Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: Nano Gateway

Test Model: SUBG100-L

Environmental Conditions

Temperature:	23.8 ° C
Relative Humidity:	52.3%
ATM Pressure:	100.0 kPa
Test Engineer:	Paddi Chen
Supervised by:	Nick Peng

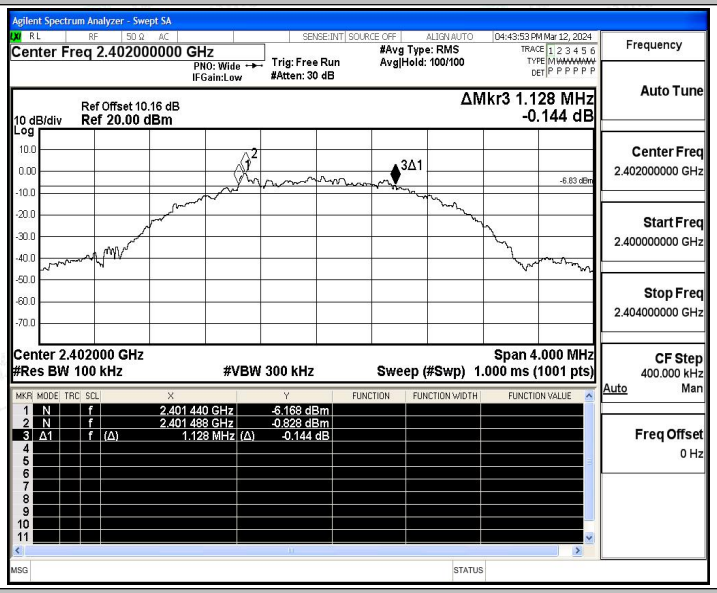
A.1 DTS Bandwidth

Test Result

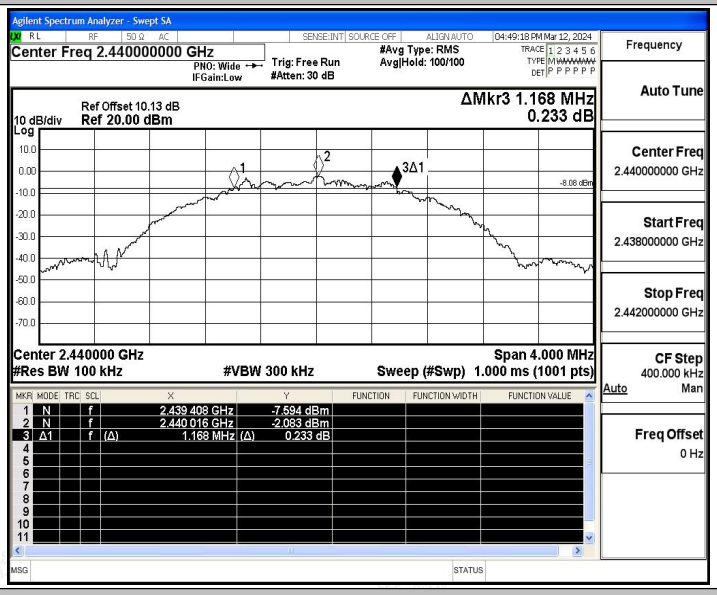
TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_2M	Ant1	2402	1.128	2401.440	2402.568	0.5	PASS
		2440	1.168	2439.408	2440.576	0.5	PASS
		2480	1.128	2479.420	2480.548	0.5	PASS

Test Graphs

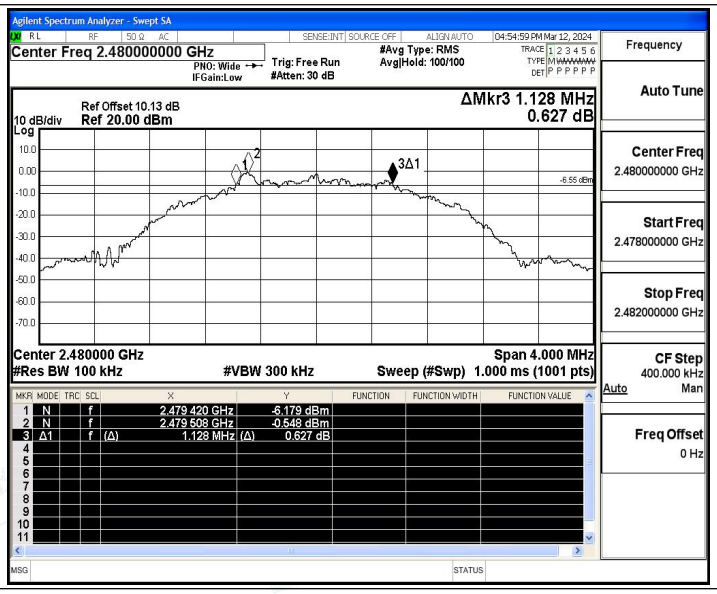
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_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
04:54:59 PM Mar 12, 2024
Ref Offset 10.13 dB
10 dB/div
Ref 20.00 dBm
ΔMkr3 1.128 MHz
0.627 dB
-6.55 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep (#Swp) 1.000 ms (1001 pts)
1 N 1 f 2.479 420 GHz -6.179 dBm
2 N 1 f 2.479 508 GHz -0.548 dBm
3 Δ1 1 f (Δ) 1.128 MHz (Δ) 0.627 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

