FCC Part 90 Test Report
for
M/A-Com, Inc.
on the
RF Exposure Testing
of the
M-803 Vehicular Tactical Radio
Model: MAMROS0016

FCC ID: BV8M803VTAC

Test Report #: 3035133
Date of Report: November 21, 2002
Revision 1 Date: May 8, 2003

Project #: 3035133
Dates of Test: November 19-20, 2002

	Nicholas Abbondante, Test Engineer
	Michael F. Murphy, Staff Engineer, EMC

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Revision #	Date	Editor	Explanation
Revision 1	**5/8/2003**	**Nicholas Abbondante**	**Client requested all references to 0 and 3 dBi gain antennae be changed to 0 and 3 dBd (2 and 5 dBi) gain, to accurately represent the antenna characteristics. This made the Minimum Safe Distance calculations obsolete, and since they were not required initially, they were simply removed.**

1.0 Summary of Tests

FCC ID: BV8M803VTAC
Model No.: MAMROS0016

FCC RULE	DESCRIPTION OF TEST	RESULTS	REPORT PAGE
2.1091, 2.1093	RF Exposure	Passed	6

Test Engineer: Nicholas Abbondante Date: 5/8/03

Staff Engineer, EMC: Chief Engineer, EMC/Telecom Michael F. Murphy Date: 5-8-2003

2.0 General Description

2.1 Product Description

The M-803 Vehicular Tactical (VTAC) Unit is a versatile voice and data radio designed for the mobile environment. The M-803 operates in the 800 MHz SMR and NPSPAC frequency bands. A production version of the M-803 Vehicular Tactical (VTAC) Unit was received on November 19, 2002 in good condition. Only the OpenSky digital modulation (OTP/ORP which employs a GSFK modulation) software was provided and tested.

The EUT has been tested at the request of

Company:	M/A-Com 1011 Pawtucket Blvd. Lowell, MA, 01853-2395
Name of contact:	Andy Moysenko
Telephone:	(978) 442-4762
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Overview of M-803 VTAC Unit

Applicant	M/A-Com
Trade Name	M-803 Vehicular Tactical Unit (VTAC)
FCC Identifier	BV8M803VTAC
Use of Product	Voice and Data Communication
Type of Modulation	GFSK and FM
Bit Rate	19200 bps
Baud Rate	9600
Occupied Bandwidth	15.8 kHz measured
RF Output	18 Watts measured VRM , 17 Watts measured at the VRB
DC voltage and current into the final RF amplifying device	Voltage: 12VDC Current: 9A
Frequency Range	806 – 824 MHz and 851 – 869 MHz
Transmitter L.O. Frequency	736 – 754 MHz, 921 – 939 MHz, 966 – 984 MHz
Max. Number of Channels	830
Antenna(e) & Gain	0 dBd (2 dBi) and 3 dBd (5 dBi)
Detachable Antenna?	[X] Yes [ ] No
Receiver L.O. Frequency	58 MHz, 70.455 MHz, 736 – 754 MHz, 921 – 939 MHz, 966 – 984 MHz
External Input	[X] Audio [X] Digital Data

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

Site 1C (Top Site) is a 3m and 10m sheltered emissions measurement range located in a light commercial environment in Boxborough, Massachusetts. It meets the technical requirements of ANSI C63.4-1992 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

3.0 RF Exposure

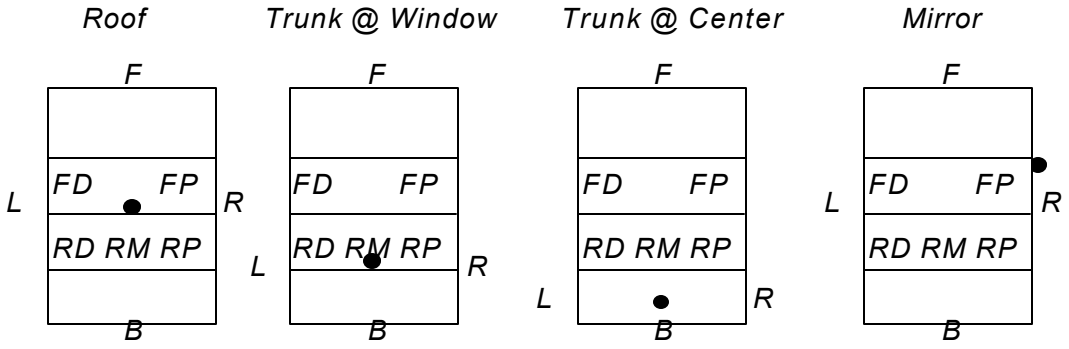
FCC §2.1091, §2.1093

3.1 Test Procedure

Description	Manufacturer	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	Agilent	E7405A	US40240205	11/11/03
BNC Cable	ITS	BNC-30	CBLBNC1	4/29/03
Antenna	Compliance Design, Inc.	B300	1651	9/16/03

Support Equipment			
Description	**Manufacturer**	**Model Number**	**Serial Number**
Laptop	Compaq	Armada 7800	7919CB630126
DC Power Supply	Hewlett Packard	6652A	910510
Test Vehicle	Jeep	Wrangler Sahara	1J4FA59S7YP760903
Test Vehicle	Oldsmobile	1994 Cutlass Supreme	1G3WH55M2RD302262
Fan	Electrix	N619	N/L
Equipment Under Test			
Vehicular Tactical Radio	M/A-Com, Inc.	M-803VTAC	VRM: A4007116E55C VRB: A400801791ED
3 dBd (5 dBi) Gain Whip	Antenna Specialists	ASPA913	N/L
3 dBd (5 dBi) Gain Whip	Antenna Specialists	APR852.3	N/L

The EUT was activated at full power, and connected to each of the antennae listed in this report. Each antenna was placed at a typical mounting point. A measurement antenna was connected to a spectrum analyzer, and peak readings of the field strength were taken at various test points outside and inside of the vehicle. Measurement antenna height and polarization were varied at each point to produce the worst-case value. Below are diagrams showing the transmit antenna mounting point and the corresponding test point locations and designations.



F = Front *FD = Front Driver Side* *RP = Rear Passenger Side*
L = Left *FP = Front Passenger Side* ● *= Transmit Antenna*
R = Right *RD = Rear Driver Side*
B = Back *RM = Rear Middle*

The readings at the spectrum analyzer are in dBuV/m. The limits are expressed in mW/cm^2. An equation that relates these two values is

$E = 20 \text{ LOG } (1x10^6 (377*10*P)^{1/2})$

where E is the measured voltage in dBuV/m, and P is the power density in mW/cm^2. The factor 377 is the impedance of free space, a constant. The obtained power density can then be compared to the limits. The power density limit for uncontrolled exposure is f/1500, where f is the transmit frequency. The worst case limits are at the lowest transmit frequency, and the measured RF output power of the EUT at the antenna port was maximum at the lowest transmit frequency. Therefore the lowest transmit frequency of 806.0125 MHz was selected as the worst case frequency and the limit for Maximum Permissible Exposure (MPE) was determined to be 0.537 mW/cm^2.

Trunk @ Window Mounting on Test Vehicle

Mirror Mounting on Test Vehicle

3.2 Test Results

Data fields in the format (low frequency)/(high frequency).

Antenna Specialists APR852.3 3dBd Gain Window Mount (M/A-Com P/N: MAMROS0089) on Oldsmobile

Test Point	Field Strength Reading (dBuV/m)	Field Strength Reading (mW/cm^2)	Total Field Strength (mW/cm^2)	MPE Limit (mW/cm^2)	Test Point Distance (cm)
Front	128.80/128.70	0.002 / 0.002	0.004	0.537	364.0
Back	143.00/139.90	0.053 / 0.026	0.079	0.537	118.0
Left	138.70/136.50	0.020 / 0.012	0.032	0.537	136.0
Right	135.80/135.00	0.010 / 0.008	0.018	0.537	136.0
Front Driver	138.30/136.50	0.018 / 0.012	0.030	0.537	112.0
Front Passenger	136.20/136.30	0.011 / 0.011	0.022	0.537	112.0
Rear Driver	144.80/141.00	0.080 / 0.033	0.113	0.537	53.0
Rear Middle	146.90/145.70	0.130 / 0.099	0.229	0.537	20.0
Rear Passenger	145.40/143.70	0.092 / 0.062	0.154	0.537	53.0

Antenna Specialists ASPA913 3dBd Gain Mirror Mount (M/A-Com P/N: MAMROS0073) on Jeep

Test Point	Field Strength Reading (dBuV/m)	Field Strength Reading (mW/cm^2)	Total Field Strength (mW/cm^2)	MPE Limit (mW/cm^2)	Test Point Distance (cm)
Front	141.60/140.20	0.038 / 0.28	0.066	0.537	185.0
Back	133.70/134.00	0.006 / 0.007	0.013	0.537	247.0
Left	138.80/137.60	0.020 / 0.015	0.035	0.537	191.0
Right	144.20/142.80	0.070 / 0.051	0.121	0.537	98.0
Front Driver	137.80/138.90	0.016 / 0.021	0.037	0.537	146.0
Front Passenger	139.20/143.10	0.022 / 0.054	0.076	0.537	97.0
Rear Driver	138.00/137.20	0.017 / 0.014	0.031	0.537	200.0
Rear Middle	138.20/139.90	0.018 / 0.026	0.044	0.537	185.0
Rear Passenger	139.80/135.50	0.025 / 0.009	0.034	0.537	175.0

This radio has been tested and complies with the FCC RF exposure limits for Uncontrolled Exposure and Occupational exposure. The difference is in the minimum safe distance that people must be away from the antenna when transmitting RF energy. To assure optimal radio performance and that human exposure to RF electromagnetic energy is within the guidelines, transmit only when people are at least the minimum distance away from a properly installed antenna. The following table lists the minimal distances.

Results: Passed