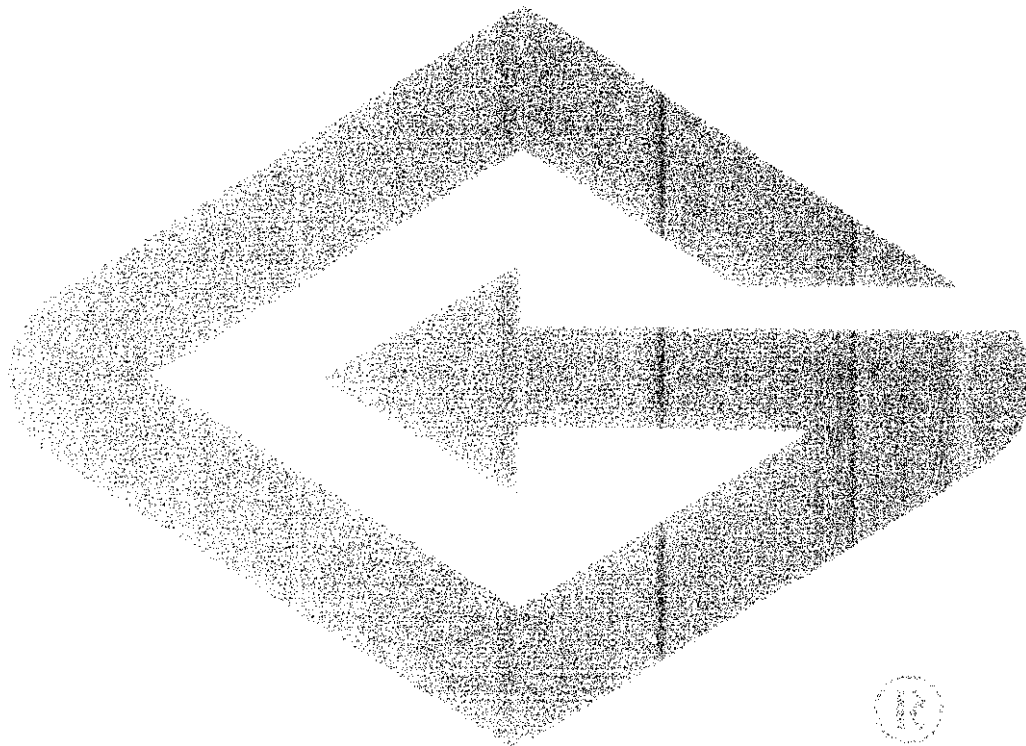




**FCC TEST REPORT**  
*for*  
**Laser Chaser**  
**Arena Transceiver**



***EMC Measurement / Technical Report***

***FCC Test Specification*** : Certification for FCC Part 15, Subpart C  
Section 15.207, 15.231(c) & 15.249

***Manufacturer*** : Laser Chaser

***Equipment Under Test*** : Arena Transceiver

***Test Report No.*** : TR1006OC

***Purchase Order No.*** : 64

| <b><i>Document History</i></b> |                          |                              |                                            |                          |                           |
|--------------------------------|--------------------------|------------------------------|--------------------------------------------|--------------------------|---------------------------|
| <b><i>Revision</i></b>         | <b><i>Issue Date</i></b> | <b><i>Affected Pages</i></b> | <b><i>Description of Modifications</i></b> | <b><i>Revised By</i></b> | <b><i>Approved By</i></b> |
| 0                              | 29 December, 1998        |                              | Initial release                            |                          |                           |
| 1                              | 4 June, 1999             | All                          | Retest                                     | E.N.                     |                           |
|                                |                          |                              |                                            |                          |                           |
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|                                |                          |                              |                                            |                          |                           |



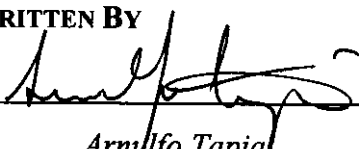
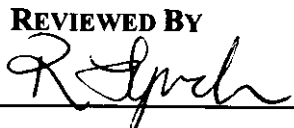
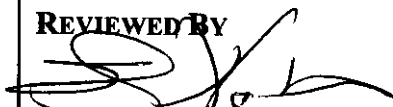
## **EMC Measurement / Technical Report**

**Document No. TR1006OC**

**From**

**Garwood Laboratories, Inc.  
World Compliance Division**

**Test for  
Laser Chaser  
Arena Transceiver**

|                                                                                                                                                               |                                                                                                                                                            |                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WRITTEN BY</b><br><br><i>Arnulfo Tapia</i><br><i>Sr. EMC Technician</i> | <b>REVIEWED BY</b><br><br><i>Robert Lynch</i><br><i>Quality Manager</i> | <b>REVIEWED BY</b><br><br><i>Ed Nakauchi</i><br><i>EMC Engineer</i><br><i>NARTE, Certified</i> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                   |                                 |
|-----------------------------------|---------------------------------|
| <b>Test Personnel</b>             | <b>Test Dates</b>               |
| Arnulfo Tapia- Sr. EMC Technician | 2, December 1998 & 20, May 1999 |

|                                                                                                      |                                                                                                            |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Test Facility</b><br><b>Address</b><br><b>City, State, Zip Code</b><br><b>Phone</b><br><b>Fax</b> | Garwood Laboratories, Inc.-OC<br>565 Porter Way<br>Placentia, CA 92870<br>(714) 572-2027<br>(714) 572-2025 |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|

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**MEASUREMENT / TECHNICAL REPORT SUMMARY**

|                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Manufacturer Company</b><br><b>Address</b><br><b>City, State, Zip</b><br><b>Country</b><br><b>Contact Name</b><br><b>Phone</b><br><b>Fax</b>                                        | Laser Chaser<br>1777 W. Arrow Route, Suite 305<br>Upland, CA 91786<br>USA<br>Craig Grim<br>909-946-2953<br>909-985-8983                                                                                                                                                                                                                                                                              |
| <b>Type of Authorization</b>                                                                                                                                                           | Certification for Intentional Radiators                                                                                                                                                                                                                                                                                                                                                              |
| <b>Applicable FCC Rules</b>                                                                                                                                                            | PART 15 - RADIO FREQUENCY DEVICES<br>Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 (10-1-96 Edition). The following subparts are applicable to the results in this test report:<br>Part 15, Subpart C – Intentional Radiators<br>Section: 15.207 Conducted Emission<br>Section 15.231(c) Occupied Bandwidth<br>Section 15.249 Radiated Emission |
| <b>Equipment Under Test</b>                                                                                                                                                            | Arena Transceiver                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Summary of Data</b>                                                                                                                                                                 | The EUT complies with the following sections of 47 CFR Ch.1 (10-1-96 Edition):<br><br>Part 15, Subpart C – Intentional Radiators<br>Section: 15.207, 15.231(c) & Section 15.249                                                                                                                                                                                                                      |
| <b>EMC Test Laboratory</b><br><b>Facility</b><br><b>Address</b><br><b>City, State, Zip Code</b><br><b>Country</b><br><b>Contact Name</b><br><b>Title</b><br><b>Phone</b><br><b>Fax</b> | Garwood Laboratories Incorporated<br>World Compliance Division<br>565 Porter Way<br>Placentia, CA 92870<br>USA<br>Jason Armstrong<br>General Manager<br>(714) 572-2027<br>(714) 572-2025                                                                                                                                                                                                             |



## **1. General Information**

### **1.1 Product Description**

|                                    |                                                                                                                                                                                                                                                                           |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Equipment Under Test</i></b> | Area Transceiver                                                                                                                                                                                                                                                          |
| <b><i>Description</i></b>          | The Area Transceiver is one piece of an RTS System used for laser tag games. The RTS system consists of a vest with a receiver and a transmitter, a laser gun, an arena transceiver, and a smart card programmer unit. This report applies only to the arena transceiver. |
| <b><i>Clock Frequencies</i></b>    | Arena transceiver 916.5MHz                                                                                                                                                                                                                                                |

Refer to the products data sheet which has been included as an Attachment to this report for additional details about the EUT.

### **1.2 Related Submittal(s)/ Grant(s)**

Peripherals tested with the EUT which contain FCC ID numbers can be located in the table in Section 3.6 of this report.

### **1.3 Tested System Description**

The Tested System was configured with all typical peripherals (or terminations) and operated to generate maximum emissions during the test. Refer to Section 3.5 for the Test Configuration and Section 3.6 the table lists all the details for Tested System components and cabling information. FCC ID numbers are included if available for a tested system component.



#### **1.4 Test Methodology**

Conducted emissions tests were performed according to the guidelines set forth in FCC Part 15, Subpart C, Section 15.207.