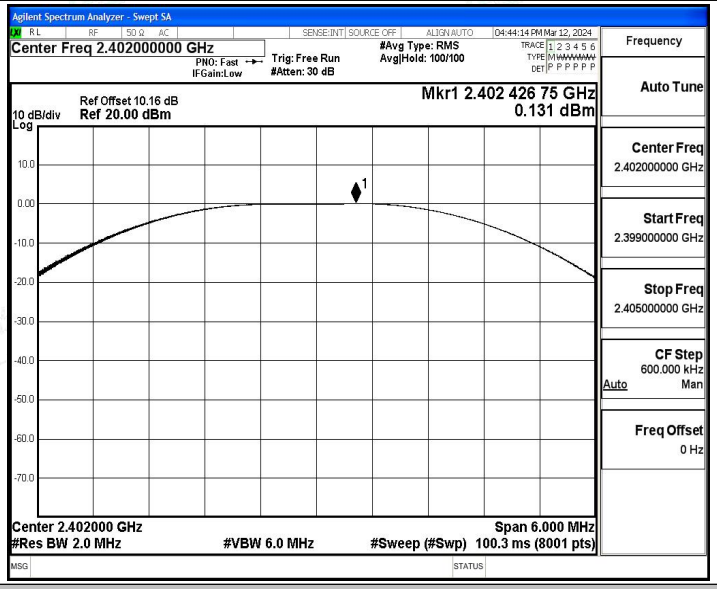
A.2 Maximum peak conducted output power

Test Result

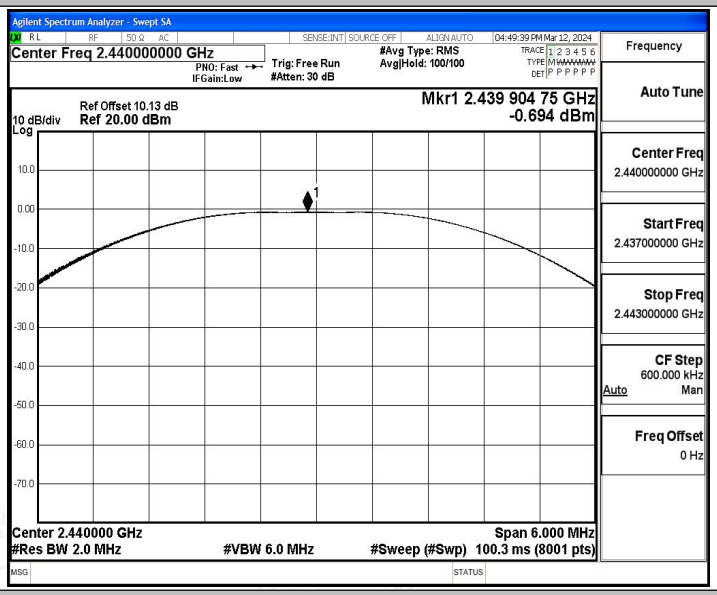
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	0.13	≤30	PASS
		2440	-0.69	≤30	PASS
		2480	-0.03	≤30	PASS

Test Graphs

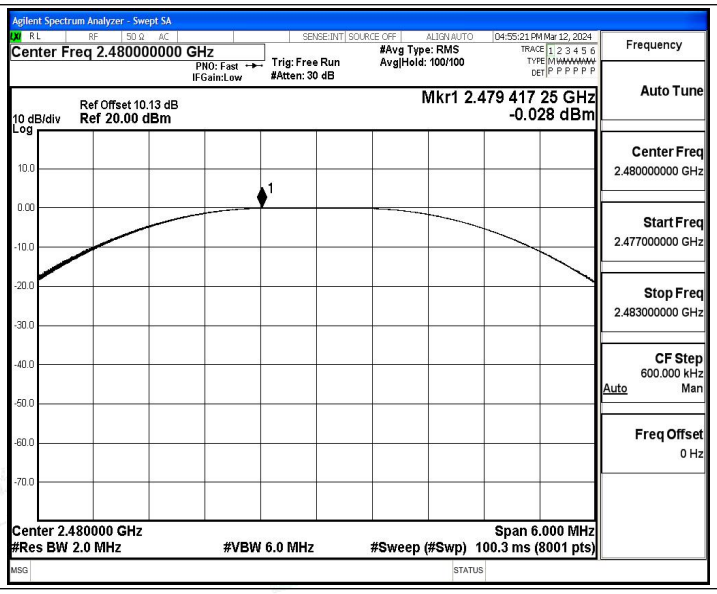
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_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: 100/100
04:55:21 PM Mar 12, 2024
Ref Offset 10.13 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.479 417 25 GHz
-0.028 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
#Sweep (#Swp) 100.3 ms (8001 pts)
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

