Appendix: Bluetooth LE

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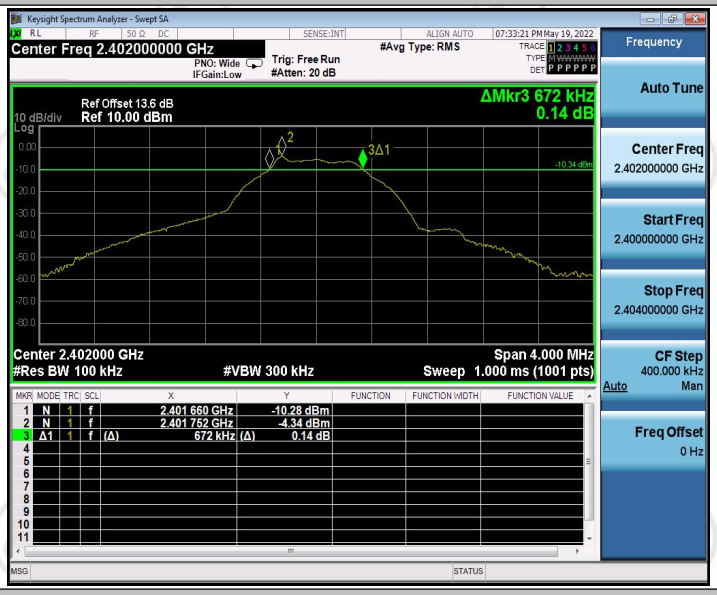
Appendix A: DTS Bandwidth

Test Result

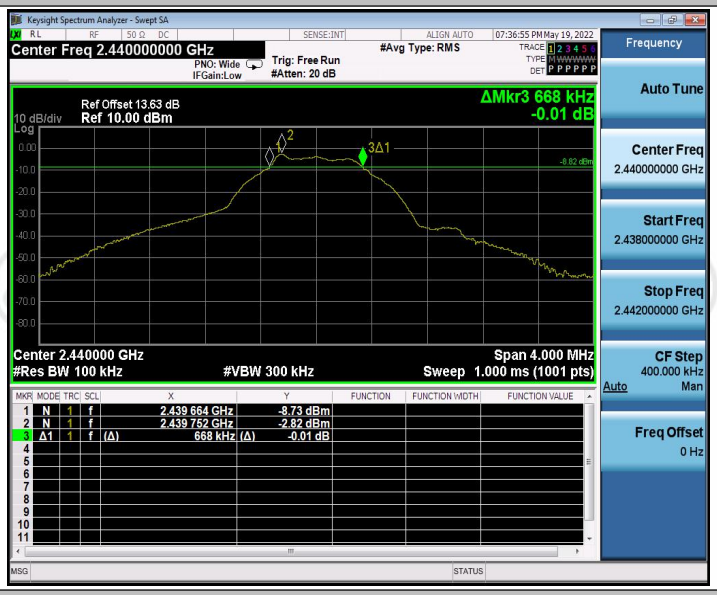
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.672	2401.660	2402.332	0.5	PASS
		2440	0.668	2439.664	2440.332	0.5	PASS
		2480	0.672	2479.660	2480.332	0.5	PASS

Test Graphs

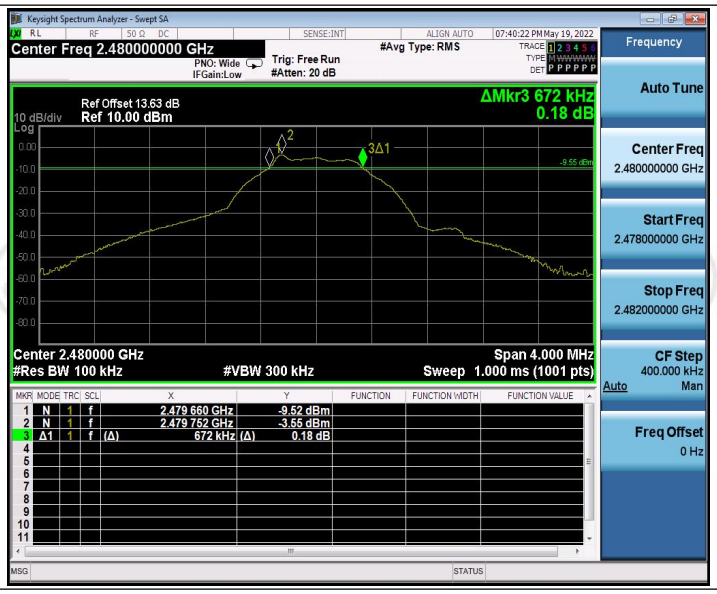
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
07:40:22 PM May 19, 2022
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
Ref Offset 13.63 dB
10 dB/div Ref 10.00 dBm
Log
ΔMkr3 672 kHz
0.18 dB
-9.55 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 2.479 660 GHz -9.52 dBm
2 N 1 f 2.479 752 GHz -3.55 dBm
3 Δ1 1 f (Δ) 672 kHz (Δ) 0.18 dB
MSG
STATUS

