FCC Certification Test Report

For the

Tianjin Hengda Wenbo S&T Co., Ltd.

Wireless Group-Guiding System

Model: HD-WT-T2-GS, HD-WT-T2-KS, HD-WT-T2-GS-01, HD-WT-T2-KS-01, HD-WT-T2-GS-02, HD-WT-T2-KS-02

FCC ID: 2AHC2-WGGS01

REPORT# **16WB0106008F Rev 0**
Mar.15, 2016

Prepared for:
Tianjin Hengda Wenbo S&T Co., Ltd.
6-7th Floor, Building 1-B, No.15 Rongyuan Road,
Huayuan Industrial Zone, Tianjin, China

Prepared by:
WASHINGTON TECHNOLOGY INTERNATIONAL LIMITED

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Prepared by:

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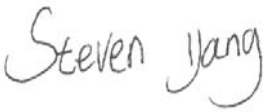
Henry guo

Reviewed by:



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Steven yang

Abstract

This report has been prepared on behalf of Tianjin Hengda Wenbo S&T Co., Ltd. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Spread Spectrum Transceiver under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for Tianjin Hengda Wenbo S&T Co., Ltd. Wireless Group-Guiding System.

And Testing was performed by Audix Technology (Shenzhen) Co., Ltd. has been accepted by the FCC, the FCC Registration Number is 90454.

Wireless Group-Guiding System is a RF device and complies with the limits for a Direct Sequence Spread Spectrum Transmitter device under Part 15.247 of the FCC Rules and Regulations.

Revision History	Reason	Date
Rev 0	Initial Release	Mar.15, 2016

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1 Introduction

1.1 Compliance Statement

After the modifications listed in Section 2.6 were installed:

The Tianjin Hengda Wenbo S&T Co., Ltd. Wireless Group-Guiding System complies with the limits for a Spread Spectrum Transceiver device under Part 15.247 of the FCC Rules and Regulations.

1.2 Test Scope Summary

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2013 version of ANSI C63.10

Test Specification	Specific Description	Result	Modifications (Y/N)	Test Location
CFR47 Part 15.207	Conducted Emissions – AC Power Ports	Not Applicable	Not Applicable	Not Applicable
CFR47 Part 15.209	Radiated Emissions	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247	RF Power Output	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247(b)	Spurious Emissions at Antenna Terminals	Complied	No	Audix Technology (Shenzhen) Co., Ltd
CFR47 Part 15.247(c)	Radiated Spurious Emissions	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247	RF Power Spectral Density	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247	Occupied Bandwidth	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247	Band Edge Measurement (Conducted)	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
CFR47 Part 15.247	Band Edge Measurement (Radiated)	Complied	No	Audix Technology (Shenzhen) Co., Ltd.
Note: The EUT is also considered as a kind of other class B digital device it has been verified to comply with the requirements of FCC Part 15B Class B (Verification) the test report has been issued by WTIL.				

1.3 Contract Information

Customer: Tianjin Hengda Wenbo S&T Co., Ltd.

6-7th Floor, Building 1-B, No.15 Rongyuan Road,
Huayuan Industrial Zone, Tianjin, China

1.4 Test and Support Personnel

Mario Wu

Audix Technology (Shenzhen) Co., Ltd.
No. 6, Ke Feng Rd., 52 Block, Shenzhen
Science & Industrial Park, Nantou, Shenzhen,
Guangdong, China
Test Engineer

1.5 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**ere**s**
b/s	**b**its per **s**econd
BW	**B**and**W**idth
CE	**C**onducted **E**mission
cm	**c**enti**m**eter
CW	**C**ontinuous **W**ave
dB	**d**eci**B**el
dc	**d**irect **c**urrent
EMI	**E**lectro**m**agnetic **I**nterference
EUT	**E**quipment **U**nder **T**est
FM	**F**requency **M**odulation
G	**g**iga - prefix for 10^9 multiplier
Hz	**H**ertz
IF	**I**ntermediate **F**requency
k	**k**ilo - prefix for 10^3 multiplier
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
M	**M**ega - prefix for 10^6 multiplier
m	**m**eter
µ	**m**icro - prefix for 10^{-6} multiplier
NB	**N**arrow**b**and
QP	**Q**uasi-**P**eak
RE	**R**adiated **E**missions
RF	**R**adio **F**requency
rms	**r**oot-**m**ean-**s**quare
SN	**S**erial **N**umber
S/A	**S**pectrum **A**nalyzer
V	**V**olt

2 Equipment Under Test

2.1 EUT Identification

The results obtained relate only to the item(s) tested.

Table 1: Overview of Wireless Group-Guiding System, Equipment Under Test

ITEM	DESCRIPTION
FCC ID Number	**2AHC2-WGGS01**
EUT Name:	**Wireless Group-Guiding System**
Test Model:	**HD-WT-T2-GS**
FCC Rule Parts:	**§15.247**
Frequency Range:	**2405MHz – 2478MHz**
Maximum Output Power:	**9.691dBm**
Modulation Technology:	**GFSK**
Necessary Bandwidth:	**N/A**
Keying:	**Automatic**
Type of Information:	**General 2.4GHz: GFSK**
Number of Channels:	**64**
Antenna Type	**Whip**
Antenna Gain	**2.5dBi**
Frequency Tolerance:	**N/A**
Emission Type(s):	**N/A**
Interface Cables:	**None**
Power Source & Voltage:	**DC 3.7V**

2.2 EUT Description

Product Name: Wireless Group-Guiding System

Model No. : HD-WT-T2-GS, HD-WT-T2-KS, HD-WT-T2-GS-01, HD-WT-T2-KS-01, HD-WT-T2-GS-02, HD-WT-T2-KS-02,

Test Model: HD-WT-T2-GS

EUT Rated Voltage: DC 3.7V

2.3 Test Configuration

The Tianjin Hengda Wenbo S&T Co., Ltd. Wireless Group-Guiding System, Equipment Under Test (EUT), was operated from 3.7VDC button battery.

The EUT firmware/software was set up to control power, bit rate, and channel selection.

Conducted test setup:

Not Applicable

Radiated test setup:

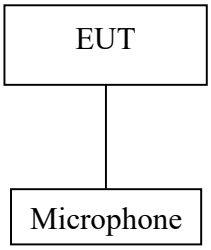


Figure 1: Test Configuration

2.4 Equipment Configuration

The EUT was set up as outlined in Figure 1. The EUT was comprised of the following equipment. (All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.)

Table 2: Equipment Configuration

Name / Description	Model Number	Part Number	Serial Number	Revision
Wireless Group-Guiding System	HD-WT-T2-GS	/	/	/

2.5 Support Equipment

The following support equipment was used during testing:

No.	Description	ACS No.	Manufacturer	Model	Serial Number
1.	Microphone	--	JINJUE	Rx-1	--

2.6 EUT Modifications

N/A

2.7 Testing Algorithm

Wireless Group-Guiding System was operated continuously by normal operating conditions.

2.8 Test Location

And Testing was performed by Audix Technology (Shenzhen) Co., Ltd. has been accepted by the FCC, the FCC Registration Number is 90454.

2.9 Measurements

2.9.1 Measurement Method

All measurements were performed according to the 2013 version of ANSI C63.10 for testing compliance of a wide variety of unlicensed wireless devices

2.9.2 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

where u_c = standard uncertainty

a, b, c,.. = individual uncertainty elements

$div_{a,\ b,\ c}$ = the individual uncertainty element divisor based on the probability distribution

divisor = 1.732 for rectangular distribution

divisor = 2 for normal distribution

divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

where U = expanded uncertainty

k = coverage factor

k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)

u_c = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 3 below

Table 3: Expanded Uncertainty List

Scope	Expanded Uncertainty
Uncertainty for Radiation Emission test in 3m chamber	2.6dB(30~200MHz, Polarize: H)
	2.6dB(30~200MHz, Polarize: V)
	3.0dB(200M~1GHz, Polarize: H)
	2.8dB(200M~1GHz, Polarize: V)
Uncertainty for Radiation Emission test in 3m chamber (1GHz-18GHz)	6.3dB (1~6GHz, Distance: 3m)
	5.7dB (6~18GHz, Distance: 3m)
Uncertainty for Radiated Spurious Emission test in RF chamber	3.6dB
Uncertainty for Conduction Spurious emission test	2.0dB
Uncertainty for Output power test	0.8dB
Uncertainty for Power density test	2.0dB
Uncertainty for Frequency range test	$7x10^{-8}$
Uncertainty for Bandwidth test	83 kHz
Uncertainty for DC power test	0.1%
Uncertainty for test site temperature and humidity	0.6℃
	3%

3 Test Equipment

Table 5 shows a list of the test equipment used for measurements along with the calibration information.

Table 4: Test Equipment List

Frequency range: 30~1000MHz

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	3#Chamber	AUDIX	N/A	N/A	Mar.28,15	1 Year
2.	EMI Spectrum	Agilent	E4407B	MY41440292	Apr.28,15	1 Year
3.	Test Receiver	Rohde & Schwarz	ESVS10	834468/011	Apr.28,15	1 Year
4.	Amplifier	HP	8447D	2648A04738	Apr.28,15	1 Year
5.	Bilog Antenna	TESEQ	CBL6112D	35375	Jun.30,15	1 Year
6.	RF Cable	MIYAZAKI	CFD400-NW(3.5M)	No.3	Apr.28,15	1 Year
7.	RF Cable	MIYAZAKI	CFD400-LW(22M)	No.7	Apr.28,15	1 Year
8.	Coaxial Switch	Anritsu	MP59B	6201397222	Apr.28,15	1 Year
9.	Test Software	AUDIX	e3	6.2009-5-21a(n)	N/A	N/A

Frequency range: above 1000MHz

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Agilent	E4446A	US44300459	Apr.28,15	1 Year
2.	Horn Antenna	ETS	3115	9510-4877	Oct.15,15	1 Year
3.	Amplifier	Agilent	8449B	3008A02495	Apr.28,15	1 Year
4.	RF Cable	Hubersuhner	SUCOFLEX106	77977/6	Apr.28,15	1 Year
5.	Horn Antenna	ETS	3116	00060089	Oct.15,15	1 Year
6.	Test Software	AUDIX	e3	6.2009-5-21a(n)	N/A	N/A

4 Test Results

4.1 RF Power Output:

To measure the output power the unit was set to transmit on a low, high and middle channel. The output from the transmitter was connected to an attenuator and then to the input of a detector diode. The output of the detector diode was displayed on an oscilloscope. The trace deflection was recorded and the transmitter was replaced with a signal generator at the same frequency. The output of the signal generator was increased until the trace deflection was the same as it was with the transmitter. The signal from the generator was then connected to a power meter and the level was taken.

4.1.1 Limit (FCC Part 15.247b(3))

For frequency hopping systems operating in the 2400-2483.5 MHz band, employing at least 75 non-overlapping hopping channels, For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

4.1.2 Test Procedure

Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power.

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

4.1.3 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 RF Power Output requirements.

Table 5 provides the test results for RF Power Output.

4.1.4 Areas of Concern

None.

Table 5: RF Power Output

EUT:Wireless Group-Guiding System			
M/N: HD-WT-T2-GS			
Test date: 2016-03-14	Pressure: 101.1±1.0kPa	Humidity:52.7±3.0%	
Tested by: Leo-Li	Test site: RF site	Temperature:22.6±0.6 ℃	
Test Mode	CH	Peak output Power （dBm）	Limit (dBm)
Tx	CH1	8.283	30
	CH32	9.691	30
	CH64	9.486	30
Conclusion: PASS			

Note1: According exploratory test, EUT will have maximum output power as above bolded data rate, so those data rate were used for all test.

4.2 RF Power Spectral Density

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system.

4.2.1 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.

4.2.2 Test Procedure

1. Connected the EUT's antenna port to spectrum analyzer device by 20dB attenuator.

2. Set the test frequency as center frequency, Set RBW=3KHz, VBW=10KHz, Span large enough capture the entire frequency, Read out maximum peak level frequency

3. Set the span to 1.5 times of the DTS Bandwidth Detector= Peak; Sweep time= Auto Couple; Trace Mode= Max hold.

4. Allow trace to fully stabilize use the peak marker function to determine the maximum amplitude level within the RBW.

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

4.2.3 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 RF Power Spectral Density requirements.

Table 6 provides the test results for RF Power Spectral Density.

4.2.4 Areas of Concern

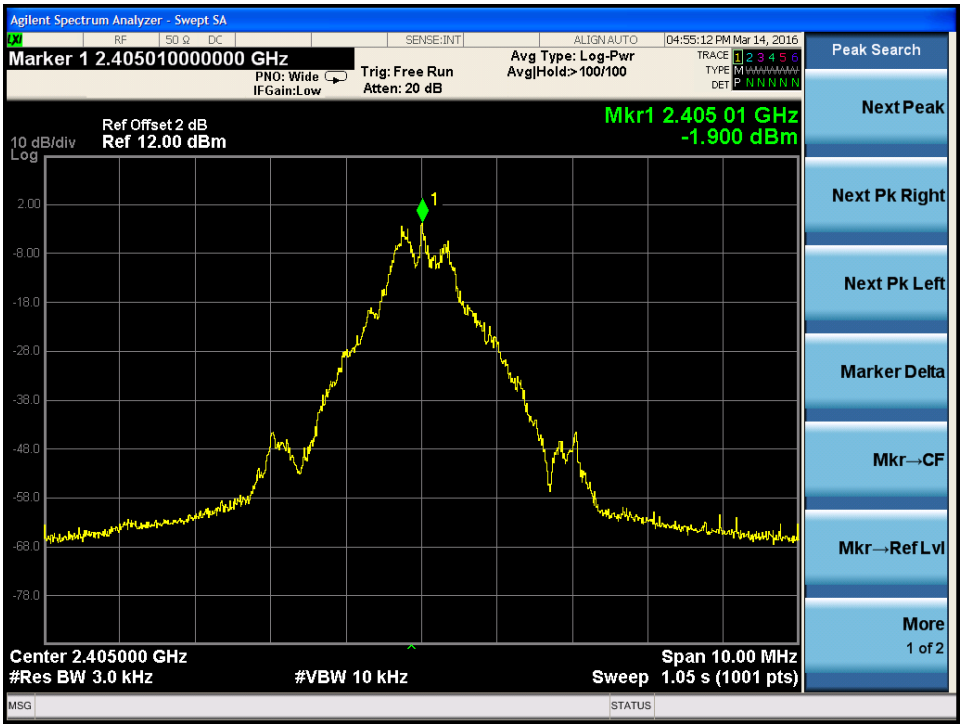
None.

