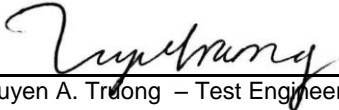





Test Report

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

Report No	EP2231-1
Client	ecoVent Robert Kim
Address	24 Cambridge St, Suite 6 Charlestown, MA 02129
Phone	857-204-4466
Items tested FCC ID	WALL SENSOR 2AFTLSS1
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	August 14, 21 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.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



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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 WALL SENSOR. 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 10, 2015

page 3 of 22



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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 was not maximized separately.

Conducted emissions at the antenna port were not performed since the EUT antenna was permanently attached.

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

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:	SS1			901-00002			Sample 1				
EUT Description:	Wall Sensor										
EUT TX Frequency:	915 MHz										
Support Equipment	MN						SN				
Laptop (set up only)											
Port Label	Port Type	# ports	# populated	cable type	shielded	ferrite s	length (m)	max length (m)	in/out	under test	comment
AC prongs	Power AC	1	1	Other	No	No	0.05		in	yes	
AC Output	Power AC	2	2	3-wire	No	No	1		In	yes	
USB	USB	2	2	USB	Yes	Yes	1	5	in	yes	
Software Operating Mode Description:											
EUT is set to transmit with -2dBi antenna gain at 915MHz at 100% duty cycle. Modulation type is FSK.											

Statement of Conformity

The WALL SENSOR 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	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:

- Radiated Spurious Emissions: ground wire was added between two ground prongs from earth ground. Also two looped ferrites (FAIRITE VO, P/N: 0443164151) were added to support USB cables. (see Modification photo exhibit)

Test Results

Bandwidth

LIMIT

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

MEASUREMENTS / RESULTS

6dB BANDWIDTH									
Date: 14-Aug-15		Company: Ecovent Systems				Work Order: P2231			
Engineer: Tuyen Truong		EUT Desc: Wall Sensor				EUT Operating Voltage/Frequency: 120Vac/60Hz			
Temp: 22°C		Humidity: 47%		Pressure: 1012mBar					
Frequency Range: Fundamental						Measurement Distance: 3 m			
Notes: M/N: 901-00002 TX on 915MHz						Modulation: FSK			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (KHz)				6dB BW			
						Limit (KHz)	Margin (KHz)	Result (Pass/Fail)	
H	915.0	1049.0	---	---	---	≥500	+549	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

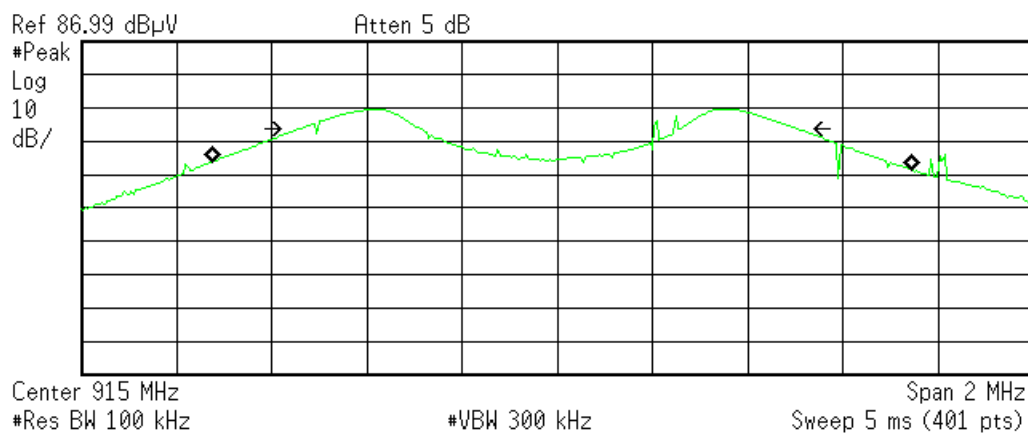
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



PLOT(s)

