Radio Frequency Exposure Test Report

EN 62311 January 2008
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0Hz – 300GHz) (IEC 62311:2007, modified)

Model: SDC-CF10G

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REVISION HISTORY

Rev#	Date	Comments	Modified By
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SCOPE

The European Committee for Electrotechnical Standardization (CENELEC) publishes standards regarding the evaluation of the rf exposure hazard of wireless communications devices. An evaluation has been performed on the Summit Data Communications model SDC-CF10G, pursuant to the relevant requirements of the following harmonized EN standard(s) covering essential requirements under article 3.1 of the R&TTE Directive:

- EN 62311 January 2008 "Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0Hz – 300GHz) (IEC 62311:2007, modified)

The evaluation was performed in accordance with the standard and the following document(s):

- Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300 GHz) (Official Journal L199 of 30 July 1999).

OBJECTIVE

The objective of the manufacturer is to comply with the harmonized standards identified in the previous section.

STATEMENT OF COMPLIANCE

The evaluation of Summit Data Communications model SDC-CF10G, in the configurations detailed within this report, complied with the relevant requirements of EN 62311. Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Summit Data Communications model SDC-CF10G is a 802.11g Compact Flash Module with Antenna Connectors (Model: SDC-CF10G) that is designed to provide wireless local area networking connectivity.

Company	Model	Description	Serial Number	FCC ID
Summit Data Communications	SDC-CF10G	802.11g Compact Flash Module	2CK7250TC5	TWG-SDCCF10G

OTHER EUT DETAILS

Antenna: Cisco 2.4GHz Dipole (AIR-ANT4941), gain 2.0dBi

EN 62311 ASSESSMENT METHODS

EN 62311 allows for various assessment methods, including far field calculation, near field calculation, simulation, and numerical modeling. Assessments should be made in accordance with an existing basic standard. For the purposes of the assessment detailed in this test report the basic standard EN 50383 was used. The assessment is based on power levels and antenna gains detailed in this report and taken from the following test reports against the appropriate ETSI radio standard:

Test Report	Radio Standard(s)	Issued By
SE941208L11B	EN 50371:2002	ADT Corp N0. 47, 14th Ling, Chia Pau Tsuen, Linko Hsiang 244, Taipei Hsien, Taiwan, R.O.C.

The assessment has only considered the intentional signals transmitted by the device. As all other emissions complied with the limits detailed in the appropriate radio standard and were significantly lower than the intentional signal it was not considered necessary to include these signals in the assessment.

EN 50383 EVALUTATION METHODS

The evaluation method first requires a determination of the antenna region(s) in which the exposure occurs, and from this determination the appropriate evaluation method (calculation or measurement) can then be used.

ANTENNA REGION

There are three regions defined in Annex A of EN 50383 – Far field region, radiating near-field region and reactive near-field region.

For each region there is a preferred (or "reference") evaluation method and possible alternatives. When an alternative method is used it typically provides a more conservative evaluation of the rf hazard.

The region is determined, based on the minimum separation distance from the device antennas to persons and the size/gain of the antenna. The minimum separation distance is based on either a distance specified in the installation/user's manual or on an evaluation of intended use.

PREFERRED EVALUATION METHODS

The preferred (reference) evaluation methods, and first and second alternatives, for each region are detailed in EN 50383 Table 1 and summarized below.

FAR FIELD CALCULATION

For calculating the field in the far-field region the free space formula below is used to determine the electric field or power flux density at a distance r from the transmitting antenna.

$$E = \frac{\sqrt{30PG}}{r}$$

$$S = \frac{PG}{4\pi r^2}$$

S = Power flux density W/m^2
E = Field Strength in V/m
P = Power in Watts
G = Gain of antenna (numeric gain)
r = distance in meters

RADIATING NEAR FIELD

When human exposure is in the radiating near-field the reference method is a SAR evaluation, as detailed above. The first alternative to SAR measurements are E-field and H-field measurements. The second alternative is a calculation, and the possible calculation methods are either the synthetic model or cylindrical wave model.
The synthetic model splits the antenna into n small sources and the field is calculated using:

$$E = \sum \alpha_n \frac{\sqrt{30.P_n G_n}}{r_n} e^{j(\gamma_n + \frac{2\pi r_n}{\lambda})}$$

E = Field Strength in V/m
P_n = Power in Watts radiated by element n
G_n = Gain of antenna element n
r_n = Distance in meters from element n

The cylindrical wave model allows direct calculation of the power flux density, S, using:

$$S = \frac{P}{\pi D r} \frac{180}{\delta}$$

S = Power flux density W/m^2
P = Power in watts radiated (W)
D = Length of antenna (m)
r = Distance in meters from the antenna

The cylindrical wave model is valid for a range of distances where r_c (the distance at which the Cylinder and far-field wave models give the same result) lies in the radiating near-field, and where the distance is less than r_c. At distances greater than r_c the far field model (refer to the far-field calculation information in the previous section) is more appropriate.

REACTIVE NEAR FIELD

When human exposure is in the reactive near-field the reference method is a SAR evaluation. If the total radiated power is below limits detailed in section 7.1.2 of EN 50383 then the device is assumed to comply and measurements are not considered necessary. Further, whole-body SAR measurement methods are not currently specified and so localized SAR evaluations are used. Localized SAR evaluations are limited to operating frequencies between 0.8 and 3 GHz, antenna apertures less than 0.6m x 0.3m and investigation distances of less than 40cm.

The alternative to SAR measurements are E-field and H-field measurements.

LIMITS

The limits are taken from the reference levels detailed in either Annex II or Annex III of *Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC).* Annex III reference levels may only be used when the exposure is not highly localized.

Compliance with the basic restrictions is ensured where the ratio of the measured/calculated value to the basic restriction / reference level is less than or equal to 1.

MULTIPLE TRANSMITTERS

When the evaluation has to account for simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. The sum of the individual ratios of measured/calculated value to basic restriction / reference level has to be less than 1 for compliance to be demonstrated.

EVALUATION RESULTS

SEPARATION DISTANCE

The separation distance used in the assessment was 20cm.

LIMIT

As the basis for compliance is being based on the far-field model, the reference level for equivalent plane wave power density is used as the basis for determining compliance. At the operating frequencies of the device, the limits are:

Frequency Band (MHz)	Power Density W/m^2
2400-2483.5	10

CALCULATIONS

The table below contains the calculations to determine the reactive near-field, radiating near-field and far-field boundaries. It also shows the value for r_c, the distance at which the far-field and cylindrical wave models produce the same value of power flux density.

Frequency (MHz)	2437
Wavelength (m)	0.123
Antenna Gain (dBi)	2
Antenna Gain (numeric)	1.6
Antenna Length (m)	0.13
Evaluation distance (m)	0.2
Beamwidth (degrees)	360
Transmit Power (dBm)	16.9
Far Field Boundary	>0.27m
Radiating Near Field	0.03m < r <= 0.27m
Reactive Near-Field	r <=0.03m
r_c	0.10

For operation in the 2400-2483.5 MHz band(s) the exposure evaluation is in the radiating near-field. The cylindrical model is not appropriate as the evaluation distance of 0.2m is at a distance that exceeds r_c, therefore the far-field model was used to provide a conservative estimate.

Frequency (MHz)	2437
Cylindrical Model Estimation (W/m^2)	0.30
Limit	10
Percentage of Limit	3.0

RESULT – SINGLE TRANSMITTER

The estimated power density at a distance of 0.2m from the transmitting antenna is 0.3 W/m^2. This is 3.0% of the limit, therefore the device complies with the requirements of EN 503085, based on the evaluation methods of EN 50383 and the reference levels detailed in *Council Recommendation of 12 July 1999.*

The calculations assumed the device may operate continuously. Although the interface protocol does not limit operating duty cycle, the actual operation would not typically be 100% and so the estimates are conservative.

Appendix A Antenna Data Sheets

The evaluation detailed in the test report was based on calculations that used specific information about the gain and dimensions of the antenna(s) to be used with the device. The data sheets from which this information was taken are attached to this Appendix.

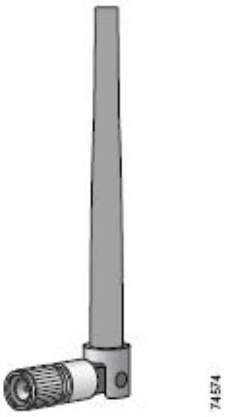
Cisco Aironet 2.4 Ghz Articulated Dipole Antenna (AIR-ANT4941)

Overview

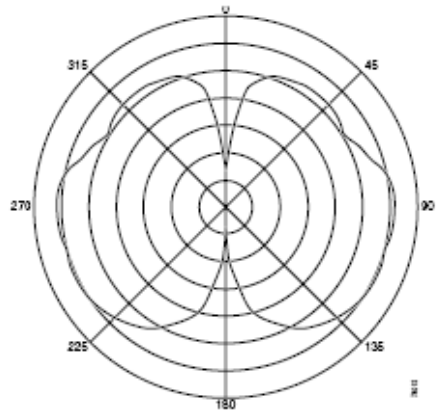
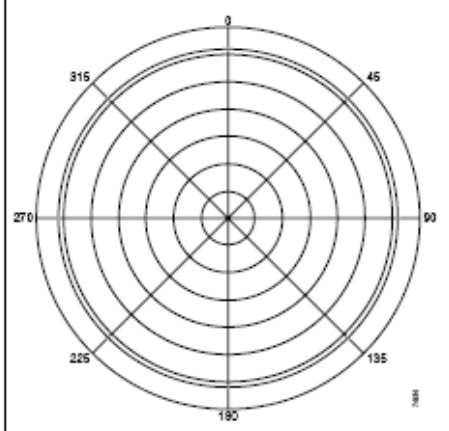
This document outlines the specifications and description of the 2.2-dBi articulating dipole antenna. This antenna operates in the 2.4- 2.5-GHz band and is designed for use with Cisco Aironet radio products utilizing a reverse-polarity threaded naval connector (RP-TNC).

Technical Specifications

Antenna type	Dipole
Operating frequency range	2402-2495 MHz
Nominal input impedance	50 Ω
2:1 VSWR bandwidth	2385 - 2515 Mhz
Peak gain	2 dBi
Polarization	Linear, vertical
E-Plane 3-dB beamwidth	70 degrees
H-Plane 3-dB beamwidth	Omnidirectional
Dimensions	5.5 in. (13 cm)
Weight	1 oz.
Connector type	RP-TNC plug
Environment	Indoor
Operating temperature range	32°F to 140°F (0°C to 60°C)



Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

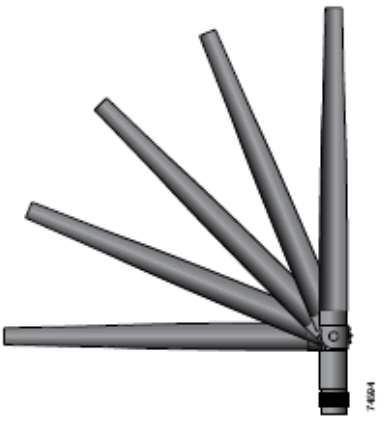
E-Plane Pattern	H-Plane Pattern
	

System Requirements

This antenna is compatible with any 2.4-GHz Cisco Aironet device that utilizes a RP-TNC plug.

Features

The antenna has an articulated base that can be rotated 360 degrees at the connection point and from 0 to 90 degrees at its knuckle. The articulated base is shown in the following illustration.



Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

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- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

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San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com, which includes the Cisco Technical Assistance Center (TAC) website, as a starting point for all technical assistance. Customers and partners can obtain online documentation, troubleshooting tips, and sample configurations from the Cisco TAC website. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC website, including TAC tools and utilities.

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We categorize Cisco TAC inquiries according to urgency:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration. There is little or no impact to your business operations.
- Priority level 3 (P3)—Operational performance of the network is impaired, but most business operations remain functional. You and Cisco are willing to commit resources during normal business hours to restore service to satisfactory levels.

- Priority level 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively impacted by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.
- Priority level 1 (P1)—An existing network is "down," or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Cisco TAC Website

The Cisco TAC website provides online documents and tools to help troubleshoot and resolve technical issues with Cisco products and technologies. To access the Cisco TAC website, go to this URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC website. Some services on the Cisco TAC website require a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

http://tools.cisco.com/RPF/register/register.do

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC website, you can open a case online at this URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, we recommend that you open P3 and P4 cases online so that you can fully describe the situation and attach any necessary files.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to this URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.

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- The *Cisco Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the *Cisco Product Catalog* at this URL:

  http://www.cisco.com/en/US/products/products_catalog_links_launch.html

Obtaining Additional Publications and Information

- Cisco Press publishes a wide range of networking publications. Cisco suggests these titles for new and experienced users: *Internetworking Terms and Acronyms Dictionary, Internetworking Technology Handbook, Internetworking Troubleshooting Guide,* and the *Internetworking Design Guide*. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access *Packet* magazine at this URL:

  http://www.cisco.com/go/packet

- iQ Magazine is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- Internet Protocol Journal is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

  http://www.cisco.com/en/US/learning/le31/learning_recommended_training_list.html

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