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May 7, 2014

Kent Britain  
SmartStock LLC, Inc.  
PO Box 337  
1310 N. Sewell  
Pawnee OK 74058  
USA

Dear Kent:

Thank you for allowing Professional Testing (EMI), Inc. an opportunity to perform testing for SmartStock LLC. Enclosed is the Wireless Certification Report for the SSL-BOLUS. This report can be used to demonstrate compliance with FCC requirements for wireless devices in the United States.

If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk  
President

Attachment

Project 13662-15

**SSL-BOLUS**

**Wireless Certification Report**

Prepared for:

SmartStock LLC, Inc.

By

Professional Testing (EMI), Inc.  
1601 North A.W. Grimes Blvd., Suite B  
Round Rock, Texas 78665

May 7, 2014

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Reviewed by



Larry Finn  
Product Development Engineer

Written by



Eric Lifsey  
Test Engineer

**Revision History**

| <b>Revision Number</b> | <b>Description</b>               | <b>Date</b> |
|------------------------|----------------------------------|-------------|
| 00                     | Draft for review.                | 2014-03-06  |
| 01                     | Revised per Larry Finn comments. | 2014-03-25  |
| 02                     | Revised per client comments.     | 2014-04-07  |
| 03                     | Revised section 1.2 by author.   | 2014-05-07  |

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NOTICE: (1) This Report must not be used to claim product endorsement, by NVLAP, NIST, the FCC or any other Agency. This report also does not warrant certification by NVLAP or NIST. (2) This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc. (3) The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.



## Certificate of Compliance

Applicant: SmartStock LLC, Inc.  
 Applicant's Address: SmartStock LLC, Inc. (Kent Britain)  
 PO Box 337  
 1310 N. Sewell  
 Pawnee OK 74058  
 USA  
 FCC ID: LPH-SSL001  
 Model: SSL-Bolus  
 Project Number: 13662-15

The **SSL-BOLUS** by **SmartStock LLC, Inc.**, a 315 MHz livestock alarm radio, was tested utilizing the following documents and found to be in compliance with the required criteria on the indicated test date.

| 47 CFR (USA), IC (Canada) |                               |            |
|---------------------------|-------------------------------|------------|
| Section Reference         | Parameter                     | Date       |
| 15.231(a), RSS-210 A1.1   | Fundamental Field Strength    | 2012-04-17 |
| 15.231(a), RSS-210 A1.1   | Harmonic & Spurious Emissions | 2012-04-17 |
| 15.203, RSS-Gen           | Antenna Requirements          | 2014-03-06 |
| 15.231, RSS-Gen           | Bandwidth                     | 2012-04-30 |
| 15.231, RSS-210 A1.1      | Timings                       | 2012-04-30 |

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures, have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Jeffrey A. Lenk  
 President

This report has been reviewed and accepted by SmartStock LLC, Inc. The undersigned is responsible for ensuring that the SSL-BOLUS by SmartStock LLC, Inc., will continue to comply with the applicable rules.

\_\_\_\_\_  
 Representative of SmartStock LLC, Inc.

## 1.0 Introduction

### 1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing. The procedures of ANSI C63.4: 2009 were used for making all radiated enclosure and mains emission measurements.

### 1.2 EUT Description

This device is a wireless livestock monitor/alarm. It is composed of a RF transmitter on 315 MHz using pulsed modulation. The EUT, as tested, consisted of the following:

**Table 1.2.1: Equipment Under Test**

| Manufacturer         | Model     | Serial # | Description               |
|----------------------|-----------|----------|---------------------------|
| SmartStock LLC, Inc. | SSL-BOLUS | none     | Wireless livestock alarm. |

The device is composed of an approximately rectangular circuit board in a smooth plastic enclosure. It is delivered orally to the stomach of livestock to monitor the health of the animal and alarm the tenders of abnormal temperatures suggesting the animal is seriously ill.



**Photograph 1.2.1: EUT**

### 1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

### 1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

### 1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

## 2.0 Applicable Documents and Clauses

This device operates on 315 MHz providing alarm functionality. As such the following relevant regulations apply.

| Table 2.0.1: Applicable Documents |  |
|-----------------------------------|--|
| Document #                        | Title/Description  |
| 47 CFR (USA)                      | Part 15 – Section 15.231   |
| IC (Canada)                       | RSS-210 Issue 8 – License Exempt Radio Apparatus (All Frequency Bands): Category I Equipment. Annex 1, Momentarily Operated Devices and Remote Control. Section A1.1 Momentarily Operated Devices<br>RSS-Gen Issue 3 – General Requirements and Information for the Certification of Radio Apparatus |
| ANSI C63.4 2009                   | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment  |

| Table 2.0.2: Applicable Clauses  |  |           |        |
|--|--|-----------|--------|
| Clause Subject   | Section References                               | Required? | Result |
| Radiated Output Power  | 15.231(a), RSS-210 A1.1 Table A                  | Yes       | Pass   |
| Occupied Bandwidth, 20 dB  | 15.231, 2.1049, RSS-Gen                          | Yes       | Pass   |
| Field Strength of Radiated Spurious/Harmonic Emissions (30 MHz to 3 GHz) | 15.231(a), 15.209, RSS-210 A1.1 Table A, RSS-Gen | Yes       | Pass   |
| Antenna Construction   | 15.203, RSS-Gen                                  | Yes       | Pass   |

### 3.0 Fundamental Field Strength

Radiated peak output power measurements were made on the EUT.

#### 3.1 Test Procedure

EUT is placed in a container filled with a solution to mimic the conditions in livestock. It is then placed on a non-conductive surface 80 cm above a reference plane and measurements of emissions are made to find maximum emission level. The device is operated within a stomach of the livestock and as such the three orthogonal positions were measured to capture the maximum emission.

#### 3.2 Test Criteria

| Section Reference                       | Parameter  | Date(s)    |
|---|--|------------|
| 15.231(a), 15.231(b)(2)<br>RSS-210 A1.1 | Fundamental Frequency 315 MHz<br>Radiated Output Power, 6,041.67 $\mu\text{V/m}$ @ 3 m<br>Restated as 75.6 dB $\mu\text{V/m}$ @ 3 m<br>Or extrapolated as 65.1 dB $\mu\text{V/m}$ @ 10 m<br>Average Detection of Pulsed Transmission | 2012-04-17 |

#### 3.3 Test Results

The EUT was found to be in compliance with the applicable criteria. The maximum emission is presented below and compared to the limit.

| 315 MHz per FCC 15.231<br>Field Strength of Fundamental, 10 Meter Measurement Distance |                 |                              |   |               |                                      |  |
|--|-----------------|------------------------------|---|---------------|--------------------------------------|--|
| Frequency (MHz)  | EUT Orientation | Antenna Polarity for Maximum | Corrected Level (Measured Peak Level) (dB $\mu\text{V/m}$ ) | Detector Mode | Duty Cycle Factor for Averaging (dB) | Corrected Level (Measured Average) (dB $\mu\text{V/m}$ ) |
| 314.9981   | X               | H                            | 62.3  | Peak          | -20                                  | 42.3   |
| 314.9981   | Y               | H                            | 62.7  | Peak          | -20                                  | 42.7   |
| 314.9981   | Z               | H                            | 63.3  | Peak          | -20                                  | 43.3   |

Resolution bandwidth 120 kHz. Video bandwidth 120 kHz. Detector mode is peak.

| Limit at 10 meters (dB $\mu\text{V/m}$ ) | Corrected Level (Measured Average Level) (dB $\mu\text{V/m}$ ) | Margin (dB) |
|--|--|-------------|
| 65.1                                     | 43.3   | -21.8       |



## 4.0 Transmitter Duty Cycle & Timings

### 4.1 Test Procedure

The EUT is placed in its normal operating position on a non-conducting table and positioned to produce a usable signal at an antenna located 1 meter away. The signal is recorded on a spectrum analyzer to measure the pulse width, view/count the train of pulses, and measure the time intervals at which the pulses occur.

The transmitter averaging duty cycle factor is determined for use elsewhere in the measurement of fundamental and spurious signals. The total transmit time during an hour window is calculated and compared to the limit.

