**Compliance Testing, LLC**
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268
fax: (480) 926-3598
http://www.ComplianceTesting.com
info@ComplianceTesting.com

# Test Report

**Prepared for: ClimbTag LLC**

**Model: Climbtag**

**Description: RFID BLE wrist worn device for monitoring rock climbing activities**

**Serial Number: N/A**

**FCC ID: NANLO-CLIMBTAG10**

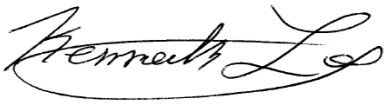
**To**

**FCC Part 15.247**
**And**
**IC RSS-247**

**Date of Issue: October 13, 2017**

| | |
|---|---|
| **On the behalf of the applicant:** | **ClimbTag LLC**<br>**31 Walnut Street**<br>**Suite 12**<br>**Summerville, MA 02143** |
| **Attention of:** | **Shay Ohayon**<br>**Ph: (626)354-5628**<br>**E-Mail: shay.ohayon@gmail.com** |

**Prepared By**
**Compliance Testing, LLC**
**1724 S. Nevada Way**
**Mesa, AZ 85204**
**(480) 926-3100 phone / (480) 926-3598 fax**
**www.compliancetesting.com**
**Project No: p1790019**



**Kenneth Lee**
**Project Test Engineer**

**Test Report Revision History**

| Revision | Date | Revised By | Reason for Revision |
|---|---|---|---|
| 1.0 | September 27, 2017 | Kenneth Lee | Original Document |
| 2.0 | October 13, 2017 | Kenneth Lee | Updated the Output Power and PSD results to show the Antenna Gain removed from the EIRP. Added statements to Annex A |
| | | | |
| | | | |

**Table of Contents**

## ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

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#2152.01

**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**

**The applicant has been cautioned as to the following**

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

**Standard Test Conditions Engineering Practices**

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

| Environmental Conditions | | |
|---|---|---|
| **Temperature (ºC)** | **Humidity (%)** | **Pressure (mbar)** |
| 19-25 | 30-38 | 962-974 |

**EUT Description**
**Model:** Climbtag
**Description:** RFID BLE wrist worn device for monitoring rock climbing activities
**Firmware:** N/A
**Software:** N/A
**Serial Number:** N/A
**Additional Information:** The EUT implements BLE modulation. The EUT was not provided with an AC adapter so a generic adapter was used to show compliance for Conducted Emissions.

**EUT Operation during Tests**
The EUT was set to transmit at the lowest, middle and highest channel of operation at the maximum available power setting. The EUT was controlled via TeraTerm software on a laptop computer.

**Accessories:**

| Qty | Description | Manufacturer | Model | S/N |
|---|---|---|---|---|
| 1 | AC Adapter | Just Wireless | SKU 04068 | N/A |

**Cables:** None

**Modifications:** None

**15.203: Antenna Requirement:**

| | |
|---|---|
| **X** | The antenna is permanently attached to the EUT |
| | The antenna uses a unique coupling |
| | The EUT must be professionally installed |
| | The antenna requirement does not apply |

**Test Results Summary**

| FCC 15.247 Specification | RSS-247 Specification | Test Name | Pass, Fail, N/A | Comments |
|---|---|---|---|---|
| 15.247(b) | Section 5.4(d) | Output Power | Pass | |
| 15.247(d) | Section 5.5 | Conducted Spurious Emissions | N/A | EUT has No Antenna Port |
| 15.247(d), 15.209(a), 15.205 | Section 5.5 | Radiated Spurious Emissions | Pass | |
| 15.247(d), 15.209(a), 15.205 | Section 5.5 | Emissions At Band Edges | Pass | |
| 15.247(a)(2) | Sections 5.2(a) | Occupied Bandwidth | Pass | |
| 15.247(e) | Section 5.2(b) | Transmitter Power Spectral Density | Pass | |
| 15.207 | RSS-GEN Section 8.8 | A/C Powerline Conducted Emissions | Pass | |

| References | Description |
|---|---|
| CFR47, Part 15, Subpart B | Unintentional Radiators |
| CFR47, Part 15, Subpart C | Intentional Radiators |
| ANSI C63.10-2013 | American National standard for testing Unlicensed Wireless Devices |
| ANSI C63.4-2014 | Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz. |
| ISO/IEC 17025:2005 | General requirements for the Competence of Testing and Calibrations Laboratories |
| KDB 558074 D01 v04 | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247 |

**Output Power**
**Engineer:** Kenneth Lee
**Test Date:** 9/27/2017

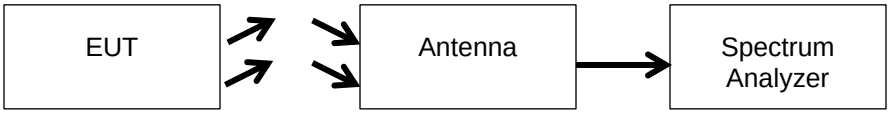
## Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Output Power. A reference level offset of 11.8 was put into the analyzer to obtain EIRP measurements. The Antenna gain was then added to the EIRP to obtain Antenna Port results.

