SAR EVALUATION REPORT

Report No. : 24EE0051-HO

Applicant	:	**SHARP CORPORATION**
Type of Equipment	:	**Cordless Handset**
Model No.	:	**UX-CD600K** **UX-K02 (Accessory Handset)**
FCC ID	:	**APYHRO00034**
Test standard	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C**
Test Result	:	**Complied**
Max SAR Measured	:	**Head SAR / 1.22 W/kg(2405.376 MHz)** **Body SAR / 0.446 W/kg(2439.936MHz)**

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 : January 07 and 08, 2004

Tested by : M. Ikuta

Miyo Ikuta
Head Office EMC Lab.

Approved by : T. Maeno

Tetsuo Maeno
Site Manager of Head Office EMC Lab.

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SECTION 1 : Client information

Company Name	:	SHARP CORPORATION
Brand Name	:	SHARP
Address	:	492 Minosho-cho, Yamatokoriyama-shi, Nara 639-1186 Japan
Telephone Number	:	+81-743-55-4085
Facsimile Number	:	+81-743-52-9514
Contact Person	:	Shigekazu Fujiwara

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

2.1 Identification of E.U.T.

Applicant	:	SHARP CORPORATION
Type of Equipment	:	Cordless Handset
Model No.	:	UX-CD600K UX-K02(Accessory Handset) * Electrical characteristic of each models are total identical. We have performed testing with UX-CD600K of Set item with Facsimile Equipment
Serial No.	:	26
Country of Manufacture	:	Thailand
Receipt Date of Sample	:	January 07 , 2004
Condition of EUT	:	Engineering prototype
Battery option	:	Only one model with EUT (M/N:UX-BA01, 3.6V / 850mA.h.)
Category Identified	:	Portable device

2.2 Product Description

Tx Frequency	:	2405.376 –2474.496MHz
Modulation	:	FHSS
Rating	:	3.6V
Max.Output Power Tested	:	19.4 dBm Peak Conducted
Antenna Type	:	λ/4 whip antenna
Size of EUT	:	44*195*30 (W*L*H [mm])
Position of Antenna	:	See photograph of following

SECTION 3 : Requirements for compliance testing defined by the FCC

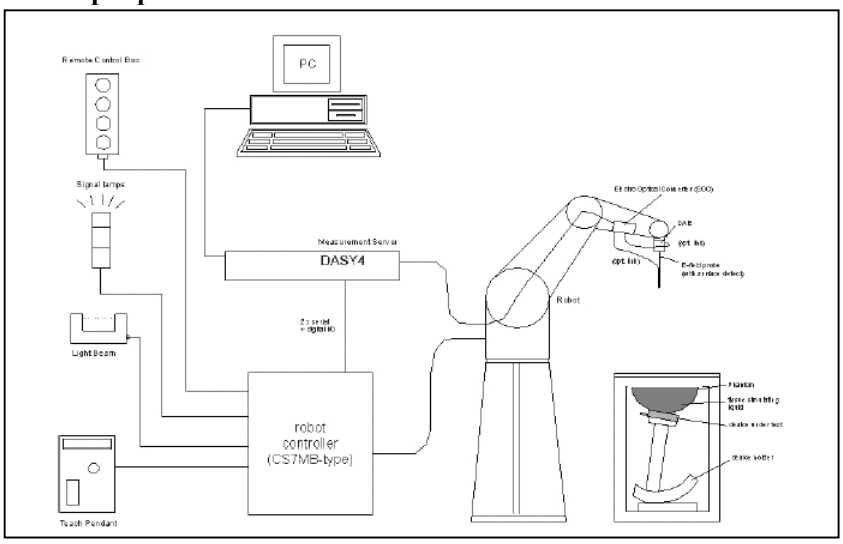
The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable 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, IEE P1528 and CENELEC EN50361.

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.

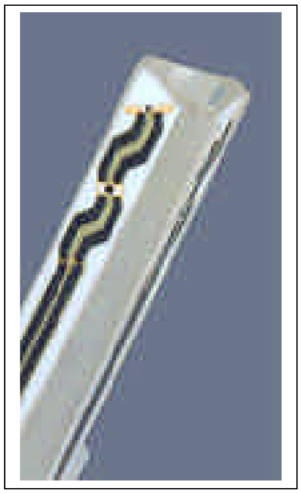
12. Tissue simulating liquid mixed according to the given recipes.

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

4.2 System components

4.2.1 ET3DV6 Probe Specification

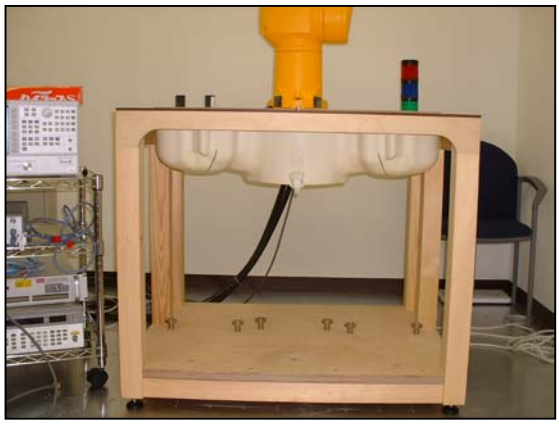
Construction:
Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Calibration:
Basic Broad Band calibration in air from 10 MHz to 2.5 GHz
In brain 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 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

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 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 µV (with auto zero)
Input Resistance	:	200 MΩ
Battery Power	:	> 10 h of operation (with two 9 V accus)
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. 20 liters
Manufacture	:	Schimid & Partner Engineering AG

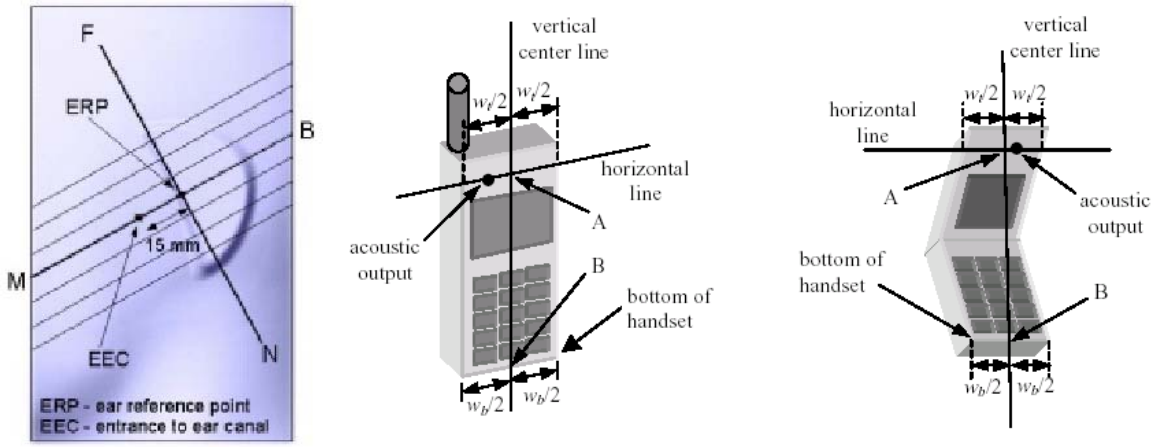
SECTION 6 : Test setup of EUT

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.

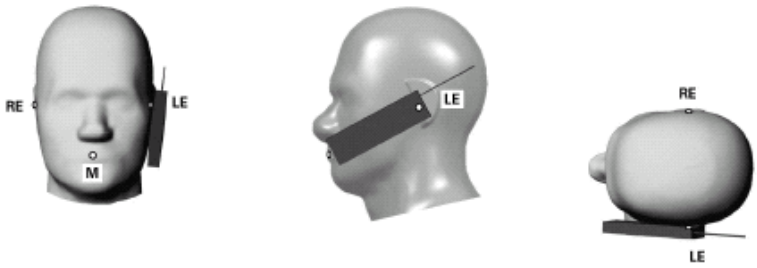
6.1.1 Initial ear position

A handset should be initially positioned with the earpiece region pressed against the ear spacerof 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".



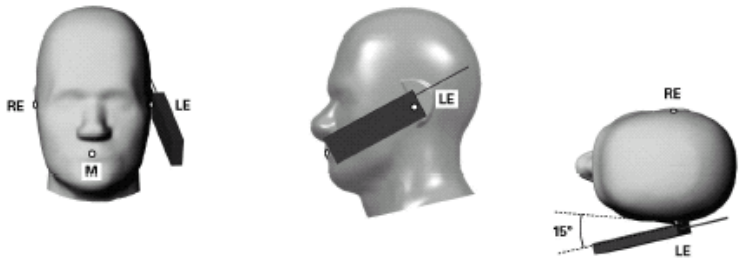
6.1.2 Cheek position

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:
i) When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
ii) (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.



6.1.2 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.



6.2 Description of the Body-worn test setup

When users operate or carry this EUT, it could be considered to get close to their bodies. In order to assume this situation, we performed the Body-worn measurements at the following position.

6.2.1 Face positionrt

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

6.2.2 Back position

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

Face position

Back position

6.3 EUT Tune-up procedure

We determined the test conditions for SAR testing as following.

Transmitting was continuous mode.
Crest Factor = 1
Frequency conditions were tested at fixed frequency of the low, middle and high channels.
(2405.376MHz ,2439.936MHz and 2474.496MHz)

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 ± %	Probability distribution	divisor	(ci)1 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±4.8	Normal	1	1	±4.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	$(1-c_p)^{1/2}$	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary effects	±1.0	Rectangular	√3	1	±0.6	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±1.0	Normal	1	1	±1.0	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient conditions	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Extrap. and integration	±1.0	Rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	Rectangular	√3	1	±2.9	9
Device holder uncertainty	±3.6	Rectangular	√3	1	±3.6	5
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (deviation from target values)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (measurement uncertainty)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid permittivity (deviation from target values)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (measurement uncertainty)	±5.0	Rectangular	√3	0.6	±1.7	∞
Combined Standard Uncertainty					**±10.37**	
Expanded Uncertainty (k=2)					**±20.7**	

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 2450MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **24.5(January 07), 24.5(January 08)**
Relative Humidity (%) : **32(January 07), 38(January 08)**

Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS							
Date	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
	Before	After					
January 07	23.7	23.7	Relative Permittivity εr	39.2	38.4	-2.0	+/-5
			Coductivity σ [mho/m]	1.80	1.85	2.8	+/-5
January 08	23.6	23.6	Relative Permittivity εr	39.2	37.9	-3.3	+/-5
			Coductivity σ [mho/m]	1.80	1.88	4.4	+/-5

8.1.2 Muscle 2450MHz

Type of liquid : **Muscle 2450 MHz**
Ambient temperature (deg.c.) : **23.9**
Relative Humidity (%) : **32**

Date : January 07,2004
Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS						
Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
Before	After					
22.6	22.6	Relative Permittivity εr	52.7	50.1	-4.9	+/-5
		Coductivity σ [mho/m]	1.95	2.02	3.6	+/-5

8.2 Simulated Tissues

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

Note:DGMBE(Diethylenglycol-monobuthyl ether)

SECTION 9 : System validation data

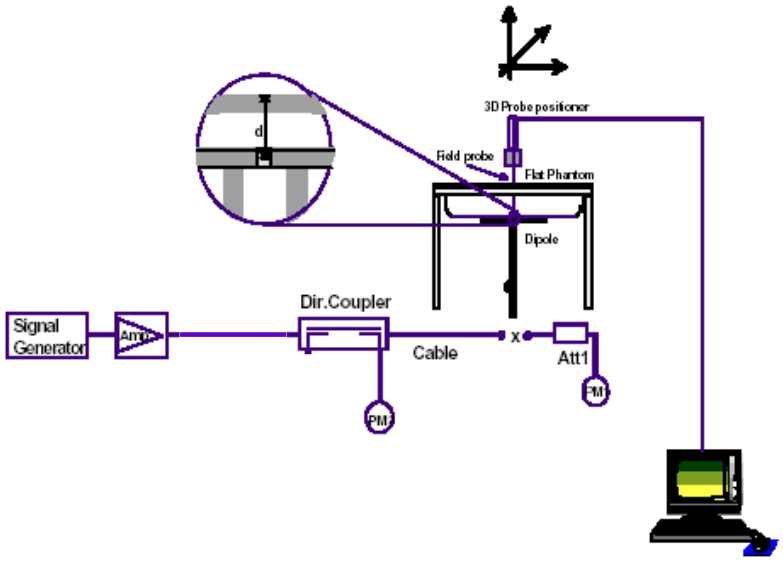
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are tabulated below. Please refer to APPENDIX 3.

Type of liquid	:	**HEAD 2450MHz**
Frequency	:	**2450MHz**
Liquid depth (cm)	:	**15.3**
Ambient temperature (deg.c.)	:	**24.5(January 07), 24.5(January08)**
Relative Humidity (%)	:	**32(January 07), 38(January 08)**
Dipole	:	**D2450V2 SN:713**
Power	:	**250mW**

Measured By : Miyo Ikuta

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target	Measured	Target	Measured	Target	Measured		
January 07	23.1	23.0	39.2	38.4	1.80	1.85	13.1	13.8	5.3	+/-10
January 08	23.2	23.2	39.2	37.9	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

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.

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 5 x 5x 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. It is measured power drift(the difference between the E-field measured in Step 4 and Step 1)

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.

