Appendix B

RF Test Data for 2.4G (Conducted Measurement)

Product Name: MA-1 MINI SPEAKER

Test Model: MA-1

Environmental Conditions

Temperature:	23.5° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Wunder Wu
Supervised by:	Li huan

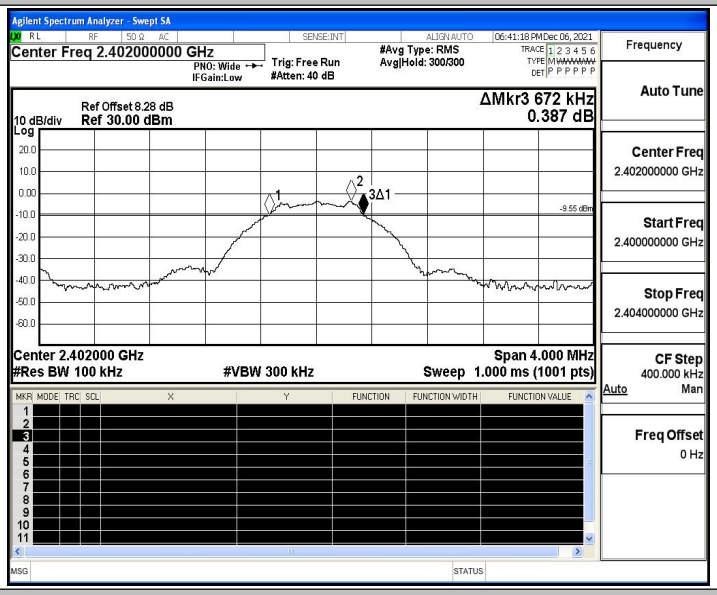
B.1 6dB Bandwidth

Test Result

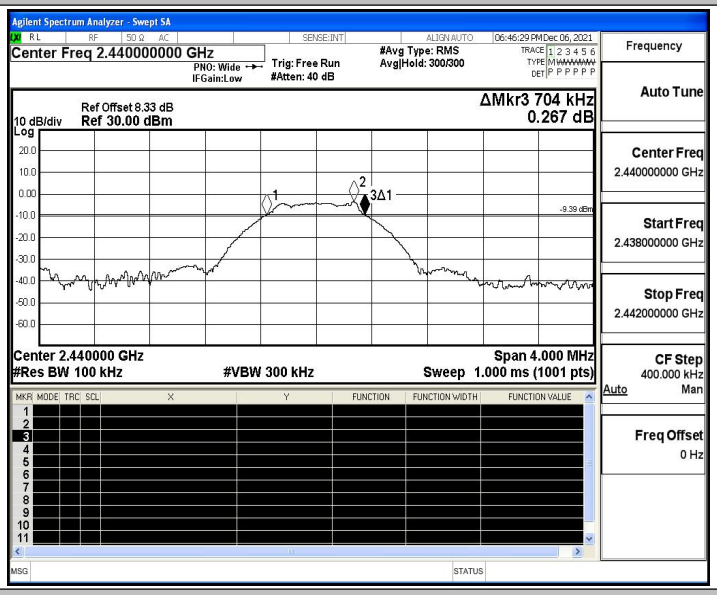
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.672	2401.664	2402.336	≥0.5	PASS
		2440	0.704	2439.644	2440.348	≥0.5	PASS
		2480	0.676	2479.660	2480.336	≥0.5	PASS

Test Graphs

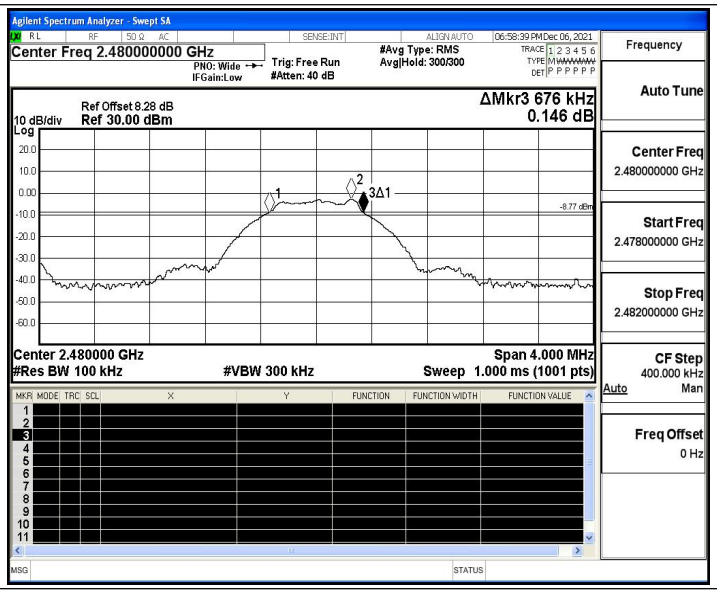
BLE_1M_Ant1_2402



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: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
06:58:39 PM Dec 06, 2021
Ref Offset 8.28 dB
10 dB/div Ref 30.00 dBm
Log
ΔMkr3 676 kHz
0.146 dB
-8.77 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)
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

