Appendix A

RF Test Data for ZigBee (Conducted Measurement)

Product Name: Water Timer

Trade Mark: None

Test Model: SAS980SWT-7

Environmental Conditions

Temperature:	21.6° C
Relative Humidity:	52.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Ken He
Supervised by:	Li Huan

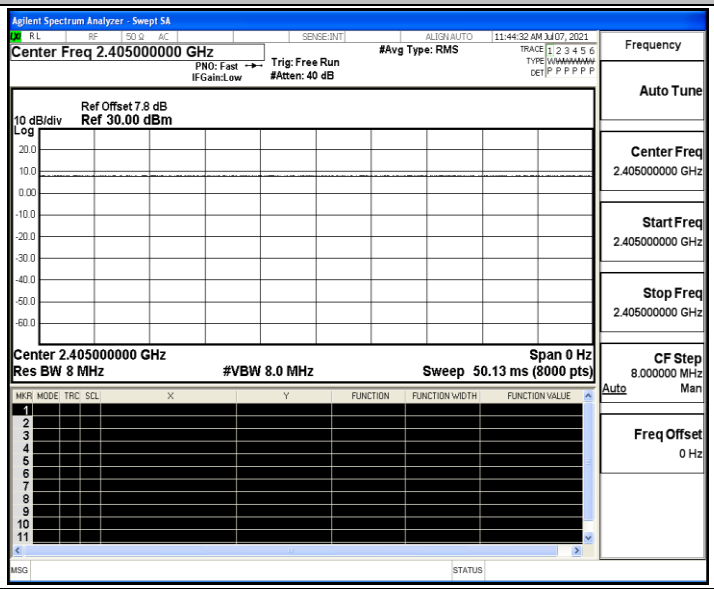
A.1 Duty Cycle

Test Result

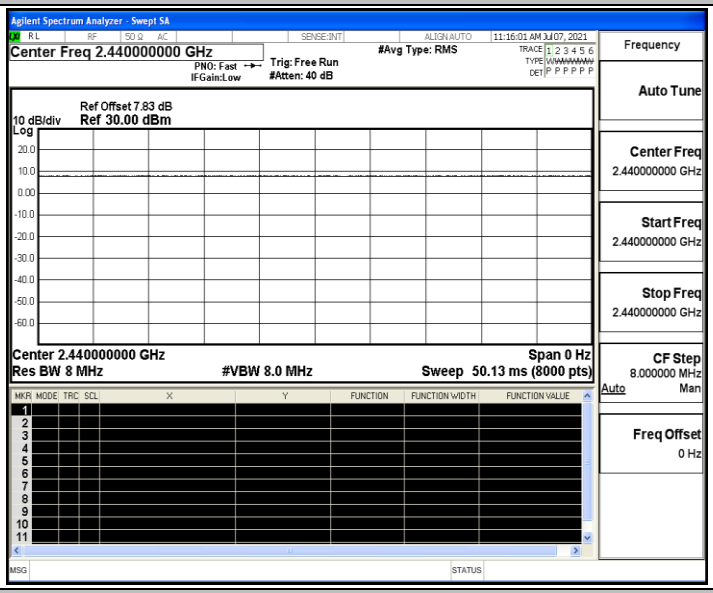
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
ZIGB	Ant1	2405	50.00	50.00	100.00	---	PASS
		2440	50.00	50.00	100.00	---	PASS
		2480	50.00	50.00	100.00	---	PASS

Test Graphs

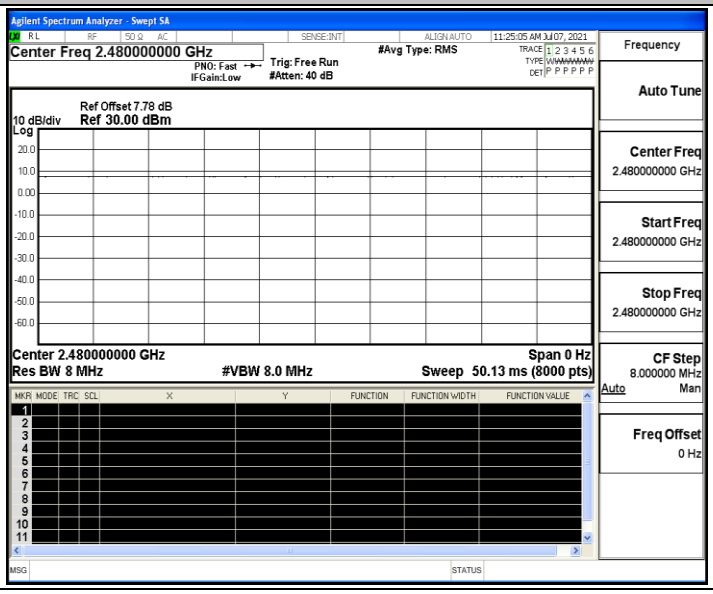
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480



