



**BUREAU
VERITAS**

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

Test Report

Report No	EM2102-1
Client	Balluff, Inc. Martin Franke
Address	8125 Holton Drive Florence, KY 41042
Phone	(859) 727 - 2200
Items tested	BIS M-400-007-001-00-S115
Standards	47 CFR FCC Part 15.225, 47 CFR FCC Part 15.209, 47 CFR FCC Part 15.207, RSS GEN Issue 3, RSS 210 Issue 8
Test Dates	Feb 22, Mar 4, 6, Jul 11 and Aug 23, 2013
Results	As detailed within this report
Prepared by	 Tuyen Truong – EMC Engineer
Authorized by	 Arik Zwirner – EMC Senior Engineer
Issue Date	May 20, 2014
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 19 of this report.

Curtis-Straus LLC is accredited to ISO/IEC 17025 by A2LA for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation. Any opinions or interpretations expressed in this report are outside the scope of our A2LA accreditation as A2LA only accredits testing.



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Form CPS Final Report REV 28-MAR-12 (KK)



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Regulatory Information

FRN number	0006334478
FCC ID	HLH-BISM4XX00
IC	5796-BISM4XX00

Release Control Record

Issue No. Reason for change

1 Original Release

Date Issued

August 5, 2015



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Summary

On Feb 22, Mar 4, 6, Jul 11 and Aug 23, 2013 we tested the BIS M-400-007-001-00-S115 for compliance with the following requirements:

EMC Emissions:

- CFR 47 FCC Part 15.207 – Conducted limits
- CFR 47 FCC Part 15.209 - Radiated emission limits; general requirements
- CFR 47 FCC Part 15.225 - Radiated emission limits; general requirements
- RSS GEN - General Requirements and Information for the Certification of Radio Apparatus – Issue 3
- RSS 210 – License - exempt Radio Apparatus (All Frequency Bands): Category I Equipment -Issue 8

Testing was performed according to procedures outlined in ANCI c63.4.

Product is an RFID system which operates at 13.56MHz. EUT emissions were maximized by rotating product around its axis and around 3 orthogonal axes. EUT antenna could not be maximized separately.

AC Mains conducted emissions was performed on AC side of AC/DC power supply (support equipment) power supply.

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Product Tested - Configuration Documentation

EUT Configuration																														
Work Order: M2102 Company: Balluff, Inc. Company Address: 8125 Holton Drive Florence, KY 41042 Contact: Jim Ramler																														
EUT: BIS M-400-007-001-00-S115 EUT Max Frequency: <108MHz EUT TX Frequency: 13.56MHz EUT Description: Non-Contact Read/Write System																														
Support Equipment: <table border="1"> <thead> <tr> <th>MN</th> <th>PN</th> <th>SN</th> </tr> </thead> <tbody> <tr> <td>Variable Power Supply set to 24VDC</td> <td>0859</td> <td>1</td> </tr> <tr> <td>24Vdc Power Supply</td> <td>E3612A</td> <td>KP61304227</td> </tr> <tr> <td>Dell PC</td> <td>1116</td> <td>Not Labeled</td> </tr> <tr> <td>Dell Monitor</td> <td>E773c</td> <td>Not Labeled</td> </tr> <tr> <td>IBM Keyboard</td> <td>SK8815</td> <td>00613630</td> </tr> <tr> <td>Lenovo Mouse</td> <td>M-UAE119</td> <td>Not Labeled</td> </tr> </tbody> </table>						MN	PN	SN	Variable Power Supply set to 24VDC	0859	1	24Vdc Power Supply	E3612A	KP61304227	Dell PC	1116	Not Labeled	Dell Monitor	E773c	Not Labeled	IBM Keyboard	SK8815	00613630	Lenovo Mouse	M-UAE119	Not Labeled				
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EUT Ports: <table border="1"> <thead> <tr> <th>Port Label</th> <th>Port Type</th> <th>No. of ports</th> <th>No. Populated</th> <th>Cable Type</th> <th>Shielded</th> <th>Ferrites</th> <th>Length</th> <th>Max Length</th> <th>In/Out</th> <th>NEBS Type</th> <th>Unpopulated Reason</th> </tr> </thead> <tbody> <tr> <td>Serial</td> <td>RS-232</td> <td>1</td> <td>1</td> <td>8 pin</td> <td>Yes</td> <td>None</td> <td>1m</td> <td>1m</td> <td>In</td> <td></td> <td></td> </tr> </tbody> </table>							Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	In/Out	NEBS Type	Unpopulated Reason	Serial	RS-232	1	1	8 pin	Yes	None	1m	1m	In		
Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	In/Out	NEBS Type	Unpopulated Reason																			
Serial	RS-232	1	1	8 pin	Yes	None	1m	1m	In																					
Software / Operating Mode Description: Powered on at 24VDC and constantly transmitting at 13.56MHz.																														



