**Compliance Testing, LLC**
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268
fax: (480) 926-3598
http://www.ComplianceTesting.com
info@ComplianceTesting.com

# Test Report

**Prepared for: Technologic Systems, Inc.**

**Model: TS-8820**

**Description: Single Board Computer with Analog and Digital Inputs and Outputs, Relays, and RS-232/485 Ports**

**To**

**IEC 61000-6-1 (2005-03)**

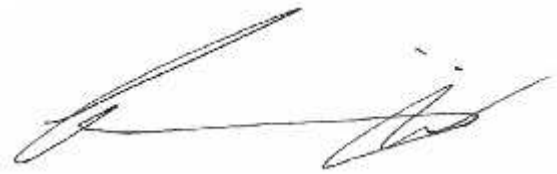
**and**

**IEC 61000-6-3 (2006-07)**

**Date of Issue: May 23, 2013**

| | |
|---|---|
| **On the behalf of the applicant:** | **Technologic Systems, Inc.**<br>**16525 E Laser Drive**<br>**Fountain Hills, AZ 85268** |
| **Attention of:** | **Bob Miller, President**<br>**Ph: (480) 837-5200**<br>**E-Mail: bob@embeddedarm.com** |

**Prepared By**
**Compliance Testing, LLC**
**3356 N San Marcos Pl, Suite 107**
**Chandler, AZ 85225-7176**
**(866) 311-3268 phone / (480) 926-3598 fax**
**www.compliancetesting.com**
**Project No: p1350012**



Alex Macon
**Project Test Engineer**

## Test Report Revision History

| Revision | Date | Revised By | Reason for Revision |
|---|---|---|---|
| 1.0 | May 23, 2013 | Alex Macon | Original Document |
| | | | |
| | | | |
| | | | |

## Table of Contents

**ILAC / A2LA**

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009)

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

ACCREDITED
TESTING CERT
#2152.01

**FCC OATS Reg, #933597**

**IC Reg. #2044A-1**

**Non-accredited tests contained in this report:**

**N/A**

**Conditions During Testing**

The tests were performed in accordance with the standards listed on the cover page.

The tests were performed in the frequency bands being investigated, with the EUT in the most susceptible, or radiating operating mode consistent with normal applications. The configuration of the test sample has been varied to achieve maximum susceptibility consistent with typical applications and installation practices.

If the EUT is a part of a system, or can be connected to auxiliary apparatus, the apparatus shall be tested while connected to the minimum representative configuration of auxiliary apparatus necessary to exercise the ports in a similar manner to that described in CISPR 11.

If the manufacturer's specifications specifically require external protection devices or measures which are clearly specified in the user's manual, the test requirements of the standards listed on the cover page were performed with the external protection in place and documented under accessories.

If the EUT has a large number of terminals, a sufficient number were selected to simulate actual operating conditions and to ensure that all the different types of terminations were covered

The tests are carried out within the ranges of temperature, humidity and pressure specified for the EUT and at the rated supply voltage, unless otherwise indicated in the basic standard

| Environmental Conditions | | |
|---|---|---|
| **Temperature (ºC)** | **Humidity (%)** | **Pressure (mbar)** |
| 25.4 – 28.6 | 16.2% – 34% | 964.6 – 969.2 |

**Summary of Restrictions**

1. Revocation of CE mark by the European Authorities can occur at any time if the equipment does not meet or continue to meet the rules.

2. A sample may be requested at any time.

**EUT Description**

**Model:** TS-8820
**Description:** Single Board Computer with Analog and Digital Inputs and Outputs, Relays, and RS-232/485 Ports

**EUT Operation During Tests**

The EUT was put into a test program during testing. There were audible clicks and visible LEDs to represent the device being exercised. A digital multi-meter was connected to monitor the output of one of the signal lines.