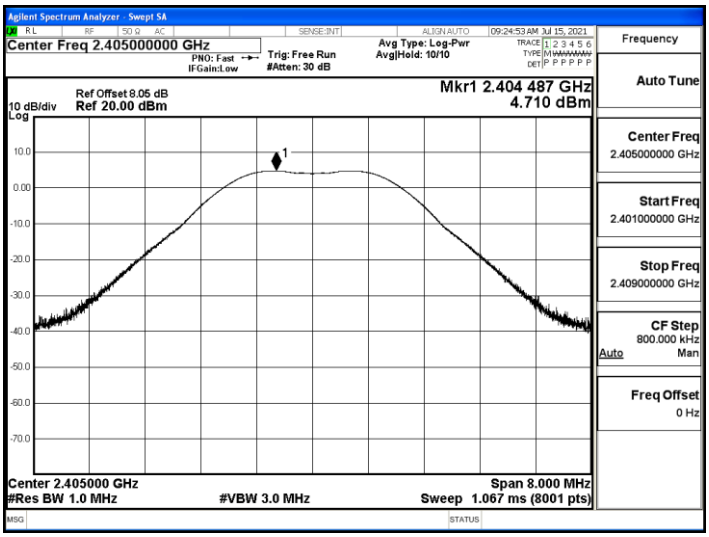
A.2 Maximum conducted output power

Test Result

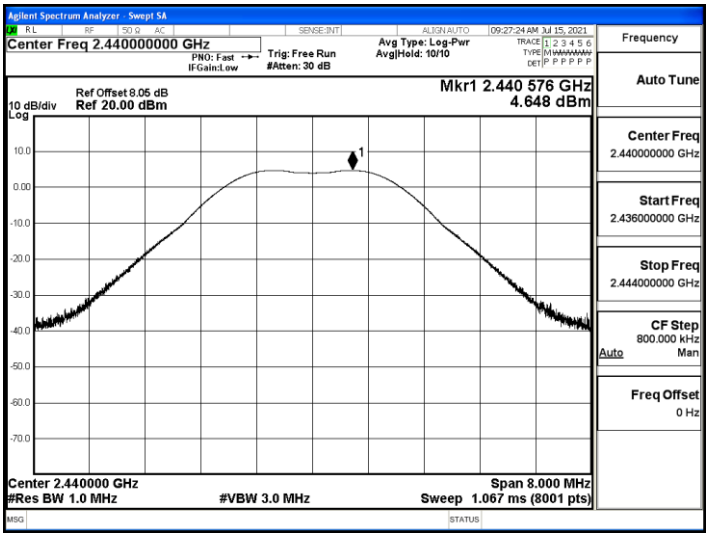
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	2405	4.710	≤30	PASS
		2440	4.648	≤30	PASS
		2480	5.069	≤30	PASS

Test Graphs

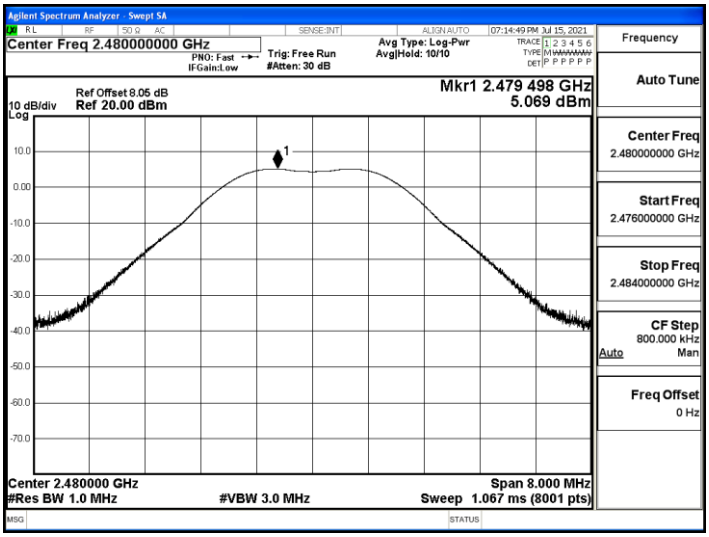
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
07:14:49 PM Jul 15, 2021
Frequency
Auto Tune
Ref Offset 8.05 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 498 GHz
5.069 dBm
Center Freq
2.480000000 GHz
Start Freq
2.476000000 GHz
Stop Freq
2.484000000 GHz
CF Step
800.000 kHz
Auto
Man
Freq Offset
0 Hz
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 8.000 MHz
Sweep 1.067 ms (8001 pts)

