



TEST REPORT

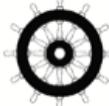
For

Marsco Technologies Inc.

23 Carmichael Court
Halifax, Nova Scotia
B3T 1T1, Canada

Date: June 02, 2015
Report No.: 12731-3E
Revision No.: 0
Project No.: 12731
Equipment: Fire Ranger System
Model No.: FR1.0-SS

ONE STOP GLOBAL CERTIFICATION SOLUTIONS



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Prepared by:	LabTest Certification Inc.	Client:	Marsco Technologies Inc.
Date Issued:	June 02, 2015	Report No.:	12731-3E
Project No:	12731	Revision No.:	0

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TEST REPORT	
FCC15 and RSS-210	
Report reference No.....	12731-3E
Report Revision History:	✓ Rev. 0: June 02, 2015
Tested by (printed name and signature)	Jeremy Lee 
Approved by (printed name and signature)	Kavinder Dhillon, Eng.L 
Date of issue	June 02, 2015
Note: By signing this report, both the Testing Technician and the Reviewer hereby declare to abide by the applicable LabTest policies: 1.) Statement of Independence # 3014 (LabTest Employees), 2.) Independence, Impartiality, and Integrity #1039, clause 11 (Engineering Service Subcontractors), or 3.) Independence, Impartiality, and Integrity #1019, clause 3.5 (Testing Subcontractors).	
Testing Laboratory Name	LabTest Certification Inc.
Address	3133 – 20800 Westminster Hwy, Richmond, B.C. V6V 2W3
FCC Site Registration No.....	373387
IC Site Registration No.	5970A-2
Test Location Name	LabTest Certification Inc.
Address	3133 – 20800 Westminster Hwy, Richmond, B.C. V6V 2W3
Applicant's Name	Marsco Technologies Inc.
Address	23 Carmichael Court, Halifax, N.S. B3T 1T1, Canada
Manufacturer's Name	Same as Applicant
Address	Same as Applicant
Test specification	
Standards	✓ FCC15.231:2010 ✓ RSS-210, Issue 8, December 2010
Testing	
Date of receipt of test item	May 20, 2015
Date(s) of performance of test	May 21 to June 02, 2015
Test item description	
Trademark	N/A
Model and/or type reference	FR1.0-SS
FCC & IC ID.....	FCC ID: 2AE5E-FR10SS IC ID: 20290-FR10SS
Serial numbers	N/A
Electrical Rating(s)	One 9V battery

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Product descriptions	
Application for	: 433MHz Data Transceiver Module
Operating Frequency	: 434.117 MHz
Equipment mobility	: Yes
Modulation	: FSK
Number of Channels	: 1
Transmission Interval	: > 450 seconds
Transmission Period.....	: < 31 msec
Nominal Voltages for	: <input checked="" type="checkbox"/> stand-alone equipment <input type="checkbox"/> combined (or host) equipment <input type="checkbox"/> test jig
Supply Voltage	: _____ AC _____ Amps _____ Hz _____ _____ _____ 9.0V ____ DC _____ Amps
If DC Power	: <input type="checkbox"/> Internal Power Supply <input type="checkbox"/> Host system is supplied the DC power <input checked="" type="checkbox"/> Battery ■ Alkaline
Size of equipment(H X D X W, inches)	: X X
Mass of equipment (g).....	: , without Battery
Operating Temperature Range	: °C to + °C
Test case verdicts	
Test case does not apply to the test object :	: N/A
Test item does meet the requirement	: Pass
Test item does not meet the requirement ..:	: Fail
General remarks	
"This report is not valid as a CB Test Report unless appended by an approved CB Testing Laboratory and appended to a CB Test Certificate.	
The test result presented in this report relate only to the object(s) tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
"(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.	
<input type="checkbox"/> Throughout this report a comma is used as the decimal separator. <input checked="" type="checkbox"/> Throughout this report a period is used as the decimal separator.	
General product information:	
The EUT, FR1.0-KB is a KeyPad in Fire Ranger system, FR1.0 of Marsco. FR1.0 is a 3-part system; FR-1.0-IB (main), FR1.0-KB (keypad) and FR1.0-SS (smoke sensor). System serves to power off an electric range in the event of smoke detection or keypad command via Radio Communication.	

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Frequencies

Module	Description	Frequencies
X1	Crystal	26.0MHz

List of ancillary and/or support equipment provided by the applicant

Model No.	Description	Manufacturer	Approvals/Standards
N/A			

Description of Interface Cables for Testing

Description	Cable Type	Cable length	Ferrite
N/A			

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst-case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

Software and Firmware

Description	Version
N/A	

Worst-case configuration and mode of operation during testing

For the testing, the device was modified to continuously turning on the signal every three seconds.

Modifications Required for Compliance

None

Test Equipment Verified for function

Model #	Description	Checked Function	Results
E7405A	EMC Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_sigal and checked OK.
E4404B	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_sigal and checked OK.
AT8447D	Pre-Amplifier, 30 to 1,000MHz	Gain at 30 and 1,000MHz	Gains were normal.
8449B	Pre-Amplifier, 1 to 26.5GHz	Gain at 1 to 26.5GHz	Gains were normal.
JB1	Anantenna, 30 to 1000MHz	Checked structure	Normal – no damage.
SAS-571	Anantenna, 1 to 18GHz	Checked structure	Normal – no damage

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AL-130	An antenna, 9kHz to 30MHz	Checked structure	Normal – no damage
Onset HOBO	Humidity/ Temperature Logger	Compared room Temp. and Hum. with another data logger	Working normally

Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests:

Parameter	Uncertainty(dB)
Radiated Emission, 20 to 30MHz	4.50
Radiated Emission, 30 to 1,000MHz	4.67
Radiated Emission, 1 to 18GHz	4.65

Uncertainty figures are valid to a confidence level of 95%.

Markings



You should refer to the clause of FCC Part 2 Section 2.295 & 2.296 and FCC Part 15 Section 15.19 for information to be contained on the label as well as information about the label. Any other statements or labelling requirements may appear on a separate label at the option of the applicant/grantee. The label has to be including FCC IC/IC ID, Product Number and Manufacturer Info.

According to FCC Section 2.925(a),

- (a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:
 - (1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be a type size large enough to be legible without the aid of magnification.

Example: FCC ID XXX123. XXX-Grantee Code 123-Equipment Product Code"

According to FCC Section 15.19(a)(3),

This device shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Some jurisdictions in Canada require Cautions and Warnings to also be in French. It is the responsibility of the Customer to provide bilingual marking, where applicable, in accordance with the requirements of the local regulatory authorities. It is the responsibility of the Customer to determine this requirement and have bilingual wording added to the "Markings".

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Test Summary

When configured and operated as specified in this report, the product was found to comply with the requirements as indicated below.

Test Type	Regulation	Measurement Method	Result
AC Power Line Conducted Emission	15.207(a) RSS-Gen	ANSI C63.4:2014 & ANSI C63.10:2009, Clause 6.2	N/A ¹⁾
Summary of the operation of RF Transmission	15.231 and RSS-210	N/A	PASS
Field Strength of Fundamental -Intentional radiator	15.231, 15.205, 15.209 & RSS-210	ANSI C63.4:2014 & ANSI C63.10:2009, Clause 6.5 & 6.6	PASS
Field Strength of Spurious Emissions -Intentional radiator	15.231, 15.205, 15.209 & RSS-210	ANSI C63.4:2014 & ANSI C63.10:2009, Clause 6.5 & 6.6	PASS
Radiated Emissions-Intentional radiators	15.209 and RSS-210	ANSI C63.4:2014 & ANSI C63.10:2009, Clause 6.5	PASS
The Bandwidth of the emission	15.231 and RSS-210	ANSI C63.10:2009, Clause 6.9	PASS

Note1): The EUT is operated by internal battery. This test was exempted by no connection to AC Power Line.

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AC Power Line Conducted Emission

Test Date	May 29, 2015
Sample Number	3564 and 3565
Tested By	Jeremy Lee

Test Limits

FCC 15.207(a):

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
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.

Test Results

The test was exempted because there is no public utility (AC) power line connection.

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Summary of the operation of RF Transmission

Regulation	FCC15.231:2010
Intentional Radiating Frequency	434.117MHz
Sample Number	3564 and 3565
Reviewed By	Jeremy LEE

Test Limits

Section 15.231 Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.