Table 6: **RF Power Spectral Density**

EUT: Wireless Group-Guiding System		
M/N: HD-WT-T2-GS		
Test date: 2016-03-14	Pressure: 101.1±1.0kPa	Humidity:52.7±3.0%
Tested by: Leo-Li	Test site: RF site	Temperature:22.9±0.6 ℃

Test Mode	CH	Power density （dBm/3KHz）	Limit (dBm/3KHz)
Tx	CH1	-1.900	8
	CH32	-2.000	8
	CH64	0.070	8
Conclusion： PASS			

Test Mode: CH1: 2405MH



Test Mode: CH32: 2446MHz

Test Mode: CH64: 2478MHz

4.3 Occupied Bandwidth

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

4.3.1 Limit

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

4.3.2 Test Procedure

The transmitter output was connected to a spectrum analyzer, The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

4.3.3 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 Occupied bandwidth requirements.

Table 7 provides the test results for occupied bandwidth.

4.3.4 Areas of Concern

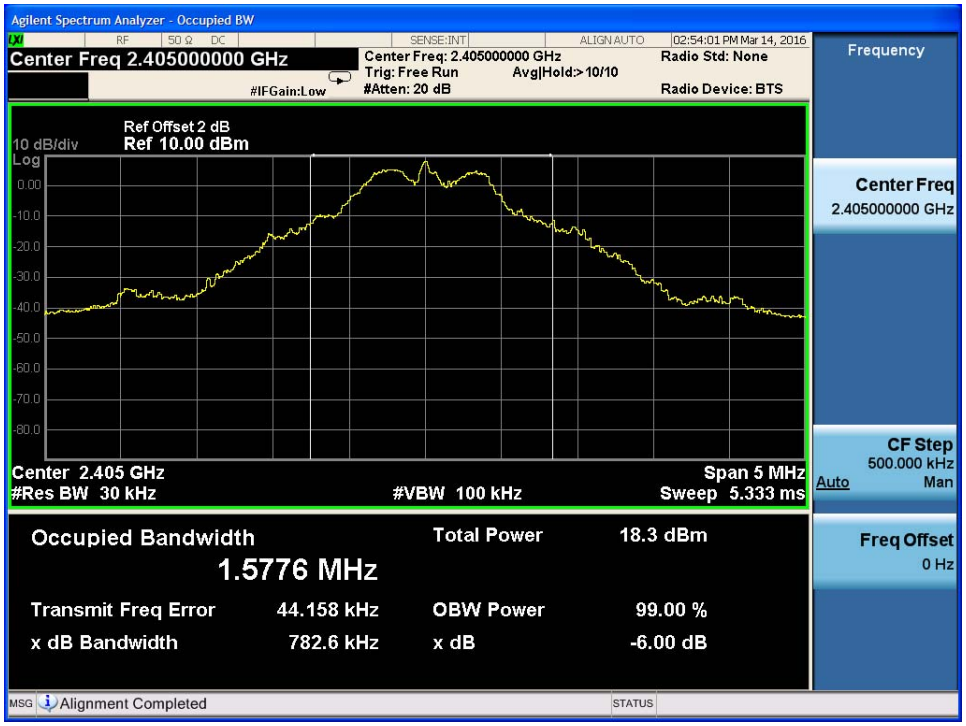
None.

Table 7: Occupied Bandwidth Results

EUT: Wireless Group-Guiding System		
M/N: HD-WT-T2_GS		
Test date: 2016-03-14	Pressure: 101.2±1.0kPa	Humidity:53.6±3.0%
Tested by: Leo-Li	Test site: RF site	Temperature:23.1±0.6 ℃

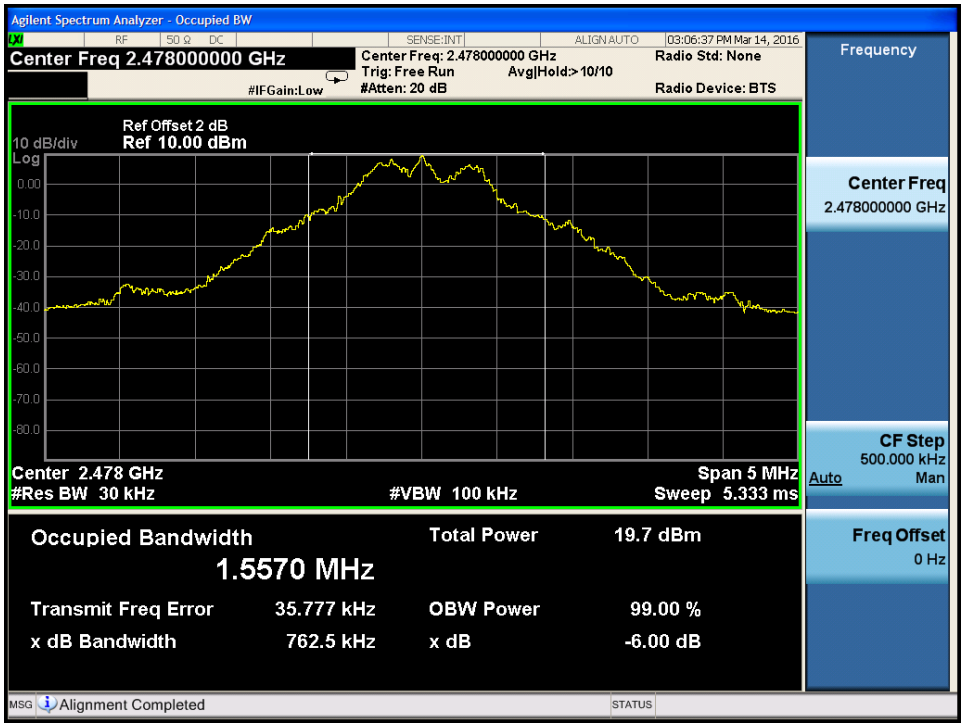
Test Mode	CH	6dB bandwidth (KHz)	Limit (KHz)
Tx	CH1	786.2	>500
	CH32	773.3	>500
	CH64	762.5	>500
Conclusion: Pass			

Test Mode: CH1: 2405MHz



Test Mode: CH32: 2446MHz

Test Mode: CH64: 2478MHz



4.4 Spurious Emissions at Antenna Terminals (FCC Part §15.247(b))

4.4.1 Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

4.4.2 Test Procedure

The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

4.4.3 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 Spurious Emissions at Antenna Terminals requirements.

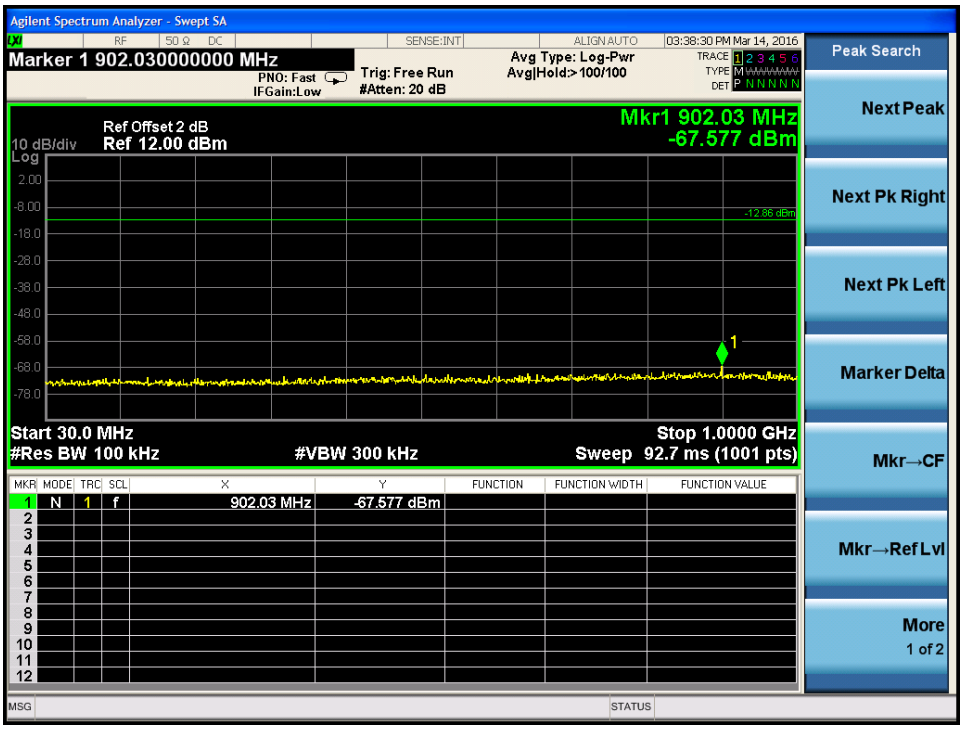
Table 8 provides the test results for Spurious Emissions at Antenna Terminals.

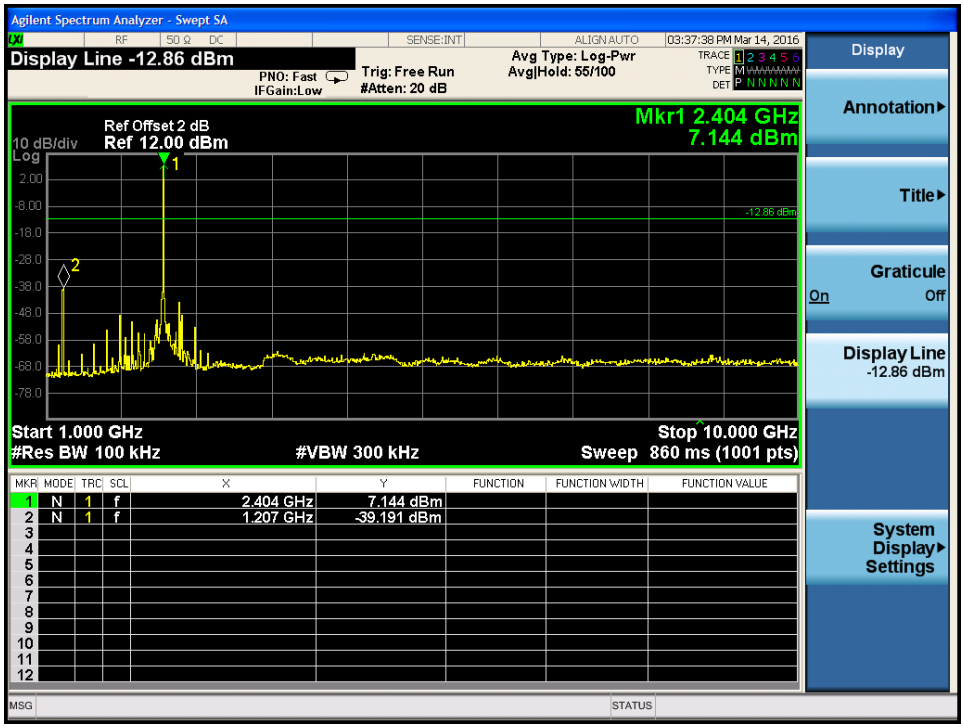
4.4.4 Areas of Concern

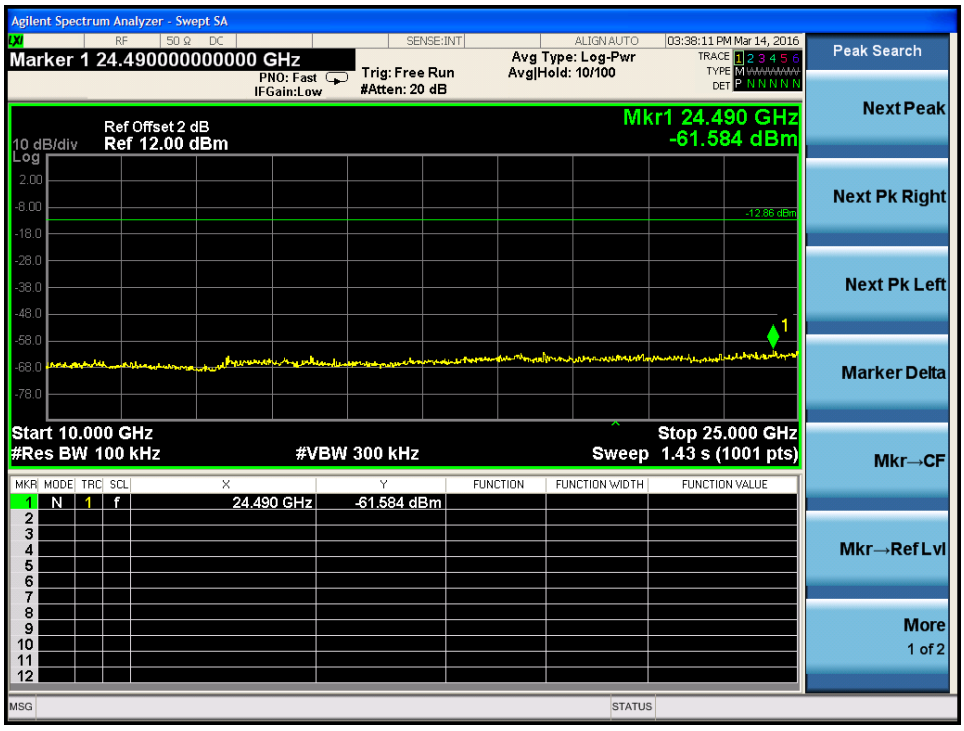
None.