### 4.2 Test Criteria

| Standard          | Clause               | Criteria  |
|-------------------|----------------------|---|
| FCC<br>IC RSS-210 | 15.35(c)<br>A1.1     | Pulsed transmissions averaged in a period not to exceed 100 ms. |
| FCC<br>IC RSS-210 | 15.231(a)(3)<br>A1.1 | Not to exceed 2 seconds of transmitting in one hour.            |

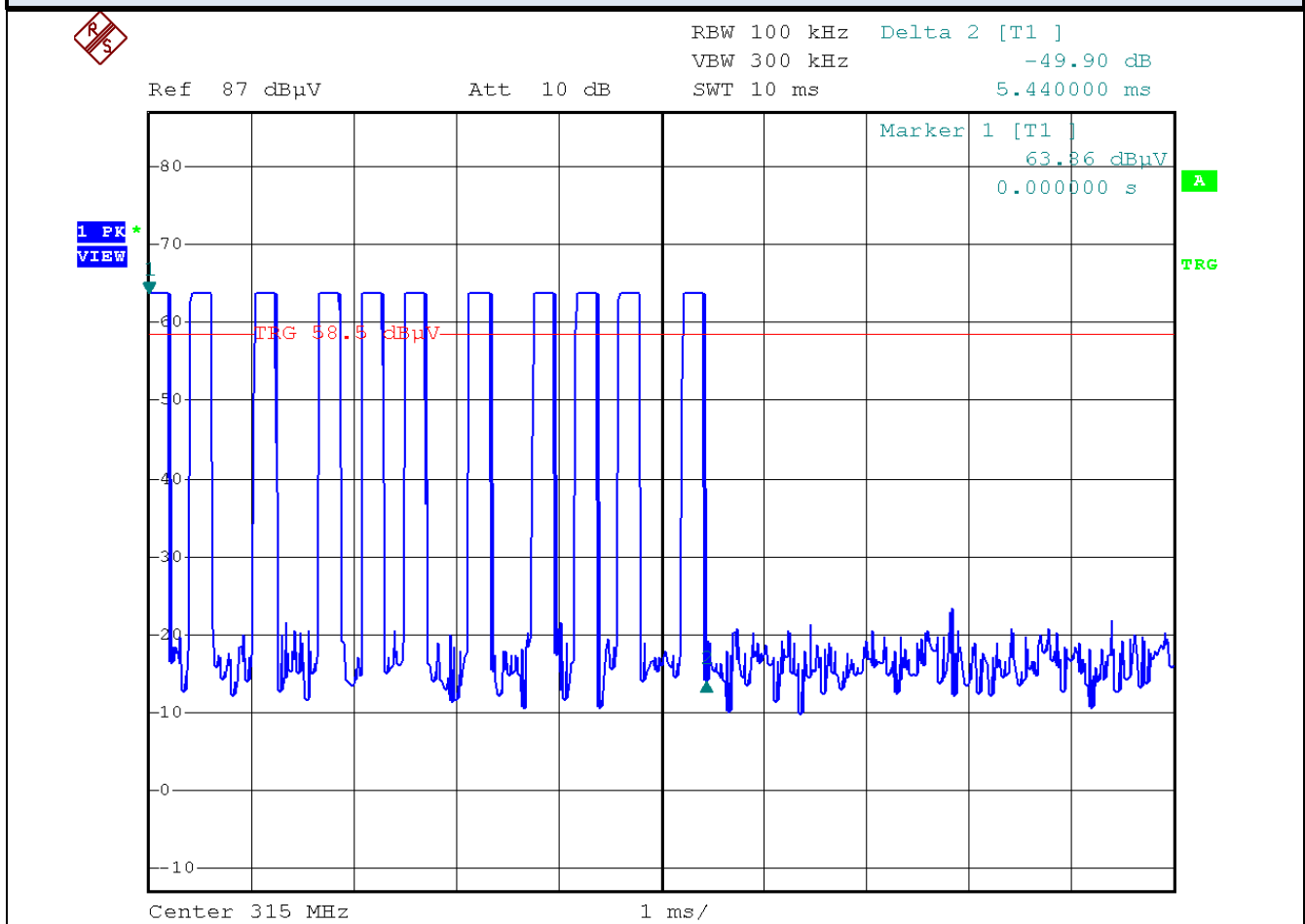
### 4.3 Test Results

| Table 4.3.1 Duty Cycle Factor (Averaging of Pulsed Transmission) per 15.35(c) |                     |                       |                        |   |
|---|---------------------|-----------------------|------------------------|---|
| Pulse Train Width (ms)  | Period Applied (ms) | Duty Cycle %          | Calculated Factor (dB) | Allowed Factor for Averaging of Peak Measurements (dB)* |
| 5.44  | 100                 | $5.44 / 100 = 0.0544$ | -25.29                 | -20   |

\*This factor may only be applied outside of restricted bands and to peak emissions above 1 GHz.

| Table 4.3.2 Timing Measurements |                      |                              |                               |                     |                                     |
|---------------------------------|----------------------|------------------------------|-------------------------------|---------------------|-------------------------------------|
| Pulse Width (μs)                | # of Pulses in Burst | Transmit Time Per Burst (μs) | Time Between Bursts (seconds) | Bursts in One Hour  | Transmit Time in One Hour (seconds) |
| 245.0                           | 11                   | $11 * 245 \mu s = 2695.0$    | 5                             | $60 * 60 / 5 = 720$ | $720 * 0.002695 = 1.9404 \text{ s}$ |

Measurements performed on 2012-04-30. The EUT satisfied the criteria.

**Table 4.3.3: Pulse Width and Pulses in Burst**

Counted 11 pulses in burst. Pulse width determined by taking a x-axis magnified inspection of the plot (see below) on a pixel basis to be 120/490 or 0.245 ms.