Compliance Statement

RSS GEN	RSS 210	FCC		Compliant (Yes) / (No) (NA)
		§15.225		
	A2.6(a)	15.225(a)	The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.	Yes
	A2.6(b)	15.225(b)	Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.	Yes
	A2.6(c)	15.225(c)	Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.	Yes
	A2.6(d)	15.225(d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.	Yes
		15.225(e)	The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.	Yes
4.7	A2.6	15.225(f)	In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.	¹ NA
5.3		15.15(b)	There are no controls accessible to the user that varies the output power above specified limits.	Yes
5.2		15.19	The label is shown in the label exhibit.	Yes
7.1.5		15.21	Information to the user is shown in the instruction manual.	Yes



		15.27	No special accessories are required for compliance.	Yes
		15.31	The EUT was tested in accordance with the measurement standards in this section.	Yes
		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.	Yes
		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.	Yes
7.1.4		15.203	EUT employs an integral antenna.	Yes
	2.6	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.	Yes
7.2.2		15.207	EUT meets the AC Line conducted emissions requirements of	yes
4.6.1			Occupied Bandwidth measurements were made	yes



Test Results

AC Mains Conducted Emissions

Test Method

Per ANSI c63.4 (2009)

Test Data

AC side of DC Supply - Conducted Emissions Data Table													
								Work Order: M2102					
								Pressure: 1005 mBar					
Notes: EUT is powered with HP E3612A Power Supply (120Vac/60Hz). EUT is tied to earth ground and EUT antenna terminated with dummy load (metal plate; damping field)													
		Frequency Range: 0.15 - 30MHz			EUT Input Voltage/Frequency: 24Vdc								
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor	ATTN Factor	FCC/CISPR Class B				
	QP1 (dB μ V)	QP2 (dB μ V)	AVG1 (dB μ V)	AVG2 (dB μ V)	L1 (dB)	L2 (dB)	(dB)	(dB)	QP Limit (dB μ V)	Margin (dB)			
0.79	21.3	24.4	16.5	20.6	0.0	-0.1	-0.2	-19.4	56.0	-12.0			
13.56	14.1	14.0	11.4	11.4	-0.1	-0.1	-0.3	-19.5	60.0	-26.2			
1.86	17.1	19.8	14.0	18.2	0.0	-0.1	-0.2	-19.4	56.0	-16.5			
2.64	14.5	19.7	10.5	18.2	0.0	-0.1	-0.2	-19.4	56.0	-16.6			
22.34	6.7	6.8	0.4	0.4	-0.1	-0.2	-0.3	-19.4	60.0	-33.3			
27.11	13.0	13.0	10.1	9.8	-0.1	-0.2	-0.3	-19.4	60.0	-27.0			
28.78	6.7	6.9	0.5	1.2	-0.1	-0.2	-0.4	-19.4	60.0	-33.1			
Result: Pass		Worst Margin: -5.8 dB			Frequency: 13.600 MHz								
Measurement Device: LISN ASSET 1726(Line 1) LISN ASSET 1727(Line 2)				Cable: CEMI-02			Spectrum Analyzer: Yellow						
Attenuator: 20dB Attenuator-36				Site: CEMI 3			Equipment Factor Sheet rev. 8/15/2013						