Table 8: Spurious Emissions at Antenna Terminals Results

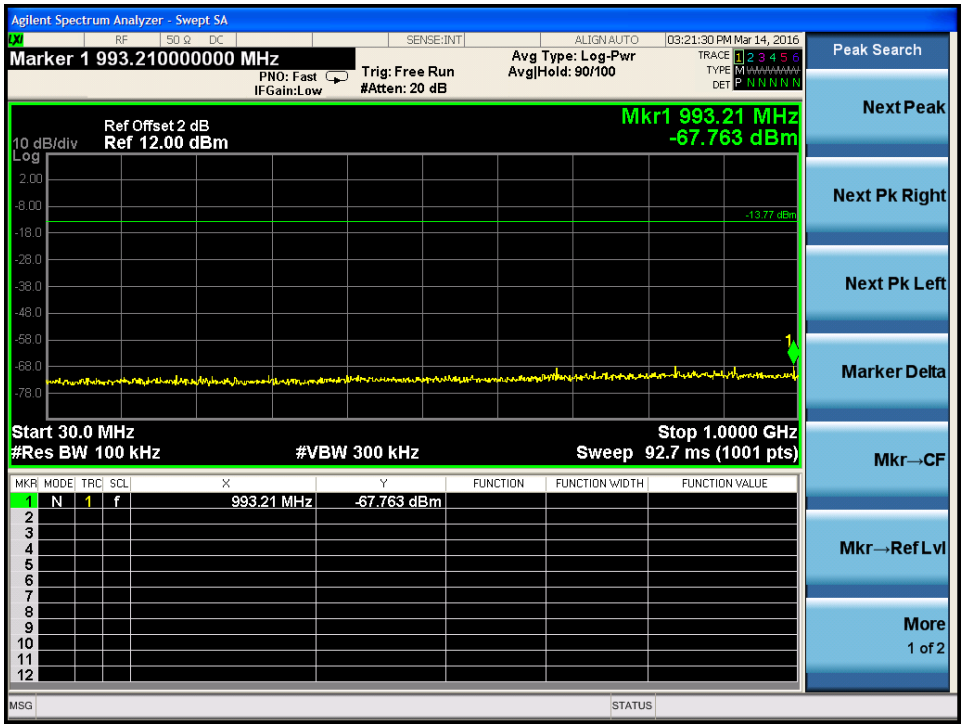
Test Mode: CH1: 2405MHz

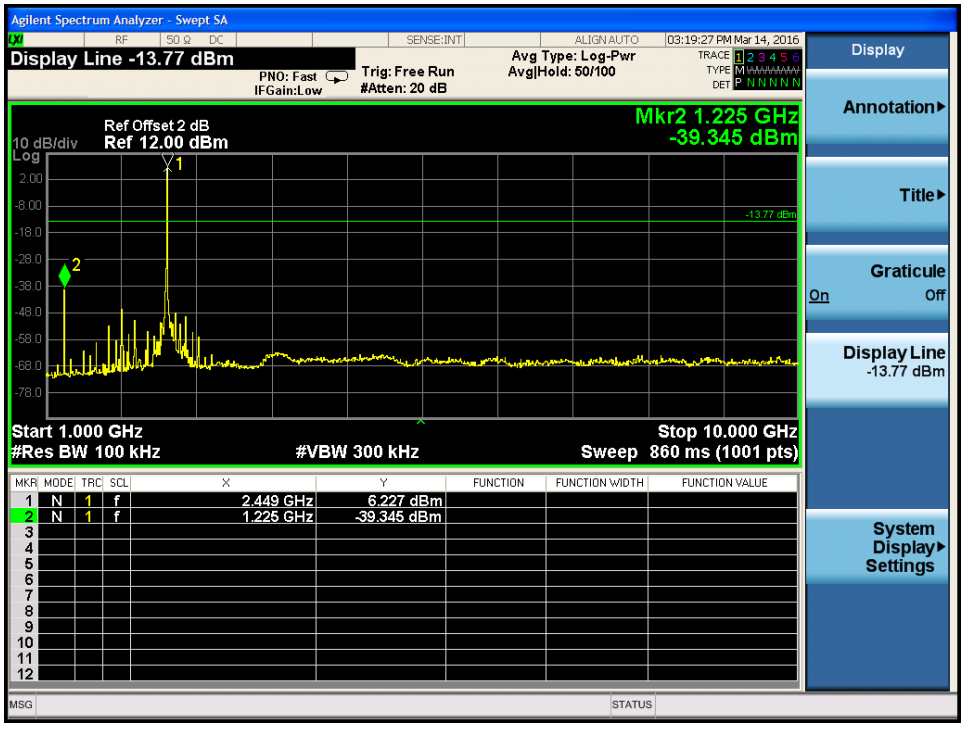


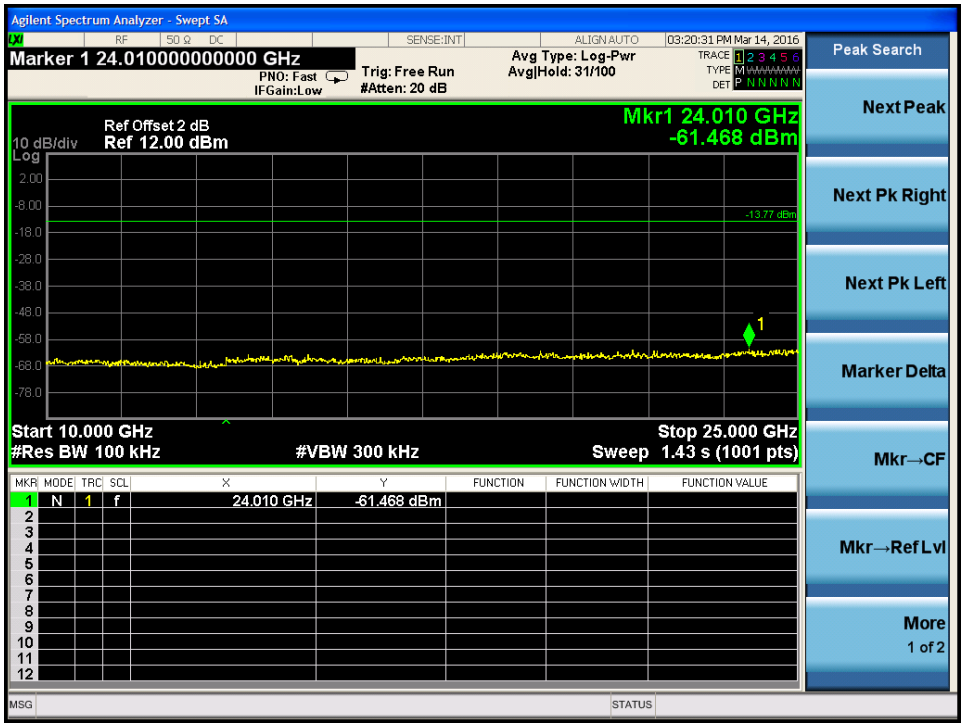




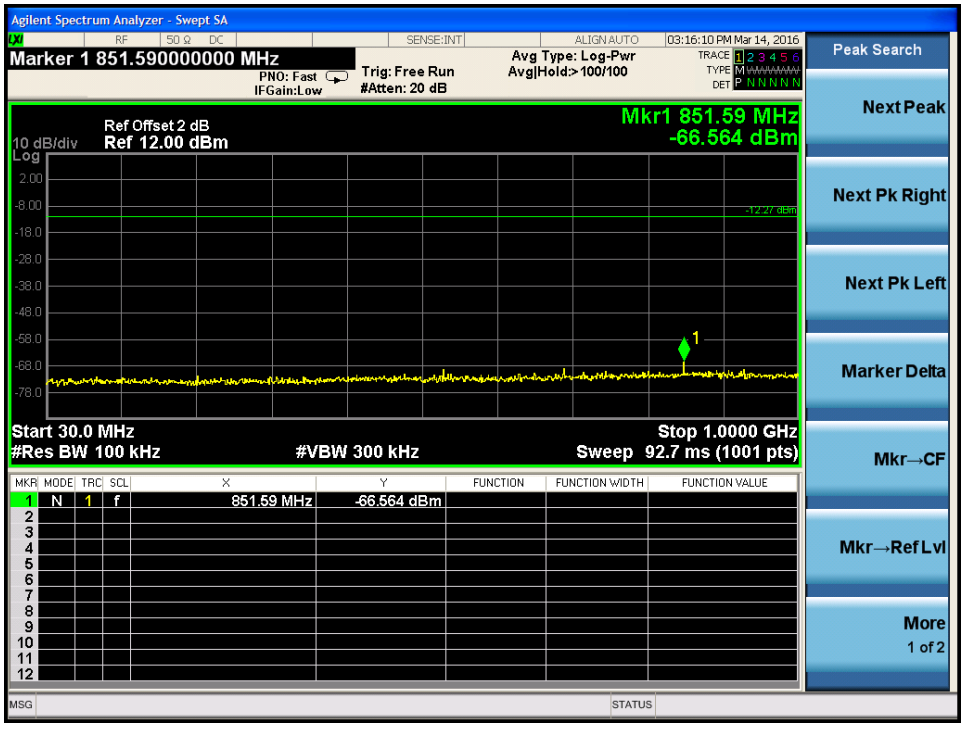
Test Mode: CH32: 2446MHz

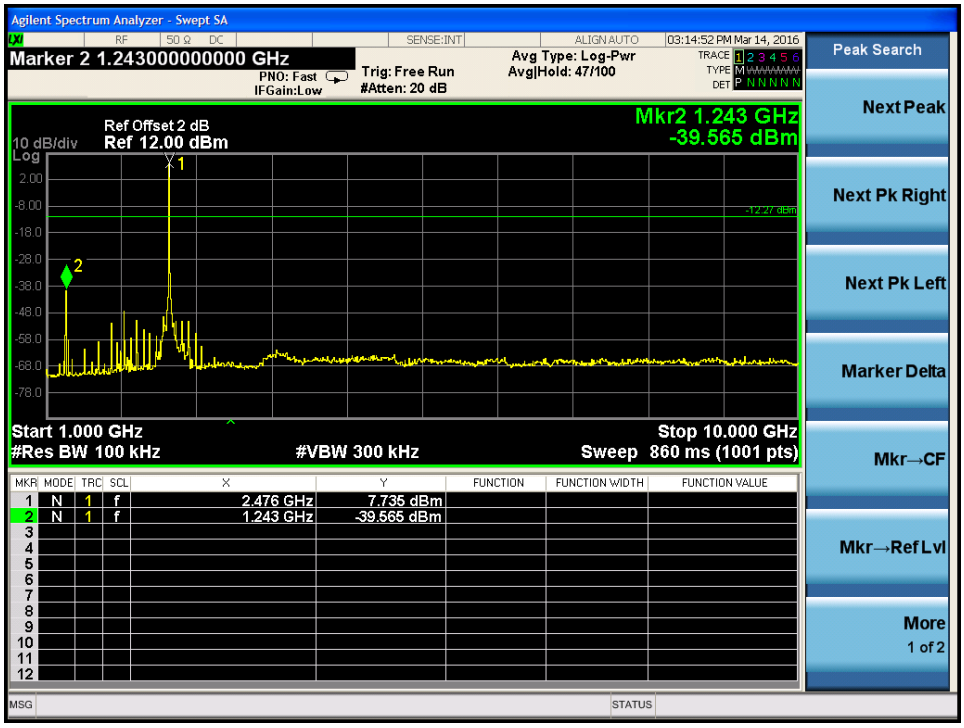


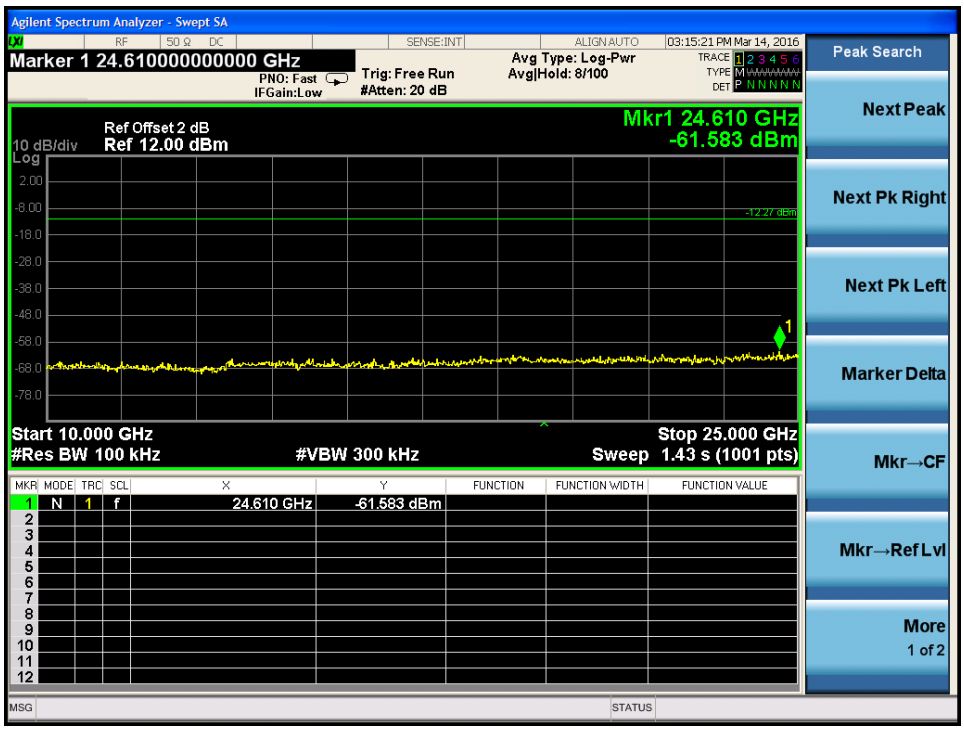




Test Mode: CH64: 2478MHz







4.5 Radiated Spurious Emissions: (FCC Part §15.247(c))

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a).

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>30 kHz
>1000 MHz	1 MHz	<30 Hz

Harmonic and Spurious emissions that were identified as coming from the EUT were checked in Peak and in Average Mode. The high frequency, which started from 18 to 26.5GHz, was pre-scan and the test result which was 20dB lower than the limit was not reported.

Peak measurements and average measurements are made. All emissions were determined to have a peak-to-average ratio of less than 20 dB.

4.5.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.10-2013. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

4.5.2 Test Data

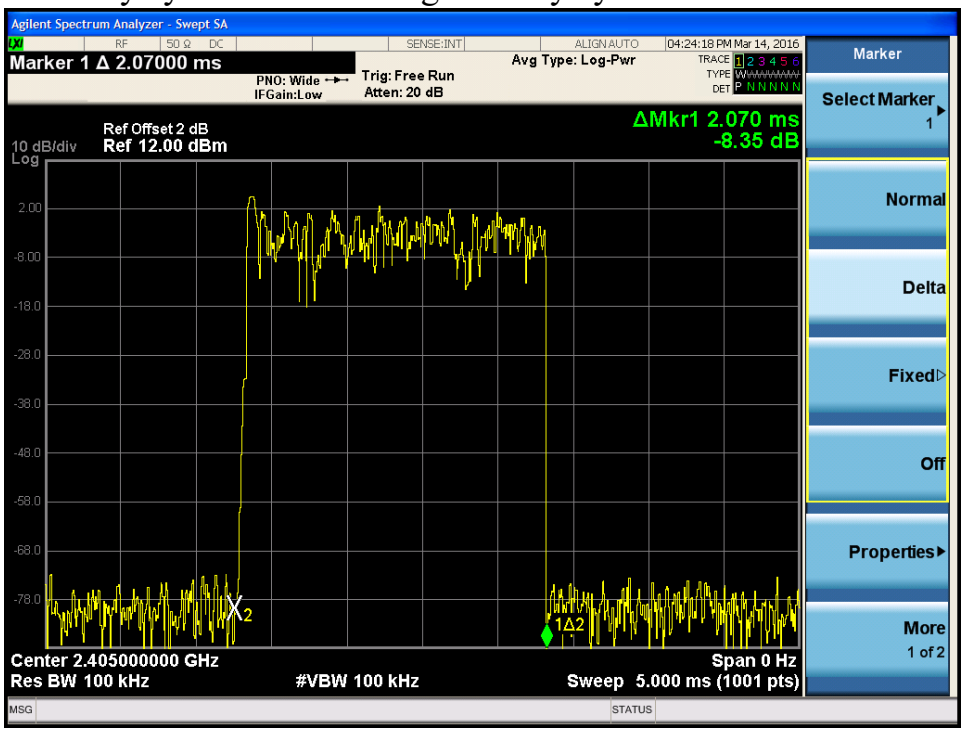
The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 Radiated Spurious Emissions requirements.

