



# TEST REPORT

For

## **Marsco Technologies Inc.**

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

Date: June 02, 2015  
Report No.: 12731-2E  
Revision No.: 0  
Project No.: 12731  
Equipment: Fire Ranger System  
Model No.: FR1.0-IB

### ONE STOP GLOBAL CERTIFICATION SOLUTIONS



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

Client:  
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Marsco Technologies Inc.  
12731-2E  
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TEST REPORT	
FCC15 and RSS-210	
Report reference No.....:	12731-2E
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-IB
FCC & IC ID.....:	FCC ID: 2AE5E-FR10IB IC ID: 20290-FR10IB
Serial numbers .....	N/A
Electrical Rating(s) .....	240VAC, 60Hz

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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 .....	> 460 seconds
Transmission Period.....	< 32 msec
Nominal Voltages for .....	<input type="checkbox"/> _X_ stand-alone equipment <input type="checkbox"/> combined (or host) equipment <input type="checkbox"/> test jig
Supply Voltage .....	<input type="checkbox"/> 240 AC <input type="checkbox"/> Amps <input type="checkbox"/> 60 Hz <input type="checkbox"/> DC <input type="checkbox"/> Amps
If DC Power .....	<input type="checkbox"/> _X_ Internal Power Supply <input type="checkbox"/> Host system is supplied the DC power <input type="checkbox"/> Battery
Size of equipment(H X D X W, inches) .....	X X
Mass of equipment (g).....	
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 <b>"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.</b> 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-IB is a Range Interbox 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_siganl and checked OK.
E4404B	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20 dBm Ref_siganl and checked OK.
8611-50-TS-10-N	LISN	Checked Insertion Losses from 150kHz to 30MHz	Losses were normal.
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	Anatenna, 30 to 1000MHz	Checked structure	Normal – no damage.

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SAS-571	Anatenna, 1 to 18GHz	Checked structure	Normal – no damage
AL-130	Anatenna, 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
Conducted Measurements	3.59

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

## Markings

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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	PASS
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

## AC Power Line Conducted Emission

Regulation	FCC15.207:2010
Intentional Radiating Frequency	434.117MHz
Detecting Method	Quasi Peak and Averaging Detector
IF Bandwidth	9kHz
Temperature	27.8 °C
Relative Humidity	46.0 %
Barometric Pressure:	101.7 kPa
Test Date	May 28, 2015
Sample Number	3562
Calibrated Test Equipment (ID)	266, 272,
Reference Equipment (ID) (Calibration not required)	374
Electrical Rating	240VAC, 60Hz
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  $\mu$ 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 $\mu$ 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 Setup

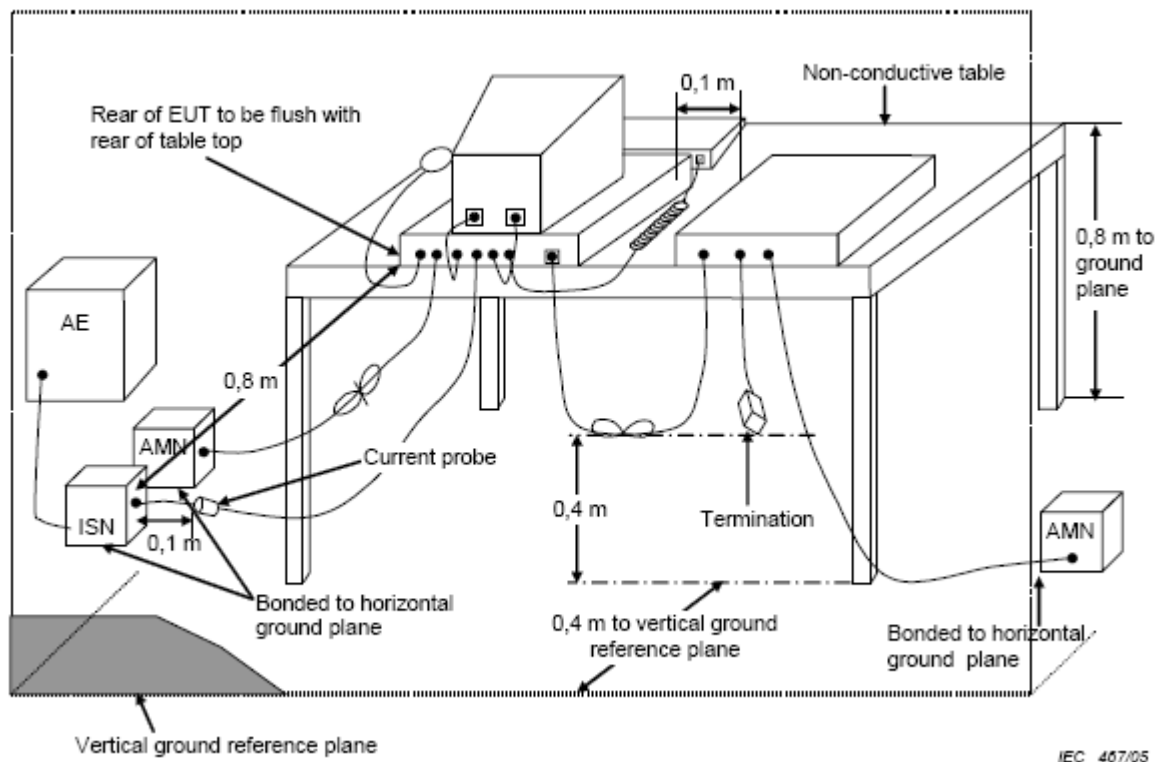
The test was performed in accordance with **FCC 15.107:2010 and ANSI C63.10, 2009.**

The EUT was placed on the table, referenced by ANSI C63.4, shown in Figure-1, and 0.4 meters from the conducting wall with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

The EUT was set up as per the test configuration to simulate typical actual usage per the user's manual. The AC power line of EUT was connected to LISN for maximum conducted interference.

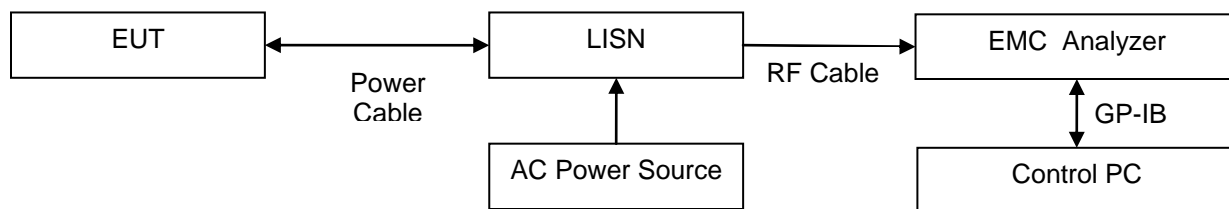


Initially a scan was made with an EMC Analyzer from 150 kHz to 30 MHz on each phase with the receiver in the peak mode. The measuring bandwidth was set up 9 kHz. Measurements were then made using CISPR16-1 quasi peak and averaging detectors when the peak readings were within 20dB of the Quasi-peak limit line.



**Figure – 1 Test setup for Conducted emissions**

## Setup Block Diagram



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### Test Result

Conducted Emission (dBuV) = Measured Emission (dBuV) + Cable Loss(dB)+LISN(dB)

**X**      **Pass**                      **Fail**                      **N/A**

### - Table of Conducted Emissions: Hot Line

LabTest Certification Inc.  
 Conducted Emission  
 FCC 15.207, AVG\_Hot1\_240Vac/60Hz

Operator: Jeremy LEE

Model Number: FR1.0-IB  
 Contact: Marvin Butt  
 Company: Marsco Tech.

05:56:27 PM, Thursday, May 28, 2015

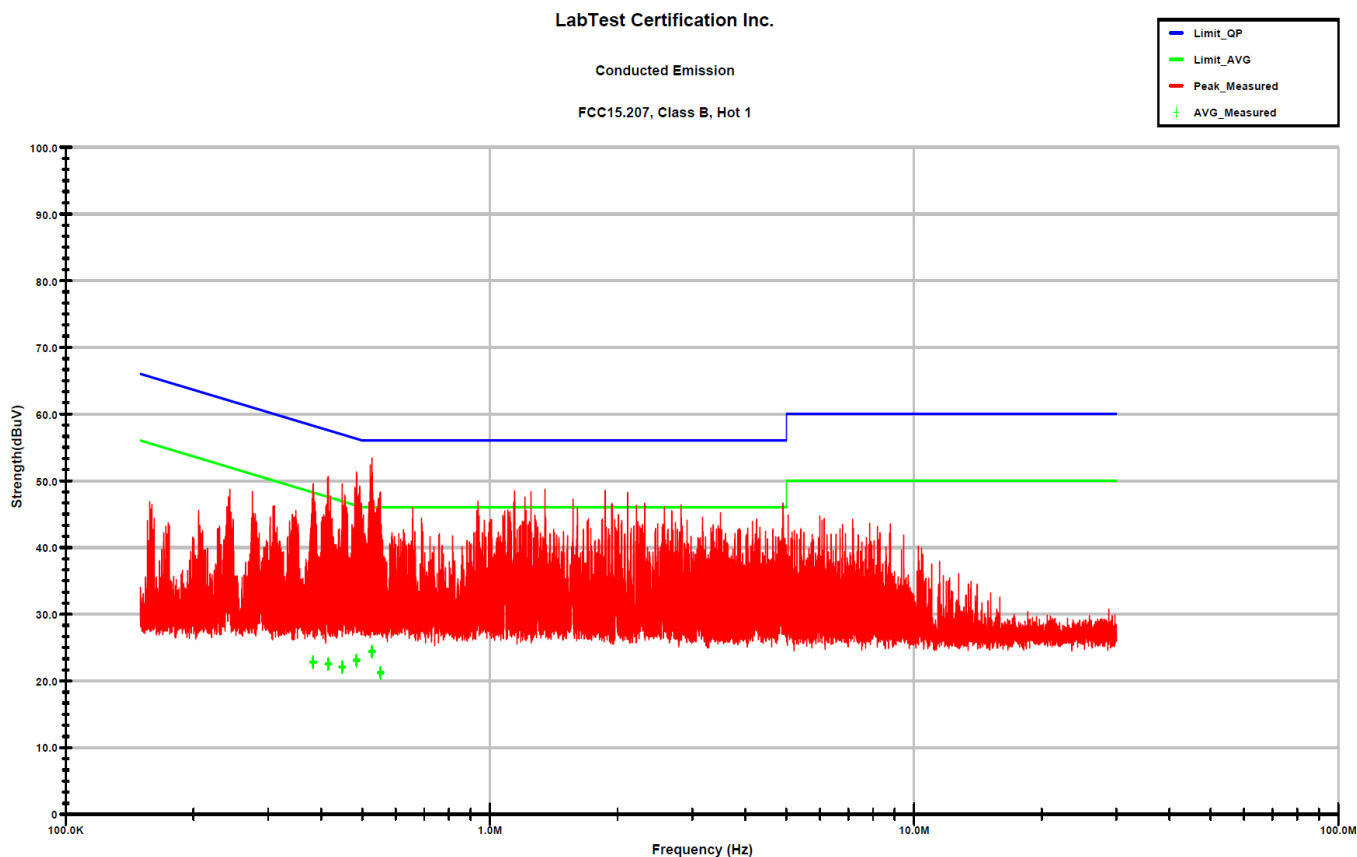
Frequency MHz	Measured_AVG dBuV	PathLoss dB	Emission_AVG dBuV	Limit_AVG dBuV	Margin_AVG dB	
552.212 KHz	11.08	10.12	21.20	46.00	24.80	
527.387 KHz	14.29	10.12	24.41	46.00	21.59	
484.620 KHz	12.93	10.12	23.05	46.44	23.39	
448.433 KHz	11.93	10.14	22.07	47.47	25.41	
415.849 KHz	12.36	10.14	22.50	48.40	25.91	
383.234 KHz	12.66	10.14	22.80	49.34	26.54	
Project #: 12731, Sample #: 3562						
Temp.: 27.8 C, Hum.: 46.0 %						
Barometer Pres.: 101.7 kPa						

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## - Graph of Conducted Emissions: Hot Line #1



Operator: Jeremy LEE

05:55:28 PM, Thursday, May 28, 2015

Project #: 12731, Sample #: 3562

Temp.: 27.8 C, Hum.: 46.0 %

Barometer Pres.: 101.7 kPa

Model Number: FR1.0-IB

Contact: Marvin Butt

Company: Marsco Tech.

Prepared by: LabTest Certification Inc.  
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## - Table of Conducted Emissions: Hot Line #2

LabTest Certification Inc.  
 Conducted Emission  
 FCC 15.207, QP\_Hot2\_240Vac/60Hz

Operator: Jeremy LEE

Model Number: FR1.0-1B  
 Contact: Marvin Butt  
 Company: Marsco Tech.

05:56:27 PM, Thursday, May 28, 2015

Frequency MHz	Measured_QP dBuV	PathLoss dB	Emission_QP dBuV	Limit_QP dBuV	Margin_QP dB
526.653 KHz	40.79	10.12	50.91	56.00	5.09
Project #: 12731, Sample #: 3562					
Temp.: 27.8 C, Hum.: 46.0 %					
Barometer Pres.: 101.7 kPa					

LabTest Certification Inc.  
 Conducted Emission  
 FCC 15.207, AVG\_Hot2\_240Vac/60Hz

Operator: Jeremy LEE

Model Number: FR1.0-1B  
 Contact: Marvin Butt  
 Company: Marsco Tech.

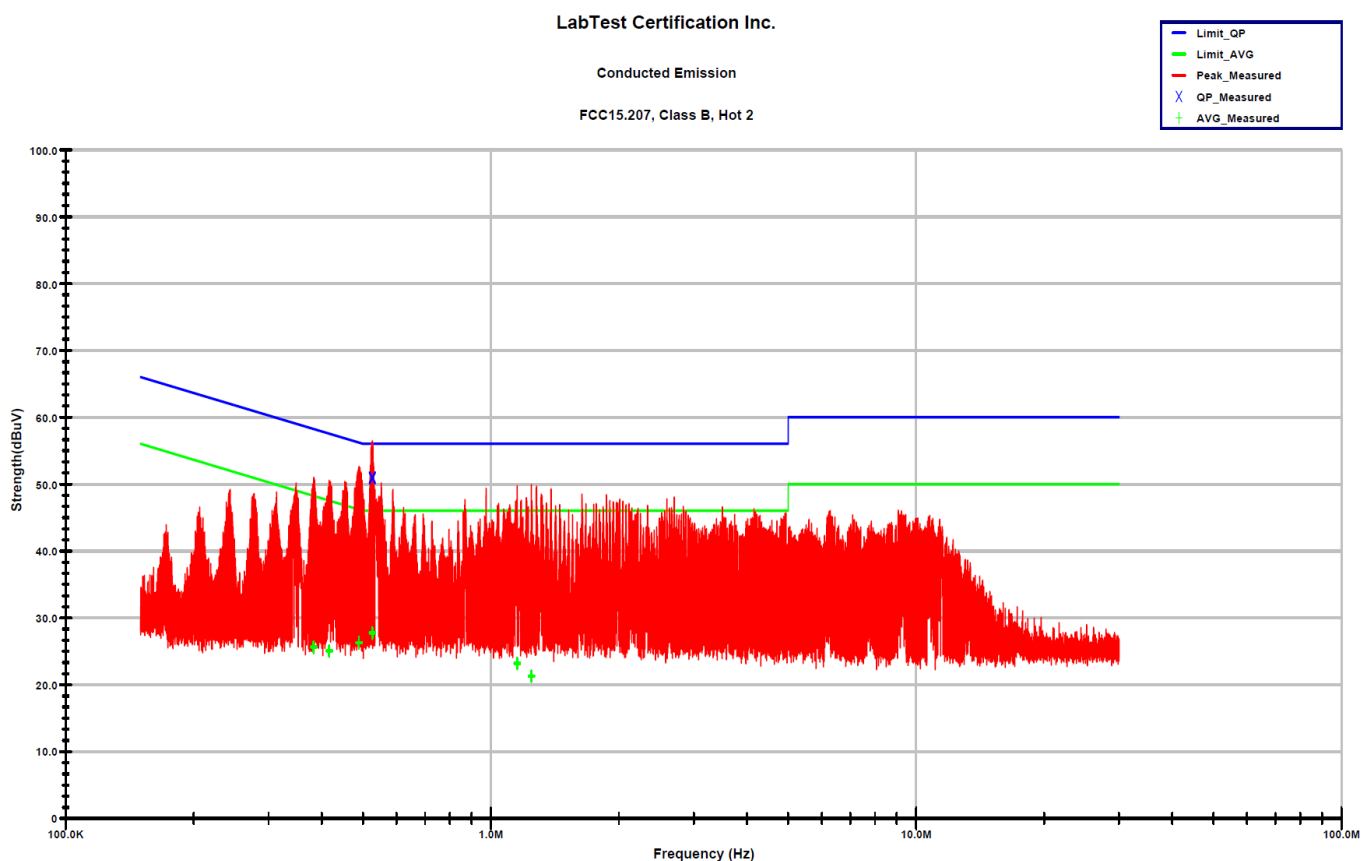
05:56:27 PM, Thursday, May 28, 2015

Frequency MHz	Measured_AVG dBuV	PathLoss dB	Emission_AVG dBuV	Limit_AVG dBuV	Margin_AVG dB
1.245 MHz	11.11	10.16	21.27	46.00	24.73
1.152 MHz	13.04	10.16	23.20	46.00	22.80
526.653 KHz	17.61	10.12	27.73	46.00	18.27
489.392 KHz	16.19	10.12	26.31	46.30	20.00
416.643 KHz	14.91	10.14	25.05	48.38	23.34
383.234 KHz	15.49	10.14	25.63	49.34	23.71
Project #: 12731, Sample #: 3562					
Temp.: 27.8 C, Hum.: 46.0 %					
Barometer Pres.: 101.7 kPa					

Prepared by: LabTest Certification Inc.  
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- Graph of Conducted Emissions: Hot Line #2



Model Number: FR1.0-IB

Operator: Jeremy LEE

Project #: 12731, Sample #: 3562

Temp.: 27.8 C, Hum.: 46.0 %

Barometer Pres.: 101.7 kPa

Contact: Marvin Butt

Company: Marsco Tech.

05:55:57 PM, Thursday, May 28, 2015

## Summary of the operation of RF Transmission

Regulation	FCC15.231:2010
Intentional Radiating Frequency	434.117MHz
Sample Number	3562 & 3563
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		

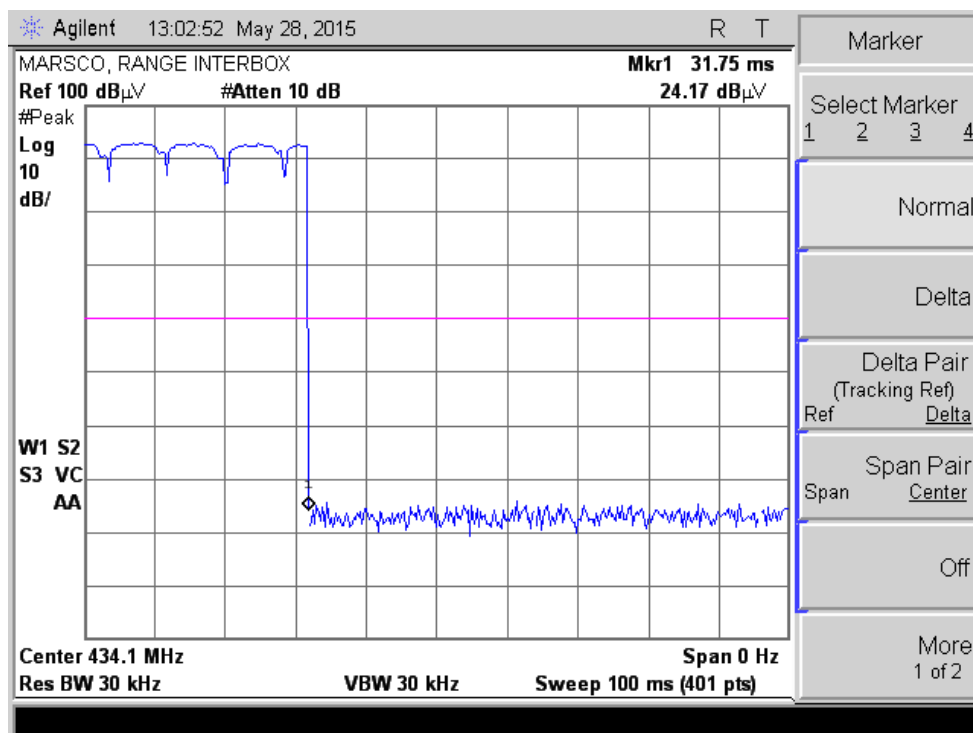
Prepared by: LabTest Certification Inc.  
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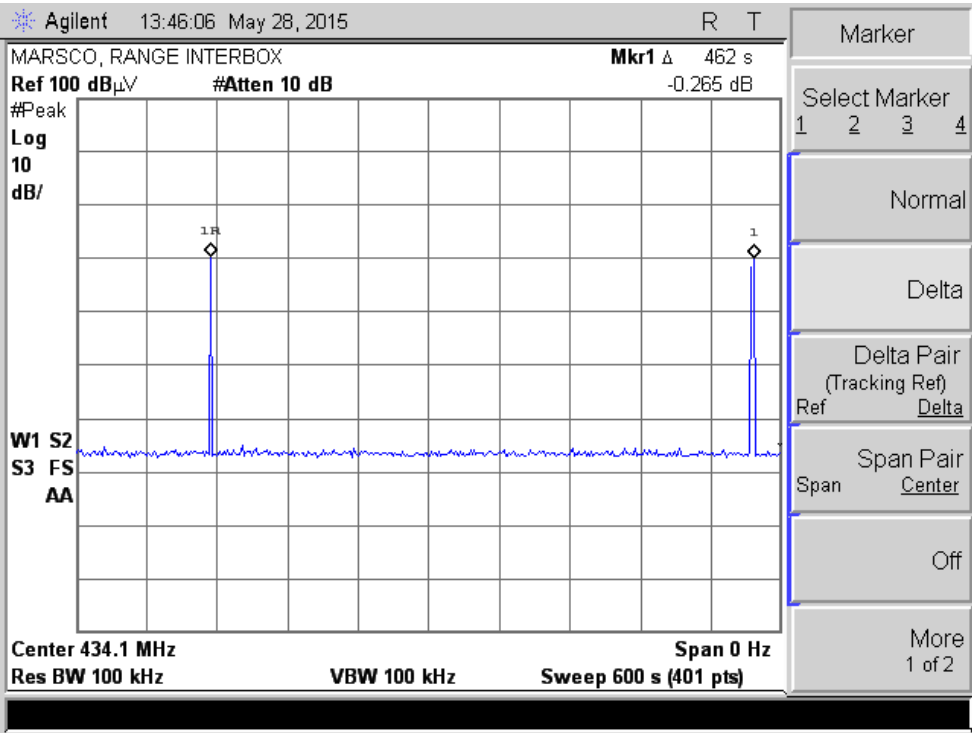
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Pt 15.231(a)(3)	Periodic transmission at regular predetermined intervals		X	
	Polling or supervision transmission, including data, to determine system integrity or transmitters used in security or safety applications requires no total duration of transmission 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 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	26.5 °C
Relative Humidity	48.0 %
Barometric Pressure:	101.9 kPa
Test Date	May 28, 2015
Sample Number	3562
Calibrated Test Equipment (ID)	266, 272, 371, 406
Reference Equipment (ID) (Calibration not required)	374, 516
Electrical Rating	240VAC, 60Hz
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:

Funda- mental fre- quency (MHz)	Field strength of funda- mental (microvolts/ meter)	Field strength of spurious emissions (microvolts/meter)
40.66– 40.70.	2,250 .....	225
70–130 .....	1,250 .....	125
130–174 ....	<sup>1</sup> 1,250 to 3,750 .....	<sup>1</sup> 125 to 375
174–260 ....	3,750 .....	375
260–470 ....	<sup>1</sup> 3,750 to 12,500 .....	<sup>1</sup> 375 to 1,250
Above 470	12,500 .....	1,250

<sup>1</sup> 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.

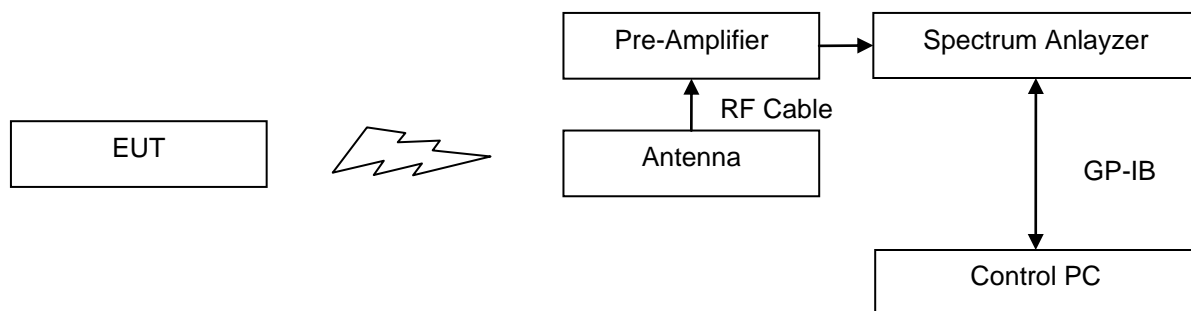
## Test Setup

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

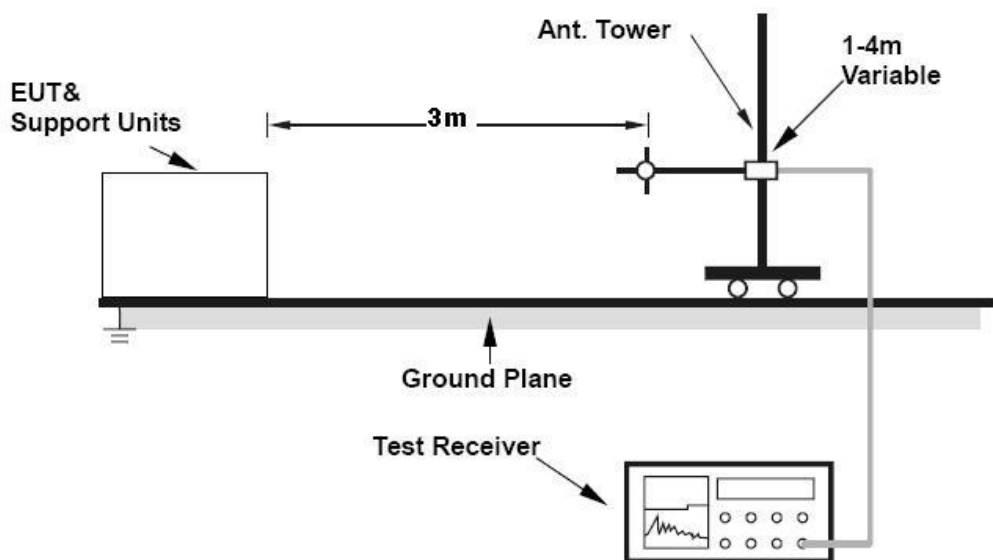
The test setup for Field Strength of Fundamental was shown in Figure - 2.

- 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 – 2 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	80.55	0.24	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

12:37:27 PM, Thursday, May 28, 2015

Model #: FR1.0-IB  
 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	88.46	17.00	-24.91	80.55	80.79	0.24	182.3	237.8	H
868.234 MHz	31.48	22.46	-22.60	31.35	60.79	29.44	182.3	260.0	H
Project # : 12731, Sample #: 3562									
Temp.: 26.5 C, Hum.: 48.0 %									
Barometer Pres.: 101.9 kPa									

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

Operator: Jeremy Lee

12:37:09 PM, Thursday, May 28, 2015

Model #: FR1.0-IB  
 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	87.38	16.68	-24.91	79.16	80.79	1.63	62.0	100.5	V
868.234 MHz	30.57	21.96	-22.60	29.94	60.79	30.85	300.0	129.8	V
Project # : 12731, Sample #: 3562									
Temp.: 26.5 C, Hum.: 48.0 %									
Barometer Pres.: 101.9 kPa									

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

Client:  
 Report No.:  
 Revision No.:

Marsco Technologies Inc.  
 12731-2E  
 0

## 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	25.5 to 26.5 °C
Relative Humidity	48.0 to 51.0 %
Barometric Pressure:	101.6 to 101.9 kPa
Test Date	May 28 & 29, 2015
Sample Number	3562
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:

Funda- mental fre- quency (MHz)	Field strength of funda- mental (microvolts/ meter)	Field strength of spurious emissions (microvolts/meter)
40.66– 40.70.	2,250 .....	225
70–130 .....	1,250 .....	125
130–174 ....	<sup>1</sup> 1,250 to 3,750 .....	<sup>1</sup> 125 to 375
174–260 ....	3,750 .....	375
260–470 ....	<sup>1</sup> 3,750 to 12,500 .....	<sup>1</sup> 375 to 1,250
Above 470	12,500 .....	1,250

<sup>1</sup> 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 - 2.

- 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:

Emission level (dBuV/m) = Average detected level (dBuV) + Cable Loss(dB) + Antenna Factor (dB/m)  
- 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	31.35	29.44	H	PASS
1302.351	Peak	73.98	52.33	21.65	H	PASS
	Averaging	53.98	31.18	22.80	V	PASS
1736.468	Peak	80.79	42.39	38.40	H	PASS
	Averaging	60.79	29.34	31.45	H	PASS
2170.585	Peak	80.79	51.42	29.37	H	PASS
	Averaging	60.79	35.20	25.59	H	PASS
2604.702	Peak	80.79	47.33	33.46	H	PASS

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	Averaging	60.79	33.42	27.37	H	PASS
3038.819	Peak	80.79	56.09	24.70	H	PASS
	Averaging	60.79	39.52	21.27	H	PASS
3472.936	Peak	80.79	49.89	30.90	H	PASS
	Averaging	60.79	35.98	24.81	H	PASS
3907.053	Peak	73.98	56.43	17.55	H	PASS
	Averaging	53.98	40.13	13.85	H	PASS
4341.17	Peak	73.98	50.43	23.56	H	PASS
	Averaging	53.98	37.66	16.32	H	PASS

**- Field Strengt 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

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

12:37:27 PM, Thursday, May 28, 2015

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	88.46	17.00	-24.91	80.55	80.79	0.24	182.3	237.8	H
868.234 MHz	31.48	22.46	-22.60	31.35	60.79	29.44	182.3	260.0	H
Project # : 12731, Sample #: 3562									
Temp.: 26.5 C, Hum.: 48.0 %									
Barometer Pres.: 101.9 kPa									

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

Operator: Jeremy Lee

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

12:37:09 PM, Thursday, May 28, 2015

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	87.38	16.68	-24.91	79.16	80.79	1.63	62.0	100.5	V
868.234 MHz	30.57	21.96	-22.60	29.94	60.79	30.85	300.0	129.8	V
Project # : 12731, Sample #: 3562									
Temp.: 26.5 C, Hum.: 48.0 %									
Barometer Pres.: 101.9 kPa									

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

Client: Marsco Technologies Inc.  
 Report No.: 12731-2E  
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**- Field Strengt 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

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

10:23:24 AM, Friday, May 29, 2015

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	56.72	24.51	-28.91	52.33	73.98	21.65	133.5	115.7	H
1.7364680 GHz	44.26	25.68	-27.55	42.39	80.79	38.40	333.0	118.1	H
2.1705850 GHz	49.94	27.64	-26.16	51.42	80.79	29.37	288.5	117.9	H
2.6047020 GHz	43.55	29.54	-25.76	47.33	80.79	33.46	269.5	117.0	H
3.0388190 GHz	50.43	30.51	-24.85	56.09	80.79	24.70	144.5	120.2	H
3.4729360 GHz	43.89	30.32	-24.32	49.89	80.79	30.90	284.0	118.7	H
3.9070530 GHz	48.42	31.60	-23.59	56.43	73.98	17.55	115.5	120.6	H
4.3411700 GHz	40.45	31.48	-21.50	50.42	73.98	23.56	56.5	120.1	H
Project # : 12731, Sample #: 3562									
Temp.: 25.5 C, Hum.: 51.0 %									
Barometer Pres.: 101.6 kPa									

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

Operator: Jeremy Lee

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

11:48:57 AM, Friday, May 29, 2015

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	53.18	24.54	-28.91	48.82	73.98	25.16	209.5	100.4	V
1.7364680 GHz	43.38	25.74	-27.55	41.57	80.79	39.22	145.5	100.9	V
2.1705850 GHz	48.34	27.72	-26.16	49.90	80.79	30.89	335.5	101.5	V
2.6047020 GHz	42.29	29.58	-25.76	46.11	80.79	34.68	330.0	104.7	V
3.0388190 GHz	49.06	30.67	-24.85	54.87	80.79	25.92	43.0	107.6	V
3.4729360 GHz	43.49	30.41	-24.32	49.59	80.79	31.20	335.0	127.1	V
3.9070530 GHz	47.16	31.64	-23.59	55.20	73.98	18.78	26.5	128.0	V
4.3411700 GHz	40.25	31.53	-21.50	50.27	73.98	23.71	205.0	129.9	V
Project # : 12731, Sample #: 3562									
Temp.: 25.5 C, Hum.: 51.0 %									
Barometer Pres.: 101.6 kPa									

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

Client: Marsco Technologies Inc.  
 Report No.: 12731-2E  
 Revision No.: 0

**- Field Strengt 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

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

10:23:24 AM, Friday, May 29, 2015

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	35.57	24.51	-28.91	31.18	53.98	22.80	133.5	115.7	H
1.73646800 GHz	31.08	25.68	-27.55	29.21	60.79	31.58	333.0	118.1	H
2.17058500 GHz	33.72	27.64	-26.16	35.20	60.79	25.59	288.5	117.9	H
2.60470200 GHz	29.64	29.54	-25.76	33.42	60.79	27.37	269.5	117.0	H
3.03881900 GHz	33.86	30.51	-24.85	39.52	60.79	21.27	144.5	120.2	H
3.47293600 GHz	29.98	30.32	-24.32	35.98	60.79	24.81	284.0	118.7	H
3.90705300 GHz	32.12	31.60	-23.59	40.13	53.98	13.85	115.5	120.6	H
4.34117000 GHz	27.69	31.48	-21.50	37.66	53.98	16.32	56.5	120.1	H
Project # : 12731, Sample #: 3562									
Temp.: 25.5 C, Hum.: 51.0 %									
Barometer Pres.: 101.6 kPa									

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

Operator: Jeremy Lee

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

11:48:57 AM, Friday, May 29, 2015

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
1.3023510 GHz	35.10	24.54	-28.91	30.74	53.98	23.24	209.5	100.4	V
1.7364680 GHz	31.15	25.74	-27.55	29.34	60.79	31.45	145.5	100.9	V
2.1705850 GHz	33.03	27.72	-26.16	34.59	60.79	26.20	335.5	101.5	V
2.6047020 GHz	28.95	29.58	-25.76	32.77	60.79	28.02	330.0	104.7	V
3.0388190 GHz	33.38	30.67	-24.85	39.19	60.79	21.60	43.0	107.6	V
3.4729360 GHz	29.40	30.41	-24.32	35.50	60.79	25.29	335.0	127.1	V
3.9070530 GHz	31.30	31.64	-23.59	39.34	53.98	14.64	26.5	128.0	V
4.3411700 GHz	27.58	31.53	-21.50	37.60	53.98	16.38	205.0	129.9	V
Project # : 12731, Sample #: 3562									
Temp.: 25.5 C, Hum.: 51.0 %									
Barometer Pres.: 101.6 kPa									



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## 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	22.8 to 24.0 °C
Relative Humidity	49.0 %
Barometric Pressure:	101.5 kPa
Test Date	May 22 and June 02, 2015
Sample Number	3561
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.

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### 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 - 2.

- 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 (dBuV/m) = Quasi-Peak detected level (dBuV) + Cable Loss (dB) + Antenna Factor (dB/m)

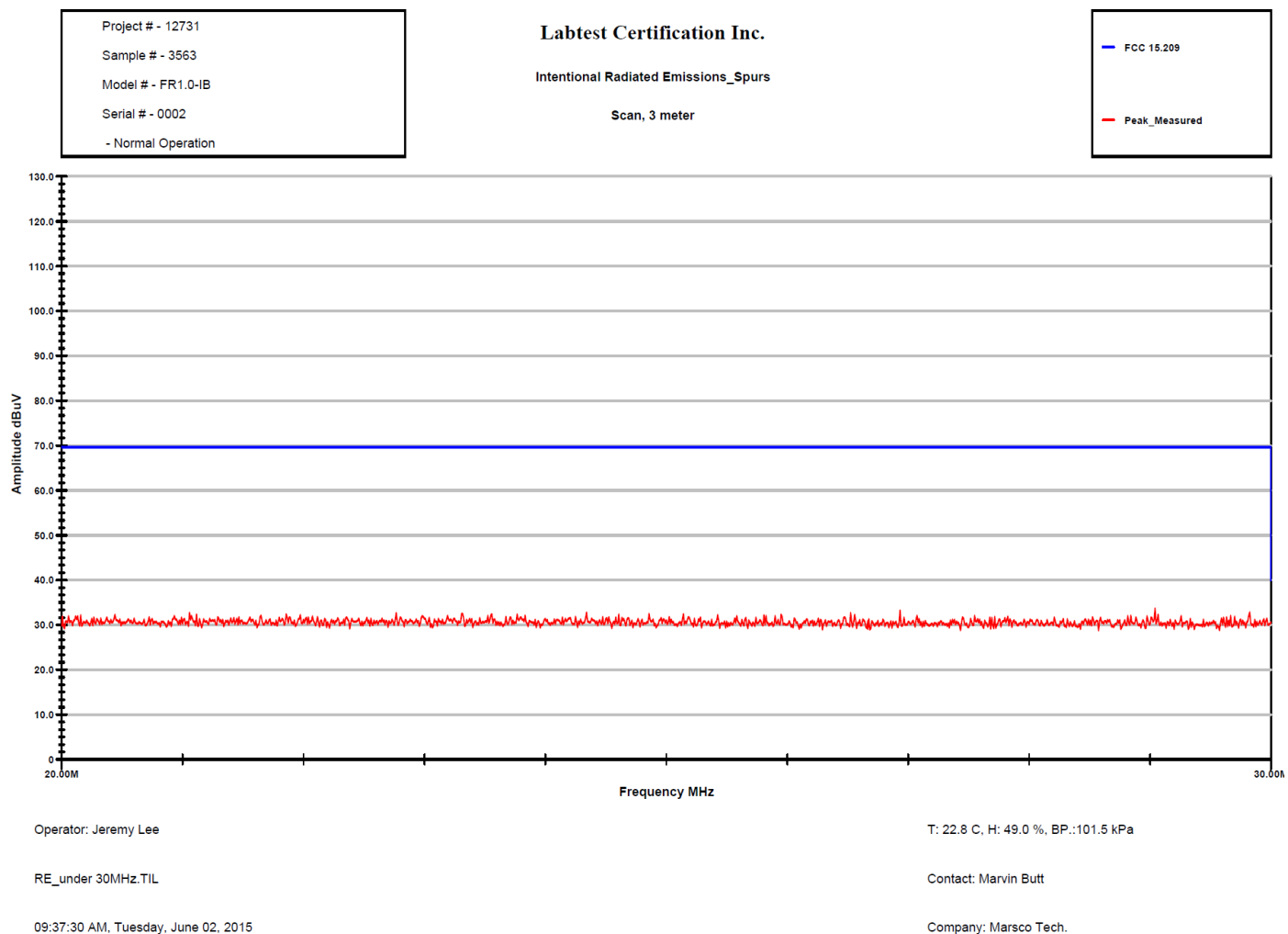
**X**    **Pass**                      **Fail**                      **N/A**

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

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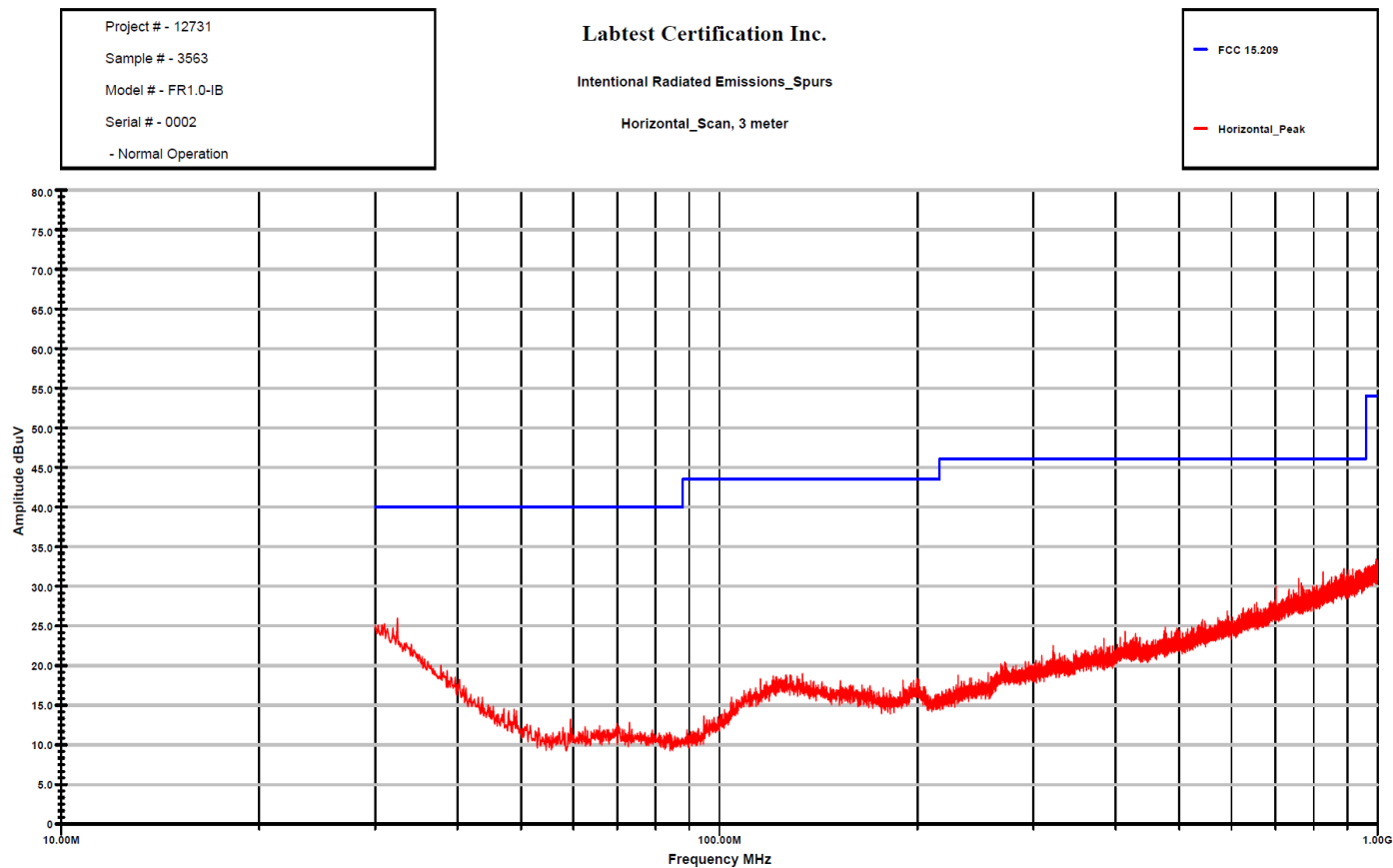
**- Graph of Radiated Emissions: 20 to 30MHz, Peak detecting, Antenna was used AL-130.**



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Project No: 12731

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



Operator: Jeremy Lee

T: 24.0 C, H: 49.0 %, BP.:101.5 kPa

RE\_30 to 1000MHz.TIL

Contact: Marvin Butt

03:21:17 PM, Friday, May 22, 2015

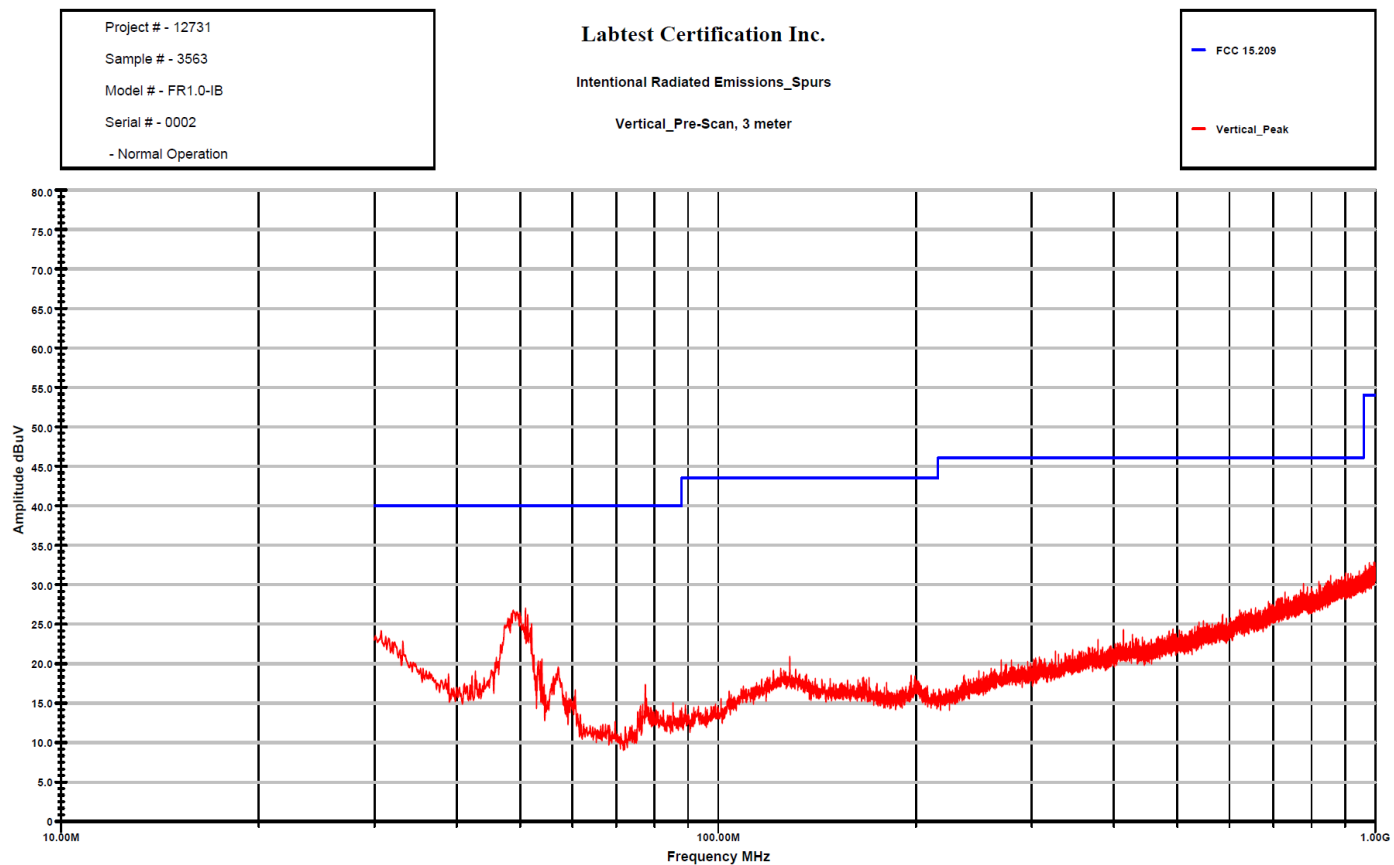
Company: Marsco Tech.

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

Client:  
Report No.:  
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**- Graph of Radiated Emissions: 30 to 1,000MHz, Peak detecting, Antenna was used JB1, Vertical.**



Operator: Jeremy Lee

T: 24.0 C, H: 49.0 %, BP.:101.5 kPa

RE\_30 to 1000MHz.TIL

Contact: Marvin Butt

03:51:23 PM, Friday, May 22, 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.  
12731-2E  
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	3562
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 - 2.

- 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**

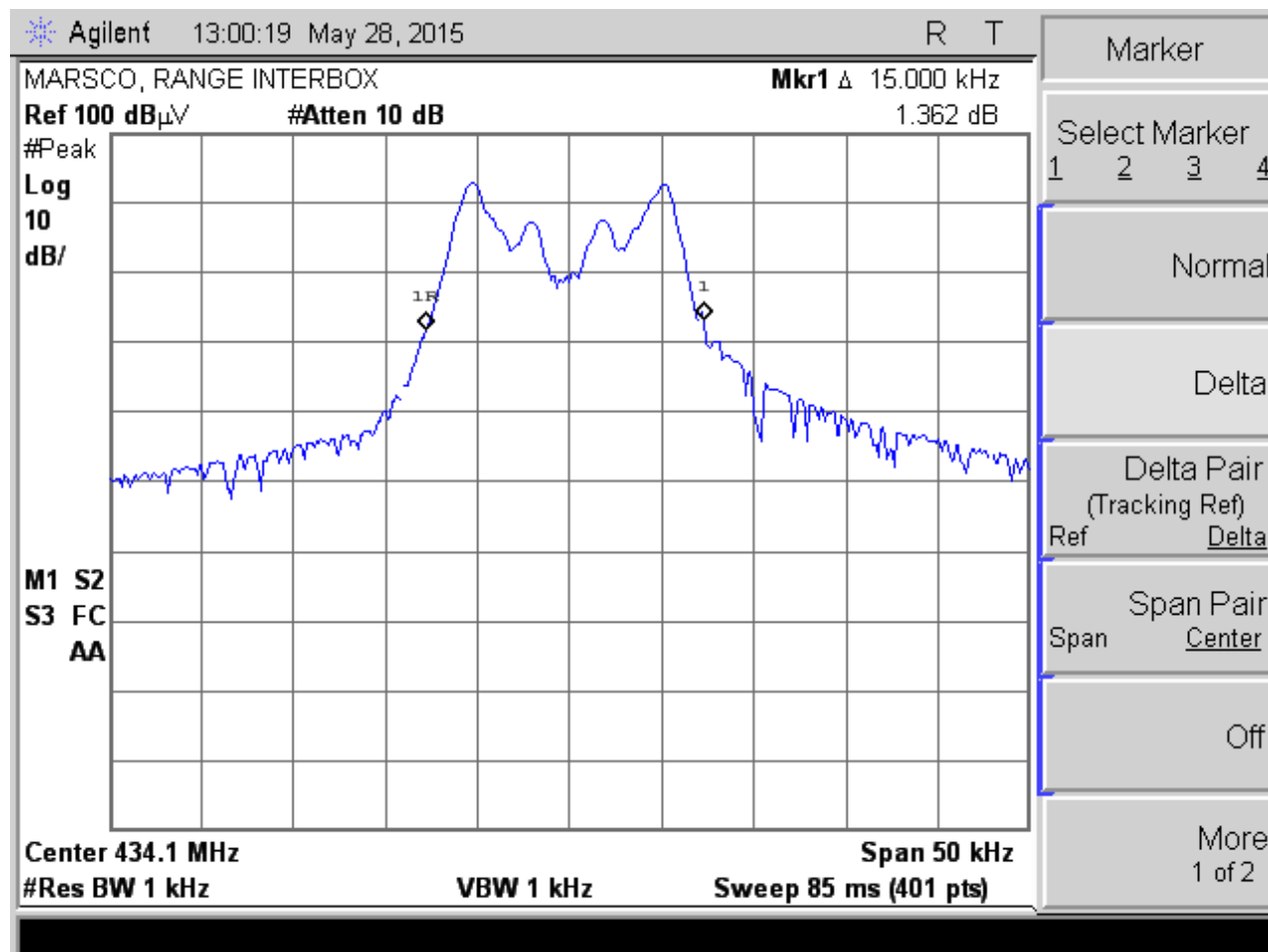
Center Frequency (MHz)	Limit( <0.25%, kHz)	Measured(kHz)	Results
434.117	< 1085.292	15.000	PASS

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

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- Measured result of the Bandwidth of the emission(20dBc method)



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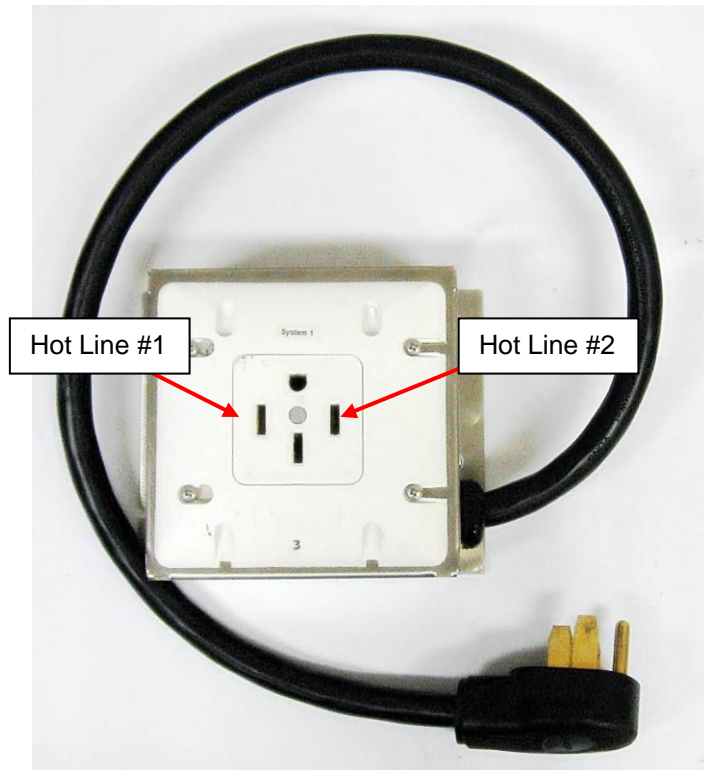
## APPENDIX A: Test Equipment Used

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



## APPENDIX B: EUT photos

### - EUT: Top View



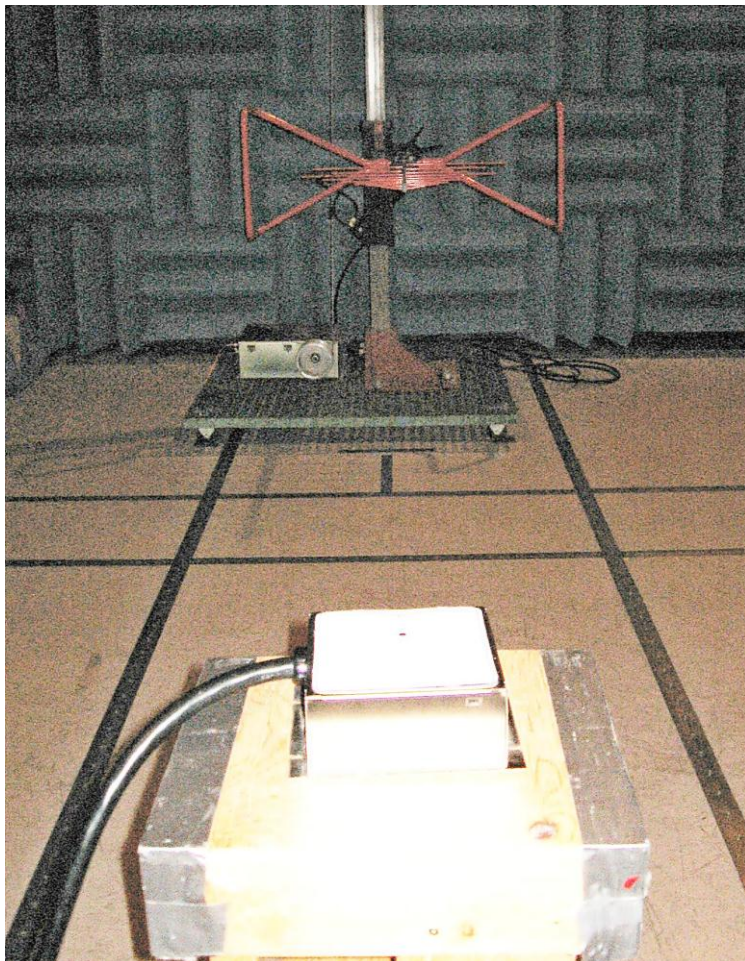
Prepared by: LabTest Certification Inc.  
Date Issued: June 02, 2015  
Project No: 12731

Client:  
Report No.:  
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## **APPENDIX C: Test setup photos**

### **- Test configuration for Field Strength measurement**

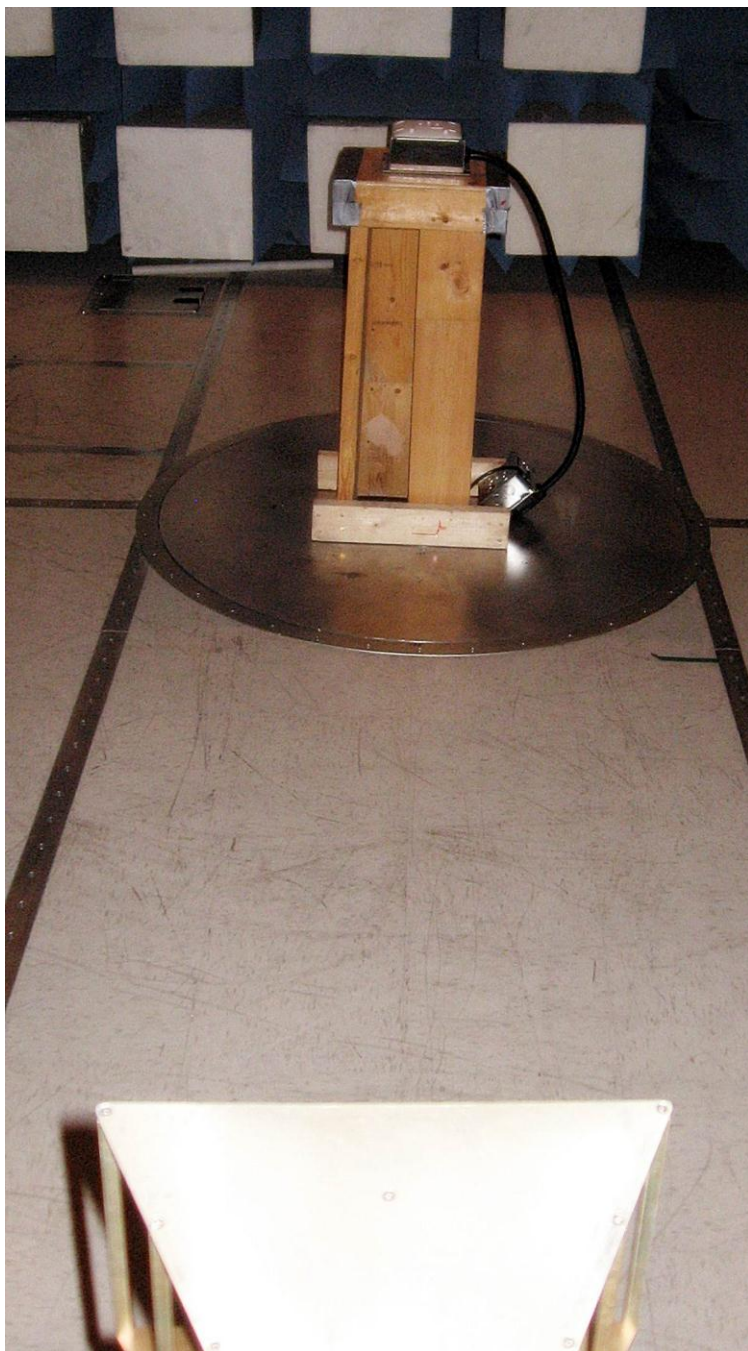


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Revision No.:

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**- Test configuration for Harmonic measurement, over 1GHz**



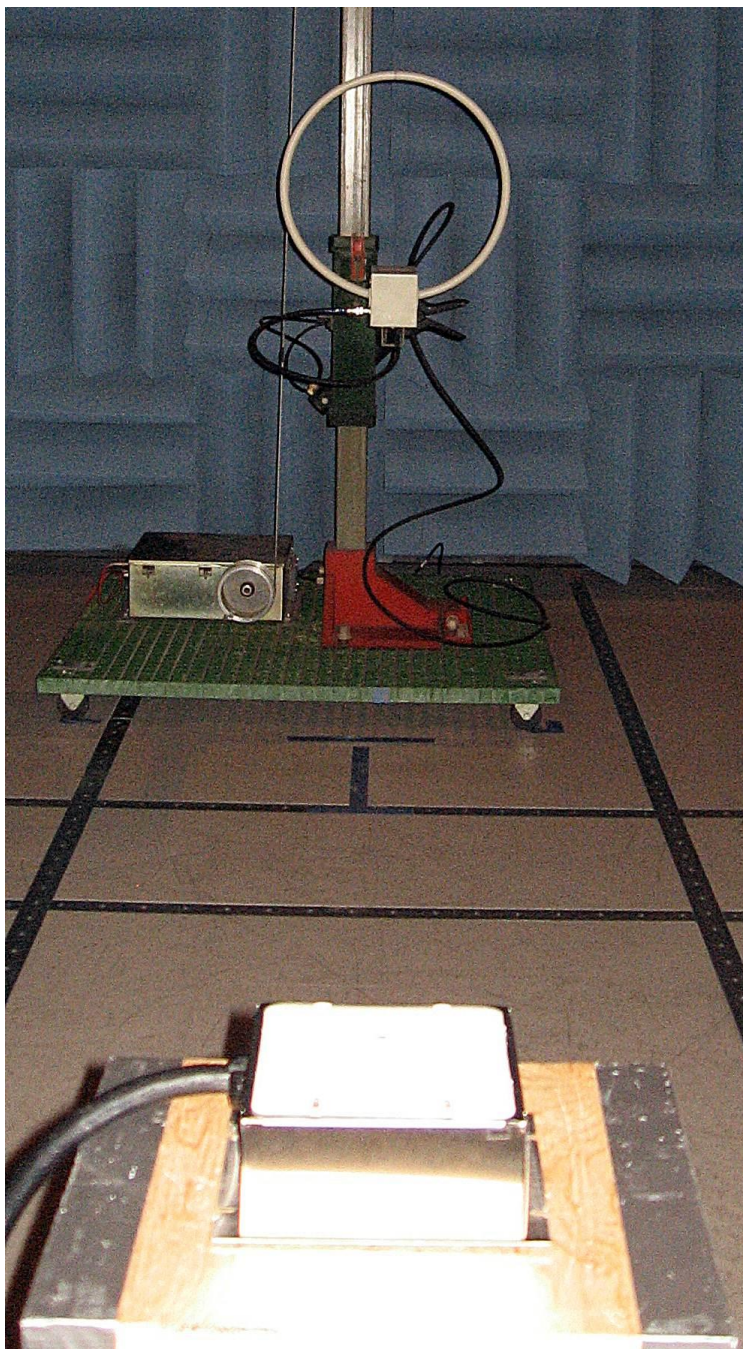


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**- Test configuration for Unintentional measurement below 30MHz**



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## APPENDIX D: ISO 17025:2005 Accreditation Certificate

<p>International Accreditation Service</p> <p><b>CERTIFICATE OF ACCREDITATION</b></p> <p><i>This is to signify that</i></p> <p><b>LABTEST CERTIFICATION, INC.</b> 3133-20800 WESTMINSTER HIGHWAY RICHMOND, BRITISH COLUMBIA V6V 2W3 CANADA</p> <p>Testing Laboratory TL-367 (Revised March 21, 2013)</p> <p>has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ISO/IEC Standard 17025:2005, <i>General requirements for the competence of testing and calibration laboratories</i>, and has been accredited, commencing May 5, 2011, for the test methods listed in the approved scope of accreditation.</p> <p><i>(see attached scope of accreditation for fields of testing and accredited test methods)</i></p> <p>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 <a href="http://www.iasonline.org">www.iasonline.org</a> for current accreditation information, or contact IAS directly at (562) 364-8201.</p> <p>Page 1 of 5</p>	<p><i>C. P. Ramani</i> C. P. Ramani, P.E. President</p> <p><i>Patrick V. McCullen</i> Patrick V. McCullen Vice President</p> <p> <b>IAS</b> ACCREDITED</p> <p> <b>ILAC-MRA</b></p>
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# International Accreditation Service SCOPE OF ACCREDITATION

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

LabTest Certification, Inc.  
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/CSA 2.2 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/CSA 1.18, 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/CSA-3.4; AS 4551/Ag101, AS 4563/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,



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](http://www.iasonline.org) for current accreditation information, or contact IAS directly at (562) 364-8201.

*C. P. Ramani*  
C. P. Ramani, P.E.  
President

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