Engineering and Testing for EMC and Safety Compliance

# CLASS II PERMISSIVE CHANGE TEST REPORT

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## MODEL: 800 MHz OpenSky Base Station Radio 851-869 MHz

**FCC ID: BV8MBS800A075**

***July 12, 2005***

| STANDARDS REFERENCED FOR THIS REPORT | |
|---|---|
| PART 2: 2003 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS |
| PART 15: 2003 | §15.109: RADIATED EMISSIONS LIMITS |
| PART 90: 2003 | PRIVATE LAND MOBILE RADIO SERVICES |
| ANSI C63.4-2003 | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS |
| ANSI/TIA/EIA 603-2002 | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA –102.CAAA; 2002 | DIGITAL C4FM/CQPSK TRANSCEIVER MEASUREMENT METHODS |

| Frequency Range (MHz) | Maximum Measured Output Power (W) Conducted | Frequency Tolerance (ppm) | Emission Designator |
|---|---|---|---|
| 866-869 | 75.0 W | 1.0 | 12K1F9W |
| 851-866 | 75.0 W | 1.0 | 12K1F9W |
| 866-869 | 75.0 W | 1.0 | 11K0F9W |
| 851-869 | 75.0 W | 1.0 | 11K3F1D |

**REPORT PREPARED BY TEST ENGINEER: DANIEL BIGGS**

*Document Number: 2005105/QRTL05-171*

## TABLE OF CONTENTS

## TABLE OF TABLES



## TABLE OF PLOTS



## TABLE OF FIGURES



## TABLE OF APPENDICES



## TABLE OF PHOTOGRAPHS

# 1 GENERAL INFORMATION

The following Class II Permissive Change Report is prepared on behalf of **M/A-COM, Inc**. in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **800 MHz OpenSky Base Station Radio; FCC ID: BV8MBS800A075**. 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, and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 2003. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

## 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 (ANSI C63.4 2003).

## 1.2 RELATED SUBMITTAL(S)/GRANT(S)

This is a Class II permissive change report for FCC ID: BV8MBS800A075, originally certified August 18, 1999, with a Class II permissive change granted January 16, 2005.

## 1.3 DESCRIPTION OF CHANGE IN DEVICE

M/A-Com adjusted the software deviation settings to slightly increase the modulation bandwidth to take full advantage of allowed signal bandwidth, thus improving the overall system signal-to-noise ratio.

## 1.4 PRODUCT DESCRIPTION

The EUT is a base station radio that operates in the 851-869 MHz band. The rated RF output power is programmable to 75.0 watts. The EUT is digitally modulated using a 4-level Gaussian Minimum Shift Keying (GMSK) with a symbol rate of 9600 Hz (19.2 kbps).

## 2 CONFORMANCE STATEMENT

| STANDARDS REFERENCED FOR THIS REPORT | |
|---|---|
| PART 2: 2003 | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS |
| PART 15: 2003 | §15.109: RADIATED EMISSIONS LIMITS |
| PART 90: 2003 | PRIVATE LAND MOBILE RADIO SERVICES |
| ANSI C63.4-2003 | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS |
| ANSI/TIA/EIA 603 - 2002 | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA – 102.CAAA; 2002 | DIGITAL C4FM/CQPSK TRANSCEIVER MEASUREMENT METHODS |

| Frequency Range | Maximum Measured Output Power (W) Conducted | Measured Frequency Tolerance (ppm) | Emission Designator |
|---|---|---|---|
| 866-869 | 75.0 W | 1.0 | 12K1F9W |
| 851-866 | 75.0 W | 1.0 | 12K1F9W |
| 866-869 | 75.0 W | 1.0 | 11K0F9W |
| 851-869 | 75.0 W | 1.0 | 11K3F1D |

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the above standards for Certification methodology.

Signature: 

Date: July 12, 2005

Typed/Printed Name: Desmond A. Fraser

Position: President

Signature: 

Date: July 12, 2005

Typed/Printed Name: Daniel W. Biggs

Position: Test Engineer

## 3 TESTED SYSTEM DETAILS

The test sample was received June 14, 2005. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

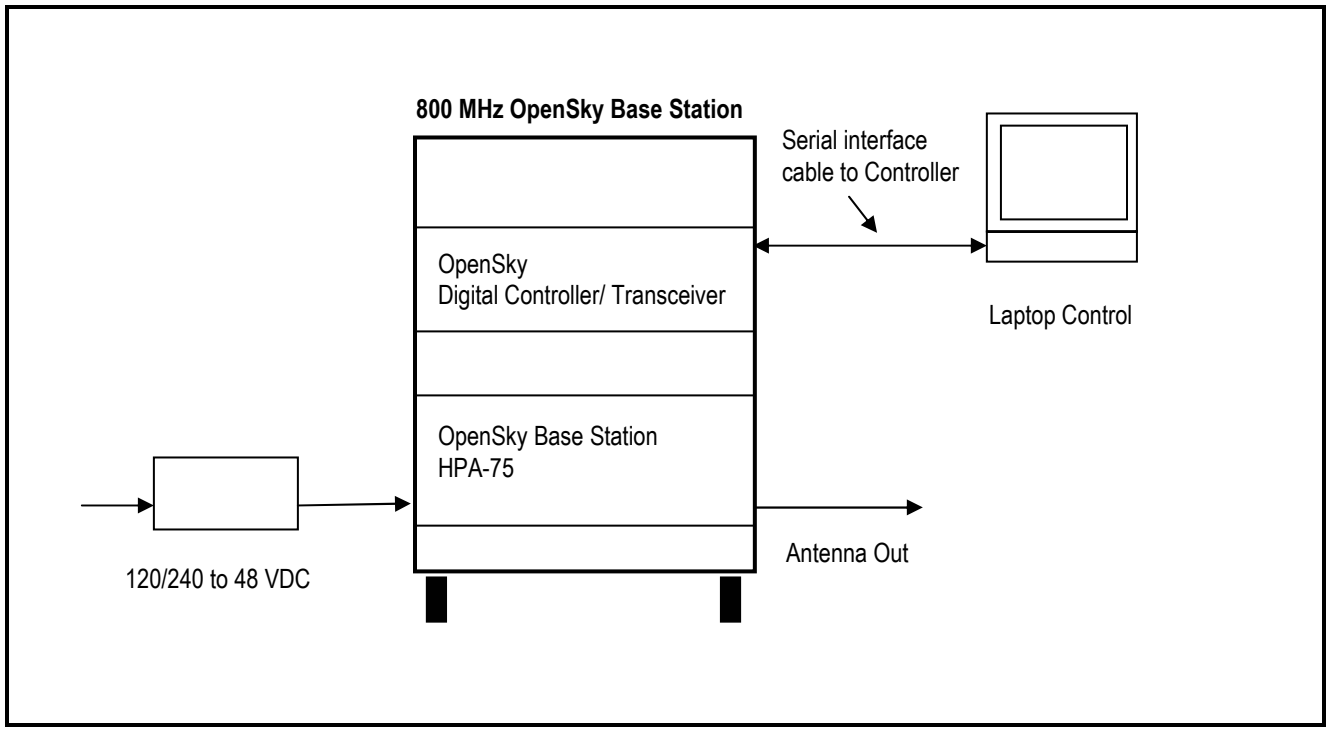
**TABLE 3-1: EQUIPMENT UNDER TEST (EUT)**

| Part | Manufacturer | Model | PN/SN | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| 800 MHz Base Station HPA-75 | M/A-Com, Inc. | BSH 1010 | AM42-0053 | BV8MBS800A075 | 15758 |
| Digital Controller/Transceiver | M/A-Com, Inc. | N/A | BS90-0001-000 | N/A | 15758 |

**TABLE 3-2: SUPPORT EQUIPMENT**

| Part | Manufacturer | Model | PN/SN | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| Notebook computer | Hewlett Packard | Omnibook | N/A | N/A | N/A |
| Serial interface cable | | DB-9 | N/A | N/A | N/A |
| Power Supply | Mean Well | SE-600-48 | N/A | N/A | N/A |

**FIGURE 3-1: CONFIGURATION OF TESTED SYSTEM**



# 4 FCC RULES AND REGULATIONS PART 2 §2.1033(C)(8) VOLTAGES AND CURRENTS THROUGH THE FINAL AMPLIFYING STAGE

**Nominal DC Voltage:** 28.0 VDC
**Current:** 10.0 AMPS

# 5 FCC RULES AND REGULATIONS PART 90 §90.541 AND PART 2 §2.1046(A): RF POWER OUTPUT: CONDUCTED

## 5.1 TEST PROCEDURE

ANSI/TIA/EIA-603-2002, Section 2.2.1.

The EUT was connected to a coaxial attenuator having a 50Ω load impedance.

## 5.2 TEST DATA

The following channels (in MHz) were tested: 851.0125, 858.4895, 865.9875, 866.0125, 867.5125, and 868.9875.

**TABLE 5-1: RF POWER OUTPUT (HIGH POWER) CARRIER OUTPUT POWER (UNMODULATED)**

| Channel | Frequency (MHz) | RF Power Measured (Watt)* |
|---|---|---|
| 1 | 851.0125 | 73.45 |
| 300 | 858.4895 | 74.30 |
| 600 | 865.9875 | 73.10 |
| 601 | 866.0125 | 73.45 |
| 715 | 867.5125 | 73.11 |
| 830 | 868.9875 | 74.13 |

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

**TABLE 5-2: RF POWER OUTPUT (RATED POWER)**

| Rated Power (W) |
|---|
| 75 |

**TABLE 5-3: RF POWER OUTPUT (CONDUCTED) TEST EQUIPMENT**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901184/901186 | Agilent | E4416A/E9323A | Power Meter/ Sensor | GB41050573/US420.52510380 | 08/02/05 |

**TEST PERSONNEL:**

| Daniel Biggs |  | June 20, 2005 |
|---|---|---|
| Test Technician/Engineer | Signature | Date Of Test |

# 6 FCC RULES AND REGULATIONS PART 90 §90.543(C) AND PART 2 §2.1051: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## 6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-2002, Section 2.2.13.

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 19,200 bps.

## 6.2 TEST DATA

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc.

Limits: Mask D (dBm): P(dBm) – (43+10xLOG P(W))

The following channels (in MHz) were investigated: 858.4895 and 867.5125. The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

**TABLE 6-1: CONDUCTED SPURIOUS EMISSIONS CHANNEL 300 – 858.4895 MHZ – HIGH POWER**

25 kHz channel spacing; Conducted power = 74.3 W

| Frequency (MHz) | Level (dBc) | Limit (dBc) | Margin(dB) |
|---|---|---|---|
| 1716.979 | 98.12 | 61.71 | -36.41 |
| 2575.469 | 90.27 | 61.71 | -28.56 |
| 3433.958 | 100.69 | 61.71 | -38.98 |
| 4292.448 | 98.53 | 61.71 | -36.82 |
| 5150.937 | 100.19 | 61.71 | -38.48 |
| 6009.427 | 98.10 | 61.71 | -36.39 |
| 6867.916 | 92.01 | 61.71 | -30.30 |
| 7726.406 | 96.90 | 61.71 | -35.19 |
| 8584.895 | 94.65 | 61.71 | -32.94 |

**TABLE 6-2: CONDUCTED SPURIOUS EMISSIONS CHANNEL 715 – 867.5125 MHZ – HIGH POWER**

12.5 kHz channel spacing; Conducted power = 73.1 W

| Frequency (MHz) | Level (dBc) | Limit (dBc) | Margin(dB) |
|---|---|---|---|
| 1735.025 | 95.91 | 100.15 | 61.64 |
| 2602.538 | 100.19 | 88.92 | 61.64 |
| 3470.05 | 110.01 | 99.28 | 61.64 |
| 4337.563 | 79.39 | 89.70 | 61.64 |
| 5205.075 | 110.28 | 100.60 | 61.64 |
| 6072.588 | 109.11 | 98.69 | 61.64 |
| 6940.1 | 101.23 | 95.06 | 61.64 |
| 7807.613 | 103.13 | 99.71 | 61.64 |
| 8675.125 | 97.17 | 91.30 | 61.64 |

**TABLE 6-3: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz-12.8 GHz) | 3826A00144 | 09/08/05 |

**TEST PERSONNEL:**

| Daniel Biggs |  | June 20, 2005 |
|---|---|---|
| Test Technician/Engineer | Signature | Date Of Test |

# 7 FCC RULES AND REGULATIONS PART 90 §90.543(C) AND PART 2 §2.1053(A): FIELD STRENGTH OF SPURIOUS RADIATION

## 7.1 TEST PROCEDURE

ANSI/TIA/EIA-603-2002, Section 2.2.12.

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 19,200 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.

## 7.2 TEST DATA

### 7.2.1 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 7-1: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 300 – 858.4895 MHZ; WIDE BAND; HIGH POWER**

Limit = 43 + 10 Log P = 61.7 dBc  Conducted Power = 48.71 dBm = 74.3 W

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss* (dB) | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1716.979 | 31.0 | -58.0 | 0.21 | 4.80 | 102.2 | -40.5 |
| 2575.469 | 34.2 | -59.2 | 0.29 | 5.30 | 102.9 | -41.2 |
| 3433.958 | 36.3 | -56.8 | 0.82 | 5.85 | 100.5 | -38.8 |
| 4292.448 | 34.0 | -52.1 | 0.86 | 6.54 | 95.1 | -33.4 |
| 5150.937 | 33.7 | -53.4 | 1.24 | 6.84 | 96.5 | -34.8 |
| 6009.427 | 33.2 | -54.4 | 1.85 | 6.65 | 98.3 | -36.6 |
| 6867.916 | 33.8 | -52.9 | 2.01 | 7.85 | 95.8 | -34.1 |
| 7726.406 | 33.5 | -53.3 | 2.46 | 7.84 | 96.6 | -34.9 |
| 8584.895 | 32.5 | -53.7 | 2.45 | 8.54 | 96.3 | -34.6 |

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

**TABLE 7-2: FIELD STRENGTH OF SPURIOUS RADIATION CHANNEL 715 – 867.5125 MHZ; WIDE BAND; HIGH POWER**

Limit = 43 + 10 Log P = 61.6 dBc  Conducted Power = 48.64 dBm = 73.1 W

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss* (dB) | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 1735.025 | 31.0 | -57.9 | 0.55 | 4.80 | 102.3 | -40.7 |
| 2602.538 | 35.5 | -57.4 | 0.79 | 5.30 | 101.5 | -39.8 |
| 3470.05 | 33.7 | -60.2 | 0.77 | 5.85 | 103.7 | -42.1 |
| 4337.563 | 34.5 | -52.3 | 1.3 | 6.54 | 95.7 | -34.1 |
| 5205.075 | 32.0 | -54.8 | 1.77 | 6.84 | 98.4 | -36.8 |
| 6072.588 | 33.3 | -55.6 | 1.97 | 6.65 | 99.5 | -37.9 |
| 6940.1 | 33.0 | -54.7 | 2.26 | 7.85 | 97.8 | -36.1 |
| 7807.613 | 31.2 | -54.3 | 2.39 | 7.84 | 97.5 | -35.9 |
| 8675.125 | 31.5 | -53.6 | 2.71 | 8.54 | 96.4 | -34.8 |

**TABLE 7-3: FIELD STRENGTH OF SPURIOUS RADIATION TEST EQUIPMENT**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901053 | Schaffner-Chase | CBL6112 | Antenna (25 MHz – 2 GHz) | 2648 | 09/20/05 |
| 900814 | Electro-Metrics | EM-6961 (RGA-60) | Double Ridge Guide Antenna (1 - 18 GHz) | 2310 | 2/17/2006 |
| 900932 | Hewlett Packard | 8449B OPT H02 | Preamplifier (1 - 26.5 GHz) | 3008A00505 | N/A |
| 901020 | Hewlett Packard | 8564E | Portable Spectrum Analyzer (9 kHz - 40 GHz) | 3943A01719 | 08/11/05 |
| 900917 | Hewlett Packard | 8648C | Synthesized Signal Generator (9 kHz - 3200 MHz) | 3537A01741 | 07/06/05 |
| 900928 | Hewlett Packard | HP 83752A | Synthesized Sweeper (.01 - 20 GHz) | 3610A00866 | 09/05/05 |

**TEST PERSONNEL:**

| Daniel Biggs |  | June 21, 2005 |
|---|---|---|
| Test Technician/Engineer | Signature | Date Of Test |

# 8 FCC RULES AND REGULATIONS PART 90 §90.543(A) AND PART 2 §2.1049(C)(1): OCCUPIED BANDWIDTH

Occupied Bandwidth - provided that the ACCP requirements are met, the applicants may request any authorized bandwidth that does not exceed the channel size.

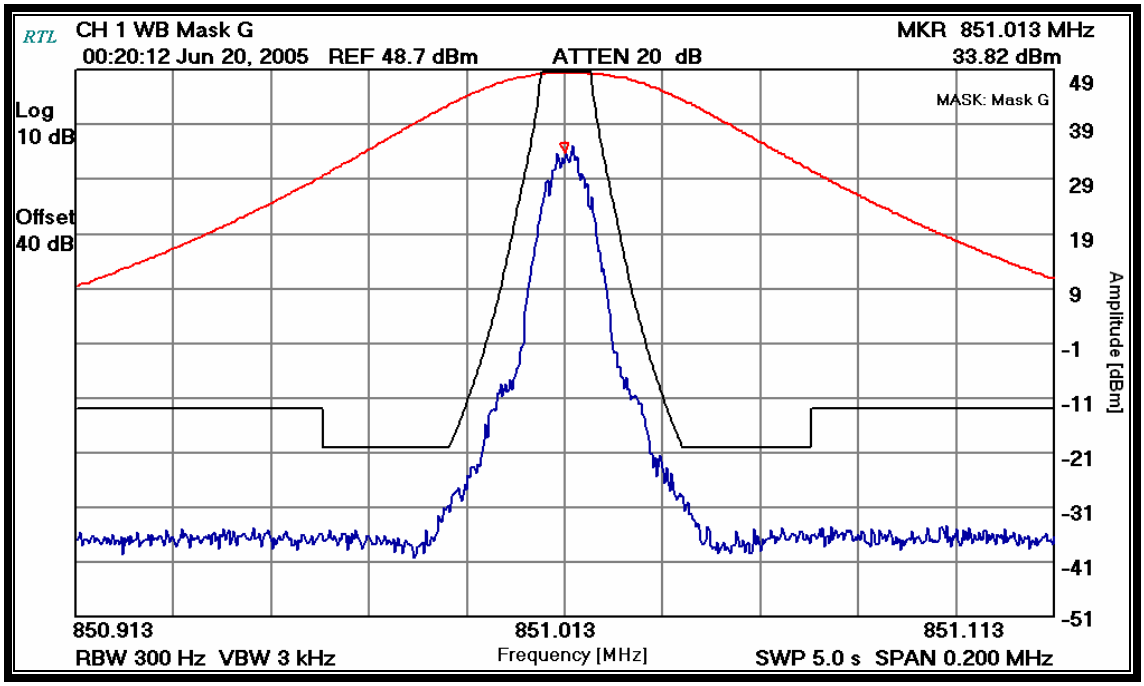
## 8.1 TEST PROCEDURE

Device with digital modulation: Modulated to its maximum extent using a pseudo random data sequence – 19,200 bps.

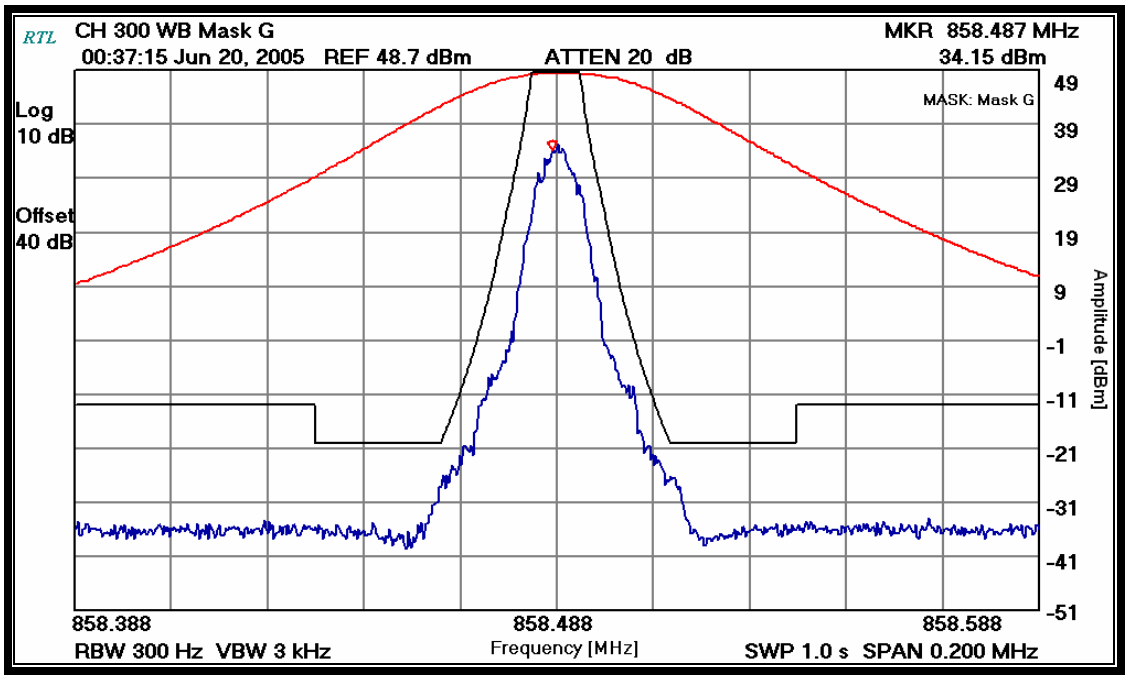
ANSI/TIA/EIA-603-2002, Section 2.2.11.

## 8.2 TEST DATA

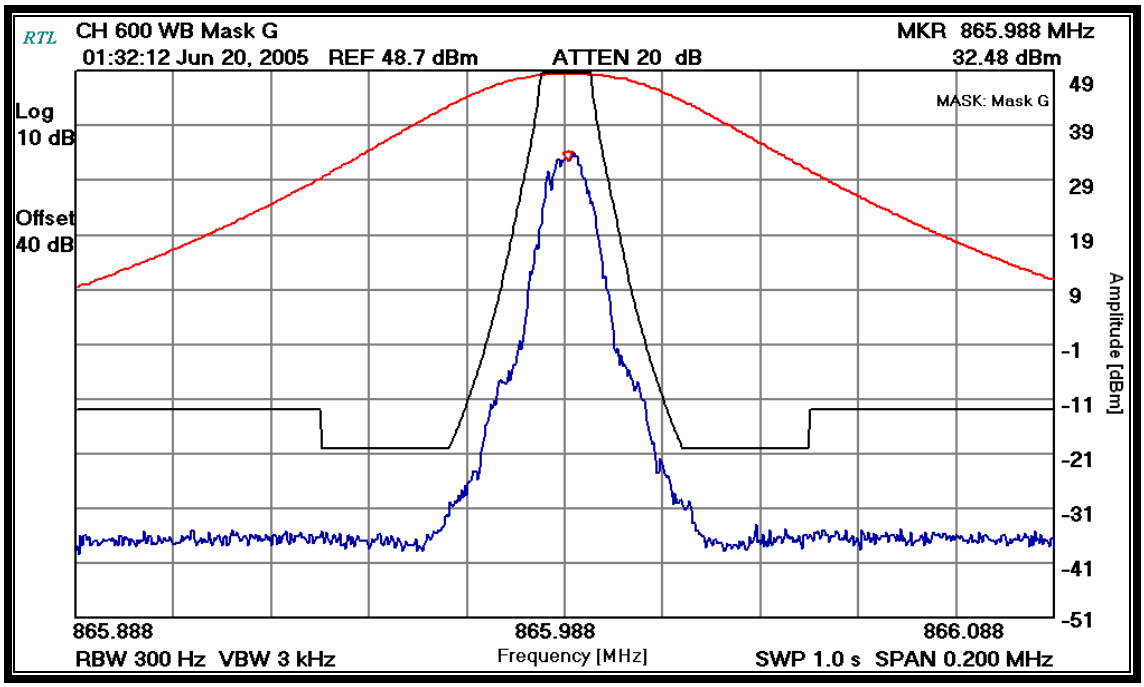
**PLOT 8-1: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 1**



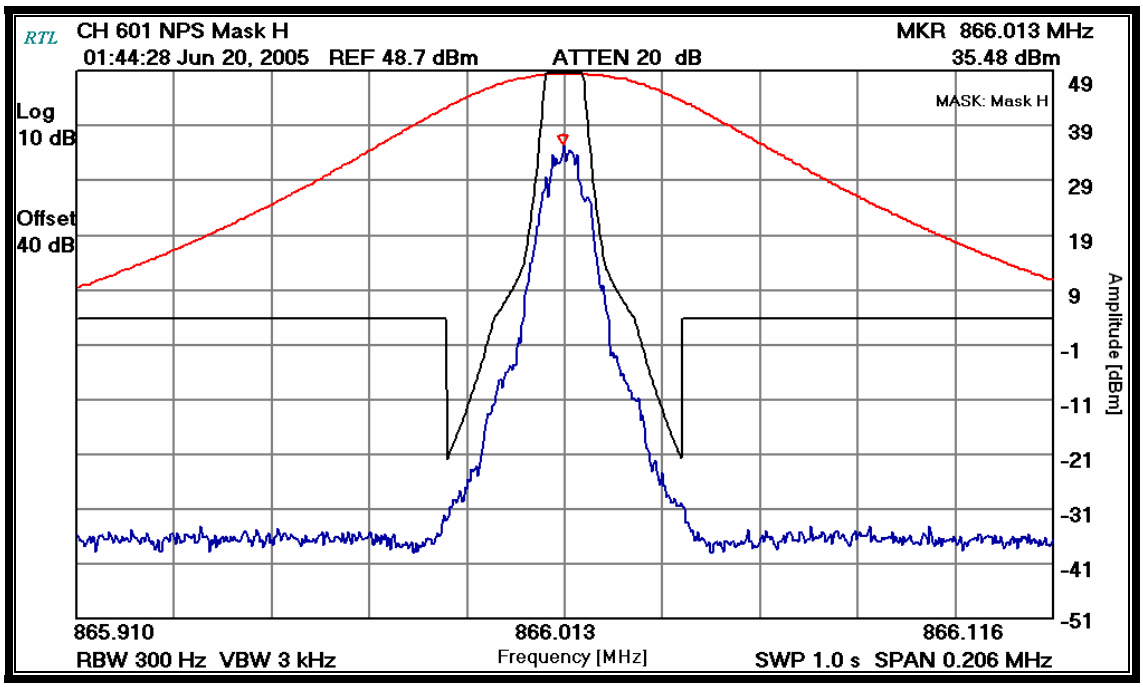
**PLOT 8-2: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 300**



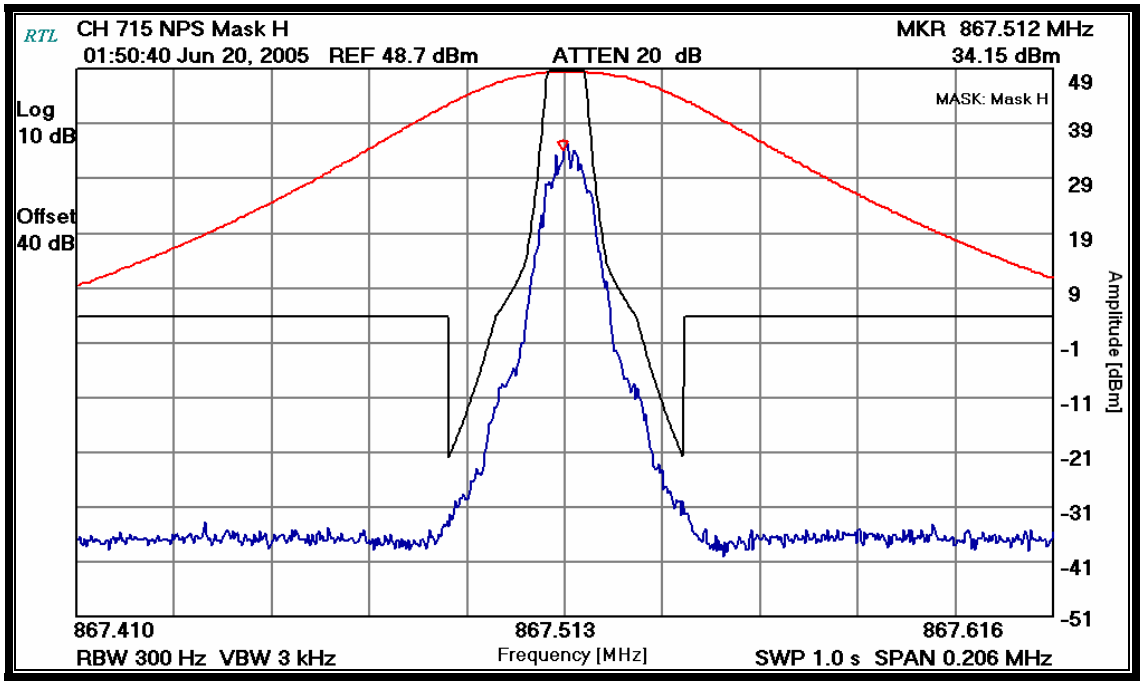
**PLOT 8-3: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 600**



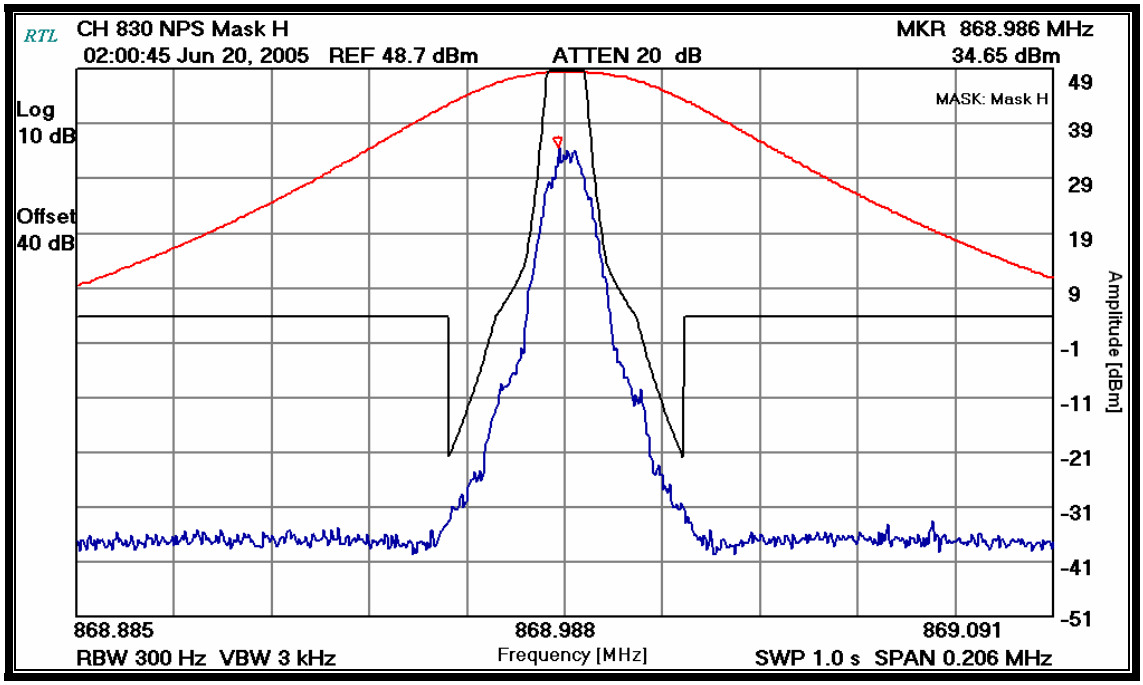
**PLOT 8-4: OCCUPIED BANDWIDTH; NPSPAC; CHANNEL 601**



**PLOT 8-5: OCCUPIED BANDWIDTH; NPSPAC; CHANNEL 715**



## PLOT 8-6: OCCUPIED BANDWIDTH; NPSPAC; CHANNEL 830




## TABLE 8-1: OCCUPIED BANDWIDTH TEST EQUIPMENT

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz - 12.8 GHz) | 3826A00144 | 09/08/05 |

## TEST PERSONNEL:

| Daniel Biggs | Daniel Biggs | June 27, 2005 |
|---|---|---|
| Test Technician/Engineer | Signature | Date Of Test |

# 9 FCC RULES AND REGULATIONS PART 2 §2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: F9W

**FCC Mask 90.210(g):**
**Type of Emission: F9W**
**Digital Voice and Data: 19,200 BPS**

**Calculation:**

B(n) = (R/Log{2}S + 2KD), where Log{2} is Log base 2

where
R = 19.2 kilobits per second [raw data rate]
S = 4 [4-level FSK]
D = 3.75 kHz [FM Deviation]
K = 0.334, [K is best quadratic fit to occupied BW measurements; K = (-0.256*d*d + 1.066*d - 0.576), where d = normalized deviation factor of 1.2]

B(n) = 12,100 or 12K1
FCC Emission Designator: 12K1F9W

**FCC Mask 90.210(h):**
**Type of Emission: F9W**
**Digital Voice and Data: 19,200 BPS**

**Calculation:**

B(n) = (R/Log{2}S + 2KD), where Log{2} is Log base 2

where
R = 19.2 kilobits per second [raw data rate]
S = 4 [4-level FSK]
D = 3.75 kHz [FM Deviation]
K = 0.334, [K is best quadratic fit to occupied BW measurements; K = (-0.256*d*d + 1.066*d - 0.576), where d = normalized deviation factor of 1.2]

B(n) = 12,100 or 12K1
FCC Emission Designator: 12K1F9W

## 10 CONCLUSION

The data in this measurement report shows that the **M/A-COM, Inc**. Model **800 MHz OpenSky Base Station Radio; FCC ID: BV8MBS800A075,** complies with all the requirements of Parts 90, 15 and 2 of the FCC Rules.