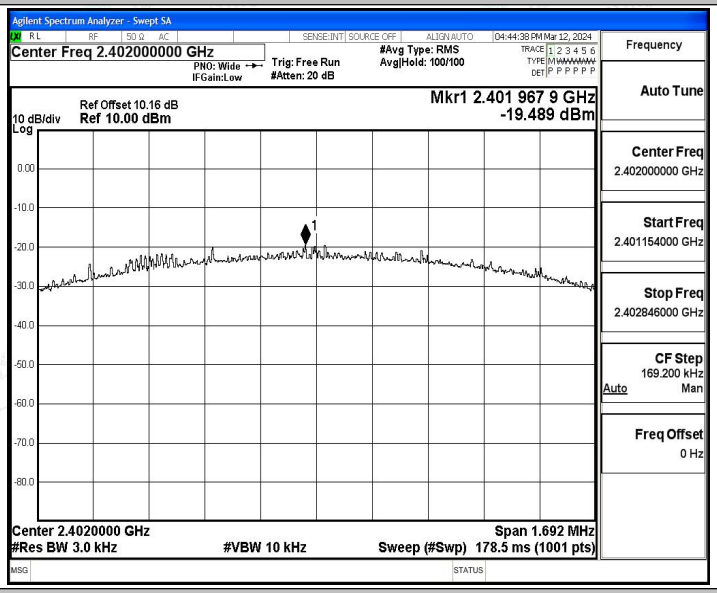
A.3 Maximum power spectral density

Test Result

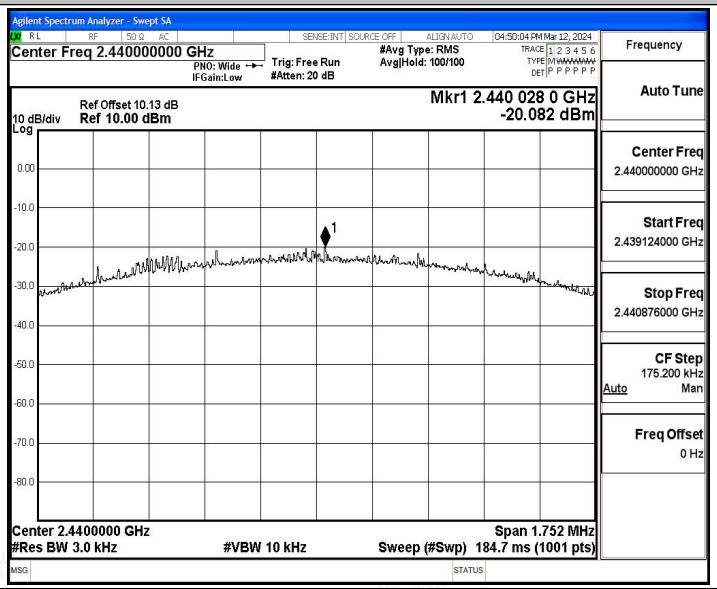
TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_2M	Ant1	2402	-19.49	≤8.00	PASS
		2440	-20.08	≤8.00	PASS
		2480	-19.62	≤8.00	PASS

Test Graphs

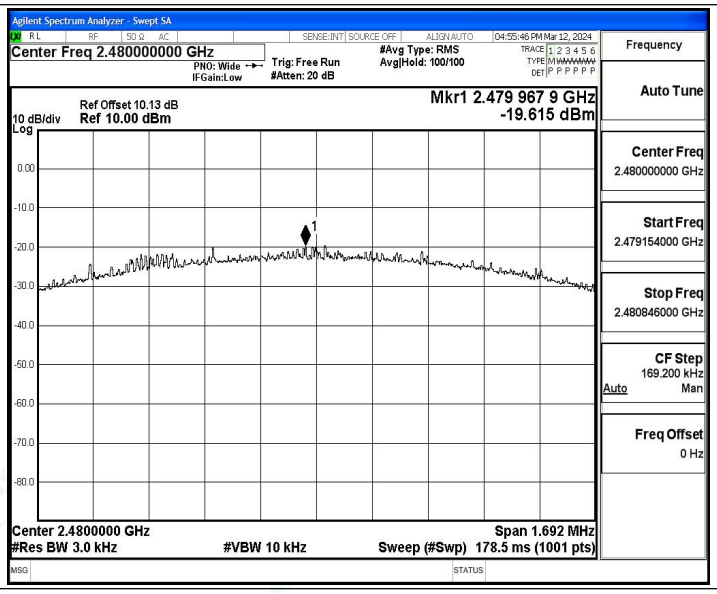
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_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: 100/100
04:55:46 PM Mar 12, 2024
Frequency
Auto Tune
Ref Offset 10.13 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 967 9 GHz
-19.615 dBm
Center Freq
2.480000000 GHz
Start Freq
2.479154000 GHz
Stop Freq
2.480846000 GHz
CF Step
169.200 kHz
Auto Man
Freq Offset
0 Hz
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.692 MHz
Sweep (#Swp) 178.5 ms (1001 pts)
MSG
STATUS

