# Test Report

| | |
|---|---|
| Report No | EP2231-4 |
| Client | ecoVent<br>Robert Kim |
| Address | 24 Cambridge St, Suite 6<br>Charlestown, MA 02129 |
| Phone | 857-204-4466 |
| Items tested<br>FCC ID | CONTROL HUB<br>2AFTLSH1 |
| FRN | 0024870743 |
| Equipment Type<br>Equipment Code | Part 15.247 Digitally Modulated<br>DTS |
| FCC/IC Rule Parts | 47 CFR 15.247, RSS-247 Issue 1 |
| Test Dates | August 21, 28 and September 1, 4 and 24, 2015 |
| Results | As detailed within this report |
| Prepared by | Tuyen A. Truong – Test Engineer |
| Authorized by | Christopher Reynolds – EMC Supervisor |
| Issue Date | 9/28/2015 |
| Conditions of Issue | This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 23 of this report. |

## *Contents*

Contents....2
Summary....3
Test Methodology....4
Product Tested - Configuration Documentation....5
Statement of Conformity....6
Modifications Required for Compliance....7
Test Results....8
*Bandwidth*....8
Fundamental Emission Output Power....10
*Radiated Spurious Emissions*....12
Power Spectral Density....16
AC Line Conducted Emissions....18
Occupied Bandwidth....19
Measurement Uncertainty....21
Conditions Of Testing....22

Form Final Report REV 7-20-07 (DW)

## *Summary*

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247. The product is the CONTROL HUB. It is a digitally modulated transmitter that operates at 915MHz. Product was tested with an on board antenna with a gain of -2dBi.

We found that the product met the above requirements with modification (see Modification Required for Compliance section on page 7 for details). The test sample was received in good condition.

| Issue No. | Reason for change | Date Issued |
|---|---|---|
| 1 | Original Release | November 4, 2015 |



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828

### *Test Methodology*

Radiated emission testing were performed according to DTS guidance document 558074D01 v03r03 specified in FCC Guidance for performing compliance measurement on DTS operating under section 15.247, April 19, 2013 and ANSI C63.10 (2009). Radiated Emissions were maximized by rotating the device around its axes as well as varying the test antenna's height and polarity. The device antenna could not be maximized separately.

Conducted emissions at the antenna port were not performed since the EUT antenna has a permanently attached integral antenna.

AC Main conducted emission was performed with a 50Ω/50µH.

Operating channel frequency = 915MHz

The following bandwidths were used during radiated spurious and line conducted emissions.

| Frequency | RBW | VBW |
|---|---|---|
| 0.15-30MHz | 9kHz | 30kHz |
| 30-1000MHz | 120kHz | 1MHz |
| 1-10GHz | 1MHz | 3MHz |

## *Product Tested - Configuration Documentation*

| EUT Configuration | | | |
|---|---|---|---|
| **Work Order:** | P2231 | | |
| **Company:** | ecoVent | | |
| **Company Address:** | 24 Cambridge St, Suite 6 | | |
| | Charlestown, MA 02129 | | |
| | | | |
| **Contact:** | Robert Kim | | |
| | | | |
| | **MN** | **PN** | **SN** |
| **EUT consists of the following:** | | | |
| **Control Hub** | SH1 | 701-00011 rev E | Sample 1 |
| **Fremo AC/DC Power Brick** | W-01(STC-A515A-Z) | -- | Sample 1 |
| **EUT Description:** | Control Hub | | |
| **EUT TX Frequency:** | 915 MHz | | |
| **EUT Max Frequency:** | 50 MHz | | |
| **EUT Min Frequency:** | 0.032768 MHz | | |

| **Support Equipment** | **MN** | **SN** |
|---|---|---|
| TLINK Ethernet Switch | TLINK | -- |
| Laptop (set up only) | -- | -- |

| Port Label | Port Type | # ports | # populated | cable type | shielded | ferrites | length (m) | max length (m) | in/out | under test | comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Power | USB | 1 | 1 | Power AC | Yes | No | 2 | | in | yes | AC/DC power brick |
| Ethernet | Ethernet | 2 | 2 | Ethernet | No | No | 10 | 100 | in | yes | |
| USB | USB | 2 | 0 | - | | | | | in | no | Not supported at this time |

**Software Operating Mode Description:**

EUT is set to transmit with a gain of -2dBi at 915 MHz with 100% Duty cycle and FSK modulation.

### *Statement of Conformity*

The CONTROL HUB has been found to conform to the following parts of 47 CFR and as detailed below:

| RSS-GEN | RSS-247 | Part 15 | Comments |
|---|---|---|---|
| 5.3 | | 15.15(b) | There are no controls accessible to the user that varies the output power above specified limits. |
| 5.2 | | 15.19 | The label is shown in the label exhibit. |
| 8.4 | | 15.21 | Information to the user is shown in the instruction manual exhibit. |
| | | 15.27 | No special accessories are required for compliance. |
| | | 15.31 | The EUT was tested in accordance with the measurement standards in this section. |
| | | 15.33 | Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates. |
| | | 15.35 | The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates. |
| 6.7 | | 15.203 | EUT employs a permanently connected antenna with -2dBi gain. |
| | 5.5 | 15.205<br>15.209 | The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209. |
| 8.8 | | 15.207 | EUT AC Main was tested. |
| | | 15.247 | The unit complies with the requirements of 15.247 |
| | RSS-247 | | The unit complies with the requirements of RSS-247 |
| 6.6 | | 15.247 | Occupied Bandwidth measurements were made. |

## *Modifications Required for Compliance*

Modifications were required for the following tests:

- Power Spectral Density: EUT fundamental power was reduced from 11.6dBm to 10.6dBm.

