DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

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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 1528-2003**
FCC Classification:	**Part 15 Spread Spectrum Transmitter (DSS)**
FCC IDENTIFER:	**G9HFH24R19**
Model(s):	**25825XXX-A**
Device Type:	**Spread Spectrum Cordless Telephone Handset**
Mode of Operation:	**Frequency Hopping Spread Spectrum (FHSS)**
Tx Frequency Range:	**2409.696 - 2473.632 MHz**
Duty Cycle Tested:	**8.7% (Crest Factor: 1:11.5)**
RF Output Power Measured:	**305 mW EIRP (2409.696 MHz)** **314 mW EIRP (2441.664 MHz)** **199 mW EIRP (2473.632 MHz)**
Source-Based Time-Average Power:	**26.5 mW EIRP (2409.696 MHz)** **27.3 mW EIRP (2441.664 MHz)** **17.3 mW EIRP (2473.632 MHz)**
Antenna Type Tested:	**Fixed**
Battery Type(s) Tested:	**NiMH 3.6V, 800mAh**
Body-Worn Accessories Tested:	**Plastic Belt-Clip, Generic Ear-Microphone**
Max. SAR Measured:	**Head: 0.082 W/kg (1g average)** **Body: 0.062 W/kg (1g average)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated 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 1528-2003 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: 25825XXX-A Spread Spectrum Cordless Telephone Handset FCC ID: G9HFH24R19 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 1528-2003 (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 Device Under Test (DUT)

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 1528-2003		
FCC Device Classification	Part 15 Spread Spectrum Transmitter (DSS)		
Device Type	Spread Spectrum Cordless Telephone Handset		
FCC IDENTIFIER	G9HFH24R19		
Model No.(s)	25825XXX-A		
Serial No.	TS030176044 (Identical Prototype)		
Tx Frequency Range	2409.696 - 2473.632 MHz		
Mode of Operation	Frequency Hopping Spread Spectrum (FHSS)		
RF Output Power Measured	2409.696 MHz	305 mW	EIRP
	2441.664 MHz	314 mW	EIRP
	2473.632 MHz	199 mW	EIRP
Source-Based Time-Averaged RF Output Power	2409.696 MHz	26.5 mW	EIRP
	2441.664 MHz	27.3 mW	EIRP
	2473.632 MHz	17.3 mW	EIRP
Source-Based Time-Averaged Duty Cycle Tested	8.7% (Crest Factor: 1:11.5)		
Battery Type(s) Tested	NiMH 3.6V, 800mAh		
Antenna Type Tested	Fixed		
Body-Worn Accessories Tested	Plastic Belt-Clip		
	Generic Ear-Microphone		

3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body 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 DASY4 measurement server. The DAE4 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 DASY4 measurement server 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. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

DASY4 Measurement System with SAM Phantom

DASY4 Measurement System with SAM Phantom

4.0 MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Freq. (MHz)	Chan.	Test Mode	Start Power EIRP (Watts) Meas.	Start Power EIRP (Watts) SBTA	SAR Drift (dB)	Battery Type	Antenna Position	Body-worn Accessory	Phantom Section	Test Position	Measured SAR 1g (W/kg)	
Head	2441.664	37	Modulated	0.314	0.0273	0.10	NiMH	Fixed	--	Left Ear	Cheek/Touch	0.082	
Head	2441.664	37	Modulated	0.314	0.0273	0.03	NiMH	Fixed	--	Left Ear	Ear/Tilt (15°)	0.056	
Head	2441.664	37	Modulated	0.314	0.0273	-0.01	NiMH	Fixed	--	Right Ear	Cheek/Touch	0.077	
Head	2441.664	37	Modulated	0.314	0.0273	0.04	NiMH	Fixed	--	Right Ear	Ear/Tilt (15°)	0.059	
Body	2441.664	37	Modulated	0.314	0.0273	0.0121	NiMH	Fixed	Belt-Clip Ear-Mic	Planar	Back of DUT with 0.5 cm Belt-Clip Separ. Dist.	P	0.062
												S	0.046

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
BRAIN / BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Dielectric Constant ε_r	**2450 MHz Brain**		**2450 MHz Body**		**Ambient Temperature**	Brain: 24.5 °C	Body: 24.7 °C
	IEEE Target	**Measured**	**IEEE Target**	**Measured**	**Fluid Temperature**	Brain: 23.9 °C	Body: 23.4 °C
	39.2 ±5%	37.3	**52.7 ±5%**	50.4	**Relative Humidity**	Brain: 37 %	Body: 30 %
Conductivity σ **(mho/m)**	**2450 MHz Brain**		**2450 MHz Body**		**Atmospheric Pressure**	Brain: 101.4 kPa	Body: 102.3 kPa
	IEEE Target	**Measured**	**IEEE Target**	**Measured**	**Fluid Depth**	≥ 15 cm	
	1.80 ±5%	1.86	**1.95 ±5%**	2.04	**ρ (Kg/m^3)**	1000	

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the SAR measurements performed at the mid channel were ≥ 3dB 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]).
3. Secondary hotspots were evaluated to report SAR levels within 3 dB of the primary (P = Primary, S = Secondary).
4. 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
5. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR 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: 25825XXX-A Spread Spectrum Cordless Telephone Handset FCC ID: G9HFH24R19 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 DUT 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 level measured at the mid channel of the band for each test configuration (left ear, right ear, cheek/touch, ear/tilt) was ≥ 3dB 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.

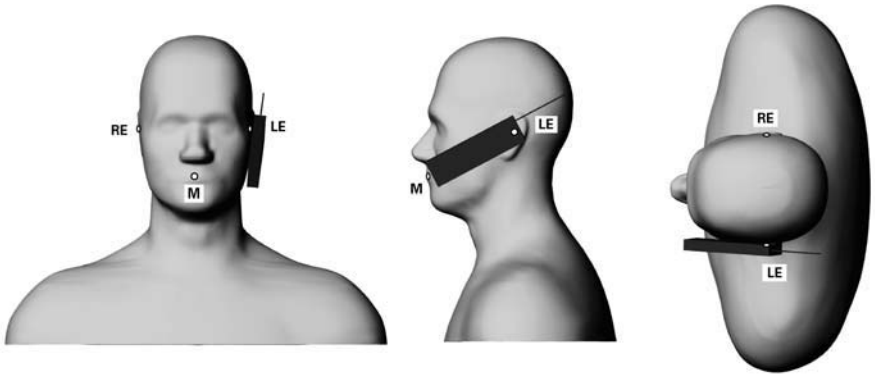


Figure 1. Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

- 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.

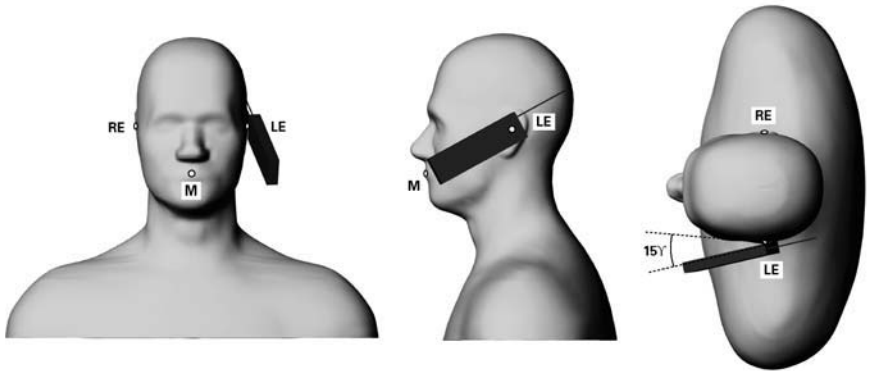


Figure 2. Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration

2) The DUT 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 plastic belt-clip accessory was touching the outer surface of the SAM phantom (planar section) and provided a 0.5 cm separation distance from the back of the handset to the SAM phantom (planar section). A generic ear-microphone accessory was connected to the DUT for the duration of the test(s).

DUT Test Mode & Power Setting

3) The DUT was placed into test mode using internal software controlled by the keypad, and tested with the frequency hopping disabled.
4) SAR measurements were performed with the DUT transmitting at maximum power in 1 time slot at a fixed frequency and random modulation with a source-based time-averaged duty cycle of 8.7% (crest factor: 1:11.5).
5) The conducted power level(s) of the DUT could not be measured for the SAR evaluation. The DUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer. The DUT was evaluated for SAR at the EIRP reference level(s) measured in accordance with ANSI TIA/EIA-603-A-2001.
6) The power drift measured by the DASY system for the duration of each test was within +/- 5% from the start power.
7) The DUT was tested with a fully charged battery for each test.

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 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 DASY4 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 15 mm x 15 mm.

An area scan was determined as follows:

c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

e. Extrapolation is used 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 form 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 trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

EVALUATION PROCEDURES (Cont.)

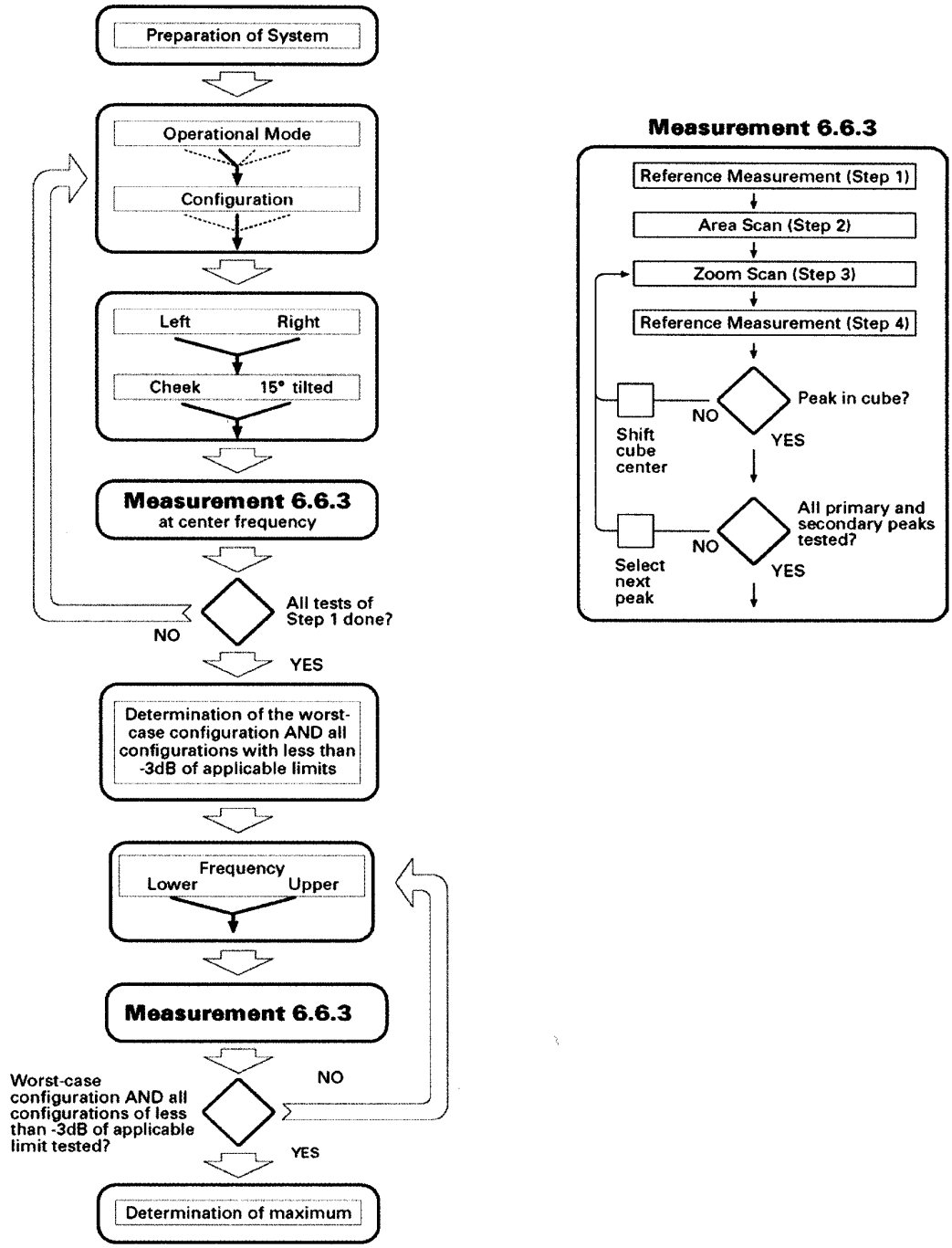


Figure 3. Flow Chart for determining the largest peak-spatial-average SAR from all devices configurations per IEEE Standard 1528-2003 (see reference [5]).

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). The fluid dielectric parameters were measured prior to the system performance check 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 ±10% (see Appendix B for system performance check test plot).

SYSTEM PERFORMANCE CHECK

Test Date	2450MHz Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
03/03/04	Brain	13.1 ±10%	12.9 (-1.5%)	39.2 ±5%	37.3	1.80 ±5%	1.86	1000	24.5	23.9	≥ 15	37	101.4

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.

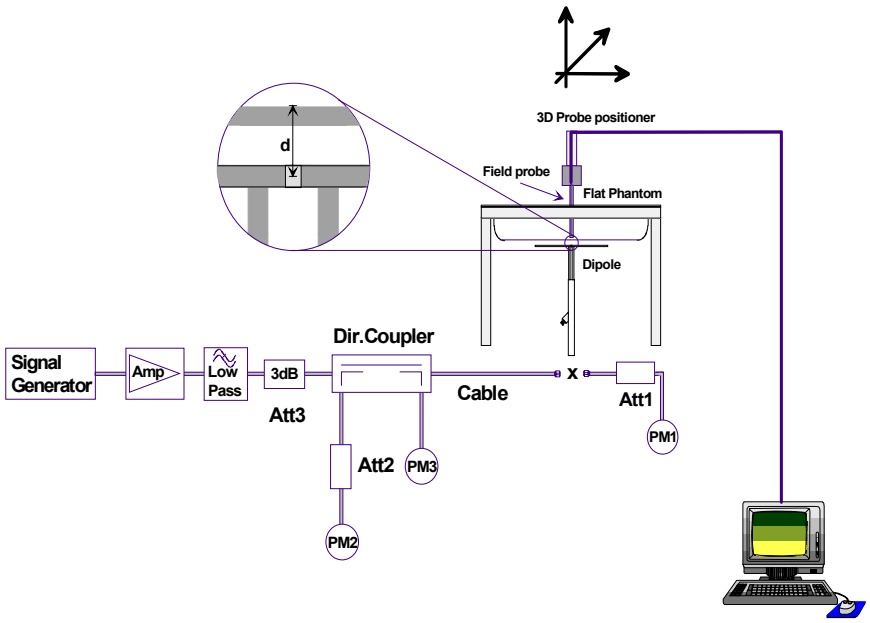


Figure 4. System Performance Check Setup Diagram

2450MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

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

SIMULATED TISSUE MIXTURES		
INGREDIENT	**2450MHz Brain (System Check & DUT Evaluation)**	**2450MHz Body (DUT Evaluation)**
Water	52.00 %	69.98 %
Glycol Monobutyl	48.00 %	30.00 %
Salt	-	0.02 %

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: AMD Athlon XP 2400+
Clock Speed: 2.0 GHz
Operating System: Windows XP Professional

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY4 software
Connecting Lines: Optical downlink for data and status info.
Optical uplink for commands and clock