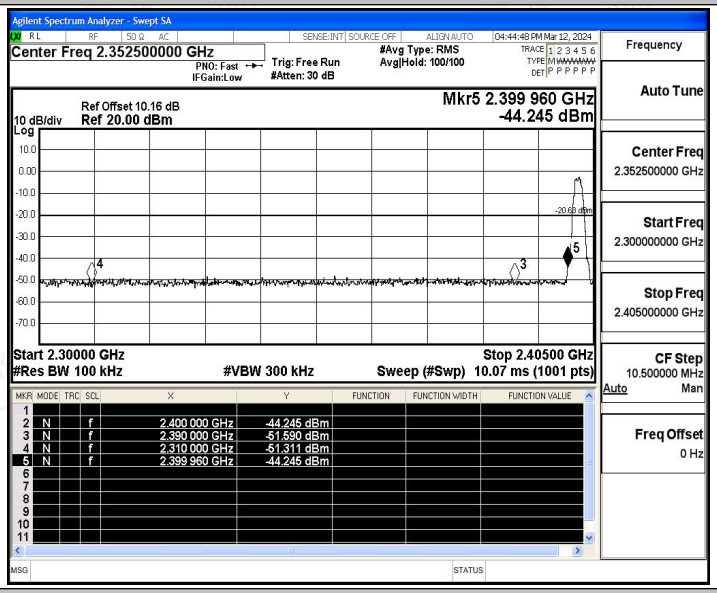
A.4 Band edge measurements

Test Result

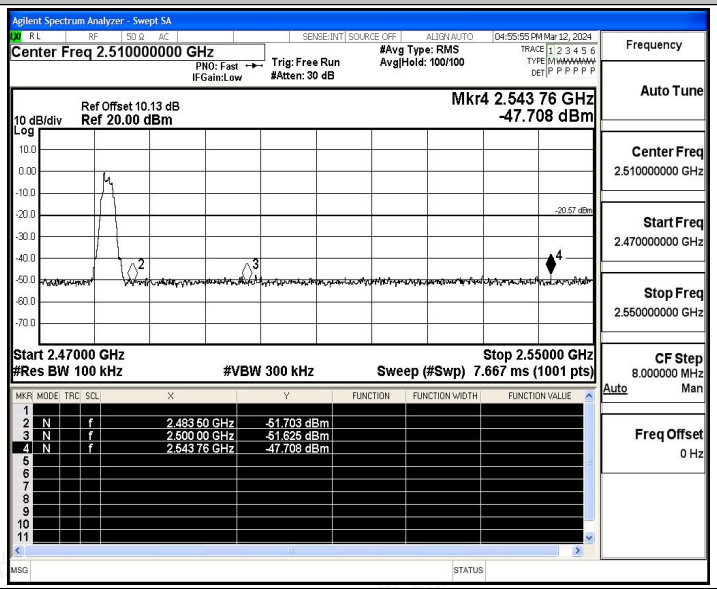
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	Low	2402	-0.68	-44.25	≤-20.68	PASS
		High	2480	-0.57	-47.71	≤-20.57	PASS

Test Graphs

BLE_2M_Ant1_Low_2402



BLE_2M_Ant1_High_2480



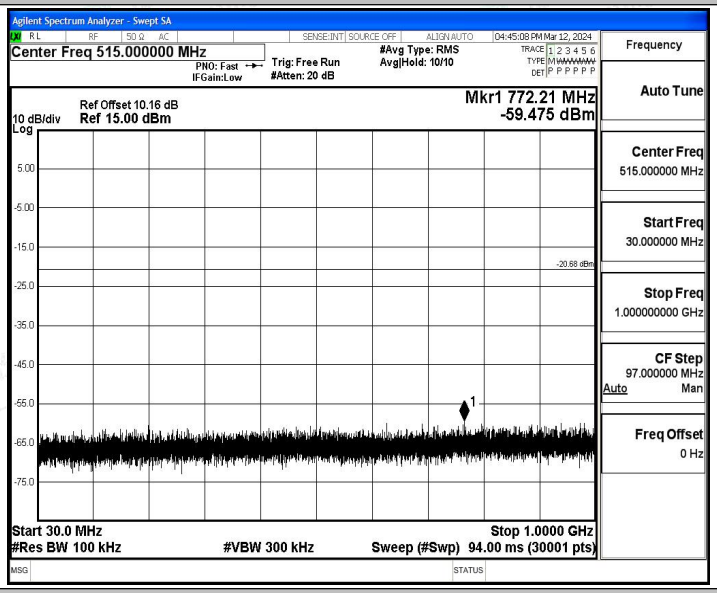
A.5 Conducted Spurious Emission

Test Result

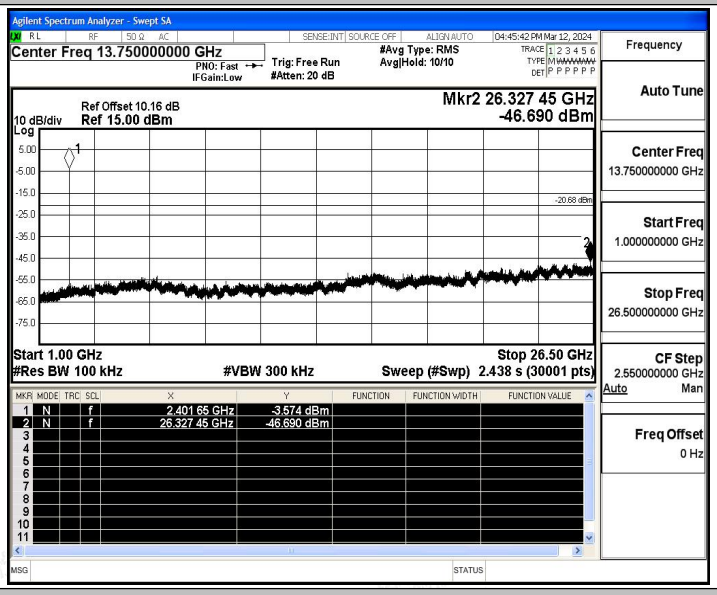
TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_2M	Ant1	2402	30~1000	-0.68	-59.48	≤-20.68	PASS
			1000~26500	-0.68	-46.69	≤-20.68	PASS
		2440	30~1000	-1.26	-59.58	≤-21.26	PASS
			1000~26500	-1.26	-46.7	≤-21.26	PASS
		2480	30~1000	-0.57	-59.55	≤-20.57	PASS
			1000~26500	-0.57	-46.88	≤-20.57	PASS

