



## INGENIUM TESTING, LLC

ELECTROMAGNETIC INTERFERENCE (EMI)

CERTIFICATION TEST REPORT FOR THE

DICKSON COMPANY WIZARD2 MODULE

DOCUMENT NUMBER CTR-10-0110, REVISION DRAFT

| APPROVAL     | RESPONSIBILITY | SIGNATURE         | DATE |
|--------------|----------------|-------------------|------|
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INGENIUM TESTING, LLC  
3761 South Central Avenue  
Rockford, Illinois 61102 USA

DATE:

May 24, 2010



## **RECORD OF REVISIONS**



## TABLE OF CONTENTS

|   |           |
|---|-----------|
| <b>1.0 SCOPE .....</b>  | <b>5</b>  |
| <b>2.0 GENERAL PRODUCT DESCRIPTION .....</b>                      | <b>5</b>  |
| 2.1 GENERAL OPERATIONAL DESCRIPTION OF THE WIZARD2 SYSTEM .....   | 5         |
| 2.2 MODES OF OPERATION .....                                      | 8         |
| 2.3 MODE OF OPERATION DURING RF EMISSION TESTING .....            | 8         |
| <b>3.0 EQUIPMENT UNDER TEST (EUT).....</b>                        | <b>8</b>  |
| 3.1 EQUIPMENT UNDER TEST (EUT) TECHNICAL SPECIFICATIONS: .....    | 9         |
| 3.2 ASSOCIATED ANTENNA DESCRIPTION .....                          | 9         |
| <b>4.0 APPLICABLE NORMATIVE DOCUMENTS.....</b>                    | <b>10</b> |
| <b>5.0 OPERATIONAL DEFINITIONS AND PERFORMANCE CRITERION.....</b> | <b>11</b> |
| 5.1 APPLICABLE TEST MATRIX AND TEST RESULTS .....                 | 11        |
| <b>6.0 DECLARATION OF CONFORMITY.....</b>                         | <b>12</b> |
| <b>7.0 SIGNATORIES.....</b>                                       | <b>12</b> |
| <b>8.0 TEST FACILITY ACCREDITATION .....</b>                      | <b>13</b> |
| 8.1 LOCATION OF TEST FACILITY .....                               | 14        |
| <b>9.0 ELECTROMAGNETIC EMISSION TESTS .....</b>                   | <b>15</b> |
| 9.1 RADIATED RF EMISSIONS MEASUREMENTS .....                      | 15        |
| 9.1.1 <i>Test Criterion</i> .....                                 | 15        |
| 9.1.2 <i>Test Equipment</i> .....                                 | 16        |
| 9.1.3 <i>Test Setup</i> .....                                     | 18        |
| 9.1.4 <i>Test Procedure</i> .....                                 | 23        |
| 9.1.5 <i>Test Results</i> .....                                   | 23        |
| 9.1.6 <i>Calculated Average</i> .....                             | 25        |
| 9.1.7 <i>Occupied Bandwidth</i> .....                             | 27        |
| 9.2 CONDUCTED RF EMISSION ONTO AC MAINS MEASUREMENTS .....        | 41        |
| 9.2.1 <i>Test Criterion</i> .....                                 | 41        |
| 9.2.2 <i>Test Equipment</i> .....                                 | 42        |
| 9.2.3 <i>Test Setup</i> .....                                     | 43        |
| 9.2.4 <i>Test Procedure</i> .....                                 | 44        |
| 9.2.5 <i>Test Results</i> .....                                   | 44        |



## TABLE OF FIGURES

|  |    |
|--|----|
| FIGURE 1 DICKSON WIZARD2 MODULE.....   | 6  |
| FIGURE 2: DICKSON WIZARD2 MODULE (COMPONENT SIDE).....   | 7  |
| FIGURE 3: SETUP OF THE LOGGER FOR RADIATED EMISSIONS 80 MHZ TO 1000MHz .....   | 18 |
| FIGURE 4: SETUP OF THE LOGGER FOR RADIATED EMISSIONS 1 GHz TO 12.5 GHz .....   | 19 |
| FIGURE 5 PULSE WIDTH OF TRANSMISSION.....  | 26 |
| FIGURE 6 PEAK OF TRANSMITTED PULSE .....   | 27 |
| FIGURE 7 99% (20 dB DOWN)OF PEAK.....  | 28 |
| FIGURE 8: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 30-1000MHz, AT 3M, AND NOMINAL VOLTAGE .....              | 29 |
| FIGURE 9: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 30-1000MHz, AT 3M, AND NOMINAL VOLTAGE.....             | 30 |
| FIGURE 10: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND NOMINAL VOLTAGE .....           | 30 |
| FIGURE 11: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND NOMINAL VOLTAGE.....          | 31 |
| FIGURE 12: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 30-1000MHz, AT 3M, AND 85% OF NOMINAL VOLTAGE .....      | 31 |
| FIGURE 13: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 30-1000MHz, AT 3M, AND 85% OF NOMINAL VOLTAGE .....    | 32 |
| FIGURE 14: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND 85% OF NOMINAL VOLTAGE .....    | 32 |
| FIGURE 15: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND 85% OF NOMINAL VOLTAGE .....  | 33 |
| FIGURE 16: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 30-1000MHz, AT 3M, AND 115% OF NOMINAL VOLTAGE .....     | 33 |
| FIGURE 17: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 30-1000MHz, AT 3M, AND 115% OF NOMINAL VOLTAGE .....   | 34 |
| FIGURE 18: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND 115% OF NOMINAL VOLTAGE .....   | 34 |
| FIGURE 19: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 1 – 12.5 GHz, AT 3M, AND 115% OF NOMINAL VOLTAGE ..... | 35 |
| FIGURE 20: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 30-1000MHz, AT 3M, BATTERY POWERED.....                  | 35 |
| FIGURE 21: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 30-1000MHz, AT 3M, BATTERY POWERED .....               | 36 |
| FIGURE 22: LOGGER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 1 – 12.5 GHz, AT 3M, BATTERY POWERED.....                | 36 |
| FIGURE 23: LOGGER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 1 – 12.5 GHz, AT 3M, BATTERY POWERED .....             | 37 |
| FIGURE 24: RECEIVER RF EMISSIONS, ANTENNA VERTICALLY POLARIZED, 30-1000MHz, AT 3M .....                                | 38 |
| FIGURE 25: RECEIVER RF EMISSIONS, ANTENNA HORIZONTALLY POLARIZED, 30 – 1000MHz, AT 3M.....                             | 39 |
| FIGURE 26: RECEIVER RF EMISSIONS, Antenna Vertically Polarized, 1 – 12.5 GHz, AT 3M .....                              | 40 |
| FIGURE 27: RECEIVER RF EMISSIONS, Antenna Horizontally Polarized, 1 – 12.5 GHz, AT 3M .....                            | 40 |
| FIGURE 28 CONDUCTED EMISSIONS FRONT VIEW .....   | 43 |
| FIGURE 29 CONDUCTED EMISSIONS SIDE VIEW .....  | 44 |
| FIGURE 30: TRANSMIT RF CONDUCTED SIGNATURE, LINE 1 (SUPPLY), 150kHz-30MHz, NOMINAL VOLTAGE .....                       | 47 |
| FIGURE 31: TRANSMIT RF CONDUCTED SIGNATURE, LINE 2 (NEUTRAL), 150kHz-30MHz, NOMINAL VOLTAGE.....                       | 47 |
| FIGURE 32: RECEIVE RF CONDUCTED SIGNATURE, LINE 1 (SUPPLY), 150kHz-30MHz, NOMINAL VOLTAGE .....                        | 48 |
| FIGURE 33: RECEIVE RF CONDUCTED SIGNATURE, LINE 2 (NEUTRAL), 150kHz-30MHz, NOMINAL VOLTAGE .....                       | 48 |

## 1.0 SCOPE

Between October 28<sup>TH</sup>, 2009 and May 19, 2010, a series of radiated RF Emissions (EMC) tests were performed on one production sample consisting of two units of the WIZARD2 MODULE, tagged as Logger and Receiver, here forth referred to as the “*Equipment Under Test*” or “*EUT*”. The emissions characteristics of the EUT were tested in transmit and receive modes and the results are covered in this report.

The radio frequency (RF) emission tests were performed in accordance with 47 CFR, issue (2008-10), Subpart C, for an *Intentional Radiator* product, qualifying under section 15.249, as well as Subpart B, for an *Un-Intentional Radiator* product, qualifying under section 15.109, using the emission standards test procedures outlined in ANSI C63.4 (2003), with test instruments adhering to CISPR 16-2 guidelines.

The tests were performed to allow verification, in part, of the product’s EMI compliance in accordance with the EMC standards in the United States of America and abroad. The tests were performed by Rick Hill, Lead EMC/EMI Technician at Ingenium Testing.

## 2.0 GENERAL PRODUCT DESCRIPTION

### 2.1 General operational description of the WiZARD2 system

#### Logger:

Each logger takes a reading every sample interval which can range from 10 seconds up to 1 hour. After taking five samples or after five minutes, the logger will send a thirty two byte packet upstream to its target unit. If the logger receives an acknowledgement for the packet, that is the end of it. If the logger does not receive an acknowledgement, it will store the readings and try again after another sample interval or five minutes whichever comes first. Since it is a logger, it can store up to 32,000 samples during a period of non communication to avoid data loss

#### Repeater:

Each repeater looks for packets addressed to its id. When it receives a packet addressed to it, it sends an acknowledgement and then transmits the packet upstream to its target unit. If it receives an acknowledgement it returns to listening downstream for more packets. If it does not receive an acknowledgement, it will retry at random intervals (to avoid collisions) until it receives an acknowledgement.

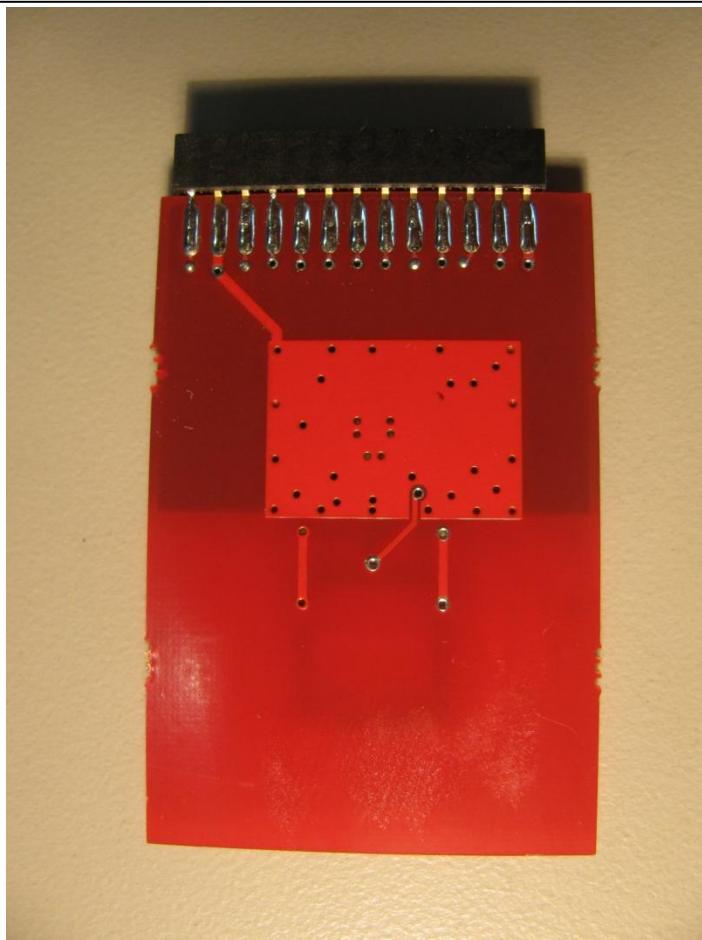
#### Receiver:

There is one and only one receiver per system. It is the final upstream targeted address. When it receives a packet addressed to it, it sends an acknowledgement and stores the packet in a buffer for retrieval by a program running in the base PC. The receiver is connected to the base PC at all times via USB. If the buffers in the receiver become full or the PC is disconnected, the receiver will no longer acknowledge packets.

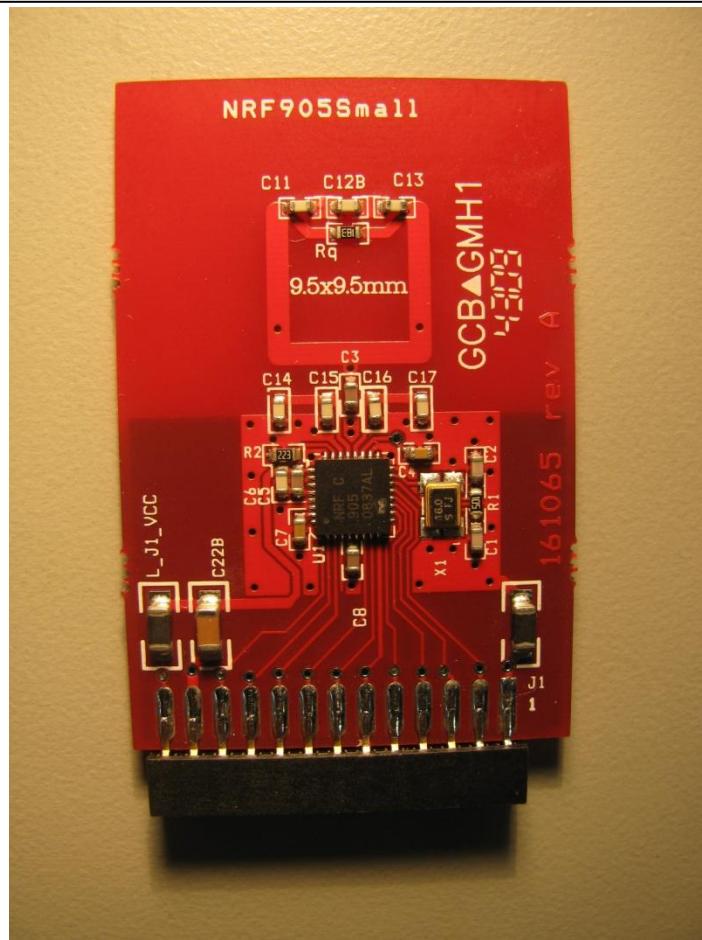
#### Base PC:

WiZARD software runs on the Base PC and continuously polls the receiver via USB. The software maintains a database of readings from the loggers and allows the user to view this data in a wide variety of methods. The software can also send commands to the receiver which will be embedded in the acknowledgements that are sent when a packet is received.

|                |                      |                       |              |
|----------------|----------------------|-----------------------|--------------|
| DATE: 02/26/10 | DOC. NO: CTR-10-0110 | REVISION: PRELIMINARY | Page 5 of 49 |
|----------------|----------------------|-----------------------|--------------|



**Figure 1 Dickson WiZARD2 Module**



**Figure 2: Dickson WiZARD2 MODULE (Component Side)**



## 2.2 Modes of Operation

The WiZARD2 Module is comprised of two units with separate modes of operation: Logger and Receiver.

- **Logger:** Information is sent to the Receiver in a burst transmission.
- **Receiver:** The information from the Logger is received and stored to a computer via USB.

One sample consisting of both Logger and Receiver was provided for testing.

## 2.3 Mode of Operation during RF Emission Testing

The logger was placed in CW mode for Radiated and Conducted Emissions during the peak receiver scan. The Logger was placed in pulse mode for recording the pulse width for the Average calculation. This mode is to transmit a single pulse of data to the receiver.

For receiver test, the Receiver unit was tested in receive mode.

## 3.0 EQUIPMENT UNDER TEST (EUT)

*The following information has been supplied by the applicant.*

|                       |                  |
|-----------------------|------------------|
| <b>Product Name:</b>  | WiZARD2 MODULE   |
| <b>Model Number:</b>  | WiZARD2 MODULE   |
| <b>Serial Number:</b> | Engineering Unit |

**Table 1: Equipment Under Test (EUT) Product Information**



### 3.1 Equipment Under Test (EUT) Technical Specifications:

|   |   |
|---|---|
| Frequency Range (in MHz)                    | 919.1384 MHz  |
| Field Strength                              | 76.064 dB $\mu$ V/m at 3m   |
| Transmitter Spurious (worst case)           | 21.71389 dB $\mu$ V/m at 3m   |
| Operating Temperature Range                 | -10°C (14F) to +70°C (158F)   |
| EUT will be operated under FCC Rule Part(s) | 47 CFR 15.249   |
| Modular Filing                              | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No     |
| Design Engineer (optional)                  | N/A   |
| Cabinet Size                                | NA  |
| Cabinet Weight                              | 0.2 Pounds  |
| Power Requirements                          | One 3.6V 1/2AA 1200mAh Lithium Battery, ER14250H, LS14250 or equivalent |
| Environmental Operating conditions          | Residential and Light Industrial  |
| Communication Ports                         | USB   |

**Table 2: Equipment Under Test (EUT) Technical Specifications**

### 3.2 Associated Antenna Description

The antenna in the system is an integrated internal PC-Board trace monopole antenna.

There are no contingencies for any other types of antennas.

The antenna is not accessible to the end user.

The antenna is not adjustable.



#### 4.0 APPLICABLE NORMATIVE DOCUMENTS

**Table 3: Regulatory Documents**

| Publication              | Year                       | Title   |
|--------------------------|----------------------------|---|
| 47 CFR, Parts 0-15 (FCC) | Release Date<br>2008-07-10 | United States of America Code of Federal Regulations<br>Title 47 – Telecommunications.  |
| RSS-210                  | Issue 7<br>(2007-06)       | Industry Canada<br>Spectrum Management and Telecommunications<br>Radio Standard Specification.<br>Low-power License-Exempt Radio communication<br>Devices (All Frequency Bands):<br>Category I Equipment. |
| ANSI C63.4               | 2003                       | American National Standard for Methods of<br>Measurement of Radio-Noise Emissions from Low-<br>Voltage Electrical and Electronic Equipment in the<br>Range of 9 kHz to 40 GHz.                            |
| CISPR 16-1-1             | Edition 2.1<br>(2006-11)   | Specification for radio disturbance and immunity<br>measuring apparatus and methods.<br>Part 1-1: Measuring Apparatus.  |
| CISPR 16-1-2             | Edition 1.2<br>(2006-08)   | Specification for radio disturbance and immunity<br>measuring apparatus and methods.<br>Part 1-2: Ancillary equipment – conducted<br>disturbances.  |
| CISPR 16-2-1             | Edition 1.1<br>(2005-09)   | Specification for radio disturbance and immunity<br>measuring apparatus and methods.<br>Part 2-1: Conducted disturbance measurement.  |
| CISPR 16-2-2             | Edition 1.2<br>(2005-09)   | Specification for radio disturbance and immunity<br>measuring apparatus and methods.<br>Part 2-2: Measurement of disturbance power.   |
| CISPR 16-2-3             | Edition 2.0<br>(2006-07)   | Specification for radio disturbance and immunity<br>measuring apparatus and methods.<br>Part 2-3: Methods of Measurement of disturbance<br>and immunity – Radiated disturbance measurements.              |

**Table 4: Non-Regulatory Controlled Documents from Ingenium Testing, LLC.**

| Document  | Owner                    | Title             |
|-----------|--------------------------|-------------------|
| JCEAQ1063 | Ingenium Testing,<br>LLC | Statement of Work |



## 5.0 OPERATIONAL DEFINITIONS AND PERFORMANCE CRITERION

### Manufacturer and Device-Specific Operational Definitions:

The Wizard2 Receiver/Repeater/Logger is a wireless data transceiver used to receive and send data such as temperature, humidity, etc. and store it in a database on a pc. Typically the Wizard2 Receiver is connected to a computer and is powered through an external power adapter. The Wizard2 also has battery backup of four AA batteries.

