

**APPLICATION FOR FCC CERTIFICATION**

**DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER**

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Model: Magic Wave PCMCIA Card SWL-2000N

**FCC ID: E2XSWL-2000N**

*August 3, 1999*

|                                                                                                                                                                       |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>This report concerns (check one):</b> <b>Original Grant:</b> X <b>Class II Change:</b>                                                                             |                          |
| <b>Equipment Type:</b> PCMCIA Board                                                                                                                                   |                          |
| <b>Deferred grant requested per 47 CFR 0.457 (d) (1) (ii)?</b>                                                                                                        | <b>Yes:</b> <b>No:</b> X |
| <b>If yes, defer until:</b>                                                                                                                                           | _____<br><i>Date</i>     |
| <b>Company name agrees to notify the Commission by: _____(date) of the intended date of announcement of the product so that the grant can be issued on that date.</b> |                          |
| <b>Transition Rules Request per 15.37? Yes:</b> <b>No:</b> X                                                                                                          |                          |
| <b>If no, assumed Part 15, subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision..</b>                                                   |                          |

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Document Number: 990362

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## **1.0 GENERAL INFORMATION**

The following Application for FCC Certification for a Direct Sequence Spread Spectrum transmitter is prepared on behalf of Samsung Electro-Mechanics in accordance with Part 15.247 of the Federal Communications Commissions rules and regulations. The Equipment Under Test (EUT) was the Samsung Electro-Mechanics Magic Wave PCMCIA Card SWL-2000N, FCC ID: E2XSWL-2000N. The test results reported in this document relate only to the item that was tested.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurement were performed manually at Rhein Tech, Incorporated. The radiated emissions measurements required by the rules were performed on the three meter, open field, test range maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. Rhein Tech, Labs, Inc. is on the FCC accepted lab list as a Facility available to do measurement work for others on a contract basis.

### **1.1 PRODUCT DESCRIPTION**

The model SWL-2000N (referred to as the EUT in this report) is a Direct Sequence Spread Spectrum wireless LAN, PCMCIA network card. The EUT provides wireless communications between computers. The EUT is designed to be installed into the PCMCIA slot of a notebook computer or desktop computer with a PCMCIA slot. The EUT communicates with other wireless LAN cards using the frequency range from 2.411 GHz to 2.462 GHz. The EUT is powered from the PCMCIA slot, and does not have an external power supply. The EUT uses a stub antenna attached to a left-turn SMA connector or an internal PCB trace antenna. The EUT uses 2-bits encoded to 4 complex code words; 2-DQPSK CCK modulation technique with 8 Chips per symbol, spread clock rate is 1.375 MHz symbol/sec, and the data rate = 11 MBPS.

## 1.2 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for certification.

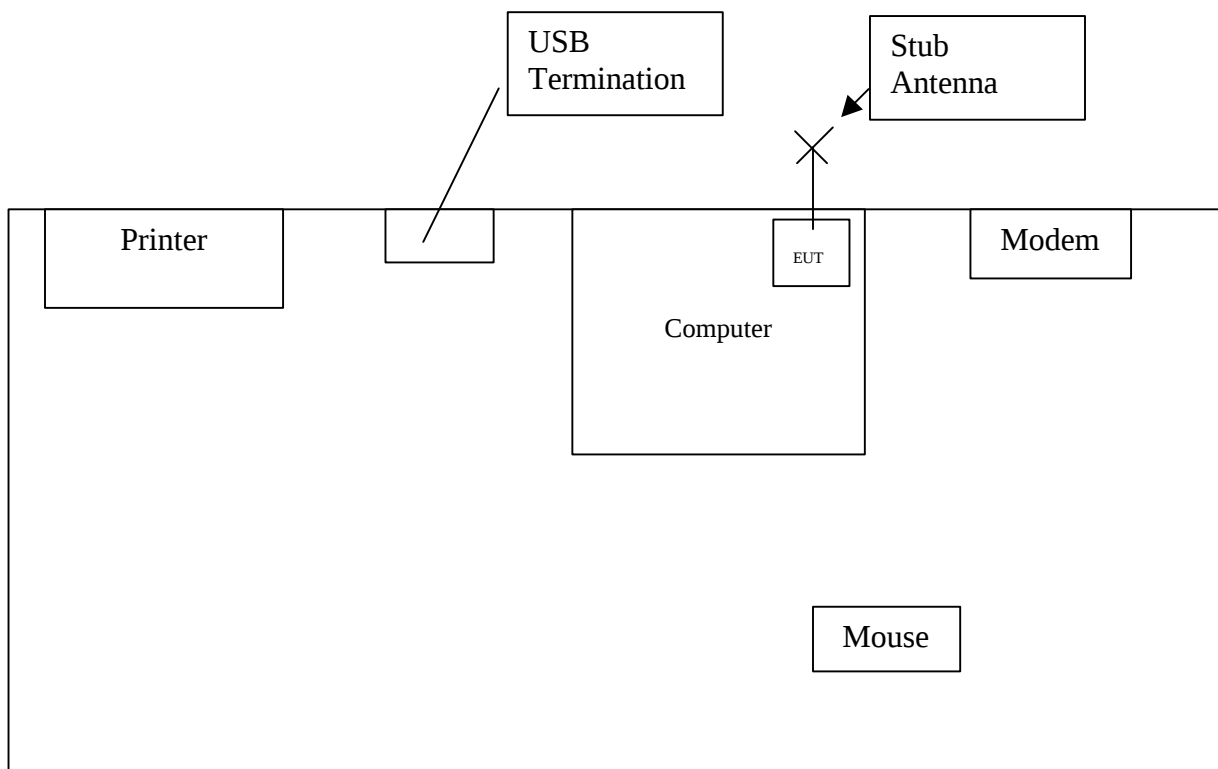
## 1.3 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

External Components

| Part                     | Manufacturer    | Model       | Serial Number     | FCC ID       | Cable Description                | RTL Bar Code |
|--------------------------|-----------------|-------------|-------------------|--------------|----------------------------------|--------------|
| COMPUTER                 | COMPAQ          | ARMADA 3500 | 3J95CBZ1B0HS      | 3872B746     | N/A                              | N/A          |
| AUDIO DEVICE             | RADIO SHACK     | SCP-59      | N/A               | N/A          | SHIELDED I/O                     | 900691       |
| MICROPHONE               | TELEX           | 700358      | N/A               | N/A          | SHIELDED I/O                     | 009578       |
| MODEM                    | US ROBOTICS     | 0413        | 839032B26M4P<br>N | DoC          | SHIELDED I/O<br>UNSHIELDED POWER | 900407       |
| MOUSE                    | HEWLETT PACKARD | M-S34       | LCA5353508449     | 10:DZL21D472 | SHIELDED I/O                     | N/A          |
| WIRELESS LAN PCMCIA CARD | SAMSUNG         |             |                   | E2XSWL-2000N | N/A                              | N/A          |
| PRINTER                  | HEWLETT PACKARD | C3941A      | JPPJ-072076       | B94C3941A    | SHIELDED I/O<br>UNSHIELDED POWER | 10272        |

## 1.4 CONFIGURATION OF TESTED SYSTEM



## 1.5 TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 1992. Radiated testing was performed at an antenna to EUT distance of 3 meters. Emissions above 1 GHz were video averaged.

## 1.6 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 1994, submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

## 2.0 PRODUCT LABELING

The label is made of coated polyester with permanent adhesive. The compliance statements are listed in the user's manual. The label is placed on the top of the card as shown in figure 1. The label size is 4 x 6.3cm and it is blue with white lettering.

**FIGURE 1: LOCATION OF LABEL ON EUT**



### **3.0 SYSTEM TEST CONFIGURATION**

#### **3.1 JUSTIFICATION**

The EUT was tested in all three orthogonal planes in order to determine worst case emission. Channel 1 at 2.411GHz, Channel 6 at 2.437GHz and Channel 11 at 2.463GHz were tested and investigated from 9kHz to 24GHz. All three channels were investigated and tested. Data for all three channels are presented in this report.

To complete the configuration required by the FCC, the transmitter was tested in a note computer with the stub antenna as well an internal antenna connected to the antenna port similar to its intended use.