Test Graphs

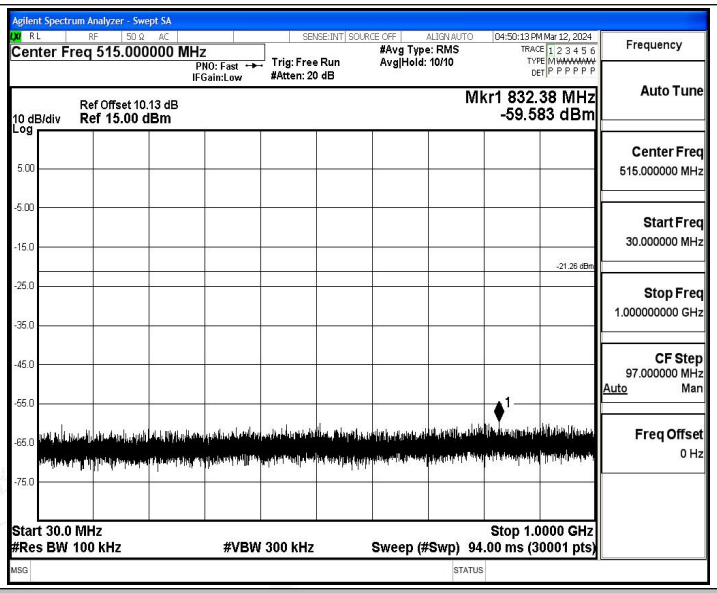
BLE_2M_Ant1_2402_30~1000



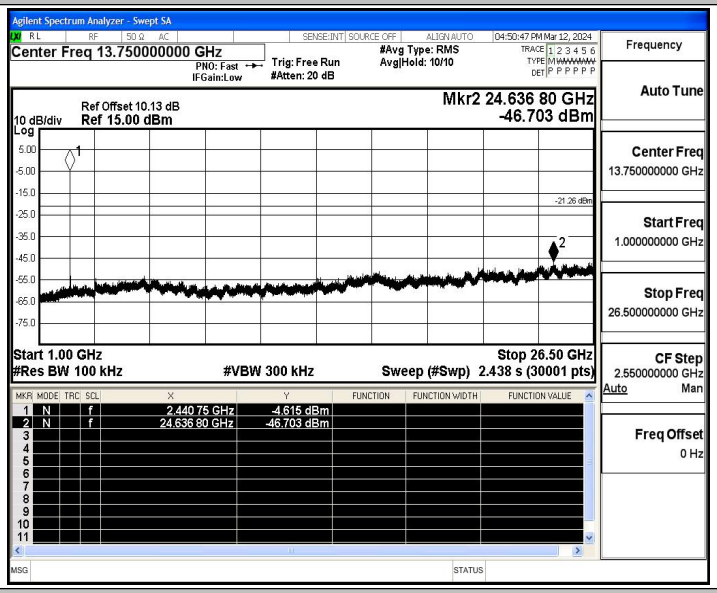
BLE_2M_Ant1_2402_1000~26500



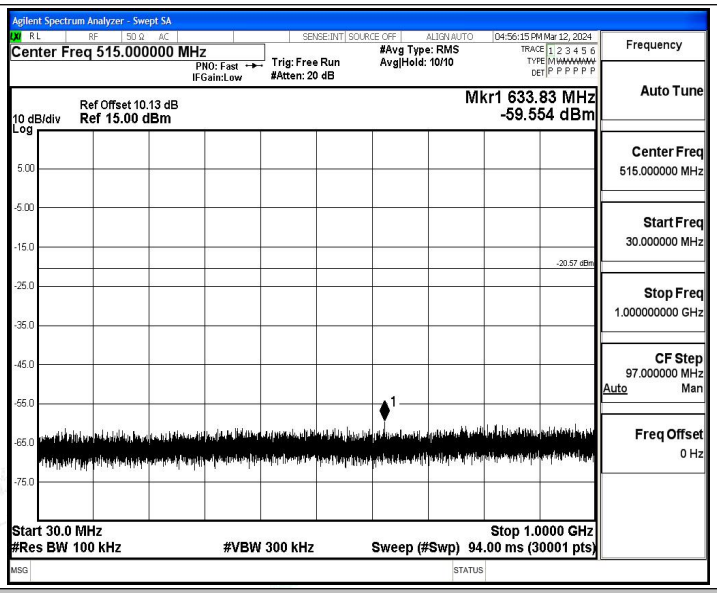
BLE_2M_Ant1_2440_30~1000



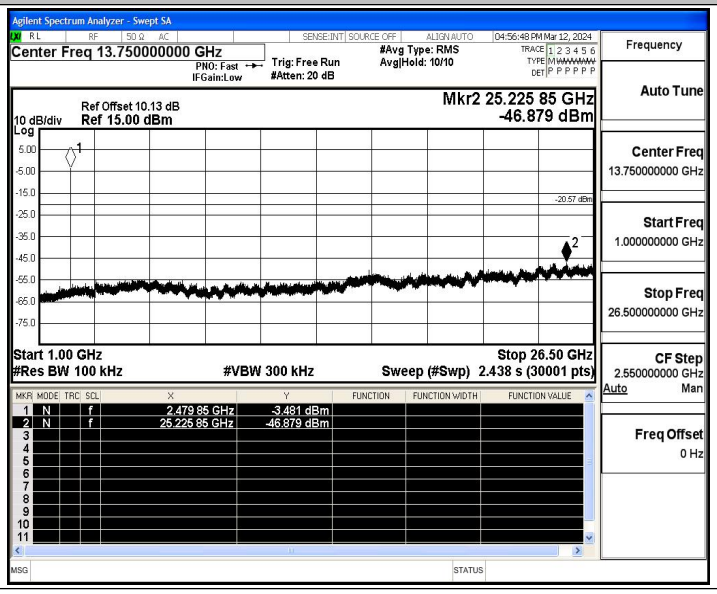
BLE_2M_Ant1_2440_1000~26500



BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500



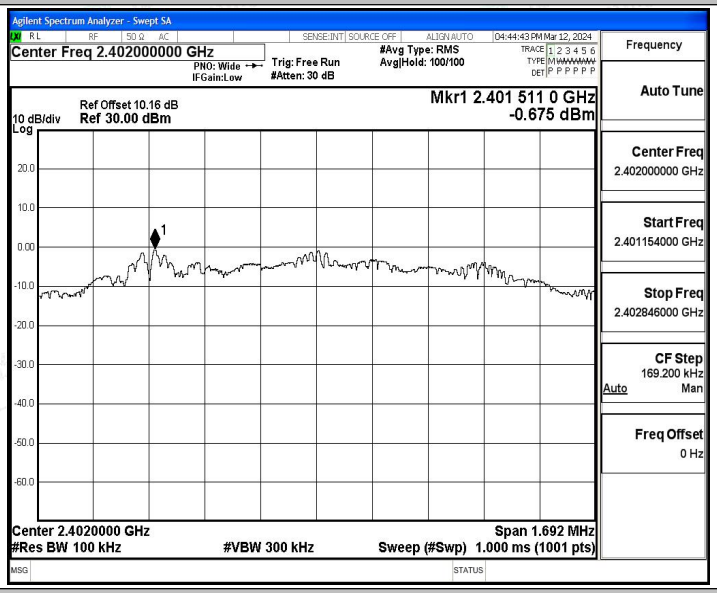
Reference level measurement

Test Result

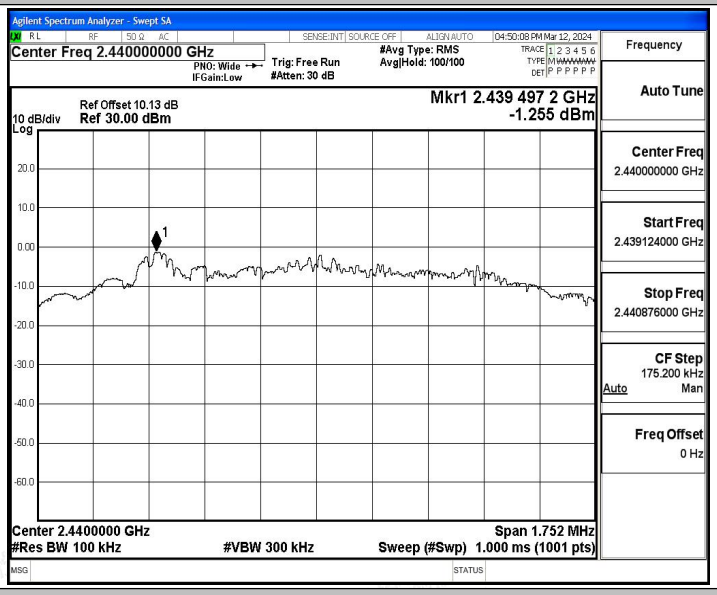
TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
BLE_2M	Ant1	2402	2401.51	-0.68
