

CHOMERICS

Parker Seals

TEST SERVICES

**EMC EVALUATION OF THE
M/A-COM
DATA BRICK
MODEL DB800 (S/N A40008000002)
OTP MODE
IN ACCORDANCE WITH THE
FCC PARTS 15 AND 90 CERTIFICATION**

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Date: **JULY 18, 2003**

Test Report Number: **EMI3465.US.03 REVISION 1**

Test Technician or Engineer: _____

CTS Approved Signatory: _____

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written approval of Chomerics Test Services.

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LIST OF DEFINITIONS/ABBREVIATIONS

AC	Alternating Current
BB	Broadband
BW	Bandwidth
cm	Centimeter
C.P.U.	Calibrate Prior to Use
dB	Decibel
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ER	Electric Radiation
EUT	Equipment Under Test
GHz	GigaHertz
Hz	Hertz
I-face	Interface
kHz	KiloHertz
m	Meter
MHz	MegaHertz
mm	Millimeter
mS	Millisecond
mV	MilliVolt
MR	Magnetic Radiation
NB	Narrowband
N.C.R.	No Calibration Required
PLC	Power Line Conduction
PPS	Pulses Per Second
uF	MicroFarad
uH	MicroHenry
uS	Microsecond
uV	MicroVolt
U.W.C.	Use With Calibrated Equipment

1.0 GENERAL**1.1 Introduction****1.1.1 Purpose**

The purpose of this report is to document the performance of the M/A-Com Data Brick Model DB800 (OTP Mode) during a variety of radio-performance tests and record the test requirements and procedures used. At the request of M/A-Com, the tests were performed by Chomerics Test Service (CTS) of Woburn, Massachusetts. The assessment will determine the compliance or non-compliance to the requirements set by FCC Part 15 and Part 90.

Testing was performed during the period of October 10 through October 11, 2002 under purchase order number 94418.

1.1.2 Requirements

The requirements for the sequence of tests performed on the M/A-Com Data Brick Model DB800 (OTP Mode) is as follows:

**Occupied Bandwidth
FCC Part 2.10498**

The Occupied Bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the means power radiated are each equal to 0.5% of the total mean power radiated by a given emission.

**Emission Mask and Spurious Emissions at Antenna Terminals
FCC Part 90.210 and Part 2.991****Mask H**

The following emission mask shall be followed. The power of any emission must be below the unmodulated carrier power (P) as follows:

1. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 4kHz or less:
Zero dB
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 4kHz but not more than 8.5kHz:
At least $107 \log (fd/4)$ dB.

3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 15kHz, but not more than 25kHz:
At least $116 \log (fd/6.1)$
4. On any frequency removed from the center of the authorized bandwidth by more than 25kHz:
At least $43 + 10 \log (P)$ dB.

Field Strength of Spurious Radiation**FCC Part 2.933**

The field strength of each harmonic and other spurious emissions shall be below $43 + 10 \log (P)$ when measured in an open field test site. The frequency range under investigation is 30MHz to 9000MHz.

P = to 6.61 watts

Limit = $43 \log (6.61) = 43.8$ dB under

Frequency Stability**FCC Part 90.213 and 2.955**

The transmitter shall have the following Frequency Stability over the temperature range of -30°C to $+50^{\circ}\text{F}$. The transmitter shall have the following Frequency Stability over the battery voltage range of 7.3VDC (nominal) to 6.093VDC (battery end-point).

The frequency stability for a mobile/portable station is 1.5ppm as stated in the Minimum Frequency Stability table of Part 90.213.

Radiated and Conducted Emissions “Receiver”**FCC Part 15**

The receiver shall meet the FCC Part 15 Subpart B Class B radiated and conducted emissions limits.

1.2 Summary

The terms "Passed" or "Failed" in this section are intended to guide the reader as to whether or not the EUT met the minimum Performance Criteria that can be interpreted from the FCC Parts 15 and 90. The "Results" paragraph in each test section to follow, and the test data sheets, will outline specifically how the EUT performed during each test.

Output Power	Passed
Occupied Bandwidth	Passed
Emission Mask H	Passed
Conducted Spurious Emissions at Antenna Terminals	Passed
Field Strength of Spurious Radiation	Passed
Frequency Stability	Passed
Radiated Emission Receiver	Passed

1.2.1 Summary of Recommendations

The M/A-Com Data Brick Model DB800 (OTP Mode) will not require modifications in order to insure compliance with FCC Parts 15 and 90.

1.3 Administrative Data

1.3.1 Test Facility

Chomerics test facility is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for NVLAP Codes 12F01; FCC test methods – 47 CFR Part 15 – Digital Devices, 12F01a; Conducted Emissions, and 12F01b; Radiated Emissions under NVLAP Accreditation Number 100296-0. Tests within this report not conforming to these NVLAP Codes are not covered under Chomerics NVLAP accreditation. Chomerics NVLAP accreditation covers test method 12/CIS22 for IEC/CISPR 22:1993, 12/CIS22a for IEC/CISPR 22 Amendment 1:1995 and Amendment 2:1996. Chomerics NVLAP accreditation code 12/CIS22b covers Chinese National Standard CNS 13438:1997.

Chomerics Radiated and Conducted Emissions testing to AS/NZS3548 is accredited to the Australian Telecommunications Authority (AUSTEL) under file number A92/TH/0048.

Chomerics' Open Area Test Sites A and B are accredited for Radiated and Conducted Emissions through Industry Canada under file numbers IC2959A and IC2959B respectively.

Chomerics' Open Area Test Site A is accredited to the Voluntary Control Council for Interference (VCCI) in Japan for Radiated and Conducted Emissions testing under file R-749 and C-770 respectively.

Chomerics test facility operates under the current revision of Chomerics Quality Assurance (QA) Manual Document Number QA002.

The QA Manual has been constructed to reflect a quality program in accordance with the requirements of the National Institute of Standards and Technology (NIST), ISO 9002, ISO Guide 25, NIST Handbook 150, EN 45001, MIL-I-45208A, MIL-STD-461D, 462D and Chomerics Quality Assurance Program (QAP).

The QA Manual outlines and describes the procedures for establishing and maintaining the quality of analysis, research, inspection, and testing within Chomerics Test Service (CTS).

This test report does not represent an endorsement by the U.S. Government.

The results and/or conclusions within this test report refer and/or apply only to the unit(s) tested as defined by this report.

Measurements performed for this test are traceable to the National Institute of Standards and Technology (NIST) based on the fact that all test equipment used for the measurements were previously calibrated using standards traceable to NIST.

No deviations, additions to, or exclusions from the test specification(s) were made.

The system amplitude accuracy for the measurements made during the radiated emission tests was ± 3 dB. Chomerics Test Services measurement uncertainty calculations are available for review upon request.

1.3.2 Equipment Calibration

The calibration of Chomerics test facility equipment is controlled under the current edition of Chomerics Laboratory Test Equipment Calibration Manual Document Number QA001.

The test equipment used throughout this test sequence conforms to laboratory calibration standards, MIL-STD-45662, traceable to the National Institute of Standards and Technology. The date of the next due scheduled calibration is listed in each test section for the applicable equipment.

All test equipment is calibrated in one year intervals

1.3.3 Personnel

The test personnel performing or supervising the tests are accredited by the National Association of Radio and Telecommunications Engineers, Inc. (NARTE) as Certified Electromagnetic Compatibility Engineers (N.C.E.) and Technicians (N.C.T.).

1.4 Test Set-up

1.4.1 Test Site Matrix

The test locations used for the emissions and immunity tests are as follows: (Refer to Section 1.4.2 for test site descriptions).

Test Performed

Output Power
Occupied Bandwidth
Emission Mask
Conducted Spurious Emissions at Antenna Terminals
Field Strength of Spurious Radiation
Frequency Stability
Radiated Emissions Receiver

Test Site

Test Site A
Safety Lab
Test Site A

1.4.2 Test Site Descriptions

The following is a list of the test sites and descriptions of each. Refer to Section 1.4.1 for specific test sites used for testing.

Open Area Test Site A: Chomerics Open Area Test Site "A" if used for this test program is located in the lower parking lot attached to the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 1). Parking is permitted on one side of test site "A" at a discrete distance from the imaginary ellipse.

The Open Area Test Site A enclosure is a wooden structure measuring 56 x 30 x 25 feet in size with galvanized steel sheet metal used as the ground plane. The structure is sized to allow 3 meter measurements and is heated and/or air conditioned.

The structure used to support equipment under test is an EMCO 4 foot diameter motorized turntable. For tabletop equipment, a wooden table measuring 1.5 x 1 meter in size is positioned at the center of the turntable, at the proper height above the ground plane.

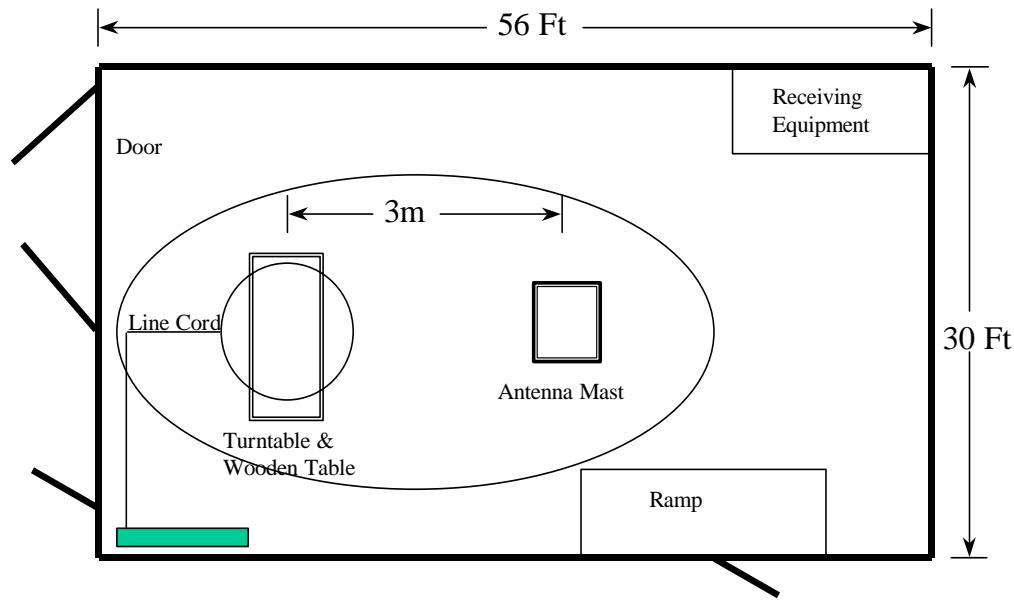
The area at the end of the Open Area Test Site "A" is the location for the test personnel and equipment to ensure they are outside the imaginary ellipse.

The available AC power within Open Area Test Site "A" is 120V 60Hz Single Phase 60Amps; 208V 60Hz Three Phase 60Amps; 208V 60Hz Single Phase 60Amps; 230V 50Hz Single Phase 50Amps.

This Site is listed with the Federal Communications Commissions (FCC).

OPEN AREA TEST SITE A

Figure 1



Key:  = Power board

Open Area Test Site B: Chomerics Open Area Test Site "B" if used for this test program is located in the lower parking lot behind the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 2). Parking is permitted on one side of test site "B" at a discrete distance from the imaginary ellipse.

The Open Area Test Site "B" enclosure is a wooden structure measuring 56 x 30 x 25 feet in size with galvanized steel sheet metal used as the ground plane. The structure is sized to allow both 3 and 10 meter measurements and is heated and/or air conditioned.

The structure used to support equipment under test is a 14 foot diameter motorized turntable. The sheet metal surface is flush with the ground plane. To ground the turntable, 175 copper fingers (1" x 1.5") are mounted around the outer edge of the turntable using machine screws. The spring fingers are equally spaced and provide a uniform interface between the turntable metal surface and ground plane. For tabletop equipment, a wooden table measuring 1.5 x 1 meter in size is positioned at the center of the turntable, at the proper height above the ground plane.

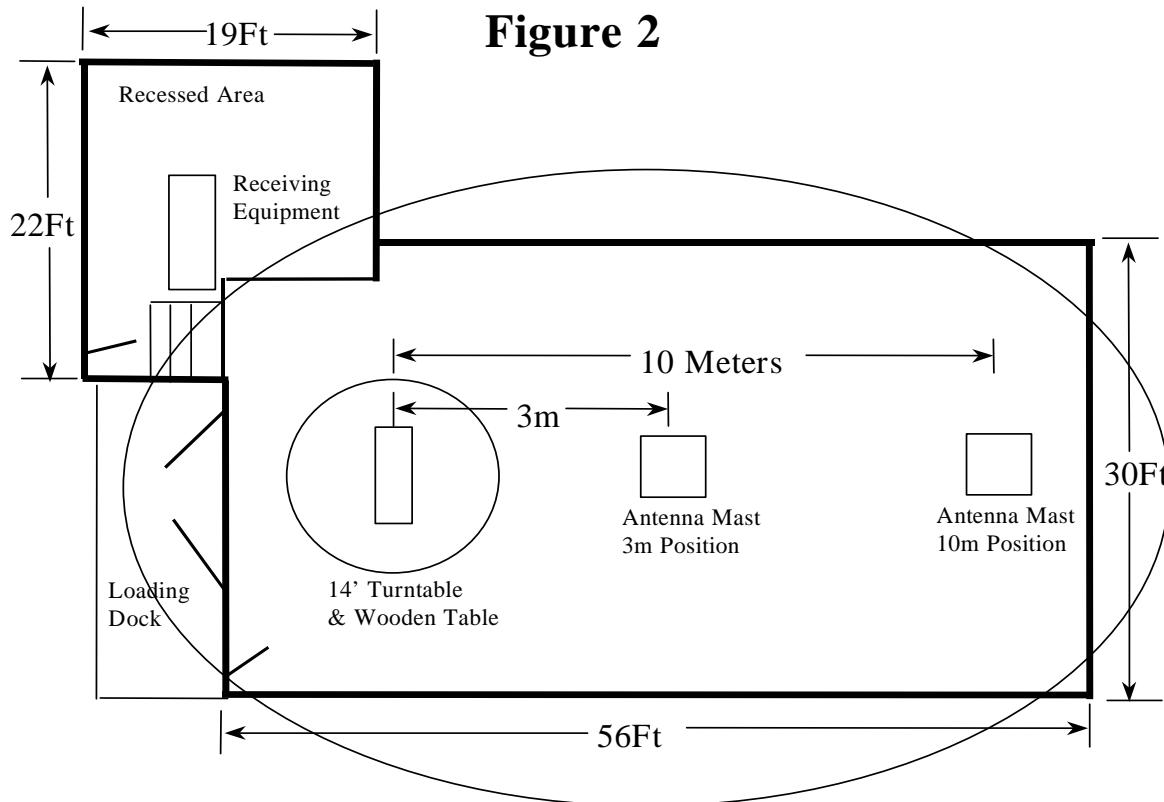
The addition at the end of the Open Area Test Site "B" is the location for the test personnel and equipment to ensure they are outside the imaginary ellipse.

The available AC power within Open Area Test Site "B" is 120V 60Hz Single Phase 60Amps; 208V 60Hz Three Phase 60Amps; 208V 60Hz Single Phase 60Amps; 230V 50Hz Single Phase 50Amps.

This site is listed with the Federal Communications Commissions (FCC).

OPEN AREA TEST SITE B

Figure 2



Test Chamber A: Chomerics Test Chamber A, if used for this test program, is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 3). The shielded enclosures (test chambers) were manufactured and installed by Universal Shielding Corporation of Deer Park, New York. Attenuation tests have demonstrated that the shielded enclosures meet the attenuation requirements of MIL-STD-285 and NSA 65-6. The main test chamber is 22 x 10 x 10 feet in size with an adjacent enclosure that is 8 x 8 x 8 feet in size. The adjacent room, used for support equipment, and the main test chamber are connected together and referenced to the same single point ground.

When needed for tabletop equipment, a wooden table measuring 3 x 9 feet in size is positioned within the test chamber. When used for MIL-STD-461D tests the tabletop surface is covered with a copper sheet and grounded to the test chamber wall so that the resistance is less than 2.5 milliohms.

The power line filters supplying the power to the enclosures provide 100dB of attenuation from 10kHz to 10GHz. The adjacent room, used for support equipment, and the main test chamber have independent AC power obtained from independent AC power line filters.

The available AC power in Test Chamber A is 120V 60Hz Single Phase 100Amps; 120V 400Hz Three Phase 50Amps; 208V 60Hz Three Phase 100Amps; 208V 60Hz Single Phase 100Amps; 230V 50Hz Single Phase 50Amps.

Test Chamber B: Chomerics Test Chamber B, if used for this test program, is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 3). The shielded enclosures (test chambers) were manufactured and installed by Universal Shielding Corporation of Deer Park, New York. Attenuation tests have demonstrated that the shielded enclosures meet the attenuation requirements of MIL-STD-285 and NSA 65-6.

The main test chamber is 22 x 10 x 10 feet in size with an adjacent enclosure that is 8 x 8 x 8 feet in size. The adjacent room, used for support equipment, and the main test chamber are connected together and referenced to the same single point ground.

Test Chamber B is lined with Rantec ferrite absorber tiles FT-100. All surfaces of the room are lined with FT-100. The floor is lined with removable tiles. This absorber material allows the test chamber to meet the 0-6dB field uniformity requirements of IEC 1000-4-3 and ENV50140.

There are two access panels between the main test chamber and the support room. The access panels are covered with absorber tiles. The absorber tiles can be removed from the access panels.

The power line filters supplying the power to the enclosures provide 100dB of attenuation from 10kHz to 10GHz. The adjacent rooms, used for support equipment, and the main test chamber have independent AC power obtained from independent AC power line filters.

The available AC power in Test Chamber B is 120V 60Hz Single Phase 30Amps; 208V 60Hz Three Phase 30Amps; and 230V 50Hz Single Phase 30Amps: A wooden table 3 x 6 feet in size is used for tabletop equipment.

Only one power line frequency is available in the chamber at a time, 50, 60 or 400 cycle, unless power is brought through an access panel.

Test Chamber C: Chomerics Test Chamber C, if used for this test program, is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 3). The shielded enclosures (test chambers) were manufactured and installed by Universal Shielding Corporation of Deer Park, New York.

Attenuation tests have demonstrated that the shielded enclosures meet the attenuation requirements of MIL-STD-285 and NSA 65-6. The main test chamber is 16 x 20 x 10 feet in size with two adjacent enclosures on either side which are 8 x 8 x 8 and 8 x 12 x 10 feet in size, respectively.

Test Chamber C is lined with Emerson-Cuming RF absorber material. This absorber material meets the following absorption specifications: 80MHz 6dB, 300MHz 30dB, 500MHz 35dB, 1GHz 40dB, and 3 to 24 GHz 50dB. Each of the two adjacent rooms used for support equipment and the main test chamber are connected together and referenced to the same single point ground.

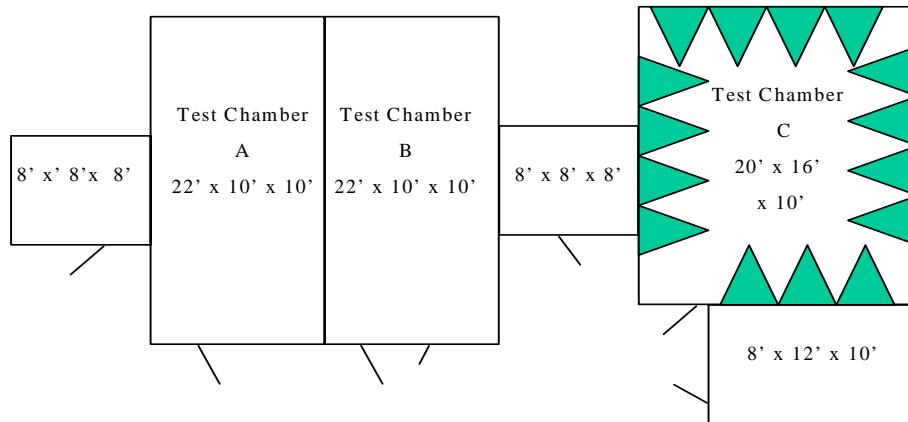
When needed for tabletop equipment, a wooden table measuring 3 x 9 feet in size is positioned within the test chamber. When used for MIL-STD-461D tests, the tabletop surface is covered with a copper sheet and grounded to the test chamber wall so that the resistance is less than 2.5 milliohms. When used for radiated electromagnetic field tests, to some standards, the copper tabletop surface is removed.

The available AC power in Test Chamber C is 120V 60Hz AC Single Phase 60Amps; 230V 50Hz AC Single Phase 50Amps; 115V 400Hz AC Three Phase 30Amps (through access panel); 208V 60Hz AC Three Phase AC 30Amps (through access panel).

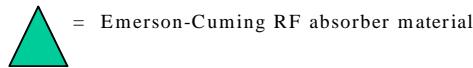
The power line filters supplying the power to the enclosures provide 100dB of attenuation from 10kHz to 10GHz. Each of the two adjacent rooms used for support equipment and the main test chamber has independent AC power obtained from independent AC power line filters.

Immunity Lab Layout

Figure 3



Key:



EC Lab A: Chomerics EC Lab A is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts.

EC Lab A is a typical room measuring 20 x 16 feet with an aluminum sheet metal (8 x 12 feet in size) in the center of the floor for a ground plane. When needed for tabletop equipment, a wooden table (0.8 meters in height) is placed on the metal ground plane that extends at least 0.1m beyond all sides of the table. A removable 3 x 6 foot sheet of aluminum is placed on top of the wooden table when a horizontal coupling plane is required.

The appropriate connections, as needed for each test, are used to interconnect the table horizontal coupling plane, ground plane floor, test equipment, and earth ground.

The available AC power in the EC Lab A is 120V 60Hz AC Single Phase 60Amps; 230V 50Hz AC Single Phase 50Amps; and 208V 60Hz AC Three Phase AC 30Amps.

EC Lab A is equipped with air and water services for use with equipment that requires it.

The humidity in EC Lab A can be automatically controlled in the range of 20% to 60%.

EC Lab B: Chomerics EC Lab B is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts.

EC Lab B is a typical room measuring 12 x 14 feet with a copper sheet (6 x 8 feet in size) in the center of the floor for a ground plane. When needed for tabletop equipment, a wooden table (0.8 meters in height) is placed on the metal ground plane that extends at least 0.1m beyond all sides of the table. A removable 3 x 6 foot sheet of aluminum is placed on top of the wooden table when a horizontal coupling plane is required.

The appropriate connections, as needed for each test, are used to interconnect the table horizontal coupling plane, ground plane floor, test equipment, and earth ground.

The available AC power in the EC Lab B is 120V 60Hz AC Single Phase 60Amps, 230V 50Hz AC Single Phase 50Amps; and 208V 60Hz AC Three Phase AC 30Amps.

The humidity in EC Lab B can be automatically controlled in the range of 20% to 60%.

Safety Lab: The Safety Test Laboratory is located in the Seeger Building at Chomerics, 84 Dragon Court, Woburn, Massachusetts.

The power in the test lab consists of a 208 Volt, three phase, 200 Amp distribution panel which feeds a power bus which has various types of American and European single and three phase receptacles. The largest of which is a 100 Amp three- phase service with its own disconnect switch. This distribution panel also provides power to a programmable power source capable of providing three- phase power up to 312 V Line to Neutral at up to 10 kVA total power. The output of this programmable power source also feeds a distribution panel that feeds a power bus with various types of American and European single and three phase receptacles.

The lab contains a 32 cubic foot temperature and humidity chamber that is required by most safety standards for temperature and humidity preconditioning of equipment.

1.4.3 Equipment Under Test

A detailed description of the Equipment Under Test is located in the M/A-Com manual attached to the certification package.

2.0 TESTS PERFORMED

2.1 Output Power

2.1.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	Hewlett Packard Power Sensor	628	2552A49410	04/03
X	Hewlett Packard Power Meter M/N 437B	N/A	2949A02617	04/03
X	Narda 769-20 High Band Attenuator	284	03793	C.P.U.
X	Narda 769-20 High Band Attenuator	471	02951	C.P.U.

2.1.2 Test Conditions

The output power was measured with the Data Brick Model DB800 (OTP Mode) placed on top of a wooded turntable located in Test Site A. The ambient temperature of the room was 20°C.

The Data Brick Model DB800 (S/N A40008000002) was configured to operate in the OTP mode of operation transmitting at the low, mid and high frequency of each band. The OTP mode of operation is a gaussian frequency shift keying TDMA modulation, which transmits from 806.0125MHz to 823.9875MHz. The Data Brick Model DB800 (OTP Mode) was set up and powered by a fully charged battery for the test.

The mode of operation and frequencies tested are as follows:

OTP Mode
Ch# 1 806.0125MHz
Ch# 415 816.3625MHz
Ch# 830 823.9875MHz

2.1.3 Test Method

The output power of the Data Brick Model DB800 (OTP Mode) was measured at the high, middle, and low frequency channels. The output of the transmitter was connected to two attenuators. The attenuators were connected to a RF Power Meter.

Channel numbers 830, 415, and 1 were tested for the occupied bandwidth

2.1.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the Output Power requirements of FCC Part 90. See the attached data sheet for the output power.

2.1.5 Test Data

OUTPUT POWER MEASUREMENTS

CUSTOMER: M/A-COM

DATE: 10/10/02 AND 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 3

TESTED BY: MANUEL MARTINEZ

FREQUENCY MHz	MODE OF OPERATION	PEAK MEASURED LEVEL dBm	PEAK MEASURED LEVEL Watts	LIMIT Watts
806.0125	OTP	38.15	6.54	6.61
816.3625	OTP	38.20	6.61	6.61
823.9875	OTP	38.18	6.58	6.61

NOTES:

2.1.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****DATE: 10/10/02 AND 10/11/02****TEST NUMBER: 3****Photograph Description: Test set-up****FORM CTS-PHOTO**

2.2 Occupied Bandwidth

2.2.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	H/P E4401 Spectrum Analyzer	N/A	4895C76451	04/03
X	Narda 769-20 High Band Attenuator	284	03793	C.P.U.
X	Narda 769-20 High Band Attenuator	471	02951	C.P.U.

2.2.2 Test Conditions

The occupied bandwidth measurement was made with the Data Brick Model DB800 (OTP Mode) placed on a turntable located in Test Site A. The output of the P-8001T was connected to a spectrum analyzer via a N-Type coax cable. The ambient temperature of the room was 20°C.

The Data Brick Model DB800 was configured to operate in the OTP Mode of operation transmitting at the low, mid and high frequency of each band. The Data Brick Model DB800 was set up and powered by a fully charged battery for the test.

The mode of operation and frequencies tested are as follows:

OTP Mode
Ch# 1 806.0125MHz
Ch# 415 816.3625MHz
Ch# 830 823.9875MHz

2.2.3 Test Method

The output of the Data Brick Model DB800 was measured at the high, middle, and low frequency channels. The output of the transmitter was connected to two attenuators. The attenuators were connected to a RF Power Meter. See Figure 4 for test set-up.

2.2.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the Occupied Bandwidth of requirements of FCC Part 90. See the attached data sheet for the results.

Test Setup

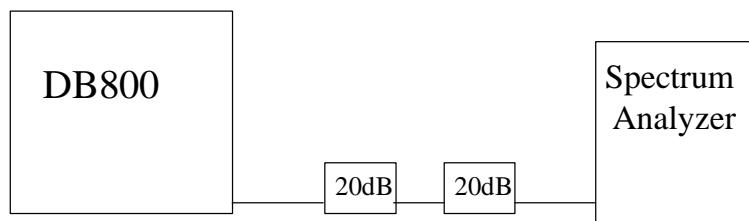


Figure 4

2.2.5 Test Data

OCCUPIED BANDWIDTH

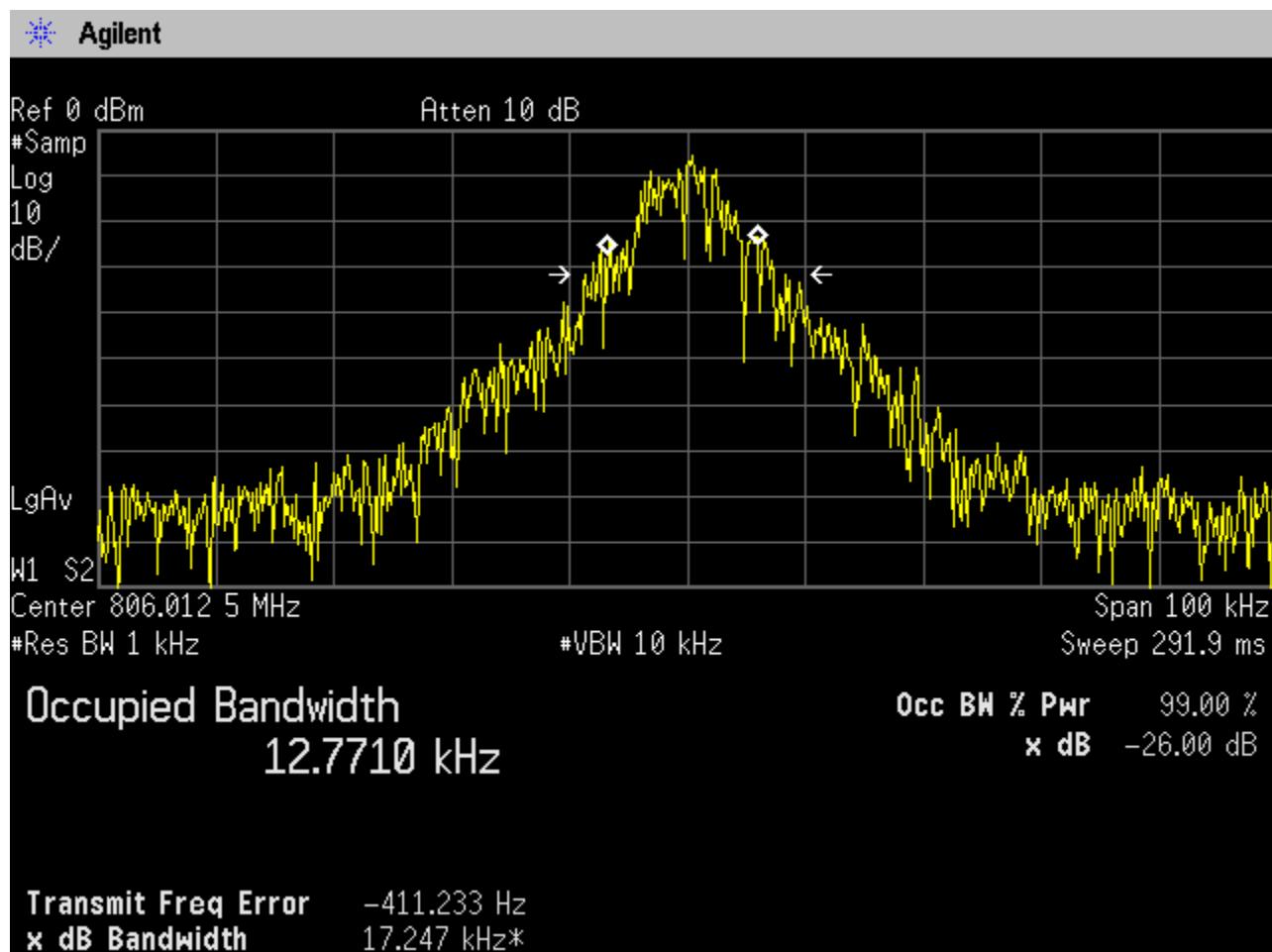
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 4

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP

OCCUPIED BANDWIDTH

CUSTOMER: M/A-COM

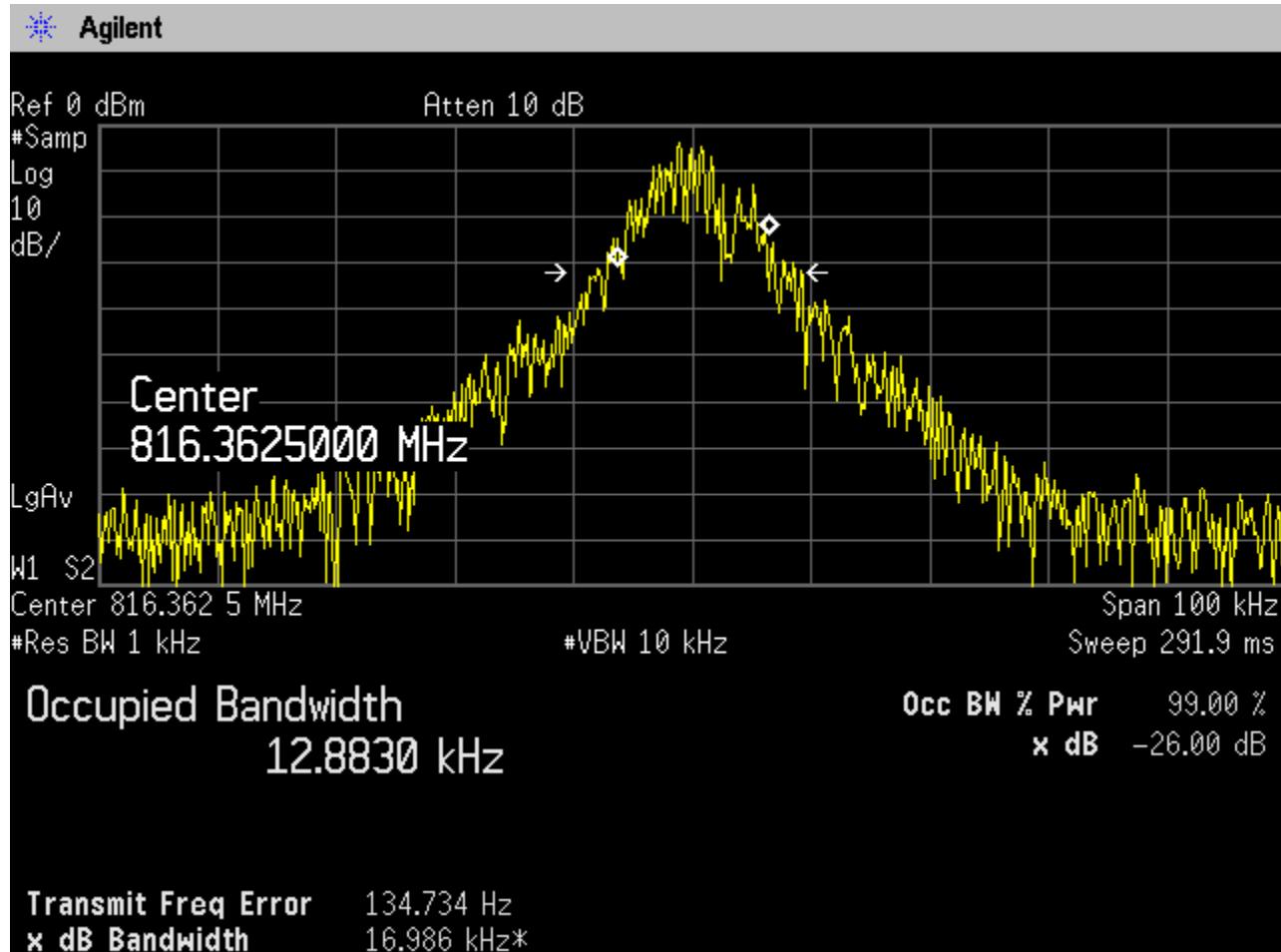
EQUIPMENT: DATA BRICK MODEL DB800 (OTP MODE)

TESTED BY: MANUEL MARTINEZ

DATE: 10/11/02

TEST NUMBER: 4

OPERATING MODE: NORMAL FULL POWER TRANSMIT MODE - CHANNEL 415- OTP



OCCUPIED BANDWIDTH

CUSTOMER: M/A-COM

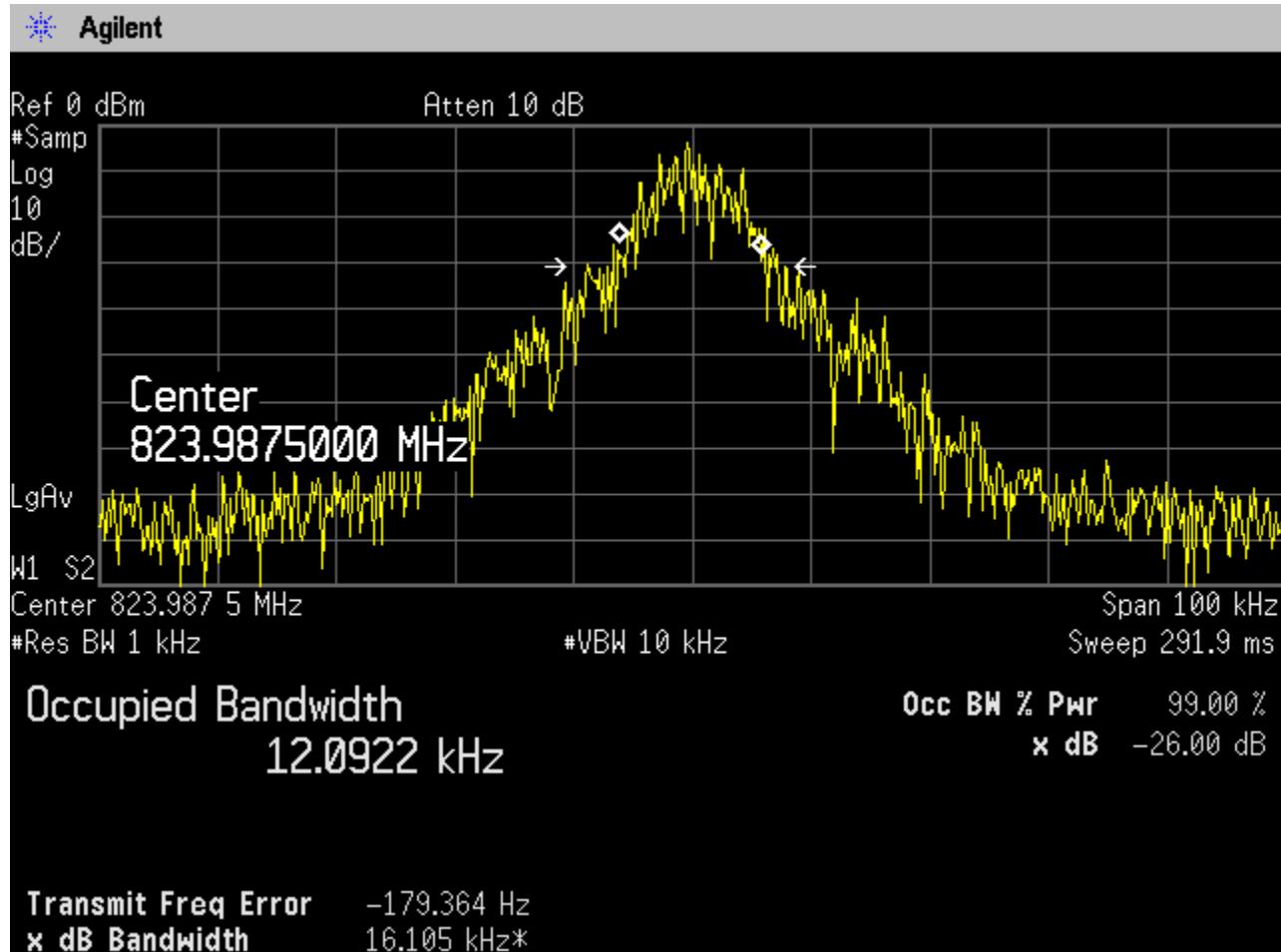
EQUIPMENT: DATA BRICK MODEL DB800 (OTP MODE)

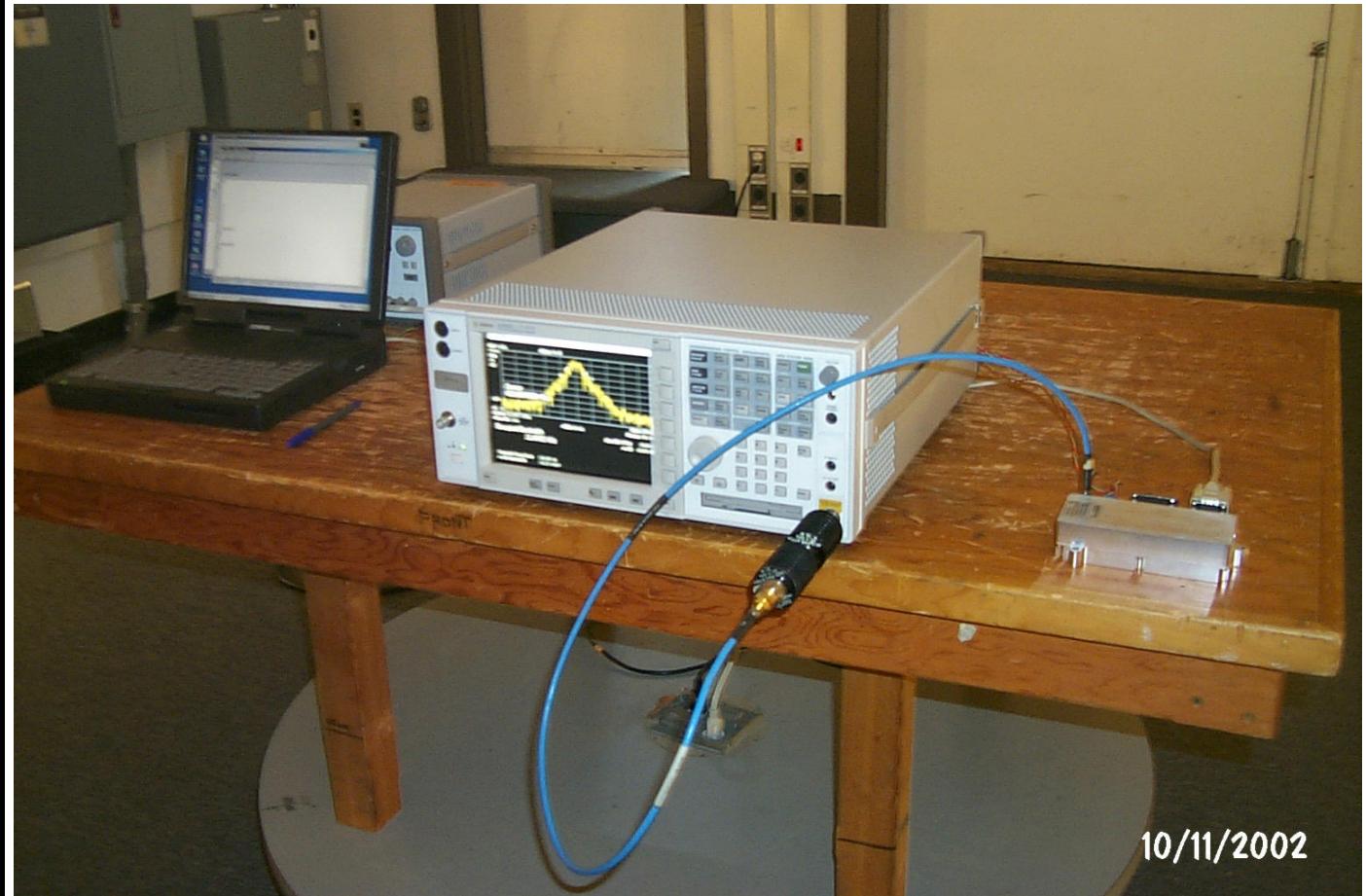
TESTED BY: MANUEL MARTINEZ

DATE: 10/11/02

TEST NUMBER: 4

OPERATING MODE: NORMAL FULL POWER TRANSMIT MODE - CHANNEL 830- OTP



2.2.6 Photographic Documentation**CUSTOMER: M/A-COM****DATE: 10/11/02****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****TEST NUMBER: 4**

Photograph Description: Test set-up

FORM CTS-PHOTO

2.3 Emissions Mask

2.3.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	H/P E4401 Spectrum Analyzer	N/A	4895C76451	04/03
X	Narda 769-20 High Band Attenuator	284	03793	C.P.U.
X	Narda 769-20 High Band Attenuator	471	02951	C.P.U.

2.3.2 Test Conditions

The Emission Mask was measured with the Data Brick Model DB800 (OTP Mode) placed on top of a wooded turntable located in Test Site A. The ambient temperature of the room was 20°C.

The Data Brick Model DB800 was configured to operate in the OTP Mode of operation transmitting at the low, mid and high frequency of each band. The Data Brick Model DB800 was set up and powered by a fully charged battery for the test.

The mode of operation and frequencies tested are as follows:

OTP Mode	
Ch# 1	806.0125MHz
Ch# 415	816.3625MHz
Ch# 830	823.9875MHz

2.3.3 Test Method

The output of the Data Brick Model DB800 was connected to a spectrum analyzer via a N-Type cable and 40dB of attenuation. The DB800 was set up to transmit without modulation the power level of transmission was recorded and the spectrum analyzers reference level was set to that power level. The DB800 was then set to transmit with the desired modulation and frequency scan of the transmitted signal was saved and compared to the appropriate emission mask.

The output of the Data Brick Model DB800 was compared to the Emissions Mask H of FCC Part 90.210.

2.3.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the requirements of FCC Part 90.210 Emissions Mask H.

2.3.5 Test Data

EMISSION MASK

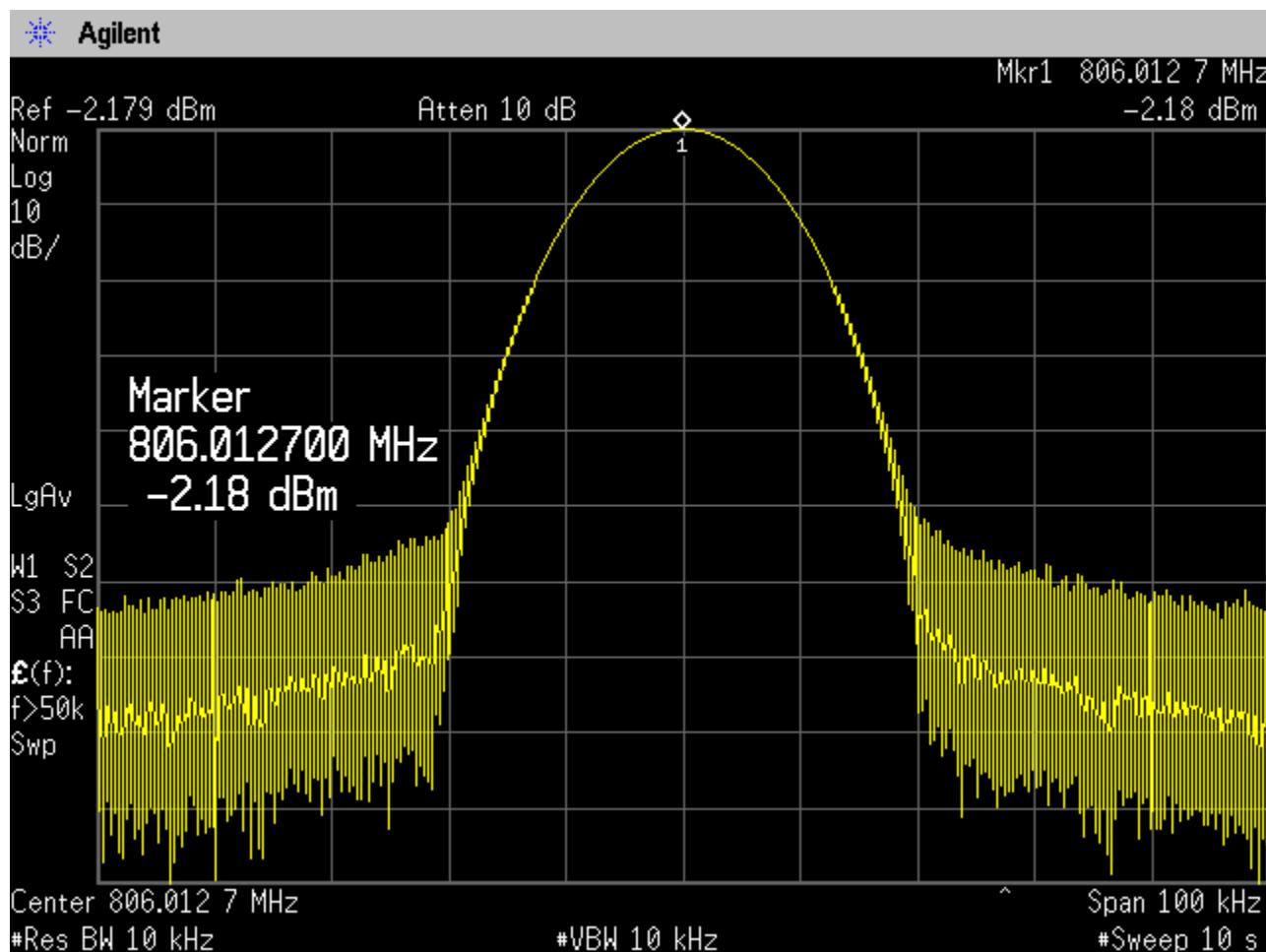
CUSTOMER: M/A-COM

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TESTED BY: MANUEL MARTINEZ

DATE: 10/11/02

TEST NUMBER: 5

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP UNMODULATED

EMISSION MASK

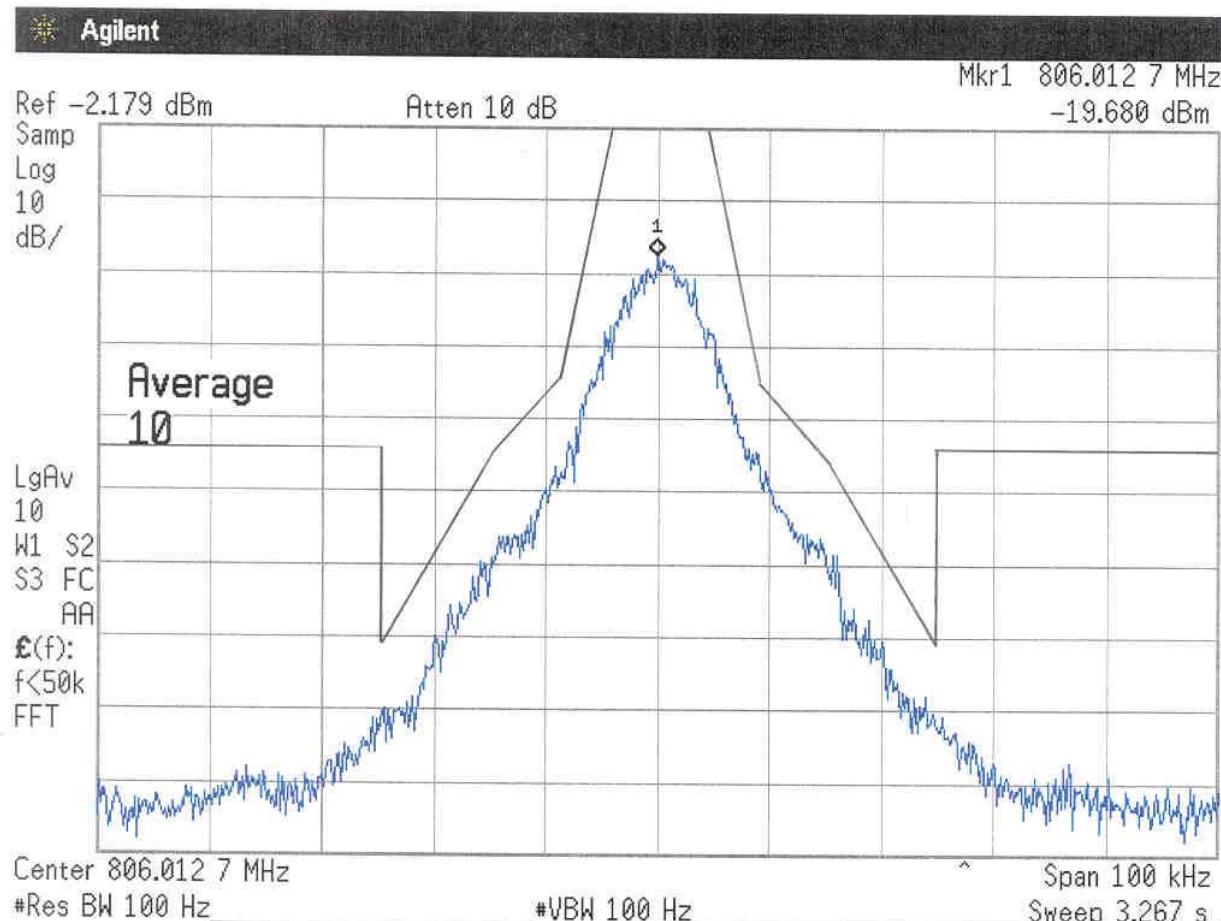
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 5

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP MODULATED

EMISSION MASK

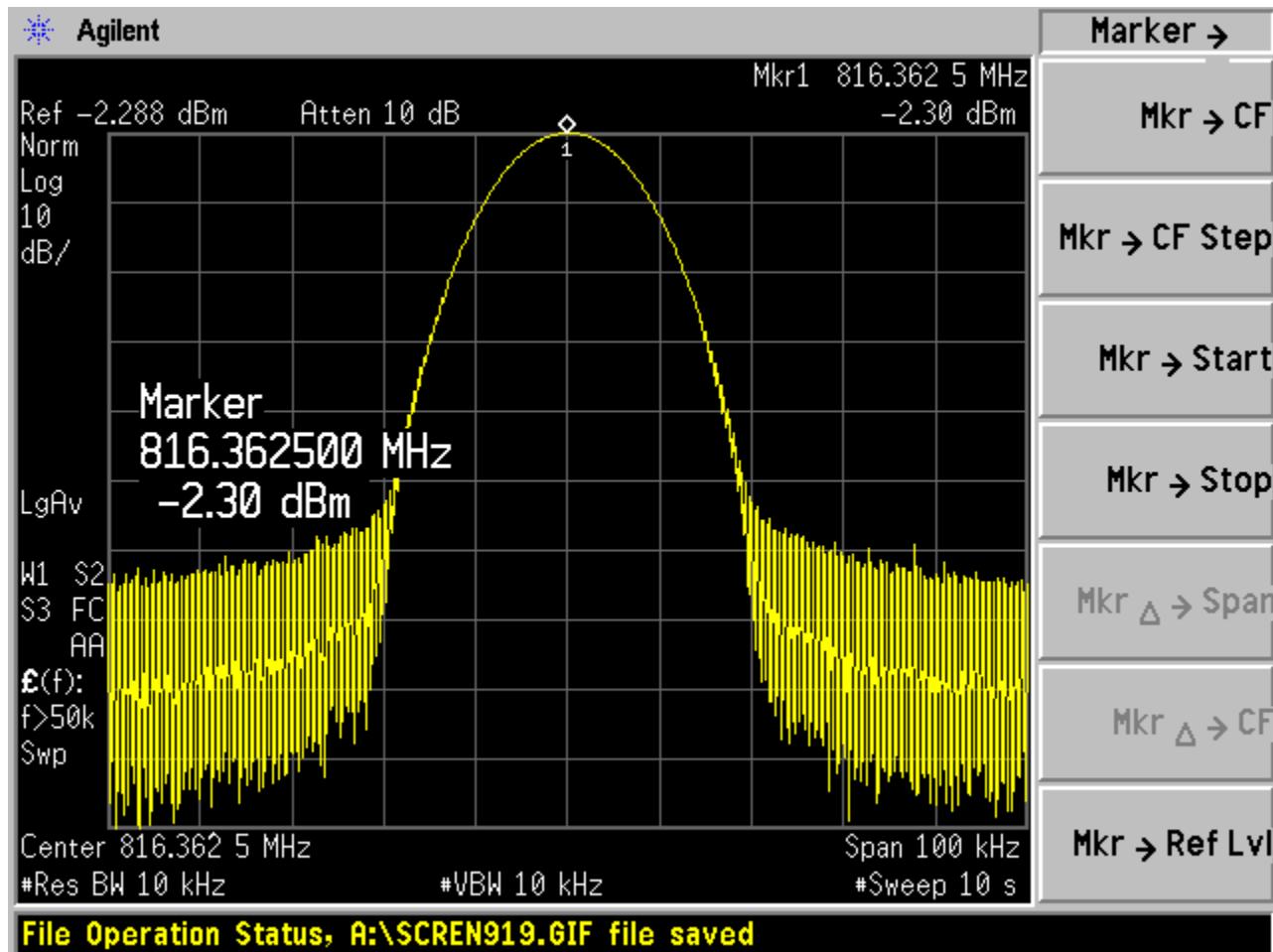
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 5

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 415-OTP UNMODULATED

EMISSION MASK

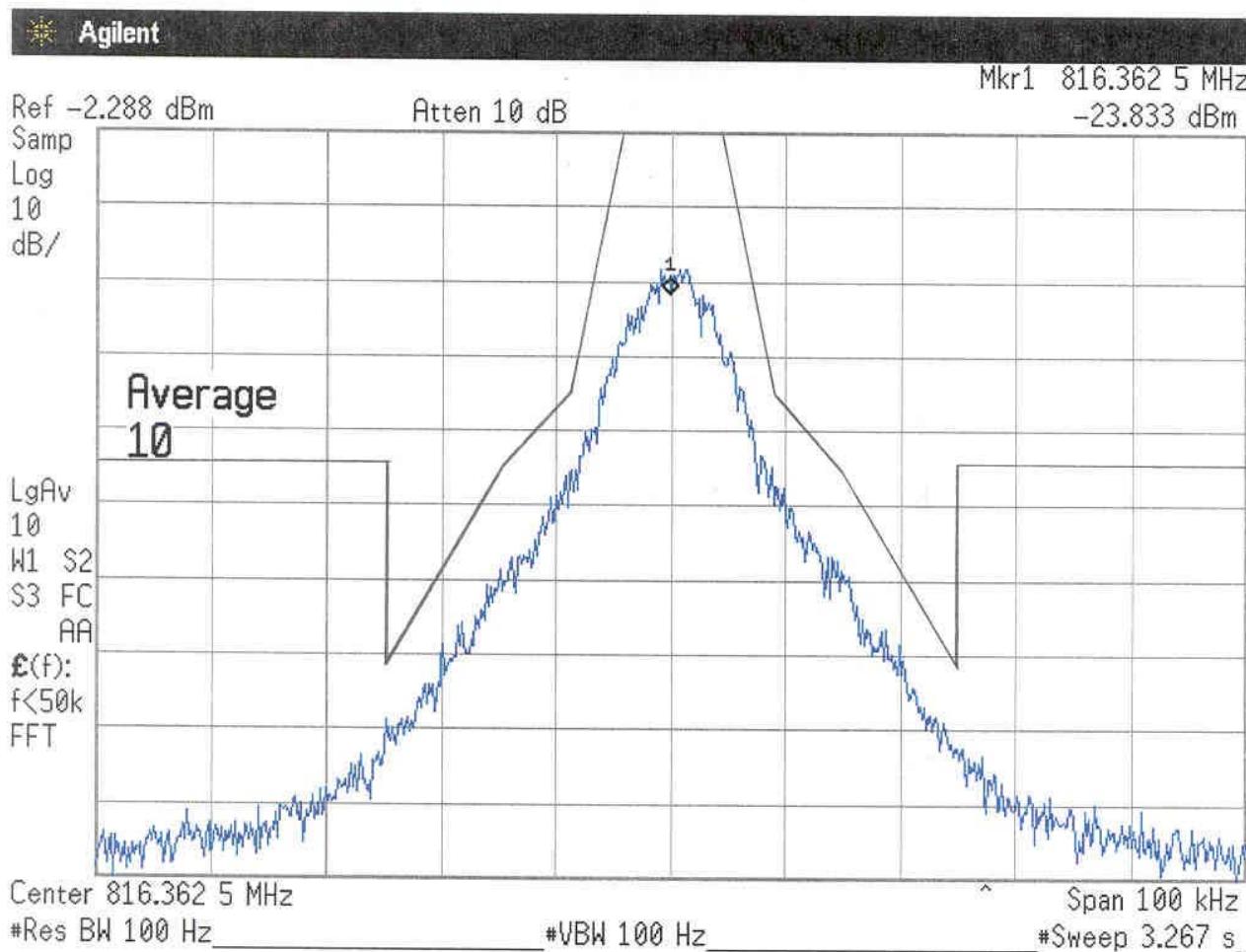
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 5

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 415-OTP MODULATED

EMISSION MASK

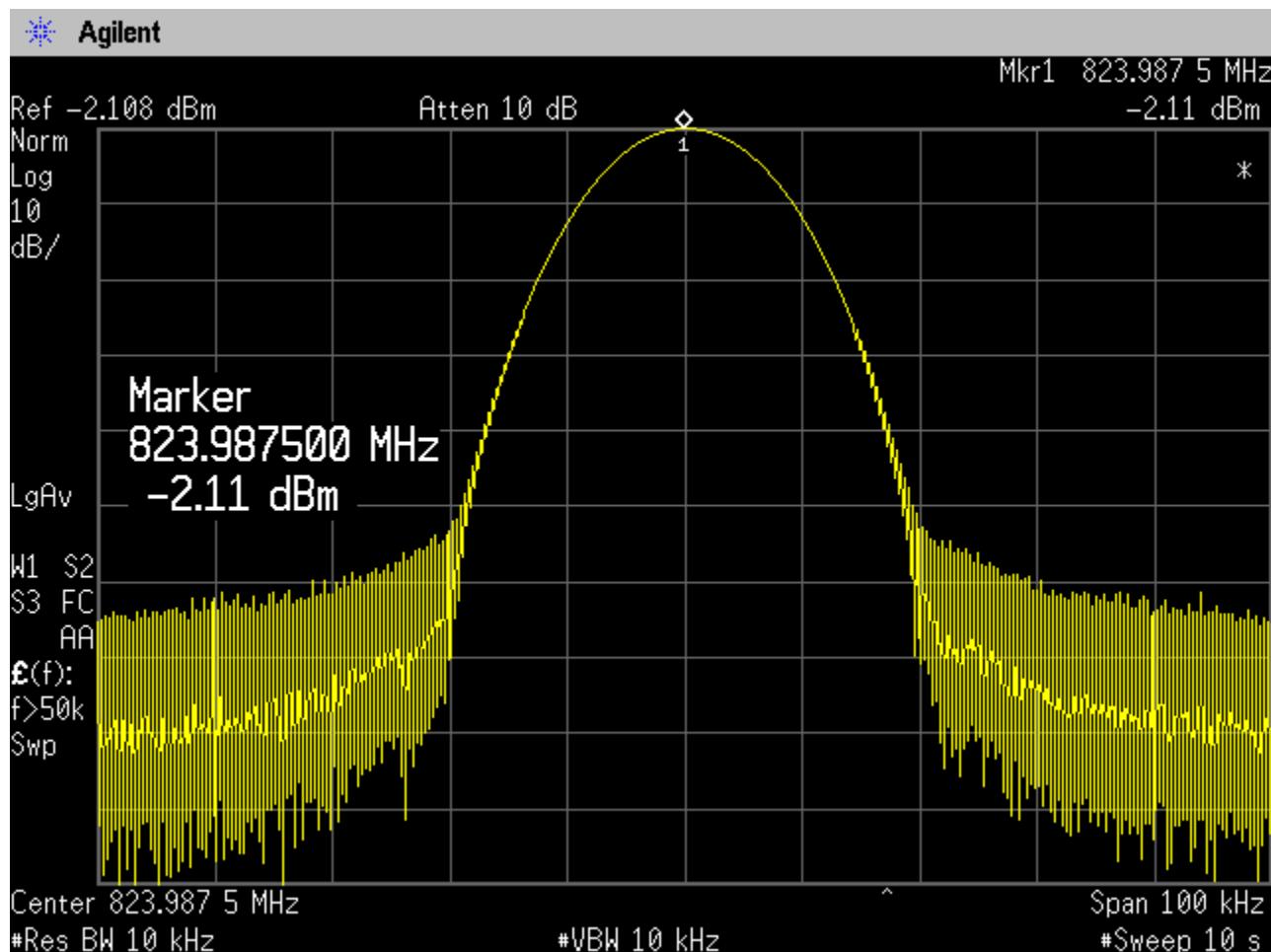
CUSTOMER: M/A-COM

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TESTED BY: MANUEL MARTINEZ

DATE: 10/11/02

TEST NUMBER: 5

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 830-OTP UNMODULATED

EMISSION MASK

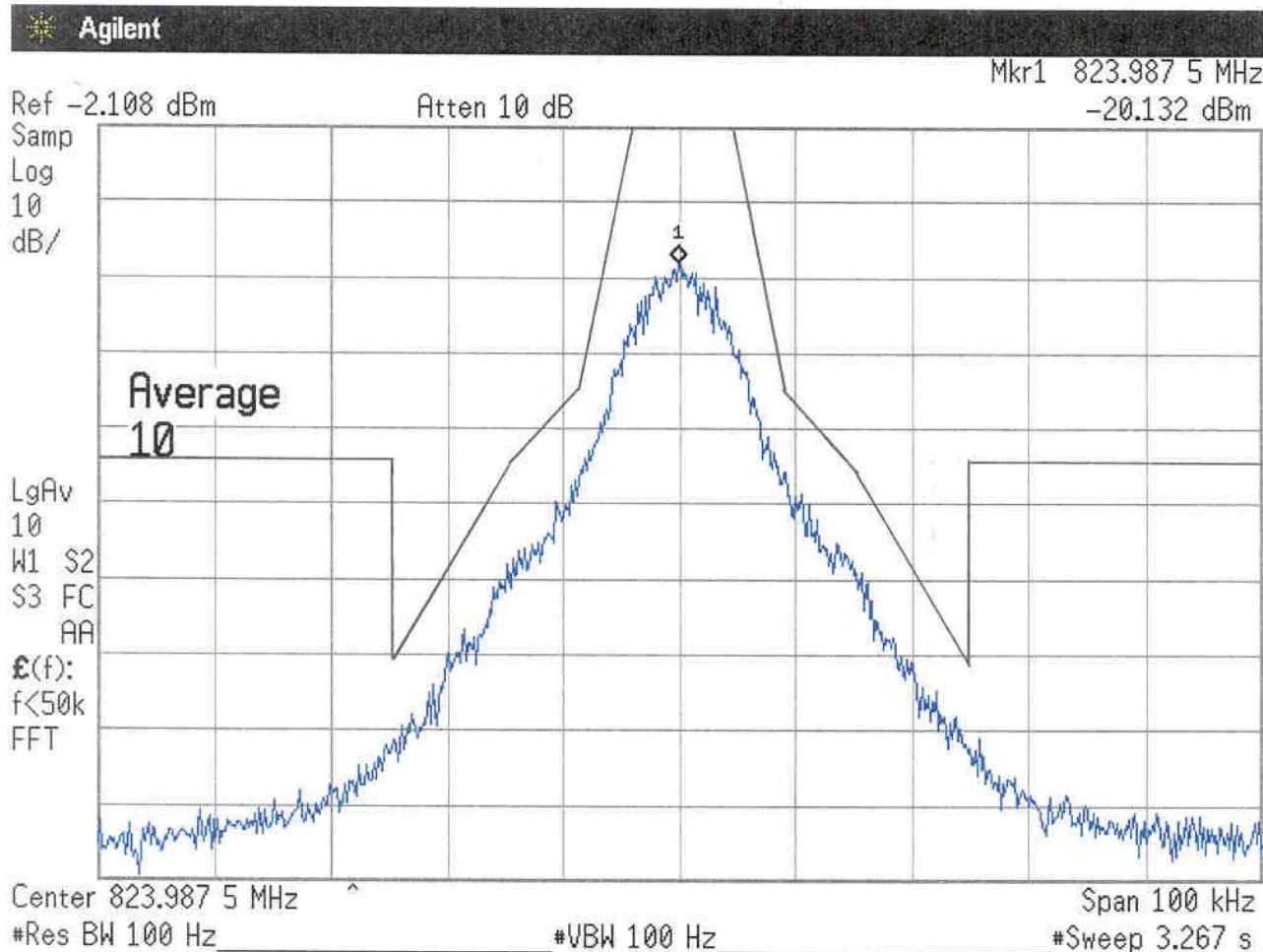
CUSTOMER: M/A-COM

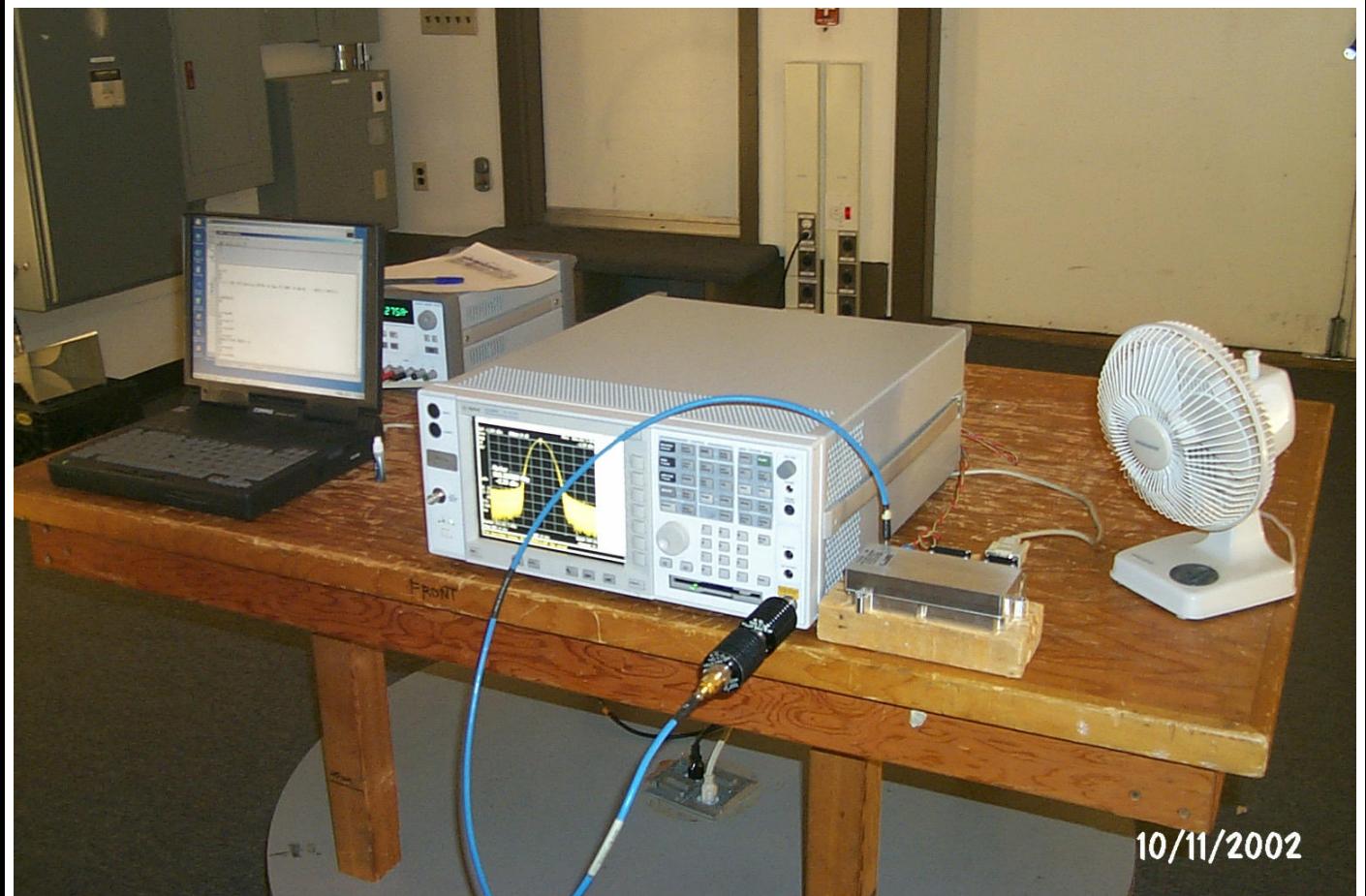
DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 5

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 830-OTP MODULATED

2.3.6 Photographic Documentation**CUSTOMER: M/A-COM****DATE: 10/11/02****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****TEST NUMBER: 5**

Photograph Description: Test set-up

FORM CTS-PHOTO

2.4 Conducted Spurious at the Antenna Terminals

2.4.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	H/P E4401 Spectrum Analyzer	N/A	4895C76451	04/03
X	Narda 769-20 High Band Attenuator	284	03793	C.P.U.
X	Narda 769-20 High Band Attenuator	471	02951	C.P.U.

2.4.2 Test Conditions

The conducted spurious emission at the antenna terminals was measured with the Data Brick Model DB800 (OTP Mode) placed on top of a wooded turntable located in Test Site A. See figure 5 for the test setup.

The Data Brick Model DB800 was configured to operate in the OTP Mode of operation transmitting at the low, mid and high frequency of each band. The Data Brick Model DB800 was set up and powered by a fully charged battery for the test.

The mode of operation and frequencies tested are as follows:

OTP Mode	
Ch# 1	806.0125MHz
Ch# 415	816.3625MHz
Ch# 830	823.9875MHz

2.4.3 Test Method

The output of the Data Brick Model DB800 was connected to a spectrum analyzer via a N-Type cable and 40dB of attenuation. The DB800 was set up to transmit with the desired modulation and maximum power. Two frequency scans were performed, 4MHz to 1GHz, 1GHz to 2GHz and 2GHz to 9GHz. The output of the Data Brick Model DB800 was compared to Part 90.210 Emission Mask H paragraph 5. *“The power of any emission must be below the unmodulated carrier power (P). On any frequency removed from the center frequency of the authorized bandwidth by more than 25kHz, At least 43 + 10log (P)”.*

2.4.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the requirements of Part 90.210 Emissions Mask H paragraph 5.

2.4.5 Test Data

CONDUCTED SPURIOUS

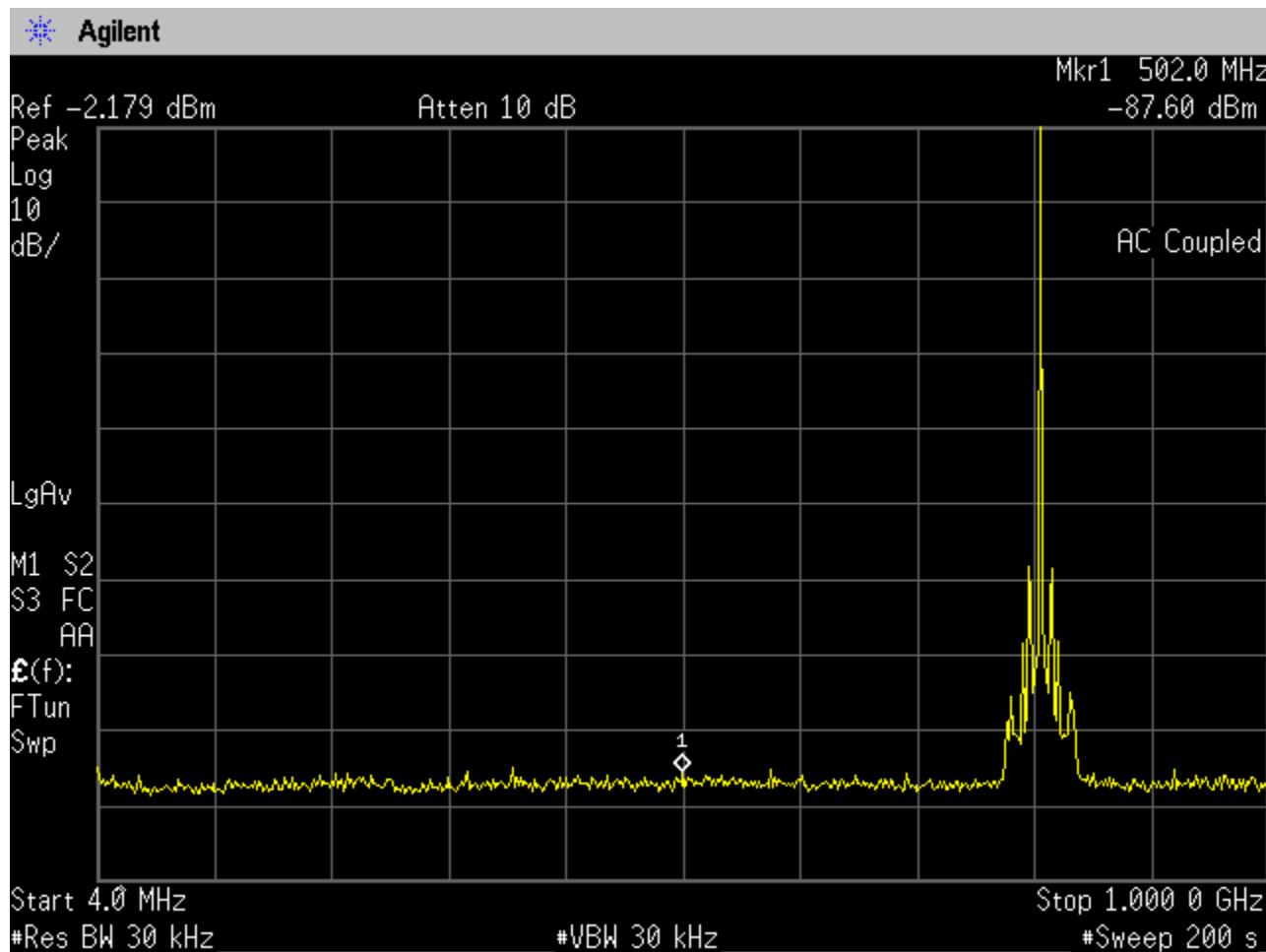
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP

CONDUCTED SPURIOUS

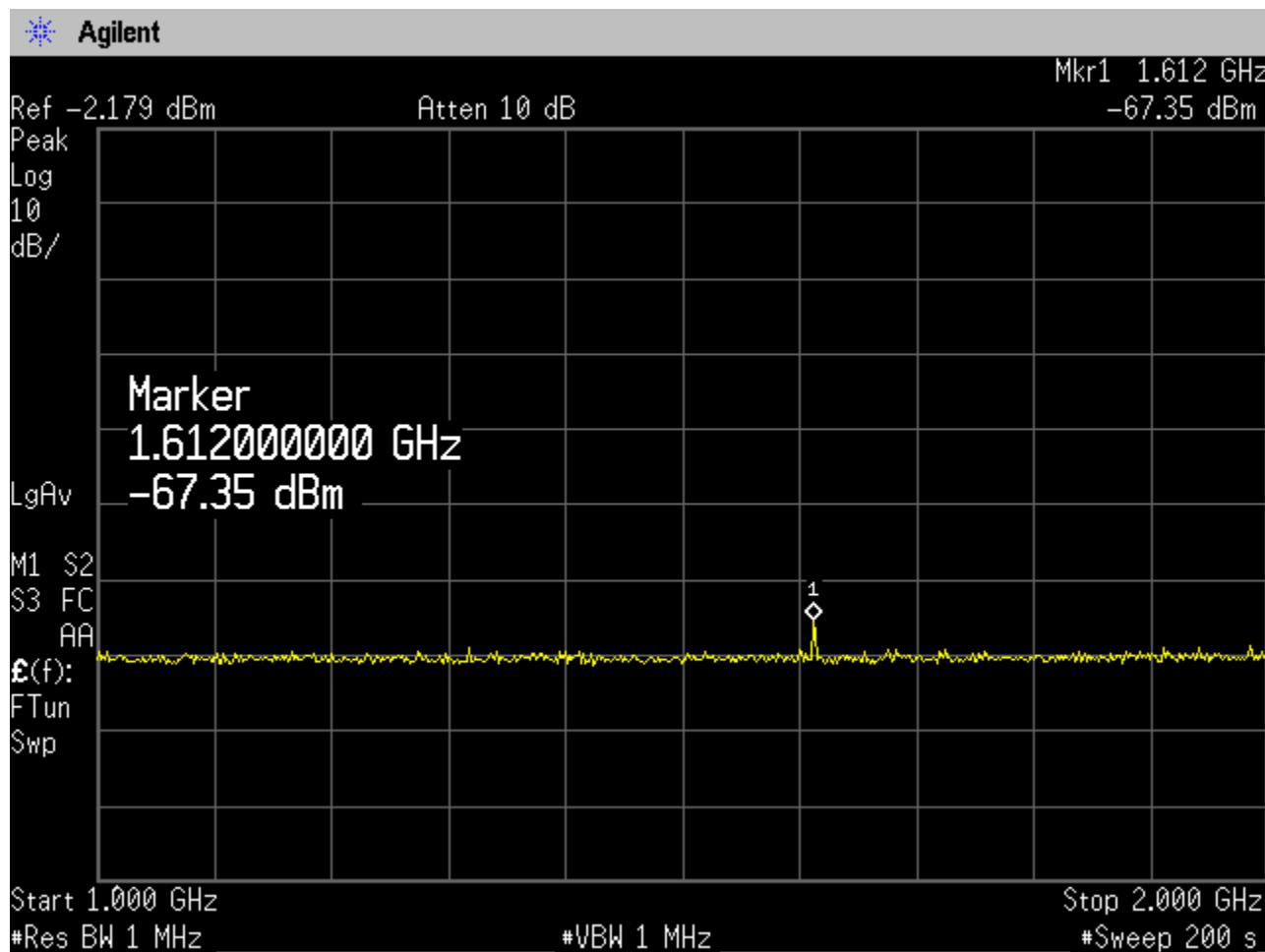
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP

CONDUCTED SPURIOUS

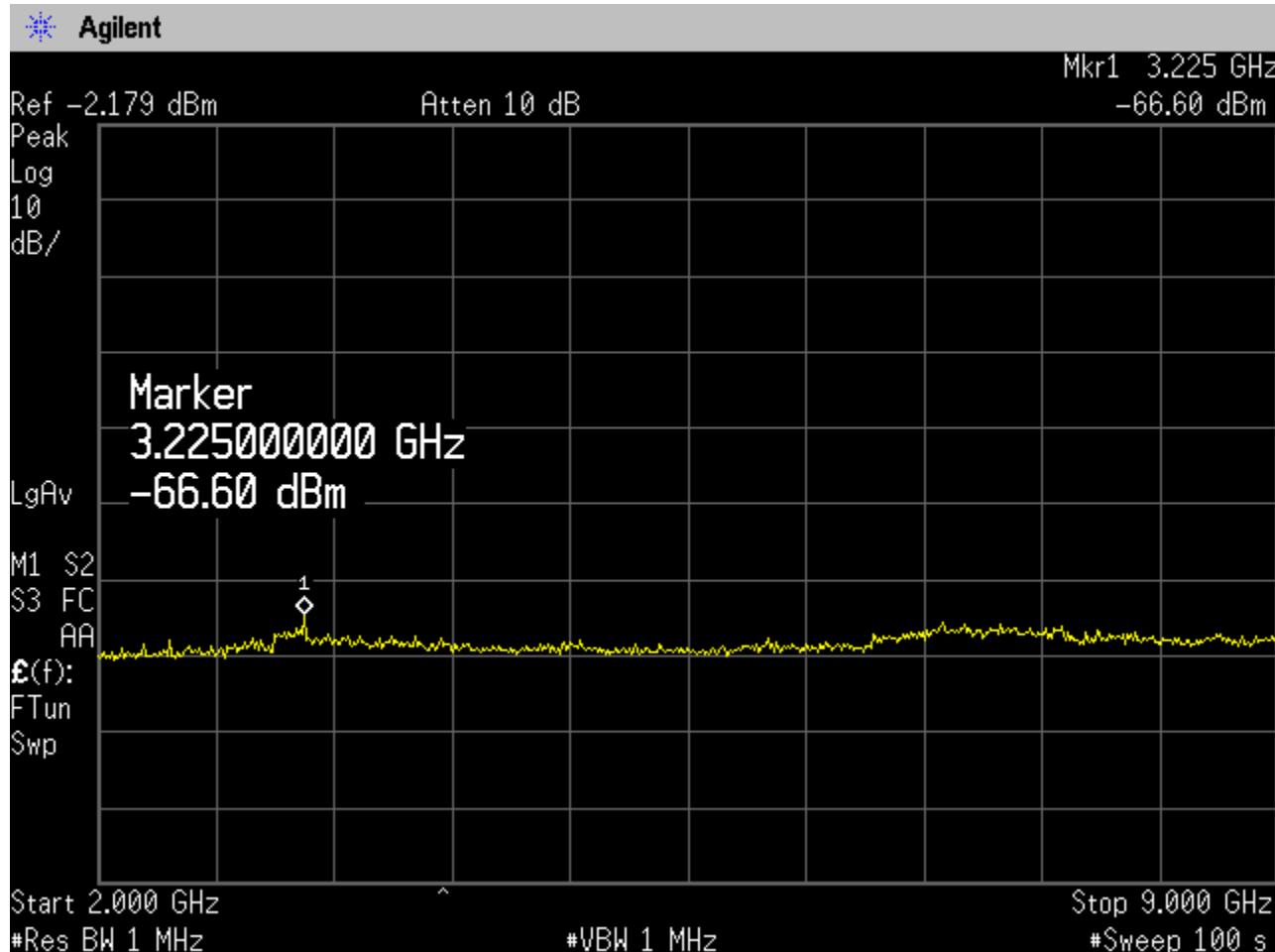
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 1-OTP

CONDUCTED SPURIOUS

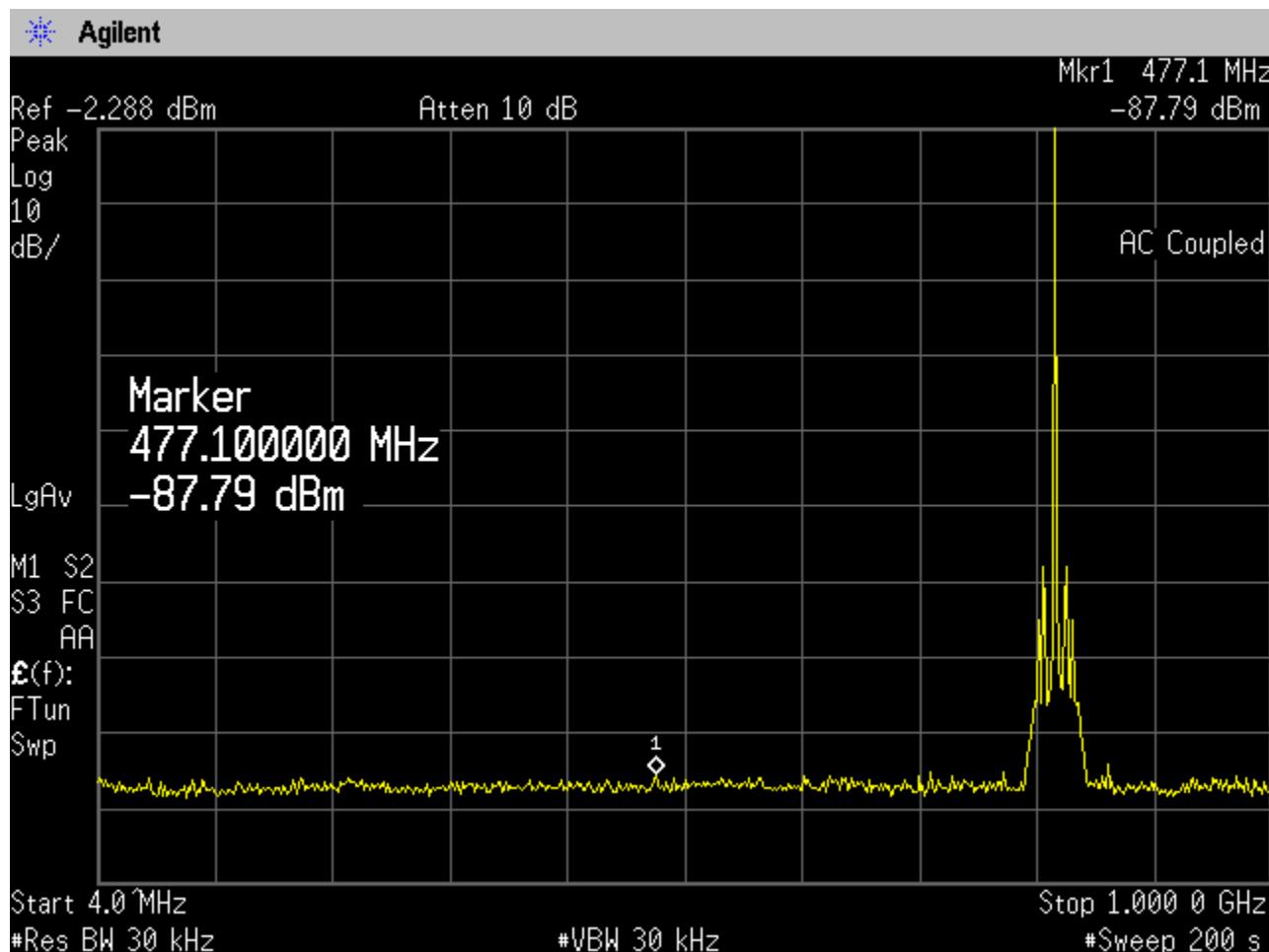
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 415-OTP

CONDUCTED SPURIOUS

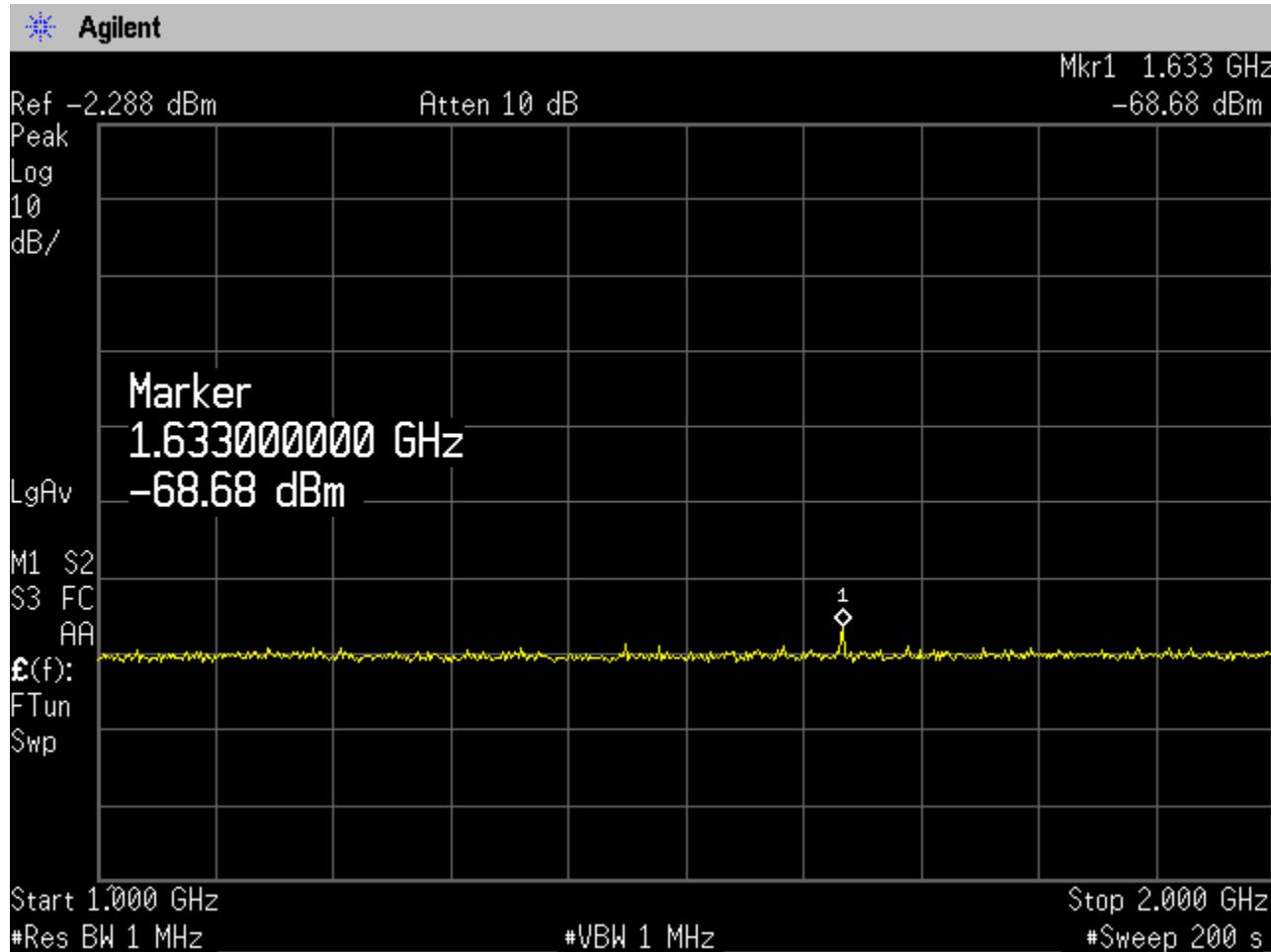
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 415-OTP

CONDUCTED SPURIOUS

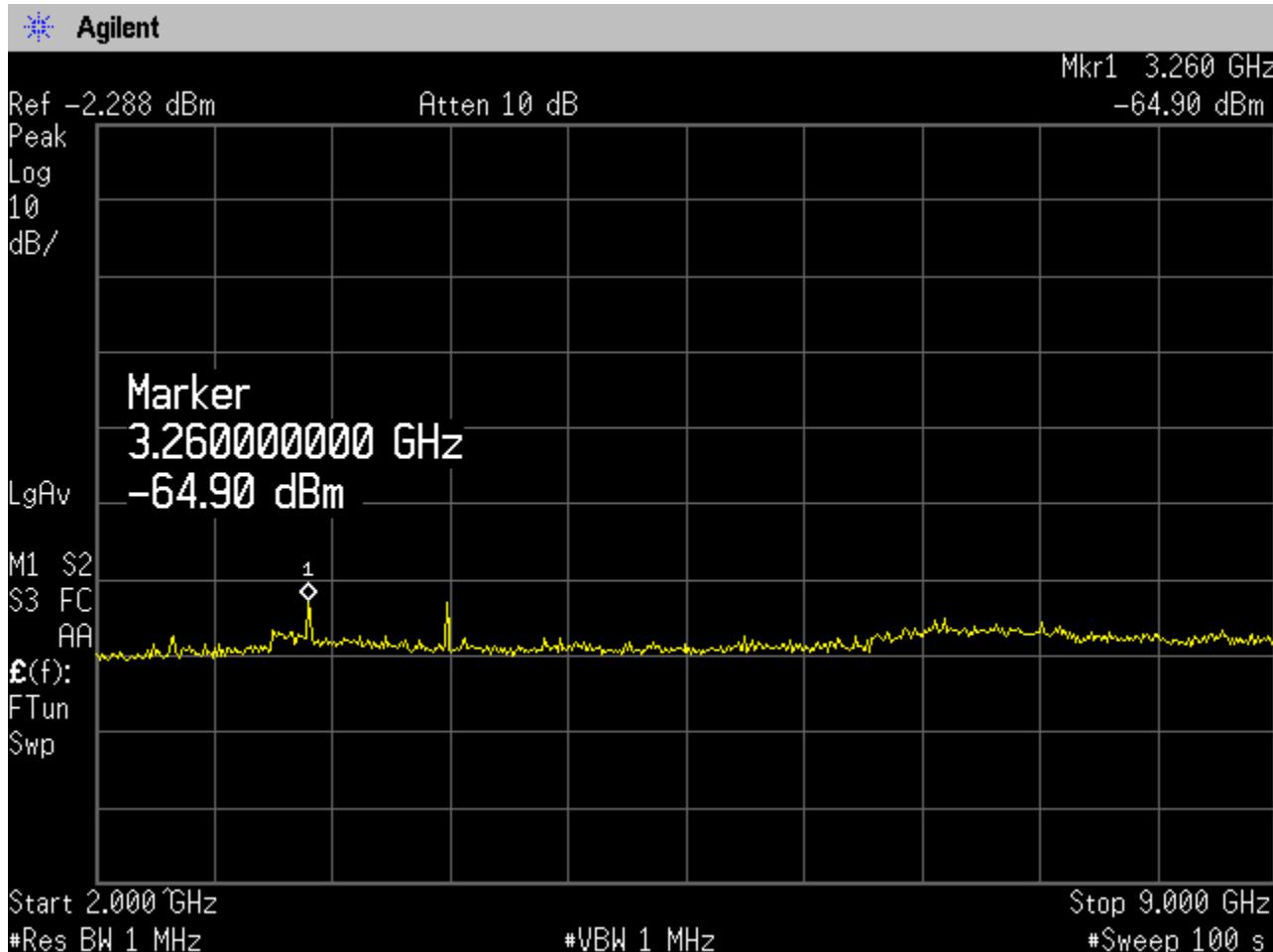
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 415-OTP

CONDUCTED SPURIOUS

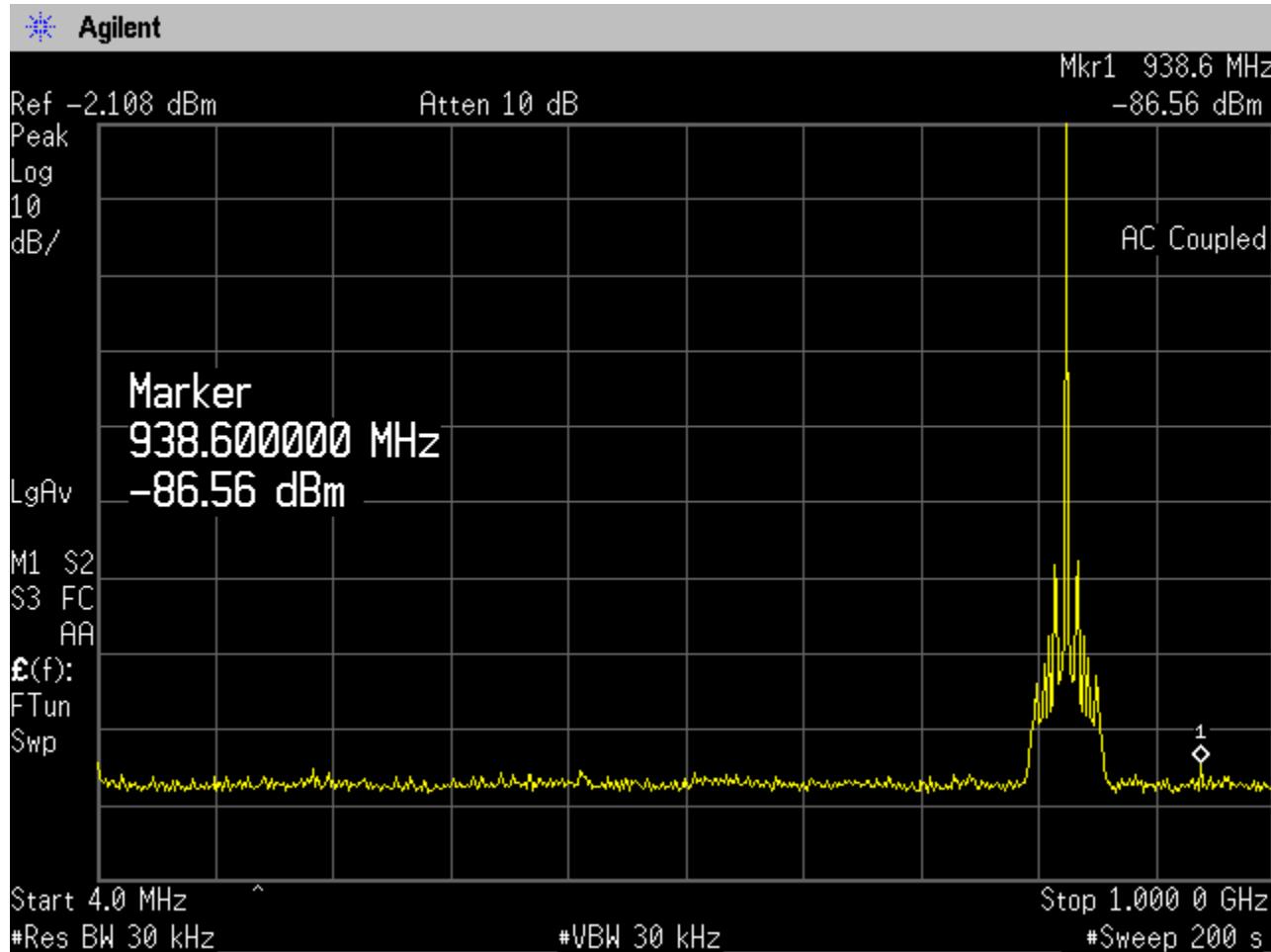
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 830-OTP

CONDUCTED SPURIOUS

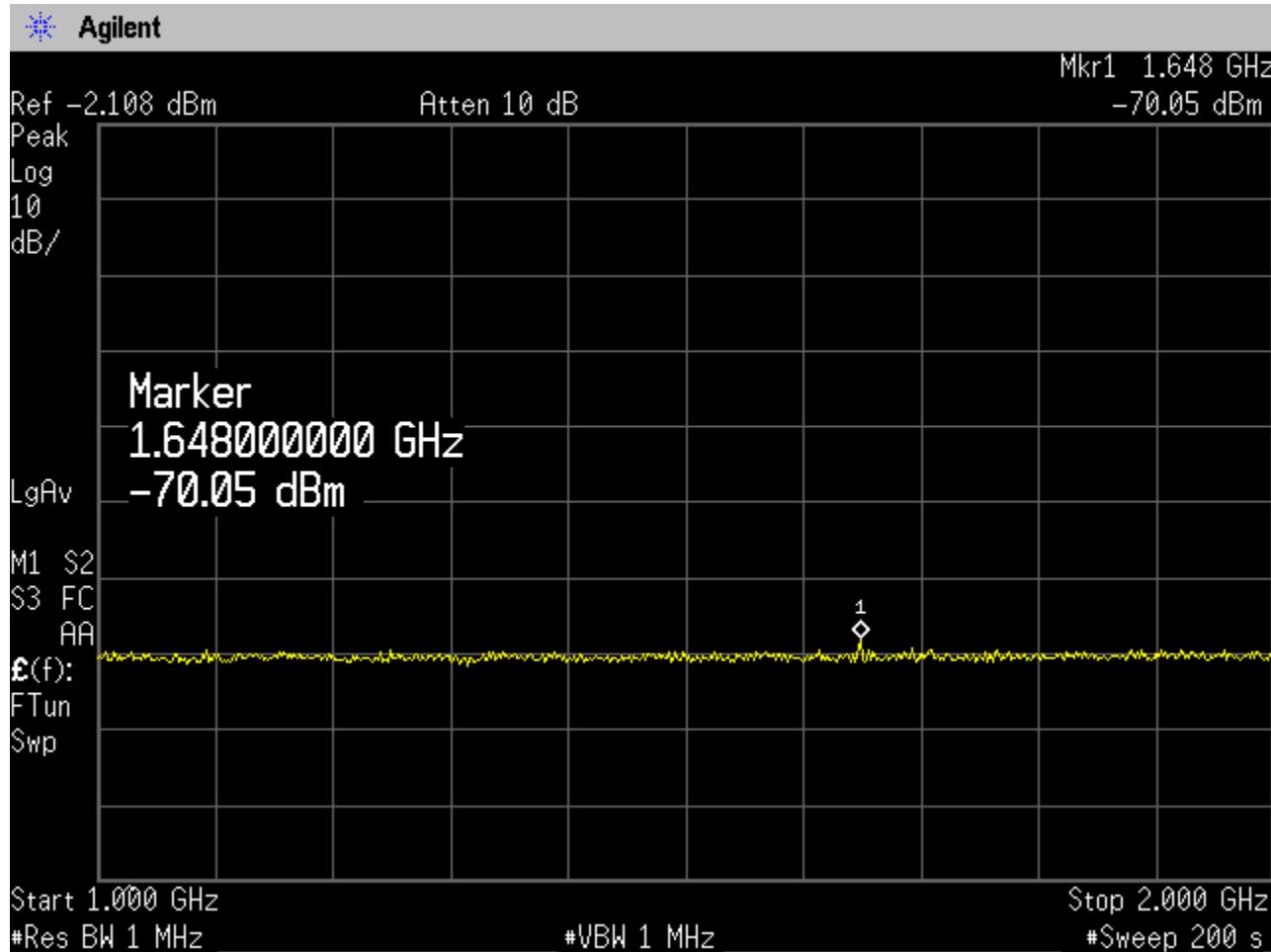
CUSTOMER: M/A-COM

DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 830-OTP

CONDUCTED SPURIOUS

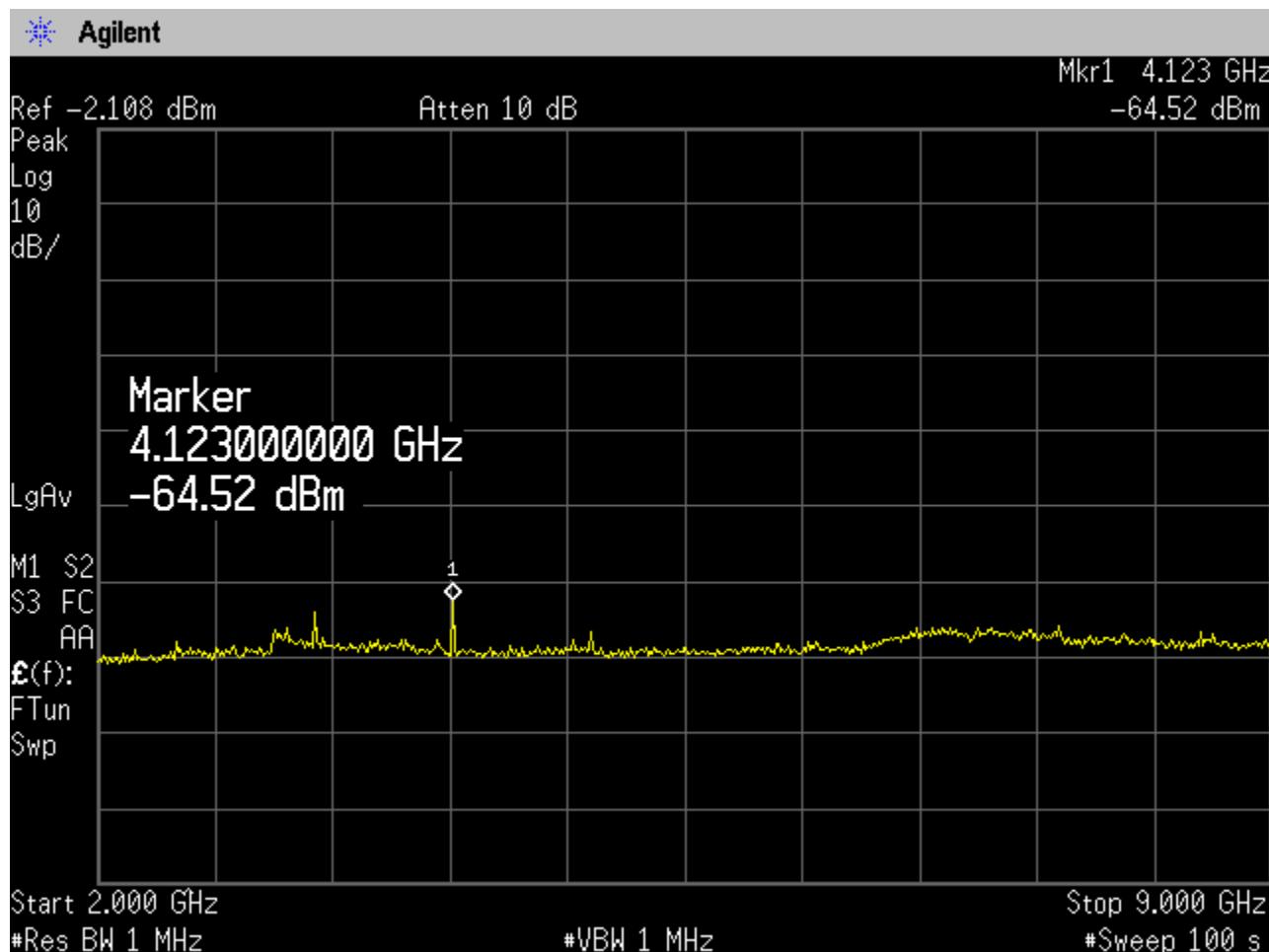
CUSTOMER: M/A-COM

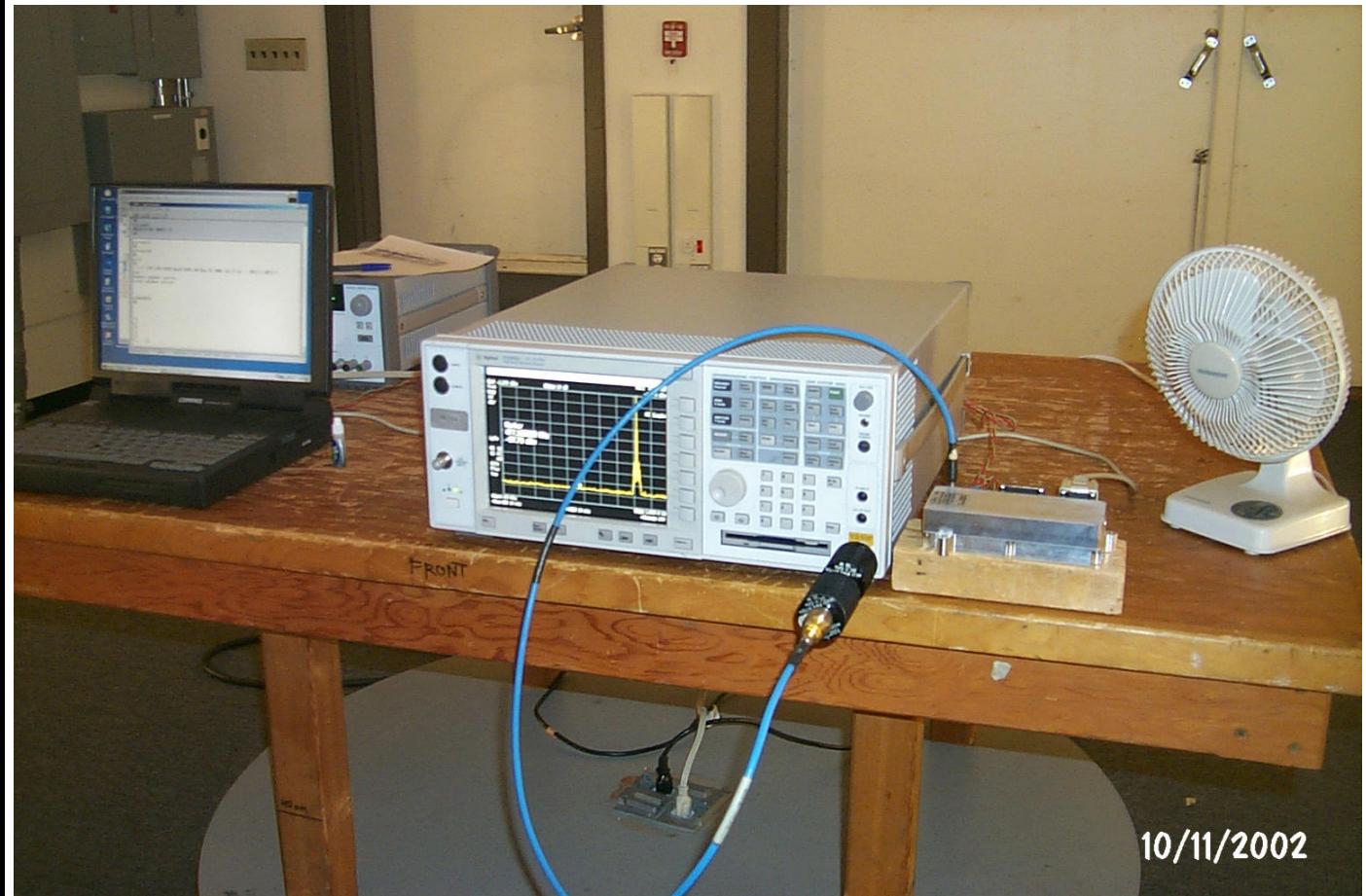
DATE: 10/11/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 6

TESTED BY: MANUEL MARTINEZ

OPERATING MODE: NORMAL FULL POWER
TRANSMIT MODE – CHANNEL 830-OTP

2.4.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800****DATE: 10/11/02****TEST NUMBER: 6****Photograph Description: Test set-up****FORM CTS-PHOTO**

2.5 Radiated Spurious Emissions

2.5.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	H/P E4401 Spectrum Analyzer	N/A	4895C76451	04/03
X	EMCO 3115 Microwave Horn Antenna	376	2796	01/03
X	EMCO 3115 Microwave Horn Antenna	376	2796	01/03
X	EMCO 3120 Tuned Dipole Antenna B1	477	56	01/03
X	EMCO 3121 Tuned Dipole Antenna B2	478	176	01/03
X	EMCO 3121 Tuned Dipole Antenna B3	479	728	01/03

2.5.2 Test Conditions

Radiated spurious emissions were measured with the Data Brick Model DB800 (OTP Mode) placed on top of a wooded turntable located in Test Site A. The test procedure and setup of TIA/EIA 603A was followed. See Figure 5 for the test setup.

The Data Brick Model DB800 was configured to operate in the OTP Mode of operation transmitting at the low, mid and high frequency of each band. The Data Brick Model DB800 was set up and powered by a fully charged battery for the test.

The mode of operation and frequencies tested are as follows:

OTP Mode
Ch# 1 806.0125MHz
Ch# 415 816.3625MHz
Ch# 830 823.9875MHz

2.5.3 Test Method

The test method of TIA/EIA 603A section 2.2.12 was followed for radiated spurious emissions. The DB800 was placed on the turntable three meters from the receive antenna. A non-radiating load was placed on the DB800. An emission scan was performed from 4 MHz to 9GHz. All spurious emissions were recorded and measured with substitution method listed in TIA/EIA 603A.

2.5.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the requirements for Radiated Spurious Emissions as required by FCC Part 2.933.

Radiated Spurious Test Setup

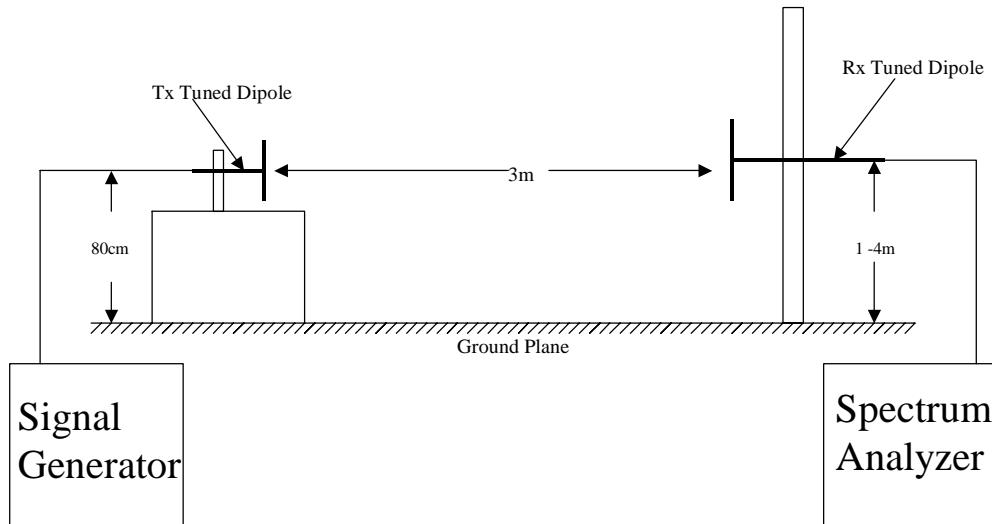


Figure 5

2.5.5 Test Data

CUSTOMER: M/A-COM

DATE: 10/10/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 2

RADIATED SPURIOUS EMISSION MEASUREMENTS
(CHANNEL #1)

FREQUENCY MHz	Mode of Operation	Output of Sig. Gen. dBm	Cable Loss	Gain dB	ERP dBm	LIMIT dBm
1612.025	OTP	-51	2.1	4.9	-44.0	-5.6
2418.038	OTP	-46	0.7	5.3	-40.0	-5.6
3224.050	OTP	-35	0.8	6.2	-28.0	-5.6
4030.063	OTP	-31	1.8	5.6	-23.6	-5.6
4836.075	OTP	-28	2.9	7.1	-18.0	-5.6
5641.088	OTP	-51	3.0	6.7	-41.3	-5.6
6448.100	OTP	-47	5.1	7.9	-34.0	-5.6
7254.113	OTP	-53	7.3	7.8	-37.9	-5.6
8060.125	OTP	-49	6.4	8.5	-34.1	-5.6

CUSTOMER: M/A-COM

DATE: 10/10/02

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 2

**RADIATED SPURIOUS EMISSION MEASUREMENTS
(CHANNEL #415)**

FREQUENCY MHz	Mode of Operation	Output of Sig. Gen. dBm	Cable Loss	Gain dB	ERP dBm	LIMIT dBm
1632.725	OTP	-47	2.1	4.9	-40.0	-5.6
2449.088	OTP	-46	0.7	5.3	-40.0	-5.6
3265.450	OTP	-24	0.8	6.2	-17.0	-5.6
4081.813	OTP	-31	1.8	5.6	-23.6	-5.6
4898.175	OTP	-33	2.9	7.1	-23.0	-5.6
5714.538	OTP	-52	3.0	6.7	-42.3	-5.6
6530.900	OTP	-51	5.1	7.9	-38.0	-5.6
7347.263	OTP	-52	7.3	7.8	-36.9	-5.6
8163.625	OTP	-52	6.4	8.5	-37.1	-5.6

CUSTOMER: M/A-COM

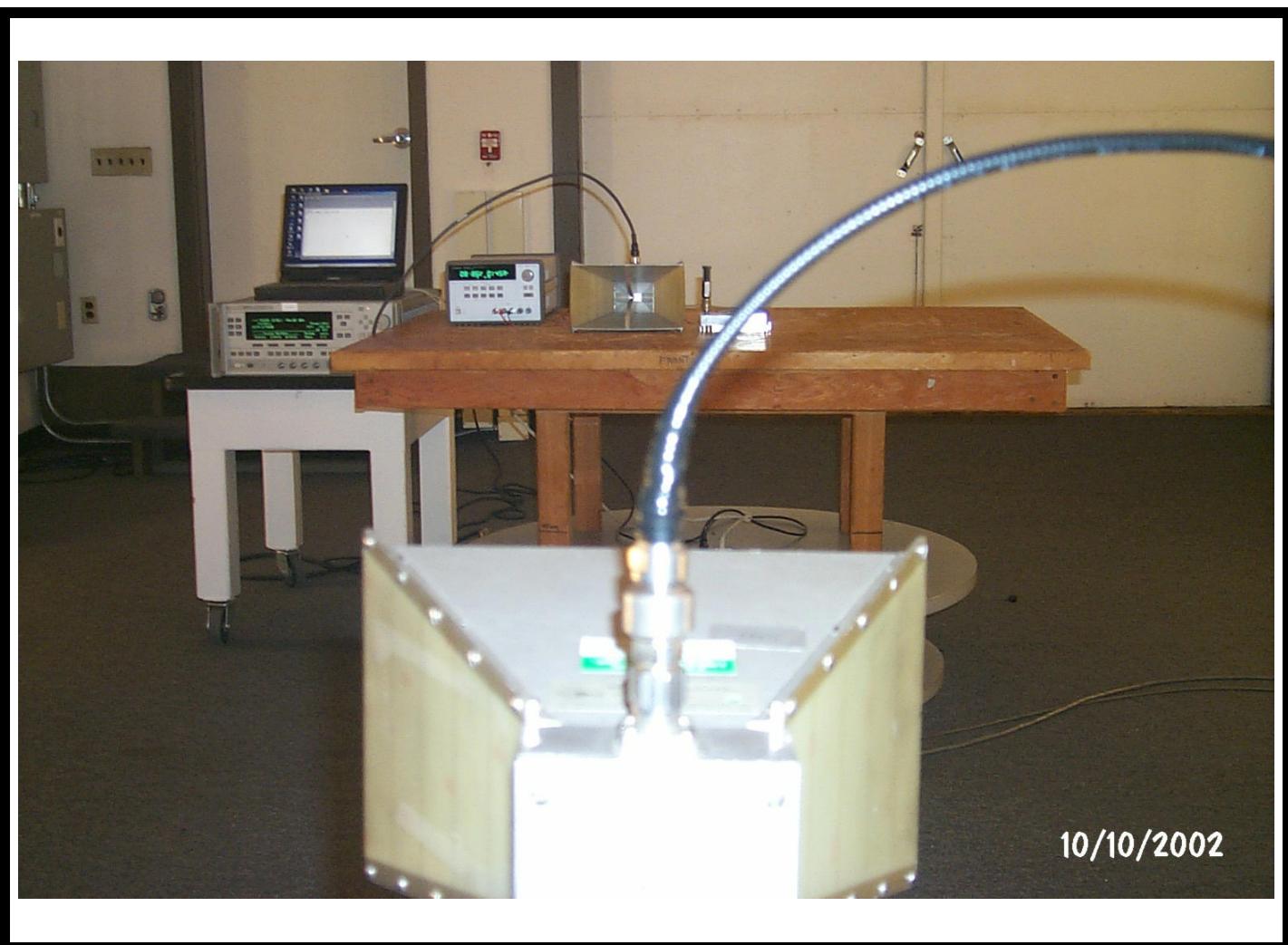
DATE: 10/10/02

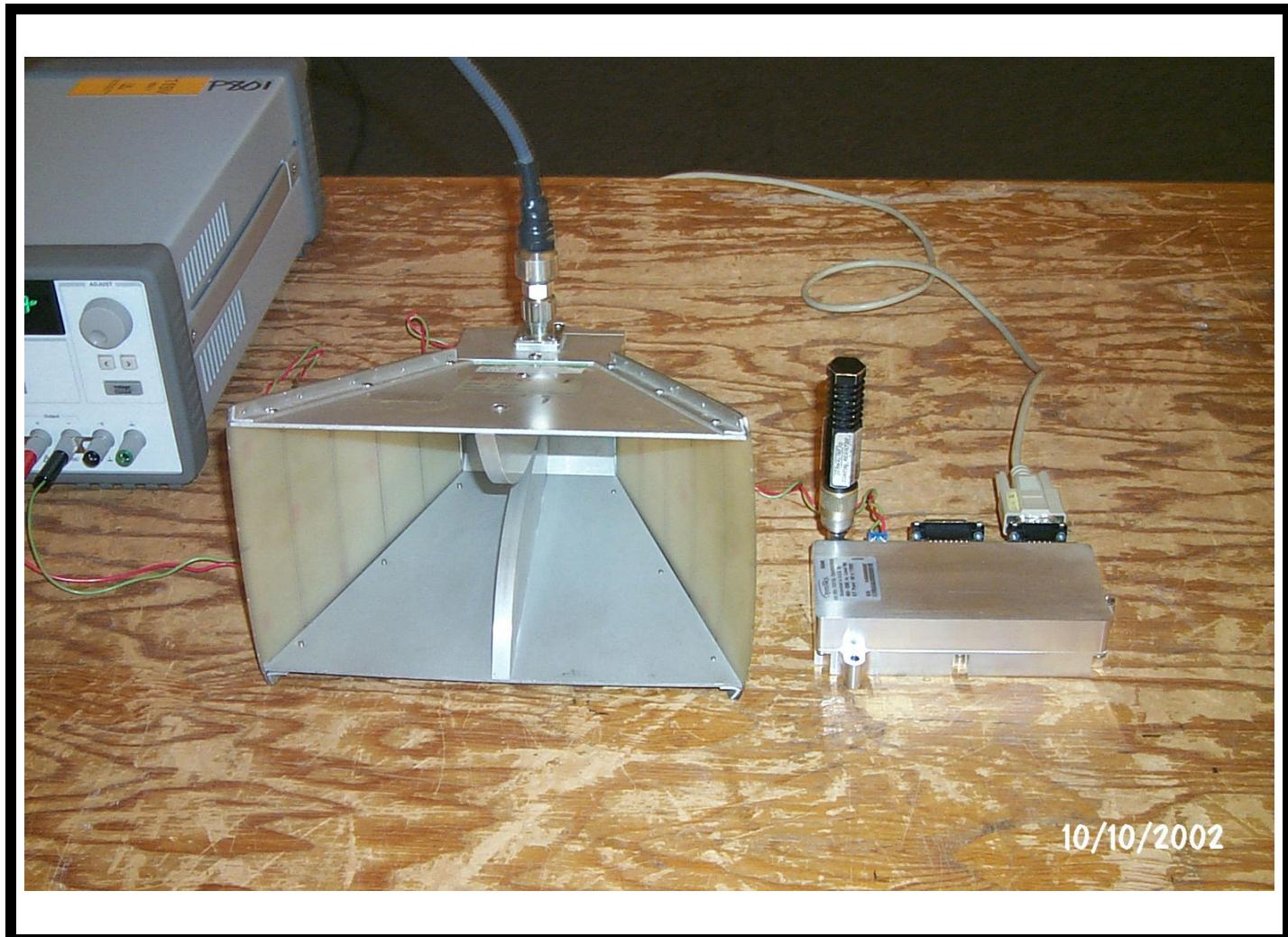
EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TEST NUMBER: 2

**RADIATED SPURIOUS EMISSION MEASUREMENTS
(CHANNEL #830)**

FREQUENCY MHz	Mode of Operation	Output of Sig. Gen. dBm	Cable Loss	Gain dB	ERP dBm	LIMIT dBm
1647.975	OTP	-52	2.1	4.9	-45	-5.6
2471.963	OTP	-59	0.7	5.3	-53	-5.6
3295.950	OTP	-27	0.8	6.2	-20	-5.6
4119.938	OTP	-36	1.8	5.6	-28.6	-5.6
4943.925	OTP	-34	2.9	7.1	-24	-5.6
5767.913	OTP	-56	3.0	6.7	-46.3	-5.6
6591.900	OTP	-57	5.1	7.9	-44	-5.6
7415.888	OTP	-54	7.3	7.8	-38.9	-5.6
8239.875	OTP	-54	6.4	8.5	-39.1	-5.6

2.5.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****DATE: 10/10/02****TEST NUMBER: 2****Photograph Description: Radiated set-up****FORM CTS-PHOTO**

2.5.6 Photographic Documentation**CUSTOMER: M/A-COM****DATE: 10/10/02****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****TEST NUMBER: 2****Photograph Description: Radiated set-up****FORM CTS-PHOTO**

2.6 Frequency Stability

2.6.1 Equipment Used

Test Equipment		Asset #	Serial #	Cal Date
X	H/P Frequency Counter 5340A	139	214A08245	12/03
X	Cincinnati Sub Zero ZH-32-2H/AC Temperature Chamber	544	Z09712530	05/03
X	Narda 769-20 High Band Attenuator	284	03793	C.P.U.
X	H/P 8368A Signal Generator	399	8965B0091	06/02
X	Narda 769-20 High Band Attenuator	471	02951	C.P.U.

2.6.2 Test Conditions

The Frequency Stability “Temperature” tests were performed with the Data Brick Model DB800 (OTP Mode) placed inside a Temperature/Humidity Chamber.

The Frequency Stability “Voltage” tests were performed with the Data Brick Model DB800 (OTP Mode) placed on top of a wooden turntable. The ambient temperature was 20°C

The Data Brick Model DB800 was configured to operate in the OTP Mode of operation transmitting at the low, mid and high frequency of each band for the Frequency Stability “Voltage” tests. The DB800 was configured to operate in the OTP Mode of operation transmitting at the mid frequency for the Frequency Stability “Temperature” tests.

2.6.3 Test Method

Frequency Stability-Temperature

The Data Brick Model DB800 was placed inside a temperature/humidity chamber. The ambient temperature inside the chamber is computer controlled and varied from -30°C to +50° in 10° steps for this test. The temperature was initially set to 20°C and a reference measurement was taken. The ambient temperature was then dropped to -30°C and stepped up to +50°C in 10°C intervals. A measurement was taken every 10°C. The output of the Data Brick Model DB800 was connected to a frequency counter via two 20dB attenuators and a N-Type coax cable. The DB800 Radio was set to 816.3625 MHz (Channel 415) OTP Mode. See Figure 6 for test set-up. The temperature was measured by placing a thermal couple on the outside chassis of the DB800 Radio. The DB800 Portable Radio was turned off between each 10° step.

Frequency Stability-Voltage

The Data Brick Model DB800 was placed on top of a wooden table connected to a modified battery pack enclosure. The battery pack enclosure with exposed terminals (no cells) was connected to a DC supply. Testing was performed at 8.5VDC (above nominal), 7.5VDC (nominal), and 6.5VDC (battery end-point). The voltage variation test was performed at the high, middle, and low channels in the OTP Mode.

The mode of operation and frequencies tested are as follows:

OTP Mode	
Ch# 1	806.0125MHz
Ch# 415	816.3625MHz
Ch# 830	823.9875MHz

2.6.4 Results

The M/A-Com Data Brick Model DB800 (OTP Mode) met the Frequency Stability requirements of FCC Part 90.213 and Part 2.995.

Test Setup

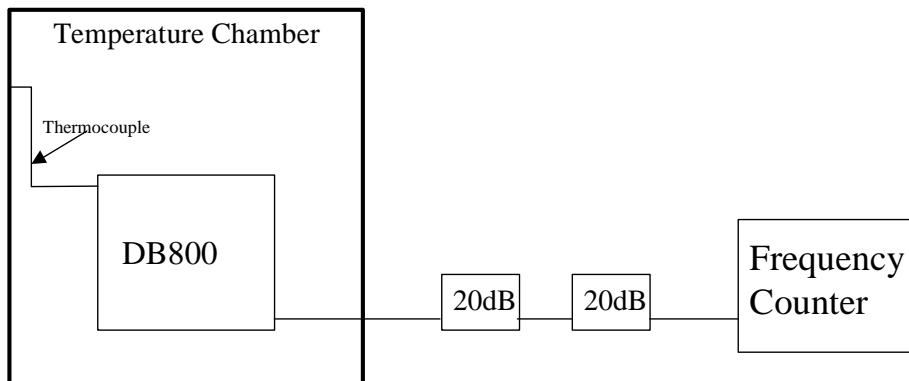


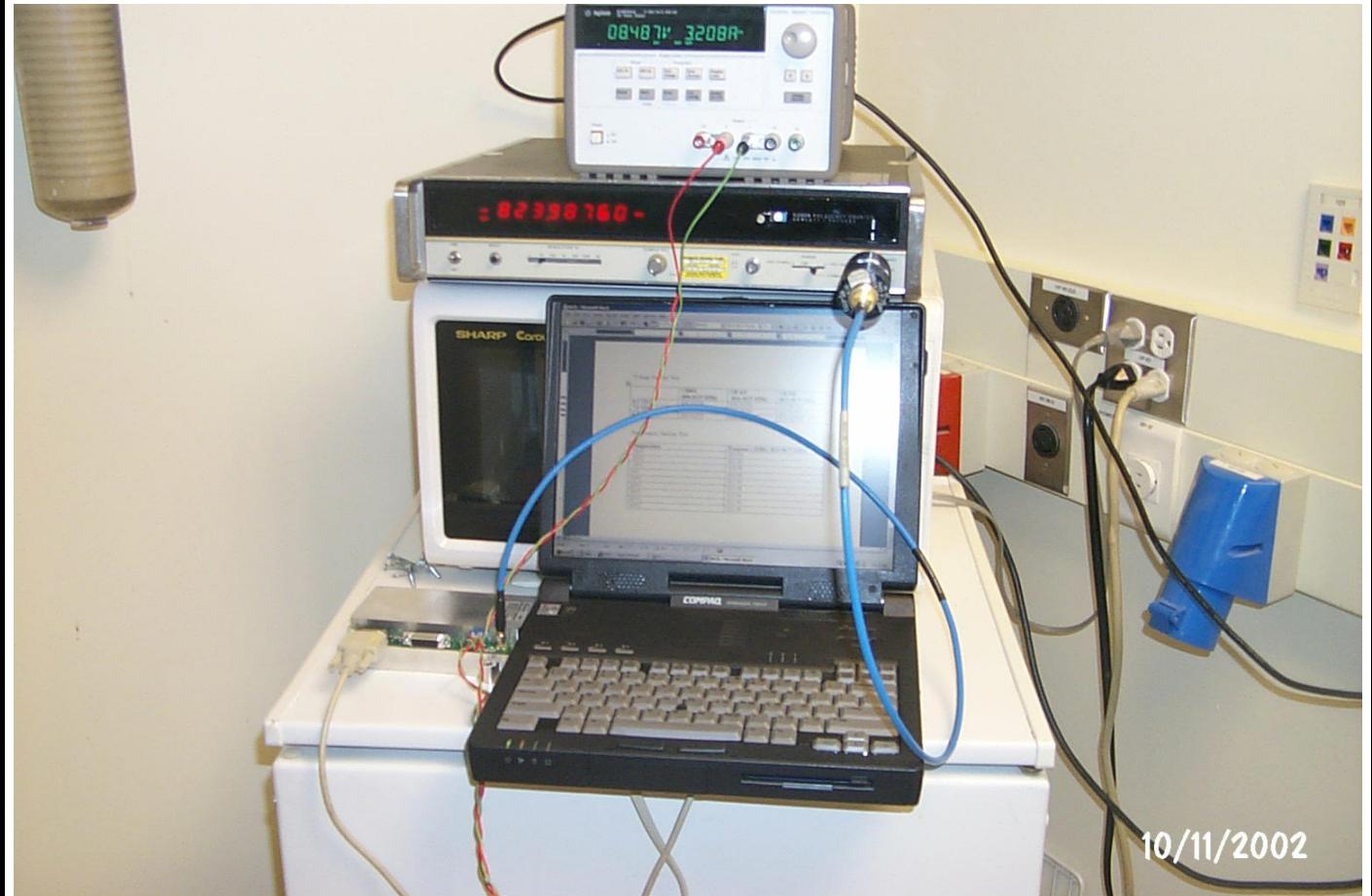
Figure 6

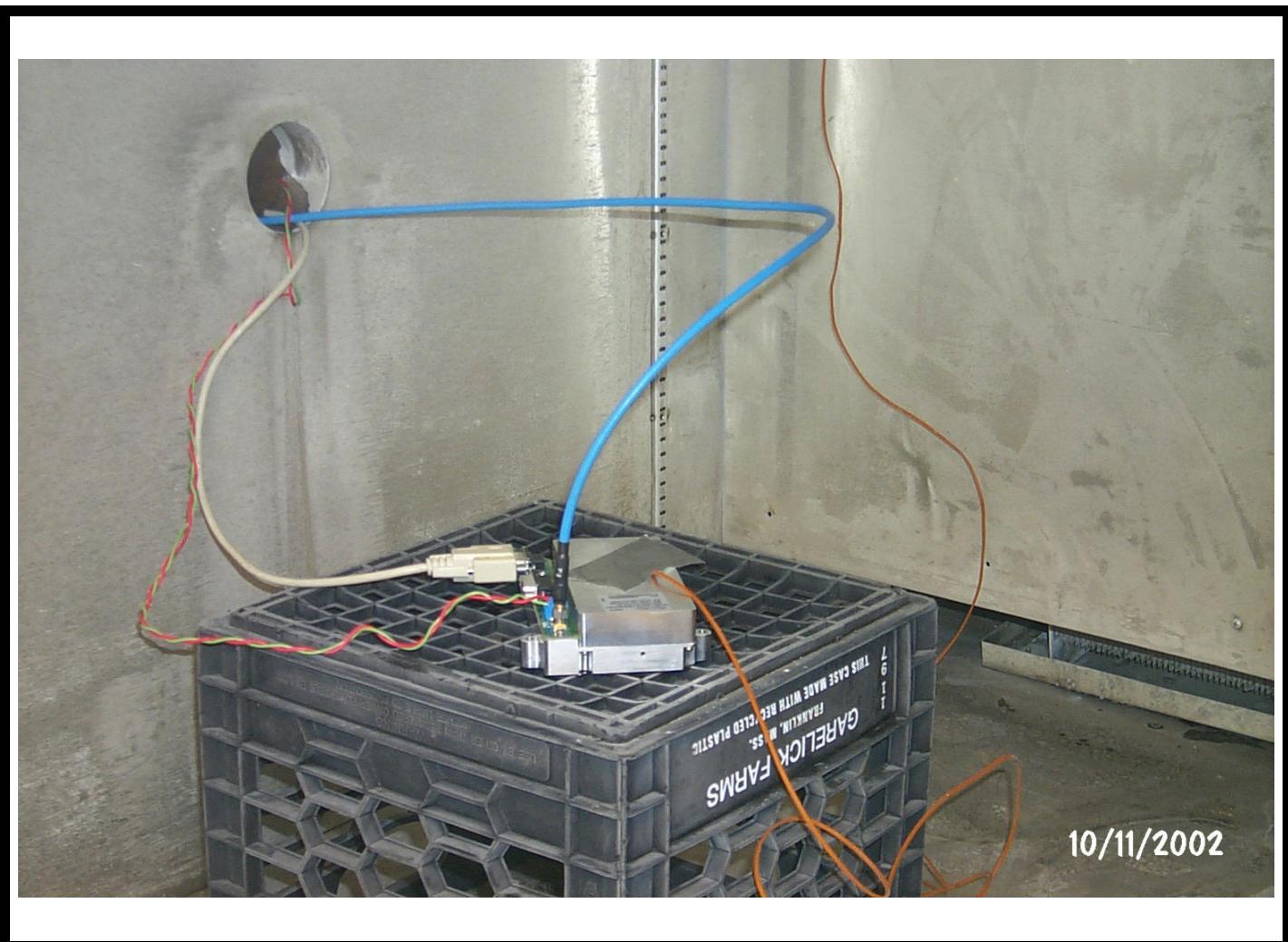
2.6.5 Test Data**DB800 OTP Mode****Frequency Stability Test (Voltage)**

	CH001 (806.0125 MHz)	CH 415 (816.3625 MHz)	CH 830 (823.9875 MHz)
8.5 VDC	806.01254	816.36256	823.98760
7.5 VDC	806.01253	816.36256	823.98759
6.5 VDC	806.01253	816.36257	823.98758

Frequency Stability Test (Temperature)

Temperature	Frequency (MHz) (823.9875 MHz)
-30°C	823.98734
-20°C	823.98728
-10°C	823.98739
0°C	823.98744
10°C	823.98744
20°C	823.98725
30°C	823.98751
40°C	823.98763
50°C	823.98778

2.6.6 Photographic Documentation**CUSTOMER: M/A-COM****DATE: 10/11/02****EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****TEST NUMBER: 7****Photograph Description: Test set-up for Voltage.****FORM CTS-PHOTO**

CUSTOMER: M/A-COM**EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****DATE: 10/11/02****TEST NUMBER: 8****Photograph Description: Test set-up for Temperature.****FORM CTS-PHOTO**

CUSTOMER: M/A-COM**EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)****DATE: 10/11/02****TEST NUMBER: 8****Photograph Description: Test set-up for Temperature.****FORM CTS-PHOTO**

2.7 Radiated Electromagnetic Emissions Receiver**2.7.1 Equipment Used**

Test Equipment		Asset #	Serial #	Cal Date
X	Tektronix 496 Spectrum Analyzer	1	B010559	10/03
X	H/P E4401 Spectrum Analyzer	N/A	4895C76451	04/03
X	Rhode and Schwartz ESV Test Receiver	15	875931049	09/03
X	Hewlett Packard 8447D Pre Amp	4	2727A06065	01/03
X	EMCO 3120 Tuned Dipole Antenna B1	477	56	01/03
X	EMCO 3121 Tuned Dipole Antenna B2	478	176	01/03
X	EMCO 3121 Tuned Dipole Antenna B3	479	728	01/03
X	EMCO 3115 Microwave Horn Antenna	376	2796	01/03

2.7.2 Test Conditions

The Data Brick Model DB800 was set up on a wooden table 3 meters from the receiving antenna within Open Area Test Site A.

The Data Brick Model DB800 was configured to operate in stand-by mode of operation to maximize the emissions. The EUT was set up and powered by a fully charged battery for radiated emission tests. The worst case signals detected were recorded.

2.7.3 Test Method

The test method of ANSI-C63.4 was followed for Class B equipment. For the radiated emission measurements, a manual scan was performed from 30MHz to 10GHz. During this scan, the antenna, turntable and EUT's cable positions were manipulated to maximize the emission levels in a given frequency band displayed on the spectrum analyzer.

2.7.4 Results

The M/A-Com Data Brick Model DB800 met the requirements for Radiated Emissions as required by FCC Part 15 Subpart B for Class B equipment.

RADIATED E FIELD EMISSION MEASUREMENTS

CUSTOMER: M/A-COM

DATE: 10/10/02

EQUIPMENT: DB800 (S/N A4000800002)

TEST NUMBER: ONE (1)

TESTED BY: MANUEL MARTINEZ

COUPLING DEVICE: TUNABLE DIPOLE ANTENNAS

OPERATING MODE: STANDBY/OTP

TEST SPEC: FCC PART 15 AND 90 CLASS B

BANDWIDTH: [X]

PROCEDURE: ANSI C63.4

OTHER (SPECIFY)

FREQUENCY RANGE: [X] 3

ANTENNA DISTANCE: [X] 3 METERS [] 10

[] 11.76 GHz –

KK All signals greater than 3dB from the limit are calculate to the nearest whole number.

KK Field Level (dBuV/m) = [107 – Measured level (dBm)] + Antenna Factor/Cable Loss (dB)

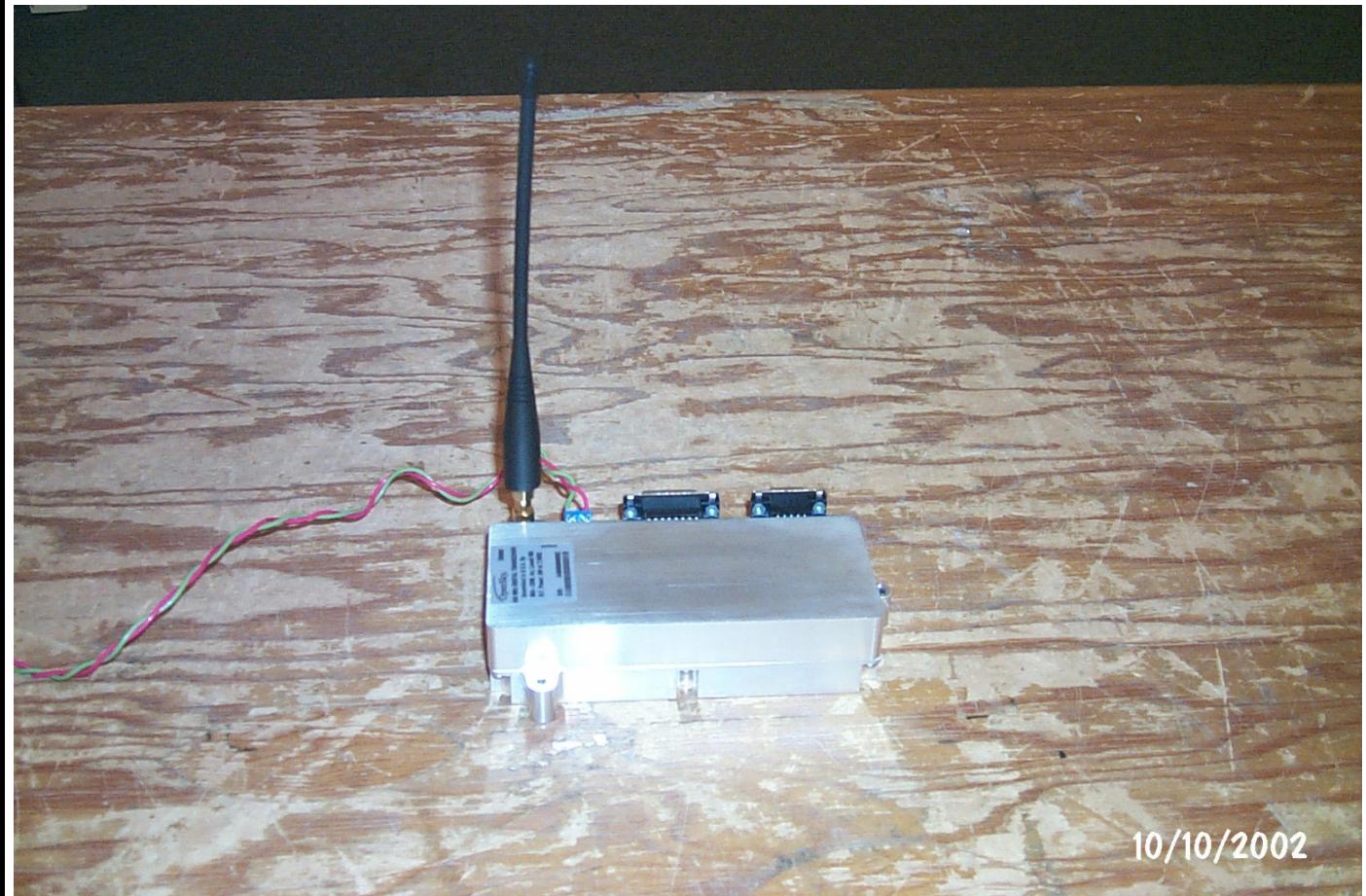
Ambient Temperature: 72°F

Humidity: 46%

Atmospheric Pressure: 30.5"

NOTES: **NF** = Spectrum Noise Floor

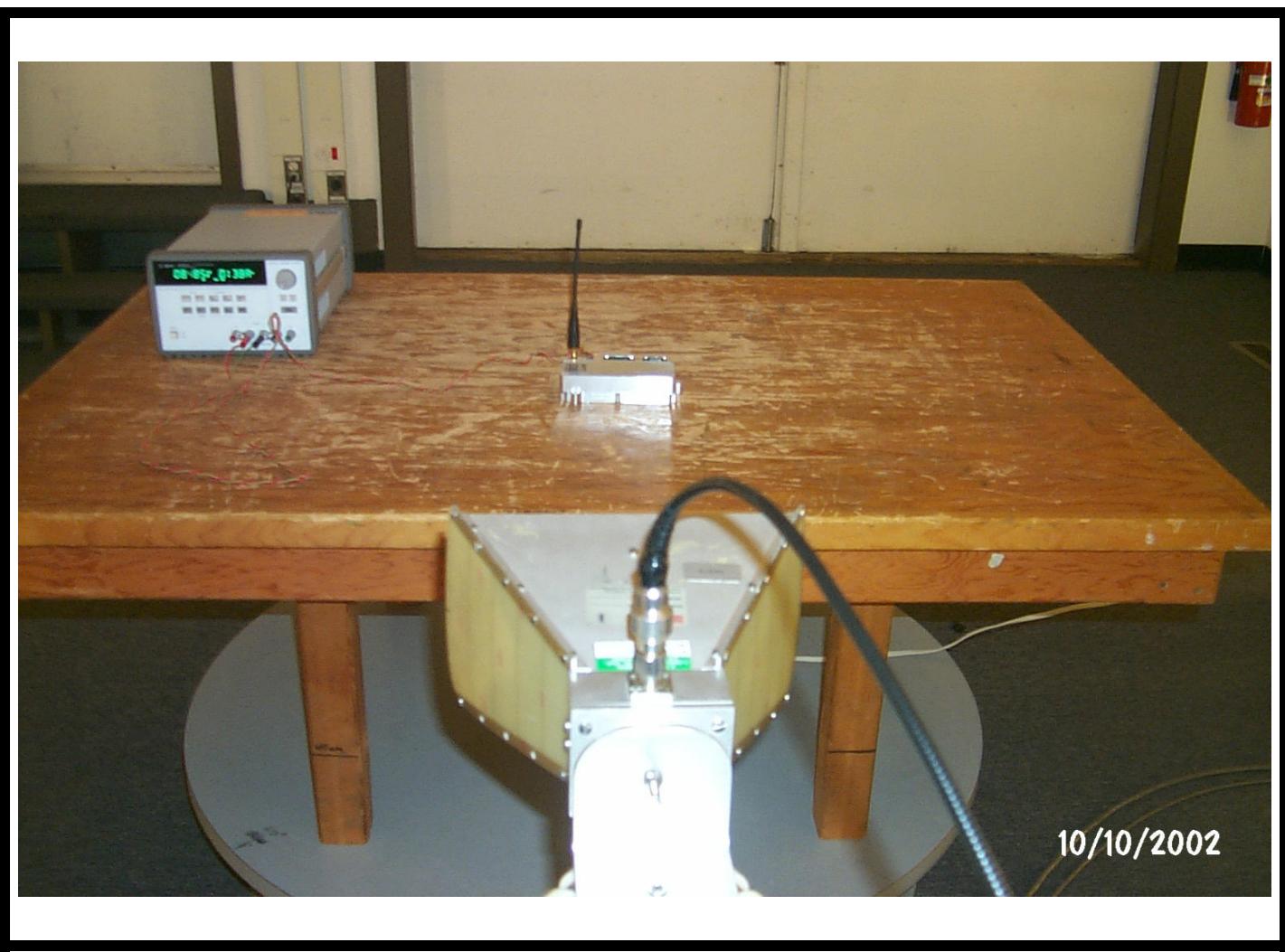
FORM CTS-DS-001R

2.7.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800****DATE: 10/10/02****TEST NUMBER: 1**

Photograph Description: Test set-up.

FORM CTS-PHOTO

2.7.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800****DATE: 10/10/02****TEST NUMBER: 1****Photograph Description: Test set-up.****FORM CTS-PHOTO**

2.7.6 Photographic Documentation**CUSTOMER: M/A-COM****EQUIPMENT: DATA BRICK MODEL DB800****DATE: 10/10/02****TEST NUMBER: 1****Photograph Description: Test set-up.****FORM CTS-PHOTO**

CHOMERICS

 Parker Seals

TEST SERVICES

APPENDIX A
TEST LOG

Document #: EMI3465.US.03 Rev. 1
Date: July 18, 2003

TEST LOG

CUSTOMER: M/A-COM

PROGRAM: N/A

EQUIPMENT: DATA BRICK MODEL DB800 (OTP
MODE)

TESTED BY: MANUEL MARTINEZ

Pre-Test Checklist	Date	Comments					
	10/10/02	<p>Test Plan/Procedure: per Test Spec</p> <p>Test Specification: FCC Part 15 Class B and Part 90</p> <p>Chomerics Procedure: CHO TPEC T2</p> <p>EUT Power Requirement Verified:</p> <p style="text-align: center;">DC Battery</p> <p>EUT Functional Operational Check: [<input checked="" type="checkbox"/>] Pass [<input type="checkbox"/>] Fail</p> <p>Environmental: Bonding/Grounding: N/A Safety Issues: N/A</p>					
In-Process Test Checklist	Date	Test #	Test Type	Test Equipment Calibrated	Test Performed Properly – Data Accepted	EUT Set-up Check/Operational Check	EUT Pass/Fail
	10/10/02	1	FCC Part 15 Emissions	X	X	X	PASS
	10/10/02	2	Radiated Spurious	X	X	X	PASS
	10/10/02	3	RF Output Power	X	X	X	PASS
	10/11/02	4	Occupied Bandwidth	X	X	X	PASS
	10/11/02	5	Emission Mask	X	X	X	PASS
	10/11/02	6	Conducted Spurious	X	X	X	PASS
	10/11/02	7	Voltage Frequency Stability	X	X	X	PASS
	10/11/02	8	Temperature Frequency Stability	X	X	X	PASS
Post Test Checklist	Date: 10/11/02	EUT Functional Operation Check: <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail					
					<hr/> Test Engineer/Tech Approved Signatory		

FORM CTS-010

Document #: EMI3465.US.03 Rev. 1
Date: July 18, 2003