

FCC Part 15C

Measurement and Test Report

For

AQUATIC AV

282 Kinney Drive, San Jose, CA, 95112, United States

FCC ID: WBQAQRFDM5D

| | | |
|--------------------------------------|---|------------------|
| FCC Rule(s): | <u>FCC Part 15.249</u> | |
| Product Description: | <u>Water/Dust Proof MP3/iPod Digital Media Locker – 2.4 GHz TX Portion</u> | |
| Tested Model: | <u>AQ-DM-5UBT</u> | |
| Report No.: | <u>STR13128002I-1</u> | |
| Tested Date: | <u>2013-12-06 to 2013-12-24</u> | |
| Issued Date: | <u>2014-01-06</u> | |
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: AQUATIC AV
 Address of applicant: 282 Kinney Drive, San Jose, CA, 95112,
 United States
 Manufacturer: Eastern Partner Limited
 Address of manufacturer: Rm. 1413, ICC Tower, Fuhau San Road,
 Futian CBD, Shenzhen, 518048, China

| General Description of EUT | |
|--|--|
| Product Name: | Water/Dust Proof MP3/iPod Digital Media Locker – 2.4 GHz TX Portion |
| Trade Names: | AQUATIC AV, JACUZZI, SUNDANCE |
| Model Nos.: | AQ-DM-5UBT, AQ-DM-5UBTG, AQ-DM-5, AQ-DM-5G, AQ-DM-5BT, AQ-DM-5BTG, AQ-BC-5UBT, AQ-BC-5UBTG, AQ-BC-5BT, AQ-BC-5BTG, 6500-819, 6500-400, 6500-880, 6560-300, 6560-302, AQ-RFDM-5U, AQ-RFDM-5BT, AQ-RFDM-5F, AQ-DM-5BT-NR, AQ-DM-5BTG-NR, AQ-BC-5BT-NR, AQ-BC-5BTG-NR, AQ-RFDM-5UBT |
| Rated Voltage: | DC 12V |
| <i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i> | |

| Technical Characteristics of EUT | |
|-----------------------------------|------------------|
| Frequency Range: | 2418.8 MHz |
| Max. Field Strength: | 88.95 dBuV/m |
| Data Rate: | / |
| Modulation: | GFSK |
| Quantity of Channels: | 1 |
| Channel Separation: | / |
| Antenna Type: | Integral Antenna |
| Antenna Gain: | 0 dBi |
| Lowest Internal Frequency of EUT: | 32.768kHz |
| Device Category: | Fixed Device |

1.2 Test Standards

The following report is prepared on behalf of the AQUATIC AV in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions Rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions Rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

| Test Mode List | | |
|----------------|--------------|------------|
| Test Mode | Description | Remark |
| TM1 | Transmitting | 2418.8 MHz |

| Special Cable List and Details | | | |
|--------------------------------|------------|-------------------------|--------------------------|
| Cable Description | Length (m) | Shielded/ Unshielded | With/ Without Ferrite |
| / | / | / | / |

| Auxiliary Equipment List and Details | | | |
|--------------------------------------|--------------|-------|---------------|
| Description | Manufacturer | Model | Serial Number |
| / | / | / | / |

2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|---------------|------------------------------|-----------|
| §15.203 | Antenna Requirement | Compliant |
| §15.205 | Restricted Band of Operation | Compliant |
| §15.207(a) | Conducted Emission | N/A |
| §15.209(a)(f) | Radiated Spurious Emissions | Compliant |
| §15.249(a) | Field Strength of Emissions | Compliant |
| §15.249(d) | Out of Band Emission | Compliant |
| §15.215 (c) | Emission Bandwidth | Compliant |

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an integral antenna, it's a whip antenna, about 12cm long, more detail please see the internal photos, it fulfill the requirement of this section.

