6. BAND EDGE COMPLIANCE TEST

6.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Amplifier	HP	8449B	3008A02495	Apr.23,19	1 Year
3.	Horn Antenna	ETS	3115	9607-4580	Dec.13,18	1 Year
4.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

6.2.Limit

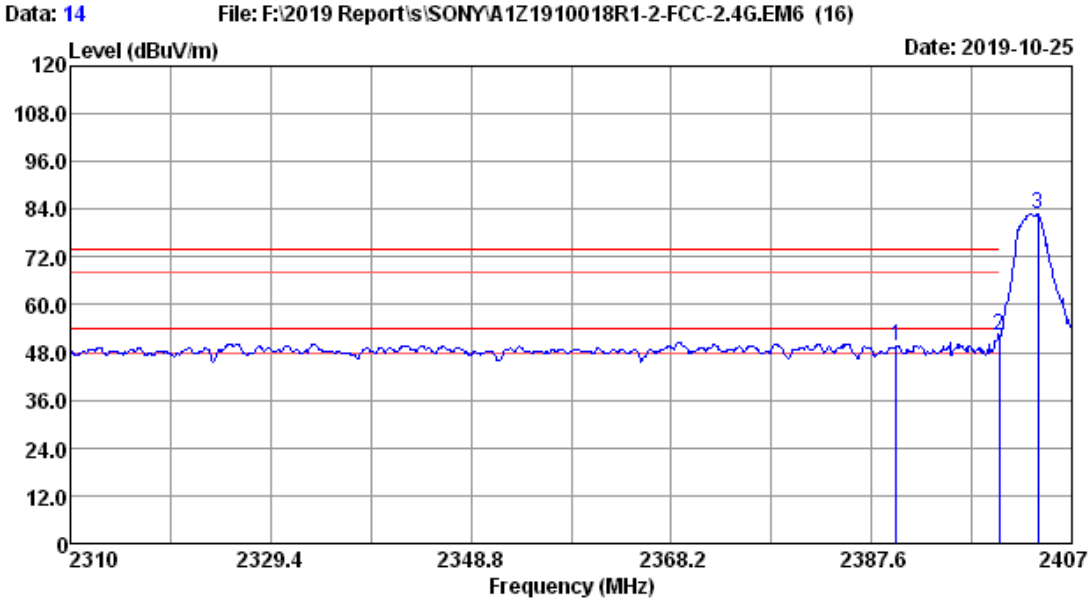
All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

6.3.Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=1MHz ; VBW=3MHz, PK detector, Sweep=AUTO
   (b)This device is pulse modulated, a duty cycle factor was used to calculate average level based measured peak level

6.4.Test Results

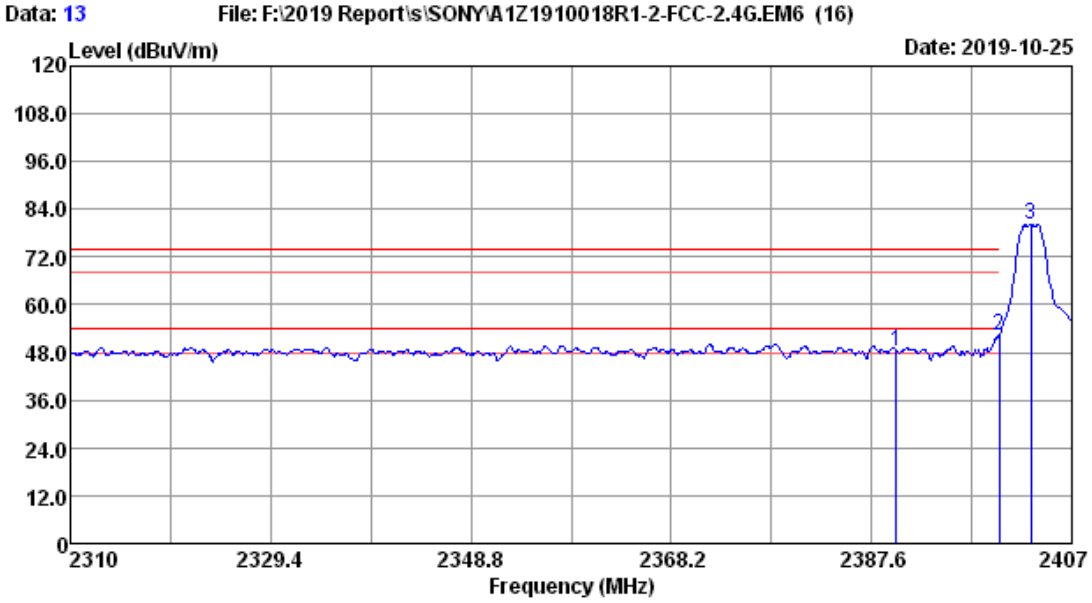
Pass (The testing data was attached in the next pages.)