(a) The provisions of this section are restricted to periodic operation within the band 40.66–40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Reviewed Results:

X Pass Fail N/A

Rule Part No.	Description of Rule	Yes	No	N/A
Pt 15.231(a)	Continuous transmission		X	
Pt 15.231(a)	Control Signals		X	
Pt 15.231(a)	Data transmission with control signal	X		
Pt 15.231(a)(1)	Manually operated		X	
	Automatically deactivate within 5 seconds of being released			X
Pt 15.231(a)(2)	Automatically operated	X		
	Deactivate within 5 seconds after activation	X		

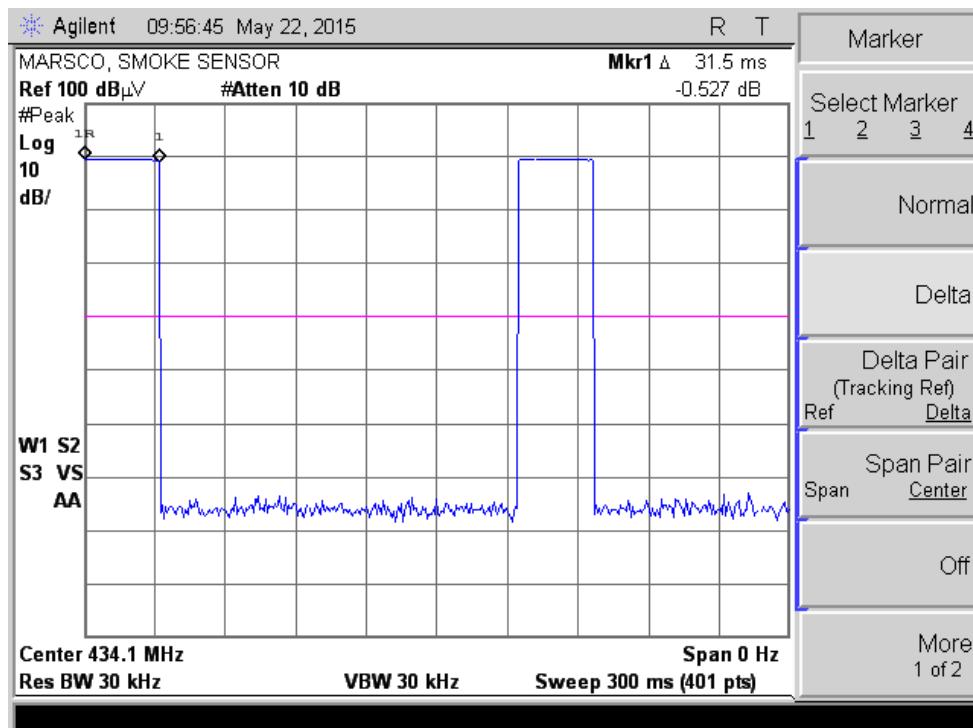
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Pt 15.231(a)(3)	Periodic transmission at regular predetermined intervals		X	
	Polling or supervision transmission, including data, to determine system integrity or transmitters used in security or safety applications requires no total duration of transmission not exceeding 2s/hr.		X	
Pt 15.231(a)(4)	Operation involving fire, security, or safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.		X	

- Measured result of the Turned-on time of Radio.

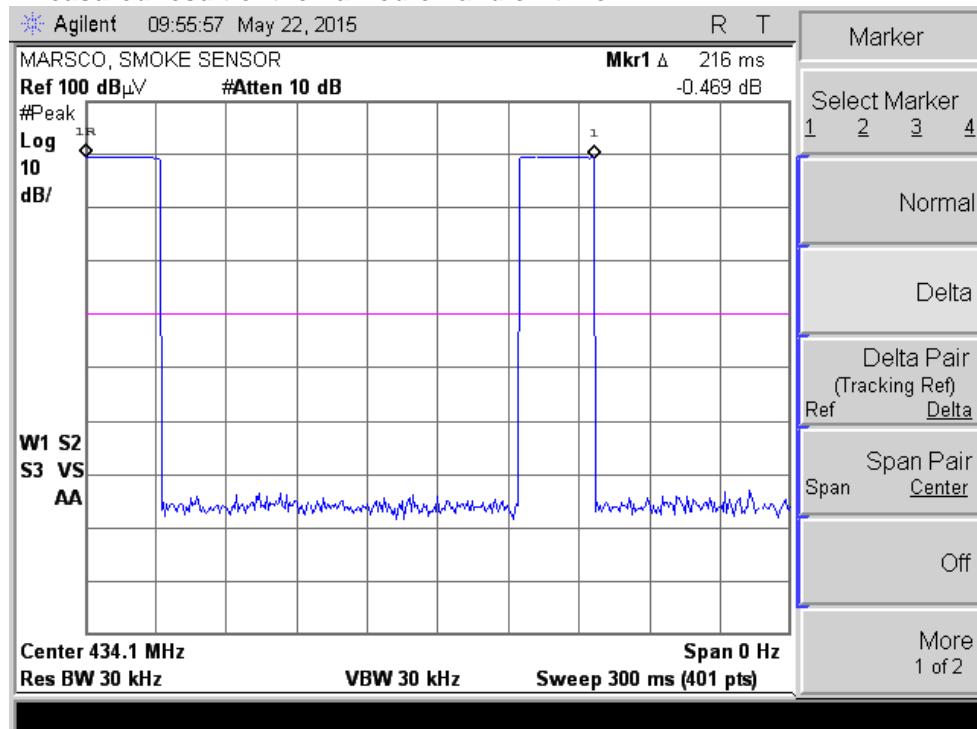


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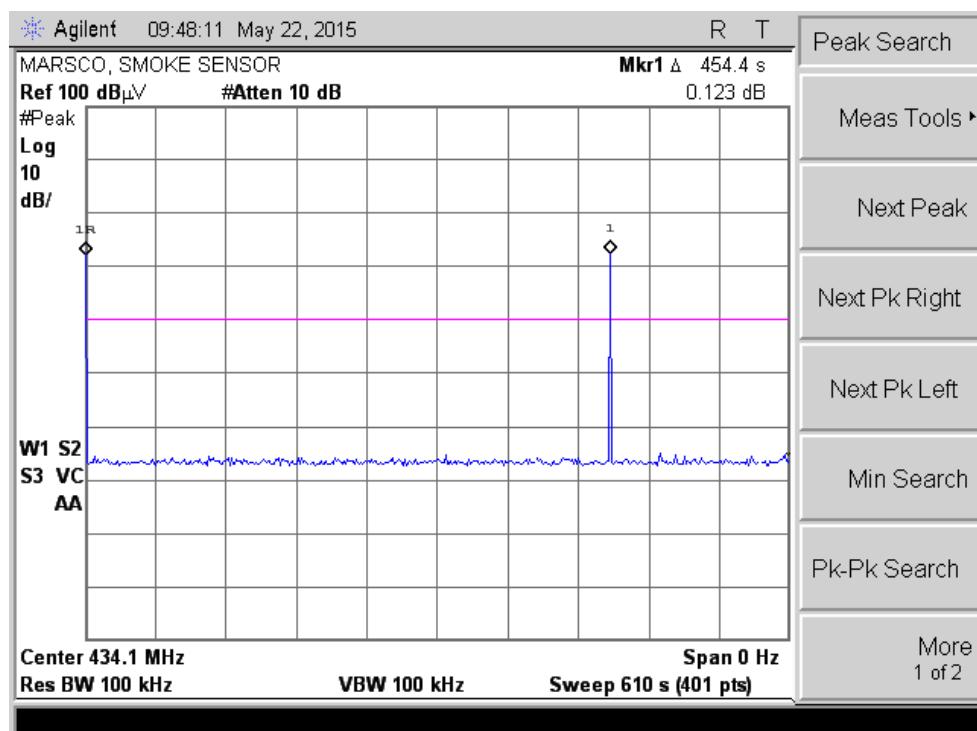
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- Measured result of the Turned-on and off time



- Measured result of the Term of Turned-on



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Field Strength of Fundamental – Intentional Radiator

Regulation	FCC15.231:2010
Intentional Radiating Frequency	434.117MHz
Detecting Method	Quasi Peak Detector
IF Bandwidth	120kHz
Temperature	24.2 °C
Relative Humidity	49.0 %
Barometric Pressure:	101.4 kPa
Test Date	May 22, 2015
Sample Number	3564
Calibrated Test Equipment (ID)	266, 272, 371, 406
Reference Equipment (ID) (Calibration not required)	374, 516
Electrical Rating	Internal battery
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/cabc0248>

Test Limits

FCC 15.231:

(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66– 40.70.	2,250	225
70–130	1,250	125
130–174	11,250 to 3,750	1125 to 375
174–260	3,750	375
260–470	13,750 to 12,500	1375 to 1,250
Above 470	12,500	1,250

