Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

SAR Test Report: R300ds (AXATR-421-A2)

Date of test: October 22-23,25, 2001

Laboratory: SAR Testing Laboratory
Sony Ericsson Mobile Communications, Inc.
7001 Development Drive, P.O. Box 13969,
Research Triangle Park, NC, 27709, USA

Tested by: William Stewart
Development Engineer, Antenna Development Group

Test Responsible: Mark Douglas, Ph.D.
Senior Technical Leader, Antenna Development Group

Accreditation: This laboratory is accredited to ISO/IEC 17025-1999 to perform the following electromagnetic tests: Specific Absorption Rate (SAR), dielectric parameters, and RF power measurement
on the following types of products: Wireless communications devices.

A2LA certificate Number: 1650-01

Statement of Compliance: Sony Ericsson Mobile Communications, Inc. declares under its sole responsibility that the product

R300ds
FCC ID: AXATR-421-A2

to which this declaration relates, is in conformity with the appropriate RF exposure standards, recommendations and guidelines. It also declares that the product was tested using specifications that closely conform to the latest appropriate measurement standards, guidelines and recommended practices. Any deviations from these specifications or from ISO/IEC 17025-1999 are noted below:

Uncalibrated thermometers were used for liquid temperature measurement. The thermometers were verified against calibrated thermometers in air and are therefore believed to be accurate.

Table of Contents

1. Introduction

In this report, compliance of the R300ds wireless handset with RF safety guidelines is demonstrated. The applicable RF safety guidelines and the SAR measurement specifications used for the test are described in [1].

2. Device Under Test

2.1 Antenna description

Type	Internal antenna	
Location	Inside the back cover, near the top	
Dimensions	Maximum length	34.5 mm
	Maximum width	41 mm
Configuration	Patch antenna	

2.2 Device description

Device model	R300ds	
FCC ID	AXATR-421-A2	
Serial number	UA2020LBTP	
Mode	800 AMPS	800 TDMA
Multiple Access Scheme	FDMA	TDMA
Maximum Output Power Setting [1]	26.0 dBm	26.0 dBm
Factory Tolerance in Power Setting	± 0.25	± 0.25
Maximum Peak Output Power [2]	26.25 dBm	26.25 dBm
Duty Cycle	1	1/3
Transmitting Frequency Range	824 – 849 MHz	824-849 MHz
Prototype or Production Unit	Prototype	
Device Category [3]	Portable	
RF exposure environment [2]	General population / uncontrolled	

3. Test equipment

3.1 Dosimetric system

SAR measurements were made using a DASY3 professional system (software version 3.1c) with a SAM twin phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The extended SAR assessment uncertainty (K = 2) is ±24% [1]. The list of calibrated equipment is given below.

Description	**Serial Number**	**Due Date**
DASY3 DAE V1	431	05/2002
E-field probe ET3DV6	1539	01/2002
Dipole Validation Kit, D835V2	428	12/2002
Dipole Validation Kit, D900V2	049	01/2003

[1] This is the peak conducted power measured at the antenna port when the device is set to its highest power setting. It is measured at the middle of the transmit frequency band. Note that the output power may be different at other frequencies.
[2] This equals the maximum output power setting plus the factory tolerance.
[3] The device is categorized as either mobile or portable according to United States Code of Federal Regulations 47 CFR §§ 2.1091 and 2.1093.

3.2 Additional calibrated equipment

Description	Serial Number	Due Date
Signal Generator HP8648C	3537A01598	9/2002
Dielectric probe kit HP 85070B	US33020390	3/2002
Network analyzer HP 8752C	3410A03105	7/2002
Power meter HP 437B	3125U12026	10/2001
Power sensor HP 8482H	3318A07097	2/2002
Power meter HP 437B	3125U113481	6/2002
Power sensor HP 8482H	MY41090240	6/2002
Power meter HP 437B	3125U13729	1/2002
Power sensor HP 8482H	MY41090239	6/2002
Hygrometer/Thermometer	21242911	10/2002
Thermometer FS15043A	8813	N/A
Thermometer FS15043A	94-29884	N/A
Spectrum Analyzer MS2623A	M07418	10/2002

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with the dielectric probe kit. These values, as well as, the temperature/humidity of the test facility, and the temperature/depth of the tissue simulant during the measurements are shown in the table below. The mass density, ρ, entered into the DASY3 program is also given. Recommended values for permittivity, conductivity and mass density are also shown. It is seen that the measured parameters are within tolerance of the recommended limits.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters			Ambient Temp. (°C)	Simulant		Humidity (%)
			e_r	s (S/m)	r (g/cm^3)		Temp (°C)	Depth (mm)	
835	Head	**Measured, 10/22/01**	41.01	0.895	1.00	23.4	21.9	153	44.4
		Measured, 10/23/01	41.27	0.90	1.00	22.7	22.7	153	47.6
		Recommended [4]	41.5	0.90	1.00	20 – 25	--	>150	30-70
	Body	**Measured, 10/25/01**	56.26	0.976	1.00	24.2	24.2	162	39.6
		Recommended [5]	55.2	0.97	1.00	20 – 25	--	>150	30-70
900	Body	**Measured, 10/25/01**	55.73	1.04	1.00	24.2	24.2	162	39.6
		Recommended [5]	55.0	1.05	1.00	20 – 25	--	>150	30-70

[4] For head parameters, recommended dielectric parameters are those given by [2] and [3]. Measured dielectric parameters also comply with closest tabulated values in [4].
[5] For body parameters, recommended dielectric parameters are those given by [2]. No specifications for body parameters are given in [3,4].

5. System accuracy verification

A system accuracy verification of the DASY3 was performed using the dipole validation kits listed in Section 3.1. The system verification test was conducted on the same day as the measurement of the DUT. The obtained results are displayed in the table below (SAR values are scaled to 1 Watt power delivered to the antenna). It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. Reference values are taken from IEEE P1528 for 835MHz head simulant and from the manufacturer for 900MHz muscle simulant. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). Also shown are the temperature/humidity of the test facility, and the temperature/depth of the tissue simulant during the test.

Daily, prior to conducting tests, measurements were made with RF sources powered off to determine system noise. The highest system noise value was 0.0013 W/kg, which is approximately $1/10^{th}$ the recommended limit in [2].

f MHz	Tissue type	Measured / Reference	SAR (W/kg) 1 g/10 g	Dielectric Parameters			Ambient Temp. (°C)	Simulant		Humidity (%)
				e_r	s (S/m)	r (g/cm^3)		Temp. (°C)	Depth (mm)	
835	Head	Measured, 10/22/01	9.87 / 6.39	41.01	0.895	1.00	24.1	22.2	153	44.1
		Measured, 10/23/01	9.75 / 6.32	41.27	0.90	1.00	23.6	22.7	153	44.8
		Reference [6] (IEEE P1528)	9.5 / 6.2	41.5	0.90	1.00	18 - 25	+/-2.0 of value in §4	>150	--
900	Body	Measured, 10/25/01	11.1 / 7.07	55.73	1.04	1.00	24.1	24.1	162	40.0
		Reference (SPEAG)	11.1 / 7.1	56.1	0.99	1.00	--	--	--	--

6. Test results

The measured 1- and 10-gram averaged SAR values of the device are provided in Tables 1 and 2. Also shown are the measured conducted output powers and the temperature of the tissue simulant during the test. The depth of the tissue simulating liquid was at least 15 cm for all the cases. The humidity and ambient temperature of the test facility were within 30%-70% and 20-26°C respectively. Test commands were used to control the device during the SAR measurements. The phone was supplied with a fully charged battery for the tests.

6.1 Results for head

SAR measured against the head, using battery BKB-193-1043 (1400mAh) is presented in Table 1. The device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom using both the "Cheek" and "Tilted" positions. For 800 AMPS, the device was tested at the lowest, middle, and highest frequencies of the transmit band. For 800 TDMA mode, the maximum power is significantly lower than that of AMPS mode, therefore SAR values are also lower and not listed. Also included in Table 1 are the results using battery BKB-193-1027 (750mAh). This configuration was tested only at the frequency/mode that gave the highest SAR value from battery BKB-193-1043 results. The results show that the choice of battery does not have a significant influence on SAR.

[6] Since SAR reference values are from [3] (no reference values are provided in [2,4]), the temperature and humidity specifications provided in the table are also from [3]. However, measured values of temperature and humidity also comply with the specifications of [2,4].

Mode / Battery	*f* (MHz)	Output Power (dBm)	Left hand (CHEEK)			Right hand (CHEEK)		
			Simulant Temps. (°C)	SAR, 1g /10g (W/kg)		Simulant Temps. (°C)	SAR, 1g /10g (W/kg)	
				measured	Calculated to max. power		measured	Calculated to max. power
800 AMPS / BKB-193-1043	824	25.91	23.0	0.82/0.54	0.88/0.58	23.3	**0.84**/0.54	**0.90**/0.58
	837	25.94	23.1	0.73/0.48	0.78/0.52	23.3	0.74/0.49	0.80/0.53
	849	25.97	23.1	0.67/0.44	0.72/0.47	23.3	0.71/0.47	0.76/0.51
800 AMPS / BKB-193-1027	824	25.91	--	--	--	23.6	0.81/0.53	0.87/0.57
			Left hand (TILT)			Right hand (TILT)		
800 AMPS / BKB-193-1043	824	25.91	23.2	0.85/0.49	0.91/0.53	23.4	0.80/0.46	0.86/0.49
	837	25.94	23.3	0.78/0.44	0.84/0.47	23.5	0.70/0.42	0.75/0.45
	849	25.97	23.3	0.73/0.42	0.79/0.45	23.5	0.65/0.39	0.70/0.42
800 AMPS / BKB-193-1027	824	25.91	23.7	**0.87**/0.50	**0.93**/0.54	--	--	--

Table 1: SAR measurement results for the R300ds telephone at highest possible output power. Measured against the head.

6.2 Results against the body

SAR measured against the body, using battery BKB-193-1043 (1400mAh) is presented in Table 2. For body worn measurements, the device was tested against a flat phantom, representing the user's body, using carry accessory SXK 109 4460 and hands free accessory RLF-501-25. For 800 AMPS, the device was tested at the lowest, middle, and highest frequencies of the transmit band. For 800 TDMA mode, the maximum power is significantly lower than that of AMPS mode, therefore SAR values are also lower and not listed. Also included in Table 2 are the results using battery BKB-193-1027 (750mAh). This configuration was tested only at the frequency/mode that gave the highest SAR value from battery BKB-193-1043 results. The results show that the choice of battery does not have a significant influence on SAR.

Mode	*f* (MHz)	Output Power (dBm)	SXK 109 4460		
			Simulant Temp. (°C)	SAR, 1g /10g (W/kg)	
				measured	Calculated to max. power
800 AMPS BATTERY BKB-193-1043	824	25.91	23.9	0.80/0.56	0.86/0.60
	837	25.94	23.8	0.78/0.53	0.84/0.57
	849	25.97	23.8	0.36/0.24	0.39/0.26
800 AMPS BATTERY BKB-193-1027	824	25.91	23.8	**0.82**/0.56	**0.88**/0.60
	837	--	--	--	--
	849	--	--	--	--

Table 2: SAR measurement results for the R300ds telephone at highest possible output power. Measured against the body using carry accessory SXK 109 4460 with hands free accessory RLF 501 25.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

References

[1] M. Douglas, “SAR Measurement Specification of Mobile Phones,” Sony Ericsson internal document EUS/CV/R-01:1061/REP, November 2001.

[2] FCC, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions,” Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01).

[3] IEEE, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques,” Std 1528-200X, Draft 6.5 – August 20, 2001.

[4] CENELEC, “Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz)”, European Standard EN 50361, July 2001.

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Approved	Checked			
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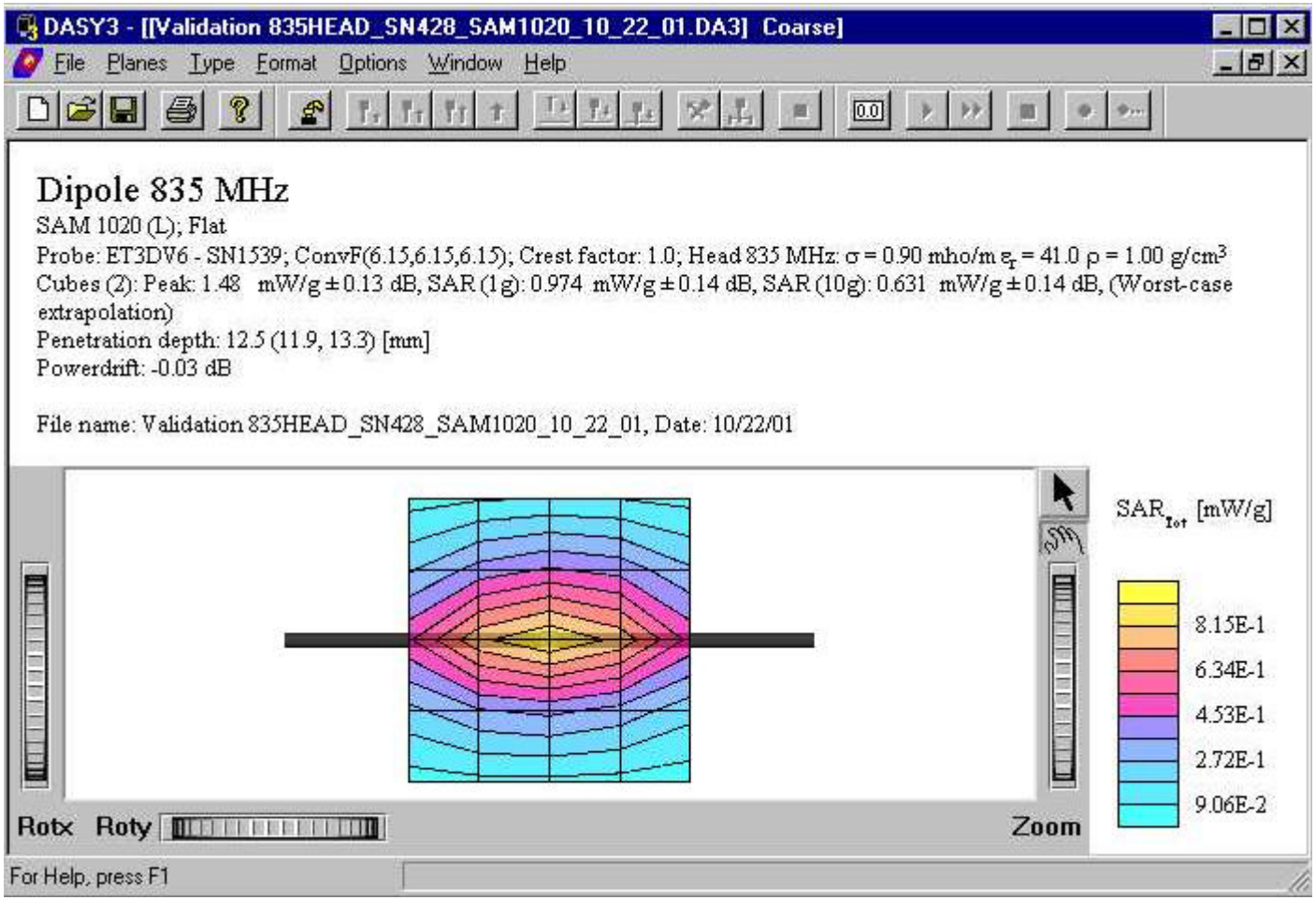
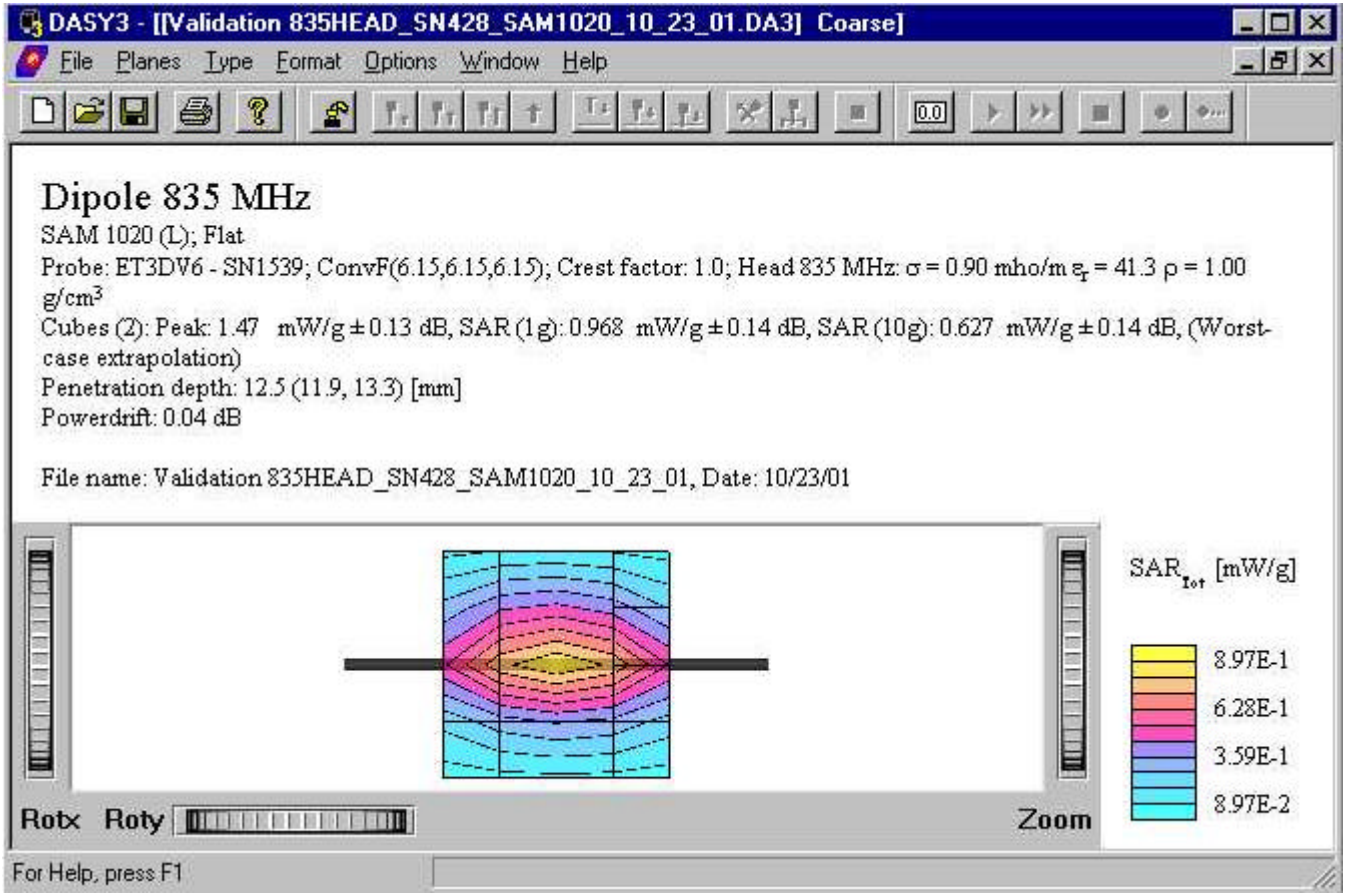
Appendix 1: SAR distribution comparison for system accuracy verification



835 MHz SAR distribution of validation dipole antenna from system accuracy verification test on October 22, 2001. Using head tissue. Antenna input power = 98.7mW.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



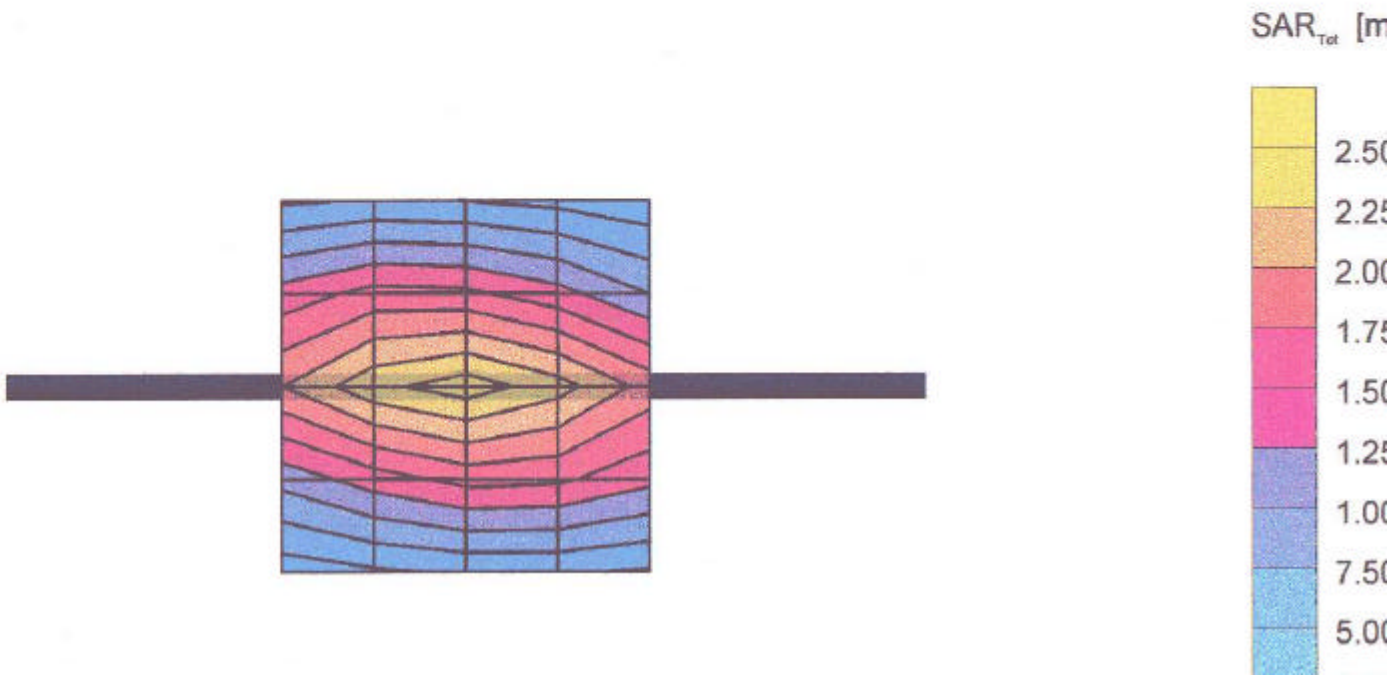
835 MHz SAR distribution of validation dipole antenna from system accuracy verification test on October 23, 2001. Using head tissue. Antenna input power = 99.2 mW.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

12/20/00

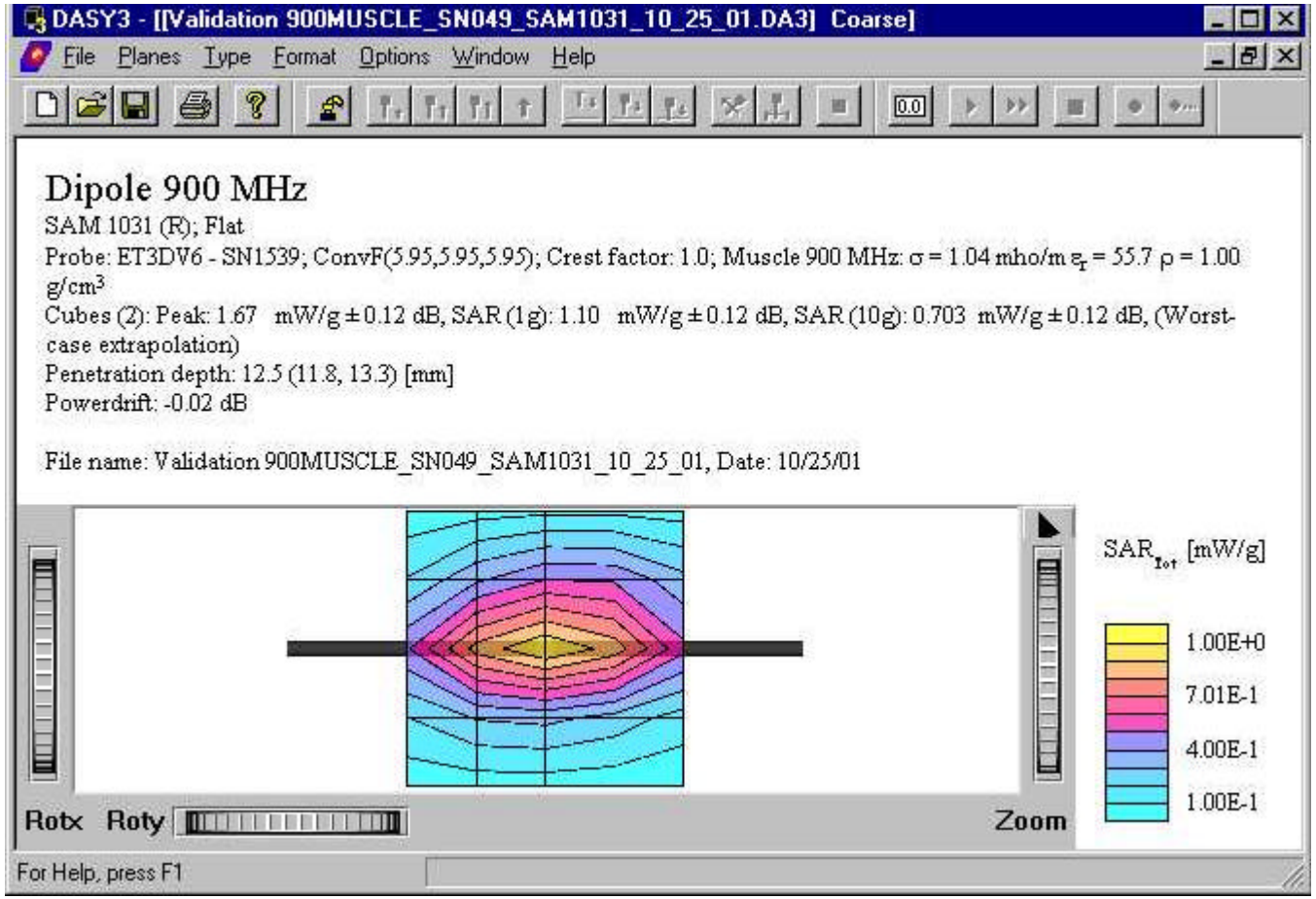
Validation Dipole D835V2 SN:428, d = 15 mm

Frequency: 835 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(6.50,6.50,6.50) at 900 MHz; IEEE1528 835 MHz; σ = 0.88 mho/m ε_r = 42.5 ρ = 1.00 g/cm^3
Cubes (2): Peak: 3.85 mW/g ± 0.05 dB, SAR (1g): 2.42 mW/g ± 0.02 dB, SAR (10g): 1.56 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 12.2 (10.7, 14.0) [mm]
Powerdrift: 0.00 dB



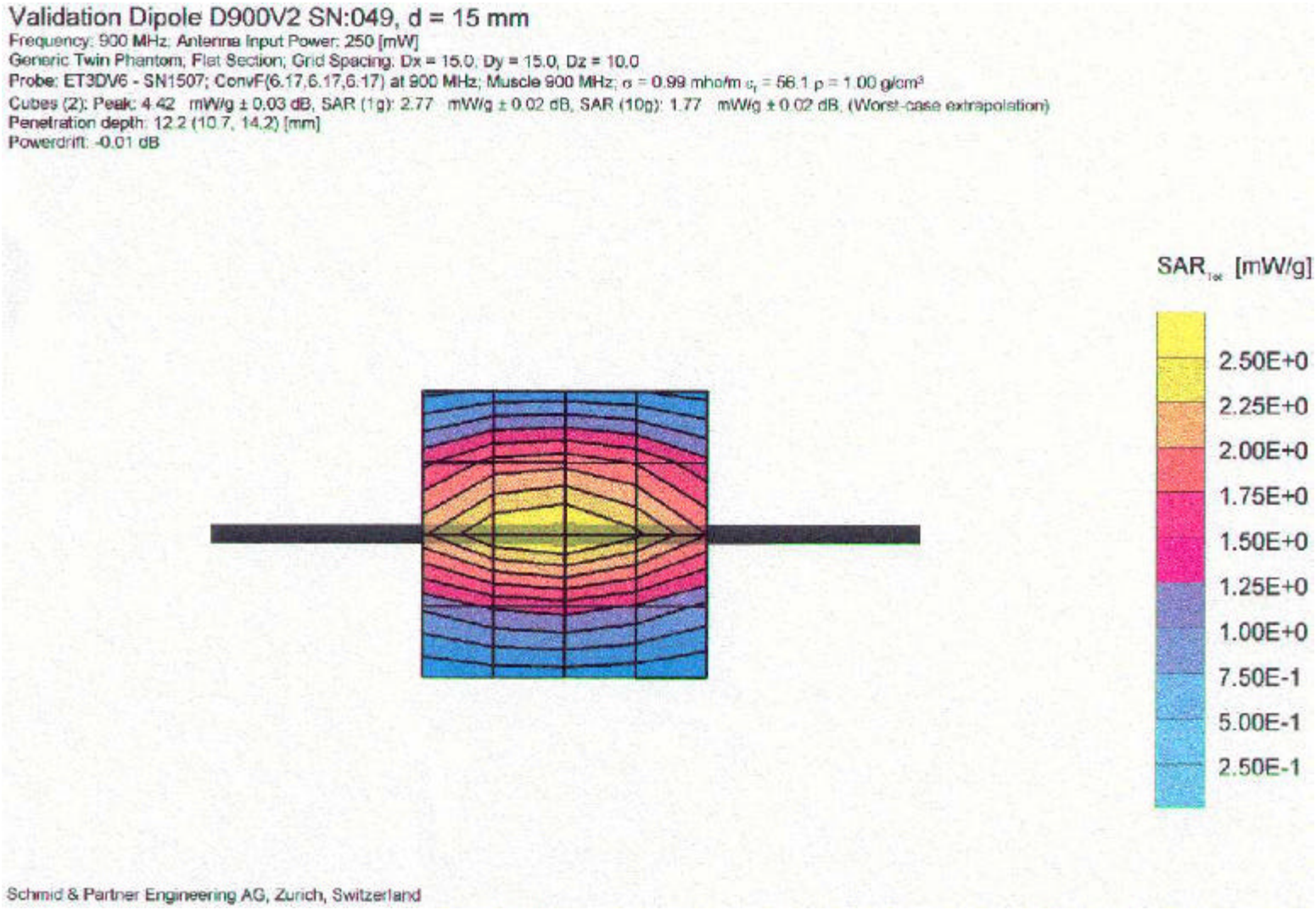
835 MHz SAR distribution of validation dipole antenna from reference measurement. Using head tissue.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on October 25, 2001. Using muscle tissue. Antenna input power = 99.4 mW.

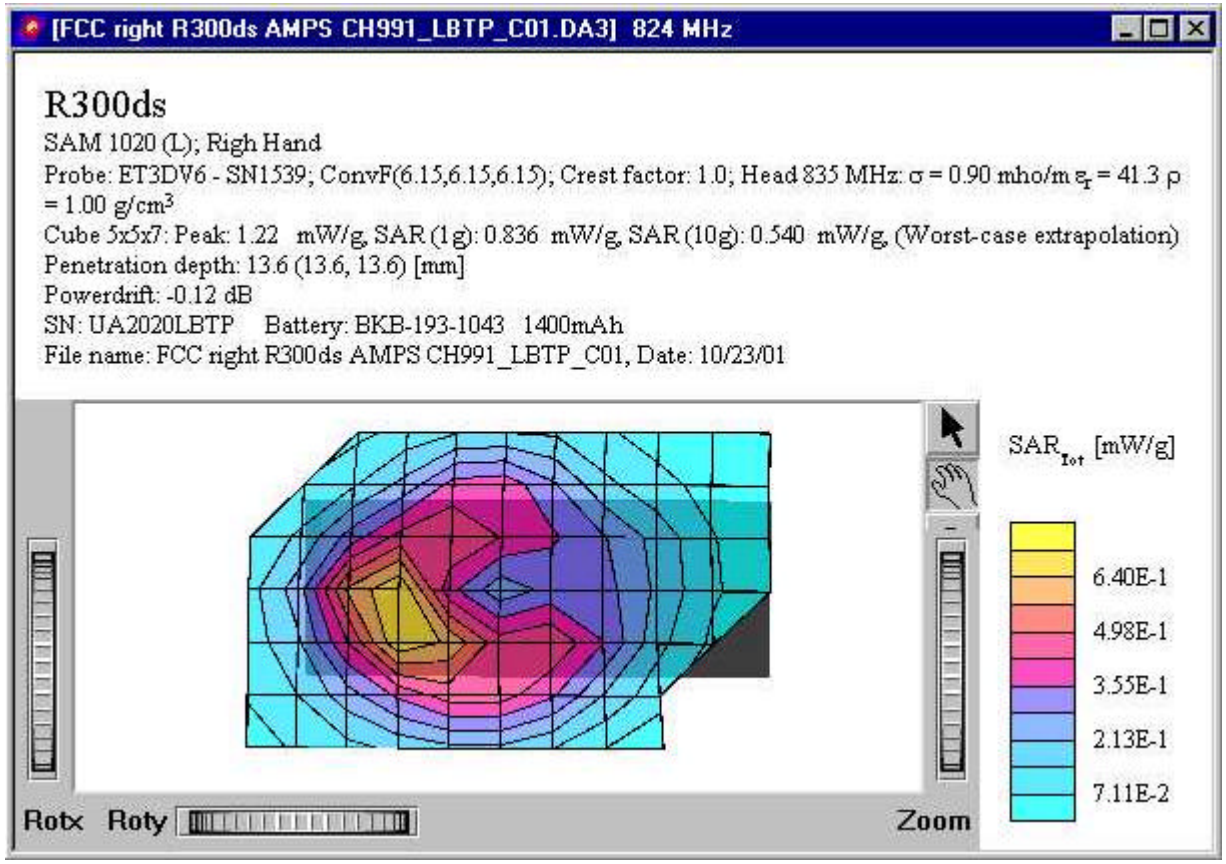
Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



900 MHz SAR distribution of validation dipole antenna from reference measurement. Using muscle tissue.

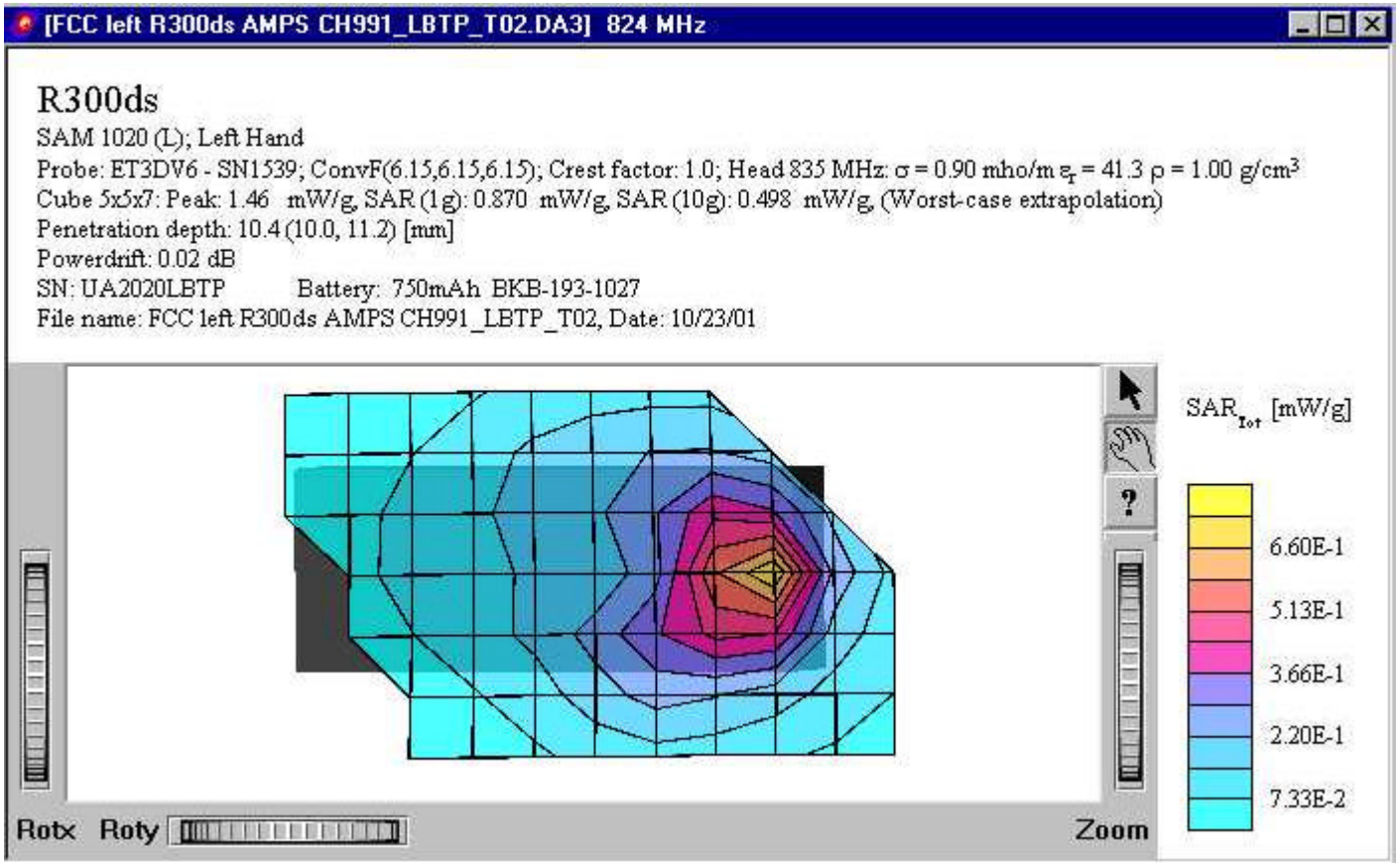
Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

Appendix 2: SAR distribution plots



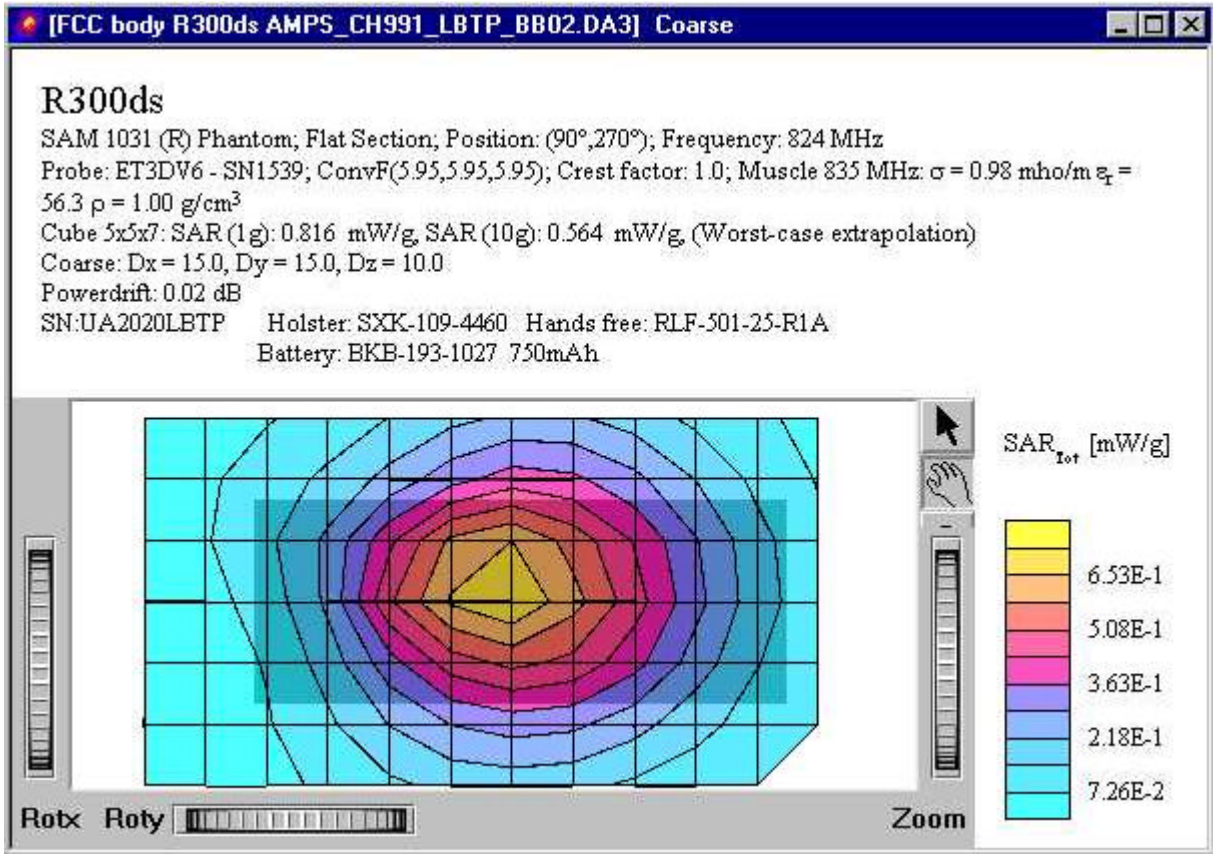
Distribution of maximum SAR in 800 AMPS band. Measured against the head in the "Cheek" position.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



Distribution of maximum SAR in 800 AMPS band. Measured against the head in the "Tilt" position.

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



Distribution of maximum SAR in 800 AMPS band. Measured against the body using carry accessory SXK 109 4460 and hands free accessory RLF 501 25

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
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Appendix 3: Photographs of Device Under Test

Prepared (also subject responsible if other)		No.		
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Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

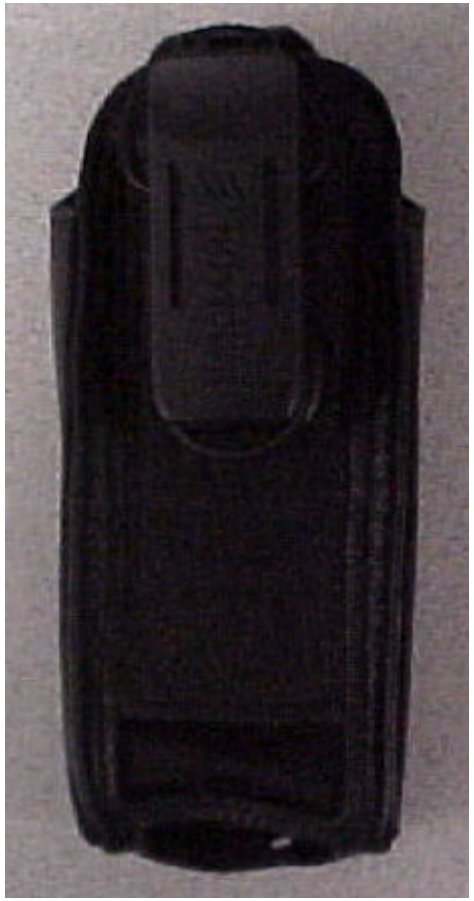
Front view of device

Back view of device

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

Side view of device.

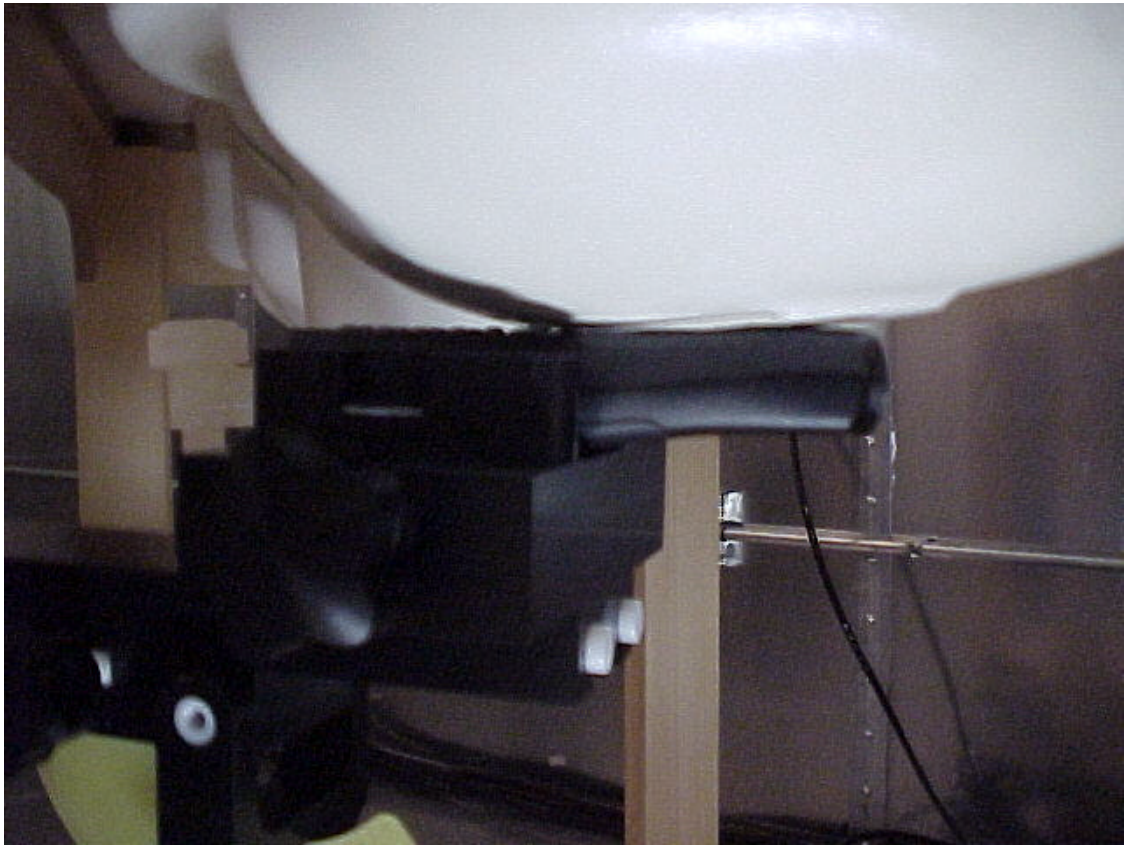
Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



Front, back, and side views of product number SXK –109- 4460

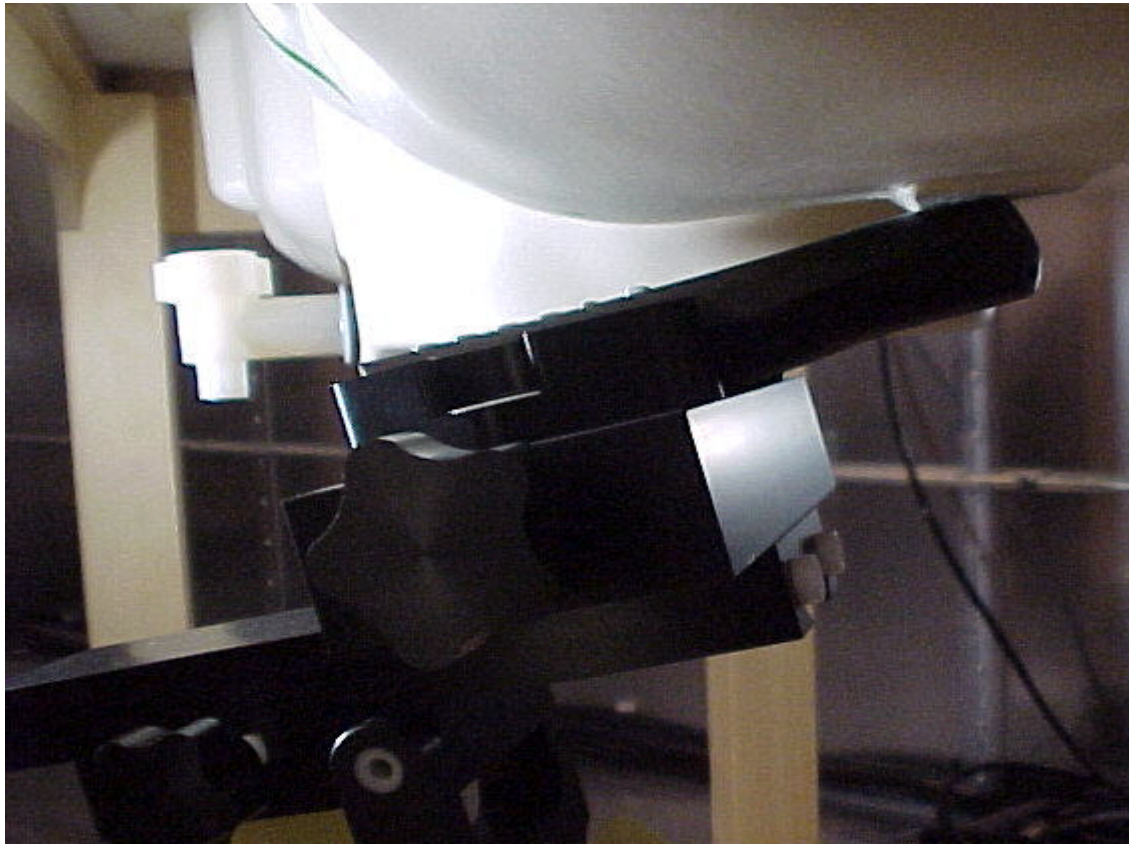
Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

Appendix 4: Position of Device on Phantom



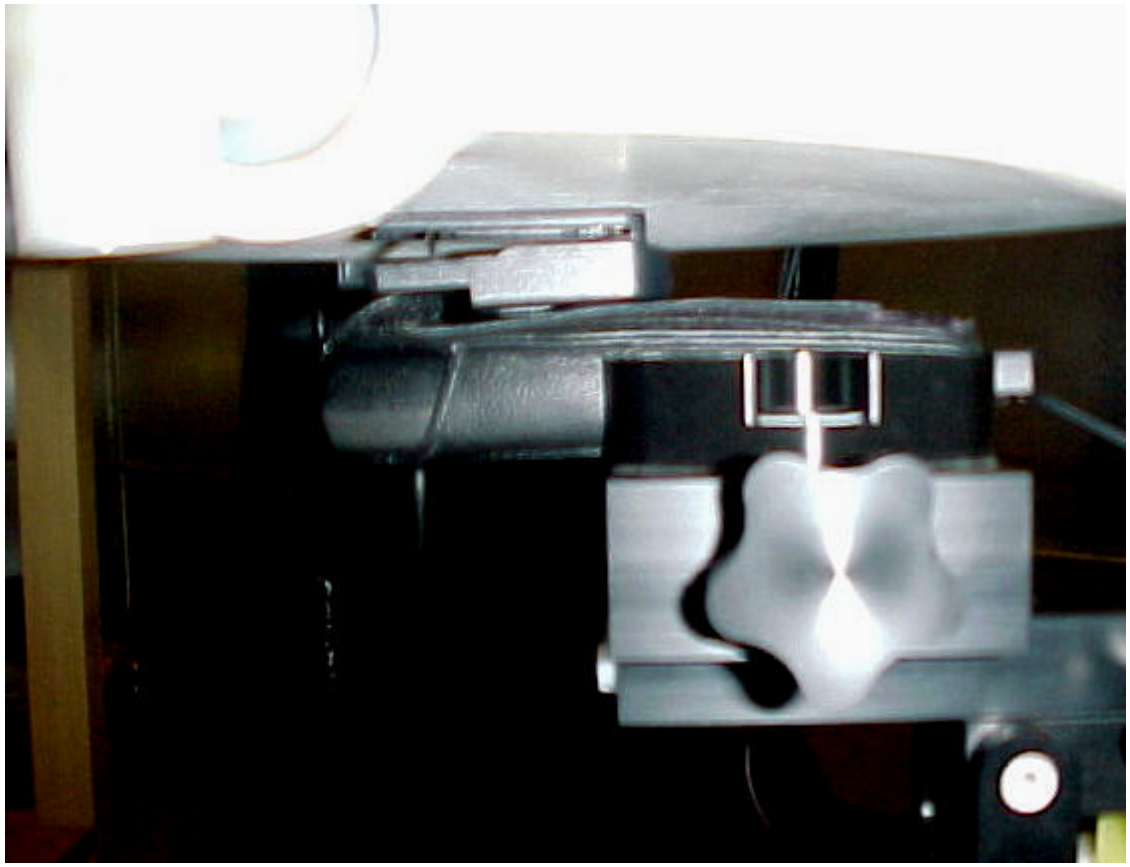
Position of device against head phantom using the "cheek" position

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc



Position of device against head phantom using the “tilt” position

Prepared (also subject responsible if other)		No.	
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP	
Approved	Checked		
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22 C	C:\TEMP\r300dsreport1.doc



Position of device against flat phantom using carry accessory SXK 109 4460 with hands free accessory RLF 501 25

Appendix 5: Probe calibration parameters

ET3DV6 SN:1539

DASY3 - Parameters of Probe: ET3DV6 SN:1539

Sensitivity in Free Space

NormX	1.36 $\mu V/(V/m)^2$	DCP X	96 mV
NormY	1.24 $\mu V/(V/m)^2$	DCP Y	96 mV
NormZ	1.36 $\mu V/(V/m)^2$	DCP Z	96 mV

Sensitivity in Tissue Simulating Liquid

Brain **450 MHz** ε_r = 48 ± 5% σ = 0.50 ± 10% mho/m

ConvF X	6.64 extrapolated	Boundary effect:	
ConvF Y	6.64 extrapolated	Alpha	0.83
ConvF Z	6.64 extrapolated	Depth	1.52

Brain **900 MHz** ε_r = 42.5 ± 5% σ = 0.86 ± 10% mho/m

ConvF X	6.27 ± 7% (k=2)	Boundary effect:	
ConvF Y	6.27 ± 7% (k=2)	Alpha	0.78
ConvF Z	6.27 ± 7% (k=2)	Depth	1.73

Brain **1500 MHz** ε_r = 41 ± 5% σ = 1.32 ± 10% mho/m

ConvF X	5.78 interpolated	Boundary effect:	
ConvF Y	5.78 interpolated	Alpha	0.70
ConvF Z	5.78 interpolated	Depth	2.01

Brain **1800 MHz** ε_r = 41 ± 5% σ = 1.69 ± 10% mho/m

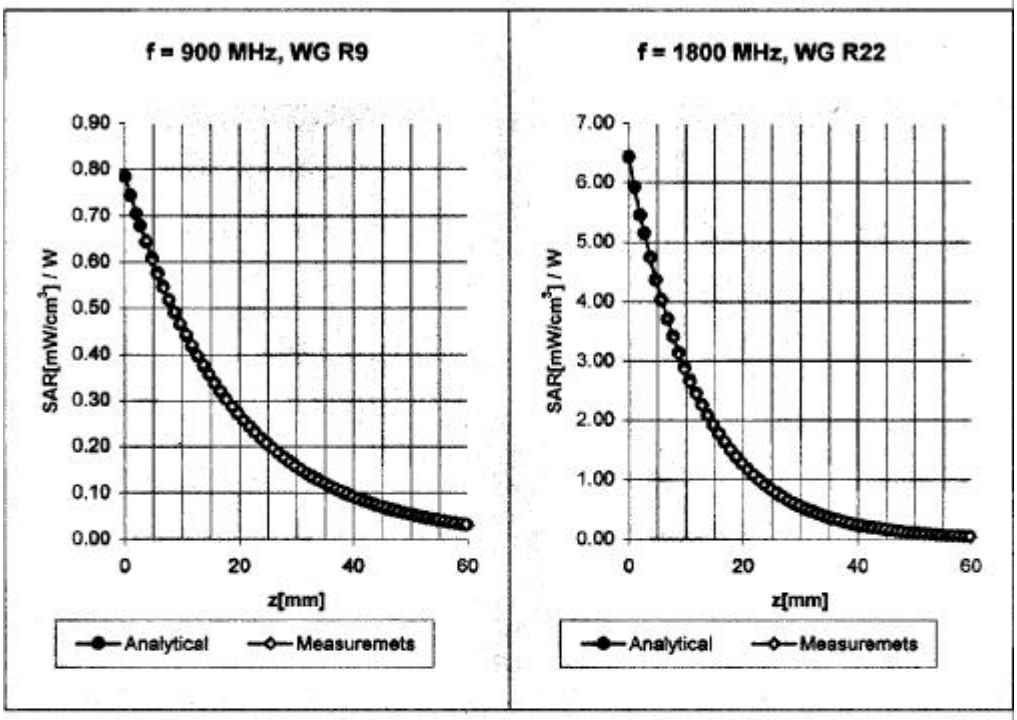
ConvF X	5.54 ± 7% (k=2)	Boundary effect:	
ConvF Y	5.54 ± 7% (k=2)	Alpha	0.66
ConvF Z	5.54 ± 7% (k=2)	Depth	2.15

Sensor Offset

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

ET3DV6 SN:1539

Conversion Factor Assessment



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

ConvF X	**6.15** ± 7% (k=2)	Boundary effect:	
ConvF Y	**6.15** ± 7% (k=2)	Alpha	**0.35**
ConvF Z	**6.15** ± 7% (k=2)	Depth	**2.99**

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

ConvF X	**5.26** ± 7% (k=2)	Boundary effect:	
ConvF Y	**5.26** ± 7% (k=2)	Alpha	**0.67**
ConvF Z	**5.26** ± 7% (k=2)	Depth	**2.05**

Prepared (also subject responsible if other)		No.		
SEM/CV/PF/P William Stewart		EUS/CV/R-01:1059/REP		
Approved	Checked			
SEM/CV/PF/P Dulce Altabella	DA	2002-1-22	C	C:\TEMP\r300dsreport1.doc

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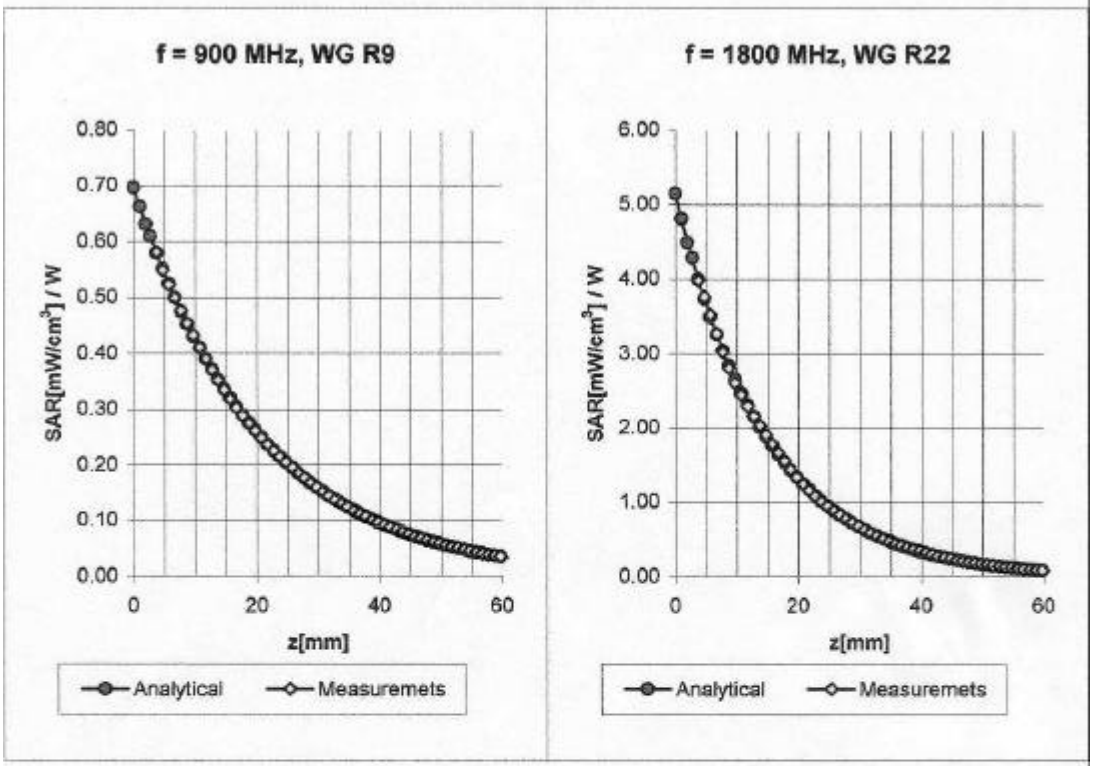
Conversion Factor Assessment



Muscle **900 MHz** ε_r = 56 ± 5% σ = 0.99 ± 10% mho/m

ConvF X	**5.95** ± 7% (k=2)	Boundary effect:	
ConvF Y	**5.95** ± 7% (k=2)	Alpha	**0.41**
ConvF Z	**5.95** ± 7% (k=2)	Depth	**2.75**

Muscle **1800 MHz** ε_r = 54 ± 5% σ = 1.4 ± 10% mho/m

ConvF X	**4.64** ± 7% (k=2)	Boundary effect:	
ConvF Y	**4.64** ± 7% (k=2)	Alpha	**0.70**
ConvF Z	**4.64** ± 7% (k=2)	Depth	**2.19**