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EUS/CV/RF/P Mark Douglas		EUS/CV/R-00:0386/REP		
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SAR Test Report: T18ds

Date(s) of test: November 15-17 and 30, 2000, December 1, 2000, and February 2, 2001

The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Ericsson encourages all feedback, both positive and negative, on this test report.

Laboratory: Electromagnetic Near Field and Radio Frequency Dosimetry Laboratory
Ericsson, Inc.
7001 Development Drive, P.O. Box 13969,
Research Triangle Park, NC, 27709, USA

Test Responsible: Mark Douglas, Ph.D.
Senior Staff Engineer, Antenna Development Group

This laboratory is accredited to ISO/IEC Guide 25-1990 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: Ericsson, Inc. declares under its sole responsibility that the product

Ericsson T18ds

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 in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

Table of Contents

1. Introduction

In this test report, compliance of the Ericsson T18ds portable telephone with RF safety guidelines is demonstrated (applicable RF safety guidelines are given in [1]). The device was tested in accordance with the latest available test guidelines [1]. Detailed procedures of the test are described in the *Ericsson SAR Measurement Specification* [1].

2. Device Under Test

2.1 Antenna description

Type	Fixed stub	
Location	Right side	
Dimensions	length	30 mm
	width at base	9 mm
Configuration	Helix	

2.2 Device description

Device model	T18ds	
Serial number	B06016D510	
Mode	800 AMPS	800 TDMA
Multiple Access Scheme	FDMA	TDMA
Maximum Output Power Setting [1]	25.5 dBm	25.5 dBm
Factory Tolerance in Power Setting	± 0.25	± 0.25
Maximum Peak Output Power [2]	25.75 dBm	25.75 dBm
Duty Cycle	1	1 / 3
Transmitting Frequency Range	824 – 849 MHz	824 – 849 MHz
Prototype or Production Unit	Prototype	

3. Test equipment

The measurement equipment used for the testing is given in the following two subsections. Each piece of equipment was used before its calibration due date.

3.1 Dosimetric system

SAR measurements were made using the DASY3 professional system (software version 3.1c), manufactured by Schmid & Partner Engineering AG and installed February 1998. The total SAR assessment uncertainty (K = 1) of the system is ±16% and includes a +15% offset (overestimation). The extended uncertainty (K = 2) is ±32% with a +15% offset. This results in a total uncertainty range of –1% to +31% for K = 1, or –17% to +47% for K = 2. The equipment list is given below.

Description	**Serial Number**	**Due Date**
DASY3 DAE V1	369	12/00
DASY3 DAE V1	392	9/01
E-field probe ET3DV5	1324	2/01
E-field probe ET3DV5	1337	6/01
Dipole Validation Kit, D900V2	035	12/01
Dipole Validation Kit, D900V2	049	12/00

[1] This is the 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.

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EUS/CV/RF/P Mark Douglas		EUS/CV/R-00:0386/REP		
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EUS/CV/RF/P Mark Douglas	MGD	2001-02-02	C	U:\FCC_TRNS\FCC_416 doly emilia2 lite\XHIBIT11\sar new.doc

3.2 Additional equipment

Description	Serial Number	Due Date
Signal Generator HP8648C	3537A01598	9/02
Dielectric probe kit HP 85070B	US33020256	10/01
Network analyser HP 8752C	3410A03105	7/01
Power meter HP 437B	3125U13729	2/01
Power sensor HP 8482H	3318A07097	2/01
Power meter HP 437B	3125U16190	4/01
Power sensor HP 8482H	2704A06235	4/01
Power meter Agilent E4418B	GB40206594	10/01
Power sensor Agilent 8482H	3318A09268	8/01

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 are shown in the table below. The mass density, ρ, entered into the DASY3 program is also given. Recommended limits for maximum permittivity, minimum conductivity and maximum mass density are also shown [2]. It is seen that the measured parameters result in an overestimation of SAR compared to the recommended values.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	ρ (g/cm^3)
835	Head	**Measured, 11/15/00**	40.9	0.91	1.00
		Measured, 11/16/00	40.9	0.91	1.00
		Measured, 11/17/00	40.8	0.91	1.00
		Recommended Limits [2]	46.1	0.74	1.03
	Muscle	**Measured, 11/30/00**	55.7	0.97	1.00
		Measured, 12/01/00	55.8	0.98	1.00
		Measured, 02/02/01	55.7	0.98	1.00
		Recommended Limits [2]	56.1	0.95	1.04

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. It is seen that the system is operating within its specification, as the results are within ±5% of the reference values. Reference values are based on an analysis performed at the laboratory using the dielectric parameters specified below (dielectric parameters have changed from those given in the manufacturer's reference). The distributions of SAR compare well with those of the reference measurements (see Appendix 1).