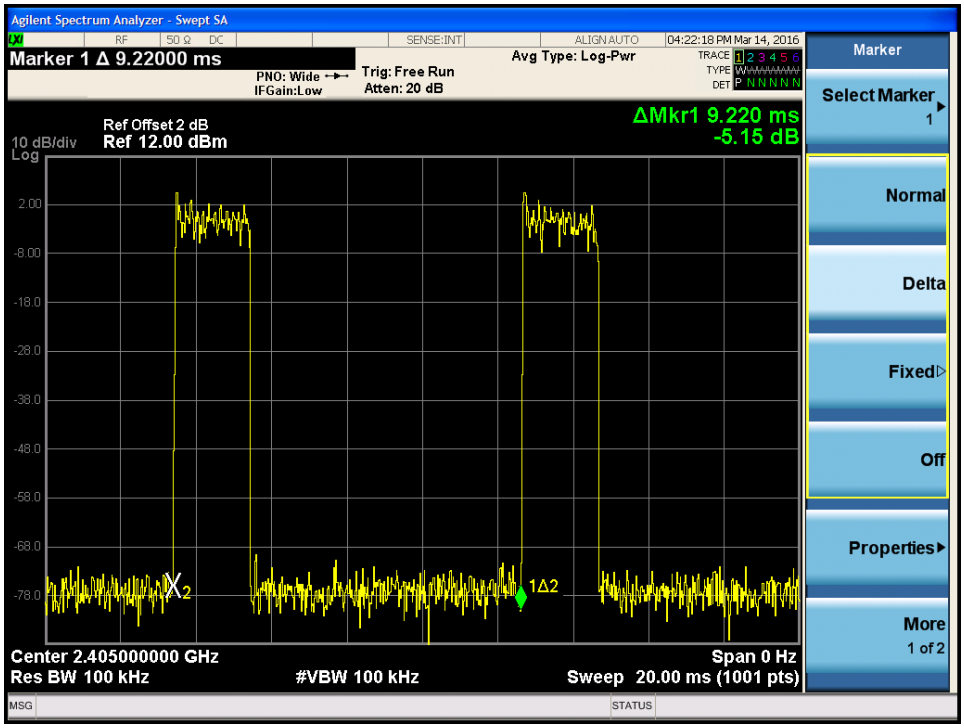
Table 9, 10 provide the test results for Radiated Spurious Emissions.

4.5.3 Areas of Concern

None.

Duty cycle factor = 20log（1/duty cycle）= 12.85dB





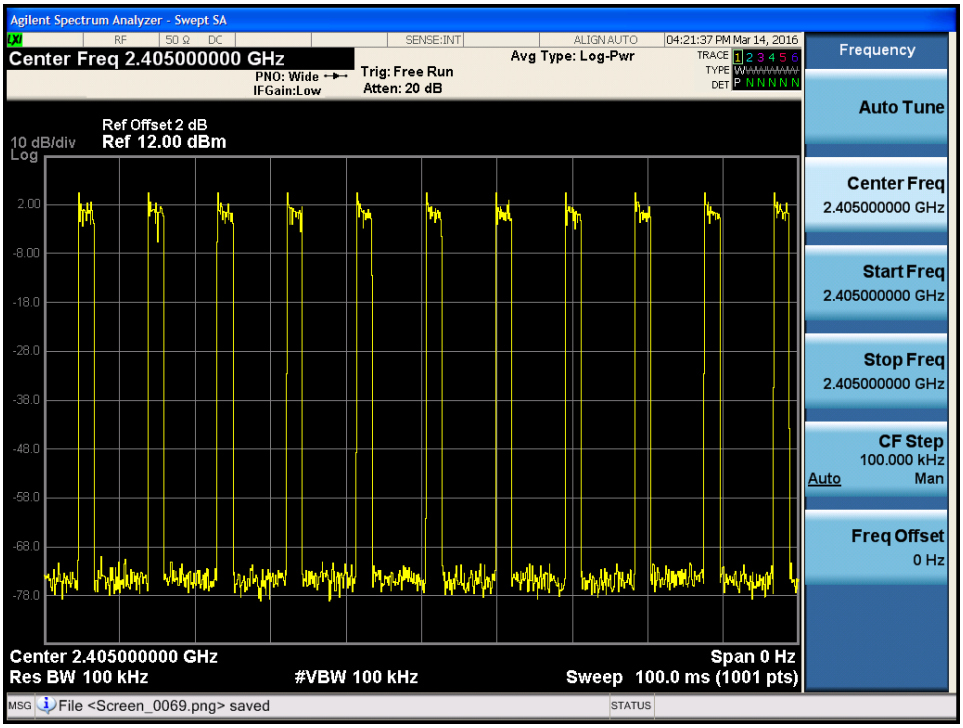
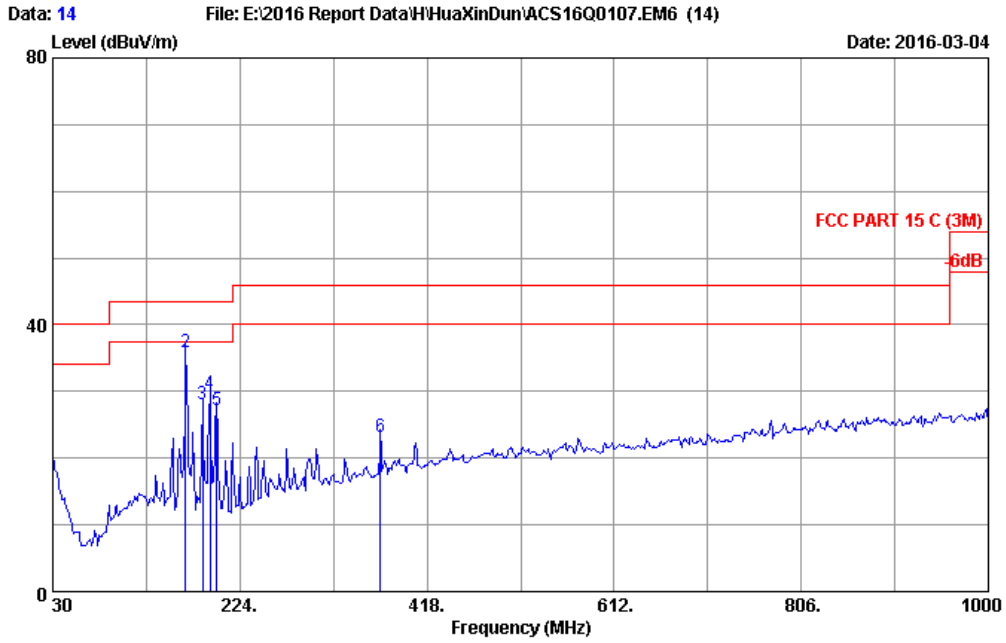


Table 9: Radiated Emission Test Data (Below 1GHz)

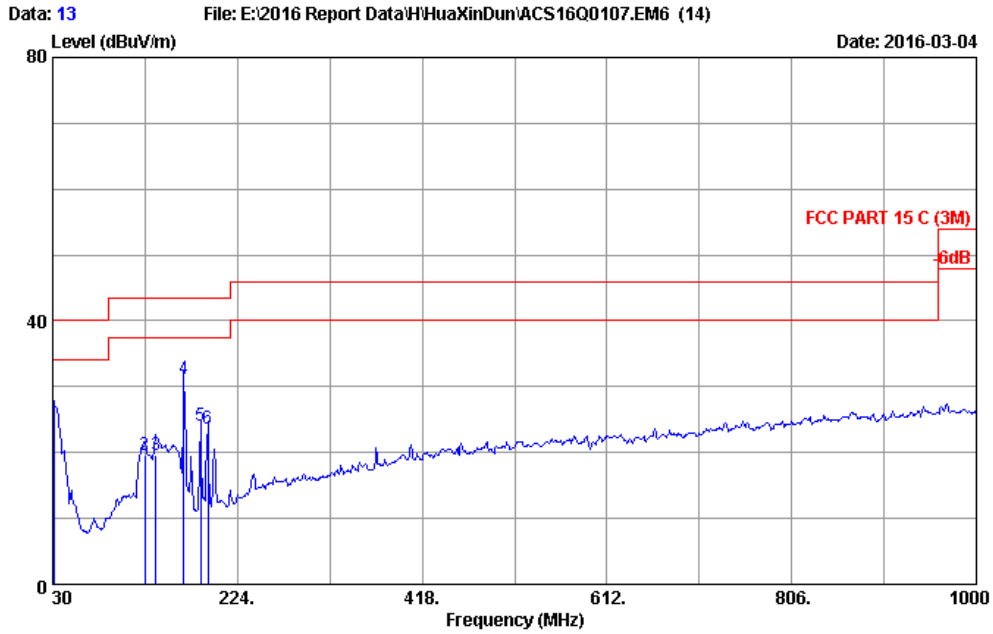
Test Mode: TX Mode



Site no. : 3m Chamber Data no. : 14
Dis. / Ant. : 3m 2015 CBL6112D 35375 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 C (3M)
Env. / Ins. : 25.1*C/51% Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : Tx Mode
M/N:HD-WT-T2-GS

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	30.000	20.30	0.51	-2.49	18.32	40.00	21.68	QP
2	167.740	10.74	1.38	23.85	35.97	43.50	7.53	QP
3	185.200	10.15	1.43	16.49	28.07	43.50	15.43	QP
4	192.960	10.39	1.49	17.73	29.61	43.50	13.89	QP
5	199.750	10.60	1.51	15.15	27.26	43.50	16.24	QP
6	369.500	16.09	2.12	5.05	23.26	46.00	22.74	QP

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



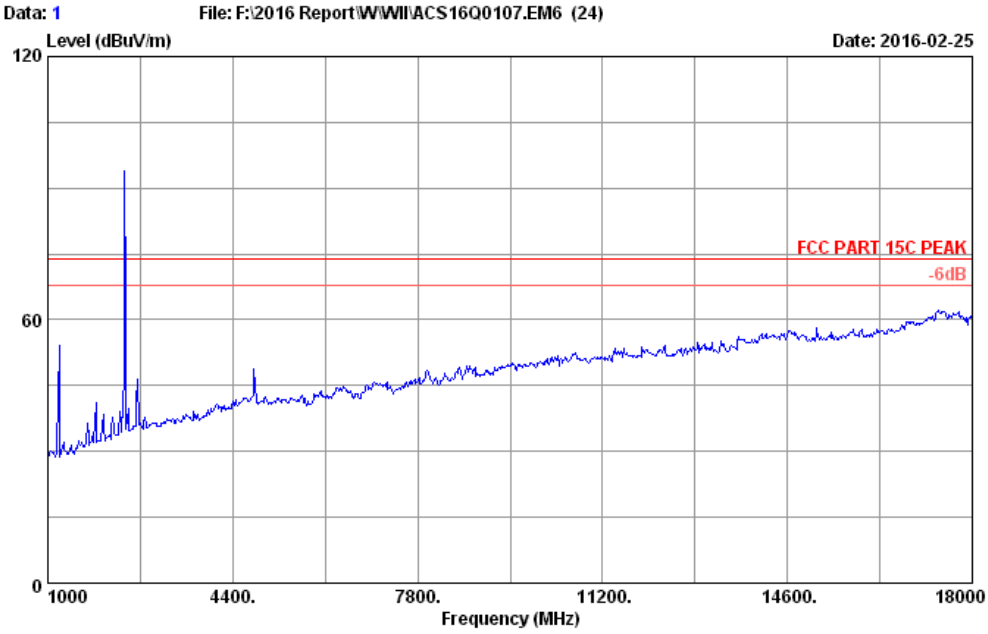

```
Site no.      : 3m Chamber                  Data no.   : 13
Dis. / Ant.   : 3m   2015 CBL6112D 35375    Ant. pol.  : VERTICAL
Limit         : FCC PART 15 C (3M)
Env. / Ins.   : 25.1*C/51%                  Engineer   : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : Tx Mode
                M/N:HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	31.940	19.06	0.61	5.50	25.17	40.00	14.83	QP
2	127.000	12.88	1.21	5.50	19.59	43.50	23.91	QP
3	138.640	12.16	1.27	6.27	19.70	43.50	23.80	QP
4	167.740	10.74	1.38	19.19	31.31	43.50	12.19	QP
5	185.200	10.15	1.43	12.47	24.05	43.50	19.45	QP
6	192.960	10.39	1.49	11.84	23.72	43.50	19.78	QP

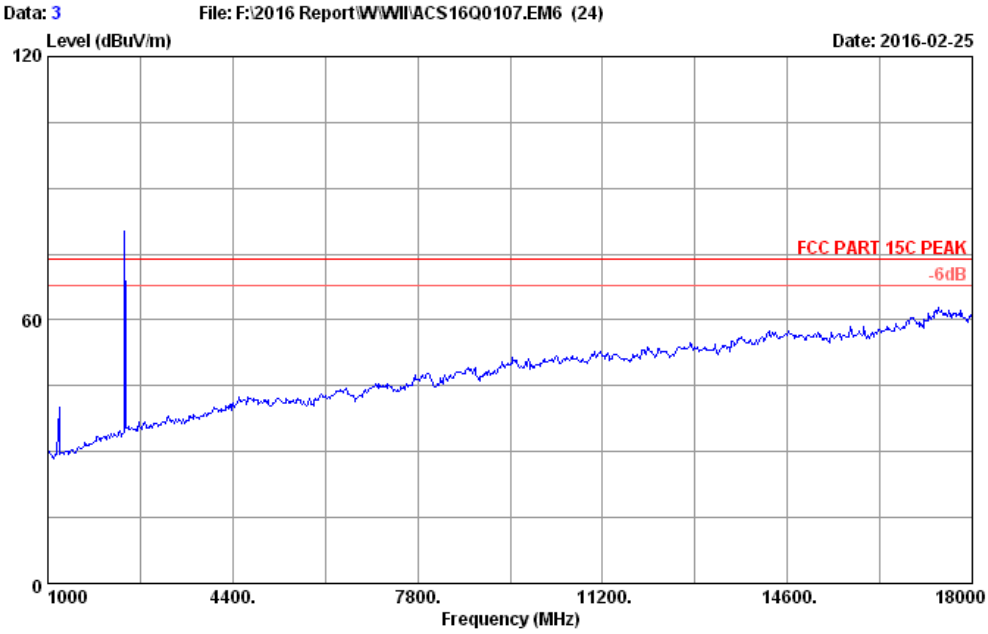
```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
         2. The emission levels that are 20dB below the official
            limit are not reported.
```


Table 10: **Radiated Emission Test Data (Above 1GHz)**

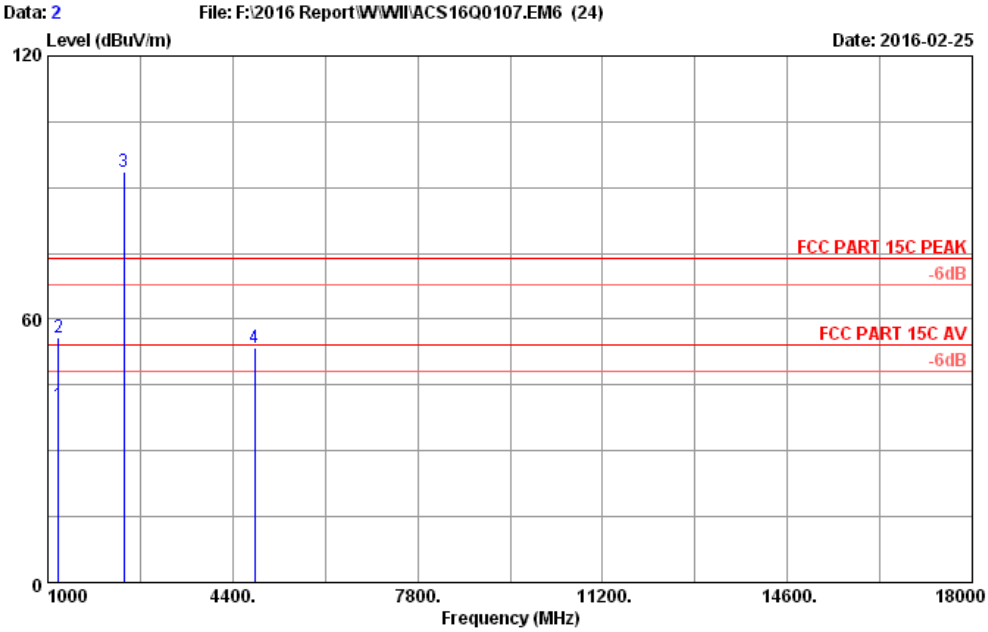
Test Mode: CH1: 2405MHz




