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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to Industry Canada RSS-Gen Issue 1 / RSS 210 Issue 6 FCC Part 15 Subpart C FCC Part 15, Subpart C Section 15.247(DTS) on the Sun Microsystems Transmitter Model: Sun Spot

UPN:	1894B-3011
FCC ID:	UDM3011
GRANTEE:	Sun Microsystems 15 Network Circle Menlo Park, CA 94025
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	June 23, 2006
FINAL TEST DATE:	May 25, May 26 and June 20, 2006

AUTHORIZED SIGNATORY: David W Bare

David W. Bare
Chief Technical Officer

A2LA ACCREDITED
2016-01

Equipment Name and Model:

Transceiver Sun Sun Spot

Manufacturer:

Sun Microsystems
15 Network Circle
Menlo Park, CA 94025

Tested to applicable standard:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"

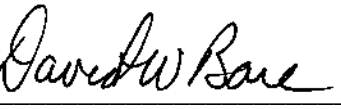
Test Report Prepared For:
James Poore
Sun Microsystems
15 Network Circle
Menlo Park, CA 94025

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 SV1 Dated August 16, 2007
Departmental Acknowledgement Number: IC2845 SV2 Dated August 16, 2007

Declaration of Compliance

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4: 2003 as referenced by FCC Part 15 and by section 1.0 of RSS-212, Issue 1, "Test Facilities and Test Methods for Radio Equipment" / RSS-Gen Issue 1); and that the equipment performed in accordance with the data submitted in this report.

Signature 
Name David W. Bare
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Date: June 23, 2006

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SCOPE

An electromagnetic emissions test has been performed on the Sun Microsystems model Sun Spot pursuant to the following rules:

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 Sun Microsystems model Sun Spot and therefore apply only to the tested sample. The sample was selected and prepared by James Poore of Sun Microsystems.

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.

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. Devices categorized as Class II equipment do not require certification by Industry 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.).

STATEMENT OF COMPLIANCE

The tested sample of Sun Microsystems model Sun Spot complied with the requirements of the following regulations:

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

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

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)

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	Minimum 2.1MHz	>500kHz	Complies
	RSP100	99% Bandwidth	5.09MHz	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	6.0dBm (0.004Watts) EIRP = 0.004W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-6.5 dBm in 3kHz Note 2	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	N/A the EUT has an integral antenna		
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.0dBµV/m @ 2483.5MHz (-1.0dB)	15.207 in restricted bands, all others < -20dBc	Complies

Note 1: EIRP was calculated from the measured field strength. An antenna gain of 0.0 dBi was used for the PCB antenna to calculate output power.
Note 2: PSD Calculated from measured field strength.

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	Integral to EUT	Refer 15.203	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	36.9dBµV/m @ 4875.97MHz (-17.1dB)	54dBuV/m	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	43.1dBµV @ 0.173MHz (-11.7dB)	Refer to standard	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11	Refer to OET 65, FCC Part 1 and RSS 102	Complies

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Sun Microsystems model Sun Spot is a 2.4GHz Zigbee radio device that is designed to provide radio connectivity to small devices. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT is battery powered or can be powered via a USB connection.

The sample was received on May 25, 2006 and tested on May 25, May 26 and June 20, 2006. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Sun Microsystems	Sun Spot	2.4 GHz Zigbee Radio Module	-	UDM3011

ANTENNA SYSTEM

The antenna is integral to the device on the PCB.

ENCLOSURE

The EUT enclosure is primarily constructed of molded plastic. It measures approximately 4 cm wide by 2.5 cm deep by 7 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 radiated emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Deskjet 5650	Printer	MY3883K42P	-
Dell	Latitude CPx	Laptop	-	-

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

Manufacturer	Model	Description	Serial Number	FCC ID
US Robotics	Palm Pilot III	PDA	-	-
Dell	Latitude CPx	Laptop	-	-

No remote support equipment was used during emissions testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	multiwire	Shielded	2.0
Laptop/Parallel	Printer	multiwire	Shielded	2
Laptop/Power	Power Mains	2 Wire	Unshielded	2

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	multiwire	Shielded	2.0
Laptop/serial	PDA	multiwire	Shielded	2
Laptop/Power	Power Mains	2 Wire	Unshielded	2

EUT OPERATION

During emissions testing the EUT was continuously transmitting.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on May 25, May 26 and June 20, 2006 at the Elliott Laboratories Open Area Test Sites #1 & 2 located at 684 West Maude Avenue, Sunnyvale, California or 41039 Boyce Road, Fremont, 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 16-1-1 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.

POWER METER

Power measurements are made using either a power meter (typically with a peak power sensor) or as detailed in FCC KDB558074 using a spectrum analyzer and either the built-in channel power measurement function or software to integrate the power over the displayed spectrum.

When using the integration method the analyzer's internal function or software account for the equivalent noise bandwidth of the resolution bandwidth used when performing the integration. The bandwidths, detector (peak or sample) and trace data (max held or power averaging) are detailed in the test data. When using a power averaging function the device is either in a continuous transmit mode or the analyzer is configured to only sweep when the transmitter is active to ensure that the averaging is performed over a transmit burst and not over quiet periods.

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.

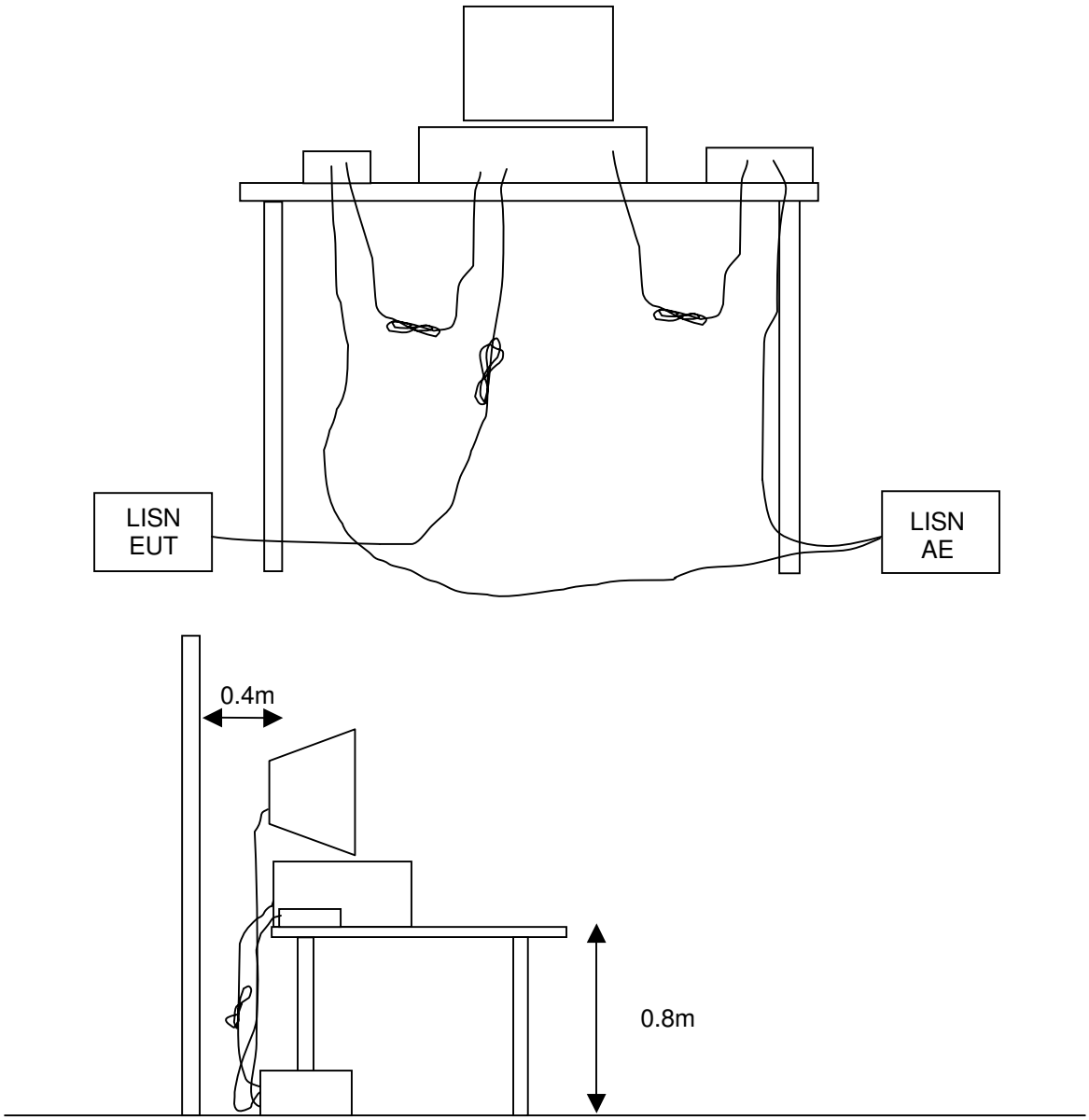
TEST PROCEDURES

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.

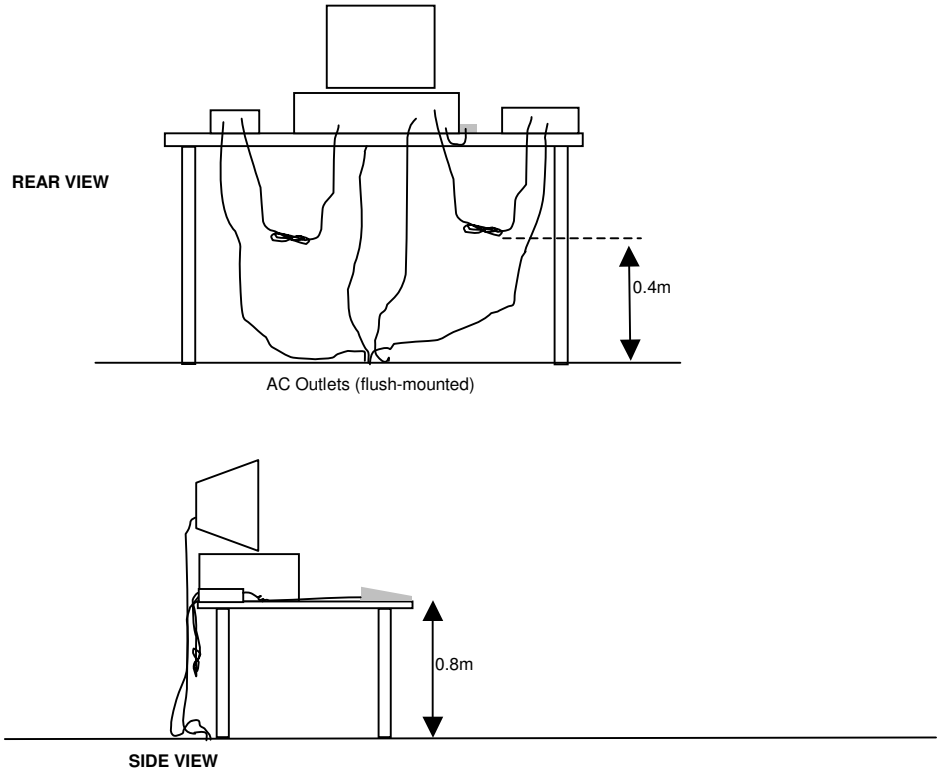


RADIATED EMISSIONS

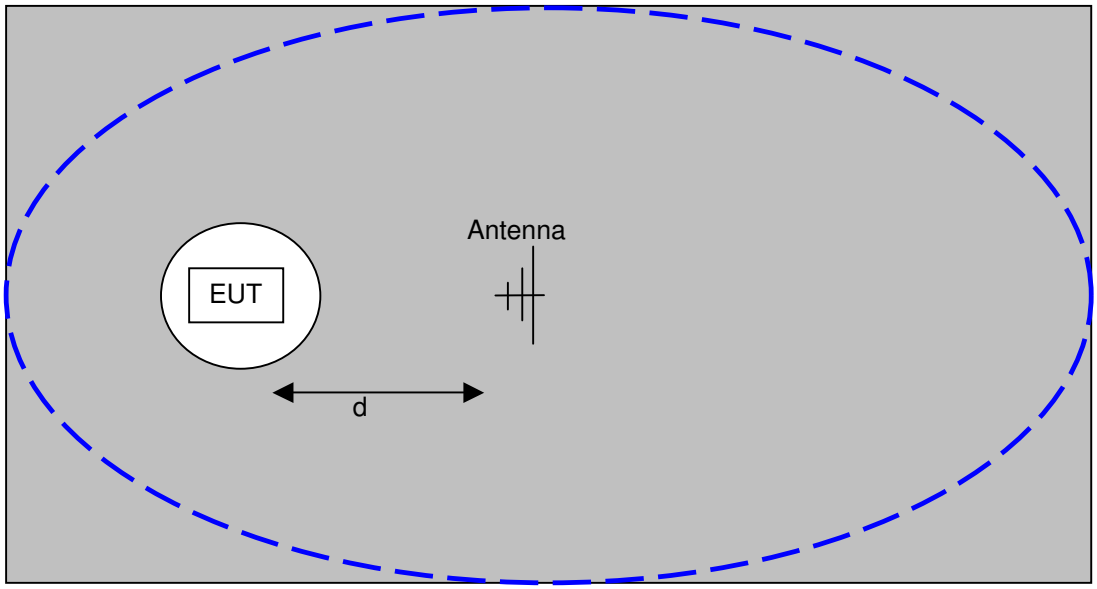
Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation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

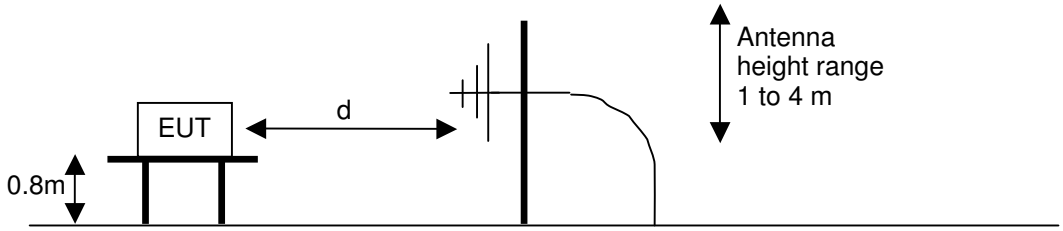
Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna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



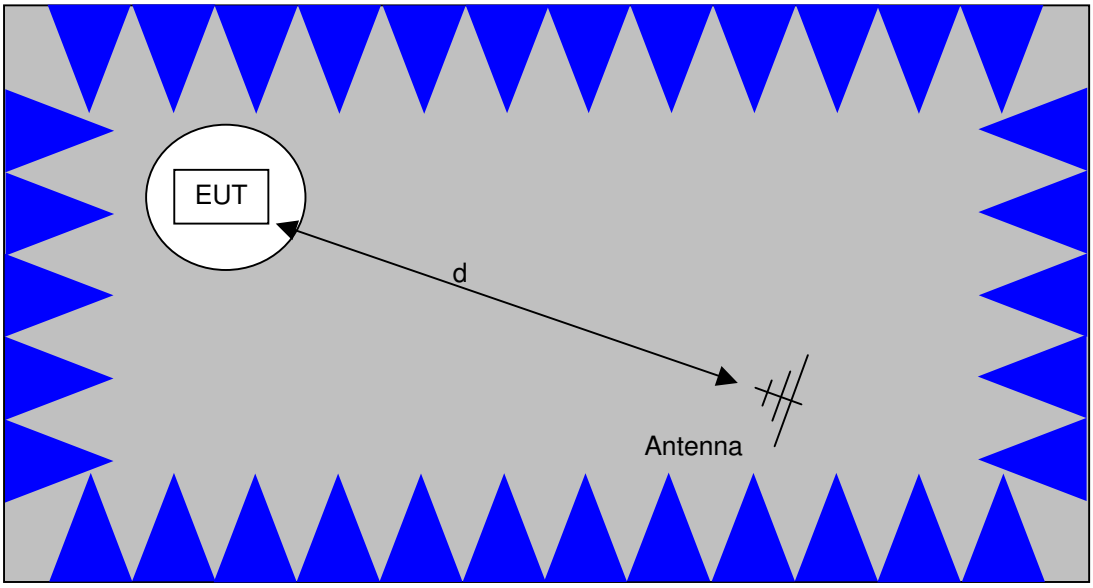
Typical Test Configuration for Radiated Field Strength Measurements



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.

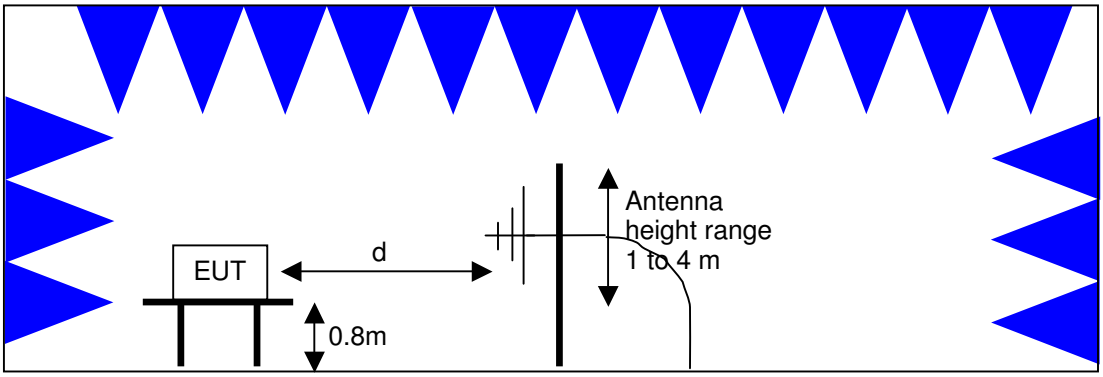


Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views



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.

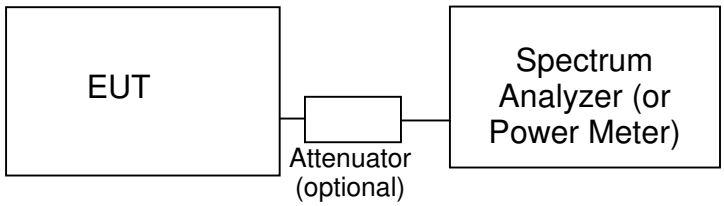
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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

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

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

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 - 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:

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

where P is the eirp (Watts)

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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, Radio Transmit Spurious, 25-May-06
Engineer: Mark Hill

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	10-Jun-06
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	21-Nov-06

Conducted Emissions - AC Power Ports, 26-May-06
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-3, OATS	304	08-Jul-06
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	06-Sep-06
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	10-Jun-06
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-Aug-06

Radiated Emissions, 1000 - 12,750 MHz, 20-Jun-06
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	13-Jan-07
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	19-May-07
Hewlett Packard	High Pass filter, 3.5 GHz	P/N 84300-80038	1157	24-Apr-07
EMCO	Antenna, Horn, 1-18 GHz	3115	1242	19-Oct-06

Radiated Emissions, 30 - 7500 MHz, 5-Jul-06
Engineer: David Bare

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	07-Mar-07
Rohde & Schwarz	Test Receiver, 20-1300 MHz	ESVP	1317	18-Jul-06

EXHIBIT 2: Test Measurement Data

24 Pages

Elliott

EMC Test Data

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Emissions Spec:	FCC Part 15.247	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Sun Microsystems

Model

Sun Spot

Date of Last Test: 8/17/2006

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Emissions Spec:	FCC Part 15.247	Class:	B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a 2.4GHz Zigbee radio device that is designed to provide radio connectivity to small devices. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT is battery powered or can be powered via a USB connection.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Sun Microsystems	Sun Spot	2.4 GHz Zigbee Radio Module	-	UDM3011

Other EUT Details

None

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device.

EUT Enclosure

The EUT enclosure is primarily constructed of molded plastic . It measures approximately 4 cm wide by 2.5 cm deep by 7 cm high.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

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

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Emissions Spec:	FCC Part 15.247	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #1

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

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Latitude CPx	Laptop	-	-
Hewlett Packard	Deskjet 5650	Printer	MY3883K42P	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	Laptop	multiwire	Shielded	2.0
Laptop/Parallel	Printer	multiwire	Shielded	2
Laptop/Power	Power Mains	2 Wire	Unshielded	2

EUT Operation During Emissions Tests

During emissions testing the EUT was continuously transmitting.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Emissions Spec:	FCC Part 15.247	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #2

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

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
US Robotics	Palm Pilot III	PDA	MY3883K42P	-
IBM	Thinkpad	Laptop	99-ZPB63	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
USB	Laptop	USB	Shielded	1
Laptop/serial	PDA	Multiwire	Shielded	2
Laptop/Power	Power Mains	2 Wire	Unshielded	2

EUT Operation During Emissions

The H pattern was running on the laptop and the EUT was on transmitting continuously on the center channel.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	LP0002	Class:	B

Radiated Emissions

Test Specifics

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

Date of Test: 7/5/2006
Test Engineer: David Bare
Test Location: SVOATS #1

Config. Used: 1
Config Change: None
EUT Voltage: Battery

General Test Configuration

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

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

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 1000MHz, Maximized Emissions	LP0002	Pass	

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:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	LP0002	Class:	B

Run #1a: Radiated Spurious Emissions, Receive Mode, 30 - 7500 MHz. EUT @ 2405 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 7500 MHz	3	3	0

Frequency	Level	Pol	LP0002		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
273.010	32.4	V	46.0	-13.6	QP	266	1.1	Upright
273.010	31.1	H	46.0	-14.9	QP	261	2.0	Upright
273.010	29.8	V	46.0	-16.2	QP	294	1.1	Flat

Note 1:	Pre-scans showed that EUT did not emit emissions above the noise floor of the measurement system from 1000 to 7500 MHz (3rd harmonic of the receive frequency). Noise floor was >20db below the limits.

Run #1b: Radiated Spurious Emissions, Receive Mode, 30 - 7500 MHz. EUT @ 2440 MHz

Frequency	Level	Pol	LP0002		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
See Note 1 Below								

Note 1:	Pre-scans showed that EUT signals below 1000MHz was independent from Mode (Tx/ Rx), Orientation (Upright/ Flat) or the Operation Channel (Low/ High).

Run #1c: Radiated Spurious Emissions, Receive Mode, 30 - 7500 MHz. EUT @ 2480 MHz

Frequency	Level	Pol	LP0002		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
See Note 1 Below								

Note 1:	Pre-scans showed that EUT signals below 1000MHz was independent from Mode (Tx/ Rx), Orientation (Upright/ Flat) or the Operation Channel (Low/ High).

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 Radiated Spurious Emissions

Test Specifics

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

Date of Test: 5/25/2006
Test Engineer: Mark Hill
Test Location: SVOATS #2
Config. Used: 1
Config Change: None
EUT Voltage: Battery

General Test Configuration

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

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

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 40 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, Peak Power	FCC Part 15.247(b)	Pass	See Data Below
2	RE, Power Spectral Density	FCC Part 15.247(e)	Pass	See Data Below
3	RE, Signal Bandwidth	FCC Part 15.247(a)(2)	Pass	See Data Below
4	RE, 1000 - 25000 MHz - Spurious Emissions - Tx	FCC Part 15.209 / 15.247(c)	Pass	53.0dBµV/m (446.7µV/m) @ 2483.5MHz (-1.0dB)
5	RE, 30 - 1000 MHz - Emissions, Receive Mode	RSS GEN, Section 6	Pass	See Data Below

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

EMC Test Data

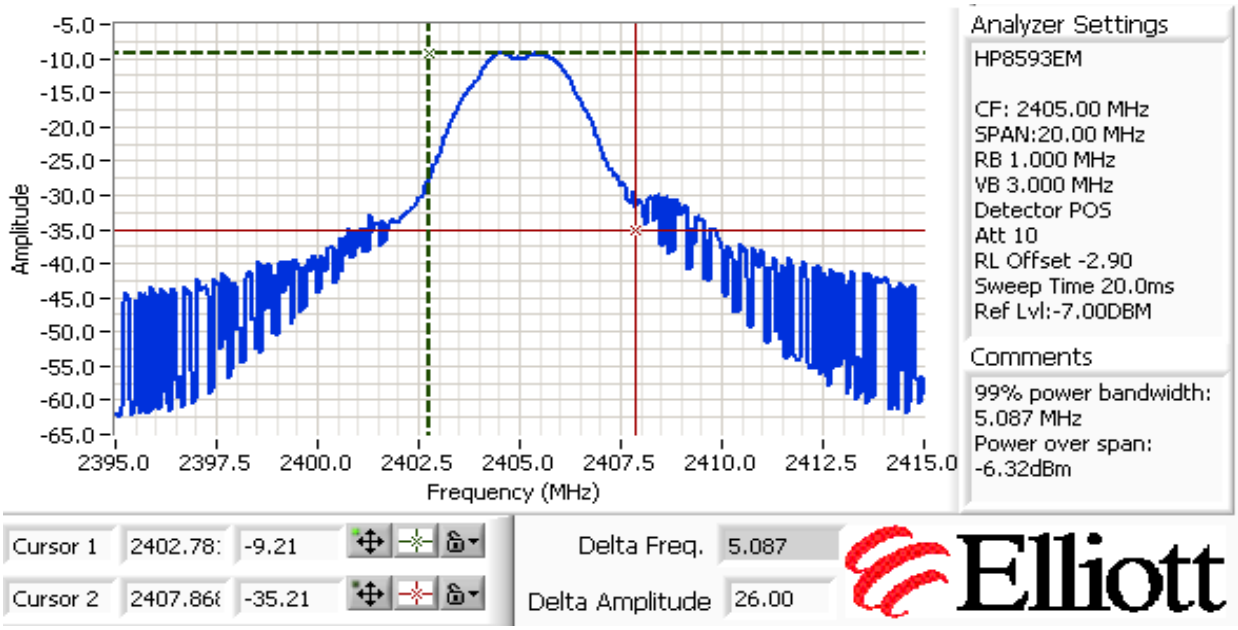
Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #1: Output Power Measurements - Radiated

Run #1a: Low Channel @ 2405 MHz

Fundamental Signal Field Strength: Peak values measured in 1 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
Preliminary to determine worst case orientation and polarization for power measurements									
2405.500	95.4	H	-	-	PK	130	2.1	flat	
2404.650	97.6	H	-	-	PK	129	2.0	side	
2404.500	90.5	H	-	-	PK	292	2.5	upright	
2404.510	97.7	V	-	-	PK	145	1.1	upright	
2404.560	93.7	V	-	-	PK	272	1.7	flat	
2404.500	94.0	V	-	-	PK	270	1.7	side	
2404.600	96.7	V	-	-	PK	95	1.1	Upright	100kHz
2405.210	90.2	V	-	-	PK	98	1.0	side	100kHz
2404.720	92.4	V	-	-	PK	284	1.0	flat	100kHz
2404.700	86.9	H	-	-	PK	124	1.0	flat	100kHz
2404.620	88.3	H	-	-	PK	228	2.4	side	100kHz
2404.690	85.9	H	-	-	PK	264	1.0	Upright	100kHz

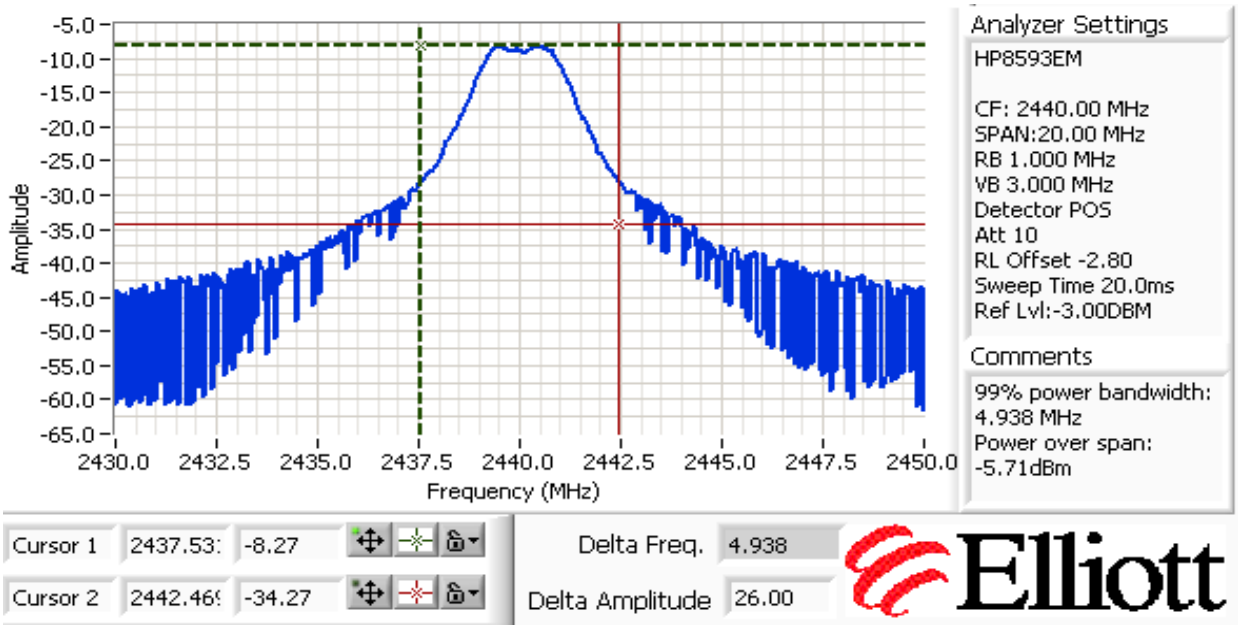


Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #1b: Mid Channel @ 2440 MHz

Fundamental Signal Field Strength: Peak values measured in 1 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
Preliminary to determine worst case orientation and polarization for power measurements									
2439.460	99.0	V	-	-	PK	27	1.1	upright	
2439.420	95.1	V	-	-	PK	351	1.1	flat	
2439.480	94.1	V	-	-	PK	350	1.1	side	
2440.520	94.7	H	-	-	PK	24	1.4	side	
2439.450	95.5	H	-	-	PK	26	1.7	flat	
2440.450	90.9	H	-	-	PK	304	2.1	upright	
2439.730	81.7	H	-	-	PK	174	2.5	upright	100kHz
2440.200	88.4	H	-	-	PK	123	1.0	side	100kHz
2440.270	86.7	H	-	-	PK	40	1.0	flat	100kHz
2440.050	94.2	V	-	-	PK	94	1.1	upright	100kHz
2439.860	90.6	V	-	-	PK	103	1.0	side	100kHz
2439.730	89.4	V	-	-	PK	281	1.0	flat	100kHz

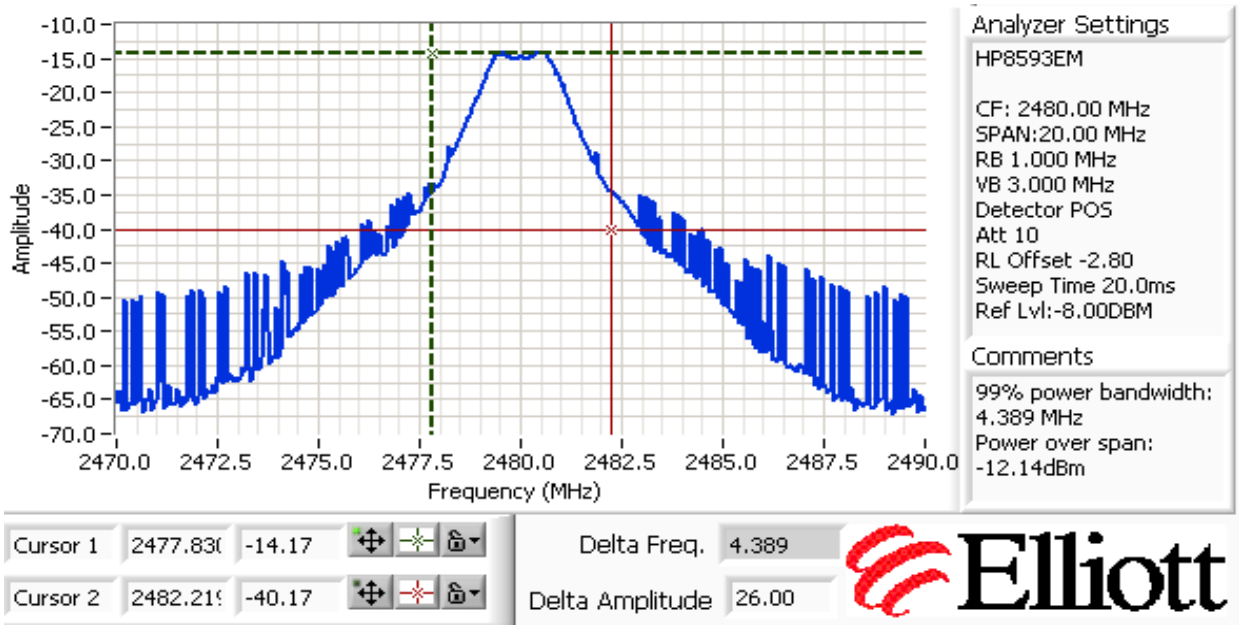


Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #1c: High Channel @ 2480 MHz

Fundamental Signal Field Strength: Peak values measured in 1 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Preliminary to determine worst case orientation and polarization for power measurements								
2479.550	90.0	V	-	-	PK	204	1.1	Upright
2480.540	89.2	V	-	-	PK	154	1.1	Flat
2480.470	89.5	V	-	-	PK	169	1.1	Side
2479.540	92.2	H	-	-	PK	51	1.6	Side
2480.520	91.1	H	-	-	PK	50	2.0	flat
2480.430	86.3	H	-	-	PK	304	2.0	upright
2480.540	88.1	H	-	-	AVG	51	1.6	side (for reference)
2480.040	89.3	V	-	-	PK	92	1.1	upright 100kHz
2480.070	86.3	V	-	-	PK	103	1.0	side 100kHz
2479.870	85.4	V	-	-	PK	259	1.0	flat 100kHz
2479.850	80.3	H	-	-	PK	246	1.0	flet 100kHz
2479.880	82.4	H	-	-	PK	346	2.4	side 100kHz
2479.890	79.2	H	-	-	PK	224	1.6	upright 100kHz



Run #1c continued on next apge

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #1c continued

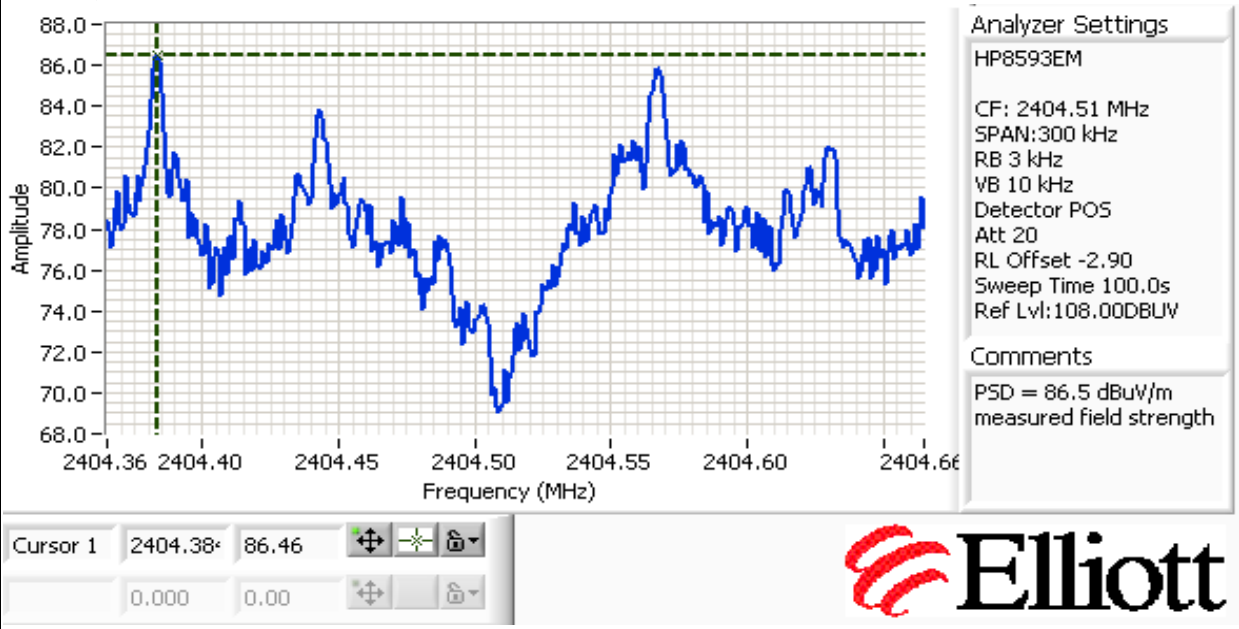
Power calculated from measured power over the full bandwidth for the maximum field strength observed.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBm	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2405.000	5.4	V	30.0	-24.6	PK	145	1.1	upright
2440.000	6.0	V	30.0	-24.0	PK	27	1.1	upright
2480.000	-0.5	H	30.0	-30.5	PK	51	1.6	side

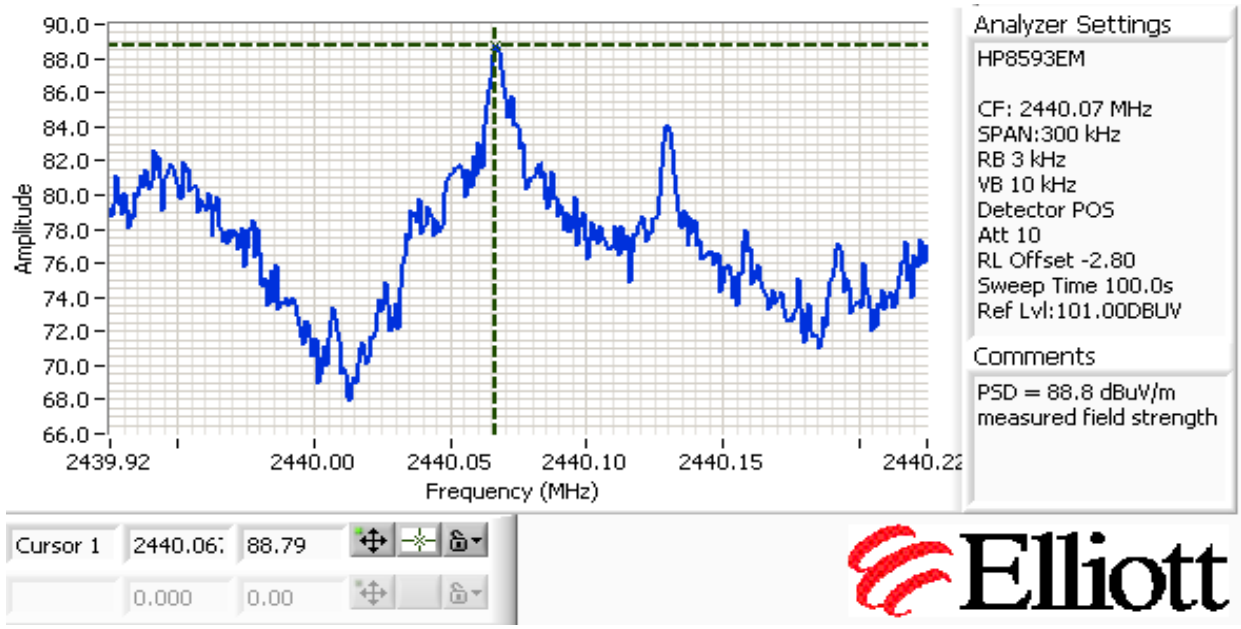
Level = power over span (dBm) + 107 (to give field strength power in dBuV/m) - 95.3 (to convert to dBm EIRP)

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #2: Power Spectral Density
PSD Plot, Low Channel

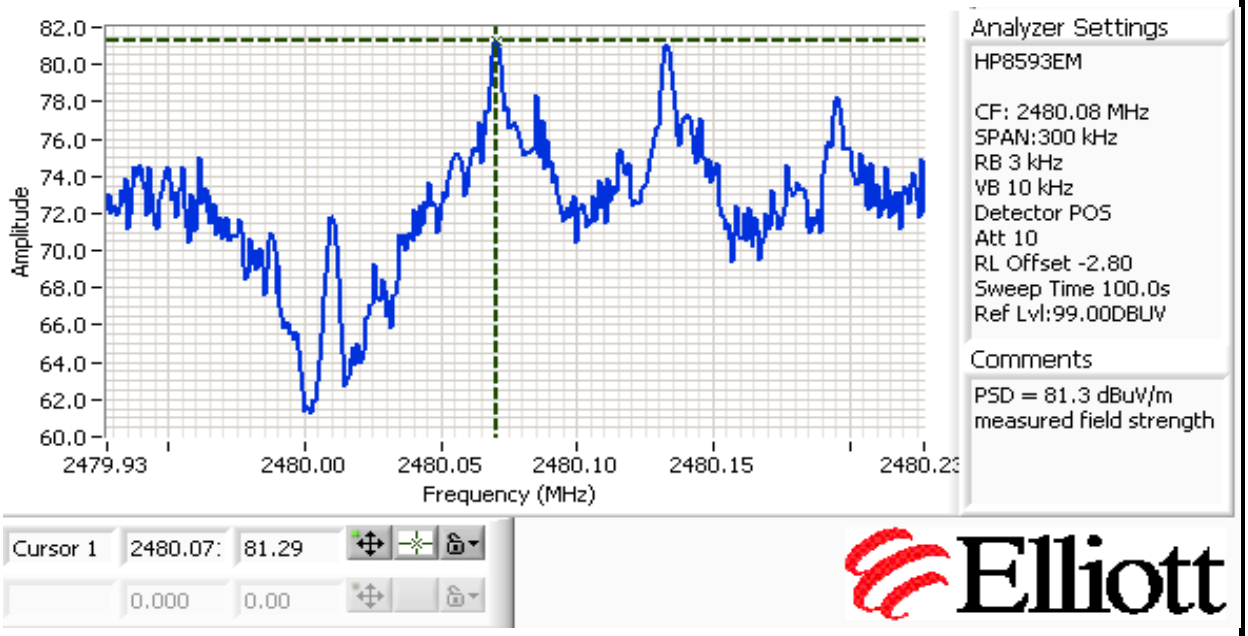


PSD Plot, Mid Channel



Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

PSD Plot, High Channel



Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
N/A	2404.5	-8.8	8.0	Pass
N/A	2440.1	-6.5	8.0	Pass
N/A	2480.7	-14.0	8.0	Pass

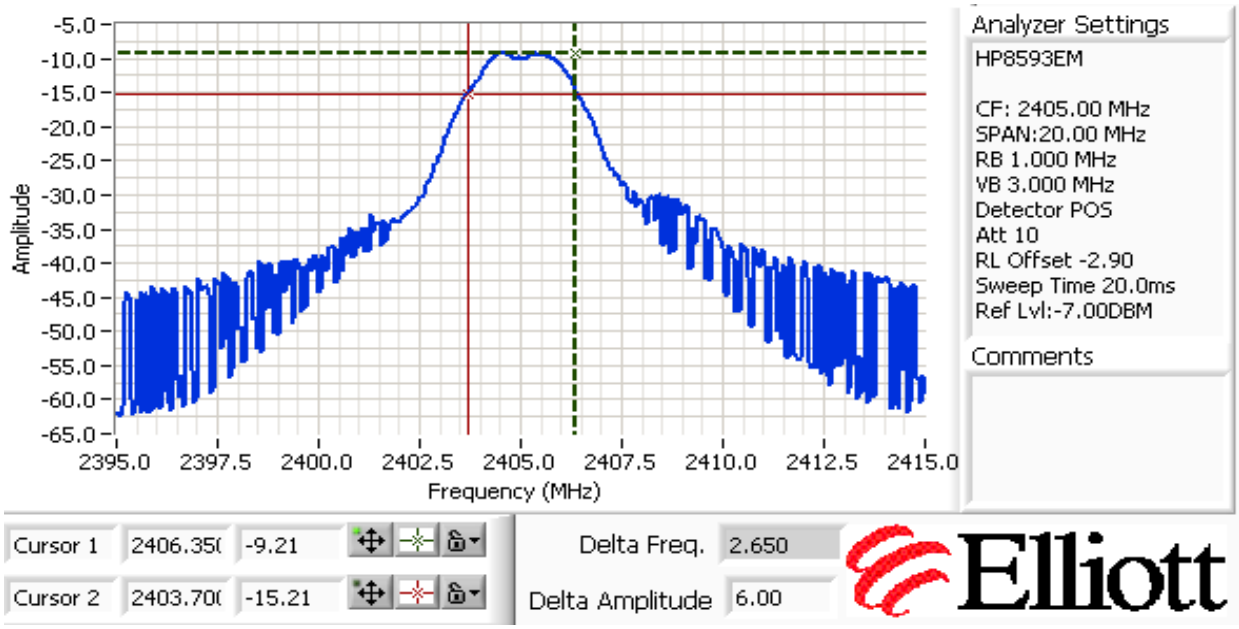
Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal. PSD was calculated from the measured field strength.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #3: Signal Bandwidth

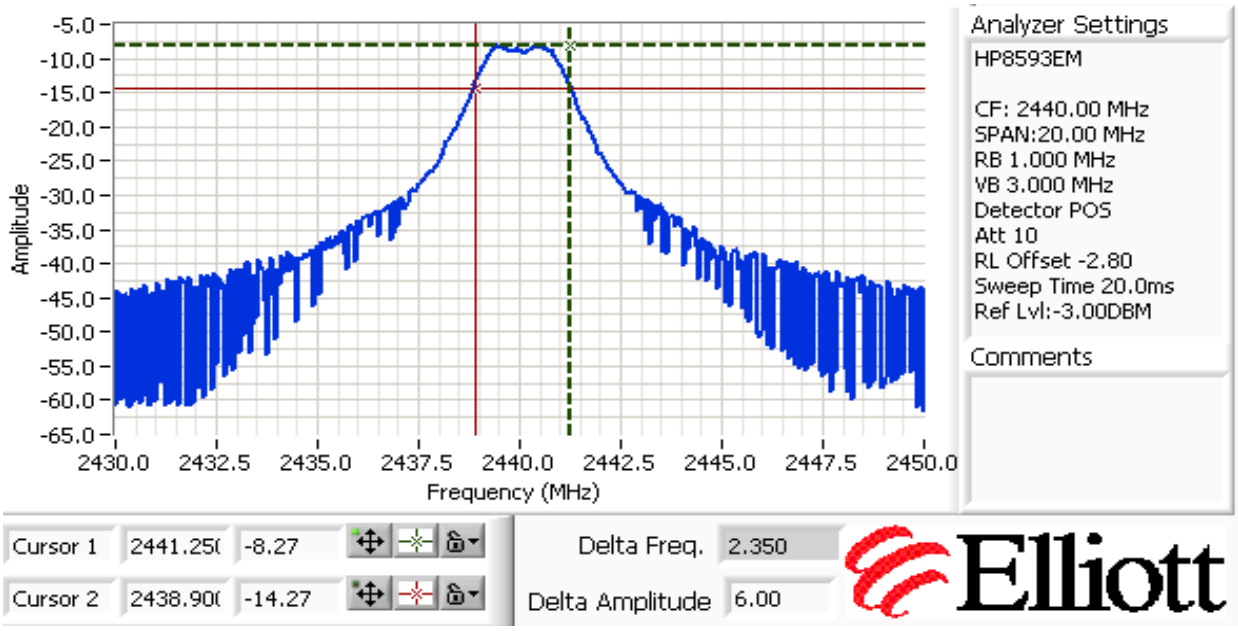
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz) 6dB	99%
N/A	2405	1MHz	2.65	5.08
N/A	2440	1MHz	2.35	4.94
N/A	2480	1MHz	2.10	4.39

6dB Bandwidth Plot, Low Channel

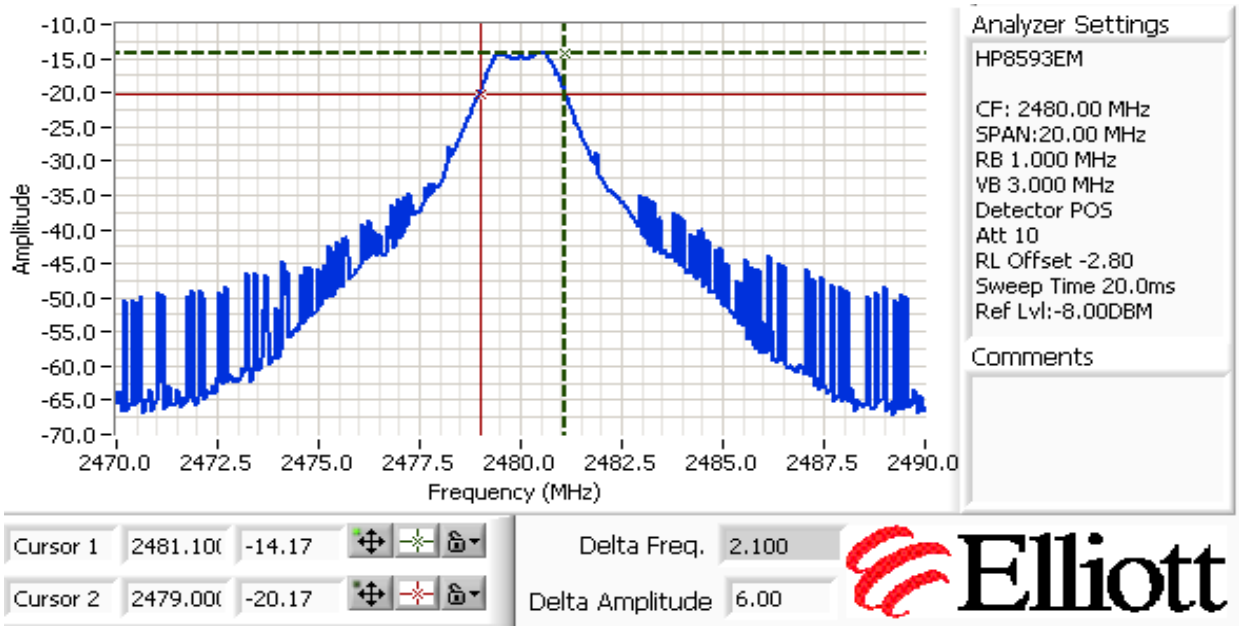


Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

6dB Bandwidth Plot, Mid Channel



6dB Bandwidth Plot, High Channel



Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #4: Radiated Spurious Emissions, 1 - 25 GHz.

Run #4a: Low Channel @ 2405 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4808.650	52.3	V	54.0	-1.7	AVG	302	1.0	EUT Upright
7212.880	64.1	H	65.9	-1.8	PK	214	1.1	EUT Upright - Unrestricted
7217.560	65.1	V	70.2	-5.1	PK	55	1.5	EUT on its Side - Unrestricted
4808.970	48.7	V	54.0	-5.3	AVG	138	1.0	EUT on its Side
4808.750	48.0	H	54.0	-6.0	AVG	164	1.0	EUT Upright
7217.300	61.1	H	68.3	-7.2	PK	144	1.6	EUT on its Side - Unrestricted
7212.750	65.1	V	76.7	-11.6	PK	93	1.9	EUT Upright - Unrestricted
4809.450	42.2	H	54.0	-11.8	AVG	239	1.0	EUT on its Side
4808.650	61.7	V	74.0	-12.3	PK	302	1.0	EUT Upright
2390.020	59.3	V	74.0	-14.7	PK	145	1.1	RB = 1MHz, VB = 10Hz
4808.970	58.6	V	74.0	-15.4	PK	138	1.0	EUT on its Side
4808.750	57.2	H	74.0	-16.8	PK	164	1.0	EUT Upright
4809.450	52.1	H	74.0	-21.9	PK	239	1.0	EUT on its Side
2390.020	31.5	V	54.0	-22.5	AVG	145	1.1	RB = VB = 1MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

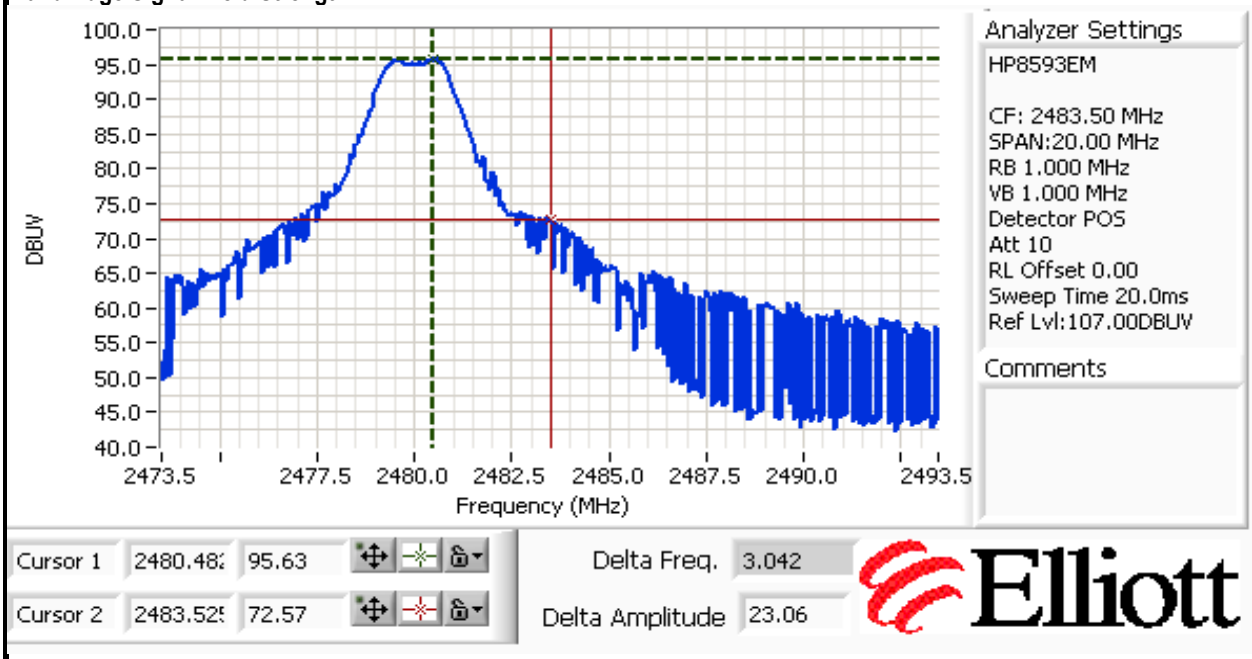
Run #4b: Mid Channel @ 2440 MHz

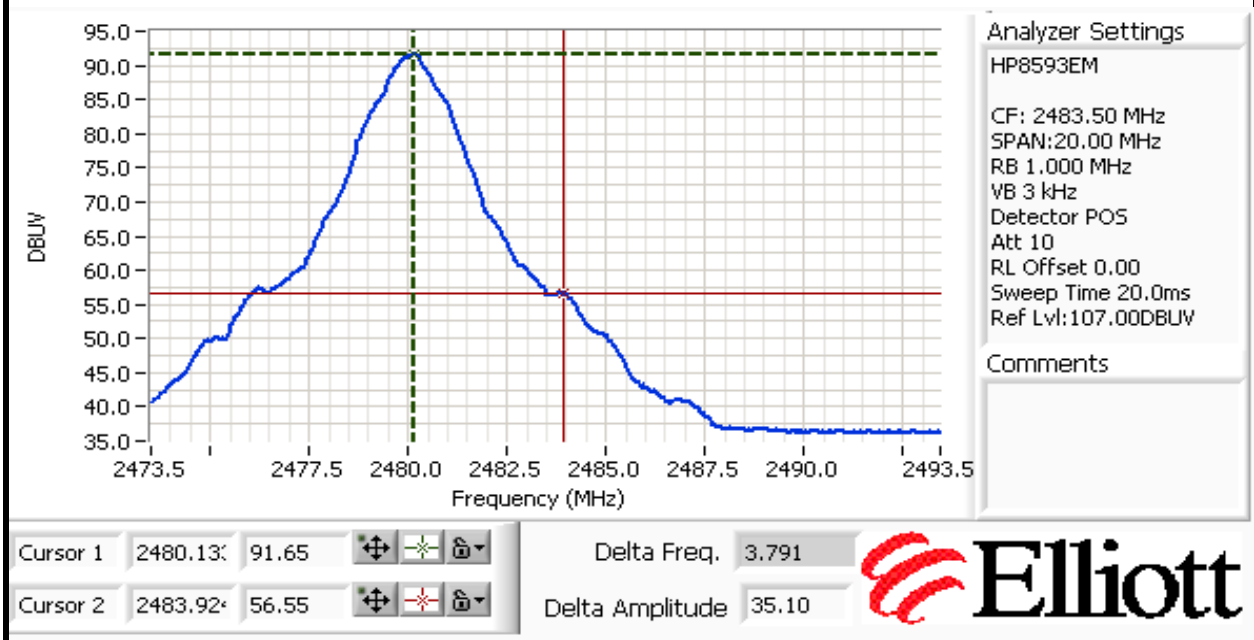
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7321.530	52.4	H	54.0	-1.6	AVG	316	1.5	Upright
7321.370	51.1	V	54.0	-2.9	AVG	0	1.4	Side
7321.460	50.8	V	54.0	-3.2	AVG	0	1.3	Upright
4878.830	49.0	V	54.0	-5.0	AVG	68	1.0	EUT Upright
7321.340	48.4	V	54.0	-5.6	AVG	308	2.3	Flat
7321.460	47.2	H	54.0	-6.8	AVG	215	1.8	Flat
4879.200	46.9	H	54.0	-7.1	AVG	143	2.2	EUT Upright
7321.430	46.3	H	54.0	-7.7	AVG	200	2.2	Side
4878.930	44.2	V	54.0	-9.8	AVG	194	1.4	EUT on its Side
7321.530	62.2	H	74.0	-11.8	PK	316	1.5	Upright
4878.800	41.4	H	54.0	-12.6	AVG	141	1.2	EUT on its Side
7321.370	60.7	V	74.0	-13.3	PK	0	1.4	Side
7321.460	60.6	V	74.0	-13.4	PK	0	1.3	Upright
4878.830	59.1	V	74.0	-14.9	PK	68	1.0	EUT Upright
7321.340	57.8	V	74.0	-16.2	PK	308	2.3	Flat
7321.460	57.3	H	74.0	-16.7	PK	215	1.8	Flat
4879.200	56.8	H	74.0	-17.2	PK	143	2.2	EUT Upright
7321.430	55.5	H	74.0	-18.5	PK	200	2.2	Side
4878.930	55.3	V	74.0	-18.7	PK	194	1.4	EUT on its Side
4878.800	52.6	H	74.0	-21.4	PK	141	1.2	EUT on its Side

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #4c: High Channel @ 2480 MHz
Band Edge Signal Field Strength





Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Delta Marker - Peak	23.1 dB	Delta between highest in-band and highest
Delta Marker - Average	35.1 dB	Note 3

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	53.0	h	54.0	-1.0	Avg	274	1.7	side - Note 1, 3
2483.500	57.1	h	74.0	-16.9	pk	274	1.7	side - Note 1
4959.730	38.6	V	54.0	-15.4	AVG	122	1.2	EUT Upright
7441.130	35.8	V	54.0	-18.2	AVG	128	1.0	EUT Upright
4960.200	35.1	V	54.0	-18.9	AVG	142	1.0	EUT on its Side
7438.250	34.8	H	54.0	-19.2	AVG	203	0.0	EUT Upright
7439.630	34.3	V	54.0	-19.7	AVG	167	1.0	EUT on its Side
7439.850	33.1	H	54.0	-20.9	AVG	166	1.9	EUT on its Side
4959.960	32.8	H	54.0	-21.2	AVG	128	1.0	EUT Upright
4959.600	29.7	H	54.0	-24.3	AVG	228	1.0	EUT on its Side
7441.130	48.2	V	74.0	-25.8	PK	128	1.0	EUT Upright
7438.250	47.2	H	74.0	-26.8	PK	203	0.0	EUT Upright
7439.630	46.8	V	74.0	-27.2	PK	167	1.0	EUT on its Side
4959.730	46.0	V	74.0	-28.0	PK	122	1.2	EUT Upright
7439.850	45.6	H	74.0	-28.4	PK	166	1.9	EUT on its Side
4960.200	43.3	V	74.0	-30.7	PK	142	1.0	EUT on its Side
4959.960	42.5	H	74.0	-31.5	PK	128	1.0	EUT Upright
4959.600	40.2	H	74.0	-33.8	PK	228	1.0	EUT on its Side

Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.
Note 2:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 3:	Average bandedge measured in a RBW=1MHz, VBW= 3kHz. Any video bandwidth setting lower then 3kHz cause the fundamental level to artificially dropped due to high duty cycle.

Run #5a: Radiated Spurious Emissions, Receive Mode, 30 - 1000 MHz. EUT @ 2405 MHz

Frequency	Level	Pol	FCC Part 15 Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
273.010	32.4	V	46.0	-13.6	Peak	266	1.1	Upright
273.010	31.1	H	46.0	-14.9	Peak	261	2.0	Upright

Note:	Pre-scan showed that EUT signals were independent from Orientation and Operating Channel while in receive mode.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	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: 5/25/2006
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 2
Config Change: None
EUT Voltage: 120V/60Hz

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: 13 °C
Rel. Humidity: 72 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	43.1 @ 0.173MHz (-11.7dB)

Modifications Made During Testing:

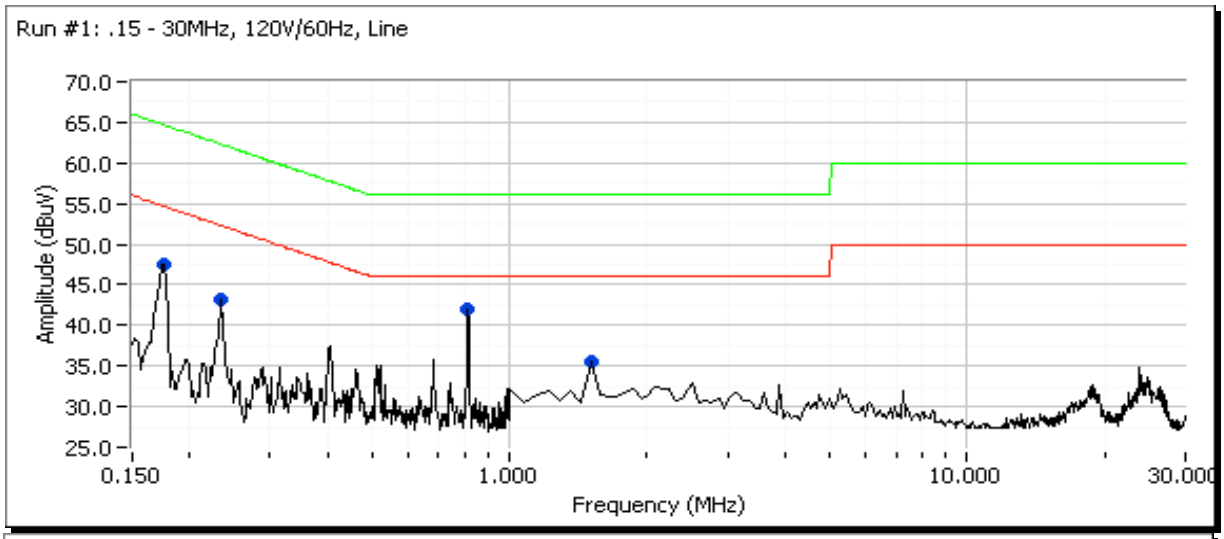
No modifications were made to the EUT during testing

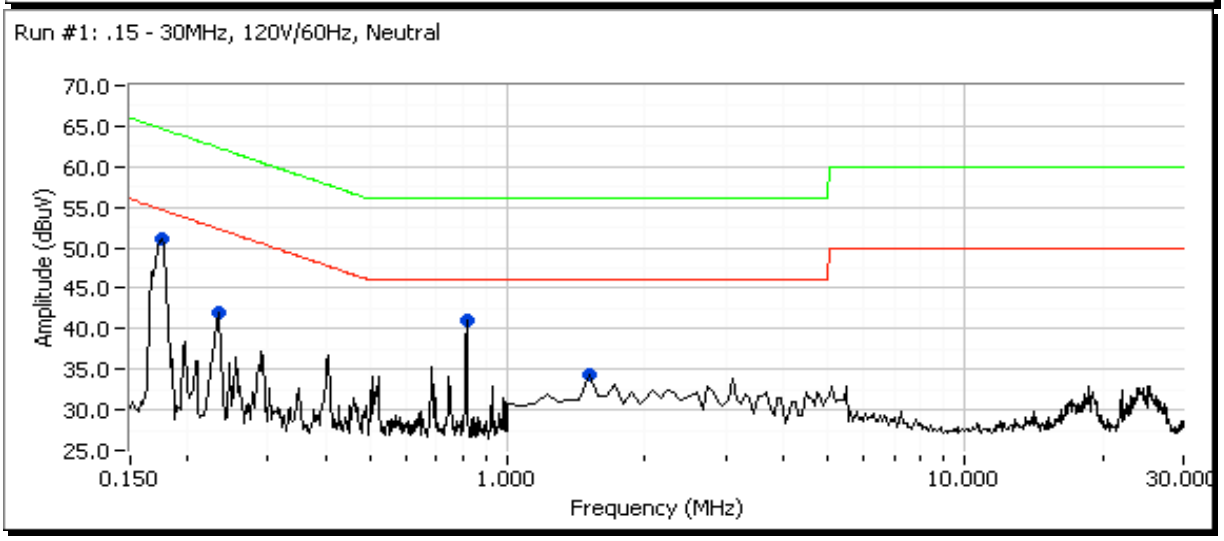
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	B

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





Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	B

Run #1: Continued

Preliminary Readings

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.173	47.4	Line 1	54.7	-7.3	Peak	
0.231	43.3	Line 1	52.3	-9.0	Peak	
0.810	42.1	Line 1	46.0	-3.9	Peak	Ambient
1.500	35.5	Line 1	46.0	-10.5	Peak	
0.173	51.0	Neutral	54.7	-3.7	Peak	
0.230	42.0	Neutral	52.3	-10.3	Peak	
0.815	41.0	Neutral	46.0	-5.0	Peak	Ambient
1.499	34.3	Neutral	46.0	-11.7	Peak	

Maximized Readings

0.173	43.1	Line 1	54.8	-11.7	Average	
0.173	43.1	Line 1	54.8	-11.7	Average	
0.173	42.9	Neutral	54.8	-11.9	Average	
0.173	52.4	Line 1	64.8	-12.4	QP	
0.173	51.5	Neutral	64.8	-13.3	QP	
0.231	36.8	Line 1	52.4	-15.6	Average	
0.231	36.3	Neutral	52.4	-16.1	Average	
0.231	45.1	Line 1	62.4	-17.3	QP	
1.500	28.4	Line 1	46.0	-17.6	Average	
1.500	28.2	Neutral	46.0	-17.8	Average	
0.231	43.9	Neutral	62.4	-18.5	QP	
1.500	32.3	Line 1	56.0	-23.7	QP	
1.500	31.9	Neutral	56.0	-24.1	QP	

Client:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 Radiated Spurious Emissions

Test Specifics

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

Date of Test: 6/20/2006
Test Engineer: Mehran Birgani
Test Location: SVOATS #1
Config. Used: 1
Config Change: None
EUT Voltage: Battery

General Test Configuration

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

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

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 30 - 12750 MHz Emissions, Receive Mode	RSS 210	Pass	36.9dBµV/m @ 4876.0MHz (-17.1dB)

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:	Sun Microsystems	Job Number:	J63114
Model:	Sun Spot	T-Log Number:	T64124
		Account Manager:	Nesha Lambert
Contact:	James Poore		
Spec:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, Receive Mode, 1000 - 12750 MHz. EUT @ 2440 MHz

Frequency	Level	Pol	RSS210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4875.970	36.9	V	54.0	-17.1	AVG	80	1.1	
4875.820	31.6	H	54.0	-22.4	AVG	15	1.0	
4875.970	45.6	V	74.0	-28.4	PK	80	1.1	
4875.820	44.3	H	74.0	-29.7	PK	15	1.0	

Note 1:	All signals up to 5th harmonic were measured, only 2nd harmonic was above the noise floor.

EXHIBIT 3: Photographs of Test Configurations

Uploaded as a separate attachment

EXHIBIT 4: Proposed FCC ID Label & Label Location

Uploaded as a separate attachment

EXHIBIT 5: Detailed Photographs of Sun Microsystems Model Sun SpotConstruction

Uploaded as a separate attachment

EXHIBIT 6: Operator's Manual for Sun Microsystems Model Sun Spot

Uploaded as a separate attachment

EXHIBIT 7: Block Diagram of Sun Microsystems Model Sun Spot

Uploaded as a separate attachment

EXHIBIT 8: Schematic Diagrams for Sun Microsystems Model Sun Spot

Uploaded as a separate attachment

EXHIBIT 9: Theory of Operation for Sun Microsystems Model Sun Spot

Uploaded as a separate attachment

EXHIBIT 10: RF Exposure Information

Uploaded as a separate attachment