

**EMC QUALIFICATION
TEST REPORT**

RF CONCEPTS

ALPHA RADIO PRODUCTS, 9500

TESTED TO CONFORM WITH:

☒ **Emissions Standards**

for

TIA-603C

TEST REPORT NUMBER: 100318-1546R

DATE OF ISSUE: APRIL 15, 2010

DATE OF TEST COMPLETION: APRIL 12, 1020

MANUFACTURER'S ADDRESS: 6185 ARAPAHOE ROAD

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Approved by:



Laboratory Director

DOCUMENT REVISION HISTORY

REVISION #	REPORT NUMBER	DESCRIPTION OF REVISION	DATE OF REVISION
0	100318-1546	ORIGINAL REPORT	2010-4-1
1	100318-1546R	ADDITIONAL TEST DATA ADDED	2010-4-15

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Any questions regarding this report should be directed to:

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EMC QUALIFICATION TEST REPORT

ALPHA RADIO PRODUCTS, 9500

1.0 EXECUTIVE SUMMARY

1.1 PURPOSE

The purpose of this report is to present EMC test data and demonstrate conformity to the requirements of the prescribed standards for Emissions and/or Immunity.

1.2 CONFORMITY

The test article was tested to the standards listed in Table I with the indicated conformity status. All test methods were performed in accordance to with the standards listed.

TABLE I. EMISSIONS CONFORMITY SUMMARY

TEST TYPE	COMPLIANCE STANDARD	TESTING TECHNIQUE	TEST DESCRIPTION	PRODUCT CLASSIFICATION	CONFORMITY STATUS
EMISSIONS	<u>TIA-603C</u>	<input checked="" type="checkbox"/> TIA-603C	Radiated Emissions	Class B	PASSED

1.3 EQUIPMENT UNDER TEST (EUT)

EUT NAME:

ALPHA RADIO PRODUCTS

EUT MODEL/PART NUMBER(S):

9500

EUT SERIAL NUMBER(S):

APR 00102

2.0 EMISSIONS TEST STANDARDS

TIA-603C

Class B

2.1 ☒ RADIATED EMISSIONS – 28 TO 30 MHZ

Measurements for *Radiated Emissions* were performed over the frequency range of 30 MHz to 1000 MHz in the horizontal and vertical antenna polarities to the requirements of:

EN 55022 for IT Equipment

Class B

Testing Conditions

Date of Test: March 23, 2010 &
April 12, 2010
Temperature: 18° C
Relative Humidity: 33%
Test Voltage: 240 VAC 60 Hz
Test Operator: LWS

Test Location

Criterion Technology Open Area Test Site

Test Distance

Antenna Distance: **10 meter(s)** **Final Measurement(s)**

Test Equipment

- ☒ Rohde and Schwarz Receiver, ESHS-30 ☐ Rohde and Schwarz Receiver, ESVS-30
☐ Mini Circuits Pre-Amp #2 ☐ Veratech Pre-Amp #3
☐ Chase BiLog Antenna, Model CB6111 ☐ Antenna Research, Horn Antenna, Model DRG118/A
☐ EMCO Loop Antenna, Model 6502 ☐ EMCO Log Periodic Antenna, Model 3146

Test Accessories: **See Appendix C for support equipment details**

Test Results of Radiated Emissions

Test Status: **PASSED**Frequency Range: **28 to 30 MHz**Minimum Margin to Limit: **1.4** dB at **29.8** MHz

Remarks

See: **APPENDIX A** for EUT Photographs
APPENDIX B for Data Sheets
APPENDIX D for Test Equipment Calibration Status

3.0 APPENDIX A: EUT PHOTOGRAPHS

3.1 RADIATED EMISSIONS – FRONT VIEW



4.0 APPENDIX B: DATA SHEETS**4.1 RADIATED EMISSIONS DATA**

RF Concepts

Alpha Radio Products, 9500

S/N: ARP00102

With a -11.23 dbm level at 28.9 MHz, using the antenna substitution method,

We obtain a Field strength of 64.8 dbuV/m at 10 Meters.

64.8 dbuV/m becomes our TIA -603C reference limit

<u>Freq. (MHz)</u>	<u>Radiated emissions level @ 10M (dbuV/m)</u>	<u>TIA-603C limit (dbuV/m)</u>	<u>Margin to Limit (db)</u>	<u>Turntable azimuth (degrees)</u>
28.1	62.5	64.8	2.3	312
28.9	61.8	64.8	3.0	314
29.7	63.4	64.8	1.4	298

<u>Freq. (MHz)</u>	<u>Radiated emissions level @ 10M (dbuV/m)</u>	<u>Power level into 2.1 dbi antenna to match radiated emissions level (dbm)</u>	<u>Power level into isotropic radiator to match radiated emissions level (dbm)</u>	<u>TIA-603C limit (dbm)</u>	<u>MARGIN TO LIMIT (db)</u>
56.2	25.4	-66.49	-64.39	-11.3	-53.09
57.8	29.1	-62.79	-60.69	-11.3	-49.39
59.4	25.6	-66.29	-64.19	-11.3	-52.89
84.3	48.93	-40.02	-37.92	-11.3	-26.62
86.7	29.24	-59.71	-57.61	-11.3	-46.31
89.1	23.6	-65.35	-63.25	-11.3	-51.95
112.4	41.35	-49.38	-47.28	-11.3	-35.98
115.6	31.9	-58.83	-56.73	-11.3	-45.43
118.8	34.11	-34.11	-32.01	-11.3	-20.71
140.5	51.34	-39.16	-37.06	-11.3	-25.76
144.5	30.73	-59.77	-57.67	-11.3	-46.37
148.5	37.38	-53.12	-51.02	-11.3	-39.72
168.6	22.72	-66.81	-64.71	-11.3	-53.41
173.4	17.77	-71.76	-69.66	-11.3	-58.36
178.2	14.57	-74.96	-72.86	-11.3	-61.56
196.7	39.25	-47.54	-45.44	-11.3	-34.14
202.3	37.2	-49.59	-47.49	-11.3	-36.19
207.9	26.99	-59.8	-57.7	-11.3	-46.4
224.8	19.52	-68.03	-65.93	-11.3	-54.63
231.2	19.05	-68.5	-66.4	-11.3	-55.1
237.6	15.41	-72.14	-70.04	-11.3	-58.74
252.9	19.4	-68.5	-66.4	-11.3	-55.1
260.1	17.51	-70.39	-68.29	-11.3	-56.99
267.3	18.4	-69.5	-67.4	-11.3	-56.1
281	20.78	-67.62	-65.52	-11.3	-54.22
289	11.21	-77.19	-75.09	-11.3	-63.79
297	14.42	-73.98	-71.88	-11.3	-60.58

5.0 APPENDIX C: PRODUCT INFORMATION FORM**CRITERION TECHNOLOGY****General Information**

Date 01/04/2010
Company Name: Alpha Radio Products
Company Address: 6185 Arapahoe Rd.
Boulder, CO 80303
Contacts: Steve Farkas Phone: 303 473-9232
email: Steve Farkas [stevef@rfconcepts.com]

Product Information

Name Alpha Radio Products Model Number 9500 Serial Number: APR00102
Product Dimensions: 17.5"W 7.5" H 20"W Weight: 74 lbs.

Product Power Source:

Battery: ☒ No ☐ Yes
Voltage 120-240 Voltage Auto Select
AC Supply:
of cords: One
Voltage for each: Auto Select
I/O Cables:
of cords under 10 meters: None
of cords over 10 meters: None

List Support equipment if any:

Device: None
Manufacturer: _____
Model: _____
Serial number: _____

Market Information (Check all that Apply)

USA ☒ Canada ☒ Euro.Union _____ Taiwan _____ Japan _____ New Zealand _____ Australia _____
Other _____

Emissions Testing:

Is this equipment to be used in a residence: ☐ No (Class B) ☒ Yes (Class A)

Does this have a transmitter or Transceiver: ☒ No ☐ Yes

Highest oscillator/Clock frequency (including internal clocks only to the microprocessor): 10 MHz

To be compliant with C63.4-2003 test methodology, for the emissions testing, the equipment must be exercising all of the functionality within the capability of the Equipment under test. In addition, the equipment must be equipped in the configuration of maximum capability, which will be offered to customers. The test software installed in the Equipment Under Test (EUT) must exercise all of the modules in this maximum capability configuration.

Description of the maximum capability configuration: 1500 watts out on the frequency band of 28.1-29.6 MHz.

Name and revision # of the test software used for the emissions test: Version 1.36 E

61000-3-2 Harmonics: ☒ No ☐ Yes

Max. Steady State Power Consumed by Product: 2727 Watts

61000-3-3 Flicker Meter: ☒ No ☐ Yes

Please attach or include the product spec or pre production spec**SPECIFICATIONS:**

Frequency coverage: All amateur frequencies from 1.8-29.7 MHz

Power output: 1500 Watts minimum on all served bands

3rd Order IM: <-30 dBc

SWR tolerance: 3:1

Drive power: 45 - 60 Watts nominal for full power out

Tube: single 3CX1500/8877 high performance power triode with a plate dissipation of 1500 watts provides key down performance on all frequency bands, all modes, and all duty cycles.

Cooling: Forced air from two blowers

Antenna outputs: comes standard with 4 x SO-239 BIRD connectors, but can be changed to Type N easily from the back panel by removing 4 screws.

Antenna selection: Internal 4 port antenna switch with 1 or 2 outputs per band/segment

Calibrated Wattmeter: The Bruene type wattmeter accurately simultaneously measures both forward and reverse power and displays this information on the easy to read bar graph meters on the front panel. It also uses the information to simultaneously monitor the gain of the amplifier.

Protection Mechanisms: HV Interlock and Power Interlock.

Bypass mode: There are two power "ON" buttons on the Alpha 9500. "ON1" activates the Wattmeter and antenna selector without powering the amplifier itself, and sets the amplifier into "bypass" mode. The Amplifier is powered with the "ON2" button.

Input: Comes standard with an SO-239 BIRD connector, but can be changed to BIRD N Type easily from the back panel – order JCX-X130

Tuning/Band switching: Automatic plus manual override

Power: 100,120,200-208,220,240 VAC, 50/60 Hz, selection Automatic. At 240 VAC, requires 10 Amps per leg, for a total of 20 Amps. Note: Although the amplifier will operate at 100V, the mains will have to be able to deliver upwards of 35 amps.

Interface: Serial port and USB. Full remote control capability.

Protection: Protected against all common faults.

Display: Bar graphs display Power, SWR, Grid Current, Plate Current, Plate Voltage, and Gain - all simultaneously. Digital Panel Meter can display Forward Power, Plate Current, Plate Voltage, Grid Current, SWR, Filament Voltage, and PEP Output.

T/R switching: Two Gigavac brand vacuum relays enabling QSK (full break-in) at QRO (full power).

Bypass capability: 1500 Watts.

Shipping Weight: 76 Lbs

PRODUCT SIZE: 17.5"W X 7.5"H X 19.75"D

6.0 APPENDIX D: TEST EQUIPMENT AND CALIBRATION STATUS

Manufacturer	Name/Description	Model Number	Serial Number	Cal. Due Date
Hewlett Packard	Quasi Peak Adapter	85650A	2403A07322	5/3/2010
Hewlett Packard	Spectrum Analyzer	HP 8566B	2421A00527	5/5/2010
Hewlett Packard	Spectrum Analyzer Display	HP 85662A	2403A07322	5/5/2010
Hewlett Packard	Tracking Generator	HP85645A	3210A00124	5/6/2010
Hewlett Packard	Signal Generator	HP 8648D	3642000145	5/9/2010
Amplifier Research	Power Amplifier	100W1000M1	20214	6/1/2010
Haefely Trench	ESD Gun	PESD 1600	H605100	6/2/2010
Veratech	Preamplifier (AMP2)	unknown	N/A	9/18/2010
FCC	EM Clamp	F2031	309	10/2/2010
FCC	CDN	FCC-801-M3-25	9714	10/2/2010
Rohde/ Schwarz	VHF/UHF Receiver	ESVS-30	863342014	10/8/2010
Rohde/ Schwarz	LISN	ESH2-Z5	828739-001	10/8/2010
Rohde/ Schwarz	HF Receiver	ESHS-30	826003/011	10/8/2010
Solar Electronics	LISN	8012-50-R-24-BNC	892310	10/15/2010
Haefely Trench	Test Mag	Mag 100	80162	10/15/2010
Gigatronics	Power Sensor	80301A-410	1831996	10/15/2010
Gigatronics	Power Meter	8541C	1830945	10/15/2010
FCC	LISN	FCC-TLISN-T4-02	20252	11/24/2010
Calorina Instruments	AC Power Source Pacs-1	5001iX-CTS-411	55637/ 72242	3/24/2011
Haefely Trench	Surge Generator	PSURGE 6.1	083-906-07	5/26/2011
Haefely Trench	EFT Tester	PEFT Junior	583-333-51	5/26/2011
Haefely Trench	Surge Coupler	FP-Surge 32.1	083-925-05	5/26/2011
EMCO	Active Loop	6502	2626	5/28/2011
Amplifier Research	E-Field Probe	FP2080	20236	10/16/2011
Amplifier Research	E-Field Probe	FP2000	19682	10/19/2011
EMCO	Horn	3160-08	1147	1/19/2012

7.0 APPENDIX E: TEST DIRECTIVES, STANDARDS AND METHODS

7.1.1 EUROPEAN DIRECTIVES, STANDARDS AND METHODS

89/336/EEC: Council Directive of 03 May 1989 on the Approximation of the Laws of the Member States Relating to Electromagnetic Compatibility, OJEC No. L 139/19-26, Aug 1993.

BS DD ENV 50204 (CENELEC): Testing and Measurement Techniques: Radiated Electromagnetic Field from Digital Radio Telephones - Immunity Test, 1996.

EN 55011 (CENELEC): ISM Radio-Frequency Equipment Radio Disturbance Characteristics - Limits and Methods of Measurement, 2007.

EN 55014-1 (CENELEC): Part 1. Electromagnetic Compatibility Requirements for Household Appliances, Electric Tools and Similar Apparatus - Part 1. Emission - Product Family Standard, 2007.

EN 55022 (CENELEC): ITE - Radio-Frequency Equipment Radio Disturbance Characteristics - Limits and Methods of Measurement, 2008.

CISPR 22: Information Technology Equipment – Radio Disturbance Characteristics - Limits and Methods of Measurement, 2009.

EN 55024 (CENELEC): ITE - Immunity Characteristics - Limits and Methods of Measurement, 2008.

EN 55103-1: Product Family standard for audio, video, audio - visual and entertainment lighting control apparatus for professional use. Part 1: Emissions, April 1997.

EN 55103-2: Product Family standard for audio, video, audio - visual and entertainment lighting control apparatus for professional use. Part 2: Immunity, April 1997.

EN 60601-1-2 (CENELEC): Medical Electrical Equipment. Part 1. General Requirements for Safety - Section 1.2. Collateral Standard: Electromagnetic Compatibility - Requirements and Tests, Third Edition 2007.

EN 61000-6-1: EMC- Part 6-1. Generic Standard-Immunity for residential, commercial and light-industrial Environments 2007.

EN 61000-6-2: EMC- Part 6-2. Generic Standard-Immunity for Industrial Environments, 2005.

EN 61000-6-3: EMC- Part 6-3. Generic Standard-Emissions for residential, commercial and light-industrial Environments 2007.

EN61000-6-4 (CENELEC): EMC - Generic Emission Standard, Part 6-4: Industrial Environment, 2007.

EN 61000-3-2 (CENELEC): EMC - Part 2. Limits for Harmonic Current Emissions (Equipment Input Current ≤16 A per phase), with Amendment 14, 2006.

EN 61000-3-3 (CENELEC): EMC - Part 3. Limitation of Voltage Fluctuation and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current ≤16 A, 2008.

EN 61000-4-2 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 2. Electrostatic Discharge Immunity Test, 2009.

EN 61000-4-3 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 3. Radiated, Radio-Frequency, Electromagnetic Field Immunity, 2008.

EN 61000-4-4 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 4. Electrical Fast Transient/Burst Immunity Test, 2008.

EN 61000-4-5 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 5. Surge Immunity Test, 2006.

EN 61000-4-6 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 6. Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields, 2009.

EN 61000-4-8 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 8. Power Frequency Magnetic Field Immunity Test, 1993 with the incorporation of amendment A1:2001.

EN 61000-4-11 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 11. Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests, 2004

EN 61326 (CENELEC): Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements, 2005.

EN 61326-1 Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements, - Part 1: General Requirements, 2008

7.1.2 47 CFR FCC PART 15 RADIO FREQUENCY DEVICES: OCT 2009

Subpart A General.

Subpart B Unintentional Radiators.

Subpart C Intentional Radiators.

Subpart D Unlicensed Personal Communications Service Devices.

7.1.3 47 CFR FCC PART 22 PUBLIC MOBILE SERVICES: OCT 2009

7.1.4 47 CFR FCC PART 24 PERSONAL COMMUNICATIONS SERVICES: OCT 2009

7.1.5 JAPAN

VCCI V-3

7.1.6 CANADA

ICES-001: Interference-Causing Equipment Standard - ISM RF Generators, 2006.

ICES-003: Interference-Causing Equipment Standard - Digital Apparatus, 2004.

7.1.7 AUSTRALIA/NEW ZEALAND

SAA AS/NZ 3548: Limits and Methods of Measurement of Radio Disturbance Characteristics of ITE, 1997.

AS/NZS CISPR22

7.1.8 TAIWAN

CNS13438, 2006.

7.1.9 KOREA

KN22, September 29, 2005

KN 24, 1998