Appendix B: Occupied Channel Bandwidth

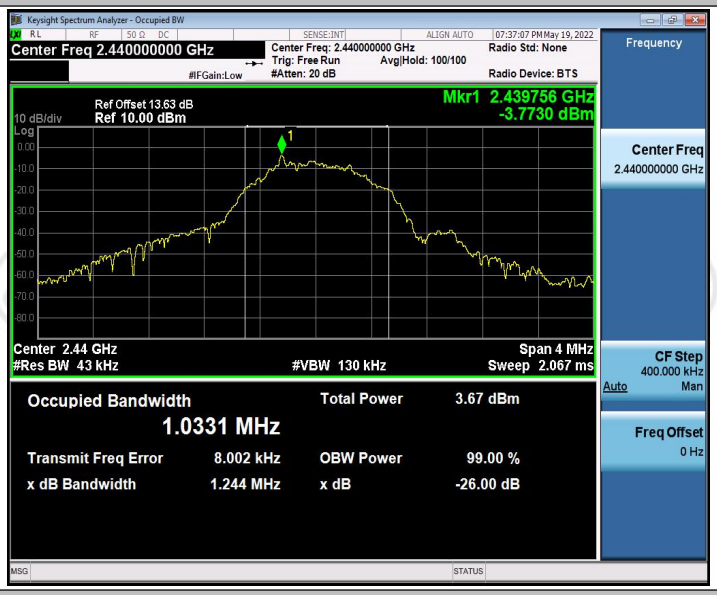
Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0251	2401.496	2402.522	---	---
		2440	1.0331	2439.491	2440.525	---	---
		2480	1.0213	2479.497	2480.518	---	---

Test Graphs

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
07:40:35 PM May 19, 2022
Frequency
Ref Offset 13.63 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479748 GHz
-4.3828 dBm
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 43 kHz
#VBW 130 kHz
Span 4 MHz
Sweep 2.067 ms
CF Step
400.000 kHz
Auto
Man
Occupied Bandwidth
1.0213 MHz
Total Power 3.26 dBm
Transmit Freq Error 7.807 kHz
OBW Power 99.00 %
x dB Bandwidth 1.232 MHz
x dB -26.00 dB
Freq Offset
0 Hz
MSG
STATUS

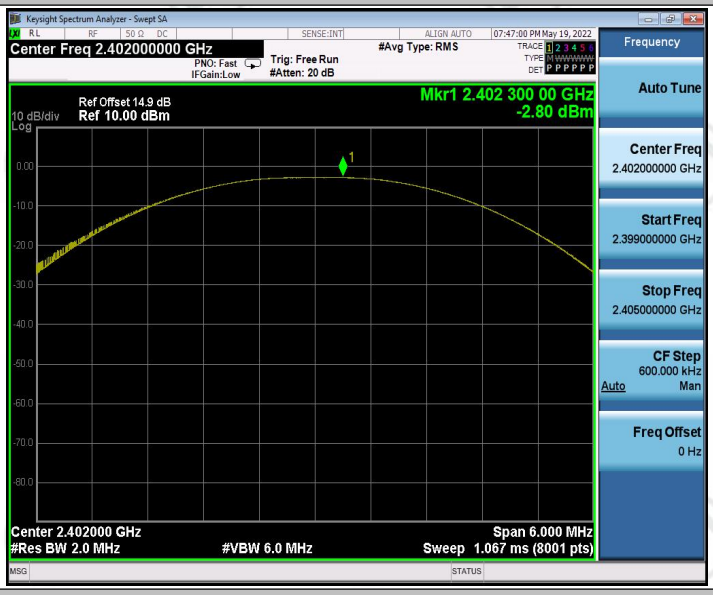
Appendix C: Maximum conducted output power