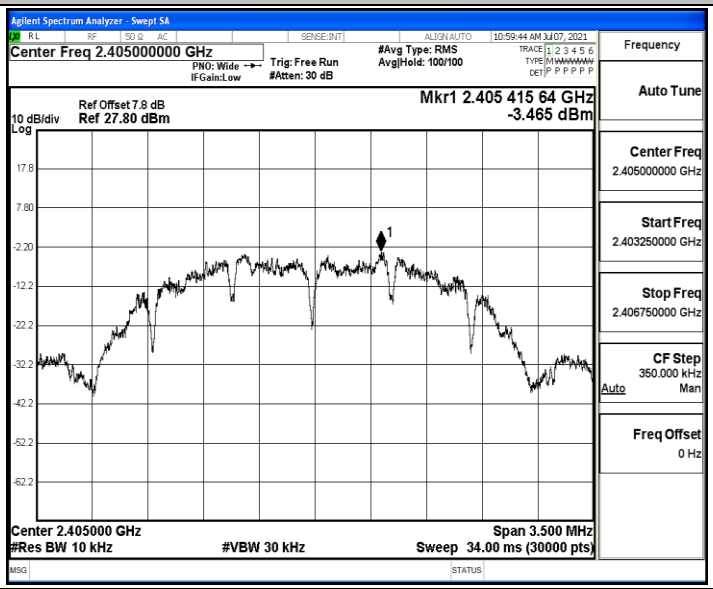
A.3 Maximum power spectral density

Test Result

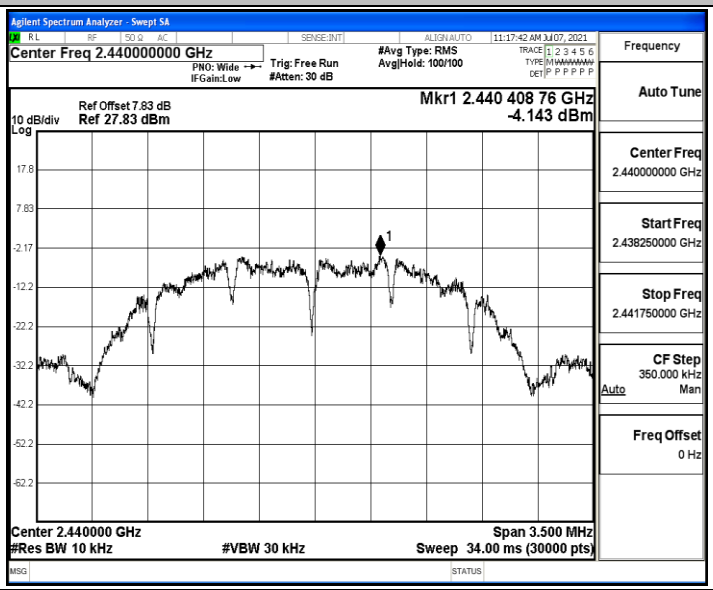
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
ZIGB	Ant1	2405	-3.47	≤8	PASS
		2440	-4.14	≤8	PASS
		2480	-3.47	≤8	PASS

Test Graphs

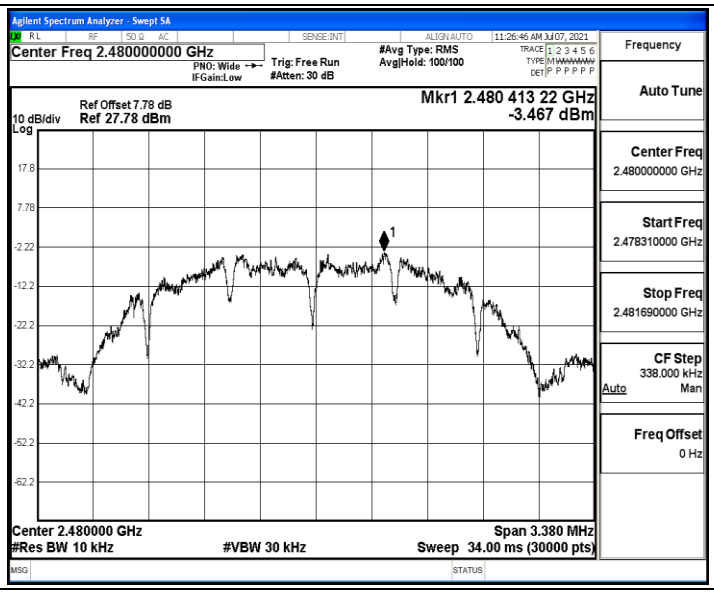
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_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
11:26:46 AM Jul 07, 2021
Ref Offset 7.78 dB
10 dB/div
Ref 27.78 dBm
Log
Mkr1 2.480 413 22 GHz
-3.467 dBm
Center 2.480000 GHz
#Res BW 10 kHz
#VBW 30 kHz
Span 3.380 MHz
Sweep 34.00 ms (30000 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478310000 GHz
Stop Freq
2.481690000 GHz
CF Step
338.000 kHz
Auto
Man
Freq Offset
0 Hz