4. Radiated Emissions

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to FCC Part 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency | Field strength of fundamental (milli-volts/meter) | Field strength of Harmonics (micro-volts/meter) |
|-----------------------|--|--|
| 902-928 MHz | 50 | 500 |
| 2400-2483.5 MHz | 50 | 500 |
| 5725-5875 MHz | 50 | 500 |
| 24.0-24.25 GHz | 250 | 2500 |

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.3 Test Equipment List and Details

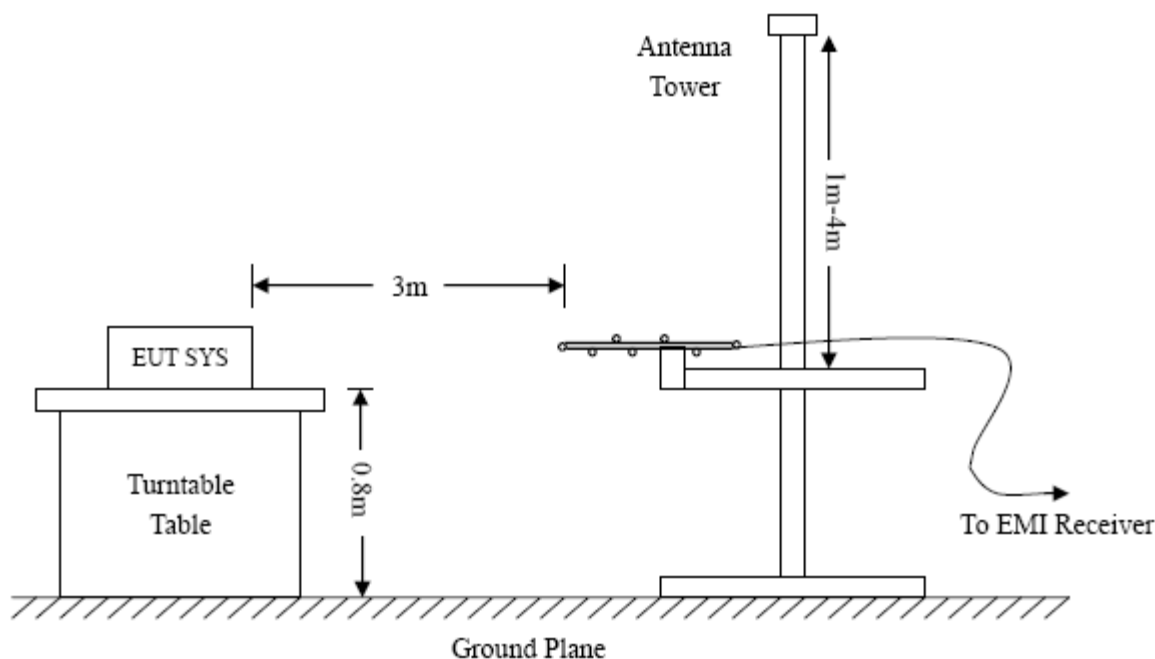
| Description | Manufacturer | Model | Serial Number | Cal. Date | Due. Date |
|--------------------------|----------------------|-----------|---------------|------------|------------|
| Spectrum Analyzer | R&S | FSP | 836079/035 | 2013-05-07 | 2014-05-06 |
| EMI Test Receiver | R&S | ESVB | 825471/005 | 2013-05-07 | 2014-05-06 |
| Pre-amplifier | Agilent | 8447F | 3113A06717 | 2013-05-07 | 2014-05-06 |
| Pre-amplifier | Compliance Direction | PAP-0118 | 24002 | 2013-05-07 | 2014-05-06 |
| Trilog Broadband Antenna | SCHWARZBECK | VULB9163 | 9163-333 | 2013-04-20 | 2014-04-19 |
| Horn Antenna | ETS | 3117 | 00086197 | 2013-04-20 | 2014-04-19 |
| Loop Antenna | SCHWARZECK | HFRA 5165 | 9365 | 2013-04-20 | 2014-04-19 |

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



Frequency: 9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency: 30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency: Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.6 Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 24 °C |
| Relative Humidity: | 60 % |
| ATM Pressure: | 1012 mbar |