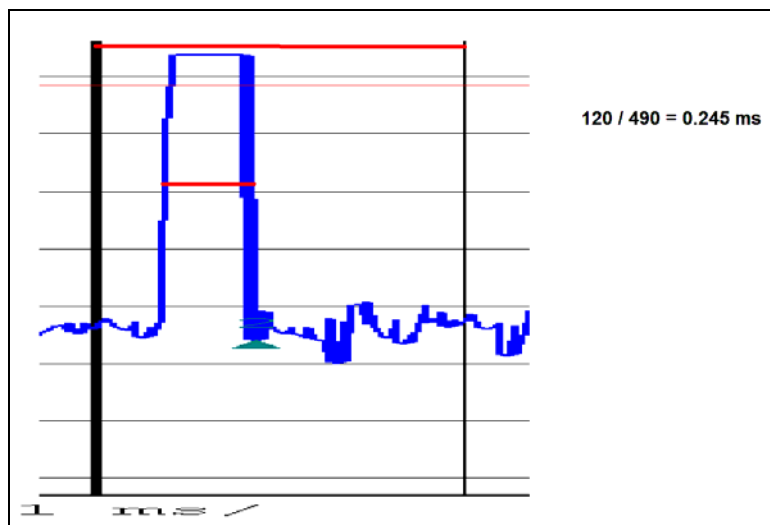
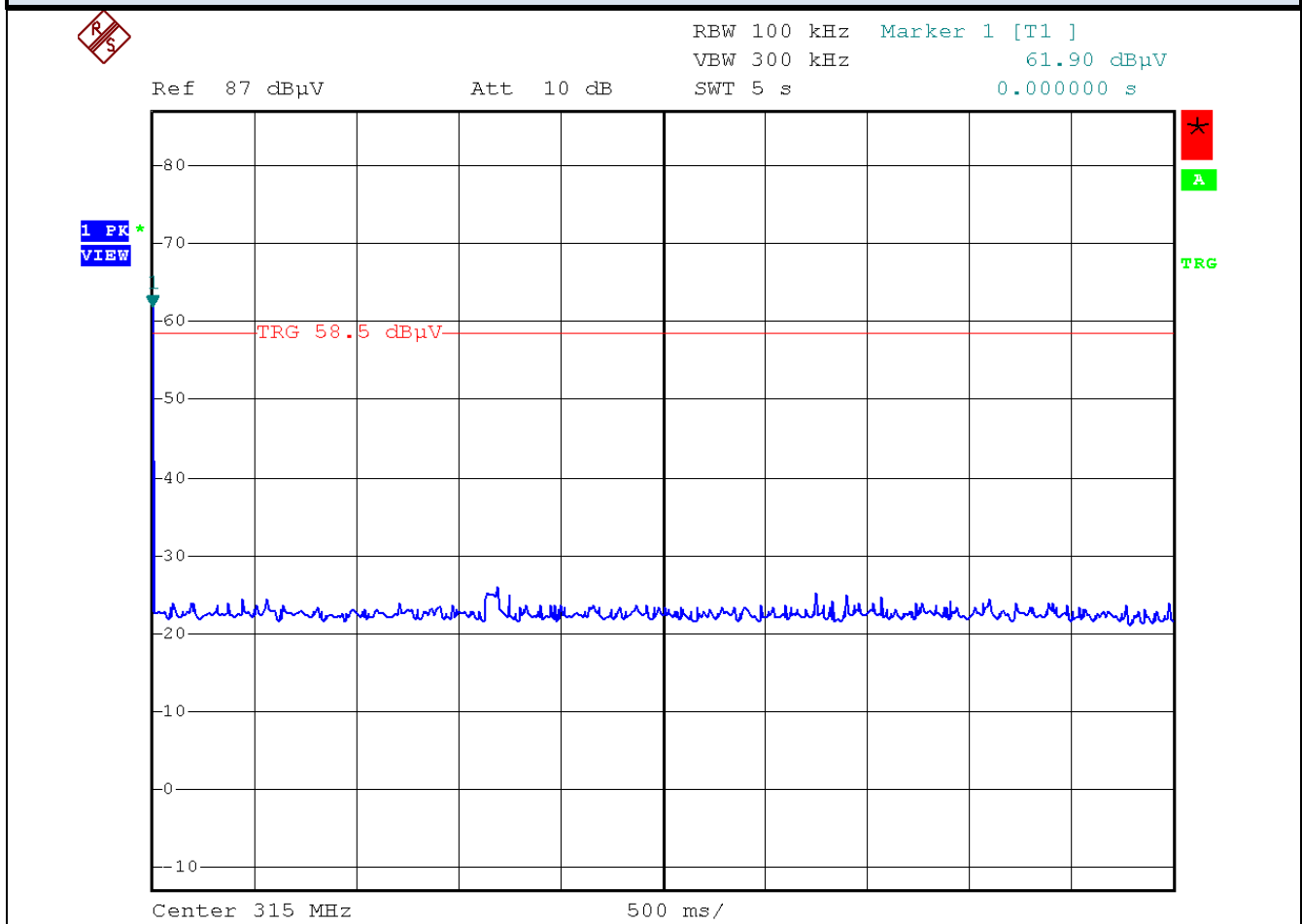


Table 4.3.4: Time Between Bursts



Time between bursts is at least five seconds.

## 5.0 Occupied Bandwidth

Occupied bandwidth measurement was made on the EUT.

### 5.1 Test Procedure

The EUT is configured for best signal/power and the bandwidth then is measured. A recording of the results is included.

### 5.2 Test Criteria

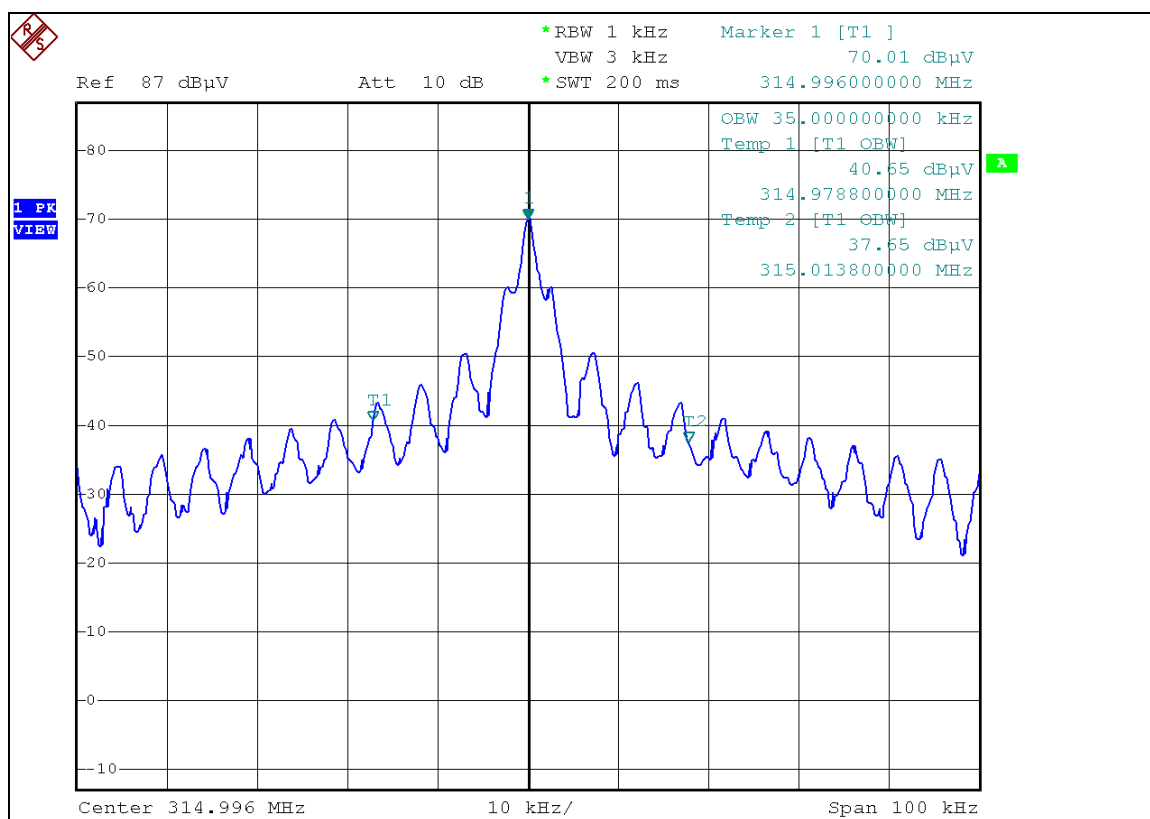
| Section Reference            | Parameter          | Date(s)    |
|------------------------------|--------------------|------------|
| 15.231(c), 2.1049<br>RSS-Gen | Occupied Bandwidth | 2012-04-30 |

