≤8.00	PASS
		2440	-11.62	≤8.00	PASS
		2480	-15.86	≤8.00	PASS

Test Graphs

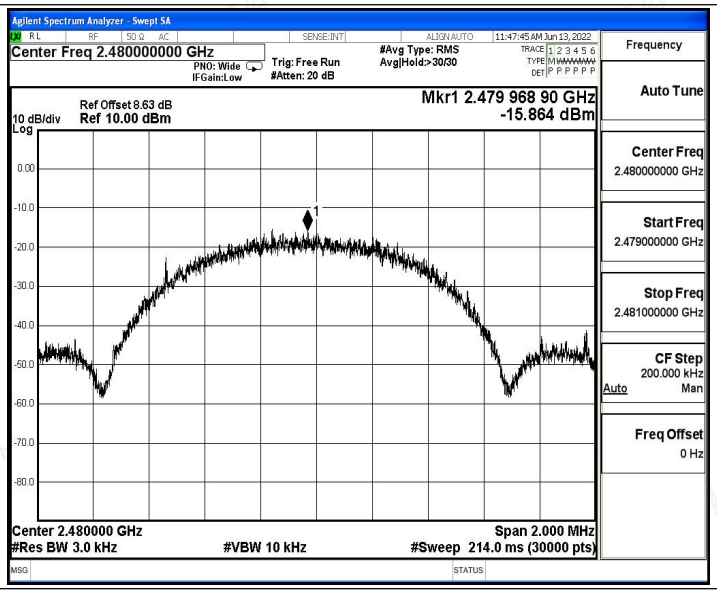
BLE_1M_Ant1_2402



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
11:47:45 AM Jun 13, 2022
Ref Offset 8.63 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 968 90 GHz
-15.864 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

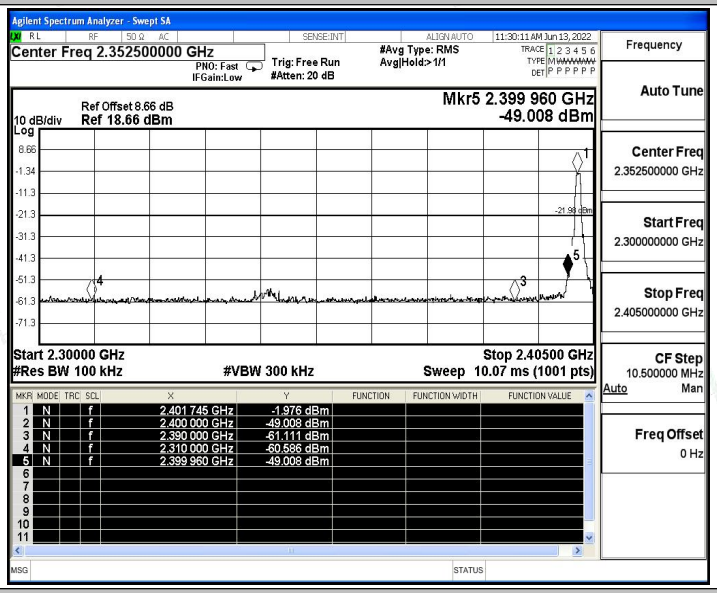
A.5 Band edge measurements

Test Result

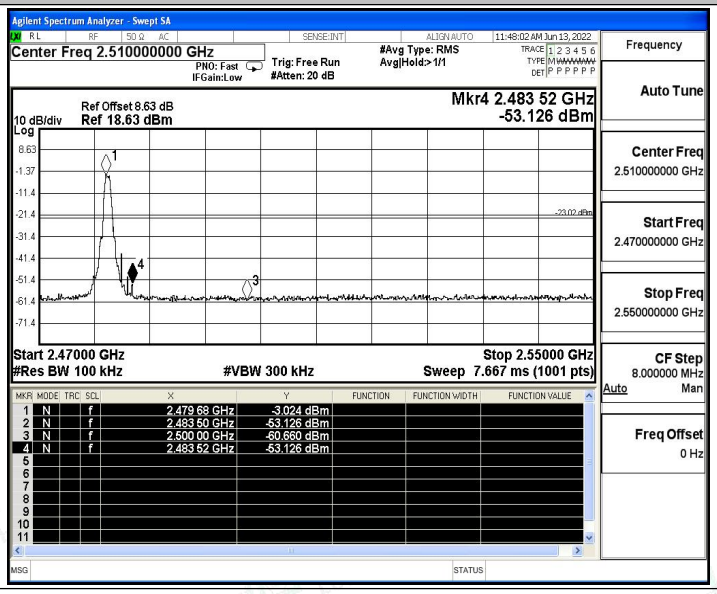
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-1.98	-49.01	≤-21.98	PASS
		High	2480	-3.02	-53.13	≤-23.02	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