**Accessories:**

| Qty | Description | Mfg | Model | S/N |
|---|---|---|---|---|
| 2 | USB Drive | N/A | N/A | N/A |

**Cables:**

| Qty | Description | Length (M) | Shielding Y/N | Shielded Hood Y/N | Termination |
|---|---|---|---|---|---|
| 1 | Ethernet Cable | <3m | Y | N | EUT to 50 ohm load |
| 1 | Serial Cable | <3m | Y | Y | EUT to self termination |
| 1 | Power Supply | <3m | N | N | AC mains to EUT |

**Modifications:**

| | |
|---|---|
| 1 | Customer provided ferrite clamps that were placed on the serial cable, the Ethernet cable, and all accessible interconnecting IO cables in order to pass Radiated Emissions Class B |

**Test Summary Table**

| Immunity Standards | Pass, Fail N/A | Comments |
|---|---|---|
| IEC 61000-6-1:2005:<br>Generic Standards – Immunity for Industrial Environments | PASS | |
| IEC 61000-4-2:<br>Electrostatic Discharge (ESD) | PASS | |
| IEC 61000-4-3:<br>Radiated, Radio Frequency, Electromagnetic Field Immunity Test | PASS | |
| IEC 61000-4-4:<br>Electrical Fast Transient/Burst Immunity Test (EFT) | N/A | Test determined not applicable by manufacturer |
| IEC 61000-4-5:<br>Surge Immunity Test (Mains) | N/A | Test determined not applicable by manufacturer |
| IEC 61000-4-6:<br>Immunity to Conducted Disturbances, Induced by Radio Frequency Fields | N/A | Test determined not applicable by manufacturer |
| IEC 61000-4-8:<br>Power Frequency Magnetic Field Immunity Test | N/A | Test determined not applicable by manufacturer |
| IEC 61000-4-11:<br>Voltage Dips, Short Interruptions and Voltage Variations Immunity Test | N/A | Test determined not applicable by manufacturer |

| Emissions Standards | Pass, Fail N/A | Comments |
|---|---|---|
| IEC 61000-6-3:2006:<br>Generic Standard – Emission standard for industrial environments | PASS | |
| CISPR 11 Radiated Emissions | PASS | |
| CISPR 11 Conducted Emissions | N/A | Test determined not applicable by manufacturer |

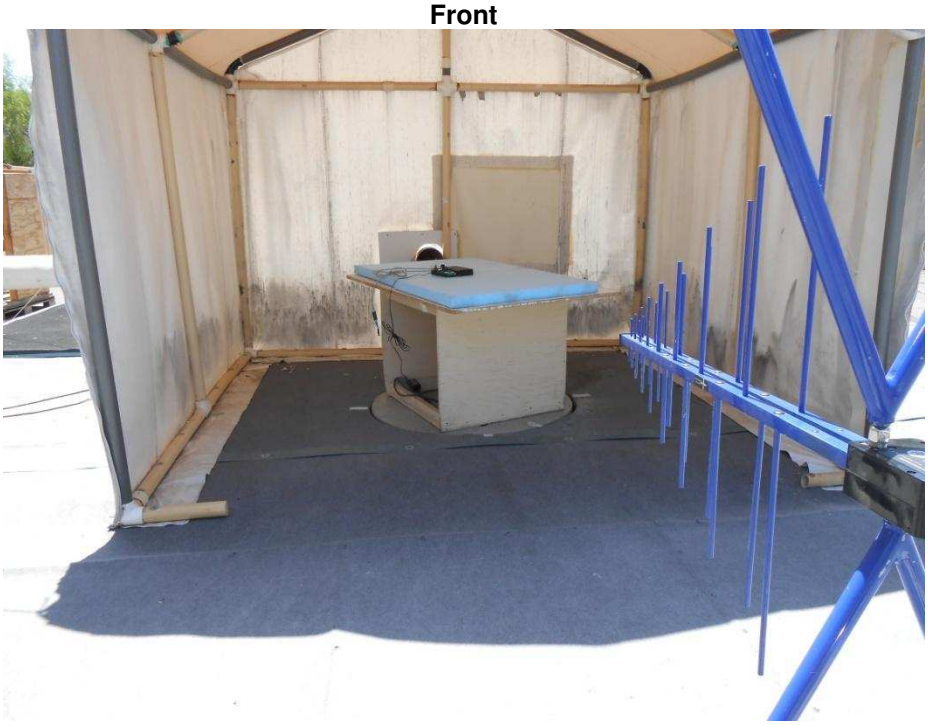
| Performance Criteria Applied: |
|---|
| 4.1 Performance Criterion A – EUT continues to operate during and after the test |
| 4.2 Performance Criterion B – EUT continues to operate after the test |
| 4.3 Performance Criterion C – Temporary loss of function allowed, provided the function is self-recoverable or can be restored by the operation of the controls |

