Nemko-CCL, Inc.

1940 West Alexander Street
Salt Lake City, UT 84119
801-972-6146

Test Report

Certification

Test Of:

Locator

FCC ID: QFG11033689

Test Specification:

FCC PART 15, Subpart C

Test Report Serial No: 224457-3.2

Applicant:
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268

Date of Test: November 6, 2012

Issue Date: December 19, 2012

Accredited Testing Laboratory By:

NVLAP

NVLAP Lab Code 100272-0

CERTIFICATION OF ENGINEERING REPORT

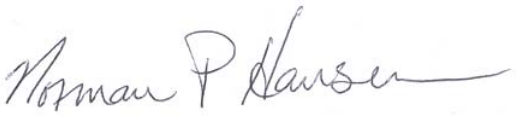
This report has been prepared by Nemko-CCL, Inc. to document compliance of the device described below with the requirements of Federal Communications Commission (FCC) Part 15, Subpart C. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: Dow AgroSciences LLC
- Manufacturer: Key Electronics
- Brand Name: Dow AgroSciences
- Model Number: Locator
- FCC ID Number: QFG11033689

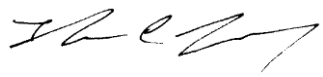
On this 19st day of December 2012, I, individually, and for Nemko-CCL, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has recognized that the Nemko-CCL, Inc. EMC testing facilities are in good standing, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Nemko-CCL, Inc.



Tested by: Norman P. Hansen
EMC Technician



Reviewed by: Thomas C. Jackson
General Manager

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SECTION 1.0 CLIENT INFORMATION

1.1 Applicant:

Company Name: Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268

Contact Name: Matt Sanders

1.2 Manufacturer:

Company Name: Key Electronics
2533 Centennial Blvd.
Jefferson, IN 47130-08535

Contact Name: Chris Browning
Title: Project Manager

SECTION 2.0 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of EUT:

Brand Name:	Dow AgroSciences
Model Number:	Locator
Serial Number:	None
Dimensions:	17.15 cm diameter x 4.5 cm height
Country of Manufacture:	U.S.A.

2.2 Description of EUT:

The Locator is a 125 kHz RFID tag locator for use in termite baiting/control applications. The Locator operates from a Tenergy 31704 rechargeable Li-Polymer battery. The battery is charged using a CUI Inc. DSA-0151F-24A power supply.

This report covers the 125 kHz transmitter subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Part 15, Subpart B has been tested and the results documented in Nemko-CCL report #224457-2.

2.3 EUT and Support Equipment:

The EUT and support equipment used during the test are listed below:

Brand Name Model Number Serial No.	FCC ID Number	Description	Name of Interface Ports / Interface Cables
BN: Dow AgroSciences MN: Locator (Note 1) SN: None	QFG11033689	125 kHz RFID locator	See Section 2.4
BN: CUI Inc. MN: DSA-0151F-24A SN:None	DoC	Power Supply	DC/2 conductors

Note: (1) EUT

2.4 Interface Ports on EUT:

Name of Ports	No. of Ports Fitted to EUT	Cable Descriptions/Length
DC/Charge	1	2 conductors/1.5 meters

2.5 Modification Incorporated/Special Accessories on EUT:

The following modifications were made to the EUT by the Client to comply with the specification. This report is not complete without an accompanying signed attestation, that the product will have all of the documented modifications incorporated into the product when manufactured and placed on the market.

1. The software was changed so the transmitter cannot transmit when charging the battery or there is power at the DC entry connector.

SECTION 3.0 TEST SPECIFICATION, METHODS & PROCEDURES

3.1 Test Specification:

Title: FCC PART 15, Subpart C (47 CFR 15)
15.203, and 15.209

Limits and methods of measurement of radio interference characteristics of radio frequency devices

Purpose of Test: The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures:

3.2.1 §15.203 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

3.2.2 §15.209 Radiated Emission Limits, General Requirements

(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:

(b)

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (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.

(c) In the emission table above, the tighter limit applies at the band edges.

(d) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(e) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(f) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(g) In accordance with § 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in § 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in § 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in § 15.109 that are applicable to the incorporated digital device.

(h) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

3.3 Test Procedure

The testing was performed according to the procedures in ANSI C63.4: 2003. Testing was performed at Nemko-CCL, Inc. Wanship open area test site #2, located at 29145 Old Lincoln Highway, Wanship, UT. This site has been registered with the FCC, and was renewed February 15, 2012 (90504). This registration is valid for three years.

Nemko-CCL, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2013.

SECTION 4.0 OPERATION OF EUT DURING TESTING

4.1 Operating Environment:

Power Supply: 11.1 VDC from Li-Polymer battery

4.2 Operating Modes:

The transmitter was tested while constantly reading an RFID tag. The EUT was tested on 3 orthogonal axes. The battery was fully charged for testing.

4.3 EUT Exercise Software:

Dow AgroSciences LLC software was used to exercise the transmitter.

SECTION 5.0 SUMMARY OF TEST RESULTS

5.1 FCC Part 15, Subpart C

5.1.1 Summary of Tests:

Section	Environmental Phenomena	Frequency Range (MHz)	Result
15.203	Antenna Requirements	Structural requirement	Complied
15.209	Radiated emissions	0.125 - 1000	Complied

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

SECTION 6.0 MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS

6.1 General Comments:

This section contains the test results only. A list of the test equipment used during the measurements can be found in Appendix 1 of this report.

6.2 Test Results:

6.2.1 §15.203 Antenna Requirements

The EUT uses an internal coil antenna and is not user replaceable.