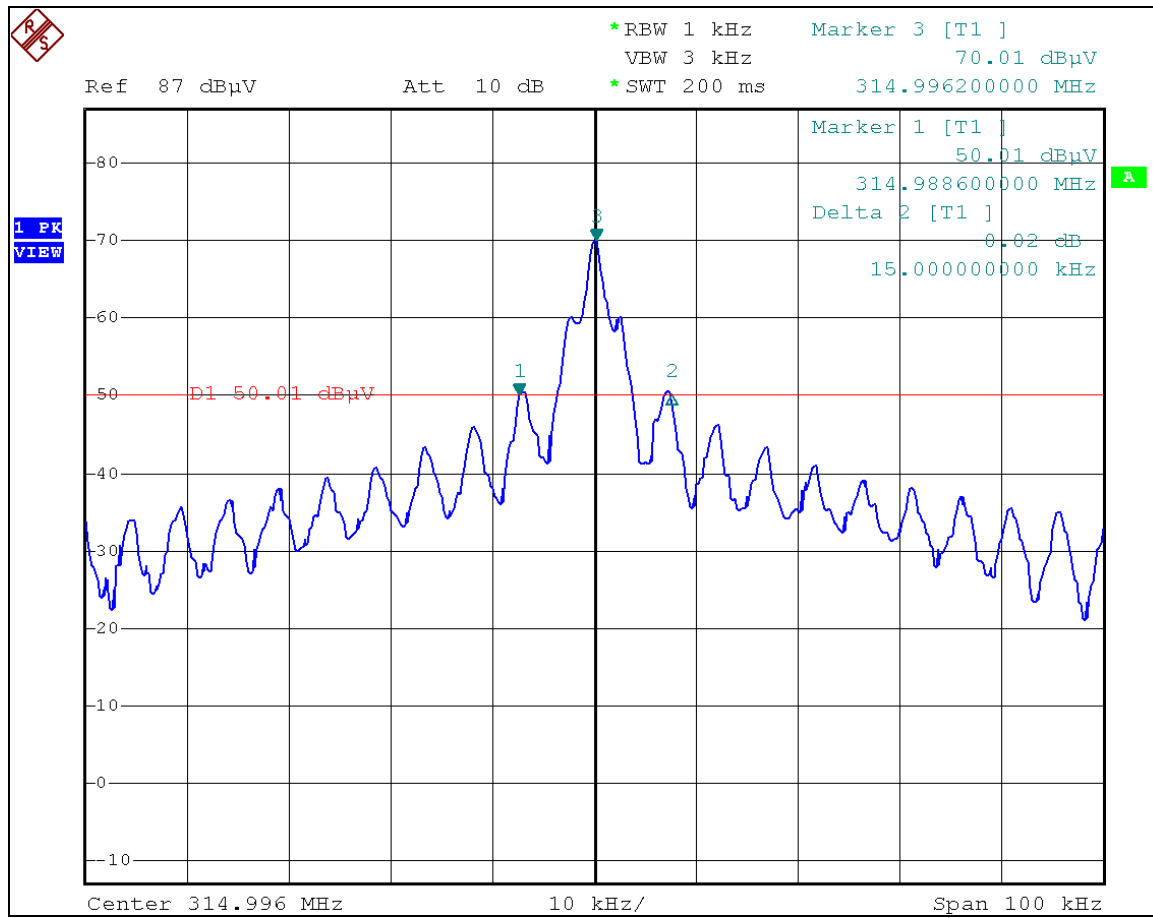
### 5.3 Test Results

| 15.231(c) BW Limit<br>For Fundamental = 315 MHz<br>0.25% of Fundamental<br>kHz | Measured OBW<br>kHz | Measured 20 dB<br>kHz |
|--|---------------------|-----------------------|
| 787.5  | 35.0                | 15.0                  |

The EUT satisfied the criteria. Plotted measurements appear below.

#### 5.3.1 Bandwidth Plot, OBW



**5.3.2 Bandwidth Plot, 20 dB**

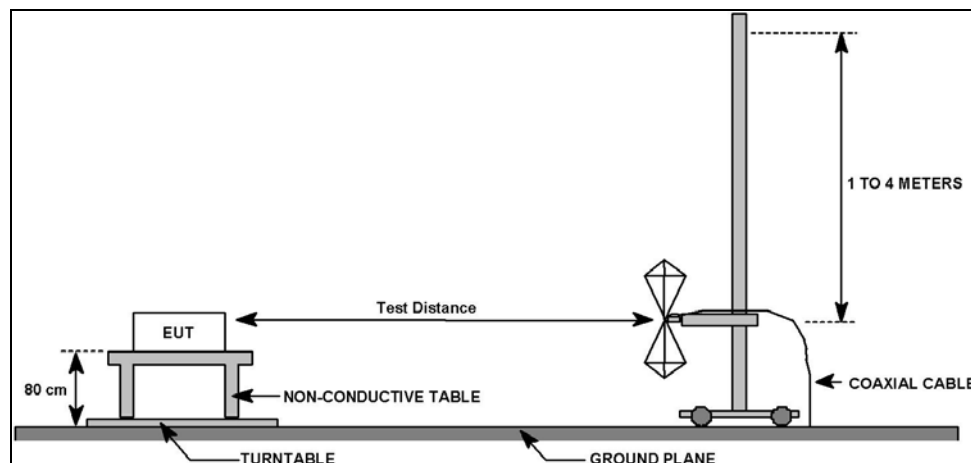
## 6.0 Radiated Spurious Emissions

Out of band spurious/harmonic emissions measurements were performed on the EUT to determine compliance to 47 CFR, Part 15.

### 6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 10 meters from the measurement antenna. The device is operated within a stomach of the livestock and as such the three orthogonal positions below 1 GHz were measured to capture the maximum emission. Above 1 GHz the orientation producing the highest fundamental emission was measured.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Transmitter products were measured with peak detection and the duty cycle factor applied to determine average. Spurious emissions above 1 GHz were measured with peak detection. A diagram showing the test setup is given as Figure 6.1.1.



**Figure 6.1.1: Field Strength of Spurious Emissions Test Setup**

### 6.2 Test Criteria

| Section Reference                     | Parameter  | Date       |
|---------------------------------------|--|------------|
| FCC 15.231(a), 15.209<br>RSS-210 A1.1 | Based on 315 MHz Fundamental<br>Limit for Radiated Spurious<br>604.17 $\mu\text{V}/\text{m}$ or 55.6 $\text{dB}\mu\text{V}/\text{m}$ at 3 m<br>Or extrapolated as 45.1 $\text{dB}\mu\text{V}/\text{m}$ at 10 m<br>Average Detection of Pulsed Transmission | 2012-04-17 |

Emissions are measured as peak values with the averaging factor applied and then compared to the limit. This is for emissions outside of restricted bands.

### 6.3 Test Results

The EUT satisfied the criteria. Recorded data is presented below; note that it includes the fundamental and spurious signals. The limit line for 15.209 is included though no signals were found that applied to the general emission limit.

## 6.3.1 Test Results – X Orientation

| Professional Testing, EMI, Inc.            |                        |  |                         |                             |                           |                          |                      |              |              |
|--|------------------------|--|-------------------------|-----------------------------|---------------------------|--------------------------|----------------------|--------------|--------------|
| <b>Test Method:</b>                        |                        | ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                             |                           |                          |                      |              |              |
| <b>In accordance with:</b>                 |                        | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                             |                           |                          |                      |              |              |
| <b>Section:</b>                            |                        | 15.231, 15.209   |                         |                             |                           |                          |                      |              |              |
| <b>Test Date(s):</b>                       |                        | 4/17/2012  |                         | <b>EUT Serial #:</b>        |                           | None                     |                      |              |              |
| <b>Customer:</b>                           |                        | Hitron Technologies Inc.   |                         | <b>EUT Part #:</b>          |                           | None                     |                      |              |              |
| <b>Project Number:</b>                     |                        | 13662-15   |                         | <b>Test Technician:</b>     |                           | Jesse Banda              |                      |              |              |
| <b>Purchase Order #:</b>                   |                        |  |                         | <b>Supervisor:</b>          |                           | Rob McCollough           |                      |              |              |
| <b>Equip. Under Test:</b>                  |                        | SSL-Bolus  |                         | <b>Witness' Name:</b>       |                           | Kent Britain             |                      |              |              |
| Radiated Emissions Test Results Data Sheet |                        |  |                         |                             |                           |                          |                      | Page: 1 of 1 |              |
| <b>EUT Line Voltage:</b>                   |                        | 3 VDC  |                         | <b>EUT Power Frequency:</b> |                           | N/A N/A                  |                      |              |              |
| <b>Antenna Orientation:</b>                |                        | Vertical   |                         | <b>Frequency Range:</b>     |                           | 30MHz to 1GHz            |                      |              |              |
| EUT Mode of Operation:                     |                        |  |                         |                             | Transmit Mode, Position X |                          |                      |              |              |
| Frequency Measured (MHz)                   | Test Distance (Meters) | EUT Direction (Degrees)  | Antenna Height (Meters) | Detector Function           | Recorded Amplitude (dBμV) | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB)  | Test Results |
| 315  | 10                     | 0  | 1                       | Average                     | 42.3                      | 42.3                     | 65.1                 | -22.8        | Pass         |
| 630  | 10                     | 0  | 1                       | Average                     | 36.9                      | 36.9                     | 45.1                 | -8.2         | Pass         |
| 945  | 10                     | 0  | 1                       | Average                     | 21.7                      | 21.7                     | 45.1                 | -23.4        | Pass         |

**Professional Testing, EMI, Inc.**  
Radiated Emissions, 10m Distance  
30MHz - 1GHz Vertical Polarity Measured Emissions

Field Strength (dBμV/m)

Frequency

Operator: Jesse Banda  
RE\_spurious X Axis.TIL  
09:38:06 AM, Tuesday, April 17, 2012

EUT Mode: 315 MHz TX, X-axis  
EUT Power: 3.6VDC

EUT: SSL-Bolus  
Project Number: 13662-10  
Client: TechTrol, Inc.