Site no. : 3m Chamber
Data no. : 14
Dis. / Ant. : 3m 2018 3115-4580
Ant. pol. : HORIZONTAL
Limit : FCC PART 15.247 (PK)
Env. / Ins. : 22.4*C/55%
Engineer : Garry
Power rating : AC 120V/60Hz
Test Mode : 2404MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.03	27.71	3.04	53.78	35.04	49.49	74.00	24.51	Peak
2	2400.00	27.71	3.04	56.35	35.04	52.06	74.00	21.94	Peak
3	2404.70	27.77	3.05	86.94	35.04	82.72	------	------	Peak

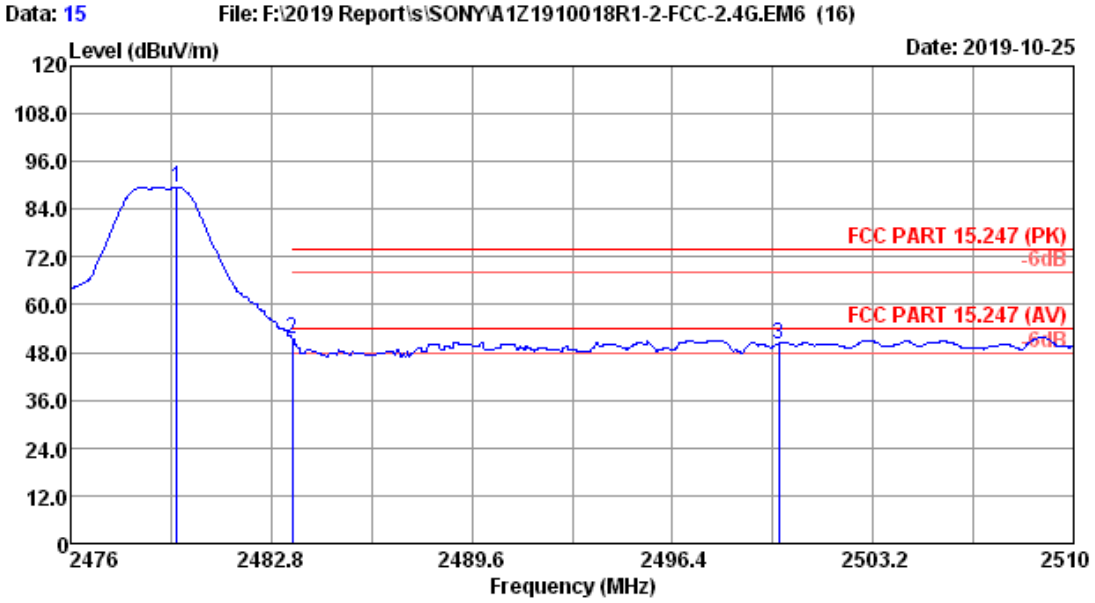
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber
Data no. : 13
Dis. / Ant. : 3m 2018 3115-4580
Ant. pol. : VERTICAL
Limit : FCC PART 15.247 (PK)
Env. / Ins. : 22.4*C/55%
Engineer : Garry
Power rating : AC 120V/60Hz
Test Mode : 2404MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.71	3.04	52.77	35.04	48.48	74.00	25.52	Peak
2	2400.00	27.71	3.04	56.68	35.04	52.39	74.00	21.61	Peak
3	2403.02	27.77	3.05	84.50	35.04	80.28	------	------	Peak