C-S CEMI Calculator Version 3.0.12

Equipment Factor Sheet rev. 8/15/2013

Rev.8/14/2013

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due		
Yellow	9kHz-2.9GHz	8594E	Agilent	3523A01958	100	I	6/3/2014		
LISNs/Measurement Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due		
LISN Asset 1726	150kHz-30MHz	LI-150A	Com-Power	201092	1726	I	1/11/2014		
LISN Asset 1727	150kHz-30MHz	LI-150A	Com-Power	201093	1727	I	1/2/2014		
Conducted Test Sites (Mains / Telco)	FCC Code	VCCI Code			Cat	Calibration Due			
CEMI-03	9kHz - 2GHz	C-S			II	10/13/2013			
Cables	Range	Mfr	C-S	Cat	Calibration Due				
CEMI-02	9kHz - 2GHz	N/A	C-S	II	3/26/2014				
Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due		
20dB Attenuator-36	9kHz-2GHz	N/A	Davis	N/A	II	4/15/2014			
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due			
Temp./Humidity/Atm. Pressure Gauge	7400 Perception II	Davis	N/A	965	I	5/29/2014			

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

AC Mains Setup Pictures

See exhibit for test setup pictures.



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Spurious Radiated Emissions

Test Method

Per ANSI c63.4 (2009)

Test Data

Radiated Emissions Table							Work Order: M2102																																		
Date: 04-Mar-13 Engineer: Edward Breen Temp: 26°C	Company: Balluff Inc. EUT Desc: BIS M-40X Humidity: 15%				EUT Operating Voltage/Frequency: 24Vdc Pressure: 996mBar																																				
Frequency Range: 9-20kHz							Measurement Distance: 3 m																																		
Notes:																																									
<table border="1"> <thead> <tr> <th rowspan="2">Antenna Polarization (0° - 90°)</th><th rowspan="2">Frequency (MHz)</th><th rowspan="2">Reading (dBμV)</th><th rowspan="2">Preamp Factor (dB)</th><th rowspan="2">Antenna Factor (dB/m)</th><th rowspan="2">Cable Factor (dB)</th><th rowspan="2">Adjusted Reading (dBμV/m)</th><th colspan="3">---</th><th colspan="3">FCC Title 47 § 15.209</th></tr> <tr> <th>Limit (dBμV/m)</th><th>Margin (dB)</th><th>Result (Pass/Fail)</th><th>Limit (dBμV/m)</th><th>Margin (dB)</th><th>Result (Pass/Fail)</th></tr> </thead> <tbody> <tr> <td>0 deg 90 deg</td><td>0.015 0.015</td><td>5.8 7.4</td><td>0.0 0.0</td><td>64.1 64.1</td><td>0.0 0.0</td><td>69.9 71.5</td><td>---</td><td>---</td><td>---</td><td>124.0 124.0</td><td>-54.1 -52.5</td><td>Pass Pass</td></tr> </tbody> </table>										Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209			Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	0 deg 90 deg	0.015 0.015	5.8 7.4	0.0 0.0	64.1 64.1	0.0 0.0	69.9 71.5	---	---	---	124.0 124.0	-54.1 -52.5	Pass Pass
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---										FCC Title 47 § 15.209																								
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)																													
0 deg 90 deg	0.015 0.015	5.8 7.4	0.0 0.0	64.1 64.1	0.0 0.0	69.9 71.5	---	---	---	124.0 124.0	-54.1 -52.5	Pass Pass																													
Table Result: 0.015 by -52.5 dB							Worst Freq: 0.015 MHz																																		
Test Site: EMI Chamber 2 Analyzer: Asset #1327	Cable 1: EMIR-14 Preamp: none			Cable 2: EMIR-15 Antenna: Lg Loop																																					

Rev.3/2/2013

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 5/30/2013
Radiated Emissions Sites EMI Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCI Code A-0015	Range		Cat II	Calibration Due 2/15/2014
Antennas Large Loop	Range 20Hz-5MHz	MN 6511	Mfr EMCO	SN 9704-1154	Asset 67	Cat I	Calibration Due 4/27/2014
Cables REMI-14 REMI-15	Range 9kHz - 2GHz 9kHz - 2GHz		Mfr C-S C-S			Cat II II	Calibration Due OUT OF SERVICE 10/15/2013
Meteorological Meters Weather Clock (Pressure Only) CHAMBER2 Thermohygrometer	MN BA928 35519-044	Mfr Oregon Scientific Control Company	SN C3166-1 72457639	Asset 831 1347	Cat I II	Calibration Due 3/28/2013 8/19/2013	