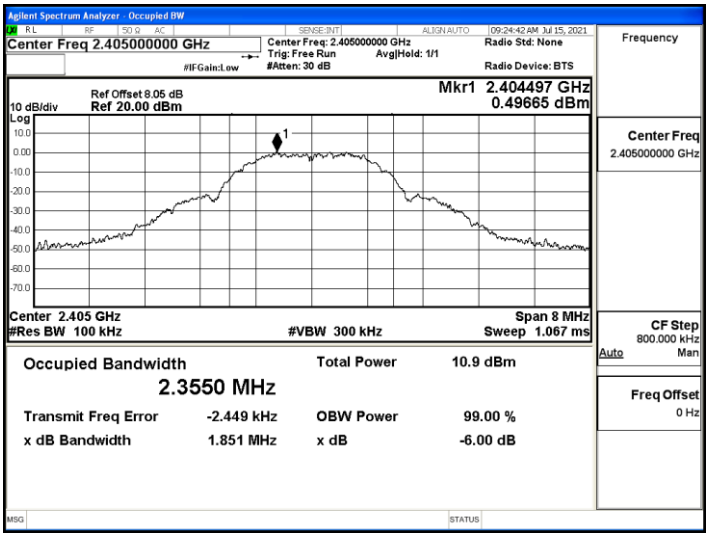
A.4 Occupied Channel Bandwidth

Test Result

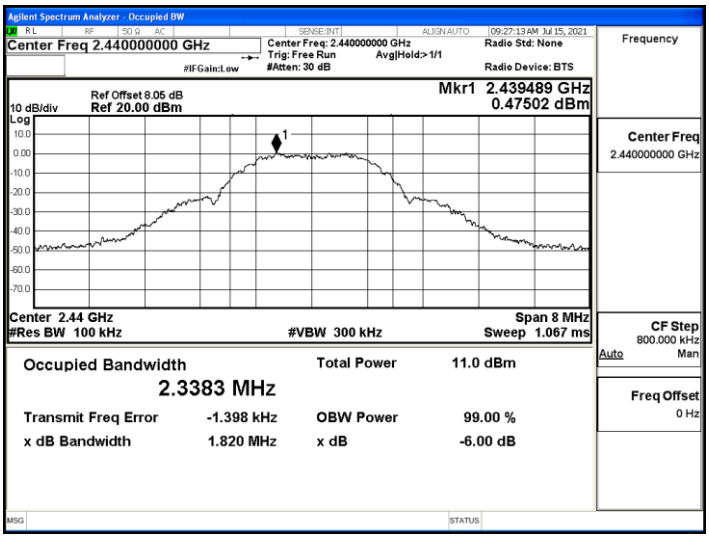
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
Zigbee	LCH	1.851	⩾0.5	PASS
Zigbee	MCH	1.820	⩾0.5	PASS
Zigbee	HCH	1.809	⩾0.5	PASS

Test Graphs

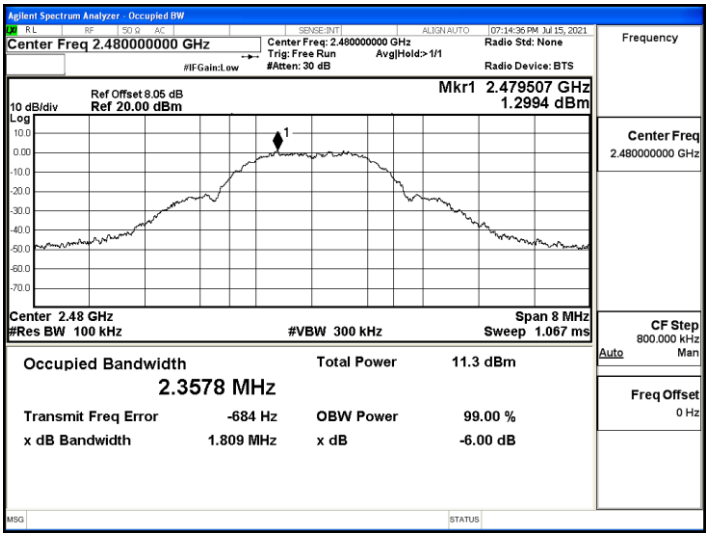
ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
07:14:36 PM Jul 15, 2021
Frequency
Ref Offset 8.05 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479507 GHz
1.2994 dBm
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8 MHz
Sweep 1.067 ms
CF Step
800.000 kHz
Auto
Man
Occupied Bandwidth
2.3578 MHz
Total Power 11.3 dBm
Transmit Freq Error -684 Hz
OBW Power 99.00 %
x dB Bandwidth 1.809 MHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

