Test Report

Report No	EP2928-3
Client	ecoVent Robert Kim
Address	24 Cambridge St, Suite 6 Charlestown, MA 02129
Phone	857-204-4466
Items tested FCC ID	CONTROL HUB 2AFTLSH1
FRN	0024870743
Equipment Type Equipment Code	Part 15.247 Digitally Modulated DTS
FCC/IC Rule Parts	47 CFR 15.247, RSS-247 Issue 1
Test Dates	October 15, 16, 22 and Nov 4, 2015
Results	As detailed within this report
Prepared by	Tuyen A. Truong – Test Engineer
Authorized by	Christopher Reynolds – EMC Supervisor
Issue Date	12/9/2015
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 27 of this report.

Contents

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

Summary

This test report details the partial testing of the CONTROL HUB (with existing FCC ID: 2AFTLSH1) with the following modifications:

> The channel plan was changed to operate on all channels (see channel plan exhibit) from 904 to 926 MHz range (formerly only 1 channel (915 MHz) used for operation). Per client, this is only a software change of the frequency and the end user cannot switch between channel plans. Also EUT transmit power setting was reduced; 9.6 dBm of power from 904 MHz up to 915 MHz range and 10.6 dBm of power from 915 to 926 MHz range.

The following tests were done to evaluate the above modifications: 6 dB Bandwidth, 99% Occupied Bandwidth, Fundamental Emission Output Power, Power Spectral Density and Spurious Radiated Emissions. We found that the product met the above requirements with modification (see Modification Required for Compliance section on page 7 for details). Testing of the original channel plan was previously performed under report EP2231-4.

Robert Kim from ecoVent was present during the testing. The test sample was received in good condition.

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
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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.

Operating channel frequency = 904 MHz
Operating channel frequency = 915 MHz
Operating channel frequency = 926 MHz

The following bandwidths were used during radiated spurious 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
Wall Industries, Inc AC/DC Power Brick	NA010050021	WMNA1105-UW	Sample 1
EUT Description:	Control Hub		
EUT TX Frequency:	904 - 926 MHz		
EUT Max Frequency:	50 MHz		
EUT Min Frequency:	0.032768 MHz		

Support Equipment	**MN**	**SN**
TLINK Ethernet Switch	TLINK	--

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 9.6 dBm of power on 904 MHz- 915 MHz and 10.6dBm from 915MHz - 926 MHz respectively. Modulation type used is FSK2 with constant transmission (100% duty cycle). Maximum antenna gain is -2 dBi.

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 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	Evaluation Not Requested. EUT AC Mains was tested under report EP2231-4
		15.247	The unit complies with the requirements of FCC Part 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

EUT transmit power was set to 9.6 dBm from 904 to 915 MHz range and 10.6 dBm from 915 to 926 MHz range. The power setting in the original application was 11.6dBm. This power setting is fixed in firmware and therefore the user cannot change the power settings. Ecovent is taking care of the firmware and sets fixed power settings at the factory.

Test Results

Bandwidth

LIMIT

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

MEASUREMENTS / RESULTS

6dB BANDWIDTH

Date: 15-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac / 60Hz
Temp: 22°C **Humidity:** 33% **Pressure:** 1006mBar
Frequency Range: 904 - 926 MHz **Measurement Distance:** 3 m
Notes: EUT tx power is set to 10.6 dBm
FSK2 modulation - 100% duty cycle

Antenna Polarization (H / V)	Frequency (MHz)	Reading (KHz)	6dB BW Limit (KHz)	6dB BW Margin (KHz)	6dB BW Result (Pass/Fail)
H	904	705.634	≥500	+205.634	Pass
H	915	693.960	≥500	+193.960	Pass
H	926	701.204	≥500	+201.204	Pass

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

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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

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

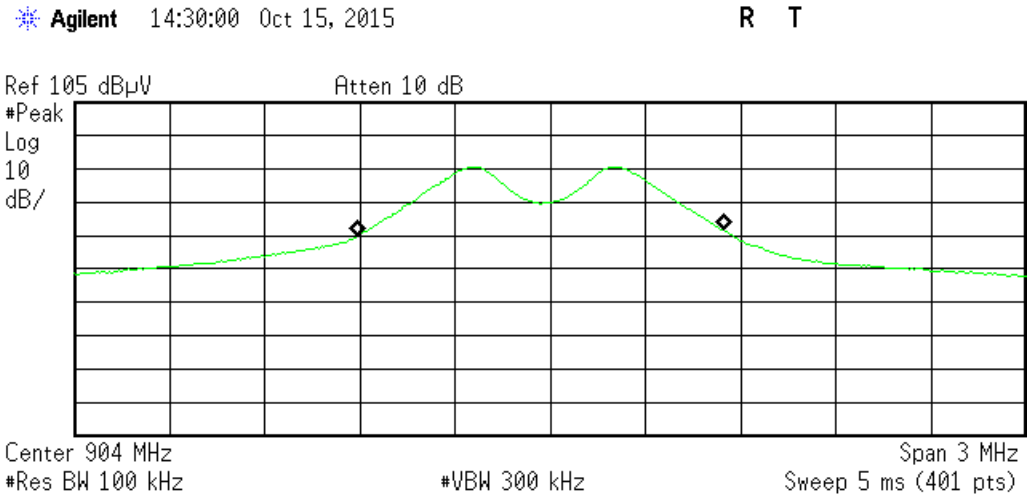
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	12/4/2016	12/4/2014

Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
Asset #2051	9kHz - 18GHz	Florida RF	II	3/8/2016	3/8/2015
Asset #2053	9kHz - 18GHz	Florida RF	II	3/8/2016	3/8/2015

