CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Test Lab:	Applicant Information:
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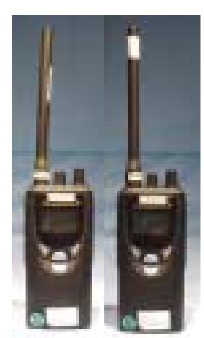
FCC Rule Part(s):	**2.1093; ET Docket 96-326**
FCC ID:	**O7KPL5161**
Model(s):	**PL5161**
EUT Type:	**Portable VHF PTT Radio Transceiver**
Modulation:	**FM (VHF Band)**
Tx Frequency Range:	**148 - 174 MHz**
Rated RF Conducted Power:	**5.0 Watts**
Antenna Type(s):	**Helical Whip**
Antenna P/N(s):	**1. ACC-115B (148-162 MHz)** **2. ACC-115R (162-174 MHz)**

Celltech Research 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 OET Bulletin 65, Supplement C, Edition 01-01 (Occupational/Controlled Exposure), and was tested in accordance with the appropriate measurement standards, guidelines, and recommended practices specified in American National Standards Institute C95.1-1992.

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 Research Inc. The results and statements contained in this report pertain only to the device(s) evaluated.



Shawn McMillen
General Manager
Celltech Research Inc.

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1.0 INTRODUCTION

This measurement report shows that the TOPAZ3 Model: PL5161 Portable VHF PTT Radio Transceiver FCC ID: O7KPL5161 complies with FCC Part 2.1093, ET Docket 96-326 Rules for mobile and portable devices (controlled exposure). The test procedures, as described in American National Standards Institute C95.1-1992 (see reference [1]), and FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

Rule Part(s)	FCC 2.1093; ET Docket 96.326
EUT Type	Portable VHF PTT Radio Transceiver
FCC ID	O7KPL5161
Model No.(s)	PL5161
Serial No.	Pre-production
Modulation	FM (VHF Band)
Tx Frequency Range	148 - 174 MHz
Rated RF Conducted Output Power	5.0 Watts
Antenna Type(s)	Helical Whip
Antenna P/N(s)	1. ACC-115B (148-162 MHz) 2. ACC-115R (162-174 MHz)
Battery Type	7.2V DC NiMH

3.0 SAR MEASUREMENT SYSTEM

Celltech Research 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, SAM phantom, and various planar phantoms for brain 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 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 small planar phantom

DASY3 SAR Measurement System with large planar 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.

Face-Held SAR Measurements

Freq. (MHz)	Chan.	Mode	Cond. Power Before (W)	Cond. Power After (W)	Antenna Position	Antenna P/N	Separation Distance (cm)	SAR (w/kg)	
								100% Duty Cycle	50% Duty Cycle
148.025	Low	CW	5.20	5.04	Fixed	ACC-115B	2.5	1.67	0.835
155.025	Mid	CW	5.14	4.96	Fixed	ACC-115B	2.5	3.42	1.71
173.980	High	CW	5.10	4.89	Fixed	ACC-115R	2.5	0.347	0.174
Mixture Type: Brain (Measured) Dielectric Constant: 52.5 Conductivity: 0.76					**ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Exposure / Occupational BRAIN: 8.0 W/kg (averaged over 1 gram)**				

Notes:

1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest face-held SAR value found was 3.42 w/kg (100% duty cycle).
3. The EUT was tested for face-held SAR with a 2.5cm separation distance between the front of the EUT and the outer surface of the planar phantom.
4. Ambient TEMPERATURE: 23.3 °C
   Relative HUMIDITY: 38.9 %
   Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

Face-held SAR Test Setup
2.5cm Separation Distance

MEASUREMENT SUMMARY (Cont.)

Body-Worn SAR Measurements (with Metal Belt-Clip)

Freq. (MHz)	Chan.	Mode	Cond. Power Before (W)	Cond. Power After (W)	Antenna Position	Antenna Type	Belt-Clip Separation Distance (cm)	SAR (w/kg)	
								100% Duty Cycle	50% Duty Cycle
148.025	Low	CW	5.20	5.11	Fixed	ACC-115B	1.2	10.7	5.35
155.025	Mid	CW	5.14	5.03	Fixed	ACC-115B	1.2	8.39	4.20
173.980	High	CW	5.10	4.97	Fixed	ACC-115R	1.2	3.25	1.63
Mixture Type: Body (Measured) **Dielectric Constant: 62.3** **Conductivity: 0.80**					**ANSI / IEEE C95.1 1992 - SAFETY LIMIT** **Spatial Peak Controlled Exposure / Occupational** **BODY: 8.0 W/kg (averaged over 1 gram)**				

Notes:
1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest body-worn SAR value found was 5.35 w/kg (50% duty cycle).
3. The EUT was tested for body-worn SAR with the attached metal belt-clip providing a 1.2cm separation distance between the back of the EUT and the outer surface of the planar phantom.
4. Ambient TEMPERATURE: 23.3 °C
   Relative HUMIDITY: 38.9 %
   Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

Body-worn SAR Test Setup
1.2cm Belt-Clip Separation Distance

MEASUREMENT SUMMARY (Cont.)

Body-Worn SAR Measurements (with Belt-Loop, Swivel, & Leather Case)

Freq. (MHz)	Chan.	Mode	Cond. Power Before (W)	Cond. Power After (W)	Antenna Position	Antenna Type	Belt-Loop, Swivel, & Case Separation Distance (cm)	SAR (w/kg)	
								100% Duty Cycle	50% Duty Cycle
148.025	Low	CW	5.20	5.07	Fixed	ACC-115B	4.5	0.572	0.286
155.025	Mid	CW	5.14	5.03	Fixed	ACC-115B	4.5	1.26	0.630
173.980	High	CW	5.10	5.01	Fixed	ACC-115R	4.5	1.39	0.695
Mixture Type: Body (Measured) Dielectric Constant: 62.3 Conductivity: 0.80					ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Exposure / Occupational BODY: 8.0 W/kg (averaged over 1 gram)				

Notes:

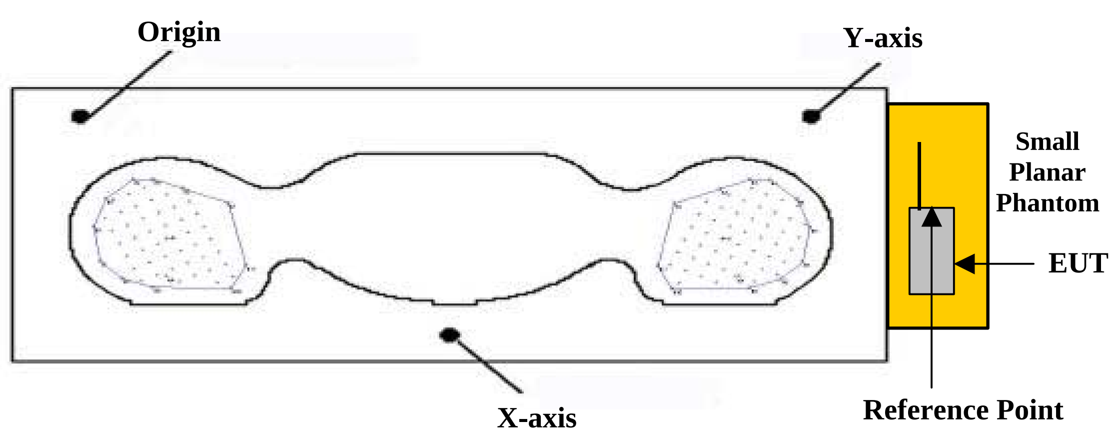
1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest body-worn SAR value found was 1.39 w/kg (100% duty cycle).
3. The EUT was tested for body-worn SAR with the attached belt-loop, swivel, and leather case providing a 4.5cm separation distance between the back of the EUT and the outer surface of the planar phantom.
4. Ambient TEMPERATURE: 23.3 °C
   Relative HUMIDITY: 38.9 %
   Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

Body-worn SAR Test Setup
4.5cm Belt-Loop, Swivel, & Case Separation

5.0 DETAILS OF SAR EVALUATION

The TOPAZ3 Model: PL5161 Portable VHF PTT Radio Transceiver FCC ID: O7KPL5161 was found to be compliant for localized Specific Absorption Rate (controlled exposure) based on the following test provisions and conditions:

1. The EUT was evaluated in a face-held configuration with the front of the device placed parallel to the outer surface of the small planar phantom. A 2.5cm separation distance was maintained between the front of the EUT and the outer surface of the small planar phantom for the duration of the test.
2. The EUT was evaluated in a body-worn configuration with back of the device placed parallel to the outer surface of the small planar phantom and the attached metal belt-clip touching the outer surface. The metal belt-clip provided a 1.2cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
3. The EUT was evaluated in a body-worn configuration with back of the device placed parallel to the outer surface of the small planar phantom and the attached belt-loop (with swivel and leather case) touching the outer surface. The belt-loop, swivel, and leather case provided a 4.5cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
4. The EUT was evaluated for SAR at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimize drift. The conducted power levels were checked before and after each test. If the conducted power level deviated more than 5% of the initial power level, then the EUT was retested. Any unusual anomalies over the course of the test also warranted a re-evaluation.
5. The conducted power was measured according to the procedures described in FCC Part 2.1046.
6. The EUT was tested with the transmitter in continuous operation (100% duty cycle) throughout the SAR evaluation. As this is a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
7. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
8. The EUT was tested with a fully charged battery.



Phantom Reference Point & EUT Positioning

6.0 EVALUATION PROCEDURES

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

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 at the low, middle, and high frequencies of the band at maximum power, and with the device antenna in both the extended and extracted positions as applicable. The positioning of the ear-held device relative to the phantom was performed in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom.

(ii) For face-held and body-worn devices a planar phantom was used. Depending on the phantom used for the evaluation, all other phantoms were drained of fluid.

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 using a uniform grid spacing.

c. A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

d. The depth of the simulating tissue in the phantom used for the SAR evaluation was no less than 15.0cm.

7.0 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.

8.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in a planar phantom with a 300MHz dipole. A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of $\pm$10%. The applicable verifications are as follows (see Appendix B for dipole validation test plots and Appendix C for dipole calibration information):

Dipole Validation Kit	Target SAR 1g (w/kg)	Measured SAR 1g (w/kg)	Fluid Temperature	Validation Date
300MHz	0.878	0.885	≈23.0 °C	11/27/01

VALIDATION TISSUE MIXTURE (300MHz Brain)	
INGREDIENT	**%**
Water	37.56
Sugar	55.32
Salt	5.95
HEC	0.98
Bactericide	0.19

BRAIN TISSUE PARAMETERS - DIPOLE VALIDATION			
Equivalent Tissue	**Dielectric Constant ε_r**	**Conductivity σ (mho/m)**	**ρ (Kg/m^3)**
300MHz Brain (Target)	45.3 ±5%	0.87 ±5%	1000
300MHz Brain (Measured: 11/27/01)	45.4 ±5%	0.87 ±5%	1000

9.0 TISSUE PARAMETERS

The dielectric parameters of the fluids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer. The dielectric parameters of the fluid are as follows:

BRAIN TISSUE PARAMETERS - EUT EVALUATION			
Equivalent Tissue	**Dielectric Constant ε_r**	**Conductivity σ (mho/m)**	**ρ (Kg/m^3)**
150MHz Brain (Target)	52.3 ±5%	0.76 ±5%	1000
150MHz Brain (Measured: 11/27/01)	52.5 ±5%	0.76 ±5%	1000

BODY TISSUE PARAMETERS - EUT EVALUATION			
Equivalent Tissue	**Dielectric Constant ε_r**	**Conductivity σ (mho/m)**	**ρ (Kg/m^3)**
150MHz Body (Target)	61.9 ±5%	0.80 ±5%	1000
150MHz Body (Measured: 11/27/01)	62.3 ±5%	0.80 ±5%	1000

10.0 SIMULATED TISSUES

The brain and muscle 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 (permitivity and conductivity).

INGREDIENT	MIXTURE %	
	150MHz Brain	**150MHz Body**
Water	38.35	46.6
Sugar	55.5	49.7
Salt	5.15	2.6
HEC	0.9	1.0
Bactericide	0.1	0.1

11.0 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:	Small Planar Phantom
Shell Material:	Plexiglas
Bottom Thickness:	2.0 mm ± 0.1mm
Dimensions:	Box: 36.5cm (L) x 22.5cm (W) x 20.3cm (H); Back Plane: 25.3cm (H)

Validation Phantom (≤ 450MHz)

Type:	Large Planar Phantom
Shell Material:	Plexiglas
Bottom Thickness:	6.2 mm ± 0.1mm
Dimensions:	86.0cm (L) x 39.5cm (W) x 21.8cm (H)

12.0 PROBE SPECIFICATION (ET3DV6)

Construction: Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration: In air from 10 MHz to 2.5 GHz
In brain simulating tissue at frequencies of 900 MHz
and 1.8 GHz (accuracy ± 8%)
Frequency: 10 MHz to > 6 GHz; Linearity: ± 0.2 dB
(30 MHz to 3 GHz)
Directivity: ± 0.2 dB in brain tissue (rotation around probe axis)
± 0.4 dB in brain tissue (rotation normal to probe axis)
Dynam. Rnge: 5 µW/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

13.0 SMALL PLANAR PHANTOM

The small planar phantom is constructed of Plexiglas material with a 2.0mm shell thickness for face-held and body-worn SAR evaluations. The small planar phantom is mounted onto the outer left hand section of the DASY3 system.


Small Planar Phantom

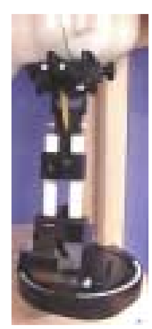
14.0 LARGE PLANAR PHANTOM

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


Large Planar Phantom

15.0 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

16.0 TEST EQUIPMENT LIST

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

17.0 MEASUREMENT UNCERTAINTIES

Uncertainty Description	Error	Distribution	Weight	Standard Deviation	Offset
Probe Uncertainty					
Axial isotropy	±0.2 dB	U-Shaped	0.5	±2.4 %	
Spherical isotropy	±0.4 dB	U-Shaped	0.5	±4.8 %	
Isotropy from gradient	±0.5 dB	U-Shaped	0	±	
Spatial resolution	±0.5 %	Normal	1	±0.5 %	
Linearity error	±0.2 dB	Rectangle	1	±2.7 %	
Calibration error	±3.3 %	Normal	1	±3.3 %	
SAR Evaluation Uncertainty					
Data acquisition error	±1 %	Rectangle	1	±0.6 %	
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %	
Conductivity assessment	±5 %	Rectangle	1	±5.8 %	
Spatial Peak SAR Evaluation Uncertainty					
Extrapolated boundary effect	±3 %	Normal	1	±3 %	±5 %
Probe positioning error	±0.1 mm	Normal	1	±1 %	
Integrated and cube orientation	±3 %	Normal	1	±3 %	
Cube Shape inaccuracies	±2 %	Rectangle	1	±1.2 %	
Device positioning	±6 %	Normal	1	±6 %	
Combined Uncertainties				±11.7 %	±5 %

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental.