**≤ 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

|                            |  |                         |                |
|----------------------------|--|-------------------------|----------------|
| <b>Test Method:</b>        | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                |
| <b>In accordance with:</b> | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                |
| <b>Section:</b>            | 15.231, 15.209   |                         |                |
| <b>Test Date(s):</b>       | 4/17/2012  | <b>EUT Serial #:</b>    | None           |
| <b>Customer:</b>           | Hitron Technologies Inc.   | <b>EUT Part #:</b>      | None           |
| <b>Project Number:</b>     | 13662-15   | <b>Test Technician:</b> | Jesse Banda    |
| <b>Purchase Order #:</b>   |  | <b>Supervisor:</b>      | Rob McCollough |
| <b>Equip. Under Test:</b>  | SSL-Bolus  | <b>Witness' Name:</b>   | Kent Britain   |

### Radiated Emissions Test Results Data Sheet

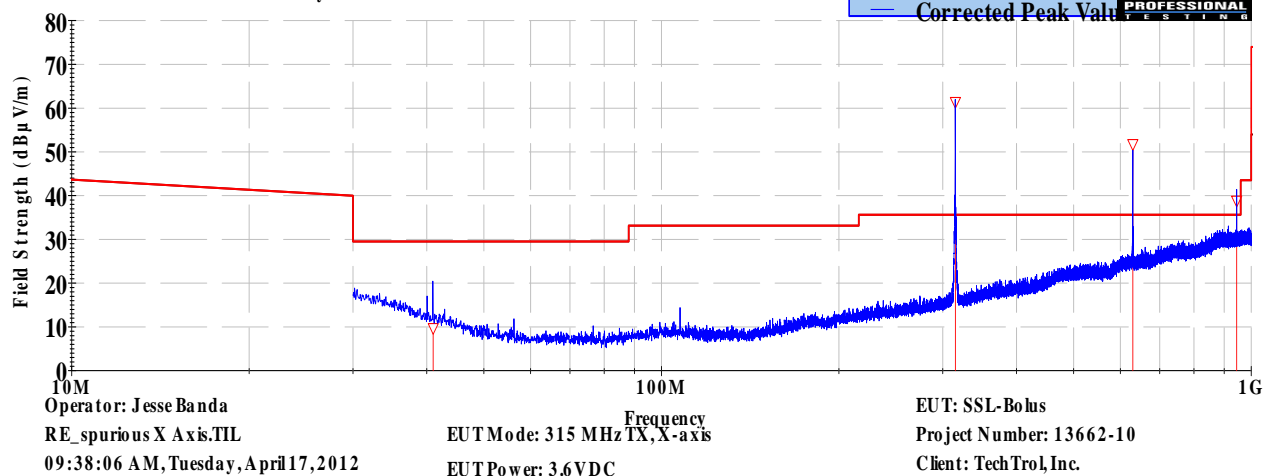
Page: 1 of 1

|                          |                        |                         |                         |                   |                           |                          |                      |             |              |
|--------------------------|------------------------|-------------------------|-------------------------|-------------------|---------------------------|--------------------------|----------------------|-------------|--------------|
| EUT Line Voltage:        |                        | 3                       | VDC                     |                   | EUT Power Frequency:      |                          | N/A                  | N/A         |              |
| Antenna Orientation:     |                        | Horizontal              |                         |                   | Frequency Range:          |                          | 30MHz to 1GHz        |             |              |
| EUT Mode of Operation:   |                        |                         |                         |                   | Transmit Mode, Position X |                          |                      |             |              |
| Frequency Measured (MHz) | Test Distance (Meters) | EUT Direction (Degrees) | Antenna Height (Meters) | Detector Function | Recorded Amplitude (dBμV) | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB) | Test Results |
| 315                      | 10                     | 0                       | 1                       | Average           | 41.9                      | 41.9                     | 65.1                 | -23.2       | Pass         |
| 630                      | 10                     | 0                       | 1                       | Average           | 31.8                      | 31.8                     | 45.1                 | -13.3       | Pass         |
| 945                      | 10                     | 0                       | 1                       | Average           | 18.8                      | 18.8                     | 45.1                 | -26.3       | Pass         |

### Professional Testing, EMI, Inc.

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



≤ 1GHz Horizontal Antenna Polarity Measured Emissions



## 6.3.2 Test Results – Y Orientation

| Professional Testing, EMI, Inc.            |                        |  |                         |                             |                           |                          |                      |              |              |
|--|------------------------|--|-------------------------|-----------------------------|---------------------------|--------------------------|----------------------|--------------|--------------|
| <b>Test Method:</b>                        |                        | ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                             |                           |                          |                      |              |              |
| <b>In accordance with:</b>                 |                        | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                             |                           |                          |                      |              |              |
| <b>Section:</b>                            |                        | 15.231, 15.209   |                         |                             |                           |                          |                      |              |              |
| <b>Test Date(s):</b>                       |                        | 4/17/2012  |                         | <b>EUT Serial #:</b>        |                           | None                     |                      |              |              |
| <b>Customer:</b>                           |                        | Hitron Technologies Inc.   |                         | <b>EUT Part #:</b>          |                           | None                     |                      |              |              |
| <b>Project Number:</b>                     |                        | 13662-15   |                         | <b>Test Technician:</b>     |                           | Jesse Banda              |                      |              |              |
| <b>Purchase Order #:</b>                   |                        |  |                         | <b>Supervisor:</b>          |                           | Rob McCollough           |                      |              |              |
| <b>Equip. Under Test:</b>                  |                        | SSL-Bolus  |                         | <b>Witness' Name:</b>       |                           | Kent Britain             |                      |              |              |
| Radiated Emissions Test Results Data Sheet |                        |  |                         |                             |                           |                          |                      | Page: 1 of 1 |              |
| <b>EUT Line Voltage:</b>                   |                        | 3 VDC  |                         | <b>EUT Power Frequency:</b> |                           | N/A N/A                  |                      |              |              |
| <b>Antenna Orientation:</b>                |                        | Vertical   |                         | <b>Frequency Range:</b>     |                           | 30MHz to 1GHz            |                      |              |              |
| EUT Mode of Operation:                     |                        |  |                         |                             | Transmit Mode, Position Y |                          |                      |              |              |
| Frequency Measured (MHz)                   | Test Distance (Meters) | EUT Direction (Degrees)  | Antenna Height (Meters) | Detector Function           | Recorded Amplitude (dBμV) | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB)  | Test Results |
| 315  | 10                     | 0  | 1                       | Average                     | 39.4                      | 39.4                     | 65.1                 | -25.7        | Pass         |
| 630  | 10                     | 0  | 1                       | Average                     | 30.6                      | 30.6                     | 45.1                 | -14.5        | Pass         |
| 945  | 10                     | 0  | 1                       | Average                     | 20.6                      | 20.6                     | 45.1                 | -24.5        | Pass         |

**Professional Testing, EMI, Inc.**  
Radiated Emissions, 10m Distance  
30MHz - 1GHz Vertical Polarity Measured Emissions

Field Strength (dBμV/m)

Frequency

Operator: Jesse Banda  
RE\_spurious Y Axis:TIL  
10:34:05 AM, Tuesday, April 17, 2012

EUT Mode: 315 MHz TX, Y-axis  
EUT Power: 3.6VDC

EUT: SSL-Bolus  
Project Number: 13662-10  
Client: TechTrol, Inc.

