

DECLARATION OF COMPLIANCE SAR 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 (01-01) |
| Device Type: | Portable UHF GMRS PTT Radio Transceiver |
| FCC ID: | PM3MK1996 |
| Model(s): | MK1996 |
| Modulation: | FM (UHF) |
| Tx Frequency Range: | 462.5625 - 467.7125 MHz (GMRS Channels 15-22) |
| RF Output Power Tested: | 1.6 Watts (ERP) |
| Antenna Type(s): | Fixed |
| Battery Type(s): | 1.5V AAA Alkaline (x4) 1.2V AAA NiMH (x4) |
| Body-Worn Accessories: | Belt-Clip, Ear-Microphone |
| Max. SAR Measured: | 0.550 W/kg - Face-held (50% Duty Cycle) 0.985 W/kg - Body-worn (50% Duty Cycle) |

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



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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Genex Telecom Co., Ltd. Model: MK1996 Portable UHF GMRS PTT Radio Transceiver FCC ID: PM3MK1996 with the RF exposure requirements of 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]) and IC RSS-102 Issue 1 (Provisional) (see reference [4]), were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

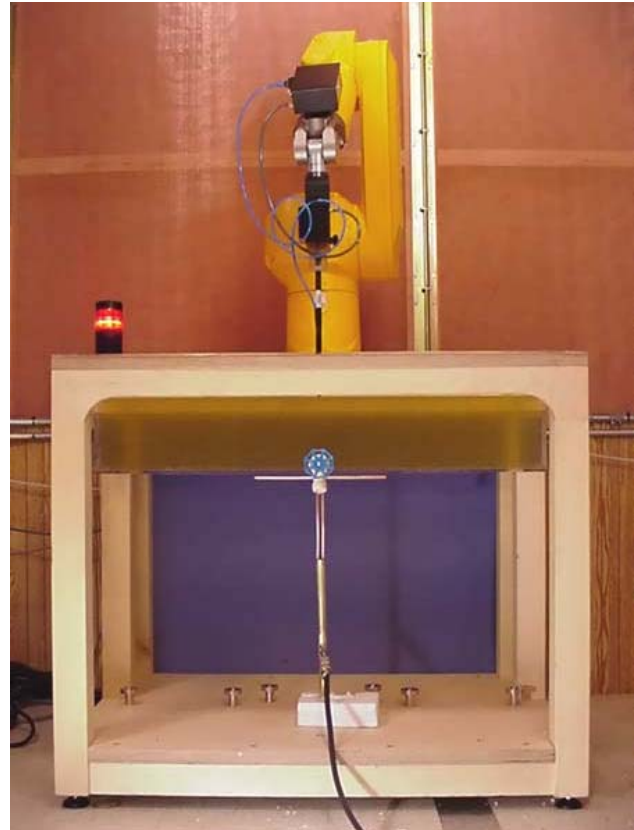
| | |
|-------------------------------------|---|
| FCC Rule Part(s) | 47 CFR §2.1093 |
| IC Rule Part(s) | RSS-102 Issue 1 (Provisional) |
| Test Procedure(s) | FCC OET Bulletin 65, Supplement C (01-01) |
| Device Type | Portable UHF GMRS PTT Radio Transceiver |
| FCC ID | PM3MK1996 |
| Model(s) | MK1996 |
| Serial No. | Pre-production |
| Modulation | FM (UHF) |
| Tx Frequency Range | 462.5625 - 462.7125 MHz (GMRS Channels 15-22) |
| RF Output Power Tested | 1.6 Watts (ERP) |
| Battery Type(s) | 1.5V AAA Alkaline (x4) 1.2V AAA NiMH (x4) |
| Antenna Type(s) | Fixed |
| Body-Worn Accessories Tested | Belt-Clip, Ear-Microphone |

3.0 SAR MEASUREMENT SYSTEM

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



DASY3 SAR Measurement System with SAM Phantom



DASY3 SAR Measurement System with validation phantom

4.0 MEASUREMENT SUMMARY

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

| SAR EVALUATION RESULTS | | | | | | | | | | | | |
|---|-------------|--------------|------|---------------------|--------------|--------------------------|------------|---------------------|----------------|----------------|-------------------|----------------|
| Test Type | Freq. (MHz) | Chan. | Mode | RF Output Power (W) | Battery Type | Separation Distance (cm) | Fluid Type | Measured SAR (W/kg) | | SAR Drift (dB) | Scaled SAR (W/kg) | |
| | | | | | | | | 100% Duty Cycle | 50% Duty Cycle | | 100% Duty Cycle | 50% Duty Cycle |
| Face | 462.6250 | 22 | CW | 1.6 Watts | Alkaline | 2.5 | Brain | 1.10 | 0.550 | 1.73 | 1.64 | 0.820 |
| Face | 462.6250 | 22 | CW | 1.6 Watts | NiMH | 2.5 | Brain | 0.766 | 0.383 | 1.73 | 1.14 | 0.570 |
| Body | 462. 6250 | 22 | CW | 1.6 Watts | Alkaline | 0.6 | Body | 1.66 | 0.830 | 1.73 | 2.47 | 1.24 |
| Body | 462. 6250 | 22 | CW | 1.6 Watts | NiMH | 0.6 | Body | 1.97 | 0.985 | 1.73 | 2.93 | 1.47 |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN / BODY: 1.6 W/kg / (averaged over 1 gram) | | | | | | | | | | | | |
| Dielectric Constant | | Brain 450MHz | | Body 450MHz | | Atmospheric Pressure | | 103.2kPa | | | | |
| | | IEEE Target | | Measured | | Relative Humidity | | 49 % | | | | |
| | | 43.5 | | 43.7 | | Ambient Temperature | | 22.8 °C | | | | |
| Conductivity | | Brain 450MHz | | Body 450MHz | | Fluid Temperature | | 20.5 °C | | | | |
| | | IEEE Target | | Measured | | Fluid Depth | | ≥ 15 cm | | | | |
| | | 0.87 | | 0.87 | | Phantom Section | | Planar | | | | |

Note(s):

1. The transmission band of the EUT is less than 10 MHz, therefore mid channel data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
2. A SAR versus time evaluation was performed at the worst-case configuration (body-worn, NiMH battery) for the duration of the test (twenty minutes). The SAR drift was converted to dBm and added to the measured SAR values (see scaled SAR values in table above). The SAR versus time evaluation plot is shown in Appendix A (SAR Test Plots).
3. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
4. The dielectric properties of the simulated body fluid were verified prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

5.0 DETAILS OF SAR EVALUATION

The Genex Telecom Co., Ltd. Model: MK1996 Portable UHF GMRS PTT Radio Transceiver FCC ID: PM3MK1996 was found to be compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix G.

1. The EUT was evaluated in a face-held configuration with the front of the device placed parallel to the outer surface of the SAM phantom (planar section). A 2.5 cm separation distance was maintained between the front side of the EUT and the outer surface of SAM phantom (planar section) for the duration of the tests.
2. The EUT was tested in a body-worn configuration with the back of the device placed parallel to the outer surface of the SAM phantom (planar section). The attached belt-clip was touching the SAM phantom (planar section) and provided a 0.6 cm separation distance between the back of the EUT and the outer surface of the SAM phantom (planar section). The EUT was tested for body-worn SAR with the ear-microphone accessory connected.
3. The conducted power level of the EUT could not be measured for the SAR evaluation. The EUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer.
4. The EUT was evaluated for SAR at the maximum ERP measured by signal substitution method.
5. The EUT was tested in unmodulated continuous transmit operation (Continuous Wave mode, 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
6. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
7. The EUT was tested with fully charged batteries.

6.0 EVALUATION PROCEDURES

- a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm.
- c. Based on the area scan data, the area of maximum absorption was determined by spline interpolation. Around this point, a volume of 40 x 40 x 35 mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points.
- d. The 1g and 10g spatial peak SAR was determined as follows:
 1. The first step was an extrapolation to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm (see probe calibration document in Appendix D). The extrapolation was based on a least square algorithm [W. Gander, Computermathematik, p.168-180] (see reference [6]). Through the points in the first 3 cm in all z-axis, polynomials of the fourth order were calculated. This polynomial was then used to evaluate the points between the surface and the probe tip.
 2. The next step used 3D-spline interpolation to get all points within the measured volume in a 1mm grid (35000 points). The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff] (see reference [6]).
 3. The maximal interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-spline interpolation algorithm. 8000 points (20x20x20) were interpolated to calculate the average.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the evaluation a system check was performed using a planar phantom with a 450MHz dipole (see Appendix C for system validation procedure). The dielectric parameters of the simulated tissue fluids were verified prior to the system check using an 85070C Dielectric Probe Kit and an 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 $\pm 10\%$ (see Appendix B for system check test plot).

| SYSTEM PERFORMANCE CHECK | | | | | | | | | | | |
|--------------------------|----------------------|---------------------|----------|----------------------------------|----------|-------------------------------|----------|-----------------------------|---------------|-------------|--------------|
| Test Date | 450MHz Equiv. Tissue | SAR 1g (W/kg) | | Dielectric Constant ϵ_r | | Conductivity σ (mho/m) | | ρ (Kg/m ³) | Ambient Temp. | Fluid Temp. | Fluid Depth |
| | | IEEE Target | Measured | IEEE Target | Measured | IEEE Target | Measured | | | | |
| 03/14/03 | Brain | 1.23 ($\pm 10\%$) | 1.21 | 43.5 ($\pm 5\%$) | 43.7 | 0.87 ($\pm 5\%$) | 0.87 | 1000 | 22.8 °C | 20.5 °C | ≥ 15 cm |

Note(s):

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

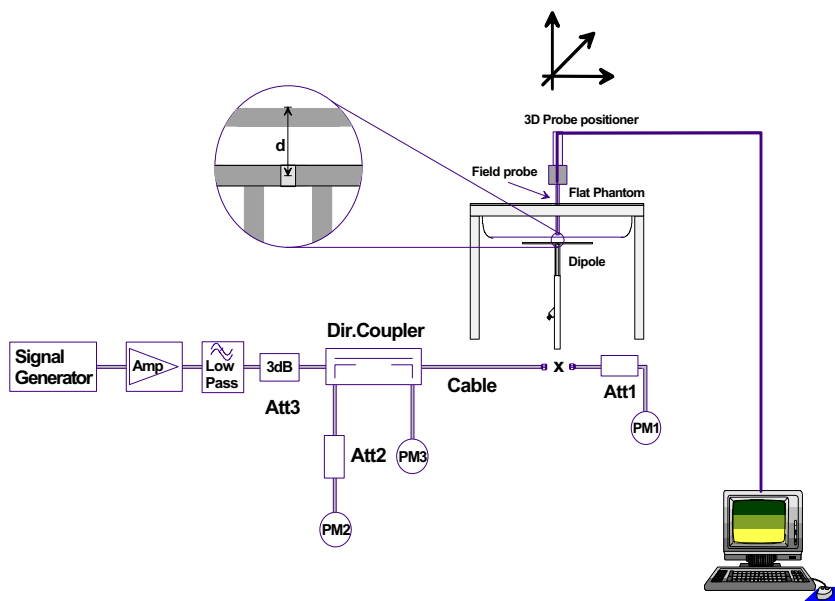


Figure 1. System Check Setup Diagram



450MHz System Check Setup

8.0 SIMULATED TISSUES

The 450MHz brain and body simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures, and measured for dielectric parameters (permittivity and conductivity).

| TISSUE MIXTURES | | |
|-----------------|--------------------------------|---------------------------------|
| INGREDIENT | 450MHz Brain (System Check) | 450MHz Body (EUT Evaluation) |
| Water | 38.56 % | 52.00 % |
| Sugar | 56.32 % | 45.65 % |
| Salt | 3.95 % | 1.75 % |
| HEC | 0.98 % | 0.50 % |
| Bactericide | 0.19 % | 0.10 % |

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 1g of tissue) | 1.60 | 8.0 |
| Spatial Peak (hands/wrists/feet/ankles averaged over 10g) | 4.0 | 20.0 |

Notes:

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

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

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

Data Acquisition Electronic (DAE) System

Cell Controller

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

Data Converter

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

PC Interface Card

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

E-Field Probe

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

Evaluation Phantom

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

Validation Phantom (for devices ≤ 450 MHz)

Type: Planar Phantom
Shell Material: Plexiglas
Bottom Thickness: $6.2 \text{ mm} \pm 0.1 \text{ mm}$
Dimensions: 83.5cm (L) x 36.9cm (W) x 21.8cm (H)

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) |
| Dynam. Rnge: | 5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB |
| Srfce. Detect. | ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces |
| Dimensions: | Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm |
| Application: | General dosimetry up to 3 GHz Compliance tests of mobile phone |



ET3DV6 E-Field Probe

12.0 VALIDATION PLANAR PHANTOM

The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at and below 450MHz. The validation planar phantom is mounted in the DASY3 compact system in place of the SAM phantom.



Validation Planar Phantom

13.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0mm 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

14.0 DEVICE HOLDER

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



Device Holder

15.0 TEST EQUIPMENT LIST

| SAR MEASUREMENT SYSTEM | | |
|---|--|---|
| EQUIPMENT | SERIAL NO. | CALIBRATION DATE |
| DASY3 System -Robot -ET3DV6 E-Field Probe -300MHz Validation Dipole -450MHz Validation Dipole -900MHz Validation Dipole -1800MHz Validation Dipole -2450MHz Validation Dipole -SAM Phantom V4.0C -Validation Planar Phantom | 599396-01 1590 135 136 054 247 150 N/A N/A | N/A Dec 2002 Oct 2002 Oct 2002 June 2001 June 2001 Oct 2002 N/A N/A |
| 85070C Dielectric Probe Kit | N/A | N/A |
| Gigatronics 8652A Power Meter -Power Sensor 80701A -Power Sensor 80701A | 1835272 1833535 1833542 | Feb 2003 Feb 2003 Mar 2003 |
| E4408B Spectrum Analyzer | US39240170 | Nov 2002 |
| 8594E Spectrum Analyzer | 3543A02721 | Feb 2003 |
| 8753E Network Analyzer | US38433013 | Feb 2003 |
| 8648D Signal Generator | 3847A00611 | Feb 2003 |
| 5S1G4 Amplifier Research Power Amplifier | 26235 | N/A |

16.0 MEASUREMENT UNCERTAINTIES

| Error Description | Uncertainty Value $\pm\%$ | Probability Distribution | Divisor | C_i 1g | Standard Uncertainty $\pm\%$ (1g) | v_i or v_{eff} |
|---|------------------------------|--------------------------|------------|-------------|--------------------------------------|--------------------|
| Measurement System | | | | | | |
| Probe calibration | ± 4.8 | Normal | 1 | 1 | ± 4.8 | ∞ |
| Axial isotropy of the probe | ± 4.7 | Rectangular | $\sqrt{3}$ | $(1-c_p)$ | ± 1.9 | ∞ |
| Spherical isotropy of the probe | ± 9.6 | Rectangular | $\sqrt{3}$ | (c_p) | ± 3.9 | ∞ |
| Spatial resolution | ± 0.0 | Rectangular | $\sqrt{3}$ | 1 | ± 0.0 | ∞ |
| Boundary effects | ± 5.5 | Rectangular | $\sqrt{3}$ | 1 | ± 3.2 | ∞ |
| Probe linearity | ± 4.7 | Rectangular | $\sqrt{3}$ | 1 | ± 2.7 | ∞ |
| Detection limit | ± 1.0 | Rectangular | $\sqrt{3}$ | 1 | ± 0.6 | ∞ |
| Readout electronics | ± 1.0 | Normal | 1 | 1 | ± 1.0 | ∞ |
| Response time | ± 0.8 | Rectangular | $\sqrt{3}$ | 1 | ± 0.5 | ∞ |
| Integration time | ± 1.4 | Rectangular | $\sqrt{3}$ | 1 | ± 0.8 | ∞ |
| RF ambient conditions | ± 3.0 | Rectangular | $\sqrt{3}$ | 1 | ± 1.7 | ∞ |
| Mech. constraints of robot | ± 0.4 | Rectangular | $\sqrt{3}$ | 1 | ± 0.2 | ∞ |
| Probe positioning | ± 2.9 | Rectangular | $\sqrt{3}$ | 1 | ± 1.7 | ∞ |
| Extrapolation & integration | ± 3.9 | Rectangular | $\sqrt{3}$ | 1 | ± 2.3 | ∞ |
| Test Sample Related | | | | | | |
| Device positioning | ± 6.0 | Normal | $\sqrt{3}$ | 1 | ± 6.7 | 12 |
| Device holder uncertainty | ± 5.0 | Normal | $\sqrt{3}$ | 1 | ± 5.9 | 8 |
| Power drift | ± 5.0 | Rectangular | $\sqrt{3}$ | | ± 2.9 | ∞ |
| Phantom and Setup | | | | | | |
| Phantom uncertainty | ± 4.0 | Rectangular | $\sqrt{3}$ | 1 | ± 2.3 | ∞ |
| Liquid conductivity (target) | ± 5.0 | Rectangular | $\sqrt{3}$ | 0.6 | ± 1.7 | ∞ |
| Liquid conductivity (measured) | ± 5.0 | Rectangular | $\sqrt{3}$ | 0.6 | ± 1.7 | ∞ |
| Liquid permittivity (target) | ± 5.0 | Rectangular | $\sqrt{3}$ | 0.6 | ± 1.7 | ∞ |
| Liquid permittivity (measured) | ± 5.0 | Rectangular | $\sqrt{3}$ | 0.6 | ± 1.7 | ∞ |
| | | | | | | |
| Combined Standard Uncertainty | | | | | ± 13.7 | |
| Expanded Uncertainty (k=2) (95% Confidence Level) | | | | | ± 27.5 | |

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

17.0 REFERENCES

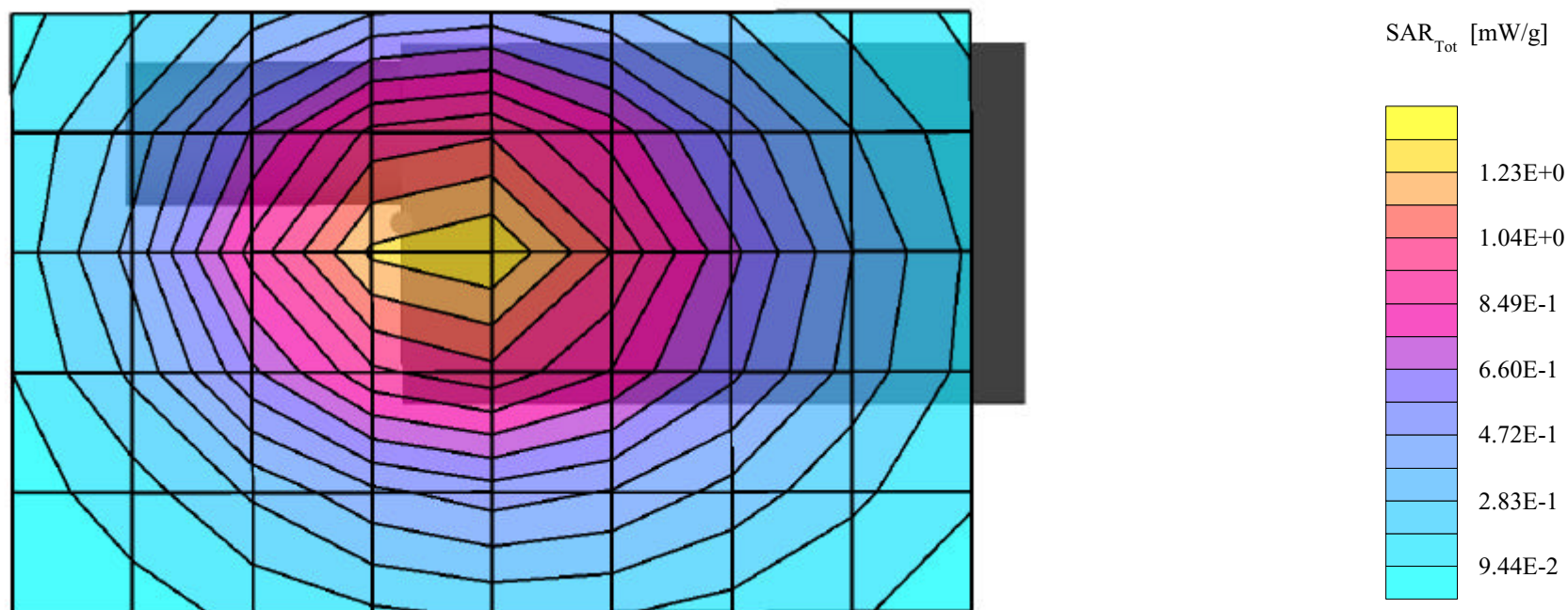
- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6.
- [3] Federal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

APPENDIX A - SAR MEASUREMENT DATA

Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Flat Section; Position: (90°,270°)
Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.87$ mho/m $\epsilon_r = 43.7$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 1.10 mW/g, SAR (10g): 0.778 mW/g

Face-held SAR at 2.5cm Separation Distance
MK1996 UHF GMRS PTT Radio Transceiver
AAA Alkaline Batteries (x4)
Continuous Wave Mode
Mid Channel [462.6250 MHz]
RF Output Power: 1.6 Watts (ERP)
Ambient Temp. 22.8° C; Fluid Temp. 20.5° C
Date Tested: March 14, 2003



Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0

450 MHz Brain: $\sigma = 0.87$ mho/m $\epsilon_r = 43.7$ $\rho = 1.00$ g/cm³

Z-Axis Extrapolation at Peak SAR Location

Face-held SAR at 2.5cm Separation Distance

MK1996 UHF GMRS PTT Radio Transceiver

AAA Alkaline Batteries (x4)

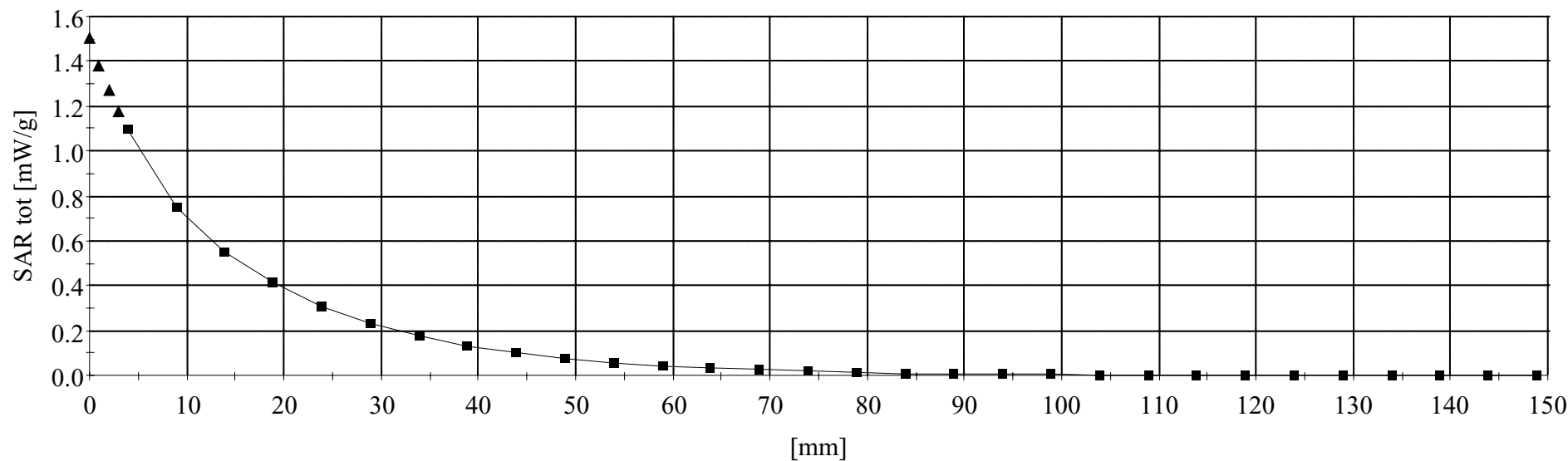
Continuous Wave Mode

Mid Channel [462.6250 MHz]

RF Output Power: 1.6 Watts (ERP)

Ambient Temp. 22.8° C; Fluid Temp. 20.5° C

Date Tested: March 14, 2003



Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Flat Section; Position: (90°,270°)

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0

450 MHz Brain: $\sigma = 0.87$ mho/m $\epsilon_r = 43.7$ $\rho = 1.00$ g/cm³

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Cube 5x5x7

SAR (1g): 0.766 mW/g, SAR (10g): 0.540 mW/g

Face-held SAR at 2.5cm Separation Distance

MK1996 UHF GMRS PTT Radio Transceiver

AAA NiMH Batteries (x4)

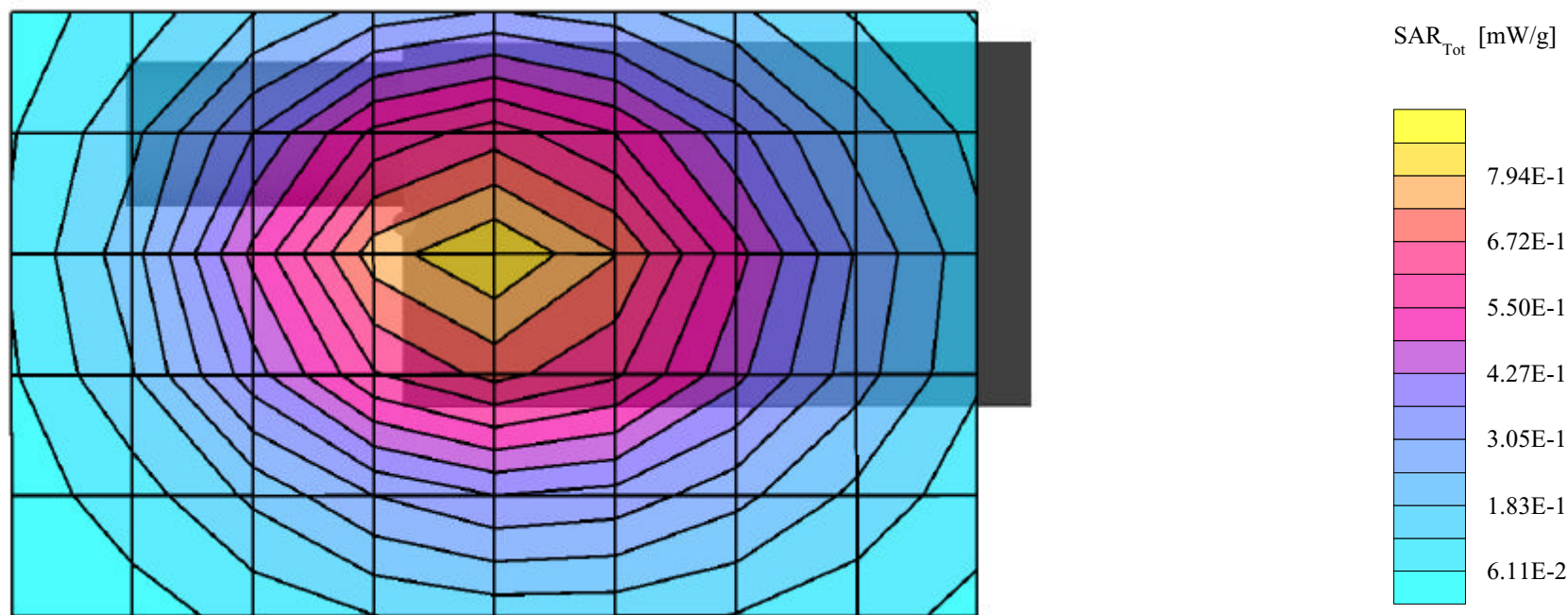
Continuous Wave Mode

Mid Channel [462.6250 MHz]

RF Output Power: 1.6 Watts (ERP)

Ambient Temp. 22.8° C; Fluid Temp. 20.5° C

Date Tested: March 14, 2003



Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Flat Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(7.90,7.90,7.90); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 59.1$ $\rho = 1.00$ g/cm³

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Cube 5x5x7

SAR (1g): 1.66 mW/g, SAR (10g): 1.18 mW/g

Body-Worn SAR with 0.6 cm Belt-Clip Separation Distance

MK1996 UHF GMRS PTT Radio Transceiver

with Ear-Microphone Accessory

AAA Alkaline Batteries (x4)

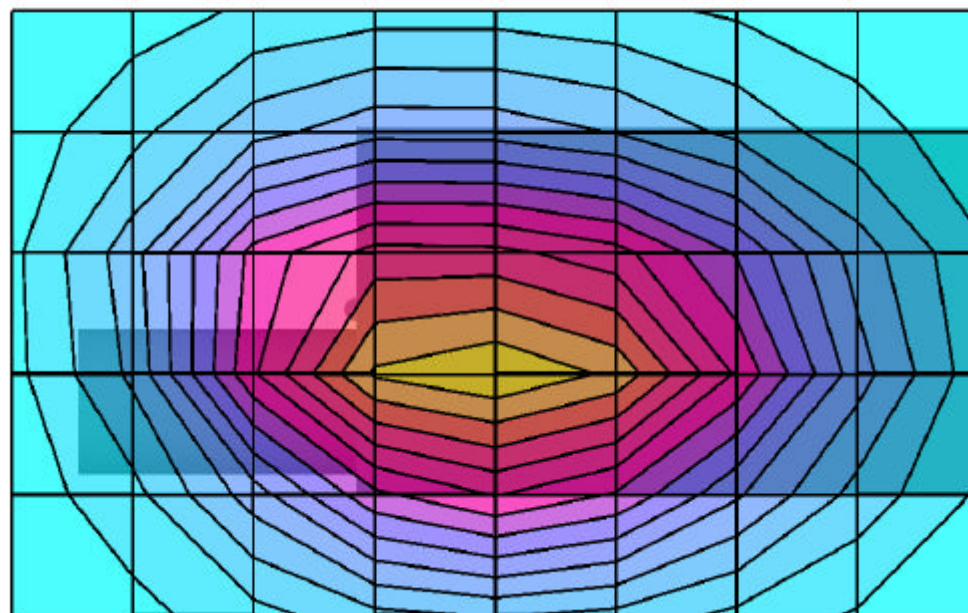
Continuous Wave Mode

Mid Channel [462.6250 MHz]

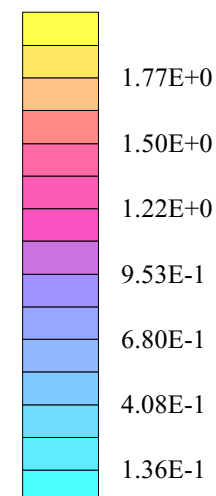
RF Output Power: 1.6 Watts (ERP)

Ambient Temp. 22.8° C; Fluid Temp. 20.5° C

Date Tested: March 14, 2003



SAR_{Tot} [mW/g]



Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Flat Section; Position: (270°,90°)

Probe: ET3DV6 - SN1590; ConvF(7.90,7.90,7.90); Crest factor: 1.0

450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 59.1$ $\rho = 1.00$ g/cm³

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Cube 5x5x7

SAR (1g): 1.97 mW/g, SAR (10g): 1.38 mW/g

Body-Worn SAR with 0.6 cm Belt-Clip Separation Distance

MK1996 UHF GMRS PTT Radio Transceiver

with Ear-Microphone Accessory

AAA NiMH Batteries (x4)

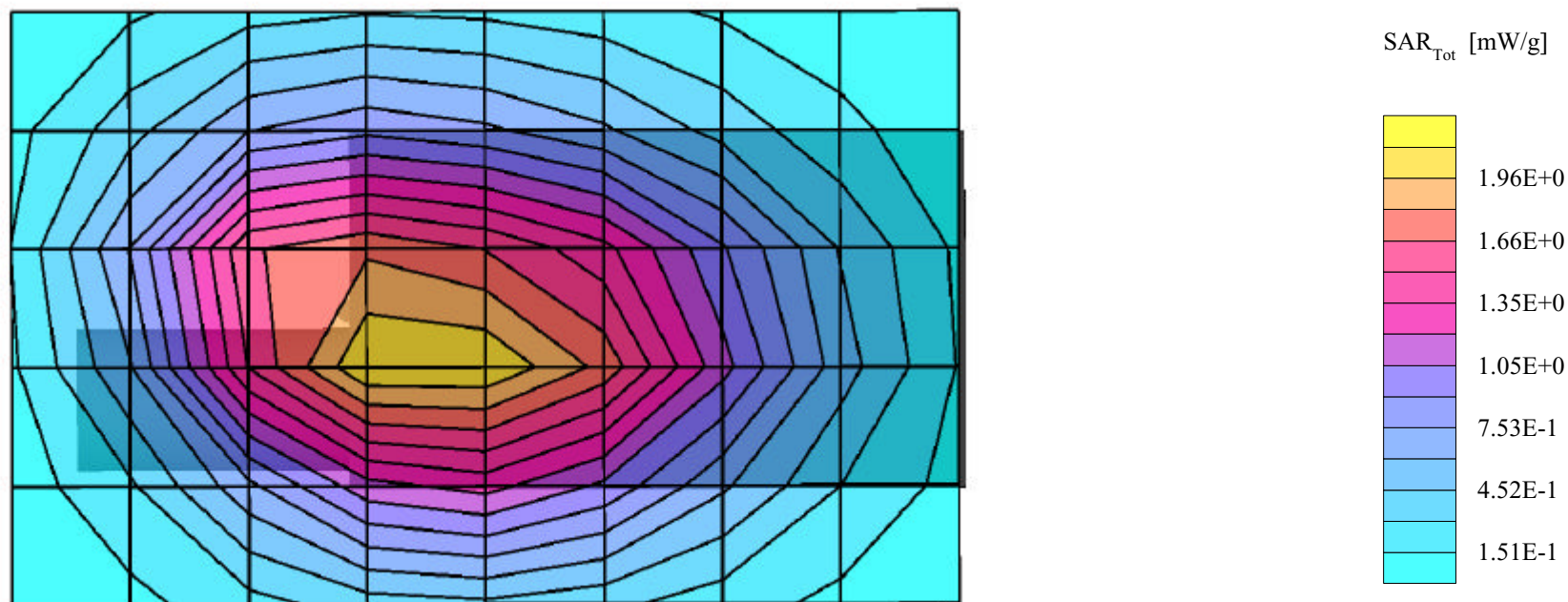
Continuous Wave Mode

Mid Channel [462.6250 MHz]

RF Output Power: 1.6 Watts (ERP)

Ambient Temp. 22.8° C; Fluid Temp. 20.5° C

Date Tested: March 14, 2003

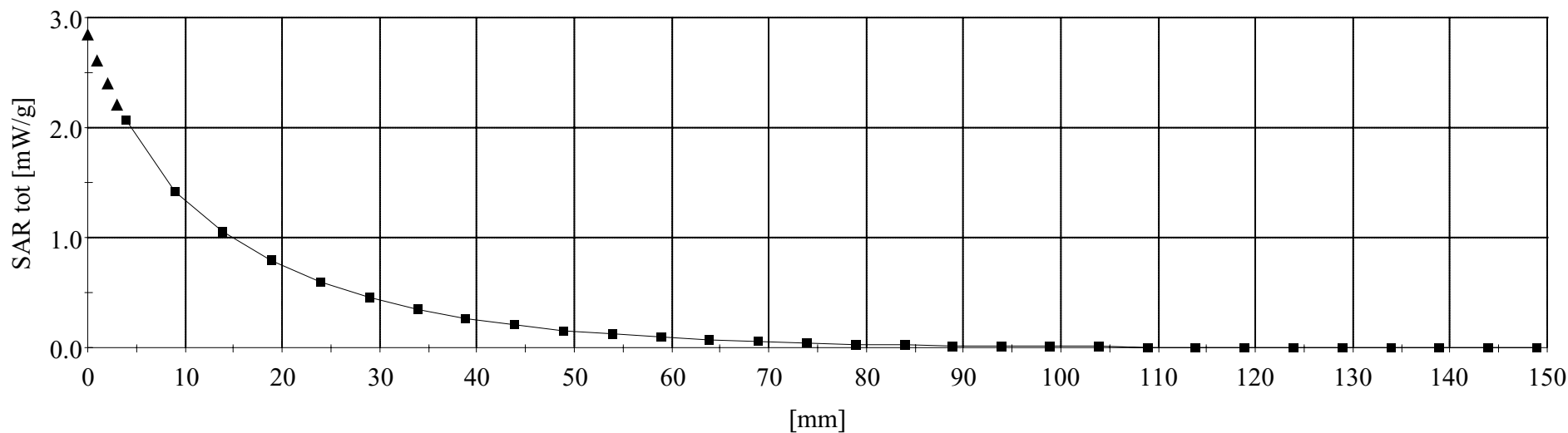


Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(7.90,7.90,7.90); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 59.1$ $\rho = 1.00$ g/cm³

Z-Axis Extrapolation at Peak SAR Location

Body-Worn SAR with 0.6 cm Belt-Clip Separation Distance
MK1996 UHF GMRS PTT Radio Transceiver
with Ear-Microphone Accessory
AAA NiMH Batteries (x4)
Continuous Wave Mode
Mid Channel [462.6250 MHz]
RF Output Power: 1.6 Watts (ERP)
Ambient Temp. 22.8° C; Fluid Temp. 20.5° C
Date Tested: March 14, 2003



Genex Telecom Co., Ltd. FCC ID: PM3MK1996

SAM Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.90,7.90,7.90); Crest factor: 1.0

450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 59.1$ $\rho = 1.00$ g/cm³**SAR VERSUS TIME**

Body-Worn SAR with 0.6 cm Belt-Clip Separation Distance

MK1996 UHF GMRS PTT Radio Transceiver

with Ear-Microphone Accessory

AAA NiMH Batteries (x4)

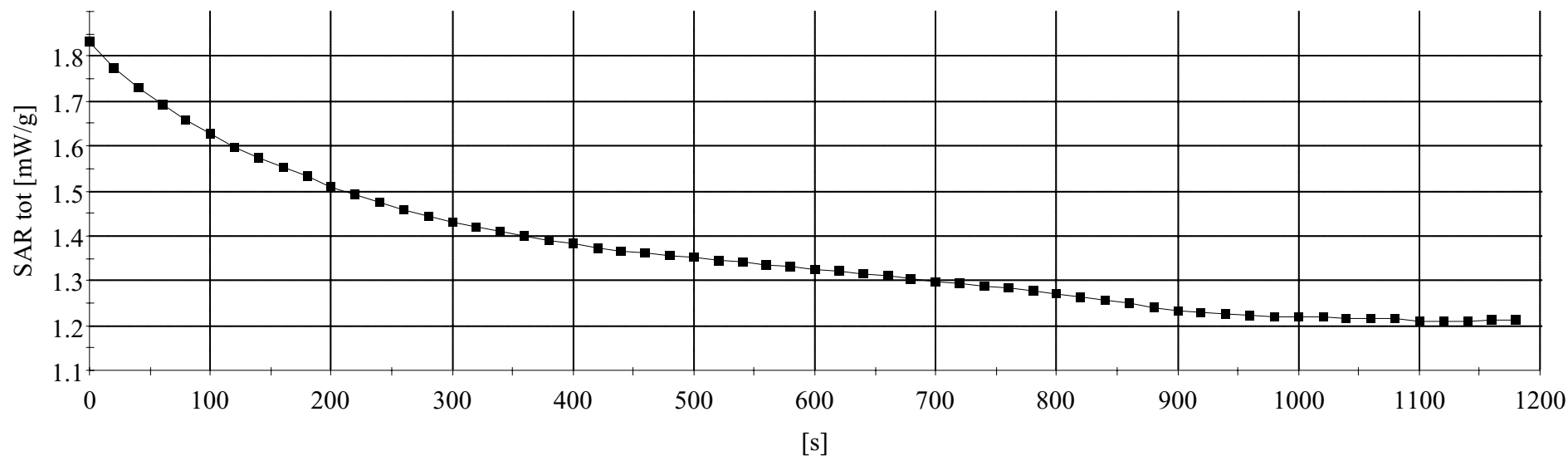
Continuous Wave Mode

Mid Channel [462.6250 MHz]

RF Output Power: 1.6 Watts (ERP)

Ambient Temp. 22.8° C; Fluid Temp. 20.5° C

Date Tested: March 14, 2003



APPENDIX B - SYSTEM PERFORMANCE CHECK

System Performance Check - 450MHz Dipole

Planar Phantom; Planar Section

Probe: ET3DV6 - SN1590; ConvF(7.80,7.80,7.80); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.87$ mho/m $\epsilon_r = 43.7$ $\rho = 1.00$ g/cm³

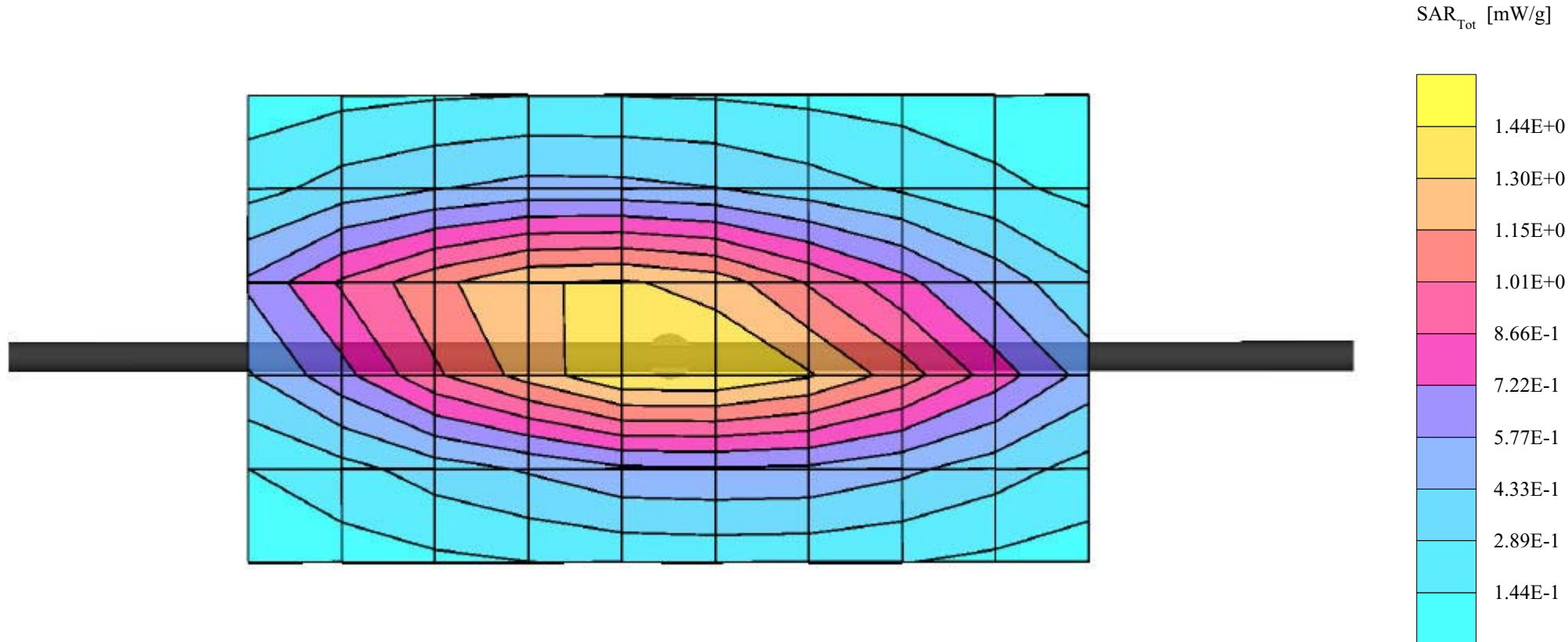
Cube 5x5x7: Peak: 1.94 mW/g, SAR (1g): 1.21 mW/g, SAR (10g): 0.792 mW/g, (Worst-case extrapolation)

Penetration depth: 12.0 (10.5, 14.0) [mm]; Powerdrift: -0.01 dB

Ambient Temp. 22.8°C; Fluid Temp. 20.5°C

Forward Conducted Power: 250 mW

Date of Test: March 14, 2003



APPENDIX C - SYSTEM VALIDATION

450MHz SYSTEM VALIDATION DIPOLE

Type:

450MHz Validation Dipole

Serial Number:

136

Place of Calibration:

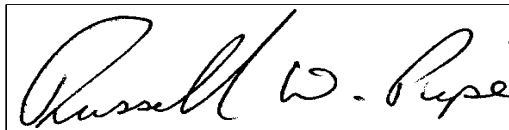
Celltech Research Inc.

Date of Calibration:

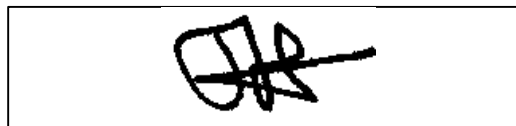
October 17, 2002

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

Calibrated by:



Approved by:

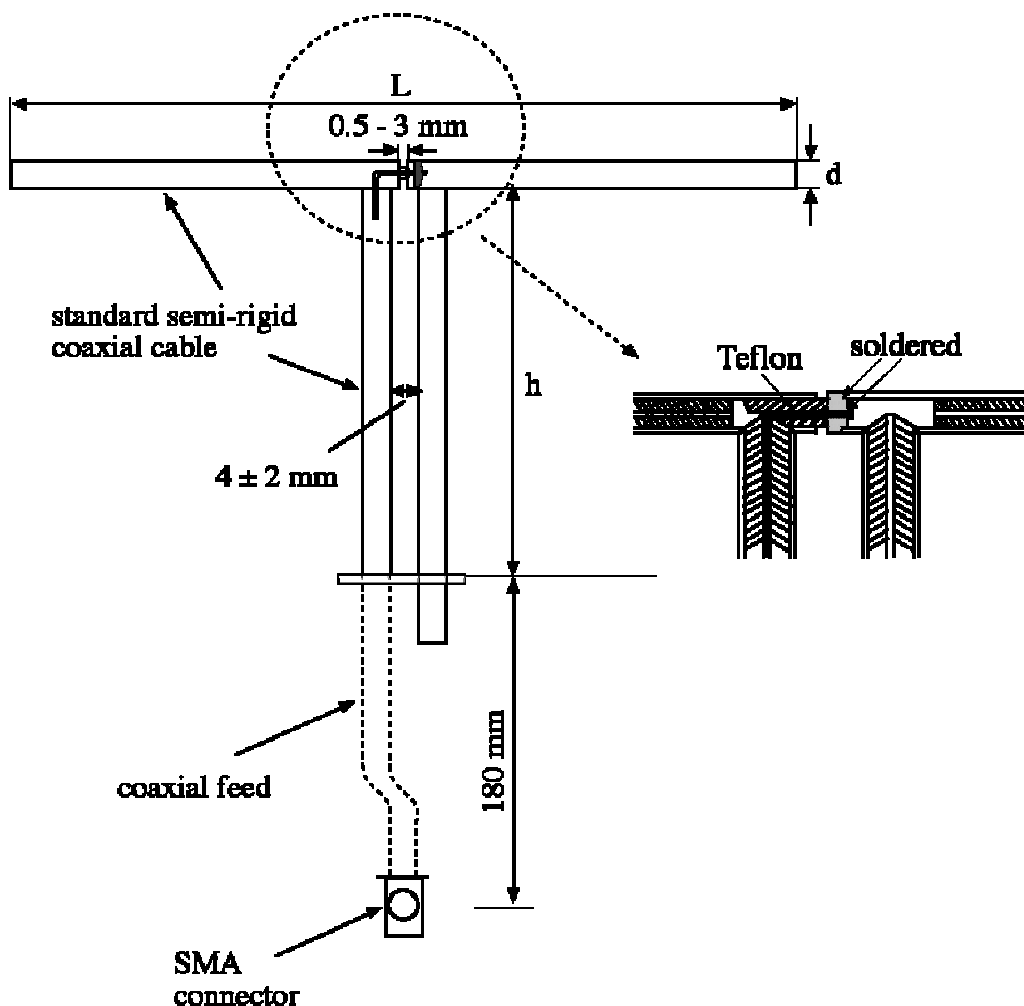


1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

| | |
|--------------------------------|---------------------------------|
| Feed point impedance at 450MHz | $\text{Re}\{Z\} = 50.299\Omega$ |
| | $\text{Im}\{Z\} = 1.6660\Omega$ |

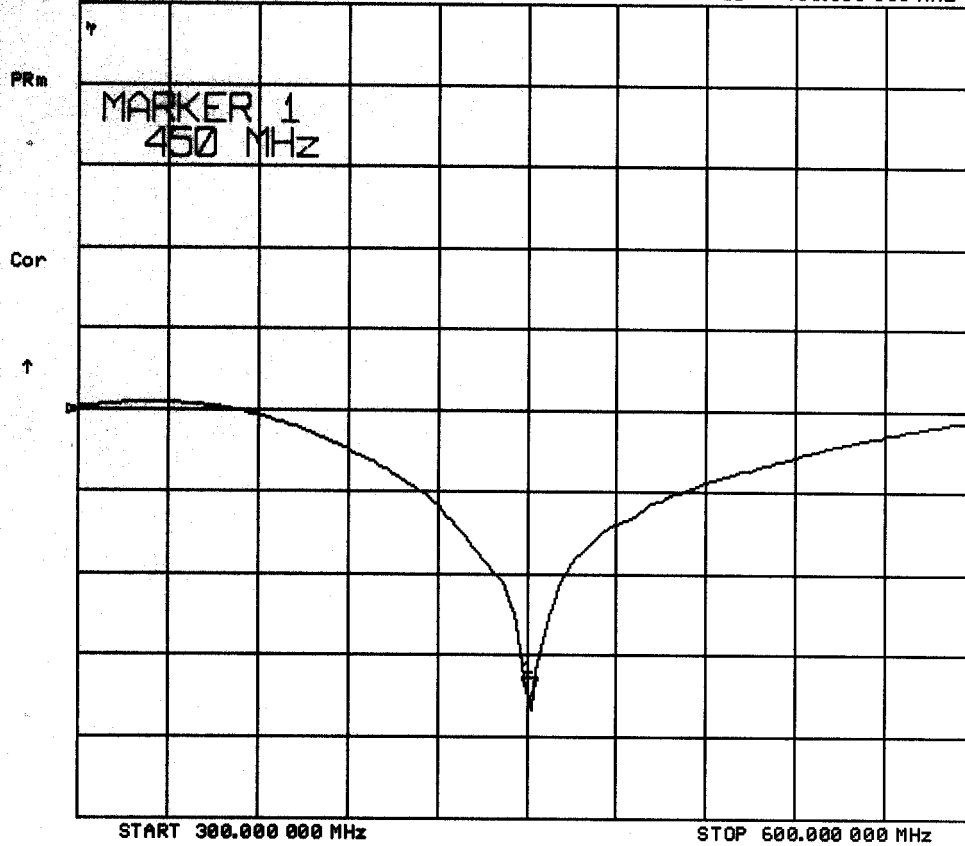
| | |
|-----------------------|-----------|
| Return Loss at 450MHz | -35.306dB |
|-----------------------|-----------|



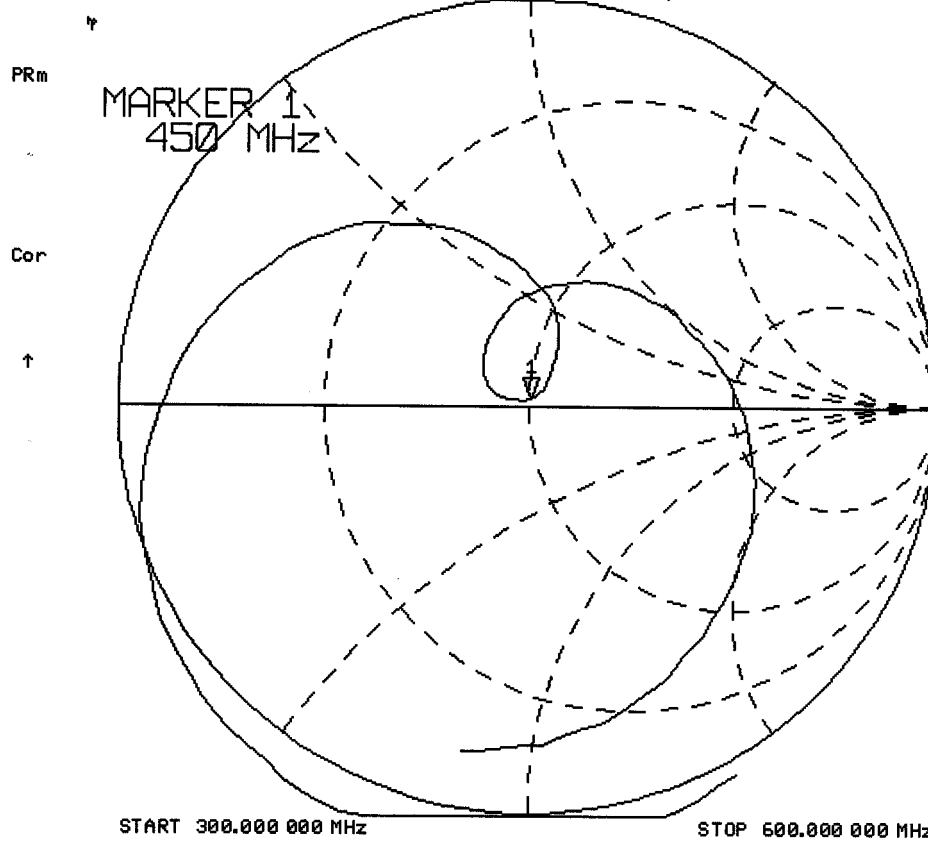
17 Oct 2002 20:34:40

CH1 S11 LOG 10 dB/REF 0 dB

11-35.306 dB 450.000 000 MHz



17 Oct 2002 20:34:13
[CH1] S11 1 U FS 1: 50.299 Ω 1.6660 Ω 589.23 μ H 450.000 000 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 |

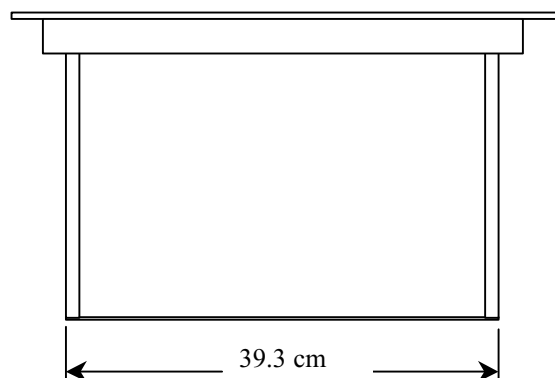
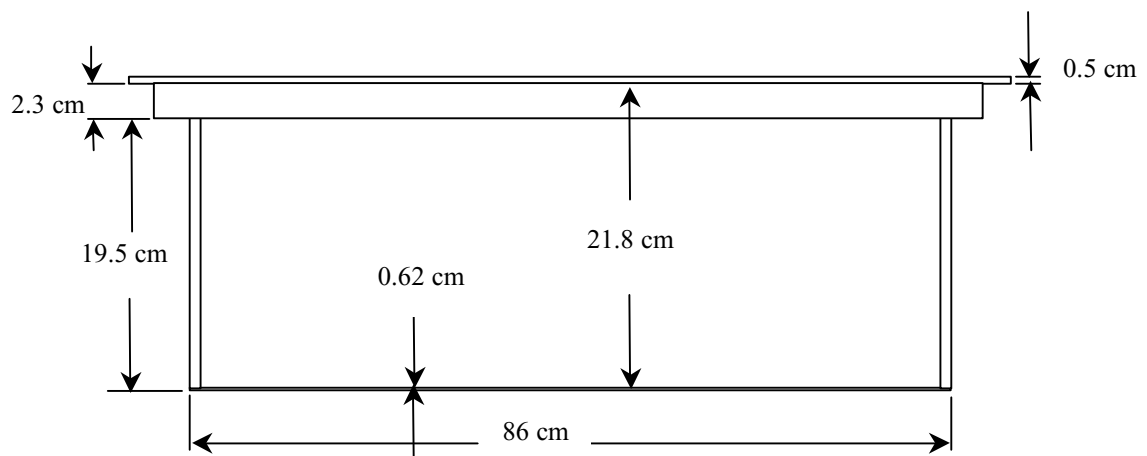
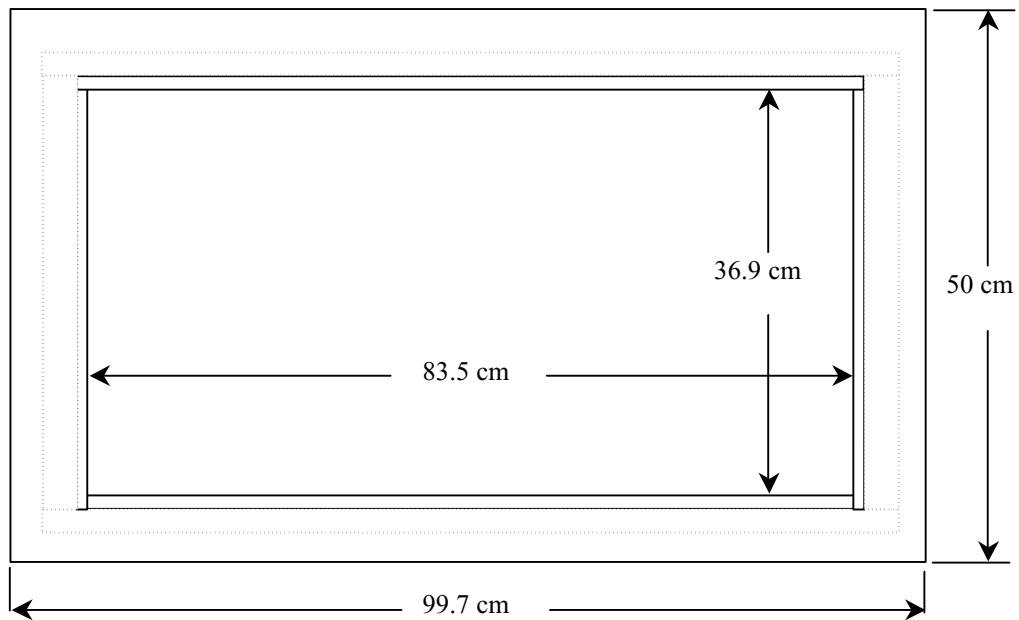
2. Validation Phantom

The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The dimensions of the phantom are as follows:

Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

The bottom of the phantom is constructed of 6.2 ± 0.1 mm Plexiglas.

Dimensions of Plexiglas Planar Phantom



450MHz System Validation Setup



450MHz System Validation Setup



3. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 450MHz:

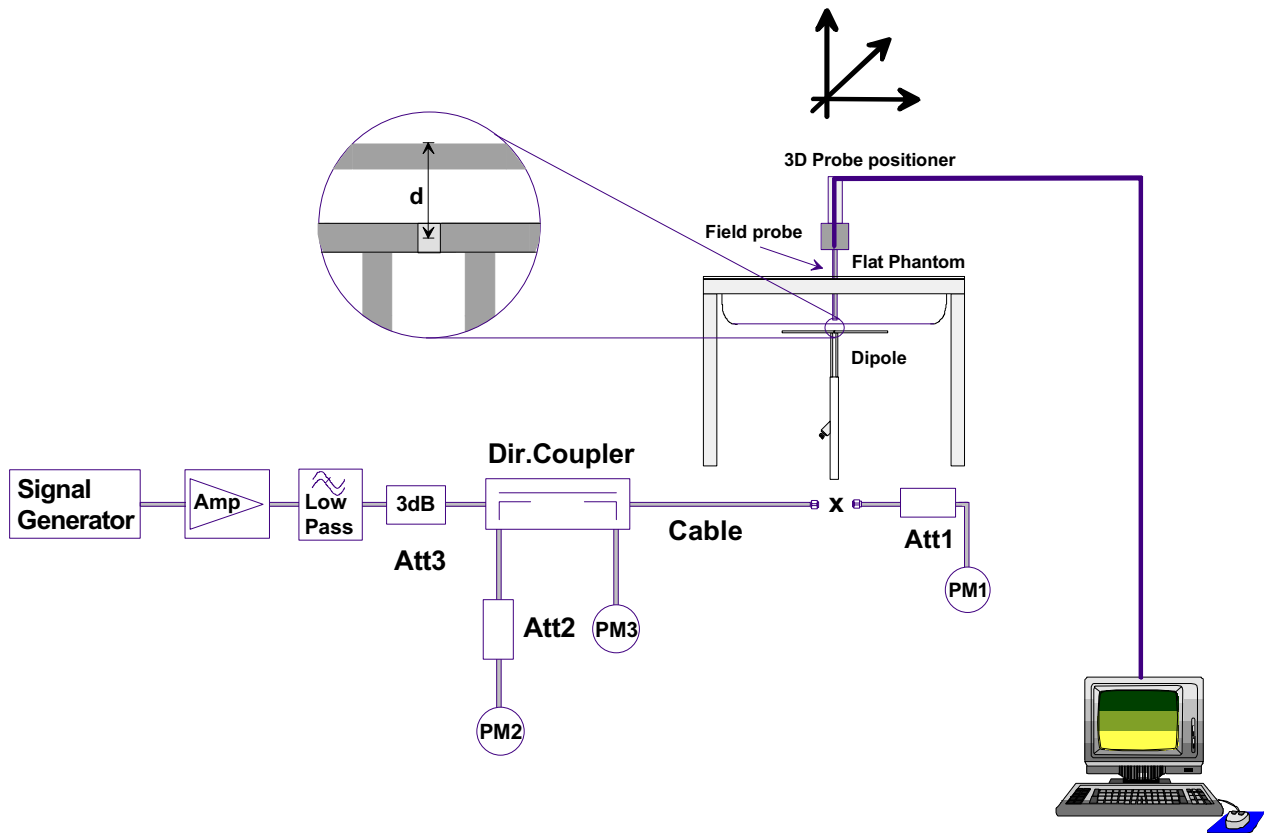
Relative Permittivity: 44.1
Conductivity: 0.88 mho/m
Ambient Temperature: 23.3 °C
Fluid Temperature: 22.2 °C
Fluid Depth: ≥ 15.0 cm

The 450MHz simulating tissue consists of the following ingredients:

| Ingredient | Percentage by weight |
|---|--|
| Water | 38.56% |
| Sugar | 56.32% |
| Salt | 3.95% |
| HEC | 0.98% |
| Dowicil 75 | 0.19% |
| Target Dielectric Parameters at 22°C | $\epsilon_r = 43.5$ $\sigma = 0.87$ S/m |

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 | 1.32 | 5.28 | 0.887 | 3.55 | 2.20 |
| Test 2 | 1.26 | 5.04 | 0.856 | 3.42 | 2.09 |
| Test 3 | 1.38 | 5.52 | 0.931 | 3.72 | 2.30 |
| Test 4 | 1.36 | 5.44 | 0.917 | 3.67 | 2.27 |
| Test 5 | 1.37 | 5.48 | 0.922 | 3.69 | 2.28 |
| Test 6 | 1.33 | 5.32 | 0.896 | 3.58 | 2.22 |
| Test 7 | 1.34 | 5.36 | 0.902 | 3.61 | 2.24 |
| Test 8 | 1.33 | 5.32 | 0.895 | 3.58 | 2.21 |
| Test 9 | 1.39 | 5.56 | 0.931 | 3.72 | 2.31 |
| Test10 | 1.36 | 5.44 | 0.917 | 3.67 | 2.27 |
| Average Value | 1.34 | 5.38 | 0.905 | 3.62 | 2.24 |

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

Averaged over 1cm (1g) of tissue: 5.38 mW/g

Averaged over 10cm (10g) of tissue: 3.62 mW/g

Dipole 450MHz, d = 15 mm

Frequency: 450 MHz; Antenna Input Power: 250 [mW]

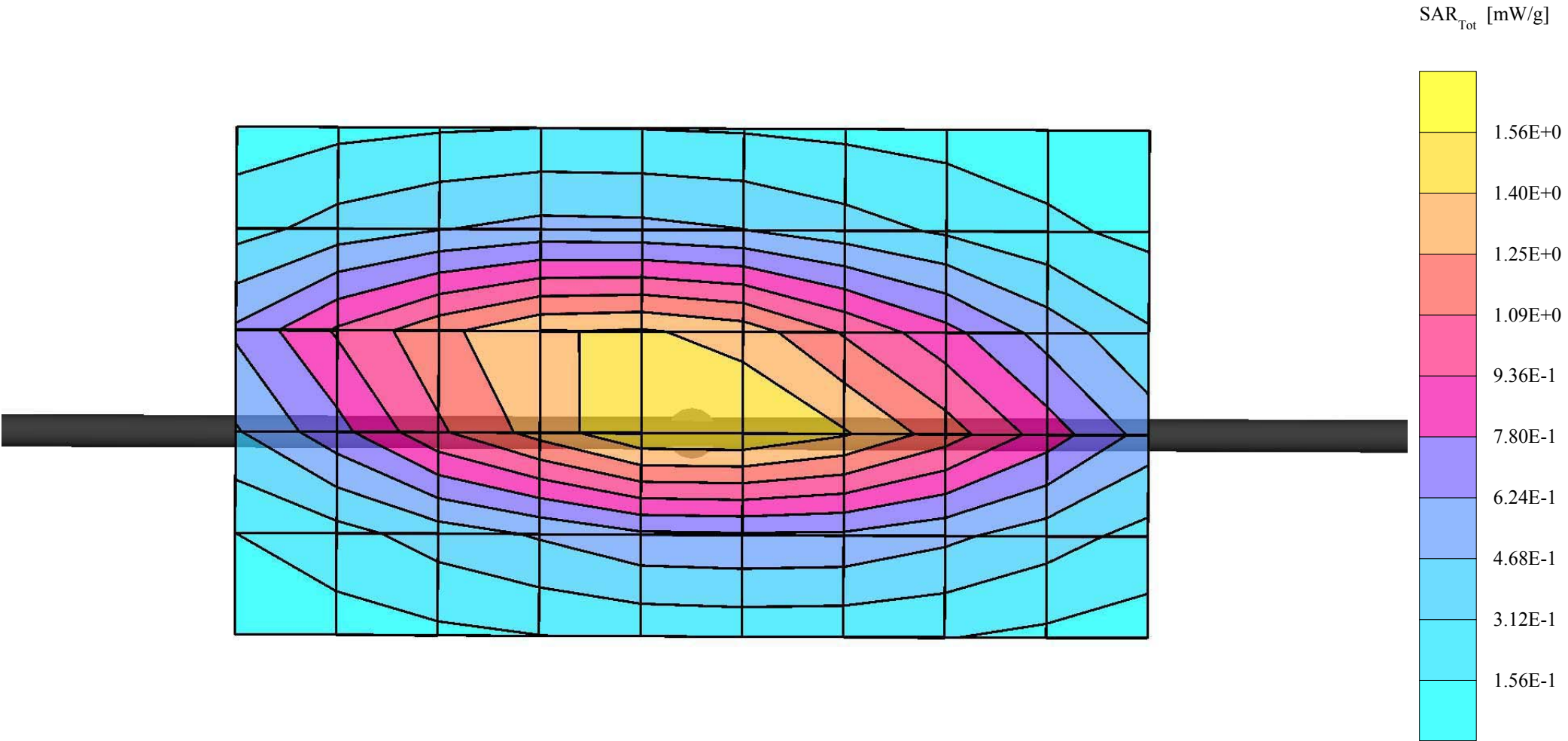
Large Planar Phantom; Planar Section

Probe: ET3DV6 - SN1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0; 450 MHz Brain: $\sigma = 0.88$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 2.24 mW/g, SAR (1g): 1.34 mW/g, SAR (10g): 0.905 mW/g, (Worst-case extrapolation)

Penetration depth: 12.0 (10.5, 14.0) [mm]; Powerdrift: 0.01 dB; Ambient Temp.: 23.3°C; Fluid Temp.: 22.2°C

Calibration Date: October 17, 2002



450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 17, 2002

| Frequency | ϵ' | ϵ'' |
|----------------|-------------|--------------|
| 350.000000 MHz | 46.6334 | 40.6323 |
| 360.000000 MHz | 46.3629 | 40.0034 |
| 370.000000 MHz | 46.1498 | 39.3672 |
| 380.000000 MHz | 45.8833 | 38.6723 |
| 390.000000 MHz | 45.5947 | 38.0484 |
| 400.000000 MHz | 45.3226 | 37.4538 |
| 410.000000 MHz | 45.0977 | 36.9636 |
| 420.000000 MHz | 44.8241 | 36.4841 |
| 430.000000 MHz | 44.5839 | 35.9541 |
| 440.000000 MHz | 44.3183 | 35.5098 |
| 450.000000 MHz | 44.0572 | 35.0854 |
| 460.000000 MHz | 43.8600 | 34.7069 |
| 470.000000 MHz | 43.6544 | 34.3371 |
| 480.000000 MHz | 43.4507 | 33.9296 |
| 490.000000 MHz | 43.2880 | 33.5147 |
| 500.000000 MHz | 43.0921 | 33.1731 |
| 510.000000 MHz | 42.8781 | 32.7813 |
| 520.000000 MHz | 42.6765 | 32.4193 |
| 530.000000 MHz | 42.5864 | 32.1000 |
| 540.000000 MHz | 42.4644 | 31.7180 |
| 550.000000 MHz | 42.3042 | 31.4503 |

APPENDIX D - PROBE CALIBRATION

Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Calibration:

Zurich

Date of Calibration:

December 1, 2002

Calibration Interval:

12 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

U. Velled

Approved by:

Heinrich Käty

Probe ET3DV6

SN:1590

| | |
|-------------------|------------------|
| Manufactured: | March 19, 2001 |
| Last calibration: | April 26, 2002 |
| Recalibrated: | December 1, 2002 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

| | |
|-------|---|
| NormX | 1.75 $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | 1.89 $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | 1.63 $\mu\text{V}/(\text{V}/\text{m})^2$ |

Diode Compression

| | | |
|-------|-----------|----|
| DCP X | 92 | mV |
| DCP Y | 92 | mV |
| DCP Z | 92 | mV |

Sensitivity in Tissue Simulating Liquid

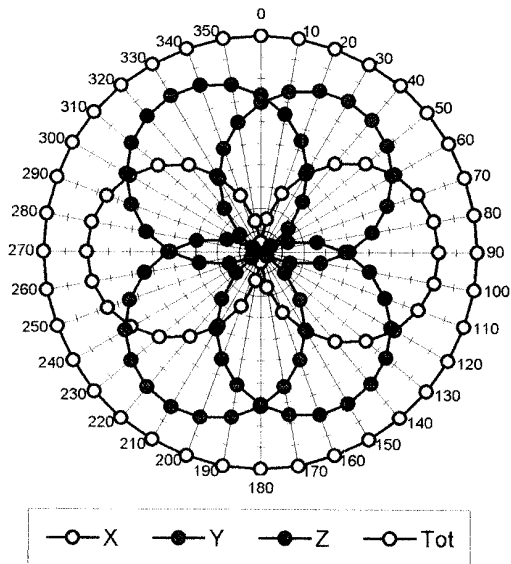
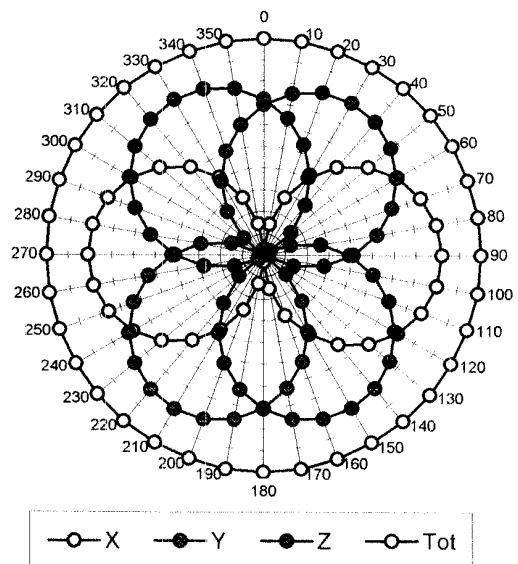
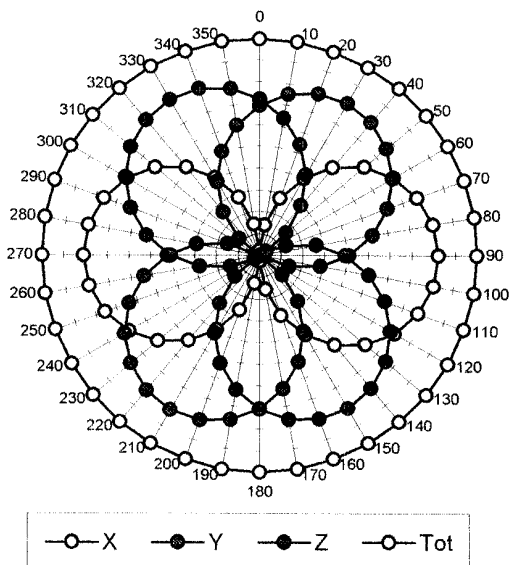
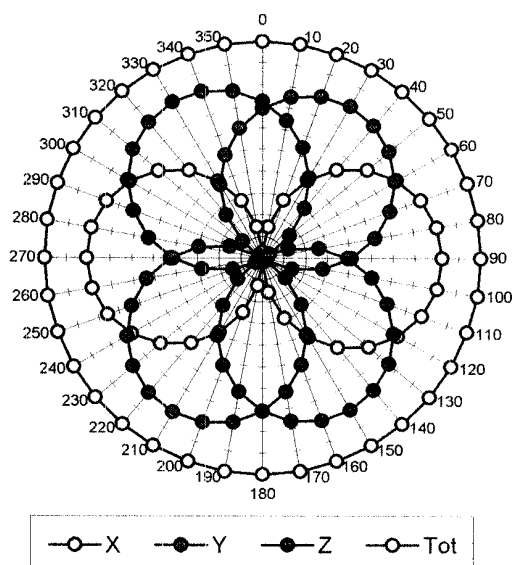
| | | | |
|---------|------------------------------|-----------------------------|---------------------------------------|
| Head | 900 MHz | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head | 835 MHz | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
| ConvF X | 6.9 $\pm 9.5\%$ (k=2) | Boundary effect: | |
| ConvF Y | 6.9 $\pm 9.5\%$ (k=2) | Alpha | 0.30 |
| ConvF Z | 6.9 $\pm 9.5\%$ (k=2) | Depth | 2.71 |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| ConvF X | 5.6 $\pm 9.5\%$ (k=2) | Boundary effect: | |
| ConvF Y | 5.6 $\pm 9.5\%$ (k=2) | Alpha | 0.42 |
| ConvF Z | 5.6 $\pm 9.5\%$ (k=2) | Depth | 2.56 |

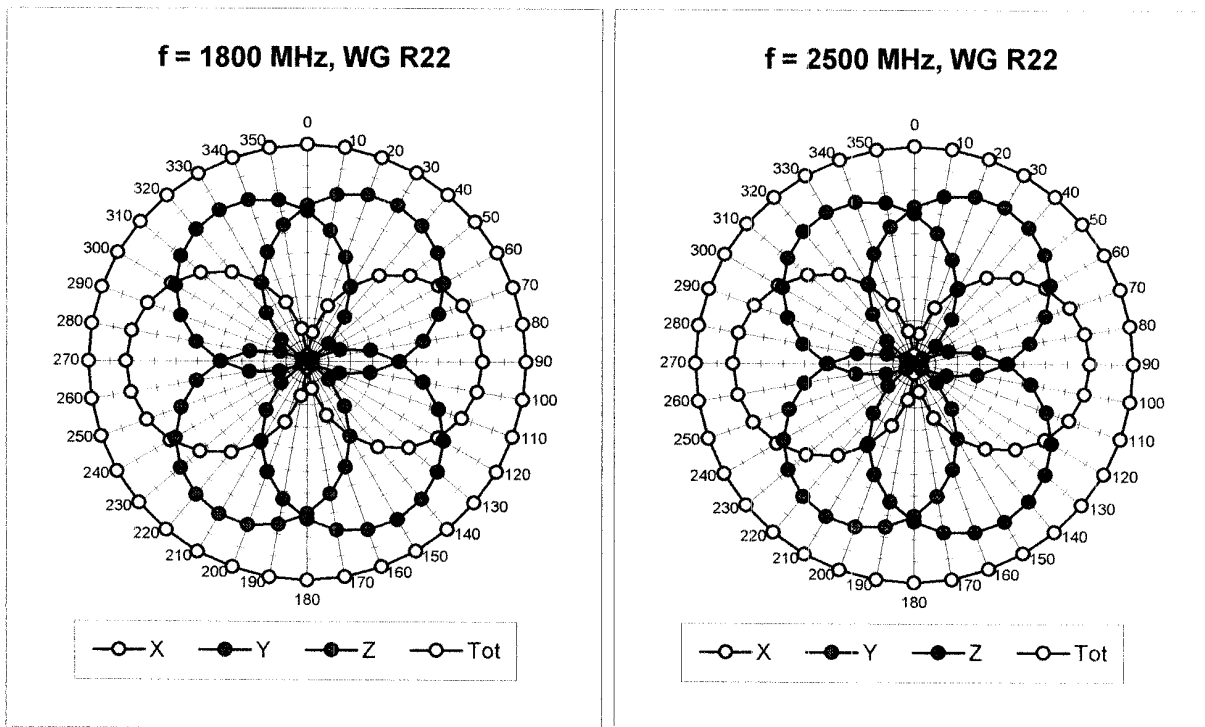
Boundary Effect

| | | | |
|-----------------------|------------------------------|--|-------------|
| 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 | 10.7 | 7.4 |
| SAR _{be} [%] | With Correction Algorithm | 0.1 | 0.3 |

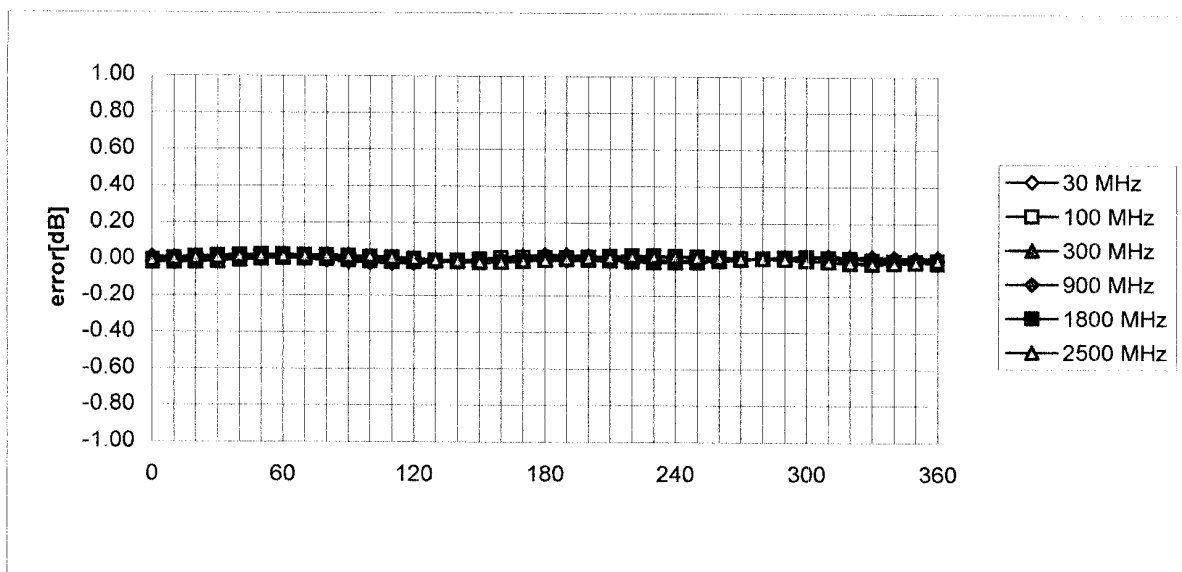
Sensor Offset

| | | |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | 2.7 | mm |
| Optical Surface Detection | 1.2 \pm 0.2 | mm |

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

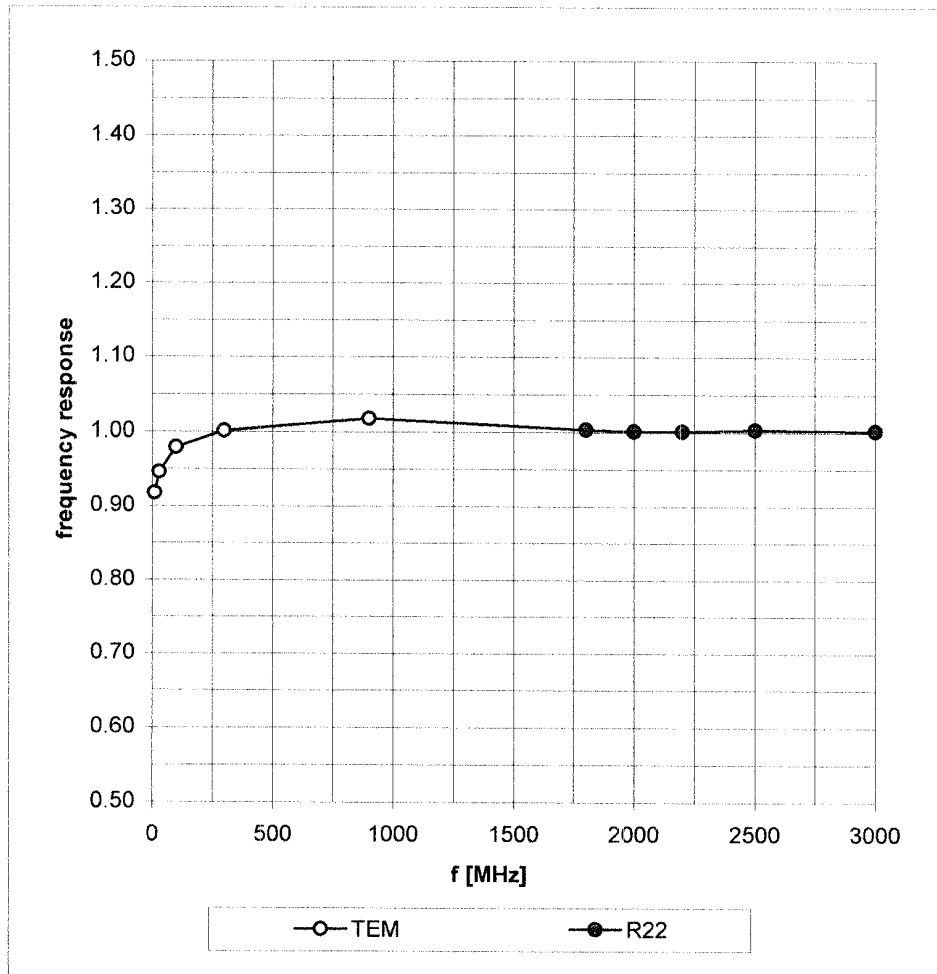


Isotropy Error (ϕ), $\theta = 0^\circ$

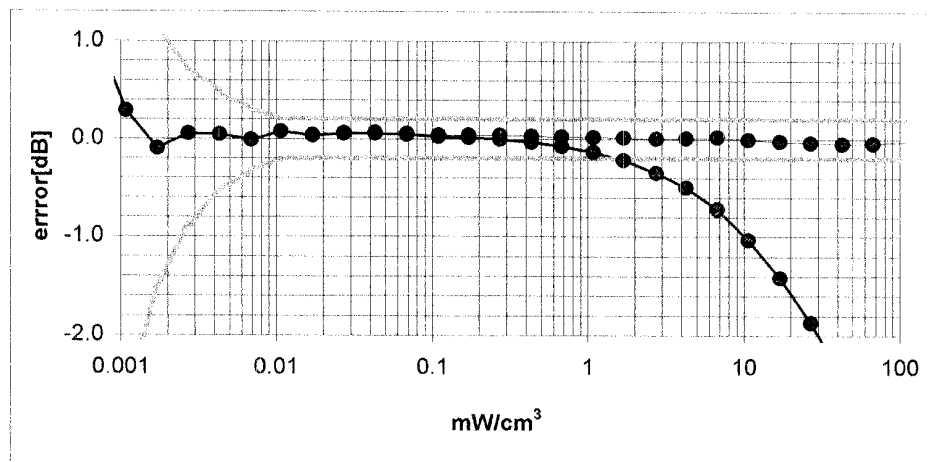
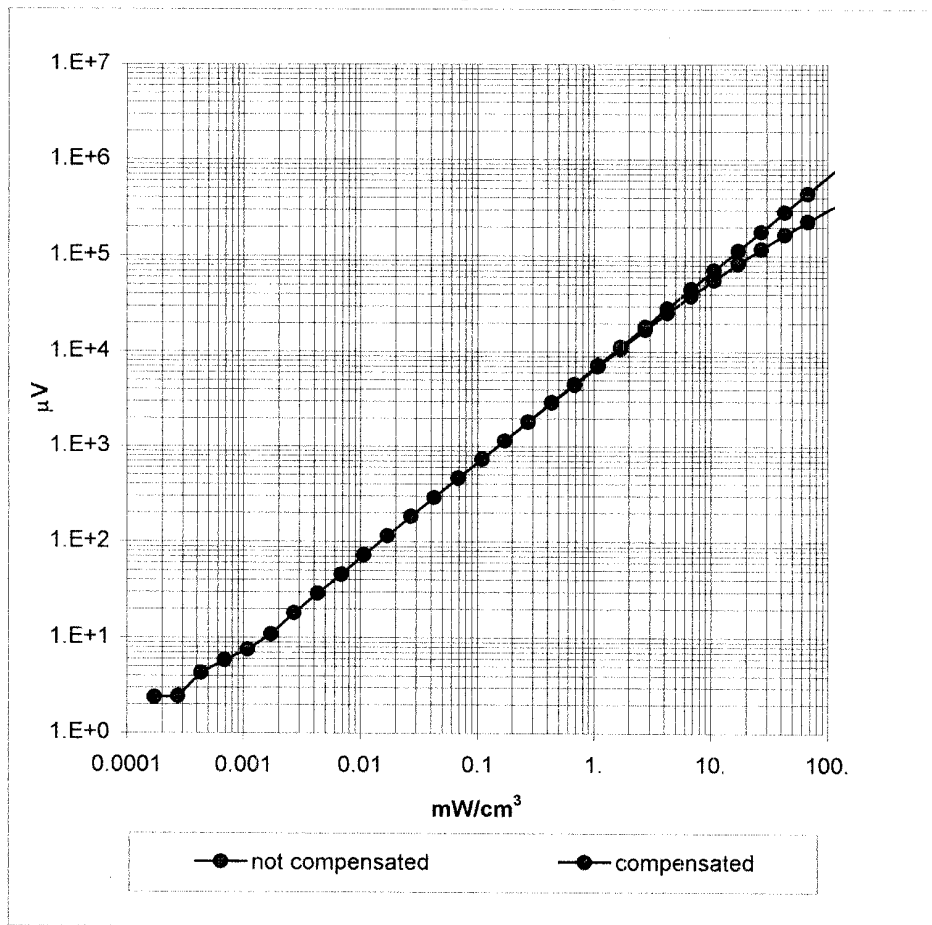


Frequency Response of E-Field

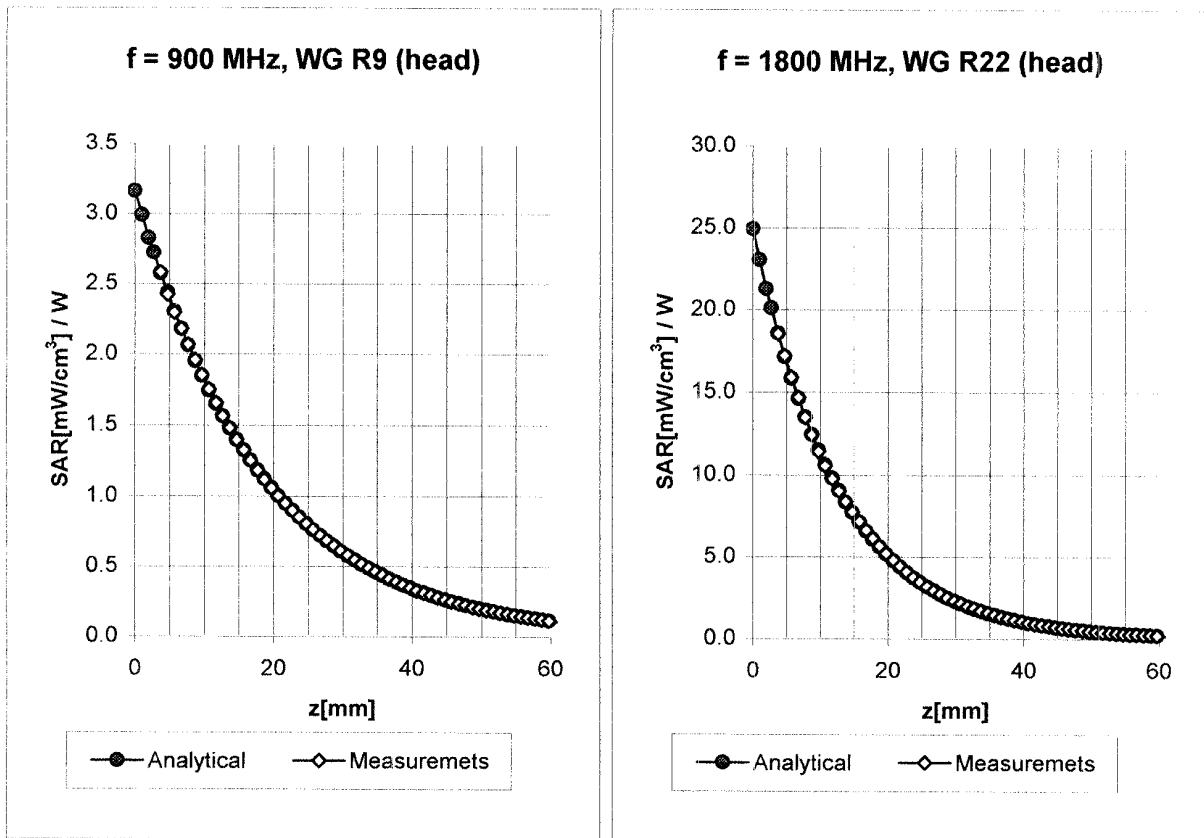
(TEM-Cell:ifi110, Waveguide R22)



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

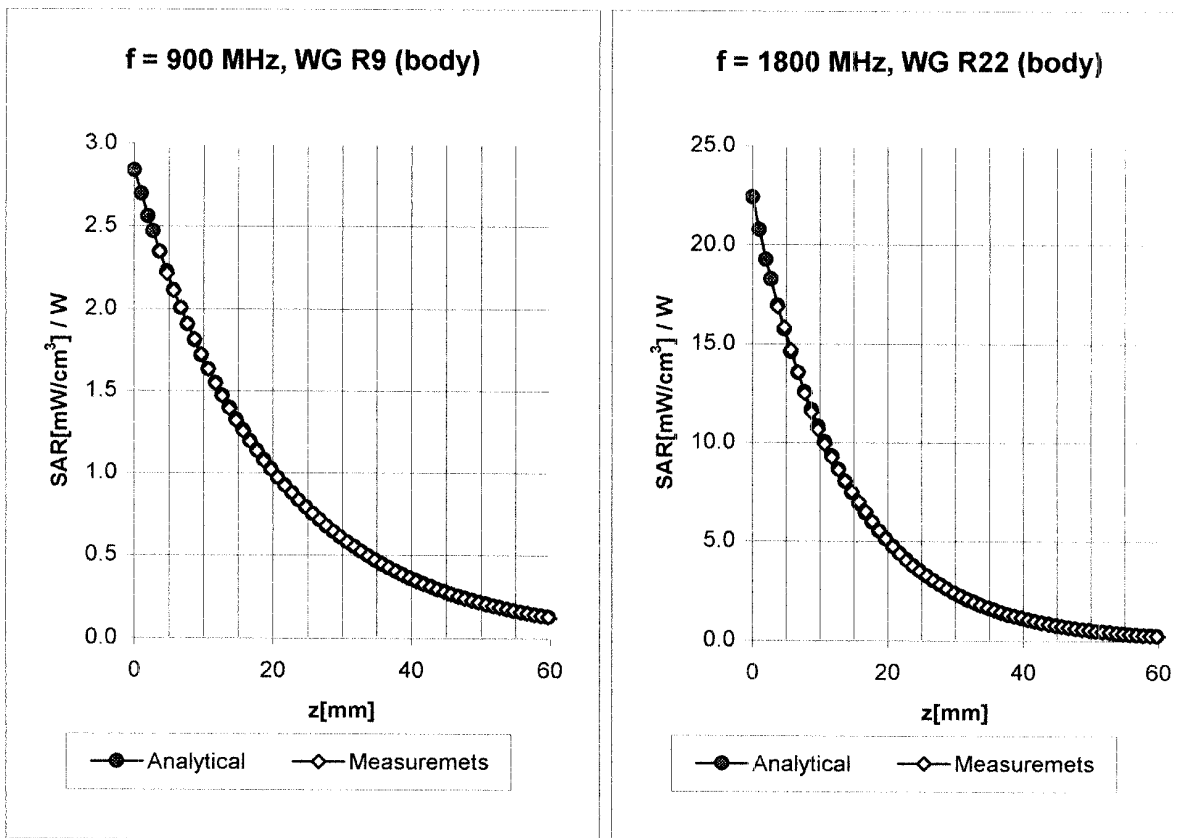


Conversion Factor Assessment



| | | | |
|------|----------|------------------------------|---------------------------------------|
| Head | 900 MHz | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head | 835 MHz | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
| | ConvF X | 6.9 $\pm 9.5\%$ (k=2) | Boundary effect: |
| | ConvF Y | 6.9 $\pm 9.5\%$ (k=2) | Alpha 0.30 |
| | ConvF Z | 6.9 $\pm 9.5\%$ (k=2) | Depth 2.71 |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| | ConvF X | 5.6 $\pm 9.5\%$ (k=2) | Boundary effect: |
| | ConvF Y | 5.6 $\pm 9.5\%$ (k=2) | Alpha 0.42 |
| | ConvF Z | 5.6 $\pm 9.5\%$ (k=2) | Depth 2.56 |

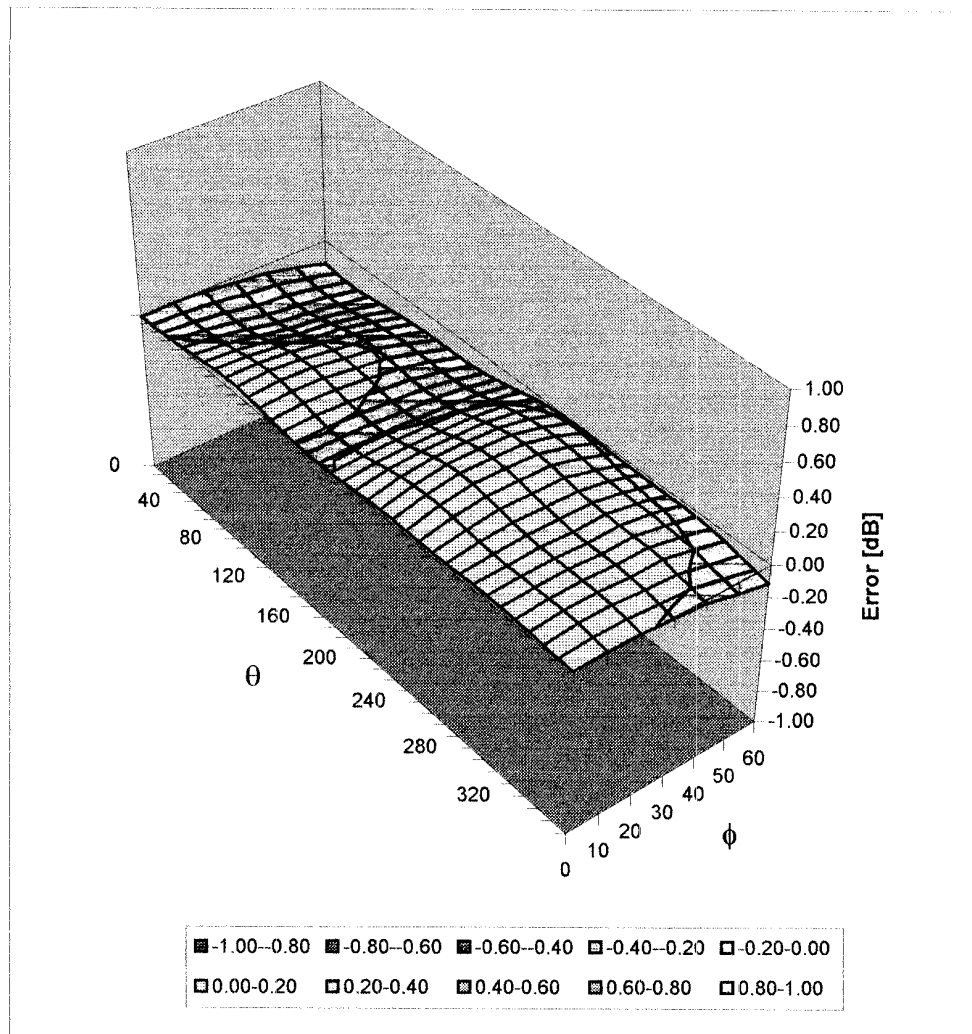
Conversion Factor Assessment



| | | | |
|------|----------|-----------------------------|---------------------------------------|
| Body | 900 MHz | $\epsilon_r = 55.0 \pm 5\%$ | $\sigma = 1.05 \pm 5\% \text{ mho/m}$ |
| Body | 835 MHz | $\epsilon_r = 55.2 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| | ConvF X | $6.7 \pm 9.5\% (k=2)$ | Boundary effect: |
| | ConvF Y | $6.7 \pm 9.5\% (k=2)$ | Alpha 0.34 |
| | ConvF Z | $6.7 \pm 9.5\% (k=2)$ | Depth 2.57 |
| Body | 1800 MHz | $\epsilon_r = 53.3 \pm 5\%$ | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
| Body | 1900 MHz | $\epsilon_r = 53.3 \pm 5\%$ | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
| | ConvF X | $5.3 \pm 9.5\% (k=2)$ | Boundary effect: |
| | ConvF Y | $5.3 \pm 9.5\% (k=2)$ | Alpha 0.52 |
| | ConvF Z | $5.3 \pm 9.5\% (k=2)$ | Depth 2.46 |

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Assessment:

Zurich

Date of Assessment:

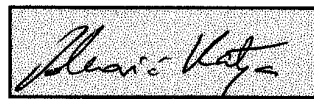
May 1, 2002

Probe Calibration Date:

April 26, 2002

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:1590

Conversion factor (\pm standard deviation)

| | | | |
|----------|-------|---------------|---|
| 150 MHz | ConvF | 9.4 \pm 8 % | $\epsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue) |
| 300 MHz | ConvF | 8.2 \pm 8 % | $\epsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue) |
| 450 MHz | ConvF | 7.8 \pm 8 % | $\epsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue) |
| 150 MHz | ConvF | 9.1 \pm 8 % | $\epsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue) |
| 450 MHz | ConvF | 7.9 \pm 8 % | $\epsilon_r = 56.7$ $\sigma = 0.94$ mho/m (body tissue) |
| 2450 MHz | ConvF | 4.5 \pm 8 % | $\epsilon_r = 39.2$ $\sigma = 1.80$ mho/m (head tissue) |
| 2450 MHz | ConvF | 4.1 \pm 8 % | $\epsilon_r = 52.7$ $\sigma = 1.95$ mho/m (body tissue) |

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

450MHz EUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

March 14, 2003

| Frequency | ϵ' | ϵ'' |
|----------------|-------------|--------------|
| 350.000000 MHz | 46.1769 | 40.0388 |
| 360.000000 MHz | 45.9729 | 39.3270 |
| 370.000000 MHz | 45.7207 | 38.6930 |
| 380.000000 MHz | 45.4921 | 38.0672 |
| 390.000000 MHz | 45.2325 | 37.4562 |
| 400.000000 MHz | 44.9646 | 36.8561 |
| 410.000000 MHz | 44.7032 | 36.3664 |
| 420.000000 MHz | 44.4370 | 35.9013 |
| 430.000000 MHz | 44.2168 | 35.4711 |
| 440.000000 MHz | 43.9694 | 34.9884 |
| 450.000000 MHz | 43.6728 | 34.6103 |
| 460.000000 MHz | 43.5134 | 34.2651 |
| 470.000000 MHz | 43.2550 | 33.8783 |
| 480.000000 MHz | 43.0667 | 33.4263 |
| 490.000000 MHz | 42.8650 | 33.0643 |
| 500.000000 MHz | 42.6675 | 32.6824 |
| 510.000000 MHz | 42.4657 | 32.3332 |
| 520.000000 MHz | 42.2836 | 31.9615 |
| 530.000000 MHz | 42.1522 | 31.6597 |
| 540.000000 MHz | 41.9631 | 31.2760 |
| 550.000000 MHz | 41.7868 | 30.9743 |

450MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 14, 2003

| Frequency | e' | e'' |
|----------------|---------|---------|
| 350.000000 MHz | 60.9023 | 43.3691 |
| 360.000000 MHz | 60.7440 | 42.6159 |
| 370.000000 MHz | 60.5696 | 41.7998 |
| 380.000000 MHz | 60.4411 | 41.0819 |
| 390.000000 MHz | 60.2963 | 40.3127 |
| 400.000000 MHz | 60.1568 | 39.6628 |
| 410.000000 MHz | 59.9430 | 39.0350 |
| 420.000000 MHz | 59.6952 | 38.5034 |
| 430.000000 MHz | 59.4638 | 37.9024 |
| 440.000000 MHz | 59.2462 | 37.4224 |
| 450.000000 MHz | 59.0602 | 37.0042 |
| 460.000000 MHz | 58.9571 | 36.5381 |
| 470.000000 MHz | 58.8175 | 36.0972 |
| 480.000000 MHz | 58.6933 | 35.6603 |
| 490.000000 MHz | 58.5341 | 35.2826 |
| 500.000000 MHz | 58.4799 | 34.8770 |
| 510.000000 MHz | 58.3742 | 34.4621 |
| 520.000000 MHz | 58.2431 | 34.0671 |
| 530.000000 MHz | 58.1270 | 33.7148 |
| 540.000000 MHz | 58.0583 | 33.2722 |
| 550.000000 MHz | 57.8828 | 32.9745 |

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

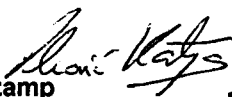
- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9
- (*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

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



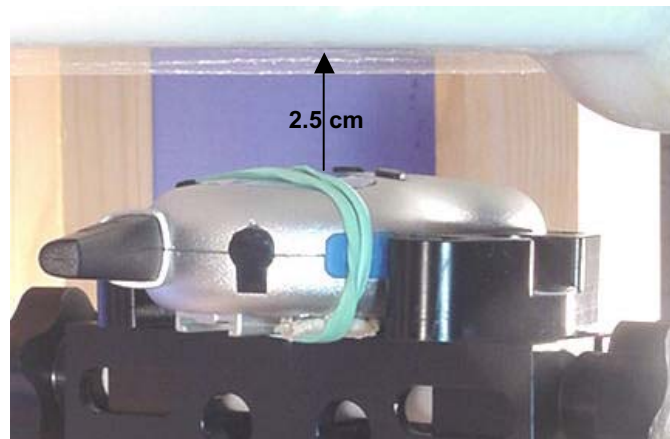
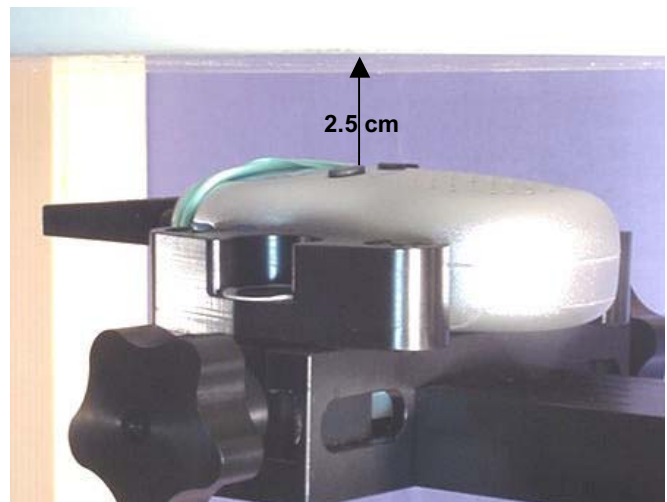
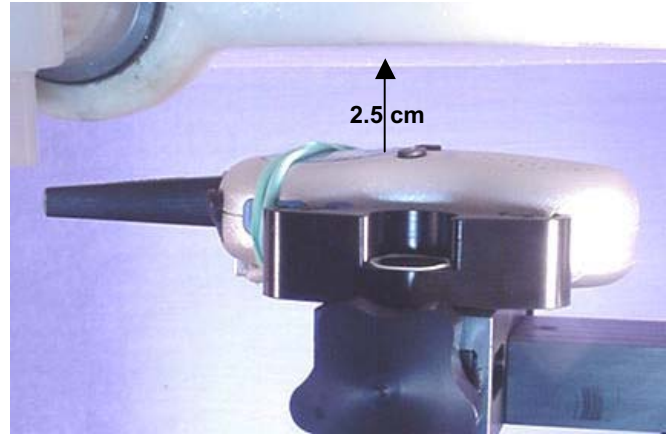
**Schmid & Partner
Engineering AG**



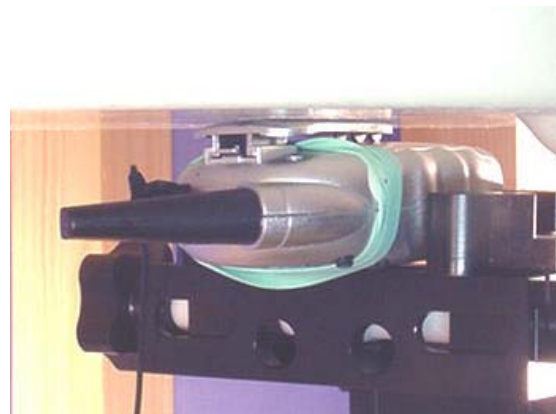
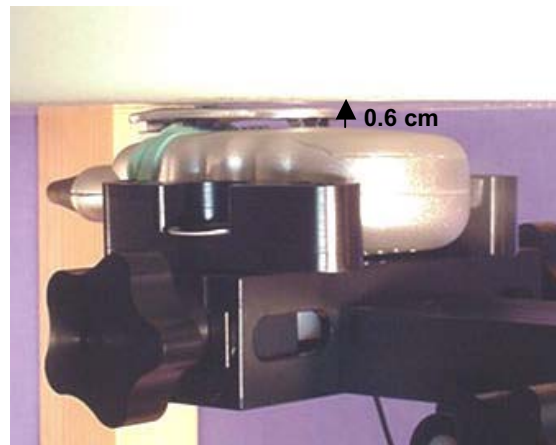
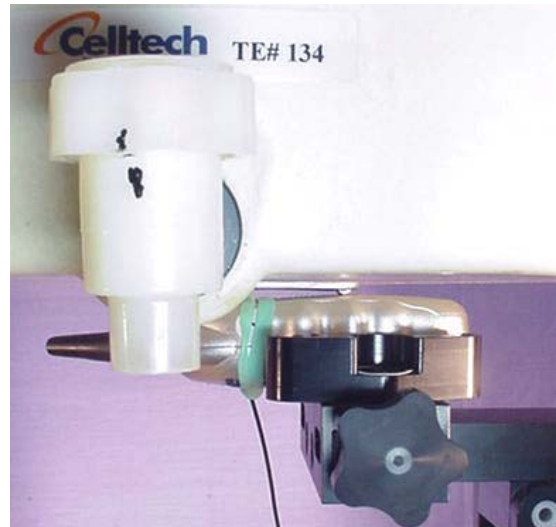
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APPENDIX G - SAR TEST SETUP & EUT PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS
2.5 cm Separation Distance from front of EUT to planar phantom



BODY-WORN SAR TEST SETUP PHOTOGRAPHS
0.6 cm Belt-Clip Separation Distance from back of EUT to planar phantom
with Ear-Microphone Accessory



EUT PHOTOGRAPHS