The Spectrum Analyzer was set to the following:

RBW ≥ DTS Bandwidth
VBW ≥ 3 x RBW
Span ≥ 3 x RBW
Sweep time = auto couple
Detector = peak
Trace Mode = max hold

## Test Setup




## Transmitter Output Power Summary Table

| Tuned Frequency (MHz) | Measured Value (dBm) | Antenna Gain (dBi) | Corrected Reading (dBm) | Specification Limit | Result |
|---|---|---|---|---|---|
| 2402 | -2.075 | -1.925 | -0.15 | 1 W (30 dBm) | Pass |
| 2440 | -3.446 | -1.925 | -1.521 | 1 W (30 dBm) | Pass |
| 2480 | -4.293 | -1.925 | -2.368 | 1 W (30 dBm) | Pass |

**Radiated Spurious Emissions**
**Engineer:** Kenneth Lee
**Test Date:** 9/27/2017

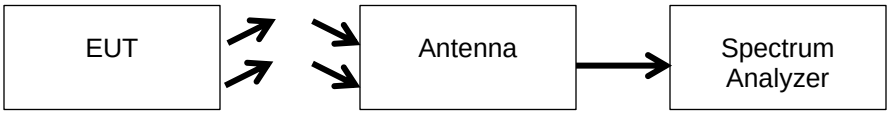
**Test Procedure**
**Radiated Spurious Emissions: 30 – 1000 MHz**

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

All emissions from 30 MHz to 1 GHz were examined.
Measured Level includes antenna and receiver cable correction factors.
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz
VBW = 300 KHz
Detector – Quasi Peak

**Test Setup**

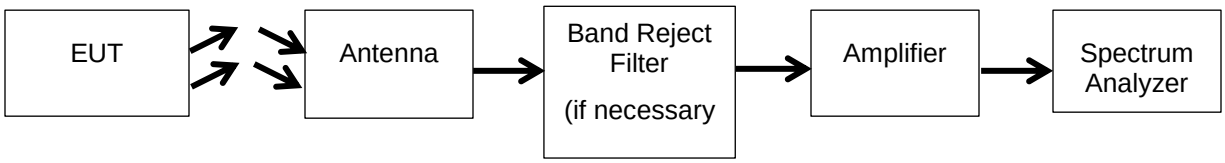



**Test Procedure for**
**Radiated Spurious Emissions above 1 GHz**

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

RBW = 100 KHz and 1 MHz
VBW = 300 KHz and 3 MHz
Detector – Peak

**Test Setup**



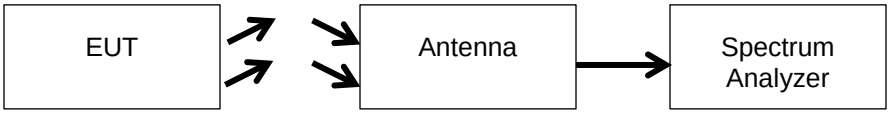

**See Annex A for test data**

**Emissions at Band Edges**
**Engineer:** Kenneth Lee
**Test Date:** 9/27/2017

## Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for band edges.