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg), 1 gram	Dielectric Parameters			Temp. (°C)
				ε_r	σ (S/m)	ρ (g/cm^3)	
900	Head	**Measured, 11/15/00**	10.8	40.2	0.97	1.00	22.0
		Measured, 11/16/00	10.6	40.1	0.97	1.00	21.9
		Measured, 11/17/00	11.0	40.1	0.97	1.00	22.1
		Reference	10.6	40.2	0.97	1.00	22.9
900	Muscle	**Measured, 11/30/00**	10.8	55.2	1.04	1.04	21.9
		Measured, 12/01/00	11.2	55.2	1.04	1.04	21.8
		Reference	10.8	56.0	1.05	1.04	22.5

		Measured, 02/02/01	11.0	55.1	1.04	1.00	23.2
		Reference	11.0	55.2	1.04	1.00	21.1

6. Test results

The measured 1-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 test facility during the test. The depth of the tissue simulating liquid was at least 15 cm. Test commands were used to control the device during the SAR measurements. The phone was supplied with a fully-charged battery for the tests.

SAR measured against the head 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. For 800 AMPS mode, 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.

mode	***f* (MHz)**	**P_{out} (dBm) [3]**	**left-hand phantom**			**right-hand phantom**		
			$T_{chamber}$ (ºC)	**SAR, 1g (W/kg)**		**$T_{chamber}$ (ºC)**	**SAR, 1g (W/kg)**	
				measured	**calc. to max. pwr.**		**measured**	**calc. to max. pwr.**
800 AMPS	824	25.58	22.8	1.28	1.28	23.5	1.23	1.23
	837	25.76	22.8	1.37	1.37	23.5	1.40	**1.40**
	849	24.65	22.8	1.08	1.08	23.5	1.15	1.15

Table 1: SAR measurement results for the Ericsson T18ds telephone at highest possible output power. Measured against the head.

For body-worn measurements, the device was tested against a flat phantom representing the user's body, using designated carry cases (product # SXK 107 4307/72, KRY 104 1253/55, KRY 104 1290/1 and SXK 107 6820/55). SAR was measured at the lowest, middle and highest frequencies of the 800 AMPS band (800 TDMA is not necessary due to the significantly lower output power). Results are given in Table 2.

mode	***f* (MHz)**	**P_{out} (dBm) [3]**	**SXK 107 4307/72**			**KRY 104 1253/55**		
			$T_{chamber}$ (ºC)	**SAR, 1g (W/kg)**		**$T_{chamber}$ (ºC)**	**SAR, 1g (W/kg)**	
				measured	**calc. to max. pwr.**		**measured**	**calc. to max. pwr.**
800 AMPS	824	25.58	22.0	0.80	0.80	21.1	0.68	0.68
	837	25.76	22.0	1.16	**1.16**	21.1	0.80	0.80
	849	24.65	22.0	0.79	0.79	21.1	0.47	0.47
			KRY 104 1290/1			**SXK 107 6820/55**		
	824	25.58	21.1	0.78	0.78	23.3	0.48	0.48
	837	25.76	21.1	0.93	0.93	23.4	0.56	0.57
	849	24.65	21.1	0.71	0.71	23.4	0.36	0.36

Table 2: SAR measurement results for the Ericsson T18ds telephone at highest possible output power. Measured against the body.

References

[1] C. Törnevik, M. Siegbahn, T. Persson, M. Douglas, and R. Plicanic, "Ericsson SAR measurement specification", Internal Document ERA/TF-00:037, November 2000.

[3] Output power was measured by Ericsson personnel outside the scope and control of the laboratory.

