



**Test Report**  
**Spurious and EMC Emissions**

**AIR-CAP1532E-A-K9**

**FCC ID: LDK102089P**  
**IC: 2461B-102089P**

**5470 -5725 MHz**

**Against the following Specifications:**  
**CFR47 Part 15**

**Cisco Systems**  
170 West Tasman Drive  
San Jose, CA 95134

Test Engineer *Brad Gilman*

Date 12-13-13



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## Section 1: Overview

### 1.1 Test Summary

The samples were assessed against the tests detailed in section 3 under the requirements of the following specifications:

| Emission      | Immunity |
|---------------|----------|
| CFR47 Part 15 | N/A      |

The specifications listed above represent actual tests performed to demonstrate compliance against the specifications and basic standards listed on the front cover of this report. This list is not a one to one match to the front cover for one or more of the following reasons.

1. Basic standards call up many different test phenomena specifications such as the 61000-4-X series. The basic standards define which elements and levels shall be applied from these specifications and as such it is not appropriate to list the individual specifications on the front cover.
2. A Standard listed on the front cover may be required in a particular country but is not appropriate for the particular technologies included in the equipment under test. E.g. You cannot test a DC product to the mains Harmonics requirements in EN61000-3-2. See section 3.2.
3. Test results against a particular standard or specification may be included in a different test report. See section 3.2 for an EDCS reference of this data.
4. Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
5. Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.
6. Testing may have been performed to an equivalent test that satisfies the requirements of the standards and specifications listed on the front cover of the report. See section 3.2.
7. Where radiated emissions testing has been performed to EN55022/CISPR22 the additional requirements of VCCI: V- 3/2006.04, EN55022: 1994 +A1/2 and CAN/CSA- CISPR 22-02 have also been evaluated unless otherwise stated.
8. Testing to the requirements of CFR47 Part 15 was performed against the CISPR22 limits. The results are therefore deemed satisfactory evidence of compliance with Industry Canada Interference Causing Equipment Standard ICES-003.
9. Where assessment has been performed to CISPR24, all the applicable test requirements may have not been covered. Refer to the results section for the tests performed.

#### Notes:

- 1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
- 2) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.
- 3) Where relevant, testing has been carried out to the requirements of both EN and IEC Specifications. This was possible because of the similarities of the test methods involved and the Cisco EMC test procedures.



## **Section 2: Assessment Information**

### **2.1 General**

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on the samples submitted. The testing was performed by and for the use of Cisco systems Inc.

With regard to this assessment, the following points should be noted:

- a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results due to production and measurement tolerances.
- b) The apparatus was set up and exercised using the configuration and modes of operation defined in the operations manual.
- c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).
- d) All testing was performed under the following environmental conditions:

|                      |                                      |
|----------------------|--------------------------------------|
| Temperature          | 15°C to 35°C (54°F to 95°F)          |
| Atmospheric Pressure | 860mbar to 1060mbar (25.4" to 31.3") |
| Humidity             | 10% to 75*%                          |

\*[Where applicable] For ESD testing the humidity limits used were 30% to 60% and for EFT/B tests the humidity limits used were 25% to 75%.
- e) All AC testing was performed at one or more of the following supply voltages:

|                     |
|---------------------|
| 110V 60 Hz (+/-20%) |
| 220V 50 Hz (+/-20%) |

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## **2.2 Date of testing**

15July thru 31October, 2013

## **2.3 Report Issue Date**

Cisco uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled.

## **2.4 Testing facilities**

This assessment was performed by:

### **Testing Laboratory**

Cisco Systems, Inc.,  
4125 Highlander Parkway  
Richfield, OH 44286  
USA

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

## **Test Engineers**

Bud Chiller

## **2.5 Equipment Assessed (EUT)**

AIR-CAP1532E-A-K9

This report provides data supporting compliance with undesired emissions regulations stated in CFR47 Part 15 of the FCC Rules and Regulations.

## **2.6 EUT Description**

The AIR-CAP1532E-A-K9 is an 802.11n dual band mesh access point employing externally mounted antennas either directly on the RF port connectors or mounted separately to provide desired coverage.