PROFESSIONAL TESTING

**≤ 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

|                            |  |                         |                |
|----------------------------|--|-------------------------|----------------|
| <b>Test Method:</b>        | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                |
| <b>In accordance with:</b> | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                |
| <b>Section:</b>            | 15.231, 15.209   |                         |                |
| <b>Test Date(s):</b>       | 4/17/2012  | <b>EUT Serial #:</b>    | None           |
| <b>Customer:</b>           | Hitron Technologies Inc.   | <b>EUT Part #:</b>      | None           |
| <b>Project Number:</b>     | 13662-15   | <b>Test Technician:</b> | Jesse Banda    |
| <b>Purchase Order #:</b>   |  | <b>Supervisor:</b>      | Rob McCollough |
| <b>Equip. Under Test:</b>  | SSL-Bolus  | <b>Witness' Name:</b>   | Kent Britain   |

### Radiated Emissions Test Results Data Sheet

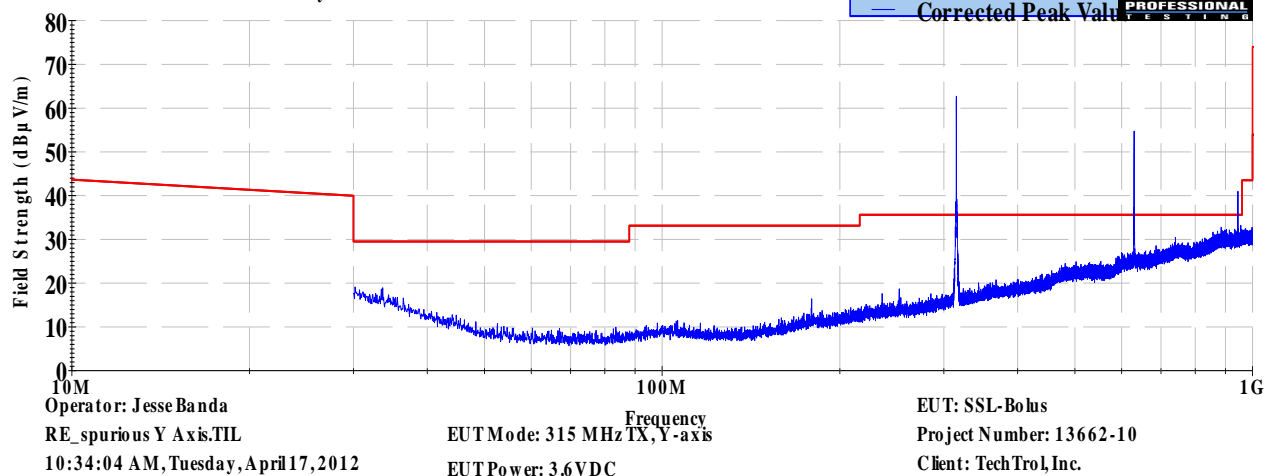
Page: 1 of 1

|                          |                        |                         |                         |                   |                           |                          |                      |             |              |
|--------------------------|------------------------|-------------------------|-------------------------|-------------------|---------------------------|--------------------------|----------------------|-------------|--------------|
| EUT Line Voltage:        |                        | 3                       | VDC                     |                   | EUT Power Frequency:      |                          | N/A                  | N/A         |              |
| Antenna Orientation:     |                        | Horizontal              |                         |                   | Frequency Range:          |                          | 30MHz to 1GHz        |             |              |
| EUT Mode of Operation:   |                        |                         |                         |                   | Transmit Mode, Position Y |                          |                      |             |              |
| Frequency Measured (MHz) | Test Distance (Meters) | EUT Direction (Degrees) | Antenna Height (Meters) | Detector Function | Recorded Amplitude (dBμV) | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB) | Test Results |
| 315                      | 10                     | 0                       | 1                       | Average           | 42.7                      | 42.7                     | 65.1                 | -22.4       | Pass         |
| 630                      | 10                     | 0                       | 1                       | Average           | 34.7                      | 34.7                     | 45.1                 | -10.4       | Pass         |
| 945                      | 10                     | 0                       | 1                       | Average           | 20.9                      | 20.9                     | 45.1                 | -24.2       | Pass         |

### Professional Testing, EMI, Inc

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



≤ 1GHz Horizontal Antenna Polarity Measured Emissions

## 6.3.3 Test Results – Z Orientation

| Professional Testing, EMI, Inc.            |                        |  |                         |                   |                             |                          |                      |             |              |  |
|--|------------------------|--|-------------------------|-------------------|-----------------------------|--------------------------|----------------------|-------------|--------------|--|
| <b>Test Method:</b>                        |                        | ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                   |                             |                          |                      |             |              |  |
| <b>In accordance with:</b>                 |                        | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                   |                             |                          |                      |             |              |  |
| <b>Section:</b>                            |                        | 15.231, 15.209   |                         |                   |                             |                          |                      |             |              |  |
| <b>Test Date(s):</b>                       |                        | 4/17/2012  |                         |                   | <b>EUT Serial #:</b>        |                          | None                 |             |              |  |
| <b>Customer:</b>                           |                        | Hitron Technologies Inc.   |                         |                   | <b>EUT Part #:</b>          |                          | None                 |             |              |  |
| <b>Project Number:</b>                     |                        | 13662-15   |                         |                   | <b>Test Technician:</b>     |                          | Jesse Banda          |             |              |  |
| <b>Purchase Order #:</b>                   |                        |  |                         |                   | <b>Supervisor:</b>          |                          | Rob McCollough       |             |              |  |
| <b>Equip. Under Test:</b>                  |                        | SSL-Bolus  |                         |                   | <b>Witness' Name:</b>       |                          | Kent Britain         |             |              |  |
| Radiated Emissions Test Results Data Sheet |                        |  |                         |                   |                             |                          | Page: 1 of 1         |             |              |  |
| <b>EUT Line Voltage:</b>                   |                        | 3 VDC  |                         |                   | <b>EUT Power Frequency:</b> |                          | N/A N/A              |             |              |  |
| <b>Antenna Orientation:</b>                |                        | Vertical   |                         |                   | <b>Frequency Range:</b>     |                          | 30MHz to 1GHz        |             |              |  |
| EUT Mode of Operation:                     |                        |  |                         |                   | Transmit Mode, Position Z   |                          |                      |             |              |  |
| Frequency Measured (MHz)                   | Test Distance (Meters) | EUT Direction (Degrees)  | Antenna Height (Meters) | Detector Function | Recorded Amplitude (dBμV)   | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB) | Test Results |  |
| 315  | 10                     | 0  | 1                       | Average           | 40.5                        | 40.5                     | 65.1                 | -24.6       | Pass         |  |
| 630  | 10                     | 0  | 1                       | Average           | 30.4                        | 30.4                     | 45.1                 | -14.7       | Pass         |  |
| 945  | 10                     | 0  | 1                       | Average           | 18.2                        | 18.2                     | 45.1                 | -26.9       | Pass         |  |

**Professional Testing, EMI, Inc**  
Radiated Emissions, 10m Distance  
30MHz - 1GHz Vertical Polarity Measured Emissions

Field Strength (dBμV/m)

Frequency

Operator: Jesse Banda  
RE\_spurious Z axis wGHzTIL  
11:12:48 AM, Tuesday, April 17, 2012

EUT Mode: 315 MHz TX, Z-axis  
EUT Power: 3.6VDC

EUT: SSL-Bolus  
Project Number: 13662-10  
Client: TechTrol, Inc.

