



Engineering and Testing for EMC and Safety Compliance



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Class II Permissive Change Report

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MODEL: M7200 Mobile Radio

FCC ID: BV8M7200
IC: 3670A-M7200

June 6, 2007

Standards Referenced for this Report	
Part 2: 2006	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2006	Private Land Portable Radio Services
ANSI TIA-603-C-2004	Land Portable FM or PM Communications Equipment - Measurement and Performance Standards
ANSI TIA/EIA-102.CAAA; 2002	Digital C4FM/CQPSK Transceiver Measurement Methods
RSS-119 Issue 9 2007	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41 to 960 MHz

Report Prepared by Test Engineer: Daniel W. Baltzell

Document Number: 2006069

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Test results relate only to the item tested.*

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1 General Information

This Class II Permissive Change report is prepared on behalf of **M/A-COM, Inc.** in accordance with the applicable Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **M7200 Mobile Radio; FCC ID: BV8M7200, IC: 3670A-M7200**. The test results reported in this document relate only to the item that was tested.

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 a Class II Permissive Change request for the FCC certification initially issued on October 4, 2005, and an IC reassessment for the IC certificate issued October 5, 2005.

The only change to the EUT is mounting in a motorcycle mount enclosure with different cabling and antenna. The EUT is intended to only operate in the 800 MHz band in this configuration. MPE measurements were performed with this antenna and are presented in a separate report. There are no circuitry changes, nor are there any transmission mode additions being performed.

2 Tested System Details

The test sample was received on May 16, 2007. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this testing, as applicable.

Table 2-1: Equipment under Test (EUT)

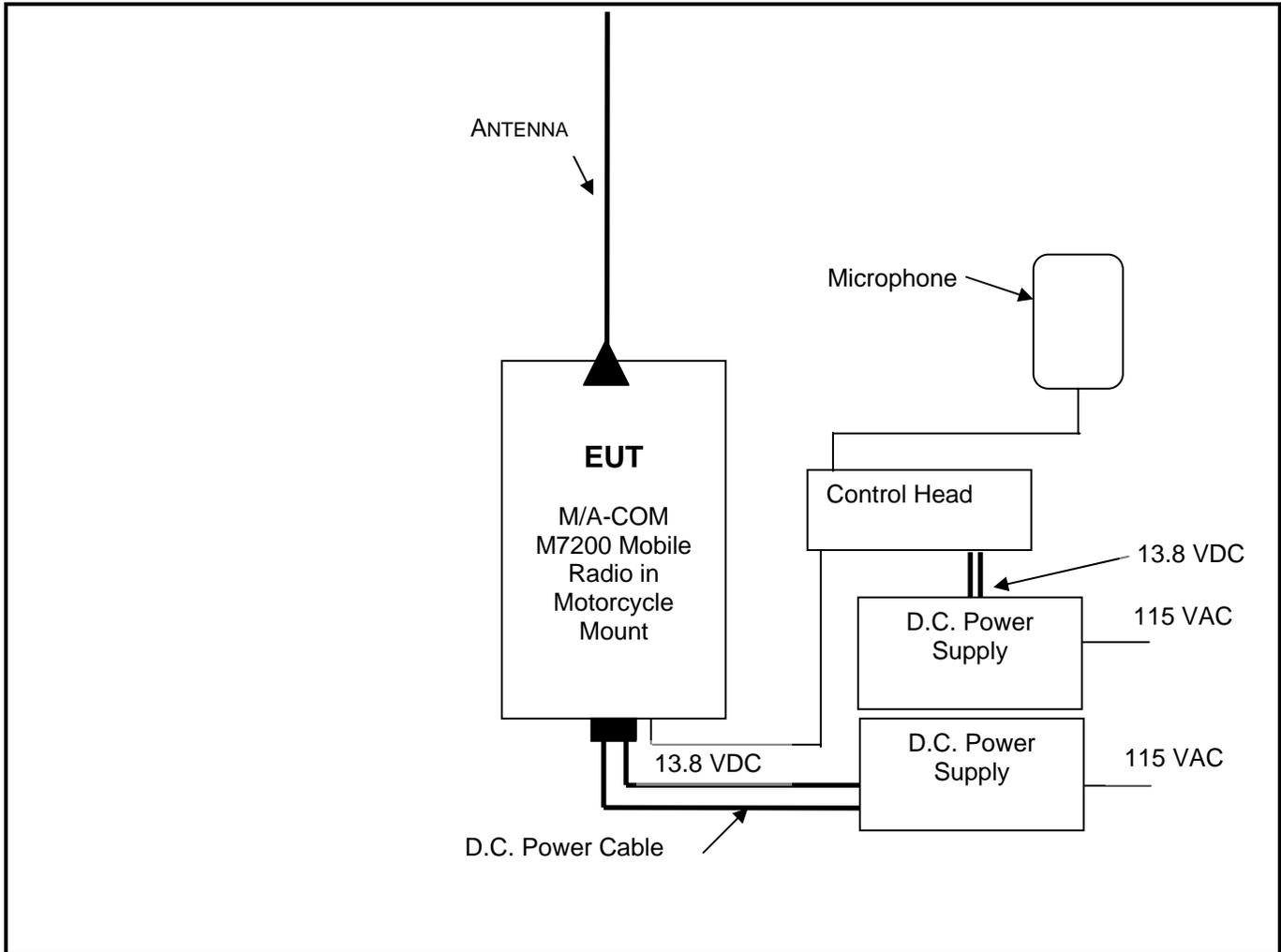
The test system contains the following components:

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Motorcycle Mount Assembly with Mobile Radio	M/A-Com, Inc.	MAMV-NZN6Z	A40074001D31	BV8M7200	17936
Control Head	M/A-Com, Inc.	CU23218-0004	96000165	N/A	17911
Handset/Microphone	M/A-Com, Inc.	N/A	MC1016-0401	N/A	17912
Motorcycle Mount Antenna	M/A-Com, Inc.	N/A	LE-OM806DBKTNCD5; 5/8 over 1/2 wave vertical	N/A	17937

Table 2-2: Support Equipment

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
DC Power Supply	M/A-Com, Inc.	N/A	N/A	N/A	17707
DC Power Supply	M/A-Com, Inc.	N/A	N/A	N/A	17706

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2 §2.1046(a): RF Power Output: Conducted; RSS-119 §4.1: Output Power Test

3.1 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.

Power is software controlled and is continuously variable from 1 W to 15 W.

3.2 Test Data

Table 3-1: RF Power Output: Carrier Output Power 800 Band

Frequency (MHz)	Band	Mode	High Power RF Power Measured (Watt)*	Low Power RF Power Measured (Watt)*
806.012500	SMR	OCF	14.29	1.02
806.012500	NPSPAC	OCF	14.32	1.02
823.987500	SMR	OCF	14.13	1.01
823.987500	NPSPAC	OCF	14.16	1.01
851.012500	SMR	OCF TA	14.55	0.99
851.012500	NPSPAC	OCF TA	14.55	0.99
868.987500	SMR	OCF TA	14.76	0.97
868.987500	NPSPAC	OCF TA	14.76	0.97
806.012500	SMR	OTP	14.39	1.00
806.012500	NPSPAC	OTP	14.39	1.00
823.987500	SMR	OTP	14.29	1.01
823.987500	NPSPAC	OTP	14.22	1.01
806.012500	SMR	EDACS	14.32	1.00
806.012500	NPSPAC	EDACS	14.39	1.00
823.987500	SMR	EDACS	14.22	1.00
823.987500	NPSPAC	EDACS	14.22	1.01
851.012500	SMR	EDACS	15.14	0.98
851.012500	NPSPAC	EDACS	15.17	0.99
868.987500	SMR	EDACS	15.21	0.95
868.987500	NPSPAC	EDACS	15.42	0.96
806.012500	SMR/NPS	P25	14.32	1.01
823.987500	SMR/NPS	P25	14.19	1.01
851.012500	SMR/NPS	P25 TA	14.55	1.00
868.987500	SMR/NPS	P25 TA	14.79	0.97

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

Table 3-2: RF Power Output (Rated Power)

Rated Power (W) High Power	Rated Power (W) Low Power
15 (800 Band)	1.0 (800 Band)
15 (700 Band)	1.0 (700 Band)

Table 3-3: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, Single Channel	GB41050573	10/03/07
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	10/03/07
901138	Weinschel Corp.	48-40-34 DC-18GHz	Attenuator, 100W 40dB	BK5883	01/13/09

Test Personnel:

Daniel W. Baltzell		June 5, 2007
Test Engineer	Signature	Date Of Test

4 FCC Rules and Regulations Part 2 §2.1053(a): Field Strength of Spurious Radiation; RSS-119 §4.2: Unwanted Emissions

4.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz.

Digital Modulation: Modulated to its maximum extent using a pseudo random data sequence – 9600 bps.

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

where:

P_d is the dipole equivalent power

P_g is the generator output power into the substitution antenna

4.2 Test Data

4.2.1 CFR 47 Part 90.210 Requirements

The worst case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

Table 4-1: Field Strength of Spurious Radiation – 859.45 MHz; P25; High Power

Limit = 43 + 10 Log P = 54.89 dBc Conducted Power = 41.89 dBm = 15.44 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
1718.90	37.5	-27.4	0.7	6.5	63.5	-8.6
2578.35	36.0	-53.3	0.9	7.4	88.7	-33.8
3437.80	51.7	-33.1	0.8	7.5	68.3	-13.4
4297.25	34.1	-51.1	1.0	8.2	85.8	-30.9
5156.70	43.0	-43.1	1.2	8.6	77.6	-22.7
6016.15	34.1	-52.7	1.3	9.0	86.9	-32.0
6875.60	32.8	-56.4	1.4	9.5	90.2	-35.3
7735.05	38.7	-50.0	1.5	9.0	84.4	-29.5
8594.50	28.2	-55.6	1.7	8.8	90.4	-35.5

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

Table 4-2: Test Equipment Used for Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz-12.8 GHz)	3826A00144	10/16/07
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	09/13/07
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 to 20 GHz)	3610A00866	11/30/07
901262	ETS	3160-9	Double ridged Guide Antenna (1-18 GHz)	6748	04/19/08
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz-2 GHz)	2648	11/01/07
900321	EMCO	3161-03	Horn Antenna (4.0-8.2 GHz)	9508-1020	05/20/08
900323	EMCO	3160-07	Horn Antenna (8.2-12.4 GHz)	9605-1054	05/20/08
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	05/20/08
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF Cable, 20'	NA	12/05/07
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	12/05/07
901235	Insulated Wire Inc.	KPS-1503-360-KPS	RF Cable 36"	NA	05/16/08

Test Personnel:

Daniel W. Baltzell		June 5, 2007
Test Engineer	Signature	Date Of Test

5 Radiated Emissions

5.1 Amendments to Emissions Test Methodology

5.1.1 Deviations from Test Methodology

There was no deviation from, additions to, or exclusions from, the test method.

5.2 Radiated Emissions Measurements

5.2.1 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 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.

5.2.2 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 dB μ V. 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:

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

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

5.2.3 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.

5.2.4 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

5.2.5 Radiated Emissions Data

Table 5-1: Radiated Emissions Test Data

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)	Pass/Fail
120.000	Qp	V	180	1.0	41.7	-16.9	24.8	43.5	-18.7	Pass
132.708	Qp	H	30	1.8	52.0	-17.0	35.0	43.5	-8.5	Pass
132.708	Qp	V	180	1.0	56.6	-17.0	39.6	43.5	-3.9	Pass
162.202	Qp	H	120	1.4	54.9	-18.3	36.6	43.5	-6.9	Pass
162.202	Qp	V	170	1.0	52.7	-18.3	34.4	43.5	-9.1	Pass
168.005	Qp	H	100	1.2	43.3	-18.3	25.0	43.5	-18.5	Pass
168.005	Qp	V	40	1.0	42.0	-18.3	23.7	43.5	-19.8	Pass
240.000	Qp	H	120	1.3	43.3	-15.9	27.4	46.0	-18.6	Pass
240.000	Qp	V	180	1.0	41.5	-15.9	25.6	46.0	-20.4	Pass
250.660	Qp	H	90	1.0	47.3	-15.0	32.3	46.0	-13.7	Pass
250.660	Qp	V	285	1.0	40.8	-15.0	25.8	46.0	-20.2	Pass
280.155	Qp	H	90	1.0	50.9	-14.1	36.8	46.0	-9.2	Pass
280.155	Qp	V	180	1.0	43.5	-14.1	29.4	46.0	-16.6	Pass
360.003	Qp	H	90	1.0	48.2	-11.2	37.0	46.0	-9.0	Pass
360.003	Qp	V	180	1.0	39.5	-11.2	28.3	46.0	-17.7	Pass
720.000	Qp	H	280	1.0	37.2	-4.9	32.3	46.0	-13.7	Pass
720.000	Qp	V	50	1.0	37.9	-4.9	33.0	46.0	-13.0	Pass

Table 5-2: Test Equipment Used for Testing Radiated Emissions

Barcode	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz-2 GHz)	2648	11/01/07
900905	Rhein Tech Labs	PR-1040	OATS 1 Preamplifier 40dB (30 MHz-2 GHz)	1006	05/16/08
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz-6.5 GHz)	3325A00159	03/21/08
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna, (9 kHz-30 MHz)	827525/019	09/15/09

Test Personnel:

Daniel W. Baltzell		May 31, 2007
Test Engineer	Signature	Date Of Test

6 Conclusion

The data in this measurement report shows that the **M/A-COM, Inc. Model M7200 Mobile Radio, FCC ID: BV8M7200, IC: 3670A-M7200**, complies with all the applicable requirements of Parts 90, 15 and 2 of the FCC Rules, and Industry Canada RSS-119.