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Radiated Emissions Table

Date: 04-Mar-13		Company: Balluff Inc.		Work Order: M2102								
Engineer: Edward Breen		EUT Desc: BIS M-40X		EUT Operating Voltage/Frequency: 24Vdc								
Temp: 26°C		Humidity: 15%		Pressure: 996mBar								
Frequency Range: 20-150kHz			Measurement Distance: 3 m									
Notes:												
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
0 deg	0.0326	8.5	18.7	58.4	0.0	48.2	---	---	---	117.3	-69.1	Pass
90 deg	0.0326	7.0	18.7	58.4	0.0	46.7	---	---	---	117.3	-70.6	Pass
0 deg	0.0654	16.1	22.1	52.7	0.0	46.7	---	---	---	111.2	-64.5	Pass
90 deg	0.0654	16.1	22.1	52.7	0.0	46.7	---	---	---	111.2	-64.5	Pass
0 deg	0.0704	18.2	22.2	52.2	0.0	48.2	---	---	---	110.6	-62.4	Pass
90 deg	0.0704	18.1	22.2	52.2	0.0	48.1	---	---	---	110.6	-62.5	Pass
0 deg	0.131	7.4	22.6	49.9	0.1	34.8	---	---	---	105.2	-70.4	Pass
90 deg	0.131	7.5	22.6	49.9	0.1	34.9	---	---	---	105.2	-70.3	Pass
Table Result: 0.0704 by -62.4 dB						Worst Freq: 0.0704 MHz						
Test Site: EMI Chamber 2			Cable 1: EMIR-14			Cable 2: Asset #1522						
Analyzer: Asset #1327			Preamp: Blue			Antenna: Lg Loop						

Rev.3/2/2013

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
SA EMI Chamber (1327)	9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range		Cat	Calibration Due
EMI Chamber 2	719150	2762A-7	A-0015			II	2/15/2014
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Blue	0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	II	6/5/2013
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Large Loop	20Hz-5MHz	6511	EMCO	9704-1154	67	I	4/27/2014
Cables	Range	Mfr	Cat	Calibration Due			
REMI-14	9kHz - 2GHz			OUT OF SERVICE			
Asset #1522	9kHz - 26.5GHz	Florida RF	II	2/2/2014			
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	3/28/2013	
CHAMBER2 Thermo hygrometer	35519-044	Control Company	72457639	1347	II	8/19/2013	

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Radiated Emissions Table

Date: 04-Mar-13		Company: Balluff Inc.		Work Order: M2102								
Engineer: Edward Breen		EUT Desc: BIS M-40X		EUT Operating Voltage/Frequency: 24Vdc								
Temp: 26°C		Humidity: 15%		Pressure: 996mBar								
Frequency Range: 0.15-5MHz			Measurement Distance: 3 m									
Notes:												
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
No emissions in this range			---	---	---	---	---	---	---	---	---	---
Table Result: --- by --- dB						Worst Freq: --- MHz						
Test Site: EMI Chamber 2			Cable 1: EMIR-14			Cable 2: Asset #1522						
Analyzer: Asset #1327			Preamp: Blue			Antenna: Lg Loop						



Rev.3/2/2013

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
SA EMI Chamber (1327)		9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range		Cat	Calibration Due
EMI Chamber 2		719150	2762A-7	A-0015			II	2/15/2014
Preamps /Couplers Attenuators / Filters		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Blue		0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	II	6/5/2013
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Large Loop		20Hz-5MHz	6511	EMCO	9704-1154	67	I	4/27/2014
Cables		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
REMI-14		9kHz - 2GHz		C-S			II	OUT OF SERVICE
Asset #1522		9kHz - 26.5GHz		Florida RF			II	2/2/2014
Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	3/28/2013	
CHAMBER2 Thermohygrometer		35519-044	Control Company	72457639	1347	II	8/19/2013	