**≤ 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

|                            |  |                         |                |
|----------------------------|--|-------------------------|----------------|
| <b>Test Method:</b>        | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                |
| <b>In accordance with:</b> | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                |
| <b>Section:</b>            | 15.231, 15.209   |                         |                |
| <b>Test Date(s):</b>       | 4/17/2012  | <b>EUT Serial #:</b>    | None           |
| <b>Customer:</b>           | Hitron Technologies Inc.   | <b>EUT Part #:</b>      | None           |
| <b>Project Number:</b>     | 13662-15   | <b>Test Technician:</b> | Jesse Banda    |
| <b>Purchase Order #:</b>   |  | <b>Supervisor:</b>      | Rob McCollough |
| <b>Equip. Under Test:</b>  | SSL-Bolus  | <b>Witness' Name:</b>   | Kent Britain   |

### Radiated Emissions Test Results Data Sheet

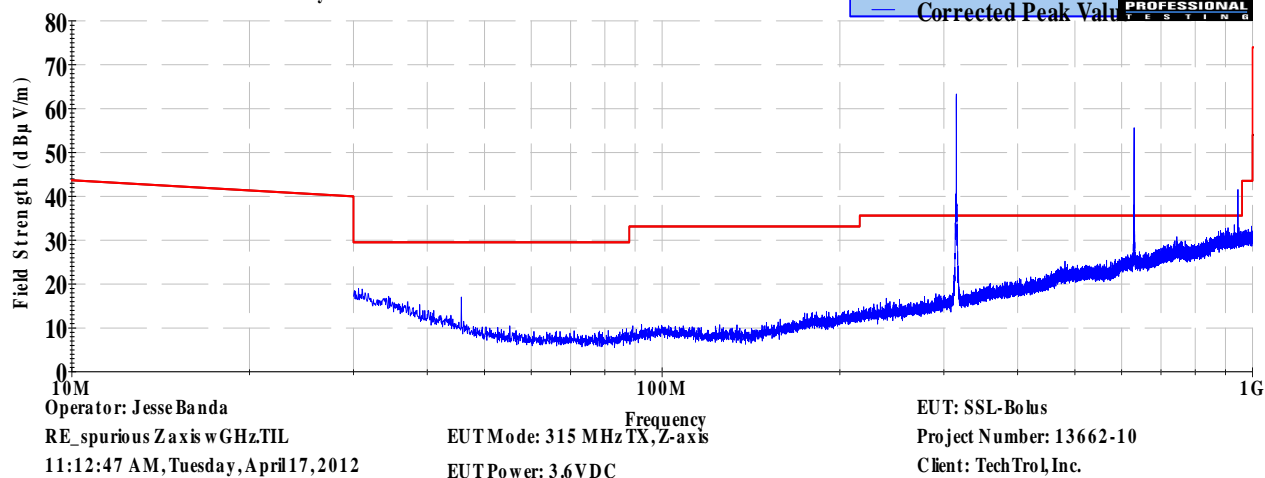
Page: 1 of 1

|                          |                        |                         |                         |                   |                           |                          |                      |             |              |
|--------------------------|------------------------|-------------------------|-------------------------|-------------------|---------------------------|--------------------------|----------------------|-------------|--------------|
| EUT Line Voltage:        |                        | 3                       | VDC                     |                   | EUT Power Frequency:      |                          | N/A                  | N/A         |              |
| Antenna Orientation:     |                        | Horizontal              |                         |                   | Frequency Range:          |                          | 30MHz to 1GHz        |             |              |
| EUT Mode of Operation:   |                        |                         |                         |                   | Transmit Mode, Position Z |                          |                      |             |              |
| Frequency Measured (MHz) | Test Distance (Meters) | EUT Direction (Degrees) | Antenna Height (Meters) | Detector Function | Recorded Amplitude (dBμV) | Corrected Level (dBμV/m) | Limit Level (dBμV/m) | Margin (dB) | Test Results |
| 315                      | 10                     | 0                       | 1                       | Average           | 43.3                      | 43.3                     | 65.1                 | -21.8       | Pass         |
| 630                      | 10                     | 0                       | 1                       | Average           | 35.6                      | 35.6                     | 45.1                 | -9.5        | Pass         |
| 945                      | 10                     | 0                       | 1                       | Average           | 18.2                      | 18.2                     | 45.1                 | -26.9       | Pass         |

### Professional Testing, EMI, Inc

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



≤ 1GHz Horizontal Antenna Polarity Measured Emissions

## Professional Testing, EMI, Inc.

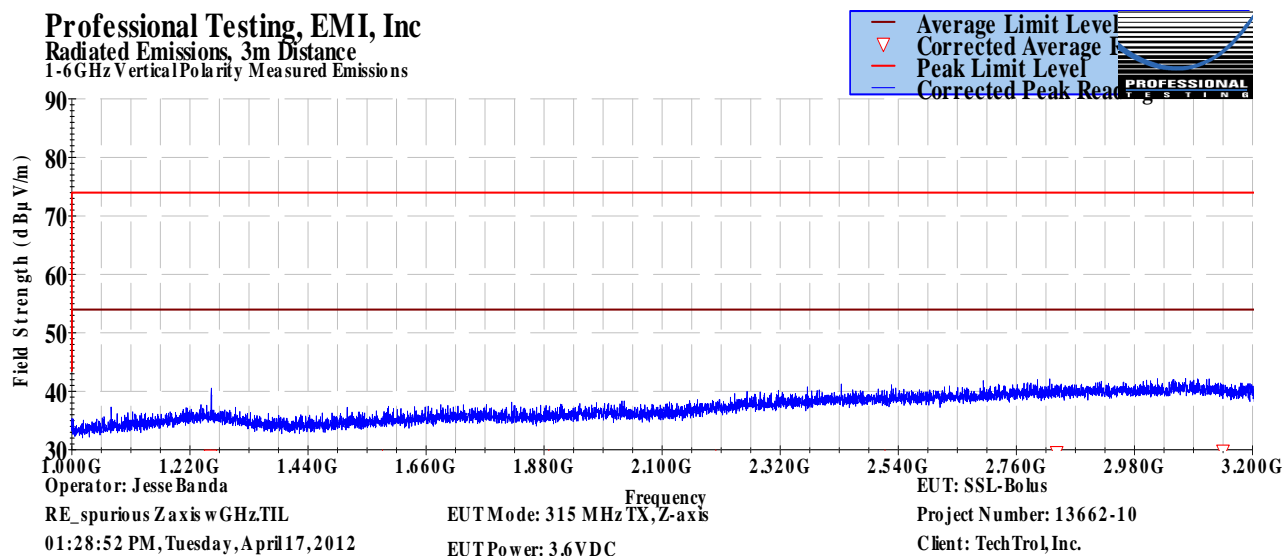
|                            |  |                         |                |
|----------------------------|--|-------------------------|----------------|
| <b>Test Method:</b>        | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                |
| <b>In accordance with:</b> | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                |
| <b>Section:</b>            | 15.231, 15.209   |                         |                |
| <b>Test Date(s):</b>       | 4/17/2012  | <b>EUT Serial #:</b>    | None           |
| <b>Customer:</b>           | Hitron Technologies Inc.   | <b>EUT Part #:</b>      | None           |
| <b>Project Number:</b>     | 13662-15   | <b>Test Technician:</b> | Jesse Banda    |
| <b>Purchase Order #:</b>   |  | <b>Supervisor:</b>      | Rob McCollough |
| <b>Equip. Under Test:</b>  | SSL-Bolus  | <b>Witness' Name:</b>   | Kent Britain   |

### Radiated Emissions Test Results Data Sheet

Page: 1 of 1

|                        |          |     |                           |            |     |
|------------------------|----------|-----|---------------------------|------------|-----|
| EUT Line Voltage:      | 3        | VDC | EUT Power Frequency:      | N/A        | N/A |
| Antenna Orientation:   | Vertical |     | Frequency Range:          | Above 1GHz |     |
| EUT Mode of Operation: |          |     | Transmit Mode, Position Z |            |     |