The transmitter external antenna connector is a unique reverse-thread and is non-interchangeable.

The EUT was investigated with the 5" stub and internal trace antenna. The 5" stub antenna was considered the worst case configuration. The worst case radiated spurious noise data is presented in this report.

#### **3.2 EUT EXERCISE SOFTWARE**

The EUT was enabled to continuously transmit, which was verified by a receiving unit during testing. The carrier was also checked to verify that the information was being transmitted.

#### **3.3 SPECIAL ACCESSORIES**

N/A.

### 3.4 MODULATED BANDWIDTH

The minimum 6 dB bandwidth per FCC 15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The Minimum 6 dB modulated bandwidths are the following:

Channel 1 = 16.94 MHz

Channel 6 = 16.92 MHz

Channel 11 = 17.03MHz

The 6dB bandwidth is listed in figures ---,--- and ---.

### 3.5 POWER OUTPUT

The power output per FCC 15.247(b) was measured on the EUT using an HP peak power meter. The output power using the HP power meter are the following:

Channel 1=0.24mW

Channel 6= 0.4mW

Channel 11= 0.8mW

### 3.6 ANTENNA CONDUCTED SPURIOUS EMISSIONS

Antenna spurious emission per FCC 15.247(c) was 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 300 kHz. The modulated carrier was identified at 2.411GHz for Channel 1, 2.437GHz for Channel 6 and 2.462GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10<sup>th</sup> harmonic. See antenna conducted spurious noise plots, figures 3 through 20.

### 3.7 RADIATED SPURIOUS EMISSIONS

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Section 15.205. The maximum permitted average field strength for the restricted band is listed in Section 15.209.

Please, refer to section 3.7 for data test results.

### 3.8 POWER SPECTRAL DENSITY

The Power spectral density per FCC 15.247(d) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 3kHz, and the sweep time set at 17 second. The spectral lines were resolved for the modulated carriers at 2.412GHz, 2.437GHz and 2.462GHz with amplitudes of -33.3dBm, -29.2dBm and -26.0dBm, respectively. These levels are well below the +8 dBm limit. See power spectral density plots figures 3, 9, and 15.

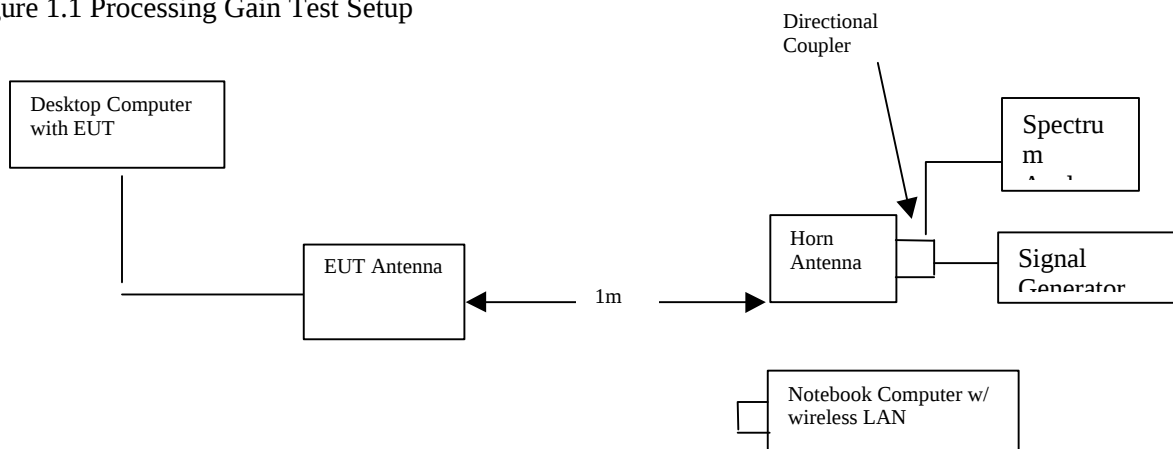
### 3.9 PROCESSING GAIN:

The Processing Gain was measured using the CW jamming margin method. Figure 1.1 shows the test configuration.

The test consists of stepping a signal generator in 50 kHz increments across the passband of the system. At each frequency, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is the jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. The worst 20% of the J/S data points were Discard. The lowest remaining J/S ratio is used when calculating the Processing Gain.

Since the spreading/despreading function of the EUT remains constant at all channels, the measurement was performed at a mid point within the operating band. Implementation losses of the system are limited to 2dB Max as permitted by the FCC guidelines.

Figure 1.1 Processing Gain Test Setup



The Notebook computer was sending data. The desktop computer was receiving information using wireless communications and continuously monitoring the Bit Error Rate. Since a radiated test was performed, the effective radiated peak power from an equivalent isotropic source was calculated using the following equation:

$$\text{Equation \#1: } P = \frac{(Ed)^2}{30}$$

Where: E= measured maximum field strength in V/m using a wide band peak power meter.

G= the numeric gain of the notebook transmitting antenna over isotropic.

D= 3.0 meters is the distance in meters from which the field strength was measured.

P= Power in watts.

(Processing gain ( $G_p$ ) is thus defined by the following equation:

$$G_p = (S/N)_0 + M_j + L_{sys}$$

Where  $(S/N)_0$  = signal/noise ratio = 21.64 dB

$M_j$  = J/S ratio, selected as described = 22 dB for the following frequency:

| Freq.<br>(GHz) | J Level EIRP | S. EIRP | J/S (dB) |
|----------------|--------------|---------|----------|
| 2.44166        | 0.189        | 2.41E5  | 25.73    |

$L_{sys}$  = System losses (dB) with  $L_{sys} = 2$  dB

The signal to noise ratio,  $(S/N)_0$ , is related to the receivers bit error rate. Although the precise relationship will vary with the demodulation scheme used, for an ideal non-coherent receiver, the probability of error (bit error rate) is related to  $(S/N)_0$  by:

$$\text{Probability of bit error} = .5 \times e^{-5 \times (S/N)_0}$$

Conclusion: Processing gain = 49.37 dB

See processing gain plot at 2.44166 GHz

### Processing gain

RBW = 1 MHz VBW = 1 MHz Sweep = 5 s Atten = 10 dB Ext. Atten = 0 dB

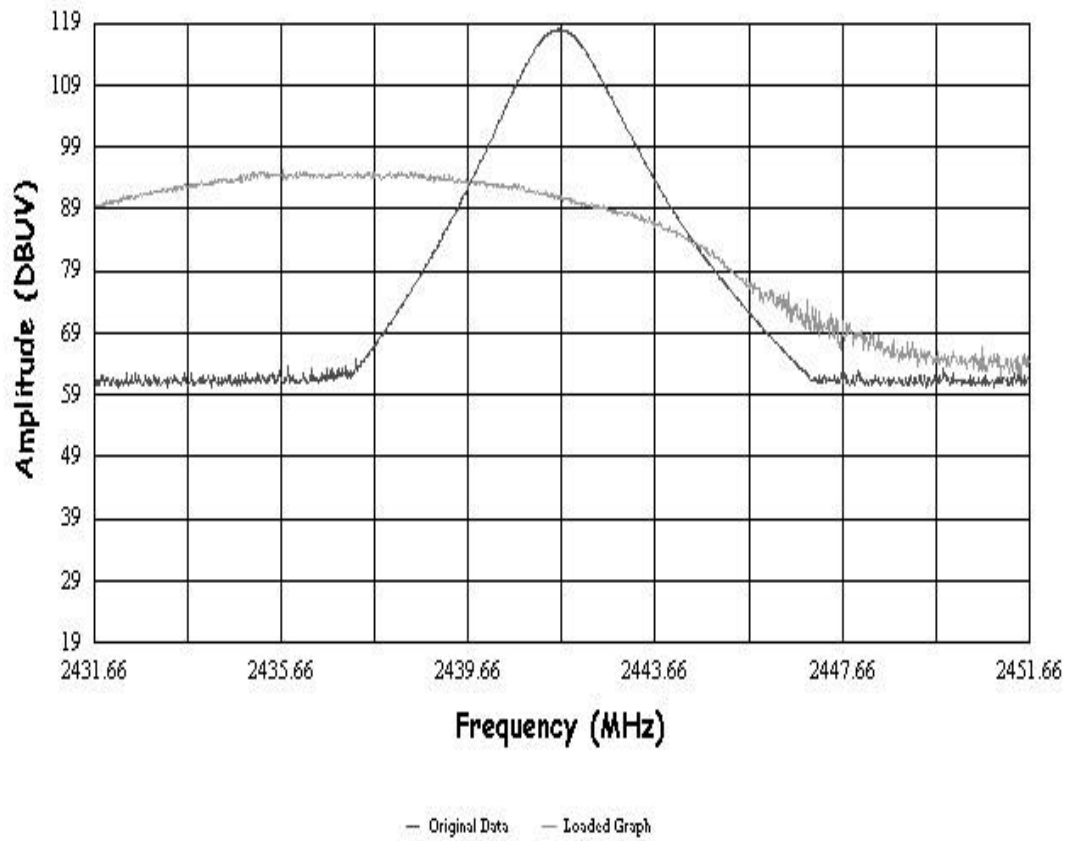


FIGURE 2: Processing Gain Plot

### 3.10 Compliance with the restricted band edge 2.4850 to 2.5000 GHz

#### **Compliance with the restricted band edge 2.4850 to 2.5000 GHz.**

The conducted carrier power was measured at  $-12.2\text{dBm}$  for channel 11, at 2.4618 GHz by setting the resolution/video bandwidth to 100kHz/300kHz. The highest spurious emission within 2.4835 GHz and 2.5000 GHz was measured  $-48.2\text{dBm}$  at 2.4882 GHz. The difference between the two measurements was subtracted from the radiated 3 meter field strength of the carrier at channel 11. The emission was in the restricted band at 2.4882 GHz =  $88.5\text{dBuV/m} - 36\text{dB} = 52.5\text{dBuV/m}$ .

### 3.12 CONFORMANCE STATEMENT

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made during testing to the equipment in order to achieve compliance with these standards.

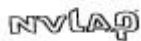
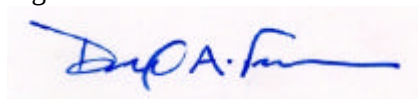
Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

Typed/Printed Name: Desmond A. Fraser

Date: August 3, 1999

Signature

Position: President, (NVLAP Signatory)



Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.

**Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.**

## 5.0 ANTENNA SPECIFICATIONS

### 5” Stub Antenna

#### Electrical Specifications:

|                       |                  |
|-----------------------|------------------|
| Model No.             | ACE-2450R        |
| Frequency Range       | 2.4-2.5GHz       |
| Bandwidth             | 100MHz           |
| Gain                  | 2.15+1dBi        |
| V.S.W.R               | <1.9             |
| Radiation Pattern     | Omni-Directional |
| Polarization          | Vertical         |
| Impedance             | 50ohms           |
| Operating Temperature | -30C – 60C       |

#### Electrical Specifications:

|                  |                    |
|------------------|--------------------|
| Dimension        | 124 + 2.0mm        |
| Pulling Strength | More than 3kgf     |
| Swivel Torque    | More than 3kgf     |
| Input Connector  | SMA-Male (REVERSE) |

### Internal trace antenna

#### Electrical Specifications:

|                       |                          |
|-----------------------|--------------------------|
| Model No.             | Samsung Internal Antenna |
| Frequency Range       | 2.4-2.5GHz               |
| Bandwidth             | 100MHz                   |
| Gain                  | 2.15dBi                  |
| V.S.W.R               | <1.9                     |
| Radiation Pattern     | Omni-Directional         |
| Polarization          | Horizontal               |
| Impedance             | 50ohms                   |
| Operating Temperature | -30C – 60C               |

#### Electrical Specifications:

|                  |                              |
|------------------|------------------------------|
| Dimension        | 26 + 2.0mm                   |
| Pulling Strength | N/A                          |
| Swivel Torque    | N/A                          |
| Input Connector  | Directly etched on PCB board |

## 7.0 Conducted Field Strength Calculation, and Radiated Test Methodology

### 7.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FI(\text{dBuV/m}) = SAR(\text{dBuV}) + SCF(\text{dB/m})$$

FI = Field Intensity

SAR = Spectrum Analyzer Reading

SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(\text{dB/m}) = -PG(\text{dB}) + AF(\text{dB/m}) + CL(\text{dB})$$

SCF = Site Correction Factor

PG = Pre-amplifier Gain

AF = Antenna Factor

CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(\text{uV/m}) = 10^{FI(\text{dBuV/m})/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$49.3 \text{ dBuV} - 11.5 \text{ dB/m} = 37.8 \text{ dBuV/m}$$

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

## 7.2 Radiated measurement

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one meter and three-meter distances if necessary 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 insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to 10GHz MHz (10<sup>th</sup> harmonic of carrier frequency) using a Hewlett Packard 8566B spectrum analyzer, a Hewlett Packard 85650A quasi-peak adapter, HP11790 mixers, and EMCO log periodic, EMCO horn antennas and biconical antenna. In order to gain sensitivity, a cougar preamplifier (from 30 to 2GHz), and an HP preamplifier (from 1GHz to 26.5 GHz) was connected in series between the antenna and the input of the spectrum analyzer.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB resolution bandwidth was set to 120 kHz for measurements below 1GHz, and 1MHz for measurements above 1GHz. The analyzer was operated in peak detection mode below 1GHz and in the peak mode with 10Hz video averaging above 1 GHz. No video filter less than 10 times the resolution bandwidth was used when measuring below 1GHz. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

*Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as daily calibration methods, technician training, and emphasis to employees on avoiding error.*

## 8.0 CONDUCTED EMISSION DATA

The following table lists worst case conducted emission data. Specifically: Emission Frequency, Test Detector, Analyzer Reading, Site Correction Factor, corrected Emission Level, Quasi Peak Limit and Margin, and the Average Limit and Margin.

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and HOT SIDE, herein referred to as L1 and L2, respectively.

**TABLE 1: CONDUCTED EMISSIONS (CHANNEL 1 WITH THE STUB ANTENNA)**

### NEUTRAL SIDE (Line 1)

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.450                    | Qp            | 44.6                    | 0.6                         | 45.2                  | 48.0            | -2.8             | 48.0            | -2.8             |
| 0.450                    | Av            | 34.8                    | 0.6                         | 35.4                  | 48.0            | -12.6            | 48.0            | -12.6            |
| 0.959                    | Qp            | 32.5                    | 0.7                         | 33.2                  | 48.0            | -14.8            | 48.0            | -14.8            |
| 0.959                    | Av            | 11.8                    | 0.7                         | 12.5                  | 48.0            | -35.5            | 48.0            | -35.5            |
| 4.214                    | Pk            | 43.7                    | 1.7                         | 45.4                  | 48.0            | -2.6             | 48.0            | -2.6             |
| 4.968                    | Pk            | 43.6                    | 1.9                         | 45.5                  | 48.0            | -2.5             | 48.0            | -2.5             |
| 13.142                   | Pk            | 28.8                    | 2.9                         | 31.7                  | 48.0            | -16.3            | 48.0            | -16.3            |
| 24.257                   | Pk            | 25.3                    | 3.8                         | 29.1                  | 48.0            | -18.9            | 48.0            | -18.9            |

### HOT SIDE (Line 2)

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.460                    | Qp            | 44.6                    | 0.6                         | 45.2                  | 48.0            | -2.8             | 48.0            | -2.8             |
| 0.460                    | Av            | 31.0                    | 0.6                         | 31.6                  | 48.0            | -16.4            | 48.0            | -16.4            |
| 3.326                    | Pk            | 41.5                    | 1.6                         | 43.1                  | 48.0            | -4.9             | 48.0            | -4.9             |
| 4.082                    | Pk            | 44.0                    | 1.7                         | 45.7                  | 48.0            | -2.3             | 48.0            | -2.3             |
| 4.937                    | Pk            | 41.4                    | 1.9                         | 43.3                  | 48.0            | -4.7             | 48.0            | -4.7             |
| 10.910                   | Pk            | 28.5                    | 2.7                         | 31.2                  | 48.0            | -16.8            | 48.0            | -16.8            |
| 13.220                   | Pk            | 29.5                    | 3.1                         | 32.6                  | 48.0            | -15.4            | 48.0            | -15.4            |

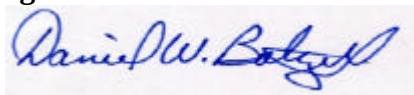
<sup>(1)</sup> Pk = Peak; QP = Quasi-Peak; Av = Average

### TEST PERSONNEL:

Typed/Printed Name: Daniel W. Baltzell

Date: July 29, 1999

Signature:



**TABLE 2: CONDUCTED EMISSIONS (CHANNEL 6 WITH THE STUB ANTENNA)****NEUTRAL SIDE (Line 1)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.462                    | Qp            | 44.3                    | 0.6                         | 44.9                  | 48.0            | -3.1             | 48.0            | -3.1             |
| 0.462                    | Av            | 13.3                    | 0.6                         | 13.9                  | 48.0            | -34.1            | 48.0            | -34.1            |
| 3.544                    | Pk            | 40.3                    | 1.5                         | 41.8                  | 48.0            | -6.2             | 48.0            | -6.2             |
| 4.131                    | Pk            | 42.9                    | 1.6                         | 44.5                  | 48.0            | -3.5             | 48.0            | -3.5             |
| 4.992                    | Pk            | 43.8                    | 1.9                         | 45.7                  | 48.0            | -2.3             | 48.0            | -2.3             |
| 10.820                   | Pk            | 29.1                    | 2.6                         | 31.7                  | 48.0            | -16.3            | 48.0            | -16.3            |
| 13.250                   | Pk            | 27.7                    | 2.9                         | 30.6                  | 48.0            | -17.4            | 48.0            | -17.4            |

**HOT SIDE (Line 2)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.451                    | Qp            | 44.3                    | 0.6                         | 44.9                  | 48.0            | -3.1             | 48.0            | -3.1             |
| 0.451                    | Av            | 11.9                    | 0.6                         | 12.5                  | 48.0            | -35.5            | 48.0            | -35.5            |
| 3.410                    | Pk            | 41.6                    | 1.6                         | 43.2                  | 48.0            | -4.8             | 48.0            | -4.8             |
| 4.110                    | Pk            | 43.8                    | 1.7                         | 45.5                  | 48.0            | -2.5             | 48.0            | -2.5             |
| 4.910                    | Pk            | 41.4                    | 1.9                         | 43.3                  | 48.0            | -4.7             | 48.0            | -4.7             |
| 10.880                   | Pk            | 28.0                    | 2.7                         | 30.7                  | 48.0            | -17.3            | 48.0            | -17.3            |
| 13.360                   | Pk            | 28.7                    | 3.1                         | 31.8                  | 48.0            | -16.2            | 48.0            | -16.2            |

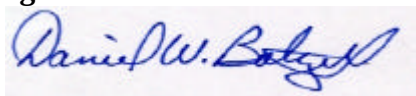
<sup>(1)</sup>Pk = Peak; QP = Quasi-Peak; Av = Average

**TEST PERSONNEL:**

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



**TABLE 3: CONDUCTED EMISSIONS (CHANNEL 11 WITH THE STUB ANTENNA)****NEUTRAL SIDE (Line 1)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.465                    | Qp            | 45.2                    | 0.6                         | 45.8                  | 48.0            | -2.2             | 48.0            | -2.2             |
| 0.465                    | Av            | 17.2                    | 0.6                         | 17.8                  | 48.0            | -30.2            | 48.0            | -30.2            |
| 4.194                    | Pk            | 44.6                    | 1.7                         | 46.3                  | 48.0            | -1.7             | 48.0            | -1.7             |
| 4.367                    | Pk            | 44.8                    | 1.7                         | 46.5                  | 48.0            | -1.5             | 48.0            | -1.5             |
| 4.368                    | Qp            | 34.6                    | 1.7                         | 36.3                  | 48.0            | -11.7            | 48.0            | -11.7            |
| 4.368                    | Av            | 26.4                    | 1.7                         | 28.1                  | 48.0            | -19.9            | 48.0            | -19.9            |
| 5.049                    | Pk            | 42.1                    | 1.9                         | 44.0                  | 48.0            | -4.0             | 48.0            | -4.0             |
| 11.050                   | Pk            | 28.0                    | 2.6                         | 30.6                  | 48.0            | -17.4            | 48.0            | -17.4            |
| 24.641                   | Pk            | 25.6                    | 3.8                         | 29.4                  | 48.0            | -18.6            | 48.0            | -18.6            |

**HOT SIDE (Line 2)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.483                    | Qp            | 42.9                    | 0.6                         | 43.5                  | 48.0            | -4.5             | 48.0            | -4.5             |
| 0.483                    | Av            | 20.1                    | 0.6                         | 20.7                  | 48.0            | -27.3            | 48.0            | -27.3            |
| 4.123                    | Pk            | 44.3                    | 1.7                         | 46.0                  | 48.0            | -2.0             | 48.0            | -2.0             |
| 4.138                    | Pk            | 43.4                    | 1.7                         | 45.1                  | 48.0            | -2.9             | 48.0            | -2.9             |
| 5.018                    | Pk            | 38.6                    | 1.9                         | 40.5                  | 48.0            | -7.5             | 48.0            | -7.5             |
| 13.897                   | Pk            | 31.1                    | 3.2                         | 34.3                  | 48.0            | -13.7            | 48.0            | -13.7            |
| 24.208                   | Pk            | 23.3                    | 4.0                         | 27.3                  | 48.0            | -20.7            | 48.0            | -20.7            |

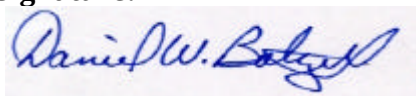
<sup>(1)</sup>Pk = Peak; QP = Quasi-Peak; Av = Average

**TEST PERSONNEL:**

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



**TABLE 4: CONDUCTED EMISSIONS (CHANNEL 1 WITH THE INTERNAL ANTENNA)****NEUTRAL SIDE (Line 1)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.473                    | Qp            | 42.9                    | 0.6                         | 43.5                  | 48.0            | -4.5             | 48.0            | -4.5             |
| 0.473                    | Av            | 12.2                    | 0.6                         | 12.8                  | 48.0            | -35.2            | 48.0            | -35.2            |
| 4.530                    | Qp            | 38.6                    | 1.8                         | 40.4                  | 48.0            | -7.6             | 48.0            | -7.6             |
| 4.530                    | Av            | 23.3                    | 1.8                         | 25.1                  | 48.0            | -22.9            | 48.0            | -22.9            |
| 9.140                    | Pk            | 31.3                    | 2.4                         | 33.7                  | 48.0            | -14.3            | 48.0            | -14.3            |
| 11.530                   | Pk            | 33.9                    | 2.7                         | 36.6                  | 48.0            | -11.4            | 48.0            | -11.4            |
| 13.660                   | Pk            | 33.4                    | 3.0                         | 36.4                  | 48.0            | -11.6            | 48.0            | -11.6            |
| 17.940                   | Pk            | 24.8                    | 3.4                         | 28.2                  | 48.0            | -19.8            | 48.0            | -19.8            |

**HOT SIDE (Line 2)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.453                    | Qp            | 42.9                    | 0.6                         | 43.5                  | 48.0            | -4.5             | 48.0            | -4.5             |
| 0.453                    | Av            | 13.3                    | 0.6                         | 13.9                  | 48.0            | -34.1            | 48.0            | -34.1            |
| 4.722                    | Qp            | 40.9                    | 1.8                         | 42.7                  | 48.0            | -5.3             | 48.0            | -5.3             |
| 4.722                    | Av            | 22.8                    | 1.8                         | 24.6                  | 48.0            | -23.4            | 48.0            | -23.4            |
| 9.200                    | Pk            | 32.3                    | 2.5                         | 34.8                  | 48.0            | -13.2            | 48.0            | -13.2            |
| 11.530                   | Pk            | 34.9                    | 2.8                         | 37.7                  | 48.0            | -10.3            | 48.0            | -10.3            |
| 13.570                   | Pk            | 36.2                    | 3.2                         | 39.4                  | 48.0            | -8.6             | 48.0            | -8.6             |
| 15.400                   | Pk            | 32.4                    | 3.4                         | 35.8                  | 48.0            | -12.2            | 48.0            | -12.2            |

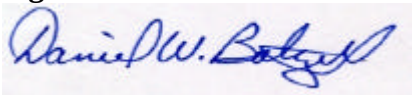
<sup>(1)</sup>Pk = Peak; QP = Quasi-Peak; Av = Average

**TEST PERSONNEL:**

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



**TABLE 5: CONDUCTED EMISSIONS (CHANNEL 6 WITH THE INTERNAL ANTENNA)****NEUTRAL SIDE (Line 1)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.513                    | Qp            | 41.0                    | 0.6                         | 41.6                  | 48.0            | -6.4             | 48.0            | -6.4             |
| 0.513                    | Av            | 18.0                    | 0.6                         | 18.6                  | 48.0            | -29.4            | 48.0            | -29.4            |
| 3.544                    | Pk            | 40.4                    | 1.5                         | 41.9                  | 48.0            | -6.1             | 48.0            | -6.1             |
| 4.745                    | Qp            | 41.6                    | 1.8                         | 43.4                  | 48.0            | -4.6             | 48.0            | -4.6             |
| 4.745                    | Av            | 23.7                    | 1.8                         | 25.5                  | 48.0            | -22.5            | 48.0            | -22.5            |
| 9.110                    | Pk            | 31.3                    | 2.4                         | 33.7                  | 48.0            | -14.3            | 48.0            | -14.3            |
| 11.270                   | Pk            | 33.1                    | 2.7                         | 35.8                  | 48.0            | -12.2            | 48.0            | -12.2            |
| 13.660                   | Pk            | 33.0                    | 3.0                         | 36.0                  | 48.0            | -12.0            | 48.0            | -12.0            |

**HOT SIDE (Line 2)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.457                    | Qp            | 42.5                    | 0.6                         | 43.1                  | 48.0            | -4.9             | 48.0            | -4.9             |
| 0.457                    | Av            | 12.2                    | 0.6                         | 12.8                  | 48.0            | -35.2            | 48.0            | -35.2            |
| 3.140                    | Pk            | 40.0                    | 1.5                         | 41.5                  | 48.0            | -6.5             | 48.0            | -6.5             |
| 4.676                    | Qp            | 41.3                    | 1.8                         | 43.1                  | 48.0            | -4.9             | 48.0            | -4.9             |
| 4.676                    | Av            | 41.6                    | 1.8                         | 43.4                  | 48.0            | -4.6             | 48.0            | -4.6             |
| 9.430                    | Pk            | 32.4                    | 2.6                         | 35.0                  | 48.0            | -13.0            | 48.0            | -13.0            |
| 10.790                   | Pk            | 29.9                    | 2.7                         | 32.6                  | 48.0            | -15.4            | 48.0            | -15.4            |
| 13.630                   | Pk            | 32.6                    | 3.2                         | 35.8                  | 48.0            | -12.2            | 48.0            | -12.2            |

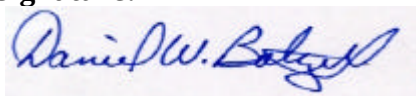
<sup>(1)</sup>Pk = Peak; QP = Quasi-Peak; Av = Average

**TEST PERSONNEL:**

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



**TABLE 6: CONDUCTED EMISSIONS (CHANNEL 11 WITH THE INTERNAL ANTENNA)****NEUTRAL SIDE (Line 1)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.460                    | Qp            | 40.9                    | 0.6                         | 41.5                  | 48.0            | -6.5             | 48.0            | -6.5             |
| 0.460                    | Av            | 13.3                    | 0.6                         | 13.9                  | 48.0            | -34.1            | 48.0            | -34.1            |
| 4.526                    | Qp            | 38.3                    | 1.8                         | 40.1                  | 48.0            | -7.9             | 48.0            | -7.9             |
| 4.526                    | Av            | 21.3                    | 1.8                         | 23.1                  | 48.0            | -24.9            | 48.0            | -24.9            |
| 9.148                    | Pk            | 31.5                    | 2.4                         | 33.9                  | 48.0            | -14.1            | 48.0            | -14.1            |
| 11.650                   | Pk            | 31.9                    | 2.7                         | 34.6                  | 48.0            | -13.4            | 48.0            | -13.4            |
| 13.660                   | Pk            | 31.4                    | 3.0                         | 34.4                  | 48.0            | -13.6            | 48.0            | -13.6            |
| 17.920                   | Pk            | 23.4                    | 3.4                         | 26.8                  | 48.0            | -21.2            | 48.0            | -21.2            |

**HOT SIDE (Line 2)**

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|-----------------|------------------|-----------------|------------------|
| 0.455                    | Qp            | 40.9                    | 0.6                         | 41.5                  | 48.0            | -6.5             | 48.0            | -6.5             |
| 0.455                    | Av            | 9.6                     | 0.6                         | 10.2                  | 48.0            | -37.8            | 48.0            | -37.8            |
| 3.520                    | Pk            | 38.8                    | 1.6                         | 40.4                  | 48.0            | -7.6             | 48.0            | -7.6             |
| 4.576                    | Qp            | 39.7                    | 1.8                         | 41.5                  | 48.0            | -6.5             | 48.0            | -6.5             |
| 4.576                    | Av            | 24.9                    | 1.8                         | 26.7                  | 48.0            | -21.3            | 48.0            | -21.3            |
| 10.170                   | Pk            | 30.7                    | 2.7                         | 33.4                  | 48.0            | -14.6            | 48.0            | -14.6            |
| 11.770                   | Pk            | 31.9                    | 2.8                         | 34.7                  | 48.0            | -13.3            | 48.0            | -13.3            |
| 14.190                   | Pk            | 31.1                    | 3.2                         | 34.3                  | 48.0            | -13.7            | 48.0            | -13.7            |

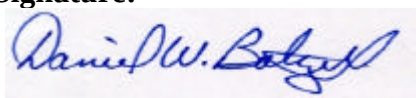
<sup>(1)</sup>Pk = Peak; QP = Quasi-Peak; Av = Average

**TEST PERSONNEL:**

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



## 9.0 RADIATED EMISSION DATA

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit. Explanation of the Correction Factor is given in paragraph 6.3.

**TABLE 7: RADIATED EMISSIONS (CHANNEL 1 WITH THE STUB ANTENNA)**

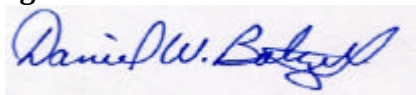
| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 219.995                  | Qp            | H                      | 220                     | 1.4                | 50.8                      | -19.1                         | 31.7                    | 46.0           | -14.3       | Pass      |             |
| 263.995                  | Qp            | H                      | 210                     | 1.1                | 47.3                      | -13.9                         | 33.4                    | 46.0           | -12.6       | Pass      |             |
| 307.995                  | Qp            | H                      | 215                     | 1.1                | 61.1                      | -13.9                         | 47.2                    | 65.3           | -18.1       | Pass      |             |
| 351.995                  | Qp            | H                      | 165                     | 1.0                | 45.4                      | -12.2                         | 33.2                    | 46.0           | -12.8       | Pass      |             |
| 396.000                  | Qp            | V                      | 180                     | 1.0                | 45.9                      | -11.1                         | 34.8                    | 46.0           | -11.2       | Pass      |             |
| 615.995                  | Qp            | V                      | 70                      | 1.0                | 41.2                      | -5.9                          | 35.3                    | 46.0           | -10.7       | Pass      |             |
| 626.995                  | Qp            | V                      | 60                      | 1.0                | 43.4                      | -6.3                          | 37.1                    | 46.0           | -8.9        | Pass      |             |
| 648.995                  | Qp            | V                      | 45                      | 1.0                | 43.4                      | -6.4                          | 37.0                    | 46.0           | -9.0        | Pass      |             |
| 659.995                  | Qp            | V                      | 55                      | 1.0                | 50.7                      | -6.3                          | 44.4                    | 46.0           | -1.6        | Pass      |             |
| 670.995                  | Qp            | H                      | 195                     | 1.4                | 43.3                      | -5.9                          | 37.4                    | 46.0           | -8.6        | Pass      |             |
| 692.995                  | Qp            | H                      | 190                     | 1.1                | 42.7                      | -5.8                          | 36.9                    | 46.0           | -9.1        | Pass      |             |
| 748.000                  | Qp            | V                      | 280                     | 1.0                | 53.3                      | -4.8                          | 48.5                    | 65.3           | -16.8       | Pass      |             |
| 780.995                  | Qp            | V                      | 45                      | 1.0                | 41.4                      | -4.8                          | 36.6                    | 46.0           | -9.4        | Pass      |             |
| 2037.997                 | Av            | V                      | 165                     | 1.0                | 31.4                      | -3.2                          | 28.2                    | 65.3           | -37.1       | Pass      |             |
| 2412.3                   | Av            | V                      | 190                     | 1.0                | 86.1                      | -0.8                          | 85.3                    |                |             |           | fundamental |
| 4075.987                 | Av            | H                      | 245                     | 1.3                | 34.4                      | -4.1                          | 30.3                    | 54.0           | -23.7       | Pass      |             |
| 4820.000                 | Av            | H                      | 0                       | 1.0                | 22.2                      | 17.5                          | 39.7                    | 54.0           | -14.3       | Pass      |             |

### TEST PERSONNEL:

**Typed/Printed Name:** Daniel W. Baltzell

**Date:** July 29, 1999

**Signature:**



**TABLE 8: RADIATED EMISSIONS (CHANNEL 6 WITH THE STUB ANTENNA)**

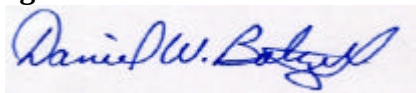
| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 219.995                  | Qp            | H                      | 205                     | 1.4                | 51.5                      | -19.1                         | 32.4                    | 46.0           | -13.6       | Pass      |             |
| 263.995                  | Qp            | H                      | 215                     | 1.1                | 47.2                      | -13.9                         | 33.3                    | 46.0           | -12.7       | Pass      |             |
| 307.995                  | Qp            | H                      | 220                     | 1.1                | 63.0                      | -13.9                         | 49.1                    | 68.2           | -19.1       | Pass      |             |
| 351.995                  | Qp            | H                      | 175                     | 1.2                | 46.2                      | -12.2                         | 34.0                    | 46.0           | -12.0       | Pass      |             |
| 395.995                  | Qp            | V                      | 165                     | 1.0                | 41.3                      | -11.1                         | 30.2                    | 46.0           | -15.8       | Pass      |             |
| 615.995                  | Qp            | V                      | 75                      | 1.0                | 41.3                      | -5.9                          | 35.4                    | 46.0           | -10.6       | Pass      |             |
| 626.995                  | Qp            | V                      | 65                      | 1.0                | 45.0                      | -6.3                          | 38.7                    | 46.0           | -7.3        | Pass      |             |
| 648.995                  | Qp            | V                      | 40                      | 1.0                | 44.5                      | -6.4                          | 38.1                    | 46.0           | -7.9        | Pass      |             |
| 659.995                  | Qp            | V                      | 60                      | 1.0                | 42.0                      | -6.3                          | 35.7                    | 46.0           | -10.3       | Pass      |             |
| 670.995                  | Qp            | V                      | 50                      | 1.0                | 45.4                      | -5.7                          | 39.7                    | 46.0           | -6.3        | Pass      |             |
| 692.995                  | Qp            | V                      | 45                      | 1.0                | 43.2                      | -5.7                          | 37.5                    | 46.0           | -8.5        | Pass      |             |
| 747.995                  | Qp            | V                      | 40                      | 1.0                | 53.1                      | -4.8                          | 48.3                    | 68.2           | -19.9       | Pass      |             |
| 780.995                  | Qp            | V                      | 45                      | 1.0                | 42.0                      | -4.8                          | 37.2                    | 46.0           | -8.8        | Pass      |             |
| 2062.987                 | Av            | V                      | 225                     | 1.0                | 31.3                      | -3.0                          | 28.3                    | 68.2           | -39.9       | Pass      |             |
| 2438.28                  | Av            | V                      | 200                     | 1.0                | 88.5                      | -0.3                          | 88.2                    |                |             |           | fundamental |
| 4125.995                 | Av            | H                      | 170                     | 1.5                | 36.3                      | -4.0                          | 32.3                    | 54.0           | -21.7       | Pass      |             |
| 4873.800                 | Av            | H                      | 0                       | 1.0                | 30.3                      | 18.6                          | 48.9                    | 54.0           | -5.1        | Pass      |             |

**TEST PERSONNEL:**

Typed/Printed Name: Daniel W. Baltzell

Date: July 29, 1999

Signature:



**TABLE 9: RADIATED EMISSIONS (CHANNEL 11 WITH THE STUB ANTENNA)**

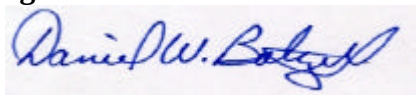
| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 219.995                  | Qp            | H                      | 210                     | 1.4                | 52.4                      | -19.1                         | 33.3                    | 46.0           | -12.7       | Pass      |             |
| 263.995                  | Qp            | H                      | 220                     | 1.1                | 48.2                      | -13.9                         | 34.3                    | 46.0           | -11.7       | Pass      |             |
| 307.995                  | Qp            | H                      | 175                     | 1.1                | 61.0                      | -13.9                         | 47.1                    | 68.5           | -21.4       | Pass      |             |
| 351.995                  | Qp            | H                      | 180                     | 1.1                | 47.1                      | -12.2                         | 34.9                    | 46.0           | -11.1       | Pass      |             |
| 395.995                  | Qp            | H                      | 285                     | 1.0                | 43.6                      | -11.4                         | 32.2                    | 46.0           | -13.8       | Pass      |             |
| 615.995                  | Qp            | V                      | 65                      | 1.0                | 41.4                      | -5.9                          | 35.5                    | 46.0           | -10.5       | Pass      |             |
| 626.995                  | Qp            | V                      | 55                      | 1.0                | 45.1                      | -6.3                          | 38.8                    | 46.0           | -7.2        | Pass      |             |
| 648.995                  | Qp            | V                      | 40                      | 1.0                | 44.4                      | -6.4                          | 38.0                    | 46.0           | -8.0        | Pass      |             |
| 659.995                  | Qp            | V                      | 65                      | 1.0                | 41.7                      | -6.3                          | 35.4                    | 46.0           | -10.6       | Pass      |             |
| 670.995                  | Qp            | V                      | 50                      | 1.0                | 45.5                      | -5.7                          | 39.8                    | 46.0           | -6.2        | Pass      |             |
| 692.995                  | Qp            | V                      | 35                      | 1.0                | 43.3                      | -5.7                          | 37.6                    | 46.0           | -8.4        | Pass      |             |
| 747.995                  | Qp            | V                      | 50                      | 1.0                | 53.3                      | -4.8                          | 48.5                    | 68.5           | -20.0       | Pass      |             |
| 758.995                  | Qp            | V                      | 55                      | 1.0                | 42.9                      | -4.4                          | 38.5                    | 46.0           | -7.5        | Pass      |             |
| 780.995                  | Qp            | V                      | 45                      | 1.0                | 41.9                      | -4.8                          | 37.1                    | 46.0           | -8.9        | Pass      |             |
| 2087.992                 | Av            | H                      | 190                     | 1.1                | 31.8                      | -2.8                          | 29.0                    | 68.5           | -39.5       | Pass      |             |
| 2462.000                 | Av            | V                      | 210                     | 1.4                | 88.6                      | 0.1                           | 88.5                    |                |             |           | fundamental |
| 4176.003                 | Av            | H                      | 180                     | 1.0                | 38.6                      | -3.9                          | 34.7                    | 54.0           | -19.3       | Pass      |             |
| 4924.000                 | Av            | H                      | 0                       | 1.0                | 22.3                      | 19.7                          | 42.0                    | 54.0           | -12.0       | Pass      |             |
| 6263.998                 | Av            | H                      | 210                     | 1.0                | 26.3                      | -1.9                          | 24.4                    | 68.5           | -44.1       | Pass      |             |

**TEST PERSONNEL:**

Typed/Printed Name: Daniel W. Baltzell

Date: July 29, 1999

Signature:



**TABLE 10: RADIATED EMISSIONS (CHANNEL 1 WITH THE INTERNAL ANTENNA)**

| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 219.995                  | Qp            | H                      | 220                     | 1.2                | 51.9                      | -19.1                         | 32.8                    | 46.0           | -13.2       | Pass      |             |
| 263.995                  | Qp            | H                      | 215                     | 1.1                | 47.4                      | -13.9                         | 33.5                    | 46.0           | -12.5       | Pass      |             |
| 307.995                  | Qp            | H                      | 225                     | 1.0                | 64.8                      | -13.2                         | 51.6                    | 64.4           | -12.8       | Pass      |             |
| 319.000                  | Qp            | V                      | 180                     | 1.0                | 45.2                      | -13.2                         | 32.0                    | 46.0           | -14.0       | Pass      |             |
| 330.000                  | Qp            | V                      | 180                     | 1.0                | 43.7                      | -13.2                         | 30.5                    | 46.0           | -15.5       | Pass      |             |
| 341.000                  | Qp            | V                      | 175                     | 1.0                | 43.1                      | -12.5                         | 30.6                    | 46.0           | -15.4       | Pass      |             |
| 352.000                  | Qp            | V                      | 175                     | 1.0                | 44.5                      | -11.7                         | 32.8                    | 46.0           | -13.2       | Pass      |             |
| 396.000                  | Qp            | V                      | 140                     | 1.0                | 44.8                      | -11.1                         | 33.7                    | 46.0           | -12.3       | Pass      |             |
| 627.000                  | Qp            | V                      | 80                      | 1.0                | 40.0                      | -5.8                          | 34.2                    | 46.0           | -11.8       | Pass      |             |
| 649.000                  | Qp            | V                      | 200                     | 1.0                | 38.7                      | -5.7                          | 33.0                    | 46.0           | -13.0       | Pass      |             |
| 670.998                  | Qp            | V                      | 80                      | 1.0                | 40.3                      | -5.6                          | 34.7                    | 46.0           | -11.3       | Pass      |             |
| 692.998                  | Qp            | V                      | 80                      | 1.0                | 38.5                      | -5.8                          | 32.7                    | 46.0           | -13.3       | Pass      |             |
| 747.998                  | Qp            | V                      | 180                     | 1.0                | 44.0                      | -4.3                          | 39.7                    | 46.0           | -6.3        | Pass      |             |
| 748.000                  | Qp            | V                      | 305                     | 1.0                | 47.1                      | -4.3                          | 42.8                    | 64.4           | -21.6       | Pass      |             |
| 2038.000                 | Av            | H                      | 180                     | 1.0                | 33.2                      | -3.2                          | 30.0                    | 64.4           | -34.4       | Pass      |             |
| 2411.000                 | Av            | V                      | 180                     | 1.0                | 85.2                      | -0.8                          | 84.4                    |                |             |           | Fundamental |
| 4075.000                 | Av            | H                      | 180                     | 1.0                | 39.3                      | -4.1                          | 35.2                    | 54.0           | -18.8       | Pass      |             |
| 4820.000                 | Av            | H                      | 0                       | 1.0                | 22.2                      | 17.5                          | 39.7                    | 54.0           | -14.3       | Pass      |             |

**TEST PERSONNEL:****Typed/Printed Name:** Daniel W. Baltzell**Date:** July 29, 1999**Signature:**


**TABLE 11: RADIATED EMISSIONS (CHANNEL 6 WITH THE INTERNAL ANTENNA)**

| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 131.998                  | Qp            | V                      | 150                     | 1.0                | 40.9                      | -18.2                         | 22.7                    | 43.5           | -20.8       | Pass      |             |
| 219.998                  | Qp            | V                      | 270                     | 1.0                | 49.4                      | -17.8                         | 31.6                    | 46.0           | -14.4       | Pass      |             |
| 308.000                  | Qp            | H                      | 250                     | 1.0                | 61.7                      | -13.9                         | 47.8                    | 63.7           | -15.9       | Pass      |             |
| 351.998                  | Qp            | V                      | 180                     | 1.0                | 44.0                      | -12.3                         | 31.7                    | 46.0           | -14.3       | Pass      |             |
| 395.998                  | Qp            | V                      | 175                     | 1.0                | 47.9                      | -11.1                         | 36.8                    | 46.0           | -9.2        | Pass      |             |
| 538.998                  | Qp            | V                      | 190                     | 1.0                | 43.8                      | -7.6                          | 36.2                    | 46.0           | -9.8        | Pass      |             |
| 715.000                  | Qp            | H                      | 280                     | 1.0                | 34.3                      | -5.6                          | 28.7                    | 46.0           | -17.3       | Pass      |             |
| 748.000                  | Qp            | H                      | 150                     | 1.0                | 44.8                      | -4.8                          | 40.0                    | 63.7           | -23.7       | Pass      |             |
| 2062.000                 | Av            | H                      | 180                     | 1.0                | 33.7                      | -3.0                          | 30.7                    | 63.7           | -33.0       | Pass      |             |
| 2436.000                 | Av            | V                      | 180                     | 1.0                | 84.1                      | -0.4                          | 83.7                    |                |             |           | fundamental |
| 4126.000                 | Av            | H                      | 180                     | 1.0                | 41.9                      | -4.0                          | 37.9                    | 54.0           | -16.1       | Pass      |             |
| 4873.480                 | Av            | H                      | 0                       | 1.0                | 22.2                      | 18.6                          | 40.8                    | 54.0           | -13.2       | Pass      |             |

**TEST PERSONNEL:**

Typed/Printed Name: Daniel W. Baltzell

Date: July 29, 1999

Signature:



**TABLE 12: RADIATED EMISSIONS (CHANNEL 11 WITH THE INTERNAL ANTENNA)**

| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV/m) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail | Comments    |
|--------------------------|---------------|------------------------|-------------------------|--------------------|---------------------------|-------------------------------|-------------------------|----------------|-------------|-----------|-------------|
| 220.000                  | Qp            | H                      | 260                     | 1.0                | 57.4                      | -19.1                         | 38.3                    | 46.0           | -7.7        | Pass      |             |
| 253.000                  | Qp            | H                      | 260                     | 1.0                | 47.2                      | -14.8                         | 32.4                    | 46.0           | -13.6       | Pass      |             |
| 264.000                  | Qp            | H                      | 250                     | 1.0                | 50.3                      | -13.9                         | 36.4                    | 46.0           | -9.6        | Pass      |             |
| 275.000                  | Qp            | H                      | 260                     | 1.0                | 48.2                      | -14.7                         | 33.5                    | 46.0           | -12.5       | Pass      |             |
| 297.000                  | Qp            | H                      | 200                     | 1.0                | 48.7                      | -14.5                         | 34.2                    | 46.0           | -11.8       | Pass      |             |
| 308.000                  | Qp            | V                      | 170                     | 1.7                | 65.7                      | -14.0                         | 51.7                    | 65.5           | -13.8       | Pass      |             |
| 352.000                  | Qp            | V                      | 175                     | 1.5                | 55.0                      | -12.3                         | 42.7                    | 46.0           | -3.3        | Pass      |             |
| 396.000                  | Qp            | V                      | 175                     | 1.0                | 59.5                      | -11.1                         | 48.4                    | 46.0           | -17.1       | Pass      |             |
| 429.000                  | Qp            | V                      | 175                     | 1.0                | 47.8                      | -9.8                          | 38.0                    | 46.0           | -8.0        | Pass      |             |
| 473.000                  | Qp            | V                      | 155                     | 1.0                | 47.0                      | -8.8                          | 38.2                    | 46.0           | -7.8        | Pass      |             |
| 484.000                  | Qp            | H                      | 150                     | 1.0                | 46.9                      | -8.3                          | 38.6                    | 46.0           | -7.4        | Pass      |             |
| 495.000                  | Qp            | V                      | 165                     | 1.0                | 47.5                      | -9.1                          | 38.4                    | 46.0           | -7.6        | Pass      |             |
| 506.000                  | Qp            | H                      | 135                     | 1.0                | 42.8                      | -8.8                          | 34.0                    | 46.0           | -12.0       | Pass      |             |
| 517.000                  | Qp            | V                      | 170                     | 1.0                | 46.2                      | -8.1                          | 38.1                    | 46.0           | -7.9        | Pass      |             |
| 539.000                  | Qp            | V                      | 190                     | 1.0                | 46.4                      | -7.6                          | 38.8                    | 46.0           | -7.2        | Pass      |             |
| 649.000                  | Qp            | H                      | 350                     | 1.5                | 39.3                      | -6.2                          | 33.1                    | 46.0           | -12.9       | Pass      |             |
| 660.000                  | Qp            | H                      | 340                     | 1.3                | 40.1                      | -6.2                          | 33.9                    | 46.0           | -12.1       | Pass      |             |
| 671.000                  | Qp            | H                      | 230                     | 1.3                | 44.0                      | -5.9                          | 38.1                    | 46.0           | -7.9        | Pass      |             |
| 682.000                  | Qp            | H                      | 190                     | 2.4                | 38.7                      | -5.9                          | 32.8                    | 46.0           | -13.2       | Pass      |             |
| 693.000                  | Qp            | H                      | 190                     | 2.4                | 43.3                      | -5.8                          | 37.5                    | 46.0           | -8.5        | Pass      |             |
| 693.000                  | Qp            | V                      | 30                      | 2.0                | 45.3                      | -5.7                          | 39.6                    | 46.0           | -6.4        | Pass      |             |
| 704.000                  | Qp            | H                      | 190                     | 1.1                | 41.6                      | -5.9                          | 35.7                    | 46.0           | -10.3       | Pass      |             |
| 715.000                  | Qp            | V                      | 45                      | 1.9                | 47.0                      | -5.2                          | 41.8                    | 46.0           | -4.2        | Pass      |             |
| 748.000                  | Qp            | V                      | 30                      | 1.7                | 51.9                      | -4.8                          | 47.1                    | 65.5           | -18.4       | Pass      |             |
| 2087.000                 | Av            | H                      | 180                     | 1.0                | 34.1                      | -2.8                          | 31.3                    | 65.5           | -34.2       | Pass      |             |
| 2440.010                 | Av            | H                      | 190                     | 1.0                | 36.7                      | 0.3                           | 37.0                    | 65.5           | -28.5       | Pass      |             |
| 2462.000                 | Av            | V                      | 180                     | 1.0                | 85.6                      | 0.1                           | 85.5                    |                |             |           | Fundamental |
| 4175.000                 | Av            | H                      | 180                     | 1.0                | 41.5                      | -3.9                          | 37.6                    | 54.0           | -16.4       | Pass      |             |
| 4924.000                 | Av            | V                      | 0                       | 1.0                | 29.9                      | 19.7                          | 49.6                    | 54.0           | -4.4        | Pass      |             |

**TEST PERSONNEL:****Typed/Printed Name:** Daniel W. Baltzell**Date:** July 29, 1999**Signature:**


**APPENDIX A: Emissions Equipment List**

| DESCRIPTION                | MANUFACTURER     | MODEL NUMBER | SERIAL NUMBER | CAL. LAB        |
|----------------------------|------------------|--------------|---------------|-----------------|
| AMPLIFIER                  | HEWLETT PACKARD  | 11975A       | 2304A00348    | TEST EQUITY     |
| AMPLIFIER (S/A 1)          | RHEIN TECH       | PR-1040      | 00001         | RTL             |
| AMPLIFIER (S/A 2)          | RHEIN TECH       | RTL2         | 900723        | RTL             |
| AMPLIFIER (S/A 3)          | RHEIN TECH       | 8447F        | 2944A03783    | RTL             |
| AMPLIFIER (S/A 4)          | RHEIN TECH       | 8447D        | 2727A05397    | RTL             |
| BICONICAL/LOG ANTENNA 1    | ANTENNA RESEARCH | LPB-2520     | 1037          | LIBERTY LABS    |
| BICONICAL/LOG ANTENNA 2    | ANTENNA RESEARCH | LPB-2520     | 1036          | LIBERTY LABS    |
| FIELD SITE SOURCE          | EMCO             | 4610         | 9604-1313     | RTL             |
| FILTER (ROOM 1)            | SOLAR            | 8130         | 947305        | RTL             |
| FILTER (ROOM 2)            | SOLAR            | 8130         | 947306        | RTL             |
| HARMONIC MIXER 1           | HEWLETT PACKARD  | 11970K       | 2332A00563    | TELOGY          |
| HARMONIC MIXER 2           | HEWLETT PACKARD  | 11970A       | 2332A01199    | TELOGY          |
| HORN ANTENNA 1             | EMCO             | 3160-10      | 9606-1033     | EMCO            |
| HORN ANTENNA 2             | EMCO             | 3160-9       | 9605-1051     | EMCO            |
| HORN ANTENNA 3             | EMCO             | 3160-7       | 9605-1054     | EMCO            |
| HORN ANTENNA 4             | EMCO             | 3160-8       | 9605-1044     | EMCO            |
| HORN ANTENNA 5             | EMCO             | 3160-03      | 9508-1024     | EMCO            |
| LISN (ROOM 1/L1)           | SOLAR            | 7225-1       | 900727        | ACUCAL          |
| LISN (ROOM 1/L2)           | SOLAR            | 7225-1       | 900726        | ACUCAL          |
| LISN (ROOM 2/L1)           | SOLAR            | 7225-1       | 900078        | ACUCAL          |
| LISN (ROOM 2/L2)           | SOLAR            | 7225-1       | 900077        | ACUCAL          |
| PRE-AMPLIFIER              | HEWLETT PACKARD  | 8449B OPT    | 3008A00505    | TELOGY          |
| QUASI-PEAK ADAPTER (S/A 1) | HEWLETT PACKARD  | 85650A       | 3145A01599    | ACUCAL          |
| QUASI-PEAK ADAPTER (S/A 2) | HEWLETT PACKARD  | 85650A       | 2811A01276    | ACUCAL          |
| QUASI-PEAK ADAPTER (S/A 3) | HEWLETT PACKARD  | 85650A       | 2521A00473    | ACUCAL          |
| QUASI-PEAK ADAPTER (S/A 4) | HEWLETT PACKARD  | 85650A       | 2521A01032    | ACUCAL          |
| RF PRESELECTOR (S/A 1)     | HEWLETT PACKARD  | 85685A       | 3146A01309    | ACUCAL          |
| SIGNAL GENERATOR (HP)      | HEWLETT PACKARD  | 8660C        | 1947A02956    | ACUCAL          |
| SIGNAL GENERATOR (WAVETEK) | WAVETEK          | 3510B        | 4952044       | ACUCAL          |
| SPECTRUM ANALYZER 1        | HEWLETT PACKARD  | 8566B        | 3138A07771    | ACUCAL          |
| SPECTRUM ANALYZER 2        | HEWLETT PACKARD  | 8567A        | 2841A00614    | ACUCAL          |
| SPECTRUM ANALYZER 4        | HEWLETT PACKARD  | 8567A        | 2727A00535    | ACUCAL          |
| TUNABLE DIPOLE             | EMCO             | 3121         | 274           | LIBERTY LABS    |
| ANTENNA                    | ATM              | WR08         | 08443-6       | ATM             |
| MIXER                      | OLESON           | M08HW        | F80814-1      | OLESON          |
| MIXER                      | OLESON           | M05HW        | G80814-1      | OLESON          |
| DIPLEXER                   | OLESON           | M05HW        | G80814-1      | OLESON          |
| MIXER                      | HEWLETT PACKARD  | 11970U       | 2332A01110    | ACUCAL          |
| MIXER                      | HEWLETT PACKARD  | 11970V       | 2521A00512    | TELOGY          |
| MIXER                      | HEWLETT PACKARD  | 11970W       | 2521A00710    | TELOGY          |
| ANTENNA                    | ATM              | WR15         | 15-443-6      | ATM             |
| ANTENNA                    | ATM              | WR10         | 10-443-6      | ATM             |
| ANTENNA                    | ATM              | WR05         | 05-443-6      | ATM             |
| SWEEP GENERATOR            | HEWLETT PACKARD  | 83752A       | 3610A00866    | HEWLETT PACKARD |

Calibration Certification available upon request.

# **APPENDIX B:**

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# **USER'S MANUAL I**

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