[2] Federal Communications Commission, “Tissue Dielectric Properties,” http://www.fcc.gov/fcc-bin/dielec.sh.

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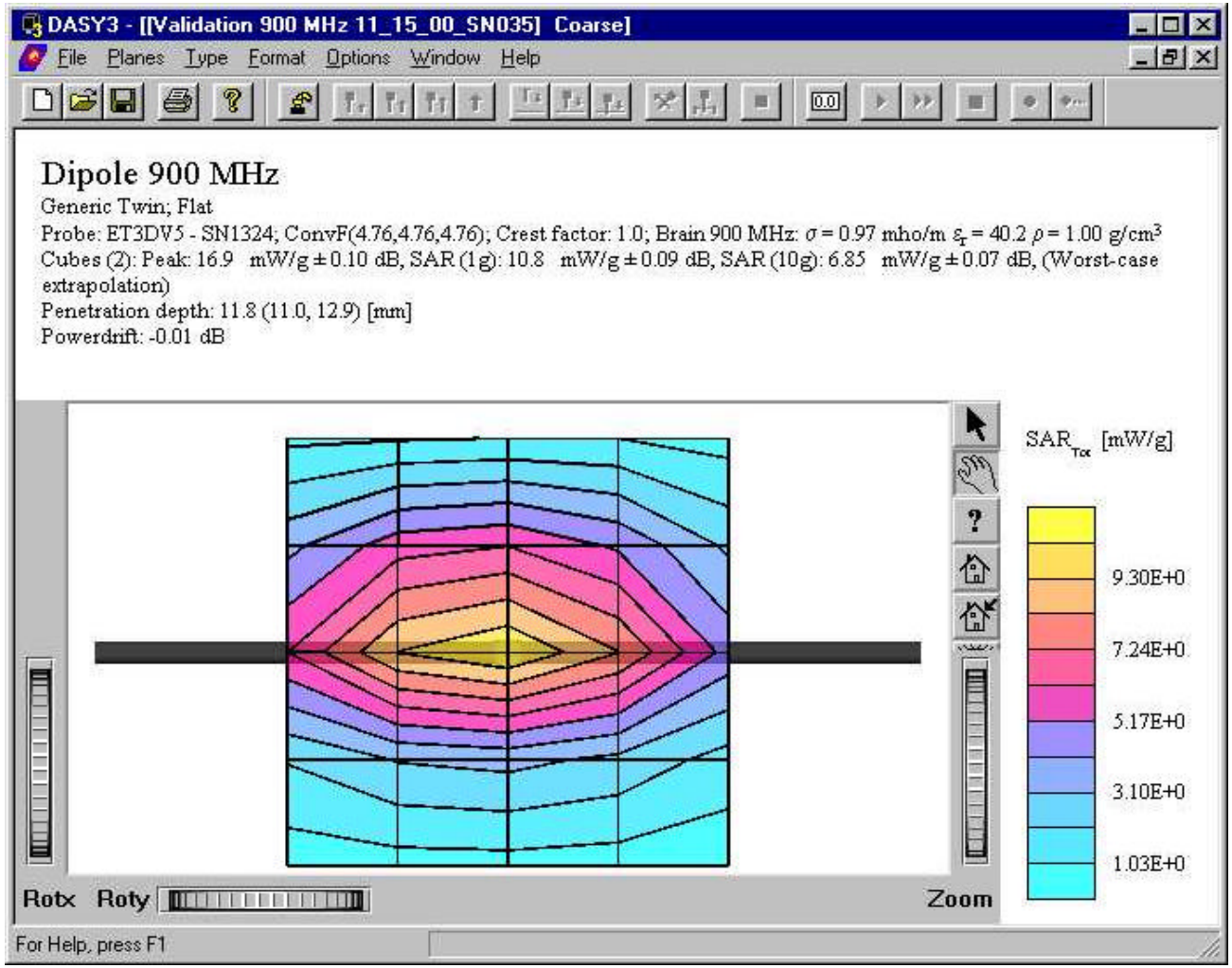
EUS/CV/RF/P Mark Douglas	MGD	2001-02-02	C	U:\FCC_TRNS\FCC_416 doly emilia2 lite\XHIBIT11\sar new.doc

Appendix 1: SAR distribution comparison for system accuracy verification



900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on November 15, 2000. Using head tissue.

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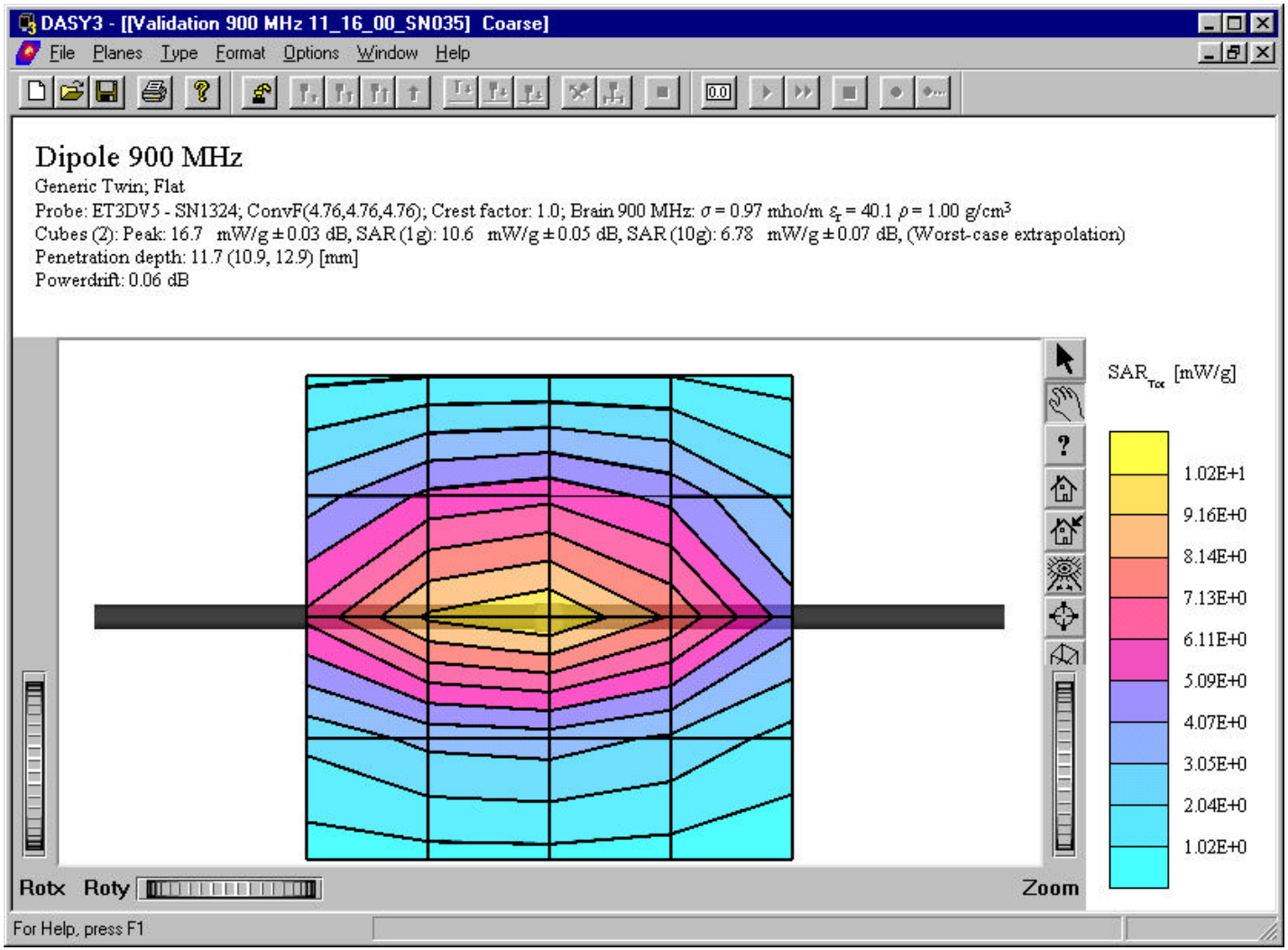
EUS/CV/RF/P Mark Douglas	MGD	2001-02-02	C	U:\FCC_TRNS\FCC_416 doly emilia2 lite\XHIBIT11\sar new.doc



900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on November 16, 2000. Using head tissue.

