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

January 11, 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
851-866	75	1.0	12K1F9W
866-869	75	1.0	11K0F9W

REPORT PREPARED BY TEST ENGINEER: DANIEL BIGGS

Document Number: 2004218/QRTL04-408

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1 GENERAL INFORMATION

The following Type Certification 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 dated March 3, 1994, 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.

1.3 DESCRIPTION OF CHANGE IN DEVICE

M/A-Com adjusted the software gain settings to slightly increase modulation bandwidth to take full advantage of allowed signal bandwidth, thus improving 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
851-866	75	1.0	12K1F9W
866-869	75	1.0	11K0F9W

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: Richard B. McMurray Date: January 11, 2005

Typed/Printed Name: Rick McMurray Position: Vice President of Operations

Signature: Daniel Biggs Date: January 11, 2005

Typed/Printed Name: Daniel W. Biggs Position: Test Engineer

3 TESTED SYSTEM DETAILS

The test sample was received August 18, 2004. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

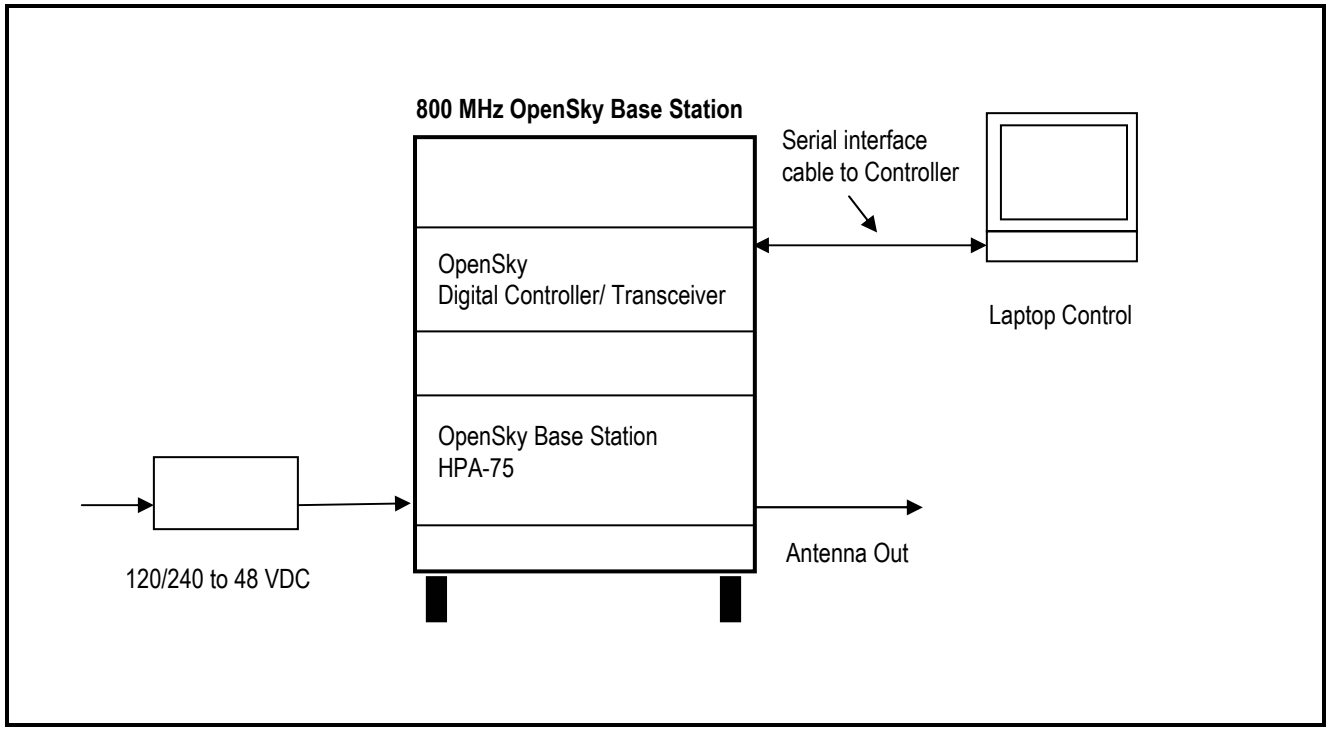
TABLE 3-1: EQUIPMENT UNDER TEST (EUT)

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
Power Supply		SE-600-48		N/A	N/A

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

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	73.96
300	858.4895	74.47
600	865.9875	73.79
601	866.0125	74.30
715	867.5125	73.79
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: TEST EQUIPMENT USED FOR TESTING RF POWER OUTPUT - CONDUCTED

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		December 2, 2004
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 = 74.47 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1716.979	92.53	61.72	-30.81
2575.469	98.34	61.72	-36.62
3433.958	112.25	61.72	-50.53
4292.448	106.59	61.72	-44.87
5150.937	110.39	61.72	-48.67
6009.427	107.65	61.72	-45.93
6867.916	98.40	61.72	-36.68
7726.406	104.39	61.72	-42.67
8584.895	99.74	61.72	-38.02

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

12.5 kHz channel spacing; Conducted power = 73.8 W

Frequency (MHz)	Level (dBc)	Limit (dBc)	Margin(dB)
1735.025	95.91	61.68	-34.23
2602.538	100.19	61.68	-38.51
3470.05	110.01	61.68	-48.33
4337.563	79.39	61.68	-17.71
5205.075	110.28	61.68	-48.60
6072.588	109.11	61.68	-47.43
6940.1	101.23	61.68	-39.55
7807.613	103.13	61.68	-41.45
8675.125	97.17	61.68	-35.49

TABLE 6-3: TEST EQUIPMENT USED FOR TESTING CONDUCTED SPURIOUS EMISSIONS

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		December 10, 2004
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; WIDEBAND; HIGH POWER

Radiated Spurious Emissions
Channel 300 (858.4895 MHz, Wideband)
Limit = 43 + 10 Log P = 61.72 dBc
Conducted Power = 48.72 dBm = 74.47 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	26.52	-62.5	0.21	4.80	106.7	-44.9
2575.469	36.78	-56.6	0.29	5.30	100.3	-38.6
3433.958	26.23	-66.9	0.82	5.85	110.6	-48.9
4292.448	25.07	-61.0	0.86	6.54	104.1	-42.4
5150.937	25.11	-62.0	1.24	6.84	105.1	-43.4
6009.427	24.06	-63.6	1.85	6.65	107.5	-45.8
6867.916	28.69	-58.0	2.01	7.85	100.9	-39.2
7726.406	29.69	-57.1	2.46	7.84	100.4	-38.7
8584.895	30.3	-55.9	2.45	8.54	98.5	-36.8

*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; WIDEBAND; HIGH POWER

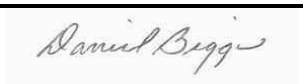
Radiated Spurious Emissions
Channel 715 (867.5125 MHz, Wideband)
Limit = 43 + 10 Log P = 61.68 dBc
Conducted Power = 48.68 dBm = 73.79 W

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	26.27	-62.6	0.55	4.80	107.1	-45.4
2602.538	30.8	-62.1	0.79	5.30	106.2	-44.5
3470.05	25.7	-68.2	0.77	5.85	111.8	-50.1
4337.563	32.25	-54.6	1.3	6.54	98.0	-36.3
5205.075	24.1	-62.7	1.77	6.84	106.3	-44.7
6072.588	24.1	-64.8	1.97	6.65	108.8	-47.1
6940.1	29.19	-58.5	2.26	7.85	101.6	-39.9
7807.613	30.47	-55.0	2.39	7.84	98.3	-36.6
8675.125	29.54	-55.6	2.71	8.54	98.4	-36.7

TABLE 7-3: TEST EQUIPMENT USED FOR TESTING FIELD STRENGTH OF SPURIOUS RADIATION

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		December 16, 2004
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.

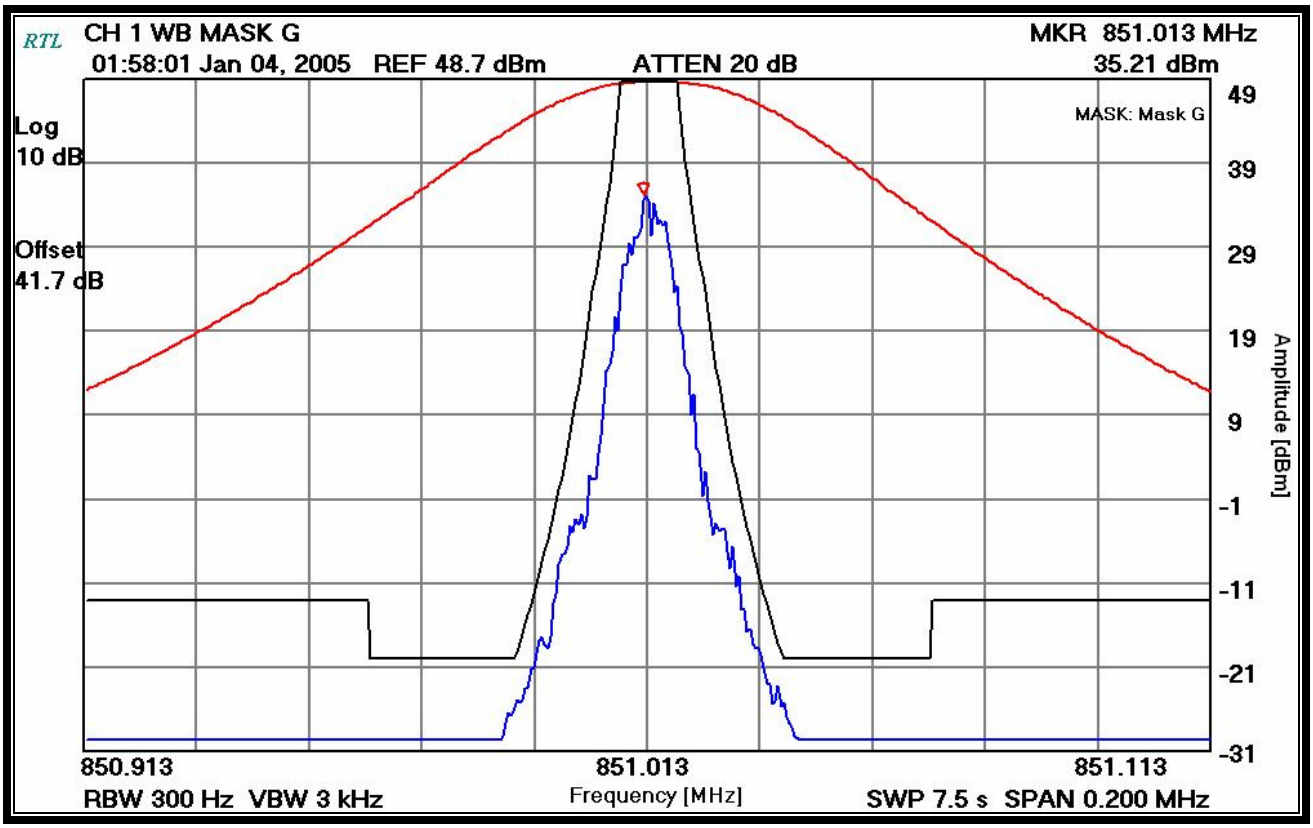
8.1 TEST PROCEDURE

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

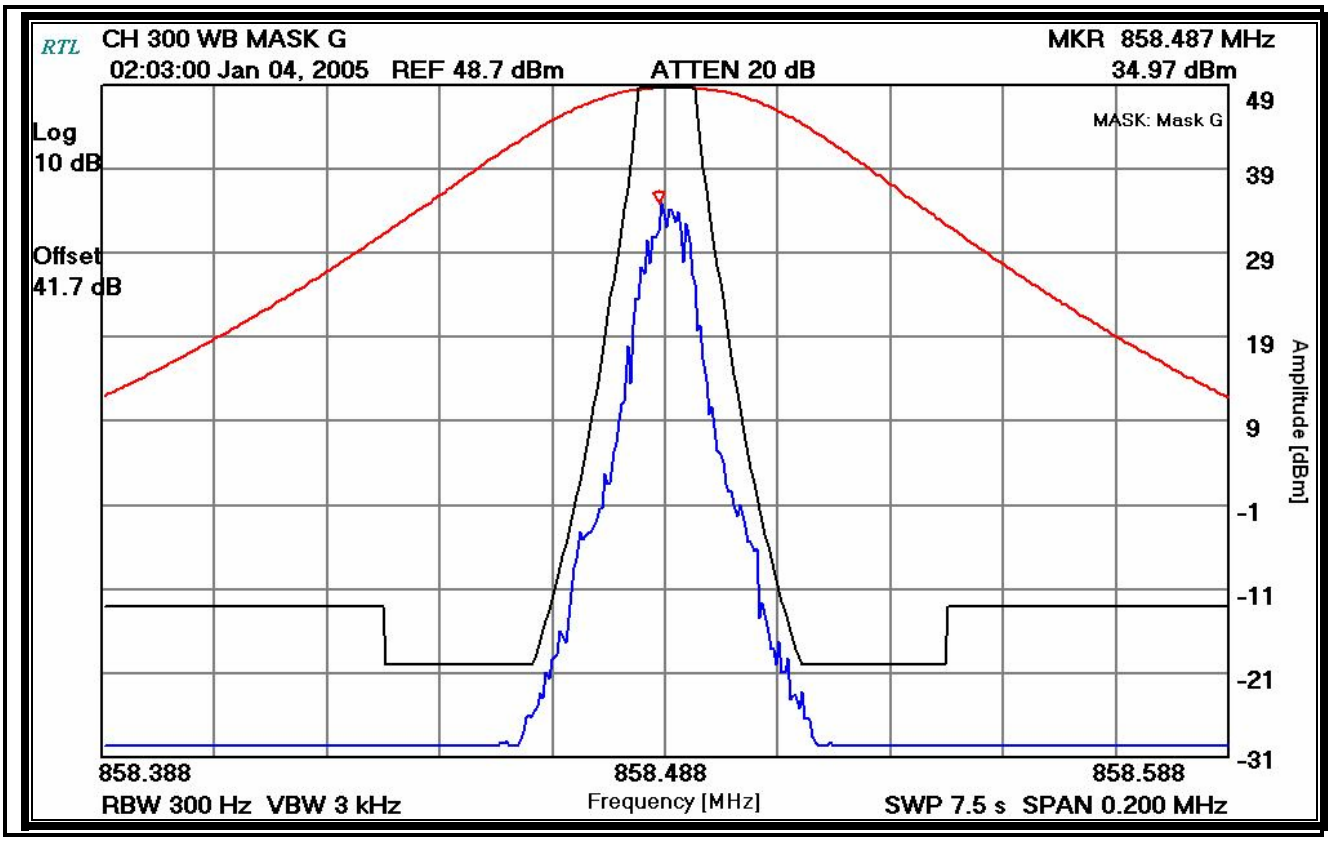
ANSI/TIA/EIA-603-2002, Section 2.2.11.

8.2 TEST DATA

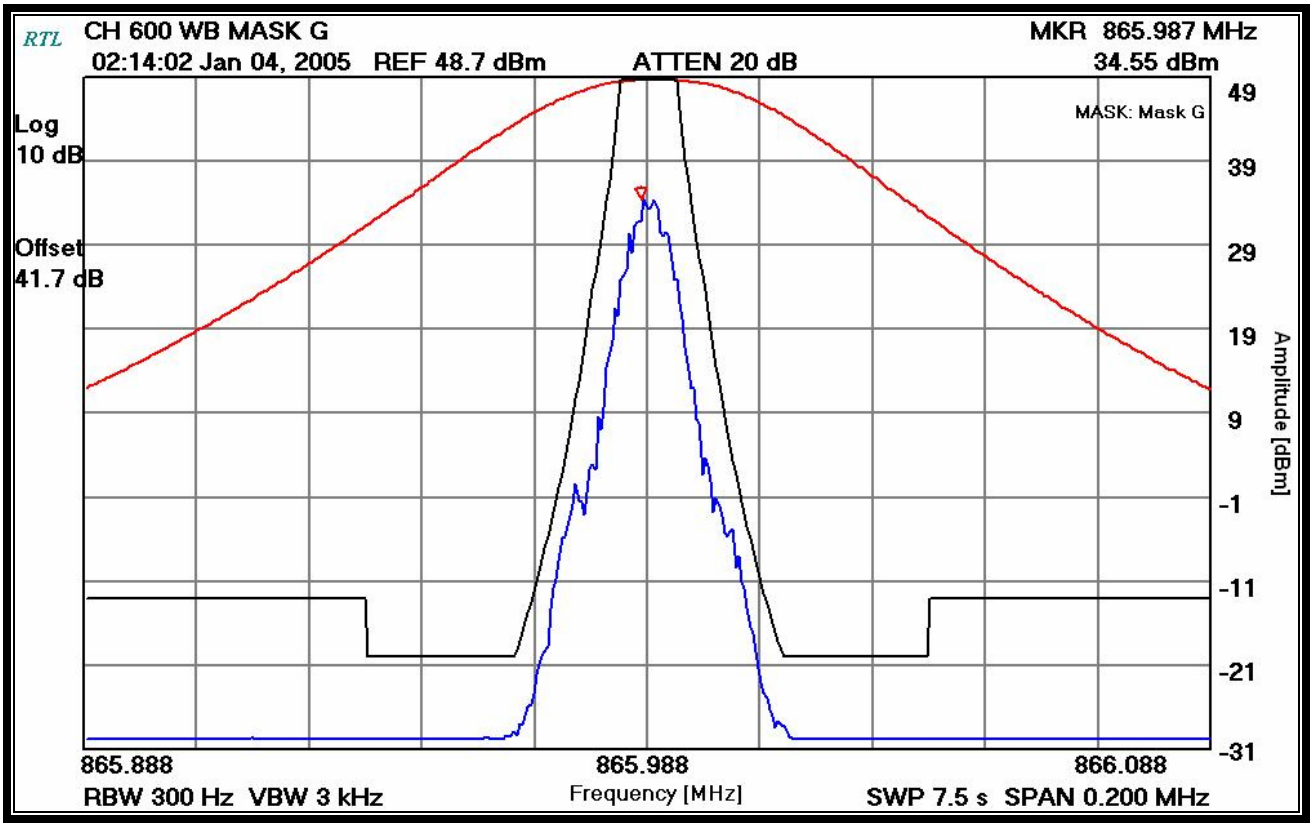
PLOT 8-1: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 1



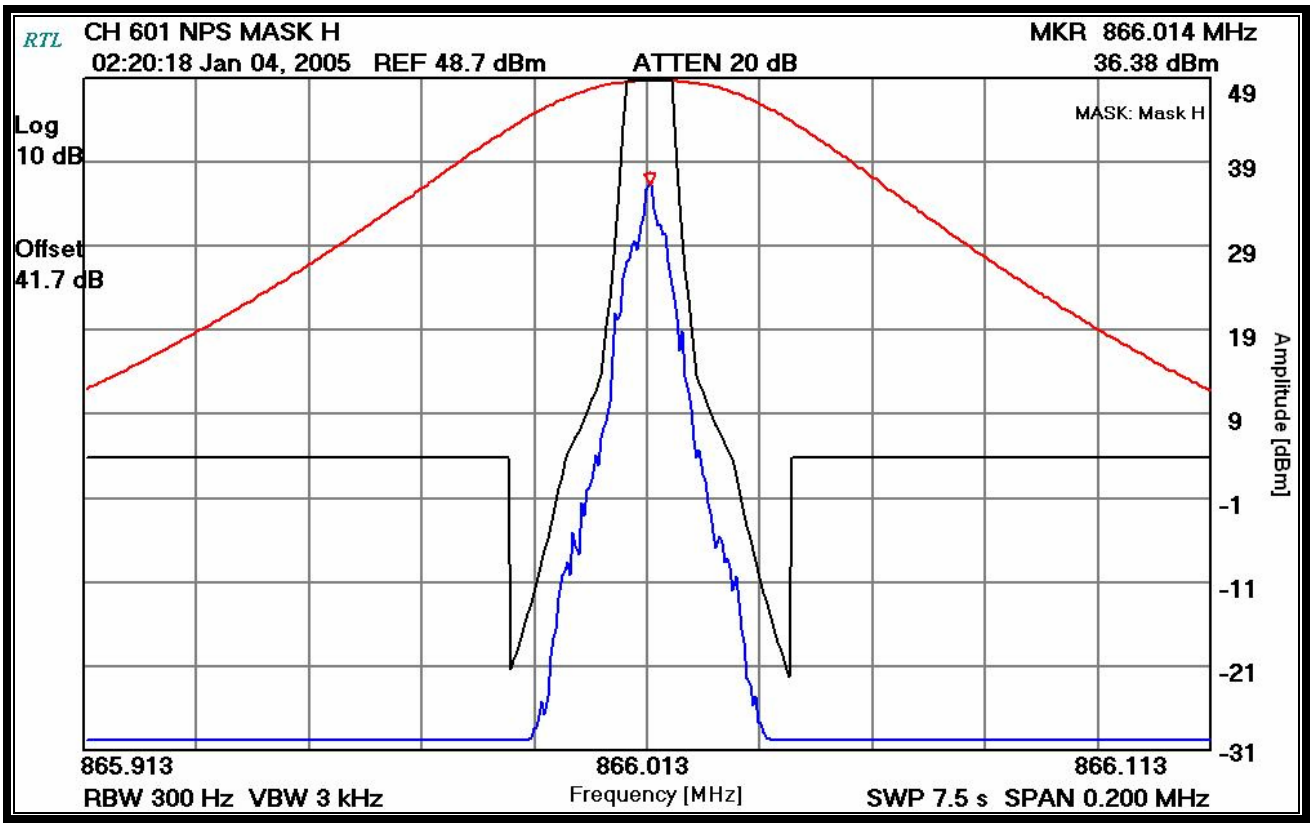
PLOT 8-2: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 300



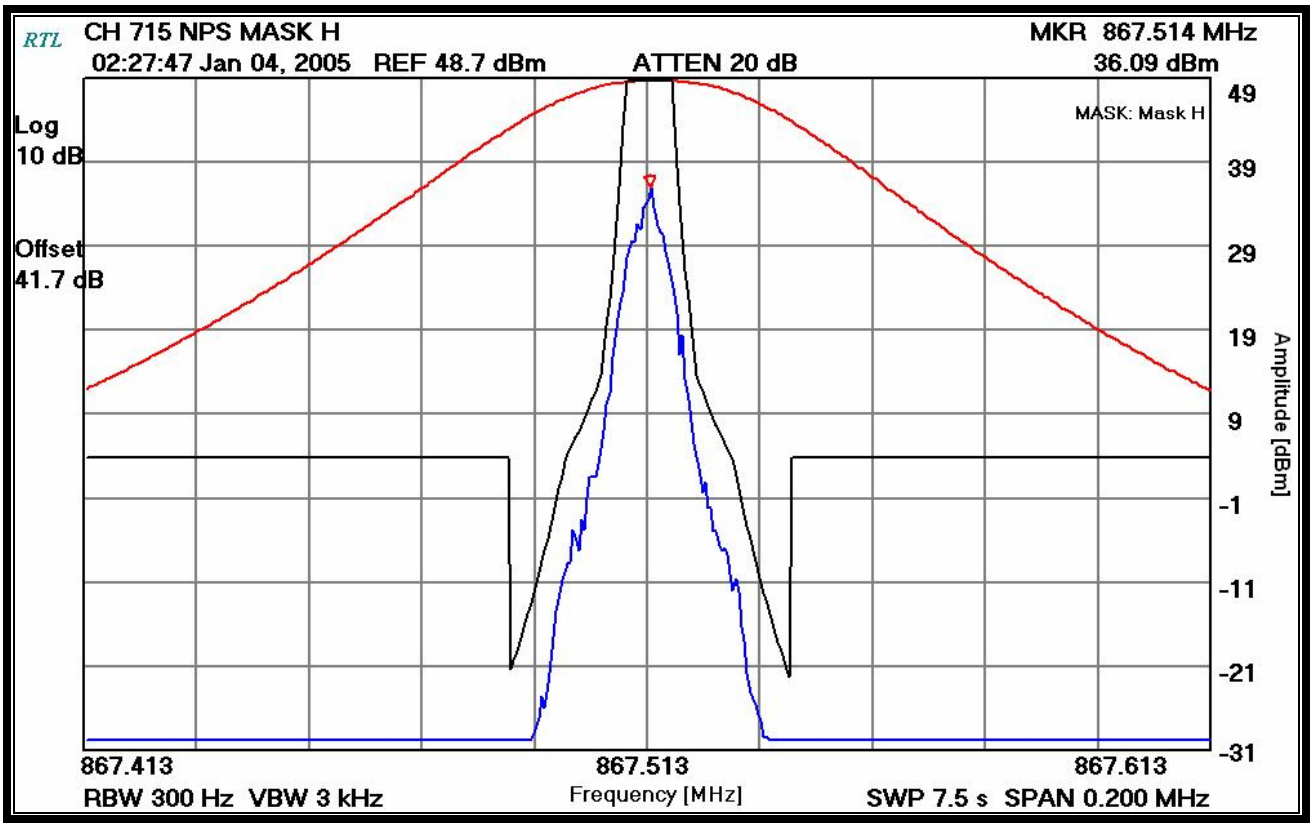
PLOT 8-3: OCCUPIED BANDWIDTH; WIDEBAND; CHANNEL 600



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



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



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

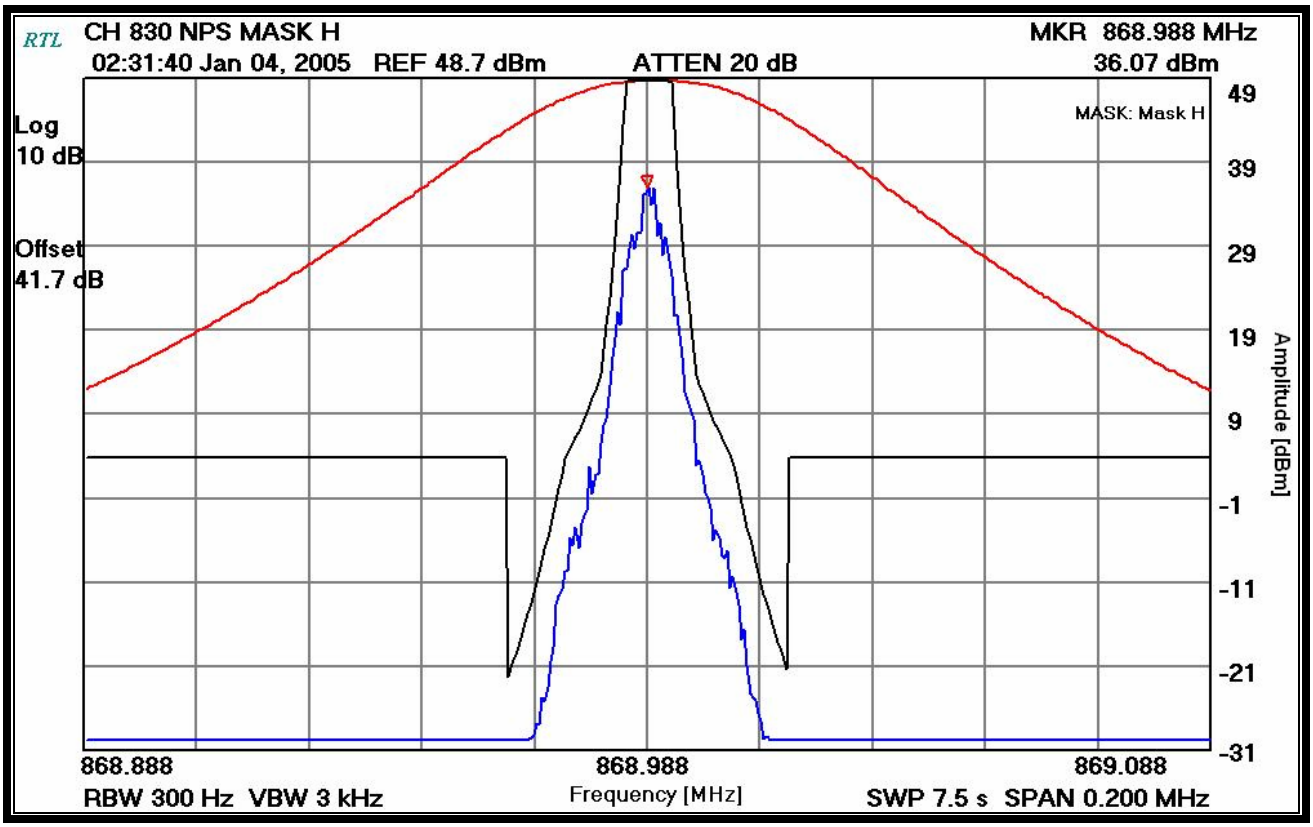


TABLE 8-1: TEST EQUIPMENT USED FOR TESTING OCCUPIED BANDWIDTH

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	January 4, 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 = 3.1 KHz [FM Deviation]
K = 0.234, [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 1.0]

B(n) = 11,050 or 11K0
FCC Emission Designator: 11K0F9W

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.