DECLARATION OF COMPLIANCE
SAR EVALUATION

Test Lab

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Applicant Information

COMMERCIANT L.P.
2901 Wilcrest, #250
Houston, TX 77042

Rule Part(s):	**FCC 47 CFR §2.1093**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (01-01)**
Device Classification:	**Licensed Non-Broadcast Station Transmitter (TNB)**
Device Type:	**Wireless Transaction Terminal with internal CDPD Modem (Novatel Wireless Technologies Ltd. Model: Expedite)**
FCC ID:	**QWLM105**
Model Name:	**M**
Model No.:	**M105**
Modulation:	**GMSK**
Tx Frequency Range:	**824.04 - 848.97 MHz**
Max. RF Output Power Tested:	**28.0 dBm (Conducted)**
Antenna Type(s):	**External Dipole**
Battery Type(s):	**Lithium-ion 4.2V (1800 mAh)**
Max. SAR Measured:	**1.14 W/kg (1g average)**

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. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C, Edition 01-01 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.

Russell Pipe
Senior Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates that the Commerciant L.P. Model: M105 Wireless Transaction Terminal FCC ID: QWLM105 with internal CDPD Modem (Novatel Wireless Technologies Ltd. Model: Expedite) complies with the RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) 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
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)
FCC Device Classification	Licensed Non-Broadcast Station Transmitter (TNB)
Device Type	Wireless Transaction Terminal with CDPD Modem (Novatel Wireless Technologies Ltd. Model: Expedite)
FCC ID	QWLM105
Model Name	M
Model No.	M105
Serial No.	Pre-production
Modulation	GMSK
Tx Frequency Range	824.04 - 848.97 MHz
Max. RF Output Power Tested	28.0 dBm (Conducted)
Antenna Type(s)	External Dipole
Battery Type(s)	Lithium-ion 4.2V (1800 mAh)

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, 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 Planar Phantom

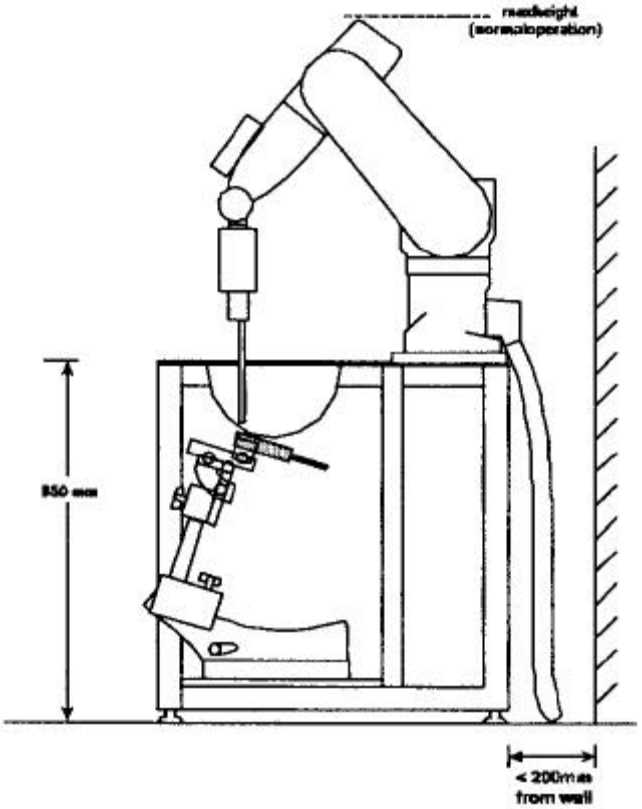


Figure 1. DASY3 Compact Version - Side View

4.0 MEASUREMENT SUMMARY

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

BODY SAR MEASUREMENT RESULTS									
Freq. (MHz)	Channel	Mode	Conducted Power (dBm)		Phantom Section	EUT Position to Planar Phantom	Antenna Position	Separation Distance (cm)	Measured SAR 1g (W/kg)
			Before	After					
824.04	991	CW	28.0	27.8	Planar	Bottom Side	Extended	0.0	0.231
836.49	383	CW	28.0	27.8	Planar	Bottom Side	Extended	0.0	0.218
848.97	799	CW	28.0	27.8	Planar	Bottom Side	Extended	0.0	0.159
824.04	991	CW	28.0	27.8	Planar	Right Side	Extended	1.5	1.04
836.49	383	CW	28.0	27.8	Planar	Right Side	Extended	1.5	1.14
848.97	799	CW	28.0	27.8	Planar	Right Side	Extended	1.5	0.900
824.04	991	CW	28.0	27.8	Planar	Top End	Extended	1.5	0.0589
836.49	383	CW	28.0	27.8	Planar	Top End	Extended	1.5	0.0833
848.97	799	CW	28.0	27.8	Planar	Top End	Extended	1.5	0.0664

ANSI / IEEE C95.1 1992 - SAFETY LIMIT BODY: 1.6 W/kg (averaged over 1 gram) Spatial Peak - Uncontrolled Exposure / General Population				
Test Date(s)	02/13/03		Relative Humidity	43 %
Measured Mixture Type	835MHz Body		Atmospheric Pressure	102.8 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	23.1 °C
	55.2 ±5%	54.1	Fluid Temperature	22.2 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	0.97 ±5%	0.97	ρ (Kg/m^3)	1000

Note(s):

1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed in the table above were consistent for all measurement periods.
2. 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 Commerciant L.P. Model: M105 Wireless Transaction Terminal FCC ID: QWLM105 with internal CDPD Modem (Novatel Wireless Technologies Ltd. Model: Expedite) was found to be compliant for localized Specific Absorption Rate based on the test provisions and conditions described below. Detailed photographs of the measurement setup are shown in Appendix F.

1. The EUT was tested for body SAR with the bottom side of the EUT placed parallel to the outer surface of the planar phantom, and the antenna in the normal operating position. A 0.0 cm separation distance was maintained between the bottom side of the EUT and the outer surface of the planar phantom.
2. The EUT was tested for body SAR with the right side of the EUT (antenna side) placed parallel to the outer surface of the planar phantom, and the antenna in the normal operating position. A 1.5 cm separation distance was maintained between the antenna and the outer surface of the planar phantom.
3. The EUT was tested for body SAR with the top end of the EUT placed parallel to the outer surface of the planar phantom, and the antenna in the normal operating position. A 1.5 cm separation distance was maintained between the top end of the EUT and the outer surface of the planar phantom.
4. The conducted power levels were measured before and after each test using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046.
5. The EUT was controlled via internal software and tested at maximum power in unmodulated continuous transmit mode (CW).
6. The EUT was tested with a fully charged battery.
7. Due to the dimensions of the EUT, a Plexiglas planar phantom was used in place of the SAM phantom. At this time there is no approved phantom available that is twice the dimensions of this device.
8. Due to the dimensions of the EUT, a stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.

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 form 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 [4]). 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 [4]).
3. The maximal interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-spline interpolation algorithm. 8000 points (20x20x20) were interpolated to calculate the average.

EVALUATION PROCEDURES (Cont.)

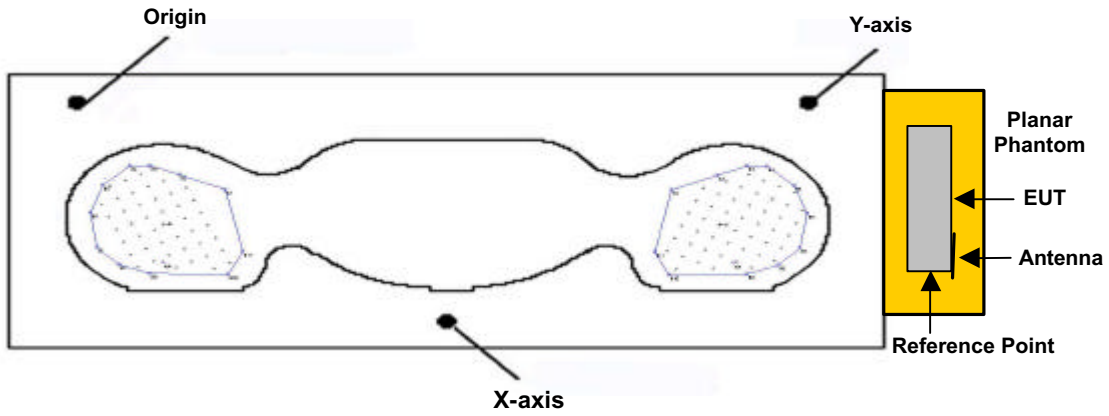


Figure 2. Phantom Reference Point & EUT Positioning
Bottom Side of EUT (Antenna Extended Position)

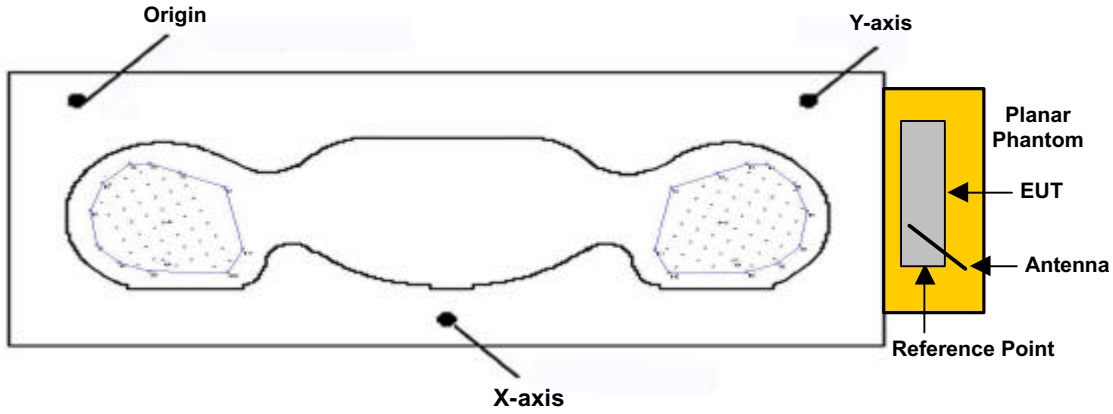


Figure 3. Phantom Reference Point & EUT Positioning
Right Side of EUT (Antenna Extended Position)

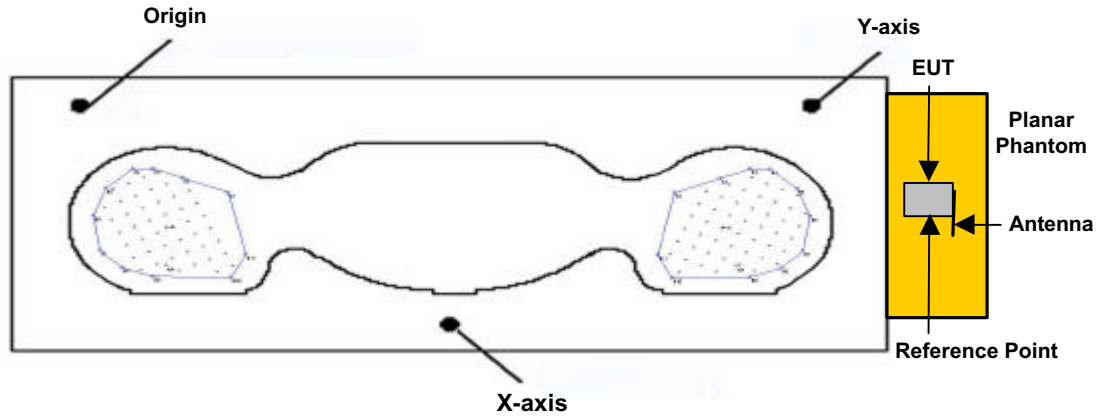


Figure 4. Phantom Reference Point & EUT Positioning
Top End of EUT (Antenna Extended Position)

7.0 SYSTEM PERFORMANCE CHECK

Prior to the assessment a system check was performed in the planar section of the SAM phantom with a 900MHz dipole (see Appendix C for system validation procedures). The fluid dielectric parameters were measured 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 ±10% (see Appendix B for system check test plot).

SYSTEM PERFORMANCE CHECK											
Test Date	900MHz 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				
02/13/03	Brain	2.70 ±10%	2.74	41.5 ±5%	41.4	0.97 ±5%	0.98	1000	23.1 °C	22.2 °C	≥ 15 cm

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

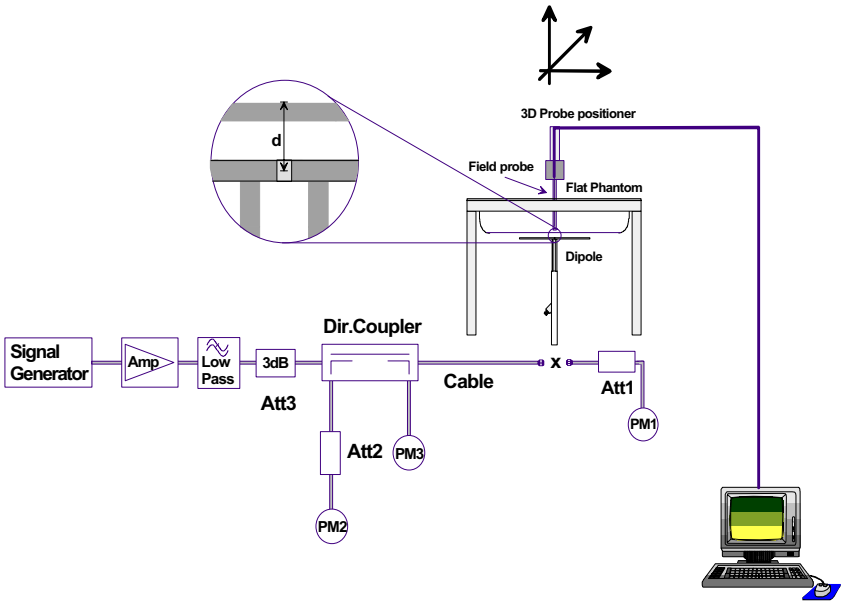


Figure 5. System Check Setup Diagram

900MHz System Check Setup

8.0 EQUIVALENT TISSUES

The 835MHz and 900MHz simulated tissues consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide was added and visual inspection was made to ensure air bubbles were not trapped during the mixing process. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

835MHz & 900MHz TISSUE MIXTURES		
INGREDIENT	**900MHz Brain (System Check)**	**835MHz Body (EUT Evaluation)**
Water	40.71 %	53.70 %
Sugar	56.63 %	45.10 %
Salt	1.48 %	0.97 %
HEC	1.00 %	0.13%
Bactericide	0.18 %	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 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Notes:

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

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

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

Data Acquisition Electronic (DAE) System

Cell Controller

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

Data Converter

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

PC Interface Card

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

E-Field Probe

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

Phantom

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

11.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 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

12.0 SAM PHANTOM V4.0C

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

SAM Phantom

13.0 PLANAR PHANTOM

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

Planar 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**
Schmid & Partner 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 -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
HP 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 Feb 2003
HP E4408B Spectrum Analyzer	US39240170	Nov 2002
HP 8594E Spectrum Analyzer	3543A02721	Feb 2003
HP 8753E Network Analyzer	US38433013	Feb 2003
HP 8648D Signal Generator	3847A00611	Feb 2003
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

16.0 MEASUREMENT UNCERTAINTIES

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

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

17.0 REFERENCES

[1] Federal Communications Commission, “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093: 1999.

[2] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[3] IEEE 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”.

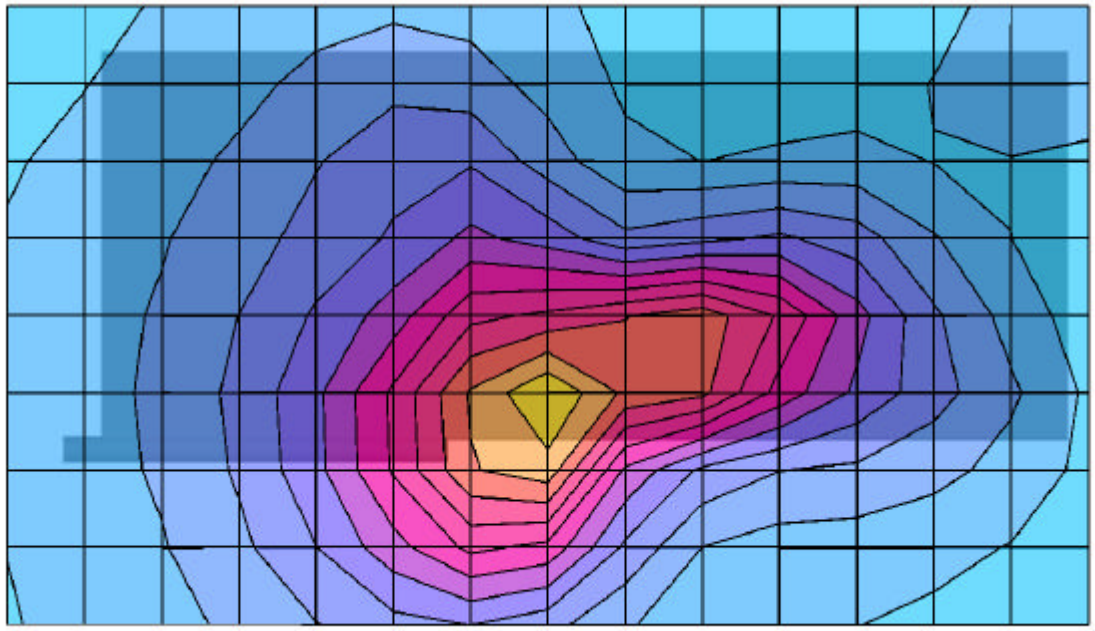
[4] W. Gander, *Computermathematick*, Birkhaeuser, Basel: 1992.

APPENDIX A - SAR MEASUREMENT DATA

Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,270°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.231 mW/g, SAR (10g): 0.160 mW/g

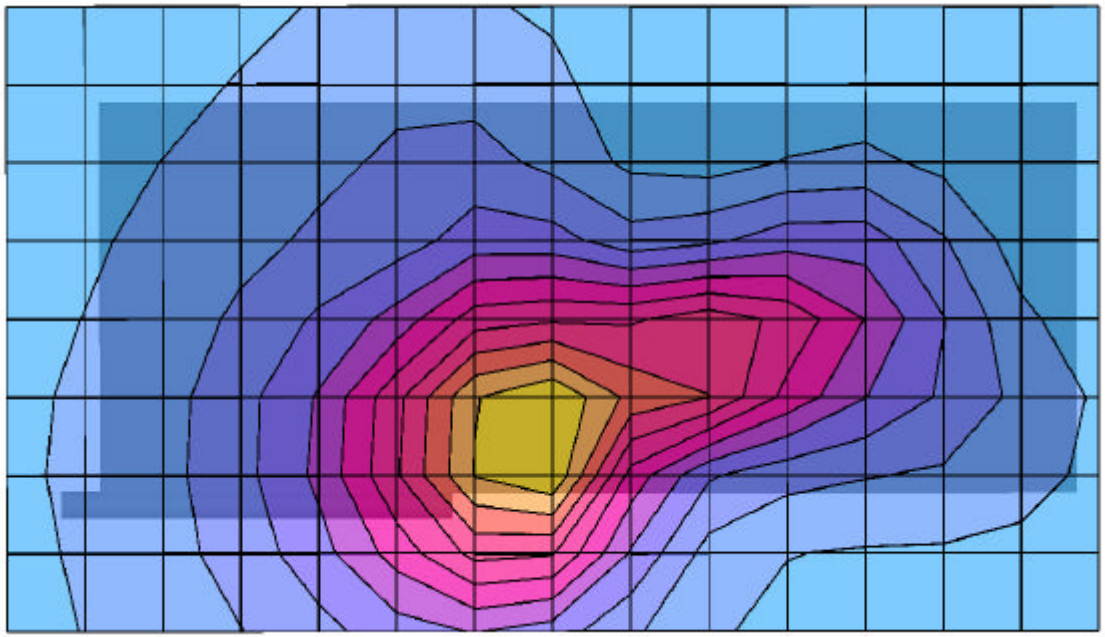
Body SAR - Bottom Side of EUT - 0.0 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 991 [824.04 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003



Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,270°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: $\sigma = 0.97$ mho/m $\varepsilon_r = 54.1$ $\rho = 1.00$ g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.218 mW/g, SAR (10g): 0.164 mW/g

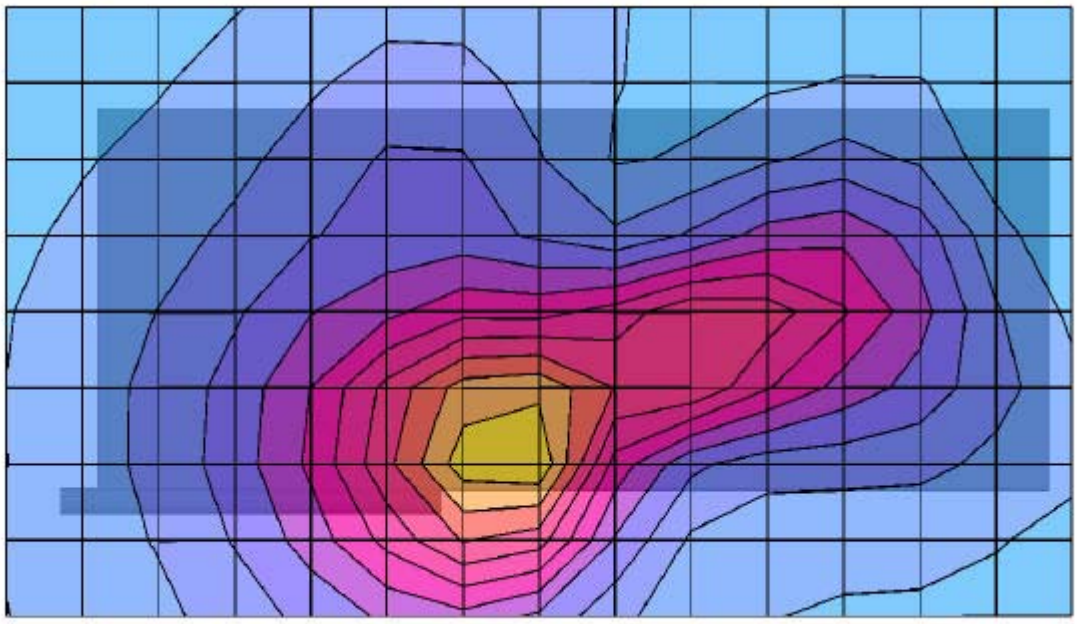
Body SAR - Bottom Side of EUT - 0.0 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 383 [836.49 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

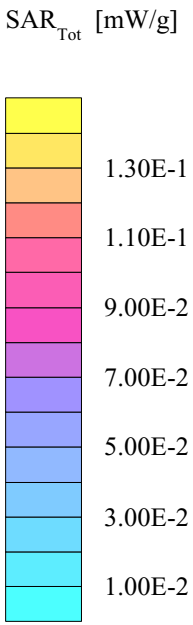


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,270°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.159 mW/g, SAR (10g): 0.119 mW/g

Body SAR - Bottom Side of EUT - 0.0 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 799 [848.97 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

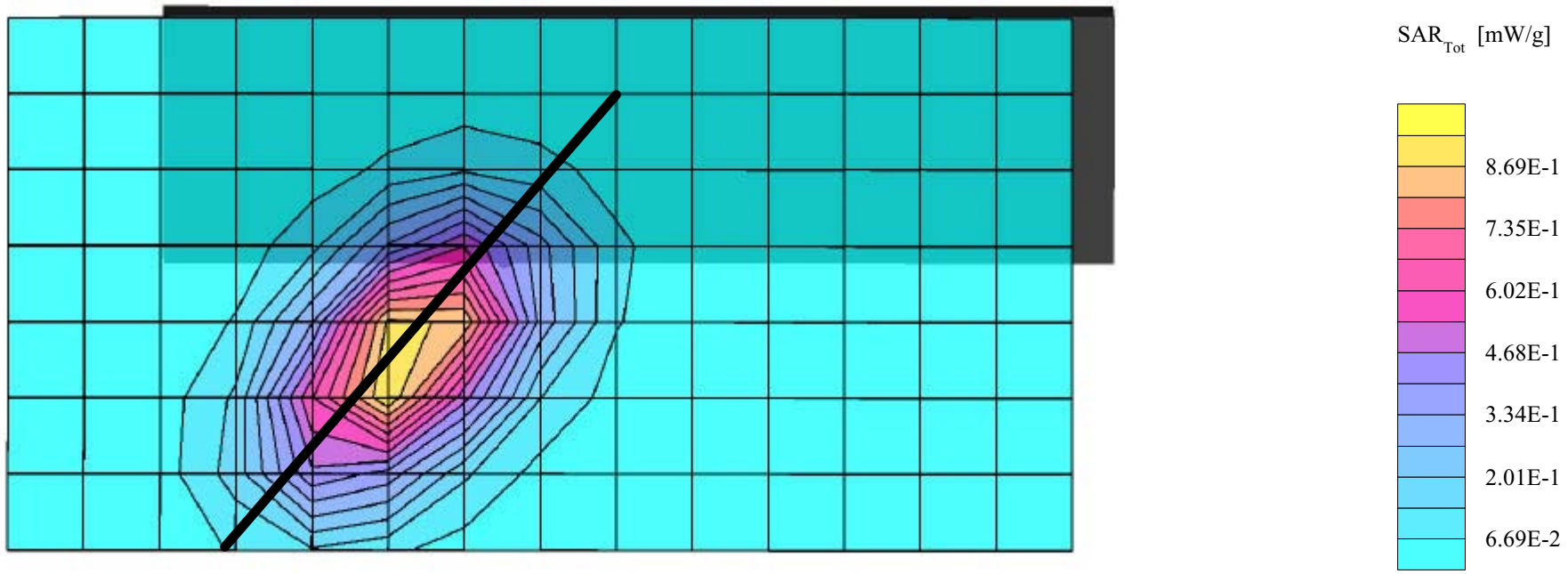




Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 1.04 mW/g, SAR (10g): 0.681 mW/g

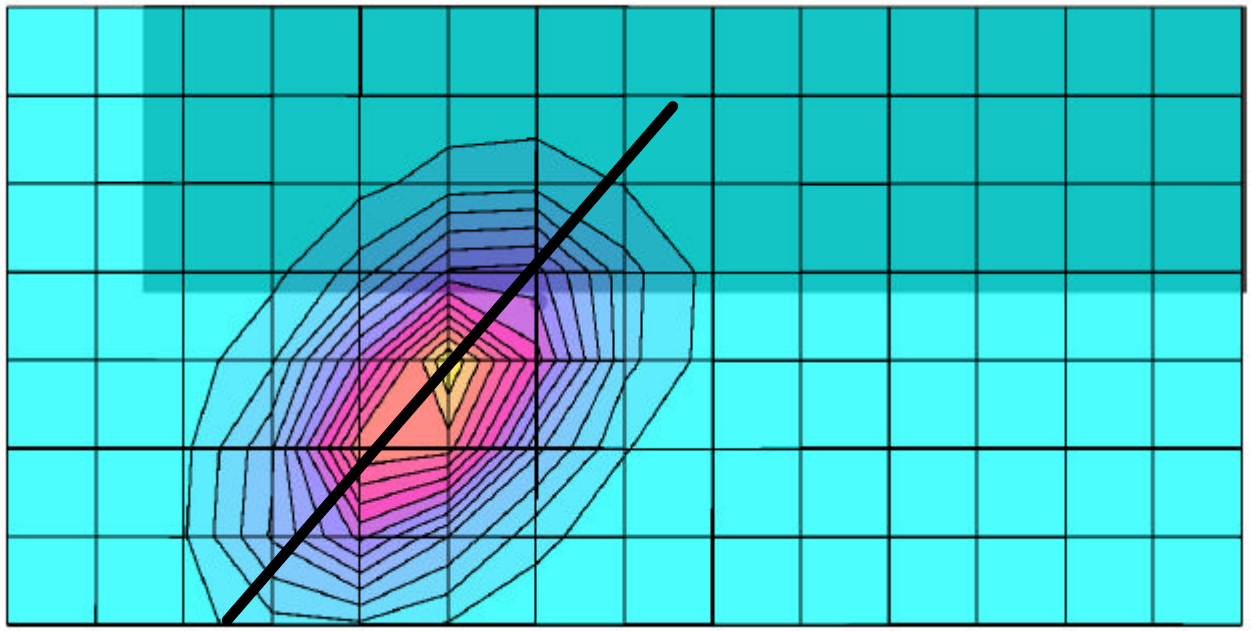
Body SAR - Right Side of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 991 [824.04 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

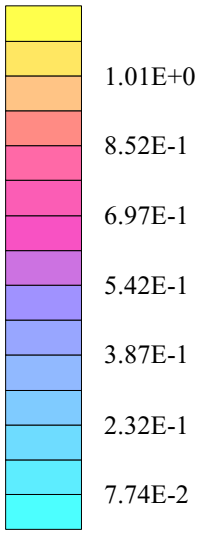


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: $\sigma = 0.97$ mho/m $\varepsilon_r = 54.1$ $\rho = 1.00$ g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 1.14 mW/g, SAR (10g): 0.746 mW/g

Body SAR - Right Side of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 383 [836.49 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003



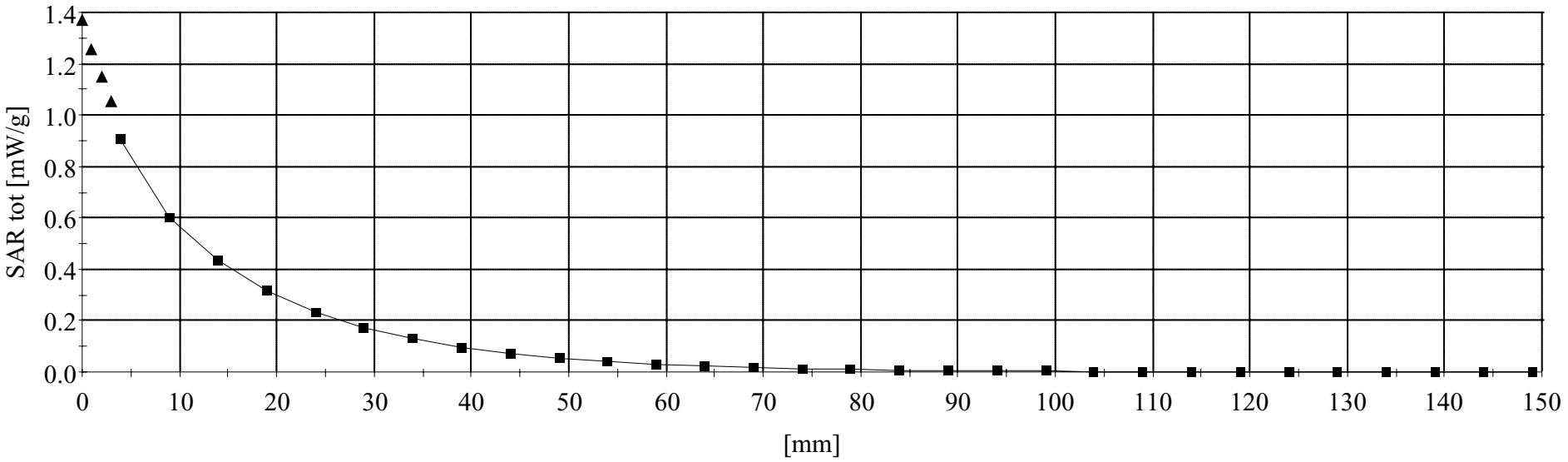


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3

Z-Axis Extrapolation at Peak SAR Location

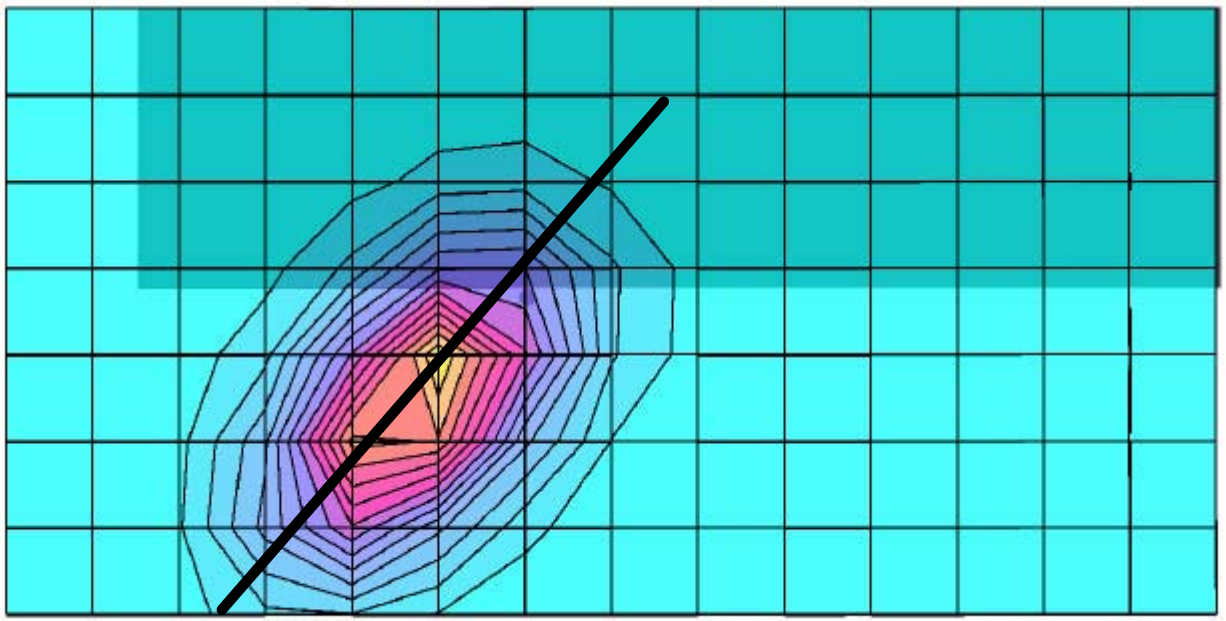
Body SAR - Right Side of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 383 [836.49 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

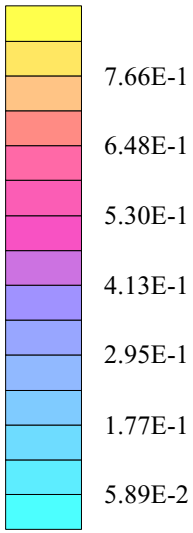


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (270°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: $\sigma = 0.97$ mho/m $\varepsilon_r = 54.1$ $\rho = 1.00$ g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.900 mW/g, SAR (10g): 0.585 mW/g

Body SAR - Right Side of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 799 [848.97 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

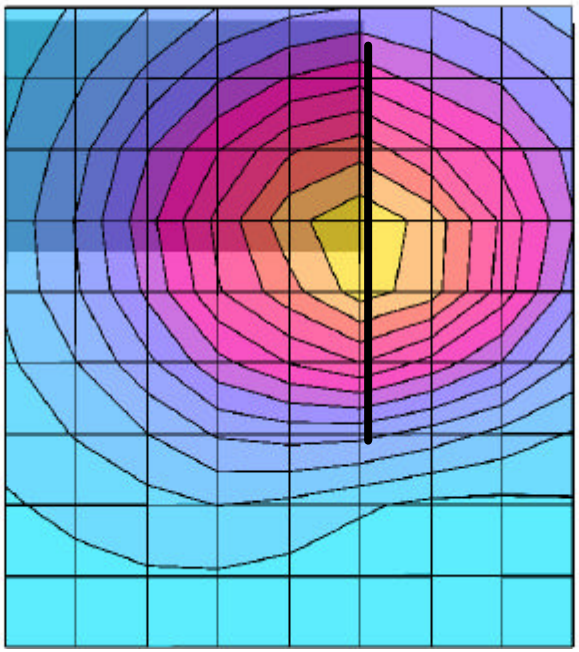


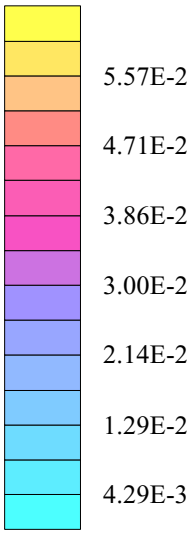


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (180°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: $\sigma = 0.97$ mho/m $\varepsilon_r = 54.1$ $\rho = 1.00$ g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.0589 mW/g, SAR (10g): 0.0444 mW/g

Body SAR - Top End of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 991 [824.04 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

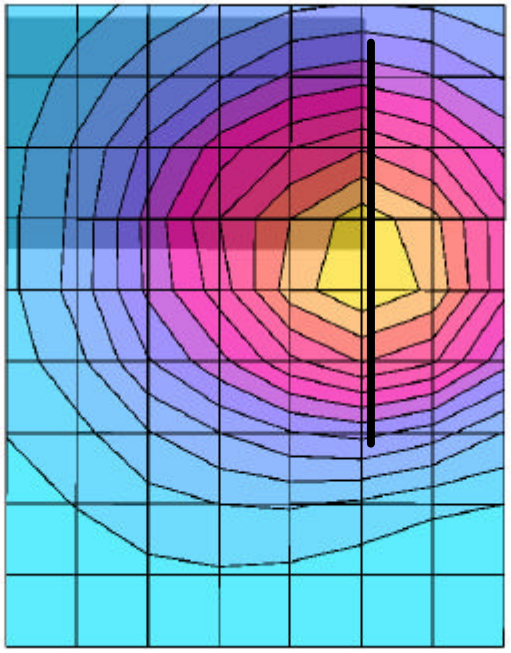


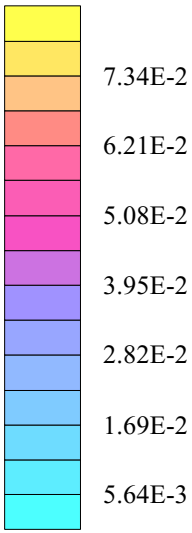


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (180°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.0833 mW/g, SAR (10g): 0.0624 mW/g

Body SAR - Top End of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 383 [836.49 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003

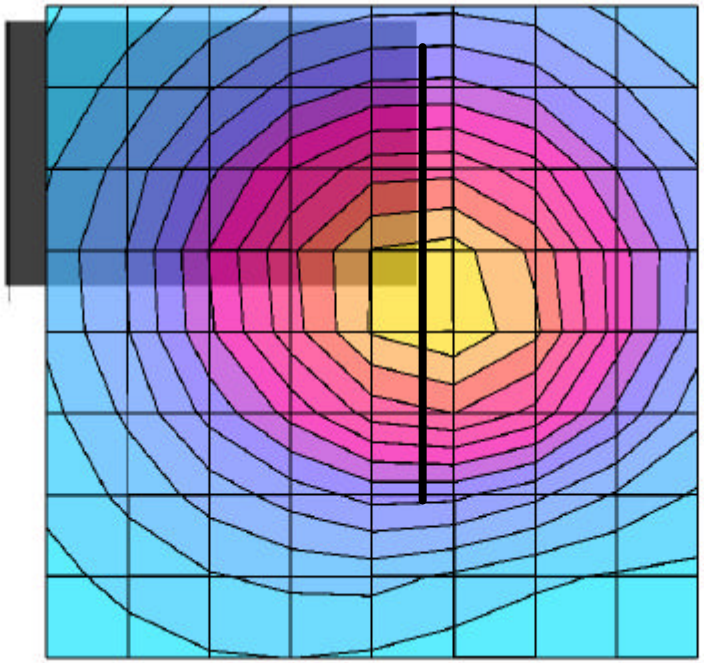


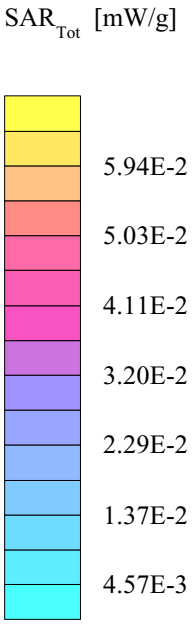


Commerciant L.P. FCC ID: QWLM105

Planar Phantom; Planar Section; Position: (180°,90°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 54.1 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7
SAR (1g): 0.0664 mW/g, SAR (10g): 0.0499 mW/g

Body SAR - Top Side of EUT - 1.5 cm Separation Distance
Antenna Extended Position
M105 Wireless Transaction Terminal with CDPD Modem
Continuous Wave Mode
Channel 799 [848.97 MHz]
Conducted Power: 28.0 dBm
Ambient Temp: 23.1°C; Fluid Temp: 22.2°C
Date Tested: February 13, 2003





APPENDIX B - SYSTEM CHECK DATA

System Performance Check - 900MHz Dipole

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1590; ConvF(6.90,6.90,6.90); Crest factor: 1.0; 900MHz Brain: $\sigma = 0.98$ mho/m $\varepsilon_r = 41.4$ $\rho = 1.00$ g/cm^3

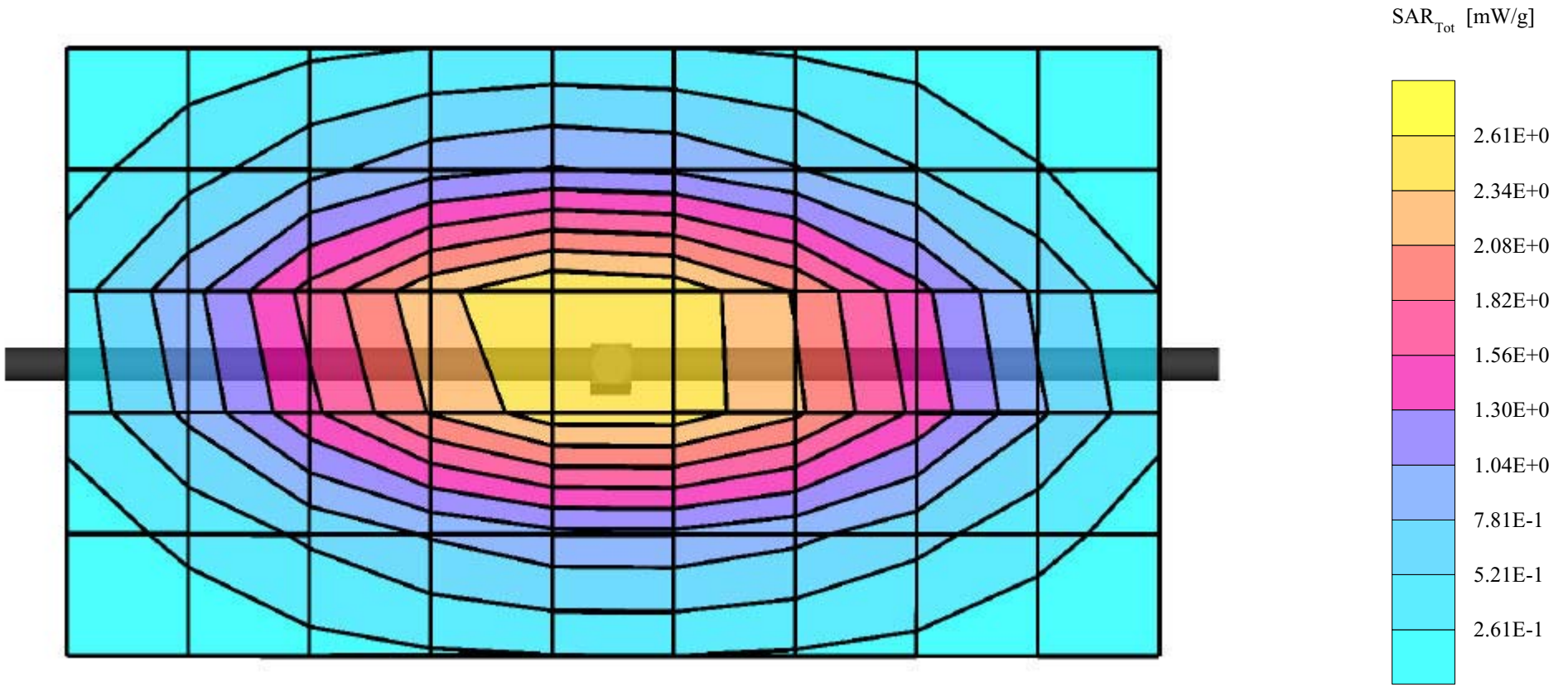
Cube 5x5x7: Peak: 4.44 mW/g, SAR (1g): 2.74 mW/g, SAR (10g): 1.72 mW/g, (Worst-case extrapolation)

Penetration depth: 11.2 (10.1, 12.6) [mm]; Powerdrift: -0.01 dB

Ambient Temp: 23.1°C; Fluid Temp: 22.2°C

Forward Conducted Power: 250 mW

Date Tested: February 13, 2003



APPENDIX C - SYSTEM VALIDATION

Schmid & Partner
Engineering AG

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

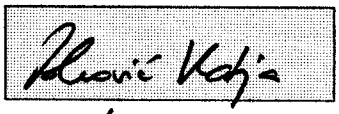
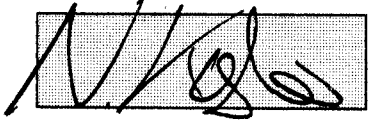
Calibration Certificate

900 MHz System Validation Dipole

Type:	**D900V2**
Serial Number:	**054**
Place of Calibration:	**Zurich**
Date of Calibration:	**June 20, 2001**
Calibration Interval:	**24 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:	
Approved by:	

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D900V2

Serial: 054

Manufactured: August 25, 1999
Calibrated: June 20, 2001

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with head simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**42.4**	± 5%
Conductivity	**0.97 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.27 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**11.12 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**7.04 mW/g**

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

3. Dipole Impedance and Return Loss

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

Electrical delay:	**1.413 ns**	(one direction)
Transmission factor:	**0.989**	(voltage transmission, one direction)

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

Feedpoint impedance at 900 MHz:	Re{Z} = **51.3 Ω**
	Im {Z} = **-0.5 Ω**
Return Loss at 900 MHz	**-36.9 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**41.0**	± 5%
Conductivity	**0.86 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.22 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 4. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue:	**10.12 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.52 mW/g**

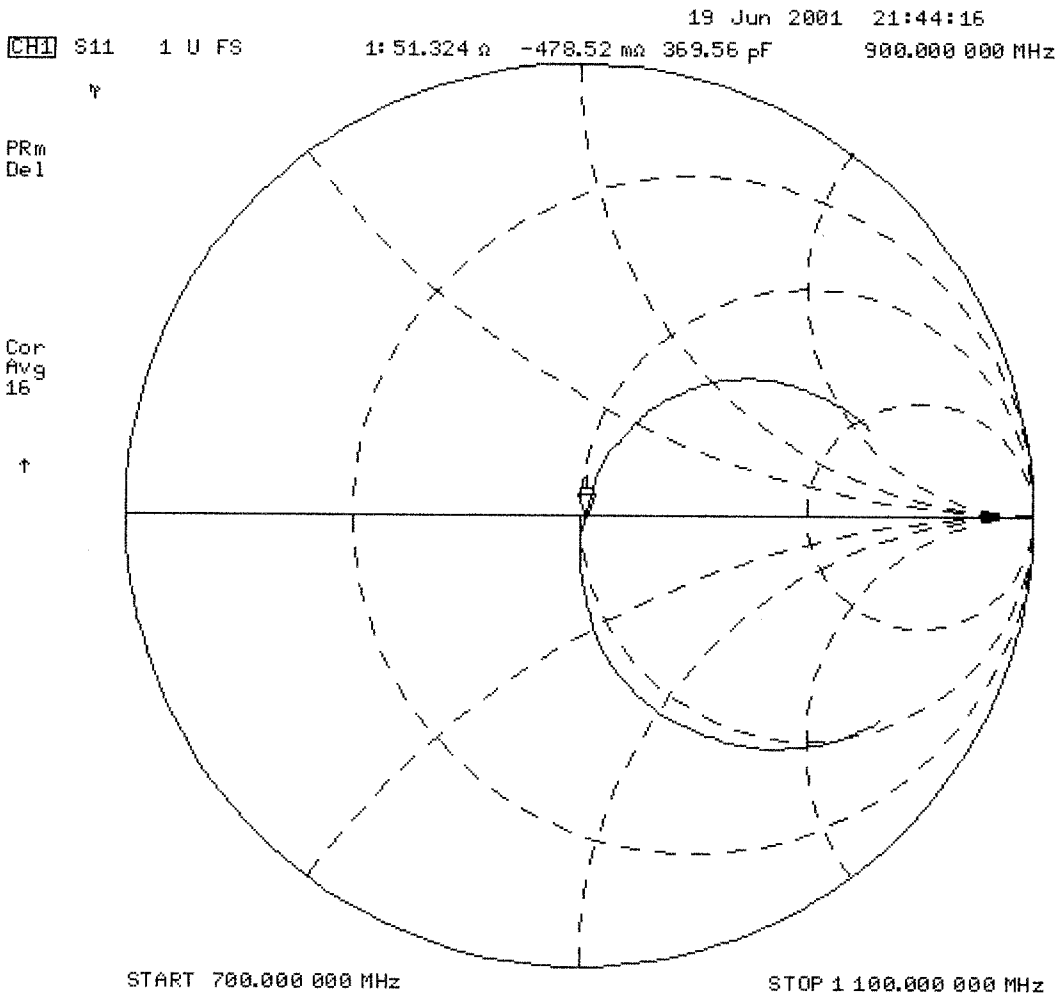
Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

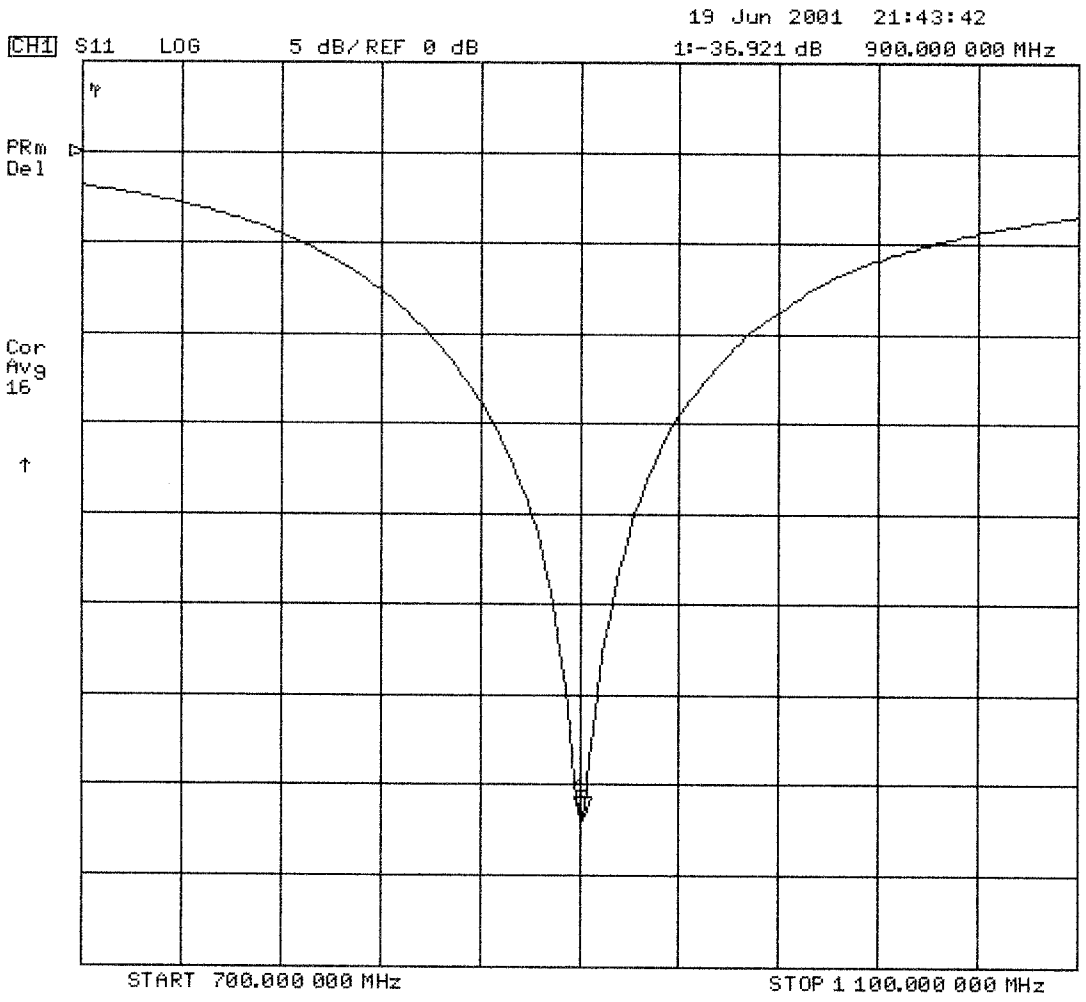
6. Handling

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

Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

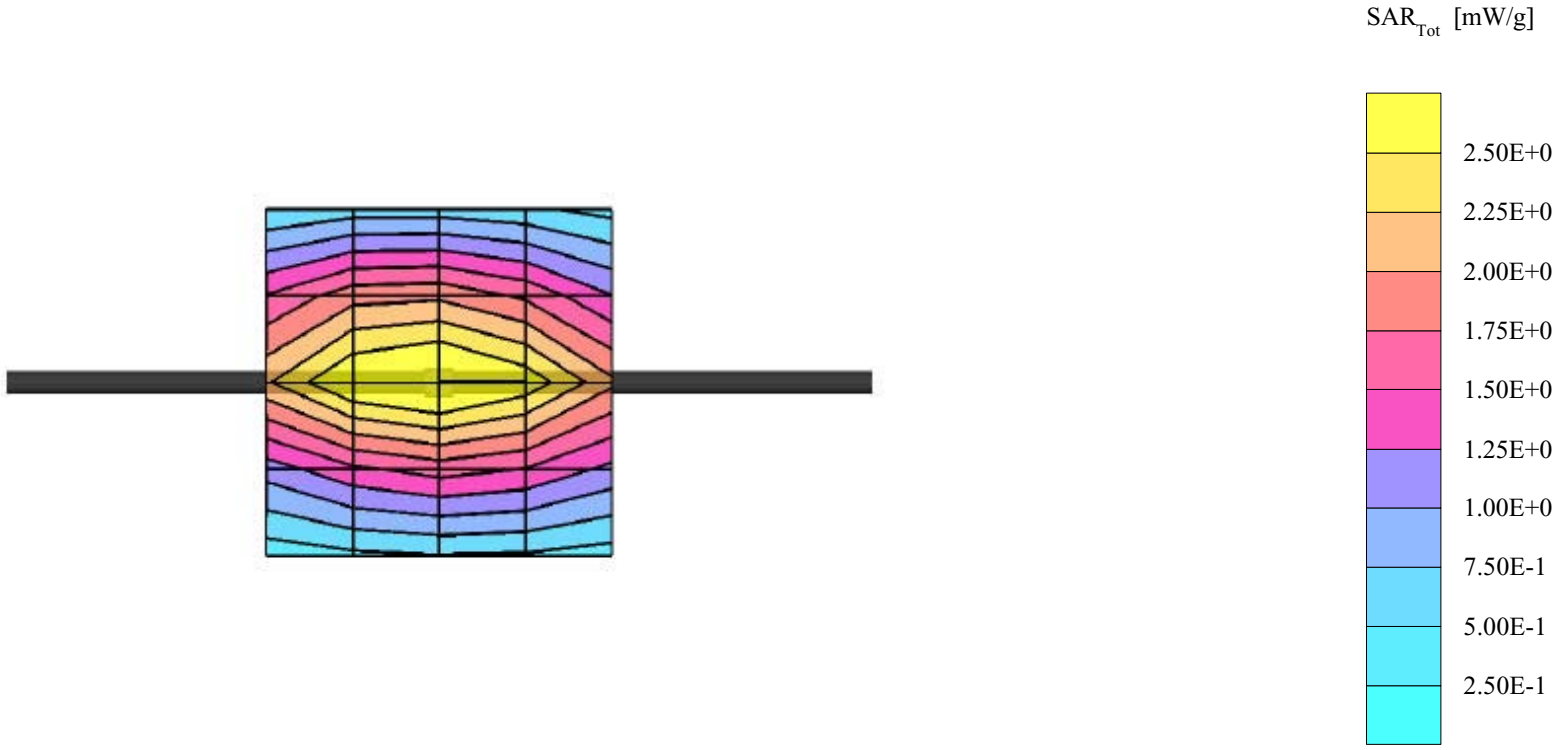
After prolonged use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.


19 Jun 2001 21:44:16
CH1 S11 1 U FS
1: 51.324 Ω -478.52 mΩ 369.56 pF
900.000 000 MHz
PRm
Del
Cor
Avg
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz


19 Jun 2001 21:43:42
CH1 S11 LOG 5 dB/ REF 0 dB
1:-36.921 dB 900.000 000 MHz
PRm
Del
Cor
Avg
16
START 700.000 000 MHz
STOP 1 100.000 000 MHz

Validation Dipole D900V2 SN:054, d = 15 mm

Frequency: 900 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing:Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.27,6.27,6.27); Crest factor: 1.0; IEEE1528 900 MHz: σ = 0.97 mho/m ε_r = 42.4 ρ = 1.00 g/cm^3
Cubes (2): Peak: 4.47 mW/g ± 0.05 dB, SAR (1g): 2.78 mW/g ± 0.04 dB, SAR (10g): 1.76 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 11.5 (10.3, 13.2) [mm]
Powerdrift: -0.00 dB



APPENDIX D - PROBE CALIBRATION

Schmid & Partner
Engineering AG

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

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:	
Approved by:	

Schmid & Partner
Engineering AG

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

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**	$\mu V/(V/m)^2$	
NormY	**1.89**	$\mu V/(V/m)^2$	
NormZ	**1.63**	$\mu V/(V/m)^2$	

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

Head	**900 MHz**	ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**	
Head	**835 MHz**	ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**	
	ConvF X	**6.9** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.9** ± 9.5% (k=2)	Alpha	**0.30**
	ConvF Z	**6.9** ± 9.5% (k=2)	Depth	**2.71**
Head	**1800 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
Head	**1900 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
	ConvF X	**5.6** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.6** ± 9.5% (k=2)	Alpha	**0.42**
	ConvF Z	**5.6** ± 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**

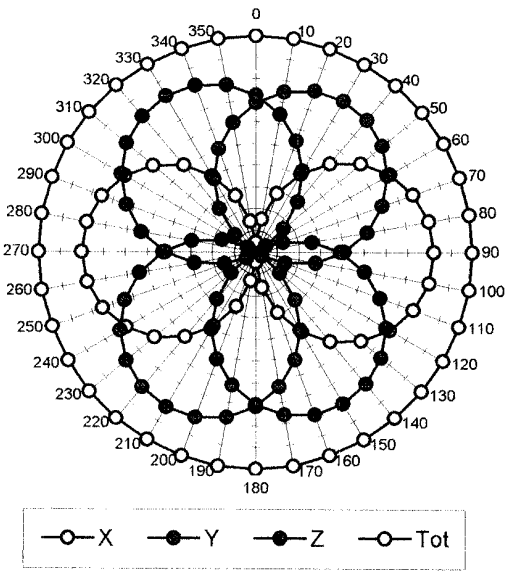
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	7.4
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

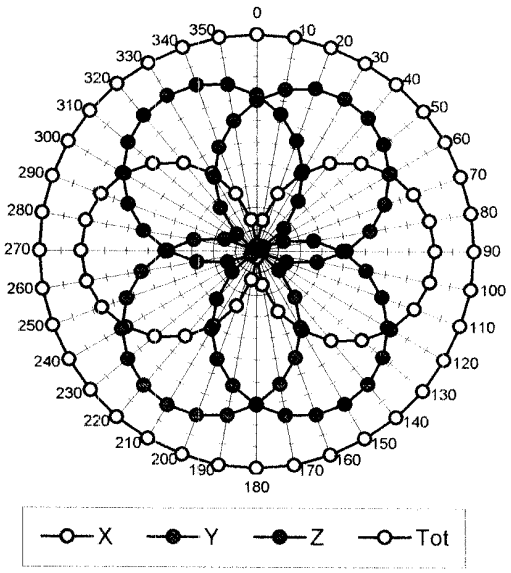
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

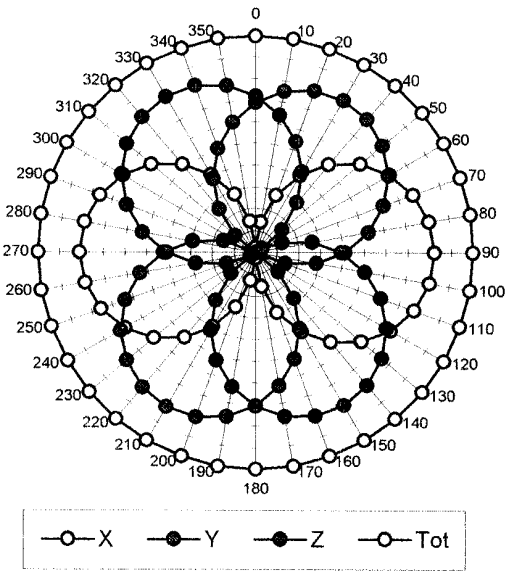
f = 30 MHz, TEM cell ifi110



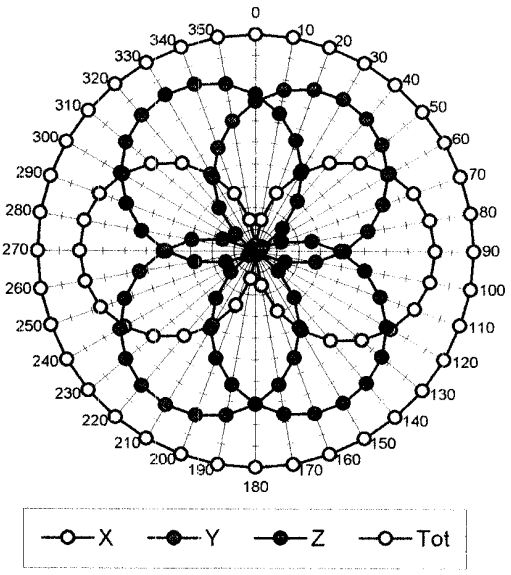
f = 100 MHz, TEM cell ifi110

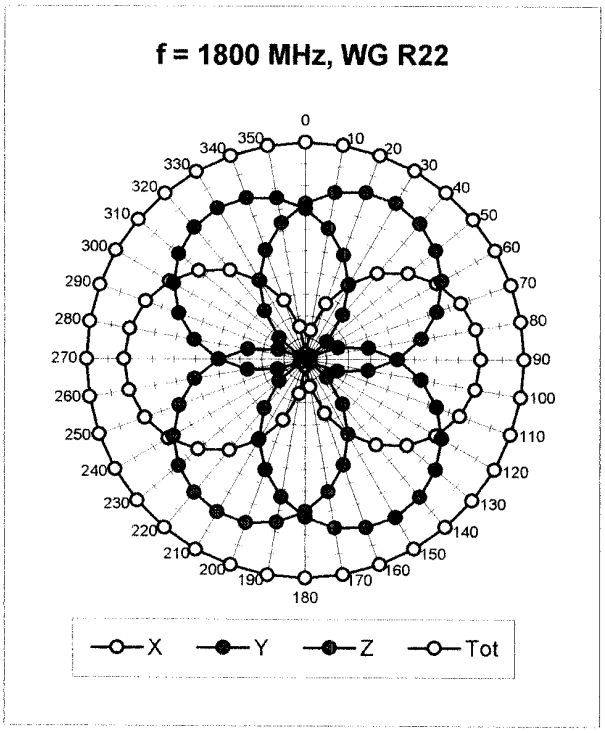


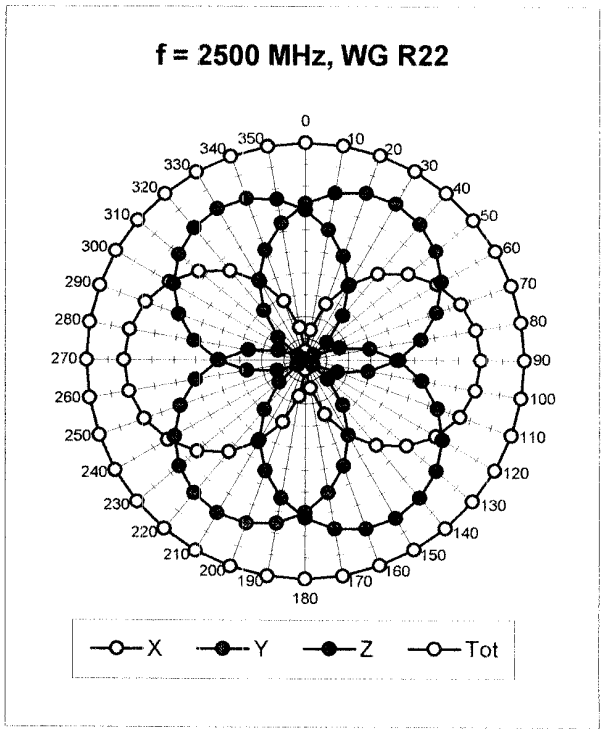
f = 300 MHz, TEM cell ifi110



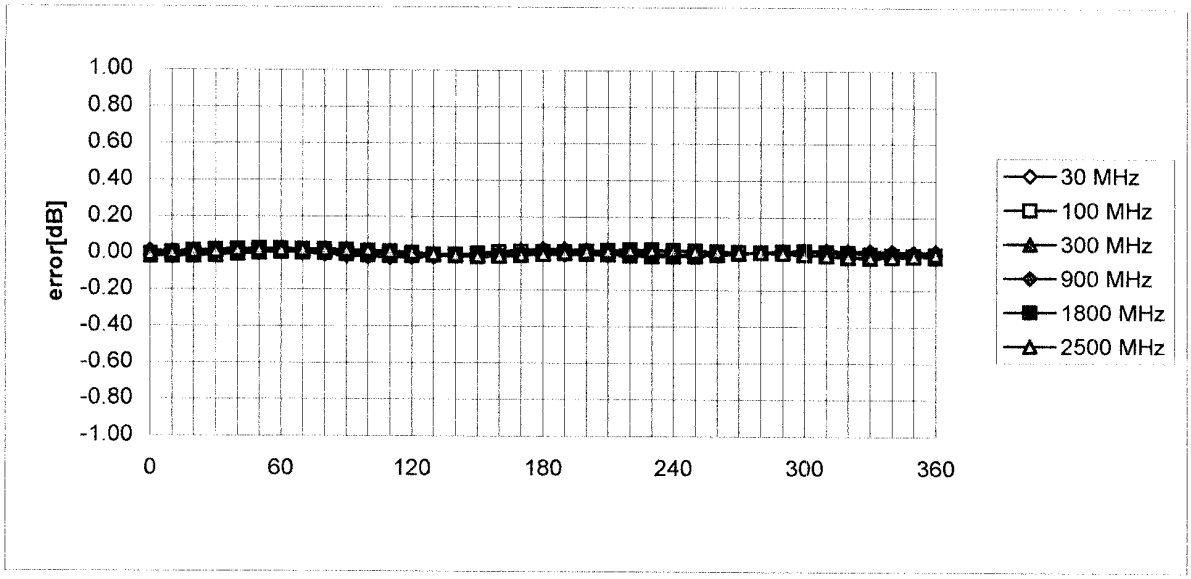
f = 900 MHz, TEM cell ifi110





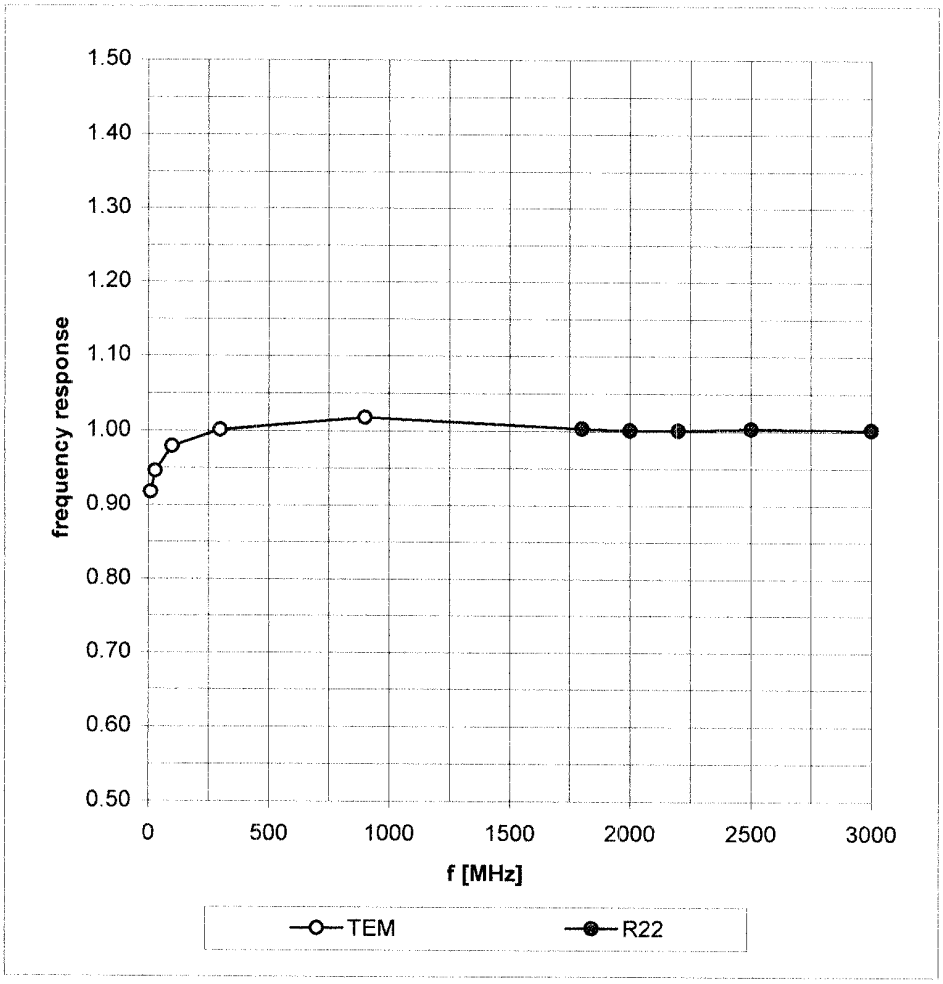


Isotropy Error (ϕ), θ = 0°



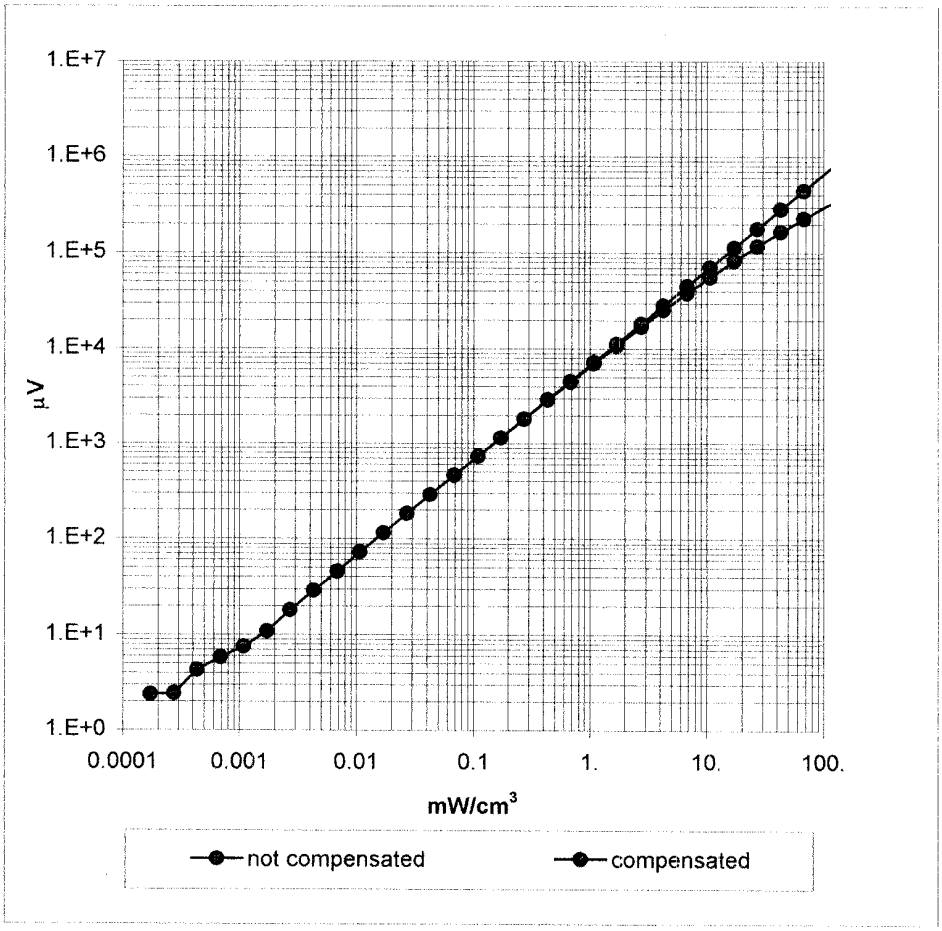
Frequency Response of E-Field

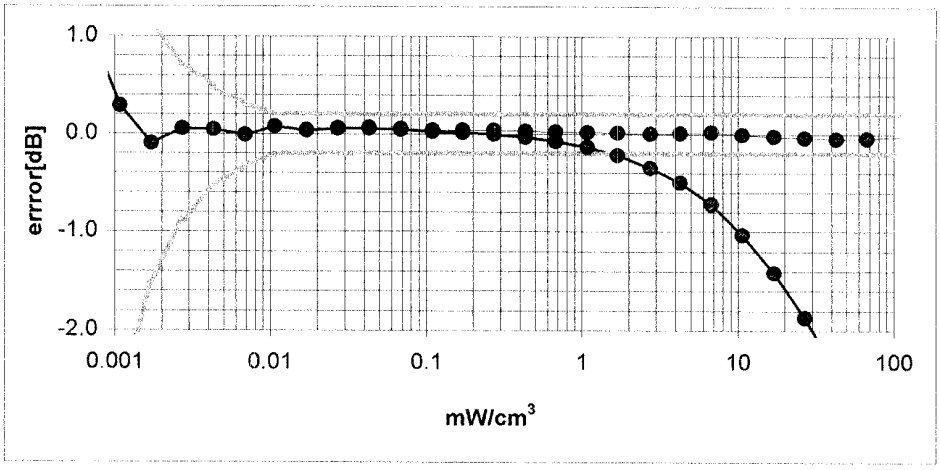
(TEM-Cell:ifi110, Waveguide R22)



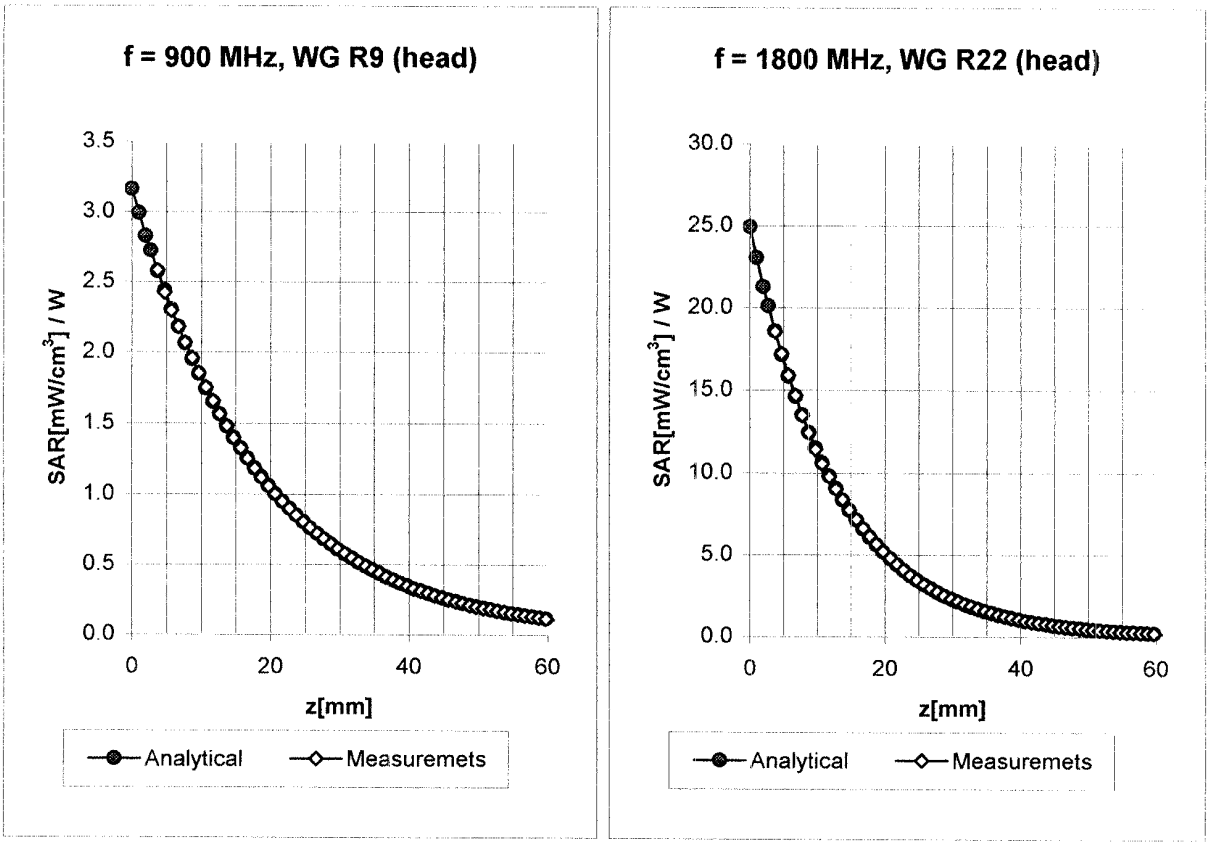
Dynamic Range f(SAR_{brain})

(Waveguide R22)





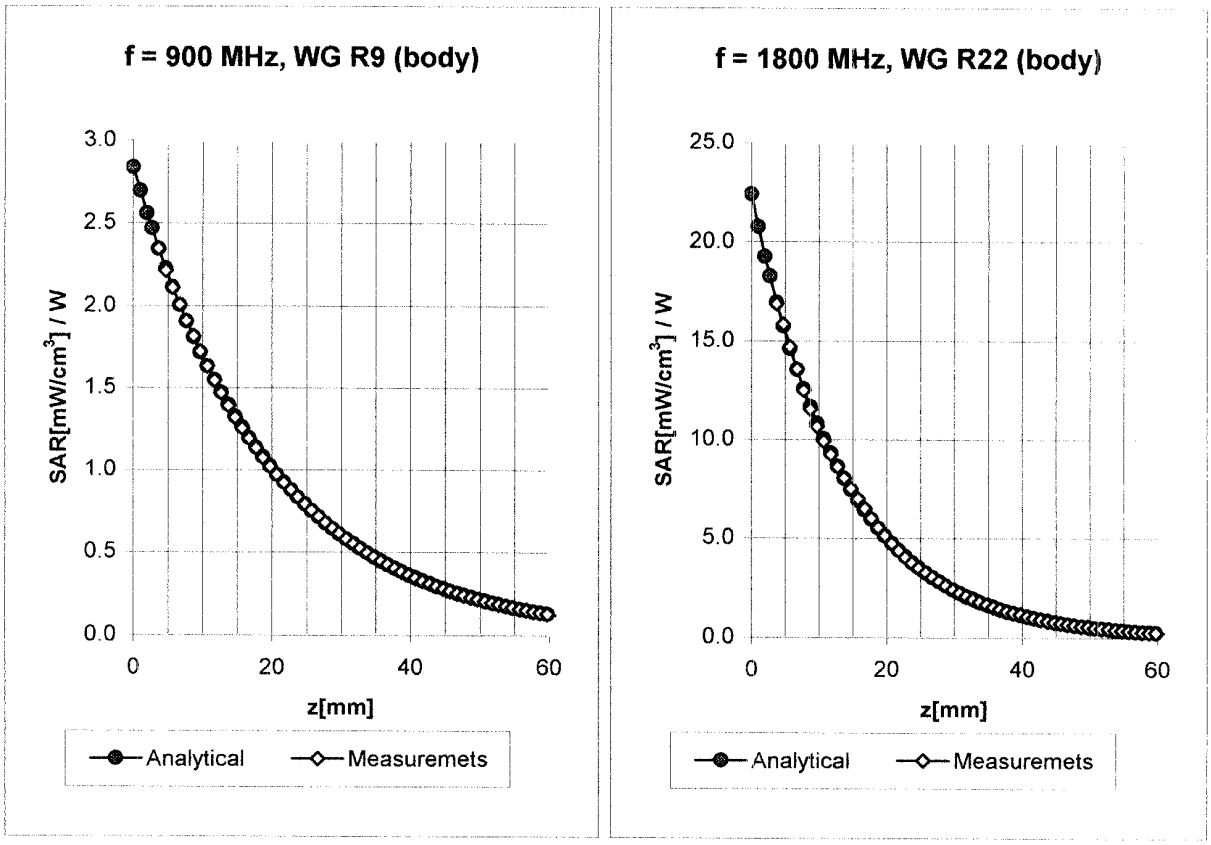
Conversion Factor Assessment



Head	**900 MHz**	ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**	
Head	**835 MHz**	ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**	
	ConvF X	**6.9** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.9** ± 9.5% (k=2)	Alpha	**0.30**
	ConvF Z	**6.9** ± 9.5% (k=2)	Depth	**2.71**

Head	**1800 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
Head	**1900 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
	ConvF X	**5.6** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.6** ± 9.5% (k=2)	Alpha	**0.42**
	ConvF Z	**5.6** ± 9.5% (k=2)	Depth	**2.56**

Conversion Factor Assessment

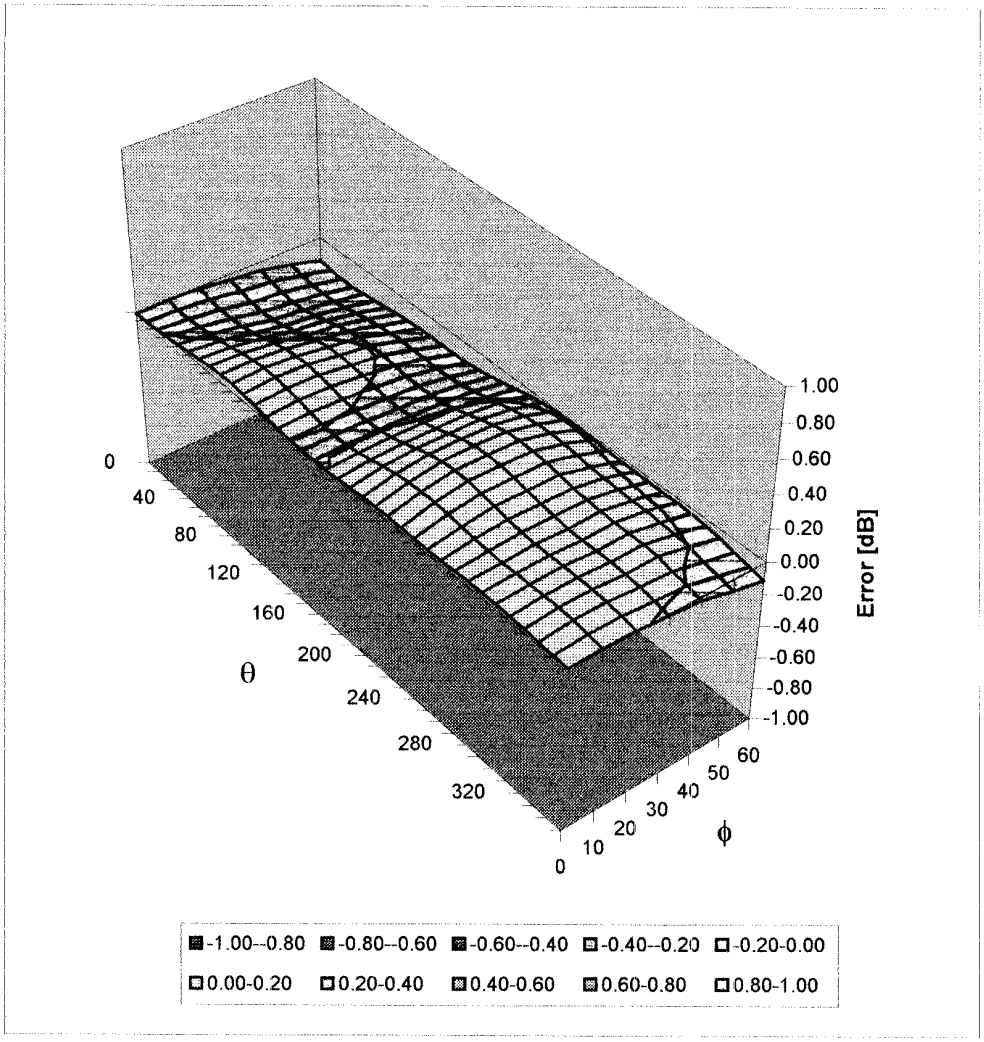


Body	**900 MHz**	ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**	
Body	**835 MHz**	ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**	
	ConvF X	**6.7** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.7** ± 9.5% (k=2)	Alpha	**0.34**
	ConvF Z	**6.7** ± 9.5% (k=2)	Depth	**2.57**

Body	**1800 MHz**	ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
Body	**1900 MHz**	ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
	ConvF X	**5.3** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.3** ± 9.5% (k=2)	Alpha	**0.52**
	ConvF Z	**5.3** ± 9.5% (k=2)	Depth	**2.46**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



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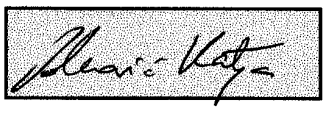
Additional Conversion Factors

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 (± standard deviation)

150 MHz	ConvF	**9.4 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
300 MHz	ConvF	**8.2 ± 8%**	**ε_r = 45.3** **σ = 0.87 mho/m** (head tissue)
450 MHz	ConvF	**7.8 ± 8%**	**ε_r = 43.5** **σ = 0.87mho/m** (head tissue)
150 MHz	ConvF	**9.1 ± 8%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
450 MHz	ConvF	**7.9 ± 8%**	**ε_r = 56.7** **σ = 0.94 mho/m** (body tissue)
2450 MHz	ConvF	**4.5 ± 8%**	**ε_r = 39.2** **σ = 1.80 mho/m** (head tissue)
2450 MHz	ConvF	**4.1 ± 8%**	**ε_r = 52.7** **σ = 1.95 mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

900MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

February 13, 2003

Frequency	e'	e''
800.000000 MHz	42.6159	19.9000
810.000000 MHz	42.5352	19.8857
820.000000 MHz	42.3736	19.8569
830.000000 MHz	42.2493	19.7928
840.000000 MHz	42.1045	19.7731
850.000000 MHz	41.9710	19.7411
860.000000 MHz	41.8565	19.7256
870.000000 MHz	41.7039	19.6710
880.000000 MHz	41.6145	19.6809
890.000000 MHz	41.4898	19.6613
900.000000 MHz	41.4133	19.5739
910.000000 MHz	41.3087	19.5508
920.000000 MHz	41.1920	19.4593
930.000000 MHz	41.1127	19.4504
940.000000 MHz	40.9903	19.4169
950.000000 MHz	40.8422	19.4117
960.000000 MHz	40.7576	19.3877
970.000000 MHz	40.6367	19.3574
980.000000 MHz	40.5295	19.3610
990.000000 MHz	40.4341	19.3476
1.000000000 GHz	40.3475	19.2820

835MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

February 13, 2003

Frequency	e'	e''
735.000000 MHz	55.1352	21.3811
745.000000 MHz	55.0311	21.3500
755.000000 MHz	54.8853	21.2859
765.000000 MHz	54.7769	21.2464
775.000000 MHz	54.6768	21.2167
785.000000 MHz	54.5498	21.1624
795.000000 MHz	54.4797	21.1583
805.000000 MHz	54.3968	21.0736
815.000000 MHz	54.3335	21.0339
825.000000 MHz	54.2258	20.9996
835.000000 MHz	54.1375	20.9757
845.000000 MHz	54.0176	20.9585
855.000000 MHz	53.8987	20.9310
865.000000 MHz	53.7677	20.8877
875.000000 MHz	53.6774	20.8835
885.000000 MHz	53.5818	20.8817
895.000000 MHz	53.5353	20.7930
905.000000 MHz	53.4344	20.7581
915.000000 MHz	53.3371	20.7226
925.000000 MHz	53.2583	20.7114
935.000000 MHz	53.1662	20.6704

APPENDIX F - SAR TEST SETUP PHOTOGRAPHS

BODY SAR TEST SETUP PHOTOGRAPHS

Bottom Side of EUT - 0.0cm Separation Distance
Antenna Extended Position

BODY SAR TEST SETUP PHOTOGRAPHS

Right Side of EUT - 1.5cm Separation Distance
Antenna Extended Position

BODY SAR TEST SETUP PHOTOGRAPHS

Top End of EUT - 1.5cm Separation Distance
Antenna Extended Position