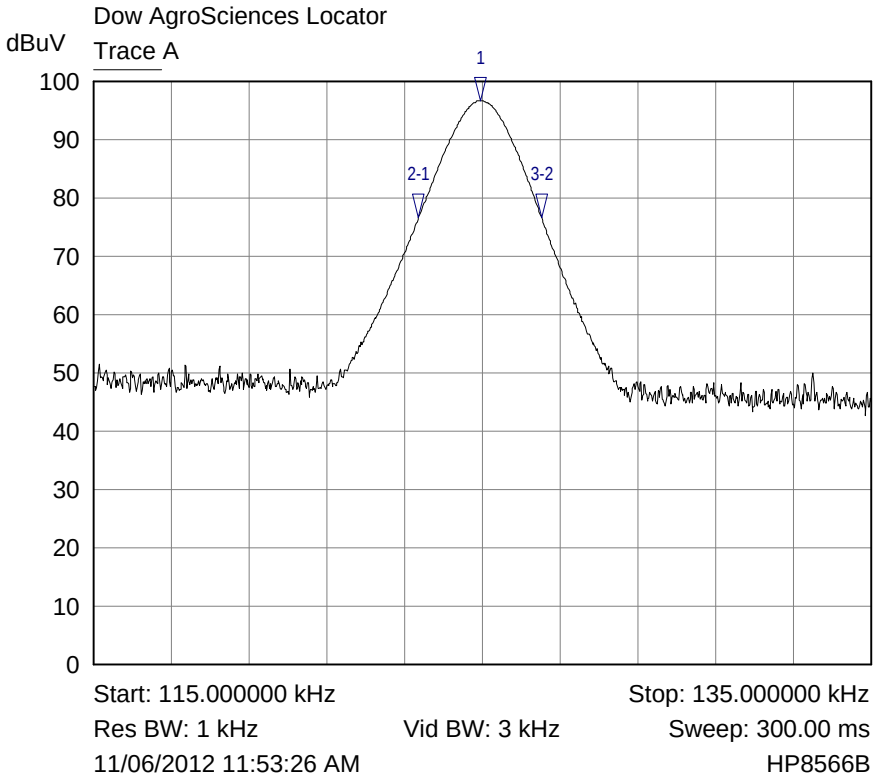
6.2.2 §15.209 Radiated Emissions

6.2.2.1 Fundamental Emission

The fundamental emission was measured at a 10 meter distance and at a 3 meter distance. The limit is specified at a 300 meter distance. 40 dB/decade was used to adjust the limit to reflect the measurement distance used. A fundamental emission plot at 3 meters distance is also shown. The bandwidth of the emission is 3.16 kHz.

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	10 m Limit (dBµV/m)	Margin (dB)
0.125	Peak (Note 1)	66.8	10.5	77.3	84.8	-7.5

Frequency (MHz)	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	3 m Limit (dBµV/m)	Margin (dB)
0.125	Peak (Note 1)	86.5	10.5	97.0	105.7	-8.7



Mkr	Trace	X-Axis	Value	Notes
1	Trace A	124.940000 kHz	96.7000 dBuV	
2-1	Trace A	-1.580000 kHz	-20.1000 dB	
3-2	Trace A	3.160000 kHz	0 dB	20 dB bandwidth

6.2.2.1 Harmonic and Spurious Emissions

Harmonic and spurious emissions from 0.125 MHz to 30 MHz were measured at a 10 meter distance and were found to be at or below the noise floor. The emissions were then measured at 3 meters and compared to the 40 dB/decade adjusted for distance limit. Emissions from 30 MHz to 1000 MHz were measured at a 3 meter distance and compared to the 3 meter limit. Results of the 3 meter testing are shown below.

Frequency (MHz)	Detector/Polarity of Antenna	Receiver Reading (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	3 m Limit (dBµV/m)	Margin (dB)
0.250	Peak/Vertical (Note 1)	54.4	10.5	64.9	99.6	-34.7
0.375	Peak/Vertical (Note 1)	47.7	10.3	58.0	96.1	-38.1
0.500	Peak/Vertical (Note 2)	40.5	10.7	51.2	73.6	-22.4

Frequency (MHz)	Detector/Polarity of Antenna	Receiver Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	3 m Limit (dBμV/m)	Margin (dB)
0.625	Peak/Vertical (Note 2)	44.9	10.7	55.6	71.7	-16.1
0.750	Peak/Vertical (Note 2)	37.9	10.7	48.6	70.1	-21.5
0.875	Peak/Vertical (Note 2)	38.1	10.7	48.8	68.8	-20.0
1.000	Peak/Vertical (Note 2)	33.6	11.4	45.0	67.6	-22.6
1.125	Peak/Vertical (Note 2)	32.9	11.3	44.2	66.6	-22.4
1.250	Peak/Vertical (Note 2)	30.2	11.3	41.5	65.7	-24.2
448.75	Quasi-Peak/Vertical (Note 2)	19.4	22.2	41.6	46.0	-4.4
560.75	Quasi-Peak/Vertical (Note 2)	18.9	24.9	43.8	46.0	-2.2
641.75	Quasi-Peak/Vertical (Note 2)	15.7	26.2	41.9	46.0	-4.1
656.75	Quasi-Peak/Vertical (Note 2)	17.1	26.5	43.6	46.0	-2.4
672.75	Quasi-Peak/Vertical (Note 2)	17.5	27.2	44.7	46.0	-1.3
689.50	Quasi-Peak/Vertical (Note 2)	15.6	27.6	43.2	46.0	-2.8
704.75	Quasi-Peak/Vertical (Note 2)	12.1	27.7	39.8	46.0	-6.2
721.63	Quasi-Peak/Horizontal (Note 2)	13.6	27.8	41.4	46.0	-4.6
752.75	Quasi-Peak/Horizontal (Note 2)	14.6	27.9	42.5	46.0	-3.5
769.63	Quasi-Peak/Horizontal (Note 2)	14.1	28.2	42.3	46.0	-3.7
785.63	Quasi-Peak/Horizontal (Note 2)	13.8	28.6	42.4	46.0	-3.6
801.63	Quasi-Peak/Horizontal (Note 2)	13.9	28.8	42.7	46.0	-3.3
817.63	Quasi-Peak/Horizontal (Note 2)	13.0	29.4	42.4	46.0	-3.6
833.63	Quasi-Peak/Horizontal (Note 2)	11.9	29.4	41.3	46.0	-4.7
848.75	Quasi-Peak/Horizontal (Note 2)	11.6	29.4	41.0	46.0	-5.0

Frequency (MHz)	Detector/Polarity of Antenna	Receiver Reading (dBμV)	Correction Factor (dB/m)	Field Strength (dBμV/m)	3 m Limit (dBμV/m)	Margin (dB)

Note 1: The reference detector used for the measurements was peak and the data was compared to the average limit.

Note 2: The reference detector used for the measurements was peak or quasi-peak and the data was compared to the quasi-peak limit.

APPENDIX 1 TEST PROCEDURES AND TEST EQUIPMENT

A1.1 Radiated Spurious Emissions in the Restricted Bands

The radiated emissions from the intentional radiator were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A loop antenna was used to measure emissions below 30 MHz. Emission readings more than 20 dB below the limit at any frequency may not be listed in the reported data. For frequencies between 9 kHz and 30 MHz, or the lowest frequency generated or used in the device greater than 9 kHz, and less than 30 MHz, the spectrum analyzer resolution bandwidth was set to 9 kHz and the video bandwidth was set to 30 kHz. For average measurements, the spectrum analyzer average detector was used.

For frequencies above 30 MHz, an amplifier and preamplifier were used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges.