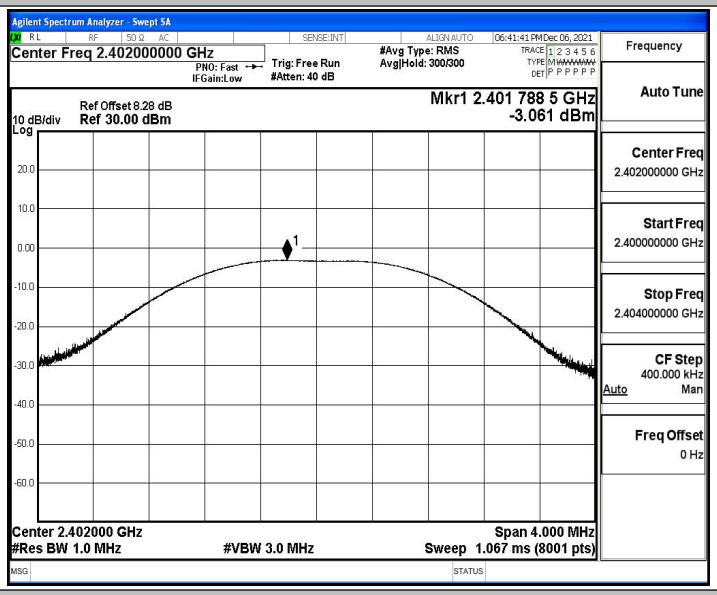
B.2 Maximum conducted output power

Test Result

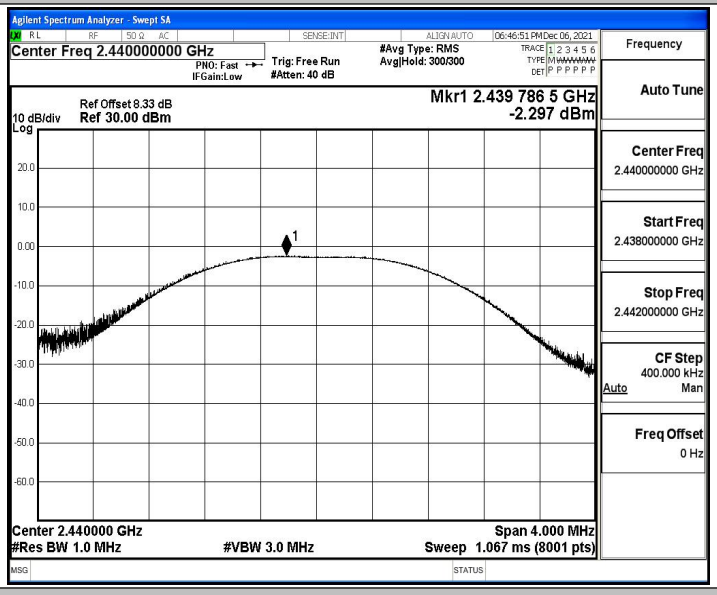
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-3.06	≤30	PASS
		2440	-2.3	≤30	PASS
		2480	-2.3	≤30	PASS

Test Graphs

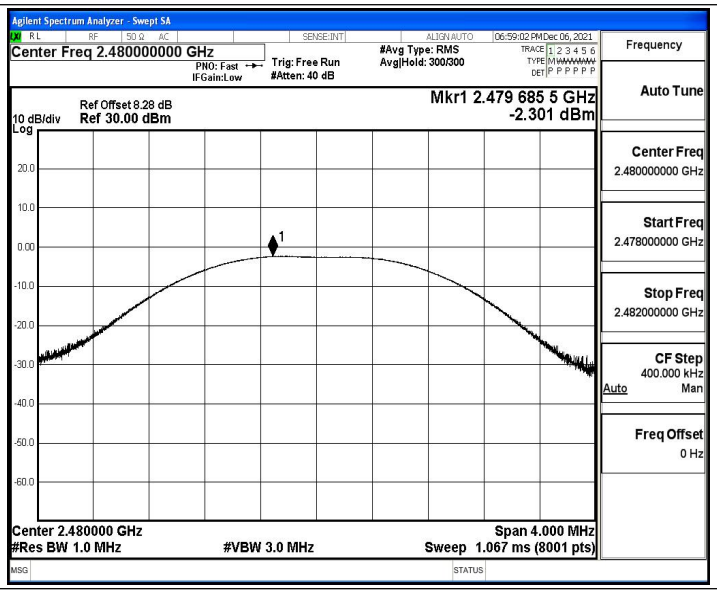
BLE_1M_Ant1_2402



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: 40 dB
#Avg Type: RMS
Avg|Hold: 300/300
06:59:02 PM Dec 06, 2021
Ref Offset 8.28 dB
10 dB/div Ref 30.00 dBm
Log
Mkr1 2.479 685 5 GHz
-2.301 dBm
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 4.000 MHz
Sweep 1.067 ms (8001 pts)
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

