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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C Specifications for an Intentional Radiator on the ShareWave, Inc. Model: Cresta II Modular Radio

FCC ID:	N9PSW22450
GRANTEE:	ShareWave, Inc. 5175 Hillsdale Circle El Dorado Hills, CA. 95762
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	March 2, 2000
FINAL TEST DATE:	December 20, 1999
AUTHORIZED SIGNATORY:	Mark R. Briggs Manager, EMC Consulting Services

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SCOPE

An electromagnetic emissions test has been performed on the ShareWave, Inc. Spread Spectrum Radio Transmitter model Cresta II Modular Radio pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been 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.

The test results recorded herein are based on a single type test of the ShareWave, Inc. model Cresta II Modular Radio and therefore apply only to the tested sample. The sample was selected and prepared by Alan Morrow of ShareWave, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization 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 which are subsequently manufactured.

STATEMENT OF COMPLIANCE

The tested sample of ShareWave, Inc. model Cresta II Modular Radio complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators.

Maintenance of FCC compliance 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.).

EMISSION TEST RESULTS

The following emissions tests were performed on the ShareWave, Inc. model Cresta II Modular Radio. The actual test results are contained in an exhibit of this report.

LIMITS OF CONDUCTED INTERFERENCE VOLTAGE

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.207.

The following measurement was extracted from the data recorded during the conducted emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

0.45 – 30.00 MHz, 120V, 60Hz, Medium Channel 2437 MHz

Frequency MHz	Level dBuV	Power Lead	spec Limit	spec Margin	Detector QP/Ave	Comments
11.830	42.3	Neutral	48.0	-5.7	QP	

LIMITS OF ANTENNA CONDUCTED POWER

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247.

All out-of-band emissions recorded in any 100 kHz band were more than 40 dB below the highest in-band (intentional) level. The actual test data and any correction factors are contained an exhibit of this report.

LIMITS OF RADIATED INTERFERENCE FIELD STRENGTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247 and 15.209 in the case of emissions falling within the frequency bands specified in Section 15.205.

The following measurement was extracted from the data recorded during the radiated electric field emissions scan and represents the highest amplitude emission relative to the specification limit. The actual test data and any correction factors are contained in an exhibit of this report.

30 – 24000 MHz, High Channel 2462 MHz

Frequency MHz	Level dBuV/m	Pol v/h	FCC 15.209 Limit	FCC 15.209 Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
2484.950	68.5	V	74.0	-5.5	Pk	0	1.0	1 MHz avg bw no pre amp. Band Edge, no filter

LIMITS OF POWER AND BANDWIDTH

The EUT tested complied with the limits detailed in FCC Rules Part 15 Section 15.247.

The maximum power output was 17.7 dBm on the low/center channels. The power spectral density was measured to be 0.1dBm/3khz on the center channel. The minimum 6 dB bandwidth was 6.5 Megahertz on the low channel.

The manufacturer stated that the peak power was 23dBm. The rationale for this value, based upon the fact that the 17.7dBm measurement was made with a thermister power head, is included with the test data in an exhibit of this report.

The actual test data and any correction factors are contained in an exhibit of this report.

PROCESSING GAIN

The minimum processing gain, after discarding 20% of the measurements with the lowest Processing Gain, was measured by the manufacturer to be 12.5dB.

The actual test data and any correction factors are contained in an exhibit of this report.

SPECIFIC ABSORPTION RATE

The SAR report for the PowerWave antenna with an input power of 19.3dBm is included an appendix of this report.

MEASUREMENT UNCERTAINTIES

ISO Guide 25 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.2

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The ShareWave, Inc. model Cresta II Modular Radio is a modular spread spectrum radio that uses Direct Sequence spreading code. The EUT is designed for use as a module in Lan and other devices. The sample was received on December 20, 1999 and tested on December 20, 1999. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	FCC ID Number
Shareware/ Crest II Modular Radio/ wireless LAN	FCC1	N9PSW2-2450 (proposed)
Sharewave Antenna/ Powerwave/ Antenna	N/A	N9PSW1-2450

INPUT POWER

The EUT power is derived from the power supply of the host unit. For testing, a PC interface card was used to provide power to the EUT.

PRINTED WIRING BOARDS

The EUT contained the following printed wiring boards during emissions testing:

Manufacturer/Description	Assembly #	Rev.	Serial #	Crystals (MHz)
Shareware/ Modular radio	301-0118-000	D	FCC1	44

SUBASSEMBLIES

The EUT did not contain subassembly modules during emissions testing.

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host device. The PCB has sheet metal shields on both sides. It measures approximately 5 cm wide by 9 cm deep by 1 cm high.

EMI SUPPRESSION DEVICES

The EUT did not contain EMI suppression devices during emissions testing.

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:

Manufacturer/Model/Description	Serial Number	FCC ID Number
Dell/ M2005/ PC	-	-
Dell/ D1025TM/ Monitor	840519	D102STM
Dell/ SK-1000REW/ Keyboard	3862A	GYUR43SK
Microsoft/ Intellimouse/ Mouse	00364949	C3KKMPS

No remote support equipment was used during emissions testing.

EXTERNAL I/O CABLING

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

Cable Description	Length (m)	From Unit/Port	To Unit/Port
Radio Cable	1	PC LAN Port	Radio
AC Power Cord	2	AC / Mains	CPU/AC Input
Monitor AC Power Cord	2	AC / Mains	Monitor / AC Input
Monitor cable	2	Monitor / VGA Input	CPU / VGA Out
Mouse cable	2	CPU / Mouse	Mouse
Keyboard	2	Keyboard / Out	CPU / keyboard input

TEST SOFTWARE

The EUT was set to operate transmitting continuously, programmable to 1 of 3 channels. All three channels were tested.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on December 20, 1999 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure 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 CISPR 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. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and thermister mount are used for all direct 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 LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude 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 entire 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.

ANSI C63.4 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 exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is 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.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS, SECTION 15.207

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1:Test Equipment Calibration Data

Test Equipment List - SVOATS#2

December 6, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☑	Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	6/10/1999	6/10/2000
☐	EMCO	Biconical Antenna, 30-300 MHz	3110B	801	11	12/1/1999	12/1/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	486	12	3/24/1999	3/24/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/1999	1/15/2000
☑	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/25/1999	9/25/2000
☐	EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	788	12	1/16/1999	1/16/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	955	12	4/17/1999	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	956	12	4/17/1999	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	957	12	4/17/1999	4/17/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/1999	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	12/3/1999	12/3/2000
☐	Hewlett Packard	Microwave Preamplifier,	8449B	785	12	12/2/1999	12/2/2000
☐	Hewlett Packard	Microwave Preamplifier,	8449B	870	12	11/15/1999	11/15/2000
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/1999	2/17/2000
☐	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/1999	1/18/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/1999	2/17/2000
☐	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/1999	4/23/2000
☑	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/1999	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/1999	8/10/2000
☑	Rohde & Schwarz	Pulse Limiter	ESH3Z2	372	12	6/10/1999	6/10/2000
☑	Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	775	12	6/10/1999	6/10/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	12	3/26/1999	3/26/2000
☑	HP	Pre Amp	8449B	263	12	8/4/99	8/4/2000
☑	HP	Analyzer	8593EM	221	12	11/8/99	11/8/2000
☑	Solar Elect	Support LISN	8028-50-TS-24BNC (379)		12	6/10/99	6/10/2000

File Number: T35037

Date: 12/13/99

Engr: Juan Banh

All calibration of equipment is traceable to a national standard of measurement such as NIST.

Test Equipment List - SVOATS#2

December 6, 1999

	Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☐	Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	6/10/1999	6/10/2000
☐	EMCO	Biconical Antenna, 30-300 MHz	3110B	801	11	12/1/1999	12/1/2000
☑	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	~~486~~ 487	12	3/24/1999	3/24/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	786	12	1/15/1999	1/15/2000
☐	EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/25/1999	9/25/2000
☐	EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	788	12	1/16/1999	1/16/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	955	12	4/17/1999	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	956	12	4/17/1999	4/17/2000
☐	Filtek	High Pass Filter	HP12/1000-5B	957	12	4/17/1999	4/17/2000
☐	Hewlett Packard	EMC Receiver /Analyzer	8595EM	780	12	1/4/1999	1/4/2000
☐	Hewlett Packard	EMC Recever /Analyzer	8595EM	787	12	12/3/1999	12/3/2000
☐	Hewlett Packard	Microwave Preamplifier,	8449B	785	12	12/2/1999	12/2/2000
☑	Hewlett Packard	Microwave Preamplifier,	8449B	870	12	11/15/1999	11/15/2000
☐	Hewlett Packard	Power Meter	432A	259, (F304)	12	2/17/1999	2/17/2000
☑	Hewlett Packard	Spectrum Analyzer	8563E	284, (F194)	12	1/18/1999	1/18/2000
☐	Hewlett Packard	Thermistor Mount	478A	652	12	2/17/1999	2/17/2000
☑	Narda West	EMI Filter 2.4 GHz, High Pass	60583 HPF-161	248	12	4/23/1999	4/23/2000
☐	Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/1999	4/29/2000
☐	Narda West	High Pass Filter	HPF 180	821	12	8/10/1999	8/10/2000
☐	Rohde & Schwarz	Pulse Limiter	ESH3Z2	372	12	6/10/1999	6/10/2000
☐	Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	775	12	6/10/1999	6/10/2000
☐	Solar Electronics	Support Equipment LISN,	8012-50-R-24-B	305, (F111)	12	3/26/1999	3/26/2000

File Number: T35084

Date: 12/16/99

Engr: Jay Dickinson

All calibration of equipment is traceable to a national standard of measurement such as NIST.

Test Equipment List - SVOATS#

December 21, 1999

Manufacturer/Description		Model	Asset #	Interval	Last Cal	Cal Due
☒ Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	6/10/99	6/10/2000
☒ Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263, (F303)	12	8/3/99	8/3/2000
☒ Narda West	EMI Filter 5.6 GHz, High Pass	60583 HXF370	247	12	4/29/99	4/29/2000
☒ Rohde & Schwarz	Pulse Limiter	ESH3Z2	372	12	6/10/99	6/10/2000
☒ Elliott Laboratories	2 x (Solar 8028 LISN + 6512 Caps)	LISN-5, Support	379	12	6/10/99	6/10/2000
☒ Rohde & Schwarz	Test Receiver, 0.009-2000 MHz	ESN	775	12	6/10/99	6/10/2000
☒ EMCO	D. Ridge Horn Antenna, 1-18GHz	3115	868	12	9/25/99	9/25/2000
☒ Hewlett Packard	EMC Analyzer	8593EM	EAL0221	12	11/8/1999	11/8/2000

File Number: D35129

Date: 12.20.99

Engr: Jerry Hill

All calibration of equipment is traceable to a national standard of measurement such as NIST.

EXHIBIT 2:Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T 35129 13 Pages
T36226 17 Pages
Processing Gain 13 Pages
(Provided by the manufacturer)

EXHIBIT 3:Radiated Emissions Test Configuration Photographs

APPENDIX 3: Radiated Emissions Test Configuration Photographs

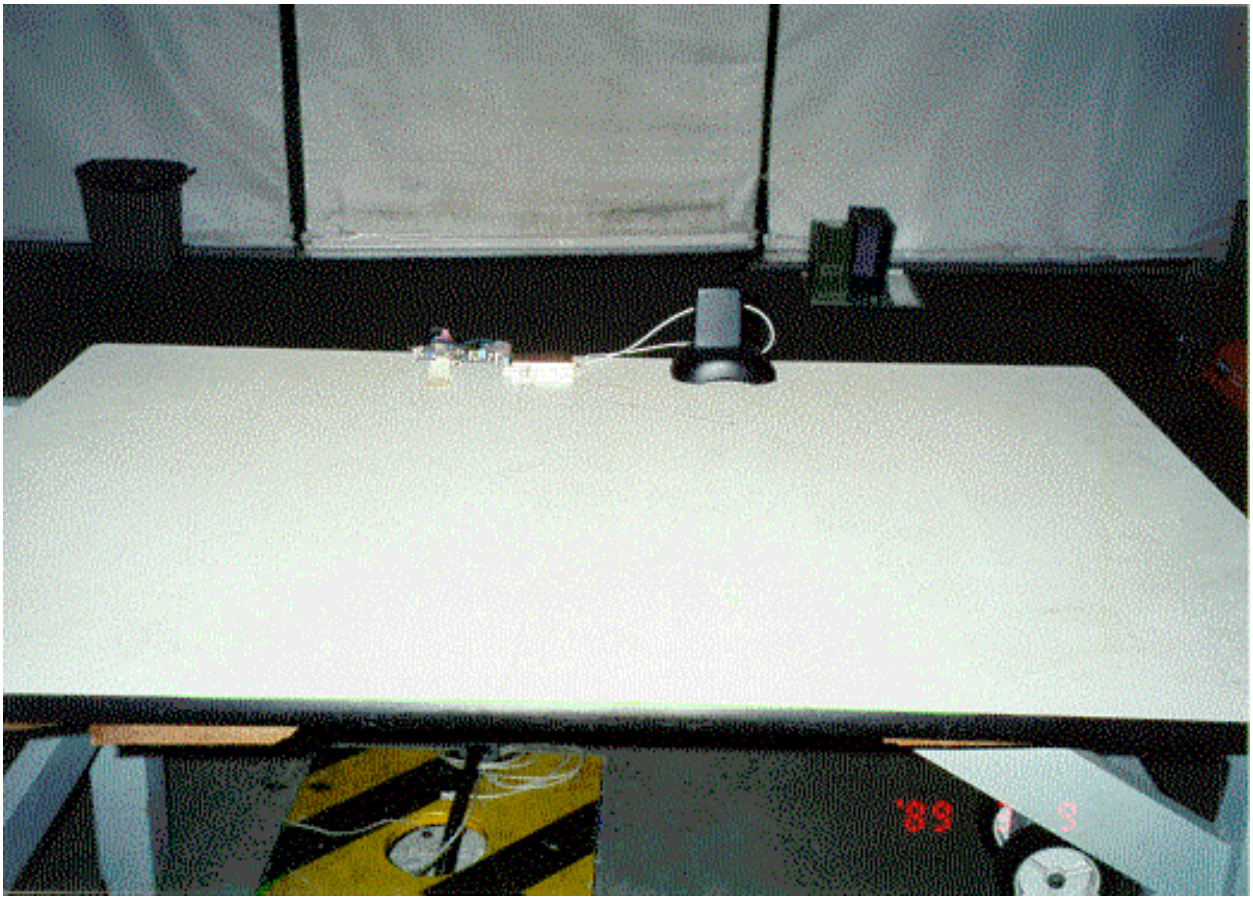

EXHIBIT 4:Conducted Emissions Test Configuration Photographs

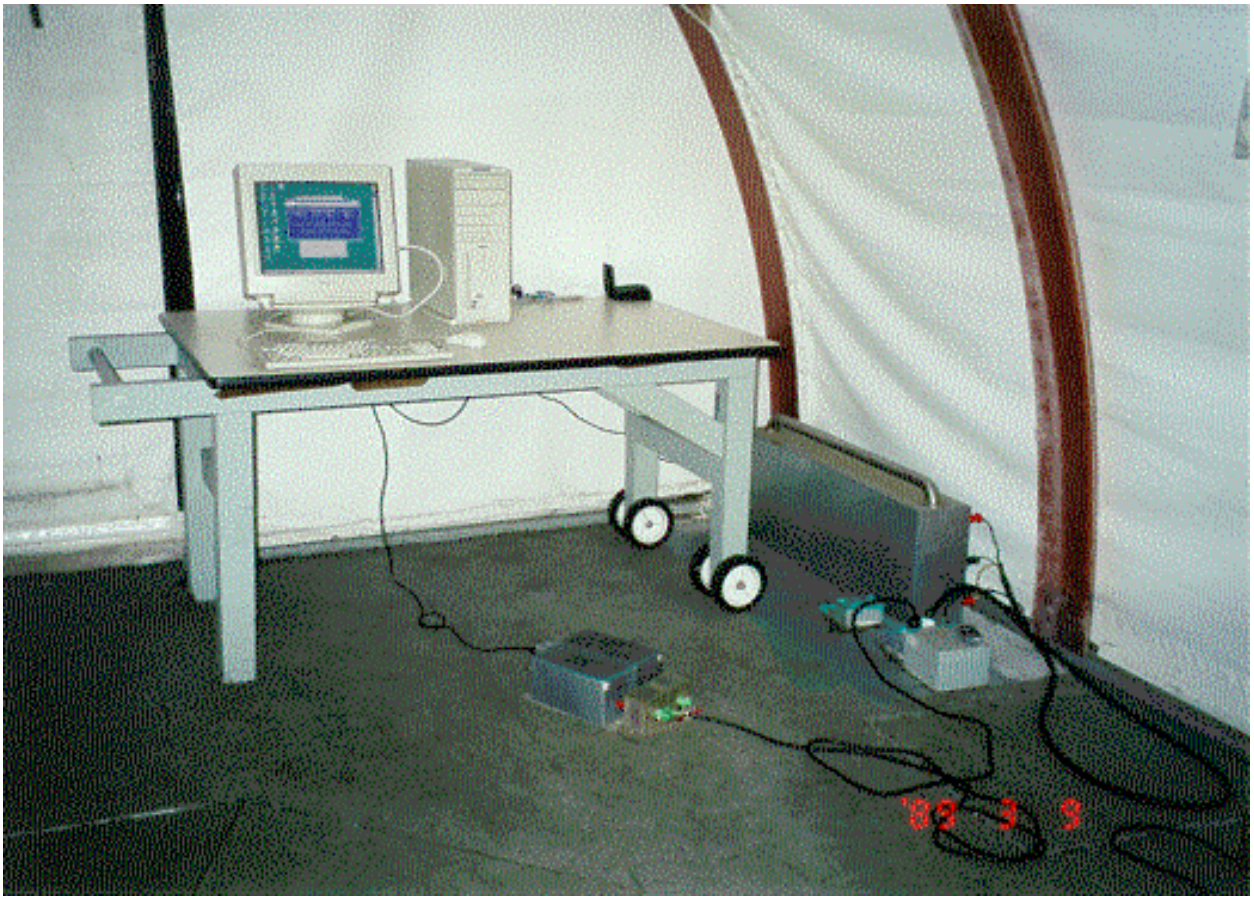

EXHIBIT 4: Conducted Emissions Test Configuration Photographs

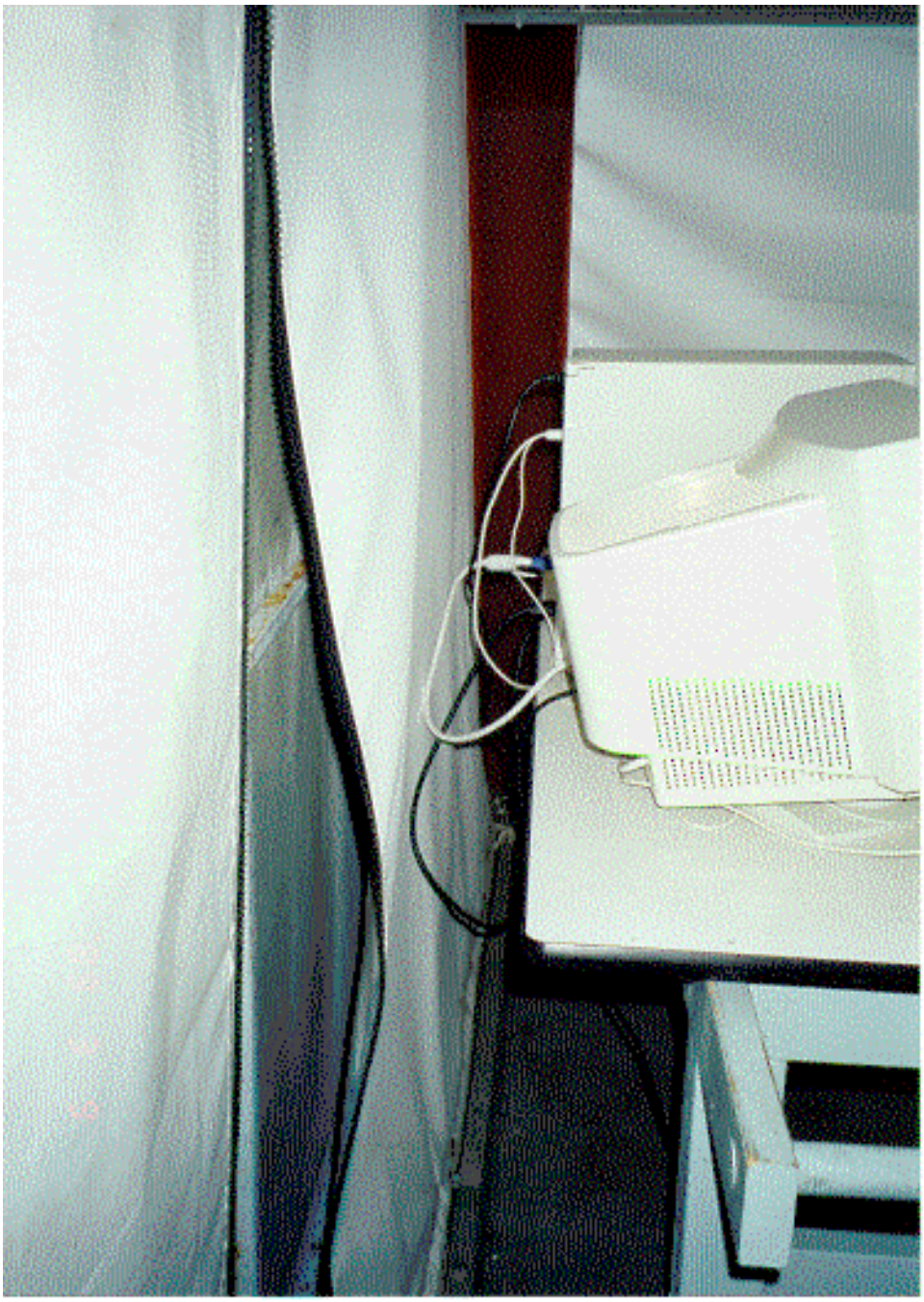

EXHIBIT 5:Proposed FCC ID Label & Label Location

2 Pages

EXHIBIT 6: Detailed Photographs Of ShareWave, Inc. Model Cresta II Modular RadioConstruction

4 Pages

EXHIBIT 7: Operator's Manual for ShareWave, Inc. Model Cresta II Modular Radio

20 Pages

EXHIBIT 8: Block Diagram Of ShareWave, Inc. Model Cresta II Modular Radio

3 Pages

EXHIBIT 9: Schematic Diagrams for ShareWave, Inc. Model Cresta II Modular Radio

3 Pages

EXHIBIT 10: Theory of Operation for ShareWave, Inc. Model Cresta II Modular Radio

12 Pages

EXHIBIT 11: SAR Report for ShareWave, Inc. Model Cresta II Modular Radio

26 Pages