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Radiated Emissions Table

Date: 04-Mar-13	Company: Balluff Inc.	Work Order: M2102										
Engineer: Edward Breen	EUT Desc: BIS M-40X	EUT Operating Voltage/Frequency: 24Vdc										
Temp: 26°C	Humidity: 15%	Pressure: 996mBar										
Frequency Range: 5-13.11MHz		Measurement Distance: 3 m										
Notes:												
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
No emissions in this range		---	---	---	---	---	---	---	---	---	---	---
Table Result: --- by --- dB			Worst Freq: --- MHz									
Test Site: EMI Chamber 2		Cable 1: EMIR-14		Cable 2: Asset #1522								
Analyzer: Asset #1327		Preamp: Blue		Antenna: Sm Loop (high)								

Rev.3/2/2013

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
SA EMI Chamber (1327)		9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	5/30/2013
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range		Cat	Calibration Due
EMI Chamber 2		719150	2762A-7	A-0015			II	2/15/2014
Preamps /Couplers Attenuators / Filters		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Blue		0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	II	6/5/2013
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Small Loop		10kHz-30MHz	PLA-130/A	ARA	1024	755	I	4/27/2014
Cables		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
REMI-14		9kHz - 2GHz		C-S			II	OUT OF SERVICE
Asset #1522		9kHz - 26.5GHz		Florida RF			II	2/2/2014
Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	3/28/2013	
CHAMBER2 Thermohygrometer		35519-044	Control Company	72457639	1347	II	8/19/2013	

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Radiated Emissions Table

Date: 04-Mar-13	Company: Balluff Inc.	Work Order: M2102										
Engineer: Edward Breen	EUT Desc: BIS M-40X	EUT Operating Voltage/Frequency: 24Vdc										
Temp: 26°C	Humidity: 15%	Pressure: 996mBar										
Frequency Range: 14.01-30MHz		Measurement Distance: 3 m										
Notes:												
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
No emissions in this range		---	---	---	---	---	---	---	---	---	---	
Table Result: --- by --- dB		Worst Freq: --- MHz										
Test Site: EMI Chamber 2	Cable 1: EMIR-14		Cable 2: Asset #1522									
Analyzer: Asset #1327	Preamp: Blue		Antenna: Sm Loop (high)									

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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 5/30/2013
Radiated Emissions Sites EMI Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCI Code A-0015	Range		Cat II	Calibration Due 2/15/2014
Preamps /Couplers Attenuators / Filters Blue	Range 0.009-2000MHz	MN ZFL-1000-LN	Mfr CS	SN N/A	Asset 759	Cat II	Calibration Due 6/5/2013
Antennas Small Loop	Range 10kHz-30MHz	MN PLA-130/A	Mfr ARA	SN 1024	Asset 755	Cat I	Calibration Due 4/27/2014
Cables REMI-14 Asset #1522	Range 9kHz - 2GHz 9kHz - 26.5GHz	Mfr C-S Florida RF				Cat II	Calibration Due OUT OF SERVICE 2/2/2014
Meteorological Meters Weather Clock (Pressure Only) CHAMBER2 Thermohygrometer	MN BA928 35519-044	Mfr Oregon Scientific Control Company	SN C3166-1 72457639	Asset 831 1347	Cat I II	Calibration Due 3/28/2013 8/19/2013	