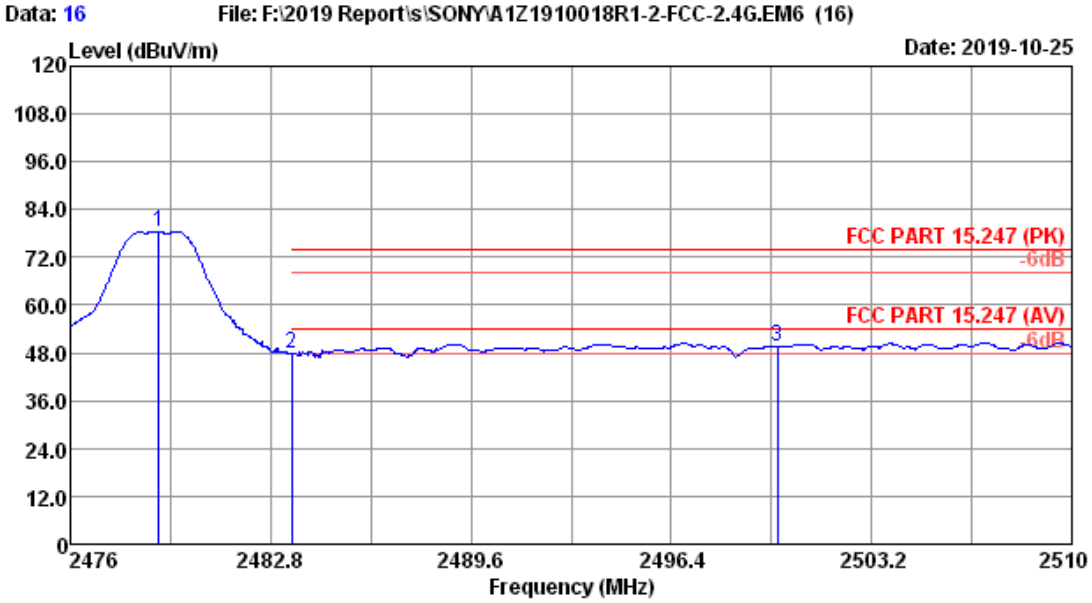
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber
Data no. : 15
Dis. / Ant. : 3m 2018 3115-4580
Ant. pol. : HORIZONTAL
Limit : FCC PART 15.247 (PK)
Env. / Ins. : 22.4*C/55%
Engineer : Garry
Power rating : AC 120V/60Hz
Test Mode : 2476MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.60	27.98	3.10	93.51	35.01	89.58	------	------	Peak
2	2483.50	27.98	3.10	55.20	35.01	51.27	74.00	22.73	Peak
3	2500.00	28.03	3.11	54.07	35.00	50.21	74.00	23.79	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber
Data no. : 16
Dis. / Ant. : 3m 2018 3115-4580
Ant. pol. : VERTICAL
Limit : FCC PART 15.247 (PK)
Env. / Ins. : 22.4*C/55%
Engineer : Garry
Power rating : AC 120V/60Hz
Test Mode : 2476MHz Tx Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2478.99	27.98	3.10	82.52	35.01	78.59	------	------	Peak
2	2483.50	27.98	3.10	51.79	35.01	47.86	74.00	26.14	Peak
3	2500.00	28.03	3.11	53.50	35.00	49.64	74.00	24.36	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

7. 6dB & 99% Bandwidth Test

7.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
3.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

7.2.Block Diagram of Test Setup

7.3.Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

7.4.Test Procedure

Use the test method descried in ANSI C63.10 Section 11.8:
The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

Use the test method descried in ANSI C63.10 Section 6.9.2:
The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

