Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report In Accordance With Industry Canada Radio Standards Specification 119 Issue 6, FCC Part 90 on the Microwave Data Systems Transmitter Model: 9710A

FCC ID NUMBER:	E5MDS9710N-1
GRANTEE:	Microwave Data Systems 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	July 11, 2005
FINAL TEST DATE:	June 22, June 30 and July 1, 2005

AUTHORIZED SIGNATORY: Juan Martinez
Senior EMC Engineer

A2LA ACCREDITED
2016-01

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FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

2.1033(c)(1) Applicant:

Microwave Data Systems
175 Science Parkway
Rochester, NY 14620

2.1033(c)(2) & RSP-100 (4) FCC ID: E5MDS9710N-1

2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions

FCC 90**: 11K2F1D**

2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range

806 – 940 MHz

2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power

FCC 90**: 6 watts**

2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level

Part 90**: 40 Watts**

2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements

3.4Vdc, 3A

2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter

Refer to Exhibit 6: Schematic diagram

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization

VCO U307 and TXCO X302 (16 MHz)

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation

L324 and 325 are used as low pass filters

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation

The DSP chip U202 controls this function

2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power

The DSP chip U202 controls this function

2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label

Refer to Exhibit 4

2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment

Refer to Exhibit 5

2.1033(c)(13) & RSP-100 (7.2(a)) Equipment Employing Digital Modulation & 90.203 (Certification Requirements)

N/A

2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.

Refer to Exhibit 2

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
9710A

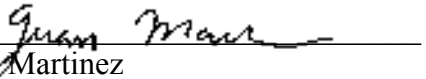
Manufacturer:
Microwave Data Systems
175 Science Parkway
Rochester, NY 14620

Tested to applicable standards:
RSS-119, Issue 6 (Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz).
FCC Part 90 (Private Land Mobile Radio Service)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC4549_**3** Dated March 5, 2003
Departmental Acknowledgement Number: IC4549_**5** Dated March 5, 2003
Departmental Acknowledgement Number: IC2845-**2** Dated August 8, 2001

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	Juan Martinez
Title	Senior EMC Engineer
	Elliott Laboratories Inc.
Address	684 W. Maude Ave
	Sunnyvale, CA 94086
	USA
Date:	July 11, 2005

Maintenance of compliance with the above standards is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SCOPE

FCC Part 90 & IC RSS-119 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rules & IC RSS-119. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the FCC Part 90 & IC RSS-119. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033 & RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC & Industry Canada. FCC & Industry Canada issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SUMMARY OF TEST RESULTS

Part 90 and RSS-119 Test Summary

Measurement Required	FCC Part 2 & 90 Sections	RSS-119 Section	Test Performed	Measured Value	Test Procedure Used	Result
Modulation Tested	GMSK	GMSK	-	-	-	-
Modulation characteristics	2.1047	5.7	Modulated with appropriated signal	-	H	-
Radiated RF power output (ERP/EIRP)	2.1046 / 90.635	6.2	Radiated Output Power Test	-	-	-
Conducted RF power output	2.1046 / 90.635	6.2	Conducted Output Power Test	37.6 dBm (5.8 Watts)	B	Complies
Spurious emissions at antenna Port	2.1051/ 90.210(b)	6.3 & 6.4(b)(g)(i)	Emission Limits and/or Unwanted Emission 30MHz – 10GHz (**Antenna Conducted**)	All spurious emissions < -20dBm	J	Complies
Occupied Bandwidth	2.1049/ 90.210(b)	6.3 & 6.4(b)(g)(i)	Emission Mask and 99% Bandwidth	Refer to Plots	C & D	Complies
Field strength of spurious radiation	2.1053 / 90.210(b)	6.3 & 6.4(d)	Radiated Spurious Emissions 30MHz – 10GHz	-40.1 dBm @ 4836 MHz (-20.4 dB)	N	Complies
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Temperature	-1018 Hz	K	Complies
Frequency stability	2.1055 / 90.213	7	Frequency Vs. Voltage	-1	L & M	Complies
Transient Frequency Behavior	90.214	6.5	N/A	N/A	I	N/A
Exposure to Mobile devices	2.1091	9	Exposure of Humans to RF Fields	RF calculation	-	
Receiver	15.109	8	Receiver Spurious Emissions	31.2dBµV/m @ 33.175MHz (-8.8dB)	N/A	N/A

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Microwave Data Systems model 9710A is a high performance DSP data transceiver which is designed to transmit and receive data. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 13.8Vdc.

The sample was received on June 22, 2005 and tested on June 22, June 30 and July 1, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	9710A	High Performance DSP Data Transceiver	1374048	E5MDS9710 N-1
Microwave Data Systems	9710A	High Performance DSP Data Transceiver	1374042	E5MDS9710 N-1

OTHER EUT DETAILS

None

ENCLOSURE

The EUT enclosure is primarily constructed of cast metal. It measures approximately 17.5 cm wide by 14.5 cm deep by 5 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

Manufacturer/Model/Description	Serial Number
Topward 3603D DC Supply	-

No remote support equipment was used during emissions testing.

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC in	DC Supply	2 wire	Unshielded	1.5
Diag.	Keypad	multiwire	Shielded	0.5
Antenna	50 ohm termination	-	-	-

EUT OPERATION DURING TESTING

The Radio was set to transmit on each channel at maximum power during testing. Modulation was turned for power and mask tests.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 22, June 30 and July 1, 2005 at the Elliott Laboratories Open Area Test Site # 2 and Chamber 5 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

RADIATED EMISSIONS CONSIDERATIONS

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The requirements of ANSI C63.4:2003 were used for configuration of the equipment turntable. It specifies that the test height above ground for table-mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

General: For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

Procedure B – Power Measurement (Conducted Method): The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 10kHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

Procedure C - Occupied Bandwidth (Conducted Method): Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used:

   26-dB or 20-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

3) For the above two methods a resolution and video bandwidth of 100 or 300 Hz was used to measure the emission's bandwidth.

Procedure D - Occupied Bandwidth (Conducted Emission Mask): Either for analog, digital, or data modulations, emission mask was performed. The EUT was set to transmit the appropriate modulation at maximum power. The following method was used:

1) The EUT was connected directly to the spectrum analyzer and used an attenuator to protect the input of the analyzer. The EUT antenna was removable, so conducted measurements was performed. The EUT was set to transmit continuous packets of data and the Fundamental Frequency set to the middle of the EUT frequency range.

2) Any emission must be attenuated below the power (P) per the appropriate rules and section.

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 300 Hz.