A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz at a distance of 3 meters and 10 meters from the EUT. The readings obtained by the antenna are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the intentional radiator was varied to find the maximum radiated emission. The intentional radiator was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cables were manipulated manually by a technician to obtain worst case radiated emissions. The intentional radiator was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there are multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

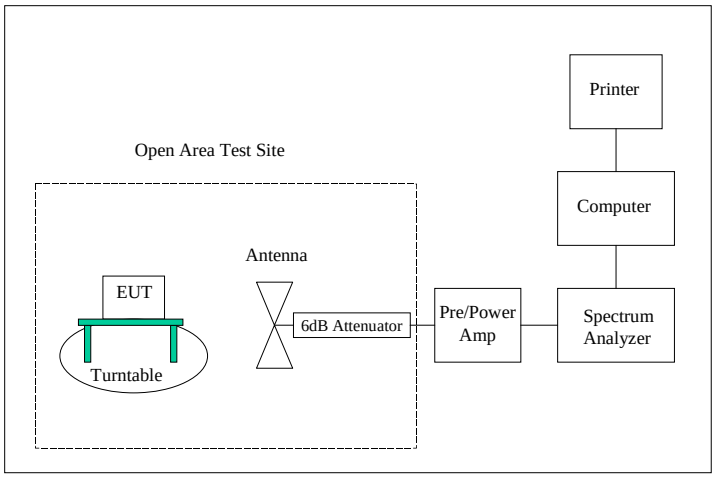
Desktop intentional radiators are measured on a non-conducting table 80 centimeters above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the intentional radiator. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

For radiated emission testing at 30 MHz or below that is performed at distances closer than the specified distance, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Due Date of Calibration
Wanship Open Area Test Site #2	Nemko-CCL, Inc.	N/A	N/A	11/16/2011	11/16/2012
Test Software	Nemko-CCL, Inc.	Radiated Emissions	Revision 1.3	N/A	N/A
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	100064	07/28/2012	07/28/2013
Spectrum Analyzer	Hewlett Packard	8566B	2230A01711	01/17/2012	01/17/2013
Quasi-Peak Detector	Hewlett Packard	85650A	2043A00137	01/18/2012	01/18/2013
Loop Antenna	EMCO	6502	2011	03/11/2011	03/11/2013
Biconilog Antenna	EMCO	3142	9601-1009	04/21/2011	04/21/2013
20’ Cable	Microcoax	UFB197C-1-3120-000000	1297	05/14/2012	05/14/2013
3 Meter Radiated Emissions Cable Wanship Site #2	Microcoax	UFB205A-0-4700-000000	1295	05/10/2011	05/10/2013
Pre/Power-Amplifier	Hewlett Packard	8447F	3113A05161	08/27/2012	08/27/2013

An independent calibration laboratory or Nemko-CCL, Inc. personnel calibrates all the equipment listed above at intervals defined in ANSI C63.4:2003 Section 4.4 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