4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

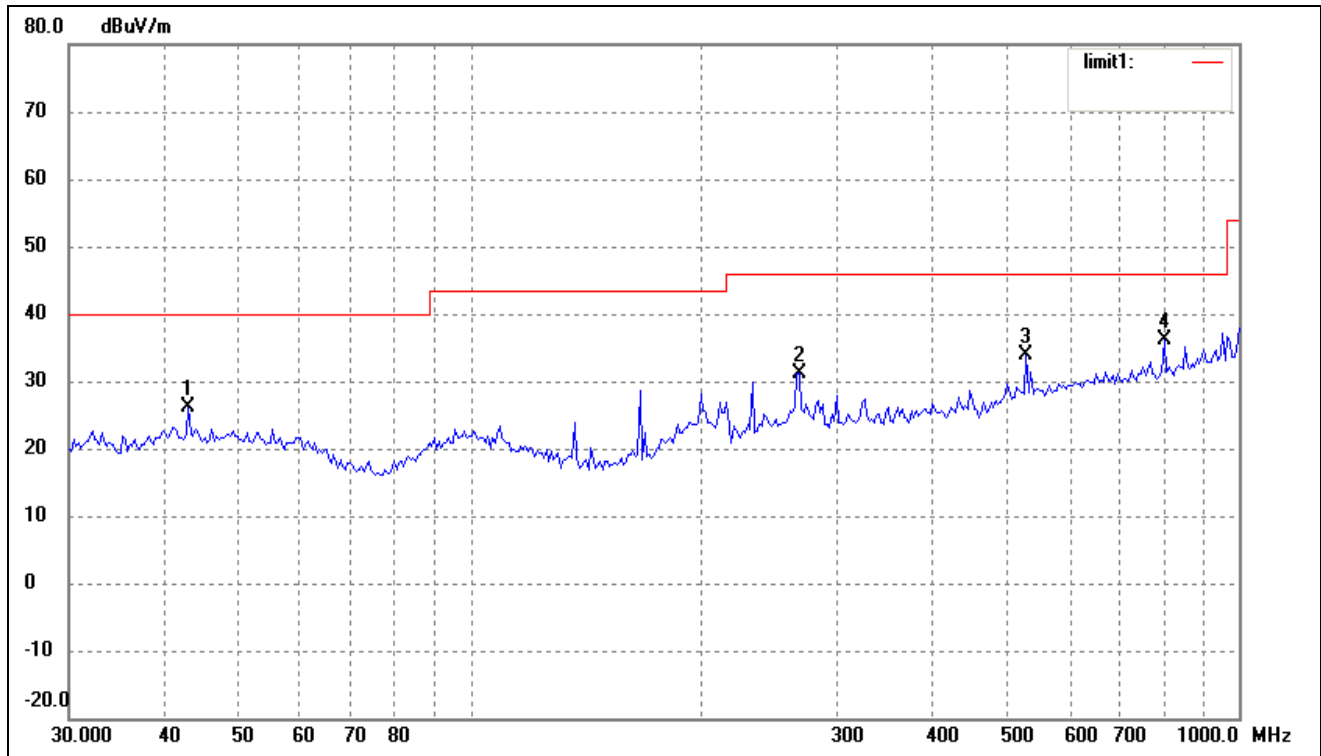
EUT: Water/Dust Proof MP3/iPod Digital Media Locker – 2.4 GHz TX Portion

