15.247 Certification
FCC ID: IMK-ILCISA

EMI TEST REPORT
On
SYMPHONY ISA Card

Prepared for
Proxim
295 N. Bernardo Ave
Mountain View, CA 94043
Tel: (650)960-1630
Fax: (650)960-0332

Prepared by
Electronic Compliance Laboratories Inc.
1249 Birchwood Dr.
Sunnyvale, CA 94089
Tel: (408) 747-1490
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Test Report Number: A806003
Date of Test: June 6, 1998
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1.0 TEST FACILITY

Name: Electronic Compliance Laboratories

Location: 1249 Birchwood Dr.
Sunnyvale, CA  94089

Site Filing: A site description is on file at the Federal Communications Commission
P.O. Box 429
Columbia, MD  21045

NVLAP LAB CODE: 200089

Types of Sites: Open Field Radiated and Indoor Screen Room (Line Conducted).
All sites are constructed and calibrated to meet ANSI C63.4-1994 requirements.

2.0 TEST EQUIPMENT

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3.0 EUT
SYMPHONY ISA CARD
M/N: 4100-05
S/N: A30253497
FCC ID: IMK-ILCISA

With Proxim 1900.0051 Dipole Antenna. Antennas were not serialized.
4.0 SUPPORT EQUIPMENT

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5.0 EQUIPMENT CONFIGURATION

All of the equipment and cables were placed in worst case positions to maximize emissions.

Interconnecting cables were of the type and length specified in the individual equipment requirements.

Grounding was in accordance with the manufacturer requirements and conditions for intended use.
6.0 SUMMARY OF TESTS

The SYMPHONY ISA CARD is a wireless LAN adapter with a low power frequency hopping spread spectrum (FHSS) radio system operating in the 2400-2483.5 MHz band. Tests were performed with one antenna. Test firmware resident in the Host PC was used to do the test.

6.1 15.247(a)(1) FREQUENCY HOPPING SYSTEMS

SYMPHONY ISA CARD uses 79 channels, each 1 MHz wide. The system hops over one of 15 pseudorandom sequences. On average, each channel is used equally. Please refer to "RangeLAN2 Frequency Hopping Theory of Operation" attached to this submission for more details.

6.1.1 15.247(a)(1)(ii) CHANNEL UTILIZATION

A spectrum analyzer plots labeled “CHANNEL UTILIZATION”. The total number of channels is 79. The channels used have nominal center frequencies of 2402 through 2480 MHz. Three spectrum analyzer MAX HOLD plots labeled "BANDWIDTH" show the 20 dB bandwidth of the hopping channel to be < 1 MHz (.940 / .930 / .875 MHz) at the low, mid, and high frequencies of 2.402/2.440/2.480 GHz. Test Plots are shown in Appendix A.

Zero span spectrum analyzer plot labeled “DWELL TIME” shows worst case transmission time in a given slot: 400 ms elapsed time, <100 % duty
Maximum allowed: 400 msec.

Test Data in Appendix A.
6.1.2 15.247(b) MAXIMUM PEAK OUTPUT POWER

The three spectrum analyzer plots labeled "POWER OUT" show the maximum power of the hopping channel to be 20.0 dBm or 100 mW. The EUT was made to transmit uninterrupted random data on each of the low/mid/high channels. Test Plots are shown in Appendix A.

The output was taken from an N connector, through 1 foot of RG 142 cable, to Spectrum Analyzer set on Max Hold with no additional attenuation.

\[
\text{Power} = 20 \text{ dBm (peak reading)} + 1.0 \text{dB cable loss} = +21.0 \text{ dBm} / 126 \text{ mW EIRP} \\
\text{Limit: +30 dBm / 1 W maximum power}
\]

Antenna

\[
\text{EIRP} = +21.0 \text{ (peak power)} + 0 \text{ (peak gain, dBi)} = + 21.0 \text{ dBm / 126 mW EIRP} \\
\text{Limit: +36 dBm / 4 W maximum EIRP}
\]
6.1.3 **15.247(c) OUT OF BAND EMISSIONS**

The spectrum analyzer plots titled "OUT OF BAND - BAND EDGES" shows the output spectrum of the EUT while hopping one of the pseudorandom sequences and continuously transmitting packetized data. The analyzer was placed in MAX HOLD mode, and individual sweeps were recorded continually for 10 minutes with the same spectrum analyzer connection as was used for peak output power. The resultant plot shows that the EUT emissions remain inside the 2400 - 2483.5 MHz band when measured in >= 100 kHz bandwidth during operation.

The spectrum analyzer plots labeled "OUT OF BAND 30 MHz- 2.46 GHz", "OUT OF BAND 2.4 – 2.75 GHz ", and "OUT OF BAND 2.75 – 2.65 GHz" show that emissions measured in >= 100 kHz bandwidth are more than 20 dB below the highest level of the desired power outside of the 2400 - 2483.5 MHz band. **Test Plots are shown in Appendix A.**

6.1.4 **15.203 ANTEenna REQUIREMENT**

This product has an polarized SMB connector to provide unique coupling to the antenna. The Manufacture’s control drawings, and the antenna drawings are in [Appendix D](#).
6.1.5 **15.205 RESTRICTED BAND RADIATION LIMITS**

The EUT was placed on a wooden table resting on a turntable. The wooden table was approximately 1 meter above the ground plane of the 3 meter test site. The search antenna was moved in to 1 meter when necessary to improve the noise floor, and the appropriate range factor was applied. While the EUT was transmitting uninterrupted random data on each of the low/mid/high channels and with the spectrum analyzer on MAX HOLD, the turntable was rotated, and the search antenna raised and lowered in an attempt to maximize the received radiated emission level. **Test results are attached in Appendix B** in tabular form showing that no spurious signals were detected above the 74 dBuV/m peak/54dBuV/m average limits. Peak measurements were made with a RBW and VBW = 1Mhz. Average measurements were made with a RBW = 1 MHz and a VBW = 10 Hz.

6.1.6 **15.207 AC LINE CONDUCTED EMISSIONS**

The RF line conducted levels for emissions in the 0.45 - 30 MHz band must not exceed 250 µV when measured with a LISN. Attached graphs and tabular data show that emissions are below the 250 µV (48 dBµV) maximum allowed level. **Test Data is in Appendix C.**

6.1.7 **15.209 RADIATED EMISSIONS**

The attached table shows that the Class B radiated limits from 30 - 1000 MHz are not exceeded by the EUT. The EUT was operating normally with a combination of transmission and reception and hopping one of the fifteen pseudorandom sequences during this test. The EUT was placed near one edge of a wooden table resting on a turntable. The wooden table was approximately 1 meter above the ground plane of the 3 meter test site. The search antennas were located at 3 meters. Measurements were made in accordance with ANSI C63.4-1994. **Test Data is in Appendix D.**

Electronic Compliance Laboratories

________________________ _____________
Chris Byleckie              Date
Technical Director
APPENDIX A

SPREAD SPECTRUM PLOTS
Channel Utilization

ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 1.17dB
-79.05MHz

START 2.40000GHz
STOP 2.48350GHz
+RBW 100kHz VBW 100kHz SWP 50ms
Bandwidth

ATTEN 40dB
RL 30.0dBm
ΔMKR -.16dB
10dB/ 940kHz

CENTER 2.402000GHz
+RBW 30kHz
VBW 30kHz
SPAN 3.000MHz
SWP 50ms
Bandwidth

ATTEN 40dB
RL 30.0dBm
ΔMKR -33dB
10dB/ 930kHz

CENTER 2.440000GHz
*RBW 30kHz
VBW 30kHz
SPAN 3.000MHz
SWP 50ms
Bandwidth

ATTEN 40dB
RL 30.0dBm
10dB/875KHz

CENTER 2.480000GHz
+RBW 30kHz
VBW 30kHz
SPAN 3.000MHz
SWP 50ms

ΔMKR = -67dB
Dwell Time

ATTEN 40dB
RL 30.0dBm 10dB/400ms

CENTER 2.4400000000GHz
*RBW 100kHz VBW 100kHz *SWP 1.0sec

ΔMKR .16dB
Power Out

ATTEN 40dB
RL 30.0dBm
MKR 20.00dBm
10dB/2.402042GHz

CENTER 2.402000GHz
*SWP 50ms
*RBW 2.0MHz
*V BW 3.0MHz
SPAN 5.000MHz
Power Out

ATTEN 40dB
RL 30.00dBm 10dB/

MKR 20.00dBm
2.439842GHz

CENTER 2.440000GHz
SPAN 5.000MHz

RBW 2.0MHz VBW 3.0MHz SWP 50ms
Power Out

ATTEN 40dB
RL 30.0dBm

MKR 19.67dBm
10dB/ 2.479875GHz

CENTER 2.48000GHz
SPAN 5.000MHz
*RBW 2.0MHz  VBW 3.0MHz  *SWP 50ms
Out Of Band Emissions Band Edges

ATTEN 40dB
RL 30.0dBm 10dB/ -6.82MHz

START 2.400000GHz STOP 2.48350GHz
RBW 100kHz VBW 100kHz SWP 50ms
Out Of Band < 1 GHz

ATTEN 40dB
RL 30.0dBm

MKR -45.33dBm

10dB/ 1.156GHz

START 30MHz

*RBW 100kHz
VBW 100kHz
SWP 600ms

STOP 2.400GHz
Out Of Band 1 – 2.75 GHz

ATTEN 40dB
RL 30.0dBm

MKR -45.17dBm

10dB/ 2.5663GHz

START 2.4000GHz

STOP 2.7500GHz

RBW 100kHz VBW 100kHz SWP 88ms
Out of Band 2.75 – 26.5 GHz

ATTEN 40dB  MKR -26.83dBm
RL 30.0dBm  10dB/  26.50GHz

MKR 26.50 GHz
-26.83 dBm

START 2.75GHz  STOP 26.50GHz
+RBW 100kHz  VBW 100kHz  SWP 6.0sec
APPENDIX B

ANTENNA DRAWINGS
ELECTRICAL SPECIFICATIONS

- Operating frequency range: 2400-2500 MHz
- VSWR: 2:1
- Impedance: 50 Ohm
- Polarization: Vertical (antenna axis)
- Vertical 3 dB beamwidth: 120°
- Gain: 2 dBi
- Gain including cable: 0 dBi
- Radiation pattern: Omni directional in the Horizontal plane
- Power input: 1 Watt

MECHANICAL SPECIFICATIONS

- Overall length (including the cable): 1597 mm
- Weight: 60g
- Connector: polarized SMB
- Color: Black

ENVIRONMENTAL SPECIFICATIONS

- Operating Temperature: -30°C to +85°C
- Humidity: Up to 100% RH @ 38°C

Initiated on 05.05.98
Approval by Brochon

Note: The information given here is subject to change without notice. Design changes may be made in order to improve the product.
APPENDIX C

RESTRICTED BAND DATA
**FCC RADIATED DATA SHEET**

**DATE:** 6/5/98

**EUT:** ISA CARD

**CUSTOMER NAME:** PROXIM

**S/N:**

**WORK ORDER:** 8060502

**RULE PART:** 15.247

**FILE:** 8060502

**ANTENNA:** HORN VERT

**OTHER CAL FACTORS:**

- **ATTN dB:** 10
- **DUTY dB:** 0
- **HP IL dB:** 0
- **DIST dB:** 0

**MODULATION TYPE:**

**COMMENTS:**

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APPENDIX C
15.207
CONDUCTED EMISSIONS
Electronic Compliance Laboratories, Inc.  
1249 Birchwood Ave.  
Sunnyvale, CA  
Conducted Emissions  
Frequency range: 450KHz-30MHz  

Government Agency and Limit: FCC Class B  
------------------------------------------
QP = Quasi-Peak  Note: Ignore peak readings when Quasi-Peak reading exists  
PK = Peak  

Customer: PROXIM  
Operator: DONNIE  
Date: 06-05-1998  
Time: 11:56:37  
Temperature Range: 70 Deg F  
Percent Humidity: 50  
E.U.T.: SYMPHONY ISA CARD  

Support Devices:  
Serial Number:  
FCC ID:  
Exercise Program: None  
Modifications: None  
Report File Name: F:\TESTDATA\8060502.F  

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ACTV DET: PEAK
MEAS DET: PEAK QP AVG

MKR 1.41 MHz
24.50 dBμV

LOG REF 92.0 dBμV
10 dB/
ATN
10 dB

START 450 kHz
IF BW 9.0 kHz
AVG BW 30 kHz
STOP 30.00 MHz
SWP 2.46 sec
11:51:01 JUN 05, 1998

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 10.13 MHz
27.40 dBµV

LOG REF 92.0 dBµV

10 dB/
ATN
10 dB

START 450 kHz
IF BW 9.0 kHz
AVG BW 30 kHz
STOP 30.00 MHz
SWP 2.46 sec
Electronic Compliance Laboratories, Inc.
1249 Birchwood Ave.
Sunnyvale, CA
Radiated Emissions
Frequency range: 30MHz-1000MHz
3 Meter Open Site
Site Calibrated: June 1997
Government Agency and Limit: FCC Class B

QP = Quasi-Peak
PK = Peak
Note: Ignore peak readings when Quasi-Peak reading exists

Customer: PROXIM          Operator: DONNIE
Date: 06-05-1998          Time: 09:57:53
Temperature Range: 68 Deg F Percent Humidity: 55
E.U.T.: SYMPHAONY ISA CARD
Support Devices:
FCC ID:
Exercise Program: None
Modifications:
Report File Name: F:\TESTDATA\8060502.RF

Antenna Type: BICONICAL

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<th>ACTUAL dBuV/m</th>
<th>CLASS B LIMIT</th>
<th>VERSUS LIMIT</th>
<th>TABLE DEGREES</th>
<th>ANTENNA HEIGHT</th>
<th>POLARIZATION</th>
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CHANGED ANTENNA TO LOG PERIODIC

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<th>CLASS B LIMIT</th>
<th>VERSUS LIMIT</th>
<th>TABLE DEGREES</th>
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NOTES:

1. MATERIAL: 2 MIL VIOLET MYLAR WITH 1 MIL MATTE MYLAR LAMINATE AND 1 MIL PERMANENT ACRYLIC ADHESIVE.

2. GRAPHICS: BACKGROUND: BLACK
   TEXT AND BOX OUTLINE: SILVER
   RINGS: REFLEX BLUE

NEW ARTWORK (TED)
APPENDIX F

SET-UP PHOTOS
FCC 15.207 Class B
Conducted Emissions
FCC 15.209 Class B
Radiated Emissions

FCC 15.205 Restricted Band
Antenna
APPENDIX G

EUT PHOTOS
APPENDIX H

OWNERS MANUAL
Warranty Return Policy

If you have a problem with your RangerLAN product, please call Proxim Technical Support at 800/233-3640. Proxim Technical Support will assess with resolving any technical difficulties you may have with your Proxim product.

After calling Proxim Technical Support, if your product is found to be defective, you may return the product to Proxim after obtaining an RMA (Return Materials Authorization) number from Proxim Technical Support. The RMA must be returned in its original packaging. The RMA number should be clearly marked on the outside of the box. Proxim cannot be held responsible for any product returned without an RMA number, and no product will be accepted without an RMA number.

FCC WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE

Statement of Compliance

Information to User

The equipment has been tested and found to comply with the European Telecommunication Standard EN 300 328. This type of equipment is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

1. Introduction
   - The RangerLAN
   - Ethernet Options
   - System Setup
   - The Product

2. Quick Install
   - Antenna Options
   - Outside Installation
   - Inside Installation

3. Wireless Tog
   - Planning and Planning
   - One Stop
   - Multiple Users
   - The
   - Building to Building
   - Reaching
   - Running Scenarios
   - How to Configure
   - Ethernet Points

4. Configuration
   - Locally (Out-of-
   - Unsecure Sites
   - Main Menu
   - SNSL Manager
   - Remote Support

5. Configuration
   - TCP/IP Configures
   - Modem Configures
   - RMA Radio Cards
1. U.S. Specifications

The following technical specification is for reference purposes only. Actual product's performance and compliance with local telecommunications regulations may vary from country to country. Pervitin, Inc. will only ship products that are type approved in the destination country.

Data Rate (per port) 1.6 Mbps
Media Access Protocol RangeLAN CSMA/CA
Frequency Band 2.4-2.5 GHz Worldwide (Depends on country)
Independent Channels 15
Output Power 100 mW or 500 mW (Depends on country and mode)
IEEE Testing For purposes of ITS 300 3/8 type testing, the Extension Point was tested over a temperature range of -20 C to 55 C.
Operating Temperature -50 C to +60 C
UL Listed Power Supply The Extension Point requires an external power supply. If you have elected not to purchase the external power supply from Pervitin, or need a replacement, you must use only a UL listed, Class 2 power supply rated min. 1A at 12VDC.

FCC Notice Warning! It is the responsibility of the installer of these antennas, as well as the responsibility of the user of this product, to guarantee that each antenna is operated at least 20 cm (8 inches) from any person. This is necessary to ensure that the product is operated in accordance with the RF Guidelines for Human Exposure which have been adopted by the Federal Communications Commission.
APPENDIX I

CLIENT CONFIDENTIAL MATERIAL