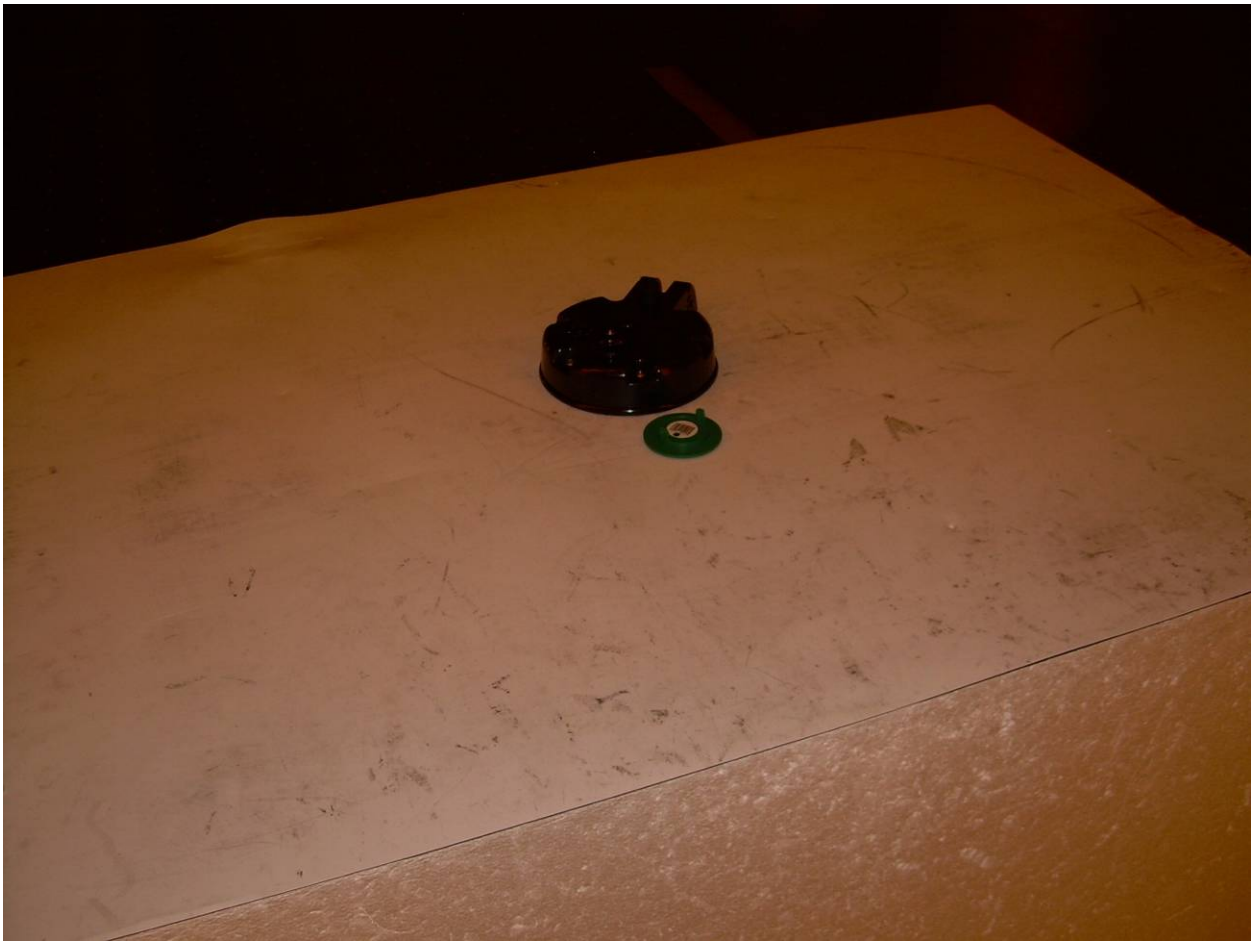
Radiated Emissions Test Setup



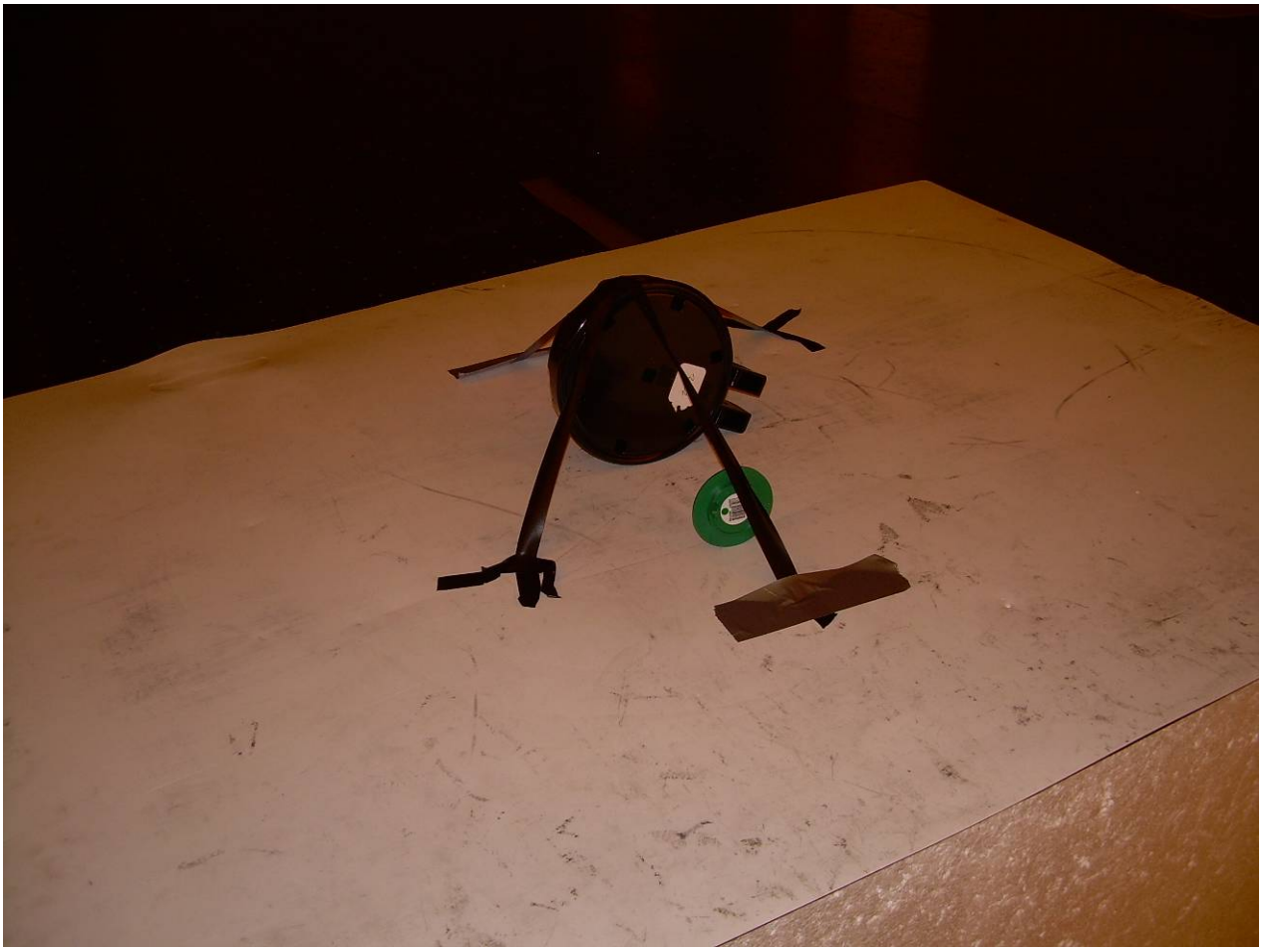
APPENDIX 2 PHOTOGRAPHS

Photograph 1 – Front View Radiated Horizontal Configuration

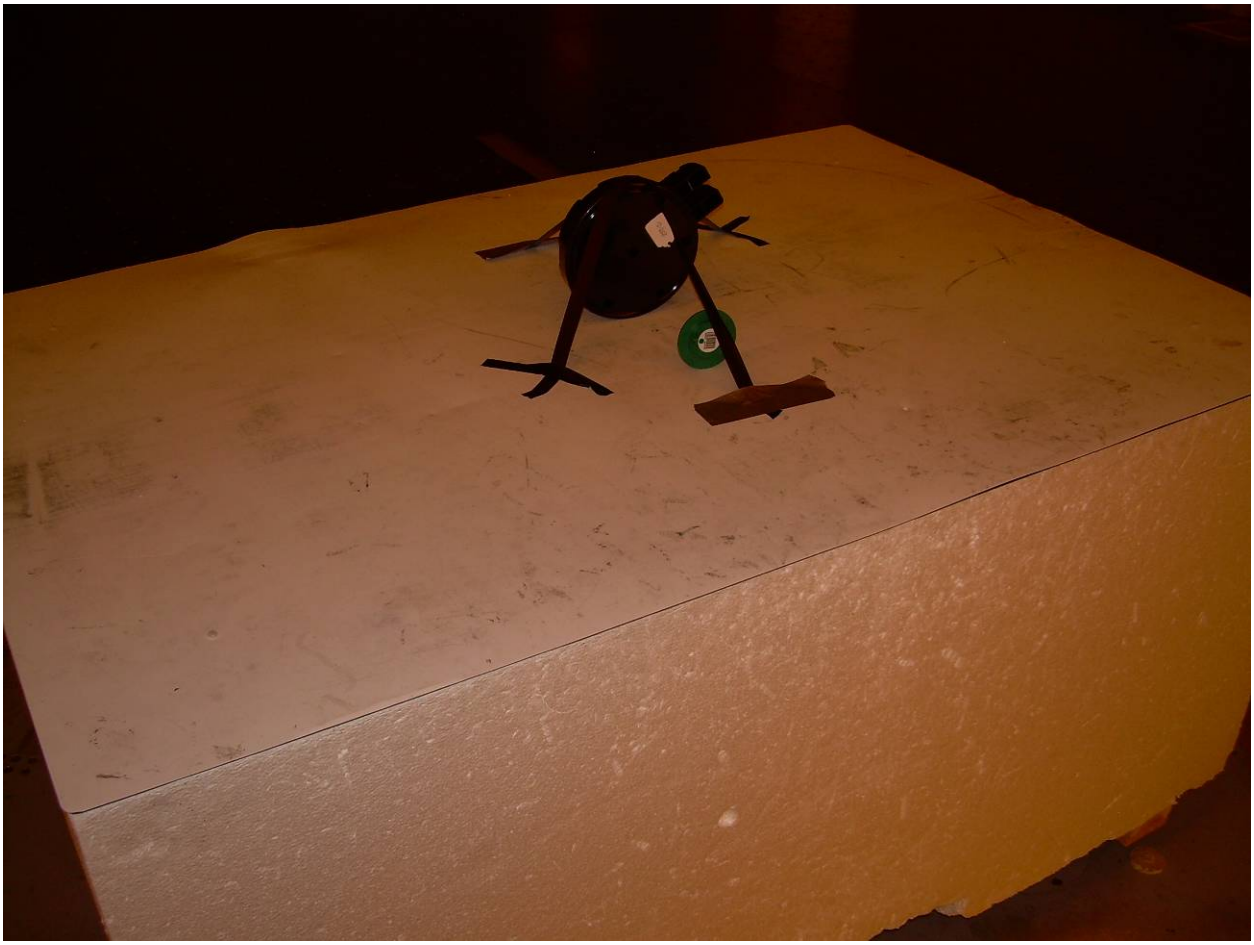
Photograph 2 – Back View Radiated Disturbance Horizontal Configuration