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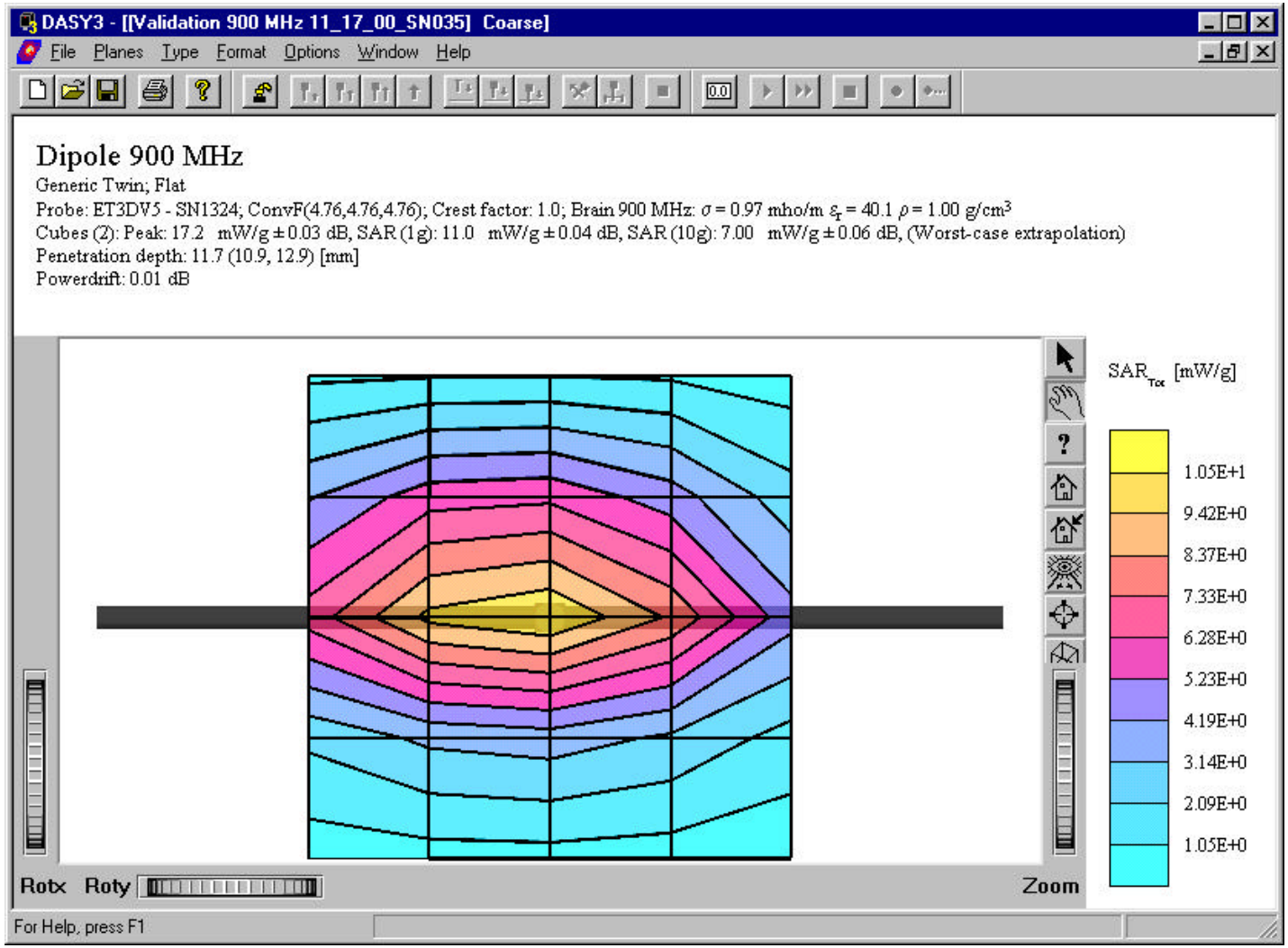

900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on November 17, 2000. Using head tissue.

Prepared (also subject responsible if other)		No.		
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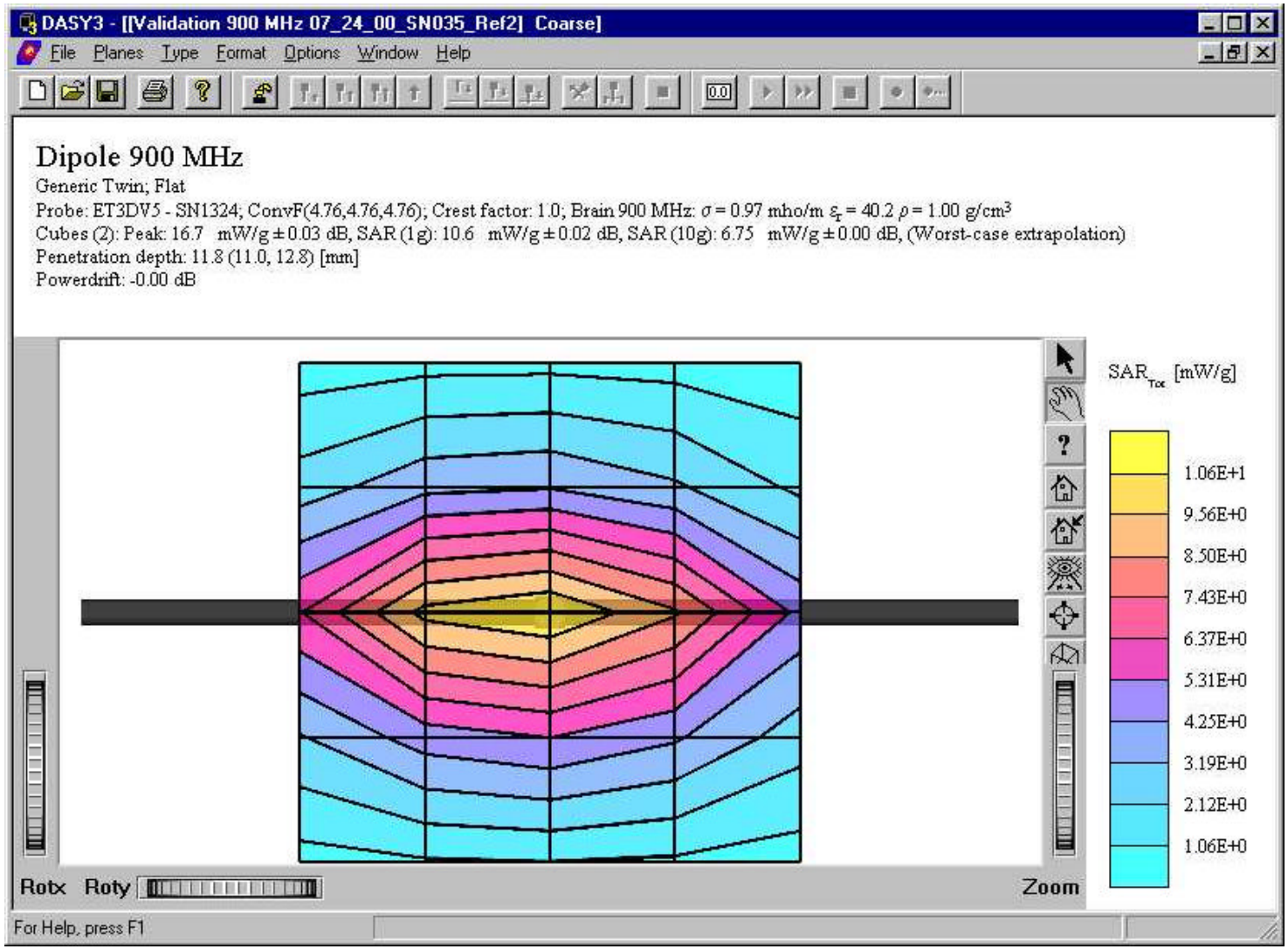