## Test Setup

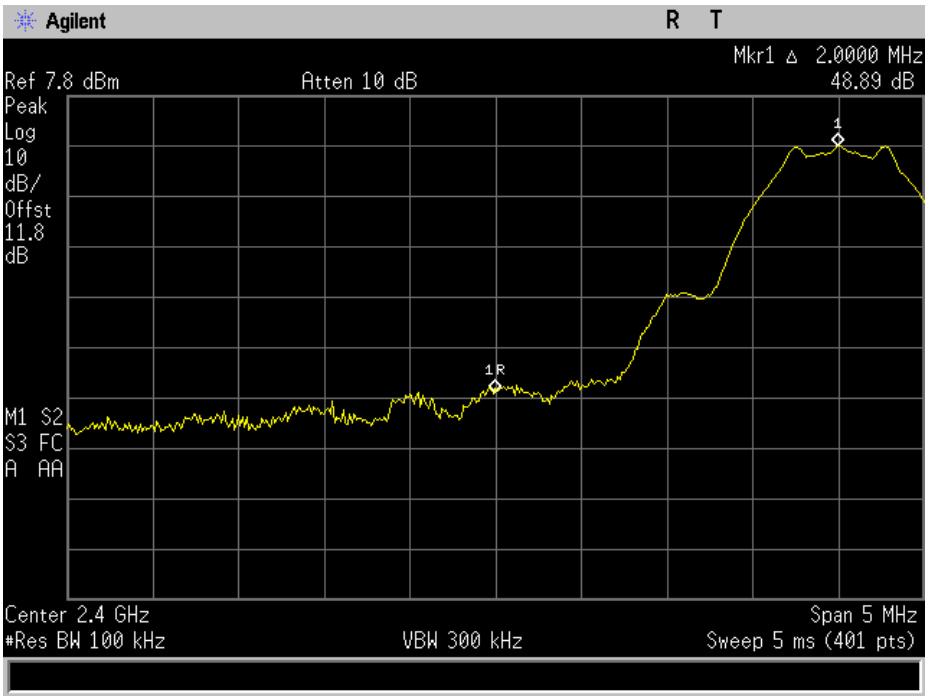



## Band Edge Emissions Summary

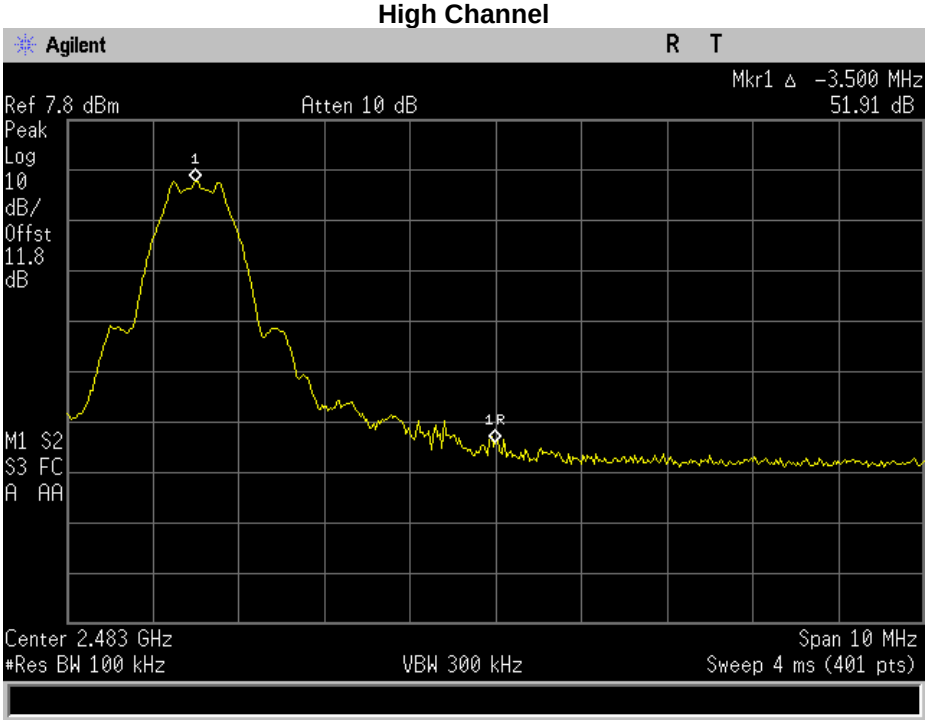
| Tuned Frequency (MHz) | Emission Frequency (MHz) | Monitored Level | Detector | Limit | Result |
|---|---|---|---|---|---|
| 2402 | 2400 | -48.89 | Peak | -20 dBc | Pass |
| 2480 | 2483.5 | -51.91 | Peak | -20 dBc | Pass |

## Band Edge Plots

### Low Channel




### High Channel



**DTS Bandwidth**
**Engineer:** Kenneth Lee
**Test Date:** 9/27/2017

## Test Procedure

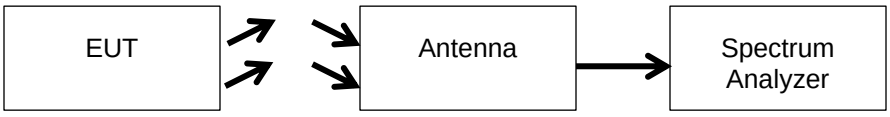
The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the Bandwidth requirements.

The Spectrum Analyzer was set to the following:

RBW = 100 kHz
VBW ≥ 3 x RBW
Peak Detector
Trace mode = max hold
Sweep = auto couple

The Spectrum Analyzers Occupied Bandwidth Function was used, with the measurement set to -6dB Bandwidth.

