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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to

FCC Part 15 Subpart C

on the Asyst Technologies, Inc. Transmitter Model: Falcon

FCC ID:	PMQFalcon
GRANTEE:	Asyst Technologies, Inc. 46897 Bayside Parkway Fremont, CA 94538
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	May 16, 2008
FINAL TEST DATE:	March 31, 2008

AUTHORIZED SIGNATORY: _____

Mark E. Hill
Staff Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
1	June 16, 2008	Initial Release	David Guidotti

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SCOPE

An electromagnetic emissions test has been performed on the Asyst Technologies, Inc. model Falcon pursuant to the following rules:

FCC Part 15 Subpart C

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

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 Asyst Technologies, Inc. model Falcon and therefore apply only to the tested sample. The sample was selected and prepared by Tou Vang of Asyst Technologies, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

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.).

STATEMENT OF COMPLIANCE

The tested sample of Asyst Technologies, Inc. model Falcon complied with the requirements of the following regulations:

FCC Part 15 Subpart C

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.).

TEST RESULTS SUMMARY

DEVICES OPERATING UNDER THE GENERAL LIMITS

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.209	RSS 210 Table 3	Fundamental Signal 0.134 MHz	10.2dBµV/m (3.2µV/m) @ 300m	25.1 dBuV/m	Complies
15.209	RSS 210 Table 3	Transmitter Radiated Spurious Emissions, 0.100 – 30 MHz	20.5dBµV/m (10.6µV/m) @ 0.822MHz	Refer to table in limits section	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Integral antenna	Integral antenna or unique antenna connector	Complies
15.109	-	Receiver spurious emissions	Not applicable, receiver operates below 30MHz		N/A
-	RSS GEN 7.2.3 Table 1		Certification against Industry Canada requirements is excluded from the scope of this report		N/A
15.207	RSS GEN Table 2	AC Conducted Emissions	59.9dBµV @ 0.202MHz	Refer to standard	Complies (- 3.6 dB)

MEASUREMENT UNCERTAINTIES

ISO/IEC 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	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Asyst Technologies, Inc. model Falcon is a 300mm load port that is designed to be used in a semiconductor fab. Since the EUT would be placed on the floor during operation, the EUT was treated as a floor standing equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 24V DC, 7.0 Amps.

The sample was received on March 25, 2008 and tested on March 31, 2008. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Asyst Technologies	Falcon Alpha	300mm Loader	TBP	N/A

ANTENNA SYSTEM

The antenna system used with the Asyst Technologies, Inc. model Falcon consists of an integral antenna, manufactured by Asyst Technology, part number 9701-2879-03. The antenna has a 0dBi gain.

ENCLOSURE

The EUT enclosure is primarily constructed of metal. It measures approximately 470 mm wide by 580.1 mm deep by 135.1 mm 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 emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Meanwell	-	24 VDC Supply	-	-

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

Manufacturer	Model	Description	Serial Number	FCC ID
Compaq	Armada	Laptop	A04449	

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	Laptop	Cat 5	Unshielded	15.0
DC Power	24 VDC Supply	3 wire	Unshielded	5.0

EUT OPERATION

For testing per 15.209, the radio was configured to transmit as often as possible. As the transmissions were pulsed all transmitter-related measurements were made using a peak detector in lieu of either Average or Quasi-Peak detectors

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on March 31, 2008 at the Elliott Laboratories chamber 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.

CONDUCTED EMISSIONS CONSIDERATIONS

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

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment 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.

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 loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then 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. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

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

INSTRUMENT CALIBRATION

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

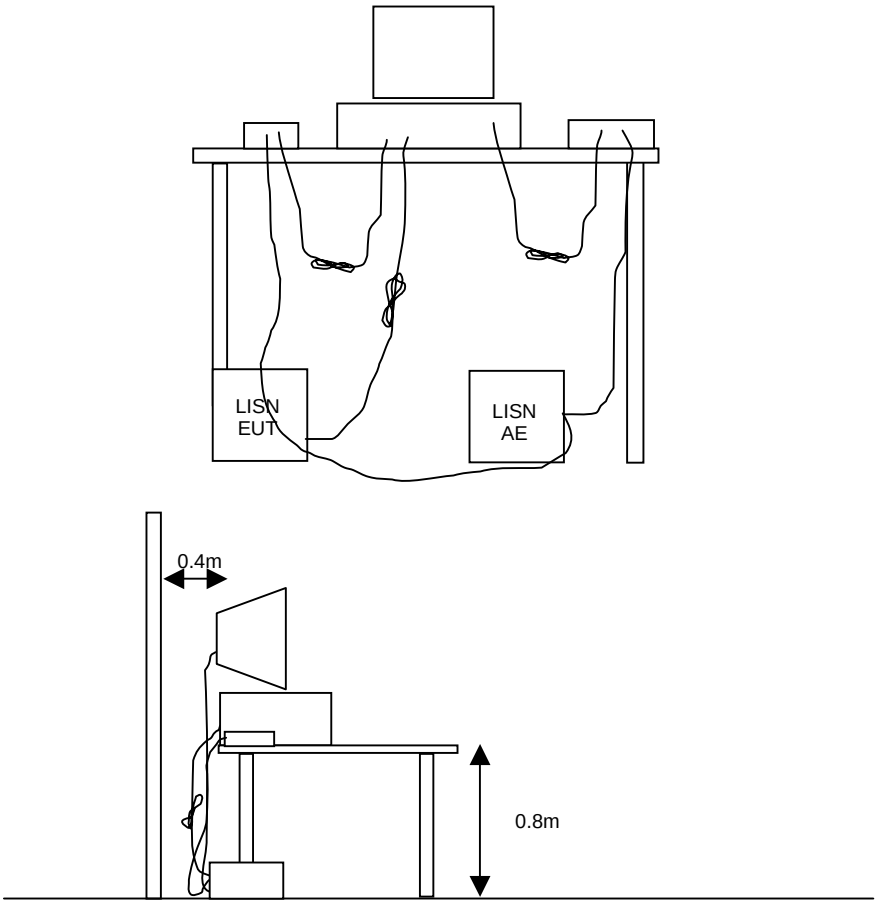
TEST PROCEDURES

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.

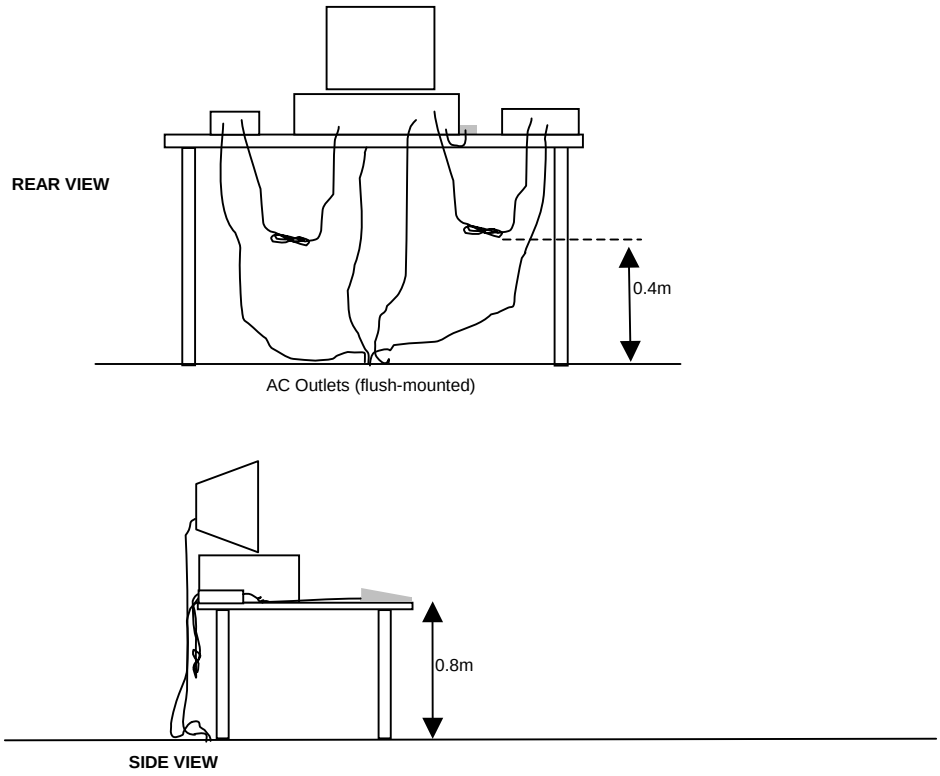


A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) 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.

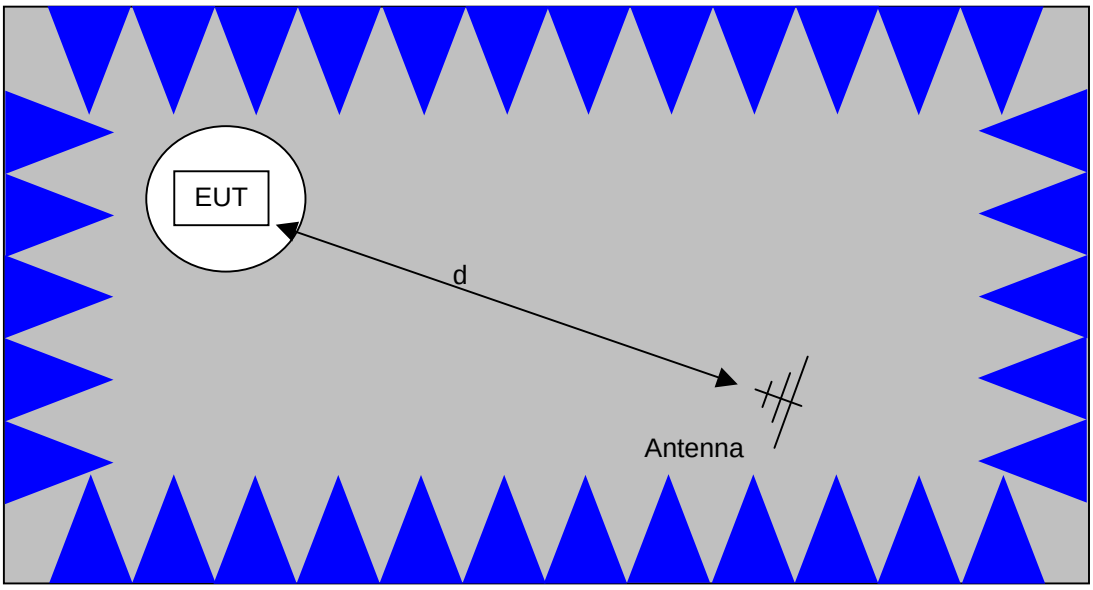
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). 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.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

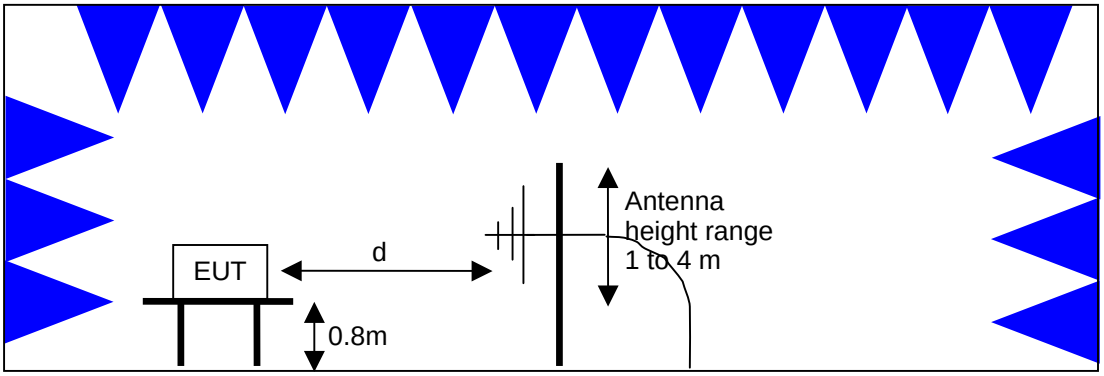


Typical Test Configuration for Radiated Field Strength Measurements



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

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

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:

GENERAL TRANSMITTER 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 RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

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

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

Radiated Emissions, 30 - 1,000 MHz, 12-Feb-08
Engineer: Vishal Narayan

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	24-Oct-08
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	18-May-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	12-Apr-08
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	25-May-08

Radiated Emissions, 30 - 1,000 MHz, 21-Mar-08
Engineer: bjing

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	25-Aug-08
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447E	1606	07-May-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	03-May-08

Radiated Emissions, 25-Mar-08
Engineer: Wayne Fisher

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	25-Aug-08
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447E	1606	07-May-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	03-May-08

Conducted Emissions - I-O Ports, 25-Mar-08
Engineer: Riaz Momand

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-4, OATS	362	18-Jul-08
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	29-Nov-08
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	21-Sep-08
Fischer Custom Comm.	FCC-TLISN-T8-02 (Includes 1907)	FCC-TLISN-T8-02	1906	05-Jul-08

Radiated Emissions, 0.100 - 30 MHz, 31-Mar-08
Engineer: Suhaila Khushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9 kHz - 6.5 GHz	8595EM	787	19-Feb-09
EMCO	Magnetic Loop Antenna, 10 kHz-30 MHz	6502	1299	05-Jan-09

Conducted Emissions - AC Power Ports, 02-Apr-08
Engineer: Suhaila Khushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-4, OATS	362	18-Jul-08
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	29-Nov-08
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	21-Sep-08
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	01-Nov-08

Radiated Emissions, 0.09 - 1,000 MHz, 02-Apr-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	26-Mar-09
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	13-Dec-08
EMCO	Magnetic Loop Antenna, 10 kHz-30 MHz	6502	1299	05-Jan-09
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	25-May-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40)	8564E	CH5273	20-Jul-08

Radiated Emissions, 0.009 - 1,000 MHz, 03-Apr-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Magnetic Loop Antenna, 10 kHz-30 MHz	6502	296	16-Jan-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	19-Sep-09
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	21-Sep-08
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	17-Jan-09

Environmental Test, 04-Apr-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40)	8564E	CH5273	20-Jul-08

EXHIBIT 2: Test Measurement Data

12 Pages

Elliott	EMC Test Data

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		-
Emissions Standard(s):	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A
Immunity Standard(s):	EN 61000-6-2, EN 301 489-1/-3	Environment:	-

EMC Test Data

For The

Asyst Technologies Inc.

Model

Falcon

Date of Last Test: 4/5/2008

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manger:	Sheareen Washington
Contact:	Tou Vang		
Emissions Standard(s):	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A
Immunity Standard(s):	EN 61000-6-2, EN 301 489-1/-3	Environment:	-

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The EUT is a 300mm load port that is designed to be used in a semiconductor fab. Since the EUT would be placed on a the floor during operation, the EUT was treated as a floor equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 24V DC, 7.0 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Asyst Technologies	Falcon Alpha	300mm Loader	TBP	

Other EUT Details

The EUT has a 134kHz transmitter using an integral antenna manufactured by Asyst Technology, part number 9701-2879-03. The antenna has a gain of 0dBi.

EUT Enclosure

The EUT enclosure is primarily constructed of metal. It measures approximately 470 mm wide by 580.1 mm deep by 135.1 mm 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.

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manger:	Sheareen Washington
Contact:	Tou Vang		
Emissions Standard(s):	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A
Immunity Standard(s):	EN 61000-6-2, EN 301 489-1/-3	Environment:	-

Test Configuration # 1

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Meanwell	TBP	24 VDC Supply	-	-

Remote Support Equipment

Manufacturer	Model	Description	Property Number	FCC ID
Compaq	Armada	Laptop	A04449	N/A
HP	Various	Spectrum Analyzer	Various	N/A

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Laptop	Cat 5	Unshielded	15.0
DC Power	24 VDC Supply	3 wire	Unshielded	5.0

EUT Operation During Emissions Tests

During emissions testing the EUT was auto cycling (Loop test). For testing per 15.209 and EN 300 330, the radio was configured to transmit as often as possible.

EUT Operation During Immunity Tests

The EUT was tested in two modes: Transmit and Cycle/Receive. In the transmit mode, the RFID reader was configured to continuously read a tag that was located on the device. In the cycle/receive mode, the device was configured to continuously move the wafer moving arms. During the cycle mode, the RFID reader was monitored for un-intentional transmissions.

Performance Criteria for Immunity Tests

Criterion A:

For cycle/receive mode testing: The EUT will run its wafer loading cycle without interruption. In addition, the transmitter shall not unintentionally transmit. This will be verified using a spectrum analyzer or thru visual indication of the transmit LED. For transmit mode, the EUT shall continue to successfully read an RFID tag and report back to the connected computer.

Criterion B:

The EUT's wafer loading cycle can be interrupted, but resumes without user intervention.

Criterion C:

The EUT's wafer loading cycle stops & must be restated by the user.

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Radiated Emissions

Test Specific Details

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

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Remote support equipment was located out side of chamber

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.

Ambient Conditions:

Temperature:	18 °C
Rel. Humidity:	50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	0.134 MHz (Fundamental)	FCC 15.209	Pass	10.2dBµV/m (3.2µV/m) @ 300m (-14.9dB)
2	0.100 - 30 MHz (Tx/RxSpurious Emissions)	FCC 15.209	Pass	20.5dBµV/m (10.6µV/m) @ 0.822MHz (-11.5dB)

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:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

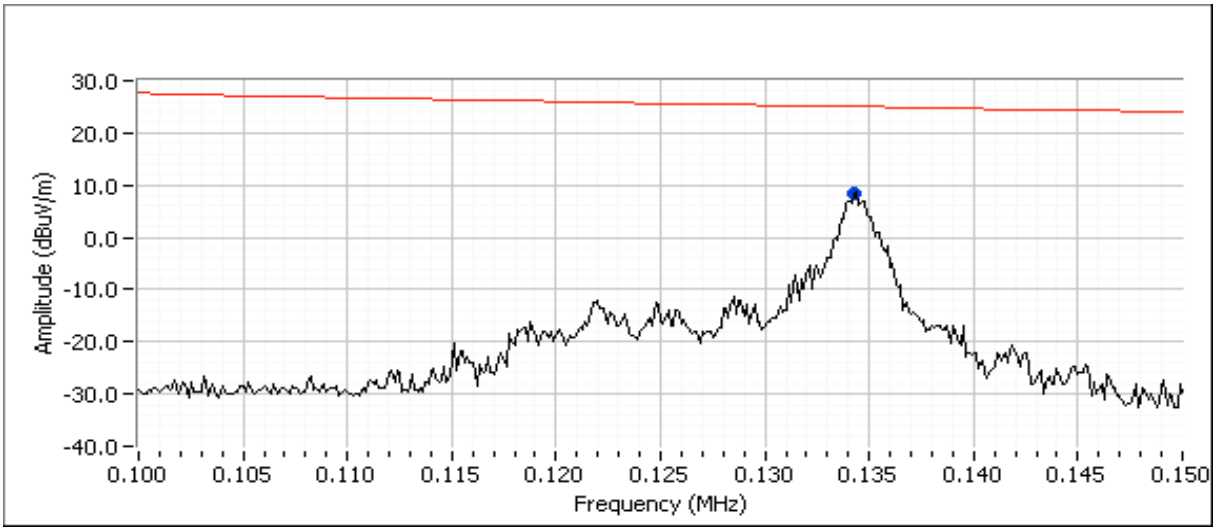
Run #1: Radiated Emissions, 0.100 - 30 MHz, FCC 15.209

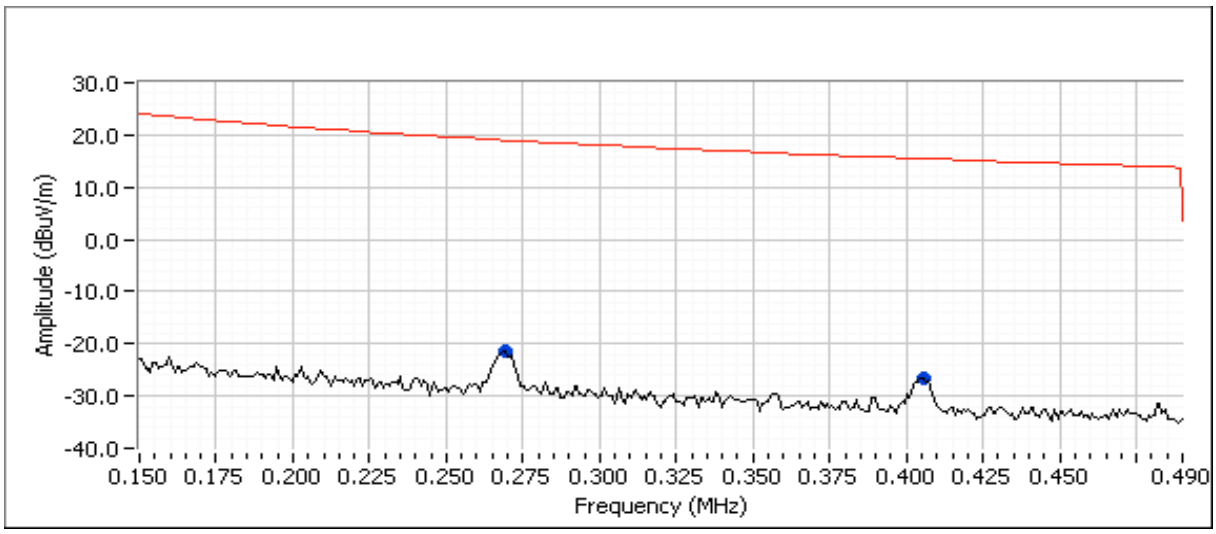
Date of Test: 3/31/2008
Test Engineer: Suhaila Khushzad
Test Location: Chamber #2

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

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
0.009 - 0.490 MHz	3	300	-80.0
0.490 - 1.705 MHz	3	30	-40.0

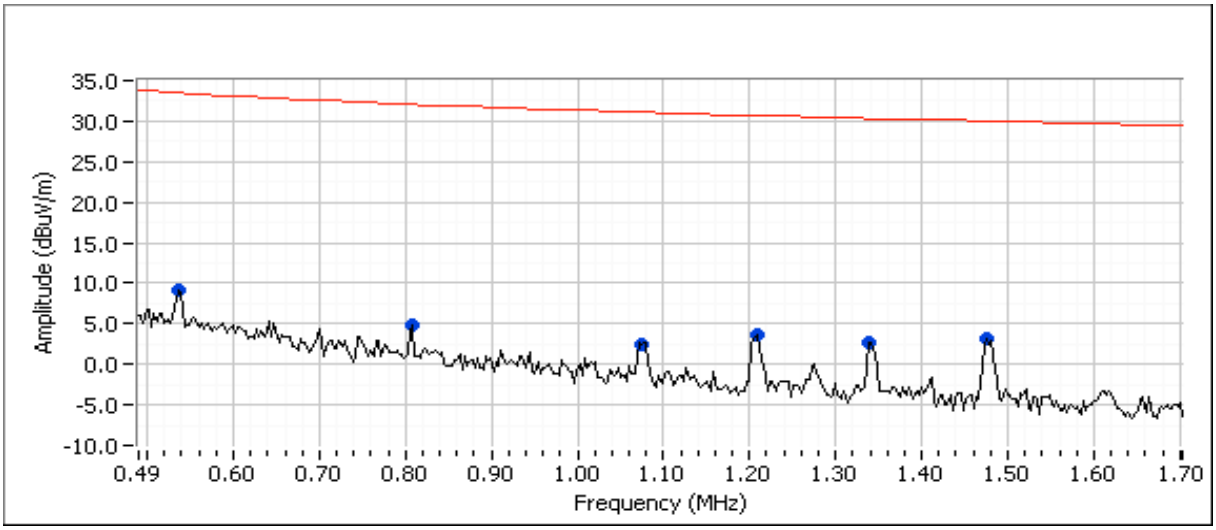
Note - the extrapolation factor is based on 40log(test distance/limit distance) as permitted by FCC 15.31





Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Run #1: Radiated Emissions, 0.100 - 30 MHz, FCC 15.209



Preliminary readings

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
0.134	8.4	Closed	25.0	-16.6	Peak	91	1.7	Fundamental
0.262	-21.5	Closed	19.0	-40.5	Peak	89	1.7	
0.402	-26.7	Closed	15.4	-42.1	Peak	89	1.7	
0.536	9.1	Closed	33.5	-24.4	Peak	119	1.7	
0.822	4.8	Closed	32.1	-27.3	Peak	59	1.7	
1.068	2.5	Open	31.1	-28.6	Peak	331	1.7	
1.204	3.7	Open	30.7	-27.0	Peak	360	1.7	
1.339	2.7	Open	30.3	-27.6	Peak	211	1.7	
1.471	3.2	Closed	30.0	-26.8	Peak	360	1.7	

Note 1:	The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, with a peak limit 20dB above the average limit.

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Test Specific Details

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: 3/31/2008
Test Engineer: Suhaila Khushzad
Test Location: OATS #1
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run # 2: Radiated Emissions, 0.100 - 30 MHz, FCC 15.209

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
0.009 - 0.490 MHz	3	300	-80.0
0.490 - 1.705 MHz	3	30	-40.0

Note - the extrapolation factor is based on 40log(test distance/limit distance) as permitted by FCC 15.31
Maximized readings (includes manipulation of EUT interface cables)
Fundamental (intentional) Signal

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
0.134	10.2	Open	25.1	-14.9	PK	112	1.0	Fundamental
0.134	8.0	Closed	25.1	-17.1	PK	172	1.0	Fundamental

Spurious emissions

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
0.822	20.5	Closed	32.0	-11.5	PK	0	1.0	Extrapolated to 30m
0.822	20.5	Closed	32.0	-11.5	PK	0	1.0	Extrapolated to 30m
1.471	17.2	Closed	30.0	-12.8	PK	12	1.0	Extrapolated to 30m
1.339	17.5	Open	30.3	-12.8	PK	202	1.0	Extrapolated to 30m
1.204	6.0	Open	30.7	-24.7	PK	106	1.0	Extrapolated to 30m
1.068	4.0	Open	31.1	-27.1	PK	277	1.0	Extrapolated to 30m
0.402	-17.3	Closed	15.5	-32.8	PK	356	1.0	Extrapolated to 300m
0.262	-14.4	Closed	19.2	-33.6	PK	360	1.0	Extrapolated to 300m
0.536								AM Radio

Note 1:	The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, with a peak limit 20dB above the average limit.
Note 2:	Fundamental measurements taken with RBW of 200Hz and all other measurements taken with a test receiver with an IF bandwidth setting of 10kHz.
Note 3:	Fundamental field strength was 90.2dBuV/m @3m. This measurement extrapolated to 30m is 50.2 dBuV/m and extrapolated to 300m it is 10.2dBuV/m as reported. All spurious emissions are below this level
Note 4:	All measurements made using a peak detector and compared to average/QP limit as pulsed operation was used.

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Conducted Emissions - Power Ports

Test Specific Details

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: 4/2/2008 8:29
Test Engineer: Suhaila Khushzad
Test Location: SVOATS #1
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz and 230/50Hz

General Test Configuration

The EUT was located above a ground plane, 80 cm from the LISN. A second LISN was used for any local support equipment. Remote support equipment was located approximately 30 meters from the test area. All I/O connections were running on top of the groundplane.

Ambient Conditions:

Temperature: 10.6 °C
Rel. Humidity: 65 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	59.9dBµV @ 0.202MHz (-3.6dB)
2	CE, AC Power, 230V/50Hz	EN55022 B	Pass	49.4dBµV @ 0.201MHz (-4.2dB)

Modifications Made During Testing

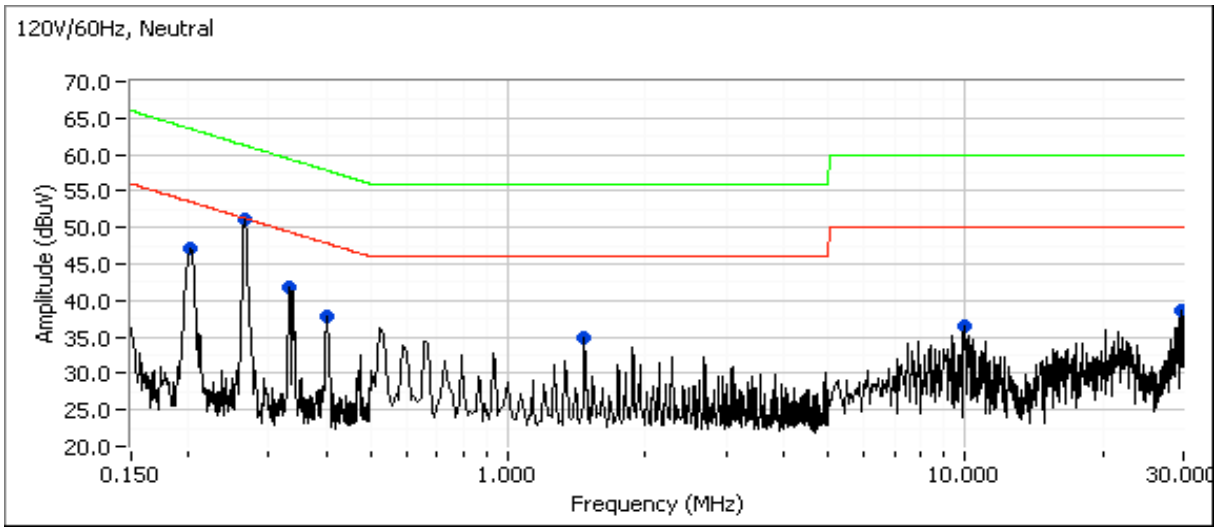
No modifications were made to the EUT during testing

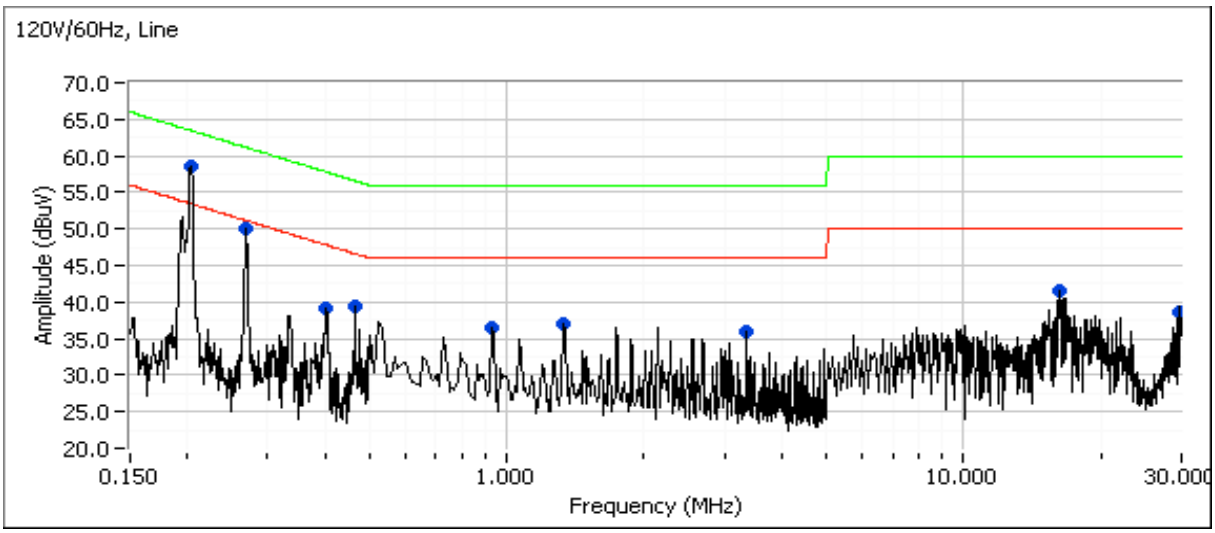
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

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





Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

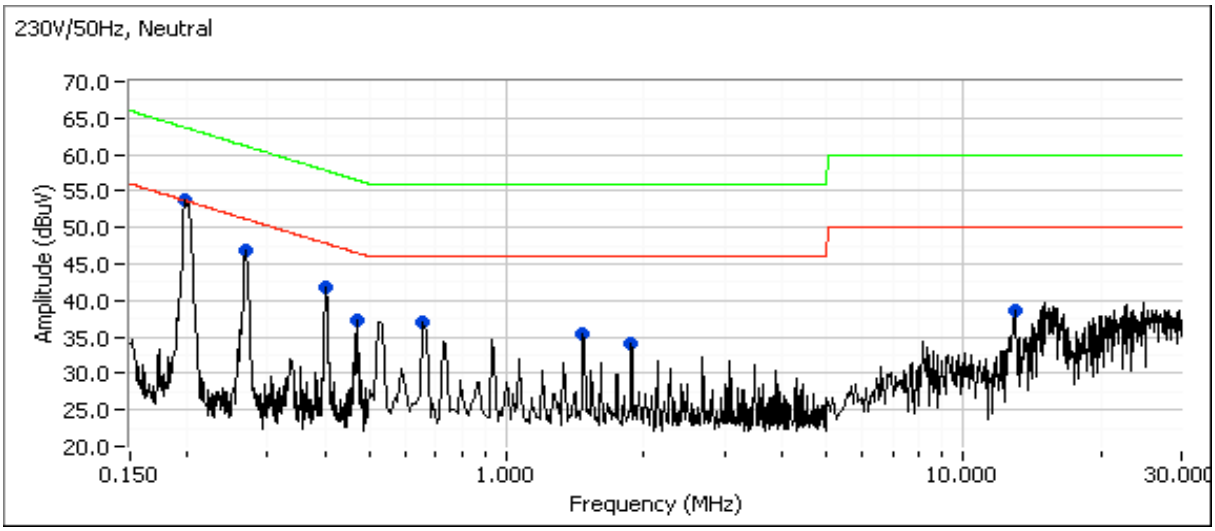
Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Transmit Mode

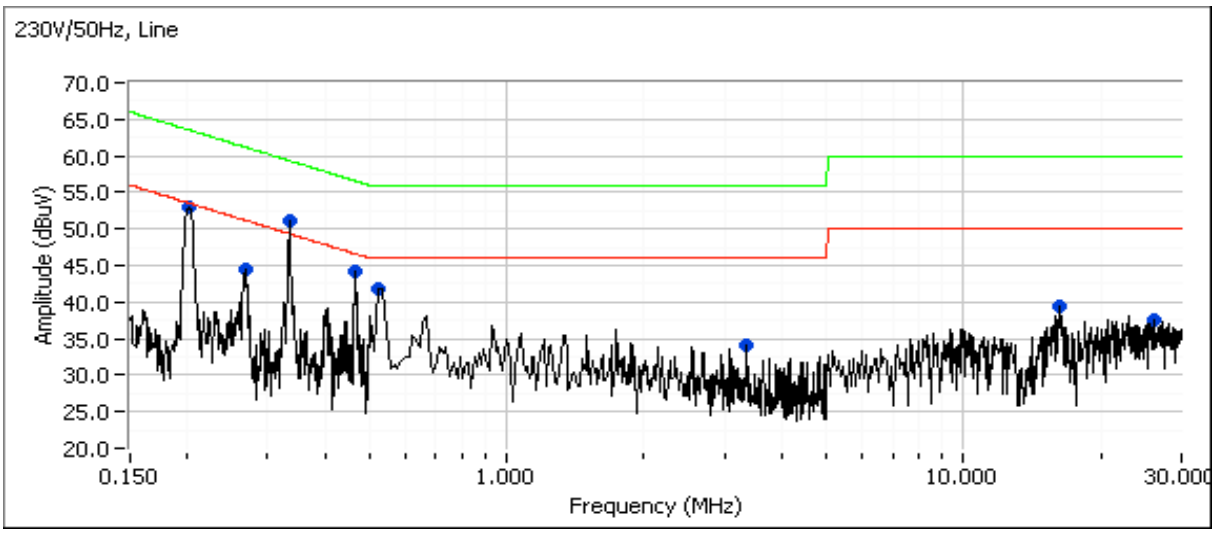
Final quasi-peak and average readings

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.202	59.9	Line	63.5	-3.6	QP	
0.202	47.3	Line	53.5	-6.2	AVG	
0.268	53.6	Line	61.2	-7.6	QP	
0.266	43.4	Neutral	51.2	-7.8	AVG	
0.936	38.2	Line	46.0	-7.8	AVG	
0.201	55.5	Neutral	63.6	-8.1	QP	
0.201	45.2	Neutral	53.6	-8.4	AVG	
0.266	52.8	Neutral	61.2	-8.4	QP	
1.338	36.9	Line	46.0	-9.1	AVG	
0.268	42.0	Line	51.2	-9.2	AVG	
0.535	36.4	Neutral	46.0	-9.6	AVG	
0.401	37.8	Line	47.8	-10.0	AVG	
0.401	35.7	Neutral	47.8	-12.1	AVG	
16.186	37.8	Line	50.0	-12.2	AVG	
1.472	33.2	Neutral	46.0	-12.8	AVG	
3.346	32.4	Line	46.0	-13.6	AVG	
0.334	45.2	Neutral	59.4	-14.2	QP	
29.694	34.7	Line	50.0	-15.3	AVG	
0.467	30.4	Line	46.6	-16.2	AVG	
0.467	40.3	Line	56.6	-16.3	QP	
29.564	33.5	Neutral	50.0	-16.5	AVG	
0.936	38.9	Line	56.0	-17.1	QP	
1.338	38.4	Line	56.0	-17.6	QP	
0.401	39.6	Line	57.8	-18.2	QP	
0.334	30.9	Neutral	49.4	-18.5	AVG	
0.535	37.5	Neutral	56.0	-18.5	QP	
16.186	41.5	Line	60.0	-18.5	QP	
9.900	31.1	Neutral	50.0	-18.9	AVG	
0.401	38.4	Neutral	57.8	-19.4	QP	
29.694	39.9	Line	60.0	-20.1	QP	
3.346	35.8	Line	56.0	-20.2	QP	
1.472	35.3	Neutral	56.0	-20.7	QP	
29.564	39.3	Neutral	60.0	-20.7	QP	
9.900	33.9	Neutral	60.0	-26.1	QP	

Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz
Transmit Mode





Client:	Asyst Technologies Inc.	Job Number:	J70603
Model:	Falcon	T-Log Number:	T70750
		Account Manager:	Sheareen Washington
Contact:	Tou Vang		
Standard:	EN 61000-6-4, EN 301 489-1/-3, 15.B, 15.209	Class:	A

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz
Transmit Mode

Final quasi-peak and average readings

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.201	49.4	Line	53.6	-4.2	AVG	
0.199	48.1	Neutral	53.7	-5.6	AVG	
0.199	56.3	Neutral	63.7	-7.4	QP	
0.201	56.2	Line	63.6	-7.4	QP	
0.268	41.9	Neutral	51.2	-9.3	AVG	
0.335	48.5	Line	59.3	-10.8	QP	
0.402	36.1	Neutral	47.8	-11.7	AVG	
1.471	34.2	Neutral	46.0	-11.8	AVG	
0.668	33.5	Neutral	46.0	-12.5	AVG	
0.266	38.6	Line	51.2	-12.6	AVG	
0.467	43.3	Line	56.6	-13.3	QP	
0.470	42.4	Neutral	56.5	-14.1	QP	
1.873	31.9	Neutral	46.0	-14.1	AVG	
0.335	35.2	Line	49.3	-14.1	AVG	
0.402	43.6	Neutral	57.8	-14.2	QP	
0.268	46.7	Neutral	61.2	-14.5	QP	
0.266	46.1	Line	61.2	-15.1	QP	
0.467	31.5	Line	46.6	-15.1	AVG	
0.470	28.9	Neutral	46.5	-17.6	AVG	
3.344	28.3	Line	46.0	-17.7	AVG	
0.668	37.8	Neutral	56.0	-18.2	QP	
1.471	36.9	Neutral	56.0	-19.1	QP	
1.873	35.6	Neutral	56.0	-20.4	QP	
12.971	28.1	Neutral	50.0	-21.9	AVG	
16.182	28.1	Line	50.0	-21.9	AVG	
16.182	38.1	Line	60.0	-21.9	QP	
12.971	37.7	Neutral	60.0	-22.3	QP	
3.344	33.0	Line	56.0	-23.0	QP	
26.062	34.8	Line	60.0	-25.2	QP	
26.062	23.3	Line	50.0	-26.7	AVG	
0.507	7.5	Line	46.0	-38.5	AVG	
0.507	14.7	Line	56.0	-41.3	QP	

EXHIBIT 3: Photographs of Test Configurations

3 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of Asyst Technologies, Inc. Model FalconConstruction

12 Pages

EXHIBIT 6: Operator's Manual for Asyst Technologies, Inc. Model Falcon

290 Pages

EXHIBIT 7: Block Diagram of Asyst Technologies, Inc. Model Falcon

1 Page

EXHIBIT 8: Schematic Diagrams for Asyst Technologies, Inc. Model Falcon

7 Pages

EXHIBIT 9: Theory of Operation for Asyst Technologies, Inc. Model Falcon

26 Pages