Agilent 10:35:02 Aug 14, 2015

R T



Occupied Bandwidth
1.4701 MHz

Occ BW % Pwr 99.00 %
x dB -6.00 dB

Transmit Freq Error 10.666 kHz
x dB Bandwidth 1.049 MHz

C:\temp.gif file saved

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 9.1.1 (Maximum Peak Conducted Output Power)

MEASUREMENTS / RESULTS

Fundamental Emission Output Power												
Date: 14-Aug-15			Company: Ecovent Systems						Work Order: P2231			
Engineer: Tuyen Truong			EUT Desc: Wall Sensor						EUT Operating Voltage/Frequency: 120Vac/60Hz			
Temp: 22°C			Humidity: 47%			Pressure: 1012mBar						
Frequency Range: Fundamental							Measurement Distance: 3 m					
Notes: M/N: 901-00002 TX on 915MHz												
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 BRP (dBm)			Limit (dBm)	Margin (dB)	Result (Pass/Fail)
v, RBW =3MHz	915.0	73.9	0.0	22.4	1.8	98.1	4.9	---	---	30.0	-25.1	Pass
h, 3MHz RBW	915.0	69.2	0.0	22.4	1.8	93.4	0.2			30.00	-29.8	Pass
Table Result: Pass by -25.1 dB Worst Freq: 915.0 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #2051				Cable 2: Asset #2054			Cable 3: ---		
Analyzer: EMI Receiver			Preamp: none				Antenna: Red-Brown			Preselector: ---		

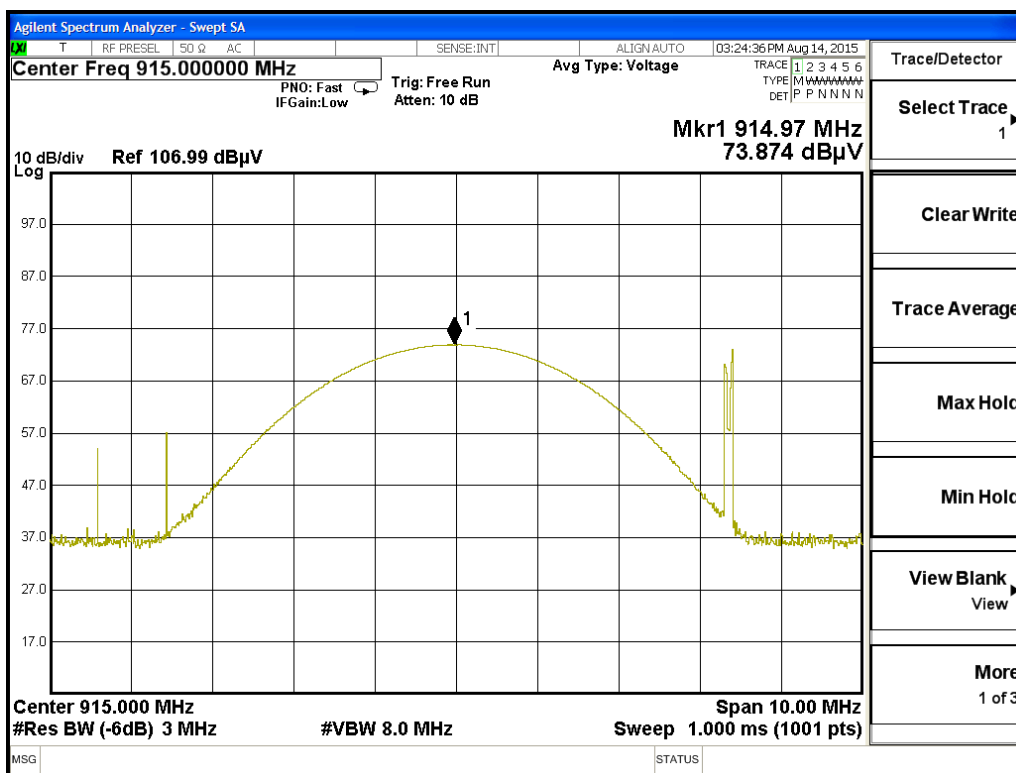
Rev.8/11/2015

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.