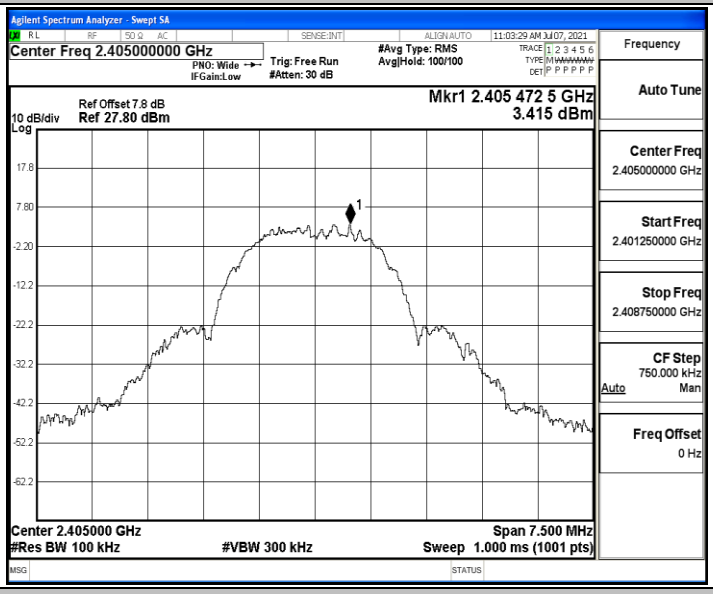
A.5 Conducted Spurious Emission

Test Result

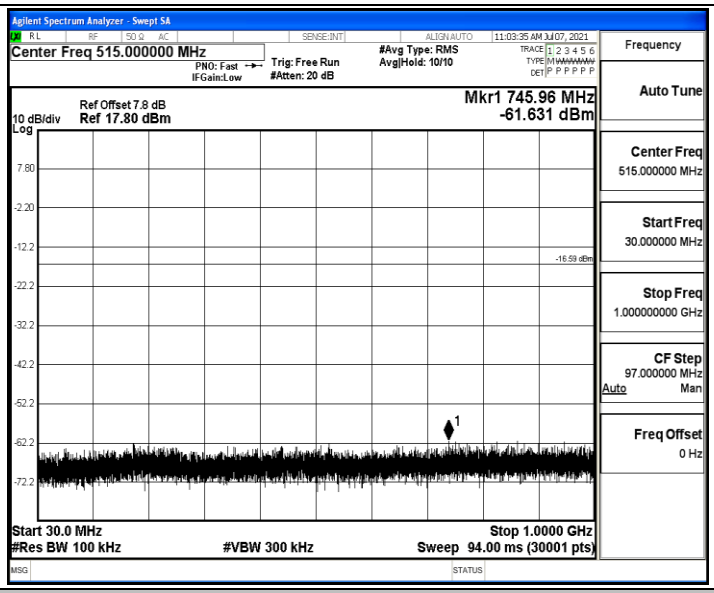
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	2405	Reference	3.42	3.42	---	PASS
			30~1000	3.42	-61.63	≤-16.59	PASS
			1000~26500	3.42	-47.54	≤-16.59	PASS
		2440	Reference	3.29	3.29	---	PASS
			30~1000	3.29	-61.22	≤-16.71	PASS
			1000~26500	3.29	-47.4	≤-16.71	PASS
		2480	Reference	2.86	2.86	---	PASS
			30~1000	2.86	-61.76	≤-17.15	PASS
			1000~26500	2.86	-47.58	≤-17.15	PASS