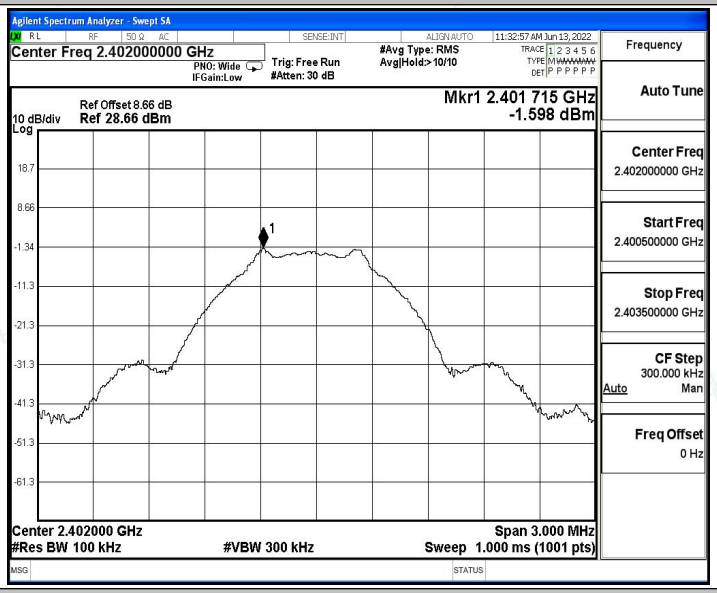
A.6 Conducted Spurious Emission

Test Result

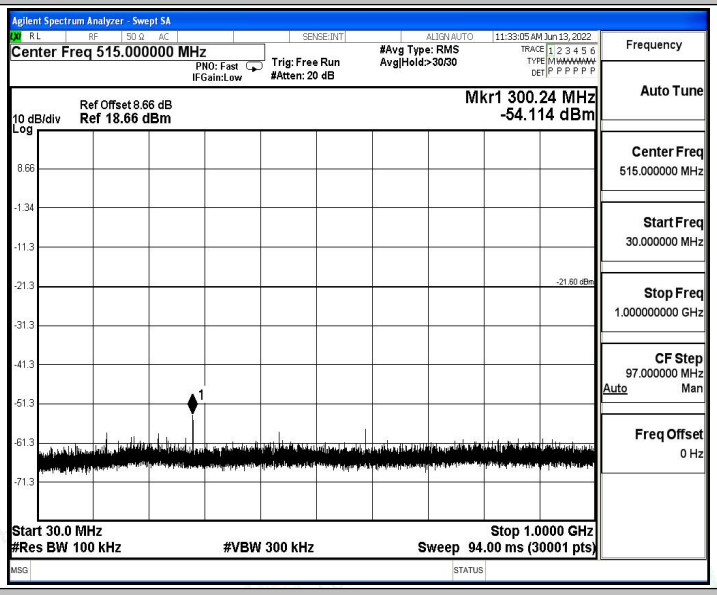
TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-1.60	-1.60	---	PASS
			30~1000	-1.60	-54.11	≤-21.6	PASS
			1000~26500	-1.60	-44.57	≤-21.6	PASS
		2440	Reference	-2.80	-2.80	---	PASS
			30~1000	-2.80	-53.68	≤-22.8	PASS
			1000~26500	-2.80	-46.19	≤-22.8	PASS
		2480	Reference	-3.16	-3.16	---	PASS
			30~1000	-3.16	-54.27	≤-23.16	PASS
			1000~26500	-3.16	-45.13	≤-23.16	PASS