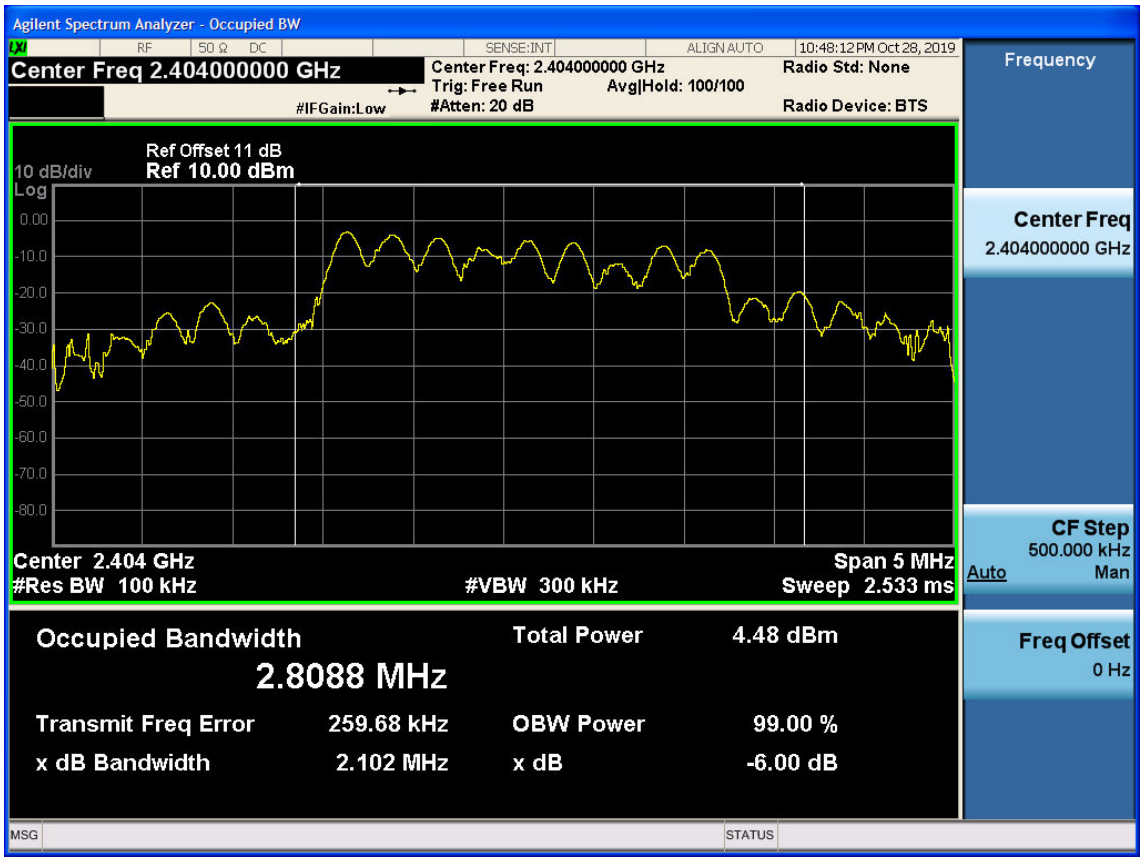
7.5.Test Results

EUT: Active Subwoofer		
M/N: SA-WG700		
Test date:2019-10-28	Pressure: 102.1±1.0 kpa	Humidity: 51.1±3.0%
Tested by: Garry	Test site: RF site	Temperature:22.8±0.6 ℃