DASY4 Measurement Server

Function: Real-time data evaluation for field measurements and surface detection
Hardware: PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections: COM1, COM2, DAE, Robot, Ethernet, Service Interface

E-Field Probe

Model: ET3DV6
Serial No.: 1590
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Validation & Evaluation Phantom

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

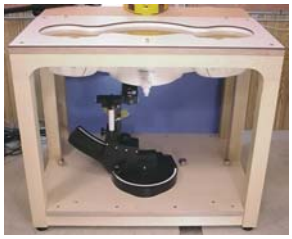
11.0 PROBE SPECIFICATION (ET3DV6)

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 ± 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 μW/g to >100 mW/g; Linearity: ±0.2 dB
Surface Detection:	±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 DASY4 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 DASY4 System	-	-
DASY4 Measurement Server	1078	N/A
-Robot	599396-01	N/A
-ET3DV6 E-Field Probe	1590	May 2003
-300MHz Validation Dipole	135	Oct 2003
-450MHz Validation Dipole	136	Nov 2003
-900MHz Validation Dipole	054	June 2003
-1800MHz Validation Dipole	247	June 2003
-2450MHz Validation Dipole	150	Sept 2003
-SAM Phantom V4.0C	1033	N/A
-Barski Planar Phantom	03-01	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	April 2003
Power Sensor 80701A	1834350	April 2003
HP E4408B Spectrum Analyzer	US39240170	Dec 2003
HP 8594E Spectrum Analyzer	3543A02721	April 2003
HP 8753E Network Analyzer	US38433013	May 2003
HP 8648D Signal Generator	3847A00611	May 2003
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

15.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration	± 4.5	Normal	1	1	± 4.5	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
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	± 1.4	Rectangular	√3	1	± 0.8	∞
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	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 10.0	Rectangular	√3	0.6	± 3.5	∞
Liquid permittivity (measured)	± 10.0	Rectangular	√3	0.6	± 3.5	∞
Combined Standard Uncertainty					**± 13.2**	
Expanded Uncertainty (k=2)					**± 26.4**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration	± 4.5	Normal	1	1	± 4.5	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
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	± 1.4	Rectangular	√3	1	± 0.8	∞
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	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input Power	± 4.7	Rectangular	√3	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 10.0	Rectangular	√3	0.6	± 3.5	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 9.8**	
Expanded Uncertainty (k=2)					**± 19.6**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (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 Std 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”.

APPENDIX A - SAR MEASUREMENT DATA

Head SAR - Left Ear Cheek/Touch Position

Dated Tested: 03/03/04

DUT: Atlinks Model: 25825-XXX-A; Type: Spread Spectrum Cordless Telephone Handset; Serial: TS030176044

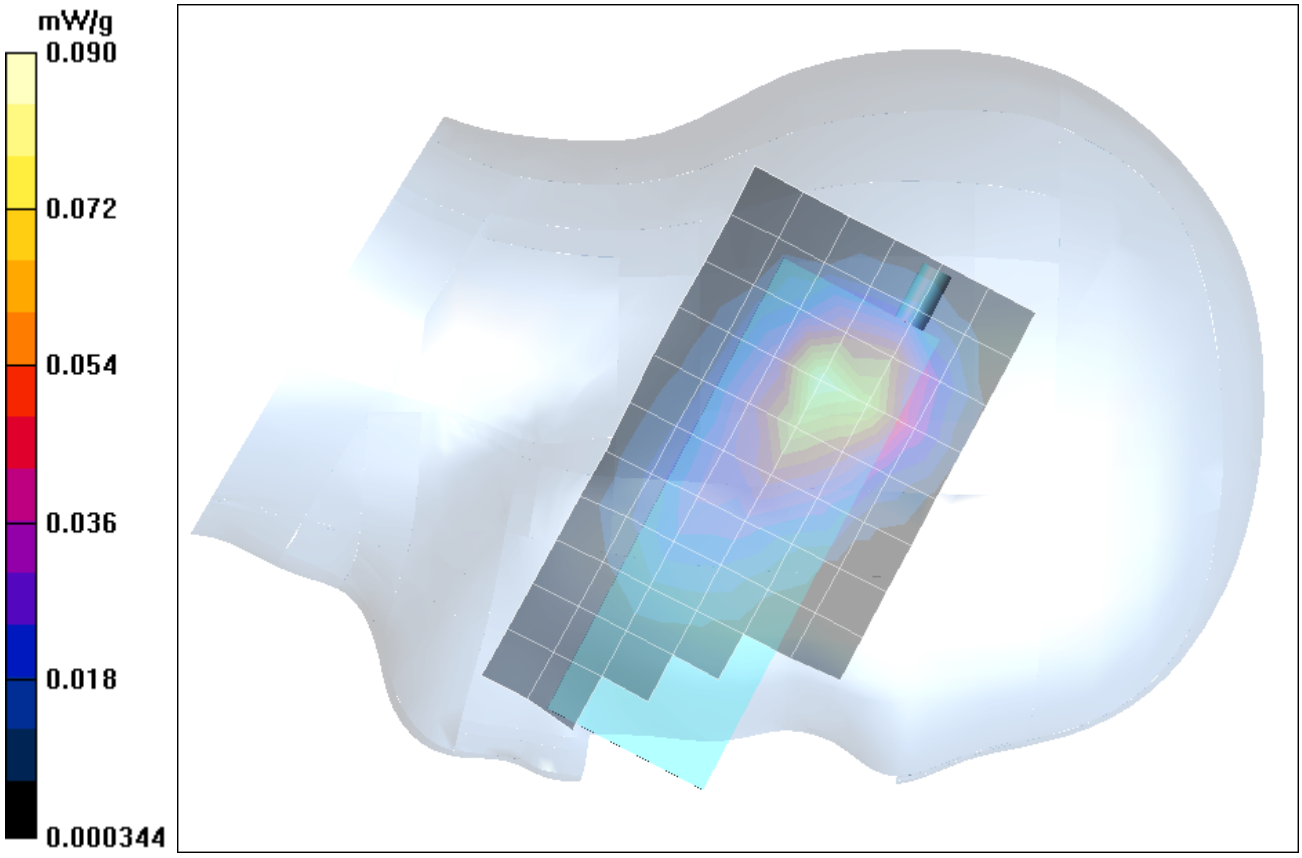
Ambient Temp: 24.5 °C; Fluid Temp: 23.9 °C; Barometric Pressure: 101.4 kPa; Humidity: 37%

NiMH 3.6V 800mAh Battery Pack
RF Output Power: 0.314 Watts (EIRP)
Communication System: Modulated Fixed Frequency
Frequency: 2441.664 MHz; Channel 37; Duty Cycle: 1:11.5
Medium: HSL2450 (σ = 1.86 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3)

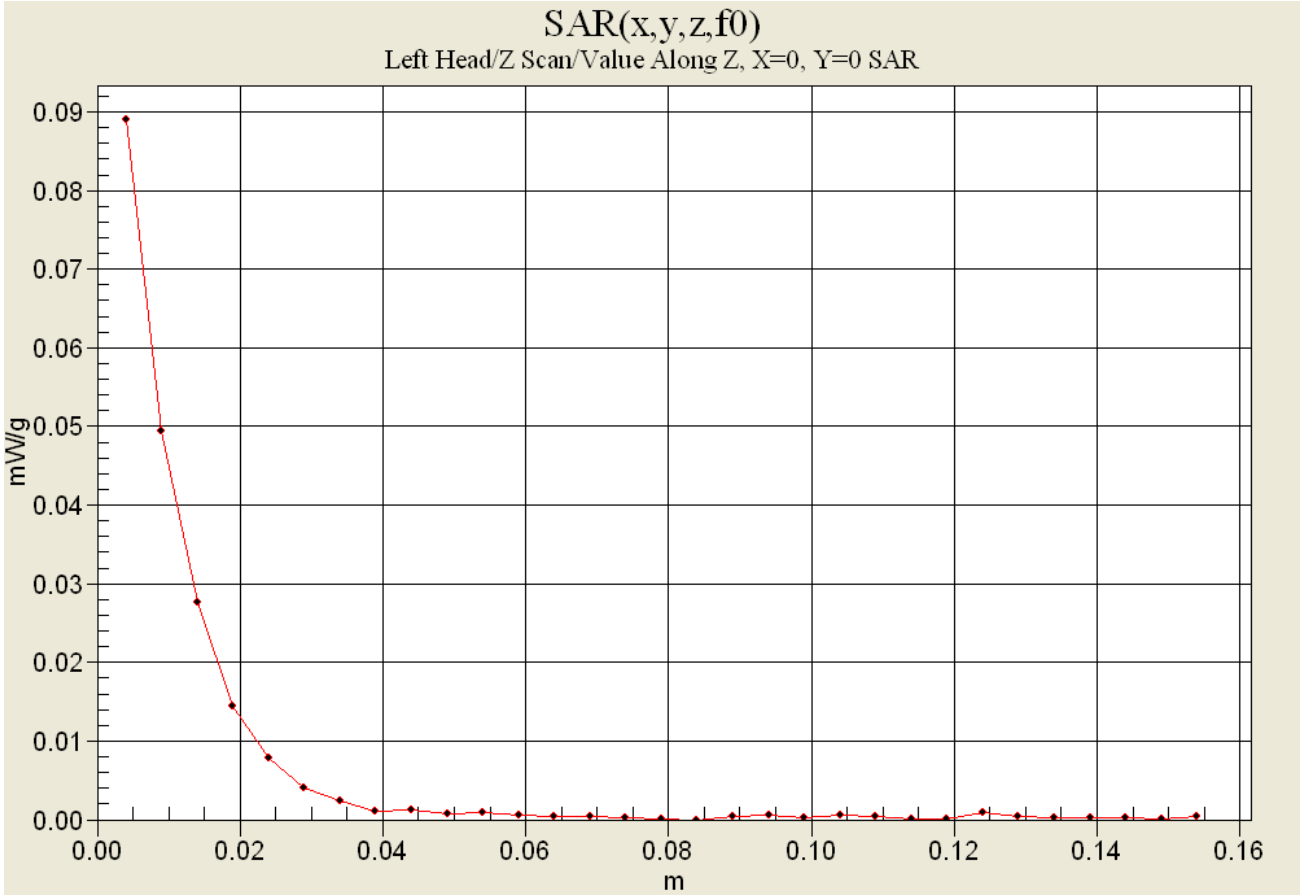
- Probe: ET3DV6 - SN1590; ConvF(5, 5, 5); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Head SAR - Left Ear Cheek/Touch Position - Mid Channel/Area Scan (12x7x1):
Measurement grid: dx=15mm, dy=15mm

Head SAR - Left Ear Cheek/Touch Position - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.155 W/kg
SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.044 mW/g
Reference Value = 6.73 V/m
Power Drift = 0.10 dB



Z-Axis Scan


SAR(x,y,z,f0)
Left Head/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Head SAR - Left Ear Tilt Position (15°)

Dated Tested: 03/03/04

DUT: Atlinks Model: 25825-XXX-A; Type: Spread Spectrum Cordless Telephone Handset; Serial: TS030176044

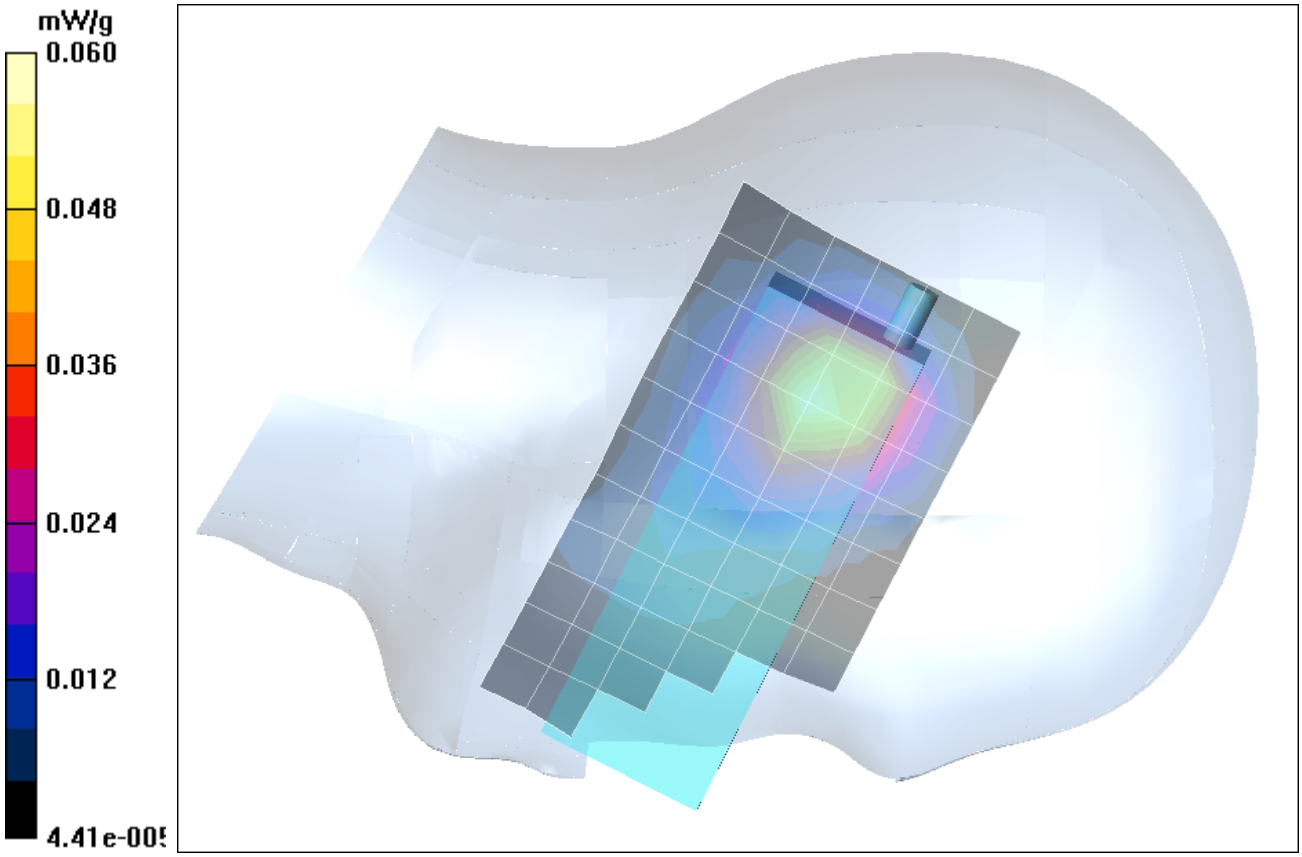
Ambient Temp: 24.5 °C; Fluid Temp: 23.9 °C; Barometric Pressure: 101.4 kPa; Humidity: 37%

NiMH 3.6V 800mAh Battery Pack
RF Output Power: 0.314 Watts (EIRP)
Communication System: Modulated Fixed Frequency
Frequency: 2441.664 MHz; Channel 37; Duty Cycle: 1:11.5
Medium: HSL2450 (σ = 1.86 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(5, 5, 5); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Head SAR - Left Ear Tilt Position (15°) - Mid Channel/Area Scan (12x7x1):
Measurement grid: dx=15mm, dy=15mm

Head SAR - Left Ear Tilt Position (15°) - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.108 W/kg
SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.031 mW/g
Reference Value = 5.94 V/m
Power Drift = 0.03 dB



Head SAR - Right Ear Cheek/Touch Position

Dated Tested: 03/03/04

DUT: Atlinks Model: 25825-XXX-A; Type: Spread Spectrum Cordless Telephone Handset; Serial: TS030176044

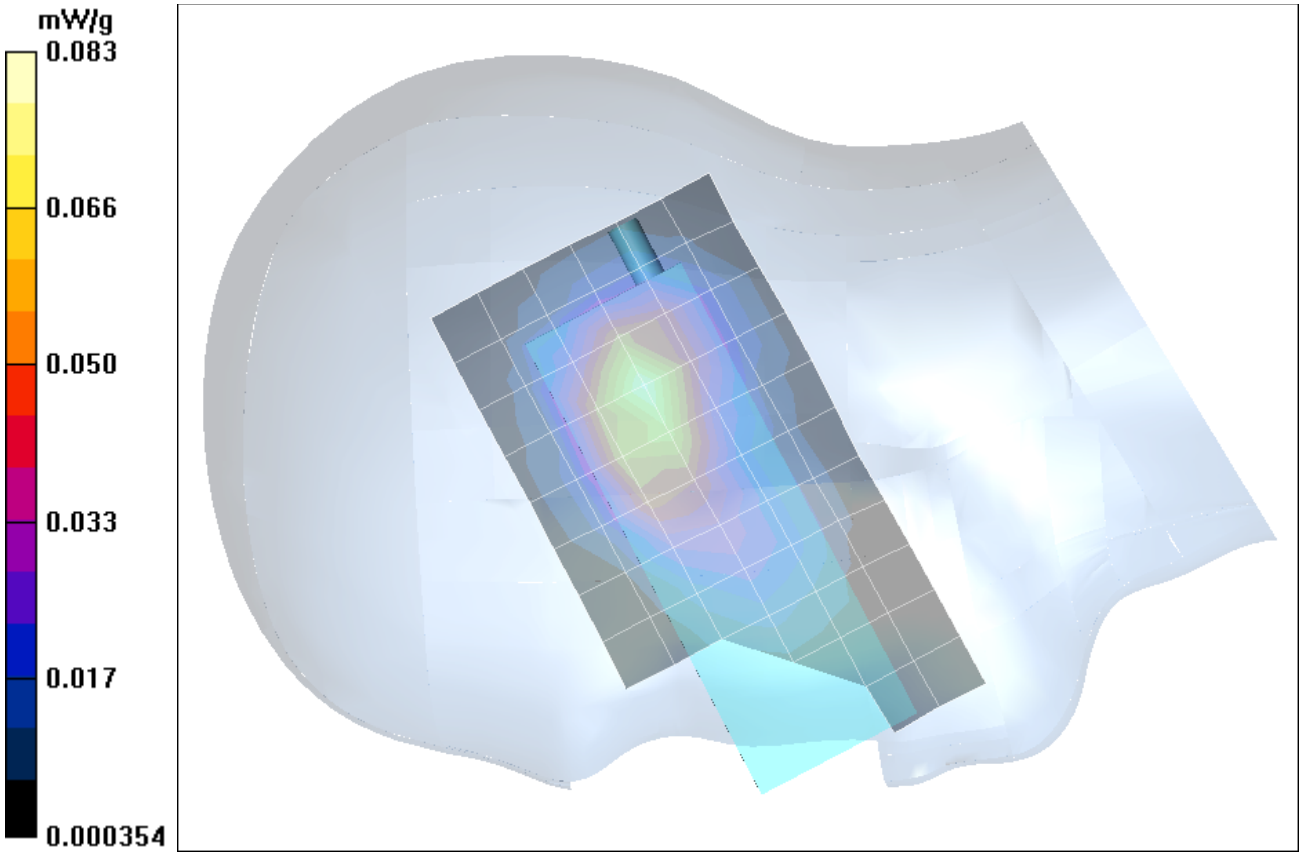
Ambient Temp: 24.5 °C; Fluid Temp: 23.9 °C; Barometric Pressure: 101.4 kPa; Humidity: 37%

NiMH 3.6V 800mAh Battery Pack
RF Output Power: 0.314 Watts (EIRP)
Communication System: Modulated Fixed Frequency
Frequency: 2441.664 MHz; Channel 37; Duty Cycle: 1:11.5
Medium: HSL2450 (σ = 1.86 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(5, 5, 5); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Head SAR - Right Ear Cheek/Touch Position - Mid Channel/Area Scan (12x7x1):
Measurement grid: dx=15mm, dy=15mm

Head SAR - Right Ear Cheek/Touch Position - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.141 W/kg
SAR(1 g) = 0.077 mW/g; SAR(10 g) = 0.042 mW/g
Reference Value = 6.85 V/m
Power Drift = -0.01 dB



Head SAR - Right Ear Tilt Position (15°)

Dated Tested: 03/03/04

DUT: Atlinks Model: 25825-XXX-A; Type: Spread Spectrum Cordless Telephone Handset; Serial: TS030176044

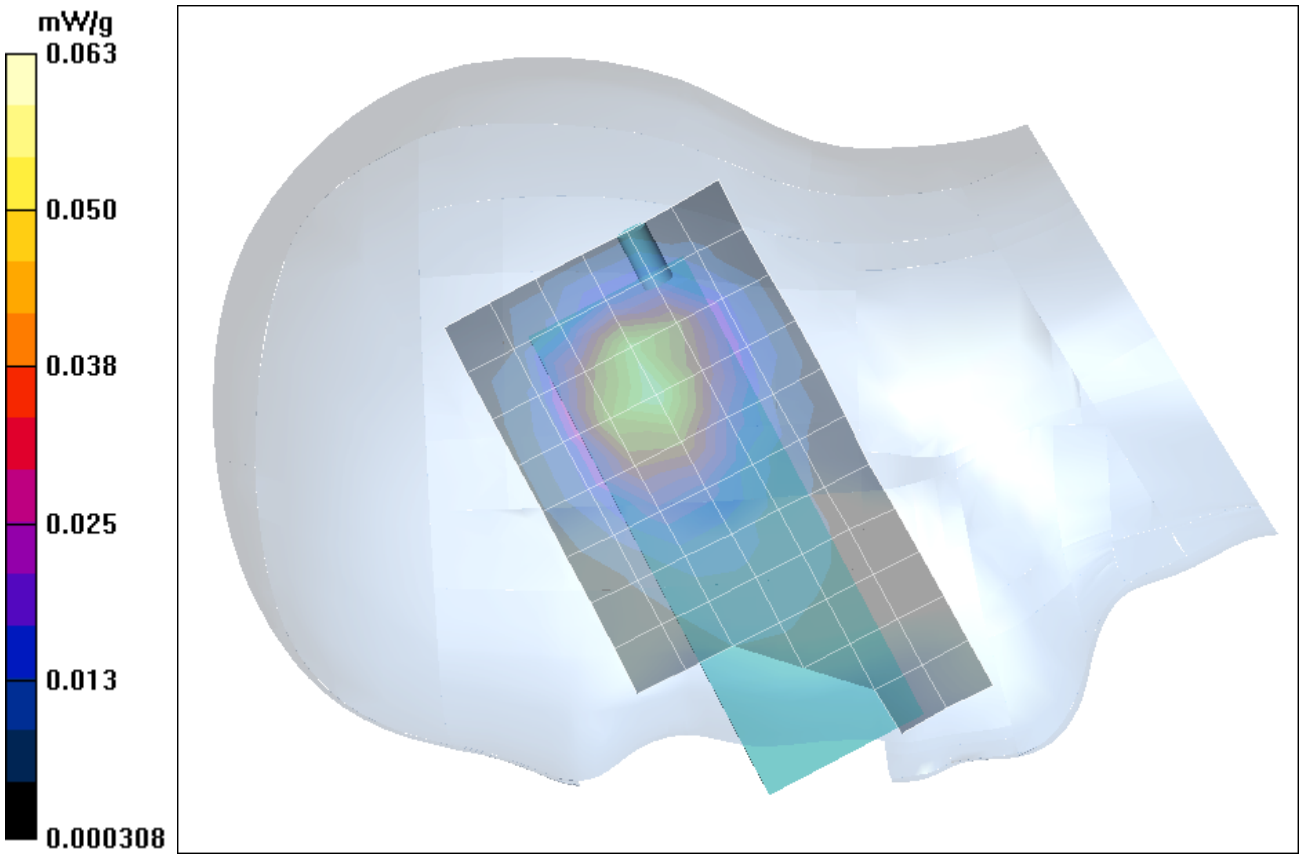
Ambient Temp: 24.5 °C; Fluid Temp: 23.9 °C; Barometric Pressure: 101.4 kPa; Humidity: 37%

NiMH 3.6V 800mAh Battery Pack
RF Output Power: 0.314 Watts (EIRP)
Communication System: Modulated Fixed Frequency
Frequency: 2441.664 MHz; Channel 37; Duty Cycle: 1:11.5
Medium: HSL2450 (σ = 1.86 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(5, 5, 5); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Head SAR - Right Ear Tilt Position (15°) - Mid Channel/Area Scan (12x7x1):
Measurement grid: dx=15mm, dy=15mm

Head SAR - Right Ear Tilt Position (15°) - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.107 W/kg
SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.033 mW/g
Reference Value = 6.18 V/m
Power Drift = 0.04 dB



Body-Worn SAR - Back of DUT with 0.5 cm Plastic Belt-Clip & Generic Ear-Microphone

Dated Tested: 03/03/04

DUT: Atlinks Model: 25825-XXX-A; Type: Spread Spectrum Cordless Telephone Handset; Serial: TS030176044

Ambient Temp: 24.7 °C; Fluid Temp: 23.4 °C; Barometric Pressure: 102.3 kPa; Humidity: 30%

Body-Worn Accessories: Plastic Belt-Clip, Generic Ear-Microphone

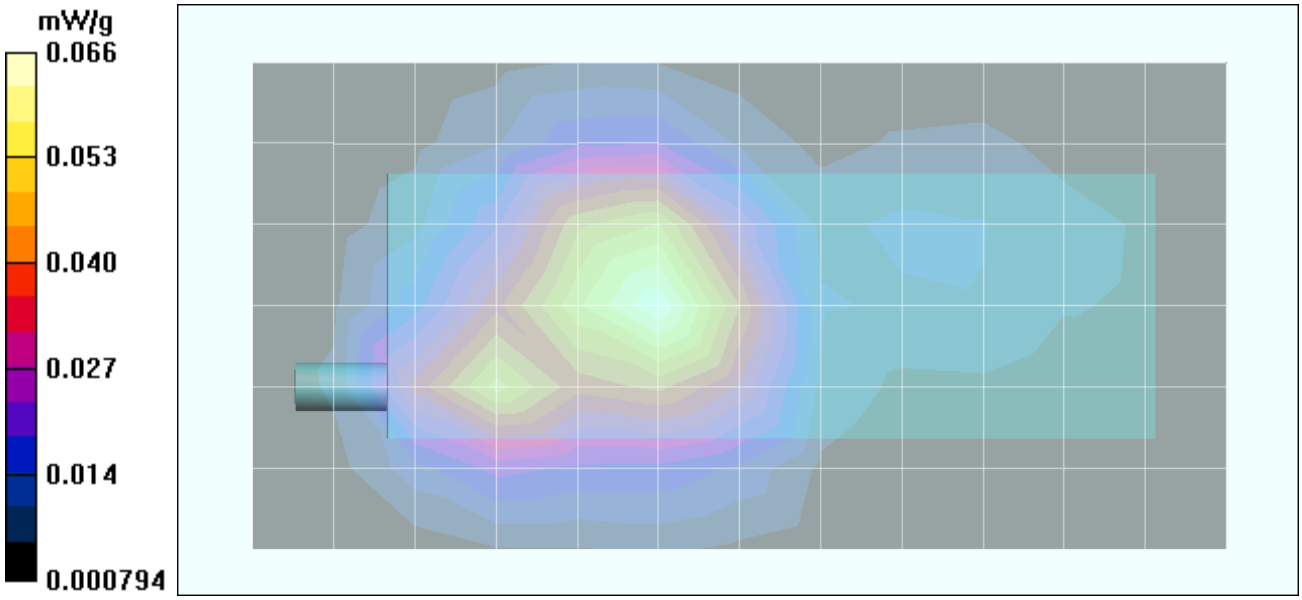
NiMH 3.6V 800mAh Battery Pack
RF Output Power: 0.314 Watts (EIRP)
Communication System: Modulated Fixed Frequency
Frequency: 2441.664 MHz; Channel 37; Duty Cycle: 1:11.5
Medium: M2450 (σ = 2.04 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(4.4, 4.4, 4.4); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

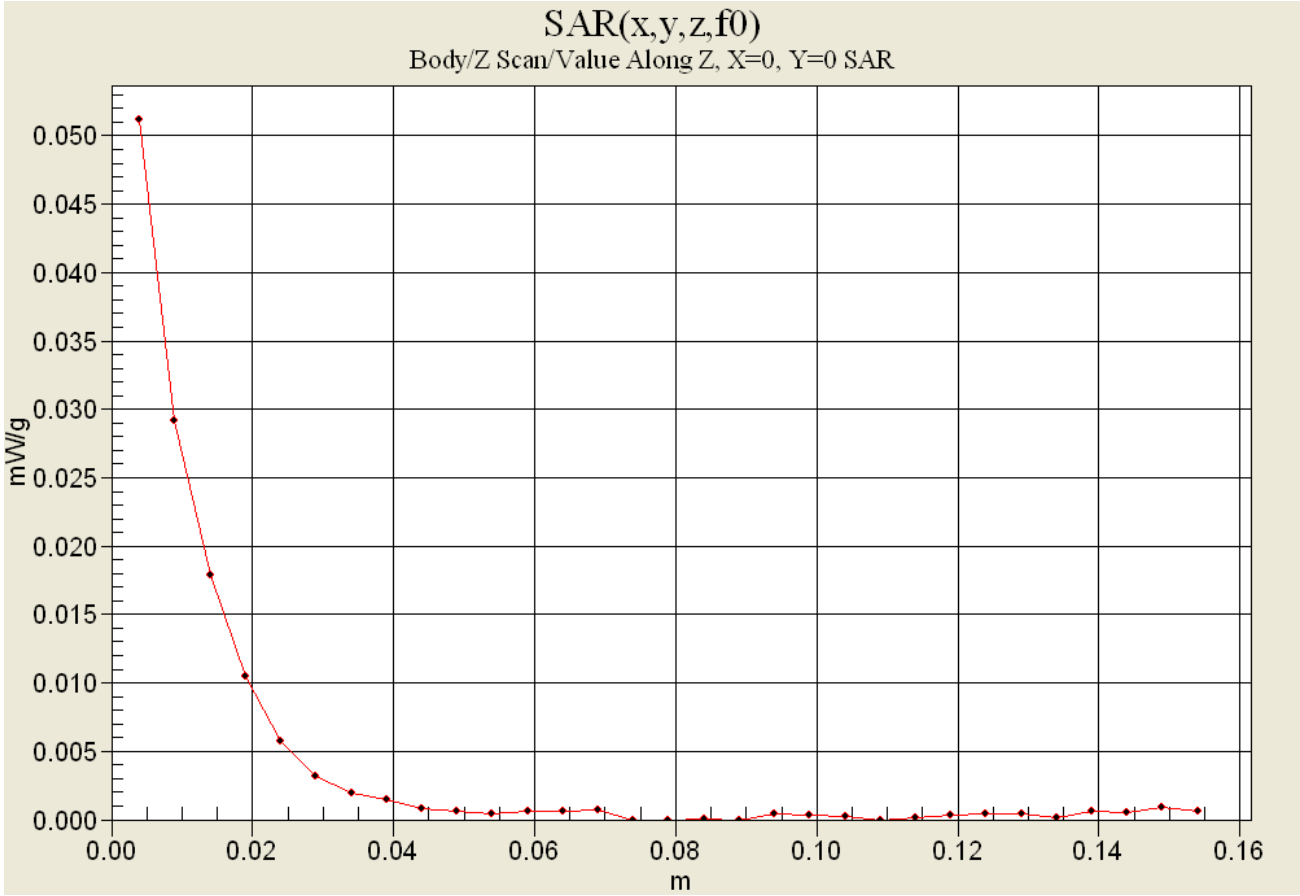
Body-Worn - 0.5 cm Belt-Clip Separation Distance - Mid Channel/Area Scan (7x13x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.5 cm Belt-Clip Separation Distance - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.118 W/kg
SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.035 mW/g
Reference Value = 5.35 V/m
Power Drift = 0.0121 dB

Body-Worn - 0.5 cm Belt-Clip Separation Distance - Mid Channel/Zoom Scan (7x7x7)/Cube 1:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.103 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.024 mW/g
Reference Value = 5.35 V/m
Power Drift = 0.0121 dB



Z-Axis Scan


SAR(x,y,z,f0)
Body/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

System Performance Check - 2450 MHz Dipole

Date Tested: 03/03/04

DUT: Dipole 2450 MHz; Model: D2450V2; Type: System Performance Check; Serial: 150

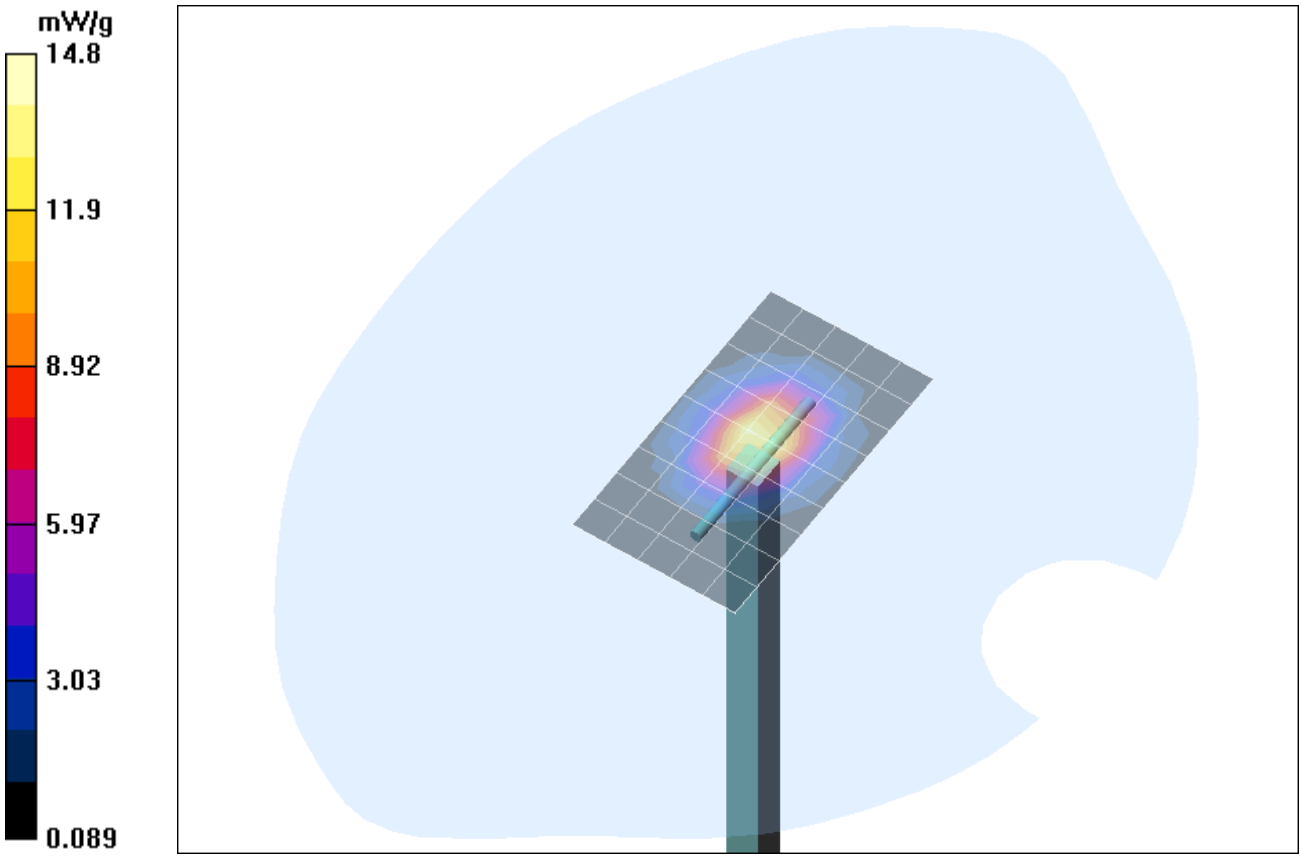
Ambient Temp: 24.5 °C; Fluid Temp: 23.9 °C; Barometric Pressure: 101.4 kPa; Humidity: 37%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450 (σ = 1.86 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3)

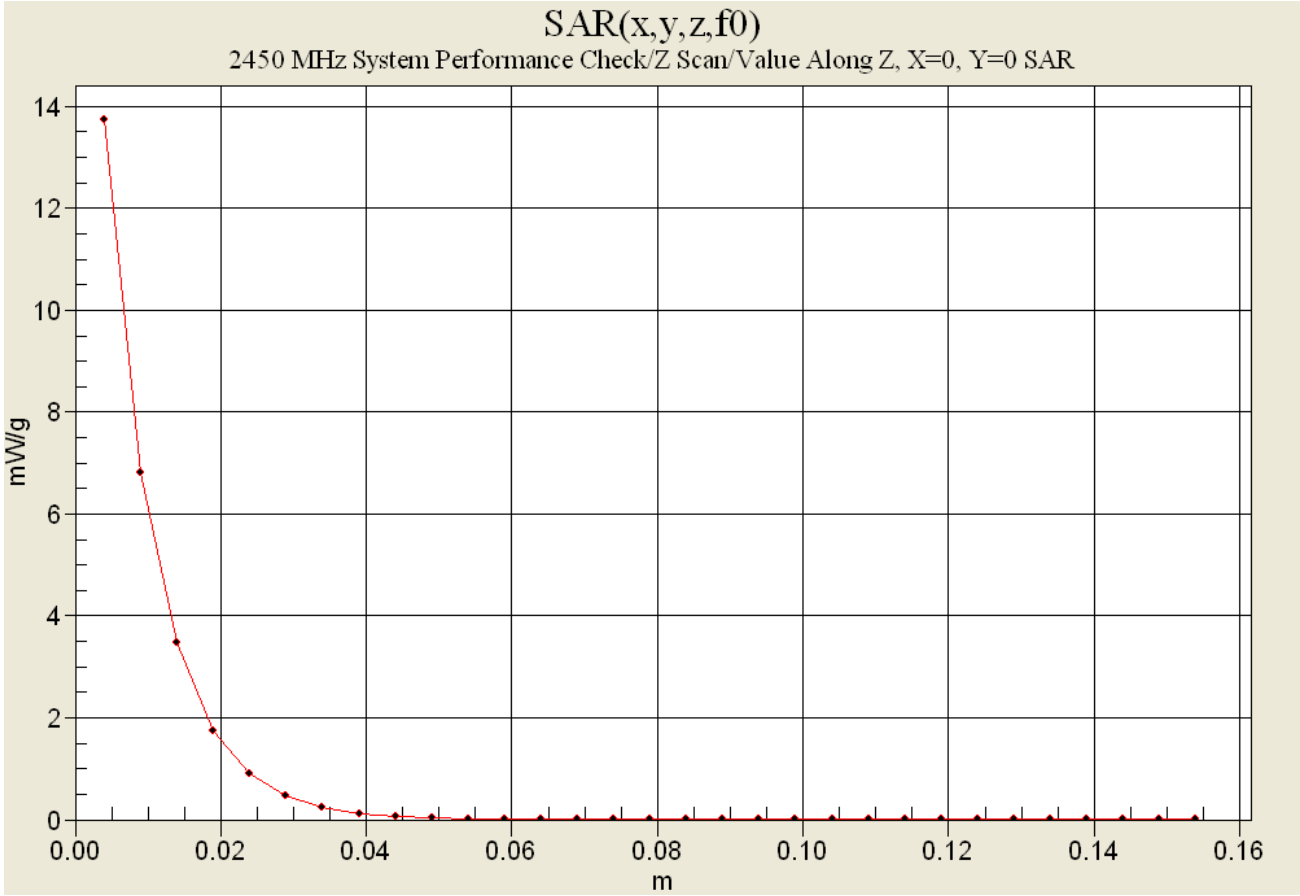
- Probe: ET3DV6 - SN1590; ConvF(5, 5, 5); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

2450 MHz System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

2450 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6.03 mW/g
Reference Value = 92 V/m
Power Drift = -0.1 dB



Z-Axis Scan


SAR(x,y,z,f0)
2450 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
14
12
10
8
6
4
2
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

APPENDIX C - SYSTEM VALIDATION

2450MHz SYSTEM VALIDATION DIPOLE

Type:	**2450MHz Validation Dipole**
Serial Number:	**150**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**September 17, 2003**

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

Calibrated by: Spencer Watson

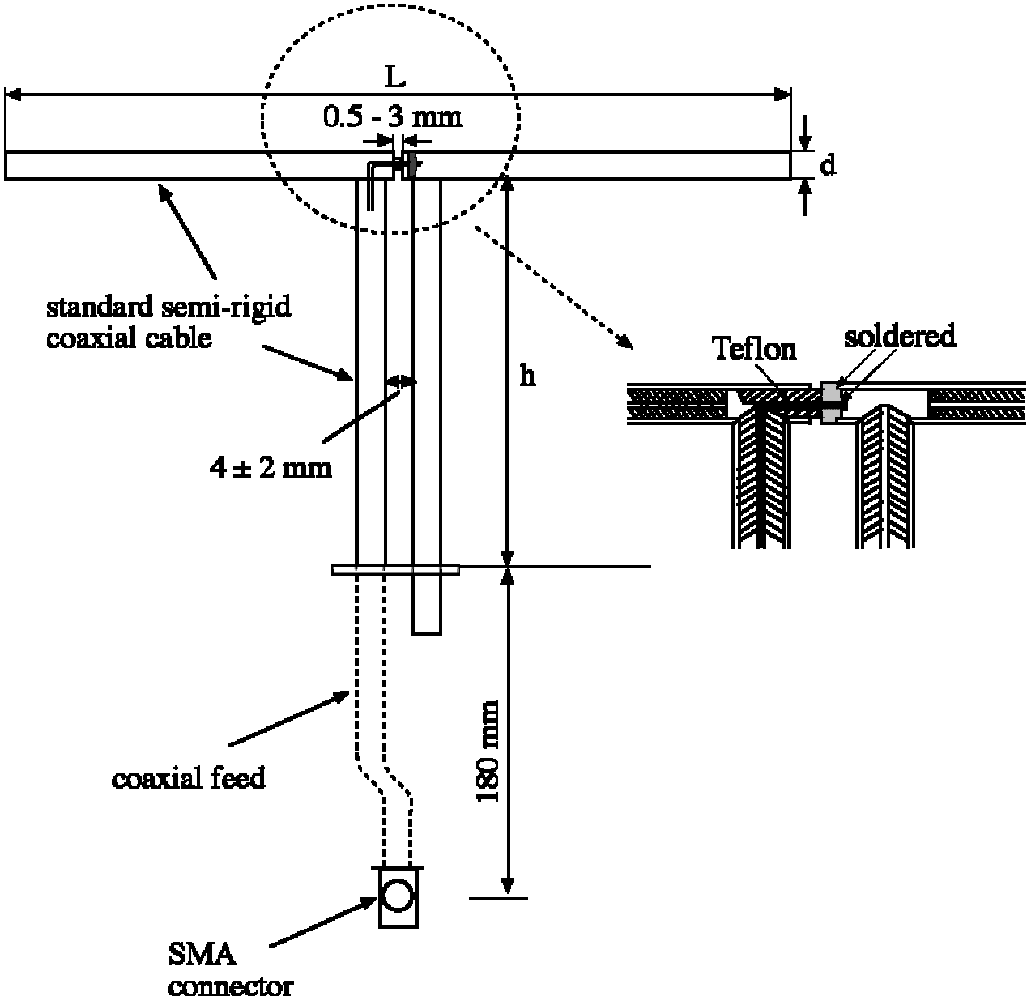
Approved by: Russell W. Pipe

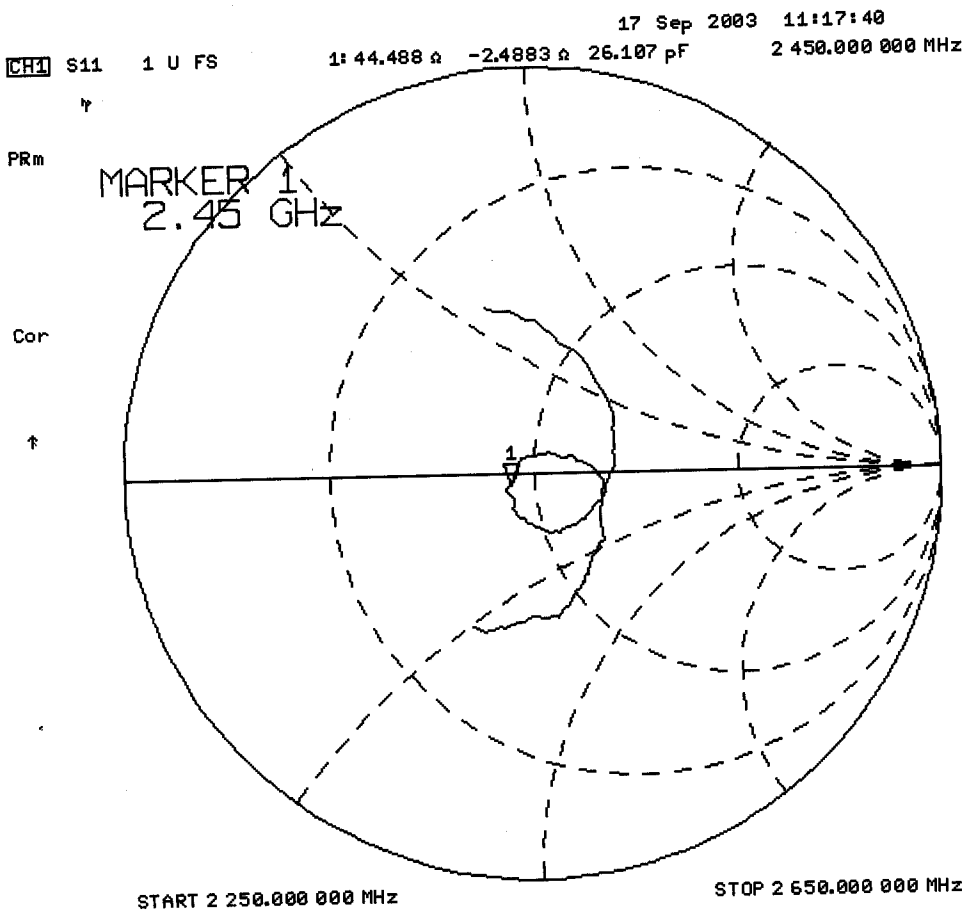
Celltech Labs Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

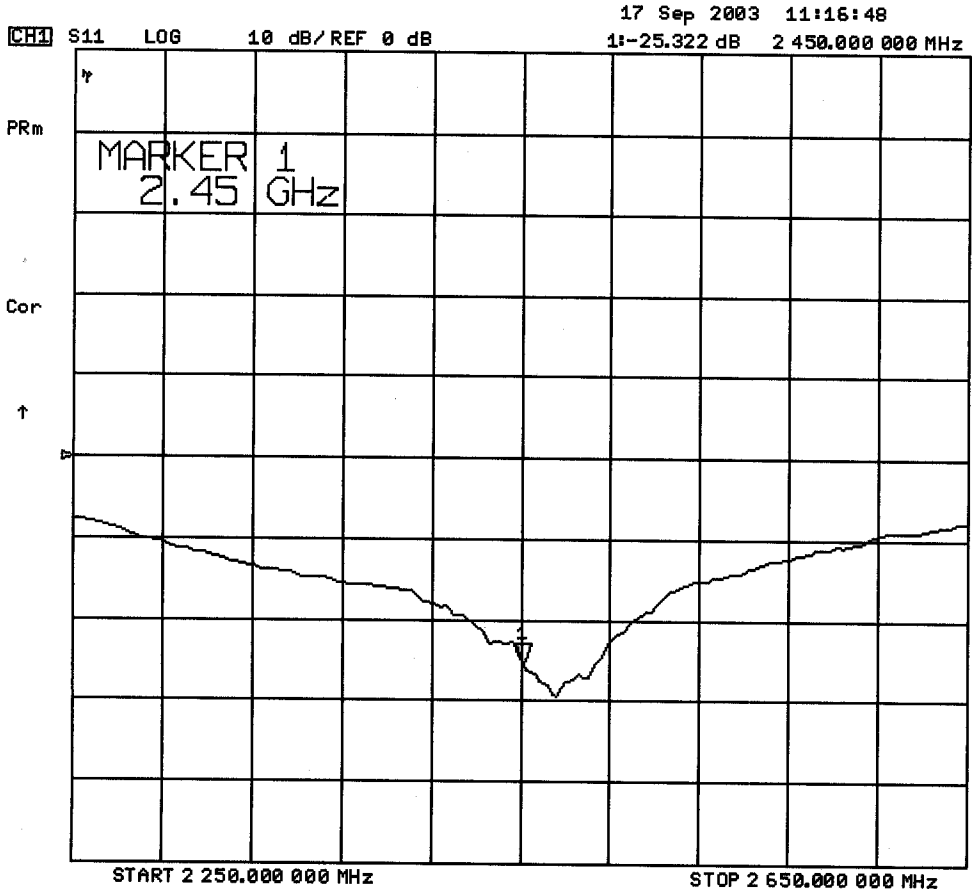
1. Dipole Construction & Electrical Characteristics

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	Re{Z} = 44.488Ω
	Im{Z} = -2.4883Ω
Return Loss at 2450MHz	-25.322 dB




17 Sep 2003 11:17:40
CH1 S11 1 U FS
1: 44.488 Ω -2.4883 Ω 26.107 pF
2 450.000 000 MHz
PRm
MARKER 1
2.45 GHz
Cor
1
START 2 250.000 000 MHz
STOP 2 650.000 000 MHz


17 Sep 2003 11:16:48
CH1 S11 LOG 10 dB/ REF 0 dB
1:-25.322 dB 2 450.000 000 MHz
PRm
MARKER 1
2.45 GHz
Cor
START 2 250.000 000 MHz
STOP 2 650.000 000 MHz

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)

2450MHz Dipole Calibration

2003 Celltech Labs Inc.

2450MHz Dipole Calibration

2003 Celltech Labs Inc.

3. Measurement Conditions

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

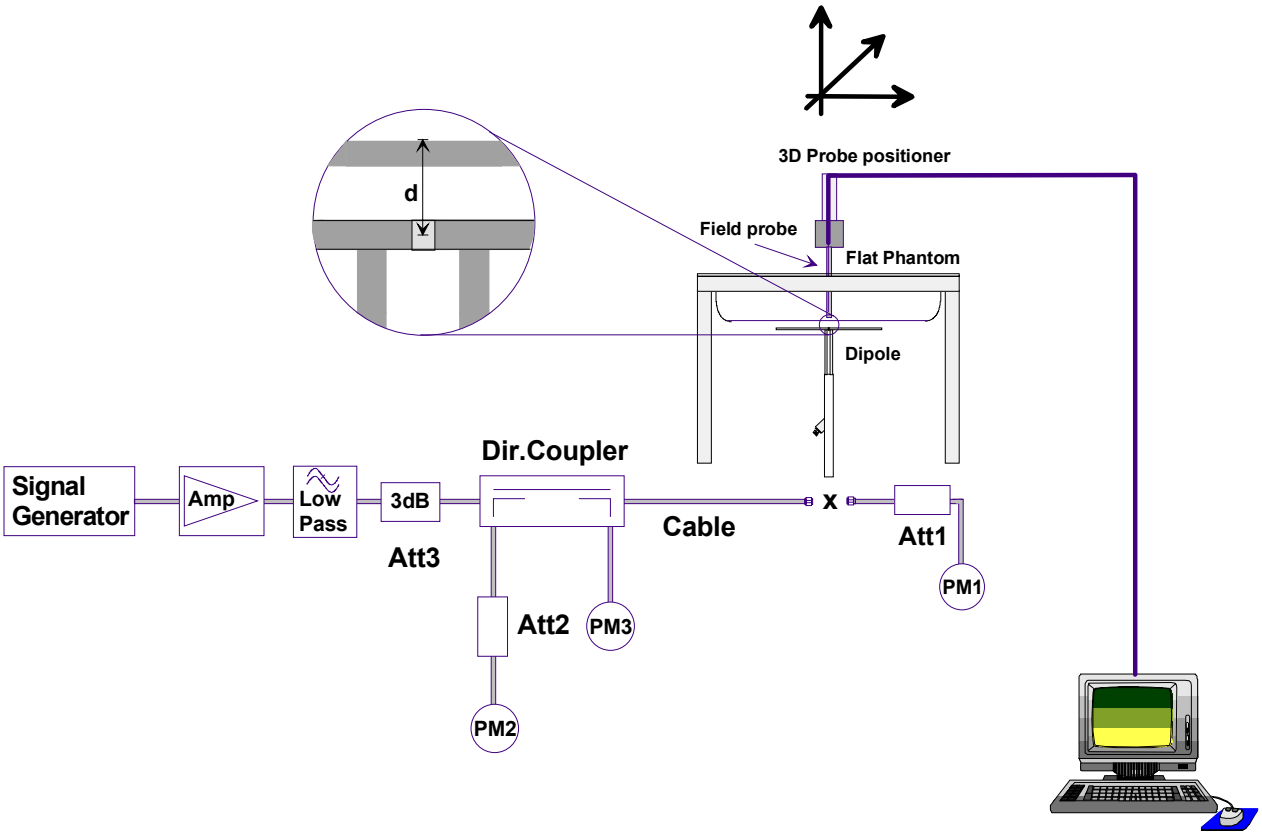
Relative Permittivity:	37.3
Conductivity:	1.88 mho/m
Ambient Temperature:	21.6°C
Fluid Temperature:	23.9°C
Fluid Depth:	≥ 15cm

The 2450MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	52.00%
Glycol Monobutyl	48.00%
Target Dielectric Parameters at 22°C	ε_r = 39.2 (+/-5%) σ = 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	13.9	55.6	6.27	25.08	29.5
Test 2	13.9	55.6	6.25	25.00	29.1
Test 3	13.9	55.6	6.24	24.96	28.9
Test 4	14.0	56.0	6.31	25.24	29.1
Test 5	14.0	56.0	6.27	25.08	29.7
Test 6	13.8	55.2	6.25	25.00	29.3
Test 7	13.9	55.6	6.22	24.88	29.3
Test 8	13.9	55.6	6.24	24.96	29.4
Test 9	14.0	56.0	6.29	25.16	30.0
Test10	13.8	55.2	6.17	24.68	29.3
Average Value	13.91	55.64	6.251	25.00	29.36

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

Averaged over 1cm (1g) of tissue: 55.64 mW/g

Averaged over 10cm (10g) of tissue: 25.00 mW/g

Test Date: 09/17/03

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:150

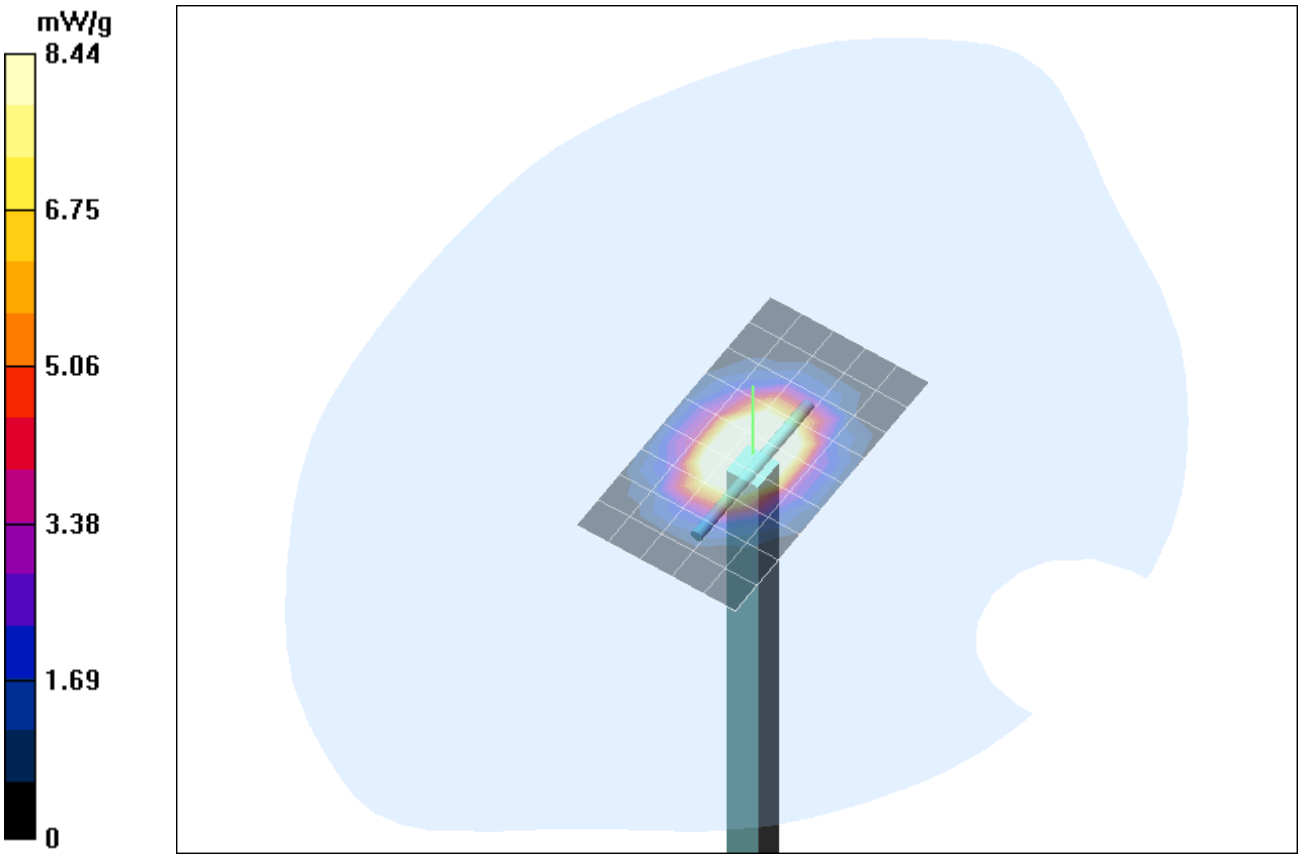
Ambient Temp: 22.2C; Fluid Temp: 23.8C
Barometric Pressure: 101.9 kPa; Humidity: 52%

Communication System: CW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450 (σ = 1.88 mho/m, ε_r = 37.3, ρ = 1000 kg/m^3)

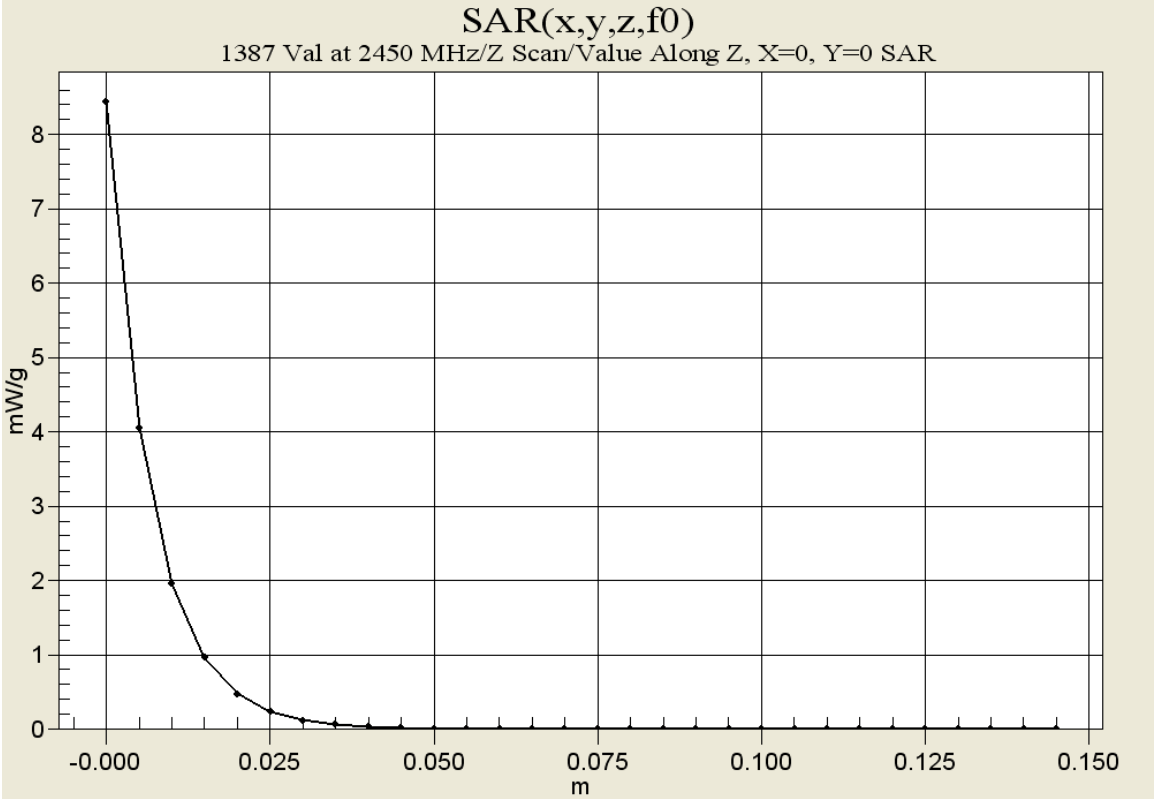
- Probe: ET3DV6 - SN1387; ConvF(5, 5, 5); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: SAM front; Type: SAM 4.0; Serial: 1033
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Probe SN1387 Validation at 2450 MHz/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Probe SN1387 Validation at 2450 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 29.5 W/kg
SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.27 mW/g
Reference Value = 96.7 V/m
Power Drift = -0.08 dB



2003 Celltech Labs Inc.


SAR(x,y,z,f0)
1387 Val at 2450 MHz/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0
1
2
3
4
5
6
7
8
-0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

2450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

September 17, 2003

Frequency	e'	e"
2.350000000 GHz	37.7457	13.5170
2.360000000 GHz	37.7101	13.5534
2.370000000 GHz	37.6951	13.5903
2.380000000 GHz	37.6613	13.6228
2.390000000 GHz	37.6411	13.6368
2.400000000 GHz	37.5853	13.6598
2.410000000 GHz	37.5236	13.6742
2.420000000 GHz	37.4573	13.7091
2.430000000 GHz	37.4063	13.7484
2.440000000 GHz	37.3419	13.7798
2.450000000 GHz	37.2875	13.8226
2.460000000 GHz	37.2447	13.8618
2.470000000 GHz	37.2198	13.8951
2.480000000 GHz	37.1940	13.9293
2.490000000 GHz	37.1679	13.9423
2.500000000 GHz	37.1333	13.9571
2.510000000 GHz	37.0990	13.9745
2.520000000 GHz	37.0410	14.0116
2.530000000 GHz	36.9938	14.0375
2.540000000 GHz	36.9185	14.0546
2.550000000 GHz	36.8657	14.0912

APPENDIX D - PROBE CALIBRATION

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

Client Celltech Labs

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1590
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	May 15, 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
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US38432426	3-May-00 (Agilent, No. 8702K064602)	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

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

Date issued: May 15, 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.

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

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibration:	April 26, 2002
Recalibrated:	May 15, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

NormX	**1.76** $\mu V/(V/m)^2$	DCP X	**92** mV
NormY	**1.91** $\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.66** $\mu V/(V/m)^2$	DCP Z	**92** mV

Diode Compression

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	**7.0** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**7.0** ± 9.5% (k=2)	Alpha	**0.33**
ConvF Z	**7.0** ± 9.5% (k=2)	Depth	**2.56**

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	**5.5** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.5** ± 9.5% (k=2)	Alpha	**0.44**
ConvF Z	**5.5** ± 9.5% (k=2)	Depth	**2.69**

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.7	5.0
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

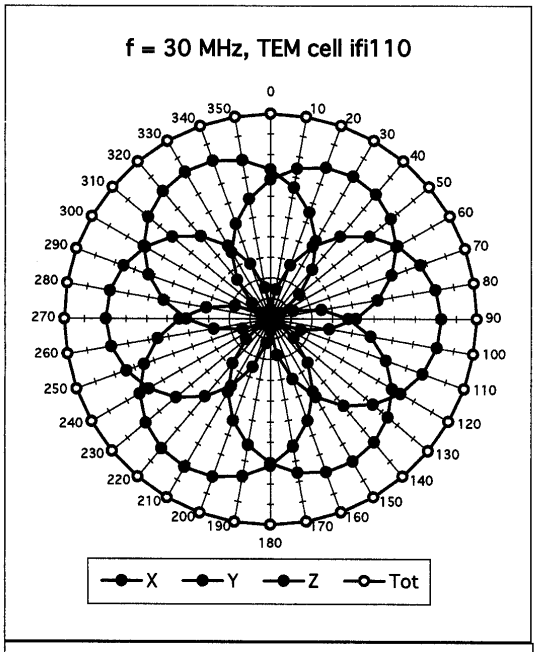
Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

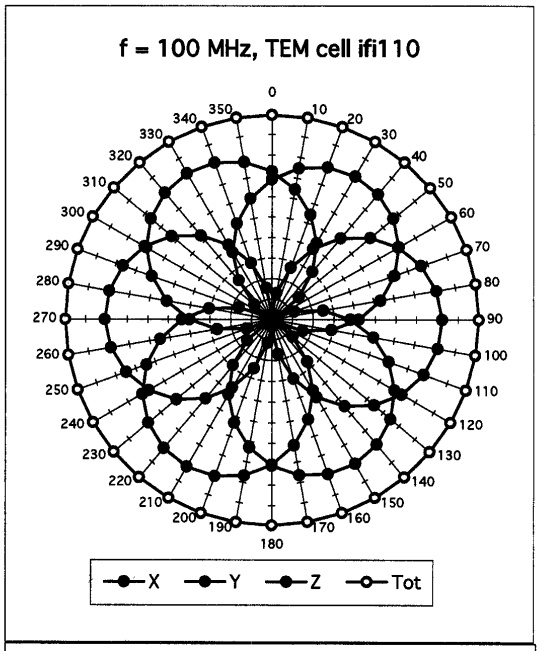
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.5
SAR_{be} [%]	With Correction Algorithm	0.2	0.1

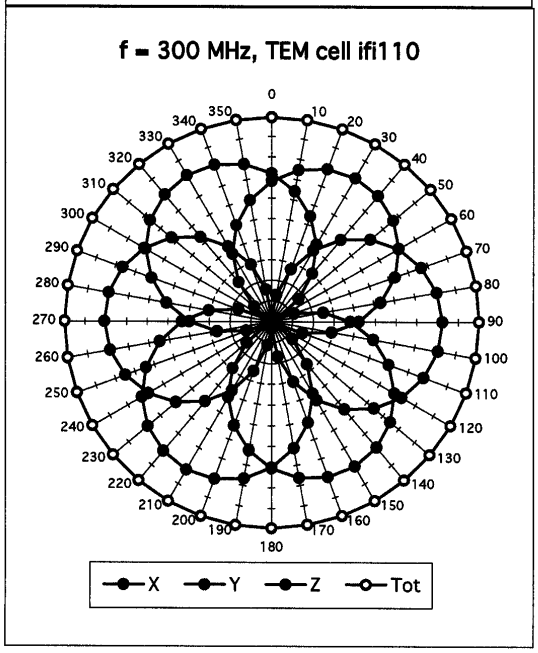
Sensor Offset

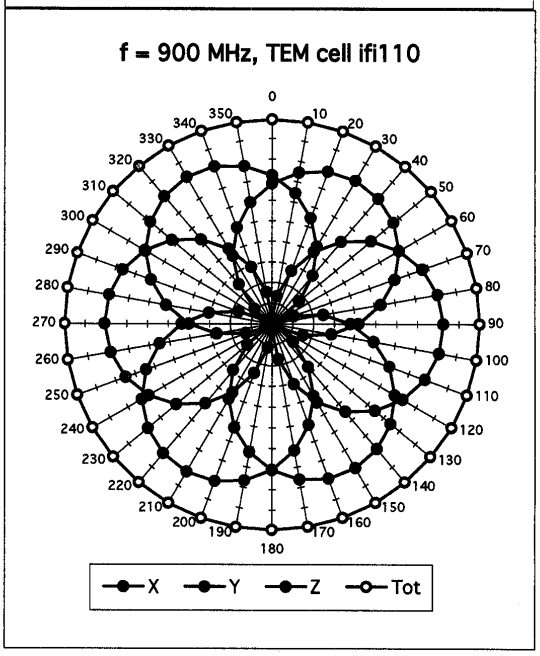
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

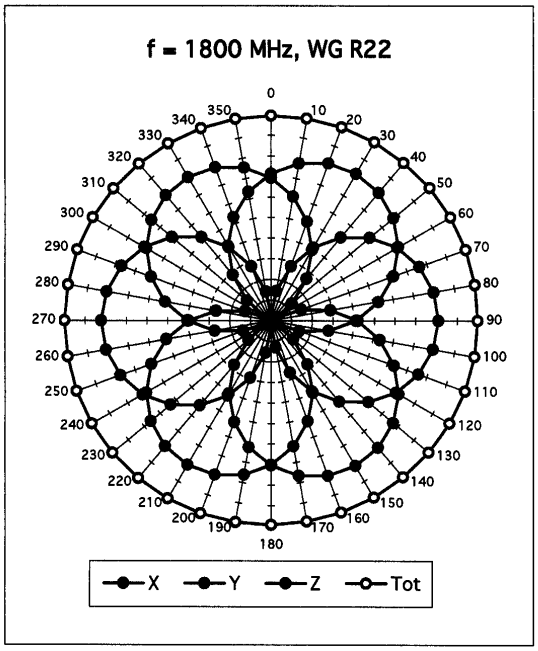
Receiving Pattern (ϕ), θ = 0°

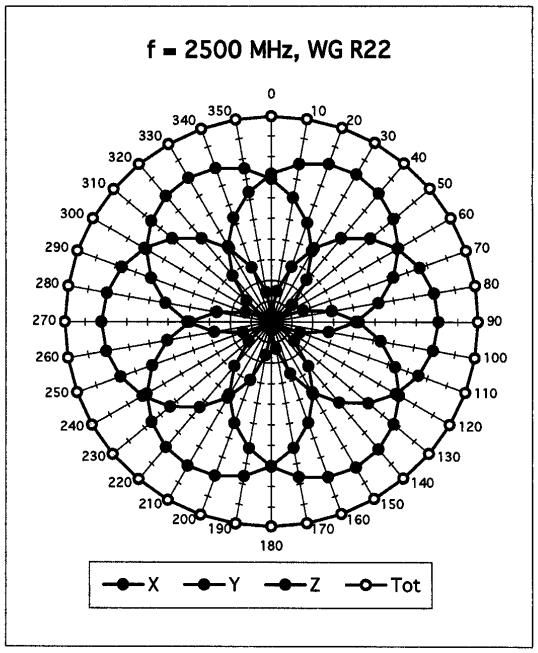




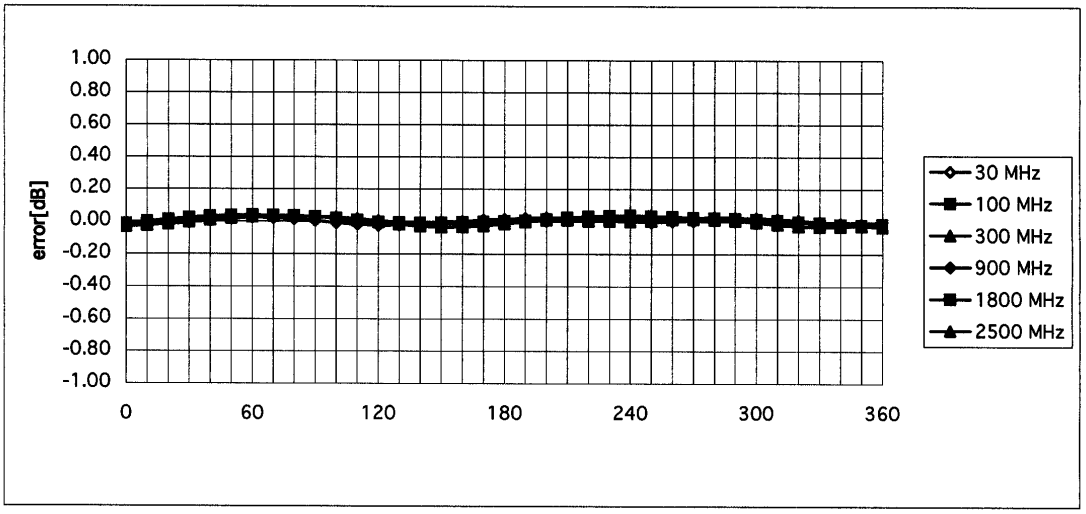






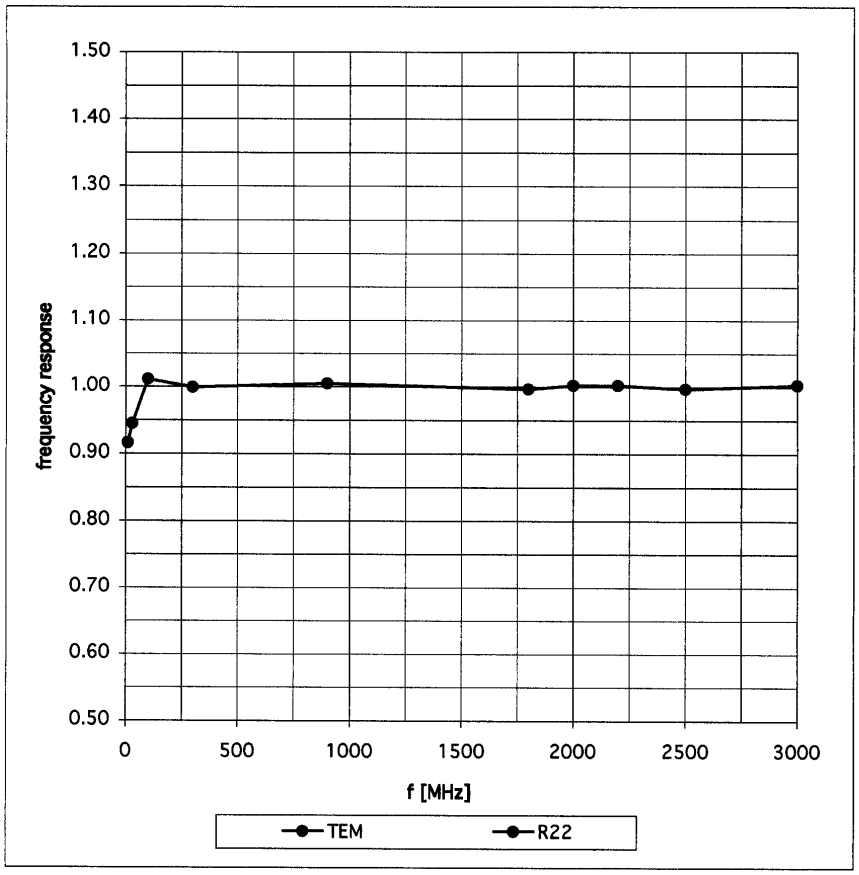


Isotropy Error (ϕ), θ = 0°



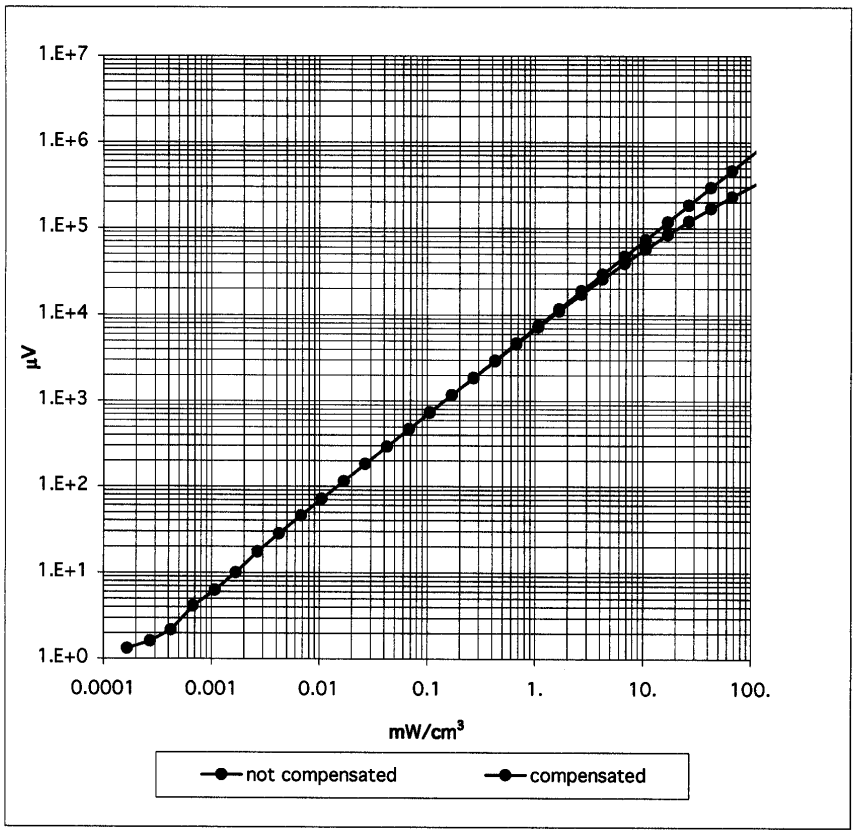
Frequency Response of E-Field

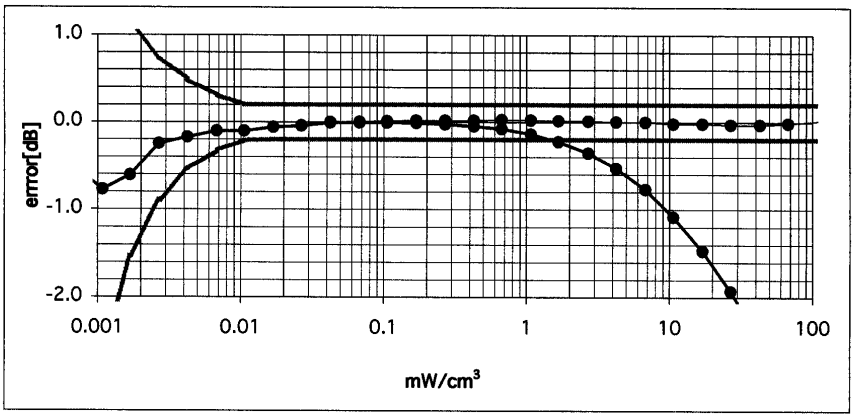
(TEM-Cell:ifi110, Waveguide R22)



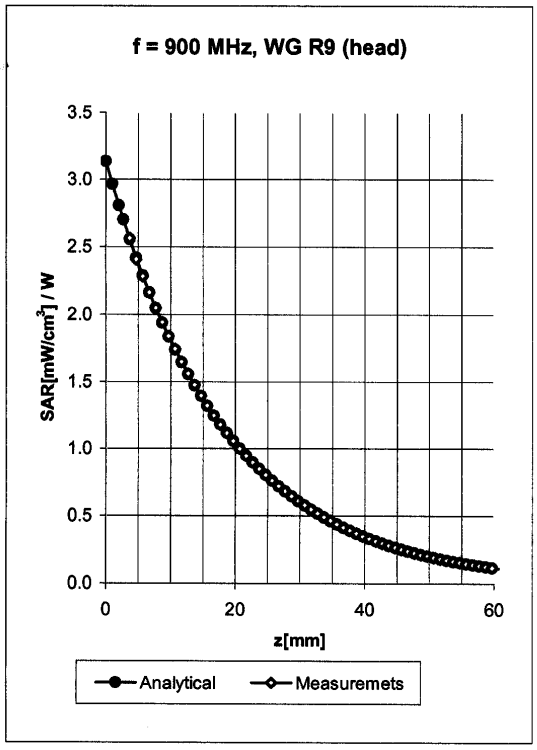
Dynamic Range f(SAR_{brain})

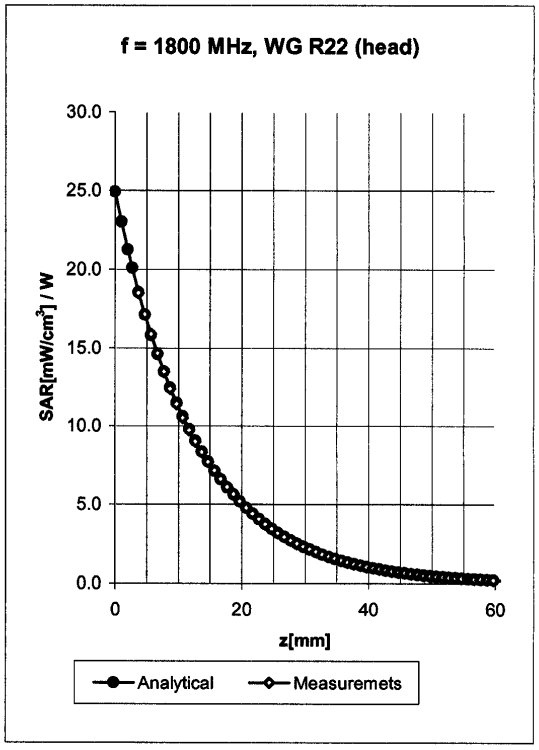
(Waveguide R22)





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

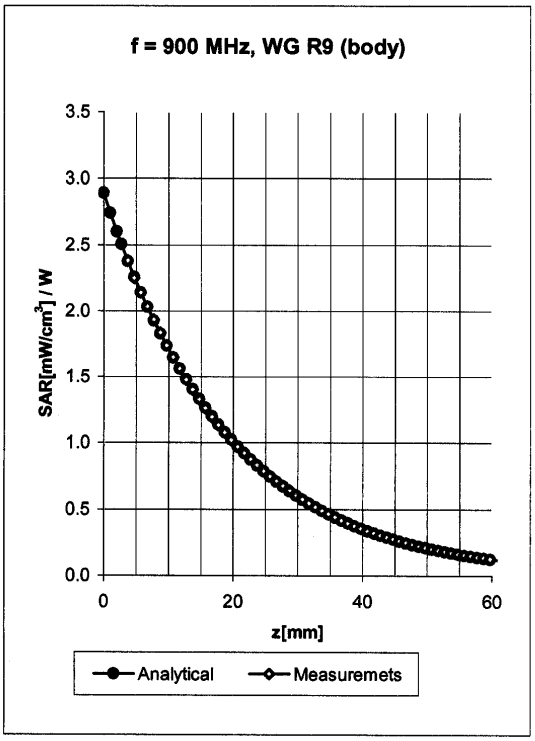
ConvF X	7.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	7.0 ± 9.5% (k=2)	Alpha	**0.33**
ConvF Z	7.0 ± 9.5% (k=2)	Depth	**2.56**

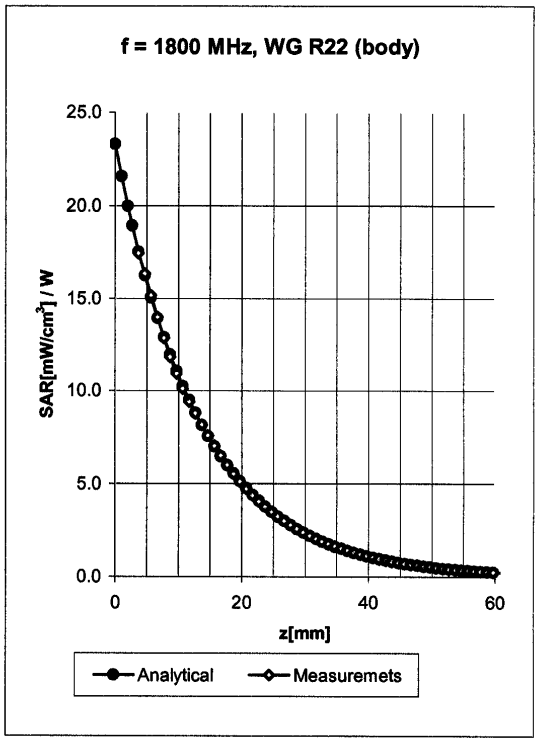
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

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

ConvF X	5.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5 ± 9.5% (k=2)	Alpha	**0.44**
ConvF Z	5.5 ± 9.5% (k=2)	Depth	**2.69**

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

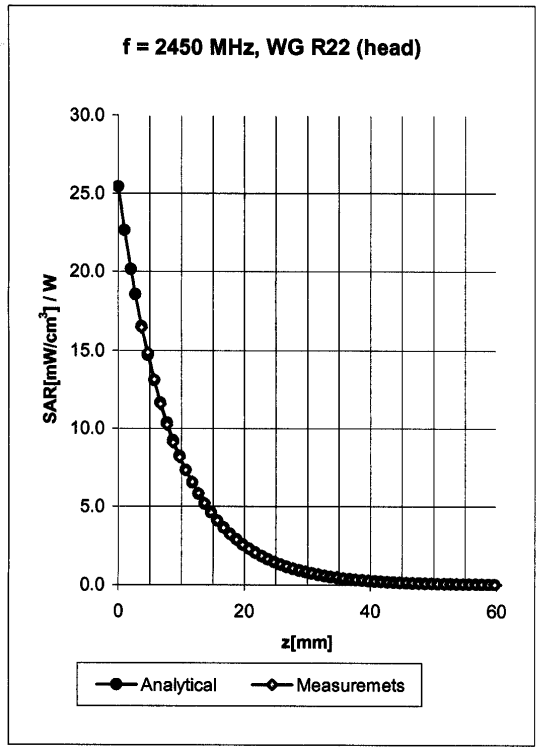
ConvF X	6.8 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.8 ± 9.5% (k=2)	Alpha	**0.34**
ConvF Z	6.8 ± 9.5% (k=2)	Depth	**2.61**

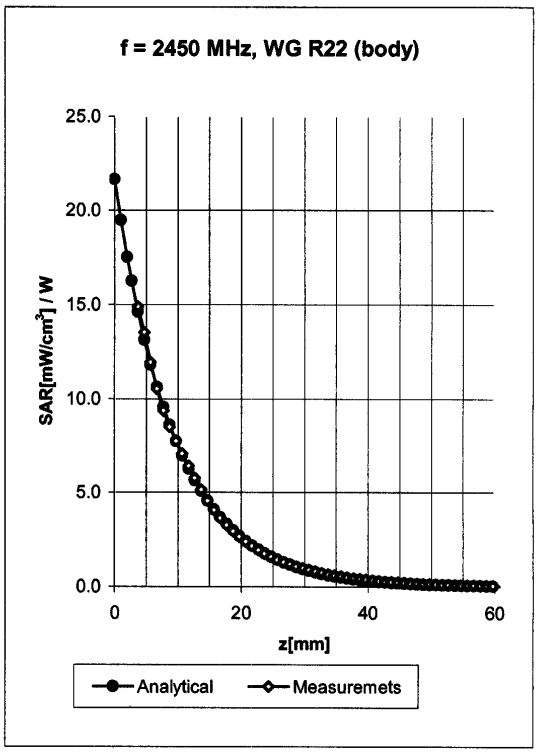
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

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

ConvF X	5.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.0 ± 9.5% (k=2)	Alpha	**0.52**
ConvF Z	5.0 ± 9.5% (k=2)	Depth	**2.69**

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	**5.0** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**0.88**
ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.92**

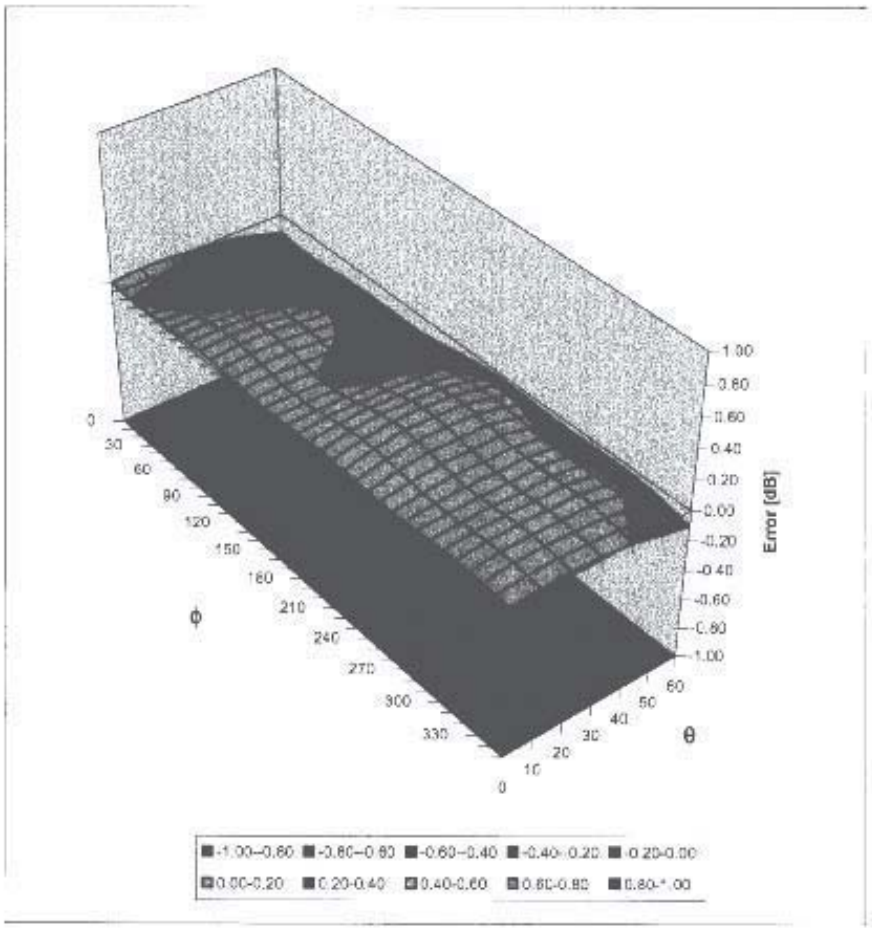
Body	**2450**	**MHz**	ε_r = **52.7 ± 5%**	σ = **1.95 ± 5%** mho/m

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

ConvF X	**4.4** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**4.4** ± 8.9% (k=2)	Alpha	**0.90**
ConvF Z	**4.4** ± 8.9% (k=2)	Depth	**1.87**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Schmid & Partner Engineering AG

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1590**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 19, 2003**
Probe Calibration Date:	**May 15, 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:

Schmid & Partner Engineering AG

s p e a g

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Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.6 ± 8%**	**ε_r = 52.3 ± 5%** **σ = 0.76 ± 5% mho/m** (head tissue)
300 MHz	ConvF	**8.3 ± 8%**	**ε_r = 45.3 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
450 MHz	ConvF	**7.9 ± 8%**	**ε_r = 43.5 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
150 MHz	ConvF	**9.2 ± 8%**	**ε_r = 61.9 ± 5%** **σ = 0.80 ± 5% mho/m** (body tissue)
450 MHz	ConvF	**8.1 ± 8%**	**ε_r = 56.7 ± 5%** **σ = 0.94 ± 5% mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

2450 MHz System Performance Check & DUT Evaluation (Head)

Measured Fluid Dielectric Parameters (Brain)

March 03, 2004

Frequency	e'	e"
2.400000000 GHz	37.5166	13.5246
2.405000000 GHz	37.4880	13.5348
2.410000000 GHz	37.4590	13.5373
2.415000000 GHz	37.4327	13.5567
2.420000000 GHz	37.4138	13.5784
2.425000000 GHz	37.4001	13.5961
2.430000000 GHz	37.3833	13.6164
2.435000000 GHz	37.3732	13.6313
2.440000000 GHz	37.3568	13.6378
2.445000000 GHz	37.3259	13.6531
2.450000000 GHz	37.3038	13.6724
2.455000000 GHz	37.2911	13.7031
2.460000000 GHz	37.2782	13.7232
2.465000000 GHz	37.2684	13.7436
2.470000000 GHz	37.2483	13.7507
2.475000000 GHz	37.2278	13.7636
2.480000000 GHz	37.2221	13.7782
2.485000000 GHz	37.2028	13.7956
2.490000000 GHz	37.1925	13.8139
2.495000000 GHz	37.1647	13.8034
2.500000000 GHz	37.1374	13.8167

2450 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 03, 2004

Frequency	e'	e"
2.400000000 GHz	50.5841	14.7836
2.405000000 GHz	50.5612	14.8037
2.410000000 GHz	50.5362	14.8338
2.415000000 GHz	50.5312	14.8438
2.420000000 GHz	50.5153	14.8779
2.425000000 GHz	50.4818	14.8968
2.430000000 GHz	50.4826	14.9076
2.435000000 GHz	50.4609	14.9237
2.440000000 GHz	50.4475	14.9373
2.445000000 GHz	50.4346	14.9540
2.450000000 GHz	50.4113	14.9799
2.455000000 GHz	50.4092	14.9838
2.460000000 GHz	50.3861	15.0062
2.465000000 GHz	50.3726	15.0242
2.470000000 GHz	50.3570	15.0341
2.475000000 GHz	50.3451	15.0469
2.480000000 GHz	50.3292	15.0501
2.485000000 GHz	50.3033	15.0657
2.490000000 GHz	50.2859	15.0820
2.495000000 GHz	50.2767	15.0958
2.500000000 GHz	50.2543	15.1224

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

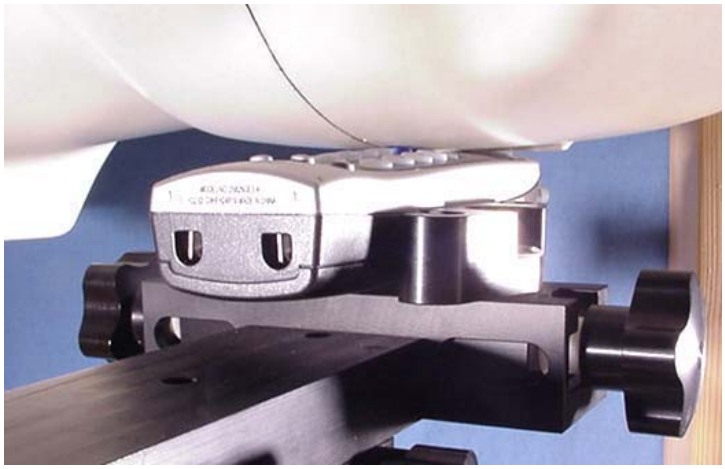
Signature / Stamp

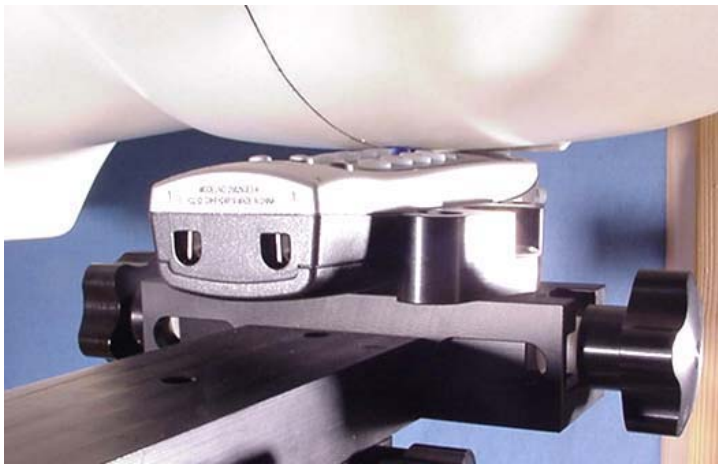
Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

APPENDIX G - SAR TEST SETUP PHOTOGRAPHS

HEAD SAR TEST SETUP PHOTOGRAPHS

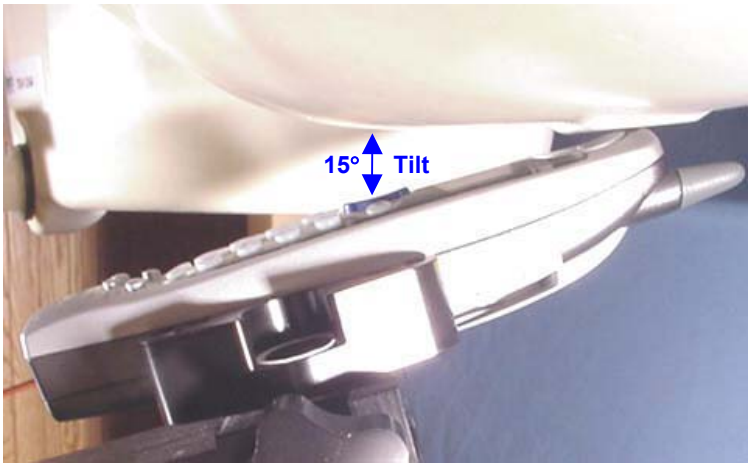
Left Head Section / Cheek-Touch Position





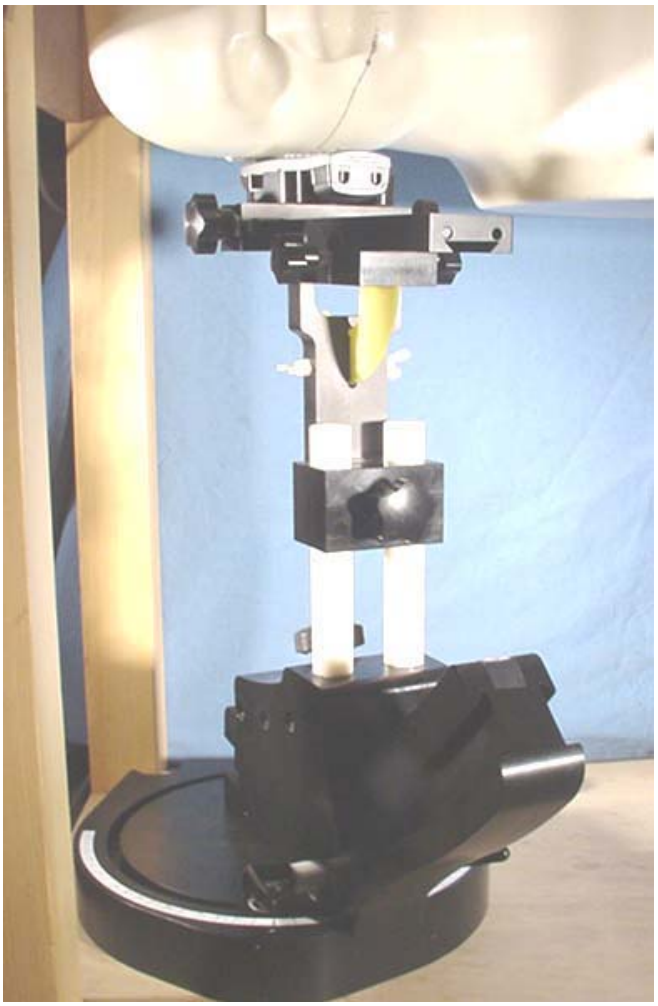
HEAD SAR TEST SETUP PHOTOGRAPHS

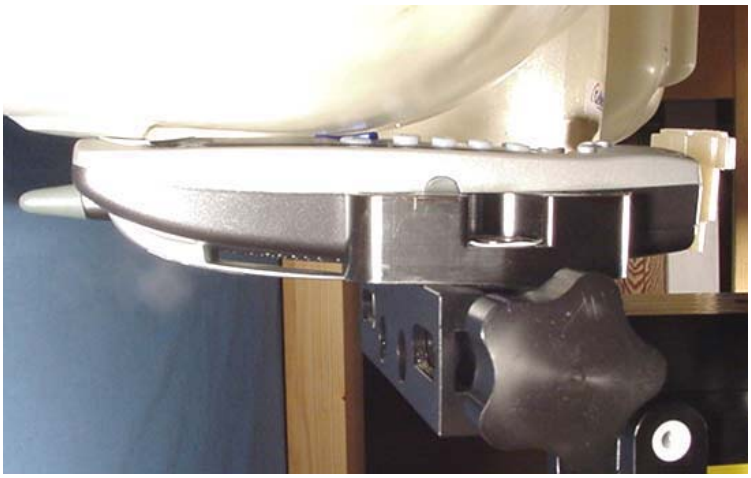
Left Head Section / Ear-Tilt Position (15°)

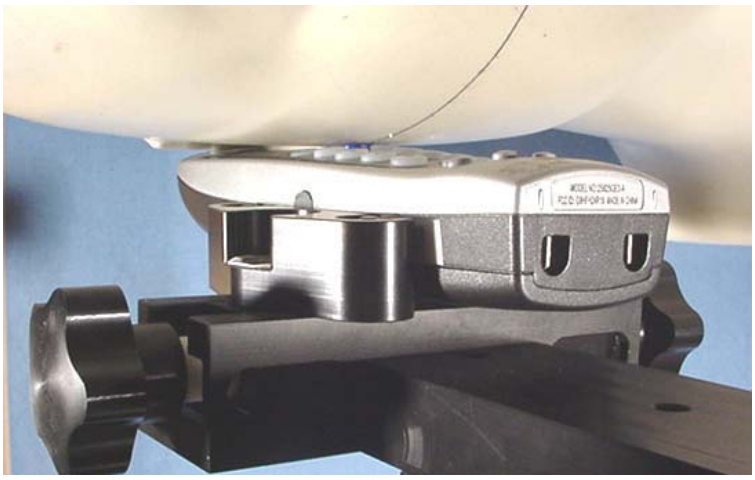


HEAD SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Cheek-Touch Position

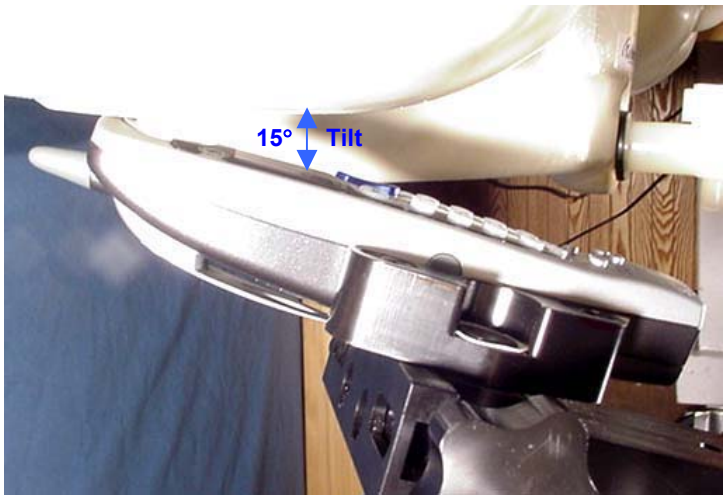






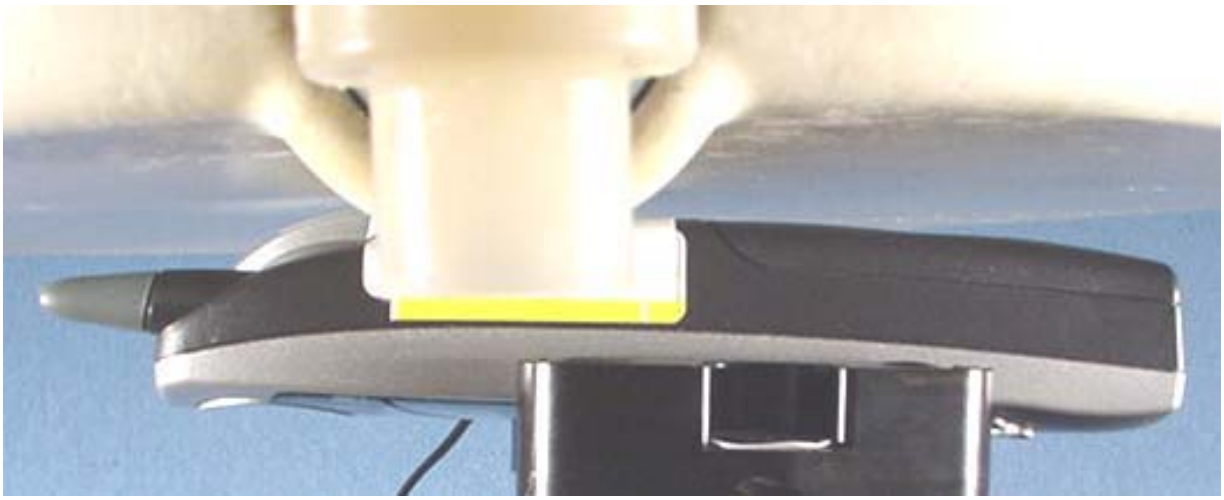
HEAD SAR TEST SETUP PHOTOGRAPHS

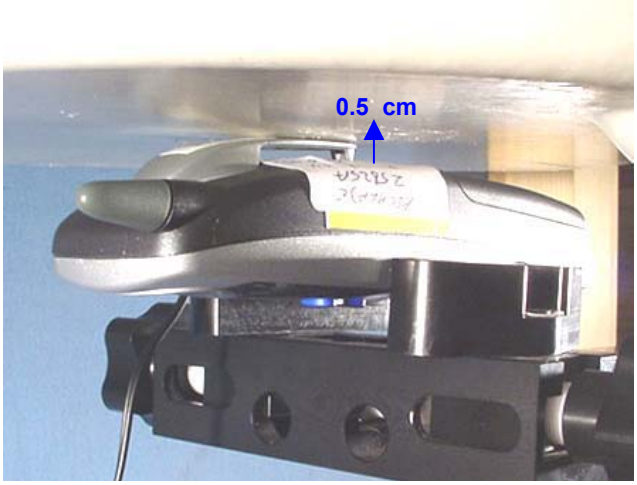
Right Head Section / Ear-Tilt Position (15º)



BODY-WORN SAR TEST SETUP PHOTOGRAPHS

0.5 cm Plastic Belt-Clip Separation Distance from Back of DUT to Planar Phantom with Generic Ear-Microphone Accessory





DUT PHOTOGRAPHS

Front of DUT

Back of DUT

Top of DUT

Bottom of DUT

DUT PHOTOGRAPHS

Left Side of DUT

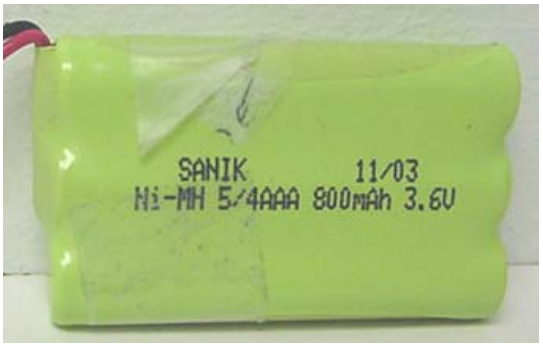
Right Side of DUT

Plastic Belt-Clip Accessory

DUT PHOTOGRAPHS

Battery Compartment

NiMH Battery Pack



NiMH Battery Pack

Handset & Base - Front

Handset & Base - Back

DUT PHOTOGRAPHS

DUT with Generic Ear-Microphone Accessory