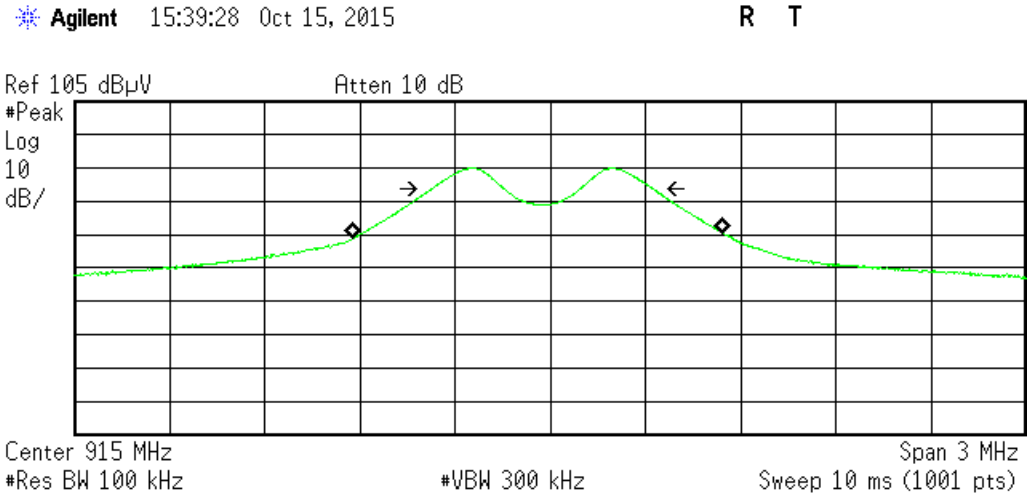
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	3/19/2016	3/19/2014
TH A#2080	HTC-1	HDE		2080	II	4/2/2016	4/2/2015

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

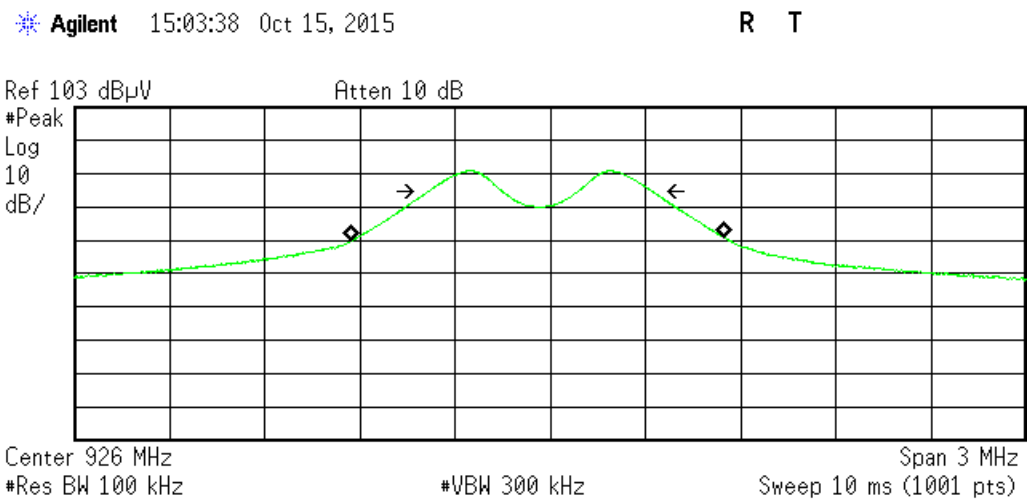
PLOT(s)



904 MHz – 6dB Bandwidth



915 MHz – 6dB Bandwidth



926 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 (AVGSA-1 - Average Conducted Output Power)

MEASUREMENTS / RESULTS

Fundamental Emission Output Power

Date: Nov 4 and 9, 2015 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
Nov 4 - Temp: 22°C **Humidity:** 0.28 **Pressure:** 1001mBar
Nov 9 - Temp: 21.4°C **Humidity:** 27% **Pressure:** 1006mBar

Frequency Range: 904 - 926 MHz **Measurement Distance:** 3 m

Notes: EUT TX power is set to 9.6 dBm from 904-915 MHz range and 10.6 dBm from 915 to 926 MHz range - FSK2 modulation - 100% duty cycle
AVGSA-1

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	Adjusted EIRP Reading (dBm)	Final Conducted Reading (dBm)	FCC 15.247 Limit (dBm)	FCC 15.247 Margin (dB)	FCC 15.247 Result (Pass/Fail)
H	*904.0*	*83.24*	*0.0*	*22.5*	*1.7*	*107.44*	*12.21*	*14.21*	30.0	-15.79	Pass
H	*915.0*	*83.33*	*0.0*	*22.4*	*1.7*	*107.43*	*12.20*	*14.20*	30.0	-15.80	Pass
H	*926.0*	*83.20*	*0.0*	*22.5*	*1.7*	*107.40*	*12.17*	*14.17*	30.0	-15.83	Pass

Table Result: Pass by -15.79 dB ***Worst Freq:*** 904.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053
Analyzer: Gold **Preamp:** none **Antenna:** Red-Brown
CSsoft Radiated Emissions Calculator v 1.017.148

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

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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

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

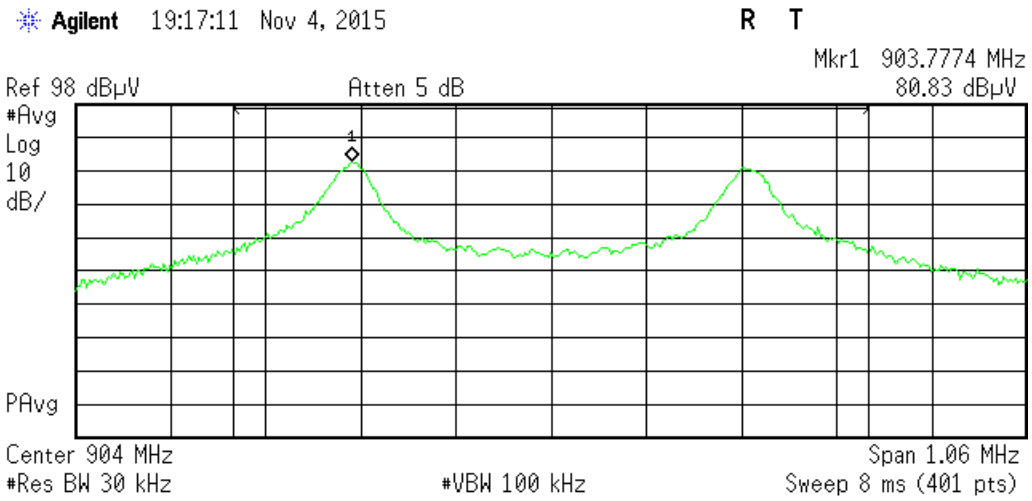
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	12/4/2016	12/4/2014

