FCC Part 15C & Industry Canada Certification Report

for the

Research Instruments Ltd

Sperm Prep Reader

Project Engineer: R. P. St John James

Approval Signatory

Approved signatories: S. M. Connolly ☑ J. A. Jones ☐

The above named are authorised Hursley EMC Services engineers.

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ilac-MRA UKAS TESTING 1871

Contents

1.0 DECLARATION

1.1 FCC Part 15C and Industry Canada Statement

The Equipment Under Test (EUT) operates at a transmit frequency of 13.56 MHz and complies with CFR 47 part 15.225 emission requirements. The EUT also complies with Industry Canada RSS-210 Issue 8 requirements.

For emissions outside the 13.110-13.410 MHz band the EUT, as described and reported within this document, complies with the parts 15.207 and 15.209 of the CFR 47 FCC rules in accordance with ANSI C63.4:2003.

The EUT uses passive tags without their own power source and will only work when collocated with the EUT.

1.2 Related Submittal(s) Grants

None

1.3 EUT Manufacturer

Trade name:	Research Instruments Ltd
Company name:	Research Instruments Ltd
Company address:	Brickland Industrial Park Falmouth Cornwall TR11 4TA United Kingdom
Manufacturing address:	As above.
Company representative:	Mr Will Thalliens Tel: +44 (0) 1326 372753

2.0 EUT DESCRIPTION

2.1 Identity

EUT:	Sperm Prep Reader
Serial numbers:	P1
Sample build:	Production
Powered by a Mains AC to DC Power supply:	Meanwell Model MES30A-3P1J S/N EJ1244435

2.2 Product Operation

The Sperm Prep reader (EUT) is used in fertility laboratories to track containers using RFID technology. All containers have an RFID tag attached so when they are placed in the reader tray, the reader RFID is used to digitally recognize the container identity therefore reducing human errors. The device operates at the frequency of 13.56MHz.

2.3 Support Equipment

Microsoft Surface (MS) Tablet Model Windows 8 pro S/N 037682231553 with Microsoft power supply Model MS 1536 (no serial number)

2.4 Exerciser Program

For the purpose of testing the following program was used to monitor the device under test.

Software: RI Witness work area, Imaging Elements, RFID Reading, Version 2.3.5217.25111

The software was running on the MS Tablet under Windows 8. With the software active the EUT continually transmitted, with the software application closed the transmitter turns off. The EUT was tested with 5 tags placed on EUT at the same time, 4 tags were attached to test tubes placed in two vertical axis, a 5th tag was attached to a Petri dish in the horizontal axis.

The software was constantly sending an Inventory command which requests the ID of the tags in the work area. As the tags are passive the RF transmitter is always on, so when the tags are inside the reading area they power up and send their ID to the reader. This process is done continuously for the rear, sides and bottom antenna, one at a time. When samples are detected inside the reading area the containers are shown on the operators display, ready to be worked on and will disappear once they are removed. During radiated emissions the EUT was connected to the MS Tablet via a 10m USB cable so that the MS tablet was situated outside of the measurement chamber or the open area test site. The USB cable is normally less than 2m in length.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Hursley EMC Services Ltd Trafalgar House , Trafalgar Close, Chandlers Ford, Eastleigh Hampshire, SO53 4BW , UK
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester, SO21 2JK, UK; FCC Registered UK Designation number: UK0006 Canada Registration Number: 7104A
Test Dates	17th June to the 7th July 2014
HEMCS References:	14R243

3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.4:2003. Final radiated testing was performed at a EUT to antenna distance of three metres (above 30 MHz).

Below 30 MHz the EUT was measured at an antenna distance of five and ten metres and compared to the limits.

Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:1996.

3.3 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	22 to 28 degrees Celsius	38 to 55% relative	1008 to 1014 millibars

3.4 Radiated Emissions

Initial Scan

Above 30 MHz a radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Below 30 MHz the loop antenna was set at a height of 1m, the EUT was measured with the antenna in the vertical and horizontal polarity and for each polarity a radiated emission profile obtained by revolving the system on the turntable. Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
040	1	HP	8593EM	3536A00137	Spectrum analyser (9kHz-26.5GHz)	10/10/2014
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	Internal
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	02/10/2015
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	06/06/2015
242	3	Rohde & Schwarz	HFH2-Z2	881056/4	Loop antenna (9kHz-30MHz)	31/05/2015

The data obtained from the profile scan was used as a guide for the final Open Area Test Site (OATS) measurements.