Test Result Peak

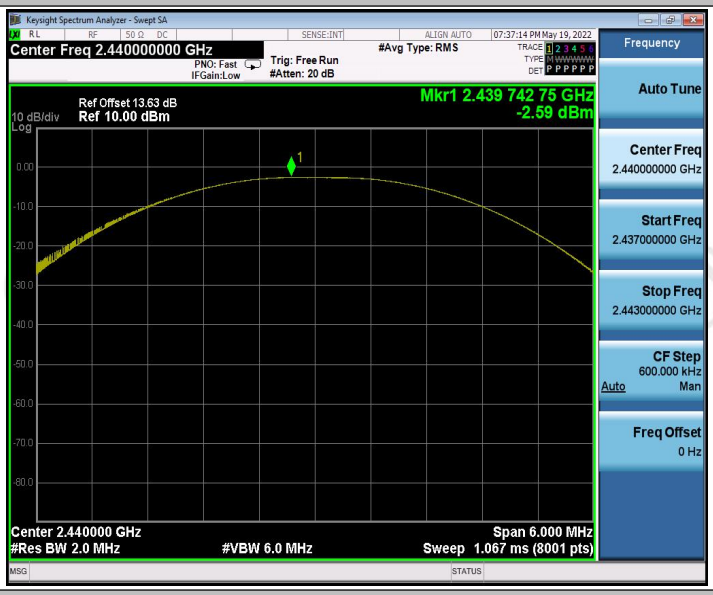
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-2.80	≤30	PASS
		2440	-2.59	≤30	PASS
		2480	**-2.33**	≤30	PASS

Test Graphs Peak

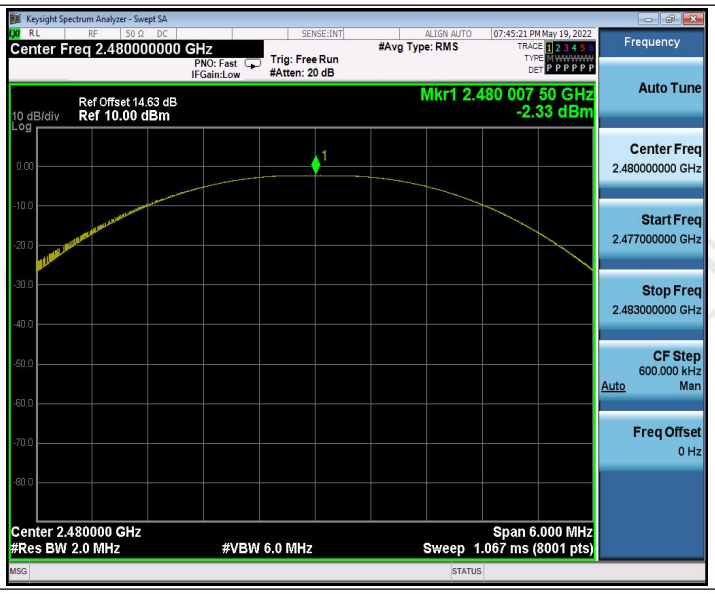
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
07:45:21 PM May 19, 2022
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.477000000 GHz
Stop Freq
2.483000000 GHz
CF Step
600.000 kHz
Auto
Man
Freq Offset
0 Hz
Ref Offset 14.63 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.480 007 50 GHz
-2.33 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
Sweep 1.067 ms (8001 pts)

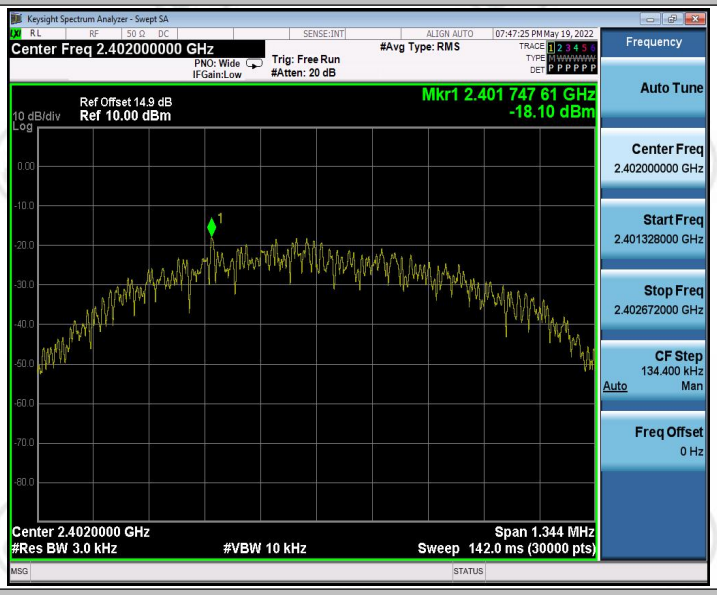
Appendix D: Maximum power spectral density

Test Result

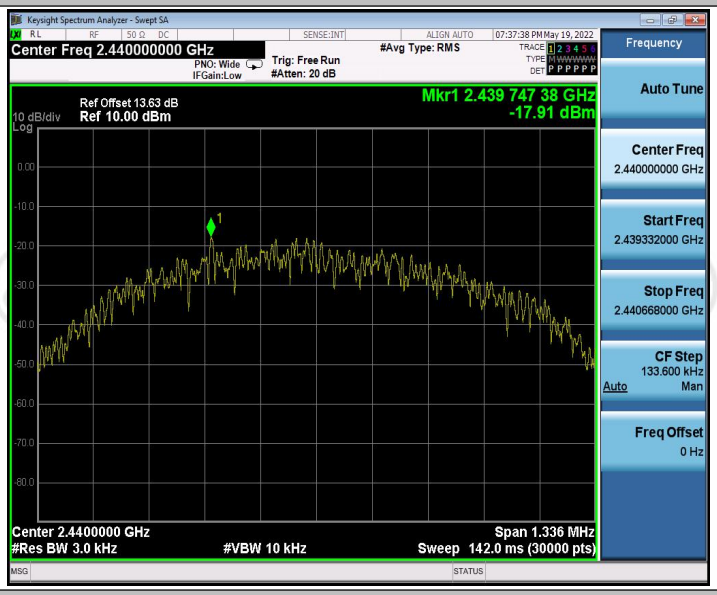
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-18.1	≤8.00	PASS
		2440	-17.91	≤8.00	PASS
		2480	-17.61	≤8.00	PASS

Test Graphs

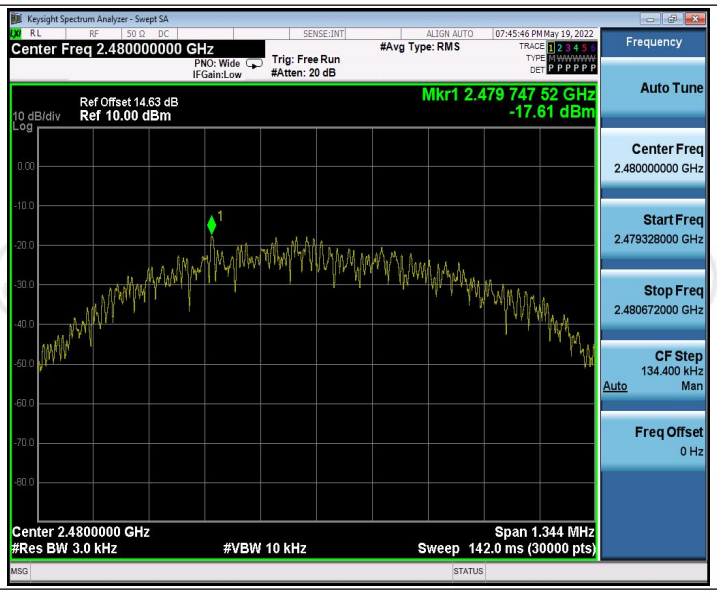
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
07:45:46 PM May 19, 2022
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479328000 GHz
Stop Freq
2.480672000 GHz
CF Step
134.400 kHz
Auto
Man
Freq Offset
0 Hz
Ref Offset 14.63 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 747 52 GHz
-17.61 dBm
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.344 MHz
Sweep 142.0 ms (30000 pts)

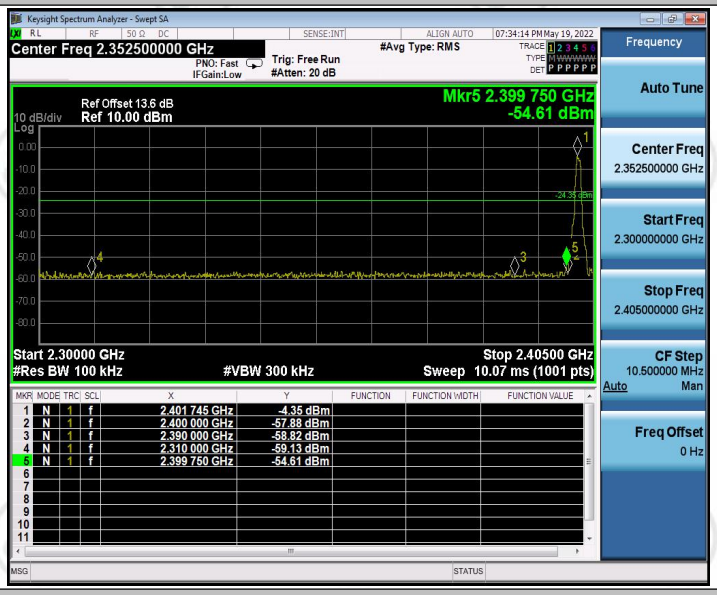
Appendix E: Band edge measurements

Test Result

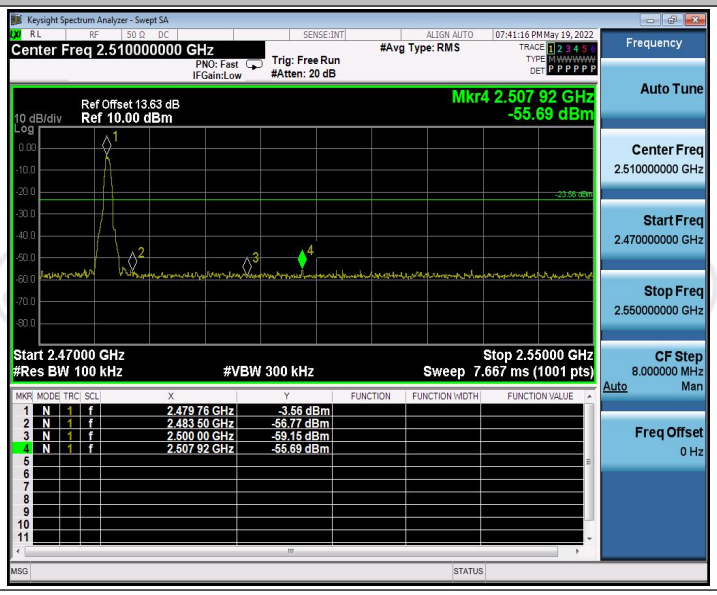
Test Mode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-4.35	-54.61	≤-24.35	PASS
		High	2480	-3.56	-55.69	≤-23.56	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



Appendix F: Conducted Spurious Emission

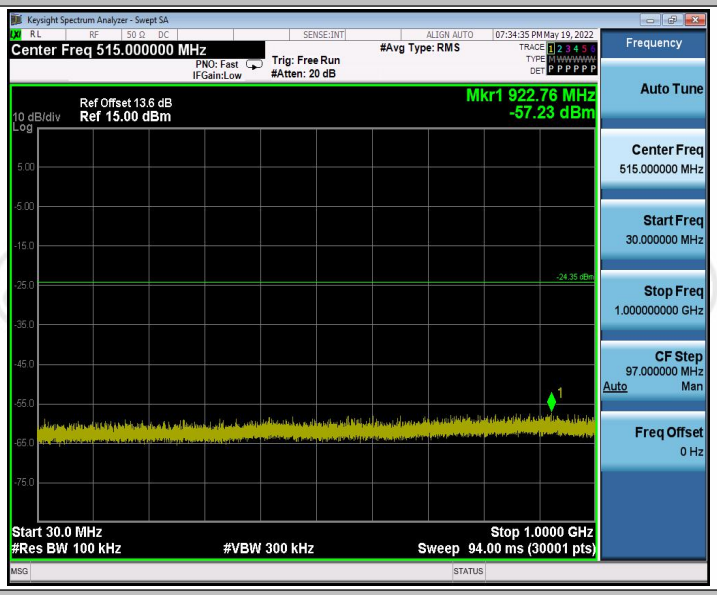
Test Result

Test Mode	Antenna	Frequency [MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-4.35	-4.35	---	PASS
			30~1000	---	-57.23	≤-24.35	PASS
			1000~26500	---	-46.78	≤-24.35	PASS
		2440	Reference	-2.78	-2.78	---	PASS
			30~1000	---	-56.91	≤-22.78	PASS
			1000~26500	---	-48.91	≤-22.78	PASS
		2480	Reference	-3.52	-3.52	---	PASS
			30~1000	---	-56.88	≤-23.52	PASS
			1000~26500	---	-49	≤-23.52	PASS

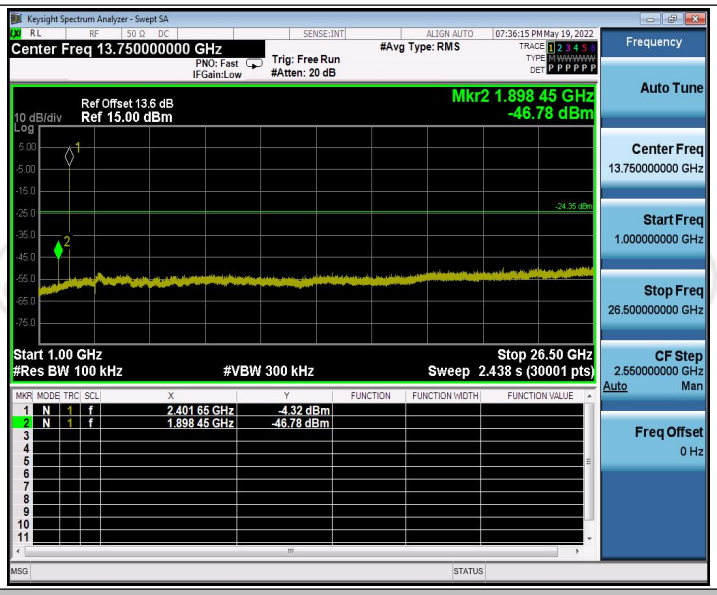
Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000