**Radiated Emissions**

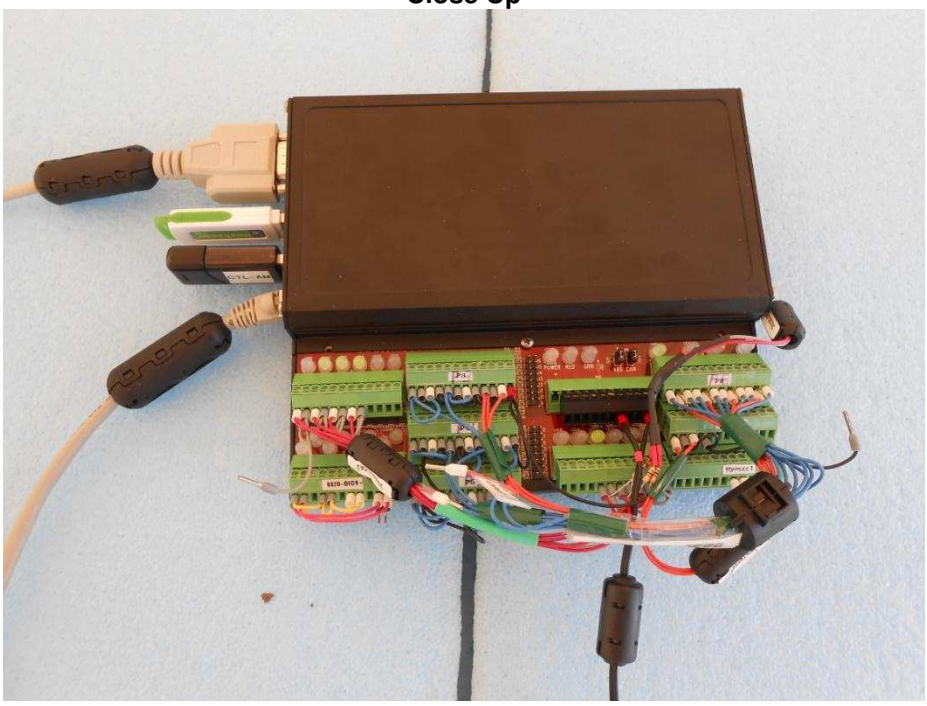
| | | |
|---|---|---|
| **Name of Test:** | Radiated Emissions | **Engineer:** Alex Macon |
| **Test Equipment Utilized** | i00033, i00267 | **Test Date:** 5/16/2013 |

**Test Setup Photos**

**Front**



**Close Up**



**Measurement Results**

| | | | |
|---|---|---|---|
| Measurement Distance (D), m | = | X | 3 |
| | | | 10 |
| Frequency of Tests, MHz | = | | 30 to 1000 |

Note 1: Worst case of horizontal or vertical.
Note 2: The applied correction factors include transducer factors, cable loss, and distance correction.

The EUT meets radiated disturbance limits for:

X 61000-6-3 Table 1, Enclosure Port Limits @ 10m

| Frequency Range | Limit (Quasi-peak) |
|---|---|
| 30MHz to 230MHz | 30 dBµV/m |
| 230MHz to 1000MHz | 37 dBµV/m |

**Radiated Emissions Test Results**

| Emission Freq (MHz) | Measured Value (dBuV/m) | Corr Factor (dB) | Corr Value (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Polarity (V/H) | Antenna Height (cm) | Turntable Position (deg) |
|---|---|---|---|---|---|---|---|---|
| 72.020 | 29.720 | -2.941 | 26.779 | 30 | -2.771 | V | 98 | 108 |
| 72.004 | 23.060 | -2.943 | 20.117 | 30 | -9.433 | H | 98 | 108 |
| 120.027 | 27.710 | 2.27 | 29.98 | 30 | -.02 | V | 98 | 361 |
| 168.025 | 25.520 | 1.139 | 26.659 | 30 | -3.341 | V | 98 | 361 |
| 216.015 | 27.980 | .928 | 28.908 | 30 | -1.092 | V | 97 | 202 |
| 471.744 | 10.040 | 9.123 | 19.163 | 37 | -17.837 | V | 98 | 361 |
| 960.002 | 17.710 | 16.74 | 34.45 | 37 | -2.55 | V | 167 | 57 |

