DECLARATION OF COMPLIANCE
SAR EVALUATION

Test Lab

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Applicant Information

ITRONIX CORPORATION
801 South Stevens Street
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Rule Part(s):	**FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (01-01)**
FCC Device Classification:	**Licensed Base Station for Part 24 (PCB)**
IC Device Classification:	**2GHz Personal Communication Services (RSS-133 Issue 2)** **800MHz CDMA Cellular Transmitter (RSS-129 Issue 2)**
FCC ID:	**KBCIX260AC555-MPI**
Model(s):	**IX260**
Device Type:	**Rugged Laptop PC with Sierra Wireless AirCard 555/550** **Dual-Band PCS/Cellular CDMA PCMCIA Modem Card** **(Co-located with Cisco Systems MPI-350 Mini-PCI DSSS WLAN Card)**
Tx Frequency Range:	**1851.25 - 1908.75 MHz (PCS CDMA)** **824.70 - 848.31 MHz (Cellular CDMA)**
RF Output Power Tested:	**23.0 dBm Conducted (PCS CDMA)** **23.0 dBm Conducted (Cellular CDMA)**
Antenna Type(s):	**External Dipole (Dual-Band CDMA Modem)** **Dual Internal (Co-located DSSS WLAN Card)**
Battery Type:	**11.1V Lithium-Ion, 6.0Ah (Model: A2121-2)**
Max. SAR Measured:	**1.15 W/kg (PCS CDMA) / 0.424 W/kg (Cellular CDMA)**

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

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

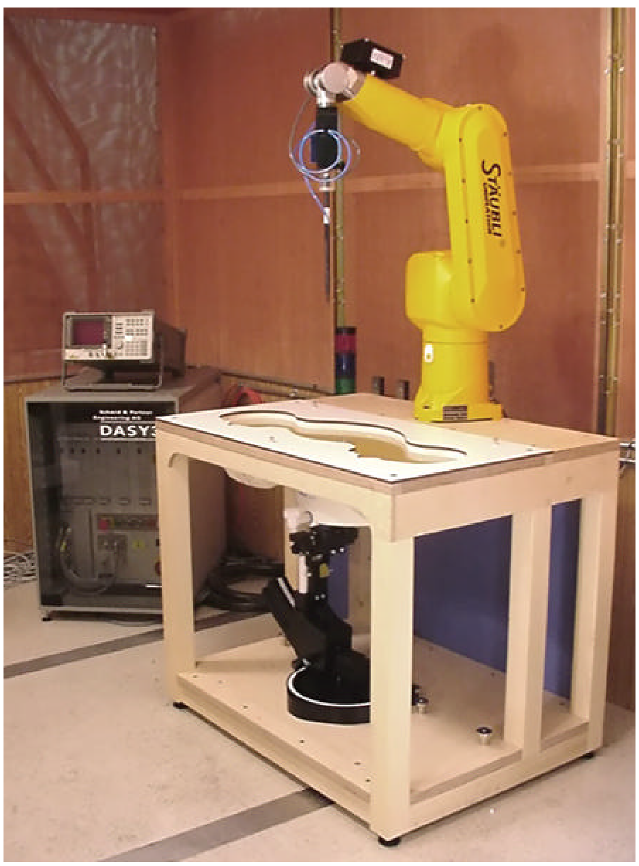
This measurement report demonstrates that the ITRONIX CORPORATION Model: IX260 Rugged Laptop PC with Sierra Wireless AirCard 555/550 Dual-Band PCS/Cellular CDMA PCMCIA Modem Card (co-located with Cisco Systems MPI-350 Mini-PCI DSSS WLAN Card) FCC ID: KBCIX260AC555-MPI complies with the RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada Safety Code 6 (see reference [2]) for the General Population environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]) and IC RSS-102 Issue 1 (Provisional) (see reference [4]), were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

FCC Rule Part(s)	47 CFR §2.1093
IC Rule Part(s)	IC RSS-102 Issue 1 (Provisional)
Test Procedure	FCC OET Bulletin 65, Supplement C (01-01)
FCC Device Classification	Licensed Base Station for Part 24 (PCB)
IC Device Classification	2GHz Personal Communication Services (RSS-133 Issue 2) 800MHz CDMA Cellular Transmitter (RSS-129 Issue 2)
Device Type	Rugged Laptop PC with Sierra Wireless AirCard 555/550 Dual-Band PCS/Cellular CDMA PCMCIA Modem Card (Co-located with Cisco MPI-350 Mini-PCI DSSS WLAN Card)
FCC ID	KBCIX260AC555-MPI
Model(s)	IX260
Serial No.	Pre-production
Operating Mode(s)	PCS CDMA / Cellular CDMA
Tx Frequency Range	1851.25 - 1908.75 MHz (PCS CDMA) 824.70 - 848.31 MHz (Cellular CDMA)
RF Output Power Tested	23.0 dBm Conducted (PCS CDMA) 23.0 dBm Conducted (Cellular CDMA)
Antenna Type(s)	External Dipole (Length: 4.3 inches) Dual Internal (Co-located DSSS WLAN Card)
Battery Type	11.1V Lithium-Ion, 6.0Ah (Model: A2121-2)

3.0 SAR MEASUREMENT SYSTEM

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



DASY3 SAR Measurement System with SAM phantom

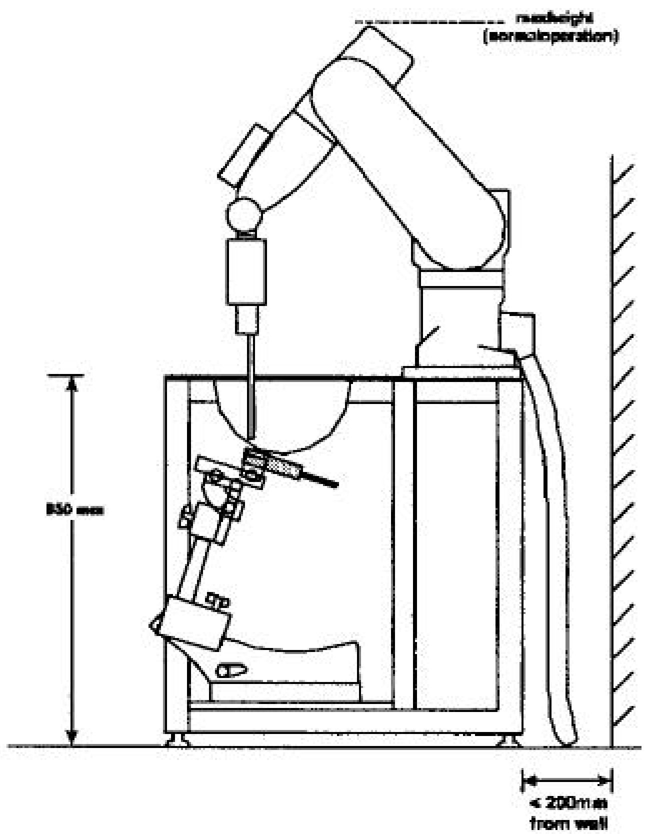


Figure 1. DASY3 Compact Version - Side View

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 - PCS CDMA									
Transmit Mode	Freq. (MHz)	Channel	Test Mode	Conducted Power (dBm)		Antenna Position to Planar Phantom	Laptop PC Position to Planar Phantom	Separation Distance (cm)	Measured SAR 1g (W/kg)
				Before	After				
CDMA	1880.00	600	PCS CDMA	23.0	22.9	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	1.05
CDMA	1851.25	25	PCS CDMA	23.0	22.9	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.961
CDMA	1908.75	1175	PCS CDMA	23.0	22.9	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.517
CDMA	1880.00	600	PCS CDMA	23.0	22.9	Perpendicular (180°)	Back of LCD (LCD Closed)	0.0	0.0712
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	1.15
CDMA & DSSS	1851.25	25	PCS CDMA	23.0	22.8	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.899
CDMA & DSSS	1908.75	1175	PCS CDMA	23.0	22.8	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.837
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Perpendicular (180°)	Back of LCD (LCD Closed)	0.0	0.498
CDMA	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Stowed)	Bottom Side (LCD Closed)	0.0	0.0298
CDMA	1880.00	600	PCS CDMA	23.0	22.8	Perpendicular (Extended)	Bottom Side (LCD Closed)	0.0	0.0342
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Stowed)	Bottom Side (LCD Closed)	0.0	0.0161
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Perpendicular (Extended)	Bottom Side (LCD Closed)	0.0	0.0249
CDMA	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Stowed)	Right Side of LCD (LCD Closed)	1.5	0.212
CDMA	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Extended)	Right Side of LCD (LCD Closed)	1.5	0.127
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Stowed)	Right Side of LCD (LCD Closed)	1.5	0.150
CDMA & DSSS	1880.00	600	PCS CDMA	23.0	22.8	Parallel (Extended)	Right Side of LCD (LCD Closed)	1.5	0.0508
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)	10/31/02		Relative Humidity	68 %
Measured Mixture Type	1900MHz Muscle		Atmospheric Pressure	103.4 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	22.2 °C
	53.3 ±5%	53.3	Fluid Temperature	21.4 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	1.52 ±5%	1.51	ρ (Kg/m^3)	1000

Note(s):

1. If the SAR measurements performed at the middle channel were ≥ 3dB below the SAR limit, SAR evaluation for the low and high channels was optional for each test configuration (per FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]).
2. 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.
3. For the simultaneous transmit tests the co-located Cisco MPI-350 DSSS WLAN Card was set to the maximum conducted power level (21.1 dBm) at the mid channel (2437MHz) with a CW signal and the right side internal antenna transmitting.

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - Cellular CDMA									
Transmit Mode	Freq. (MHz)	Channel	Test Mode	Conducted Power (dBm)		Antenna Position to Planar Phantom	Laptop PC Position to Planar Phantom	Separation Distance (cm)	Measured SAR 1g (W/kg)
				Before	After				
CDMA	835.89	363	CDMA	23.0	23.0	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.493
CDMA	835.89	363	CDMA	23.0	23.0	Perpendicular (180°)	Back of LCD (LCD Closed)	0.0	0.0404
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Parallel (Stowed)	Back of LCD (LCD Closed)	0.0	0.424
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Perpendicular (180°)	Back of LCD (LCD Closed)	0.0	0.401
CDMA	835.89	363	CDMA	23.0	22.8	Parallel (Stowed)	Bottom Side of PC (LCD Closed)	0.0	0.0072
CDMA	835.89	363	CDMA	23.0	22.8	Perpendicular (Extended)	Bottom Side of PC (LCD Closed)	0.0	0.0175
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Parallel (Stowed)	Bottom Side of PC (LCD Closed)	0.0	0.0047
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Perpendicular (Extended)	Bottom Side of PC (LCD Closed)	0.0	0.0197
CDMA	835.89	363	CDMA	23.0	22.9	Parallel (Stowed)	Right Side of LCD (LCD Closed)	0.0	0.112
CDMA	835.89	363	CDMA	23.0	22.9	Parallel (Extended)	Right Side of LCD (LCD Closed)	0.0	0.231
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Parallel (Stowed)	Right side of LCD (LCD Closed)	0.0	0.0790
CDMA & DSSS	835.89	363	CDMA	23.0	22.8	Parallel (Extended)	Right side of LCD (LCD Closed)	0.0	0.207
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)	11/01/02		Relative Humidity	66 %
Measured Mixture Type	835MHz Muscle		Atmospheric Pressure	103.3 kPa
Dielectric Constant ε_r	IEEE Target	Measured	Ambient Temperature	22.2 °C
	55.2 ±5%	53.3	Fluid Temperature	22.0 °C
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	0.97 ±5%	0.96	ρ (Kg/m^3)	1000

Note(s):
1. If the SAR measurements performed at the middle channel were ≥ 3dB below the SAR limit, SAR evaluation for the low and high channels was optional for each test configuration (per FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]).
2. 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.
3. For the simultaneous transmit tests the co-located Cisco MPI-350 DSSS WLAN Card was set to the maximum conducted power level (21.1 dBm) at mid channel (2437MHz) with a CW signal and the right side internal antenna transmitting.

5.0 DETAILS OF SAR EVALUATION

The ITRONIX CORPORATION Model: IX260 Rugged Laptop PC with Sierra Wireless AirCard 555/550 Dual-Band PCS/Cellular CDMA PCMCIA Modem Card (co-located with Cisco Systems MPI-350 Mini-PCI DSSS WLAN Card) FCC ID: KBCIX260AC555-MPI was found to be compliant for localized Specific Absorption Rate based on the following test provisions and conditions described below. The detailed test setup photographs are shown in Appendix G.

1. The EUT was tested for body SAR with the LCD display closed and the back of the LCD display facing parallel to, and touching, the outer surface of the planar phantom. The EUT was tested with the antenna in both the parallel (stowed) and perpendicular (180°) positions to the outer surface of the planar phantom, and the worst-case position was reported.
2. The EUT was tested for body SAR with the LCD display closed and the bottom of the Laptop PC facing parallel to, and touching, the outer surface of the planar phantom. The EUT was tested with the antenna in both the parallel (stowed) and perpendicular (extended) positions to the outer surface of the planar phantom, and the worst-case position was reported.
3. The EUT was tested for body SAR with the LCD display closed and the right side of the LCD display (antenna side) facing parallel to the outer surface of the planar phantom and a 1.5 cm separation distance between the antenna and the planar phantom. The EUT was tested with the antenna parallel to the outer surface of the planar phantom in both the stowed and extended positions, and the worst-case position was reported.
4. The EUT was tested at the highest SAR configurations for both PCS and cellular CDMA bands with the co-located Mini-PCI DSSS WLAN Card transmitting simultaneously at maximum power (21.1 dBm), mid channel (2437MHz), in CW mode.
5. 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. Any unusual anomalies over the course of the test warranted a re-evaluation.
6. The EUT was controlled in test mode via internal software. SAR measurements were performed with the EUT transmitting in the “always up” power control mode with a modulated CDMA signal.
7. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and antenna.
8. The EUT was tested with a fully charged battery.
9. 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.
10. Due to the dimensions of the EUT the initial coarse scans did not cover the entire area of the Laptop PC. Subsequently, a second coarse scan was performed for the highest SAR configurations to show there were no secondary peak SAR locations within 3dB of the primary peak values. At this time there is no recognized flat phantom available that is twice the dimensions of the Laptop PC.
11. All secondary peak SAR locations within 3dB of the primary peak value were evaluated (See SAR Plots - Appendix A).

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 [6]). Through the points in the first 3 cm in all z-axis, polynomials of the fourth order were calculated. This polynomial was then used to evaluate the points between the surface and the probe tip.

2. The next step used 3D-spline interpolation to get all points within the measured volume in a 1mm grid (35000 points). The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff] (see reference [6]).

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

EVALUATION PROCEDURES (Cont.)

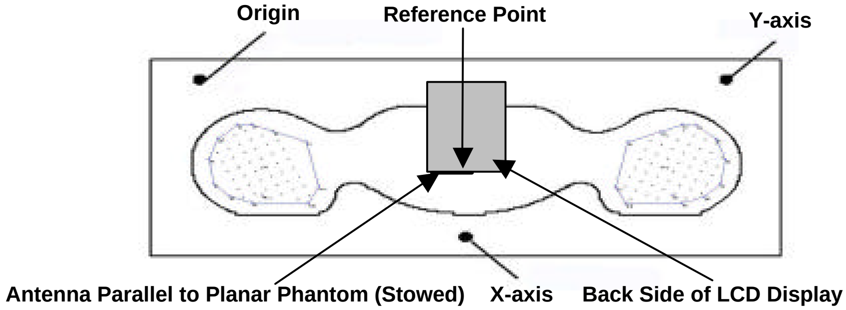


Figure 2. Phantom Reference Point & EUT Positioning
Back Side of LCD Display (Closed)

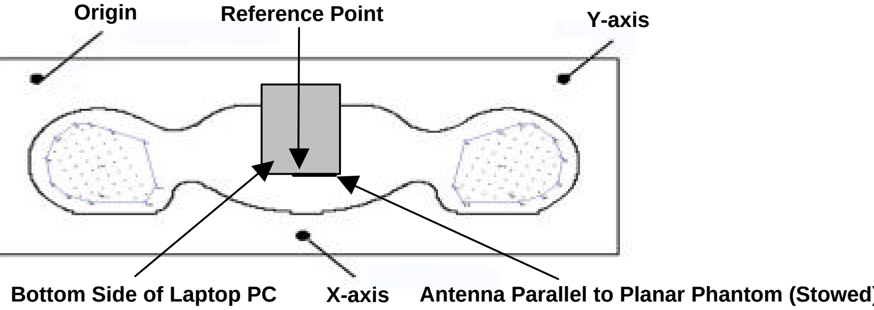


Figure 3. Phantom Reference Point & EUT Positioning
Bottom Side of Laptop PC (LCD Display Closed)

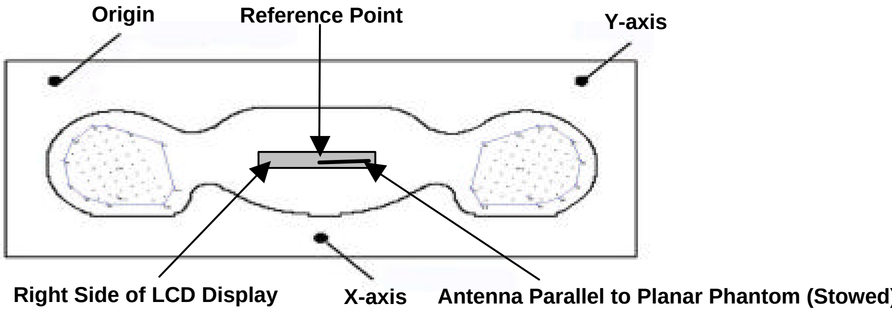


Figure 4. Phantom Reference Point & EUT Positioning
Right Side of LCD Display (Closed)

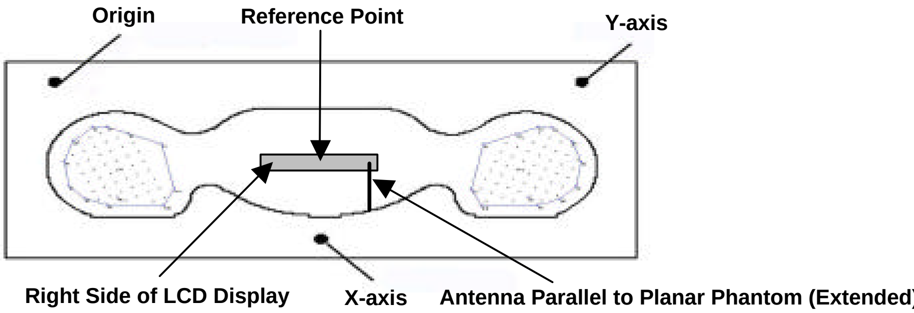


Figure 5. Phantom Reference Point & EUT Positioning
Right Side of LCD Display (Closed)

7.0 SYSTEM PERFORMANCE CHECK

Prior to the assessment a system check was performed in the planar section of the SAM phantom with an 1800MHz dipole and 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 plots).

SYSTEM PERFORMANCE CHECK											
Test Date	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				
10/31/02	1800MHz (Brain)	9.53 ±10%	9.61	40.0 ±5%	40.9	1.40 ±5%	1.35	1000	22.2 °C	21.4 °C	≥ 15 cm
11/01/02	900MHz (Brain)	2.70 ±10%	2.64	41.5 ±5%	40.1	0.97 ±5%	0.96	1000	22.2 °C	22.0 °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.

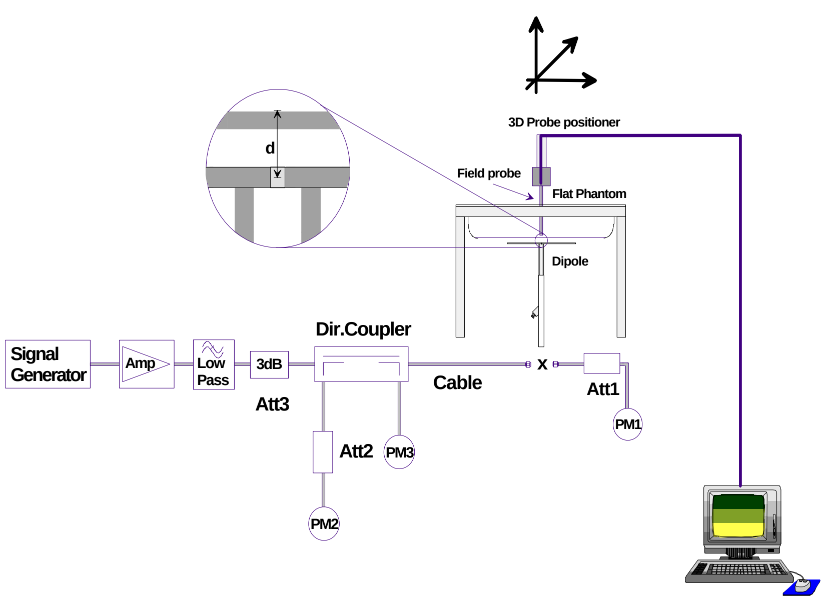


Figure 6. System Check Setup Diagram

1800MHz System Check Setup

900MHz System Check Setup

8.0 EQUIVALENT TISSUES

The 1800-2000MHz simulated tissues consist of Glycol-monobutyl, water, and salt. 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).

1800/1900MHz TISSUE MIXTURES (1 Liter Yields)		
INGREDIENT	1800MHz Brain (System Check)	1900MHz Body (EUT Evaluation)
Water	548.0 g	716.60 g
Glycol Monobutyl	448.5 g	300.70 g
Salt	3.20 g	3.10 g

835/900MHz 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

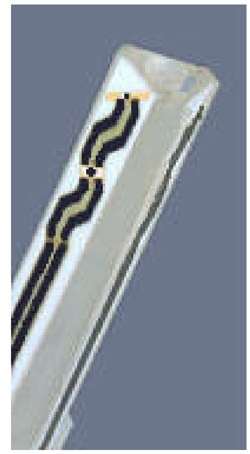
Model:	ET3DV6
Serial No.(s):	1387
Construction:	Triangular core fiber optic detection system
Frequency:	10 MHz to 6 GHz
Linearity:	±0.2 dB (30 MHz to 3 GHz)

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

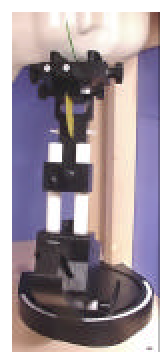
12.0 SAM PHANTOM V4.0C

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 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

14.0 TEST EQUIPMENT LIST

SAR MEASUREMENT SYSTEM		
EQUIPMENT	**SERIAL NO.**	**CALIBRATION DATE**
DASY3 System -Robot -ET3DV6 E-Field Probe -300MHz Validation Dipole -450MHz Validation Dipole -900MHz Validation Dipole -1800MHz Validation Dipole -2450MHz Validation Dipole -SAM Phantom V4.0C -Small Planar Phantom -Medium Planar Phantom -Large Planar Phantom	 599396-01 1387 135 136 054 247 150 N/A N/A N/A N/A	 N/A Feb 2002 Oct 2002 Oct 2002 June 2001 June 2001 Oct 2002 N/A N/A N/A N/A
85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8652A Power Meter -Power Sensor 80701A -Power Sensor 80701A	1835272 1833535 1833542	Feb 2002 Feb 2002 Mar 2002
Pasternack Attenuator (30dB, 2W)	PE7014-30	N/A
E4408B Spectrum Analyzer	US39240170	Nov 2002
8594E Spectrum Analyzer	3543A02721	Feb 2002
8753E Network Analyzer	US38433013	Feb 2002
8648D Signal Generator	3847A00611	Feb 2002
5S1G4 Amplifier Research Power Amplifier	26235	N/A

15.0 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 [5])

16.0 REFERENCES

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

[2] Health Canada, “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6.

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

[4] Industry Canada, “Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada’s Safety Code 6 for Exposure of Humans to Radio Frequency Fields”, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

[5] IEEE Standards Coordinating Committee 34, Std 1528-200X, “DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”.

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

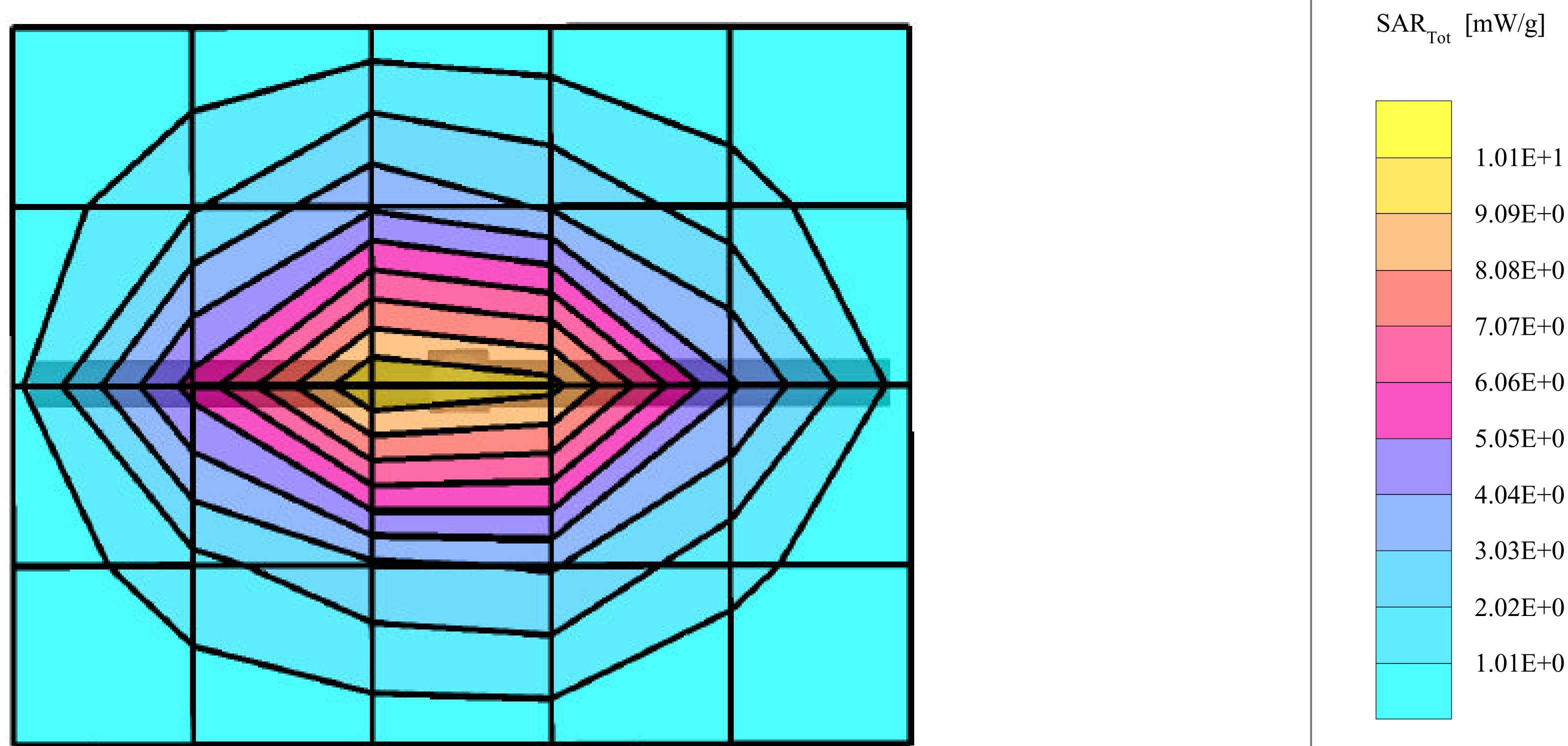
APPENDIX A - SAR MEASUREMENT DATA

APPENDIX B - SYSTEM CHECK DATA

System Performance Check - 1800MHz Dipole

SAM Phantom; Flat Section
Probe: ET3DV6 - SN1387; ConvF(5.40,5.40,5.40); Crest factor: 1.0; 1800 MHz Brain: σ = 1.35 mho/m ε_r = 40.9 ρ = 1.00 g/cm³
Cube 5x5x7: Peak: 18.2 mW/g, SAR (1g): 9.61 mW/g, SAR (10g): 5.00 mW/g, (Worst-case extrapolation)
Penetration depth: 8.3 (7.7, 9.5) [mm]; Powerdrift: 0.04 dB
Ambient Temp: 22.2°C; Fluid Temp: 21.4°C

Forward Conducted Power: 250 mW
Date Tested: October 31, 2002



System Performance Check - 900MHz Dipole

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1387; ConvF(6.60,6.60,6.60); Crest factor: 1.0; 900 MHz Brain: σ = 0.96 mho/m ε_r = 40.1 ρ = 1.00 g/cm³

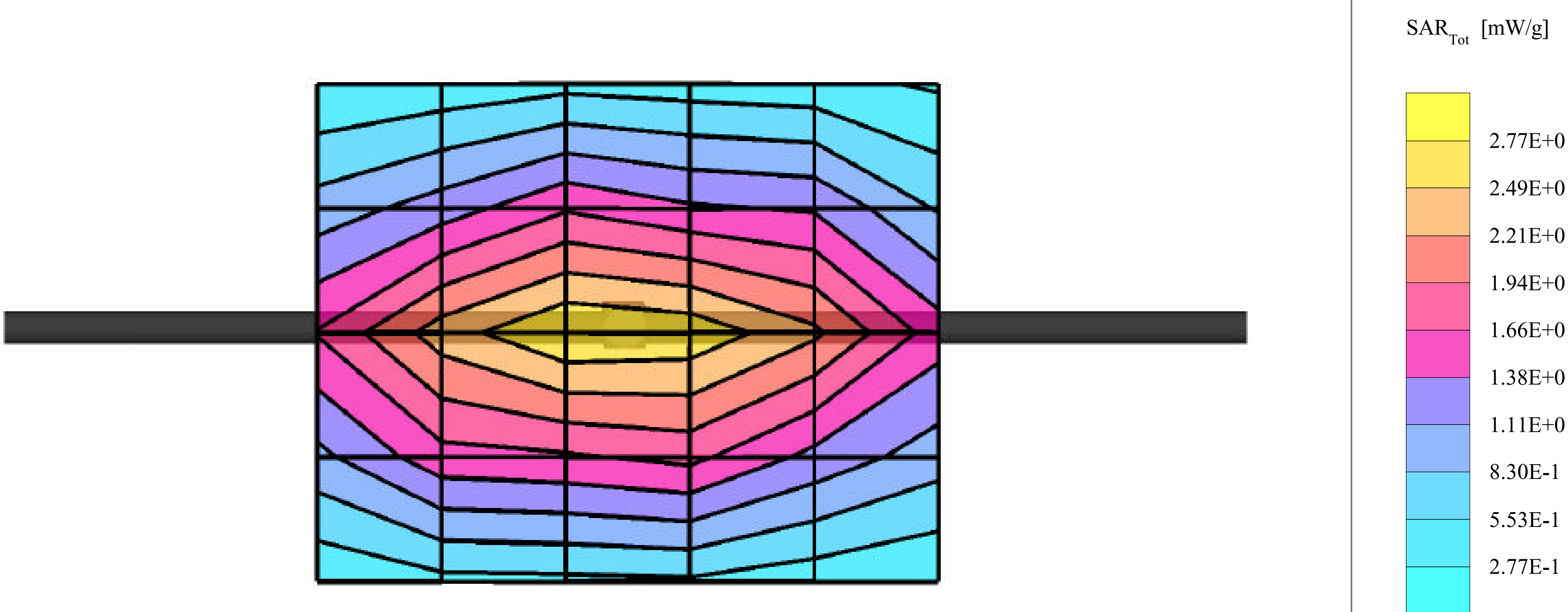
Cube 5x5x7: Peak: 4.32 mW/g, SAR (1g): 2.64 mW/g, SAR (10g): 1.65 mW/g, (Worst-case extrapolation)

Penetration depth: 11.0 (10.1, 12.6) [mm]; Powerdrift: -0.01 dB

Ambient Temp: 22.2°C; Fluid Temp: 22.0°C

Forward Conducted Power: 250 mW

Date Tested: November 01, 2002



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

1800 MHz System Validation Dipole

Type:	**D1800V2**
Serial Number:	**247**
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: D1800V2

Serial: 247

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 glycol solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	**40.0**	± 5%
Conductivity	**1.36 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.57 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance 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:	**38.64 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**20.08 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. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

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:	**1.208 ns**	(one direction)
Transmission factor:	**0.995**	(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 1800 MHz:	Re{Z} = **52.4 Ω**
	Im {Z} = **0.7 Ω**
Return Loss at 1800 MHz	**-32.1 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain sugar-water solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	**40.1**	± 5%
Conductivity	**1.71 mho/m**	± 5%

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.63 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance 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:	**43.6 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**21.6 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. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

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.

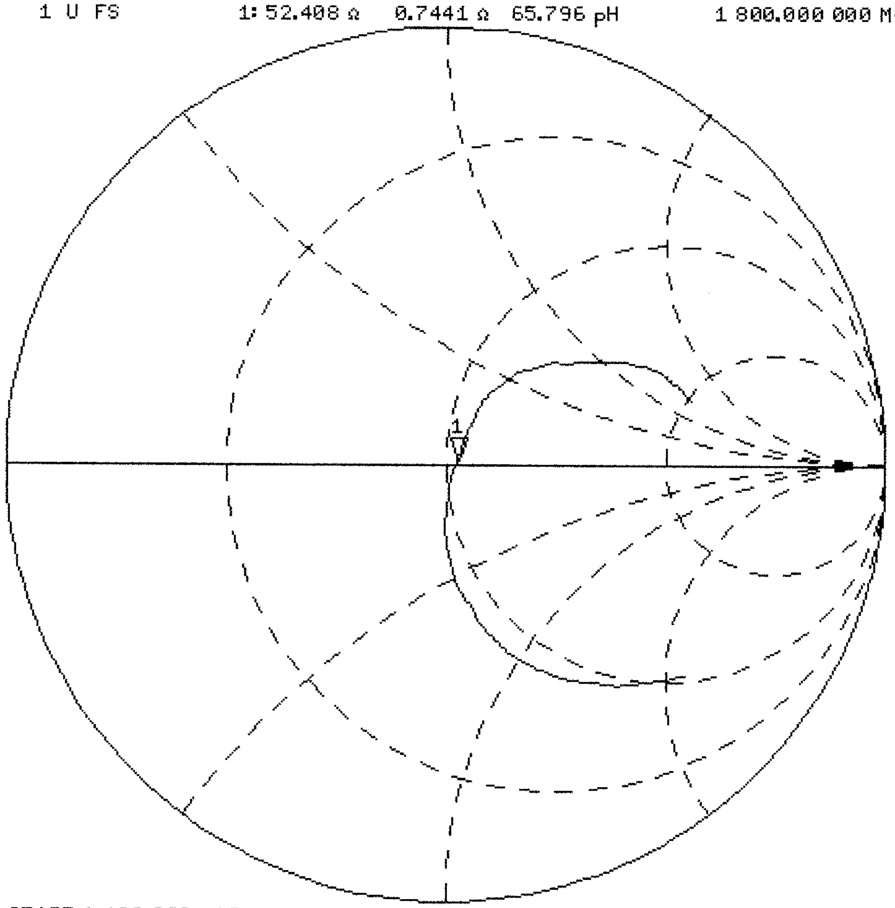
After prolonged use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

20 Jun 2001 15:31:17

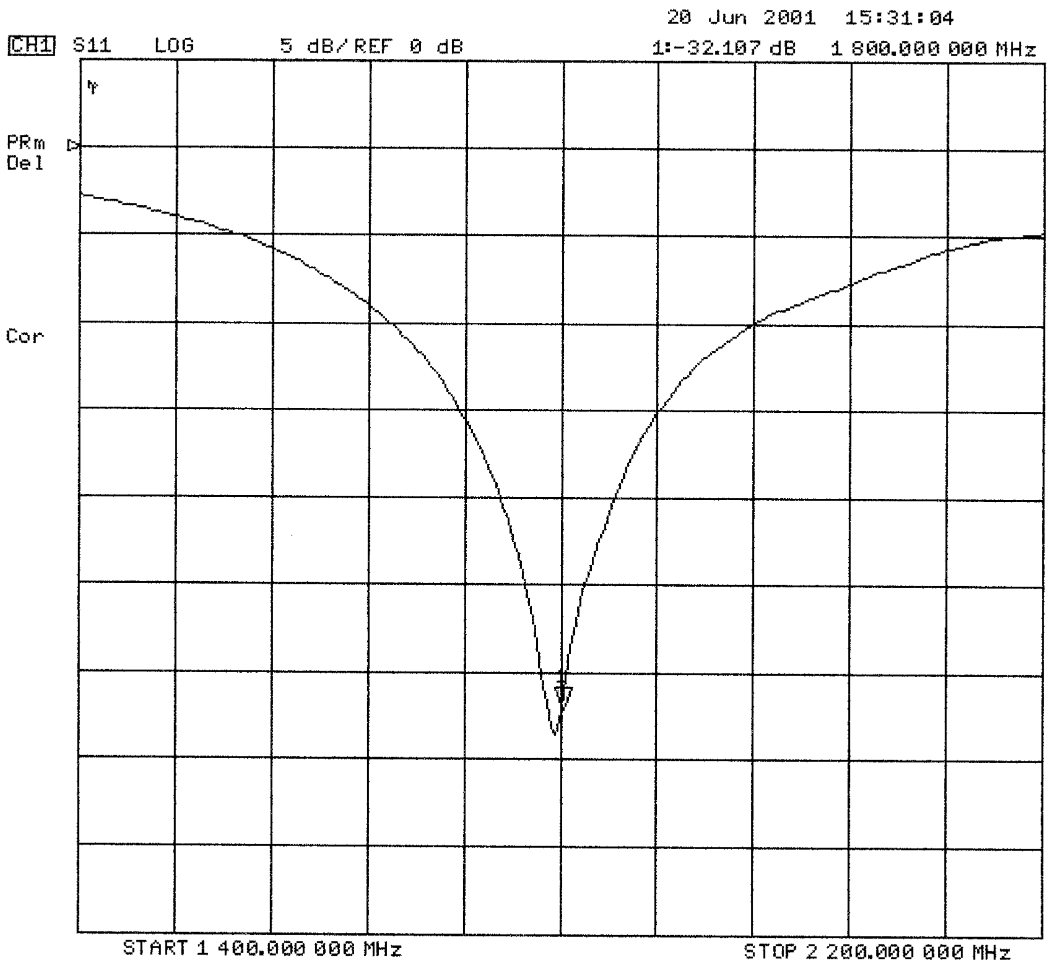
CH1 S11 1 U FS 1: 52.408 Ω 0.7441 Ω 65.796 pH 1 800.000 000 MHz

PRm
Del

Cor



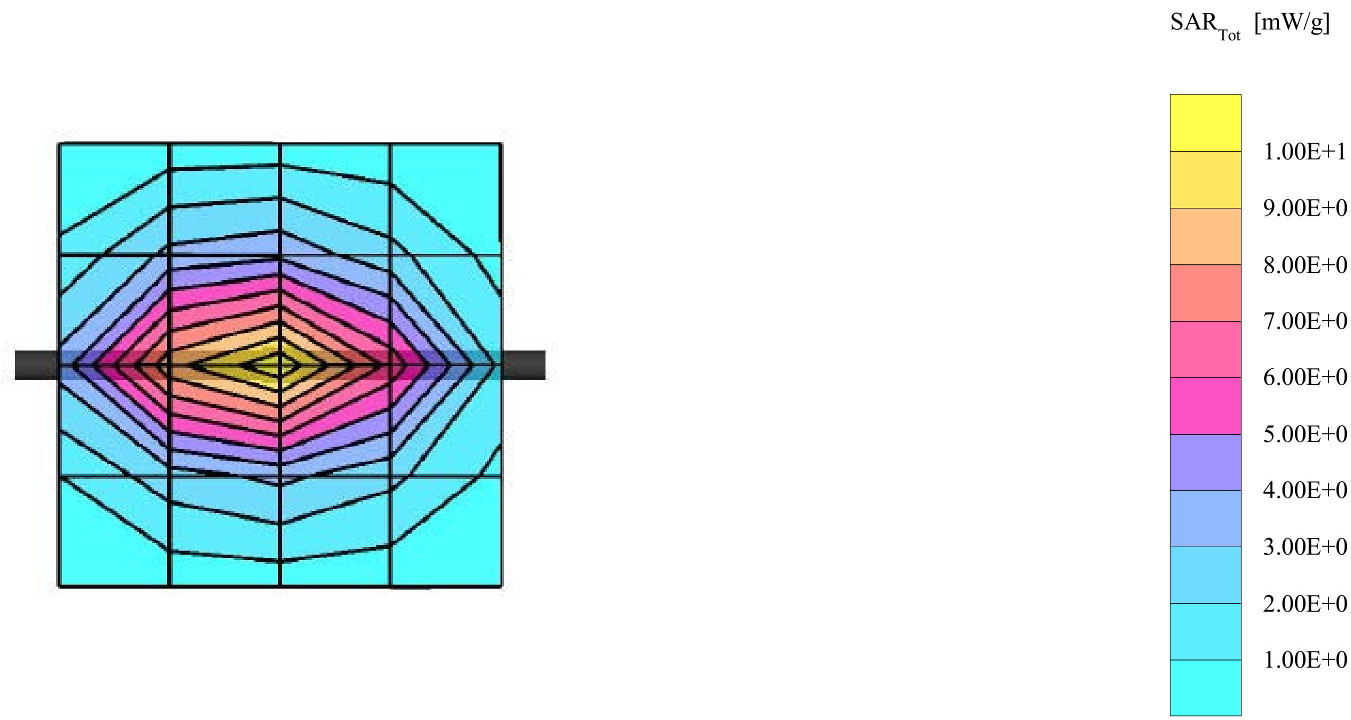
START 1 400.000 000 MHz STOP 2 200.000 000 MHz


20 Jun 2001 15:31:04
CH1 S11 LOG 5 dB/ REF 0 dB 1:-32.107 dB 1 800.000 000 MHz
PRm
Del
Cor
START 1 400.000 000 MHz
STOP 2 200.000 000 MHz

06/20/01

Validation Dipole D1800V2 SN:247, d = 10 mm

Frequency: 1800 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(5.57,5.57,5.57); Crest factor: 1.0; IEEE1528 1800 MHz : σ = 1.36 mho/m ε_r = 40.0 ρ = 1.00 g/cm^3
Cubes (2): Peak: 18.2 mW/g ± 0.04 dB, SAR (1g): 9.66 mW/g ± 0.03 dB, SAR (10g): 5.02 mW/g ± 0.03 dB, (Worst-case extrapolation)
Penetration depth: 8.2 (7.6, 9.4) [mm]
Powerdrift: -0.01 dB



Schmid & Partner Engineering AG, Zurich, Switzerland

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.

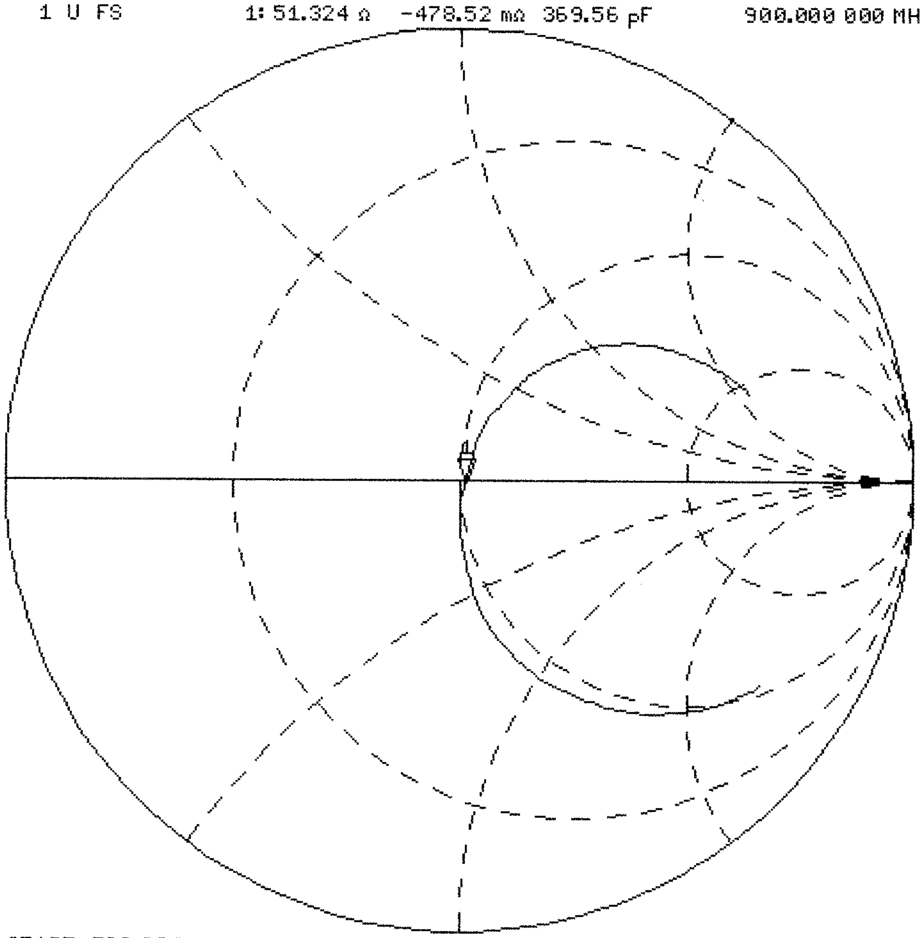
After prolonged use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

19 Jun 2001 21:44:16

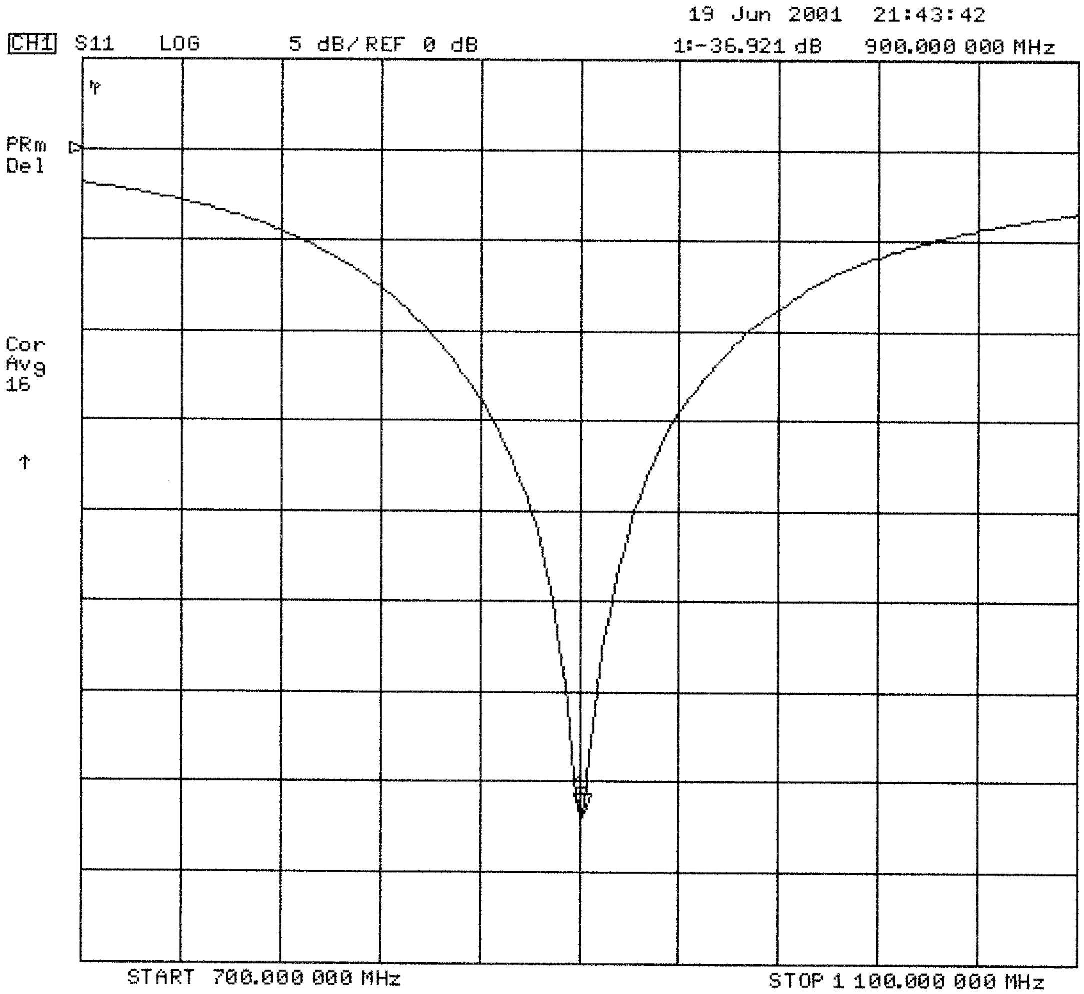
CH1 S11 1 U FS 1: 51.324 Ω -478.52 mΩ 369.56 pF 900.000 000 MHz

PRm
Del

Cor
Avg
16

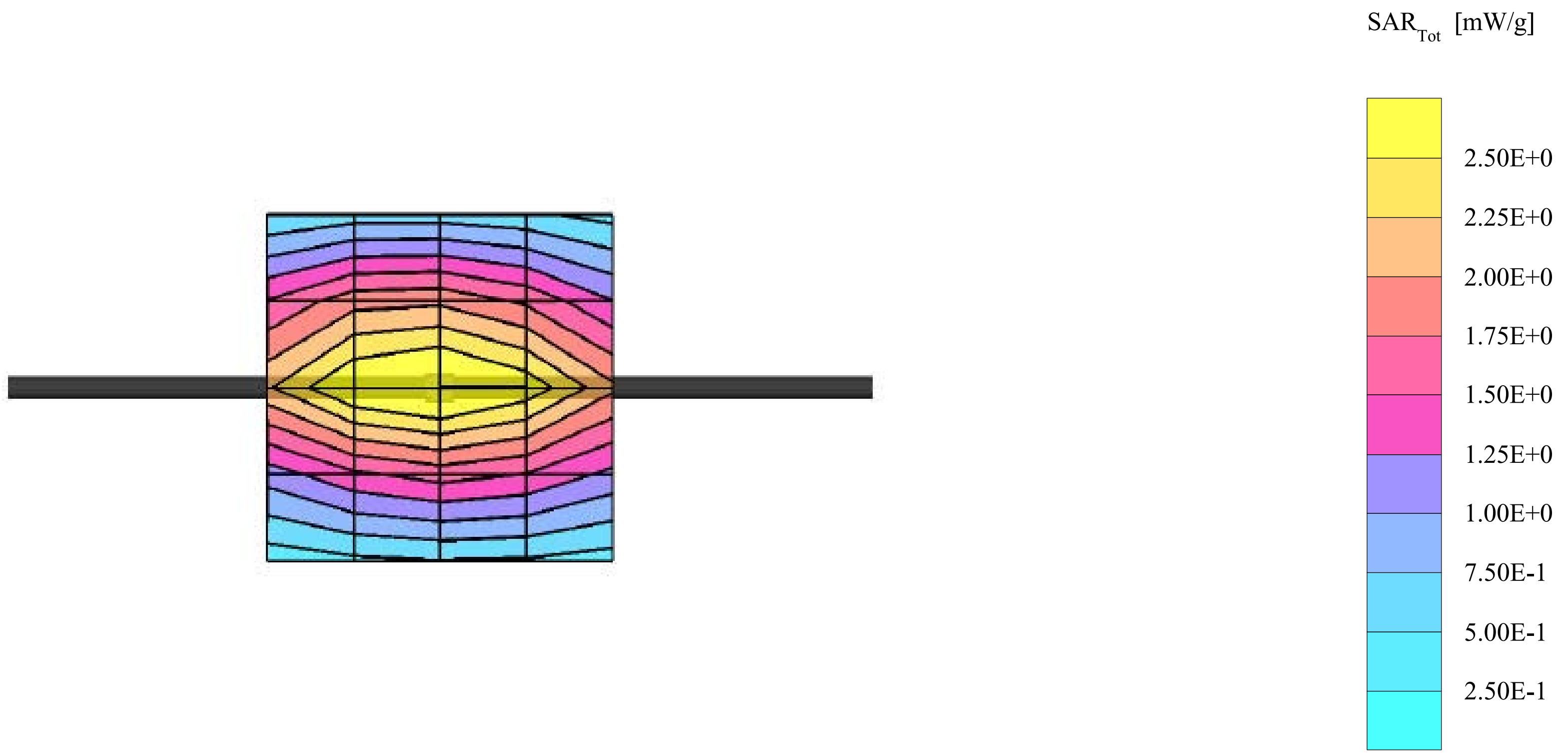


START 700.000 000 MHz STOP 1 100.000 000 MHz


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:	**1387**
Place of Calibration:	**Zurich**
Date of Calibration:	**February 22, 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:

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibration:	September 22, 1999
Recalibrated:	February 22, 2002

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

NormX	**1.58**	$\mu V/(V/m)^2$
NormY	**1.67**	$\mu V/(V/m)^2$
NormZ	**1.67**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**97**	mV
DCP Y	**97**	mV
DCP Z	**97**	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	**6.6**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6**	± 9.5% (k=2)	Alpha	**0.40**
ConvF Z	**6.6**	± 9.5% (k=2)	Depth	**2.38**

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	**5.4**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.4**	± 9.5% (k=2)	Alpha	**0.57**
ConvF Z	**5.4**	± 9.5% (k=2)	Depth	**2.18**

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	9.7	5.4
SAR_{be} [%]	With Correction Algorithm	0.3	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

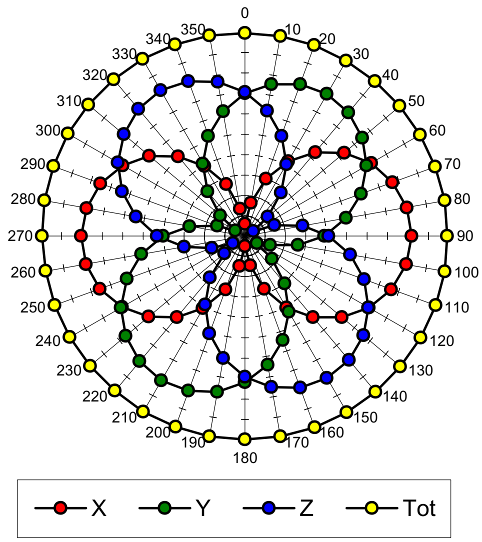
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.5	7.3
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

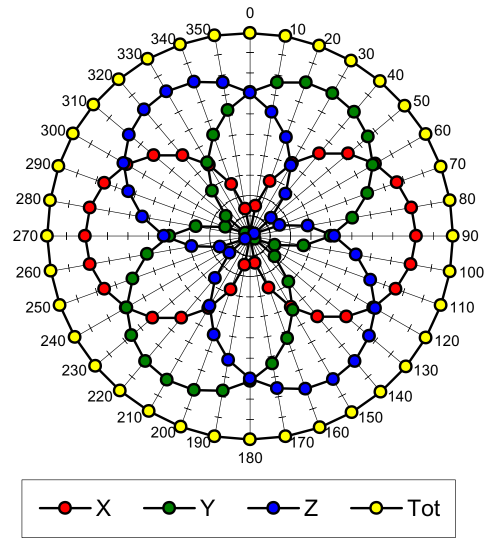
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.3 ± 0.2**	mm

Receiving Pattern (ϕ , θ = 0°

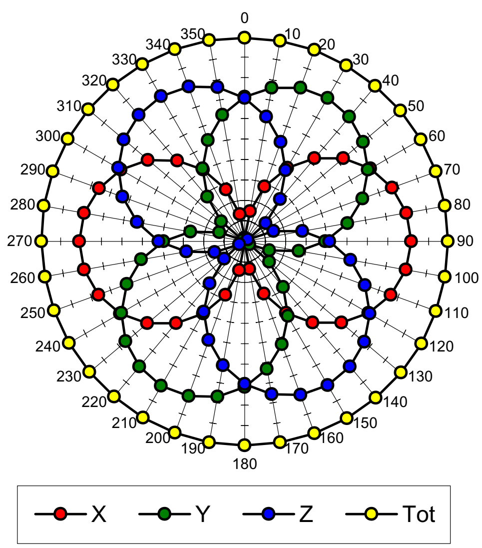
f = 30 MHz, TEM cell ifi110



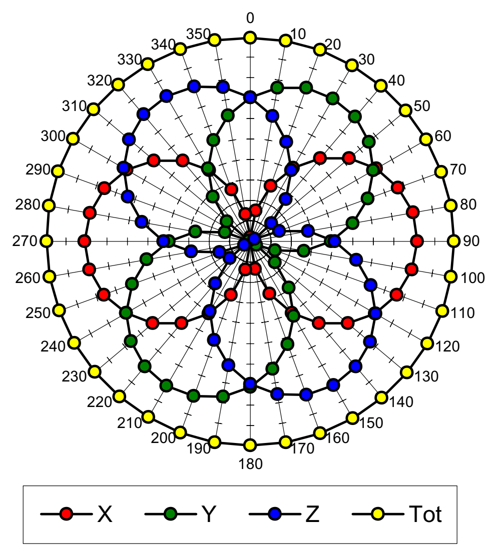
f = 100 MHz, TEM cell ifi110

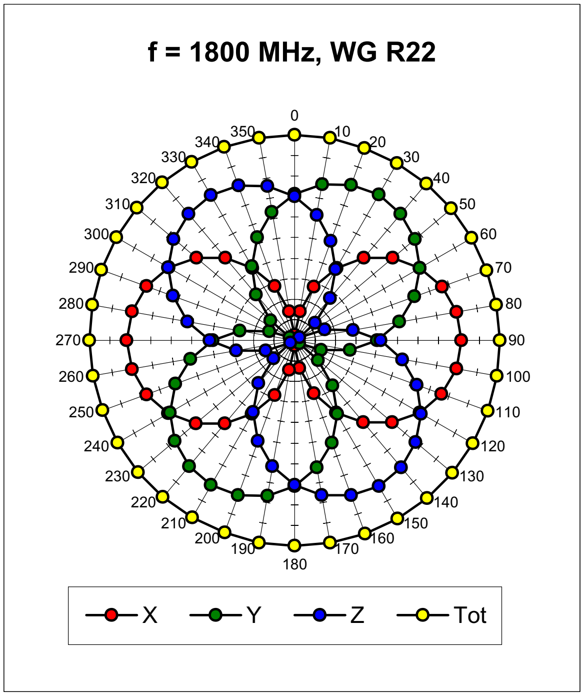


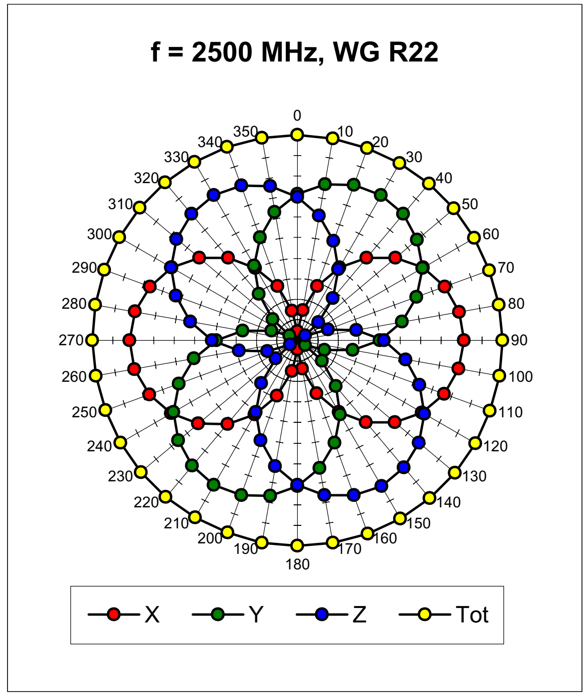
f = 300 MHz, TEM cell ifi110



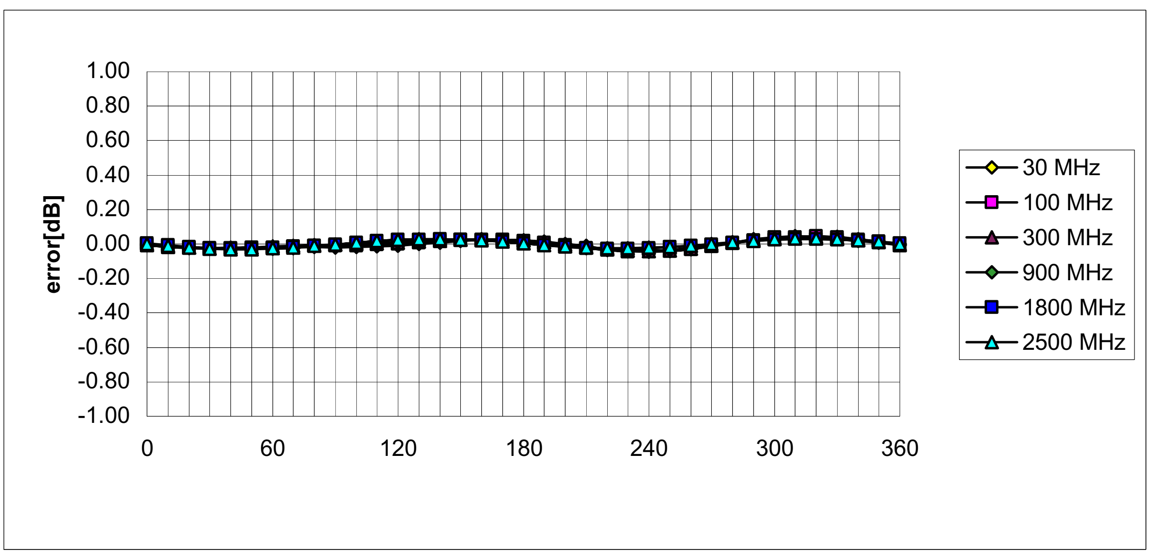
f = 900 MHz, TEM cell ifi110





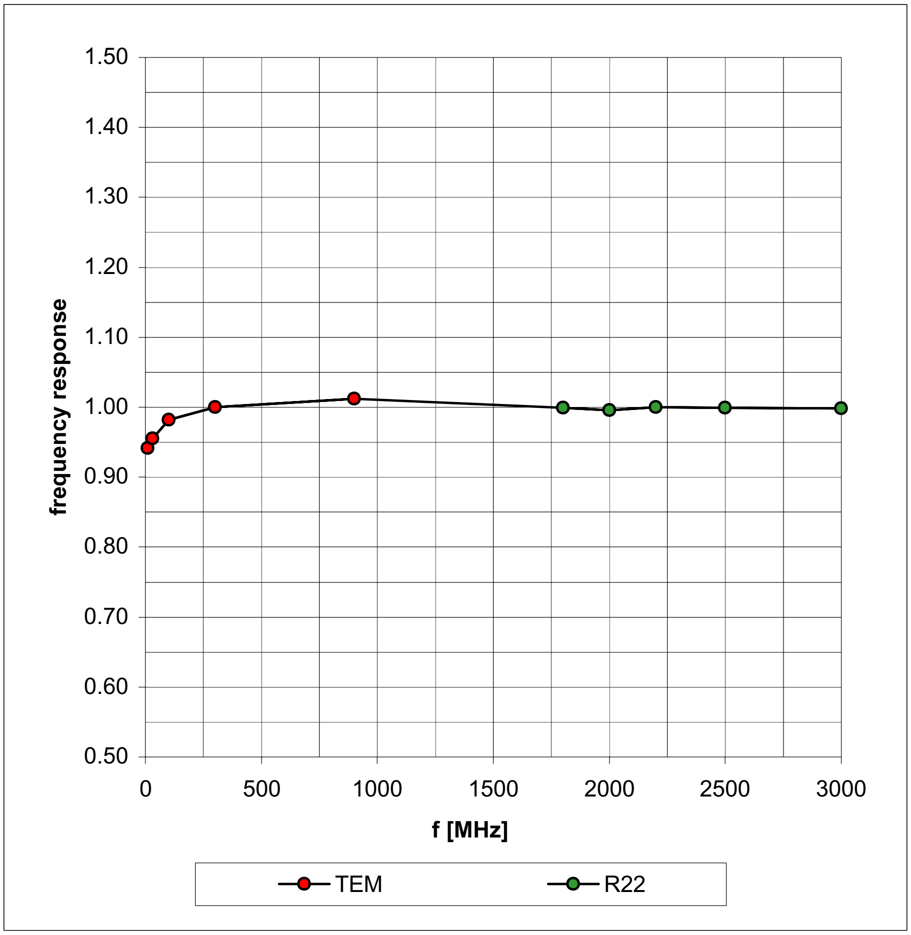


Isotropy Error (ϕ), θ = 0°



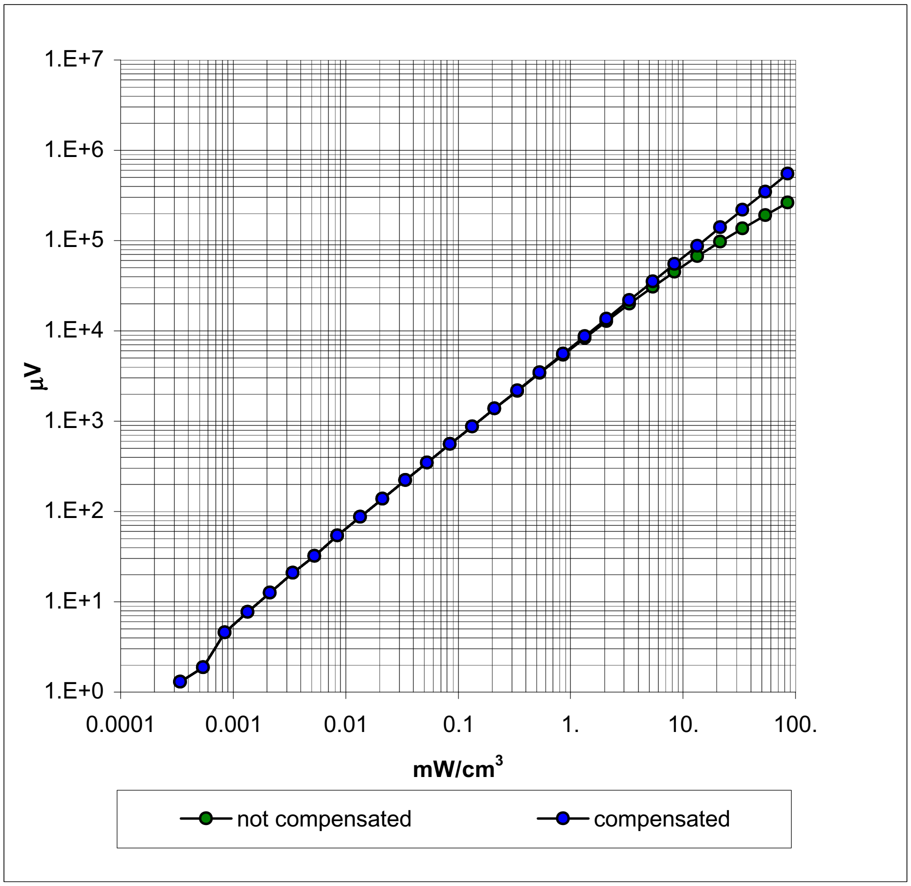
Frequency Response of E-Field

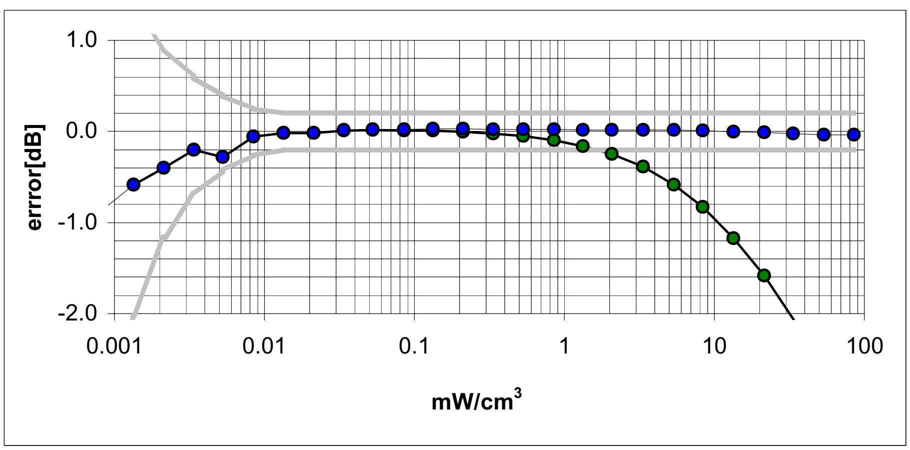
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})

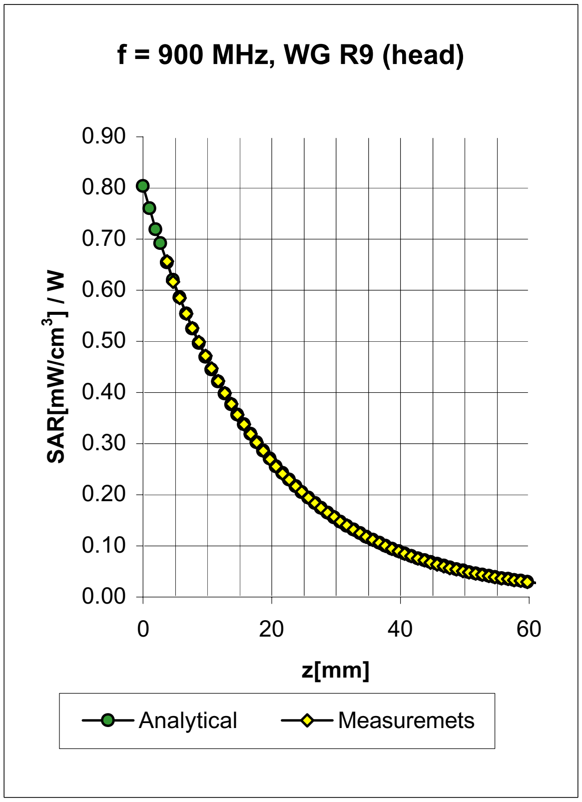
(Waveguide R22)

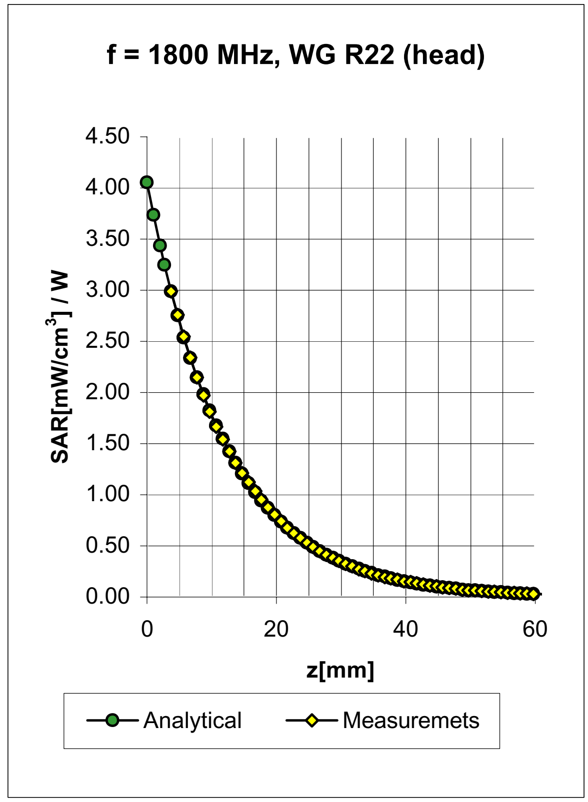




ET3DV6 SN:1387 February 22, 2002

Conversion Factor Assessment

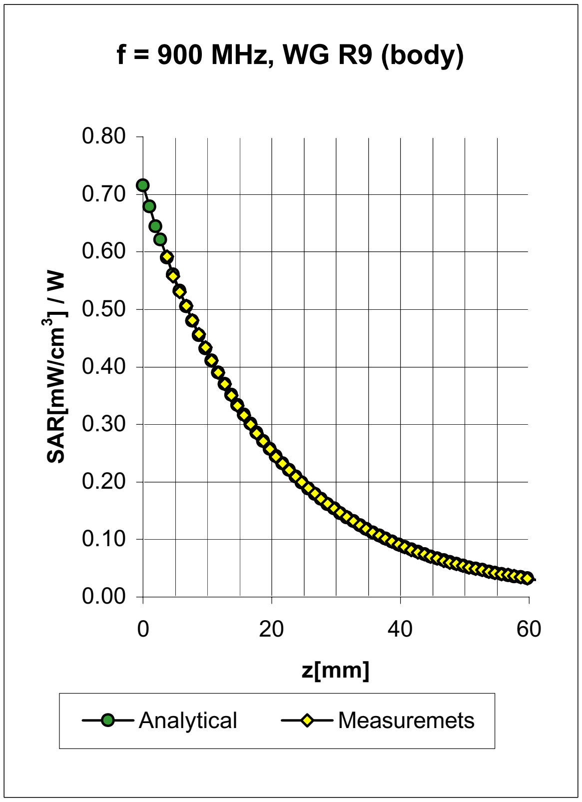


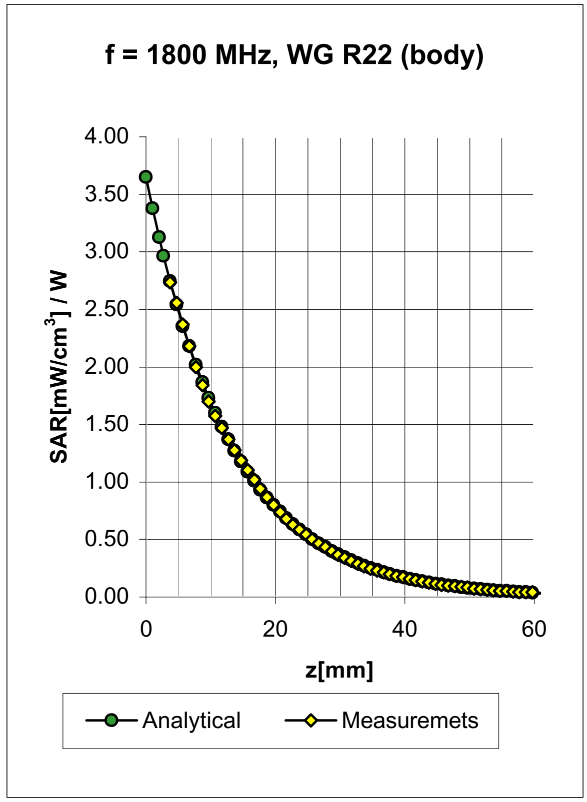


Head	**900 MHz**		**ε_r = 41.5 ± 5%**	**σ = 0.97 ± 5% mho/m**	
Head	**835 MHz**		**ε_r = 41.5 ± 5%**	**σ = 0.90 ± 5% mho/m**	
	ConvF X	**6.6**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.6**	± 9.5% (k=2)	Alpha	**0.40**
	ConvF Z	**6.6**	± 9.5% (k=2)	Depth	**2.38**

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	**5.4**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.4**	± 9.5% (k=2)	Alpha	**0.57**
	ConvF Z	**5.4**	± 9.5% (k=2)	Depth	**2.18**

Conversion Factor Assessment



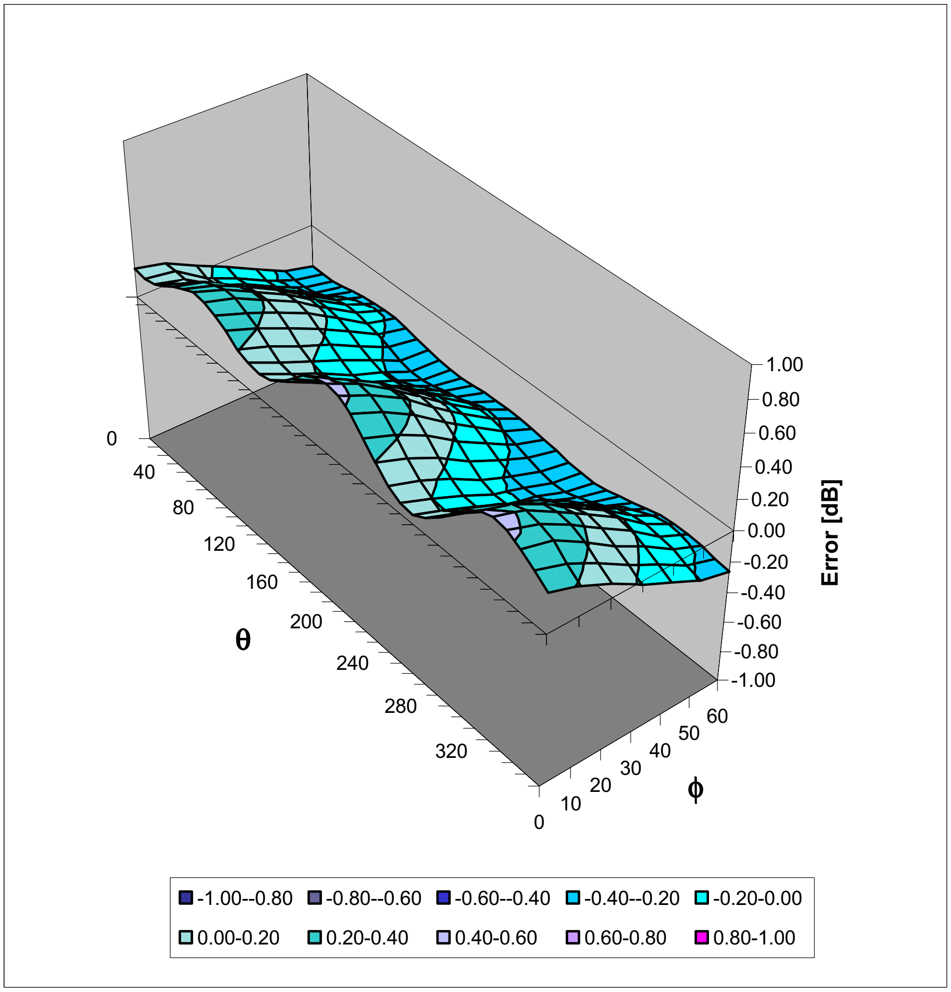


Body	**900 MHz**		**ε_r = 55.0 ± 5%**	**σ = 1.05 ± 5% mho/m**	
Body	**835 MHz**		**ε_r = 55.2 ± 5%**	**σ = 0.97 ± 5% mho/m**	
	ConvF X	**6.3**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.3**	± 9.5% (k=2)	Alpha	**0.42**
	ConvF Z	**6.3**	± 9.5% (k=2)	Depth	**2.44**

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	**5.0**	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.0**	± 9.5% (k=2)	Alpha	**0.76**
	ConvF Z	**5.0**	± 9.5% (k=2)	Depth	**2.01**

Deviation from Isotropy in HSL

Error (θφ), f = 900 MHz



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Engineering AG

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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 25, 2002**
Probe Calibration Date:	**February 22, 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:1387

Conversion Factor (± standard deviation)

150 MHz	ConvF	**9.2 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
300 MHz	ConvF	**8.0 ± 8%**	**ε_r = 45.3** **σ = 0.87 mho/m** (head tissue)
450 MHz	ConvF	**7.3 ± 8%**	**ε_r = 43.5** **σ = 0.87 mho/m** (head tissue)
2450 MHz	ConvF	**4.7 ± 8%**	**ε_r = 39.2** **σ = 1.80 mho/m** (head tissue)
150 MHz	ConvF	**8.8 ± 8%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
450 MHz	ConvF	**7.7 ± 8%**	**ε_r = 56.7** **σ = 0.94 mho/m** (body tissue)
2450 MHz	ConvF	**4.3 ± 8%**	**ε_r = 52.7** **σ = 1.95 mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

1800MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

October 31, 2002

Frequency	e'	e''
1.700000000 GHz	41.2798	13.0837
1.710000000 GHz	41.2602	13.0951
1.720000000 GHz	41.2428	13.1239
1.730000000 GHz	41.2332	13.1635
1.740000000 GHz	41.1970	13.2033
1.750000000 GHz	41.1597	13.2594
1.760000000 GHz	41.1399	13.3108
1.770000000 GHz	41.0942	13.3531
1.780000000 GHz	41.0424	13.3931
1.790000000 GHz	41.0023	13.4196
1.800000000 GHz	40.9392	13.4514
1.810000000 GHz	40.8723	13.5044
1.820000000 GHz	40.8305	13.5262
1.830000000 GHz	40.7701	13.5601
1.840000000 GHz	40.7256	13.6024
1.850000000 GHz	40.6963	13.6136
1.860000000 GHz	40.6578	13.6371
1.870000000 GHz	40.6143	13.6698
1.880000000 GHz	40.5860	13.7051
1.890000000 GHz	40.5368	13.7388
1.900000000 GHz	40.4979	13.7539
1.910000000 GHz	40.4361	13.7782
1.920000000 GHz	40.3913	13.8216
1.930000000 GHz	40.3420	13.8382
1.940000000 GHz	40.2957	13.8799
1.950000000 GHz	40.2504	13.8943
1.960000000 GHz	40.2068	13.9137
1.970000000 GHz	40.1537	13.9220
1.980000000 GHz	40.1066	13.9680
1.990000000 GHz	40.0705	13.9890
2.000000000 GHz	40.0110	14.0174
2.010000000 GHz	39.9634	14.0526
2.020000000 GHz	39.9454	14.0734
2.030000000 GHz	39.9005	14.0836
2.040000000 GHz	39.8735	14.0757
2.050000000 GHz	39.8261	14.0793
2.060000000 GHz	39.7697	14.0897
2.070000000 GHz	39.7324	14.1132
2.080000000 GHz	39.6860	14.1142
2.090000000 GHz	39.6347	14.1394
2.100000000 GHz	39.6010	14.1757

1900MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

October 31, 2002

Frequency	e'	e''
1.780000000 GHz	53.7799	14.1634
1.790000000 GHz	53.7451	14.1811
1.800000000 GHz	53.6851	14.2061
1.810000000 GHz	53.6466	14.2278
1.820000000 GHz	53.5981	14.2401
1.830000000 GHz	53.5462	14.2632
1.840000000 GHz	53.5197	14.2792
1.850000000 GHz	53.4766	14.2954
1.860000000 GHz	53.4572	14.2945
1.870000000 GHz	53.4243	14.3098
1.880000000 GHz	53.3928	14.3204
1.890000000 GHz	53.3722	14.3288
1.900000000 GHz	53.3463	14.3497
1.910000000 GHz	53.3347	14.3760
1.920000000 GHz	53.3135	14.3820
1.930000000 GHz	53.3075	14.4182
1.940000000 GHz	53.3146	14.4349
1.950000000 GHz	53.3167	14.4599
1.960000000 GHz	53.2951	14.4929
1.970000000 GHz	53.2730	14.5118
1.980000000 GHz	53.2137	14.5745

900MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

November 01, 2002

Frequency	e'	e''
800.000000 MHz	41.2662	19.6652
810.000000 MHz	41.2314	19.7088
820.000000 MHz	41.1038	19.7337
830.000000 MHz	40.9247	19.7465
840.000000 MHz	40.7396	19.6991
850.000000 MHz	40.5885	19.6444
860.000000 MHz	40.4447	19.5281
870.000000 MHz	40.2887	19.4286
880.000000 MHz	40.2284	19.3349
890.000000 MHz	40.1639	19.3241
900.000000 MHz	40.0967	19.2946
910.000000 MHz	39.9764	19.3598
920.000000 MHz	39.7993	19.3830
930.000000 MHz	39.6051	19.3158
940.000000 MHz	39.5146	19.2297
950.000000 MHz	39.4518	19.1656
960.000000 MHz	39.3739	19.1074
970.000000 MHz	39.2703	19.0490
980.000000 MHz	39.1973	18.9920
990.000000 MHz	39.1346	18.9467
1.000000000 GHz	39.0321	18.9421

835MHz EUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

November 01, 2002

Frequency	e'	e''
735.000000 MHz	54.3563	21.0114
745.000000 MHz	54.2502	20.9616
755.000000 MHz	54.0917	20.9181
765.000000 MHz	54.0164	20.8607
775.000000 MHz	53.9204	20.8343
785.000000 MHz	53.8288	20.8070
795.000000 MHz	53.7482	20.7992
805.000000 MHz	53.6311	20.7704
815.000000 MHz	53.5235	20.7392
825.000000 MHz	53.4250	20.7056
835.000000 MHz	53.3029	20.6705
845.000000 MHz	53.1899	20.6332
855.000000 MHz	53.0621	20.6024
865.000000 MHz	52.9515	20.5772
875.000000 MHz	52.8425	20.5735
885.000000 MHz	52.7526	20.5528
895.000000 MHz	52.6987	20.4932
905.000000 MHz	52.6232	20.4374
915.000000 MHz	52.5281	20.4157
925.000000 MHz	52.4357	20.3785
935.000000 MHz	52.3238	20.3598

APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

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

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

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