Photograph 3 – View Radiated Disturbance On-Edge Configuration



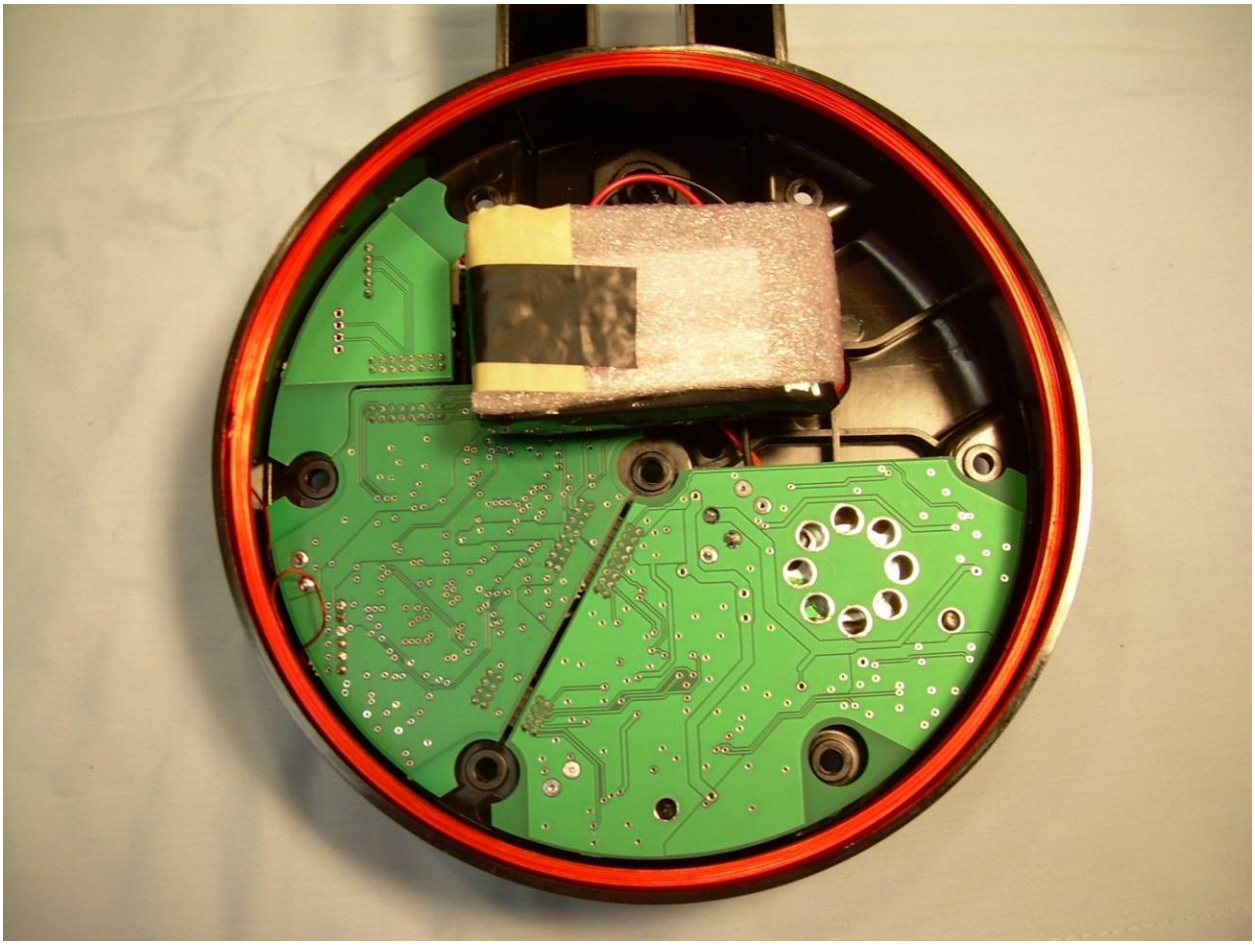
Photograph 4 – View Radiated Disturbance Vertical Configuration