#### 5.1 Applicable Test Matrix and Test Results

The following matrix defines the scope of testing as covered by this report, and agreed to between Dickson Company (Client) and Ingenium Testing, LLC.

This series of testing is performed to verify that the electromagnetic performance of the "Wizard 2" adheres to the expected performance stated in the aforementioned standards. These tests verified that the transmitter characteristics met the specific limits dictated by 47CFR 15.249, and that the receiver characteristics met the specific limits dictated by 47CFR 15.109. The following matrix describes the test regimen.

**Table 5: Test Matrix and Test Results**

| Port Definition | Terminal Name  | Description/Detail   | Test Standard                           | Performance Criteria  | Pass / Fail |
|-----------------|----------------|--|---|---|-------------|
| Enclosure       | N/A            | Enclosure containing digital circuitry<br><br><b>Transmit Mode</b> | Radiated RF Emissions<br>47 CFR 15.249  | 30 MHz-12.0 GHz<br>Measured RF Emission should be Below specified Limits    | Pass        |
| Power Mains     | AC Power Lines | AC Power Mains<br><br><b>Transmit Mode</b>                         | Conducted RF Emissions<br>47 CFR 15.207 | .150 MHz to 30 MHz<br>Measured RF Emission should be Below specified Limits | Pass        |
| Enclosure       | N/A            | Enclosure containing digital circuitry<br><br><b>Receive Mode</b>  | Radiated RF Emissions<br>47 CFR 15.109  | 30 MHz-12.0 GHz<br>Measured RF Emission should be Below specified Limits    | Pass        |
| Power Mains     | AC Power Lines | AC Power Mains<br><br><b>Receive Mode</b>                          | Conducted RF Emissions<br>47 CFR 15.107 | .150 MHz to 30 MHz<br>Measured RF Emission should be Below specified Limits | Pass        |

#### Notes and Exceptions to Report

None.



## 6.0 DECLARATION OF CONFORMITY

The Dickson Company "Wizard2 Module" Intelligent Wireless Data Logging Solutions system, serial number "Logger and Receiver" were found to **MEET** the emission and performance requirements as described within the specifications of Title 47, Part 15, of the Code of Federal Regulations for the United States of America.

Dickson Company "Wizard2 Module" Intelligent Wireless Data Logging Solutions system meets the requirements of 47 CFR 15.249, subpart C, for an intentional radiator product in transmit mode, and meets the requirements of 47 CFR 15.109, subpart B, for an un-intentional radiator in receive mode. The conformity statement is limited in scope to the testing that was commissioned and administered and covered in this report.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

Ingenium Testing, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT, subsequent to the indicated test date(s), will invalidate the data herein, and void this certification.

## 7.0 SIGNATORIES

The test matrix presented in this report was generated, in agreement, by the cognizant parties representing the client as the manufacturer of the equipment, and by the cognizant parties at Ingenium Testing. The performance of the tests and reporting of the results are accurate to the best of our collective knowledge as presented within the body of this report.

The testing of this product was approved by the cognizant parties representing the manufacturer:

|                           |   |
|---------------------------|---|
| <b>Manufacturer Name:</b> | <b>DICKSON</b><br>Dickson Company   |
| Address:                  | 930 S. Westwood Ave.<br>Addison, IL 601101-4917<br>United States of America   |
| Contact Person:           | Mr. Steve Thompson<br>Dickson Company<br>930 S. Westwood Ave.<br>Addison, IL 601101-4917<br>United States of America<br>PH: +1 630 563 4258<br>EM: sthompson@dicksontdata.com |



## 8.0 TEST FACILITY ACCREDITATION

Ingenium Testing, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025:2005, "General Requirements for the Competence of Calibration and Testing Laboratories."

Ingenium Testing's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation (testing certificate number 2674.01) may be accessed at the Ingenium Testing website ([www.ingeniumtesting.com](http://www.ingeniumtesting.com)), and the accreditation status may be verified at the A2LA website ([www.a2la.net](http://www.a2la.net)).



The American Association for Laboratory Accreditation

World Class Accreditation

## Accredited Laboratory

A2LA has accredited

## INGENIUM TESTING, LLC

Rockford, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO/ILAC-IAF Communiqué dated 8 January 2009).

Presented this 5th day of May 2010.



  
\_\_\_\_\_  
President & CEO  
For the Accreditation Council  
Certificate Number 2674.01  
Valid to February 28, 2012

*For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*



TESTING CERTIFICATE NUMBER 2674.01



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#### 8.1 Location of Test Facility

All testing was performed at Ingenium Testing, LLC, 3761 South Central Avenue, Rockford, Illinois, 61102-4292, United States of America, utilizing the facilities listed below, unless otherwise noted.

List of Facilities used at Ingenium Testing, LLC:

- 10-meter SEMC-Anechoic Chamber designated Chamber number 6.
- RF Shielded room designated Chamber 11.



## 9.0 ELECTROMAGNETIC EMISSION TESTS

- 9.1 Radiated RF Emissions Measurements  
9.1.1 Test Criterion

| Port Definition | Terminal Name | Description/Detail   | Test Standard                          | Performance Criteria   | Pass / Fail |
|-----------------|---------------|--|--|--|-------------|
| Enclosure       | N/A           | Alarm Enclosure containing digital circuitry<br><br><b>Transmit Mode</b> | Radiated RF Emissions<br>47 CFR 15.249 | 30 MHz-12.0 GHz<br>Measured RF Emission should be Below specified Limits | Pass        |
| Enclosure       | N/A           | Alarm Enclosure containing digital circuitry<br><br><b>Receive Mode</b>  | Radiated RF Emissions<br>47 CFR 15.109 | 30 MHz-12.0 GHz<br>Measured RF Emission should be Below specified Limits | Pass        |

The following tables present the limits for intentional radiated RF emissions, at the fundamental frequency, and harmonic frequencies as specified in Title 47 CFR, Part 15.249, section (a). These limits were also applied to any signals found in the restricted frequency bands as defined in 47 CFR, Part 15.205.

| Emission  | Field Strength Limit at 3m (mV/m) | Field Strength Limit at 3m ( $\mu$ V/m) | Field Strength Limit at 3m ( $\text{dB}\mu\text{V}/\text{m}$ ) |
|---|-----------------------------------|---|--|
| Fundamental:<br>902-928 MHz                           | 50.0                              | 50,000.0                                | 93.9   |
| Harmonic:<br>2 <sup>nd</sup> through 10 <sup>th</sup> | -                                 | 500.0                                   | 53.9   |
| Spurious:   | -                                 | 500.0                                   | 53.9   |

**Table 6: Field Strength Limit for Intentional Radiators under 47 CFR 15.249**



The following table presents the limits for unintentional radiated RF emissions as specified in Title 47 CFR, Part 15.109, section (a), for products qualifying as Class B Digital Devices. These limits were also applied to any signals found in the restricted frequency bands as defined in 47 CFR, Part 15.205.

| Frequency (MHz) | Field Strength Limit at 3m ( $\mu$ V/m) | Field Strength Limit at 3m ( $\text{dB}\mu\text{V}/\text{m}$ ) |
|-----------------|---|--|
| 30 – 88         | 100.0                                   | 40.0   |
| 88 - 216        | 150.0                                   | 43.5   |
| 216 – 960       | 200.0                                   | 46.0   |
| Above 960       | 500.0                                   | 54.0   |

*Notes:*

*In the calculations for margin below the limit, the limits are rounded to one digit past the decimal.*

#### 9.1.2 Test Equipment

All equipment is calibrated according to governing standards, and is N.I.S.T. traceable. The equipment is used according to the operation manuals as provided by the manufacturers.

**Table 7: List of Test Equipment January:**

| Ingenium Asset Number | Description                  | Manufacturer   | Model        | Last Cal data | Cal due date |
|-----------------------|------------------------------|----------------|--------------|---------------|--------------|
| 1206                  | PRESELECTOR, RF              | AGILENT        | N9039A       | 12-Jan-10     | 12-Jan-11    |
| 1207                  | SPECTRUM ANALYZER            | AGILENT        | E4440A       | 12-Jan-10     | 12-Jan-11    |
| 1753                  | CABLE, 56ft, TRUE BLUE .290  | STORM PRODUCTS | PR90-206-670 | 10-Aug-09     | 10-Aug-10    |
| 1751                  | CABLE, 8 ft., TRUE BLUE .290 | STORM PRODUCTS | PR90-206-118 | 9-May-09      | 9-May-10     |
| RP-0057               | PREAMPLIFIER                 | AGILENT        | 8449B        | 13-Oct-09     | 13-Apr-10    |
| RP-0054               | PREAMPLIFIER                 | HP             | 8447D        | 13-Oct-09     | 13-Apr-10    |
| 1351                  | ANTENNA, HORN                | ETS LINDGREN   | 3117         | 10-Mar-09     | 10-Mar-10    |
| 1361                  | ANTENNA, BICONILOG           | EMCO           | 3142C        | 18-Dec-09     | 18-Dec-10    |



**Table 8: List of Test Equipment May:**

| Ingenium Asset Number | Description                 | Manufacturer   | Model        | Last Cal data | Cal due date |
|-----------------------|-----------------------------|----------------|--------------|---------------|--------------|
| 1360                  | ANTENNA, BICONILOG          | EMCO           | 3142C        | 19-Nov-09     | 19-Nov-10    |
| 1750                  | CABLE, 6FT, TRUE BLUE .290  | STORM PRODUCTS | PR90-195-098 | 4-Aug-09      | 4-Aug-10     |
| 1753                  | CABLE, 56ft, TRUE BLUE .290 | STORM PRODUCTS | PR90-206-670 | 10-Aug-09     | 10-Aug-10    |
| RP-0054               | PREAMPLIFIER                | HP             | 8447D        | 28-Mar-10     | 28-Sep-10    |
| 1206                  | PRESELECTOR, RF             | AGILENT        | N9039A       | 12-Jan-10     | 12-Jan-11    |
| 1207                  | SPECTRUM ANALYZER           | AGILENT        | E4440A       | 12-Jan-10     | 12-Jan-11    |
| 1352                  | ANTENNA, HORN               | ETS LINDGREN   | 3117         | 18-Nov-09     | 18-Nov-10    |
| 0833                  | PREAMPLIFIER, 26dB          | HP             | 8449B        | 13-Apr-10     | 13-Oct-10    |

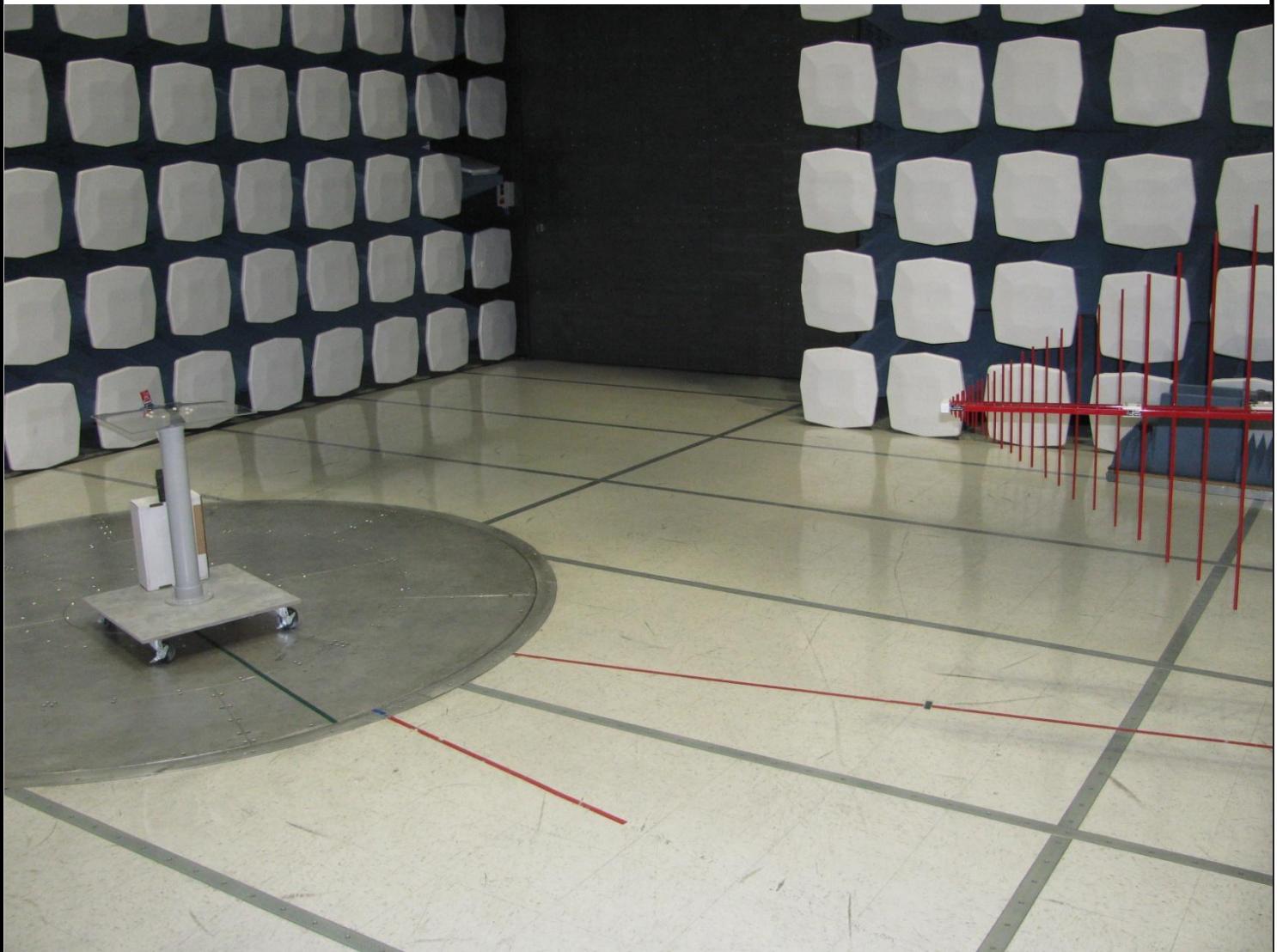
**May Testing**

The data presented accounts for the antenna correction factor as well as cable loss or other corrections, and can, therefore, be entered into the database as a corrected measurement result.

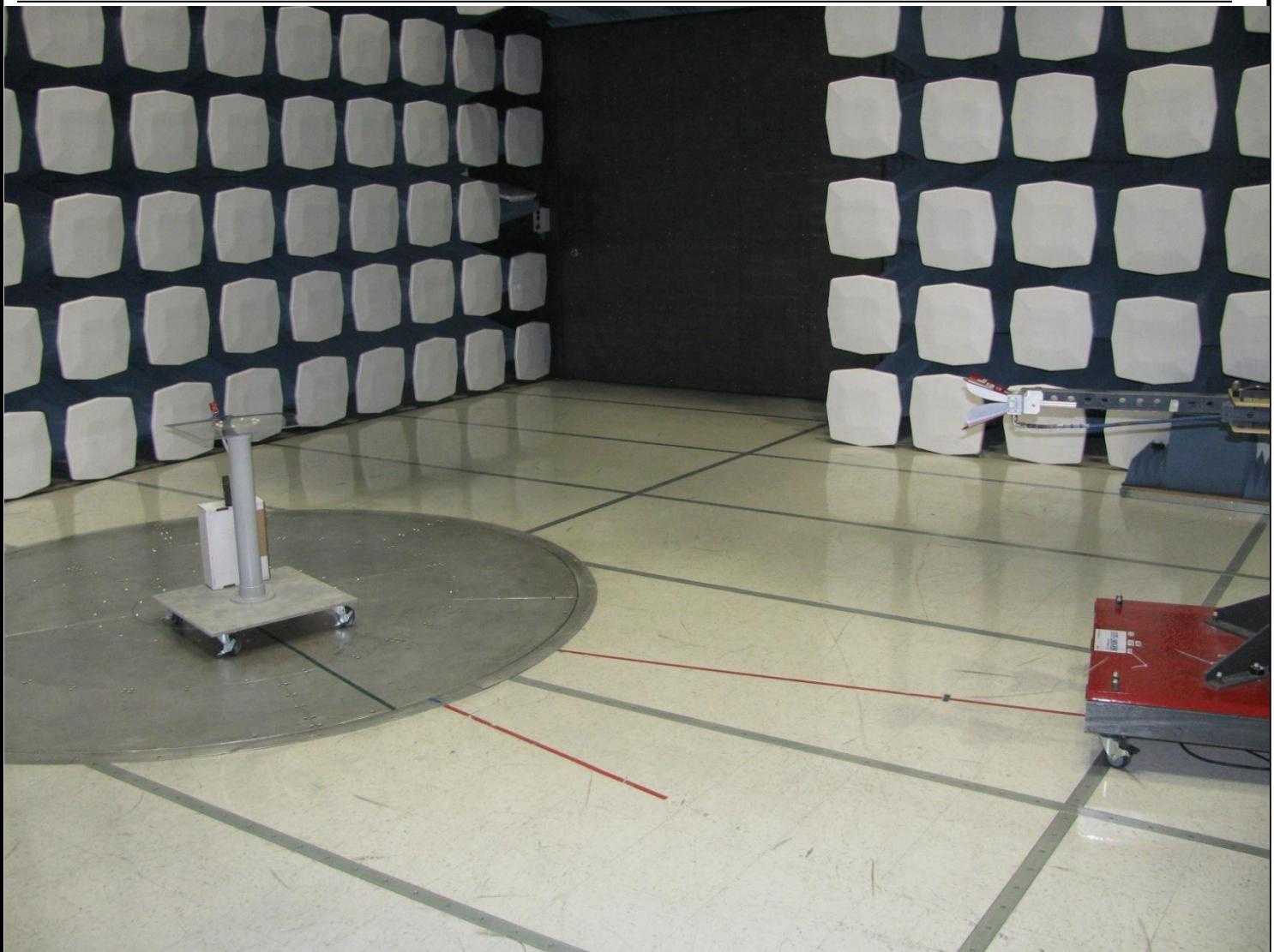
### 9.1.3 Test Setup

The EUT was tested as a “table-top device” type product, as described in ANSI C63.4. The EUT was placed on a non-conductive table, centered on a flush-mounted 3 meter-diameter turntable in the 10 Meter FCC Listed Semi-Anechoic Chamber located at Ingenium Testing. The test setup complies with the necessary procedures as described in the ANSI standard. The EUT was exercised under standard operating conditions, and powered by four type ‘AA’ batteries or by a wall transformer. This radio was tested in three orthogonal positions to determine worse case emissions. The data found in Table 10 have been determined to be worse case emissions.