## Test Setup




### 6 dB Occupied Bandwidth Summary

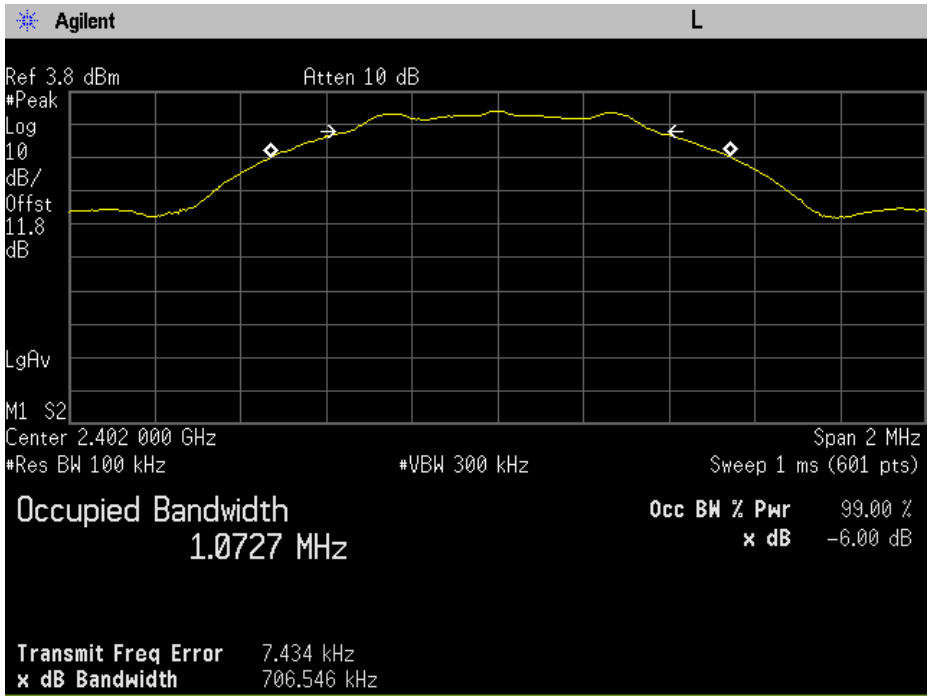
| Frequency (MHz) | Measured Bandwidth (kHz) | Specification Limit (kHz) | Result |
|---|---|---|---|
| 2402 | 706.546 | ≥ 500 | Pass |
| 2440 | 705.22 | ≥ 500 | Pass |
| 2480 | 712.986 | ≥ 500 | Pass |

### 99% Bandwidth Summary

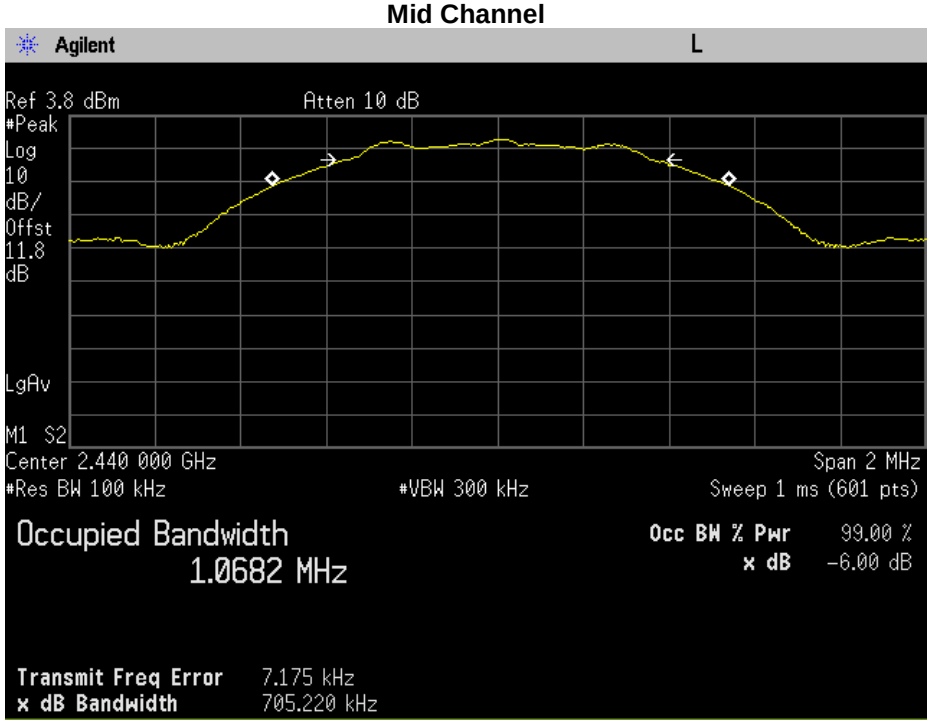
| Frequency (MHz) | Measured Bandwidth (kHz) | Result |
|---|---|---|
| 2402 | 1072.7 | Pass |
| 2440 | 1068.2 | Pass |
| 2480 | 1070.8 | Pass |

