



**UL Apex Co., Ltd.**

Test report No. : 24GE0195-HO-1  
Page : 1 of 66  
Issued date : May 17, 2004  
Revised date : June 25, 2004  
FCC ID : MMFMB200-W1

## **SAR EVALUATION REPORT**

**Report No. : 24GE0195-HO-1**

**Applicant** : SATO CORPORATION  
**Type of Equipment** : Wireless LAN SiP Module  
**Model No.** : WM-B-AG-02  
**FCC ID** : MMFMB200-W1  
**Test standard** : FCC47CFR 2.1093  
FCC OET Bulletin 65, Supplement C  
**Test Result** : Complied  
**Max SAR Measured** : 0.449W/kg( Body, 2412MHz and 2437MHz )

1. This test report shall not be reproduced except full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

**Date of test** : May 11, 2004

**Tested by** : Miyo Ikuta  
Miyo Ikuta  
Head Office EMC Lab.

**Approved by** : Tetsuo Maeno  
Tetsuo Maeno  
Site Manager of Head Office EMC Lab.

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## **SECTION 1 : Client information**

Company Name : SATO CORPORATION  
Brand Name : SATO  
Address : 1-207,Onari-cho,Omiya-ku,Saitama-shi,Saitama 330-0852, Japan  
Telephone Number : +81-48-663-8118  
Facsimile Number : +81-48-651-6662  
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## **SECTION 2 : Equipment under test**

### **2.1 Identification of EUT**

Applicant : SATO CORPORATION  
Type of Equipment : Wireless LAN SiP Module  
Model No. : WM-B-AG-02  
Serial No. : No.7  
Country of Manufacture : Japan  
Receipt Date of Sample : May 10,2004  
Condition of EUT : Engineering prototype  
(Not for sale: This sample is equivalent to mass-produced items.)  
Category Identified : Portable device

### **2.2 Product description of EUT**

Tx Frequency : 2412MHz~2462MHz  
Modulation : DSSS (IEEE802.11b)  
Rating : DC 3.3 V  
Max.Output Power Tested : 15.51 dBm Peak Conducted  
Antenna Type : chip Antena



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### **SECTION 3 : 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. 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. 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.

- 1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
- 2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

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### **SECTION 4 : Dosimetry assessment setup**

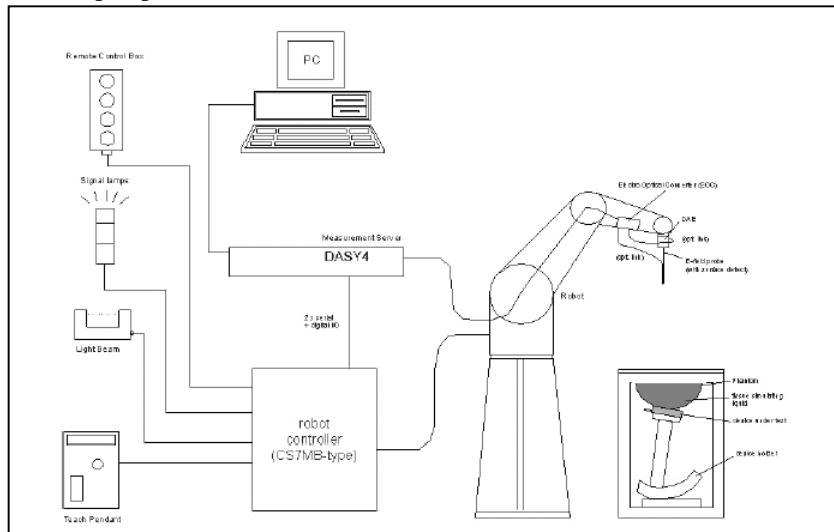
These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. 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 dosimetry probe ET3DV6, SN: 1685 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN50361.

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#### 4.1 Configuration and peripherals



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

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.  
An arm extension for accommodating the data acquisition electronics (DAE).
2. 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.
3. A data acquisition electronic (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.
4. 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.
5. 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.
6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
7. A computer operating Windows 2000.
8. DASY4 software.
9. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
10. The SAM twin phantom enabling testing left-hand and right-hand usage.
11. The device holder for handheld mobile phones.
12. Tissue simulating liquid mixed according to the given recipes.
13. Validation dipole kits allowing to validate the proper functioning of the system.

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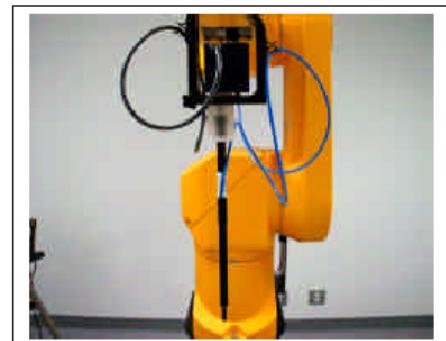
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## 4.2 System components

### 4.2.1 ET3DV6 Probe Specification

#### **Construction:**

Symmetrical design with triangular core  
 Built-in optical fiber for surface detection System  
 Built-in shielding against static charges  
 PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)



#### **Calibration:**

Basic Broad Band calibration in air from 10 MHz to 2.5 GHz  
 In brain and muscle simulating tissue at  
 Frequencies of 450 MHz, 900 MHz, 1.8 GHz and 2.45GHz (accuracy +/-8%)

#### **Frequency:**

10 MHz to 3GHz; 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 probe axis)



#### **Dynamic Range:**

5 mW/g to > 100 mW/g; Linearity: +/-0.2 dB

#### **Optical Surface Detection:**

+/-0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.

#### **Dimensions:**

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

#### **Application:**

General dosimetric up to 3 GHz  
 Compliance tests of mobile phones  
 Fast automatic scanning in arbitrary phantoms

**Inside view of  
 ET3DV6 E-field Probe**

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#### 4.2.2 SAM Phantom

**Construction:**

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC EN 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:**

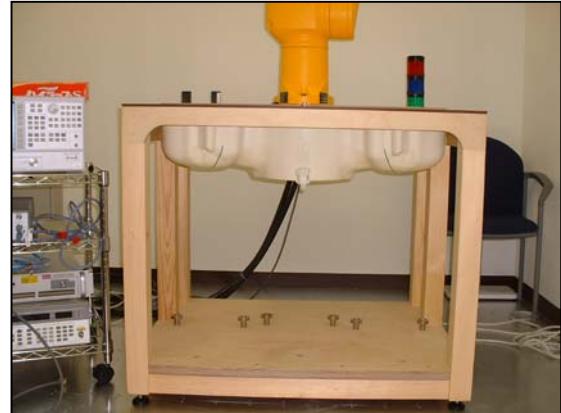
2 +/-0.2 mm

**Filling Volume:**

Approx. 25 liters

**Dimensions:**

(H x L x W): 810 x 1000 x 500 mm



**SAM Phantom**

#### 4.2.3 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter

in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

\* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.

To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Device holder couldn't be used at this SAR measurement.



**Device Holder**

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## **SECTION 5 : Test system specifications**

### **Robot RX60L**

<b>Number of Axes</b>	:	6
<b>Payload</b>	:	1.6 kg
<b>Reach</b>	:	800mm
<b>Repeatability</b>	:	+/-0.025mm
<b>Control Unit</b>	:	CS7M
<b>Programming Language</b>	:	V+
<b>Manufacture</b>	:	Stäubli Unimation Corp. Robot Model: RX60

### **DASY4 Measurement sever**

<b>Features</b>	:	166MHz low power Pentium MMX 32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision) 16 Bit A/D converter for surface detection system Two serial links to robot (one for real-time communication which is supervised by watchdog) Ethernet link to PC (with watchdog supervision) Emergency stop relay for robot safety chain Two expansion slots for future applications
<b>Manufacture</b>	:	Schimid & Partner Engineering AG

### **Data Acquisition Electronic (DAE)**

<b>Features</b>	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
<b>Measurement Range</b>	:	1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV) < 1 µV (with auto zero)
<b>Input Offset voltage</b>	:	200 MΩ
<b>Input Resistance</b>	:	> 10 h of operation (with two 9 V battery)
<b>Battery Power</b>	:	60 x 60 x 68 mm
<b>Dimension</b>	:	Schimid & Partner Engineering AG
<b>Manufacture</b>	:	

### **Software**

<b>Item</b>	:	Dosimetric Assesment System DASY4
<b>Type No.</b>	:	SD 000 401A, SD 000 402A
<b>Software version No.</b>	:	4.1
<b>Manufacture / Origin</b>	:	Schimid & Partner Engineering AG

### **E-Field Probe**

<b>Model</b>	:	ET3DV6
<b>Serial No.</b>	:	1685
<b>Construction</b>	:	Triangular core fiber optic detection system
<b>Frequency</b>	:	10 MHz to 6 GHz
<b>Linearity</b>	:	+/-0.2 dB (30 MHz to 3 GHz)
<b>Manufacture</b>	:	Schimid & Partner Engineering AG

### **Phantom**

<b>Type</b>	:	SAM Twin Phantom V4.0
<b>Shell Material</b>	:	Fiberglass
<b>Thickness</b>	:	2.0 +/-0.2 mm
<b>Volume</b>	:	Approx. 25 liters
<b>Manufacture</b>	:	Schimid & Partner Engineering AG

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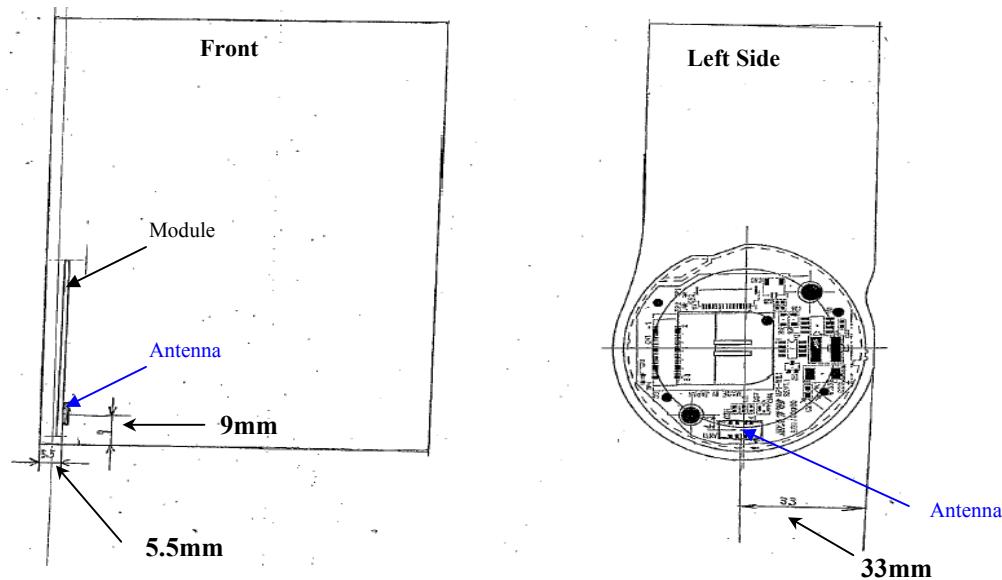
## SECTION 6 : Measurement outline

This EUT will be inserted into only printers.