**Professional Testing, EMI, Inc**  
Radiated Emissions, 3m Distance  
1-6 GHz Vertical Polarity Measured Emissions



**> 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

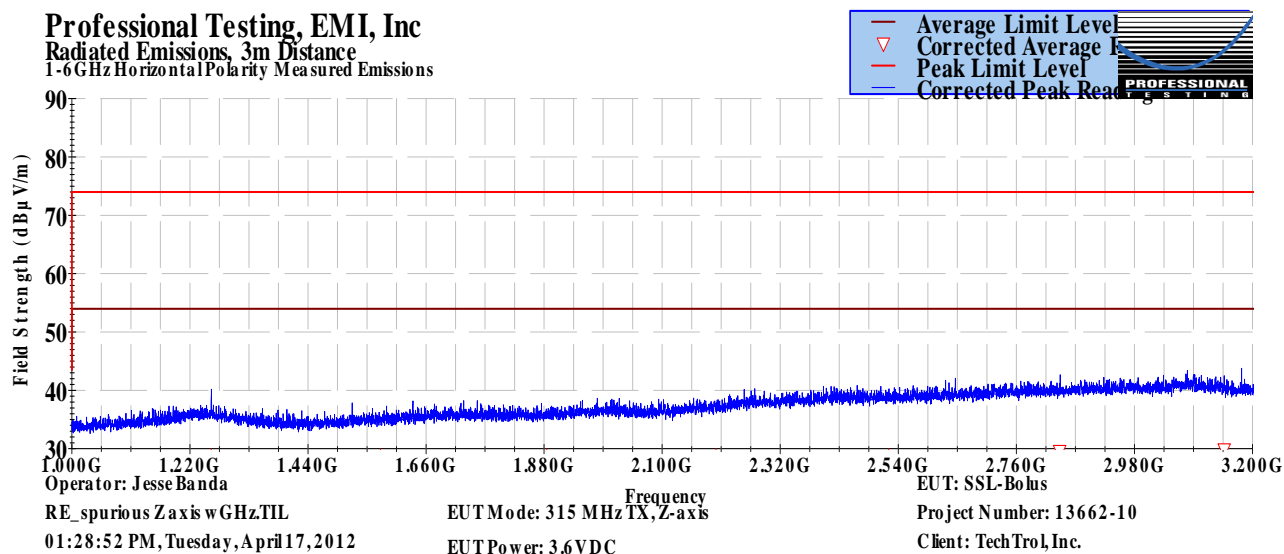
|                            |  |                         |                |
|----------------------------|--|-------------------------|----------------|
| <b>Test Method:</b>        | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38). |                         |                |
| <b>In accordance with:</b> | FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits  |                         |                |
| <b>Section:</b>            | 15.231, 15.209   |                         |                |
| <b>Test Date(s):</b>       | 4/17/2012  | <b>EUT Serial #:</b>    | None           |
| <b>Customer:</b>           | Hitron Technologies Inc.   | <b>EUT Part #:</b>      | None           |
| <b>Project Number:</b>     | 13662-15   | <b>Test Technician:</b> | Jesse Banda    |
| <b>Purchase Order #:</b>   |  | <b>Supervisor:</b>      | Rob McCollough |
| <b>Equip. Under Test:</b>  | SSL-Bolus  | <b>Witness' Name:</b>   | Kent Britain   |

### Radiated Emissions Test Results Data Sheet

Page: 1 of 1

|                        |            |     |                           |            |     |
|------------------------|------------|-----|---------------------------|------------|-----|
| EUT Line Voltage:      | 3          | VDC | EUT Power Frequency:      | N/A        | N/A |
| Antenna Orientation:   | Horizontal |     | Frequency Range:          | Above 1GHz |     |
| EUT Mode of Operation: |            |     | Transmit Mode, Position Z |            |     |

**Professional Testing, EMI, Inc**  
Radiated Emissions, 3m Distance  
1-6 GHz Horizontal Polarity Measured Emissions



> 1GHz Horizontal Antenna Polarity Measured Emissions

## 7.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

### 7.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevents wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

### 7.2 Criteria

| Clause Subject       | Section Number  | Date       |
|----------------------|-----------------|------------|
| Antenna Construction | 15.203, RSS-Gen | 2014-03-06 |

### 7.3 Results

|  |  |
|--|--|
| Antenna for 315 MHz<br>Antenna Manufacturer, Details |  |
| SmartStock LLC<br>Printed circuit trace antenna.     | Antenna gain is estimated as 1.7 dBi (small loop). |

- There is no antenna connector/port.
- The device is sealed to survive in a caustic environment.

The antenna design meets the requirements of the rules.

## 8.0 Equipment Lists

### 8.1 Equipment for Spurious Radiated Emissions

| Professional Testing, EMI, Inc. |              |   |   |                |                      |
|---------------------------------|--------------|---|---|----------------|----------------------|
| Test Method:                    |              | ANSI C63.4-2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, FCC Part 15.231, 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits |   |                |                      |
| In accordance with:             |              | Radiated Emissions Limits   |   |                |                      |
| Section:                        |              | 15.231, 15.209  |   |                |                      |
| Test Date(s):                   |              | 4/17/2012   | EUT Serial #:                                 | None           |                      |
| Customer:                       |              | Hitron Technologies Inc.  | EUT Part #:                                   | None           |                      |
| Project Number:                 |              | 13662-15  | Test Technician:                              | Jesse Banda    |                      |
| Purchase Order #:               |              |   | Supervisor:                                   | Rob McCollough |                      |
| Equip. Under Test:              |              | SSL-Bolus   | Witness' Name:                                | Kent Britain   |                      |
| Asset #                         | Manufacturer | Model   | Equipment Nomenclature                        | Serial Number  | Calibration Due Date |
| 1509A                           | Braden       | N/A   | TDK 10M Chamber, NSA < 1 GHz                  | DAC-012915-005 | 8/7/2012             |
| 0586                            | HP           | 8447D   | Preamplifier, 0.1-1300MHz, 26dB               | 1726A01364     | 12/21/2012           |
| 1930                            | Agilent      | E4440A-239  | Spectrum Analyzer, 3 Hz - 26.5 GHz            | MY45304903     | 6/19/2013            |
| Rental                          | ETS-Lindgren | 3142D   | Antenna, Biconilog, 26 MHz - 6 GHz            | 146493         | 5/8/2013             |
| C027                            | N/A          | RG214   | Cable Coax, N-N, 25m                          | none           | 8/26/2012            |
| 1327                            | EMCO         | 1050  | Controller, Antenna Mast                      | none           | N/A                  |
| 0942                            | EMCO         | 11968D  | Turntable, 4ft.                               | 9510-1835      | N/A                  |
| 1969                            | HP           | 11713A  | Attenuator/Switch Driver                      | 3748A04113     | N/A                  |
|                                 |              |   |   |                |                      |
| 1509B                           | Braden       | N/A   | TDK 10M Chamber, VSWR > 1 GHz                 | DAC-012915-005 | 4/8/2013             |
| 1594                            | Miteq        | AFS44-00102650  | Amplifier, 1-26.5GHz, 42dB                    | none           | 2/14/2013            |
| 2004                            | Miteq        | AFS44-00101800-2S-10P-44  | Amplifier, 40dB, .1-18GHz                     | 0              | 10/12/2012           |
| C030                            | N/A          | 0   | Cable Coax, N-N, 30m                          | none           | 8/26/2012            |
| 1780                            | ETS-Lindgren | 3117  | Antenna, Double Ridged Guide Horn, 1 - 18 GHz | 00110313       | 1/19/2013            |
| 1325                            | EMCO         | 1050  | Controller, Antenna Mast                      | 9003-1461      | N/A                  |



**8.2 Equipment for Timings and Bandwidth**

| <b>Asset #</b> | <b>Manufacturer</b> | <b>Model #</b> | <b>Description</b>  | <b>Calibration Due</b> |
|----------------|---------------------|----------------|---------------------|------------------------|
| 0582           | EMCO                | 3115           | Ridge Guide Antenna | Not Required           |
| ALN-077        | Rohde & Schwarz     | FSP-30         | Spectrum Analyzer   | 2012-12-22             |

**Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty**

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

**1. Rationale and Summary of Expanded Uncertainty.**

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

**Table 1: Summary of Measurement Uncertainties for Site 45**

| Type of Measurement         | Frequency Range   | Meas. Dist. | Expanded Uncertainty U, dB (k=2) |
|-----------------------------|-------------------|-------------|----------------------------------|
| Mains Conducted Emissions   | 150 kHz to 30 MHz | N/A         | 2.9                              |
| Telecom Conducted Emissions | 150 kHz to 30 MHz | N/A         | 2.8                              |
| Radiated Emissions          | 30 to 1,000 MHz   | 10 m        | 4.8                              |
|                             | 1 to 18 GHz       | 3 m         | 5.7                              |

**End of Report**

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