Final Measurements

The system under test was transferred to the OATS from the semi-anechoic chamber. The data obtained from the chamber profile-scan was used to guide the test engineer. Above 30 MHz, each emission from the transmitter was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. Below 30 MHz the loop antenna was set at a height of 1m, the EUT was measured with the antenna in the vertical and horizontal polarity and each emission was maximised by revolving the system on the turntable. The worst-case data is presented in this report. Test instrumentation used in the OAT's measurements was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
109	3	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (OATS)	19/10/2015
242	3	Rohde & Schwarz	HFH2-Z2	881056/4	Loop antenna (9kHz-30MHz)	31/05/2015
552	1	R & S	ESCI7	1166595007	7GHz Receiver	17/04/2015

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'*' denotes that the calibration, as defined by Hursley EMC Services quality system, remains valid whilst within four calendar months of the due date.

3.5 Conducted Emissions

Test Configuration

A filtered 115V/60Hz supply was fed to the system under test, via a 50Ω/50µH Line Impedance Stabilisation Network (LISN). The LISN was directly bonded to a conductive ground plane.

Test Measurement

The worst-case emissions were identified on both the neutral and phase(s) with a spectrum analyser set to scan from 0.15 MHz to 30 MHz.

The worst-case peaks were then identified and measured using an RF receiver using a quasi-peak detector and compared to the frequency range and limits of CISPR 22 as specified by ANSI C63.4-2003. Quasi-peak values that exceeded the average limit were then re-measured using the average signal detector.

The worst-case results are presented in this report.

Test instrumentation used in the conducted test was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
004	1	Rohde & Schwarz	ESH-3	893607/002	Test receiver (9kHz-30MHz)	10/01/2015
010	1	HP	8568B	2601A02322	Spectrum analyser	Internal
265	1	Rohde & Schwarz	ESH3-Z5	861189/003	Mains LISN / AMN	09/04/2015
189	1	Rohde & Schwarz	ESH3-Z2	-	Pulse limiter N type	12/07/2014

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.

4.0 TEST DATA

4.1 Power Line Conducted Emissions

4.1.1 Data

A search was made of the frequency spectrum between 0.15 MHz to 30 MHz and the measurements reported here are the highest emissions relative to the CISPR 22 Class B limits. Emissions that meet the average limit on a quasi-peak measurement are deemed to meet both the average and quasi-peak specification.

MAINS – LINE

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.640	45.1	56.0	20.5	46.0	Pass
3.722	42.9	56.0	15.5	46.0	Pass
13.568	36.0	60.0	31.1	50.0	Pass

MAINS – NEUTRAL

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.534	44.1	56.0	25.3	46.0	Pass
0.640	45.3	56.0	26.7	46.0	Pass
13.558	34.1	60.0	29.9	50.0	Pass

Uncertainty of measurement: ± 3.22dBµV for a 95% confidence level.

Measurements made according to the FCC rules and Hursley EMC Services test procedure CON-02.

TEST ENGINEER: Allan Wheelen

4.2 FCC – Radiated Emissions (Transmitting)

A search was made of the frequency spectrum from 9 kHz to 1 GHz and the measurements reported are the highest emissions relative to the 'FCC CFR 47 Section 15.209 and 15.255 Limits' at a measuring distance of three metres above 30MHz. Below 30 MHz the results at 5m have been compared to the limits extrapolated from 30m or 300m, the limits were extrapolated using 20 dB per decade. The transmitter emission ant 13.56MHz was re-measured at 10m and compared directly against the 30m limit.

