Engineering and Testing for EMC and Safety Compliance

Type Certification Report

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MODEL: M7200 V-TAC
(Vehicular Tactical Network)
700/800 MHz Mobile Radio

FCC ID: BV8M7200VTAC
IC: 3670A-M72VTAC

March 1, 2007

Standards Referenced for This Report	
Part 2: 2006	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 15: 2006	§15.109: Radiated Emissions Limits
Part 90: 2006	Private Land Mobile Radio Services
ANSI TIA-603-C-2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA/EIA – 102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
RSS-119 Issue 7	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz

Report Prepared By Test Engineer: Daniel Biggs

Document Number: 2007101/QRTL06-447

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance (ppm)	Mode	Emission Designator
806-824	10	1.5	P25 Ph 1 Trunked/Conventional	8K4F1D
806-824	10	1.5	P25 Ph 1 Trunked/Conventional	8K4F1E
851-869	10	1.5	P25 T/A	8K4F1D
851-869	10	1.5	P25 T/A	8K4F1E
851-869	3	1.5	P25 Ph 1 Trunked/Conventional	8K4F1D
851-869	3	1.5	P25 Ph 1 Trunked/Conventional	8K4F1E
806-824	10	1.5	OTP SMR Trunked	12K8F9W
806-824	10	1.5	OTP NPSPAC Trunked	12K1F9W
851-869	3	1.5	OTP SMR Trunked	12K8F9W
851-869	3	1.5	OTP NPSPAC Trunked	12K1F9W
806-824	10	1.5	Analog FM SMR Trunked/Conventional	16K0F3E
806-824	10	1.5	Analog FM NPSPAC Trunked/Conventional	14K0F3E
851-869	10	1.5	Analog FM T/A	16K0F3E
851-869	10	1.5	Analog FM T/A	14K0F3E
806-824	10	1.5	EDACS SMR Trunked/Conventional	14K2F1D
806-824	10	1.5	EDACS SMR Trunked/Conventional	14K2F1E
806-824	10	1.5	EDACS NPSPAC Trunked/Conventional	11K9F1D
806-824	10	1.5	EDACS NPSPAC Trunked/Conventional	11K9F1E
851-869	10	1.5	EDACS SMR T/A	14K2F1D
851-869	10	1.5	EDACS SMR T/A	14K2F1E
851-869	10	1.5	EDACS NPSPAC T/A	11K9F1D
851-869	10	1.5	EDACS NPSPAC T/A	11K9F1E
764-767, 773-776	10	0.04	P25 Ph 1T/A	8K4F1D

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764-767, 773-776	10	0.04	P25 Ph 1T/A	8K4F1E
764-767, 773-776	3	0.04	P25 Ph 1 Trunked/Conventional	8K4F1D
764-767, 773-776	3	0.04	P25 Ph 1 Trunked/Conventional	8K4F1E
794-797, 803-806	10	0.04	P25 Ph 1 Trunked/Conventional	8K4F1D
794-797, 803-806	10	0.04	P25 Ph 1 Trunked/Conventional	8K4F1E
794-797, 803-806	10	0.04	OTP Trunked	12K1F9W
764-767, 773-776	3	0.04	OTP Trunked	12K1F9W
764-767, 773-776	10	0.04	Analog FM (12.5 kHz spaced) T/A	11K0F3E
794-797, 803-806	10	0.04	Analog FM (12.5 kHz spaced) Trunked/Conventional	11K0F3E

*Power shown is product rated power. Maximum conducted power as shown in test report, is either 12.8 W, 10.6 W or 3.1 W; operational mode dependent. For those modes shown as 3 W, power is continuously variable from .25W to 3 W. For those modes shown as 10 W, power is continuously variable from 1 W to 10W.

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1 General Information

The following certification report is prepared on behalf of **M/A-COM, Inc**. in accordance with the Federal Communications Commission Rules and Regulations. The Equipment Under Test (EUT) was the **M7200 V-TAC (Vehicular Tactical Network) 700-800 MHz Mobile Radio; FCC ID: BV8M7200VTAC**, **IC: 3670A-M72VTAC**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, Part 90, and ANSI TIA-603-C-2004, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards and Industry Canada RSS-119 Issue 7. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

Please note that portions of the EUT are subject to Part 15 DoC testing. A DoC report is on file for this product.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.2 Related Submittal(s)/Grant(s)

This is an original certification application report.

1.3 Product Description

The M7200 Vehicular Tactical (V-TAC) is a voice and data radio designed for a mobile environment. The V-TAC operates on all 700 MHz narrowband channel segments authorized for voice, data and interoperability, and all 800 MHz SMR and NPSPAC frequency bands.

The V-TAC consists of a Full Duplex M7200 Mobile transceiver (VRM) with GPS which operates on all 700/800 MHz mobile subscriber frequencies, an M7200 Vehicular Repeater Base Unit (VRB) which operates on all 700/800 MHz base station frequencies and a 700/800 MHz RF Combiner.

The V-TAC can operate as a regular mobile radio, as a base for local "scene of incident" communications outside of regular base station coverage areas, and as a network repeater for improved in-building coverage. When in "network extension" mode, the V-TAC is capable of time slot-based simultaneous transmission with a single antenna through the RF Combiner.

The rated RF output power is continuously variable between 1-10 W in regular mobile radio mode, 0.25 – 3 W in base mode, and 0.25-13 W in network extension, simultaneous TX mode. Digital and conventional modulation software was provided for testing.

Table 1-1: Product Description

Trade Name	M7200 V-TAC (Vehicular Tactical Network) 700/800 MHz Mobile Radio
Use of Product	Voice and data communication
FCC Identifier	BV8M7200VTAC
Type Modulation	GFSK, FM
Bit Rate	9600, 19200 bps
Baud Rate	9600
Rated RF Output	Continuously Variable: VRM 1.0-10.0 Watts VRB: 0.25-3.0 Watts Simultaneous: 13 Watts Max
Frequency Range	764-767, 774-776, 794-797, 806-824 MHz and 851-869 MHz
Antenna Gain	3 dBd, 5 dBd
External Input	Audio and digital

2 Tested System Details

The EUT test sample was received on January 2, 2007. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

The system consists of a 700/800 MHz transceiver (VRM), a 700/800 MHz repeater (VRB), and an RF combiner, and is controlled by a control head/microphone. The system was tested in a duplex operating mode.

The EUT consists of two transceivers that can transmit simultaneously, while connected to a single antenna through an RF combiner. Since both transceivers can transmit simultaneously, simultaneous transmission was determined to be the worst case mode of operation for power measurements and spurious measurements.

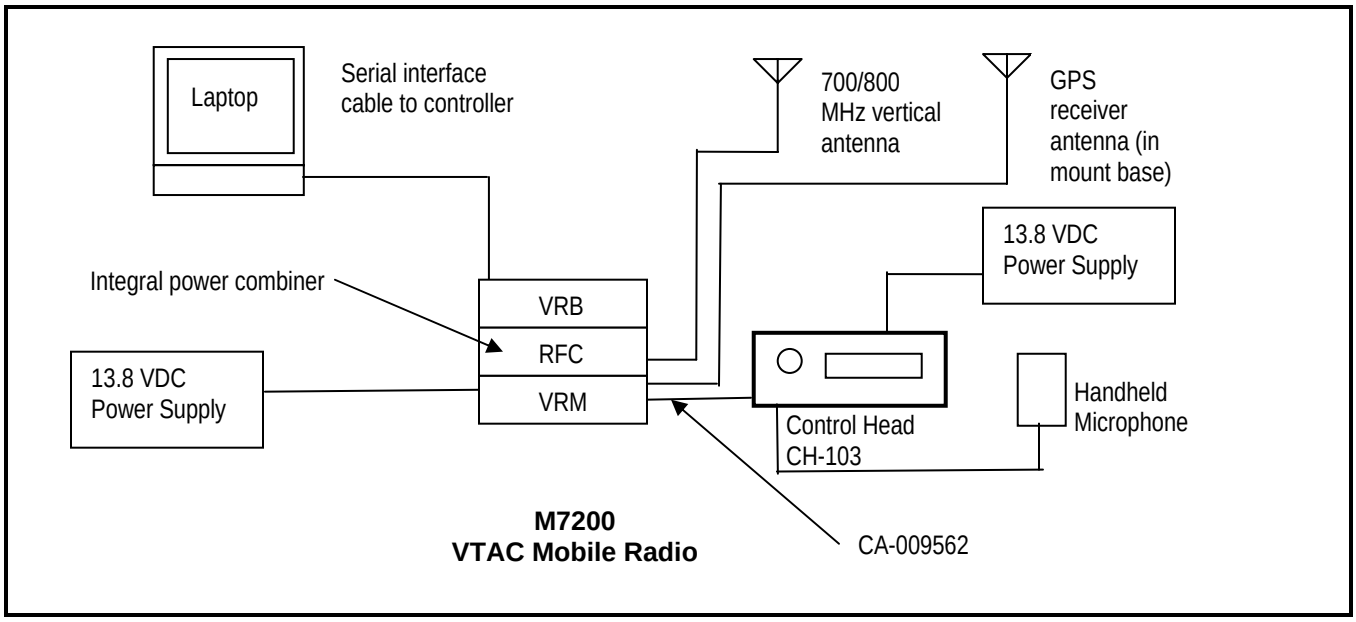
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
700/800 MHz VTAC Mobile with GPS Receiver	M/A-Com, Inc.	MAMV-FDLXX	RU-008736-001	BV8M7200VTAC	17709
CH-103 Control Head	M/A-Com, Inc.	MACDOS0003	A40000A17036D	N/A	17713
Microphone, Noise Canceling	M/A-Com, Inc.	N/A	MC-101616-040	N/A	17712
Whip Antenna	M/A-Com, Inc.	N/A	AN-025167-001	N/A	17704
Whip Antenna	M/A-Com, Inc.	N/A	AN-025167-002	N/A	
Whip Antenna	M/A-Com, Inc.	N/A	AN-025167-004	N/A	

Table 2-2: Support Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Notebook Computer	N/A	N/A	N/A	N/A	N/A
RS-232 Interface Cable	N/A	DB-9	N/A	N/A	16500
Power Supply	M/A-Com, Inc.	N/A	N/A	N/A	17706
Power Supply	M/A-Com, Inc.	N/A	N/A	N/A	17707

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

Nominal DC Voltage: 13.6 VDC
Current: 7.5 A

4 FCC Rules and Regulations Part 2 §2.1046 (a): RF Power Output: Conducted; RSS-119 §6.2: Output Power Test

4.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.1.

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance. The EUT was tested in three different transmitting configurations:

1. VRM and VRB units transmitting simultaneously on separate frequencies.
2. VRM transmitting alone at high power.
3. VRB transmitting alone at high power.

The VRM was set to a power of 40.0 dBm (high power) and the VRB was set to a power of 34.8 dBm (high power) for all configurations.

4.2 Test Data

Table 4-1: RF Power Output (VRM/VRB Combined, VRM and VRB): Carrier Output Power

Configuration	Mode	Frequency (MHz) (VRM/VRB)	RF Power Measured (Watt)*
VRM/VRB Combined	P25	794.0125/764.0125	12.1
VRM/VRB Combined	P25	794.0125/868.9875	12.4
VRM/VRB Combined	P25	823.9875/764.0125	12.1
VRM/VRB Combined	P25	823.9875/868.9875	12.3
VRM/VRB Combined	OTP	794.0125/764.0125	12.7
VRM/VRB Combined	OTP	794.0125/868.9875	12.8
VRM/VRB Combined	OTP	823.9875/764.0125	12.4
VRM/VRB Combined	OTP	823.9875/868.9875	12.6
VRM	OCF SMR	764.0125	9.9
VRM	OCF NPSPAC	775.9875	9.9
VRM	OCF SMR	794.0125	9.6
VRM	OCF NPSPAC	805.9875	9.8
VRM	OCF SMR	806.0125	10.4
VRM	OCF NPSPAC	806.0125	10.4
VRM	OCF SMR	823.9875	10.1
VRM	OCF NPSPAC	823.9875	10.1
VRM	OCF SMR	851.0125	10.1
VRM	OCF NPSPAC	851.0125	10.1
VRM	OCF SMR	868.9898	10.1
VRM	OCF NPSPAC	868.9898	10.1

*Measurement accuracy: +/- .02 dB (logarithmic mode)

Configuration	Mode	Frequency (MHz) (VRM/VRB)	RF Power Measured (Watt)*
VRM	P25	764.0125	10.0
VRM	P25	775.9875	10.0
VRM	P25	794.0125	9.8
VRM	P25	805.9875	10.0
VRM	P25	806.0125	10.4
VRM	P25	823.9875	10.1
VRM	P25	851.0125	10.1
VRM	P25	868.9875	10.1
VRM	OTP	794.0125	9.6
VRM	OTP	805.9875	9.8
VRM	OTP	806.0125	10.4
VRM	OTP	806.0125	10.6
VRM	OTP	823.9875	9.9
VRM	OTP	823.9875	9.8
VRM	EDACS (2-level)	806.0125	10.4
VRM	EDACS (2-level)	806.0125	10.2
VRM	EDACS (2-level)	823.9875	10.2
VRM	EDACS (2-level)	823.9875	10.0
VRM	EDACS (2-level)	851.0125	10.0
VRM	EDACS (2-level)	851.0125	10.0
VRM	EDACS (2-level)	868.9898	10.0
VRM	EDACS (2-level)	868.9898	10.0
VRB	P25	764.0125	3.1
VRB	P25	775.9875	3.1
VRB	P25	851.0125	2.9
VRB	P25	868.9875	3.0
VRB	OTP	764.0125	2.9
VRB	OTP	775.9875	2.9
VRB	OTP	851.0125	3.0
VRB	OTP	851.0125	3.0
VRB	OTP	868.9875	3.1
VRB	OTP	868.9875	2.9

*Measurement accuracy: +/- .02 dB (logarithmic mode)

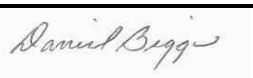
Table 4-2: RF Power Output

Maximum Measured Conducted Power (W)
12.8 W combined mode

Table 4-3: Test Equipment for Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901184/901186	Agilent	E4416A/E9323A	Power Meter/ Sensor	GB41050573/US420.52510380	10/03/07

Test Personnel:

Daniel Biggs		January 2, 2007
Test Technician/Engineer	Signature	Date Of Test