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

PLOTS



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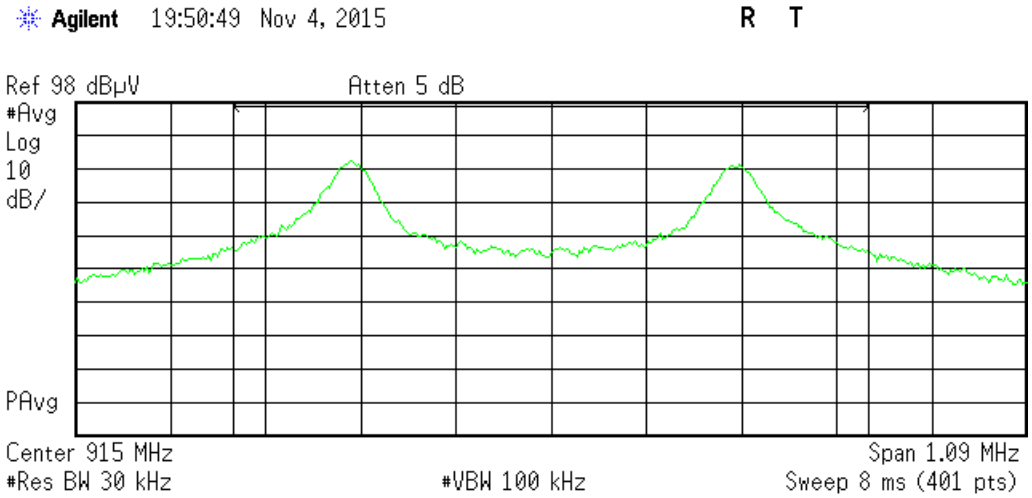
904 MHz – Channel Power



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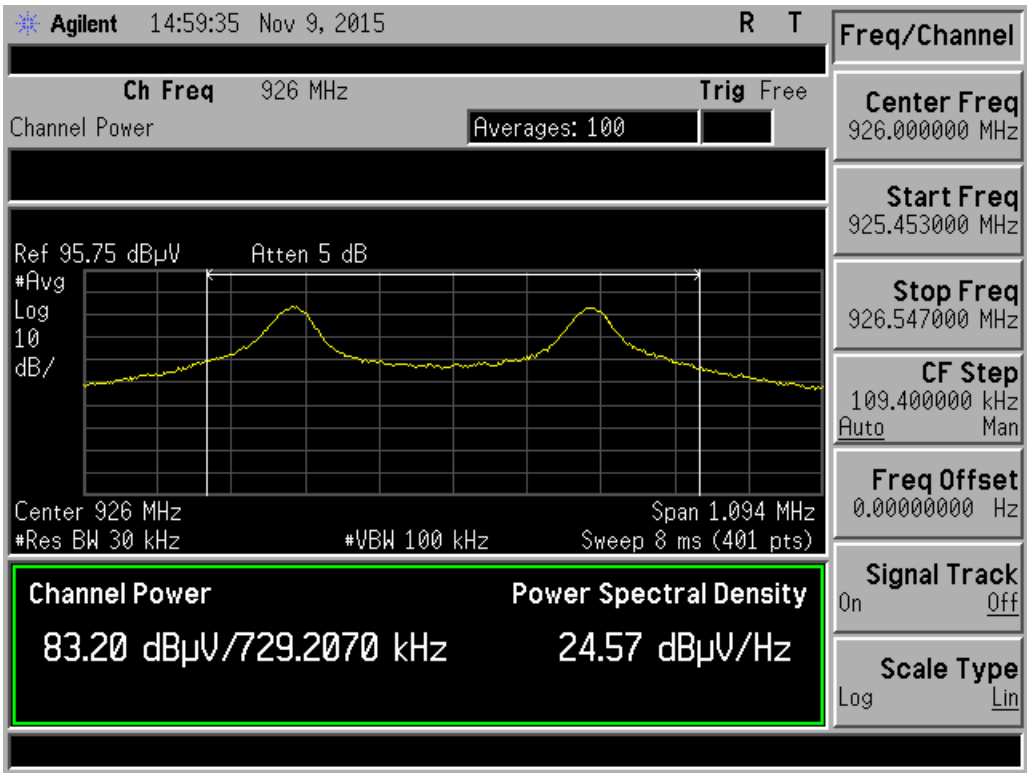
915 MHz – Channel Power



926 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 - Radiated Band Edge

Date: 15-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Module **EUT Operating Voltage/Frequency:** 120VAC/60Hz
Temp: 22°C **Humidity:** 33% **Pressure:** 1006mBar
Frequency Range: Band Edge Readings **Measurement Distance:** 3 m
Notes: The limit here is set to -30dB from the max in-band peak PSD in 100kHz (this correspond 79.6dBuV/M)

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 Band Edge Limit Limit (dBµV/m)	FCC Band Edge Limit Margin (dB)	FCC Band Edge Limit Result (Pass/Fail)
V	902.0	49.6	0.0	22.5	1.7	73.8	---	---	---	79.6	-5.8	Pass
V	928.0	47.8	0.0	22.5	1.6	71.9	---	---	---	79.6	-7.7	Pass

Table Result: Pass by -5.8 dB ***Worst Freq:*** 902.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **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 - maximum peak PSD in 100kHz rbw

Date: 15-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Module **EUT Operating Voltage/Frequency:** 120VAC/60Hz
Temp: 22°C **Humidity:** 33% **Pressure:** 1006mBar
Frequency Range: Fundamental Reading **Measurement Distance:** 3 m
Notes:

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)
MAX Peak PSD in 100kHz BW			---	---	---	---	---	---	---	---	---	---
V	904.0	85.4	0.0	22.5	1.7	109.6	---	---	---	---	---	---

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

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Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	4/22/2016
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**		**Cat**	**Calibration Due**
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz		II	3/21/2017
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	12/4/2016
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**
Asset #2051	9kHz - 18GHz		Florida RF			II	3/8/2016
Asset #2053	9kHz - 18GHz		Florida RF			II	3/8/2016
Meteorological Meters		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	3/19/2016
TH A#2080		HTC-1	HDE		2080	II	4/2/2016

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: 16-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
Temp: 22°C **Humidity:** 31% **Pressure:** 1003mBar
Frequency Range: 30 - 1000MHz **Measurement Distance:** 3 m
Notes: EUT is set to tx on 904 MHz **EUT Tx Freq:** 904 - 926 MHz
Note: Spectrum Analyzer setting: RBW = 120 KHz, VBW = 1MHz, span = 0 Hz, 401 points, sweep rate = auto, Detector: Quasi-Peak.

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	50.4	41.3	25.4	8.0	0.4	24.3	---	---	---	40.0	-15.7	Pass
v	150.0	45.5	25.1	12.5	0.7	33.6	---	---	---	43.5	-9.9	Pass
v	250.0	52.3	25.1	11.7	0.9	39.8	---	---	---	46.0	-6.2	Pass
h	250.0	54.8	25.1	11.7	0.9	42.3	---	---	---	46.0	-3.7	Pass
v	400.0	48.9	25.2	15.6	1.1	40.4	---	---	---	46.0	-5.6	Pass
h	400.0	48.2	25.2	15.6	1.1	39.7	---	---	---	46.0	-6.3	Pass
v	550.0	41.0	25.2	18.1	1.5	35.4	---	---	---	46.0	-10.6	Pass
v	960.0	33.4	24.5	22.9	1.7	33.5	---	---	---	46.0	-12.5	Pass
h	975.0	33.0	24.4	22.9	1.8	33.3	---	---	---	54.0	-20.7	Pass

Table Result: Pass by -3.7 dB ***Worst Freq:*** 250.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Blue-Blk **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

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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
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
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
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 #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#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 Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 1 - 6 GHz **Measurement Distance:** 3 m
Notes: TX on Low channel **EUT Tx Freq:** 904 - 926 MHz
HP1288
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)	FCC 15.209 High Frequency - Peak Margin (dB)	FCC 15.209 High Frequency - Peak Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	FCC 15.209 High Frequency - Average Margin (dB)	FCC 15.209 High Frequency - Average Result (Pass/Fail)
v	1808.0	40.26	23.0	18.8	30.6	2.6	54.7	37.4	74.0	-19.3	Pass	54.0	-16.6	Pass
v	2712.0	38.33	26.8	18.9	32.9	3.5	55.8	44.3	74.0	-18.2	Pass	54.0	-9.7	Pass
h	2712.0	35.4	24.2	18.9	32.9	3.5	52.9	41.7	74.0	-21.1	Pass	54.0	-12.3	Pass
v	3616.0	36.73	22.5	18.5	33.3	4.1	55.6	41.4	74.0	-18.4	Pass	54.0	-12.6	Pass
h	3616.0	36.64	22.3	18.5	33.3	4.1	55.5	41.2	74.0	-18.5	Pass	54.0	-12.8	Pass
v	4520.0	37.61	26.7	17.1	34.2	4.5	59.2	48.3	74.0	-14.8	Pass	54.0	-5.7	Pass
h	4520.0	35.44	22.5	17.1	34.2	4.5	57.0	44.1	74.0	-17.0	Pass	54.0	-9.9	Pass
v	5424.0	32.77	22.1	16.4	34.8	5.1	56.3	45.6	74.0	-17.7	Pass	54.0	-8.4	Pass

Table Result: Pass by -5.7 dB ***Worst Freq:*** 4520.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Radiated Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 6 - 10GHz **Measurement Distance:** 1 m
Notes: TX on Low channel **EUT Tx Freq:** 904 - 926 MHz
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)
NO EMISSIONS FOUND IN THIS RANGE														

Table Result: --- by --- dB ***Worst Freq:*** --- MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/19/2015

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
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
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	10/8/2015
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**
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/8/2017	2/8/2015
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2051	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#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 Emissions Table

Date: 16-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
Temp: 22°C **Humidity:** 31% **Pressure:** 1003mBar
Frequency Range: 30 - 1000MHz **Measurement Distance:** 3 m
Notes: EUT is set to tx on 915 MHz **EUT Tx Freq:** 904 - 926 MHz
Note: Spectrum Analyzer setting: RBW = 120 KHz, VBW = 1MHz, span = 0 Hz, 401 points, sweep rate = auto, Detector: Quasi-Peak.

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC 15.209		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
v	50.4	46.4	25.4	8.0	0.4	29.4	---	---	---	40.0	-10.6	Pass
v	150.0	47.8	25.1	12.5	0.7	35.9	---	---	---	43.5	-7.6	Pass
v	250.0	50.5	25.1	11.7	0.9	38.0	---	---	---	46.0	-8.0	Pass
h	250.0	54.3	25.1	11.7	0.9	41.8	---	---	---	46.0	-4.2	Pass
v	400.0	49.6	25.2	15.6	1.1	41.1	---	---	---	46.0	-4.9	Pass
h	400.0	42.0	25.2	15.6	1.1	33.5	---	---	---	46.0	-12.5	Pass
v	550.0	38.3	25.2	18.1	1.5	32.7	---	---	---	46.0	-13.3	Pass
v	960.0	29.4	24.5	22.9	1.7	29.5	---	---	---	46.0	-16.5	Pass
h	975.0	31.9	24.4	22.9	1.8	32.2	---	---	---	54.0	-21.8	Pass

Table Result: Pass by -4.2 dB ***Worst Freq:*** 250.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Blue-Blk **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/8/2015