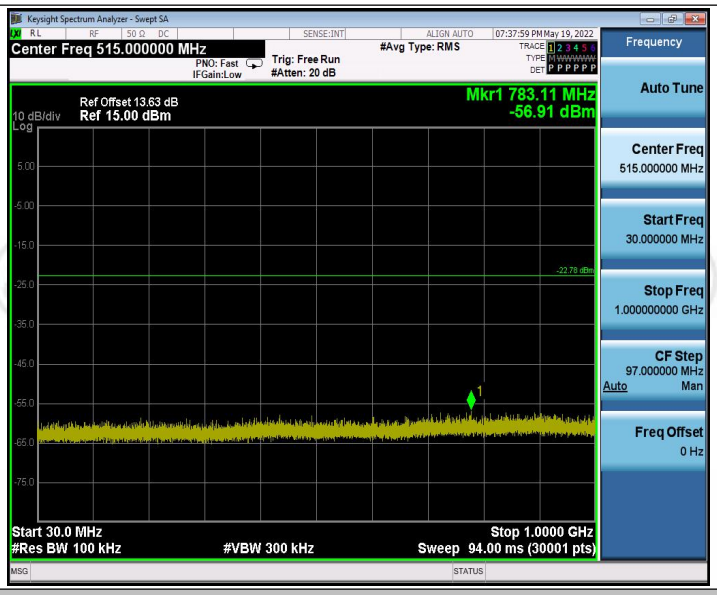


BLE_1M_Ant1_2402_1000~26500

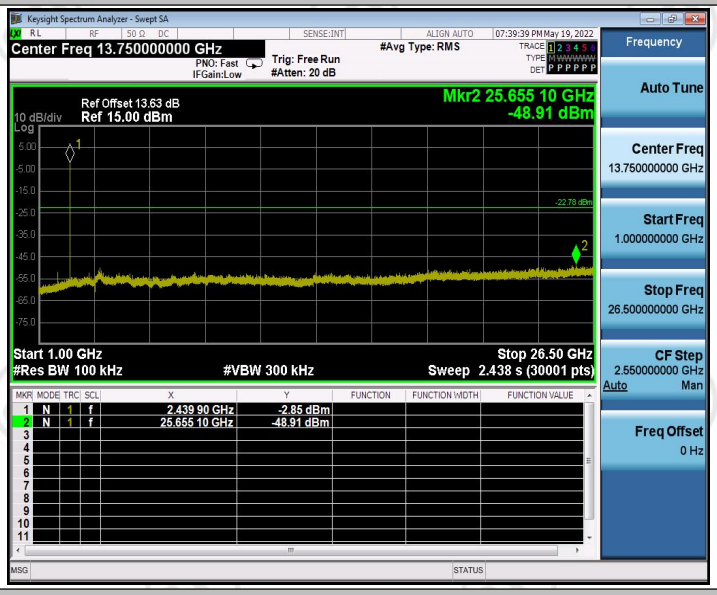


BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000

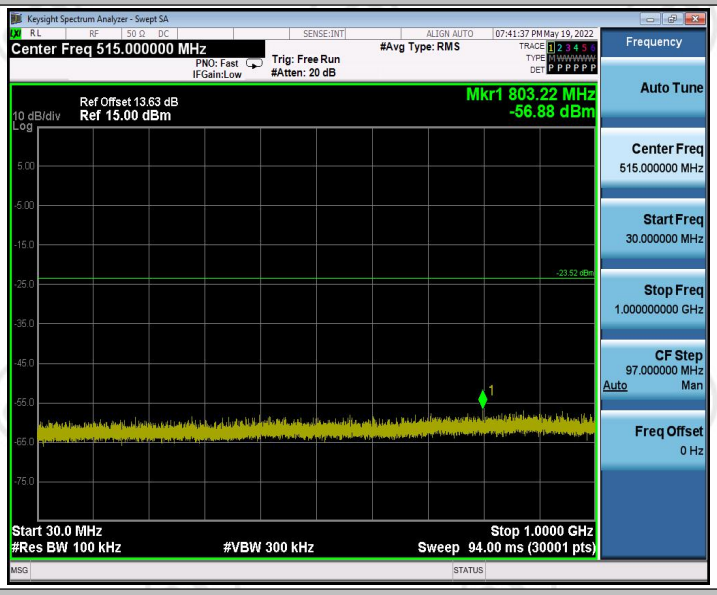


BLE_1M_Ant1_2440_1000~26500

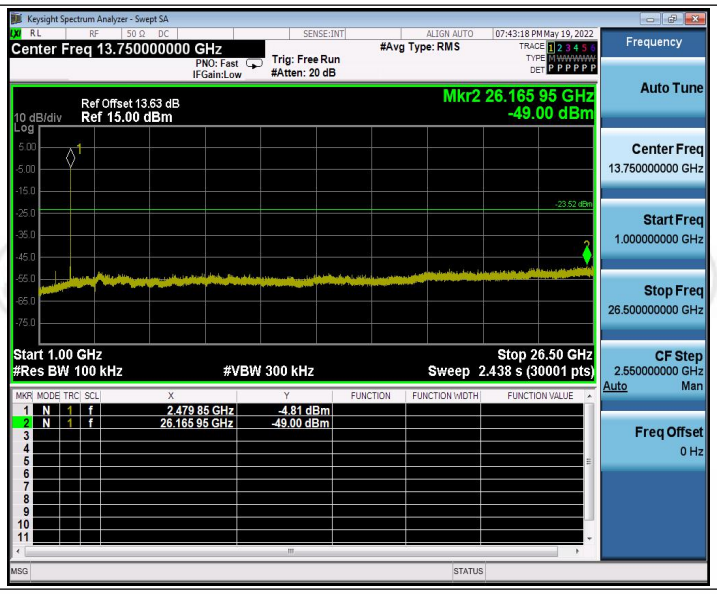


BLE_1M_Ant1_2480_0~Reference

BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500


Keysight Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
07:43:18 PM May 19, 2022
Ref Offset 13.63 dB
10 dB/div
Ref 15.00 dBm
Mkr2 26.165 95 GHz
-49.00 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
1 N 1 f 2.479 85 GHz -4.81 dBm
2 N 1 f 26.165 95 GHz -49.00 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

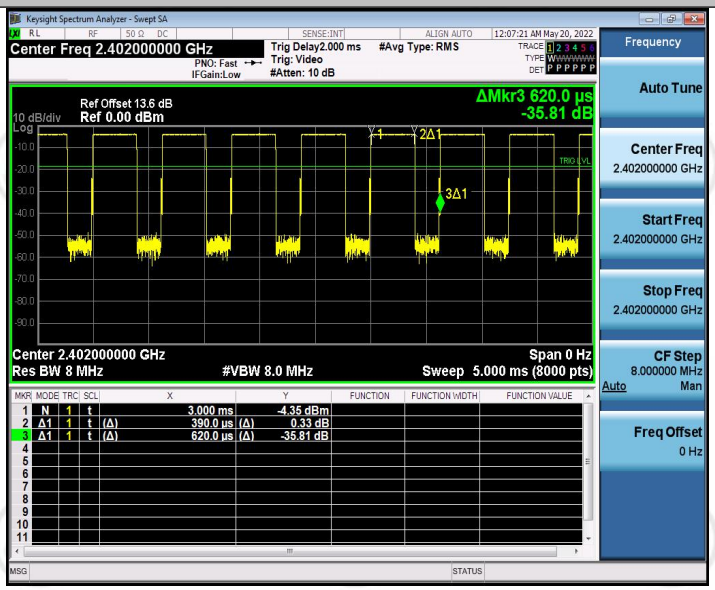
Appendix G: Duty Cycle

Test Result

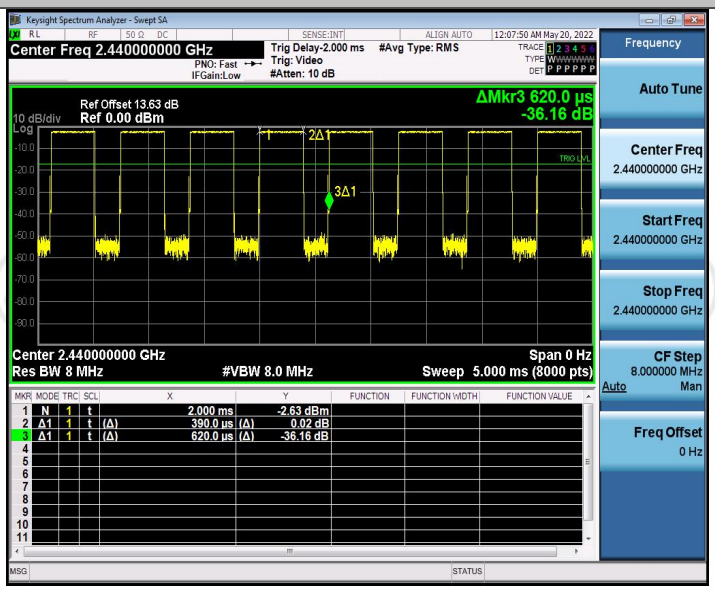
Test Mode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]
BLE_1M	Ant1	2402	0.39	0.62	62.90	2.01
		2440	0.39	0.62	62.90	2.01
		2480	0.40	0.63	63.49	1.97

Test Graphs

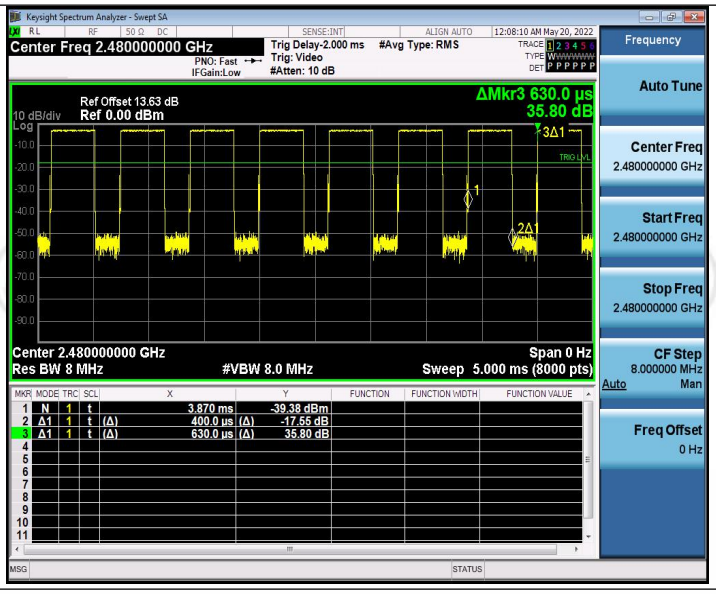
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



END OF REPORT