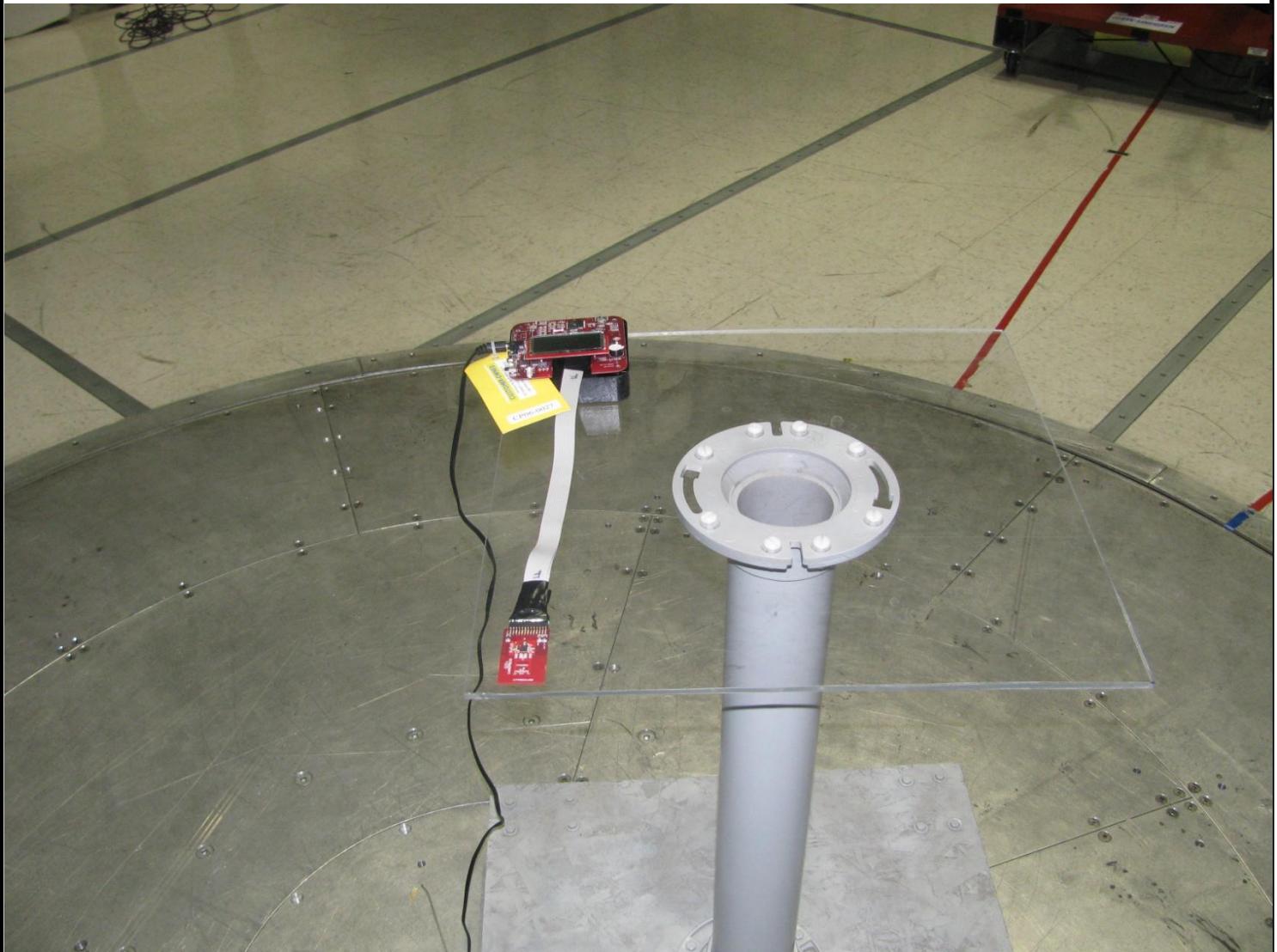
#### Test Setup Photos:



**Figure 3: Setup of the Logger for Radiated Emissions 80 MHz to 1000MHz**



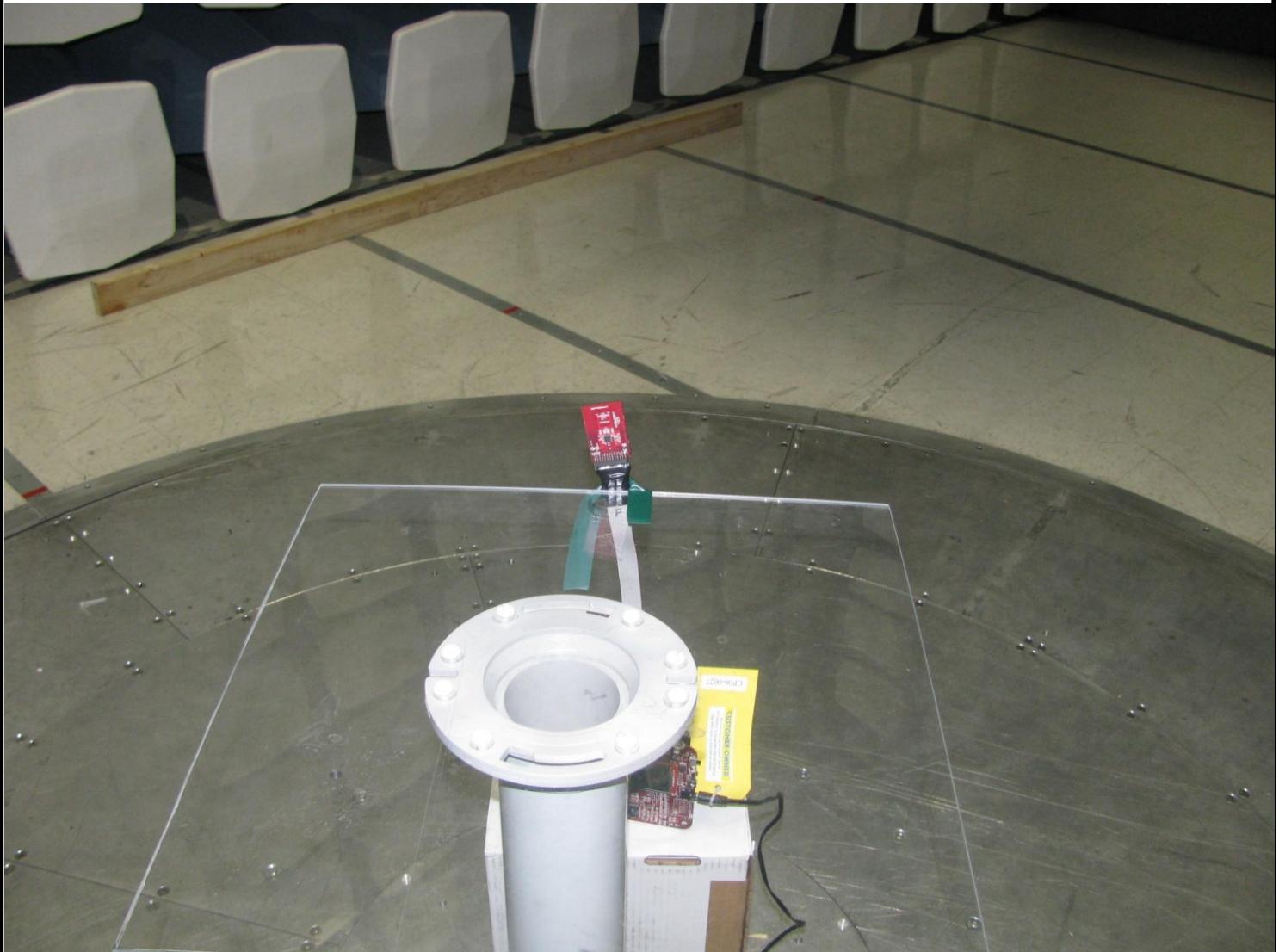
**Figure 4: Setup of the Logger for Radiated Emissions 1 GHz to 12.5 GHz**



**Figure 5: Setup of the Logger for Radiated Emissions Back Axis**



**Figure 6: Setup of the Logger for Radiated Emissions Side Axis**



**Figure 7: Setup of the Logger for Radiated Emissions Upright Axis**



#### 9.1.4 Test Procedure

The EUT was measured for Radiated RF Emissions in the 10 Meter FCC Listed Semi-Anechoic Chamber located at Ingenium Testing. The frequency range from 30 MHz to 12.5 GHz was investigated for RF emissions, and emission levels were noted along with the fixed degree settings of azimuth on the turntable and sense antenna height. The EUT was placed on a non-conductive table, centered on a turn-table with a conductive rotating surface, flush and in contact with the conductive ground plane. The antenna mast was placed such that the antenna was separated by 3 meters from the test object for testing. A Hybrid Bicon-Log Antenna was used to measure emissions from 30 MHz to 1000 MHz. A Double-Ridged Wave-Guide Horn Antenna was used to measure emissions from 1 GHz to 12.5 GHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height, while utilizing the turn-table to rotate the product. The process was repeated using both horizontal and vertical antenna polarizations. The maximum emission levels were then recorded along with the attitude of the product.

The EUT was programmed in advance, by the client cognizant engineer, in the proper mode. The mode tested was in continuous-transmit CW, for the intentional radiator testing, and in stand-by for the un-intentional radiator testing. The alarm sounder was deactivated in order to conserve battery power during CW testing.

The applicable limits as noted in 47 CFR 15.249 were applied for the intentional radiator tests. As per 47 CFR 15 Section 15.31 (e), the transmitter was tested at 85% and 115% as well as nominal. The transmitter can also operate on battery power and this was checked also.

The applicable limits as noted in 47 CFR 15.109 for a Class B type product were applied for the un-intentional radiator tests. The receiver was operated with a resolution bandwidth (RBW) of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 3 MHz).

#### 9.1.5 Test Results

The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.249 for radiated emissions from an intentional radiator.

The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.109 for radiated emissions from a Class B product, as well as the Industry Canada requirements specified within ICES-003 for a Class B digital device. Supporting evidence of significant measured RF emissions, are tabulated and presented below.

##### CLIMATE TEST CONDITIONS

|                     |                 |
|---------------------|-----------------|
| <b>Temperature:</b> | 73 °F (22.8 °C) |
| <b>Humidity:</b>    | 48 % RH         |

|                |                      |                       |               |
|----------------|----------------------|-----------------------|---------------|
| DATE: 02/26/10 | DOC. NO: CTR-10-0110 | REVISION: PRELIMINARY | Page 23 of 49 |
|----------------|----------------------|-----------------------|---------------|

**Table 9: Level of Significant Spurious Radiated RF Emissions**

| Mode<br>(Tx / Rx)                 | Frequency<br>(MHz) | Antenna<br>Polarization | Height<br>(cm) | Azimuth<br>(0° - 360°) | Type of<br>Measurement | Measured EFI<br>(dB $\mu$ V/m@3m) | 15.109 Limit<br>(dB $\mu$ V/m@3m) | Margin<br>(dB) |
|-----------------------------------|--------------------|-------------------------|----------------|------------------------|------------------------|-----------------------------------|-----------------------------------|----------------|
| Rx                                | 30.06              | H                       | 206.1          | 296.3                  | Peak                   | 17.60                             | 40                                | 22.4           |
| Rx                                | 106.7998           | H                       | 399.6          | 314.3                  | Peak                   | 9.8777                            | 43.5                              | 33.6223        |
| Rx                                | 735.82             | H                       | 100.3          | 360                    | Peak                   | 25.94                             | 46                                | 20.06          |
| Rx                                | 30.88512           | V                       | 305            | 122.9                  | Peak                   | 15.63                             | 40                                | 24.37          |
| Rx                                | 101.5981           | V                       | 100.3          | 122.9                  | Peak                   | 9.289                             | 43.5                              | 34.211         |
| Rx                                | 474.1145           | V                       | 305            | 350                    | Peak                   | 21.127                            | 46                                | 24.873         |
| T <sub>x</sub> <sub>nom</sub>     | 48.0066            | V                       | 143.4          | 67.532                 | Peak                   | 19.86216                          | 40                                | 20.13784       |
| T <sub>x</sub> <sub>nom</sub>     | 199.993            | V                       | 143.4          | 67.5                   | Peak                   | 21.44568                          | 43.5                              | 22.05433       |
| T <sub>x</sub> <sub>nom</sub>     | 459.559            | V                       | 245.3          | 67.5                   | Peak                   | 25.831                            | 46                                | 20.169         |
| T <sub>x</sub> <sub>nom</sub>     | 184.0187           | H                       | 145.6          | 22.8                   | Peak                   | 23.21565                          | 43.5                              | 20.28435       |
| T <sub>x</sub> <sub>nom</sub>     | 200.0236           | H                       | 244.3          | 336.5                  | Peak                   | 23.06688                          | 43.5                              | 20.43312       |
| T <sub>x</sub> <sub>nom</sub>     | 459.559            | H                       | 255.4          | 157.6                  | Peak                   | 25.69223                          | 46                                | 20.30777       |
| T <sub>x</sub> <sub>85%nom</sub>  | 34.18412           | V                       | 253.6          | 22.1                   | Peak                   | 21.26386                          | 40                                | 18.73614       |
| T <sub>x</sub> <sub>85%nom</sub>  | 48.00661           | V                       | 146.3          | 248.1                  | Peak                   | 21.61816                          | 40                                | 18.38185       |
| T <sub>x</sub> <sub>85%nom</sub>  | 96.02156           | V                       | 145.9          | 157.8                  | Peak                   | 16.37289                          | 43.5                              | 27.12711       |
| T <sub>x</sub> <sub>85%nom</sub>  | 200                | V                       | 144.2          | 68                     | Peak                   | 22.18486                          | 43.5                              | 21.31514       |
| T <sub>x</sub> <sub>85%nom</sub>  | 459.559            | V                       | 246            | 68                     | Peak                   | 27.062                            | 46                                | 18.938         |
| T <sub>x</sub> <sub>85%nom</sub>  | 200.0236           | H                       | 154.8          | 336.8                  | Peak                   | 23.63388                          | 43.5                              | 19.86612       |
| T <sub>x</sub> <sub>85%nom</sub>  | 459.559            | H                       | 255.7          | 247                    | Peak                   | 26.12423                          | 46                                | 19.87577       |
| T <sub>x</sub> <sub>115%nom</sub> | 42.1563            | V                       | 144.5          | 243.3                  | Peak                   | 21.71389                          | 40                                | 18.28611       |
| T <sub>x</sub> <sub>115%nom</sub> | 48.00661           | V                       | 151.9          | 198.3                  | Peak                   | 21.23616                          | 40                                | 18.76384       |
| T <sub>x</sub> <sub>115%nom</sub> | 183.9883           | V                       | 144.1          | 63.4                   | Peak                   | 20.12385                          | 43.5                              | 23.37615       |
| T <sub>x</sub> <sub>115%nom</sub> | 200                | V                       | 144.1          | 63.4                   | Peak                   | 21.11863                          | 43.5                              | 22.38137       |
| T <sub>x</sub> <sub>115%nom</sub> | 459.5893           | V                       | 244.8          | 243.3                  | Peak                   | 25.19561                          | 46                                | 20.80439       |
| T <sub>x</sub> <sub>115%nom</sub> | 55.97878           | H                       | 355.7          | 333.4                  | Peak                   | 14.41953                          | 40                                | 25.58047       |
| T <sub>x</sub> <sub>115%nom</sub> | 184.0187           | H                       | 150.8          | 161.5                  | Peak                   | 21.948032                         | 43.5                              | 21.55197       |
| T <sub>x</sub> <sub>115%nom</sub> | 200.0236           | H                       | 154.4          | 333.4                  | Peak                   | 24.08888                          | 43.5                              | 19.41112       |
| T <sub>x</sub> <sub>115%nom</sub> | 459.559            | H                       | 255.9          | 161.5                  | Peak                   | 24.80124                          | 46                                | 21.19877       |
| T <sub>x</sub> <sub>Battery</sub> | 168.0044           | V                       | 244.7          | 68                     | Peak                   | 17.01525                          | 47                                | 29.98475       |
| T <sub>x</sub> <sub>Battery</sub> | 184.0187           | V                       | 245.1          | 68                     | Peak                   | 19.32659                          | 48                                | 28.67341       |
| T <sub>x</sub> <sub>Battery</sub> | 200.054            | V                       | 244.7          | 247.5                  | Peak                   | 18.30456                          | 49                                | 30.69544       |
| T <sub>x</sub> <sub>Battery</sub> | 459.559            | V                       | 245.1          | 68                     | Peak                   | 23.748                            | 50                                | 26.252         |
| T <sub>x</sub> <sub>Battery</sub> | 168.0137           | H                       | 155.8          | 157.8                  | Peak                   | 23.6919                           | 50                                | 26.3081        |
| T <sub>x</sub> <sub>Battery</sub> | 184.0187           | H                       | 145            | 202.6                  | Peak                   | 26.30966                          | 50                                | 23.69034       |
| T <sub>x</sub> <sub>Battery</sub> | 200.0236           | H                       | 145            | 202.6                  | Peak                   | 24.89189                          | 50                                | 25.10811       |

**Table 10: Significant Radiated RF Emissions Measured in Transmit Fundamental and Harmonic Frequencies**

| Frequency (MHz) | Ant./EUT Polarization | Height (cm) | Azimuth (0° - 360°) | Measured Peak (dB $\mu$ V/m@3m) | Calculated Average dB $\mu$ V/m (Note 1) | Average Limit (dB $\mu$ V/m) | Peak Limit (dB $\mu$ V/m) | Average Margin (dB) |
|-----------------|-----------------------|-------------|---------------------|---------------------------------|--|------------------------------|---------------------------|---------------------|
| 919.1384        | V                     | 107.8       | 138.8               | 76.064                          |  |                              | 93.9                      | 41.716              |
| 1838.277        | H                     | 100.1       | 299.2               | 64.659                          | 40.779                                   | 53.9                         | 73.9                      | 13.121              |
| 2757.415        | V                     | 100.1       | 329.5               | 72.889                          | 49.009                                   | 53.9                         | 73.9                      | 4.891               |
| 3676.554        | V                     | 100.1       | 213.6               | 56.737                          | 32.857                                   | 53.9                         | 73.9                      | 21.043              |
| 4595.692        | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |
| 5514.83         | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |
| 6433.969        | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |
| 7353.107        | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |
| 8272.246        | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |
| 9191.384        | -                     |             |                     | ( Note 2 )                      |  |                              |                           |                     |

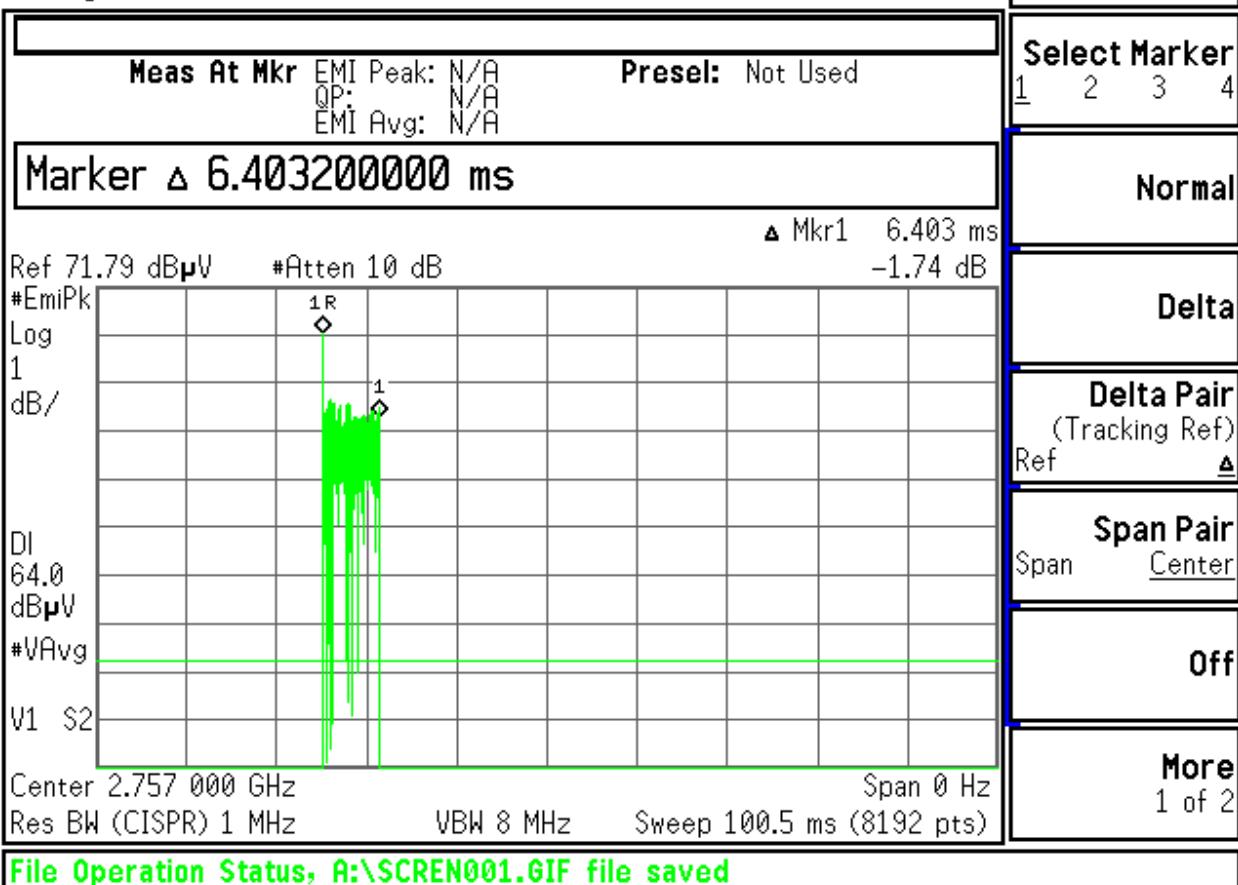
Notes:

1) See following for justification

2) Measurement at receiver system noise floor, and better than 20 dB below limits.

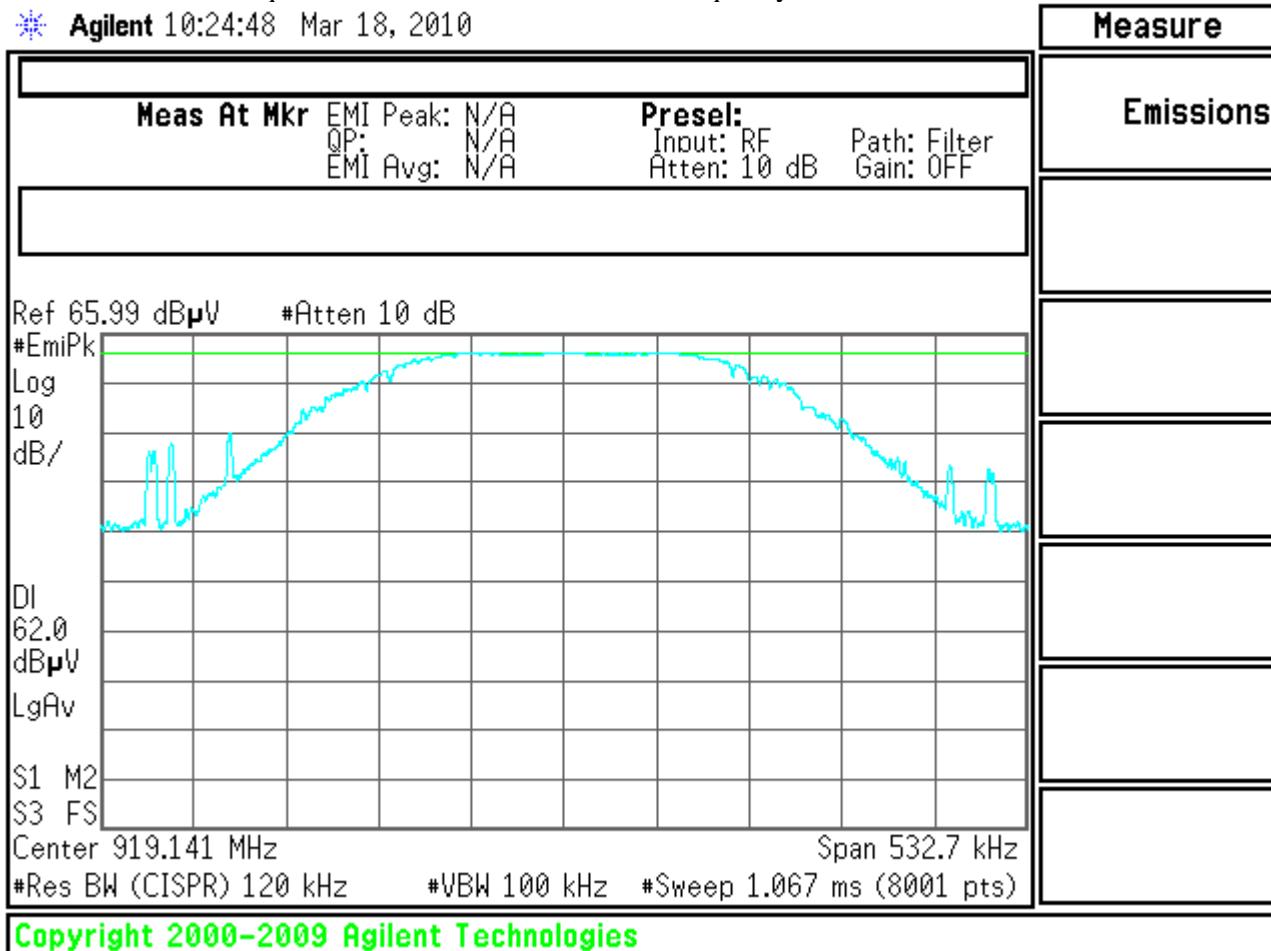
#### 9.1.6 Calculated Average

The Second harmonic of the fundamental is at 2.757344 GHz. The EUT sends out one pulse every minute. Since this is a pulsed signal it cannot be properly measured with an average receiver, the pulse was captured and the pulse width measured 0Hz span with a window width 100ms sweep speed with a 1dB/div settings per ANSI C63.4 H.4 j. The pulse width is 6.4ms as shown below. Convert the dutycycle to dB $\mu$ V/m using  $20 \times \log(6.4/100)$  yields a -23.88dB average correction factor. This is added to the peak signal at the 2.757344 GHz, 72.89dB $\mu$ V + (-23.88dB) = 49.01 dB $\mu$ V, well under the average limit of 54dB $\mu$ V.

**\* Agilent** 14:24:15 Jan 5, 2010

**Figure 8 Pulse width of transmission**

### 9.1.7 Occupied Bandwidth

In Accordance with Industry Canada RSS-210 Issue 7 – 2007 section A1.1.3 the occupied bandwidth was measured at 349.51 kHz which equated to .04% of the fundamental frequency.



**Figure 9 Peak of transmitted pulse**

Agilent 10:27:15 Mar 18, 2010

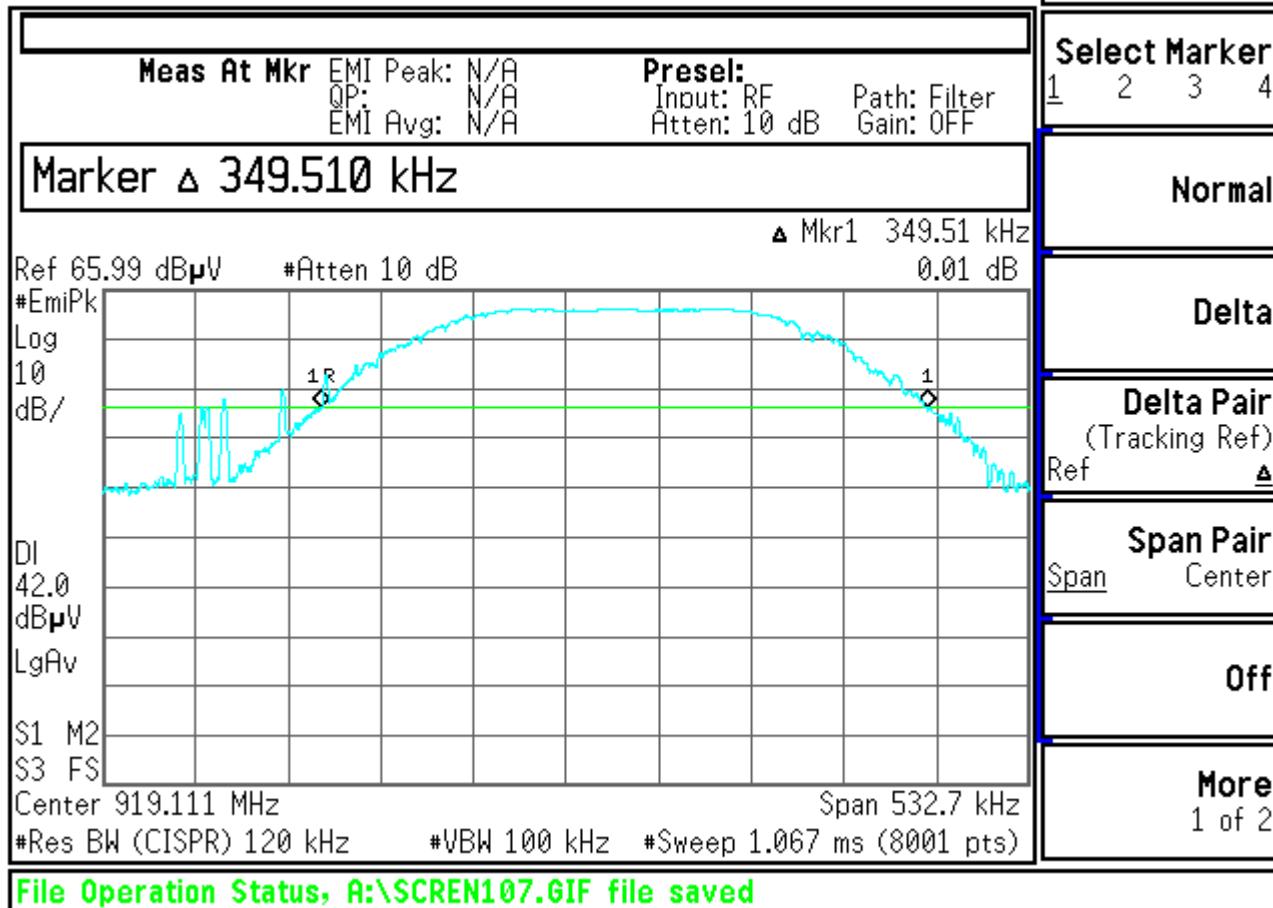


Figure 10 99% (20 dB down)of Peak



## SCREEN CAPTURES – RADIATED RF EMISSIONS TESTING

These screen captures represent Peak Emissions. For radiated Emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from **worst-case** emissions, as measured with the sense antenna both in vertical and horizontal polarity.

### Transmit Mode

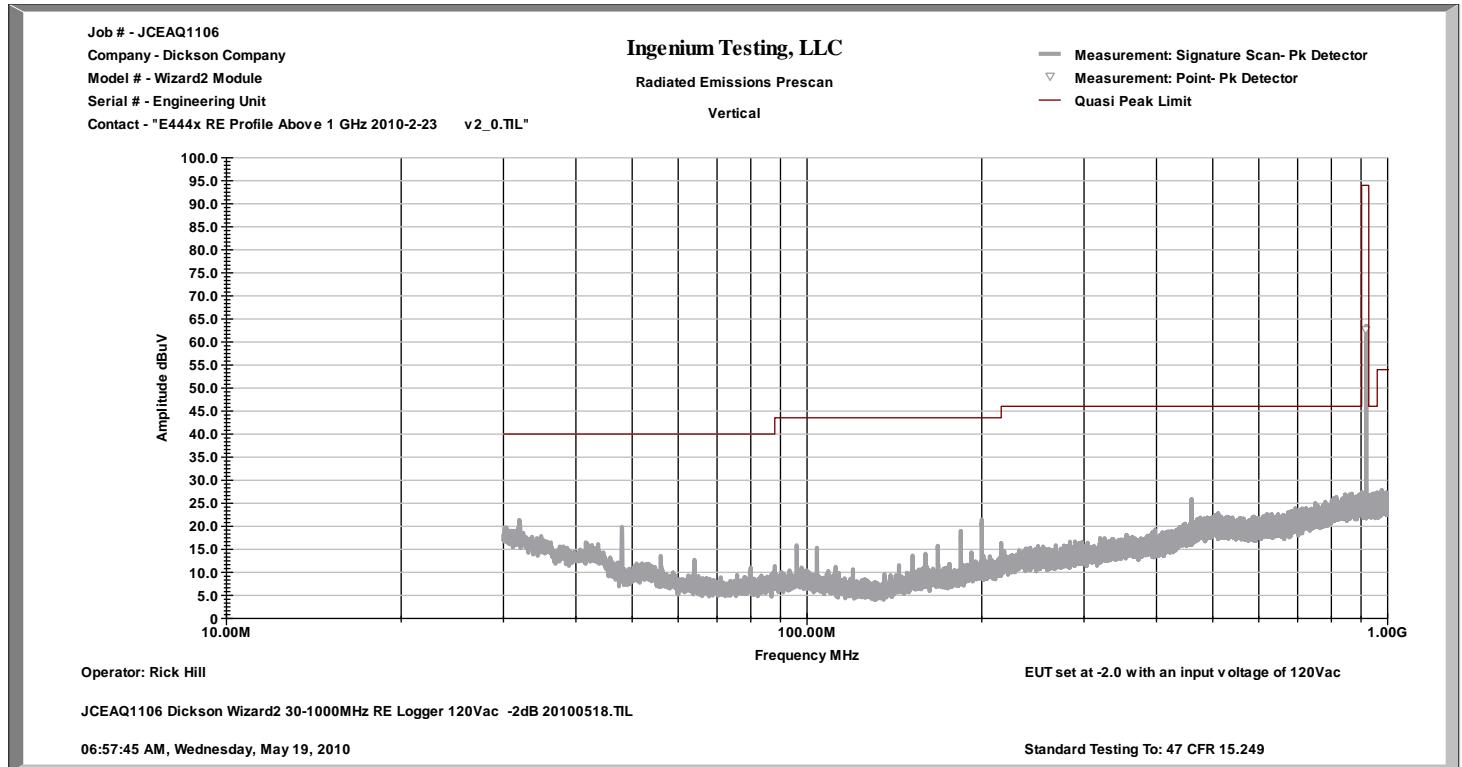


Figure 11: Logger RF Emissions, Antenna Vertically Polarized, 30-1000MHz, at 3m, and nominal Voltage

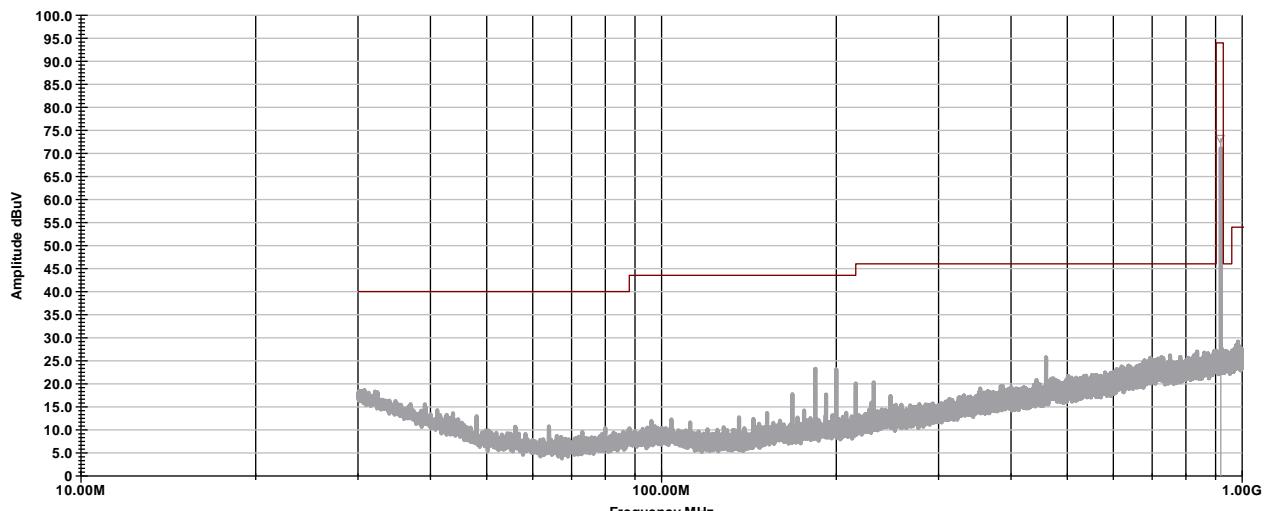


Job # - JCEAQ1106  
 Company - Dickson Company  
 Model # - Wizard2 Module  
 Serial # - Engineering Unit  
 Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
 Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 120Vac

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger 120Vac -2dB 20100518.TIL

07:02:06 AM, Wednesday, May 19, 2010

Standard Testing To: 47 CFR 15.249

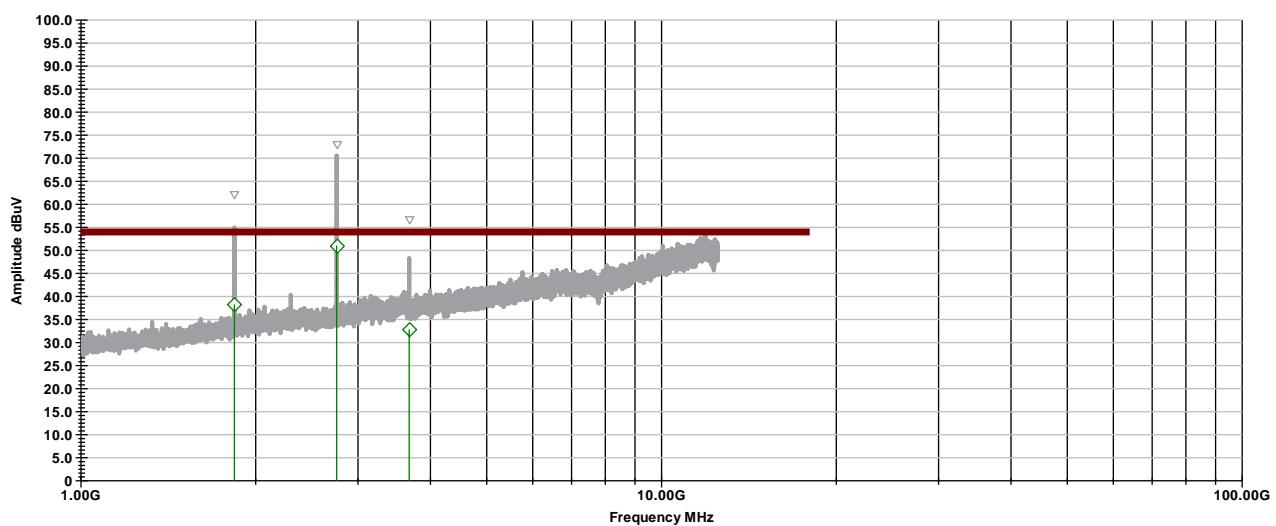
**Figure 12: Logger RF Emissions, Antenna Horizontally Polarized, 30-1000MHz, at 3m, and nominal Voltage**

Job # - JCEAQ1106  
 Company - Dickson Company  
 Model # - Wizard2 Module  
 Serial # - NA  
 Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
 Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point-Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with 120 Vac input

JCEAQ1106 Dickson Wizard2 1-12.5GHz RE Logger 120 V -2dB 20100518.TIL

11:17:35 AM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 13: Logger RF Emissions, Antenna Vertically Polarized, 1 – 12.5 GHz, at 3m, and nominal Voltage**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 30 of 49



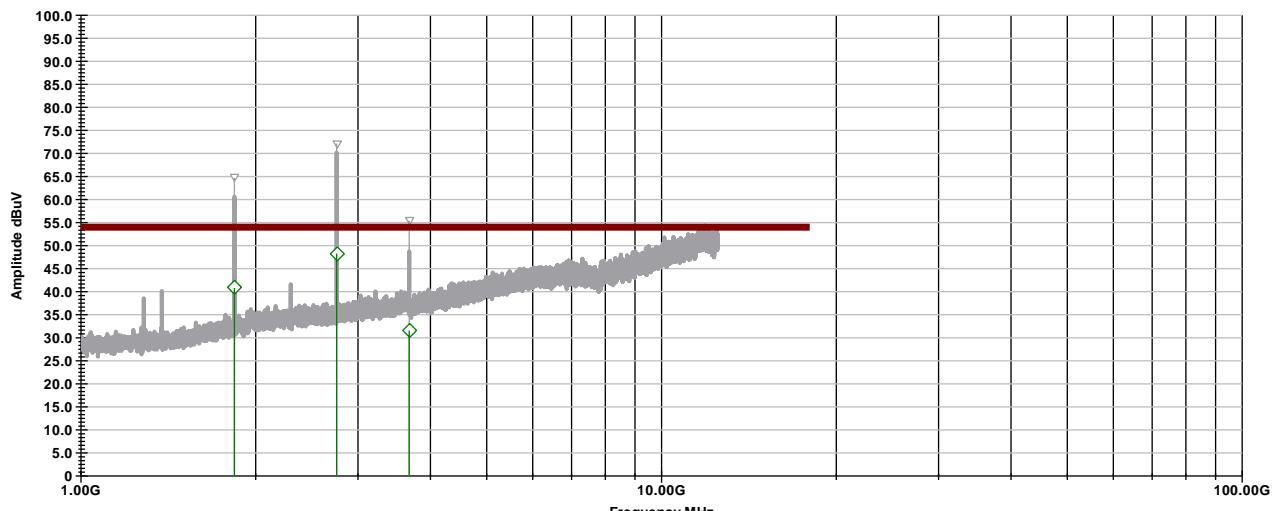
Job # - JCEAQ1106  
 Company - Dickson Company  
 Model # - Wizard2 Module  
 Serial # - NA  
 Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point- Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with 120 Vac input

JCEAQ1106 Dickson Wizard2 1-12\_5GHz RE Logger 120 V -2dB 20100518.TIL

11:27:23 AM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 14: Logger RF Emissions, Antenna Horizontally Polarized, 1 – 12.5 GHz, at 3m, and nominal Voltage**

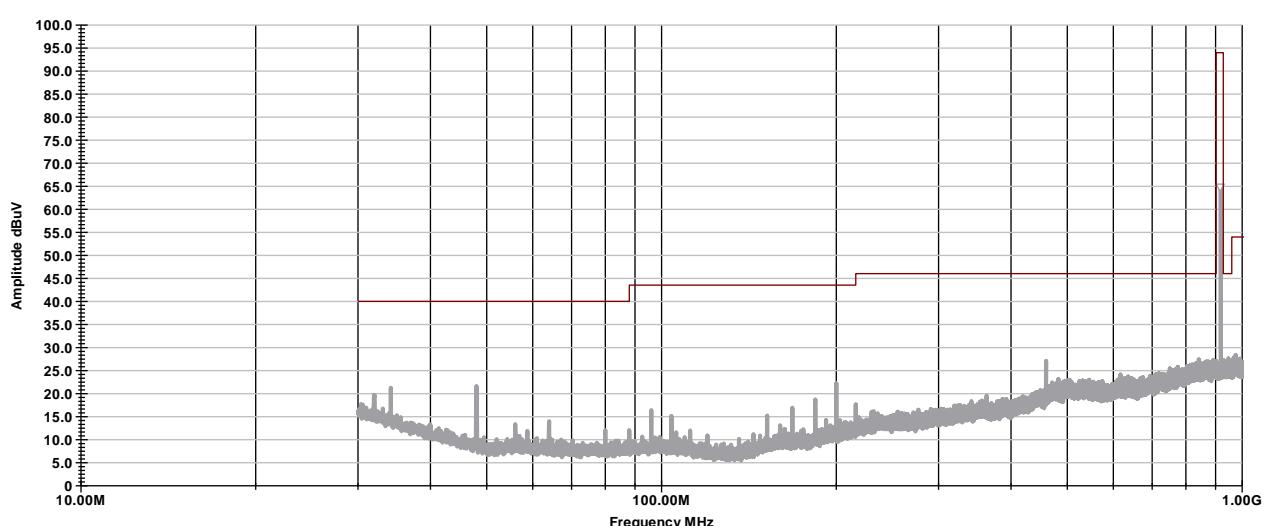
Job # - JCEAQ1106  
 Company - Dickson Company  
 Model # - Wizard2 Module  
 Serial # - Engineering Unit  
 Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 108Vac

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger 108Vac -2dB 20100518.TIL

05:50:08 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 15: Logger RF Emissions, Antenna Vertically Polarized, 30-1000MHz, at 3m, and 85% of nominal Voltage**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 31 of 49

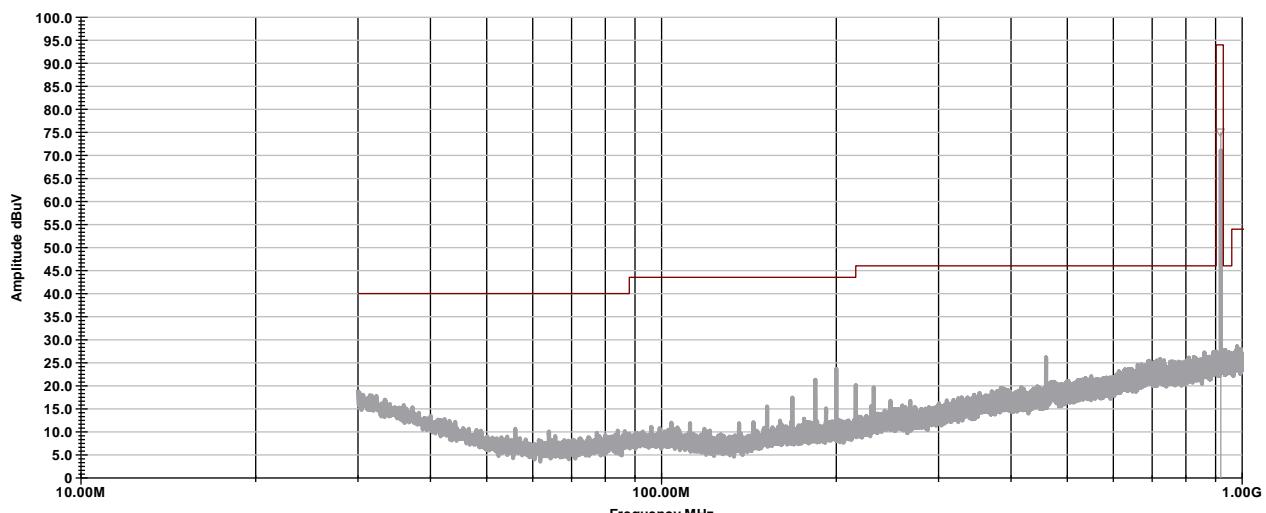


Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Engineering Unit  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 108Vac

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger 108Vac -2dB 20100518.TIL

05:52:35 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

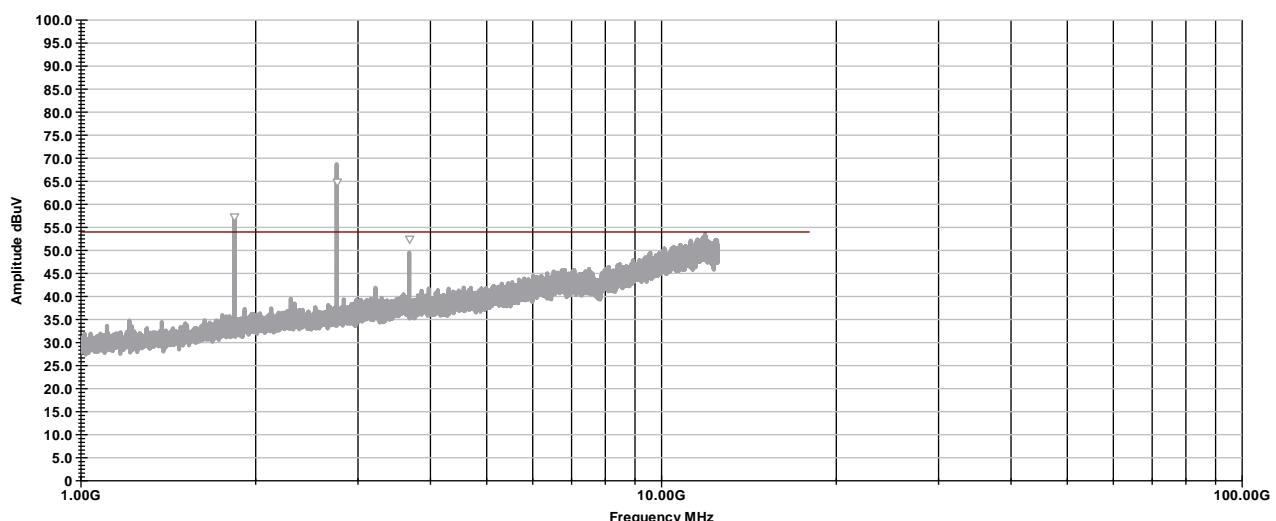
Figure 16: Logger RF Emissions, Antenna Horizontally Polarized, 30-1000MHz, at 3m, and 85% of nominal Voltage

Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Engineering Unit  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point-Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 108Vac

JCEAQ1106 Dickson Wizard2 1-12.5GHz RE Logger 108V -2dB 20100518.TIL

01:26:38 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

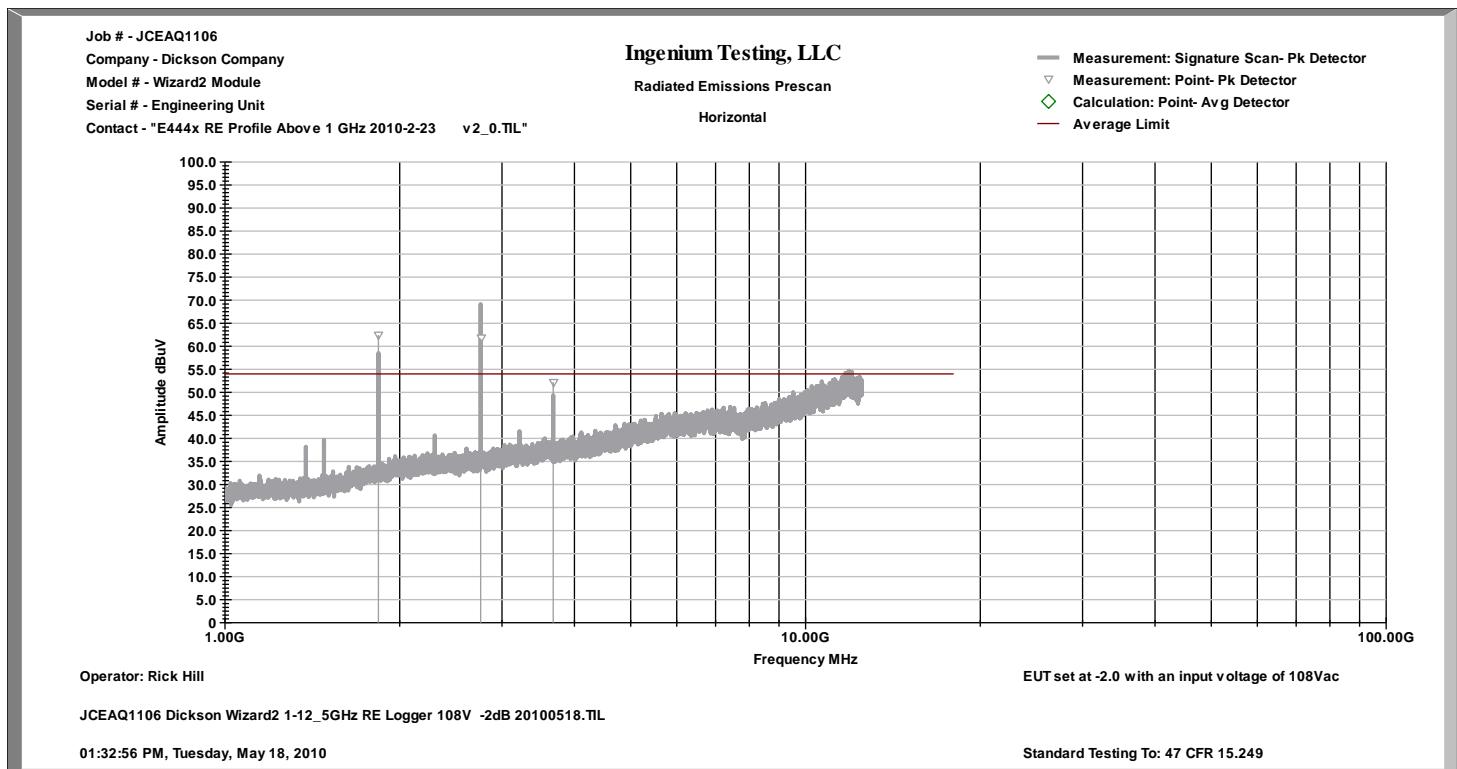
Figure 17: Logger RF Emissions, Antenna Vertically Polarized, 1 – 12.5 GHz, at 3m, and 85% of nominal Voltage

DATE: 02/26/10

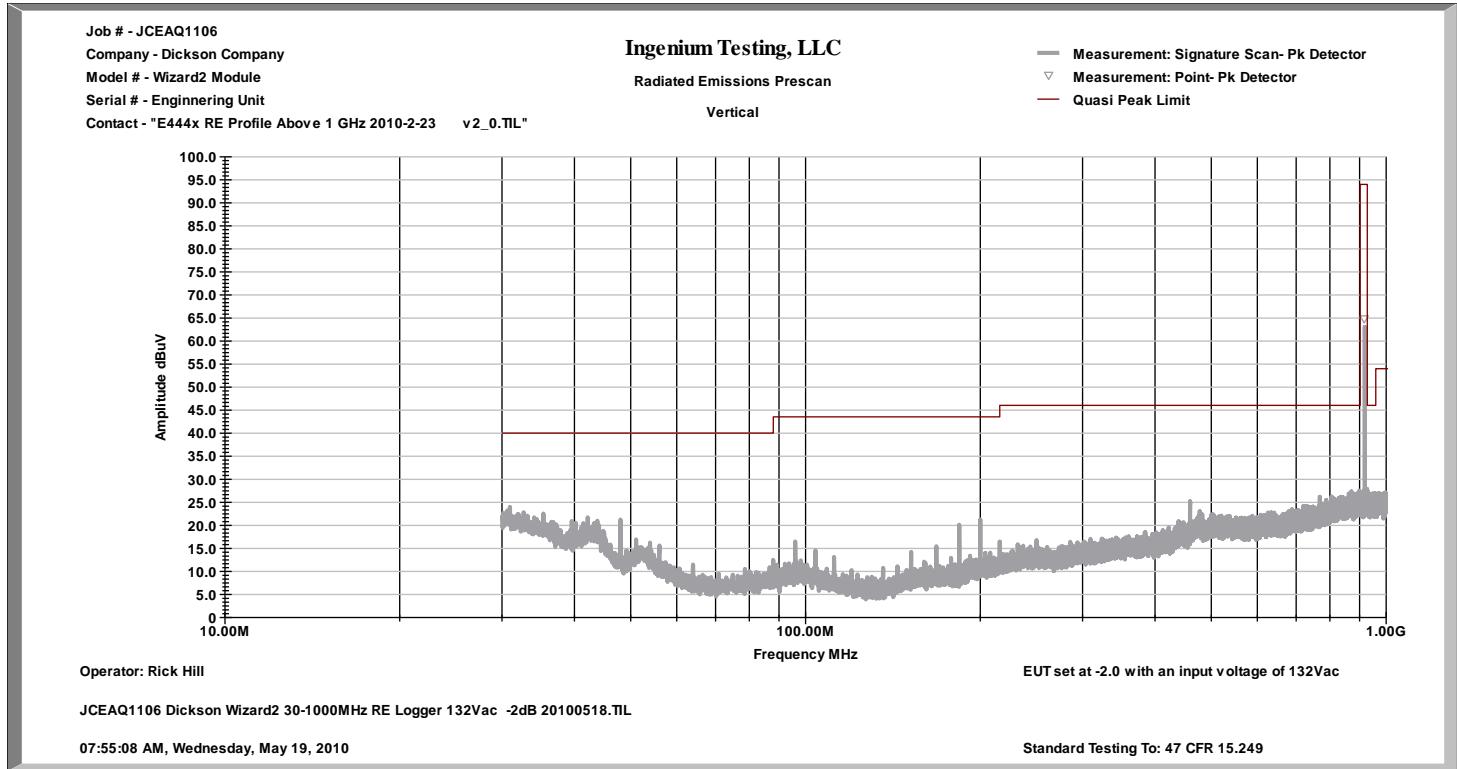
DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 32 of 49



**Figure 18: Logger RF Emissions, Antenna Horizontally Polarized, 1 – 12.5 GHz, at 3m, and 85% of nominal Voltage**



**Figure 19: Logger RF Emissions, Antenna Vertically Polarized, 30-1000MHz, at 3m, and 115% of nominal Voltage**

|                |                      |                       |               |
|----------------|----------------------|-----------------------|---------------|
| DATE: 02/26/10 | DOC. NO: CTR-10-0110 | REVISION: PRELIMINARY | Page 33 of 49 |
|----------------|----------------------|-----------------------|---------------|



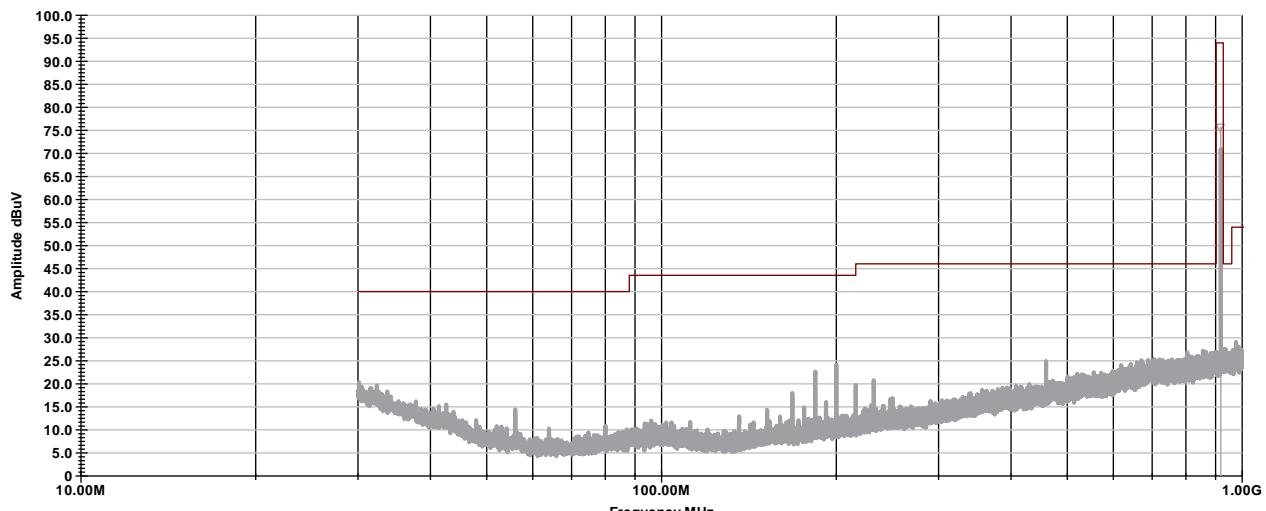
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Engineering Unit  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 132Vac

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger 132Vac -2dB 20100518.TIL

08:11:29 AM, Wednesday, May 19, 2010

Standard Testing To: 47 CFR 15.249

**Figure 20: Logger RF Emissions, Antenna Horizontally Polarized, 30-1000MHz, at 3m, and 115% of nominal Voltage**

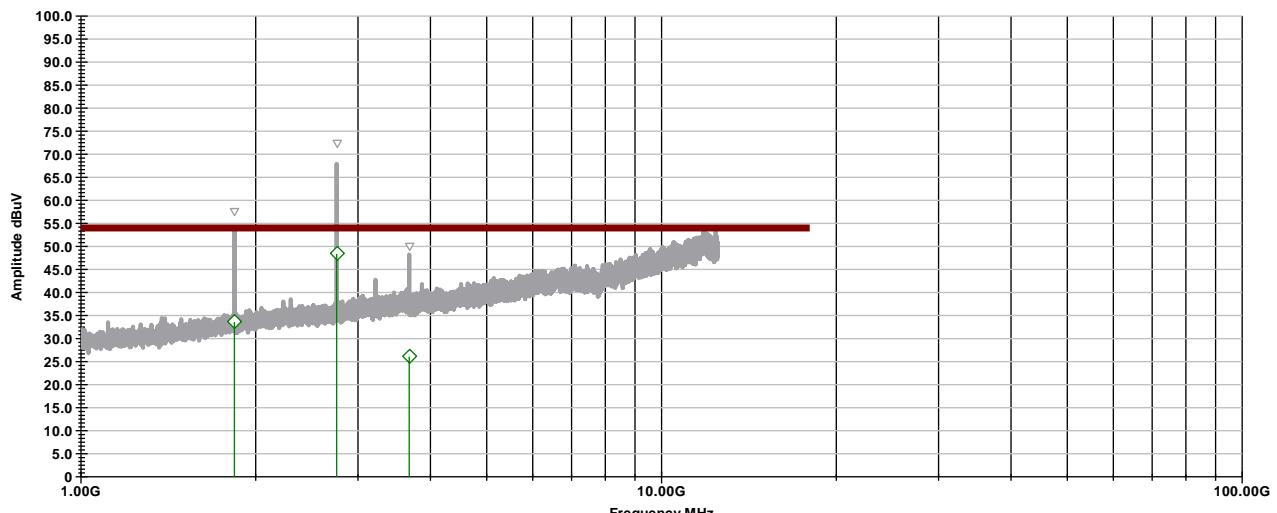
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - NA  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point-Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 132Vac

JCEAQ1106 Dickson Wizard2 1-12.5GHz RE Logger 132V -2dB 20100518.TIL

12:53:16 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 21: Logger RF Emissions, Antenna Vertically Polarized, 1 – 12.5 GHz, at 3m, and 115% of nominal Voltage**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 34 of 49



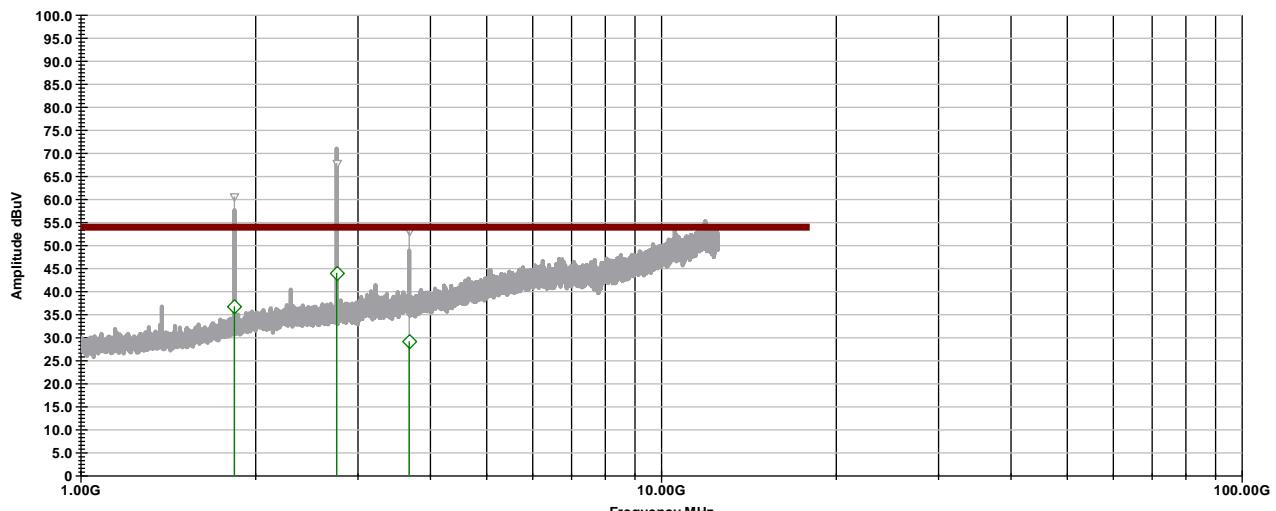
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - NA  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point- Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of 132Vac

JCEAQ1106 Dickson Wizard2 1-12\_5GHz RE Logger 132V -2dB 20100518.TIL

12:51:33 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 22: Logger RF Emissions, Antenna Horizontally Polarized, 1 – 12.5 GHz, at 3m, and 115% of nominal Voltage**

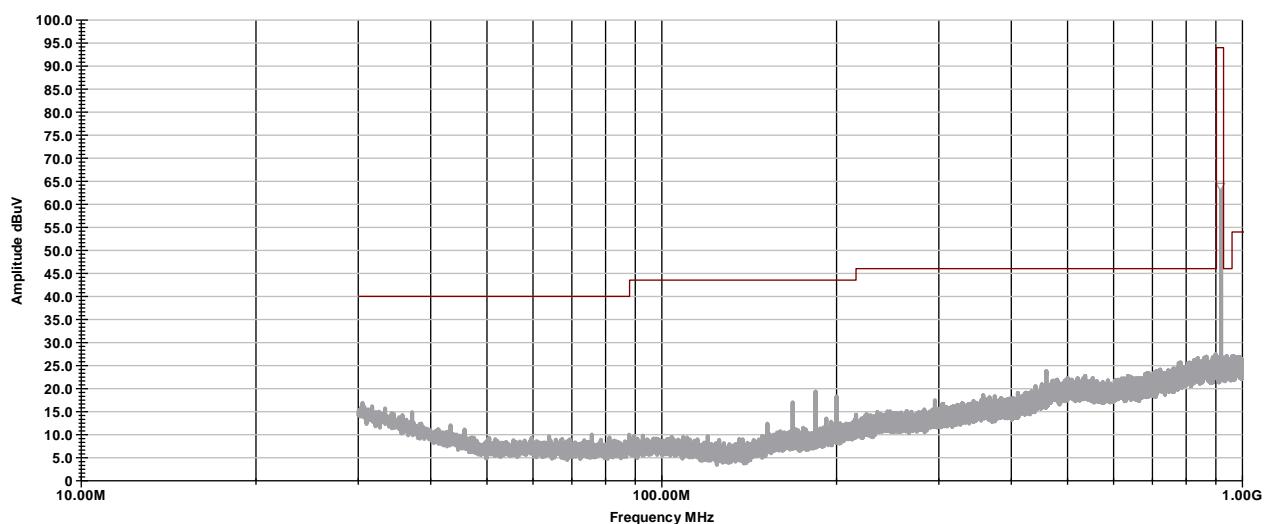
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Engineering Unit  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of Battery Power

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger Batt -2dB 20100518.TIL

05:07:01 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 23: Logger RF Emissions, Antenna Vertically Polarized, 30-1000MHz, at 3m, Battery powered**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 35 of 49

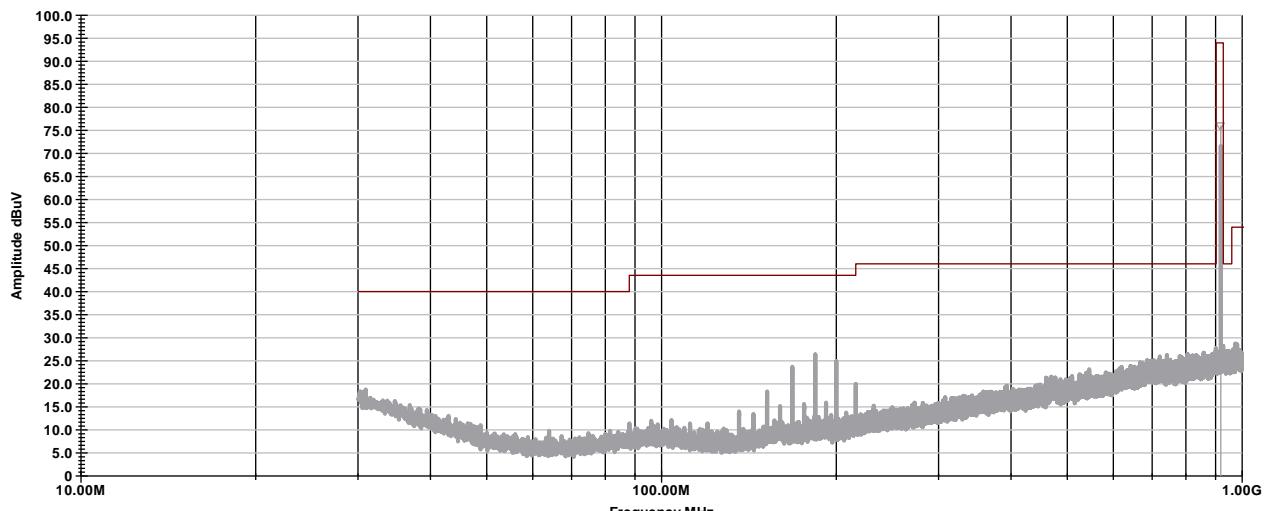


Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Engineering Unit  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Quasi Peak Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of Battery Power

JCEAQ1106 Dickson Wizard2 30-1000MHz RE Logger Batt -2dB 20100518.TIL

05:10:24 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

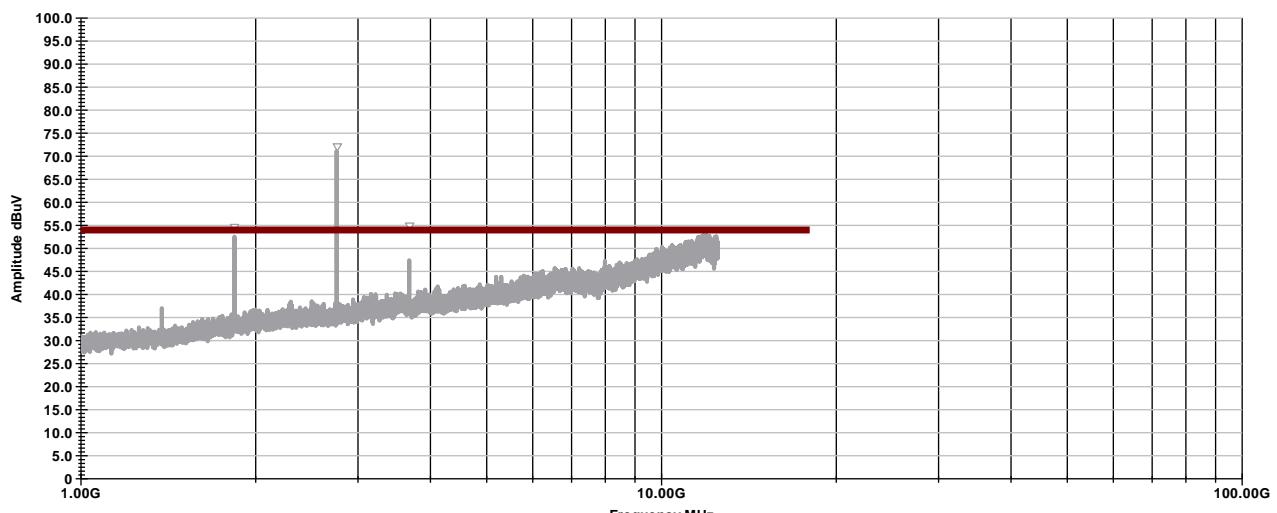
**Figure 24: Logger RF Emissions, Antenna Horizontally Polarized, 30-1000MHz, at 3m, Battery powered**

Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - NA  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

Radiated Emissions Prescan  
Vertical

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point-Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of Battery Power

JCEAQ1106 Dickson Wizard2 1-12.5GHz RE Logger Batt -2dB 20100518B.TIL

03:02:24 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 25: Logger RF Emissions, Antenna Vertically Polarized, 1 – 12.5 GHz, at 3m, Battery powered**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 36 of 49



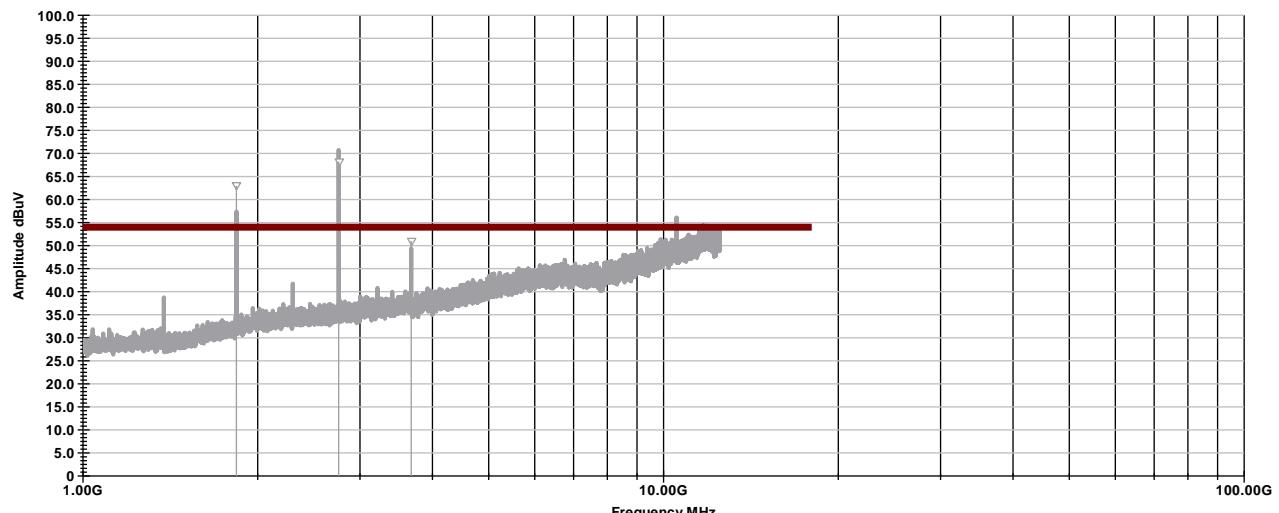
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - NA  
Contact - "E444x RE Profile Above 1 GHz 2010-2-23 v2\_0.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Prescan

Horizontal

- Measurement: Signature Scan- Pk Detector
- Measurement: Point- Pk Detector
- Calculation: Point- Avg Detector
- Average Limit



Operator: Rick Hill

EUT set at -2.0 with an input voltage of Battery Power

JCEAQ1106 Dickson Wizard2 1-12\_5GHz RE Logger Batt -2dB 20100518B.TIL

03:08:22 PM, Tuesday, May 18, 2010

Standard Testing To: 47 CFR 15.249

**Figure 26: Logger RF Emissions, Antenna Horizontally Polarized, 1 – 12.5 GHz, at 3m, Battery powered**



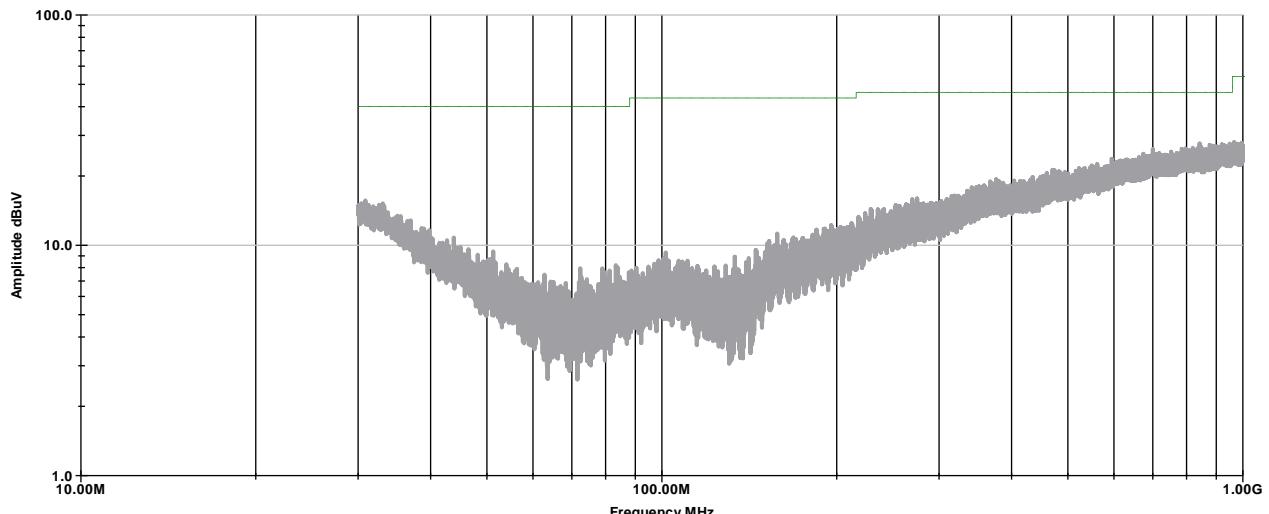
## Receive Mode

Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Receiver  
Contact - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