Note: the following modifications made during subpart B testing under work order P2150 were present for this testing (see Modification photo exhibits):

- Copper tape was added to the Control Kit housing internally.
- R108 and R124 were changed from 0Ω to 49.9Ω.

## *Test Results*

# *Bandwidth*

### LIMIT

*The minimum 6 dB bandwidth shall be at least 500 kHz.* [15.247(a) (2)]

### MEASUREMENTS / RESULTS

**6dB BANDWIDTH**

**Date:** 28-Aug-15 **Company:** Ecovent Systems **Work Order:** P2231
**Engineer:** Ryan Brown **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 22°C **Humidity:** 47% **Pressure:** 1009mBar
**Frequency Range:** Fundamental **Measurement Distance:** 3 m
**Notes:** Modulation: FSK

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (KHz) | 6dB BW Limit (KHz) | 6dB BW Margin (KHz) | 6dB BW Result (Pass/Fail) |
|---|---|---|---|---|---|
| *H* | *915.0* | *1110.0* | *≥500* | *+610* | *Pass* |

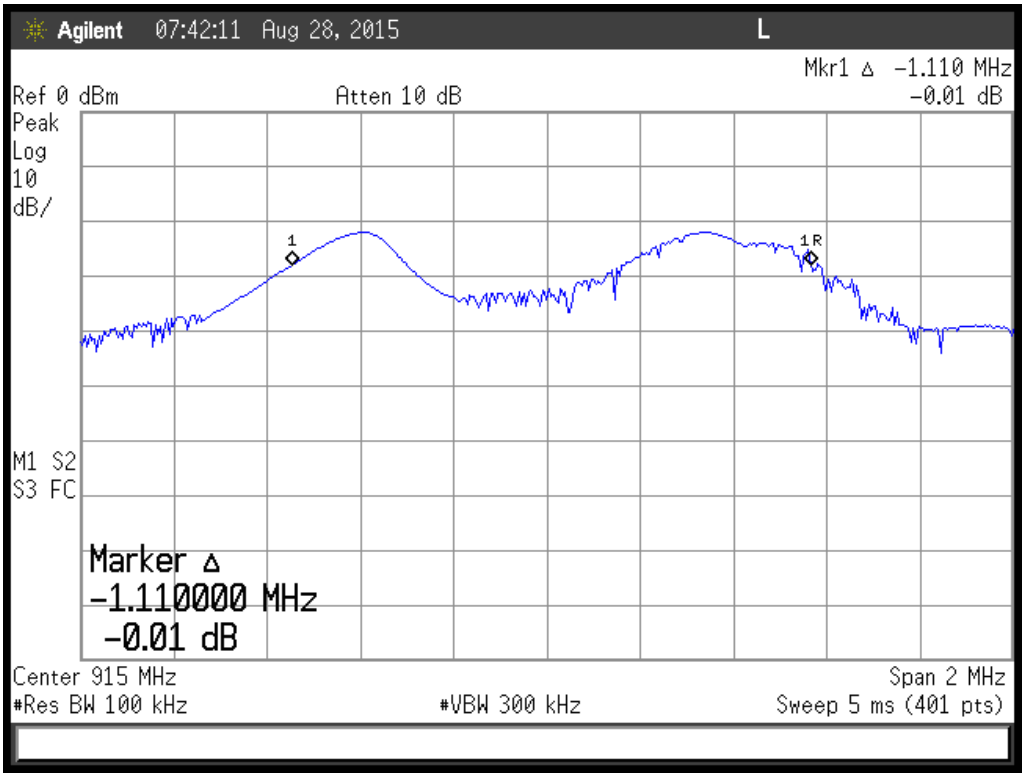
**Test Site:** EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2054 **Cable 3:** ---
**Analyzer:** 1327 **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---

Rev.8/11/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| SA EMI Chamber (1327) | 9kHz-13.2 GHz | E4405B | Agilent | MY45103416 | 1327 | I | 7/10/2016 | |
| **Radiated Emissions Sites** | **FCC Code** | **IC Code** | **VCCI Code** | **Range** | | **Cat** | **Calibration Due** | **Calibrated on** |
| EMI Chamber 1 | 719150 | 2762A-6 | A-0015 | 30-1000MHz | | II | 3/21/2017 | 3/21/2015 |
| **Antennas** | **Range** | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Red-Brown Bilog | 30-2000MHz | JB1 | Sunol | A0032406 | 1218 | I | 12/4/2016 | 12/4/2014 |
| **Cables** | **Range** | | **Mfr** | | | **Cat** | **Calibration Due** | **Calibrated on** |
| Asset #2051 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2054 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| **Meteorological Meters** | | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2080 | | HTC-1 | HDE | | 2080 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

**PLOT(s)**




915 MHz – 6dB Bandwidth

## Fundamental Emission Output Power

### LIMIT

Conducted Output Power
1 Watt
[15.247(b) (3)]

Per 558074 D01 DTS Measurement Guidance v0303 - Section 9.2.2.2 Method AVGSA-1 (trace averaging with the EUT transmitting at full power throughout each sweep)