According to ANSI/IEEE C95.3, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ± 1 to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least ± 2dB can be expected.

According to CENELEC, typical worst-case uncertainty of field measurements is ± 5 dB.
For well-defined modulation characteristics the uncertainty can be reduced to ± 3 dB.

18.0 REFERENCES

(1) ANSI, *ANSI/IEEE C95.1: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 Ghz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY: 1992.*

(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. 20554: June 2001.

(3) Thomas Schmid, Oliver Egger, and Neils Kuster, "Automated E-field scanning system for dosimetric assessments", IEEE *Transaction on Microwave Theory and Techniques,* Vol. 44, pp. 105 – 113: January 1996.

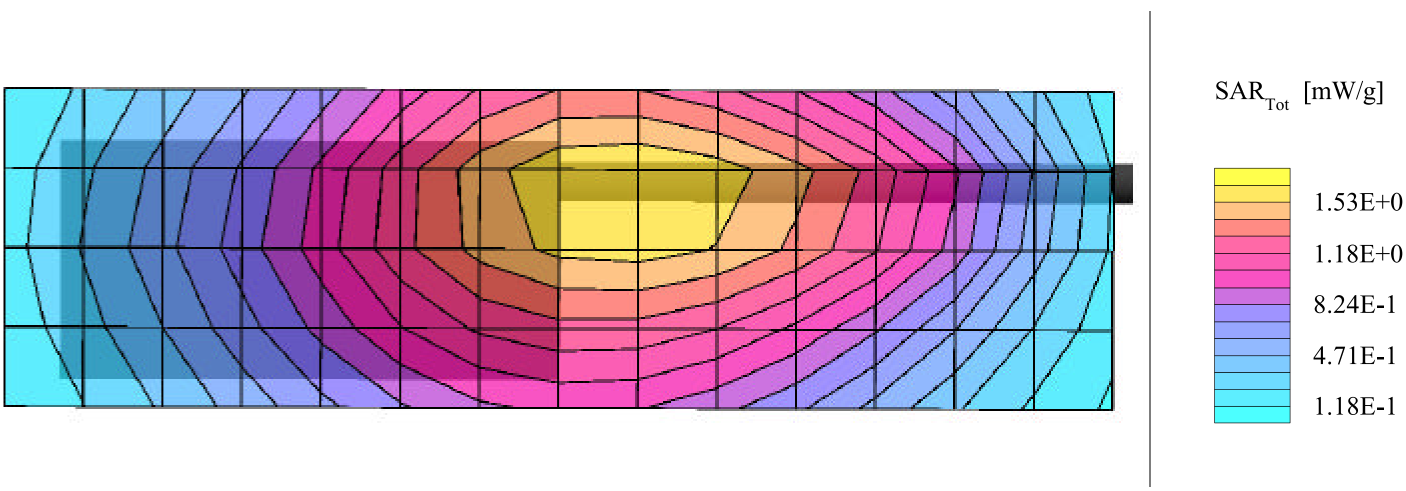
(4) Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with know precision", IEICE Transactions of Communications, vol. E80-B, no. 5, pp. 645 – 652: May 1997.

APPENDIX A - SAR MEASUREMENT DATA

Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Brain : σ = 0.76 mho/m ε_r = 52.3 ρ = 1.00 g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.18 dB
SAR (1g): 1.67 mW/g, SAR (10g): 1.31 mW/g

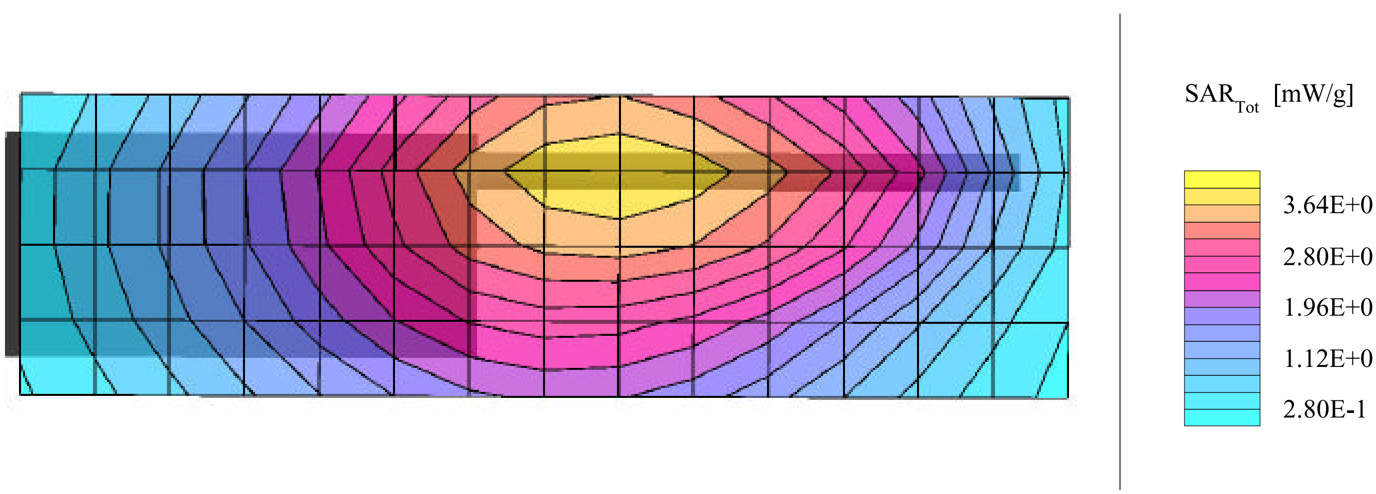
Face SAR at 2.5cm Separation Distance
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Low Channel [148.025 MHz]
Conducted Power: 5.20 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Brain : σ = 0.76 mho/m ε_r = 52.3 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.19 dB
SAR (1g): 3.42 mW/g, SAR (10g): 2.64 mW/g

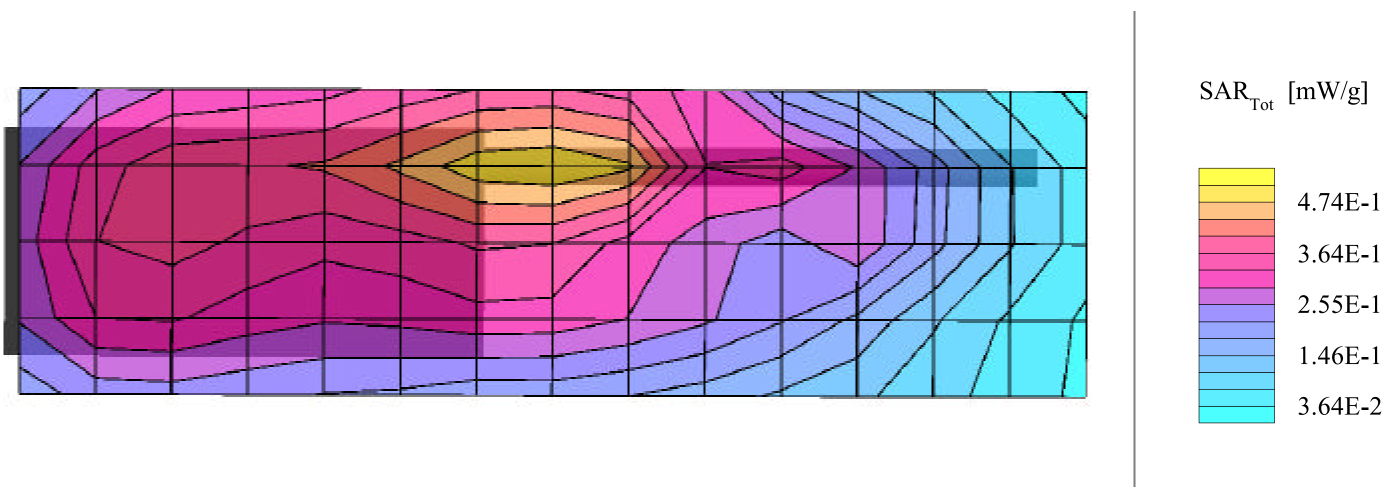
Face SAR at 2.5cm Separation Distance
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Mid Channel [155.025 MHz]
Conducted Power: 5.14 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Brain : σ = 0.76 mho/m ε_r = 52.3 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.20 dB
SAR (1g): 0.347 mW/g, SAR (10g): 0.237 mW/g

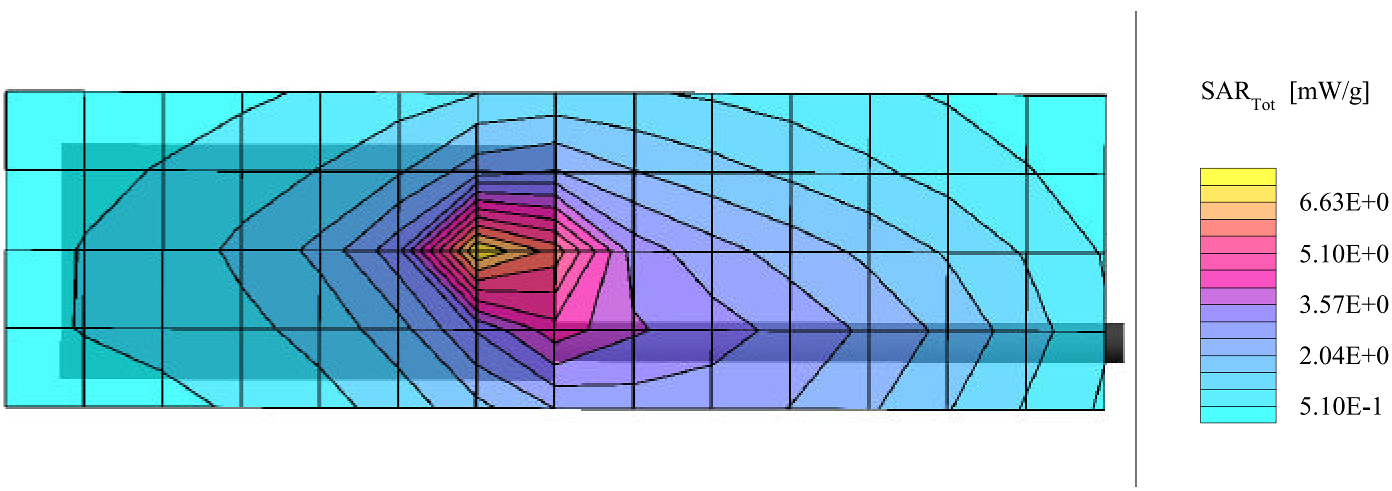
Face SAR at 2.5cm Separation Distance
Portable VHF PTT Radio Transceiver
Antenna: ACC-115R
Topaz3 Model: PL5161
Continuous Wave Mode
High Channel [173.980 MHz]
Conducted Power: 5.10 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: σ = 0.80 mho/m ε_r = 61.9 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.12dB
SAR (1g): 10.7 mW/g, SAR (10g): 5.15 mW/g

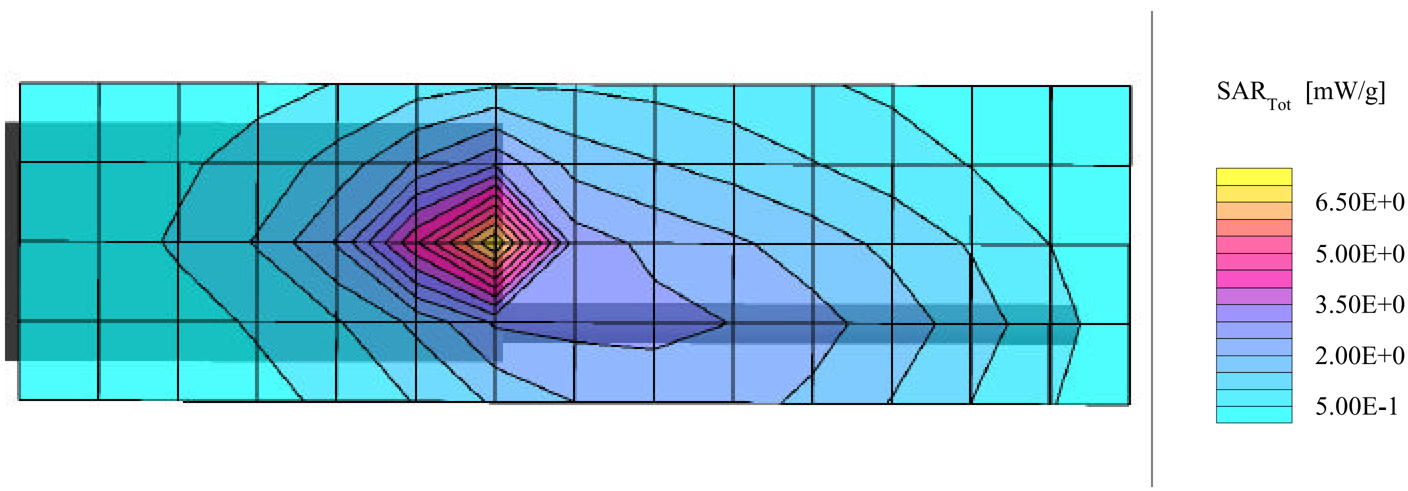
Body-Worn SAR with 1.2cm Metal Belt-Clip
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Low Channel [148.025 MHz]
Conducted Power: 5.20 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: $\sigma = 0.80$ mho/m $\varepsilon_r = 61.9$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.09 dB
SAR (1g): 8.39 mW/g, SAR (10g): 3.95 mW/g

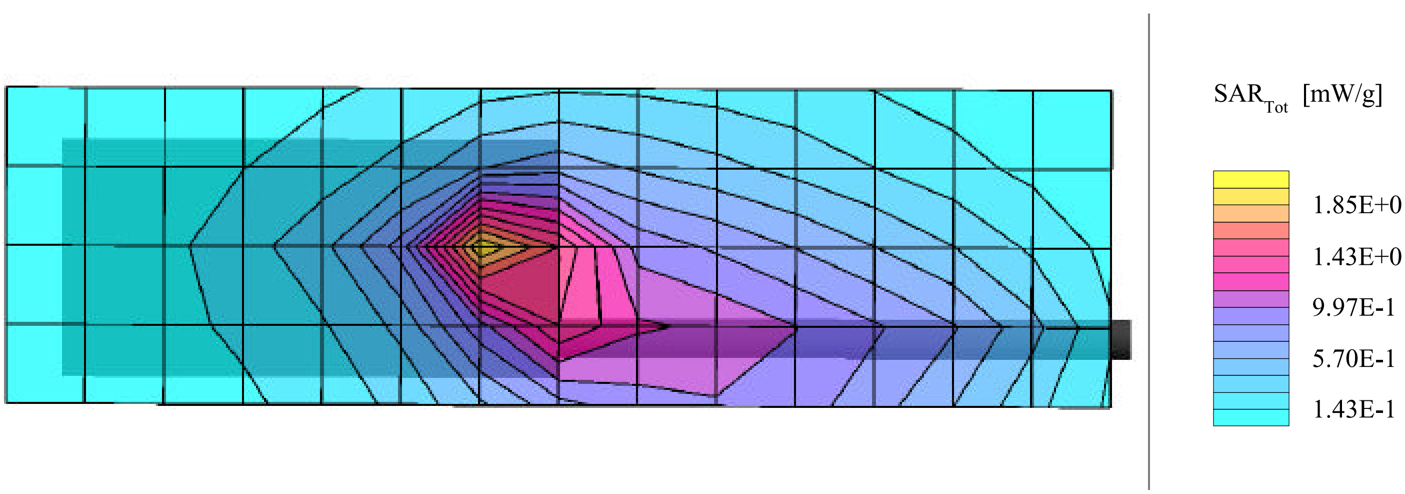
Body-Worn SAR with 1.2cm Metal Belt-Clip
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Mid Channel [155.025 MHz]
Conducted Power: 5.14 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: σ = 0.80 mho/m ε_r = 61.9 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.15dB
SAR (1g): 3.25 mW/g, SAR (10g): 1.51 mW/g

