



# SAR Evaluation Report

in accordance with the requirements of  
FCC Report and Order: ET Docket 93-62, and OET Bulletin 65 Supplement C

for

Wireless LAN CardBus PC Card (802.11b/g)

Model: WG2400

FCC ID: MQ4WG2K4

October 31, 2003

REPORT NO: B31030204

*Prepared for*

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## CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

**Dates of Tests:** October 30, 2003

<b>APPLICANT:</b>	AboCom System Inc. 1F, No.21, R&D Rd.II, SBIP, Hsin-Chu, Taiwan , R.O.C.
<b>BRAND/MODEL:</b>	AboCom /WG2400
<b>FCC ID:</b>	MQ4WG2K4
<b>DEVICE CATEGORY:</b>	PORTABLE DEVICES
<b>EXPOSURE CATEGORY:</b>	GENERAL POPULATION/UNCONTROLLED EXPOSURE

**Test Sample is a:** Production unit

**Modulation type:** 802.11b  
Direct Sequence Spread Spectrum  
802.11g  
Orthogonal Frequency Division Multiplexing (OFDM)

**Tx Frequency:** 2412 ~ 2462 MHz

**Max. O/P Power:** 15.90 dBm  
(Conducted/Peak)

**Max. SAR (1g):** 0.426 mW/g

**Application Type:** Certification

**FCC Rule Part(s):** 15C

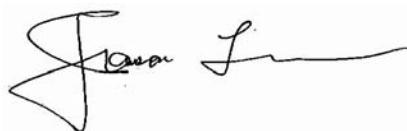


**Note:** This Report is only applicable for 802.11b/g.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (released on 6/29/2001 see Test Report).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

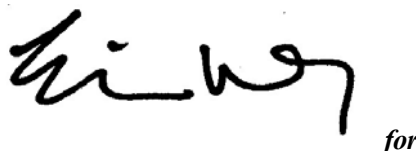
*Approved by:*



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*Reviewed by:*



*for*

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**Miro Chueh / Section Manager**  
Compliance Certification Services Inc.

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**1. EUT DESCRIPTION**

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**Application Type:** Certification

**FCC Rule Part(s):** 15C

**Antennas:** Main: Manufactured by AboCom, Mono pole (Mount on PCB) type.  
Aux: Manufactured by AboCom, Mono pole (Mount on PCB) type.



<b>Host Type</b>	Laptop PC
<b>Brand Name</b>	TOSHIBA
<b>P/N</b>	PS111T-00CMW
<b>S/N</b>	Y2382109

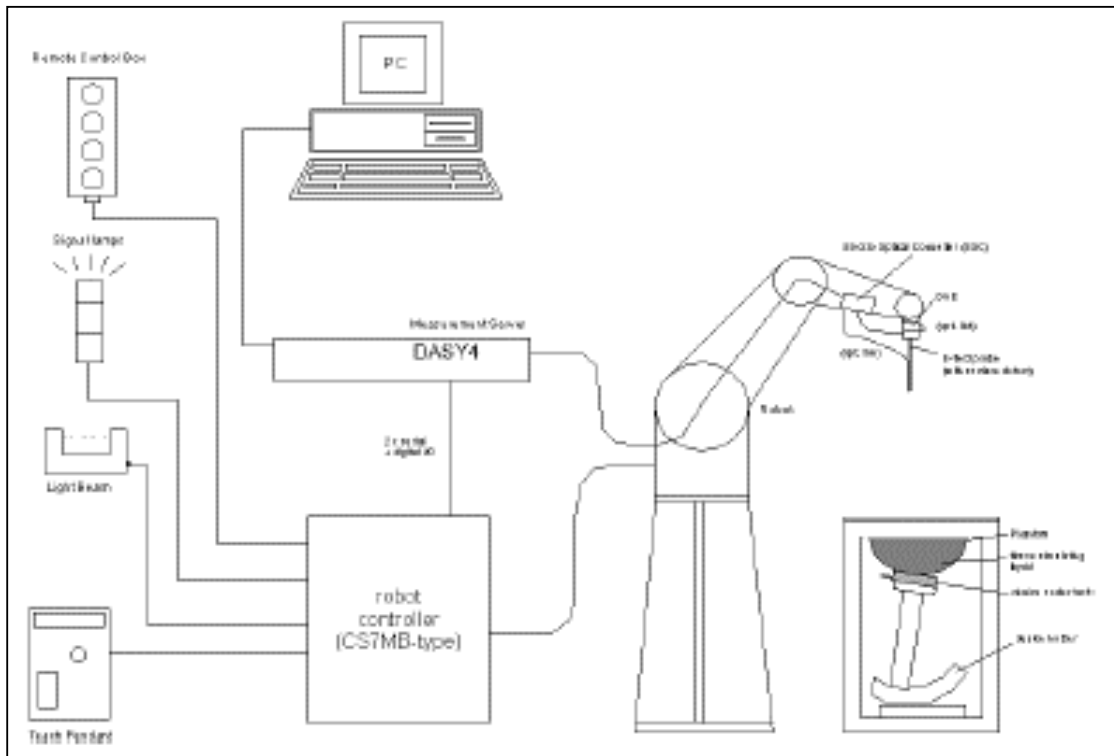
**2. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC**

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1]. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992 [6]. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

**3. DOSIMETRIC ASSESSMENT SYSTEM**

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m) which positions the probes with a positional repeatability of better than  $\pm 0.02$  mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe ET3DV6-SN: 1762 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure and found to be better than  $\pm 0.25$  dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and EN50361.

### 3.1. MEASUREMENT SYSTEM DIAGRAM



**The DASYS4 system for performing compliance tests consists of the following items:**

- A standard high precision 6-axis robot (Stäubli 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.
- 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.
- DASYS4 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 validating the proper functioning of the system.

### 3.2. SYSTEM COMPONENTS

#### DASY4 Measurement Server



The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

#### Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 box is 200M $\Omega$ ; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



#### ET3DV6 Isotropic E-Field Probe for Dosimetric Measurements

- Construction:** Symmetrical design with triangular core Interleaved sensors Built-in optical fiber for surface detection System and shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
- Calibration:** Basic Broad Band Calibration in air: 10-2500 MHz. Conversion Factors (CF) for HSL 900 and HSL 1800 CF-Calibration for other liquids and frequencies upon request.
- Frequency:** 10 MHz to > 3 GHz; Linearity:  $\pm 0.2$  dB
- Directivity:**  $\pm 0.2$  dB in HSL (rotation around probe axis);  
 $\pm 0.3$  dB in tissue material (rotation normal to probe axis)
- Dynamic Range:** 5 mW/g to > 100 mW/g; Linearity:  $\pm 0.2$  dB
- Dimensions:** Overall length: 330 mm (Tip: 16 mm)  
Tip diameter: 6.8 mm (Body: 12 mm)  
Distance from probe tip to dipole centers: 2.7 mm
- Application:** General dosimetry up to 3 GHz  
Dosimetry in strong gradient fields  
Compliance tests of mobile phones



Interior of probe

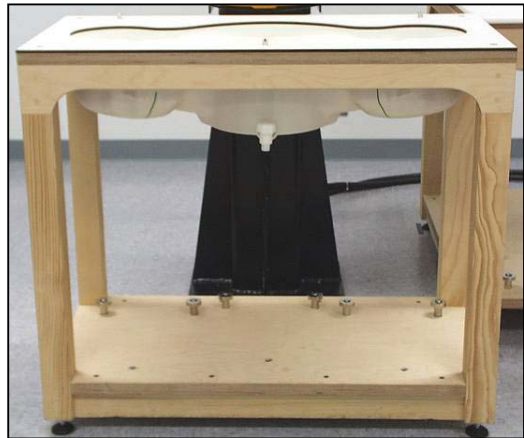


Isotropic E-Field Probe

### SAM Phantom (V4.0)

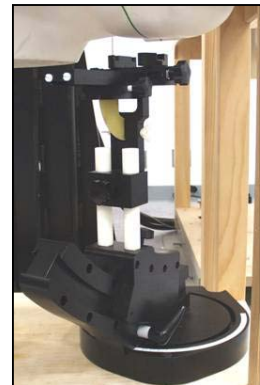
**Construction:** The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. 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: 810mm; Length: 1000mm; Width: 500mm



### Device Holder for SAM Twin Phantom

**Construction:** In combination with the Twin SAM Phantom V4.0 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).



### System Validation Kits

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 450, 900, 1800, 2450, 5800 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W (f < 1GHz); > 40 W (f > 1GHz)

**Dimensions:**  
450V2: dipole length: 270 mm; overall height: 330 mm  
D900V2: dipole length: 149 mm; overall height: 330 mm  
D1800V2: dipole length: 72 mm; overall height: 300 mm  
D2450V2: dipole length: 51.5 mm; overall height: 300 mm  
D5GHzV2: dipole length: 25.5 mm; overall height: 290 mm





#### 4. EVALUATION PROCEDURES

##### DATA EVALUATION

The DASY4 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	$dcp_i$
Device parameters:	- Frequency	$f$
	- Crest factor	$cf$
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with	$V_i$	= Compensated signal of channel i	(i = x, y, z)
	$U_i$	= Input signal of channel i	(i = x, y, z)
	$cf$	= Crest factor of exciting field	(DASY parameter)
	$dcp_i$	= Diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E-field probes: } E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H-field probes: } H_i = \sqrt{V_i} \cdot \frac{a_{i10} + a_{i11}f + a_{i12}f^2}{f}$$

with	$V_i$	= Compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i	(i = x, y, z)
		$\mu\text{V}/(\text{V/m})^2$ for E0field Probes	
	$ConvF$	= Sensitivity enhancement in solution	
	$a_{ij}$	= Sensor sensitivity factors for H-field probes	
	$f$	= Carrier frequency (GHz)	
	$E_i$	= Electric field strength of channel i in V/m	
	$H_i$	= Magnetic field strength of channel i in A/m	

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

- with  $SAR$  = local specific absorption rate in mW/g  
 $E_{tot}$  = total field strength in V/m  
 $\sigma$  = conductivity in [mho/m] or [Siemens/m]  
 $\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

- with  $P_{pwe}$  = Equivalent power density of a plane wave in mW/cm<sup>2</sup>  
 $E_{tot}$  = total electric field strength in V/m  
 $H_{tot}$  = total magnetic field strength in A/m

### SAR MEASUREMENT PROCEDURES

The procedure for assessing the peak spatial-average SAR value consists of the following steps:

- **Power Reference Measurement**

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **Area Scan**

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to **10 mm by 10 mm** and can be edited by a user.

- **Zoom Scan**

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures **5x5x7** points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- **Power Drift measurement**

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY4 software stop the measurements if this limit is exceeded.

- **Z-Scan**

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

5. MEASUREMENT UNCERTAINTY

UNCERTAINTY BUDGE ACCORDING TO IEEE P1528						
Error Description	Uncertainty Value ±%	Probablility distribution	Divisor	C <sub>1</sub> 1g	Standard unc.(1g) ±%	V <sub>1</sub> or V <sub>eff</sub>
<b>Measurement System</b>						
Probe calibration	±4.8	normal	1	1	±4.8	∞
Axial isotropy of probe	±4.6	rectangular	$\sqrt{3}$	$(1-C_p)^{1/2}$	±1.9	∞
Sph. Isotropy of probe	±9.7	rectangular	$\sqrt{3}$	$(C_p)^{1/2}$	±3.9	∞
Probe linearity	±4.5	rectangular	$\sqrt{3}$	1	±2.7	∞
Detection Limit	±0.9	rectangular	$\sqrt{3}$	1	±0.6	∞
Boundary effects	±8.5	rectangular	$\sqrt{3}$	1	±4.8	∞
Readoutelectronics	±1.0	normal	1	1	±1.0	∞
Response time	±0.9	rectangular	$\sqrt{3}$	1	±0.5	∞
Integration time	±1.2	rectangular	$\sqrt{3}$	1	±0.8	∞
Mech Constrains of robot	±0.5	rectangular	$\sqrt{3}$	1	±0.2	∞
Probe positioning	±2.7	rectangular	$\sqrt{3}$	1	±1.7	∞
Extrap. And integration	±4.0	rectangular	$\sqrt{3}$	1	±2.3	∞
RF ambient conditiona	±0.54	rectangular	$\sqrt{3}$	1	±0.43	∞
<b>Test Sample Related</b>						
Device positioning	±2.2	normal	1	1	±2.23	11
Device holder uncertainty	±5	normal	1	1	±5.0	7
Power drift	±5	rectangular	$\sqrt{3}$	1	±2.9	∞
<b>Phantom and Setup</b>						
Phantom uncertainty	±4	rectangular	$\sqrt{3}$	1	±2.3	∞
Liquid conductivity	±5	rectangular	$\sqrt{3}$	0.6	±1.7	∞
Liquid conductivity	±5	rectangular	$\sqrt{3}$	0.6	±3.5/1.7	∞
Liquid permittivity	±5	rectangular	$\sqrt{3}$	0.6	±1.7	∞
Liquid permittivity	±5	rectangular	$\sqrt{3}$	0.6	±1.7	∞
<b>Combined Standard Uncertainty</b>					±12.14/11.76	
<b>Coverage Factor for 95%</b>		kp=2				
<b>Expanded Standard Uncertainty</b>					±24.29/23.51	

Table: Worst-case uncertainty for DASy4 assessed according to IEEE P1528.

The budge is valid for the frequency range 300 MHz to 3G Hz and represents a worst-case analysis.

**6. EXPOSURE LIMIT**

(A).Limits for Occupational/Controlled Exposure (W/kg)

<u>Whole-Body</u>	<u>Partial-Body</u>	<u>Hands, Wrists, Feet and Ankles</u>
0.4	8.0	2.0

(B).Limits for General Population/Uncontrolled Exposure (W/kg)

<u>Whole-Body</u>	<u>Partial-Body</u>	<u>Hands, Wrists, Feet and Ankles</u>
0.08	1.6	4.0

NOTE: *Whole-Body SAR* is averaged over the entire body, *partial-body SAR* is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. *SAR for hands, wrists, feet and ankles* is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

**Population/Uncontrolled Environments:**

are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Occupational/Controlled Environments:**

are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

**NOTE**  
**GENERAL POPULATION/UNCONTROLLED EXPOSURE**  
**PARTIAL BODY LIMIT**  
**1.6 mW/g**

**7. MEASUREMENT RESULTS**

**7.1. SYSTEM PERFORMANCE CHECK**

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

**SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS**

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an E-field probe ET3DV6 SN: 1762 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 5x5x7 fine cube was chosen for cube integration (dx=dy= 7.5 mm, dz= 3 mm).
- Distance between probe sensors and phantom surface was set to 3.0 mm.
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

**Reference SAR values**

The reference SAR values were using measurement results indicated in the dipole calibration document (see table below)

Frequency (MHz)	1g SAR	10g SAR	Local SAR at Surface (Above Feed Point)	Local SAR at Surface (y = 2cm offset from feed point)
900	10.3	6.57	16.4	5.4
1800	38.2	20.3	69.5	6.8
2450	54.8	24.2	104.2	7.7

**SYSTEM PERFORMANCE CHECK RESULTS**

**Dipole:** D2450V2 SN: 728

**Date:** October 30, 2003

**Ambient condition:** Temperature 26.0°C; Relative humidity :50%

Head Simulating Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
f(GHz)	Temp. [°C]	Depth [cm]					
2450	24.70	15.00	Permittivity:	39.2	38.0712	-2.88	± 5
			Conductivity:	1.80	1.75537	-2.48	± 5
			1g SAR:	54.8	53.6	-2.19	± 5

## 7.2. TEST LIQUID CONFIRMATION

### SIMULATING LIQUIDS PARAMETER CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values

The relative permittivity and conductivity of the tissue material should be within  $\pm 5\%$  of the values given in the table below. 5% may not be easily achieved at certain frequencies. Under such circumstances, 10% tolerance may be used until more precise tissue recipes are available

### IEEE SCC-34/SC-2 P1528 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in P1528

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	45.3	5.27	48.2	6.00

### SIMULATING LIQUIDS PARAMETER CHECK RESULTS

Ambient condition: Temperature: 26.0°C; Relative humidity: 50%

Date: October 30, 2003

Body Simulating Liquid			Parameters	Target	Measured	Deviation[%]	Limited[%]
f (GHz)	Temp. [°C]	Depth (cm)					
2450	24.7	15	Permittivity:	52.70	51.0116	-3.20	$\pm 5$
			Conductivity:	1.95	1.956	0.31	$\pm 5$

**7.3. EUT TUNE-UP PROCEDURES**

The following procedure had been used to prepare the EUT for the SAR test.

- The client supplied a special driver to program the EUT, allowing it to continually transmit the specified maximum power and change the channel frequency.
- The conducted power was measured at the high, middle and low channel frequency before and after the SAR measurement.
- The output power(dBm) we measured before SAR test in different transition rate and channel

IEEE802.11b:

Rate \ CH	1M	2M	5.5M	11M	22M
1	<b>15.90</b>	15.86	15.75	15.69	15.58
6	<b>15.60</b>	15.57	15.46	15.50	15.48
11	<b>14.20</b>	14.15	14.08	14.16	14.12

IEEE802.11g:

Rate \ CH	6M	9M	12M	18M	24M	36M	48M	54M
1	<b>11.60</b>	11.55	11.53	11.49	11.51	11.47	11.36	11.29
6	<b>11.20</b>	11.15	11.12	11.09	11.14	11.05	11.02	10.98
11	<b>10.10</b>	10.05	10.03	9.95	9.97	9.92	9.84	9.87



**7.4. SAR MEASUREMENTS RESULTS**

**EUT Setup Configuration 1 (Antenna 1)**



802.11b (DSSS): Duty Cycle = 100%, Crest Factor: 1.

Depth of liquid: 15.0 cm

Sep. [mm]	Antenna	Rate	Channel	Frequency [MHz]	*Conducted Pwr_dBm		Liquid Temp [°C]	SAR (W/kg)	Limit (W/kg)
					Before	After			
0	1	1	6	2437	15.60	15.58	24.7	0.410	1.6
0	1	2	6	2437	15.57	15.55	24.7	0.405	1.6
0	1	5.5	6	2437	15.46	15.47	24.7	0.307	1.6
0	1	11	6	2437	15.50	15.48	24.7	0.310	1.6
0	1	22	6	2437	15.48	15.50	24.7	0.351	1.6

Notes:

1. \*: Peak power.
2. Bottom face in parallel with flat phantom.
3. See attachment for the result presentation in plot format.

EUT Setup Configuration 2 (Antenna 2)



802.11b (DSSS): Duty Cycle = 100%, Crest Factor: 1. Depth of liquid: 15.0 cm

Sep. [mm]	Antenna	Channel	Frequency [MHz]	*Conducted Pwr_dBm		Liquid Temp [°C]	SAR (W/kg)	Limit (W/kg)
				Before	After			
0	2	1	2412	<b>15.90</b>	15.88	24.7	0.214	1.6
0	2	6	2437	15.60	15.59	24.7	<b>0.426</b>	1.6
0	2	11	2462	14.20	14.22	24.7	0.417	1.6

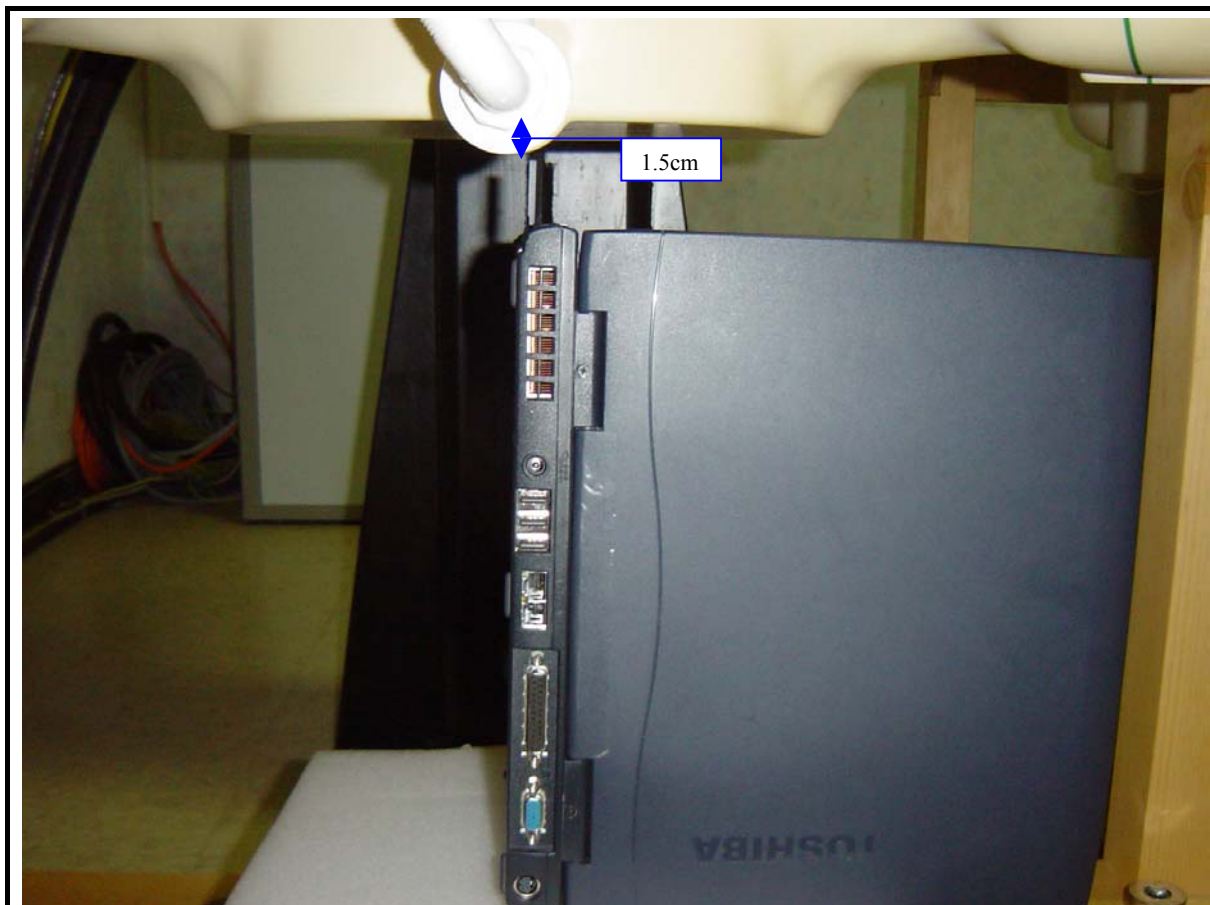
802.11g (OFDM): Duty Cycle = 100%, Crest Factor: 1. Depth of liquid: 15.0 cm

Sep. [mm]	Antenna	Channel	Frequency [MHz]	*Conducted Pwr_dBm		Liquid Temp [°C]	SAR (W/kg)	Limit (W/kg)
				Before	After			
0	2	1	2412	11.60	11.58	24.7	0.178	1.6
0	2	6	2437	11.20	11.18	24.7	0.269	1.6
0	2	11	2462	11.10	11.12	24.7	0.215	1.6

Notes:

1. \*: Peak power.
2. Bottom face in parallel with flat phantom.
3. See attachment for the result presentation in plot format.

