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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 Industry Canada RSS 210 Issue 6 Industry Canada RSS-Gen Issue 1 / RSS 310 Issue 1

Intentional Radiator on the Simrex Corp Model: DataMover ESS-II

FCC ID:	T72-DMESSII
UPN:	6492A-DMESSII
GRANTEE:	Simrex Corp 2120 E. Nantuckett Drive Gilbert, AZ. 85234
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	May 2, 2006
FINAL TEST DATE:	November 16, November 17 and November 18, 2005

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

A2LA ACCREDITED
2016-01

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SCOPE

An electromagnetic emissions test has been performed on the Microwave Data Systems model iNETII 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 C63.4:2003 as outlined in Elliott Laboratories test procedures.

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart C requirements for DTS devices

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
RSS-212 Issue 1 Test Facilities and Test Methods for Radio Equipment

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada 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 iNETII and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of Microwave Data Systems.

Testing performed on the Microwave Data Systems model iNETII was considered representative of the Simrex Corp model DataMover ESS-II. The only difference is the paint and other cosmetic changes necessary for rebranding.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section. Certification of these devices is required as a prerequisite to marketing in the US and Canada.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance 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.).

SUMMARY OF RESULTS

DIGITAL TRANSMISSION SYSTEMS (902 – 928 MHz)

FCC Part 15 Reference	RSS Reference	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses DSSS techniques	-	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	649 kHz	>500kHz	Complies
	RSP100	99% Bandwidth	1.5 MHz	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power, 902 – 928 MHz	28.4 dBm (0.74 Watts) EIRP = 2.95 W	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	7.94 dBm / MHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 9.28 GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 9.28 GHz	47.4dBuV/m @ 3710.6 MHz (-6.6dB)	15.207 in restricted bands, all others < -20dBc	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Part 15 Section	RSS 210 Section	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Standard TNC-Type connector. Professional installation required. Not a consumer radio.	Standard rf connectors permitted for professionally installed systems	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	44.8dBuV/m @ 792.160MHz	FCC 15.109 RSSGen Table 1	Complies (-1.2dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	49.6dBuV @ 9.602MHz	Refer to standards	Complies (-0.4dB) Note 2
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations	Refer to OET 65, FCC Part 1 and RSS 102	Complies

Note 2: The device is intended to be operated from a dc power source. Measurements were made on the AC input of the AC-DC power supply used to power the device during testing.

MEASUREMENT UNCERTAINTIES

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

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Simrex Corp. model DataMover ESS-II is a spread spectrum radio, which is a wireless modem that is designed to provide wireless internet access. The device is identical to the Microwave Data Systems iNETII wireless modem with the exception of the enclosure color and the product labels.

Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 14-30Volts, 2 Amps.

The sample was received on November 16, 2005 and tested on November 16, November 17 and November 18, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	iNETII	Wireless Modem	1425430	E5MDS-INETII

OTHER EUT DETAILS

The EUT may use the following antennas:

- Yagi antenna, gain 12dBi or less, such as MDS pn 97-3194A14
- Omni antenna, gains not exceeding 9.2dBi (2dBd), such as MaxRad MFB series.

The antenna connects to the EUT via a non-standard antenna connector, thereby meeting the requirements of FCC 15.203.

The EUT is designed for professional installation, thereby allowing the output power to be set based on the antenna configuration used.

ENCLOSURE

The EUT enclosure is primarily constructed of DIECAST aluminum. It measures approximately 17 cm wide by 11 cm deep by 3 cm high. .

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Topward	3603D	DC Supply	677301	-
Winbook	Winbook XL	PC Laptop	UXI456W3528X83	-
Microwave Data Systems	97-3194A14	Antenna	-	-

No remote support equipment was used during 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)
Ethernet LAN	Laptop	Cat 5	Unshielded	1.0
Com 1	Laptop	Serial	Shielded	3.0
DC Power	DC Power Supply	-	Unshielded	1.0
Link	Antenna	RF Cable	Shilded	3.0

EUT OPERATION DURING TESTING

During emissions testing a ping was exercising the ethernet interface for all radiated spurious measurements. The radio was in receive mode on the specified channel(s) for receiver emissions measurements which were measured with the highest gain Yagi and highest gain Omni antennas, representing the highest gain antennas of each type.

For transmitter emissions measurements the EUT was configured to continuously transmit a modulated signal. For radiated spurious emissions the output power was set to a nominal 24dBm for the measurements with the Yagi antenna connected and a nominal 30dBm for measurements with the omni antenna connected. The purpose of setting the power to the maximum setting for the omni antenna was to cover all lower gain antennas of that type.

PSD and bandwidth measurements were made with the transmitter at the highest compliant power setting (the maximum power setting to comply with the PSD limit of 8dBm/3kHz). Output power measurements were made at the maximum power setting and at the power settings for use with the Yagi antennas and with the omni antennas of gains between 6dBi and 9.2dBi.

ANTENNA REQUIREMENTS

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

MEASUREMENT INSTRUMENTATION

GENERAL INFORMATION

Final test measurements were taken on November 16, November 17 and November 18, 2005 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 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 requirements of ANSI C63.4:2003 and RSS 212.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. 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 or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

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. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak 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, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & 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.

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 or incorporated into the test software.

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 and RSS 212 specify 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.

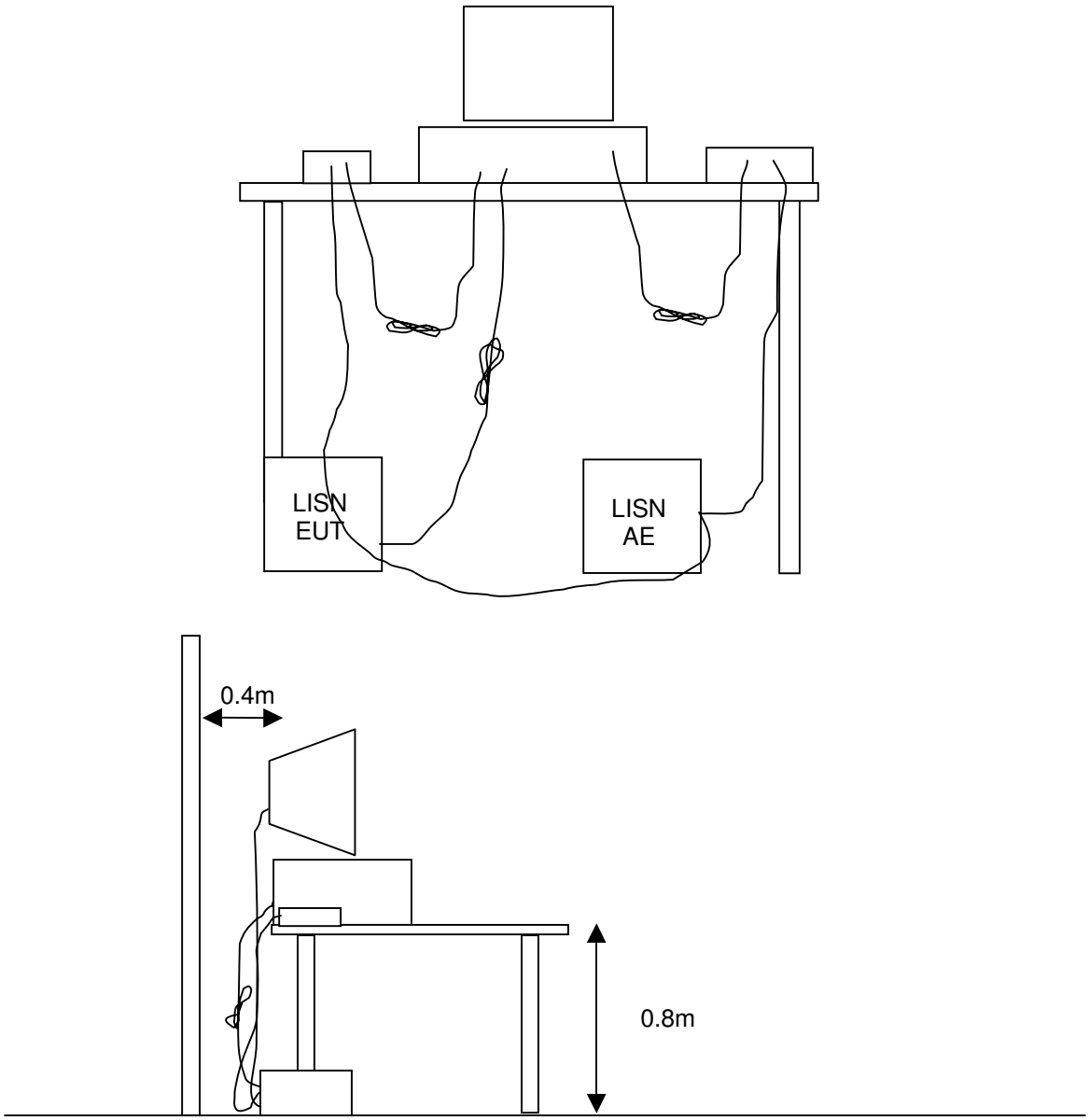
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require 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 C63.4:2003, 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.

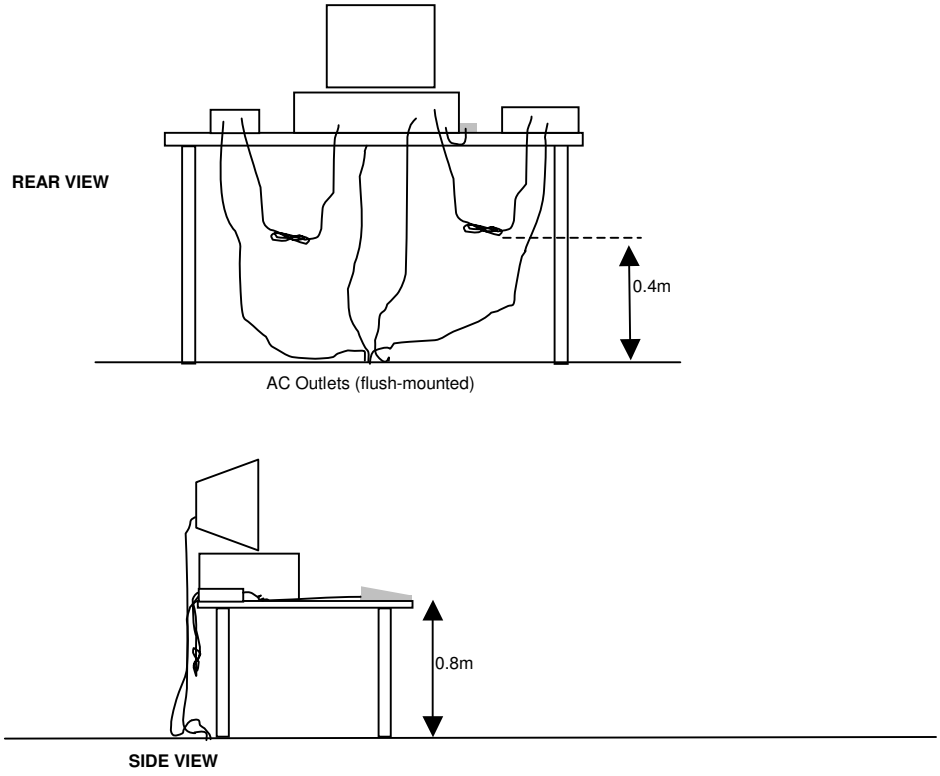


RADIATED EMISSIONS

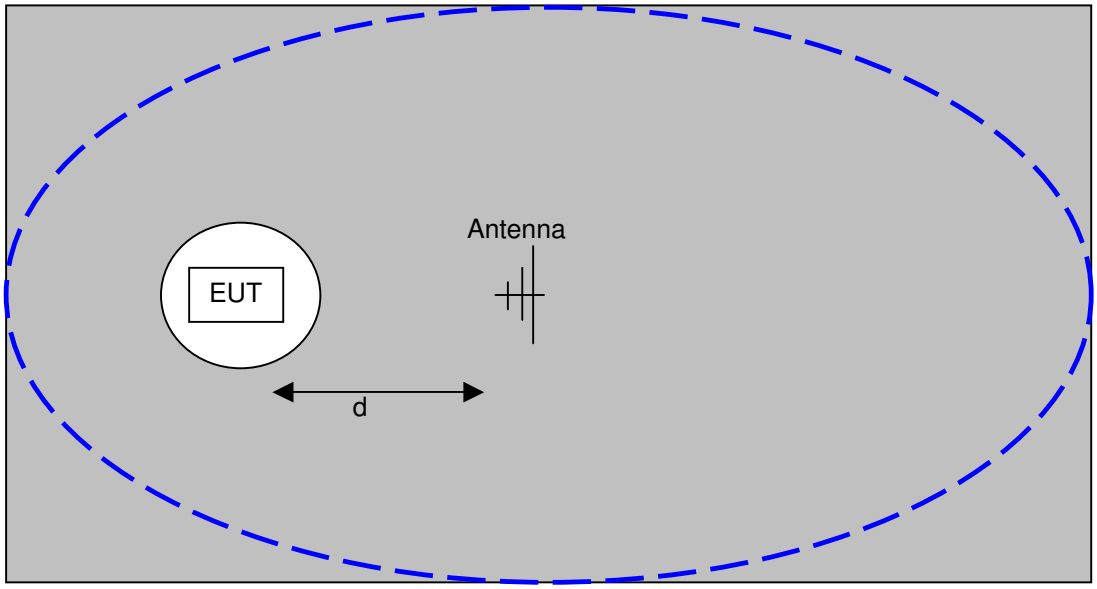
Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation 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. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

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.

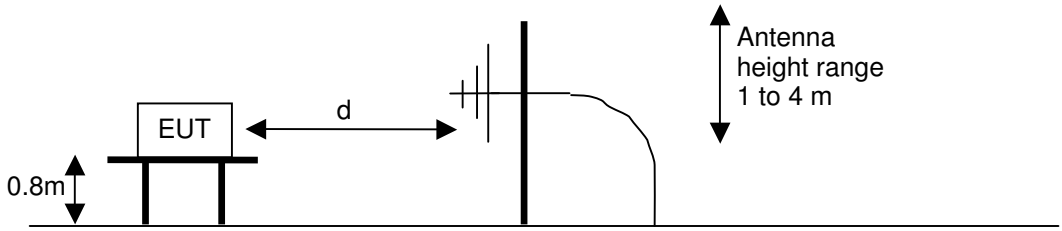
Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna 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.



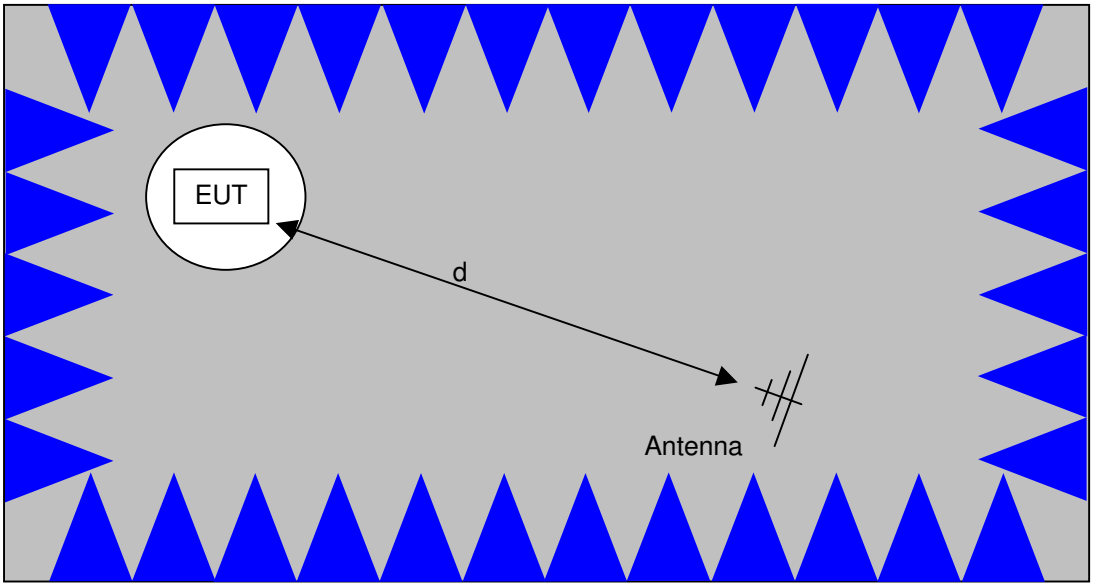
Typical Test Configuration for Radiated Field Strength Measurements



The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.

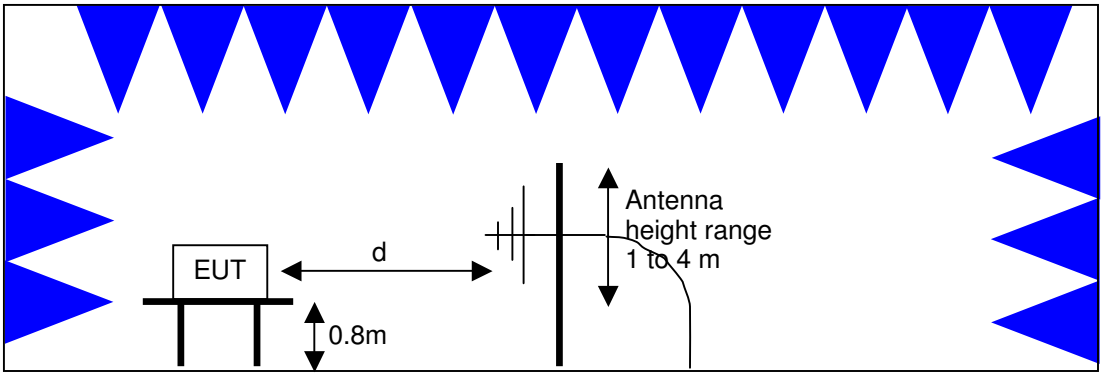


Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

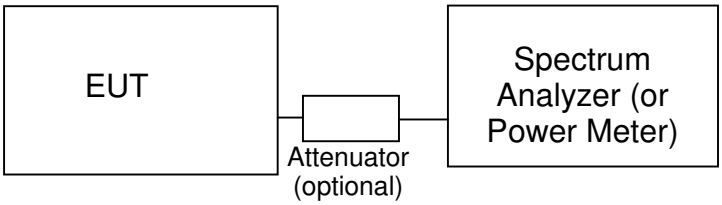
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density 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.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and Elliott's test procedures for the type of radio being tested.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. 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.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

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

GENERAL RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D) and the limits for all emissions for a low power device operating under the general rules of RSS 210, FCC Part 15 Subpart C.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

RECEIVER SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for emissions from the receiver as detailed in FCC Part 15.109, RSS 210 table 2, RSS GEN table 1.

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

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

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)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

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 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

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 above 30MHz, 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

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Conducted Emissions - AC Power Ports, 07-Nov-05
Engineer: Peter Sales

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	08-Jul-06
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	17-Dec-05
Fischer Custom Comm.	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/250-16-2	1079	07-Jul-06
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-May-06
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	11-Feb-06

Radiated Emissions, 30 - 2,000 MHz, 07-Nov-05
Engineer: Peter Sales

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	17-Dec-05
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	13-Jan-06
Filtek	High Pass Filter, 1GHz	HP12/1000-5BA	955	31-Mar-06
EMCO	Horn antenna, D. Ridge 1-18GHz (SA40 system antenna)30Hz sunnyvale	3115	1142	11-Jun-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	30-Mar-07
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-May-06
EMCO	Biconical Antenna, 30-300 MHz	3110B	1497	15-Jun-06

Transmitter and Receiver Spurious Emissions, 30MHz - 10 GHz, 17 and 18-Nov-05
Engineer: Mehran Birgani, Mark Briggs

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	26-Apr-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06
EMCO	Biconical Antenna, 30-300 MHz	3110B	1320	05-Oct-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	30-Mar-07
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-May-06
EMCO	Horn antenna, D. Ridge 1-18GHz	3115	1386	????

Re, 18-Nov-05
Engineer: Mark Briggs

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Horn Antenna D. Ridge 1-18 GHz (SA40 horn)	3115	1386	07-Jul-06

Radiated Emissions, 30 - 5,000 MHz, 18-Nov-05
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	26-Apr-06
Filtek	High Pass Filter, 1GHz	HP12/1000-5BA	957	18-Apr-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	30-Mar-07
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-May-06
EMCO	Horn Antenna D. Ridge 1-18 GHz (SA40 horn)	3115	1386	07-Jul-06

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T61789 34 Pages

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	Test-Log Number:	T61789
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC, FCC 15.247, RSS-210	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Microwave Data Systems

Model

INETII

Date of Last Test: 11/18/2005

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	Test-Log Number:	T61789
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC, FCC 15.247, RSS-210	Class:	B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a wireless modem that is designed to provide wireless internet access. Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 14-30Volts, 2 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	INETII	Wireless Modem	1425430	-

EUT Antenna (Intentional Radiators Only)

The EUT may use the following antennas:

Yagi antenna, gain 12dBi or less, such as MDS pn 97-3194A14

Omni antenna, gains not exceeding 9.2dBi (7dBd), such as MaxRad MFB series

The antenna connects to the EUT via a non-standard antenna connector, thereby meeting the requirements of FCC 15.203. The EUT is designed for professional installation, thereby allowing the output power to be set based on the antenna configuration used.

EUT Enclosure

The EUT enclosure is primarily constructed of DIECAST aluminum. It measures approximately 17 cm wide by 11 cm deep by 3 cm high.

Modification History

Mod. #	Test	Date	Modification
1			

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

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC, FCC 15.247, RSS-210	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Topward	3603D	DC Supply	677301	-
Winbook	Winbook XL	PC Laptop	UXI456W3528X83	-
Microwave Data Systems	97-3194A14	Antenna	-	-

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)
Ethernet LAN	Laptop	Cat 5	Unshielded	1.0
Com 1	Laptop	Serial	Shielded	3.0
DC Power	DC Power Supply	-	Unshielded	1.0
Link	Antenna	RF Cable	Shilded	3.0

Note: The Com 2 port was not connected during testing. The manufacturer stated that these are for Configuration purposes and therefore would not normally be connected.

EUT Operation During Emissions Tests (Digital Device)

During emissions testing a ping was exercising the ethernet interface and the radio was in receive mode on the center channel.

EUT Operation During Emissions Tests (Transceiver)

During emissions testing a ping was exercising the ethernet interface for all radiated spurious measurements. The radio was in receive mode on the specified channel for receiver emissions measurements.

For transmitter emissions measurements the EUT was configured to continuously transmit a modulated signal. For radiated spurious emissions the output power was set to a nominal 24dBm for the measurements with the Yagi antenna connected and a nominal 30dBm for measurements with the omni antenna connected. The purpose of setting the power to the maximum setting for the omni antenna was to cover all lower gain antennas of that type.

PSD and bandwidth measurements were made with the transmitter at the highest compliant power setting (the maximum power setting to comply with the PSD limit of 8dBm/3kHz). Output power measurements were made at the maximum power setting and at the power settings for use with the Yagi antennas and with the omni antennas of gains between 6dBi and 9.2dBi.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Radiated Emissions - Digital Device

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: 11/7/2005
Test Engineer: Pete Sales
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 15Vdc

General Test Configuration

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

The test distance and extrapolation factor (if used) are detailed under each run description.

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: 65 °F
Rel. Humidity: 70 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Preliminary Scan	FCC B	Pass	42.0dBµV/m @ 140.002MHz (-1.5dB)
2	RE, 30 - 1000MHz, Maximized Emissions	FCC B	Pass	42.0dBµV/m @ 140.002MHz (-1.5dB)
3	RE, 1000 - 2000 MHz, Maximized Emissions	FCC B	Pass	38.1dBµV/m @ 1155.0MHz (-15.9dB)

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:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

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

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
140.002	42.0	v	43.5	-1.5	QP	18	1.0	
100.003	39.2	v	43.5	-4.3	QP	327	1.0	
120.005	38.1	h	43.5	-5.4	QP	49	1.6	
160.002	35.6	v	43.5	-7.9	QP	1	1.0	
160.002	35.3	h	43.5	-8.2	QP	71	2.1	
150.002	32.6	h	43.5	-10.9	QP	77	2.1	
100.002	32.5	h	43.5	-11.0	QP	91	1.7	
150.001	32.0	v	43.5	-11.5	QP	27	1.0	
380.003	34.2	v	46.0	-11.8	QP	10	1.1	

Run #2: Maximized Readings From Run #1

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
140.002	42.0	v	43.5	-1.5	QP	18	1.0	
100.003	39.2	v	43.5	-4.3	QP	327	1.0	
120.005	38.1	h	43.5	-5.4	QP	49	1.6	
160.002	35.6	v	43.5	-7.9	QP	1	1.0	
160.002	35.3	h	43.5	-8.2	QP	71	2.1	
150.002	32.6	h	43.5	-10.9	QP	77	2.1	

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Run #3: Maximized readings, 1000 - 2000 MHz

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1154.980	38.1	v	54.0	-15.9	Avg	150	1.0	
1430.120	37.5	h	54.0	-16.5	Avg	181	1.0	
1122.615	37.3	v	54.0	-16.7	Avg	131	1.0	
1099.880	36.6	v	54.0	-17.4	Avg	192	1.0	
1002.370	34.2	v	54.0	-19.8	Avg	187	1.0	
1100.075	33.5	h	54.0	-20.5	Avg	149	1.0	
1100.075	51.0	h	74.0	-23.0	Pk	149	1.0	
1430.120	44.5	h	74.0	-29.5	Pk	181	1.0	
1154.980	44.2	v	74.0	-29.8	Pk	150	1.0	
1122.615	43.9	v	74.0	-30.1	Pk	131	1.0	
1099.880	43.3	v	74.0	-30.7	Pk	192	1.0	
1002.370	42.8	v	74.0	-31.2	Pk	187	1.0	

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	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: 11/7/2005
Test Engineer: Pete Sales
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: 13.8Vdc

General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located approximately 30 meters from the test area.

Ambient Conditions:

Temperature: 65 °F
Rel. Humidity: 70 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	EN 55022 B	Pass	49.6dBµV @ 9.602MHz (-0.4dB)

Modifications Made During Testing:

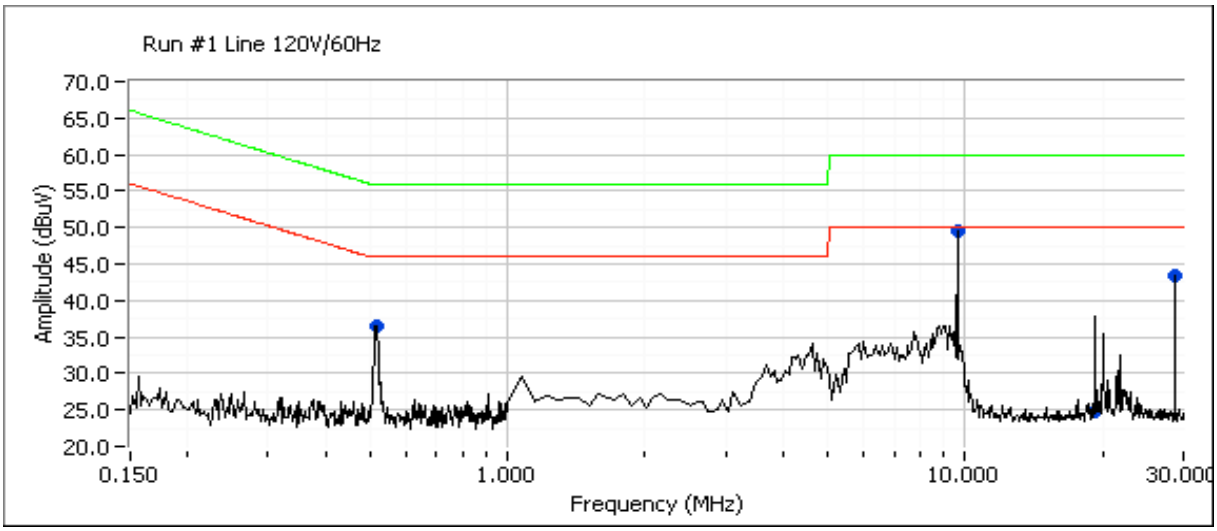
No modifications were made to the EUT during testing

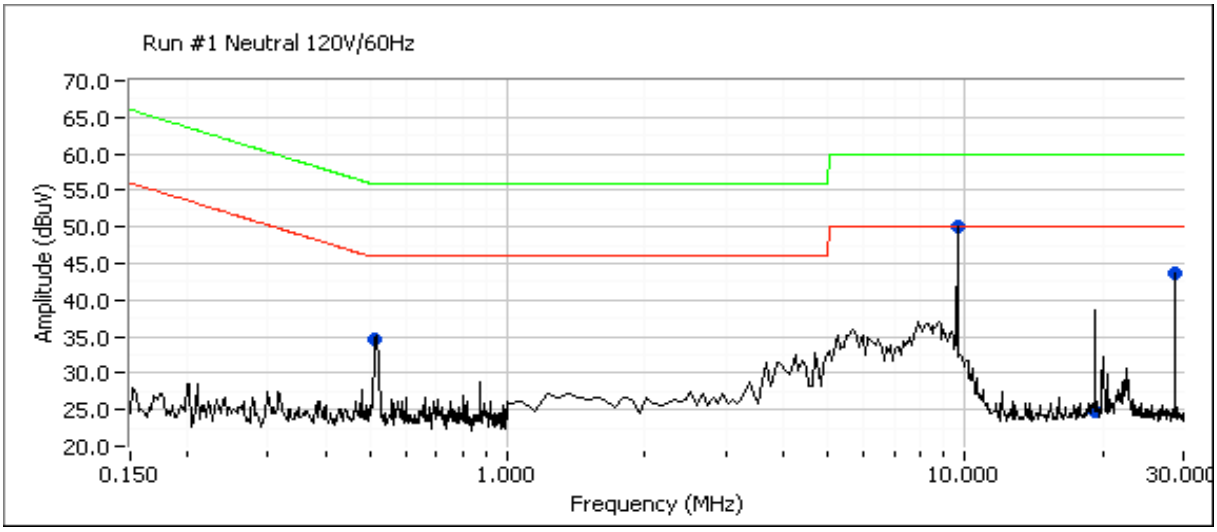
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Do not Use for final report, for Elliott documentation only.
Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Testing DC power supply AC input, Tx mode. Middle Channel 915





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

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Frequency	Level	AC	FCC B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
9.602	49.6	Neutral	50.0	-0.4	Average	
9.602	49.3	Line	50.0	-0.7	Average	
28.806	43.8	Neutral	50.0	-6.2	Average	
28.806	43.5	Line	50.0	-6.5	Average	
9.602	49.7	Neutral	60.0	-10.3	QP	
9.602	49.1	Line	60.0	-10.9	QP	
0.515	33.6	Line	46.0	-12.4	Average	
19.203	37.3	Neutral	50.0	-12.7	Average	
28.806	43.9	Neutral	60.0	-16.1	QP	
28.806	43.4	Line	60.0	-16.6	QP	
0.515	35.1	Line	56.0	-20.9	QP	
19.203	37.4	Neutral	60.0	-22.6	QP	

Note - Transmit mode was the worst-case mode for AC conducted emissions. Receive mode had lower or similar emissions levels.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

FCC 15.247 DTS - Power and Bandwidth

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: 11/16/2005
Test Engineer: Jmartinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 15VDC

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.

Ambient Conditions:

Temperature: 15 °C
Rel. Humidity: 47 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Antenna port spurious	15.247(a)	Pass	All spurious signals more than -30dBc
2	Bandwidth	15.247(a)	Pass	6dB: 649kHz 99%: 1.514MHz
3	Output Power at highest power setting	15.247(b)	Pass	Refer to run
4	Power Spectral Density (PSD) at highest power setting	15.247(d)	Pass	7.94dBm/3kHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

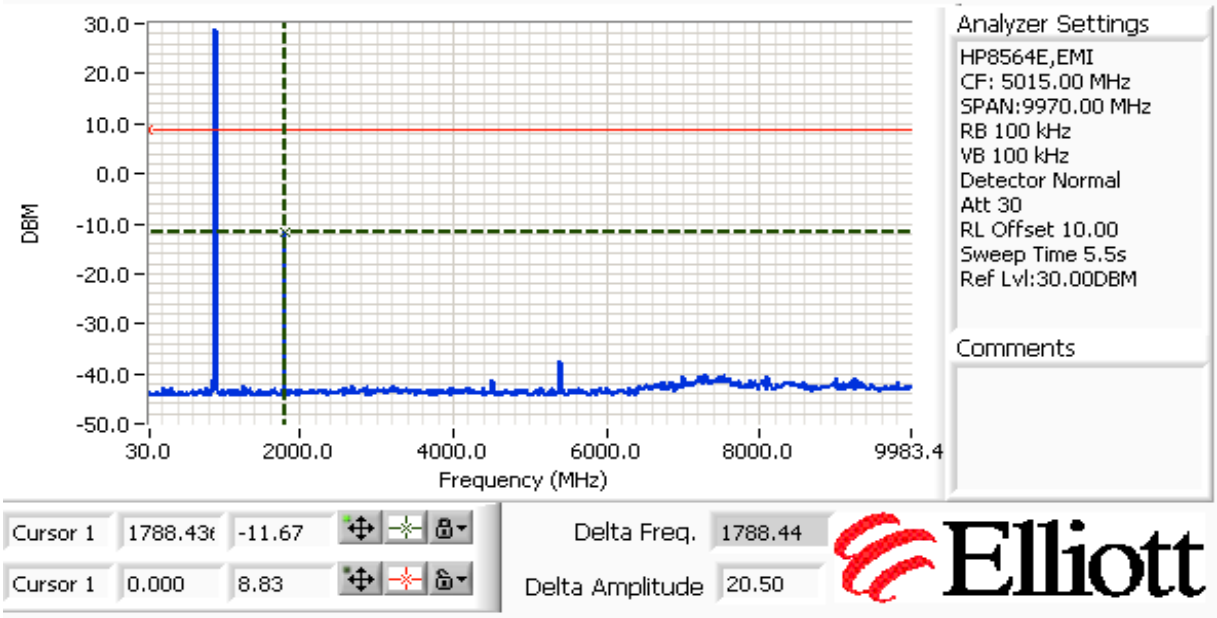
Deviations From The Standard

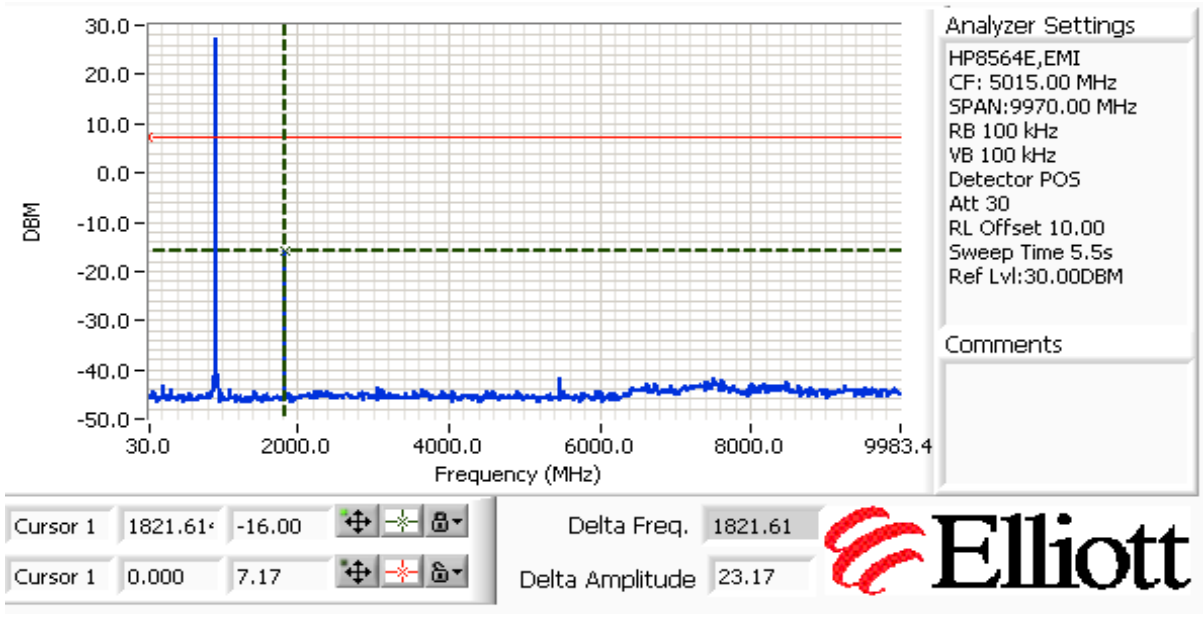
No deviations were made from the requirements of the standard.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

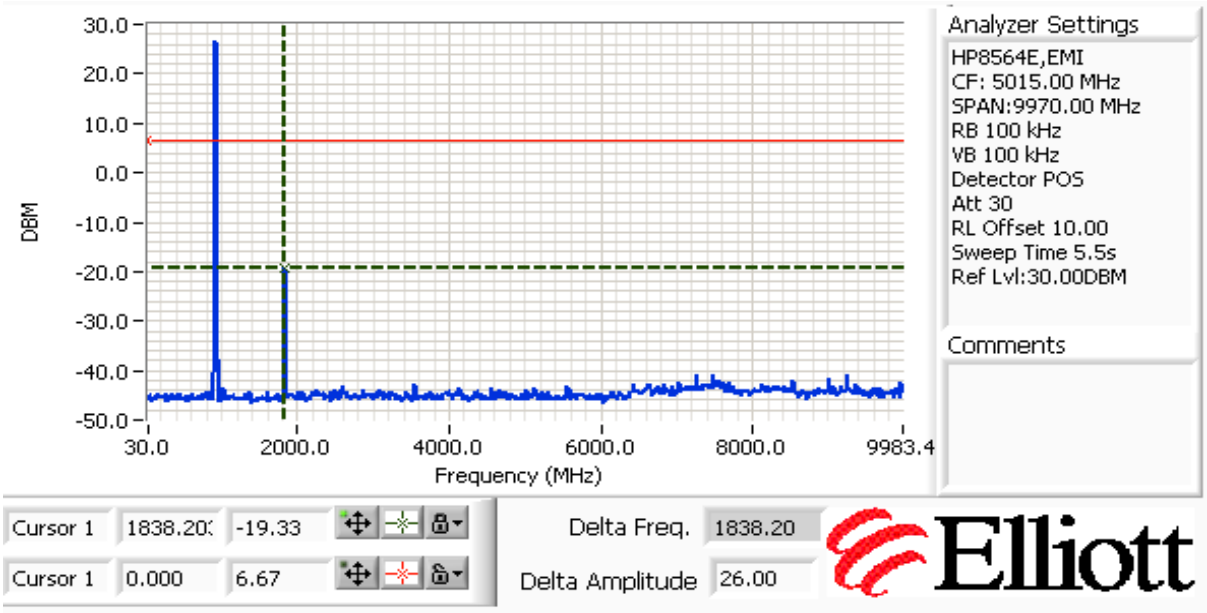
Run #1d: Antenna Conducted Spurious Emissions, 30 - 26 MHz.

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.





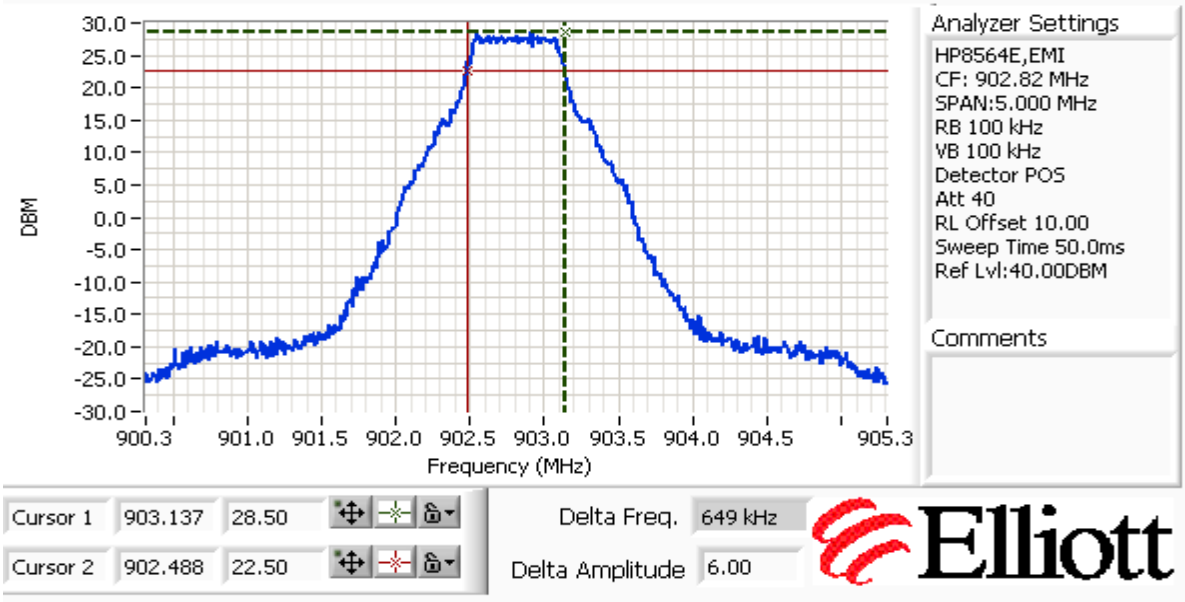
Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A



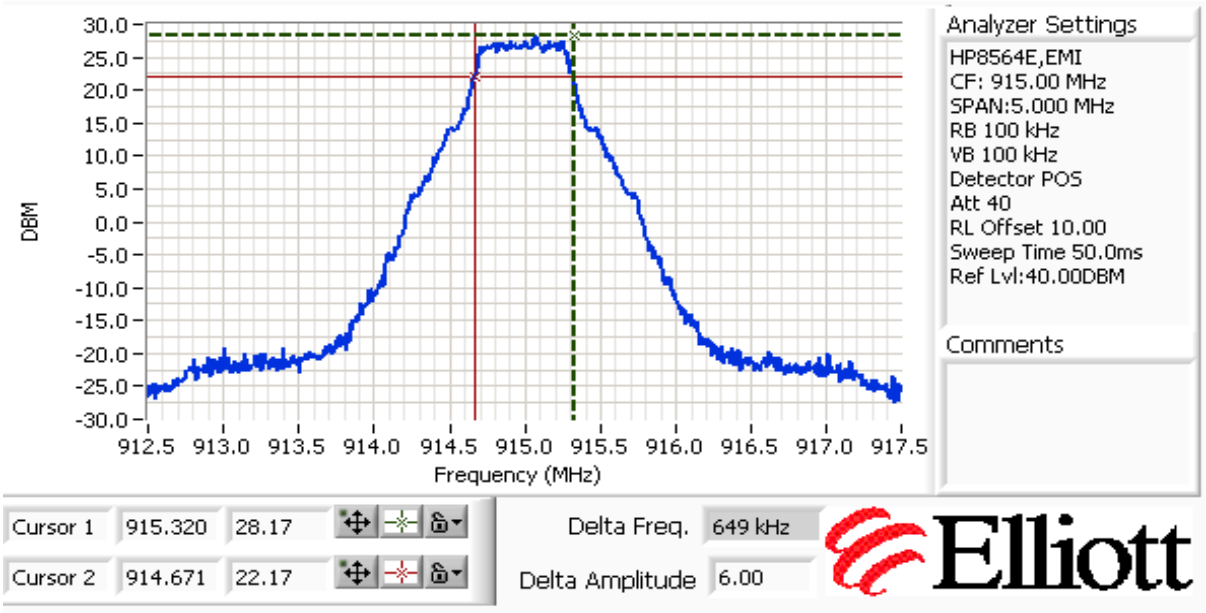
Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

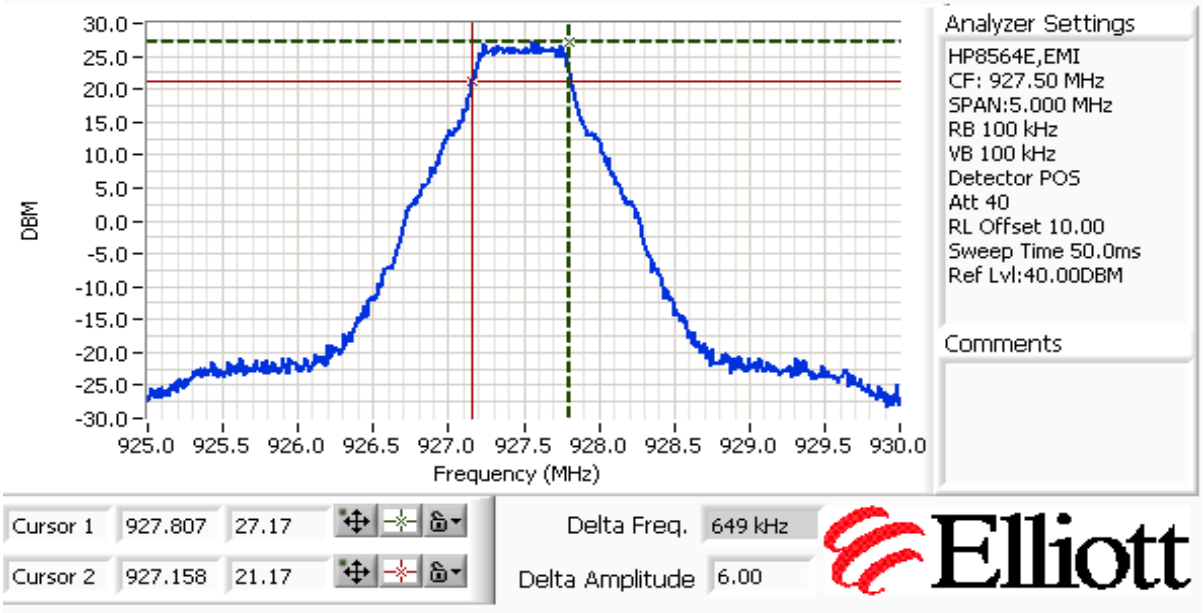
Run #2: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	99% Signal Bandwidth
29	902	100 kHz	649 kHz	1.514 MHz
30	915	100 kHz	649 kHz	1.431 MHz
30	927	100 kHz	649 kHz	1.464 MHz

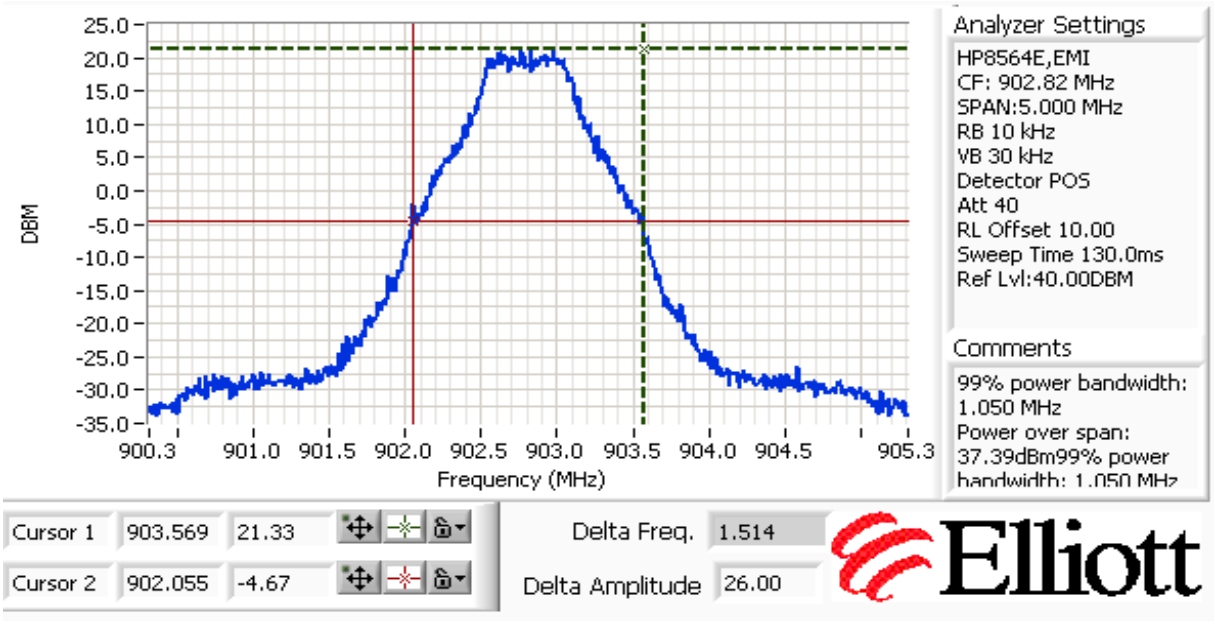


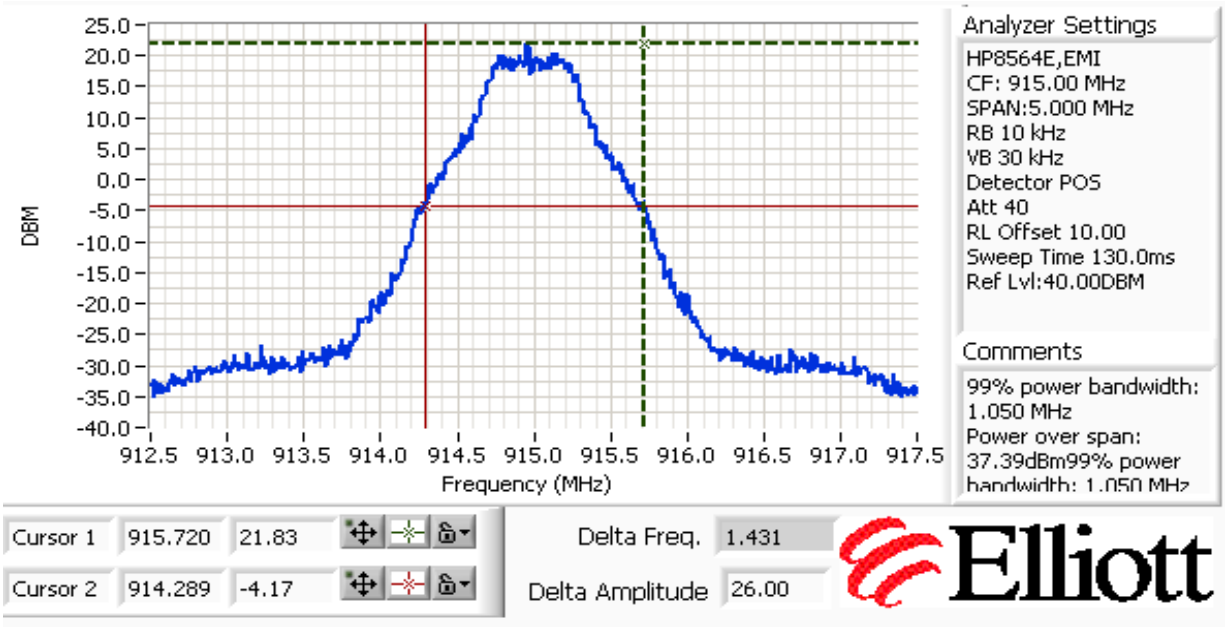
Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A





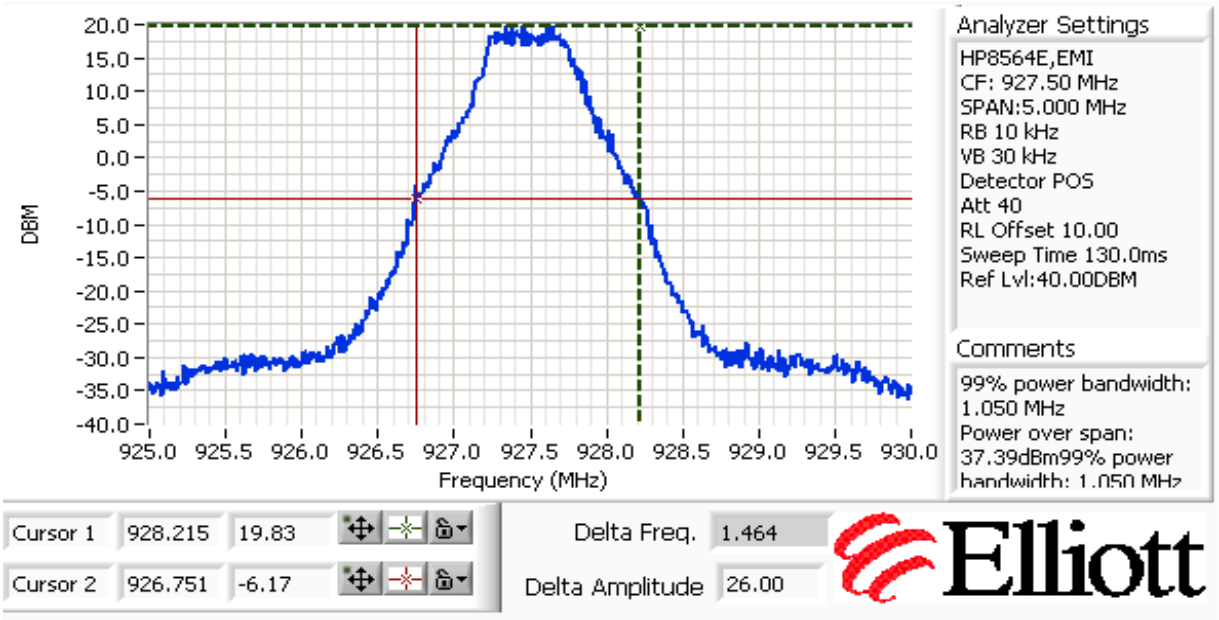
Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A





EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A



Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Run #3: Output Power

Maximum antenna gain: 12.2 dBi (10dBd)

This setting used for Yagi antennas with gains not exceeding 12.2dBi

Power Setting	Frequency (MHz)	Output Power Note 1		EIRP	Peak Power Note 2	
		dBm	W	W	dBm	W
20	902.8165	23.7	0.234	3.890	23.7	0.234
24	915.0000	23.8	0.240	3.981	23.8	0.240
26	927.5035	23.6	0.229	3.802	23.7	0.234

Maximum antenna gain: 9.2 dBi (7dBd) Power max = 26.8dBm

This setting used for omni antennas with gains above 6dBi but not exceeding 9.2dBi)

Power Setting	Frequency (MHz)	Output Power Note 1		EIRP	Peak Power Note 2	
		dBm	W	W	dBm	W
25	902.8165	26.1	0.407	3.388	26.0	0.398
26	915.0000	26.6	0.457	3.802	26.6	0.457
26	927.5035	26.6	0.457	3.802	26.7	0.468

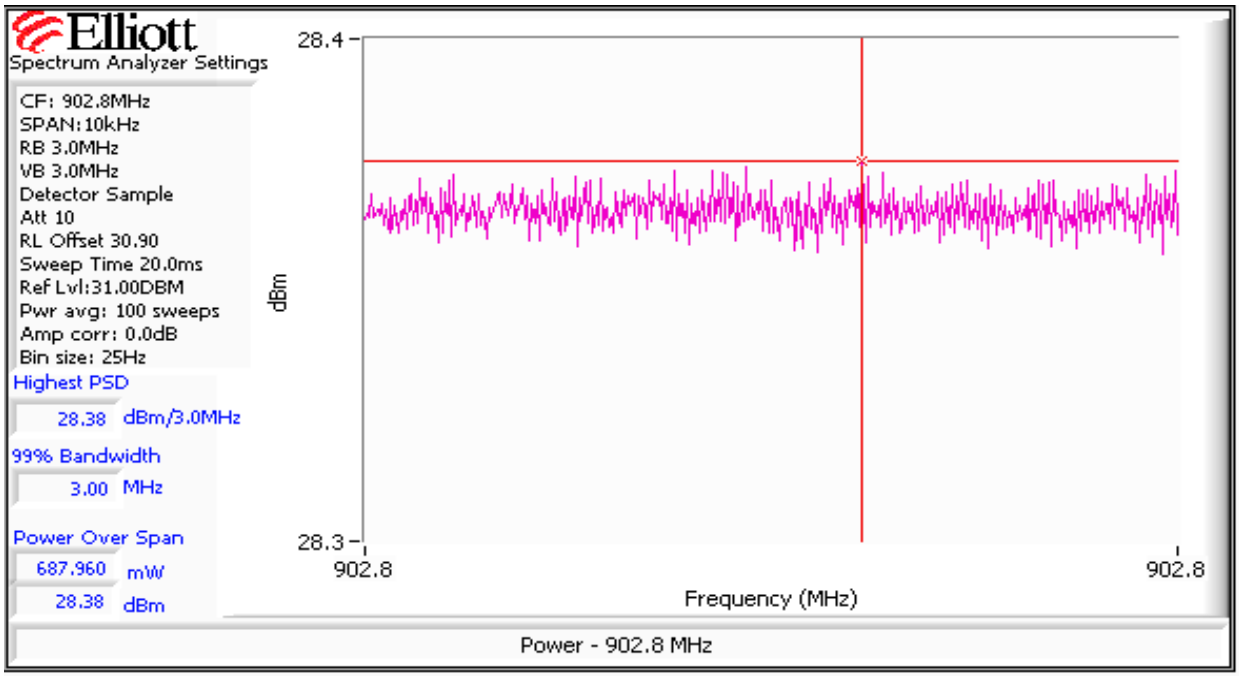
Maximum antenna gain: 6 dBi

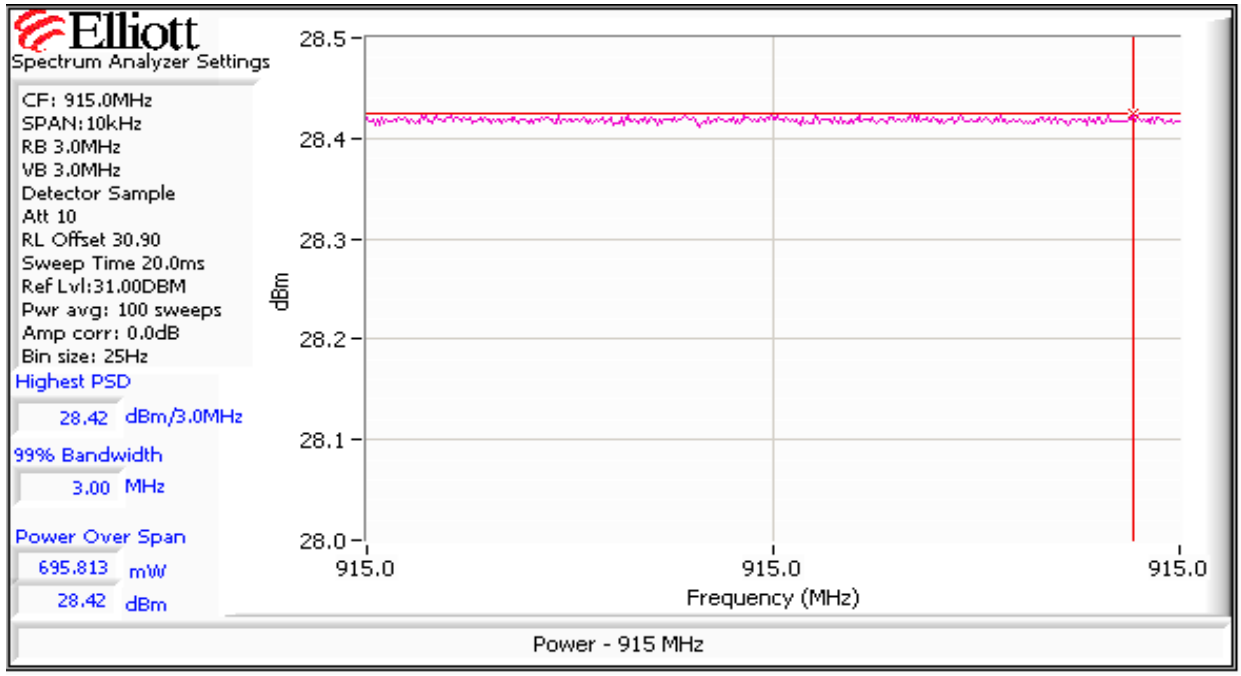
This setting used for omni antennas with gains of 6dBi or less and is the highest output power setting available.

Power Setting	Frequency (MHz)	Output Power Note 1		EIRP	Peak Power Note 2	
		dBm	W	W	dBm	W
28	902.8165	28.4	0.692	2.754	28.3	0.676
29	915.0000	28.4	0.692	2.754	28.3	0.676
29	927.5035	28.7	0.741	2.951	28.7	0.741

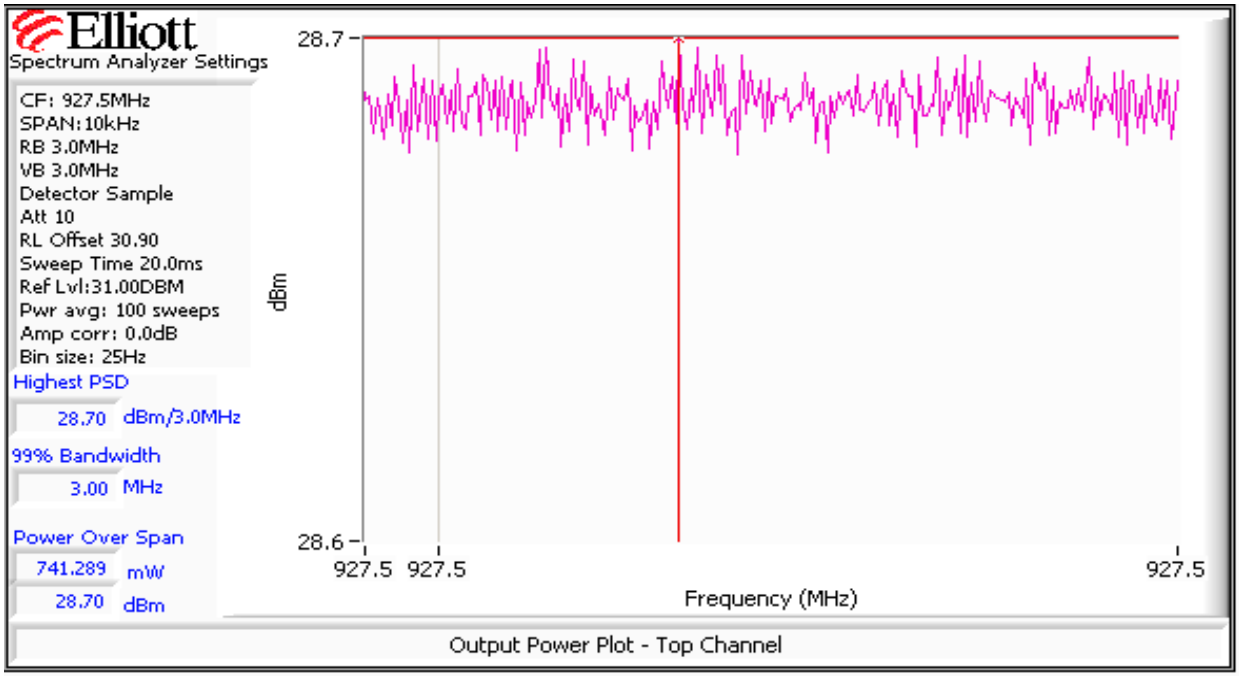
Note 1:	Output power measured using a spectrum analyzer, zero span, sample detector and RB = VB= 3MHz and power averaging over 100 sweeps (knowledge database reference 558074, option 2, method 2). [Note actual span is 10kHz to allow power averaging to be enabled]. Plots are provided for the highest output power setting only.
Nbote 2:	Output power measured with RB=VB=3MHz, peak detector for reference only
Note 3:	The output power is different depending on the antennas used. Yagi antennas are limited to the output power in the first table. The omni antennas with gains between 6dBi and 9.2dBi are limited to the output power in the center table. The Omni antennas with a gain not exceeding 6dBi (4.8dBd) the maximum output power is detailed in the last table. Note that the spurious emissions for all of the omni range of antennas are covered by the spurious tests performed on the highest gain omni antenna as these tests were performed with the output power set to the maximum permitted.
Note 4:	Output power for antennas with 6dBi of gain or less is limited to the values in the table above to ensure compliance with the limits for PSD.
Note 5:	Power setting is the setting used in the control software to set the output power with the software confiougred for "cal on" and "pwrctrl off" and are provided for reference purposes only.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A





Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

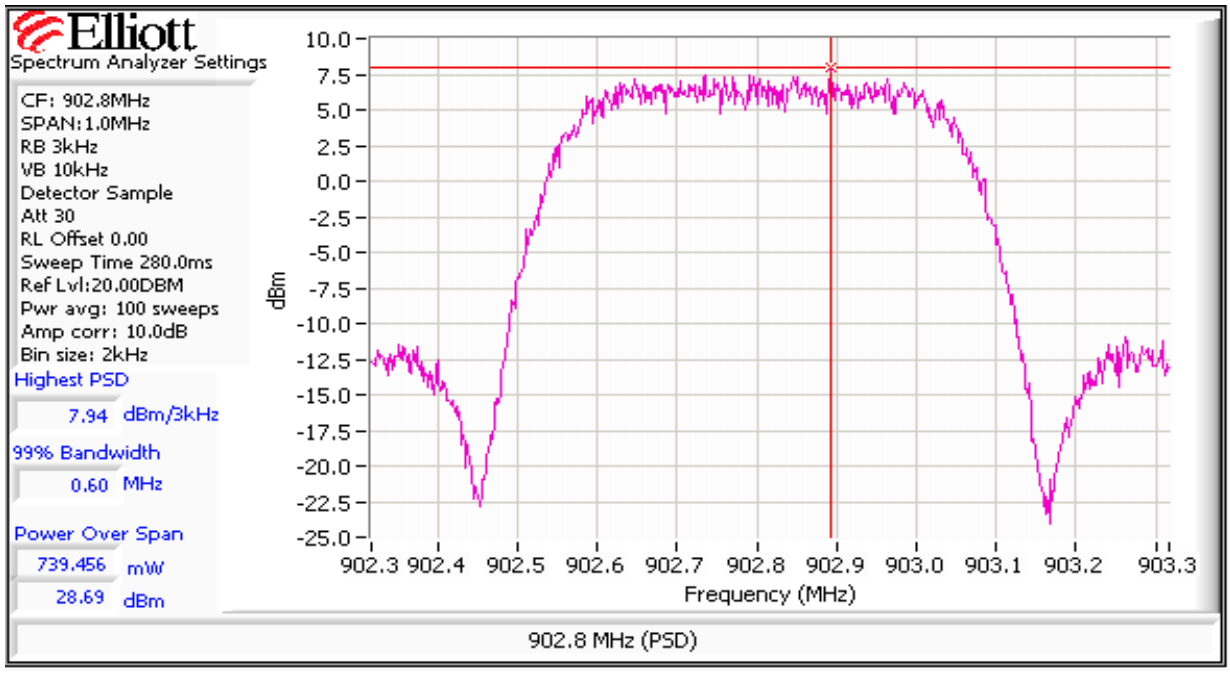


Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

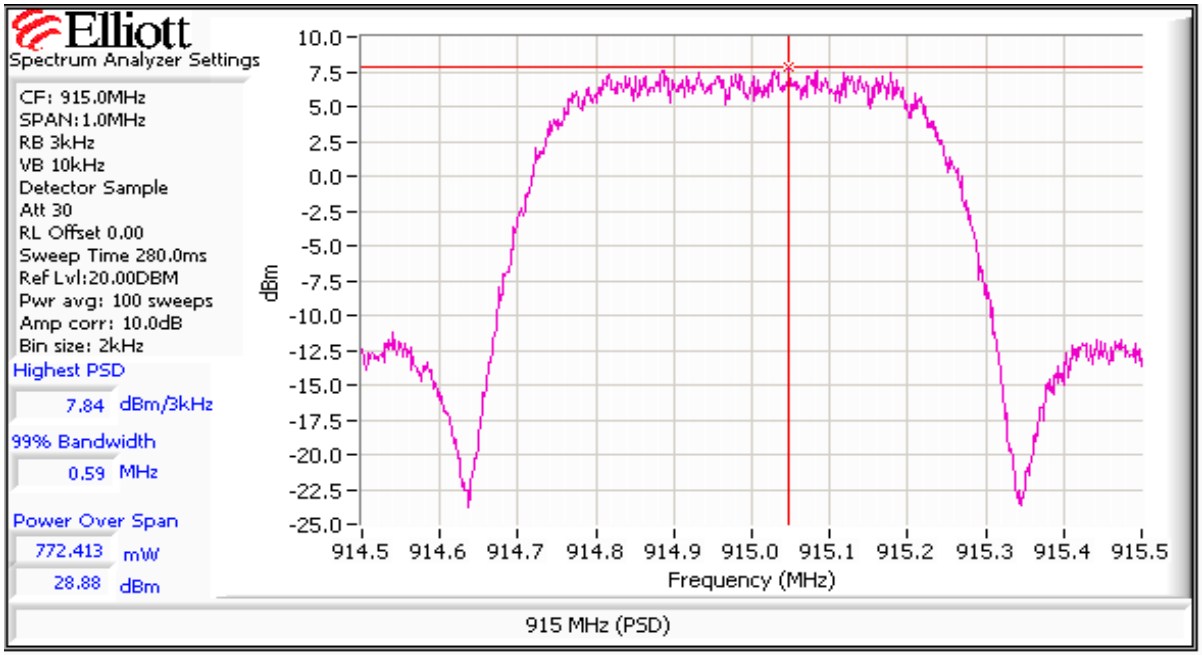
Run #4: Power Spectral Density

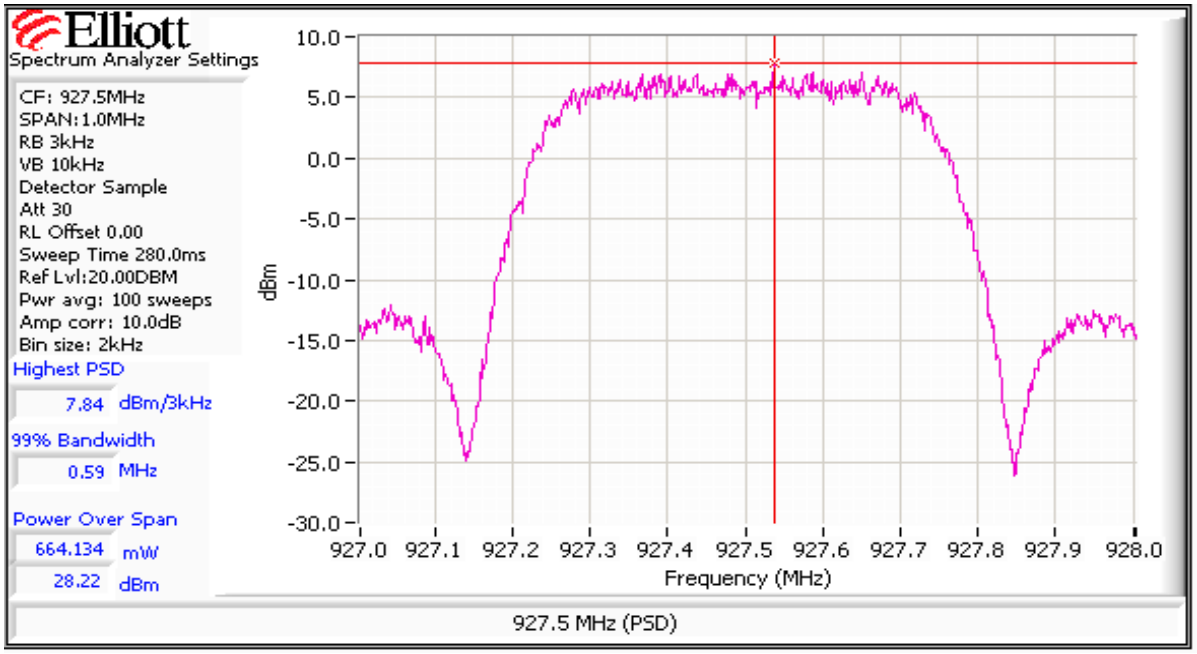
Power Setting	Operating Frequency (MHz)	Freq. @ PPSD	Res BW	P.S.D. (dBm/3kHz)
29	902	902.88	3kHz	7.94
30	915	915.05	3kHz	7.84
30	927	927.52	3kHz	7.84

Note 1:	Freq. @ PPSD: Frequency of the Peak Power Spectral Density (PPSD)
Note 2:	Power spectral density measured using RB=3 kHz, VB=10kHz and power averaging enabled over 100 sweeps option 2 detailed in the FCC knowledge database). The same basic method (i.e. power averaging) was used for the measurement of output power.
Note 3:	Power spectral density was measured at the highest output power setting.



Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A





Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Transmitter Spurious Emissions - 10dBd Yagi Antenna

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: 11/17/2005
Test Engineer: Mehran Birgani
Test Location: SVOATS #2
Config. Used: 1
Config Change: EUT power set to a nominal 24dBm
EUT Voltage: 15V dc

General Test Configuration

The EUT was 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: 12 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1b	RE, 30 - 10000 MHz Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	44.2dBµV/m @ 3659.9MHz (-9.8dB)

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:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 10000 MHz. Low Channel @ 902.817 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3611.229	42.7	V	54.0	-11.3	AVG	4	1.0	
2708.420	39.7	V	54.0	-14.3	AVG	20	1.0	
2708.517	38.1	H	54.0	-15.9	AVG	324	1.0	
3611.229	51.5	V	74.0	-22.5	PK	4	1.0	
2708.420	49.2	V	74.0	-24.8	PK	20	1.0	
2708.517	47.5	H	74.0	-26.6	PK	324	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.

Run #1b: Radiated Spurious Emissions, 30 - 10000 MHz. Center Channel @ 915.000 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3659.925	44.2	H	54.0	-9.8	AVG	21	1.0	
2744.985	42.5	H	54.0	-11.5	AVG	21	1.0	
2745.045	37.7	V	54.0	-16.4	AVG	34	1.0	
3659.925	52.7	H	74.0	-21.3	PK	21	1.0	
2744.985	50.1	H	74.0	-23.9	PK	21	1.0	
2745.045	48.6	V	74.0	-25.4	PK	34	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.

Run #1c: Radiated Spurious Emissions, 30 - 10000 MHz. High Channel @ 927.504 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3710.066	44.2	H	54.0	-9.8	AVG	55	1.0	
2782.540	39.9	H	54.0	-14.1	AVG	30	1.0	
2782.390	38.4	V	54.0	-15.6	AVG	140	1.0	
3710.066	51.5	H	74.0	-22.5	PK	55	1.0	
2782.540	49.0	H	74.0	-25.1	PK	30	1.0	
2782.390	48.5	V	74.0	-25.5	PK	140	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Radiated Emissions - 10 dBd Yagi Antenna

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: 11/18/2005
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 15V dc

General Test Configuration

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

The test distance and extrapolation factor (if used) are detailed under each run description.

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: 21 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	44.8dBµV/m @ 792.160MHz (-1.2dB)
2	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	46.5dBµV/m @ 2410.7MHz (-7.5dB)
3	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	41.4dBµV/m @ 816.806MHz (-4.6dB)

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:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Run #1: Maximized readings, 30 - 5000 MHz (Rx Mode, Low Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
792.160	44.8	H	46.0	-1.2	QP	275	1.1	
792.116	42.3	V	46.0	-3.7	QP	60	1.1	
2375.110	44.1	H	54.0	-9.9	Pk	120	1.0	Pk Reading average limit
2377.328	43.8	V	54.0	-10.2	Pk	100	1.0	Pk Reading average limit
1584.356	41.3	V	54.0	-12.7	Pk	0	1.0	Pk Reading average limit
1583.839	41.1	H	54.0	-12.9	Pk	0	1.0	Pk Reading average limit

Run #2: Maximized readings, 30 - 5000 MHz (Rx Mode, Center Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2410.663	46.5	H	54.0	-7.5	Pk	16	1.9	Pk Reading average limit
2410.685	42.7	V	54.0	-11.3	Pk	0	1.0	Pk Reading average limit
1606.200	42.1	V	54.0	-11.9	Pk	19	1.0	Pk Reading average limit
1606.543	41.6	H	54.0	-12.4	Pk	20	2.1	Pk Reading average limit
803.650	32.1	H	46.0	-13.9	QP	60	1.0	
803.650	31.7	V	46.0	-14.3	QP	15	1.1	

Run #3: Maximized readings, 30 - 5000 MHz (Rx Mode, High Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
816.806	41.4	H	46.0	-4.6	QP	30	1.0	
816.806	39.0	V	46.0	-7.0	QP	180	1.3	
2450.032	43.9	H	54.0	-10.1	Pk	0	2.4	Pk Reading average limit
1633.925	43.8	H	54.0	-10.2	Pk	15	2.5	Pk Reading average limit
2449.245	43.7	V	54.0	-10.3	Pk	0	1.0	Pk Reading average limit
1632.418	42.2	V	54.0	-11.8	Pk	145	1.0	Pk Reading average limit

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Radiated Emissions - 7 dBd Omni Antenna

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: 11/18/2005
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 15V dc

General Test Configuration

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

The test distance and extrapolation factor (if used) are detailed under each run description.

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: 21 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	40.9dBµV/m @ 792.116MHz (-5.1dB)
2	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	44.5dBµV/m @ 2410.1MHz (-9.5dB)
3	RE, 30 - 5000MHz, Maximized Emissions	FCC Class B	Pass	42.1dBµV/m @ 816.806MHz (-3.9dB)

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:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Run #1: Maximized readings, 30 - 5000 MHz (Rx Mode, Low Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
792.116	40.9	V	46.0	-5.1	QP	230	1.0	
792.160	39.8	H	46.0	-6.2	QP	313	1.0	
2375.032	46.0	H	54.0	-8.0	Pk	161	1.0	Pk Reading average limit
2377.395	45.7	V	54.0	-8.3	Pk	360	1.0	Pk Reading average limit
1583.833	41.3	H	54.0	-12.7	Pk	360	1.0	Pk Reading average limit
1584.335	41.1	V	54.0	-12.9	Pk	0	1.0	Pk Reading average limit

Run #2: Maximized readings, 30 - 5000 MHz (Rx Mode, Center Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2410.070	44.5	H	54.0	-9.5	PK	0	1.0	Pk Reading average limit
2410.625	43.2	V	54.0	-10.8	Pk	0	1.0	Pk Reading average limit
1606.125	42.5	V	54.0	-11.5	Pk	139	1.0	Pk Reading average limit
1607.225	41.9	H	54.0	-12.1	PK	158	1.0	Pk Reading average limit
803.650	32.1	H	46.0	-13.9	QP	60	1.0	
803.650	31.7	V	46.0	-14.3	QP	15	1.1	

Run #3: Maximized readings, 30 - 5000 MHz (Rx Mode, High Channel)

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
816.806	42.1	H	46.0	-3.9	QP	181	1.2	
816.806	41.4	V	46.0	-4.6	QP	322	1.0	
2451.157	43.7	H	54.0	-10.3	Pk	120	1.0	Pk Reading average limit
2449.207	43.7	V	54.0	-10.3	Pk	360	1.0	Pk Reading average limit
1634.255	42.8	H	54.0	-11.2	Pk	0	1.0	Pk Reading average limit
1632.178	41.7	V	54.0	-12.3	Pk	275	1.0	Pk Reading average limit

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Transmitter Spurious Emissions - 7dBd Yagi Antenna

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: 11/18/2005
Test Engineer: Mark Briggs
Test Location: SVOATS #2
Config. Used: 1
Config Change: EUT power set to 30dBm
EUT Voltage: 15V dc

General Test Configuration

The EUT was 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: 17 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 30 - 10000 MHz Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	47.4dBµV/m (233.3µV/m) @ 3710.6MHz (-6.6dB)

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:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 10000 MHz. Low Channel @ 902.817 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3611.575	43.1	V	54.0	-10.9	AVG	9	1.2	
3610.525	42.1	H	54.0	-11.9	AVG	7	2.5	
2708.428	40.4	H	54.0	-13.6	AVG	24	1.0	
2708.128	39.9	V	54.0	-14.1	AVG	351	1.0	
3610.525	54.5	H	74.0	-19.5	PK	7	2.5	
1805.926	78.2	V	98.0	-19.8	Pk(100k)	2	2.0	
3611.575	54.0	V	74.0	-20.0	PK	9	1.2	
2708.428	51.8	H	74.0	-22.2	PK	24	1.0	
1805.933	75.4	H	98.0	-22.6	Pk(100k)	9	1.0	
2708.128	50.2	V	74.0	-23.8	PK	351	1.0	
902.817	128.0	V	-	-	Peak	17	1.2	100kHz RBW - fundamental signal

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.

Run #1b: Radiated Spurious Emissions, 30 - 10000 MHz. Center Channel @ 915.000 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3659.280	45.1	V	54.0	-8.9	AVG	345	1.0	
3660.383	43.7	H	54.0	-10.3	AVG	11	1.0	
4574.753	42.8	V	54.0	-11.2	AVG	0	1.0	Noise floor
2744.625	39.4	H	54.0	-14.6	AVG	44	1.0	
2744.565	39.3	V	54.0	-14.7	AVG	43	1.0	
2744.625	54.8	H	74.0	-19.2	PK	44	1.0	
3659.280	54.7	V	74.0	-19.3	PK	345	1.0	
1829.693	74.3	V	94.0	-19.7	Pk(100k)	360	2.0	
3660.383	53.8	H	74.0	-20.2	PK	11	1.0	
4574.753	53.2	V	74.0	-20.8	PK	0	1.0	Noise floor
2744.565	50.0	V	74.0	-24.0	PK	43	1.0	
1829.685	68.2	H	94.0	-25.8	Pk(100k)	14	1.4	
902.817	124.0	V	-	-	Peak	8	1.0	100kHz RBW - fundamental signal

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 10000 MHz. High Channel @ 927.504 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3710.555	47.4	V	54.0	-6.6	AVG	15	1.1	
3710.330	44.8	H	54.0	-9.2	AVG	336	1.0	
2782.065	39.3	H	54.0	-14.7	AVG	19	1.0	
2782.275	38.5	V	54.0	-15.5	AVG	314	1.0	
3710.555	56.5	V	74.0	-17.5	PK	15	1.1	
3710.330	54.6	H	74.0	-19.4	PK	336	1.0	
1855.248	71.8	V	92.0	-20.2	Pk(100k)	19	1.0	
2782.065	49.4	H	74.0	-24.6	PK	19	1.0	
2782.275	48.8	V	74.0	-25.3	PK	314	1.0	
1855.263	65.7	H	92.0	-26.3	Pk(100k)	10	1.2	
902.817	122.0	V	-	-	Peak	5	1.0	100kHz RBW - fundamental signal

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and is based on a peak measurement in 100kHz bandwidth.
Note 2:	There were no signals related to the transmitter in the restricted band that starts at 960MHz.

Elliott

EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	Test-Log Number:	T61789
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC, FCC 15.247, RSS-210	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Microwave Data Systems

Model

INETII

Date of Last Test: 11/18/2005

Client:	Microwave Data Systems	Job Number:	J61736
Model:	INETII	T-Log Number:	T61789
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC, FCC 15.247, RSS-210	Class:	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: 11/7/2005
Test Engineer: Pete Sales
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 13.8Vdc

General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located approximately 30 meters from the test area.

Ambient Conditions:

Temperature: 65 °F
Rel. Humidity: 70 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	EN 55022 B	Pass	49.6dBµV @ 9.602MHz (-0.4dB)

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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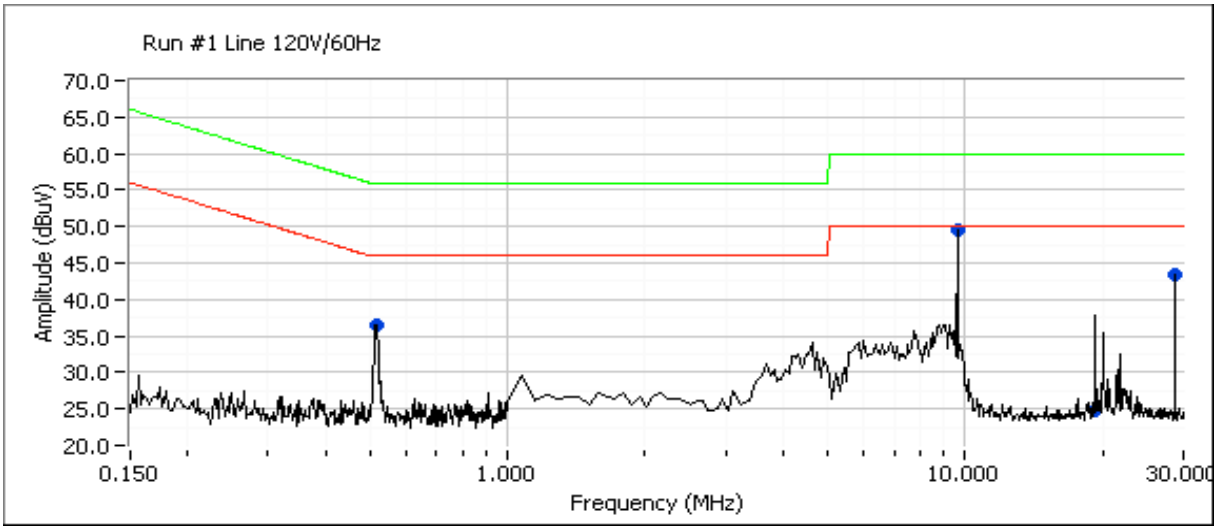
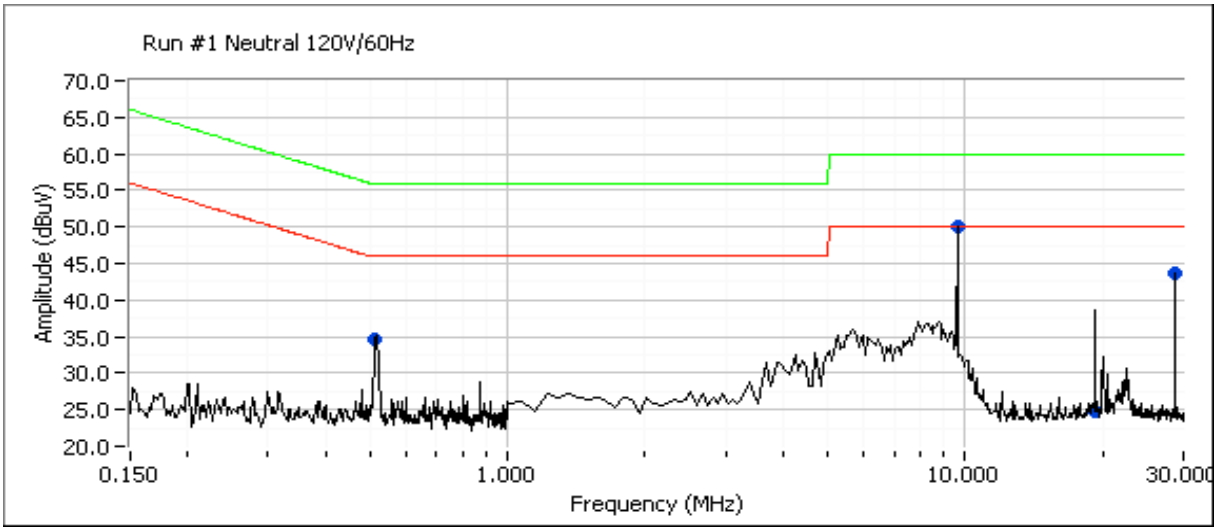
Do not Use for final report, for Elliott documentation only.
Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Testing DC power supply AC input, Tx mode. Middle Channel 915





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

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EMC Test Data

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Spec:	FCC, FCC 15.247, RSS-210	Class:	B

Frequency	Level	AC	FCC B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
9.602	49.6	Neutral	50.0	-0.4	Average	
9.602	49.3	Line	50.0	-0.7	Average	
28.806	43.8	Neutral	50.0	-6.2	Average	
28.806	43.5	Line	50.0	-6.5	Average	
9.602	49.7	Neutral	60.0	-10.3	QP	
9.602	49.1	Line	60.0	-10.9	QP	
0.515	33.6	Line	46.0	-12.4	Average	
19.203	37.3	Neutral	50.0	-12.7	Average	
28.806	43.9	Neutral	60.0	-16.1	QP	
28.806	43.4	Line	60.0	-16.6	QP	
0.515	35.1	Line	56.0	-20.9	QP	
19.203	37.4	Neutral	60.0	-22.6	QP	

EXHIBIT 3: Test Configuration Photographs

Pages