Test Graphs

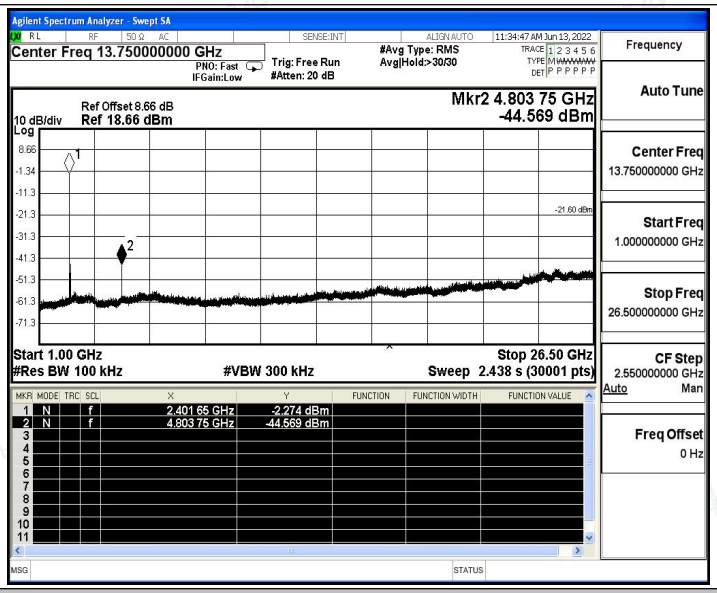
BLE_1M_Ant1_2402_0~Reference



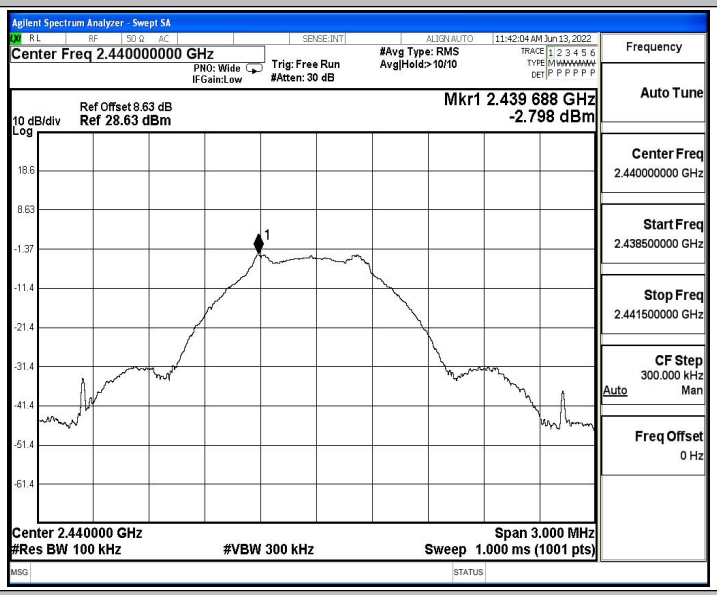
BLE_1M_Ant1_2402_30~1000



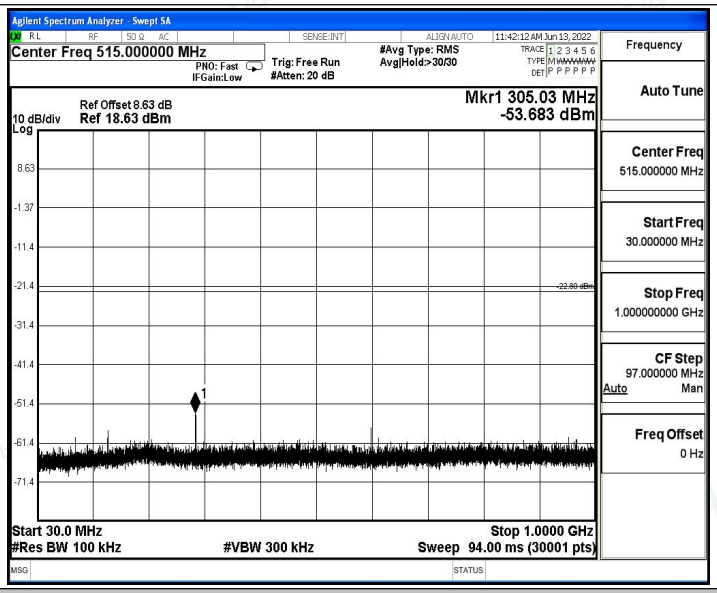
BLE_1M_Ant1_2402_1000~26500



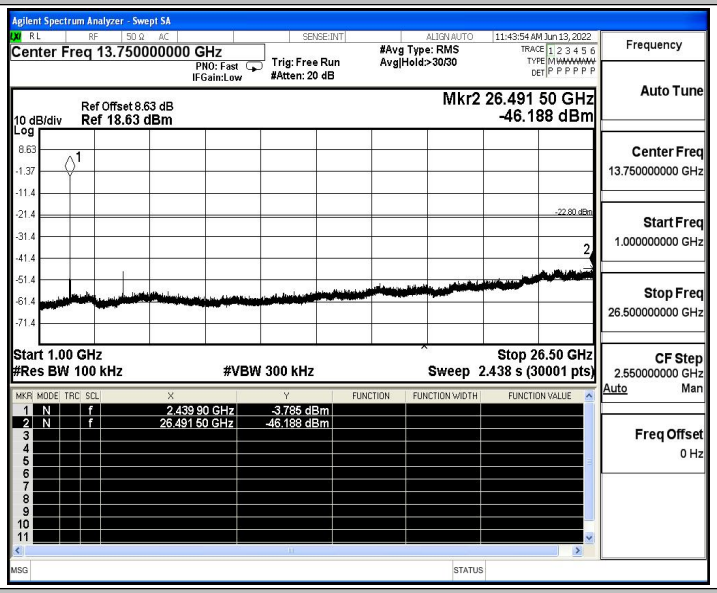
BLE_1M_Ant1_2440_0~Reference



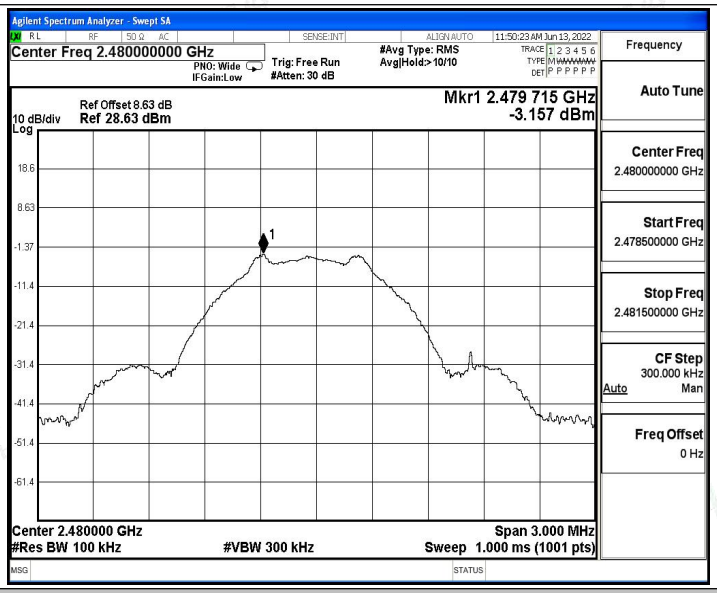
BLE_1M_Ant1_2440_30~1000