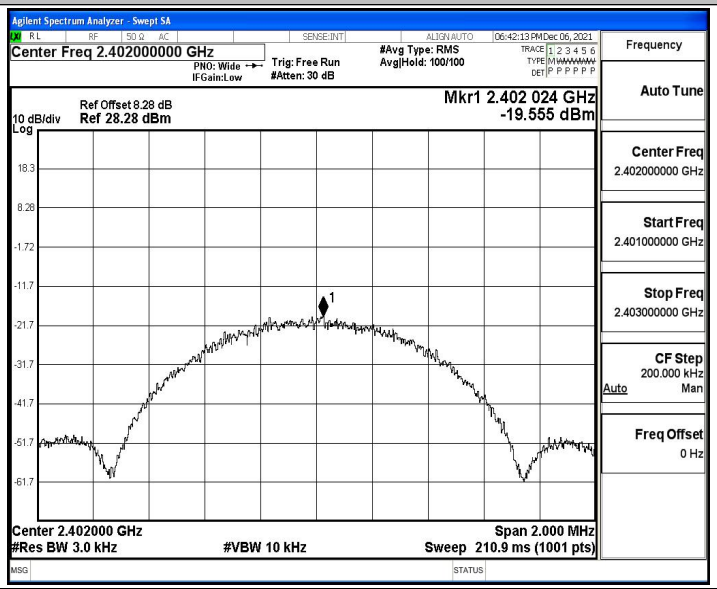
B.3 Maximum power spectral density

Test Result

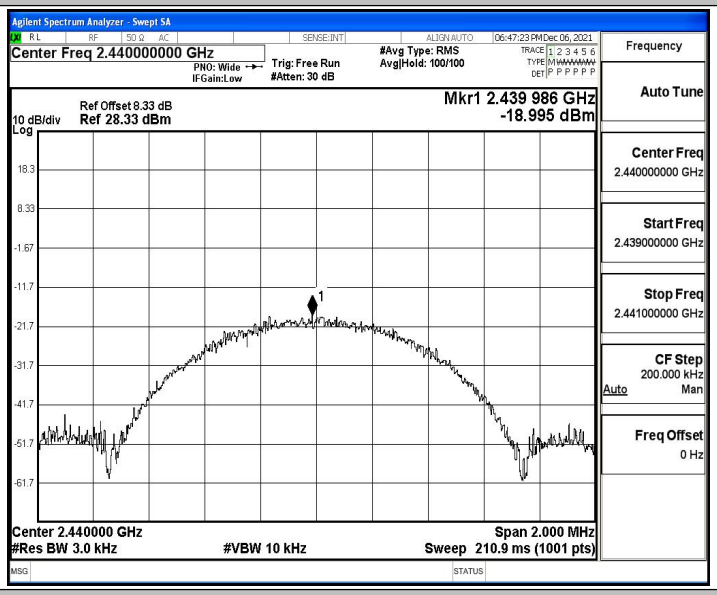
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-19.56	≤8	PASS
		2440	-19	≤8	PASS
		2480	-18.79	≤8	PASS

Test Graphs

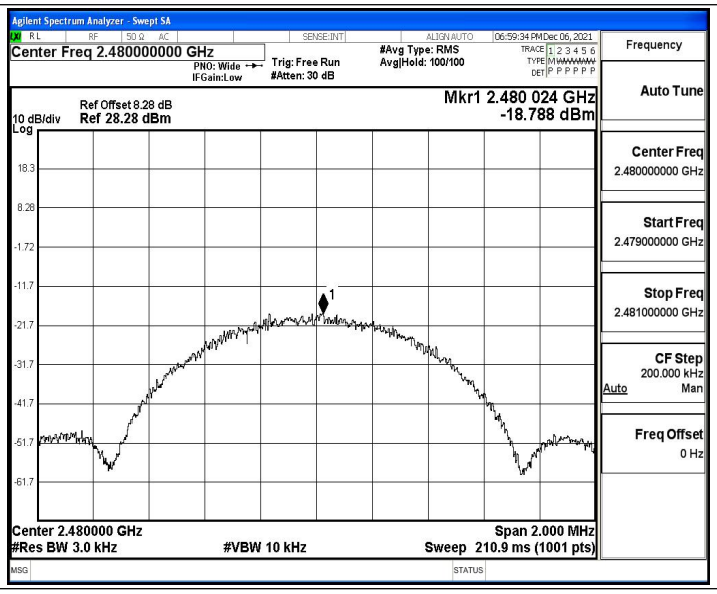
BLE_1M_Ant1_2402



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
06:59:34 PM Dec 06, 2021
Ref Offset 8.28 dB
10 dB/div Ref 28.28 dBm
Log
Mkr1 2.480 024 GHz
-18.788 dBm
18.3
8.28
-1.72
-11.7
-21.7
-31.7
-41.7
-51.7
-61.7
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 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