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
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
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
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 #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#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 Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 1 - 6 GHz **Measurement Distance:** 3 m
Notes: TX on Mid channel **EUT Tx Freq:** 904 - 926 MHz
HP1288
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)	Margin (dB)	Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
v	1830.0	35.5	22.8	18.9	30.7	2.7	50.0	37.3	74.0	-24.0	Pass	54.0	-16.7	Pass
v	2745.0	39.77	27.5	18.9	33.0	3.5	57.4	45.1	74.0	-16.6	Pass	54.0	-8.9	Pass
h	2745.0	40.57	28.3	18.9	33.0	3.5	58.2	45.9	74.0	-15.8	Pass	54.0	-8.1	Pass
v	3660.0	36.47	23.5	18.5	33.4	4.1	55.5	42.5	74.0	-18.5	Pass	54.0	-11.5	Pass
h	3660.0	35.18	22.8	18.5	33.4	4.1	54.2	41.8	74.0	-19.8	Pass	54.0	-12.2	Pass
v	4575.0	38.35	25.6	17.2	34.3	4.6	60.1	47.3	74.0	-13.9	Pass	54.0	-6.7	Pass
h	4575.0	36.96	24.2	17.2	34.3	4.6	58.7	45.9	74.0	-15.3	Pass	54.0	-8.1	Pass
v	5490.0	33.9	21.6	16.4	34.8	5.2	57.5	45.2	74.0	-16.5	Pass	54.0	-8.8	Pass

Table Result: Pass by -6.7 dB ***Worst Freq:*** 4575.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Radiated Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 6 - 10GHz **Measurement Distance:** 1 m
Notes: TX on Mid channel **EUT Tx Freq:** 904 - 926 MHz
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)	Margin (dB)	Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
NO EMISSIONS FOUND IN THIS RANGE														

Table Result: --- by --- dB ***Worst Freq:*** --- MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/19/2015

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
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
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	10/8/2015
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**
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/8/2017	2/8/2015
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2051	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#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 Emissions Table

Date: 16-Oct-15 **Company:** ecoVent **Work Order:** P2928

Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz

Temp: 22°C **Humidity:** 31% **Pressure:** 1003mBar

Frequency Range: 30 - 1000MHz **Measurement Distance:** 3 m

Notes: EUT is set to tx on 926 MHz **EUT Tx Freq:** 904 - 926 MHz

Note: Spectrum Analyzer setting: RBW = 120 KHz, VBW = 1MHz, span = 0 Hz, 401 points, sweep rate = auto, Detector: Quasi-Peak.

							---			FCC 15.209		
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	50.4	45.5	25.4	8.0	0.4	28.5	---	---	---	40.0	-11.5	Pass
v	150.0	41.6	25.1	12.5	0.7	29.7	---	---	---	43.5	-13.8	Pass
v	250.0	53.3	25.1	11.7	0.9	40.8	---	---	---	46.0	-5.2	Pass
h	250.0	55.6	25.1	11.7	0.9	43.1	---	---	---	46.0	-2.9	Pass
v	400.0	46.6	25.2	15.6	1.1	38.1	---	---	---	46.0	-7.9	Pass
h	400.0	39.9	25.2	15.6	1.1	31.4	---	---	---	46.0	-14.6	Pass
v	550.0	42.7	25.2	18.1	1.5	37.1	---	---	---	46.0	-8.9	Pass
v	960.0	30.1	24.5	22.9	1.7	30.2	---	---	---	46.0	-15.8	Pass
h	975.0	30.8	24.4	22.9	1.8	31.1	---	---	---	54.0	-22.9	Pass

Table Result: Pass by -2.9 dB ***Worst Freq:*** 250.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---

Analyzer: Gold **Preamp:** Blue-Blk **Antenna:** Red-Brown **Preselector:** ---

CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/8/2015

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
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
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
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 #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#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 Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 1 - 6 GHz **Measurement Distance:** 3 m
Notes: TX on High channel **EUT Tx Freq:** 904 - 926 MHz
HP1288
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)	Margin (dB)	Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
v	1852.0	34.56	22.9	18.9	30.9	2.7	49.3	37.6	74.0	-24.7	Pass	54.0	-16.4	Pass
v	2778.0	38.79	25.4	18.9	33.0	3.5	56.4	43.0	74.0	-17.6	Pass	54.0	-11.0	Pass
h	2778.0	40.36	29.2	18.9	33.0	3.5	58.0	46.8	74.0	-16.0	Pass	54.0	-7.2	Pass
v	3704.0	38.21	23.8	18.5	33.4	4.2	57.3	42.9	74.0	-16.7	Pass	54.0	-11.1	Pass
h	3704.0	34.88	23.4	18.5	33.4	4.2	54.0	42.5	74.0	-20.0	Pass	54.0	-11.5	Pass
v	4630.0	39.9	26.9	17.1	34.3	4.6	61.7	48.7	74.0	-12.3	Pass	54.0	-5.3	Pass
h	4630.0	38.56	23.8	17.1	34.3	4.6	60.4	45.6	74.0	-13.6	Pass	54.0	-8.4	Pass
v	5556.0	33.35	22.1	16.4	34.9	5.2	57.1	45.8	74.0	-16.9	Pass	54.0	-8.2	Pass

Table Result: Pass by -5.3 dB ***Worst Freq:*** 4630.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Radiated Emissions Table

Date: 22-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 3.2Vdc
Temp: 23.2°C **Humidity:** 32% **Pressure:** 1013mBar
Frequency Range: 6 - 10GHz **Measurement Distance:** 1 m
Notes: TX on High channel **EUT Tx Freq:** 904 - 926 MHz
Note: Spectrum Analyzer setting: RBW = 1MHz, VBW = 3MHz (Peak reading) & VBW = 10 Hz (Avg reading), span ≤ 10 MHz, 401 points, sweep rate = auto, Detector: Peak.

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)	Margin (dB)	Result (Pass/Fail)	FCC 15.209 High Frequency - Average Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
NO EMISSIONS FOUND IN THIS RANGE														

Table Result: --- by --- dB ***Worst Freq:*** --- MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** Brown **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/19/2015

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
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
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	10/8/2015
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**
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/8/2017	2/8/2015
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2051	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#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.