Procedure H - Other Types of Equipment: Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

Procedure J – Antenna Conducted Emissions: For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal at the middle of the operating range of the transmitter, as specified in the standard. Power is set to maximum and then to minimum.
2) Set the spectrum analyzer display line function to –20-dBm.
3) Set the spectrum analyzer bandwidth to 10kHz <1GHz and 1 MHz >1GHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10^{th} harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –20dBm limit.
5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

Procedure K - Frequency Stability: The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from –30 to +50° C (or +60° C for some IC RSS standards, if applicable) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

Procedure L - Frequency Stability: For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

Procedure M - Frequency Stability: For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

Procedure N - Field Strength Measurement: The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

RADIATED EMISSIONS SPECIFICATION LIMITS

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m,). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is $43+10\text{Log}_{10}$(mean output power in watts) dB below the measured amplitude at the operating power.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radio Antenna Port (Power and Spurious Emissions), 17-Jun-05
Engineer: David Bare

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9KHz-26.5GHz, non programmable	8563E	284	22-Apr-06
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1534	01-Mar-06
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1423	01-Mar-06

Radiated Emissions, 1000 - 10,000 MHz, 22-Jun-05
Engineer: Chris Byleckie

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	18-Jan-06
Hewlett Packard	EMC Spectrum Analyzer 9KHz-26.5GHz, non programmable	8563E	284	22-Apr-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1561	04-May-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	868	20-Apr-06
Rohde & Schwarz	Power Sensor, 1uW-100mW, DC-18 GHz, 50ohm	NRV-Z51	1069	04-Apr-06
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1534	01-Mar-06
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB7	1538	08-Jun-06

Radio Antenna Port (Power and Spurious Emissions), 30-Jun-05
Engineer: David Bare

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	780	26-May-06
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	09-May-06
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1536	09-May-06

Radiated Emissions, 1,000 - 10,000 MHz, 01-Jul-05
Engineer: David Bare

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	26-Apr-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	08-Nov-05
Filtek	High Pass Filter, 1GHz	HP12/1000-5BA	957	18-Apr-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06

Radiated Emissions, 300 - 6,500 MHz, 4-Aug-05
Engineer: Vishal Narayan

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	13-Jan-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	19-Oct-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12-Jan-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	03-Nov-05

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T60106_Part90 27 Pages

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	-	Class:	-
Immunity Spec:		Environment:	

EMC Test Data

For The

Microwave Data Systems

Model

MDS 9710

Date of Last Test: 7/1/2005

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	-	Class:	-
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

General Description

The EUT is a high performance DSP data transceiver which is designed to transmit and receive data. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 13.8Vdc.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	MDS 9710	High Performance DSP Data Transceiver	1374048	-
Microwave Data Systems	MDS 9710	High Performance DSP Data Transceiver	1374042	-

Other EUT Details

EUT Antenna

The EUT is not provided with an antenna. It is the Licensee's responsibility.

EUT Enclosure

The EUT enclosure is primarily constructed of cast metal. It measures approximately 17.5 cm wide by 14.5 cm deep by 5 cm high.

Modification History

Mod. #	Test	Date	Modification
1	None	-	None

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	-	Class:	-
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Topward	3603D	DC Supply		

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

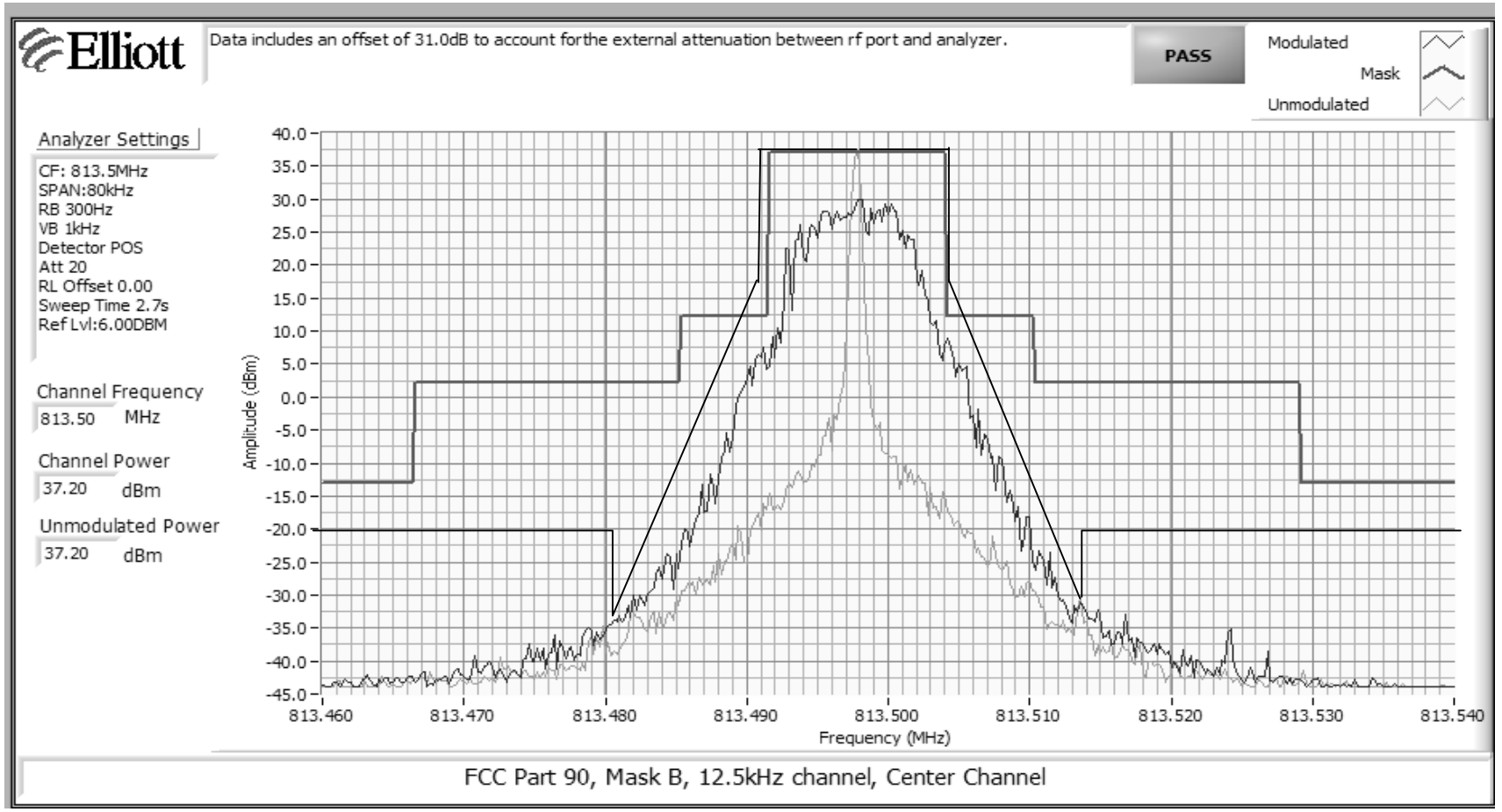
Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
DC in	DC Supply	2 wire	Unshielded	1.5
Diag.	Keypad	multiwire	Shielded	0.5
Antenna	50 ohm termination	-	-	-

EUT Operation During Emissions Tests

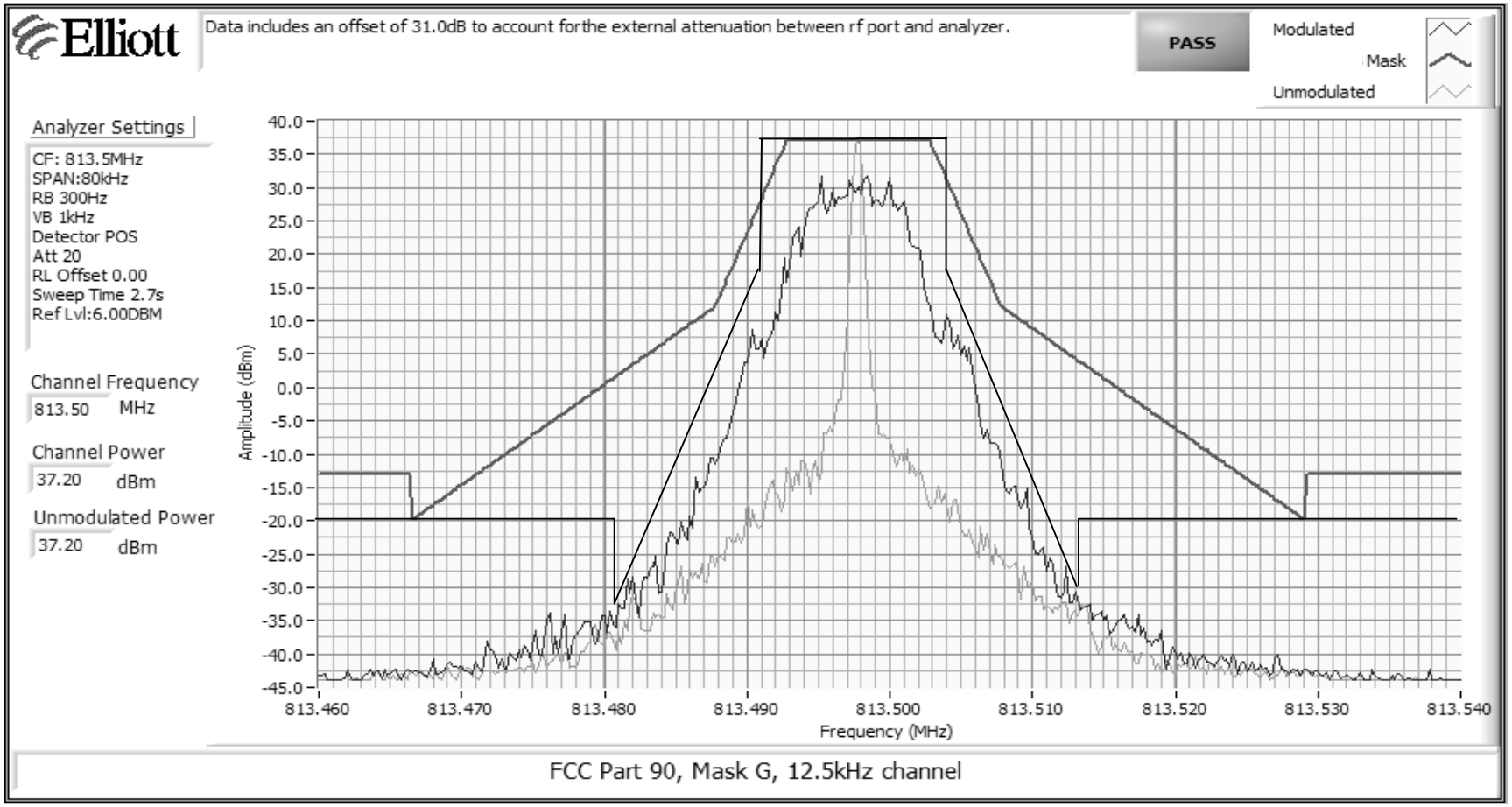
The Radio was set to transmit on each channel at maximum power during testing. Modulation was turned for power and mask tests.

Run #1: Output Power and Mask



RSS-119 Mask D

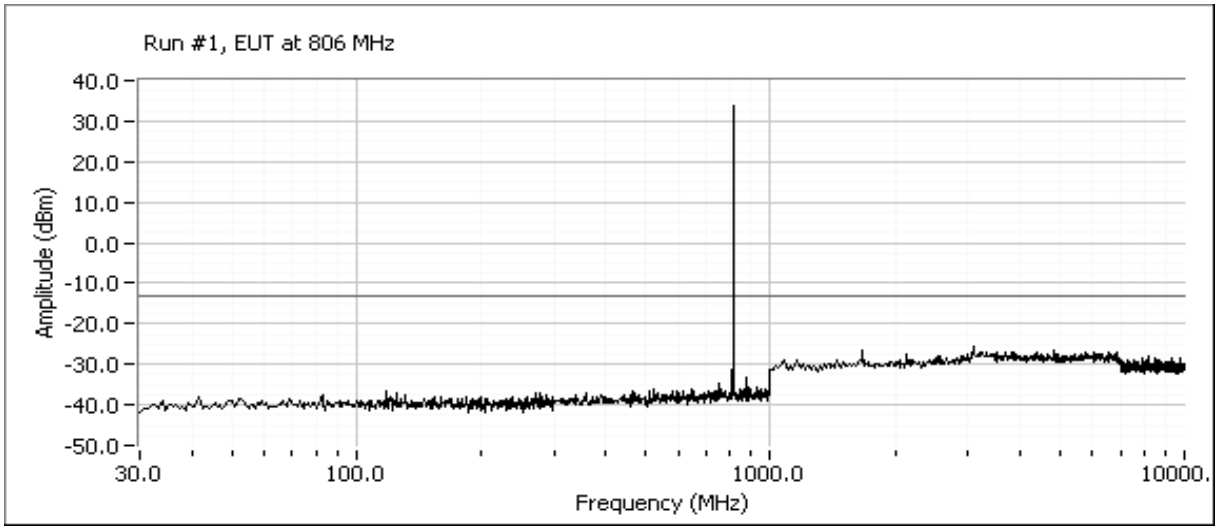
Run #1: Output Power and Mask



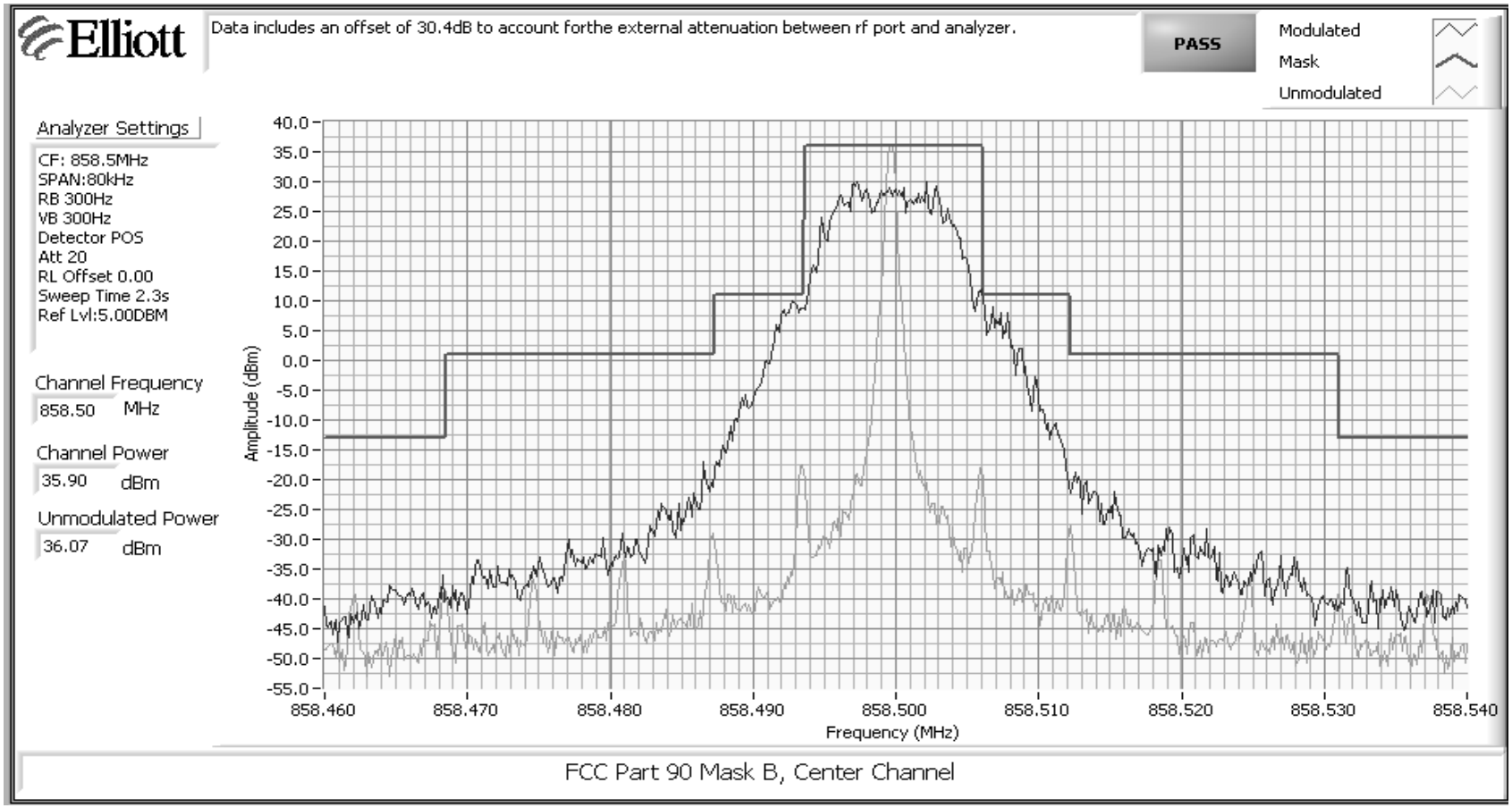
RSS-119 Mask D

Run #2: Out Of Band Spurious Emissions - Antenna Conducted

(RBW=VBW=100kHz < 1 GHz, RBW=VBW=1MHz > 1 GHz)

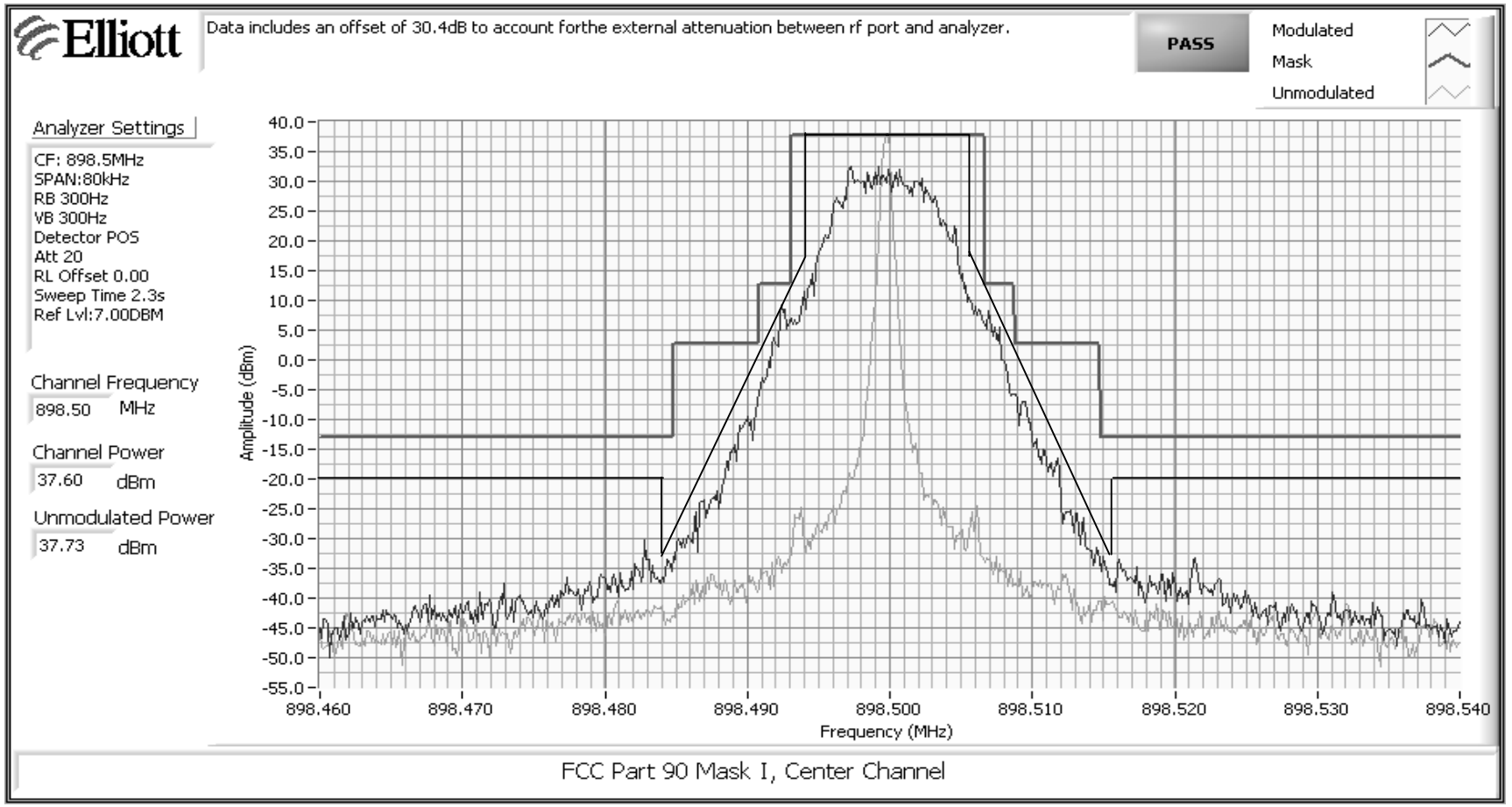


Run #3: Output Power and Mask



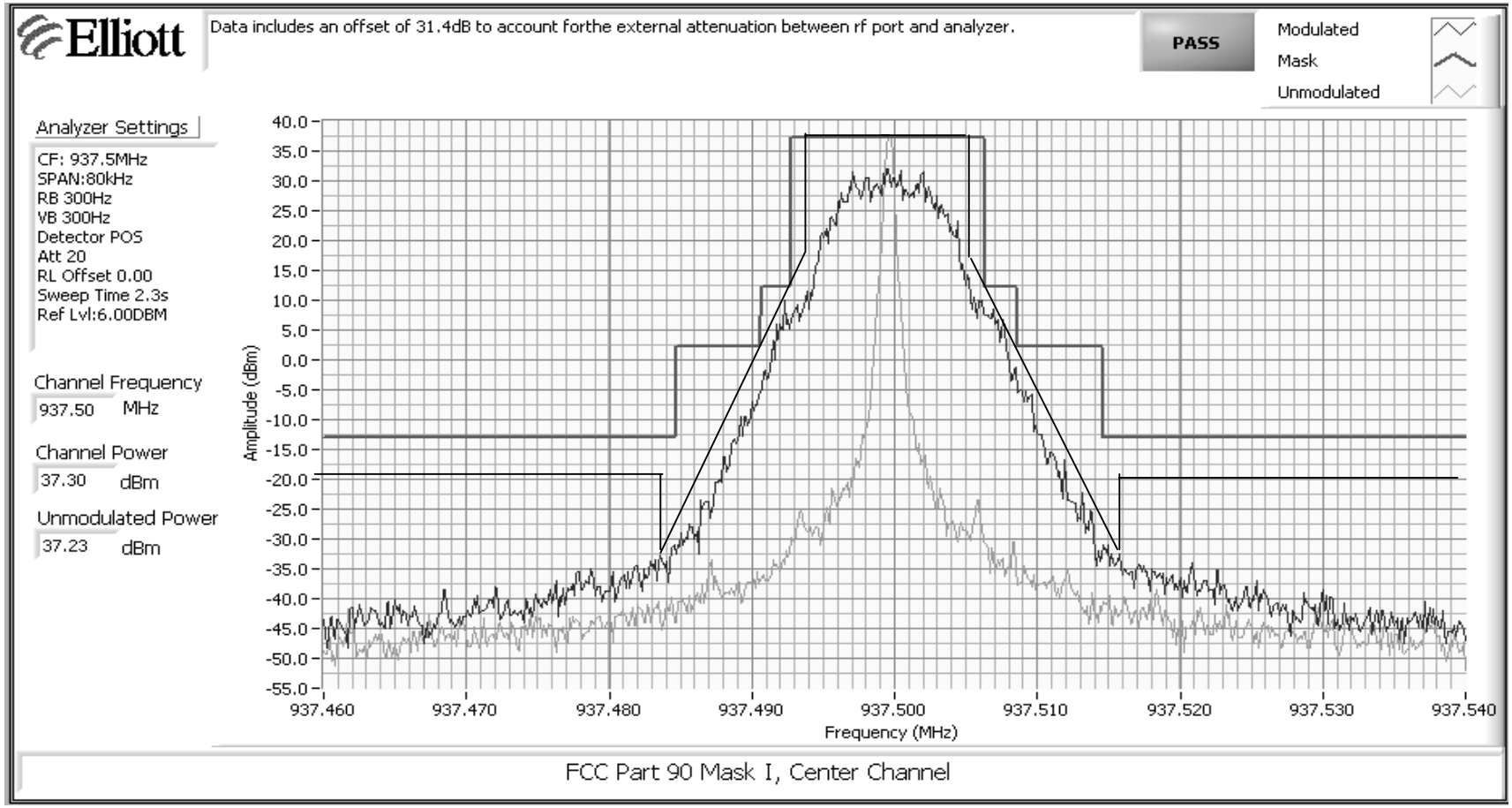
25kHz Channel)

Run #4: Output Power and Mask



RSS-119 Mask D

Run #5: Output Power and Mask



RSS-119 Mask D

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

FCC Part 90 Subpart I Tests

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/16/2005 Config. Used: 1
Test Engineer: David Bare Config Change: None
Test Location: Fremont Chamber #4 EUT Voltage: 13.8Vdc

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 19.5 °C
Rel. Humidity: 58 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	90.205(j)	Pass	Refer to run
2	Spectral Masks	90.210(g)(j)	Pass	Refer to run
3	Antenna Conducted - Out of Band Spurious	90.210(g)(j)(n)	Pass	Refer to run

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

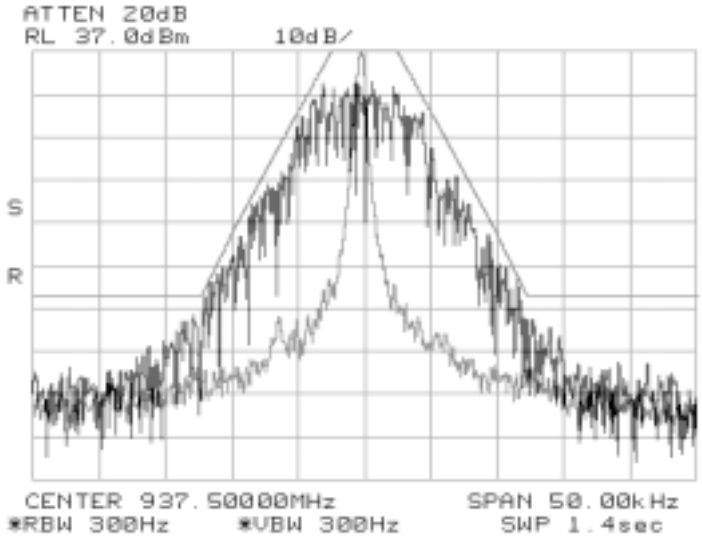
Run #1: Output Power

Unable to set transmitter to transmit in the 806 to 821 MHz band (Refer to data dated July 1, 2005)

Frequency (MHz)	Output Power (note 1) dBm Measured		Power (Watts)
858.5	35.9		3.9
898.5	37.6		5.8
937.5	37.3		5.4

Note 1:	Output power measured using a peak power meter on the unmodulated carrier

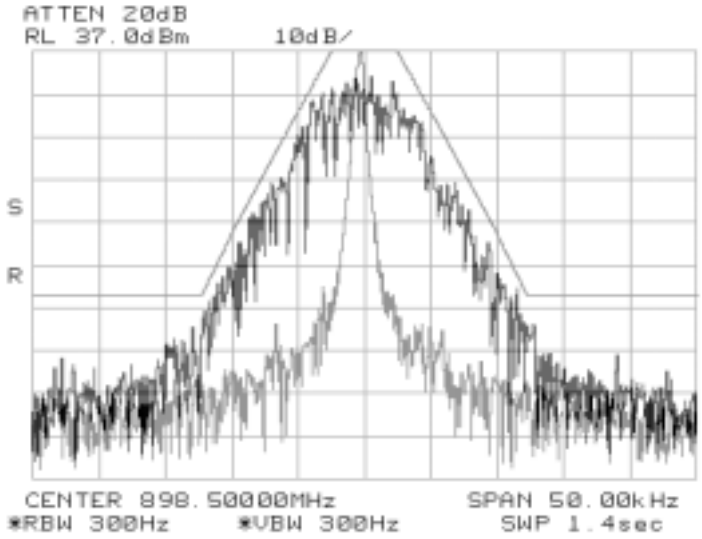
Run #2: Masks



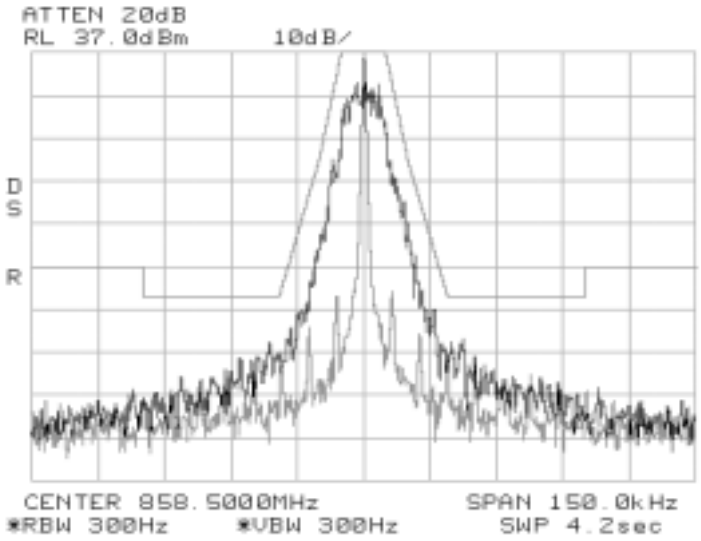
Mask J (25kHz Channel)

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

Run #2: Masks



Mask J (25kHz Channel)



(25KHz Channel) Mask G

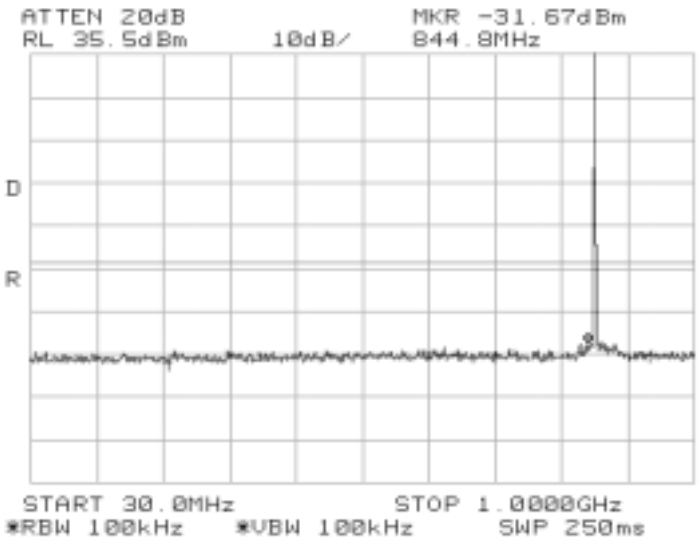
Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted

Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
858.5	30 - 1000 MHz	Note 1	T60106/501
	1 to 10 GHz		T60106/502
899.5	30 - 1000 MHz	Note 2	T60106/503
	1 to 10 GHz		T60106/504
937.5	30 - 1000 MHz	Note 2	T60106/505
	1 to 10 GHz		T60106/506

Note 1:	Limit is -13dBm for spurious emissions
Note 2:	Limit is -20dBm for spurious emissions

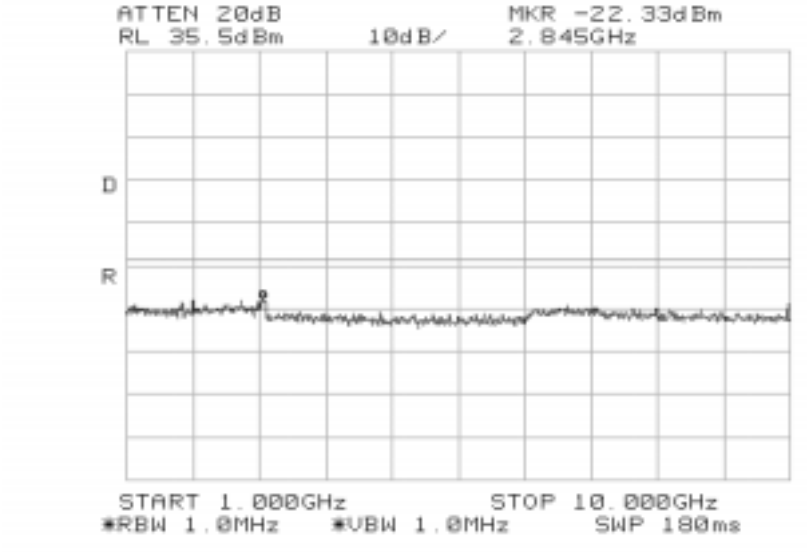
Plots Showing Out-Of-Band Emissions (RBW=VBW=100kHz < 1 GHz, RBW=VBW=1MHz > 1 GHz)



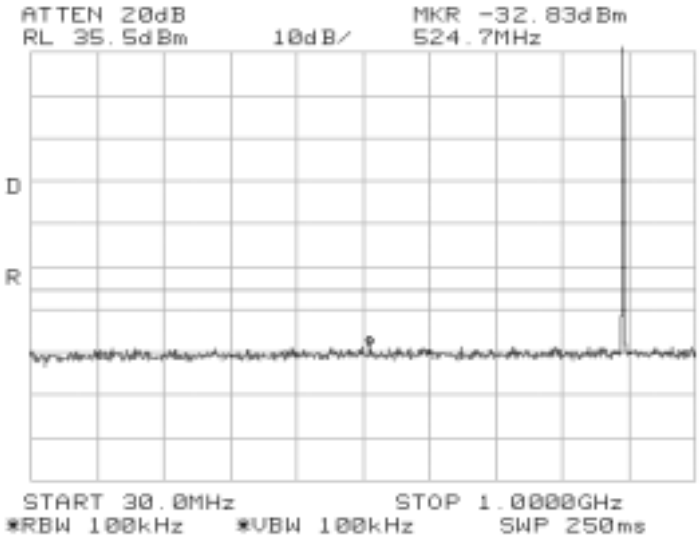
Graph T60106/501

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted



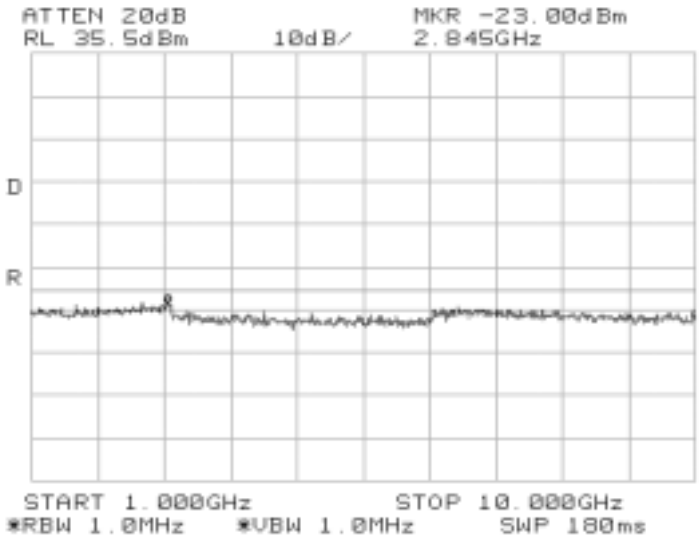
Graph T60106/502



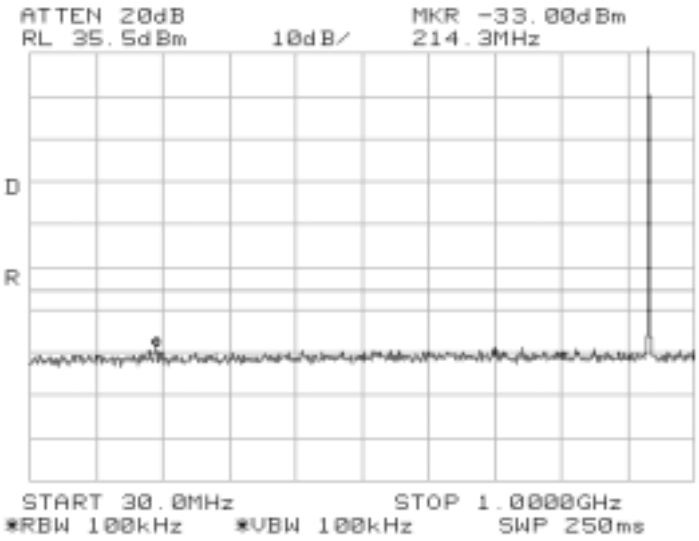
Graph T60106/503

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted



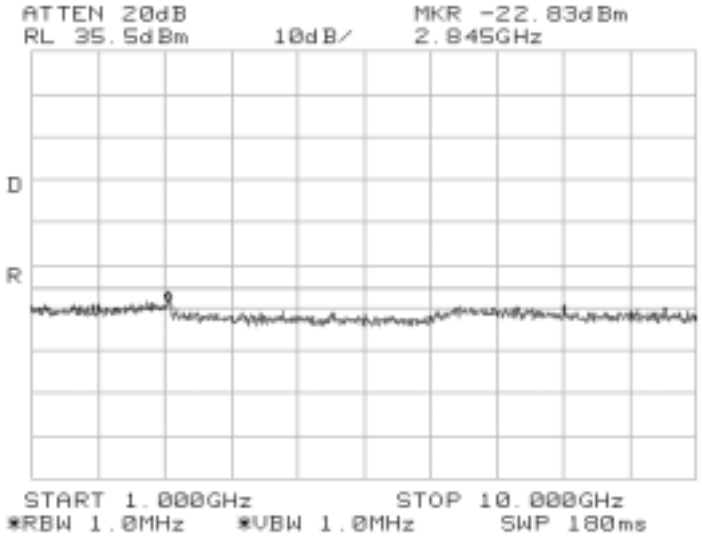
Graph T60106/504



Graph T60106/505

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted



Graph T60106/506

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Radio Performance Test - Part 90, 101 & RSS-119
Frequency Stability

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/3/2005
Test Engineer: Juan Martinez
Test Location: Environmental Chamber
Config. Used: 1
Config Change: None
EUT Voltage: 13.8Vdc

General Test Configuration

The EUT's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary. EUT was place inside an environmental chamber.

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1-2	Frequency and Voltage Stability	Part 90, 101 & RSS-119	Pass	Refer to individual runs

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Run #1: Temperature Vs. Frequency

Drift	Freq.	Limit
(ppm)	(MHz)	(Hz)
1.5	928.00	1392.0

Temperature	Frequency Drift	Limit
(Celsius)	(Hz)	(Hz)
-30	-1018	1392.0
-20	-740	1392.0
-10	-372	1392.0
0	-270	1392.0
10	-138	1392.0
20	0	1392.0
30	-138	1392.0
40	38	1392.0
50	13	1392.0

Run #2: Voltage Vs. Frequency

Nominal Voltage is 13Vdc.

Voltage	Drift	Limit	Comment
(Dc)	(Hz)	(Hz)	13.8
85%	-1.0	1392.0	11.7
115%	0.0	1392.0	15.9

Battery endpoint is 8.92 Vdc

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Radiated Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 7/1/2005
Test Engineer: David Bare
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: 13.8VDC

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal c

Unless otherwise specified, the measurement antenna was located 5 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measuremen

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 44 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 10000 MHz, Maximized Emissions	FCC 90 & 101	Pass	-40.4dBm @ 4836.0MHz (-20.4dB)

Modifications Made During Testing

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 10000 MHz	3	3	0

Run #1: Maximized Readings, 1000 - 10000 MHz
Final peak readings
EUT @ 806MHz

Frequency	Level	Pol	FCC 90 & 101		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4836.000	56.4	V	75.3	-18.9	PK	134	1.0	
4836.030	51.4	H	75.3	-24.0	PK	136	1.5	
1553.818	50.4	V	75.3	-24.9	PK	0	1.3	
1612.000	49.2	V	75.3	-26.1	PK	326	1.0	
2186.396	46.0	V	75.3	-29.3	PK	186	1.0	
1612.000	45.8	H	75.3	-29.6	PK	128	1.0	
2186.358	45.4	H	75.3	-29.9	PK	226	1.0	

Frequency	Substitution measurements			Site	EUT measurements				erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)		dBm	dB
4835.972	-29.2	11.0	76.4	94.6	56.4	-38.2	-40.4		-20.0	-20.4
1553.818	-33.5	8.4	70.4	95.5	50.4	-45.1	-47.3		-20.0	-27.3
1612.000	-35.0	8.5	69.2	95.7	49.2	-46.5	-48.7		-20.0	-28.7

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during maximization.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Radiated Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 6/22/2005
Test Engineer: Chris Byleckie
Test Location: Fremont Chamber #5
Config. Used: 1
Config Change: None
EUT Voltage: 13.8VDC

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Unless otherwise specified, the measurement antenna was located 5 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 54 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1b	RE, 1000 - 10000 MHz, Maximized Emissions	FCC 90 & 101	Pass	-33.4dBm @ 4640.0MHz (-13.4dB)

Modifications Made During Testing

Modifications are detailed under each run description.

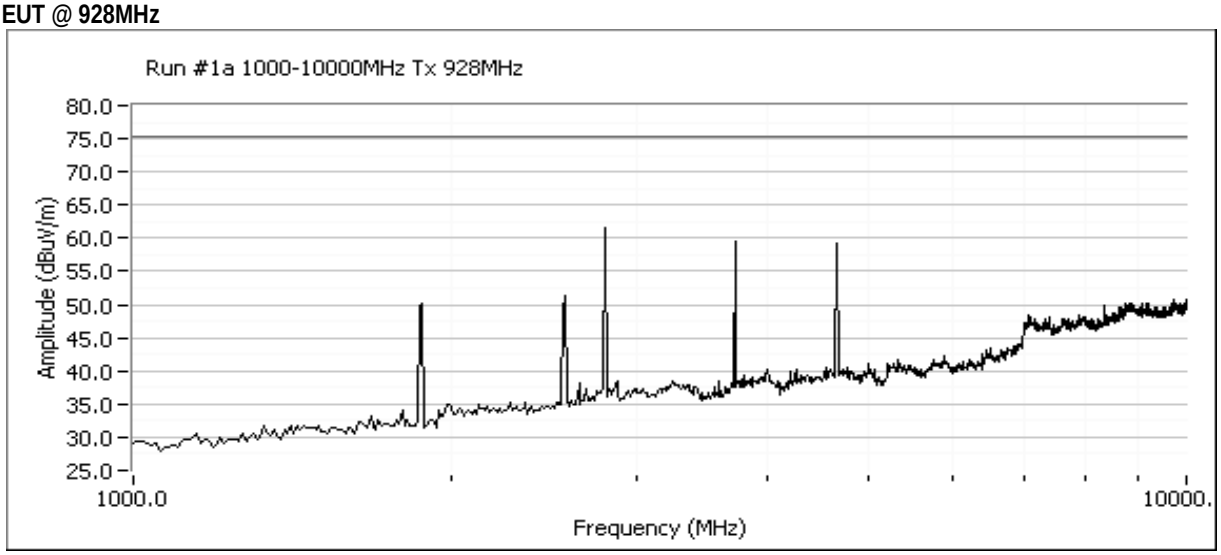
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 10000 MHz	3	3	0

Run #1a: Maximized Readings, 1000 - 10000 MHz
Final peak readings
EUT @ 928MHz



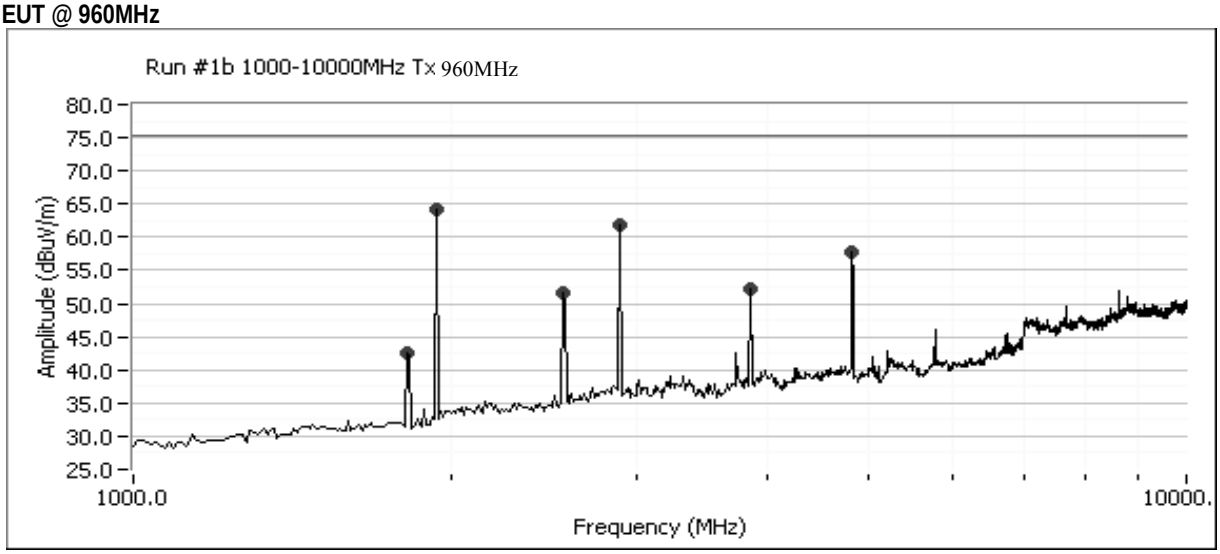
Frequency	Level	Pol	FCC 90 & 101		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2783.958	63.0	V	75.3	-12.3	PK	167	1.1	
4639.968	61.5	V	75.3	-13.8	PK	174	1.5	
3711.997	60.4	V	75.3	-14.9	PK	167	1.0	
2543.395	52.5	V	75.3	-22.8	PK	166	1.3	
1855.994	51.1	V	75.3	-24.2	PK	153	1.0	

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
4639.968	-26.2	11.1	77.6	92.7	61.5	-31.2	-33.4		-20.0	-13.4
3711.997	-24.8	9.8	80.3	95.3	60.4	-34.9	-37.1		-20.0	-17.1
2783.958	-28.1	9.6	81.1	99.6	63.0	-36.7	-38.9		-20.0	-18.9

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Run #1b: Maximized Readings, 1000 - 10000 MHz
Final peak readings
EUT @ 960MHz



Frequency	Level	Pol	FCC 90 & 101		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1919.900	64.1	V	75.3	-11.2	Peak	179	1.5	
2879.568	61.8	V	75.3	-13.5	Peak	181	1.0	
4799.867	57.8	V	75.3	-17.5	Peak	152	1.5	
3839.568	52.2	V	75.3	-23.1	Peak	163	1.0	
2543.223	51.7	V	75.3	-23.6	Peak	165	1.5	
1807.209	42.4	V	75.3	-32.9	Peak	181	1.0	

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
1919.900	-25.0	8.5	79.9	96.4	64.1	-32.3	-34.5		-20.0	-14.5
2879.568	-26.3	9.6	81.4	98.1	61.8	-36.3	-38.5		-20.0	-18.5
4799.867	-28.3	10.9	79.8	97.2	57.8	-39.3	-41.5		-20.0	-21.5

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 8/4/2005
Test Engineer: Vishal Narayan
Test Location: SVOATS #1
Config. Used: 1
Config Change: None
EUT Voltage: 13.8V DC

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 2.3 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 84 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Radiated Emissions	FCC B	Pass	28.5dBµV/m (26.6µV/m) @ 33.175MHz (-11.5dB)
2	RE, 30 -1000 MHz, Radiated Emissions	FCC B	Pass	31.2dBµV/m (36.3µV/m) @ 33.175MHz (-8.8dB)
3	RE, 30 -1000 MHz, Radiated Emissions	FCC B	Pass	31.0dBµV/m (35.5µV/m) @ 33.175MHz (-9.0dB)

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Run #1a: Radiated Emissions, 30-1000 MHz
Digital/Receive Mode (Receive mode at 806 MHz)

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.175	28.5	V	40.0	-11.5	QP	340	1.0	
88.260	30.0	V	43.5	-13.5	QP	0	1.0	
82.943	26.5	V	40.0	-13.5	QP	270	1.0	
33.175	25.0	H	40.0	-15.0	QP	360	1.2	
82.943	20.0	H	40.0	-20.0	QP	280	1.2	
155.008	22.9	H	43.5	-20.6	QP	100	1.4	
216.000	22.3	H	43.5	-21.2	QP	150	1.6	
900.560	23.2	V	46.0	-22.8	QP	0	1.0	
88.260	19.5	H	43.5	-24.0	QP	250	1.6	
155.008	17.5	V	43.5	-26.0	QP	0	1.0	
432.000	20.0	V	46.0	-26.0	QP	300	1.0	
216.000	16.0	V	43.5	-27.5	QP	310	1.6	

Run #1b: Maximized readings, 1000 - 2300 MHz
Measurements made at 3m per FCC requirements.
Receive Mode (Receive mode at 806 MHz)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1510.000	42.5	V	74.0	-31.5	Pk	250	1.0	
1510.000	45.1	H	74.0	-28.9	Pk	170	1.0	
1510.000	39.2	V	54.0	-14.8	Avg	250	1.0	
1510.000	40.1	H	54.0	-13.9	Avg	170	1.0	

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Run #2a: Radiated Emissions, 30-1000 MHz
Digital/Receive Mode (Receive mode at 932 MHz)

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.175	31.2	V	40.0	-8.8	QP	360	1.0	
88.260	30.0	V	43.5	-13.5	QP	0	1.0	
82.943	26.5	V	40.0	-13.5	QP	270	1.0	
33.175	25.0	H	40.0	-15.0	QP	360	1.2	
82.943	20.0	H	40.0	-20.0	QP	280	1.2	
155.008	22.9	H	43.5	-20.6	QP	100	1.4	

Run #2b: Maximized readings, 1000 - 2300 MHz
Measurements made at 3m per FCC requirements.
Receive Mode (Receive mode at 932 MHz)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1510.000	43.3	H	74.0	-30.7	Pk	360	1.2	
1510.000	43.2	V	74.0	-30.8	Pk	80	1.0	
1510.000	30.5	H	54.0	-23.5	Avg	360	1.2	
1510.000	30.4	V	54.0	-23.6	Avg	80	1.0	

Client:	Microwave Data Systems	Job Number:	J60036
Model:	MDS 9710	T-Log Number:	T60106
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	-	Class:	-

Run #3a: Radiated Emissions, 30-1000 MHz
Receive Mode (Receive mode at 960 MHz)

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
33.175	31.0	V	40.0	-9.0	QP	180	1.0	
88.260	27.0	V	43.5	-16.5	QP	0	11.0	
82.943	21.0	V	40.0	-19.0	QP	180	1.0	
88.260	22.0	H	43.5	-21.5	QP	300	1.4	
155.008	21.5	V	43.5	-22.0	QP	334	1.0	
33.175	18.0	H	40.0	-22.0	QP	60	1.6	
82.943	18.0	H	40.0	-22.0	QP	0	1.4	
900.560	23.2	V	46.0	-22.8	QP	0	1.0	
220.000	21.7	H	46.0	-24.3	QP	140	1.6	
155.008	18.0	H	43.5	-25.5	QP	360	1.0	
220.000	17.0	V	46.0	-29.0	QP	80	1.0	
440.000	15.3	V	46.0	-30.7	QP	0	1.0	

Run #3b: Maximized readings, 1000 - 2300 MHz
Measurements made at 3m per FCC requirements.
Receive Mode (Receive mode at 960 MHz)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1510.000	50.0	V	74.0	-24.0	Pk	200	1.0	
1510.000	48.1	H	74.0	-25.9	Pk	80	1.0	
1510.000	45.4	V	54.0	-8.6	Avg	200	1.0	
1510.000	42.2	H	54.0	-11.8	Avg	80	1.0	

EXHIBIT 3: Test Configuration Photographs

Uploaded as A Separate Attachment

EXHIBIT 4: Theory of Operation Microwave Data Systems Model MDS9710

11 pages

EXHIBIT 5: Proposed FCC ID Label & Label Location

1 page

EXHIBIT 6: Detailed Photographs Microwave Data Systems Model MDS9710

5 pages

EXHIBIT 7: Installation Guide Microwave Data Systems Model MDS9710

58 pages

EXHIBIT 8: Block Diagram Microwave Data Systems Model MDS9710

1 page

EXHIBIT 9: Schematic Diagrams Microwave Data Systems Model MDS9710

3 pages

EXHIBIT 10: Advertising Literature

None