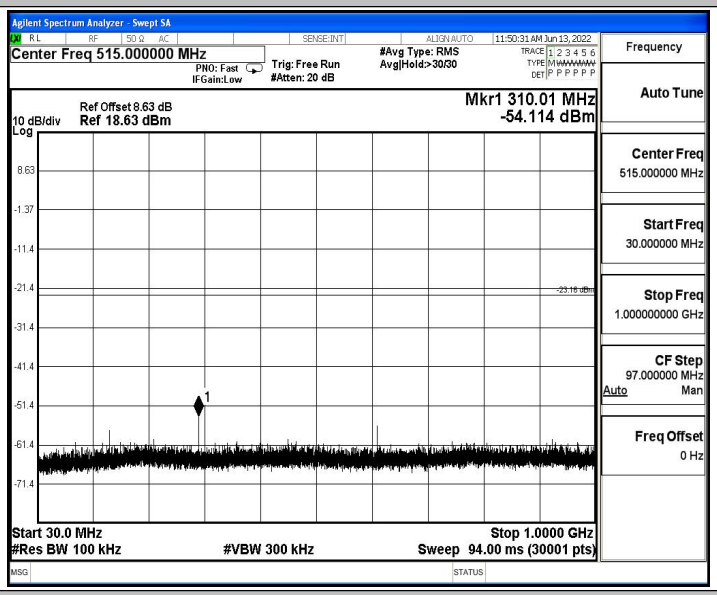
BLE_1M_Ant1_2440_1000~26500



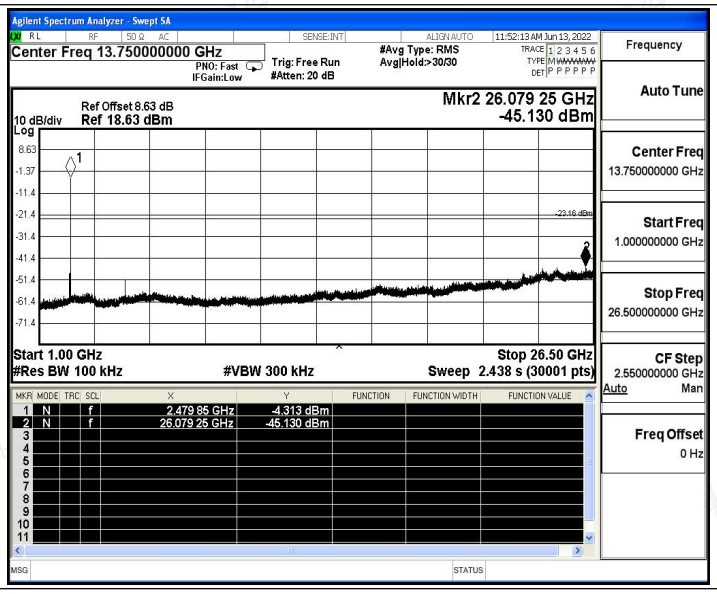
BLE_1M_Ant1_2480_0~Reference



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
11:52:13 AM Jun 13, 2022
Ref Offset 8.63 dB
10 dB/div Ref 18.63 dBm
Log
Mkr2 26.079 25 GHz
-45.130 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 -4.313 dBm