Test Graphs

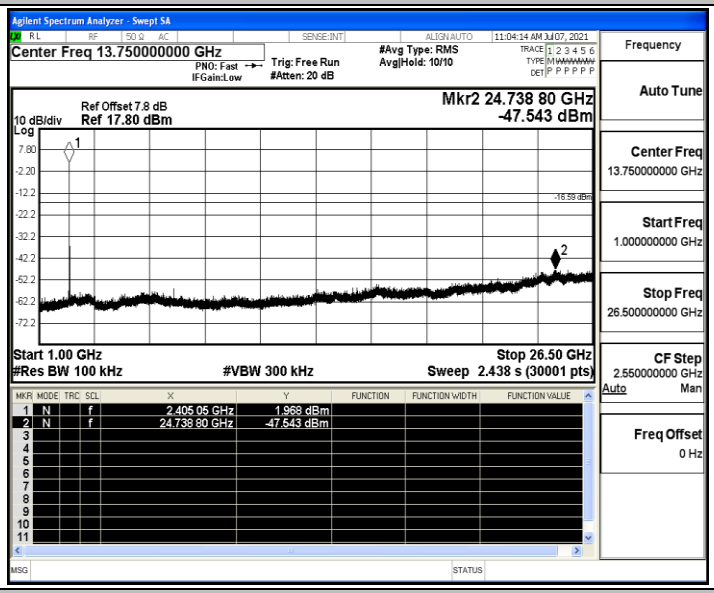
ZIGB_Ant1_2405_0~Reference



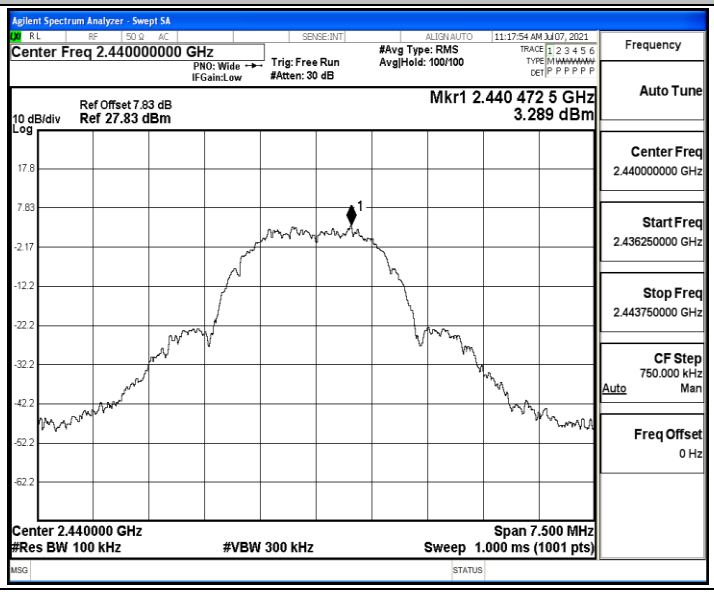
ZIGB_Ant1_2405_30~1000



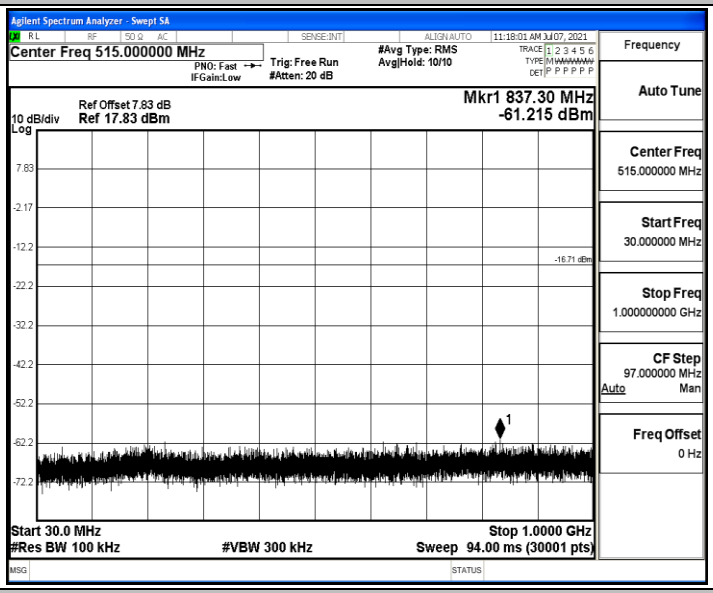
ZIGB_Ant1_2405_1000~26500



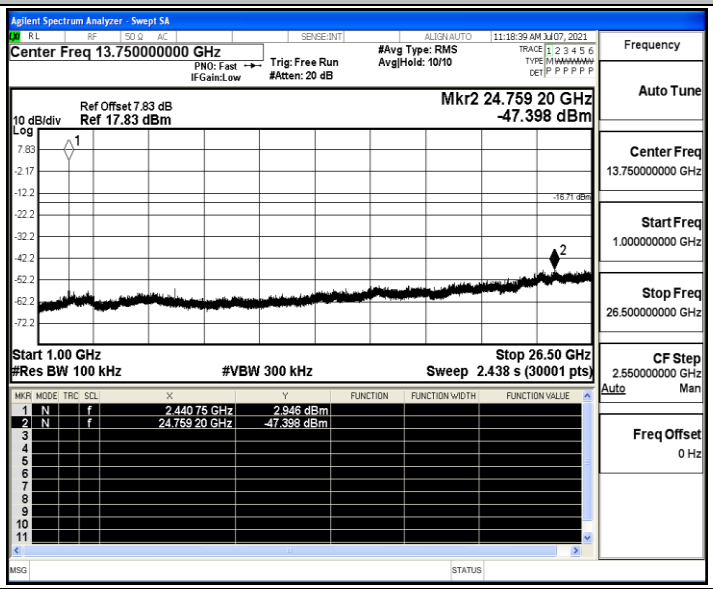
ZIGB_Ant1_2440_0~Reference



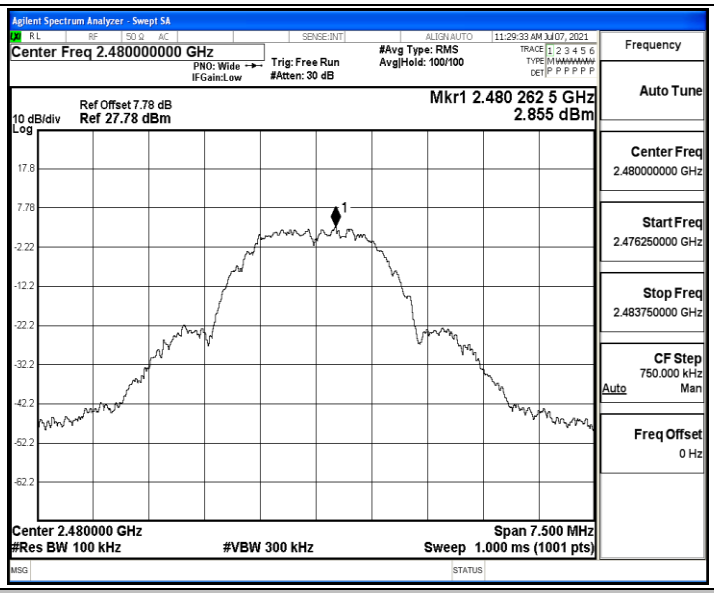
ZIGB_Ant1_2440_30~1000



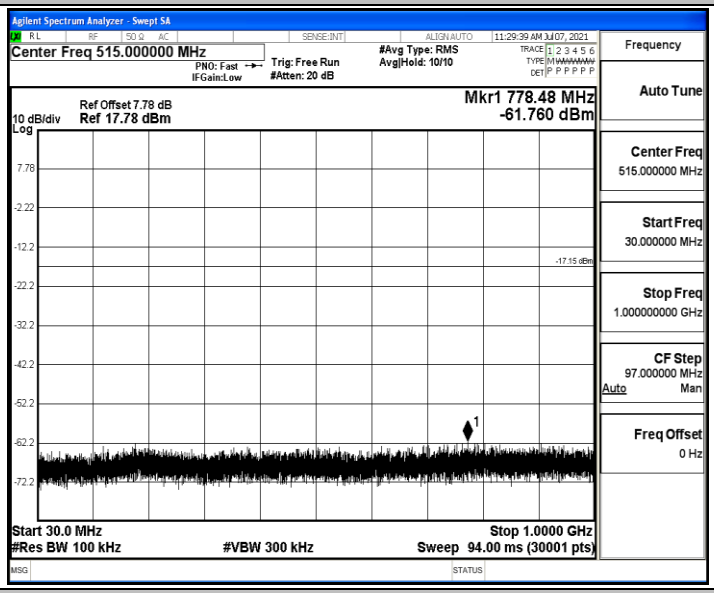
ZIGB_Ant1_2440_1000~26500



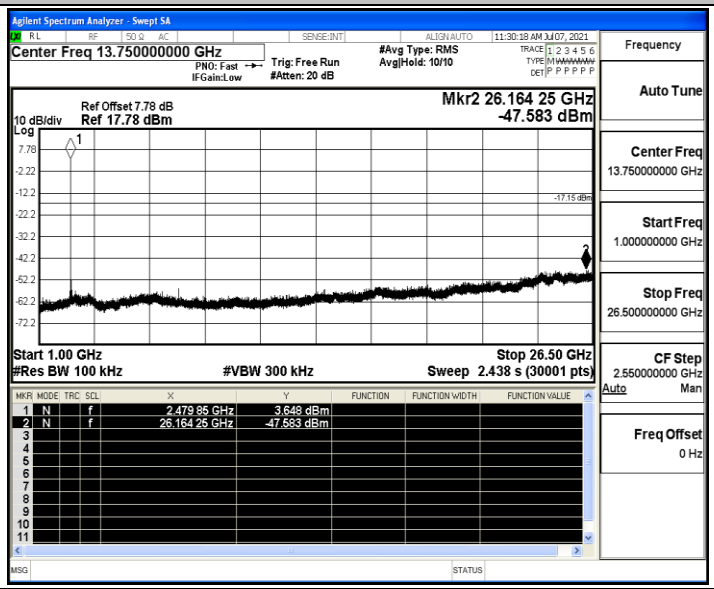
ZIGB_Ant1_2480_0~Reference



ZIGB_Ant1_2480_30~1000



ZIGB_Ant1_2480_1000~26500



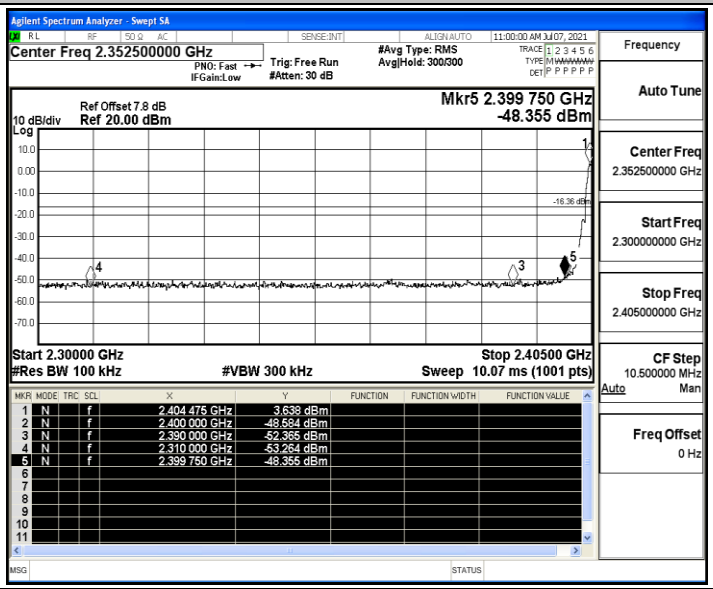
A.6 Band edge measurements

Test Result

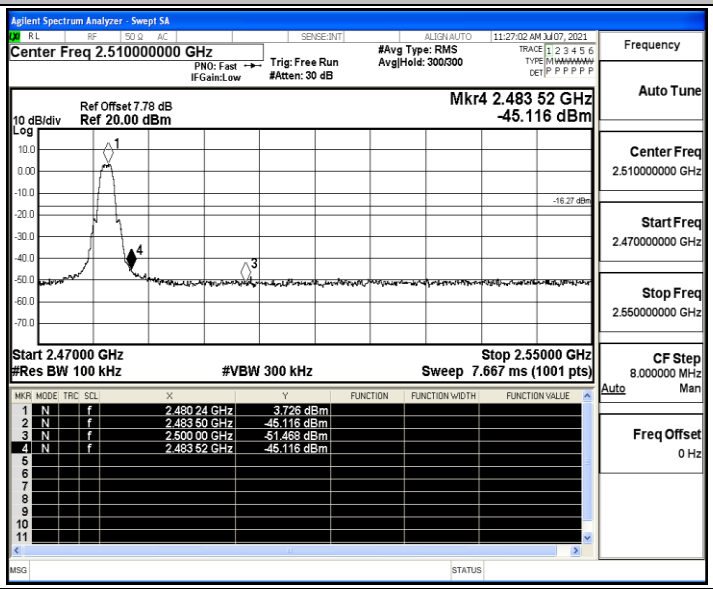
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	Low	2405	3.64	-48.36	≤-16.36	PASS