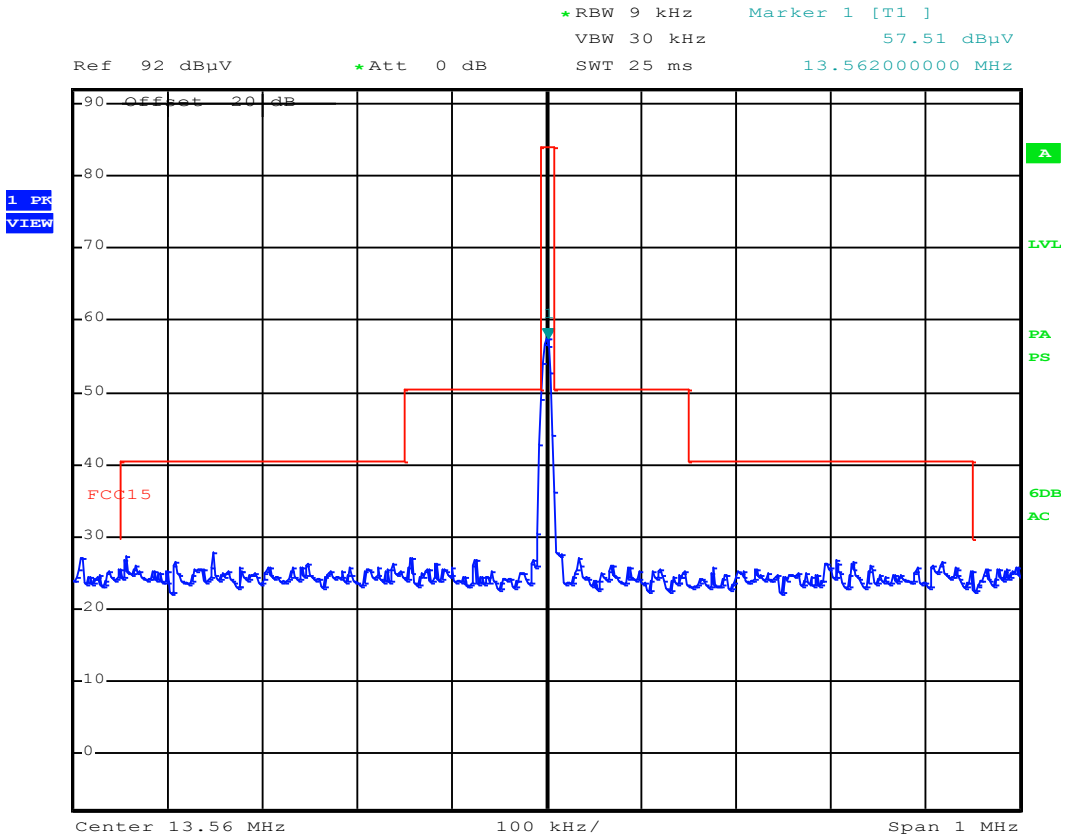
Measurements were made using a quasi-peak detector with a 9kHz bandwidth below 30MHz and a 120kHz bandwidth above 30MHz. Below 30MHz the only significant emission was from the transmitter at 13.56MHz. Below 30MHz no significant emissions were detected with the transmitter off (idle state).

RESULTS - 9 kHz to 30 MHz

Frequency	Receiver amplitude	Antenna factor	Measured amplitude @ 10m	Specified limit @ 30m	
MHz	dBµV	db	dBµV/m	dBµV/m	µV/m
13.560	32.0	20	52.0	84.0	15,848
13.554	21.6	20	31.6	84.0	15,848
13.566	21.4	20	31.4	84.0	15,848
13.567	17.6	20	37.6	50.5	334
13.553	17.7	20	37.7	50.5	334
13.700	1.0	20	21.0	50.5	334
13.420	1.0	20	21.0	50.5	334
13.410	1.0	20	21.0	40.5	106
13.710	1.0	20	21.0	40.5	106
13.110	1.0	20	21.0	29.5	30
14.010	1.0	20	21.0	29.5	30

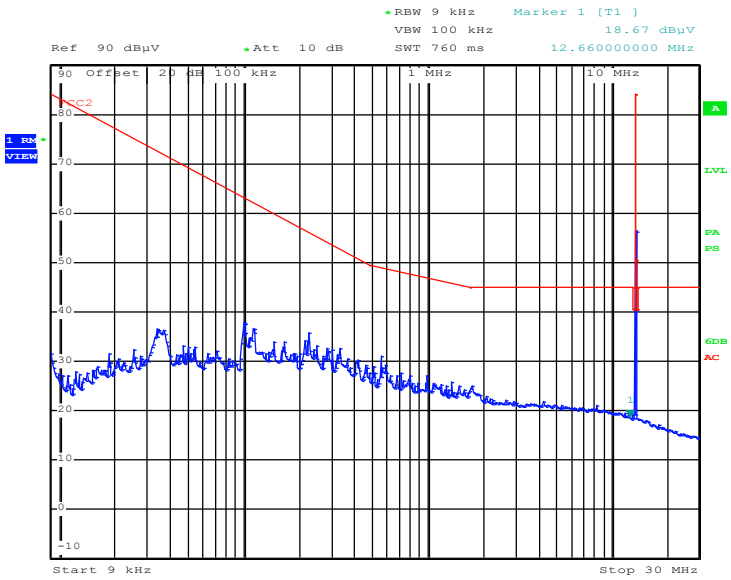
The attached plot shows the transmitter emission relative to the FCC part 15.255 limit envelope/mask.