2 N f 26.079 25 GHz -45.130 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

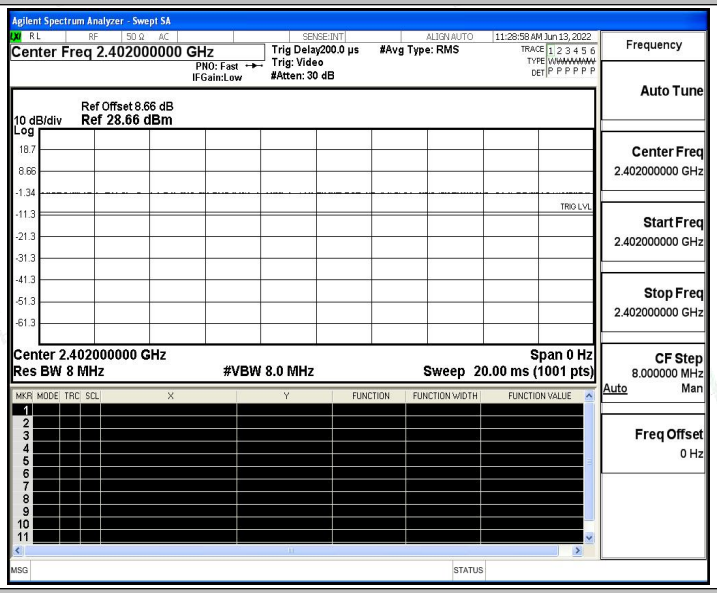
A.7 Duty Cycle

Test Result

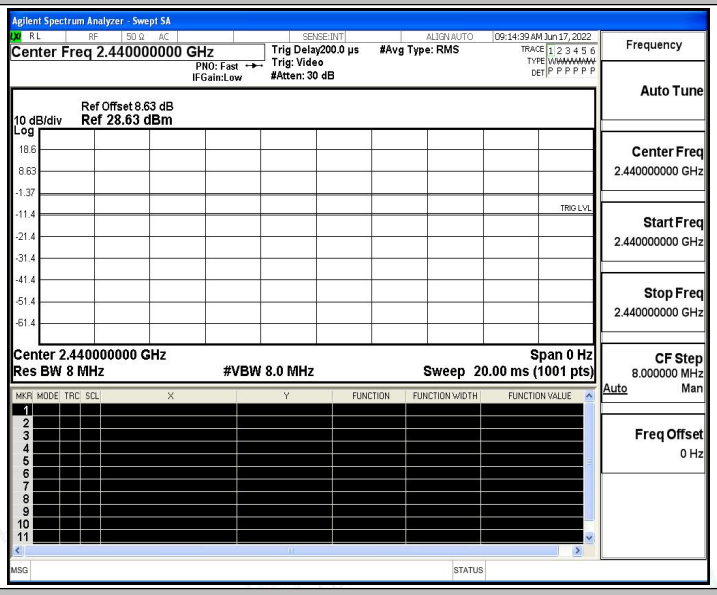
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T
BLE_1M	Ant1	2402	20.00	20.00	1.0000	100.00	0.00	0.05
		2440	20.00	20.00	1.0000	100.00	0.00	0.05
		2480	20.00	20.00	1.0000	100.00	0.00	0.05

