

DECLARATION OF COMPLIANCE SAR EVALUATION

Test Lab

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Applicant Information

ATLINKS USA INC.

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Rule Part(s):	FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)
Test Procedure(s):	FCC OET Bulletin 65, Supplement C (Edition 01-01) IEEE Standard 1528-200X (Draft)
FCC Classification:	Part 15 Spread Spectrum Transmitter (DSS)
FCC ID:	G9H2-1008A
Model(s):	21008xxx-A
Device Type:	2.4 GHz Spread Spectrum Cordless Telephone Handset
Mode of Operation:	Frequency Hopping Spread Spectrum (FHSS)
Duty Cycle:	19.5% (Source-Based Time-Averaged)
Tx Frequency Range:	2401.808 - 2479.401 MHz
RF Output Power Tested:	0.282 Watts EIRP (2440.159 MHz)
Source-Based Time-Av. Power:	55.0 mW EIRP (2440.159 MHz)
Antenna Type:	Fixed Stubby
Battery Type(s):	3.6V NiCd (600mAh D-AA600BX3, 800mAh D-AA800BX3)
Body-Worn Access. Tested:	Belt-Clip, Ear-Microphone
Max. SAR Measured:	0.0833 W/kg (Head) / 0.0347 W/kg (Body)

Celltech Labs Inc. declares under its sole responsibility that this device was found to be in compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C, Edition 01-01, Industry Canada's RSS-102 Issue 1 (Provisional), and IEEE Standard 1528-200X (Draft) for the General Population / Uncontrolled Exposure environment.

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

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.



Russell W. Pipe
Senior Compliance Technologist
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1.0 INTRODUCTION

This measurement report shows that the ATLINKS USA INC. Model: 21008xxx-A 2.4GHz Spread Spectrum Cordless Telephone Handset FCC ID: G9H2-1008A complies with the SAR (Specific Absorption Rate) RF exposure requirements for portable devices specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]), Industry Canada's RSS-102 Issue 1 (Provisional) (see reference [4]), and IEEE Standard 1528-200X (Draft) (see reference [5]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

EUT Type	2.4 GHz Spread Spectrum Cordless Telephone Handset
FCC Equipment Class	Part 15 Spread Spectrum Transmitter (DSS)
FCC Rule Part(s)	47 CFR §2.1093
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01) IC RSS-102 Issue 1 (Provisional) IEEE Standard 1528-200X (Draft)
FCC ID	G9H2-1008A
Model No.(s)	21008xxx-A
Serial No.	Pre-production unit
Tx Frequency Range	2401.808 - 2479.401 MHz
Mode of Operation	Frequency Hopping Spread Spectrum (FHSS)
RF Output Power Tested	0.282 Watts EIRP (2440.159 MHz)
Source-Based Time-Averaged RF Output Power	55.0 mW EIRP (2440.159 MHz)
Source-Based Time-Averaged Duty Cycle	19.5 %
Battery Type(s)	3.6V NiCd (600mAh D-AA600BX3, 800mAh D-AA800BX3)
Antenna Type	Fixed Stubby
Body-Worn Accessories Tested	Belt-Clip, Ear-Microphone

3.0 SAR MEASUREMENT SYSTEM

Celltech Labs SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for face-held and/or body-worn SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



DASY3 SAR Measurement System with SAM Phantom

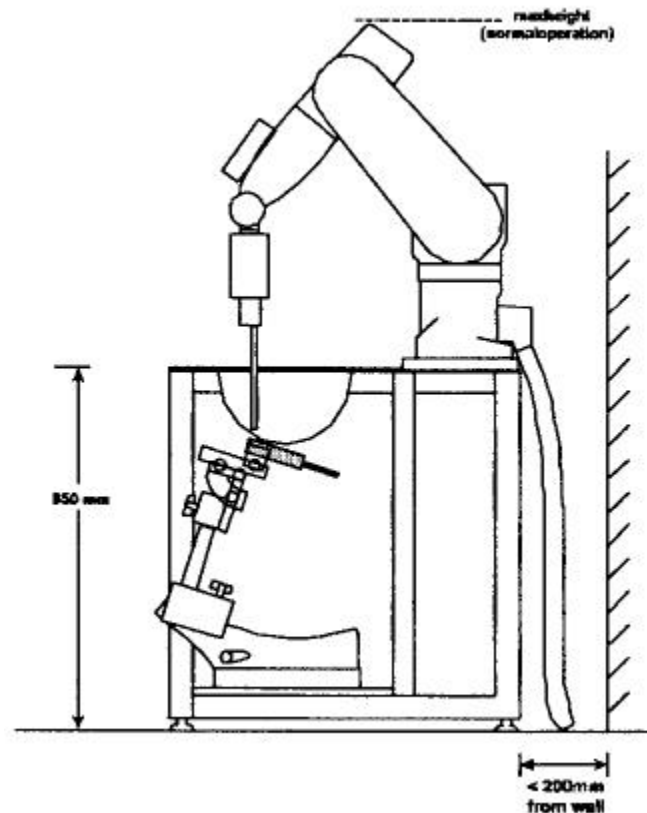


Figure 1. DASY3 Compact Version - Side View

4.0 MEASUREMENT SUMMARY

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

SAR EVALUATION RESULTS										
Freq. (MHz)	Chan.	Test Mode	RF Output Power		Battery (mAh)	Antenna Position	Phantom Section	Test Position	Measured SAR 1g (W/kg)	
			EIRP	Drift						
2440.159	55	Modulated	0.282 W	-0.20 dB	600	Fixed	Left Ear	Cheek/Touch	P	0.0458
									S	0.0250
2440.159	55	Modulated	0.282 W	-0.08 dB	800	Fixed	Left Ear	Cheek/Touch	P	0.0435
									S	-
2440.159	55	Modulated	0.282 W	-0.03 dB	600	Fixed	Left Ear	Ear/Tilt (15°)	P	0.0231
									S	0.0227
2440.159	55	Modulated	0.282 W	-0.05 dB	800	Fixed	Left Ear	Ear/Tilt (15°)	P	0.0238
									S	0.0238
2440.159	55	Modulated	0.282 W	-0.08 dB	600	Fixed	Right Ear	Cheek/Touch	P	0.0833
									S	-
2440.159	55	Modulated	0.282 W	-0.13 dB	800	Fixed	Right Ear	Cheek/Touch	P	0.0752
									S	-
2440.159	55	Modulated	0.282 W	-0.13 dB	600	Fixed	Right Ear	Ear/Tilt (15°)	P	0.0339
									S	-
2440.159	55	Modulated	0.282 W	-0.13 dB	800	Fixed	Right Ear	Ear/Tilt (15°)	P	0.0342
									S	-
2440.159	55	Modulated	0.282 W	-0.19 dB	600	Fixed	Planar	Body-worn	P	0.0347
									S	0.0315
2440.159	55	Modulated	0.282 W	-0.15 dB	800	Fixed	Planar	Body-worn	P	0.0327
									S	0.0299
ANSI / IEEE C95.1 1992 - SAFETY LIMIT BRAIN / BODY: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population										
Measured Tissue Simulant			2450MHz Brain				2450MHz Body			
			IEEE Target		Measured		IEEE Target		Measured	
Dielectric Constant ϵ_r			39.2 ±10%		37.2		52.7 ±10%		47.6	
Conductivity σ (mho/m)			1.80 ±5%		1.87		1.95 ±5%		1.99	
ρ (Kg/m³)			1000				1000			
Atmospheric Pressure			101.6 kPa				101.4 kPa			
Relative Humidity			33 %				35 %			
Ambient Temperature			22.5 °C				23.1 °C			
Fluid Temperature			23.8 °C				23.9 °C			
Fluid Depth			≥ 15 cm				≥ 15 cm			

Note(s):

1. If the SAR measurements performed at the middle channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
2. Secondary hotspot evaluations were performed to show secondary SAR levels within 3 dB of the primary (P = Primary, S = Secondary).
3. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
4. The dielectric properties of the simulated fluids were verified prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

5.0 DETAILS OF SAR EVALUATION

The ATLINKS USA INC. Model: 21008xxx-A 2.4GHz Spread Spectrum Cordless Telephone Handset FCC ID: G9H2-1008A was found to be compliant for localized Specific Absorption Rate (SAR) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix G.

Ear-held Configuration

- 1) The EUT was tested in an ear-held configuration on both the left and right sections of the SAM phantom at the middle channel of the operating band. If the SAR value of the middle channel for each test configuration (left ear, right ear, cheek/touch, ear/tilt) was ≥ 3 dB below the SAR limit, measurements at the low and high channels were optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
- a) The handset was placed in the device holder in a normal operating position with the test device reference point located along the vertical centerline on the front of the device aligned to the ear reference point, with the center of the earpiece touching the center of the ear spacer of the SAM phantom.
- b) With the handset positioned parallel to the cheek, the test device reference point was aligned to the ear reference point on the head phantom, and the vertical centerline was aligned to the phantom reference plane (initial ear position).
- c) While maintaining the three alignments, the body of the handset was gradually adjusted to each of the following test positions:
 - Cheek/Touch Position: the handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.

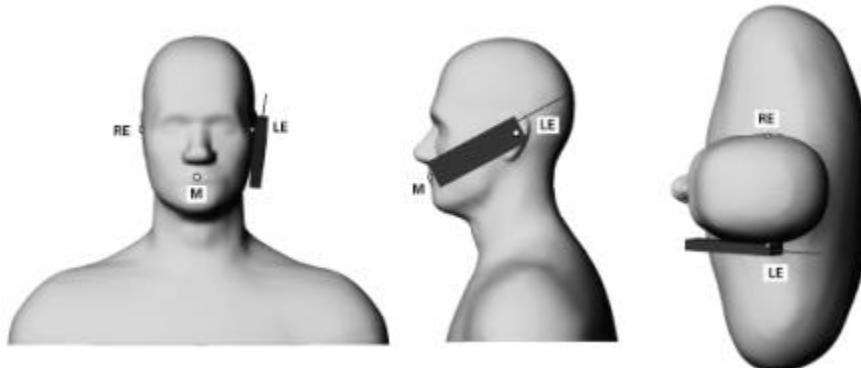


Figure 2. Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

- Ear/Tilt Position: With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.

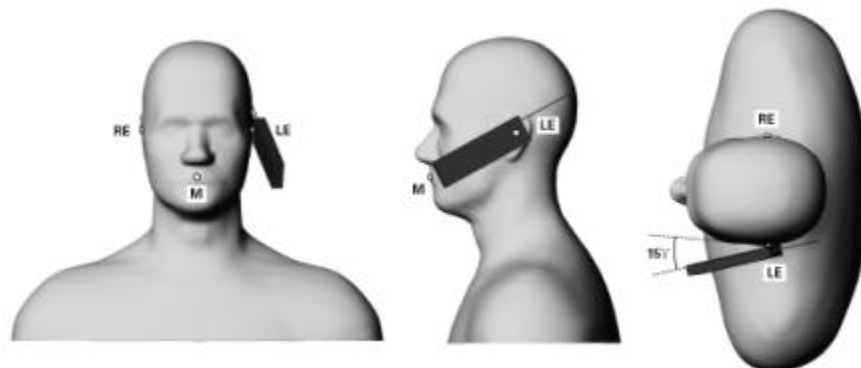


Figure 3. Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration

- 2) The EUT was tested in a body-worn configuration with the back of the device placed parallel to the outer surface of the SAM phantom (planar section). The attached belt-clip accessory was touching the outer surface of the SAM phantom (planar section) and provided a 0.7 cm separation distance from the back of the handset to the SAM phantom (planar section). An ear-microphone accessory was connected to the EUT for the duration of the tests.

EUT Test Mode & Power Setting

- 3) The EUT was placed into test mode using internal software controlled by the keypad, and with the frequency hopping disabled.
- 4) SAR measurements were performed with the EUT transmitting continuously at maximum power in 2 time slots at a fixed frequency and random modulation with a source-based time-averaged duty cycle of 19.5% (crest factor: 5.1).
- 5) The conducted power level(s) of the EUT could not be measured for the SAR evaluation. The EUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer.
- 6) The EUT was evaluated for SAR at the maximum EIRP measured by signal substitution method in accordance with ANSI TIA/EIA-603-A-2001.
- 7) The power drift measured by the DASY3 system for the duration of each test was within +/- 5%.
- 8) The EUT was tested with a fully charged battery.

6.0 EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom.

(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

c. Based on the area scan data, the area of maximum absorption was determined by spline interpolation. Around this point, a volume of 40 x 40 x 35 mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points.

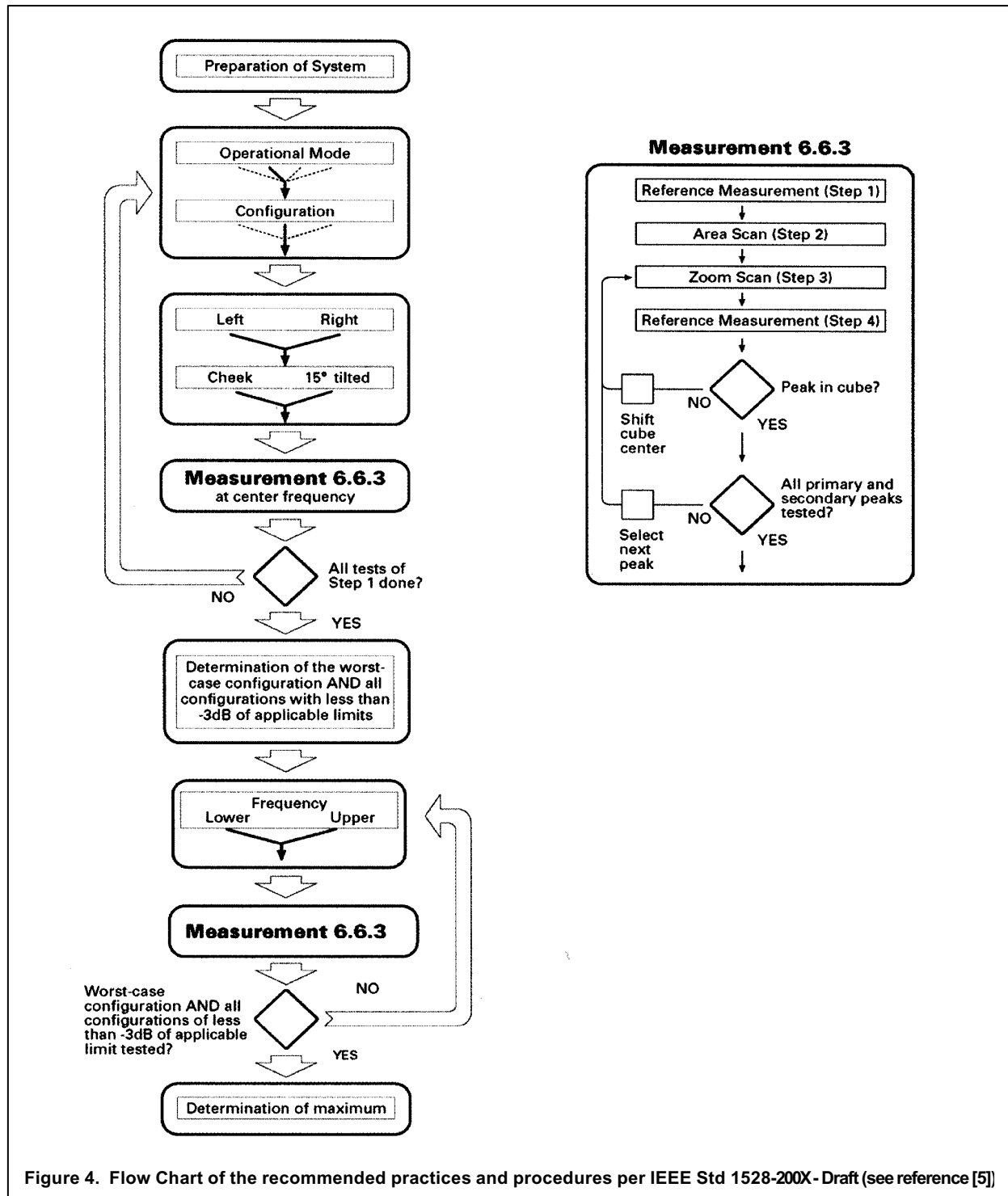
d. The 1g and 10g spatial peak SAR was determined as follows:

1. The first step was an extrapolation to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, 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 1.4 mm (see probe calibration document in Appendix D). The extrapolation was based on a least square algorithm [W. Gander, Computermathematik, p.168-180] (see reference [6]). Through the points in the first 3 cm in each z-axis, polynomials of the fourth order were calculated. These polynomials were then used to evaluate the points between the surface and the probe tip.

2. The next step used 3D-spline interpolation to get all points within the measured volume in a 1mm grid (35000 points). The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff] (see reference [6]).

3. The maximal interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-spline interpolation algorithm. 8000 points (20x20x20) were interpolated to calculate the average.

EVALUATION PROCEDURES (Cont.)



7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed at the planar section of the SAM phantom with a 2450MHz dipole (see Appendix C for system validation procedures). Prior to the system check the fluid dielectric parameters were measured using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$ (see Appendix B for system check test plot).

SYSTEM PERFORMANCE CHECK											
Test Date	Equiv. Tissue (2450MHz)	SAR 1g (W/kg)		Dielectric Constant ϵ_r		Conductivity σ (mho/m)		ρ (Kg/m ³)	Ambient Temp.	Fluid Temp.	Fluid Depth
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured				
07/07/03	Brain	13.1 $\pm 10\%$	14.1	39.2 $\pm 10\%$	37.2	1.80 $\pm 5\%$	1.87	1000	22.5 °C	23.8 °C	≥ 15 cm

Note(s):

1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.

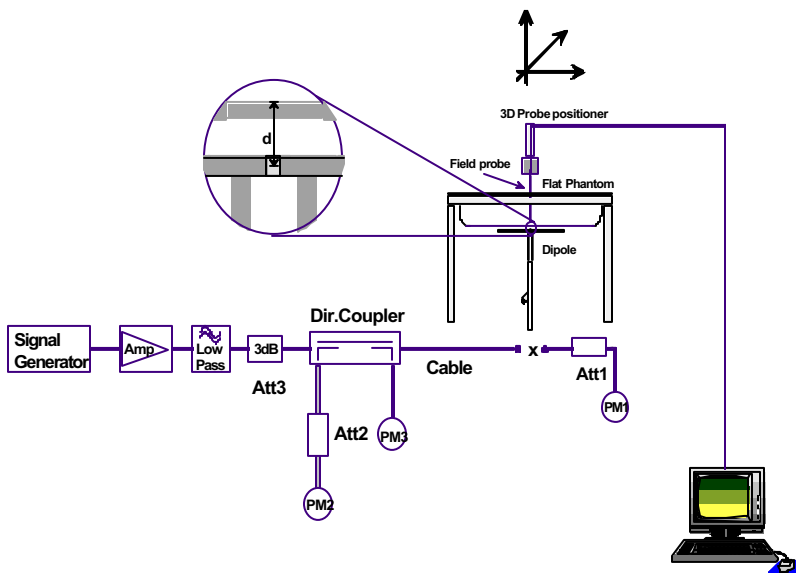


Figure 5. System Check Setup Diagram



2450MHz Dipole

8.0 EQUIVALENT TISSUES

The 2450MHz brain and body simulated tissue mixtures consist of Glycol-monobutyl, water, and salt. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

TISSUE MIXTURES		
INGREDIENT	2450MHz Brain (System Check & EUT Evaluation)	2450MHz Body (EUT Evaluation)
Water	55.20 %	69.95 %
Glycol Monobutyl	44.80 %	30.00 %
Salt	-	0.05 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

POSITIONER: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability: 0.02 mm
No. of axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: Pentium III
Clock Speed: 450 MHz
Operating System: Windows NT
Data Card: DASY3 PC-Board

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY3 software
Connecting Lines: Optical downlink for data and status info.
 Optical uplink for commands and clock

PC Interface Card

Function: 24 bit (64 MHz) DSP for real time processing
 Link to DAE3
 16-bit A/D converter for surface detection system
 serial link to robot
 direct emergency stop output for robot

E-Field Probe

Model: ET3DV6
Serial No.: 1387
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Phantom

Type: SAM V4.0C
Shell Material: Fiberglass
Thickness: 2.0 ± 0.1 mm
Volume: Approx. 20 liters

11.0 PROBE SPECIFICATION (ET3DV6)

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g. glycol)

Calibration: In air from 10 MHz to 2.5 GHz
In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$)

Frequency: 10 MHz to >6 GHz; Linearity: ± 0.2 dB
(30 MHz to 3 GHz)

Directivity: ± 0.2 dB in brain tissue (rotation around probe axis)
 ± 0.4 dB in brain tissue (rotation normal to probe axis)

Dynamic Range: $5 \mu\text{W/g}$ to $>100 \text{ mW/g}$; Linearity: ± 0.2 dB

Surface Detect.: ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

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

Application: General dosimetry up to 3 GHz
Compliance tests of mobile phone



ET3DV6 E-Field Probe

12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0 mm shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections.



SAM Phantom V4.0C

13.0 DEVICE HOLDER

The DASY3 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65° . The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.



Device Holder

14.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	SERIAL NO.	CALIBRATION DATE
Schmid & Partner DASY3 System	-	-
-Robot	599396-01	N/A
-ET3DV6 E-Field Probe	1387	Feb 2003
-300MHz Validation Dipole	135	Oct 2002
-450MHz Validation Dipole	136	Oct 2002
-900MHz Validation Dipole	054	June 2003
-1800MHz Validation Dipole	247	June 2003
-2450MHz Validation Dipole	150	Oct 2002
-SAM Phantom V4.0C	N/A	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2003
Gigatronics 8652A Power Meter	1835267	April 2003
Power Sensor 80701A	1833542	Feb 2003
Power Sensor 80701A	1833699	April 2003
HP E4408B Spectrum Analyzer	US39240170	Dec 2002
HP 8594E Spectrum Analyzer	3543A02721	Feb 2003
HP 8753E Network Analyzer	US38433013	Feb 2003
HP 8648D Signal Generator	3847A00611	Feb 2003
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

15.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty $\pm\%$ (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 1.4	Rectangular	$\sqrt{3}$	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	$\sqrt{3}$	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	$\sqrt{3}$	1	± 5.9	8
Power drift	± 5.0	Rectangular	$\sqrt{3}$		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (target)	± 10.0	Rectangular	$\sqrt{3}$	0.6	± 3.5	∞
Liquid permittivity (measured)	± 10.0	Rectangular	$\sqrt{3}$	0.6	± 3.5	∞
Combined Standard Uncertainty					± 13.3	
Expanded Uncertainty (k=2)					± 26.6	

Measurement Uncertainty Table in accordance with IEEE Std 1528-200X (Draft - see reference [5])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty $\pm\%$ (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 1.4	Rectangular	$\sqrt{3}$	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Input Power	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (target)	± 10.0	Rectangular	$\sqrt{3}$	0.6	± 3.5	∞
Liquid permittivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Combined Standard Uncertainty						
					± 9.9	
Expanded Uncertainty (k=2)						
					± 19.8	

Measurement Uncertainty Table in accordance with IEEE Std 1528-200X (Draft - see reference [5])

16.0 REFERENCES

- [1] Federal Communication Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6.
- [3] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [4] Industry Canada, "Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields", Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.
- [5] IEEE Standards Coordinating Committee 34, Std 1528-200X, "DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques".
- [6] W. Gander, *Computermathematick*, Birkhaeuser, Basel: 1992.

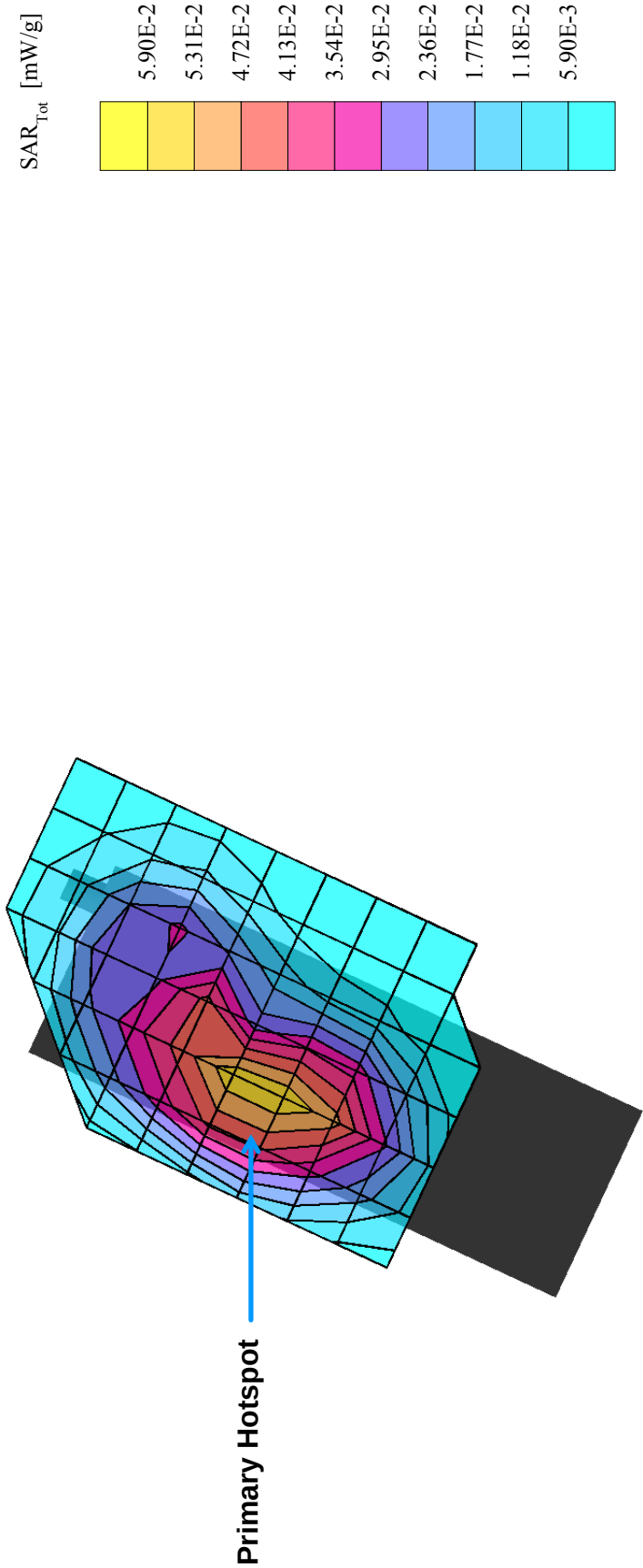
APPENDIX A - SAR MEASUREMENT DATA

ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (90°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.20 dB
SAR (1g): 0.0458 mW/g, SAR (10g): 0.0261 mW/g

Head SAR - Left Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

Primary Hotspot Evaluation

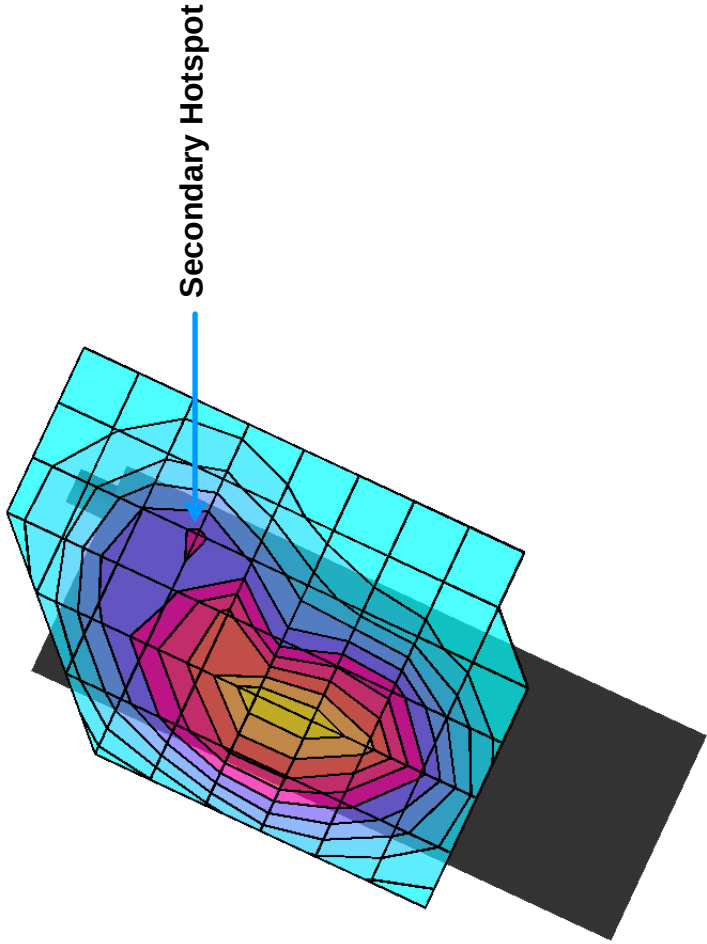


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (90°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.20 dB
SAR (1g): 0.0250 mW/g, SAR (10g): 0.0133 mW/g

Head SAR - Left Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

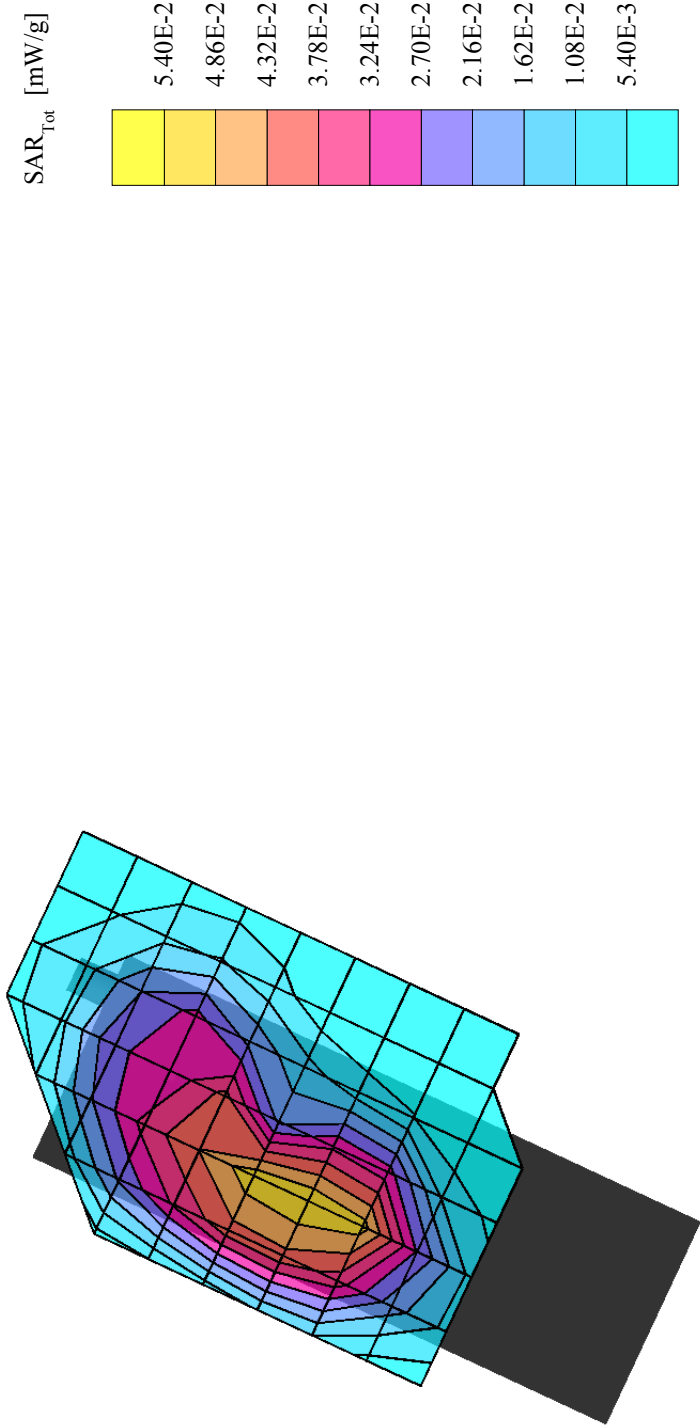
Secondary Hotspot Evaluation



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (90°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.08 dB
SAR (1g): 0.0435 mW/g, SAR (10g): 0.0248 mW/g

Head SAR - Left Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

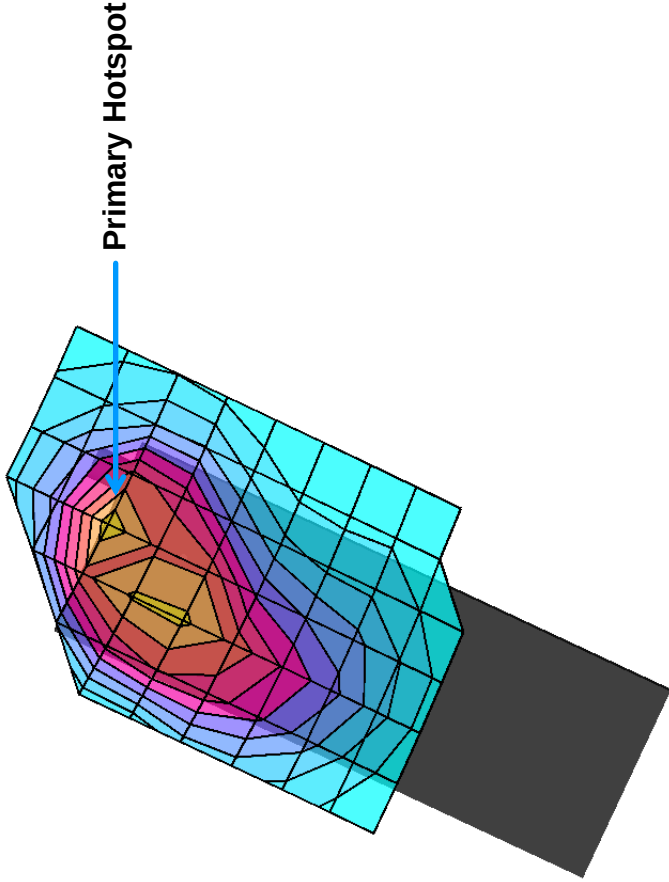


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (105°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.03 dB
SAR (1g): 0.0231 mW/g, SAR (10g): 0.0130 mW/g

Head SAR - Left Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

Primary Hotspot Evaluation

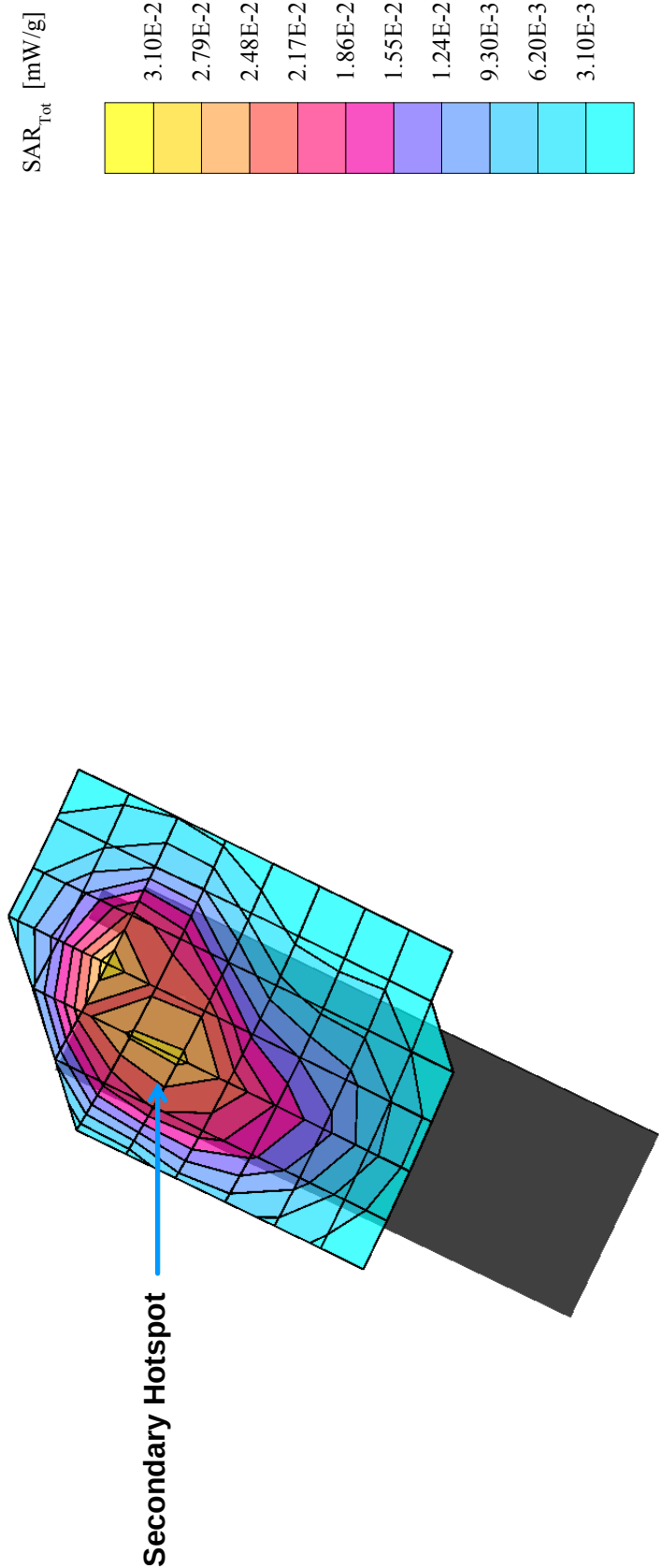


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (105°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.03 dB
SAR (1g): 0.0227 mW/g, SAR (10g): 0.0133 mW/g

Head SAR - Left Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

Secondary Hotspot Evaluation

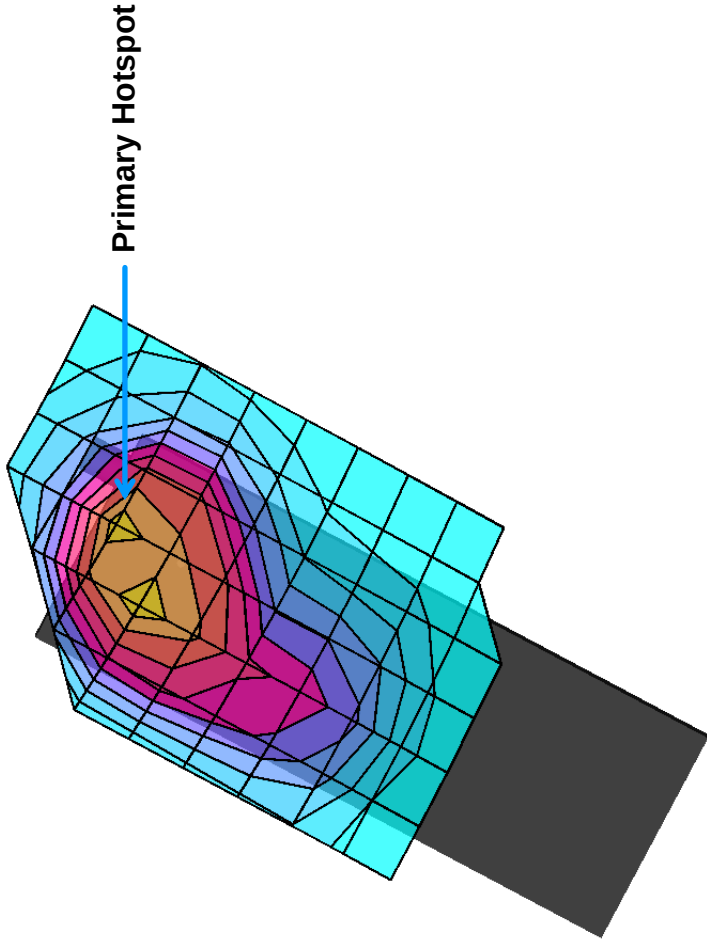


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (105°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.05 dB
SAR (1g): 0.0238 mW/g, SAR (10g): 0.0137 mW/g

Head SAR - Left Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

Primary Hotspot Evaluation

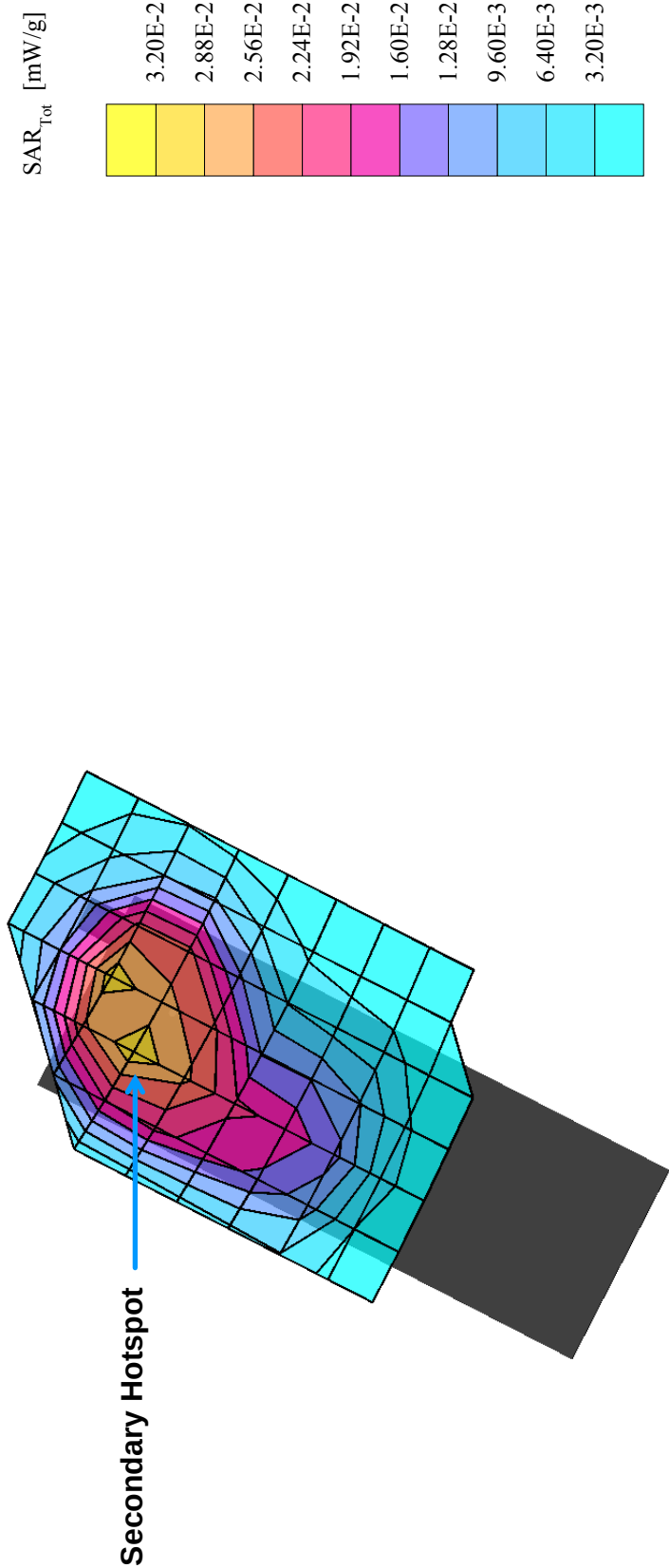


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Left Head Section; Position: (105°,65°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.05 dB
SAR (1g): 0.0238 mW/g, SAR (10g): 0.0140 mW/g

Head SAR - Left Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

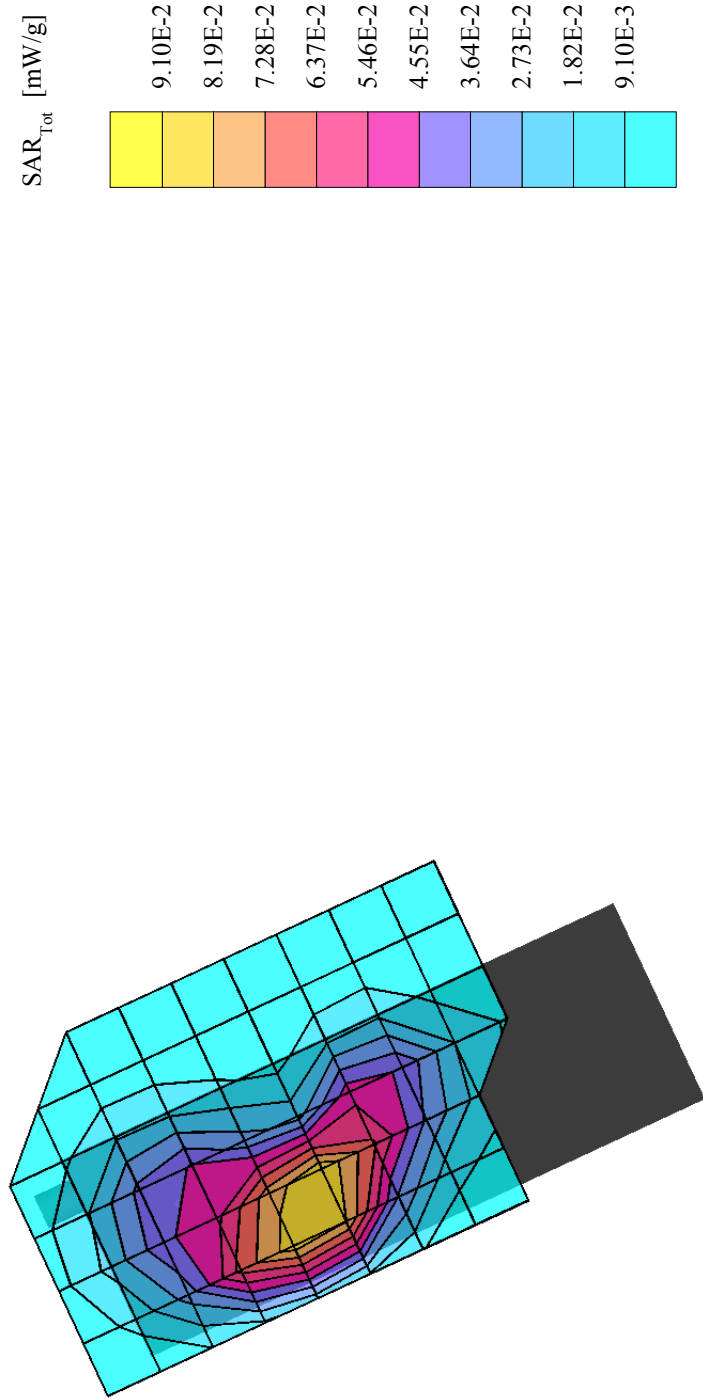
Secondary Hotspot Evaluation



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Right Head Section; Position: (90°,295°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.08 dB
SAR (1g): 0.0833 mW/g, SAR (10g): 0.0442 mW/g

Head SAR - Right Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003

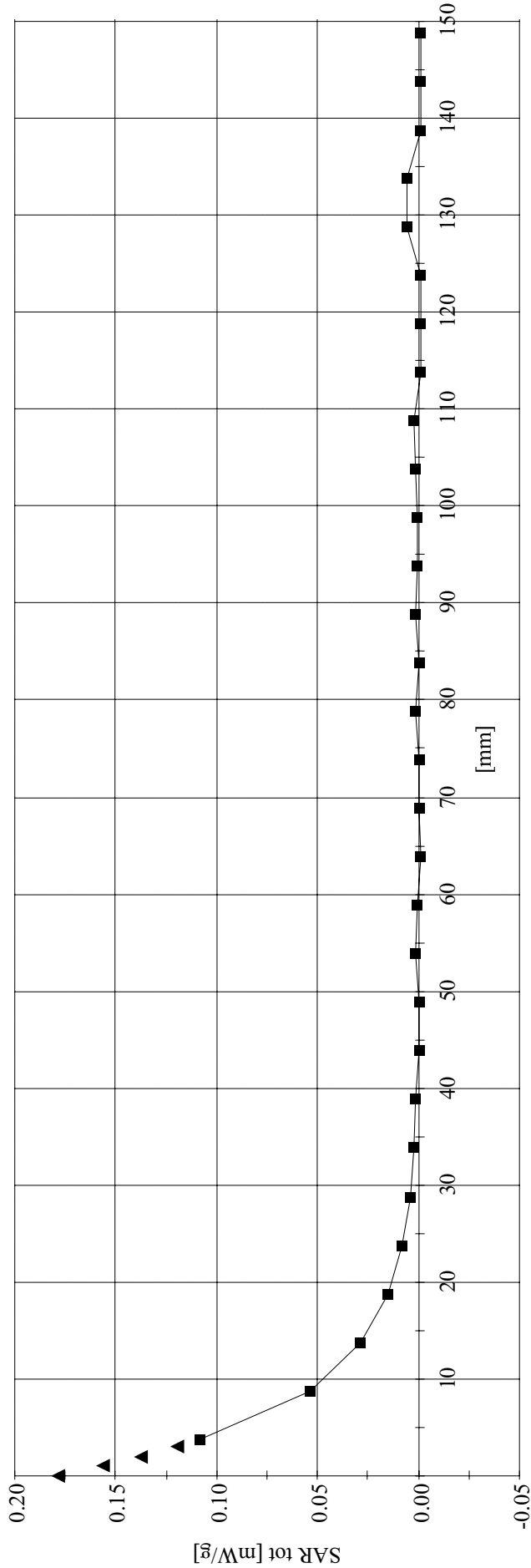


ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Right Head Section
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$

Z-Axis Extrapolation at Peak SAR Location

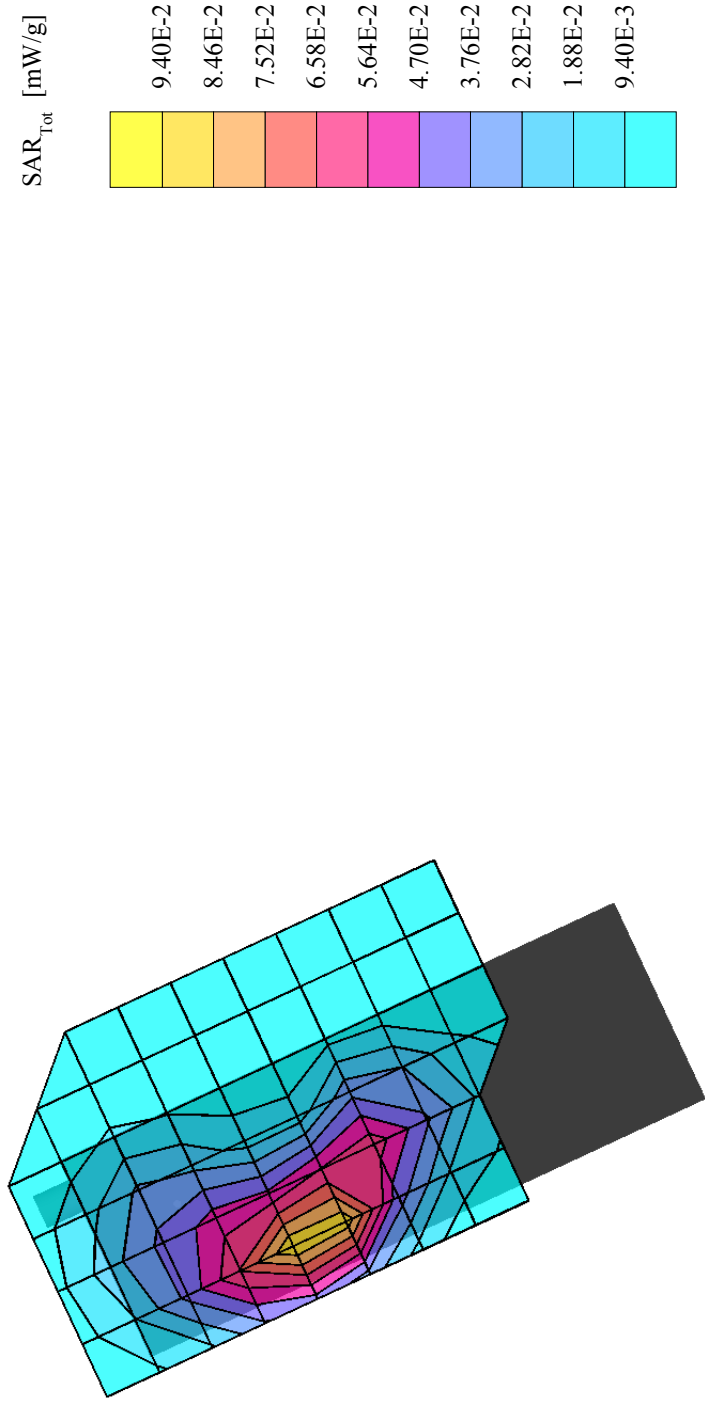
Head SAR - Right Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency-Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Right Head Section; Position: (90°,295°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.13 dB
SAR (1g): 0.0752 mW/g, SAR (10g): 0.0410 mW/g

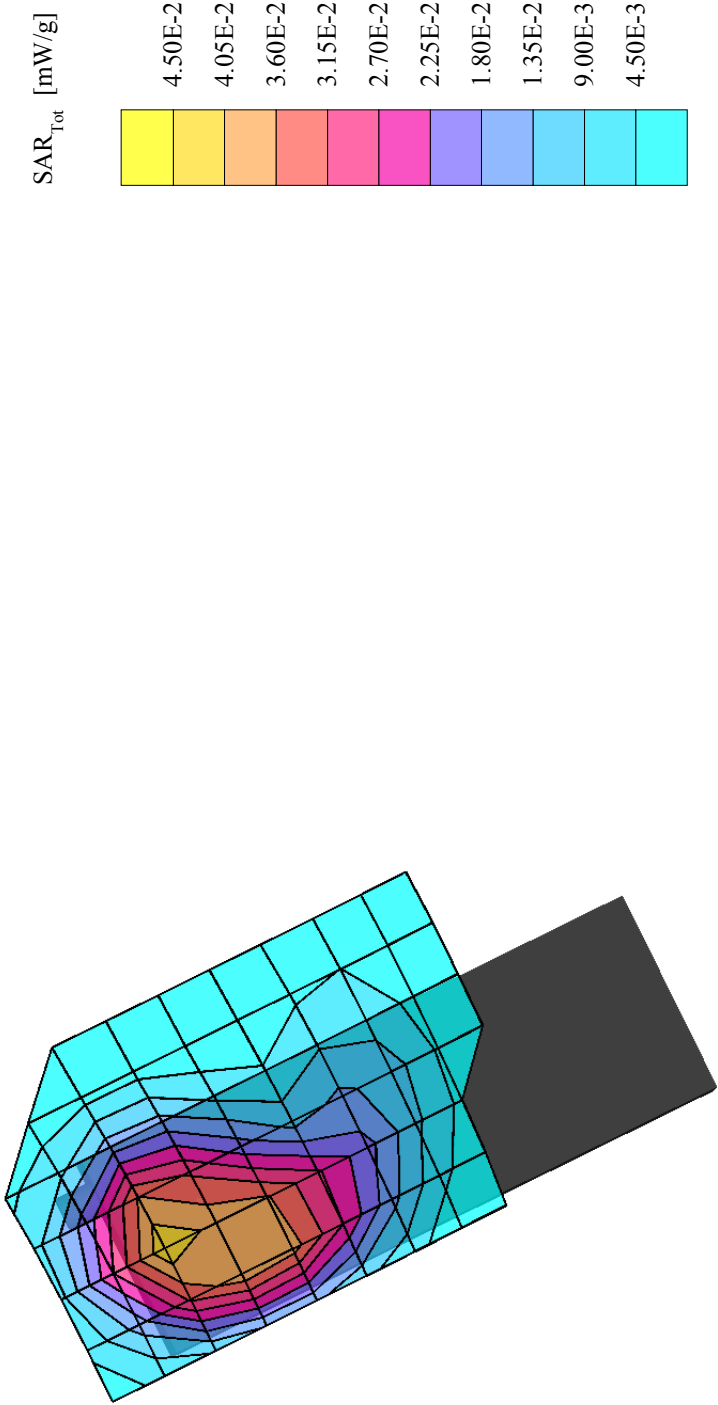
Head SAR - Right Cheek/Touch Position
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Right Head Section; Position: (105°,295°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.13 dB
SAR (1g): 0.0339 mW/g, SAR (10g): 0.0194 mW/g

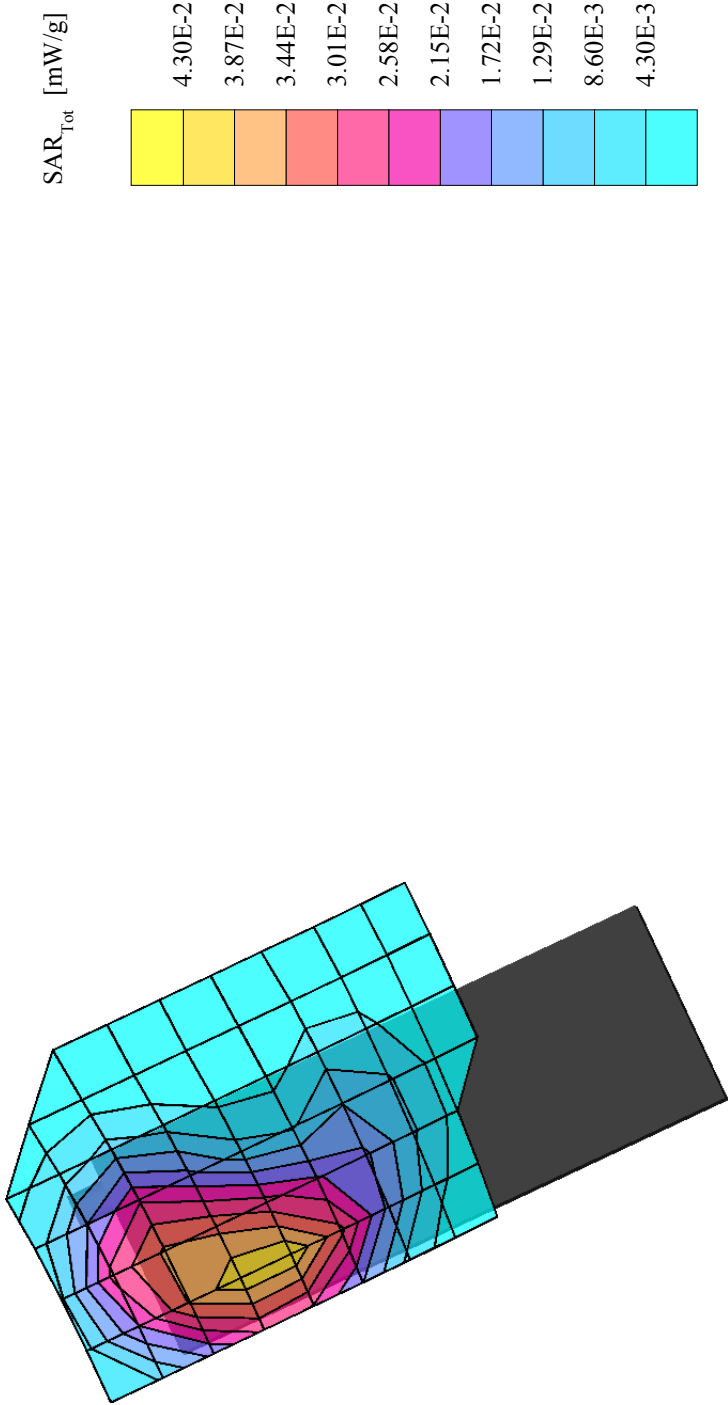
Head SAR - Right Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Right Head Section; Position: (105°,295°)
Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 5.1
Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.13 dB
SAR (1g): 0.0342 mW/g, SAR (10g): 0.0195 mW/g

Head SAR - Right Ear/Tilt Position (15°)
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V NiCd Battery (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 22.5°C; Fluid Temp. 23.8°C
Date Tested: July 7, 2003



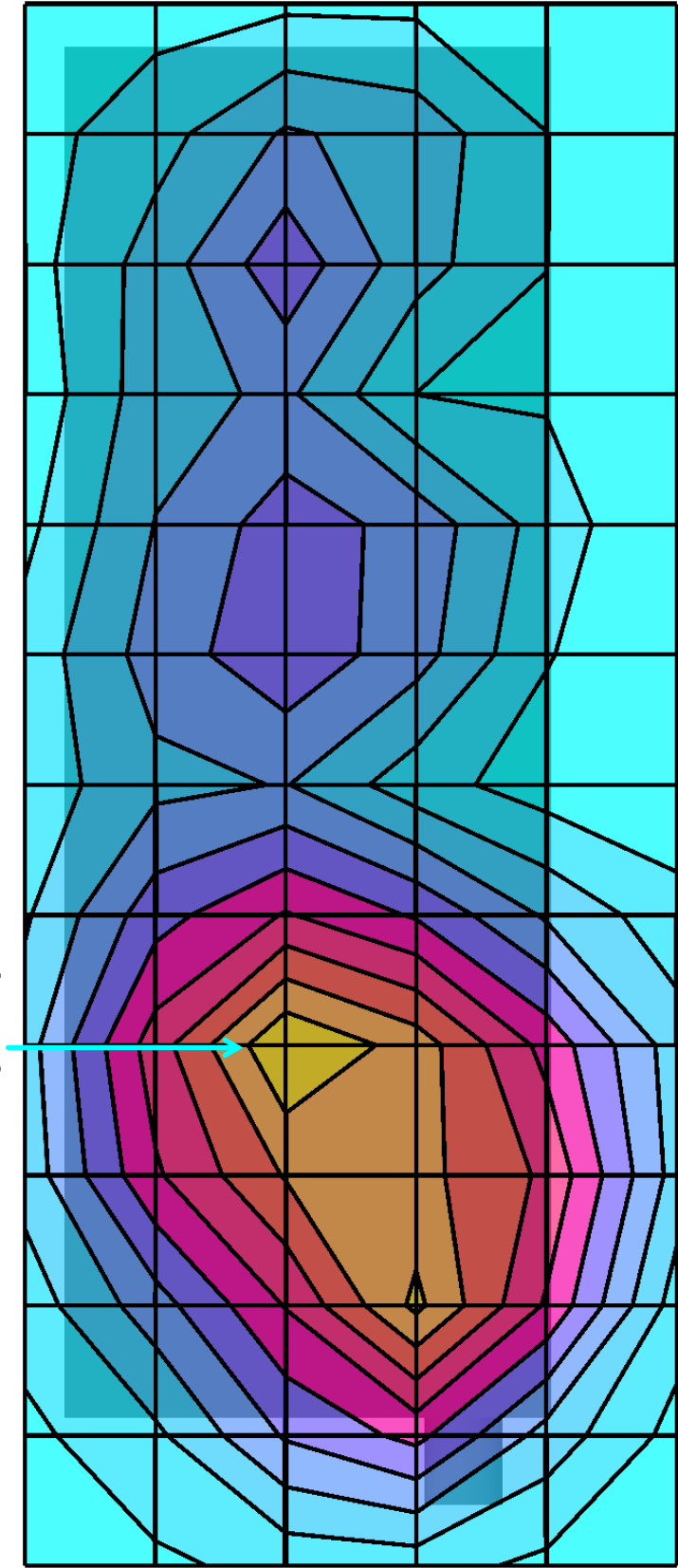
ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Flat Section; Position: (270°, 90°)
Probe: ET3DV6 - SN1387; ConvF(4.60,4.60,4.60); Crest factor: 5.1
Muscle 2450 MHz: $\sigma = 1.99 \text{ mho/m}$, $\epsilon_r = 47.6$, $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.19 dB
SAR (1g): 0.0347 mW/g, SAR (10g): 0.0194 mW/g

Body-worm SAR - 0.7 cm Belt-Clip Separation Distance
with Ear-Microphone Accessory
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V Battery NiCd (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 23.1°C; Fluid Temp. 23.9°C
Date Tested: July 7, 2003

Primary Hotspot Evaluation

Primary Hotspot



ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1387; ConvF(4.60,4.60,4.60); Crest factor: 5.1

Muscle 2450 MHz: $\sigma = 1.99 \text{ mho/m}$ $\epsilon_r = 47.6$ $\rho = 1.00 \text{ g/cm}^3$

Z-Axis Extrapolation at Peak SAR Location

Body-worn SAR - 0.7 cm Belt-Clip Separation Distance
with Ear-Microphone Accessory

21008xxx-A 2.4 GHz FHSS Cordless Handset

Fixed Stubby Antenna

3.6V Battery NiCd (600mAh)

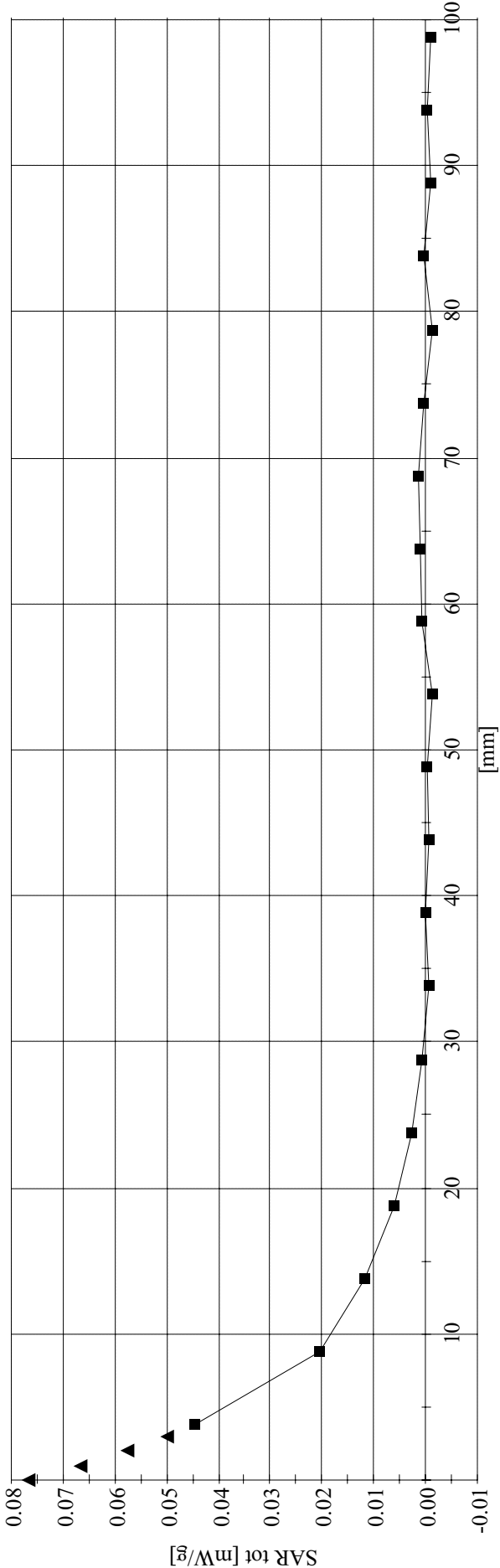
Fixed Frequency-Random Modulation

Mid Channel [2440.159 MHz]

RF Output Power: 0.282 Watts (EIRP)

Ambient Temp. 23.1 °C; Fluid Temp. 23.9 °C

Date Tested: July 7, 2003



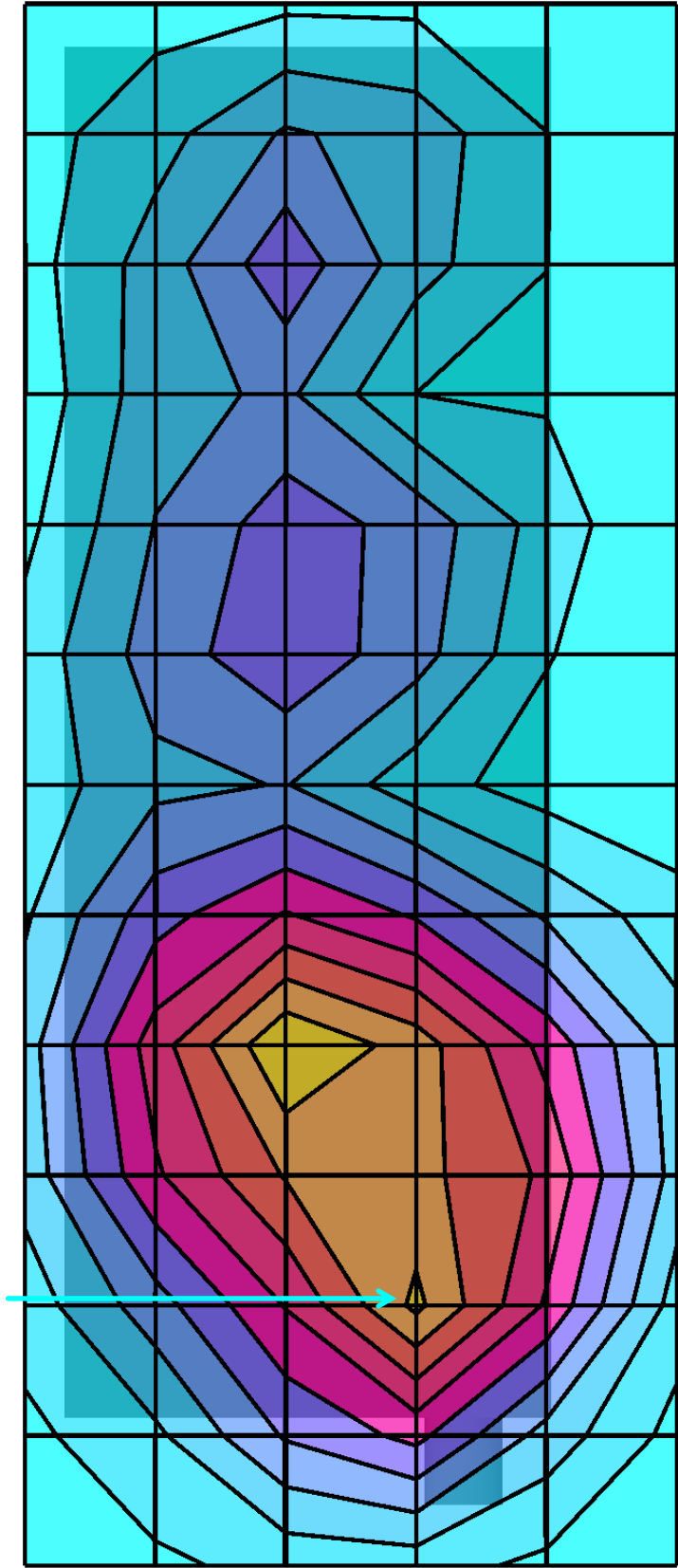
ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Flat Section; Position: (270°,90°)
Probe: ET3DV6 - SN1387; ConvF(4.60,4.60,4.60); Crest factor: 5.1
Muscle 2450 MHz: $\sigma = 1.99 \text{ mho/m}$ $\epsilon_r = 47.6$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.19 dB
SAR (1g): 0.0315 mW/g, SAR (10g): 0.0158 mW/g

Body-worm SAR - 0.7 cm Belt-Clip Separation Distance
with Ear-Microphone Accessory
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V Battery NiCd (600mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 23.1°C; Fluid Temp. 23.9°C
Date Tested: July 7, 2003

Secondary Hotspot Evaluation

Secondary Hotspot



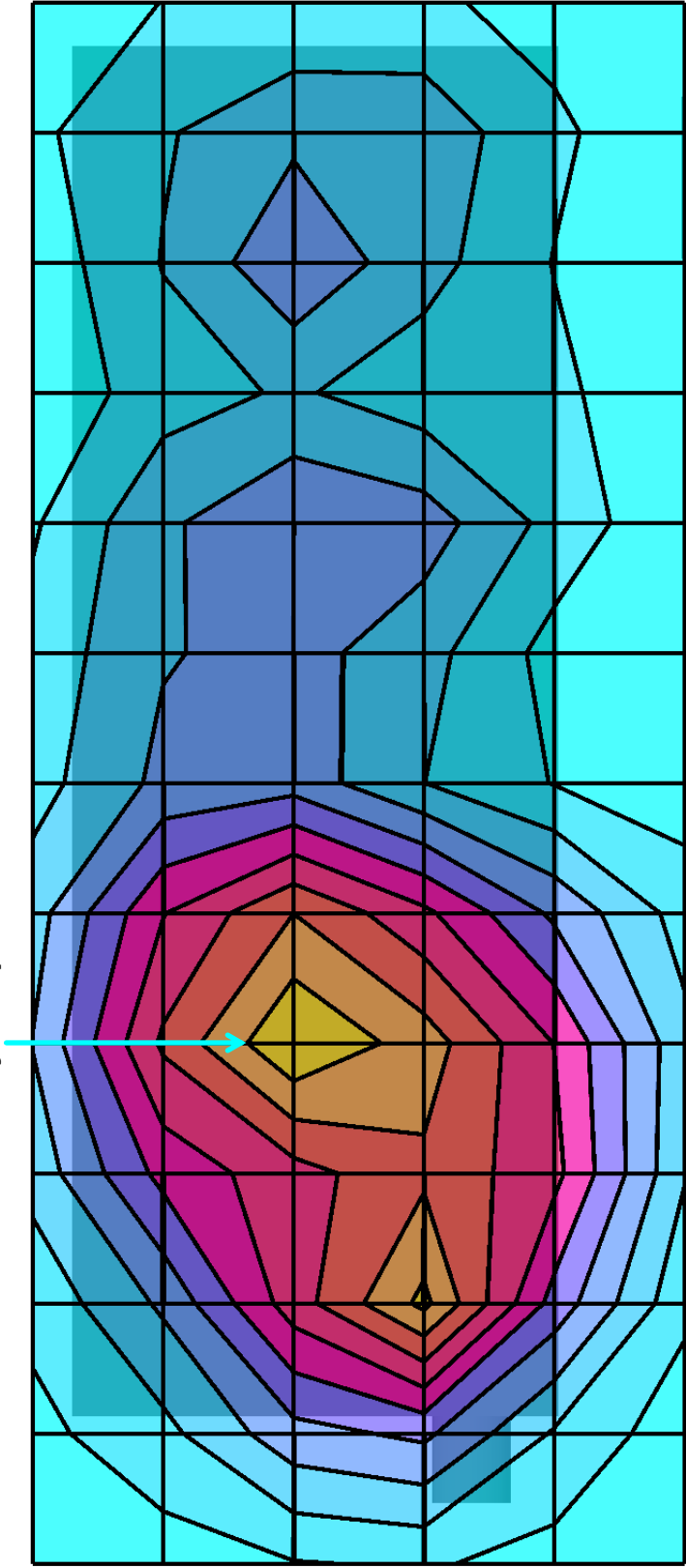
ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Flat Section; Position: (270°, 90°)
Probe: ET3DV6 - SN1387; ConvF(4.60,4.60,4.60); Crest factor: 5.1
Muscle 2450 MHz: $\sigma = 1.99 \text{ mho/m}$, $\epsilon_r = 47.6$, $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.15 dB
SAR (1g): 0.0327 mW/g, SAR (10g): 0.0183 mW/g

Body-worn SAR - 0.7 cm Belt-Clip Separation Distance
with Ear-Microphone Accessory
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V Battery NiCd (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 23.1°C; Fluid Temp. 23.9°C
Date Tested: July 7, 2003

Primary Hotspot Evaluation

Primary Hotspot



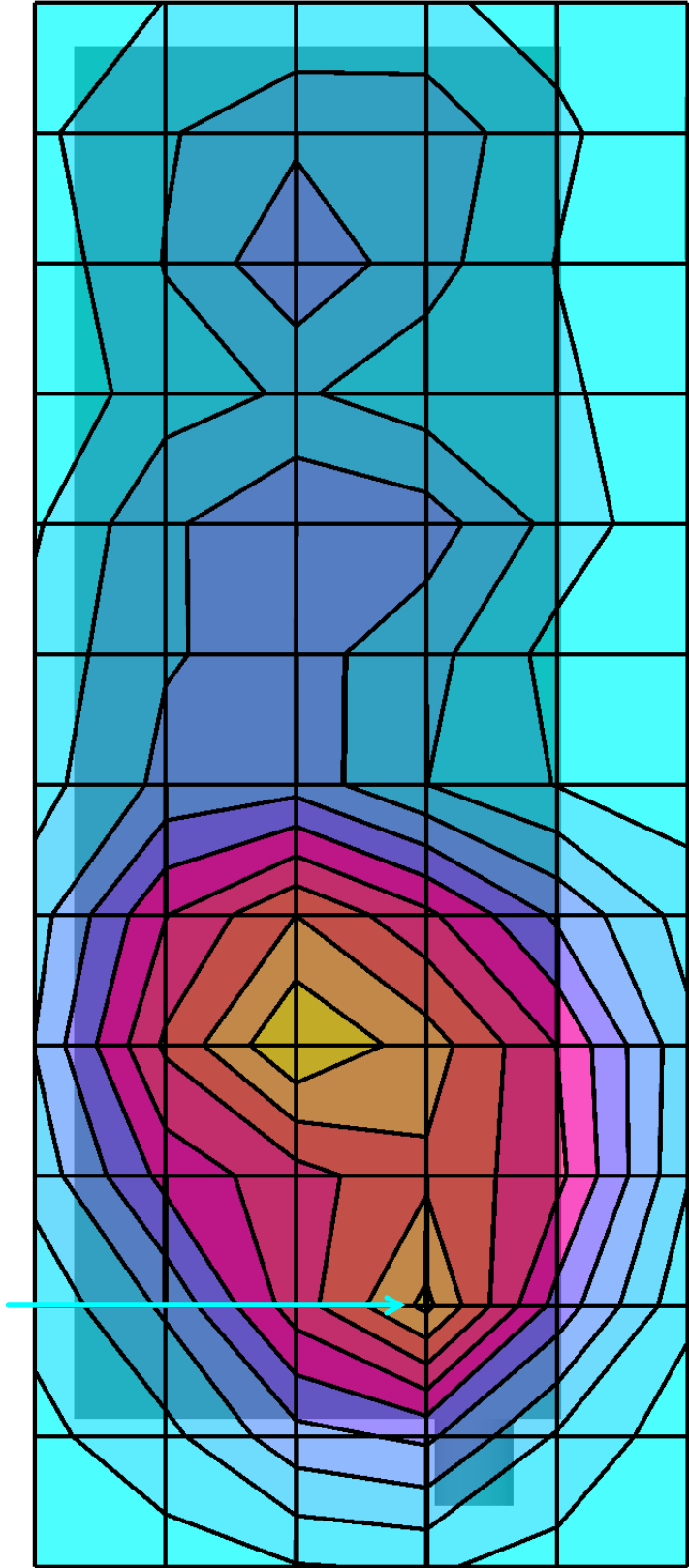
ATLINKS USA INC. FCC ID: G9H2-1008A

SAM Phantom; Flat Section; Position: (270°, 90°)
Probe: ET3DV6 - SN1387; ConvF(4.60,4.60,4.60); Crest factor: 5.1
Muscle 2450 MHz: $\sigma = 1.99 \text{ mho/m}$ $\epsilon_r = 47.6$ $\rho = 1.00 \text{ g/cm}^3$
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.15 dB
SAR (1g): 0.0299 mW/g, SAR (10g): 0.0143 mW/g

Body-worm SAR - 0.7 cm Belt-Clip Separation Distance
with Ear-Microphone Accessory
21008xxx-A 2.4 GHz FHSS Cordless Handset
Fixed Stubby Antenna
3.6V Battery NiCd (800mAh)
Fixed Frequency - Random Modulation
Mid Channel [2440.159 MHz]
RF Output Power: 0.282 Watts (EIRP)
Ambient Temp. 23.1°C; Fluid Temp. 23.9°C
Date Tested: July 7, 2003

Secondary Hotspot Evaluation

Secondary Hotspot



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

System Performance Check - 2450MHz Dipole

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1387; ConvF(5.00,5.00,5.00); Crest factor: 1.0; Brain 2450 MHz: $\sigma = 1.87 \text{ mho/m}$ $\epsilon_r = 37.2$ $\rho = 1.00 \text{ g/cm}^3$

Cube 5x5x7: Peak: 27.8 mW/g, SAR (1g): 14.1 mW/g, SAR (10g): 6.54 mW/g, (Worst-case extrapolation)

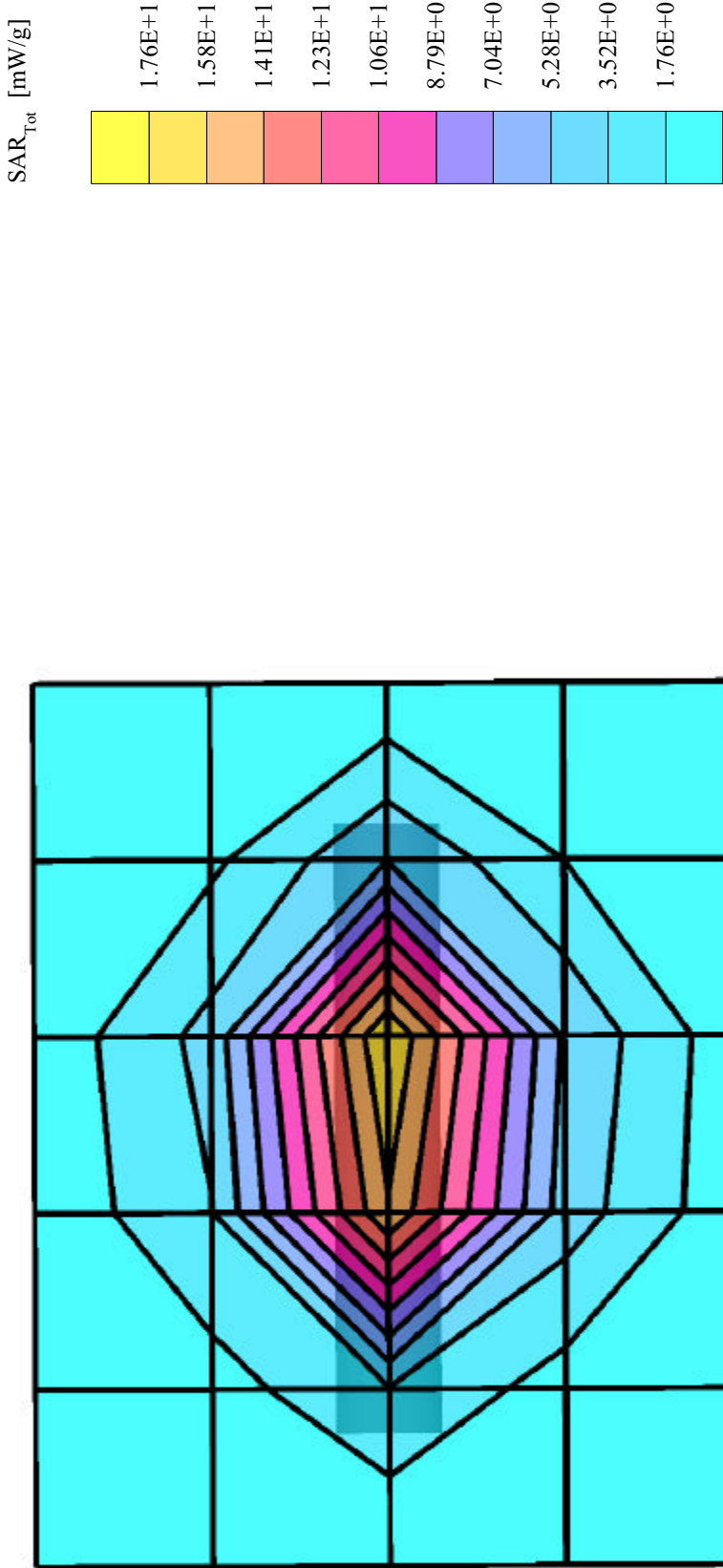
Penetration depth: 7.0 (6.8, 7.2) [mm]

Powerdrift: -0.01 dB

Forward Conducted Power: 250mW

Ambient Temp. 22.5°C; Fluid Temp. 23.8°C

Date Tested: July 7, 2003



APPENDIX C - SYSTEM VALIDATION

2450MHz SYSTEM VALIDATION DIPOLE

Type:

2450MHz Validation Dipole

Serial Number:

150

Place of Calibration:

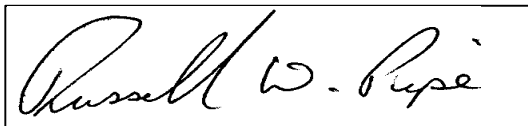
Celltech Research Inc.

Date of Calibration:

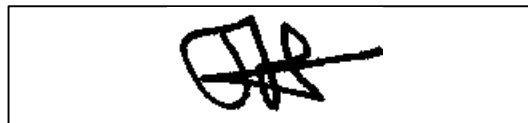
October 24, 2002

Celltech Research Inc. hereby certifies that this device has been calibrated on the date indicated above.

Calibrated by:



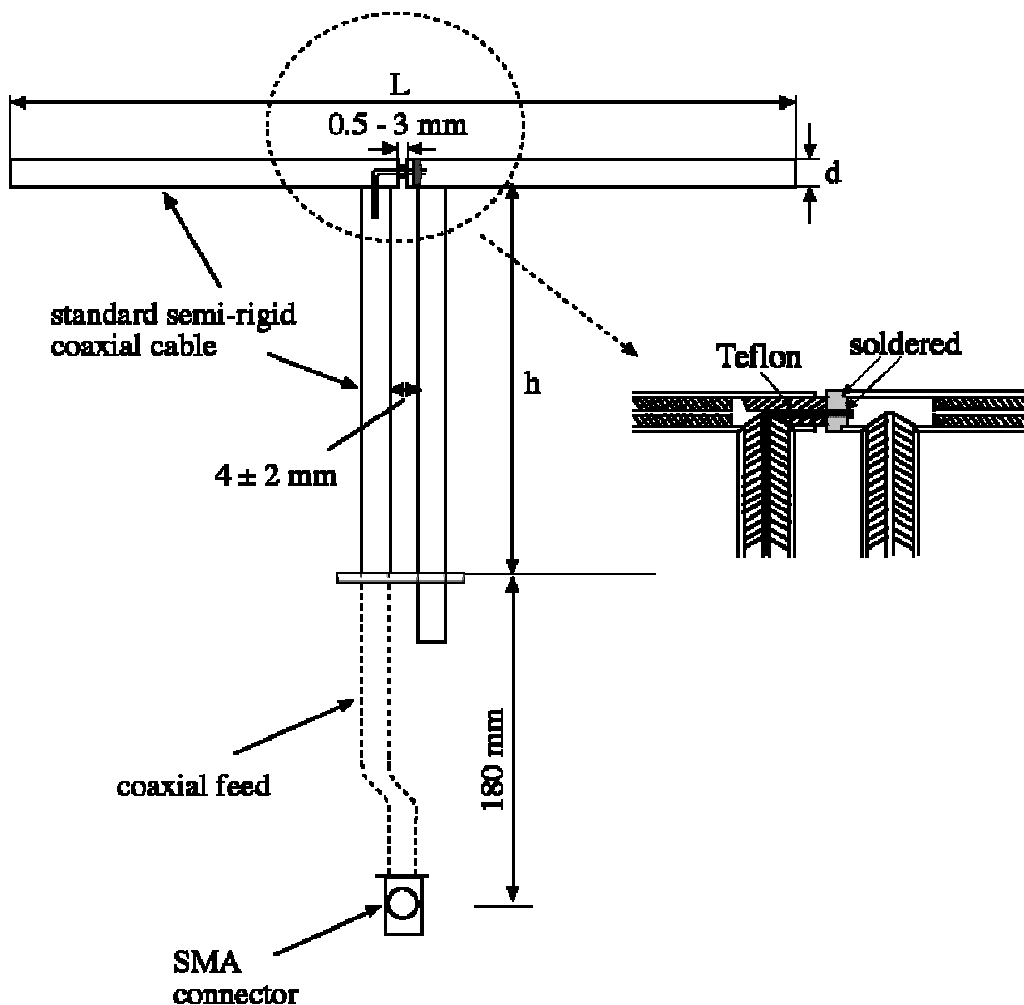
Approved by:



1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Std “Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”. The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 10.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 2450MHz	$\text{Re}\{Z\} = 49.838\Omega$ $\text{Im}\{Z\} = 0.2207\Omega$
Return Loss at 2450MHz	-49.398 dB



Validation Dipole Dimensions

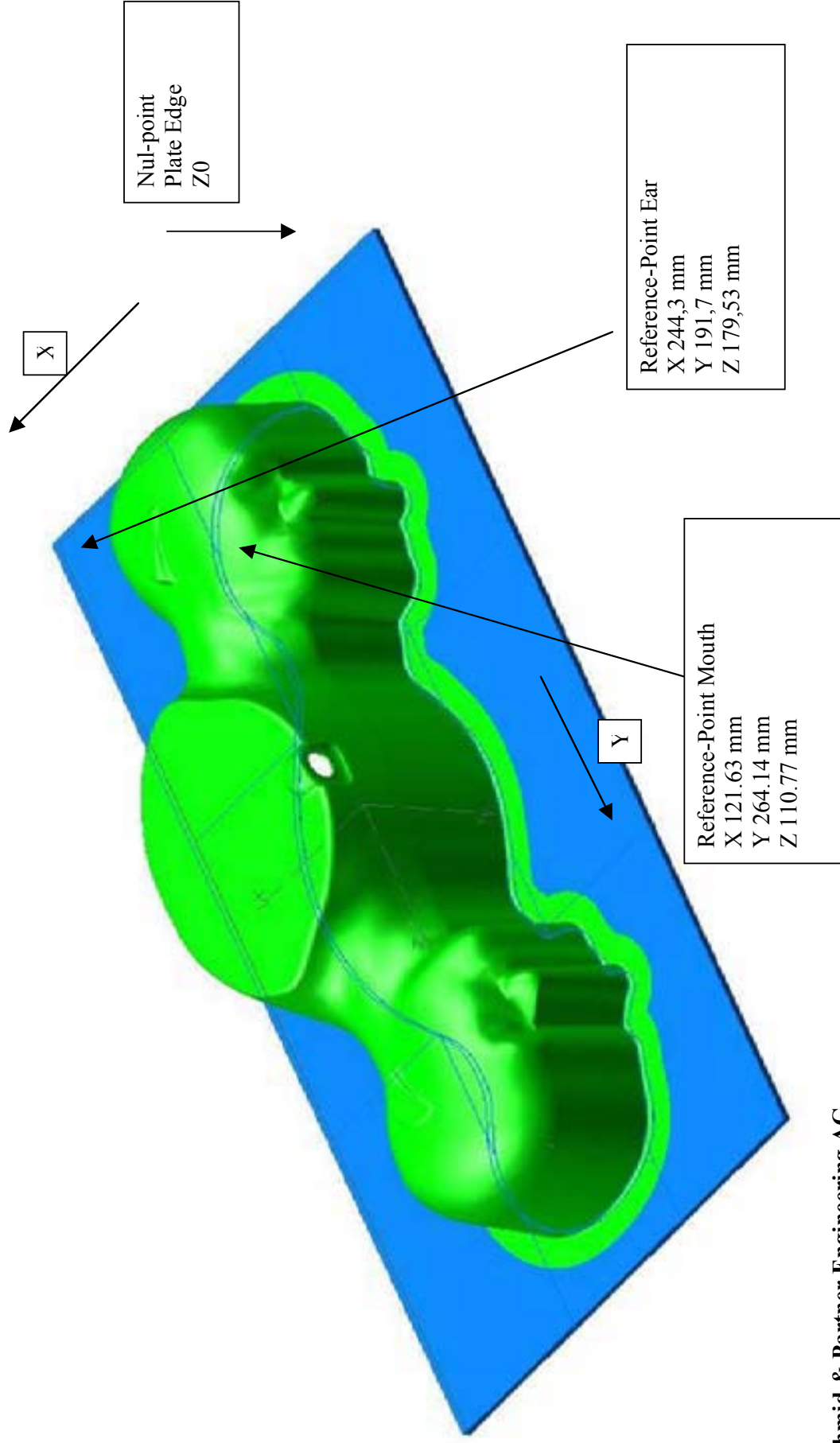
Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	420.0	250.0	6.2
450	288.0	167.0	6.2
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.6	3.6
3000	41.5	25.0	3.6

2. Validation Phantom

The validation phantom is the SAM (Specific Anthropomorphic Mannequin) phantom manufactured by Schmid & Partner Engineering AG. The SAM phantom is a Fiberglass shell integrated in a wooden table. The shape of the shell corresponds to the phantom defined by SCC34-SC2. 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 in the robot.

Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 20 liters
Dimensions: 50 cm (W) x 100 cm (L)

SAM Twin-Phantom



2450MHz Dipole Calibration



2450MHz Dipole Calibration



3. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 2450MHz:

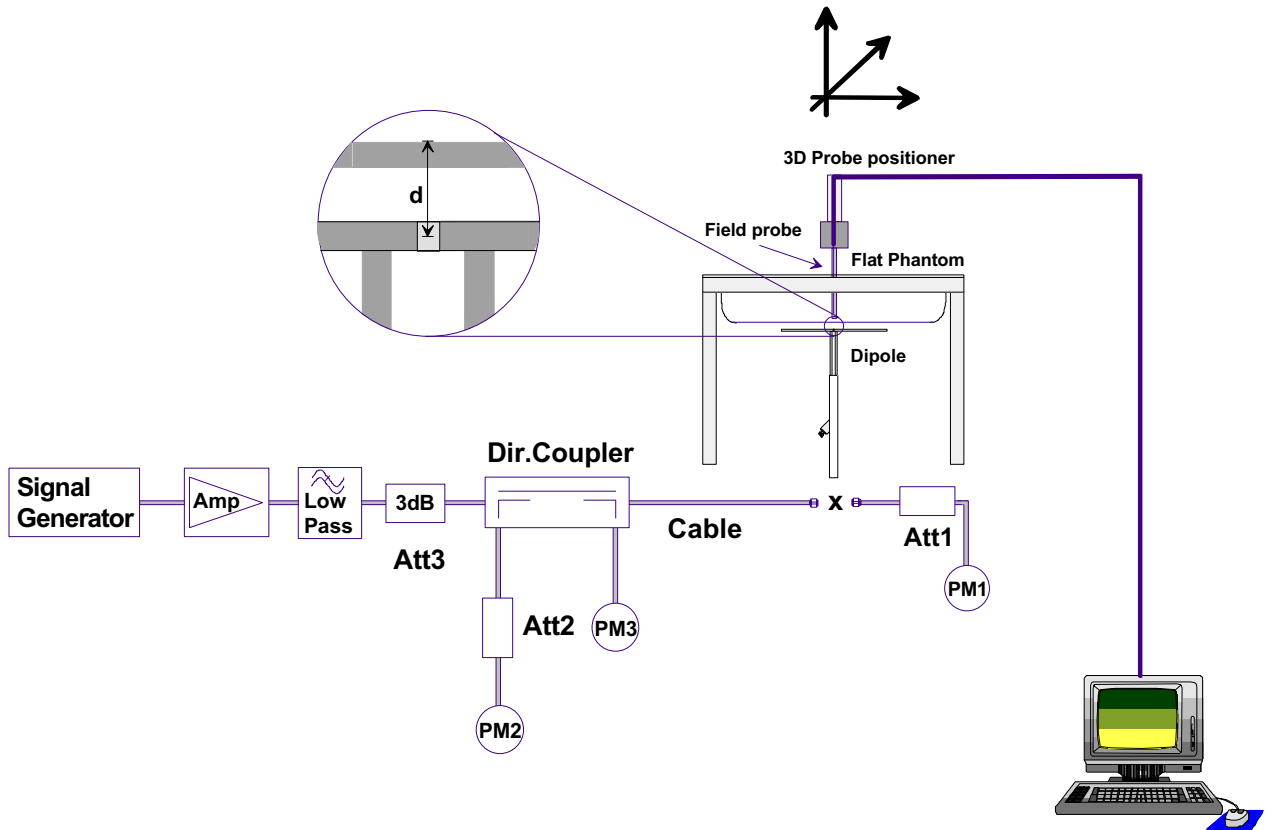
Relative Permittivity:	36.8
Conductivity:	1.79 mho/m
Ambient Temperature:	23.6°C
Fluid Temperature:	23.8°C
Fluid Depth:	≥ 15cm

The 2450MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	55.20%
Glycol Monobutyl	44.80%
Target Dielectric Parameters at 22°C	$\epsilon_r = 39.2$ (+/-10%) $\sigma = 1.80$ S/m (+/-5%)

4. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First, the power meter **PM1** (including attenuator **Att1**) is connected to the cable to measure the forward power at the location of the dipole connector (**X**). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of **Att1**) as read by power meter **PM2**. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter **PM2**. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at **PM2** must be taken into consideration. **PM3** records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

Ten SAR measurements were performed in order to achieve repeatability and to establish an average target value.

Validation Dipole SAR Test Results

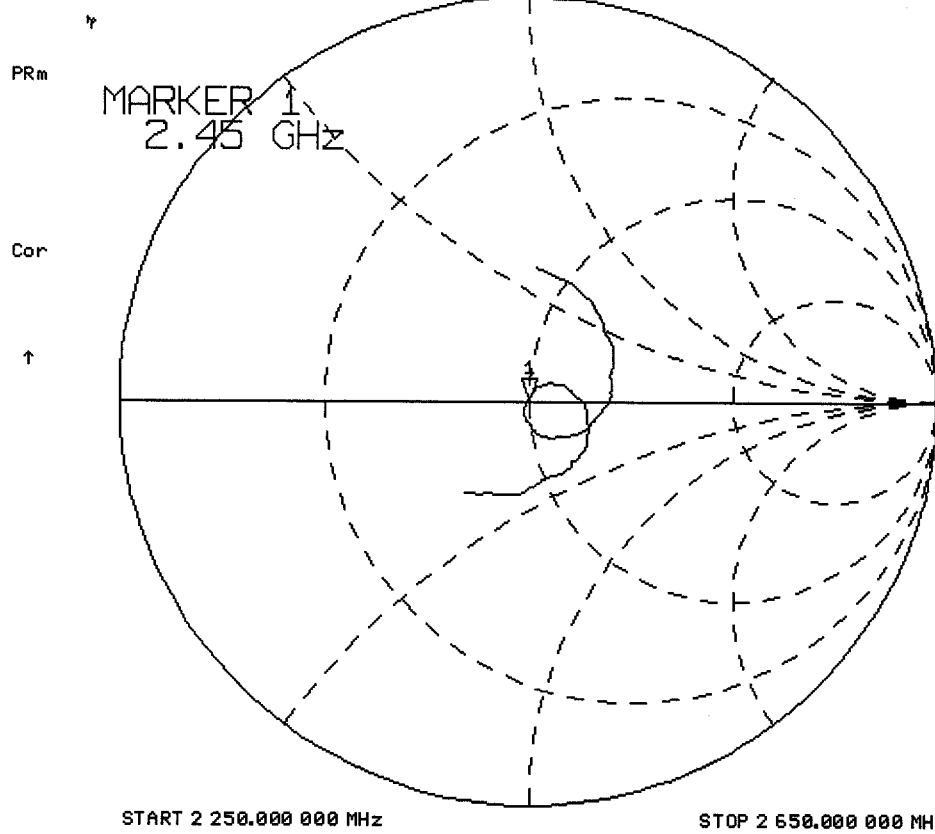
Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	14.4	57.6	6.55	26.20	30.5
Test 2	14.2	56.8	6.44	25.76	30.0
Test 3	14.0	56.0	6.35	25.40	29.7
Test 4	13.9	55.6	6.32	25.28	29.5
Test 5	14.0	56.0	6.33	25.32	29.7
Test 6	14.0	56.0	6.33	25.32	29.7
Test 7	13.9	55.6	6.31	25.24	29.5
Test 8	13.8	55.2	6.28	25.12	29.3
Test 9	13.8	55.2	6.28	25.12	29.4
Test10	14.0	56.0	6.33	25.32	29.7
Average Value	14.0	56.0	6.35	25.41	29.7

The results have been normalized to 1W (forward power) into the dipole.

Averaged over 1cm (1g) of tissue: 56.00 mW/g

Averaged over 10cm (10g) of tissue: 25.41 mW/g

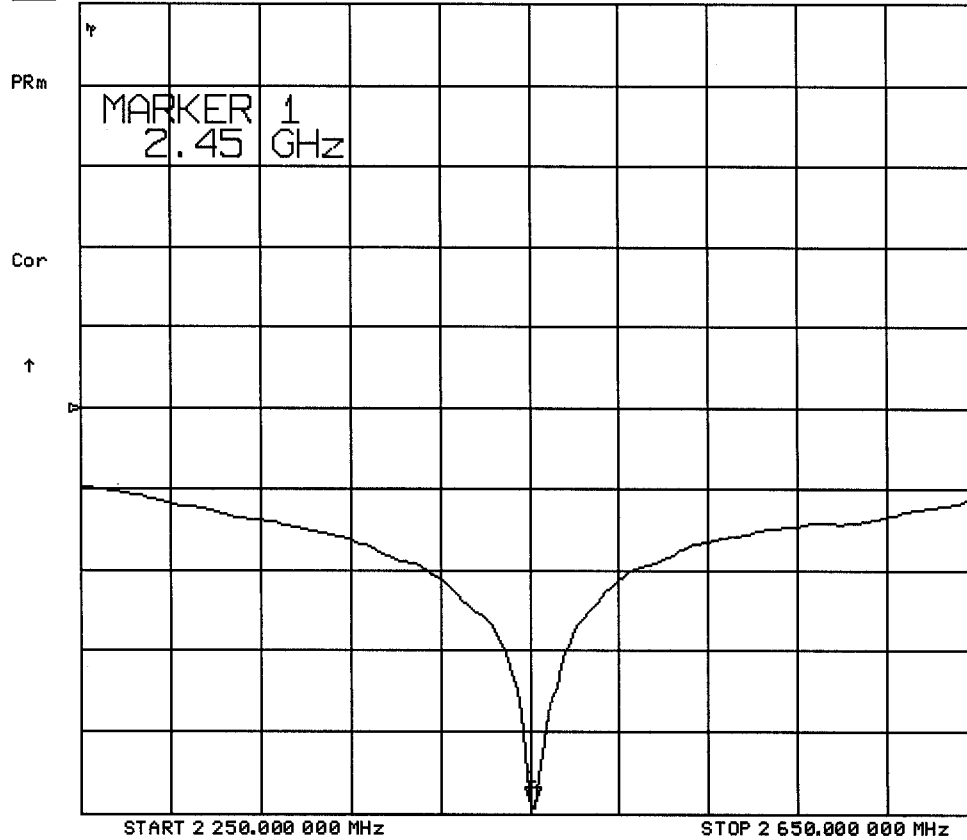
24 Oct 2002 09:28:50
CH1 S11 1 U FS 1: 49.838 Ω 0.2207 Ω 14.337 pH 2 450.000 000 MHz



24 Oct 2002 09:28:12

CH1 S11 LOG 10 dB/REF 0 dB

11-49.398 dB 2 450.000 000 MHz



Dipole 2450MHz

SAM Phantom; Flat Section

Probe: ET3DV6 - SNI1387; ConvF(4.70,4.70,4.70); Crest factor: 1.0; 2450 MHz Brain: $\sigma = 1.79 \text{ mho/m}$ $\epsilon_r = 36.8 \text{ g/cm}^3$

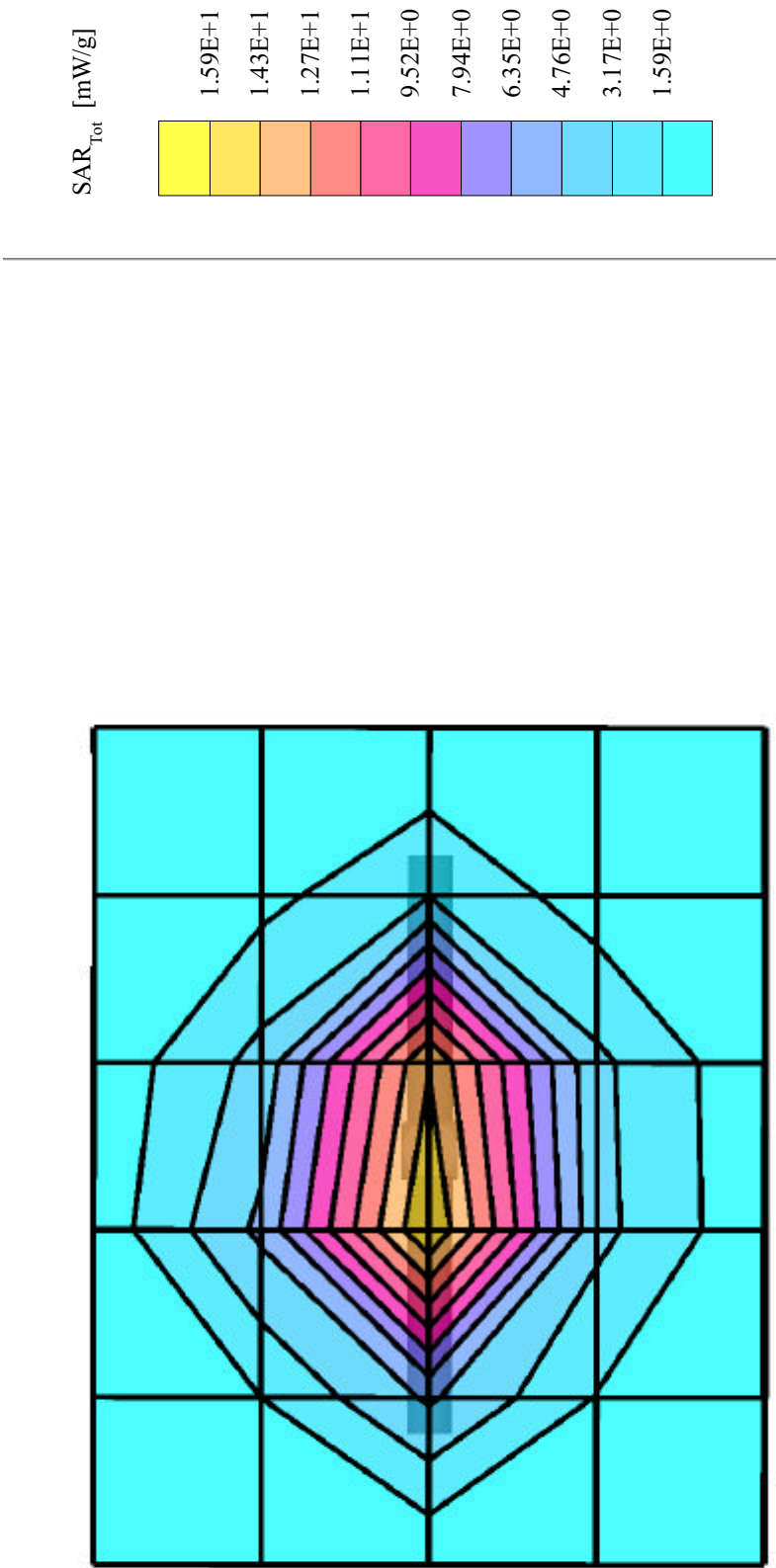
Cubes (4): Peak: 29.7 mW/g $\pm 0.04 \text{ dB}$, SAR (1g): 14.0 mW/g $\pm 0.04 \text{ dB}$, SAR (10g): 6.35 mW/g $\pm 0.04 \text{ dB}$, (Worst-case extrapolation)

Penetration depth: 6.4 (6.1, 7.2) [mm]; Powerdrift: -0.04 dB

Ambient Temp.: 23.6°C; Fluid Temp.: 23.8°C

Forward Conducted Power: 250 mW

Calibration Date: October 24, 2002



2450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 24, 2002

Frequency	ϵ'	ϵ''
2.350000000 GHz	37.2108	12.9039
2.360000000 GHz	37.1695	12.9350
2.370000000 GHz	37.1398	12.9630
2.380000000 GHz	37.1057	12.9945
2.390000000 GHz	37.0746	13.0290
2.400000000 GHz	37.0424	13.0464
2.410000000 GHz	36.9746	13.0743
2.420000000 GHz	36.9322	13.1074
2.430000000 GHz	36.8908	13.1372
2.440000000 GHz	36.8449	13.1527
2.450000000 GHz	36.7983	13.1767
2.460000000 GHz	36.7651	13.2038
2.470000000 GHz	36.7300	13.2377
2.480000000 GHz	36.7004	13.2677
2.490000000 GHz	36.6658	13.2862
2.500000000 GHz	36.6120	13.2988
2.510000000 GHz	36.5655	13.3268
2.520000000 GHz	36.5147	13.3582
2.530000000 GHz	36.4743	13.3922
2.540000000 GHz	36.4044	13.4131
2.550000000 GHz	36.3807	13.4402

APPENDIX D - PROBE CALIBRATION

Client

Celltech Labs

CALIBRATION CERTIFICATE

Object(s)

ET3DV6 - SN: 1387

Calibration procedure(s)

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

Calibration date:

February 26, 2003

Condition of the calibrated item

In Tolerance (according to the specific calibration document)

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

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

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

Calibrated by:

Name

Nico Vetterli

Function

Technician

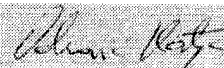
Signature



Approved by:

Katja Pokovic

Laboratory Director



Date issued: February 26, 2003

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

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibration:	February 22, 2002
Recalibrated:	February 26, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

NormX	1.55 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.65 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.64 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	92	mV
DCP Y	92	mV
DCP Z	92	mV

Sensitivity in Tissue Simulating Liquid

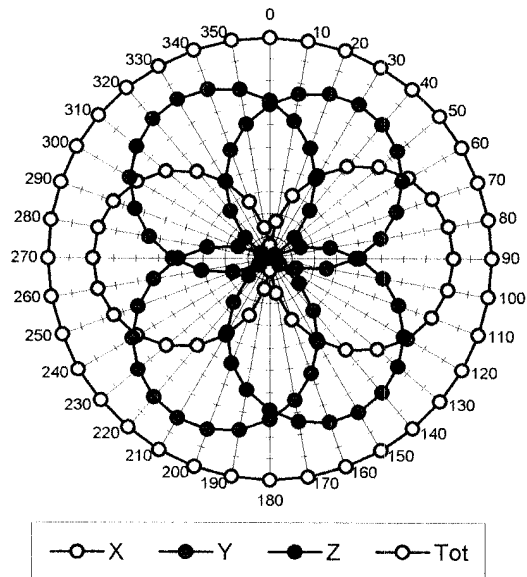
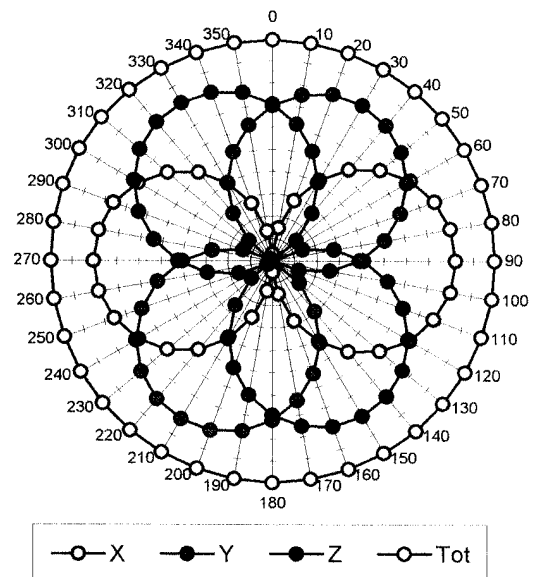
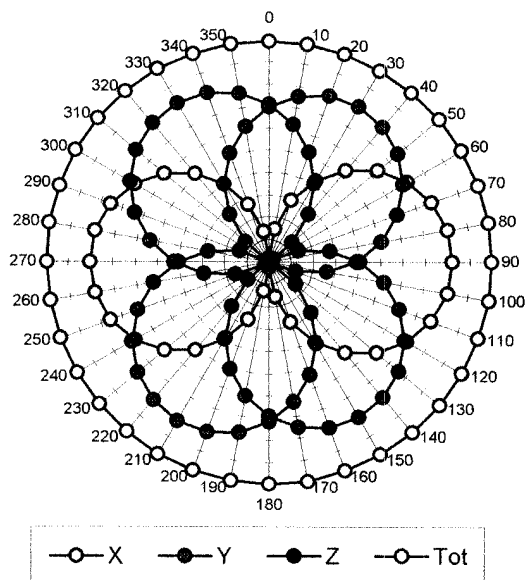
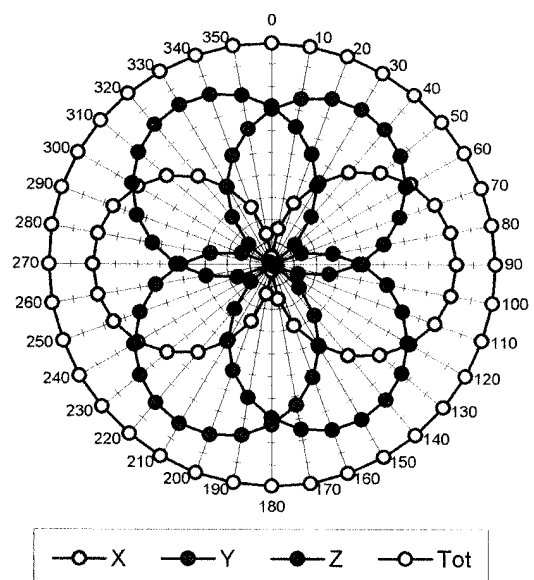
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha	0.37
ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth	2.61
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.50
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.73

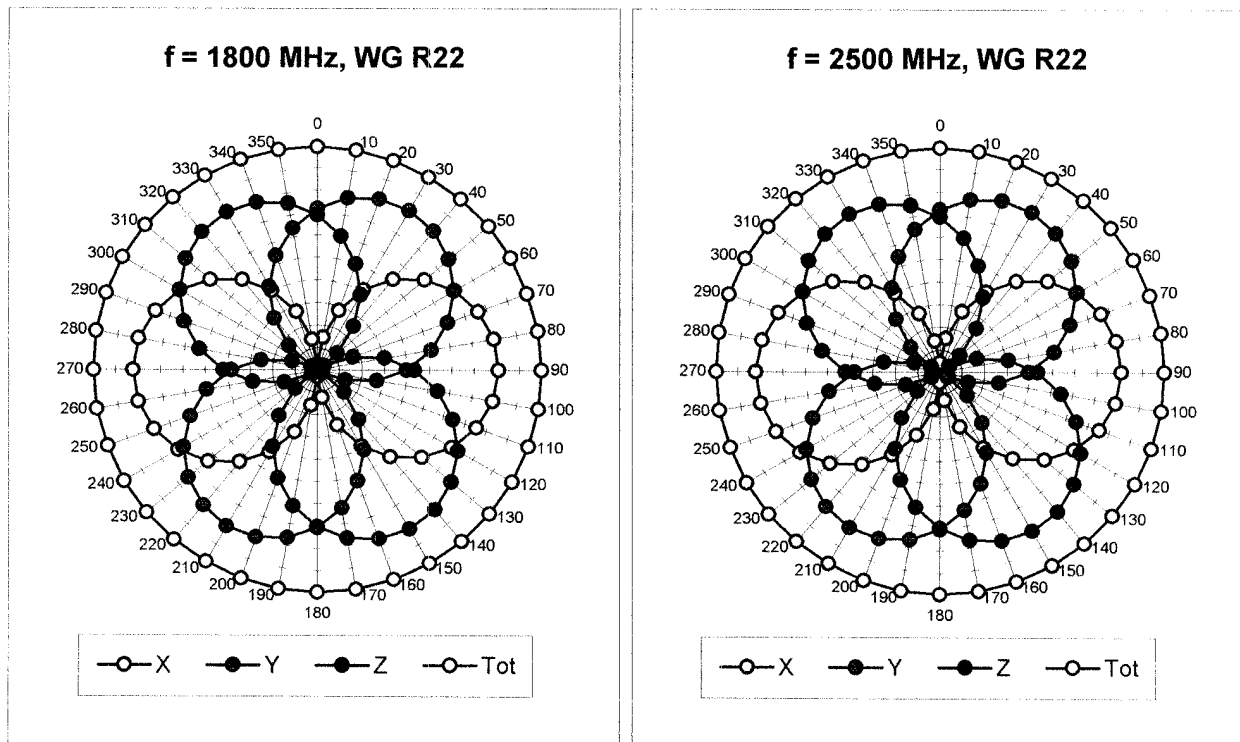
Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm	
Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%]	Without Correction Algorithm	10.2	5.9
SAR _{pe} [%]	With Correction Algorithm	0.4	0.6
Head	1800 MHz	Typical SAR gradient: 10 % per mm	
Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%]	Without Correction Algorithm	14.6	9.8
SAR _{pe} [%]	With Correction Algorithm	0.2	0.0

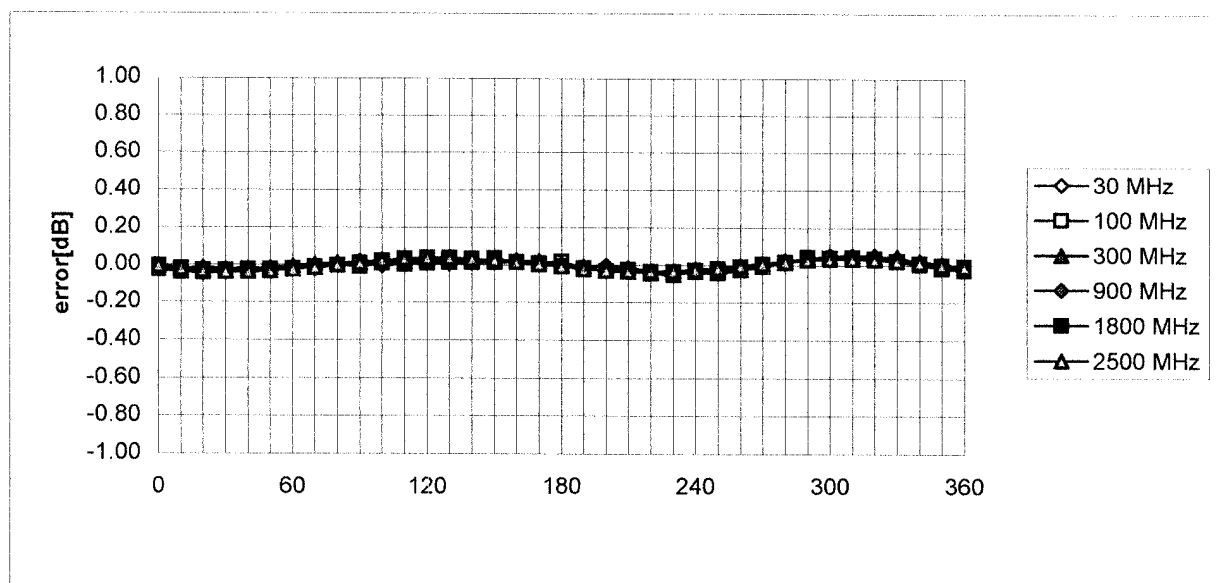
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.4 $\pm$ 0.2	mm

Receiving Pattern (ϕ), $\theta = 0^\circ$ **f = 30 MHz, TEM cell ifi110****f = 100 MHz, TEM cell ifi110****f = 300 MHz, TEM cell ifi110****f = 900 MHz, TEM cell ifi110**

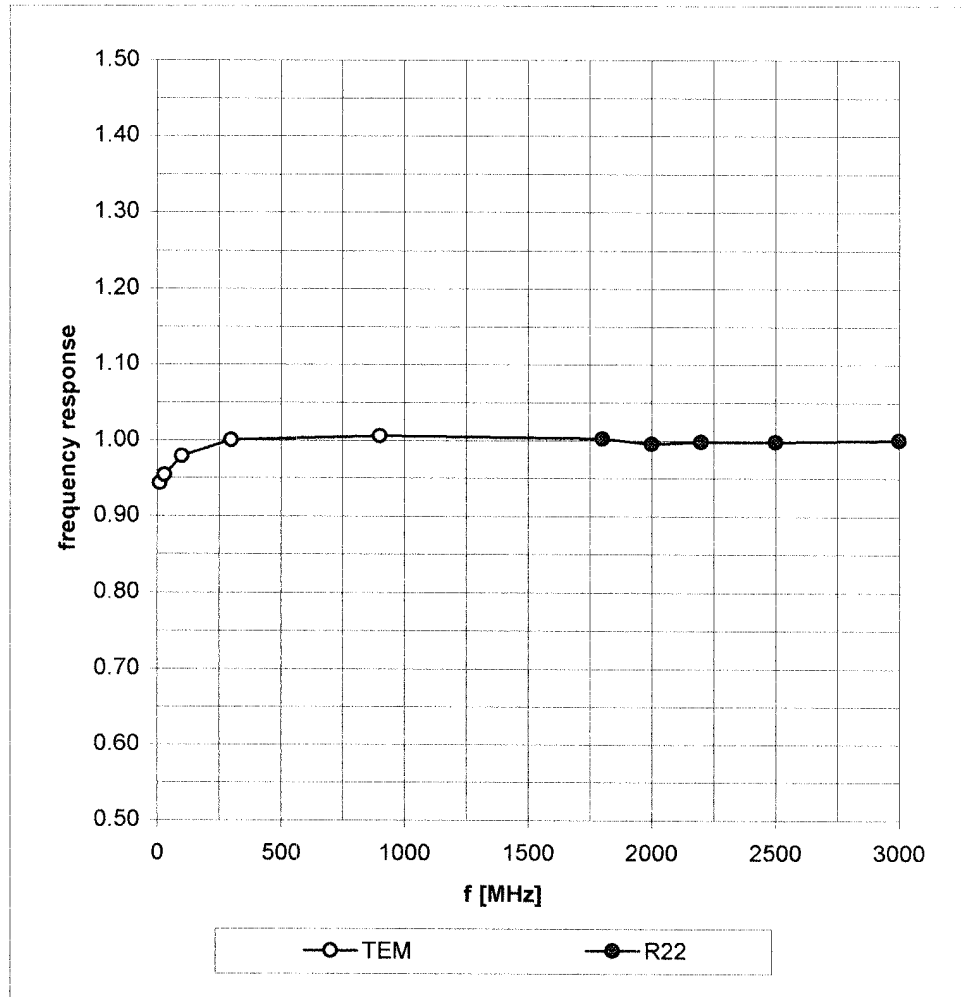


Isotropy Error (ϕ), $\theta = 0^\circ$

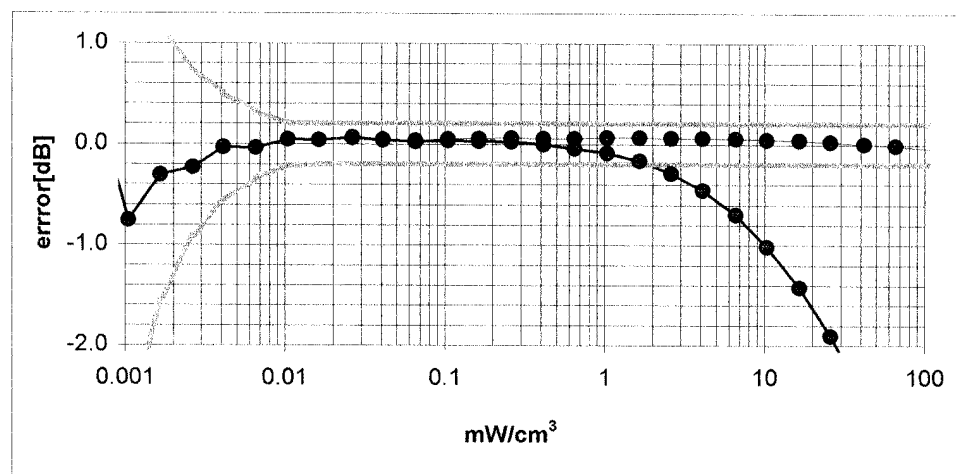
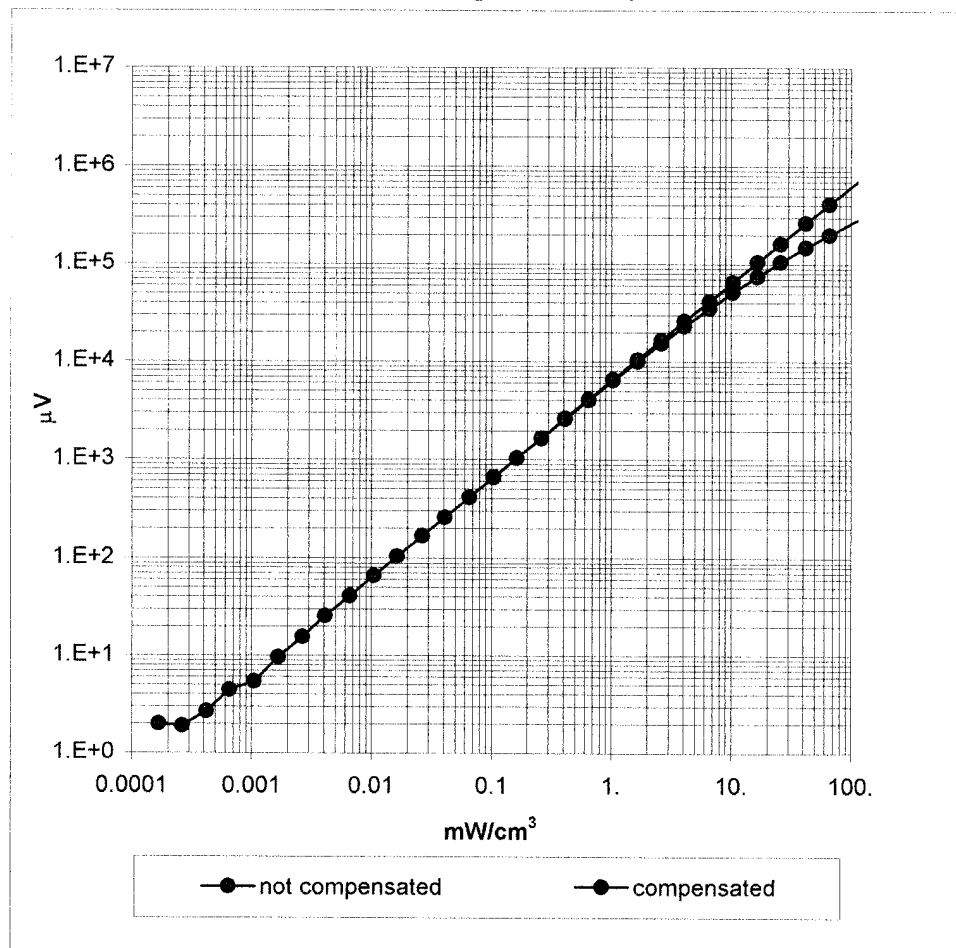


Frequency Response of E-Field

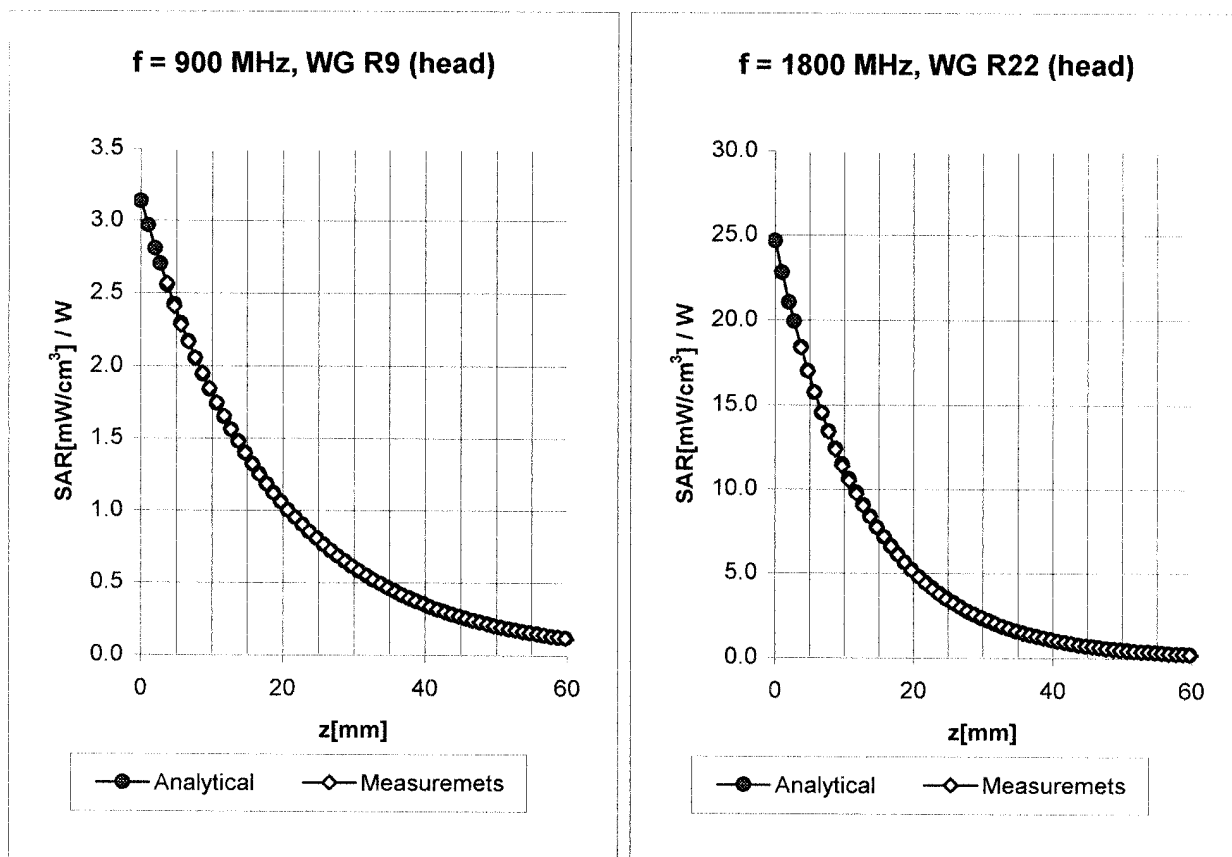
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain}) (Waveguide R22)

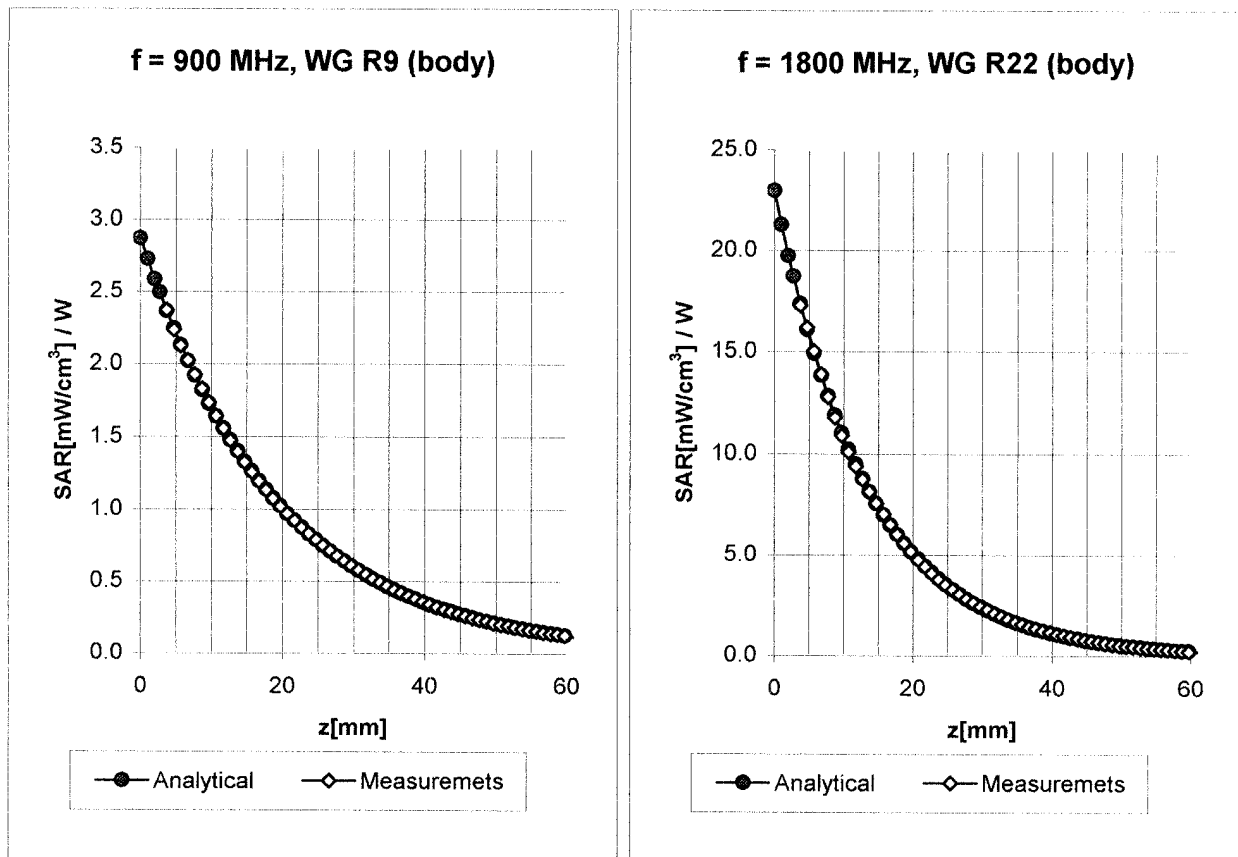


Conversion Factor Assessment



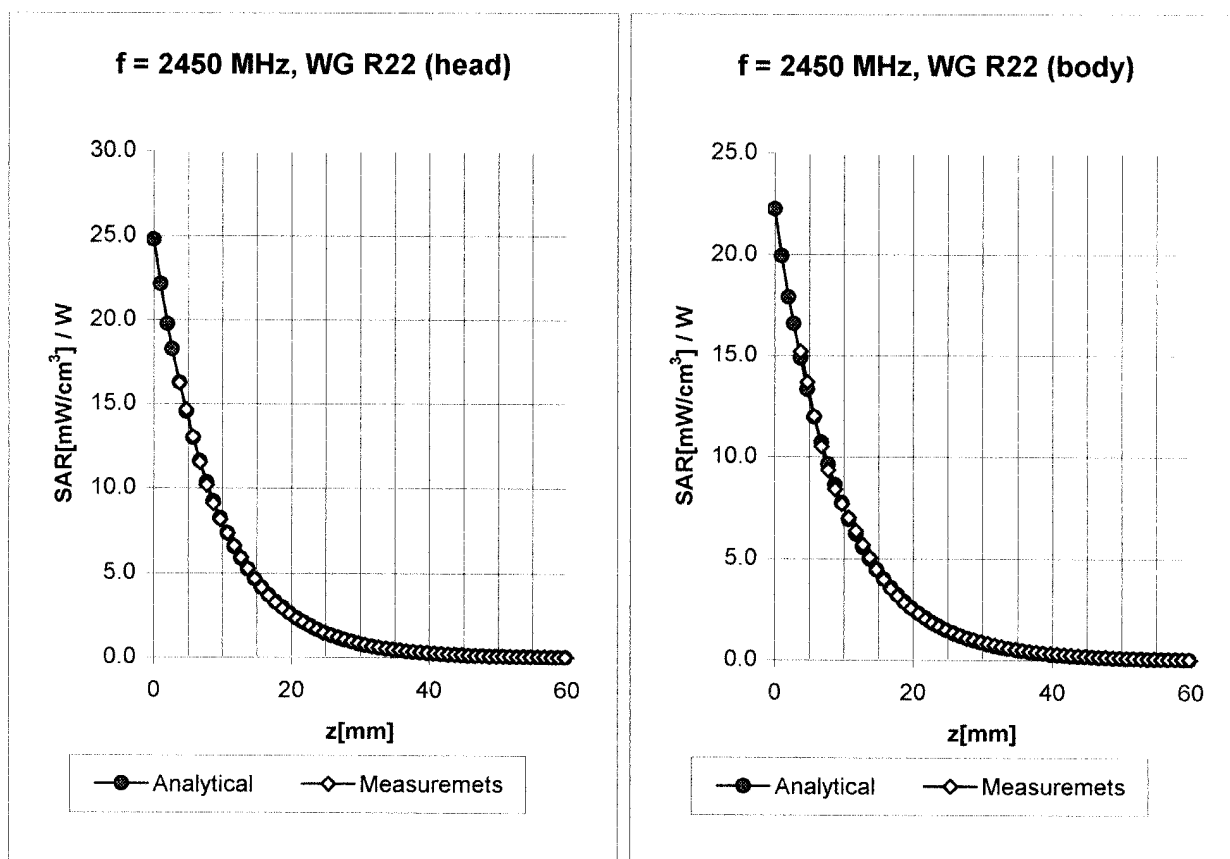
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
	ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha 0.37
	ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth 2.61
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha 0.50
	ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth 2.73

Conversion Factor Assessment



Body	900 MHz	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
Body	835 MHz	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	ConvF X	6.4 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.4 $\pm 9.5\%$ (k=2)	Alpha 0.45
	ConvF Z	6.4 $\pm 9.5\%$ (k=2)	Depth 2.35
Body	1800 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
Body	1900 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
	ConvF X	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha 0.60
	ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth 2.59

Conversion Factor Assessment



Head 2450 MHz $\epsilon_r = 39.2 \pm 5\%$ $\sigma = 1.80 \pm 5\%$ mho/m

ConvF X **5.0** $\pm 8.9\%$ (k=2)

Boundary effect:

ConvF Y **5.0** $\pm 8.9\%$ (k=2)

Alpha **1.04**

ConvF Z **5.0** $\pm 8.9\%$ (k=2)

Depth **1.85**

Body 2450 MHz $\epsilon_r = 52.7 \pm 5\%$ $\sigma = 1.95 \pm 5\%$ mho/m

ConvF X **4.6** $\pm 8.9\%$ (k=2)

Boundary effect:

ConvF Y **4.6** $\pm 8.9\%$ (k=2)

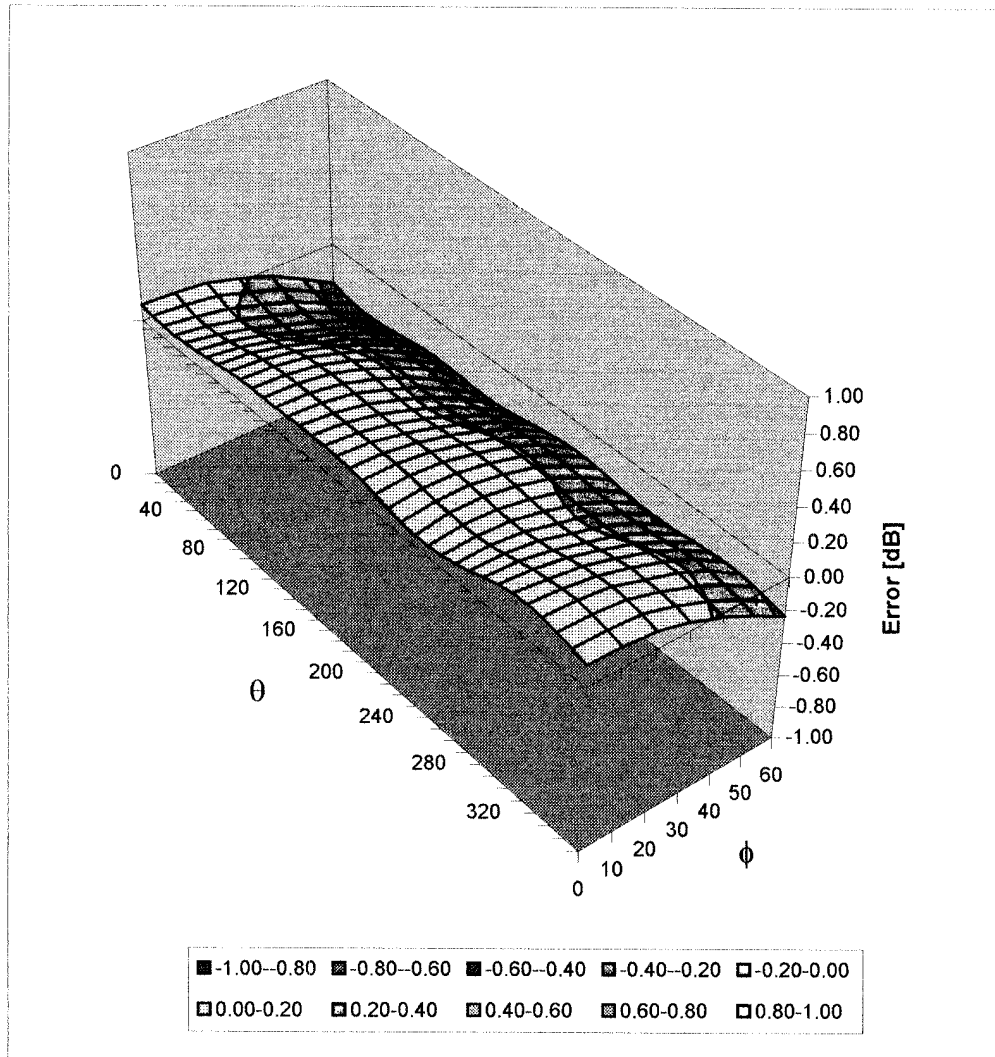
Alpha **1.20**

ConvF Z **4.6** $\pm 8.9\%$ (k=2)

Depth **1.60**

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1387

Place of Assessment:

Zurich

Date of Assessment:

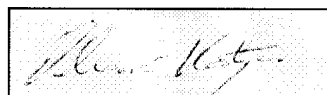
February 28, 2003

Probe Calibration Date:

February 26, 2003

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	$9.1 \pm 8\%$	$\epsilon_r = 52.3$ $\sigma = 0.76 \text{ mho/m}$ (head tissue)
300 MHz	ConvF	$7.9 \pm 8\%$	$\epsilon_r = 45.3$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
450 MHz	ConvF	$7.5 \pm 8\%$	$\epsilon_r = 43.5$ $\sigma = 0.87 \text{ mho/m}$ (head tissue)
150 MHz	ConvF	$8.8 \pm 8\%$	$\epsilon_r = 61.9$ $\sigma = 0.80 \text{ mho/m}$ (body tissue)
300 MHz	ConvF	$8.0 \pm 8\%$	$\epsilon_r = 58.2$ $\sigma = 0.92 \text{ mho/m}$ (body tissue)
450 MHz	ConvF	$7.7 \pm 8\%$	$\epsilon_r = 56.7$ $\sigma = 0.94 \text{ mho/m}$ (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

2450MHz System Performance Check & EUT Evaluation (Head)

Measured Fluid Dielectric Parameters (Brain)

July 07, 2003

Frequency	e'	e''
2.350000000 GHz	37.6499	13.4105
2.360000000 GHz	37.6153	13.4520
2.370000000 GHz	37.5811	13.4715
2.380000000 GHz	37.5406	13.5098
2.390000000 GHz	37.5261	13.5280
2.400000000 GHz	37.4791	13.5555
2.410000000 GHz	37.4187	13.5857
2.420000000 GHz	37.3671	13.6120
2.430000000 GHz	37.3106	13.6480
2.440000000 GHz	37.2701	13.6825
2.450000000 GHz	37.2045	13.7047
2.460000000 GHz	37.1658	13.7357
2.470000000 GHz	37.1270	13.7589
2.480000000 GHz	37.1047	13.7880
2.490000000 GHz	37.0744	13.8129
2.500000000 GHz	37.0401	13.8252
2.510000000 GHz	36.9833	13.8452
2.520000000 GHz	36.9422	13.8770
2.530000000 GHz	36.8950	13.9034
2.540000000 GHz	36.8458	13.9263
2.550000000 GHz	36.7851	13.9538

2450MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

July 07, 2003

Frequency	ϵ'	ϵ''
2.350000000 GHz	47.9833	14.2606
2.360000000 GHz	47.9469	14.3087
2.370000000 GHz	47.9179	14.3592
2.380000000 GHz	47.8726	14.3806
2.390000000 GHz	47.8353	14.4176
2.400000000 GHz	47.7963	14.4331
2.410000000 GHz	47.7336	14.4753
2.420000000 GHz	47.6945	14.5192
2.430000000 GHz	47.6468	14.5665
2.440000000 GHz	47.6096	14.6096
2.450000000 GHz	47.5659	14.6333
2.460000000 GHz	47.5173	14.7004
2.470000000 GHz	47.4881	14.7499
2.480000000 GHz	47.4519	14.7738
2.490000000 GHz	47.4211	14.7923
2.500000000 GHz	47.3948	14.8197
2.510000000 GHz	47.3414	14.8342
2.520000000 GHz	47.3087	14.8598
2.530000000 GHz	47.2394	14.8971
2.540000000 GHz	47.1943	14.9483
2.550000000 GHz	47.1501	14.9993

Test Report S/N:	061903-393G9H
Test Date(s):	July 07, 2003
Test Type:	FCC/IC SAR Evaluation

APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

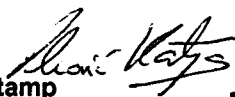
- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9
- (*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp



**Schmid & Partner
Engineering AG**



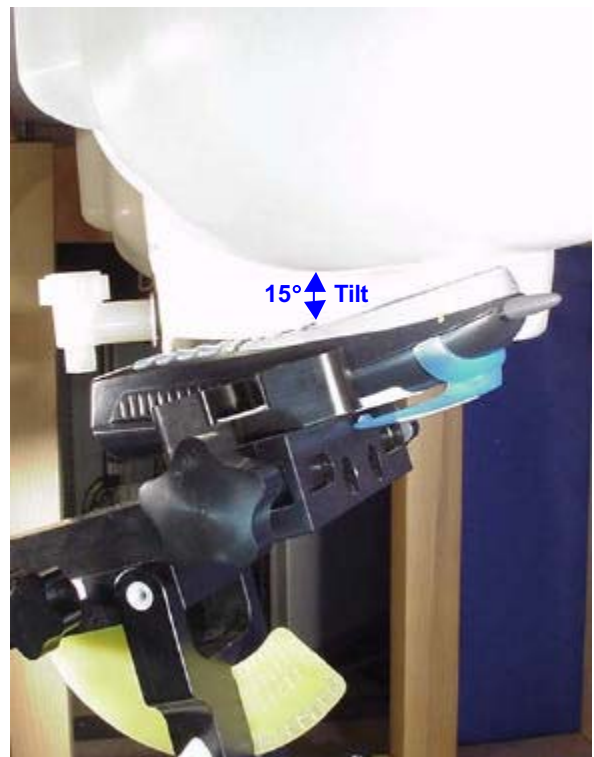
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

APPENDIX G - SAR TEST SETUP PHOTOGRAPHS

SAR TEST SETUP PHOTOGRAPHS
Left Head Section / Cheek-Touch Position



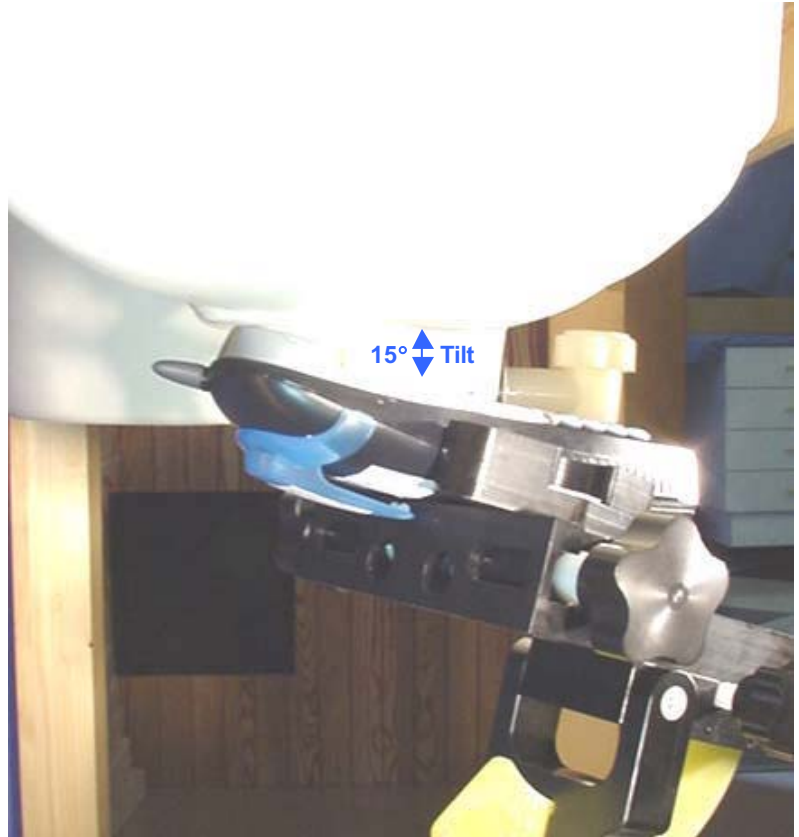
SAR TEST SETUP PHOTOGRAPHS
Left Head Section / 15° Ear-Tilt Position



SAR TEST SETUP PHOTOGRAPHS
Right Head Section / Cheek-Touch Position

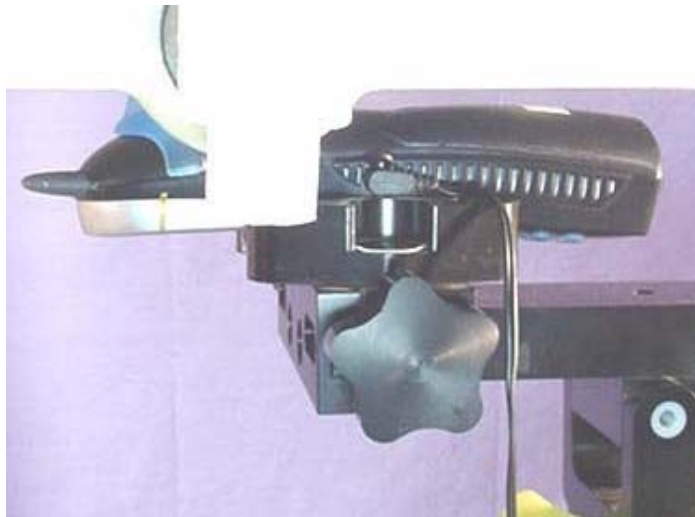


SAR TEST SETUP PHOTOGRAPHS
Right Head Section / 15° Ear-Tilt Position



SAR TEST SETUP PHOTOGRAPHS

Body-worn - 0.7 cm Belt-Clip Separation Distance from Back of EUT to Planar Phantom
with Ear-Microphone Accessory



EXTERNAL EUT PHOTOGRAPHS



Front of EUT



Back of EUT



Right Side of EUT



Left Side of EUT



Top of EUT



Bottom of EUT

EXTERNAL EUT PHOTOGRAPHS



EUT with Ear-Microphone Accessory



**Back of EUT with
Belt-Clip Accessory**



**Side of EUT with
Belt-Clip Accessory**



Belt-Clip Accessory

EXTERNAL EUT PHOTOGRAPHS



Back of EUT & Battery



3.6V 600mAh NiCd Battery Pack



3.6V 800mAh NiCd Battery Pack