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 (AVGPSD-1)

MEASUREMENTS / RESULTS

Power Spectral Density

Date: 04-Nov-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac/60Hz
Temp: 22°C **Humidity:** 28% **Pressure:** 1001mBar
Frequency Range: 904 - 926 MHz **Measurement Distance:** 3 m
Notes: EUT TX power is set to 9.6 dBm from 904-915 MHz range and 10.6 dBm from 915 to 926 MHz range - FSK2 modulation - 100% duty cycle
AVGPSD-1

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	Adjusted EIRP Reading (dBm)	Final Conducted Reading (dBm)	FCC 15.247 Limit (dBm)	FCC 15.247 Margin (dB)	FCC 15.247 Result (Pass/Fail)
H	*904.0*	*73.72*	*0.0*	*22.5*	*1.7*	*97.9*	*2.67*	*4.67*	8.0	-3.33	Pass
H	915.0	74.09	0.0	22.4	1.7	98.2	*2.97*	*4.97*	8.0	-3.03	Pass
H	*926.0*	*73.68*	*0.0*	*22.5*	*1.7*	*97.9*	*2.67*	*4.67*	8.0	-3.33	Pass

Table Result: Pass by -3.03 dB ***Worst Freq:*** 915.0 MHz

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053
Analyzer: Gold **Preamp:** none **Antenna:** Red-Brown
CSsoft Radiated Emissions Calculator v 1.017.148

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

Rev.10/8/2015

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

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

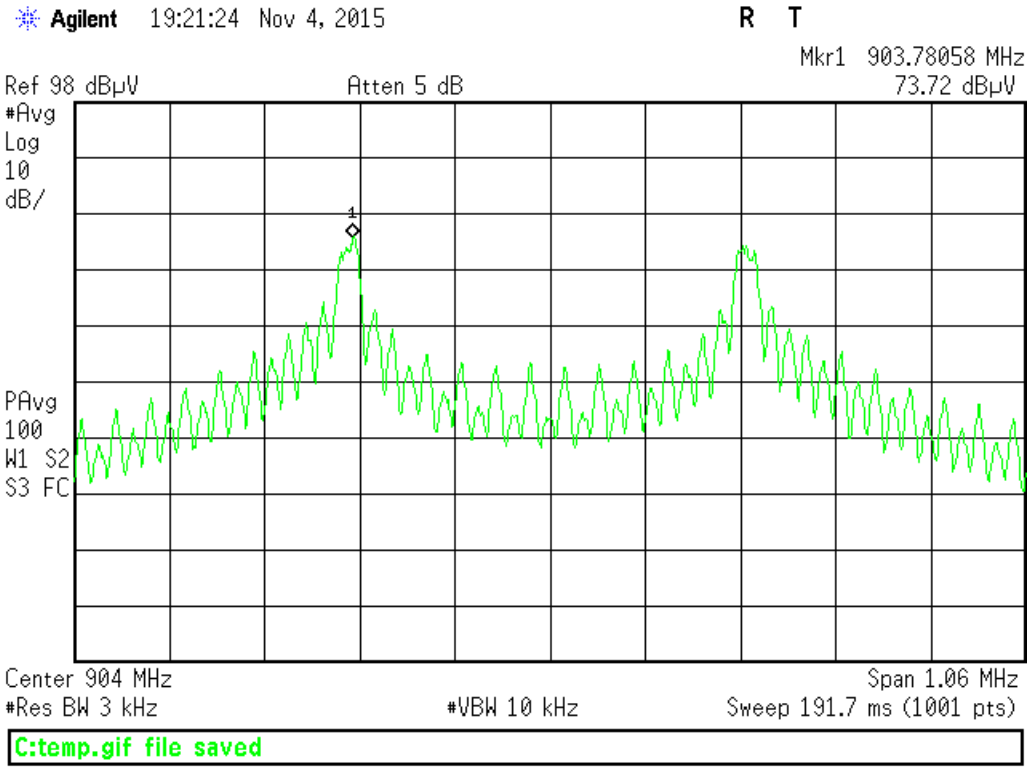
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	12/4/2016	12/4/2014

Cables	Range	Mfr	Cat	Calibration Due	Calibrated on
Asset #2051	9kHz - 18GHz	Florida RF	II	3/8/2016	3/8/2015
Asset #2053	9kHz - 18GHz	Florida RF	II	3/8/2016	3/8/2015

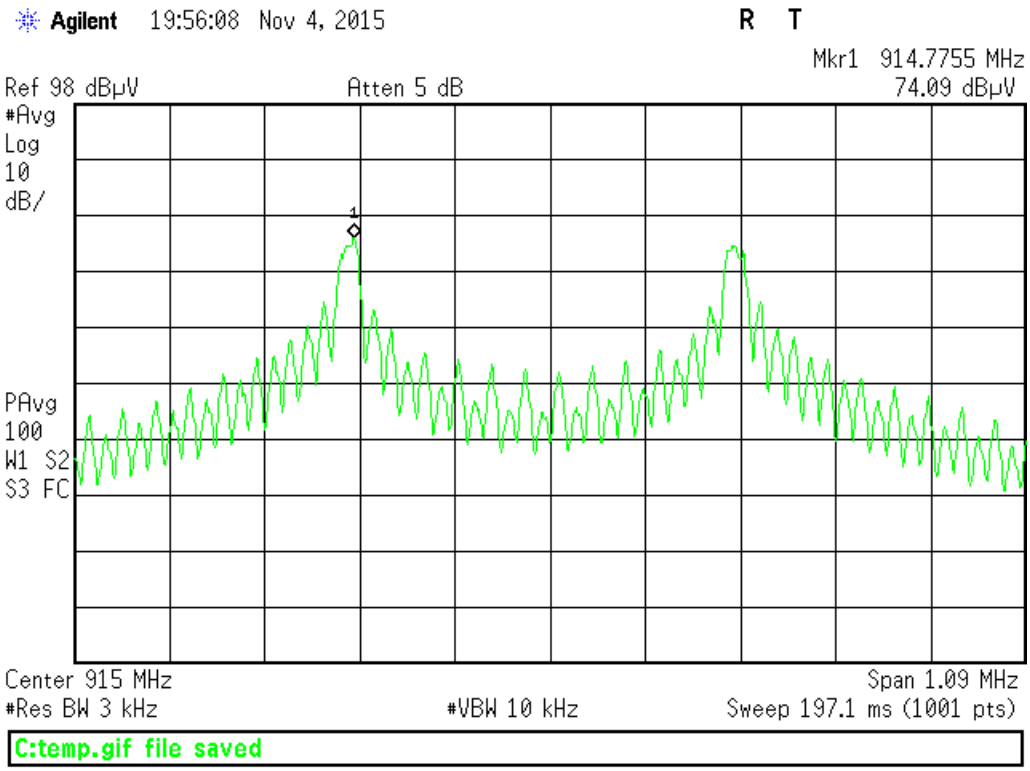
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	3/19/2016	3/19/2014
TH A#2080	HTC-1	HDE		2080	II	4/2/2016	4/2/2015

