ACME TESTING INC., 2002 VALLEY HWY, P.O. BOX 3, ACME, WASHINGTON 98220-0003 888-226-3837.

# REPORT OF MEASUREMENTS
# PART 15C (15.247) - INTENTIONAL RADIATOR

| | |
|---|---|
| DEVICE: | 2.4 GHZ 6 CHANNEL DIRECT SEQUENCE SPREAD SPECTRUM TRANSCEIVER |
| MODEL: | WRM1151 |
| MANUFACTURER: | WAVERIDER COMMUNICATIONS (CANADA) INC. |
| ADDRESS: | 6120 – 1A STREET S.W.<br>CALGARY ALBERTA<br>CANADA T2H 0G3 |

THE DATA CONTAINED IN THIS REPORT WAS
COLLECTED ON 25 & 26 MAY 2000 AND COMPILED BY:

PAUL G. SLAVENS
CHIEF EMC ENGINEER

WORK ORDER: 2354

*(Table of Contents Continued)*

# 1. General

## 1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for spread spectrum unlicensed devices operating under section 15.247 of the Code of Federal Regulations title 47.

## 1.2 Manufacturer

| | |
|---|---|
| Company Name: | WaveRider Communications (Canada) Inc. |
| Contact: | Ivan Rodrigues |
| Street Address: | 6120 – 1A Street S.W. |
| City/Province: | Calgary Alberta |
| Country/Postal Code: | Canada T2H 0G3 |
| Telephone: | 403 319-2350 |
| Fax: | 403 319-2359 |

## 1.3 Test location

| | |
|---|---|
| Company: | Acme Testing Inc. |
| Street Address: | 2002 Valley Highway |
| Mailing Address: | PO Box 3 |
| City/State/Zip: | Acme WA 98220-0003 |
| Laboratory: | Test Site 2 |
| Telephone: | 888 226-3837 |
| Fax: | 360 595-2722 |
| E-mail: | acmetest@acmetesting.com |
| Web: | www.acmetesting.com |
| Receipt of EUT: | 25 May 2000 |

## 1.4 Test Personnel

Paul G. Slavens, Chief EMC Engineer

## 2. Test Results Summary

Summary of Test Results

| Requirement | CFR Section | Test Result |
|---|---|---|
| Radiated Spurs < 15.209 | 15.205(b) | PASS |
| AC Emissions < 48 dBuV | 15.207 | PASS |
| 6 dB BW > 500 kHz | 15.247(a) | PASS |
| Max Output Power < 1 W | 15.247(a) | PASS |
| Antenna Gain Requirements | 15.247(b) | PASS |
| Radio Frequency Exposure | 15.247(b) | PASS |
| Conducted Spurious >-20 dBc | 15.247(c) | PASS |
| Power Density < 8dBm in 3 kHz | 15.247(d) | PASS |
| Process Gain > 10 dB | 15.247(e) | PASS |

The signed original of this report, supplied to the client, represents the only "official" copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing's discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) is factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the referenced standards and all applicable Public Notices received prior to the date of testing. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

Paul G. Slavens
Chief EMC Engineer

26 JUNE 2000
Date of Issuance

# 3. Description of Equipment and Peripherals

## 3.1 Equipment Under Test (EUT)

| | |
|---|---|
| Device: | Spread Spectrum Bridge |
| Model Number: | WRM1151 |
| FCC ID: | OOX-WRM1151 |
| Power: | 120 V/60 Hz |
| Grounding: | 3-Wire AC Plug |
| Antennas: | Dish, Yagi and Omni-directional |
| Number of Channels: | 6 |
| Lowest Frequency: | 2412 MHz |
| Highest Frequency: | 2462 MHz |

## 3.2 EUT Peripherals

The EUT was tested as a stand-alone device.

## 3.3 Description of Interface Cables for Emissions

**CPU and Transmitter Unit/Antenna**

| Shielded | Unshielded | Flat | Round | Length | Ferrite |
|---|---|---|---|---|---|
| Yes | No | No | Yes | 12 m (coiled) | No |

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

## 3.4 Mode of Operation During Tests

The EUT was exercised by transmitting a modulated signal on channels 1, 3 & 6. During radiated spurious emissions testing the EUT was tested with three (dish, yagi and omnidirectional) antennas

## 3.5 Modifications Required for Compliance

1. None.

# 4. Antenna requirement

## 4.1 Regulation

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

## 4.2 Result

The intentional radiator uses a standard connector, however the intentional radiator is only installed by professionals.

## 5. Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

### 5.1 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2410A-00168, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

⇒ RF Preselector: Hewlett-Packard 85685, Serial Number 2648A-00519, Calibrated: 12 March 1999, Calibration due Date: 12 March 2000

⇒ Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2043A-00327, Calibrated: 17 March 1999, Calibration due Date: 17 March 2000

⇒ Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 1 September 1999, Calibration due Date: 01 September 2000

### 5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the AC mains.

### 5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

| Conducted Emissions Test Characteristics | |
|---|---|
| Frequency range | 0.45 MHz - 30.0 MHz |
| Test instrumentation resolution bandwidth | 9 kHz |
| Lines Tested | Line 1/Line 2 |

## 5.4 Test Results

LINE 1
PEAK EMISSIONS

| PEAK # | FREQ. (MHz) | AMPL (dBuV) |
|---|---|---|
| 1 | 1.191 | 39.0 |
| 2 | 1.279 | 39.0 |
| 3 | 0.9986 | 37.8 |
| 4 | 1.02 | 37.8 |
| 5 | 1.385 | 37.8 |
| 6 | 0.7321 | 37.7 |
| 7 | 1.317 | 37.7 |
| 8 | 1.469 | 37.7 |

LINE 2
PEAK EMISSIONS

| PEAK # | FREQ. (MHz) | AMPL (dBuV) |
|---|---|---|
| 1 | 0.5104 | 35.9 |
| 2 | 14.22 | 35.9 |
| 3 | 0.9861 | 35.8 |
| 4 | 0.9221 | 35.1 |
| 5 | 1.072 | 31.5 |
| 6 | 1.186 | 31.0 |
| 7 | 1.29 | 31.0 |
| 8 | 3.023 | 31.0 |

A summary of the highest amplitude emissions is listed above. For detailed plots of all emissions from 0.45 MHz – 30 MHz, please refer to the accompanying data in the list of attachments.

# 6. 6 dB Bandwidth

## 6.1 Regulation

15.247(a2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

## 6.2 Test Equipment

⇒ Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2403A06519, Calibrated: 7 January 2000, Calibration due Date: 7 January 2001

⇒ RF Preselector: Hewlett-Packard 85685A, Serial Number 2926A00971, Calibrated: 17 March 2000, Calibration due Date: 17 March 2001

## 6.3 Test Procedures

The RF output of the EUT is connected to the RF input port of the RF reselector through a 10 dB pad. The following measurements were made with a RBW = 100 kHz and VBW = 300 KHz.

## 6.4 Test Results

⇒ The measured 6 dB bandwidth at channel 1 is 9.95 MHz.
⇒ The measured 6 dB bandwidth at channel 3 is 9.70 MHz.
⇒ The measured 6 dB bandwidth at channel 6 is 9.20 MHz.

Please see plots in the list of attachments.