## 6 dB and 99% Bandwidth Plots

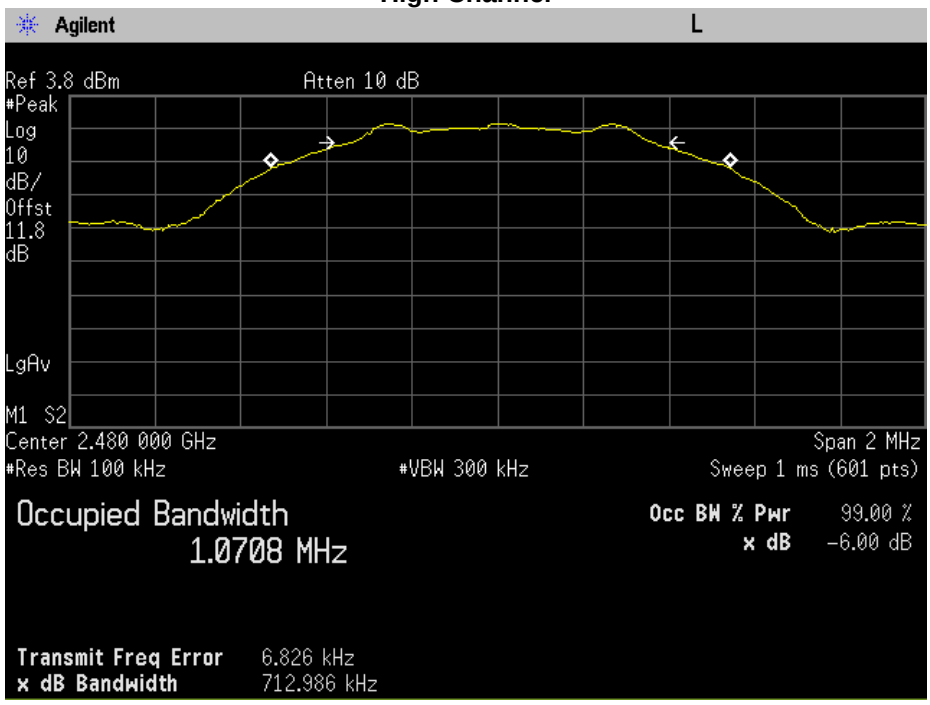
**Low Channel**




**Mid Channel**



**High Channel**



**Transmitter Power Spectral Density (PSD)**
**Engineer:** Kenneth Lee
**Test Date:** 9/27/2017

## Test Procedure

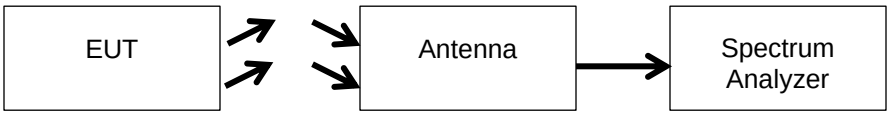
The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements. A reference level offset of 11.8 was put into the analyzer to obtain EIRP measurements. The Antenna gain was then added to the EIRP to obtain Antenna Port results.

The Spectrum Analyzer was set to the following:

DTS channel center frequency
Span 1.5 x DTS bandwidth
RBW =3 kHz ≤ RBW ≤ 100 kHz
VBW ≥ 3 x RBW
Peak Detector
Sweep time = auto couple
Trace mode = max hold

Once the trace has stabilized the peak marker was used to determine the power spectral density.

