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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C (15.247) DTS Specifications and Industry Canada RSS 210 Issue 5 for an Intentional Radiator on the Microwave Data Systems Model: 2.4 GHz TransNet

FCC ID:	E5MDS-EL806-24
UPN:	3738A-EL80624
GRANTEE:	Microwave Data Systems 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	March 1, 2004
FINAL TEST DATE:	February 24 and February 25, 2004

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

ACCREDITED

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the Microwave Data Systems model 2.4 GHz TransNet pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and RSS-210 Issue 5 for licence-exempt low power devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 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 2.4 GHz TransNet 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 C of Part 15 of FCC Rules and RSS-210 Issue 5 for license-exempt low power devices for the radiated and conducted emissions of intentional radiators. 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

Note ñ remove references in the table below that do not apply to the radio tested

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
	6.2.2(o)(a)	20dB Bandwidth	160.8 kHz	The channel spacing shall be greater than the 20dB bandwidth	Complies
	6.2.2(o)(a)	Channel Separation	200kHz		Complies
	6.2.2(o)(a)	Number of Channels	381	**2400- 2483.5 MHz**: 75 hopping frequencies: average time of occupancy <0.4 second within a 30 second period. *Less than 75 hopping frequencies: The total span of hopping channels shall be at least 75 MHz. The time of occupancy on any one channel shall be no greater than 0.4 seconds within the time period required to hop through all channels*	Complies
	6.2.2(o)(a)	Channel Dwell Time	0.0094 seconds per 30 seconds		Complies
	6.2.2(o)(a)	Channel Utilization	All channels are used equally	Refer to Theory of Operations for detailed description of the hopping algorithm	Complies
15.247 (b) (3)	6.2.2(o)(a)	Output Power, 2400 - 2483.5 MHz	27 dBm (0.5 Watts) EIRP = 37 W	Multi-point applications: **2400 ñ 2483.5 MHz** Maximum permitted is 1Watt, with EIRP limited to 4 Watts for a 50-channel system.	Complies

				Maximum permitted is *0.125 Watts for a system that uses less than 75 channels*	
15.247(c)	6.2.2(o)(e1)	Spurious Emissions ñ 30MHz ñ 25GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies
15.247(c) / 15.209		Radiated Spurious Emissions 30MHz ñ 25GHz	53.5 dBuV/m @ 7447.164 MHz (-0.6 dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207. All others must be < -20dBc	Complies
15.207		AC Conducted Emissions	47.8 dBuV @ .3685 MHz (-0.7dB)		Complies
	6.6	AC Conducted Emissions	N/A	EUT is DC operated	Complies
15.247 (b) (5)		RF Exposure Requirements	FCC /IC limits of power density not exceeded provided antenna is located a minimum of 20 cm from persons	Refer to MPE calculation Refer to Userís Guide for installation instructions requiring a 20cm separation	Complies
15.203		RF Connector	Describe antenna .	External (requires professional Installation)	Complies

EIRP calculated using antenna gain of dBi (10) for the highest EIRP point-to-multipoint system.

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 NAMAS document NIS 81.

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 2.4 GHz TransNet is a 2.4GHz module, which is a spread spectrum wireless module, designed for license-free operation in the 2402 - 2483.5 MHz frequency range. 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 12Vdc.

The sample was received on February 23, 2004 and tested on February 24 and February 25, 2004. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
MDS El806-2.4 2.4 GHz FHSS module	4052A01	E5MDS-EL806-24

OTHER EUT DETAILS

Antennas

Manufacturer	Model	Description	Gain (dBi)	Internal or External
Maxrad	MHWS2400MSMA	1/2 Stub antenna	2	External
Maxrad	MFB24010	Omni antenna	10	External
Maxrad	MYP24010PT	Yagi antenna	10	External

Cables

Manufacturer	Model	Description	Cable loss (1dB)	Length (cm)
Times Microwave	LMR-195	Coaxial	1	38

ENCLOSURE

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 4.5 cm wide by 9 cm deep by 1.5 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	FCC ID
IBM	2647	Laptop	78-7PX8M	DoC
Bellcorp Technology	ZVC3OFS12D	power supply	6794	N/A

No remote support equipment was used 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)
RJ-11	Laptop (Com 1)	Multiwire	Unshielded	2.5
DC input	Power Supply	2-wire	Unshielded	1.2
Antenna Out	External Antenna	Coaxial	Shielded or Unshielded	0.38

EUT OPERATION DURING TESTING

During radiated the unit was continuously hopping at one channel (low, middle, and high) at maximum output power.

ANTENNA REQUIREMENTS

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

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on February 24 and February 25, 2004 at the Elliott Laboratories Open Area Test Site #4 located at 684 West Maude Avenue, Sunnyvale, 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 C63.4-1992. 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 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 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

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is 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.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

$$E = \frac{1000000\ H30\ P}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a)and RSS 210 (o) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Number Of Channels	Output Power
902 ñ 928	>=50	1 W (30 dBm)
902 ñ 928	< 50	0.25 W (24 dBm)
2400 ñ 2483.5	>= 75	1 W (30 dBm)
2400 ñ 2483.5	>= 75	0.125 W (21 dBm)
5725 ñ 5850	>=75	1 W (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 ñ 5850 MHz band are not subject to this restriction.

RSS 210 (o) AND FCC 15.247 SPURIOUS RADIATED EMISSIONS LIMITS

T limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands detailed in Part 15.205 and for all spurious emissions from the receiver are:

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level.

FCC AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.207.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

RSS-210 SECTION 6.6 AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

2 Page

Antenna Conducted Emissions, 09-Mar-04
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	12	12/10/2003	12/10/2004
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), Sunnyvale	84125C	1149	02-Apr-04		
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12	4/8/2003	4/8/2004
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1555	12	8/28/2003	8/28/2004

Radiated Emissions, 30 - 26,000 MHz, 09-Mar-04
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	12	11/20/2003	11/20/2004
Hewlett Packard	High Pass filter, 3.5GHz	84300-80038	1157	18	9/11/2003	9/11/2004
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	487	12	4/24/2003	4/24/2004
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	1/23/2004	1/23/2005
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12	4/8/2003	4/8/2004
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1236	12	9/11/2003	9/11/2004

, 23-Feb-04
Engineer: Adam LaCourse

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9KHz - 26.5GHz, non programable	8563E	284	03-Mar-04
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	868	14-Mar-04
Miteq	Preamplifier, 1-18GHz	AFS44	1540	16-Jun-04
Sunol Sciences	Biconilog, 30-3000MHz	JB3	1549	06-Apr-04
Rohde & Schwarz	EMI Test Receiver, 20Hz-7GHz	ESIB7	1630	05-Jan-05

Conducted Emissions - AC Power Ports, 17-Mar-04
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	17-Jul-04
Fischer Custom Comm.	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/250-16-2	1079	01-Jul-04
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	15-Dec-04

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T54584 34 Pages
T54571 12 Pages

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Microwave Data Systems

Model

EL806-2.4

Date of Last Test: 4/10/03

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a 2.4GHz module which is a spread spectrum wireless module, designed for license-free operation in the 2402 - 2483.5 MHz frequency range. . 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 12Vdc.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
MDS	EL806-2.4	2.4GHz FHSS module	4052A01	E5MDS-EL806-2.4

Antenna(s)

Manufacturer	Model	Description	Gain (dBi)	Internal or External
Maxrad	MHWS2400MSMA	1/2 Stub antenna	2	External
Maxrad	MFB24010	Omni antenna	10	External
Maxrad	MYP24010PT	Yagi antenna	10	External

Cable(s)

Manufacturer	Model	Description	Cable loss (1dB)	Length (cm)
Times Microwave	LMR-195	Coaxial	1	38

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 4.5 cm wide by 9 cm deep by 1.5 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.

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	2647	Laptop	78-7PX8M	DoC
Bellcorp Technology	ZVC3OFS12D	power supply	6794	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)
RJ-11	Laptop (Com 1)	Multiwire	Unshielded	2.5
DC input	Power Supply	2-wire	Unshielded	1.2
Antenna Out	External Antenna	Coaxial	Shielded or Unshielded	0.38

EUT Operation During Emissions

During radiated the unit was continously hopping at one channel (low, middle, and high) at maximum output power.

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Antenna Conducted

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: 2/24/04
Test Engineer: Juan Martinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

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 used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 89 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	20dB Bandwidth	15.247(a)	Pass	Refer to run
2	Output Power	15.247(b)	Pass	Refer to run
3	Channel Occupancy / Separation	15.247(a)	Pass	Refer to run
4	Number of Channels	15.247(a)	Pass	Refer to run
5	Bandedge	FCC Part 15.247(c)	Pass	Refer to run
6	Out of band	FCC Part 15.247(c)	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.

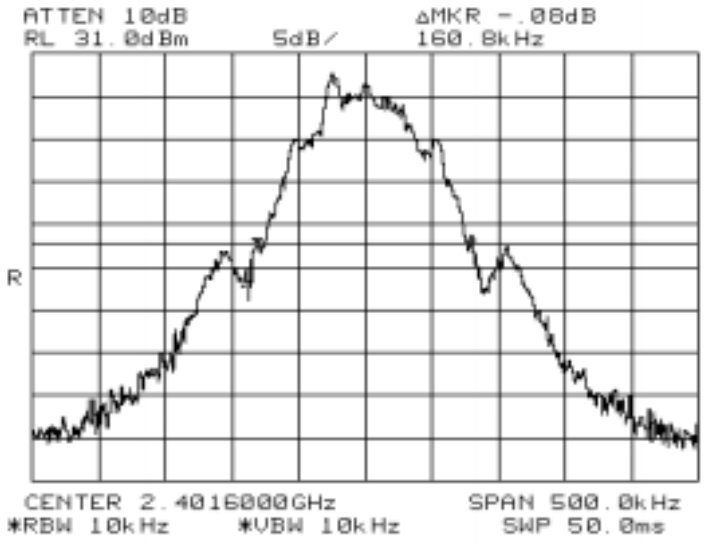
Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1: Signal Bandwidth

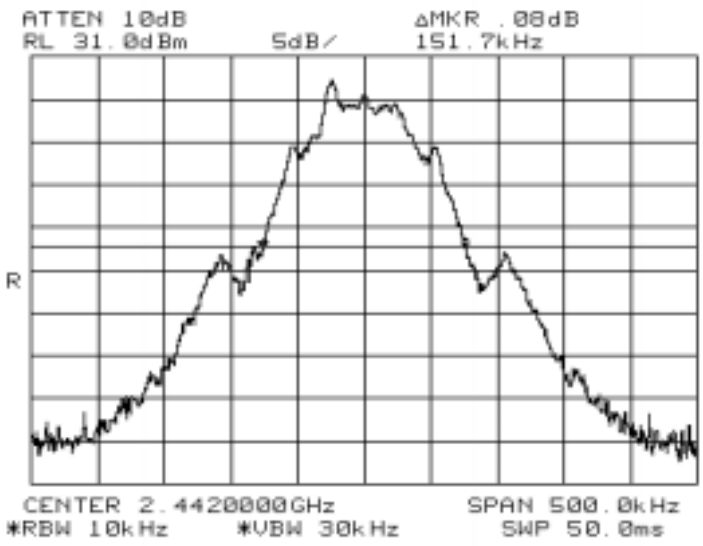
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Signal Bandwidth	Comments
Low	2401.6	10kHz	160.8 kHz	
Mid	2442.0	10kHz	151.7 kHz	
High	2477.8	10kHz	150.0 kHz	

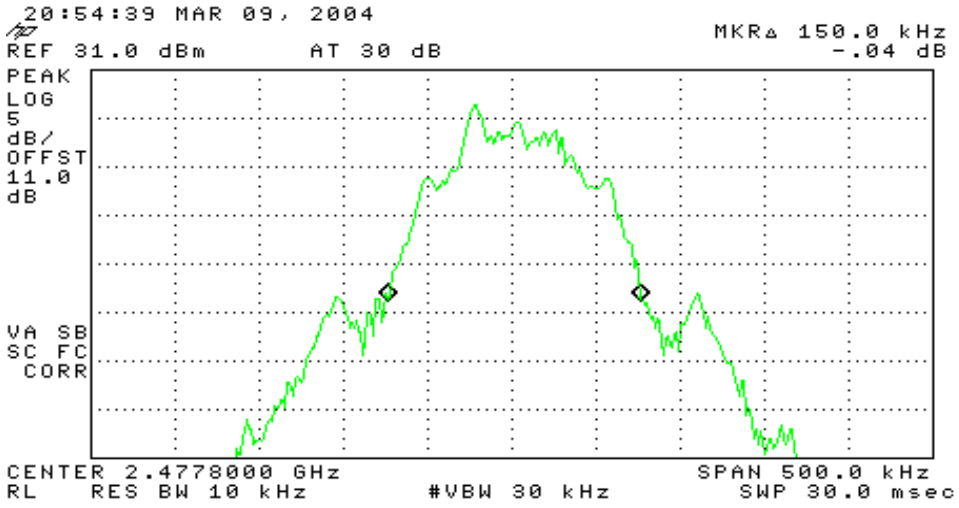
Note 1:	Add note here
Note 2:	

Low Channel



Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A





Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #2: Output Power

Channel	Frequency (MHz)	Measured	Cable loss	Output power
Low	2401.6	26	1.0	27.0
Mid	2442	25.72	1.0	26.7
High	2477.8	25.62	1.0	26.6

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

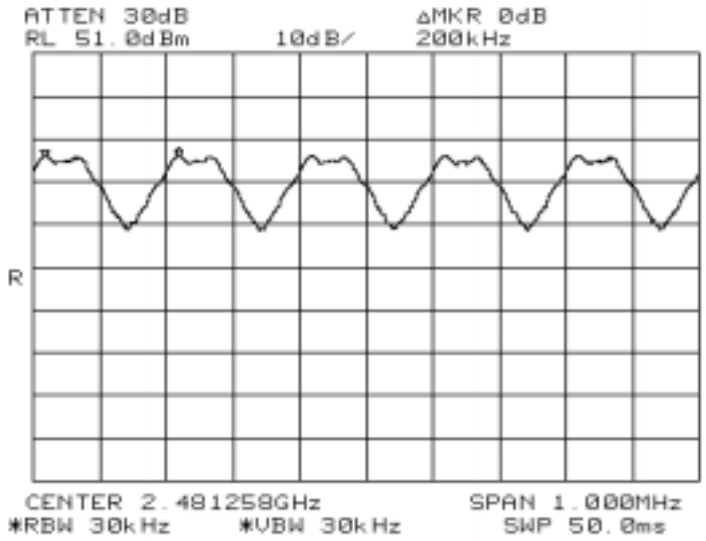
Run #3: Channel Occupancy And Spacing

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

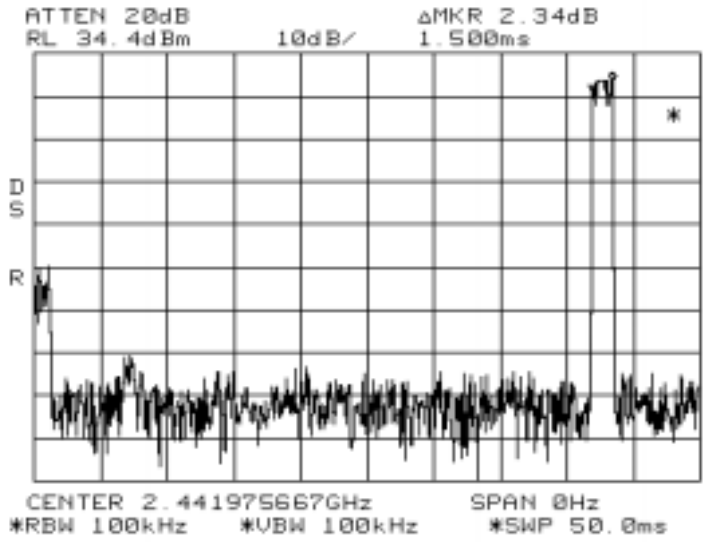
The channel spacing was:	200 kHz	**Plot# 201**
The minimum channel separation permitted is:	160 kHz	
The total number of channels (N) was:	381 channels	
The dwell time (Dt) on the center channel was:	0.0015 Seconds	**Plot# 202**
Time between succesive occupancy of a channel (Ot):	0.897 Seconds	**Plot# 203**
Time between succesive occupancy of a channel:	0.119 Seconds	Calculated (Dt * N)
Dwell time calculated :	0.0024 Seconds	Calculated (Ot /* N)
Average time per 30 seconds:	0.079 Seconds	Calculated (30 / N)
Average time per 30 seconds:	0.050 Seconds	Measured (30/Ot * Dt)
The maximum permitted dwell time in a 30 second period for FCC Part 15.247/RSS 210(o), based on a signal bandwidth >250kHz:	0.4 Seconds	

Plot# 201

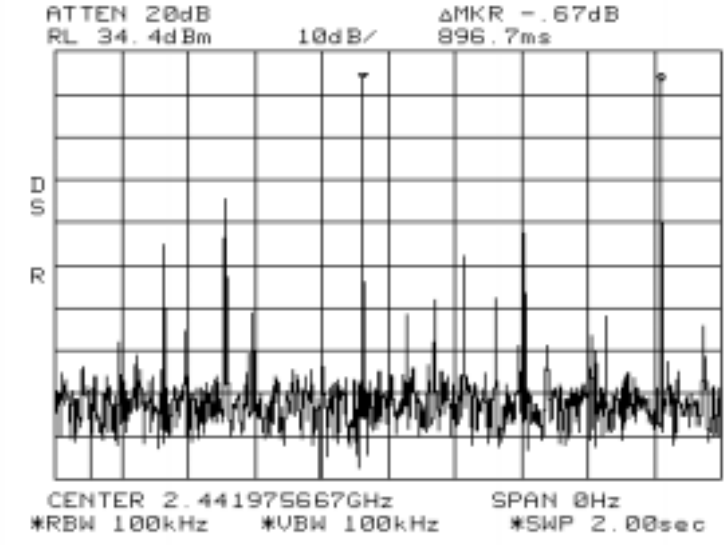


Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

7ms hoptime (202)



7ms hoptime (203)

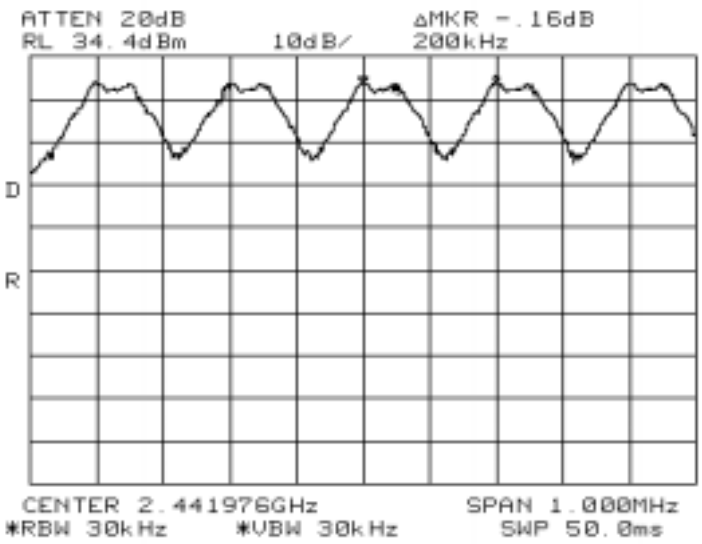


Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

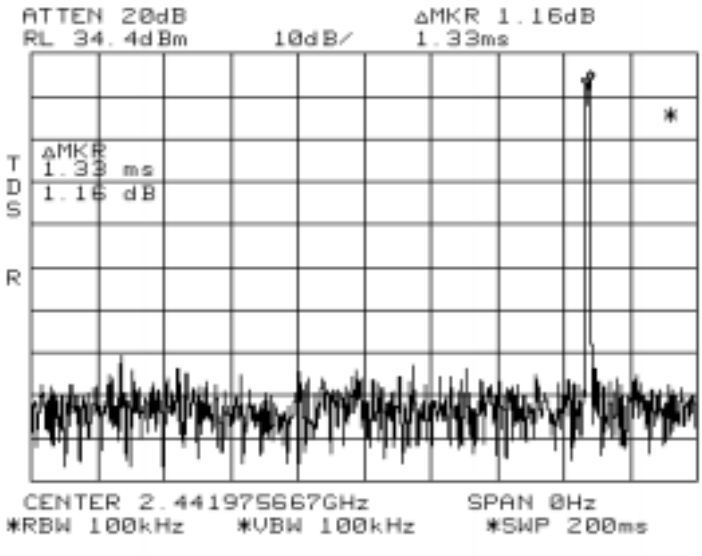
The channel spacing was:	200	kHz	**Plot# 301**
The minimum channel separation permitted is:	160	kHz	
The total number of channels (N) was:	381	channels	
The dwell time (Dt) on the center channel was:	0.0013	Seconds	**Plot# 302**
Time between succesive occupancy of a channel (Ot):	3.590	Seconds	**Plot# 303**
Time between succesive occupancy of a channel:	0.105	Seconds	Calculated (Dt * N)
Dwell time calculated :	0.0094	Seconds	Calculated (Ot /* N)
Average time per 30 seconds:	0.079	Seconds	Calculated (30 / N)
Average time per 30 seconds:	0.011	Seconds	Measured (30/Ot * Dt)
The maximum permitted dwell time in a 30 second period for FCC Part 15.247/RSS 210(o), based on a signal bandwidth >250kHz:	0.4	Seconds	

Plot# 301

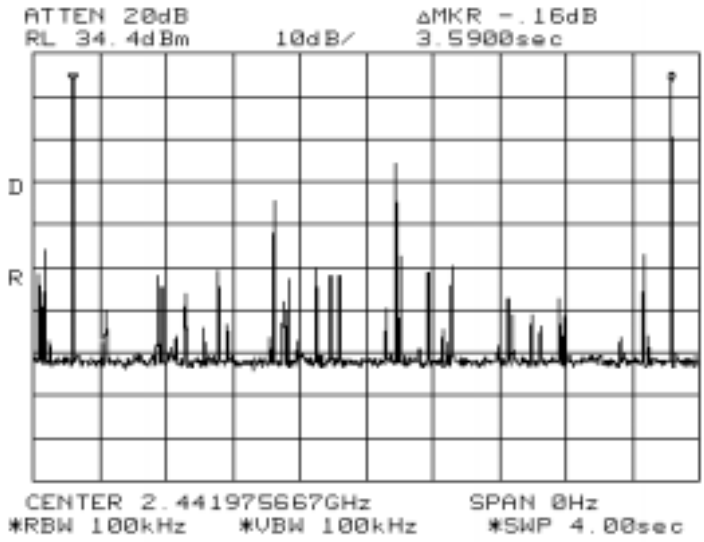


Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Hoptime 28ms (302)



Hoptime 28ms (303)



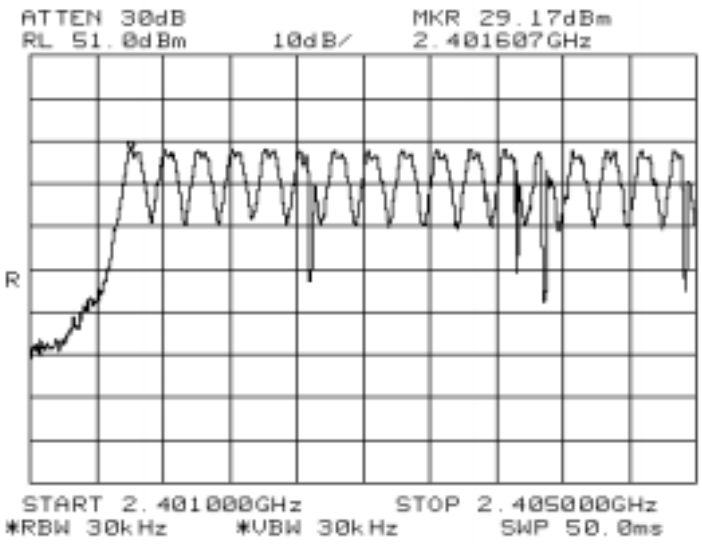
Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #4: Number of Channels

The number of channels was verified with the radio transmitting normally (i.e. In hopping mode)

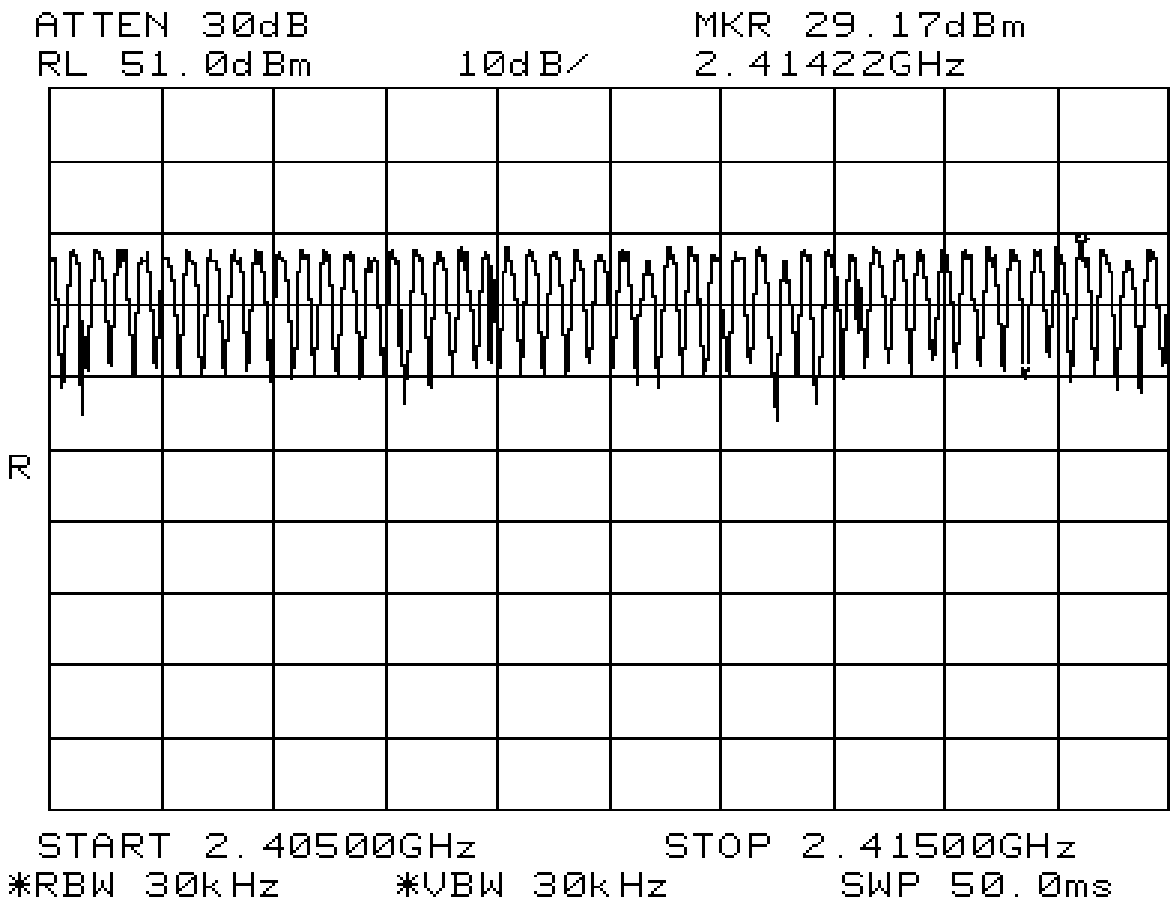
The number of channels in Band A:	127
The number of channels in Band B:	127
The number of channels in Band C:	127

Total number of channels from 2402 to 2447.8 MHz: 381



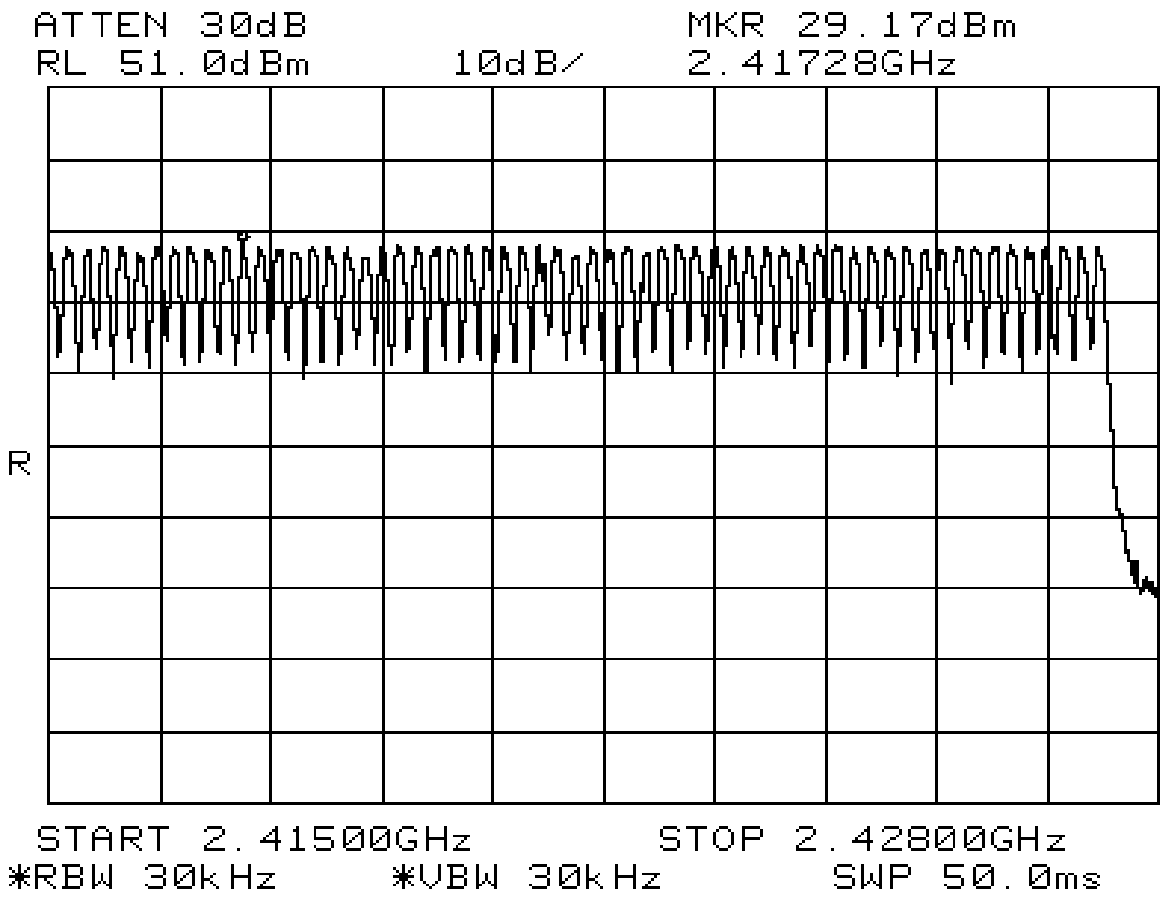
Hopping channels Band A: **17**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A



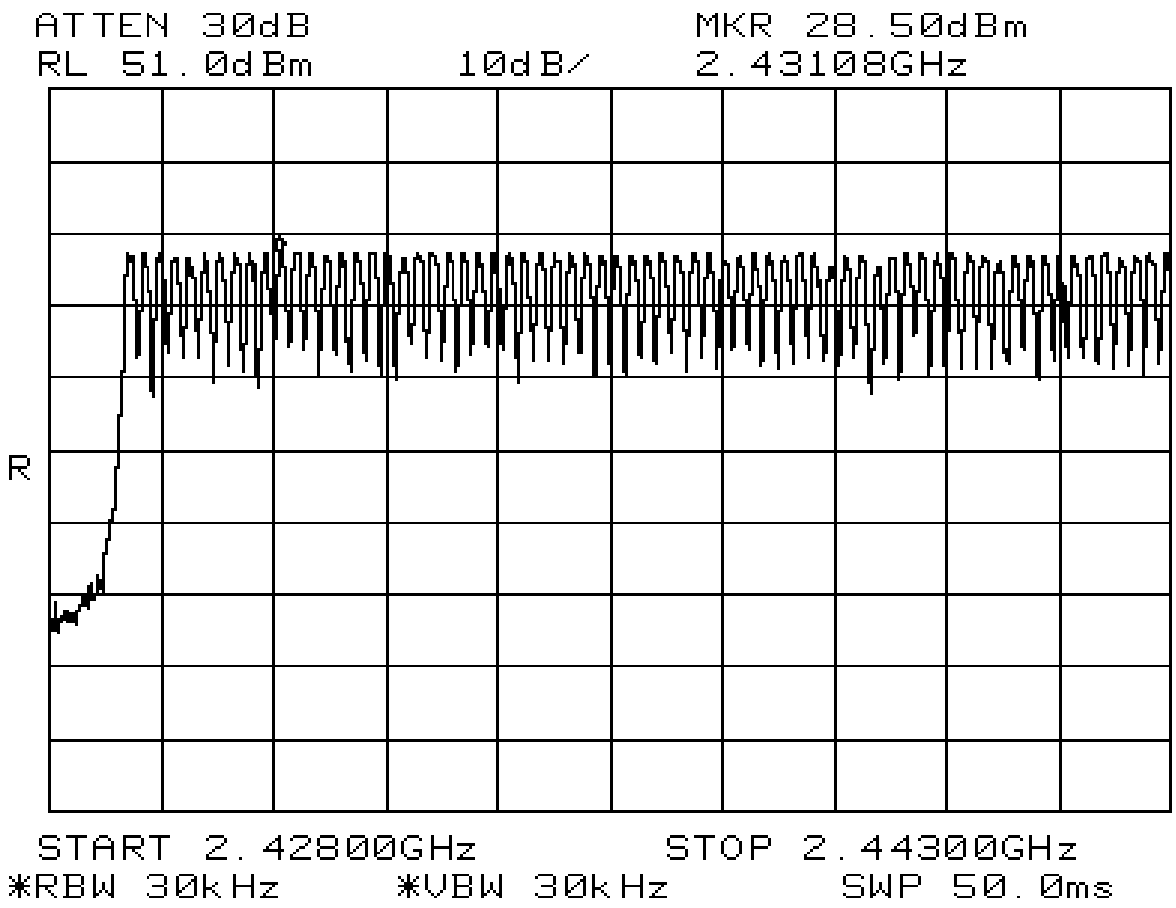
Hopping channels Band A: **49**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A



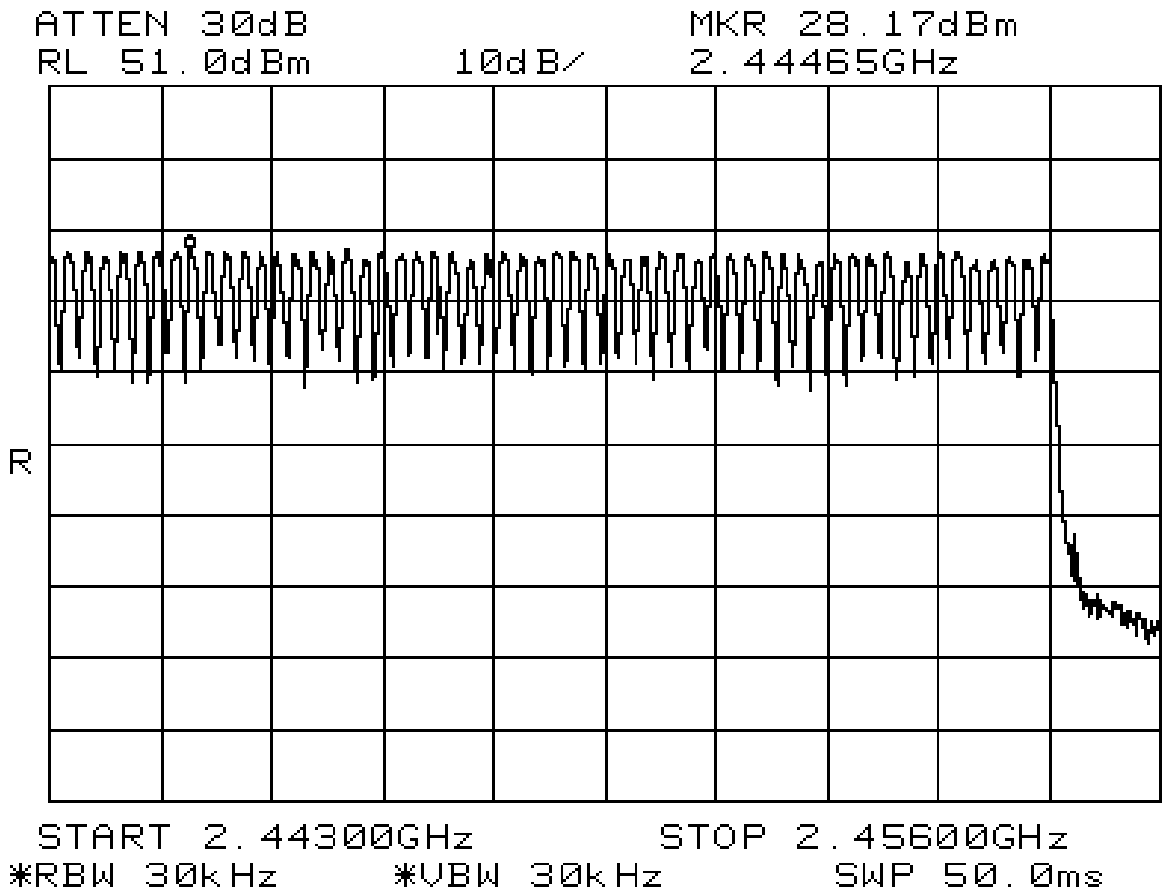
Hopping channels Band A: **61**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A



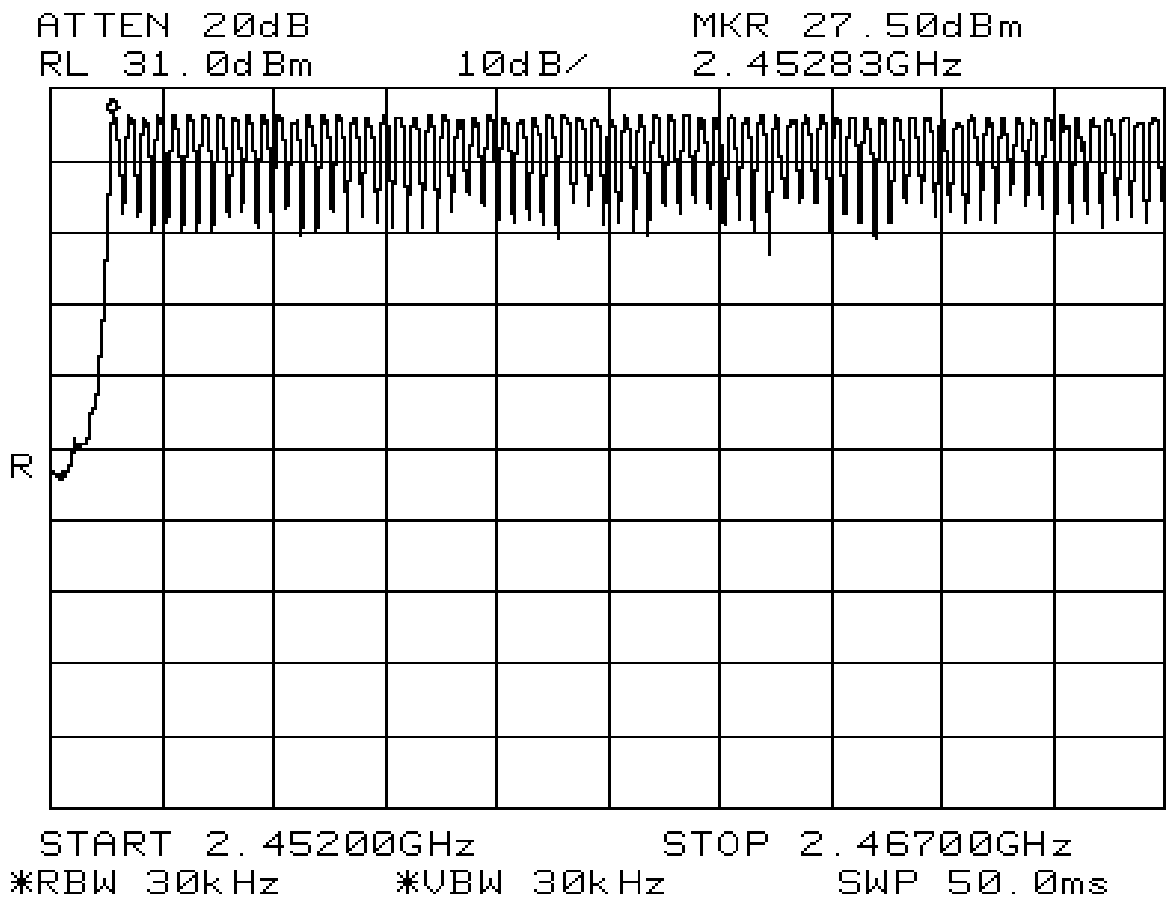
Hopping channels Band B: **69**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A



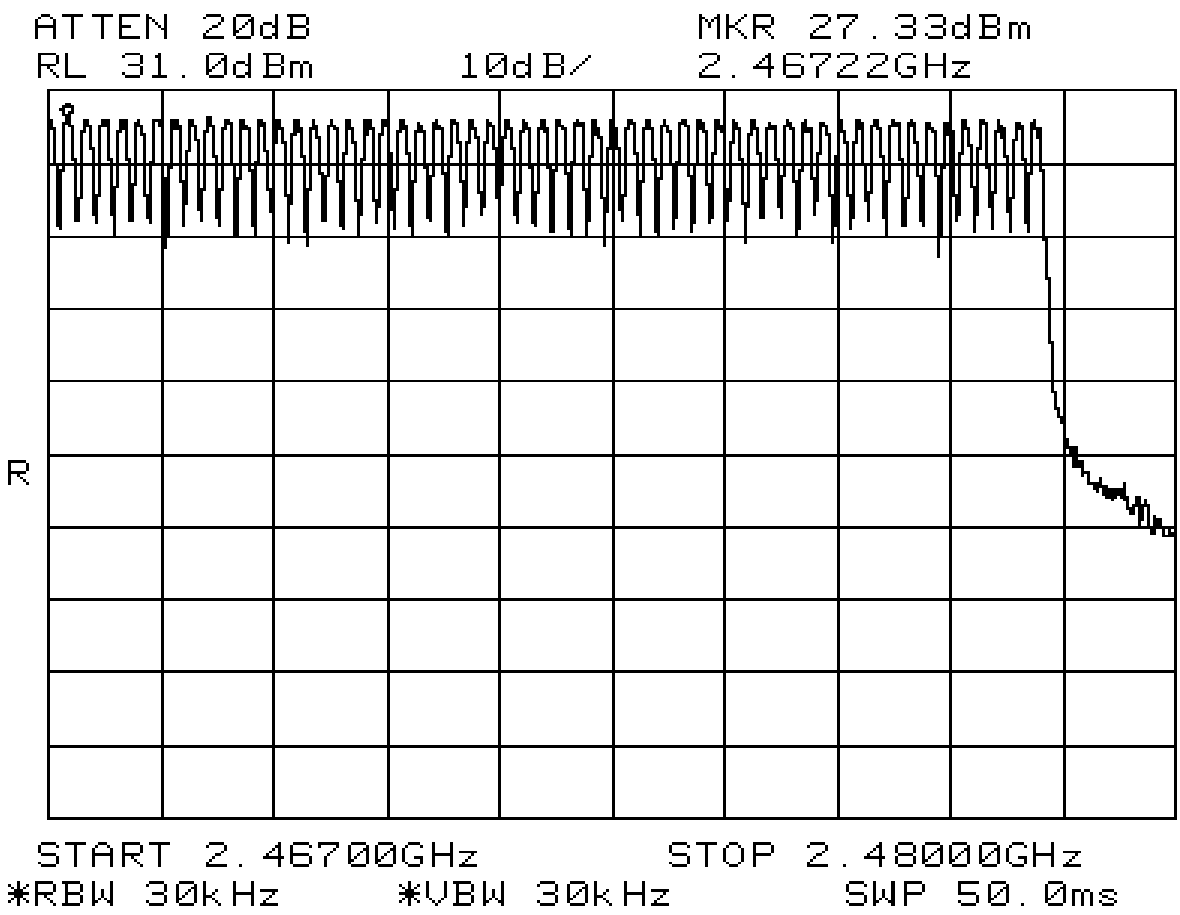
Hopping channels Band B: **58**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A



Hopping channels Band C: **70**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

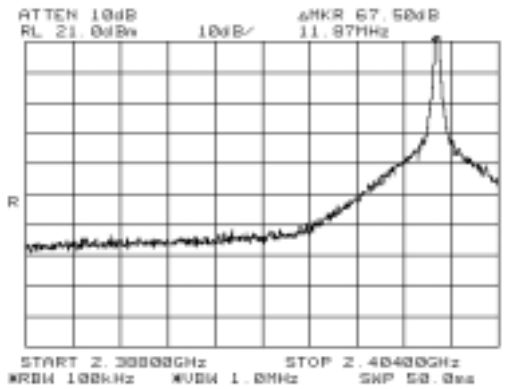


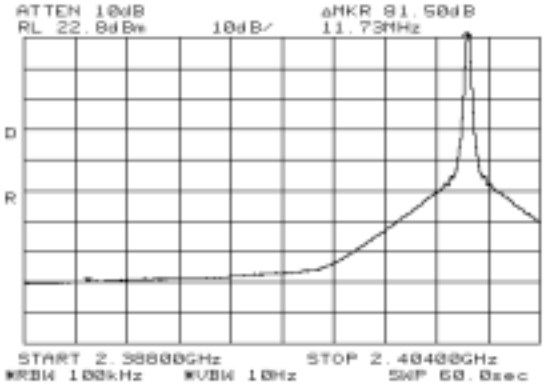
Hopping channels Band C: **57**

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run# 5: Band-Edge Measurements - Plots for use with radiated measurements of the fundamental

Level of fundamental: 28.47dBm (RBW=100kHz, VBW=1MHz); 28.47dBm (RBW=100kHz, VBW=10Hz)
Level at 2390MHz band edge: -48.67dBm (RBW=100kHz, VBW=1MHz); -60dBm (RBW=100kHz, VBW=10Hz)
Band edge level is **-77.17dBc (peak), -88.47dBc (average)**





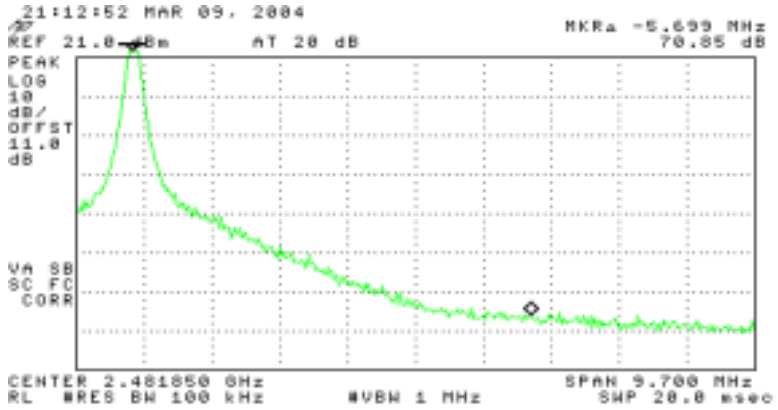
Fundamental	restricted level @ 2390 MHz	Attenuation
(dBm)	(dBm)	(dBc)
28.47	-48.67	77.14
28.47	-60	88.47

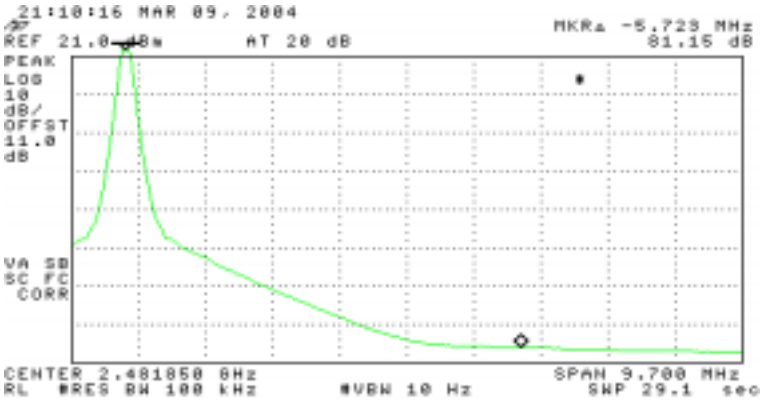
Highest Fundamental	Attenuation	Reading	Limit	Margin
(dBuV/m)	(dBc)	(dBuV/m)	(dBuV/m)	(dB)
133	77.14	55.86	74	-18.14
132	88.47	43.53	54	-10.47

Plot of lower band edge relative to low channel signal - for reference only, the delta value in the plot does not allow for the peak of the transmit signal above the screen

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Level of fundamental: 26.33dBm (RBW=100kHz, VBW=1MHz); 26.33dBm (RBW=100kHz, VBW=10Hz)
Level at 2483.5MHz (highest signal in Restricted band): --47.83dBm (RBW=100kHz, VBW=1MHz); -57.33dBm (RBW=100kHz, VBW=10Hz)
Band edge level is **-74.16dBc (peak), -83.66dBc (average)**





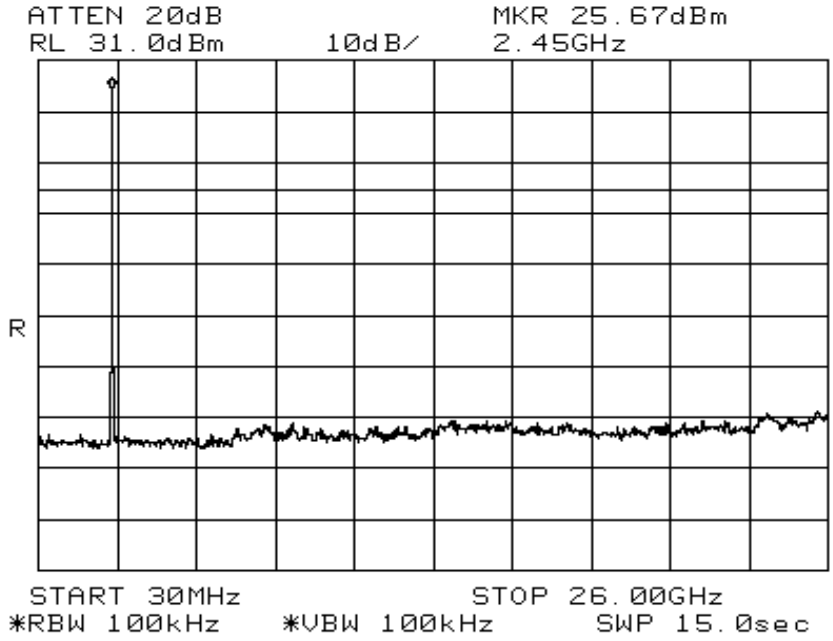
Fundamental	restricted level @ 2483.5 MHz	Attenuation
(dBm)	(dBm)	(dBc)
26.33	-47.83	74.16
26.33	-57.33	83.66

Highest Fundamental	Attenuation	Reading	Limit	Margin
(dBuV/m)	(dBc)	(dBuV/m)	(dBuV/m)	(dB)
131.4	74.16	57.24	74	-16.76
131.3	83.66	47.64	54	-6.36

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

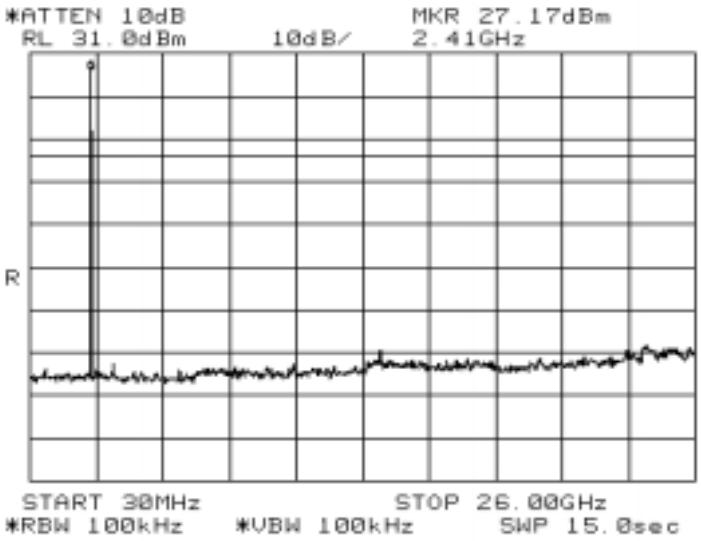
Run# 6: Out-of-band emissions

High Channel

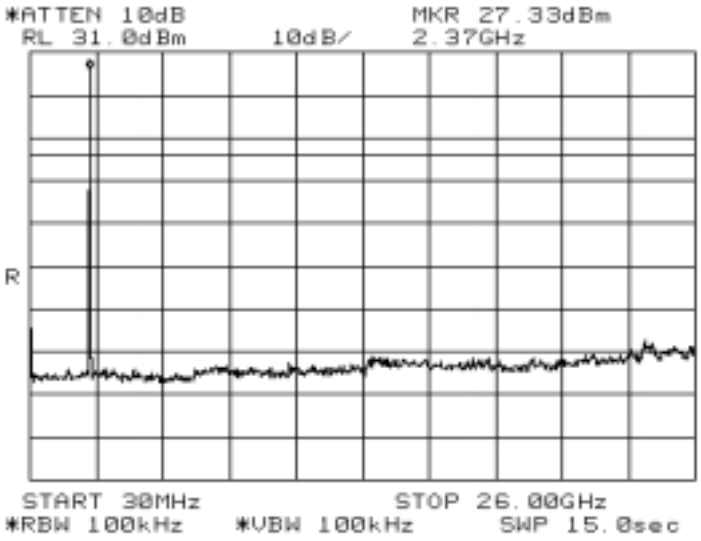


Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Middle



Low Channel



Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Radiated Emissions (1/2 wave)

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: 2/24/04
Test Engineer: Juan Martinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

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

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1b	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	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:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2401.6 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	116.1	126.6	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	116	126.5	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	77.14 dB		
Delta Marker - Average	88.74 dB		
Calculated Band-Edge Measurement:	49.46 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	37.76 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.655	126.5	V	-	-	AVG	305	1.0	
2401.655	126.6	V	-	-	PK	305	1.0	
2401.670	116.0	H	-	-	AVG	231	1.0	
2401.670	116.1	H	-	-	PK	231	1.0	
4803.318	53.3	V	54.0	-0.7	AVG	243	1.0	Restricted
4803.318	56.8	V	74.0	-17.2	PK	286	1.0	Restricted
12007.93	52.1	V	54.0	-1.9	AVG	48	1.3	Restricted
12007.93	58.1	V	74.0	-15.9	PK	48	1.3	Restricted
4803.21	47.8	H	54.0	-6.2	AVG	204	1.0	Restricted
4803.21	53.3	H	74.0	-20.7	PK	204	1.0	Restricted
12008.09	43.5	H	54.0	-10.5	AVG	360	1.0	Restricted
12008.09	53.6	H	74.0	-20.4	PK	360	1.0	Restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2442 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.900	126.5	V	-	-	AVG	305	1.0	
2441.900	126.6	V	-	-	PK	305	1.0	
2441.600	116.0	H	-	-	AVG	231	1.0	
2441.600	116.1	H	-	-	PK	231	1.0	
4882.630	38.2	H	54.0	-15.9	AVG	361	1.0	restricted
4882.630	49.6	H	74.0	-24.4	PK	361	1.0	restricted
7325.980	48.5	H	54.0	-5.5	AVG	331	1.4	restricted
7325.980	54.2	H	74.0	-19.8	PK	331	1.4	restricted
12209.73	43.1	H	54.0	-10.9	AVG	0	1.0	restricted
12209.73	53.9	H	74.0	-20.1	PK	0	1.0	restricted
4882.70	39.4	V	54.0	-14.6	AVG	216	1.0	restricted
4882.70	49.8	V	74.0	-24.2	PK	216	1.0	restricted
7326.01	51.3	V	54.0	-2.7	AVG	298	1.8	restricted
7326.01	55.6	V	74.0	-18.4	PK	298	1.8	restricted
12210.13	51.9	V	54.0	-2.1	AVG	13	1.4	restricted
12210.13	57.9	V	74.0	-16.1	PK	13	1.4	restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2477.8 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	115	126.2	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	114.8	125.9	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	74.16 dB		
Delta Marker - Average	83.66 dB		
Calculated Band-Edge Measurement:	52.04 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	42.24 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2477.800	114.8	H	-	-	AVG	250	1.2	
2477.800	115.0	H	-	-	PK	250	1.2	
2477.800	125.9	V	-	-	AVG	287	1.0	
2477.800	126.2	V	-	-	PK	287	1.0	
4966.145	38.6	V	54.0	-15.4	AVG	361	1.0	Restricted
4966.145	50.1	V	74.0	-23.9	PK	361	1.0	Restricted
7447.164	53.4	V	54.0	-0.6	AVG	61	1.0	Restricted
7447.164	57.4	V	74.0	-16.6	PK	61	1.0	Restricted
12411.92	46.9	V	54.0	-7.1	AVG	50	1.4	restricted
12411.92	59.3	V	74.0	-14.7	PK	50	1.4	restricted
12412.12	47.1	H	54.0	-6.9	AVG	32	1.3	restricted
12412.12	59.7	H	74.0	-14.3	PK	32	1.3	restricted
7447.35	47.7	H	54.0	-6.3	AVG	86	1.3	Restricted
7447.35	54.5	H	74.0	-19.5	PK	86	1.3	Restricted
4964.76	39.1	H	54.0	-14.9	AVG	361	1.0	Restricted
4964.76	49.4	H	74.0	-24.6	PK	361	1.0	Restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Radiated Emissions (YAGI)

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: 2/24/04
Test Engineer: Juan Martinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

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

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1b	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	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.

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2401.6 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	133	133	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	132.3	132.3	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	77.14 dB		
Delta Marker - Average	88.74 dB		
Calculated Band-Edge Measurement:	55.86 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	43.56 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.645	112.4	H	-	-	AVG	217	1.0	
2401.645	112.6	H	-	-	PK	217	1.0	
2401.680	132.3	V	-	-	AVG	360	1.0	
2401.680	133.0	V	-	-	PK	360	1.0	
4803.258	52.5	V	54.0	-1.5	AVG	309	1.1	Restricted
4803.258	57.8	V	74.0	-16.2	PK	309	1.1	Restricted
5799.875	49.1	V	113.0	-63.9	PK	190	2.0	Non-restricted
7204.707	56.0	V	113.0	-57.0	PK	361	1.3	Non-restricted
12008.10	51.5	V	54.0	-2.5	AVG	44	1.2	Restricted
12008.10	57.7	V	74.0	-16.3	PK	44	1.2	Restricted
9606.40	56.6	V	113.0	-56.4	PK	-1	1.0	Non-restricted
14409.55	62.9	V	113.0	-50.1	PK	56	1.5	Non-restricted
16810.95	57.2	V	113.0	-55.8	PK	66	1.0	Non-restricted
4803.19	44.2	H	54.0	-9.8	AVG	314	1.0	Restricted
4803.19	51.9	H	74.0	-22.2	PK	314	1.0	Restricted
12008.41	44.5	H	54.0	-9.5	AVG	361	1.3	Restricted
12008.41	54.3	H	74.0	-19.7	PK	361	1.3	Restricted
7204.83	55.1	H	113.0	-57.9	PK	353	1.2	Non-restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2442 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.800	110.1	H	-	-	AVG	217	1.0	
2441.800	111.2	H	-	-	PK	217	1.0	
2442.100	131.8	V	-	-	AVG	360	1.0	
2442.100	132.5	V	-	-	PK	360	1.0	
5800.890	47.5	H	54.0	-6.5	PK	101	1.0	Non-restricted
4885.270	38.1	H	54.0	-15.9	AVG	341	1.3	restricted
4885.270	49.3	H	74.0	-24.7	PK	341	1.3	restricted
7325.880	47.3	H	54.0	-6.7	AVG	298	1.2	restricted
7325.880	53.0	H	74.0	-21.0	PK	298	1.2	restricted
9768.089	53.5	H	112.5	-59.0	PK	351	1.3	non-restricted
12208.29	42.6	H	54.0	-11.4	AVG	110	1.0	restricted
12208.29	54.1	H	74.0	-20.0	PK	110	1.0	restricted
17093.71	56.3	H	112.5	-56.2	PK	307	1.0	non-restricted
5799.92	48.5	V	112.5	-64.0	PK	235	1.8	Non-restricted
4883.92	41.5	V	54.0	-12.5	AVG	358	1.0	restricted
4883.92	50.5	V	74.0	-23.5	PK	358	1.0	restricted
7326.00	47.5	V	54.0	-6.5	AVG	361	1.0	restricted
7326.00	54.0	V	74.0	-20.0	PK	361	1.0	restricted
12209.99	48.8	V	54.0	-5.2	AVG	361	1.3	restricted
12209.99	56.7	V	74.0	-17.3	PK	361	1.3	restricted
9768.05	56.0	V	112.5	-56.6	PK	11	1.0	non-restricted
17094.00	58.5	V	112.5	-54.0	PK	28	1.2	non-restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2477.8 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	113.4	131.4	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	113.1	131.3	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	74.16 dB		
Delta Marker - Average	83.66 dB		
Calculated Band-Edge Measurement:	57.24 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	47.64 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2477.800	131.3	V	-	-	AVG	0	1.3	
2477.800	131.4	V	-	-	PK	0	1.3	
2477.800	113.1	H	-	-	AVG	228	1.3	
2477.800	113.4	H	-	-	PK	228	1.3	
7433.400	52.0	V	54.0	-2.0	AVG	361	2.0	Restricted
7433.400	56.0	V	74.0	-18.0	PK	361	2.0	Restricted
4964.819	52.8	V	54.0	-1.2	AVG	48	1.0	Restricted
4964.819	56.4	V	74.0	-17.6	PK	48	1.0	Restricted
5799.390	49.5	V	111.4	-61.9	PK	361	1.8	Non-restricted
9911.200	55.4	V	111.4	-56.0	PK	12	1.4	Non-restricted
12389.00	52.0	V	54.0	-2.0	AVG	46	1.3	restricted
12389.00	57.0	V	74.0	-17.0	PK	46	1.3	restricted
4964.819	39.3	H	54.0	-14.7	AVG	360	1.7	Restricted
4964.819	49.2	H	74.0	-24.9	PK	360	1.7	Restricted
5799.390	47.7	H	111.4	-63.7	PK	361	1.0	Non-restricted
7433.400	49.2	H	54.0	-4.8	AVG	67	1.0	Restricted
7433.400	54.7	H	74.0	-19.3	PK	67	1.0	Restricted
9911.200	52.9	H	111.4	-58.5	PK	55	1.0	Non-restricted
12389.00	49.4	H	54.0	-4.6	AVG	38	1.0	restricted
12389.00	55.2	H	74.0	-18.8	PK	38	1.0	restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Radiated Emissions (OMNI-directional)

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: 2/24/04
Test Engineer: Juan Martinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

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

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1b	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to run
1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	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.

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2401.6 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	113.5	127.2	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	113.3	127.7	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	77.14 dB		
Delta Marker - Average	88.74 dB		
Calculated Band-Edge Measurement:	50.06 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	38.96 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.620	127.7	V	-	-	AVG	360	1.1	Low Fundamental
2401.620	127.2	V	-	-	PK	360	1.1	Low Fundamental
2401.620	113.3	H	-	-	AVG	181	1.0	Low Fundamental
2401.620	113.5	H	-	-	PK	181	1.0	Low Fundamental
4803.308	47.6	V	54.0	-6.4	AVG	106	1.0	Restricted
4803.308	53.7	V	74.0	-20.3	PK	106	1.0	Restricted
12008.00	52.5	V	54.0	-1.5	AVG	90	1.3	Restricted
12008.00	58.1	V	74.0	-16.0	PK	90	1.3	Restricted
14409.66	65.0	V	107.7	-42.7	PK	110	1.3	Non-restricted
5800.17	51.0	V	107.7	-56.7	PK	344	1.0	Non-restricted
7204.79	57.6	V	107.7	-50.1	PK	24	1.0	Non-restricted
9606.20	56.5	V	107.7	-51.2	PK	158	1.0	Non-restricted
16811.11	58.6	V	107.7	-49.1	PK	83	1.0	Non-restricted
12008.22	47.4	H	54.0	-6.6	AVG	103	1.2	Restricted
12008.22	55.4	H	74.0	-18.6	PK	103	1.2	Restricted
4803.23	39.0	H	54.0	-15.0	AVG	115	1.0	Restricted
4803.23	49.3	H	74.0	-24.7	PK	115	1.0	Restricted
5799.86	48.7	H	107.7	-59.0	PK	250	1.0	Non-restricted
14409.60	60.8	H	107.7	-46.9	PK	280	1.2	Non-restricted
7204.79	56.1	H	107.7	-51.6	PK	361	2.1	Non-restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2442 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2442.025	112.7	H	-	-	AVG	209	1.3	Middle Fundamental
2442.025	112.7	H	-	-	PK	209	1.3	Middle Fundamental
2442.040	126.8	V	-	-	AVG	0	1.2	Middle Fundamental
2442.040	127.1	V	-	-	PK	0	1.2	Middle Fundamental
5800.160	47.9	V	107.1	-59.2	PK	361	1.0	Non-restricted
4883.997	39.8	V	54.0	-14.2	AVG	304	1.5	restricted
4883.997	49.3	V	74.0	-24.8	PK	304	1.5	restricted
7325.998	51.1	V	54.0	-2.9	AVG	330	1.7	restricted
7325.998	55.4	V	74.0	-18.6	PK	330	1.7	restricted
9767.998	55.6	V	107.1	-51.5	PK	333	1.4	non-restricted
17094.00	61.4	V	107.1	-45.7	PK	93	1.0	non-restricted
12210.00	47.5	V	54.0	-6.5	AVG	39	1.3	restricted
12210.00	55.6	V	74.0	-18.4	PK	39	1.3	restricted
5799.65	48.8	H	107.1	-58.3	PK	56	1.0	Non-restricted
4884.00	39.4	H	54.0	-14.6	AVG	76	2.0	restricted
4884.00	49.3	H	74.0	-24.8	PK	76	2.0	restricted
7326.00	51.6	H	54.0	-2.5	AVG	361	1.3	restricted
7326.00	55.5	H	74.0	-18.6	PK	361	1.3	restricted
9768.00	53.4	H	107.1	-53.7	PK	288	1.0	non-restricted
17094.00	62.2	H	107.1	-44.9	PK	80	1.2	non-restricted
12210.00	43.6	H	54.0	-10.4	AVG	293	1.0	restricted
12210.00	55.2	H	74.0	-18.8	PK	293	1.0	restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	EL806-2.4	T-Log Number:	T54584
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2477.8 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	110.5	124	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	110.3	123.7	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	74.16 dB		
Delta Marker - Average	83.66 dB		
Calculated Band-Edge Measurement:	49.84 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	40.04 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

	H	V
Fundamental emission level @ 3m in 100kHz RBW:		
Limit for emissions outside of restricted bands:	-20 dBµV/m	

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2477.800	123.7	V	-	-	AVG	326	1.0	High Fundamental
2477.800	124.0	V	-	-	PK	326	1.0	High Fundamental
2477.800	110.3	H	-	-	AVG	289	1.8	High Fundamental
2477.800	110.5	H	-	-	PK	289	1.8	High Fundamental
4964.819	41.1	H	54.0	-12.9	AVG	33	1.5	Restricted
4964.819	49.6	H	74.0	-24.4	PK	33	1.5	Restricted
5799.390	47.8	H	104.0	-56.2	PK	14	1.2	Non-restricted
7433.400	52.0	H	54.0	-2.1	AVG	346	1.3	Restricted
7433.400	56.0	H	74.0	-18.0	PK	346	1.3	Restricted
9911.200	54.6	H	104.0	-49.4	PK	85	1.1	Non-restricted
12389.00	49.0	H	54.0	-5.0	AVG	80	1.4	restricted
12389.00	55.2	H	74.0	-18.9	PK	80	1.4	restricted
4964.819	46.6	V	54.0	-7.4	AVG	71	1.2	Restricted
4964.819	52.2	V	74.0	-21.9	PK	71	1.2	Restricted
5799.390	51.0	V	104.0	-53.0	PK	302	1.9	Non-restricted
7433.400	53.4	V	54.0	-0.6	AVG	42	1.0	Restricted
7433.400	57.4	V	74.0	-16.6	PK	42	1.0	Restricted
9911.200	55.3	V	104.0	-48.7	PK	360	1.4	Non-restricted
12389.00	48.4	V	54.0	-5.7	AVG	125	1.3	restricted
12389.00	54.5	V	74.0	-19.5	PK	125	1.3	restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	EN55022/FCC	Class:	A/B
Immunity Spec:		Environment:	

EMC Test Data

For The

Microwave Data Systems

Model

2.4 GHz TransNet

Date of Last Test: 4/10/2003

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	EN55022/FCC	Class:	A/B
Immunity Spec:	Enter immunity spec on cover	Environment:	

EUT INFORMATION

The EUT is a 2.4GHz module which is a spread spectrum wireless module, designed for license-free operation in the 2402 - 2483.5 MHz frequency range. 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 12Vdc.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
MDS	EL806-2.4	2.4GHz FHSS module	4052A01	E5MDS-EL806-24

Other EUT Details

EUT Enclosure

The EUT enclosure is primarily constructed of fabricated sheet steel. It measures approximately 4.5 cm wide by 9 cm deep by 1.5 cm high.

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

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

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Emissions Spec:	EN55022/FCC	Class:	A/B
Immunity Spec:	Enter immunity spec on cover	Environment:	

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	2647	Laptop	78-7PX8M	DoC
Bellcorp Technology	ZVC3OFS12D	power supply	6794	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)
RJ-11	Laptop (Com 1)	Multiwire	Unshielded	2.5
DC input	Power Supply	2-wire	Unshielded	1.2
Antenna Out	External Antenna	Coaxial	Shielded or Unshielded	0.38

EUT Operation During Emissions

EUT was set to continuously received at 2442 MHz. During AC conducted emission the unit was transmitting at maximum power on the middle channel.

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

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: 2/23/2004
Test Engineer: Adam LaCourse
Test Location: Fremont Chamber #5
Config. Used: 1
Config Change: none
EUT Voltage: 10 VDC

General Test Configuration

The EUT was 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 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.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature: 18.3 °C
Rel. Humidity: 47 %

Summary of Results

Runs	Test Performed	Limit	Result	Margin
1	RE, 30 - 1000 MHz, Maximized Emissions	EN55022A	Pass	-23.6dB @ 920.006Maximized
2	RE, 1000 - 18000 MHz, Maximized Emissions	RSS210 RX Mode	Pass	No Emissions found

Modifications Made During Testing

No modifications were made to the EUT during testing

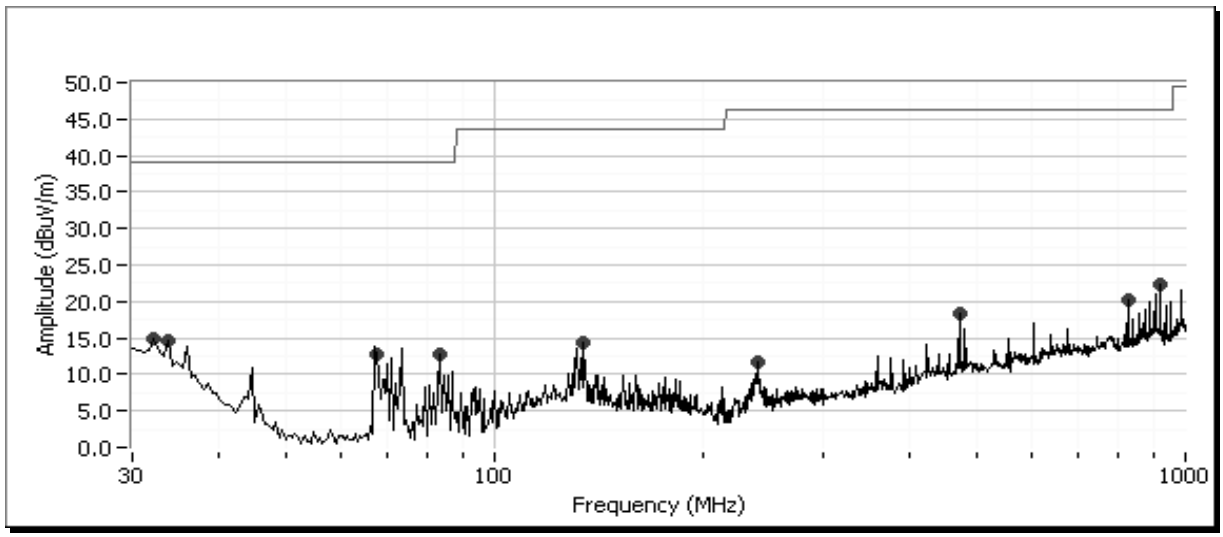
Deviations From The Standard

No deviations were made from the requirements of the standard.

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz



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EMC Test Data

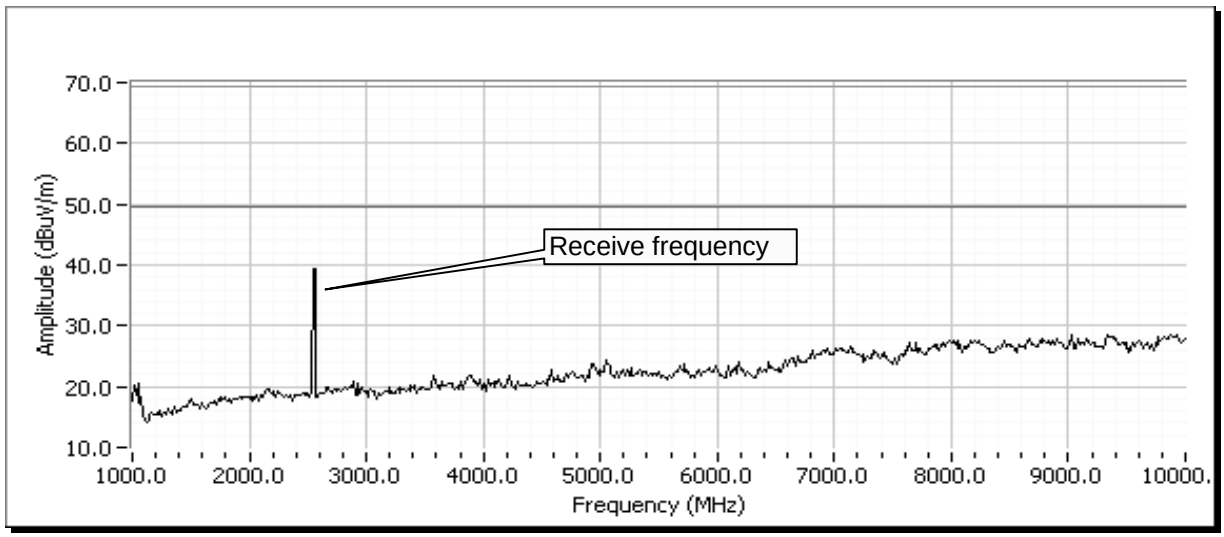
Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

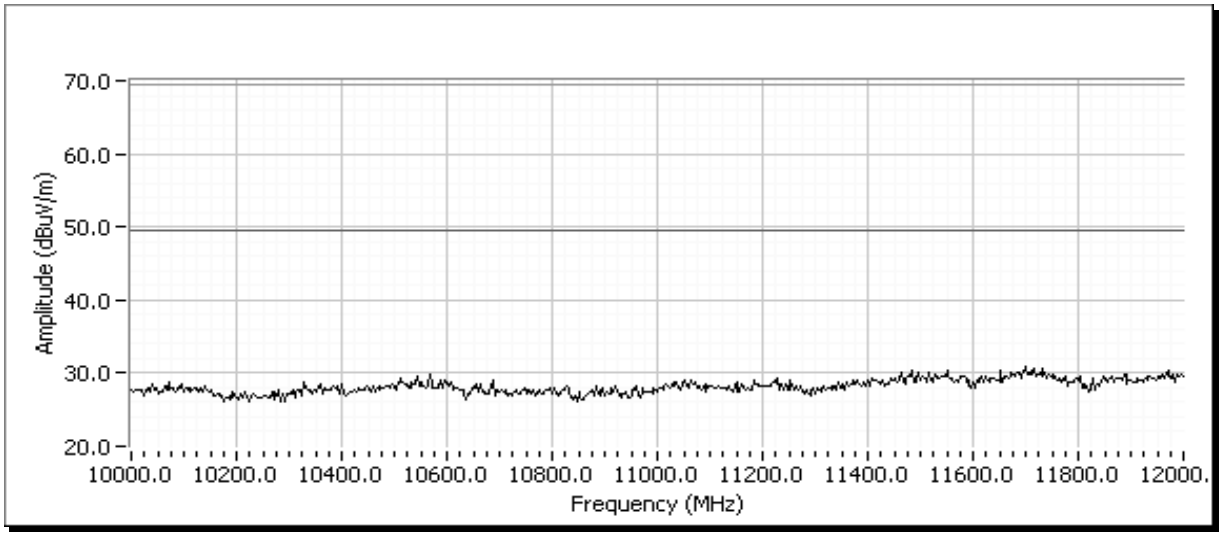
Frequency	Level	Pol	EN55022A		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Preliminary peak readings captured during pre-scan								
32.471	14.8	V	39.1	-24.3	Peak	26	1.0	
33.857	14.8	V	39.1	-24.4	Peak	176	1.0	
67.746	12.8	V	39.1	-26.3	Peak	195	2.0	
134.260	14.4	H	43.5	-29.1	Peak	95	4.0	
240.787	11.8	V	46.4	-34.6	Peak	165	3.0	
83.470	12.6	V	39.1	-26.5	Peak	175	3.5	
471.265	18.5	V	46.4	-27.9	Peak	292	1.5	
824.000	20.3	V	46.4	-26.1	Peak	359	1.5	
920.006	22.3	H	46.4	-24.1	Peak	209	1.5	
Maximized quasi-peak readings (no manipulation of EUT interface cables)								
920.006	23.4	H	47.0	-23.6	QP	208	1.5	
32.471	8.7	V	40.0	-31.3	QP	25	1.0	
33.857	8.5	V	40.0	-31.5	QP	175	1.0	
824.000	13.7	V	47.0	-33.3	QP	359	1.5	
134.260	5.8	H	40.0	-34.2	QP	94	4.0	
471.265	12.8	V	47.0	-34.2	QP	292	1.5	
83.470	4.9	V	40.0	-35.1	QP	175	3.5	
67.746	3.8	V	40.0	-36.2	QP	195	2.0	
240.787	1.0	V	47.0	-46.0	QP	165	3.0	

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

Run #2: Maximized readings, 1000 - 18000 MHz RX

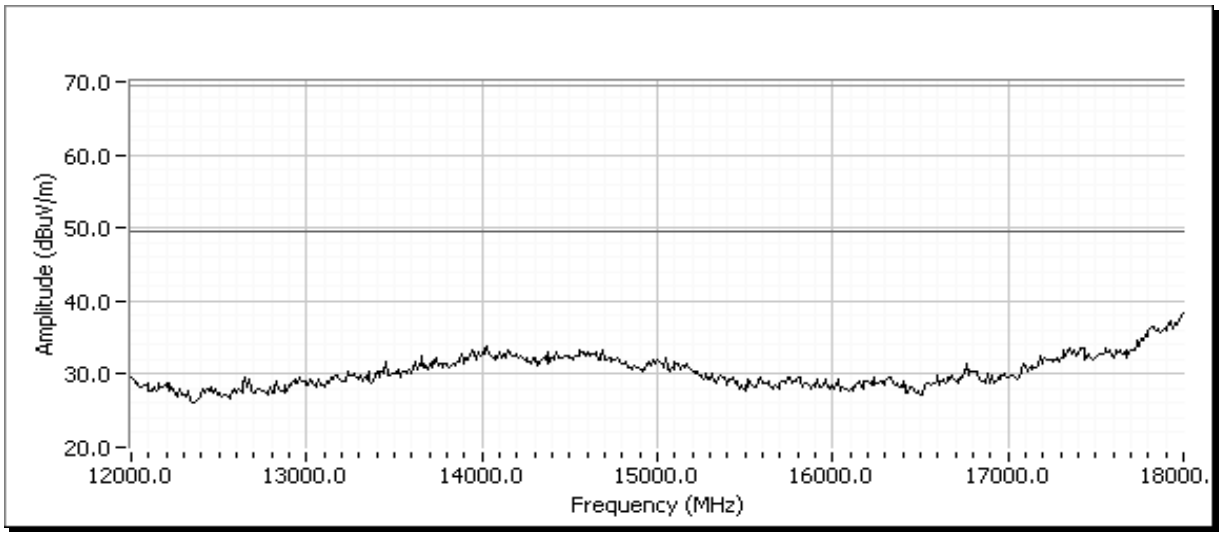
Measurements made at 3m test distance and extrapolated to 10m.





EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B



Frequency	Level	Pol	RSS210 RX		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Preliminary peak readings captured during pre-scan (peak readings vs. average limit)								
2442.000	39.0	V	60.0	-21.0	Pk	180	1.1	

Note 1:	No emissions were found above 1 GHz.

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

Conducted Emissions - Power Ports

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: 3/17/2004
Test Engineer: Juan Martinez
Test Location: SVOATS #3
Config. Used: 1
Config Change: None
EUT Voltage: 12Vdc

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. The EUT was set to transmit continously at maximum power on the middle channel.

Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	-0.7dB @ 0.369MHz
2	CE, AC Power,120V/60Hz	RSS-210	Pass	-5.5dB @ 0.613MHz

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.

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EMC Test Data

Client:	Microwave Data Systems	Job Number:	J54055
Model:	2.4 GHz TransNet	T-Log Number:	T54571
		Account Manager:	Danni Olivas
Contact:	Dennis McCarthy		
Spec:	EN55022/FCC	Class:	A/B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.3685	47.8	Line 1	48.5	-0.7	AV	
0.3689	47.1	Neutral	48.5	-1.4	AV	
0.3685	47.8	Line 1	58.5	-10.7	QP	
0.3689	47	Neutral	58.5	-11.5	QP	
0.1527	50.3	Neutral	65.7	-15.4	QP	
0.15	49.8	Line 1	66.0	-16.2	QP	
0.1605	47.8	Line 1	65.2	-17.4	QP	
28.8409	27.3	Line 1	50	-22.7	AV	
29.1264	26.3	Neutral	50	-23.7	AV	
28.8409	34.6	Line 1	60	-25.4	QP	
29.1264	33.1	Neutral	60	-26.9	QP	
0.1527	17.7	Neutral	55.7	-38	AV	
0.15	17.6	Line 1	56.0	-38.4	AV	
0.1605	16.5	Line 1	55.2	-38.7	AV	

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	RSS-210		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.6126	42.5	Line 1	48	-5.5	QP	
0.6126	38.5	Line 1	48	-9.5	AV	
28.8409	34.6	Line 1	48	-13.4	QP	
29.1264	33.1	Neutral	48	-14.9	QP	
28.8409	27.3	Line 1	48	-20.7	AV	
29.1264	26.3	Neutral	48	-21.7	AV	
0.589	16.3	Line 1	48	-31.7	AV	

Note 1:	
Note 2:	

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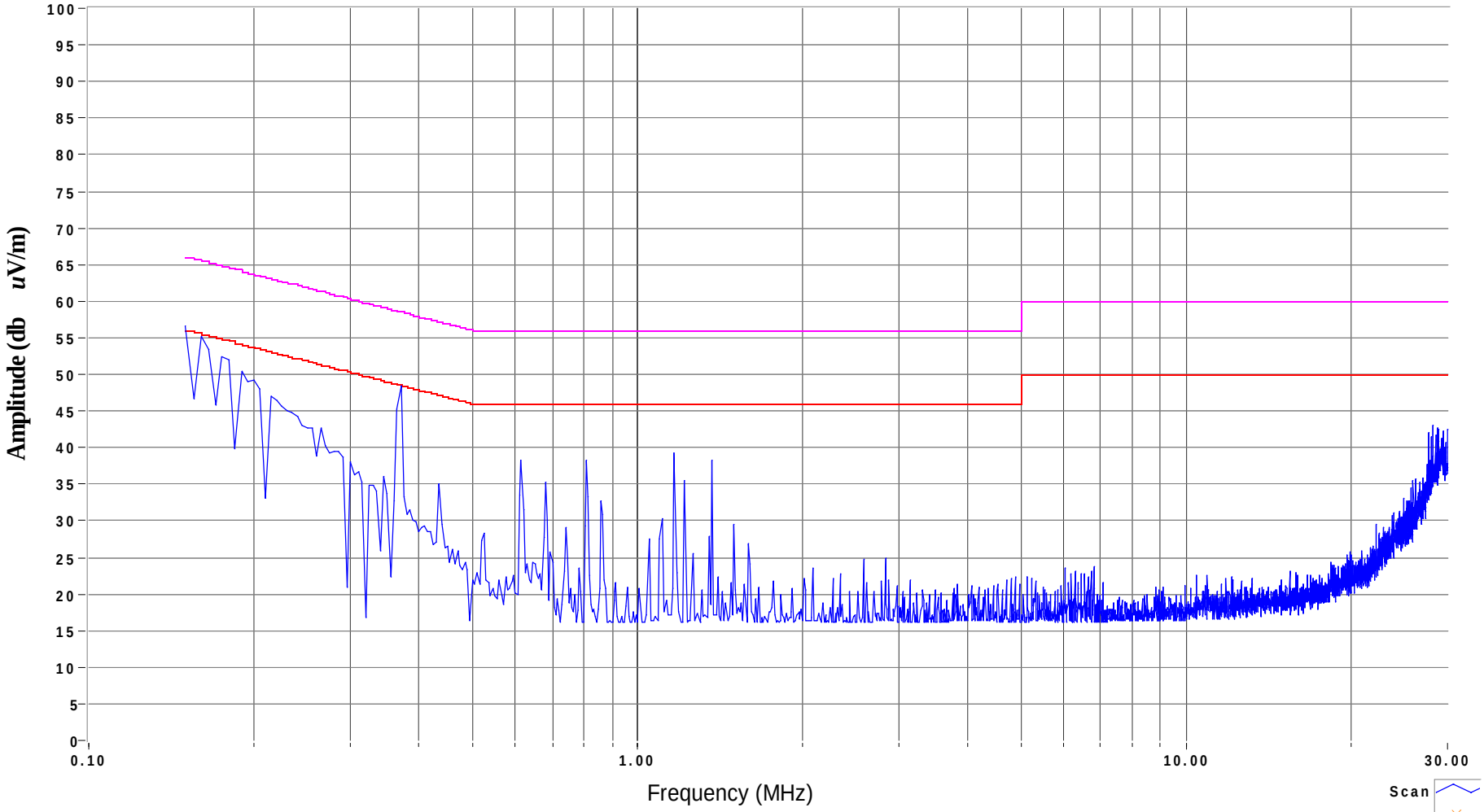
SVOATS# 3: Microwave Data Systems EL806-2.4 Run 2

Spec: EN55022B

Mains Lead Line 1

2.4GHz TransNEt module



120Vac, 60Hz

3/17/04

Juan Martinez

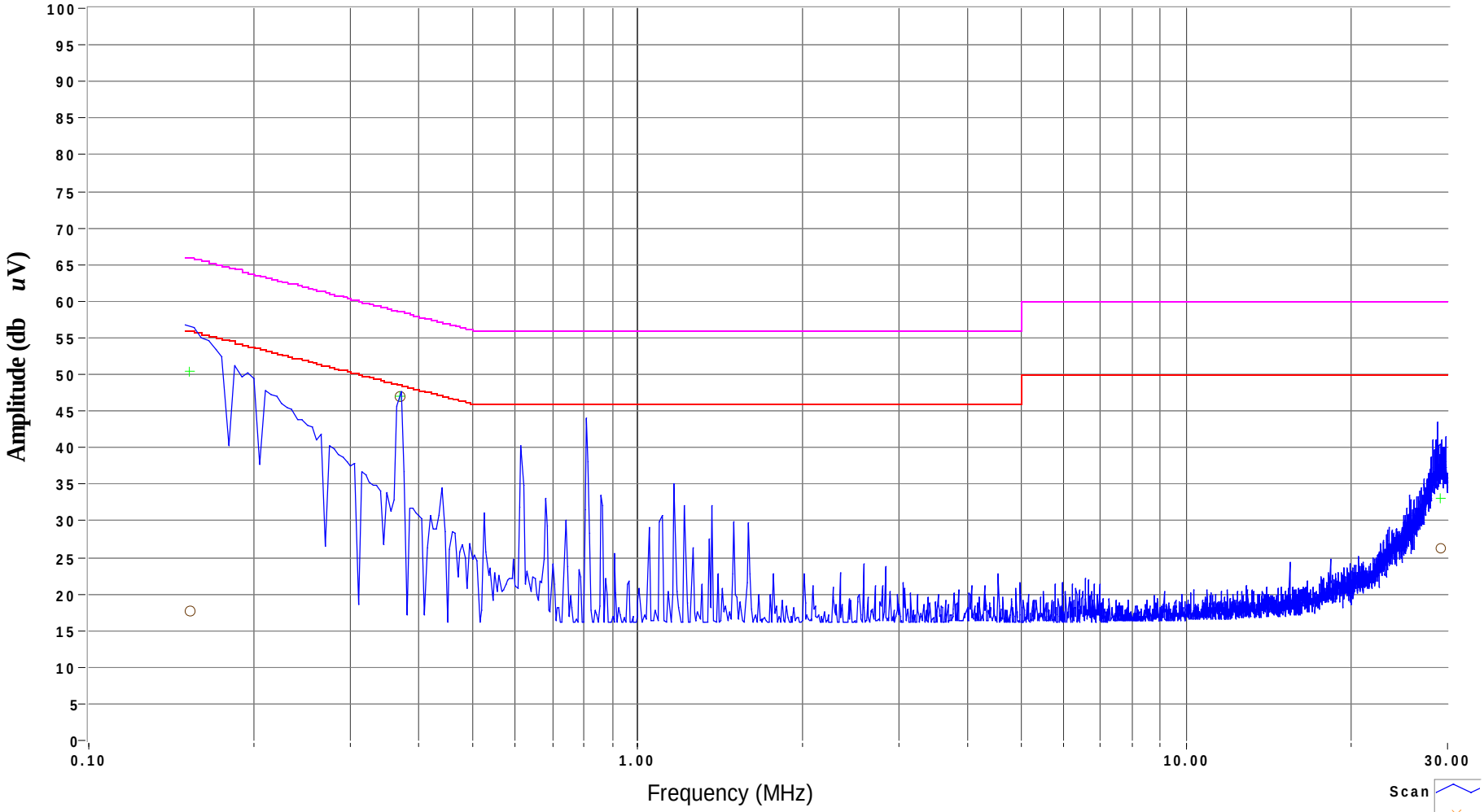
Elliott

SVOATS# 3: Microwave Data Systems EL806-2.4 Run 1

Spec: EN55022B

Mains Lead Neutral

2.4GHz TransNEt module



120Vac, 60Hz

Scan
Peak
Quasi-peak
Average
Average Limit
QuasiPeak Limit

3/17/04

Juan Martinez