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

SECTION 12 : SAR Measurement results

12.1 Head 2450MHz SAR

12.1.1 Conducted power measurement results

Date : January 08,2004
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]		
2405.376	-0.65	20	0.07	19.4	87.5	-0.68	20	0.07	19.4	86.9	-0.7	+/-5
2439.936	-0.99	20	0.07	19.1	80.9	-1.03	20	0.07	19.0	80.2	-0.9	+/-5
2474.496	-1.63	20	0.07	18.4	69.8	-1.71	20	0.07	18.4	68.5	-1.8	+/-5

12.2 Head 2450MHz SAR

Liquid Depth (cm)	:	**15.3**	Model	:	**UX-CD600K**
Parameters	:	ε_r =**37.9**, σ =**1.88**	Serial No.	:	**26**
Ambient Temperature[deg.c.]	:	**24.5**	Test mode	:	**Continuous mode**
Relative Humidity (%)	:	**38**	Crest factor	:	**1**

Date : January 08, 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	2439.936	Left	Fixed	Cheek	22.7	22.7	**0.845**
Mid	2439.936	Left	Fixed	Tilt	22.7	22.7	**0.497**
Low	2405.376	Left	Fixed	Cheek	22.8	22.8	**0.854**
High	2474.496	Left	Fixed	Cheek	22.9	22.9	**0.58**
Mid	2439.936	Right	Fixed	Cheek	22.4	22.3	**1.12**
Mid	2439.936	Right	Fixed	Tilt	22.3	22.4	**0.618**
Low	2405.376	Right	Fixed	Cheek	22.3	22.2	**1.22**
High	2474.496	Right	Fixed	Cheek	22.9	22.9	**0.874**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population					**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

12.2 Body 2450MHz SAR
12.2.1 Conducted power measurement results

Date : January 07,2004
Measured By : Miyo Ikuta

CONDUCTED POWER MEASUREMENT RESULTS												
	Before					After						
Frequency [MHz]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Deviation [%]	Limit [%]
2405.376	-0.66	20	0.07	19.4	87.3	-0.65	20	0.07	19.4	87.5	0.2	+/-5
2439.936	-1.19	20	0.07	18.9	77.3	-0.98	20	0.07	19.1	81.1	5.0	+/-5
2474.496	-1.81	20	0.07	18.3	67.0	-1.66	20	0.07	18.4	69.3	3.5	+/-5

12.2 Body 2450MHz SAR

Liquid Depth (cm)	:	**15.6**	Model	:	**UX-CD600K**
Parameters	:	ε_r =**50.1**, σ =**2.02**	Serial No.	:	**26**
Ambient Temperature[deg.c.]	:	**24.5**	Test mode	:	**Continuous mode**
Relative Humidity (%)	:	**32**	Crest factor	:	**1**

Date : January 07, 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	2439.936	Flat	Fixed	Face	15	22.4	22.4	**0.215**
Mid	2439.936	Flat	Fixed	Back	15	22.3	22.4	**0.446**
Low	2405.376	Flat	Fixed	Back	15	22.5	22.6	**0.416**
High	2474.496	Flat	Fixed	Back	15	22.6	22.8	**0.333**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

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
Spectrum Analyzer	Advantest	R3272	101202382	2003/12/14	2004/12/13
Signal Generator	Rohde&Schwarz	SML03	100331	2003/09/11	2004/09/10
RF Amplifier	OPHIR	5056F	1005	2003/02/06	2004/02/05
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	2003/04/10	2004/04/09
Robot,SAM Phantom	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
Attenuator	Weinschel Corp	93459	BG0143	2003/03/26	2004/03/25
Attenuator	Agilent	US40010300	08498-60012	2003/12/16	2004/12/15
2450MHz System Validation Dipole	Schmid&Partner Engineering AG	D2450V2	713	2002/11/14	2004/11/13
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

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.

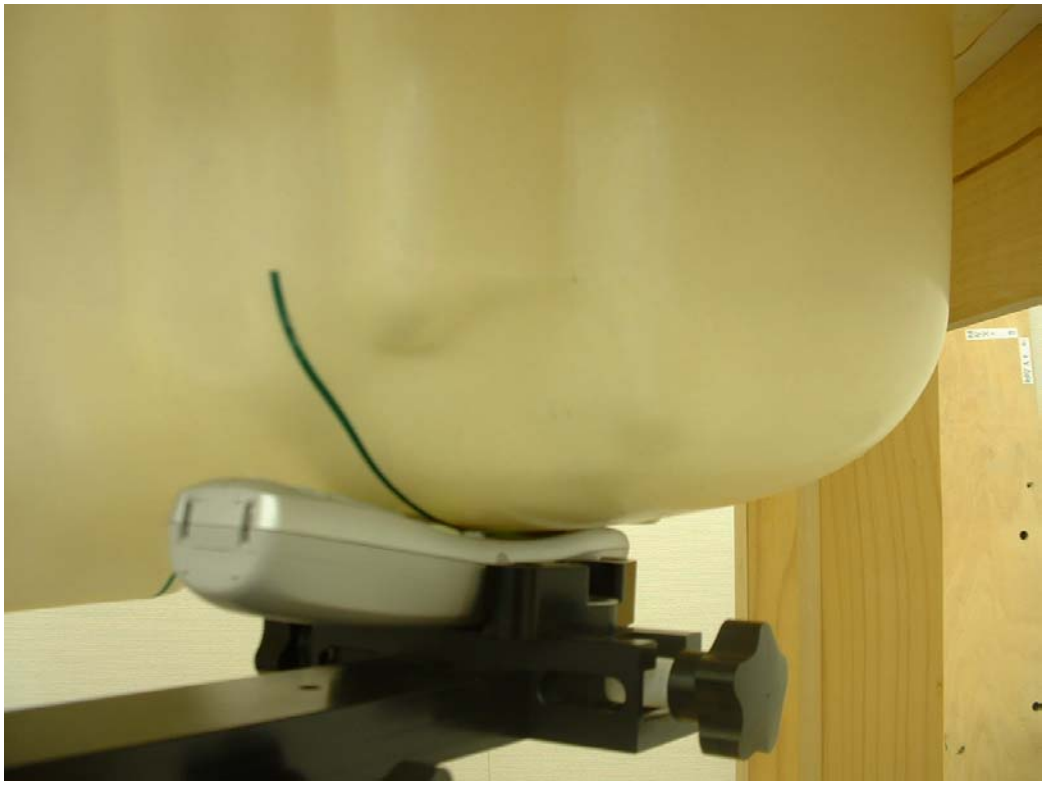
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

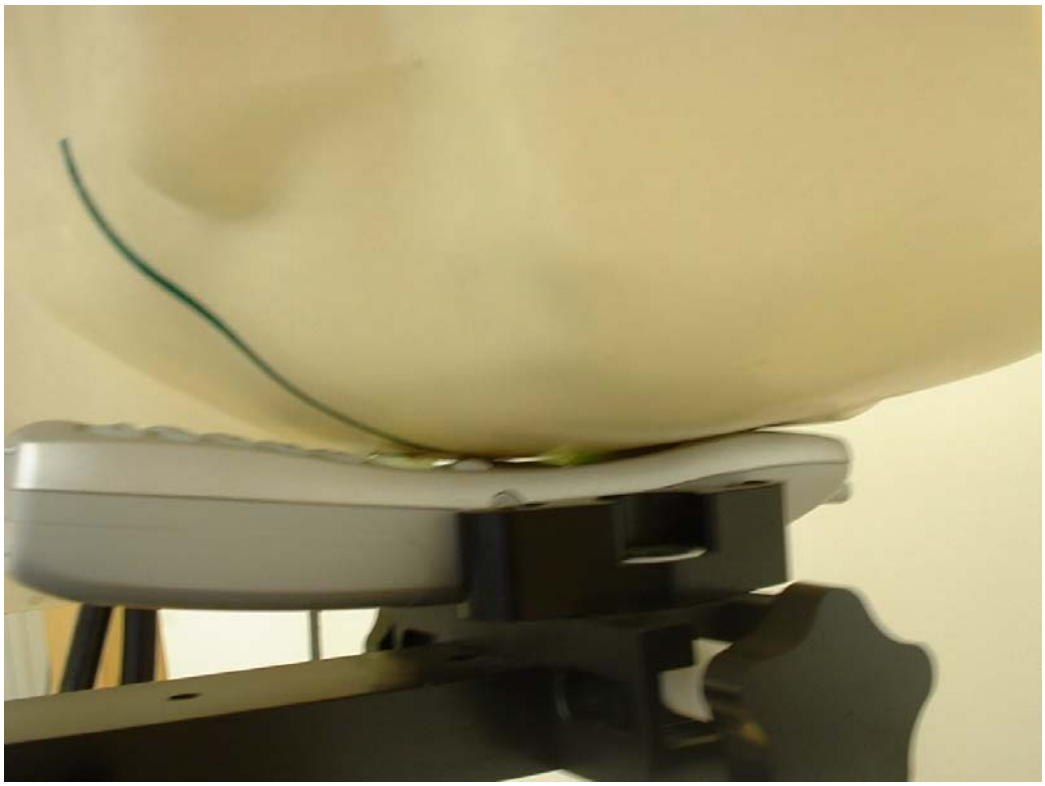
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.

[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.