¹ Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in § 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of § 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

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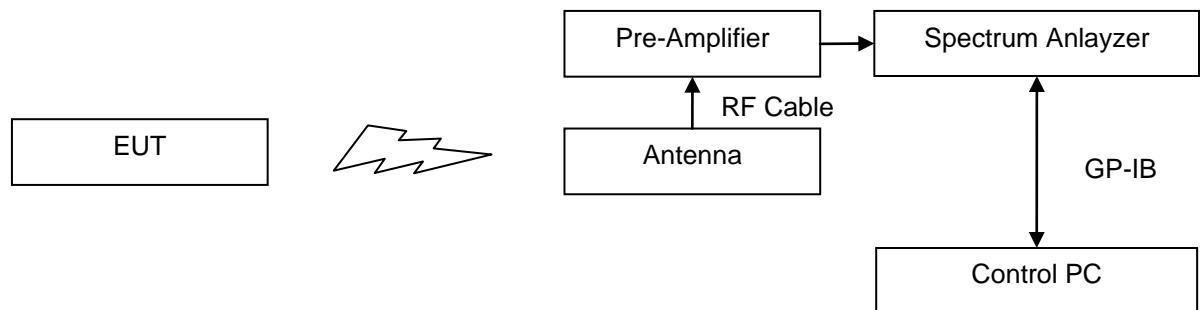
Test Setup

The test was performed in accordance with **FCC 15.31, 15.33, 15.35 and ANSI C63.10, 2009.**

The test setup for Field Strength of Fundamental was shown in Figure - 1.

- a) The EUT was placed on a wooden table and the table was put on the turning ground plate.
- b) The EUT was set up on 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter.
- c) The EUT was continually on its RF Transmitter. It was modified to transmit in 3000ms intervals for this testing.
- d) It was measured with a receiver - Spectrum analyzer, was software controlled.

Setup Block Diagram



Test Setup in Chamber

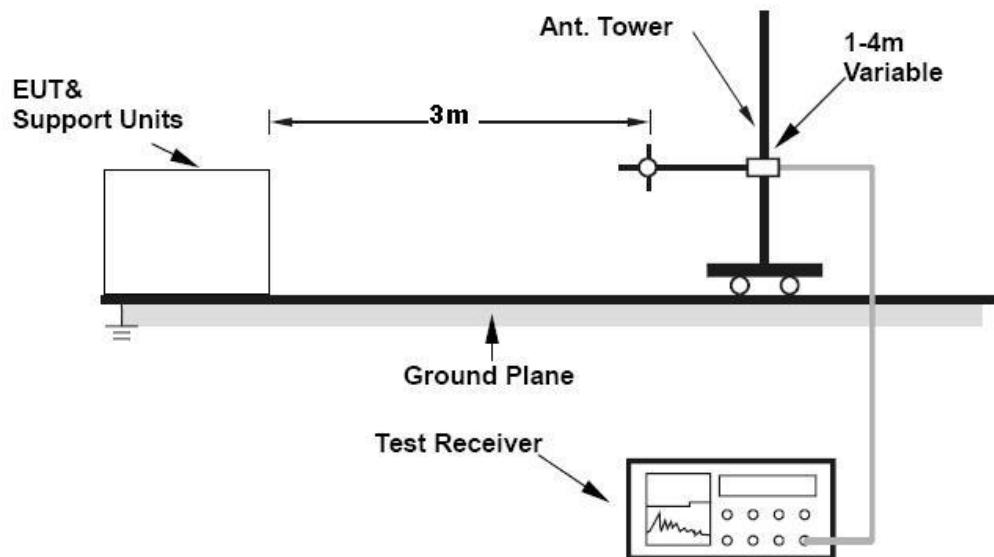


Figure – 1 Test setup for Radiated emissions in Chamber

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Test Results:

Measured level (dBuV/m) = Quasi-Peak detected level (dBuV) + Cable Loss(dB)
 + Antenna Factor (dB/m) - Pre-amplifier's Gain (dB)

X Pass Fail N/A

Fundamental Frequency (MHz)	Limit (dBuV/m)	Measured (dBuV/m)	Margin (dB)	Pol.	Results
434.117	80.79	79.71	1.08	H	PASS

- Table of Field Strength of Fundamental; Quasi Peak Detecting, Antenna was used a JB1.

LabTest Certification Inc.
 Intentional Radiated Emissions
 FCC15.231, 205 & 209, 3 meters, Horizontal

Operator: Jeremy Lee

04:38:30 PM, Friday, May 22, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency MHz	Measured dBuV	AntFactor dB/m	PathLoss dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T Degree	Tower cm	POL
434.117 MHz	87.62	17.00	-24.91	79.71	80.79	1.08	110.0	100.1	H
868.234 MHz	34.05	22.46	-22.60	33.92	60.79	26.87	0.0	108.7	H

Project # : 12731, Sample # : 3564
 Temp. : 24.2 C, Hum. : 49.0 %
 Barometer Pres. : 101.4 kPa

LabTest Certification Inc.
 Intentional Radiated Emissions
 FCC15.231, 205 & 209, 3 meters, Vertical

Operator: Jeremy Lee

04:38:30 PM, Friday, May 22, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency MHz	Measured dBuV	AntFactor dB/m	PathLoss dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T Degree	Tower cm	POL
434.117 MHz	78.85	16.68	-24.91	70.63	80.79	10.16	33.0	100.9	V
868.234 MHz	30.88	21.96	-22.60	30.25	60.79	30.54	40.0	139.9	V

Project # : 12731, Sample # : 3564
 Temp. : 24.2 C, Hum. : 49.0 %
 Barometer Pres. : 101.4 kPa

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Field Strength of Spurious Emissions

Regulation	FCC15.231: 2010
Intentional Radiating Frequency	434.117MHz
Detecting Method	Average and Quasi-Peak Detector
IF Bandwidth	1MHz and 120kHz
Temperature	23.5 TO 24.2 °C
Relative Humidity	49.0 to %
Barometric Pressure:	101.4 to 101.7 kPa
Test Date	May 22 and 25, 2015
Sample Number	3564
Calibrated Test Equipment (ID)	227-3, 266, 272, 273, 371, 406
Reference Equipment (ID) (Calibration not required)	374, 516
Electrical Rating	Internal battery
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/cabc0248>

Test Limits

FCC 15.231:

(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66– 40.70.	2,250	225
70–130	1,250	125
130–174	¹ 1,250 to 3,750	¹ 125 to 375
174–260	3,750	375
260–470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹ Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in § 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of § 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the

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fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.

FCC 15.205:

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

- 1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
- 2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

Test Setup

The test was performed in accordance with **FCC 15.31, 15.33, 15.35, 15.205, 15.209:2010 and ANSI C63.10: 2009.**

The test setup for Field Strength of Spurious is shown in Figure - 1.

- a) The EUT was placed on a wooden table and the table was put on the turning ground plate.
- b) The EUT was set up on 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter.
- c) The EUT was continually on its RF Transmitter. It was modified to transmit in 3000ms intervals for this testing.
- d) It was measured with a receiver - Spectrum analyzer, was software controlled.

Test Results:

$$\text{Emission level (dBuV/m)} = \text{Average detected level (dBuV)} + \text{Cable Loss(dB)} \\ + \text{Antenna Factor (dB/m)} - \text{Pre-amplifier's Gain (dB)}$$

X Pass Fail N/A

Harmonic Frequency (MHz)	Detector	Limit (dBuV/m)	Measured (dBuV/m)	Margin (dB)	Pol.	Results
868.234	Quasi-Peak	60.79	33.92	26.87	H	PASS
	Peak	73.98	51.25	22.73	H	PASS
	Averaging	53.98	36.35	17.63	H	PASS
1302.351	Peak	80.79	42.12	38.67	H	PASS
	Averaging	60.79	28.58	32.21	H	PASS
1736.468	Peak	80.79	54.03	26.76	H	PASS
	Averaging	60.79	38.84	21.95	H	PASS
2170.585	Peak	80.79	45.98	34.81	H	PASS
2604.702	Peak	80.79				

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	Averaging	60.79	33.17	27.62	H	PASS
3038.819	Peak	80.79	56.21	24.58	H	PASS
	Averaging	60.79	41.91	18.88	H	PASS
3472.936	Peak	80.79	47.23	33.56	H	PASS
	Averaging	60.79	34.71	26.08	H	PASS
3907.053	Peak	73.98	52.24	21.74	V	PASS
	Averaging	53.98	39.02	14.96	V	PASS
4341.17	Peak	73.98	50.68	23.30	H	PASS
	Averaging	53.98	37.28	16.70	H	PASS

- Field Strength of Spurious Emission; 2nd harmonic, Quasi-peak Detecting, Antenna was used JB1.