### MEASUREMENTS / RESULTS

**Fundamental Emission Output Power**

**Date:** 24-Sep-15 **Company:** Ecovent Systems **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 22.1°C **Humidity:** 46% **Pressure:** 1019mBar
**Frequency Range:** Fundamental **Measurement Distance:** 3 m
**Notes:** 100% duty cycle - Full power
AVG 9.2.2.2

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dBµV/m) | --- | | | FCC 15.247 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Conducted EIRP (dBm) | | | Limit (dBm) | Margin (dB) | Result (Pass/Fail) |
| h | 915.0 | 83.1 | 0.0 | 22.7 | 1.7 | 107.5 | 14.3 | --- | --- | 30.0 | -15.7 | |

***Table Result:*** Pass by -15.7 dB ***Worst Freq:*** 915.0 MHz

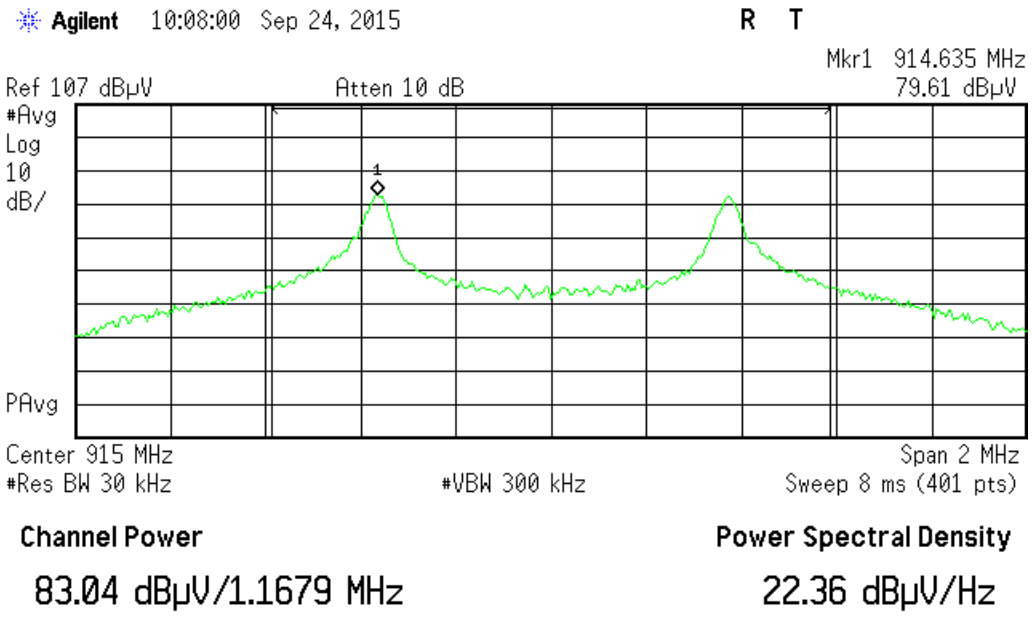
**Test Site:** EMI Chamber 2 **Cable 1:** Asset #2052 **Cable 2:** Asset #2053 **Cable 3:** ---
**Analyzer:** EMI Receiver **Preamp:** none **Antenna:** Red-Black **Preselector:** ---

Rev.9/17/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| MXE EMI Receiver | 20Hz-8.4GHz | N9038A | Agilent | MY53290009 | 1168255 | I | 6/16/2016 | 6/16/2015 |
| **Radiated Emissions Sites** | **FCC Code** | **IC Code** | **VCCI Code** | **Range** | | **Cat** | **Calibration Due** | **Calibrated on** |
| EMI Chamber 2 | 719150 | 2762A-7 | A-0015 | 30-1000MHz | | II | 3/22/2017 | 3/22/2015 |
| **Antennas** | **Range** | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Red-Black Bilog | 30-2000MHz | JB1 | Sunol | A091604-2 | 1106 | I | 2/9/2017 | 2/9/2015 |
| **Cables** | **Range** | | **Mfr** | | | **Cat** | **Calibration Due** | **Calibrated on** |
| Asset #2052 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2053 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| **Meteorological Meters** | | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2081 | | HTC-1 | HDE | | 2081 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## PLOTS




C:temp.gif file saved

915 MHz – Channel Power

# *Radiated Spurious Emissions*

## LIMITS

*Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).*
[15.247(d)]

## MEASUREMENTS / RESULTS

Radiated Band Edge (902 – 928 MHz)

**Radiated Emissions Table**

**Date:** 14-Aug-15 **Company:** ecoVent **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 22°C **Humidity:** 47% **Pressure:** 1009mBar
**Frequency Range:** Lower Band Edge (902 MHz) **Measurement Distance:** 3 m
**Notes:** M/N: 901-00002; Modulation: FSK, 100% duty cycle
TX on 915MHz
Limit is 69.7dBuV/m or -30 dB down from the maximum in band Peak PSD level

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dBµV/m) | --- Limit (dBµV/m) | --- Margin (dB) | --- Result (Pass/Fail) | --- Limit (dBµV/m) | --- Margin (dB) | --- Result (Pass/Fail) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v | 902.0 | 40.4 | 0.0 | 22.5 | 1.8 | 64.7 | --- | --- | --- | 69.7 | -5.0 | Pass |
| v | 901.4025 | 41.1 | 0.0 | 22.5 | 1.8 | 65.4 | --- | --- | --- | 69.7 | -4.3 | Pass |