Ingenium Testing, LLC

Radiated Emissions

Measurement: Signature Scan- Pk Detector  
Limit 15.109



Operator: Rick Hill

Receiver, with USB to a Laptop under the turntable

JCEAQ1106 Dickson Wizard2 30M-1GHz RE Receiver 20100125.til

07:00:03 PM, Monday, January 25, 2010

Job #: JCEAQ1106

**Figure 27: Receiver RF Emissions, Antenna Vertically Polarized, 30-1000MHz, at 3m**

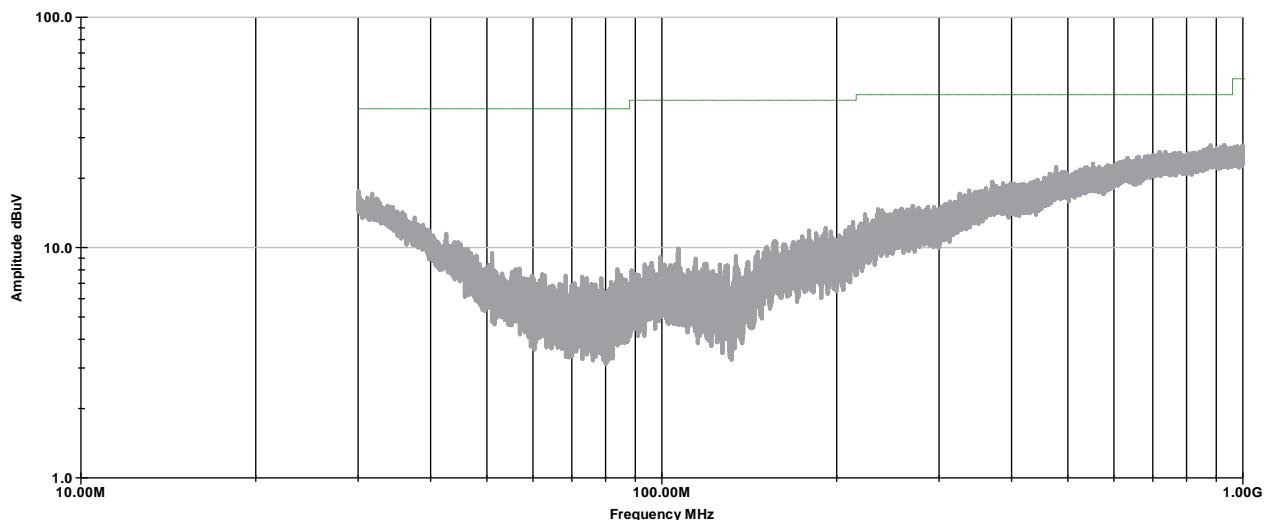


Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Receiver  
Contact - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions Horizontal

Measurement: Signature Scan- Pk Detector  
Limit 15.109



Operator: Rick Hill

Receiver, with USB to a Laptop under the turntable

JCEAQ1106 Dickson Wizard2 30M-1GHz RE Receiver 20100125.til

07:00:01 PM, Monday, January 25, 2010

Job #: JCEAQ1106

**Figure 28: Receiver RF Emissions, Antenna Horizontally Polarized, 30 – 1000MHz, at 3m**



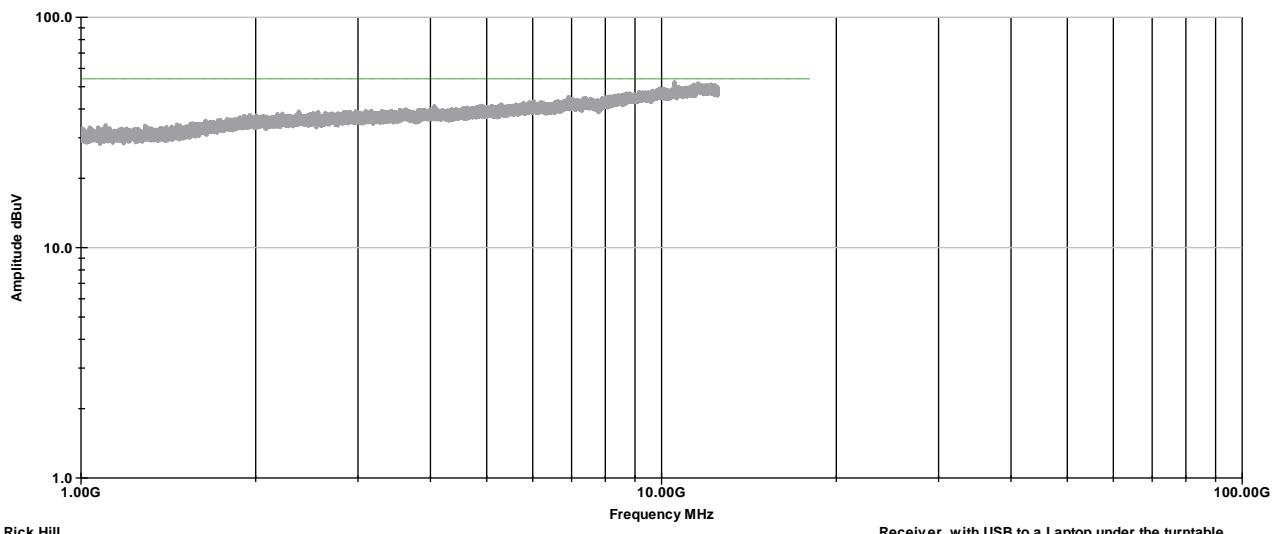
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Receiver  
Contact - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions

Vertical

Measurement: Signature Scan- Pk Detector  
Limit 15.109



Operator: Rick Hill

Receiver, with USB to a Laptop under the turntable

JCEAQ1106 Dickson Wizard2 1-12\_5GHz RE Receiver 20100125.TIL

05:22:58 PM, Monday, January 25, 2010

Job #: JCEAQ1106

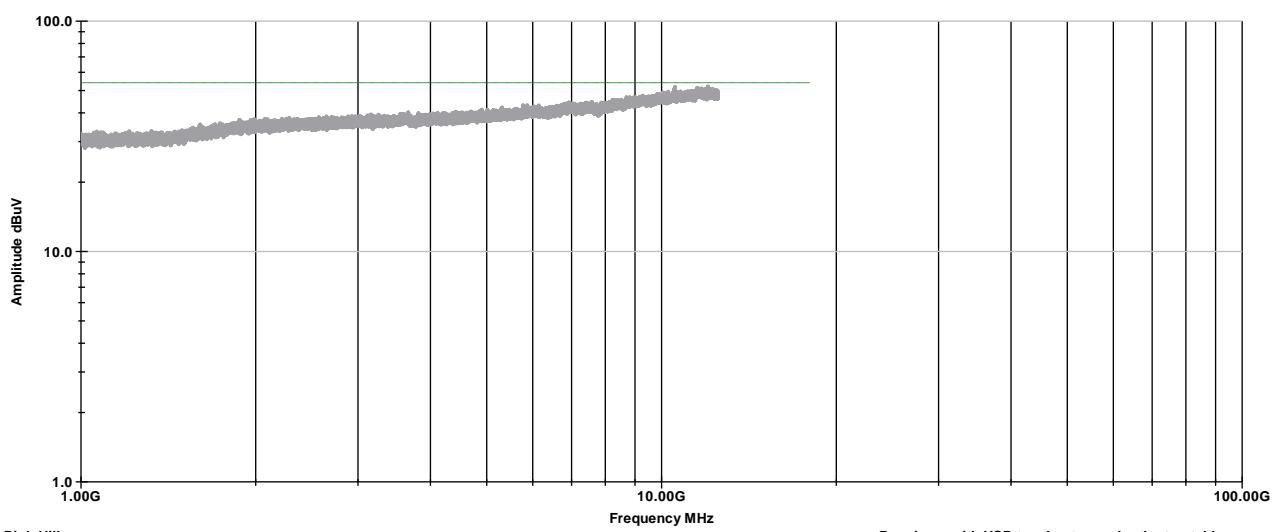
Job # - JCEAQ1106  
Company - Dickson Company  
Model # - Wizard2 Module  
Serial # - Receiver  
Contact - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

### Ingenium Testing, LLC

#### Radiated Emissions

Horizontal

Measurement: Signature Scan- Pk Detector  
Limit 15.109



Operator: Rick Hill

Receiver, with USB to a Laptop under the turntable

JCEAQ1106 Dickson Wizard2 1-12\_5GHz RE Receiver 20100125.TIL

05:22:58 PM, Monday, January 25, 2010

Job #: JCEAQ1106

**Figure 29: Receiver RF Emissions, Antenna Vertically Polarized, 1 – 12.5 GHz, at 3m**

DATE: 02/26/10

DOC. NO: CTR-10-0110

REVISION: PRELIMINARY

Page 40 of 49



## 9.2 Conducted RF Emission onto AC Mains Measurements

This EUT is powered by either batteries or by a transformer plugged into the AC Mains. Conducted RF Emission measurements were performed on the AC Mains supply.

### 9.2.1 Test Criterion

| Port Definition | Terminal Name | Description/Detail   | Test Standard                           | Performance Criteria  | Pass / Fail |
|-----------------|---------------|--|---|---|-------------|
| Enclosure       | N/A           | Alarm Enclosure containing digital circuitry<br><b>Transmit Mode</b> | Conducted RF Emissions<br>47 CFR 15.207 | .150 MHz to 30 MHz<br>Measured RF Emission should be Below specified Limits | Pass        |
| Enclosure       | N/A           | Alarm Enclosure containing digital circuitry<br><b>Receive Mode</b>  | Conducted RF Emissions<br>47 CFR 15.107 | .150 MHz to 30 MHz<br>Measured RF Emission should be Below specified Limits | Pass        |

The following tables present the limits for intentional radiator connected to the AC Mains.

| Frequency (MHz) | Conducted RF Voltage Quasi-peak Limit (dB $\mu$ V)              | Conducted RF Voltage Average Limit (dB $\mu$ V)                 |
|-----------------|---|---|
| 0.15 – 0.50     | 66.0<br>Decreasing linearly with logarithm of frequency to 56.0 | 56.0<br>Decreasing linearly with logarithm of frequency to 46.0 |
| 0.50 – 5.0      | 56.0  | 46.0  |
| 5.0 – 30.0      | 60.0  | 50.0  |

Notes: In the calculations for margin below the limit, the limits are rounded to one digit past the decimal.

**Table 11: Conducted Limit for Intentional Radiators under 47CFR 15.107 and 15.207**



### 9.2.2 Test Equipment

All equipment is calibrated according to governing standards, and is N.I.S.T. traceable. The equipment is used according to the operation manuals as provided by the manufacturers.

**Table 12: List of Equipment Used:**

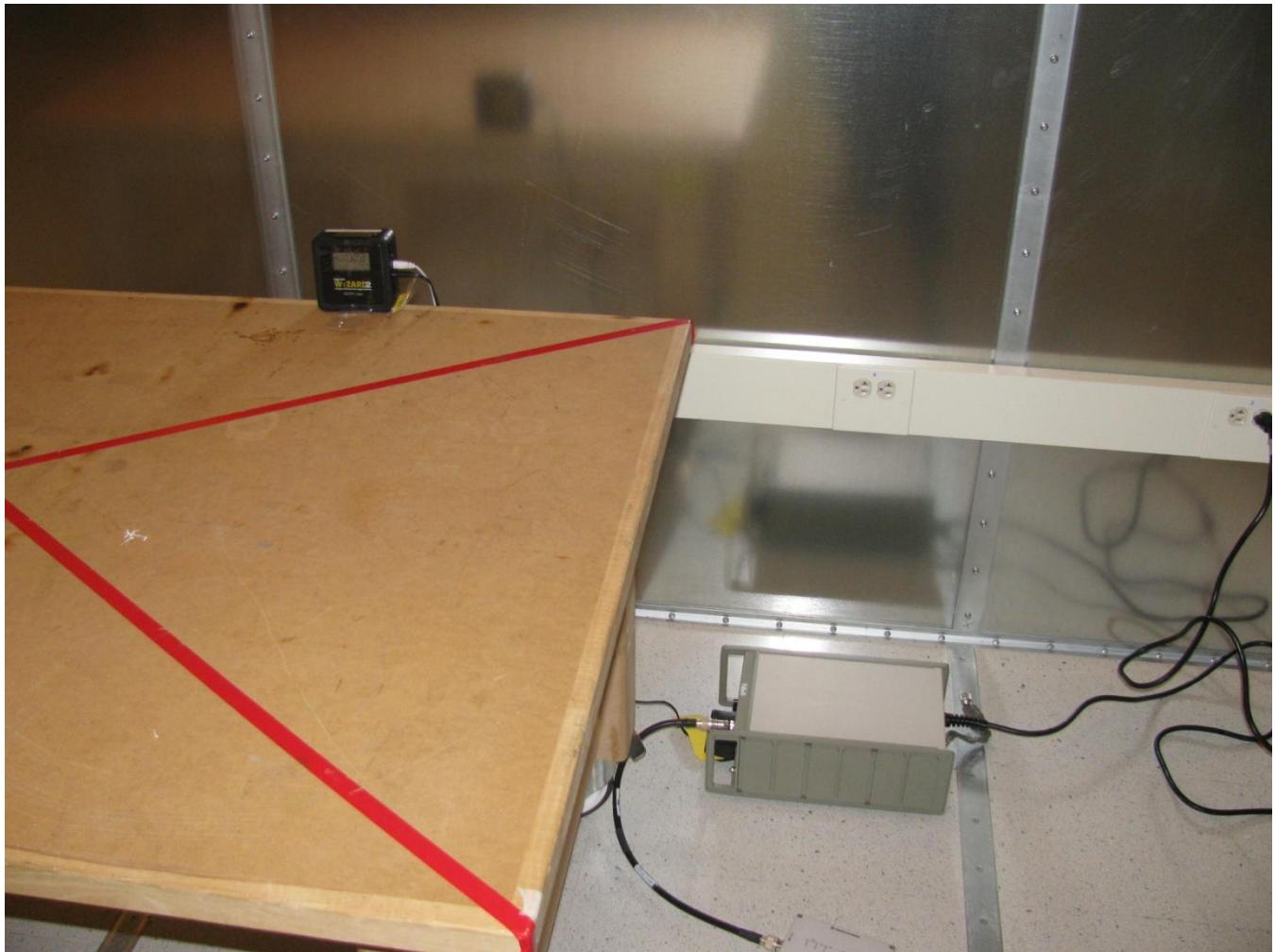
| Manufacturer     | Model        | Ingenium Asset Number | Description                     | Last Cal data | Cal due date |
|------------------|--------------|-----------------------|---------------------------------|---------------|--------------|
| HP               | 85462A       | 1130                  | RECEIVER, EMI TEST              | 12/18/2008    | 12/18/2009   |
| AGILENT          | 11947A       | 1313                  | TRANSIENT LIMITER               | 12/18/2008    | 12/18/2009   |
| TIMES MICROWAVE  | 098-2320-003 | 1769                  | CABLE, 10FT, "N" TO "N"         | 10/1/2009     | 10/1/2010    |
| INTERCOMP        | RG214/U      | 2227                  | CABLE, 17FT                     | 10/1/2009     | 10/1/2010    |
| ROHDE & SCHWARZ  | EZ-25        | 2007                  | HIGH PASS FILTER                | 11/27/2008    | 11/27/2009   |
| TIMES MICROWAVE  | 098-2320-007 | 2283                  | CABLE, 2 FT                     | 10/1/2009     | 10/1/2010    |
| EMCO             | 3816/2NM     | 1363                  | LISN, 50/250µH, 16A, COMMERCIAL | 3/6/2008      | 3/6/2010     |
| AGILENT          | N5182A       | 1187                  | GENERATOR, MXG VECTOR SIGNAL    | 1/9/2009      | 1/9/2010     |
| UNIFLEX          | UFB311P      | 0874                  | CABLE, 44ft                     | 8/11/2009     | 8/11/2010    |
| INGENIUM TESTING | NONE         | 2284                  | ADAPTER, SIGNAL INJECTION       | NCR           | NCR          |

The data presented accounts for the antenna correction factor as well as cable loss or other corrections, and can, therefore, be entered into the database as a corrected measurement result.

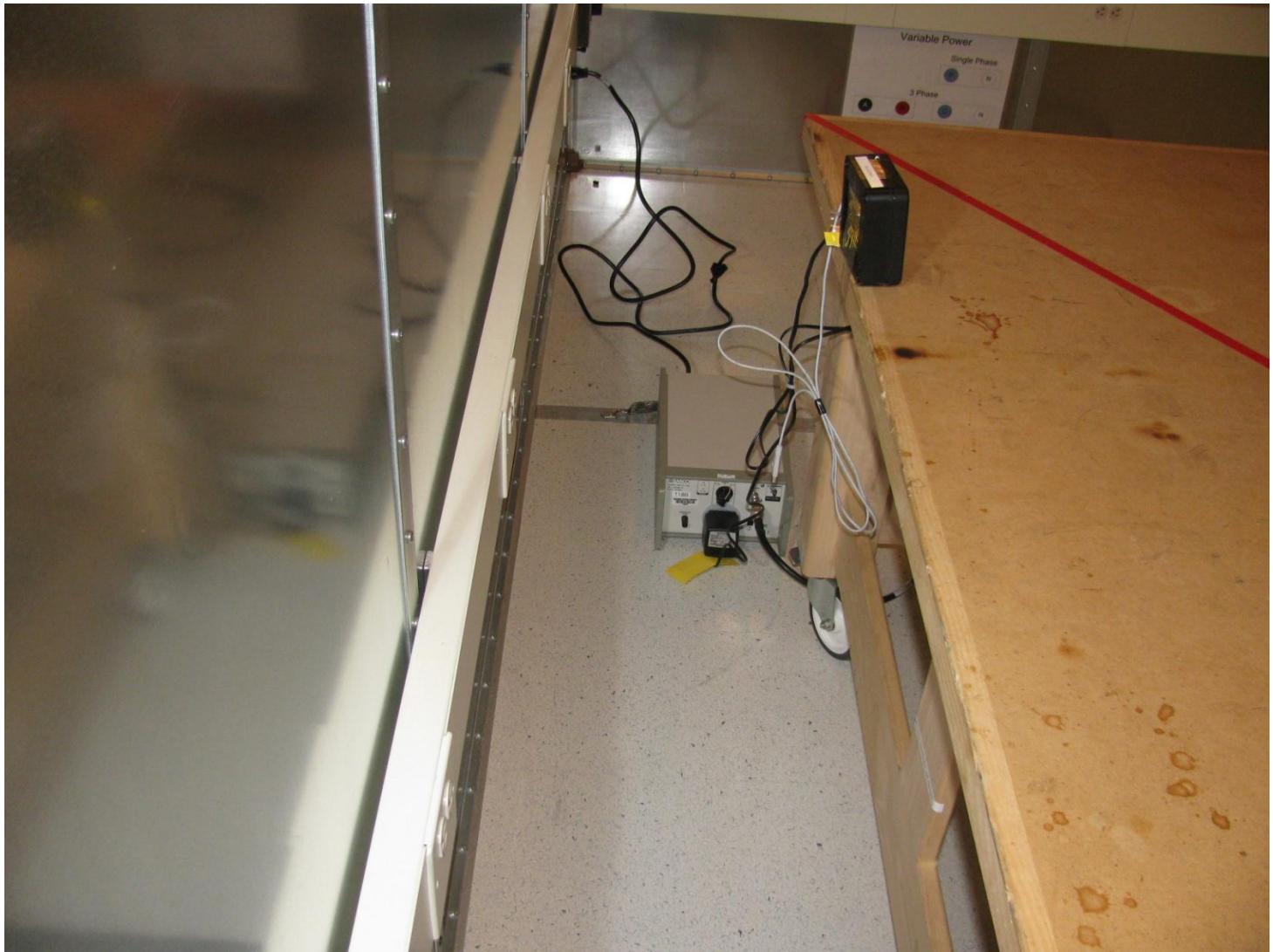
### 9.2.3 Test Setup

The EUT was tested as a “table-top device” type product, as described in ANSI C63.4. The EUT was placed on a non-conductive table, 80 cm in height and 40 cm from the vertical ground plane in a shielded enclosure located at Ingenium Testing. The test setup complies with the necessary procedures as described in the ANSI standard. The EUT was exercised under standard operating conditions, and powered by a wall transformer.