LabTest Certification Inc.
 Intentional Radiated Emissions
 FCC15.231, 205 & 209, 3 meters, Horizontal

Operator: Jeremy Lee

04:38:30 PM, Friday, May 22, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency	Measured	AntFactor	PathLoss	Emission	Limit	Margin	T/T	Tower	POL
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
434.117 MHz	87.62	17.00	-24.91	79.71	80.79	1.08	110.0	100.1	H
868.234 MHz	34.05	22.46	-22.60	33.92	60.79	26.87	0.0	108.7	H
Project # : 12731, Sample # : 3564									
Temp. : 24.2 C, Hum. : 49.0 %									
Barometer Pres.:101.4 kPa									

LabTest Certification Inc.
 Intentional Radiated Emissions
 FCC15.231, 205 & 209, 3 meters, Vertical

Operator: Jeremy Lee

04:38:30 PM, Friday, May 22, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency	Measured	AntFactor	PathLoss	Emission	Limit	Margin	T/T	Tower	POL
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
434.117 MHz	78.85	16.68	-24.91	70.63	80.79	10.16	33.0	100.9	V
868.234 MHz	30.88	21.96	-22.60	30.25	60.79	30.54	40.0	139.9	V
Project # : 12731, Sample # : 3564									
Temp. : 24.2 C, Hum. : 49.0 %									
Barometer Pres.:101.4 kPa									

Prepared by: LabTest Certification Inc.
 Date Issued: June 02, 2015
 Project No: 12731

Client:
 Report No.:
 Revision No.:

Marsco Technologies Inc.
 12731-3E
 0

- Field Strength of Spurious Emissions; 3rd to 10th harmonics, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
 Intentional Radiated Emissions-Harmonics
 FCC15.231, 205 & 209, 3 meters, Peak Detector_Horizontal

Operator: Jeremy Lee

03:28:58 PM, Monday, May 25, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency Hz	Measured_PK dBuV	AntFactor dB/m	PathLoss dB	Emission_PK dBuV/m	Limit_PK dBuV/m	Margin_PK dB	T/T Degree	Tower cm	POL
1.3023510 GHz	55.64	24.51	-28.91	51.25	73.98	22.73	299.5	128.1	H
1.7364680 GHz	43.99	25.68	-27.55	42.12	80.79	38.67	300.3	100.0	H
2.1705850 GHz	52.55	27.64	-26.16	54.03	80.79	26.76	180.3	101.1	H
2.6047020 GHz	42.20	29.54	-25.76	45.98	80.79	34.81	29.5	148.5	H
3.0388190 GHz	50.55	30.51	-24.85	56.21	80.79	24.58	144.8	105.1	H
3.4729360 GHz	41.23	30.32	-24.32	47.23	80.79	33.56	30.0	100.0	H
3.9070530 GHz	43.51	31.60	-23.59	51.52	73.98	22.46	269.5	101.2	H
4.3411700 GHz	40.71	31.48	-21.50	50.68	73.98	23.30	277.8	101.2	H

Project # : 12731, Sample #: 3564
 Temp.: 23.5 C, Hum.: 49.0 %
 Barometer Pres.: 101.7 kPa

LabTest Certification Inc.
 Intentional Radiated Emissions-Harmonics
 FCC15.231, 205 & 209, 3 meters, Peak Detector_Vertical

Operator: Jeremy Lee

04:34:14 PM, Monday, May 25, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency Hz	Measured_PK dBuV	AntFactor dB/m	PathLoss dB	Emission_PK dBuV/m	Limit_PK dBuV/m	Margin_PK dB	T/T Degree	Tower cm	POL
1.3023510 GHz	54.62	24.54	-28.91	50.26	73.98	23.72	25.8	104.6	V
1.7364680 GHz	42.54	25.74	-27.55	40.73	80.79	40.06	184.8	102.9	V
2.1705850 GHz	48.67	27.72	-26.16	50.23	80.79	30.56	281.0	100.1	V
2.6047020 GHz	40.41	29.58	-25.76	44.23	80.79	36.56	280.5	100.1	V
3.0388190 GHz	48.84	30.67	-24.85	54.65	80.79	26.14	142.8	100.5	V
3.4729360 GHz	40.88	30.41	-24.32	46.98	80.79	33.81	358.8	100.5	V
3.9070530 GHz	44.20	31.64	-23.59	52.24	73.98	21.74	254.5	100.7	V
4.3411700 GHz	39.92	31.53	-21.50	49.94	73.98	24.04	180.0	100.7	V

Project # : 12731, Sample #: 3564
 Temp.: 23.5 C, Hum.: 49.0 %
 Barometer Pres.: 101.7 kPa

Prepared by: LabTest Certification Inc.
 Date Issued: June 02, 2015
 Project No.: 12731

Client:
 Report No.:
 Revision No.:

Marsco Technologies Inc.
 12731-3E
 0

- Field Strength of Spurious Emissions; 3rd to 10th harmonics, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
 Intentional Radiated Emissions-Harmonics
 FCC15.231, 205 & 209, 3 meters, Averaging Detector_Horizontal

Operator: Jeremy Lee

03:28:58 PM, Monday, May 25, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency Hz	Measured_AVG dBuV	AntFactor dB/m	PathLoss dB	Emission_AVG dBuV/m	Limit_AVG dBuV/m	Margin_AVG dB	T/T Degree	Tower cm	POL
1.30235100 GHz	40.74	24.51	-28.91	36.35	53.98	17.63	299.5	128.1	H
1.73646800 GHz	30.45	25.68	-27.55	28.58	60.79	32.21	300.3	100.0	H
2.17058500 GHz	37.36	27.64	-26.16	38.84	60.79	21.95	180.3	101.1	H
2.60470200 GHz	29.39	29.54	-25.76	33.17	60.79	27.62	29.5	148.5	H
3.03881900 GHz	36.25	30.51	-24.85	41.91	60.79	18.88	144.8	105.1	H
3.47293600 GHz	28.71	30.32	-24.32	34.71	60.79	26.08	30.0	100.0	H
3.90705300 GHz	29.34	31.60	-23.59	37.35	53.98	16.63	269.5	101.2	H
4.34117000 GHz	27.31	31.48	-21.50	37.28	53.98	16.70	277.8	101.2	H

Project # : 12731, Sample # : 3564
 Temp. : 23.5 C, Hum. : 49.0 %
 Barometer Pres. : 101.7 kPa

LabTest Certification Inc.
 Intentional Radiated Emissions-Harmonics
 FCC15.231, 205 & 209, 3 meters, Averaging Detector_Vertical

Operator: Jeremy Lee

04:34:14 PM, Monday, May 25, 2015

Model #: FR1.0-SS
 Contact: Marvin Butt
 Company: Marsco Tech.

Frequency Hz	Measured+AVG dBuV	AntFactor dB/m	PathLoss dB	Emission_AVG dBuV/m	Limit_AVG dBuV/m	Margin_AVG dB	T/T Degree	Tower cm	POL
1.30235100 GHz	40.05	24.54	-28.91	35.69	53.98	18.29	25.8	104.6	V
1.73646800 GHz	30.17	25.74	-27.55	28.36	60.79	32.43	184.8	102.9	V
2.17058500 GHz	34.59	27.72	-26.16	36.15	60.79	24.64	281.0	100.1	V
2.60470200 GHz	28.03	29.58	-25.76	31.85	60.79	28.94	280.5	100.1	V
3.03881900 GHz	35.13	30.67	-24.85	40.94	60.79	19.85	142.8	100.5	V
3.47293600 GHz	28.33	30.41	-24.32	34.43	60.79	26.36	358.8	100.5	V
3.90705300 GHz	30.98	31.64	-23.59	39.02	53.98	14.96	254.5	100.7	V
4.34117000 GHz	27.00	31.53	-21.50	37.02	53.98	16.96	180.0	100.7	V

Project # : 12731, Sample # : 3564
 Temp. : 23.5 C, Hum. : 49.0 %
 Barometer Pres. : 101.7 kPa

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No.: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
0

Radiated Emission; Intentional Radiators

Regulation	FCC15.209:2010
Intentional Radiating Frequency	434.117MHz
Detecting Method	Quasi Peak Detector
IF Bandwidth	9kHz(under 30MHz) and 120kHz(30 to 1,000MHz)
Temperature	22.6 to 25.2 °C
Relative Humidity	49.0 to 51.0 %
Barometric Pressure:	101.0 to 101.3 kPa
Test Date	May 21 and June 02, 2015
Sample Number	3565
Calibrated Test Equipment (ID)	241, 266, 272, 371, 406
Reference Equipment (ID) (Calibration not required)	374, 516
Electrical Rating	Internal battery
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/cabc0248>

Test Limits

FCC 15.209:

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Prepared by: LabTest Certification Inc. Client: Marsco Technologies Inc.
Date Issued: June 02, 2015 Report No.: 12731-3E
Project No: 12731 Revision No.: 0

Test Setup

The test was performed in accordance with **FCC 15.31, 15.33, 15.35, 15.205, 15.209:2010 and ANSI C63.10: 2009.**

The test setup for Radiated Emissions is shown in Figure - 1.