***Table Result:*** Pass by -4.3 dB ***Worst Freq:*** 901.4 MHz

**Test Site:** EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2054 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

**Radiated Emissions Table**

**Date:** 14-Aug-15 **Company:** ecoVent **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 22°C **Humidity:** 47% **Pressure:** 1009mBar
**Frequency Range:** Upper Band Edge (928 MHz) **Measurement Distance:** 3 m
**Notes:** M/N: 901-00002; Modulation: FSK, 100% duty cycle
TX on 915MHz
Limit is 69.7dBuV/m or -30 dB down from the maximum in band Peak PSD level

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dBµV/m) | --- Limit (dBµV/m) | --- Margin (dB) | --- Result (Pass/Fail) | --- Limit (dBµV/m) | --- Margin (dB) | --- Result (Pass/Fail) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v | 928.0 | 40.0 | 0.0 | 22.5 | 1.7 | 64.2 | --- | --- | --- | 69.7 | -5.5 | Pass |
| v | 928.9275 | 40.3 | 0.0 | 22.5 | 1.7 | 64.5 | --- | --- | --- | 69.7 | -5.2 | Pass |

***Table Result:*** Pass by -5.2 dB ***Worst Freq:*** 928.9 MHz

**Test Site:** EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2054 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Rev.8/27/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| MXE EMI Receiver | 20Hz-8.4GHz | N9038A | Agilent | MY53290009 | 1168255 | I | 6/16/2016 | 6/16/2015 |

| Radiated Emissions Sites | FCC Code | IC Code | VCCI Code | Range | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| EMI Chamber 1 | 719150 | 2762A-6 | A-0015 | 30-1000MHz | | II | 3/21/2017 | 3/21/2015 |

| Antennas | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Red-Brown Bilog | 30-2000MHz | JB1 | Sunol | A0032406 | 1218 | I | 12/4/2016 | 12/4/2014 |

| Cables | Range | Mfr | | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|
| Asset #2051 | 9kHz - 18GHz | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2054 | 9kHz - 18GHz | Florida RF | | | II | 3/8/2016 | 3/8/2015 |

| Meteorological Meters | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|
| Weather Clock (Pressure Only) | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2080 | HTC-1 | HDE | | 2080 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## Radiated Spurious EMI (30 to 10000 MHz)

### Radiated Emissions Table

**Date:** 01-Sep-15 **Company:** Ecovent **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Controller **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 23°C **Humidity:** 54% **Pressure:** 1009mBar
**Frequency Range:** 30 - 1000 MHz **Measurement Distance:** 3 m
**Notes:** **EUT Max Freq:**

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dBµV/m) | --- Limit (dBµV/m) | --- Margin (dB) | --- Result (Pass/Fail) | FCC 15.209 Limit (dBµV/m) | FCC 15.209 Margin (dB) | FCC 15.209 Result (Pass/Fail) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v | 250.0 | 51.1 | 25.1 | 11.7 | 0.9 | 38.6 | --- | --- | --- | 46.0 | -7.4 | Pass |
| h | 250.0 | 53.3 | 25.1 | 11.7 | 0.9 | 40.8 | --- | --- | --- | 46.0 | -5.2 | Pass |
| h | 400.0 | 46.8 | 25.2 | 15.6 | 1.1 | 38.3 | --- | --- | --- | 46.0 | -7.7 | Pass |

***Table Result:*** Pass by -5.2 dB ***Worst Freq:*** 250.0 MHz

**Test Site:** EMI Chamber 2 **Cable 1:** Asset #2052 **Cable 2:** Asset #2053 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** Blue-Blk **Antenna:** Red-Black **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.146

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Rev. 8/27/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| SA EMI Chamber (1327) | 9kHz-13.2 GHz | E4405B | Agilent | MY45103416 | 1327 | I | 7/10/2016 | 7/10/2015 |
| **Radiated Emissions Sites** | **FCC Code** | **IC Code** | **VCCI Code** | **Range** | | **Cat** | **Calibration Due** | **Calibrated on** |
| EMI Chamber 2 | 719150 | 2762A-7 | A-0015 | 30-1000MHz | | II | 3/22/2017 | 3/22/2015 |
| **Antennas** | **Range** | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Red-Black Bilog | 30-2000MHz | JB1 | Sunol | A091604-2 | 1106 | I | 2/9/2017 | 2/9/2015 |
| **Meteorological Meters** | | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2081 | | HTC-1 | HDE | | 2081 | II | 4/2/2016 | 4/2/2015 |
| **Cables** | **Range** | | **Mfr** | | | **Cat** | **Calibration Due** | **Calibrated on** |
| Asset #2052 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2053 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| **Preamps /Couplers Attenuators / Filters** | **Range** | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Blue-Black | 0.009-2000MHz | ZFL-1000-LN | CS | N/A | 800 | II | 12/26/2015 | 12/26/2014 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

