

DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

HOP-ON WIRELESS, INC.
35 Hammond
Irvine, CA 92618

FCC Rule Part(s):	47 CFR §2.1093
FCC Classification:	PCS Licensed Transmitter held to ear (PCE)
Test Procedure(s):	FCC OET Bulletin 65, Supplement C (01-01)
	IEEE Standard 1528-2003
FCC IDENTIFIER:	QHOHOP1800
Model(s):	HOP1806
Device Type:	Portable Single-Band PCS GSM Handset
Modulation:	GMSK
Tx Frequency Range(s):	1850.2 - 1909.8 MHz
RF Output Power Measured:	29.77 dBm Peak Conducted (1850.2 MHz)
	29.89 dBm Peak Conducted (1880.0 MHz)
	30.20 dBm Peak Conducted (1909.8 MHz)
Antenna Type Tested:	Stubby
Battery Type Tested:	Lithium-ion 3.7 V, 550 mAh
Body-Worn Accessories Tested:	Ear-Microphone
Max. SAR Levels Measured:	Head: 1.10 W/kg (1g average)
	Body: 0.147 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. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), and IEEE Standard 1528-2003 for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

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.



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1.0 INTRODUCTION

This measurement report demonstrates that the HOP-ON WIRELESS INC. Model: HOP1806 Portable Single-Band PCS GSM Handset FCC ID: QHOHOP1800 complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, (Edition 01-01) (see reference [2]) and IEEE Standard 1528-2003 (see reference [3]) 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)		
	IEEE Standard 1528-2003		
FCC Device Classification	PCS Licensed Transmitter held to ear (PCE)		
Device Type	Portable Single-Band PCS GSM Handset		
Modulation	GMSK		
FCC IDENTIFIER	QHOHOP1800		
Model(s)	HOP1806		
Serial No.	353543000004822 (Production Unit)		
Tx Frequency Range	1850.2 - 1909.8 MHz		
RF Output Power Measured	29.77 dBm	Peak Conducted	1850.2 MHz
	29.89 dBm	Peak Conducted	1880.0 MHz
	30.20 dBm	Peak Conducted	1909.8 MHz
Battery Type(s) Tested	Lithium-ion	3.7 V, 550 mAh	P/N: HOP1806LB550
Antenna Type(s) Tested	Stubby Antenna		Length: 30 mm
Body-Worn Accessories Tested	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

HEAD SAR EVALUATION RESULTS

Freq. (MHz)	Channel	Test Mode	Battery Type	Antenna Position	Phantom Section	Test Position	Conducted Power Before Test (dBm)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
1880.0	Mid	PCS GSM	Lithium-ion	Fixed	Right Ear	Cheek/Touch	29.89	0.0691	P 0.668
									S 0.651
1880.0	Mid	PCS GSM	Lithium-ion	Fixed	Right Ear	Ear/Tilt (15°)	29.89	-0.0317	0.918
1850.2	Low	PCS GSM	Lithium-ion	Fixed	Right Ear	Ear/Tilt (15°)	29.77	-0.00677	0.916
1909.8	High	PCS GSM	Lithium-ion	Fixed	Right Ear	Ear/Tilt (15°)	30.20	0.0432	1.10
1880.0	Mid	PCS GSM	Lithium-ion	Fixed	Left Ear	Cheek/Touch	29.89	-0.0375	P 0.650
									S 0.478
1880.0	Mid	PCS GSM	Lithium-ion	Fixed	Left Ear	Ear/Tilt (15°)	29.89	-0.0379	0.729
ANSI / IEEE C95.1 1999 - SAFETY LIMIT BRAIN: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population									
Test Date(s)		04/28/04		Relative Humidity		38 %			
Measured Fluid Type		1880 MHz Brain		Atmospheric Pressure		102.8 kPa			
Dielectric Constant ϵ_r		IEEE Target	Measured	Ambient Temperature		23.2 °C			
		40.0 ± 5%	38.5	Fluid Temperature		23.5 °C			
Conductivity σ (mho/m)		IEEE Target	Measured	Fluid Depth		≥ 15 cm			
		1.40 ± 5%	1.42	ρ (Kg/m ³)		1000			

Note(s):

- 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.
- If the SAR levels measured 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]).
- Secondary hotspots were reported for SAR levels within 3 dB of the primary (P = Primary, S = Secondary).
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported in the table above were consistent for all measurement periods.
- The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
- The SAR measurements were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY-WORN EVALUATION RESULTS

Freq. (MHz)	Channel	Test Mode	Battery Type	Antenna Position	Body-worn Accessories	DUT Position to Planar Phantom	Separation Distance to Planar Phantom	Conducted Power Before Test (dB)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
1880.0	Mid	PCS GSM	Lithium-ion	Fixed	Ear-Microphone	Back Side	2.0 cm (Air-Gap)	29.89	-0.160	0.147
ANSI / IEEE C95.1 1999 - SAFETY LIMIT BODY: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population										
Test Date(s)		04/28/04		Relative Humidity		33 %				
Measured Fluid Type		1880 MHz Body		Atmospheric Pressure		102.1 kPa				
Dielectric Constant ϵ_r		IEEE Target	Measured	Ambient Temperature		24.2 °C				
		53.3 ± 5%	50.8	Fluid Temperature		21.5 °C				
Conductivity σ (mho/m)		IEEE Target	Measured	Fluid Depth		≥ 15 cm				
		1.52 ± 5%	1.57	ρ (Kg/m³)		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 levels measured 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. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported in the table above were consistent for all measurement periods.
4. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
5. The SAR measurements were performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The HOP-ON WIRELESS INC. Model: HOP1806 Portable PCS GSM Handset FCC ID: QHOHOP1800 was 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 mid channel of the operating band. If the SAR level at the mid channel of the frequency band 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.

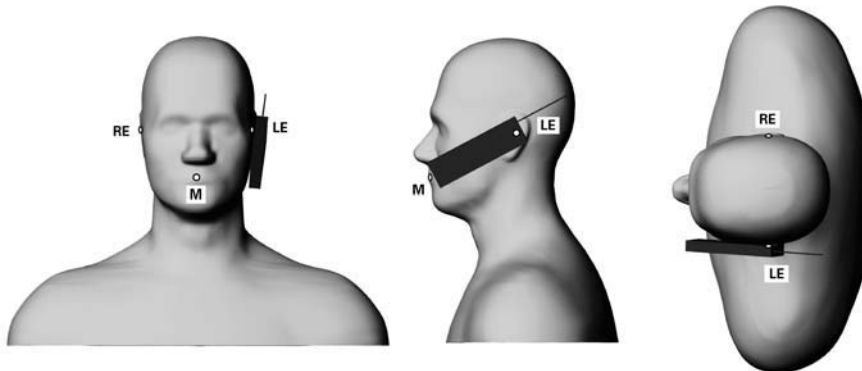


Figure 1. Phone position 1, “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

- 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.

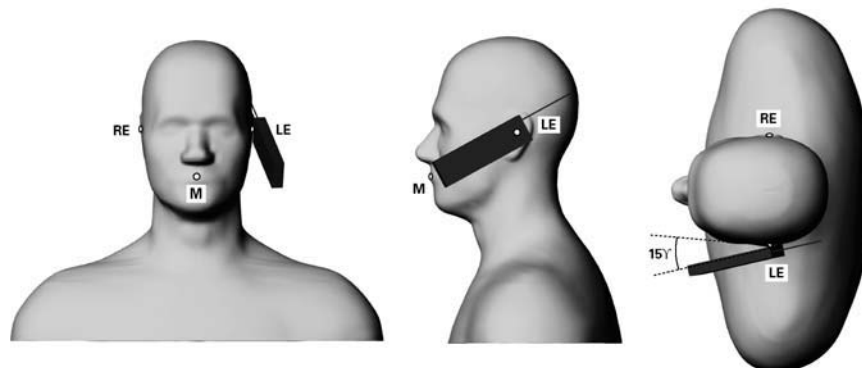


Figure 2. Phone position 2, “tilted position.” The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration

- 2) The DUT was tested in a body-worn configuration with an Ear-Microphone accessory connected. The back of the DUT was placed facing parallel to the outer surface of the SAM phantom (planar section) with an air-gap separation distance of 2.0 cm between the back of the DUT and the outer surface of the SAM phantom (planar section).

Test Modes & Power Settings

- 3) The DUT was controlled in test mode via internal software. SAR measurements were performed with the DUT transmitting continuously at maximum power in 1 time slot (crest factor = 8.3).
- 4) The conducted power levels were measured before each test according to the procedures described in FCC 47 CFR §2.1046 using a Gigatronics 8652A Universal Power Meter.
- 5) The power drift measured by the DASY4 system for the duration of each test was within +/- 5% from the measured start power.
- 6) The DUT was tested with a fully charged Lithium-ion 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 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 15mm x 15mm.

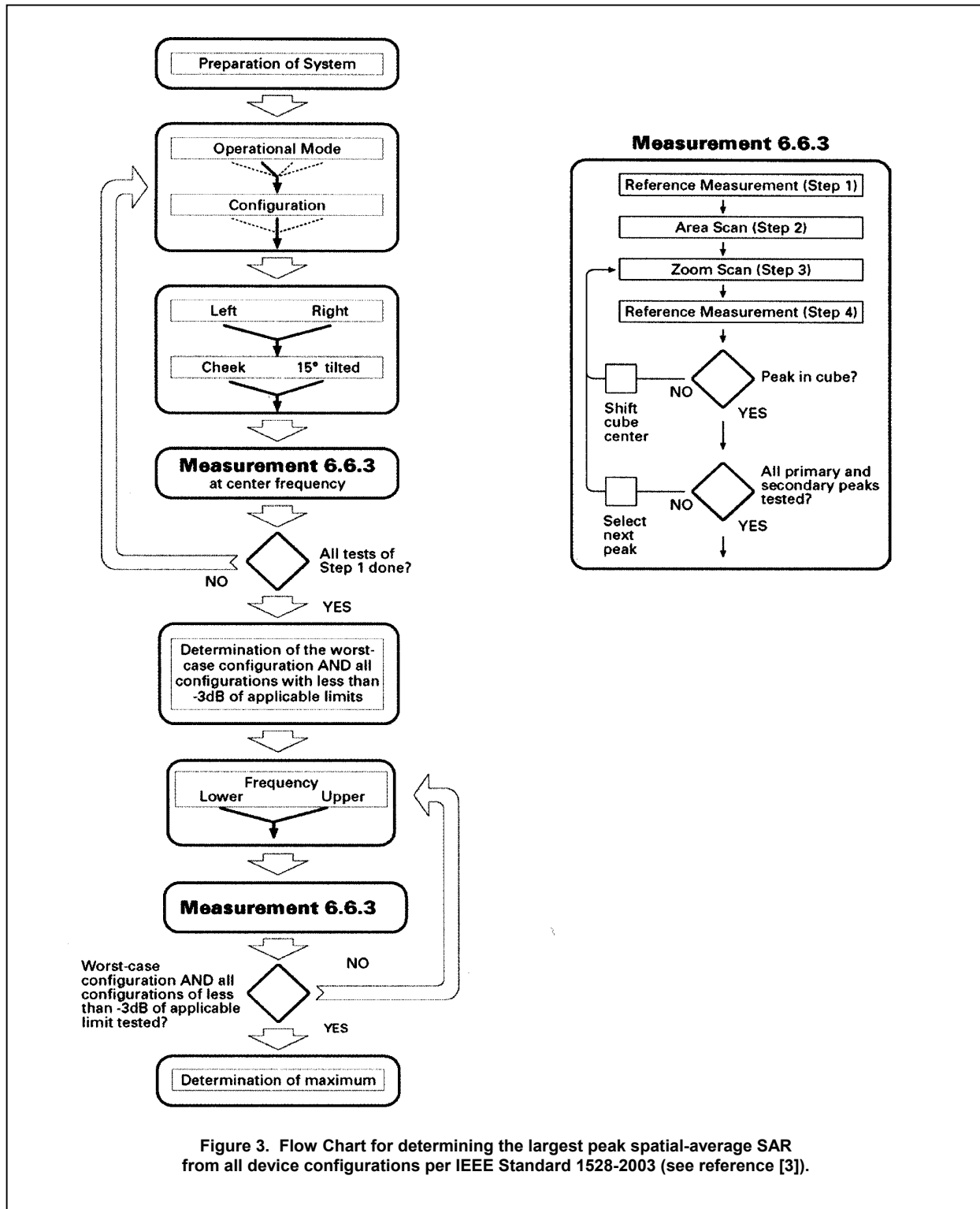
An area scan was determined as follows:

- 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 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 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.)



7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed at the planar section of the SAM phantom with an 1800MHz 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 250mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$.

SYSTEM PERFORMANCE CHECK													
Test Date	1800MHz 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						
04/28/04	Brain	9.53 $\pm 10\%$	8.97 (-5.9%)	40.0 $\pm 5\%$	39.7	1.40 $\pm 5\%$	1.38	1000	21.5	23.2	≥ 15	33	102.8

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 reported in the table above were consistent for all measurement periods.

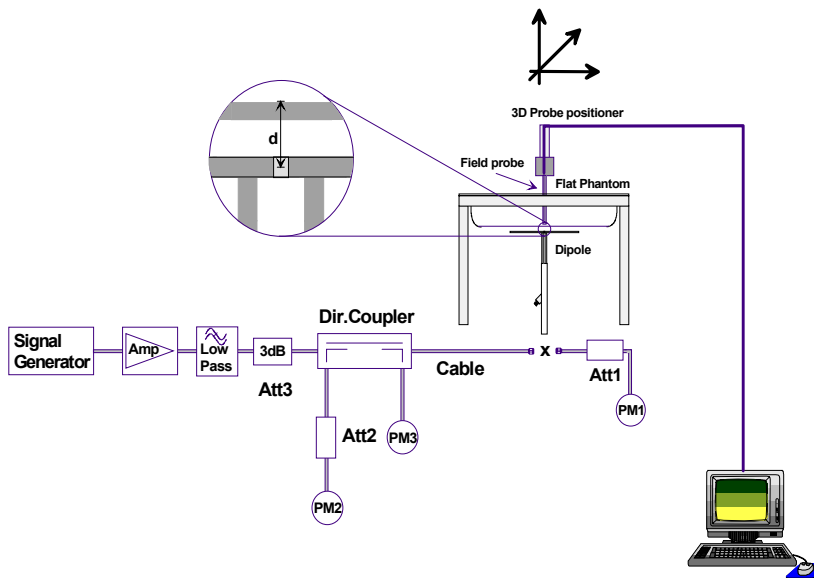
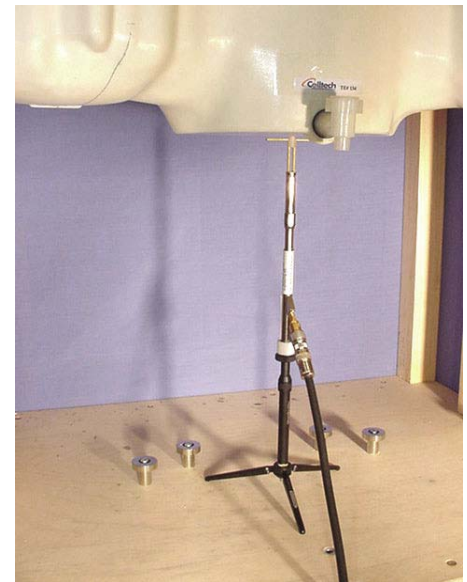


Figure 4. System Performance Check Setup Diagram



1800MHz Dipole Setup

8.0 SIMULATED TISSUE MIXTURES

The 1800MHz and 1880MHz simulated tissue mixtures consist of Glycol-monobutyl, water, and salt. Preservation with a bactericide was added and visual inspection was made to ensure air bubbles were not trapped during the mixing process. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

1800MHz & 1880MHz SIMULATED TISSUE MIXTURES			
INGREDIENT	1800MHz Brain	1880MHz Brain	1880MHz Body
	System Check	DUT Evaluation	DUT Evaluation
Water	54.825 %	55.85 %	69.85 %
Glycol Monobutyl	44.8651 %	44.00 %	29.89 %
Salt	0.31%	0.15 %	0.26 %

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.: 1387
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Phantom(s)

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

11.0 PROBE SPECIFICATION (ET3DV6)

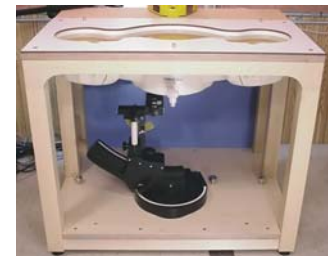
Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$)
Frequency:	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 μ W/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 portable 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 (+/-0.2 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 (see Appendix F for specifications of the SAM phantom V4.0C).



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
DAE3	353	Dec 2003
DAE3	370	May 2004
-ET3DV6 E-Field Probe	1387	Mar 2004
-ET3DV6 E-Field Probe	1590	May 2004
-300MHz Validation Dipole	135	Oct 2003
-450MHz Validation Dipole	136	Nov 2003
-835MHz Validation Dipole	411	Mar 2004
-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
-Plexiglas Planar Phantom	161	N/A
-Validation Planar Phantom	137	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2004
Gigatronics 8652A Power Meter	1835267	April 2004
Power Sensor 80701A	1833535	April 2004
Power Sensor 80701A	1833542	April 2004
Power Sensor 80701A	1834350	April 2004
HP E4408B Spectrum Analyzer	US39240170	Dec 2003
HP 8594E Spectrum Analyzer	3543A02721	April 2004
HP 8753E Network Analyzer	US38433013	April 2004
HP 8648D Signal Generator	3847A00611	April 2004
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	± 4.8	Normal	1	1	± 4.8	∞
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)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty						
					± 13.3	
Expanded Uncertainty (k=2)						
					± 26.6	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

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)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
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 Standard 1528-2003 (see reference [3])

16.0 REFERENCES

- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] 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.
- [3] IEEE Standard 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 - Right Ear - Cheek/Touch Position - Mid Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822
Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 29.89 dBm (Conducted)
3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)
Medium: HSL1880 ($\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$)
- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Right Ear Cheek/Touch Position - Mid Channel/Area Scan (6x9x1):

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

Reference Value = 17.3 V/m; Power Drift = 0.0691 dB

Peak SAR (extrapolated) = 0.870 W/kg

SAR(1 g) = 0.668 mW/g; SAR(10 g) = 0.409 mW/g

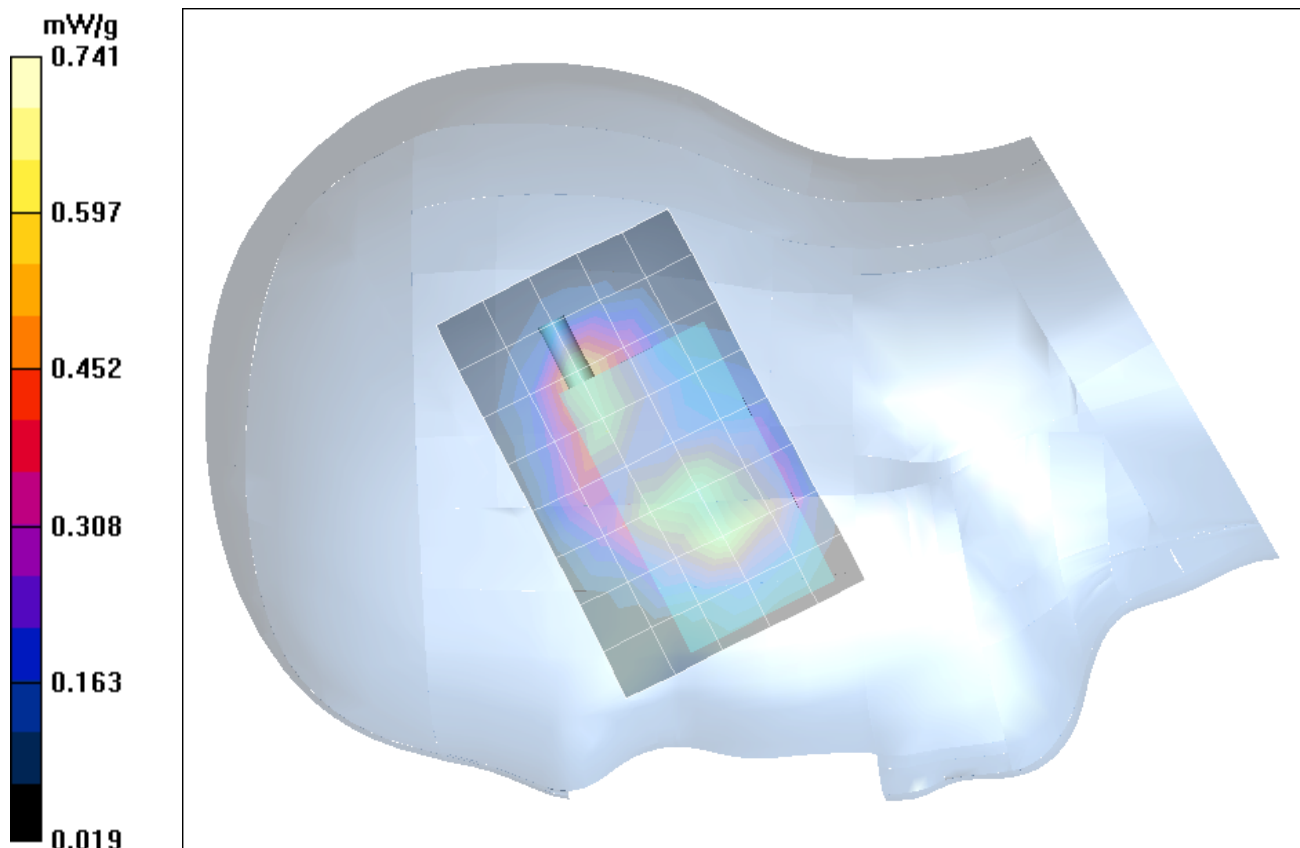
Head SAR - Right Ear Cheek/Touch Position - Mid Channel/Zoom Scan (7x7x7)/Cube 1:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.3 V/m; Power Drift = 0.0691 dB

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.651 mW/g; SAR(10 g) = 0.334 mW/g



Head SAR - Right Ear-Tilt Position (15°) - Mid Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822

Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM

Frequency: 1880.0 MHz; Duty Cycle: 1:8.3

RF Output Power: 29.89 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: HSL1880 ($\sigma = 1.42$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Right Ear-Tilt Position (15°) - Mid Channel/Area Scan (6x9x1):

Measurement grid: dx=15mm, dy=15mm

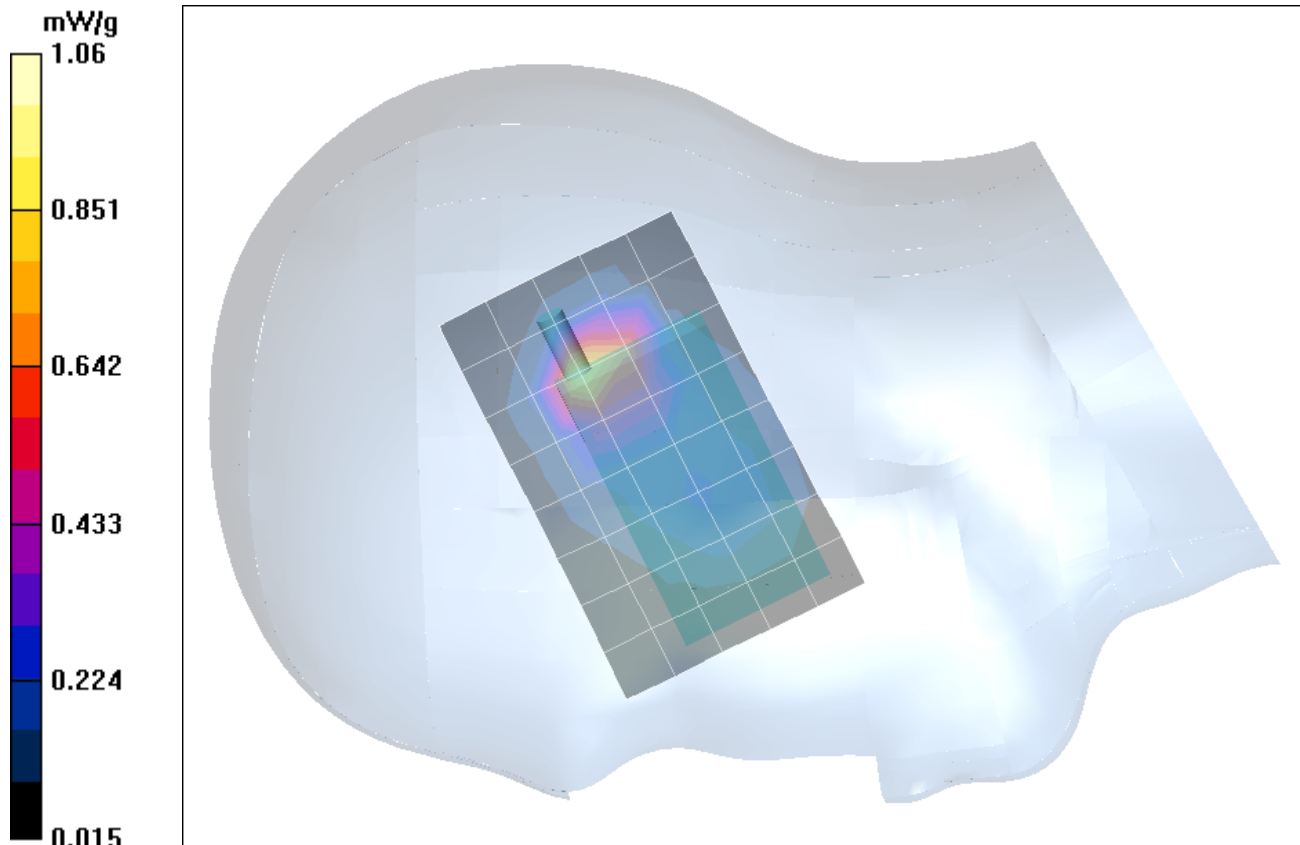
Head SAR - Right Ear-Tilt Position (15°) - Mid Channel/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.8 V/m; Power Drift = -0.0317 dB

Peak SAR (extrapolated) = 1.69 W/kg

SAR(1 g) = 0.918 mW/g; SAR(10 g) = 0.452 mW/g



Head SAR - Right Ear-Tilt Position (15°) - Low Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822

Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM

Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

RF Output Power: 29.77 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: HSL1880 ($\sigma = 1.42$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Right Ear-Tilt Position (15°) - Low Channel/Area Scan (6x9x1):

Measurement grid: dx=15mm, dy=15mm

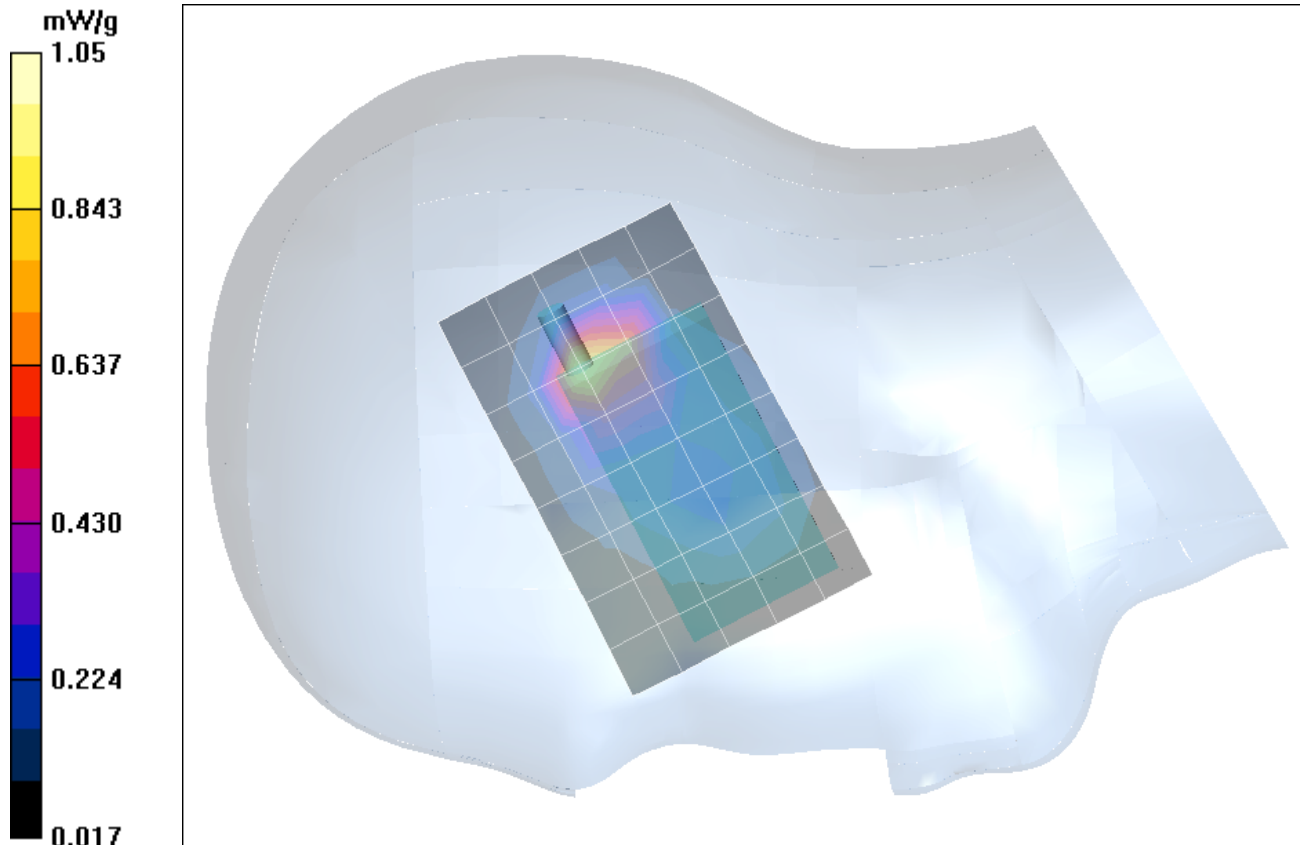
Head SAR - Right Ear-Tilt Position (15°) - Low Channel/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.4 V/m; Power Drift = -0.00677 dB

Peak SAR (extrapolated) = 1.67 W/kg

SAR(1 g) = 0.916 mW/g; SAR(10 g) = 0.455 mW/g



Head SAR - Right Ear-Tilt Position (15°) - High Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822

Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

RF Output Power: 30.20 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: HSL1880 ($\sigma = 1.42$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Right Ear-Tilt Position (15°) - High Channel/Area Scan (6x9x1):

Measurement grid: dx=15mm, dy=15mm

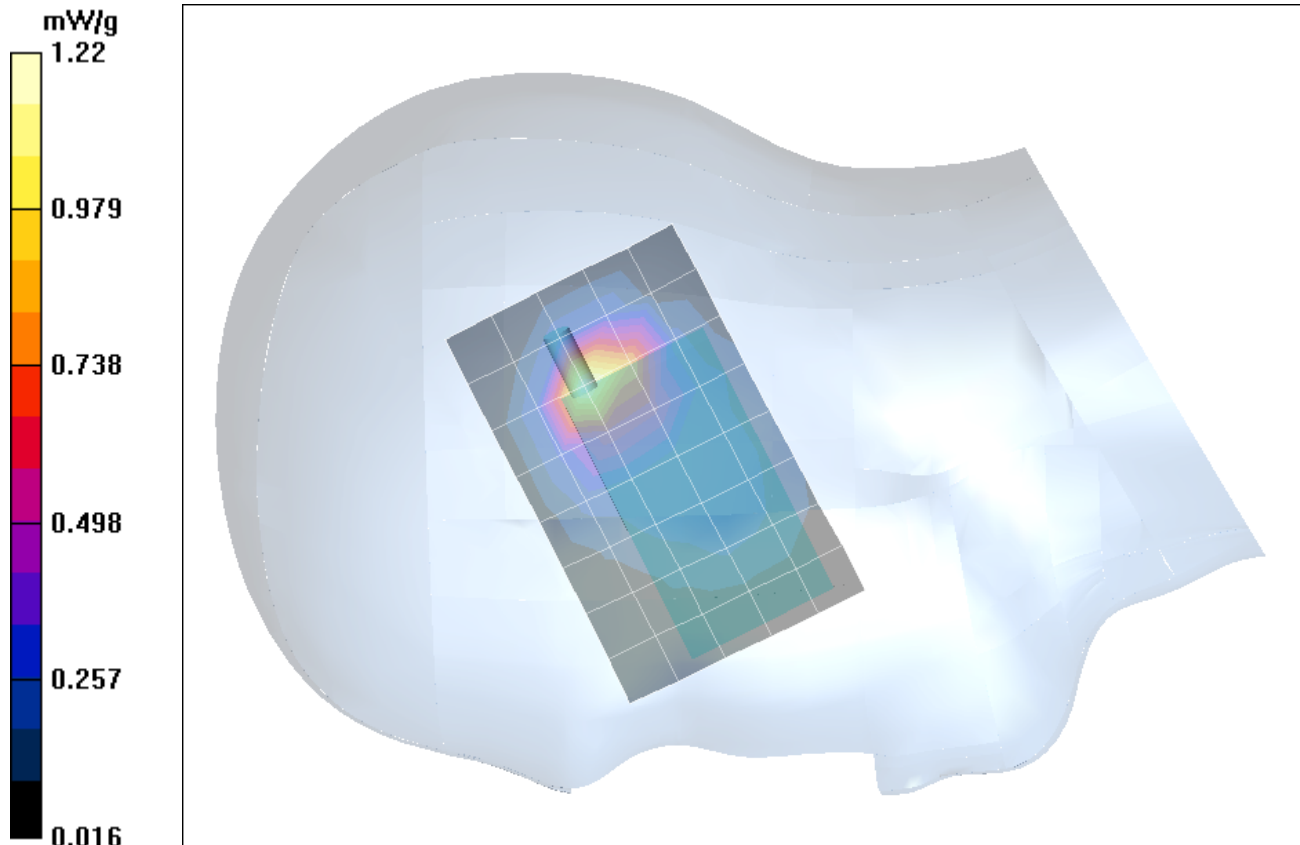
Head SAR - Right Ear-Tilt Position (15°) - High Channel/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

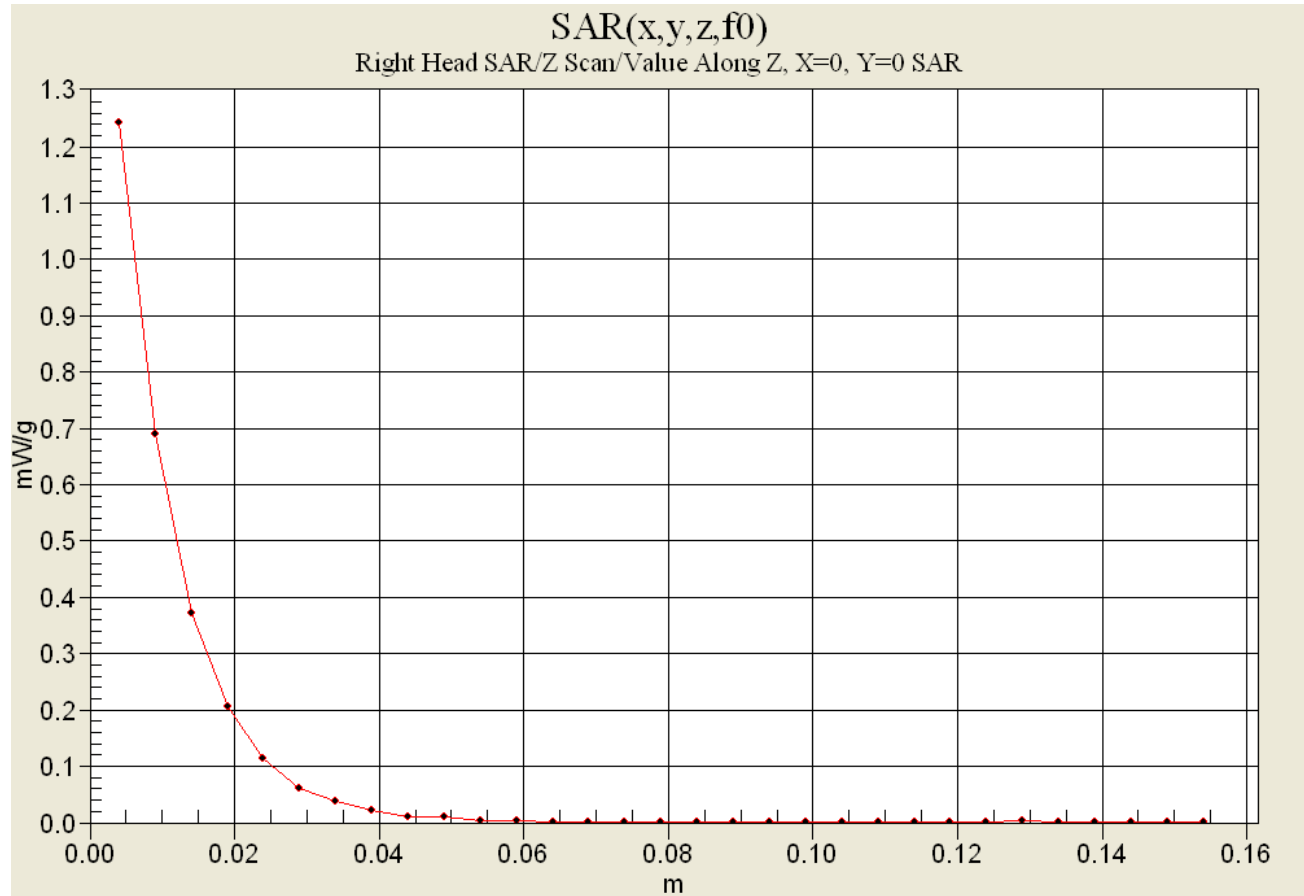
Reference Value = 22.3 V/m; Power Drift = 0.0432 dB

Peak SAR (extrapolated) = 2.07 W/kg

SAR(1 g) = 1.10 mW/g; SAR(10 g) = 0.538 mW/g



Z-Axis Scan



Head SAR - Left Ear - Cheek/Touch Position - Mid Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822
Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM

Frequency: 1880.0 MHz; Duty Cycle: 1:8.3

RF Output Power: 29.89 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: HSL1880 ($\sigma = 1.42$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004

- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

- Electronics: DAE3 Sn353; Calibrated: 19/12/2003

- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033

- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Left Ear Cheek/Touch Position - Mid Channel/Area Scan (6x9x1):

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

Reference Value = 16.8 V/m; Power Drift = -0.0375 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.650 mW/g; SAR(10 g) = 0.389 mW/g

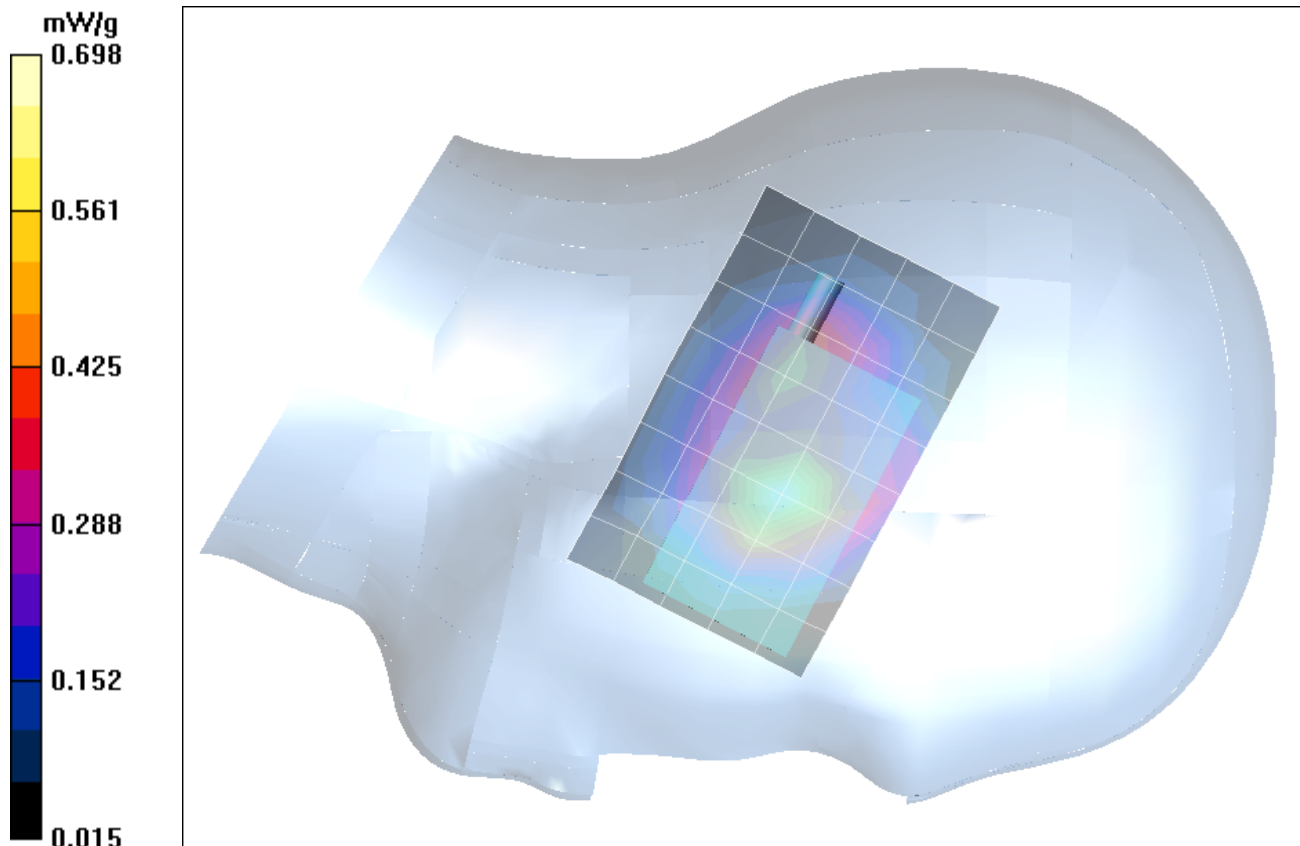
Head SAR - Left Ear Cheek/Touch Position - Mid Channel/Zoom Scan (7x7x7)/Cube 1:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.8 V/m; Power Drift = -0.0375 dB

Peak SAR (extrapolated) = 0.798 W/kg

SAR(1 g) = 0.478 mW/g; SAR(10 g) = 0.270 mW/g



Head SAR - Left Ear-Tilt Position (15°) - Mid Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822

Ambient Temp: 23.2 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 38%

Communication System: PCS GSM

Frequency: 1880.0 MHz; Duty Cycle: 1:8.3

RF Output Power: 29.89 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: HSL1880 ($\sigma = 1.42$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Head SAR - Left Ear-Tilt Position (15°) - Mid Channel/Area Scan (6x9x1):

Measurement grid: dx=15mm, dy=15mm

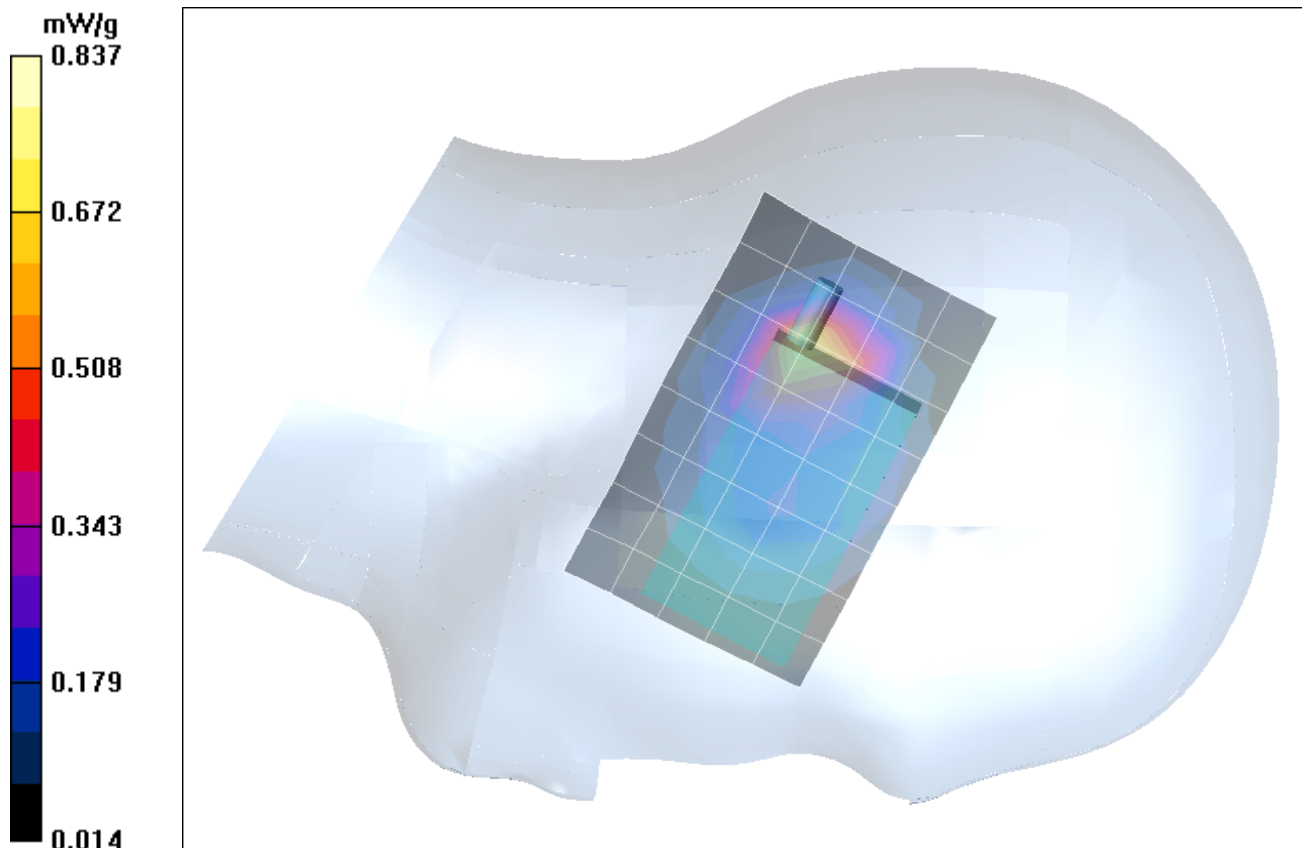
Head SAR - Left Ear-Tilt Position (15°) - Mid Channel/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.2 V/m; Power Drift = -0.0379 dB

Peak SAR (extrapolated) = 1.28 W/kg

SAR(1 g) = 0.729 mW/g; SAR(10 g) = 0.377 mW/g



Body-Worn SAR - Back Side of DUT (2.0 cm Air-Gap Spacing) - Mid Channel

Date Tested: 04/28/04

DUT: Hop-On Wireless Model: HOP1806; Type: Portable PCS GSM Handset; Serial: 353543000004822

Ambient Temp: 24.2 °C; Fluid Temp: 21.5 °C; Barometric Pressure: 102.1 kPa; Humidity: 33%

Body-Worn Accessories: Ear-Microphone

Communication System: PCS GSM

Frequency: 1880.0 MHz; Duty Cycle: 1:8.3

RF Output Power: 29.89 dBm (Conducted)

3.7V 550mAh Li-ion Battery (P/N: HOP1806LB550)

Medium: M1880 ($\sigma = 1.57$ mho/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(4.57, 4.57, 4.57); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Body-Worn - 2.0 cm Air-Gap Separation Distance to Planar Phantom - Mid Channel/Area Scan (6x9x1):

Measurement grid: dx=15mm, dy=15mm

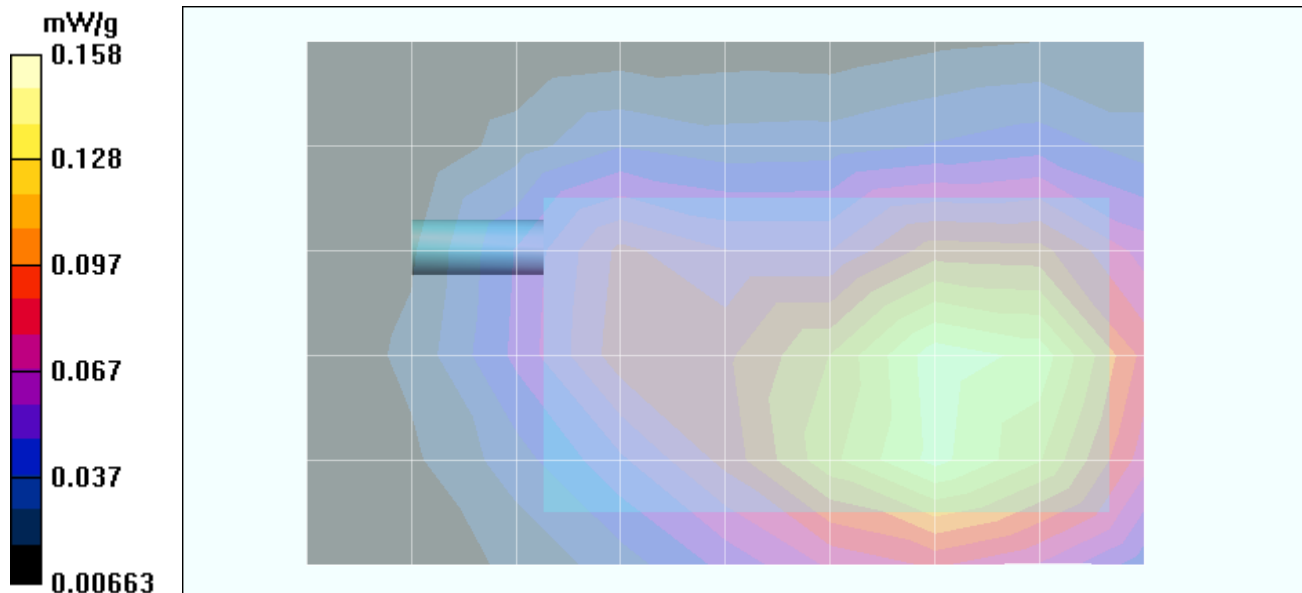
Body-Worn - 2.0 cm Air-Gap Separation Distance to Planar Phantom - Mid Channel/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

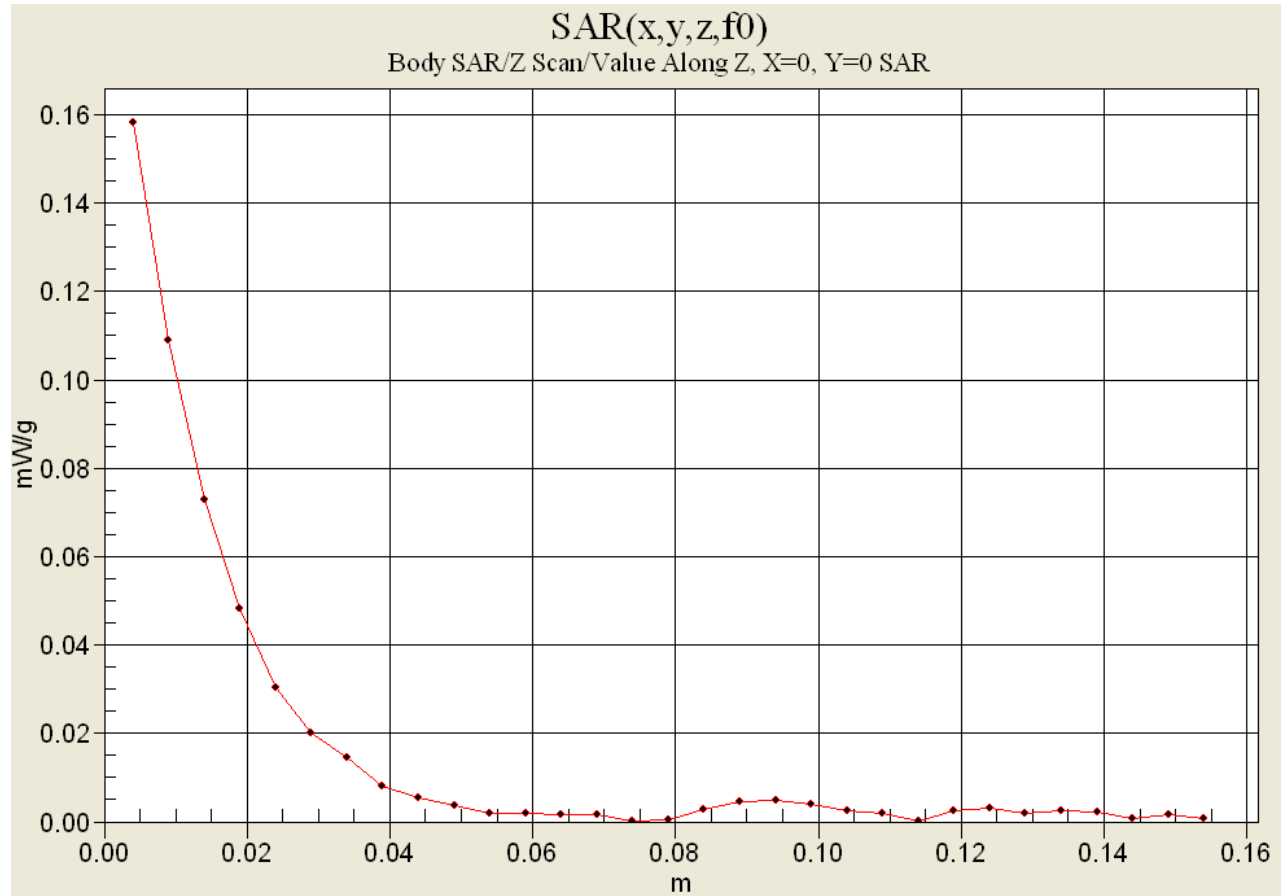
Reference Value = 7.59 V/m; Power Drift = -0.160 dB

Peak SAR (extrapolated) = 0.208 W/kg

SAR(1 g) = 0.147 mW/g; SAR(10 g) = 0.096 mW/g



Z-Axis Scan



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

System Performance Check - 1800 MHz Dipole

Date Tested: 04/28/04

DUT: Dipole 1800 MHz; Model: D1800V2; Type: System Performance Check; Serial: 247

Ambient Temp: 21.5 °C; Fluid Temp: 23.2 °C; Barometric Pressure: 102.8 kPa; Humidity: 33%

Communication System: CW

Forward Conducted Power: 250mW

Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL1800 ($\sigma = 1.38 \text{ mho/m}$; $\epsilon_r = 39.7$; $\rho = 1000 \text{ kg/m}^3$)

- Probe: ET3DV6 - SN1387; ConvF(5.38, 5.38, 5.38); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

1800 MHz System Performance Check/Area Scan (5x8x1):

Measurement grid: dx=15mm, dy=15mm

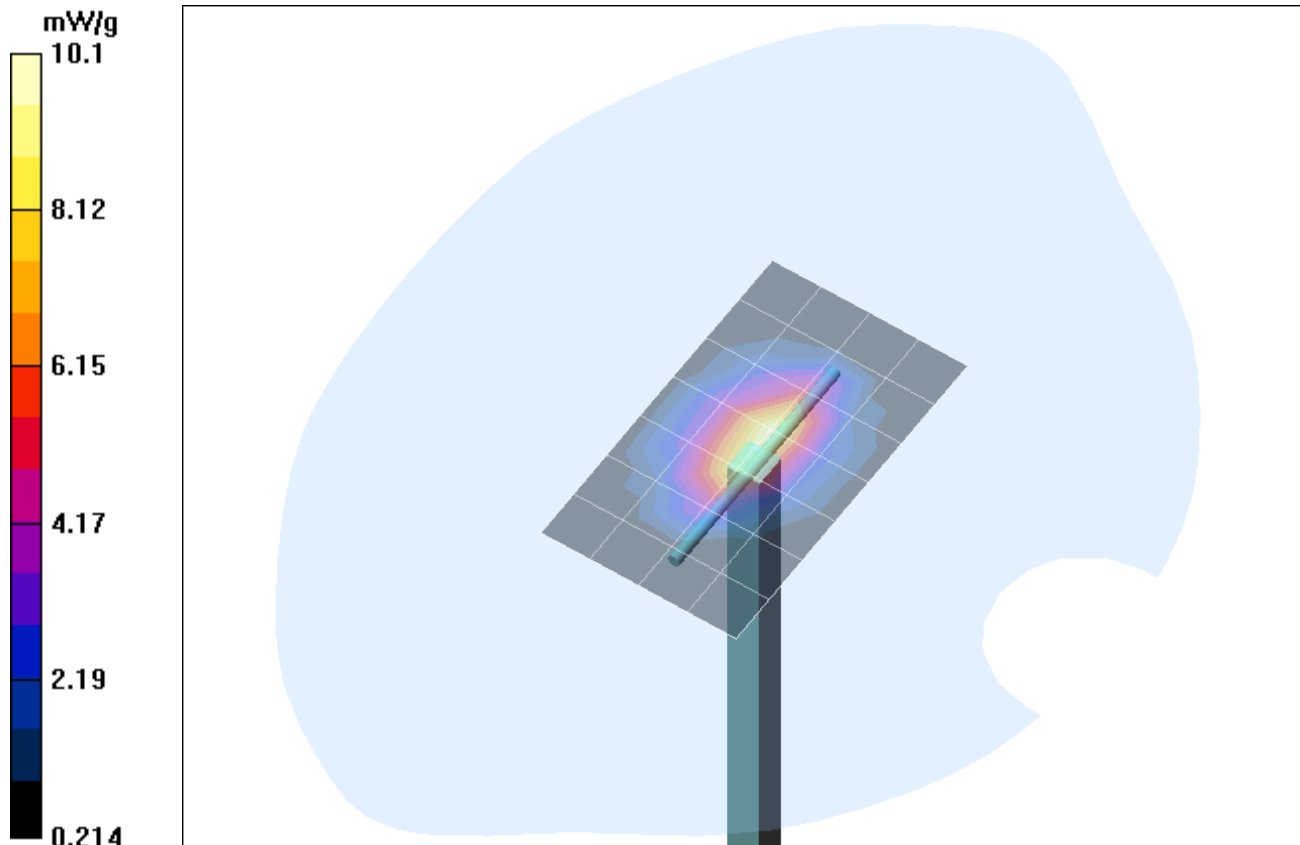
1800 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

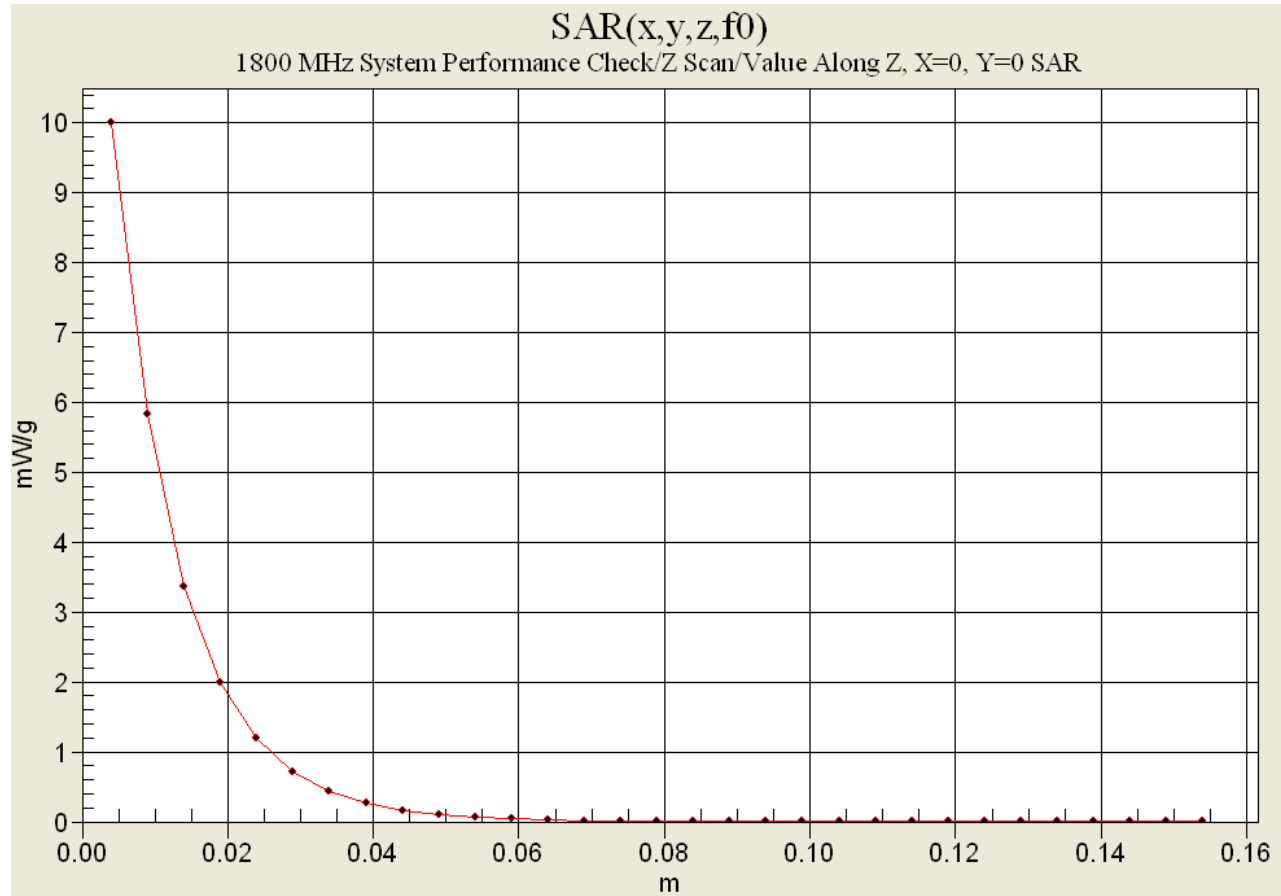
Reference Value = 90.7 V/m; Power Drift = -0.0 dB

Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 8.97 mW/g; SAR(10 g) = 4.79 mW/g



Z-Axis Scan



APPENDIX C - SYSTEM VALIDATION

Client

Celltech Labs

CALIBRATION CERTIFICATE

Object(s)

D1800V2 - SN.247

Calibration procedure(s)

QA CAL-05.v2
Calibration procedure for dipole validation kits

Calibration date:

June 4, 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 R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

Calibrated by:

Name

Judith Mueller

Function

Technician

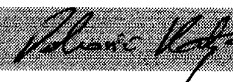
Signature



Approved by:

Katja Pokovic

Laboratory Director



Date issued: June 4, 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.

DASY

Dipole Validation Kit

Type: D1800V2

Serial: 247

Manufactured: August 25, 1999
Calibrated: June 4, 2003

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **head simulating solution** of the following electrical parameters at 1800 MHz:

Relative Dielectricity	39.2	$\pm 5\%$
Conductivity	1.36 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.3 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was $250\text{mW} \pm 3\%$. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	39.6 mW/g $\pm 16.8\%$ (k=2)¹
averaged over 10 cm^3 (10 g) of tissue:	20.9 mW/g $\pm 16.2\%$ (k=2)¹

¹ validation uncertainty

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.190 ns	(one direction)
Transmission factor:	0.998	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:	$\text{Re}\{Z\} = 48.5 \, \Omega$
----------------------------------	-----------------------------------

	$\text{Im}\{Z\} = -6.5 \, \Omega$
--	-----------------------------------

Return Loss at 1800 MHz	-23.3 dB
-------------------------	-----------------

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 06/04/03 14:55:26

Test Laboratory: SPEAG, Zurich, Switzerland
 File Name: SN247_SN1507_HSL1800_040603.da4

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN247
Program: Dipole Calibration

Communication System: CW-1800; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL 1800 MHz ($\sigma = 1.36 \text{ mho/m}$, $\epsilon_r = 39.22$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.3, 5.3, 5.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 96 V/m

Power Drift = -0.004 dB

Maximum value of SAR = 11 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

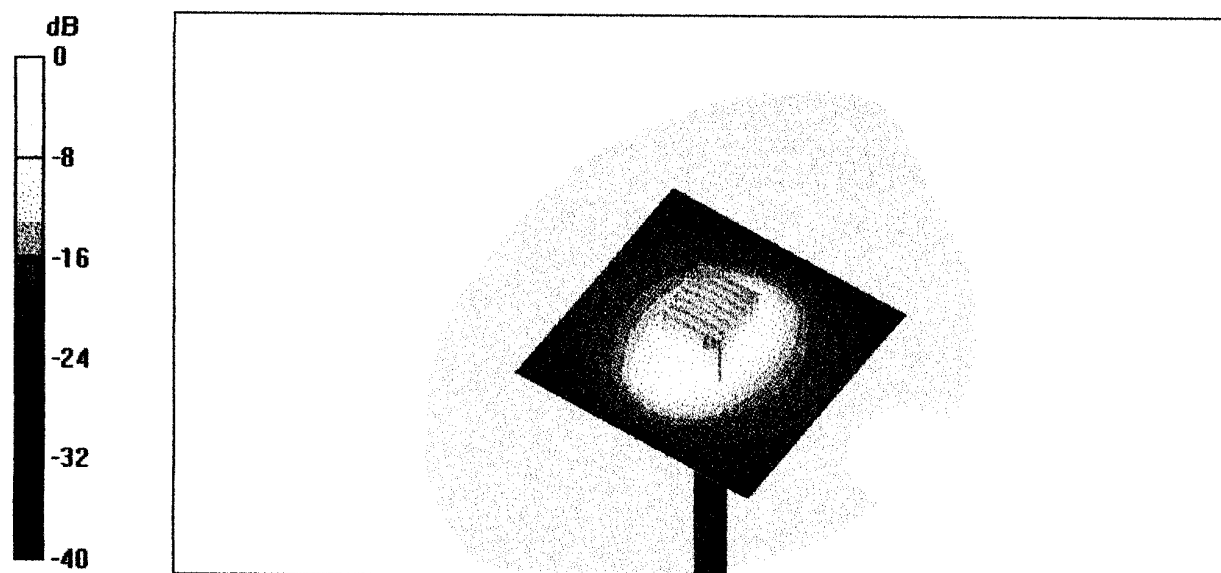
Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.9 mW/g; SAR(10 g) = 5.22 mW/g

Reference Value = 96 V/m

Power Drift = -0.004 dB

Maximum value of SAR = 11.1 mW/g



0 dB = 11.1mW/g

4 Jun 2003 10:48:36

[CH1] S11 1 U FS

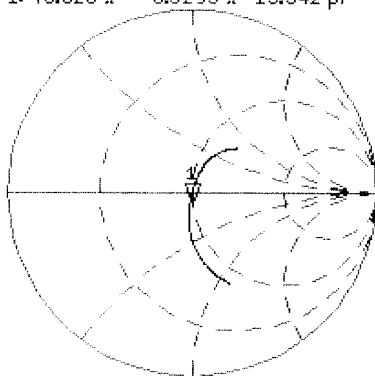
1: 48.520 $\angle$ -6.5293 $\angle$ 13.542 pF

1 800.000 000 MHz

De1

Cor

Avg
16



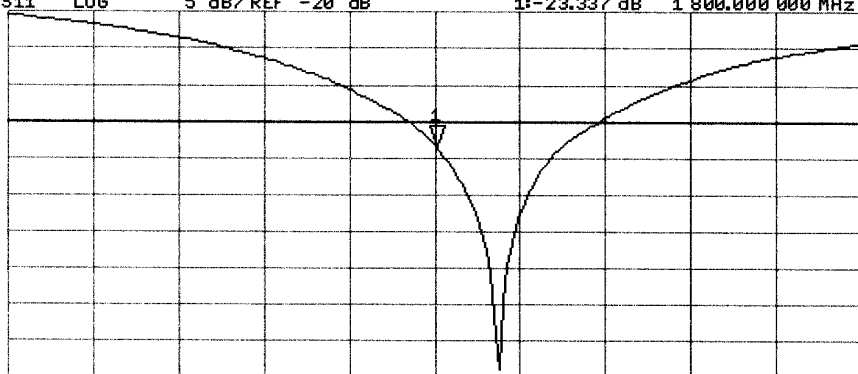
CH2 S11 LOG

5 dB/REF -20 dB

1:-23.337 dB

1 800.000 000 MHz

Cor



CENTER 1 800.000 000 MHz

SPAN 400.000 000 MHz

APPENDIX D - PROBE CALIBRATION

Client **Celltech**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1387**

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

Calibration date: **March 18, 2004**

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

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Date issued: March 18, 2004

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 calibrated:	February 26, 2003
Recalibrated:	March 18, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

Diode Compression^A

NormX	$1.62 \mu\text{V}/(\text{V}/\text{m})^2$	DCP X	92	mV
NormY	$1.71 \mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	92	mV
NormZ	$1.71 \mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Sensor Cener to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.3	4.4
SAR _{be} [%]	With Correction Algorithm	0.0	0.1

Head 1800 MHz Typical SAR gradient: 10 % per mm

Sensor to Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	14.8	10.0
SAR _{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

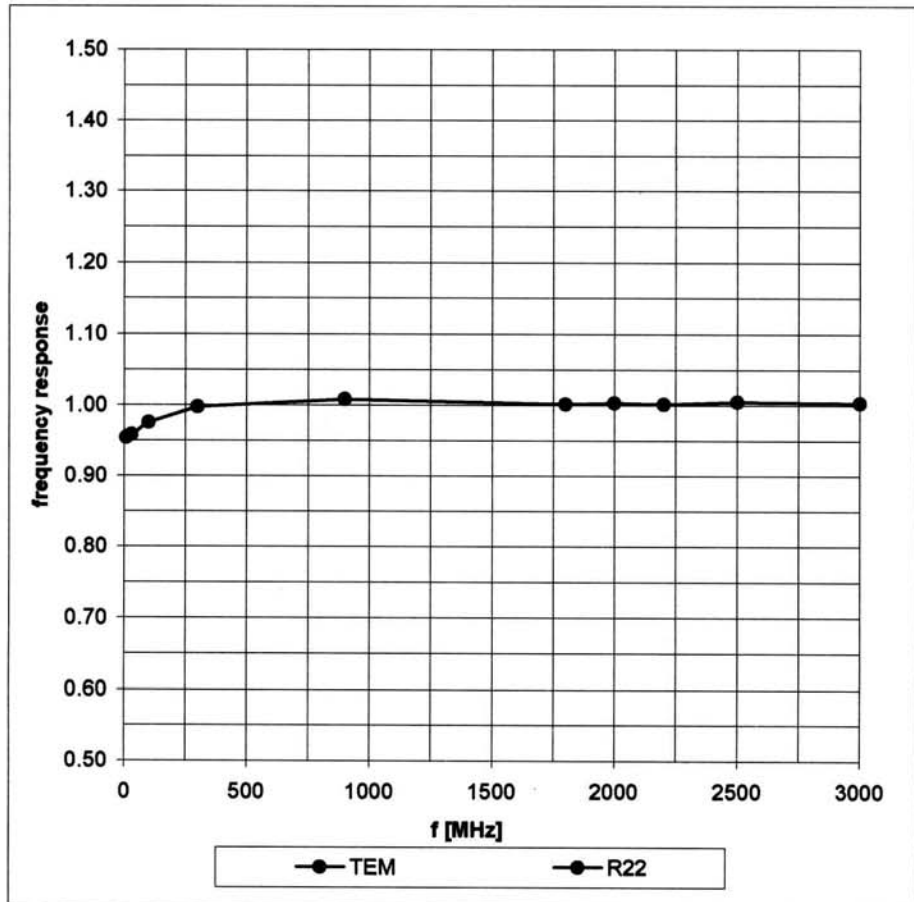
Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

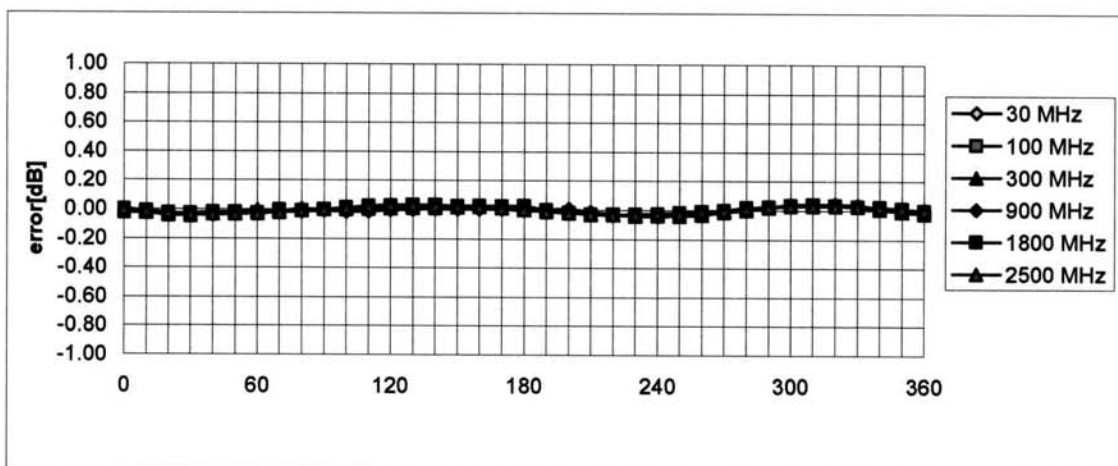
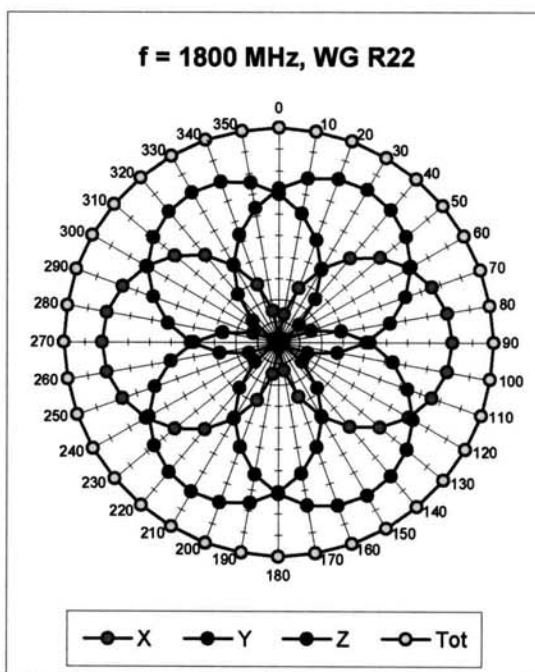
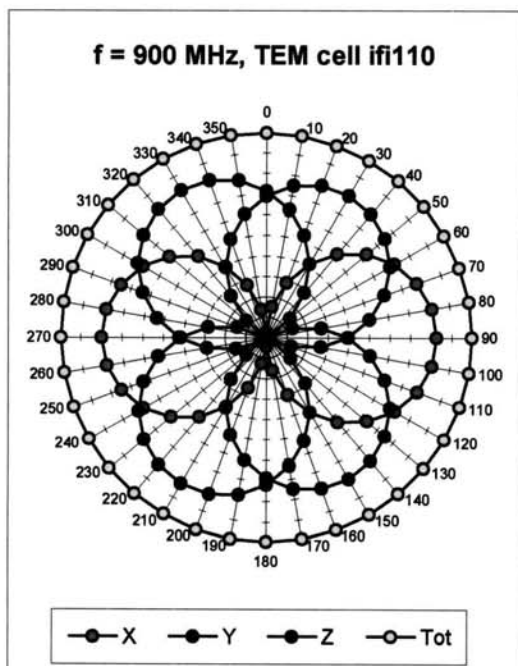
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A numerical linearization parameter: uncertainty not required

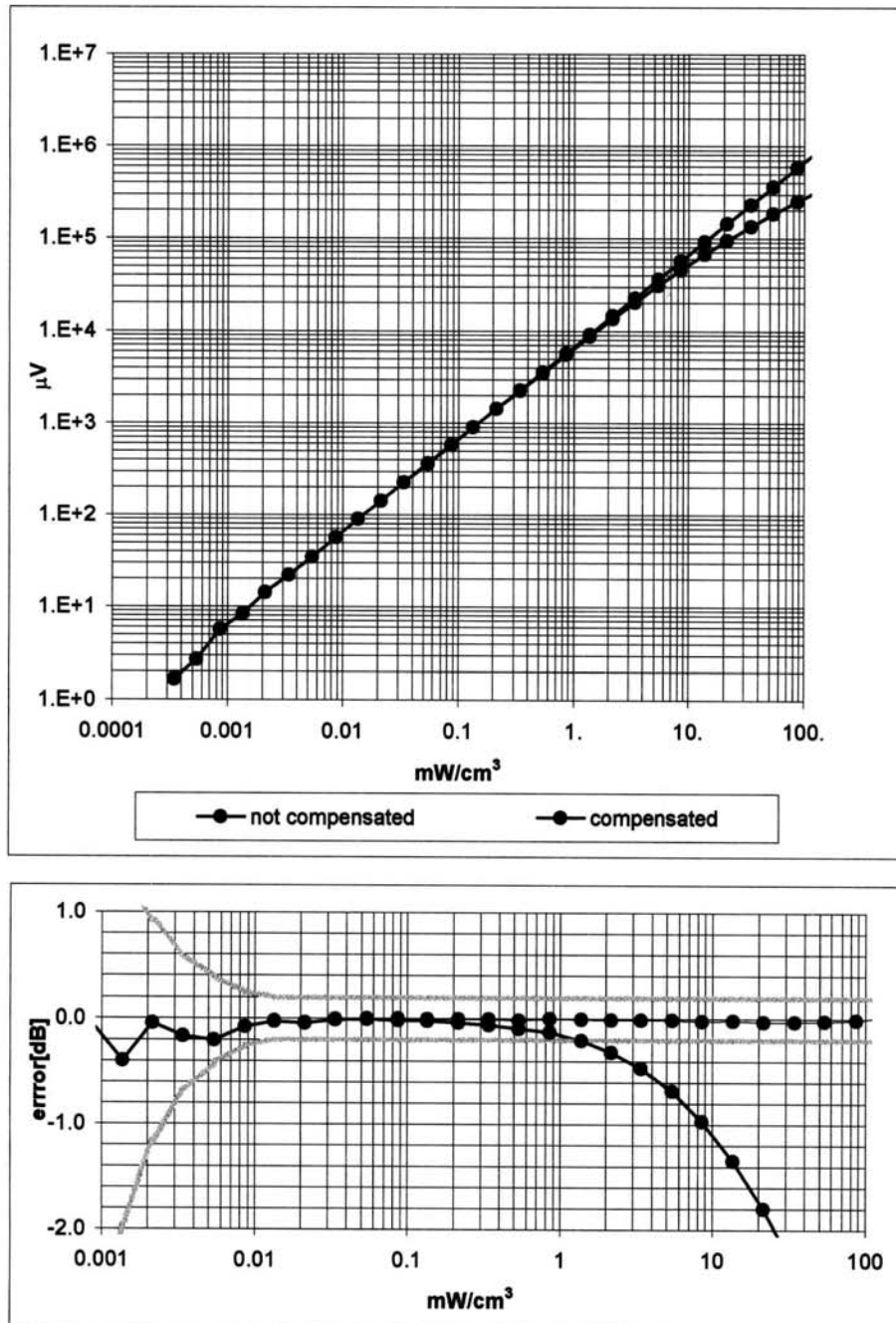
Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



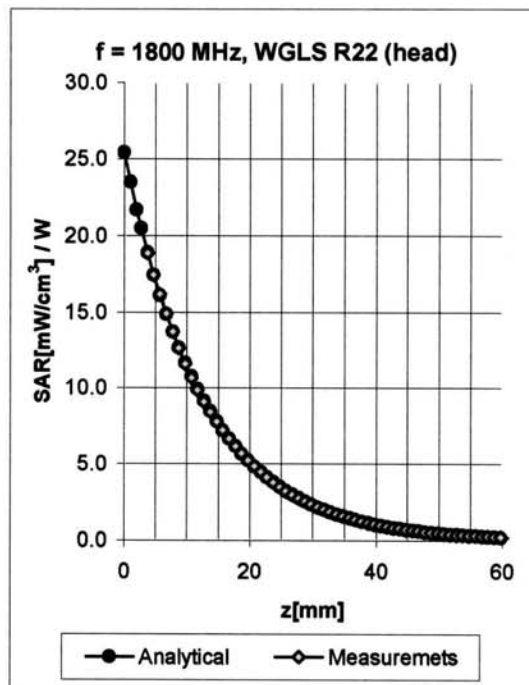
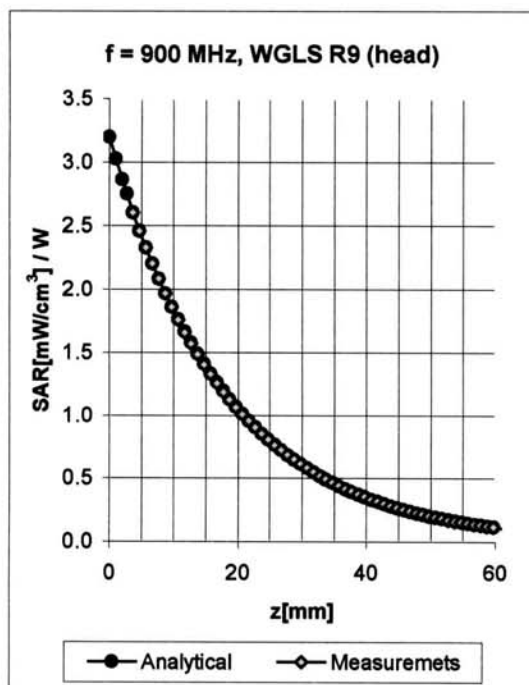
Receiving Pattern (ϕ) , $\theta = 0^\circ$ **Axial Isotropy Error < ± 0.2 dB**

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22)



Probe Linearity $< \pm 0.2$ dB

Conversion Factor Assessment

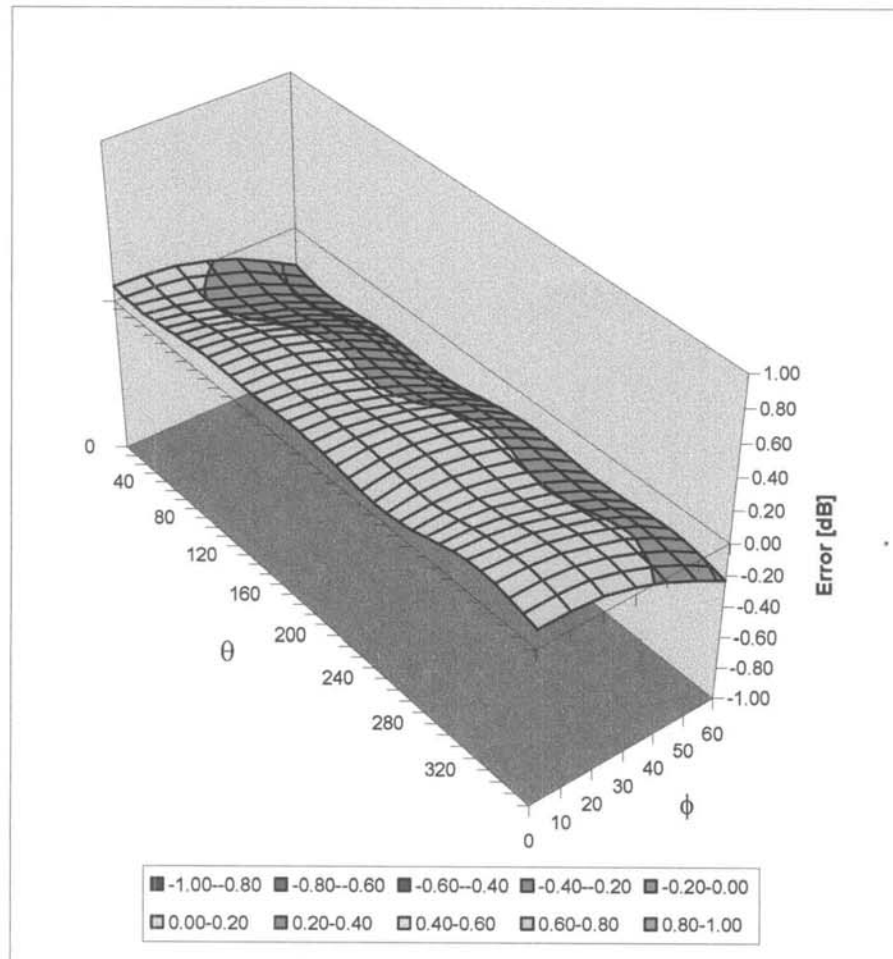


f [MHz]	Validity [MHz] ^B	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	750-950	Head	41.5 ± 5%	0.90 ± 5%	0.72	1.78	6.71	± 11.9% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.51	2.67	5.38	± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.66	5.25	± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.99	1.89	4.77	± 9.7% (k=2)
835	750-950	Body	55.2 ± 5%	0.97 ± 5%	0.56	2.04	6.24	± 11.9% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.58	2.82	4.68	± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.62	2.77	4.57	± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.75	1.28	4.50	± 9.7% (k=2)

^B The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Spherical Isotropy Error < ± 0.4 dB

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1387

Place of Assessment:

Zurich

Date of Assessment:

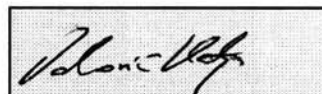
March 22, 2004

Probe Calibration Date:

March 18, 2004

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:1387Conversion factor ($\pm$ standard deviation)

150 MHz	ConvF	9.1 $\pm$ 8%	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\%$ mho/m (head tissue)
300 MHz	ConvF	7.8 $\pm$ 8%	$\epsilon_r = 45.3 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
450 MHz	ConvF	7.5 $\pm$ 8%	$\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
150 MHz	ConvF	8.7 $\pm$ 8%	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\%$ mho/m (body tissue)
450 MHz	ConvF	7.6 $\pm$ 8%	$\epsilon_r = 56.7 \pm 5\%$ $\sigma = 0.94 \pm 5\%$ mho/m (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

1800 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

April 28, 2004

Frequency	e'	e''
1.700000000 GHz	40.1163	13.4302
1.710000000 GHz	40.0881	13.4671
1.720000000 GHz	40.0488	13.5040
1.730000000 GHz	39.9669	13.5346
1.740000000 GHz	39.8912	13.5837
1.750000000 GHz	39.8457	13.6183
1.760000000 GHz	39.7923	13.6576
1.770000000 GHz	39.7632	13.6888
1.780000000 GHz	39.7305	13.7068
1.790000000 GHz	39.7046	13.7391
1.800000000 GHz	39.6693	13.7587
1.810000000 GHz	39.6292	13.7934
1.820000000 GHz	39.5878	13.8290
1.830000000 GHz	39.5372	13.8521
1.840000000 GHz	39.4999	13.8702
1.850000000 GHz	39.4556	13.8897
1.860000000 GHz	39.4315	13.9059
1.870000000 GHz	39.3683	13.9346
1.880000000 GHz	39.3158	13.9688
1.890000000 GHz	39.2625	13.9947
1.900000000 GHz	39.2410	14.0217

1880 MHz DUT Evaluation (Head)

Measured Fluid Dielectric Parameters (Brain)

April 28, 2004

Frequency	e'	e''
1.780000000 GHz	38.9370	13.3545
1.790000000 GHz	38.8982	13.3745
1.800000000 GHz	38.8606	13.4151
1.810000000 GHz	38.8259	13.4177
1.820000000 GHz	38.7690	13.4367
1.830000000 GHz	38.7303	13.4840
1.840000000 GHz	38.6829	13.4947
1.850000000 GHz	38.6212	13.5142
1.860000000 GHz	38.5932	13.5285
1.870000000 GHz	38.5454	13.5668
1.880000000 GHz	38.4824	13.5879
1.890000000 GHz	38.4538	13.6293
1.900000000 GHz	38.4164	13.6497
1.910000000 GHz	38.3725	13.6861
1.920000000 GHz	38.3492	13.7301
1.930000000 GHz	38.3174	13.7678
1.940000000 GHz	38.2937	13.7887
1.950000000 GHz	38.2608	13.7980
1.960000000 GHz	38.1972	13.8123
1.970000000 GHz	38.1388	13.8237
1.980000000 GHz	38.0641	13.8488

1880 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

April 28, 2004

Frequency	e'	e''
1.780000000 GHz	51.2251	14.8351
1.790000000 GHz	51.2097	14.8804
1.800000000 GHz	51.1828	14.9135
1.810000000 GHz	51.1431	14.9502
1.820000000 GHz	51.0900	14.9555
1.830000000 GHz	51.0721	14.9497
1.840000000 GHz	51.0315	14.9490
1.850000000 GHz	50.9749	14.9443
1.860000000 GHz	50.9311	14.9613
1.870000000 GHz	50.8797	14.9674
1.880000000 GHz	50.8274	15.0243
1.890000000 GHz	50.8172	15.0702
1.900000000 GHz	50.7914	15.1120
1.910000000 GHz	50.7890	15.1868
1.920000000 GHz	50.7954	15.2326
1.930000000 GHz	50.7918	15.2729
1.940000000 GHz	50.7955	15.3033
1.950000000 GHz	50.7534	15.3002
1.960000000 GHz	50.7132	15.3133
1.970000000 GHz	50.6504	15.3191
1.980000000 GHz	50.5907	15.3579

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

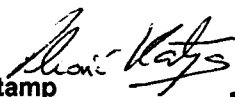
- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9
- (*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

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 & DUT PHOTOGRAPHS

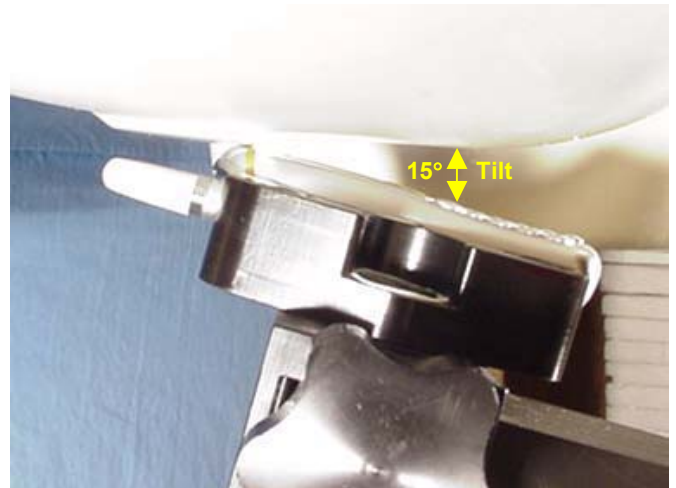
HEAD SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Cheek-Touch Position



HEAD SAR TEST SETUP PHOTOGRAPHS

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



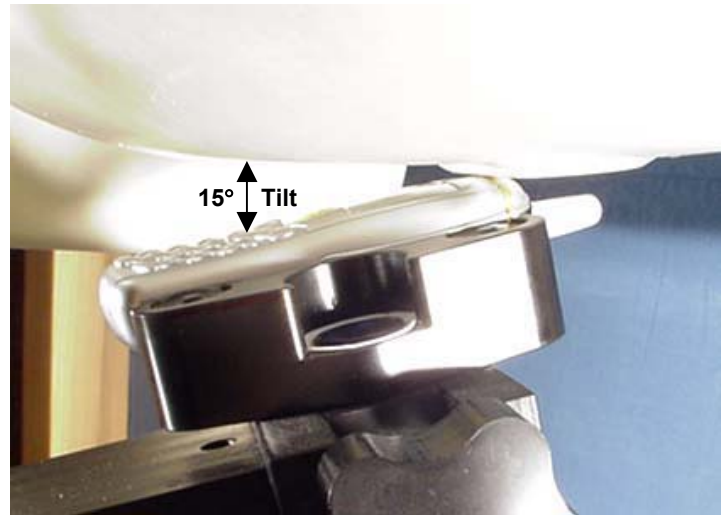
HEAD SAR TEST SETUP PHOTOGRAPHS

Left Head Section / Cheek-Touch Position



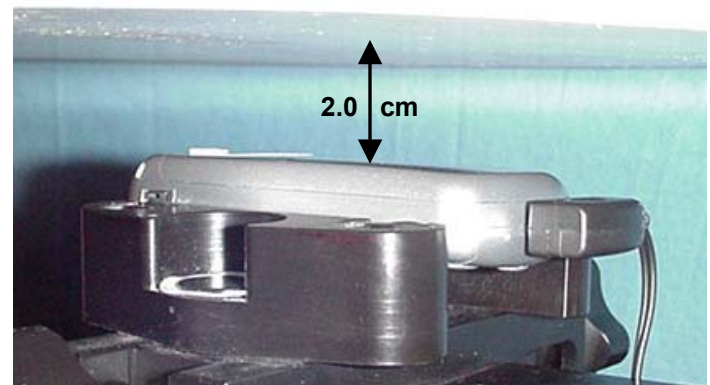
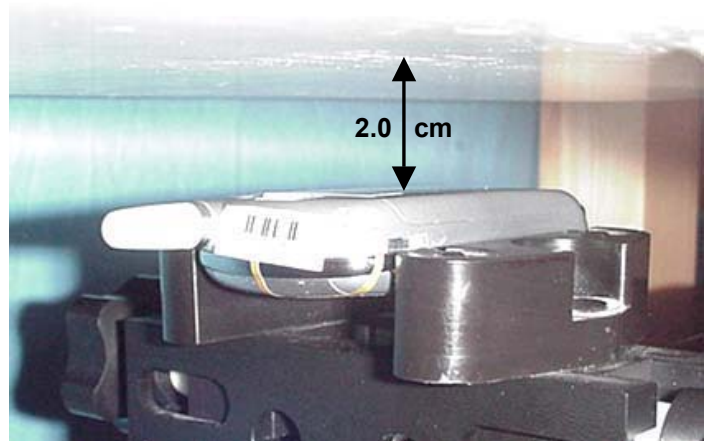
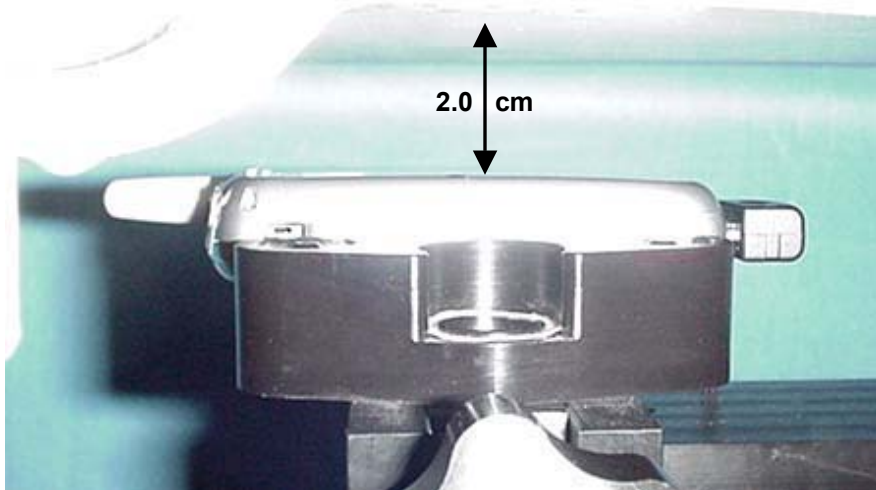
HEAD SAR TEST SETUP PHOTOGRAPHS

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



BODY SAR TEST SETUP PHOTOGRAPHS

Body-Worn with 2.0 cm Air-Gap Separation Distance from Back of DUT to Planar Phantom
(with Ear-Microphone Accessory)



DUT PHOTOGRAPHS



Front of DUT



Back of DUT



Bottom End of DUT



Right Side of DUT



Left Side of DUT



Top End of DUT

DUT PHOTOGRAPHS



with Ear-Microphone Accessory



Stubby Antenna

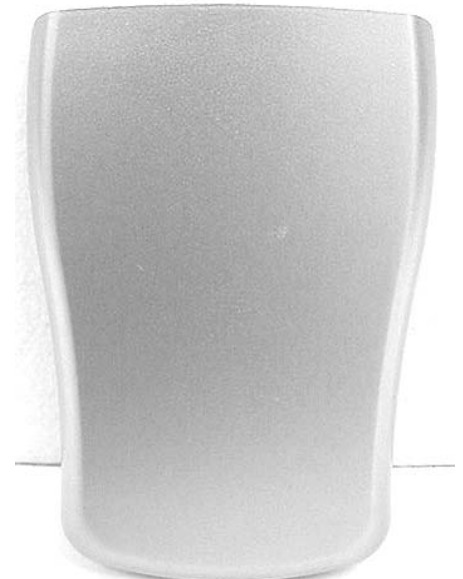
DUT PHOTOGRAPHS



Battery Compartment



Lithium-ion Battery Pack



Lithium-ion Battery Pack