The Equipment Under Test (EUT) was setup in a shielded enclosure to perform conducted emissions measurements in a typical installation configuration. The EUT was powered from the 50VH/50Ω Line Impedance Stabilization Network (LISN). The LISN's unused connection were terminated with a 50Ω load. The amplitude levels (dBμV) of the emissions were maximized by varying the mode of operations of the EUT and cables. Measurements were performed from 450 kHz to 30 MHz in peak detection. The peak measurements within 5 dB of the specification limits were re-measured with the receiver in either the quasi-peak or average detection as required.

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 15, Subpart C, Section 15.249.

The field strength of emissions from an intentional radiator test was performed at a receiving antenna to EUT distance of 3 meters in the Open Area Test Site. Rotating the turntable 360 degrees and varying the antenna height 1 to 4 meters maximized the emissions. The field strength of the fundamental frequency and harmonics, up to the 10<sup>th</sup> harmonic, was measured utilizing a BiLog and Horn antenna. Measurements were made in both, vertical and horizontal antenna polarizations.

The radiated emissions test was performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).



### **1.5 Test Facility**

The open area test site (OATS) and measurement facilities used to collect the test data are located at Garwood Laboratories, Inc. World Compliance Division test facility in Placentia, CA. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated 29 January 1999 (31040/SIT 1300F2) registration #90681.

**The test facility is also recognized and accredited from following accreditation organizations:**

|                                                                                                        |                                                                                         |                               |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------|
| <b>Acemark Europe, Ltd.</b>                                                                            | Laboratory Number: 0007<br><i>ISO Guide 25, EN45001, and relevant parts of ISO 9002</i> | Dated: 03/17/97               |
| <b>Industry Canada</b>                                                                                 | Reference: IC 3298                                                                      | Dated: 03/11/99               |
| <b>I<sup>2</sup>T</b><br><i>(Interference Tech International)</i>                                      | Certificate Number: 99-051<br>CE Mark for European Country                              | Dated: 05/05/99               |
| <b>NVLAP</b><br><i>(NIST)</i>                                                                          | NVLAP Lab Code: 200119-0<br>CISPR, FCC, AUSTEL                                          | Effective Through<br>12/31/99 |
| <b>VCCI</b><br><i>(Voluntary Control Council for Interference by Information Technology Equipment)</i> | Registration #'s C574, C575, C576, R561                                                 | Effective Through<br>02/04/00 |



## **2. Product Labeling**

### **2.1 FCC ID Label**

Refer to Attachment Page C2 for FCC ID label and its location drawing for details.

**FCC ID: XXX 123...789**

### **2.2 Location of Label on EUT**

The label shall be located in a conspicuous place on the device consistent with the requirements of Section §15.19 of FCC CFR 47.

*This device complies with Part 15 of the FCC rules and regulations. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference including interference that may cause undesired operation.*

### **2.3 Information to user**

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- (a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- (b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

**NOTE:** 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 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 receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.



### **3. System Test Configuration**

#### **3.1 Justification**

The EUT was used in a system configured for testing in a typical fashion as a customer would normally use it.

#### **3.2 EUT Exercise Software/Equipment**

During testing, the arena transceiver was continuously transmitting. This unit transmits and receives continuously in order to keep track of the ongoing laser tag action on the game floor. The vest transmitter only transmits for a quick and short period of time when the vest is hit by a laser shot. During testing, the laser gun was used to activate the vest transmitter.

#### **3.3 Special Accessories**

The EUT requires no special accessories to comply with the limits.

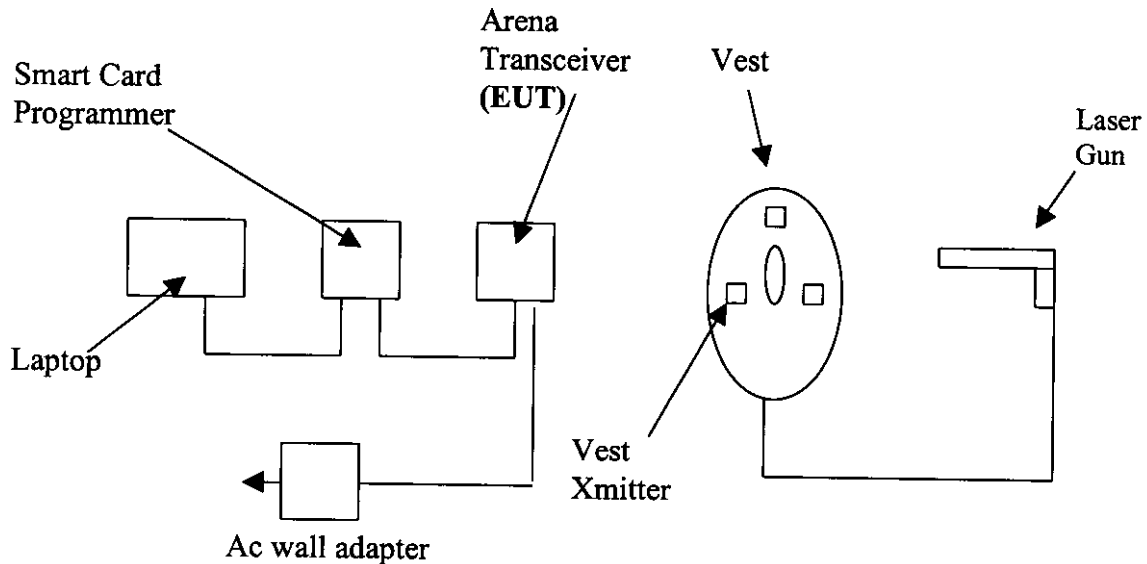
#### **3.4 Equipment Modifications**

The following modification was made to achieve the required specification limit.

1. The antenna for the arena transceiver was changed.



### 3.5 Configuration of Tested System



### 3.6 Details of Tested System

The following table lists all of the components of the tested system. FCC ID numbers are included if available for a tested system component. Refer to the table following Tested System Details for cabling information.

| <i><b>Item No.</b></i> | <i><b>Manufacturer</b></i> | <i><b>Description</b></i> | <i><b>Identification Numbers</b></i>                                 |
|------------------------|----------------------------|---------------------------|----------------------------------------------------------------------|
| 1                      | Laser Chaser               | Vest                      | Model No: Refer to the Manufacture<br>Serial No.:                    |
| 2                      | Laser Chaser               | Laser Gun                 | Model No: Refer to the Manufacture<br>Serial No.:                    |
| 3                      | Laser Chaser               | Smart Card Programmer     | Model No: Refer to the Manufacture<br>Serial No.:                    |
| 4                      | Laser Chaser               | Arena Transceiver (EUT)   | Model No: Refer to the Manufacture<br>Serial No:                     |
| 5                      | Compudyne                  | Laptop                    | Model No: N386SXE<br>Serial No.: 3530A0R21J0279<br>FCC ID: IIRBC380A |



**Garwood Laboratories, Inc. - World Compliance Division**  
*Electromagnetic Compatibility*

The following table lists all of the cabling details for the tested system. Refer to 3.5 configuration of tested system.

| <i>Cabling of The Tested System</i> |                     |                   |                                              |                       |                       |
|-------------------------------------|---------------------|-------------------|----------------------------------------------|-----------------------|-----------------------|
| <i>Item No.</i>                     | <i>Description</i>  | <i>Length (m)</i> | <i>Type<br/>Shielded-S<br/>Unshielded-US</i> | <i>Connected From</i> | <i>Connected To</i>   |
| A                                   | DB-9 Serial Cable   | 2.0               | Shielded                                     | Laptop                | Smart Card Programmer |
| B                                   | DB-9 Serial Cable   | 2.0               | Unshielded                                   | Smart Card Programmer | Arena Transceiver     |
| C                                   | Vest to Gun Harness | 1.0               | Shielded                                     | Vest                  | Gun                   |



**4. BLOCK DIAGRAM(S) OF EUT**

Please consult the manufacturer for all block diagrams, circuit layout, and component information.



## 6. TEST DATA

### 6.1 Conducted Emissions Limits

| <i>FCC Part 15, Subpart C, Section 15.207</i> |                                            |
|-----------------------------------------------|--------------------------------------------|
| <i>Frequency Range (MHz)</i>                  | <i>Class B Limit (dB<math>\mu</math>V)</i> |
| 0.45 to 1.705                                 | 48                                         |
| 1.705 to 30.0                                 | 48                                         |

### 6.2 Conducted Emissions Results

The highest emissions are listed in the tables below.

| <i>Worst-Case Conducted Emissions (Compared To The Quasi-Peak Limit Line)</i> |                        |                       |                                                |                                                |                        |
|-------------------------------------------------------------------------------|------------------------|-----------------------|------------------------------------------------|------------------------------------------------|------------------------|
|                                                                               | <i>Frequency (MHz)</i> | <i>Detection Mode</i> | <i>Corrected Reading (dB<math>\mu</math>V)</i> | <i>Delta To QP Limit (dB<math>\mu</math>V)</i> | <i>Sensor Location</i> |
| 1.                                                                            | 0.4576                 | QP                    | 40.9                                           | -7.1                                           | Line 1                 |
| 2.                                                                            | 0.5278                 | QP                    | 36.2                                           | -11.8                                          | Line 1                 |
| 3.                                                                            | 0.5481                 | Peak                  | 41                                             | -7.0                                           | Line 1                 |
| 4.                                                                            | 0.5621                 | Peak                  | 39.9                                           | -8.1                                           | Line 1                 |
| 5.                                                                            | 0.5716                 | Peak                  | 39.2                                           | -8.8                                           | Line 1                 |
| 6.                                                                            | 0.5837                 | Peak                  | 37.9                                           | -10.1                                          | Line 1                 |

The highest emissions are listed in the table below.

| <i>Worst-Case Conducted Emissions (Compared To The Quasi-Peak Limit Line)</i> |                        |                       |                                                |                                                |                        |
|-------------------------------------------------------------------------------|------------------------|-----------------------|------------------------------------------------|------------------------------------------------|------------------------|
|                                                                               | <i>Frequency (MHz)</i> | <i>Detection Mode</i> | <i>Corrected Reading (dB<math>\mu</math>V)</i> | <i>Delta To QP Limit (dB<math>\mu</math>V)</i> | <i>Sensor Location</i> |
| 1.                                                                            | 0.4615                 | Peak                  | 43.4                                           | -4.6                                           | Line 2                 |
| 2.                                                                            | 0.4713                 | Peak                  | 42.5                                           | -5.5                                           | Line 2                 |
| 3.                                                                            | 0.9697                 | Peak                  | 40.6                                           | -7.4                                           | Line 2                 |
| 4.                                                                            | 0.9779                 | Peak                  | 40.6                                           | -7.4                                           | Line 2                 |
| 5.                                                                            | 0.9456                 | Peak                  | 40.5                                           | -7.5                                           | Line 2                 |
| 6.                                                                            | 0.9576                 | Peak                  | 40.5                                           | -7.5                                           | Line 2                 |



### 6.3 Radiated Spurious Emissions Limits

| <i>FCC Part 15, Subpart C, Section 15.249</i> |                                                             |                                                           |
|-----------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|
| <i>Fundamental frequency</i>                  | <i>Field Strength of Fundamental<br/>(millivolts/meter)</i> | <i>Field Strength of Harmonics<br/>(microvolts/meter)</i> |
| 902 – 928 MHz                                 | 50                                                          | 500                                                       |
| 2400 – 2486.5 MHz                             | 50                                                          | 500                                                       |
| 5725 – 5875 MHz                               | 50                                                          | 500                                                       |
| 24.0 – 24.25 MHz                              | 250                                                         | 2500                                                      |

The applicable limits for the Arena Transceiver are those listed for fundamental frequencies falling within the band of 902 – 928 MHz.



#### 6.4 Radiated Spurious Emissions Results

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable, preamplifier and antenna corrections), the corrected reading, plus the limit.

EUT Name: Arena Transceiver

Test Results: Field Strength and Spurious Emissions Measurements (Reference: FCC Part 15, Subpart C, Section 15.249)

Fundamental Frequency tuned at: 916.5 MHz

| Antenna Polarity (V or H) | Frequency (MHz) | S.A. Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB)       | Pre-Amp Gain (dB) | QP Field Strength (dBuV/m) | QP Field Strength (uV/m) | FCC Limit 3 meters (uV/m) |
|---------------------------|-----------------|---------------------|---------------------|-----------------------|-------------------|----------------------------|--------------------------|---------------------------|
| V                         | 916.5           | 89.0                | 23.4                | Gain/Loss Factor 18.4 |                   | 93.8                       | 48,978                   | 50,000.0                  |
| H                         | 916.5           | 94.4                | 23.4                | Gain/Loss Factor 18.4 |                   | 89.9                       | 31,261                   | 50,000.0                  |
| V                         | 1833            | 47.6                | 27.3                | 5.7                   | 37.59             | 43.01                      | 141.4                    | 500.0                     |
| H                         | 1833            | 48.4                | 27.3                | 5.7                   | 37.59             | 43.81                      | 155.06                   | 500.0                     |
| V                         | 2749.5          | NDS                 | 29.6                | 9.8                   | 36.85             | NDS                        | NDS                      | 500.0                     |
| H                         | 2749.5          | NDS                 | 29.6                | 9.8                   | 36.85             | NDS                        | NDS                      | 500.0                     |
| V                         | 3666            | NDS                 | 30.5                | 12.2                  | 36.50             | NDS                        | NDS                      | 500.0                     |
| H                         | 3666            | NDS                 | 30.5                | 12.2                  | 36.50             | NDS                        | NDS                      | 500.0                     |
| V                         | 4582.5          | 18.3                | 32.0                | 14.8                  | 36.10             | 29.0                       | 28.19                    | 500.0                     |
| H                         | 4582.5          | 20.7                | 32.0                | 14.8                  | 36.10             | 31.4                       | 37.2                     | 500.0                     |
| V                         | 5499            | NDS                 | 34.2                | 16.0                  | 35.95             | NDS                        | NDS                      | 500.0                     |
| H                         | 5499            | NDS                 | 34.2                | 16.0                  | 35.95             | NDS                        | NDS                      | 500.0                     |
| V                         | 6415.5          | NDS                 | 35.5                | -                     | 36.03             | NDS                        | NDS                      | 500.0                     |
| H                         | 6415.5          | NDS                 | 35.5                | -                     | 36.03             | NDS                        | NDS                      | 500.0                     |
| V                         | 7332            | NDS                 | 37.4                | -                     | 36.16             | NDS                        | NDS                      | 500.0                     |
| H                         | 7332            | NDS                 | 37.4                | -                     | 36.16             | NDS                        | NDS                      | 500.0                     |
| V                         | 8248.5          | NDS                 | 37.6                | -                     | 36.51             | NDS                        | NDS                      | 500.0                     |
| H                         | 8248.5          | NDS                 | 37.6                | -                     | 36.51             | NDS                        | NDS                      | 500.0                     |
| V                         | 9165            | NDS                 | 37.2                | -                     | 36.65             | NDS                        | NDS                      | 500.0                     |
| H                         | 9165            | NDS                 | 37.2                | -                     | 36.65             | NDS                        | NDS                      | 500.0                     |

**Test Personnel:**

Arnulfo Tapia - EMC Sr. Test Technician



### **6.5 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:

$$FS = RA + AF + CF - AG$$

Where: FS = Field strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier gain

Example:

Assume a receiver reading of 52.5 dB $\mu$ V is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$



#### 6.6 Occupied Bandwidth

| <i>FCC Part 15, Subpart C, Section 15.231(c)</i> |                                             |
|--------------------------------------------------|---------------------------------------------|
| <i>Operating Frequency</i>                       | <i>Bandwidth of the Emission Allowed</i>    |
| Above 70 MHz &<br>Below 900 MHz                  | No wider than 0.25% of the center frequency |
| Above 900 MHz                                    | No wider than 0.5% of the center frequency  |

The Bandwidth is determined at the points 20 dB down from the modulated carrier.

#### Results:

The Bandwidth of the emission allowed for the Arena Transceiver was calculated to be 4.5 MHz (0.5% of 916.5 MHz). The emission from the Arena Transceiver was within the allowable bandwidth requirements. Detail plots are attached in appendix B.



## APPENDIX A - TEST EQUIPMENT USED

A complete list of test equipment used for each test can be found in their perspective test procedure. The absolute performance calibration, of the equipment requiring calibration, is performed on an as needed basis in accordance with MIL-STD-45662. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least +/- 2 dB amplitude and +/-2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file Garwood Laboratories, Inc. All equipment is checked and verified for proper operation before and after each series of tests.

### A.1 Specific Equipment Used

| <i>Test Instrument</i>               | <i>Mfg / Model No.</i>    | <i>Serial No.</i> | <i>Cal. Due Date</i> |
|--------------------------------------|---------------------------|-------------------|----------------------|
| <b>Radiated Emissions Test</b>       |                           |                   |                      |
| Spectrum Analyzer                    | Hewlett Packard / 8566B   | A17517            | 04/22/00             |
| BiLog Antenna                        | Chase / CBL6111A          | 1823              | 04/12/00             |
| Preamplifier (30-1000MHz)            | ISCI / ZFL-2000           | 017               | 03/05/00             |
| RF Coax Cable                        | Times Microwave / LMR-600 | 030               | 03/05/00             |
| Preamplifier (Above 1000MHz)         | Hewlett Packard / 8449B   | 0357              | 10/14/99             |
| Double Ridge Guide Horn Antenna      | Emco / 3115               | 9511-4575         | 1/10/00              |
| <b>Conducted Emissions Test</b>      |                           |                   |                      |
| EMI Receiver System                  | Hewlett Packard / 8574A   | 23837A00824       | 11/25/99             |
| Line Impedance Stabilization Network | ISCI / 3PH-20A            | 010               | 03/16/00             |
| RF Coax Cable                        | Pasternack / RG223        | 020               | 12/02/99             |



**APPENDIX B – SUPPLEMENTAL TEST DATA**

| <i>Test Type</i>    | <i>Basic Standard</i>                      | <i>Details</i>                            | <i>Data Format</i>   | <i>Page No.</i> |
|---------------------|--------------------------------------------|-------------------------------------------|----------------------|-----------------|
| Conducted Emissions | FCC Part 15<br>Subpart C<br>Section 15.207 | Line 1 and Line 2,<br>Peak and Quasi-peak | Plotted<br>Tabulated | D1-D4           |

hp  
87

GARWOOD LABORATORIES INC.  
EMISSION LEVEL [ dBuV]

20 May 1999 10:55:35  
PEAK QUASI-PEAK

FCC Pt 15 - CONDUCTED  
LASER CHASER  
EUT: ARENA TRANCEIVER  
M/N: N/A S/N: N/A  
AC HI. 115VAC/60Hz

67

47

27

7

CLASS B

.45

1

10

30

FREQUENCY [MHz]

hp  
87

GARWOOD LABORATORIES INC.  
EMISSION LEVEL [ dBuV]

20 May 1999 11:14:50  
PEAK

FCC Pt 15 - CONDUCTED  
LASER CHASER  
EUT: ARENA TRANCEIVER  
M/N: N/A S/N: N/A  
AC RETURN, 120VAC/60Hz

67

47

27

7

CLASS B

.45

1

10

30

FREQUENCY [MHz]

GARWOOD LABORATORIES INC  
EMI TEST DATA

DATE: 20 MAY, 1999 TEST NO.: 1  
TITLE OF TEST: FCC PART 15 CLASS B, CONDUCTED EMISSIONS  
CUSTOMER: LASER CHASER  
EUT DESCRIPTION: ARENA TRANCEIVER  
MODEL NO.: N/A SERIAL NO.: N/A  
TEST MODE: TRANSMITTING 916.5 MHz, TYPICAL OPERATION  
SENSOR LOCATION: AC HI SENSOR POL.: N/A  
FREQUENCY RANGE: .450 - 30 MHz  
TEST PERFORMED BY: K.VU TEMP. 71 F. HUM. 52 %  
TEST RESULTS: COMPLIED  
TEST CONDITIONS: 120VAC/60Hz

=====

GARWOOD LABORATORIES INC. 20 May 1999 10:55:35

=====

1. ARENA TRANCEIVER  
1.1 FCC Pt 15 - CONDUCTED

=====

LASER CHASER  
EUT: ARENA TRANCEIVER  
M/N: N/A, S/N: N/A  
AC HI, 120VAC/60Hz

25 highest Peaks above -30 dB of Limit Line #1  
peak criteria = .1 dB

| PEAK# | FREQ (MHz) | (dBuV) | DELTA |
|-------|------------|--------|-------|
| 1     | .4576      | 47.7   | -.3   |
| 2     | .4615      | 47.6   | -.4   |
| 3     | .4853      | 46.5   | -1.5  |
| 4     | .4914      | 45.9   | -2.1  |
| 5     | .4977      | 45.6   | -2.4  |
| 6     | .5168      | 43.6   | -4.4  |
| 7     | .5481      | 41     | -7.0  |
| 8     | .5621      | 39.9   | -8.1  |
| 9     | .5716      | 39.2   | -8.8  |
| 10    | .5837      | 37.9   | -10.1 |
| 11    | .9068      | 37.7   | -10.3 |
| 12    | .8768      | 37.5   | -10.5 |
| 13    | .8444      | 37.4   | -10.6 |
| 14    | .8586      | 37.4   | -10.6 |
| 15    | .8954      | 37.4   | -10.6 |
| 16    | .5961      | 37     | -11.0 |
| 17    | .9183      | 37     | -11.0 |
| 18    | .8303      | 36.9   | -11.1 |
| 19    | .9299      | 36.7   | -11.3 |
| 20    | .8131      | 36.5   | -11.5 |
| 21    | .9377      | 36.5   | -11.5 |
| 22    | .6062      | 36.3   | -11.7 |
| 23    | .9496      | 36.1   | -11.9 |
| 24    | .9576      | 36.1   | -11.9 |
| 25    | .7962      | 35.9   | -12.1 |

GARWOOD LABORATORIES INC  
EMI TEST DATA

DATE: 20 MAY, 1999 TEST NO.: 1  
TITLE OF TEST: FCC PART 15 CLASS B, CONDUCTED EMISSIONS  
CUSTOMER: LASER CHASER  
EUT DESCRIPTION: ARENA TRANCEIVER  
MODEL NO.: N/A SERIAL NO.: N/A  
TEST MODE: TRANSMITTING 916.5 MHz, TYPICAL OPERATION  
SENSOR LOCATION: AC HI SENSOR POL.: N/A  
FREQUENCY RANGE: .450 - 30 MHz  
TEST PERFORMED BY: K.VU TEMP. 71 F. HUM. 52 %  
TEST RESULTS: COMPLIED  
TEST CONDITIONS: 120VAC/60Hz

=====

GARWOOD LABORATORIES INC. 20 May 1999 10:55:35

=====

1. ARENA TRANCEIVER  
1.1 FCC Pt 15 - CONDUCTED

=====

LASER CHASER  
EUT: ARENA TRANCEIVER  
M/N: N/A, S/N: N/A  
AC HI, 120VAC/60Hz

25 highest Quasi-Peaks above -40 dB of Limit Line #1  
peak criteria = .1 dB

| PEAK# | FREQ (MHz) | (dBuV) | DELTA |
|-------|------------|--------|-------|
| 1     | .4576      | 40.9   | -7.1  |
| 2     | .5278      | 36.2   | -11.8 |

GARWOOD LABORATORIES INC  
EMI TEST DATA

DATE: 20 MAY, 1999 TEST NO.: 2  
TITLE OF TEST: FCC PART 15 CLASS B, CONDUCTED EMISSIONS  
CUSTOMER: LASER CHASER  
EUT DESCRIPTION: ARENA TRANCEIVER  
MODEL NO.: N/A SERIAL NO.: N/A  
TEST MODE: TRANSMITTING 916.5 MHz, TYPICAL OPERATION  
SENSOR LOCATION: AC RETURN SENSOR POL.: N/A  
FREQUENCY RANGE: .450 - 30 MHz  
TEST PERFORMED BY: K.VU TEMP. 71 F. HUM. 52 %  
TEST RESULTS: COMPLIED  
TEST CONDITIONS: 120VAC/60Hz

=====

GARWOOD LABORATORIES INC. 20 May 1999 11:14:50

=====

1. ARENA TRANCEIVER  
1.1 FCC Pt 15 - CONDUCTED

=====

LASER CHASER  
EUT: ARENA TRANCEIVER  
M/N: N/A, S/N: N/A  
AC RETURN, 120VAC/60Hz

25 highest Peaks above -30 dB of Limit Line #2  
peak criteria = .1 dB

| PEAK# | FREQ (MHz) | (dBuV) | DELTA |
|-------|------------|--------|-------|
| 1     | .4615      | 43.4   | -4.6  |
| 2     | .4713      | 42.5   | -5.5  |
| 3     | .9697      | 40.6   | -7.4  |
| 4     | .9779      | 40.6   | -7.4  |
| 5     | .9456      | 40.5   | -7.5  |
| 6     | .9576      | 40.5   | -7.5  |
| 7     | .4812      | 40.4   | -7.6  |
| 8     | .9945      | 40.3   | -7.7  |
| 9     | .926       | 40.2   | -7.8  |
| 10    | .903       | 40.1   | -7.9  |
| 11    | .53        | 39.9   | -8.1  |
| 12    | 1.011      | 39.9   | -8.1  |
| 13    | .5234      | 39.8   | -8.2  |
| 14    | .5435      | 39.8   | -8.2  |
| 15    | .5147      | 39.6   | -8.4  |
| 16    | 1.028      | 39.6   | -8.4  |
| 17    | .5367      | 39.5   | -8.5  |
| 18    | .5597      | 39.5   | -8.5  |
| 19    | .5644      | 39.5   | -8.5  |
| 20    | .8805      | 39.3   | -8.7  |
| 21    | .5764      | 39.2   | -8.8  |
| 22    | .4894      | 39.1   | -8.9  |
| 23    | .5061      | 39.1   | -8.9  |
| 24    | .5692      | 39.1   | -8.9  |
| 25    | .8659      | 39.1   | -8.9  |



## ATTACHMENTS

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