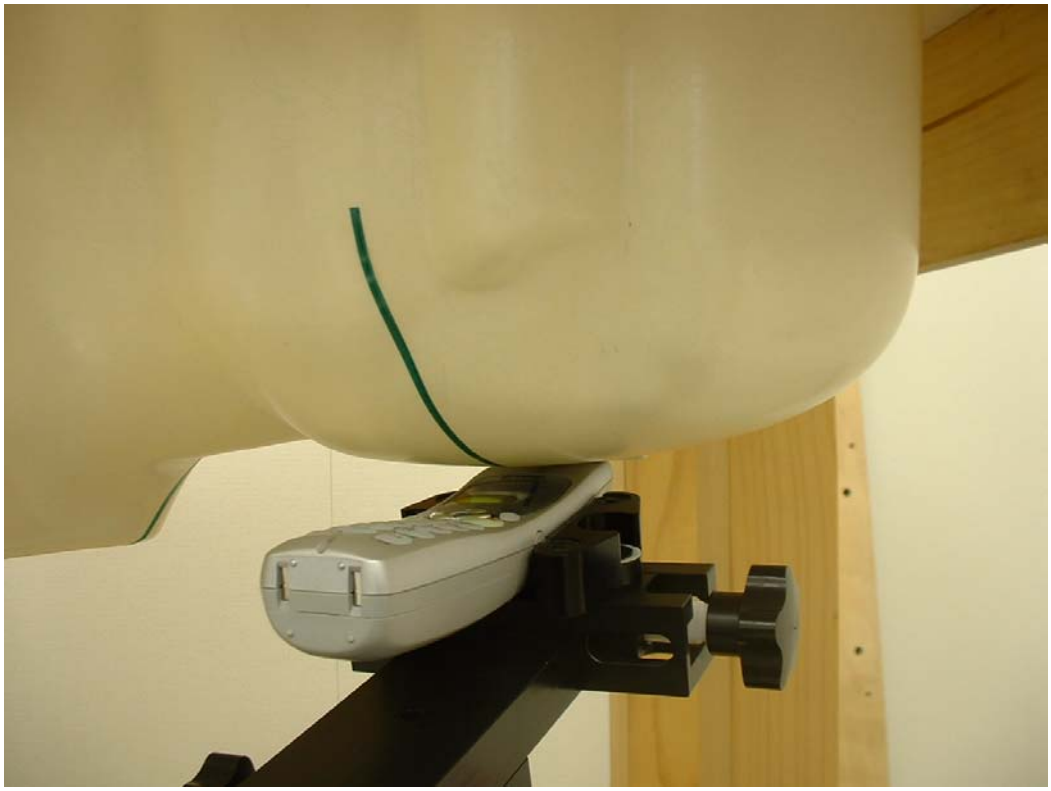
APPENDIX 1 : Photographs of test setup

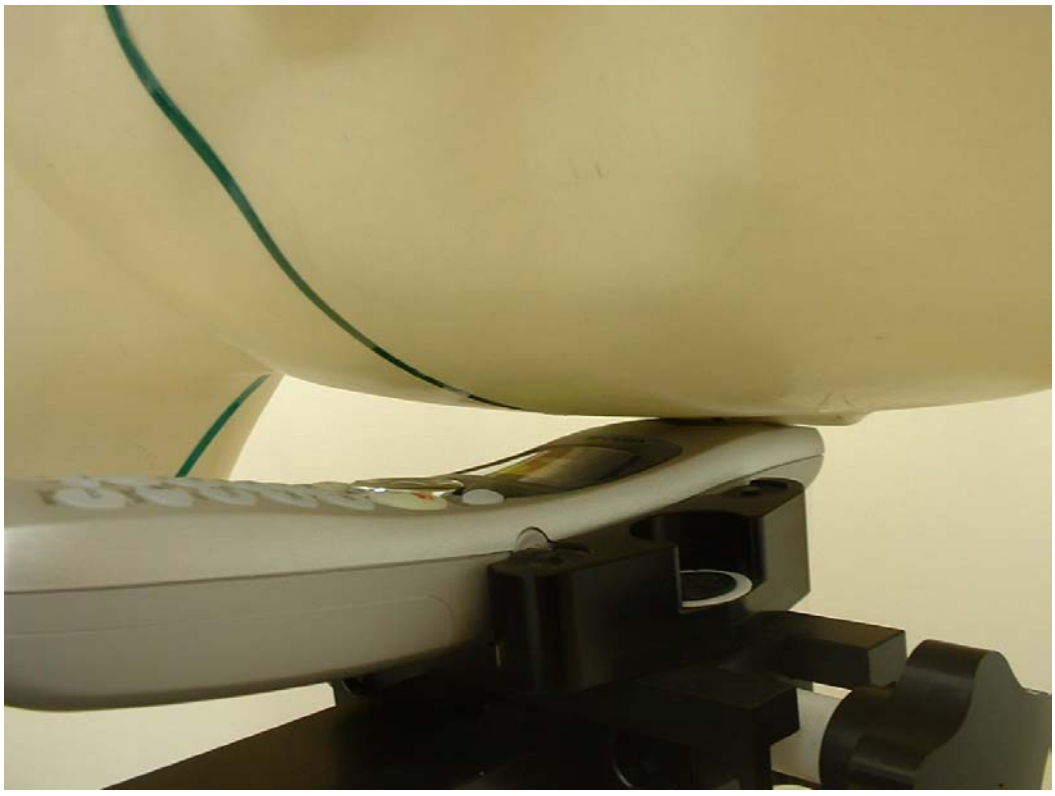
Left head / Cheek





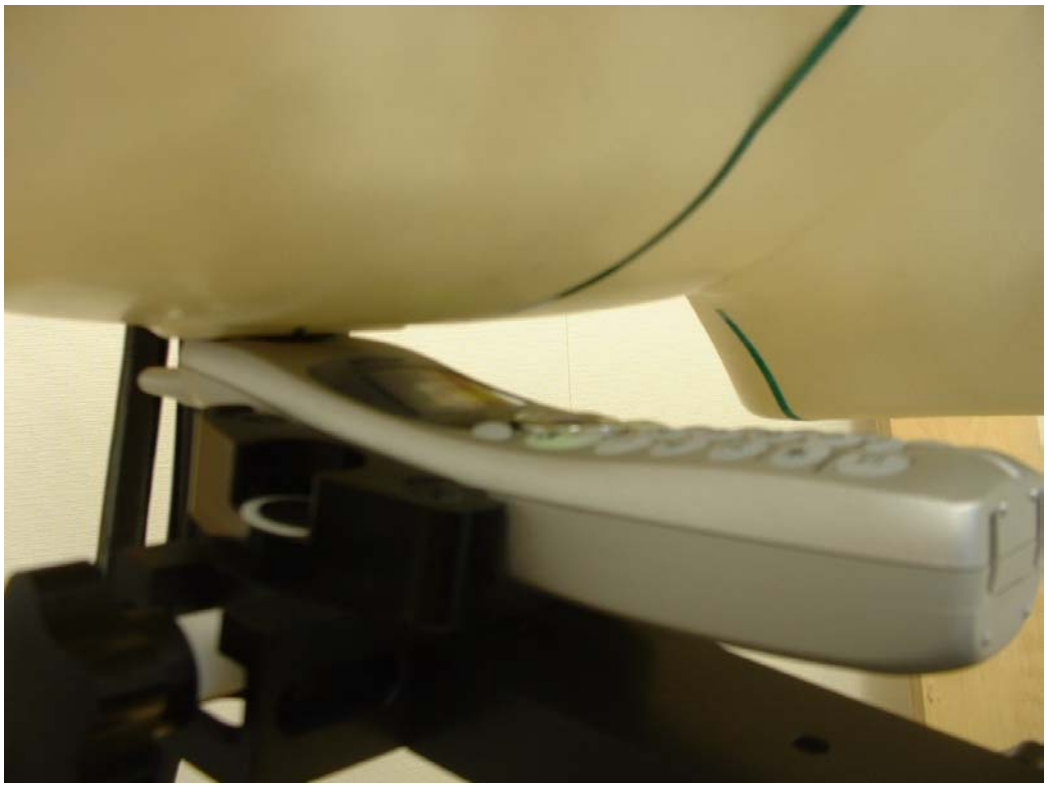
Left head / Tilt



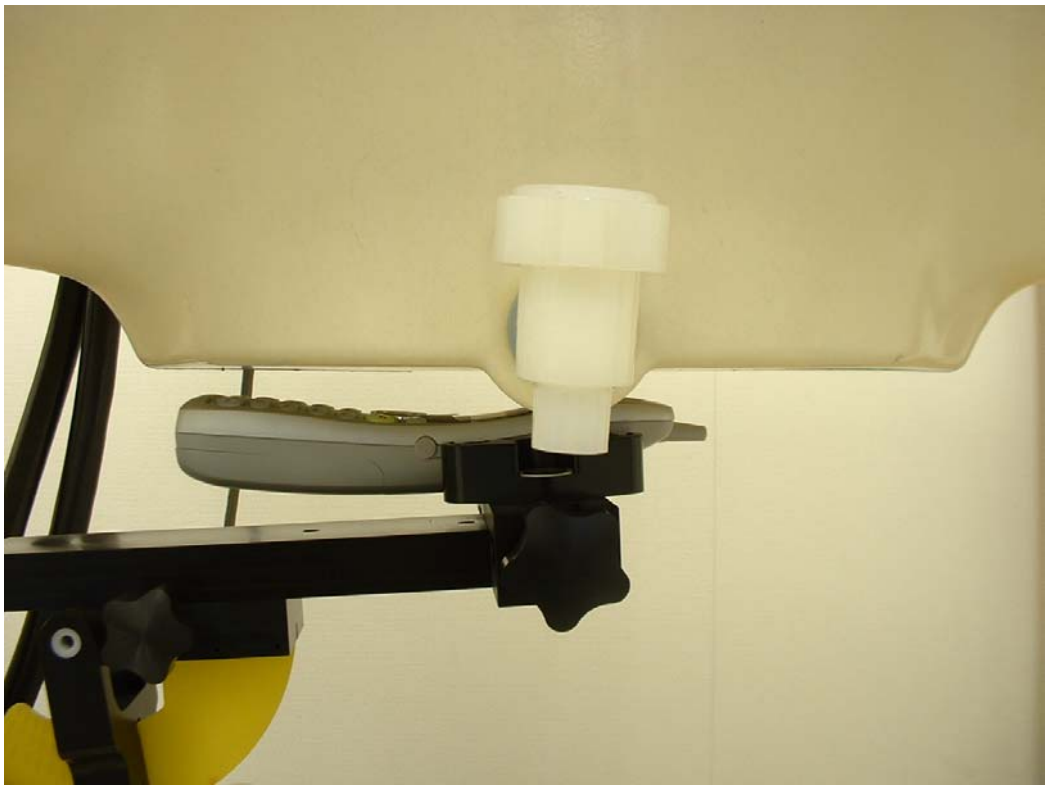


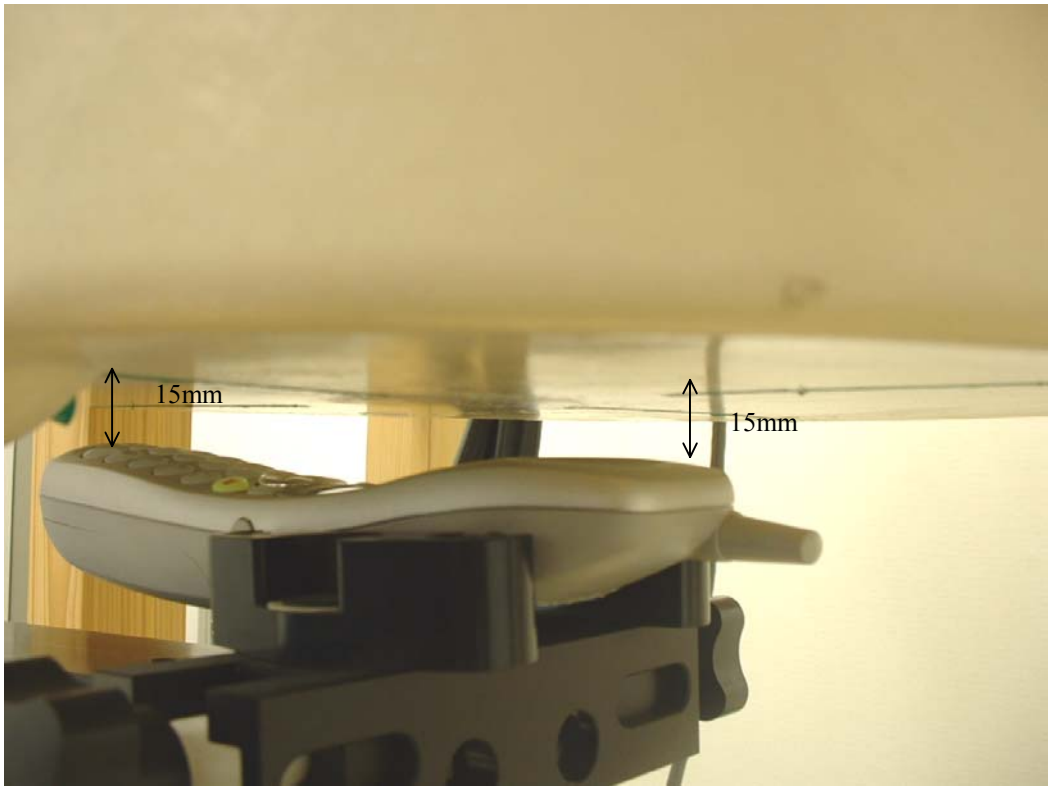
Right head / Cheek

Right head / Tilt

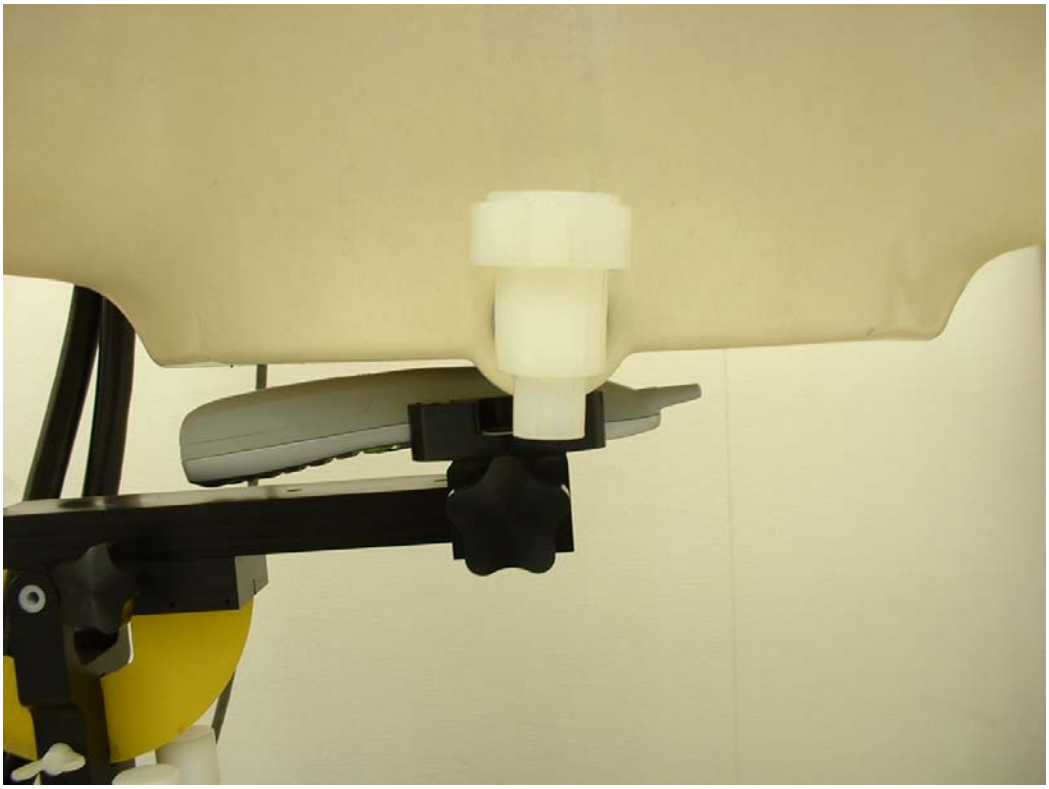


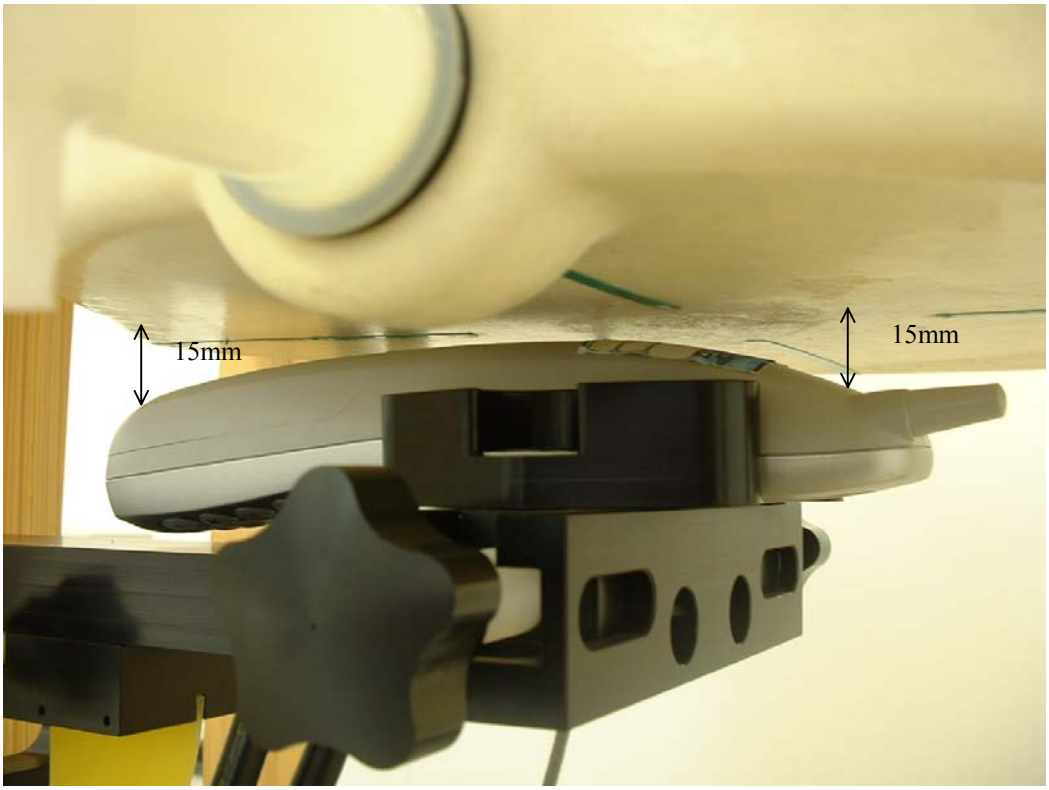
Body / Face





Body / Back





APPENDIX 2 : SAR Measurement data

UX-CD600K / Left Head / Cheek / 2439.936 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Left Section

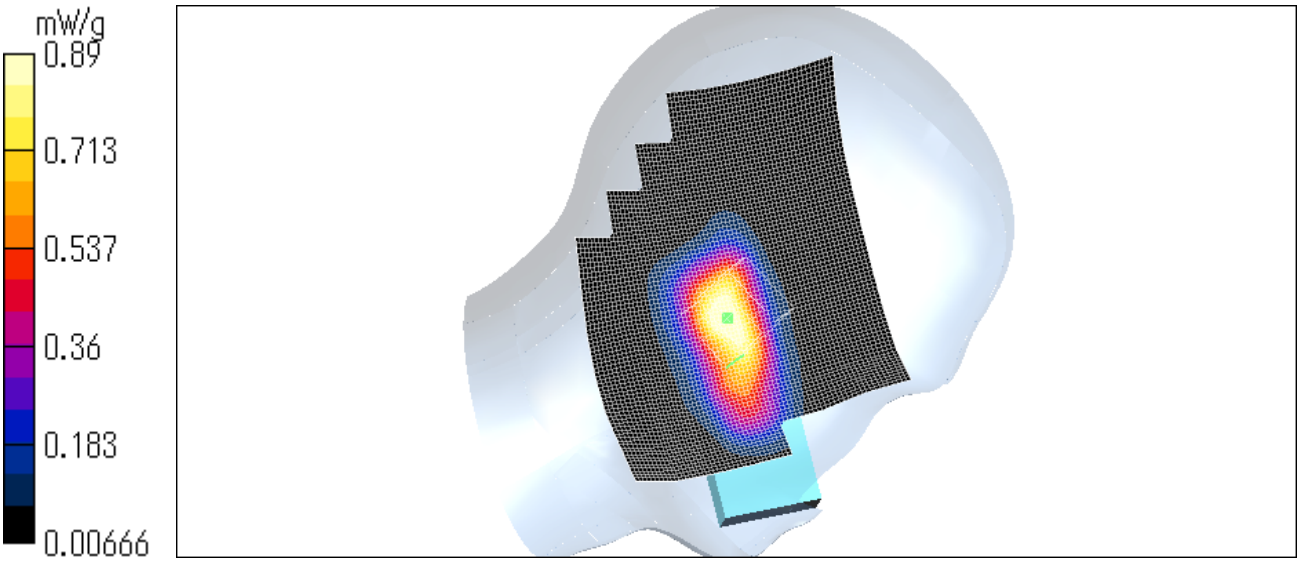
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.96 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.845 mW/g; SAR(10 g) = 0.442 mW/g
Maximum value of SAR = 0.89 mW/g

Test date = 01 / 08 / 04
Reference Value = 17.2 V/m
Power Drift = -0.1 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.7 degree.C , After 22.7 degree.C



UX-CD600K / Left Head / Tilt / 2439.936 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Left Section

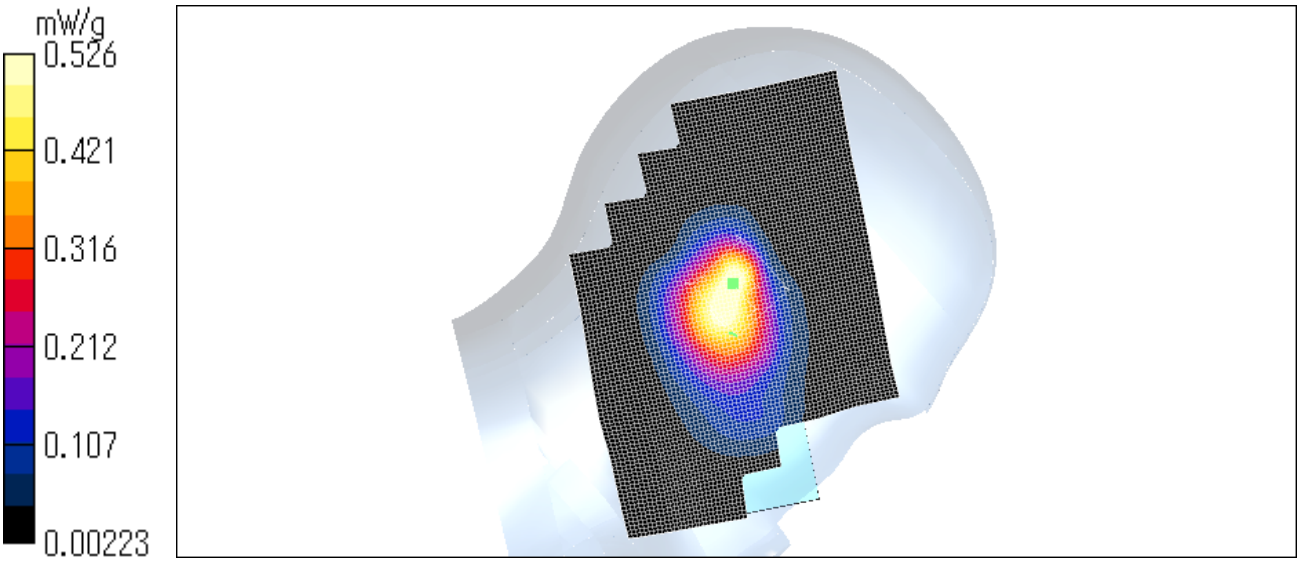
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.569 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.917 W/kg
SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.268 mW/g
Maximum value of SAR = 0.526 mW/g

Test date = 01 / 08 / 04
Reference Value = 16.7 V/m
Power Drift = 0.01 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.7 degree.C , After 22.7 degree.C



UX-CD600K / Left Head / Cheek / 2405.376MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Left Section

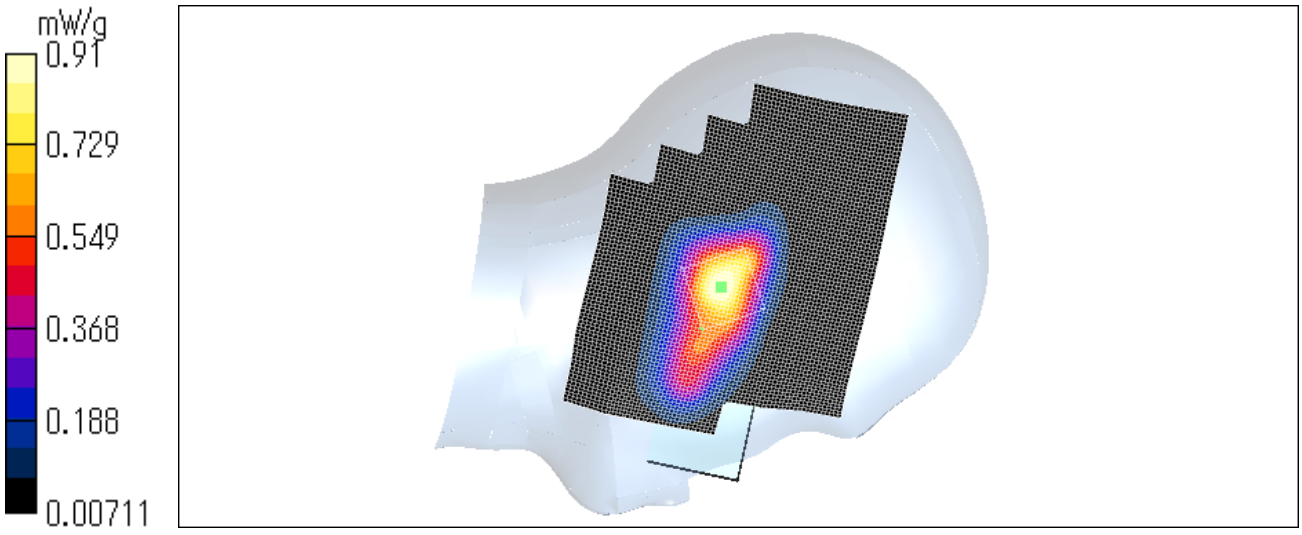
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.944 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.854 mW/g; SAR(10 g) = 0.454 mW/g
Maximum value of SAR = 0.91 mW/g

Test date = 01 / 08 / 04
Reference Value = 17.5 V/m
Power Drift = -0.07 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.8 degree.C , After 22.8 degree.C



UX-CD600K / Left Head / Cheek / 2474.496MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Left 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

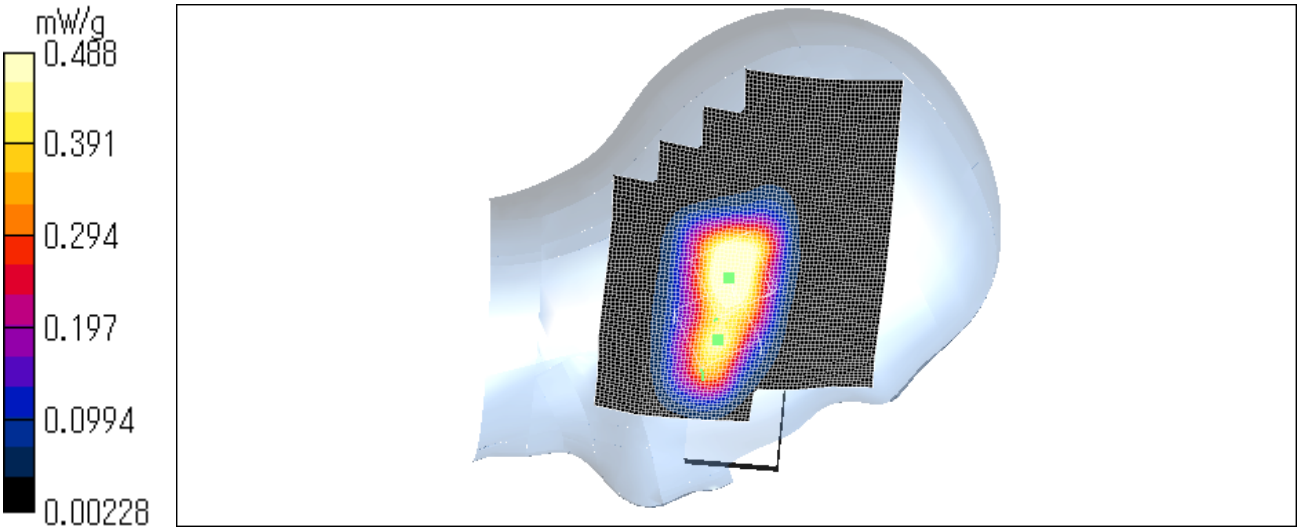
Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.633 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.58 mW/g; SAR(10 g) = 0.306 mW/g
Maximum value of SAR = 0.596 mW/g

Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.836 W/kg
SAR(1 g) = 0.422 mW/g; SAR(10 g) = 0.232 mW/g
Maximum value of SAR = 0.488 mW/g

Test date = 01 / 08 / 04
Reference Value = 15 V/m
Power Drift = -0.2 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.9 degree.C , After 22.9 degree.C



UX-CD600K / Right Head / Cheek / 2439.936 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Right Section

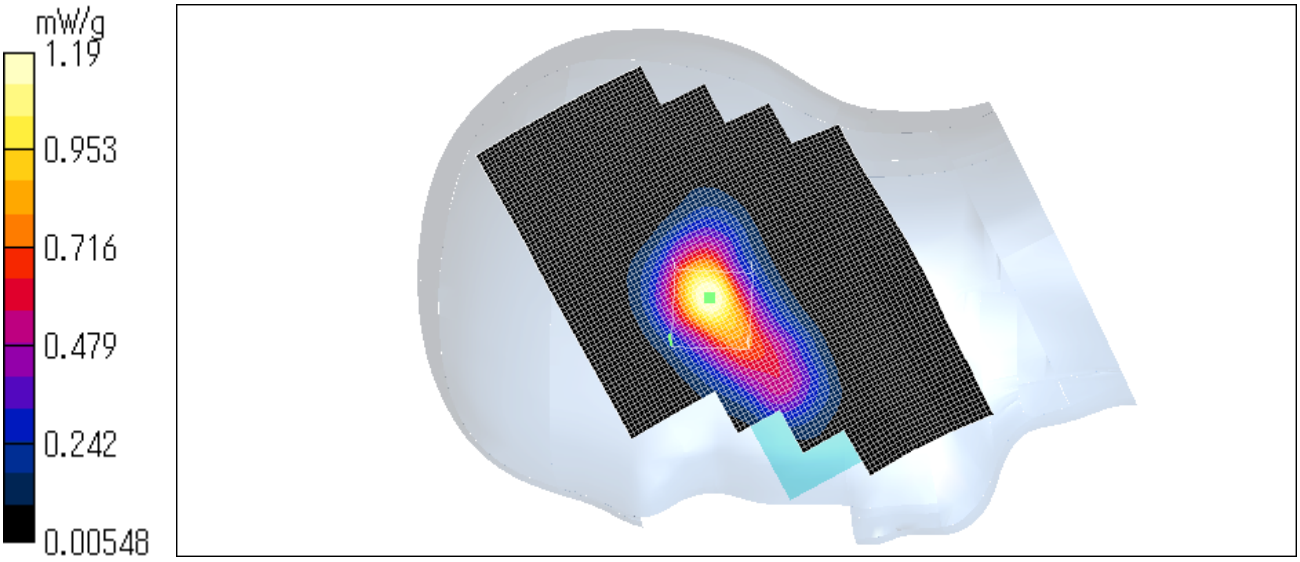
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 1.24 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.561 mW/g
Maximum value of SAR = 1.19 mW/g

Test date = 01 / 08 / 04
Reference Value = 15.5 V/m
Power Drift = -0.05 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.4 degree.C , After 22.3 degree.C



UX-CD600K / Right Head / Tilt / 2439.936 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Right Section

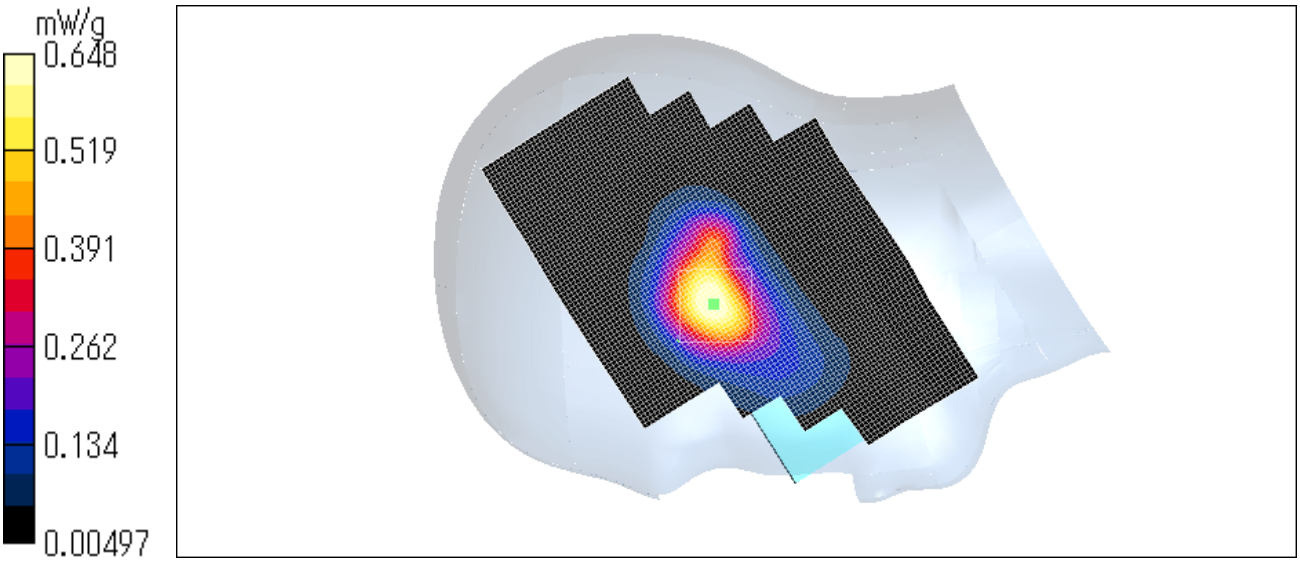
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.673 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.618 mW/g; SAR(10 g) = 0.33 mW/g
Maximum value of SAR = 0.648 mW/g

Test date = 01 / 08 / 04
Reference Value = 15.3 V/m
Power Drift = -0.07 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.3 degree.C , After 22.4 degree.C



UX-CD600K / Right Head / Cheek / 2405.376 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Right Section

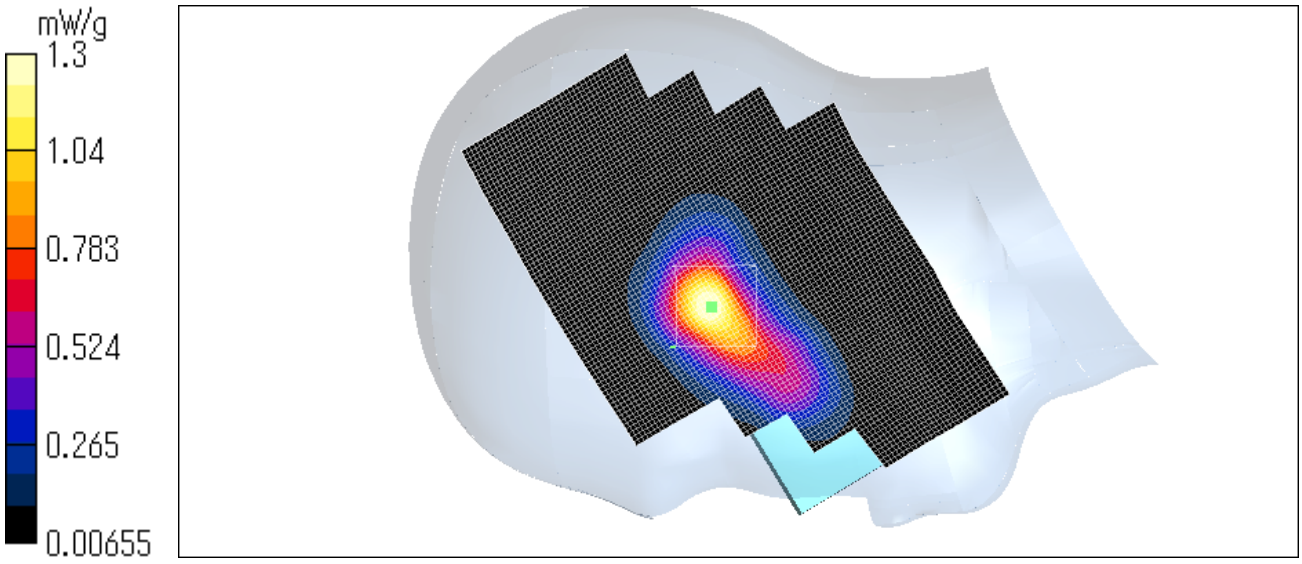
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 1.35 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.41 W/kg
SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.62 mW/g
Maximum value of SAR = 1.3 mW/g

Test date = 01 / 08 / 04
Reference Value = 15.1 V/m
Power Drift = -0.02 dB

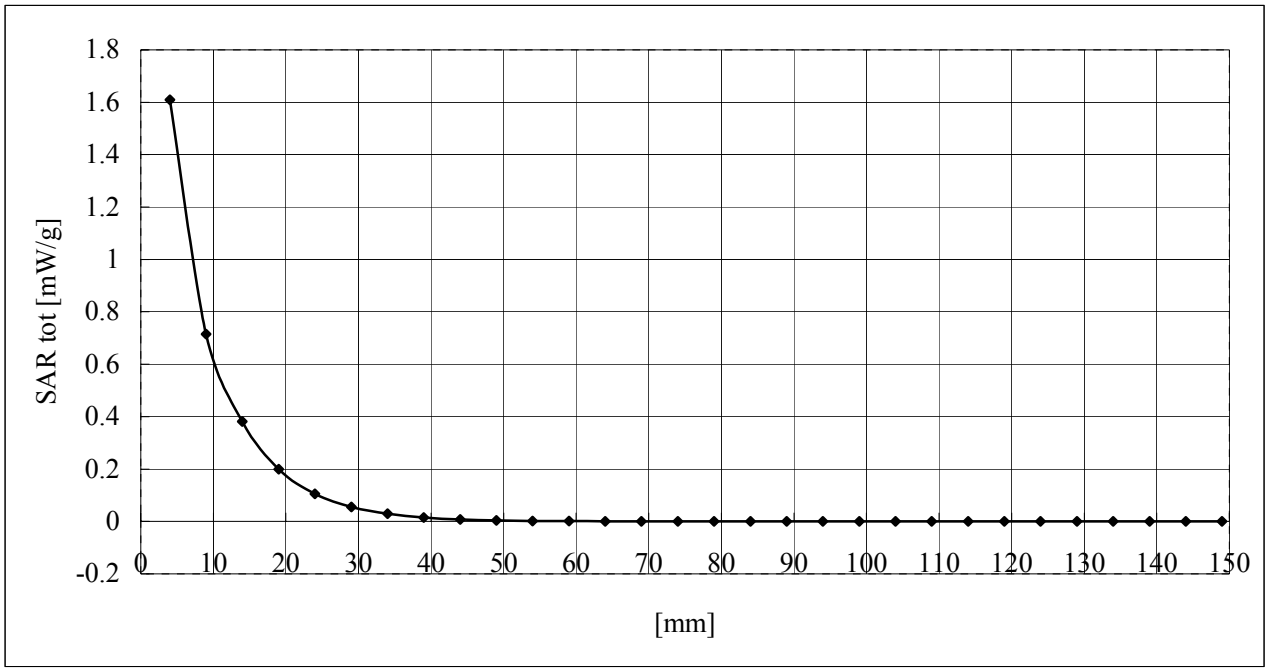
Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.3 degree.C , After 22.2 degree.C



Z-axis scan at max SAR location

UX-CD600K / Right Head / Cheek / 2405.376 MHz
Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Right 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



UX-CD600K / Right Head / Cheek / 2474.496 MHz

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Right Section

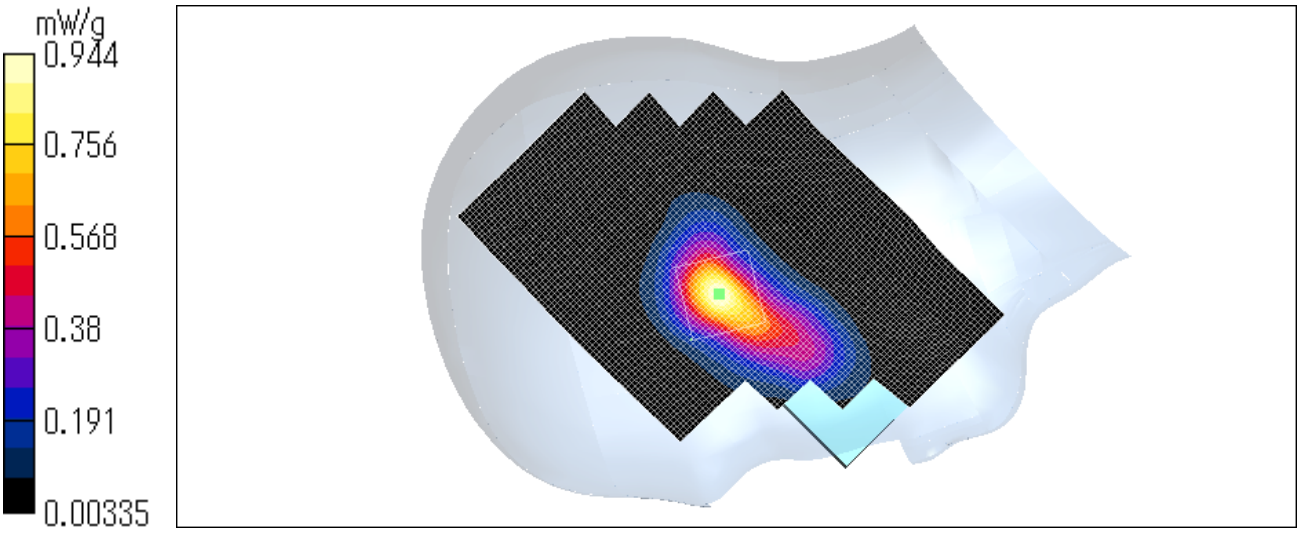
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (71x101x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.958 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 0.874 mW/g; SAR(10 g) = 0.437 mW/g
Maximum value of SAR = 0.944 mW/g

Test date = 01 / 08 / 04
Reference Value = 13.2 V/m
Power Drift = 0.2 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.9 degree.C , After 22.9 degree.C



UX-CD600K / Body / Face / 2439.936 MHz

Crest factor: 1
Medium: M2450 (σ = 2.02 mho/m, ε_r = 50.1, ρ = 1000 kg/m^3)
Phantom section: Flat Section

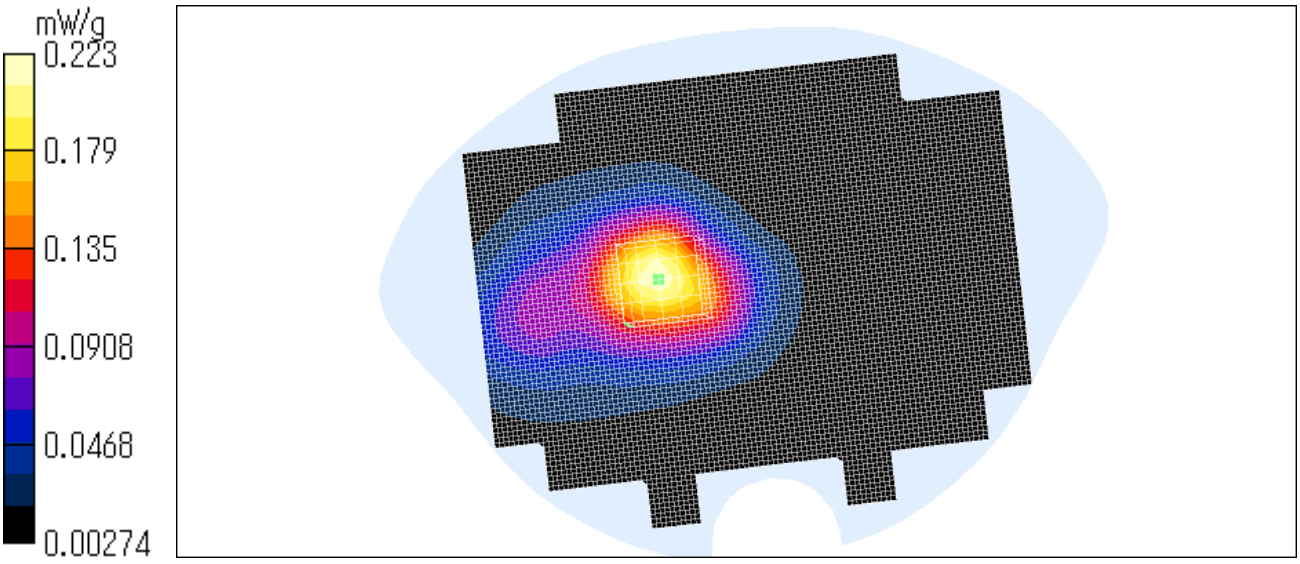
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x111x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.223 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.41 W/kg
SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.122 mW/g
Maximum value of SAR = 0.223 mW/g

Test date = 01 / 07 / 04
Reference Value = 6.98 V/m
Power Drift = -0.08 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.4 degree.C , After 23.5 degree.C



UX-CD600K / Body / Back / 2439.936 MHz

Crest factor: 1
Medium: M2450 (σ = 2.02 mho/m, ε_r = 50.1, ρ = 1000 kg/m^3)
Phantom section: Flat Section

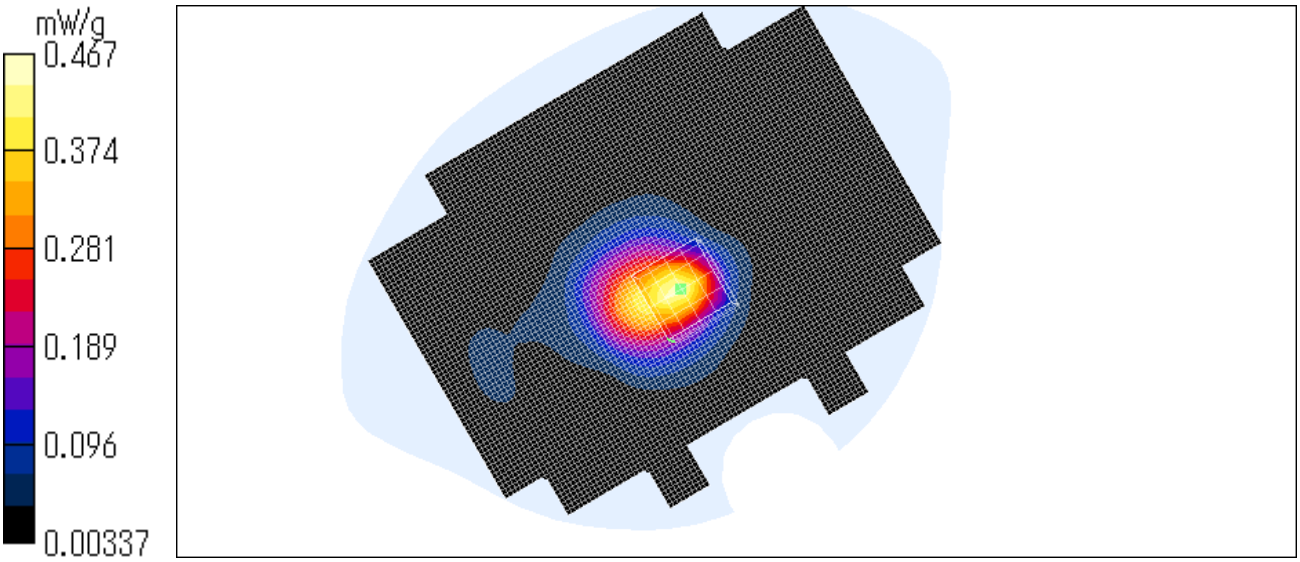
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x111x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.473 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.987 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.229 mW/g
Maximum value of SAR = 0.467 mW/g

Test date = 01 / 07 / 04
Reference Value = 14.2 V/m
Power Drift = -0.2 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.3 degree.C , After 22.4 degree.C



UX-CD600K / Body / Back / 2405.376 MHz

Crest factor: 1
Medium: M2450 (σ = 2.02 mho/m, ε_r = 50.1, ρ = 1000 kg/m^3)
Phantom section: Flat Section

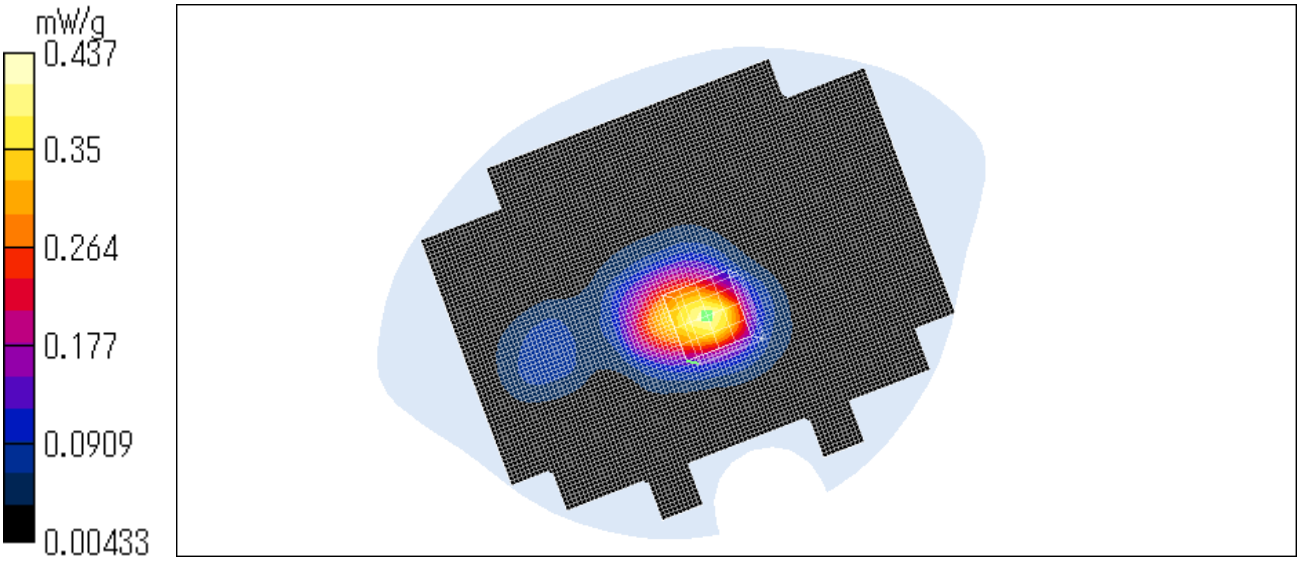
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x111x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 13.4 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 0.45 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.876 W/kg
SAR(1 g) = 0.416 mW/g; SAR(10 g) = 0.22 mW/g
Maximum value of SAR = 0.437 mW/g

Test date = 01 / 07 / 04
Reference Value = 13.4 V/m
Power Drift = -0.02 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.5 degree.C , After 22.6 degree.C



UX-CD600K / Body / Back / 2474.496 MHz

Crest factor: 1
Medium: M2450 (σ = 2.02 mho/m, ε_r = 50.1, ρ = 1000 kg/m^3)
Phantom section: Flat Section

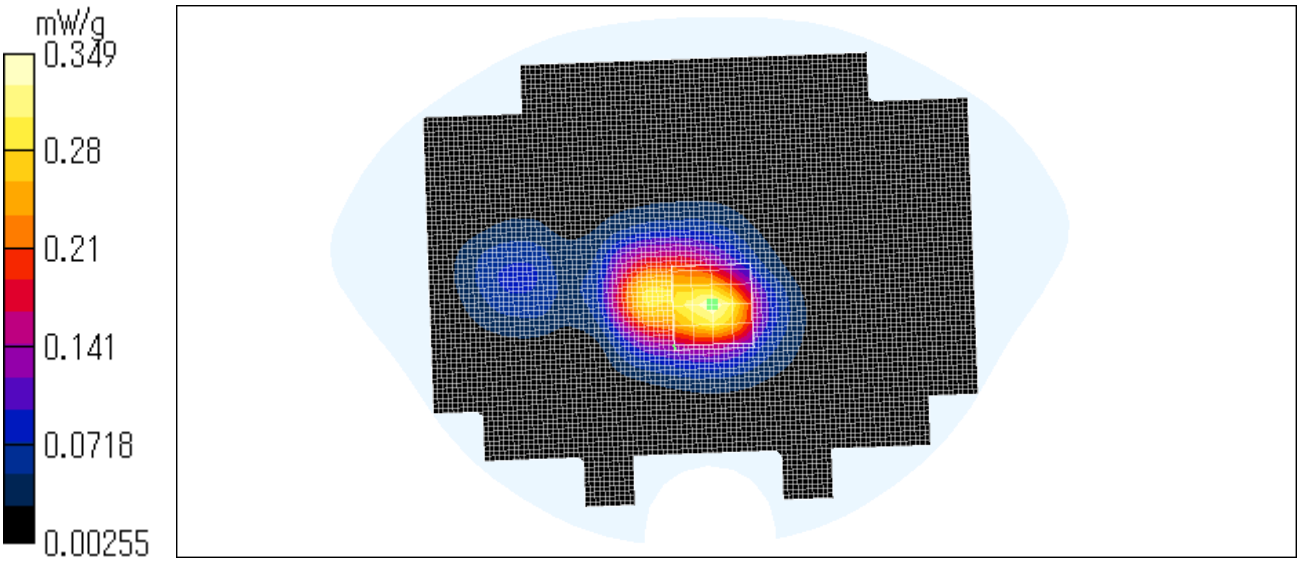
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x111x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.359 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.742 W/kg
SAR(1 g) = 0.333 mW/g; SAR(10 g) = 0.171 mW/g
Maximum value of SAR = 0.349 mW/g

Test date = 01 / 07 / 04
Reference Value = 11.4 V/m
Power Drift = 0.08 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.6 degree.C , After 22.8 degree.C



APPENDIX 3 : Validation Measurement data

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

Crest factor: 1
Medium: HSL2450 (σ = 1.85 mho/m, ε_r = 38.4, ρ = 1000 kg/m^3)
Phantom section: Flat Section

Dipole 2450 MHz;
- Type: D2450V2; Serial: SN:713

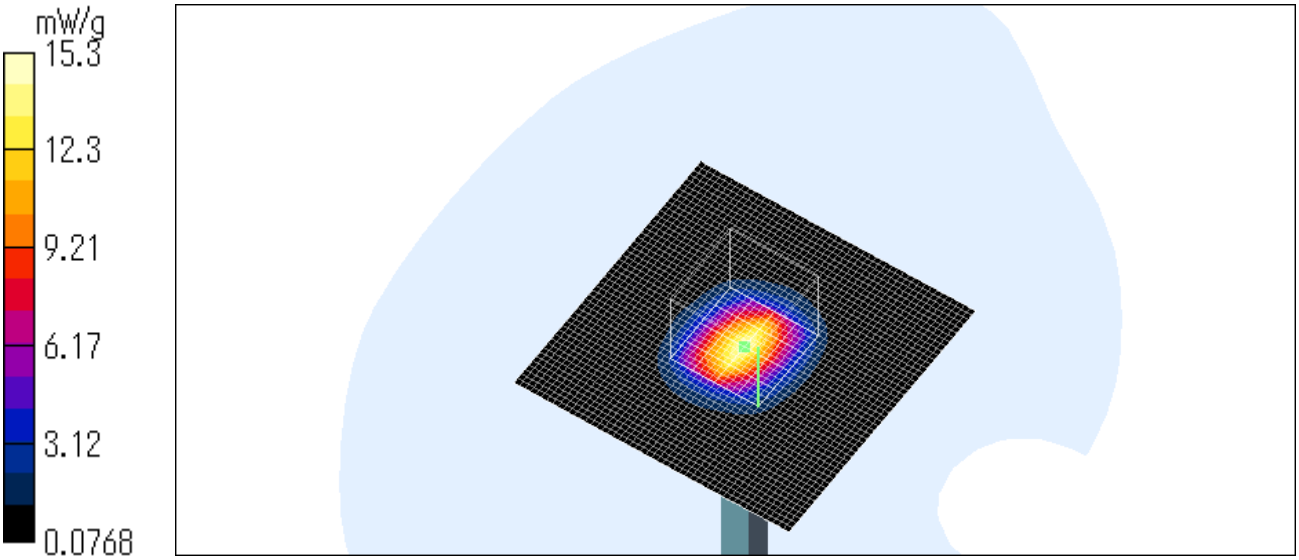
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 16.5 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 29 W/kg
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.32 mW/g
Maximum value of SAR = 15.3 mW/g

Test date = 01 / 07 / 04
Reference Value = 96.2 V/m
Power Drift = 0.04 dB

Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.1 degree.C , After 23.0degree.C



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

Crest factor: 1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.9, ρ = 1000 kg/m^3)
Phantom section: Flat Section

Dipole 2450 MHz;
- Type: D2450V2; Serial: SN:713

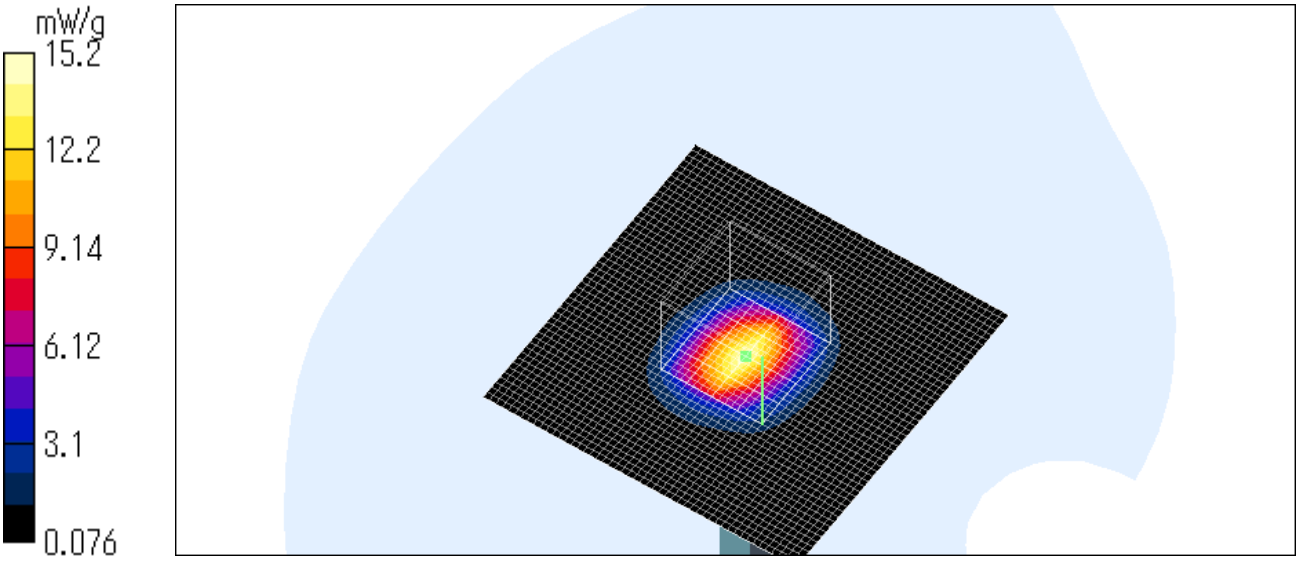
DASY4 Configuration:
- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 16.1 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g
Maximum value of SAR = 15.2 mW/g

Test date = 01 / 07 / 04
Reference Value = 95.4 V/m
Power Drift = 0.02 dB

Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 23.2 degree.C , After 23.2 degree.C



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

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. Vellen
Approved by:	Nikolai Kuster

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D2450V2

Serial: 713

Manufactured: July 5, 2002
Calibrated: November 15, 2002

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 permitivity	**38.0**	± 5%
Conductivity	**1.87 mho/m**	± 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 250mW ± 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 cm^3 (1 g) of tissue:	**54.4 mW/g**
averaged over 10 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 permitivity	**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

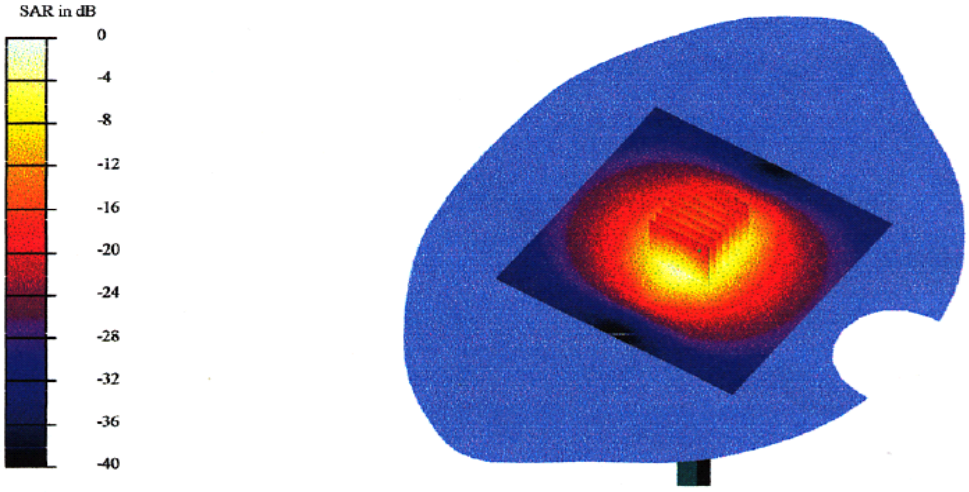
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN713_SN1507_HSL2450_131102.da4

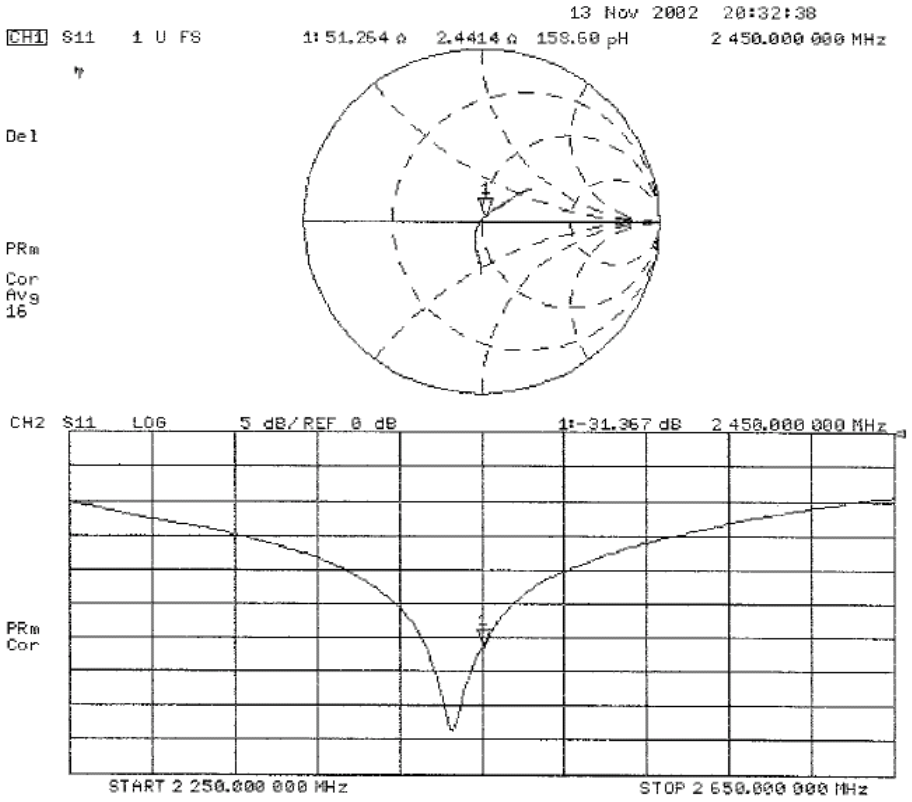
DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN713
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL 2450 MHz (σ = 1.87 mho/m, ε = 38.03, ρ = 1000 kg/m3)
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




13 Nov 2002 20:32:38
CH1 S11 1 U FS
1: 51.254 Ω 2.4414 Ω 158.60 pH
2 450.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB
1: -31.367 dB 2 450.000 000 MHz
PRm
Cor
START 2 250.000 000 MHz
STOP 2 650.000 000 MHz

Date/Time: 11/15/02 14:25:17

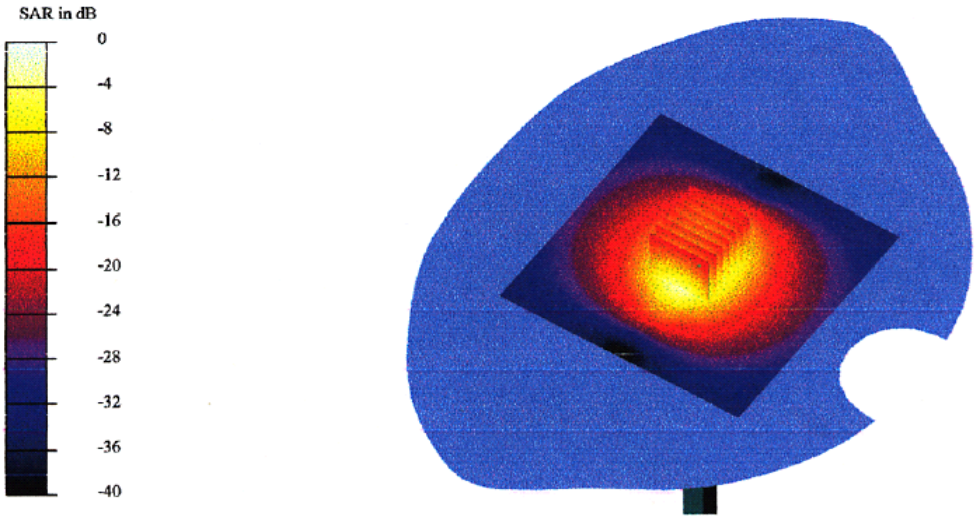
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN713_SN1507_M2450_141102.da4

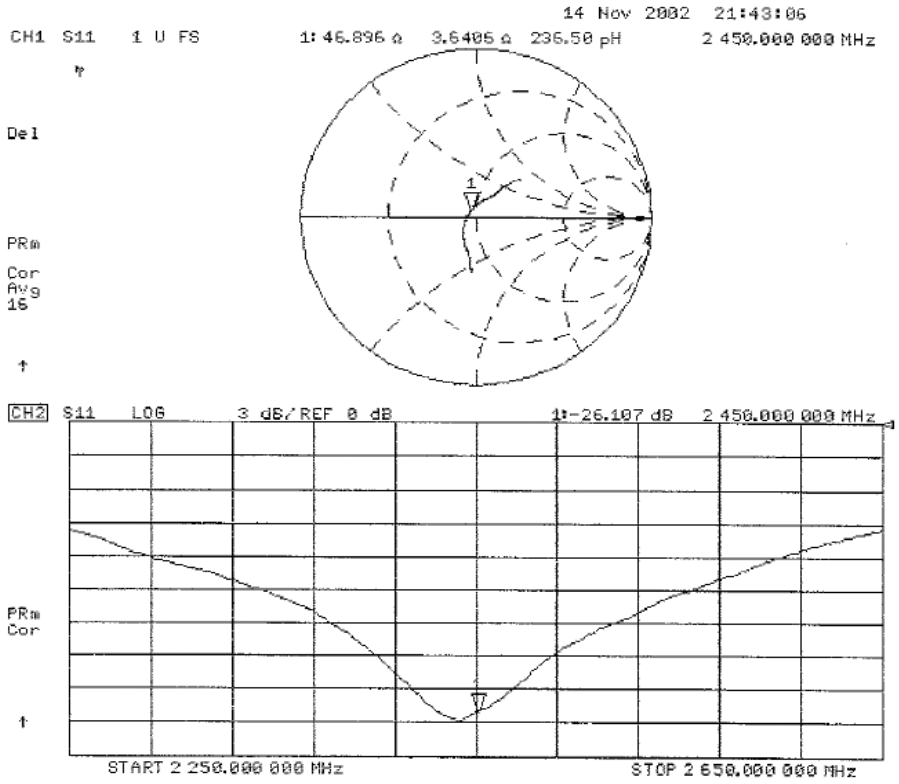
DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN713
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Muscle 2450 MHz (σ = 1.96 mho/m, ε = 51.15, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(4.5, 4.5, 4.5); 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 = 95.2 V/m
Peak SAR = 25 mW/g
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.99 mW/g
Power Drift = 0.02 dB




14 Nov 2002 21:43:06
CH1 S11 1 U FS
1: 46.896 Ω 3.6405 Ω 236.50 pH
2 450.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 3 dB/ REF 0 dB
1: -26.107 dB 2 450.000 000 MHz
PRm
Cor
START 2 250.000 000 MHz
STOP 2 650.000 000 MHz

APPENDIX 5 : Dosimetric E-Field Probe Calibration (ET3DV6,S/N: 1685)

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Gycol Monobuthy Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:
- ET3DV6
- ET3DV6R
- ES3DV2
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:
The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

s p e a g

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Schmid & Partner Engineering AG

Technical Note 01.06.15-1 June 2002

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

Client UL Apex (MTT)

CALIBRATION CERTIFICATE

Object(s) ET3DV6 - SN:1685

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

Calibration date: October 10, 2003

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

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS No. 251-0340	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	In house check: Oct 03
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

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

Date issued: October 23, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 international Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

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Schmid & Partner Engineering AG

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

s p e a g

Probe ET3DV6

SN:1685

Manufactured:	April 3, 2002
Last calibration:	May 10, 2002
Recalibrated:	October 10, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

ET3DV6 SN:1685 October 10, 2003

DASY - Parameters of Probe: ET3DV6 SN:1685

Sensitivity in Free Space

Diode Compression

NormX	**1.60** μV/(V/m)^2	DCP X	**95**	mV
NormY	**1.65** μV/(V/m)^2	DCP Y	**95**	mV
NormZ	**1.56** μV/(V/m)^2	DCP Z	**95**	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.26**
ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**3.07**

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**5.2** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.2** ± 9.5% (k=2)	Alpha	**0.41**
ConvF Z	**5.2** ± 9.5% (k=2)	Depth	**2.77**

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.9	5.4
SAR_{be} [%]	With Correction Algorithm	0.4	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

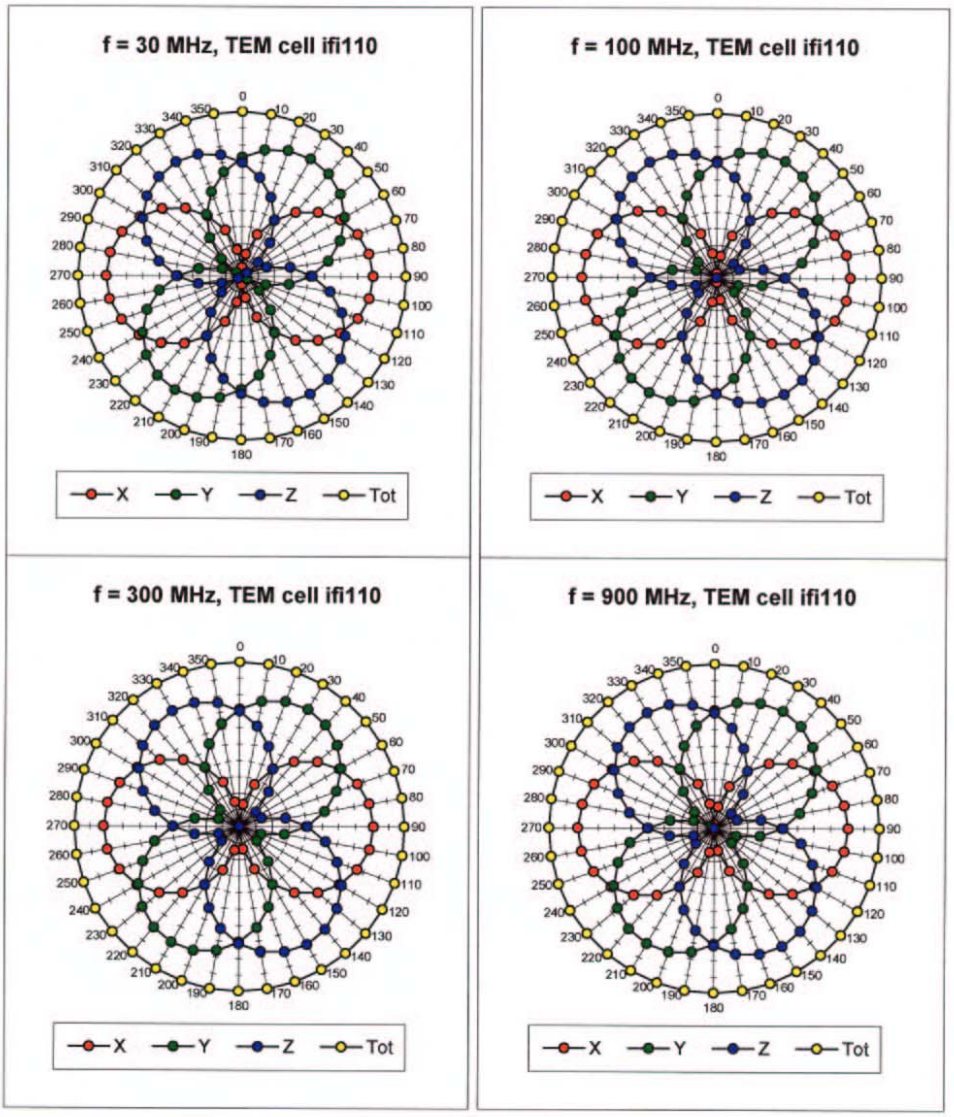
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.8	8.4
SAR_{be} [%]	With Correction Algorithm	0.4	0.2

Sensor Offset

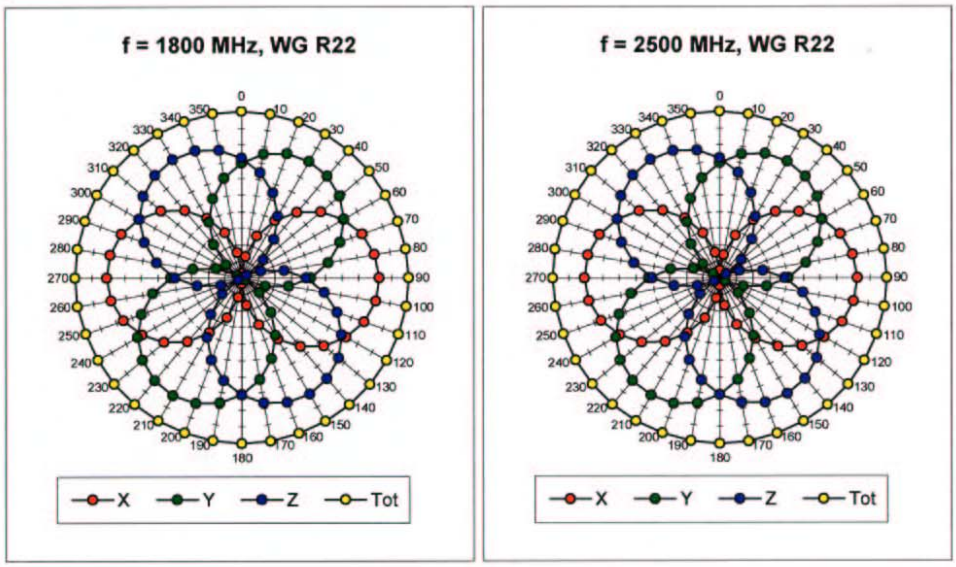
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.6 ± 0.2**	mm

ET3DV6 SN:1685 October 10, 2003

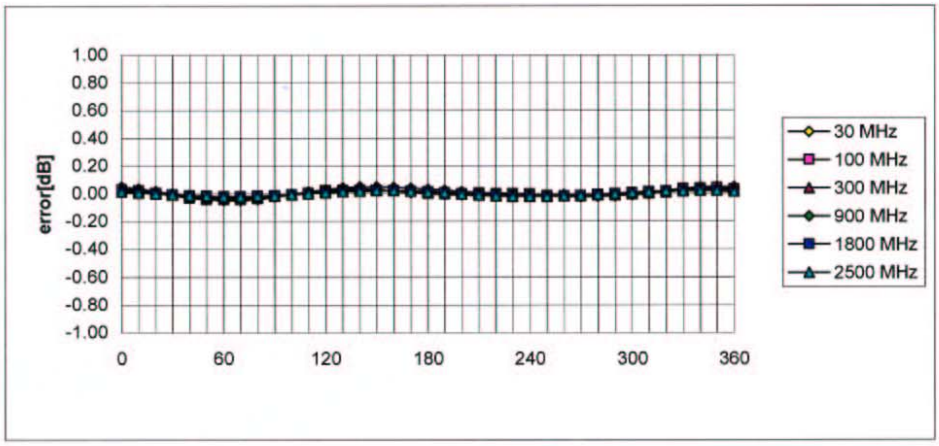
Receiving Pattern (ϕ , θ = 0°



ET3DV6 SN:1685 October 10, 2003



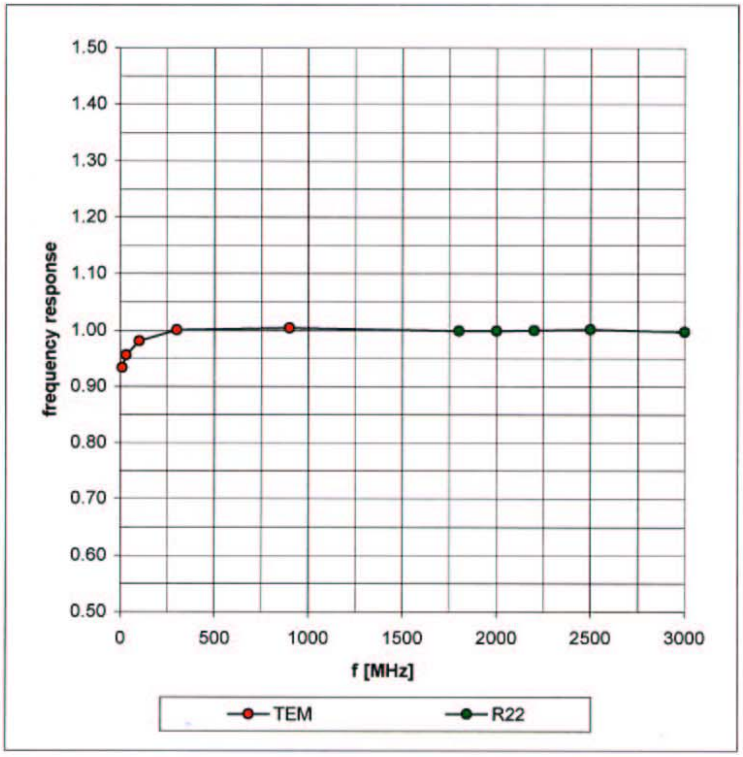
Isotropy Error (ϕ), θ = 0°



ET3DV6 SN:1685 October 10, 2003

Frequency Response of E-Field

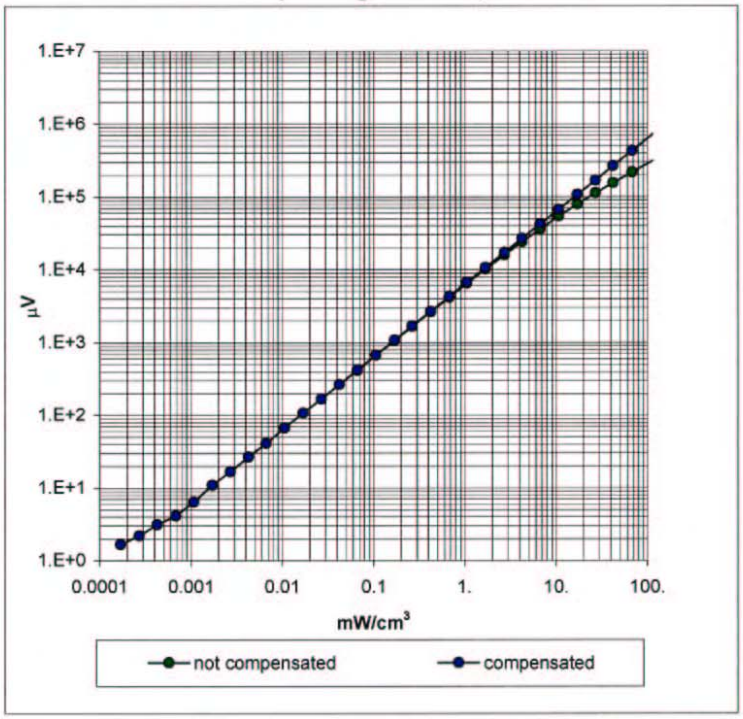
(TEM-Cell:ifi110, Waveguide R22)

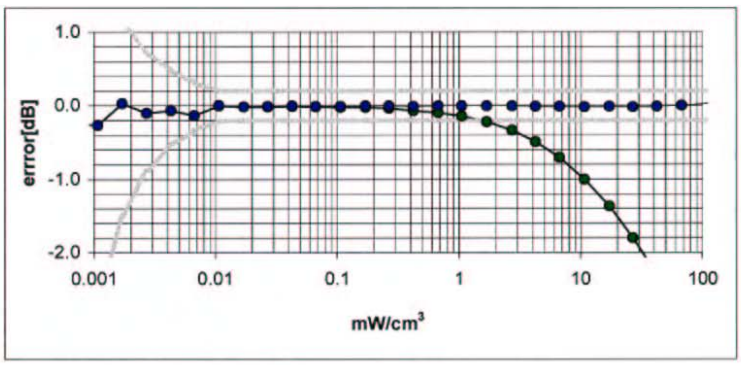


ET3DV6 SN:1685 October 10, 2003

Dynamic Range f(SAR_{brain})

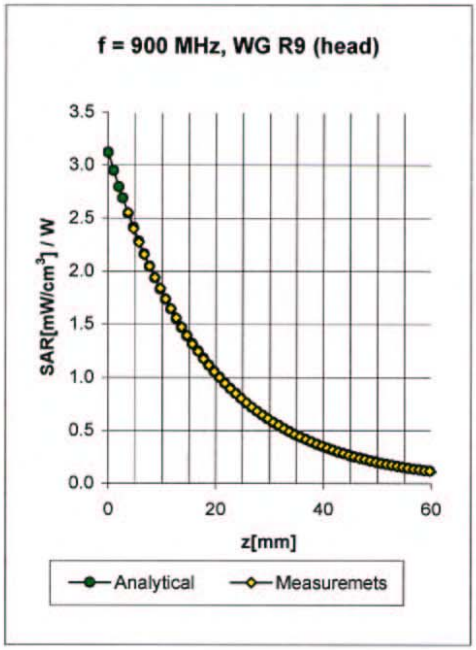
(Waveguide R22)

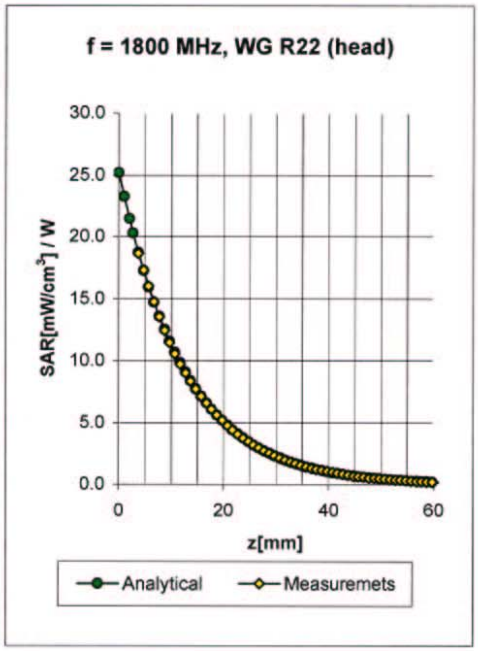




ET3DV6 SN:1685 October 10, 2003

Conversion Factor Assessment





Head **900 MHz** ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.26**
ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**3.07**

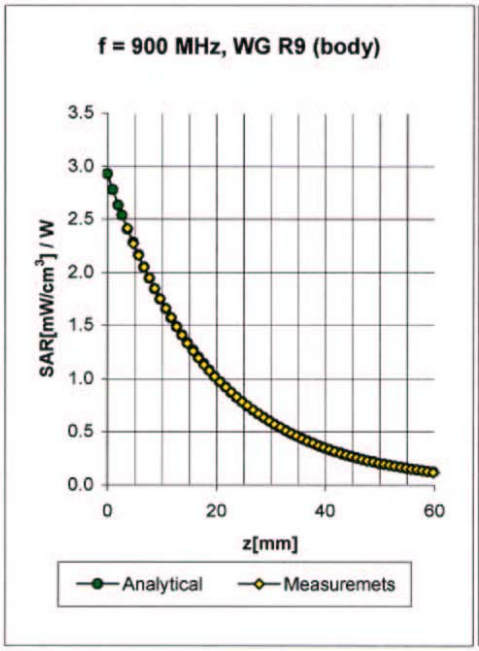
Head **1800 MHz** ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

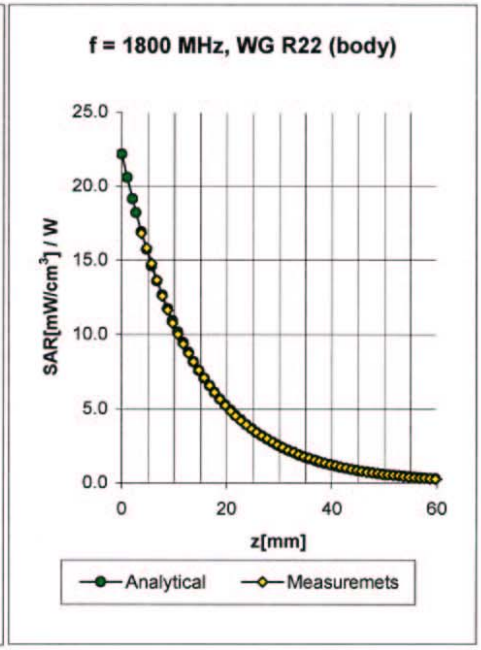
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**5.2** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.2** ± 9.5% (k=2)	Alpha	**0.41**
ConvF Z	**5.2** ± 9.5% (k=2)	Depth	**2.77**

ET3DV6 SN:1685 October 10, 2003

Conversion Factor Assessment





Body 900 MHz ε_r = 55.0 ± 5% σ = 1.05 ± 5% mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**6.4** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.4** ± 9.5% (k=2)	Alpha	**0.27**
ConvF Z	**6.4** ± 9.5% (k=2)	Depth	**3.22**

Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.7** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)	Alpha	**0.48**
ConvF Z	**4.7** ± 9.5% (k=2)	Depth	**2.94**

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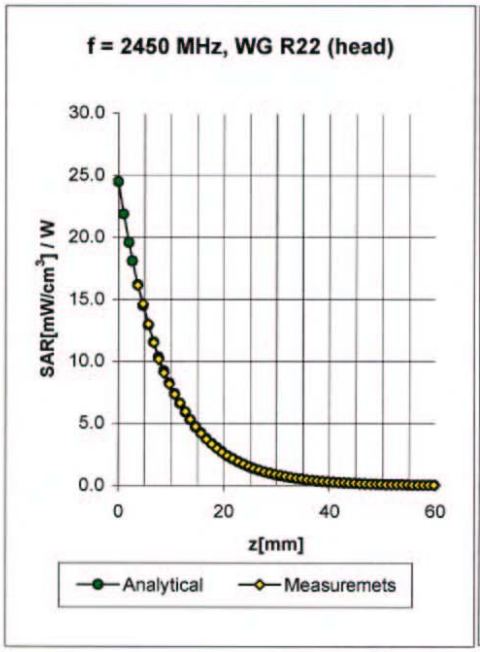
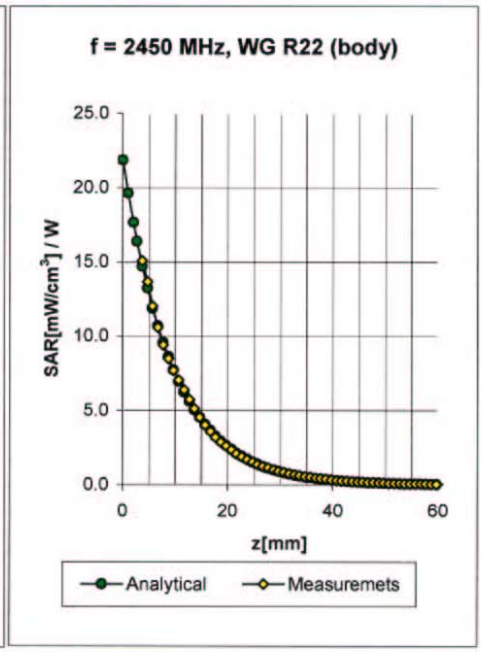
Conversion Factor Assessment





Head **2450 MHz** ε_r = 39.2 ± 5% σ = 1.80 ± 5% mho/m

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	**4.7** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.7** ± 9.5% (k=2)	Alpha	**0.78**
ConvF Z	**4.7** ± 9.5% (k=2)	Depth	**2.04**

Body **2450 MHz** ε_r = 52.7 ± 5% σ = 1.95 ± 5% mho/m

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	**4.3** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.3** ± 9.5% (k=2)	Alpha	**0.80**
ConvF Z	**4.3** ± 9.5% (k=2)	Depth	**1.89**

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Deviation from Isotropy in HSL

Error (θϕ), f = 900 MHz