Tested Model: AQ-DM-5UBT

Operating Condition: Transmitting

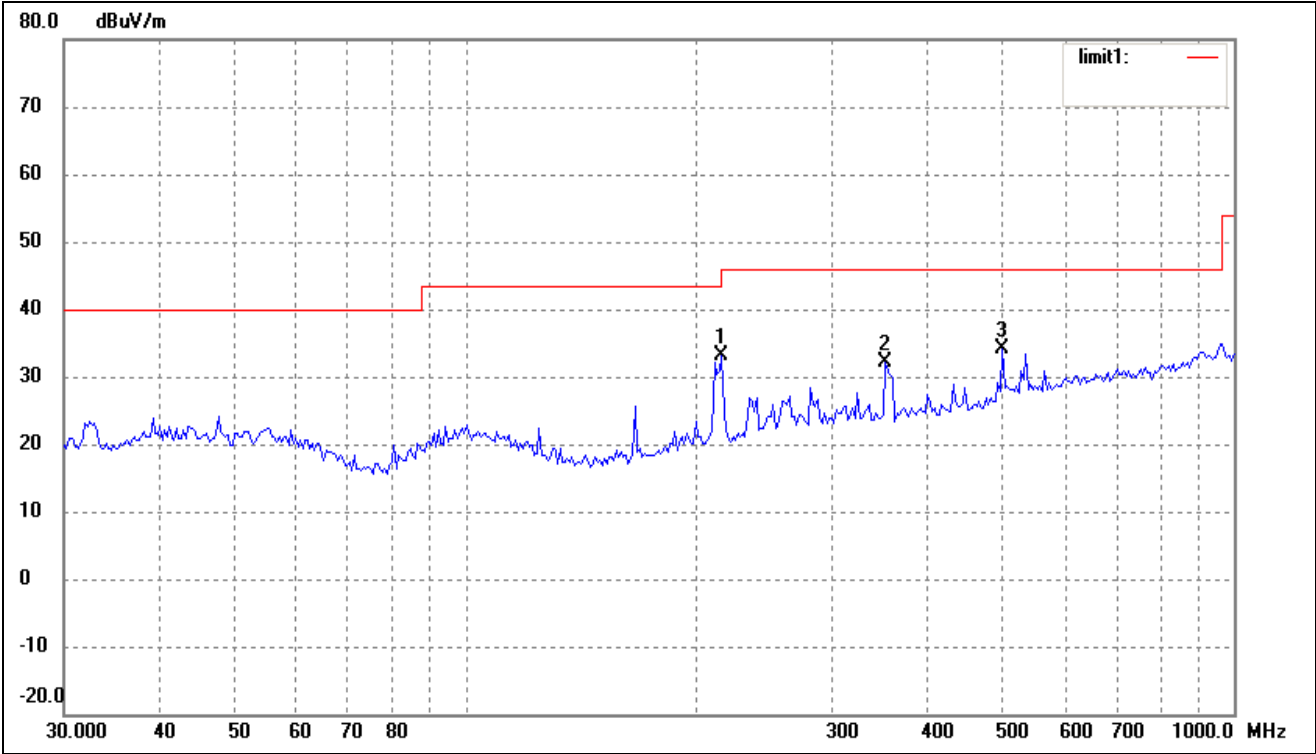
Comment: DC 12V

Test Specification: Horizontal



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct dB/m | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Degree (°) | Height (cm) | Remark |
|-----|--------------------|---------------------|-----------------|--------------------|-------------------|----------------|-----------------|----------------|--------|
| 1 | 42.8998 | 18.15 | 7.97 | 26.12 | 40.00 | -13.88 | 122 | 100 | peak |
| 2 | 267.5455 | 23.12 | 8.12 | 31.24 | 46.00 | -14.76 | 21 | 100 | peak |
| 3 | 528.2458 | 20.95 | 12.91 | 33.86 | 46.00 | -12.14 | 36 | 100 | peak |
| 4 | 798.9797 | 20.59 | 15.50 | 36.09 | 46.00 | -9.91 | 58 | 100 | peak |

Test Specification: Vertical



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|-----|-----------|----------|---------|----------|----------|--------|--------|--------|--------|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | (°) | (cm) | |
| 1 | 215.2678 | 27.03 | 6.18 | 33.21 | 43.50 | -10.29 | 336 | 100 | peak |
| 2 | 351.7079 | 22.69 | 9.48 | 32.17 | 46.00 | -13.83 | 28 | 100 | peak |
| 3 | 499.4247 | 21.25 | 12.88 | 34.13 | 46.00 | -11.87 | 84 | 100 | peak |

Spurious Emissions Above 1GHz

| Frequency | Reading | Correct | Result | Limit | Margin | Polar | Detector |
|-----------|----------|---------|----------|----------|--------|-------|----------|
| (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | H/V | |
| 2418.8 | 90.03 | -3.46 | 86.57 | 114 | -27.43 | H | PK |
| 2418.8 | 73.62 | -3.46 | 70.16 | 94 | -23.84 | H | AV |
| 4837.6 | 71.03 | -1.65 | 69.38 | 74 | -4.62 | H | PK |
| 4837.6 | 52.61 | -1.65 | 50.96 | 54 | -3.04 | H | AV |
| 7256.4 | 67.05 | -0.48 | 66.57 | 74 | -7.43 | H | PK |
| 7256.4 | 48.28 | 0.48 | 48.76 | 54 | -5.24 | H | AV |
| 2418.8 | 92.41 | -3.46 | 88.95 | 114 | -25.05 | V | PK |
| 2418.8 | 75.7 | -3.46 | 72.24 | 94 | -21.76 | V | AV |
| 4837.6 | 69.54 | -1.65 | 67.89 | 74 | -6.11 | V | PK |
| 4837.6 | 51.45 | -1.65 | 49.80 | 54 | -4.2 | V | AV |
| 7256.4 | 69.44 | -0.48 | 68.96 | 74 | -5.04 | V | PK |
| 7256.4 | 50.69 | 0.48 | 51.17 | 54 | -2.83 | V | AV |

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz.