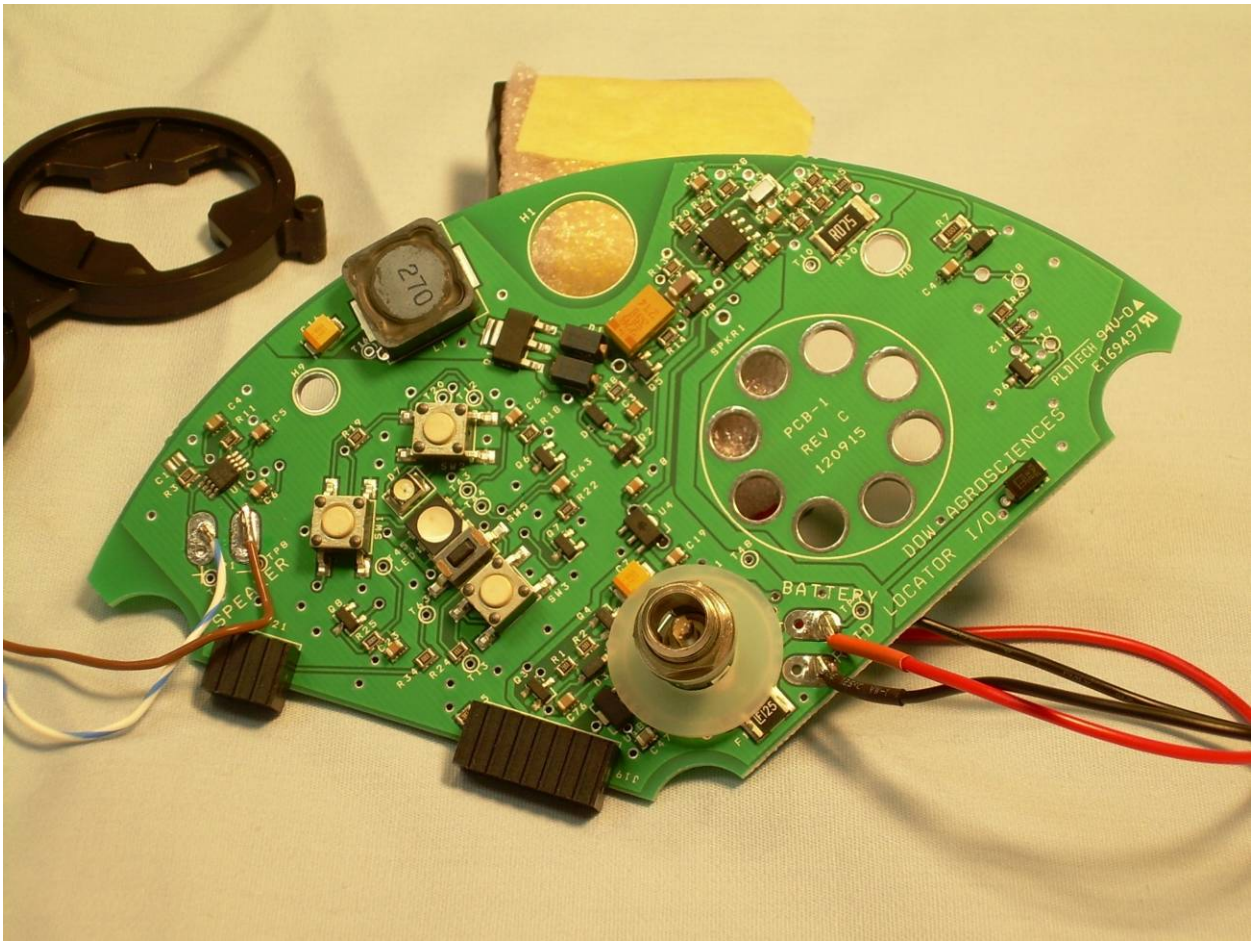
Photograph 5 – Front View of the EUT

Photograph 6 – Back View of the EUT

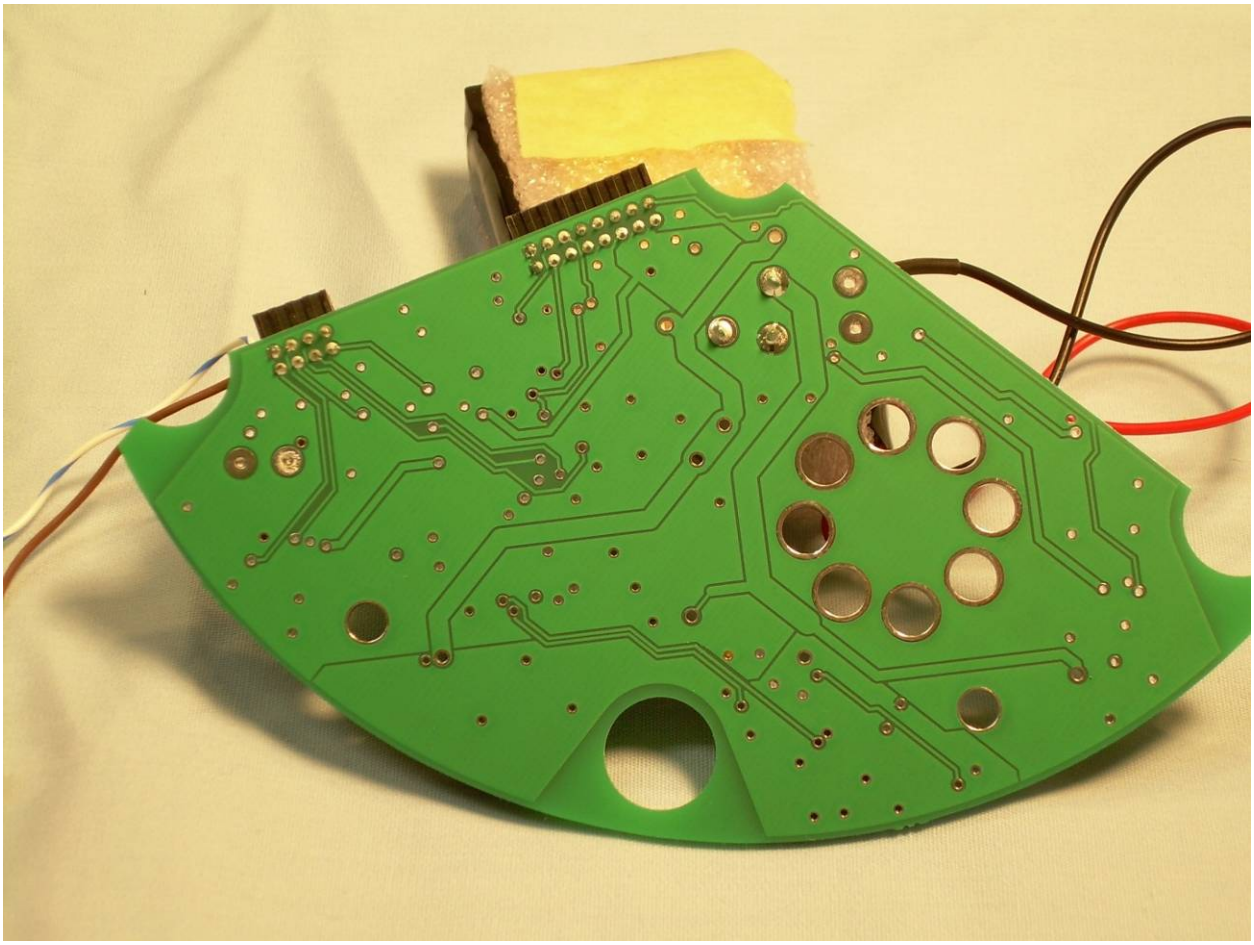
Photograph 7 – Internal View of the EUT



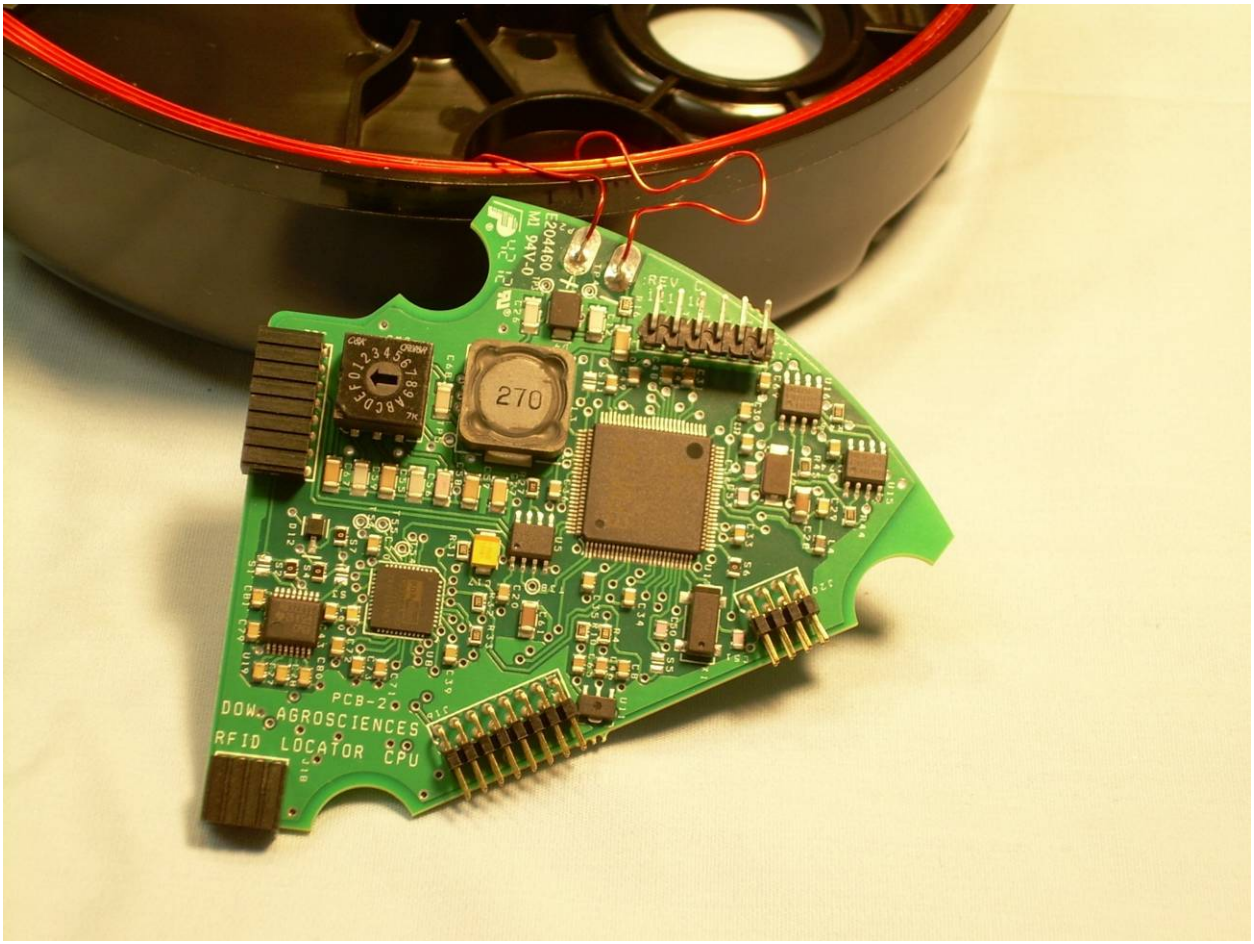