```
Site no.      : 3m Chamber                    Data no.  : 1
Dis. / Ant.   : 3m   2015 3115-4877       Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2405MHz Tx
                HD-WT-T2-GS
```

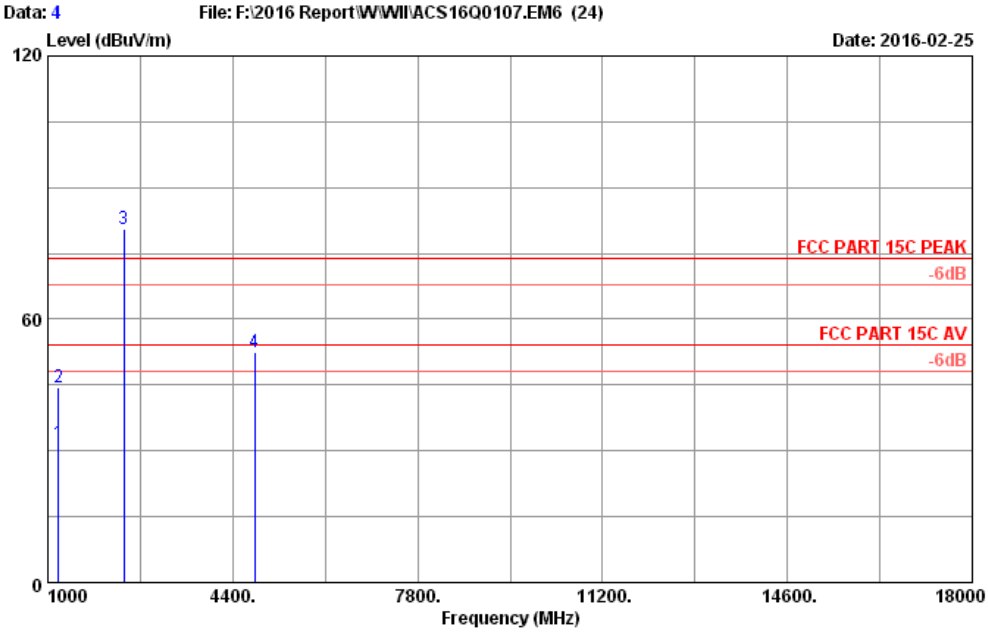

```
Site no.      : 3m Chamber                      Data no.  : 3
Dis. / Ant.   : 3m   2015 3115-4877         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2405MHz Tx
                HD-WT-T2-GS
```

Site no. : 3m Chamber Data no. : 2
Dis. / Ant. : 3m 2015 3115-4877 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.9*C/52.8%
Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : 2405MHz Tx
HD-WT-T2-GS

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1202.600	24.72	4.71	37.36	48.34	40.41	54.00	13.59	Average
2	1202.600	24.72	4.71	37.36	63.72	55.79	74.00	18.21	Peak
3	2405.000	28.01	7.32	36.62	94.73	93.44	74.00	-19.44	Peak
4	4810.000	33.70	9.46	35.54	45.92	53.54	74.00	20.46	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.

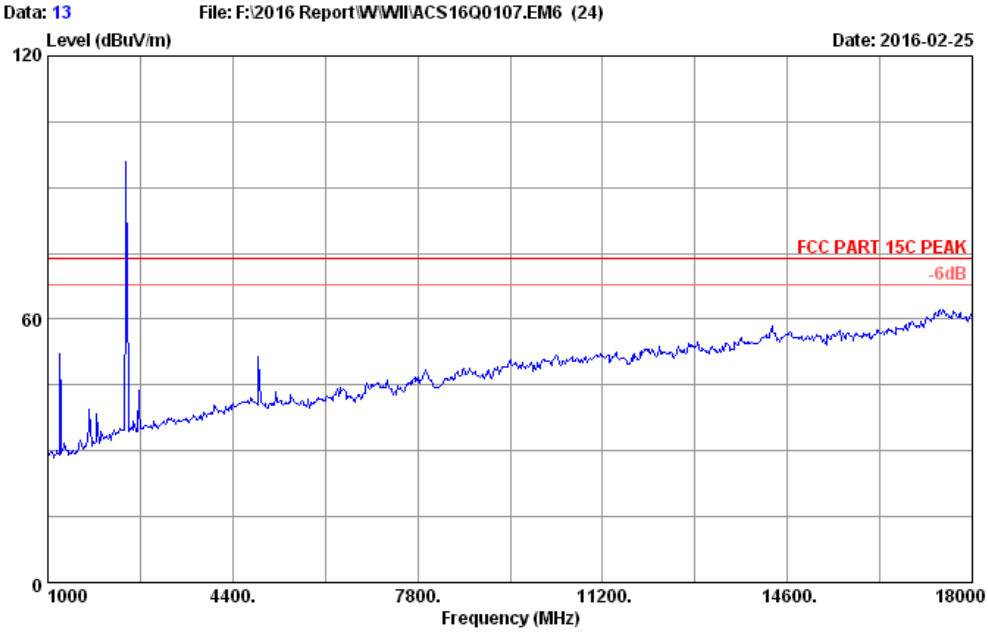


Site no. : 3m Chamber Data no. : 4
Dis. / Ant. : 3m 2015 3115-4877 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.9*C/52.8%
Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : 2405MHz Tx
HD-WT-T2-GS

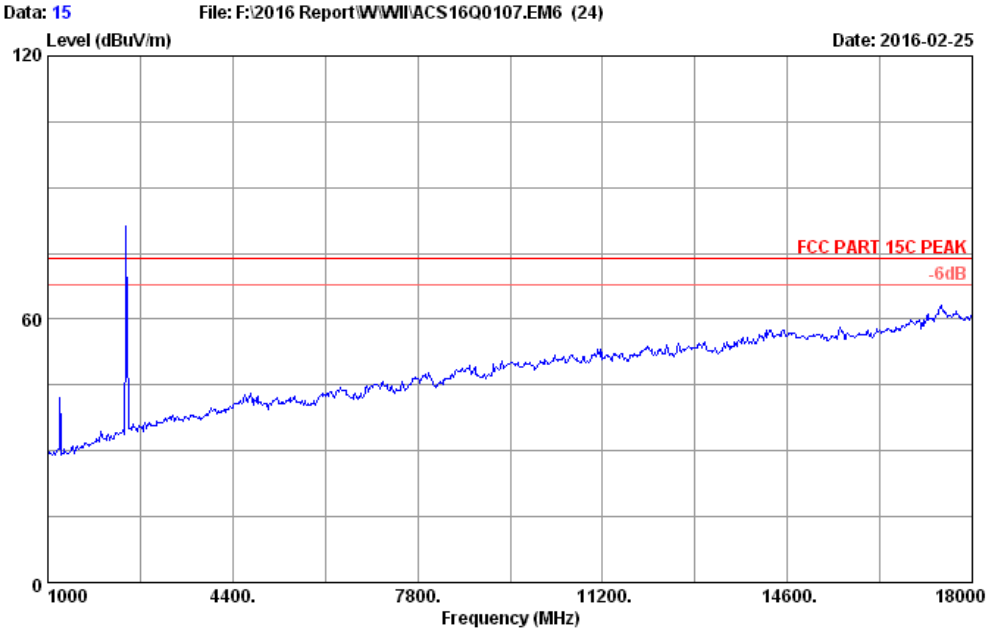
No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1202.400	24.72	4.71	37.36	39.59	31.66	54.00	22.34	Average
2	1202.400	24.72	4.71	37.36	52.37	44.44	74.00	29.56	Peak
3	2405.000	28.01	7.32	36.62	81.79	80.50	74.00	-6.50	Peak
4	4810.000	33.70	9.46	35.54	44.88	52.50	74.00	21.50	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.

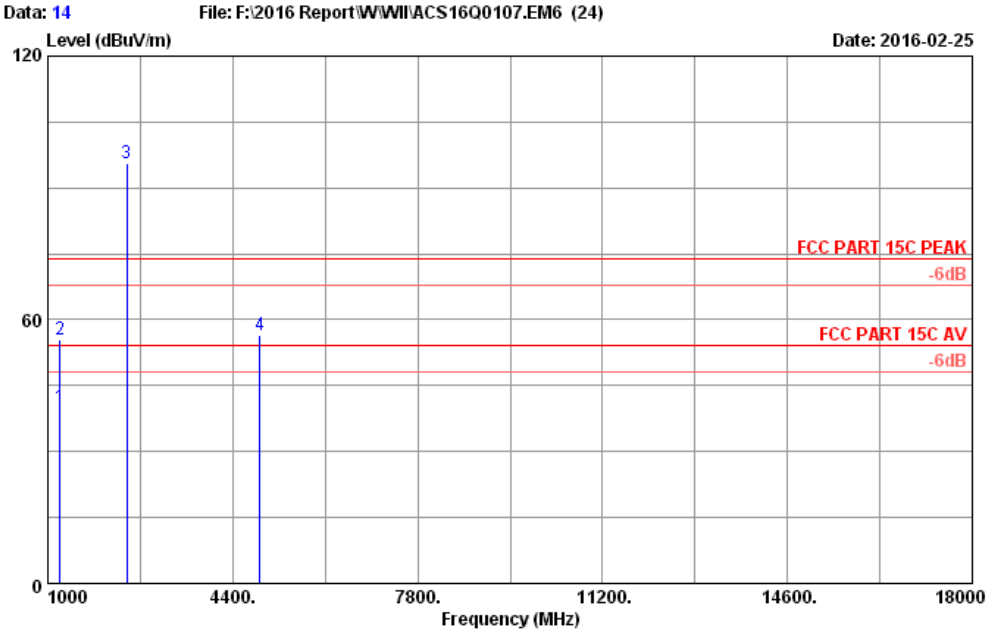
Test Mode: CH32: 2446MHz




```
Site no.      : 3m Chamber                    Data no.  : 13
Dis. / Ant.   : 3m   2015 3115-4877      Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2446MHz Tx
                HD-WT-T2-GS
```


```
Site no.      : 3m Chamber                    Data no.  : 15
Dis. / Ant.   : 3m   2015 3115-4877       Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2446MHz Tx
                HD-WT-T2-GS
```

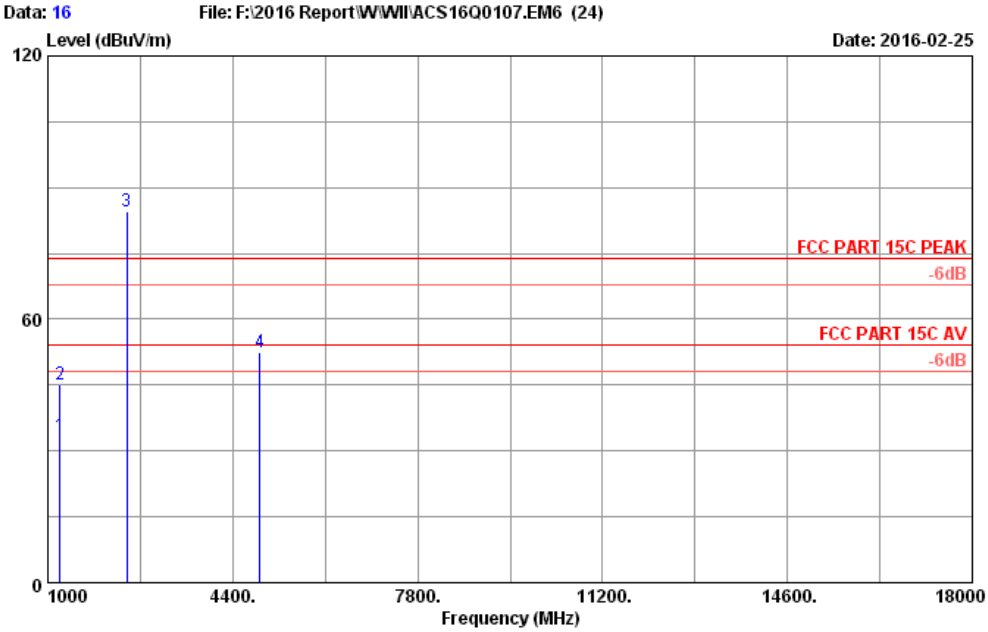




