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Electromagnetic Emissions Test Report and Request for Class II Permissive Change pursuant to FCC Part 101 Intentional Radiator on the Microwave Data Systems Model: MDS9790

FCC ID:	E5MDS9790
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 20, 2005
FINAL TEST DATE:	July 15 and July 19, 2005
AUTHORIZED SIGNATORY:	Juan Martinez Senior EMC Engineer

A2LA ACCREDITED
2016-01

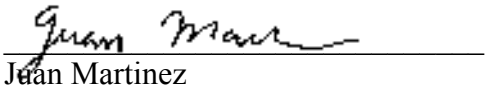
DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
MDS9790

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

Tested to applicable standards:
FCC Part 101

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-603, October 27, 1992 w/ ammendum, March 4, 1998); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	Juan Martinez
Title	Senior EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	July 20, 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.).

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the Microwave Data Systems model MDS9790 pursuant to Subpart O of Part 101 of FCC Rules for intentional radiators. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in TIA-603, October 27, 1992 w/ ammendum, March 4, 1998 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC 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.

The test results recorded herein are based on a single type test of the Microwave Data Systems model MDS9790 and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of Microwave Data Systems

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart O of Part 101 of FCC Rules. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization 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 that are subsequently manufactured.

SUMMARY OF RESULTS

FCC Part 101 Section	Description	Measured Value	Comments	Result
	Data Modulation	Systems uses Digital techniques	-	-
	99% Bandwidth	11.2kHz	For information only	Complies
101.113	Output Power, 928 – 960 MHz	36.7 dBm (4.7 Watts)		Complies
101.111(5)	Antenna Port Spurious Emissions – 30MHz –10 GHz	All spurious emissions < -20dBm	All spurious emissions < -20 dBm	Complies
101.111(5)	Radiated Spurious Emissions – 30MHz – 10 GHz	-35.3 dBm @ 3837.675 MHz (-15.3 dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 101. All others must be < -20dBc	Complies
1.1307	RF Exposure Requirements	Fixed installation (Licensee will be responsible for RF exposure at installation site)		
15.109	Receiver Spurious Emissions	794.3 pW @ 13,4800 MHz		Complies

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)
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Microwave Data Systems model MDS9790 is a data transceiver that is designed to transmit and receive full duplex data. Normally, the EUT would be placed on a tabletop or rack mount during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 4 Amps.

The sample was received on July 15, 2005 and tested on July 15 and July 19, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	MDS9790	900MHz Full or Half Duplex master station	1390805	E5MDS9790

ENCLOSURE

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 43.5 cm wide by 40 cm deep by 9 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
Bird	500-WA-FFN-30	30-dB attenuator	312

No equipment was used as remote support equipment for 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)
Tx	Attenuator Load	Coaxial	Shielded	0.5

EUT OPERATION DURING TESTING

Transmitting at full power on 928, 944, & 960 MHz.

ANTENNA REQUIREMENTS

The antenna port is a standard, N-type connector, which is permitted as the system is intended to be professionally installed.

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the Microwave Data Systems model MDS9790 being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 15 and July 19, 2005at the Elliott Laboratories Anechoic Chambers 3 and 4 located at 41039 Boyce Road Fremont, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure 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 CISPR 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. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and peak power sensor are used for all direct 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 LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude 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 entire 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.

ANSI C63.4:2003 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 exhibit 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 specific rule part and section.

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 100 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 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

Radiated Emissions, 1000 - 10,000 MHz, 19-Jul-05
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9KHz-26.5GHz, non programmable	8563E	284	22-Apr-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	868	20-Apr-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz-26.5GHz	8593EM	1141	10-Jun-06
Hewlett Packard	Signal Generator (sweep) 0.01 - 26.5 GHz	8340A	1244	N/A
Miteq	Preamplifier, 1-18GHz	AFS44	1540	10-May-06

Radiated Emissions, 30 - 10,000 MHz, 19-Jul-05
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Signal Generator (sweep) 0.01 - 26.5 GHz	8340A	1244	N/A
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	487	13-May-06
Hewlett Packard	Microwave EMI test system (SA40, 9kHz - 40GHz) Fremont	84125C	1410	24-Jul-05
Com-Power Corp.	Pre Amplifier, 30-1000MHz	PA-103	1543	17-Dec-05
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1561	04-May-06
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB7	1630	22-Dec-05
Sunol Sciences	Biconilog, 30-3000MHz	JB3	1657	10-Mar-06

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T60458 19 Pages

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 101	Class:	Radio
Immunity Spec:		Environment:	

EMC Test Data

For The

Microwave Data Systems

Model

MDS9790

Date of Last Test: 7/19/2005

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 101	Class:	Radio
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

General Description

The EUT is a data transceiver which is designed to transmit and receive full duplex data. Normally, the EUT would be placed on a tabletop or rack mount during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 4 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	MDS9790	900MHz Full or Half Duplex master station	1390805	E5MDS9790

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 43.5 cm wide by 40 cm deep by 9 cm high.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

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

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 101	Class:	Radio
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Bird Electronics Inc.	500-WA-FFN-30	30-dB attenuator	312	N/A

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)
TX	Attenuator Load	Coxial	Shielded	0.5

EUT Operation During Emissions Tests

Transmitting at full power on 928, 944, 960 MHz.

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

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: 7/15/2005
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

For antenna conducted emissions, the EUT was connected to the analyzer. Attenuators and cable losses were taken into account, if used.

Ambient Conditions:

Temperature: 14 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Power Output	101.113	Pass	Refer to plots
1	Emission Mask	101.111(5)	Pass	Refer to plots
2	Antenna Conducted, 30 - 10,000MHz	101.111(5)	Pass	Emissions Levels < -20dBm

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:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

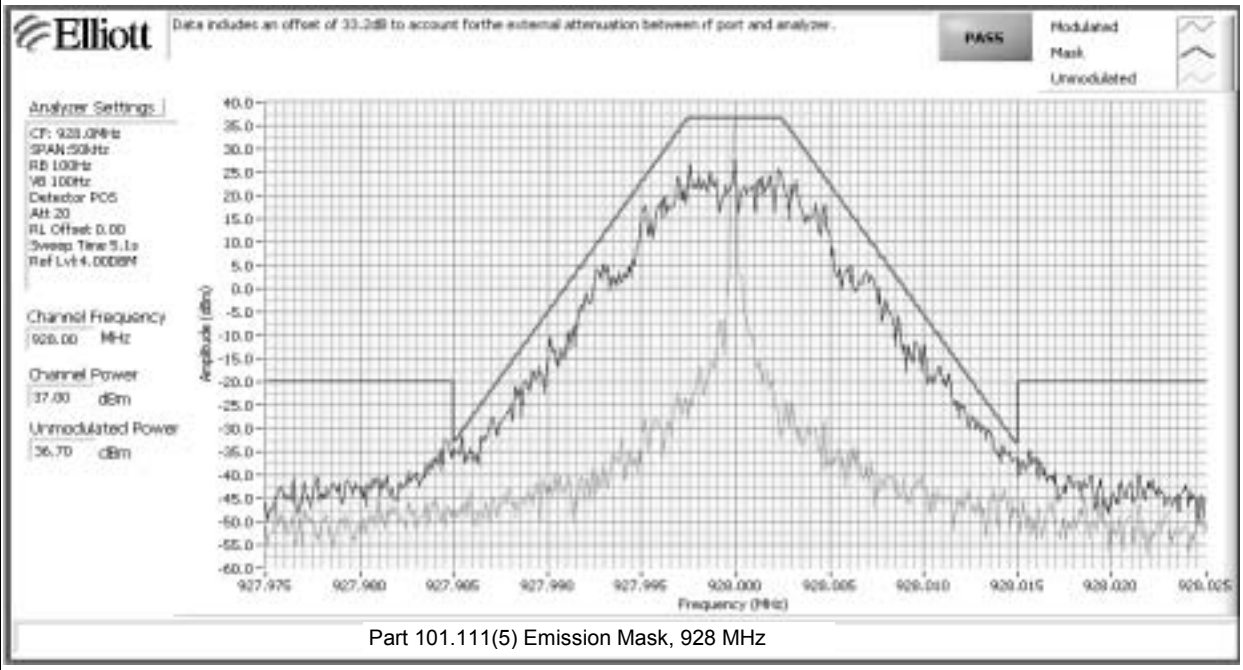
Run #1: Power Output

Frequency (MHz)	Output Power (note 1) dBm Measured	Power (Watts)
928	36.7	4.7
944	36.7	4.7
960	36.5	4.5

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

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

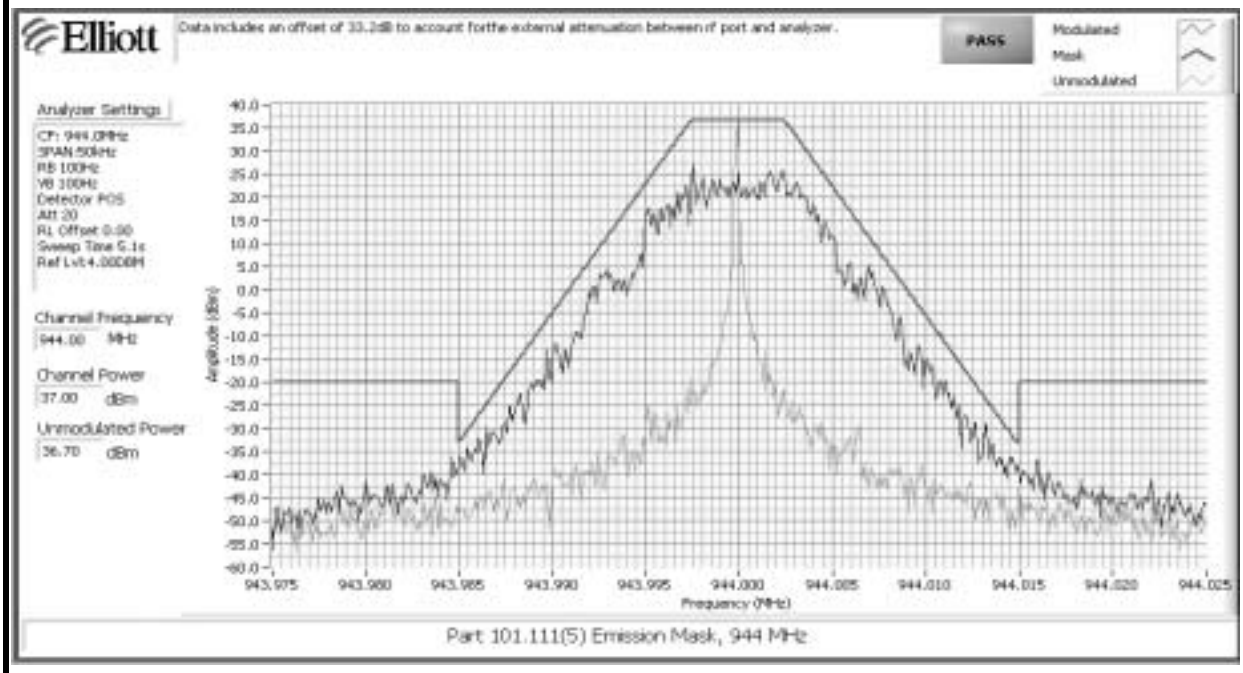
Run #1: Emission Mask



Part 101.111(5) Emission Mask, 928 MHz

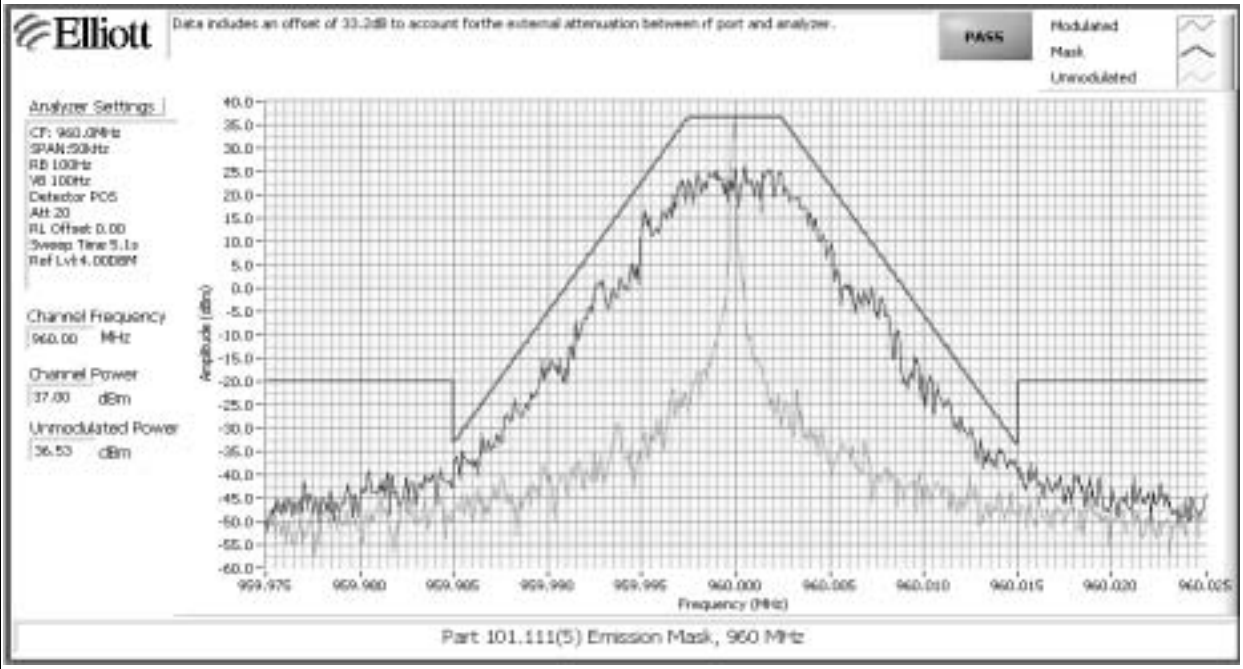
EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio



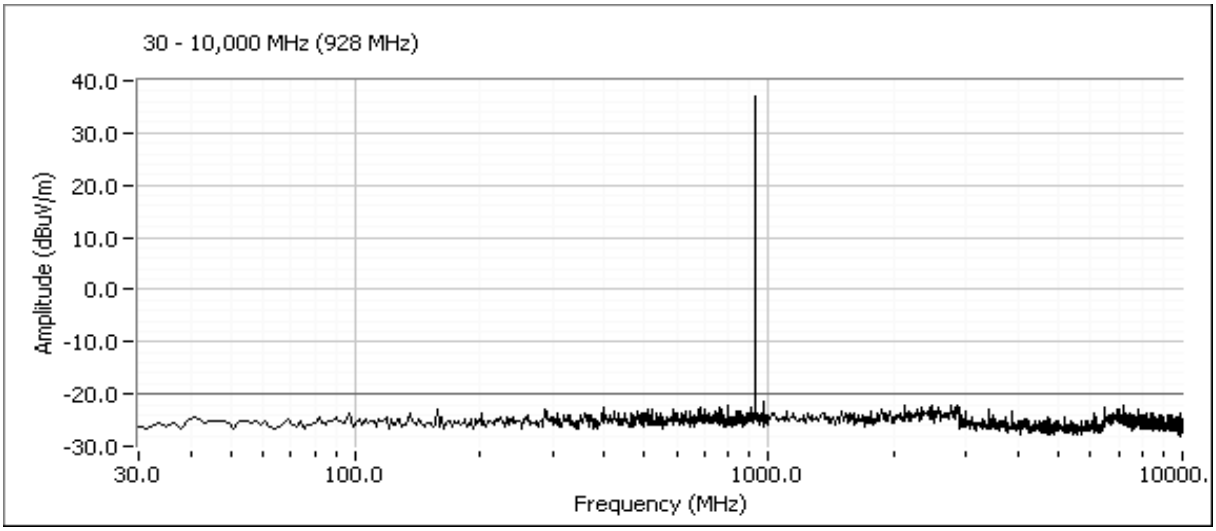
Part 101.111(5) Emission Mask, 944 MHz

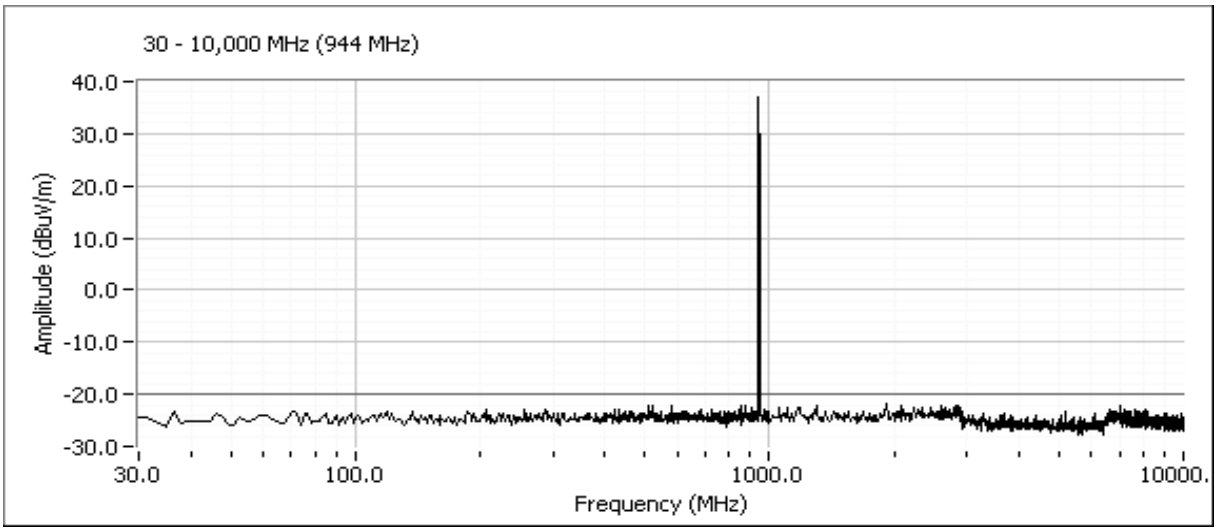
Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio



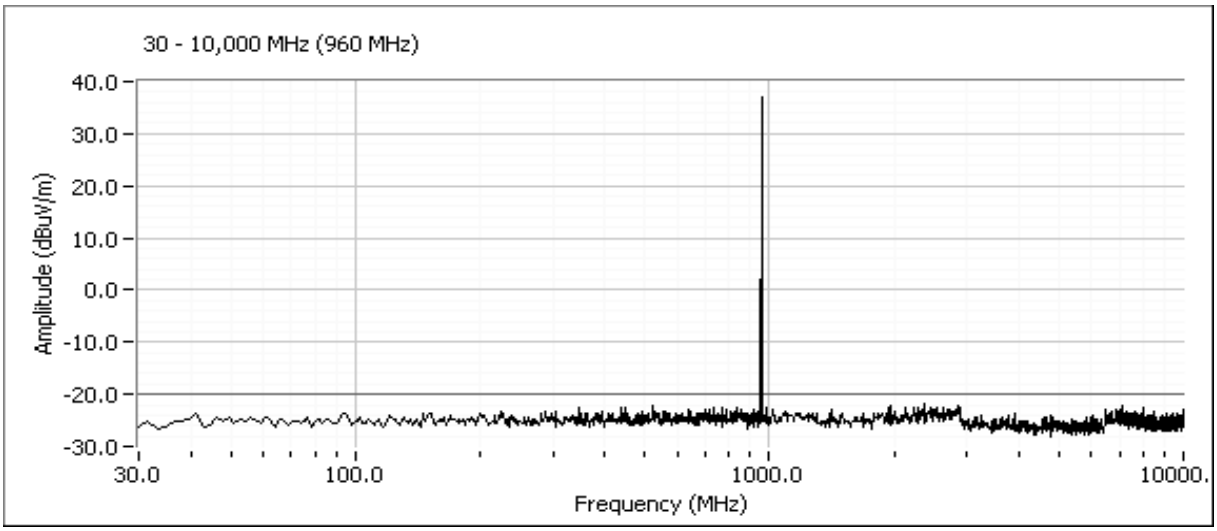
Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

Run #2: Antenna Conducted, 30 - 10,000 MHz





Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio



Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Radiated Spurious Emissions, FCC 101

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: 7/15/2005 & 7/19/2005
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #4 & # 3
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.

The measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a-1c	RE, 30 - 10,000 MHz - Spurious Emissions Transmit Mode	101.111(5)	Pass	-35.3 dBm @ 3837.675 MHz (-15.3 dB)

Modifications Made During Testing:

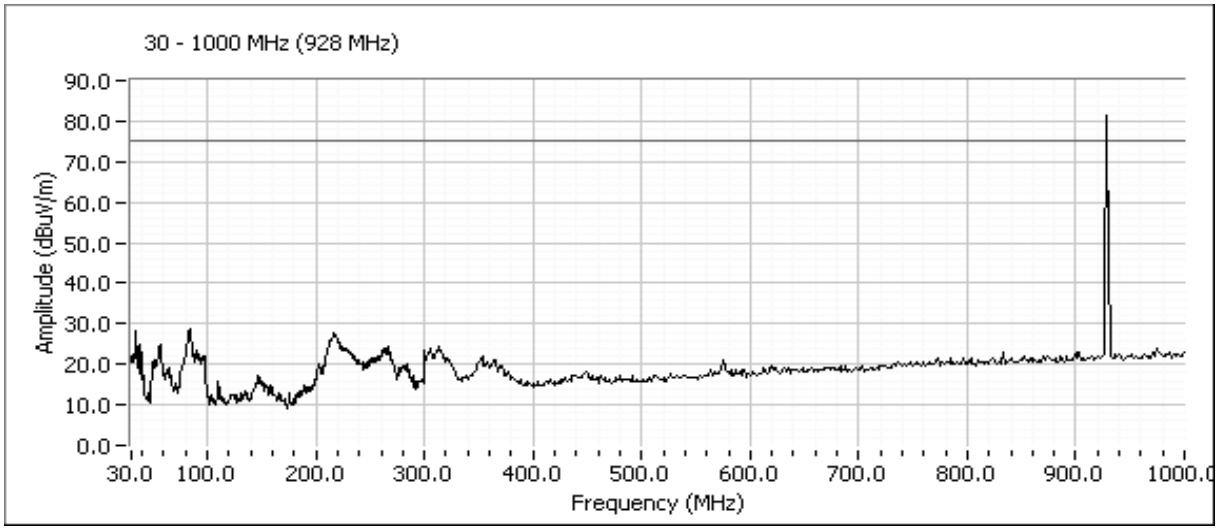
No modifications were made to the EUT during testing

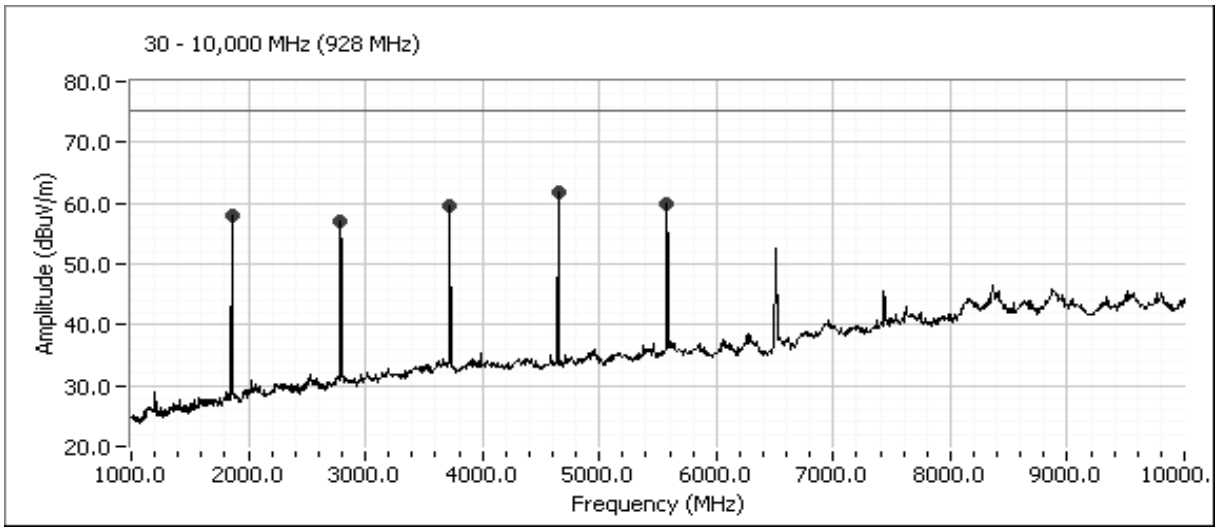
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Run #1a: Radiated Spurious Emissions, Transmit Mode, 30 - 10,000 MHz. EUT @ 928 MHz





Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Frequency	Level	Pol	Part 101 Note 1		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1859.750	58.0	V	75.3	-17.3	Peak	344	1.2	
2790.750	57.1	H	75.3	-18.2	Peak	342	2.0	
3719.000	59.5	V	75.3	-15.8	Peak	147	1.6	
4646.000	61.9	H	75.3	-13.4	Peak	354	1.8	
5573.000	60.0	V	75.3	-15.3	Peak	175	1.4	

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E= (30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Vertical

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
1859.750	-24.0	8.5	82.5	98.0	58.0	-40.0	-42.2		-20.0	-22.2
5573.000	-26.2	10.4	83.2	99.0	60.0	-39.0	-41.2		-20.0	-21.2
3719.000	-24.8	9.8	82.1	97.1	59.5	-37.6	-39.8		-20.0	-19.8

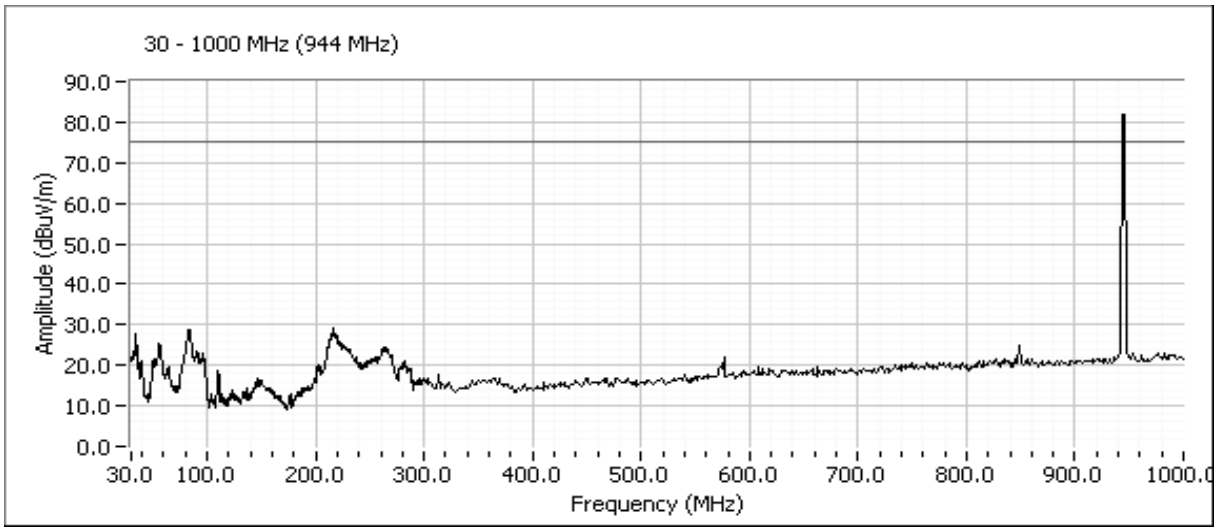
Horizontal

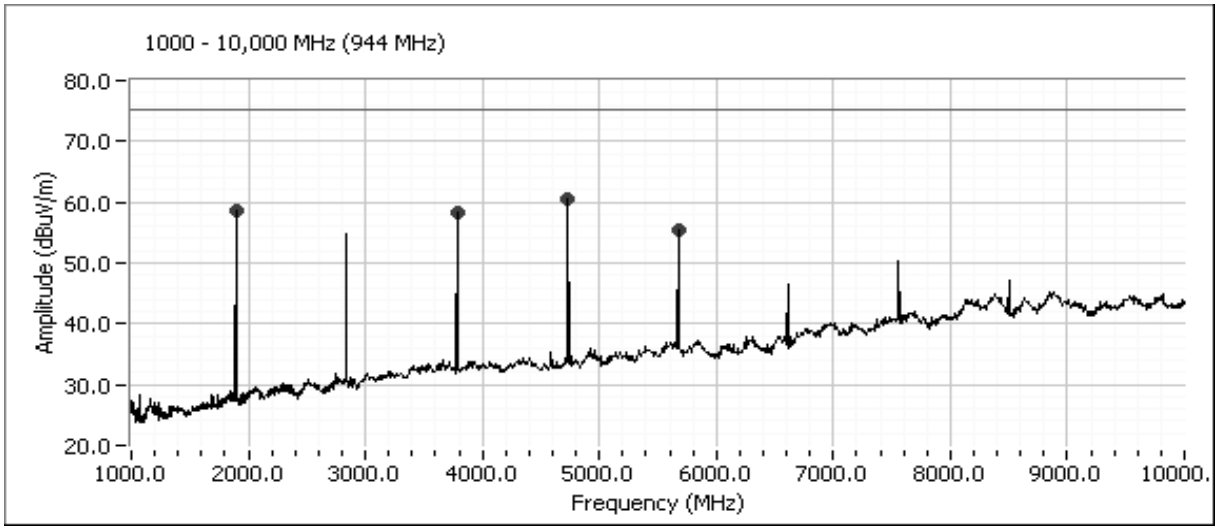
Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
4646.000	-26.2	11.1	82.2	97.3	61.9	-35.4	-37.6		-20.0	-17.6
2790.750	-28.1	9.6	81.4	99.9	57.1	-42.8	-45.0		-20.0	-25.0

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:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Run #1b: Radiated Spurious Emissions, Transmit Mode, 30 - 10,000 MHz. EUT @ 944 MHz





Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Frequency	Level	Pol	Part 101 Note 1		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1893.000	58.7	V	75.3	-16.6	Peak	200	1.2	
3782.000	58.4	V	75.3	-16.9	Peak	160	1.6	
4727.000	60.6	V	75.3	-14.7	Peak	173	1.6	
5672.000	55.5	V	75.3	-19.8	Peak	168	1.4	

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E= (30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

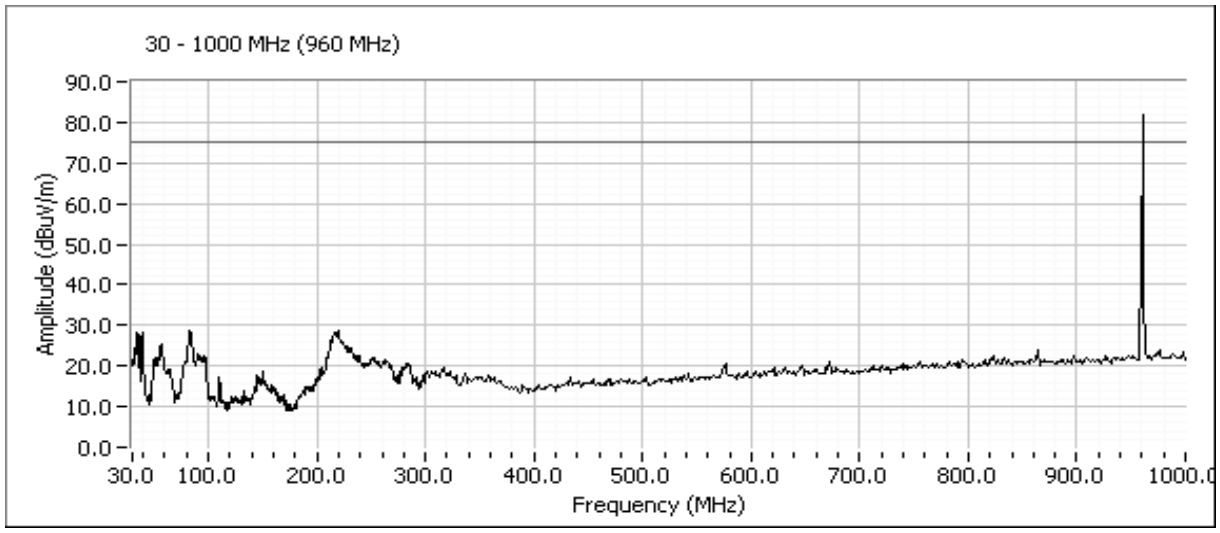
Vertical

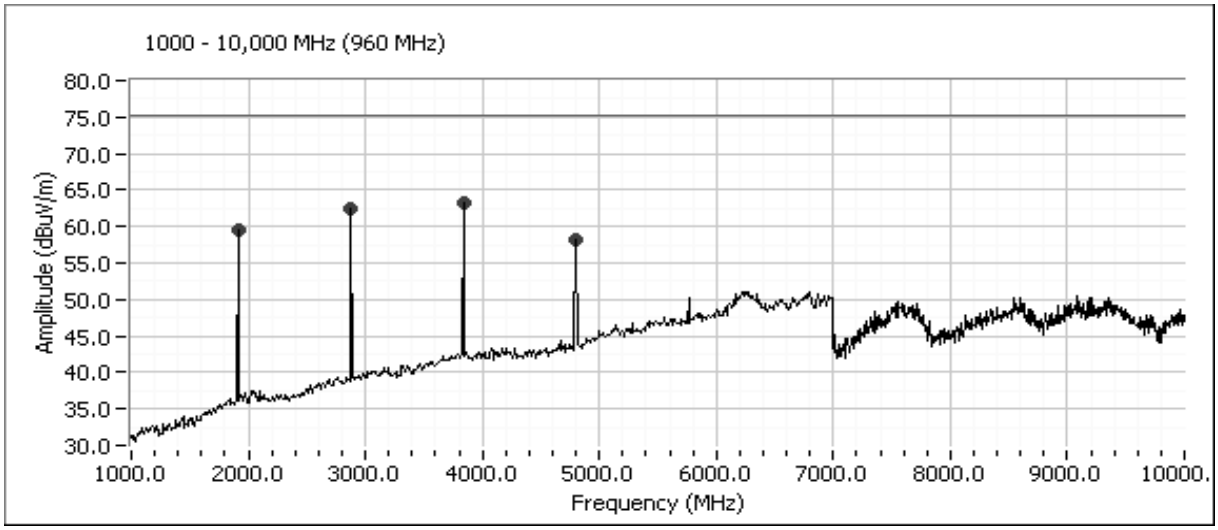
Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
1893.000	-25.0	8.5	79.9	96.4	58.7	-37.7	-39.9		-20.0	-19.9
4727.000	-25.2	10.9	82.5	96.8	58.4	-38.4	-40.6		-20.0	-20.6
5672.000	-26.2	10.4	83.5	99.3	60.6	-38.7	-40.9		-20.0	-20.9
3782.000	-24.8	9.8	80.3	95.3	55.5	-39.8	-42.0		-20.0	-22.0

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:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Run #1c: Radiated Spurious Emissions, Transmit Mode, 30 - 10,000 MHz. EUT @ 960 MHz





EMC Test Data

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	N/A

Frequency	Level	Pol	Part 101 Note 1		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1913.828	59.5	H	75.3	-15.8	Peak	70	1.8	
2875.751	62.4	H	75.3	-12.9	Peak	40	1.8	
3837.675	63.4	V	75.3	-11.9	Peak	155	1.6	
4799.599	58.2	H	75.3	-17.1	Peak	346	1.2	

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E= (30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Vertical

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
3837.675	-27.5	10.5	79.5	96.5	63.4	-33.1	-35.3		-20.0	-15.3

Horizontal

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
4799.599	-29.2	11.0	81.2	99.4	58.2	-41.2	-43.4		-20.0	-23.4
2875.750	-28.1	9.6	80.5	99.0	62.4	-36.6	-38.8		-20.0	-18.8
1913.828	-26.0	8.5	79.5	97.0	59.5	-37.5	-39.7		-20.0	-19.7

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:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

Receiver 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: 8/6/2005
Test Engineer: jmartinez
Test Location: SVOATS #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The Eut was connected directly to Spectrum Analyzer. A 20-dB attenuator was used between the EUT and Spectrum Analyzer. A external output connector was available to performed antenna receive conducted emissions. The device was set to received at midpoint of the operating range.

Ambient Conditions:

Temperature: 16 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 25,000 MHz, Antenna Conducted Emissions	FCC 15.109	Pass	794.3 pW @ 13,4800 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

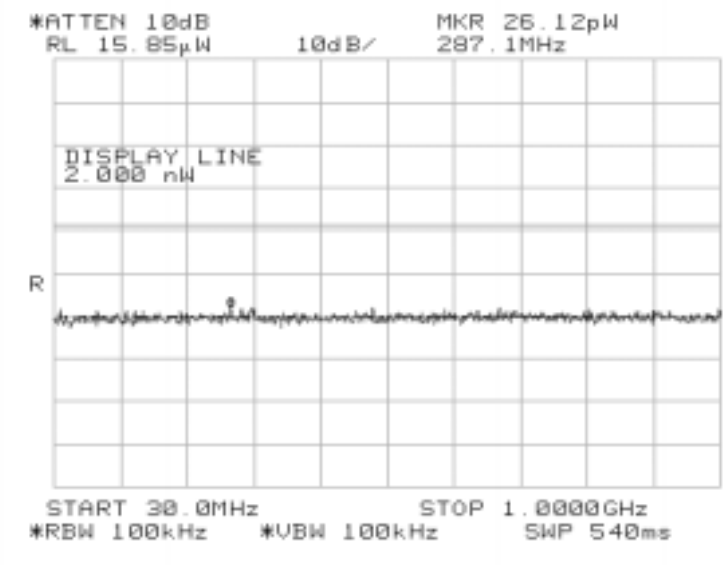
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J60281
Model:	MDS9790	T-Log Number:	T60458
		Account Manager:	-
Contact:	Dennis McCarthy		
Spec:	FCC 101	Class:	Radio

Run #1: Antenna Conducted Emissions, 30-20,000 MHz

Rx mode



Rx mode

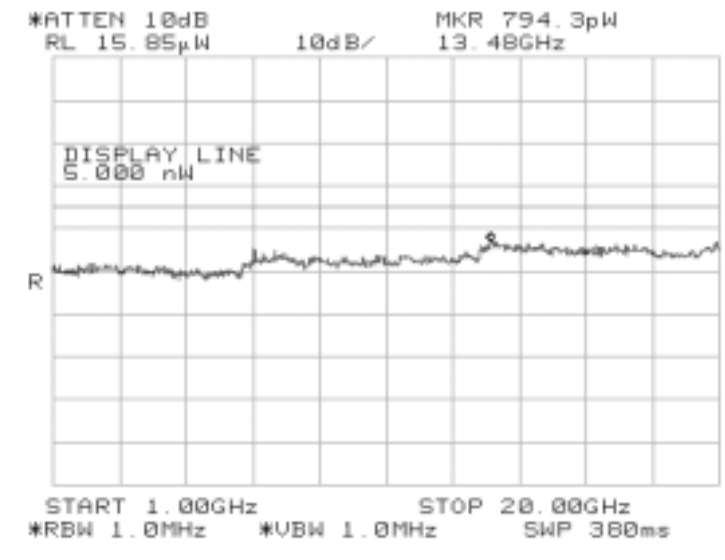


EXHIBIT 3: Test Configuration Photographs

2 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

Unchanged from original application

EXHIBIT 5: Detailed Photographs of Microwave Data Systems Model MDS9790Construction

Unchanged from original application

EXHIBIT 6: Operator's Manual for Microwave Data Systems Model MDS9790

Unchanged from original application

EXHIBIT 7: Block Diagram of Microwave Data Systems Model MDS9790

Unchanged from original application

EXHIBIT 8: Schematic Diagrams for Microwave Data Systems Model MDS9790

Unchanged from original application

EXHIBIT 9: Theory of Operation for Microwave Data Systems Model MDS9790

Unchanged from original application

EXHIBIT 10: Advertising Literature

Unchanged from original application

EXHIBIT 11: RF Exposure Information

Unchanged from original application