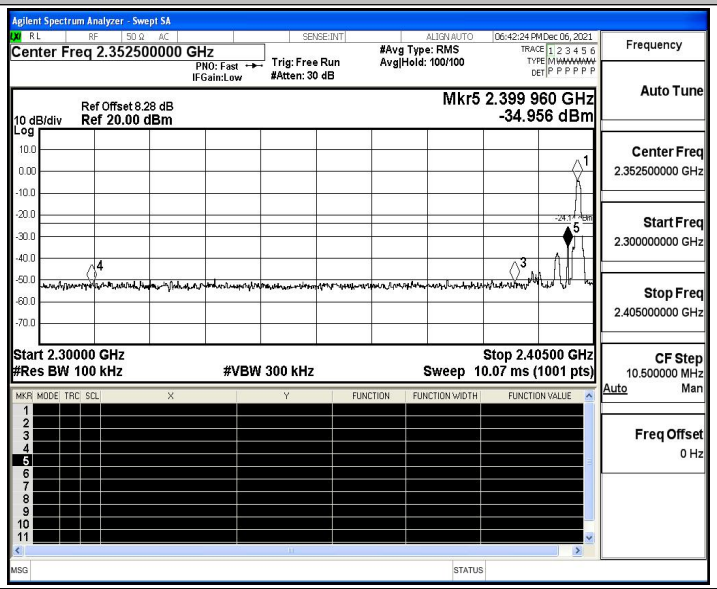
B.4 Band edge measurements

Test Result

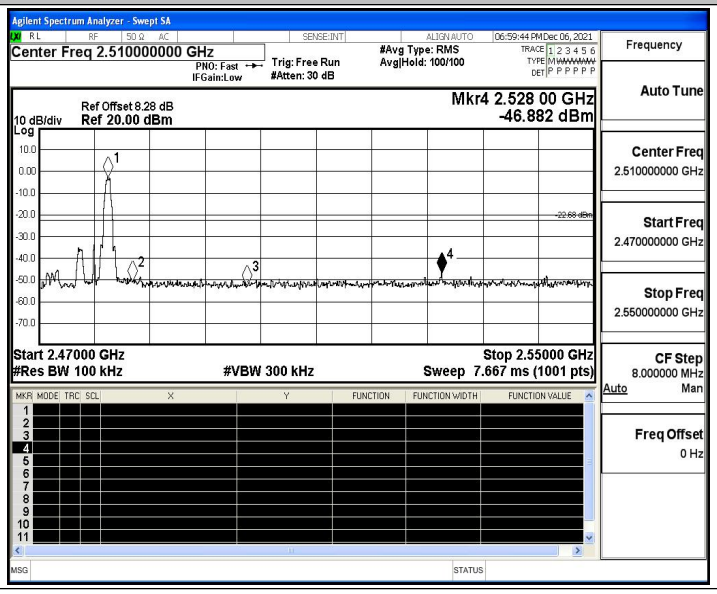
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-4.14	-34.96	≤-24.14	PASS
		High	2480	-2.68	-46.88	≤-22.68	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



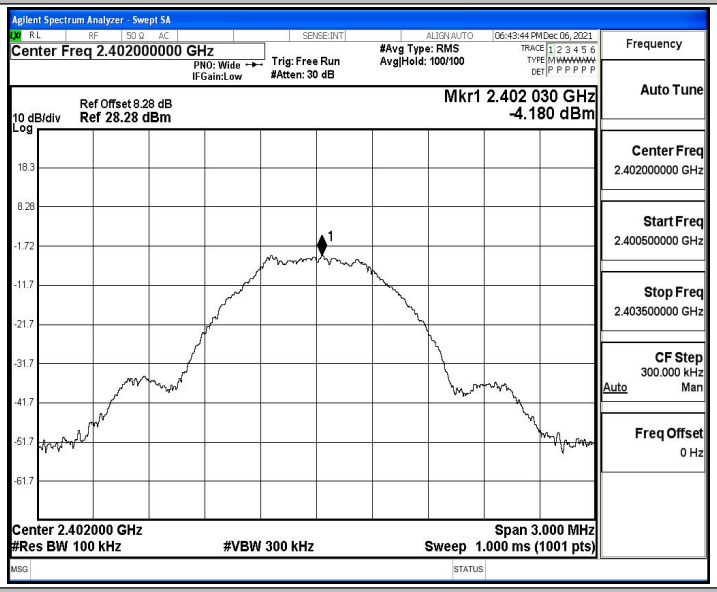
B.5 Conducted Spurious Emission

Test Result

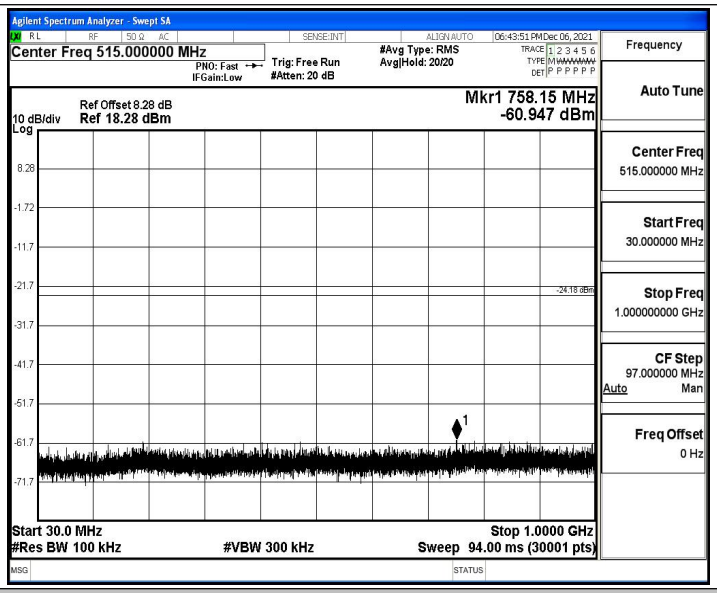
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-4.18	-4.18	---	PASS
			30~1000	-4.18	-60.95	≤-24.18	PASS
			1000~26500	-4.18	-46.26	≤-24.18	PASS
		2440	Reference	-3.62	-3.62	---	PASS
			30~1000	-3.62	-61.13	≤-23.62	PASS
			1000~26500	-3.62	-46	≤-23.62	PASS
		2480	Reference	-2.99	-2.99	---	PASS
			30~1000	-2.99	-33.61	≤-22.99	PASS
			1000~26500	-2.99	-44.59	≤-22.99	PASS