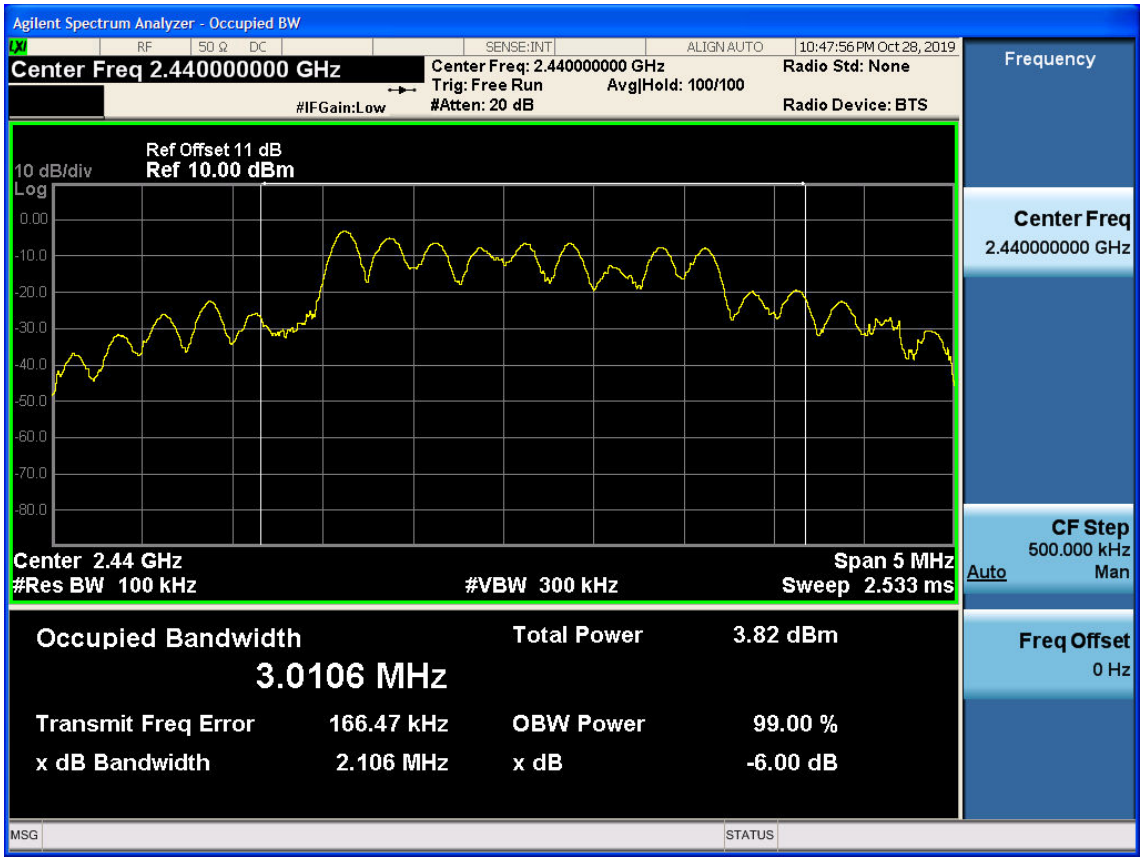
Test Mode	Frequency (MHz)	-6dB bandwidth (MHz)	Limit (KHz)
GFSK	2404	2.102	≧ 500
	2440	2.106	
	2476	2.107	
Conclusion：PASS			

Test Mode	Frequency (MHz)	99% bandwidth (MHz)	Limit (KHz)
GFSK	2404	2.8088	N/A
	2440	3.0106	
	2476	3.2696	
Conclusion：PASS			