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

Radiated Emissions Table

Date: 22-Feb-13	Company: Balluff Inc.	Work Order: M2102											
Engineer: Mairaj Hussain	EUT Desc: BIS M-40X	EUT Operating Voltage/Frequency: 24 DC											
Temp: 24.8°C	Humidity: 20%	Pressure: 1018mBar											
Frequency Range: 30-140MHz		Measurement Distance: 3 m											
Notes: Peak Readings													
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.209			
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	
v	47.5	39.3	25.7	9.0	0.7	23.3	---	---	---	40.0	-16.7	Pass	
v	81.4	44.2	25.7	7.6	0.8	26.9	---	---	---	40.0	-13.1	Pass	
v	67.6	38.4	25.7	8.1	0.7	21.5	---	---	---	40.0	-18.5	Pass	
v	108.6	35.7	25.7	12.2	1.0	23.2	---	---	---	43.5	-20.3	Pass	
v	132.2	36.2	25.8	13.9	1.1	25.4	---	---	---	43.5	-18.1	Pass	
v	135.6	42.0	25.8	13.6	1.0	30.8	---	---	---	43.5	-12.7	Pass	
Table Result: Pass by -13.1 dB		Worst Freq: 81.4 MHz											
Test Site: EMI Chamber 1	Cable 1: EMIR-03		Cable 2: Asset #1522		Cable 3: ---								
Analyzer: Rental SA#2	Preamp: Green		Antenna: Red-Black		Preselector: ---								



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Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Rental SA #2		9kHz-26.5 GHz	E7405A	Agilent	MY45104194	rental	I	12/8/2013
Radiated Emissions Sites	FCC Code		IC Code	VCCI Code	Range		Cat	Calibration Due
EMI Chamber 1	719150		2762A-6	A-0015			II	2/16/2014
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	
Green	0.009-2000MHz	ZFL-1000-LN	CS	N/A	802	II	9/19/2013	
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	
Red-Black Biolog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	1/28/2015	
Cables	Range	Mfr				Cat	Calibration Due	
REMI-03	9kHz - 2GHz	C-S				II	4/10/2013	
Asset #1522	9kHz - 26.5GHz	Florida RF				II	2/2/2014	
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due		
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	3/28/2013		
CHAMBER1 Thermohygrometer	35519-044	Control Company	72457642	1345	II	8/19/2013		

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Spurious Radiated Emissions Setup Pictures

See exhibit for test setup pictures.



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Frequency Stability

Test Method

Per ANSI c63.4 (2009)

Test Data

15.225(e): Frequency tolerance							
Work Order: M2102							
Date(s): 3/6/2013							
Engineer(s): Edward Breen							
EUT: BIS M-400-007-001-00-S115							
Company: Balluff							
Testing Location: Littleton Distribution Center, One Distribution Center Circle, #1 - Littleton, MA 01460							
Test Equipment Used:							
Chambers and Stripline Environmental (Safety)		MN SGTH-31S		Mfr B-M-A Inc.		SN 2245	Asset 321
Spectrum Analyzers / Receivers /Preselectors SA EMI Chamber (1327)	Range 9kHz-13.2 GHz	MN E4405B		Mfr Agilent		SN MY45103416	Asset 1327
Antennas Small Loop	Range 10kHz-30MHz	MN PLA-130/A		Mfr ARA		SN 1024	Asset 755
Cables REMI-15	Range 9kHz - 2GHz			Mfr C-S			Calibration Due II
Meteorological Meters Temp./Humidity/Atm. Pressure Gauge CHAMBER1 Thermohygrometer		MN 7400 Perception II 35519-044		Mfr Davis Control Company		SN N/A 72457642	Asset 965 1345
Atmospheric Conditions:							
Temp: 22.6°C		Humidity: 21%		Pressure: 1013mbar			
Results:							
	Temperature (°C)	Voltage (Vdc)	Carrier signal tolerance (kHz)	Δ (kHz)	Result		
	-20	24	±1.356	0	Pass		
	50	24	±1.356	0	Pass		
	20	20.4	±1.356	0	Pass		
	20	27.6	±1.356	0	Pass		

Frequency Stability Setup Pictures

See exhibit for test setup pictures.