## **Appendix A: Emission Test Results**

### **Radiated Spurious Emissions**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Using Vasona, configure the spectrum analyzer as shown below (be sure to enter all losses between the transmitter output and the spectrum analyzer). Place the radio in continuous transmit mode.

|                       |                                   |
|-----------------------|-----------------------------------|
| Span:                 | 1GHz – 18 GHz                     |
| Reference Level:      | 80 dBuV                           |
| Attenuation:          | 10 dB                             |
| Sweep Time:           | Coupled                           |
| Resolution Bandwidth: | 1MHz                              |
| Video Bandwidth:      | 1 MHz for peak, 10 Hz for average |
| Detector:             | Peak                              |

Maximize Turntable (find worst case table angle), Maximize Antenna (find worst case height)

Save 2 plots:     1) Average Plot (Vertical and Horizontal), Limit= 54dBuV @3m  
                      2) Peak plot (Vertical and Horizontal), Limit = 74dBuV @3m

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance.  
Also measure any emissions in the restricted bands.

This report represents the worst case data for all supported operating modes and antennas.  
There are no measurable emissions above 18 GHz.

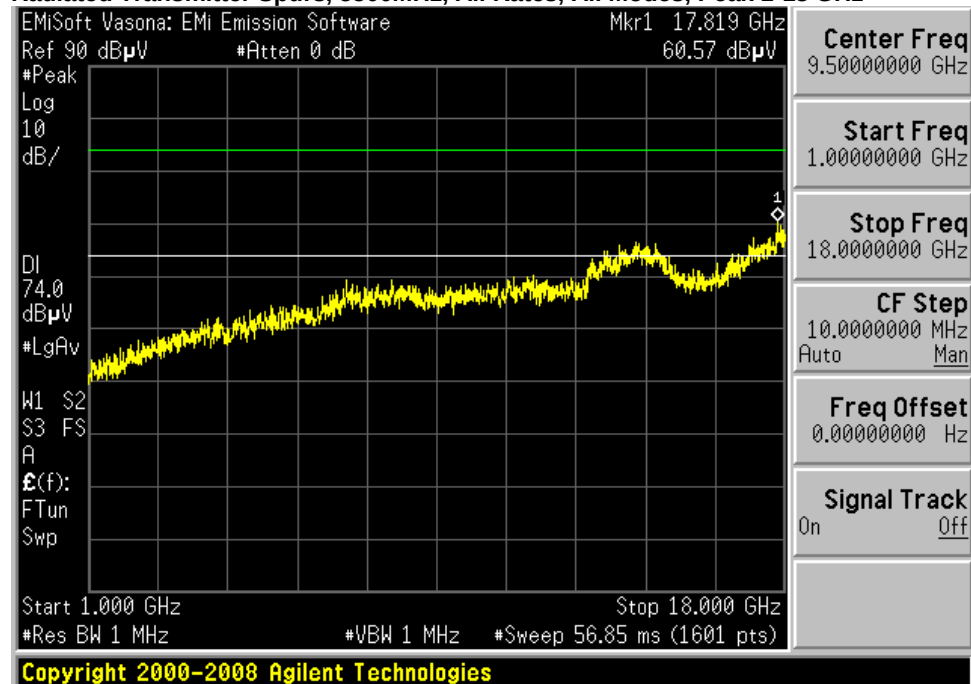


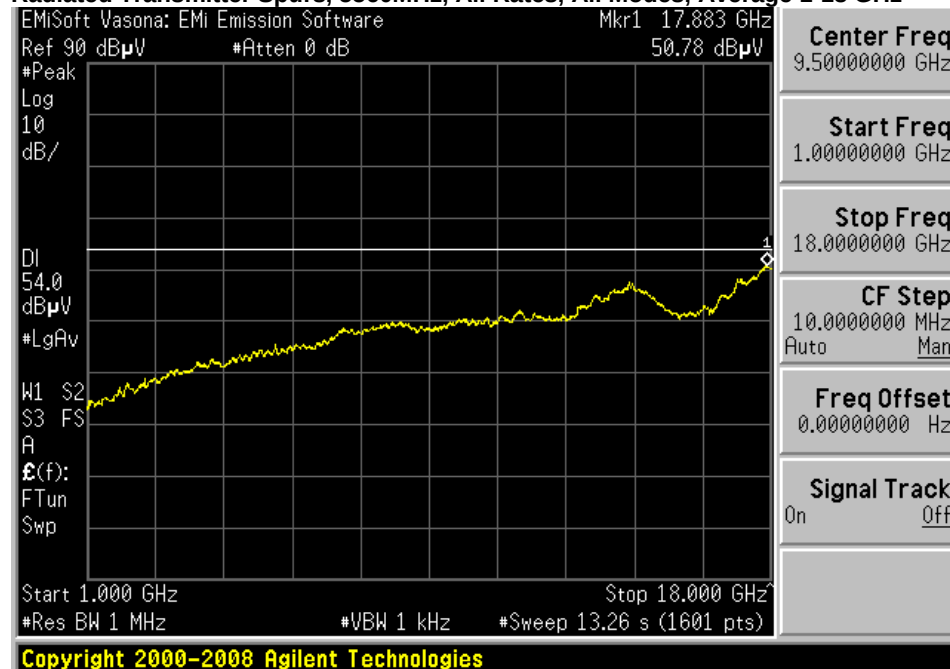
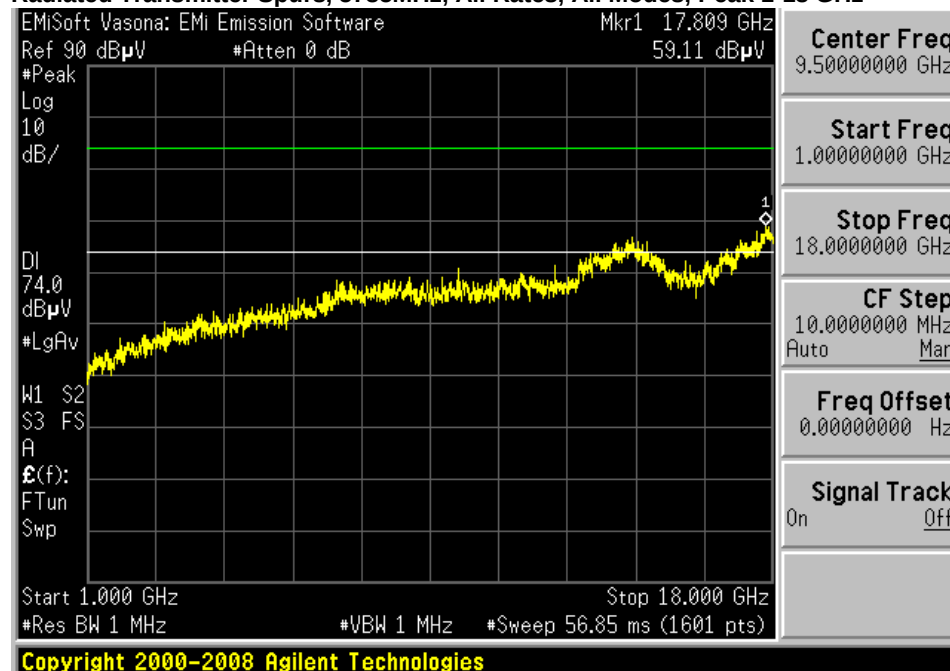
## Transmitter Radiated Spurious Emissions

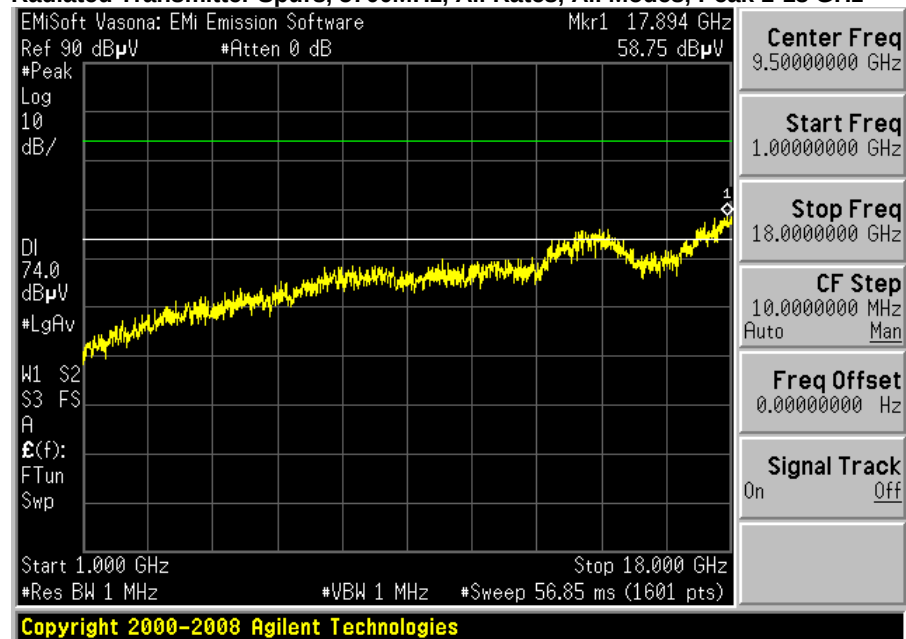
### Radiated Transmitter Spurs, 5500MHz, All Rates, All Modes, Average 1-18 GHz



### Radiated Transmitter Spurs, 5500MHz, All Rates, All Modes, Peak 1-18 GHz



**Radiated Transmitter Spurs, 5560MHz, All Rates, All Modes, Average 1-18 GHz****Radiated Transmitter Spurs, 5785MHz, All Rates, All Modes, Peak 1-18 GHz**

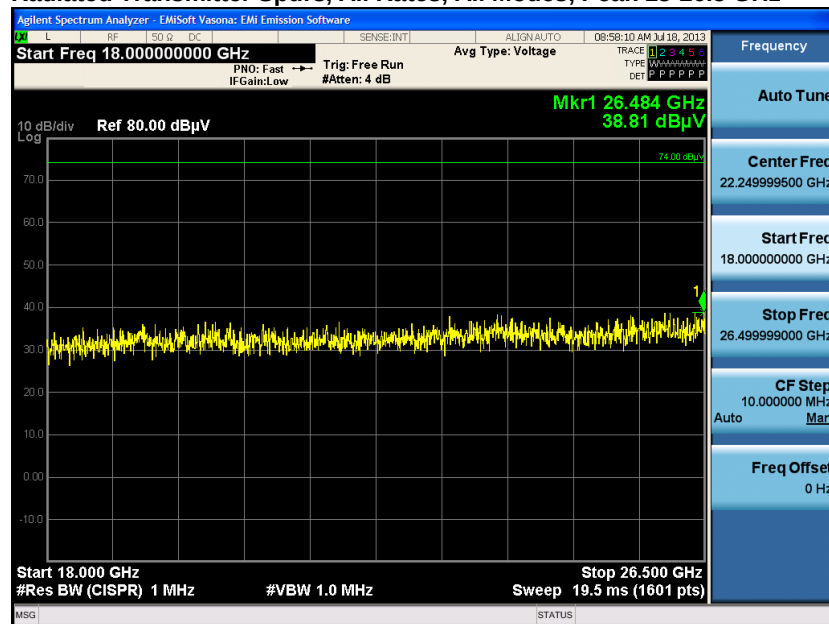
**Radiated Transmitter Spurs, 5700MHz, All Rates, All Modes, Average 1-18 GHz****Radiated Transmitter Spurs, 5700MHz, All Rates, All Modes, Peak 1-18 GHz**



## Radiated Transmitter Spurs, All Rates, All Modes, Average 18-26.5 GHz



## Radiated Transmitter Spurs, All Rates, All Modes, Peak 18-26.5 GHz

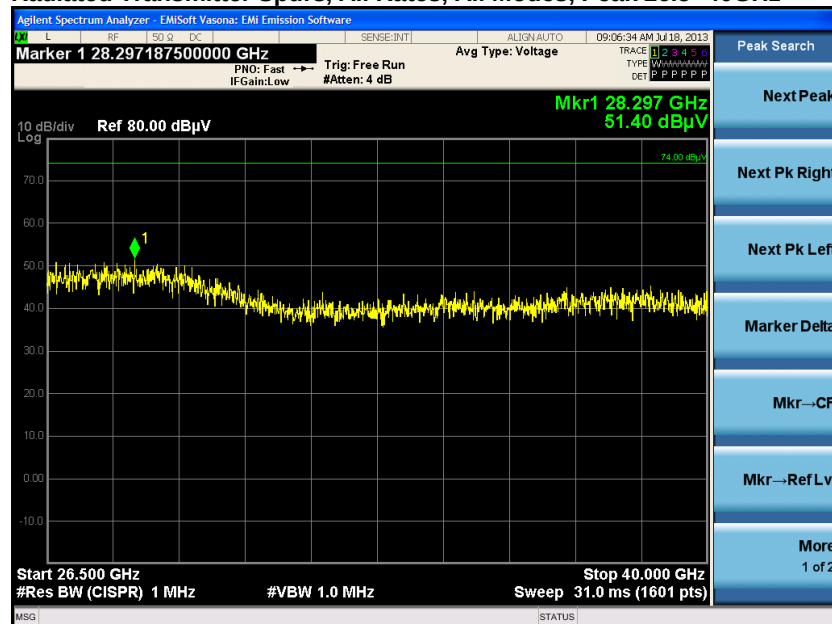




## Radiated Transmitter Spurs, All Rates, All Modes, Average 26.5-40 GHz



## Radiated Transmitter Spurs, All Rates, All Modes, Peak 26.5- 40GHz

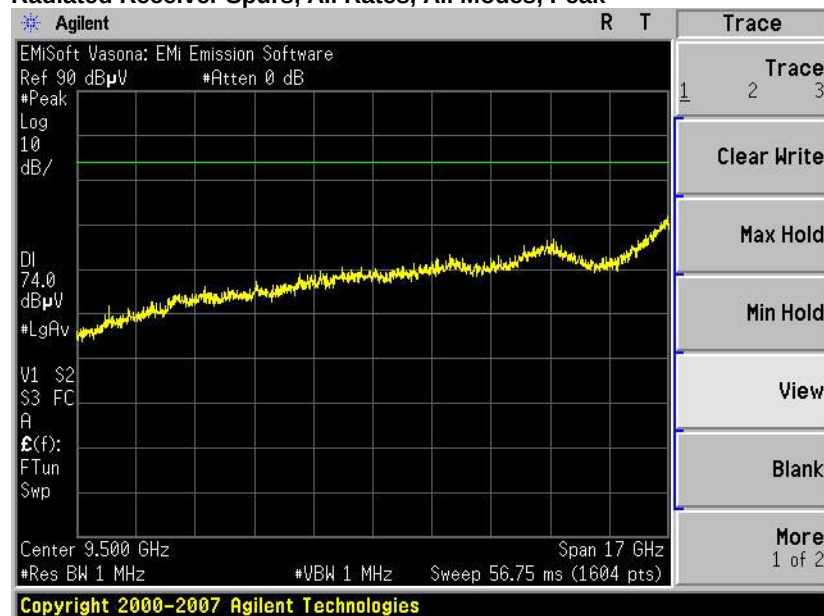


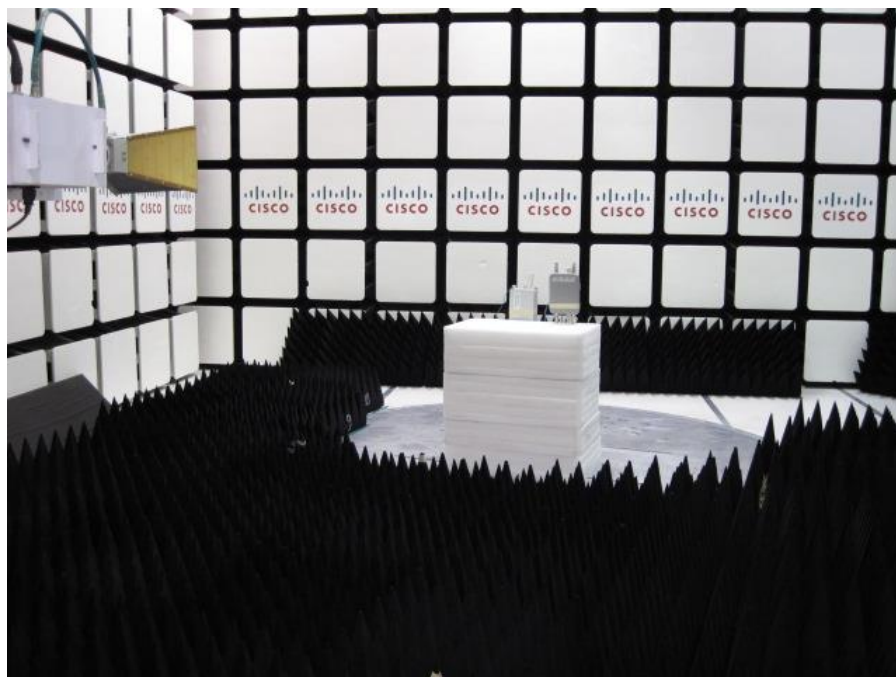
## Receiver Radiated Spurious Emissions

### Radiated Receiver Spurs, All Rates, All Modes, Average



### Radiated Receiver Spurs, All Rates, All Modes, Peak



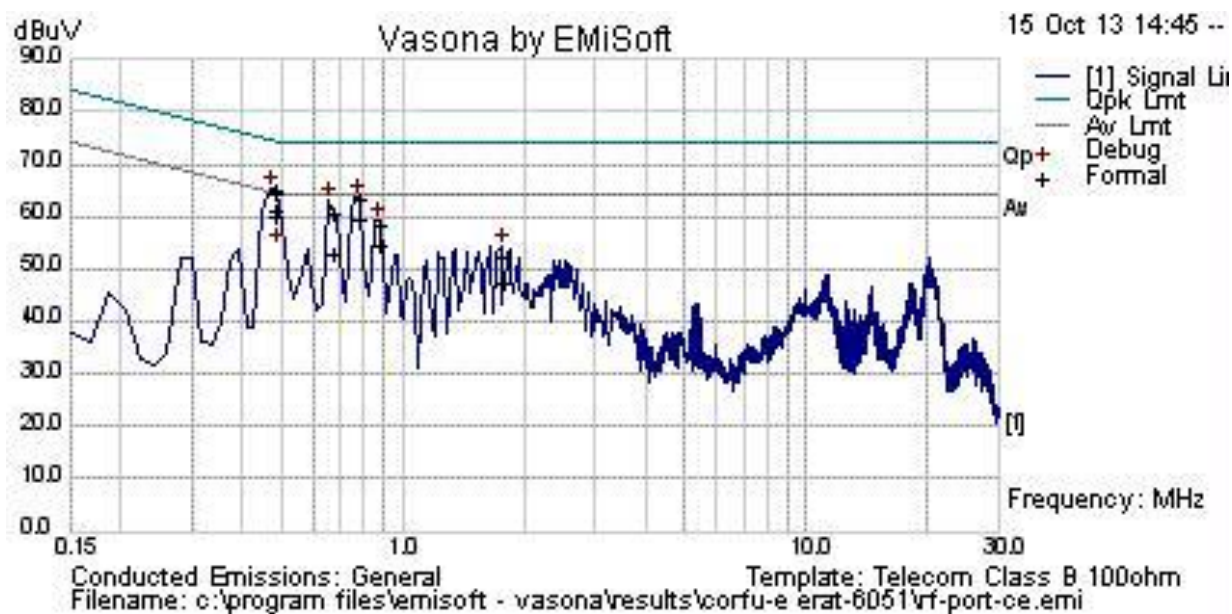


**Radiated Test Setup 1–18GHz**



**Radiated Test Setup 18–40GHz**

## Conducted Emissions

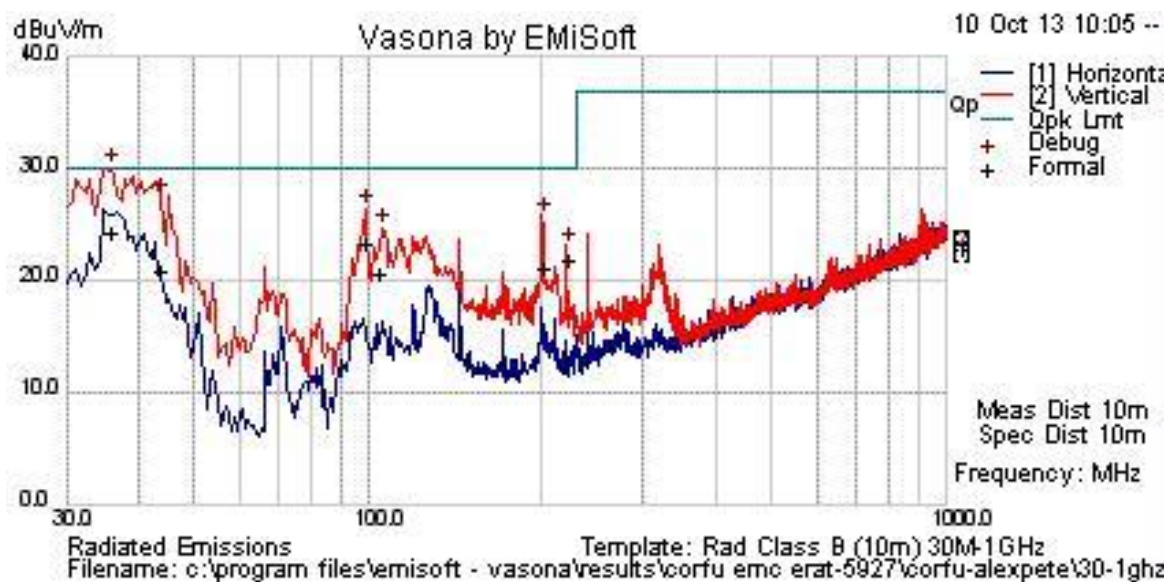


| MHz      | Raw dBuV | Cable Loss | Factors dB | Level dBuV | Measurement Type | Line | Limit dBuV | Margin dB | Pass /Fail |
|----------|----------|------------|------------|------------|------------------|------|------------|-----------|------------|
| 0.484234 | 55.5     | 0.1        | 9.5        | 65.1       | Qp               | RF   | 74.3       | -9.2      | Pass       |
| 0.774814 | 53.7     | 0.1        | 9.5        | 63.4       | Qp               | RF   | 74         | -10.6     | Pass       |
| 0.671719 | 50.9     | 0.1        | 9.5        | 60.5       | Qp               | RF   | 74         | -13.5     | Pass       |
| 0.872798 | 49       | 0.1        | 9.5        | 58.6       | Qp               | RF   | 74         | -15.4     | Pass       |
| 1.743    | 42.6     | 0.1        | 9.5        | 52.3       | Qp               | RF   | 74         | -21.7     | Pass       |
| 0.484913 | 54.9     | 0.1        | 9.5        | 64.5       | Qp               | RF   | 74.2       | -9.8      | Pass       |
| 0.484234 | 51.4     | 0.1        | 9.5        | 61         | Av               | RF   | 64.3       | -3.3      | Pass       |
| 0.774814 | 49.8     | 0.1        | 9.5        | 59.4       | Av               | RF   | 64         | -4.6      | Pass       |
| 0.671719 | 43.1     | 0.1        | 9.5        | 52.7       | Av               | RF   | 64         | -11.3     | Pass       |
| 0.872798 | 45       | 0.1        | 9.5        | 54.6       | Av               | RF   | 64         | -9.4      | Pass       |
| 1.743    | 37.6     | 0.1        | 9.5        | 47.3       | Av               | RF   | 64         | -16.7     | Pass       |
| 0.484913 | 50.5     | 0.1        | 9.5        | 60.1       | Av               | RF   | 64.2       | -4.2      | Pass       |

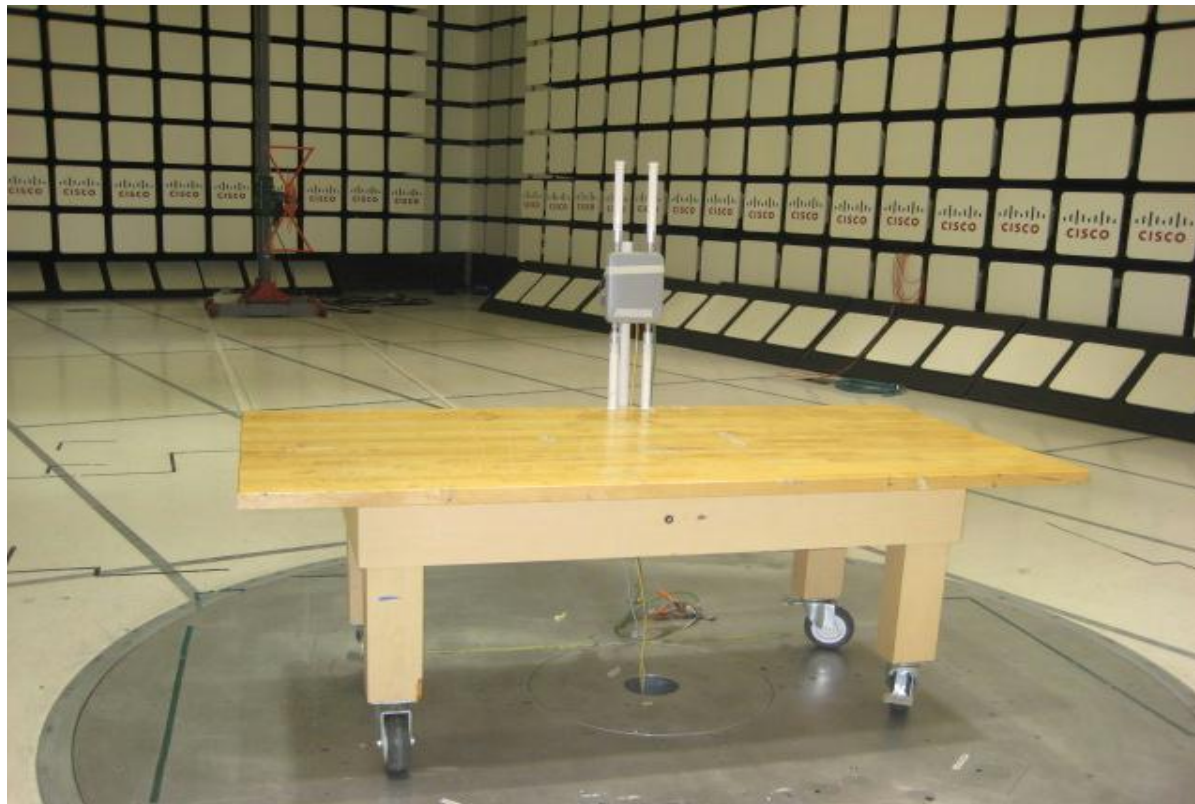
### Conducted Emission Test Setup



## Radiated emissions 30 – 1000 MHz



| Frequency<br>MHz | Raw<br>dBuV | Cable<br>Loss | AF dB | Level<br>dBuV/m | Measurement<br>Type | Pol | Hgt<br>cm | Azt<br>Deg | Limit<br>dBuV/m | Margin<br>dB | Pass<br>/Fail |
|------------------|-------------|---------------|-------|-----------------|---------------------|-----|-----------|------------|-----------------|--------------|---------------|
| 35.534           | 34.4        | 0.7           | -10.9 | 24.2            | Qp                  | V   | 342       | 14         | 30              | -5.8         | Pass          |
| 43.358           | 36.9        | 0.8           | -16.8 | 20.8            | Qp                  | V   | 104       | 124        | 30              | -9.2         | Pass          |
| 98.457           | 39.8        | 1.2           | -17.8 | 23.3            | Qp                  | V   | 121       | 324        | 30              | -6.7         | Pass          |
| 199.965          | 34          | 1.7           | -14.5 | 21.1            | Qp                  | V   | 113       | 121        | 30              | -8.9         | Pass          |
| 104.661          | 35.1        | 1.2           | -15.8 | 20.5            | Qp                  | V   | 127       | 18         | 30              | -9.5         | Pass          |
| 220.027          | 36.5        | 1.7           | -16.4 | 21.9            | Qp                  | V   | 150       | 198        | 30              | -8.1         | Pass          |



**Title:** Radiated Emissions 30-1000MHz Configuration Photograph

**Appendix B: Test Equipment/Software Used to perform the test**

| Equip # | Manufacturer    | Model                 | Description                 | Last Cal  | Next Due  |
|---------|-----------------|-----------------------|-----------------------------|-----------|-----------|
| 44940   | Rohde & Schwarz | ESU                   | Spectrum Analyzer           | 15May13   | 15May14   |
| 40514   | Agilent         | E4440A                | Spectrum Analyzer           | 12-NOV-12 | 12-NOV-13 |
| 3003    | HP              | 8373B                 | Signal Generator            | 26Mar13   | 26Mar14   |
| 30654   | Sunol Sciences  | JB1                   | Combination Antenna         | 16Oct12   | 16Oct13   |
| 4882    | EMCO            | 3115                  | Horn Antenna                | 28Jun13   | 28Jun14   |
| 41935   | Newport         | iBTHP-5-DB9           | Temperature Probe           | 25MAR13   | 25MAR14   |
| 5691    | Miteq           | NSP1800-25-S1         | 1GHz to 18GHz Pre-Amplifier | 01Feb13   | 01Feb14   |
| 41979   | Cisco           | 1840                  | 18-40GHz EMI Test Head      | 09Jul13   | 09Jul14   |
| 25658   | Micro-Coax      | UFB311A-1-0840-504504 | RF Cable                    | 13Feb13   | 13Feb14   |
| 47300   | Agilent         | MXE                   | EMI Receiver                | 13Nov12   | 13Nov13   |
| 8195    | TTE             | H613-150K-50-21378    | Filter                      | 04Jan13   | 04Jan14   |
| 8496    | Fischer Custom  | FCC-450B-2.4-N        | Pulse limiter               | 20May13   | 20May14   |
| 39110   | Coleman         | RG-223                | RF Cable, 25 ft., N         | 29Nov12   | 29Nov13   |
| 44023   | Fischer         | M2                    | CDN                         | 16Nov12   | 16Nov13   |
| 25001   | Micro-Coax      | UFB197C-1-0240-504504 | RF Cable, 2 ft.             | 24Mar13   | 24Mar14   |