## Test Setup

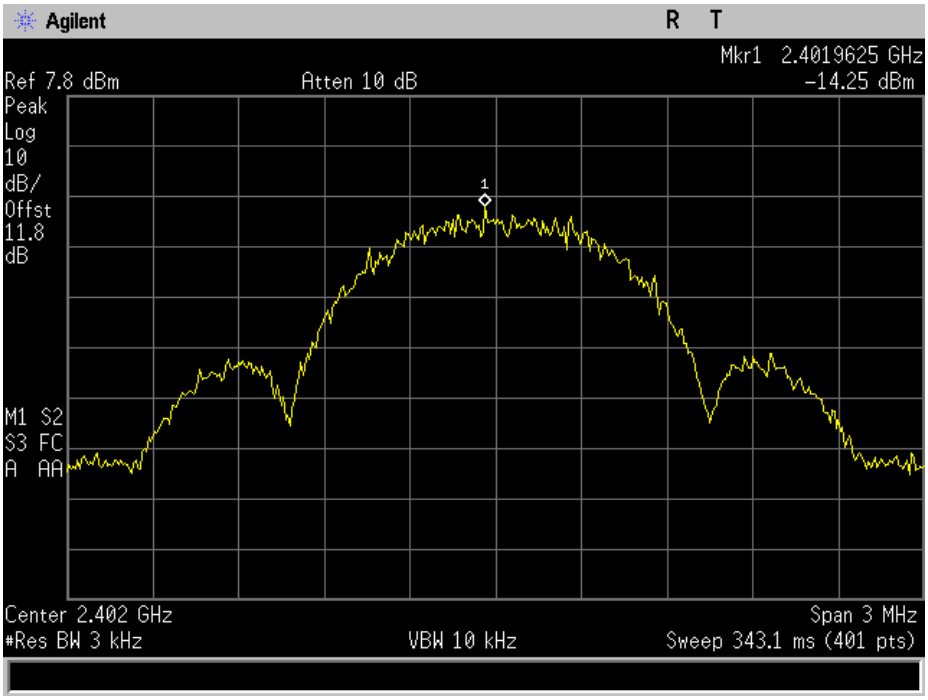



## PSD Summary

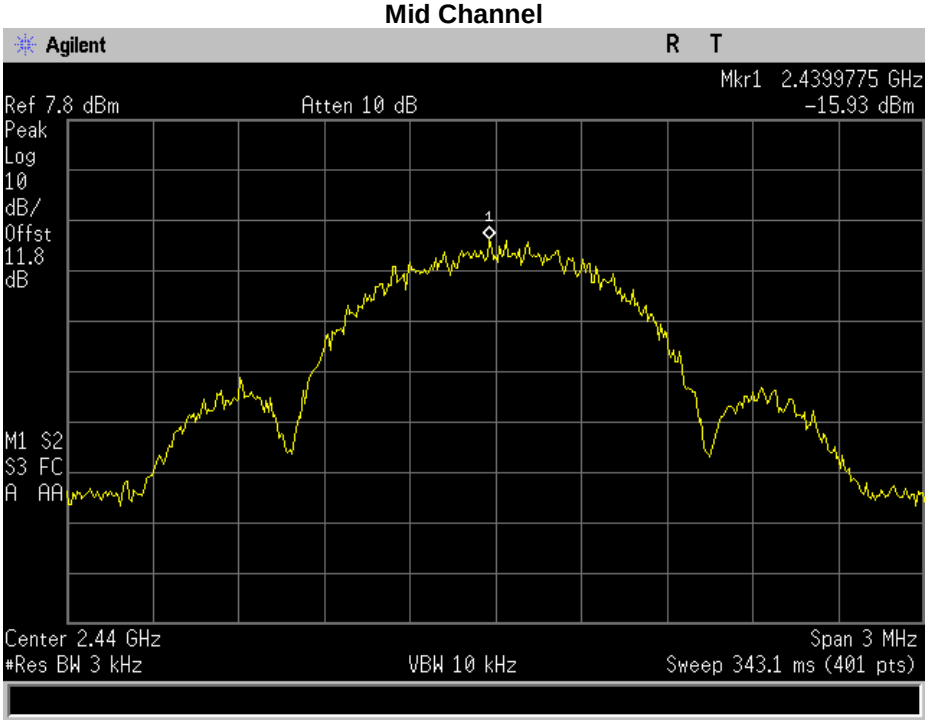
| Frequency (MHz) | Measured Data (dBm) | Antenna Gain (dBi) | Corrected Reading (dBm) | Specification Limit (dBm) | Result |
|---|---|---|---|---|---|
| 2402 | -14.25 | -1.925 | -12.325 | 8 | Pass |
| 2440 | -15.93 | -1.925 | -14.005 | 8 | Pass |
| 2480 | -16.3 | -1.925 | -14.375 | 8 | Pass |