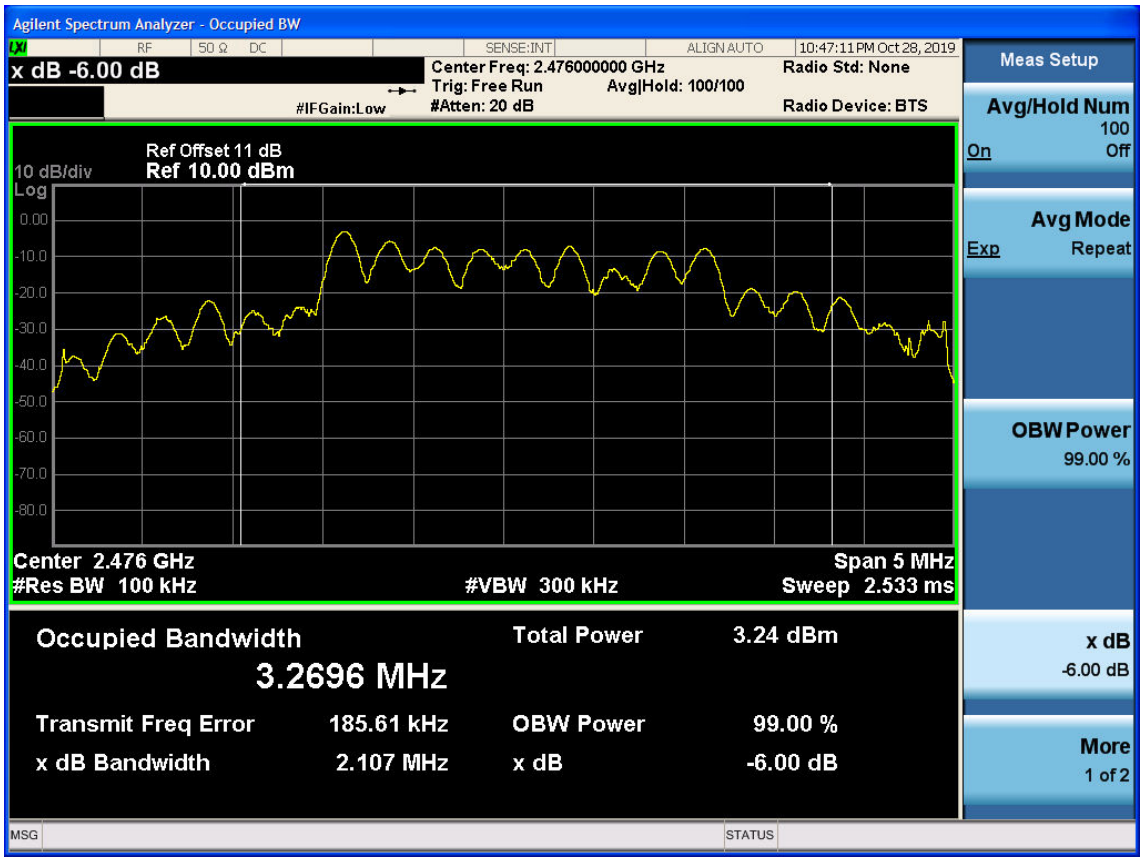
2404MHz:



2440MHz:



2476MHz:


Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω
DC
SENSE:INT
ALIGN AUTO
10:47:11 PM Oct 28, 2019
x dB -6.00 dB
Center Freq: 2.476000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Meas Setup
Avg/Hold Num
100
On
Off
Avg Mode
Exp
Repeat
Ref Offset 11 dB
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.476 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 5 MHz
Sweep 2.533 ms
OBW Power
99.00 %
Occupied Bandwidth
3.2696 MHz
Total Power
3.24 dBm
Transmit Freq Error
185.61 kHz
OBW Power
99.00 %
x dB Bandwidth
2.107 MHz
x dB
-6.00 dB
x dB
-6.00 dB
More
1 of 2
MSG
STATUS

8. OUTPUT POWER TEST

8.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Power Meter	Anritsu	ML2487A	6K00003262	Apr.13,19	1 Year
3.	Power Sensor	Anritsu	MA2491A	032516	Apr.13,19	1 Year
4.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
5.	RF Cable	EMCI	EMC102-KM-KM 3500	170702	May.13,19	1 Year

8.2.Limit (FCC Part 15C 15.247 b(3))

For systems using digital modulation in the 2400—2483.5MHz, The Peak output Power shall not exceed 1W(30dBm), As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

8.3.Test Procedure

1, Connected the EUT's antenna port to Spectrum Analyzer.