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

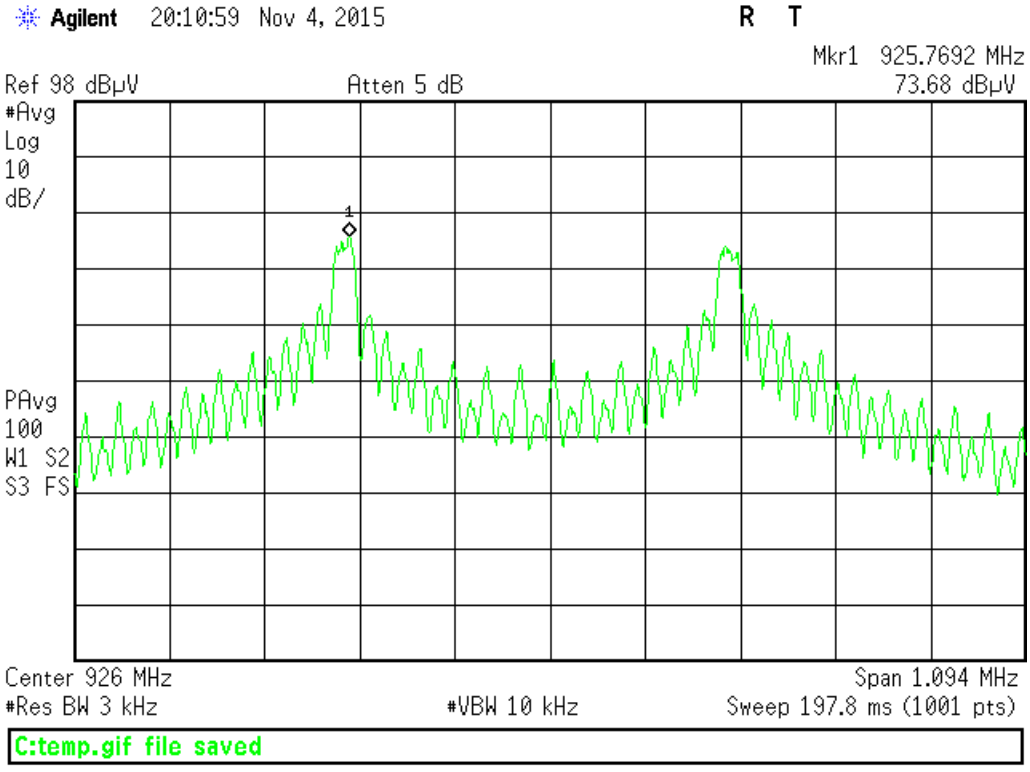
PLOTS



904 MHz – PSD



915 MHz – PSD



926 MHz – PSD

Occupied Bandwidth

REQUIREMENT

When an occupied bandwidth is not 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: 15-Oct-15 **Company:** ecoVent **Work Order:** P2928
Engineer: Tuyen Truong **EUT Desc:** Control Hub **EUT Operating Voltage/Frequency:** 120Vac / 60Hz
Temp: 22°C **Humidity:** 33% **Pressure:** 1006mBar
Frequency Range: 904 - 926 MHz **Measurement Distance:** 3 m
Notes: EUT tx power is set to 10.6 dBm
FSK2 modulation - 100% duty cycle

Antenna Polarization (H / V)	Frequency (MHz)	Occupied Bandwidth Reading (KHz)
H	904	706.5306
H	915	726.5904
H	926	729.2070

Test Site: EMI Chamber 1 **Cable 1:** Asset #2051 **Cable 2:** Asset #2053 **Cable 3:** ---
Analyzer: Gold **Preamp:** none **Antenna:** Red-Brown **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.148
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Rev.10/8/2015