### Radiated Emissions Table

**Date:** 01-Sep-15 **Company:** Ecovent **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Controller **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 23°C **Humidity:** 54% **Pressure:** 1009mBar
**Frequency Range:** 1-6GHz **Measurement Distance:** 3m
**Notes:** HPF (1288) **EUT Max Freq:** 915 MHz

| Antenna Polarization (H / V) | Frequency (MHz) | Peak Reading (dBµV) | Average Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Peak Reading (dBµV/m) | Adjusted Avg Reading (dBµV/m) | FCC 15.209 High Frequency - Peak Limit (dBµV/m) | Peak Margin (dB) | Peak Result (Pass/Fail) | FCC 15.209 High Frequency - Average Limit (dBµV/m) | Average Margin (dB) | Average Result (Pass/Fail) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| h | 1840.0 | 36.07 | 23.9 | 18.2 | 27.3 | 2.7 | 47.9 | 35.7 | 74.0 | -26.1 | Pass | 54.0 | -18.3 | Pass |
| h | 2745.0 | 39.43 | 28.9 | 18.7 | 29.1 | 3.5 | 53.3 | 42.8 | 74.0 | -20.7 | Pass | 54.0 | -11.2 | Pass |
| h | 4572.9 | 36.85 | 25.6 | 17.0 | 32.5 | 4.6 | 57.0 | 45.7 | 74.0 | -17.0 | Pass | 54.0 | -8.3 | Pass |

***Table Result:*** Pass by -8.3 dB ***Worst Freq:*** 1840.0 MHz

**Test Site:** EMI Chamber 2 **Cable 1:** Asset #2052 **Cable 2:** Asset #2053 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** Brown **Antenna:** Black Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.146

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

## Radiated Emissions Table

**Date:** 01-Sep-15 **Company:** Ecovent **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Controller **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 23°C **Humidity:** 54% **Pressure:** 1009mBar
**Frequency Range:** 6-10 GHz **Measurement Distance:** 1 m
**Notes:** **EUT Max Freq:** 915 MHz

| Antenna Polarization (H / V) | Frequency (MHz) | Peak Reading (dBµV) | Average Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Peak Reading (dBµV/m) | Adjusted Avg Reading (dBµV/m) | FCC 15.209 High Frequency - Peak | | | FCC 15.209 High Frequency - Average | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Limit (dBµV/m) | Margin (dB) | Result (Pass/Fail) | Limit (dBµV/m) | Margin (dB) | Result (Pass/Fail) |
| v | 6404.8 | 36.54 | 25.1 | 15.8 | 35.5 | 5.9 | 62.1 | 50.7 | 83.5 | -21.4 | Pass | 63.5 | -12.8 | Pass |
| v | 7320.0 | 35.11 | 22.7 | 15.7 | 37.9 | 5.8 | 63.1 | 50.7 | 83.5 | -20.4 | Pass | 63.5 | -12.8 | Pass |

***Table Result:*** Pass by -12.8 dB ***Worst Freq:*** 6404.8 MHz

**Test Site:** EMI Chamber 2 **Cable 1:** Asset #2052 **Cable 2:** Asset #2053 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** Brown **Antenna:** Black Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.146

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Rev.8/27/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| SA EMI Chamber (1327) | 9kHz-13.2 GHz | E4405B | Agilent | MY45103416 | 1327 | I | 7/10/2016 | 7/10/2015 |

| Radiated Emissions Sites | FCC Code | IC Code | VCCI Code | Range | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| EMI Chamber 2 | 719150 | 2762A-7 | A-0015 | 30-1000MHz | | II | 3/22/2017 | 3/22/2015 |

| Preamps /Couplers Attenuators / Filters | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Brown | 1-10GHz | CS | CS | N/A | 1523 | II | 4/9/2016 | 4/9/2015 |
| High Pass Filter | 0.03-9 GHz | VHP-16 | Mini-Circuits | NA | 1288 | II | 1/13/2016 | 1/13/2015 |

| Antennas | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Black Horn | 1-18GHz | 3115 | EMCO | 9703-5148 | 56 | I | 8/21/2016 | 8/21/2014 |

| Cables | Range | | Mfr | | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Asset #2052 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2053 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |

| Meteorological Meters | | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2081 | | HTC-1 | HDE | | 2081 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

# Power Spectral Density

## LIMIT

*…the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.* [15.247(e)]

Per 558074 D01 DTS Measurement Guidance v0303 Section 10.3 Method AVGPSD-1 (trace averaging with EUT transmitting at full power throughout each sweep)

## MEASUREMENTS / RESULTS

**Power Spectral Density**

**Date:** 04-Sep-15 **Company:** Ecovent Systems **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Controller **EUT Operating Voltage/Frequency:** 120Vac/60Hz
**Temp:** 22°C **Humidity:** 51% **Pressure:** 1014mBar
**Frequency Range:** Fundamental **Measurement Distance:** 3 m
**Notes:** 100% duty cycle - with reduced power 10.6dBm Modification: EUT tx power was reduced from 11.6 dBm to 10.6 dBm.
10.3 (AVGPSD-1)

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (dBµV) | Preamp Factor (dB) | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dBµV/m) | --- | | | FCC 15.247 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Conducted EIRP (dBm) | | | Limit (dBm) | Margin (dB) | Result (Pass/Fail) |
| h | 915.0 | 75.3 | 0.0 | 22.7 | 1.7 | 99.7 | 6.5 | --- | --- | 8.0 | -1.5 | Pass |

***Table Result:*** Pass by -1.5 dB ***Worst Freq:*** 915.0 MHz

**Test Site:** EMI Chamber 2 **Cable 1:** Asset #2052 **Cable 2:** Asset #2053 **Cable 3:** ---
**Analyzer:** Asset #1327 **Preamp:** none **Antenna:** Red-Black **Preselector:** ---
*CSsoft Radiated Emissions Calculator v 1.017.146*