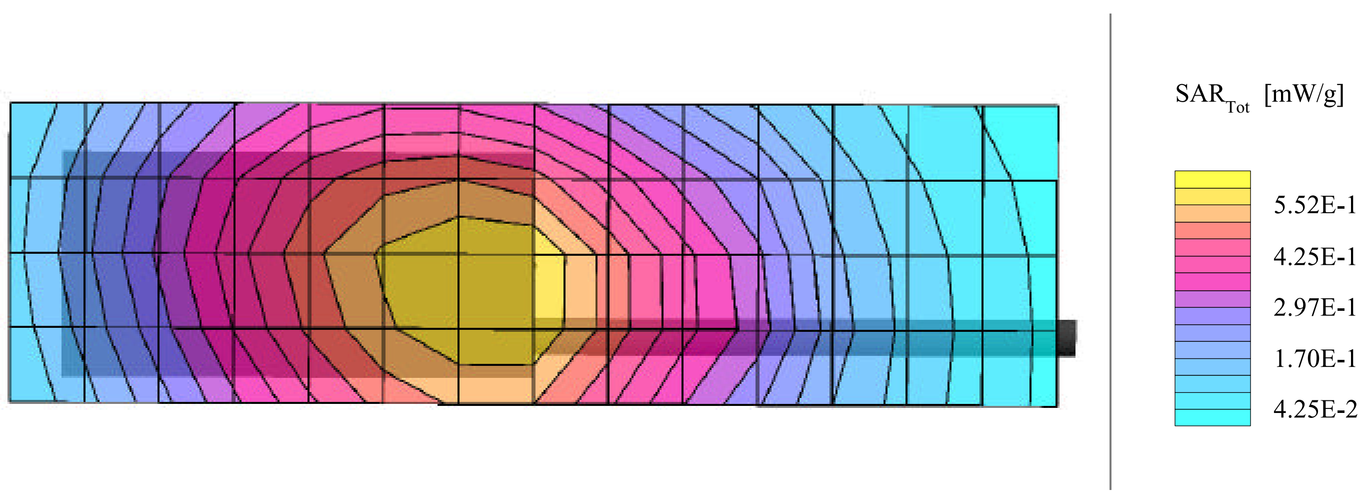
Body-Worn SAR with 1.2cm Metal Belt-Clip
Portable VHF PTT Radio Transceiver
Antenna: ACC-115R
Topaz3 Model: PL5161
Continuous Wave Mode
High Channel [173.980 MHz]
Conducted Power: 5.10 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: σ = 0.80 mho/m ε_r = 61.9 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.16 dB
SAR (1g): 0.572 mW/g, SAR (10g): 0.454 mW/g

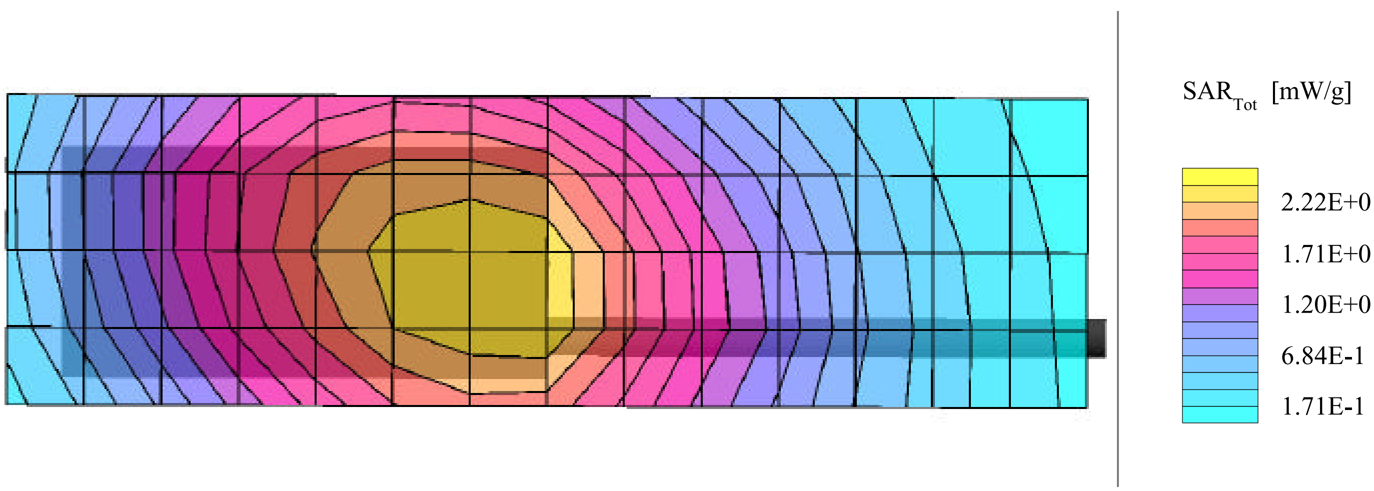
Body-Worn SAR with 4.5cm Belt-Loop, Swivel, & Case
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Low Channel [148.025 MHz]
Conducted Power: 5.20 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: σ = 0.80 mho/m ε_r = 61.9 ρ = 1.00 g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.10 dB
SAR (1g): 1.26 mW/g, SAR (10g): 0.850 mW/g

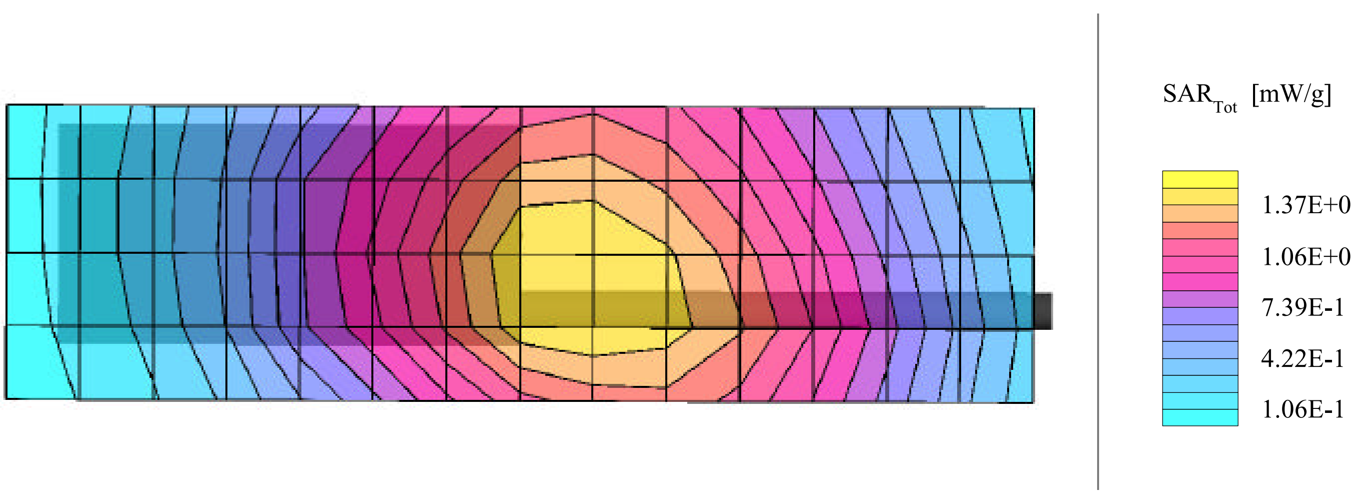
Body-Worn SAR with 4.5cm Belt-Loop, Swivel, & Case
Portable VHF PTT Radio Transceiver
Antenna: ACC-115B
Topaz3 Model: PL5161
Continuous Wave Mode
Mid Channel [155.025 MHz]
Conducted Power: 5.14 W
Date Tested: November 27, 2001



Topaz3 LLC FCC ID: O7KPL5161

Small Planar Phantom; Planar Section; Position: (270°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0
150 MHz Muscle: $\sigma = 0.80$ mho/m $\varepsilon_r = 61.9$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.12 dB
SAR (1g): 1.39 mW/g, SAR (10g): 1.09 mW/g

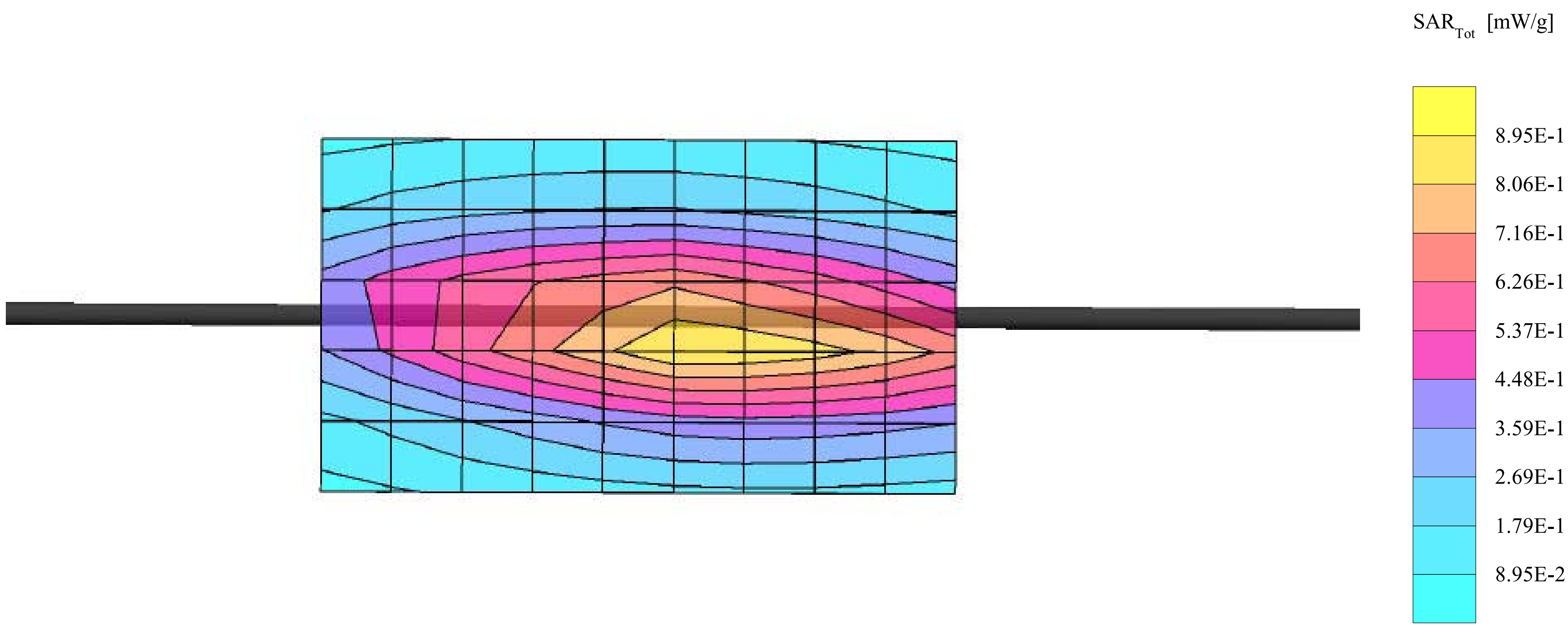
Body-Worn SAR with 4.5cm Belt-Loop, Swivel, & Case
Portable VHF PTT Radio Transceiver
Antenna: ACC-115R
Topaz3 Model: PL5161
Continuous Wave Mode
High Channel [173.980 MHz]
Conducted Power: 5.10 W
Date Tested: November 27, 2001



APPENDIX B - DIPOLE VALIDATION

Dipole 300 MHz

Frequency: 300 MHz; Conducted Input Power: 250 [mW]
Flat Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(7.54,7.54,7.54); Crest factor: 1.0; 300 MHz Brain: $\sigma = 0.87$ mho/m $\varepsilon_r = 45.3$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: Peak: 1.41 mW/g, SAR (1g): 0.885 mW/g, SAR (10g): 0.583 mW/g, (Worst-case extrapolation)
Penetration depth: 12.4 (10.5, 14.7) [mm]
Powerdrift: -0.03 dB
Calibration Date: Nov. 27, 2001

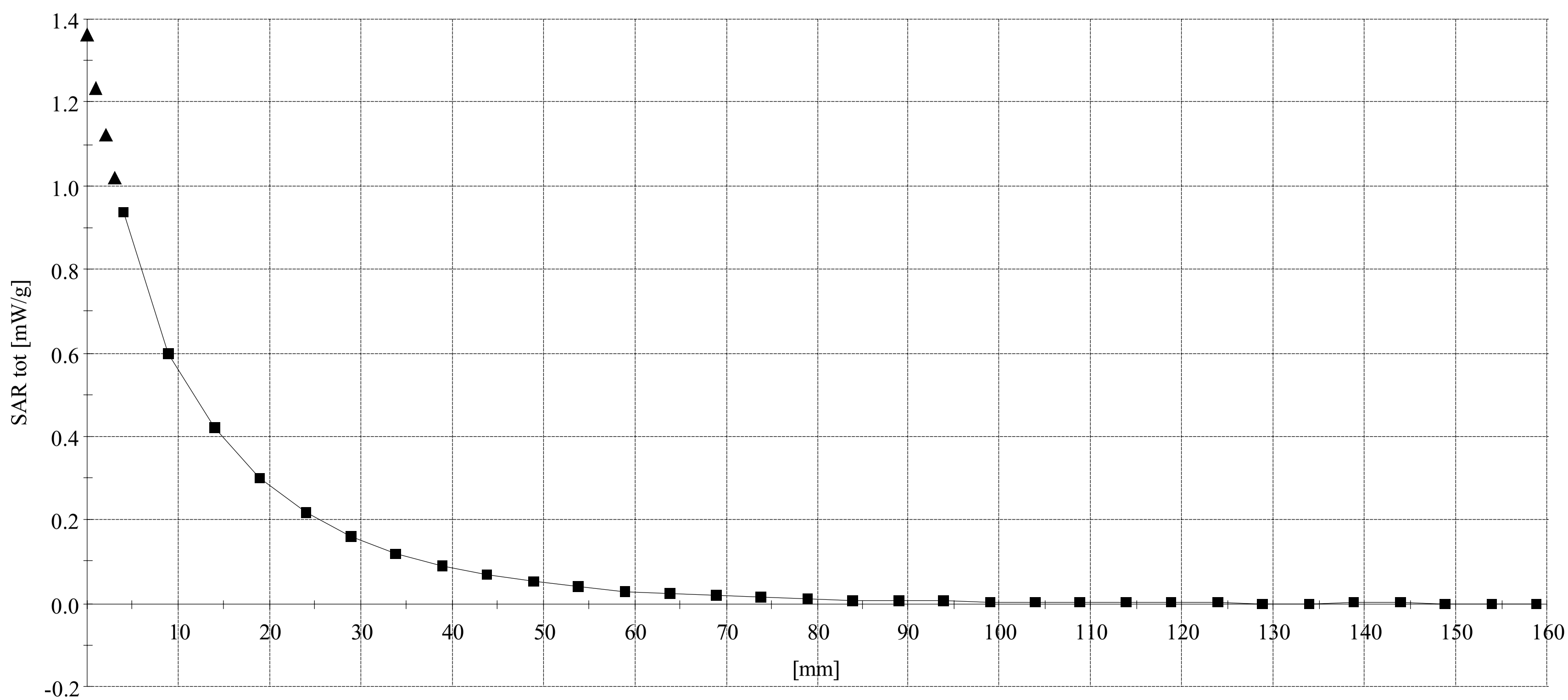


Dipole 300 MHz

Flat Phantom; Section; Position:
Probe: ET3DV6 - SN1590; ConvF(7.54,7.54,7.54); Crest factor: 1.0
300 MHz Brain: $\sigma = 0.87$ mho/m $\varepsilon_r = 45.3$ $\rho = 1.00$ g/cm^3
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Z-Axis Scan to show minimum fluid depth of 15cm was maintained

Conducted Power: 250 mW
Date Tested: November 27, 2001



APPENDIX C - DIPOLE CALIBRATION

300MHz SYSTEM VALIDATION DIPOLE

Type:	**300MHz Validation Dipole**
Serial Number:	**135**
Place of Calibration:	**Celltech Research Inc.**
Date of Calibration:	**October 15, 2001**

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

Calibrated by:

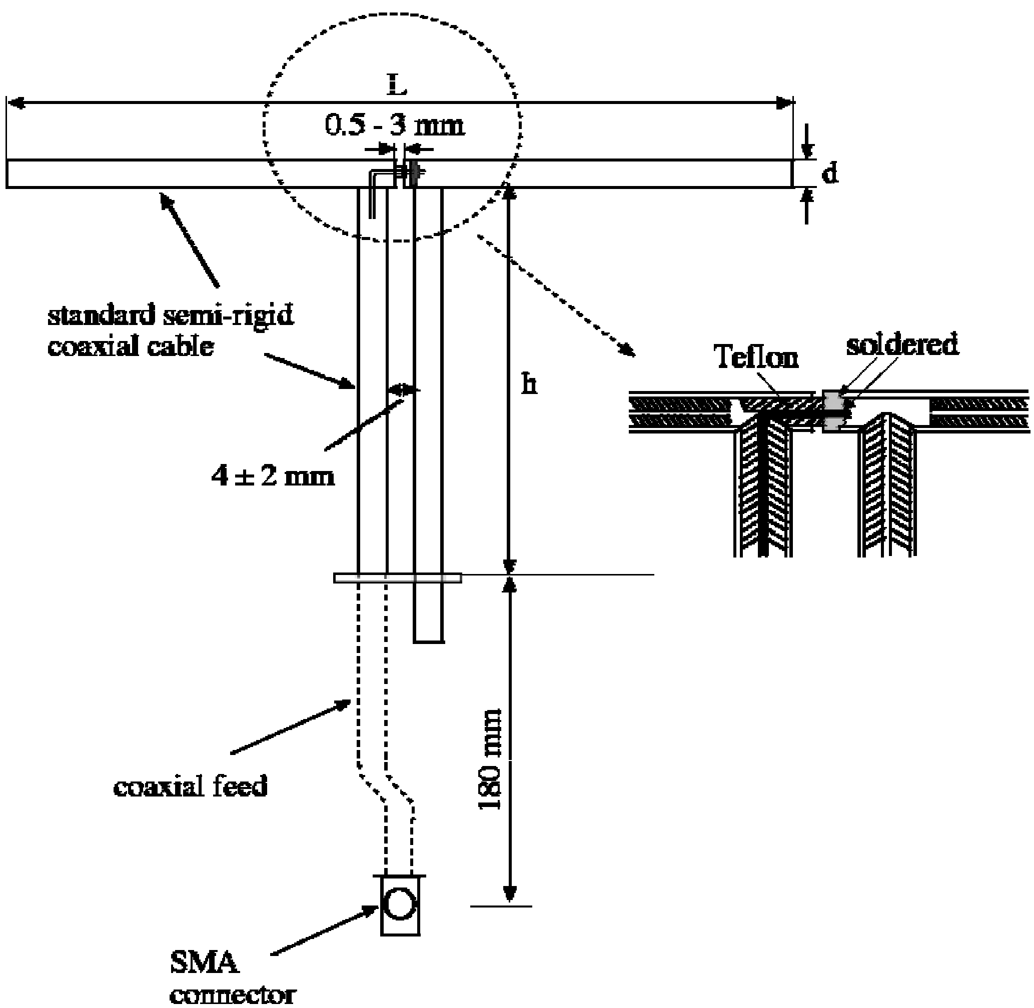
Approved by:

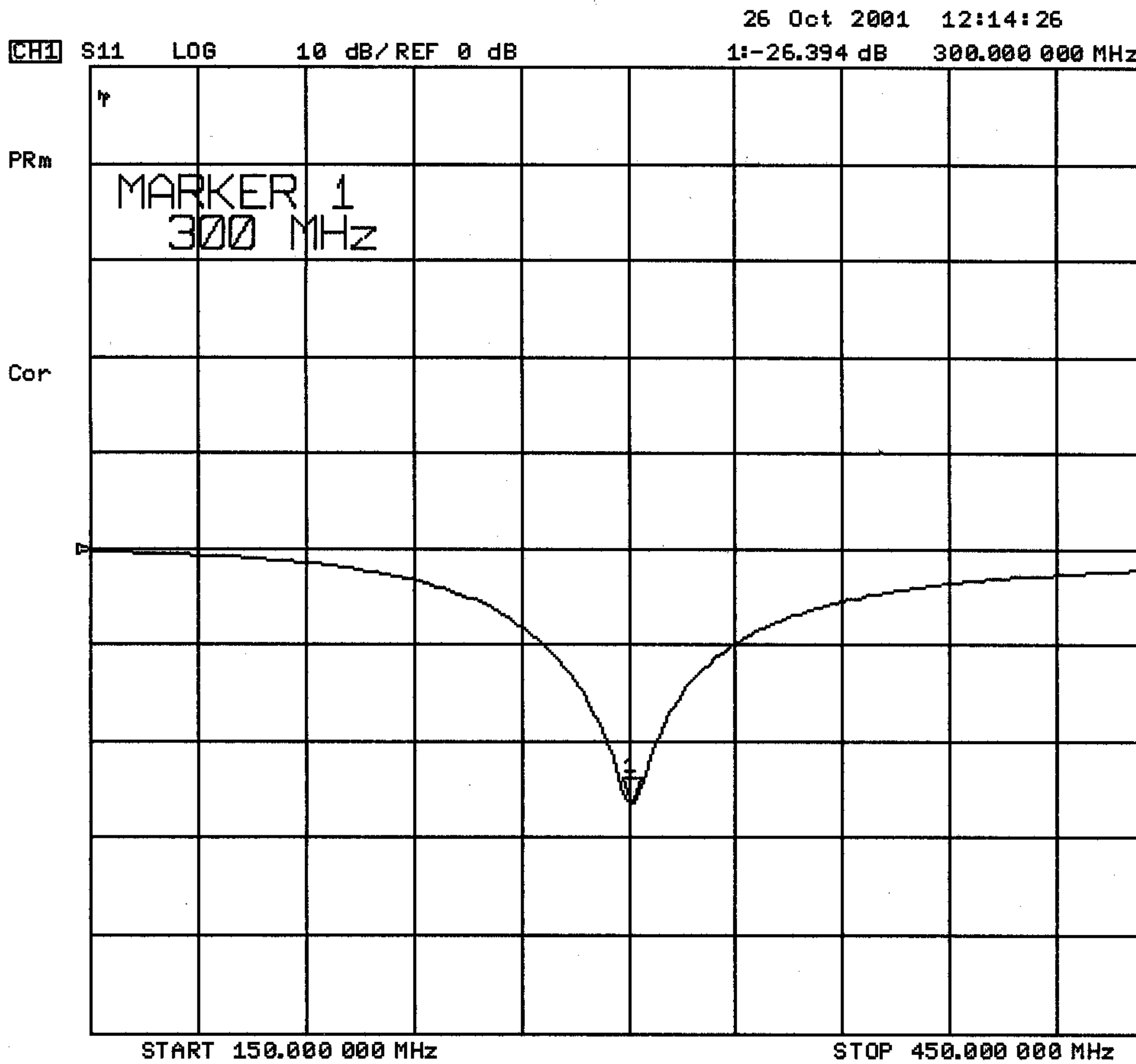
Celltech Research Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-860-3130 • Fax. 250-860-3110 • e-mail: info@celltechlabs.com
www.celltechlabs.com

1. Dipole Construction & Electrical Characteristics

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

Feed point impedance at 300MHz	Re{Z} = 45.789Ω
	Im{Z} = 1.2598Ω
Return Loss at 300MHz	-26.394dB





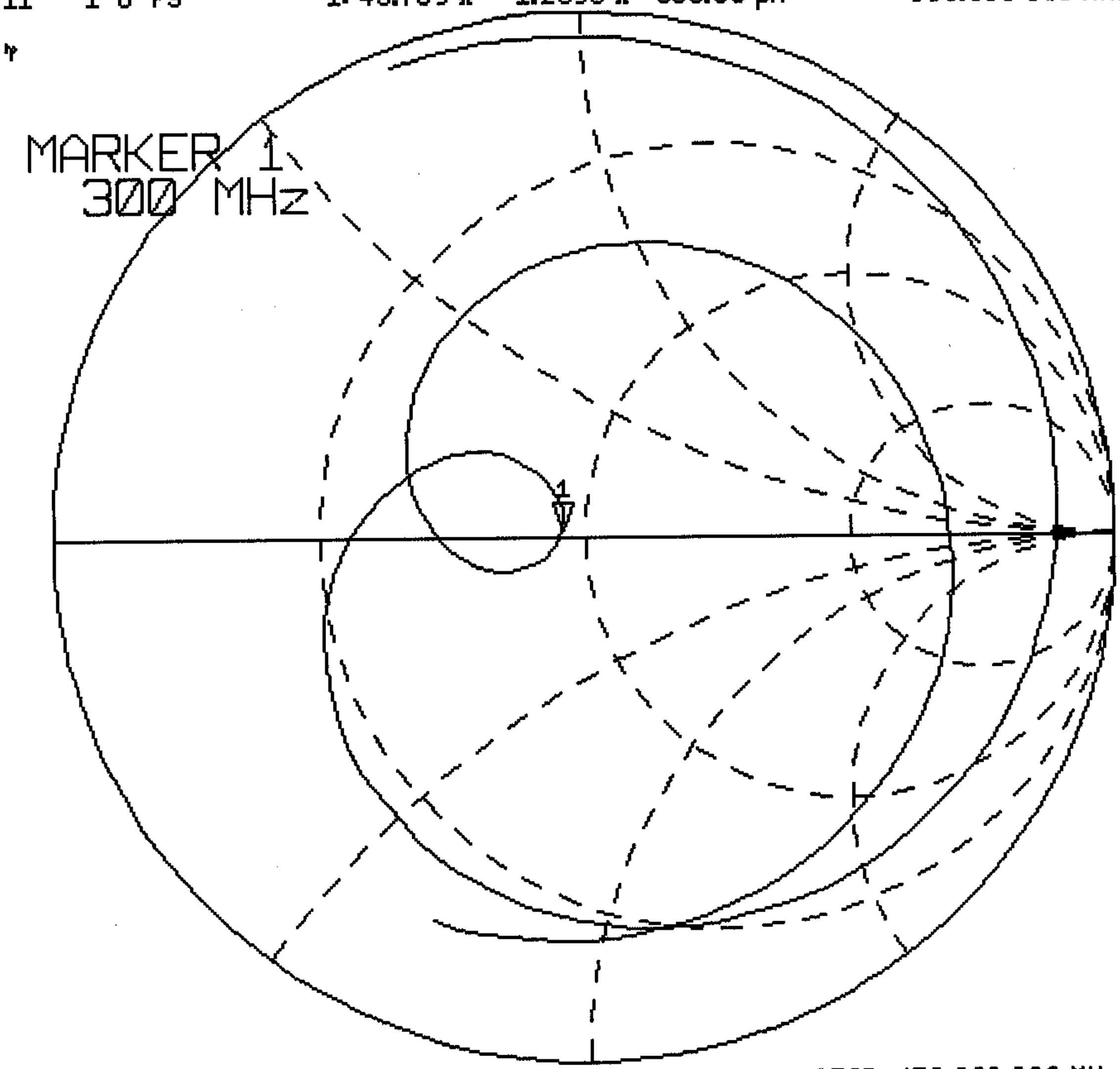
26 Oct 2001 12:14:26
CH1 S11 LOG 10 dB/ REF 0 dB 1:-26.394 dB 300.000 000 MHz
PRm
MARKER 1
300 MHz
Cor
START 150.000 000 MHz
STOP 450.000 000 MHz

26 Oct 2001 12:15:29

CH1 S11 1 U FS 1: 45.789 Ω 1.2598 Ω 668.33 pH 300.000 000 MHz

PRm

Cor



START 150.000 000 MHz

STOP 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

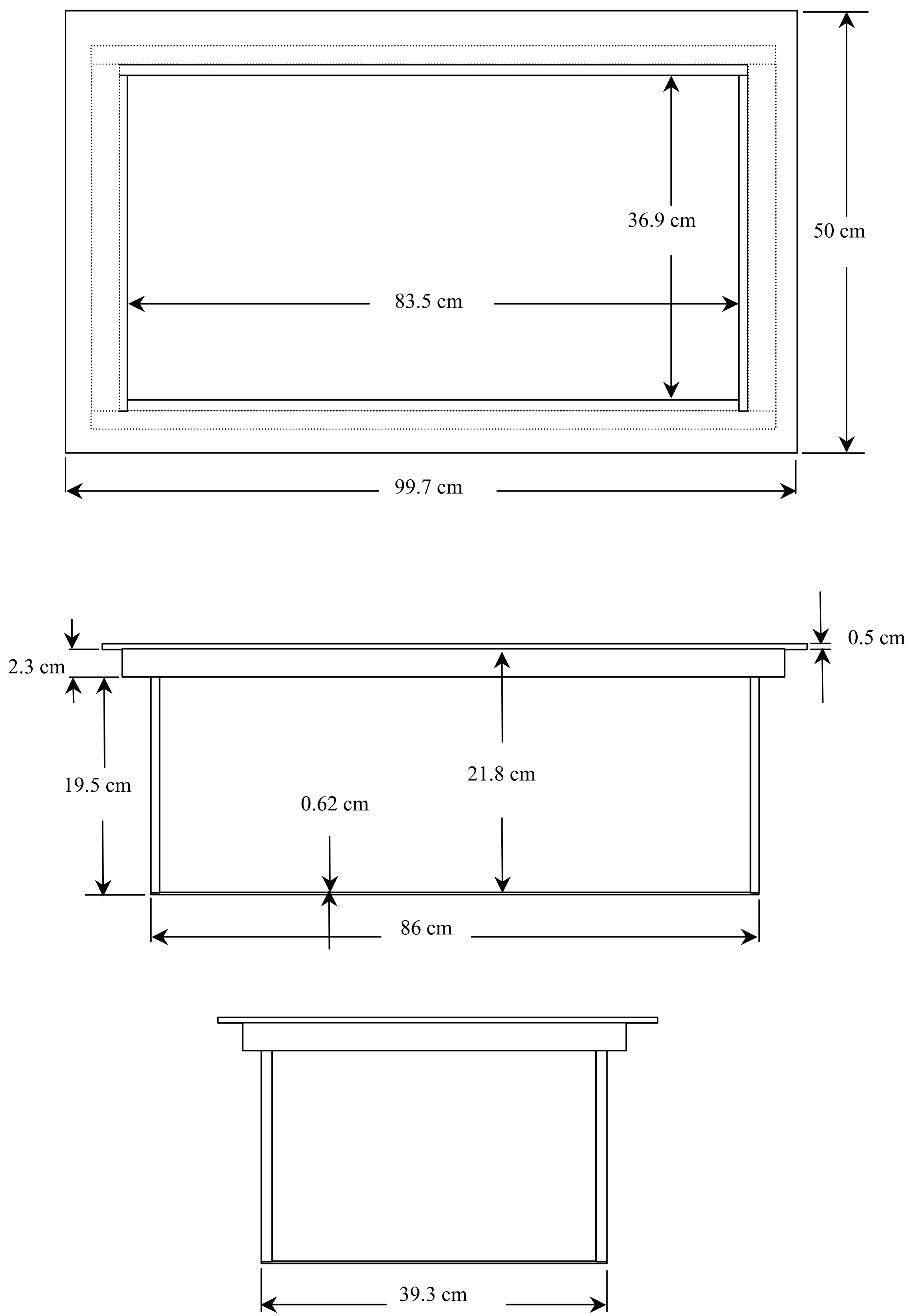
2. Validation Phantom

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

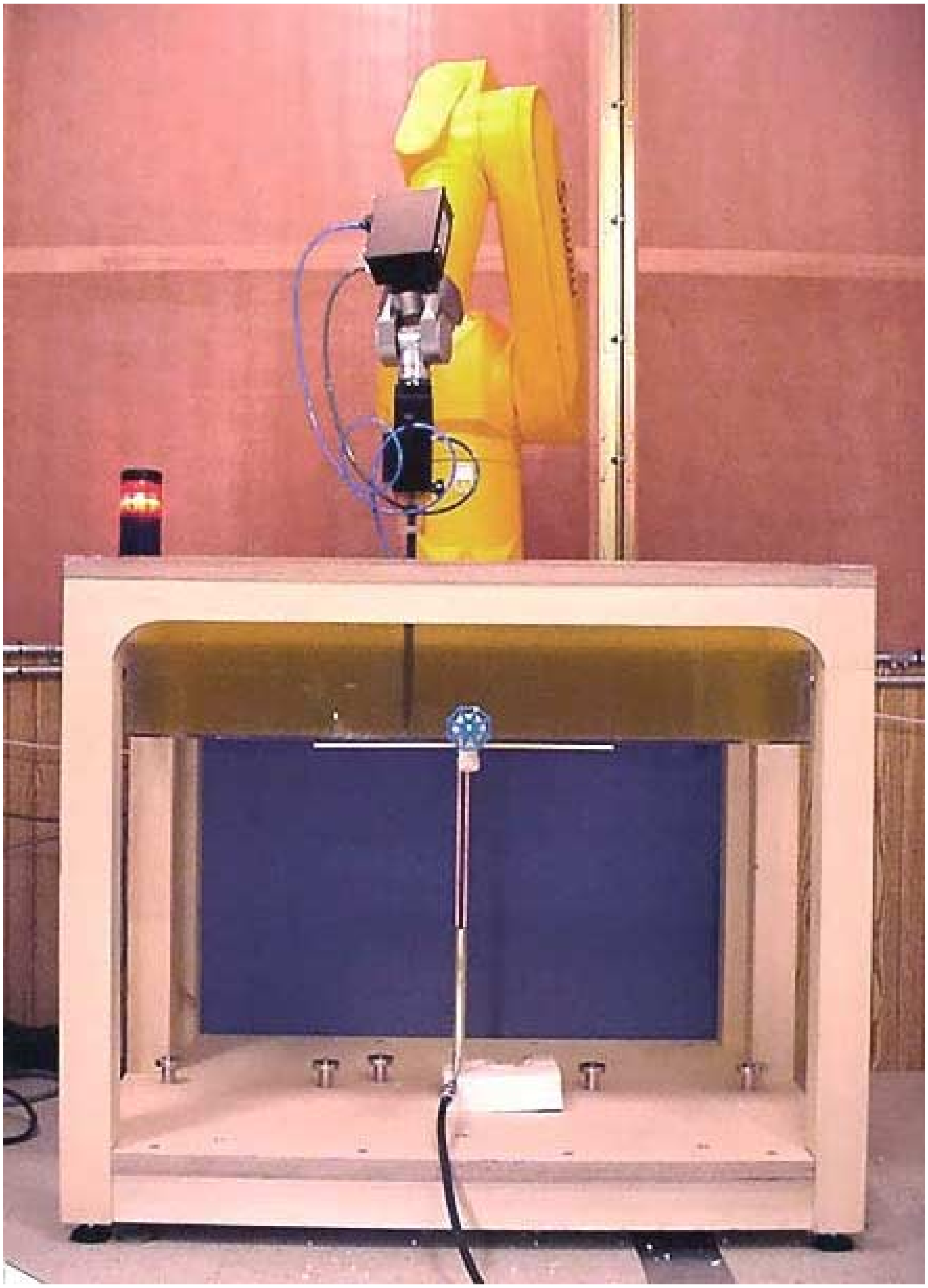
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

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

Dimensions of Plexiglas Planar Phantom



300MHz Dipole Calibration Photo



300MHz Dipole Calibration Photo

3. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 300MHz:

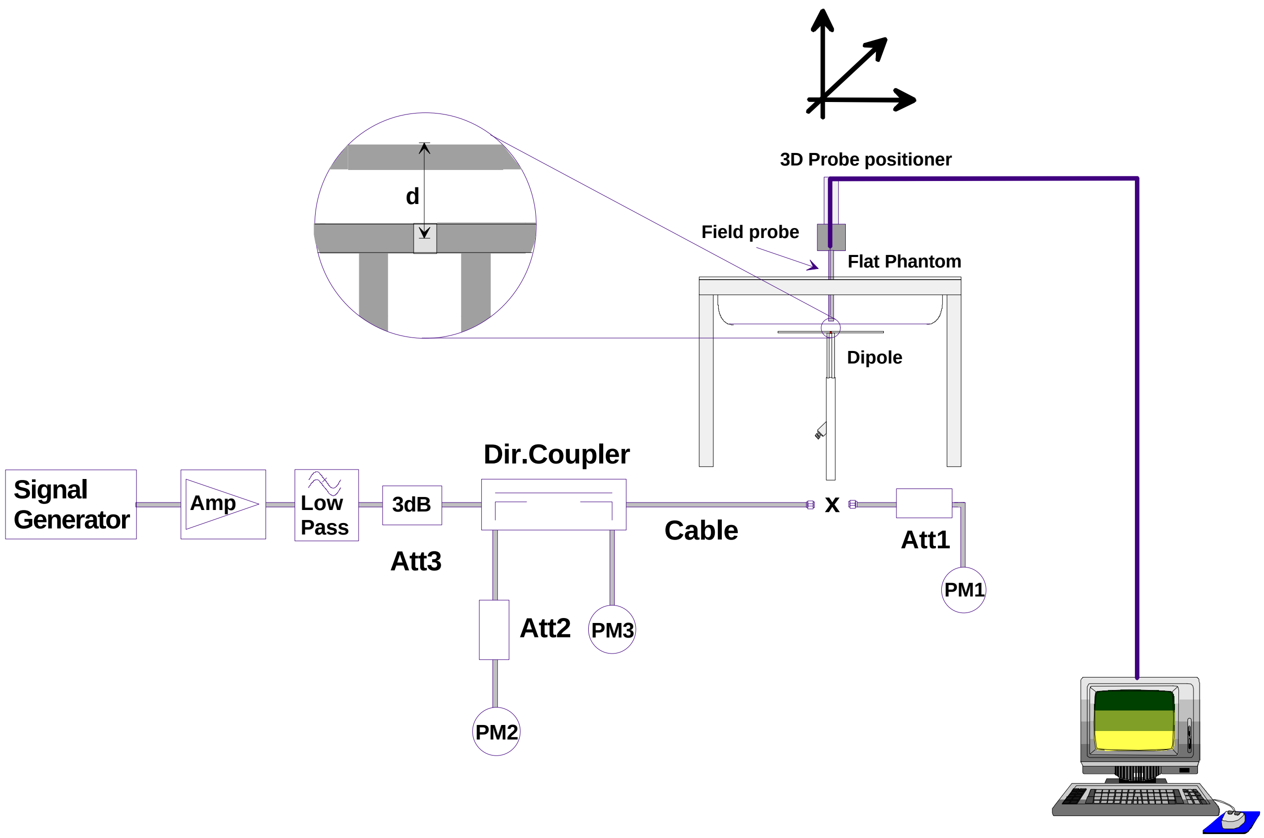
Relative Permitivity:	45.7	± 5%
Conductivity:	0.86 mho/m	± 5%
Temperature:	22.5°C	

The 300MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	37.56%
Sugar	55.32%
Salt	5.95%
HEC	0.98%
Dowicil 75	0.19%
Target Dielectric Parameters at 22°C	ε_r = 45.3 σ = 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	0.872	3.488	0.579	2.316	1.38
Test 2	0.876	3.504	0.580	2.320	1.39
Test 3	0.876	3.504	0.581	2.324	1.39
Test 4	0.878	3.512	0.583	2.332	1.39
Test 5	0.881	3.524	0.581	2.324	1.39
Test 6	0.875	3.500	0.580	2.320	1.38
Test 7	0.884	3.536	0.582	2.328	1.40
Test 8	0.879	3.516	0.581	2.324	1.39
Test 9	0.876	3.504	0.580	2.320	1.39
Test10	0.873	3.492	0.579	2.316	1.39
Average Value	0.877	3.508	0.581	2.322	1.39

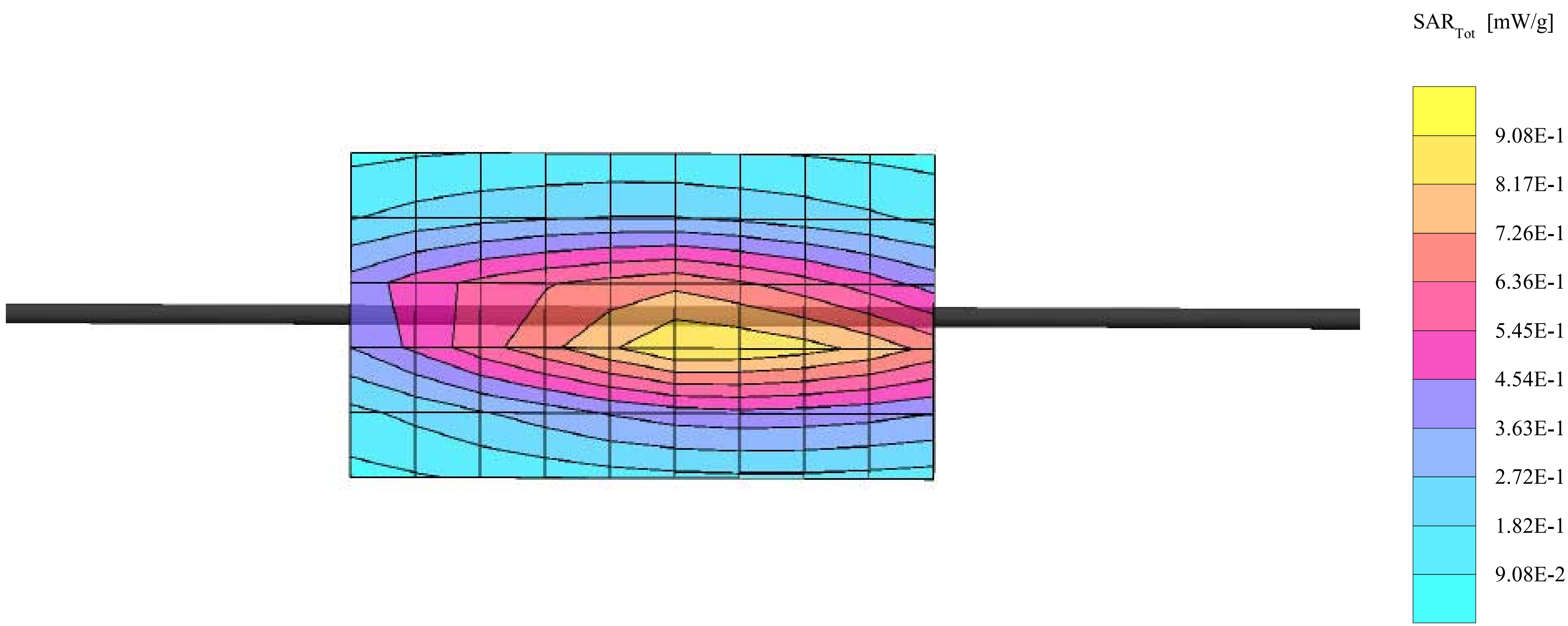
The results have been normalized to 1W (forward power) into the dipole.

Averaged over 1cm (1g) of tissue: 3.51 mW/g

Averaged over 10cm (10g) of tissue: 2.32 mW/g

Dipole 300 MHz

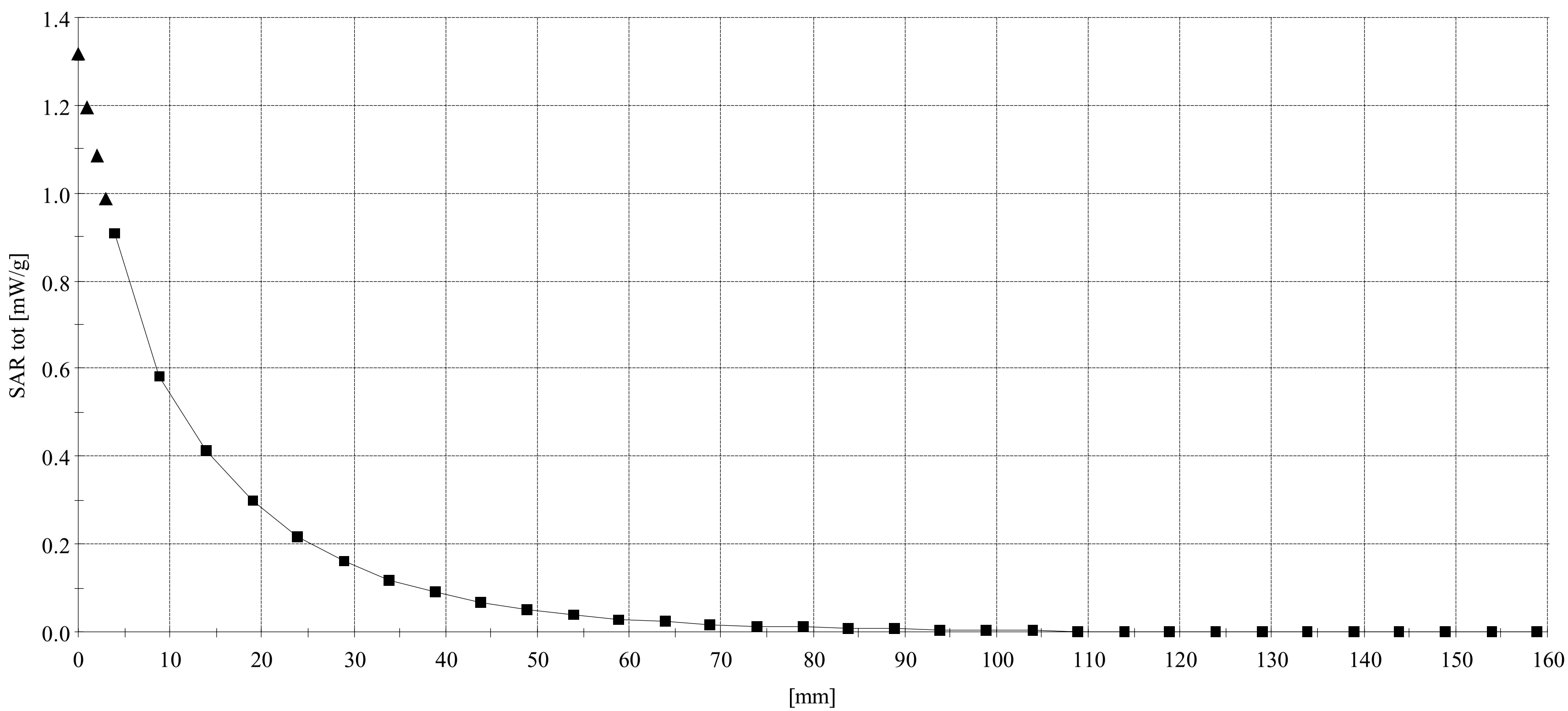
Frequency: 300 MHz; Conducted Input Power: 250 [mW]
Flat Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(7.54,7.54,7.54); Crest factor: 1.0; 300 MHz Brain: $\sigma = 0.87$ mho/m $\varepsilon_r = 45.3$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: Peak: 1.43 mW/g, SAR (1g): 0.899 mW/g, SAR (10g): 0.592 mW/g, (Worst-case extrapolation)
Penetration depth: 12.4 (10.6, 14.7) [mm]
Powerdrift: -0.08 dB
Calibration Date: Oct. 15, 2001



Dipole 300 MHz

Flat Phantom; Section; Position:
Probe: ET3DV6 - SN1590; ConvF(7.54,7.54,7.54); Crest factor: 1.0
300 MHz Brain: $\sigma = 0.87$ mho/m $\varepsilon_r = 45.3$ $\rho = 1.00$ g/cm^3
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Date of Calibration: October 15, 2001



APPENDIX D - PROBE CALIBRATION

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Calibrated:	March 26, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

NormX	**1.77**	$\mu V/(V/m)^2$
NormY	**1.91**	$\mu V/(V/m)^2$
NormZ	**1.67**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**100**	mV
DCP Y	**100**	mV
DCP Z	**100**	mV

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** **ε_r = 43.5 ± 5%** **σ = 0.87 ± 10% mho/m**

ConvF X	**7.36**	extrapolated	Boundary effect:	
ConvF Y	**7.36**	extrapolated	Alpha	**0.29**
ConvF Z	**7.36**	extrapolated	Depth	**2.72**

Head **900 MHz** **ε_r = 42 ± 5%** **σ = 0.97 ± 10% mho/m**

ConvF X	**6.83**	± 7% (k=2)	Boundary effect:	
ConvF Y	**6.83**	± 7% (k=2)	Alpha	**0.37**
ConvF Z	**6.83**	± 7% (k=2)	Depth	**2.48**

Head **1500 MHz** **ε_r = 40.4 ± 5%** **σ = 1.23 ± 10% mho/m**

ConvF X	**6.13**	interpolated	Boundary effect:	
ConvF Y	**6.13**	interpolated	Alpha	**0.47**
ConvF Z	**6.13**	interpolated	Depth	**2.17**

Head **1800 MHz** **ε_r = 40 ± 5%** **σ = 1.40 ± 10% mho/m**

ConvF X	**5.78**	± 7% (k=2)	Boundary effect:	
ConvF Y	**5.78**	± 7% (k=2)	Alpha	**0.53**
ConvF Z	**5.78**	± 7% (k=2)	Depth	**2.01**

Sensor Offset

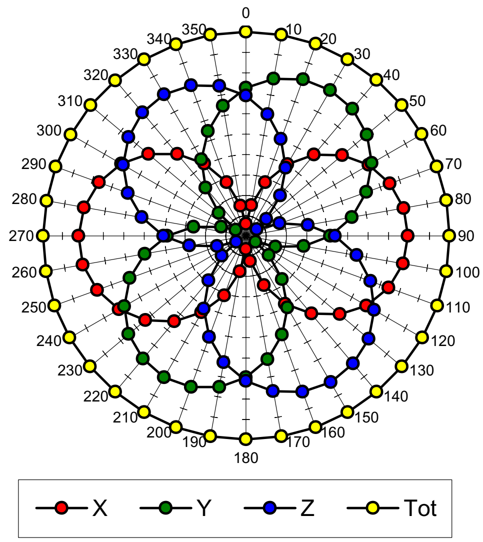
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

DASY3 - Parameters of Probe: ET3DV6 SN: 1590

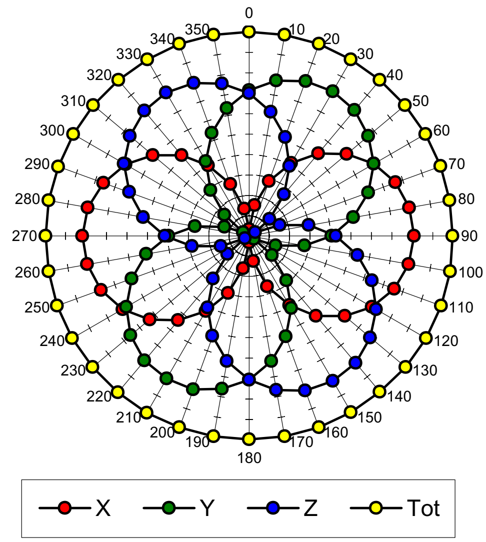
Body	**450 MHz**	**ε_r = 56.7 ± 5%**	**σ = 0.94 ± 10% mho/m**
	ConvF X	**7.23** extrapolated	
	ConvF Y	**7.23** extrapolated	
	ConvF Z	**7.23** extrapolated	
Body	**900 MHz**	**ε_r = 55.0 ± 5%**	**σ = 1.05 ± 10% mho/m**
	ConvF X	**6.61** ± 7% (k=2)	
	ConvF Y	**6.61** ± 7% (k=2)	
	ConvF Z	**6.61** ± 7% (k=2)	
Body	**1500 MHz**	**ε_r = 54.0 ± 5%**	**σ = 1.30 ± 10% mho/m**
	ConvF X	**5.78** interpolated	
	ConvF Y	**5.78** interpolated	
	ConvF Z	**5.78** interpolated	
Body	**1800 MHz**	**ε_r = 53.3 ± 5%**	**σ = 1.52 ± 10% mho/m**
	ConvF X	**5.36** ± 7% (k=2)	
	ConvF Y	**5.36** ± 7% (k=2)	
	ConvF Z	**5.36** ± 7% (k=2)	

Receiving Pattern (ϕ, θ = 0°)

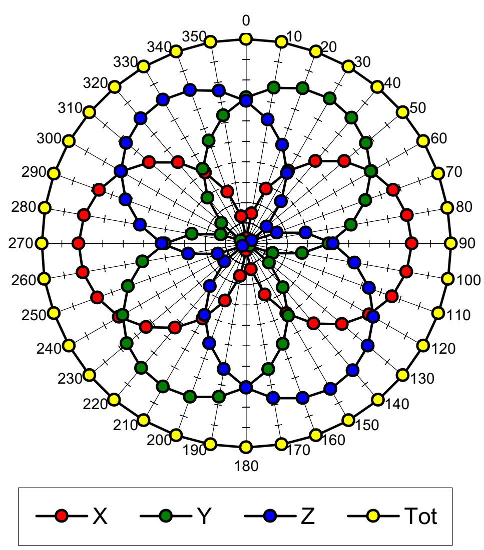
f = 30 MHz, TEM cell ifi110



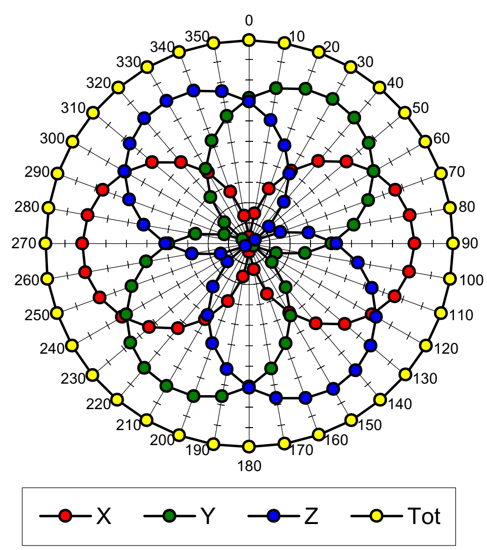
f = 100 MHz, TEM cell ifi110



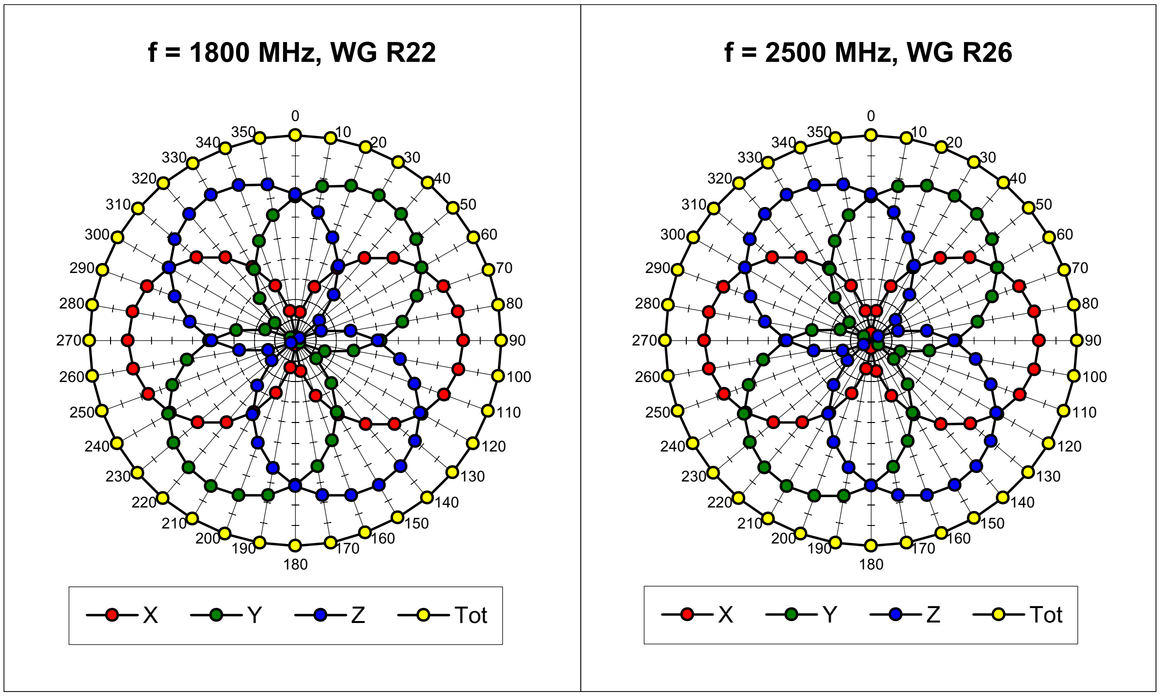
f = 300 MHz, TEM cell ifi110



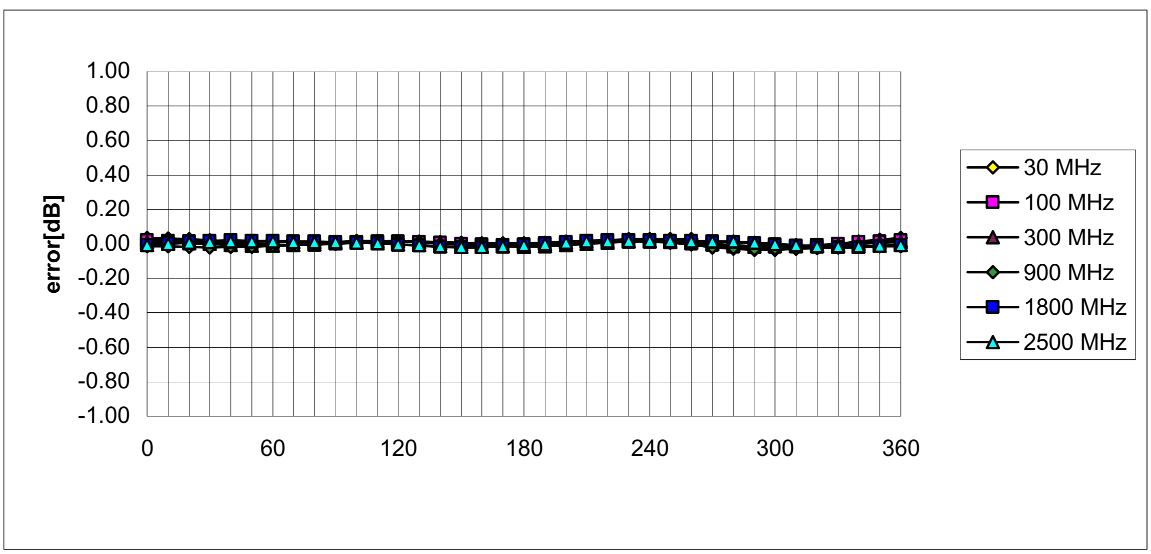
f = 900 MHz, TEM cell ifi110



ET3DV6 SN:1590

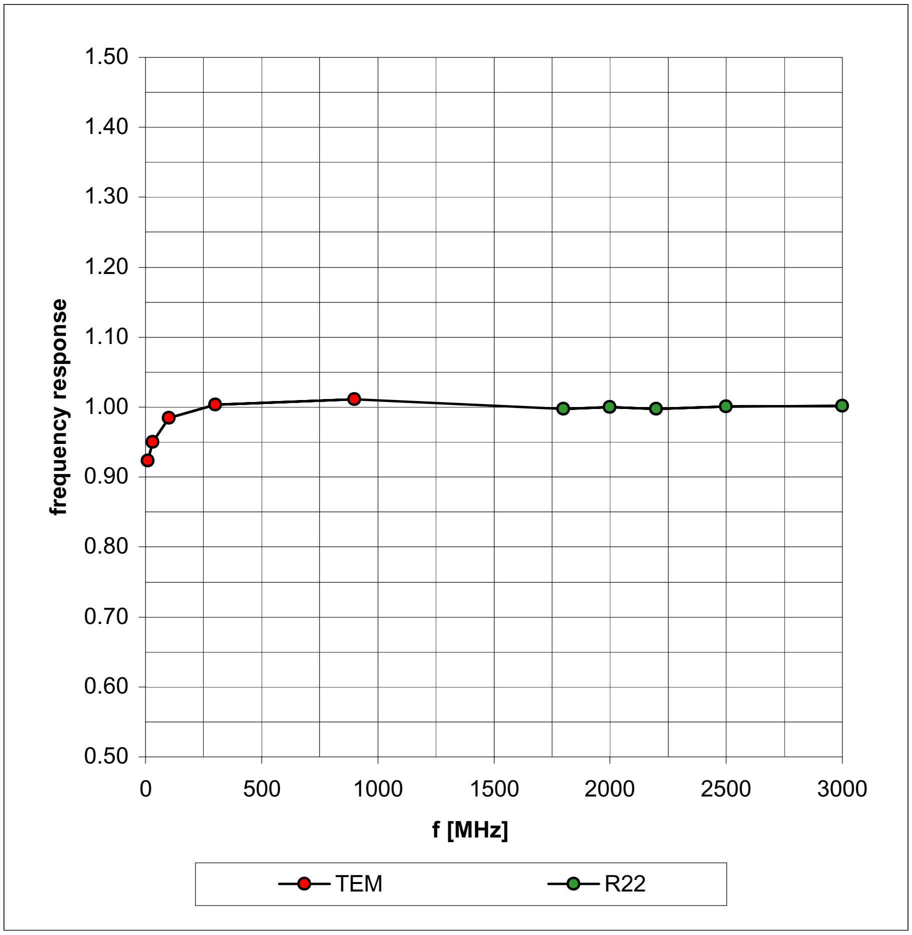


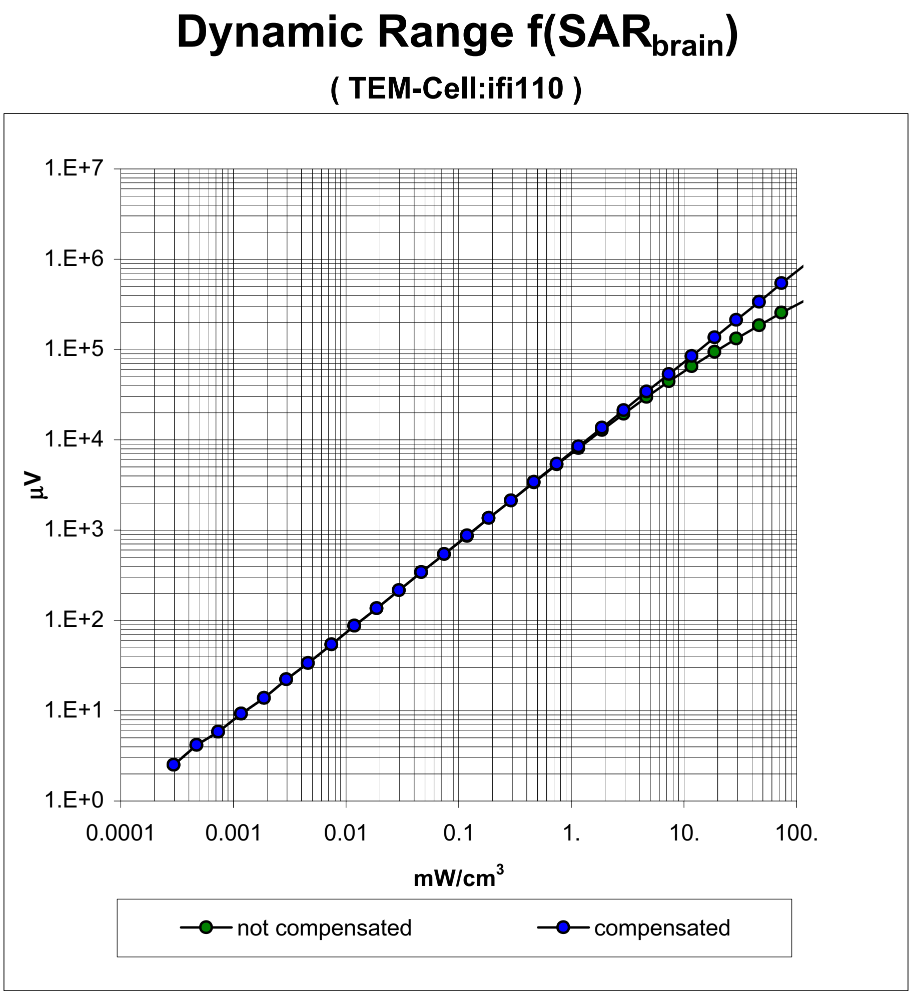
Isotropy Error (ϕ), θ = 0°

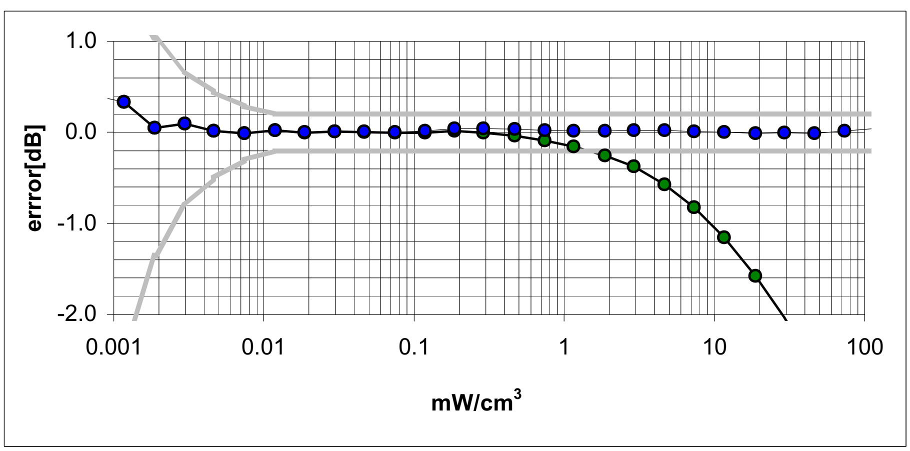


Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)

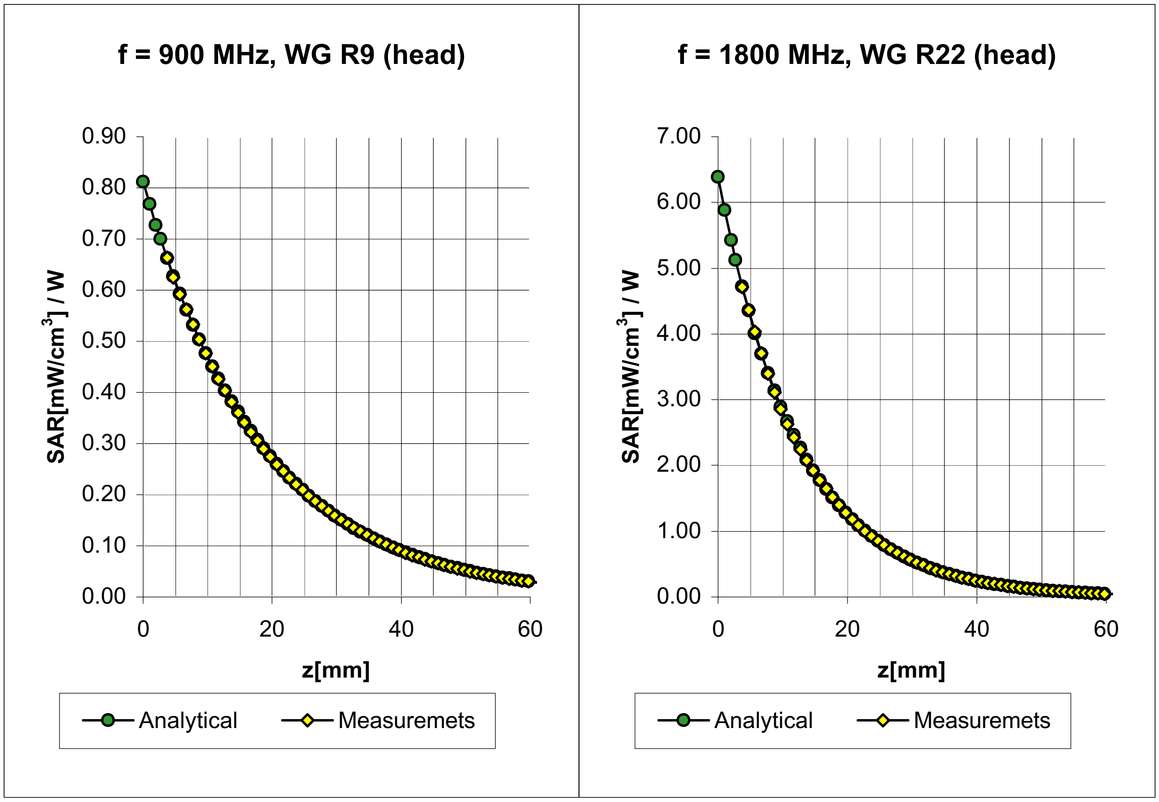






ET3DV6 SN:1590

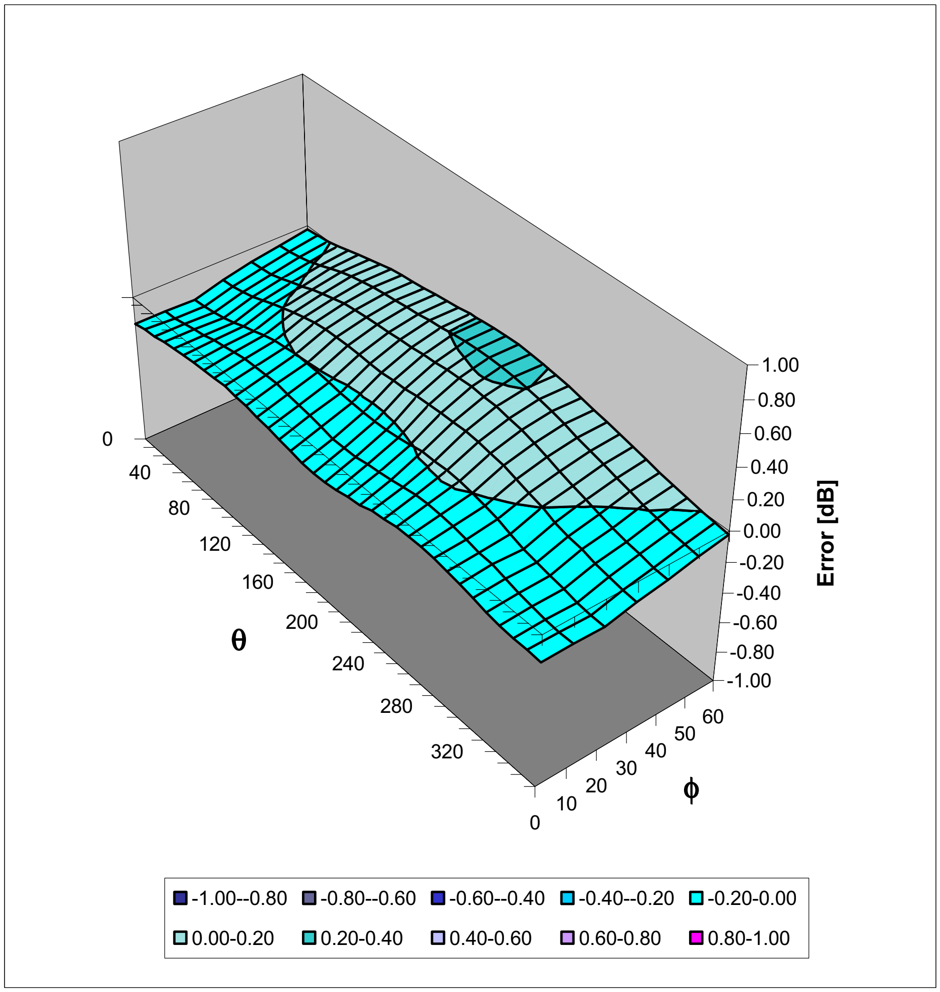
Conversion Factor Assessment



ET3DV6 SN:1590

Deviation from Isotropy in HSL

Error (θϕ), f = 900 MHz



APPENDIX E - DETERMINATION OF E-FIELD PROBE CONVERSION NUMBERS

Determination of Probe Conversion Factors for 150MHz

Since at this time there exists no experimental method in determining E-field probe conversion factors for frequencies below 800MHz, the following procedure was carried out to give an approximation of the probe conversion factors for 150MHz.

The accuracy of the system was determined based on the two calibrated test frequencies of 900 and 1800MHz, using validation dipoles as supplied by the manufacturer. The measured results were found to be within the specified tolerances. For conversion factors outside these two frequencies a linear extrapolation was performed as per the manufacturer's recommendations. In order to determine the accuracy of the conversion factors, 300 and 450MHz dipoles were constructed in accordance with IEEE Std. P1528. The two dipoles were then characterized for SAR using the appropriate head simulating fluid for the given frequencies in a planar phantom as prescribed in IEEE Std. P1528. The table below indicates the analytical target values for each dipole with the associated measured results.

Frequency (MHz)	Analytical SAR @ 1W input averaged over 1 gram	Measured SAR @ 1W input averaged over 1 gram	Delta Δ	Fluid Parameters
300	3.0	3.51	17.0%	ε_r=45.3
				σ=0.87
450	4.9	5.77	17.8%	ε_r=43.5
				σ=0.87

The extrapolated head conversion factors determined for 300 and 450MHz resulted in SAR values being 17.0% and 17.8% greater than expected for each frequency respectively. It is assumed that as this extrapolation is extended down to 150MHz, the resulting SAR will again be overestimated by at least 17%.
The body conversion factors were determined based on a combination of the obtained data from the validations, and numerical modeling results from an identical probe from the same manufacturer.

The following two pages show examples of the conversion factors that were derived through numerical modeling for a probe of similar properties.

Dosimetric E-Field Probe ET3DV6

EXAMPLE

Head Tissue Conversion Factor (± standard deviation)

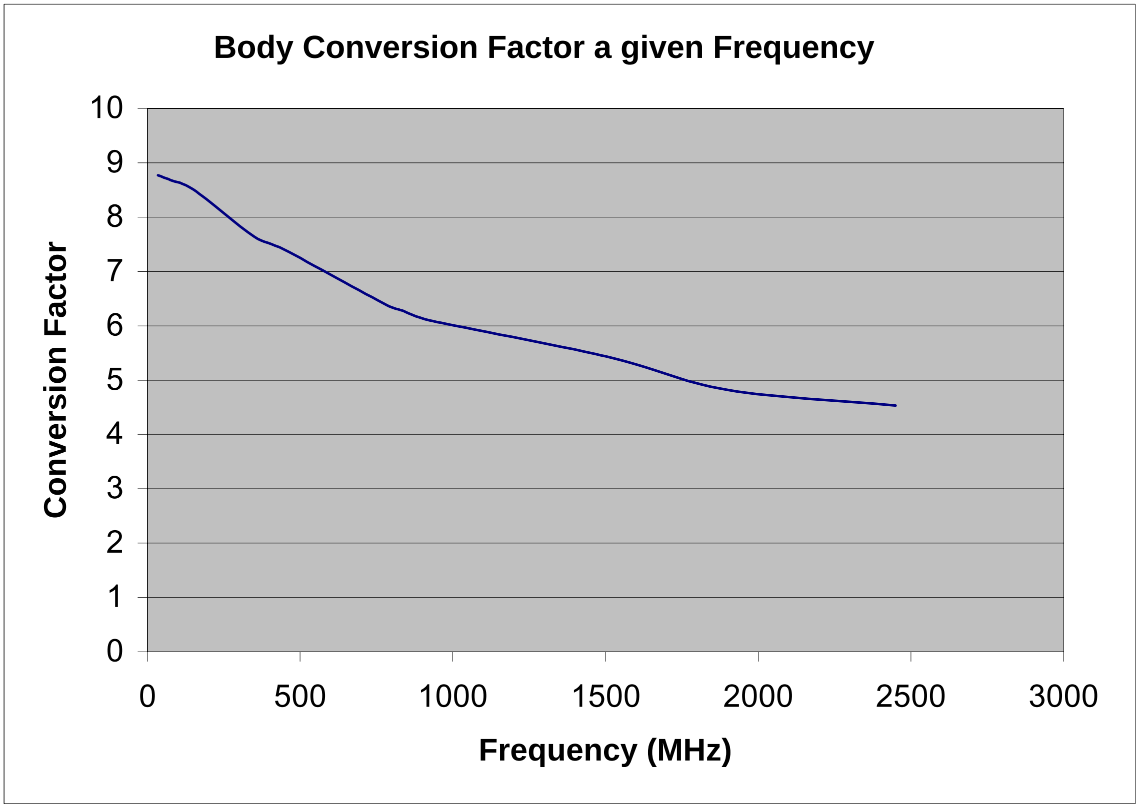
400 MHz	ConvF	7.64 ± 8%	ε_r = 44.4 σ = 0.87 mho/m CENELEC Head Tissue
835 MHz	ConvF	6.54 ± 8%	ε_r = 42.5 σ = 0.98 mho/m CENELEC Head Tissue
900 MHz	ConvF	6.41 ± 8%	ε_r = 42.3 σ = 0.99 mho/m CENELEC Head Tissue
350 MHz	ConvF	7.76 ± 8%	ε_r = 44.7 σ = 0.87 mho/m IEEE Head Tissue
450 MHz	ConvF	7.52 ± 8%	ε_r = 43.5 σ = 0.87 mho/m IEEE Head Tissue
835 MHz	ConvF	6.53 ± 8%	ε_r = 41.5 σ = 0.90 mho/m IEEE Head Tissue
925 MHz	ConvF	6.37 ± 8%	ε_r = 41.45 σ = 0.98 mho/m IEEE Head Tissue
1500 MHz	ConvF	6.04 ± 8%	ε_r = 40.43 σ = 1.23 mho/m IEEE Head Tissue
1900 MHz	ConvF	5.41 ± 8%	ε_r = 40.0 σ = 1.40 mho/m IEEE Head Tissue
2450 MHz	ConvF	5.18 ± 8%	ε_r = 39.2 σ = 1.8 mho/m IEEE Head Tissue
2450 MHz	ConvF	5.40 ± 8%	ε_r = 37.2 σ = 2.09 mho/m H1800 at 2450 MHz

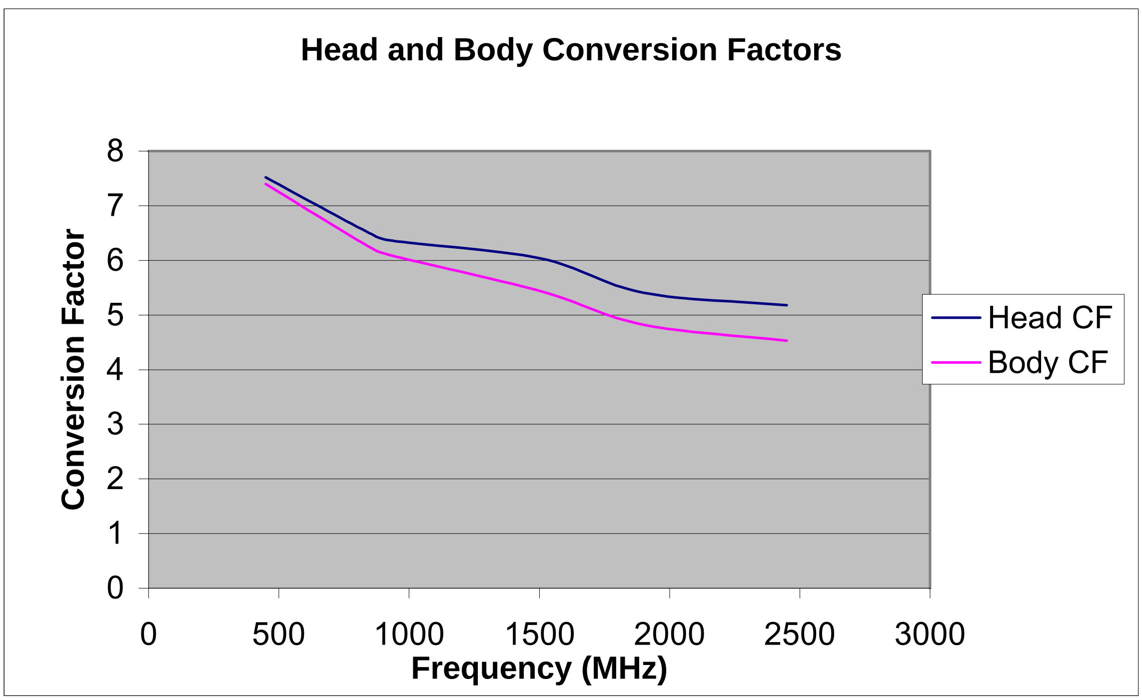
Dosimetric E-Field Probe ET3DV6

EXAMPLE

Body Tissue Conversion Factor (± standard deviation)

35 MHz	ConvF	8.77 ± 15%	ε_r = 85.19 σ = 0.69 mho/m FCC Body Tissue
75 MHz	ConvF	8.68 ± 10%	ε_r = 69.93 σ = 0.72 mho/m FCC Body Tissue
150 MHz	ConvF	8.51 ± 8%	ε_r = 62.68 σ = 0.75 mho/m FCC Body Tissue
350 MHz	ConvF	7.64 ± 8%	ε_r = 58.41 σ = 0.80 mho/m FCC Body Tissue
450 MHz	ConvF	7.40 ± 8%	ε_r = 57.62 σ = 0.83 mho/m FCC Body Tissue
784 MHz	ConvF	6.38 ± 8%	ε_r = 56.25 σ = 0.93 mho/m FCC Body Tissue
835 MHz	ConvF	6.28 ± 8%	ε_r = 56.11 σ = 0.95 mho/m FCC Body Tissue
925 MHz	ConvF	6.10 ± 8%	ε_r = 55.9 σ = 0.98 mho/m FCC Body Tissue
1500 MHz	ConvF	5.44 ± 8%	ε_r = 54.87 σ = 1.23 mho/m FCC Body Tissue
1900 MHz	ConvF	4.82 ± 8%	ε_r = 54.3 σ = 1.45 mho/m FCC Body Tissue
2450 MHz	ConvF	4.53 ± 8%	ε_r = 53.57 σ = 1.81 mho/m FCC Body Tissue


Body Conversion Factor a given Frequency
Conversion Factor
Frequency (MHz)
10
9
8
7
6
5
4
3
2
1
0
0
500
1000
1500
2000
2500
3000


Head and Body Conversion Factors
Conversion Factor
Frequency (MHz)
Head CF
Body CF
8
7
6
5
4
3
2
1
0
0
500
1000
1500
2000
2500
3000

Frequency	Head Conversion Factors	Body Conversion Factors	Delta Δ
450	7.52	7.40	1.62
835	6.53	6.28	3.98
925	6.37	6.10	4.43
1500	6.04	5.44	11.02
1900	5.41	4.82	12.24
2450	5.18	4.53	14.35

Conclusion:

Based on the results from the 300 and 450MHz validations, the derived conversion factors should over-estimate the SAR for a device operating in the 150MHz band by approximately 17%. In addition, the above graphs and tabular results show that the probe conversion factors vary only slightly between head and body as the frequency approaches 450MHz. It is therefore safe to assume that as the frequency is further extended to 150MHz, the difference in the conversion factors between head and body will be less significant. Therefore, for this reason only one conversion factor is reported for both head and body at 150MHz.

APPENDIX F - SAR SENSITIVITIES

Application Note: SAR Sensitivities

Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{d\,SAR / SAR}{d\,x / x}$$

The controlling parameters x are:

- ε : permitivity
- σ : conductivity
- ρ : brain density (= one over integration volume)

For example: If The liquid permitivity increases by 2 percent and the sensitivity of the SAR to permitivity is -0.6 then the SAR will decrease by 1.2 percent.

The sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 10mm (for frequencies below 1000 MHz) and 15mm (for frequencies above 1000 MHz) from the liquid surface.

Liquid parameters are as proposed in the new standards (e.g., IEEE 1528).

References

[1] N. Kuster and Q. Balzano, “Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz”, *IEEE Transacions on Vehicular Technology*, vol. 41(1), pp. 17-23, 1992.

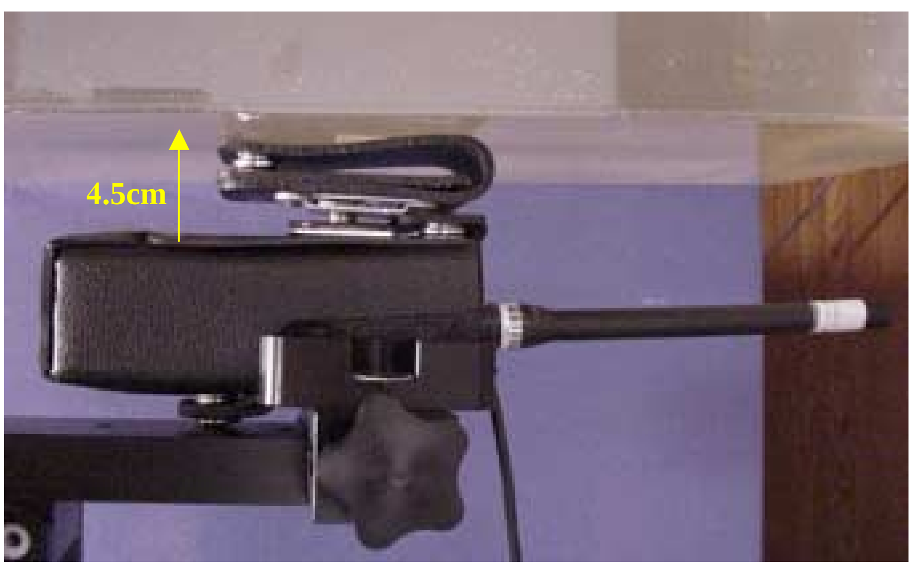
Parameter	ε	σ	ρ
f=300 MHz (εr=45.3, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.41	+ 0.48	—
1 g	- 0.33	+ 0.28	0.08
10 g	- 0.26	+ 0.09	0.16
f=450 MHz (εr=43.5, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.56	+ 0.67	—
1 g	- 0.46	+ 0.43	0.09
10 g	- 0.37	+ 0.22	0.17
f=835 MHz (εr=41.5, σ=0.90S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.70	+ 0.86	—
1 g	- 0.57	+ 0.59	0.10
10 g	- 0.45	+ 0.35	0.18
f=900 MHz (εr=41.5, σ=0.97S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.69	+ 0.86	—
1 g	- 0.55	+ 0.57	0.10
10 g	- 0.44	+ 0.32	0.19
f=1450 MHz (εr=40.5, σ=1.20/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.91	—
1 g	- 0.55	+ 0.55	0.12
10 g	- 0.42	+ 0.27	0.22
f=1800 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.92	—
1 g	- 0.52	+ 0.51	0.14
10 g	- 0.38	+ 0.21	0.24
f=1900 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.93	—
1 g	- 0.53	+ 0.51	0.14
10 g	- 0.39	+ 0.22	0.24
f=2000 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.94	—
1 g	- 0.53	+ 0.52	0.14
10 g	- 0.39	+ 0.22	0.24
f=2450 MHz (εr=39.2, σ=1.80S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.93	—
1 g	- 0.49	+ 0.41	0.17
10 g	- 0.34	+ 0.12	0.28
f=3000 MHz (εr=38.5, σ=2.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.75	+ 0.90	—
1 g	- 0.45	+ 0.28	0.21
10 g	- 0.32	+ 0.02	0.31

APPENDIX G - SAR TEST PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS
2.5cm Separation Distance

BODY-WORN SAR TEST SETUP PHOTOGRAPHS
1.2cm Belt-Clip Separation Distance

BODY-WORN SAR TEST SETUP PHOTOGRAPHS
with Belt-Loop, Swivel, & Leather Case
(4.5cm Separation Distance)



EUT PHOTOGRAPHS
Profile

EUT PHOTOGRAPHS
With Metal Belt-Clip

EUT PHOTOGRAPHS
With Belt-Loop, Swivel, & Leather Case

ANTENNA PHOTOGRAPHS

Antenna P/N: ACC-115B (148-162 MHz)

Antenna P/N: ACC-115R (162-174 MHz)