```
Site no.      : 3m Chamber                    Data no.  : 14
Dis. / Ant.   : 3m   2015 3115-4877       Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2446MHz Tx
                HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1222.980	24.76	4.75	37.34	48.01	40.18	54.00	13.82	Average
2	1222.980	24.76	4.75	37.34	63.46	55.63	74.00	18.37	Peak
3	2446.000	28.09	7.39	36.60	96.59	95.47	74.00	-21.47	Peak
4	4892.000	33.83	9.50	35.50	48.81	56.64	74.00	17.36	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.
```

Frequency（MHz）	Peak level（dBuv/m）	Duty cycle factor (dB)	AV level (dBuv/m)	Limit(dBuv/m)	Conclusion
4892.000	56.64	12.85	43.79	54	Pass

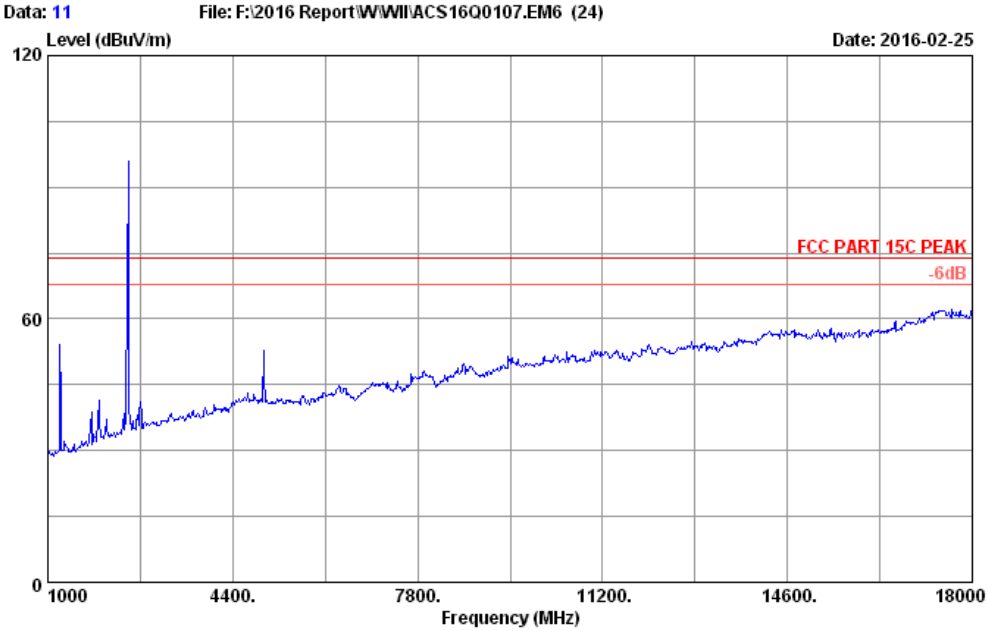


Site no. : 3m Chamber Data no. : 16
Dis. / Ant. : 3m 2015 3115-4877 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.9*C/52.8%
Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : 2446MHz Tx
HD-WT-T2-GS

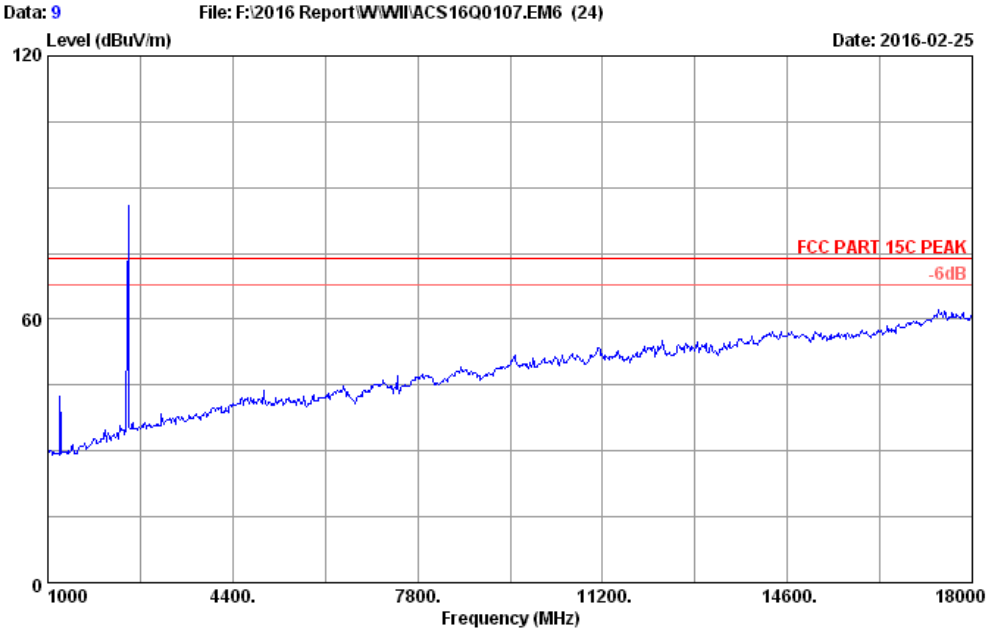
No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1223.090	24.76	4.75	37.34	41.31	33.48	74.00	40.52	Peak
2	1223.090	24.76	4.75	37.34	53.01	45.18	74.00	28.82	Peak
3	2446.000	28.09	7.39	36.60	85.74	84.62	74.00	-10.62	Peak
4	4892.000	33.83	9.50	35.50	44.67	52.50	74.00	21.50	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.

Test Mode: CH64: 2478MHz




```
Site no.      : 3m Chamber                    Data no.  : 11
Dis. / Ant.   : 3m   2015 3115-4877      Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2478MHz Tx
                HD-WT-T2-GS
```


```
Site no.      : 3m Chamber                      Data no.  : 9
Dis. / Ant.   : 3m   2015 3115-4877         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2478MHz Tx
                HD-WT-T2-GS
```

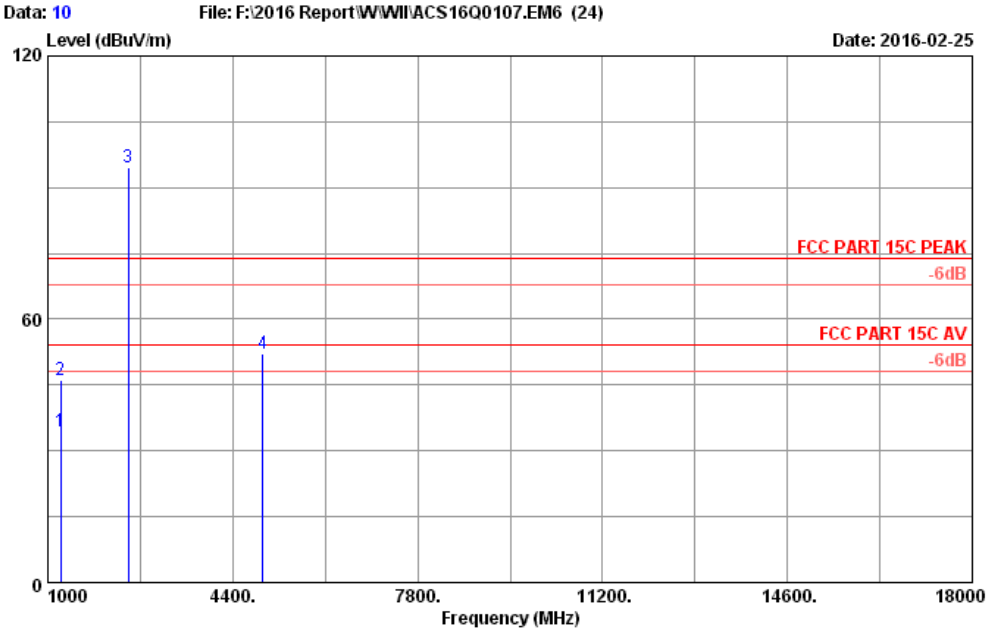


```
Site no.      : 3m Chamber                      Data no.  : 12
Dis. / Ant.   : 3m   2015 3115-4877         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2478MHz Tx
                HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1239.000	24.78	4.79	37.33	48.58	40.82	54.00	13.18	Average
2	1239.000	24.78	4.79	37.33	64.11	56.35	74.00	17.65	Peak
3	2478.000	28.16	7.47	36.59	97.42	96.46	74.00	-22.46	Peak
4	4956.000	33.93	9.52	35.47	49.22	57.20	74.00	16.80	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.
```

Frequency（MHz）	Peak level（dBuv/m）	Duty cycle factor (dB)	AV level (dBuv/m)	Limit(dBuv/m)	Conclusion
4956.000	57.20	12.85	44.35	54	Pass



Site no. : 3m Chamber Data no. : 10
Dis. / Ant. : 3m 2015 3115-4877 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.9*C/52.8%
Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : 2478MHz Tx
HD-WT-T2-GS

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1239.100	24.78	4.79	37.33	42.24	34.48	54.00	19.52	Average
2	1239.100	24.78	4.79	37.33	53.93	46.17	74.00	27.83	Peak
3	2478.000	28.16	7.47	36.59	95.48	94.52	74.00	-20.52	Peak
4	4956.000	33.93	9.52	35.47	44.29	52.27	74.00	21.73	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.

4.6 Band Edge Measurements (Conducted)

Conducted band edge measurements at 2390MHz and 2483MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the shielding room and the table lists the corrected levels of the emissions at the band edge for comparison to the limit.

4.6.1 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 Conducted band edge emissions requirements.

Table 11 provides the test results for Conducted band edge emissions.

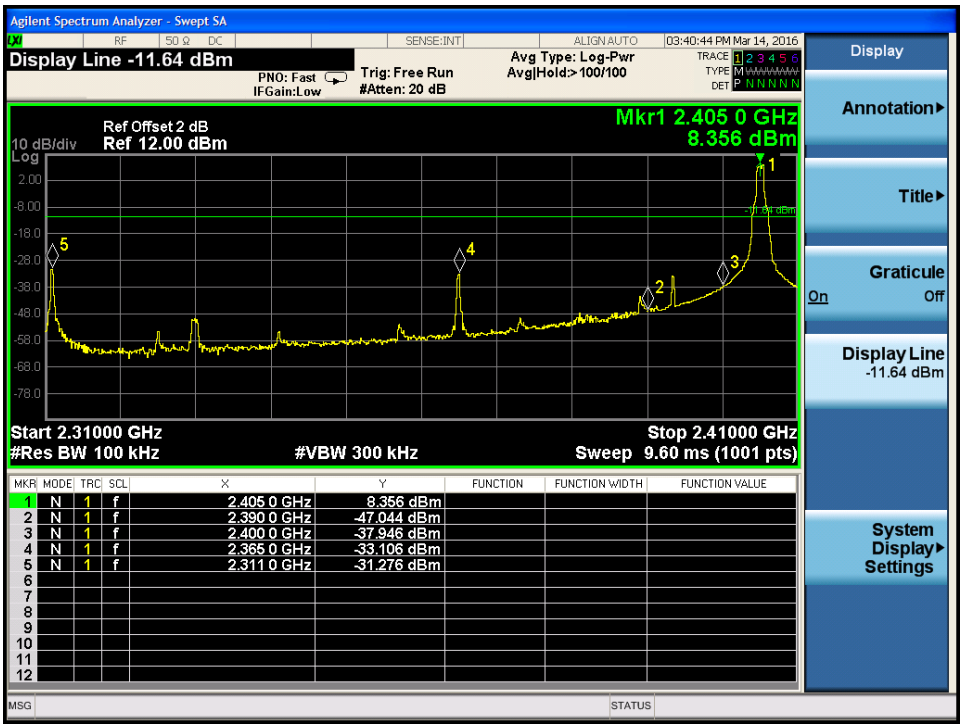
4.6.2 Areas of Concern

None.

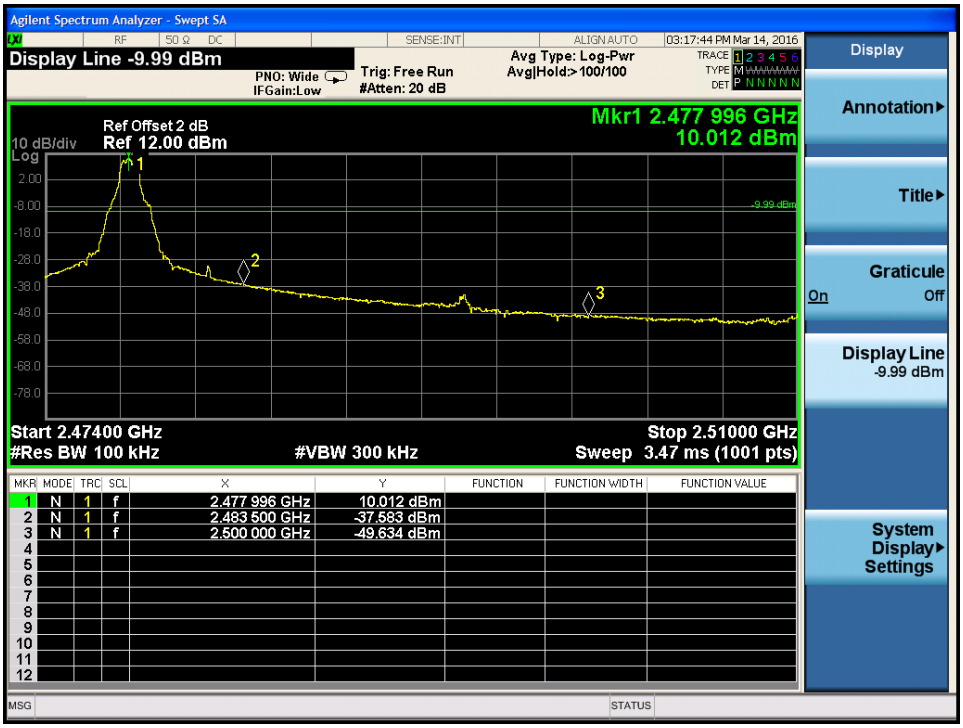
.

Table 11: Band Edge Measurements (Conducted)

Test Mode: CH1: 2405MHz



Test Mode: CH64: 2478MHz



4.7 Band Edge Measurements (Radiated)

Radiated band edge measurements at 2390MHz and 2483MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 1 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz for average levels).

4.7.1 Test Data

The EUT Wireless Group-Guiding System complied with the FCC Part 15.247 Radiated band edge emissions requirements.

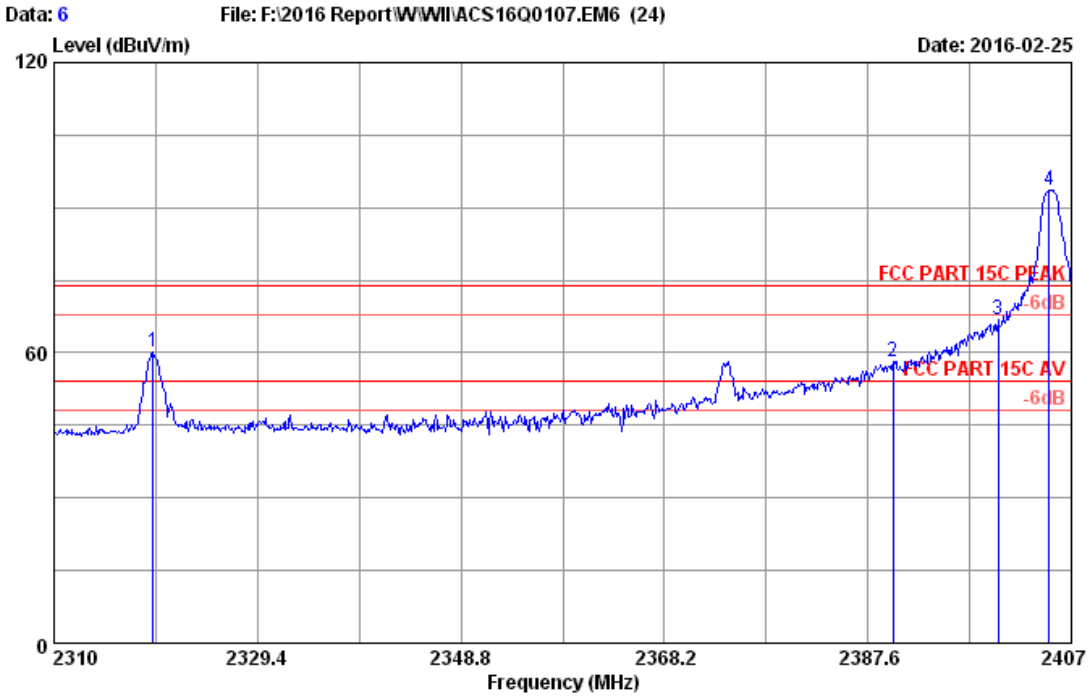
Table 12 provides the test results for Radiated band edge emissions.

4.7.2 Areas of Concern

None.

Table 12: Band Edge Measurements (Radiated)

Test Mode: CH0: 2405MHz

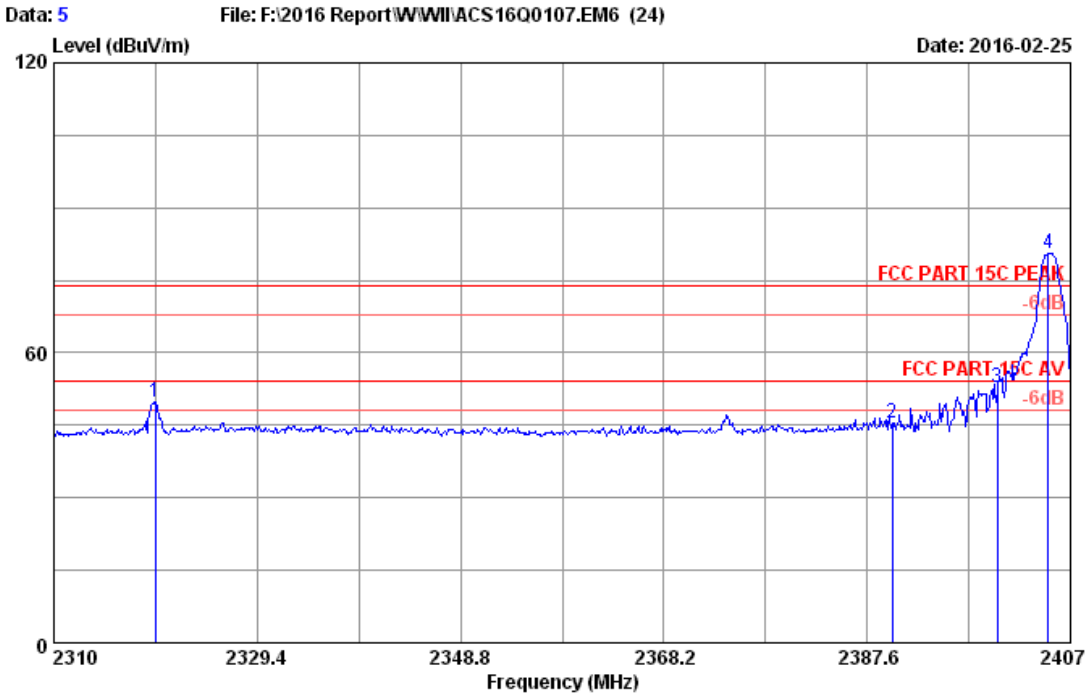



