TEST REPORT

Equipment Under Test	:	802.11g/b WLAN Cardbus Adapter
Model No.	:	MWL-31G1
FCC ID	:	QVZ20090000
Applicant		MicroLink Communications Inc.
Address of Applicant	:	8F, No, 31, Hsintai Rd., Chupei City Hsinchu 302, Taiwan, R.O.C
Date of Receipt	:	2003.09.05
Date of Test(s)	:	2003.09.08
Date of Issue	:	2003.09.09

Standards:

FCC OET Bulletin 65 supplement C,
ANSI / IEEE C95.1 , C95.3

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan E&E Services or testing done by SGS Taiwan E&E Services in connection with distribution or use of the product described in this report must be approved by SGS Taiwan E&E Services in writing.

Tested by : Dikin Yang **Date : 2003.09.09**

Approved by : Robert Chang **Date : 2003.09.10**

Contents

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. (FCC Registration number: 573967)
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1.2 Details of Applicant

Applicant : MicroLink Communications Inc.
Address : 8F, No, 31, Hsintai Rd., Chupei City Hsinchu 302, Taiwan, R.O.C

Product Name : 802.11g/b WLAN Cardbus Adapter
Model Name : MWL-31G1

1.3 Description of EUT(s)

1	Product name	802.11g/b WLAN Cardbus Adapter
2	Model Number	MWL-31G1
3	Power supply	Powered by PCMCIA slot 3.3V/5V
4	Frequency range	2412-2462 MHz

1.4 Test Environment

Ambient temperature : 22.0° C

Tissue Simulating Liquid : 21° C- 23° C

1.5 Operation Configuration

Configuration 1: " Edge-on" placement; edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom (Fig.3 & Fig.4 & Fig.5)

Configuration 2: "End-on" placement; Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom, but 1.1 cm Spacing between EUT & Planar Phantom. (Fig.6 & Fig.7 & Fig.8)

1.6 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. 2. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (Speag Dasy 4 professional system). A Model ET3DV6 1759 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= $\sigma (|Ei|^2)/ \rho$ where σ and ρ are the conductivity and mass density of the tissue-simulant.

1.7 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig.1. The Measured SAR distribution for the peak 1-g SAR is 13.7 m W/g and 10-g SAR is 6.16 m W/g. The measured 1-g SAR is 13.1 m W/g and 10-g SAR is 5.75 m W/g for this dipole. In comparison, it shows that the measured SAR plot is quite close to the original one.(see **APPENDIX 6** System Validation from Original equipment supplier SPEAG by Schmid & Partner)

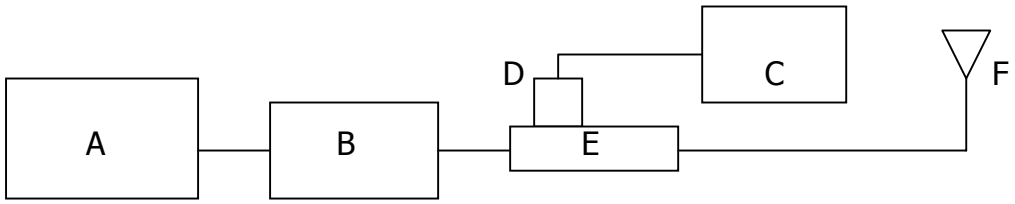


Fig.1 The microwave circuit arrangement used for SAR system verification

A. Agilent Model 8648D Signal Generator
B. Mini circuits Model ZHL-42 Amplifier
C. Agilent Model E4416A Power Meter
D. Agilent Model 8482H Power Sensor
E. Agilent Model 777D Dual directional coupling
F. Reference dipole antenna

Validation Kit	Frequency	Target SAR 1g (250mW)	Target SAR 10g (250mW)	Measured SAR 1g	Measured SAR 10g	Measured date
DT3DV6 S/N :1759	2450 MHz	13.7 m W/g	6.16 m W/g	13.1 m W/g	5.75 m W/g	2003-09-09

Table 1. Results system validation

1.8 Tissue Simulant Fluid for the Frequency Band 2.4 to 2.5 GHz

The dielectric properties for this body-simulant fluid were measured by using the HP Model 85070D Dielectric Probe (rates frequence band 200 MHz to 20 GHz) in conjuncation with HP 8714ET Network Analyzer(300 KHz-3000 MHz) by using a procedure detailed in Section V. The Measured dielectric parameters of the body-simulant fluid at 2400 MHz are ρ =52.5± 5%, σ =2.00±10% S/m. The measured properties are close to the values of ρ =51.66 and σ =2.021 S/m. The Conductivity (σ) and Permittivity (ρ) are listed in Table 1.For the SAR measurement given in this report . We obtain the desired dielectric properties to simulate the body tissue at the midband frequency of 2437MHz to be ρ=51.58 and σ=1.926 S/m.(Table 2). A photograph of the Tissue Simulant Fluid liquid depth 15cm is given in Fig .9 .

Channel	Frequency (MHz)	Conductivity (σ)	Permittivity (ρ)
01	2412	1.898	51.8
06	2437	1.926	51.58
11	2462	1.93	51.43

Table 2. Dielectric parameters for the Frequency Band 2.4 to 2.5 GHz

1.9 Operation Procedure

By using the program subordinated in the computer, and change into the written channel, and then set in highest power. Finally, we will test it by dividing into 2 ways.

Configuration 1: " Edge-on" placement ; edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom.

Configuration 2: "End-on" placement; Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom, but 1.1 cm Spacing between EUT & Planar Phantom.

The way by using the holder makes EUT 1.5cm close to the flat phantom then aims the center, and start to make the measurement. In doing so, we can measure data .The Peak 1-g SAR for the various configurations of the 802.11g/b WLAN Cardbus Adapter are summarized in Table 3. All of the measured 1-g SAR are less then the FCC 96-326 guideline of 1.6 W/kg .

1-g SAR in W/kg

Pc position relative to the flat phantom		2412 MHz channel 01	2437 MHz channel 06	2462 MHz channel 11
802.11b Peak Power Output		17.85 dbm	17.70 dbm	18.43 dbm
802.11g Peak Power Output		17.53 dbm	17.43 dbm	17.17 dbm
802.11b	Configuration 1 **Edge-on**	0.0303	0.0357	0.0399
	Configuration 2 **End-on**	0.091	0.101	0.134
802.11g	Configuration 1 **Edge-on**	0.0252	0.0286	0.0327
	Configuration 2 **End-on**	0.0743	0.0868	0.111

Table 3. The peak 1-g SAR measured for the 802.11g/b WLAN Cardbus Adapter

The lowest channel supported by the EUT is channel 0, and highest channel can be measured is channel 11. So the channels above are used as the lowest and highest channel in the testing, and the middle channel is set as channel 06.

1.10 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy

absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .4)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR (Brain)	**1.60 m W/g**	8.00 m W/g
Spatial Average SAR (Whole Body)	0.08 m W/g	0.40 m W/g
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 m W/g	20.00 m W/g

Table .4 RF exposure limits

2. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1759	March 7 2003
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2	727	March 5 2003
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE3	547	January 30 2003
Schmid & Partner Engineering AG	Software	DASY 4 V4.1c Build 47	---	Calibration isn't necessary
Schmid & Partner Engineering AG	Phantom	SAM	---	Calibration isn't necessary
Agilent	Network Analyzer	8714ET	US41442815	16 JAN 2003
Agilent	Dielectric Probe Kit	85070D	US01440168	20-JAN 2003
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	102189	08-11-2002

3.Summary of Results

EUT position			Peak SAR (W/Kg)	1g Average (mW/g)	10g Average (mW/g)	Max value of SAR (mW/g)	Verdict
802.11b	Configuration1 Edge-on	Ch01	0.0612	**0.0303**	0.0159	0.0322	***PASS***
		CH06	0.0735	**0.0357**	0.0188	0.0372	***PASS***
		CH11	0.0827	**0.0399**	0.021	0.042	***PASS***
	Configuration2 End-on	Ch01	0.186	**0.091**	0.0465	0.0956	***PASS***
		CH06	0.211	**0.101**	0.0515	0.105	***PASS***
		CH11	0.287	**0.134**	0.0673	0.142	***PASS***
802.11g	Configuration1 Edge-on	Ch01	0.0527	**0.0252**	0.0132	0.0261	***PASS***
		CH06	0.0597	**0.0286**	0.015	0.0297	***PASS***
		CH11	0.0696	**0.0327**	0.017	0.0337	***PASS***
	Configuration2 End-on	Ch01	0.154	**0.0743**	0.0377	0.0782	***PASS***
		CH06	0.183	**0.0868**	0.0411	0.0908	***PASS***
		CH11	0.243	**0.111**	0.0549	0.118	***PASS***

4.Measurements

Edge-on position, lowest channel Date/Time: 09/09/03 13:34:47

802.11b

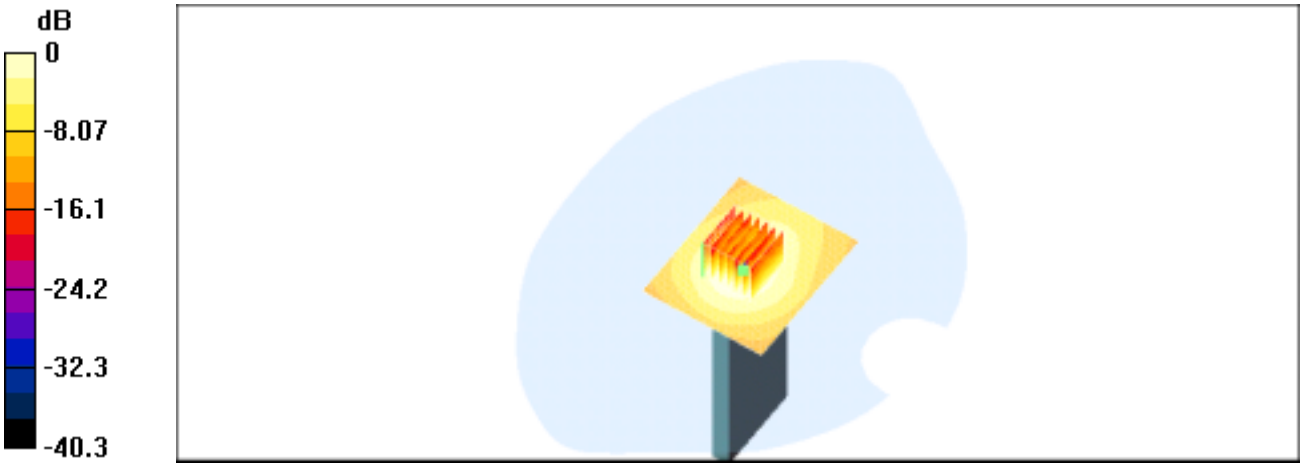
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch01

Communication System: Wireless LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.89775 mho/m, ε_r = 51.7957, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 4.24 V/m
Power Drift = 0.1 dB
Maximum value of SAR = 0.0318 mW/g
Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0612 W/kg
SAR(1 g) = 0.0303 mW/g; SAR(10 g) = 0.0159 mW/g
Reference Value = 4.24 V/m
Power Drift = 0.1 dB
Maximum value of SAR = 0.0322 mW/g



0 dB = 0.0322mW/g

Edge-on position, middle channel 802.11b

Date/Time: 09/09/03 13:58:44

DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch06

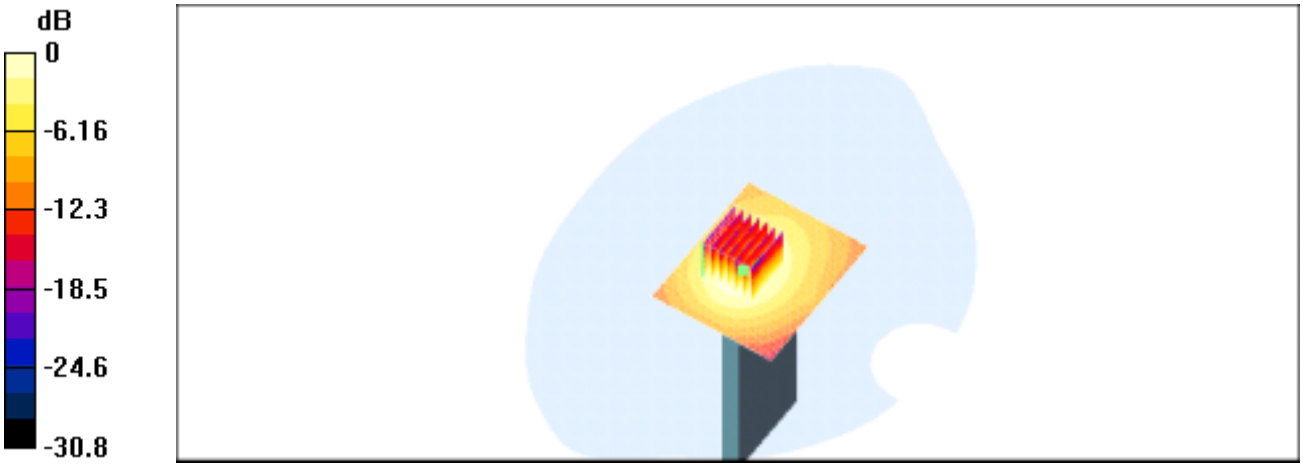
Communication System: Wireless LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.92587 mho/m, ε_r = 51.5833, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 4.43 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 0.037 mW/g

Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0735 W/kg
SAR(1 g) = 0.0357 mW/g; SAR(10 g) = 0.0188 mW/g
Reference Value = 4.43 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 0.0372 mW/g



0 dB = 0.0372mW/g

Edge-on position, highest channel 802.11b

Date/Time: 09/09/03 14:32:34

DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch11

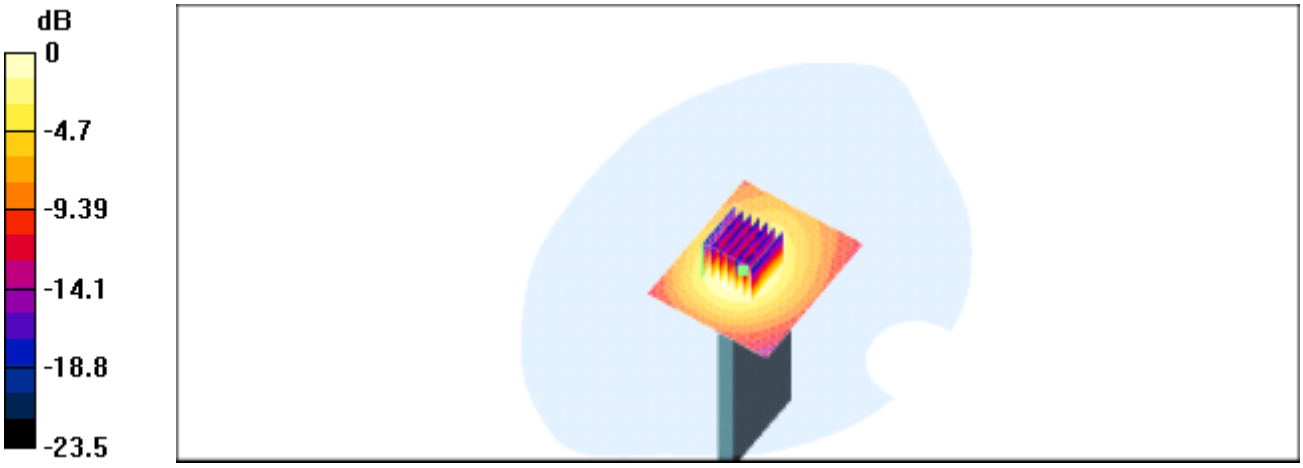
Communication System: Wireless LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.9299 mho/m, ε_r = 51.4294, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 4.75 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 0.042 mW/g

Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0827 W/kg
SAR(1 g) = 0.0399 mW/g; SAR(10 g) = 0.021 mW/g
Reference Value = 4.75 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 0.042 mW/g



0 dB = 0.042mW/g

End-on position, lowest channel 802.11b

Date/Time: 09/08/03 10:38:35

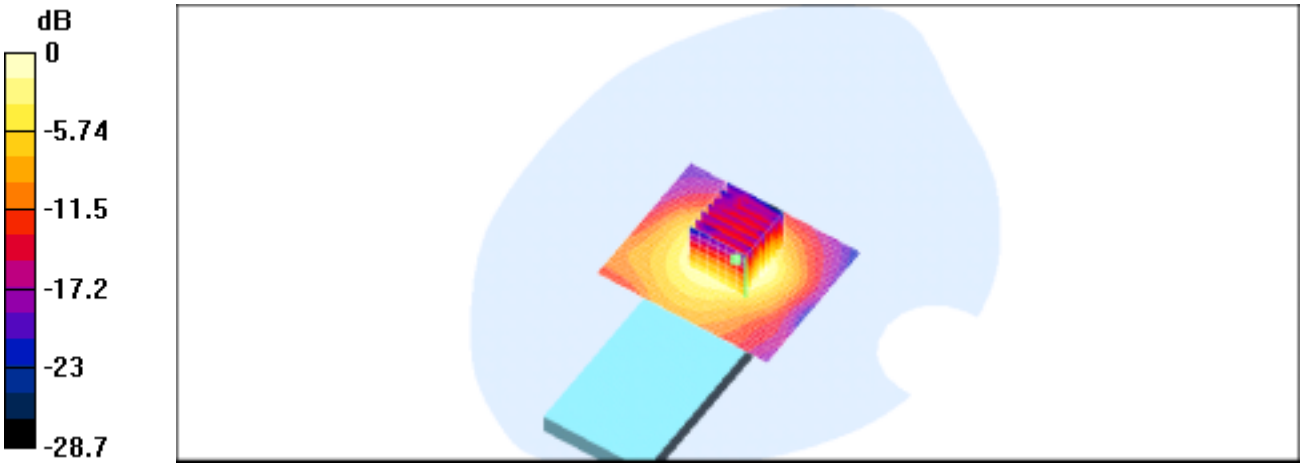
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch01

Communication System: Wireless LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.89775 mho/m, ε_r = 51.7957, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.91 V/m
Power Drift = 0.02 dB
Maximum value of SAR = 0.0969 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.186 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.0465 mW/g
Reference Value = 5.91 V/m
Power Drift = 0.02 dB
Maximum value of SAR = 0.0956 mW/g



0 dB = 0.0956mW/g

End-on position, middle channel 802.11b

Date/Time: 09/08/03 11:08:30

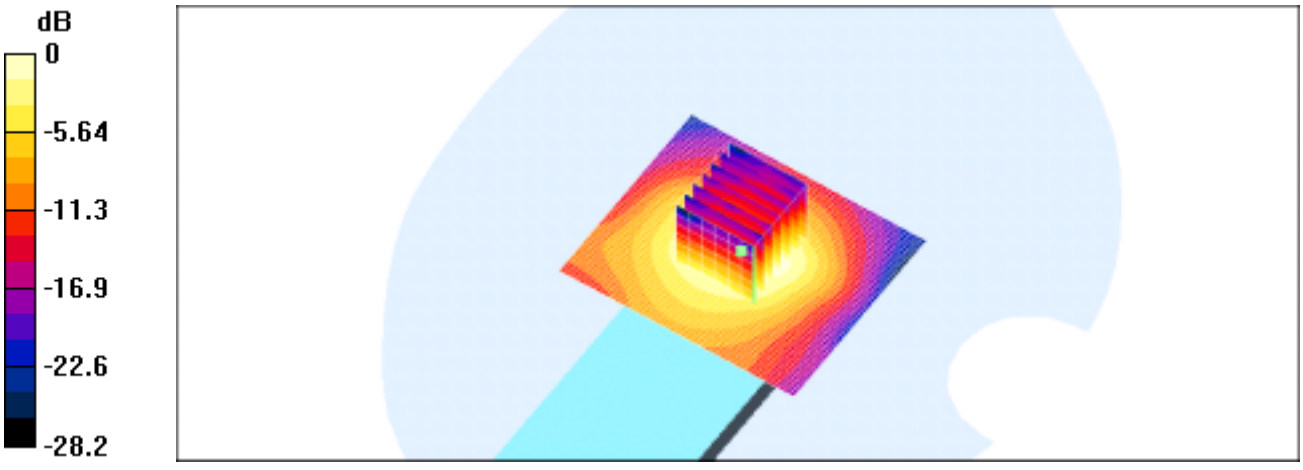
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch06

Communication System: Wireless LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.92587 mho/m, ε_r = 51.5833, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 6.05 V/m
Power Drift = -0.07 dB
Maximum value of SAR = 0.109 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.211 W/kg
SAR(1 g) = 0.101 mW/g; SAR(10 g) = 0.0515 mW/g
Reference Value = 6.05 V/m
Power Drift = -0.07 dB
Maximum value of SAR = 0.105 mW/g



0 dB = 0.105mW/g

End-on position, highest channel 802.11b

Date/Time: 09/08/03 11:34:54

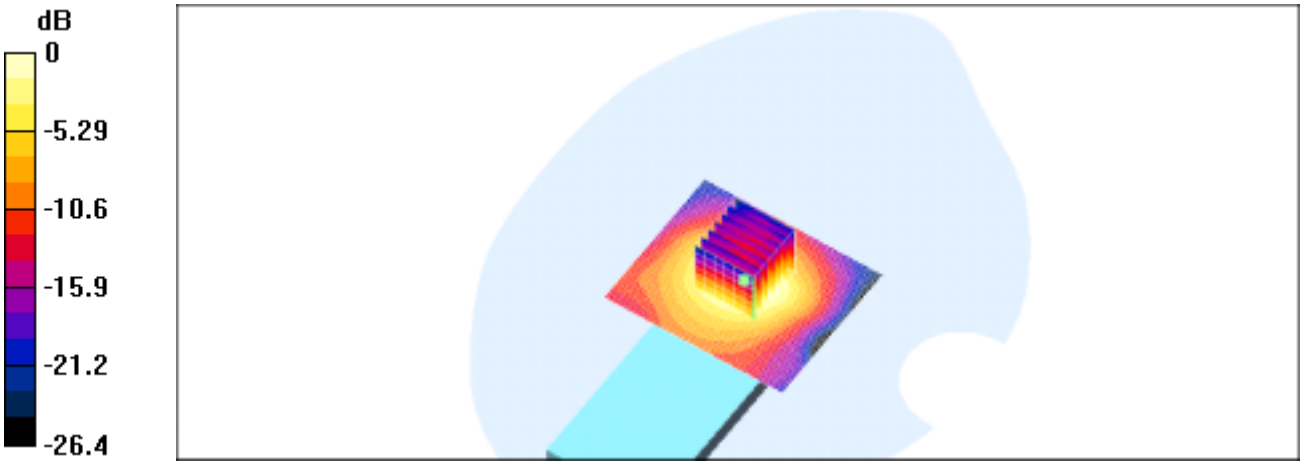
DUT: 802.11g/b WLAN Cardbus Adapter; Type: PCMCIA Slot;
Program: Ch11

Communication System: Wireless LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.9299 mho/m, ε_r = 51.4294, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 7.26 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.144 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.287 W/kg
SAR(1 g) = 0.134 mW/g; SAR(10 g) = 0.0673 mW/g
Reference Value = 7.26 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.142 mW/g



0 dB = 0.142mW/g

Edge-on position, lowest channel 802.11g

Date/Time: 09/08/03 16:51:18

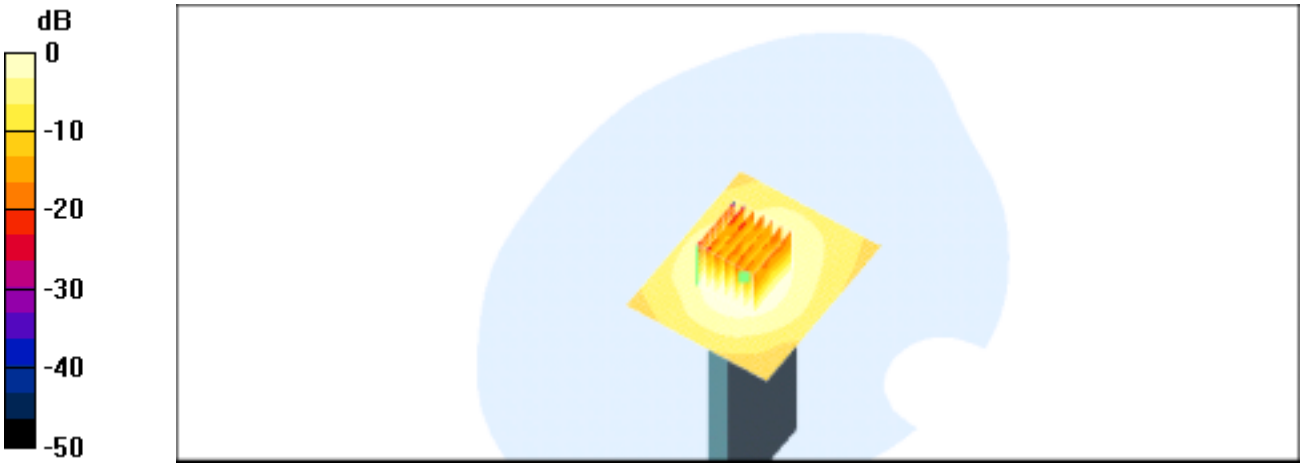
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch01