PLOTS



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: Wall Sensor						EUT Operating Voltage/Frequency: 120Vac/60Hz			
Temp: 22°C			Humidity: 47%						Pressure: 1012mBar			
Frequency Range: Band Edges (902 MHz and 928MHz)								Measurement Distance: 3 m				
Notes: M/N: 901-00002; Modulation: FSK, 100% duty cycle TX on 915MHz Limit is 66.1dBuV/m or -30 dB down from the maximum in band Peak PSD level												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBuV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBuV/m)	---			---		
							Limit (dBuV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBuV/m)	Margin (dB)	Result (Pass/Fail)
v	902.0	32.8	21.8	22.5	1.8	35.3	---	---	---	66.1	-30.8	Pass
v	900.6375	40.0	21.8	22.5	1.8	42.5	---	---	---	66.1	-23.6	Pass
v	928.0	33.1	22.0	22.5	1.7	35.3	---	---	---	66.1	-30.8	Pass
v	929.64	33.8	22.0	22.5	1.7	36.0	---	---	---	66.1	-30.1	Pass
Table Result: Pass by -23.6 dB Worst Freq: 900.6375 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #2051			Cable 2: Asset #2054			Cable 3: ---			
Analyzer: Asset #1327			Preamp: Blue			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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Rev. 8/11/2015

Spectrum Analyzers / Receivers /Preselectors

SA EMI Chamber (1327)

Range 9kHz-13.2 GHz

MN E4405B

Mfr Agilent

SN MY45103416

Asset 1327

Cat I

Calibration Due 7/10/2016

Calibrated on 7/10/2016

Radiated Emissions Sites

EMI Chamber 1

FCC Code 719150

IC Code 2762A-6

VCCI Code A-0015

Range 30-1000MHz

Cat II

Calibration Due 3/21/2017

Calibrated on 3/21/2015

Antennas

Red-Brown Bilog

Range 30-2000MHz

MN JB1

Mfr Sunol

SN A0032406

Asset 1218

Cat I

Calibration Due 12/4/2016

Calibrated on 12/4/2014

Cables

Asset #2051

Asset #2054

Range 9kHz - 18GHz

Range 9kHz - 18GHz

Mfr Florida RF

Florida RF

SN C3166-1

Asset 831

Cat I

Calibration Due 3/19/2016

Calibrated on 3/19/2014

Meteorological Meters

Weather Clock (Pressure Only)

TH A#2080

MN BA928

HTC-1

Mfr Oregon Scientific

HDE

SN C3166-1

Asset 831

Cat I

Calibration Due 3/19/2016

Calibrated on 3/19/2014

Preamps /Couplers Attenuators / Filters

Blue

Range 0.009-2000MHz

MN ZFL-1000-LN

Mfr CS

SN N/A

Asset 759

Cat II

Calibration Due 5/17/2016

Calibrated on 5/17/2015

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



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Radiated Spurious EMI (30 to 10000 MHz)