- a) The EUT was placed on a wooden table and the table was put on the turning ground plate.
- b) The EUT was set up on 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter.
- c) It was measured with a receiver - Spectrum analyzer, was software controlled.

Test Results:

Emission level (dB_{UV}/m) = Quasi-Peak detected level (dB_{UV}) + Cable Loss (dB) + Antenna Factor (dB/m)

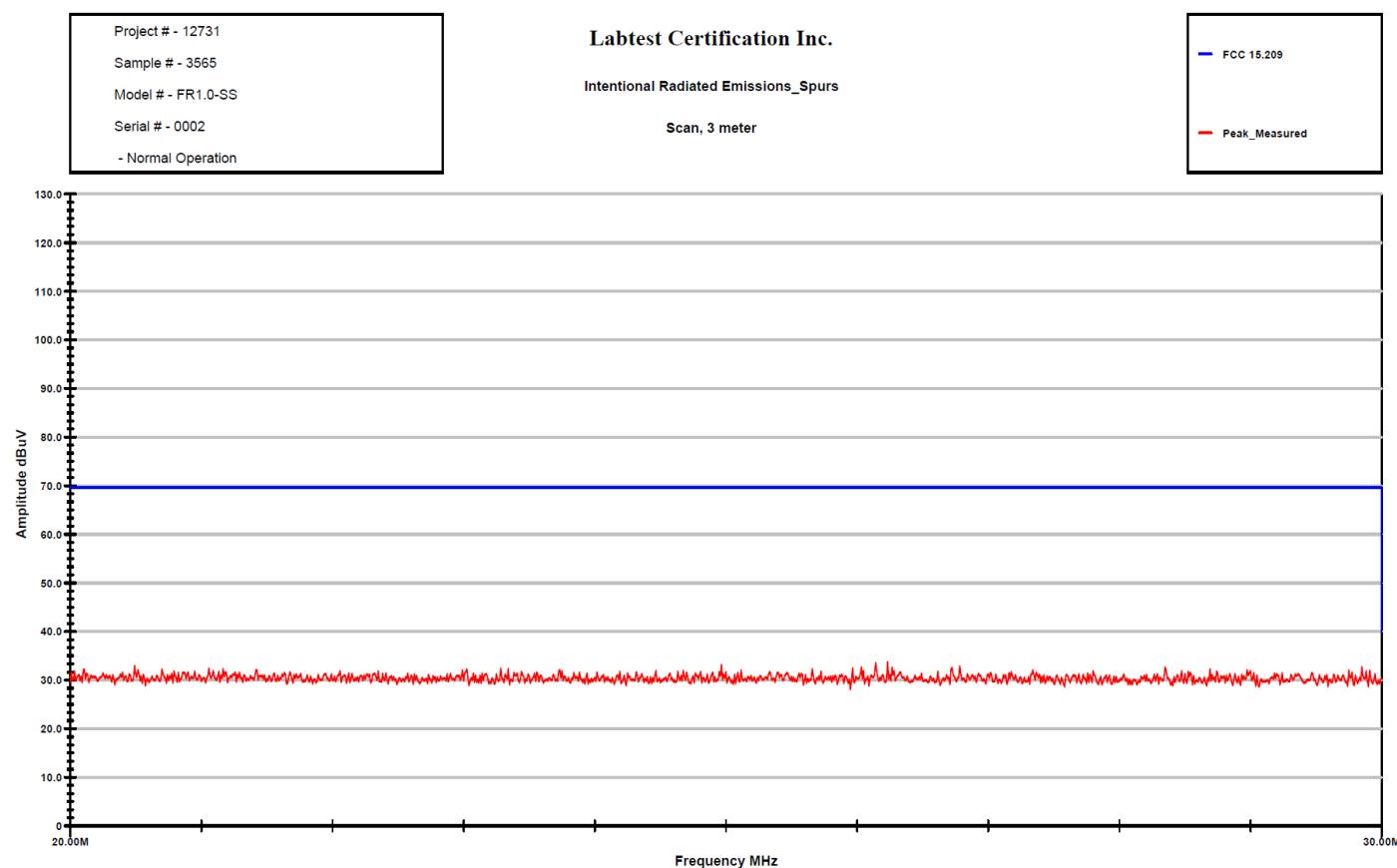
X Pass Fail N/A

There was no Quasi-peak measured data cause of all emissions were 10dB below of limit level with peak detector.

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client: Marsco Technologies Inc.
Report No.: 12731-3E
Revision No.: 0

- Graph of Radiated Emissions: 20 to 30MHz, Peak detecting, Antenna was used AL-130.



Operator: Jeremy Lee

T: 22.6 C, H: 49.0 %, BP.:101.3 kPa

RE_under 30MHz.TIL

Contact: Marvin Butt

09:16:46 AM, Tuesday, June 02, 2015

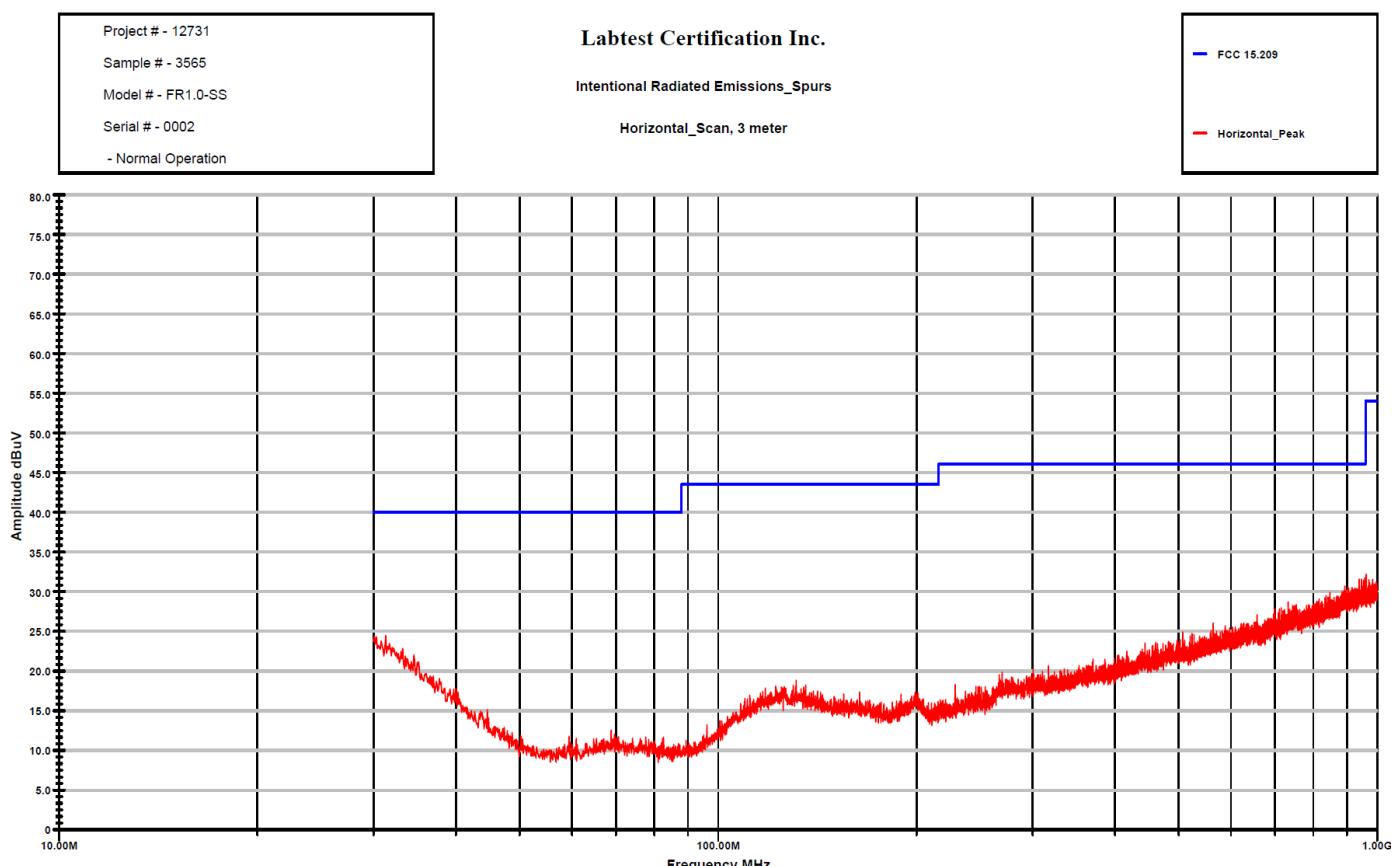
Company: Marsco Tech.