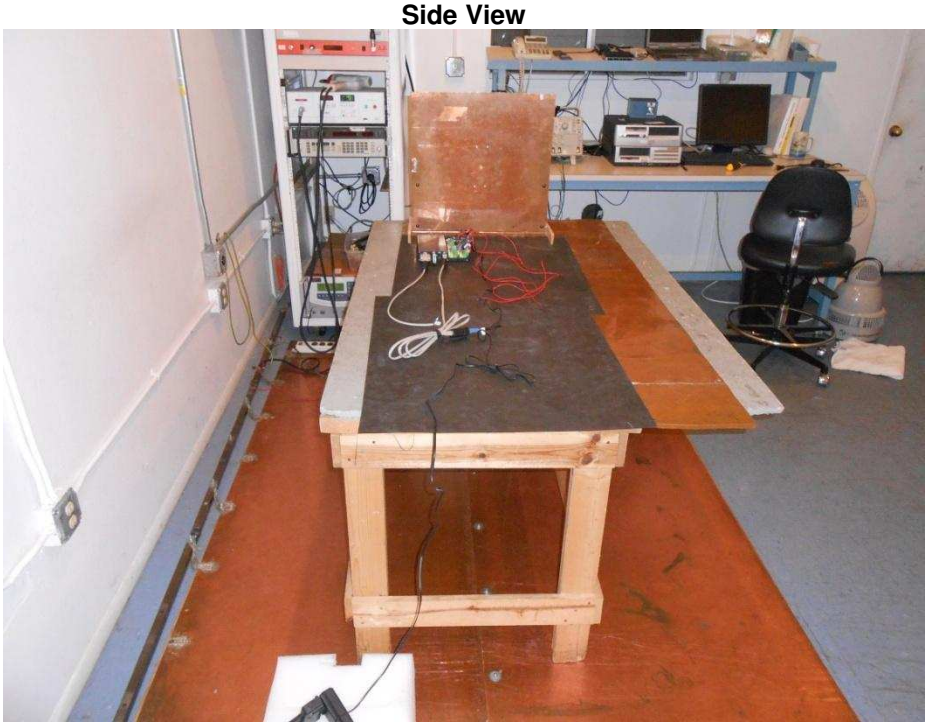
All other emissions in the required measurement range were more than 20 dB below the required limits

**Electro-Static Discharge**

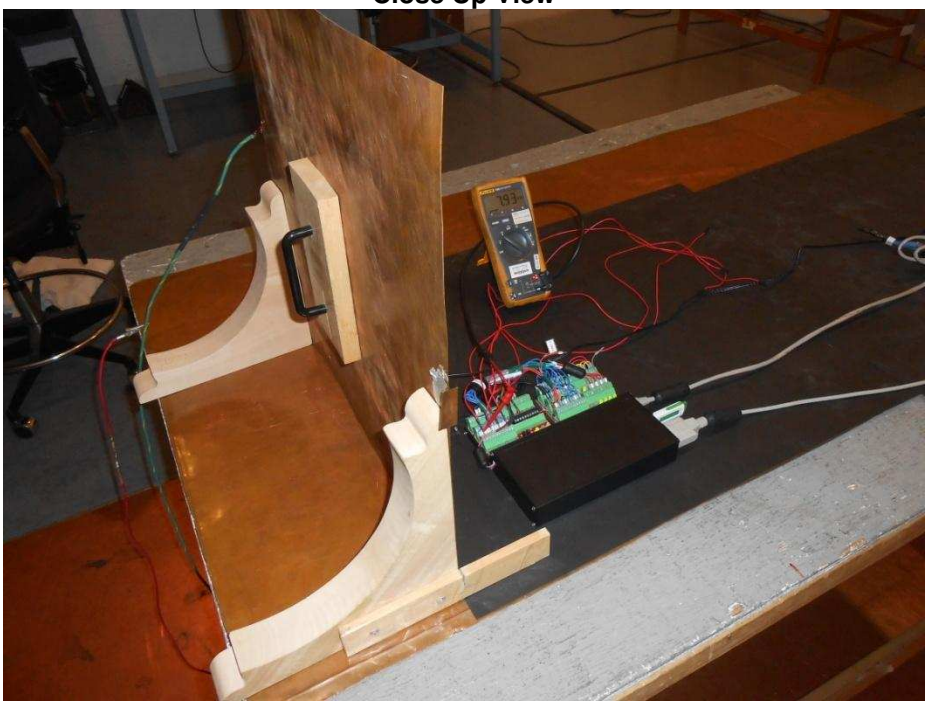
| | | | |
|---|---|---|---|
| **Name of Test:** | Electro-Static Discharge | **Engineer:** | Alex Macon |
| **Test Equipment Utilized:** | i00282, i00320, i00357, i00362 | **Test Date:** | 5/23/2013 |
| **Temperature:** | 26.5℃ | **Humidity:** | 34% |
| **Pressure:** | 963.8 mbar | | |

**Test Setup Photos**

**Side View**



**Close Up View**



**Measurement Information**

**Note:** ESD was applied to all exposed surfaces of the EUT, except where the user documentation specifically indicated a requirement for appropriate protective measures.

**ESD Test Results**

| Contact Discharge | | | | | | | | Location |
|---|---|---|---|---|---|---|---|---|
| 1 2kV | | 2 4kV | | 3 6kV | | 4 8kV | | |
| 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Serial cable shield |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Corner of metal case |

| Horizontal Coupling Plane | | | | | | | | Location |
|---|---|---|---|---|---|---|---|---|
| 1 2kV | | 2 4kV | | 3 6kV | | 4 8kV | | |
| 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Front |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Back |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Left |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Right |

| Vertical Coupling Plane | | | | | | | | Location |
|---|---|---|---|---|---|---|---|---|
| 1 2kV | | 2 4kV | | 3 6kV | | 4 8kV | | |
| 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Front |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Back |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Left |
| Pass | Pass | Pass | Pass | N/A | N/A | N/A | N/A | Right |

| Air Discharge | | | | | | | | Location |
|---|---|---|---|---|---|---|---|---|
| 1 2kV | | 2 4kV | | 3 8kV | | 4 15kV | | |
| 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | 10 + | 10 - | |
| Pass | Pass | Pass | Pass | Pass | Pass | N/A | N/A | Ethernet Cable |
| Pass | Pass | Pass | Pass | Pass | Pass | N/A | N/A | Serial Cable |
| Pass | Pass | Pass | Pass | Pass | Pass | N/A | N/A | USB Drive |
| Pass | Pass | Pass | Pass | Pass | Pass | N/A | N/A | P1 – P10 connector heads |

| Criteria Met | Remark |
|---|---|
| A | There *was not* any degradation of performance noted |

