



## SAR EVALUATION REPORT

Report No. : 24JE0153-HO-2

Applicant : SHARP CORPORATION

Type of Equipment : Tri-Band Mobile Cellular Phone

Model No. : TM150

FCC ID : APYNAR0057

Test standard : FCC47CFR 2.1093  
FCC OET Bulletin 65, Supplement C

Test Result : Complied

Max SAR Measured : Head 0.823 W/kg( 1909.8 MHz )  
Body 0.733 W/kg( 1909.8 MHz )

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 26 and 27, 2004

Tested by :

Miyo Ikuta  
Head Office EMC Lab.

Approved by :

Hironobu Shimoji  
Group Leader of EMC Service

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**SECTION 1 : Client information**

Company Name : SHARP CORPORATION  
Brand Name : SHARP  
Address : 2-13-1 Iida Hachihonmatsu Higashihiroshima-city Hiroshima, 739-0192 , Japan  
Telephone Number : +81-824-20-1863  
Facsimile Number : +81-824-20-1864  
Contact Person : Hiroyuki Uwatoko / Tamotsu Iwasa

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## **SECTION 2 : Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Applicant : SHARP CORPORATION

Type of Equipment : Tri-Band Mobile Cellular Phone

Model No. : TM150

Serial No. : CS-268

Country of Manufacture : JAPAN

Receipt Date of Sample : May 26, 2004

Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)

Battery option : Only one model with EUT  
( M/N:XN-IBT30, 3.7V (3.3 ~ 4.2V)/ 780mA.h.)

Accessories : Earphone

Category Identified : Portable device

### **2.2 Product Description**

Tx Frequency : 1850.2 - 1909.8 MHz for PCS1900

Modulation : GSMK

Rating : DC 2.7-3.0V

Max.Output Power Tested : 28.89 dBm Peak Conducted

Antenna Type : Fixed antenna

Size of EUT : 47\*175\*13 (W\*L\*H)

Position of Antenna : See photograph of following

Antenna  
(This antenna cannot be  
extended and retracted.)



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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.

### **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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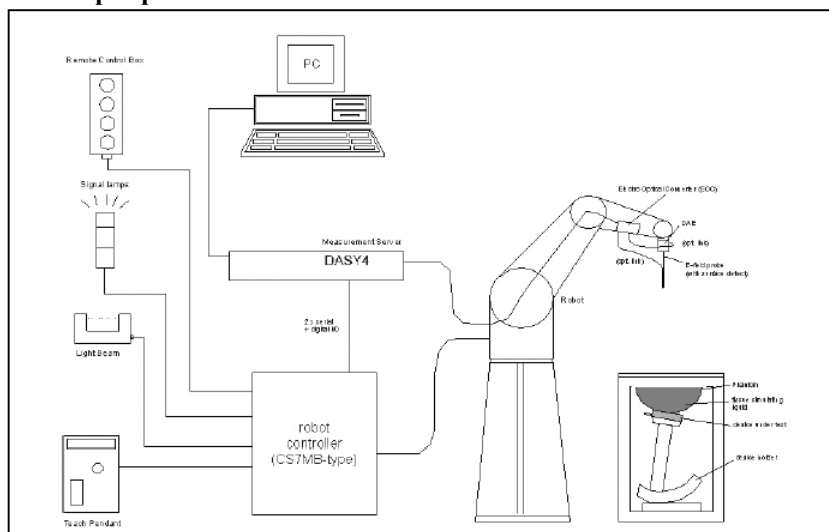
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#### 4.1 Configuration and peripherals



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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## 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

#### 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 EN50361 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:**

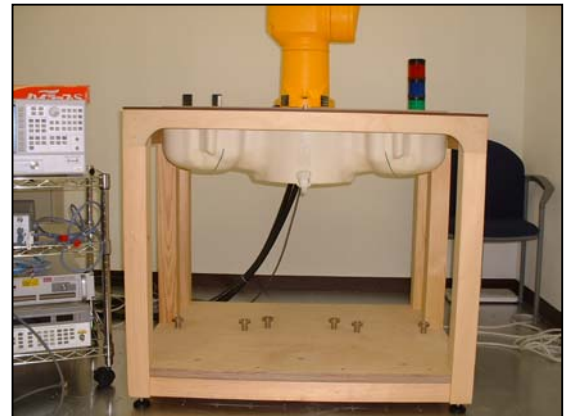
2 +/-0.2 mm

**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**

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

### **Robot RX60L**

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

### **DASY4 Measurement sever**

Features	:	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 chainTwo expansion slots for future applications
Manufacture	:	Schimid & Partner Engineering AG

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

Features	:	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)
Measurement Range	:	1 $\mu$ V to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 $\mu$ V (with auto zero)
Input Resistance	:	200 M $\Omega$
Battery Power	:	> 10 h of operation (with two 9 V battery)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

### **Software**

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

### **E-Field Probe**

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

### **Phantom**

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

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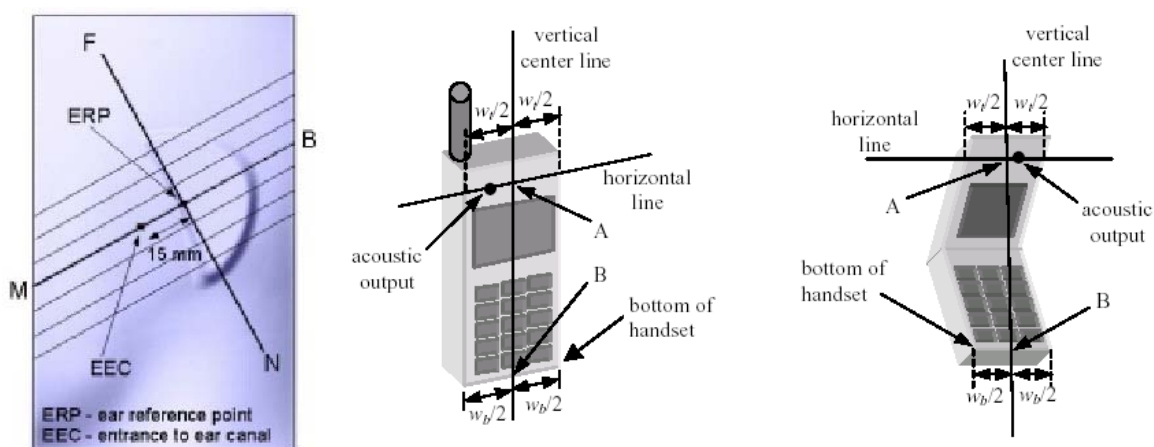
## SECTION 6 : Test setup of EUT

### 6.1 Description of the head test setup

According to the OET 65 and IEEE1528, this EUT was tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. Antenna is built in the EUT and is fixed.

#### 6.1.1 Initial ear position

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. The device should be positioned parallel to the “N-F” line defined along the base of the ear spacer that contains the “ear reference point”. The “test device reference point” is aligned to the “ear reference point” on the head phantom and the “vertical centerline” is aligned to the “phantom reference plane”.

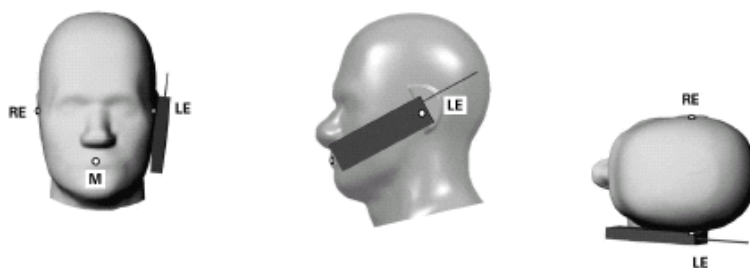


#### 6.1.2 Cheek position

The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line.

This test position is established:

- When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.



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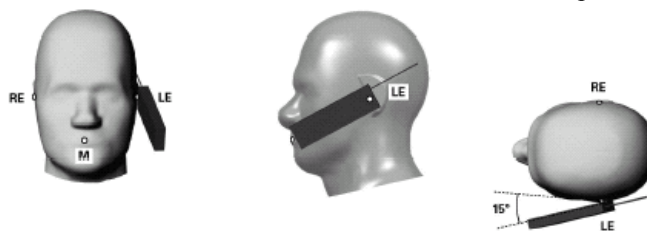
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### 6.1.3 Tilt position

If the earpiece of the handset is not in full contact with the phantom's ear spacer and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer. Otherwise the handset should be moved away from the cheek perpendicular to the line passes through both "ear reference points" for approximate 2-3 cm. While it is in this position, the handset is tilted away from the mouth with respect to the "test device reference point" by 15°. After the tilt, it is then moved back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously.



### 6.1.4 Antenna position

The antenna of this EUT(model name TM150) cannot be extended and retracted.

## 6.2 Description of the Body-worn test setup

Body-worn measurements were performed in GSM and GPRS modes.  
The measurements in GSM mode were performed in the EUT with the earphone.

It is the antenna part on the back side of the phone that is closest to the human body in both the flip open and closed conditions. we confirmed that the output power and the distance between the antenna and a phantom were same in both the flip open and closed conditions. After consideration of the various RF exposure possibilities it was determined that the flip open configuration would be worse case. As such, the device was tested in the flip open condition.

In addition, test-setup is the following positions.

### 6.2.1 Face position

The test was performed in distanced 15mm with face of EUT to the flat phantom.

### 6.2.2 Bottom position

The test was performed in distanced 15mm with bottom of EUT to the flat phantom.

#### Face position



#### Bottom position



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### 6.3 EUT Tune-up procedure

We used the basic-station simulator and determined the following conditions.

GSM mode (Class 10, 1 TX slot)

Crest Factor = 8.3

Frequency conditions tested at low, middle and high channel (1850.2MHz, 1880.0MHz , 1909.8MHz).