Test Graphs

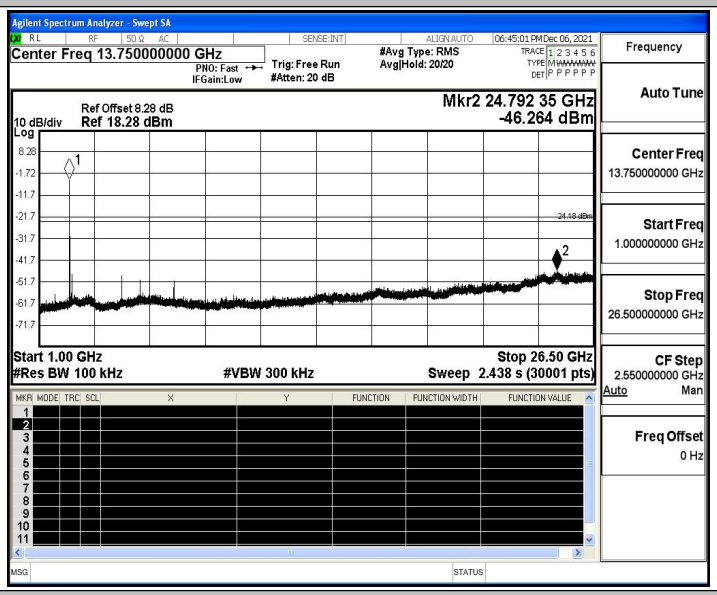
BLE_1M_Ant1_2402_0~Reference



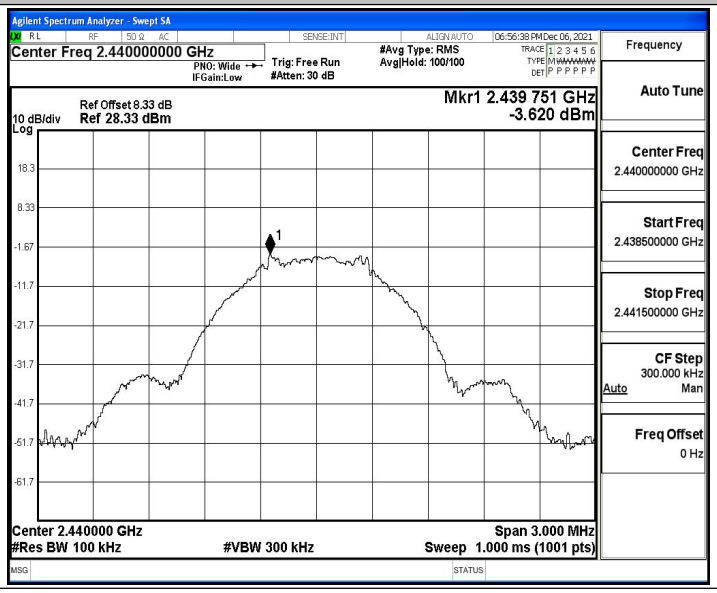
BLE_1M_Ant1_2402_30~1000



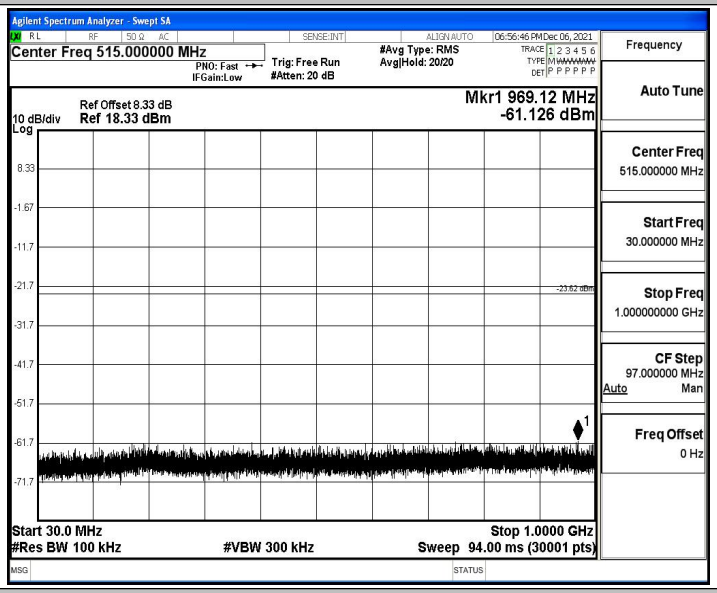
BLE_1M_Ant1_2402_1000~26500



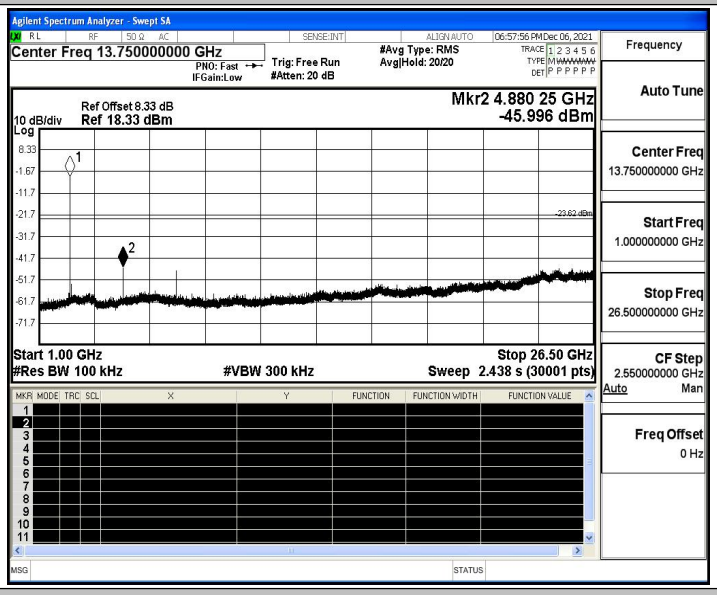