## PSD Plots

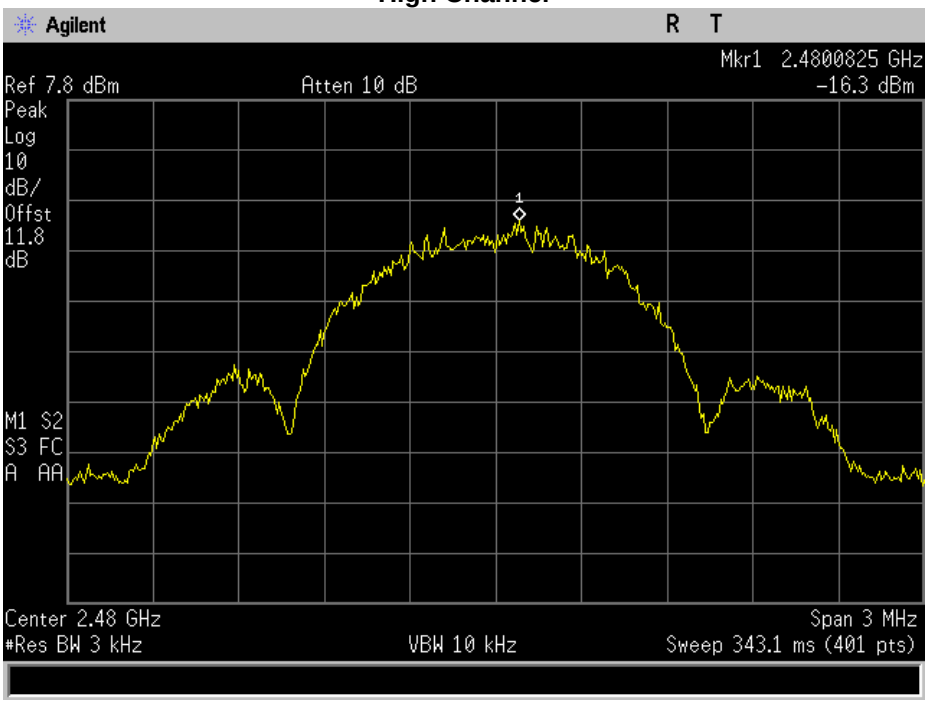
### Low Channel




### Mid Channel



**High Channel**



**A/C Powerline Conducted Emission**

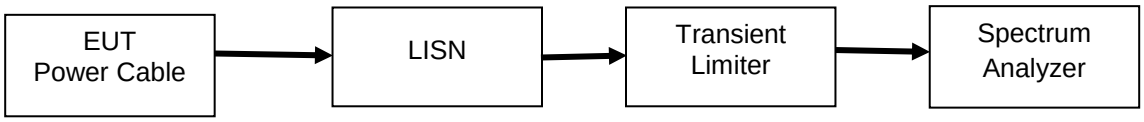
**Engineer:** Kenneth Lee

**Test Date:** 9/27/2017

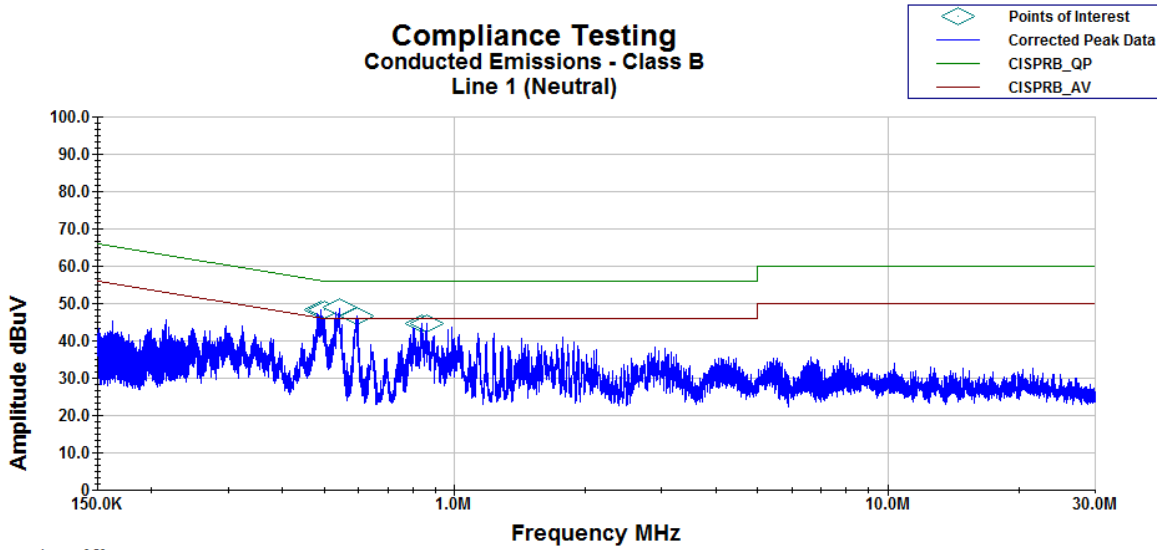
## Test Procedure

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

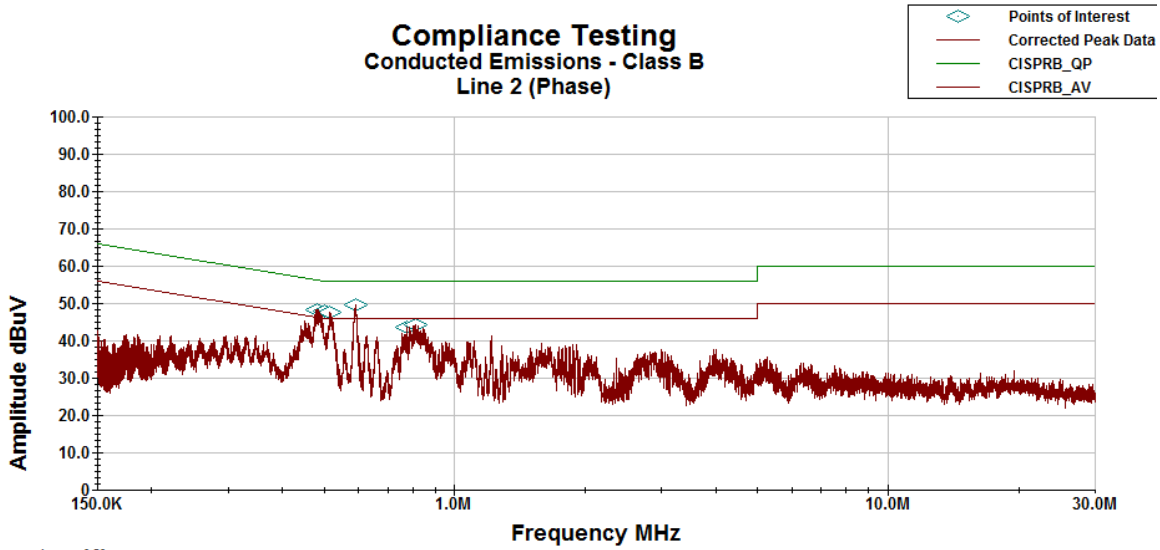
## Test Setup



## Conducted Emissions Test Results




**Operator: KL**
**Conducted Emissions.til** **Job #: p1790019**




**Operator: KL**
**Conducted Emissions.til** **Job #: p1790019**

**Line 1 Neutral Avg Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | Avg Margin (dB) |
|---|---|---|---|---|---|---|---|
| 492.87 KHz | 26.19 | 0.1 | 0.03 | 10.1 | 36.423 | 46.204 | -9.78 |
| 497.15 KHz | 25.73 | 0.1 | 0.03 | 10.1 | 35.957 | 46.081 | -10.125 |
| 544.67 KHz | 21.45 | 0.1 | 0.03 | 10.1 | 31.68 | 46 | -14.32 |
| 592.33 KHz | 30.03 | 0.1 | 0.03 | 10.1 | 40.26 | 46 | -5.74 |
| 848.3 KHz | 20.67 | 0 | 0.04 | 10.1 | 30.807 | 46 | -15.193 |
| 865.55 KHz | 19.27 | 0 | 0.04 | 10.1 | 29.413 | 46 | -16.587 |