4.3 Transmitter Mask



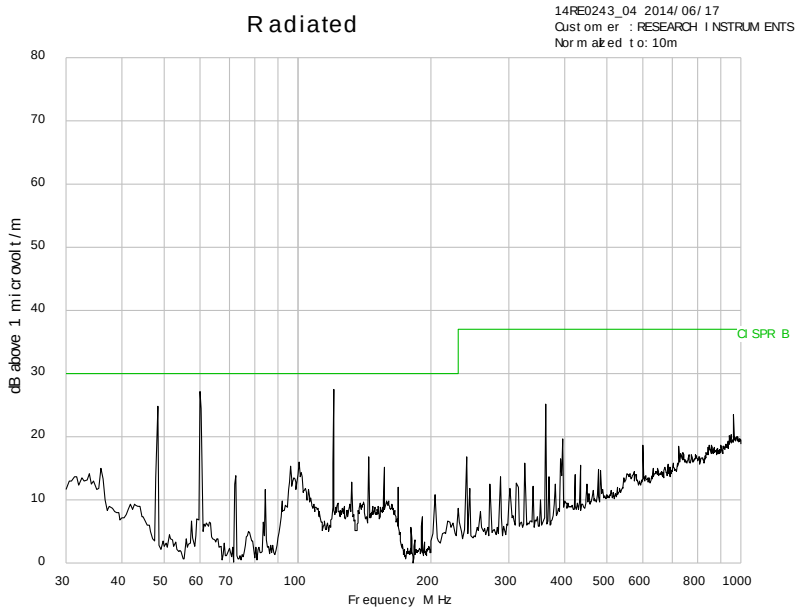
Date: 18.JUN.2014 18:07:43

4.4 Emissions Plots



Date: 18.JUN.2014 16:03:15

Below 30 MHz the results at 5m have been compared to the limits extrapolated from 30m or 300m, the limits were extrapolated using 20 dB per decade. Above 30MHz the results are measured at 3m and extrapolated to 10m to compare against the alternate CISPR limit.



Radiated emissions (continued)

RESULTS (Transmitting) - 30 MHz to 1000 MHz

Frequency	Receiver amplitude	Antenna factor	Cable loss	Actual quasi-peak value @ 3m	Specified limit @ 3m	
MHz	dBµV	dB	dB	dBµV/m	dBµV/m	µV/m
40.676	18.87	12.8	0.8	32.47	40.0	100
60.005	23.61	12.7	1.0	37.31	40.0	100
67.802	18.34	9.6	1.0	28.94	40.0	100
120.012	26.14	9.1	1.4	36.64	43.5	150
126.505	11.04	8.5	1.5	21.04	43.5	150
360.040	19.16	14.4	2.7	36.26	46.0	200

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1.0 GHz performed with a quasi-peak detector (120kHz BW). Measurements above 1.0 GHz performed with an average and peak detector (1MHz BW).

TEST ENGINEER: Ross Goodenough

Radiated emissions (continued)

RESULTS (Idle)- 30 MHz to 1000 MHz

Frequency	Receiver amplitude	Antenna factor	Cable loss	Actual quasi-peak value @ 3m	Specified limit @ 3m	
MHz	dBµV	dB	dB	dBµV/m	dBµV/m	µV/m
48.005	23.43	13.4	0.9	37.73	40.0	100
60.006	23.48	12.7	1.0	37.18	40.0	100
120.012	26.92	9.1	1.4	37.42	43.5	150
144.016	18.23	8.2	1.6	28.03	43.5	150
240.050	14.34	11.6	2.2	28.14	43.5	150
360.038	18.23	14.4	2.7	35.33	46.0	200

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector.

TEST ENGINEER: Ross Goodenough

4.5 Frequency Error

FCC 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% (85V to 265V) of the rated supply voltage (100-230V) at a temperature of 20 degrees C.

The EUT was placed in a climatic chamber. A small loop antenna was placed in a jig under the Transmitter; the output from the loop antenna was fed via a 10 dB attenuator into the input of the ESCI 7 spectrum analyser/receiver. The frequency of the transmitter was measured with an ESCI 7 receiver.