BLE_1M_Ant1_2440_0~Reference



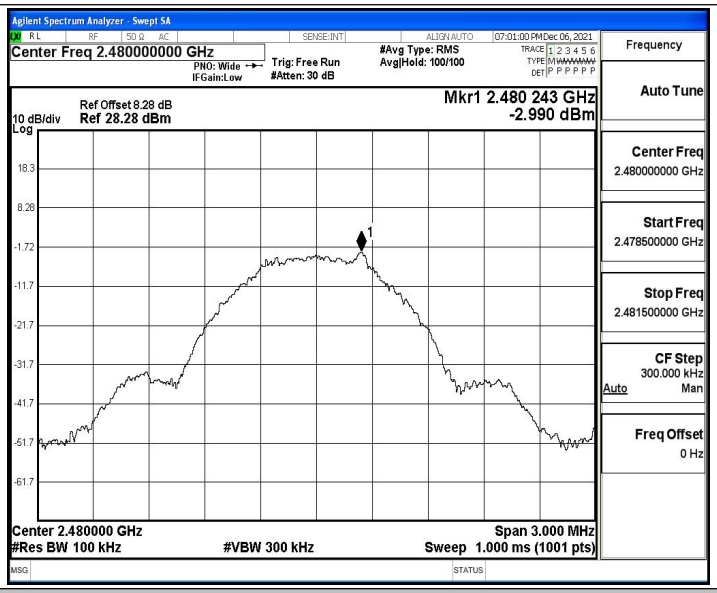
BLE_1M_Ant1_2440_30~1000



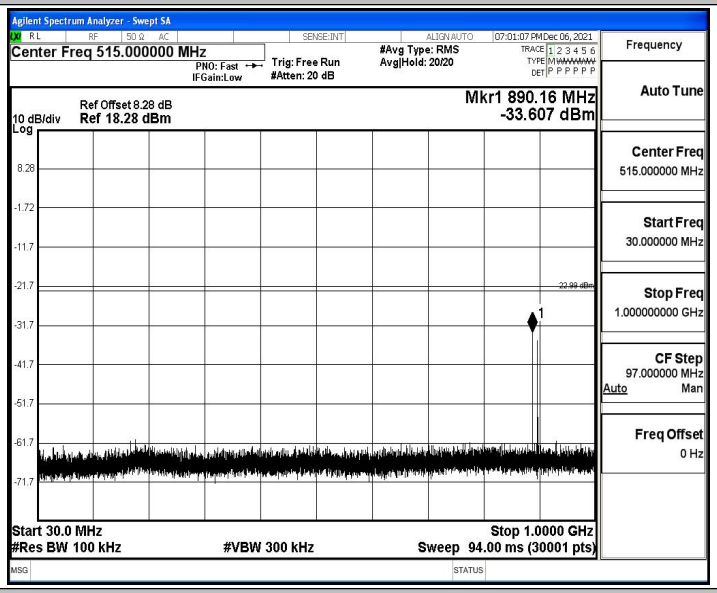
BLE_1M_Ant1_2440_1000~26500



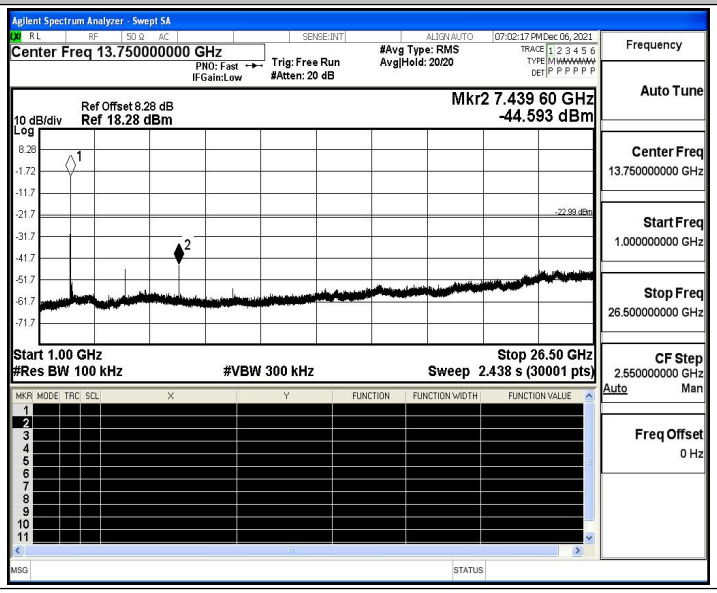
BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



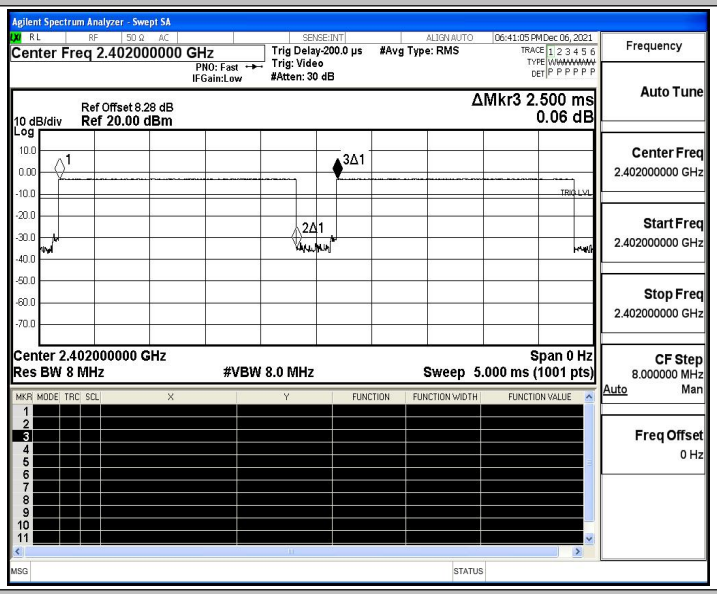
B.6 Duty Cycle

Test Result

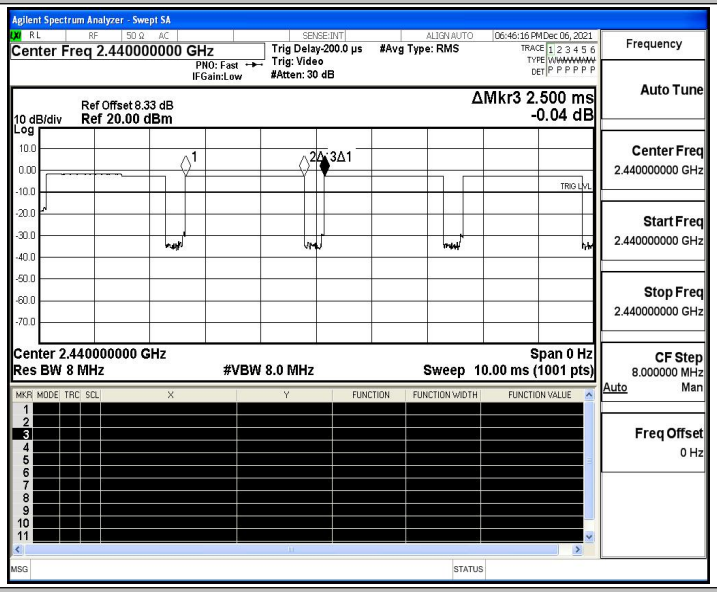
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.13	2.50	0.8520	85.20	0.70	---	PASS
		2440	2.13	2.50	0.8520	85.20	0.70	---	PASS
		2480	2.13	2.50	0.8520	85.20	0.70	---	PASS

Test Graphs

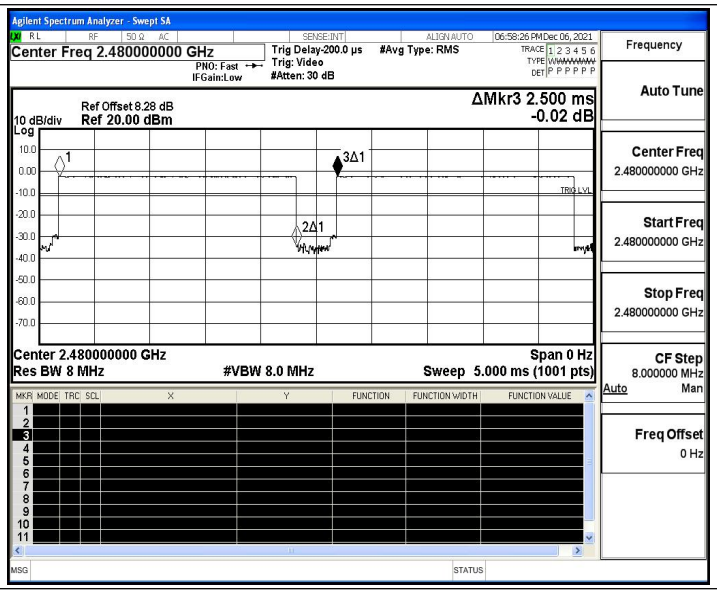
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
Trig Delay-200.0 µs
#Avg Type: RMS
Trig: Video
PNO: Fast
IFGain:Low
#Atten: 30 dB
06:58:26 PM Dec 06, 2021
Ref Offset 8.28 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr3 2.500 ms
-0.02 dB
3Δ1
2Δ1
Center 2.480000000 GHz
Span 0 Hz
Res BW 8 MHz
#VBW 8.0 MHz
Sweep 5.000 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

B.7 Emissions in Restricted Bands

Test Result

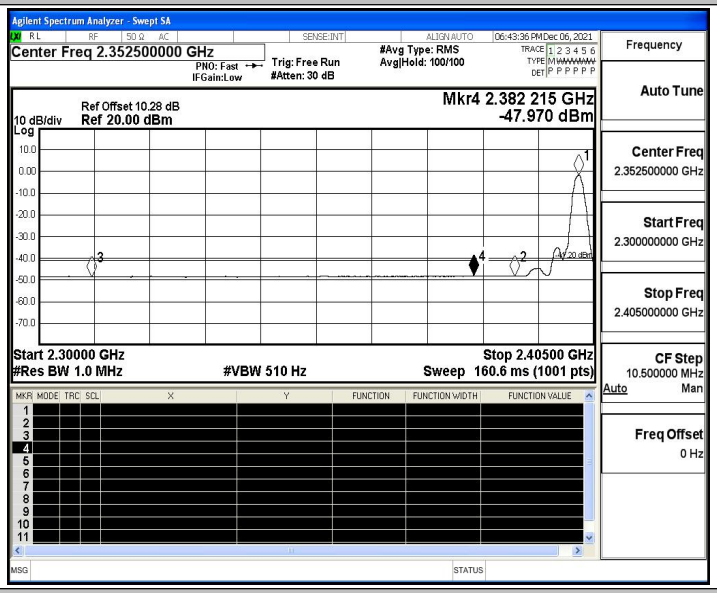
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-48.56	≤-41.20	46.64	≤54	PASS
				AV	2382.215	-47.97	≤-41.20	47.23	≤54	PASS
				AV	2390.000	-48.26	≤-41.20	46.94	≤54	PASS
				Peak	2310.000	-41.49	≤-21.20	53.71	≤74	PASS
				Peak	2389.565	-37.72	≤-21.20	57.48	≤74	PASS
				Peak	2390.000	-42.63	≤-21.20	52.57	≤74	PASS
		High	2480	AV	2483.500	-45.45	≤-41.20	49.75	≤54	PASS
				AV	2483.520	-45.45	≤-41.20	49.75	≤54	PASS
				AV	2500.000	-47.64	≤-41.20	47.56	≤54	PASS
				Peak	2483.500	-39.06	≤-21.20	56.14	≤74	PASS
				Peak	2495.200	-36.45	≤-21.20	58.75	≤74	PASS
				Peak	2500.000	-39.4	≤-21.20	55.80	≤74	PASS

Note：

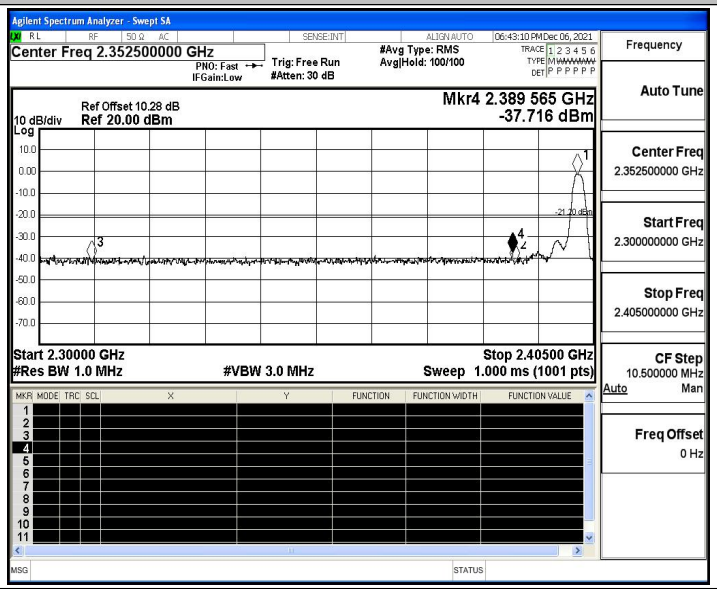
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

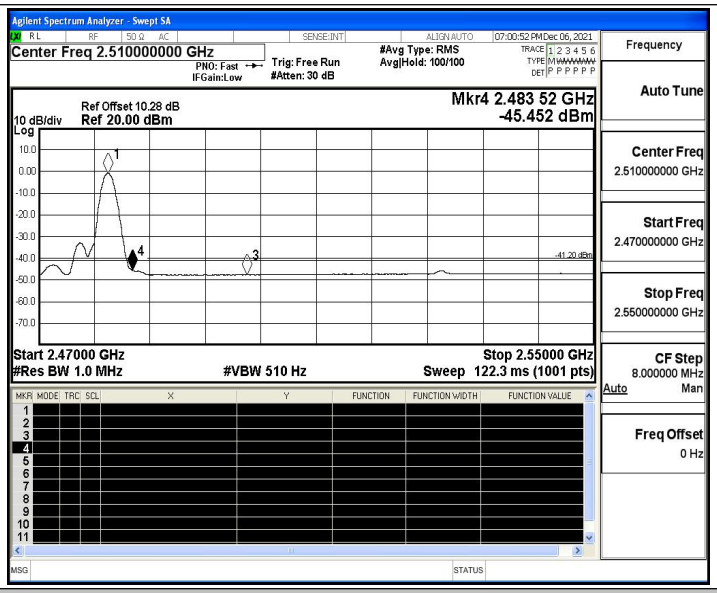
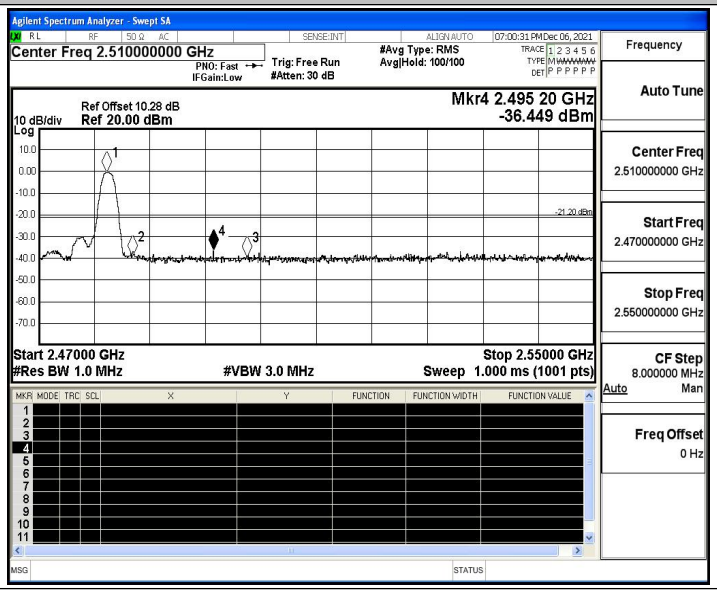
BLE_1M_Ant1_Low_2402_AV



BLE_1M_Ant1_Low_2402_Peak



BLE_1M_Ant1_High_2480_AV



BLE_1M_Ant1_High_2480_Peak