Test Graphs

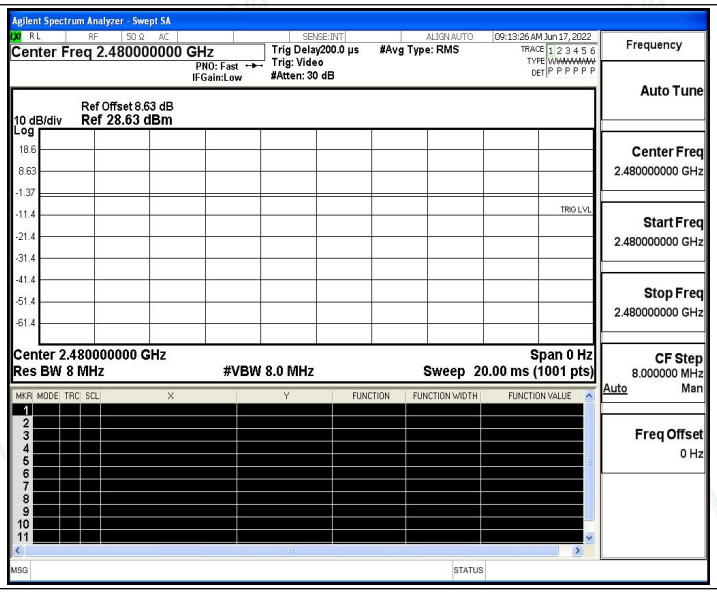
BLE_1M_Ant1_2402



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
09:13:26 AM Jun 17, 2022
Ref Offset 8.63 dB
10 dB/div Ref 28.63 dBm
Log
Center 2.480000000 GHz
Span 0 Hz
Res BW 8 MHz
#VBW 8.0 MHz
Sweep 20.00 ms (1001 pts)
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.8 Emissions in Restricted Bands

Test Result

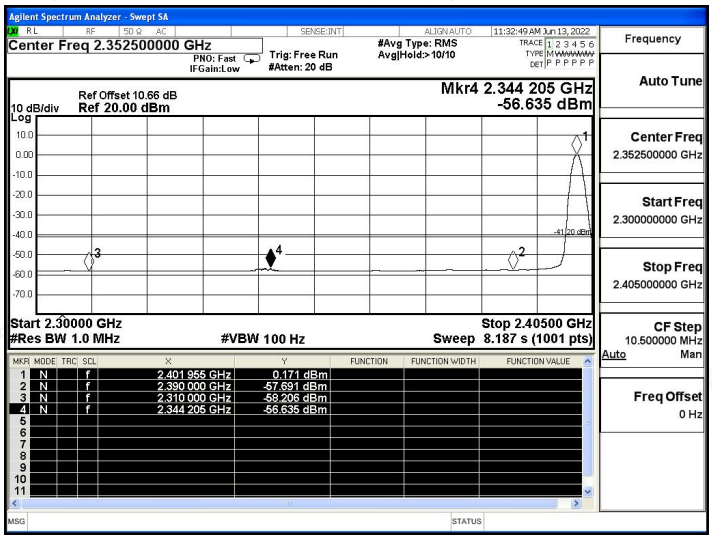
TestMode	Antenna	ChName	Frequency[MHz]	Detector	Freq [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-58.21	≤-41.20	36.99	≤54	PASS
				AV	2344.205	-56.64	≤-41.20	38.56	≤54	PASS
				AV	2390.000	-57.69	≤-41.20	37.51	≤54	PASS
				Peak	2310.000	-48.77	≤-21.20	46.43	≤74	PASS
				Peak	2343.470	-46.02	≤-21.20	49.18	≤74	PASS
				Peak	2390.000	-48.13	≤-21.20	47.07	≤74	PASS
		High	2480	AV	2483.500	-54.72	≤-41.20	40.48	≤54	PASS
				AV	2483.520	-54.72	≤-41.20	40.48	≤54	PASS
				AV	2500.000	-57.16	≤-41.20	38.04	≤54	PASS
				Peak	2483.500	-46.23	≤-21.20	48.97	≤74	PASS
				Peak	2483.680	-31.59	≤-21.20	63.61	≤74	PASS
				Peak	2500.000	-47.62	≤-21.20	47.58	≤74	PASS