**Line 2 Phase Avg Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | Avg Margin (dB) |
|---|---|---|---|---|---|---|---|
| 485.0 KHz | 25.26 | 0.1 | 0.03 | 10.1 | 35.487 | 46.429 | -10.942 |
| 490.6 KHz | 27.71 | 0.1 | 0.03 | 10.1 | 37.943 | 46.269 | -8.325 |
| 524.1 KHz | 21.67 | 0.1 | 0.03 | 10.1 | 31.897 | 46 | -14.103 |
| 590.1 KHz | 33.08 | 0.1 | 0.03 | 10.1 | 43.31 | 46 | -2.69 |
| 775.33 KHz | 21.36 | 0.01 | 0.039 | 10.1 | 31.514 | 46 | -14.486 |
| 814.86 KHz | 21.8 | 0 | 0.04 | 10.1 | 31.94 | 46 | -14.06 |

**Line 1 Neutral QP Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | QP Margin (dB) |
|---|---|---|---|---|---|---|---|
| 492.87 KHz | 32.46 | 0.1 | 0.03 | 10.1 | 42.69 | 56.204 | -13.514 |
| 497.15 KHz | 32.71 | 0.1 | 0.03 | 10.1 | 42.94 | 56.081 | -13.141 |
| 544.67 KHz | 27.97 | 0.1 | 0.03 | 10.1 | 38.2 | 56 | -17.8 |
| 592.33 KHz | 32.93 | 0.1 | 0.03 | 10.1 | 43.16 | 56 | -12.84 |
| 848.3 KHz | 26.16 | 0 | 0.04 | 10.1 | 36.3 | 56 | -19.7 |
| 865.55 KHz | 28.05 | 0 | 0.04 | 10.1 | 38.19 | 56 | -17.81 |

**Line 2 Phase QP Detector**

| Frequency | Measured Value (dBuV) | LISN Correction Factor (dB) | Cable Loss (dB) | Transient Limiter (dB) | Final Data (dBuV) | Limit (dBuV) | QP Margin (dB) |
|---|---|---|---|---|---|---|---|
| 485.0 KHz | 33.76 | 0.1 | 0.03 | 10.1 | 43.99 | 56.429 | -12.439 |
| 490.6 KHz | 34.7 | 0.1 | 0.03 | 10.1 | 44.93 | 56.269 | -11.339 |
| 524.1 KHz | 28.6 | 0.1 | 0.03 | 10.1 | 38.83 | 56 | -17.17 |
| 590.1 KHz | 36.35 | 0.1 | 0.03 | 10.1 | 46.58 | 56 | -9.42 |
| 775.33 KHz | 28.63 | 0.01 | 0.039 | 10.1 | 38.781 | 56 | -17.219 |
| 814.86 KHz | 29.44 | 0 | 0.04 | 10.1 | 39.58 | 56 | -16.42 |

**Test Equipment Utilized**

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| EMI Receiver | HP | 8546A | i00033 | 3/28/17 | 3/28/18 |
| Transient Limiter | Com-Power | LIT-153 | i00123 | Verified on: 9/27/17 | |
| Horn Antenna | ARA | DRG-118/A | i00271 | 6/16/16 | 6/16/18 |
| Humidity / Temp Meter | Newport | IBTHX-W-5 | i00282 | 6/9/17 | 6/9/18 |
| Bi-Log Antenna | Schaffner | CBL 6111D | i00349 | 8/3/16 | 8/3/18 |
| AC Power Source | Behlman | BL 6000 | i00362 | Verified on: 9/27/17 | |
| EMI Analyzer | Agilent | E7405A | i00379 | 2/22/17 | 2/22/18 |
| 3 Meter Semi-Anechoic Chamber | Panashield | 3 Meter Semi-Anechoic Chamber | i00428 | 8/15/16 | 8/15/19 |
| LISN | COM-Power | LI-125A | i00447 | 9/11/17 | 9/11/19 |
| LISN | COM-Power | LI-125A | i00449 | 9/11/17 | 9/11/19 |
| PSA Spectrum Analyzer | Agilent | E4445A | i00471 | 9/6/17 | 9/6/19 |
| Preamplifier for 1-18GHz horn antenna | Miteq | AFS44 00101 400 23-10P-44 | i00509 | N/A | N/A |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT