Engineering and Testing for EMC and Safety Compliance

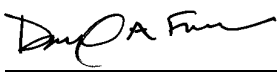
# CERTIFICATION APPLICATION REPORT
# FCC Part 15.247 & INDUSTRY CANADA RSS-210

| Test Lab: | Applicant: |
|---|---|
| Rhein Tech Laboratories, Inc. Phone: 703-689-0368<br>360 Herndon Parkway Fax: 703-689-2056<br>Suite 1400 Web: www.rheintech.com<br>Herndon, VA 20170<br>E-Mail: ATCBINFO@rheintech.com | Motorola, Inc Phone: 215-323-2117<br>Connected Home Solutions Fax: 215-323-0480<br>Contact: Michael Welty<br>101 Tournament Dr<br>Horsham, PA 19044<br>E-Mail: MWELTY@MOTOROLA.COM |

| | | | |
|---|---|---|---|
| **FCC ID/ IC ID:** | ACQWACA/3231A - WACA | **Test Report Date:** | February 27, 2006 |
| **Platform:** | N/A | **RTL Work Order Number:** | 2006021 |
| **Model Name/ Model Numbers:** | RCKT Wireless Audio Car Adapter; Model: WACA-d | **RTL Quote Number:** | QRTL06-150 |
| | | | |
| **American National Standard Institute:** | ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | | |
| **FCC Classification:** | DSS – Part 15 Spread Spectrum Transmitter (Bluetooth portion) | | |
| **FCC Rule Part(s):** | FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System | | |
| **Industry Canada:** | RSS-210: Low Power License-Exempt Communications Devices | | |
| **Digital Interface Information** | Digital Interface was found to be compliant | | |

| Frequency Range (MHz) | Output Power (W) | Frequency Tolerance | Emission Designator |
|---|---|---|---|
| 2402-2480 | 0.0022 | N/A | N/A |

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: 

Date: February 27, 2006

Typed/Printed Name: Desmond A. Fraser

Position: President

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# 1 General Information

## 1.1 Scope

This is a original certification application request.

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

## 1.2 Description of EUT

| | |
|---|---|
| **Equipment Under Test** | RCKT Wireless Audio Car Adapter |
| **Model** | WACA-d |
| **Power Supply** | +12V DC |
| **Modulation Type** | FHSS - Bluetooth |
| **Frequency Range** | 2402 – 2480 MHz |
| **Antenna Connector Type** | Antenna is PCB trace |
| **Antenna Types** | Internal |

## 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

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

This is an original application for certification for Motorola CHS Model: WACA-d, FCC ID ACQWACA, IC: 3231A - WACA.

## 1.5 Modifications

No modifications were required for compliance.

# 2 Test Information

## 2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

**Table 2-1: Channels Tested for FHSS – 1 Mbps**

| Channel | Frequency |
|---|---|
| 0 | 2402 |
| 38 | 2440 |
| 78 | 2480 |

## 2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

## 2.3 Test Result Summary

**Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)**

| Standard | Test | Pass/Fail or N/A |
|---|---|---|
| FCC 15.207 | AC Power Conducted Emissions | Pass |
| FCC 15.209 | Radiated Emissions | Pass |
| FCC 15.247(b) | Maximum Peak Power Output | Pass |
| FCC 15.247(d) | Antenna Conducted Spurious Emissions | Pass |
| FCC 15.247(d) | Band Edge Measurement | Pass |
| FCC 15.247(a)(1) | Carrier Frequency Separation | Pass |
| FCC 15.247(a)(1)(ii) | 20 dB Bandwidth | Pass |
| FCC 15.247(a)(1)(iii) | Hopping Characteristics | Pass |
| FCC 15.247(a)(1)(iii) | Average Time of Occupancy | Pass |

### 2.4 Test System Details

The test samples were received on February 22, 2006. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

**Table 2-3: Equipment Under Test**

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|---|---|---|---|---|---|---|
| **RCKT Wireless Audio Car Adapter (EUT)** | **Motorola CHS** | **WACA-d** | **Prototype1** | **ACQWACA** | **Unshielded power and I/O** | **17056** |
| RCKT Wireless Audio Car Adapter (EUT) for conducted measurements | Motorola CHS | WACA-d | 7 | ACQWACA | Unshielded power and I/O | 17057 |
| Communication adapter | Motorola CHS | 66108 | N/A | N/A | 0.3m unshielded power; 0.1 and 1.75m unshielded I/O | 17058 |
| Mobile Radio/CD player | Alpine Electronics, Inc. | CDA-9851 | N/A | N/A | 0.75m I/O and power | 17054 |

**Table 2-4: Additional Equipment Required for Testing**

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|---|---|---|---|---|---|---|
| Mouse | Microsoft | Intellimouse 1.2A | 2881943-5 | N/A | 1.8m unshielded I/O | 12221 |
| PC | Dell | Dimension 4600 Series | GBG0X41 | N/A | 1.7m unshielded Power | 901330 |
| Flat Screen Monitor | MAG | 700P | F6EQ5810281 8U | N/A | 1.5m unshielded power/1.5m Shielded I/O | 901427 |
| Keyboard | Dell | SK8110 | N/A | N/A | 1.9m unshielded | N/A |
| DC Power Supply | GW | Instek PSS-3203 | N/A | N/A | 1.9m unshielded power | 2679 |

## 2.5 Configuration of Tested System

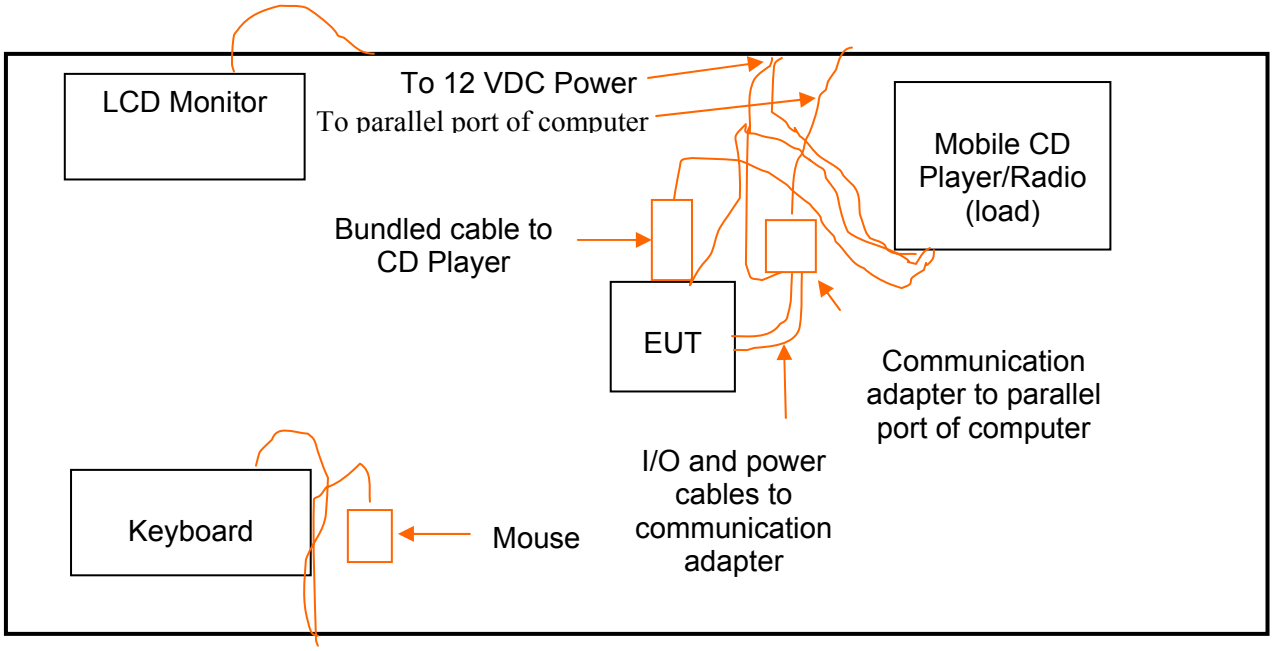



**Figure 2-1: Configuration of System Under Test**

## 3 Peak Output Power - §15.247(b)(1); RSS-210 §6.6.2(o)

### 3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

**Table 3-1: Power Output Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 901356 | Agilent | E9323A | Power Sensor | 31764-264 | 9/21/06 |
| 901184 | Agilent Technologies | E4416A | EPM-P Power Meter, single channel | GB41050573 | 9/21/06 |

### 3.2 Power Output Test Data

**Table 3-2: Power Output Test Data**

| Channel | Frequency (MHz) | Peak Power conducted output (dBm) |
|---|---|---|
| 0 | 2402 | 3.47 |
| 38 | 2440 | 2.84 |
| 78 | 2480 | 2.11 |

**Test Personnel:**

| Daniel W. Baltzell | | February 25, 2006 |
|---|---|---|
| Test Engineer | Signature | Dates Of Test |

## 4 Compliance with the Band Edge – FCC §15.247(d); RSS-210 §6.6.2(o)

### 4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

**Table 4-1: Band Edge Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 901020 | Hewlett Packard | 8564E | Portable Spectrum Analyzer (9 kHz - 40 GHz) | 3943A01719 | 9/14/06 |
| 900878 | Rhein Tech Labs | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | Not Required |
| 901231 | IW Microwave Products | KPS-1503-2400-KPS | High frequency RF cables | 240" | 9/1/06 |
| 901232 | IW Microwave Products | KPS-1503-2400-KPS | High frequency RF cables | 240" | 9/1/06 |
| 901235 | IW Microwave Products | KPS-1503-360-KPS | High frequency RF cables | 36" | 9/1/06 |
| 901242 | Rhein Tech Labs | WRT-000-0003 | Wood rotating table | N/A | Not Required |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 5/20/07 |
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |

## 4.2 Restricted Band Edge Test Results

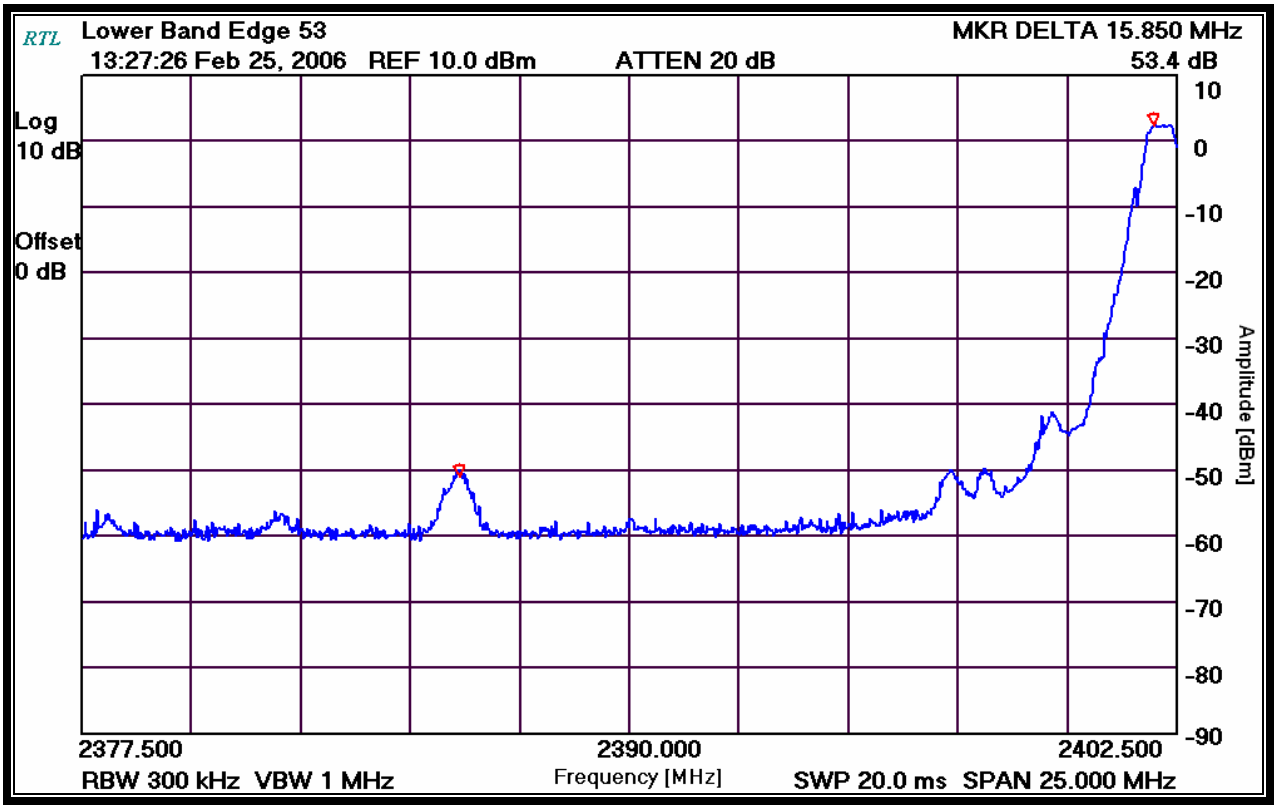
### 4.2.1 Calculation of Lower Band Edge

95.9 dBuV/m is the field strength measurement, from which the delta measurement of 53.4 dB is subtracted (reference plots), resulting in a level of 42.5 dB. This level has a margin of 11.5 dB below the limit of 54 dBuV/m.

Calculation: 95.9 dBuV/m – 53.4 dB – 54 dBuV/m = -11.5 dB

Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 95.9 dBuV/m
Delta measurement = 53.4 dB

**Plot 4-1: Lower Band Edge: Average Measurement Channel 0 (TX Frequency: 2402 MHz)**



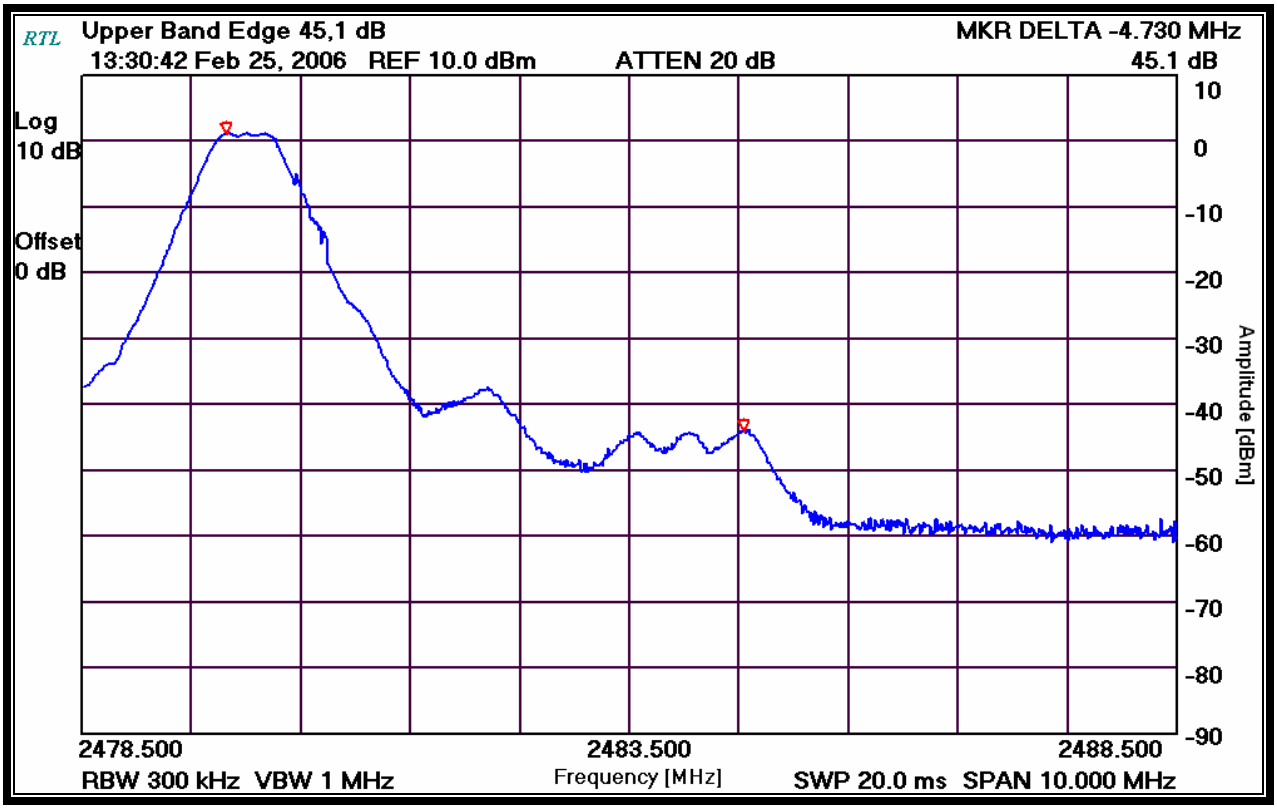
### 4.2.2 Calculation of Upper Band Edge

93.2 dBuV/m is the field strength measurement, from which the delta measurement of 45.1 dB is subtracted (reference plots), resulting in a level of 48.1 dB. This level has a margin of 5.9 dB below the limit of 54 dBuV/m.

Calculation: 93.2 dBuV/m – 45.1 dB – 54 dBuV/m = -5.9 dB

Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 93.2 dBuV/m
Delta measurement = 45.1 dB

**Plot 4-2: Upper Band Edge: Average Measurement Channel 78 (TX Frequency: 2480 MHz)**




**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | February 25, 2006 |
|---|---|---|
| Test Engineer | Signature | Dates Of Test |

# 5 Antenna Conducted Spurious Emissions - §15.247(d); RSS-210 §6.6.2(o)

## 5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The modulated carrier was identified at the following frequencies: 2402 MHz, 2440 MHz and 2480 MHz.

## 5.2 Antenna Conducted Spurious Emissions Test Results

No harmonics or spurs were found within 20 dB (note that we are reporting power as peak) of the limit from the carrier to the 10$^{th}$ harmonic of the carrier frequency.

**Table 5-1: Antenna Conducted Spurious Emissions; 2402 MHz**

| Frequency ( MHz) | Spectrum Analyzer Level (dBm) | Limit (20 dBc) | Margin (dB) |
|---|---|---|---|
| 4804.0 | -49.8 | -17.5 | -32.3 |
| 7206.0 | -60.3 | -17.5 | -42.8 |
| 9608.0 | -67.4 | -17.5 | -49.9 |
| 12010.0 | -86.4 | -17.5 | -68.9 |
| 14412.0 | -64.0 | -17.5 | -46.5 |
| 16814.0 | -75.7 | -17.5 | -58.2 |
| 19216.0 | -71.4 | -17.5 | -53.9 |

**Table 5-2: Antenna Conducted Spurious Emissions; 2440 MHz**

| Frequency ( MHz) | Spectrum Analyzer Level (dBm) | Limit (20 dBc) | Margin (dB) |
|---|---|---|---|
| 4880.0 | -48.3 | -18.2 | -30.1 |
| 7320.0 | -68.1 | -18.2 | -49.9 |
| 9760.0 | -73.1 | -18.2 | -54.9 |
| 12200.0 | -73.4 | -18.2 | -55.2 |
| 14640.0 | -75.8 | -18.2 | -57.6 |
| 17080.0 | -88.4 | -18.2 | -70.2 |

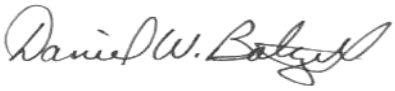
**Table 5-3: Antenna Conducted Spurious Emissions; 2480 MHz**

| Frequency ( MHz) | Spectrum Analyzer Level (dBm) | Limit (20 dBc) | Margin (dB) |
|---|---|---|---|
| 4960.0 | -47.0 | -18.7 | -28.3 |
| 7440.0 | -70.1 | -18.7 | -51.4 |
| 9920.0 | -75.0 | -18.7 | -56.3 |
| 12400.0 | -74.7 | -18.7 | -56.0 |
| 14880.0 | -85.6 | -18.7 | -66.9 |
| 17360.0 | -88.6 | -18.7 | -69.9 |

**Table 5-4: Antenna Conducted Spurious Emissions Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |

**Test Personnel:**

| Daniel W. Baltzell |  | February 25, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

## 6 20 dB Bandwidth – FCC §15.247(a)(1)(ii); IC RSS-210 §5.9.1

### 6.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths per RSS-210 were measured using a 50 ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the Spectrum Analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 1 MHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer delta marker set 20 dB down from the peak of the carrier. The table below contains the bandwidth measurement results.

**Table 6-1: 20 dB Bandwidth Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 901413 | Agilent | E4448A | Spectrum Analyzer (3 Hz – 50 GHz) | US440203416 | 11/02/06 |

### 6.2 20 dB Modulated Bandwidth Test Data

**Table 6-2: 20 dB Modulated Bandwidth Test Data**

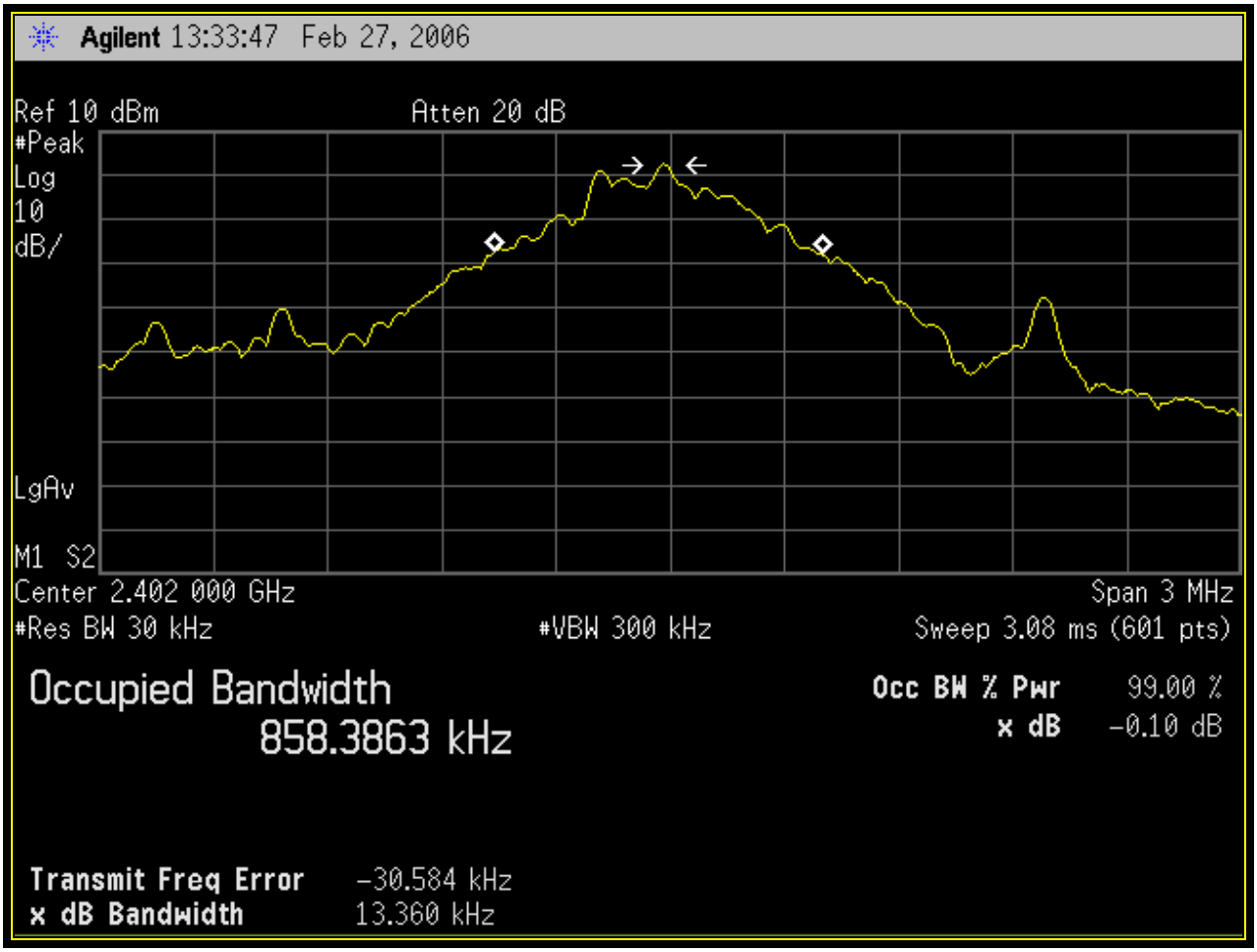
**Minimum 20 dB Bandwidths**

| Channel | 20 dB Bandwidth (MHz) |
|---|---|
| 0 | 858.4 |
| 38 | 851.0 |
| 78 | 850.0 |

## 6.3 20 dB Bandwidth Plots

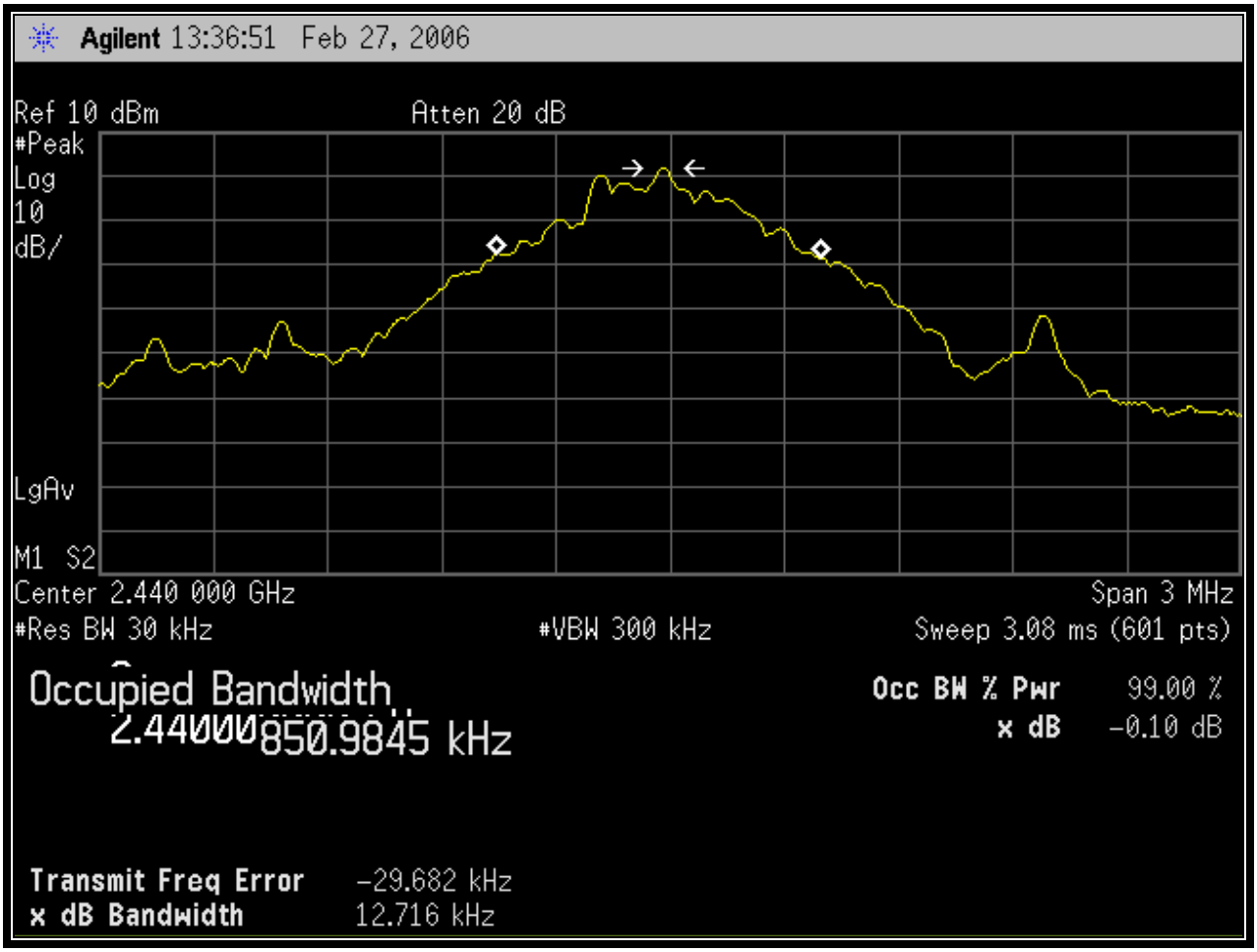
| | |
|---|---|
| **Channel:** | 0 |
| **Channel Frequency (MHz):** | 2402 |
| **Resolution Bandwidth (kHz):** | 30 |
| **Video Bandwidth (kHz):** | 300 |
| **Span (MHz):** | 3 |

**Plot 6-1: 20 dB Bandwidth Channel 0**



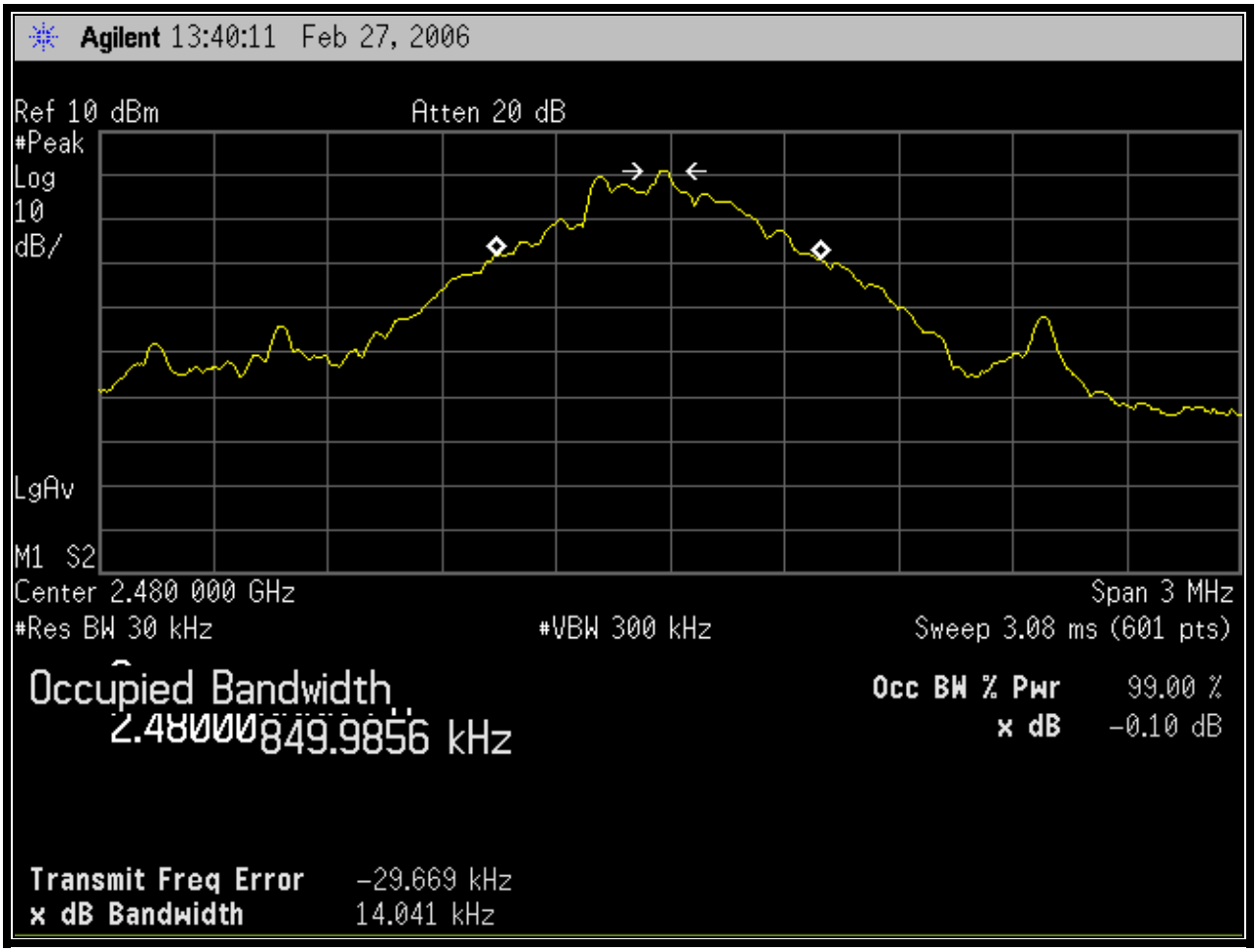
| | |
|---|---|
| **Channel:** | 38 |
| **Channel Frequency (MHz):** | 2440 |
| **Resolution Bandwidth (kHz):** | 30 |
| **Video Bandwidth (kHz):** | 300 |
| **Span (MHz):** | 3 |

**Plot 6-2: 20 dB Bandwidth Channel 38**



| | |
|---|---|
| **Channel:** | 78 |
| **Channel Frequency (MHz):** | 2480 |
| **Resolution Bandwidth (kHz):** | 30 |
| **Video Bandwidth (kHz):** | 300 |
| **Span (MHz):** | 3 |

**Plot 6-3: 20 dB Bandwidth Channel 78**




**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | February 27, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

## 7 Carrier Frequency Separation - §15.247(a)(1)

### 7.1 Carrier Frequency Separation Test Procedure

Frequency Hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

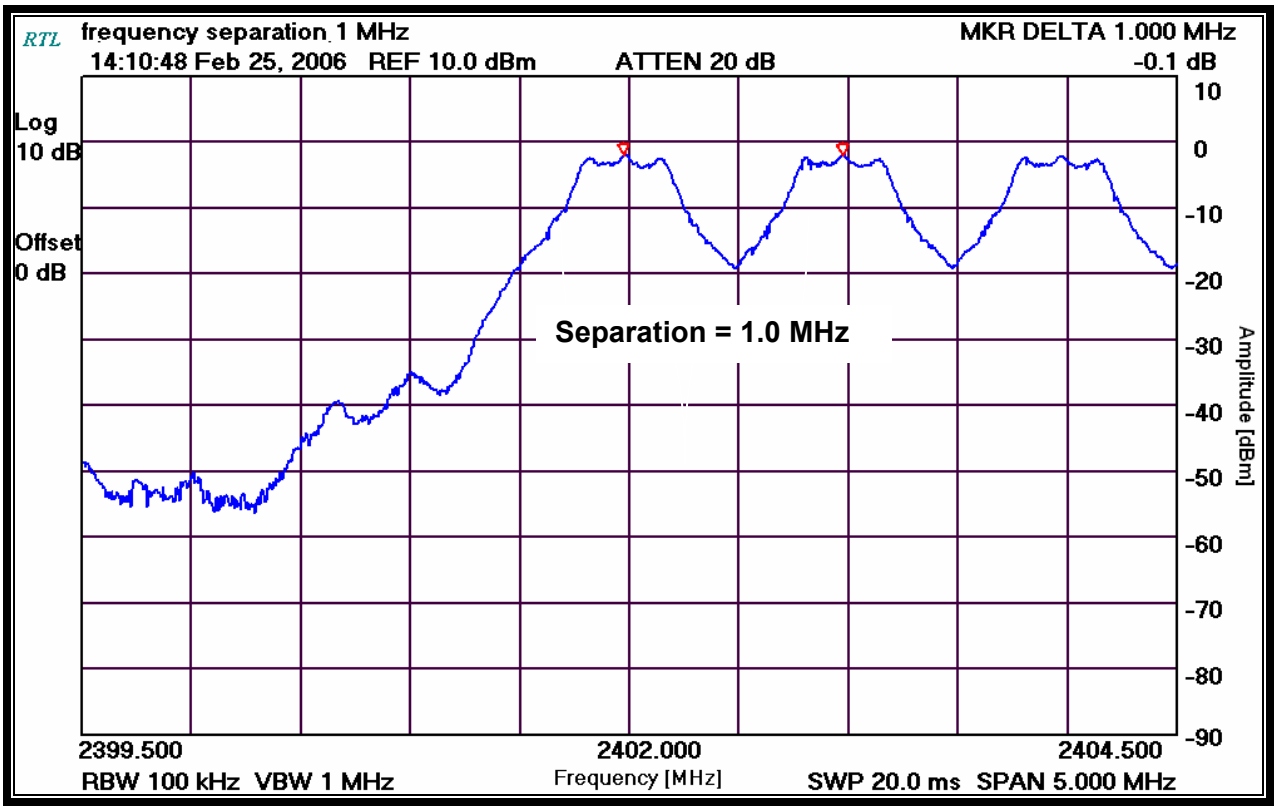
Measured frequency separation = 1.0 MHz

**Table 7-1: Carrier Frequency Separation Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |

### 7.2 Carrier Frequency Separation Test Data

**Plot 7-1: Carrier Frequency Separation**




**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | February 25, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

# 8 Hopping Characteristics – FCC §15.247(a)(1)(iii); IC RSS-210 §6.2.2(o)

## 8.1 Hopping Characteristics Test Procedure

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

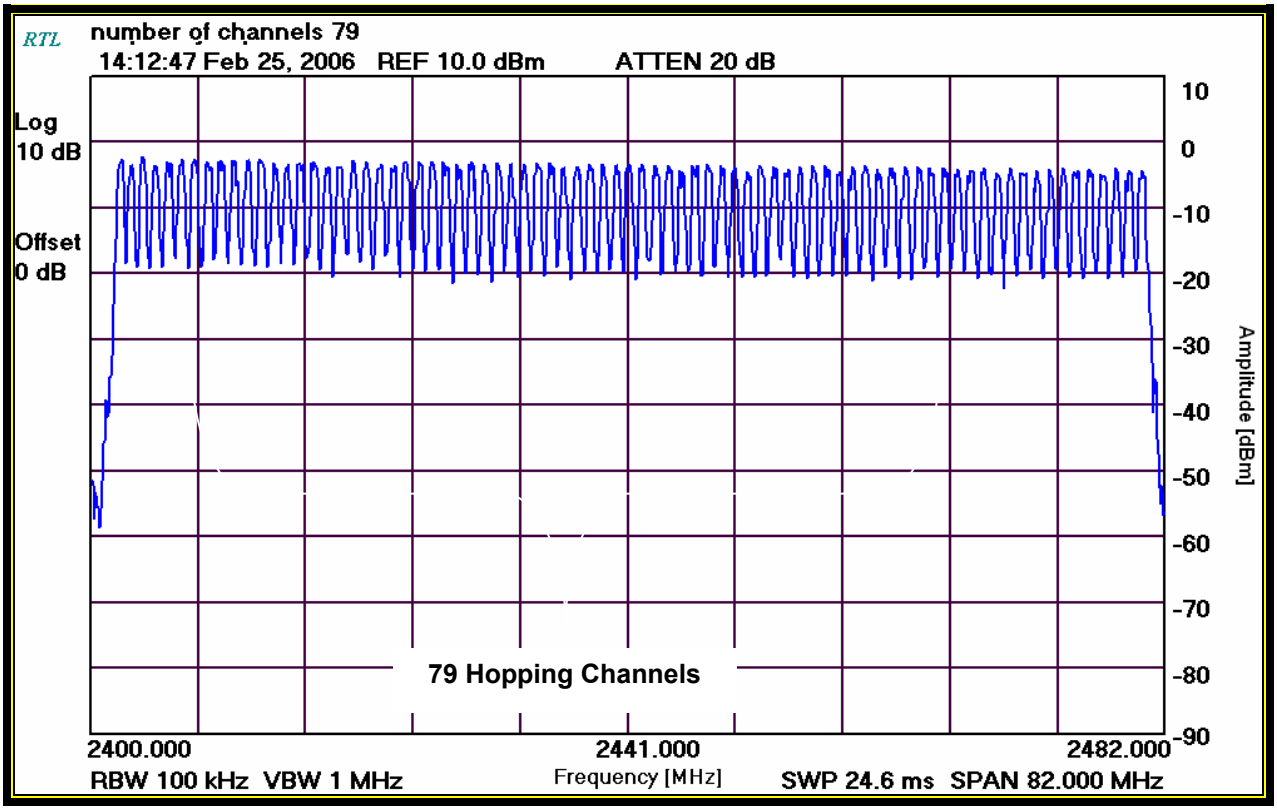
**Table 8-1: Hopping Characteristics Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |

## 8.2 Number of Hopping Frequencies

Measured number of hopping frequencies = 79

**Plot 8-1: Number of Hopping Frequencies**



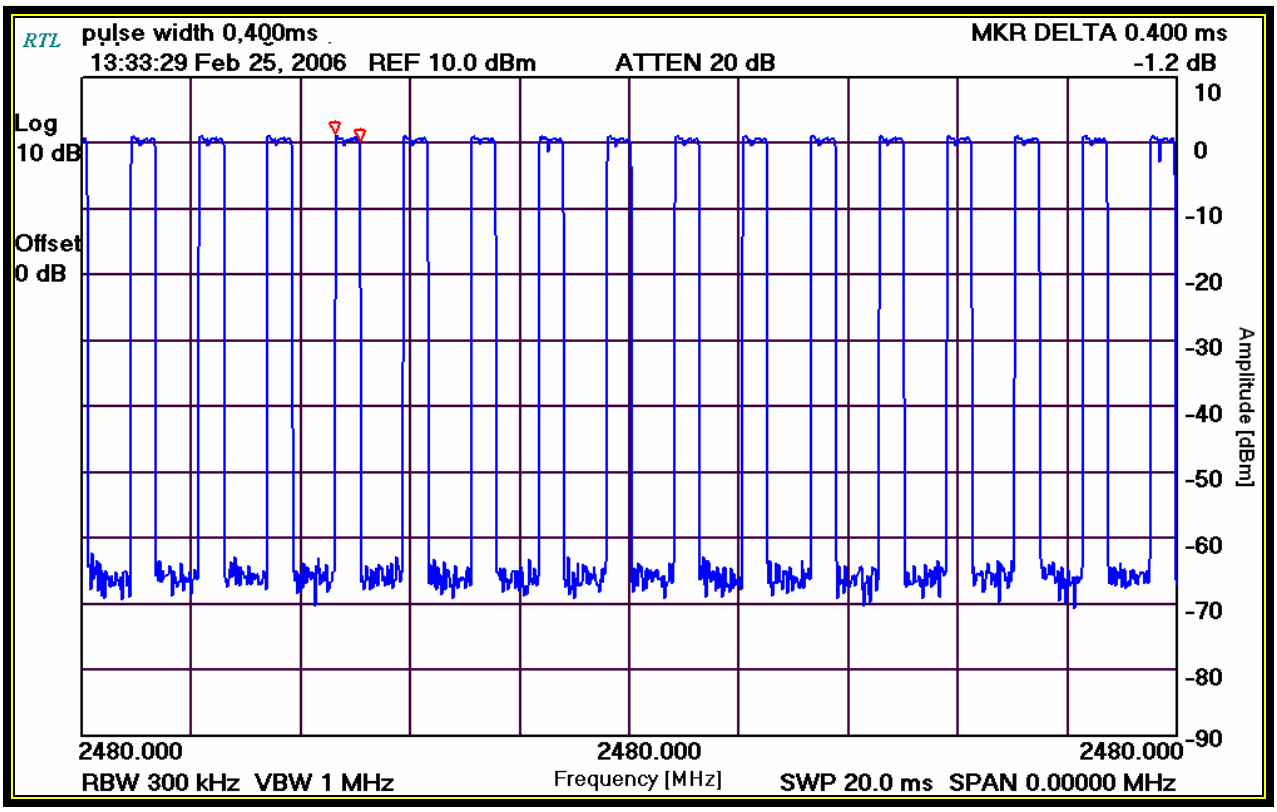
## 8.3 Average Time of Occupancy

The spectrum analyzer sweep was set to 20 ms, with a zero span and captured pulses from the device under test. A marker delta was used to measure the dwell time for this pulse. The sweep was then set to single sweep for 5 s (it was not possible to get a suitable display with a sweep time of 31.6 s).

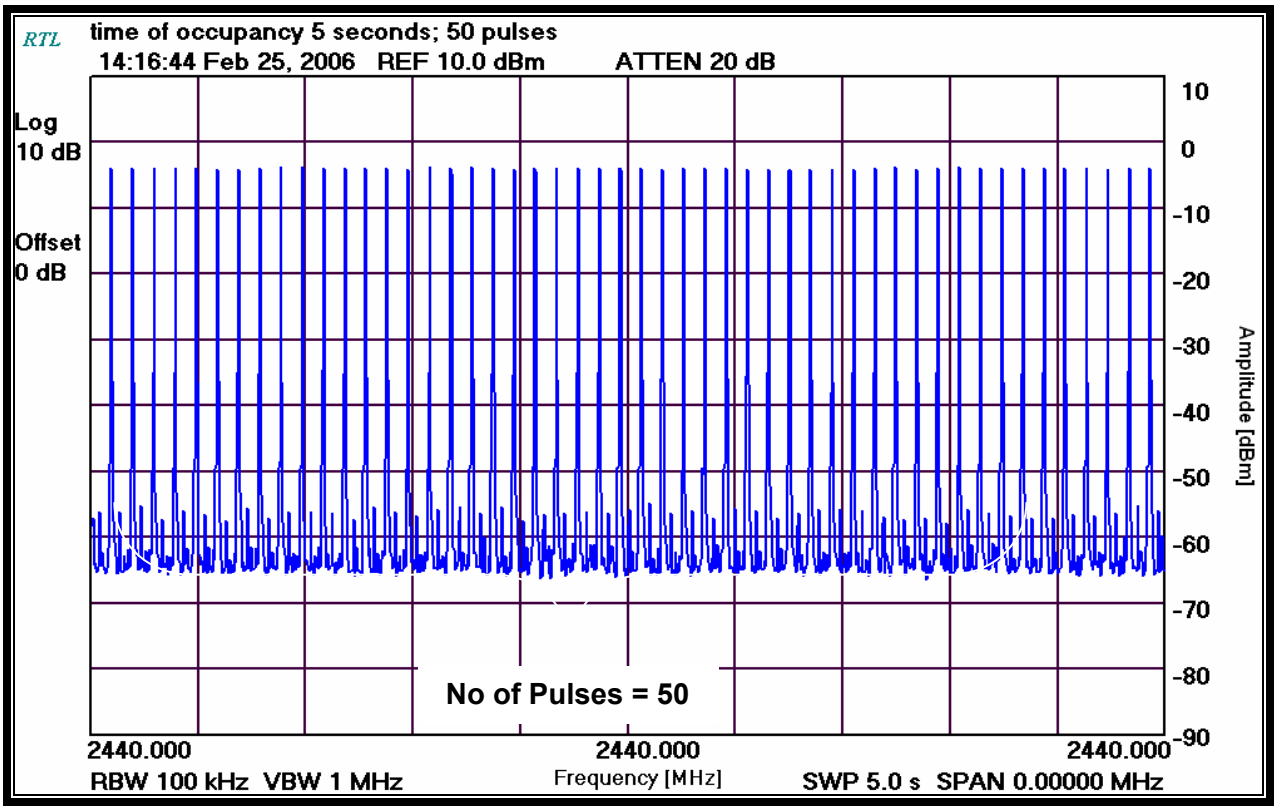
The number of pulses in 5 s was 50. Therefore, the number of pulses in a period of 0.4 seconds X 79 hopping channels (31.6 s) would be 316 pulses.

The average time of occupancy in the above period (31.6 s) is equal to 316 pulses X 400 us = 126.4 ms, which meets the limit as defined by 15.247(a)(1)(iii) of 0.4 seconds.

**Plot 8-2: Time of Occupancy (Dwell Time)**



**Plot 8-3: Time of Occupancy (Dwell Time 5 Second Sweep)**




Number of pulses in 5 seconds: 50. Therefore, the number of pulses in the period of 0.4 s X 79 channels would be 316 pulses.

**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | February 25, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

# 9 Conducted Emissions Measurement Limits – FCC §15.207; RSS-210 §9

## 9.1 Limits of Conducted Emissions Measurement

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

## 9.2 Conducted Emissions Measurement Test Procedure

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 micro Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50 ohm output of the EUT LISN was connected to the spectrum analyzer input. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

## 9.3 Conducted Emissions Line Test Equipment

**Table 9-1: Conducted Emissions Line Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |
| 901083 | AFJ International | LS16 | 16A LISN | 16010020080 | 3/24/06 |

## 9.4 Conducted Line Emission Test Data

**Table 9-2: Conducted Emissions (Neutral Side); Transmitting (2440 MHz)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B QP Limit (dBuV) | FCC B QP Margin (dBuV) | FCC B AV Limit (dBuV) | FCC B AV Margin (dBuV) | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.155 | Pk | 52.2 | 0.2 | 52.4 | 65.7 | -13.3 | 55.7 | -3.3 | Pass |
| 0.207 | Pk | 43.0 | 0.2 | 43.2 | 63.3 | -20.1 | 53.3 | -10.1 | Pass |
| 0.426 | Pk | 34.5 | 0.3 | 34.8 | 57.3 | -22.5 | 47.3 | -12.5 | Pass |
| 0.617 | Pk | 27.2 | 0.3 | 27.5 | 56.0 | -28.5 | 46.0 | -18.5 | Pass |
| 16.420 | Pk | 34.5 | 2.2 | 36.7 | 60.0 | -23.3 | 50.0 | -13.3 | Pass |
| 24.120 | Pk | 37.4 | 2.5 | 39.9 | 60.0 | -20.1 | 50.0 | -10.1 | Pass |

**Table 9-3: Conducted Emissions (Phase Side); Transmitting (2440 MHz)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B QP Limit (dBuV) | FCC B QP Margin (dBuV) | FCC B AV Limit (dBuV) | FCC B AV Margin (dBuV) | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.151 | Qp | 46.0 | 0.2 | 46.2 | 65.9 | -19.7 | 55.9 | -9.7 | Pass |
| 0.151 | Av | 5.3 | 0.2 | 5.5 | 65.9 | -60.4 | 55.9 | -50.4 | Pass |
| 0.216 | Pk | 43.1 | 0.2 | 43.3 | 63.0 | -19.7 | 53.0 | -9.7 | Pass |
| 0.430 | Pk | 37.8 | 0.2 | 38.0 | 57.3 | -19.3 | 47.3 | -9.3 | Pass |
| 0.581 | Pk | 29.9 | 0.3 | 30.2 | 56.0 | -25.8 | 46.0 | -15.8 | Pass |
| 17.040 | Pk | 36.3 | 2.2 | 38.5 | 60.0 | -21.5 | 50.0 | -11.5 | Pass |
| 24.060 | Pk | 37.1 | 2.5 | 39.6 | 60.0 | -20.4 | 50.0 | -10.4 | Pass |

**Table 9-4: Conducted Emissions (Neutral Side); Receive Mode**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B QP Limit (dBuV) | FCC B QP Margin (dBuV) | FCC B AV Limit (dBuV) | FCC B AV Margin (dBuV) | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.152 | Pk | 51.0 | 0.2 | 51.2 | 65.9 | -14.7 | 55.9 | -4.7 | Pass |
| 0.209 | Pk | 42.6 | 0.2 | 42.8 | 63.2 | -20.4 | 53.2 | -10.4 | Pass |
| 0.447 | Pk | 37.1 | 0.2 | 37.3 | 56.9 | -19.6 | 46.9 | -9.6 | Pass |
| 0.508 | Pk | 33.2 | 0.2 | 33.4 | 56.0 | -22.6 | 46.0 | -12.6 | Pass |
| 16.870 | Pk | 35.8 | 2.2 | 38.0 | 60.0 | -22.0 | 50.0 | -12.0 | Pass |
| 24.060 | Pk | 36.0 | 2.5 | 38.5 | 60.0 | -21.5 | 50.0 | -11.5 | Pass |

**Table 9-5: Conducted Emissions (Phase Side); Receive Mode**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B QP Limit (dBuV) | FCC B QP Margin (dBuV) | FCC B AV Limit (dBuV) | FCC B AV Margin (dBuV) | Pass/ Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.156 | Pk | 48.4 | 0.2 | 48.6 | 65.7 | -17.1 | 55.7 | -7.1 | Pass |
| 0.203 | Pk | 43.8 | 0.2 | 44.0 | 63.5 | -19.5 | 53.5 | -9.5 | Pass |
| 0.433 | Pk | 34.8 | 0.2 | 35.0 | 57.2 | -22.2 | 47.2 | -12.2 | Pass |
| 0.649 | Pk | 27.7 | 0.2 | 27.9 | 56.0 | -28.1 | 46.0 | -18.1 | Pass |
| 16.620 | Pk | 35.8 | 2.2 | 38.0 | 60.0 | -22.0 | 50.0 | -12.0 | Pass |
| 23.870 | Pk | 36.0 | 2.5 | 38.5 | 60.0 | -21.5 | 50.0 | -11.5 | Pass |

**Test Personnel:**

| Daniel W. Baltzell |  | February 25, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

## 10 Radiated Emissions - §15.209; RSS-210 §6.2.1

### 10.1 Limits of Radiated Emissions Measurement

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009-0.490 | 2400/f (kHz) | 300 |
| 0.490-1.705 | 2400/f (kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

### 10.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the $10^{th}$ harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Table 10-1: Radiated Emissions Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900932 | Hewlett Packard | 8449B OPT H02 | Preamplifier (1 - 26.5 GHz) | 3008A00505 | 5/20/06 |
| 901020 | Hewlett Packard | 8564E | Portable Spectrum Analyzer (9 kHz - 40 GHz) | 3943A01719 | 9/14/06 |
| 900811 | Rhein Tech Labs | PR-1040 | Amplifier | 1003 | 3/8/06 |
| 900878 | Rhein Tech Labs | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | Not Required |
| 901231 | IW Microwave Products | KPS-1503-2400-KPS | High frequency RF cables | 240" | 9/1/06 |
| 901232 | IW Microwave Products | KPS-1503-2400-KPS | High frequency RF cables | 240" | 9/1/06 |
| 901235 | IW Microwave Products | KPS-1503-360-KPS | High frequency RF cables | 36" | 9/1/06 |
| 901242 | Rhein Tech Labs | WRT-000-0003 | Wood rotating table | N/A | Not Required |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 5/20/07 |
| 900321 | EMCO | 3161-03 | Horn Antennas (4 - 8,2GHz) | 9508-1020 | 5/20/07 |
| 900323 | EMCO | 3160-7 | Horn Antennas (8,2 - 12,4 GHz) | 9605-1054 | 5/20/07 |
| 900356 | EMCO | 3160-08 | Horn Antenna (12.4 - 18 GHz) | 9607-1044 | 5/20/07 |
| 900325 | EMCO | 3160-9 | Horn Antennas (18 - 26.5 GHz) | 9605-1051 | 5/20/07 |
| 900392 | Hewlett Packard | 1197OK | Harmonic Mixer (18 – 26.5 GH)z | 3525A00159 | 11/27/07 |
| 900931 | Hewlett Packard | 8566B | Spectrum Analyzer (100 Hz - 22 GHz) | 3138A07771 | 8/3/06 |
| 900930 | Hewlett Packard | 85662A | Spectrum Analyzer Display Section | 3144A20839 | 8/3/06 |
| 900889 | Hewlett Packard | 85685A | RF Preselector (20 Hz - 2 GHz) | 3146A01309 | 4/5/06 |
| 901020 | Hewlett Packard | 8564E | Spectrum Analyzer (30 Hz – 40 GHz) | 3943A01719 | 9/14/06 |

### 10.3 Radiated Emissions Test Results

#### 10.3.1 Radiated Emissions Digital/Receiver

**Table 10-2: Digital/Receiver Radiated Emissions Test Results**

| Temperature: 31°F Humidity: 22% | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/ Fail |
| 32.000 | Qp | V | 225 | 1.0 | 48.9 | -13.2 | 35.7 | 40.0 | -4.3 | 32.000 |
| 48.000 | Qp | V | 270 | 1.0 | 59.8 | -20.8 | 39.0 | 40.0 | -1.0 | 48.000 |
| 56.000 | Qp | V | 270 | 1.0 | 57.5 | -22.7 | 34.8 | 40.0 | -5.2 | 56.000 |
| 64.000 | Qp | V | 270 | 1.0 | 59.1 | -23.7 | 35.4 | 40.0 | -4.6 | 64.000 |
| 88.016 | Qp | V | 120 | 1.0 | 40.6 | -19.1 | 21.5 | 43.5 | -22.0 | 88.016 |
| 92.017 | Qp | H | 80 | 2.0 | 46.2 | -19.2 | 27.0 | 43.5 | -16.5 | 92.017 |
| 112.000 | Qp | V | 270 | 1.0 | 50.2 | -15.7 | 34.5 | 43.5 | -9.0 | 112.000 |
| 176.000 | Qp | H | 270 | 2.0 | 47.1 | -18.3 | 28.8 | 43.5 | -14.7 | 176.000 |
| 192.035 | Qp | H | 260 | 1.8 | 53.4 | -18.2 | 35.2 | 43.5 | -8.3 | 192.035 |

#### 10.3.2 Radiated Emissions Harmonics/Spurious

**Table 10-3: Radiated Emissions Harmonics/Spurious Channel 0 (TX Frequency: 2402 MHz)**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 4804.0 | 43.3 | 33.5 | 10.1 | 43.6 | 54.0 | -10.4 |
| 7206.0 | 30.2 | 20.5 | 10.4 | 30.9 | 75.9 | -45.0 |
| 9608.0 | 26.8 | 17.2 | 13.3 | 30.5 | 75.9 | -45.4 |
| 12010.0 | 27.7 | 19.7 | 15.8 | 35.5 | 54.0 | -18.5 |
| 14412.0 | 25.7 | 15.8 | 19.0 | 34.8 | 54.0 | -19.2 |
| 16814.0 | 29.8 | 20.3 | 19.2 | 39.5 | 75.9 | -36.4 |

**Table 10-4: Radiated Emissions Harmonics/Spurious Channel 38 (TX Frequency: 2440 MHz)**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 4880.0 | 45.0 | 35.8 | 9.9 | 45.7 | 54.0 | -8.3 |
| 7320.0 | 31.8 | 21.3 | 10.1 | 31.4 | 54.0 | -22.6 |
| 9760.0 | 27.1 | 18.3 | 12.4 | 30.7 | 75.2 | -44.5 |
| 12200.0 | 36.0 | 22.8 | 14.5 | 37.3 | 54.0 | -16.7 |
| 14640.0 | 25.8 | 12.7 | 20.1 | 32.8 | 75.2 | -42.4 |
| 17080.0 | 31.2 | 20.5 | 19.8 | 40.3 | 75.2 | -34.9 |
| 19520.0 | 30.8 | 21.7 | 21.3 | 43.0 | 54.0 | -11.0 |

**Table 10-5: Radiated Emissions Harmonics/Spurious Channel 78 (TX Frequency: 2480 MHz)**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|---|---|---|---|---|---|---|
| 4960.0 | 45.3 | 36.7 | 10.6 | 47.3 | 54.0 | -6.7 |
| 7440.0 | 31.0 | 21.2 | 10.8 | 32.0 | 54.0 | -22.0 |
| 9920.0 | 25.8 | 18.5 | 13.3 | 31.8 | 73.2 | -41.4 |
| 12400.0 | 26.8 | 22.2 | 17.8 | 40.0 | 54.0 | -14.0 |
| 14880.0 | 23.2 | 11.2 | 20.6 | 31.8 | 73.2 | -41.4 |
| 17360.0 | 20.7 | 11.8 | 17.8 | 29.6 | 73.2 | -43.6 |
| 19840.0 | 23.5 | 12.8 | 23.1 | 35.9 | 54.0 | -18.1 |

**Test Personnel:**

| Daniel W. Baltzell |  | February 26, 2006 |
|---|---|---|
| EMC Test Engineer | Signature | Date Of Test |

## 11 Conclusion

The data in this measurement report shows that the EUT as tested, Motorola, Inc. RCKT Wireless Audio Car Adapter; Model Number: WACA-d, FCC ID: ACQWACA, IC: 3231A - WACA, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210.

## Appendix A: RF Exposure Compliance

No RF Exposure Evaluation Required if power is below the following threshold:

| Tunable Range | | | |
|---|---|---|---|
| **f(GHz) Low** | **f(GHz) High** | **Center of Tunable Band (GHz)** | **60/f SAR Limitation (mW)** |
| 2.402 | 2.480 | 2.441 | 24.58 |

Maximum measured transmitter power:

| **Pout Conducted (mW)** | **Maximum Antenna Gain (numeric)** | **Pout EIRP (mW)** |
|---|---|---|
| 2.2 | 0.55 | 1.2 |

Threshold for no RF exposure evaluation is 24.58 mW

Maximum TX Power is 2.2 mW Conducted and 1.2 mW EIRP

Conclusion: No RF exposure evaluation required since maximum Transmitter Pout (both conducted and EIRP) is below FCC threshold.

## Appendix B: FCC Agency Authorization Letter

Please refer to the following page.

## Appendix C: FCC Confidentiality Request Letter

Please refer to the following page.

## Appendix D: Acknowledgement of IC Listing Requirements Letter

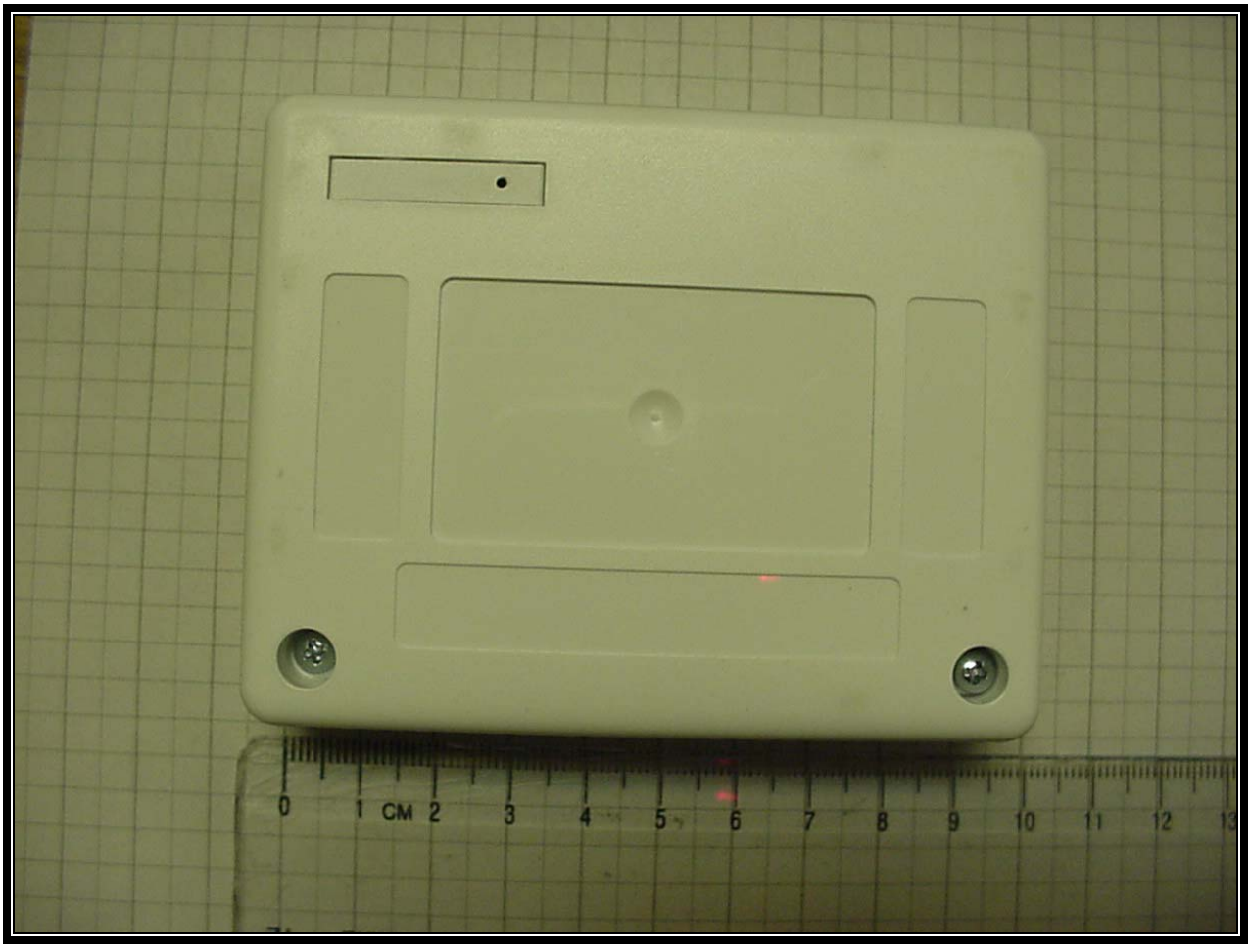
Please refer to the following page.

## Appendix E: IC Authority to Act as Agent

Please refer to the following page.

## Appendix F: Label and Label Location

Please refer to the following pages for a sample of the ID label and location on the Bluetooth module, as well as a sample of the ID label that will be visible on the host.



## Appendix G: Technical Operational Description

Please refer to the following pages.

## Appendix H: Schematics

Please refer to the following pages.

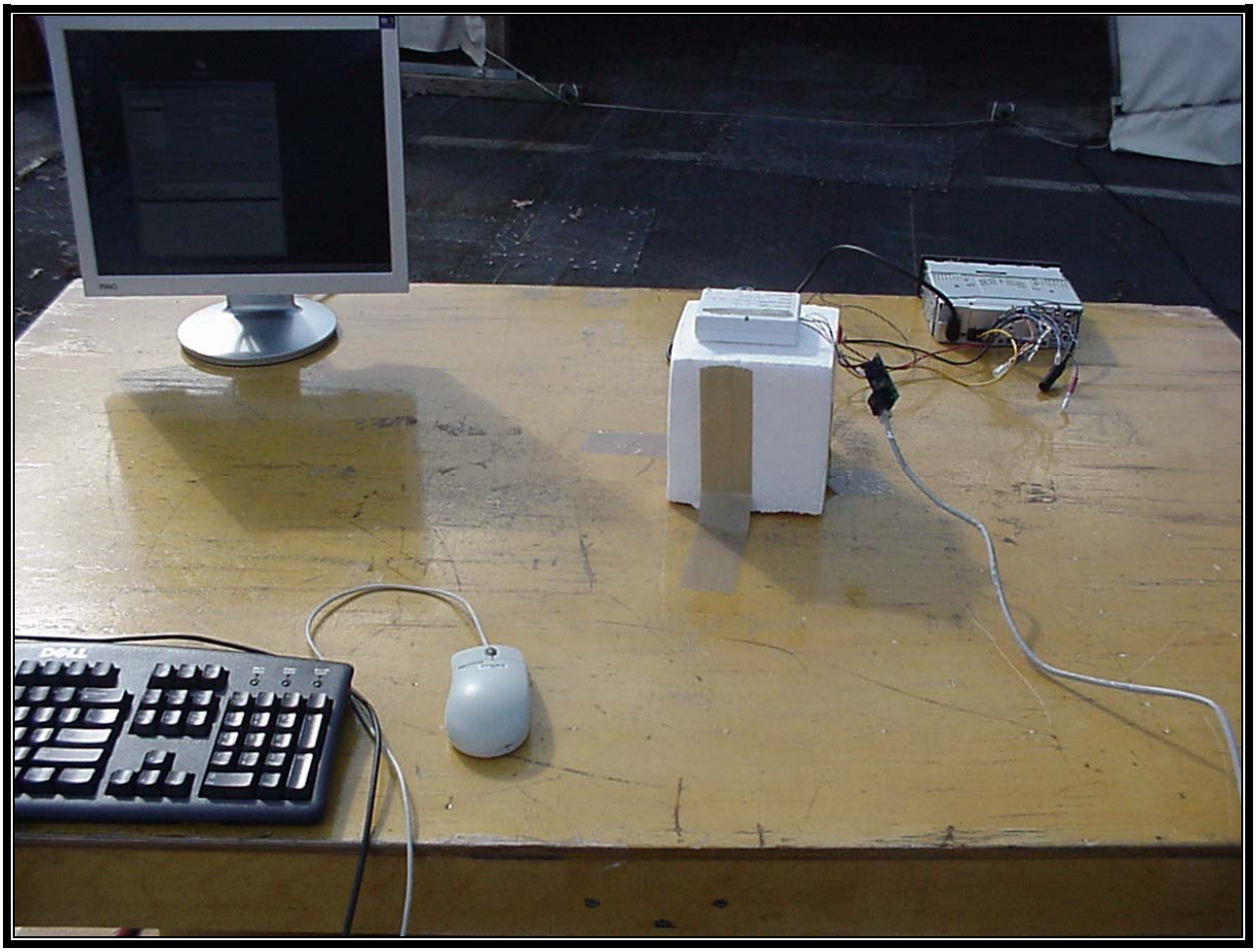
## Appendix I: Block Diagram

Please refer to the following pages.

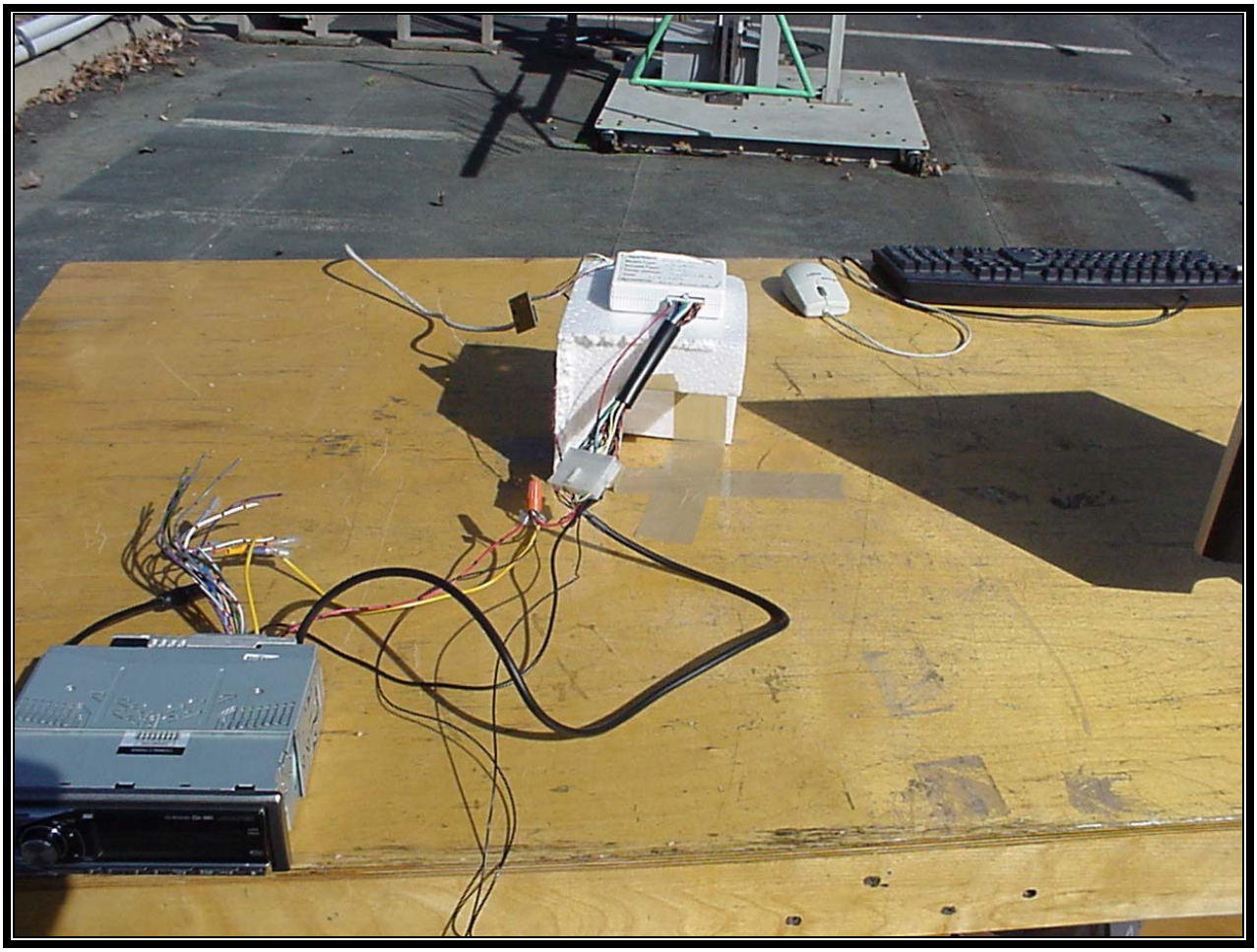
**Appendix J: Manual**

Please refer to the following page.

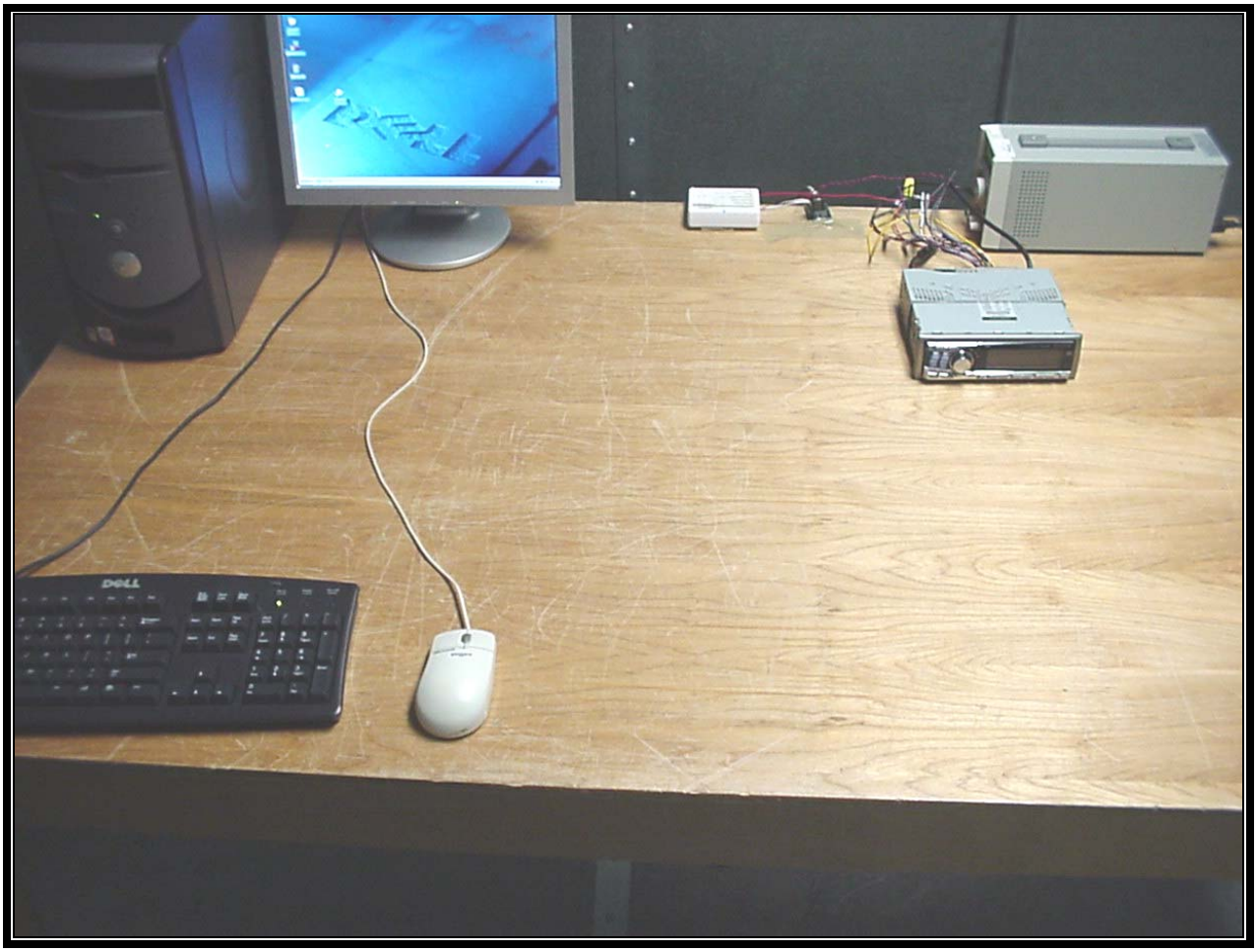
## Appendix K: Test Photographs



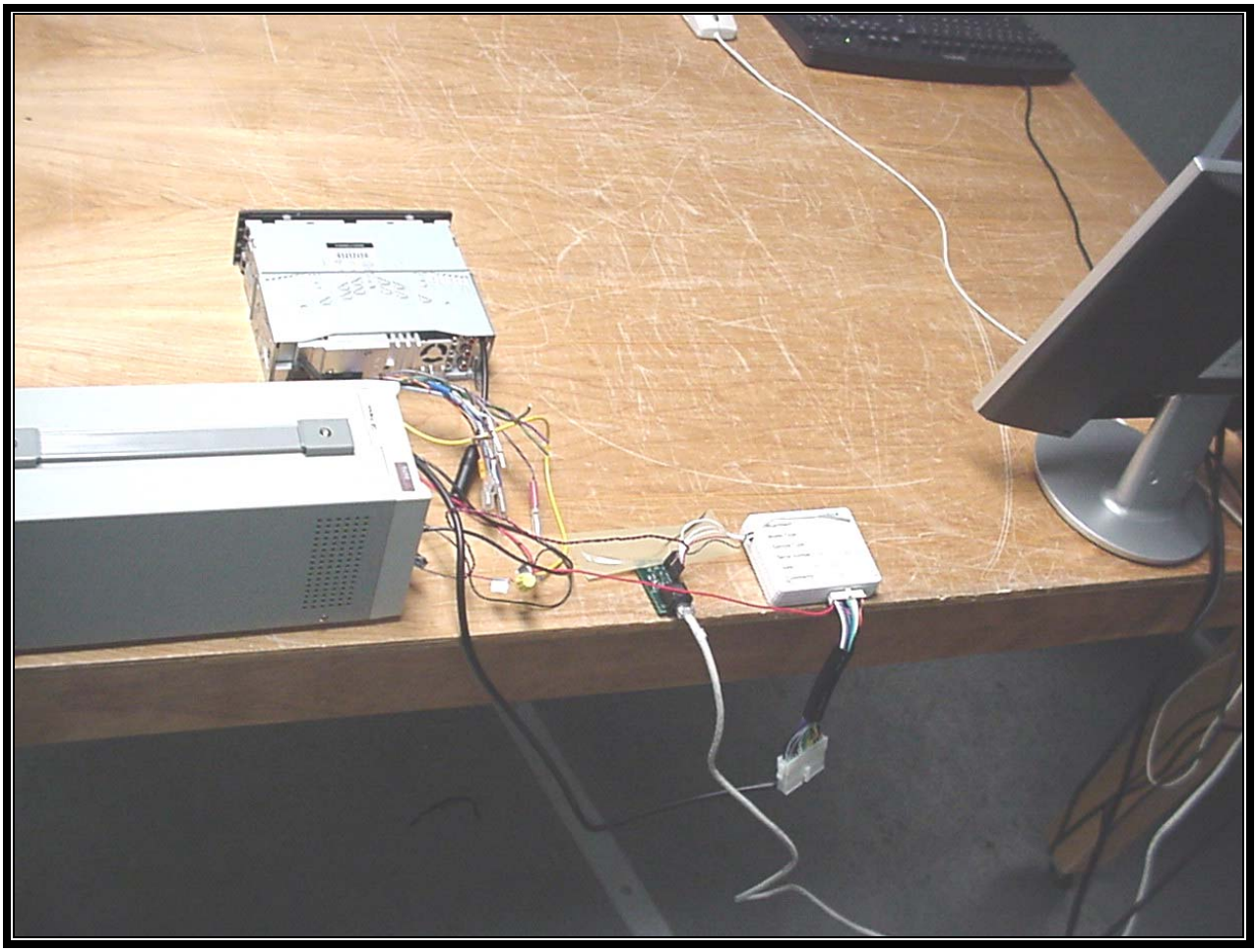
**Photograph 1: Radiated Testing – Front View**



**Photograph 2: Radiated Testing – Back View**

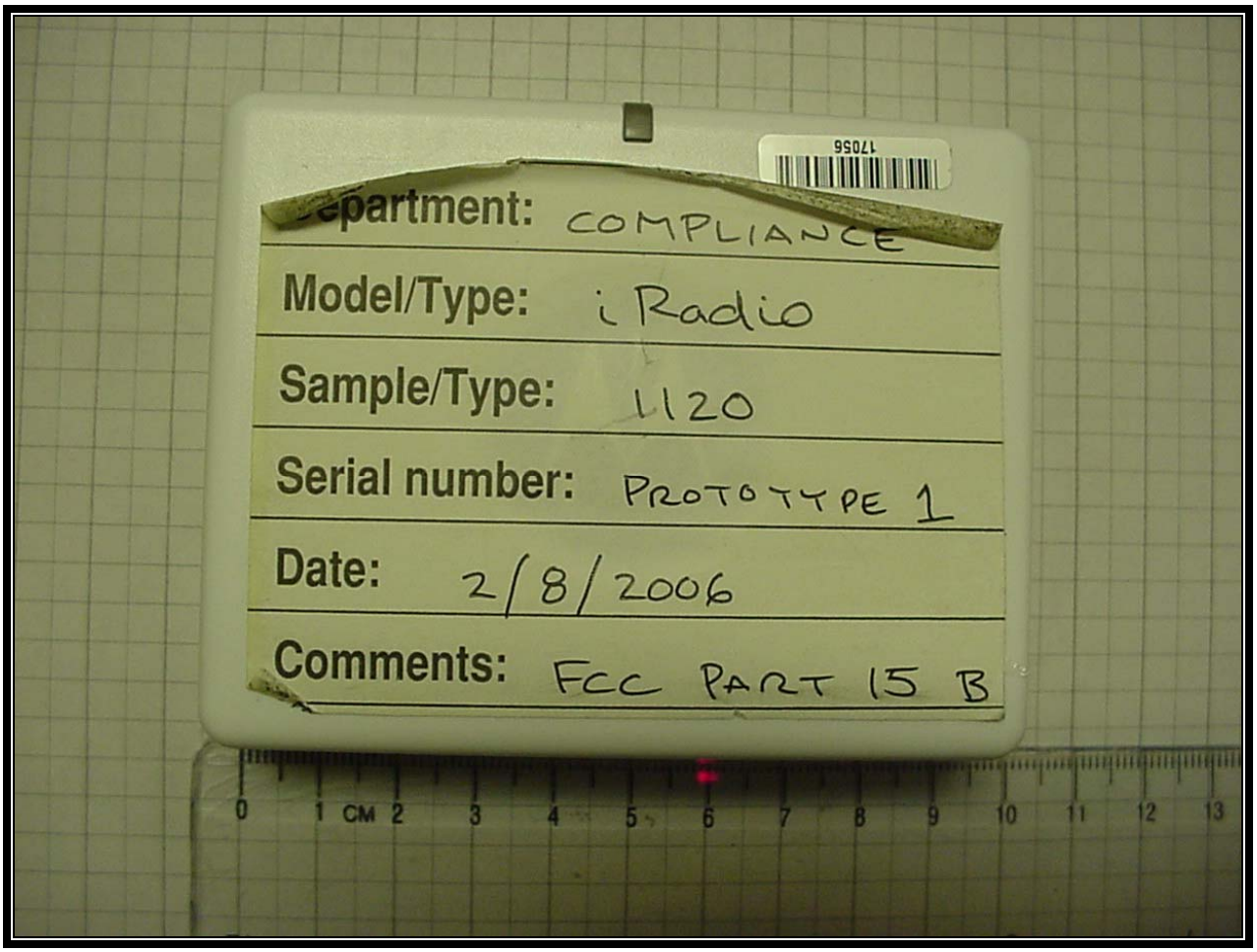



**Photograph 3: Conducted AC Testing – Front View**

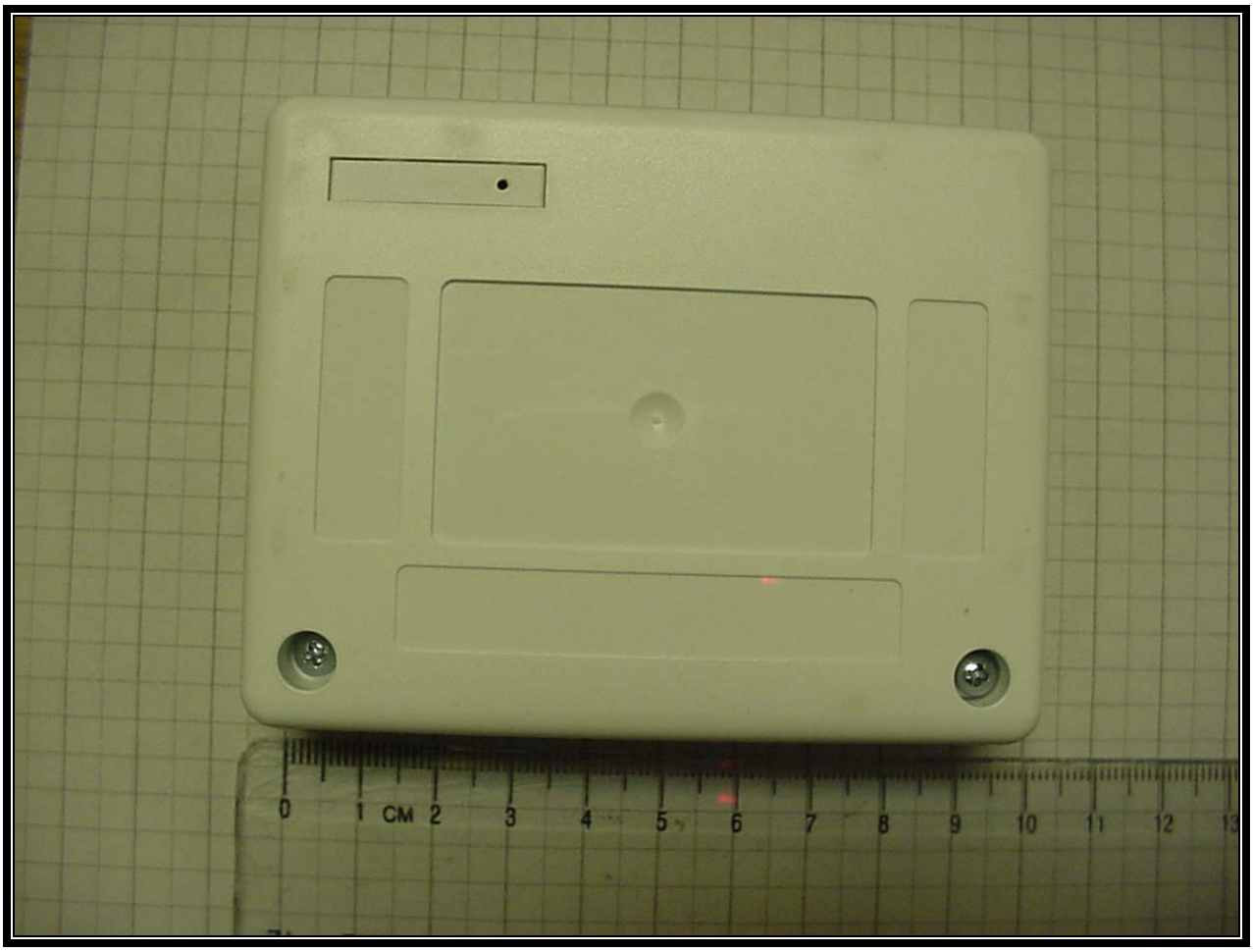


**Photograph 4: Conducted AC Testing – Back View**

## Appendix L: External Photographs

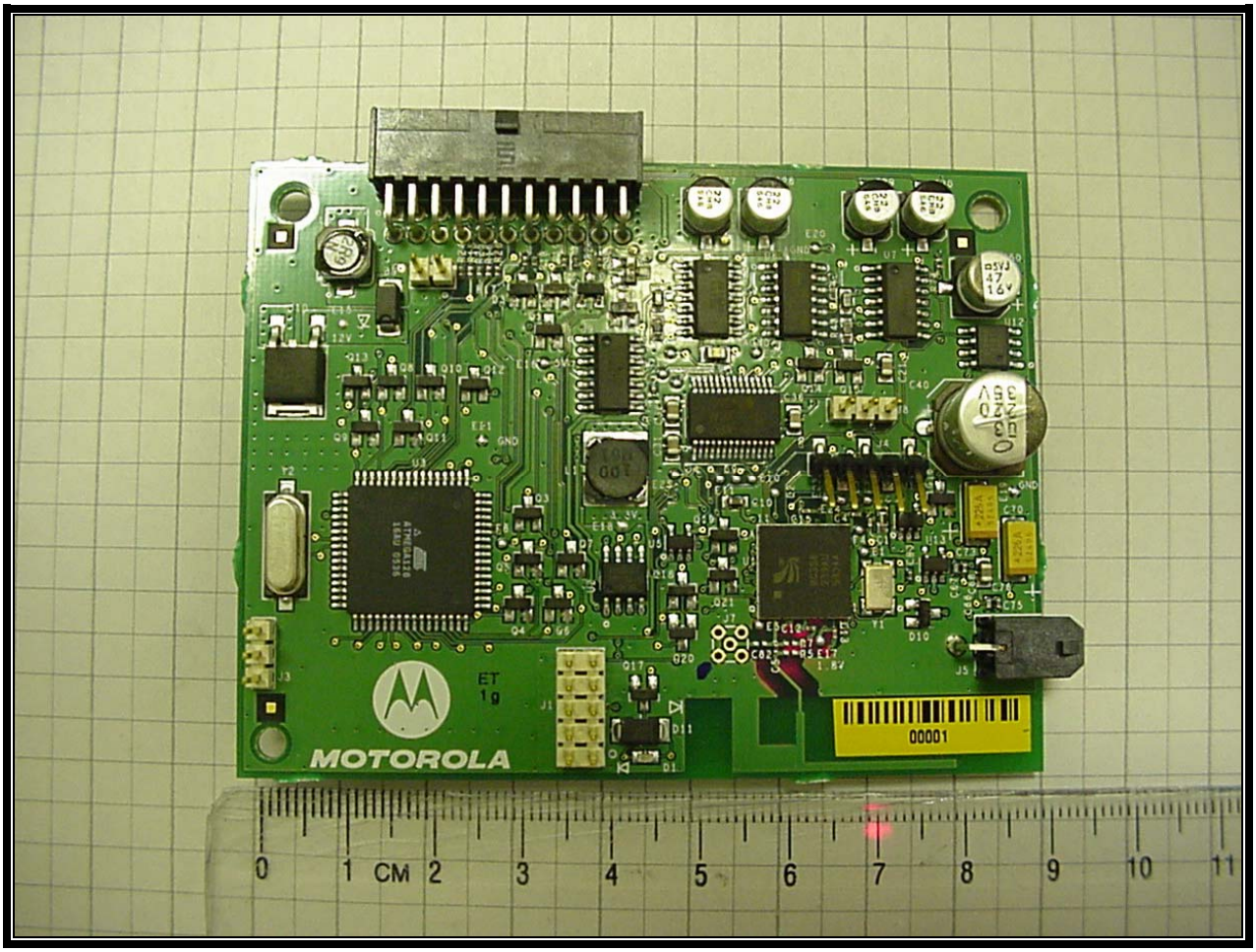



**Photograph 5: Top**

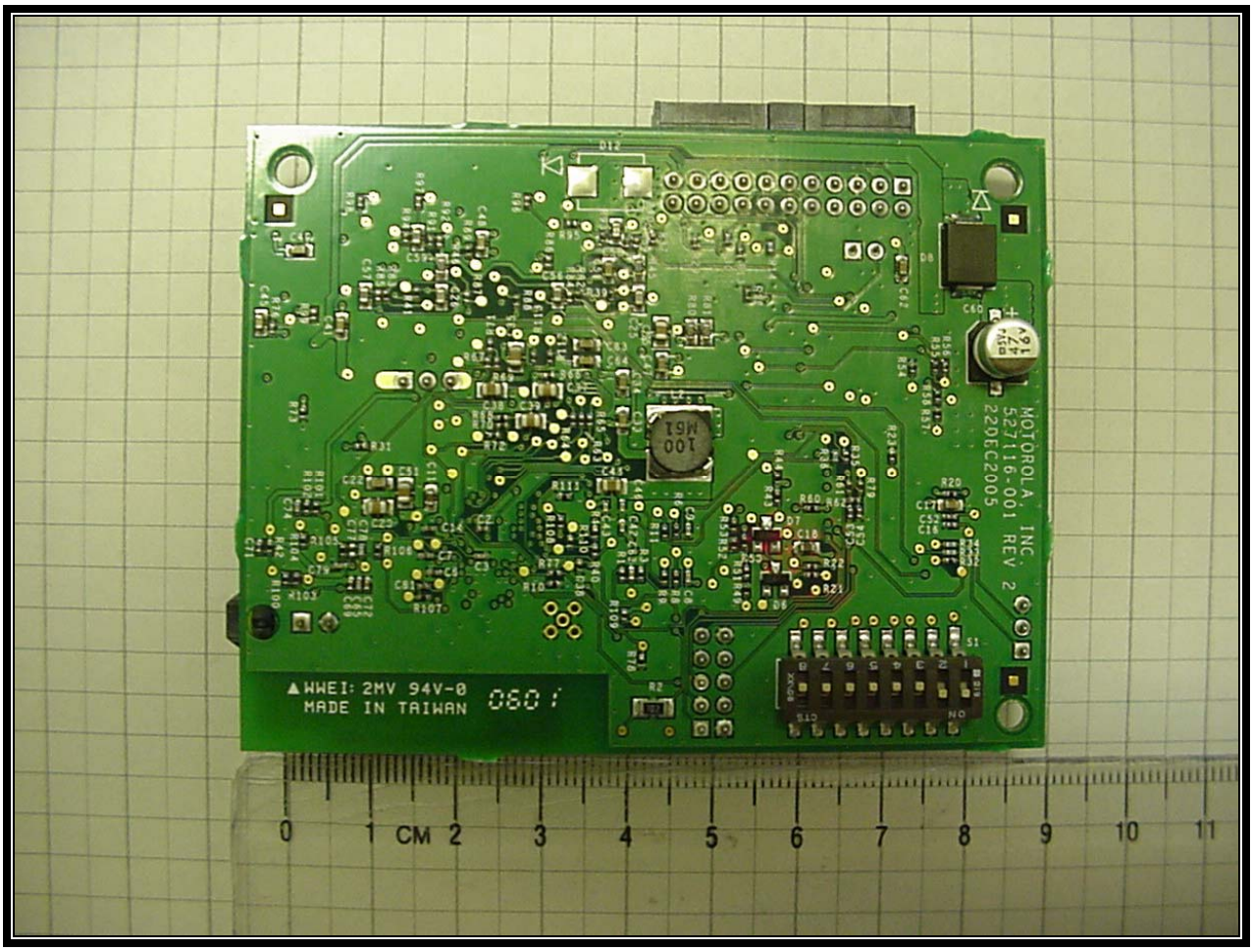



**Photograph 6: Bottom**

## Appendix M: Internal Photographs



**Photograph 7: Top of PCB**




**Photograph 8: Bottom of PCB**