

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

FCC ID: BV8P800

Test Report #: 3060726.P800.02
Date of Report: June 9, 2004

Project #: 3060726
Dates of Test: June 8-9, 2004

Total No of Pages Contained in this Report: 13

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FCC Part 90 Certification

Table of Contents

1.0	Summary of Tests	3
2.0	General Description	4
2.1	Product Description	4
2.2	Related Submittal(s) Grants.....	4
2.3	Test Facility	5
2.4	Test Equipment and Support Equipment	6
3.0	Occupied Bandwidth, Bandwidth Limitation, Emission Masks.....	7
3.1	Test Procedure	7
3.2	Test Results.....	7

M/A-Com, Model No. P800
FCC ID: BV8P800

Date of Test: June 8-9, 2004

1.0 Summary of Tests

FCC ID: BV8P800
Model No.: P800

FCC RULE	DESCRIPTION OF TEST	RESULTS	REPORT PAGE
2.1049, 90.209(b)(5), 90.210	Occupied Bandwidth, Bandwidth Limitation, Emission Masks	Passed	7

M/A-Com, Model No. P800
FCC ID: BV8P800

Date of Test: June 8-9, 2004

2.0 General Description**2.1 Product Description**

The P800 is a hand held mobile radio operating in the 806 to 824 and 851 to 869 MHz bands. The emission designators were defined as 13K8F9W in the band 806 – 821 MHz, and 13K2F9W in the 821 – 824 MHz band. It has a rated output power of 3W. The FCC ID is BV8P800. The purpose of testing is to explore the effects of adjusting the modulation deviation level to widen the signal and take full advantage of the spectral mask limitations in the 806-824 MHz band for the OpenSky modulation (OTP/ORP which employs a GFSK modulation), to show compliance of the P25 C4FM modulation with masks G and H in the 806-824 and 851-869 MHz bands, and to show compliance of the TalkAround analog modulation with masks G and H in the 851-869 MHz band. A production version of the P800 Handheld Portable Radio was received on June 8, 2004 in good condition, with serial number A400071000C2.

Transmit Band (OTP modulation)	806-821 MHz	821-824 MHz
Emissions Designator	13K8F9W	13K2F9W

The EUT has been tested at the request of

Company: M/A-Com
1011 Pawtucket Blvd.
Lowell, MA, 01853-2395

Name of contact: Ben George and Roman Makarewicz

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Overview of P800 Unit

Applicant	M/A-Com, Inc.
FCC Identifier	BV8P800
Use of Product	Voice and Data Communication
Type of Modulation	GFSK
Bit Rate	19200 bps
Baud Rate	9600
Occupied Bandwidth	13.8 kHz measured
AT@DEVSCALE (OTP only)	806 – 821 MHz Band: 5800 821 – 824 MHz Band: 5000
Frequency Range	806 – 824 MHz, 851 – 869 MHz
Max. Number of Channels	830
Detachable Antenna?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
External Input	<input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Digital Data

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
EMI Receiver Set	Hewlett Packard	8542E	REC2	3520A00125	12/18/2004
RF Filter	Hewlett Packard	85420E	RECFL2	3427A00126	12/18/2004
Universal Power Meter	Gigatronics	8651A	GIG1	8651298	10/24/2004
Peak Power Sensor	Gigatronics	80354A	GIG2	1821196	10/24/2004
RF Communications Test Set	Hewlett Packard	8920B	HEW64	US36141447	10/17/2004
Attenuator, 30 dB	Weinschel	47-30-34	WEI13	BD4329	08/18/2004
High Frequency Cable	Megaphase	TM40 K1K1 197	CBL028	CBL028	11/11/2004
Spectrum Analyzer	Agilent	E7405A	AGL001	US40240205	07/02/2004
Digital 4 Line Barometer	Mannix	0ABA116	BAR2	BAR2	07/09/2004

Support Equipment

Description	Manufacturer	Model Number	Serial Number
Laptop Computer IBM Thinkpad	IBM	2647	78-GPZ99

Cables

Quantity	Type	Length (m)	Shielding	Ferrite	Connector Type
1	Side Connector Cable	1	Foil	No	Metal/Screw
1	Mouse Cable	1	None	No	Metal/360

3.0 Occupied Bandwidth, Bandwidth Limitation, Emission Masks

FCC §2.1049, 90.209(b)(5), 90.210

3.1 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 120 kHz span around the transmit frequency and video bandwidth was set to 3 kHz, and the spectrum of the transmitting signal was recorded using Peak detector mode and Trace Mode: Max Hold. This spectrum was compared to the required emission mask. Carrier power was normalized at the frequencies plotted by recording 400 data points using 300 Hz bandwidth to cover the entire 120 kHz span and integrating the values to obtain the carrier power observed using the instrument settings with which the plots are generated. These normalized carrier powers are used to determine the upper limit for the applicable emissions masks. For the Talk Around analog modulation plots, the transmitter was modulated by an injected 2.5 kHz tone at 16 dB above the level that produced 50% modulation.

Occupied bandwidth was measured in the OTP modulation mode using the 99% power function on the spectrum analyzer using a 300 Hz resolution bandwidth and a 1 kHz video bandwidth. The OTP modulation mode is the only modulation mode affected by the AT@DEVSCALE setting.

The emission designators were defined as 13K8F9W in the band 806 – 821 MHz, and 13K2F9W in the 821 – 824 MHz band. The Necessary Bandwidth is determined using the formula $B=R/(\text{LOG}_2(S))+2DK$, where R is the Bit Rate of 19,200 bps, S is the number of FSK levels, in this case 4, D is the maximum symbol deviation, and K is a unitless factor of 1. D is controlled through software and is set at 5800 Hz in the 806 – 821 MHz band, and at 5000 Hz in the band 821 – 824 MHz. K was adjusted to reflect the actual necessary bandwidth of the signals. In this case $k=0.36$ in the 806-821 MHz band and $k=0.36$ in the 821-824 MHz band. The EUT implements a digital data stream through software FSK modulation and the digital data is not affected by an audio low pass filter.

3.2 Test Results

Performed 6/8-9/2004 Equipment: REC2, RECFL2, CBL028, AGL001, GIG1, GIG2, WEI13, BAR2, HEW64

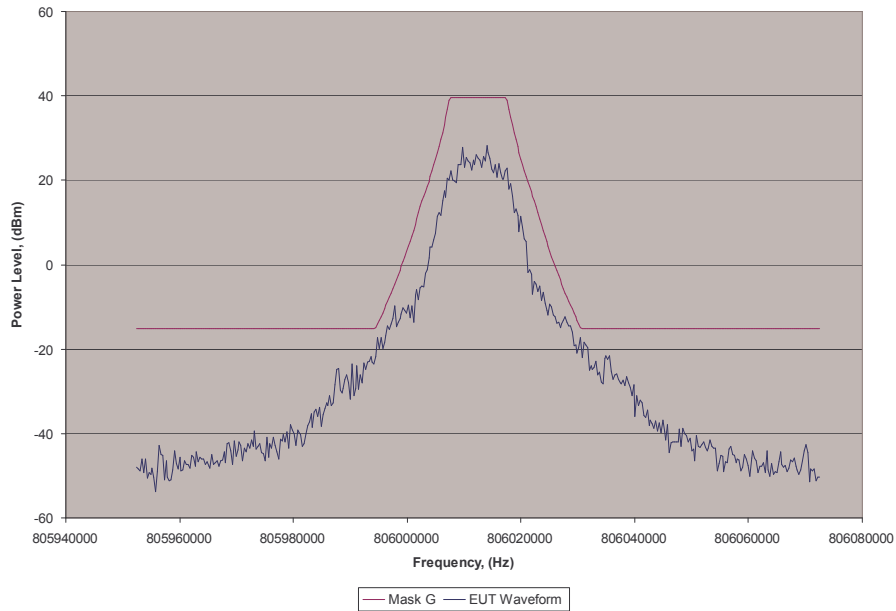
Frequency (MHz)	Occupied Bandwidth (kHz)	Authorized Bandwidth (kHz)
806.0125, Channel 1 (Low Channel)	13.5	20
816.3625, Channel 415 (Middle Channel)	13.8	20
823.9875, Channel 830 (High Channel)	13.2	20

Plots of the recorded fundamental emissions spectra against the corresponding emissions masks for each channel listed above can be found below.

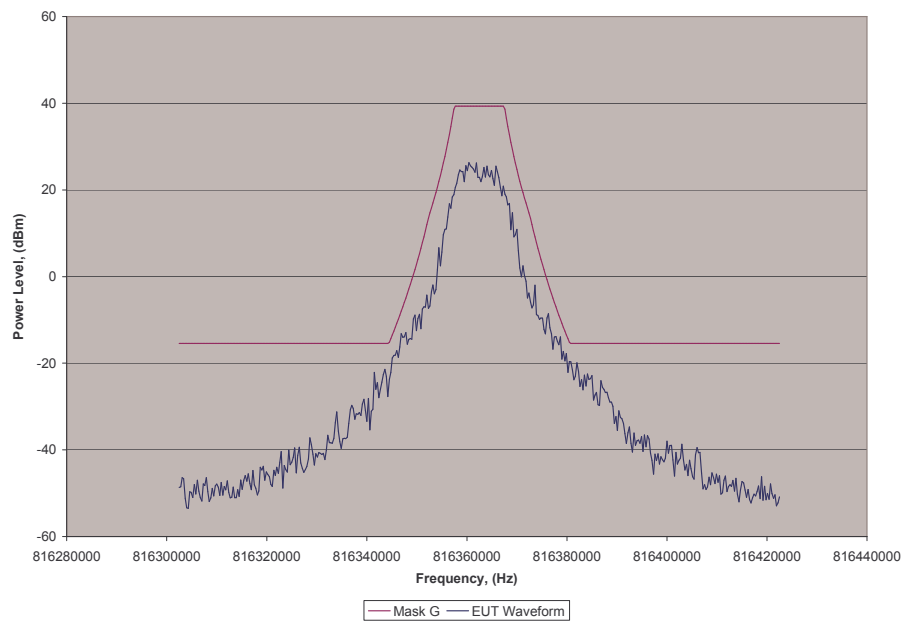
Results: Passed

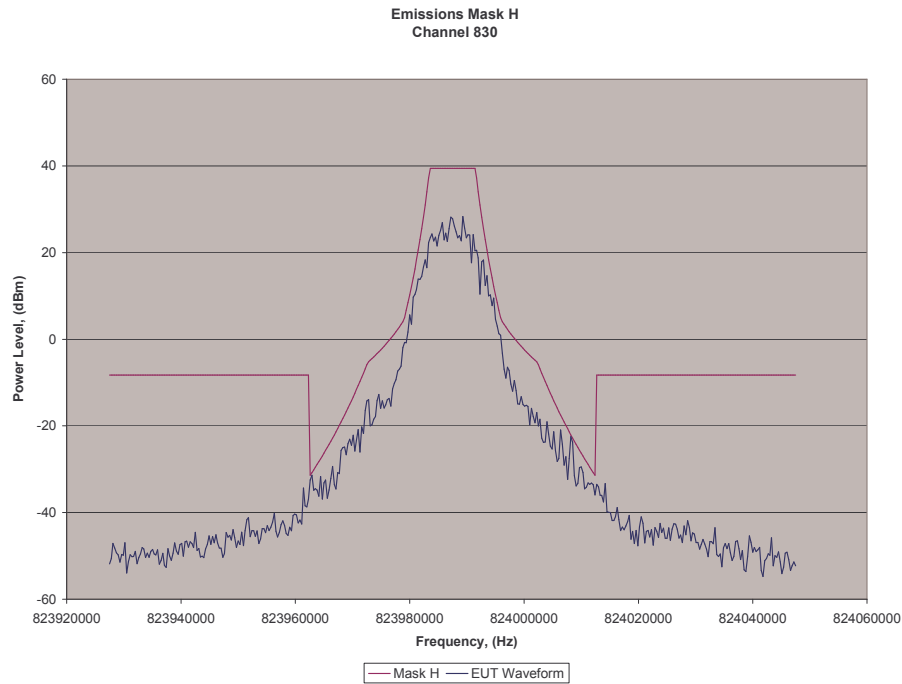
OTP Plots

Emissions Mask G
Channel 1

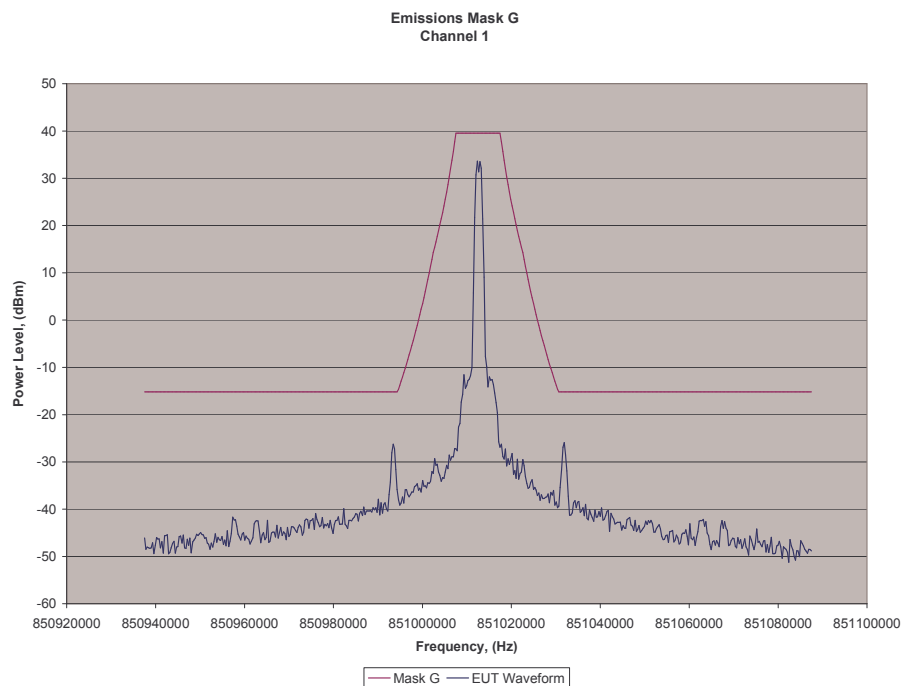


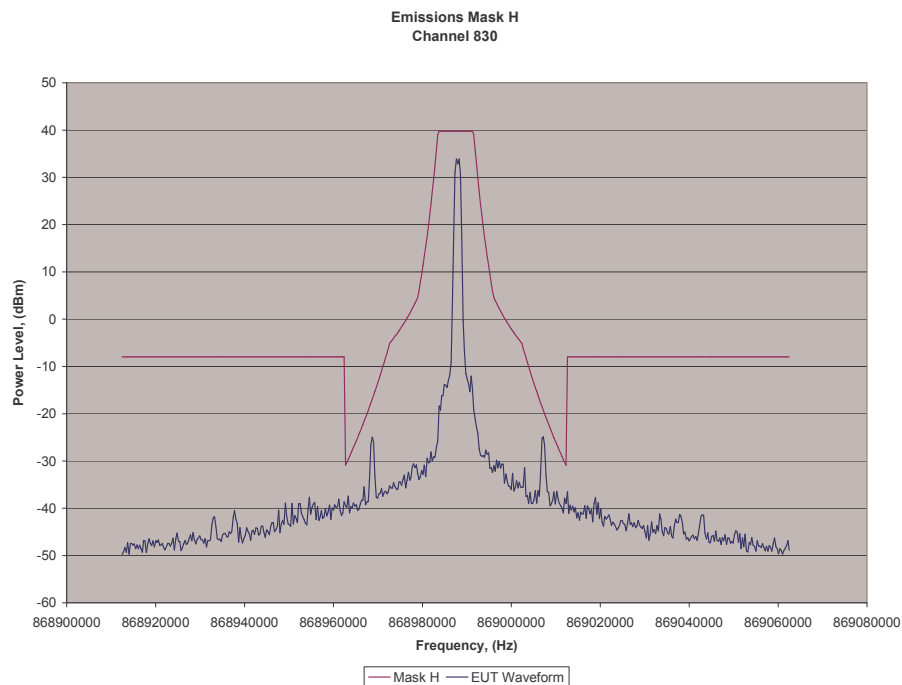
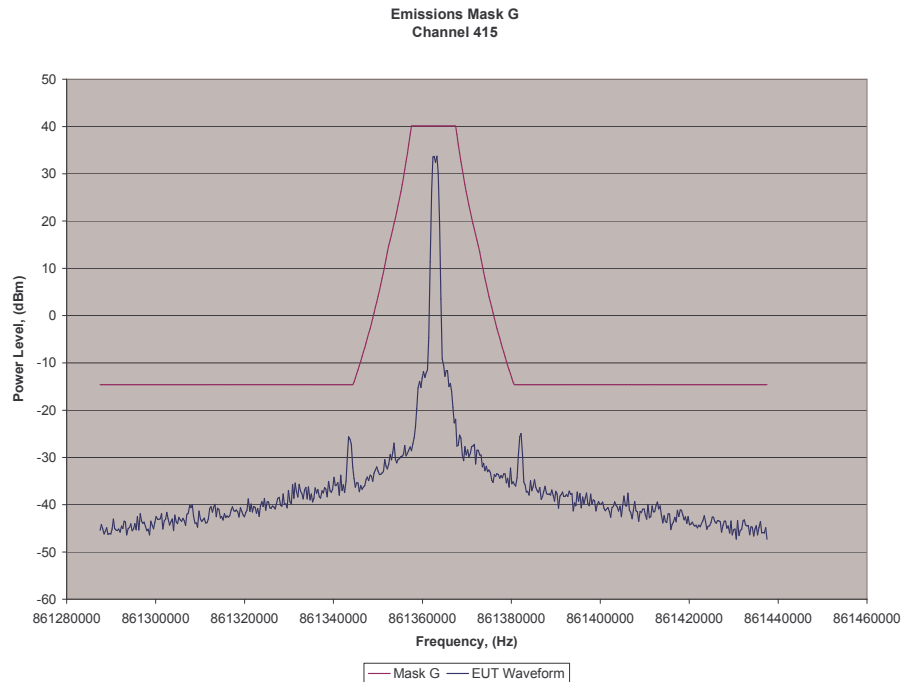
Emissions Mask G
Channel 415





Talk Around Analog Plots





P25 C4FM Plots