2, Use the test method descried in ANSI C63.10 clause 11.9.1.1:

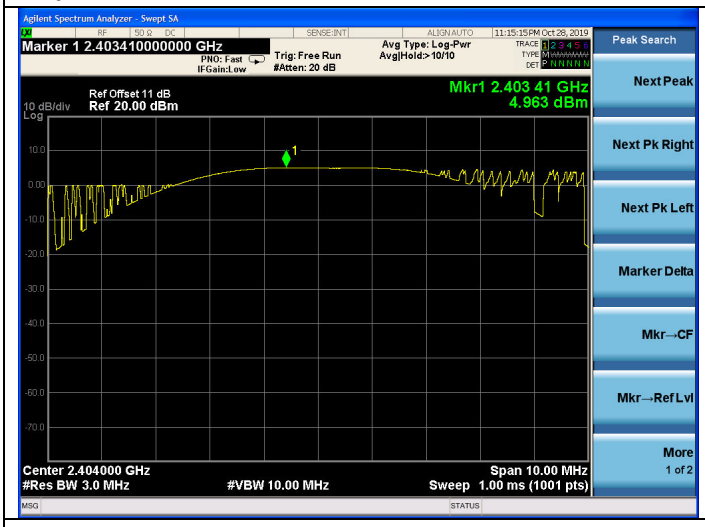
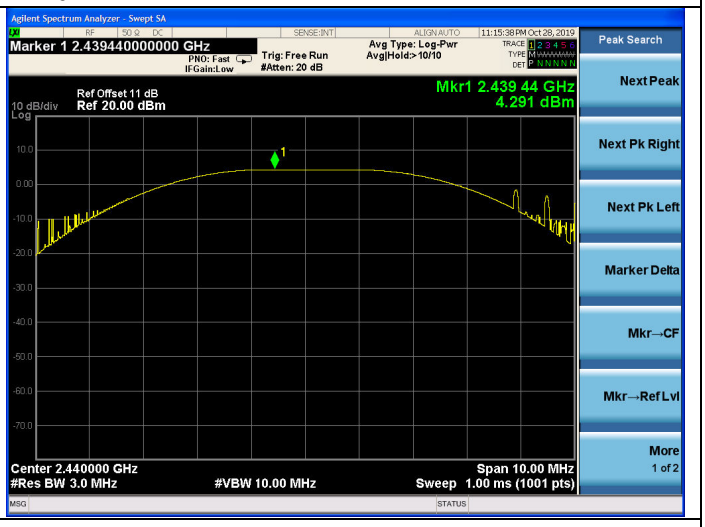
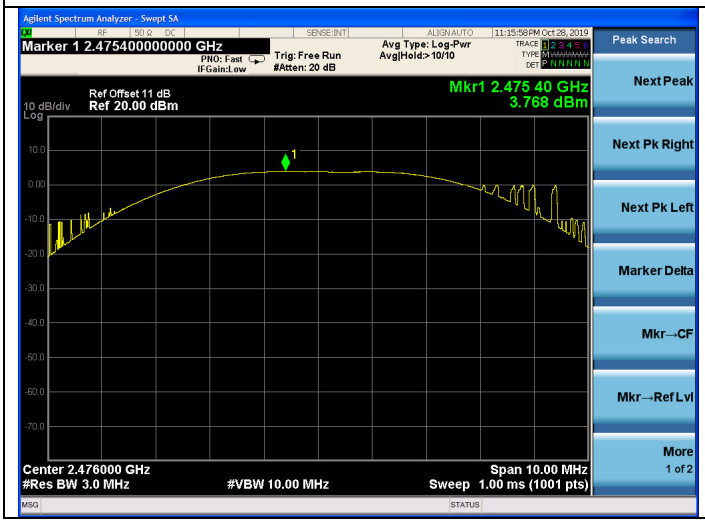
1) Set the RBW ≥ DTS bandwidth.
2) Set VBW ≥ [3 × RBW].
3) Set span ≥ [3 × RBW].
4) Sweep time = auto couple.
5) Detector = peak.
6) Trace mode = max hold.
7) Allow trace to fully stabilize.
8) Use peak marker function to determine the peak amplitude level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