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

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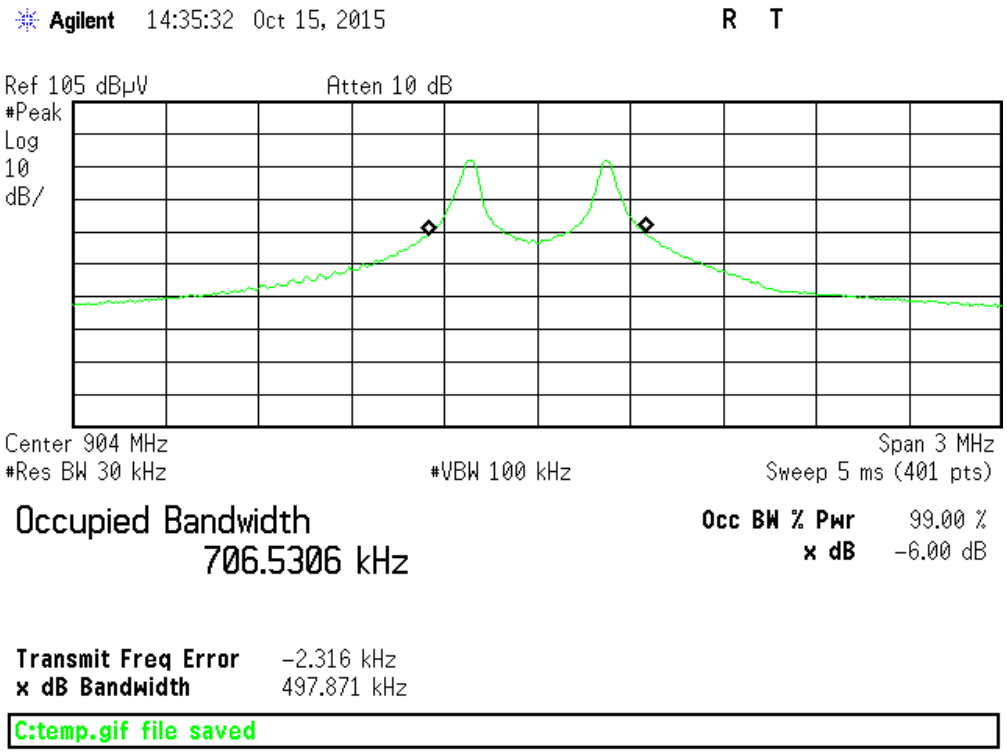
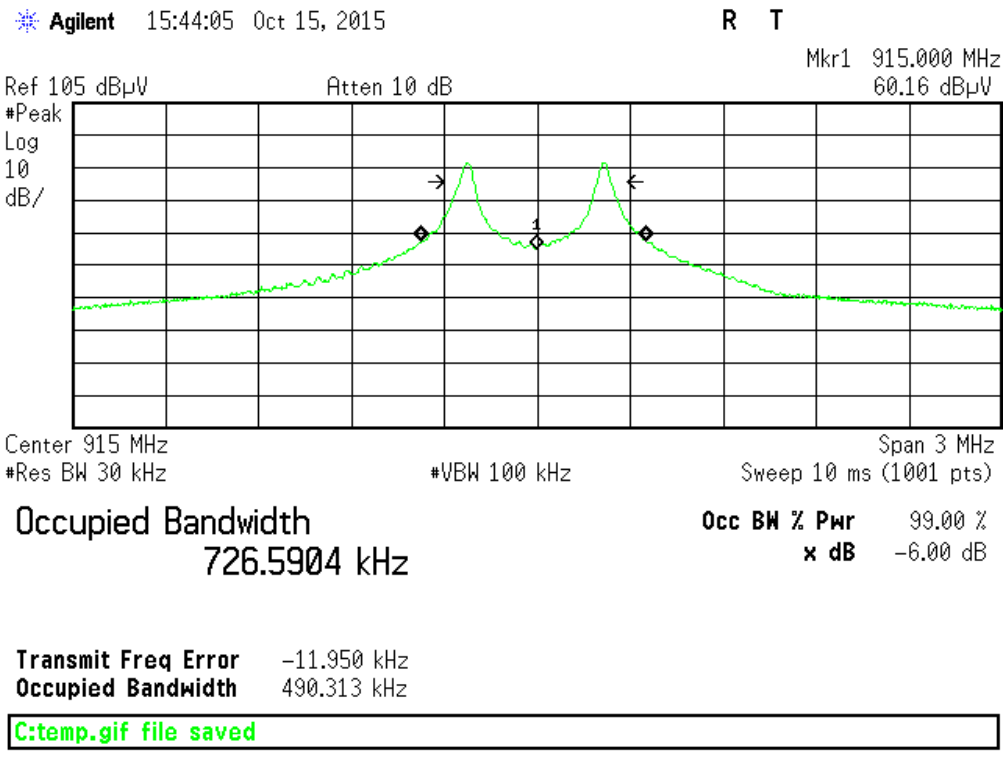
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	3/19/2016	3/19/2014
TH A#2080	HTC-1	HDE		2080	II	4/2/2016	4/2/2015

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

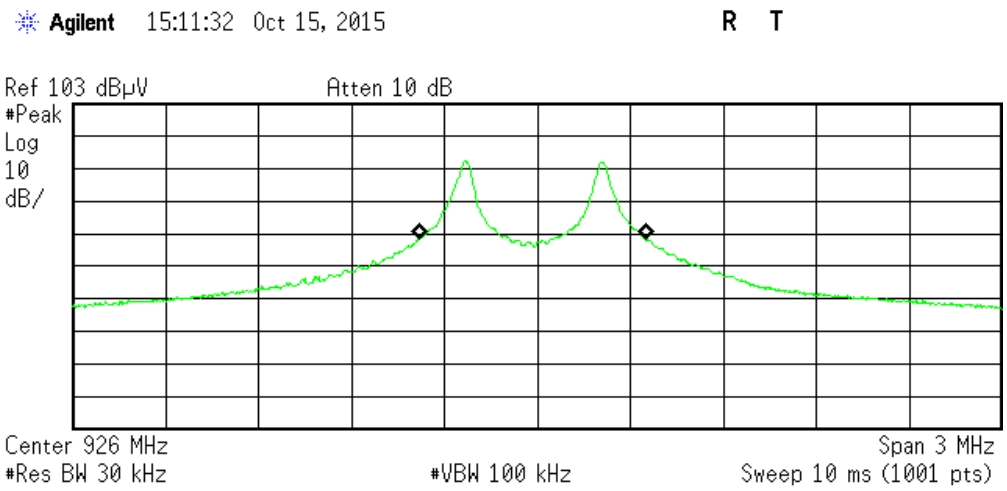
Plot(s)



904 MHz – Occupied Bandwidth



915 MHz – Occupied Bandwidth



926 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) NIST CISPR	 5.6dB 4.6dB	 N/A 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 NIST CISPR	 3.9dB 3.6dB	 N/A 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)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: • Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	 3.4% 0.3dB	 5% 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 eCONTROL HUB, 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 ECONTROL HUB 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 ECONTROL HUB 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 eCONTROL HUB of force majeure or any eCONTROL HUB outside the control of the Company. If any such eCONTROL HUB 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.

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