Test Report

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

Report No	ER1267-1
Client	Ideal Industries, Inc. Tim Tunnell
Address	Becker Place Sycamore, IL 60178
Phone	(815) 895-1295
Items tested	ESCGRID1001
FCC ID	2AAMXESCGRID1001
IC	11250A-ESCGRID1001
FRN	0002862225
Equipment Type	Digital Transmission System
Equipment Code	DTS
Emission Designator	813KG1D
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 1
Test Dates	May 1-2, 2017
Results	As detailed within this report
Prepared by	Christopher Bramley – Test Engineer
Authorized by	Yunus Faziloglu – Sr. EMC Engineer
Issue Date	6/5/2017
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 29 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.

ACCREDITED Cert No. 1627-01

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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: CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 1

The product is the ESCGRID1001. It is a digitally modulated transmitter that operates in the 902-928MHz frequency range. The product has a PCB trace antenna with a maximum gain of 1.43dBi.

We found that the product met the above requirements without modification. The test samples were received in good condition.

Test Methodology

All testing was performed according to the following rules/procedures/documents;
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 1, ISED Canada RSS-Gen Issue 4, FCC KDB 558074 D01 DTS Measurement Guidance v04 and ANSI C63.10-2013.

Radiated emissions were maximized by rotating the device around three orthogonal axes as well as varying the test antenna's height and polarity. AC line conducted emissions testing was performed with a 50Ω/50μH LISN. The AC side of the support AC/DC brick to the EUT was tested.

RF measurements were performed at the antenna port on 3 channels as follows:
Low channel = 902.7MHz
Mid channel = 915MHz
High channel = 927.3MHz

The following bandwidths were used during radiated spurious and AC line conducted emissions tests:

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

Product Tested - Configuration Documentation

EUT Configuration			
Work Order:	R1267		
Company:	Ideal Industries Inc.		
Company Address:	Becker Place		
	Sycamore, IL, 60178		
Contact:	Tim Tunnell		
	MN		**SN**
EUT:	ESCGRID1001		Sample 1(Radiated) and Sample 2(Conducted)
EUT Description:	LVDC Grid Luminaire Controller 10V		
EUT Tx Frequency:	902.7-927.3 MHz		

Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
24Vdc Output	Power DC	1	1	Power DC	No	No	2	in	yes	24Vdc output power provided by EUT
0-10V Dimming Control	other	1	1	other	No	No	1	in	yes	Dimming control to LED Driver
24Vdc Input	Power DC	1	1	Power DC	No	No	0	in	yes	Clipped directly to DIN rail

Software Operating Mode Description:

The EUT is rated to 24V DC input and provides 24VDC power and a 0-10V dimming control to a LED Driver. The EUT will be mounted to FlexZone Grid during normal operation. The EUT transmits in the frequency range 902.7-927.3MHz.

Statement of Conformity

RSS-GEN	RSP-100	RSS 247	Part 15	Comments
6.3			15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
	3.1		15.19	The label is shown in the label exhibit.
	4		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3, 6.1			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
8.1			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.
8.3			15.203	The product has a PCB trace antenna with a maximum gain of 1.43dBi.
8.10			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 or RSS-Gen as applicable
8.8			15.207	EUT meets the AC Line conducted emissions requirements of this section.
			15.247	The unit complies with the requirements of 15.247
		RSS 247		The unit complies with the requirements of RSS-247
6.6				Occupied Bandwidth measurements were made.

Test Results

Bandwidth

LIMIT

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

MEASUREMENTS / RESULTS

DTS Bandwidth (6dB)

Date: 02-May-17 **Company:** Ideal Industries, Inc. **Work Order:** R1267
Engineer: Chris Bramley **EUT Desc:** ESCGRID1001 **EUT Operating Voltage/Frequency:** 24Vdc
Temp: 23.0°C **Humidity:** 37% **Pressure:** 990mBar
Notes: Per FCC KDB 558074 D01 DTS Meas Guidance v04 Section 8.2

Channel	Frequency (MHz)	DTS Bandwidth (kHz)	DTS Bandwidth Limit (kHz)	Test Results (Pass/Fail)
Low	902.7	645.1	≥500	**Pass**
Middle	915	647.9	≥500	**Pass**
High	927.3	650.3	≥500	**Pass**

Rev. 4/30/2017

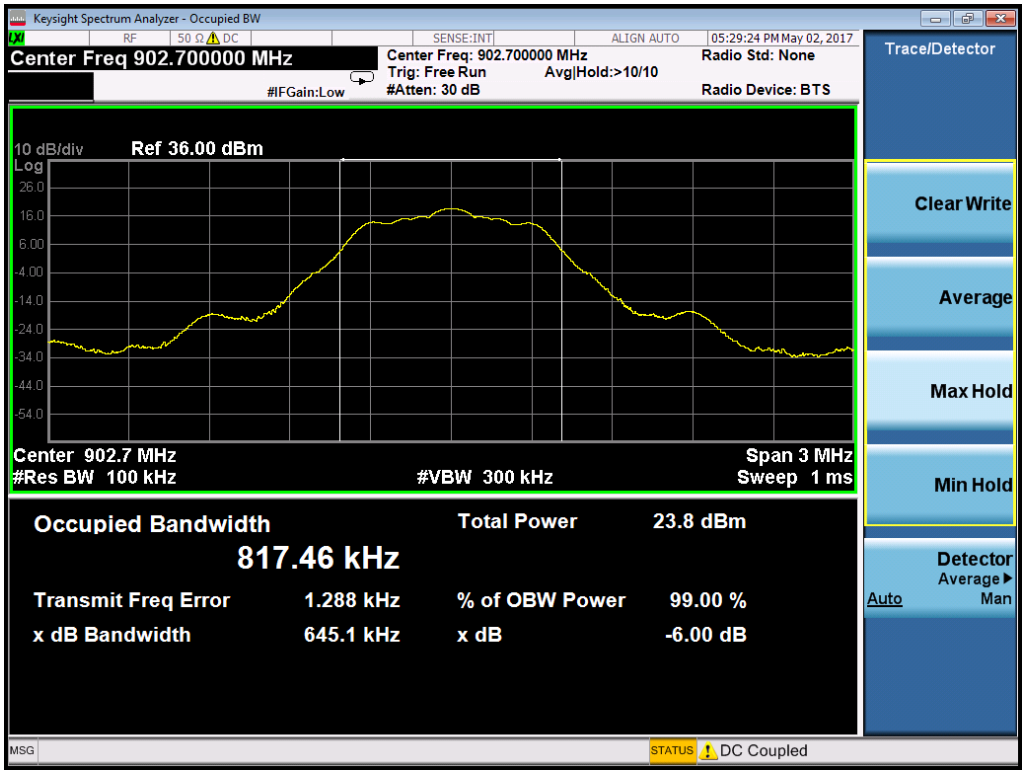
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017

Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

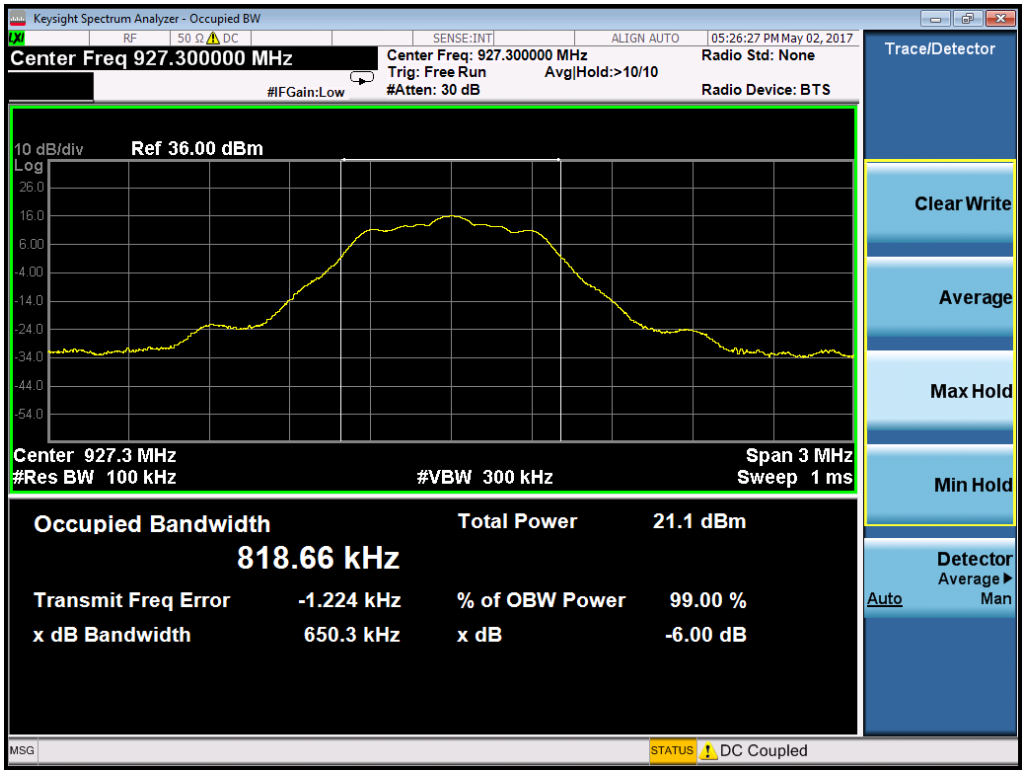
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

PLOT(s)



6dB Bandwidth – Low Channel

6dB Bandwidth – Mid Channel



6dB Bandwidth – High Channel

Fundamental Emission Output Power

LIMIT

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

MEASUREMENTS / RESULTS

Output Power

Date: 02-May-17 **Company:** Ideal Industries, Inc. **Work Order:** R1267
Engineer: Chris Bramley **EUT Desc:** ESCGRID1001 **EUT Operating Voltage/Frequency:** 24Vdc
Temp: 23.0°C **Humidity:** 37% **Pressure:** 990mBar
Notes: Per FCC KDB 558074 D01 DTS Meas Guidance v04 Section 9.2.2.2

Channel	Frequency (MHz)	Output Power (dBm)	Reference Level Offset (dB)	Output Power Limit (dBm)	Margin (dB)	Test Results (Pass/Fail)
Low	902.7	18.29	19.42	30	-11.71	Pass
Middle	915	16.82	19.42	30	-13.18	Pass
High	927.3	15.72	19.42	30	-14.28	Pass

Rev. 4/30/2017

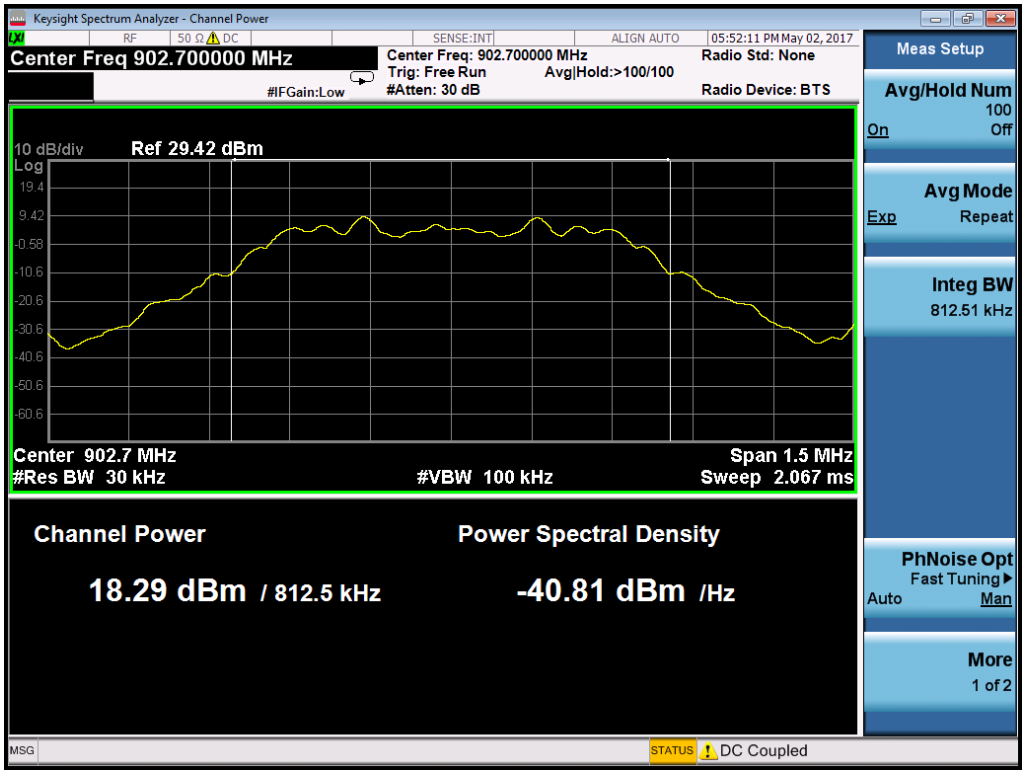
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017

Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017

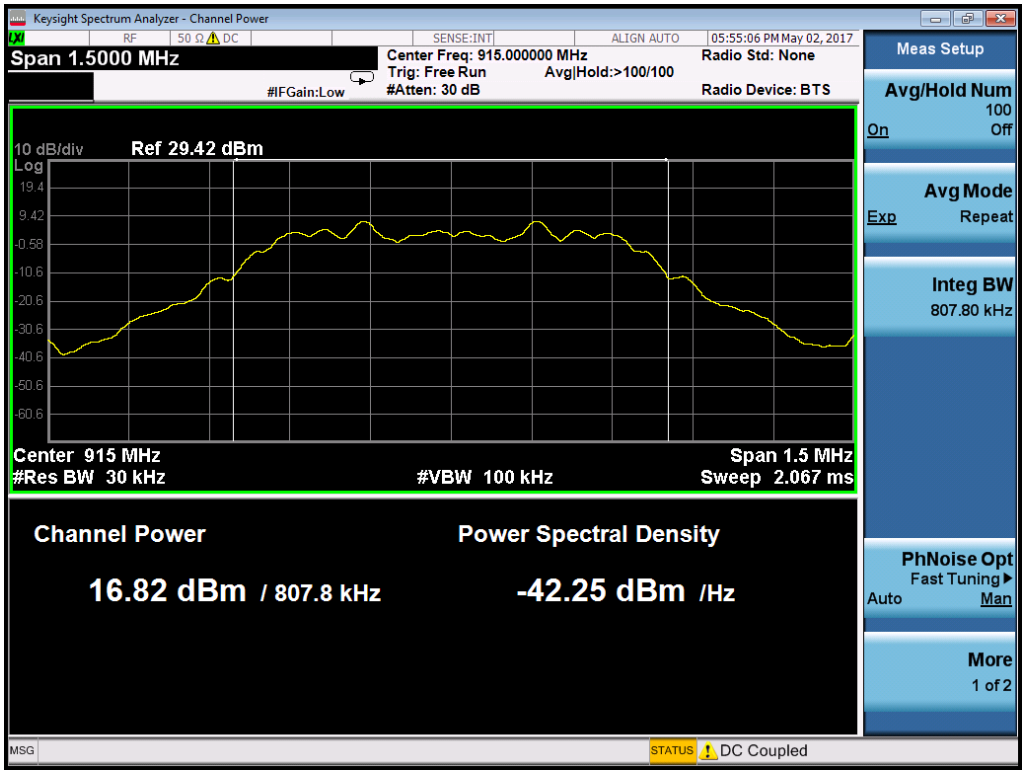
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

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

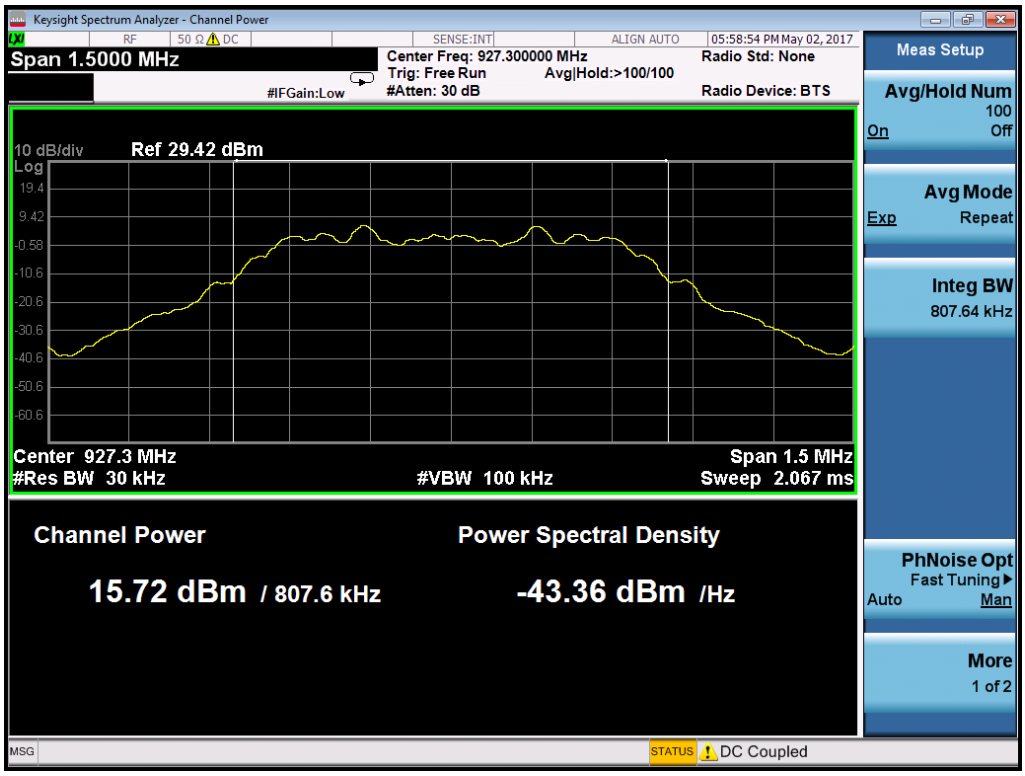
PLOTS



Channel Power – Low Channel



Channel Power – Mid Channel



Channel Power – High Channel

Radiated Spurious Emissions

LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
[15.247(d)]

MEASUREMENTS / RESULTS

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: ZJ
Client Present:
Company:

Work Order - R1267
EUT Power Input - 24V DC
Test Site - Chamber 2
Temp; Humid; Pres - 22.9°C; 29%RH; 1007mBar
Center Channel with 900-930Mhz filter
EUT Maximum Frequency - 928MHz

Frequency	Delta to M	Peak Reac	Preamplif	Antenna F	Cable Fact	Adjusted I	Requirem	Requirem	Requirem	Requirem	Requirem	Requirem	Antenna H	EUT Azimu	Worst Mar	Worst Margin	Limit 2
MHz	dB	dBµV	dB	dB/m	dB	dBµV/m	dBµV/m	dB	Pass/Fail	dBµV/m	dB	Pass/Fail	centimete	degrees	dB	dB	
30	-13	24.3	25.2	21.5	0.4	21	40	-19	PASS	200	-179	PASS	150	180			
532.145	-12.9	32.7	25.4	17.9	1.5	27.1	46	-18.9	PASS	200	-172.9	PASS	150	135			
533.866	-12.9	32.6	25.4	18	1.5	27.1	46	-18.9	PASS	200	-172.9	PASS	150	135			
541.966	-13.4	31.9	25.4	18.2	1.5	26.6	46	-19.4	PASS	200	-173.4	PASS	100	135			

30MHz-800MHz Horizontal

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: ZJ
Client Present:
Company:

Work Order - R1267
EUT Power Input - 24V DC
Test Site - Chamber 2
Temp; Humid; Pres - 22.9°C; 29%RH; 1007mBar
Center Channel with 900-930Mhz filter
EUT Maximum Frequency - 928MHz

Frequency	Delta to M	Peak Reac	Preamp Fa	Antenna F	Cable Fact	Adjusted I	Requirem	Requirem	Requirem	Requirem	Requirem	Requirem	Antenna H	Turntable	Worst Mar	Worst Margin	Limit 2
MHz	dB	dBµV	dB	dB/m	dB	dBµV/m	dBµV/m	dB	Pass/Fail	dBµV/m	dB	Pass/Fail	centimete	degrees	dB	dB	
31.164	-14	24.5	25.2	20.3	0.4	20	40	-20	PASS	200	-180	PASS	200	315			
522.542	-15.1	30.7	25.4	17.7	1.5	24.9	46	-21.1	PASS	200	-175.1	PASS	200	45			
532.266	-13	32.6	25.4	17.9	1.5	27.1	46	-19	PASS	200	-172.9	PASS	200	45			
541.675	-13.9	31.4	25.4	18.2	1.5	26.1	46	-19.9	PASS	200	-173.9	PASS	200	90			

30MHz-800MHz Vertical

No emissions found in the 800MHz – 1GHz range.

Curtis Straus - a Bureau Veritas Company							Work Order - R1267											
Radiated Emissions Electric Field 3m Distance							EUT Power Input - 24V DC											
1-6GHz Horizontal Tabular Data							Test Site - Chamber 2											
Operator: ZJ							Temp; Humid; Pres - 22.9°C; 29%RH; 1007mBar											
Client Present:							Center Channel with 900-930Mhz filter											
Company:							EUT Maximum Frequency - 928MHz											
Frequency	Raw Peak Re	Raw Averag	Preamp Fact	Antenna Fac	Cable Factor	Adjusted Pe	Adjusted Av	Peak Limit	Peak Margir	Peak Results	Average Lim	Average Ma	Average Res	Antenna He	Turntable	Antenna	Worst Peak	Worst Avera
MHz	dBµV	dBµV	dB	dB/m	dB	dBµV/m	dBµV/m	dBµV/m	dB	Pass/Fail	dBµV/m	dB	Pass/Fail	centimeters	degrees	H/V	dB	dB
Center Channel																		
5264	23.3	15.2	18.3	34.3	5.2	44.6	36.6	74	-29.3	PASS	54	-17.4	PASS	125	12	H	-29.3	-17.4
5223.7	22.4	14.9	18.3	34.2	5.1	43.6	36	74	-30.4	PASS	54	-17.9	PASS	222	230	V	-30.4	-17.9
High Channel																		
1909.8	24	16.4	19.7	31.3	3.4	39.3	31.7	74	-34.7	PASS	54	-22.3	PASS	295	53	H		
2435.8	29.6	19.6	20.9	32.3	3.4	45.1	35.1	74	-28.9	PASS	54	-18.8	PASS	125	174	H		
2460.4	28.7	19.9	21	32.4	3.5	44	35.3	74	-30	PASS	54	-18.7	PASS	275	25	H		
5216.5	23.9	14.9	18.3	34.2	5.1	45	36.1	74	-29	PASS	54	-17.9	PASS	105	63	H		
5232.9	23.9	15	18.3	34.2	5.1	45.1	36.2	74	-28.9	PASS	54	-17.8	PASS	125	51	H		
5244	24.1	14.9	18.3	34.2	5.1	45.4	36.2	74	-28.6	PASS	54	-17.8	PASS	100	32	H	-28.6	-17.8
2464	28.1	20.1	21	32.4	3.5	43.4	35.4	74	-30.6	PASS	54	-18.5	PASS	125	41	V		
4578.6	25.5	16.9	18.7	34.1	4.8	45.9	37.3	74	-28.1	PASS	54	-16.7	PASS	275	174	V		
5215.7	25.4	14.9	18.3	34.2	5.1	46.5	36	74	-27.5	PASS	54	-17.9	PASS	215	113	V		
5236.1	23.8	14.9	18.3	34.2	5.1	45.1	36.2	74	-28.9	PASS	54	-17.8	PASS	212	89	V		
5246.7	26.1	14.9	18.3	34.3	5.2	47.4	36.2	74	-26.6	PASS	54	-17.8	PASS	181	159	V		
5960	24.5	15.3	18.1	35.1	5.8	47.5	38.3	74	-26.5	PASS	54	-15.7	PASS	299	25	V	-26.5	-15.7
Low Channel																		
1752.9	27.5	18.4	19.7	30	3.2	41.4	32.3	74	-32.6	PASS	54	-21.7	PASS	285	10	H		
2408.2	28.8	19.5	20.9	32.2	3.4	44.5	35.2	74	-29.5	PASS	54	-18.8	PASS	290	251	H		
2458.4	28.6	20.3	21	32.4	3.5	44	35.7	74	-30	PASS	54	-18.3	PASS	215	307	H		
4619.9	26.7	16.2	18.7	34.1	4.9	47.3	36.7	74	-26.7	PASS	54	-17.3	PASS	300	150	H		
5235.6	22.8	14.9	18.3	34.2	5.1	44	36.1	74	-30	PASS	54	-17.9	PASS	176	244	H		
5870.8	25.3	15.5	18.2	34.9	5.7	47.8	38.1	74	-26.1	PASS	54	-15.9	PASS	175	234	H	-26.1	-15.9
1754.5	25.9	18.3	19.7	30	3.2	39.8	32.2	74	-34.2	PASS	54	-21.8	PASS	175	251	V		
1904.5	25.6	16.6	19.7	31.3	3.4	40.8	31.8	74	-33.2	PASS	54	-22.2	PASS	183	167	V		
2463.4	29.7	20.1	21	32.4	3.5	45.1	35.4	74	-28.9	PASS	54	-18.6	PASS	201	170	V		
4623.4	25	16.2	18.6	34.1	4.9	45.6	36.7	74	-28.4	PASS	54	-17.3	PASS	125	17	V		
4973.4	25.2	16	18.6	34	5	45.9	36.8	74	-28.1	PASS	54	-17.2	PASS	107	110	V	-28.1	
5890.5	23.3	15.6	18.2	35	5.7	45.9	38.3	74	-28.1	PASS	54	-15.7	PASS	201	111	V		-15.7

1-6GHz, 3 Channels

Rev. 4/30/2017								
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017	12/22/2016
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	II	12/21/2018	12/21/2016
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
1517 HF Preamp	1-20GHz	CS	CS	N/A	1517	II	8/14/2017	8/14/2016
2130 BRF	0.009-18000MHz	BRM18770	Micro-Tronics	1	2130	II	1/7/2018	1/7/2017
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/14/2019	2/14/2017
Meteorological Meters		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2078		HTC-1	HDE		2078	II	3/23/2018	3/23/2017
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
Asset #2052	9kHz - 18GHz		Florida RF			II	3/5/2018	3/5/2017
Asset #2053	9kHz - 18GHz		Florida RF			II	10/1/3017	10/30/2016
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								

No emissions found in the 6GHz – 10GHz range.

Conducted Spurious Emissions

LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth that contains the highest level of desired power based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB …
[15.247(d)]

MEASUREMENTS / RESULTS

Conducted Bandedge

Plots

Low Channel

High Channel

Rev. 4/30/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017

Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

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

Conducted Spurious Emissions

Conducted Spurious Emissions				
Date: 02-May-17	**Company:** Ideal Industries, Inc.			**Work Order:** R1267
Engineer: Chris Bramley	**EUT Desc:** ESCGRID1001		**EUT Operating Voltage/Frequency:** 24Vdc	
Temp: 23.0°C	**Humidity:** 32%	**Pressure:** 990mBar		
Notes: Per FCC KDB 558074 D01 DTS Meas Guidance v04 Section 11				

Channel	Frequency (MHz)	Frequency Range Measured	Limit (dBm)	Test Results (Pass/Fail)
Low	902.7	9kHz to 10GHz	See Graphs	Pass
Middle	915	9kHz to 10GHz	See Graphs	Pass
High	927.3	9kHz to 10GHz	See Graphs	Pass

Rev. 4/30/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017

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

Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081	HTC-1	HDE		2081	II	3/23/2018	3/23/2017

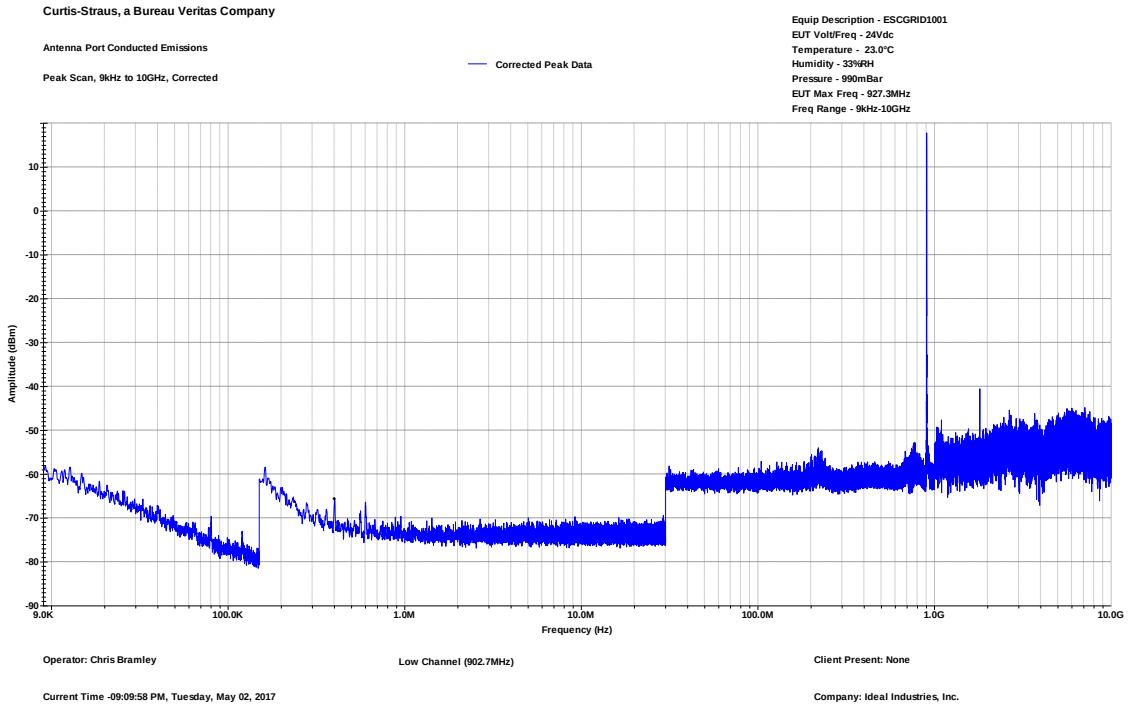
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

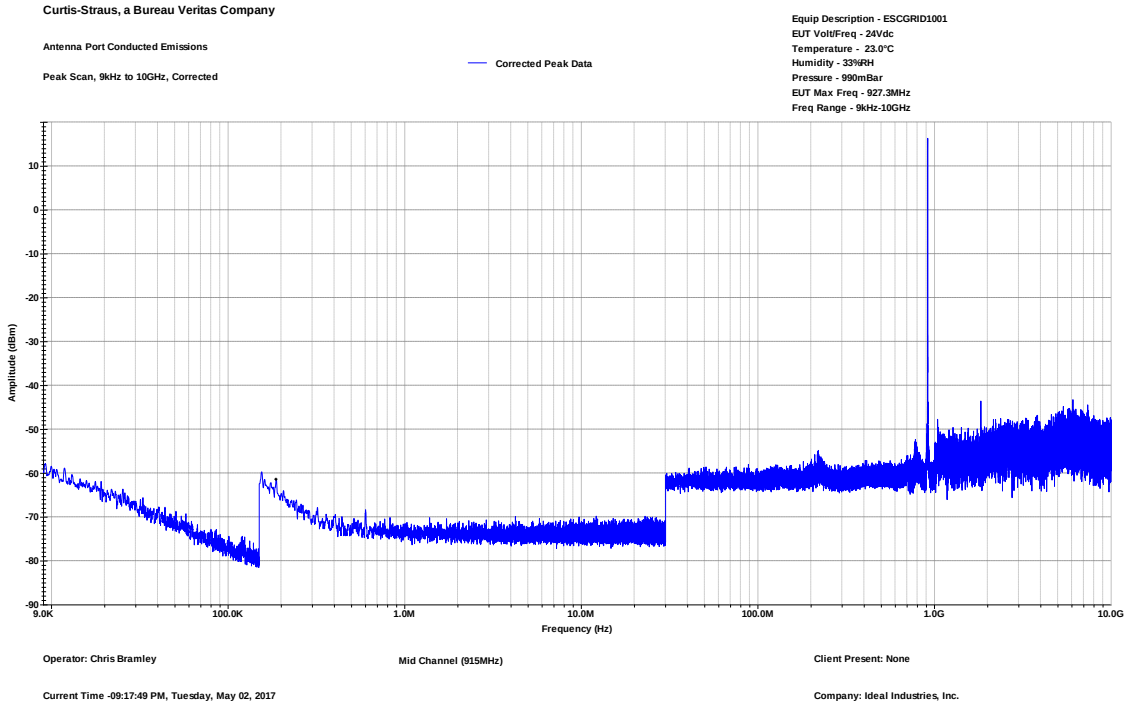
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

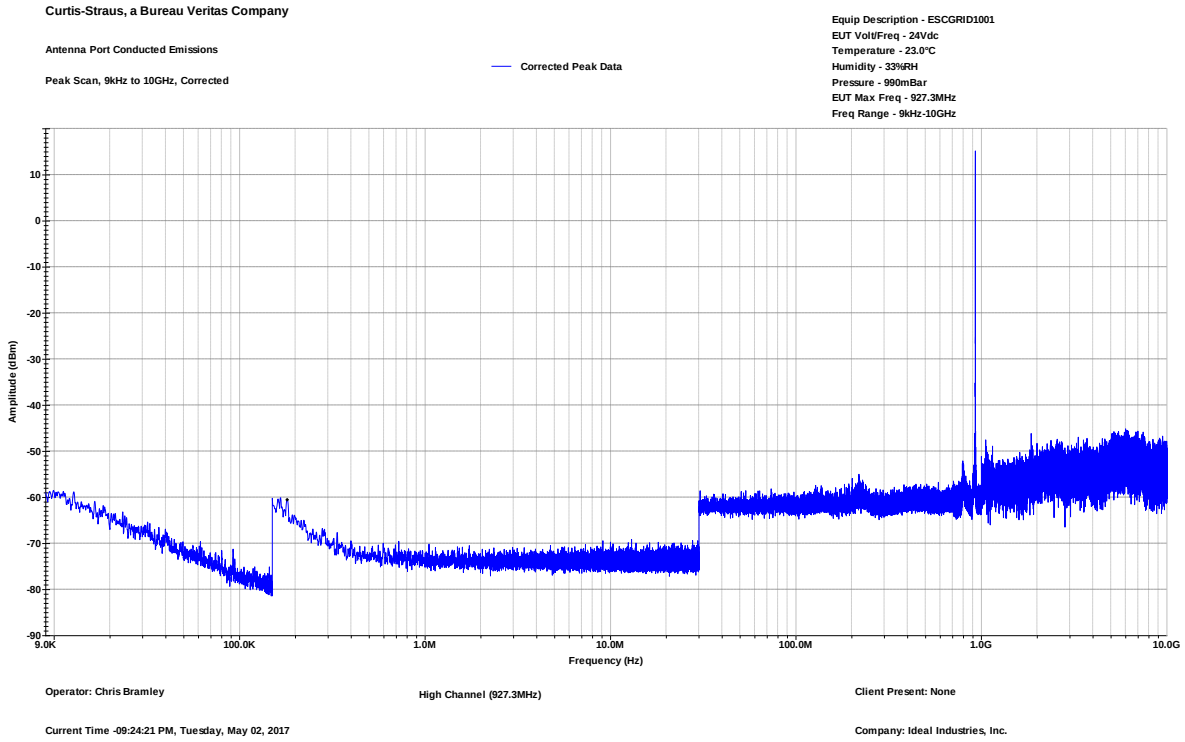
Frequency range up to 10GHz was investigated for all 3 channels (low, middle and high) at the EUT antenna port. Plots below show that all emissions are more than 30dB below the fundamental.

Plots

Conducted Spurious Emissions






Curtis-Straus, a Bureau Veritas Company
Antenna Port Conducted Emissions
Peak Scan, 9kHz to 10GHz, Corrected
Corrected Peak Data
Equip Description - ESCGRID1001
EUT Volt/Freq - 24Vdc
Temperature - 23.0°C
Humidity - 33%RH
Pressure - 990mBar
EUT Max Freq - 927.3MHz
Freq Range - 9kHz-10GHz
Amplitude (dBm)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
9.0K
100.0K
1.0M
10.0M
100.0M
1.0G
10.0G
Frequency (Hz)
Operator: Chris Bramley
High Channel (927.3MHz)
Client Present: None
Current Time -09:24:21 PM, Tuesday, May 02, 2017
Company: Ideal Industries, Inc.

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)]

MEASUREMENTS / RESULTS

Power Spectral Density

Date: 02-May-17 **Company:** Ideal Industries, Inc. **Work Order:** R1267
Engineer: Chris Bramley **EUT Desc:** ESCGRID1001 **EUT Operating Voltage/Frequency:** 24Vdc
Temp: 23.0°C **Humidity:** 37% **Pressure:** 990mBar
Notes: Per FCC KDB 558074 D01 DTS Meas Guidance v04 Section 10.3

Channel	Frequency (MHz)	PSD Measured (dBm)	PSD Limit (dBm)	Margin (dB)	Test Results (Pass/Fail)
Low	902.7	4.40	8	-3.60	Pass
Middle	915	3.29	8	-4.71	Pass
High	927.3	2.20	8	-5.80	Pass

Rev. 4/30/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017

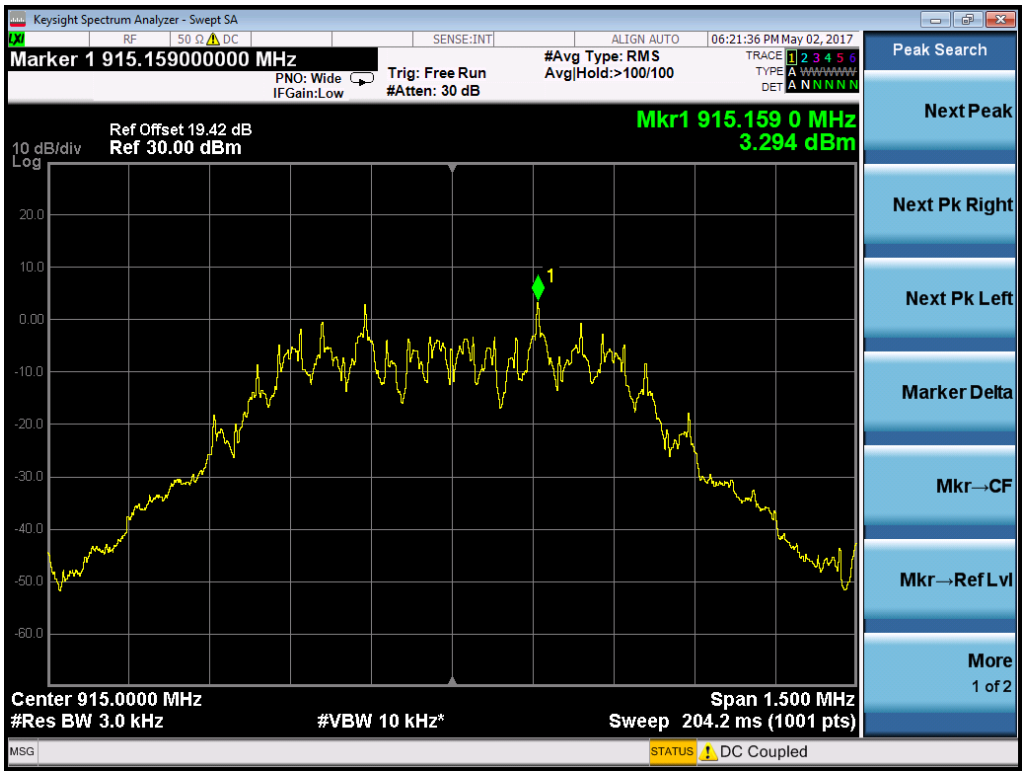
Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017

Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

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

PLOTS

PSD – Low Channel



PSD – Mid Channel

PSD – High Channel

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

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Peak Detector Tabular Data - Voltage Measurement
Operator: Nirak So

Work Order # - R1267
EUT Power Input - 120 VAC/ Hz
Test Site - CEMI-2
Temp; Humid; Pres - 21.2 °C; 31%RH; 1007 mBar

Frequency	Raw Peak Reading	Correction Factor	Adjusted Peak Amplitude	Quasi-peak Limit	Margin to the QP Limit	Peak to QP Limit Results	Worst Margin	Average Limit	Margin to Average Limit	Peak to Avg Limit Results	Worst Margin	
MHz	dBµV	dB	dBµV	dBµV	dB	Pass/Fail	dB	dBµV	dB	Pass/Fail	dB	
0.165	26.7	20.1	46.9	65.2	-18.4	PASS						
0.204	22.8	20.1	42.9	63.5	-20.6	PASS		53.5	-10.6	PASS	-10.6	
0.237	19.5	20.1	39.6	62.2	-22.6	PASS		52.2	-12.6	PASS		
0.311	22.6	20.1	42.7	59.9	-17.2	PASS	-17.2					
0.496	14.2	20.1	34.3	56.1	-21.7	PASS		46.1	-11.7	PASS		
0.62	12.9	20.1	33	56	-23	PASS		46	-13	PASS		

EUT Line tested: 120 VAC/ 60 Hz; Neutral

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1 CISPR Average Detector
Final Average Detector Tabular Data - Voltage Measurement
Operator: Nirak So

Work Order # - R1267
EUT Power Input - 120 VAC/ Hz
Test Site - CEMI-2
Temp; Humid; Pres - 21.2 °C; 31%RH; 1007 mBar

Frequency	Raw Average Reading	Correction Factor	Adjusted Average Amplitude	Average Limit	Average Margin	Average Results	Worst Average Margin		
MHz	dBµV	dB	dBµV	dBµV	dB	Pass/Fail	dB		
0.163	5.7	20.1	25.8	55.3	-29.5	PASS			
0.311	16.6	20.1	36.7	49.9	-13.3	PASS	-13.3		

EUT Line tested: 120 VAC/ 60 Hz; Neutral

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Peak Detector Tabular Data - Voltage Measurement
Operator: Nirak So

Work Order # - R1267
EUT Power Input - 120 VAC/ Hz
Test Site - CEMI-2
Temp; Humid; Pres - 21.2 °C; 31%RH; 1007 mBar

Frequency	Raw Peak Reading	Correction Factor	Adjusted Peak Amplitude	Quasi-peak Limit	Margin to the QP Limit	Peak to QP Limit Results	Worst Margin	Average Limit	Margin to Average Limit	Peak to Avg Limit Results	Worst Margin	
MHz	dBµV	dB	dBµV	dBµV	dB	Pass/Fail	dB	dBµV	dB	Pass/Fail	dB	
0.165	26.3	20.1	46.4	65.2	-18.8	PASS		55.2				
0.231	19.4	20.1	39.5	62.4	-22.9	PASS		52.4	-12.9	PASS		
0.278	16.9	20.1	37	60.9	-23.9	PASS		50.9	-13.9	PASS		
0.313	22.2	20.1	42.4	59.9	-17.5	PASS	-17.5	49.9				
0.507	13.9	20.1	34	56	-22	PASS		46	-12	PASS	12	
0.599	14	20.1	34.1	56	-21.9	PASS		46	-11.9	PASS		

EUT Line tested: 120 VAC/ 60 Hz; Phase

Curtis Straus - a Bureau Veritas Company
Conducted Em CISPR Average Detector
Final Average Detector Tabular Data - Voltage Measurement
Operator: Nirak So

Work Order # - R1267
EUT Power Input - 120 VAC/ Hz
Test Site - CEMI-2
Temp; Humid; Pres - 21.2 °C; 31%RH; 1007 mBar

Frequency	Raw Average Reading	Correction Factor	Adjusted Average Amplitude	Average Limit	Average Margin	Average Results	Worst Average Margin		
MHz	dBµV	dB	dBµV	dBµV	dB	Pass/Fail	dB		
0.166	5.2	20.1	25.3	55.1	-29.8	PASS			
0.311	17.5	20.1	37.6	49.9	-12.3	PASS	-12.3		

EUT Line tested: 120 VAC/ 60 Hz; Phase

Rev. 5/7/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017
LISNs/Measurement Probes	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
LISN Asset 1791	9KHz-30MHz	NNLK 8121	Schwarzbeck	NNLK 8121-603	1791	I	6/23/2017	6/23/2016
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 2	719150		A-0015			III	NA	N/A
Meteorological Meters		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI-12	9kHz - 2GHz		C-S			II	10/2/2017	1/2/2016
Attenuators	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
20dB Attenuator-01	9kHz-2GHz			N/A		II	10/2/2017	10/2/2016

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

Occupied Bandwidth

REQUIREMENT

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured.
[RSS-GEN Section 6.6]

MEASUREMENTS / RESULTS

99% Occupied Bandwidth

Date: 02-May-17	**Company:** Ideal Industries, Inc.	**Work Order:** R1267
Engineer: Chris Bramley	**EUT Desc:** ESCGRID1001	**EUT Operating Voltage/Frequency:** 24Vdc
Temp: 23.0°C	**Humidity:** 37%	**Pressure:** 990mBar

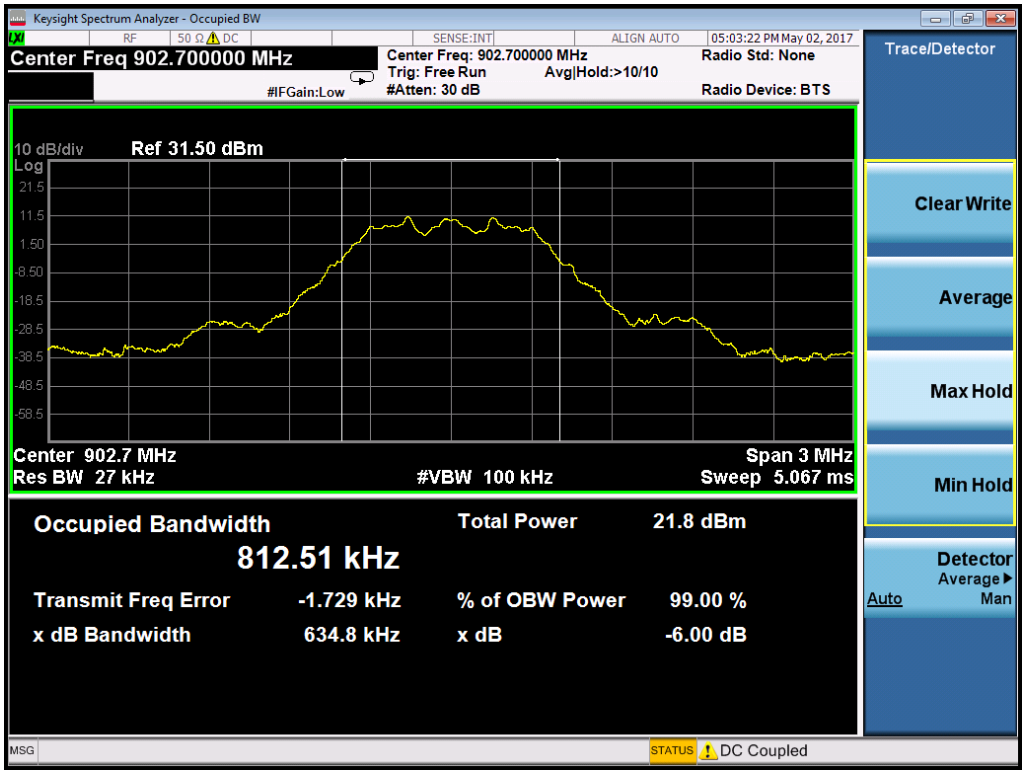
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Low	902.7	812.51
Middle	915.0	807.80
High	927.3	807.64

Rev. 4/30/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental EXA Signal Analyzer(1199509)	9KHz-26.5GHz	N9010A-526;R	AT	SG53470118	1199509	I	1/27/2018	1/27/2017
Meteorological Meters		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2081		HTC-1	HDE		2081	II	3/23/2018	3/23/2017
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II	8/14/2017	8/14/2016

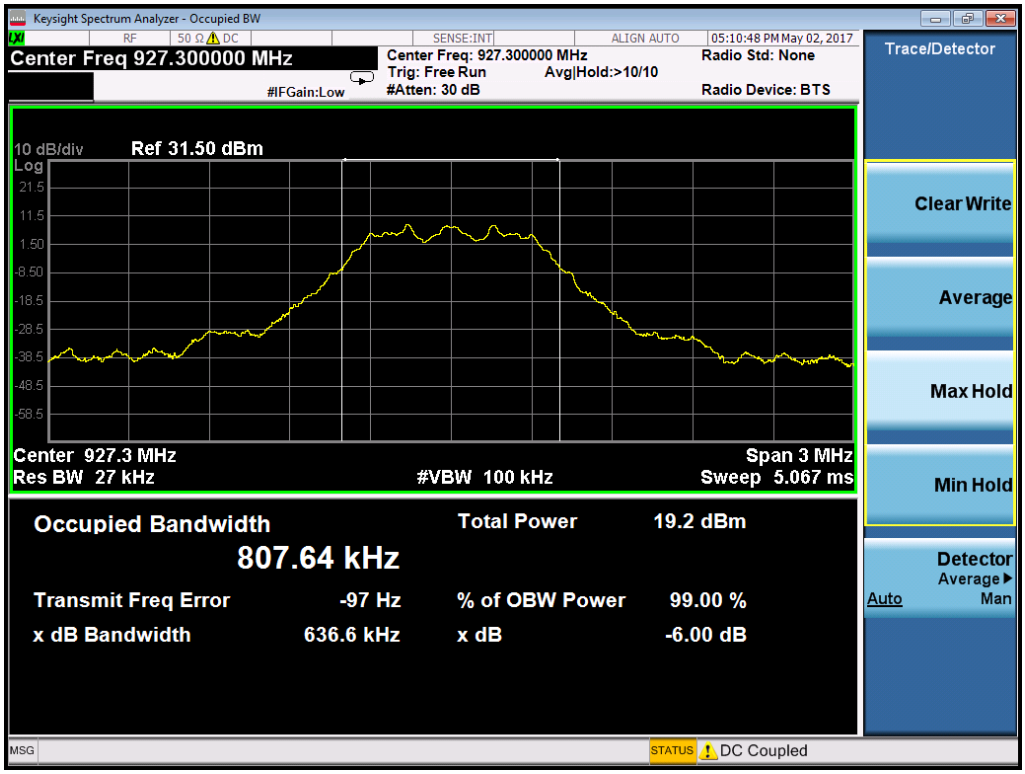
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Plot(s)



Occupied Bandwidth – Low Channel

Occupied Bandwidth – Middle Channel



Occupied Bandwidth – High Channel

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 event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all

such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.

13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

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

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

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

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.