Printer model MB200 is the worst model of all printers( the printers can be installed with EUT) produced by SATO in that the distance between the surface of printer and transmitting antenna is shortest (5.5mm).  
The detail of printer model MB200 is shown in the following.

### 6.1 Information of printer model MB200

Type of Equipment : Printer  
Model No. : MB200  
Serial No. : 30680456  
Manufacture : SATO



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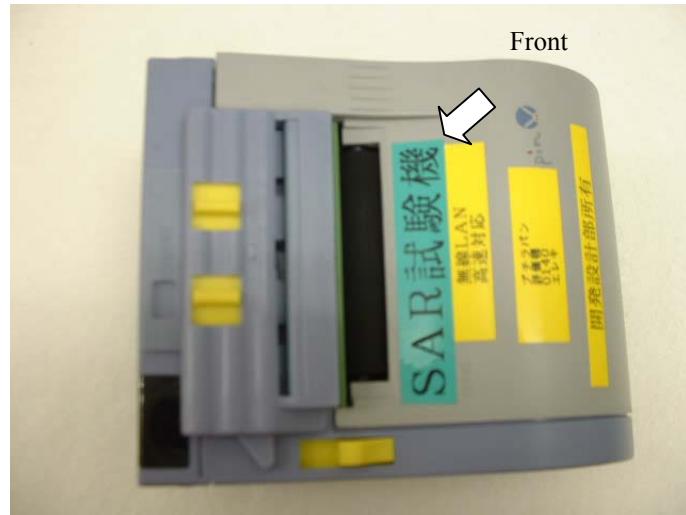
## **SECTION 7 : Test setup of EUT**

### **7.1 Photographs of test setup**

When users operate or carry this EUT, it could be considered to touch or get close to their bodies. In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

- 1.Front : The test was performed in touch with front surface of the printer to the flat phantom.
- 2.Back : The test was performed in touch with back surface of the printer to the flat phantom.
- 3.Right Side : The test was performed in touch with right side of the printer to the flat phantom.
- 4.Left Side : The test was performed in touch with left side of the printer to the flat phantom.
- 5.Top : The test was performed in touch with top of the printer to the flat phantom.
- 5.Bottom : The test was performed in touch with bottom of the printer to the flat phantom.

#### **1. Front**



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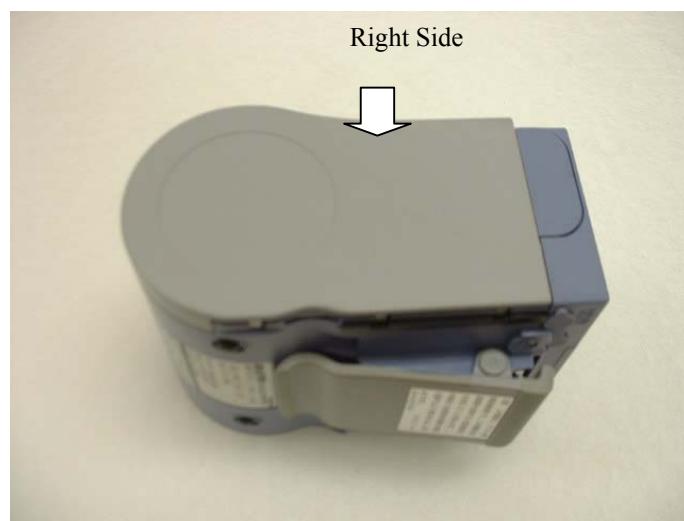
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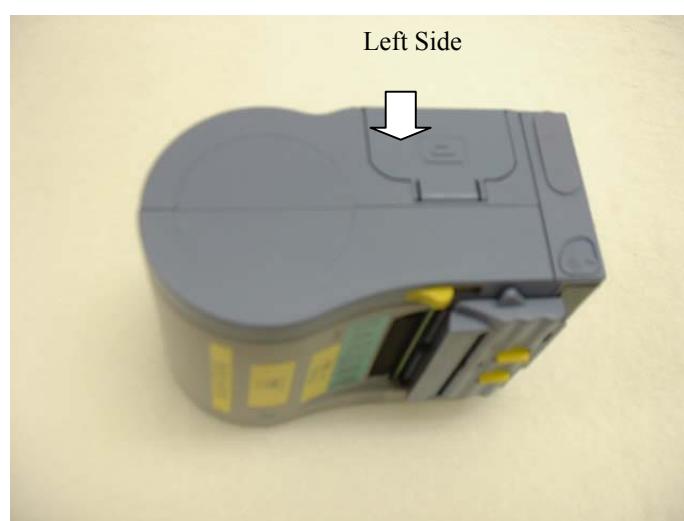
**2. Back**



**3. Right Side**



**4. Left Side**

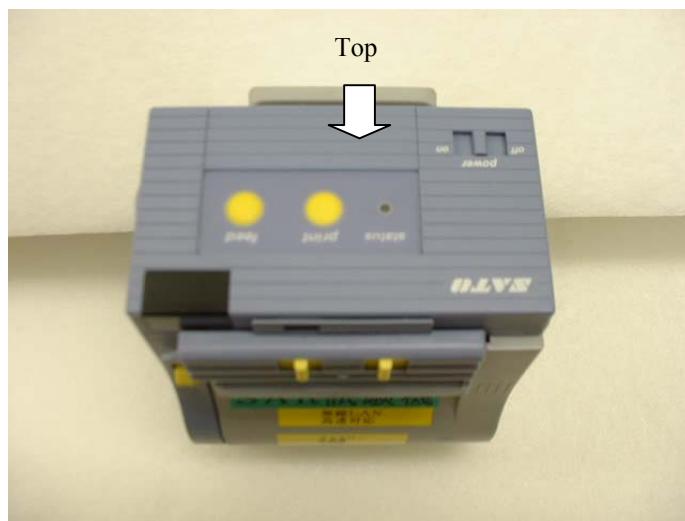


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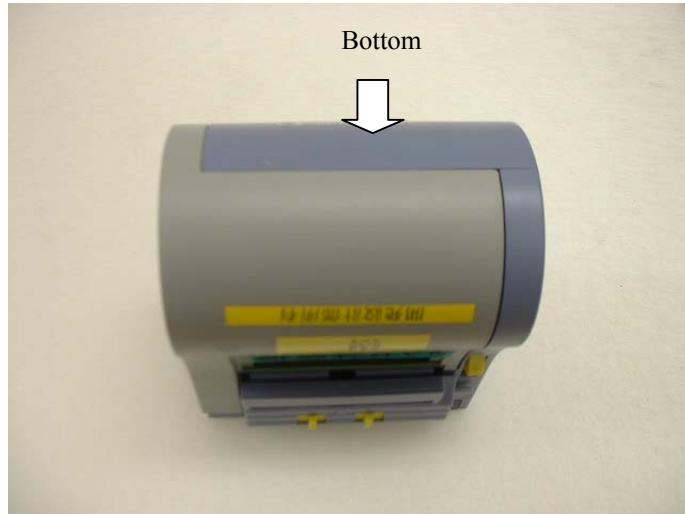
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### 5. Top



### 5. Bottom



### 7.2 EUT Tune-up procedure

We determined following conditions ;

Transmitter was continuous mode.

Crest Factor = 1

Frequency conditions were low , middle and high channels (2412MHz ,2437MHz and 2462MHz)

### 7.3 Distance between Printer and Phantom

The position for the highest SAR value of this Printer with the EUT was at "Left side" position.

The measurement was performed with the distance,5mm,10mm and 15mm to check if the distance 0mm may not have the worst value.As a result,the distance 0mm had the worst value.

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## **SECTION 8 : Measurement uncertainty**

The uncertainty budget has been determined for the DASY4 measurement system according to the NIS81 [13] and the NIST1297 [6] documents and is given in the following Table. The result of some test showed that the power drift has exceeded 5%. Therefor, the uncertainty of power drift expanded to 10%. However, the extended uncertainty ( $k=2$ ) of a test is less than 30%.

Error Description	Uncertainty value $\pm \%$	Probability distribution	divisor	(ci)1 1g	Standard Uncertainty (1g)	vi or veff
<b>Measurement System</b>						
Probe calibration	$\pm 4.8$	Normal	1	1	$\pm 4.8$	$\infty$
Axial isotropy of the probe	$\pm 4.7$	Rectangular	$\sqrt{3}$	$(1-c_p)^{1/2}$	$\pm 1.9$	$\infty$
Spherical isotropy of the probe	$\pm 9.6$	Rectangular	$\sqrt{3}$	$(c_p)^{1/2}$	$\pm 3.9$	$\infty$
Boundary effects	$\pm 1.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Probe linearity	$\pm 4.7$	Rectangular	$\sqrt{3}$	1	$\pm 2.7$	$\infty$
Detection limit	$\pm 1.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
Readout electronics	$\pm 1.0$	Normal	1	1	$\pm 1.0$	$\infty$
Response time	$\pm 0.8$	Rectangular	$\sqrt{3}$	1	$\pm 0.5$	$\infty$
Integration time	$\pm 2.6$	Rectangular	$\sqrt{3}$	1	$\pm 1.5$	$\infty$
RF ambient conditions	$\pm 3.0$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Mech. constraints of robot	$\pm 0.4$	Rectangular	$\sqrt{3}$	1	$\pm 0.2$	$\infty$
Probe positioning	$\pm 2.9$	Rectangular	$\sqrt{3}$	1	$\pm 1.7$	$\infty$
Extrap. and integration	$\pm 1.0$	Rectangular	$\sqrt{3}$	1	$\pm 0.6$	$\infty$
<b>Test Sample Related</b>						
Device positioning	$\pm 2.9$	Rectangular	$\sqrt{3}$	1	$\pm 2.9$	10
Device holder uncertainty	$\pm 3.6$	Rectangular	$\sqrt{3}$	1	$\pm 3.6$	5
Power drift	$\pm 5.0$	Rectangular	$\sqrt{3}$	1	$\pm 5.8$	$\infty$
<b>Phantom and Setup</b>						
Phantom uncertainty	$\pm 4.0$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
Liquid conductivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.64	$\pm 1.8$	$\infty$
Liquid conductivity (meas.)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.64	$\pm 1.8$	$\infty$
Liquid permittivity (target)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (meas.)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
<b>Combined Standard Uncertainty</b>					<b><math>\pm 10.369</math></b>	
<b>Expanded Uncertainty (k=2)</b>					<b><math>\pm 20.7</math></b>	

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## **SECTION 9 : Simulated tissue liquid parameter**

### **9.1 Simulated Tissue Liquid Parameter confirmation**

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit. The dielectric parameters measurement are reported in each correspondent section.

#### **9.1.1 Head 2450MHz**

Type of liquid : **Head 2450 MHz**  
 Ambient temperature (deg.c.) : **24.5**  
 Relative Humidity (%) : **59**  
 Liquid depth (cm) : **15.3**

Date : May 11, 2004  
 Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS					
Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]
Before	After				Limit [%]
24.8	24.8	Relative Permittivity $\epsilon_r$	39.2	37.3	-4.8
		Coductivity $\sigma$ [mho/m]	1.80	1.88	4.4

#### **9.1.2 Muscle 2450MHz**

Type of liquid : **Muscle 2450 MHz**  
 Ambient temperature (deg.c.) : **24.0**  
 Relative Humidity (%) : **59**  
 Liquid depth (cm) : **15.3**

Date : May 11, 2004  
 Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS					
Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]
Before	After				Limit [%]
23.2	23.2	Relative Permittivity $\epsilon_r$	52.7	50.7	-3.8
		Coductivity $\sigma$ [mho/m]	1.95	1.98	1.5

### **9.2 Simulated Tissues**

Ingredient	MiXTURE(%)	
	Head 2450MHz	Muscle 2450MHz
Water	45.0	69.83
DGMBE	55.0	30.17

Note:DGMBE(Diethylenglycol-monobutyl ether)

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## **SECTION 10: System validation data**

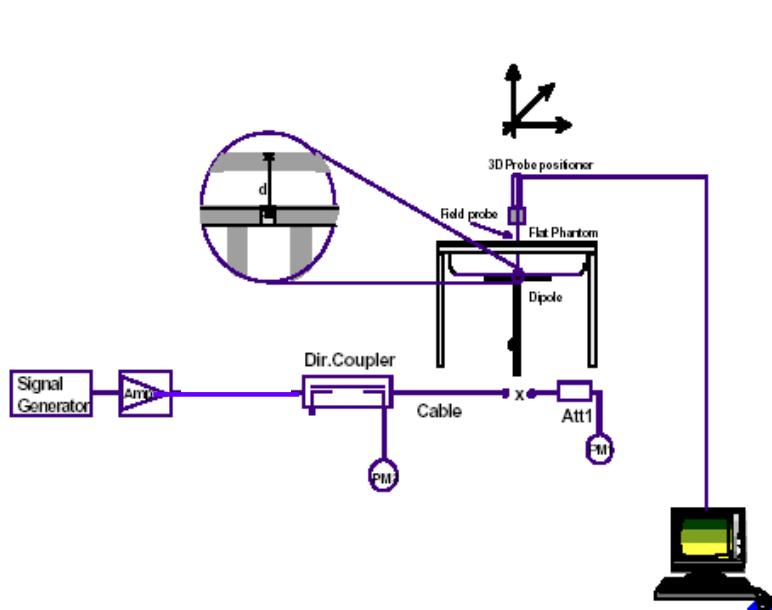
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are tabulated below. Please refer to APPENDIX 3.

Type of liquid : **HEAD 2450MHz**  
 Frequency : **2450MHz**  
 Liquid depth (cm) : **15.3**  
 Ambient temperature (deg.c.) : **24.5**  
 Relative Humidity (%) : **59**  
 Dipole : **D2450V2 SN:713**  
 Power : **250mW**

Date : May 11, 2004  
 Measured By : Miyo Ikuta

SYSTEM PERFORMANCE CHECK									
Liquid (HEAD 2450MHz)				System dipole validation target & measured					
Liquid Temp [deg.c.]		Relative Permittivity $\epsilon_r$		Conductivity $\sigma$ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
Before	After	Target	Measured	Target	Measured	Target	Measured		
24.8	24.8	39.2	37.3	1.80	1.88	13.1	13.7	4.6	+/-10

Note: Please refer to Attachment for the result representation in plot format



**2450MHz System performance check setup**

**Test system for the system performance check setup diagram**

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## **SECTION 11 : Evaluation procedure**

**The evaluation was performed with the following procedure:**

**Step 1:** Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

**Step 2:** The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the EUT and the horizontal grid spacing was 20 mm x 20 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

**Step 3:** Around this point found in the Step 2 (area scan) , a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x5 x 7 points. And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
2. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
3. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

**Step 4:** Re-measurement of the E-field at the same location as in Step 1.

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## **SECTION 12 : Exposure limit**

### **(A) Limits for Occupational/Controlled Exposure (W/kg)**

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

### **(B) Limits for General population/Uncontrolled Exposure (W/kg)**

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

**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).

**General Population/Uncontrolled Environments:** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE  
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT  
1.6 W/kg**

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## **SECTION 13 : SAR Measurement results**

### **13.1 Conducted power measurement results**

Date : May 11, 2004  
 Measured By : Miyo Ikuta

CONDUCTED POWER MEASUREMENT RESULTS												
Frequency [MHz]	Before					After					Deviation [%]	Limit [%]
	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]		
2412	4.40	10	0.80	15.20	33.1	4.50	10	0.80	15.30	33.9	2.3	+/-5
2437	4.52	10	0.80	15.32	34.0	4.33	10	0.80	15.13	32.6	-4.3	+/-5
2462	4.71	10	0.80	15.51	35.6	4.68	10	0.80	15.48	35.3	-0.7	+/-5

### **13.2 Body 2450MHz SAR**

Liquid Depth (cm) : **15.3** Model : **WM-B-AG-02**  
 Parameters :  $\epsilon_r = 50.7, \sigma = 1.98$  Serial No. : **No.7**  
 Ambient Temperature[deg.c.] : **24.0** Modulation : **DSSS**  
 Relative Humidity (%) : **59** Crest factor : **1**

Date : May 11, 2004  
 Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS								
Frequency		Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Mid	2437	Flat	Fixed	Front	0	23.5	23.5	<b>0.0745</b>
Mid	2437	Flat	Fixed	Back	0	23.3	23.4	<b>0.027</b>
Mid	2437	Flat	Fixed	Right Side	0	23.4	23.5	<b>0.0276</b>
Mid	2437	Flat	Fixed	Left Side	0	23.2	23.2	<b>0.449</b>
Mid	2437	Flat	Fixed	Top	0	23.5	23.6	<b>0.0318</b>
Mid	2438	Flat	Fixed	Bottom	0	23.5	23.5	<b>0.0783</b>
Low	2412	Flat	Fixed	Left Side	0	23.6	23.6	<b>0.449</b>
High	2462	Flat	Fixed	Left Side	0	23.6	23.6	<b>0.439</b>
Mid	2437	Flat	Fixed	Left Side	5	23.2	23.2	<b>0.2</b>
Mid	2437	Flat	Fixed	Left Side	10	23.2	23.2	<b>0.0958</b>
Mid	2437	Flat	Fixed	Left Side	15	23.2	23.2	<b>0.0565</b>
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						Body SAR: 1.6 W/kg (averaged over 1 gram)		

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## SECTION 14 : Equipment & calibration information

Name of Equipment	Manufacture	Model number	Serial number	Calibration	
				Last Cal	due date
Power Meter	Agilent	E4417A	GB41290639	2003/11/12	2004/11/11
Power Sensor	Agilent	E9300B	US40010300	2003/11/17	2004/11/16
Power Sensor	Agilent	E9327A	US40440576	2003/11/13	2004/11/12
S-Parameter Network Analyzer	Agilent	E8358A	US41080381	2003/08/13	2004/08/12
Signal Generator	Rohde&Schwarz	SML40	100023	2003/11/26	2004/11/25
RF Amplifier	OPHIR	5056F	1005	2004/02/17	2005/02/16
Dosimetric E-Field Probe	Schmid&Partner Engineering AG	ET3DV6	1685	2003/10/10	2004/10/09
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3 V1	517	2004/01/08	2005/01/07
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3 V1	509	2004/04/22	2005/04/21
Robot,SAM Phantom	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-110	-	2004/01/28	2005/01/27
Attenuator	Agilent	US40010300	08498-60012	2003/12/16	2004/12/15
2450MHz System Validation Dipole	Schmid&Partner Engineering AG	D2450V2	713	2002/11/15	2004/11/14
Dual Directional Coupler	N/A	Narda	03702	N/A	N/A
Head 2450MHz	N/A	N/A	N/A	N/A	N/A
Body 2450MHz	N/A	N/A	N/A	N/A	N/A

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## **SECTION 15 : References**

- [1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [2] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-124.
- [3] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
- [4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [5] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
- [6] Barry N. Taylor and Christ E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.

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**APPENDIX 1 : Photographs of test setup**

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**Front**

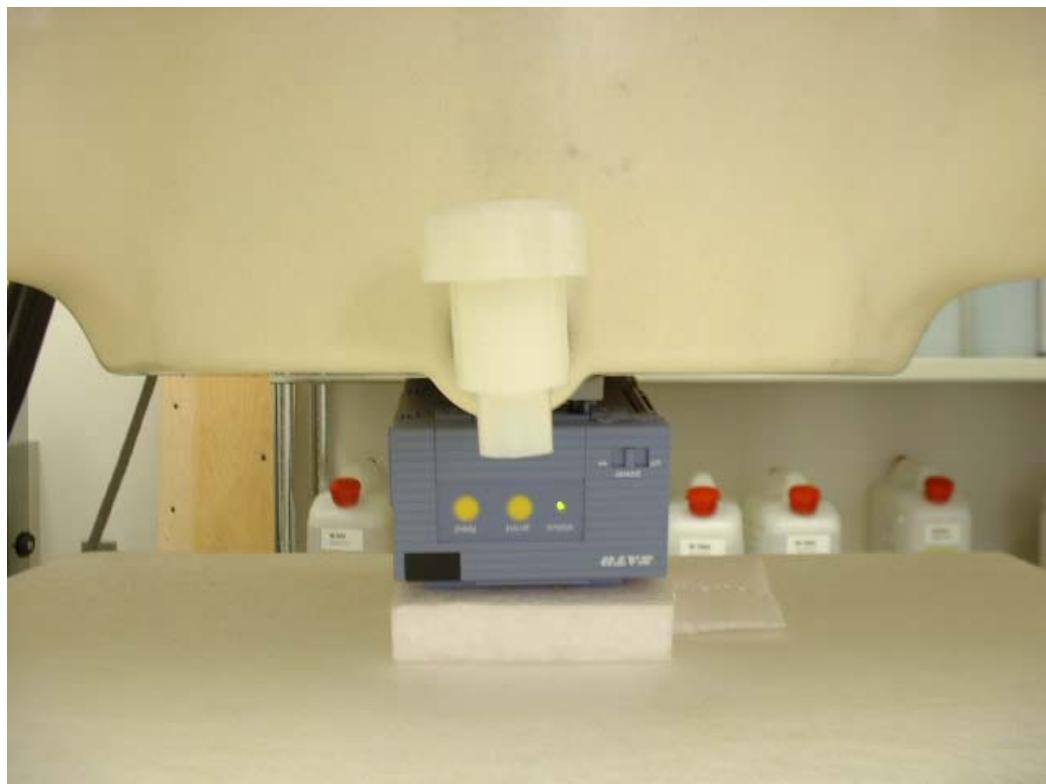


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Back



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**Right Side**



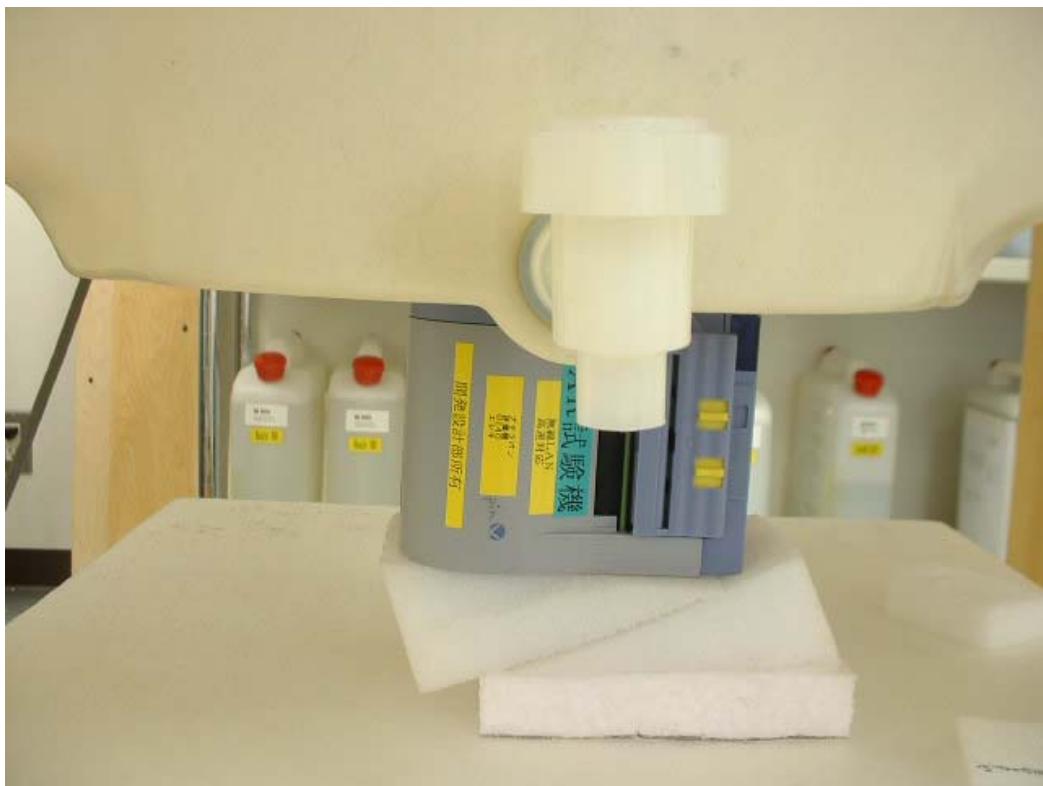
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Left Side



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## Top



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**Bottom**



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**APPENDIX 2 : SAR Measurement data**

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## WM-B-AG-02 / Body / Front / 2437MHz

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0787 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.155 W/kg

**SAR(1 g) = 0.0745 mW/g; SAR(10 g) = 0.039 mW/g**

Maximum value of SAR = 0.0798 mW/g

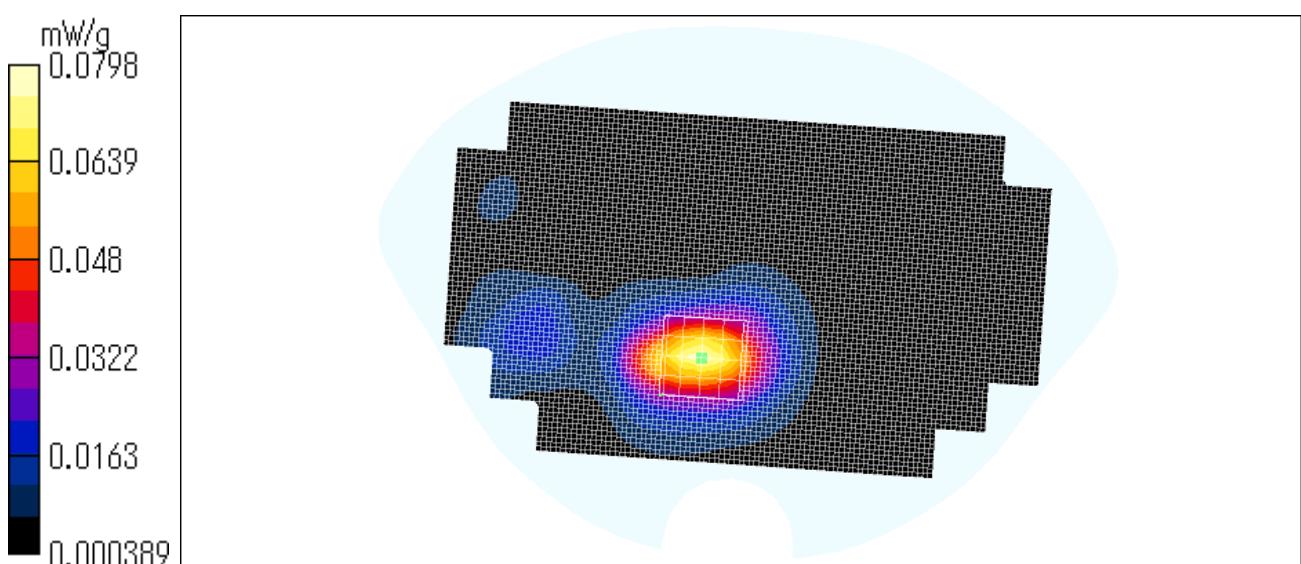
Test date = 05 / 11 / 04

Reference Value = 2.81 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.5 degree.C , After 23.5 degree.C



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**WM-B-AG-02 / Body / Back / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0283 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.0545 W/kg

**SAR(1 g) = 0.027 mW/g; SAR(10 g) = 0.014 mW/g**

Maximum value of SAR = 0.0285 mW/g

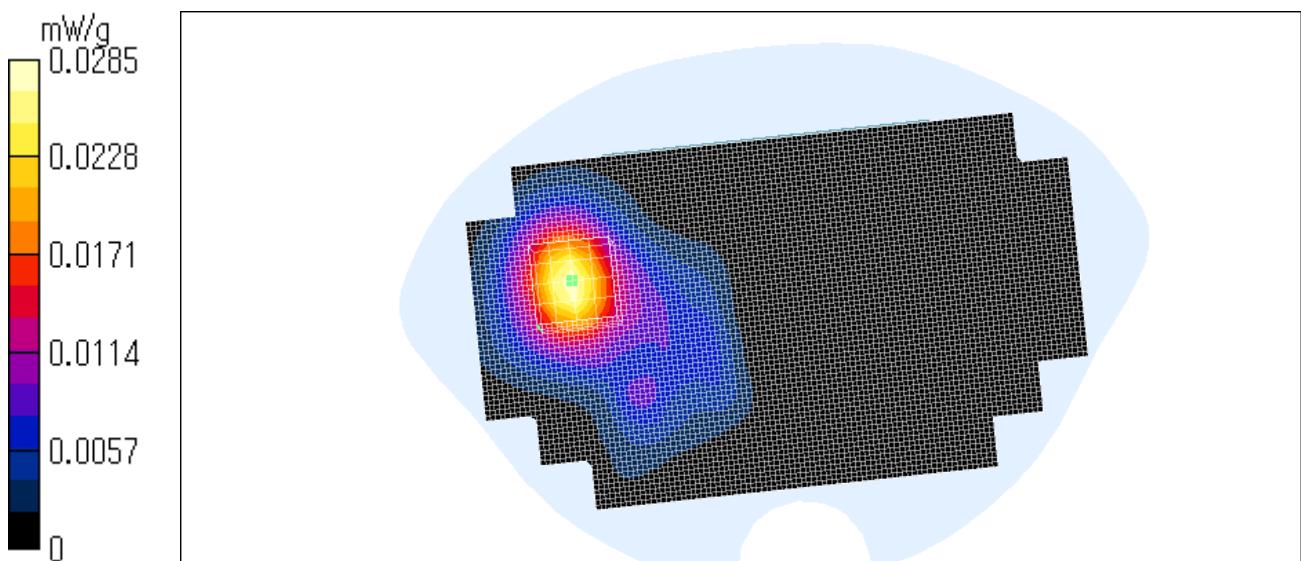
Test date = 05 / 11 / 04

Reference Value = 0.348 V/m

Power Drift = 0 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.4 degree.C , After 23.4 degree.C



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**WM-B-AG-02 / Body / Right Side / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0302 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.0635 W/kg

**SAR(1 g) = 0.0276 mW/g; SAR(10 g) = 0.0121 mW/g**

Maximum value of SAR = 0.0285 mW/g

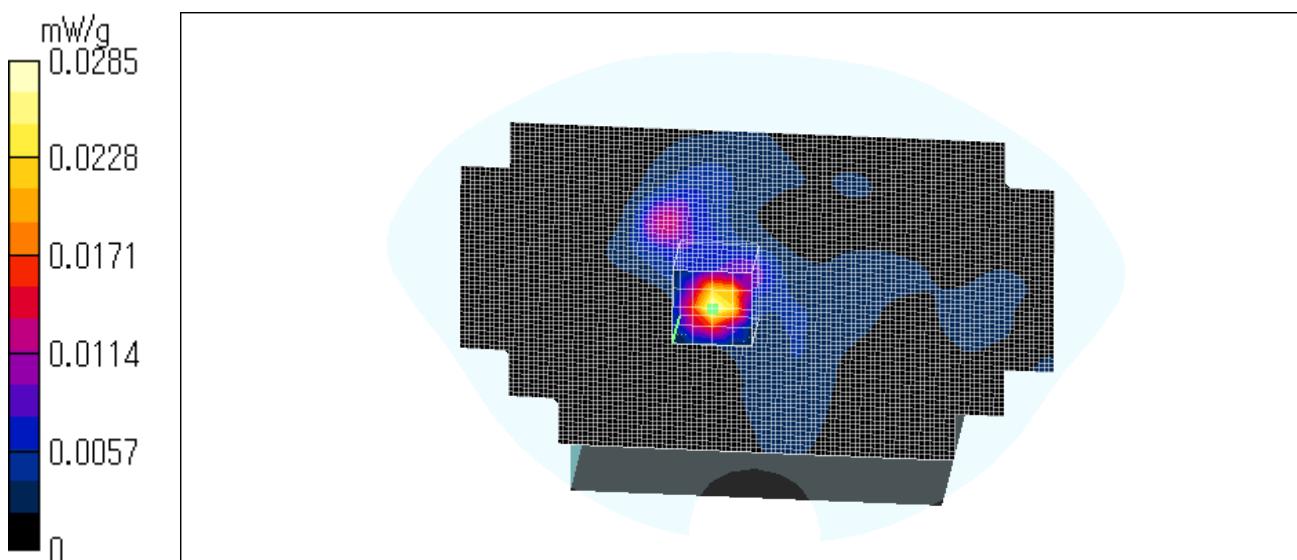
Test date = 05 / 11 / 04

Reference Value = 2.04 V/m

Power Drift = 0.06 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.4 degree.C , After 23.5 degree.C



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**WM-B-AG-02 / Body / Left Side 0mm / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.739 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 1.09 W/kg

**SAR(1 g) = 0.449 mW/g; SAR(10 g) = 0.218 mW/g**

Maximum value of SAR = 0.466 mW/g

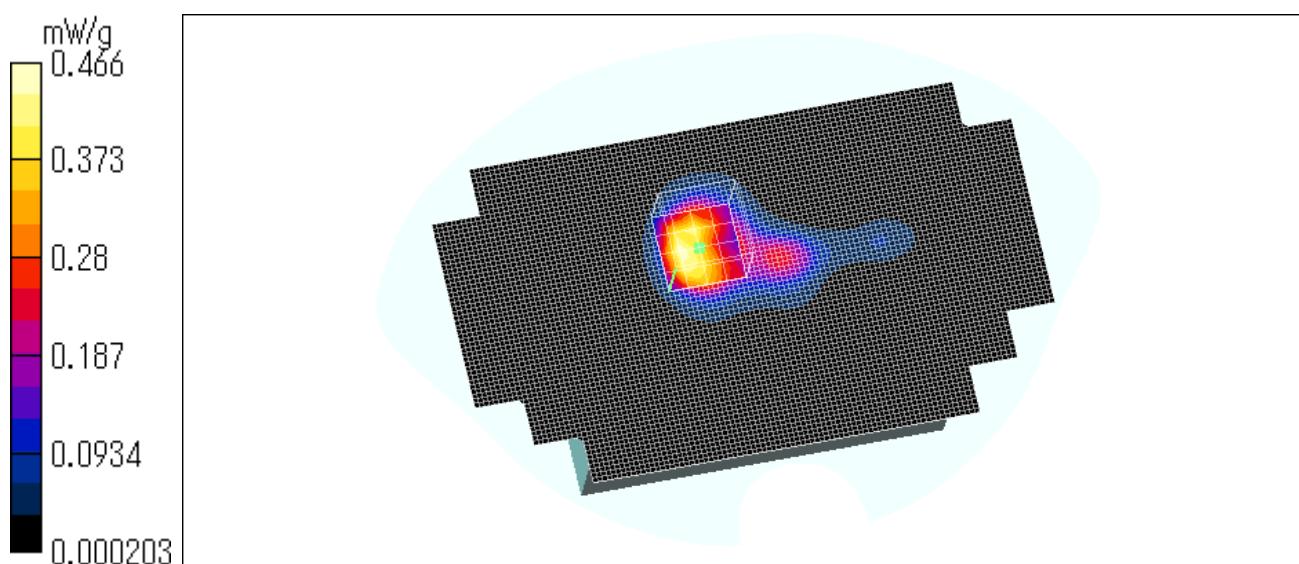
Test date = 05 / 11 / 04

Reference Value = 11 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.2 degree.C , After 23.2 degree.C



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### Z-axis scan at max SAR location

**WM-B-AG-02 / Body / Left Side 0mm / 2437MHz**

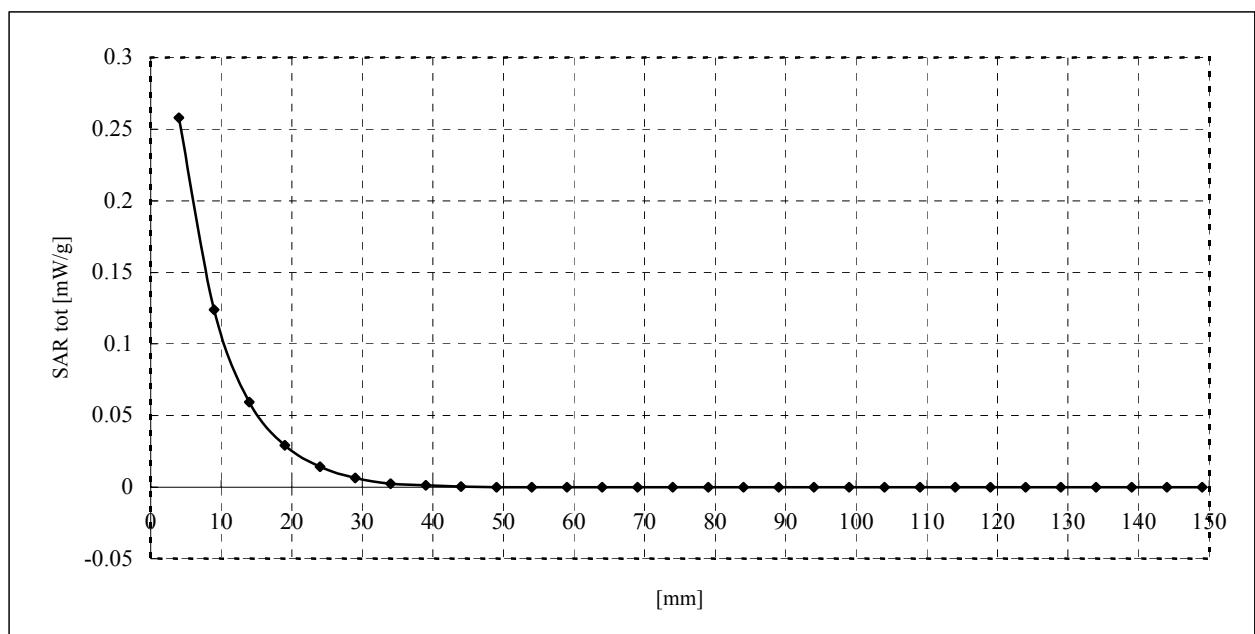
Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115



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**WM-B-AG-02 / Body / Top / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0418 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.0614 W/kg

**SAR(1 g) = 0.0318 mW/g; SAR(10 g) = 0.015 mW/g**

Maximum value of SAR = 0.0333 mW/g

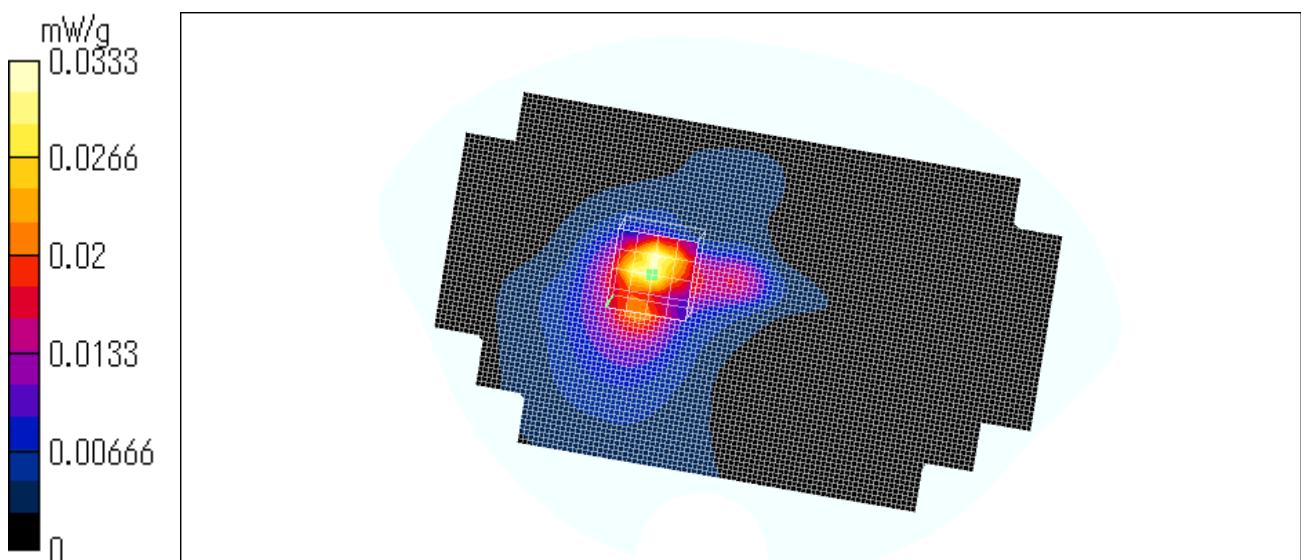
Test date = 05 / 11 / 04

Reference Value = 2.53 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.5 degree.C , After 23.5 degree.C



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**WM-B-AG-02 / Body / Bottom / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0587 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.193 W/kg

**SAR(1 g) = 0.0783 mW/g; SAR(10 g) = 0.0366 mW/g**

Maximum value of SAR = 0.0836 mW/g

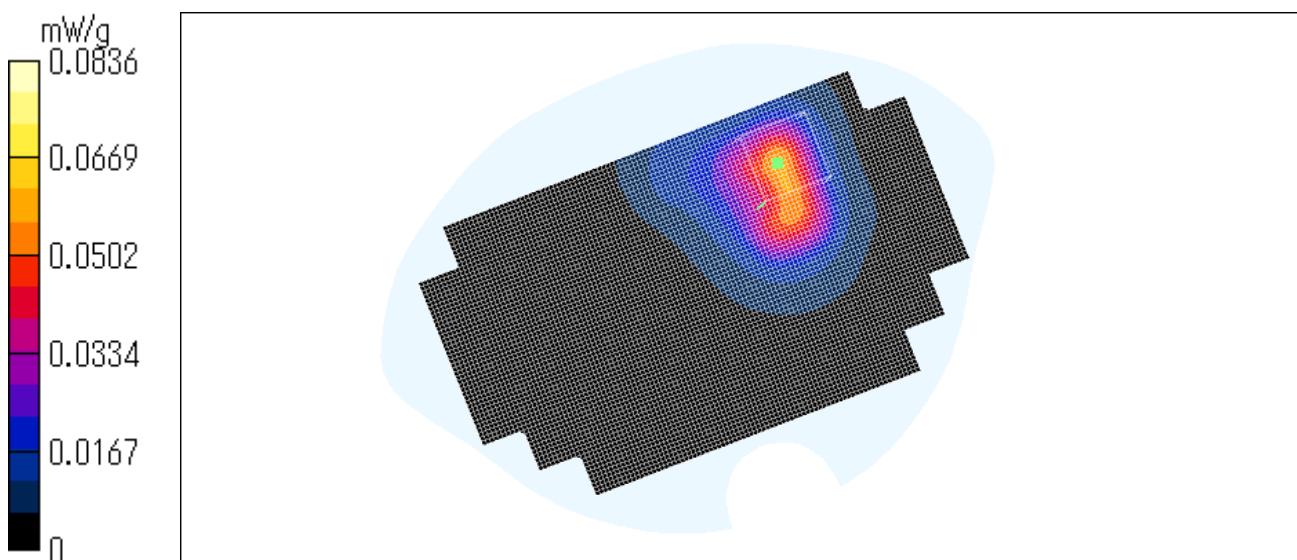
Test date = 05 / 11 / 04

Reference Value = 1.61 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.5 degree.C , After 23.5 degree.C

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**WM-B-AG-02 / Body / Left Side 0mm / 2412MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.639 mW/g

**Unnamed procedure/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 1.06 W/kg

**SAR(1 g) = 0.449 mW/g; SAR(10 g) = 0.22 mW/g**

Maximum value of SAR = 0.471 mW/g

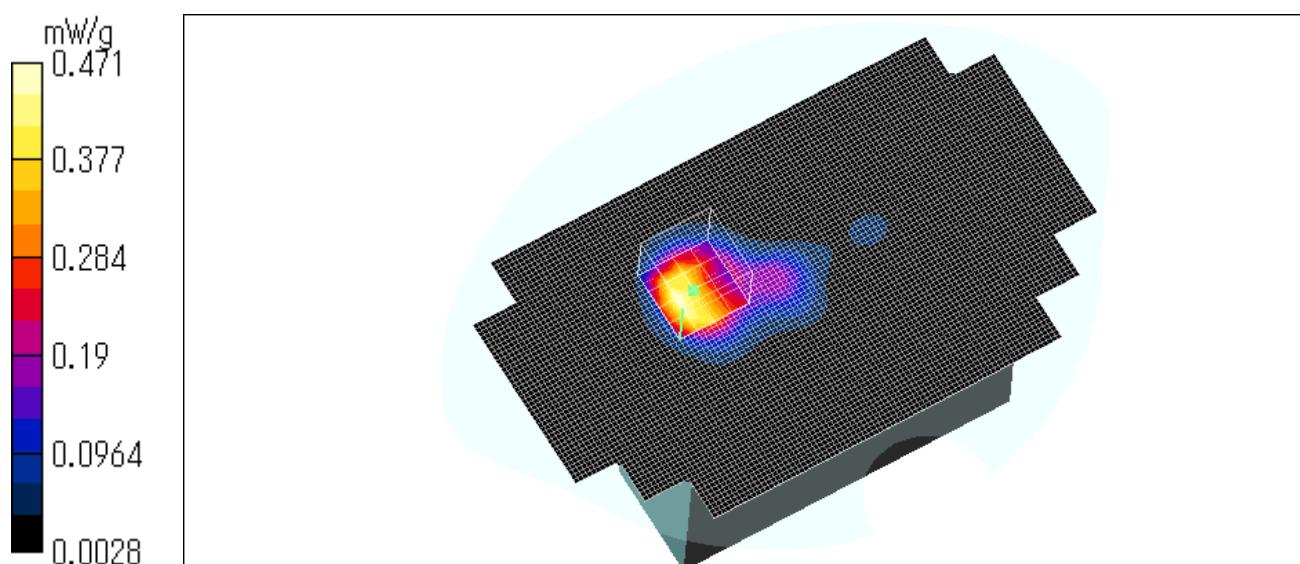
Test date = 05 / 11 / 04

Reference Value = 13.4 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0degree.c

Liquid Temperature : Before 23.6 degree.C , After 23.6degree.C



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### Z-axis scan at max SAR location

**WM-B-AG-02 / Body / Left Side 0mm / 2437MHz**

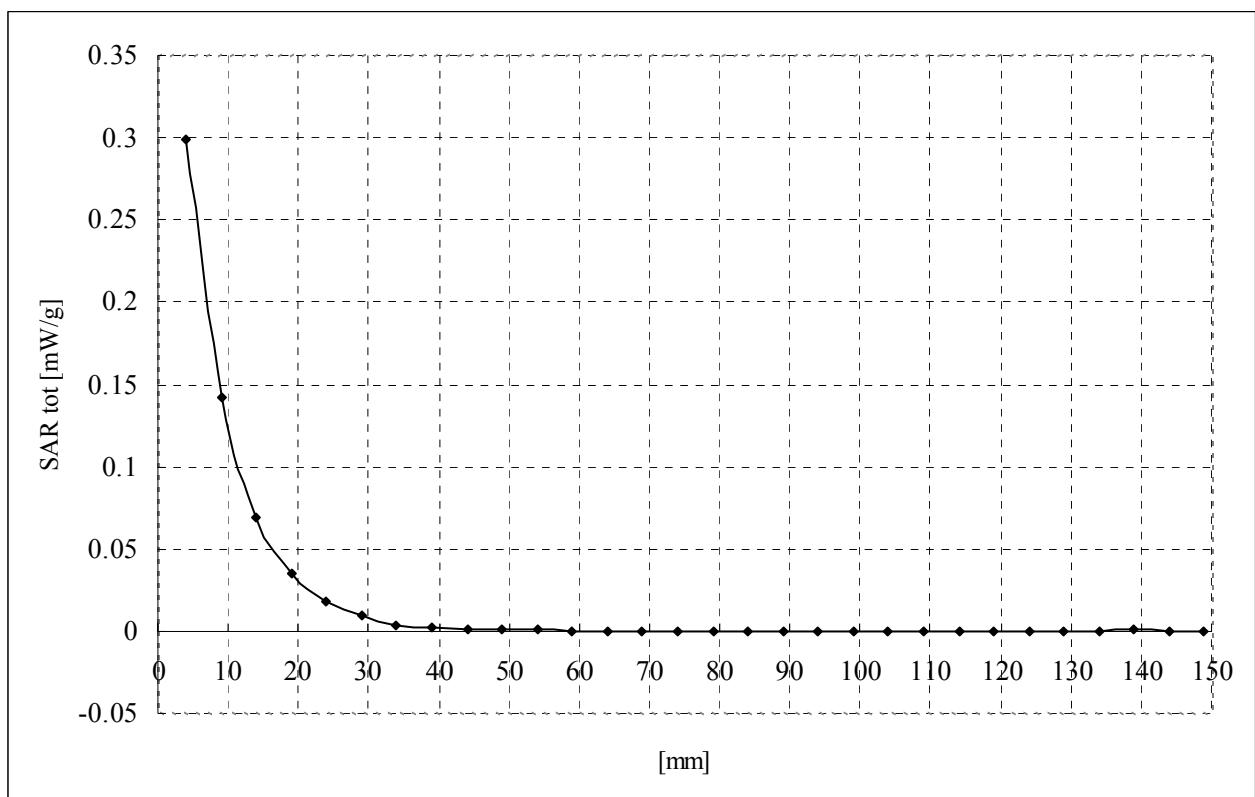
Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115



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**WM-B-AG-02 / Body / Left Side 0mm / 2462MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.573 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 1.12 W/kg

**SAR(1 g) = 0.439 mW/g; SAR(10 g) = 0.216 mW/g**

Maximum value of SAR = 0.438 mW/g

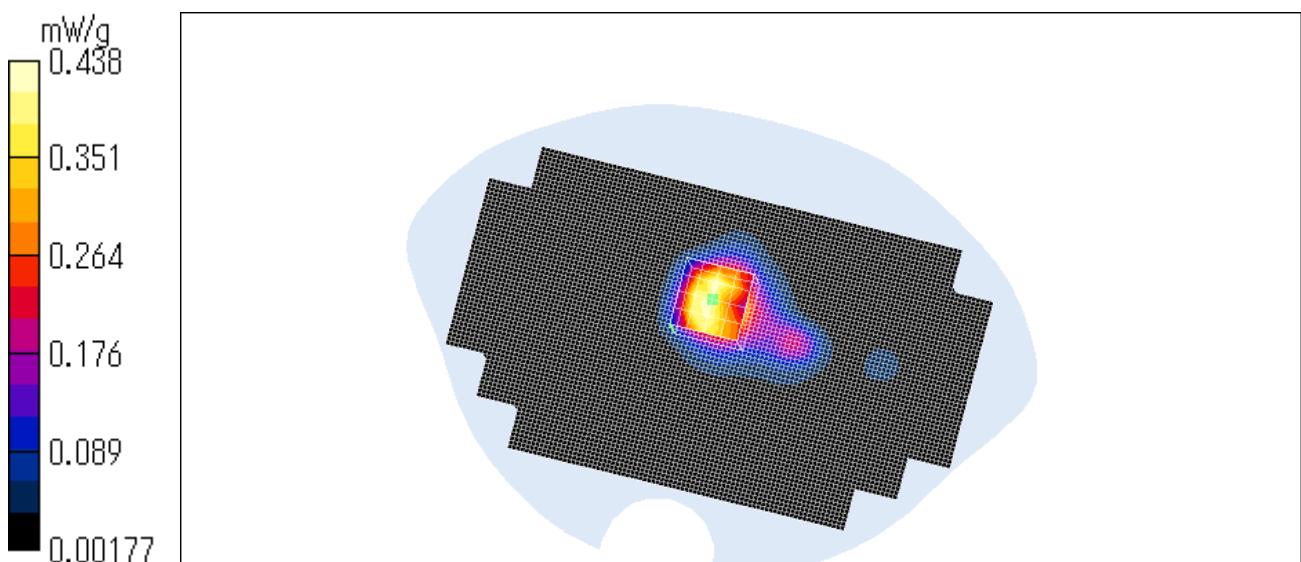
Test date = 05 / 11 / 04

Reference Value = 13.5 V/m

Power Drift = -0.1 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.6 degree.C , After 23.6 degree.C



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## WM-B-AG-02 / Body / Left Side 5mm / 2437MHz

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Reference Value = 7.1 V/m

Power Drift = -3e+01 dB

Maximum value of SAR = 0.248 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.416 W/kg

**SAR(1 g) = 0.194 mW/g; SAR(10 g) = 0.101 mW/g**

Maximum value of SAR = 0.208 mW/g

**Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.428 W/kg

**SAR(1 g) = 0.2 mW/g; SAR(10 g) = 0.0976 mW/g**

Maximum value of SAR = 0.207 mW/g

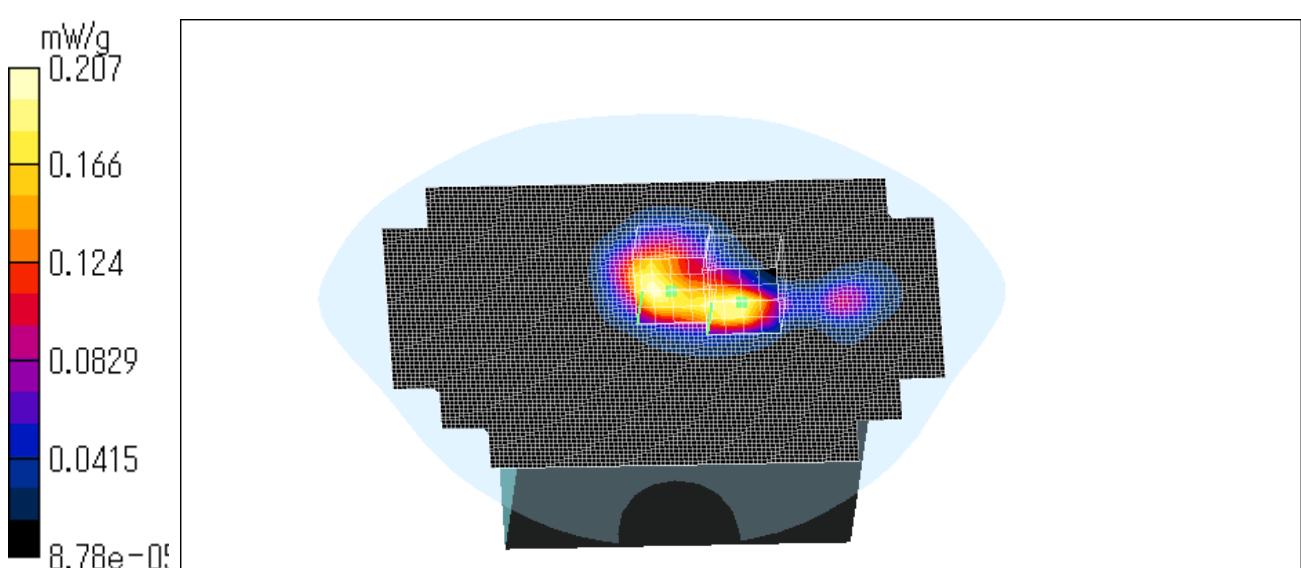
Test date = 05 / 11 / 04

Reference Value = 7.1 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0 degree.c

Liquid Temperature : Before 23.2 degree.C , After 23.2 degree.C



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**WM-B-AG-02 / Body / Left Side 10mm / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98 \text{ mho/m}$ ,  $\epsilon_r = 50.7$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.117 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.19 W/kg

**SAR(1 g) = 0.0958 mW/g; SAR(10 g) = 0.0523 mW/g**

Maximum value of SAR = 0.106 mW/g

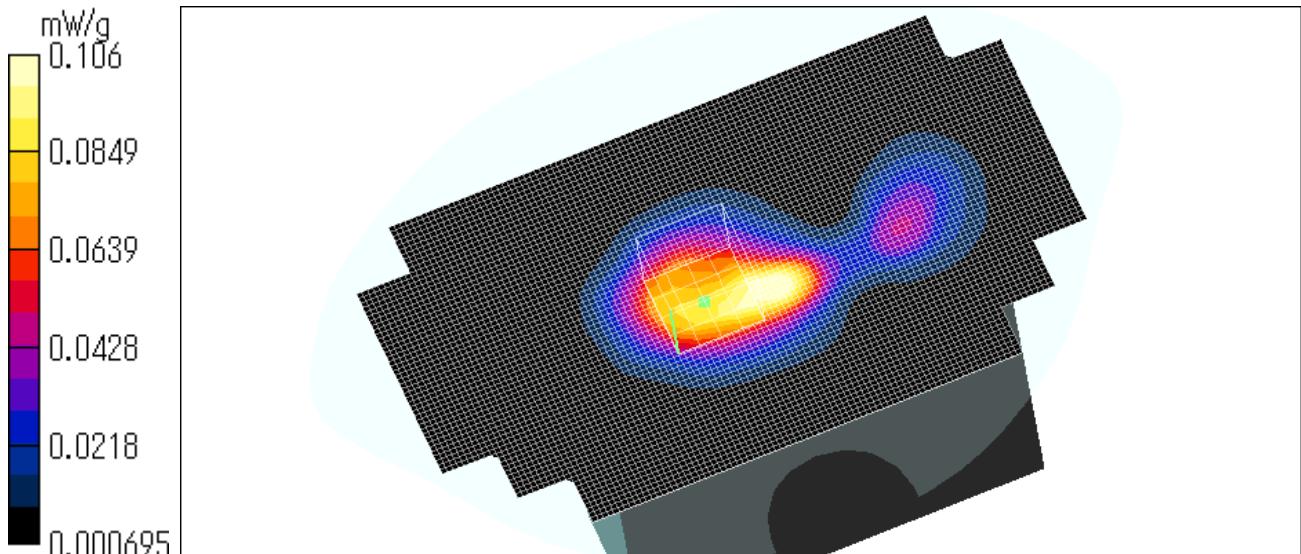
Test date = 05 / 11 / 04

Reference Value = 6.84 V/m

Power Drift = -0.06 dB

Ambient Temperature : 24.0degree.c

Liquid Temperature : Before 23.2 degree.C , After 23.2 degree.C



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**WM-B-AG-02 / Body / Left Side 15mm / 2437MHz**

Crest factor: 1

Medium: M2450 ( $\sigma = 1.98$  mho/m,  $\epsilon_r = 50.7$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (71x121x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.0622 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.107 W/kg

**SAR(1 g) = 0.0565 mW/g; SAR(10 g) = 0.0317 mW/g**

Maximum value of SAR = 0.059 mW/g

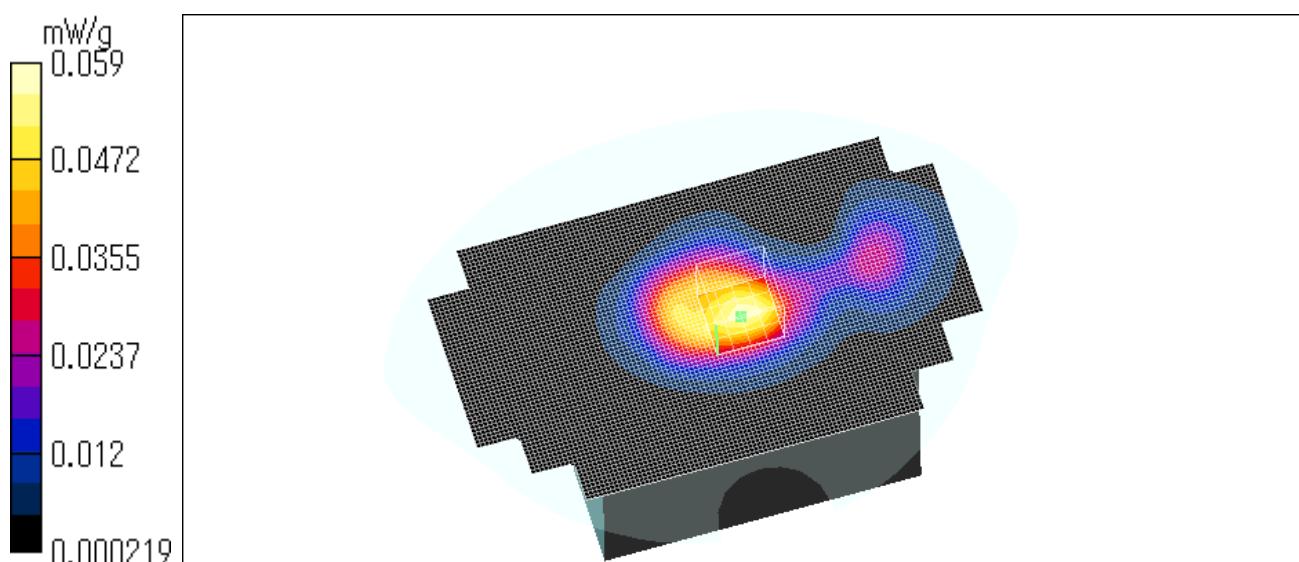
Test date = 05 / 11 / 04

Reference Value = 5.67 V/m

Power Drift = -0.2 dB

Ambient Temperature : 24.0degree.c

Liquid Temperature : Before 23.2 degree.C , After 23.2 degree.C

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### **APPENDIX 3 : Validation Measurement data**

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## System Validation / Dipole 2450 MHz / Forward Conducted Power : 250mW

Crest factor: 1

Medium: HSL2450 ( $\sigma = 1.88 \text{ mho/m}$ ,  $\epsilon_r = 37.3$ ,  $\rho = 1000 \text{ kg/m}^3$ )

Phantom section: Flat Section

Dipole 2450MHz

-Type:D2450V2;Serial:713

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

**Area Scan (51x51x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 14.4 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 29 W/kg

**SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g**

Reference Value = 89.6 V/m

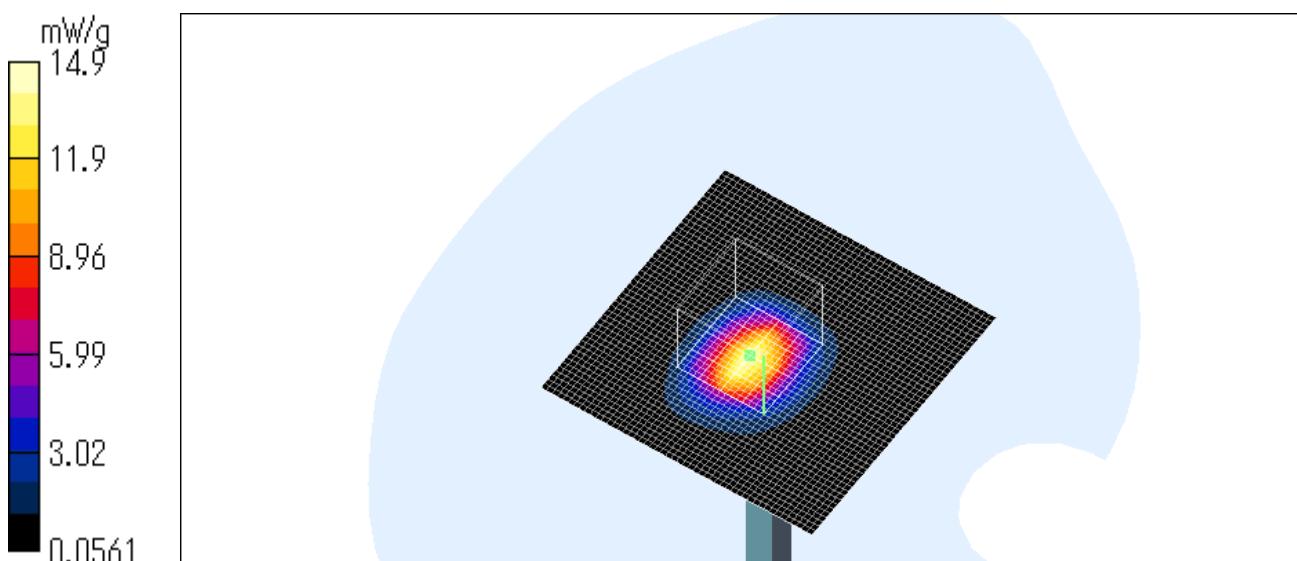
Test date = 01 / 06 / 04

Power Drift = 0.01 dB

Maximum value of SAR = 14.9 mW/g

Ambient Temperature : 24.5 degree.c

Liquid Temperature : Before 24.8 degree.C , After 24.8 degree.C



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**APPENDIX 4 : System Validation Dipole (D2450V2,S/N: 713)**

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**Schmid & Partner  
Engineering AG**

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

**Calibration Certificate**

**2450 MHz System Validation Dipole**

Type:

**D2450V2**

Serial Number:

**713**

Place of Calibration:

**Zurich**

Date of Calibration:

**November 15, 2002**

Calibration Interval:

**24 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

*D. Vetter*

Approved by:

*Volene Kafe*

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Head Office EMC Lab.**

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**Schmid & Partner  
Engineering AG**

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

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**DASY**

**Dipole Validation Kit**

**Type: D2450V2**

**Serial: 713**

**Manufactured: July 5, 2002**

**Calibrated: November 15, 2002**

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**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

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## **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 permittivity	<b>38.0</b>	$\pm 5\%$
Conductivity	<b>1.87 mho/m</b>	$\pm 10\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.0 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and 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 ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over  $1\text{ cm}^3$  (1 g) of tissue: **54.4 mW/g**

averaged over  $10\text{ cm}^3$  (10 g) of tissue: **24.2 mW/g**

### **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: **1.158 ns** (one direction)  
Transmission factor: **0.997** (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: **Re{Z} = 51.3 Ω**

**Im {Z} = 2.4 Ω**

Return Loss at 2450 MHz **- 31.4 dB**

### **4. Measurement Conditions**

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

Relative permittivity **51.2** ± 5%  
Conductivity **1.96 mho/m** ± 10%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 4.5 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and 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 250mW ± 3 %. The results are normalized to 1W input power.

Date/Time: 11/13/02 21:52:22

Test Laboratory: SPEAG, Zurich, Switzerland  
File Name: SN713\_SN1507\_HSL2450\_131102.da4

**DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN713**  
**Program: Dipole Calibration; Pin = 250 mW; d = 10 mm**

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium: HSL 2450 MHz ( $\sigma = 1.87 \text{ mho/m}$ ,  $\epsilon = 38.03$ ,  $\rho = 1000 \text{ kg/m}^3$ )  
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5, 5, 5); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

**Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 94.4 V/m

Peak SAR = 29.6 mW/g

SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.04 mW/g

Power Drift = 0.01 dB