5. Out of Band Emissions

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Equipment List and Details

| Description | Manufacturer | Model | Serial Number | Cal. Date | Due. Date |
|--------------------------|----------------------|----------|---------------|------------|------------|
| Spectrum Analyzer | R&S | FSP | 836079/035 | 2013-05-07 | 2014-05-06 |
| EMI Test Receiver | R&S | ESVB | 825471/005 | 2013-05-07 | 2014-05-06 |
| Pre-amplifier | Agilent | 8447F | 3113A06717 | 2013-05-07 | 2014-05-06 |
| Pre-amplifier | Compliance Direction | PAP-0118 | 24002 | 2013-05-07 | 2014-05-06 |
| Trilog Broadband Antenna | SCHWARZBECK | VULB9163 | 9163-333 | 2013-04-20 | 2014-04-19 |
| Horn Antenna | ETS | 3117 | 00086197 | 2013-04-20 | 2014-04-19 |

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC Rules.

5.4 Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 24 °C |
| Relative Humidity: | 60 % |
| ATM Pressure: | 1012 mbar |

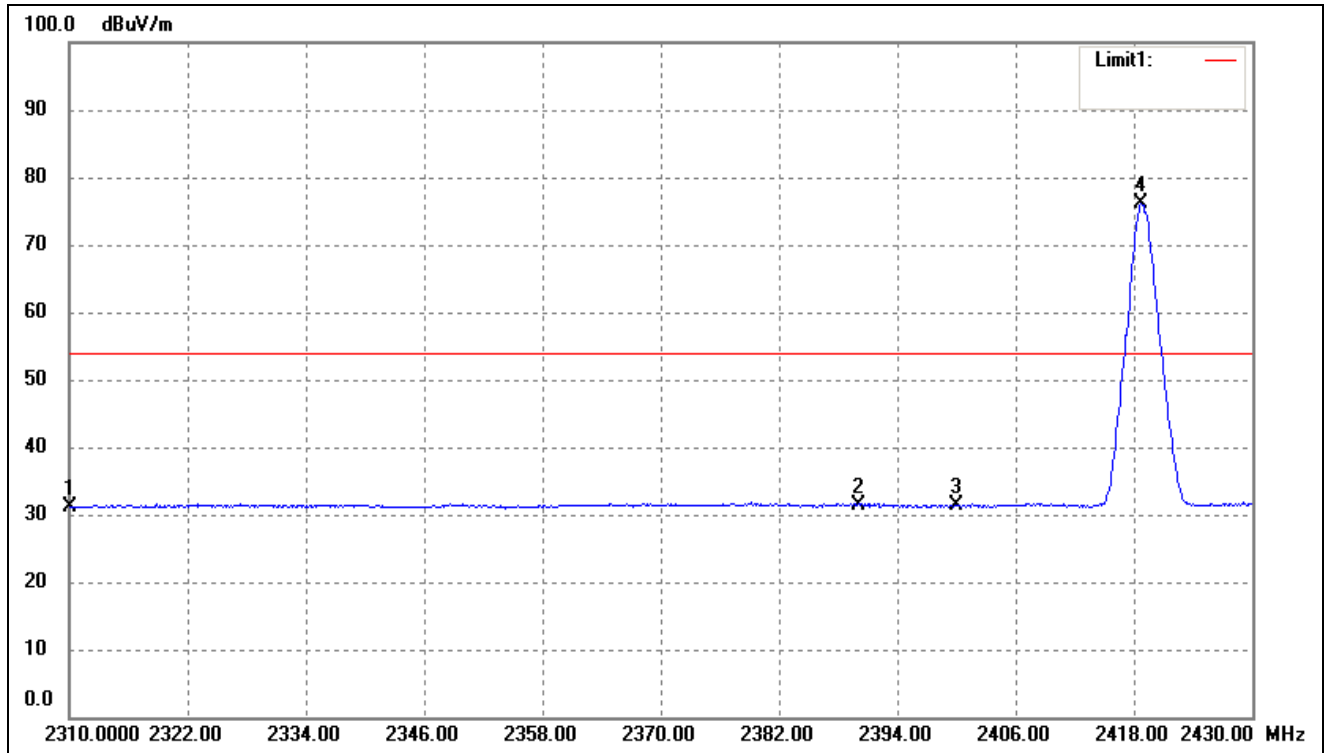
5.5 Summary of Test Results/Plots

| Test mode | Frequency | Limit | Result |
|-----------|-----------|------------|--------|
| | MHz | dBuV / dBc | |
| Lowest | 2310.00 | <54 dBuV | Pass |
| | 2390.00 | <54 dBuV | Pass |
| | 2400.00 | <54 dBuV | Pass |
| Highest | 2483.50 | <54 dBuV | Pass |
| | 2500.00 | <54 dBuV | Pass |

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

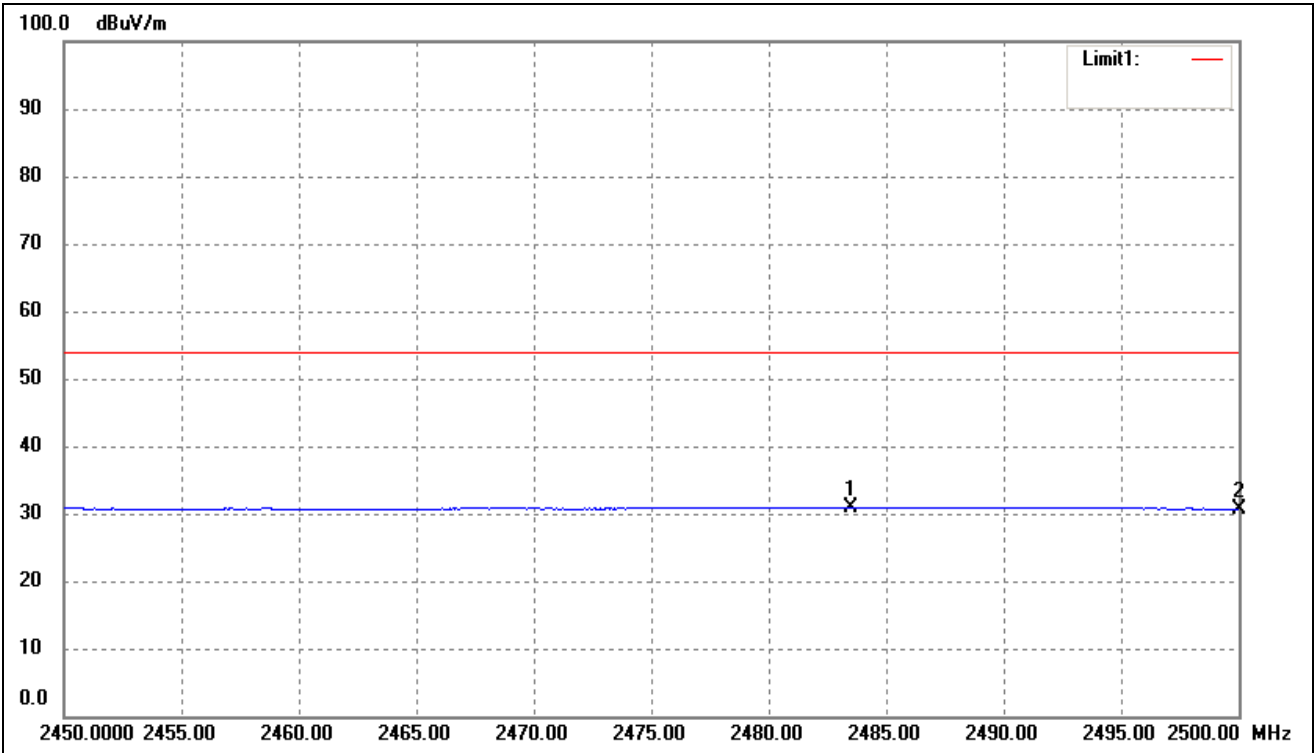
Please refer to the test plots as below.