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Rev.8/27/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| SA EMI Chamber (1327) | 9kHz-13.2 GHz | E4405B | Agilent | MY45103416 | 1327 | I | 7/10/2016 | 7/10/2015 |

| Radiated Emissions Sites | FCC Code | IC Code | VCCI Code | Range | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| EMI Chamber 2 | 719150 | 2762A-7 | A-0015 | 30-1000MHz | | II | 3/22/2017 | 3/22/2015 |

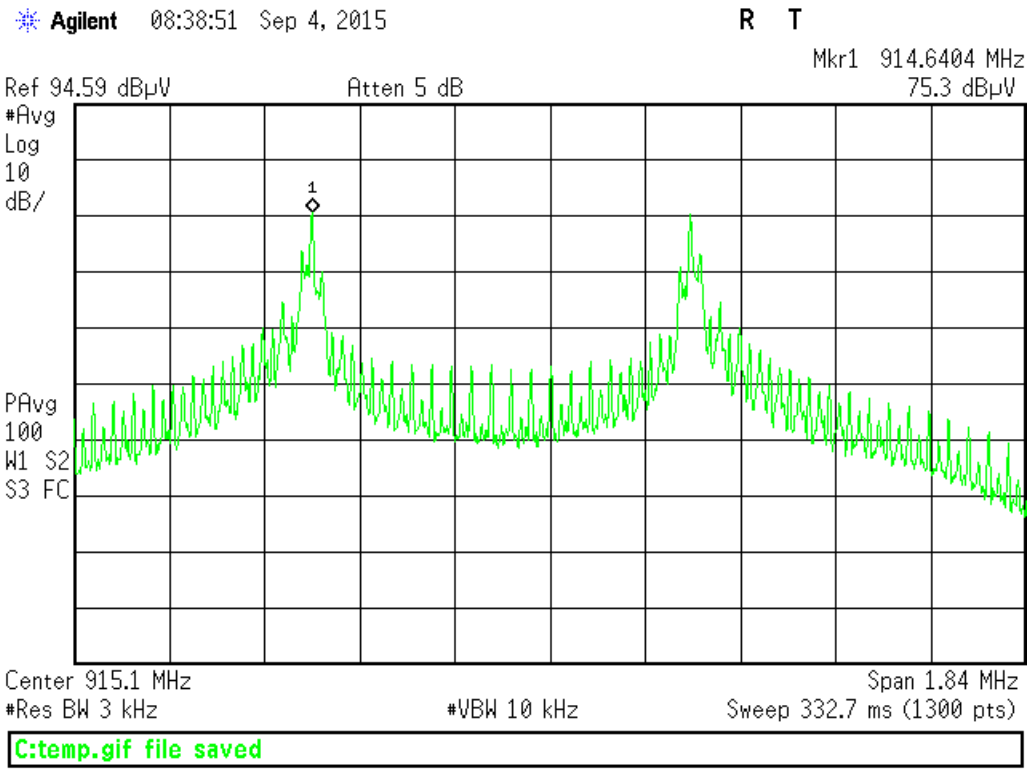
| Antennas | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Red-Black Bilog | 30-2000MHz | JB1 | Sunol | A091604-2 | 1106 | I | 2/9/2017 | 2/9/2015 |

| Cables | Range | Mfr | | | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|
| Asset #2052 | 9kHz - 18GHz | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2053 | 9kHz - 18GHz | Florida RF | | | II | 3/8/2016 | 3/8/2015 |

| Meteorological Meters | | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2081 | | HTC-1 | HDE | | 2081 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## PLOTS




915 MHz – PSD

# AC Line Conducted Emissions

## LIMITS

| Frequency of emission (MHz) | Quasi-peak limit (dBµV) | Average limit (dBµV) |
|---|---|---|
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

## MEASUREMENTS / RESULTS

**AC Conducted Emissions Data Table**

**Date:** 24-Sep-15 **Company:** Ecovent Systems **Work Order:** P2231
**Engineer:** Tuyen Truong **EUT Desc:** Control Hub
**Temp:** 23.2 ºC **Humidity:** 40% **Pressure:** 1019 mBar
**Notes:**
**Frequency Range:** 0.15 - 30 MHz **EUT Input Voltage/Frequency:** 120Vac/60Hz

| | Quasi-Peak Readings | | Average Readings | | LISN Factors | | Cable | ATTN | FCC 15.207 | | | FCC 15.207 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | QP1 | QP2 | AVG1 | AVG2 | L1 | L2 | Factor | Factor | QP Limit | Margin | Result | AVG Limit | Margin | Result |
| (MHz) | (dBµV) | (dBµV) | (dBµV) | (dBµV) | (dB) | (dB) | (dB) | (dB) | (dBµV) | (dB) | (Pass/Fail) | (dBµV) | (dB) | (Pass/Fail) |
| 0.49 | 19.4 | 15.6 | 19.4 | 15.6 | 0.0 | 0.0 | -0.1 | -19.6 | 56.3 | -17.1 | Pass | 46.3 | -7.1 | Pass |
| 3.81 | 27.2 | 26.3 | 10.5 | 12.6 | 0.0 | 0.0 | -0.2 | -19.6 | 56.0 | -9.0 | Pass | 46.0 | -13.6 | Pass |
| 5.37 | 25.3 | 27.1 | 25.3 | 27.1 | 0.0 | 0.0 | -0.2 | -19.6 | 60.0 | -13.1 | Pass | 50.0 | -3.1 | Pass |
| 13.51 | 22.5 | 18.5 | 22.5 | 18.5 | -0.1 | -0.1 | -0.2 | -19.6 | 60.0 | -17.6 | Pass | 50.0 | -7.6 | Pass |
| 14.18 | 23.2 | 18.7 | 23.2 | 18.7 | -0.1 | -0.1 | -0.2 | -19.6 | 60.0 | -16.9 | Pass | 50.0 | -6.9 | Pass |
| 25.75 | 10.2 | 11.9 | 10.2 | 11.9 | -0.1 | -0.1 | -0.3 | -19.6 | 60.0 | -28.1 | Pass | 50.0 | -18.1 | Pass |