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Spectrum Mask

Test Method

Per ANSI c63.4 (2009)

Test Data

Radiated Emissions Table

Date: 04-Mar-13	Company: Balluff Inc.	Work Order: M2102												
Engineer: Edward Breen	EUT Desc: BIS M-40X	EUT Operating Voltage/Frequency: 24Vdc												
Temp: 26°C	Humidity: 15%	Pressure: 996mBar												
Frequency Range: 13.11-14.01MHz		Measurement Distance: 3 m												
Notes:														
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---			FCC Title 47 § 15.225				
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)		
0 deg	13.56	40.9	22.6	39.0	0.7	58.0	---	---	---	123.9	-65.9	Pass		
90 deg	13.56	39.6	22.6	39.0	0.7	56.7	---	---	---	123.9	-67.2	Pass		
---			---			---			---					
Table Result: 13.56 by -65.9 dB			Worst Freq: 13.56 MHz											
Test Site: EMI Chamber 2		Cable 1: EMIR-14		Cable 2: Asset #1522		Antenna: Sm Loop (high)								
Analyzer: Asset #1327		Preamp: Blue												

Rev.3/2/2013

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 5/30/2013
Radiated Emissions Sites EMI Chamber 2	FCC Code 719150	IC Code 2762A-7	VCCI Code A-0015	Range		Cat II	Calibration Due 2/15/2014
Preamps /Couplers Attenuators / Filters Blue	Range 0.009-2000MHz	MN ZFL-1000-LN	Mfr CS	SN N/A	Asset 759	Cat II	Calibration Due 6/5/2013
Antennas Small Loop	Range 10kHz-30MHz	MN PLA-130/A	Mfr ARA	SN 1024	Asset 755	Cat I	Calibration Due 4/27/2014
Cables REMI-14 Asset #1522	Range 9kHz - 2GHz 9kHz - 26.5GHz	Mfr C-S Florida RF				Cat II	Calibration Due OUT OF SERVICE 2/2/2014
Meteorological Meters Weather Clock (Pressure Only) CHAMBER2 Thermohygrometer	MN BA928 35519-044	Mfr Oregon Scientific Control Company	SN C3166-1 72457639	Asset 831 1347	Cat I II	Calibration Due 3/28/2013 8/19/2013	

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



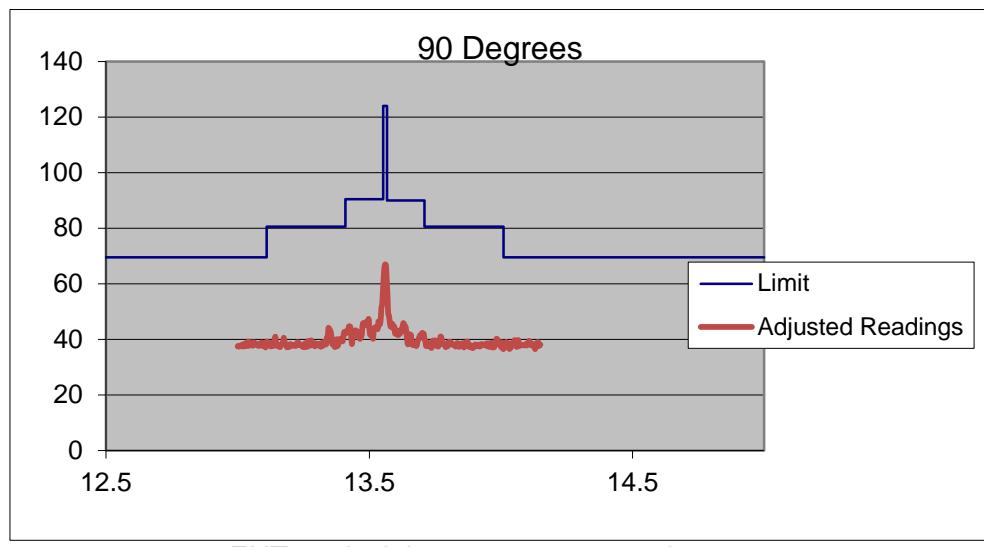
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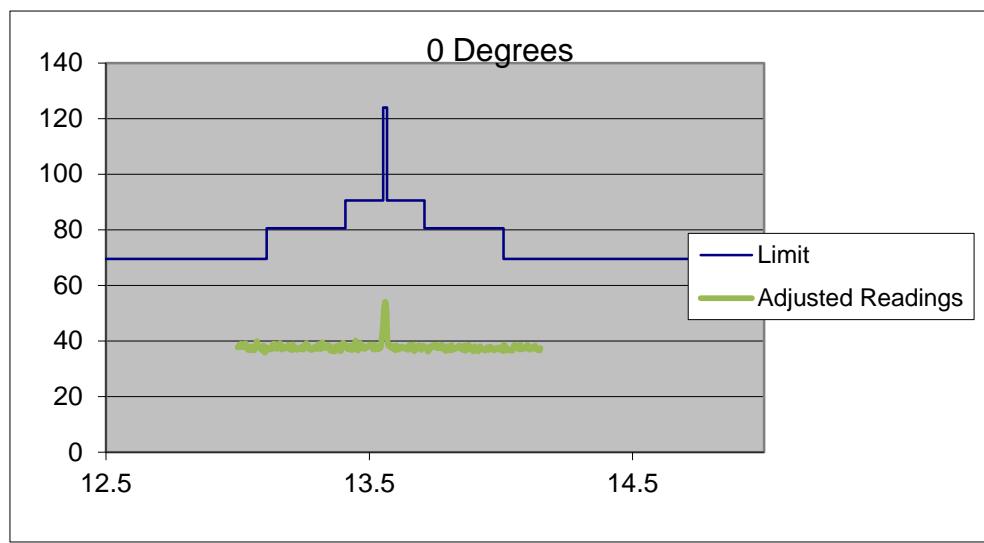
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Cert. No. 1627-01