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
0

- Graph of Radiated Emissions: 30 to 1,000MHz, Peak detecting, Antenna was used JB1, Horizontal.



Operator: Jeremy Lee

T: 25.2 C, H: 51.0 %, BP: 101.0 kPa

RE_30 to 1000MHz.TIL

Contact: Marvin Butt

02:33:52 PM, Thursday, May 21, 2015

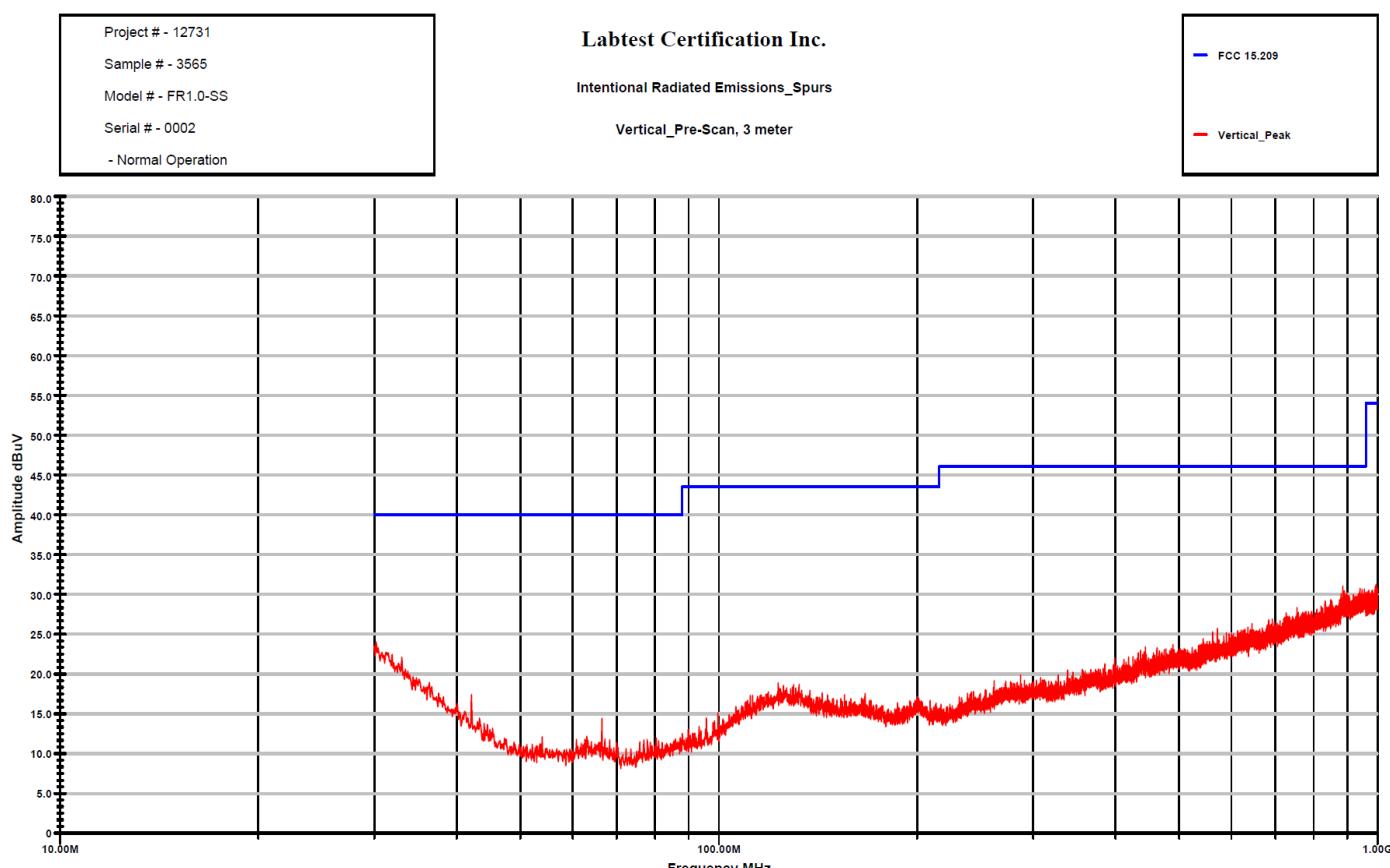
Company: Marsco Tech.

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
0

- Graph of Radiated Emissions: 30 to 1,000MHz, Peak detecting, Antenna was used JB1, Vertical.



Operator: Jeremy Lee

T: 25.2 C, H: 51.0 %, BP.:101.0 kPa

RE_30 to 1000MHz.TIL

Contact: Marvin Butt

01:58:11 PM, Thursday, May 21, 2015

Company: Marsco Tech.

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
0

The Bandwidth of the emission

Regulation	FCC15.231: 2010
Temperature	24.7 °C
Relative Humidity	43.0 %
Barometric Pressure:	102.1 kPa
Test Date	May 22, 2015
Sample Number	3564
Calibrated Test Equipment (ID)	266, 371, 406
Reference Equipment (ID) (Calibration not required)	374, 516
Electrical Rating	Internal battery
Tested By	Jeremy LEE

Use the barometric pressure reported at: <http://www.theweathernetwork.com/weather/cabc0248>

Test Limits

FCC 15.231:

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

Test Setup

The test was performed in accordance with **ANSI C63.10: 2009**.

The setup for Bandwidth of the emission measurements is shown in Figure - 1.

- The EUT was placed on a wooden table and the table was put on the turning ground plate.
- The EUT was set up on 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter.
- The EUT was continually on its RF Transmitter. It was modified to transmit in 3000ms intervals for this testing.
- It was measured with a receiver - Spectrum analyzer, was software controlled.

Test Results:

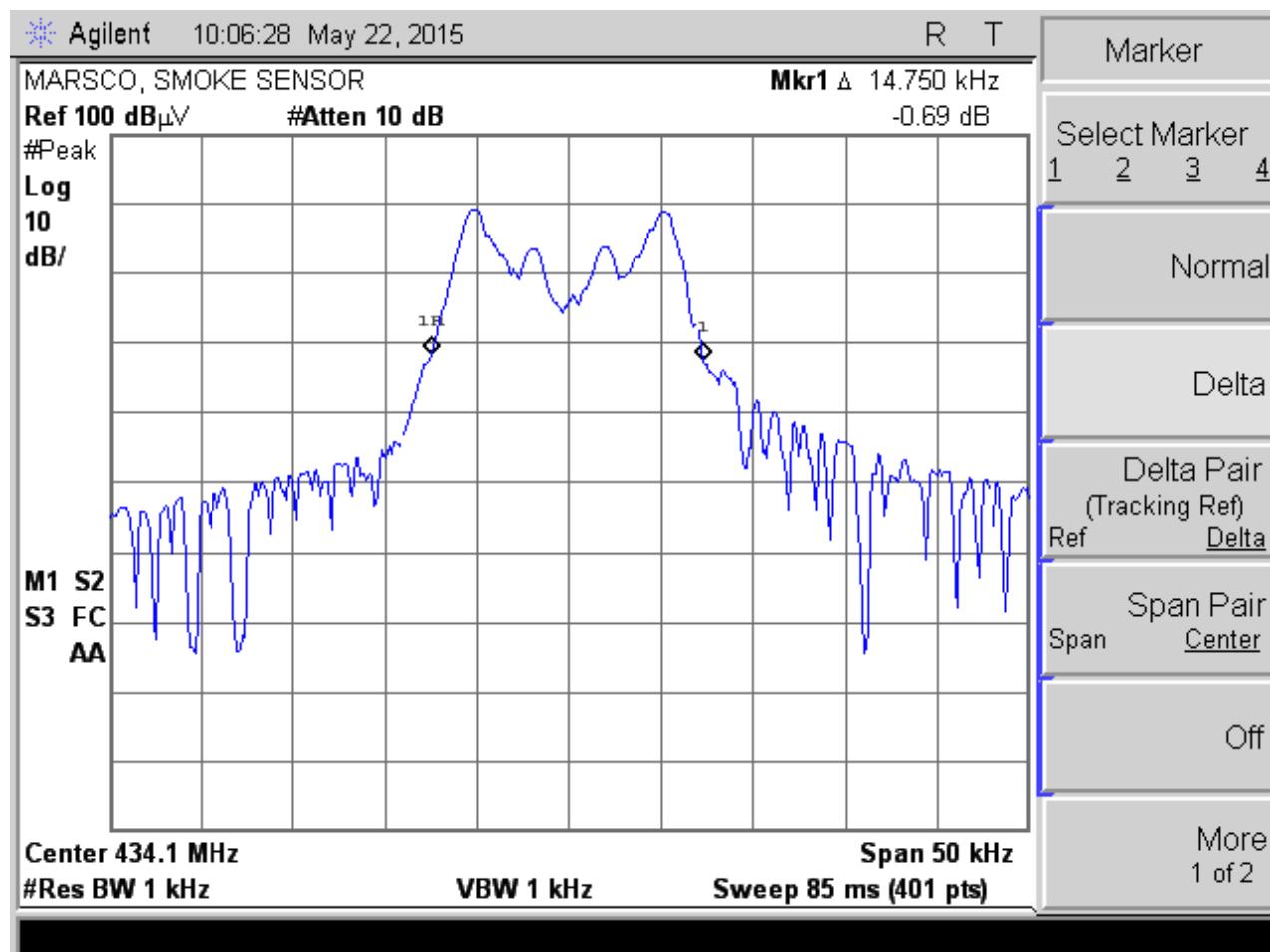
X	Pass	Fail	N/A
Center Frequency (MHz)	Limit(<0.25%, kHz)	Measured(kHz)	Results
434.117	< 1085.292	14.750	PASS

Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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- Measured result of the Bandwidth of the emission(20dBc method)



Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
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APPENDIX A: Test Equipment Used

ID No.	Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due Date	Calibration Certificate No:	Calibration Laboratory
227-3	Horn Antenna	A.H. Systems	SAS-571	936	31-Jul-2014	31-Jul-2016	1407300211	Liberty Labs
241	Active Loop Antenna	AL-130	Com-Power	17075	09-Oct-2013	09-Oct-2015	1310070101	Liberty Labs
266	Humidity/Temperature Logger	Onset HOBO	U14-001	2436907	23-Jan-2014	23-Jan-2016	890824060	Techmaster
272	EMC Analyzer	Agilent	E7405A	US41110263	13-May-2014	13-May-2016	1-5983694499-1	Agilent
273	RF Preamplifier	Agilent	8449B	3008A02264	07-Oct-2014	07-Oct-2015	35231	Tradeport
371	EMC Broadband Antenna	Sunol	JB1	A022012	17-Mar-2014	17-Mar-2016	1403130381	Liberty Labs
374	EMC Shielded Enclosure	USC	USC-26	111811	N/A	N/A	N/A	N/A
406	Spectrum Analyzer	Agilent	E4404B	MY45115702	15-Sep-2014	15-Sep-2015	35030	Tradeport
516	Pre-Amplifier	Agilent	AT8447D	2944A10969	N/A	N/A	N/A	N/A

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Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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APPENDIX B: EUT photos

- EUT: Top View



- EUT: Bottom View



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Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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APPENDIX C: Test setup photos

- Test configuration for Field Strength measurement

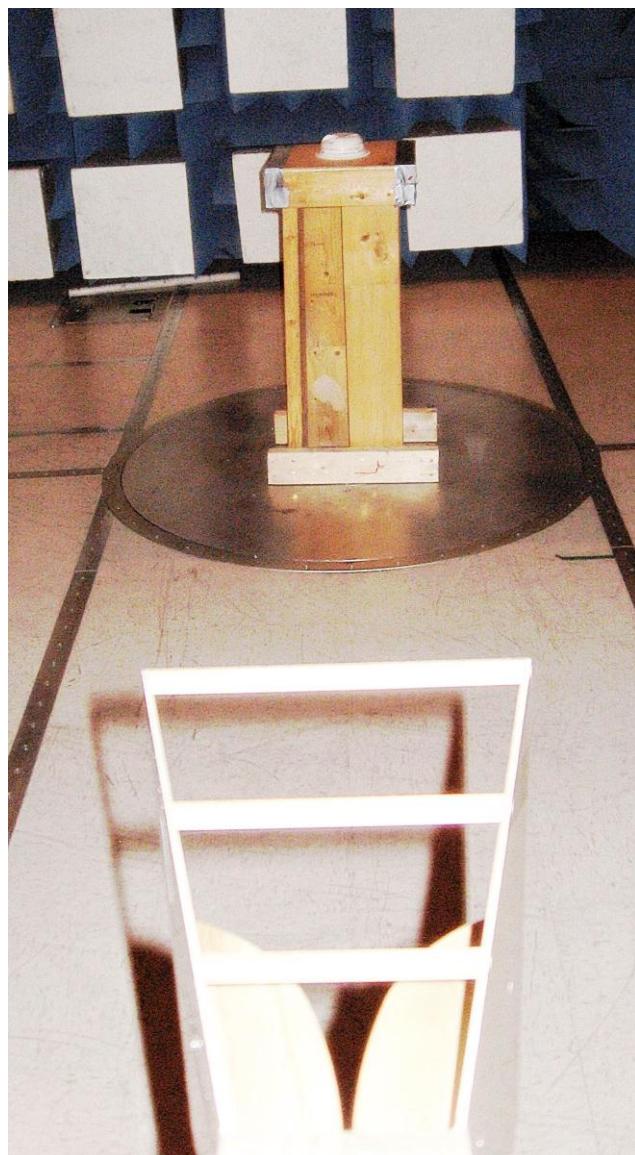


Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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- Test configuration for Harmonic measurement, over 1GHz

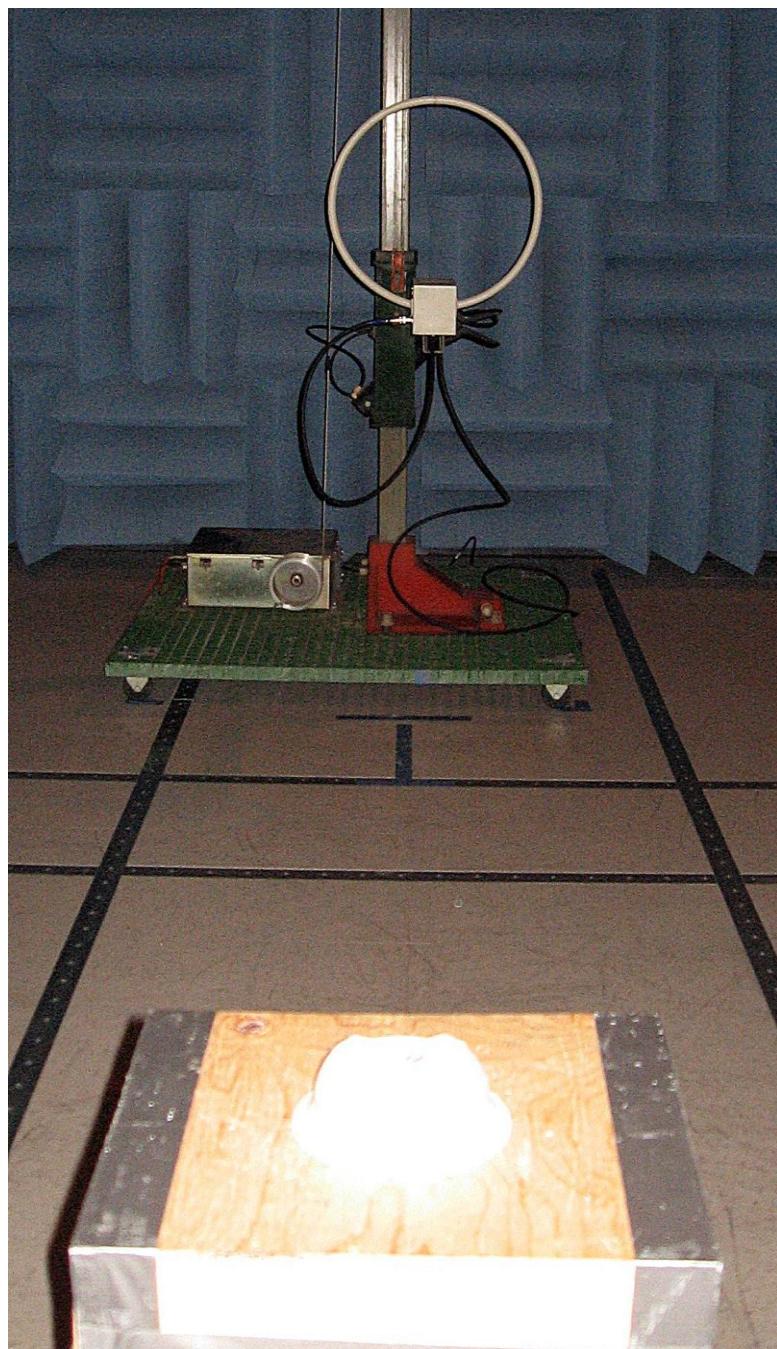


Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
Report No.:
Revision No.:

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12731-3E
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- Test configuration for Unintentional measurement below 30MHz



Prepared by: LabTest Certification Inc.
Date Issued: June 02, 2015
Project No: 12731

Client:
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Marsco Technologies Inc.
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APPENDIX D: ISO 17025:2005 Accreditation Certificate



Prepared by:
Date Issued:
Project No:

LabTest Certification Inc.
June 02, 2015
12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367
(Revised March 21, 2013)

3133-20800 Westminster Hwy.
Richmond, British Columbia V6V 2W3
Canada

Kavinder Dhillon
QMS Manager
(604) 247-0444

FIELDS OF TESTING	ACCREDITED TEST METHODS
Gas and Plumbing	ANSI Standards Z21.1, Z21.8, Z21.10.1, Z21.13/CSA 4.9, Z21.15, Z21.17/CSA 2.7, Z21.19/1.6, Z21.20/C22.2 NO. 199, Z21.42, Z21.50, Z21.57, Z21.58, Z21.63/CSA 11.3, Z21.72/CSA 11.2, Z21.76, Z21.86/CSA 2.32, Z21.91, Z21.97 and Z21.89/CGA1.18, Z83.7/CSA 2.14, Z83.11/CSA 1.8, Z83.26/CSA 2.37; CAN1-1.1, CAN1-2.15, CAN1-2.21, CSA Standards B45 Series, B125, B140.0, B140.1, B140.2.1, B140.2.2, B140.3, B140.4, B140.7-05, B140.8, B140.9.3, B140.9.4-10, B140.12-03, B212-00, B366.1-11, B415.1-10; CGA 1.3, CGA 1.16, CGA 2.17, CSA/CGA-3.4; AS 4551/Ag101, AS 4553/AG 103, AS 4563 and AS 2658; EN Standards 30-1-1, 30-1-2, 30-1-3, 30-1-4, 30-2-1 and 30-2-2, ASME A112 Series; UL Standards 296, 372, and 795
Electrical, EMC and Electro-mechanical	AS 4268.1, 4268.2; AS/NZS 1044, 1053, 2064, 3548, 3652, 4051, 4251.1, 4251.2, 62040.2; 60335.1; AS/NZS 60598.1, AS/NZS 60950.1, AS/NZS 60745.1, AS/NZS 60730.1, CISPR 11 / EN55011; CISPR 14 / EN55014, CISPR 15 / EN55015, CISPR 22 / EN55022, CISPR 24 / EN55024, EN 12895, 301 489, 300 386, 50083-2, 50090-2-2, 50091-2, 50121-1, 50121-2,



ACCREDITED

May 5, 2011
Commencement Date

Print Date: 04/25/2013
This accreditation certificate supersedes any IAS accreditation certificate bearing an earlier date. The certificate becomes invalid upon suspension, cancellation or revocation of accreditation.
See the IAS Accreditation Listings on the web at www.iasonline.org for current accreditation information, or contact IAS directly at (562) 364-8201.

Page 2 of 5
C.P. Raman, P.E.
President

11-04680

Prepared by:
Date Issued:
Project No:

LabTest Certification Inc.
June 02, 2015
12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
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International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367

(Revised March 21, 2013)

ACCREDITED TEST METHODS	
FIELDS OF TESTING	
Electrical, EMC and Electro-mechanical (continued)	139, 141, 147, 148, 149, 150, 156, 157, 158, 164, 165, 166, 167, 168, 169, 173, 177, 183, 1, 183, 2, 184, 187, 191, 195, 205, 207, 213, 217, 218, 1, 218, 2, 223, 224, 225, 231, 234, 236, 243, 247, 250, 60065, 60947-1; 60947-4-1; 60950-22, 60950-23, 62368-1, E60335-1, -2, E60730-1, -2, E60745-1, -2, E61010-1, -2, E742, Z240 RV Series 08; IEC/EN Standards 60335-1, -2, 60730-1, -2, 60745-1, -2, 61010-1, -2, 60065, 60079-0, -6, -11, -15 and 60950-1, -2; IEC/EN 60529; 60945, 60598-1, -2, 61347-1; UL Standards 48, 50, 73, 197, 499, 507, 508, 508A, 676, 745-1, 751, 763, 778, 858, 867, 875, 924, 935, 982, 987, 998, 1004, 1012, 1026, 1261, 1310, 1431, 1472, 5085-2, 1; 5085-3; 1563, 1564, 1585, 1598, 1647, 1795, 1993, 1995, UL/CSA 5085-16500, 8750, 2388; 60335-1, 60335-2, 60601-1, 60601-2, 60730-1, 60730-2, 60745-1, 60745-2, 60950-1, 61010-1 and 61010-2; ISO EN Standards 60601-1-2, Part 1-2, 61000-3-2 (Equipment input current less than or equal to 16 Amps/Phase) and 61000-4-3; ANSI Standards C63.4 and C63.7 (only to 26.5GHz); UL Standards 1778, 60947-1, 60947-4-1, 60950-22, 60950-23, and 62368-1
Environmental and Energy	IEC/EN Standards 60068-2-1, 2-2, 2-6, 2-30, 2-27, 2-14, 2-64, 60092-101, 60695-2-2; MIL- STD-810: Method 500.4, 501.4, 502.4, 503.4, 506.4, 507.4, 510.4, 512.4 and 514.5; RTCA- DO-160E: Section 4, 5, 6, 7.2, 8, 10, 12, 16, 17 and 25; CSA Standard P4; CAN/CSA Standards C-300 and C-814; ISO Standards 9806-1, 9806-2 and 9806-3; SRCC 100-08, SRCC TM-1, SRCC-150; CSA Standards F378 and F379, EN Standards 12975-1 and 12975-2



ACCREDITED

C.P. Raman
C. P. Raman, P.E.
President

May 5, 2011
Commencement Date

Print Date: 04/25/2013
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Prepared by:
Date Issued:
Project No:

LabTest Certification Inc.
June 02, 2015
12731

Client:
Report No.:
Revision No.:

Marsco Technologies Inc.
12731-3E
0

International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367
(Revised March 21, 2013)

FIELDS OF TESTING		ACCREDITED TEST METHODS
ENERGY STAR Program Requirements		Product Specification for Water Coolers Eligibility Criteria
Maritime		ABYC Standards A-3, A-7, A-26, A-27, A-28, A-30, A-31, E-2, E-11 H-2, P-14, P-18, P-21, P-22, P-24 and P-27; EN Standards 28846, 28848, 28849, 29775, 60092-507; EN ISO 10133, 12216, 13297, 13929, 14895, 15083, 7840, 8847, 8849, 10239, 10240, 10592; 1995/A1, 11105, 11192 and 9097-1994/A1; IACS E1 – E21, 21005; DNV 2.4, BV: Rules for Classification of Steel Ships – Part C, Chapter 3, Section 6.2 Type Approval; ABS Part 4, Chapter 9, Section 7, Lloyds Type Approval Systems – Test Specification Number 1; GL VI-Part 7 Section 3 – Section – B Test Requirements, Chapter 2
Lighting		CAN/CSA C22.2 NO. 1993/UL 1993/NMX-J-578/1-ANCE), C22.2 NO. 206, C22.2 NO. 250.7, C22.2 NO. 256/UL 1786), C22.2 NO. 250.13/E61347-1, E61347-2-3
Hazardous Locations		CAN/CSA C22.2 NO. 25, 30, 137, 157, 213; CAN/CSA C22.2, EN, IEC and UL 60079-0, 60079-1, 60079-2, 60079-6, 60079-11, 60079-15, 60079-18, 60079-31; IEC/EN 13463-1, 13463-3, 13463-5, 13463-8; ISA 12.12.01; UL 913



ACCREDITED

C.P. Ramani, P.E.
President

Print Date: 04/25/2013
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END OF REPORT

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