#### Test Setup Photos



**Figure 31 Conducted Emissions Logger front view**



**Figure 32 Conducted Emissions Logger side view**

#### 9.2.4 Test Procedure

The EUT was measured for Conducted RF Emissions in the shielded enclosure labeled Chamber 12, located at Ingenium Testing. The EUT Power lines were scanned from .150 MHz to 30 MHz for RF emissions.

The EUT was programmed in advance, by the client cognizant engineer, in the proper mode. The mode tested for the logger was in continuous-transmit CW and the receiver was placed in receive mode.

The applicable limits as noted in 47 CFR 15.207 were applied for the intentional radiator tests. The applicable limits as noted in 47 CFR 15.107 for a Class B type product were applied for the Receiver tests.

#### 9.2.5 Test Results

The EUTs were found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.207 for radiated emissions from an intentional radiator.



The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.107 for radiated emissions from a Class B product. Supporting evidence of significant measured RF emissions, are tabulated and presented below.

**CLIMATE TEST CONDITIONS**

|                     |                 |
|---------------------|-----------------|
| <b>Temperature:</b> | 73 °F (22.8 °C) |
| <b>Humidity:</b>    | 48 % RH         |

| Frequency (MHz) | Line/Test Mode | Measured-QP (dB $\mu$ V) | Measured-Average (dB $\mu$ V) | QP Limit (dBmV) | Average Limit (dBmV) | QP Margin (dBmV) | Average Margin (dB) |
|-----------------|----------------|--------------------------|-------------------------------|-----------------|----------------------|------------------|---------------------|
| 162336          | 1              | 39.34                    | 13.41                         | 65.34           | 55.34                | 26.00            | 41.93               |
| 236683          | 1              | 36.37                    | 11.97                         | 62.21           | 52.21                | 25.84            | 40.24               |
| 719913          | 1              | 40.04                    | 33.91                         | 56.00           | 46.00                | 15.96            | 12.09               |
| 1299340         | 1              | 38.41                    | 32.53                         | 56.00           | 46.00                | 17.59            | 13.47               |
| 1964080         | 1              | 38.19                    | 31.84                         | 56.00           | 46.00                | 17.82            | 14.16               |
| 2520980         | 1              | 38.24                    | 32.21                         | 56.00           | 46.00                | 17.77            | 13.79               |
| 2848880         | 1              | 38.36                    | 32.40                         | 56.00           | 46.00                | 17.64            | 13.60               |
| 3017520         | 1              | 38.33                    | 32.38                         | 56.00           | 46.00                | 17.67            | 13.62               |
| 4185010         | 1              | 39.78                    | 33.67                         | 56.00           | 46.00                | 16.22            | 12.33               |
| 4510550         | 1              | 40.30                    | 34.15                         | 56.00           | 46.00                | 15.70            | 11.85               |
| 6537950         | 1              | 42.77                    | 36.20                         | 60.00           | 50.00                | 17.23            | 13.81               |
| 7492660         | 1              | 44.44                    | 38.00                         | 60.00           | 50.00                | 15.56            | 12.00               |
| 8077330         | 1              | 45.06                    | 38.03                         | 60.00           | 50.00                | 14.94            | 11.97               |
| 9811010         | 1              | 35.94                    | 28.96                         | 60.00           | 50.00                | 24.06            | 21.04               |
| 20017100        | 1              | 21.75                    | 15.22                         | 60.00           | 50.00                | 38.26            | 34.78               |
| 24072200        | 1              | 18.12                    | 10.69                         | 60.00           | 50.00                | 41.88            | 39.31               |
| 199681          | 2              | 38.10                    | 11.11                         | 63.62           | 53.62                | 25.53            | 42.51               |
| 297051          | 2              | 35.04                    | 11.05                         | 60.33           | 50.33                | 25.28            | 39.28               |
| 680468          | 2              | 36.11                    | 30.13                         | 56.00           | 46.00                | 19.89            | 15.87               |
| 1307600         | 2              | 34.69                    | 28.69                         | 56.00           | 46.00                | 21.32            | 17.32               |
| 3289720         | 2              | 35.74                    | 29.60                         | 56.00           | 46.00                | 20.26            | 16.40               |
| 3980880         | 2              | 36.43                    | 30.40                         | 56.00           | 46.00                | 19.57            | 15.60               |
| 7849270         | 2              | 41.54                    | 35.23                         | 60.00           | 50.00                | 18.46            | 14.77               |
| 20947100        | 2              | 19.91                    | 13.25                         | 60.00           | 50.00                | 40.09            | 36.75               |
| 162336          | 1              | 39.34                    | 13.41                         | 65.34           | 55.34                | 26.00            | 41.93               |
| 236683          | 1              | 36.37                    | 11.97                         | 62.21           | 52.21                | 25.84            | 40.24               |
| 719913          | 1              | 40.04                    | 33.91                         | 56.00           | 46.00                | 15.96            | 12.09               |
| 1299340         | 1              | 38.41                    | 32.53                         | 56.00           | 46.00                | 17.59            | 13.47               |
| 1964080         | 1              | 38.19                    | 31.84                         | 56.00           | 46.00                | 17.82            | 14.16               |
| 2520980         | 1              | 38.24                    | 32.21                         | 56.00           | 46.00                | 17.77            | 13.79               |
| 2848880         | 1              | 38.36                    | 32.40                         | 56.00           | 46.00                | 17.64            | 13.60               |
| 3017520         | 1              | 38.33                    | 32.38                         | 56.00           | 46.00                | 17.67            | 13.62               |
| 4185010         | 1              | 39.78                    | 33.67                         | 56.00           | 46.00                | 16.22            | 12.33               |
| 4510550         | 1              | 40.30                    | 34.15                         | 56.00           | 46.00                | 15.70            | 11.85               |
| 6537950         | 1              | 42.77                    | 36.20                         | 60.00           | 50.00                | 17.23            | 13.81               |
| 7492660         | 1              | 44.44                    | 38.00                         | 60.00           | 50.00                | 15.56            | 12.00               |
| 8077330         | 1              | 45.06                    | 38.03                         | 60.00           | 50.00                | 14.94            | 11.97               |
| 9811010         | 1              | 35.94                    | 28.96                         | 60.00           | 50.00                | 24.06            | 21.04               |
| 20017100        | 1              | 21.75                    | 15.22                         | 60.00           | 50.00                | 38.26            | 34.78               |
| 24072200        | 1              | 18.12                    | 10.69                         | 60.00           | 50.00                | 41.88            | 39.31               |
| 199681          | 2              | 38.10                    | 11.11                         | 63.62           | 53.62                | 25.53            | 42.51               |

|          |   |       |       |       |       |       |       |
|----------|---|-------|-------|-------|-------|-------|-------|
| 297051   | 2 | 35.04 | 11.05 | 60.33 | 50.33 | 25.28 | 39.28 |
| 680468   | 2 | 36.11 | 30.13 | 56.00 | 46.00 | 19.89 | 15.87 |
| 1307600  | 2 | 34.69 | 28.69 | 56.00 | 46.00 | 21.32 | 17.32 |
| 3289720  | 2 | 35.74 | 29.60 | 56.00 | 46.00 | 20.26 | 16.40 |
| 3980880  | 2 | 36.43 | 30.40 | 56.00 | 46.00 | 19.57 | 15.60 |
| 7849270  | 2 | 41.54 | 35.23 | 60.00 | 50.00 | 18.46 | 14.77 |
| 20947100 | 2 | 19.91 | 13.25 | 60.00 | 50.00 | 40.09 | 36.75 |

1) All emissions were greater than 20 dB below the limits.

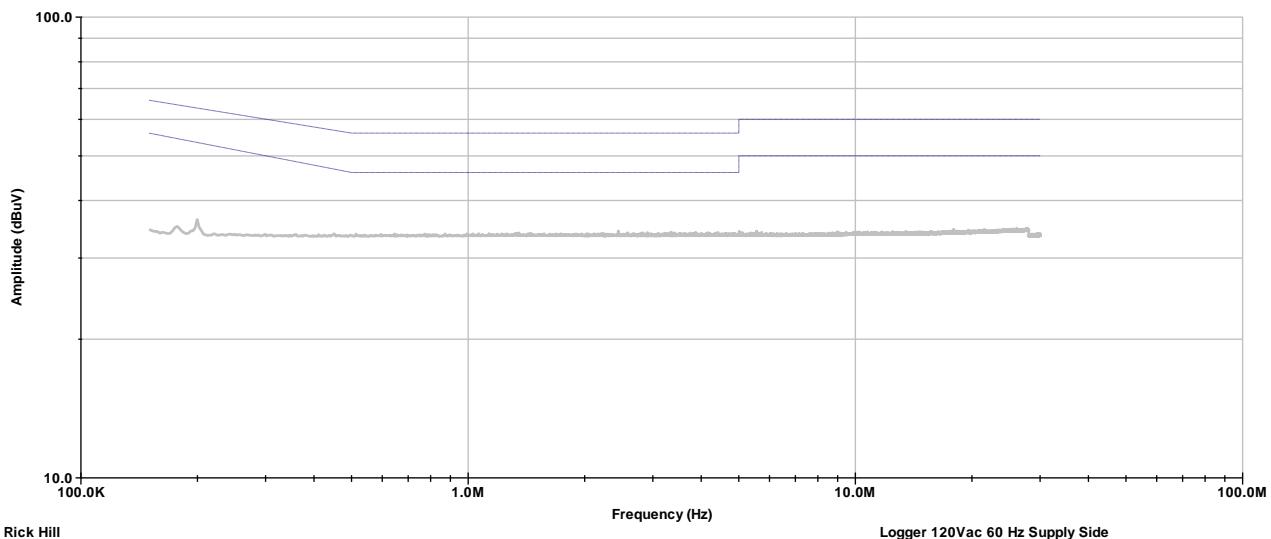
**Table 13: Results table – RF emissions conducted onto AC Mains (120VAC, 60Hz).**



Job # - JCEAQ1106  
Company - Dickson Company  
Model Number - Wizard2 Module  
Serial Number - Logger  
Test Mode - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

**Conducted RF Emissions**  
Onto AC Mains, measured via LISN  
Corrected Measurement Values 150kHz-30MHz

Measured Peak Envelope  
Part 15.207 QP Limit  
Part 15.207 Average Limit



Operator: Rick Hill

Logger 120Vac 60 Hz Supply Side

JCEAQ1106 Dickson Wizard2 CE line 1 20100111.TIL

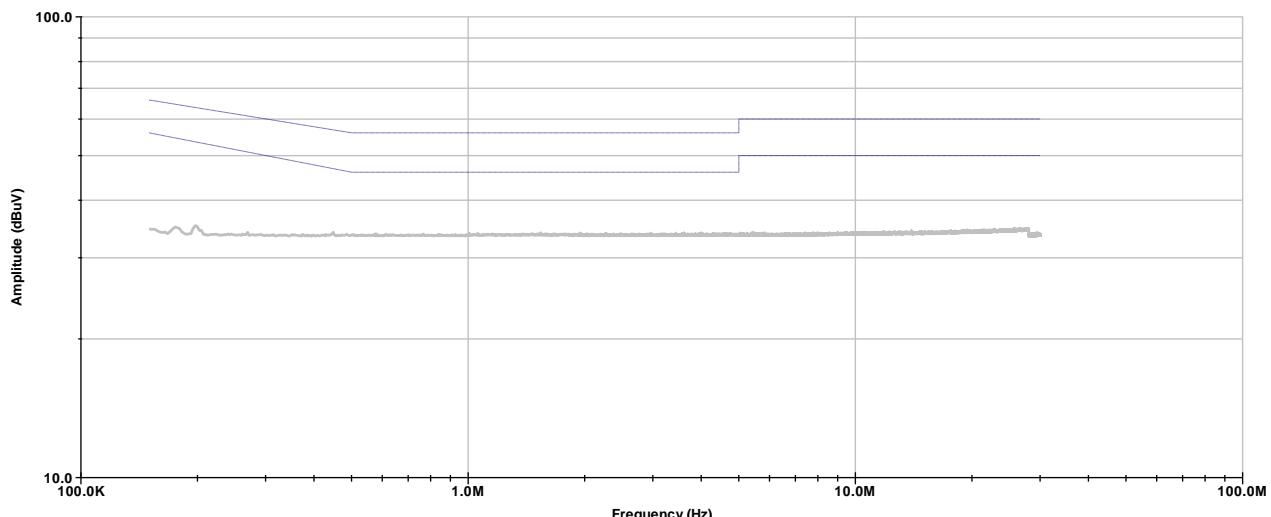
09:46:16 AM, Monday, January 11, 2010

**Figure 33: Transmit RF Conducted Signature, Line 1 (Supply), 150kHz-30MHz, nominal Voltage**

Job # - JCEAQ1106  
Company - Dickson Company  
Model Number - Wizard2 Module  
Serial Number - Logger  
Test Mode - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

**Conducted RF Emissions**  
Onto AC Mains, measured via LISN  
Corrected Measurement Values 150kHz-30MHz

Measured Peak Envelope  
Part 15.207 QP Limit  
Part 15.207 Average Limit



Operator: Rick Hill

Logger 120Vac 60 Hz Return Side

JCEAQ1106 Dickson Wizard2 CE Logger line 2 20100111.TIL

09:58:35 AM, Monday, January 11, 2010

**Figure 34: Transmit RF Conducted Signature, Line 2 (Neutral), 150kHz-30MHz, nominal Voltage**

DATE: 02/26/10

DOC. NO: CTR-10-0110

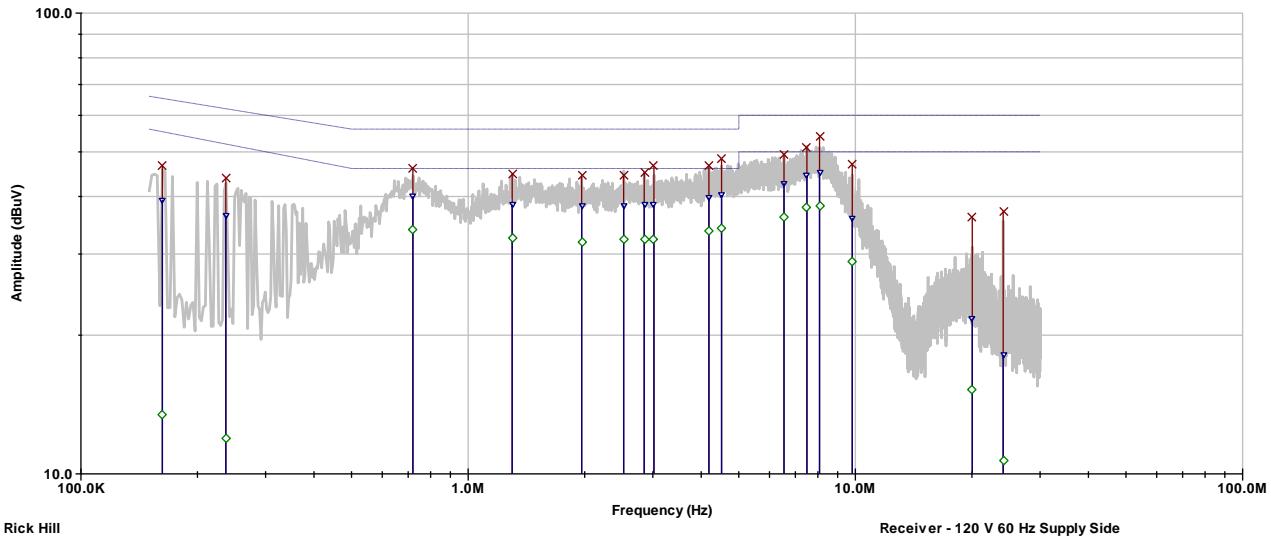
REVISION: PRELIMINARY

Page 47 of 49

Job # - JCEAQ1106  
 Company - Dickson Company  
 Model Number - Wizard2 Module  
 Serial Number - Receiver  
 Test Mode - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

**Conducted RF Emissions**  
 Onto AC Mains, measured via LISN  
 Corrected Measurement Values 150kHz-30MHz

- Measured Peak Envelope
- CISPR 11 QP Limit
- CISPR 11 Average Limit
- ✖ Peaks
- ▼ QP Level
- ◆ Ave Reading



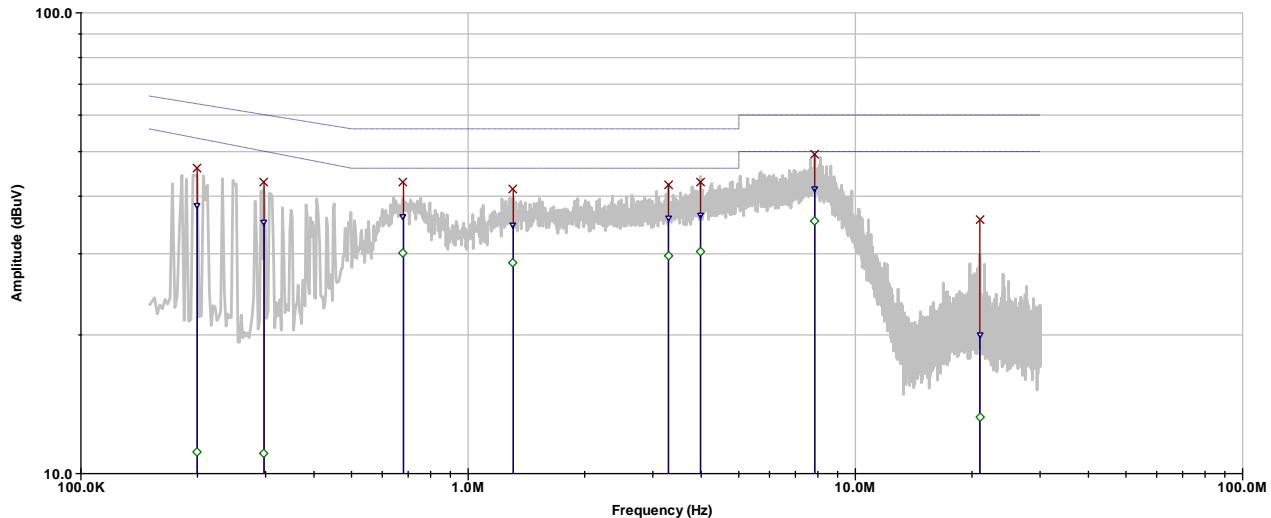
JCEAQ1106 Dickson Wizard2 CE line 1 Receiver 20100127.TIL  
 09:16:29 AM, Wednesday, January 27, 2010

**Figure 35: Receive RF Conducted Signature, Line 1 (Supply), 150kHz-30MHz, nominal Voltage**

Job # - JCEAQ1106  
 Company - Dickson Company  
 Model Number - Wizard2 Module  
 Serial Number - Receiver  
 Test Mode - Profile "E444x RE Profile 2009-05-22 v0\_1.TIL"

**Conducted RF Emissions**  
 Onto AC Mains, measured via LISN  
 Corrected Measurement Values 150kHz-30MHz

- Measured Peak Envelope
- CISPR 11 QP Limit
- CISPR 11 Average Limit
- ✖ Peaks
- ▼ QP Level
- ◆ Ave Reading



JCEAQ1106 Dickson Wizard2 CE line 2 Receiver 20100127.TIL  
 10:03:55 AM, Wednesday, January 27, 2010

**Figure 36: Receive RF Conducted Signature, Line 2 (Neutral), 150kHz-30MHz, nominal Voltage**



END OF REPORT