Photograph 8 – Top View of PCB #1



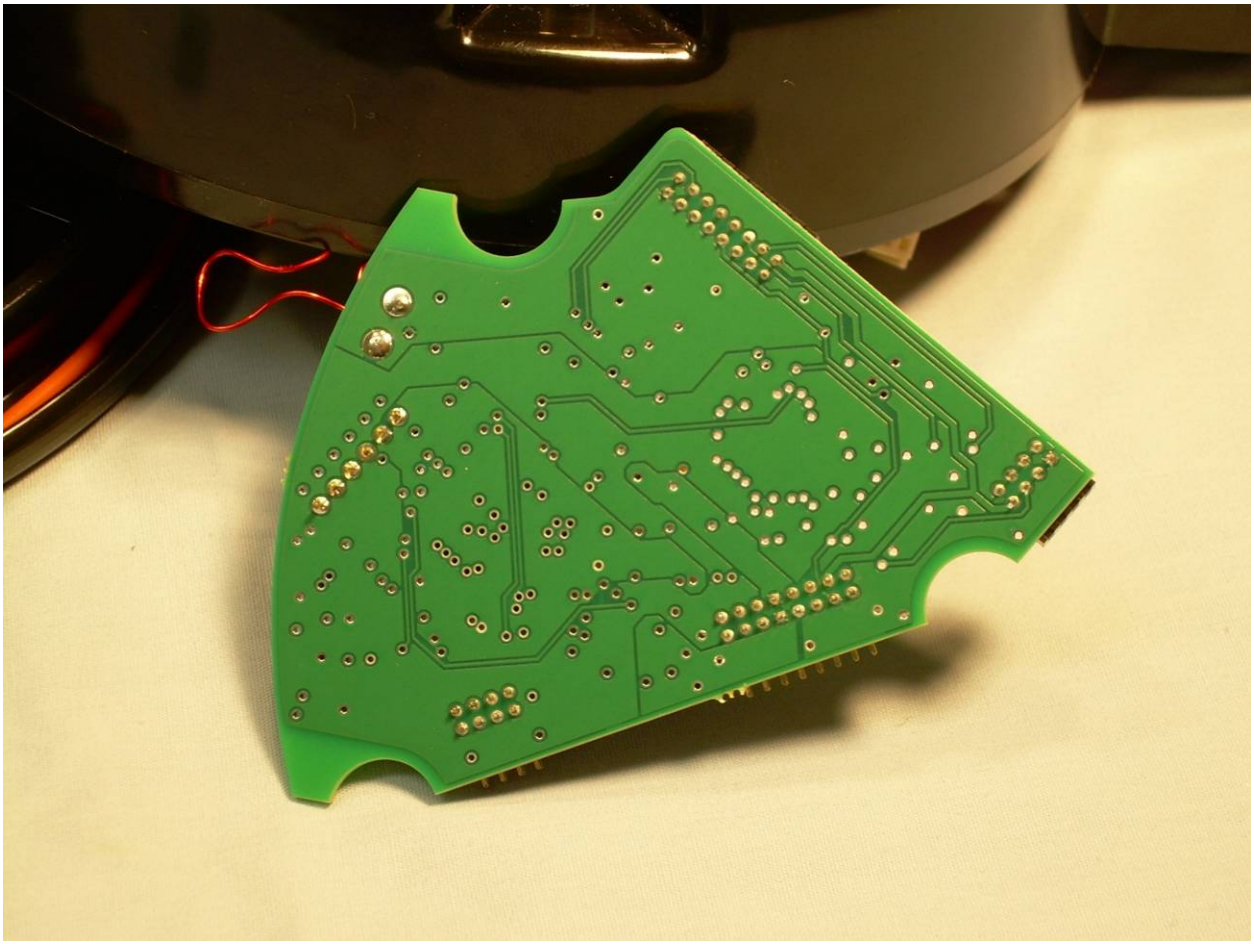
Photograph 9 – Bottom View of PCB #1



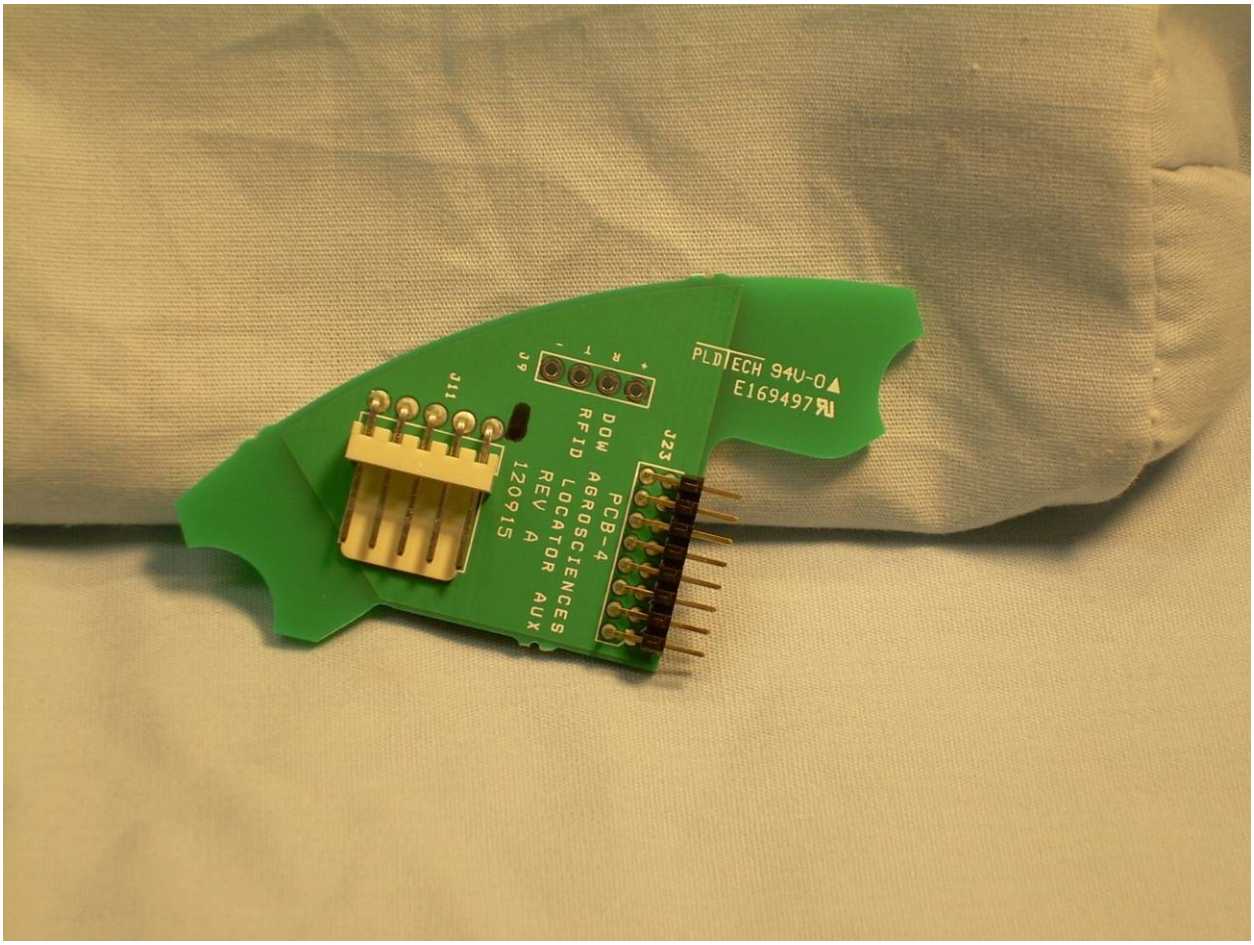
Photograph 10 – Top View of PCB #2



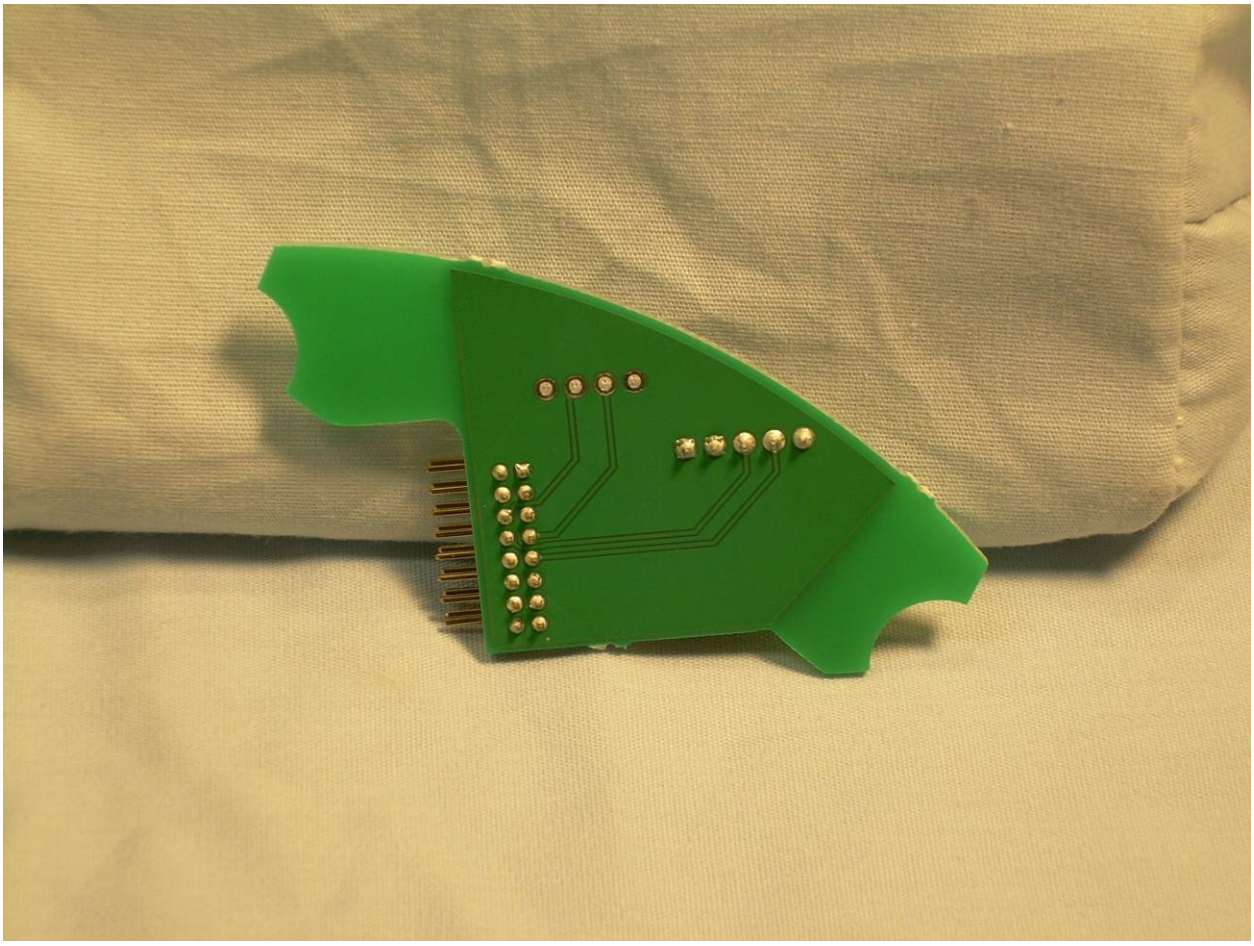
Photograph 11 – Bottom View of PCB #2



Photograph 12 – Top View of PCB #3



Photograph 13 – Bottom View of PCB #3



Photograph 14 – View of the Charger/Power Supply

Photograph 15 – Top View of the RFID Tag

Photograph 16 – Bottom View of the RFID Tag