Radiated Emissions Table												
Date: 04-Sep-15			Company: Ecovent						Work Order: P2231			
Engineer: Tuyen Truong			EUT Desc: Wall sensor						EUT Operating Voltage/Frequency: 120Vac / 60Hz			
Temp: 22°C			Humidity: 51%			Pressure: 1014mBar						
Frequency Range: 30 to 1000 MHz								Measurement Distance: 3 m				
Notes:			EUT TX Freq: 2402-2480MHz, 915MHz									
			Modifications: 1) Added ground wire between two ground prongs from earth ground. 2) Added two looped ferrites to support USB cable (PN: 0443164151)									
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	46.64	46.6	25.3	9.8	0.4	31.5	---	---	---	40.0	-8.5	Pass
v	52.0	45.1	25.4	7.8	0.4	27.9	---	---	---	40.0	-12.1	Pass
v	55.14	49.6	25.4	7.4	0.5	32.1	---	---	---	40.0	-7.9	Pass
v	258.6	33.3	25.2	11.8	1.0	20.9	---	---	---	46.0	-25.1	Pass
v	607.5	48.1	25.2	18.7	1.5	43.1	---	---	---	46.0	-2.9	Pass
v	608.6	48.0	25.2	18.7	1.5	43.0	---	---	---	46.0	-3.0	Pass
h	609.7	40.5	25.2	18.8	1.5	35.6	---	---	---	46.0	-10.4	Pass
v	611.0	47.8	25.3	18.9	1.5	42.9	---	---	---	46.0	-3.1	Pass
v	634.5	37.5	25.7	19.7	1.4	32.9	---	---	---	46.0	-13.1	Pass
v	902.0	28.6	25.5	22.6	1.7	27.4	---	---	---	46.0	-18.6	Pass
v	928.0	27.6	24.9	22.7	1.6	27.0	---	---	---	46.0	-19.0	Pass
Table Result: Pass by -2.9 dB Worst Freq: 607.5 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												
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Note: The Bluetooth transmitter was on during the spurious emissions scan

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
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: 21-Aug-15			Company: Ecovent Systems						Work Order: P2231					
Engineer: Ryan Brown			EUT Desc: Wall Sensor						EUT Operating Voltage/Frequency: 120Vac/60Hz					
Temp: 24.1°C			Humidity: 57%						Pressure: 1010 mBar					
Frequency Range: 1-6GHz									Measurement Distance: 3 m					
Notes:									EUT TX Freq: 2402-2480MHz, 915MHz					
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(NF)	1892.5	38.87	23.9	18.9	31.1	2.9	54.0	39.0	74.0	-20.0	Pass	54.0	-15.0	Pass
V(NF)	2970.0	39.34	22.8	20.0	33.0	3.6	55.9	39.4	74.0	-18.1	Pass	54.0	-14.6	Pass
V(NF)	3095.0	38.63	22.7	19.8	33.1	3.7	55.6	39.7	74.0	-18.4	Pass	54.0	-14.3	Pass
V	4575.0	40.76	32.3	17.9	34.3	4.5	61.7	53.2	74.0	-12.3	Pass	54.0	-0.8	Pass
V(NF)	5585.0	37.52	22.1	17.6	34.9	4.9	59.7	44.3	74.0	-14.3	Pass	54.0	-9.7	Pass
V(NF)	5830.0	35.99	20.6	17.7	35.3	5.0	58.6	43.2	74.0	-15.4	Pass	54.0	-10.8	Pass
Table Result:			Pass		by		-0.8 dB		Worst Freq:			4575.0 MHz		
Test Site: EMI Chamber 1			Cable 1: Asset #2054			Cable 2: Asset #2052			Cable 3: ---					
Analyzer: Gold			Preamp: Asset #1517			Antenna: Blue Horn			Preselector: ---					
v 1.017.146														
CSoft Radiated Emissions Calculator Copyright Curtis-Straus LLC 2000														
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														

Note: The Bluetooth transmitter was on during the spurious emissions scan

Radiated Emissions Table

Date: 21-Aug-15				Company: Ecovent Systems				Work Order: P2231							
Engineer: Ryan Brown				EUT Desc: Wall Sensor				EUT Operating Voltage/Frequency: 120Vac/60Hz							
Temp: 24.1°C				Humidity: 57%				Pressure: 1010 mBar							
Frequency Range: 6-10GHz								Measurement Distance: 1 m							
Notes:								EUT TX Freq: 2402-2480MHz, 915MHz							
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: ---				Cable 1: Asset #2054				Cable 2: Asset #2052				Cable 3: ---			
Analyzer: Gold				Preamp: Asset #1517				Antenna: Blue Horn				Preselector: ---			
v 1.017.146												CSoft Radiated Emissions Calculator Copyright Curtis-Straus LLC 2000			
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															