		2440	2439.50	-1.26
		2480	2479.50	-0.57

Test Graphs

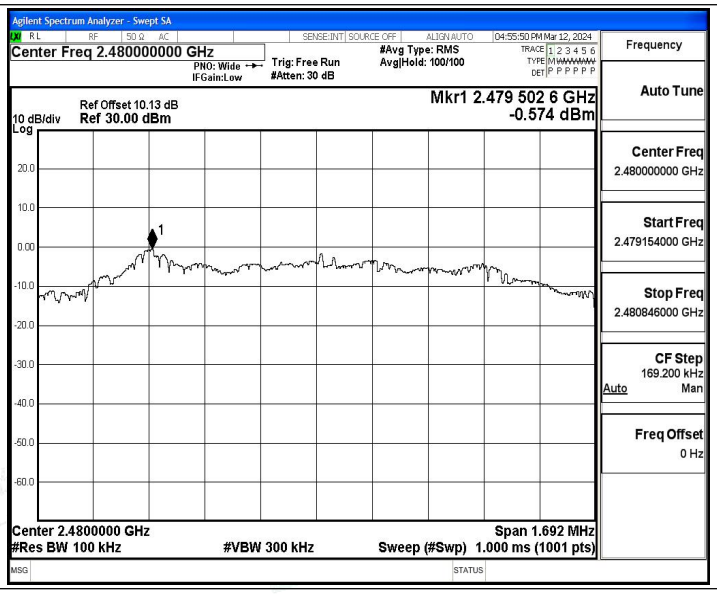
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_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
04:55:50 PM Mar 12, 2024
Ref Offset 10.13 dB
10 dB/div Ref 30.00 dBm
Log
Mkr1 2.479 502 6 GHz
-0.574 dBm
Center 2.4800000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 1.692 MHz
Sweep (#Swp) 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479154000 GHz
Stop Freq
2.480846000 GHz
CF Step
169.200 kHz
Auto
Man
Freq Offset
0 Hz