Communication System: Wireless LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.89775 mho/m, ε_r = 51.7957, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 3.93 V/m
Power Drift = 0.02 dB
Maximum value of SAR = 0.0262 mW/g
Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0527 W/kg
SAR(1 g) = 0.0252 mW/g; SAR(10 g) = 0.0132 mW/g
Reference Value = 3.93 V/m
Power Drift = 0.02 dB
Maximum value of SAR = 0.0261 mW/g



0 dB = 0.0261mW/g

Edge-on position, middle channel 802.11g

Date/Time: 09/08/03 16:24:18

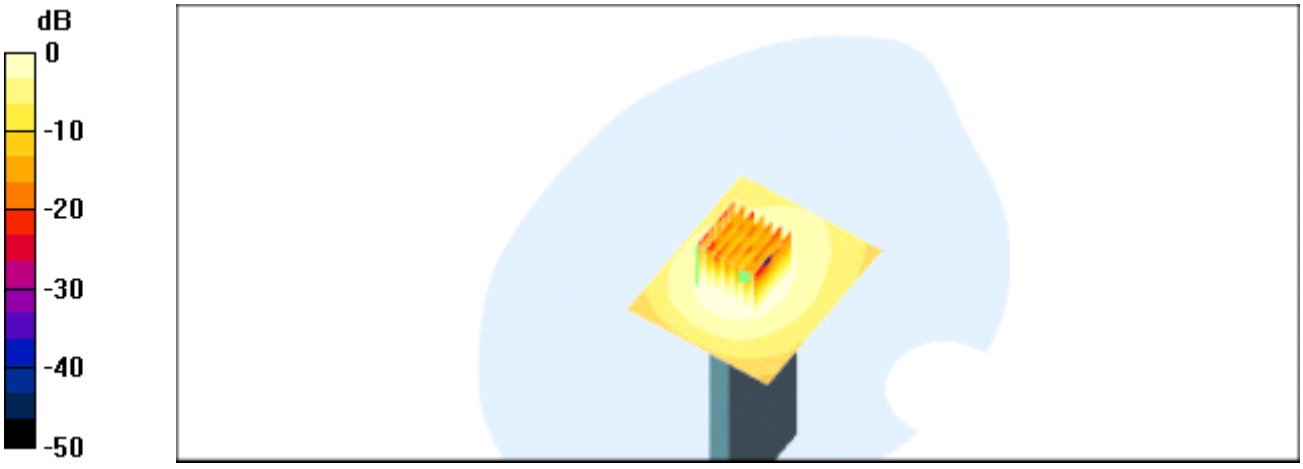
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch06

Communication System: Wireless LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.92587 mho/m, ε_r = 51.5833, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 4.1 V/m
Power Drift = 0.04 dB
Maximum value of SAR = 0.0301 mW/g
Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0597 W/kg
SAR(1 g) = 0.0286 mW/g; SAR(10 g) = 0.015 mW/g
Reference Value = 4.1 V/m
Power Drift = 0.04 dB
Maximum value of SAR = 0.0297 mW/g



0 dB = 0.0297mW/g

Edge-on position, highest channel 802.11g

Date/Time: 09/08/03 16:00:01

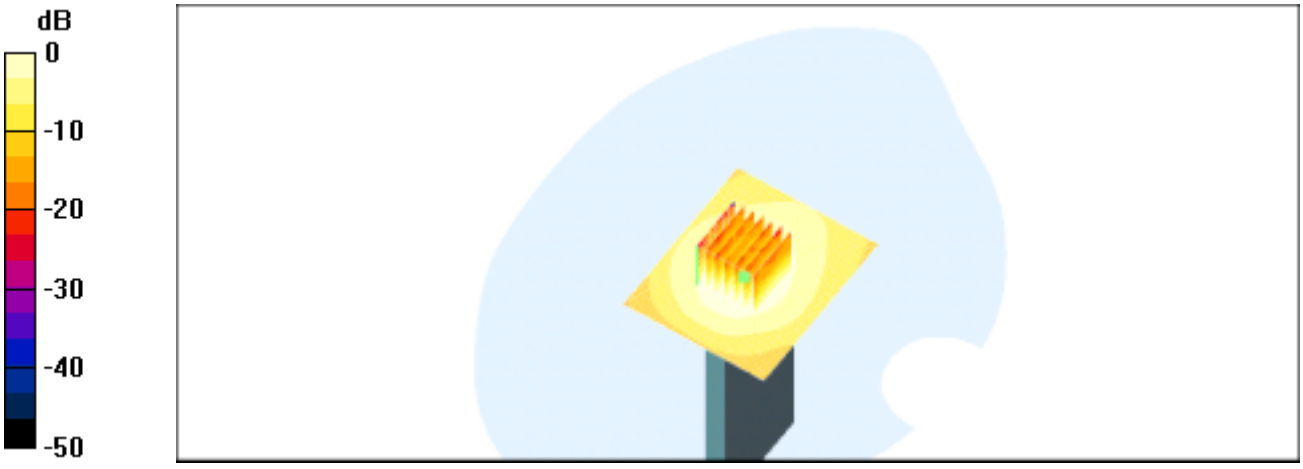
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch11

Communication System: Wireless LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.9299 mho/m, ε_r = 51.4294, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Vertical 1.5cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 4.47 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.0338 mW/g
Vertical 1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0696 W/kg
SAR(1 g) = 0.0327 mW/g; SAR(10 g) = 0.017 mW/g
Reference Value = 4.47 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.0337 mW/g



0 dB = 0.0337mW/g

End-on position, lowest channel 802.11g

Date/Time: 09/08/03 13:36:36

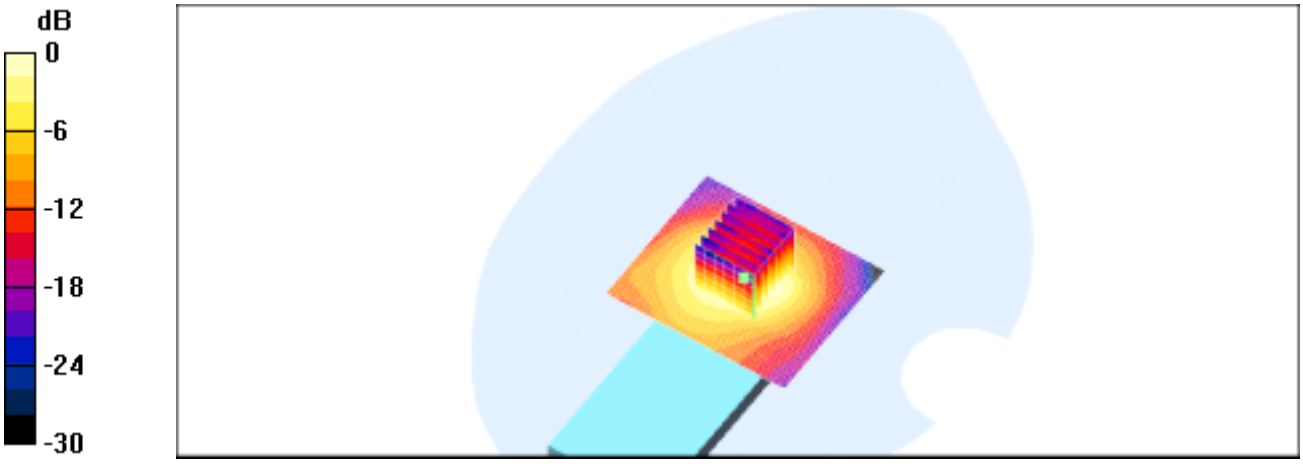
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch11