GPRS mode (Class 10, 2 TX slot)

Crest Factor = 4.2

Frequency conditions tested at low, middle and high channel (1850.2MHz, 1880.0MHz , 1909.8MHz).

\*Detail of base-station simulator

Item : Universal Radio Cimmunication Tester

Model Number : CMU200

Serial Number : 130900897

Manufacture : Rohde & Schwarz

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## SECTION 7 : 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.

Error Description	Uncertainty value $\pm$ %	Probability distribution	divisor	(ci)1 lg	Standard Uncertainty (1g)	vi or v <sub>eff</sub>
<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	$\pm 2.9$	13
Device holder uncertainty	$\pm 3.6$	Rectangular	$\sqrt{3}$	1	$\pm 3.6$	7
Power drift	$\pm 5.0$	Rectangular	$\sqrt{3}$	1	$\pm 2.9$	$\infty$
<b>Phantom and Setup</b>						
Phantom uncertainty	$\pm 4.0$	Rectangular	$\sqrt{3}$	1	$\pm 2.3$	$\infty$
Liquid conductivity (deviation from target values)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.64	$\pm 1.8$	$\infty$
Liquid conductivity (measurement uncertainty)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.64	$\pm 1.8$	$\infty$
Liquid permittivity (deviation from target values)	$\pm 5.0$	Rectangular	$\sqrt{3}$	0.6	$\pm 1.7$	$\infty$
Liquid permittivity (measurement uncertainty)	$\pm 5.0$	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 8 : Simulated tissue liquid parameter**

### **8.1 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.

#### **8.1.1 Head 1800MHz**

Type of liquid : **Head 1800 MHz**  
Ambient temperature (deg.c.) : **22.1(May 26 and 27)**  
Relative Humidity (%) : **41(May 26), 51(May 27)**

Measured By : Miyo Ikuta

<b>DIELECTRIC PARAMETERS MEASUREMENT RESULTS</b>								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
May 26	1800	21.8	21.8	Relative Permittivity $\epsilon_r$	40.0	39.6	-1.0	+/-5
				Conductivity $\sigma$ [mho/m]	1.40	1.39	-0.7	+/-5
May 27	1800	21.3	21.3	Relative Permittivity $\epsilon_r$	40.0	39.2	-2.0	+/-5
				Conductivity $\sigma$ [mho/m]	1.40	1.39	-0.7	+/-5
May 26	1880	21.8	21.8	Relative Permittivity $\epsilon_r$	40.0	39.3	-1.8	+/-5
				Conductivity $\sigma$ [mho/m]	1.40	1.41	0.7	+/-5

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## 8.1.2 Muscle 1800MHz

Type of liquid : Muscle 1800 MHz  
Ambient temperature (deg.c.) : 23.0  
Relative Humidity (%) : 51

Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
May 27	1880	21.6	21.6	Relative Permittivity	53.3	51.8	-2.8	+/-5
				Conductivity $\sigma$ [mho/m]	1.52	1.51	-0.7	+/-5

## 8.2 Simulated Tissues

Ingredient	MiXTURE(%)	
	Head 1800MHz	Muscle 1800MHz
Water	55.2	71.6
DGMBE	44.4	30.0
Salt	0.3	0.4

Note:DGMBE(Diethylenglycol-monobuthyl ether)

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## SECTION 9 : System validation data

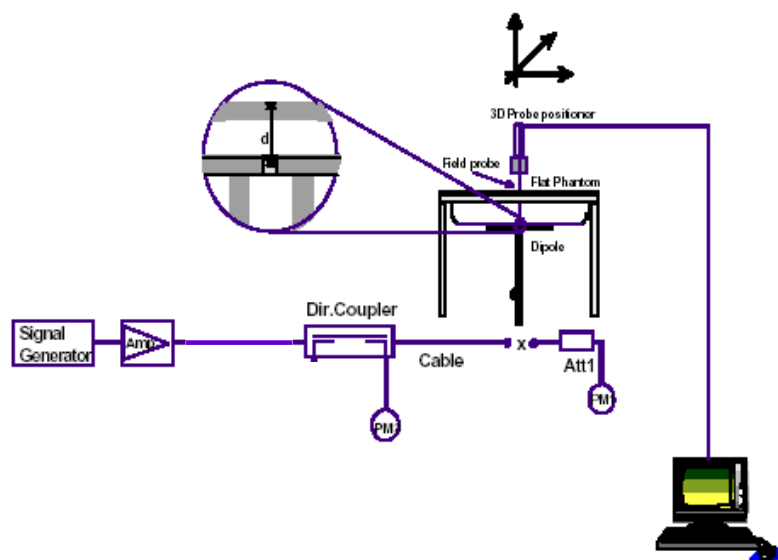
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are tabulated below. Please refer to APPENDIX 3.

Type of liquid : **HEAD 1800MHz**  
Frequency : **1800MHz**  
Liquid depth (cm) : **15.4**  
Ambient temperature (deg.c.) : **22.1(May 26), 22.5(May 27)**  
Relative Humidity (%) : **41 (May 26), 51(May 27)**  
Dipole : **D1800V2 SN:2d040**  
Power : **250mW**

Measured By : Miyo Ikuta

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 1800MHz)						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		
May 26	21.6	21.6	40.0	39.6	1.40	1.39	9.525	9.42	-1.1	+/-10
May 27	21.3	21.3	40.0	39.2	1.40	1.39	9.525	9.47	-0.6	+/-10

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



**1800MHz System performance check setup**

Test system for the system performance check setup diagram

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## **SECTION 10 : 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 of Step 4

**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 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7 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 11 : 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.

<p><b>NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE SPATIAL PEAK(averaged over any 1g of tissue) LIMIT 1.6 W/kg</b></p>
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## SECTION 12 : SAR Measurement results

### 12.1 Head 1800MHz SAR

#### 12.1.1 Conducted power measurement results

Date : May 26, 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]		
1850.2	-2.66	30	1.36	28.70	741.3	-2.69	30	1.36	28.67	736.2	-0.7	+/-5
1880.0	-2.47	30	1.36	28.89	774.5	-2.60	30	1.36	28.76	751.6	-2.9	+/-5
1909.8	-2.95	30	1.36	28.41	693.4	-2.95	30	1.36	28.41	693.4	0.0	+/-5

### 12.2 Head 1800MHz SAR

Liquid Depth (cm) : 15.4  
Parameters :  $\epsilon_r = 39.3$ ,  $\sigma = 1.41$   
Ambient temperature (deg.c.) : 23.2(May 26)  
Relative Humidity (%) : 41(May 26)

Model : TM150  
Serial No. : CS-268  
Operating mode : GSM  
Crest factor : 8.3

Date : May 26, 2004

Measured By : Miyo Ikuta

HEAD SAR MEASUREMENT RESULTS							
Frequency		Phantom Section	EUT Set-up Conditions		Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]		Antenna	Position	Before	After	Maximum value of multi-peak)
Mid	1880.0	Left	Fixed	Cheek	21.6	21.7	0.817
Mid	1880.0	Left	Fixed	Tilt	21.6	21.6	0.302
Mid	1880.0	Right	Fixed	Cheek	21.5	21.3	0.563
Mid	1880.0	Right	Fixed	Tilt	21.4	21.6	0.228
Low	1850.2	Left	Fixed	Cheek	21.7	21.7	0.736
High	1909.8	Left	Fixed	Cheek	21.7	21.7	0.823
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General					Head SAR: 1.6 W/kg (averaged over 1 gram)		

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## 12.3 Body 1800MHz SAR

### 12.3.1 Conducted power measurement results

Date : May 27, 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]		
1850.2	-2.60	30	1.36	28.76	751.6	-2.69	30	1.36	28.67	736.2	-2.1	+/-5
1880.0	-2.52	30	1.36	28.84	765.6	-2.67	30	1.36	28.69	739.6	-3.4	+/-5
1909.8	-2.95	30	1.36	28.41	693.4	-2.99	30	1.36	28.37	687.1	-0.9	+/-5

## 12.4 Body 1800MHz SAR

Liquid Depth (cm) : 15.4  
Parameters :  $\epsilon_r = 53.0$ ,  $\sigma = 1.51$   
Ambient Temperature[deg.c.] : 24.5  
Relative Humidity (%) : 42

Model : TM150  
Serial No. : CS-268  
Operating mode : GSM,GPRS  
Crest factor : 8.3(GSM)  
4.2(GPRS)

Date : May 27, 2004

Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS									
Mode	Frequency		Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]  Maximum value of multi-peak
	Channel	[MHz]		Antenna	Position	Separation [mm]	Before	After	
GSM	Mid	1880.0	Flat	Fixed	Face	15	21.3	21.3	0.161
	Mid	1880.0	Flat	Fixed	Bottom	15	21.3	21.4	0.241
	Low	1850.2	Flat	Fixed	Bottom	15	21.4	21.6	0.259
	High	1909.8	Flat	Fixed	Bottom	15	21.6	21.6	0.355
GPRS	Mid	1880.0	Flat	Fixed	Face	15	21.8	21.8	0.488
	Mid	1880.0	Flat	Fixed	Bottom	15	22.0	22.1	0.719
	Low	1850.2	Flat	Fixed	Bottom	15	21.7	21.6	0.694
	High	1909.8	Flat	Fixed	Bottom	15	21.6	21.6	0.733
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 13 : 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	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-120	901247	2004/01/28	2005/01/27
Attenuator	Orient Microwave	BX10-0476-00	-	2004/03/30	2005/03/29
Attenuator	Agilent	US40010300	08498-60012	2003/12/16	2004/12/15
1800MHz System Validation Dipole	Schmid&Partner Engineering AG	D1800V2	2d040	2002/11/14	2004/11/13
Dual Directional Coupler	N/A	Narda	03702	N/A	N/A
Head 1800MHz	N/A	N/A	N/A	N/A	N/A
Body 1800MHz	N/A	N/A	N/A	N/A	N/A

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## **SECTION 14 : 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 Recipes 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**

**Left head / Cheek**

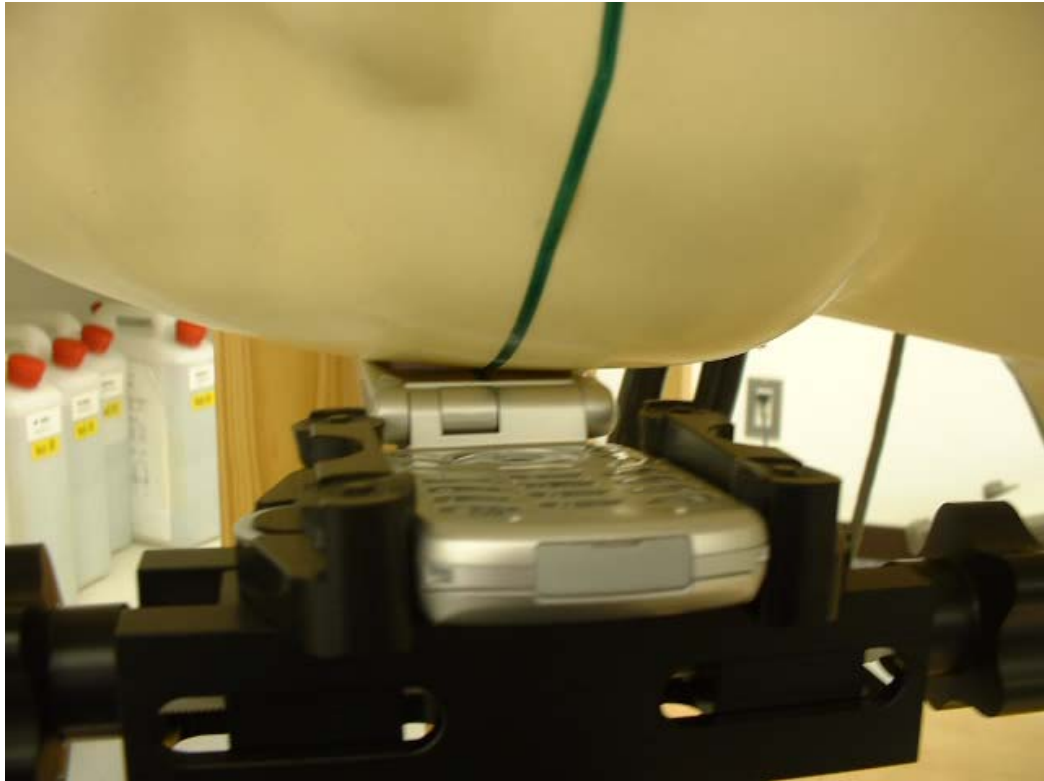




**Left head / Tilt**



**Right head / Cheek**

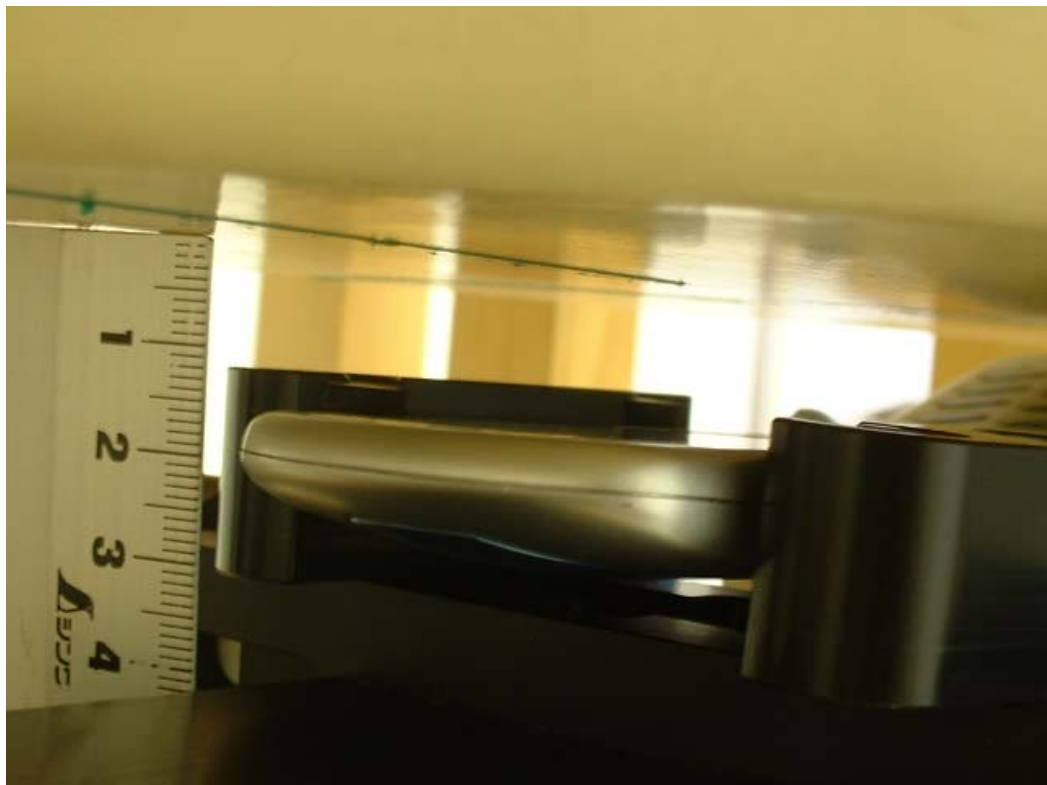


**Right head / Tilt**



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**Body / Face (GSM)**



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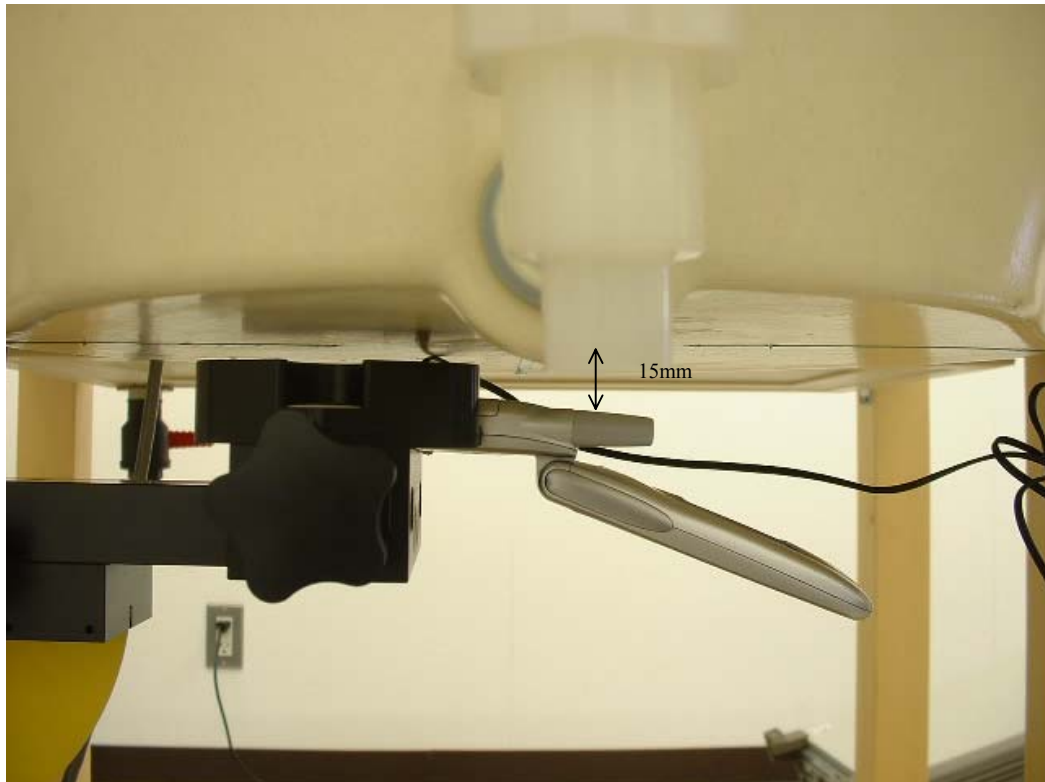
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**Body / Bottom (GSM)**



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**Body / Face (GPRS)**



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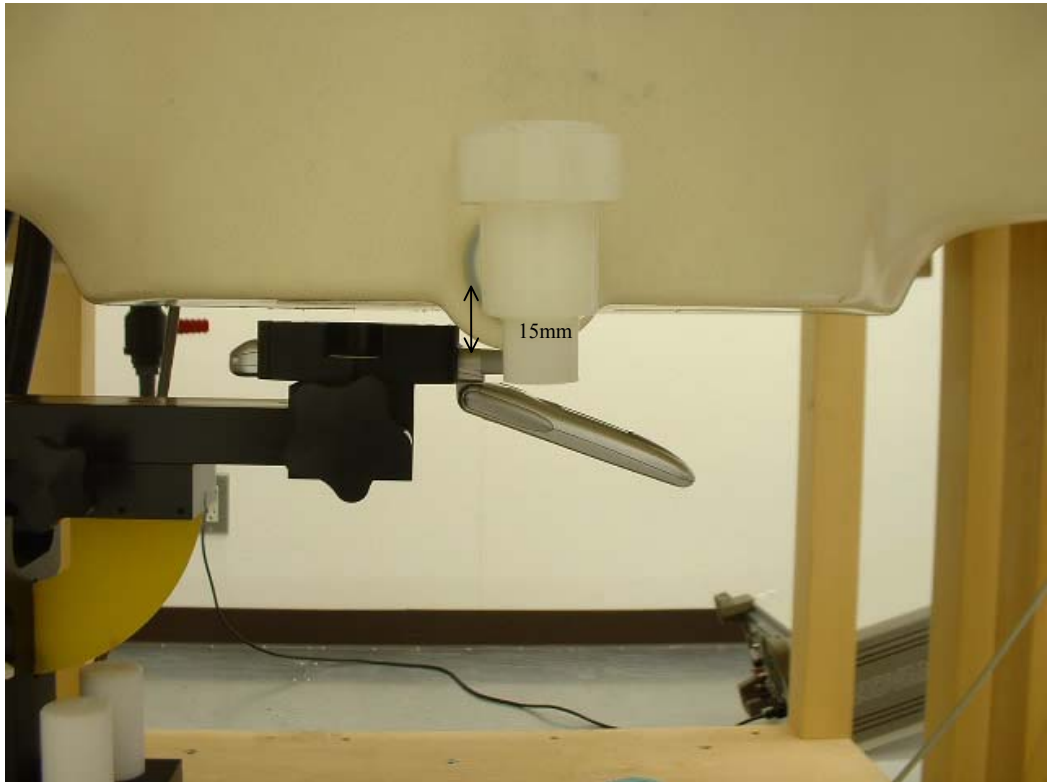
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**Body / Bottom (GPRS)**



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## **APPENDIX 2 : SAR Measurement data**



### TM150 / Left Head / Cheek / 1880.0 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.997 mW/g

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

Peak SAR (extrapolated) = 1.44 W/kg

**SAR(1 g) = 0.817 mW/g; SAR(10 g) = 0.444 mW/g**

Maximum value of SAR = 0.874 mW/g

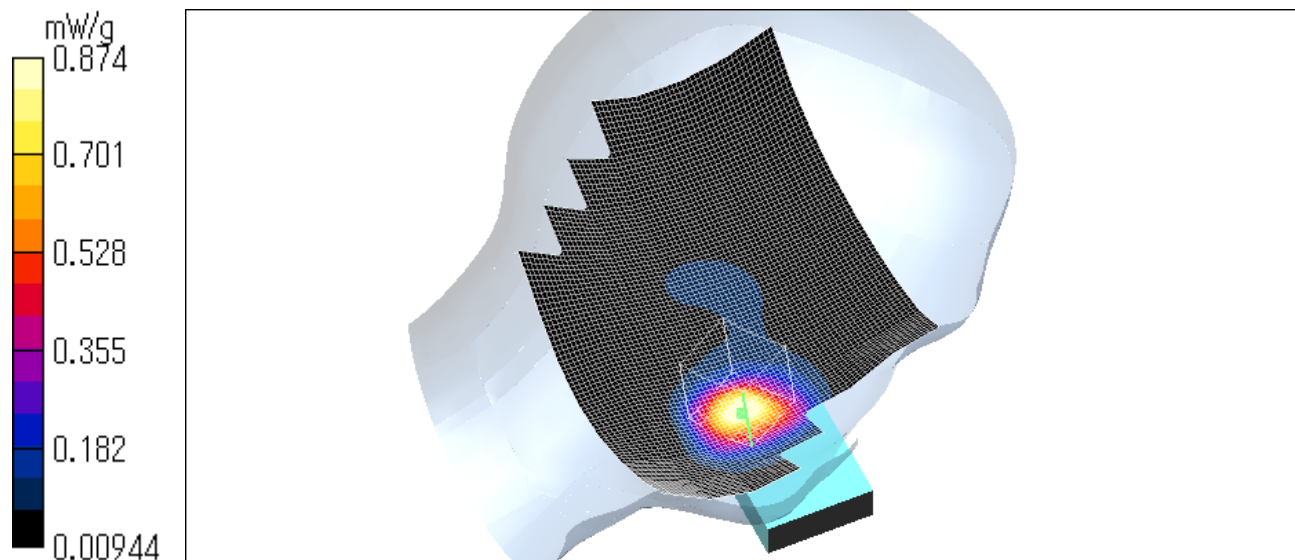
Test Date = 05/26/04

Reference Value = 9.89 V/m

Power Drift = -0.1 dB

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.6 degree.C , After 21.7 degree.C



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## TM150 / Left Head / Tilt / 1880.0 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.327 mW/g

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

Peak SAR (extrapolated) = 0.467 W/kg

**SAR(1 g) = 0.302 mW/g; SAR(10 g) = 0.164 mW/g**

Maximum value of SAR = 0.337 mW/g

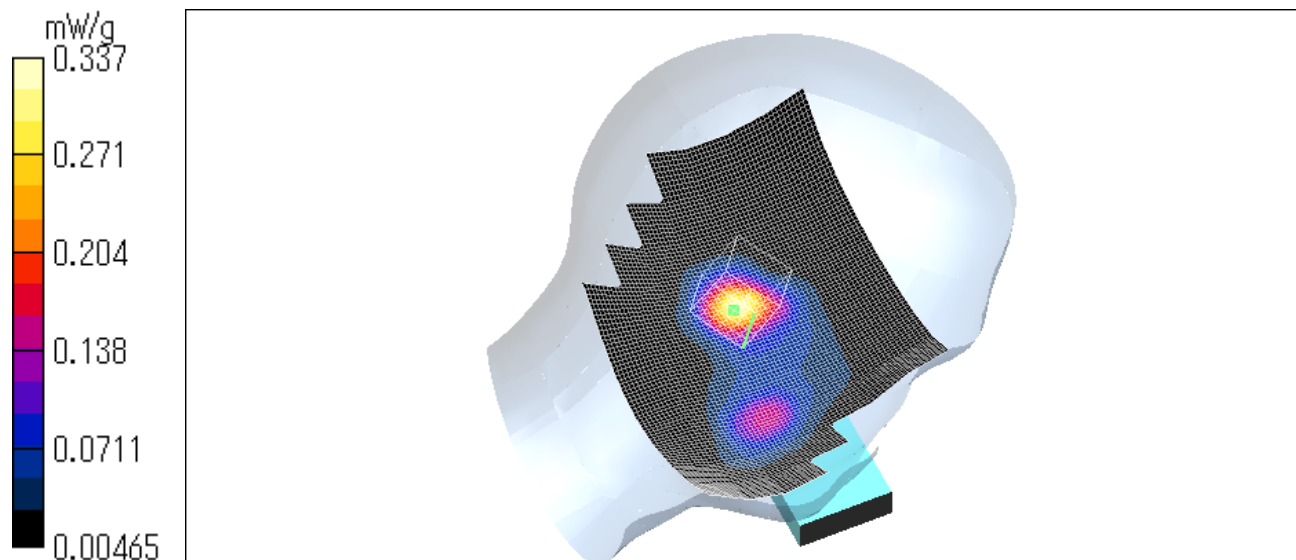
Test Date = 05/26/04

Reference Value = 15.8 V/m

Power Drift = 0.05 dB

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.6 degree.C , After 21.6 degree.C



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## TM150 / Right Head / Cheek / 1880.0 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.695 mW/g

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

Peak SAR (extrapolated) = 0.876 W/kg

**SAR(1 g) = 0.563 mW/g; SAR(10 g) = 0.34 mW/g**

Maximum value of SAR = 0.601 mW/g

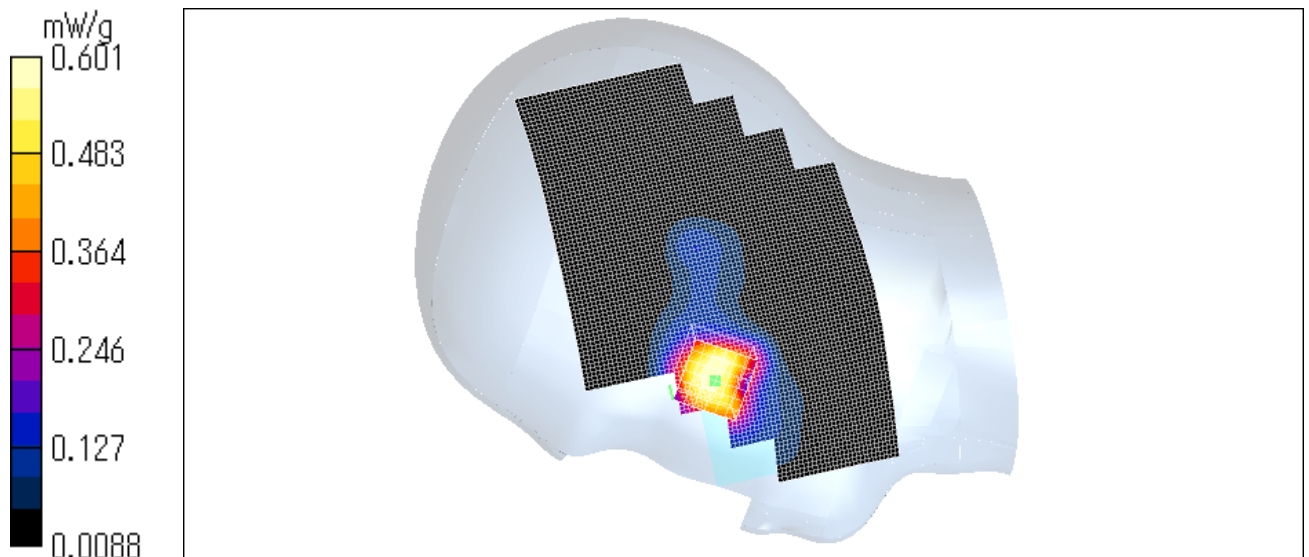
Test Date = 05/26/04

Reference Value = 8.4 V/m

Power Drift = -0.02 dB

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.5 degree.C , After 21.3 degree.C



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## TM150 / Right Head / Tilt / 1880.0 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.272 mW/g

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

Peak SAR (extrapolated) = 0.37 W/kg

**SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.124 mW/g**

Maximum value of SAR = 0.251 mW/g

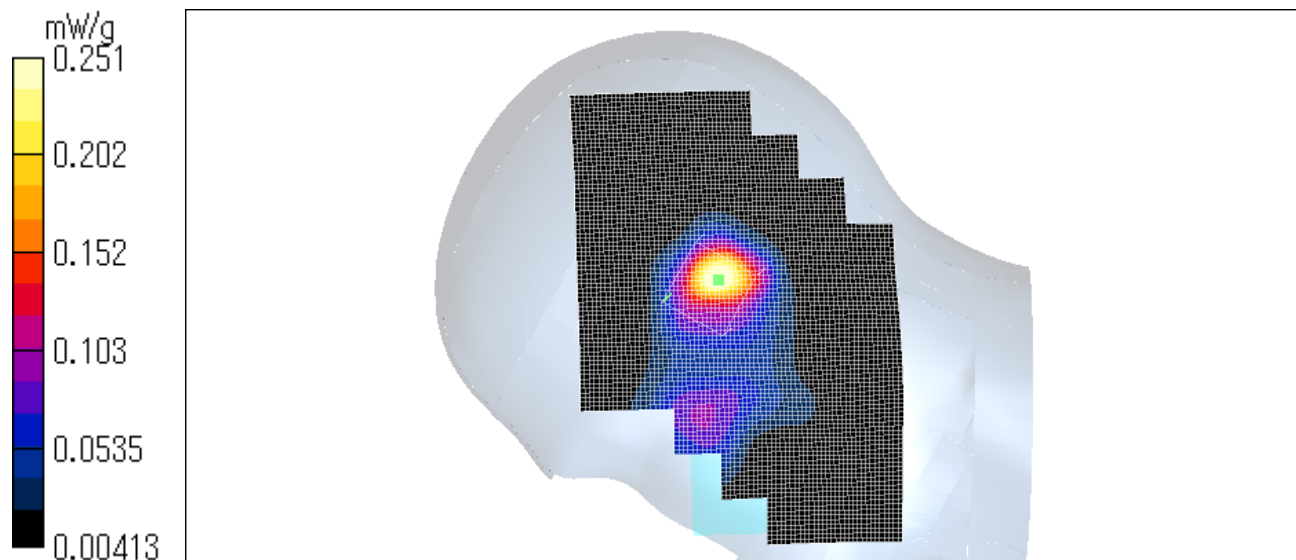
Test Date = 05/26/04

Reference Value = 13 V/m

Power Drift = -0.2 dB

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.4 degree.C , After 21.6 degree.C



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### TM150 / Left Head / Cheek / 1850.2 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.772 mW/g

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

Peak SAR (extrapolated) = 1.28 W/kg

**SAR(1 g) = 0.736 mW/g; SAR(10 g) = 0.389 mW/g**

Maximum value of SAR = 0.798 mW/g

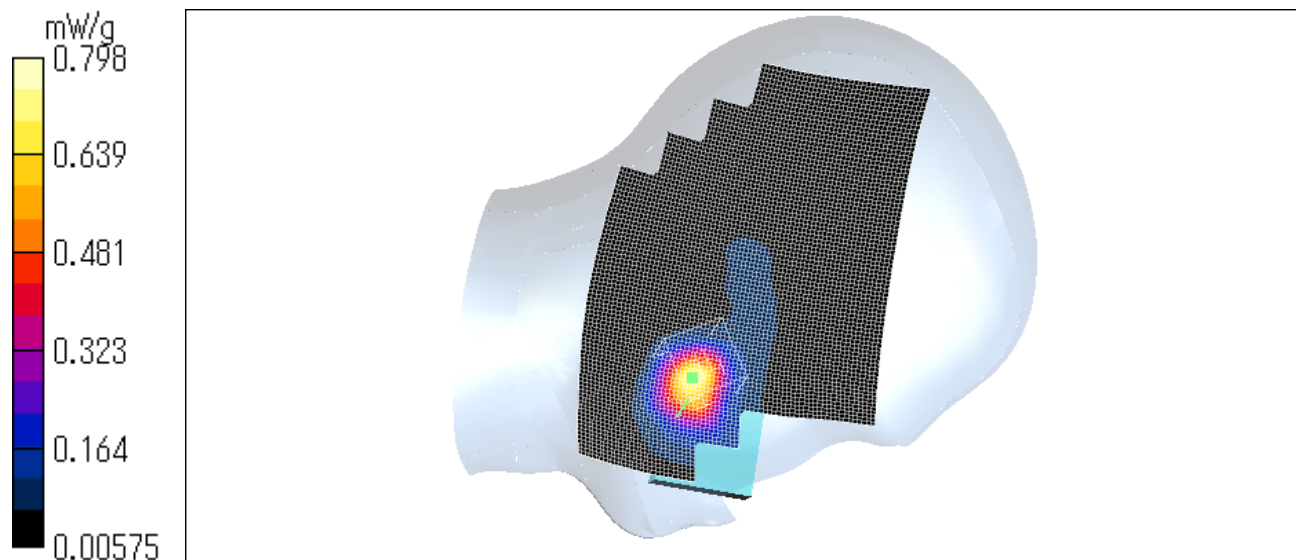
Reference Value = 7.49 V/m

Power Drift = -0.2dB

Test Date = 05/26/04

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.7 degree.C , After 21.7 degree.C



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### TM150 / Left Head / Cheek / 1909.8 MHz

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 (71x101x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.89 mW/g

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

Peak SAR (extrapolated) = 1.56 W/kg

**SAR(1 g) = 0.823 mW/g; SAR(10 g) = 0.436 mW/g**

Maximum value of SAR = 0.904 mW/g

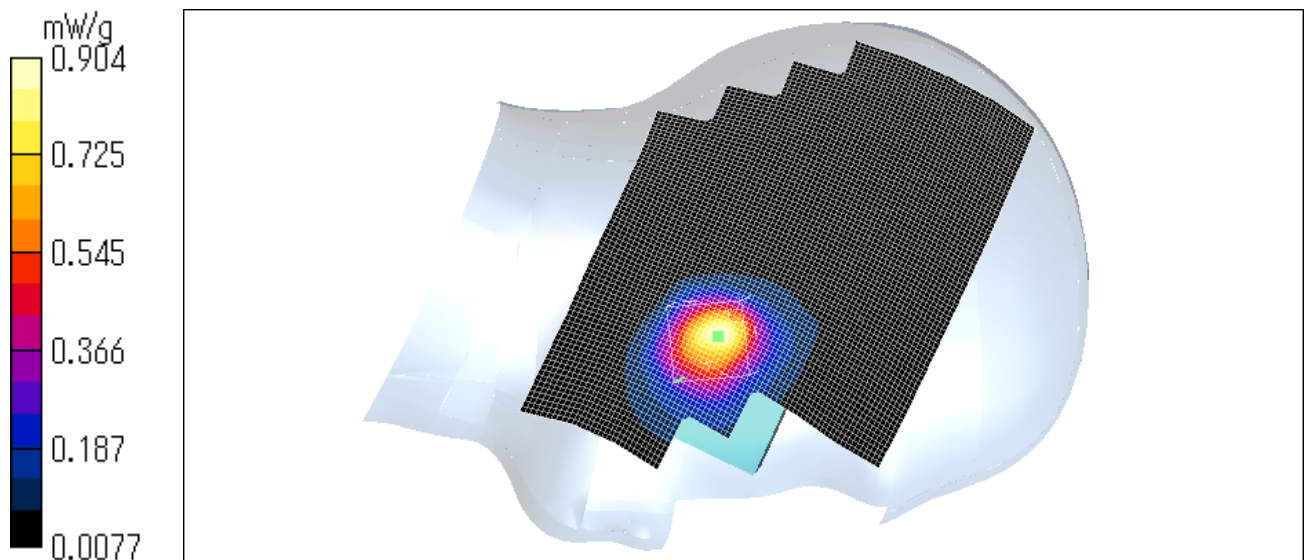
Test Date = 05/26/04

Reference Value = 7.34 V/m

Power Drift = 0.2 dB

Ambient Temperature = 23.2 degree.c

Liquid Temperature = Before 21.7 degree.C , After 21.7 degree.C



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### Z-axis scan at max SAR location

**TM150 / Left Head / Cheek / 1909.8 MHz**

Crest factor: 8.3

Medium: HSL1800 ( $\sigma = 1.41$  mho/m,  $\epsilon_r = 39.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Left Section

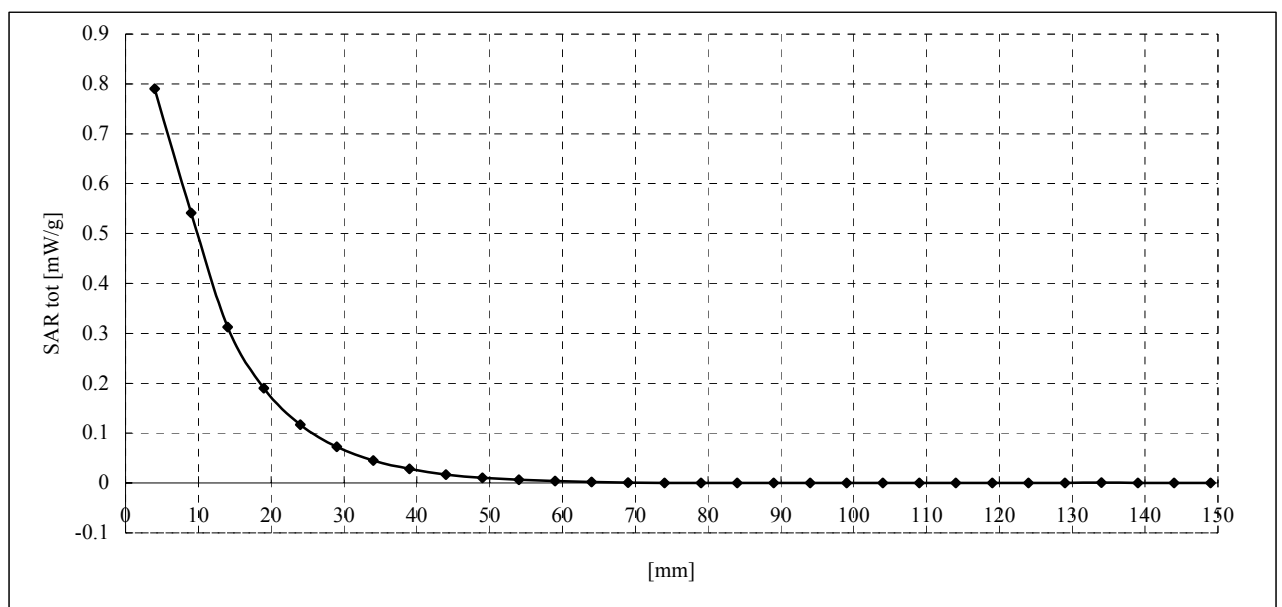
DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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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## TM150 / Body / Face (GSM) / 1880.0 MHz

Crest factor: 8.3

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (71x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.182 mW/g

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

Peak SAR (extrapolated) = 0.231 W/kg

**SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.104 mW/g**

Maximum value of SAR = 0.17 mW/g

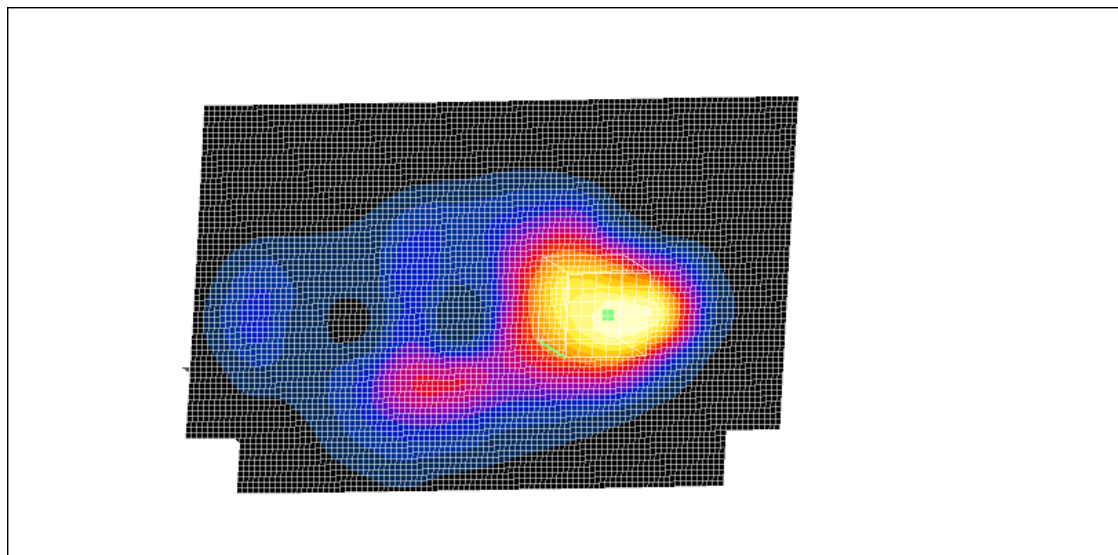
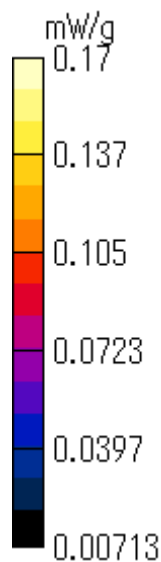
Test Date = 05/27/04

Reference Value = 5.13 V/m

Power Drift = 0.1 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.3 degree.C , After 21.3 degree.C



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## TM150 / Body / Bottom (GSM) / 1880.0 MHz

Crest factor: 8.3

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (71x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.267 mW/g

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

Peak SAR (extrapolated) = 0.386 W/kg

**SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.14 mW/g**

Maximum value of SAR = 0.261 mW/g

**Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 0.245 W/kg

**SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.105 mW/g**

Maximum value of SAR = 0.178 mW/g

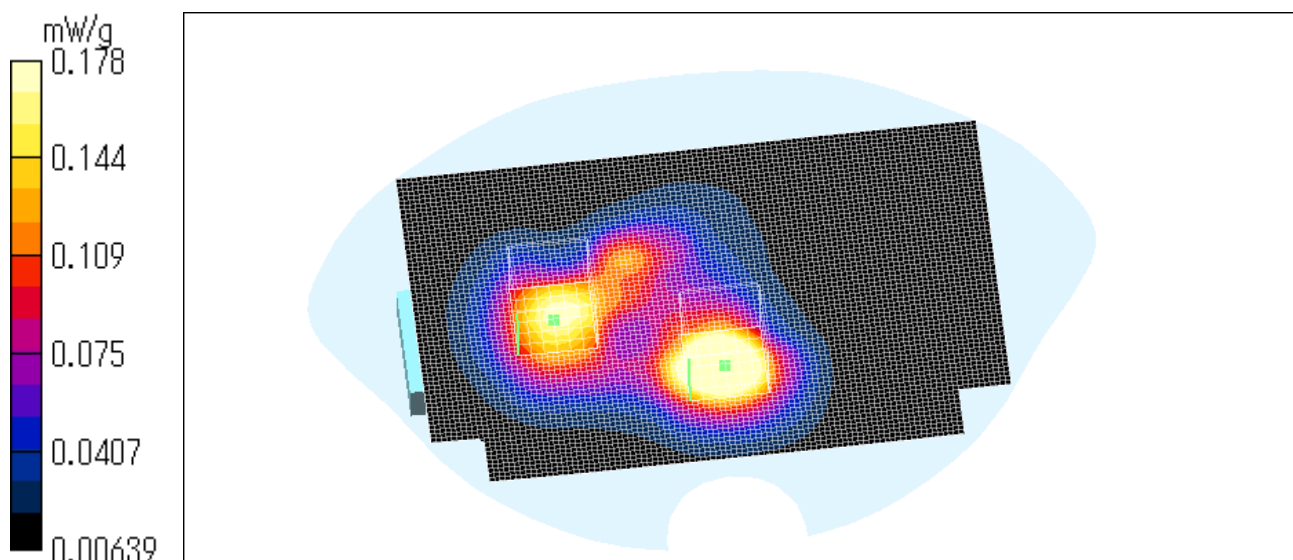
Test Date = 05/27/04

Reference Value = 8.05 V/m

Power Drift = -0.07 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.3 degree.C , After 21.4 degree.C



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## TM150 / Body / Bottom (GSM) / 1850.2 MHz

Crest factor: 8.3

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (71x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.287 mW/g

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

Peak SAR (extrapolated) = 0.418 W/kg

**SAR(1 g) = 0.259 mW/g; SAR(10 g) = 0.148 mW/g**

Maximum value of SAR = 0.281 mW/g

**Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Peak SAR (extrapolated) = 0.259 W/kg

**SAR(1 g) = 0.181 mW/g; SAR(10 g) = 0.116 mW/g**

Maximum value of SAR = 0.193 mW/g

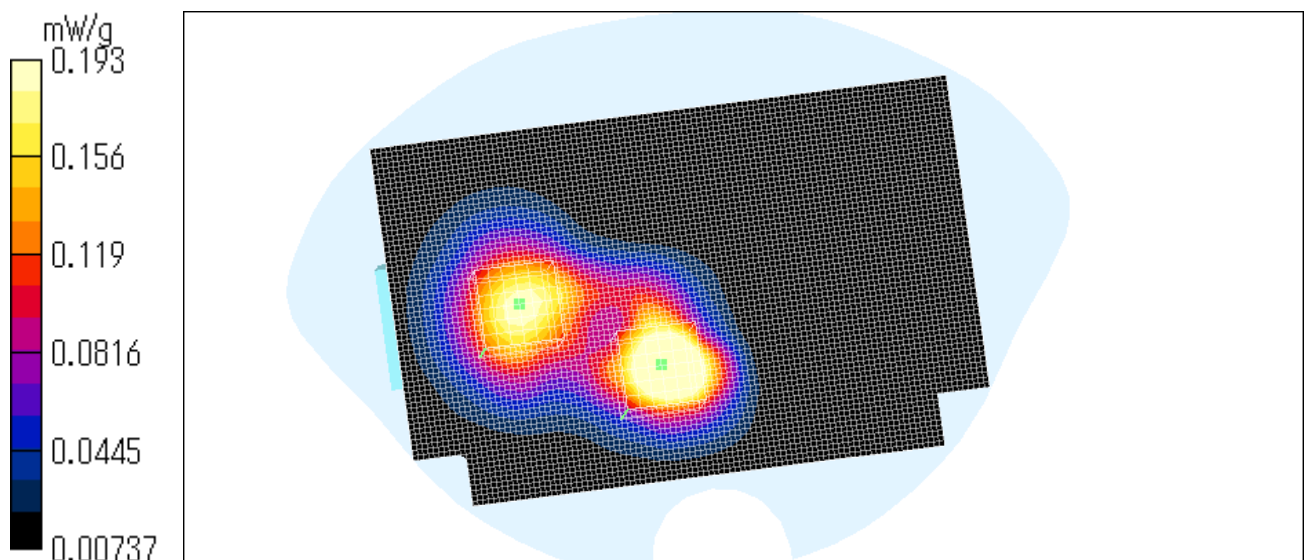
Test Date = 05/27/2004

Reference Value = 7.18 V/m

Power Drift = 0.02 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.4 degree.C , After 21.6 degree.C



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### TM150 / Body / Bottom (GSM) / 1909.80 MHz

Crest factor: 8.3

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (71x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.391 mW/g

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

Peak SAR (extrapolated) = 0.581 W/kg

**SAR(1 g) = 0.355 mW/g; SAR(10 g) = 0.203 mW/g**

Maximum value of SAR = 0.38 mW/g

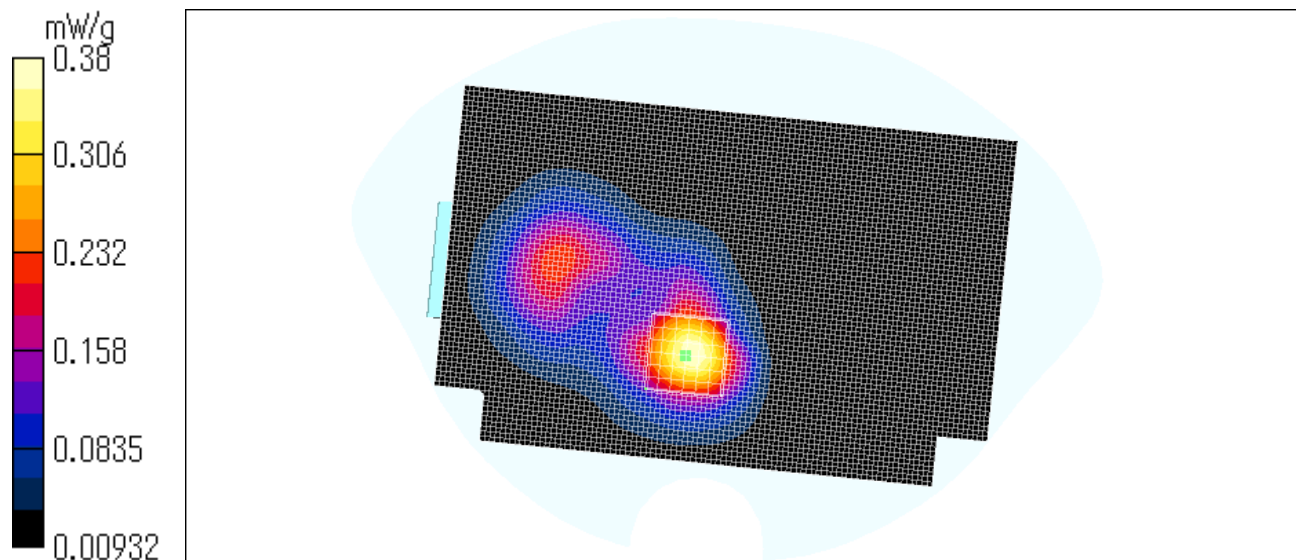
Test Date = 05/27/04

Reference Value = 7.96 V/m

Power Drift = -0.1 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.6 degree.C , After 21.6 degree.C



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### TM150 / Body / Face (GPRS) / 1880.0 MHz

Crest factor: 4.2

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (91x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.657 mW/g

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

Peak SAR (extrapolated) = 0.732 W/kg

**SAR(1 g) = 0.488 mW/g; SAR(10 g) = 0.303 mW/g**

Maximum value of SAR = 0.523 mW/g

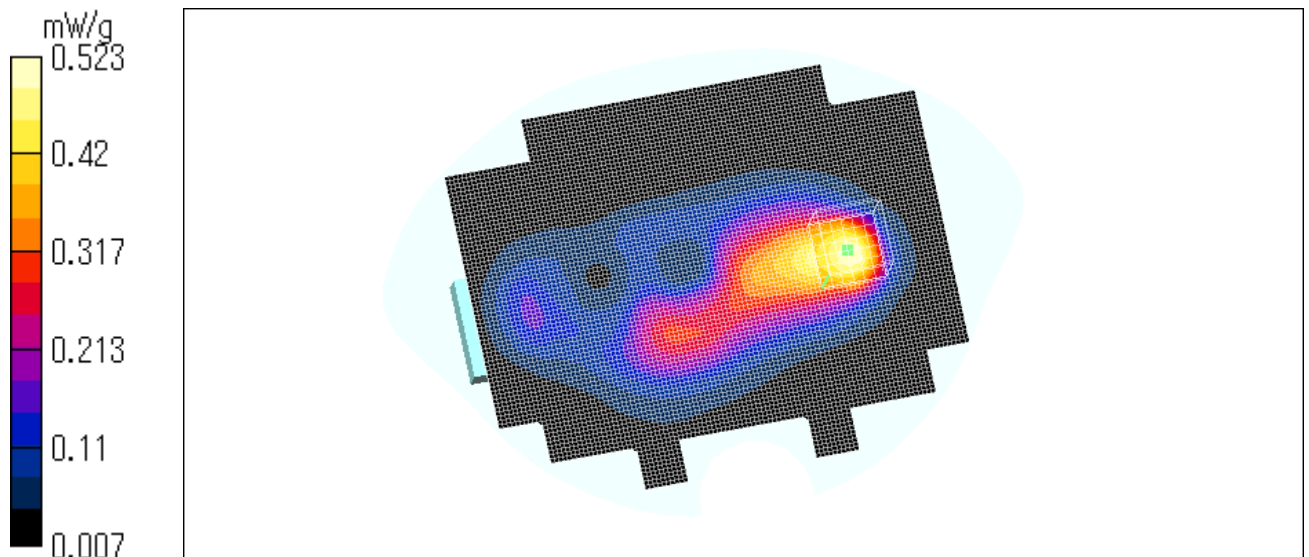
Test Date = 05/27/04

Reference Value = 9.59 V/m

Power Drift = -0.02 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.8 degree.C , After 21.8 degree.C



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### TM150 / Body / Bottom (GPRS) / 1880.0 MHz

Crest factor: 4.2

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (91x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.737 mW/g

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

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.719 mW/g; SAR(10 g) = 0.411 mW/g**

Maximum value of SAR = 0.782 mW/g

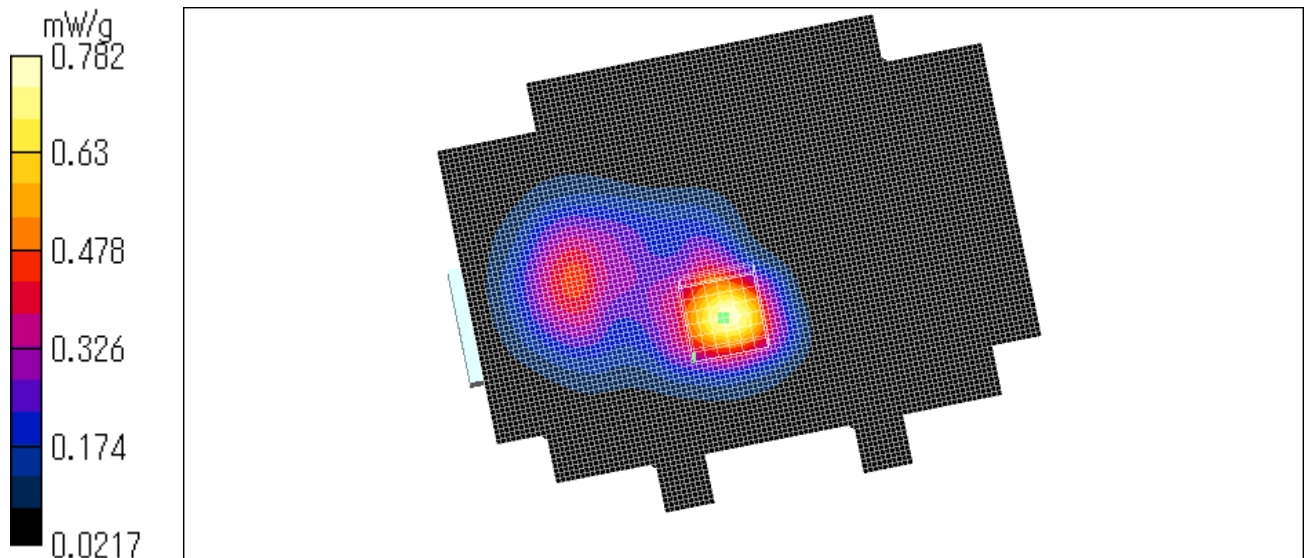
Test Date = 05/27/04

Reference Value = 14.6 V/m

Power Drift = 0.005 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.0 degree.C , After 22.1 degree.C



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### TM150 / Body / Bottom (GPRS) / 1850.2 MHz

Crest factor: 4.2

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (91x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.748 mW/g

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

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.694 mW/g; SAR(10 g) = 0.394 mW/g**

Maximum value of SAR = 0.744 mW/g

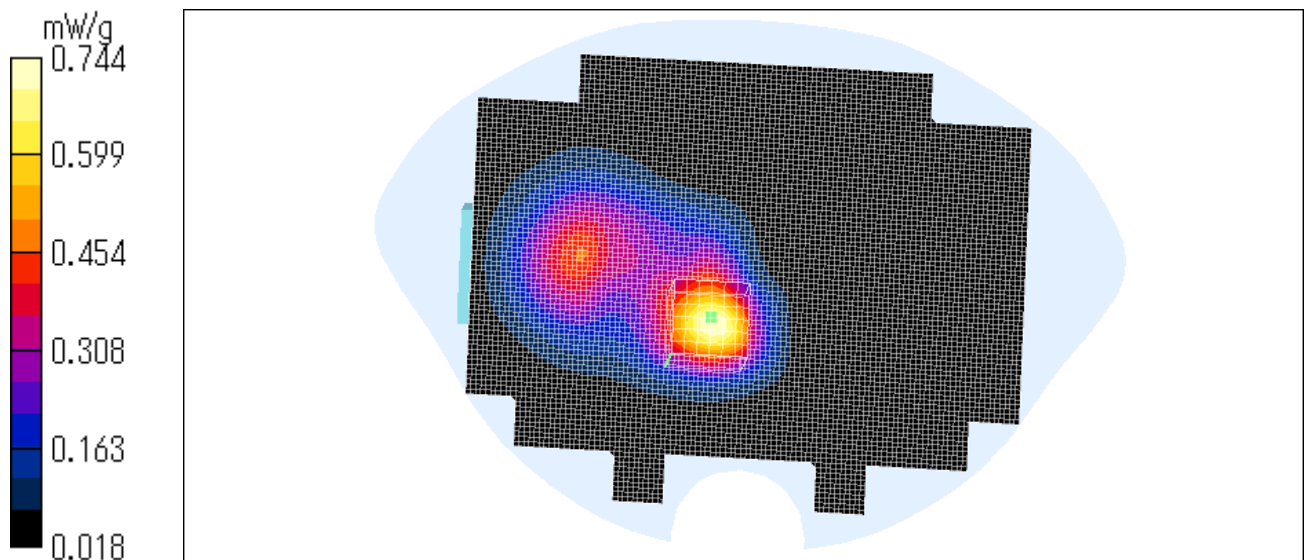
Test Date = 05/27/04

Reference Value = 13.3 V/m

Power Drift = -0.09 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.7 degree.C , After 21.6degree.C



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### TM150 / Body / Bottom (GPRS) / 1909.8 MHz

Crest factor: 4.2

Medium: M1800 ( $\sigma = 1.51$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

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 (91x111x1):** Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.766 mW/g

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

Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.733 mW/g; SAR(10 g) = 0.413 mW/g**

Maximum value of SAR = 0.796 mW/g

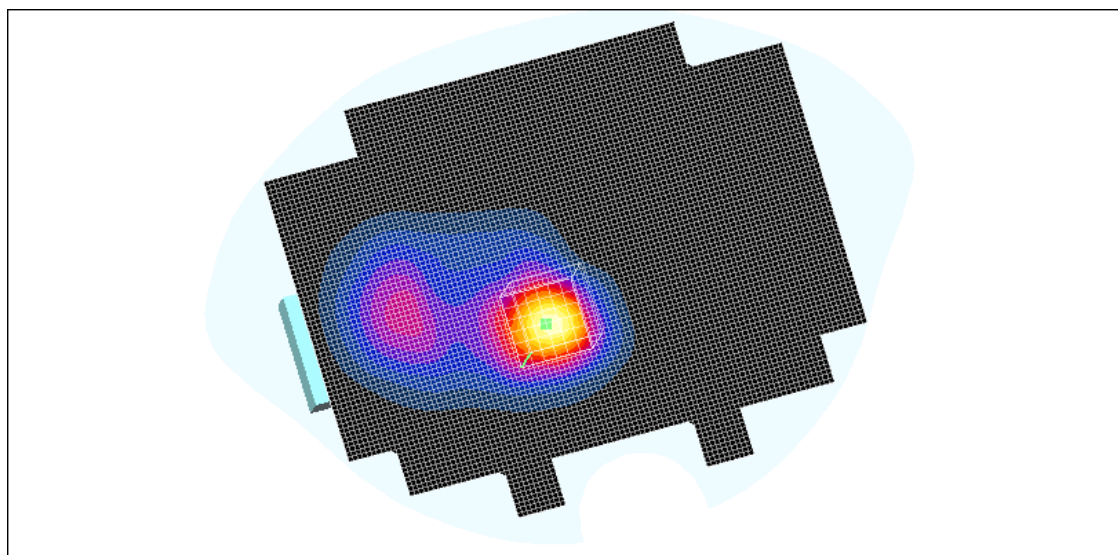
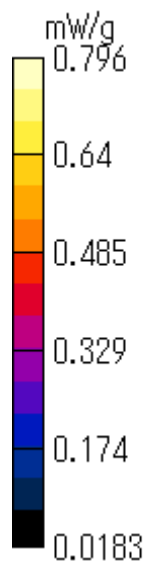
Test Date = 05/27/04

Reference Value = 12.6 V/m

Power Drift = -0.0008 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 21.6 degree.C , After 21.6degree.C



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



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## System Validation / Dipole 1800 MHz / Forward Conducted Power : 250mW

Crest factor: 1

Medium: HSL1800 ( $\sigma = 1.39$  mho/m,  $\epsilon_r = 39.2$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

Dipole 1800 MHz;

- Type: D1800V2; Serial: SN:2d040

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 = 11.5 mW/g

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

Peak SAR (extrapolated) = 16.1 W/kg

**SAR(1 g) = 9.42 mW/g; SAR(10 g) = 4.99 mW/g**

Maximum value of SAR = 10.5 mW/g

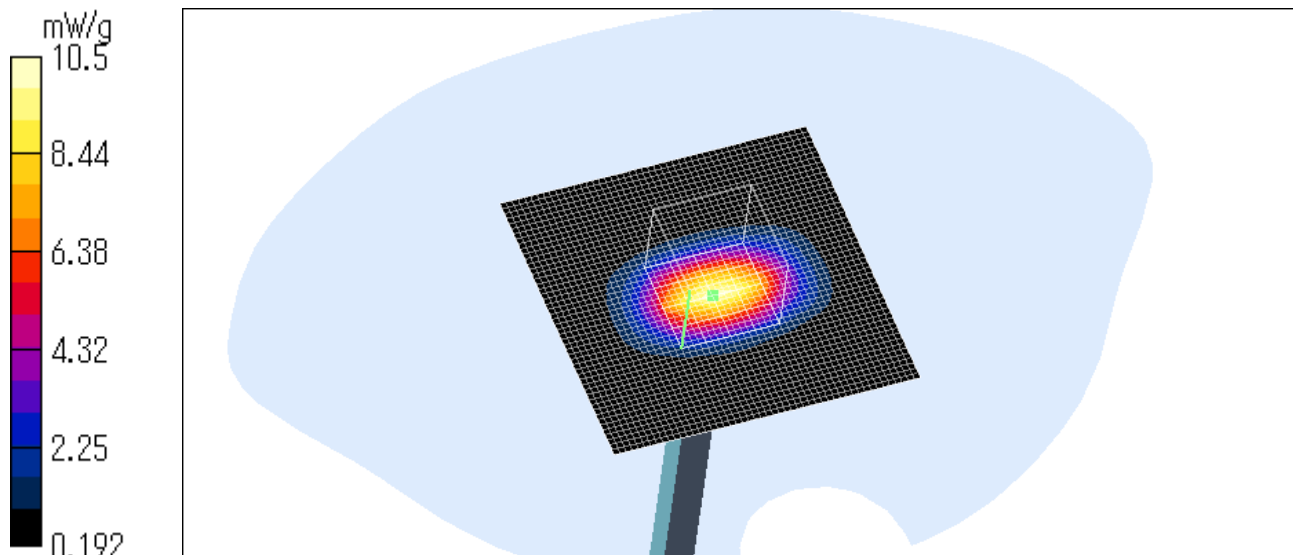
Test Date = 05/26/04

Reference Value = 91.3 V/m

Power Drift = 0.009 dB

Ambient Temperature = 22.1 degree.c

Liquid Temperature = Before 21.6 degree.C , After 21.6 degree.C



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## System Validation / Dipole 1800 MHz / Forward Conducted Power : 250mW

Crest factor: 1

Medium: HSL1800 ( $\sigma = 1.39$  mho/m,  $\epsilon_r = 39.6$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Flat Section

Dipole 1800 MHz;

- Type: D1800V2; Serial: SN:2d040

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(5.2, 5.2, 5.2); 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 = 11.5 mW/g

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

Peak SAR (extrapolated) = 16.2 W/kg

**SAR(1 g) = 9.47 mW/g; SAR(10 g) = 5 mW/g**

Maximum value of SAR = 10.5 mW/g

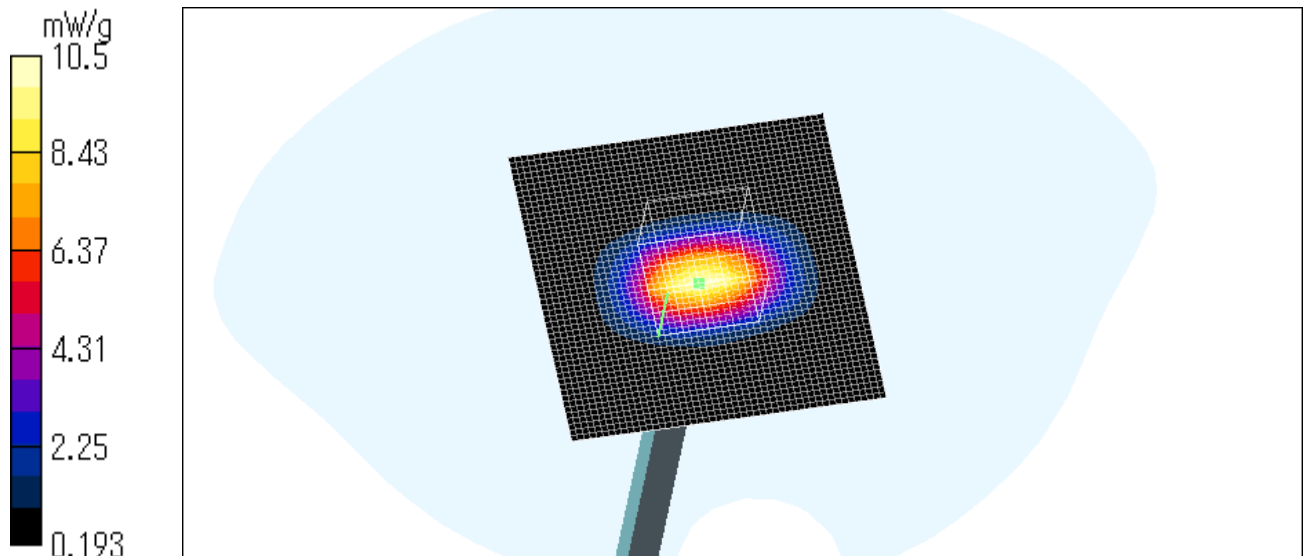
Test Date = 05 / 27 / 04

Reference Value = 91.5 V/m

Power Drift = 0.02 dB

Ambient Temperature = 22.5 degree.c

Liquid Temperature = Before 21.3 degree.C , After 21.3 degree.C



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