

*Electromagnetic Emissions Test Report
In Accordance With
FCC Part 21 Subpart K
on the
Soma Networks
Model: SOMAport (TM) subscriber terminal*

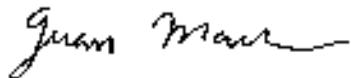
FCC ID: POZCPEMDS004324

GRANTEE: Soma Networks
185 Berry Street, Suite 2000
San Francisco, CA 94107

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Ave
Sunnyvale, CA 94086

REPORT DATE: July 29, 2003

FINAL TEST DATE: July 24, 2003



AUTHORIZED SIGNATORY:

Juan Martinez
Sr. EMC Engineer



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FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant: Soma Networks
185 Berry Street, Suite 2000
San Francisco, CA 94107

2.1033(c)(2) (4) FCC ID: POZCPEMDS004324

2.1033(c)(3) Instructions/Installation Manual

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

2.1033(c)(4) Type of emissions

4M15FXW

2.1033(c)(5) Frequency Range

2500 – 2566 MHz

2.1033(c)(6) Range of Operation Power

Maximum: 1.12 Watts
Minimum: 0.000050 Watts

2.1033(c)(7) Maximum FCC & IC Allowed Power Level

§ 21.904 EIRP limitations: (a) The maximum EIRP of a main or booster station shall not exceed $33 \text{ dBW} + 10\log(X/6) \text{ dBW}$, where X is the actual bandwidth if other than 6 MHz, except as provided in paragraph (b) of this section.

2.1033(c)(8) Applied voltage and currents into the final transistor elements

Refer to Exhibit 6. Schematic diagram

2.1033(c)(9) Tune-up Procedure

Refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure.

2.1033(c)(10) Schematic Diagram of the Transmitter

Refer to Exhibit 6. Schematic diagram

2.1033(c)(10) Means for Frequency Stabilization

16 MHz TXCO (Y1)

2.1033(c)(10) Means for Suppression of Spurious radiation

Bandpass filters location F3

2.1033(c)(10) for Limiting Modulation

Controlled by the DSP software.

2.1033(c)(10) Means for Limiting Power

Controlled by the DSP software.

2.1033(c)(11) Photographs or Drawing of the Equipment Identification Plate or Label

Refer to Exhibit 4

2.1033(c)(12) Photographs of equipment

Refer to Exhibit 5

2.1033(c)(13) Equipment Employing Digital Modulation

W-CDMA is a "direct-sequence spread spectrum" technique. It is similar to IS-95, but with a wider (5 MHz) carrier. SOMA's air interface is a variant of W-CDMA (aka 3GPP), and uses the same chip rate of 3.84 Mcps. In addition to the standard QPSK modulation scheme contained in W-CDMA, SOMA's radio system utilizes higher-order modulation: 16- and 64-QAM.

2.1033(c)(14) Data taken per Section 2.1046 to 2.1057.

Refer to Exhibit 2

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
SOMAport (TM) subscriber terminal

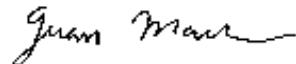
Manufacturer:
Soma Networks
185 Berry Street, Suite 2000
San Francisco, CA 94107

Tested to applicable standards:
FCC Part 21 Subpart K

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC4549_3 Dated March 5, 2003

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.



| Signature | |
|-----------|--|
| Name | Juan Martinez |
| Title | Sr. EMC Engineer |
| Company | Elliott Laboratories Inc. |
| Address | 684 W. Maude Ave Sunnyvale, CA 94086 USA |

Date: July 29, 2003

Maintenance of compliance with the above standards is the responsibility of the manufacturer. Any modification of the product, which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SCOPE

Part 21 Subpart K testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the Part 21 Subpart K. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC. FCC issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SUMMARY OF TEST RESULTS**Part 21K and 741 Test Summary**

| Part 2 Measurements Required Section | FCC Part 21 Subpart K Section | Test Performed | Measured Value | Test Procedure Used | Result |
|---|-------------------------------|--|---|---------------------|----------|
| Modulation Tested | W-CDMA | - | - | - | - |
| 2.1047: Modulation characteristics | 21.905 | 99% Bandwidth | 4.15 MHz | D | Complies |
| 2.1046: RF power output | 21.904 | Radiated Output Power Test | 30.5 dBm (1.12 Watts EIRP) | A | Complies |
| 2.1046: RF power output | 21.904 | Conducted Output Power Test | 26.5 dBm (0.45 Watts) | B | Complies |
| 2.1051: Spurious emissions at antenna Port | 21.908(a) | Emission Limits and/or Unwanted Emission 30MHz – 25GHz (Antenna Conducted) | All spurious emissions: Bandedge: 25dB 250kHz: 40dB 3MHz: 60dB > 3 MHz: 60 dB | J | Complies |
| 2.1049: Occupied Bandwidth | 21.908(a) | Out of Block Emissions (Antenna Conducted) | All spurious emissions < 60dBm | I | Complies |
| 2.1053 Field strength of spurious radiation | 21.908(a) | Radiated Spurious Emissions 30MHz – 25GHz | -34.7dBm @ 5126 MHz (-1.2 dB) | N | Complies |
| 2.1055: Frequency stability | 21.101(a) | Frequency Stability (Frequency Vs. Temperature) | -883 Hz | K | Complies |
| 2.1055: Frequency stability | 21.101(a) | Frequency Stability (Frequency Vs. Voltage) | -375 Hz | L & M | Complies |
| 2.1093: Exposure to portable devices | 2.1093 | Exposure of Humans to RF Fields | MPE Calculation | - | - |
| - | N/A | Receiver Spurious Emissions (Antenna Conducted) | All spurious emission below 1 GHz < 2 nanowatts and above 1 GHz < 5 nanowatts | N/A | N/A |

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Soma Networks model SOMAport (TM) subscriber terminal is a wireless terminal that is designed to provide wireless network access in a residence as well as two phone lines. The MMDS SomePort2 is a compact terminal to which you can connect a computer or local area network (LAN) as well as two telephones. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end user environment. The electrical rating of the EUT is 100-240V, 50-60 Hz, 70-80 VA.

The sample was received on July 18, 2003 and tested on July 24, 2003.

The EUT consisted of the following component(s):

| Manufacturer | Model | Description | Serial Number | FCC ID |
|---------------|--------------------------------------|-------------------|---------------|--------|
| Soma Networks | SOMAport (TM) subscriber terminal | Wireless Terminal | | TBD |

ENCLOSURE

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 12 cm wide by 22 cm deep by 28 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

| Port | Connected To | Cable(s) | | |
|------|--------------|-------------|------------------------|-----------|
| | | Description | Shielded or Unshielded | Length(m) |
| DC | AC outlet | 2 wire | Unshielded | 2 |

EUT OPERATION DURING TESTING

Operating at Full power continuously.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 24, 2003 at the Elliott Laboratories Open Area Test Site #3 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into field strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

POWER METER

A power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The requirements of ANSI C63.4 were used for configuration of the equipment turntable. It specifies that the test height above ground for table-mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

For Transmitter with non-detachable antennas field strength measurements are performed. The substitution method is also performed for the appropriate test requirement.

Procedure A – Power Measurement (Radiated Method): The following procedure was used for transmitters that do not use external antennas.

- 1) Set the EUT to maximum power and to the lowest channel.
- 2) A spectrum analyzer was used to measure the power output. The search antenna was located 3 meter from the EUT.
- 3) The spectrum analyzer resolution and video bandwidth was set to 5 MHz to measure the power output. No amplifier was used since the fundamental will cause the amplifier to saturate.
- 4) The EUT was then rotated for a complete 360 degrees and the search antenna was raised and lowered to maximize the fundamental. Both vertical and horizontal polarizations were performed. All correction factors are applied to the fundamental.
- 5) Substitution is then performed. Substitution method is performed by replacing the EUT with a horn antenna, which factors can be reference to a half-wave dipole, and with a signal generator. The signal generator power level is adjusted until a similar level, which was measured, in step 4, is achieved on the spectrum analyzer. The level on the signal generator is then added to the antenna factor, in dBi, which will give the corrected value.
- 6) Steps 1 to 5 are repeated for the middle and the highest channel.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

- 1) Set the EUT to maximum power and to the lowest channel.
- 2) Either a power meter or a spectrum analyzer was used to measure the power output.
- 3) If a spectrum analyzer was used a resolution and video bandwidth 1MHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
- 4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
- 5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure D - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

- 1) The built-in 99% function of the spectrum analyzer was used.
- 2) If the built-in 99% is not available then the following method is used:
26-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.
- 3) For the above two methods a resolution and video bandwidth of 10 or 30 kHz was used to measure the emission's bandwidth.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure I – Occupied Bandwidth (Emission Mask): The following procedure was used:

- 1) Set the frequency of the device as close as possible to the FCC frequency block edge.
- 2) Set the center frequency to the FCC frequency block edge. The span was set to 30 MHz to encapsulate the fundamental and any other spurs 6 MHz away from the fundamental.
- 3) Set the RBW and VBW to 100 kHz to measure the spectral points of the fundamental.
- 4) The digital signal is W-CDMA a non-constant envelope, so average video was enabled.
- 5) Section 21.908(a) for digital modulation states the following attenuation:

At 6 MHz channel edge: 25dB below the average 6 MHz channel power
From edge to 250 kHz: 40dB
Beyond 250 kHz: 60 dB at 3MHz removed from edge

- 6) Per section 21.908(e):

Absolute power measurements:

$$\text{Attenuation in dB (below channel power)} = A + 10\log \left(\frac{\text{RBW1}}{\text{RBW2}} \right)$$

- 7) Results were then plotted and mask applied. Repeated for the higher channel used by the transmitter.

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

- 1) Set the transmitting signal as close as possible to the edge of the frequency band/block as specified in the standard. Power is set to maximum.
- 2) Set the spectrum analyzer display line function to 60-dB below the average 6 MHz channel power.
- 3) Set the spectrum analyzer bandwidth to 100 kHz.
- 4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10th harmonic of the fundamental. All spurious or intermodulation emission must not exceed the 60-dB attenuation.
- 5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

Procedure K - Frequency Stability: The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from -30 to $+50^{\circ}\text{C}$ (or $+60^{\circ}\text{C}$ for some IC RSS standards) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

Procedure L - Frequency Stability: For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled $+20^{\circ}\text{C}$ temperature.

Procedure M - Frequency Stability: For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled $+20^{\circ}\text{C}$ temperature.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360° , the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS**RADIATED EMISSIONS SPECIFICATION LIMITS**

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m.). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43 + 10\log_{10}$ (mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m

P= Power in Watts (for this example we use 3 watts)

G= Gain of antenna in numeric gain (Assume 1.64 for ERP)

d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

$$20 * \log (4.049 \text{ V/m} * 1,000,000) = 132.14 \text{ dBuV/m} @ 3 \text{ meters}$$

FCC Rules request an attenuation of $43 + 10 \log (3)$ or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

$$132.1 \text{ dBuV/m} - 47.8 \text{ dB} = 84.3 \text{ dBuV/m} @ 3 \text{ meter.}$$

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

Radiated Emissions, 1000 - 30,000 MHz, 11-Sep-03**Engineer: jmartinez**

| Manufacturer | Description | Model # | Assett # | Cal interval | Last Calibrated | Cal Due |
|---------------------|--|----------------|-----------------|---------------------|------------------------|----------------|
| EMCO | Horn antenna, D. Ridge 1-18GHz (SA40 system antenna) | 3115 | 1142 | 12 | 3/27/2003 | 3/27/2004 |
| Hewlett Packard | Microwave EMI test system (SA40, 9kHz - 40GHz) | 84125C | 1149 | 12 | 3/12/2003 | 3/12/2004 |

Power Measurement, 11-Sep-03**Engineer: jmartinez**

| Manufacturer | Description | Model # | Assett # | Cal interval | Last Calibrated | Cal Due |
|---------------------|-------------------------------|----------------|-----------------|---------------------|------------------------|----------------|
| Rohde & Schwarz | Power Meter, Single Channel | NRVS | 1534 | 12 | 3/20/2003 | 3/20/2004 |
| Rohde & Schwarz | Power Sensor 100uW - 10 Watts | NRV-Z53 | 1236 | 12 | 8/15/2002 | 9/15/2003 |

Substitution Method, 11-Sep-03**Engineer: jmartinez**

| Manufacturer | Description | Model # | Assett # | Cal interval | Last Calibrated | Cal Due |
|---------------------|--|----------------|-----------------|---------------------|------------------------|----------------|
| EMCO | Horn Antenna, D. Ridge 1-18GHz | 3115 | 487 | 12 | 4/24/2003 | 4/24/2004 |
| Hewlett Packard | Signal Generator (sweep) 0.01 - 26.5 GHz | 8340A | 1244 | N/A | | |

EXHIBIT 2: Test Measurement Data

The following data includes conducted and radiated emission measurements of the Soma Networks, model: SOMAport (TM) subscriber terminal.

14 Pages



EMC Test Data

| | | | |
|-----------------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Emissions Spec: | FCC part 21 | Class: | Radio |
| Immunity Spec: | | Environment: | |

EMC Test Data

For The

Soma Networks

Model

SOMAport (TM) subscriber terminal



EMC Test Data

| | | | |
|-----------------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Emissions Spec: | FCC part 21 | Class: | Radio |
| Immunity Spec: | Enter immunity spec on cover | Environment: | |

EUT INFORMATION

General Description

The EUT is a wireless terminal that is designed to provide wireless network access in a residence as well as two phone lines. The MMDS SomePort2 is a compact terminal to which you can connect a computer or local area network (LAN) as well as two telephones. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the EUT is 100-240V, 50-60 Hz, 70-80 VA.

Equipment Under Test

| Manufacturer | Model | Description | Serial Number | FCC ID |
|---------------|--------------------------------------|-------------------|---------------|-----------------|
| Soma Networks | SOMAport (TM) subscriber terminal | Wireless Terminal | N/A | POZCPEMDS004324 |

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 12 cm wide by 22 cm deep by 28 cm high.



EMC Test Data

| | | | |
|-----------------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Emissions Spec: | FCC part 21 | Class: | Radio |
| Immunity Spec: | Enter immunity spec on cover | Environment: | |

Test Configuration #1

Local Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| None | | | | |

Remote Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| None | | | | |

Interface Cabling and Ports

| Port | Connected To | Cable(s) | | |
|------|--------------|-------------|------------------------|-----------|
| | | Description | Shielded or Unshielded | Length(m) |
| DC | AC outlet | 2 wire | Unshielded | 2 |

Note: The USB, J11, and J45 ports were not connected since they're not required during the Radio test portion. The F-type connector was not connected since this is an optional accessory of an external ERU.

EUT Operation During Emissions

Operating at Full power continuously.



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| Contact: | Dale | Account Manager: | Christine Vu |
| Spec: | FCC part 21 | Class: | Radio |

Power Output Measurement

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/25/2003

Config. Used: 1

Test Engineer: jmartinez

Config Change: None

Test Location: SVOATS #3

EUT Voltage: 120Vac, 60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 3 meters from the EUT for the Power Output Measurement.

Substitution was then performed to get the EIRP power in dBm.

Ambient Conditions:

Temperature: 21°C

Rel. Humidity: 35%

Summary of Results

| Run # | Test Performed | Limit | Result | Level |
|-------|---------------------|------------|--------|----------|
| 1 | Power Output (EIRP) | FCC 21.904 | Pass | 30.5 dBm |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | Radio |

Run #1: Conducted Output Power (Average Power Meter)

| Channel | Frequency (MHz) | Average Power (dBm) | Antenna Gain | |
|---------|-----------------|---------------------|--------------|------|
| Middle | 2680.0 | 26.5 | 4 | 30.5 |

Run #2: Output Power (Substitution Method)

EIRP measurements (Low Channel)

| Frequency | Level | Pol | Substitution | | | | Comments | | |
|-----------|-------|-----|--------------|--------------|-----|-------|----------|-------|-------|
| | | | MHz | dB μ V/m | v/h | Pin | Gain | EIRP | |
| | | | | | | (dBm) | (dBi) | (dBm) | |
| 2502.00 | 133.4 | v | 21.0 | 9.3 | | 30.3 | | | Ch. 1 |
| 2502.00 | 121.4 | h | 17.2 | 9.3 | | 26.5 | | | Ch. 1 |

EIRP measurements (Middle Channel)

| Frequency | Level | Pol | Substitution | | | | Comments | | |
|-----------|-------|-----|--------------|--------------|-----|-------|----------|-------|-------|
| | | | MHz | dB μ V/m | v/h | Pin | Gain | EIRP | |
| | | | | | | (dBm) | (dBi) | (dBm) | |
| 2532.00 | 131.3 | v | 21.2 | 9.3 | | 30.5 | | | Ch. 6 |
| 2532.00 | 120.0 | h | 15.5 | 9.3 | | 24.8 | | | Ch. 6 |

EIRP measurements (High Channel)

| Frequency | Level | Pol | Substitution | | | | Comments | | |
|-----------|-------|-----|--------------|--------------|-----|-------|----------|-------|--------|
| | | | MHz | dB μ V/m | v/h | Pin | Gain | EIRP | |
| | | | | | | (dBm) | (dBi) | (dBm) | |
| 2563.00 | 131.1 | v | 21.0 | 9.3 | | 30.3 | | | Ch. 11 |
| 2563.00 | 121.4 | h | 16.3 | 9.3 | | 25.6 | | | Ch. 11 |



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | N/A |

Antenna Conducted Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/21/2003 Config. Used: 1
Test Engineer: Jmartinez Config Change: None
Test Location: SVOATS# 3 EUT Voltage: 120Vac, 60Hz

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Ambient Conditions: Temperature: 21°C
Rel. Humidity: 35%

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|--------------|--------------------|--------|--------|--------------------|
| Low Channel | | | | |
| 1 | Emission Mask | FCC 21 | Pass | Refer to plot |
| 1 | Occupied Bandwidth | FCC 21 | Pass | 4.15 MHz |
| 1 | Antenna Conducted | FCC 21 | Pass | -41.1dBm @ 4.98GHz |
| High Channel | | | | |
| 2 | Emission Mask | FCC 21 | Pass | Refer to plot |
| 2 | Occupied Bandwidth | FCC 21 | Pass | 4.13 MHz |
| 2 | Antenna Conducted | FCC 21 | Pass | -37.3dBm @ 5.13GHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

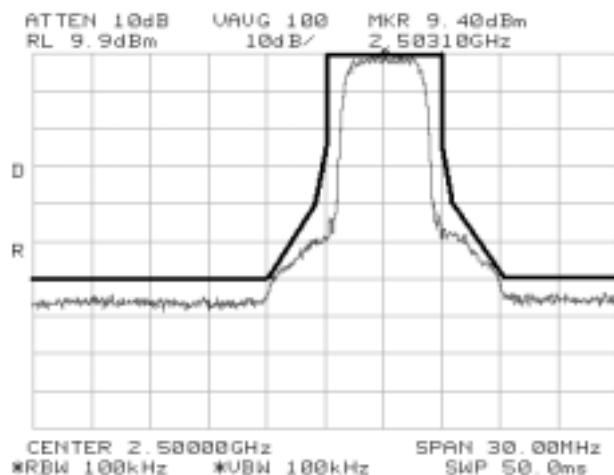


EMC Test Data

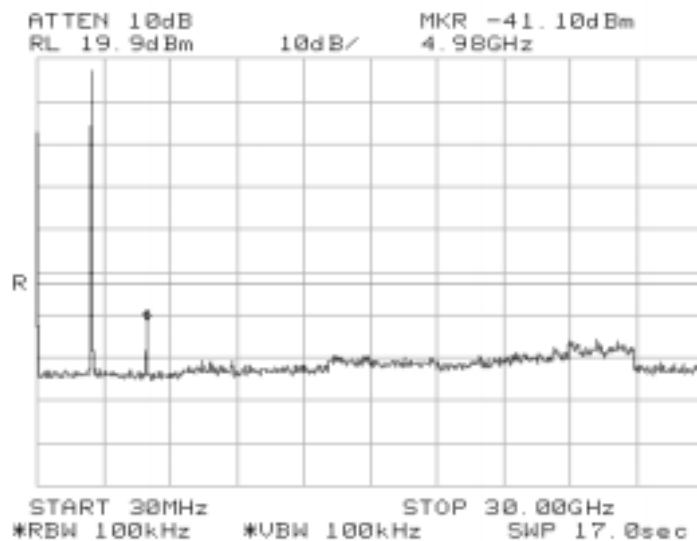
| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | N/A |

Run #1: Emission Mask (Bandedge Measurement), 99% BW, Out of Band emissions, low channel

Low Channel



Low Channel out of band

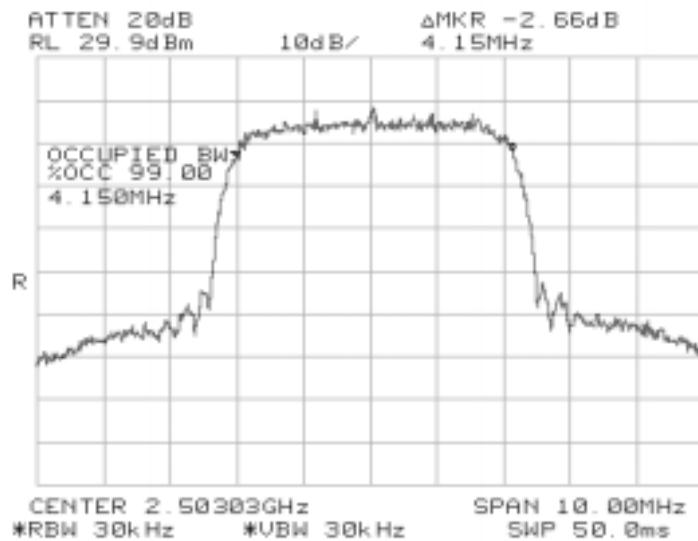




EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | N/A |

99% BW

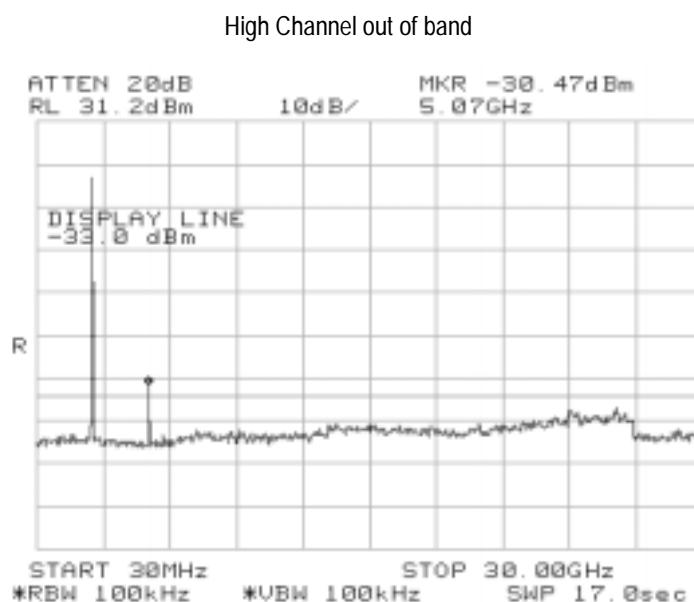
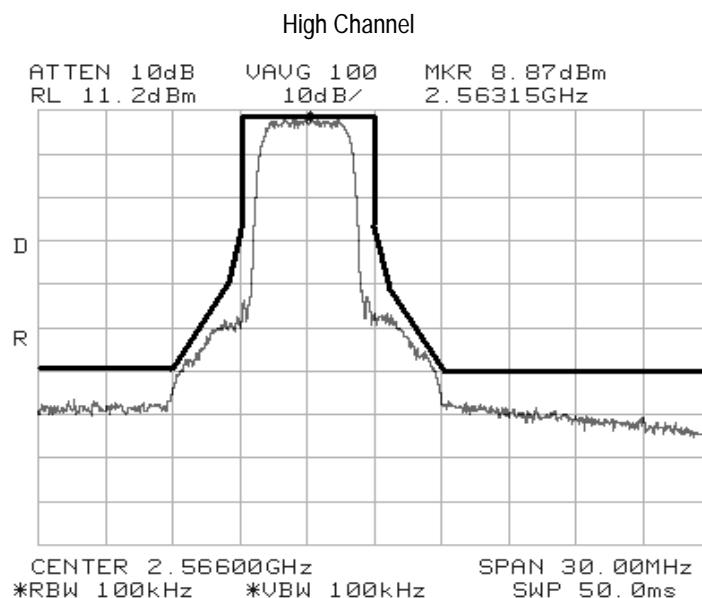




EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | N/A |

Run #2: Emission Mask (Bandedge Measurement), 99% BW, Out of Band emissions, High channel

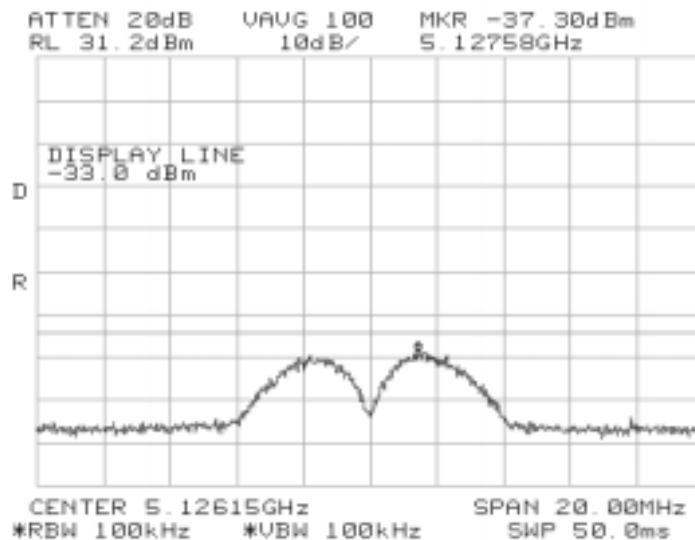




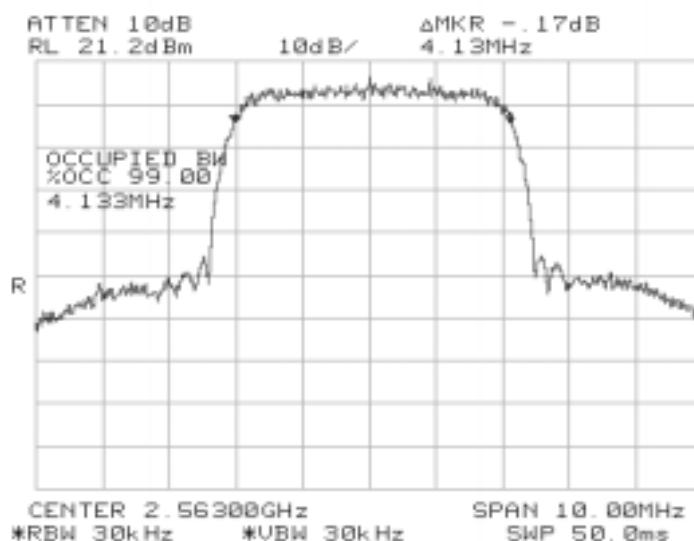
EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | N/A |

Second Harmonic



99% BW





EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | Radio |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/18/2003 Config. Used: 1
Test Engineer: Jmartinez Config Change: None
Test Location: SVOATS# 3 EUT Voltage: 120Vac, 60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

On the OATS, the measurement antenna was located 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Ambient Conditions: Temperature: 21°C
Rel. Humidity: 35%

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|--|-------------|--------|--------------------------|
| 1 | Radiated Emissions 1000-24000 MHz (Field Strength) | FCC Part 21 | Pass | Refer to individual runs |
| 2 | Radiated Emissions 1000-24000 MHz (EIRP) | FCC Part 21 | Pass | Refer to individual runs |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| | | Account Manager: | Christine Vu |
| Contact: | Dale | | |
| Spec: | FCC part 21 | Class: | Radio |

Run #1: Radiated Emissions, 1000-27000 MHz (Substitution)

Fundamental signal at 2502 MHz

EIRP measurements

| Frequency | Level | Pol | Substitution | | | | | Comments | | | |
|-----------|-------|-----|--------------|--------------|-----|-----------|------------|------------|-------------------------------|-------------|--------------|
| | | | MHz | dB μ V/m | v/h | Pin (dBm) | Gain (dBi) | EIRP (dBm) | Limit ^{Note 1} (dBm) | Margin (dB) | |
| 5005.85 | 53.7 | v | -52.1 | 9.6 | | -42.5 | | -33.5 | -9.0 | | Ch. 1 Note 1 |
| 7507.65 | 47.3 | v | -61.0 | 10.0 | | -51.0 | | -33.5 | -17.5 | | Ch. 1 Note 1 |
| 5005.85 | 48.8 | h | -57.3 | 9.6 | | -47.7 | | -33.5 | -14.2 | | Ch. 1 Note 1 |
| 7507.65 | 45.0 | h | -62.7 | 10.0 | | -52.7 | | -33.5 | -19.2 | | Ch. 1 Note 1 |

Note 1: The limit was derived from 60-dB from FCC part 21. The output power used to determine the limit was 26.5 dBm.

Run #2: Radiated Emissions, 1000-27000 MHz (Substitution)

Fundamental signal at 2532 MHz

EIRP measurements

| Frequency | Level | Pol | Substitution | | | | | Comments | | | |
|-----------|-------|-----|--------------|--------------|-----|-----------|------------|------------|-------------------------------|-------------|--------------|
| | | | MHz | dB μ V/m | v/h | Pin (dBm) | Gain (dBi) | EIRP (dBm) | Limit ^{Note 1} (dBm) | Margin (dB) | |
| 5065.60 | 56.5 | v | -49.3 | 9.6 | | -39.7 | | -33.5 | -6.2 | | Ch. 6 Note 1 |
| 7598.40 | 53.0 | v | -55.2 | 10.0 | | -45.2 | | -33.5 | -11.7 | | Ch. 6 Note 1 |
| 5065.60 | 44.0 | h | -62.1 | 9.6 | | -52.5 | | -33.5 | -19.0 | | Ch. 6 Note 1 |
| 7598.40 | 48.0 | h | -59.7 | 10.0 | | -49.7 | | -33.5 | -16.2 | | Ch. 6 Note 1 |

Note 1: The limit was derived from 60-dB from FCC part 21. The output power used to determine the limit was 26.5 dBm.

Run #3: Radiated Emissions, 1000-27000 MHz (Substitution)

Fundamental signal at 2563 MHz

EIRP measurements

| Frequency | Level | Pol | Substitution | | | | | Comments | | | |
|-----------|-------|-----|--------------|--------------|-----|-----------|------------|------------|-------------------------------|-------------|---------------|
| | | | MHz | dB μ V/m | v/h | Pin (dBm) | Gain (dBi) | EIRP (dBm) | Limit ^{Note 1} (dBm) | Margin (dB) | |
| 5126.00 | 61.6 | v | -44.2 | 9.5 | | -34.7 | | -33.5 | -1.2 | | Ch. 11 Note 1 |
| 7689.00 | 51.0 | v | -57.2 | 10.0 | | -47.2 | | -33.5 | -13.7 | | Ch. 11 Note 1 |
| 5126.00 | 56.0 | h | -50.1 | 9.5 | | -40.6 | | -33.5 | -7.1 | | Ch. 11 Note 1 |
| 7689.00 | 44.5 | h | -63.2 | 10.0 | | -53.2 | | -33.5 | -19.7 | | Ch. 11 Note 1 |

Note 1: The limit was derived from 60-dB from FCC part 21. The output power used to determine the limit was 26.5 dBm.



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| Contact: | Dale | Account Manager: | Christine Vu |
| Spec: | FCC part 21 | Class: | Radio |

Frequency Stability

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/24/2003 Config. Used: 1
Test Engineer: Juan Martinez Config Change: None
Test Location: Environmental Chamber EUT Voltage: 120V/60Hz

General Test Configuration

EUT was placed inside the Temperature Chamber and all local support equipment were located outside on a table for testing. The Eut was connected directly to Spectrum Analyzer. An attenuator was used between the EUT and Spectrum Analyzer. Chamber was set to -30 to 50 degrees Celsius (60 degrees Celsius for Canada). Incremented 10 degrees per temperature and let unit stabilized for every temperature.

Voltage stability was done at 20 degrees Celsius. For battery operated units decrease DC voltage until battery end-point was found.

Voltage stability was done at 20 degrees Celsius. For AC operated units varied voltage at 85% and 115% of the nominal AC voltage.

Summary of Results

| Run # | Test Performed | Limit | Result | Result |
|-------|---------------------------|---------|--------|---------|
| 1 | Temperature Vs. Frequency | Part 21 | Pass | -883 Hz |
| 2 | Voltage Vs. Frequency | Part 21 | Pass | -375 Hz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|-----------------------------------|------------------|--------------|
| Client: | Soma Networks | Job Number: | J51896 |
| Model: | SOMAport (TM) subscriber terminal | T-Log Number: | T51933 |
| Contact: | Dale | Account Manager: | Christine Vu |
| Spec: | FCC part 21 | Class: | Radio |

Run# 1: Temperature Vs. Frequency

| Drift | Freq. | Limit |
|-------|---------|--------|
| (ppm) | (MHz) | (Hz) |
| 1 | 2503.00 | 2503.0 |

| Temperature | Reference Frequency | Frequency Drift | Drift | Limit |
|-------------|---------------------|-----------------|-------|--------|
| (Celsius) | (MHz) | (MHz) | (Hz) | (Hz) |
| -30 | 2503.003333 | 2503.003333 | 0 | 2503.0 |
| -20 | 2503.003333 | 2503.003333 | 0 | 2503.0 |
| -10 | 2503.003333 | 2503.002958 | -375 | 2503.0 |
| 0 | 2503.003333 | 2503.002666 | -667 | 2503.0 |
| 10 | 2503.003333 | 2503.002741 | -592 | 2503.0 |
| 20 | 2503.003333 | 2503.002750 | -583 | 2503.0 |
| 30 | 2503.003333 | 2503.002450 | -883 | 2503.0 |
| 40 | 2503.003333 | 2503.002566 | -767 | 2503.0 |
| 50 | 2503.003333 | 2503.002883 | -450 | 2503.0 |

Run# 2: Voltage Vs. Frequency

Nominal Voltage is 120Vac.

| Voltage | Voltage | Drift | Limit |
|---------|---------|--------|--------|
| (Dc) | (AC) | (Hz) | (Hz) |
| 85% | 102.00 | -200.0 | 2503.0 |
| 115% | 138.00 | -375.0 | 2503.0 |

EXHIBIT 3: Photographs of Test Configuration

EXHIBIT 4: FCC ID Label and Location

2 pages

EXHIBIT 5: Internal and External Photos

| | |
|-----------------|---------|
| External Photos | 4 Pages |
| Internal Photos | 7 Pages |

EXHIBIT 6: Schematics and Bill of Material

| | |
|------------------|----------|
| Schematics | 11 Page |
| Bill of Material | 25 Pages |

EXHIBIT 7: User Manual, Theory of Operation, and Tune-Up procedure

| | |
|---------------------|----------|
| User Manual | 80 Pages |
| Theory of Operation | 1 Pages |
| Tune-Up Procedure | 14 Page |