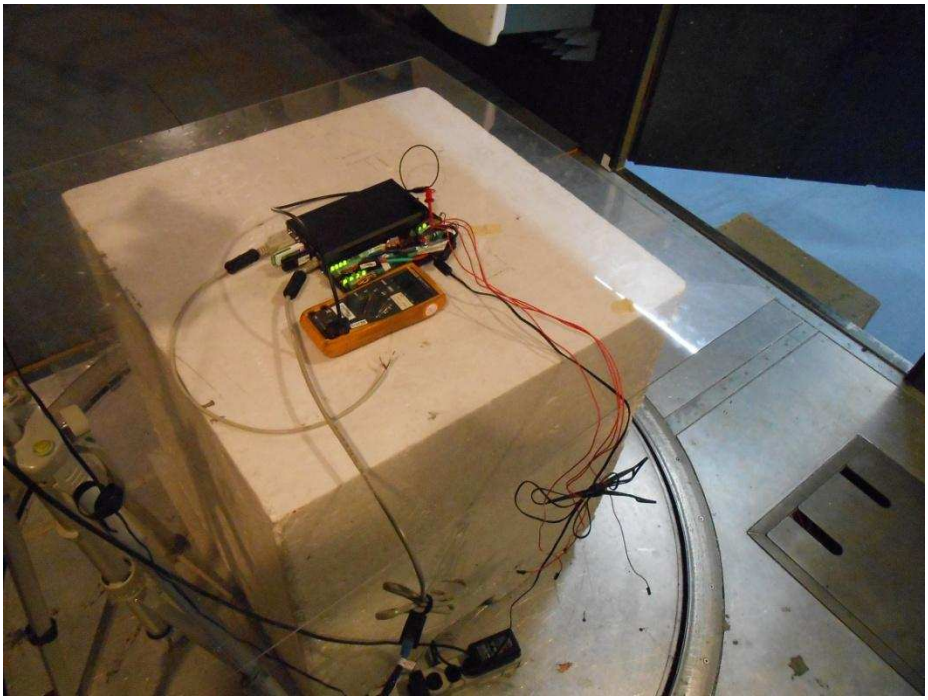
**Radio Frequency, Electromagnetic Field Immunity**

**Name of Test:** Radio Frequency, Electromagnetic Field Immunity **Engineer:** Alex Macon
**Test Equipment Utilized** i00266, i00280, i00310, i00320 **Test Date:** 5/13/2013

**Test Setup Photos**

**Front View**

**Back View**



**Test Results**

| Criteria Met | Freq. Range (MHz) | Test Level (V/m) | Polarization (V/H) | Orientation (Degrees) | Comment |
|---|---|---|---|---|---|
| A | 80-1000 | 3 | Vertical | 0 | |
| A | 80-1000 | 3 | Vertical | 90 | |
| A | 80-1000 | 3 | Vertical | 180 | |
| A | 80-1000 | 3 | Vertical | 270 | |
| A | 80-1000 | 3 | Horizontal | 0 | |
| A | 80-1000 | 3 | Horizontal | 90 | |
| A | 80-1000 | 3 | Horizontal | 180 | |
| A | 80-1000 | 3 | Horizontal | 270 | |
| A | 1000-2700 | 3 | Vertical | 0 | |
| A | 1000-2700 | 3 | Vertical | 90 | |
| A | 1000-2700 | 3 | Vertical | 180 | |
| A | 1000-2700 | 3 | Vertical | 270 | |
| A | 1000-2700 | 3 | Horizontal | 0 | |
| A | 1000-2700 | 3 | Horizontal | 90 | |
| A | 1000-2700 | 3 | Horizontal | 180 | |
| A | 1000-2700 | 3 | Horizontal | 270 | |

**Note:** No degradation of performance was noted. (See comments above for degradation specifics)

**Test Equipment Utilized**

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| EMI Receiver | HP | 8546A | i00033 | 12/27/12 | 12/27/13 |
| Signal Generator | Rohde & Schwarz | SMT03 | i00266 | 1/7/13 | 1/7/14 |
| Bi-Log Antenna | Schaffner | CBL611C | i00267 | 12/19/11 | 12/19/13 |
| Semi-Anechoic Chamber | CT | N/A | i00276 | 8/31/11 | 8/31/13 |
| Antenna | Amplifier Research | AT5080 | i00280 | 8/31/11 | 8/31/13 |
| Humidity / Temp Meter | Newport | IBTHX-W-5 | i00282 | 12/04/12 | 12/04/13 |
| RF Amplifier | EMPower | 2024 BBS1C4ALP | i00310 | 8/31/11 | 8/31/13 |
| Voltmeter | Fluke | 75III | i00320 | 2/1/13 | 2/1/14 |
| ESD Simulator | Thermo Scientific | MZ-30 | i00357 | 6/8/12 | 6/8/13 |
| A/C Power Source | Behlman | BL 6000 | i00362 | Verified on: 5/23/13 | |
| Labview Software | National Instruments | FCC_PART15AB_R2 | i00395 | Verified on:06/11 | |
| Humidity / Temp Meter | Omega | RH-81 | i00408 | 4/15/13 | 4/15/15 |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT