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M/A Com Private Radio Systems, Inc.
Model: P7100(IP) VHF Radio
FCC ID: OWDTR-0013-E
FCC & IC: Part 90 and RSS-119
RTL WO: 2002158

APPENDIX K: CLASS B DOC REPORT

Please refer to the following pages.



Engineering and Testing for EMC and Safety Compliance

Test Report

DoC for a Class B digital device

MODEL: P7100(IP) VHF Portable Radio

Prepared for:

M/A COM Private Radio Systems, Inc.
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Report Number: 2002158-002

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Work Order: 2002158
Quote Number: QRTL02-535
M/A Com Private Radio Systems, Inc.
Jaguar P7100(IP) VHF Radio
Report Number: 2002158-002

Radiated and Conducted Emissions Conformance Statement

We, the undersigned, hereby state that the proper standards and procedures were followed as detailed in this test record. Furthermore, we attest that the data contained within this report is accurate and concise within the bounds of the standards and our company procedures. There were no modifications made to the equipment under test in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to or exclusions from the ANSI C63.4 test methodology.

Signature: 

Title: Test Engineer

Vice President of Operations
(NVLAP Signatory)

Date: December 3, 2002

Date: December 3, 2002

Report Prepared By:
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For:
M/A COM Private Radio Systems, Inc.

Contact:
Bryan McWatters



Accredited by the National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under laboratory code 200061-0

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1 General Information

1.1 Executive Summary

The following DoC of a Class B Digital Device is prepared on behalf of M/A COM Private Radio Systems, Inc. in accordance with the rules of the Federal Communications Commission (47 CFR 15).

This report covers testing for the **P7100 VHF Portable Radio**. All testing was performed on August 12, 2002.

All equipment configurations and measurements contained in this report were performed in accordance with the revision of the standards listed in this report. Also, the instrumentation and facilities utilized for the measurements conform to all appropriate standards. Calibration checks are performed regularly on all test equipment by a local calibration lab, with traceability to the National Institute of Standards and Technology (NIST).

1.2 Test Facility Information

All radiated and conducted emission measurements were performed manually at Rhein Tech Laboratories, Inc. The radiated emissions measurements required by the rules were performed on an open area test site (OATS) maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, VA, USA. Complete site descriptions and site attenuation measurement data have been placed on file with the Federal Communications Commission (FCC) and can be made available upon request. .

1.3 Client Responsibilities

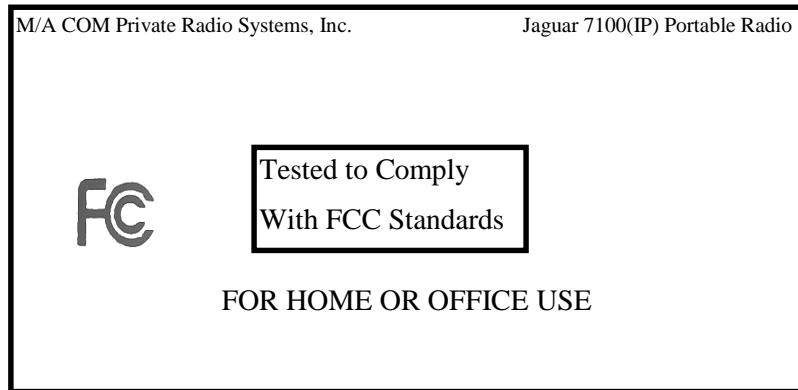
It is the responsibility of M/A COM Private Radio Systems, Inc. to supply Rhein Tech Laboratories, Inc. with the information necessary to complete the documentation. This information includes, but is not limited to, the user's manual, EUT schematics, etc.

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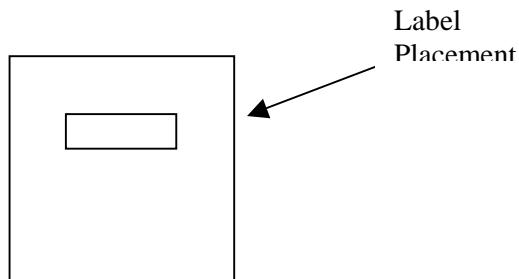
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1.4 Product Labeling

DoC LABEL



LOCATION OF LABEL ON EUT (TO BE PROVIDED BY MANUFACTURER)



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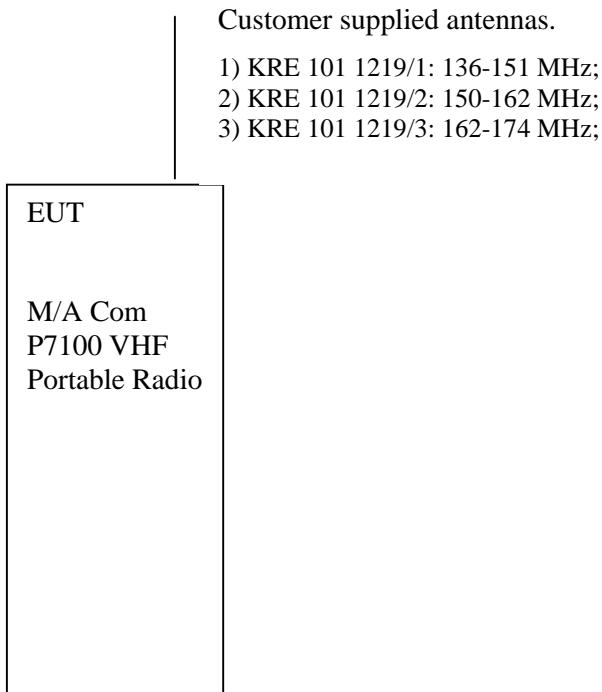
2 System Test Configuration

2.1 Tested Configuration

2.1.1 System Components Table

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	BAR CODE
VHF Portable Radio	M/A COM PRIVATE RADIO SYSTEMS, INC.	P7100	T1H-VFCC01	OWDTR-0013-E	14620
136-151 MHz	M/A COM PRIVATE RADIO SYSTEMS, INC	KRE 101 1219/1			14623
150-162 MHz;	M/A COM PRIVATE RADIO SYSTEMS, INC	KRE 101 1219/2			14624
162-174 MHz	M/A COM PRIVATE RADIO SYSTEMS, INC	KRE 101 1219/3			14622
High Capacity NICAD Battery (BKB191210/3)	M/A COM PRIVATE RADIO SYSTEMS, INC	BKB191210/3			N/A

2.1.2 Test Configuration Diagram



2.2 ***Modifications to EUT***

There were no modifications made to the EUT before or during testing.

3 **Test Results**

3.1 ***Amendments to Emissions Test Methodology***

3.1.1 **Deviations from Test Methodology**

There was no deviation from, additions to, or exclusions from, ANSI C63.4:1992.

3.2 ***Radiated Emissions Measurements***

3.2.1 **Site and Test Description**

Before final radiated emissions measurements were made on the OATS, the EUT was scanned indoors at both one and three meter distances. This was done in order to determine its emission spectrum signal. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emission measurements on the OATS, at each frequency, in order to ensure that maximum emission amplitudes were measured.

Final radiated emissions measurements were made on the OATS at a distance of 3 meters. The floor standing EUT was placed on a nonconductive turntable at a height of 1m.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emissions maximum levels. Measurements were taken using both horizontal and vertical antenna polarization. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

3.2.2 Field Strength Calculations

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:

$$FI(dB\mu V / m) = SAR(dB\mu V) + SCF(dB / m)$$

FI=Field Intensity

SAR=Spectrum Analyzer Reading

SCF=Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(dB / m) = -PG(dB) + AF(dB / m) + CL(dB)$$

SCF=Site Correction Factor

PG=Pre-Amplifier Gain

AF=Antenna Factor

CL=Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(\mu V / m) = 10^{FI(dB\mu V / m) / 20}$$

For example, assume a signal frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$49.3dB\mu V - 11.5dB / m = 37.8dB\mu V / m$$

$$10^{37.8/20} = 10^{1.89} = 77.6\mu V / m$$

3.2.3 Measurement Uncertainty

Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

3.2.4 Test Limits

FCC Class B Radiated Emissions	
Frequency (MHz)	At 3m (dB μ V/m)
30-88	40.0
88-216	43.5
216-960	46.0
> 1000	54

3.2.5 Radiated Emissions Data

Radiated Test Data - OATS 2 Test Date: August 28, 2002

Model: P7100 Mode: Ch. 155 NB

Limit/Distance: FCC B/3M

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dB μ V)	Site Correction Factor (dB/m)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
103.640	Qp	H	180	2.0	22.8	-13.7	9.1	43.5	-34.4
114.040	Qp	H	210	2.0	20.6	-11.3	9.3	43.5	-34.2
137.560	Qp	H	165	2.0	20.6	-12.4	8.2	43.5	-35.3
194.900	Qp	H	215	1.6	21.1	-11.0	10.1	43.5	-33.4
228.740	Qp	V	215	1.0	20.8	-9.3	11.5	46.0	-34.5
318.021	Qp	V	310	1.0	20.6	-6.2	14.4	46.0	-31.6
326.000	Qp	V	245	1.0	20.8	-5.7	15.1	46.0	-30.9

**All readings are quasi-peak unless, stated otherwise.*

3.3 AC Conducted Measurement

3.3.1 Conducted Emissions Data

Conducted Test Data - Screen Room 2 S/A 3

Test Date: August 28, 2002

Model: 7100P Mode: Ch. 155 NB

Limit: FCC B

NEUTRAL SIDE (Line 1)

Temperature: 77°F Humidity: 47%										Comments
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail	Comments
0.780	Pk	25.2	0.7	25.9	48.0	-22.1	48.0	-22.1	Pass	
2.840	Pk	34.3	1.3	35.6	48.0	-12.4	48.0	-12.4	Pass	
4.080	Pk	29.8	1.4	31.2	48.0	-16.8	48.0	-16.8	Pass	
6.390	Pk	25.4	1.8	27.2	48.0	-20.8	48.0	-20.8	Pass	
13.660	Pk	20.5	2.6	23.1	48.0	-24.9	48.0	-24.9	Pass	
26.720	Pk	21.6	3.4	25.0	48.0	-23.0	48.0	-23.0	Pass	

HOT SIDE (Line 2)

Temperature: 77°F Humidity: 47%										Comments
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)	FCC B AV Limit (dBuV)	FCC B AV Margin (dBuV)	Pass/ Fail	Comments
0.780	Pk	25.2	0.7	25.9	48.0	-22.1	48.0	-22.1	Pass	
2.840	Pk	34.3	1.3	35.6	48.0	-12.4	48.0	-12.4	Pass	
4.080	Pk	29.8	1.4	31.2	48.0	-16.8	48.0	-16.8	Pass	
6.390	Pk	25.4	1.8	27.2	48.0	-20.8	48.0	-20.8	Pass	
13.660	Pk	20.5	2.6	23.1	48.0	-24.9	48.0	-24.9	Pass	
26.720	Pk	21.6	3.4	25.0	48.0	-23.0	48.0	-23.0	Pass	

4 Test Photographs

4.1 *Radiated Emissions Photographs*



Radiated Front



Radiated Back

4.2 *Conducted Emissions Photographs*



Side View



Rear View

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5 Test Equipment Used

RTL Asset Number	Manufacturer	Model	Part Type	Serial Number	Calibration due date
900901	Hewlett Packard	85650A	Quasi-Peak Adapter (30 Hz – 40 GHz)	3145A01599	11/09/02
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	05/10/03
901053	Schaffner –Chase	CBL6112B	Bilog Chase antenna (200 MHz – 2 GHz)	2648	06/17/03
900930	Hewlett Packard	85662A	Spectrum Analyzer Display	3144A20839	05/10/03
900268	Taylor	5565	Hygrometer / Thermometer	N/A	09/17/02
901040	Industrial	SMX100	Wide Band Preamplifier (0.01-1000 MHz)	1736-0696	11/17/01
900339	Hewlett Packard	85650A	Quasi peak adapter	2521A00743	04/10/03
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	04/10/03
900968	Hewlett Packard	8567A	Spectrum Analyzer	2602A00160	04/10/03
901084	AFJ	LS16	16A LISN	16010020082	09/05/02