***Result:*** Pass ***Worst Margin:*** -3.1 dB ***Frequency:*** 5.370 MHz

**Measurement Device:** LISN ASSET 1728(Line 1) LISN ASSET 1729(Line 2) **Cable:** CEMI-01 **Spectrum Analyzer:** Gold
**Attenuator:** 20dB Attenuator-73 **Site:** CEMI 2

Rev.9/17/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| Gold | 100Hz-26.5 GHz | E4407B | Agilent | MY45113816 | 1284 | I | 4/22/2016 | 4/22/2015 |

| LISNs/Measurement Probes | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| LISN Asset 1728 | 150kHz-30MHz | LI-150A | Com-Power | 201084 | 1728 | I | 4/7/2016 | 4/7/2015 |
| LISN Asset 1729 | 150kHz-30MHz | LI-150A | Com-Power | 201085 | 1729 | I | 4/7/2016 | 4/7/2015 |

| Conducted Test Sites (Mains / Telco) | FCC Code | VCCI Code | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|
| CEMI 2 | 719150 | A-0015 | III | NA | N/A |

| Cables | Range | Mfr | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|
| CEMI-01 | 9kHz - 2GHz | C-S | II | 9/11/2016 | 9/11/2015 |

| Attenuators | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| 20dB Attenuator-73 | 9kHz-2GHz | | | N/A | | II | 9/11/2016 | 9/11/2015 |

| Meteorological Meters | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|
| Weather Clock (Pressure Only) | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2078 | HTC-1 | HDE | | 2078 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

# Occupied Bandwidth

## REQUIREMENT

*When an occupied bandwidth is no specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.* [RSS-GEN 6.6]

## MEASUREMENTS / RESULTS

**99% OCCUPIED BANDWIDTH**

| | | | |
|---|---|---|---|
| **Date:** 28-Aug-15 | **Company:** Ecovent Systems | | **Work Order:** P2231 |
| **Engineer:** Ryan Brown | **EUT Desc:** Control Hub | | **EUT Operating Voltage/Frequency:** 120Vac/60Hz |
| **Temp:** 22°C | **Humidity:** 47% | **Pressure:** 1009mBar | |
| **Frequency Range:** Fundamental | | | **Measurement Distance:** 3 m |
| **Notes:** | Modulation: FSK | | |

| Antenna Polarization (H / V) | Frequency (MHz) | Reading (KHz) |
|---|---|---|
| H | 915.0 | 1167.9 |

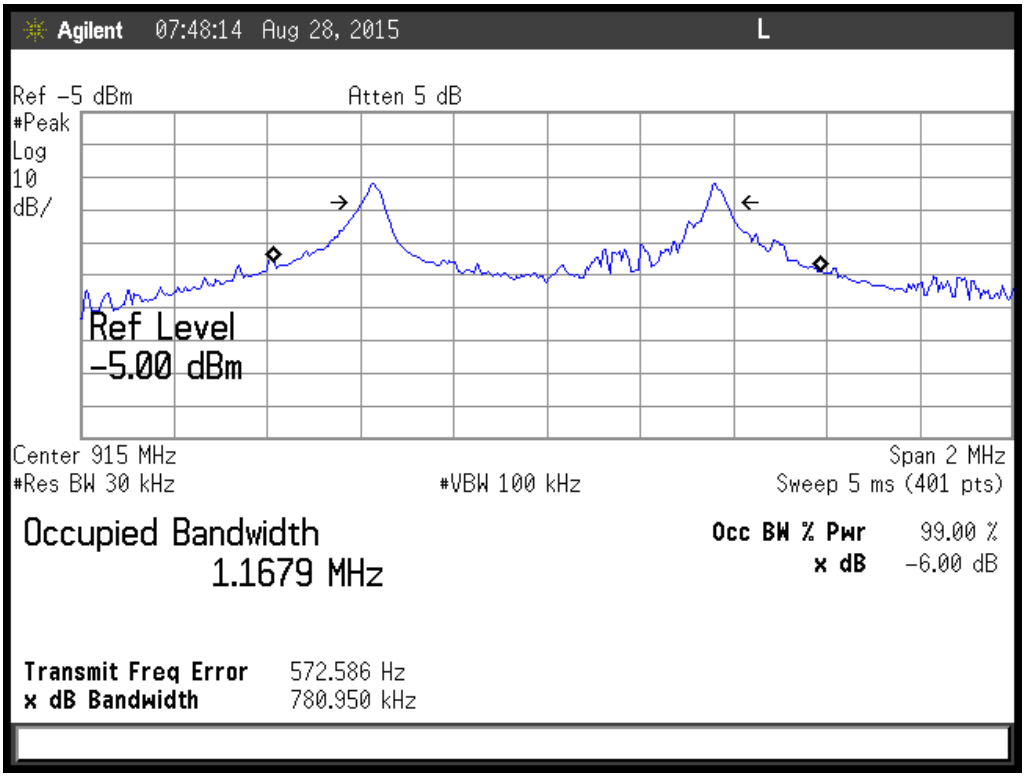
| | | | |
|---|---|---|---|
| **Test Site:** EMI Chamber 1 | **Cable 1:** Asset #2051 | **Cable 2:** Asset #2054 | **Cable 3:** --- |
| **Analyzer:** 1327 | **Preamp:** none | **Antenna:** Red-Brown | **Preselector:** --- |

