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TEST REPORT

Saber Farm Automation Modular System

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A and B – Unintentional Radiators

for

LIC Automation Ltd

This Test Report is issued with the authority of:

A handwritten signature in black ink, appearing to read "Andrew Cutler", is shown within a rectangular box.

Andrew Cutler – General Manager



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation

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1. STATEMENT OF COMPLIANCE

The **Saber Farm Automation Modular System** complies with FCC Part 15 Subparts A and B as a Class A Unintentional Radiator when the methods as described in ANSI C63.4 – 2014 are applied.

2. RESULTS SUMMARY

The results from testing carried out in June 2017 are summarised in the following table:

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	Verification required as the device would be categorised as “Other Class A digital devices”.
15.103	Exempted devices.	System contains a digital device and therefore it is not an exempt device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies with a 4.2 dB margin at 22.376 MHz (Average) when the Class B limits are applied.
15.109	Radiated Emissions 30 - 1000 MHz	Complies with a 0.0 dB margin at 51.525 MHz (Vertical) when the Class A limits are applied.
15.111	Antenna Terminal Disturbance 30 – 950 MHz	Not applicable. Device is not a receiver.

3. INTRODUCTION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

4. CLIENT INFORMATION

Company Name LIC Automation Ltd

Postal Address PO Box 20306
Hamilton 3241

Street Address 119 Maui Street
Pukete
Hamilton 3200

Country New Zealand

Contact Mr Chris Anderson

5. DESCRIPTION OF TEST SAMPLE

Brand Name	Saber
Model	-
Product	Farm Automation Modular System
Manufacturer	LIC Automation Ltd
Country of Origin	New Zealand
Serial Number	System not serialised

The system that was tested consisted for the following individual items:

EID / RFID Readers

This consisted of:

- 3 x 1002206 TIRIS S251B EID / RFID Readers
- 1 x Wieland wipos P1 24-10 Representative Switch Mode Power Supply
- 3 x Allflex test eartag
- 50 metre cables to supply 24 Vdc power and Cat 5e communications (synch, RS 232)
- 3 x 134.2 kHz Dummy loads

The EID readers operate on 134.2 kHz and will be “phase synchronised” in Master-Slave-Slave mode.

The ‘charge-up / read’ cycle is a 50 msec on and 20 msec off (ISO 11784/5 HDX).

Testing was carried out with the antenna ports being terminated with passive dummy loads.

The Wieland power supply also powered the Accubail Kit items that are listed below.

Accubail Kit

This consisted of

- 1 x 1002237 OMRON Photo Eye pair
- 1 x 1002671 OMRON M30 Proximity Switch
- 1 x 1002216 SUNX Cow in bail Photo-eye

Milk Meters

This consisted of:

Device	Serial Number	SAP Code
YieldSense 2.1	03008873	1005128
YieldSense 2.5	UID: 5909739	-
CellSense 3	03000599	1004931
CellSense 3.5	UID: 5909565	-
OWL	UID: 6096638	1005039

Typical lengths of Power and Ethernet / CANbus cables provided in order to connect these devices into the system.

All these items were placed on a wooden board and tested with the EID readers operating using a read cycle of 50 ms on / 20 ms off.

The milk meters were powered using a MW Meanwell DRP 240-24-PS (10A) Power Supply.

The Meanwell power supply also powered the Universal Dairy Automation Controller which is described below.

Universal Dairy Automation Controller (UDA)

This consisted of:

- 1 x Universal Dairy Automation Controller

This is connected to the TIRIS Reader using a RS 232 serial communications.

Typical lengths of Power and Ethernet / CANbus cables provided in order to connect the various devices in the system together

6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subparts A and B as a Class A digital device.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 2014 were used.

Section 15.101: Equipment authorisation requirement

The digital device would be classed as an Other Class A digital devices and peripherals.

The verification process has been applied.

Section 15.107: Conducted emissions testing

Conducted Emissions testing was carried out over the frequency range of 150 kHz to 30 MHz which was carried out at the laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room

The device was placed on top of the emissions table, which is 0.8 m x 0.8 m, 80 cm above the screened room floor which acts as the horizontal ground plane.

In addition the device was positioned 40 cm away from the screened room wall which acts as the vertical ground plane.

The artificial mains network was bonded to the screened room floor.

At all times the device was kept more than 80 cm from the artificial mains network.

The supplied plot is combined plot showing the worst case quasi peak and average results of both the phase and neutral lines to the representative AC power supply.

Quasi peak and average detectors have been used with resolution bandwidths of 9 kHz.

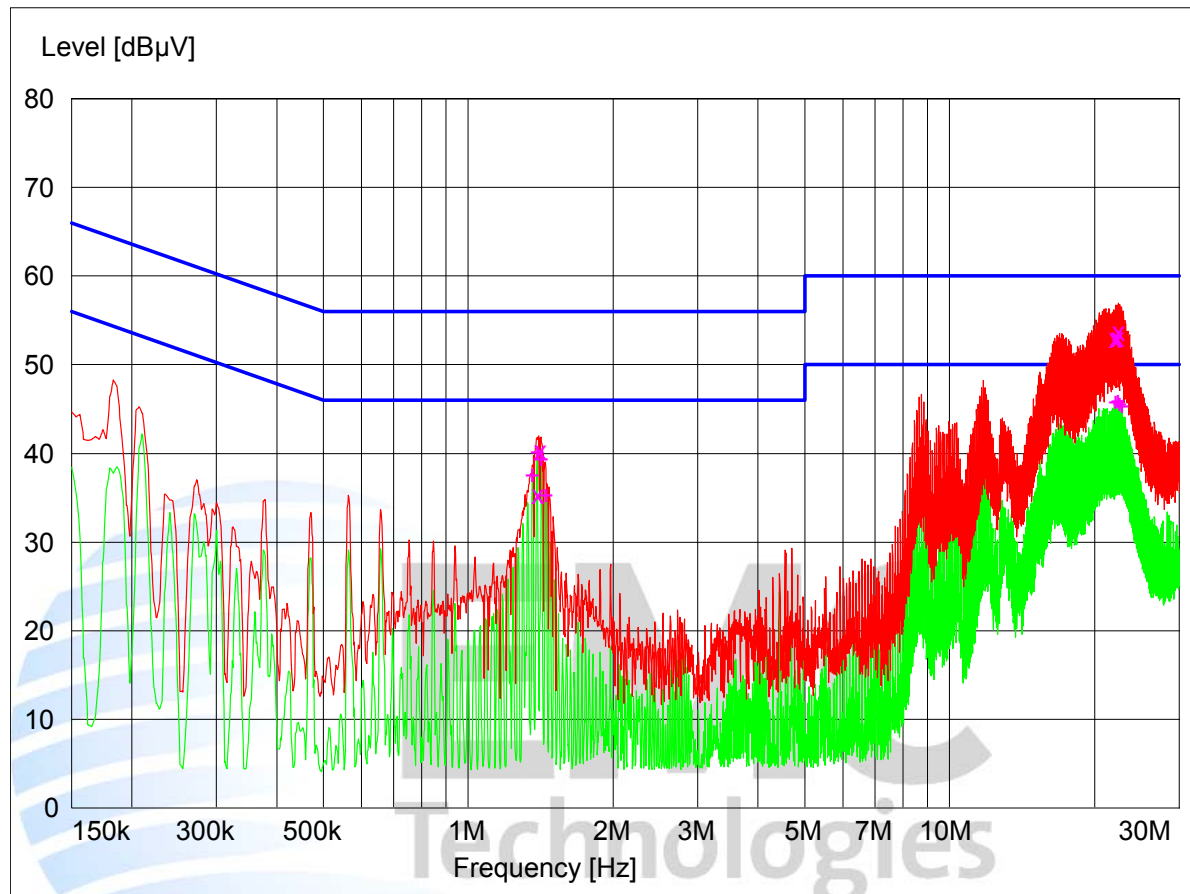
Measurement uncertainty with a confidence interval of 95% is:

- AC Mains port $(0.15-30 \text{ MHz}) \pm 2.8 \text{ dB}$

Conducted Emissions – AC Input Power Port

Setup: System tested when powered at 120 Vac 60 Hz when all items were connected together on the supplied test board and when the 134.2 kHz devices were operating in 50 ms on / 20 ms off read cycle with dummy loads attached to the antenna ports.

Peak --- Average -- Quasi Peak X Average +



Final Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
1.401000	35.40	56.0	20.6	N	
1.416000	40.40	56.0	15.6	N	
22.187000	53.00	60.0	7.0	N	
22.380500	53.10	60.0	6.9	N	
22.470500	53.10	60.0	6.9	N	
22.565000	53.70	60.0	6.3	N	

Final Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
1.359000	37.50	46.0	8.5	N	
1.389000	40.10	46.0	5.9	N	
1.419000	39.30	46.0	6.7	N	
1.449000	35.30	46.0	10.7	N	
22.092500	45.70	50.0	4.3	N	
22.376000	45.80	50.0	4.2	N	
22.565000	45.50	50.0	4.5	N	
22.844000	45.30	50.0	4.7	N	

Section 15.109: Radiated emission limits

Radiated emissions testing was carried out over the frequency range of 30 to 1000 MHz as the highest frequency in use in the digital device is less than 108 MHz.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

Before testing was carried out, a receiver Self Test and Internal Calibration was undertaken along with a check of all connecting cables and programmed antenna factors.

The device was placed on the test tabletop, which was a total of 0.8 m above the test site ground plane.

Measurements of the radiated field were made by manually scanning between 30 and 1000 MHz in 100 kHz steps while aurally and visually monitoring for emissions.

Measurements were made at a distance of 10 meters between 30 – 1000 MHz.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower.

The emission is measured in both vertical and horizontal antenna polarisations using a Quasi Peak detector with a bandwidth of 120 kHz below 1 GHz.

During the test, a number of ambient emissions are identified (list of which can be provided upon request).

The emission level is determined in field strength by taking the following into consideration:

Level (dB μ V/m) = Receiver Reading (dB μ V) + Antenna Factor (dB/m) + Coax Loss (dB)

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) $\pm$ 4.1 dB

Radiated Emissions 30 – 1000 MHz

Device was tested when powered at 120 Vac 60 Hz which powered the 24 Vdc power supply.

Placed on top of the test table was the supplied test board which contained the UDA, Milk Meters and the Meanwell 24 Vdc power supply along with various interconnecting cables including a RS-232 Serial link between the UDA and the EID Master Reader.

The Master EID Reader unit and 2 Slave EID Reader units were loosely placed on top of the devices on to the test board with the antennas on each device being replaced by 134.2 kHz passive dummy loads.

Attached to the Master Reader unit was a Wieland Power Supply that supplied voltage to the 3 EID readers.

The Accubail Kit which consisted of Photo Eyes and a Proximity switch was contained within the Master Reader box and they were all attached to the Wieland Power Supply.

The Master and Slave devices were connected to the system using various supplied power and communications cables that were draped and coiled on top of the turntable.

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result	Antenna
30.300	34.5		39.0	4.5	Pass	Vertical
34.350	26.2		39.0	12.8	Pass	Vertical
51.525	39.0		39.0	0.0	Pass	Vertical
60.300	37.5		39.0	1.5	Pass	Vertical
68.700	38.8		39.0	0.2	Pass	Vertical
85.875	33.1		39.0	5.9	Pass	Vertical
103.050	36.1	37.4	43.5	6.1	Pass	Horizontal
120.225	37.3		43.5	6.2	Pass	Vertical
137.400	43.3	38.1	43.5	0.2	Pass	Vertical
154.575	36.8		43.5	6.7	Pass	Vertical
171.750	36.6		43.5	6.9	Pass	Vertical

Predominate emissions were observed to occur every 17.175 MHz approximately

All other emissions were observed to have a margin to the limit that exceeded at least 15 dB when measurements were attempted between 30 – 1000 MHz using both vertical and horizontal antenna polarisations.

Result: Complies.

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Period
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	Not applic
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	Not applic
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	Not applic
Loop Antenna	EMCO	6502	9003-2485	3798	4 July 2017	3 years
VHF Balun	Schwarzbeck	VHA 9103	9594	3696	3 Feb 2018	3 years
Biconical Antenna	Schwarzbeck	BBA 9106	-	3680	3 Feb 2018	3 years
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	1 Dec 2017	3 years
Mains Network	R & S	ESH2-Z5	881362/001	3805	4 August 2017	2 years
Receiver	R & S	ESHS 10	828404/005	3728	9 June 2018	2 years
Receiver	R & S	ESIB 40	100295	INV0818	27 April 2018	1 year

All test equipment was within calibration at the time of testing.

8. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was updated in June 2014.

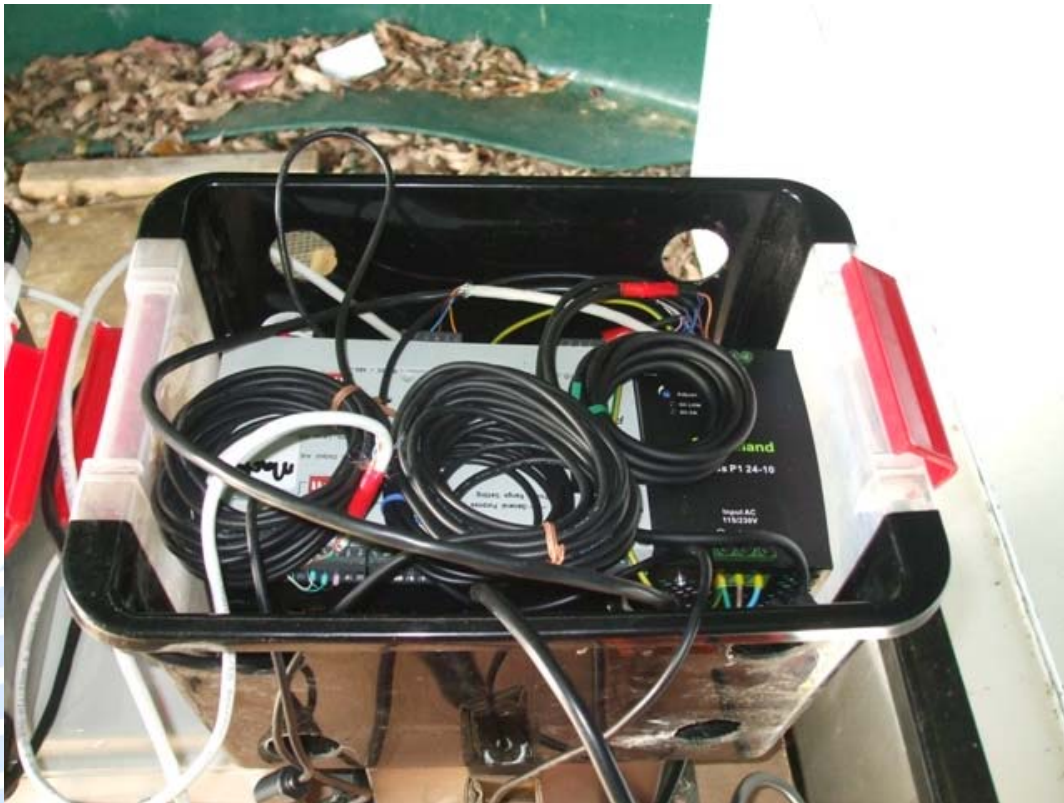
All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

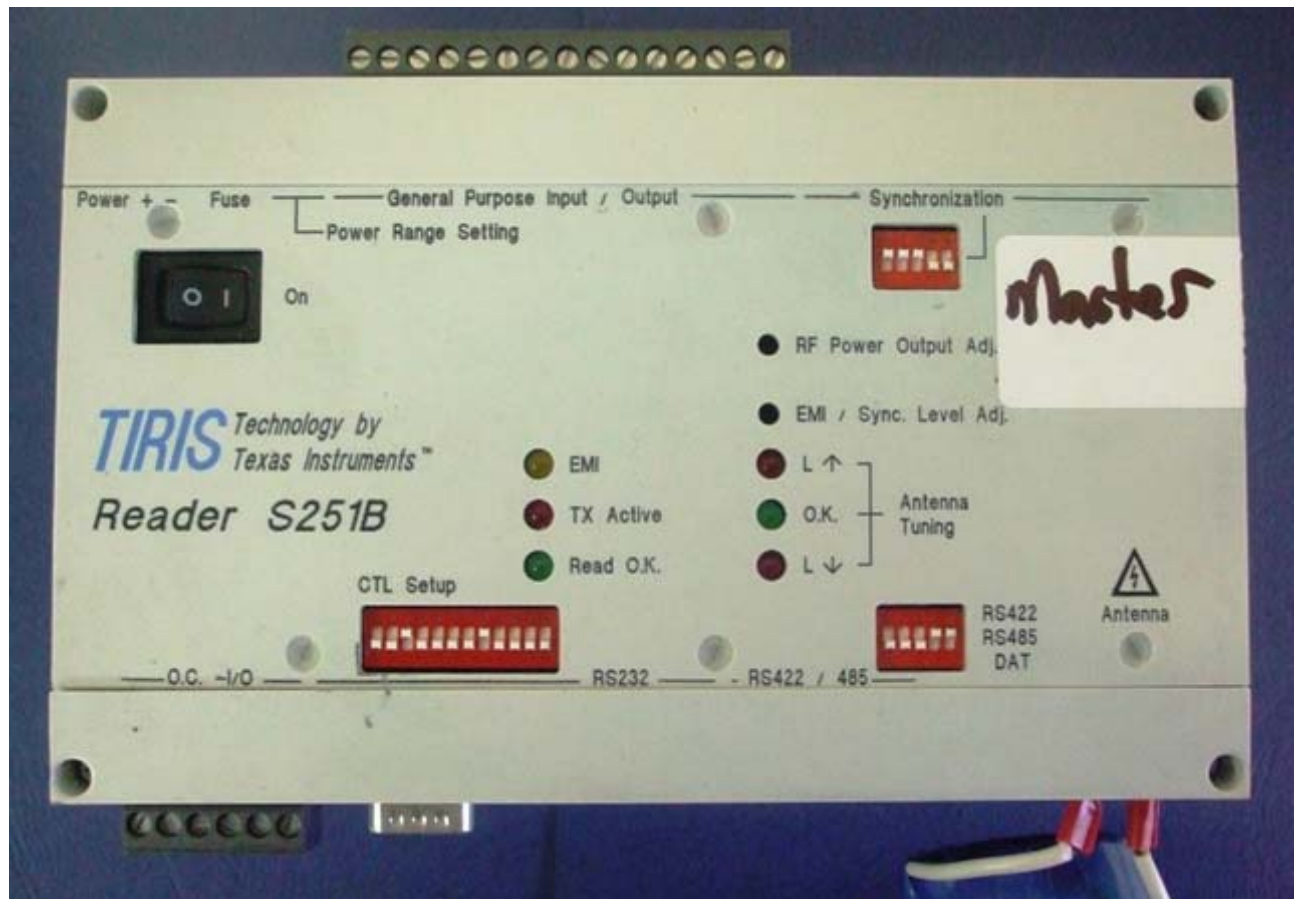
All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with accreditation bodies in a number of economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

9. PHOTOGRAPHS

External Photos Of Items Tested - Master box





Also enclosed in the Master Box Were



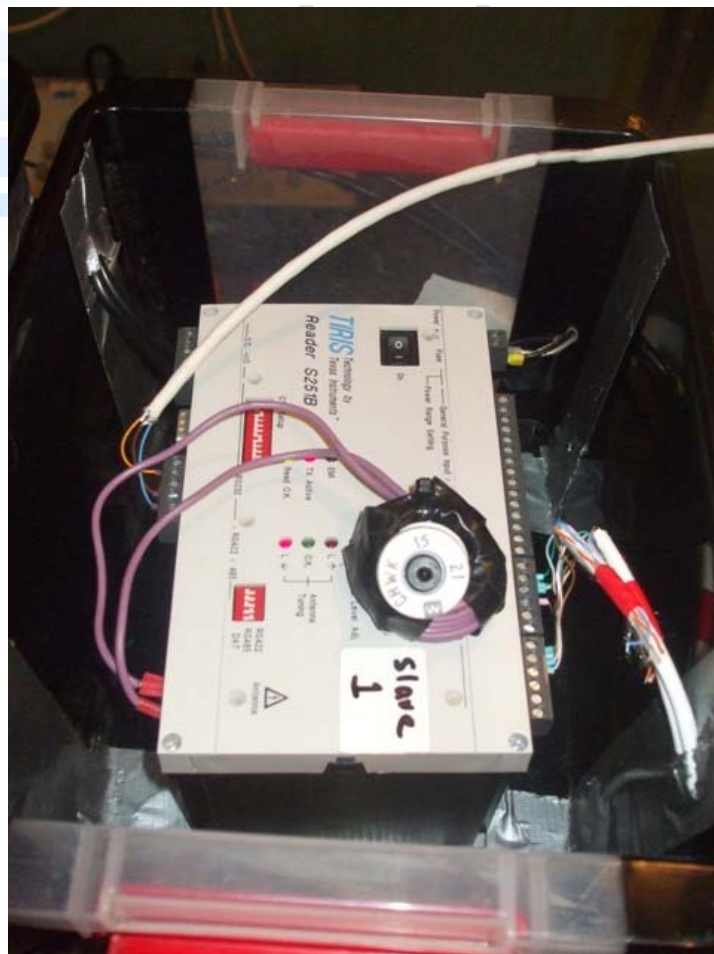
Attached to the Wieland Power Supply was the Accubail Kit that consisted of an OMRON Photo Eye pair, an OMRON M30 Proximity Switch and a SUNX Cow in bail Photo-eye







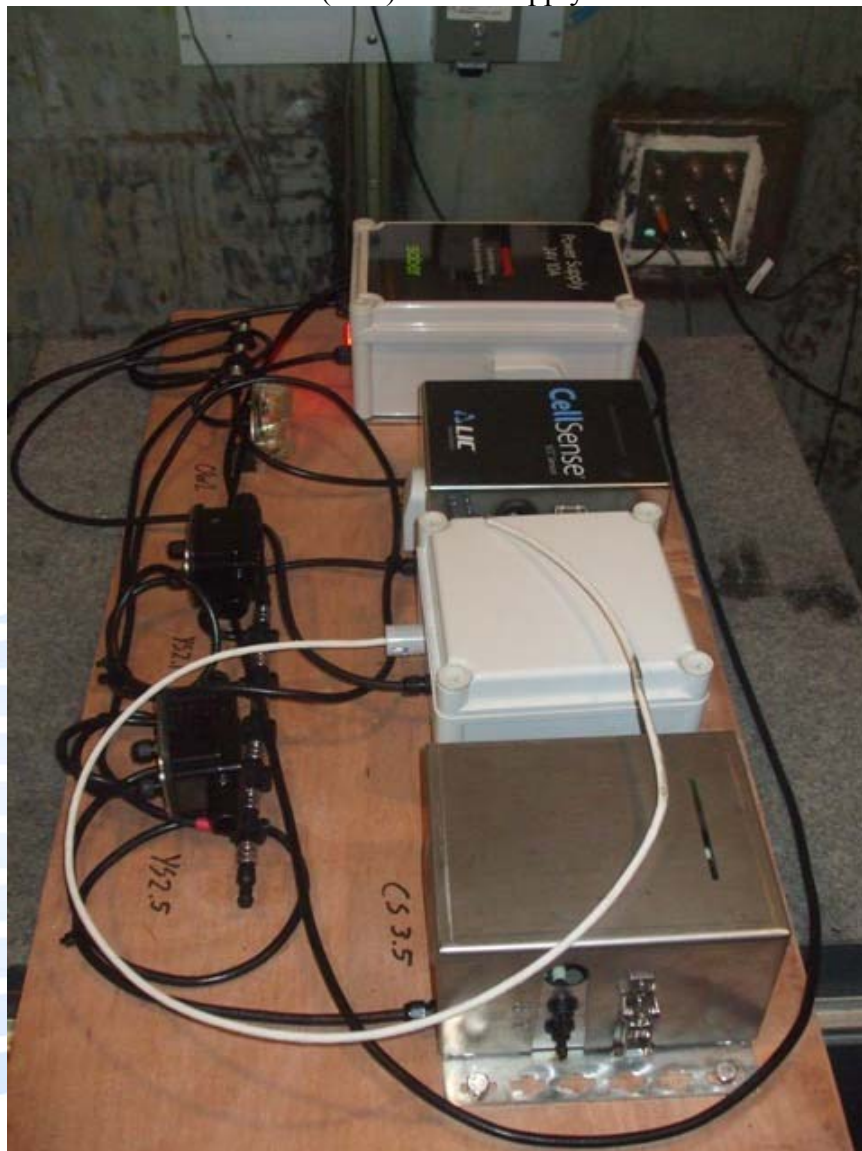
Slave 1 box

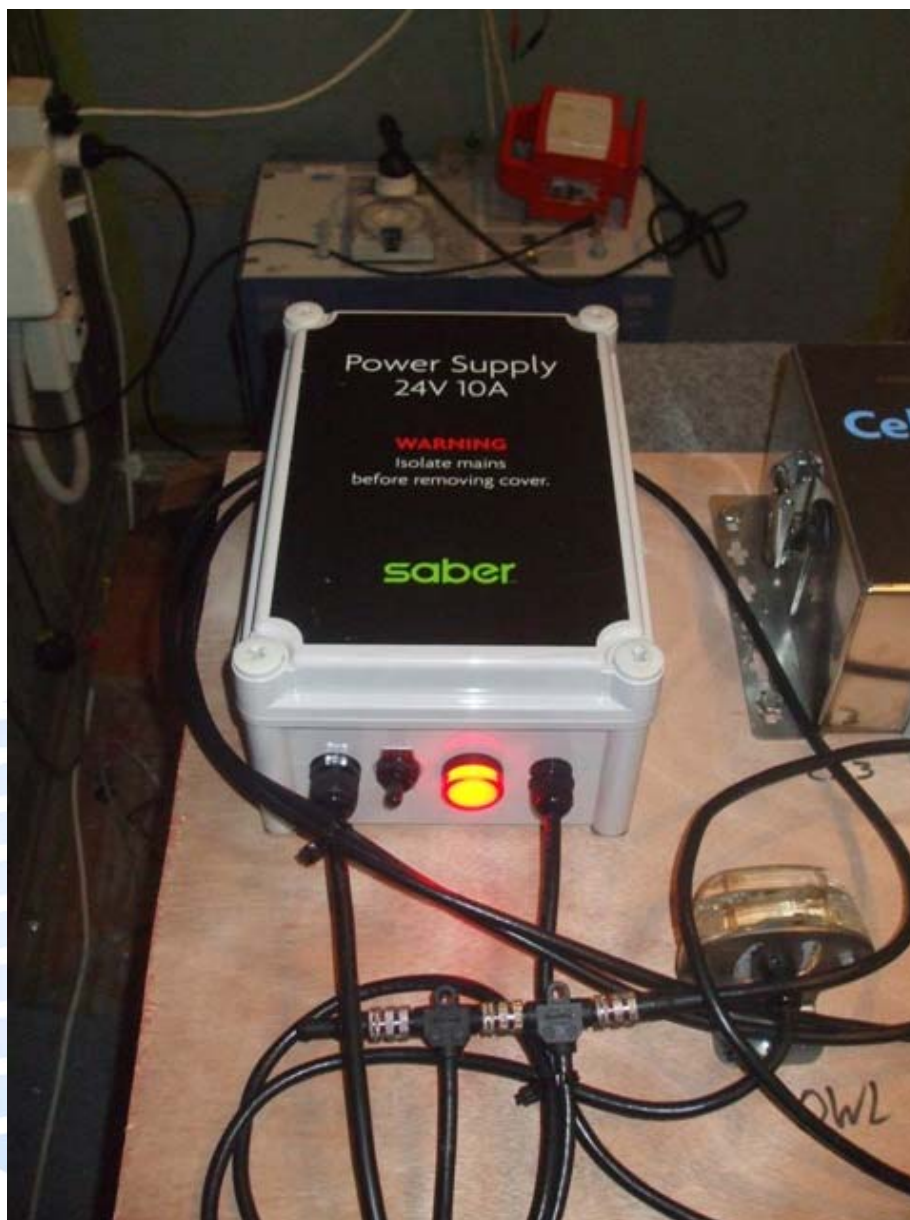


Slave 2 Box



Universal Dairy Automation Controller, Cellsense, Yieldsense with Interbail/OWL Cable,
OWL and Meanwell DRP 240-24-PS (10A) Power Supply





Conducted emission test set up photos



Radiated Emissions Test Set Up





