**Application for Certification**

**Per**

**Title 47 USC Part 2, Subpart J, Equipment Authorization Procedures, Paragraph 2.907, Certification and Part 15, Subpart C, Intentional Radiators, Paragraph 15.207, Conducted limits and 209, Radiated emission limits; general requirements.**

**For the**

**Radio Systems Corporation**

**Model:**
**300-2564**
**PASSport Pet Access Smart System Medium**

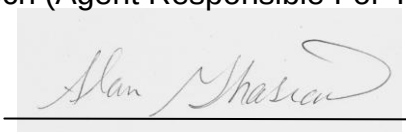
**UST Project: 13-0013**
**Issue Date: April 16, 2013**

Number of Pages in this report: 21

**3505 Francis Circle Alpharetta, GA 30004**
**PH: 770-740-0717 Fax: 770-740-1508**
**www.ustech-lab.com**

I certify that I am authorized to sign for the test facility and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US Tech (Agent Responsible For Test):

By: 

Name: Alan Ghasiani

Title: President – Consulting Engineer

Date: April 16, 2013

NVLAP LAB CODE 200162-0



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# MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: Radio Systems Corporation

MODEL: 300-2564

FCC ID: KE3-3002564
IC: 2721A-3002564

DATE: April 16, 2013

This report concerns (check one): Original grant X
Class II change_____

Equipment type: 134.2 kHz intentional transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until:_____
date

N.A. agrees to notify the Commission by N.A.
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
Fax Number: (770) 740-1508

## Table of Contents

**Paragraph Title Page**

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## List of Tables

# 1. General Information

The information contained in this report is presented for the FCC Equipment Authorization of Certification of the Equipment Under Test (EUT).

## 1.1 Product Description

This EUT is an electronic pet door. The door uses passive RFID to detect and decode the RFID transponder either mounted on the pet's collar or implanted in the pet. If the pet door being tested detects an ID matching one stored in the pet door, it will automatically respond according to the owner's setting by pet to allow the pet to enter, exit, or neither. If the ID is not recognized, the door ignores the pet. This allows an owner to prevent unwanted entry of stray animals and wildlife into their residence as well as have very refined control of their own pet's access through the door.

## 1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on March 28, 2013 in good operating condition.

## 1.3 Related Submittal(s)/Grant(s)

The EUT will be used to wirelessly send/receive data.

## 1.4 The EUT is subject to the following authorizations:

a) Certification of the transmitter circuitry.
b) Verification of the non-transmitter circuitry as a Digital Device.

## 2. Tests and Measurements

### 2.1 Configuration of Tested System

The Test sample was tested per *ANSI C63.4-2003, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003).* Radiated emissions data were taken according to paragraph 8.0 with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. There were no interconnecting cables to manipulate in an attempt to maximize emissions; however, the physical position of the EUT was varied through the three mutually exclusive orthogonal planes in an attempt to maximize the emissions. The worse case position is the position used for final measurements and is gathered in this test report. A block diagram of the tested system is shown in Figure 1. All test configuration photographs are shown in the Test Configuration Annex.

### 2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC, under site registration number 186022. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 2982A-1. US Tech is also a NVLAP accredited test lab; lab code 200162-0.

### 2.3 Test Equipment

**Table 1. EUT and Peripherals**

| PERIPHERAL AND MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | FCC ID: | CABLES P/D |
|---|---|---|---|---|
| PASSport Pet Access Smart System Radio Systems Corp (EUT) | 300-2564 | Engineering Sample | Pending: KE3-3002564 2721A-3002564 | PU |
| Power Supply Radio Systems | V16V-1.5V | 850-898W | Unknown | PU |

**P = Power D = data S = Shielded U = Unshielded**

**Table 2. Test Instruments**

| TEST INSTRUMENT | MODEL NUMBER | MANUFACTURER | SERIAL NUMBER | DATE OF LAST CALIBRATION |
|---|---|---|---|---|
| SPECTRUM ANALYZER | 8566B | HEWLETT-PACKARD | 2648A13875 | 11/21/2012 |
| SPECTRUM ANALYZER | E4407B | Agilent | US41442935 | 10/29/2012 |
| RF PREAMP | 8447D | HEWLETT-PACKARD | 2944A07436 | 11/29/2012 |
| LOOP ANTENNA | SAS-200/562 | AH Systems | 142 | 8/09/2011 2 yrs |
| BICONICAL ANTENNA | 3110B | EMCO | 9306-1708 | 7/02/2012 |
| LOG PERIODIC | 3146 | EMCO | 9305-3600 | 11/22/2011 2 yrs |
| LISN (x 2) 8028-50-TS24-BNC | 8028 | Solar Electronics | 910495 & 910494 | 3/01/2013 |
| HORN ANTENNA | 3115 | EMCO | 9107-3723 | 8/10/2011 2 yrs |
| PREAMP | 8449B | HEWLETT-PACKARD | 3008A00480 | 4/12/2012 |
| CALCULATION PROGRAM | N/A | N/A | Ver. 6.0 | N/A |

**Note: The calibration interval of the above test instruments is 12 months unless stated otherwise, and all calibrations are traceable to NIST/USA.**

## 2.4 Modifications to Equipment

In order to meet the requirements of FCC Part 15.209, radiated emissions in the range of 30 MHz to 100 MHz, modifications were needed. The modifications are as follows:

1. Added capacitors, C43 and C47 to the circuit.
2. Added inductors, L4 and L5 to the circuit.

No other components were changed. Modification photographs have been included in the internal photographs attachment document. The schematics will show the electrical location of the modifications.

## 2.5 Test Procedure

The EUT was configured as shown in the following block diagram(s) and photograph(s). The sample was tested per ANSI C63.4-2003, Methods of Measurement for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003) following US Tech's procedures paragraph 7 for conducted and paragraph 8 for radiated. Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter on the spectrum analyzer was OFF throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. The EUT was rotated 360 degrees with the turntable to maximize emissions. The physical position of the EUT was varied through the three mutually exclusive orthogonal planes in an attempt to maximize the emissions. The final setup description is found in the test section of this report.

### 2.5.1 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 below.

**Table 3. Number of Test Frequencies for Intentional Radiators**

| Frequency Range over which the device operates | Number of Frequencies | Location in the Range of Operation |
|---|---|---|
| 1 MHz or less | 1 | Middle |
| 1 to 10 MHz | 2 | 1 near the top<br>1 near the bottom |
| Greater than 10 MHz | 3 | 1 near top<br>1 near middle<br>1 near bottom |

### 2.5.2 Frequency Range of Radiated Emissions (Part 15.33(a)/RSS Gen 4.10)

Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation and according to the table in 47 CFR 15.33(b).

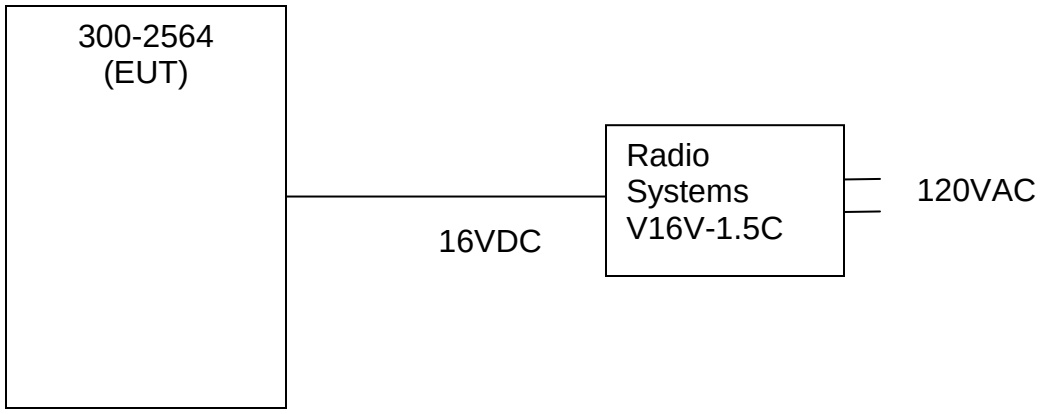



**Figure 1. Test Configuration**

## 2.6 EUT Antenna Description (FCC Sec. 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Radio Systems Corporation Model: 300-2564 transmitter incorporates the following antenna(s) only.

**Table 4. Antenna Description**

| MANUFACTURER | TYPE | MODEL | GAIN $dB_i$ |
|---|---|---|---|
| Radio Systems Corporation | Passive Loop Antenna | Integral | 0 |

## 2.7 Field Strength of Fundamental (47 CFR 15.209)

The results of the measurements for peak fundamental emissions are given in Table 5. The EUT emissions measurement was started by setting up the Log-periodic Antenna (L-pA) or generally, any antenna, in the vertical orientation at a distance of 3 meters from the EUT and at a height of 1.0 meters above the ground. The EUT packages' major axis was set normal to the direction of the measuring antenna.

The Spectrum Analyzer (SA) displays were set to: Channel A free-running, Channel B to Max-Hold. Choose a frequency or frequency range and scan it at a coupled rate. When a suspicious signal is found, center the signal on the screen and raise the L-pA to the 4-meter height while observing the SA display for changes to the max-hold and free-running display. Next, the antenna is lowered to 1 meter height above the ground plane while observing the channel A and B displays. The display having max-hold shows the maximum signal seen across the height range of 1 to 4 meters. The next action is to raise or lower the antenna until the free-running display matches the Max-hold display's magnitude on the SA screen. When this occurs, the signal is maximized for antenna height. Record the antenna height on the data sheet corresponding to the present frequency.

When the antenna height has been maximized, the next step in the measurement process is to maximize the EUT direction with respect to the receiving antenna. Rotate the turn-table through 360 degrees with one SA channel set for max-hold and the other channel in free-run mode. The object is to find that azimuth direction where the free-running indication just matches the greatest max-hold indication. This is the direction where the signal is peaked for azimuth. Record the direction on the data sheet next to the frequency.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated Loop Antenna and per the requirements of ANSI C63.4-2003. The resolution bandwidth was set to 9 kHz; the video bandwidth was set to three times the resolution bandwidth.

## 2.8 Intentional Radiated Emissions, 9 kHz to 30 MHz (47 CFR 15.205, 15.209)

The peak radiated spurious emissions were measured over the frequency range of 9 kHz to 10 times the fundamental frequency, or 30 MHz.

**Table 5. Intentional Radiated Emissions (9 kHz to 30 MHz)**

| Intentional Radiator Radiated Emissions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test By: JCW | Test: Part 15B, Para 15.209 | | | | Client: Radio Systems Corporation | | | |
| | Project: 13-0013 | Class: B | | | Model: 300-2564 | | | |
| **Frequency (MHz)** | **Peak Test Data (dBuV)** | **Additional factor (Note 2) dB** | **AF+CL-PA (dB/m)** | **Peak Corrected Results (dBuV/m)** | **Limits (dBuV/m)** | **Application Test Distance/ Polarization** | **Margin (dB)** | **Detector Used** |
| Measurements were made over the frequency range of fundamental to 10th harmonic | | | | | | | | |
| 0.134 | 57.32 | -- | 57.70 | 115.02 | 125.3[1] | Loop/3 meter | 10.3 | **PK** |
| 0.520 | 21.13 | -40.00 | 43.70 | 24.83 | 33.3 | Loop/3 meter | 8.4 | **PK** |
| 0.650 | 22.43 | -40.00 | 42.20 | 24.63 | 31.3 | Loop/3 meter | 6.7 | **PK** |
| 0.780 | 21.66 | -40.00 | 40.90 | 22.56 | 29.7 | Loop/3 meter | 7.2 | **PK** |
| 0.910 | 22.10 | -40.00 | 38.80 | 20.90 | 28.4 | Loop/3 meter | 7.5 | **PK** |
| 1.040 | 23.70 | -40.00 | 38.30 | 22.00 | 27.3 | Loop/3 meter | 5.3 | **PK** |
| 1.290 | 24.20 | -40.00 | 38.30 | 22.50 | 25.4 | Loop/3 meter | 2.9 | **PK** |

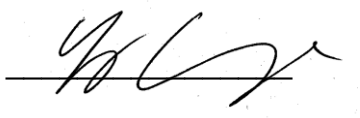
* frequency falls in restricted band of CFR 15.205.

Note 1: limit extrapolated using the factor of 50dB/decade. See Extrapolation Factor attachment for details.

Note 2: Additional factor of 40dB/Decade

SAMPLE CALCULATIONS: At 0.1340 MHz = 57.32 dBuV + (57.7) = 115.02 dBuV

Test Date: April 9, 2013

Tested By
Signature:  Name: George Yang

## 2.9 Bandwidth of Fundamental (RSS-210, A8.1(a))

The 99% occupied bandwidth of the radio module shall be recorded to show compliance with RSS-210.

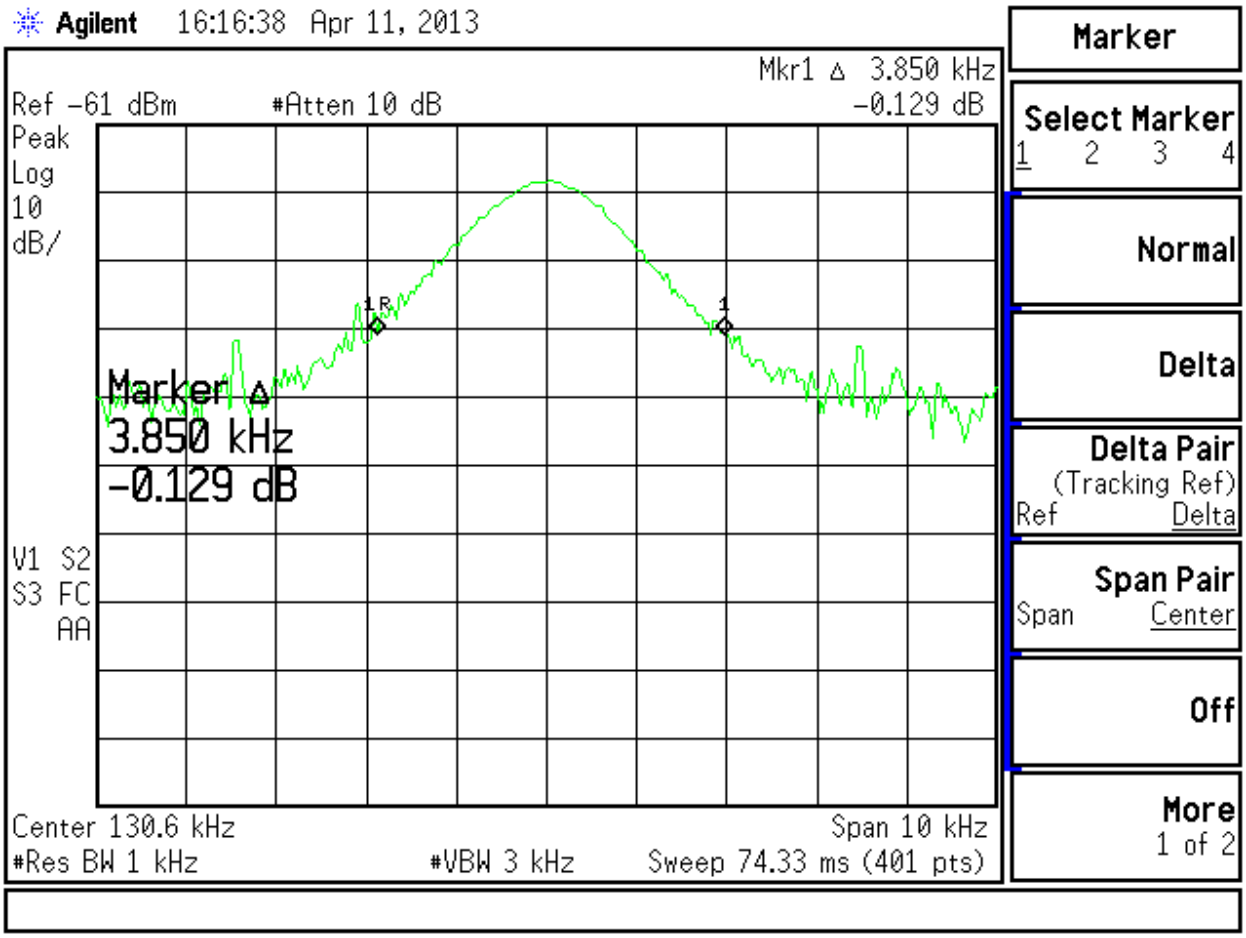



**Figure 2. Occupied Bandwidth**

## 2.10 Power Line Conducted Emissions for Transmitter and Receiver/Digital Apparatus (47 CFR 15.107/15.207).

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.4-2003, Paragraph 7, with a spectrum analyzer connected to an LISN and the EUT placed into a continuous mode of transmission.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission.

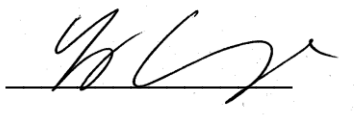
The worst-case power line conducted emission was 11.1 dB below the limit at 0.1508 MHz on the Neutral lead. All other conducted emissions were at least 12.0 dB below the FCC Part 15.207 limits. The data is presented in the table below.

## Table 6. Unintentional Powerline Conducted Emissions

| Conducted Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test By: GY | Test: Part 15.107/207 | | | Client: Radio Systems Corp | | | |
| | Project: 13-0013 | | | Model: 300-2564 | | | |
| **Frequency (MHz)** | **Test Data (dBuV)** | **LISN+CL-PA (dB)** | **Results (dBuV)** | **Limits AVG (dBuV)** | **Application Point** | **Margin (dB)** | **DET P/QP/AVG** |
| 120 VAC, 60 Hz Phase | | | | | | | |
| 0.1500 | 51.47 | 1.69 | 53.16 | 66.0 | Phase | *12.8 | **PK** |
| 0.1500 | 30.65 | 1.69 | 32.34 | 56.0 | Phase | 23.7 | **AVG** |
| 0.7812 | 32.64 | 0.48 | 33.12 | 46.0 | Phase | 12.9 | **PK** |
| 2.4800 | 33.47 | 0.48 | 33.95 | 46.0 | Phase | 12.0 | **PK** |
| 7.4120 | 32.52 | 0.64 | 33.16 | 50.0 | Phase | 16.8 | **PK** |
| 13.7750 | 25.52 | 0.82 | 26.34 | 50.0 | Phase | 23.7 | **PK** |
| 29.9200 | 19.30 | 1.18 | 20.48 | 50.0 | Phase | 29.5 | **PK** |
| 120 VAC, 60 Hz Neutral | | | | | | | |
| 0.1508 | 53.29 | 1.60 | 54.89 | 66.0 | Neutral | *11.1 | **PK** |
| 0.1508 | 33.59 | 1.60 | 35.19 | 56.0 | Neutral | 20.8 | **AVG** |
| 0.7813 | 33.29 | 0.46 | 33.75 | 46.0 | Neutral | 12.3 | **PK** |
| 2.4700 | 32.80 | 0.48 | 33.28 | 46.0 | Neutral | 12.7 | **PK** |
| 8.1120 | 30.29 | 0.66 | 30.95 | 50.0 | Neutral | 19.0 | **PK** |
| 11.0500 | 23.81 | 0.74 | 24.55 | 50.0 | Neutral | 25.4 | **PK** |
| 24.9750 | 21.12 | 1.08 | 22.20 | 50.0 | Neutral | 27.8 | **PK** |

Tested from 150 kHz to 30 MHz
SAMPLE CALCULATIONS: at 0.1508 MHz; 53.29 dBuV + (1.6) dB= 54.89 dBuV

Test Date: April 10, 2013
Tested By

Signature:  Name: George Yang

## 2.11 Unintentional Radiator Radiated Emissions (47 CFR 15.33(a); 15.109/209)

These test data are provided herein to support the Verification requirement for digital devices. Radiated emissions coming from the EUT in a non-transmit state were evaluated as well as in a continuous transmit state from 9 kHz or the lowest emissions generated by the EUT up to 30 MHz per 47 CFR 15.33a and 30 MHz to 1 GHz per ANSI C63.4-2003, Paragraph 8.

Measurements made below 30 MHz were recorded using the procedure in section 2.8 and are displayed in Table 7. No other emissions were seen within 20 dB of the limit.

For measurements above 30 MHz the measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth. The test data was maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters in height as a part of the measurement procedure. All measured signals were at least 6 db below the specification limit.

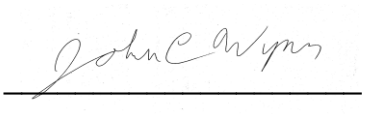
The worst-case radiated emission was 2.1 dB below the limit at 169.0400 MHz. All other radiated emissions were at least 3.0 dB below the FCC Part 15.109/209 limit. The data is tabulated in the table below.

## Table 7. Spurious Radiated Emissions (30 MHz to 1000 MHz)

| Spurious Radiated Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test By: JW | Test: Part 15B, Para 15.33, 15.109/209 | | Client: Radio Systems Corporation | | | | |
| | Project: 13-0013 | Class: B | Model: 300-2564 | | | | |
| Measurements were made over the frequency range of 30 MHz to 1 GHz | | | | | | | |
| **Frequency (MHz)** | **Peak Test Data (dBuV)** | **AF+CL-PA (dB/m)** | **Peak Corrected Results (dBuV/m)** | **Average Limits (dBuV/m)** | **Application Test Distance/ Polarization** | **Margin (dB)** | **Detector Used** |
| 169.0400 | 41.10 | -11.51 | 29.59 | 43.5 | 3m./Hor. | 2.1 | **PK** |
| 161.7000 | 47.10 | -10.71 | 36.39 | 43.5 | 3m./vert. | 6.0 | **PK** |
| 53.0400 | 53.80 | -16.31 | 37.49 | 40.0 | 3m./vert. | 5.2 | **PK** |
| 53.0400 | 45.60 | -16.31 | 29.29 | 40.0 | 3m./vert. | 9.8 | **QP** |
| 63.9200 | 38.90 | -16.23 | 22.67 | 40.0 | 3m./Hor. | 13.9 | **PK** |
| 207.9900 | 44.60 | -12.39 | 32.21 | 43.5 | 3m./Hor. | 9.5 | **PK** |
| 240.0800 | 49.60 | -11.85 | 37.76 | 46.0 | 3m./Hor. | 9.9 | **PK** |
| 283.5500 | 45.40 | -9.66 | 35.74 | 46.0 | 3m./Hor. | 17.5 | **PK** |
| 329.4400 | 39.70 | -8.63 | 31.07 | 46.0 | 3m./Hor. | 18.5 | **PK** |
| 358.9500 | 47.90 | -8.53 | 39.37 | 46.0 | 3m./Hor. | 12.9 | **PK** |
| 419.8200 | 45.40 | -7.55 | 37.85 | 46.0 | 3m./Hor. | 13.4 | **QP** |
| 498.9380 | 40.00 | -6.17 | 33.83 | 46.0 | 3m./Hor. | 12.0 | **PK** |
| 200.6400 | 45.90 | -12.59 | 33.31 | 43.5 | 3m./vert. | 8.2 | **PK** |
| 236.5800 | 46.60 | -12.25 | 34.36 | 46.0 | 3m./vert. | 4.7 | **PK** |
| 278.7140 | 42.20 | -10.06 | 32.14 | 46.0 | 3m./vert. | 3.0 | **PK** |
| 325.8100 | 48.40 | -8.83 | 39.57 | 46.0 | 3m./vert. | 4.9 | **QP** |
| 354.1300 | 47.70 | -8.73 | 38.97 | 46.0 | 3m./vert. | 4.4 | **QP** |
| 418.4700 | 50.00 | -7.75 | 42.25 | 46.0 | 3m./vert. | 7.1 | **QP** |

Tested from 30 MHz to 1000 MHz
SAMPLE CALCULATIONS: At 418.47 MHz = 50.0 + (-7.75) = 42.25 dBuV

Test Date: April 1, 2013

Tested by
Signature:  Name: John C. Wynn

## 2.12 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4. A coverage factor of k=2 was used to give a level of confidence of approximately 95%.

### 2.12.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ±2.8 dB.

The data listed in this test report does have sufficient margin to negate the effects of uncertainty, therefore, the EUT unconditionally meets this requirement.

### 2.12.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ±5.3 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ±5.1 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ±2.45

The data listed in this test report does not have sufficient margin to negate the effects of uncertainty, therefore, the EUT conditionally meets this requirement.