		High	2480	3.73	-45.12	≤-16.27	PASS

Test Graphs

ZIGB_Ant1_Low_2405



ZIGB_Ant1_High_2480



7 Emissions in Restricted Bands

Test Result

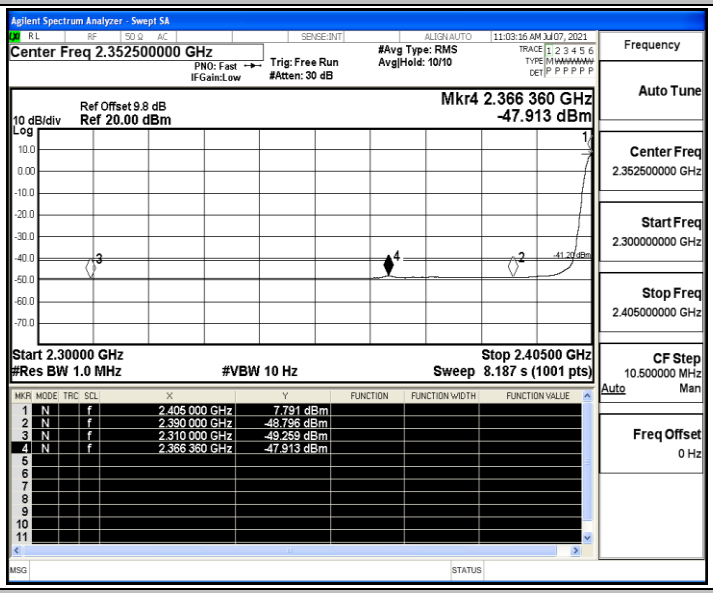
TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Verdict
ZIGB	Ant1	Low	2405	AV	2310.000	-49.26	≤-41.20	PASS
				AV	2366.360	-47.91	≤-41.20	PASS
				AV	2390.000	-48.80	≤-41.20	PASS
				Peak	2310.000	-45.21	≤-21.20	PASS
				Peak	2383.265	-39.71	≤-21.20	PASS
				Peak	2390.000	-43.86	≤-21.20	PASS
		High	2480	AV	2483.500	-47.53	≤-41.20	PASS
				AV	2483.520	-47.53	≤-41.20	PASS
				AV	2500.000	-48.00	≤-41.20	PASS
				Peak	2483.500	-39.40	≤-21.20	PASS
				Peak	2483.600	-37.63	≤-21.20	PASS
				Peak	2500.000	-39.49	≤-21.20	PASS