EUT Setup Configuration 3 (Antenna 2)



802.11b (DSSS): Duty Cycle = 100%, Crest Factor: 1 Depth of liquid: 15.0 cm

Sep. [mm]	Antenna	Channel	Frequency [MHz]	*Conducted Pwr_dBm		Liquid Temp [°C]	SAR (W/kg)	Limit (W/kg)
				Before	After			
15	1 (aux)	1	2412	15.89	15.87	24.7	0.0956	1.6
15	1 (aux)	6	2437	15.59	15.57	24.7	<b>0.1890</b>	1.6
15	1 (aux)	11	2462	14.19	14.17	24.7	0.0605	1.6

802.11g (OFDM): Duty Cycle = 100%, Crest Factor: 1 Depth of liquid: 15.0 cm

Sep. [mm]	Antenna	Channel	Frequency [MHz]	*Conducted Pwr_dBm		Liquid Temp [°C]	SAR (W/kg)	Limit (W/kg)
				Before	After			
15	2	1	2412	11.58	11.57	24.7	0.0405	1.6
15	2	6	2437	11.18	11.16	24.7	0.0483	1.6
15	2	11	2462	11.09	11.08	24.7	0.0243	1.6

Notes:

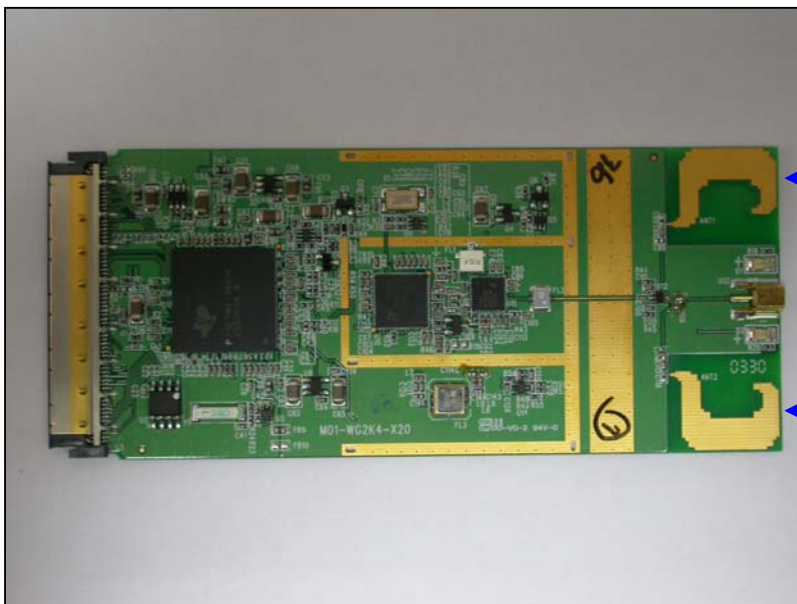
1. \*: Average power.
2. Host device perpendicular to flat phantom.
3. See attachment for the result presentation in plot format.

8. EUT PHOTOS

EUT



ANTENNA LOCATIONS



Ant.1

Ant.2

**EQUIPMENT LIST & CALIBRATION STATUS**

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Due
S-Parameter Network Analyzer	Agilent	E8358A	US40280243	03/24/04
Electronic Probe kit	Hewlett Packard	85070D	N/A	N/A
3.5mm electronic Calibration Kit	Agilent	85093C	US01400208	01/22/04
Power Meter	Boonton	4531	13061	01/10/04
Power Sensor	Boonton	56218	2240	01/10/04
Power Meter	Agilent	E4416A	GB41291611	03/15/04
Power Sensor	Agilent	E9327A	US40441097	03/15/04
Thermometer	Amarell	4046	23641	12/12/04
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	1100.0008.02	N/A
Signal Generator	Agilent	83630B	3844A01022	01/15/04
Amplifier	Mini-Circuit	ZHL-1724HLN	N/A	N/A
DC Power generator	ABM	8301HD		N/A
Data Acquisition Electronics (DAE)	SPEAG	DAE3	558	03/07/04
Dosimetric E-Field Probe	SPEAG	ET3DV6	1762	03/31/04
900 MHz System Validation Dipole	SPEAG	D900V2	179	03/31/04
1800 MHz System Validation Dipole	SPEAG	D1800V2	2d026	04/01/04
2450 MHz System Validation Dipole	SPEAG	D2450V2	728	03/05/04
Probe Alignment Unit	SPEAG	LB (V2)	348	N/A
Robot	Staubli	RX90B L	F02/5T69A1/A/01	N/A
SAM Twin Phantom V4.0	SPEAG	N/A	N/A	N/A
Devices Holder	SPEAG	N/A	N/A	N/A
Head 835 MHz	CCS	H835A	N/A	N/A
Muscle 835 MHz	CCS	M835A	N/A	N/A
Head 900 MHz	CCS	H900A	N/A	N/A
Muscle 900 MHz	CCS	M900A	N/A	N/A
Head 1800 MHz	CCS	H1800A	N/A	N/A
Muscle 1800 MHz	CCS	M1800A	N/A	N/A
Head 1900 MHz	CCS	H1900A	N/A	N/A
Muscle 1900 MHz	CCS	M1900A	N/A	N/A
Head 2450 MHz	CCS	H2450A	N/A	N/A
Muscle 2450 MHz	CCS	M2450A	N/A	N/A

**9. REFERENCES**

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- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
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**10. ATTACHMENTS**

<b>Exhibit</b>	<b>Content</b>
1	Data Acquisition Electronics (DAE)-DAE3, S/N: 558
2	Dosimetric E-Field Probe - ET3DV6, S/N: 1762
3	Validation Dipole - D2450V2, S/N: 728
4	System Performance Check Plots
5	SAR Test Plots

**End of Report**

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

**Client** [REDACTED]

## CALIBRATION CERTIFICATE

**Object(s)** [REDACTED] DAE3 - SN:558

**Calibration procedure(s)** [REDACTED] QA CAL-06 v2  
Calibration procedure for the data acquisition unit (DAE)

**Calibration date:** [REDACTED] March 07, 2003

**Condition of the calibrated item** [REDACTED] 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
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

	Name	Function	Signature
<b>Calibrated by:</b>	[REDACTED] Eric Hainfeld	[REDACTED] Technician	[REDACTED] 
<b>Approved by:</b>	[REDACTED] Fin Bornhoff	[REDACTED] R&D Director	[REDACTED] 

Date issued: March 07, 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.



## 1. DC Voltage Measurement

DA - Converter Values from DAE

High Range: 1LSB = 6.1 $\mu$ V, full range = 400 mV  
 Low Range: 1LSB = 61nV, full range = 4 mV

Software Set-up: Calibration time: 3 sec Measuring time: 3 sec

Setup	X	Y	Z
High Range	405.010098	404.9037428	405.0817835
Low Range	3.972	3.95185	3.96828
Connector Position	86 °		

High Range	Input	Reading in $\mu$ V	% Error
Channel X + Input	200mV	200000	0.00
	20mV	20003.4	0.02
Channel X - Input	20mV	-19993	-0.04
	200mV	200001	0.00
Channel Y + Input	20mV	20002.7	0.01
	20mV	-19993	-0.04
Channel Y - Input	20mV	-19993	-0.04
	200mV	200000	0.00
Channel Z + Input	20mV	20000.8	0.00
	20mV	-19997.7	-0.01
Channel Z - Input	20mV	-19997.7	-0.01

Low Range	Input	Reading in $\mu$ V	% Error
Channel X + Input	2mV	2000.2	0.01
	0.2mV	200.04	0.02
Channel X - Input	0.2mV	-200.81	0.41
	2mV	2000.1	0.00
Channel Y + Input	0.2mV	199.47	-0.27
	0.2mV	-201.01	0.50
Channel Y - Input	0.2mV	-201.01	0.50
	2mV	1999.9	0.00
Channel Z + Input	0.2mV	198.68	-0.66
	0.2mV	-201.1	0.55
Channel Z - Input	0.2mV	-201.1	0.55

## 2. Common mode sensitivity

Software Set-up

Calibration time: 3 sec, Measuring time: 3 sec

High/Low Range

in $\mu\text{V}$	Common mode Input Voltage	High Range Reading	Low Range Reading
Channel X	200mV	-1.0284	-1.5716
	- 200mV	3.9204	1.3725
Channel Y	200mV	6.7686	5.874
	- 200mV	-6.8145	-8.0898
Channel Z	200mV	2.1943	2.766
	- 200mV	-2.52	-4.6218

## 3. Channel separation

Software Set-up

Calibration time: 3 sec, Measuring time: 3 sec

High Range

in $\mu\text{V}$	Input Voltage	Channel X	Channel Y	Channel Z
Channel X	200mV	-	0.88082	0.19177
Channel Y	200mV	0.049124	-	0.25676
Channel Z	200mV	-2.1226	-0.89508	-

## 4. AD-Converter Values with inputs shorted

in LSB	Low Range	High Range
Channel X	16492	16236
Channel Y	16307	15690
Channel Z	16461	16033

## 5. Input Offset Measurement

Measured after 15 min warm-up time of the Data Acquisition Electronic.  
Every Measurement is preceded by a calibration cycle.

Software set-up:

Calibration time: 3 sec  
Measuring time: 3 sec  
Number of measurements: 100, Low Range

Input 10M $\Omega$

in $\mu\text{V}$	Average	min. Offset	max. Offset	Std. Deviation
Channel X	-0.52	-1.64	0.60	0.43
Channel Y	-2.05	-3.65	0.06	0.51
Channel Z	-0.34	-2.05	0.43	0.37

Input shorted

in $\mu\text{V}$	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.04	-0.84	1.09	0.41
Channel Y	-0.77	-2.08	0.17	0.40
Channel Z	-1.01	-1.68	-0.38	0.24

## 6. Input Offset Current

in fA	Input Offset Current
Channel X	< 25
Channel Y	< 25
Channel Z	< 25

## 7. Input Resistance

	Calibrating	Measuring
Channel X	200 k $\Omega$	200 M $\Omega$
Channel Y	200 k $\Omega$	200 M $\Omega$
Channel Z	200 k $\Omega$	200 M $\Omega$

### 8. Low Battery Alarm Voltage

in V	Alarm Level
Supply (+ Vcc)	7.66 V
Supply (- Vcc)	-7.53 V

### 9. Power Consumption

in mA	Switched off	Stand by	Transmitting
Supply (+ Vcc)	0.000	5.83	14.1
Supply (- Vcc)	-0.011	-7.86	-9.13

### 10. Functional test

Touch async pulse 1	ok
Touch async pulse 2	ok
Touch status bit 1	ok
Touch status bit 2	ok
Remote power off	ok
Remote analog Power control	ok
Modification Status	B – C

Client **C&C (Auden)**

## CALIBRATION CERTIFICATE

Object(s) **ET3DV5 - SN:1762**

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

Calibration date: **March 31, 2003**

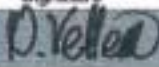
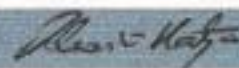
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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	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
Flyke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

Calibrated by:	Name <b>Nico Veltrop</b>	Function <b>Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Laboratory Director</b>	Signature 

Date issued: April 2, 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.

# Probe ET3DV6

**SN:1762**

**Manufactured:** January 20, 2003  
**Last calibration:** March 31, 2003

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ET3DV6 SN:1762****Sensitivity in Free Space**

NormX	<b>1.90</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>1.78</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>1.82</b> $\mu\text{V}/(\text{V}/\text{m})^2$

**Diode Compression**

DCP X	<b>96</b>	mV
DCP Y	<b>96</b>	mV
DCP Z	<b>96</b>	mV

**Sensitivity in Tissue Simulating Liquid**

Head	<b>900 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	<b>835 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
ConvF X	<b>6.7</b> $\pm 9.5\%$ (k=2)		Boundary effect:
ConvF Y	<b>6.7</b> $\pm 9.5\%$ (k=2)		Alpha <b>0.67</b>
ConvF Z	<b>6.7</b> $\pm 9.5\%$ (k=2)		Depth <b>1.74</b>
Head	<b>1800 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	<b>1900 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
ConvF X	<b>5.4</b> $\pm 9.5\%$ (k=2)		Boundary effect:
ConvF Y	<b>5.4</b> $\pm 9.5\%$ (k=2)		Alpha <b>0.50</b>
ConvF Z	<b>5.4</b> $\pm 9.5\%$ (k=2)		Depth <b>2.63</b>

**Boundary Effect**

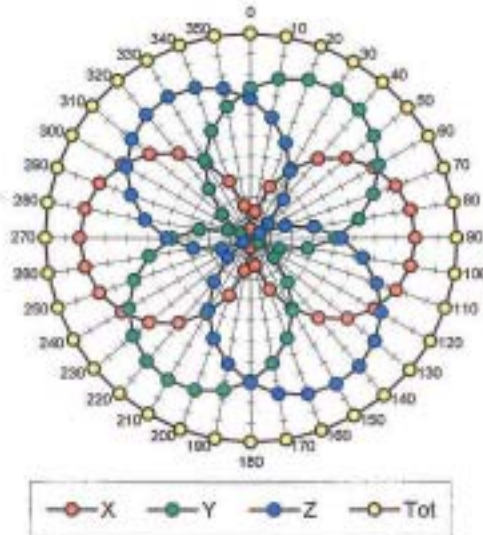
Head	<b>900 MHz</b>	<b>Typical SAR gradient: 5 % per mm</b>	
	Probe Tip to Boundary	<b>1 mm</b>	<b>2 mm</b>
	SAR <sub>be</sub> [%] Without Correction Algorithm	<b>8.8</b>	<b>4.5</b>
	SAR <sub>be</sub> [%] With Correction Algorithm	<b>0.1</b>	<b>0.2</b>
Head	<b>1800 MHz</b>	<b>Typical SAR gradient: 10 % per mm</b>	
	Probe Tip to Boundary	<b>1 mm</b>	<b>2 mm</b>
	SAR <sub>be</sub> [%] Without Correction Algorithm	<b>13.8</b>	<b>9.3</b>
	SAR <sub>be</sub> [%] With Correction Algorithm	<b>0.2</b>	<b>0.1</b>

**Sensor Offset**

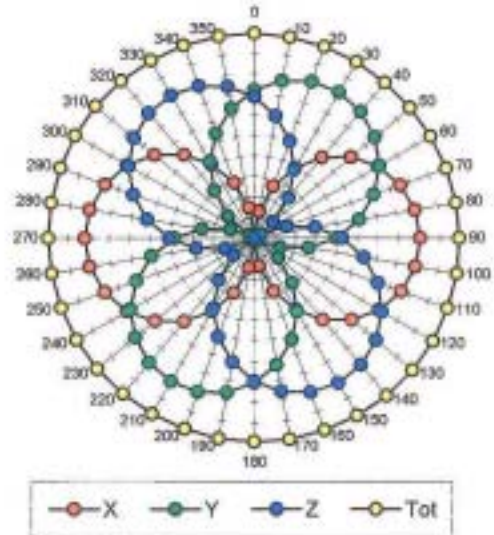
Probe Tip to Sensor Center	<b>2.7</b>	mm
Optical Surface Detection	<b>1.4 <math>\pm</math> 0.2</b>	mm

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

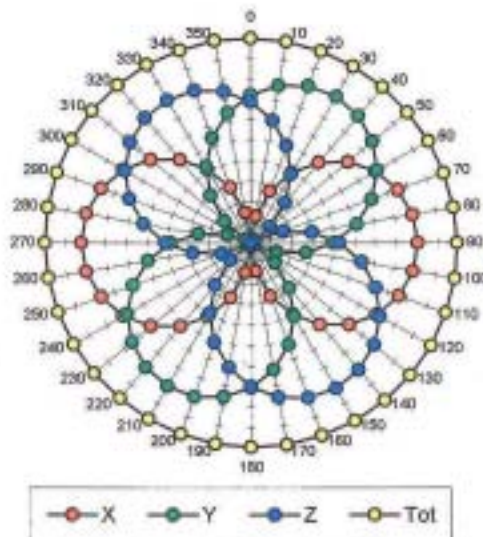
**f = 30 MHz, TEM cell if110**



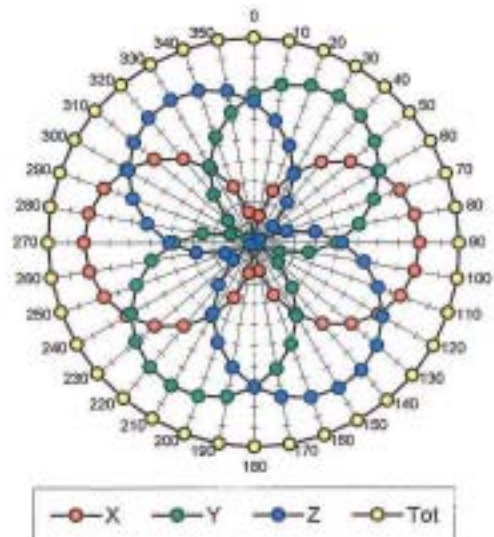
**f = 100 MHz, TEM cell if110**



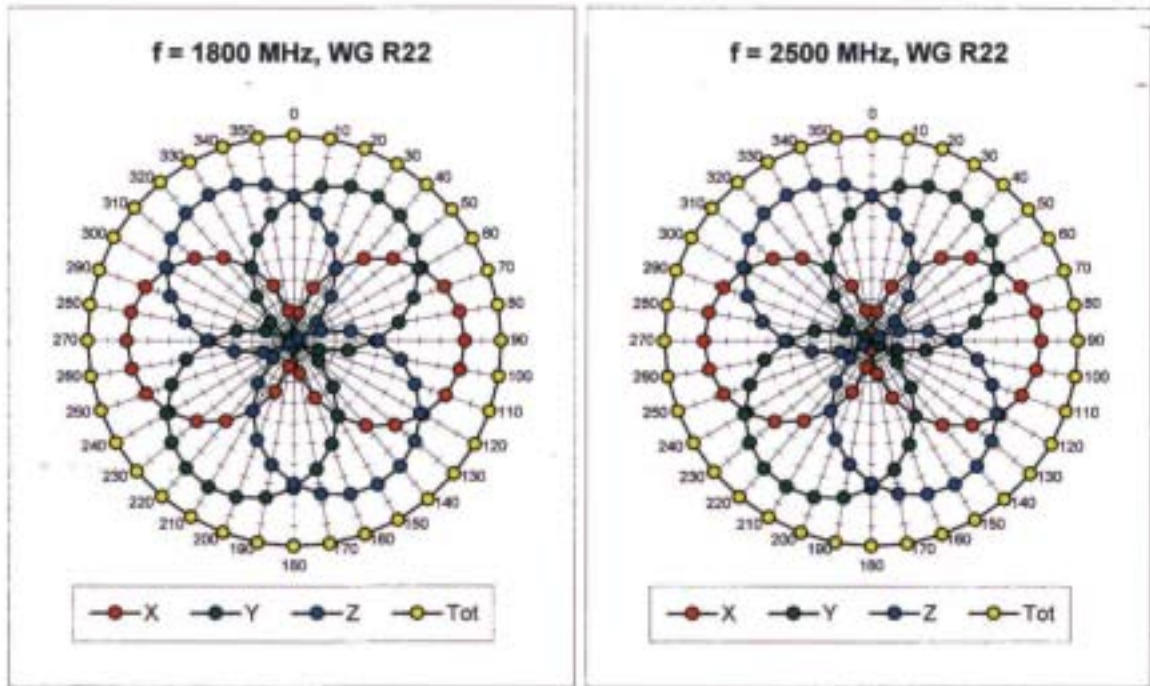
**f = 300 MHz, TEM cell if110**



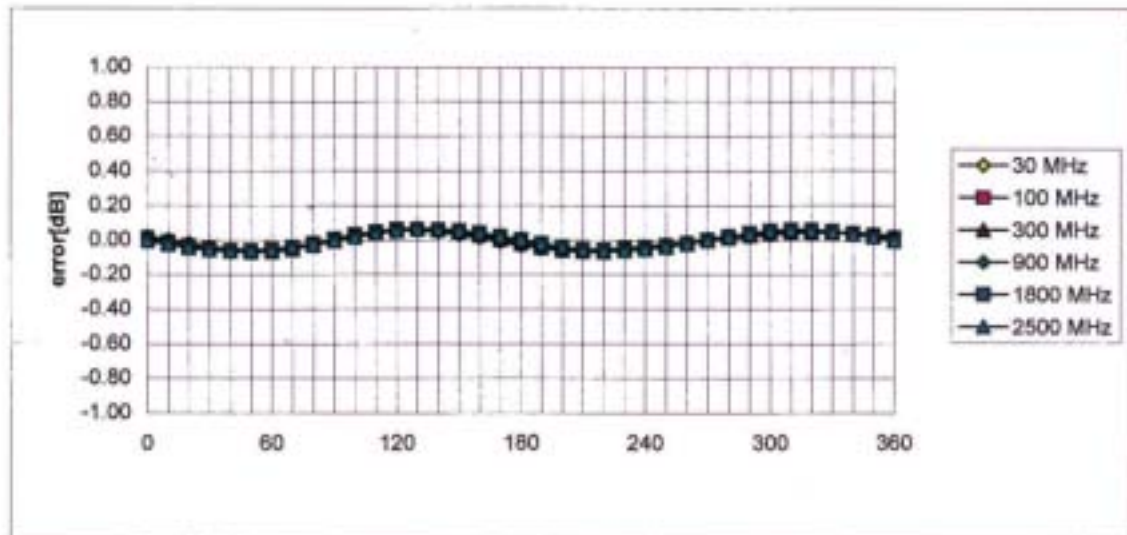
**f = 900 MHz, TEM cell if110**





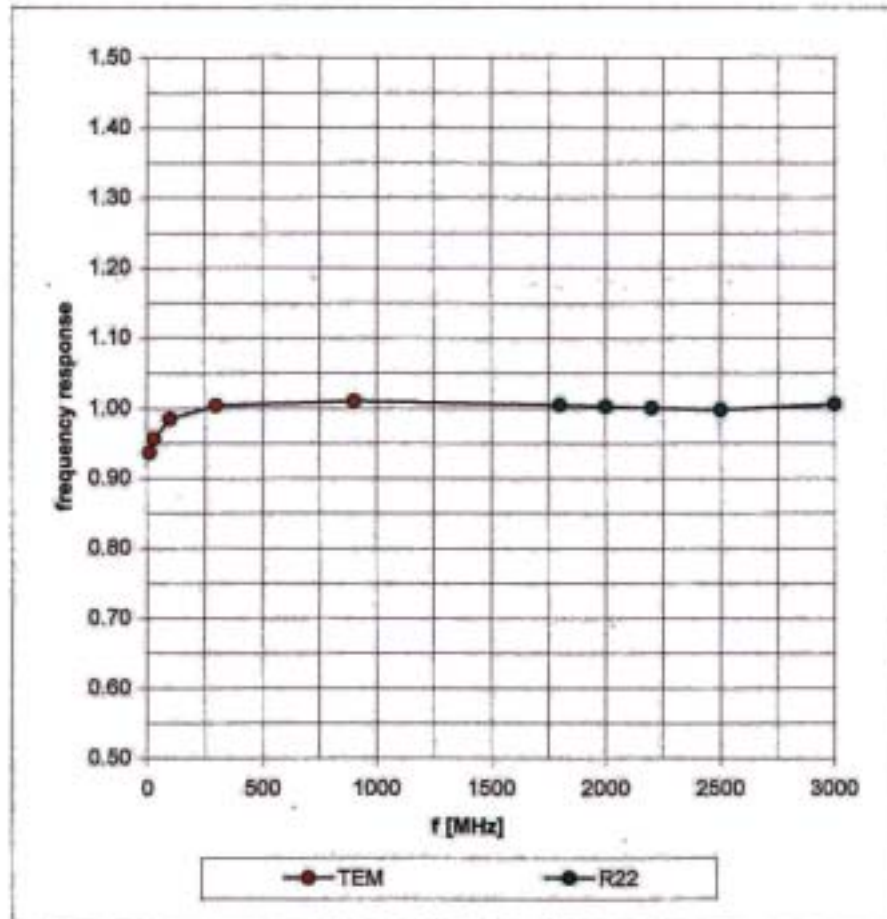


Isotropy Error ( $\phi$ ),  $\theta = 0^\circ$

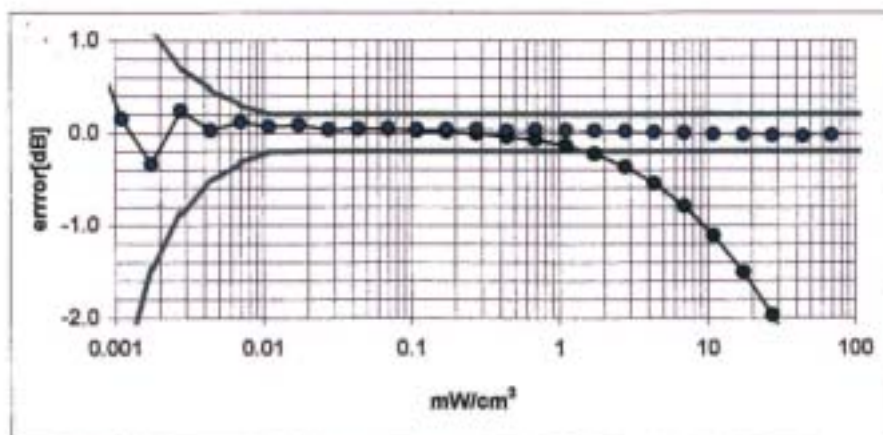
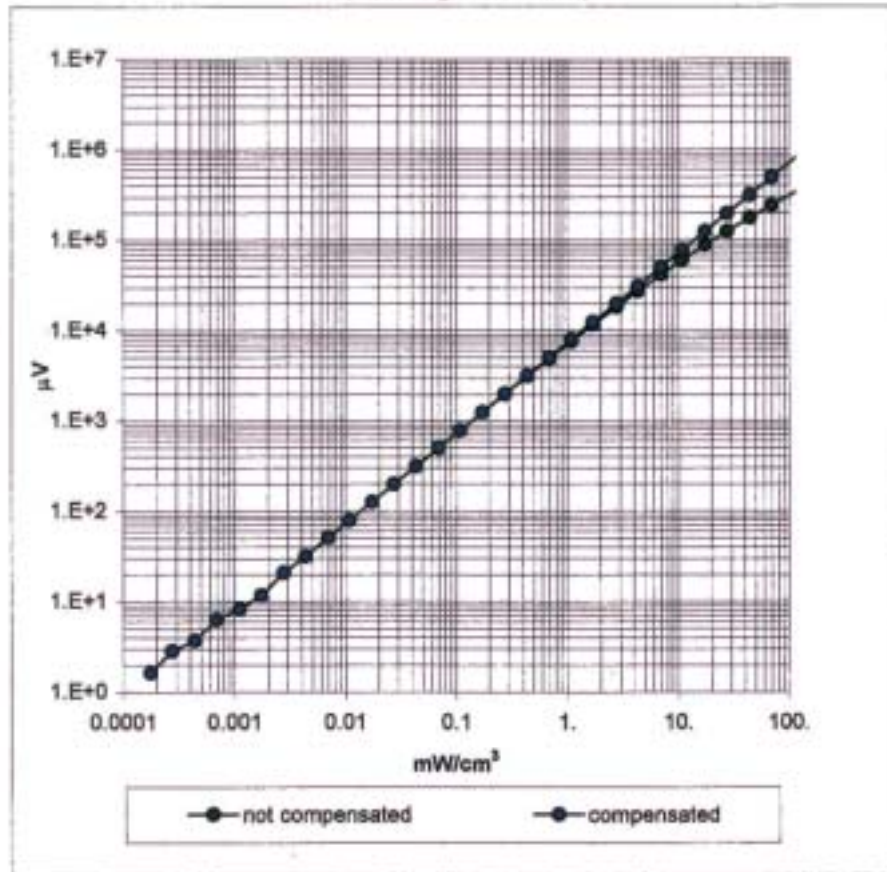


### Frequency Response of E-Field

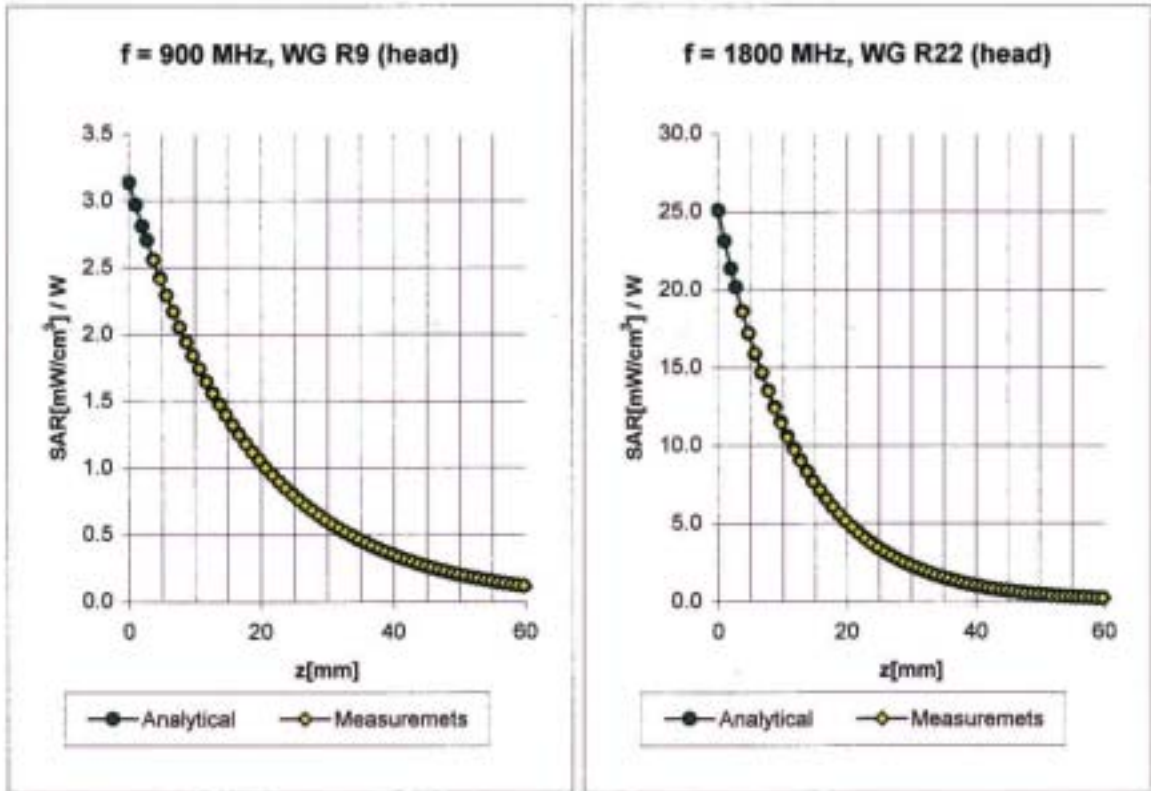
( TEM-Cell:ifi110, Waveguide R22)



### Dynamic Range f(SAR<sub>brain</sub>) ( Waveguide R22 )

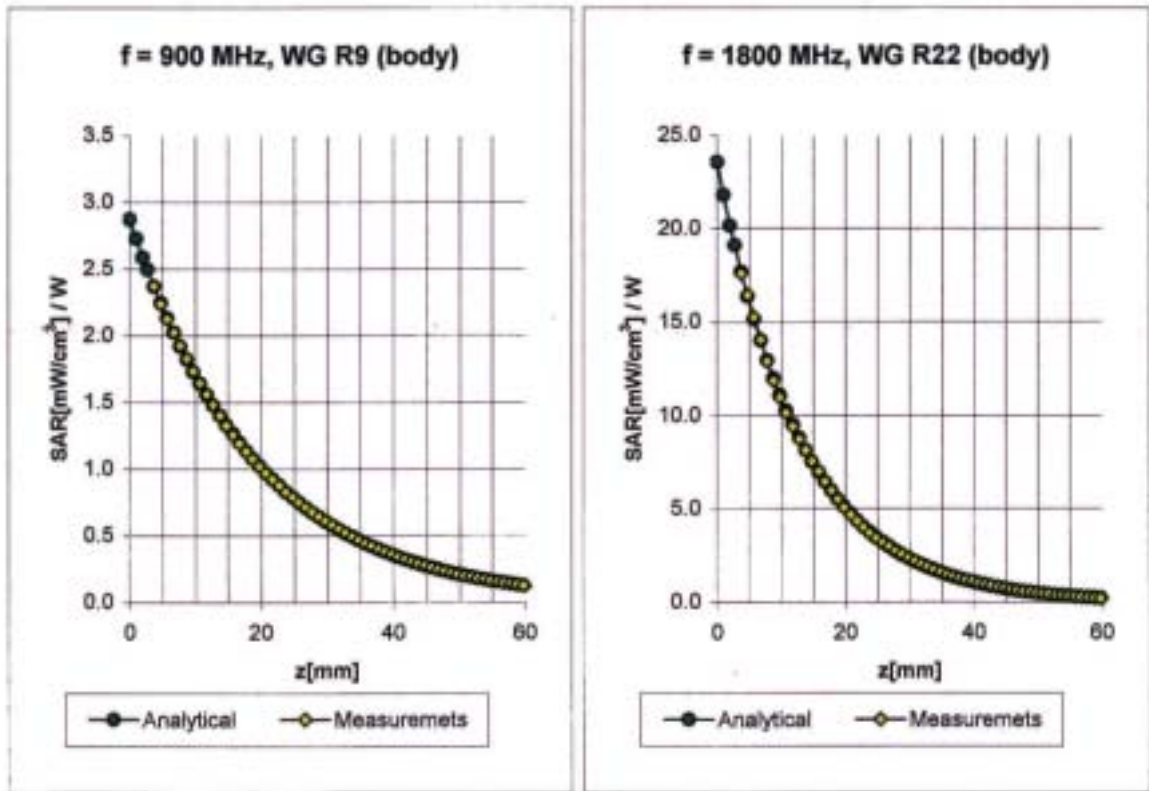


### Conversion Factor Assessment



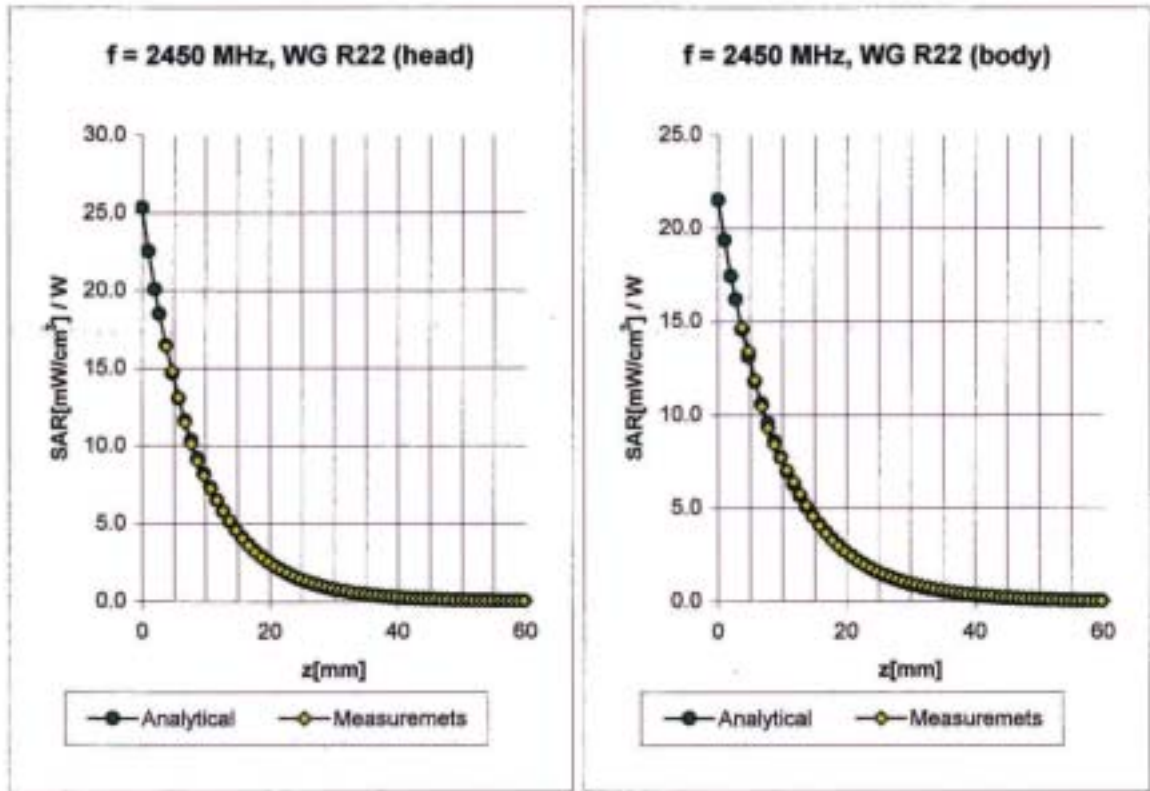
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	<b>6.7</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>6.7</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.67</b>
	ConvF Z	<b>6.7</b> $\pm 9.5\%$ (k=2)	Depth <b>1.74</b>
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	<b>5.4</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>5.4</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.50</b>
	ConvF Z	<b>5.4</b> $\pm 9.5\%$ (k=2)	Depth <b>2.63</b>

### Conversion Factor Assessment



<b>Body</b>	<b>900 MHz</b>	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
<b>Body</b>	<b>835 MHz</b>	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	ConvF X	<b>6.5</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>6.5</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.43</b>
	ConvF Z	<b>6.5</b> $\pm 9.5\%$ (k=2)	Depth <b>2.34</b>
<b>Body</b>	<b>1800 MHz</b>	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
<b>Body</b>	<b>1900 MHz</b>	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
	ConvF X	<b>5.0</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>5.0</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.57</b>
	ConvF Z	<b>5.0</b> $\pm 9.5\%$ (k=2)	Depth <b>2.65</b>

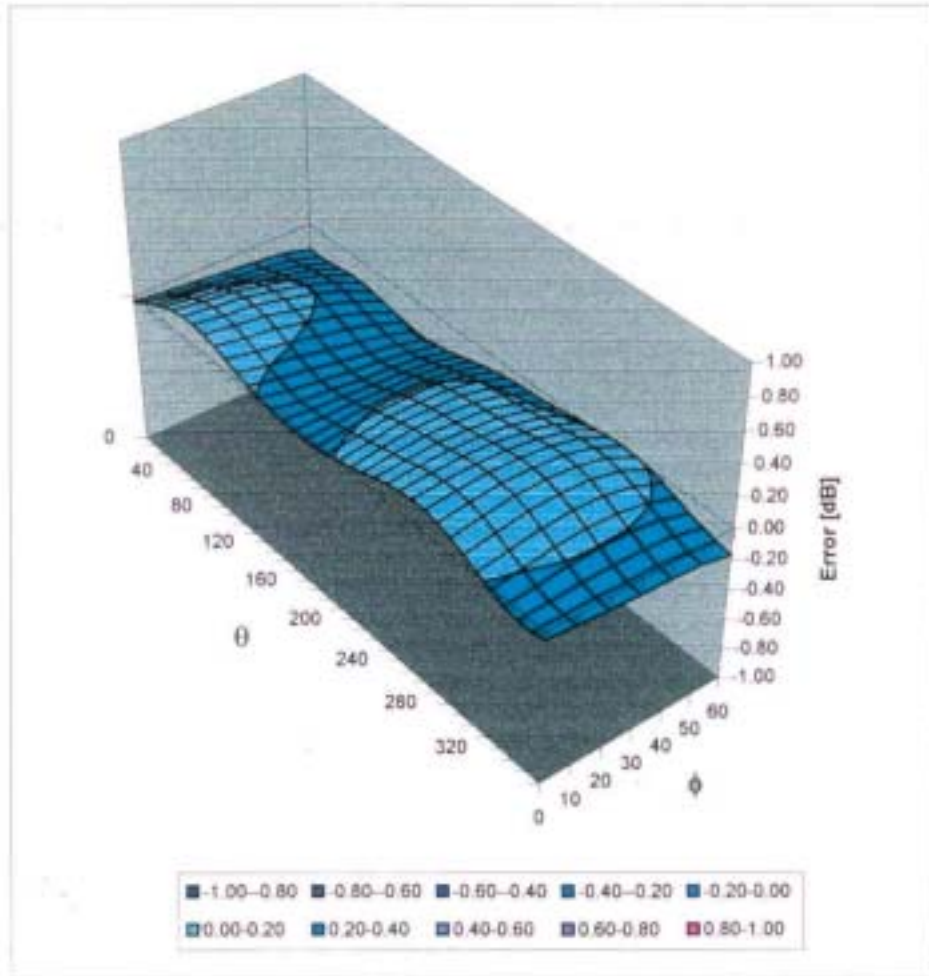
### Conversion Factor Assessment



<b>Head</b>	<b>2450</b>	<b>MHz</b>	$\epsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\%$ mho/m
	ConvF X		<b>5.1</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y		<b>5.1</b> $\pm 8.9\%$ (k=2)	Alpha <b>1.32</b>
	ConvF Z		<b>5.1</b> $\pm 8.9\%$ (k=2)	Depth <b>1.61</b>
<b>Body</b>	<b>2450</b>	<b>MHz</b>	$\epsilon_r = 52.7 \pm 5\%$	$\sigma = 1.95 \pm 5\%$ mho/m
	ConvF X		<b>4.6</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y		<b>4.6</b> $\pm 8.9\%$ (k=2)	Alpha <b>1.39</b>
	ConvF Z		<b>4.6</b> $\pm 8.9\%$ (k=2)	Depth <b>1.60</b>

### Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz



Client **C&C (Auden)**

## CALIBRATION CERTIFICATE

Object(s) **D2450V2 - SN:728**

Calibration procedure(s) **QA CAL-05.v2  
Calibration procedure for dipole validation kits**

Calibration date: **March 5, 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 R&S SML-03	100698	27-Mar-2002	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02	Oct-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03

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

Date issued: April 2, 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.



# DASY

## Dipole Validation Kit

Type: D2450V2

Serial: 728

Manufactured: January 9, 2003

Calibrated: March 5, 2003

## 1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 2450 MHz:

Relative Dielectricity	<b>37.4</b>	$\pm 5\%$
Conductivity	<b>1.88 mho/m</b>	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ES3DV2 (SN:3013, Conversion factor 4.8 at 2450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was  $250\text{mW} \pm 3\%$ . The results are normalized to 1W input power.

## 2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ES3DV2 SN:3013 and applying the advanced extrapolation are:

averaged over $1\text{ cm}^3$ (1 g) of tissue:	<b>54.8 mW/g</b> $\pm 16.8\%$ $(k=2)^{\dagger}$
averaged over $10\text{ cm}^3$ (10 g) of tissue:	<b>24.2 mW/g</b> $\pm 16.2\%$ $(k=2)^{\dagger}$

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<sup>†</sup> validation uncertainty

### 3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	<b>1.153 ns</b>	(one direction)
Transmission factor:	<b>0.997</b>	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 2450 MHz:       $\text{Re}\{Z\} = 53.7 \Omega$

$\text{Im}\{Z\} = 3.8 \Omega$

Return Loss at 2450 MHz                      **-25.9 dB**

### 4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

### 5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

### 6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 03/05/03 12:24:05

Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN728\_SN3013\_HSL2450\_050303.da4

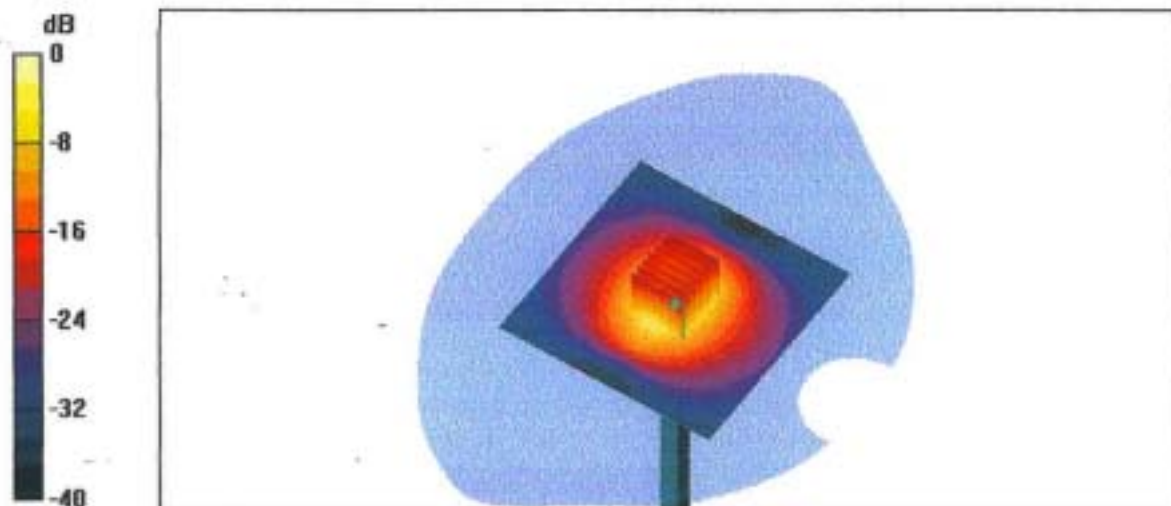
**DUT: Dipole 2450 MHz; Serial: D2450V2 - SN728**  
**Program: Dipole Calibration**

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium: HSL 2450 MHz; ( $\sigma = 1.88$  mho/m,  $\epsilon_r = 37.4$ ,  $\rho = 1000$  kg/m<sup>3</sup>)  
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3013; ConvF(4.8, 4.8, 4.8); 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 = 91.6 V/m  
Peak SAR = 30.6 W/kg  
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.04 mW/g  
Power Drift = 0.02 dB



CH1 S11 1 U F9

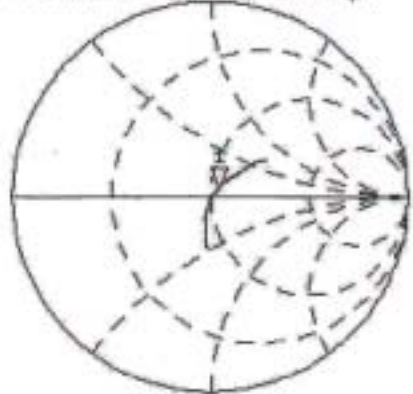
f: 53.662 a 3.8359 a 249.19 pHz

5 Mar 2003 18:02:21

2 450.000 000 MHz

728  
Head

De1



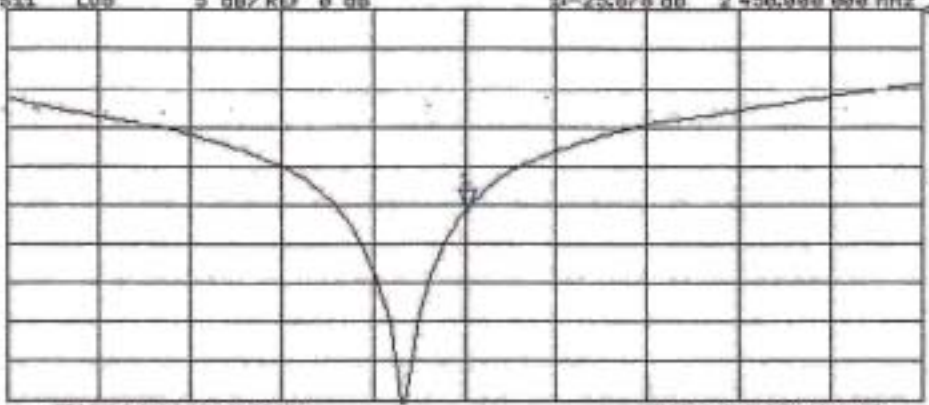
PRn  
Cor  
Avg  
16

CH2 S11 LOG

5 dB/REF 0 dB

f: -25.078 dB 2 450.000 000 MHz

PRn  
Cor



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

Test Laboratory: Compliance Certification Services Inc.  
File Name: [D2450V2 SN 728.da4](#)

## D2450V2 SN 728

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 728**  
**Program: System Performance Check at 2450MHz**

Communication System: CW2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450 ( $\sigma = 1.75537$  mho/m,  $\epsilon_r = 38.0712$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(5.1, 5.1, 5.1); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1271
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Pin=250mW,d=10mm/Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 95.1 V/m

Power Drift = -0.004 dB

Maximum value of SAR = 10.9 mW/g

**Pin=250mW,d=10mm/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 95.1 V/m

Power Drift = -0.006 dB

Maximum value of SAR = 11.7 mW/g

**Pin=250mW,d=10mm/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

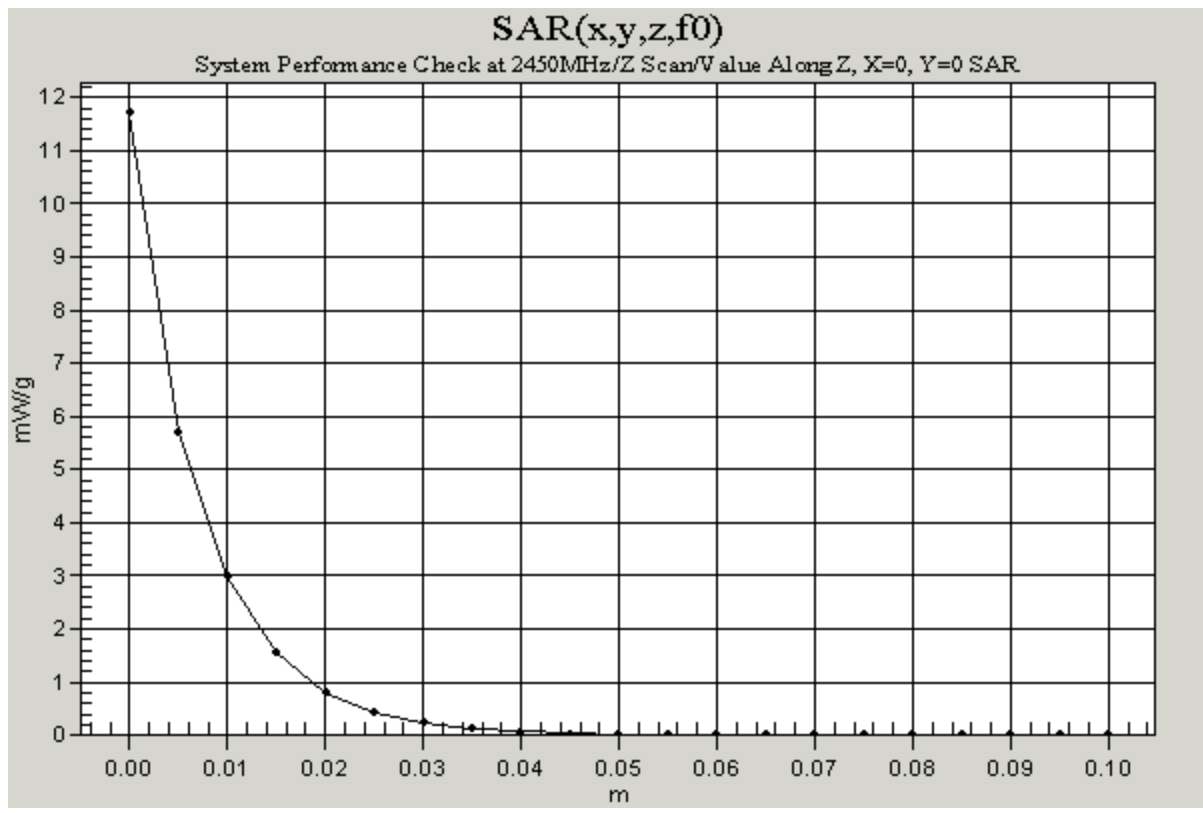
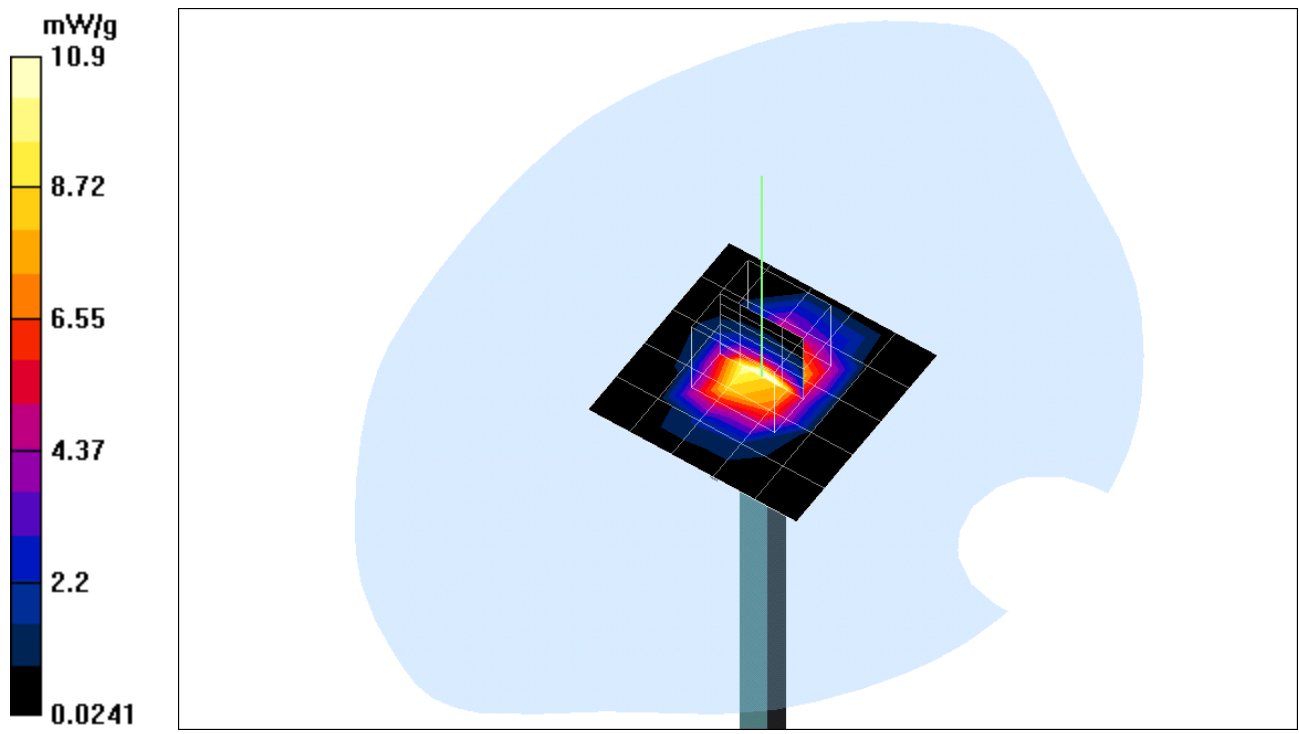
Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.16 mW/g

Reference Value = 95.1 V/m

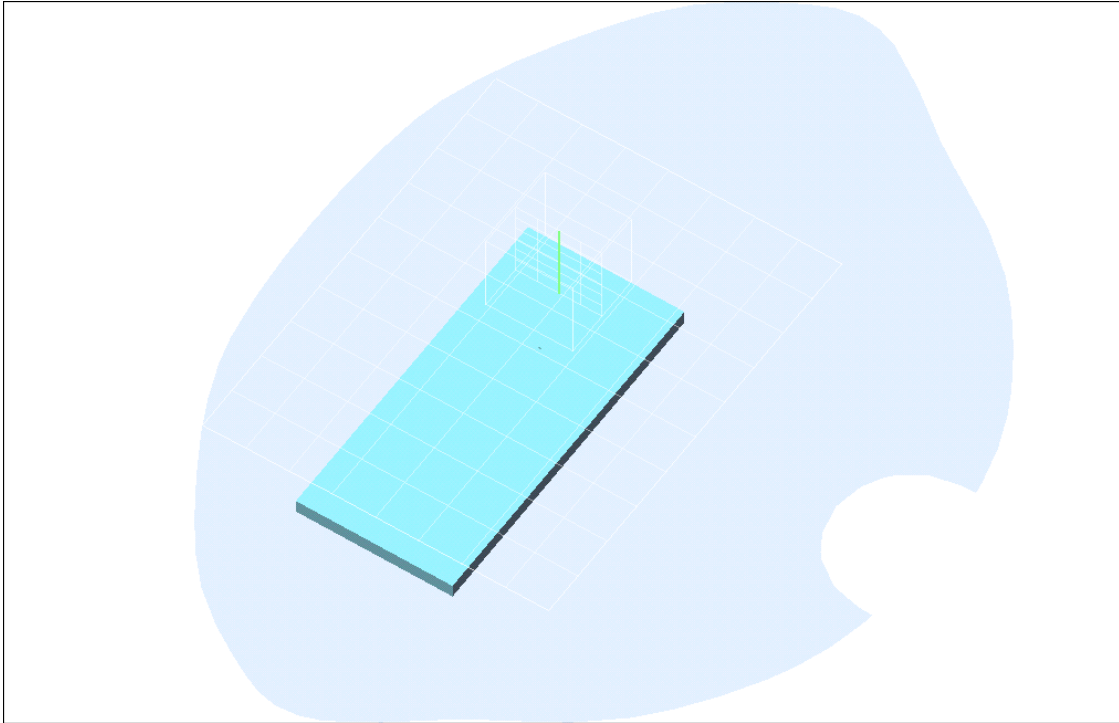
Power Drift = -0.004 dB

Maximum value of SAR = 15 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

# Test Configuration 1





Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

## WG2400-Touch mode-Ant1

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956 \text{ mho/m}$ ,  $\epsilon_r = 51.0116$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=1M bit/Area Scan (9x11x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 8 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.434 mW/g

**mid Rate=1M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 8 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.361 mW/g

**mid Rate=1M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

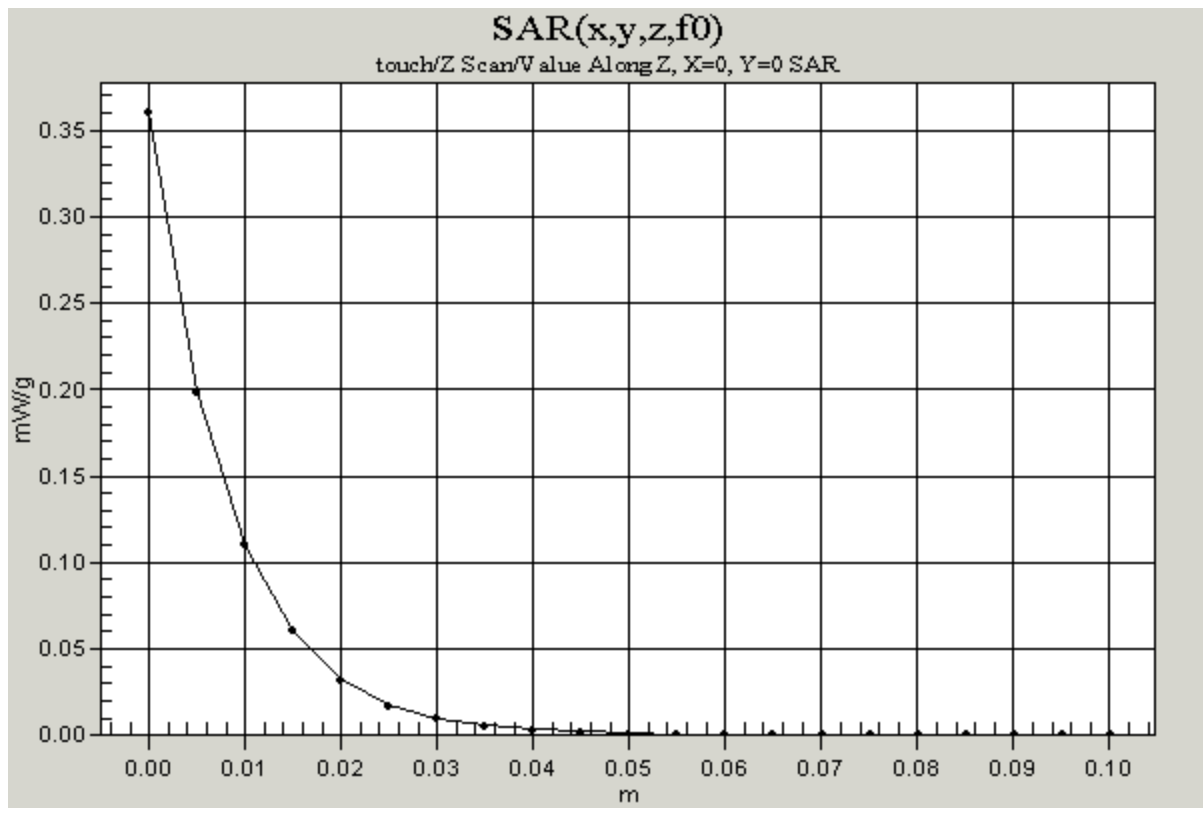
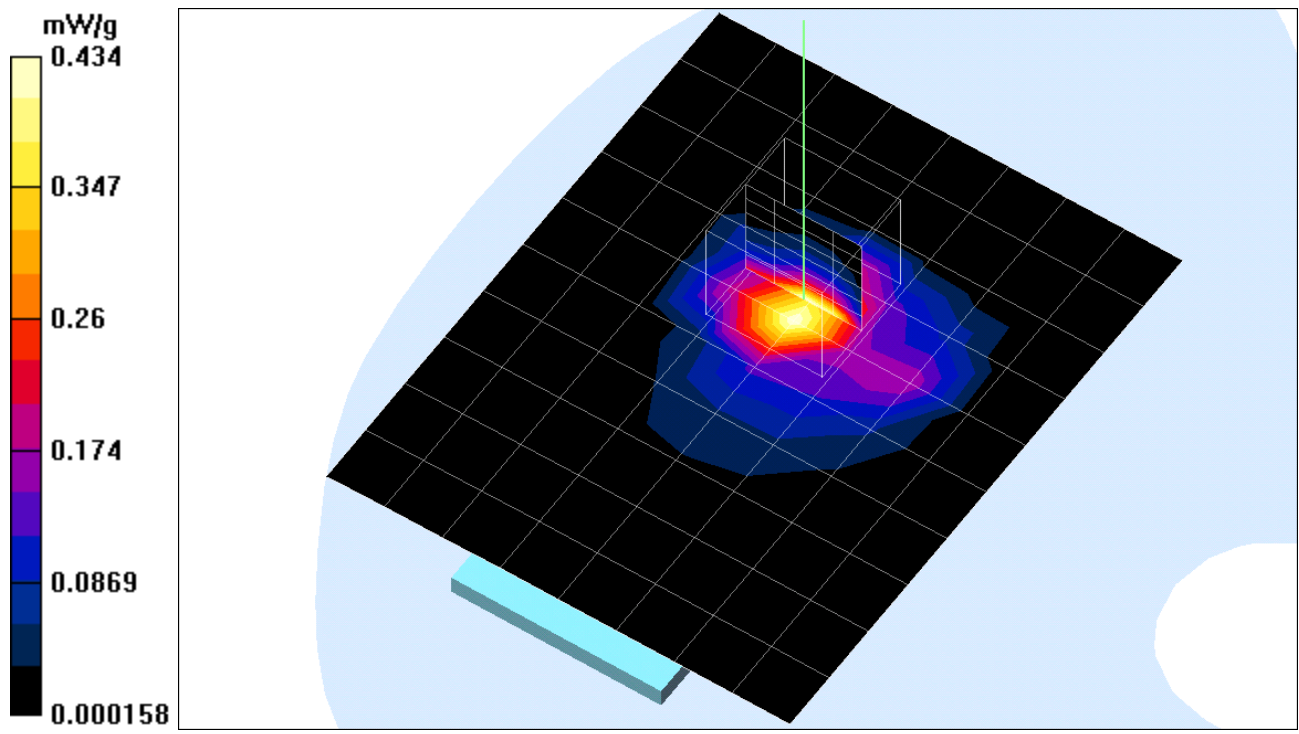
Peak SAR (extrapolated) = 0.827 W/kg

SAR(1 g) = 0.41 mW/g; SAR(10 g) = 0.186 mW/g

Reference Value = 8 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.445 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

## WG2400-Touch mode-Ant1

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)  
Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=2M bit/Area Scan (8x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 5.18 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.382 mW/g

**mid Rate=2M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 5.18 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 0.338 mW/g

**mid Rate=2M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Peak SAR (extrapolated) = 0.838 W/kg

SAR(1 g) = 0.405 mW/g; SAR(10 g) = 0.184 mW/g

Reference Value = 5.18 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.425 mW/g

**mid Rate=2M bit/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

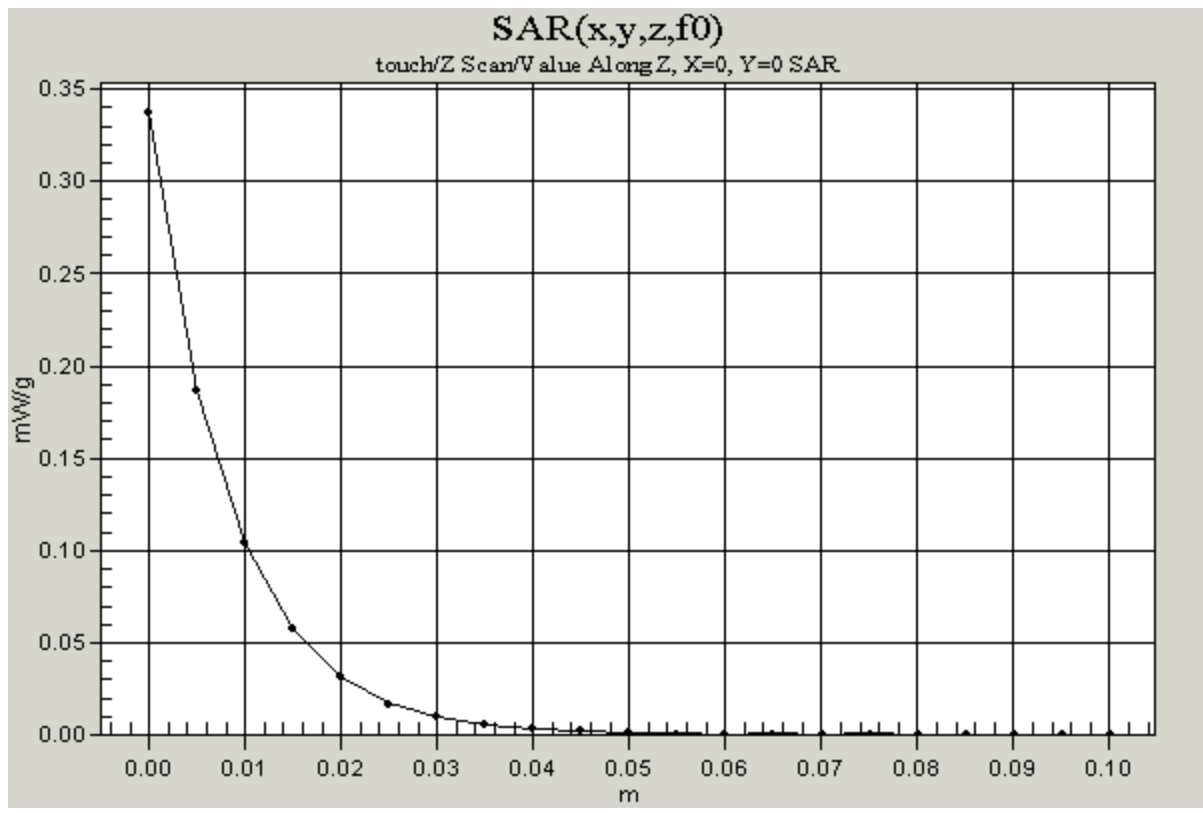
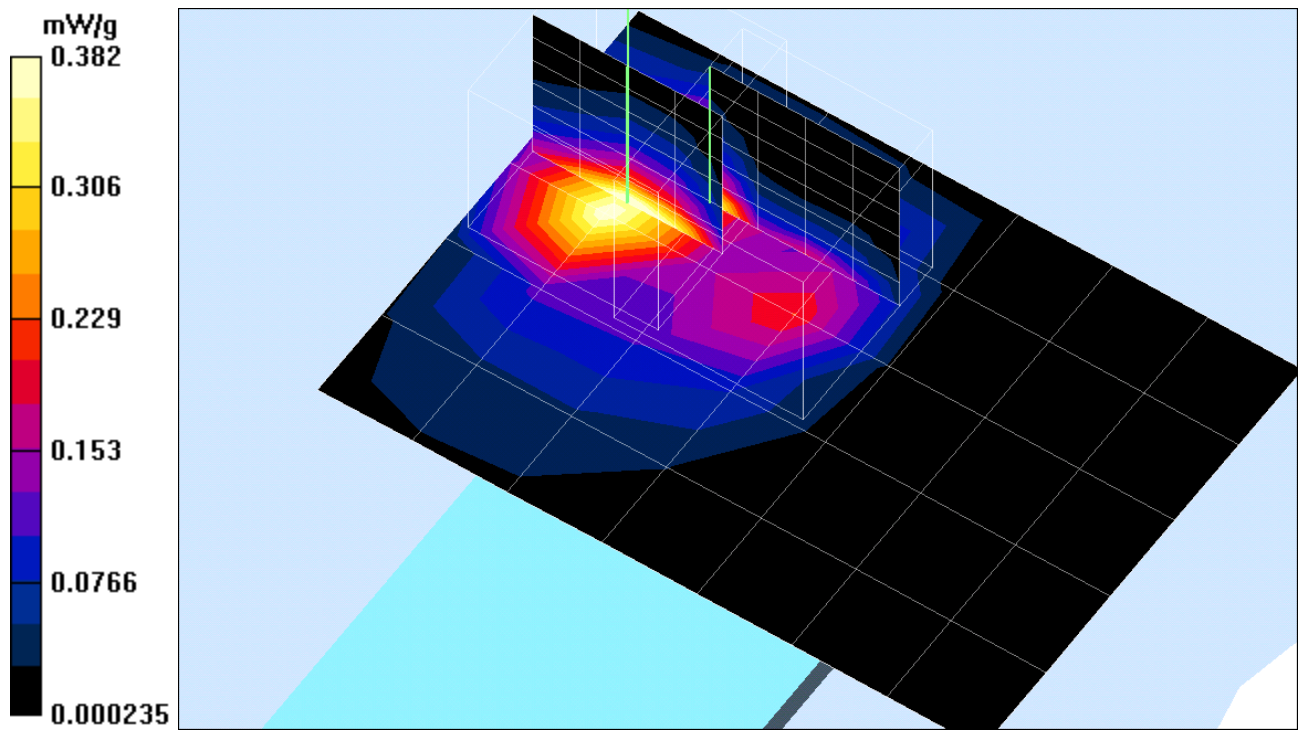
Peak SAR (extrapolated) = 0.612 W/kg

SAR(1 g) = 0.197 mW/g; SAR(10 g) = 0.0945 mW/g

Reference Value = 5.18 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.383 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

## WG2400-Touch mode-Ant1

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=5.5M bit CCK/Area Scan (10x5x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 5.77 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.255 mW/g

**mid Rate=5.5M bit CCK/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 5.77 V/m

Power Drift = -0.08 dB

Maximum value of SAR = 0.251 mW/g

**mid Rate=5.5M bit CCK/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

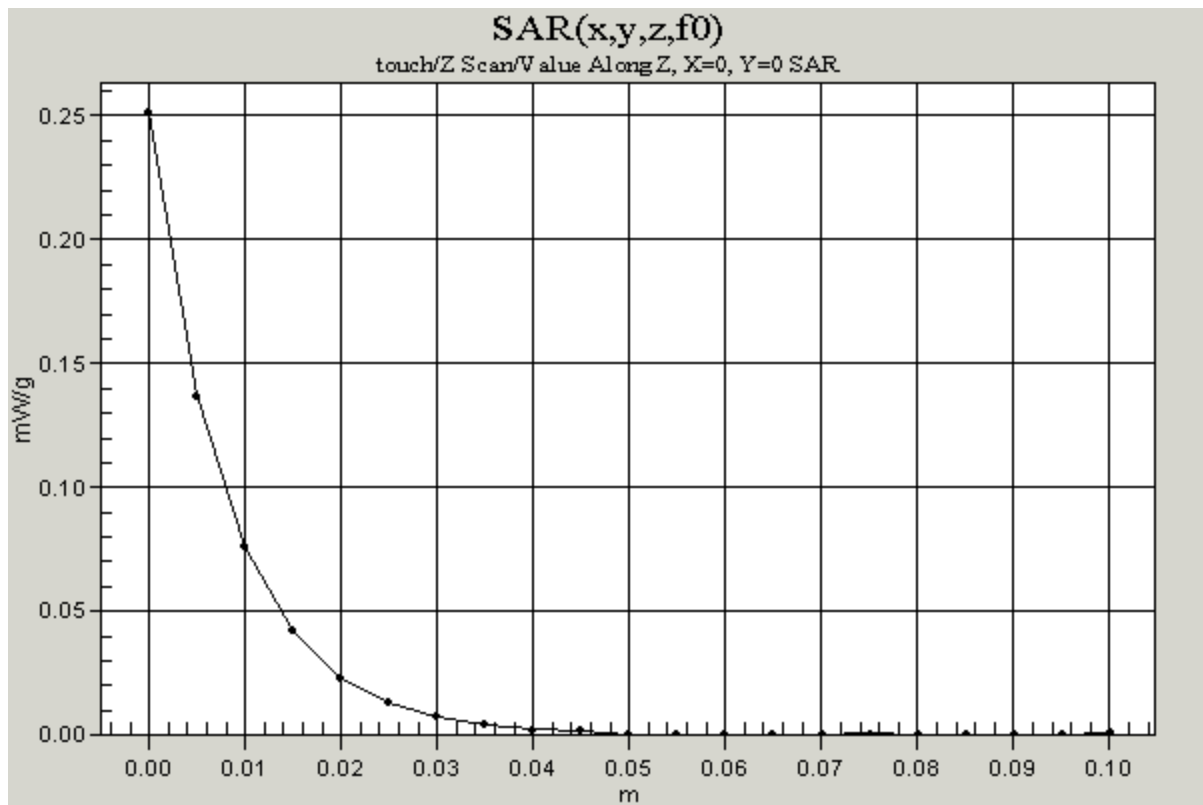
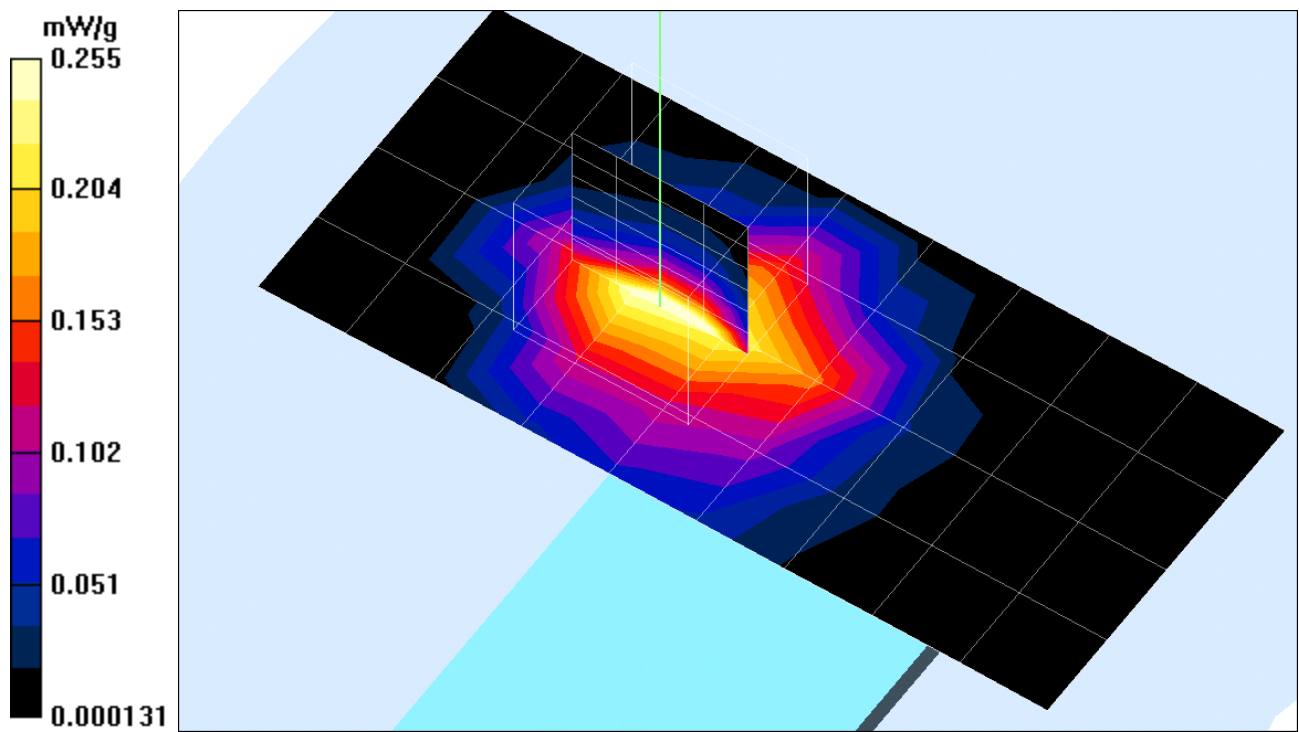
Peak SAR (extrapolated) = 0.629 W/kg

SAR(1 g) = 0.307 mW/g; SAR(10 g) = 0.145 mW/g

Reference Value = 5.77 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.322 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

## WG2400-Touch mode-Ant1

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=11M bit PBCC/Area Scan (9x5x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 5.46 V/m

Power Drift = 0.03 dB

Maximum value of SAR = 0.311 mW/g

**mid Rate=11M bit PBCC/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 5.46 V/m

Power Drift = 0.02 dB

Maximum value of SAR = 0.283 mW/g

**mid Rate=11M bit PBCC/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

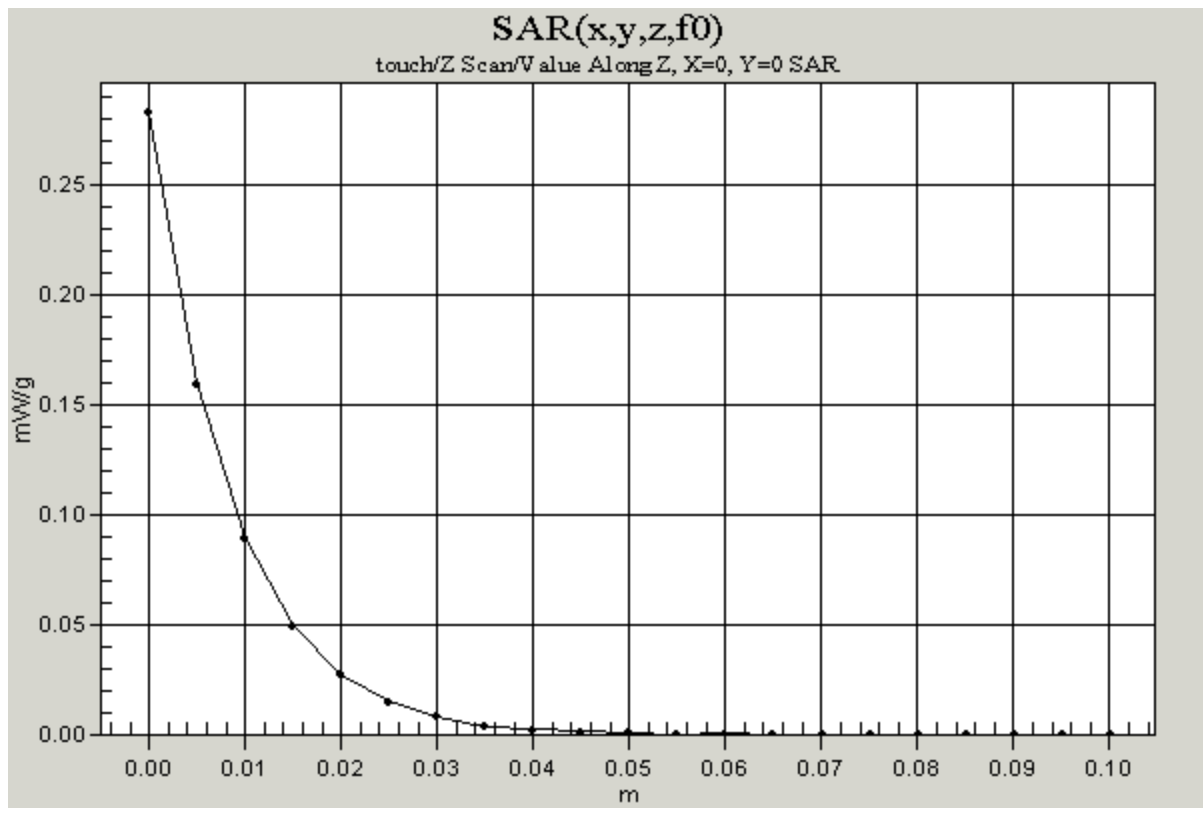
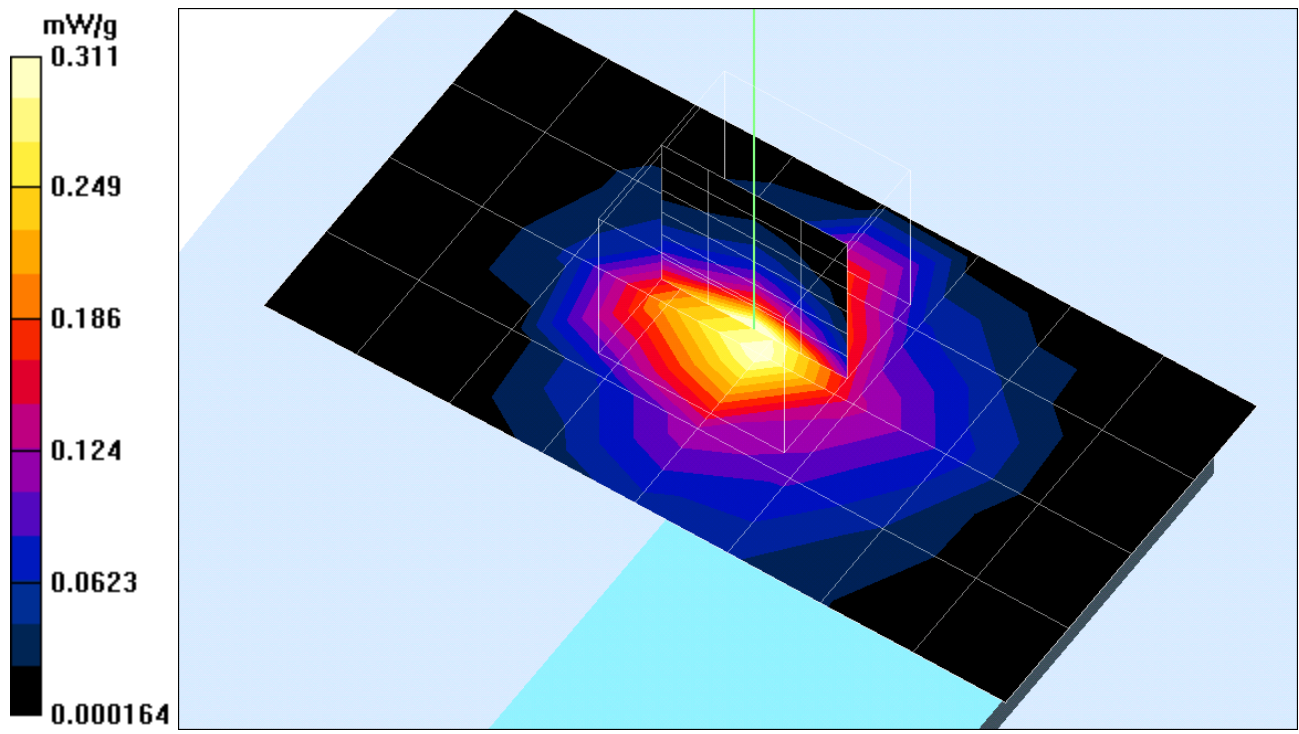
Peak SAR (extrapolated) = 0.629 W/kg

SAR(1 g) = 0.31 mW/g; SAR(10 g) = 0.148 mW/g

Reference Value = 5.46 V/m

Power Drift = 0.03 dB

Maximum value of SAR = 0.352 mW/g





Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant1.da4](#)

## WG2400-Touch mode-Ant1

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=22M bit/Area Scan (7x5x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 7.86 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.276 mW/g

**mid Rate=22M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 7.86 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.293 mW/g

**mid Rate=22M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

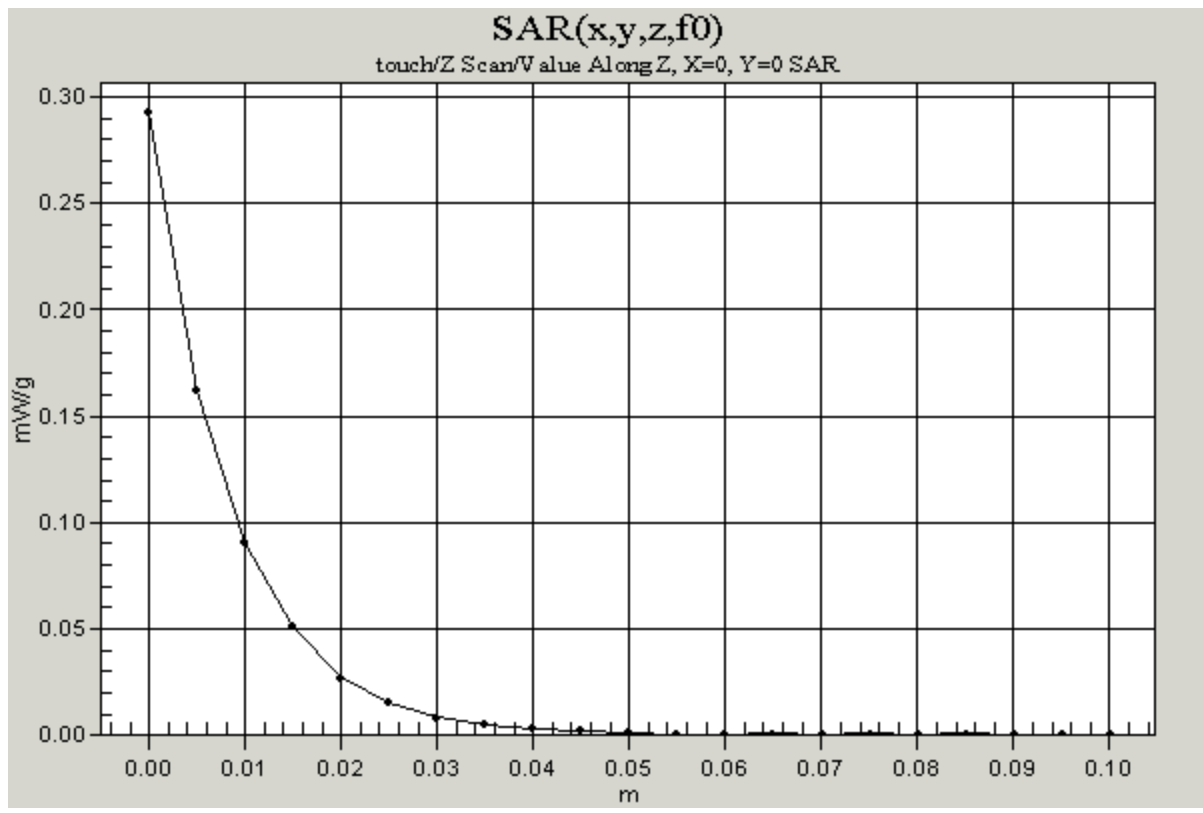
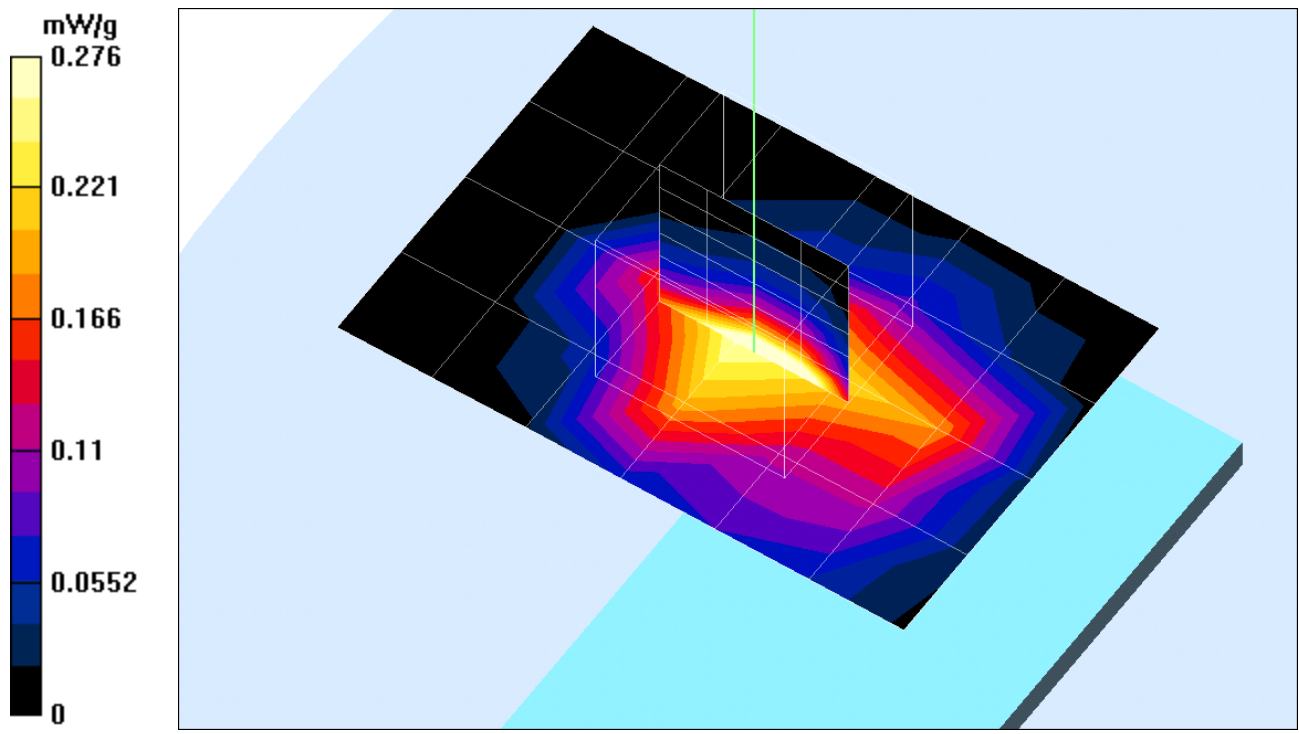
Peak SAR (extrapolated) = 0.713 W/kg

SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.165 mW/g

Reference Value = 7.86 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.374 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2.da4](#)

## WG2400-Touch mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Low Rate=1M bit/Area Scan (8x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 2.3 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.187 mW/g

**Low Rate=1M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 2.3 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.171 mW/g

**Low Rate=1M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

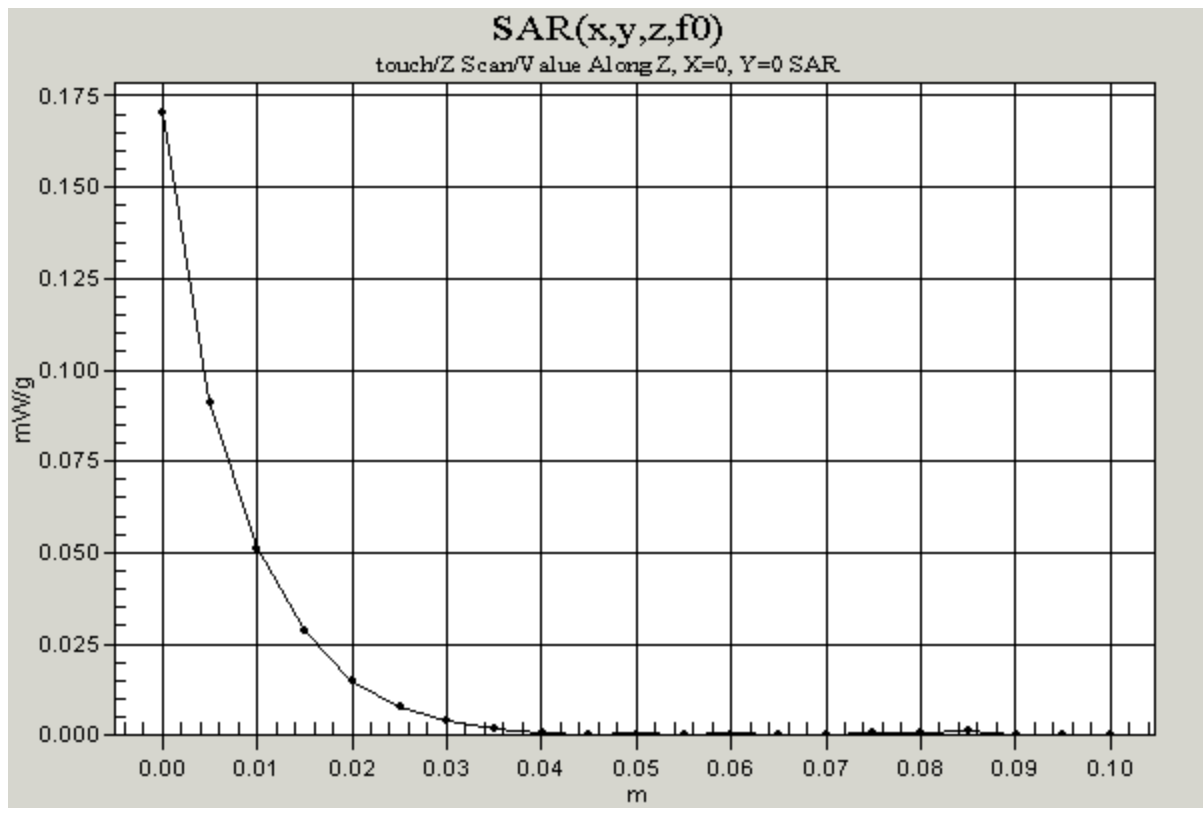
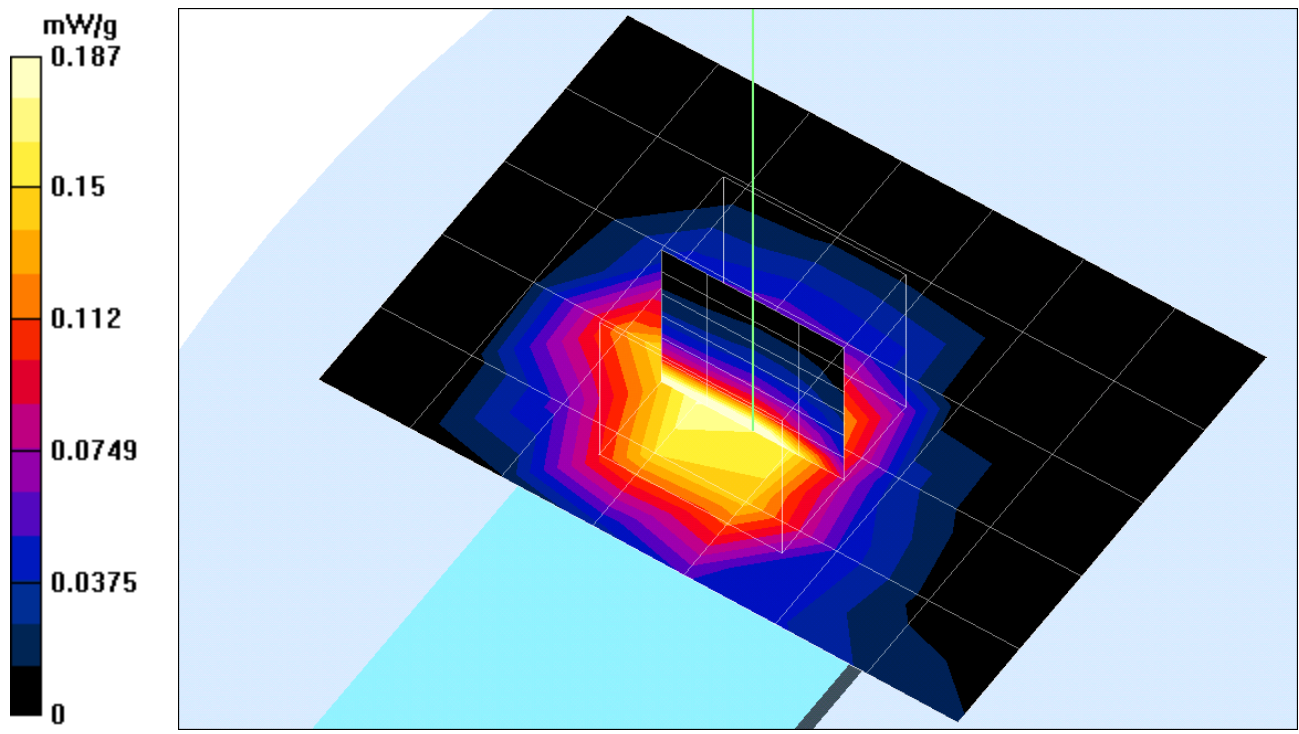
Peak SAR (extrapolated) = 0.443 W/kg

SAR(1 g) = 0.214 mW/g; SAR(10 g) = 0.112 mW/g

Reference Value = 2.3 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.223 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2.da4](#)

## WG2400-Touch mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956 \text{ mho/m}$ ,  $\epsilon_r = 51.0116$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=1M bit/Area Scan (9x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 3.15 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.405 mW/g

**mid Rate=1M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 3.15 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.321 mW/g

**mid Rate=1M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

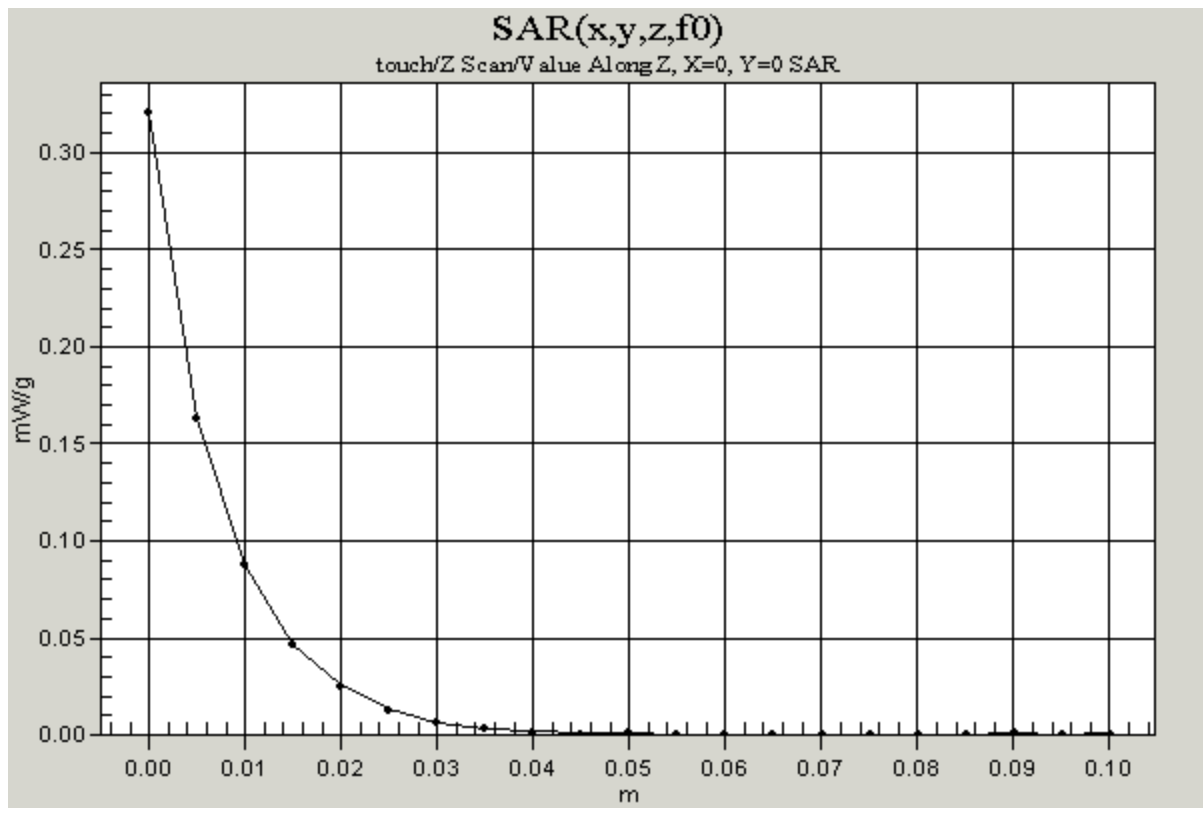
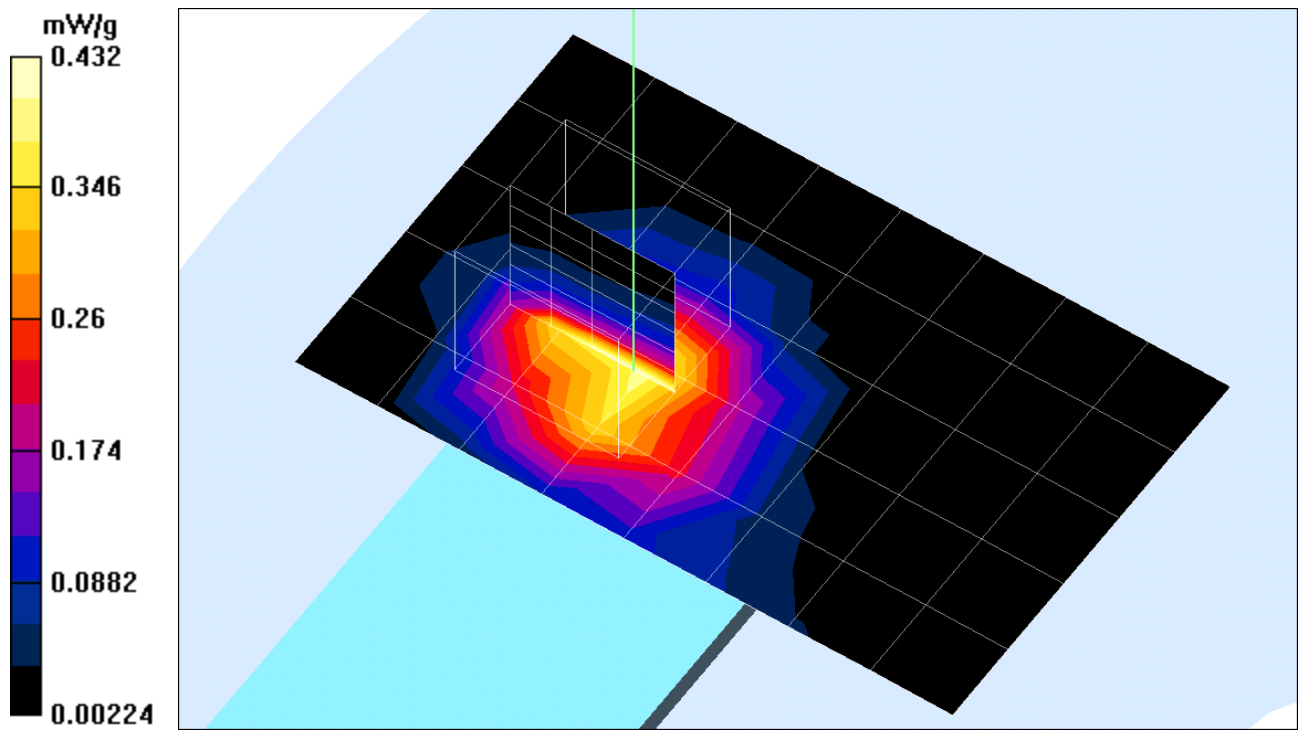
Peak SAR (extrapolated) = 0.899 W/kg

SAR(1 g) = 0.426 mW/g; SAR(10 g) = 0.219 mW/g

Reference Value = 3.15 V/m

Power Drift = 0.2 dB

Maximum value of SAR = 0.432 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2.da4](#)

## WG2400-Touch mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11b WLAN cf card; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**High Rate=1M bit 2/Area Scan (9x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 3.95 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.381 mW/g

**High Rate=1M bit 2/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 3.95 V/m

Power Drift = 0.001 dB

Maximum value of SAR = 0.334 mW/g

**High Rate=1M bit 2/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

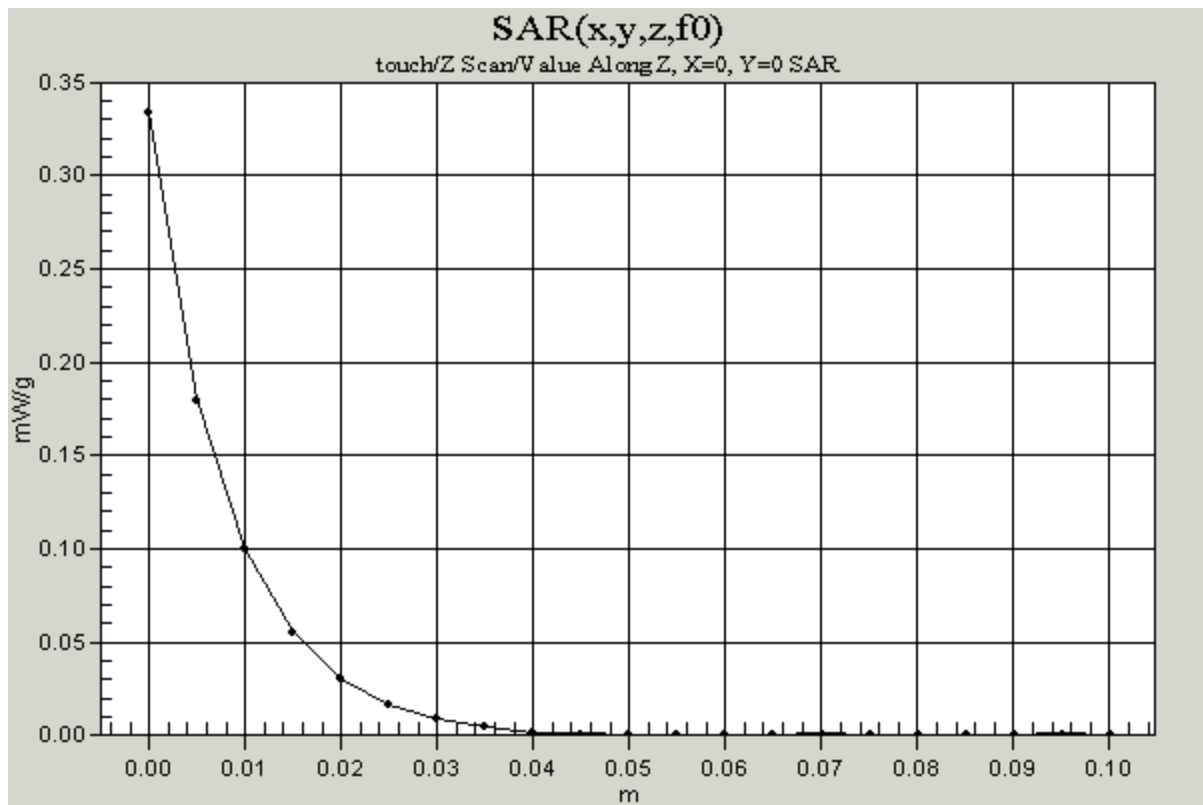
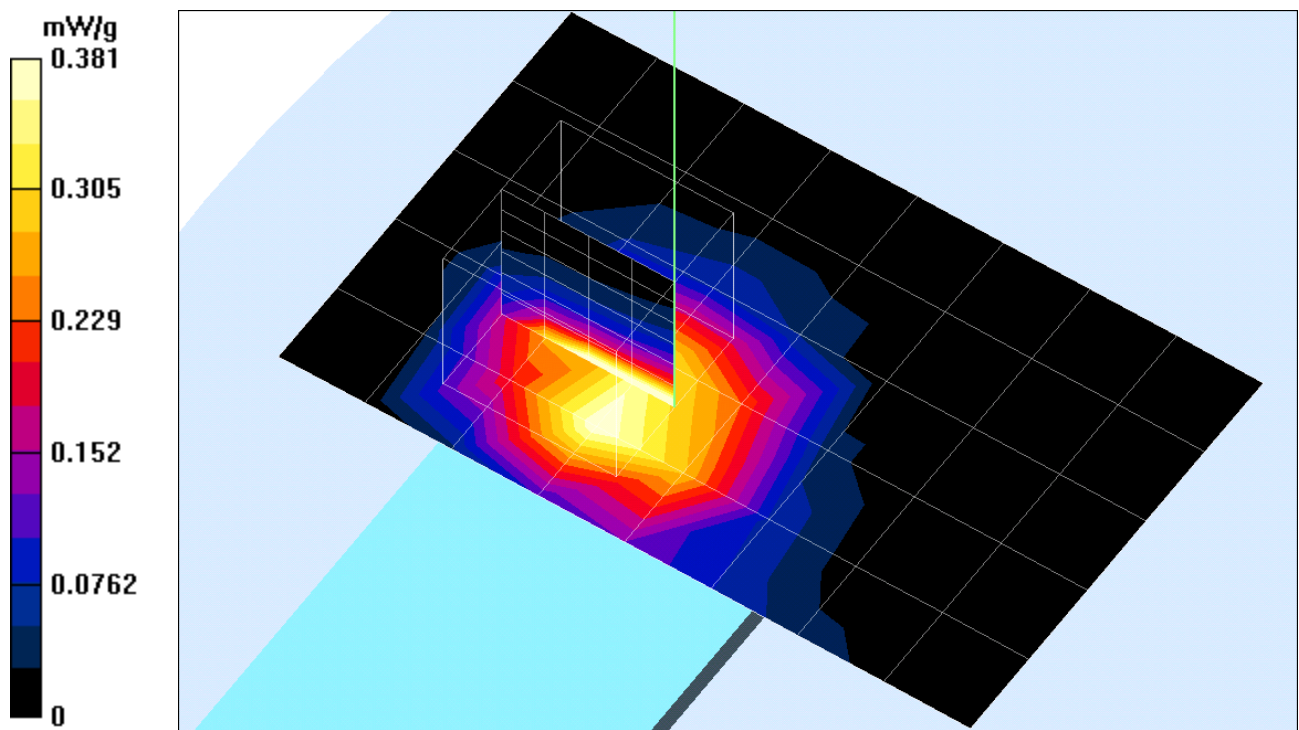
Peak SAR (extrapolated) = 0.876 W/kg

SAR(1 g) = 0.417 mW/g; SAR(10 g) = 0.212 mW/g

Reference Value = 3.95 V/m

Power Drift = -0.01 dB

Maximum value of SAR = 0.435 mW/g





Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2-G mode.da4](#)

## WG2400-Touch mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11G WLAN cf card; Frequency: 2412 MHz;Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature:26.0 deg C;Liquid Temperature:24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**low/Area Scan (9x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 2.26 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.18 mW/g

**low/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 2.26 V/m

Power Drift = -0.2

Maximum value of SAR = 0.138 mW/g

**low/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

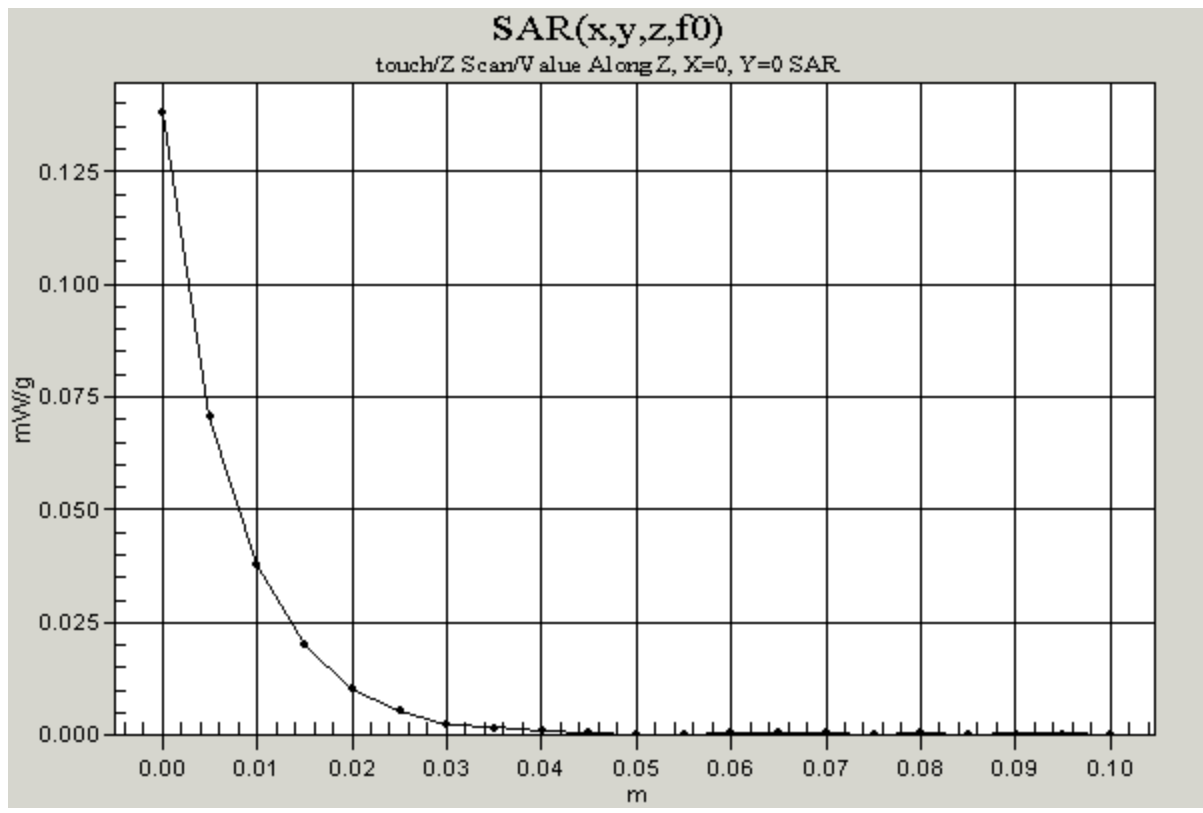
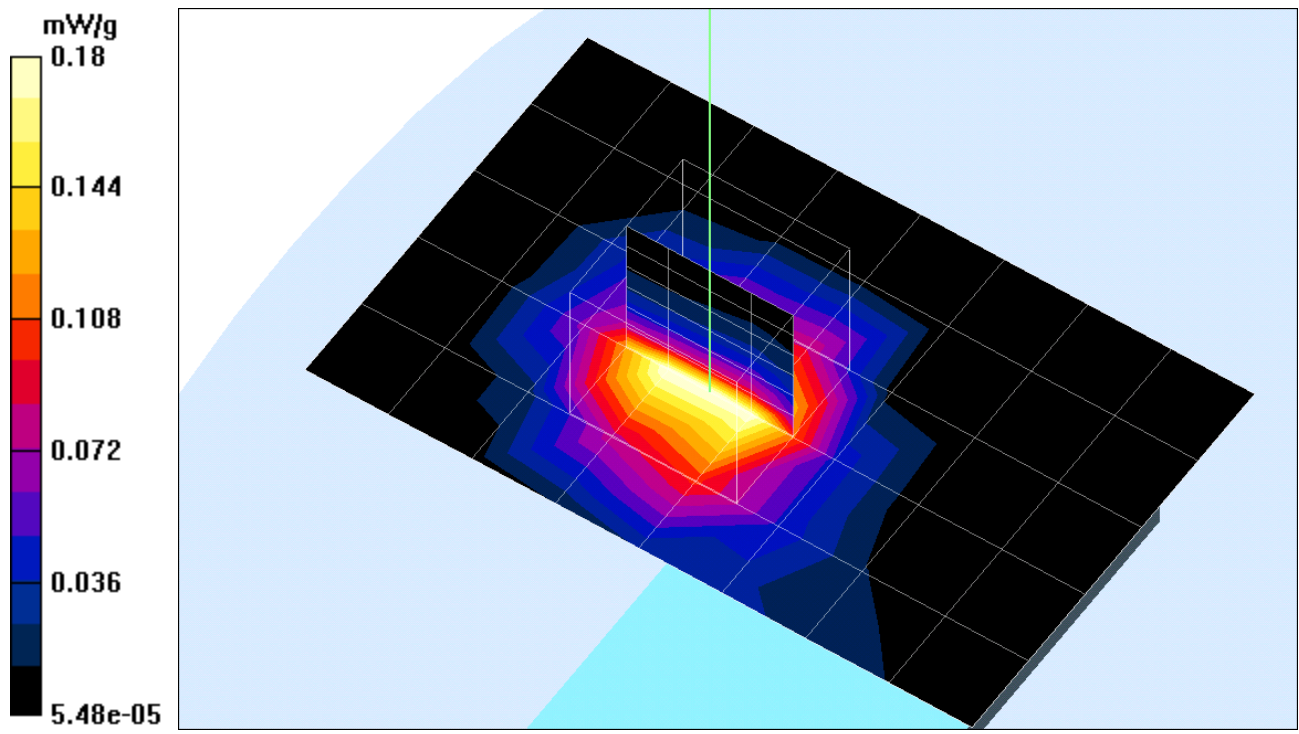
Peak SAR (extrapolated) = 0.369 W/kg

SAR(1 g) = 0.178 mW/g; SAR(10 g) = 0.092 mW/g

Reference Value = 2.26 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.184 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2-G mode.da4](#)

## WG2400-Touch mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11G WLAN cf card; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature:26.0 deg C;Liquid Temperature:24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid /Area Scan (9x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 3.12 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.278 mW/g

**mid /Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 3.12 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.214 mW/g

**mid /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

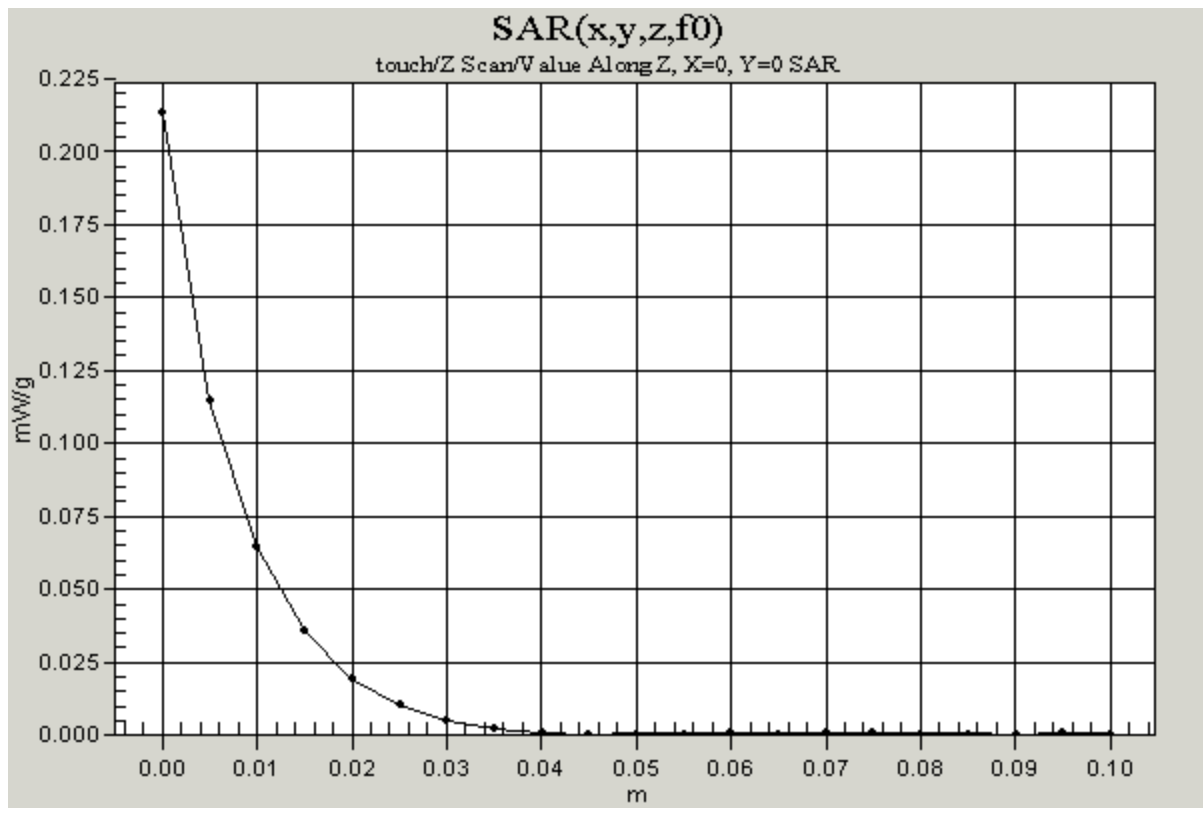
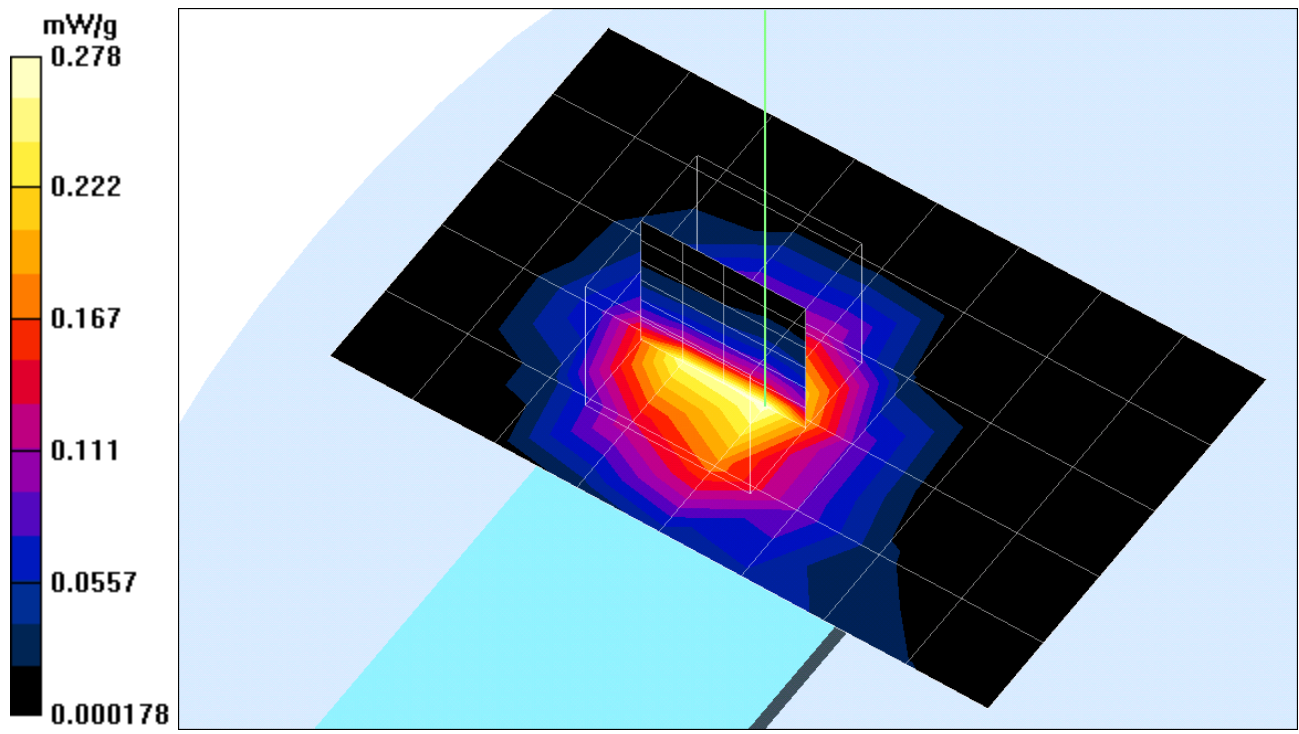
Peak SAR (extrapolated) = 0.565 W/kg

SAR(1 g) = 0.269 mW/g; SAR(10 g) = 0.14 mW/g

Reference Value = 3.12 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.278 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-Touch mode-Ant2-G mode.da4](#)

## WG2400-Touch mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: touch**

Communication System: 802.11G WLAN cf card; Frequency: 2462 MHz;Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature:26.0 deg C;Liquid Temperature:24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**High/Area Scan (9x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 1.37 V/m

Power Drift = -0.09 dB

Maximum value of SAR = 0.185 mW/g

**High/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 1.37 V/m

Power Drift = -0.03 dB

Maximum value of SAR = 0.175 mW/g

**High/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

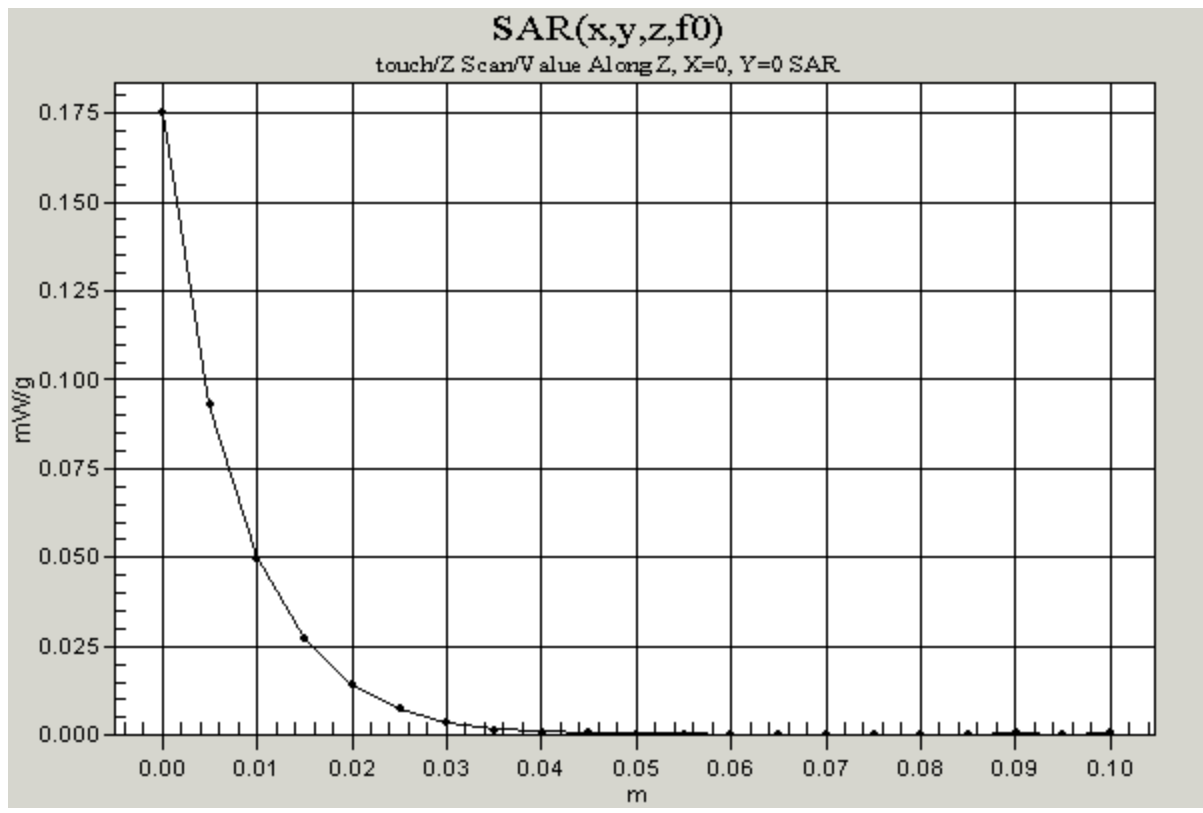
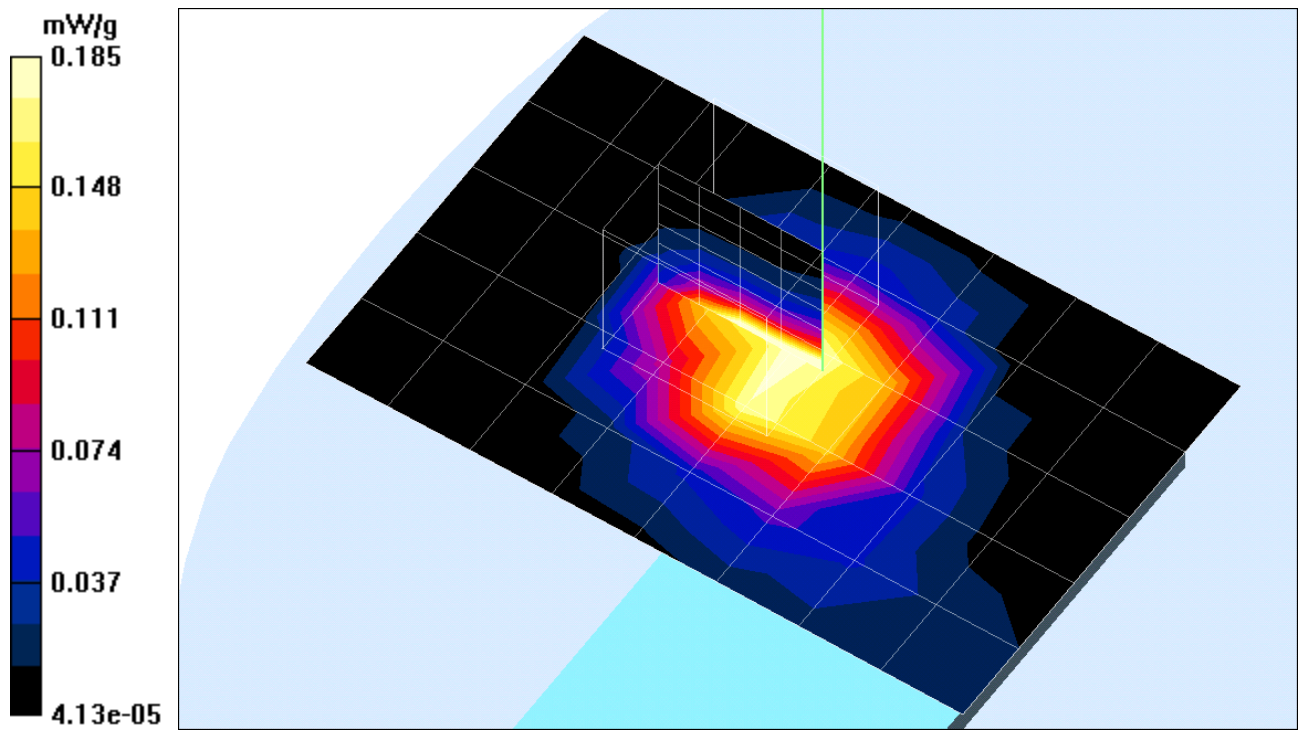
Peak SAR (extrapolated) = 0.457 W/kg

SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.103 mW/g

Reference Value = 1.37 V/m

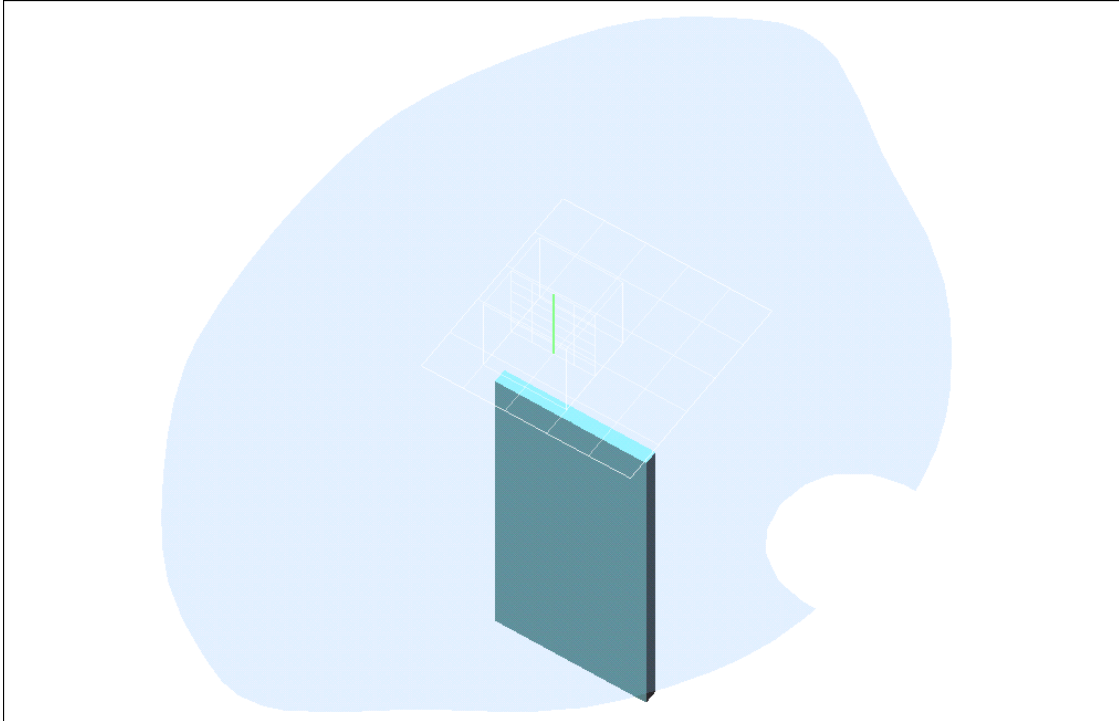
Power Drift = -0.09 dB

Maximum value of SAR = 0.228 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2.da4](#)

# Test Configuration2



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2.da4](#)

## WG2400-15mm mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Low Rate=1M bit/Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 6.66 V/m

Power Drift = 0.04 dB

Maximum value of SAR = 0.0937 mW/g

**Low Rate=1M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 6.66 V/m

Power Drift = 0.01 dB

Maximum value of SAR = 0.0793 mW/g

**Low Rate=1M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Peak SAR (extrapolated) = 0.186 W/kg

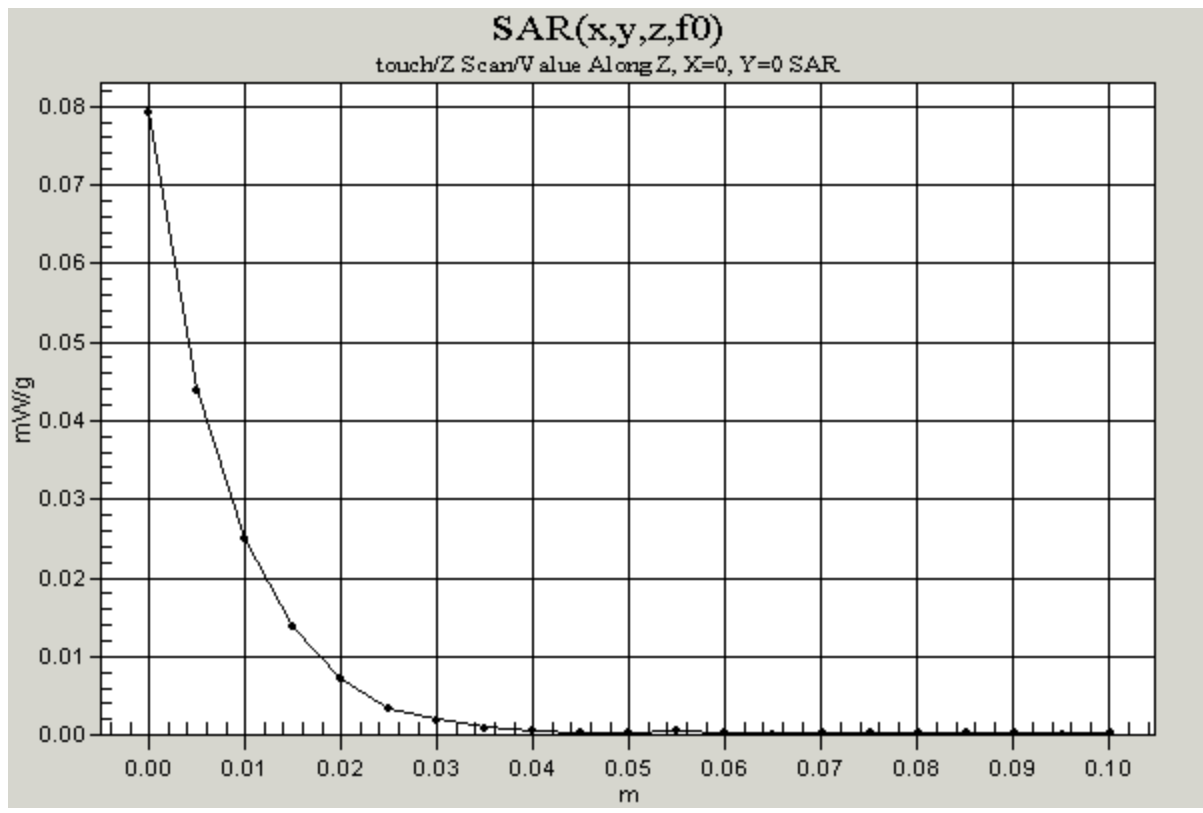
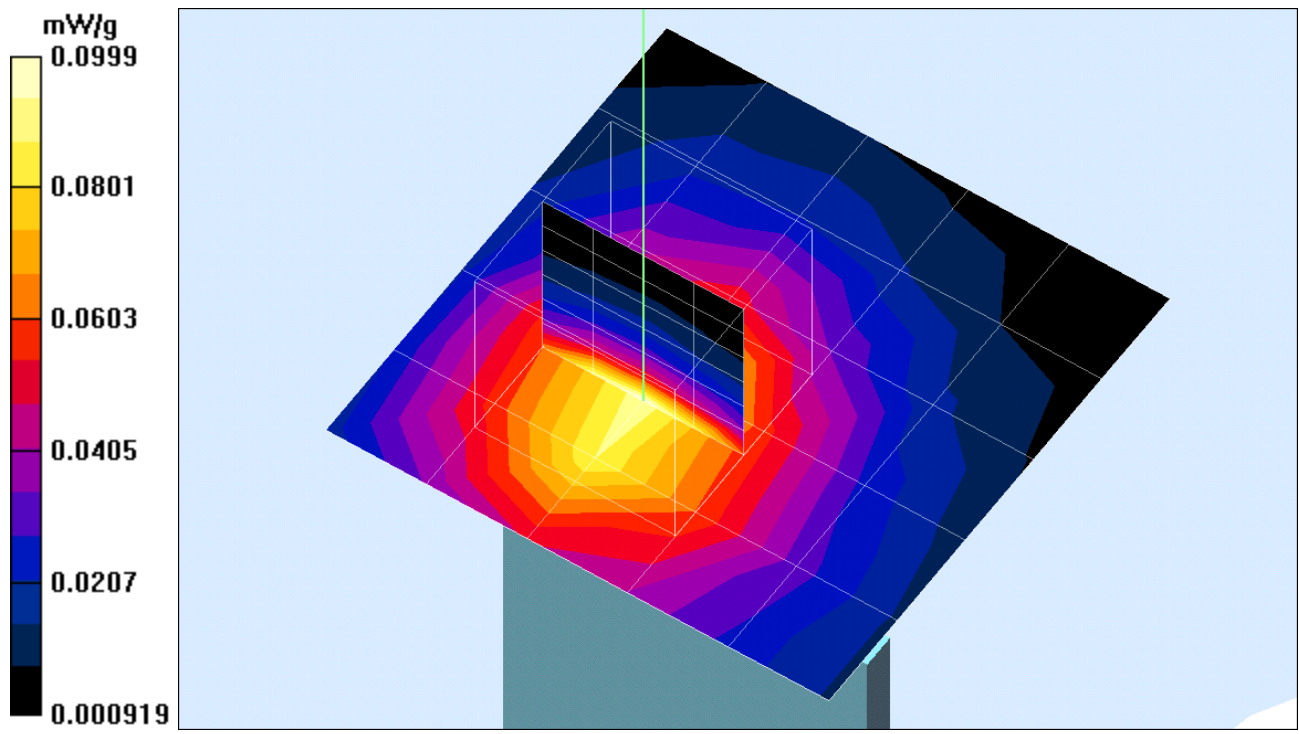
SAR(1 g) = 0.0956 mW/g; SAR(10 g) = 0.0523 mW/g

Reference Value = 6.66 V/m

Power Drift = 0.04 dB

Maximum value of SAR = 0.0999 mW/g





Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2.da4](#)

## WG2400-15mm mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid Rate=1M bit/Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 9.47 V/m

Power Drift = 0.003 dB

Maximum value of SAR = 0.173 mW/g

**mid Rate=1M bit/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 9.47 V/m

Power Drift = 0.003 dB

Maximum value of SAR = 0.155 mW/g

**mid Rate=1M bit/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

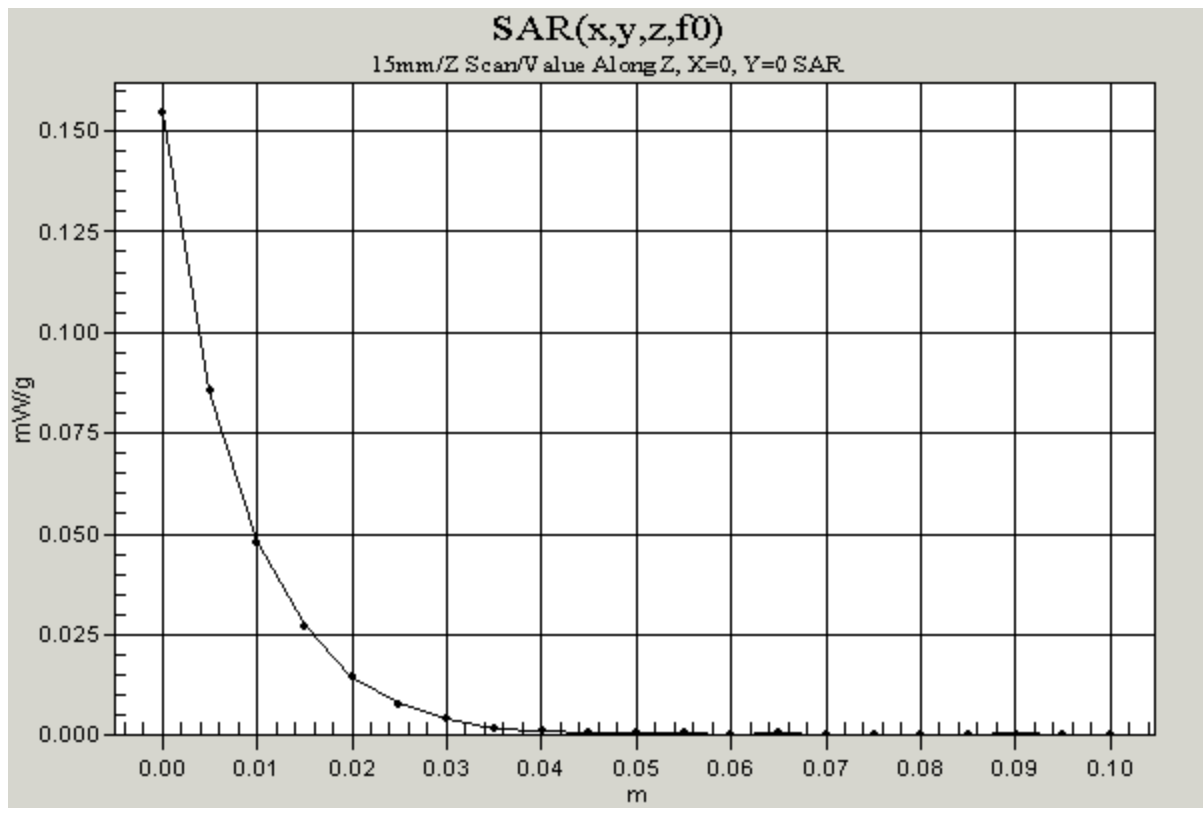
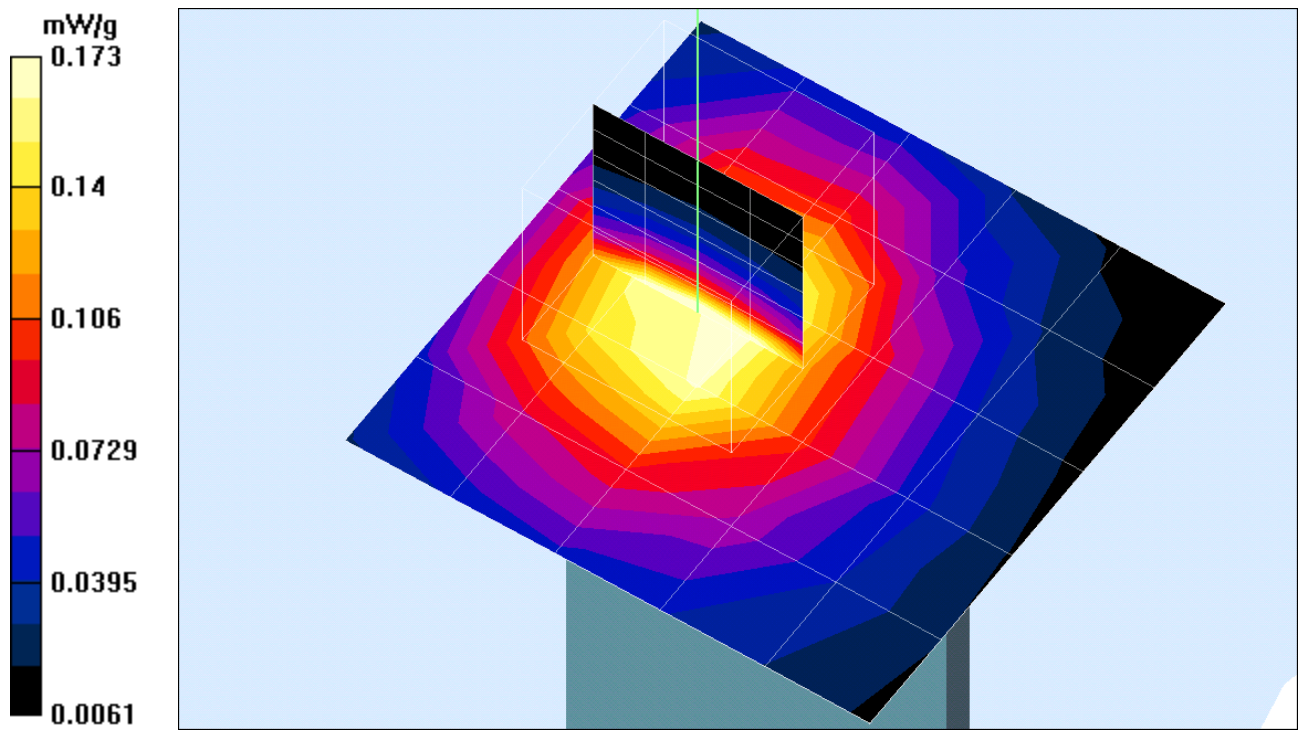
Peak SAR (extrapolated) = 0.371 W/kg

SAR(1 g) = 0.189 mW/g; SAR(10 g) = 0.104 mW/g

Reference Value = 9.47 V/m

Power Drift = 0.003 dB

Maximum value of SAR = 0.198 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2.da4](#)

## WG2400-15mm mode-Ant2

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**High Rate=1M bit 2/Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 5.15 V/m

Power Drift = -0.001 dB

Maximum value of SAR = 0.0612 mW/g

**High Rate=1M bit 2/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 5.15 V/m

Power Drift = -0.005 dB

Maximum value of SAR = 0.049 mW/g

**High Rate=1M bit 2/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

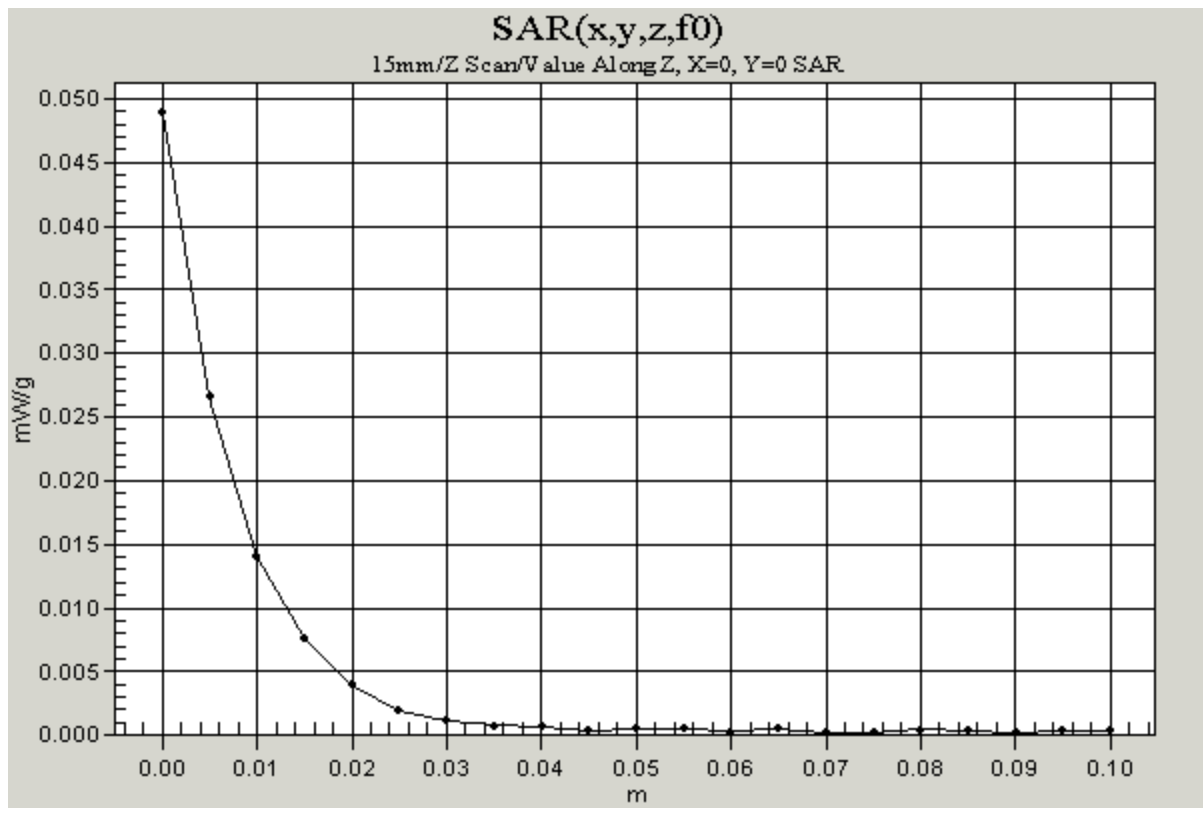
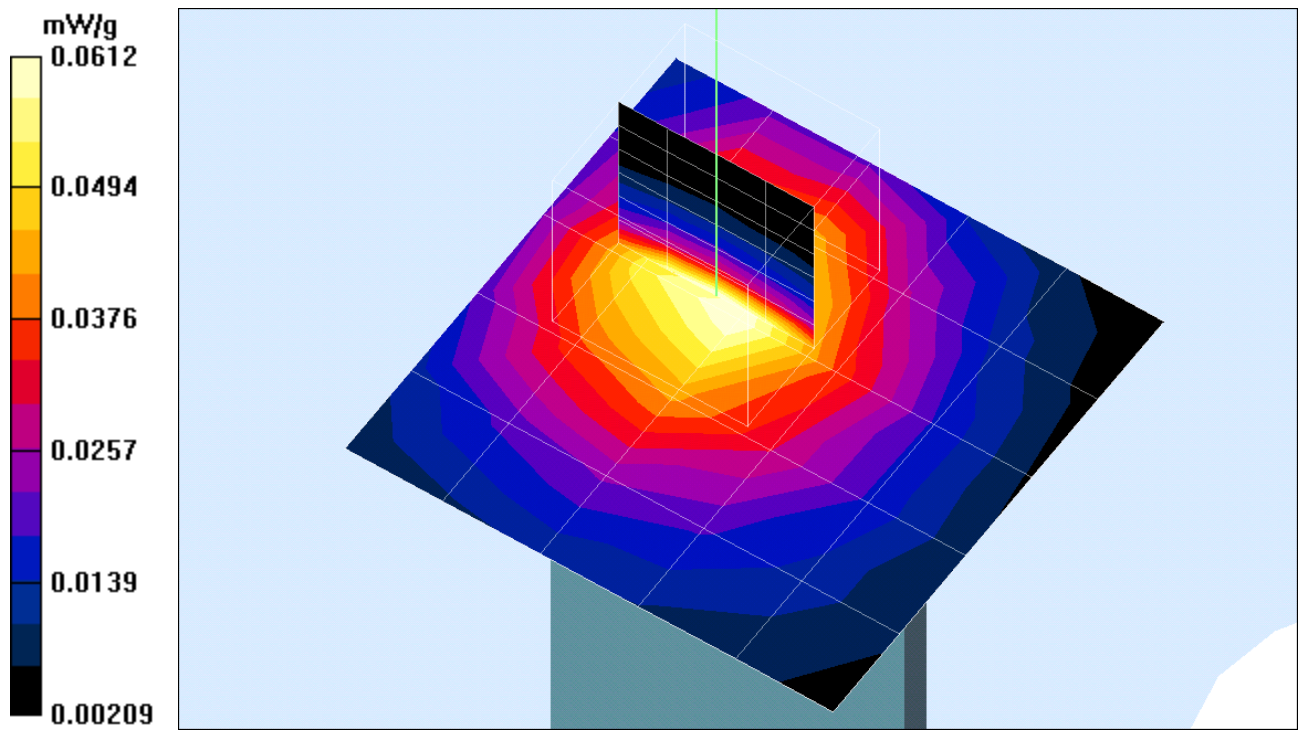
Peak SAR (extrapolated) = 0.121 W/kg

SAR(1 g) = 0.0605 mW/g; SAR(10 g) = 0.0329 mW/g

Reference Value = 5.15 V/m

Power Drift = -0.001 dB

Maximum value of SAR = 0.0636 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2-G mode.da4](#)

## WG2400-15mm mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956$  mho/m,  $\epsilon_r = 51.0116$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Low /Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 4.57 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0412 mW/g

**Low /Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 4.57 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0335 mW/g

**Low /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

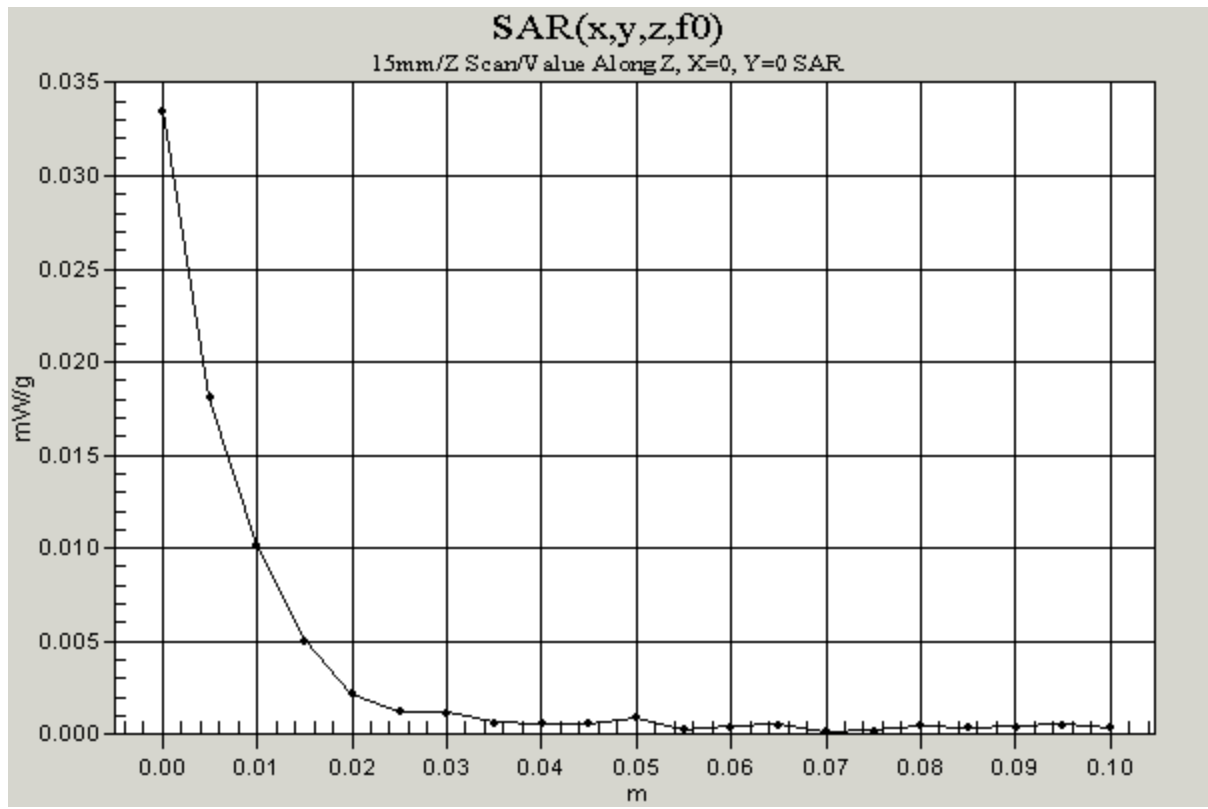
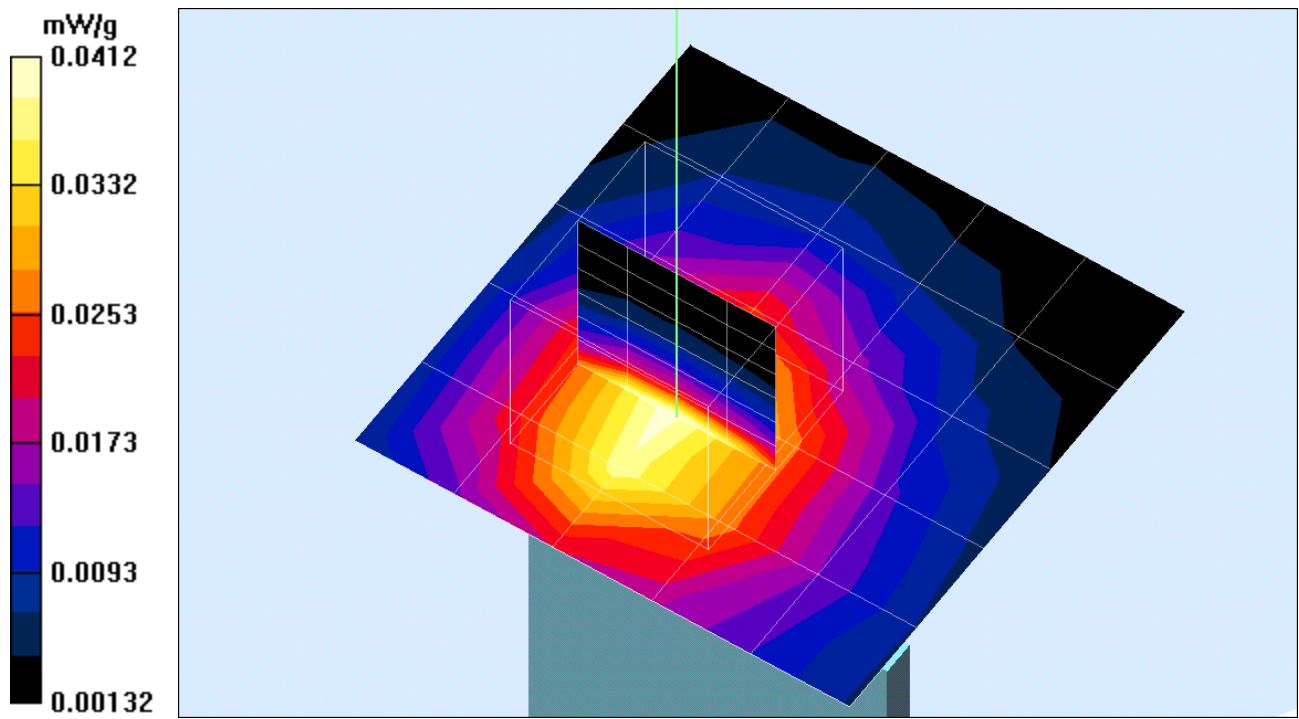
Peak SAR (extrapolated) = 0.0802 W/kg

SAR(1 g) = 0.0405 mW/g; SAR(10 g) = 0.0219 mW/g

Reference Value = 4.57 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0422 mW/g



Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2-G mode.da4](#)

## WG2400-15mm mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956 \text{ mho/m}$ ,  $\epsilon_r = 51.0116$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**mid /Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 5.04 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0475 mW/g

**mid/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 5.04 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0392 mW/g

**mid /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Peak SAR (extrapolated) = 0.0962 W/kg

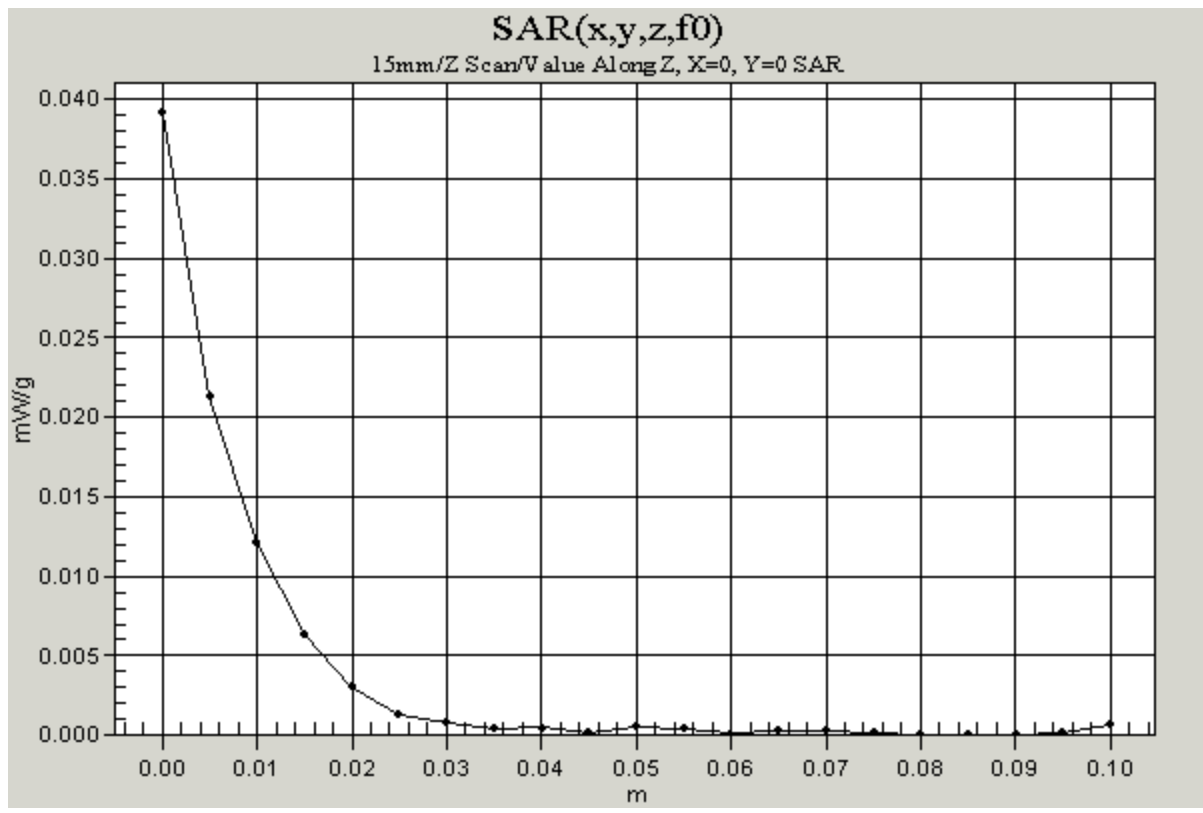
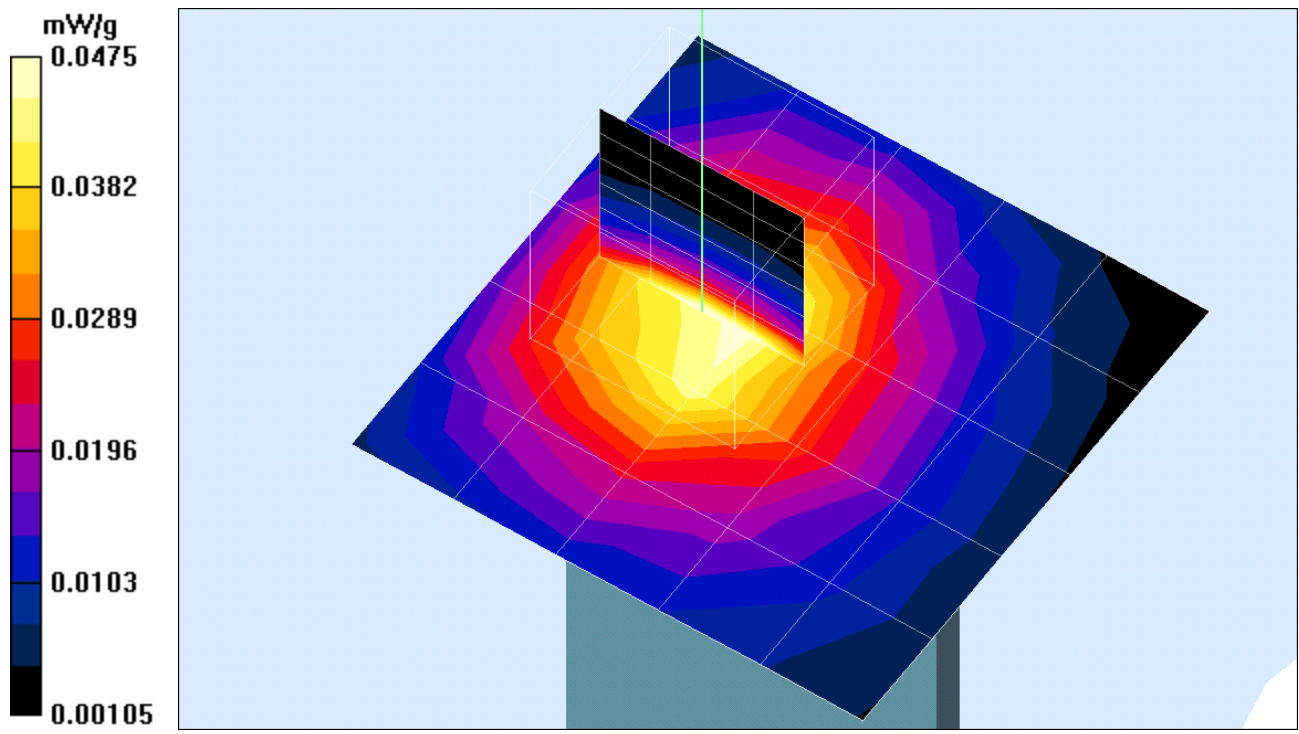
SAR(1 g) = 0.0483 mW/g; SAR(10 g) = 0.0261 mW/g

Reference Value = 5.04 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0502 mW/g





Test Laboratory: Compliance Certification Services Inc.  
File Name: [WG2400-15mm mode-Ant2-G mode.da4](#)

## WG2400-15mm mode-Ant2-G mode

**DUT: Wireless LAN Cardbus PC Card (802.11 b/g); Type: WG2400; Serial: N/A**  
**Program: 15mm**

Communication System: 802.11b WLAN cf card; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: BSL2450 ( $\sigma = 1.956 \text{ mho/m}$ ,  $\epsilon_r = 51.0116$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Air Temperature: 26.0 deg C; Liquid Temperature: 24.7 deg C

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1762; ConvF(4.6, 4.6, 4.6); Calibrated: 3/31/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)  
Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn558; Calibrated: 3/7/2003
- Phantom: SAM 34; Type: SAM V4.0; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**High /Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 3.3 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0211 mW/g

**High /Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Reference Value = 3.3 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0191 mW/g

**High /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm,

dz=5mm

Peak SAR (extrapolated) = 0.0502 W/kg

SAR(1 g) = 0.0243 mW/g; SAR(10 g) = 0.0126 mW/g

Reference Value = 3.3 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0253 mW/g