8.4.Test Results

EUT: Active Subwoofer		
M/N: SA-WG700		
Test date:2019-10-28	Pressure: 102.1±1.0 kpa	Humidity: 51.1±3.0%
Tested by: Garry	Test site: RF site	Temperature:22.8±0.6 ℃

Test Mode	Frequency (MHz)	Output power (dBm)	Limit (dBm)
GFSK	2404	4.963	30
	2440	4.291	
	2476	3.768	
Conclusion：PASS			

2404MHz	2440MHz
	
2476MHz	---
	---

9. POWER SPECTRAL DENSITY TEST

9.1.Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
2.	Attenuator	Agilent	8491B	MY39269201	Oct.13,19	1 Year
3.	RF Cable	Mini-Circuits	CBL-1M-SMSM+	No.4	Oct.13,19	1 Year

9.2.Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

9.3.Test Procedure

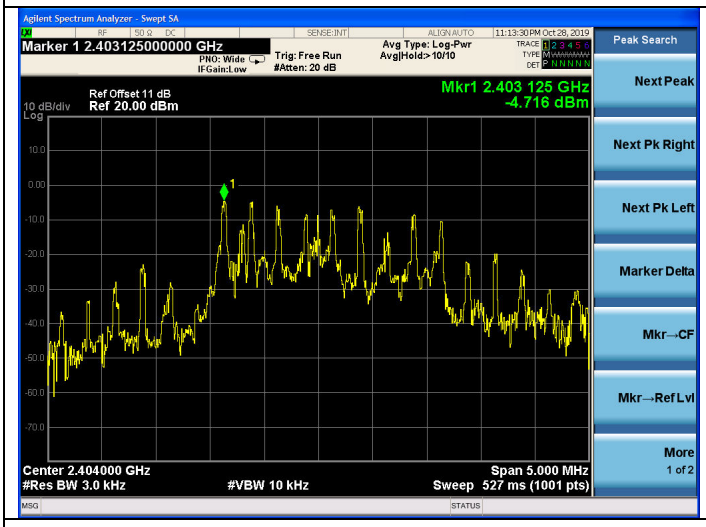
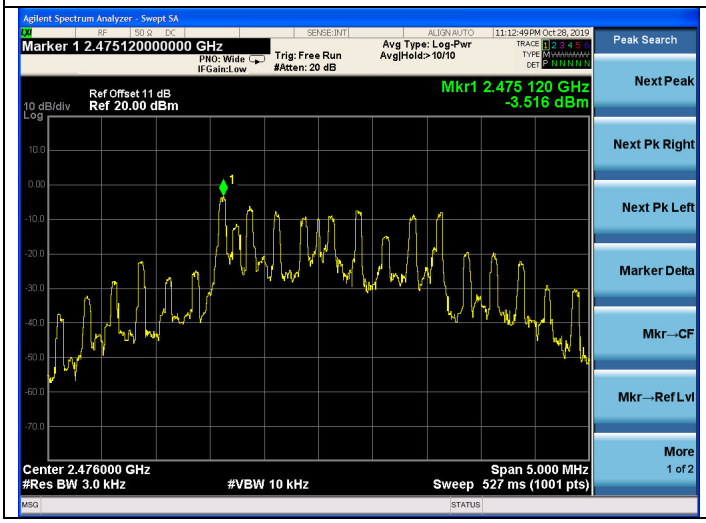
Use the test method descried in ANSI C63.10 clause 11.10.2:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

9.4.Test Results

EUT: Active Subwoofer		
M/N: SA-WG700		
Test date:2019-10-28	Pressure: 102.3±1.0 kpa	Humidity: 53.6±3.0%
Tested by: Garry	Test site: RF site	Temperature: 25.5±0.6 ℃

Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2404	-4.716	≤8
	2440	-5.503	
	2476	-3.516	
Conclusion：PASS			

2404MHz	2440MHz
	
2476MHz	---
	---

10. ANTENNA REQUIREMENT

10.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2. Antenna Connected Construction

The antennas used for this product are PCB antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2.95dBi.

11. DEVIATION TO TEST SPECIFICATIONS

[NONE]

THE END