

TEST REPORT

| | |
|----------------------|-----------------------------------------------------------------------------------------------------------|
| Equipment Under Test | : IEEE 802.11b/g Cardbus Wireless LAN Card. |
| Model No. | : GN-WMKG |
| FCC ID | : JCK-GN-WMKG |
| Applicant | : GIGA-BYTE TECHNOLOGY CO., LTD. |
| Address of Applicant | : 3F-2, No. 23, Nan-Ke 3th Rd Tanin Science-Based Industrial Park, Hsin-Shi, Tainan 744 Taiwan, R.O.C. |
| Date of Receipt | : 2004.03.24 |
| Date of Test(s) | : 2004.03.29 |
| Date of Issue | : 2004.04.27 |

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 : 2004/03/29

Approved by : Robert Chang Date : 2004/04/27

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1. General Information

1.1 Testing Laboratory

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 Internet : <http://www.sgs.com.tw>

1.2 Details of Applicant

Name : GIGA-BYTE TECHNOLOGY CO., LTD.
 Address : 3F-2, No. 23, Nan-Ke 3th Rd Tanin Science-Based
 Industrial Park, Hsin-Shi, Tainan 744 Taiwan, R.O.C.

1.3 Description of EUT(s)

| | | |
|--------------------|-------------------------------------------|------------|
| Equipment Type | IEEE 802.11b/g Cardbus Wireless LAN Card. | |
| Test Procedure | FCC OET Bulletin 65, Supplement C | |
| TX Frequency range | 2412-2462 MHz | |
| FCC ID | JCK-GN-WMKG | |
| Model No. | GN-WMKG | |
| Number Of Channel | 11 | |
| Modulation | Direct Sequence Spread Spectrum (DSSS) | |
| Transfer Rate | 802.11b | 11 Mbps |
| | 802.11g | 54 Mbps |
| Max. SAR Measured | 802.11b | 1.02 W/kg |
| | 802.11g | 0.499 W/kg |
| Antenna Gain | 0 dBi | |
| Antenna Type | PRINTED | |
| I/O Port | PCMCIA | |

| | |
|--------------------------|--------------------------|
| Power Supply | From PCMCIA slot 3.3V/5V |
| Host Laptop PC(s) Tested | COMPAQ N800v |

NOTE:

1. The EUT is powered by the following adapter:

| | |
|--------|--------------------------|
| Brand | COMPAQ |
| Model | PPP009H |
| Input | 100-240 Vac 1.7A 50-60Hz |
| Output | 18.5Vdc 3.5A |

2. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

1.4 Test Environment

Ambient temperature : 22.4° C

Tissue Simulating Liquid : 21.6° C

Relative Humidity : 62 %

1.5 Operation Configuration

The EUT is PCMCIA Card, which is installed inside a Notebook. Since the Notebook is placed on the top of the leg, when it operates, it is to be defined as a portable device. SAR measurement is mandatory. In order to measure SAR value, we used continuous transmission mode. The test set up mode was prepared by manufacturer. Value of Crest Factor = 1 was used for SAR testing according to the nature of the EUT. The test configuration tested at the low, middle and high frequency channels (2412MHz, 2437MHz and 2462MHz). 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.

| Channel Frequency Under Test And Its Conducted Output Power (Average) | 802.11b | 802.11g |
|-----------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| | 18.78dBm(2412MHz) 19.32dBm(2437MHz) 19.43dBm(2462MHz) | 16.31dBm(2412MHz) 16.10dBm(2437MHz) 15.28dBm(2462MHz) |
| Antenna Configuration | Internal Antenna | |
| EUT Power Source | From The Host Equipment | |
| HOST Power Source | Fully Charged Battery | |

The following test configurations have been applied in this test report:

Configuration 1: The left side of the notebook is paralleled with flat phantom and the top of EUT contact to the flat phantom, Spacing between EUT and phantom - In contact (0 mm).(Fig.2 & Fig.3)

Configuration 2: Bottom face of the notebook is paralleled with flat phantom. Spacing between Notebook and phantom - In contact (0 mm) . Spacing between EUT and phantom - 10 mm (Fig.4 & Fig.5)

NOTE:

1. Please reference "APPENDIX 1" for the photos of test configuration.
2. All test Configuration have been complied with the body worn configuration.
3. The Notebook has been installed the controlling software that could control the EUT transmitted channel and power. But that software is just for test software, not for normal user.

1.6 EVALUATION PROCEDURES

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less

than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.7 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 1760 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation $SAR = \sigma (|E_i|^2) / \rho$ 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 dosimeter 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.

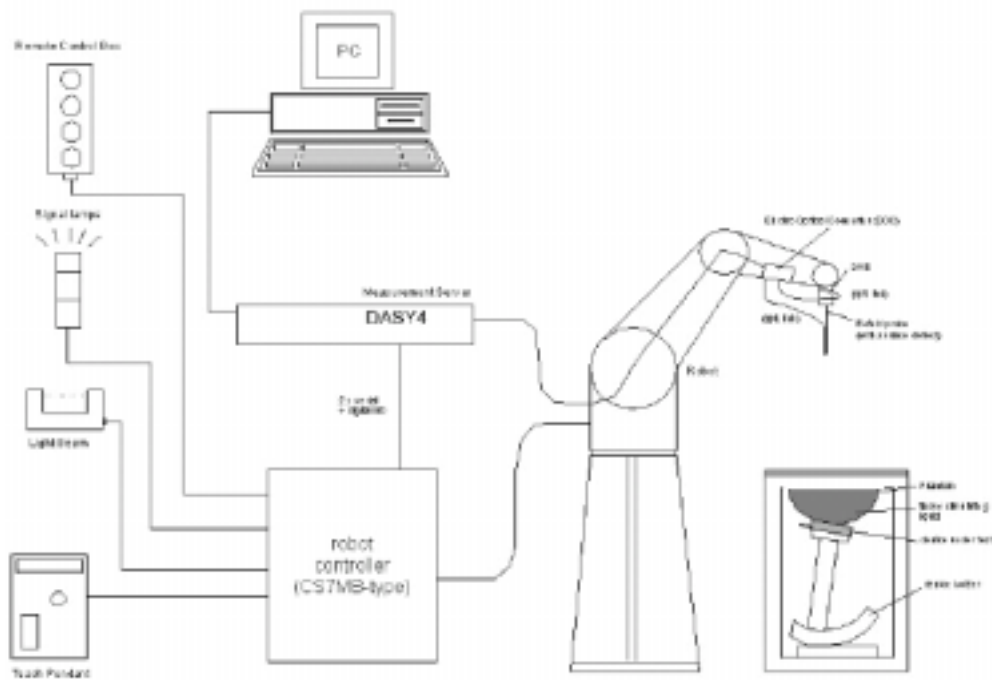


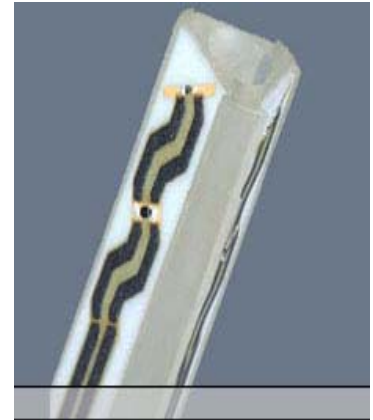
Fig. a The microwave circuit arrangement used for SAR system verification

- 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.
- 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.

1.8 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 $\pm 8\%$) |
| Frequency: | 10 MHz to >6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz) |
| Directivity: | ± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal to probe axis) |
| Dynamic Range: | 5 μ W/g to >100 mW/g; Linearity: ± 0.2 dB |
| Srfce. 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 dosimetry up to 3 GHz Compliance tests of mobile phone |



ET3DV6 E-Field Probe

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX 3" for the Calibration Certification Report.

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 dosimetric 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



PHANTOM v4.0C

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

1.9 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 $\pm 10\%$ from the target SAR values. These tests were done at 2450MHz. 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 22.4 °C, the relative humidity was in the range 62% and the liquid depth above the ear reference points was above 15 cm (Fig.6) 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.

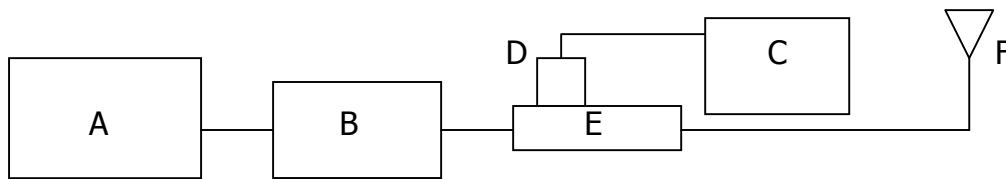


Fig. b The microwave circuit arrangement used for SAR system verification

- A. Agilent Model 8648D Signal Generator
- B. Mini circuits Model ZHL-42-SMA 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 :1760 | 2450 MHz | 13.7 m W/g | 6.02 m W/g | 13.5 m W/g | 6.06 m W/g | 2004/3/29 |

Table 1. Results system validation

1.10 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 frequency band 200 MHz to 20 GHz) in conjunction 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 | | |
|---------|-------------|----------------------|-----------------------|--------------|----------------------------|
| | | | Permittivity | Conductivity | Simulated Tissue Temp(° C) |
| 2450 | Body | Measured, 2004/03/29 | 51.88 | 1.963 | 21.6 |
| | | Measured, 2004/03/29 | 52.3 | 1.971 | 21.6 |
| | | Recommended Limits | 50.1-55.3 | 1.85-2.05 | 20-24 |

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) |

1.11 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 Radio frequency 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 | Dosimetric E-Field Probe | ET3DV6 | 1760 | Feb.17.2004 |
| Schmid & Partner Engineering AG | 2450 MHz System Validation Dipole | D2450V2 | 712 | SEP.17. 2003 |
| Schmid & Partner Engineering AG | Data acquisition Electronics | DAE3 | 547 | Feb.10.2004 |
| 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 | Jun.16.2003 |
| Agilent | Dielectric Probe Kit | 85070D | US01440168 | Jun.20.2003 |

3.Summary of Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in 4.Measurements

802.11b

| SAR MEASUREMENT | | | | | | | |
|-------------------------------------|------------------|-----------|------|----------------------------------|-----------------|---------------|--------------|
| Crest factor : 1 (Duty cycle: 100%) | | | | Depth of Liquid : 15.0 cm | | | |
| Laptop PC : COMPAQ N800v | | | | | | | |
| EUT Configuration 1 | | | | | | | |
| EUT Set-up conditions | | Frequency | | Conducted Output Power (Average) | Liquid Temp[°C] | 1g SAR (W/kg) | Limit (W/kg) |
| Sep. [cm] | Antenna Position | Channel | MHz | | | | |
| 0.0 | Vertical | 1 | 2412 | 18.78dBm | 21.5 | 0.967 | 1.6 |
| | | 6 | 2437 | 19.32dBm | 21.5 | 1.02 | |
| | | 11 | 2462 | 19.43dBm | 21.6 | 0.875 | |
| EUT Configuration 2 | | | | | | | |
| EUT Set-up conditions | | Frequency | | Conducted Output Power (Average) | Liquid Temp[°C] | 1g SAR (W/kg) | Limit (W/kg) |
| Sep. [cm] | Antenna Position | Channel | MHz | | | | |
| 1.0 | Horizontal | 1 | 2412 | 18.78dBm | 21.6 | 0.619 | 1.6 |
| | | 6 | 2437 | 19.32dBm | 21.6 | 0.673 | |
| | | 11 | 2462 | 19.43dBm | 21.5 | 0.557 | |

| | | | |
|-----------------------|--------|-------------------|--------|
| Measured Mixture Type | Body | Relative Humidity | 62% |
| Ambient Temperature | 22.4°C | Fluid Temperature | 21.6°C |

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in 4.Measurements

802.11g

| SAR MEASUREMENT | | | | | | | |
|-------------------------------------|------------------|-----------|------|----------------------------------|---------------------------|---------------|--------------|
| Crest factor : 1 (Duty cycle: 100%) | | | | | | | |
| Laptop PC : COMPAQ N800v | | | | | Depth of Liquid : 15.0 cm | | |
| EUT Configuration 1 | | | | | | | |
| EUT Set-up conditions | | Frequency | | Conducted Output Power (Average) | Liquid Temp[°C] | 1g SAR (W/kg) | Limit (W/kg) |
| Sep. [cm] | Antenna Position | Channel | MHz | | | | |
| 0.0 | Vertical | 1 | 2412 | 16.31dBm | 21.5 | 0.499 | 1.6 |
| | | 6 | 2437 | 16.10dBm | 21.7 | 0.422 | |
| | | 11 | 2462 | 16.31dBm | 21.4 | 0.356 | |
| EUT Configuration 2 | | | | | | | |
| EUT Set-up conditions | | Frequency | | Conducted Output Power (Average) | Liquid Temp[°C] | 15.28dBm | Limit (W/kg) |
| Sep. [cm] | Antenna Position | Channel | MHz | | | | |
| 1.0 | Horizontal | 1 | 2412 | 16.31dBm | 21.5 | 0.319 | 1.6 |
| | | 6 | 2437 | 16.10dBm | 21.5 | 0.274 | |
| | | 11 | 2462 | 15.28dBm | 21.6 | 0.228 | |
| | | | | | | | |
| Measured Mixture Type | | Body | | Relative Humidity | | 62% | |
| Ambient Temperature | | 22.4°C | | Fluid Temperature | | 21.6°C | |

4. Measurements

Vertical position, lowest channel

Date/Time: 03/29/04 11:11:45

DUT: 802.11b CardBus Wireless LAN Card;
Program: Notebook

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: M2450 ($\rho = 1.90938$ mho/m, $\mu_r = 52.2053$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 24 V/m

Power Drift = -0.04 dB

Maximum value of SAR = 1.01 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

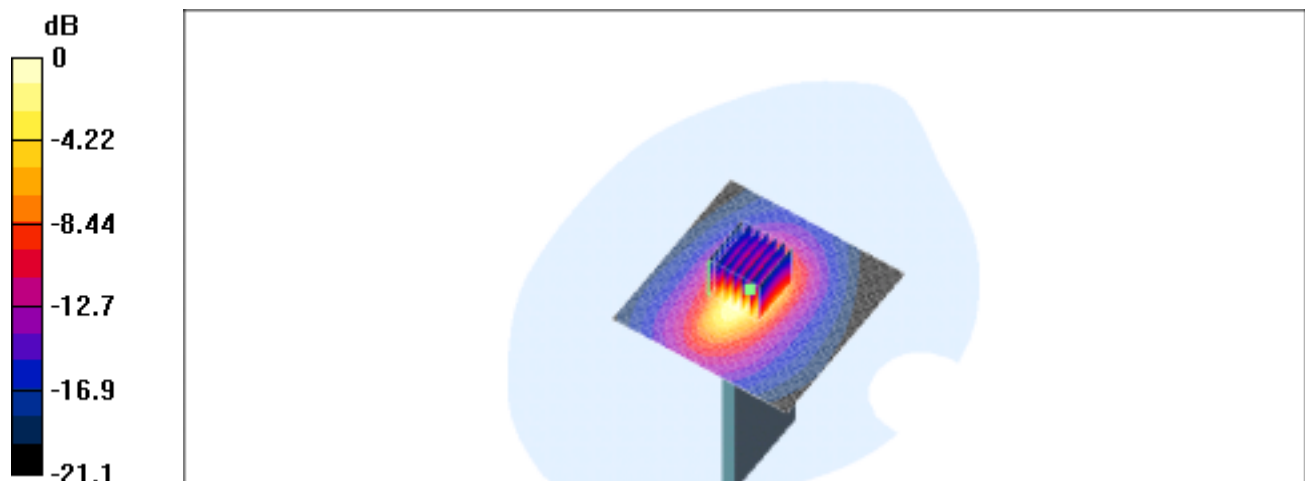
Peak SAR (extrapolated) = 2.32 W/kg

SAR(1 g) = 0.967 mW/g; SAR(10 g) = 0.434 mW/g

Reference Value = 24 V/m

Power Drift = -0.04 dB

Maximum value of SAR = 1.04 mW/g



0 dB = 1.04mW/g

Vertical position, middle channel

DUT: 802.11b CardBus Wireless LAN Card;
Program: Notebook

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: M2450 ($\epsilon = 1.94243$ mho/m, $\mu_r = 52.0584$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 24.7 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 1.08 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

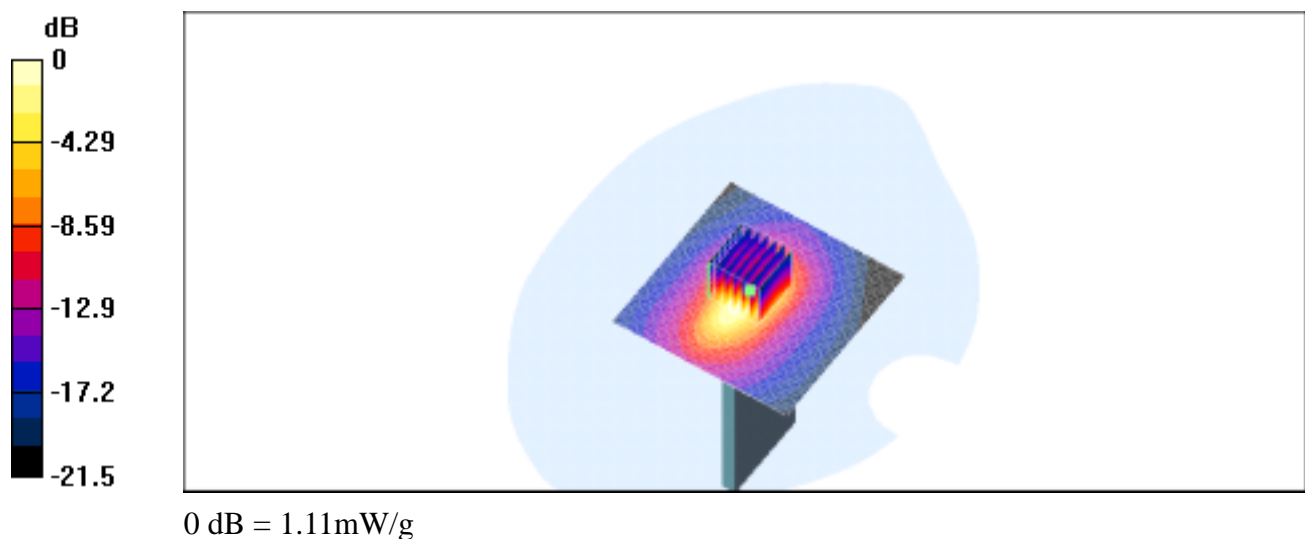
Peak SAR (extrapolated) = 2.51 W/kg

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.456 mW/g

Reference Value = 24.7 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 1.11 mW/g



Vertical position, highest channel

DUT: 802.11b CardBus Wireless LAN Card;
Program: Notebook

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: M2450 ($\epsilon = 1.99705$ mho/m, $\mu_r = 52.0904$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 22.6 V/m

Power Drift = -0.0003 dB

Maximum value of SAR = 0.913 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

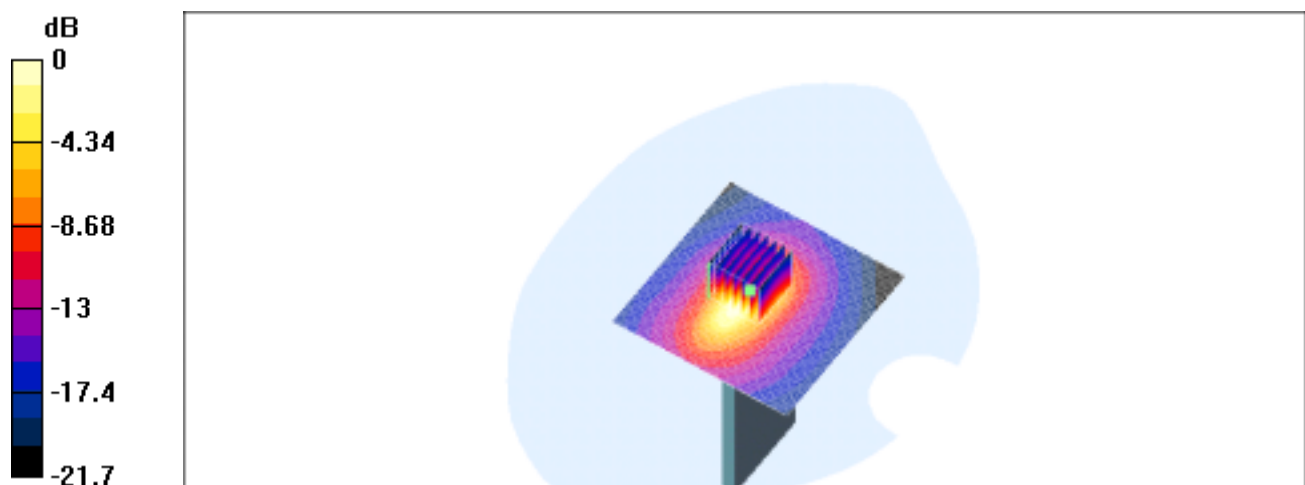
Peak SAR (extrapolated) = 2.23 W/kg

SAR(1 g) = 0.875 mW/g; SAR(10 g) = 0.388 mW/g

Reference Value = 22.6 V/m

Power Drift = -0.0003 dB

Maximum value of SAR = 0.951 mW/g



0 dB = 0.951mW/g

Horizontal position, lowest channel**DUT: 802.11b CardBus Wireless LAN Card;****Program: Notebook**

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: M2450 ($\rho = 1.90938$ mho/m, $r = 52.2053$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 14.9 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.657 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

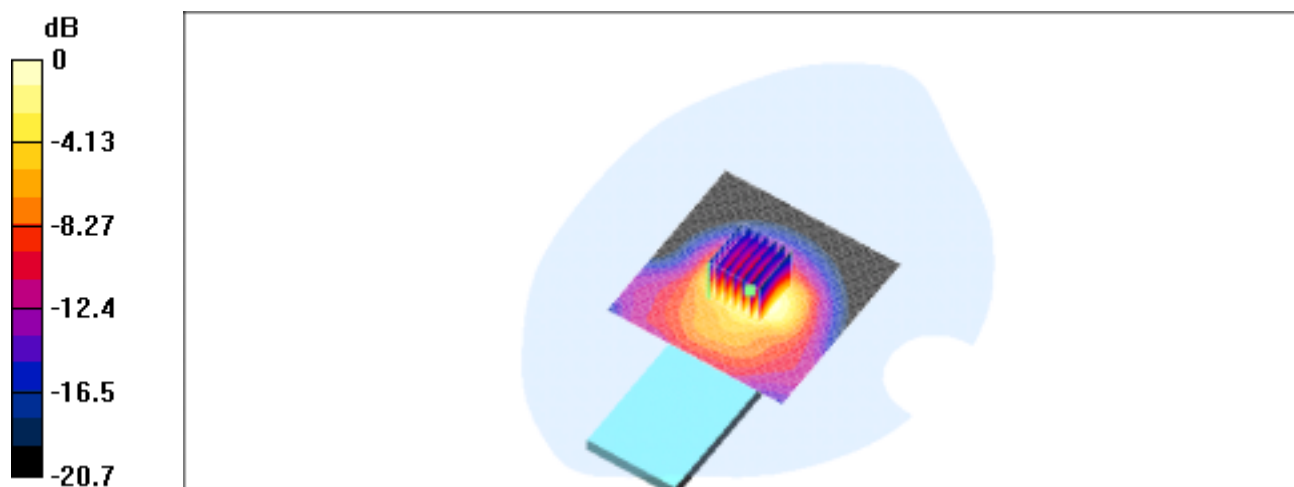
Peak SAR (extrapolated) = 1.28 W/kg

SAR(1 g) = 0.619 mW/g; SAR(10 g) = 0.319 mW/g

Reference Value = 14.9 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.658 mW/g



0 dB = 0.658mW/g

Horizontal position, middle channel

DUT: 802.11b CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: M2450 ($\epsilon = 1.94243$ mho/m, $\mu_r = 52.0584$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 15.3 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.712 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

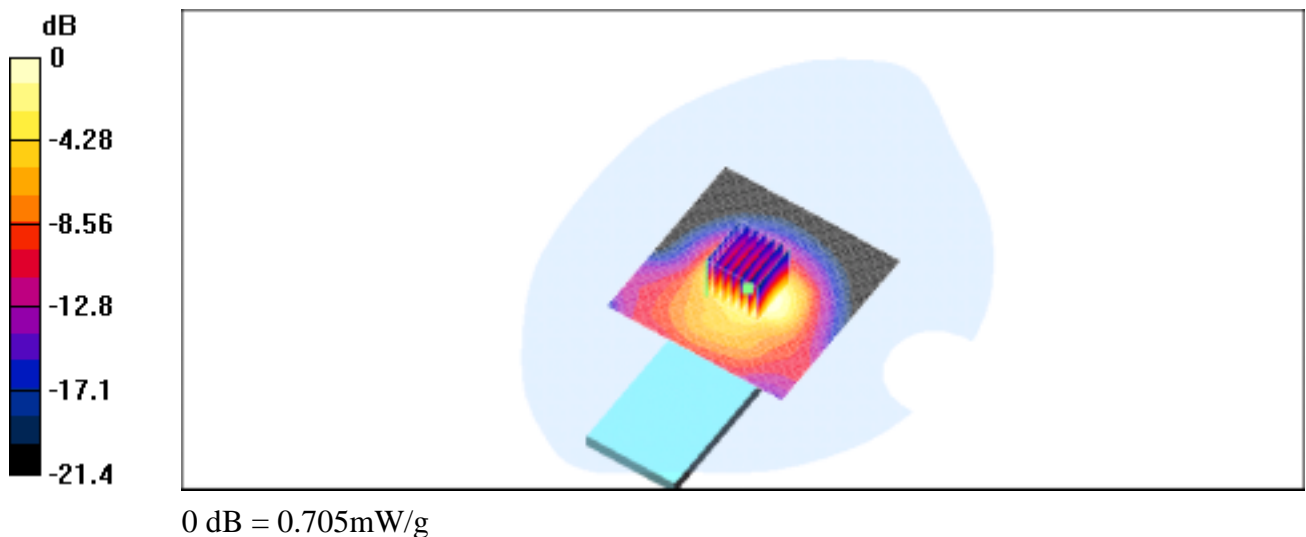
Peak SAR (extrapolated) = 1.4 W/kg

SAR(1 g) = 0.673 mW/g; SAR(10 g) = 0.349 mW/g

Reference Value = 15.3 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.705 mW/g



Horizontal position, highest channel

DUT: 802.11b CardBus Wireless LAN Card;
Program: Notebook

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 ($\rho = 1.99705 \text{ mho/m}$, $\mu_r = 52.0904$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 13.8 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.588 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

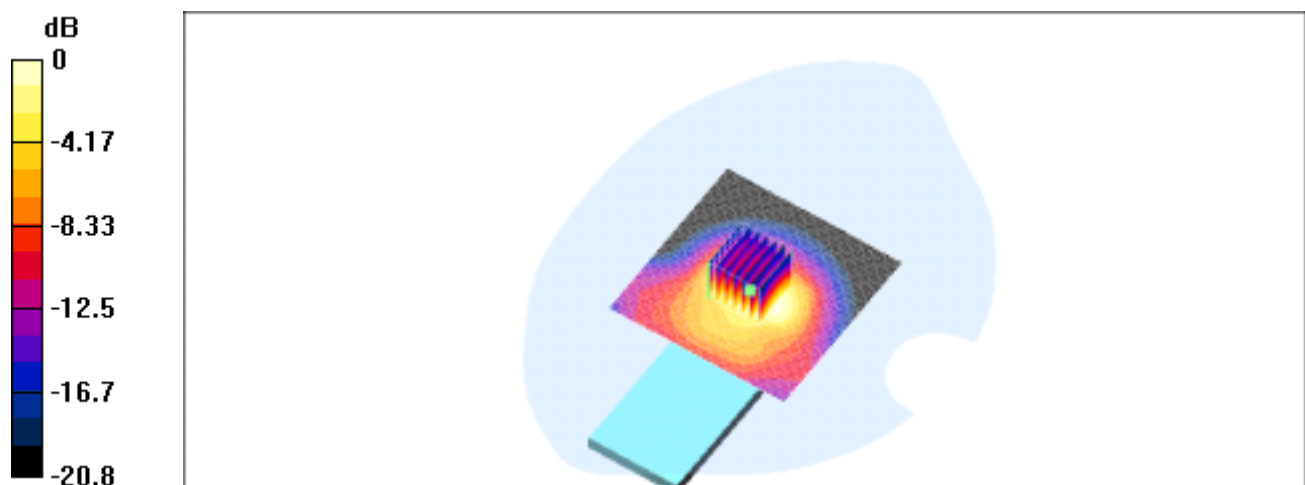
Peak SAR (extrapolated) = 1.18 W/kg

SAR(1 g) = 0.557 mW/g; SAR(10 g) = 0.287 mW/g

Reference Value = 13.8 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.587 mW/g



0 dB = 0.587mW/g

Vertical position, lowest channel**DUT: 802.11g CardBus Wireless LAN Card;****Program: Notebook**

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: M2450 ($\rho = 1.90938$ mho/m, $\mu_r = 52.2053$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.2 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.527 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

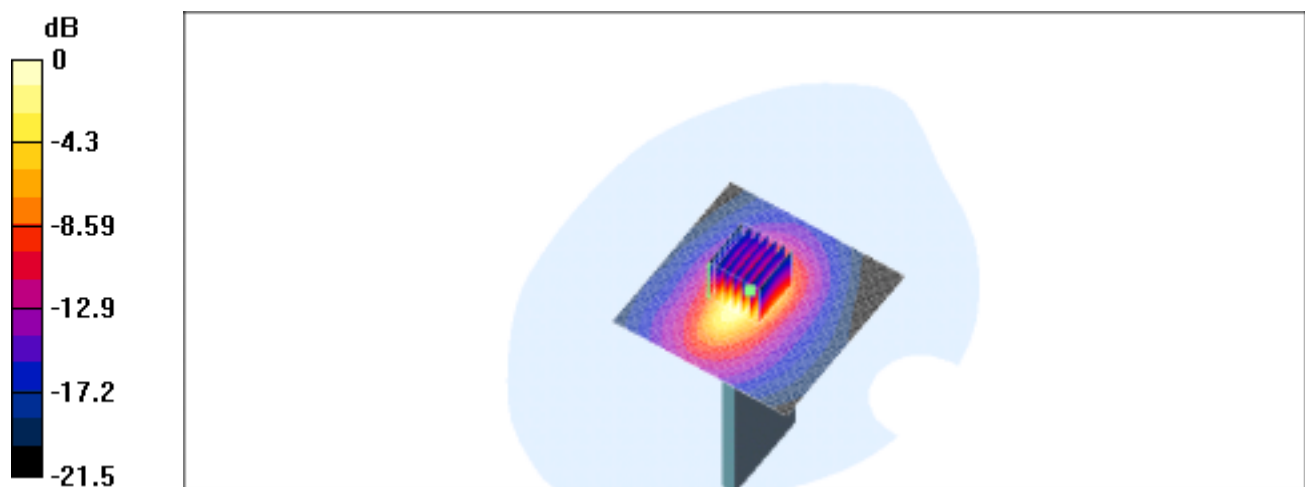
Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.499 mW/g; SAR(10 g) = 0.222 mW/g

Reference Value = 17.2 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.538 mW/g



0 dB = 0.538mW/g

Vertical position, middle channel

DUT: 802.11g CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: M2450 ($\epsilon = 1.94243$ mho/m, $\mu_r = 52.0584$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 15.8 V/m

Power Drift = -0.004 dB

Maximum value of SAR = 0.451 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

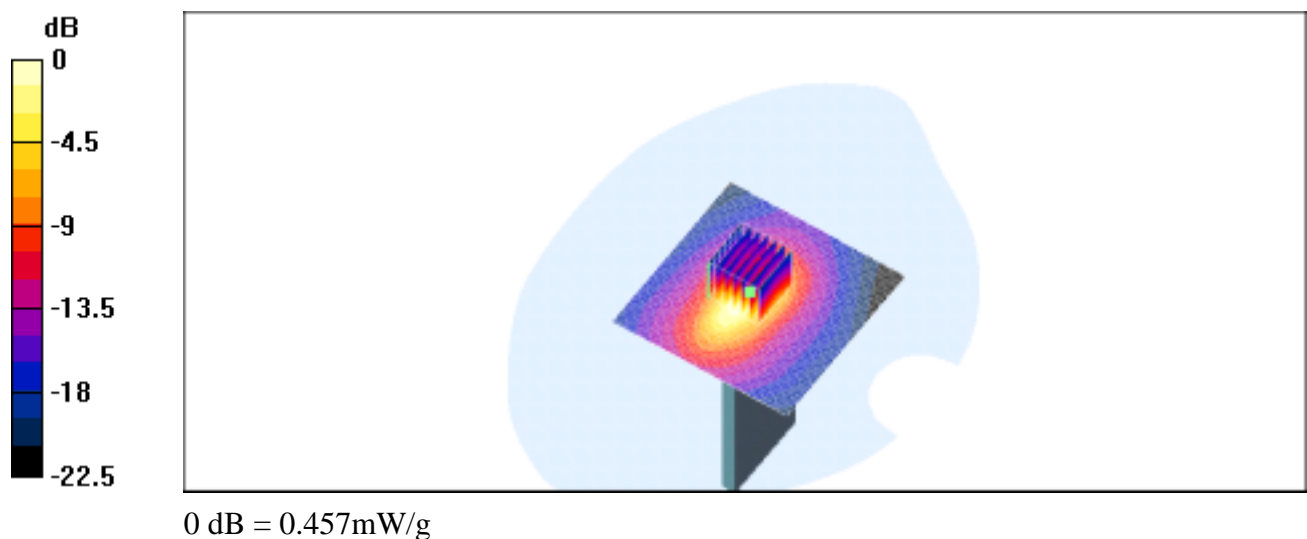
Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.422 mW/g; SAR(10 g) = 0.189 mW/g

Reference Value = 15.8 V/m

Power Drift = -0.004 dB

Maximum value of SAR = 0.457 mW/g



Vertical position, highest channel

DUT: 802.11g CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 ($\epsilon = 1.99705$ mho/m, $\mu_r = 52.0904$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 14.3 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 0.375 mW/g

Vertical/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

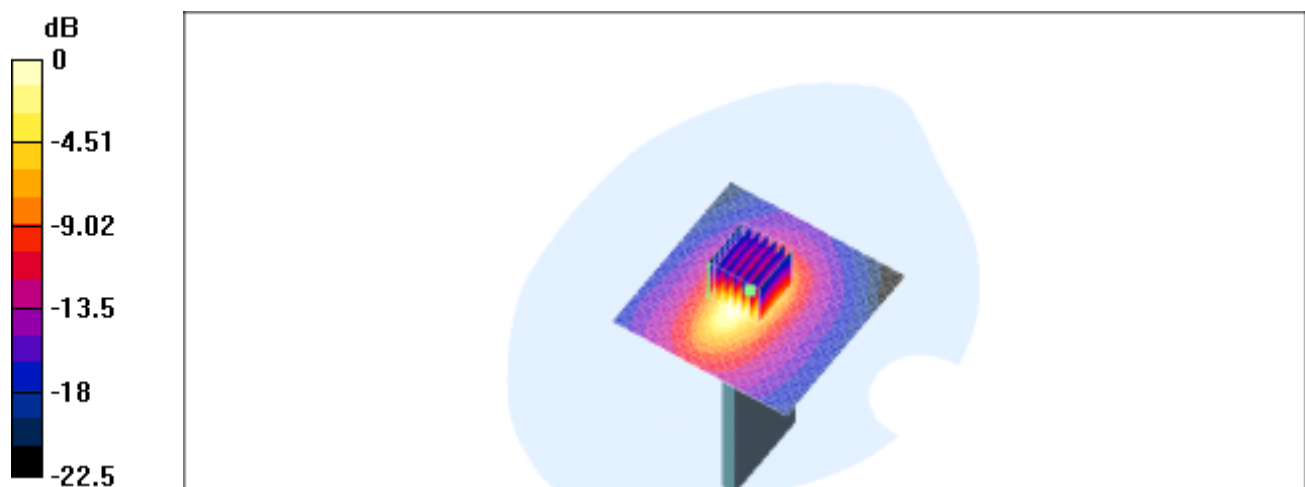
Peak SAR (extrapolated) = 0.903 W/kg

SAR(1 g) = 0.356 mW/g; SAR(10 g) = 0.159 mW/g

Reference Value = 14.3 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 0.382 mW/g



0 dB = 0.382mW/g

Horizontal position, lowest channel

DUT: 802.11g CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: M2450 ($\rho = 1.90938 \text{ mho/m}$, $r = 52.2053$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 10.7 V/m

Power Drift = -0.009 dB

Maximum value of SAR = 0.345 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

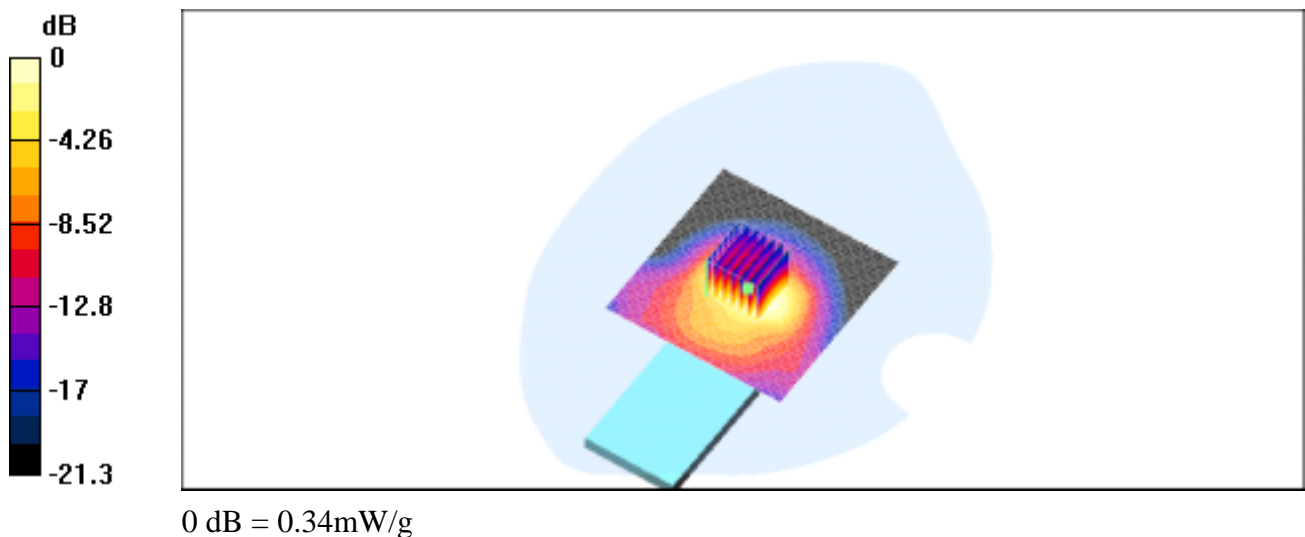
Peak SAR (extrapolated) = 0.659 W/kg

SAR(1 g) = 0.319 mW/g; SAR(10 g) = 0.165 mW/g

Reference Value = 10.7 V/m

Power Drift = -0.009 dB

Maximum value of SAR = 0.34 mW/g



Horizontal position, middle channel

DUT: 802.11g CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: M2450 ($\epsilon = 1.94243$ mho/m, $\mu_r = 52.0584$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 9.69 V/m

Power Drift = 0.02 dB

Maximum value of SAR = 0.293 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

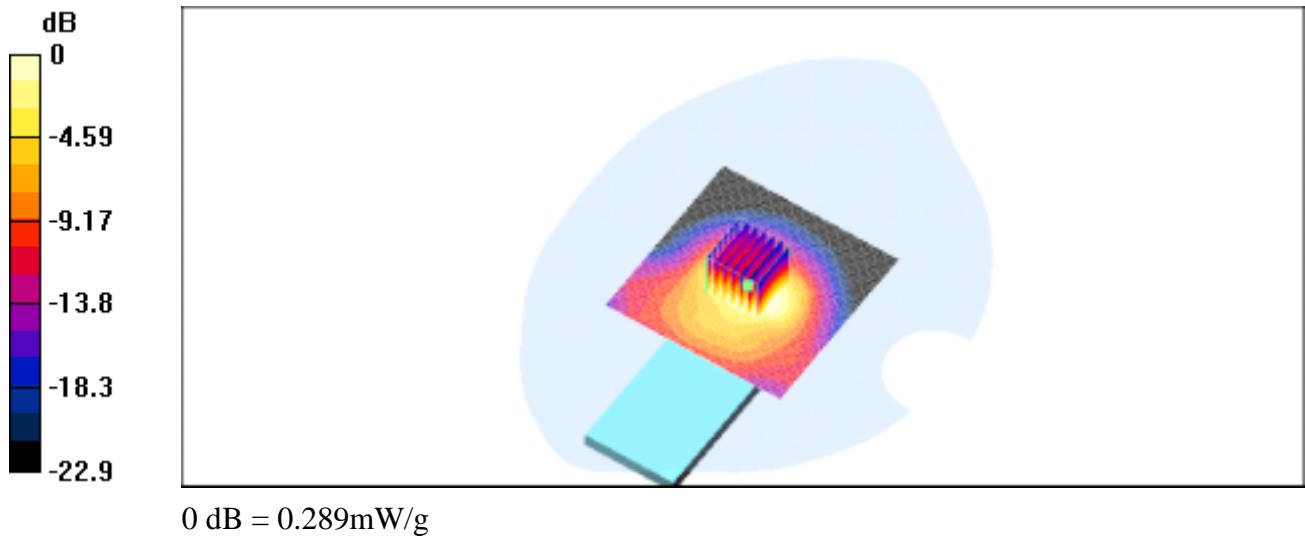
Peak SAR (extrapolated) = 0.567 W/kg

SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.141 mW/g

Reference Value = 9.69 V/m

Power Drift = 0.02 dB

Maximum value of SAR = 0.289 mW/g



Horizontal position, highest channel

Date/Time: 03/29/04 22:40:29

DUT: 802.11g CardBus Wireless LAN Card;

Program: Notebook

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 ($\rho = 1.99705 \text{ mho/m}$, $r = 52.0904$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- 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 (71x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 8.79 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.239 mW/g

Horizontal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

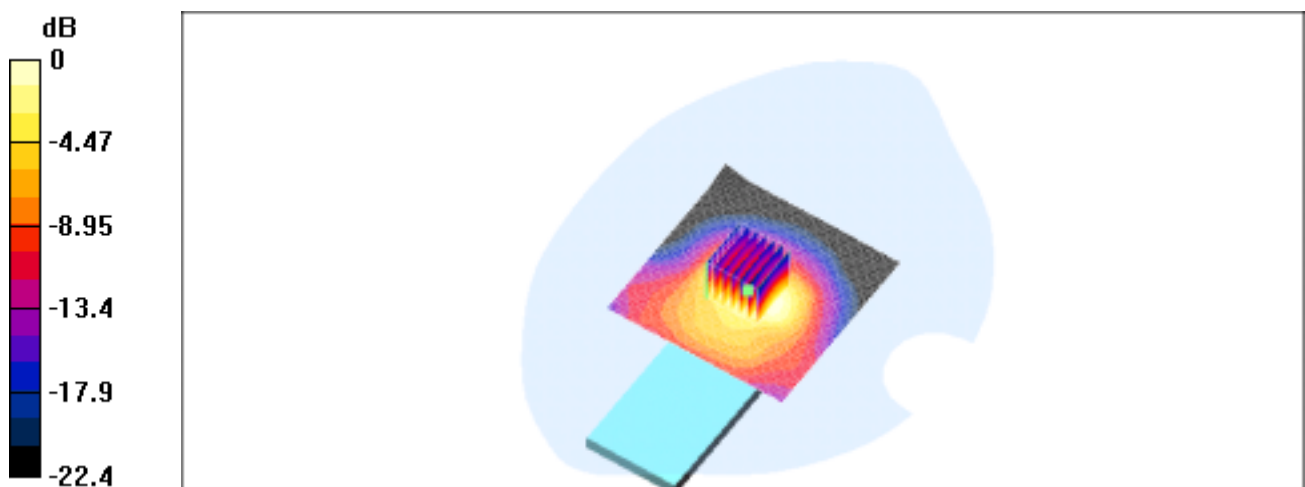
Peak SAR (extrapolated) = 0.482 W/kg

SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.117 mW/g

Reference Value = 8.79 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.239 mW/g



0 dB = 0.239mW/g

SAR System Performance Verification

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:712

Program: 20040329

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: M2450 ($\epsilon = 1.96329$ mho/m, $\mu_r = 51.8809$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1760; ConvF(4.18, 4.18, 4.18); Calibrated: 2004/2/17
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn547; Calibrated: 2004/2/10
- Phantom: SAM 12; Type: SAM 4.0; Serial: TP:1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

System Cal/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm

Reference Value = 90.8 V/m

Power Drift = -0.0009 dB

Maximum value of SAR = 14.8 mW/g

System Cal/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

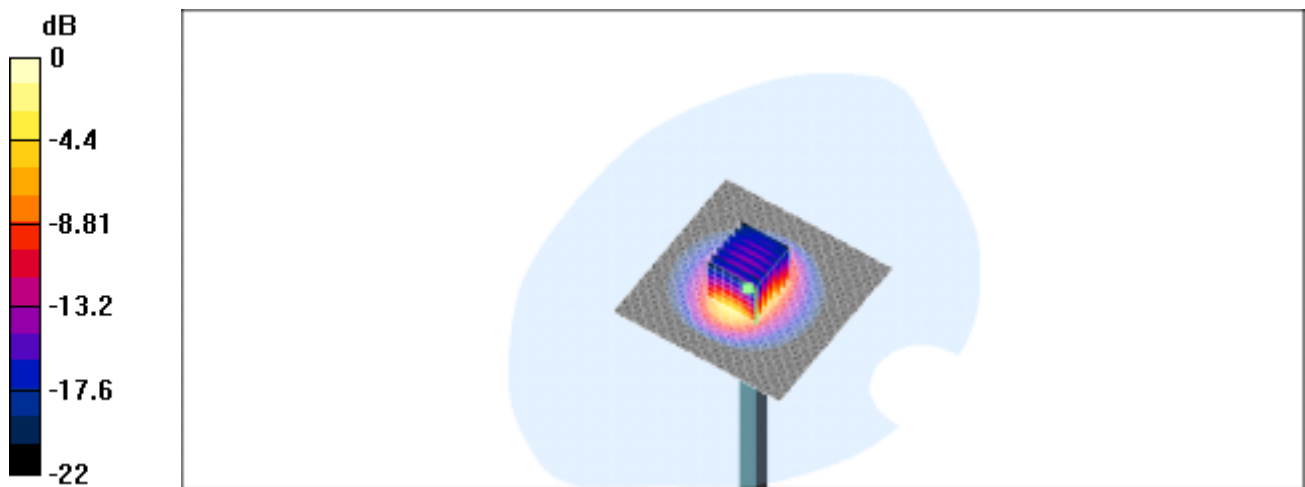
Peak SAR (extrapolated) = 30.4 W/kg

SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.06 mW/g

Reference Value = 90.8 V/m

Power Drift = -0.0009 dB

Maximum value of SAR = 14.7 mW/g



0 dB = 14.7mW/g

Photographs of Test Setup



Fig.1 Photograph of the SAR measurement System

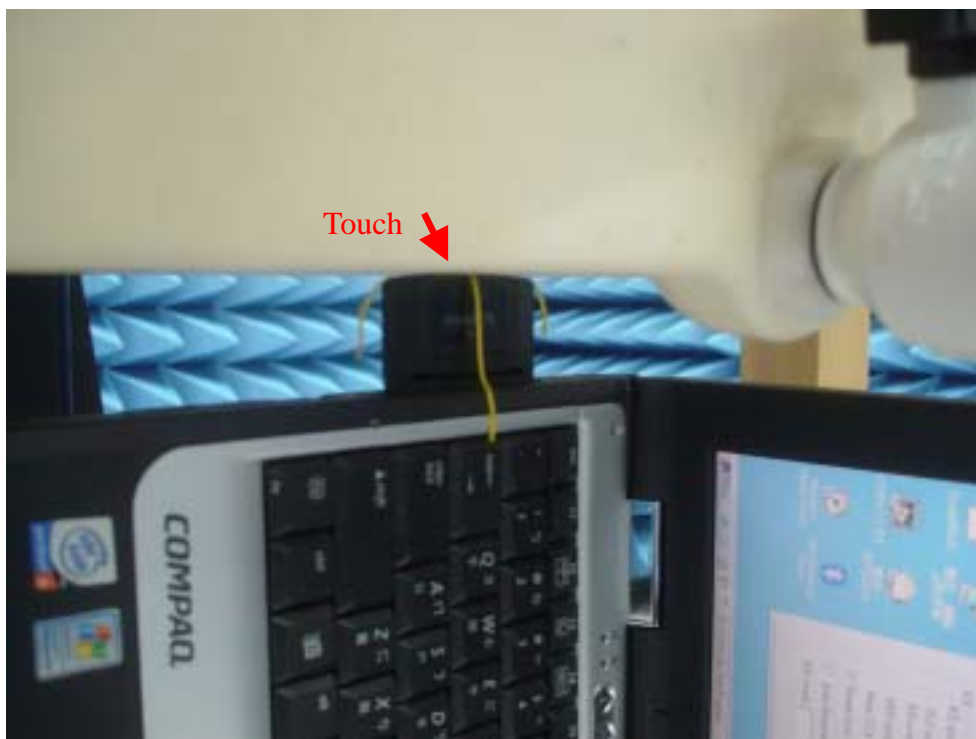


Fig.2 Photograph of the Left side of the Notebook and the top of EUT contact to the flat phantom, Spacing between EUT and phantom - In contact (0 mm).

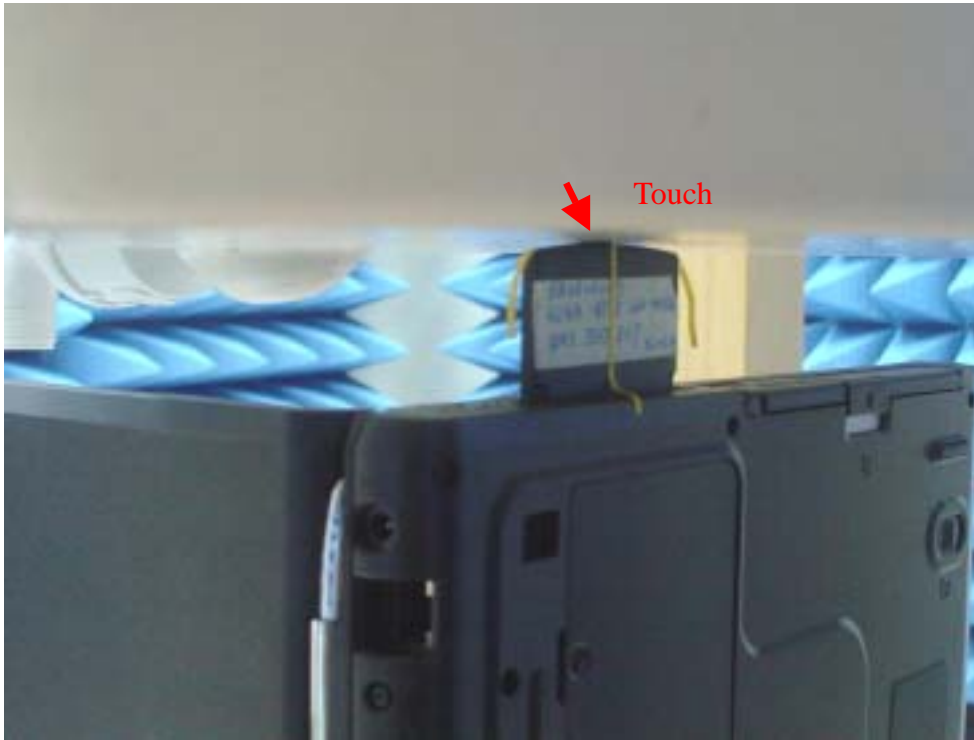


Fig.3 Photograph of the Left side of the Notebook and the top of EUT contact to the flat phantom, Spacing between EUT and phantom - In contact (0 mm).



Fig.4 Photograph of the Bottom face of the notebook is paralleled with flat phantom. Spacing between EUT and phantom - In contact (10 mm)

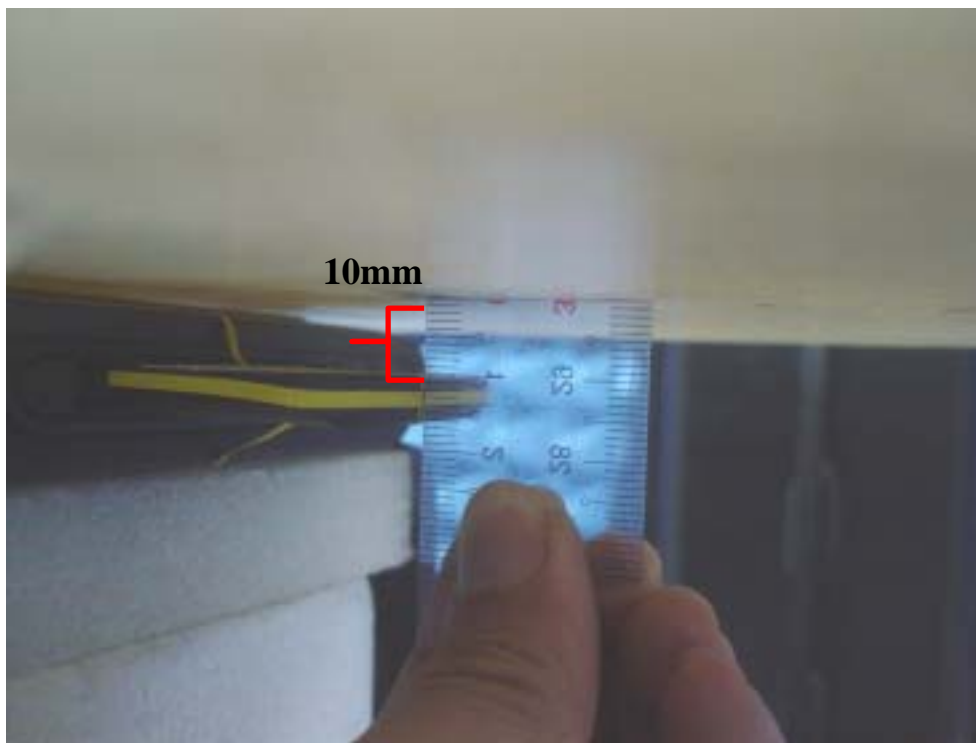


Fig.5 Photograph of the Bottom face of the notebook is paralleled with flat phantom. Spacing between EUT and phantom - In contact (10 mm)

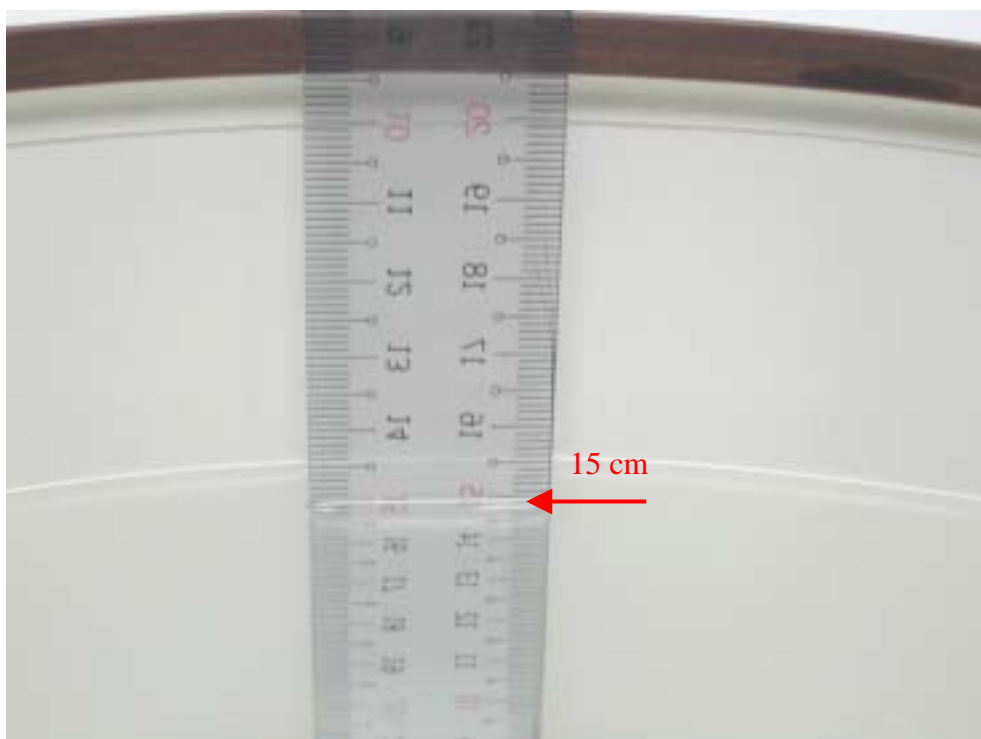


Fig.6 Photograph of the Tissue Simulant Fluid liquid depth 15cm

Photographs of the EUT

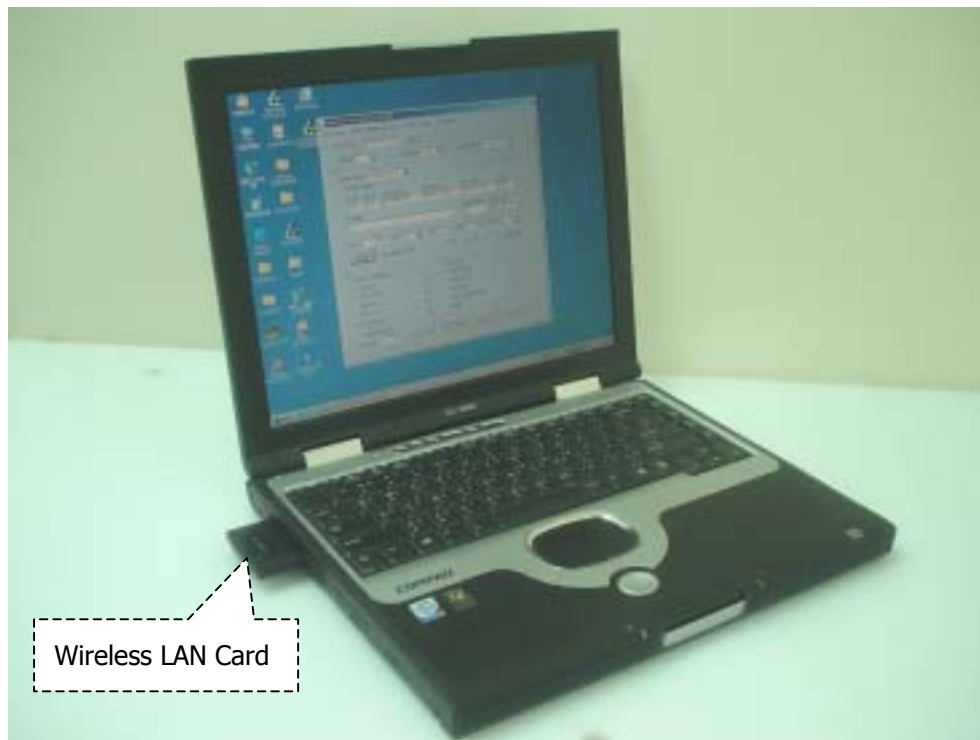


Fig.7 Photograph of EUT Position



Fig.8 Antenna Position of EUT



Fig.9 Front view of EUT



Fig.10 Back view of EUT

Probe Calibration certificate

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

Client **SGS Taiwan (Auden)**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1760**

Calibration procedure(s) **QA CAL-01.v2
Calibration procedure for dosimetric E-field probes**

Calibration date **February 17, 2004**

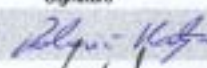

Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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 (Calibrated by, Certificate No.) | Scheduled Calibration |
|----------------------------------|----------------|-------------------------------------------|-----------------------|
| Power meter EPM E4419B | GB41293874 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Power sensor E4412A | MY41495277 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Reference 20 dB Attenuator | SN: 5006 (20c) | 3-Apr-03 (METAS, No. 251-0340) | Apr-04 |
| Fuke Process Calibrator Type 702 | SN: 6295803 | 8-Sep-03 (Sintrel SCS No. E-030020) | Sep-04 |
| Power sensor HP 8431A | MY41052180 | 18-Sep-02 (SPEAG, in house check Oct-03) | In house check Oct-05 |
| RF generator HP 8684C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Aug-02) | In house check Aug-05 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Oct-03) | In house check Oct-05 |

| | | | |
|----------------|---------------|---------------------|---------------------------------------------------------------------------------------|
| | Name | Function | Signature |
| Calibrated by: | Kolja Polovic | Laboratory Director |  |
| Approved by: | Niels Kuster | Quality Manager |  |

Date issued: February 17, 2004

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.

Probe ET3DV6

SN:1760

| | |
|------------------|-------------------|
| Manufactured: | November 12, 2002 |
| Last calibrated: | March 7, 2003 |
| Recalibrated: | February 17, 2004 |

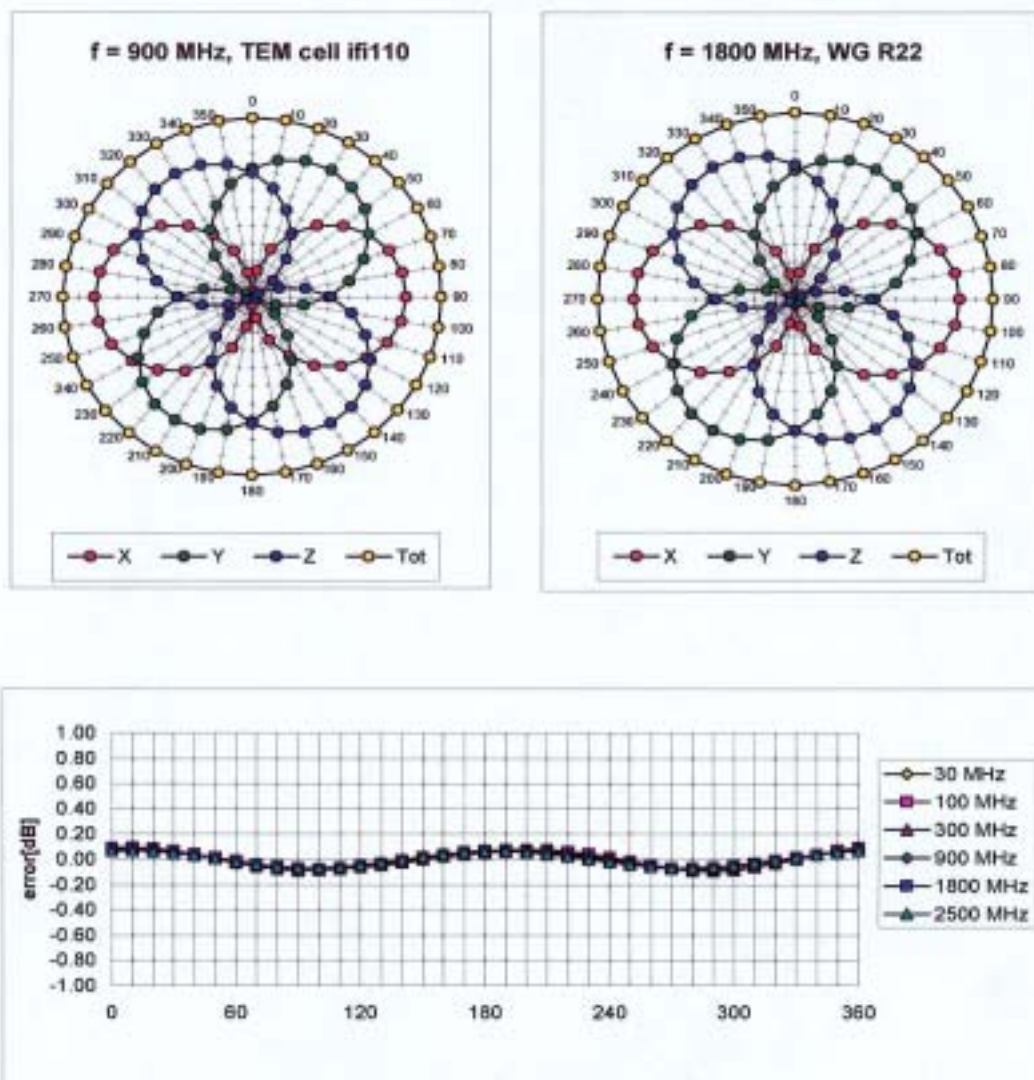
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1760

February 17, 2004

Receiving Pattern (ϕ) , $\theta = 0^\circ$

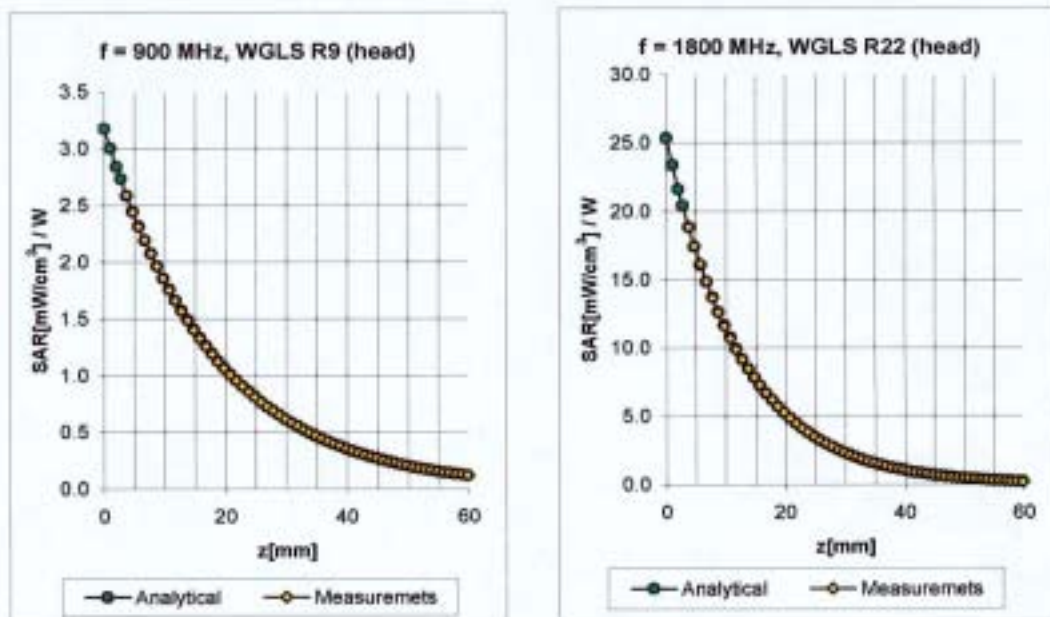


Axial Isotropy Error < ± 0.2 dB

ET3DV6 SN:1760

February 17, 2004

Conversion Factor Assessment



| f [MHz] | Validity [MHz] ^a | Tissue | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---------|-----------------------------|--------|--------------|--------------|-------|-------|--------------------|
| 900 | 800-1000 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.51 | 1.96 | 6.34 ± 11.3% (k=2) |
| 1800 | 1710-1890 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.52 | 2.36 | 5.13 ± 10.9% (k=2) |
| 1900 | 1805-1995 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.54 | 2.42 | 5.10 ± 11.1% (k=2) |
| 900 | 800-1000 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.43 | 2.21 | 6.04 ± 11.3% (k=2) |
| 1800 | 1710-1890 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.60 | 2.56 | 4.56 ± 10.9% (k=2) |
| 1900 | 1805-1995 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.59 | 2.76 | 4.43 ± 11.1% (k=2) |
| 2450 | 2400-2500 | Body | 52.7 ± 5% | 1.95 ± 5% | 1.47 | 1.45 | 4.18 ± 9.7% (k=2) |

^a The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Uncertainty Analysis

| DASY4 Uncertainty Budget According to IEEE P1528 [1] | | | | | | | | |
|----------------------------------------------------------------|-------------------|-------------|------|--------------|---------------|----------------|-----------------|---------------------|
| Error Description | Uncertainty value | Prob. Dist. | Div. | (c_i) 1g | (c_i) 10g | Std. Unc. (1g) | Std. Unc. (10g) | (v_i) v_{eff} |
| 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. | IT1S 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 IT1S 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

F. Bornhult

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Johannes Kappeler

System Validation from Original equipment supplier SPEAG Schmid & Partner

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Date/Time: 09/17/03 17:55:53

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN712_SN3013_M2450_170903.da4

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN712
Program: Dipole Calibration

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Muscle 2450 MHz ($\sigma = 2.03 \text{ mho/m}$, $\epsilon_r = 50.75$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

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 47; Postprocessing SW: SEMCAD, V1.6 Build 115

$P_{in} = 250 \text{ mW}$; $d = 10 \text{ mm}$ /Area Scan (81x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Reference Value = 90.4 V/m

Power Drift = -0.04 dB

Maximum value of SAR = 15.7 mW/g

$P_{in} = 250 \text{ mW}$; $d = 10 \text{ mm}$ /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.37 mW/g

Reference Value = 90.4 V/m

Power Drift = -0.04 dB

Maximum value of SAR = 15.6 mW/g