Rev.8/11/2015

| Spectrum Analyzers / Receivers /Preselectors | Range | MN | Mfr | SN | Asset | Cat | Calibration Due | Calibrated on |
|---|---|---|---|---|---|---|---|---|
| SA EMI Chamber (1327) | 9kHz-13.2 GHz | E4405B | Agilent | MY45103416 | 1327 | I | 7/10/2016 | |
| **Radiated Emissions Sites** | **FCC Code** | **IC Code** | **VCCI Code** | **Range** | | **Cat** | **Calibration Due** | **Calibrated on** |
| EMI Chamber 1 | 719150 | 2762A-6 | A-0015 | 30-1000MHz | | II | 3/21/2017 | 3/21/2015 |
| **Antennas** | **Range** | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Red-Brown Bilog | 30-2000MHz | JB1 | Sunol | A0032406 | 1218 | I | 12/4/2016 | 12/4/2014 |
| **Cables** | **Range** | | **Mfr** | | | **Cat** | **Calibration Due** | **Calibrated on** |
| Asset #2051 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| Asset #2054 | 9kHz - 18GHz | | Florida RF | | | II | 3/8/2016 | 3/8/2015 |
| **Meteorological Meters** | | **MN** | **Mfr** | **SN** | **Asset** | **Cat** | **Calibration Due** | **Calibrated on** |
| Weather Clock (Pressure Only) | | BA928 | Oregon Scientific | C3166-1 | 831 | I | 3/19/2016 | 3/19/2014 |
| TH A#2080 | | HTC-1 | HDE | | 2080 | II | 4/2/2016 | 4/2/2015 |

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

**Plot(s)**




915 MHz – Occupied Bandwidth

## Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

| Measurement | Expanded Uncertainty k=2 | Maximum allowable uncertainty |
|---|---|---|
| Radiated Emissions (30-1000MHz)<br>NIST<br>CISPR | <br>5.6dB<br>4.6dB | <br>N/A<br>5.2dB (Ucispr) |
| Radiated Emissions (1-26.5GHz) | 4.6dB | N/A |
| Radiated Emissions (above 26.5GHz) | 4.9dB | N/A |
| Magnetic Radiated Emissions | 5.6dB | N/A |
| Conducted Emissions<br>NIST<br>CISPR | <br>3.9dB<br>3.6dB | <br>N/A<br>3.6dB (Ucispr) |
| Telco Conducted Emissions (Current) | 2.9dB | N/A |
| Telco Conducted Emissions (Voltage) | 4.4dB | N/A |
| Electrostatic Discharge | 11.5% | N/A |
| Radiated RF Immunity (Uniform Field) | 1.6dB | N/A |
| Electrical Fast Transients | 23.1% | N/A |
| Surge | 23.1% | N/A |
| Conducted RF Immunity | 3dB | N/A |
| Magnetic Immunity | 12.8% | N/A |
| Dips and Interrupts | 2.3V | N/A |
| Harmonics | 3.5% | N/A |
| Flicker | 3.5% | N/A |
| Radio frequency (@ 2.4GHz) | $3.23 \times 10^{-8}$ | $1 \times 10^{-7}$ |
| RF power, conducted | 0.40dB | 0.75dB |
| Maximum frequency deviation:<br>• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency | <br>3.4%<br>0.3dB | <br>5%<br>3dB |
| Adjacent channel power | 1.9dB | 3dB |
| Conducted spurious emission of transmitter, valid up to 12.75GHz | 2.39dB | 3dB |
| Conducted emission of receivers | 1.3dB | 3dB |
| Radiated emission of transmitter, valid up to 26.5GHz | 3.9dB | 6dB |
| Radiated emission of transmitter, valid up to 80GHz | 3.3dB | 6dB |
| Radiated emission of receiver, valid up to 26.5GHz | 3.9dB | 6dB |
| Radiated emission of receiver, valid up to 80GHz | 3.3dB | 6dB |
| Humidity | 2.37% | 5% |
| Temperature | 0.7°C | 1.0°C |
| Time | 4.1% | 10% |
| RF Power Density, Conducted | 0.4dB | 3dB |
| DC and low frequency voltages | 1.3% | 3% |
| Voltage (AC, <10kHz) | 1.3% | 2% |
| Voltage (DC) | 0.62% | 1% |
| The above reflects a 95% confidence level | | |

## *Conditions Of Testing*

**[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation],** and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS", "MTL", "ACTS", "MTL-ACTS" and CURTIS-STRAUS** (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request.
Rev.160009121(2)_#684340 v14CS