Lowest Bandedge



| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|---------------|
| 1 | 2310.000 | 34.87 | -3.71 | 31.16 | 54.00 | -22.84 | Ave Detector |
| | 2310.000 | 48.22 | -3.71 | 44.51 | 74.00 | -29.49 | Peak Detector |
| 2 | 2390.000 | 35.04 | -3.54 | 31.50 | 54.00 | -22.50 | Ave Detector |
| | 2390.000 | 48.29 | -3.54 | 44.75 | 74.00 | -29.25 | Peak Detector |
| 3 | 2400.000 | 34.77 | -3.51 | 31.26 | 54.00 | -22.74 | Ave Detector |
| 4* | 2418.800 | 79.49 | -3.46 | 76.03 | 54.00 | 22.03 | Ave Detector |

Highest Bandedge



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Detector |
|-----|-----------|---------|---------|----------|----------|--------|---------------|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1* | 2483.500 | 34.22 | -3.33 | 30.89 | 54.00 | -23.11 | Ave Detector |
| | 2483.500 | 47.06 | -3.33 | 43.73 | 74.00 | -30.27 | Peak Detector |
| 2 | 2500.000 | 33.98 | -3.28 | 30.70 | 54.00 | -23.30 | Ave Detector |
| | 2500.000 | 46.39 | -3.28 | 43.11 | 74.00 | -30.89 | Peak Detector |

6. Emission Bandwidth

6.1 Standard Applicable

According to FCC Part 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Equipment List and Details

| Description | Manufacturer | Model | Serial Number | Cal. Date | Due. Date |
|-------------------|--------------|-------------|---------------|------------|------------|
| Spectrum Analyzer | Agilent | E4402B | US41192821 | 2013-05-07 | 2014-05-06 |
| Attenuator | ATTEN | ATS100-4-20 | / | 2013-05-07 | 2014-05-06 |

6.3 Test Procedure

According to the ANSI 63.4-2003, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW \geq 1% 20dB Bandwidth, VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

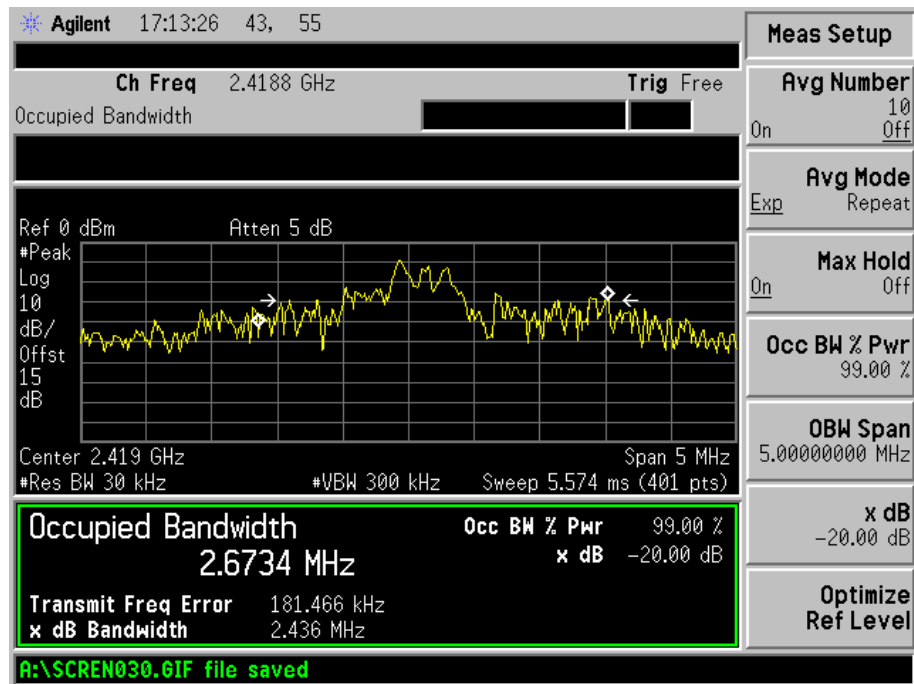
6.4 Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 25 °C |
| Relative Humidity: | 53% |
| ATM Pressure: | 1018 mbar |

6.5 Summary of Test Results/Plots

| Frequency MHz | 20dB Bandwidth kHz | 99% Bandwidth kHz |
|------------------|-----------------------|----------------------|
| 2418.8 | 2436 | 2673.4 |

Please refer to the following test plots



***** END OF REPORT *****