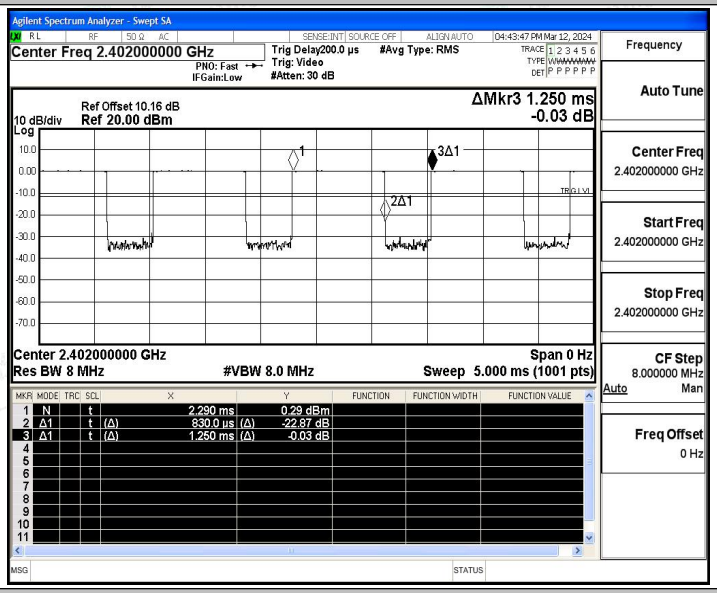
A.6 Duty Cycle

Test Result

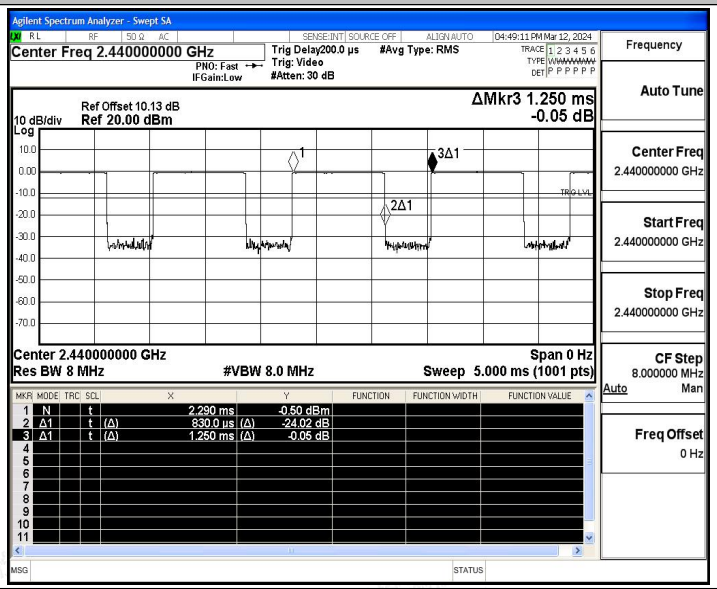
TestMode	Antenna	Frequency[MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	Duty Cycle Factor[dB]	1/T Factor[dB]
BLE_2M	Ant1	2402	0.83	1.25	66.40	1.78	1.20
		2440	0.83	1.25	66.40	1.78	1.20
		2480	0.83	1.25	66.40	1.78	1.20

Test Graphs

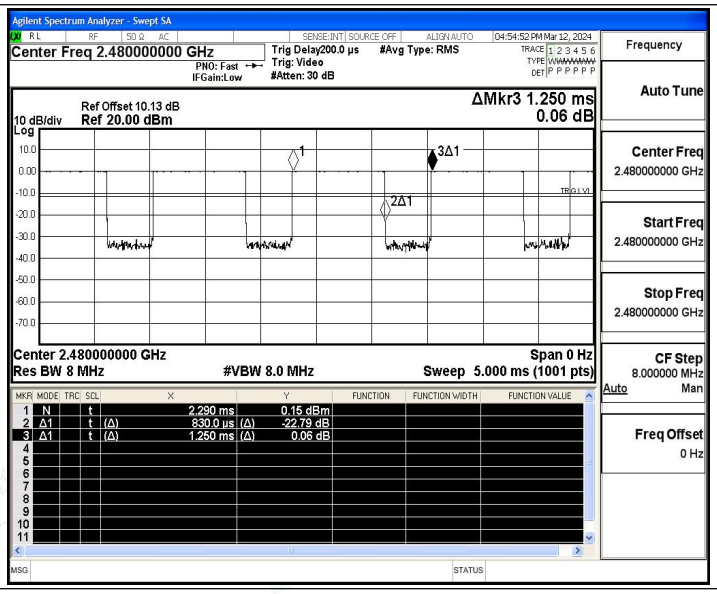
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_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
04:54:52 PM Mar 12, 2024
Ref Offset 10.13 dB
10 dB/div Ref 20.00 dBm
ΔMkr3 1.250 ms
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 1 t 2.290 ms 0.15 dBm
2 Δ1 t (Δ) 830.0 µs (Δ) -22.79 dB
3 Δ1 t (Δ) 1.250 ms (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

A.7 Emissions in Restricted Bands

Test Result

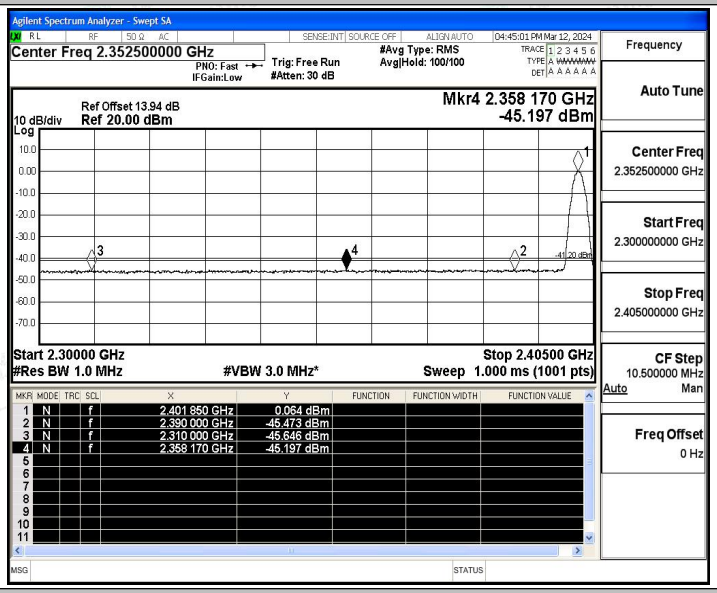
TestMode	Antenna	ChName	Frequency[MHz]	Detector	Freq [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_2M	Ant1	Low	2402	AV	2310.000	-45.65	≤-41.20	49.55	≤54	PASS
				AV	2358.170	-45.2	≤-41.20	50.00	≤54	PASS
				AV	2390.000	-45.47	≤-41.20	49.73	≤54	PASS
				Peak	2310.000	-39.57	≤-21.20	55.63	≤74	PASS
				Peak	2347.040	-36.32	≤-21.20	58.88	≤74	PASS
				Peak	2390.000	-40.84	≤-21.20	54.36	≤74	PASS
		High	2480	AV	2483.500	-45.57	≤-41.20	49.63	≤54	PASS
				AV	2498.240	-44.9	≤-41.20	50.30	≤54	PASS
				AV	2500.000	-45.63	≤-41.20	49.57	≤54	PASS
				Peak	2483.500	-40.19	≤-21.20	55.01	≤74	PASS
				Peak	2483.680	-36.42	≤-21.20	58.78	≤74	PASS
				Peak	2500.000	-40.15	≤-21.20	55.05	≤74	PASS

Note：

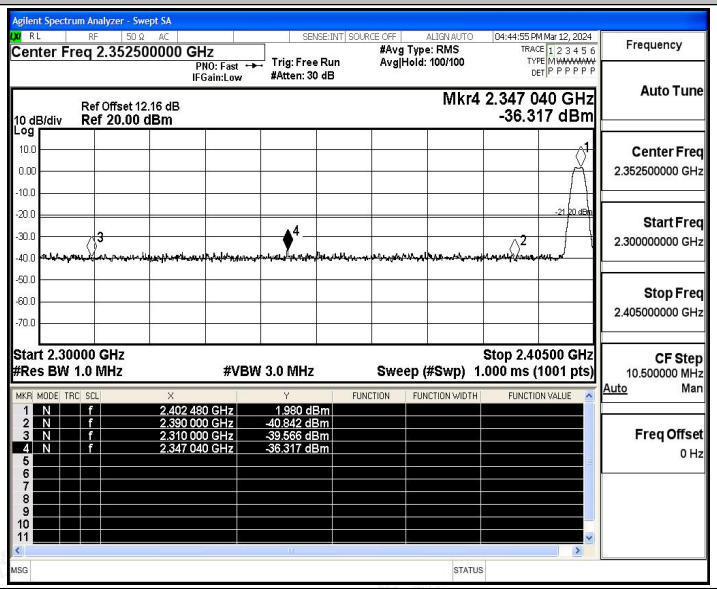
1. The Antenna Gain is compensated in the graph. The Correction Factor is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

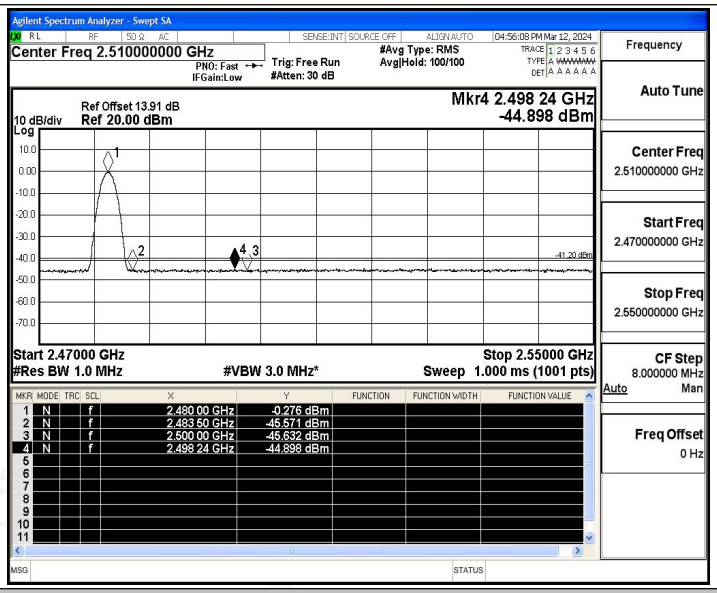
BLE_2M_Ant1_Low_2402_AV



BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV



BLE_2M_Ant1_High_2480_Peak