Plots



EUT vertical, loop antenna at 90 degrees.



EUT horizontal, loop antenna at 90 degrees.

Spectrum Mask Setup Pictures

See exhibit for test setup pictures.

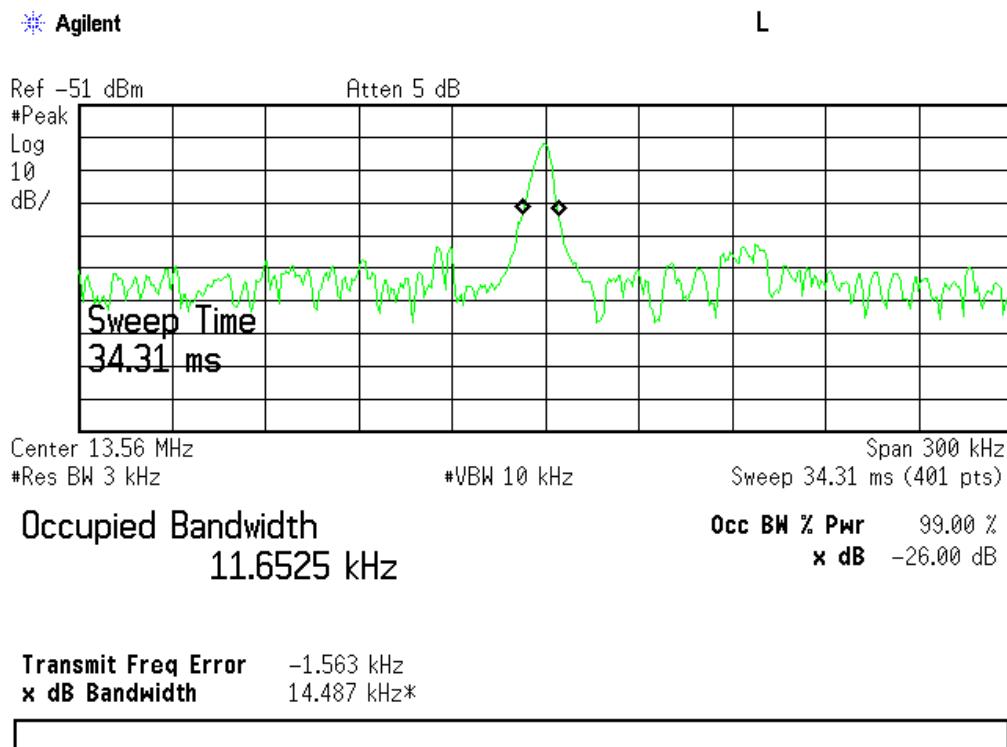


Occupied Bandwidth

Test Method

Per RSS GEN – Issue 3

Plots



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

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.

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