Note：

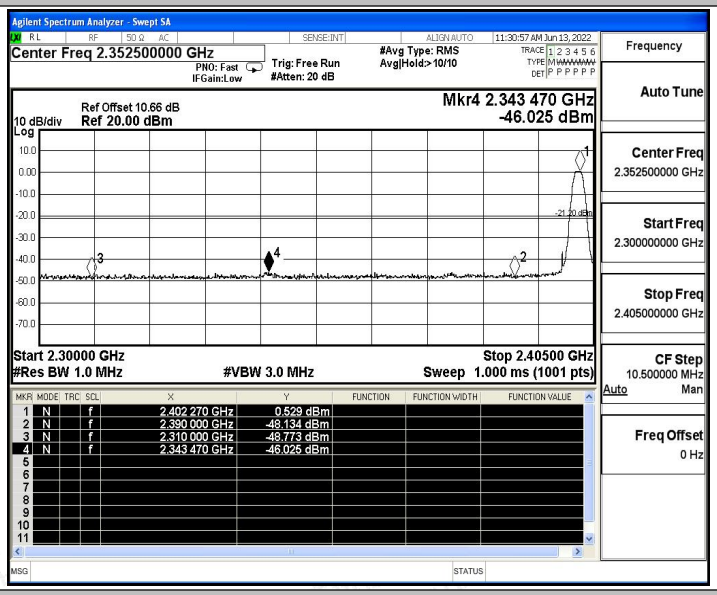
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

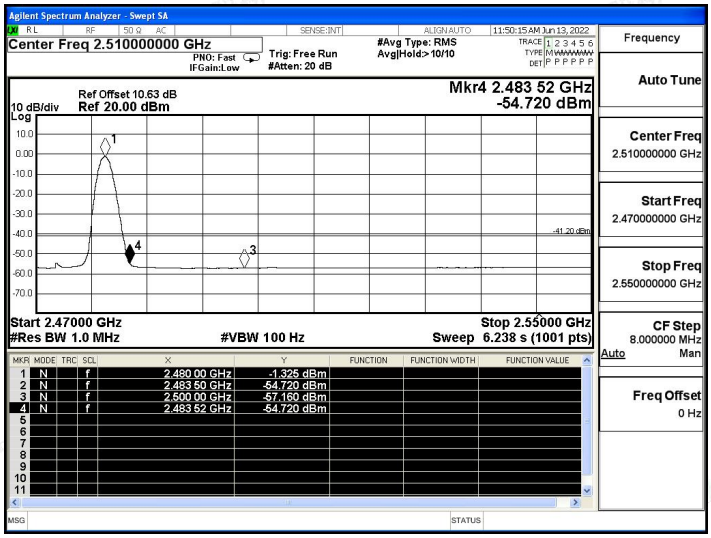
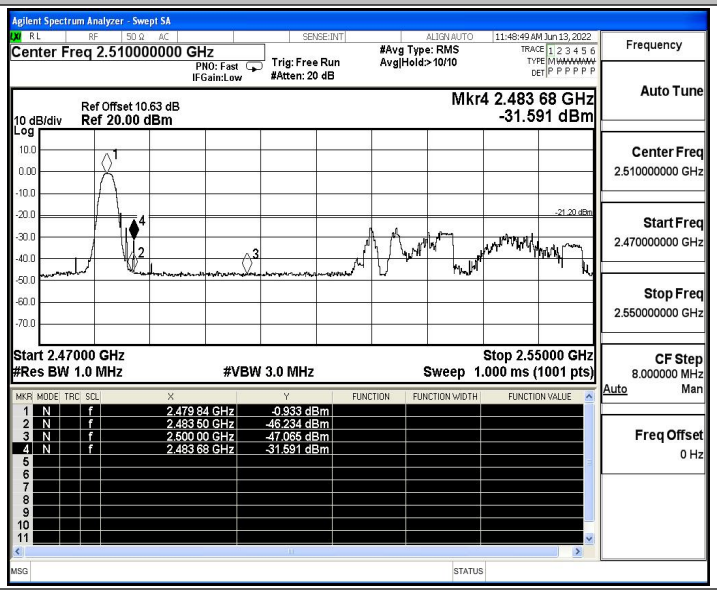
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak