

***Electromagnetic Emissions Test Report  
In Accordance With  
FCC Part 90  
on the  
Cisco Systems, Inc.  
Transmitter  
Model: U58H068***

FCC ID NUMBER: LDKXSCLCR14

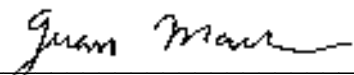
GRANTEE: Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134

TEST SITE: Elliott Laboratories, Inc.  
684 W. Maude Ave  
Sunnyvale, CA 94086

REPORT DATE: April 23, 2005

FINAL TEST DATE: April 21, 2005

AUTHORIZED SIGNATORY:

  
\_\_\_\_\_  
Juan Martinez  
Senior EMC Engineer



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**FCC CERTIFICATION INFORMATION**

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.1033(C) & to Industry Canada RSP-100.

**2.1033(c)(1) Applicant:**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, Ca 95134

**2.1033(c)(2) & RSP-100 (4) FCC ID: LDKXSCLCR14**

**2.1033(c)(3) & RSP-100 (7.2(a)) Instructions/Installation Manual**

Please refer to Exhibit 7: User Manual, Theory of Operation, and Tune-up Procedure

**2.1033(c)(4) & RSP-100 (7.2(b)(iii)) Type of emissions**

FCC 90: 5M00X1D, 10M0X1D, 20M0X1D

**2.1033(c)(5) & RSP-100 (7.2(a)) Frequency Range**

FCC 90: 4940 – 4990 MHz

**2.1033(c)(6) & RSP-100 (7.2(a)) Range of Operation Power**

FCC 90: 0.05 Watts

**2.1033(c)(7) & RSP-100 (7.2(a)) Maximum FCC & IC Allowed Power Level**

FCC 90.210: Maximum power is 20dBm (100mW)

**2.1033(c)(8) & RSP-100 (7.2(a)) Applied voltage and currents into the final transistor elements**

+5Vdc, 1amp

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**2.1033(c)(9) & RSP-100 (7.2(a)) Tune-up Procedure**

There are no tuneable components on the Radio. All transmitter parameters are controlled by software and by AR5414 chip

**2.1033(c)(10) & RSP 100 (7.2(a)) Schematic Diagram of the Transmitter**

Refer to Exhibit 6: Schematic diagram

**2.1033(c)(10) & RSP-100 (7.2(a)) Means for Frequency Stabilization**

Y1 = 40 MHz (XTAL) Frequency stability.

**2.1033(c)(10) & RSP-100 (7.2(a)) Means for Suppression of Spurious radiation**

F2 DEA165850LT-1197B2 low pass filter

**2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Modulation**

Controlled by software in the Atheros chip U1 (AR5414)

**2.1033(c)(10) & RSP-100 (7.2(a)) Means for Limiting Power**

Controlled by software in the Atheros chip U1 (AR5414) and scrip files.

**2.1033(c)(11) & RSP-100 (7.2(g)) Photographs or Drawing of the Equipment Identification Plate or Label**

Refer to Exhibit 4

**2.1033(c)(12) & RSP-100 (7.2(c)) Photographs of equipment**

Refer to Exhibit 5

**2.1033(c)(13) & RSP-100 (7.2(a)) Equipment Employing Digital Modulation & 90.203 (Certification Requirements)**

N/A

**2.1033(c)(14) & RSP-100 (7.2(b)(ii)) Data taken per Section 2.1046 to 2.1057 and RSS-133 issue 2, Rev. 1.**

Refer to Exhibit 2

### **DECLARATIONS OF COMPLIANCE**

Equipment Name and Model:  
U58H068

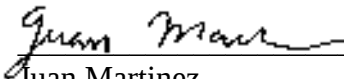
Manufacturer:  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134

Tested to applicable standards:  
FCC Part 90 (Private Land Mobile Radio Service)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC4549\_3 Dated March 5, 2003  
Departmental Acknowledgement Number: IC2845-2 Dated August 8, 2001

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of TIA/EIA-603 and the specific RSS standards applicable to this device); and that the equipment performed in accordance with the data submitted in this report.

|           |                                                                                      |
|-----------|--------------------------------------------------------------------------------------|
| Signature |  |
| Name      | Juan Martinez                                                                        |
| Title     | Senior EMC Engineer                                                                  |
|           | Elliott Laboratories Inc.                                                            |
| Address   | 684 W. Maude Ave                                                                     |
|           | Sunnyvale, CA 94086                                                                  |
|           | USA                                                                                  |

Date: April 23, 2005

Maintenance of compliance with the above standards is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

## **SCOPE**

FCC Part 90 testing was performed for the equipment mentioned in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the FCC Rule. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

## **OBJECTIVE**

The primary objective of the manufacturer is compliance with the FCC Part 90. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC. FCC issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

**SUMMARY OF TEST RESULTS****Part 90 and RSS-119 Test Summary**

| Measurement Required                 | FCC Part 2 & 90 Sections | Test Performed                                                                      | Measured Value                  | Test Procedure Used | Result   |
|--------------------------------------|--------------------------|-------------------------------------------------------------------------------------|---------------------------------|---------------------|----------|
| Modulation Tested                    | OFDM                     | -                                                                                   | -                               | -                   | -        |
| Modulation characteristics           | 2.1047                   | Modulated with appropriated signal                                                  | -                               | H                   | -        |
| Radiated RF power output (ERP/EIRP)  | 2.1046 / 90.1215(a)      | Radiated Output Power Test                                                          | -                               | -                   | -        |
| Conducted RF power output            | 2.1046 / 90.1215(a)      | Conducted Output Power Test                                                         | 17dBm (.05 Watts)               | B                   | Complies |
| Spurious emissions at antenna Port   | 2.1051/ 90.210(L)        | Emission Limits and/or Unwanted Emission 30MHz – 40GHz ( <b>Antenna Conducted</b> ) | All spurious emissions < -36dBm | J                   | Complies |
| Occupied Bandwidth                   | 2.1049/ 90.210(L)        | Emission Mask and 99% Bandwidth                                                     | Refer to Plots                  | C & D               | Complies |
| Field strength of spurious radiation | 2.1053 / 90.210(b)       | Radiated Spurious Emissions 30MHz – 40GHz                                           | -40.2 dBm @ 9970 MHz (-2.0 dB)  | N                   | Complies |
| Frequency stability                  | 2.1055 / 90.213          | Frequency Vs. Temperature                                                           | 100 Hz                          | K                   | Complies |
| Frequency stability                  | 2.1055 / 90.213          | Frequency Vs. Voltage                                                               | 15 Hz                           | L & M               | Complies |
| Transient Frequency Behavior         | 90.214                   | Transient Behavior                                                                  | N/A                             | N/A                 | N/A      |
| Exposure to Mobile devices           | 2.1091                   | Exposure of Humans to RF Fields                                                     | MPE Calculation                 | -                   |          |
| Receiver                             | 15.109                   | Receiver Spurious Emissions                                                         | N/A                             | N/A                 | Complies |

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**MEASUREMENT UNCERTAINTIES**

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

| Measurement Type    | Frequency Range<br>(MHz) | Calculated Uncertainty<br>(dB) |
|---------------------|--------------------------|--------------------------------|
| Conducted Emissions | 0.15 to 30               | $\pm 2.4$                      |
| Radiated Emissions  | 30 to 1000               | $\pm 3.6$                      |

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The EUT is an Atheros base 802.11a radio which Clear Creek will use for Public Safety organizations for applications that require high throughput and citywide coverage in the United States. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 5Vdc.

The sample was received on April 19, 2005 and tested on April 21, 2005. The EUT consisted of the following component(s):

| Manufacturer  | Model   | Description   | Serial Number | FCC ID      |
|---------------|---------|---------------|---------------|-------------|
| Cisco Systems | U58H068 | 4.9GHz module | -             | LDKXSCLCR14 |

**ENCLOSURE**

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host.

**MODIFICATIONS**

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

**SUPPORT EQUIPMENT**

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

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| IBM          | X31   | Laptop      | 99-ARYWO      | DoC    |

No remote support equipment was used during emissions testing.

**EUT INTERFACE PORTS**

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

| Port          | Connected to | Description | Shielded or Unshielded | Length (m) |
|---------------|--------------|-------------|------------------------|------------|
| Antenna power | Termination  | Coaxial     | Shielded               | 0.5        |

**EUT OPERATION DURING TESTING**

The device was configured to transmit or receive on the channel specified in the test description. The antenna port was terminated in a 50-ohm load during radiated emissions tests.

## **TEST SITE**

### **GENERAL INFORMATION**

Final test measurements were taken on April 19 and 21, 2005 at the Elliott Laboratories Site 2 and 3 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to Section 2.948 of the FCC Rules, construction, calibration, and equipment data has been filed with the Commission.

### **CONDUCTED EMISSIONS CONSIDERATIONS**

Conducted emissions testing are performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

### **RADIATED EMISSIONS CONSIDERATIONS**

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area.

## **MEASUREMENT INSTRUMENTATION**

### **RECEIVER SYSTEM**

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring 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 particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

### **INSTRUMENT CONTROL COMPUTER**

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into field strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

### **PEAK POWER METER**

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

### **FILTERS/ATTENUATORS**

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and 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 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers

**ANTENNA MAST AND EQUIPMENT TURNTABLE**

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

The requirements of ANSI C63.4 were used for configuration of the equipment turntable. It 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 appendix of this report contains the list of test equipment used and calibration information.

## TEST PROCEDURES

**General:** For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

**Procedure B – Power Measurement (Conducted Method):** The following procedure was used for transmitters that do use external antennas.

- 1) Set the EUT to maximum power and to the lowest channel.
- 2) Either a power meter or a spectrum analyzer was used to measure the power output.
- 3) If a spectrum analyzer was used a resolution and video bandwidth 10kHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 2MHz and video to 3 MHz.
- 4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
- 5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

**Procedure C - Occupied Bandwidth (Conducted Method):** Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

- 1) The built-in 99% function of the spectrum analyzer was used.
- 2) If the built-in 99% is not available then the following method is used:

26-dB or 20-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.

- 3) For the above two methods a resolution and video bandwidth of 100 or 300 Hz was used to measure the emission's bandwidth.

**Procedure D - Occupied Bandwidth (Conducted Emission Mask):** Either for analog, digital, or data modulations, emission mask was performed. The EUT was set to transmit the appropriate modulation at maximum power. The following method was used:

Taken from Part 90.210 Emission Mask L

The following Resolution and Video bandwidth was used to show compliance for the above requirement: 1% of the occupied bandwidth.

**Procedure H - Other Types of Equipment:** Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

**Procedure J – Antenna Conducted Emissions:** For spurious emission measurements at the antenna terminal the following procedure was performed:

- 1) Set the transmitting signal at the middle of the operating range of the transmitter, as specified in the standard. Power is set to maximum and then to minimum.
- 2) Set the spectrum analyzer display line function to –37-dBm.
- 3) Set the spectrum analyzer bandwidth to 1MHz <1GHz and 1 MHz >1GHz.
- 4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10<sup>th</sup> harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –37dBm limit.
- 5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

**Procedure K - Frequency Stability:** The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from –30 to +50° C (or +60° C for some IC RSS standards, if applicable) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

**Procedure L - Frequency Stability:** For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

**Procedure M - Frequency Stability:** For battery-powered devices the voltage battery end-point is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

---

**Procedure N - Field Strength Measurement:** The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50-ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

For the first scan, a pre-liminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a transmit antenna and signal generator. The substitution antenna can be reference to a half-wave dipole in dBi. The signal generator is then set to a fix output level of either -10 or -20dBm. This is then injected into the substitution antenna. The field strength produced by the substitution antenna is then measured. This measured value is then used to determine the conversion factor to convert the EUTs field strength levels to a dBm value.

---

**Procedure I – Transient Frequency Behavior:** The TIA/EIA 603 procedure was used to determine compliance to radio being keyed on and off.

- 1) Connected the Test Receiver DOP or Video Output to Channel 1 of the oscilloscope. The output of the RF crystal detector was connected to Auxiliary channel 1, which served as a trigger input. The output of the combiner was connected to the Test Receiver.
- 2) Set the EUT to maximum power and connected as illustrated above. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at 6.25kHz, 12.5 kHz, or 25 kHz deviation and set its output to –100 dBm, then turn on the EUT.
- 3) The Combiner output side was connected to the Test Receiver, which was used to measure the Power. Used enough external attenuation so that the output at the combiner was set to 40 dB below the maximum input of the Test Receiver, then turn off the EUT.
- 4) Set the signal generator output to the same level in step 3. This level was maintained for the remainder of the test.
- 5) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjusted the display to continuously view the 1 kHz tone from the DOP or Video Output. Adjusted the vertical amplitude control to display the 1 kHz at +/- 4 divisions vertically centered on the display.
- 6) Set the oscilloscope to trigger at the AUX channel 1 input port.
- 7) Removed enough external attenuation so that the input to the RF detector and combiner is increased by 30 dB.
- 8) Turn on the transmitter and plotted the result for **T<sub>on</sub>**, **T<sub>1</sub>**, and **T<sub>2</sub>**.
- 9) Set the oscilloscope to trigger in decreasing magnitude from the RF crystal detector.
- 10) Turn off the transmitter and plotted the result for **T<sub>3</sub>**.

**SPECIFICATION LIMITS AND SAMPLE CALCULATIONS****RADIATED EMISSIONS SPECIFICATION LIMITS**

The limits for radiated emissions are based on the power of the transmitter at the operating frequency. Data is measured in the logarithmic form of decibels relative to one milliwatt (dBm) or one microvolt/meter (dBuV/m.). The field strength of the emissions from the EUT is measured on a test site with a receiver.

Below is a formula example used to calculate the attenuation requirement, relative to the transmitters power output, in dBuV/m. For this example an operating power range of 3 watts is used. The radiated emissions limit for spurious signals outside of the assigned frequency block is  $43 + 10 \log_{10}(\text{mean output power in watts})$  dB below the measured amplitude at the operating power.

**CALCULATIONS – EFFECTIVE RADIATED POWER**

$$E(\text{V/m}) = \frac{\sqrt{30 * P * G}}{d}$$

E= Field Strength in V/m

P= Power in Watts (for this example we use 3 watts)

G= Gain of antenna in numeric gain (Assume 1.64 for ERP)

d= distance in meters

$$E(\text{V/m}) = \frac{\sqrt{30 * 3 \text{ watts} * 1.64 \text{ dB}}}{3 \text{ meters}}$$

$$20 * \log(4.049 \text{ V/m} * 1,000,000) = 132.14 \text{ dBuV/m @ 3 meters}$$

FCC Rules request an attenuation of  $43 + 10 \log(3)$  or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

$$132.1 \text{ dBuV/m} - 47.8 \text{ dB} = 84.3 \text{ dBuV/m @ 3 meter.}$$

**Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.**

***EXHIBIT 1: Test Equipment Calibration Data***

1 Page

**Antenna Conducted, Radiated Emissions 1000 - 40,000 MHz, 06-May-05****Engineer: Chris Groat**

| <b><u>Manufacturer</u></b> | <b><u>Description</u></b>                                    | <b><u>Model #</u></b> | <b><u>Asset #</u></b> | <b><u>Cal Due</u></b> |
|----------------------------|--------------------------------------------------------------|-----------------------|-----------------------|-----------------------|
| Hewlett Packard            | Microwave EMI test system (SA40, 30Hz - 40GHz),<br>Sunnyvale | 84125C                | 1149                  | 11-Jun-05             |
| Rohde & Schwarz            | Power Meter, Single Channel                                  | NRVS                  | 1534                  | 01-Mar-06             |
| Rohde & Schwarz            | Power Sensor 100uW - 10 Watts                                | NRV-Z53               | 1555                  | 01-Nov-05             |

***EXHIBIT 2: Test Data Log Sheets***

***ELECTROMAGNETIC EMISSIONS***

***TEST LOG SHEETS***

***AND***

***MEASUREMENT DATA***

T59447 29 Pages



## ***EMC Test Data***

|                 |                  |                  |             |
|-----------------|------------------|------------------|-------------|
| Client:         | Cisco Systems    | Job Number:      | J59447      |
| Model:          | U58H068          | T-Log Number:    | T59447      |
|                 |                  | Account Manager: | Susan Pelzl |
| Contact:        | Fred Leffingwell |                  |             |
| Emissions Spec: | FCC part 90      | Class:           | Radio       |
| Immunity Spec:  | -                | Environment:     | -           |

# **EMC Test Data**

For The

## **Cisco Systems**

Model

### **U58H068**

Date of Last Test: 5/6/2005



## EMC Test Data

|                 |                  |                  |             |
|-----------------|------------------|------------------|-------------|
| Client:         | Cisco Systems    | Job Number:      | J59447      |
| Model:          | U58H068          | T-Log Number:    | T59447      |
|                 |                  | Account Manager: | Susan Pelzl |
| Contact:        | Fred Leffingwell |                  |             |
| Emissions Spec: | FCC part 90      | Class:           | Radio       |
| Immunity Spec:  | -                | Environment:     | -           |

### EUT INFORMATION

#### General Description

The EUT is an Atheros base 802.11a radio which Clear Creek will use for Public Safety organizations for applications that require high throughput and citywide coverage in the United States. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 5Vdc.

#### Equipment Under Test

| Manufacturer  | Model   | Description          | Serial Number | FCC ID      |
|---------------|---------|----------------------|---------------|-------------|
| Cisco Systems | U58H068 | 4.9 GHz radio module | N/A           | LDKXSCLCR14 |

#### EUT Enclosure

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host.

#### 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.



## EMC Test Data

|                 |                  |                  |             |
|-----------------|------------------|------------------|-------------|
| Client:         | Cisco Systems    | Job Number:      | J59447      |
| Model:          | U58H068          | T-Log Number:    | T59447      |
|                 |                  | Account Manager: | Susan Pelzl |
| Contact:        | Fred Leffingwell |                  |             |
| Emissions Spec: | FCC part 90      | Class:           | Radio       |
| Immunity Spec:  | -                | Environment:     | -           |

### Test Configuration #1

#### Local Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| IBM          | X31   | Laptop      | 99-ARYWO      | DoC    |

#### Remote Support Equipment

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

#### Interface Cabling and Ports

| Port          | Connected To | Cable(s)    |                        |           |
|---------------|--------------|-------------|------------------------|-----------|
|               |              | Description | Shielded or Unshielded | Length(m) |
| Antenna power | termination  | coaxial     | Shielded               | 0.5       |

#### EUT Operation During Emissions Tests

Transmitting continuously on selected frequencies at 16 dBm average power.



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pelzl |
| Spec:    | FCC part 90      | Class:           | N/A         |

### Radiated Spurious Emissions, FCC Part 90

#### 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: 4/21/2005

Test Engineer: Juan Martinez

Test Location: SVOATS #3

Config. Used: 1

Config Change: None

EUT Voltage: 120V/60Hz

#### General Test Configuration

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

The measurement antenna was located 3 meters from the EUT.

**Ambient Conditions:** Temperature: 16 °C  
Rel. Humidity: 47 %

#### Summary of Results

| Run # | Test Performed                                         | Limit  | Pass / Fail | Result / Margin |
|-------|--------------------------------------------------------|--------|-------------|-----------------|
| 1     | RE, 1000 - 40,000 MHz -<br>Spurious Emissions Transmit | FCC 90 | Pass        | Refer to run    |
| 2     | RE, 1000 - 40,000 MHz -<br>Spurious Emissions Transmit | FCC 90 | Pass        | Refer to run    |

#### Modifications Made During Testing:

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | N/A         |

### Run #1: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

#### Frequency = 4985 MHz (5MHz)

| Frequency | Level        | Pol | FCC 90 <sup>Note 1</sup> |        | Detector  | Azimuth | Height | Comments |
|-----------|--------------|-----|--------------------------|--------|-----------|---------|--------|----------|
| MHz       | dB $\mu$ V/m | v/h | Limit                    | Margin | Pk/QP/Avg | degrees | meters |          |
| 9970.000  | 59.6         | v   | 59.2                     | 0.4    | Avg       | -       | -      |          |
| 9970.000  | 52.3         | h   | 59.2                     | -6.9   | Avg       | -       | -      |          |
| 14055.00  | 33.8         | v   | 59.2                     | -25.4  | Avg       | -       | -      |          |
| 14055.00  | 32.3         | h   | 59.2                     | -26.9  | Avg       | -       | -      |          |

#### Frequency = 4985 MHz (10MHz)

|          |      |   |      |       |     |   |   |  |
|----------|------|---|------|-------|-----|---|---|--|
| 9970.000 | 58.3 | v | 59.2 | -0.9  | Avg | - | - |  |
| 9970.000 | 52.7 | h | 59.2 | -6.5  | Avg | - | - |  |
| 14055.00 | 37.0 | v | 59.2 | -22.2 | Avg | - | - |  |
| 14055.00 | 36.4 | h | 59.2 | -22.8 | Avg | - | - |  |

#### Frequency = 4985 MHz (20MHz)

|          |      |   |      |       |     |   |   |  |
|----------|------|---|------|-------|-----|---|---|--|
| 9970.000 | 59.0 | v | 59.2 | -0.2  | Avg | - | - |  |
| 9970.000 | 53.4 | h | 59.2 | -5.8  | Avg | - | - |  |
| 14055.00 | 36.0 | v | 59.2 | -23.2 | Avg | - | - |  |
| 14055.00 | 38.2 | h | 59.2 | -21.0 | Avg | - | - |  |

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



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pelzl |
| Spec:    | FCC part 90      | Class:           | N/A         |

### Horizontal

| Frequency<br>MHz | Substitution measurements |                   |                 | Site<br>Factor <sup>4</sup> | EUT measurements |            | eirp Limit<br>dBm | erp Limit<br>dBm | Margin<br>dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-------------------|------------------|--------------|
|                  | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> |                             | FS <sup>5</sup>  | eirp (dBm) | erp (dBm)         |                  |              |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 52.3             | -44.7      | -46.9             | -36.0            | -8.7         |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 52.7             | -44.3      | -46.5             | -36.0            | -8.3         |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 53.4             | -43.6      | -45.8             | -36.0            | -7.6         |

### Vertical

| Frequency<br>MHz | Substitution measurements |                   |                 | Site<br>Factor <sup>4</sup> | EUT measurements |            | eirp Limit<br>dBm | erp Limit<br>dBm | Margin<br>dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-------------------|------------------|--------------|
|                  | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> |                             | FS <sup>5</sup>  | eirp (dBm) | erp (dBm)         |                  |              |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 59.6             | -38.0      | -40.2             | -36.0            | -2.0         |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 58.3             | -39.3      | -41.5             | -36.0            | -3.3         |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 59.0             | -38.6      | -40.8             | -36.0            | -2.6         |

Note 1: Pin is the input power (dBm) to the substitution antenna

Note 2: Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.

Note 3: FS is the field strength (dBuV/m) measured from the substitution antenna.

Note 4: Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.

Note 5: EUT field strength as measured during initial run.



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | N/A         |

### Run #2: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

#### Frequency = 4950 MHz (5MHz)

| Frequency | Level  | Pol | FCC 90 <sup>Note 1</sup> |        | Detector  | Azimuth | Height | Comments |
|-----------|--------|-----|--------------------------|--------|-----------|---------|--------|----------|
| MHz       | dBμV/m | v/h | Limit                    | Margin | Pk/QP/Avg | degrees | meters |          |
| 9970.000  | 54.2   | v   | 59.2                     | -5.1   | Avg       | -       | -      |          |
| 9970.000  | 53.4   | h   | 59.2                     | -5.8   | Avg       | -       | -      |          |
| 14055.00  | 37.0   | v   | 59.2                     | -22.2  | Avg       | -       | -      |          |
| 14055.00  | 38.0   | h   | 59.2                     | -21.2  | Avg       | -       | -      |          |

#### Frequency = 4950 MHz (10MHz)

|          |      |   |      |       |     |   |   |  |
|----------|------|---|------|-------|-----|---|---|--|
| 9970.000 | 55.0 | v | 59.2 | -4.2  | Avg | - | - |  |
| 9970.000 | 48.5 | h | 59.2 | -10.7 | Avg | - | - |  |
| 14055.00 | 36.0 | v | 59.2 | -23.2 | Avg | - | - |  |
| 14055.00 | 37.8 | h | 59.2 | -21.4 | Avg | - | - |  |

#### Frequency = 4950 MHz (20MHz)

|          |      |   |      |       |     |   |   |  |
|----------|------|---|------|-------|-----|---|---|--|
| 9970.000 | 59.3 | v | 59.2 | 0.1   | Avg | - | - |  |
| 9970.000 | 48.4 | h | 59.2 | -10.8 | Avg | - | - |  |
| 14055.00 | 35.0 | v | 59.2 | -24.2 | Avg | - | - |  |
| 14055.00 | 36.7 | h | 59.2 | -22.5 | Avg | - | - |  |

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



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pelzl |
| Spec:    | FCC part 90      | Class:           | N/A         |

### Horizontal

| Frequency<br>MHz | Substitution measurements |                   |                 | Site<br>Factor <sup>4</sup> | EUT measurements |            | eirp Limit<br>dBm | erp Limit<br>dBm | Margin<br>dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-------------------|------------------|--------------|
|                  | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> |                             | FS <sup>5</sup>  | eirp (dBm) | erp (dBm)         |                  |              |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 54.3             | -42.7      | -44.9             | -36.0            | -6.7         |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 48.5             | -48.5      | -50.7             | -36.0            | -12.5        |
| 9970.000         | -17.7                     | 12.8              | 92.0            | 97.0                        | 48.4             | -48.6      | -50.8             | -36.0            | -12.6        |

### Vertical

| Frequency<br>MHz | Substitution measurements |                   |                 | Site<br>Factor <sup>4</sup> | EUT measurements |            | eirp Limit<br>dBm | erp Limit<br>dBm | Margin<br>dB |
|------------------|---------------------------|-------------------|-----------------|-----------------------------|------------------|------------|-------------------|------------------|--------------|
|                  | Pin <sup>1</sup>          | Gain <sup>2</sup> | FS <sup>3</sup> |                             | FS <sup>5</sup>  | eirp (dBm) | erp (dBm)         |                  |              |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 54.2             | -43.4      | -45.6             | -36.0            | -7.4         |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 55.0             | -42.6      | -44.8             | -36.0            | -6.6         |
| 9970.000         | -17.7                     | 12.8              | 92.6            | 97.6                        | 59.3             | -38.3      | -40.5             | -36.0            | -2.3         |

Note 1: Pin is the input power (dBm) to the substitution antenna

Note 2: Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.

Note 3: FS is the field strength (dBuV/m) measured from the substitution antenna.

Note 4: Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.

Note 5: EUT field strength as measured during initial run.



## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

### OCCUPIED BANDWIDTH (EMISSION MASK)

#### 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: 5/5/2005

Test Engineer: Juan Martinez

Test Location: SVOATS# 2

Config. Used: 1

Config Change: None

EUT Voltage: 120V/60Hz

#### General Test Configuration

Connected the radios antenna port directly to the spectrum analyzer. Used external attenuation to protect the analyzer input. Any losses were included into the measurements.

**Ambient Conditions:**              Temperature:              18 °C  
                                                 Rel. Humidity:              45 %

#### Summary of Results

| Run # | Test Performed     | Limit               | Result | Comment        |
|-------|--------------------|---------------------|--------|----------------|
| 1     | Occupied Bandwidth | FCC 90.210 (Mask L) | Pass   | Refer to plots |

#### Modifications Made During Testing:

No modifications were made to the EUT during testing

#### Deviations From The Standard

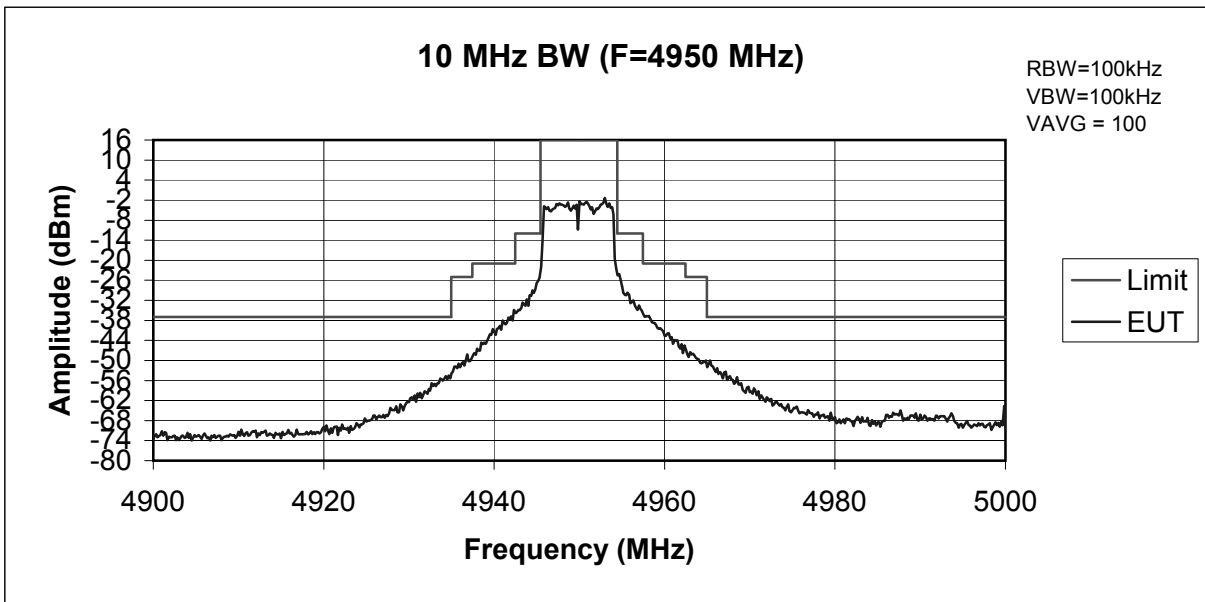
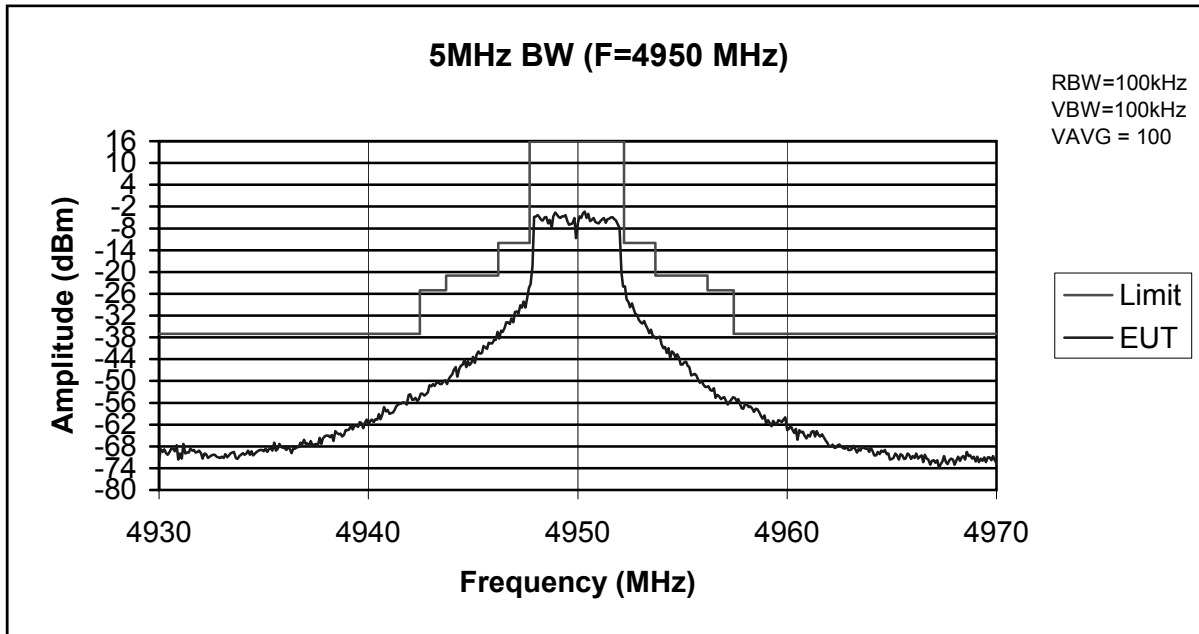
No deviations were made from the requirements of the standard.



## EMC Test Data

|          |                  |                  |            |
|----------|------------------|------------------|------------|
| Client:  | Cisco Systems    | Job Number:      | J59447     |
| Model:   | U58H068          | T-Log Number:    | T59447     |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pezl |
| Spec:    | FCC part 90      | Class:           | Radio      |

### Run #1: Emission Mask Plots

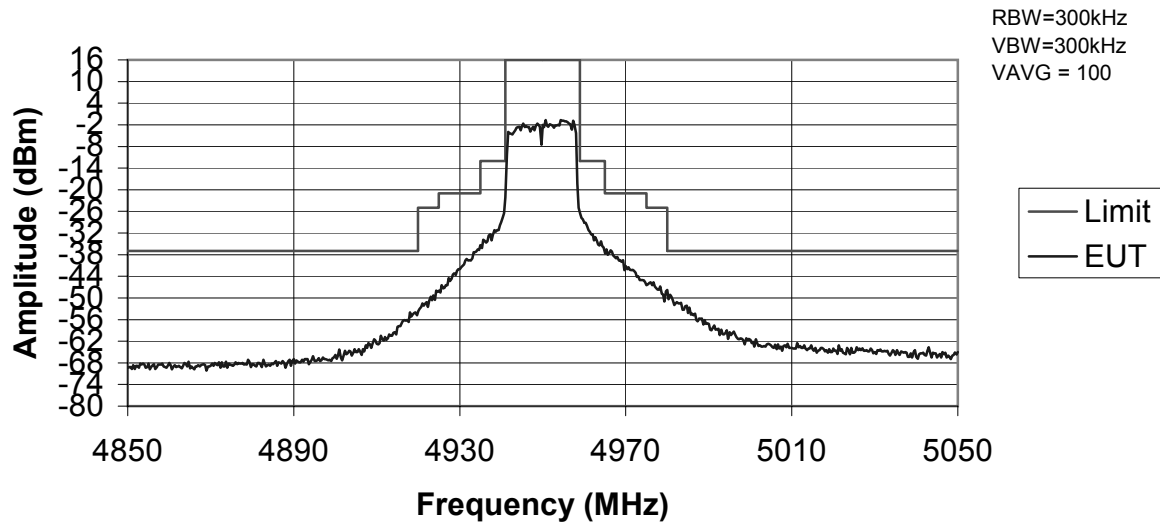




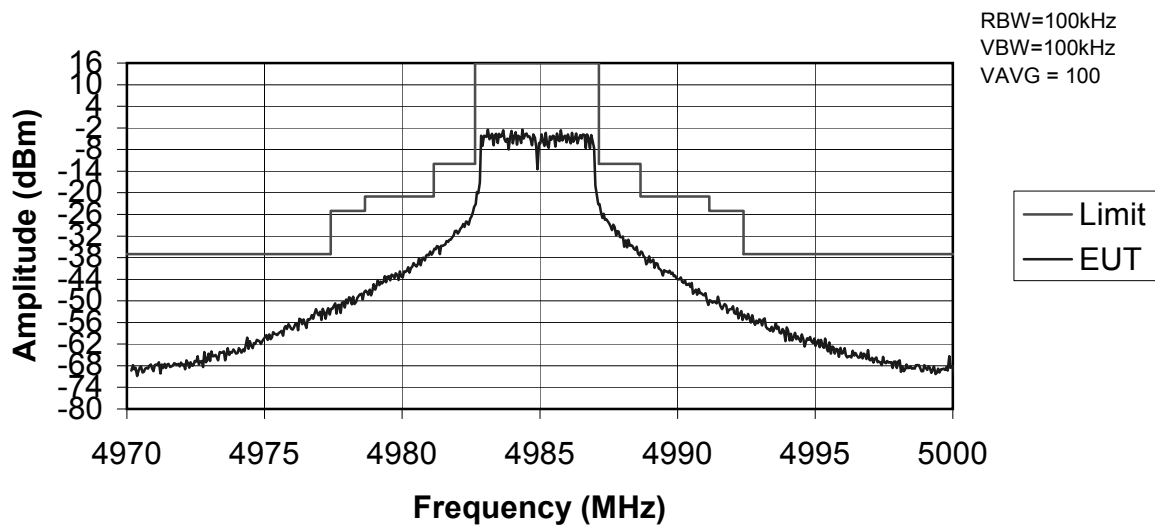
## EMC Test Data

|          |                  |                  |            |
|----------|------------------|------------------|------------|
| Client:  | Cisco Systems    | Job Number:      | J59447     |
| Model:   | U58H068          | T-Log Number:    | T59447     |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pezl |
| Spec:    | FCC part 90      | Class:           | Radio      |

### 20 MHz BW (F= 4950 MHz)



### 5MHz BW (F=4985 MHz)



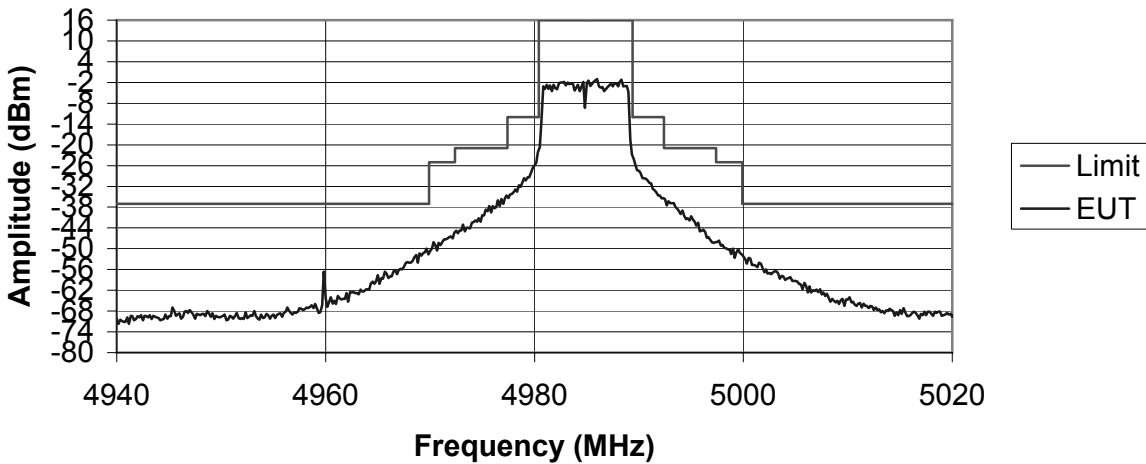


## EMC Test Data

|          |                  |                  |            |
|----------|------------------|------------------|------------|
| Client:  | Cisco Systems    | Job Number:      | J59447     |
| Model:   | U58H068          | T-Log Number:    | T59447     |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pezl |
| Spec:    | FCC part 90      | Class:           | Radio      |

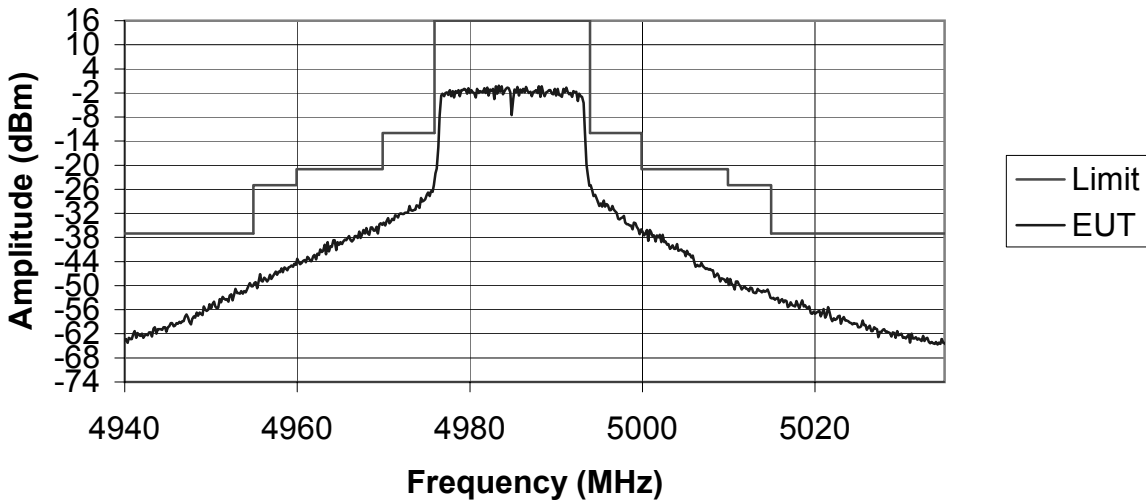
**10MHz BW (F=4985 MHz)**

RBW=100kHz  
VBW=100kHz  
VAVG = 100



**20MHz BW (F=4985 MHz)**

RBW=300kHz  
VBW=300kHz  
VAVG = 100





## EMC Test Data

|          |                  |                  |            |
|----------|------------------|------------------|------------|
| Client:  | Cisco Systems    | Job Number:      | J59447     |
| Model:   | U58H068          | T-Log Number:    | T59447     |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pezl |
| Spec:    | FCC part 90      | Class:           | Radio      |

### Antenna Conducted 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: 4/19/2005  
Test Engineer: Juan Martinez  
Test Location: SVOATS #2

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

#### General Test Configuration

Connected the radios antenna port directly to the spectrum analyzer. Used external attenuation to protect the analyzer input. Any losses were included into the measurements.

For the out of band measurements the limit is based on the following: 17dBm (Average Power) and Per 90.210 (L)(4) 53 dB attenuation. Per this emissions must be below 17 dBm - 53 dB = **-36 dBm**.

**Ambient Conditions:**  
Temperature: 18 °C  
Rel. Humidity: 45 %

#### Summary of Results

| Run # | Test Performed | Limit   | Result | Margin         |
|-------|----------------|---------|--------|----------------|
| 1     | Power Output   | Part 90 | Pass   | Refer to plots |
| 2     | PSD            | Part 90 | Pass   | Refer to plots |
| 3     | Out of Band    | Part 90 | Pass   | Refer to plots |

#### 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:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

### Run #1: Power Output

Max Hold, sample detector, power = 19.78dBm (FRAME mode)

#### Spectrum Analyzer Settings

CF: 4985.0MHz  
SPAN: 25.0MHz  
RB 1.0MHz  
VB 3.0MHz  
Detector Sample  
Att 40  
RL Offset 3.00  
Sweep Time 50.0ms  
Ref Lvl: 33.00DBM

Max held trace over 100 sweeps

#### Highest PSD

10.50 dBm/1.0MHz

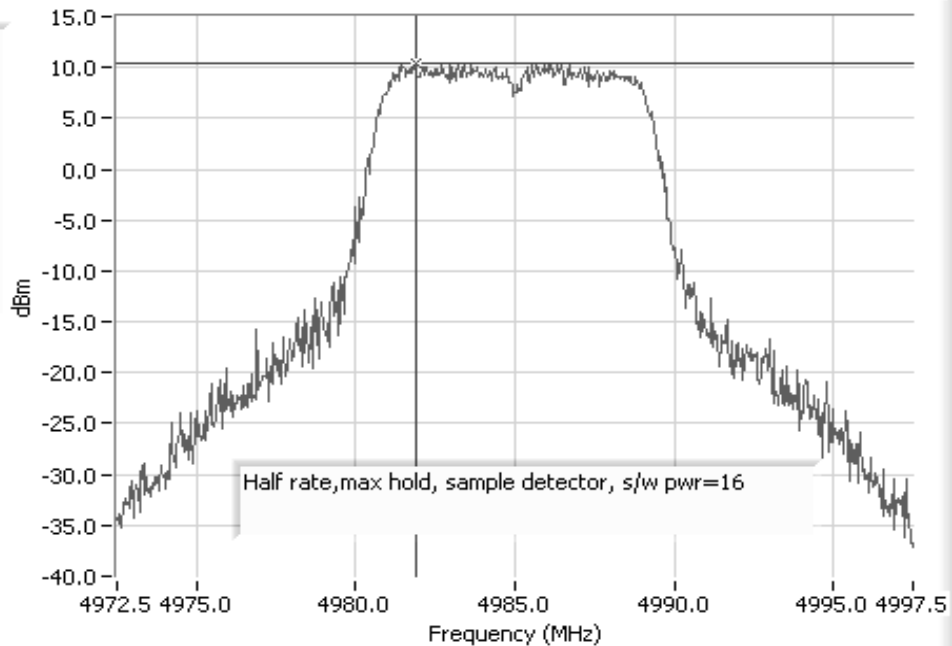
#### 99% Bandwidth (MHz)

5.00

#### Power Over Span

94.968 mW

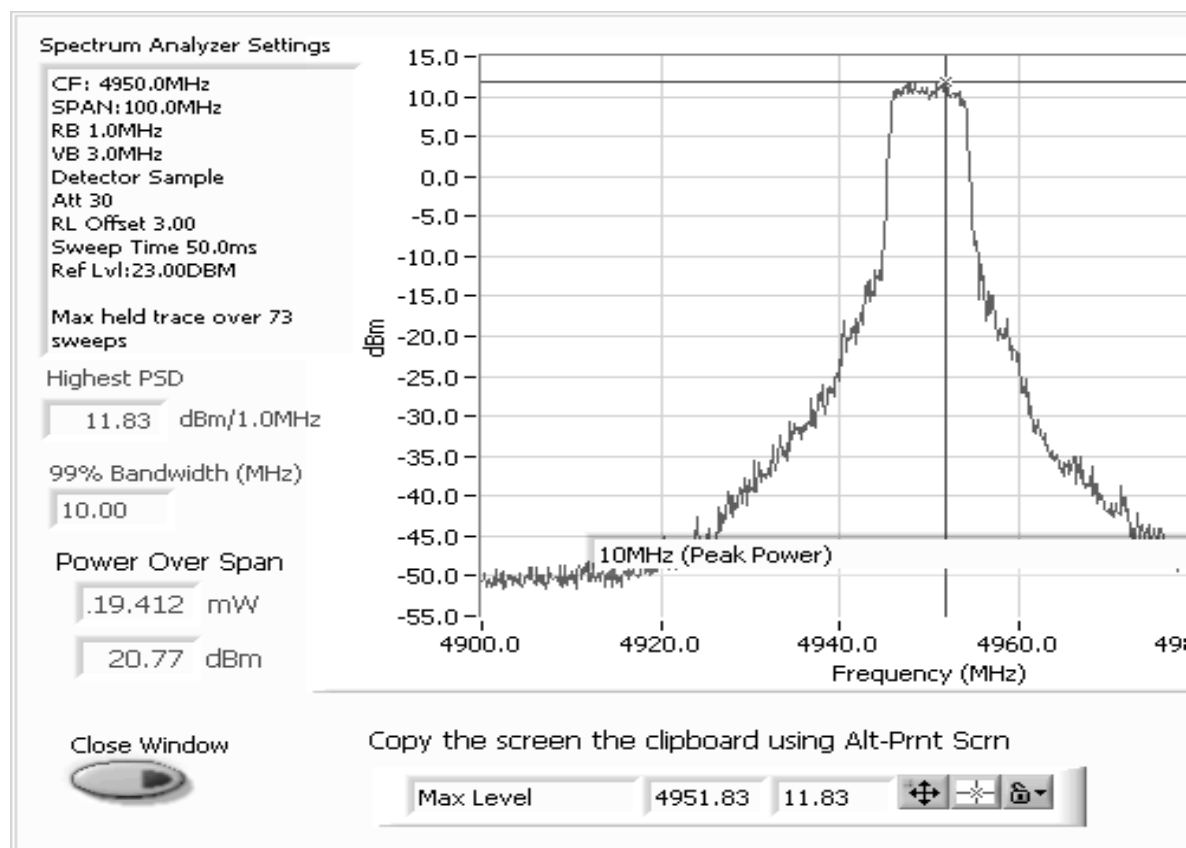
19.78 dBm





## EMC Test Data

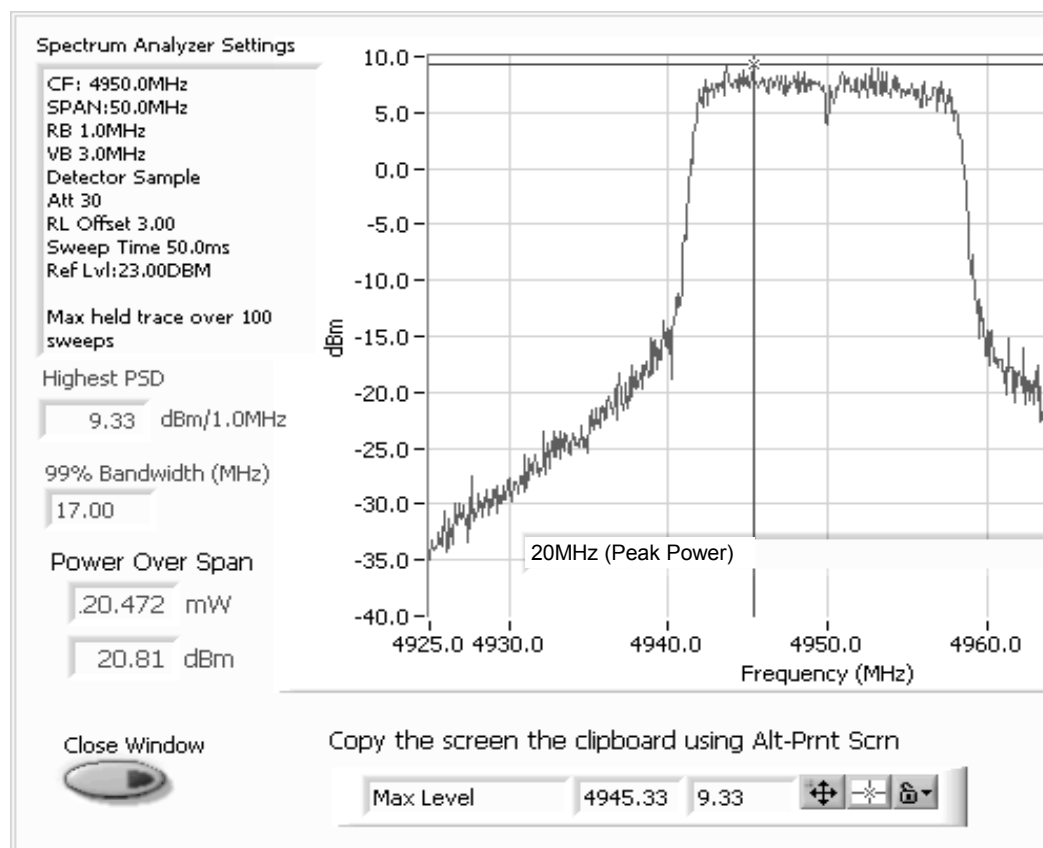
|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |





## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |



| Freq.<br>(MHz) | Average Power<br>(dBm) | Peak Power<br>(dBm) | Bandwidth<br>(MHz) |
|----------------|------------------------|---------------------|--------------------|
| 4950.0         | 17                     | -                   | 5.0                |
| 4950.0         | 17                     | 20.8                | 10.0               |
| 4950.0         | 17                     | 20.8                | 20.0               |
| 4985.0         | 17                     | 19.8                | 5.0                |
| 4985.0         | 17                     | -                   | 10.0               |
| 4985.0         | 17                     | -                   | 20.0               |

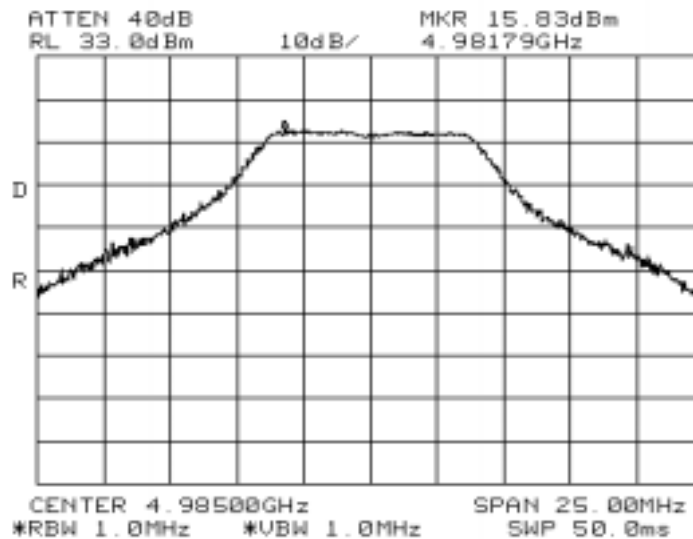


## EMC Test Data

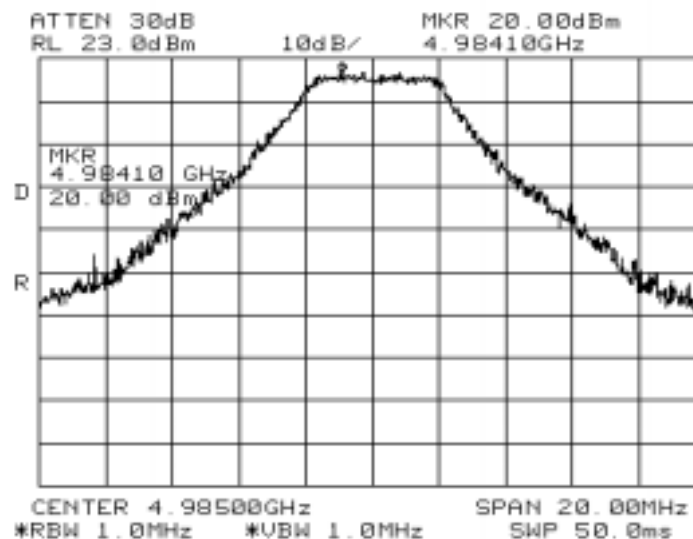
|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

### Run #2: Power spectral density

#### 10MHz (4985 MHz)



#### 5MHz (4985 MHz)

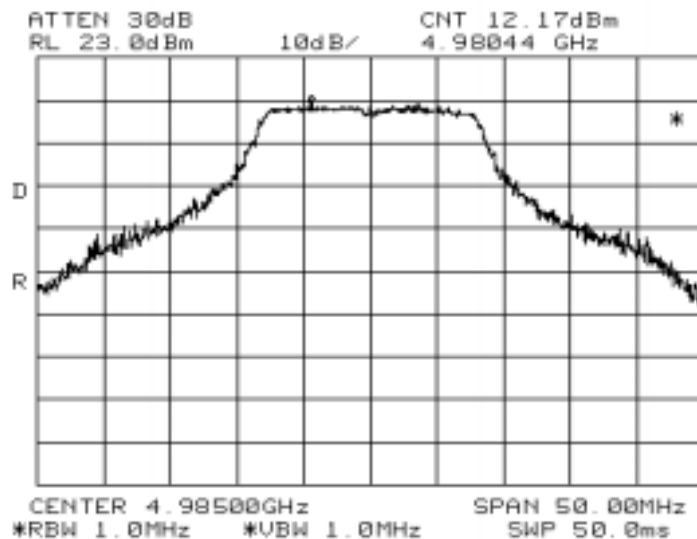




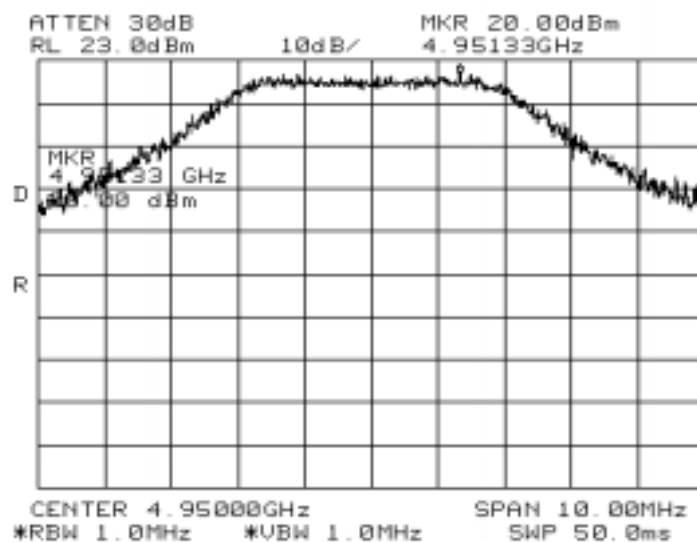
## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

20MHz (4985 MHz)



5MHz (4950 Mhz)

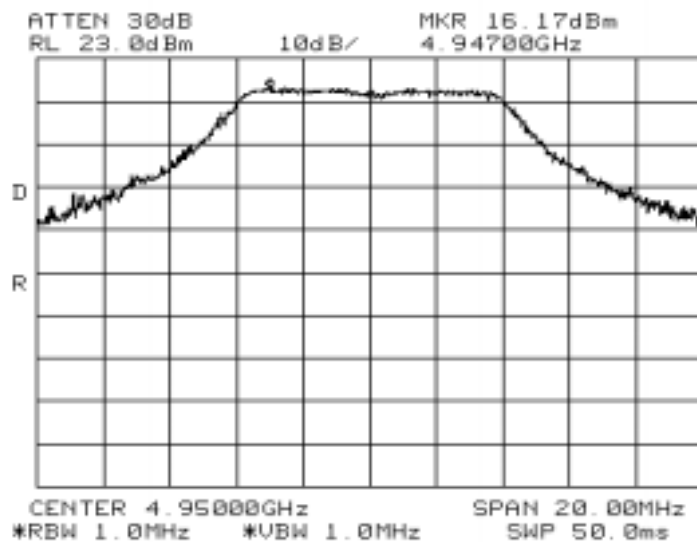




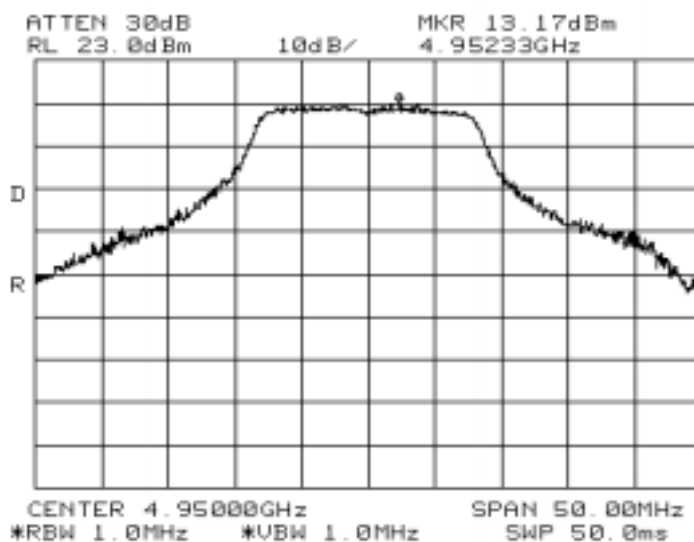
## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

10MHz (4950 MHz)



20MHz (4950 MHz)



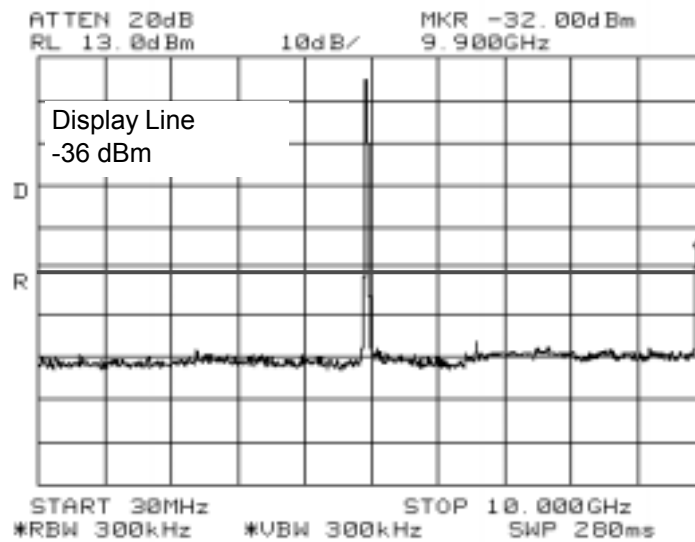


## EMC Test Data

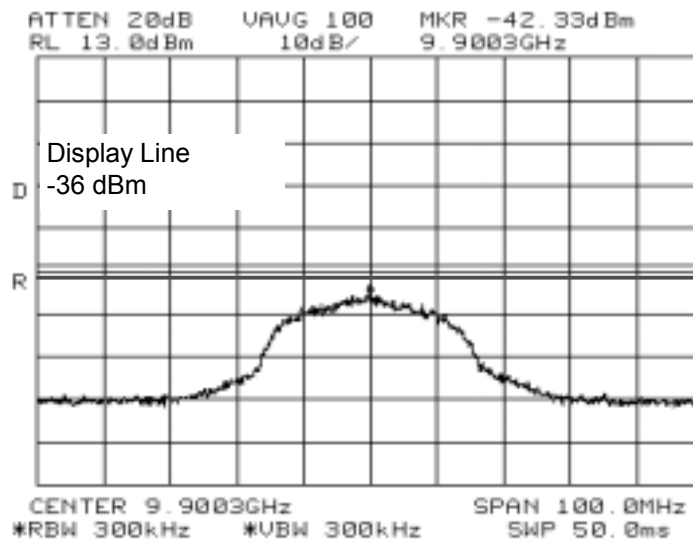
|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

### Run #3: Out of Band

#### 20MHz out of band



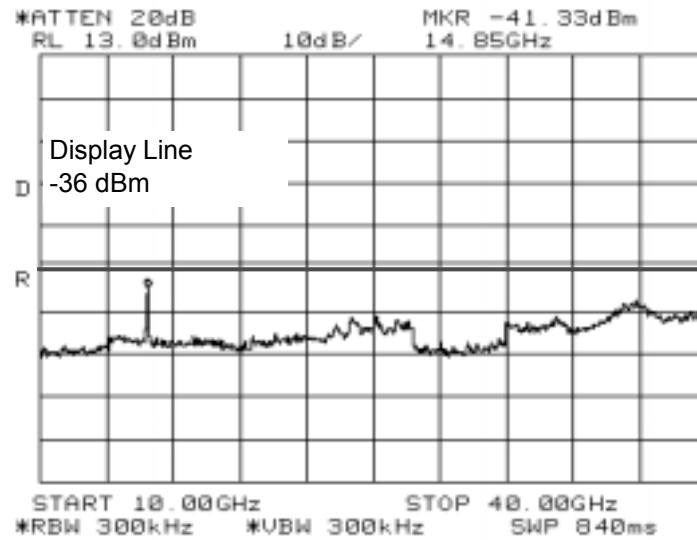
Plot below is based with a Video Average (Sample Detector) set to 100 Sweeps (This is to show non-compliant 2nd harmonic from above plot to be in compliance when using average.)





## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

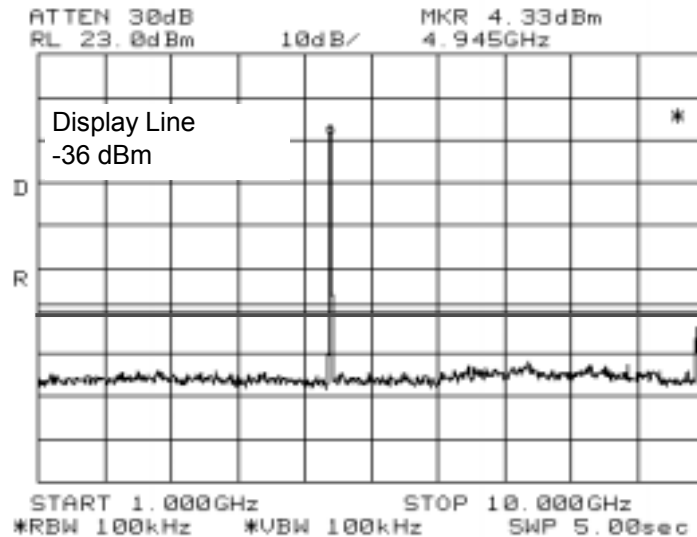
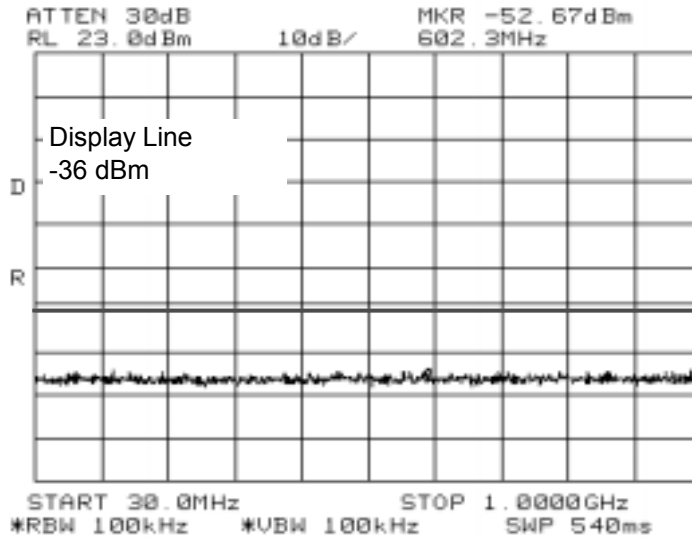




## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

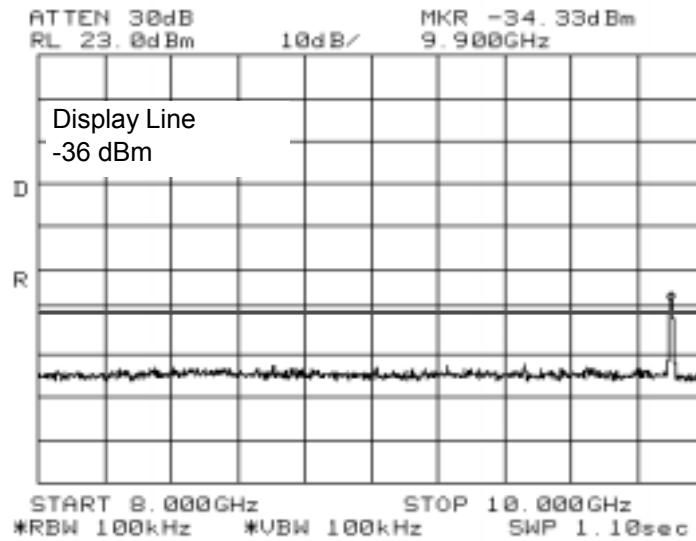
10MHz out of band



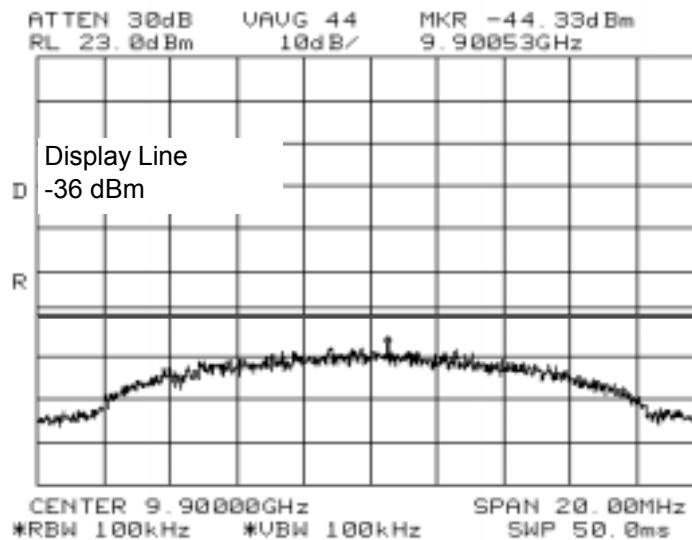


## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |



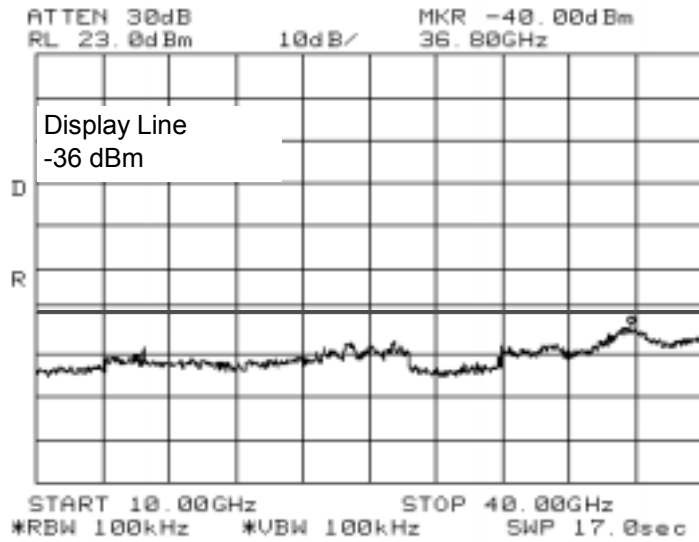
Plot below is based with a Video Average (Sample Detector) set to 100 Sweeps (This is to show non-compliant 2nd harmonic from above plot to be in compliance when using average.)





## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

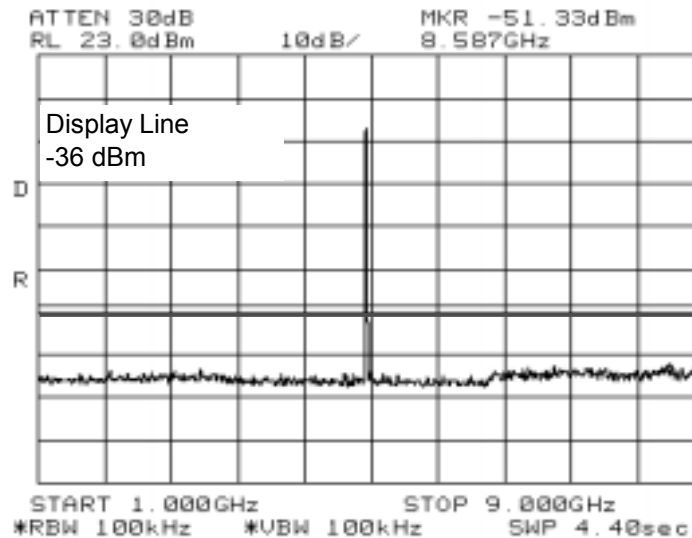
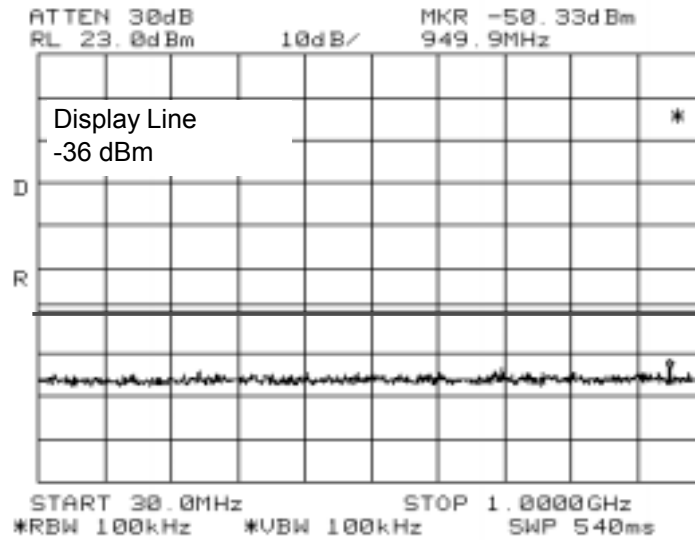




## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |

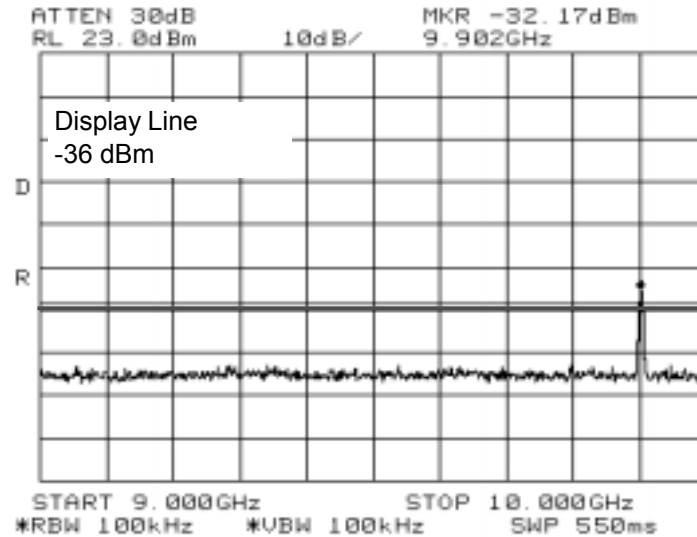
### 5MHz out of band



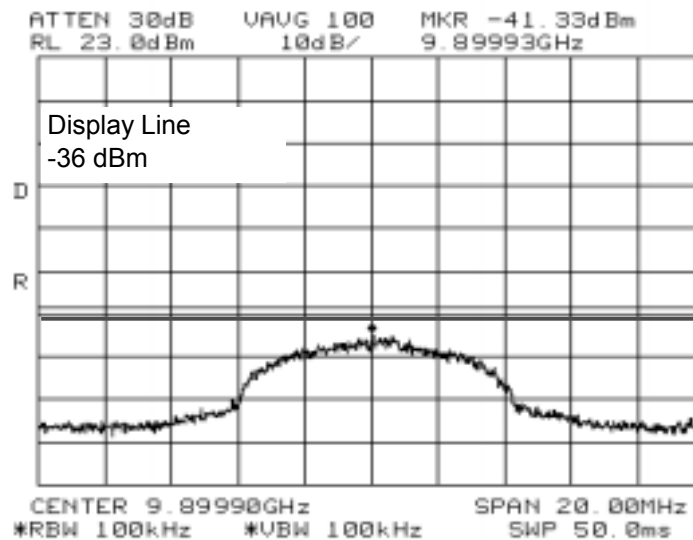


## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |



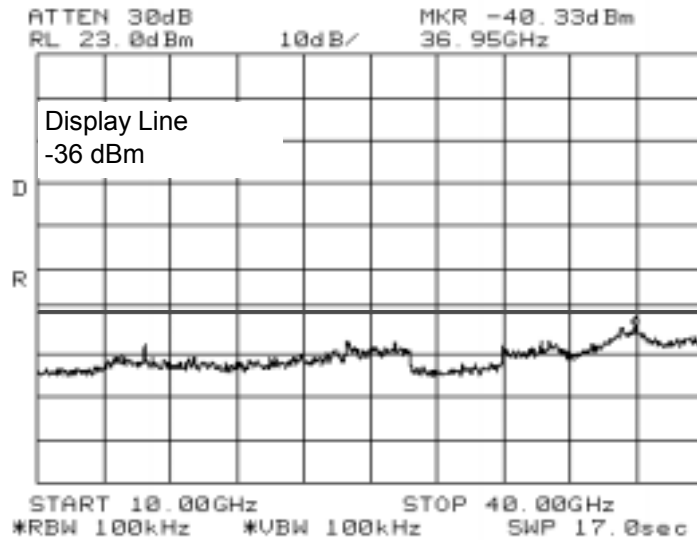
Plot below is based with a Video Average (Sample Detector) set to 100 Sweeps (This is to show non-compliant 2nd harmonic from above plot to be in compliance when using average.)





## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Peizi |
| Spec:    | FCC part 90      | Class:           | Radio       |





## EMC Test Data

|          |                  |                  |             |
|----------|------------------|------------------|-------------|
| Client:  | Cisco Systems    | Job Number:      | J59447      |
| Model:   | U58H068          | T-Log Number:    | T59447      |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pelzl |
| Spec:    | FCC part 90      | Class:           | Radio       |

### Radio Performance Test - Part 90 Frequency Stability

#### 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: 4/20/2005  
Test Engineer: Juan Martinez  
Test Location: Environmental Chamber

Config. Used: 1  
Config Change: None  
EUT Voltage: 3.3Vdc

#### General Test Configuration

The EUT's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary. EUT was placed inside an environmental chamber.

#### Summary of Results

| Run # | Test Performed                  | Limit   | Result | Value / Margin           |
|-------|---------------------------------|---------|--------|--------------------------|
| 1-2   | Frequency and Voltage Stability | Part 90 | Pass   | Refer to individual runs |

#### 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:  | Cisco Systems    | Job Number:      | J59447     |
| Model:   | U58H068          | T-Log Number:    | T59447     |
| Contact: | Fred Leffingwell | Account Manager: | Susan Pezl |
| Spec:    | FCC part 90      | Class:           | Radio      |

### Run #1: Temperature Vs. Frequency

| Drift | Freq. | Limit |
|-------|-------|-------|
| (ppm) | (MHz) | (Hz)  |
| N/A   |       |       |

| Temperature | Reference Frequency | Frequency Drift | Drift | Limit |
|-------------|---------------------|-----------------|-------|-------|
| (Celsius)   | (MHz)               | (MHz)           | (Hz)  | (Hz)  |
| -30         | 4950.000000         | 4949.999967     | -33   | 0.0   |
| -20         | 4950.000000         | 4949.999954     | -46   | 0.0   |
| -10         | 4950.000000         | 4949.999998     | -2    | 0.0   |
| 0           | 4950.000000         | 4950.000018     | 18    | 0.0   |
| 10          | 4950.000000         | 4950.000089     | 89    | 0.0   |
| 20          | 4950.000000         | 4950.000075     | 75    | 0.0   |
| 30          | 4950.000000         | 4950.000100     | 100   | 0.0   |
| 40          | 4950.000000         | 4950.000065     | 65    | 0.0   |
| 50          | 4950.000000         | 4950.000087     | 87    | 0.0   |

### Run #2: Voltage Vs. Frequency

#### Nominal Voltage is 5Vdc.

| Voltage | Reference Frequency | Frequency Drift | Drift | Limit | Comment |
|---------|---------------------|-----------------|-------|-------|---------|
| (Dc)    | (MHz)               | (MHz)           | (Hz)  | (Hz)  |         |
| 85%     | 4950.000000         | 4949.999990     | -10   | 0.0   | 2.8     |
| 115%    | 4950.000000         | 4950.000015     | 15    | 0.0   | 3.8     |

#### Battery endpoint is 1.5 Vdc

| Voltage | Reference Frequency | Frequency Drift | Drift | Limit | Comment |
|---------|---------------------|-----------------|-------|-------|---------|
| (Dc)    | (MHz)               | (MHz)           | (Hz)  | (Hz)  |         |
| 3.3     | 4950.000000         | 4950.000034     | 34    | 0.0   | Note 1  |

Note 1: Maximum drift of fundamental frequency before it shut down at 1.5 Vdc.

***EXHIBIT 3: Test Configuration Photographs***

3 Pages

***EXHIBIT 4: Theory of Operation Cisco Systems Model U58H068***

Theory of Operation 24 Pages  
Bill of Materials 4 Pages  
Tune Up Procedure 330 Pages

***EXHIBIT 5: Proposed FCC ID Label & Label Location***

2 Pages

***EXHIBIT 6: Detailed Photographs Cisco Systems Model U58H068***

External Photographs 1 Pages  
Internal Photographs 3 Pages

***EXHIBIT 7: Installation Guide Cisco Systems Model U58H068***

56 Pages

***EXHIBIT 8: Block Diagram Cisco Systems Model U58H068***

1 Page

***EXHIBIT 9: Schematic Diagrams Cisco Systems Model U58H068***

6 Pages

***EXHIBIT 10: RF Exposure Information***

MPE 2 Pages  
Antenna Specifications 6 Pages