



# Intertek Testing Services

## ETL SEMKO

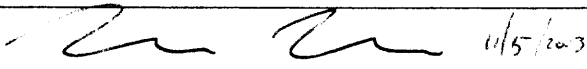
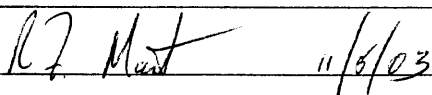
**Test Report**  
for  
**M/A-Com, Inc.**  
on the  
**Handheld Portable Radio**  
**Model: P800**  
to  
**FCC Part 90**

**FCC ID: BV8P800**

Test Report #: 3049668  
Date of Report: November 4, 2003

Project #: 3049668  
Dates of Test: November 3-4, 2003

Total No of Pages Contained in this Report: 16

|                                                                                                |                                            |
|------------------------------------------------------------------------------------------------|--------------------------------------------|
| <br>11/5/03 | Nicholas Abbondante, Test Engineer         |
| <br>11/5/03 | Robert F. Martin, Senior Technical Manager |

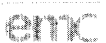
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FCC Part 90 Certification

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M/A-Com, Model: P800  
FCC ID: BV8P800

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## 1.0 Summary of Tests

### Handheld Portable Radio FCC ID: BV8P800 Serial #: A40007100074 Model: P800

| FCC RULE                     | DESCRIPTION OF TEST                                      | RESULTS     | REPORT PAGE |
|------------------------------|----------------------------------------------------------|-------------|-------------|
| 2.1046, 90.205(i), 90.635(d) | RF Power Output                                          | Passed      | 7           |
| 2.1049, 90.209(b)(5), 90.210 | Occupied Bandwidth, Bandwidth Limitation, Emission Masks | Passed      | 8           |
| 2.1051, 90.210               | Out-of-Band Emissions at Antenna Terminals               | Passed      | 12          |
| 2.1047                       | Modulation Characteristics                               | N/A         | --          |
| 2.1055                       | Frequency Stability vs. Temperature                      | Not Tested* | --          |
| 2.1055                       | Frequency Stability vs. Voltage                          | Not Tested* | --          |
| 2.914                        | Transient Frequency Behavior                             | N/A         | --          |
| 2.1091, 2.1093               | RF Exposure                                              | Not Tested* | --          |
| 2.1053, 90.205, 90.635       | Field Strength of Spurious Radiation                     | Passed      | 15          |

\*Not Tested means the test was not performed as the results are not expected to change based on the device modifications since the last filing

M/A-Com, Model: P800  
FCC ID: BV8P800

Dates of Test: November 3-4, 2003

## 2.0 General Description

### 2.1 Product Description

The EUT is a hand held mobile radio operating in the 806 to 824 and 851 to 869 MHz bands. It has a rated output power of 3W. The intended FCC ID is BV8P800. The purpose of testing is to explore the effects of adding P25 C4FM modulation to the device.

The EUT has been tested at the request of

|                         |                                                           |
|-------------------------|-----------------------------------------------------------|
| <b>Company:</b>         | M/A-Com<br>1011 Pawtucket Blvd.<br>Lowell, MA, 01853-2395 |
| <b>Name of contact:</b> | Roman Makarewicz                                          |
| <b>Telephone:</b>       | (978) 442-5151                                            |
| <b>Fax:</b>             | (978) 442-5353                                            |

### 2.2 Related Submittal(s) Grants

None.

## 2.3 Test Facility

Site 2C (Middle Site) is a 3m and 10m sheltered EMI 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 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets of metal 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. A 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 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.

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## 2.4 Test Equipment and Support Equipment

### Test Equipment

| Description              | Manufacturer    | Model Number  | ITS ID | Serial Number | Cal Due Date |
|--------------------------|-----------------|---------------|--------|---------------|--------------|
| Antenna                  | EMCO            | 3142          | LOG4   | 9711-1225     | 02/18/2004   |
| EMI Receiver Set         | Hewlett Packard | 8542E         | REC2   | 3520A00125    | 12/05/2003   |
| RF Filter                | Hewlett Packard | 85420E        | RECFL2 | 3427A00126    | 12/05/2003   |
| High Frequency Cable     | Megaphase       | TM40 K1K1 197 | CBL030 | CBL030        | 11/13/2003   |
| High Frequency Cable     | Megaphase       | TM40 K1K1 80  | CBL027 | CBL027        | 11/13/2003   |
| High Frequency Cable     | Megaphase       | TM40 K1K1 80  | CBL029 | CBL029        | 11/13/2003   |
| Spectrum Analyzer        | Rohde & Schwarz | FSEK-30       | ROS001 | 100225        | 05/26/2004   |
| Signal Generator         | Hewlett Packard | AT-83640B/1   | TMP001 | 3844A00757    | 10/05/2005   |
| Horn Antenna             | EMCO            | 3115          | HORN3  | 9610-4980     | 09/16/2004   |
| Digital 4 Line Barometer | Mannix          | 0ABA116       | BAR2   | BAR2          | 07/09/2004   |
| 20 dB Attenuator         | Mini Circuits   | 20 dB, 50 Ohm | DS28   | DS28          | 01/07/2004   |
| 20 dB Attenuator         | Mini Circuits   | 20 dB, 50 Ohm | DS24   | DS24          | 01/07/2004   |
| 10 dB Attenuator         | Mini Circuits   | 10 dB, 50 Ohm | DS11   | DS11          | 01/08/2004   |
| Horn Antenna             | EMCO            | 3115          | HORN2  | 9602-4675     | 09/03/2004   |
| Preamplifier 1-40 GHz    | Miteq           | NSP4000-NF    | PRE8   | 507145        | 10/22/2004   |
| 30 dB Attenuator         | Weinschel       | 23-30-34      | WE14   | AY9076        | 02/15/2004   |

No support equipment was used during testing.

M/A-Com, Model: P800

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**3.0 RF Power Output**

FCC § 2.1046, § 90.205(i), § 90.635(d)

**3.1 Test Procedure**

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer.

Requirement: The RF Power Output must be below 20 dBW.

**3.2 Test Results**

|                 |
|-----------------|
| Results: Passed |
|-----------------|

11/03/2003

Equipment: REC2, RECFL2, WEI4, DS28

| Frequency (MHz) | Description                      | Value (dBm) | Value (dBW) | Limit (dBW) |
|-----------------|----------------------------------|-------------|-------------|-------------|
| 806.0125        | Channel 1 Low Normal Band        | 33.37       | 3.37        | 20          |
| 816.3625        | Channel 415 Mid Normal Band      | 33.63       | 3.63        | 20          |
| 823.9875        | Channel 830 High Normal Band     | 33.82       | 3.82        | 20          |
| 851.0125        | Channel 1 Low TalkAround Band    | 34.06       | 4.06        | 20          |
| 861.3625        | Channel 415 Mid TalkAround Band  | 34.29       | 4.29        | 20          |
| 868.9875        | Channel 830 High TalkAround Band | 34.82       | 4.82        | 20          |

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#### 4.0 Occupied Bandwidth, Bandwidth Limitation, Emission Masks

FCC §2.1049, 90.209(b)(5), 90.210

##### 4.1 Test Procedure

The antenna was disconnected from the transmitter and a spectrum analyzer was connected to the transmitter RF output through sufficient attenuation to prevent overloading of the analyzer. The resolution bandwidth of the spectrum analyzer was set up to 300 Hz in the 100 kHz span around the transmit frequency, and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask. The measured RF output power was used to determine the upper limit for the applicable emissions masks.

Occupied bandwidth was measured using the 99% power function on the spectrum analyzer.

Requirement: The Transmit Waveform must stay within the confines of Emissions Mask B and the Occupied Bandwidth must not exceed 20 kHz.

##### 4.2 Test Results

Results: Passed

11/03/2003

Equipment: REC2, RECFL2, DS24, DS28, DS11

| Frequency (MHz) | Description                      | Occupied Bandwidth (kHz) | Authorized Bandwidth (kHz) |
|-----------------|----------------------------------|--------------------------|----------------------------|
| 806.0125        | Channel 1 Low Normal Band        | 11.8                     | 20                         |
| 816.3625        | Channel 415 Mid Normal Band      | 11.5                     | 20                         |
| 823.9875        | Channel 830 High Normal Band     | 12.3                     | 20                         |
| 851.0125        | Channel 1 Low TalkAround Band    | 12.3                     | 20                         |
| 861.3625        | Channel 415 Mid TalkAround Band  | 12.3                     | 20                         |
| 868.9875        | Channel 830 High TalkAround Band | 10.3                     | 20                         |

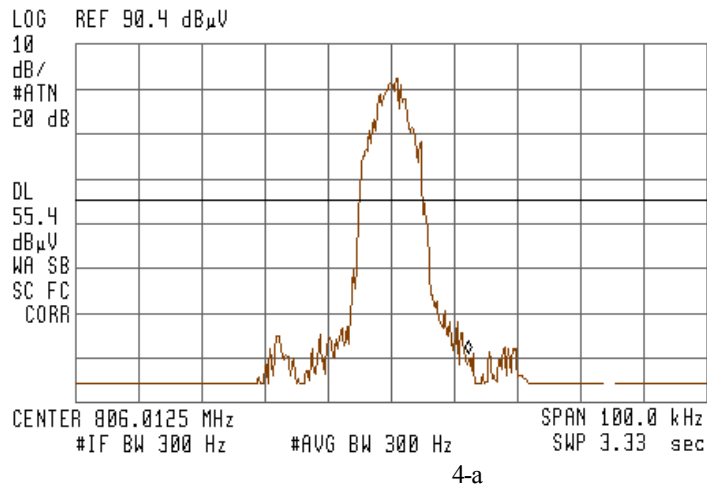
11/03/2003

Equipment: REC2, RECFL2, DS24, DS28, DS11

| Plot Number | Description                      |
|-------------|----------------------------------|
| 4-a         | Channel 1 Low Normal Band        |
| 4-b         | Channel 415 Mid Normal Band      |
| 4-c         | Channel 830 High Normal Band     |
| 4-d         | Channel 1 Low TalkAround Band    |
| 4-e         | Channel 415 Mid TalkAround Band  |
| 4-f         | Channel 830 High TalkAround Band |

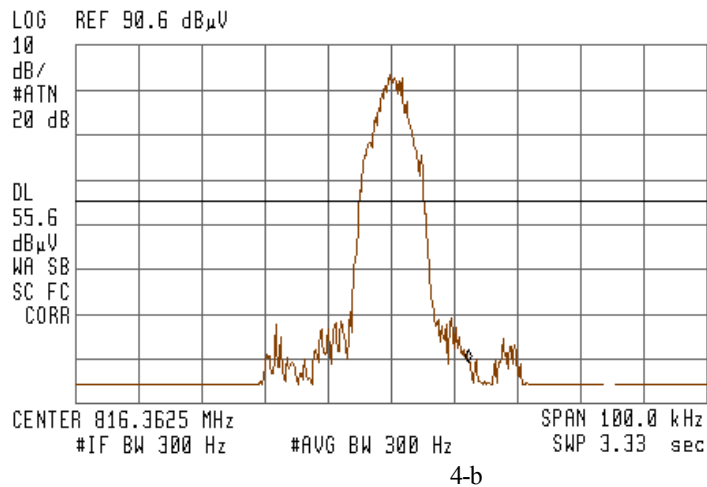
11:13:30 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 806.0248 MHz  
21.31 dBμV



11:08:27 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 816.3748 MHz  
19.92 dBμV

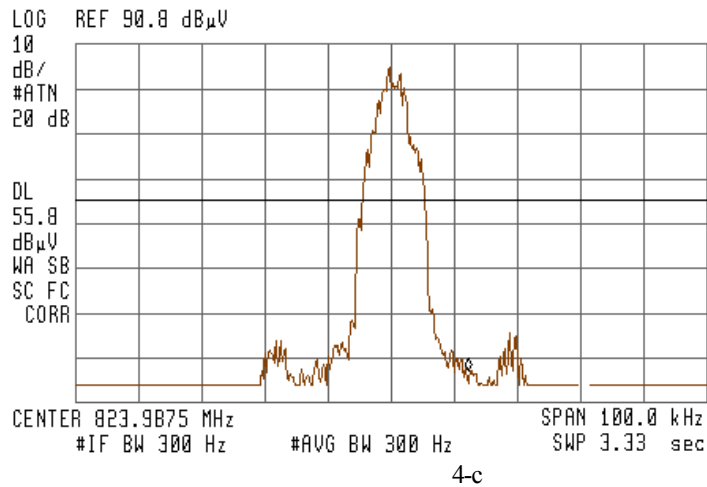


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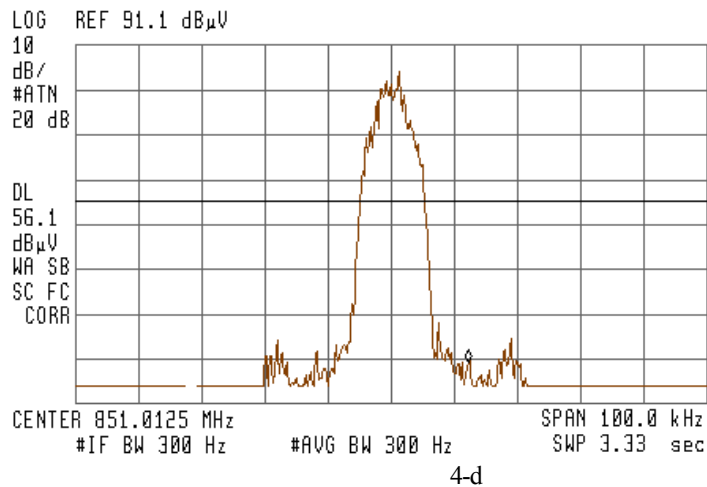
11:02:25 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 823.9998 MHz  
17.00 dBμV



10:52:34 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 851.0248 MHz  
20.32 dBμV

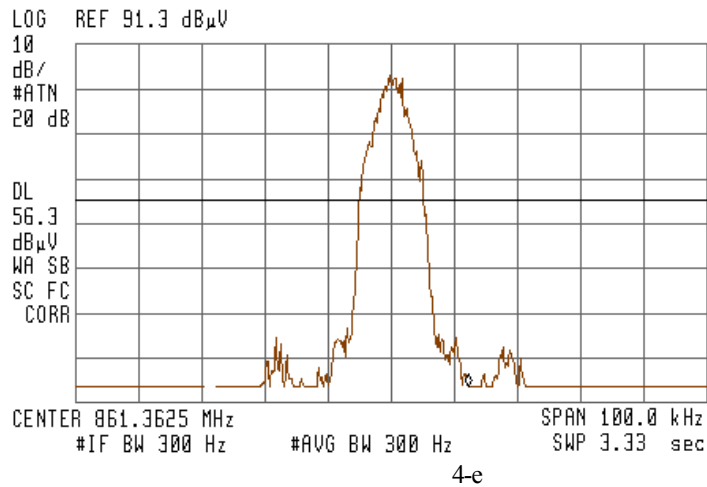


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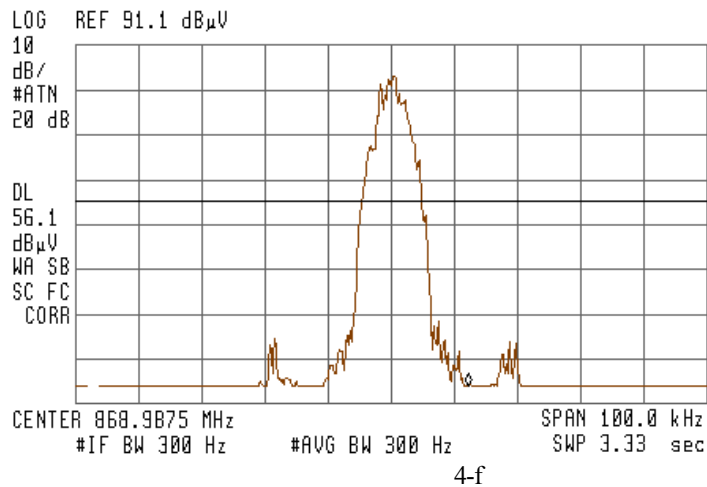
10:41:53 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 861.3748 MHz  
14.85 dBμV



10:33:29 03 NOV 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 868.9998 MHz  
14.88 dBμV



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Dates of Test: November 3-4, 2003

## 5.0 Out-of-Band Emissions at Antenna Terminals

FCC §2.1051, FCC §90.210

### 5.1 Test Procedure

The RF output of the radio was connected to a spectrum analyzer through 50 dB of attenuation to prevent overloading the analyzer. The resolution bandwidth of the spectrum analyzer was set at 100 kHz below 1 GHz. Above 1 GHz the bandwidth was set to 1 MHz. The frequency range from 30 MHz to 8.1 GHz was investigated.

Requirement: The power of emissions must be attenuated below the power of the unmodulated carrier (P) on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least  $(43 + 10 \log P)$  dB. This corresponds to a limit on the output power of spurious emissions of  $-13$  dBm. Since the measurement was performed through 50 dB of attenuation, the display line is set at  $-63$  dBm.

### 5.2 Test Results

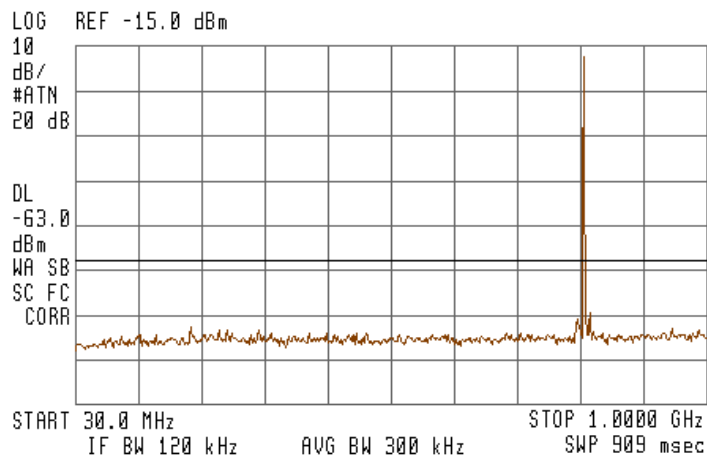
Results: Passed

11/03/2003

Equipment: ROS001, REC2, RECFL2, WEI4, DS28

| Plot Number | Description     |
|-------------|-----------------|
| 5-a         | 30 MHz – 1 GHz  |
| 5-b         | 1 GHz – 4 GHz   |
| 5-c         | 4 GHz – 6 GHz   |
| 5-d         | 6 GHz – 8.1 GHz |

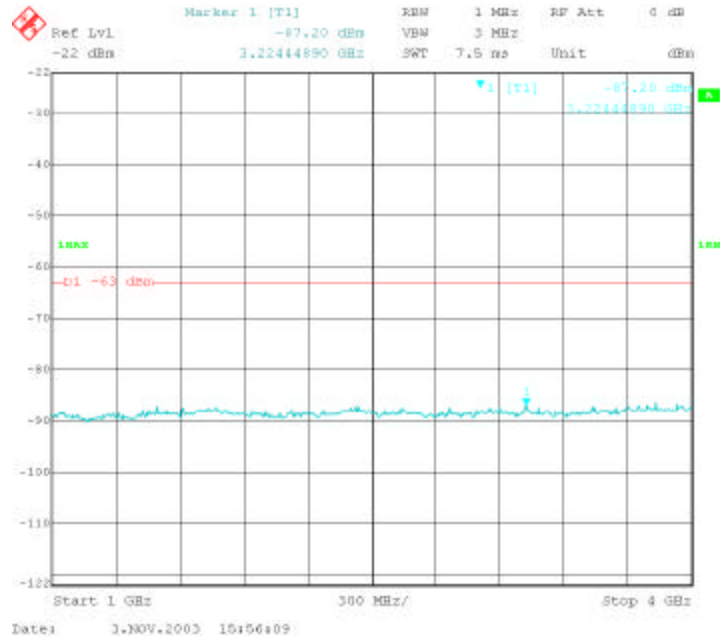
 09:35:11 03 NOV 2003

ACTV DET: PEAK  
MERS DET: PEAK QP AVG


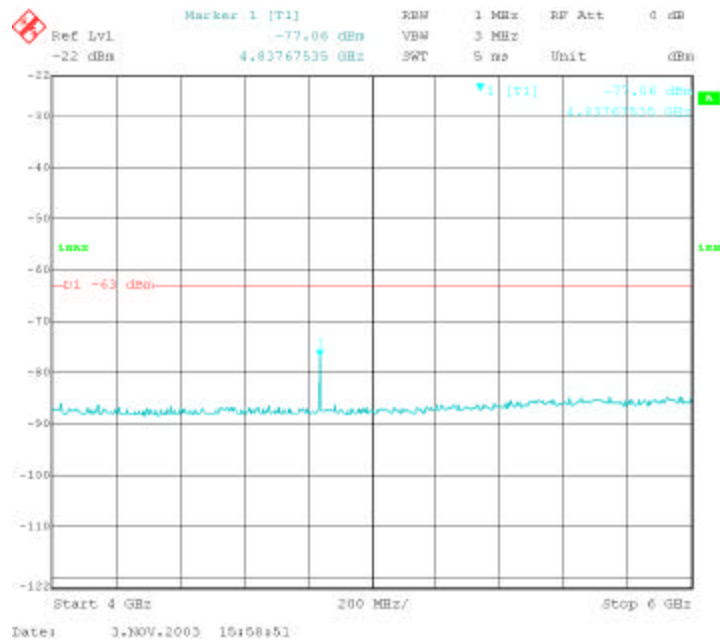
M/A-Com, Model: P800  
FCC ID: BV8P800

Dates of Test: November 3-4, 2003

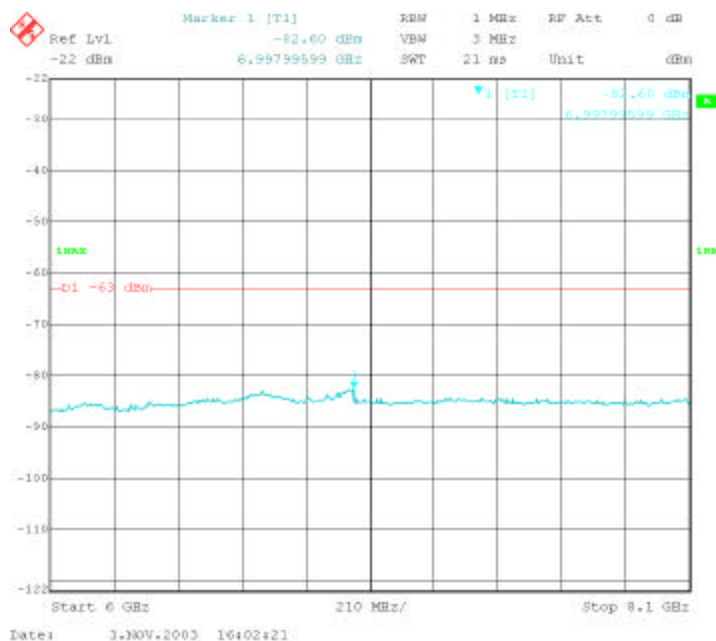
5-a



5-b



5-c



5-d

## 6.0 Field Strength of Spurious Radiation

FCC §2.1053, §90.210

### 6.1 Test Procedure

The transmitter was placed on a wooden turntable. The measurement antenna was placed at a distance of 10 meters from the EUT below 1 GHz, and 3 meters from the EUT above 1 GHz. During the tests, the antenna height and polarization were varied, and the EUT was rotated through 360 degrees in order to identify the maximum level of emissions. A max hold function was used to determine maximum field strength levels.

The Radiated Power was measured by the substitution method using a horn antenna connected to a signal generator. Power P (in dBm) was calculated as follows:

$$P = P_{sg} + dB_{adj} - L + G_H - G_d$$

Where  $G_H$  is the gain of the transmit horn/biconical antenna attached to the signal generator

$L$  is the loss in the cable between the signal generator and the transmit antenna

$P_{sg}$  is the generator output power

$G_d$  is 2.14 dBi – the gain of the half-wave dipole.

$dB_{adj}$  is the adjustment in dB used to correct for the difference between the observed field strengths of the EUT and of the signal generator signal, respectively.

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Requirement: The power into a dipole required to duplicate the chassis emission must be below -13 dBm.

## 6.2 Test Results

|               |
|---------------|
| Results: Pass |
|---------------|

11/04/2003

Equipment: REC2, RECFL2, ROS001, PRE8, HORN2, HORN3, LOG4, TMP001, CBL027, CBL029, CBL030

| Frequency (MHz) | Description | Power (dBm) | Power Limit (dBm) |
|-----------------|-------------|-------------|-------------------|
| 1612            | Harmonic    | -43.7       | -13               |
| 1842            | Spurious    | -78.6       | -13               |
| 2418            | Harmonic    | -33.0       | -13               |
| 3224            | Harmonic    | -21.8       | -13               |
| 3684            | Spurious    | -45.1       | -13               |
| 4030            | Harmonic    | -20.6       | -13               |
| 4605            | Spurious    | -48.8       | -13               |
| 4836            | Harmonic    | -17.0       | -13               |
| 5526            | Spurious    | -49.0       | -13               |
| 5642            | Harmonic    | -26.2       | -13               |
| 6448            | Harmonic    | -38.6       | -13               |
| 7254            | Harmonic    | -39.3       | -13               |
| 8060            | Harmonic    | -47.6       | -13               |

## 6.3 Configuration Photographs – Radiated Emissions



Spurious Test Setup, Front View



Spurious Test Setup, Back View