Rev.8/14/2015

Spectrum Analyzers / Receivers / Preselectors Gold	Range 100Hz-26.5 GHz	MN E4407B	Mfr Agilent	SN MY45113816	Asset 1284	Cat I	Calibration Due 4/22/2016	Calibrated on 4/22/2015
Radiated Emissions Sites EMI Chamber 1	FCC Code 719150	IC Code 2762A-6	VCCI Code A-0015	Range 30-1000MHz		Cat II	Calibration Due 3/21/2017	Calibrated on 3/21/2015
Preamps / Couplers Attenuators / Filters 1517 HF Preamp	Range 1-20GHz	MN CS	Mfr CS	SN N/A	Asset 1517	Cat II	Calibration Due 8/6/2016	Calibrated on 8/6/2015
Antennas Blue Horn	Range 1-18Ghz	MN 3117	Mfr ETS	SN 157647	Asset 1861	Cat I	Calibration Due 2/8/2017	Calibrated on 2/8/2015
Cables Asset #2054	Range 9kHz - 18GHz		Mfr Florida RF			Cat II	Calibration Due 3/8/2016	Calibrated on 3/8/2015
Asset #2052	9kHz - 18GHz		Florida RF			II	3/8/2016	3/8/2015
Meteorological Meters Weather Clock (Pressure Only) TH A#2080		MN BA928 HTC-1	Mfr Oregon Scientific HDE	SN C3166-1	Asset 831 2080	Cat I II	Calibration Due 3/19/2016 4/2/2016	Calibrated on 3/19/2014 4/2/2015

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



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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 10.2 Method PKPSD (Peak PSD)

MEASUREMENTS / RESULTS

Power Spectral Density												
Date: 01-Sep-15			Company: Ecovent						Work Order: P2231			
Engineer: Tuyen Truong			EUT Desc: Wall Sensor						EUT Operating Voltage/Frequency: 120Vac/60Hz			
Temp: 23°C			Humidity: 54%			Pressure: 1009mBar						
Frequency Range: Fundamental								Measurement Distance: 3 m				
Notes: M/N: 901-00002 TX on 915MHz			Modulation: FSK, 100% duty cycle									
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)
v	915.0	71.7	0.0	22.7	1.7	96.1	2.9	---	---	8.0	-5.1	Pass
h	915.0	64.1	0.0	22.7	1.7	88.5	-4.7	---	---	8.0	-12.7	Pass
Table Result: Pass by -5.1 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												
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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

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PLOTS

Agilent 11:58:47 Sep 1, 2015

R T

Mkr1 915.375 MHz
71.71 dB μ VRef 84.99 dB μ V

Atten 5 dB

#Peak

Log

10

dB/

M1 S2

S3 FC

DC Coupled

Center 915 MHz

#Res BW 3 kHz

#VBW 10 kHz

Span 2 MHz
Sweep 228.7 ms (401 pts)