```
Site no.      : 3m Chamber                    Data no.  : 6
Dis. / Ant.   : 3m   2015 3115-4877        Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2405MHz Tx
                HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2319.409	27.84	7.12	36.65	61.97	60.28	74.00	13.72	Peak
2	2390.000	27.98	7.28	36.62	59.46	58.10	74.00	15.90	Peak
3	2400.000	28.00	7.32	36.62	68.30	67.00	74.00	7.00	Peak
4	2404.866	28.01	7.32	36.62	94.81	93.52	74.00	-19.52	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.
```

Frequency（MHz）	Peak level（dBuv/m）	Duty cycle factor (dB)	AV level (dBuv/m)	Limit(dBuv/m)	Conclusion
2390.000	58.10	12.85	45.25	54	Pass

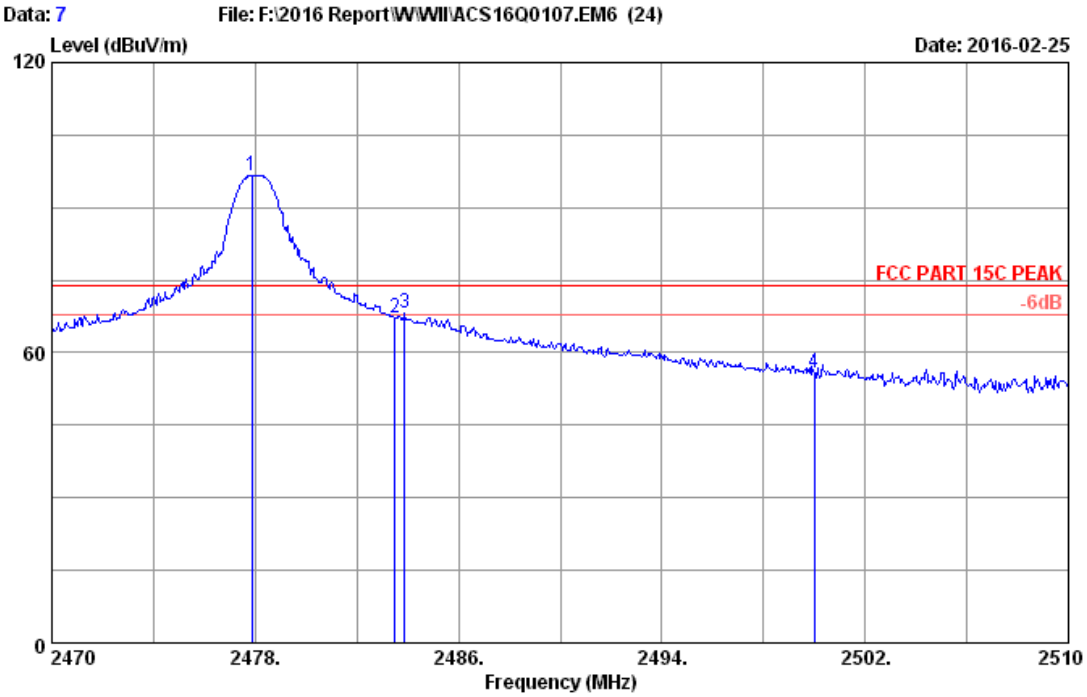


Site no. : 3m Chamber Data no. : 5
Dis. / Ant. : 3m 2015 3115-4877 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.9*C/52.8%
Engineer : Leo-Li
EUT : Wireless Group-Guiding System
Power rating : DC 3.7V
Test Mode : 2405MHz Tx
HD-WT-T2-GS

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2319.700	27.84	7.12	36.65	51.40	49.71	74.00	24.29	Peak
2	2390.000	27.98	7.28	36.62	46.90	45.54	74.00	28.46	Peak
3	2400.000	28.00	7.32	36.62	54.09	52.79	74.00	21.21	Peak
4	2404.866	28.01	7.32	36.62	81.82	80.53	74.00	-6.53	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.

Test Mode: CH39: 2480MHz

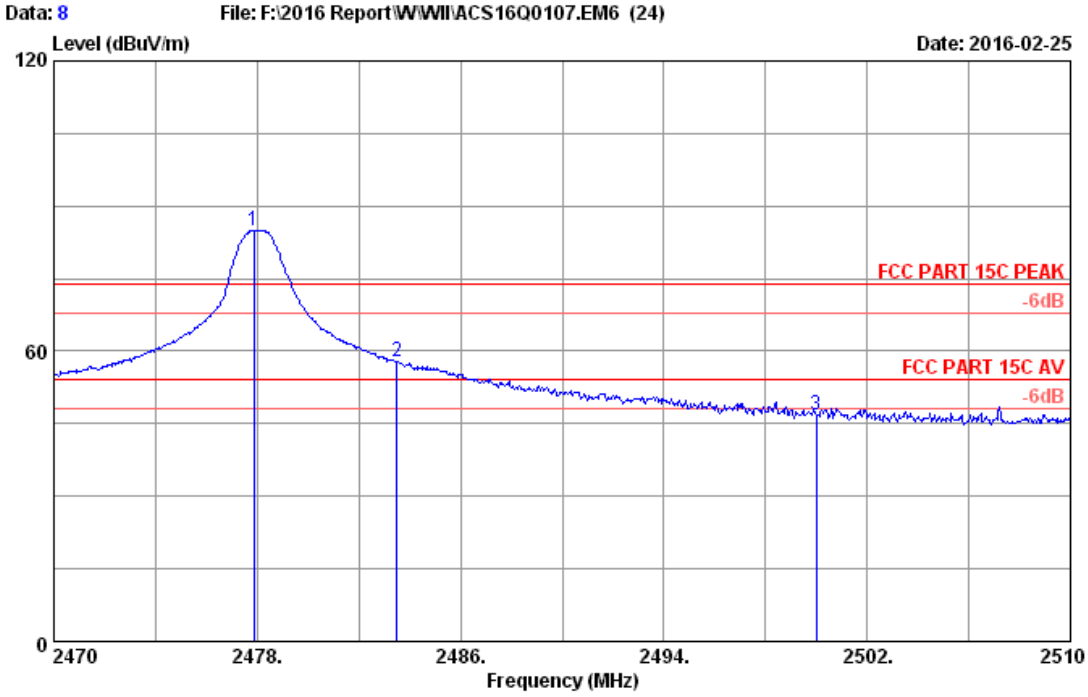



```
Site no.      : 3m Chamber                    Data no.  : 7
Dis. / Ant.   : 3m   2015 3115-4877        Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2478MHz Tx
                HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2477.880	28.16	7.47	36.59	97.56	96.60	74.00	-22.60	Peak
2	2483.500	28.17	7.51	36.59	68.22	67.31	74.00	6.69	Peak
3	2483.880	28.17	7.51	36.59	69.06	68.15	74.00	5.85	Peak
4	2500.000	28.20	7.51	36.58	56.80	55.93	74.00	18.07	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.
```

Frequency（MHz）	Peak level（dBuv/m）	Duty cycle factor (dB)	AV level (dBuv/m)	Limit(dBuv/m)	Conclusion
2483.500	67.31	12.85	54.46	54	Pass




```
Site no.      : 3m Chamber                      Data no.  : 8
Dis. / Ant.   : 3m   2015 3115-4877         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.9*C/52.8%
Engineer      : Leo-Li
EUT           : Wireless Group-Guiding System
Power rating  : DC 3.7V
Test Mode     : 2478MHz Tx
                HD-WT-T2-GS
```

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	AMP factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2477.880	28.16	7.47	36.59	85.95	84.99	74.00	-10.99	Peak
2	2483.500	28.17	7.51	36.59	58.82	57.91	74.00	16.09	Peak
3	2500.000	28.20	7.51	36.58	47.54	46.67	74.00	27.33	Peak

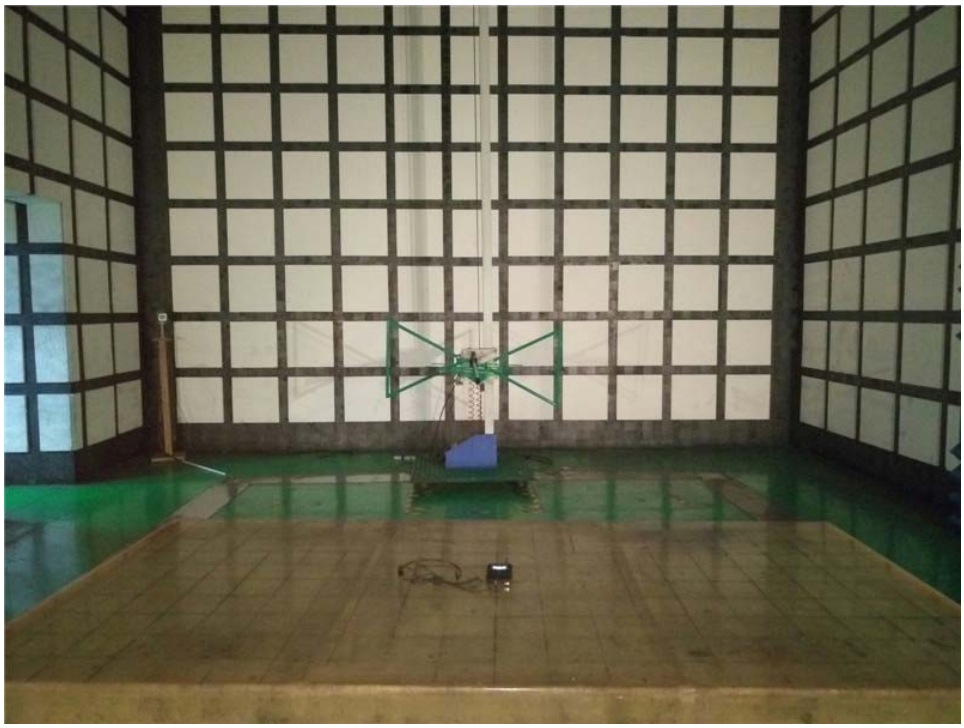
```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
            -Amp Factor
         2. The emission levels that are 20dB below the official
            limit are not reported.
```

Frequency（MHz）	Peak level（dBuv/m）	Duty cycle factor (dB)	AV level (dBuv/m)	Limit(dBuv/m)	Conclusion
2483.500	57.91	12.85	45.06	54	Pass

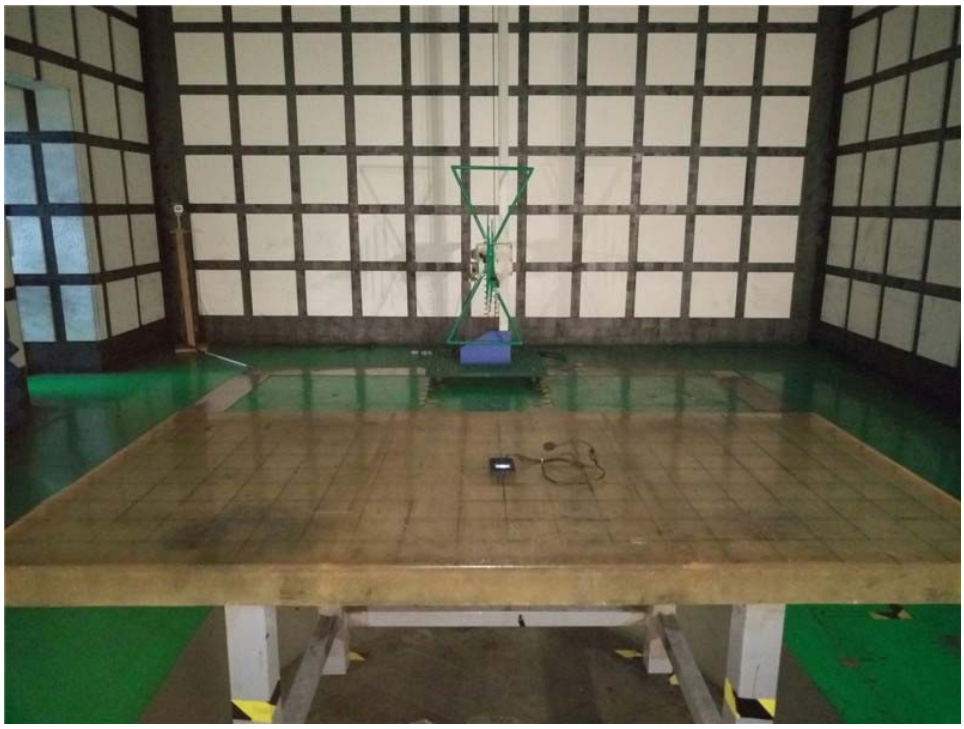
4.8 AC Powerline Conducted Emissions: (FCC Part §15.207)

According to Paragraph (c) of FCC Part 15 section 15.207, Tests to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

Photograph 1: Radiated Emission Test Configuration, (Below 1GHz) Front



Photograph 2: Radiated Emission Test Configuration, (Below 1GHz) Back



Photograph 3: Radiated Emission Test Configuration, (Above 1GHz) Front

5 Attachment (EUT Photograph)

EUT Photo #1– Front View

EUT Photo #2– Front View

EUT Photo #3– Front View

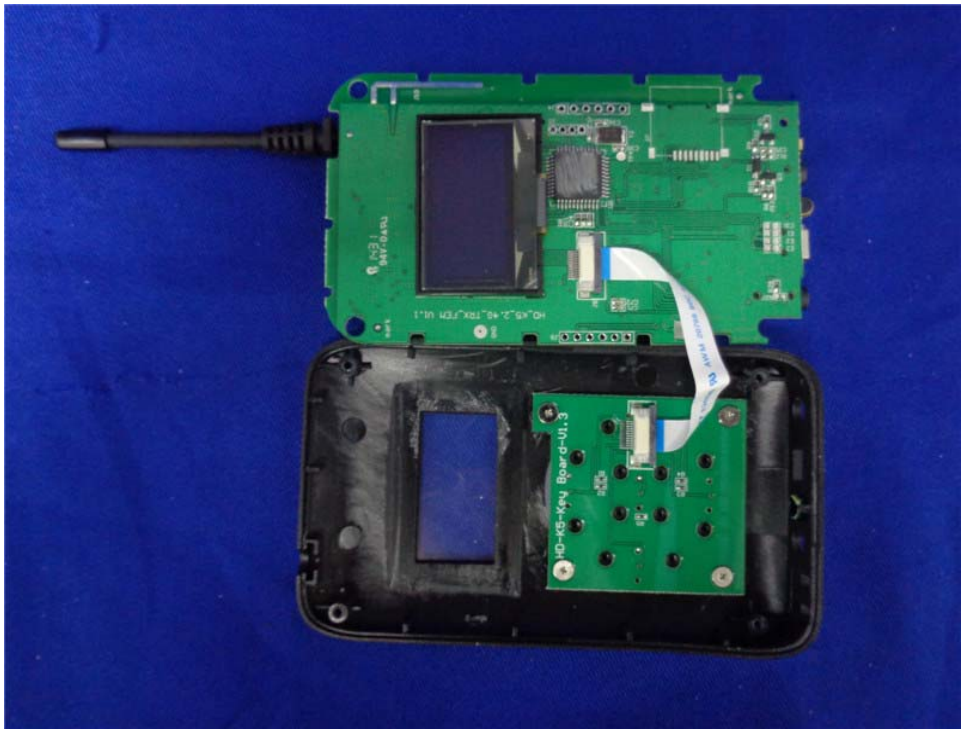
EUT Photo #4– Front View

EUT Photo #5– Front View

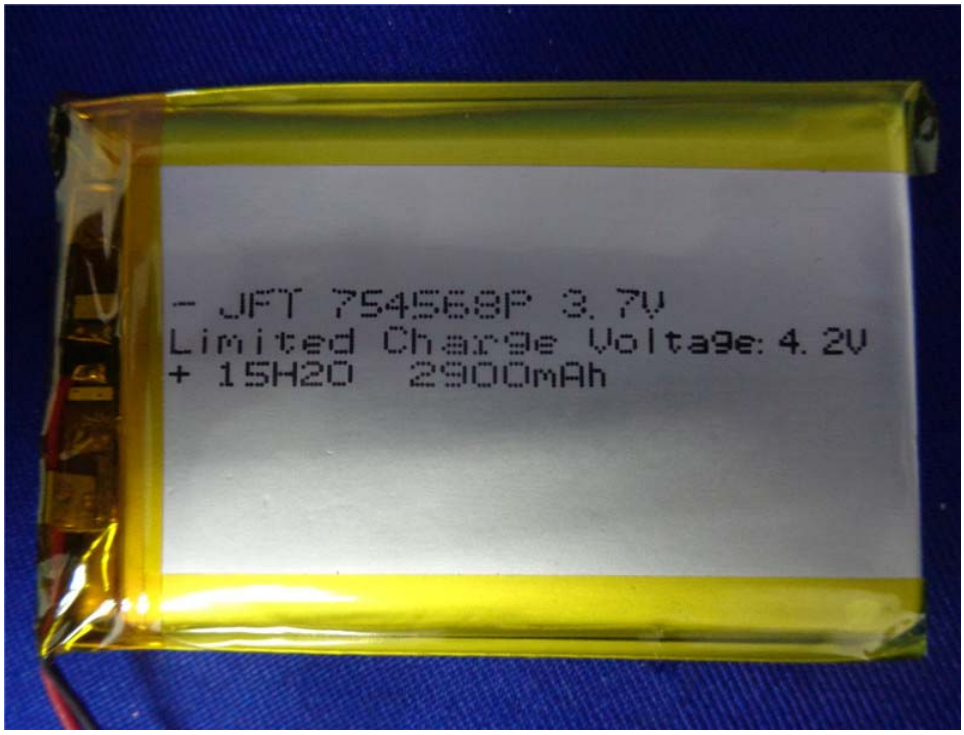
EUT Photo #6– Front View

EUT Photo #7– Inside View

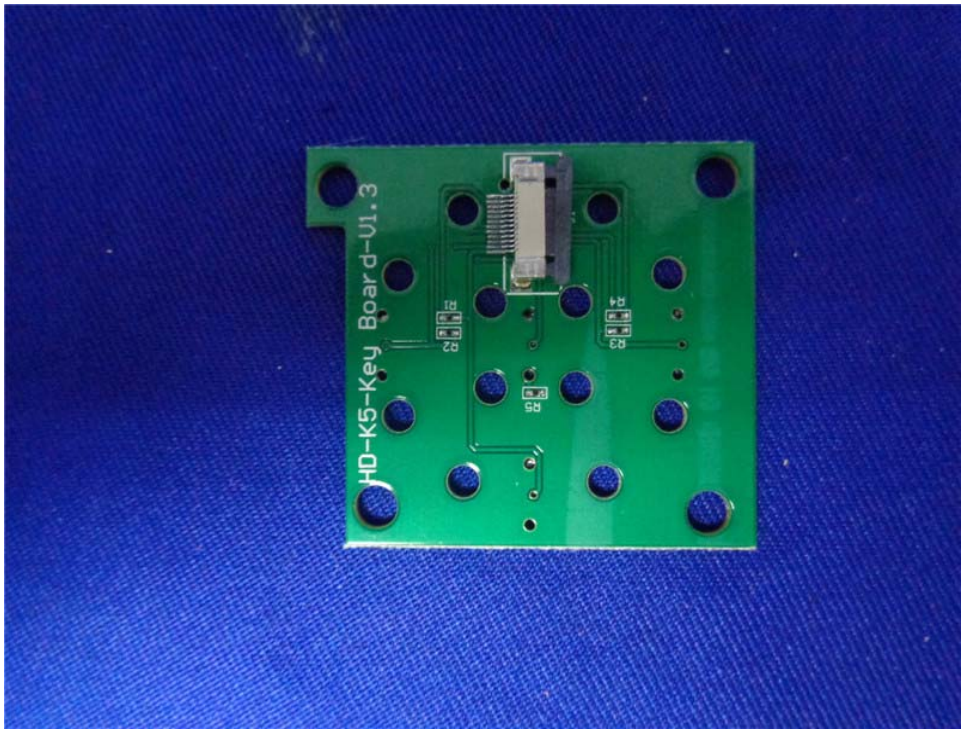
EUT Photo #8– Inside View



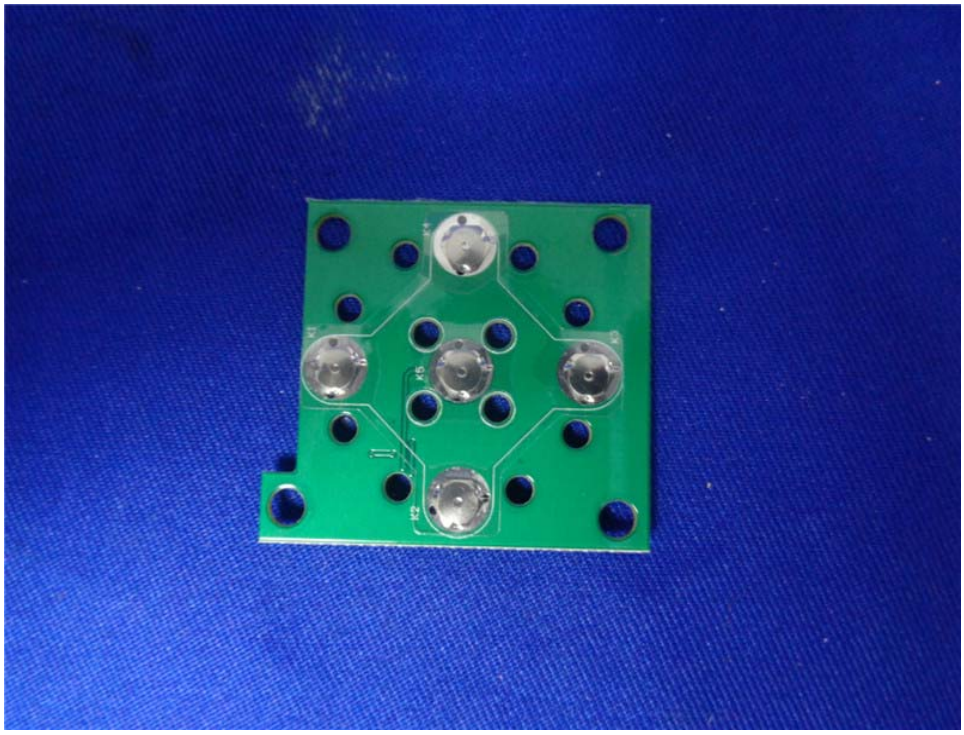
EUT Photo #9– Inside View



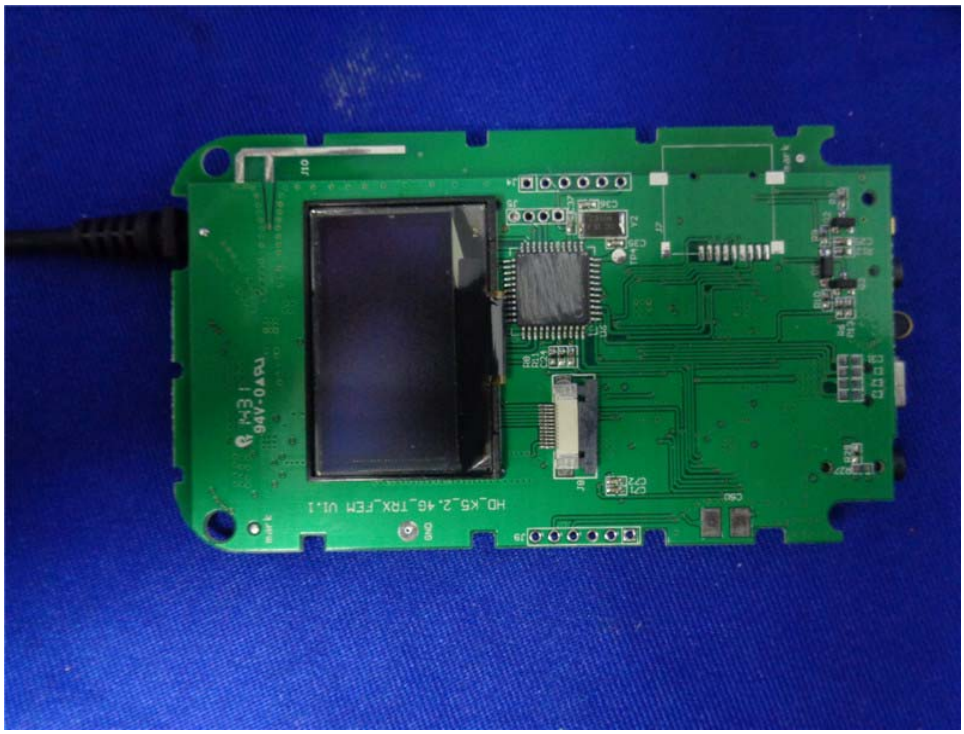
EUT Photo #10– Inside View



EUT Photo #11– Inside View



EUT Photo #12– Inside View



EUT Photo #13– Inside View