TEST REPORT

Equipment Under Test	:	Notebook PC
Model No.	:	ML900
FCC ID	:	ABZ89FT7602
Applicant		Motorola Inc.
Address of Applicant	:	1301E . Algonquin Road , Schaumburg , IL 60196
Date of Receipt	:	2003.07.03
Date of Test(s)	:	2003.07.03-2003.07.07
Date of Issue	:	2003.07.07

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**	:	**2003.07.07**
Approved by	:	**Robert Chang**	**Date**	:	**2003.07.07**

Contents

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. (FCC Registration number: 573967)
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Taipei county , Taiwan , R.O.C.
Telephone : +886-2-2299-3279
Fax : +886-2-2298-2698
Internet : http://www.sgs.com.tw

1.2 Details of Applicant

Applicant : Motorola Inc.
Address : 1301E . Algonquin Road , Schaumburg , IL 60196

1.3 Description of EUT(s)

Equipment Type	Notebook PC
Test Procedure	FCC OET Bulletin 65, Supplement C
TX Frequency range	2412-2462 MHz
FCC ID	ABZ89FT7602
Model(s)	ML900
RF Conducted Output Power (Peak)	802.11b Mode 17.84 dBm(2412MHz) 18.05 dBm(2437MHz) 16.92 dBm(2462MHz)
Max. SAR Measured	0.34 (mW/g)
Antenna Type	PIFA
Battery Type(s)	Internal battery , 19Volt

1.4 Test Environment

Ambient temperature : 22.0° C

Tissue Simulating Liquid : 21.9° C

Relative Humidity : 62 %

1.5 Operation Configuration

This combo notebook come with 802.11b and Bluetooth module . For SAR test , use the following procedures: (1) Test SAR with WLAN transmitter **ON** and Bluetooth **OFF** . (2) Both WLAN and Bluetooth **ON** .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 4 ways.

WALN transmitter **ON** and Bluetooth **OFF**

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.2 & Fig.3 & Fig.4)

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 2.3 cm Spacing between EUT & Planar Phantom. (Fig.5 & Fig.6 & Fig.7)

Both WLAN and Bluetooth **ON**

Configuration 3 " Edge-on" placement; edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom (Fig.2 & Fig.3 & Fig.4)

Configuration 4 "End-on" placement; Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom, but 2.3 cm Spacing between EUT & Planar Phantom. (Fig.5 & Fig.6 & Fig.7)

1.6 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. 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.

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal

multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

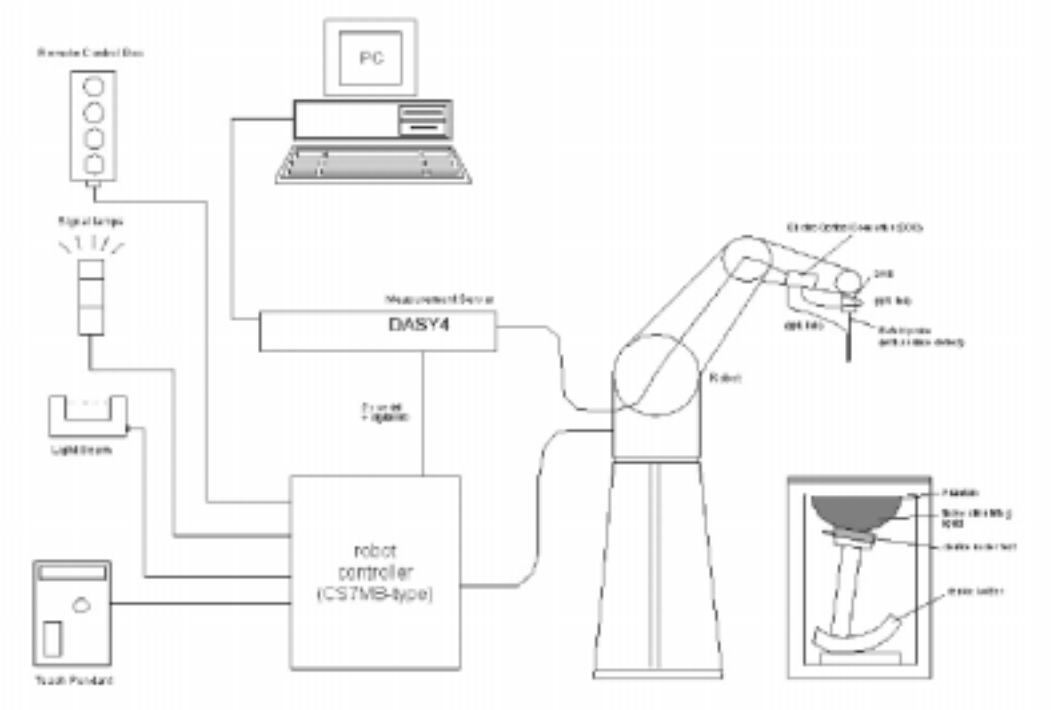


Fig. a The microwave circuit arrangement used for SAR system verification

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.

• Validation dipole kits allowing to validate the proper functioning of the system.

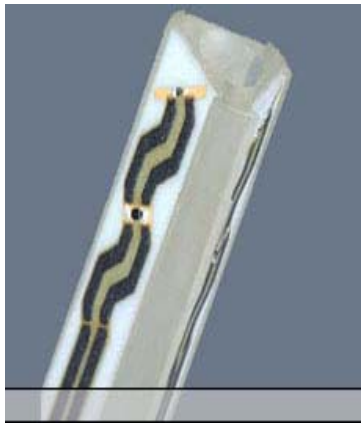
1.7 System Components

ET3DV6 E-Field Probe

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material
(resistant to organic solvents, e.g. glycol)

Calibration: In air from 10 MHz to 2.5 GHz
In brain simulating tissue at
frequencies of 900 MHz
and 1.8 GHz (accuracy ± 8%)

Frequency: 10 MHz to >6 GHz; Linearity: ±0.2 dB
(30 MHz to 3 GHz)



ET3DV6 E-Field Probe

Directivity: ±0.2 dB in brain tissue (rotation around probe axis)
±0.4 dB in brain tissue (rotation normal to probe axis)

Dynamic Rnge: 5 µW/g to >100 mW/g; Linearity: ±0.2 dB

Surface. Detect: ±0.2 mm repeatability in air and clear liquids over
diffuse reflecting surfaces

Dimensions: Overall length: 330 mm
Tip length: 16 mm
Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm

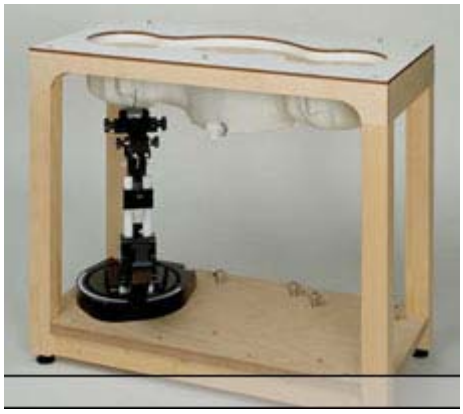
Application: General dissymmetry up to 3 GHz
Compliance tests of mobile phone

SAM PHANTOM V4.0C

Construction: The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dissymmetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the

robot.

Shell Thickness:	2 ± 0.2 mm
Filling Volume:	Approx. 25 liters
Dimensions:	Height: 810 mm; Length: 1000 mm; Width: 500 mm



DEVICE HOLDER

Construction

In combination with the Twin SAM Phantom V4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Device Holder

1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 1900MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was in the range 22.3 °C, the relative humidity was in the range 54% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

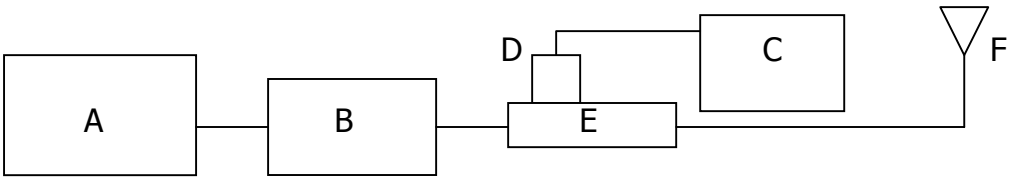


Fig. b The microwave circuit arrangement used for SAR system verification

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

Photograph of the 2450MHz System Check

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	6.02 m W/g	13.6 m W/g	6.07 m W/g	2003-07-03

Table 1. Results system validation

1.9 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.

F (Mhz)	Tissue type	Limits/ Measured	Dielectric Parameters		
			ρ	σ (S/m)	Simulated Tissue Temp(° C)
2450	Body	Measured, 03-July-03	51.75	1.923	22.1
		Measured, 03-July-03	51..8	1.922	22.1
		Recommended Limits	50.1-55.3	1.85-2.05	20-24

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the ear reference point of the phantom was 15cm±5mm during all tests. (Fig .8)
The composition of the brain tissue simulating liquid for 2450 MHz is:

Ingredient	2450Mhz (Head)	2450Mhz (Body)
DGMBE	550.0 g	301.7 ml
Water	450.0 g	698.3 ml
Total amount	1 L (1.0kg)	1 L (1.0kg)

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

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

2. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration
Schmid & Partner Engineering AG	Dissymmetric E-Field Probe	ET3DV6	1759	Mar.07.2003
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2	727	Mar.05. 2003
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE3	547	Jan.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	Jan.16.2003
Agilent	Dielectric Probe Kit	85070D	US01440168	Jan.20.2003
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	102189	Aug.11.2003

3.Summary of Results

WLAN ON and Bluetooth OFF

EUT Configuration 1

EUT Set-up conditions		Frequency		Conducted Power [dBm] (Peak)	Liquid Temp[°C]	SAR (W/kg)	Limit (W/kg)
Sep. [cm]	Antenna	Channel	MHz				
1.5	PIFA	1	2412	17.84 dBm (2412MHz)	22.1	0.266	1.6
		6	2437	18.05 dBm (2437MHz)	22.2	0.139	
		11	2462	16.92 dBm (2462MHz)	22	0.0786	

EUT Configuration 2

EUT Set-up conditions		Frequency		Conducted Power [dBm] (Peak)	Liquid Temp[°C]	SAR (W/kg)	Limit (W/kg)
Sep. [cm]	Antenna	Channel	MHz				
1.5	PIFA	1	2412	17.84 dBm (2412MHz)	22.1	0.34	1.6
		6	2437	18.05 dBm (2437MHz)	22	0.235	
		11	2462	16.92 dBm (2462MHz)	22	0.119	

Both WLAN and Bluetooth ON

EUT Configuration 3

EUT Set-up conditions		Frequency		Conducted Power [dBm] (Peak)	Liquid Temp[°C]	SAR (W/kg)	Limit (W/kg)
Sep. [cm]	Antenna	Channel	MHz				
0.0	PIFA	1	2412	17.84 dBm (2412MHz)	22.1	0.19	1.6
		6	2437	18.05 dBm (2437MHz)	22	0.167	
		11	2462	16.92 dBm (2462MHz)	22	0.0759	

EUT Configuration 4

EUT Set-up conditions		Frequency		Conducted Power [dBm] (Peak)	Liquid Temp[°C]	SAR (W/kg)	Limit (W/kg)
Sep. [cm]	Antenna	Channel	MHz				
0.0	PIFA	1	2412	17.84 dBm (2412MHz)	22.1	0.335	1.6
		6	2437	18.05 dBm (2437MHz)	22.1	0.233	
		11	2462	16.92 dBm (2462MHz)	22	0.128	

Measured Mixture Type	Body	Relative Humidity	62%
Ambient Temperature	22°C	Fluid Temperature	21.9°C

4.Measurements

Configuration 1

Edge-on position, lowest channel Date/Time: 07/04/03 15:02:12

802.11b

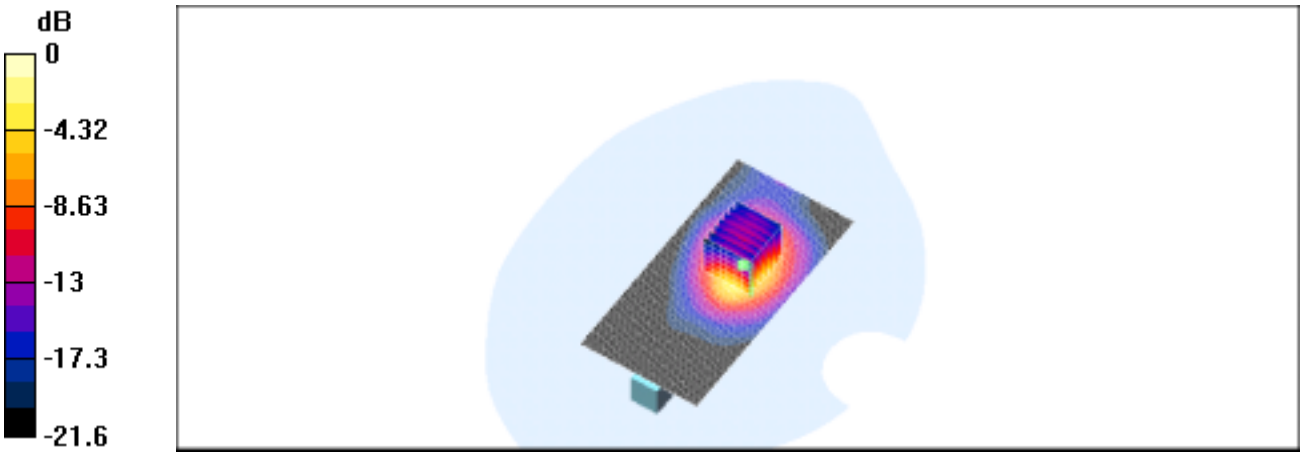
DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

Communication System: Notebook PC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.95826 mho/m, ε_r = 51.7097, 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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 6.01 V/m
Power Drift = 0.08 dB
Maximum value of SAR = 0.295 mW/g
Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.543 W/kg
SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.129 mW/g
Reference Value = 6.01 V/m
Power Drift = 0.08 dB
Maximum value of SAR = 0.292 mW/g



0 dB = 0.292mW/g

Configuration 1

Edge-on position, middle channel 802.11b

Date/Time: **07/04/03 12:31:34**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

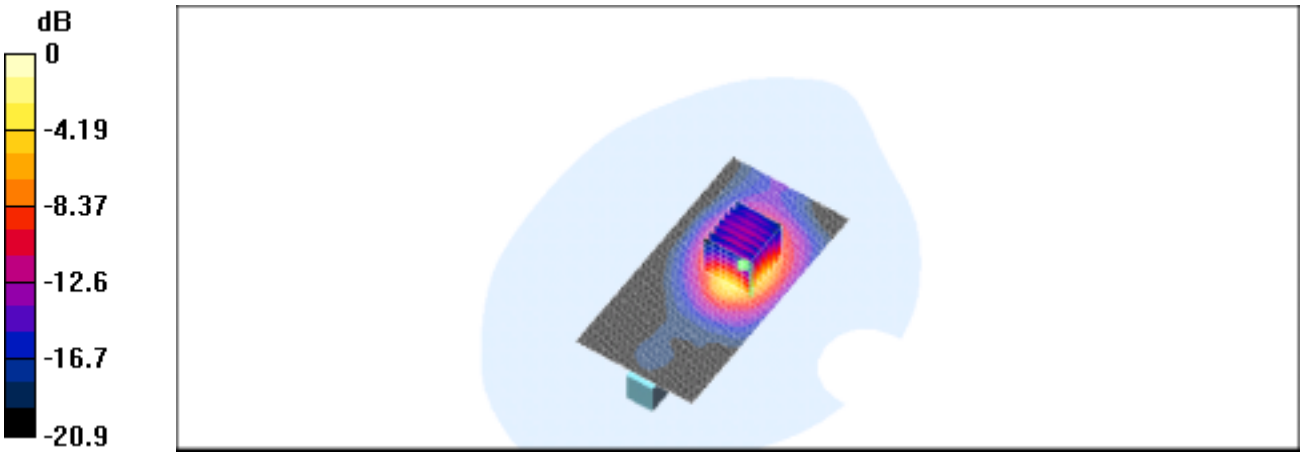
Communication System: Notebook PC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.99146 mho/m, ε_r = 51.6172, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 3.88 V/m
Power Drift = -0.04 dB
Maximum value of SAR = 0.158 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.284 W/kg
SAR(1 g) = 0.139 mW/g; SAR(10 g) = 0.0679 mW/g
Reference Value = 3.88 V/m
Power Drift = -0.04 dB
Maximum value of SAR = 0.151 mW/g



0 dB = 0.151mW/g

Configuration 1

Edge-on position, highest channel 802.11b

Date/Time: **07/04/03 15:57:37**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

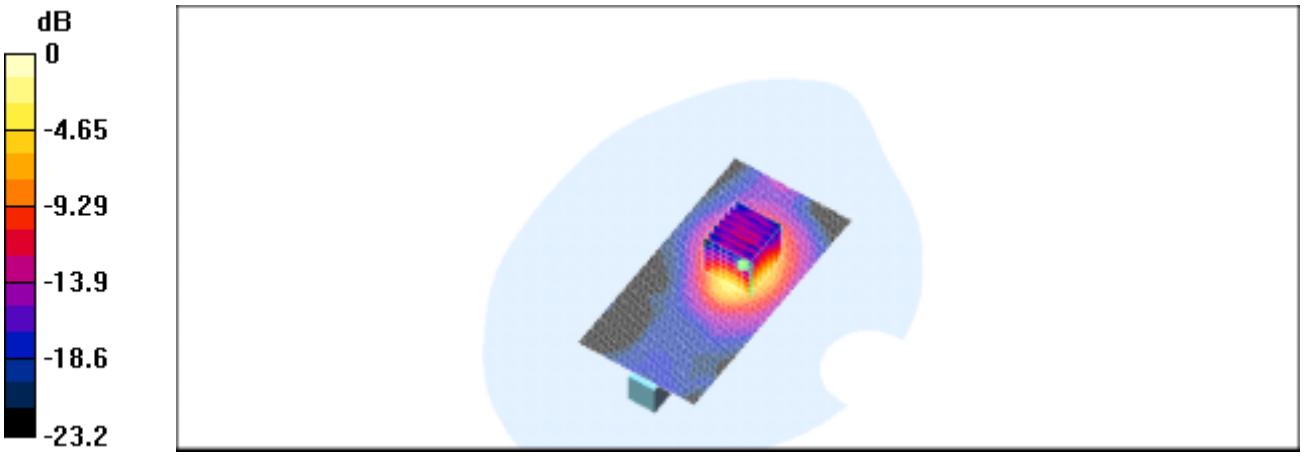
Communication System: Notebook PC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 2.01798 mho/m, ε_r = 51.4499, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 2.98 V/m
Power Drift = -0.008 dB
Maximum value of SAR = 0.0874 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.0786 mW/g; SAR(10 g) = 0.0376 mW/g
Reference Value = 2.98 V/m
Power Drift = -0.008 dB
Maximum value of SAR = 0.0858 mW/g



0 dB = 0.0858mW/g

Configuration 2

End-on position, lowest channel 802.11b

Date/Time: **07/04/03 17:35:39**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

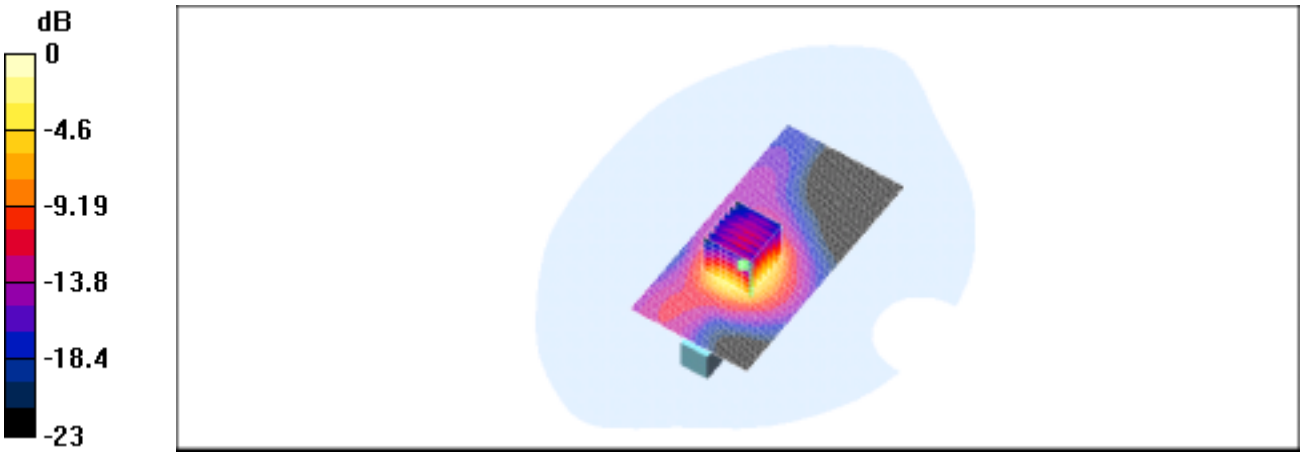
Communication System: Notebook PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: M2450 (σ = 1.95826 mho/m, ε_r = 51.7097, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 10.1 V/m
Power Drift = -0.1 dB
Maximum value of SAR = 0.389 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.691 W/kg
SAR(1 g) = 0.34 mW/g; SAR(10 g) = 0.163 mW/g
Reference Value = 10.1 V/m
Power Drift = -0.1 dB
Maximum value of SAR = 0.369 mW/g



0 dB = 0.369mW/g

Configuration 2

End-on position, middle channel 802.11b

Date/Time: **07/04/03 17:11:38**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

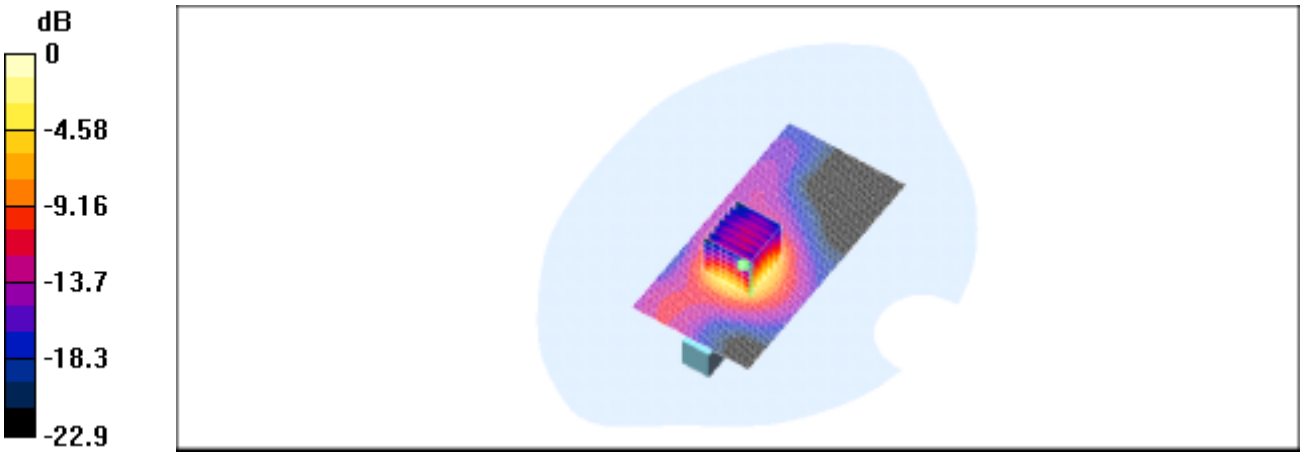
Communication System: Notebook PC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.99146 mho/m, ε_r = 51.6172, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 8.07 V/m
Power Drift = -0.09 dB
Maximum value of SAR = 0.274 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.49 W/kg
SAR(1 g) = 0.235 mW/g; SAR(10 g) = 0.112 mW/g
Reference Value = 8.07 V/m
Power Drift = -0.09 dB
Maximum value of SAR = 0.255 mW/g



0 dB = 0.255mW/g

Configuration 2

End-on position, highest channel 802.11b

Date/Time: **07/04/03 16:45:55**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

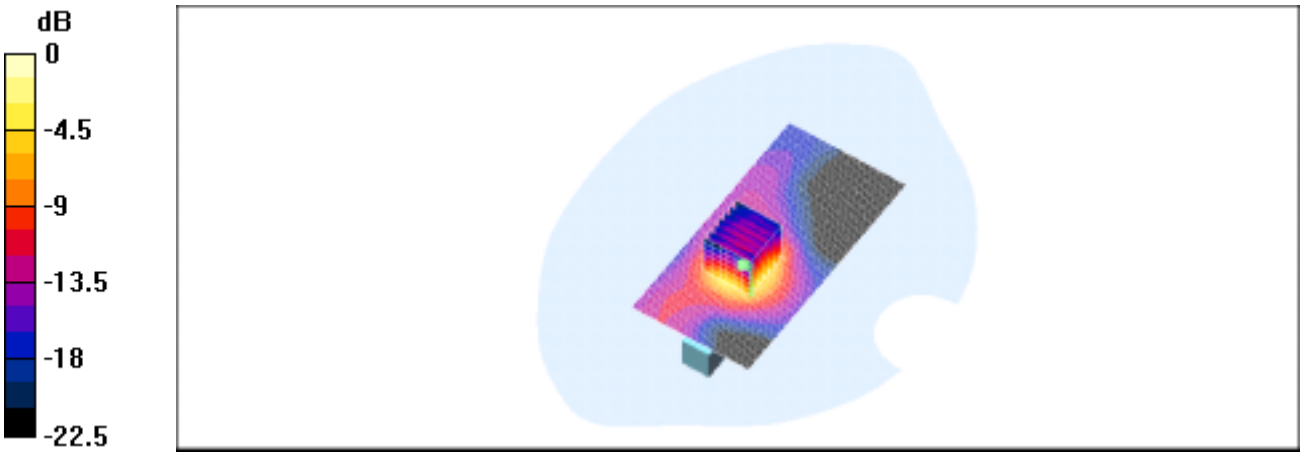
Communication System: Notebook PC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 2.01798 mho/m, ε_r = 51.4499, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.35 V/m
Power Drift = 0.007 dB
Maximum value of SAR = 0.137 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.251 W/kg
SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.0569 mW/g
Reference Value = 5.35 V/m
Power Drift = 0.007 dB
Maximum value of SAR = 0.129 mW/g



0 dB = 0.129mW/g

Configuration 3

Edge-on position, lowest channel 802.11b

Date/Time: **07/03/03 18:27:56**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

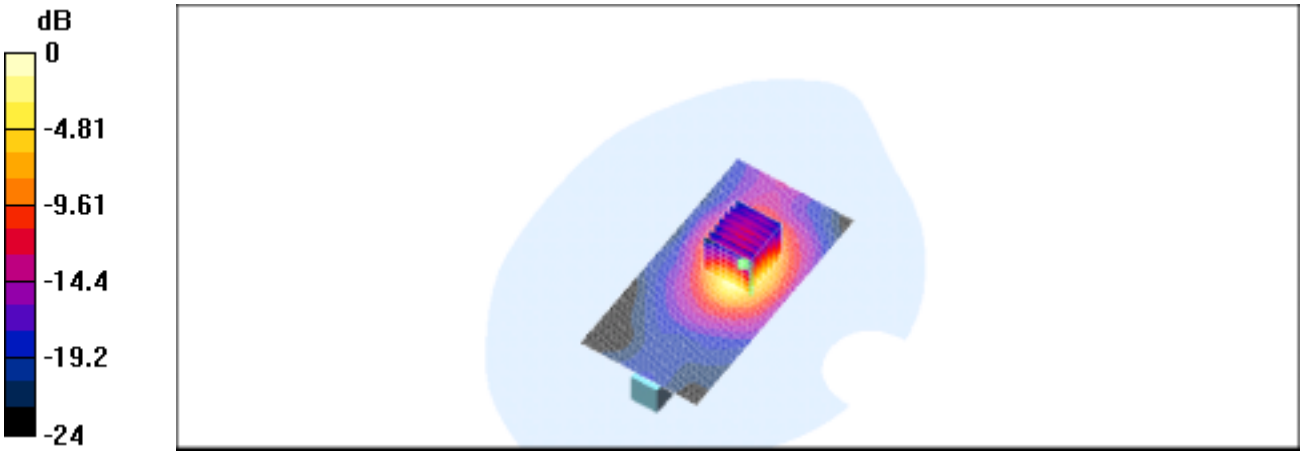
Communication System: Wireless LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.95826 mho/m, ε_r = 51.7097, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.94 V/m
Power Drift = -0.8 dB
Maximum value of SAR = 0.232 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.407 W/kg
SAR(1 g) = 0.19 mW/g; SAR(10 g) = 0.0899 mW/g
Reference Value = 5.94 V/m
Power Drift = -0.8 dB
Maximum value of SAR = 0.206 mW/g



0 dB = 0.206mW/g

Configuration 3

Edge-on position, middle channel 802.11b

Date/Time: **07/04/03 09:28:04**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

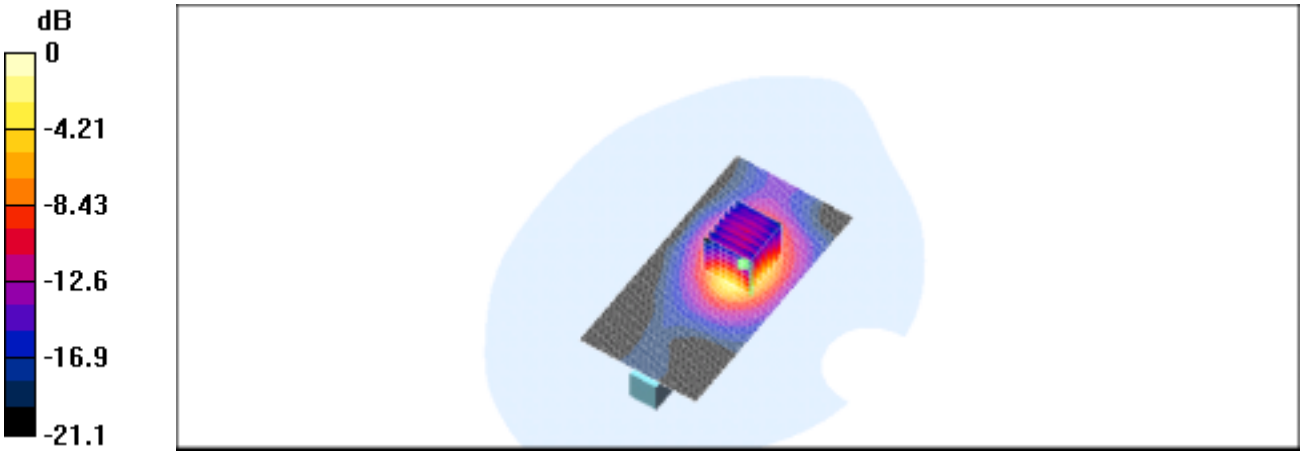
Communication System: Notebook PC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.99146 mho/m, ε_r = 51.6172, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.26 V/m
Power Drift = -0.3 dB
Maximum value of SAR = 0.194 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.335 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.0822 mW/g
Reference Value = 5.26 V/m
Power Drift = -0.3 dB
Maximum value of SAR = 0.183 mW/g



0 dB = 0.183mW/g

Configuration 3

Edge-on position, highest channel 802.11b

Date/Time: **07/04/03 09:54:38**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

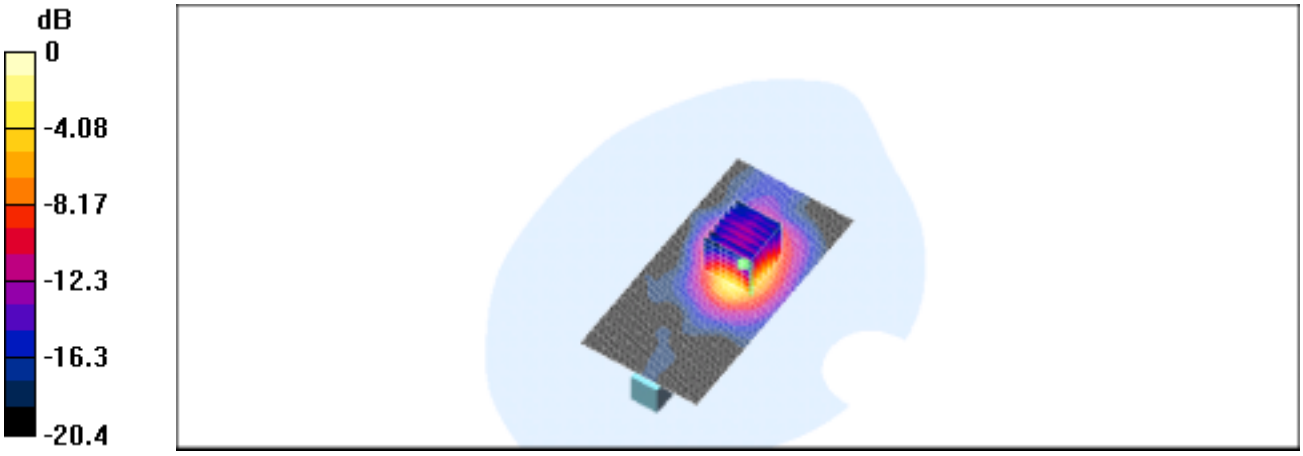
Communication System: Notebook PC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 2.01798 mho/m, ε_r = 51.4499, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 3.3 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.0861 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.158 W/kg
SAR(1 g) = 0.0759 mW/g; SAR(10 g) = 0.037 mW/g
Reference Value = 3.3 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.0829 mW/g



0 dB = 0.0829mW/g

Configuration 4

End-on position, lowest channel 802.11b

Date/Time: **07/07/03 09:02:11**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

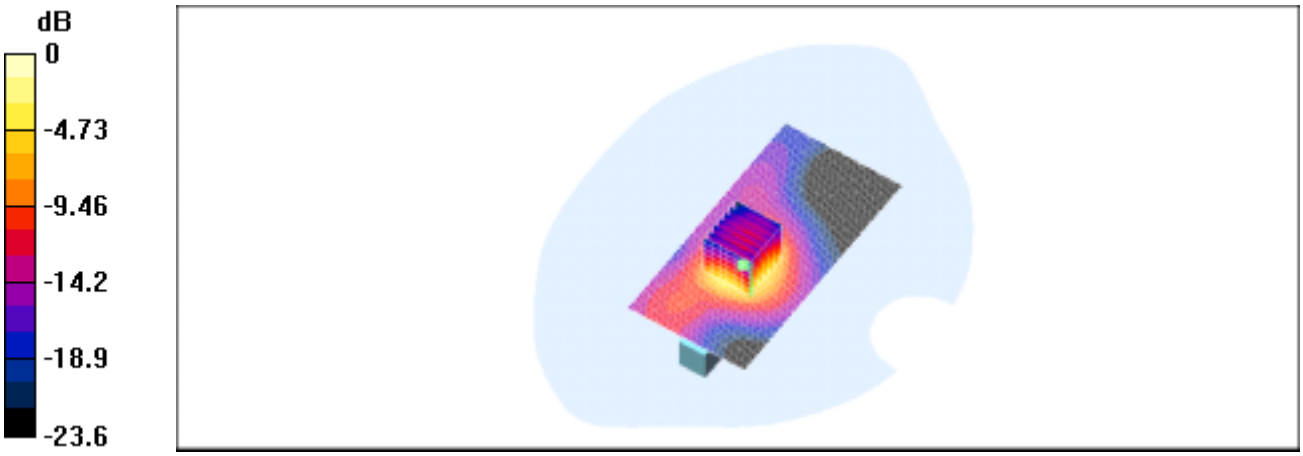
Communication System: Notebook PC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: M2450 (σ = 1.95826 mho/m, ε_r = 51.7097, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 10.7 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.405 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.688 W/kg
SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.162 mW/g
Reference Value = 10.7 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.363 mW/g



0 dB = 0.363mW/g

Configuration 4

End-on position, middle channel 802.11b

Date/Time: **07/07/03 09:29:02**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

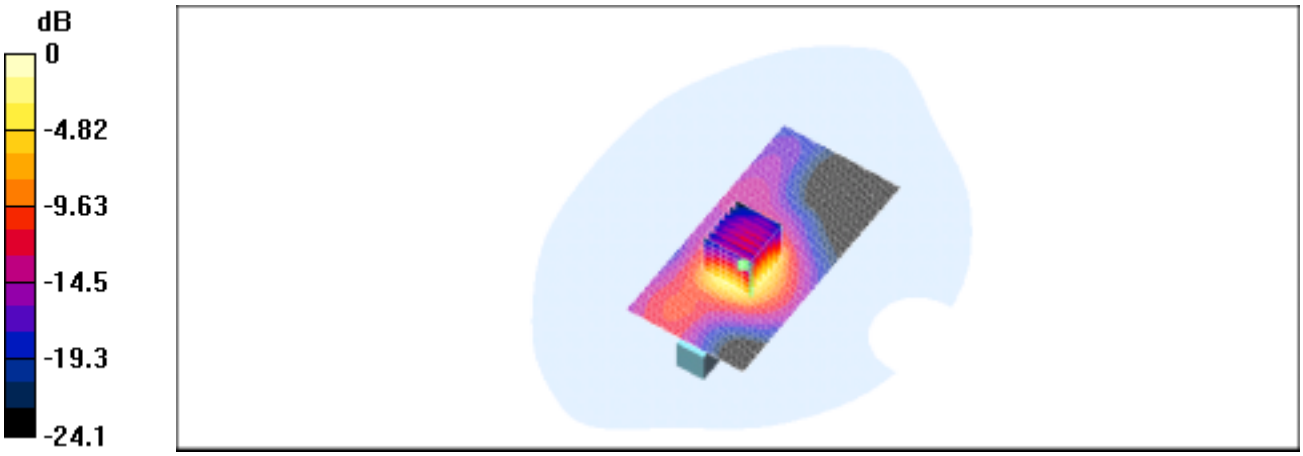
Communication System: Notebook PC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.99146 mho/m, ε_r = 51.6172, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 8.89 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.268 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.479 W/kg
SAR(1 g) = 0.233 mW/g; SAR(10 g) = 0.111 mW/g
Reference Value = 8.89 V/m
Power Drift = -0.06 dB
Maximum value of SAR = 0.252 mW/g



0 dB = 0.252mW/g

Configuration 4

End-on position, highest channel 802.11b

Date/Time: **07/07/03 09:54:50**

DUT: Notebook PC; Type: ML900;
Program: Wireless LAN 802.11b

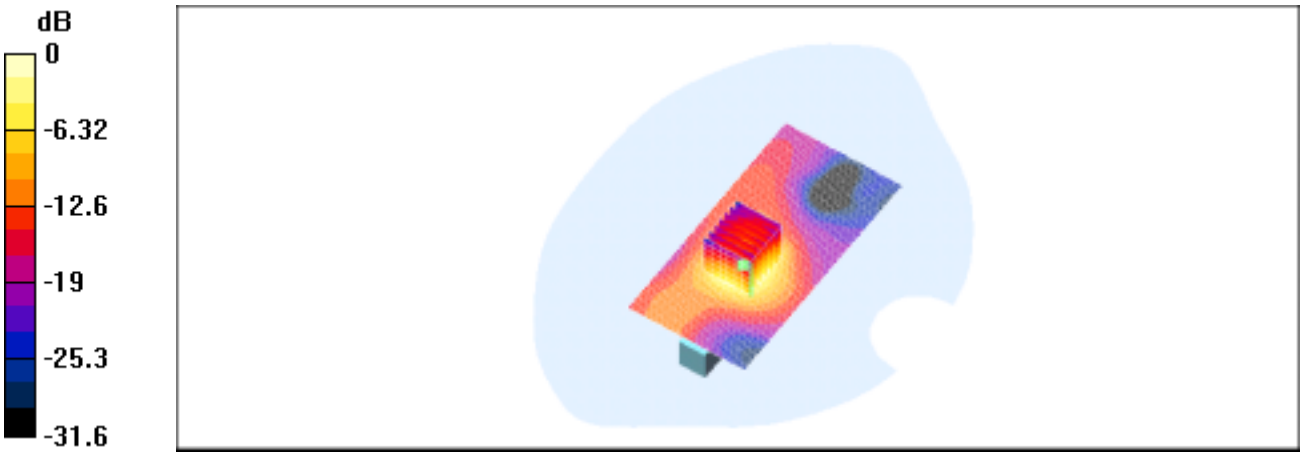
Communication System: Notebook PC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 2.01798 mho/m, ε_r = 51.4499, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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

Horizontal/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 6.25 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.14 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.273 W/kg
SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.06 mW/g
Reference Value = 6.25 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.139 mW/g



0 dB = 0.139mW/g

SAR System Performance Verification

Date/Time: 07/03/03 14:27:56

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727
Program: 2003-07-03

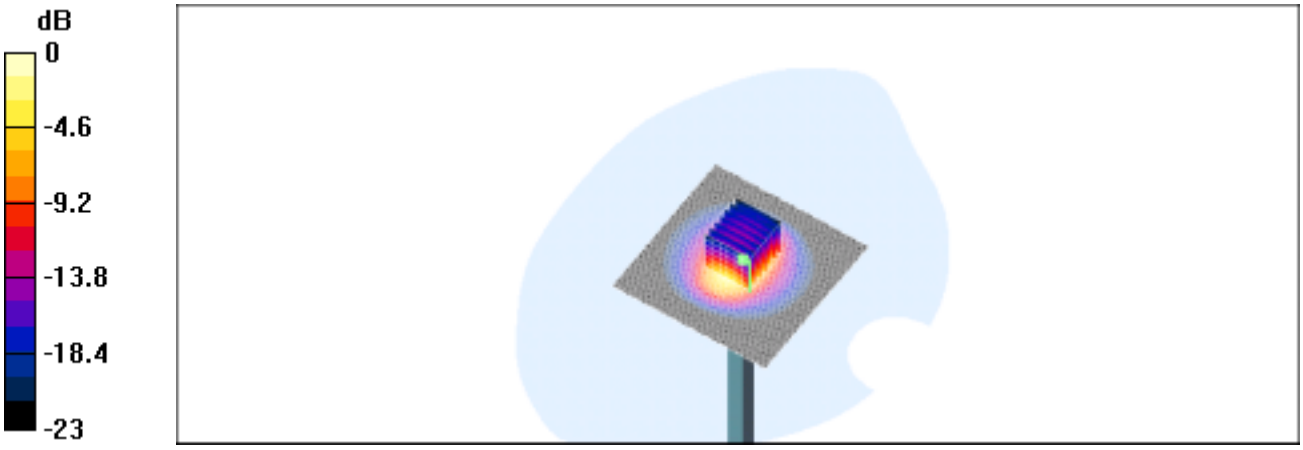
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: M2450 (σ = 1.93 mho/m, ε_r = 51.17, ρ = 1000 kg/m^3)
Phantom section: Flat Section

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 = 92.1 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 15.1 mW/g

Systerm Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.07 mW/g
Reference Value = 92.1 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 15 mW/g



0 dB = 15mW/g

Appendix
Photographs of Test Setup

Fig.1 Photograph of the SAR measurement System

Fig.2 Photograph of the edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom

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.

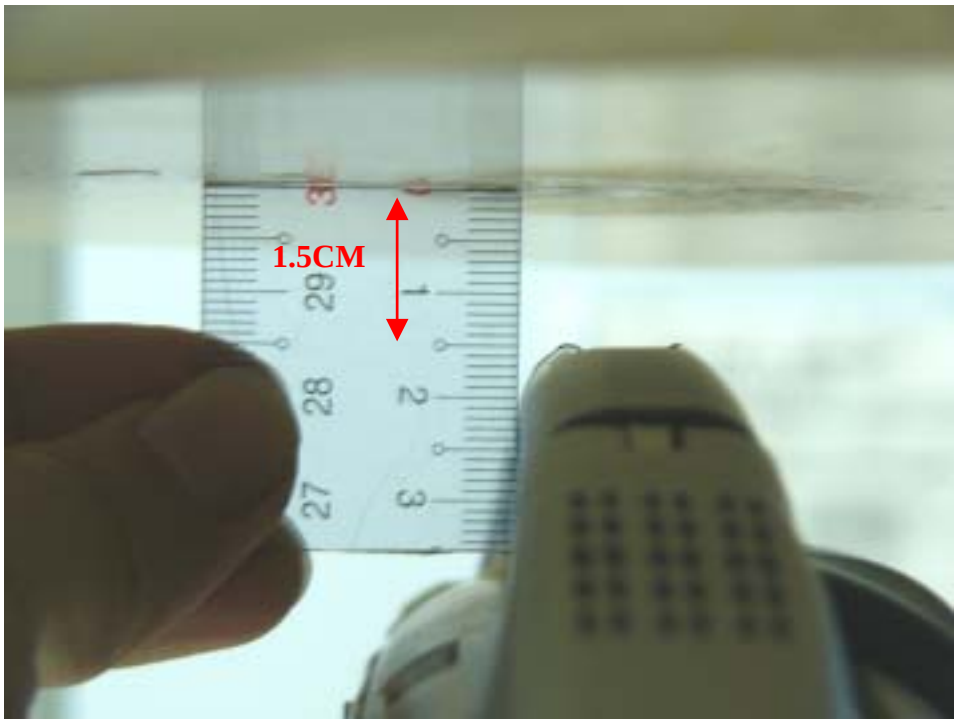


Fig.4 Photograph of the edge of the PC at 90° and at a distance of 1.5 cm from the base of the phantom.

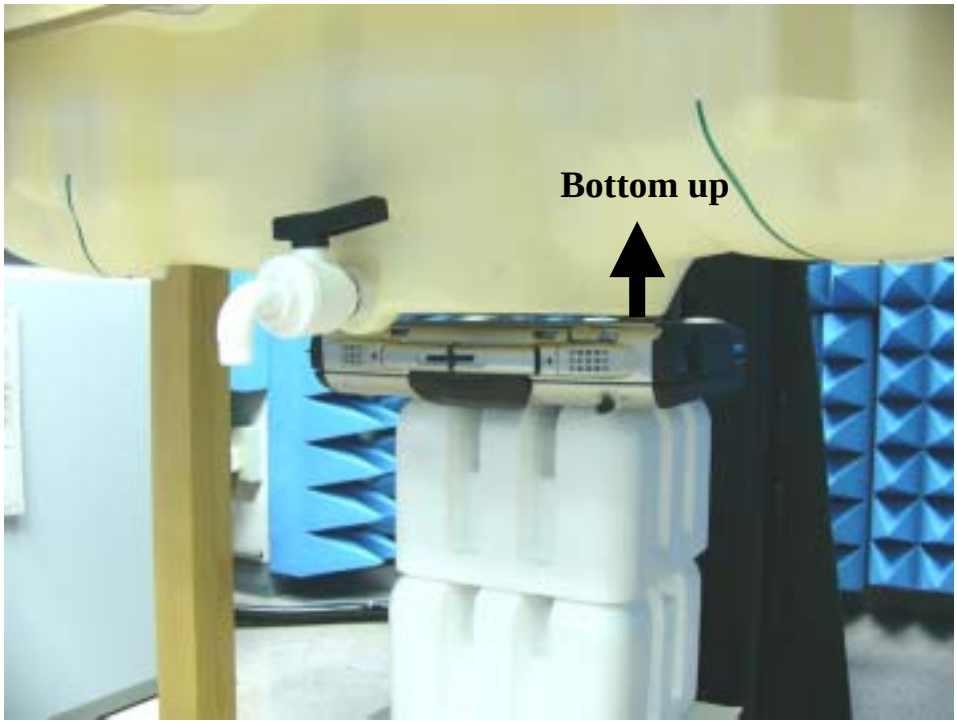


Fig.5 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom.

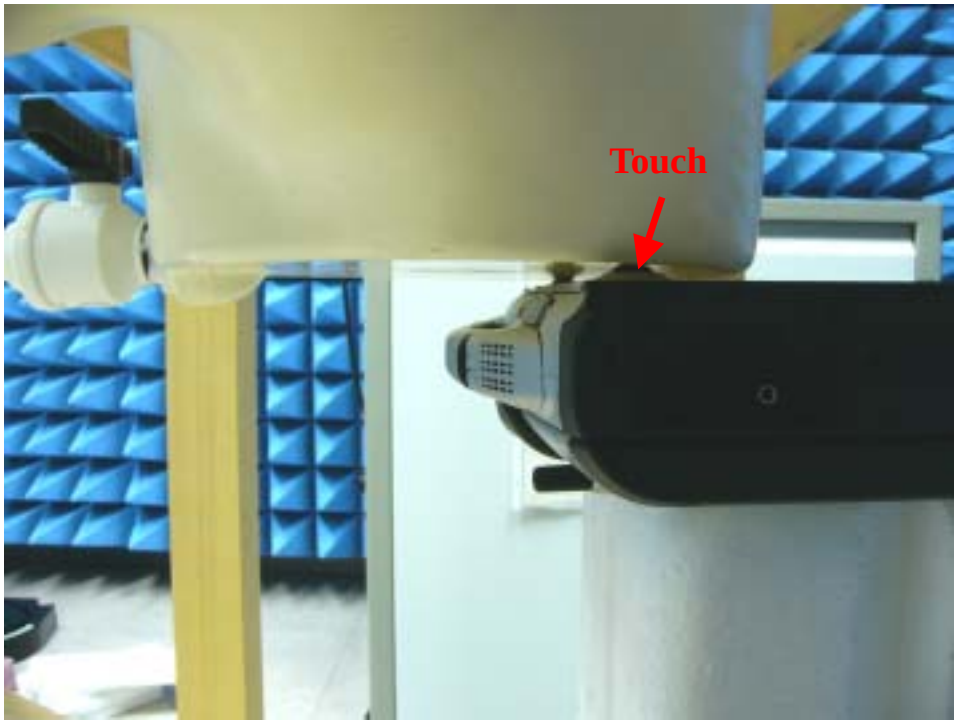


Fig.6 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom.

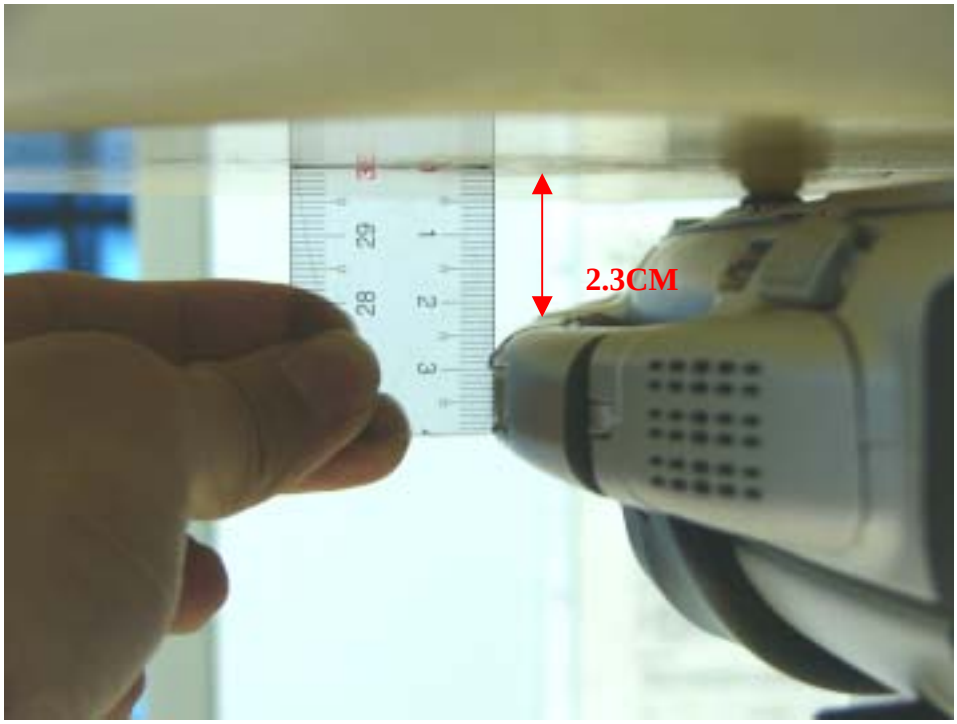


Fig.7 Photograph of the Bottom of the Pc is paralleled and at a distance of 0.0 cm from the base of the phantom, but 2.3 cm Spacing between EUT & Planar Phantom

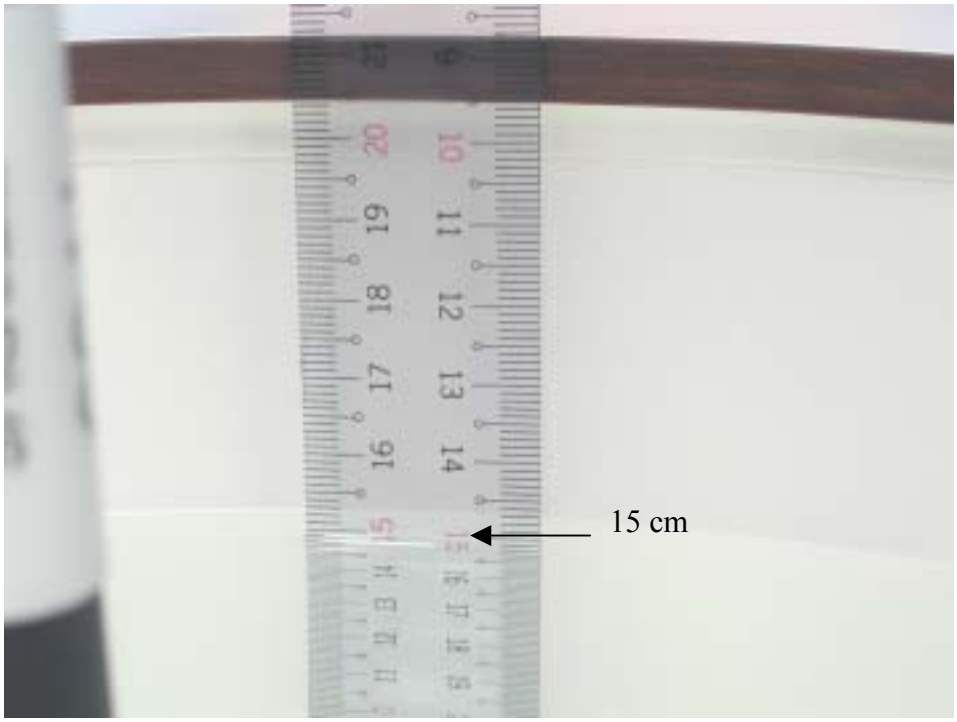


Fig.8 Photograph of the Tissue Simulant Fluid liquid depth 15cm

Photographs of the EUT

Fig.9 Front view of device

Fig.10 Back view of device

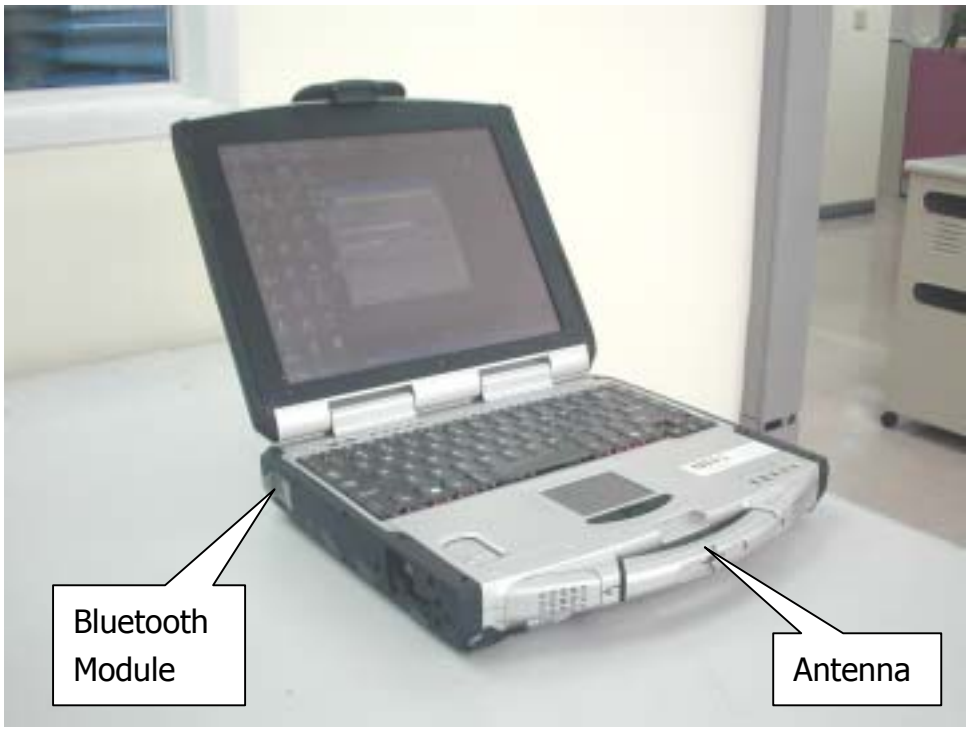


Fig.11 With Motorola ML900 Notebook PC

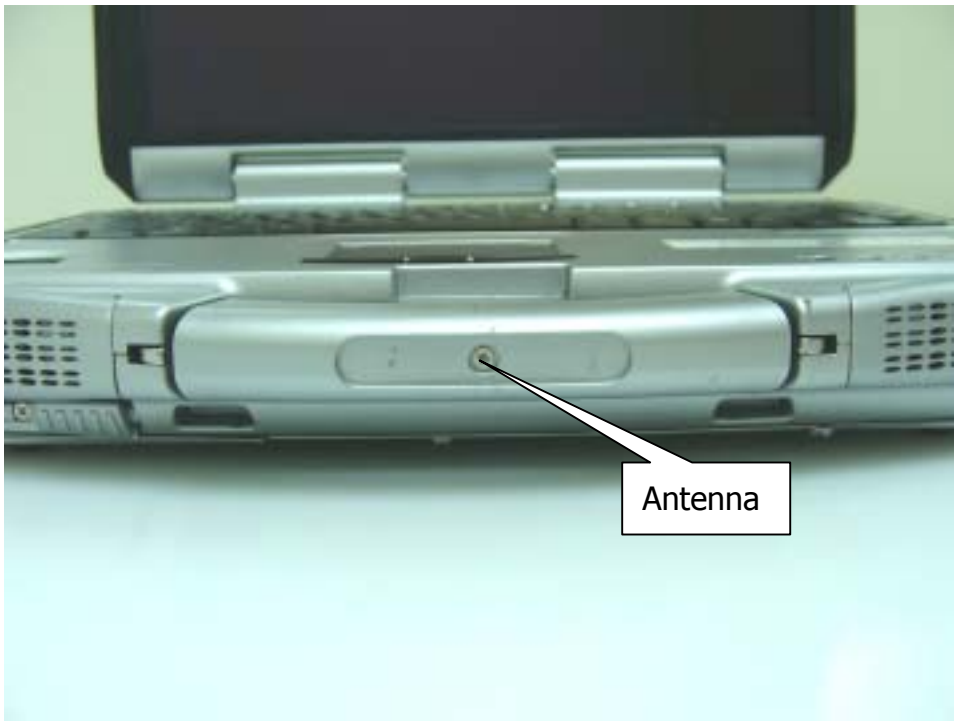


Fig.12 With Motorola ML900 Notebook PC

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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info@speag.com, http://www.speag.com

Probe ET3DV6

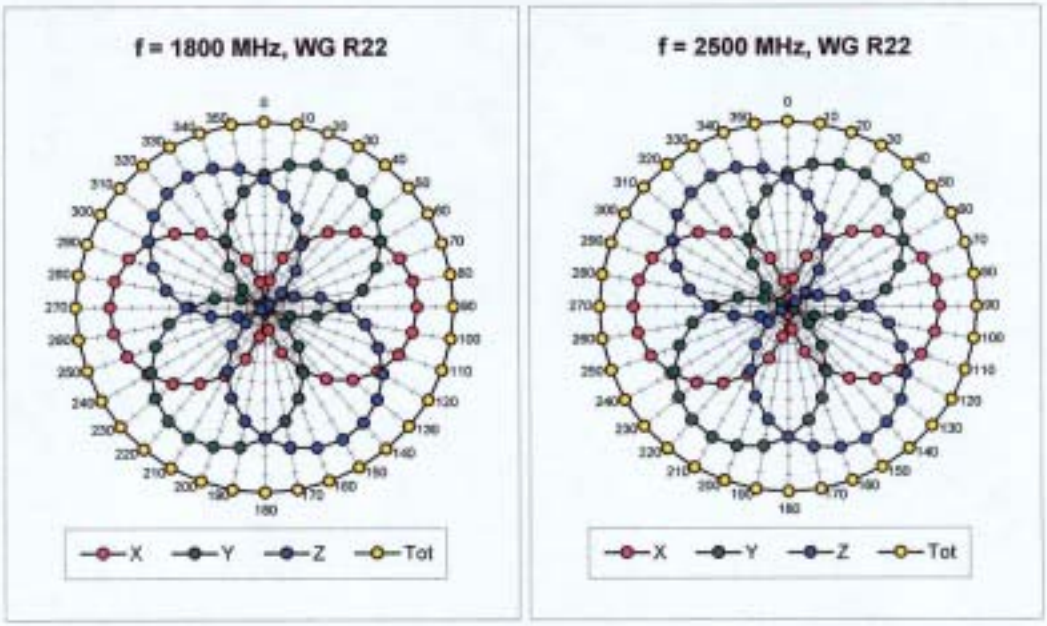
SN:1759

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

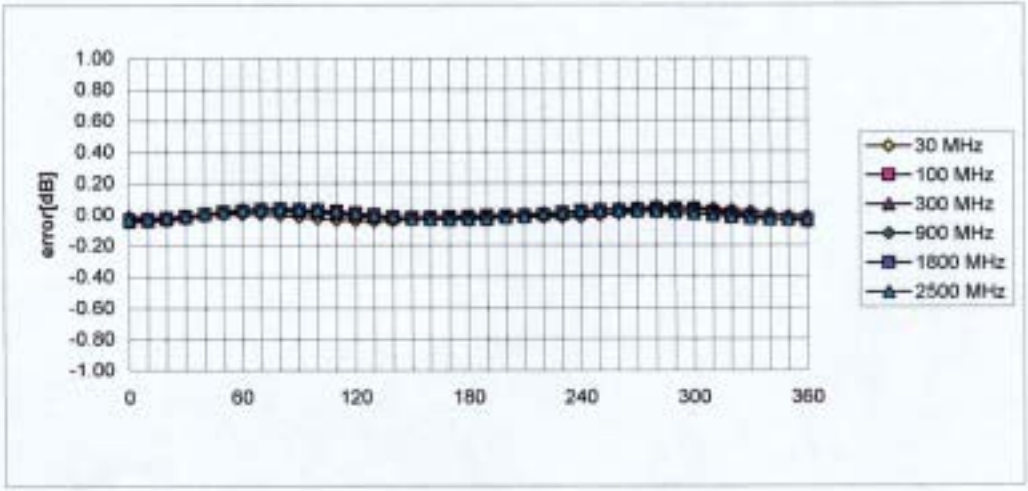
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1759 March 7, 2003

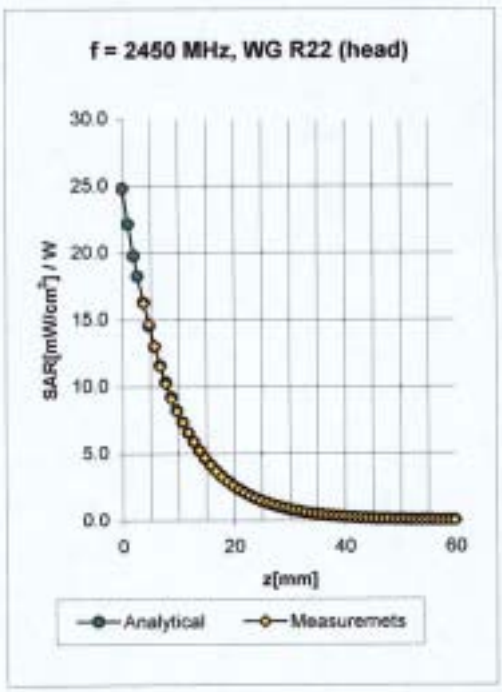


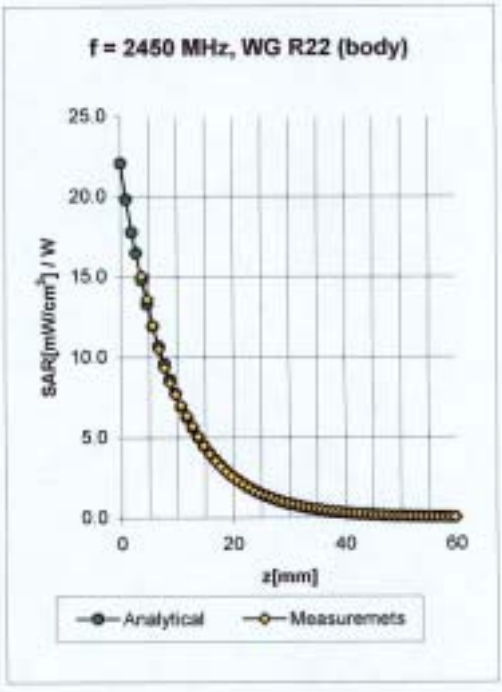
Isotropy Error (ϕ), θ = 0°



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

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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

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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