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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 Engineer: Tuyen Truong Temp: 23.2 °C							Company: Ecovent Systems EUT Desc: Wall Sensor Humidity: 40%					Work Order: P2231 Pressure: 1019 mBar		
Notes:														
Frequency Range: 0.15 - 30 MHzEUT Input Voltage/Frequency: 120Vac/60Hz														
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC 15.207			FCC 15.207		
	QP1 (dBµV)	QP2 (dBµV)	AVG1 (dBµV)	AVG2 (dBµV)	L1 (dB)	L2 (dB)			QP Limit (dBµV)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dBµV)	Margin (dB)	Result (Pass/Fail)
	0.48	13.1	17.5	13.1	17.5	0.0	0.0	-0.1	-19.6	56.3	-19.1	Pass	46.3	-9.1
2.09	24.0	23.7	24.0	23.7	0.0	0.0	-0.1	-19.6	56.0	-12.3	Pass	46.0	-2.3	Pass
3.89	26.1	28.3	9.2	13.7	0.0	0.0	-0.2	-19.6	56.0	-8.0	Pass	46.0	-12.6	Pass
6.19	23.0	27.2	23.0	27.2	0.0	0.0	-0.2	-19.6	60.0	-13.0	Pass	50.0	-3.0	Pass
12.46	25.6	25.7	25.6	25.7	-0.1	-0.1	-0.2	-19.6	60.0	-14.4	Pass	50.0	-4.4	Pass
16.72	27.5	28.8	27.5	28.8	-0.1	-0.1	-0.2	-19.6	60.0	-11.3	Pass	50.0	-1.3	Pass
24.03	20.9	27.2	20.9	27.2	-0.1	-0.1	-0.3	-19.6	60.0	-12.8	Pass	50.0	-2.8	Pass
27.02	20.5	24.6	20.5	24.6	-0.1	-0.1	-0.3	-19.6	60.0	-15.4	Pass	50.0	-5.4	Pass
Result: Pass					Worst Margin: -1.3 dB					Frequency: 16.720 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

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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: 14-Aug-15		Company: Ecovent Systems				Work Order: P2231			
Engineer: Tuyen Truong		EUT Desc: Wall Sensor				EUT Operating Voltage/Frequency: 120Vac/60Hz			
Temp: 22°C		Humidity: 47%		Pressure: 1012mBar					
Frequency Range: Fundamental						Measurement Distance: 3 m			
Notes: M/N: 901-00002 Modulation: FSK TX on 915MHz									
Antenna Polarization (H / V)	Frequency (MHz)	99% Occupied BW (KHz)							
H	915.0	1118.5							
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

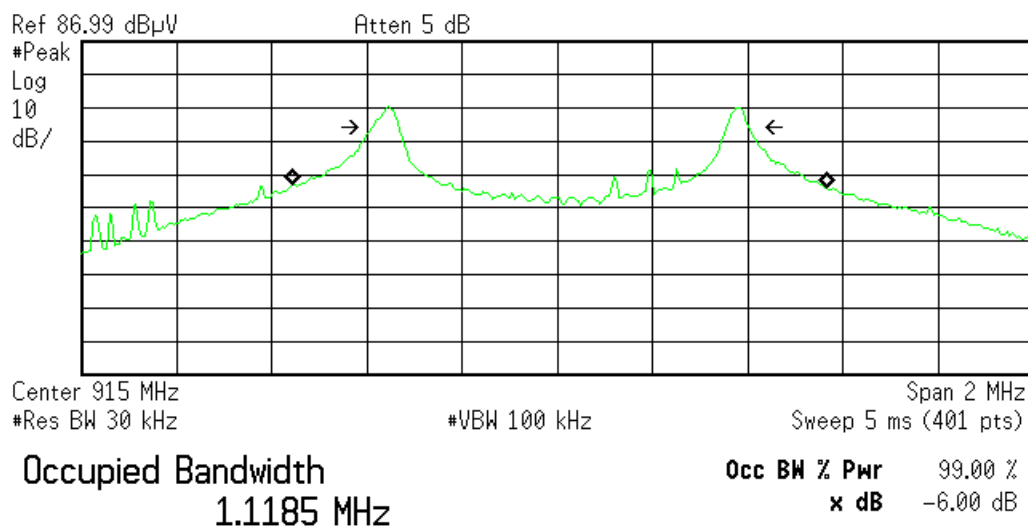
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Plot(s)

✱ Agilent 10:37:19 Aug 14, 2015

R T



Transmit Freq Error 4.781 kHz
x dB Bandwidth 790.872 kHz

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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)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucisp)
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	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisp)
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 where 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.



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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.
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