Limit = +/-100 ppm (+/-0.01%)

Temperature	Voltage	Frequency (MHz)	Delta Hz	Limit (Hz)	Pass / Fail
Normal	Nominal	13.55797	0	+/-1355.797	**Pass**
Normal	85%	13.55809	+120	+/-1355.797	**Pass**
Normal	115%	13.55809	+120	+/-1355.797	**Pass**
-20Deg	Nominal	13.55842	+450	+/-1355.797	**Pass**
-20Deg	85%	13.55842	+450	+/-1355.797	**Pass**
-20Deg	115%	13.55841	+440	+/-1355.797	**Pass**
+50Deg	Nominal	13.55794	-30	+/-1355.797	**Pass**
+50Deg	85%	13.55794	-30	+/-1355.797	**Pass**
+50Deg	115%	13.55795	-20	+/-1355.797	**Pass**

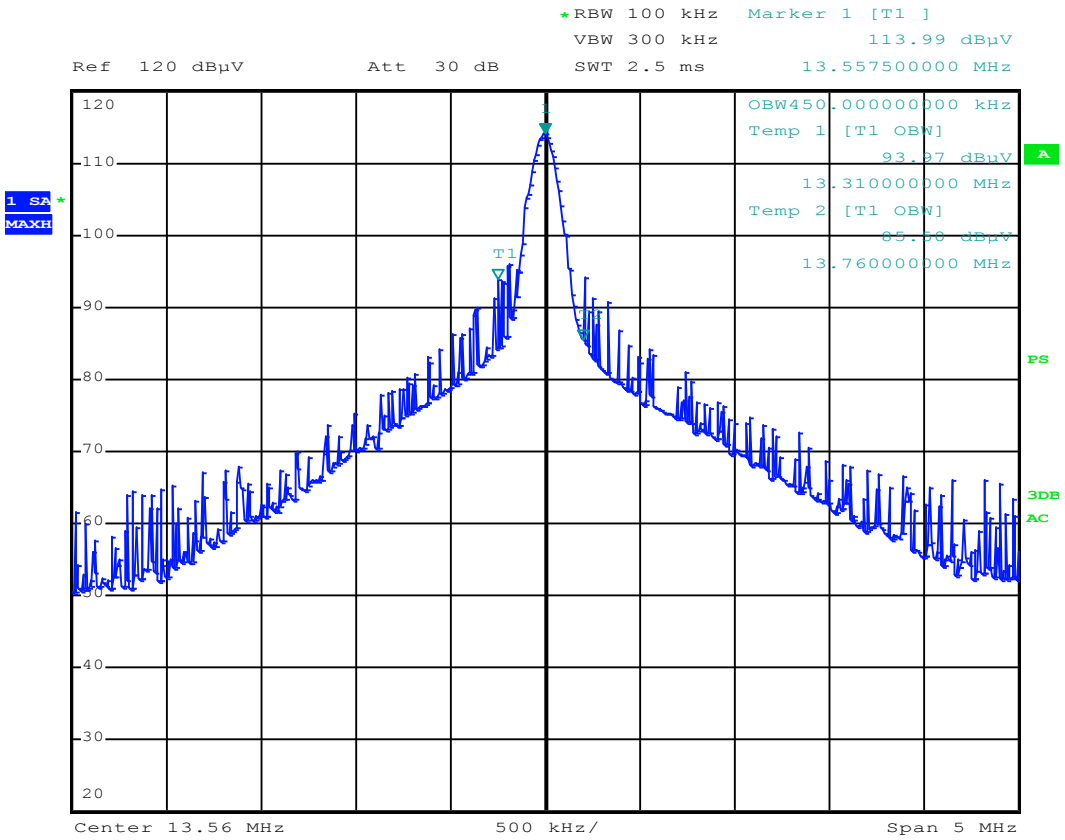
4.1 Occupied Bandwidth

Section 4.6 of RSS-GEN

A small loop antenna was placed in a jig under the Transmitter; the output from the loop antenna was fed via a 10 dB attenuator into the input of the spectrum analyzer. The bandwidth of the transmitter was measured with an ESCI 7 receiver set to 99% Occupied Bandwidth with a sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated on the occupied bandwidth plot (modulated) included with this report.

The bandwidth of the Transmitter was measured as 450 kHz (modulated).

4.2 Bandwidth Plot



Date: 7.JUL.2014 16:19:16

5.0 FCC DETAILS

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,

Thomas Phillips
Electronics Engineer

6.0 INDUSTRY CANADA LETTER

Industry Canada Industrie Canada

May 22, 2013

OUR FILE: 46405-7104
Submission No: 167120

Hursley EMC Services Ltd.
Unit 16, Brickfield Lane, Eastleigh
Hampshire
GBR
SO53 4DP

Attention: Rob St. John James

Dear Sir:

The Bureau has received your application for the renewal of 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought **(Site# 7104A-1)**. Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **7104A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to **exceed three years**. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca Please reference our file and submission number above for all correspondence.

Yours sincerely,

Bill Payn
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Certification and Engineering Bureau
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