Communication System: Wireless LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.89775 mho/m, ε_r = 51.7957, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.29 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0791 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.154 W/kg
SAR(1 g) = 0.0743 mW/g; SAR(10 g) = 0.0377 mW/g
Reference Value = 5.29 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0782 mW/g



0 dB = 0.0782mW/g

End-on position, middle channel 802.11g

Date/Time: 09/08/03 14:25:59

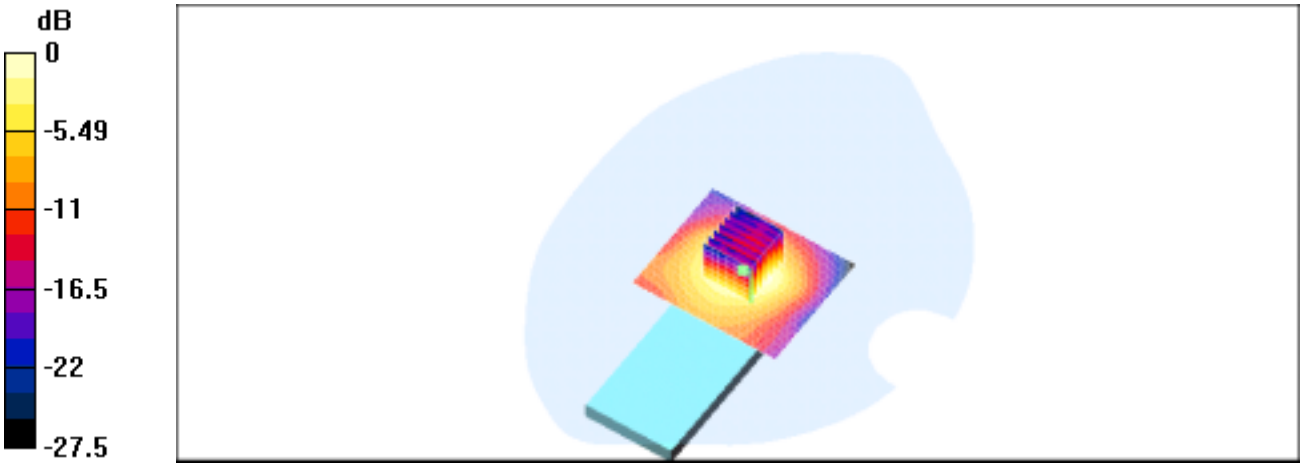
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch06

Communication System: Wireless LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.92587 mho/m, ε_r = 51.5833, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.68 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0926 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.183 W/kg
SAR(1 g) = 0.0868 mW/g; SAR(10 g) = 0.0441 mW/g
Reference Value = 5.68 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0908 mW/g



0 dB = 0.0908mW/g

End-on position, highest channel 802.11g

Date/Time: 09/08/03 14:49:03

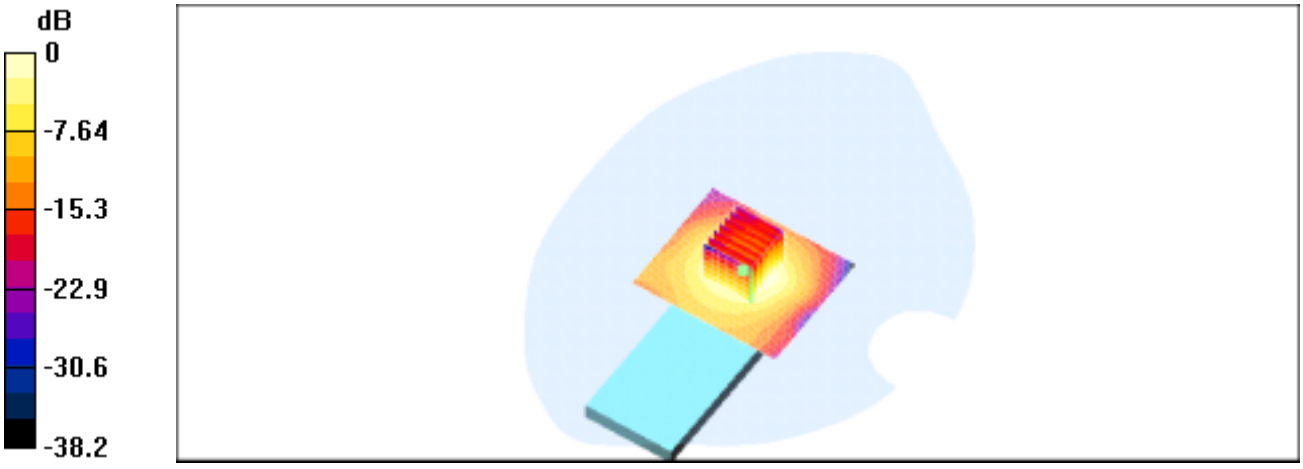
DUT: 802.11g/b WLAN Cardbus Adapter ; Type: PCMCIA Slot;
Program: Ch11

Communication System: Wireless LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.9299 mho/m, ε_r = 51.4294, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Horizonal 0.0cm/Area Scan (61x51x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 6.34 V/m
Power Drift = 0.008 dB
Maximum value of SAR = 0.116 mW/g
Horizonal 0.0cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.243 W/kg
SAR(1 g) = 0.111 mW/g; SAR(10 g) = 0.0549 mW/g
Reference Value = 6.34 V/m
Power Drift = 0.008 dB
Maximum value of SAR = 0.118 mW/g



0 dB = 0.118mW/g

SAR System Performance Verification

Date/Time: 09/09/03 12:45:52

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727
Program: 2003-09-09

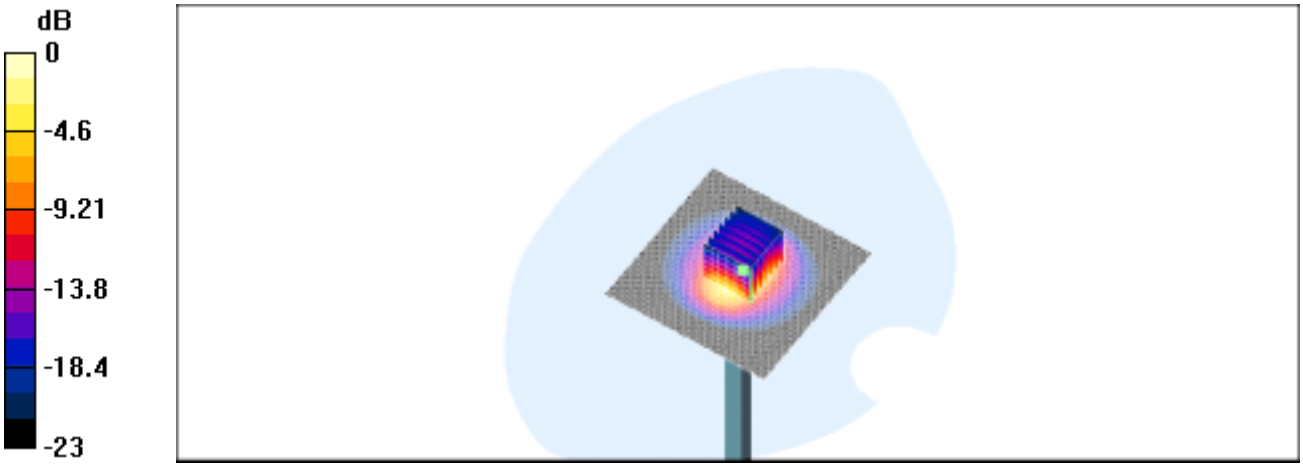
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.93224 mho/m, ε_r = 51.5674, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1759; ConvF(4.5, 4.5, 4.5); Calibrated: 2003/3/7
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2003/1/30
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Systerm Test/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 90.6 V/m
Power Drift = -0.002 dB
Maximum value of SAR = 14.6 mW/g

Systerm Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 5.75 mW/g
Reference Value = 90.6 V/m
Power Drift = -0.002 dB
Maximum value of SAR = 14.7 mW/g



0 dB = 14.7mW/g

Appendix
Photographs of Test Setup

Fig.2 Photograph of the SAR measurement System

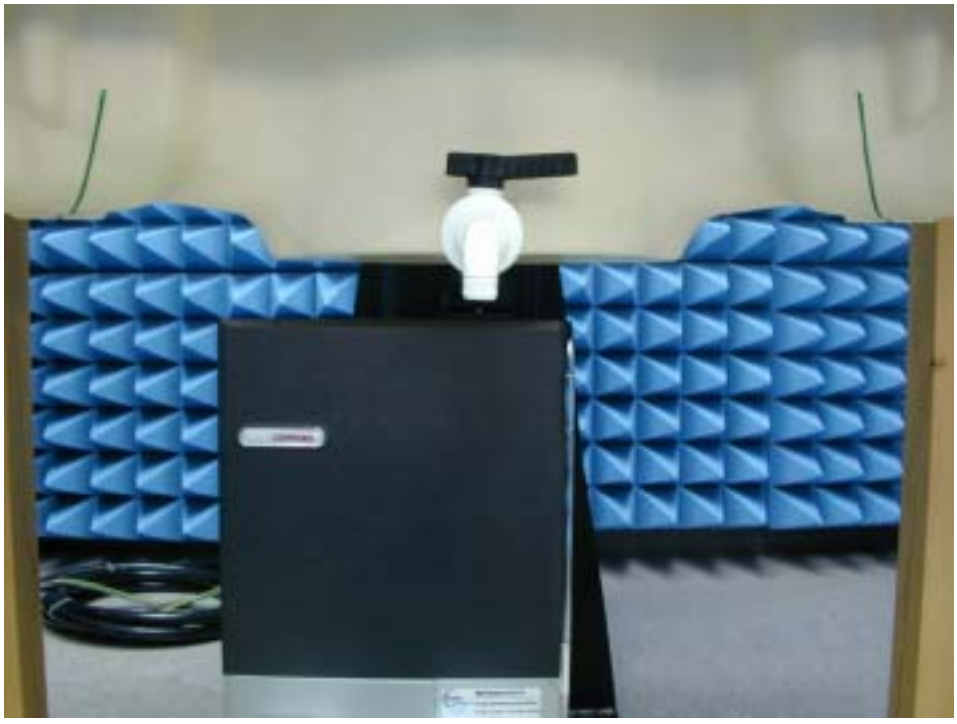


Fig.3 Photograph of the edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom

Fig.4 Photograph of the edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom.

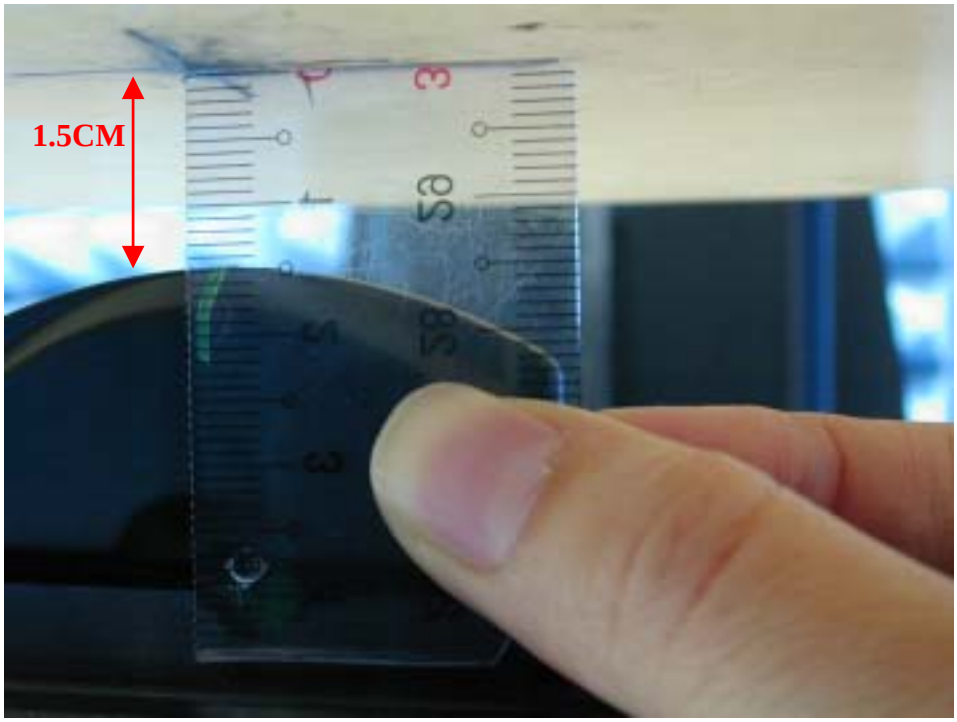


Fig.5 Photograph of the edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom.

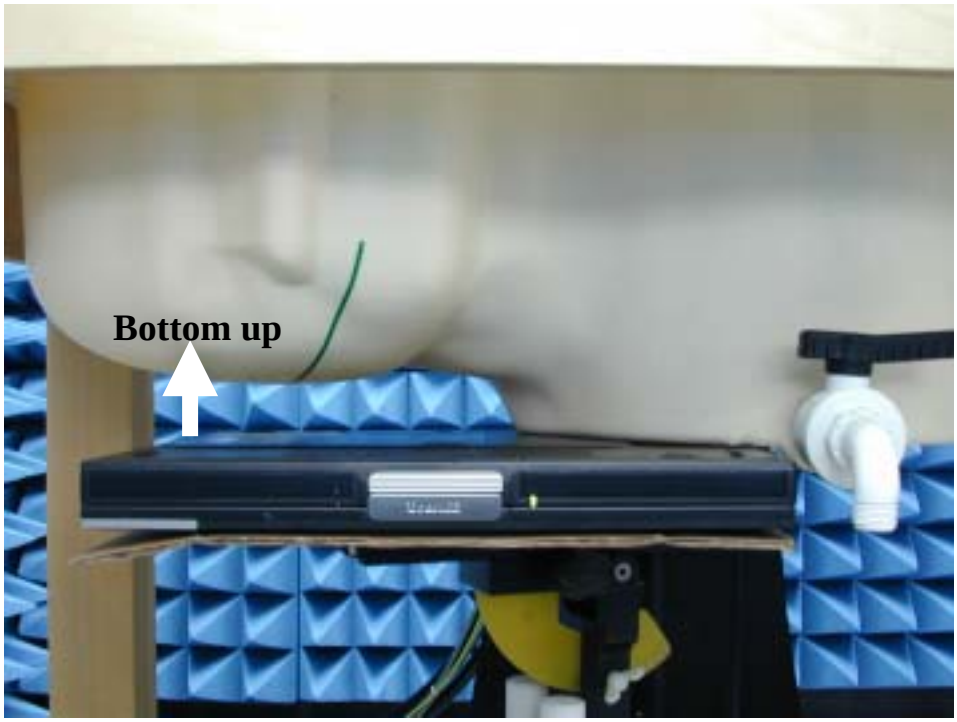


Fig.6 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom.

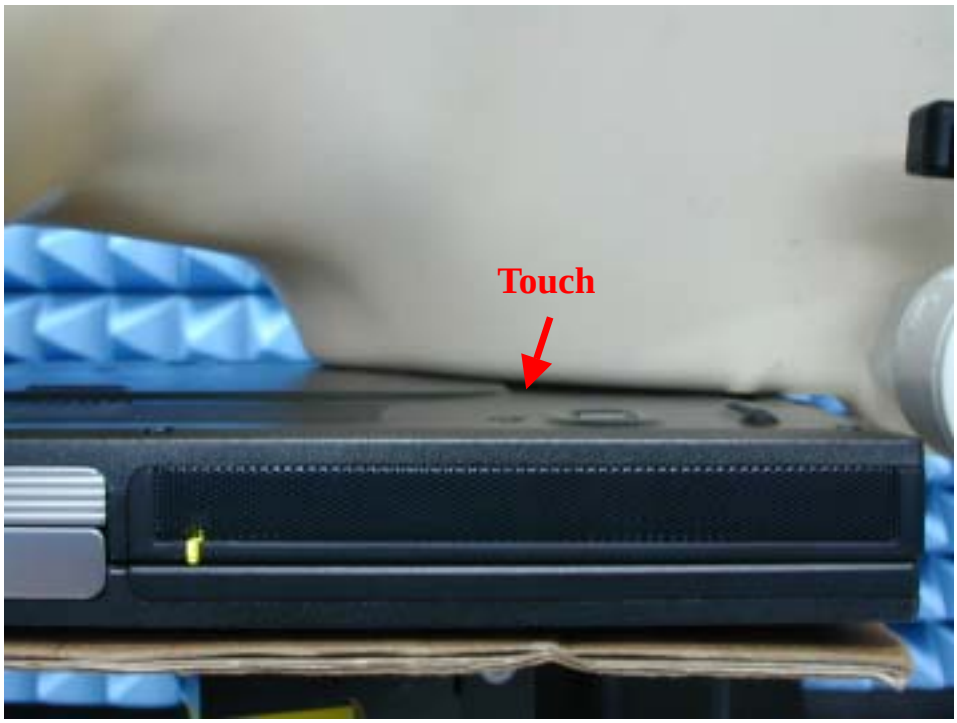


Fig.7 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom.

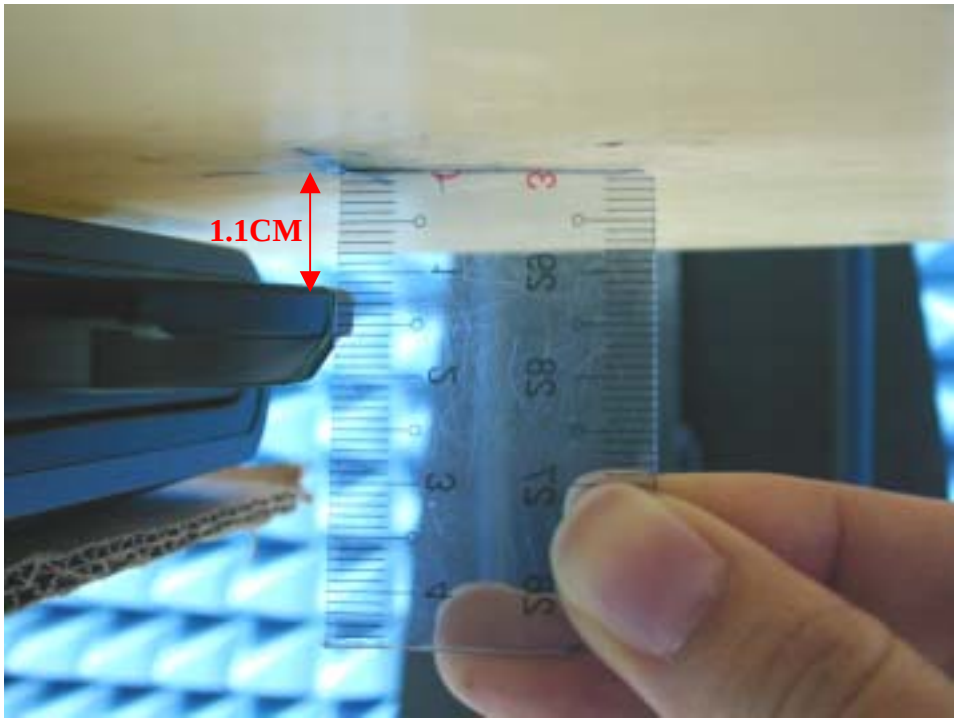


Fig.8 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom, but 1.1 cm Spacing between EUT & Planar Phantom

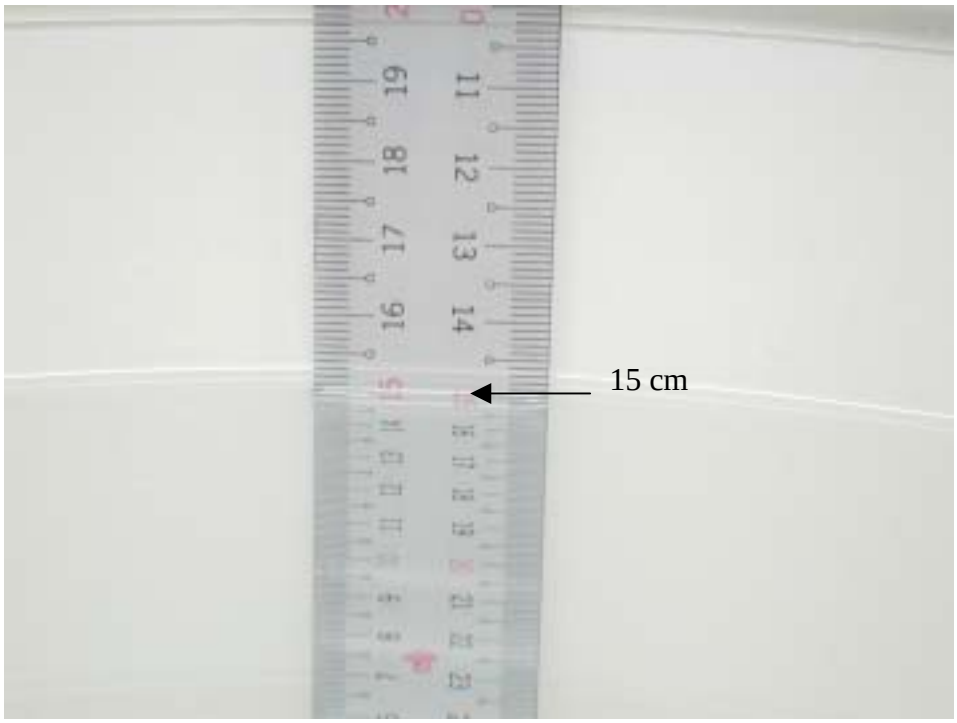


Fig.9 Photograph of the Tissue Simulant Fluid liquid depth 15cm

Photographs of the EUT

Fig.10 Back view of device

Fig.11 Front view of device

Fig.12 with COMPAQ N800 Host Laptop PC PCMCIA slot

Fig.13 with COMPAQ N800 Host Laptop PC PCMCIA slot

Probe Calibration certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client SGS (Auden)

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1759
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	March 7, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: March 7, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Schmid & Partner Engineering AG
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Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

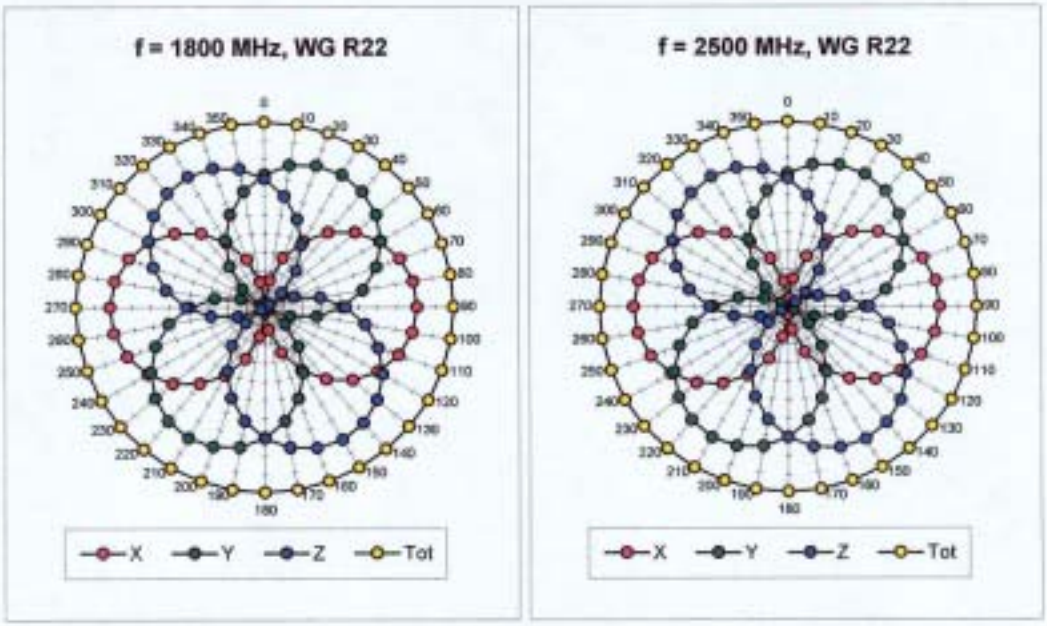
SN:1759

Manufactured: November 12, 2002
Last calibration: March 7, 2003

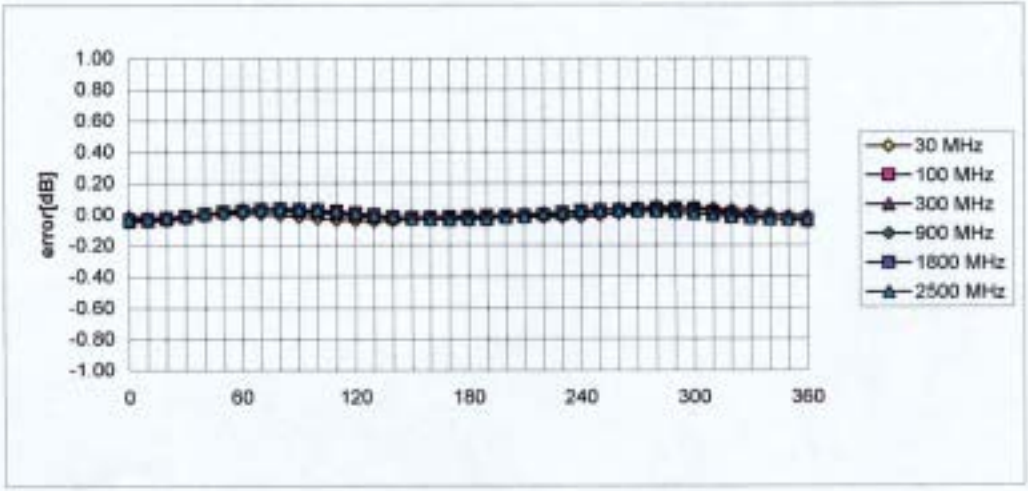
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1759 March 7, 2003

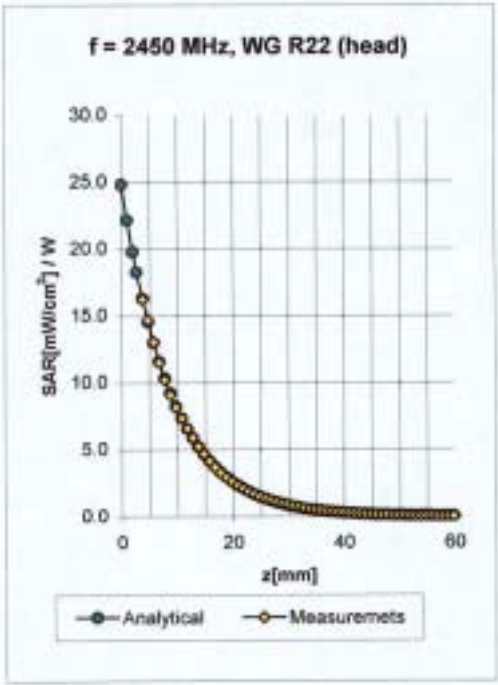


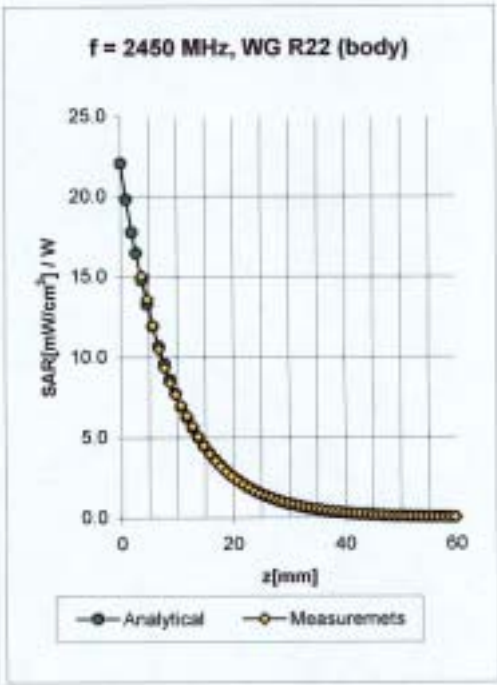
Isotropy Error (ϕ), θ = 0°



ET3DV6 SN:1759 March 7, 2003

Conversion Factor Assessment





2450	Head	MHz	ε_r = 39.2 ± 5%	σ = 1.80 ± 5% mho/m
	ConvF X	5.0 ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	5.0 ± 8.9% (k=2)	Alpha	0.98
	ConvF Z	5.0 ± 8.9% (k=2)	Depth	1.95

2450	Body	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m
	ConvF X	4.5 ± 8.9% (k=2)	Boundary effect:	
	ConvF Y	4.5 ± 8.9% (k=2)	Alpha	1.01
	ConvF Z	4.5 ± 8.9% (k=2)	Depth	1.80

Uncertainty Analysis

DASY4 Uncertainty Budget *According to IEEE P1528*								
Error Descripion	Uncertainty Value	Prob. Dist.	Div.	(Ci) 1g	(Ci) 10g	Std.Unc. (1g)	Std. Unc. (10g)	(Vi) Veff
Measurement System								
Probe Calibration	± 4.8%	N	1	1	1	± 4.8%	± 4.8%	∞
Axial Isotropy	± 4.7%	R	√3	0.7	0.7	± 1.9%	± 1.9%	∞
Hemispherical Isotropy	± 9.6%	R	√3	0.7	0.7	± 3.9%	± 3.9%	∞
Boundary Effects	± 1.0%	R	√3	1	1	± 0.6%	± 0.6%	∞
Linearity	± 4.7%	R	√3	1	1	± 2.7%	± 2.7%	∞
System Detection Limits	± 1.0%	R	√3	1	1	± 0.6%	± 0.6%	∞
Readout Electronics	± 1.0%	N	1	1	1	± 1.0%	± 1.0%	∞
Response Time	± 0.8%	R	√3	1	1	± 0.5%	± 0.5%	∞
Integration Time	± 2.6%	R	√3	1	1	± 1.5%	± 1.5%	∞
RF Ambient Conditions	± 3.0%	R	√3	1	1	± 1.7%	± 1.7%	∞
Probe Positioner	± 0.4%	R	√3	1	1	± 0.2%	± 0.2%	∞
Probe Positioning	± 2.9%	R	√3	1	1	± 1.7%	± 1.7%	∞
Max. SAR Eval	± 1.0%	R	√3	1	1	± 0.6%	± 0.6%	∞
Test Sample Related								
Device Positioning	± 2.9%	N	1	1	1	± 2.9%	± 2.9%	875
Device Holder	± 3.6%	N	1	1	1	± 3.6%	± 3.6%	5
Power Drift	± 5.0%	R	√3	1	1	± 2.9%	± 2.9%	∞
Phantom and Setup								
Phantom Uncertainty	± 4.0%	R	√3	1	1	± 2.3%	± 2.3%	∞
Liquid Conductivity (target)	± 5.0%	R	√3	0.64	0.43	± 1.8%	± 1.2%	∞
Liquid Conductivity (meas.)	± 2.5%	N	1	0.64	0.43	± 1.6%	± 1.1%	∞
Liquid Permittivity (target)	± 5.0%	R	√3	0.6	0.49	± 1.7%	± 1.4%	∞
Liquid Permittivity (meas)	± 2.5%	N	1	0.6	0.49	± 1.5%	± 1.2%	∞
Combined Std. Uncertainty						± 10.3%	± 10.0%	331
Expanded STD Uncertainty						± 20.6%	± 20.1%	∞

Phantom description

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 28.02.2002

Signature / Stamp

Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

F. Bomholt

Claire Kaja

System Validation from Original equipment supplier SPEAG Schmid & Partner

Date/Time: 03/05/03 16:17:40

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN727_SN3013_M2450_050303.da4

DUT: Dipole 2450 MHz; Serial: D2450V2 - SN727
Program: Dipole Calibration

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Muscle 2450 MHz; (σ = 2.05 mho/m, ε_r = 51.05, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV2 - SN3013; ConvF(4.2, 4.2, 4.2); Calibrated: 1/19/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 25; Postprocessing SW: SEMCAD, V1.6 Build 105

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.7 V/m
Peak SAR = 27.6 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.16 mW/g
Power Drift = 0.007 dB