Note：

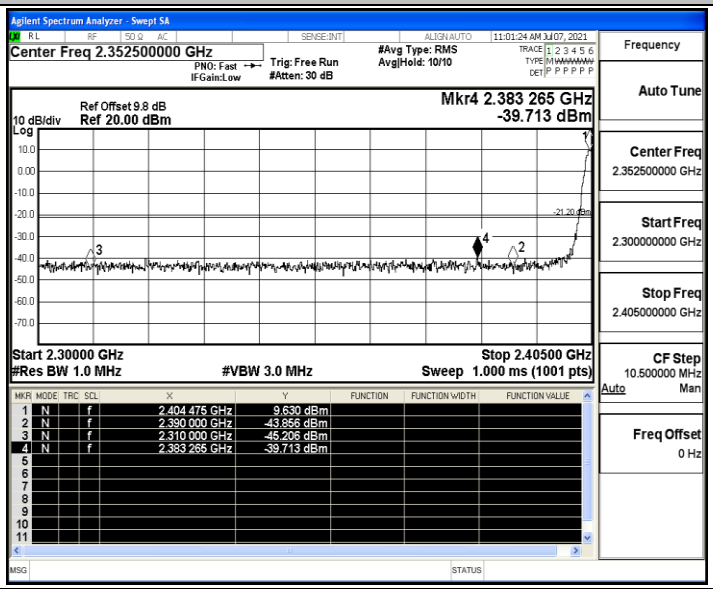
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

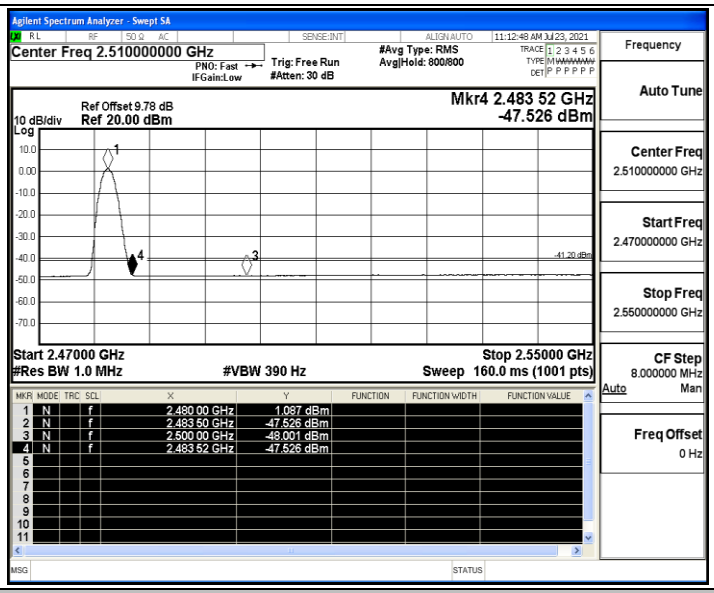
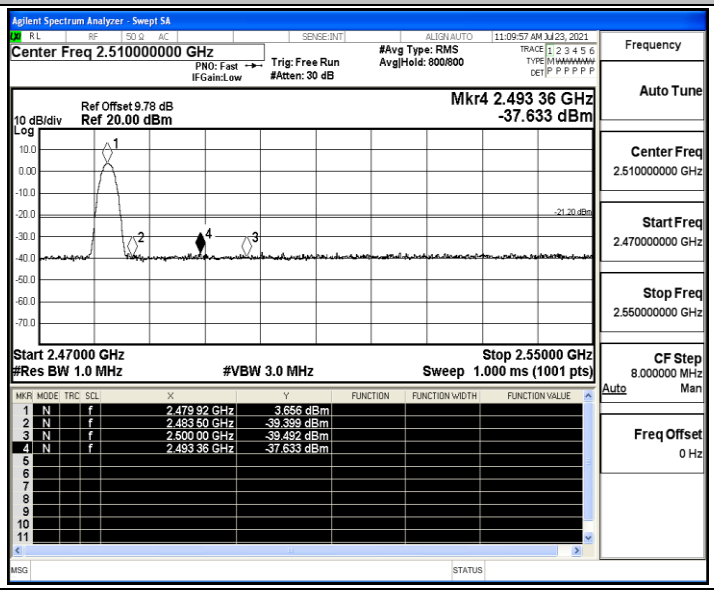
ZIGB_Ant1_Low_2405_AV



ZIGB_Ant1_Low_2405_Peak



ZIGB_Ant1_High_2480_AV



ZIGB_Ant1_High_2480_Peak