900 MHz SAR distribution of validation dipole antenna from reference measurement. Using head tissue.

Prepared (also subject responsible if other)		No.		
EUS/CV/RF/P Mark Douglas		EUS/CV/R-00:0386/REP		
Approved	Checked	Date	Rev	File
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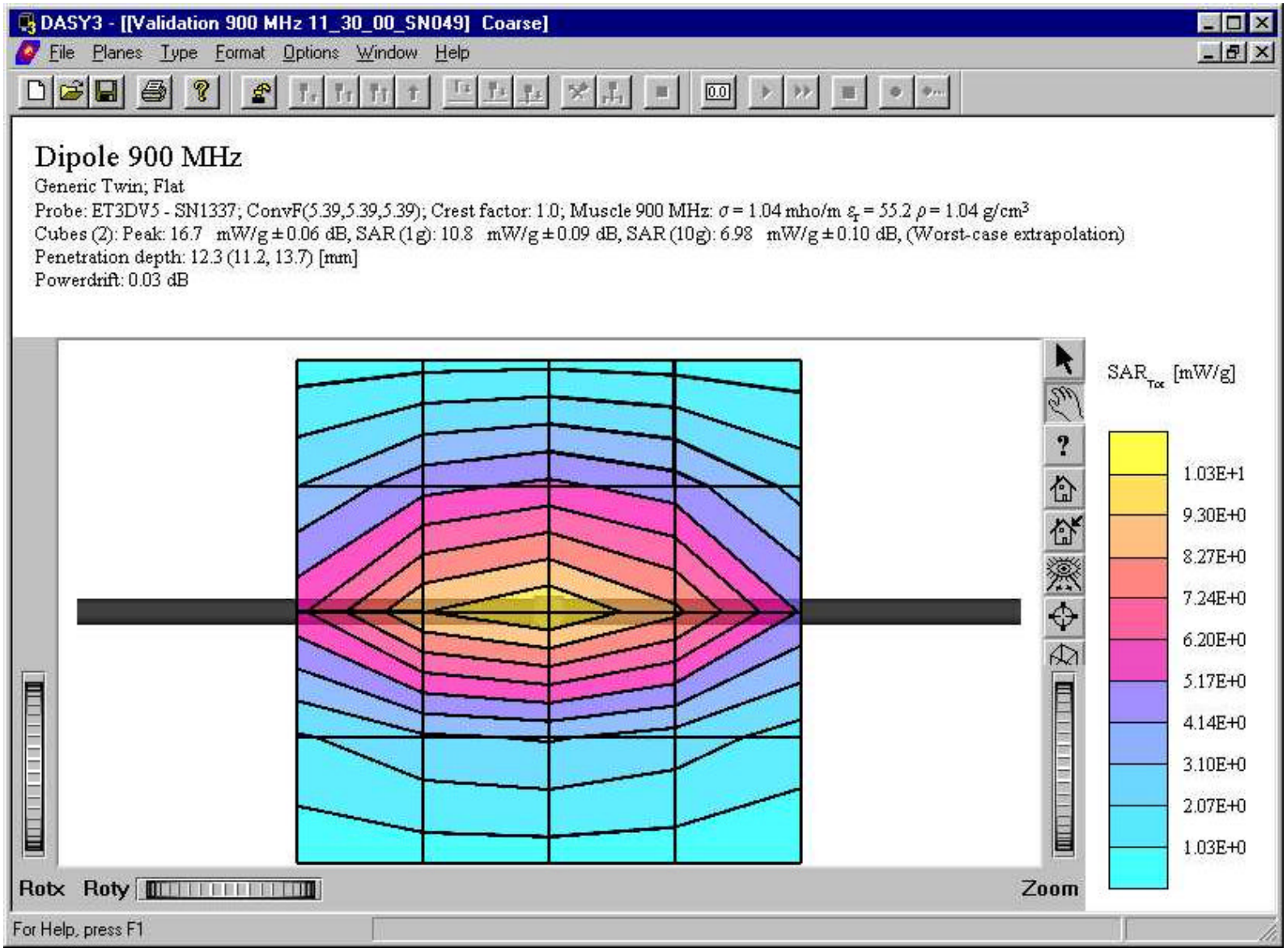

900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on November 30, 2000. Using muscle tissue.

Prepared (also subject responsible if other)		No.		
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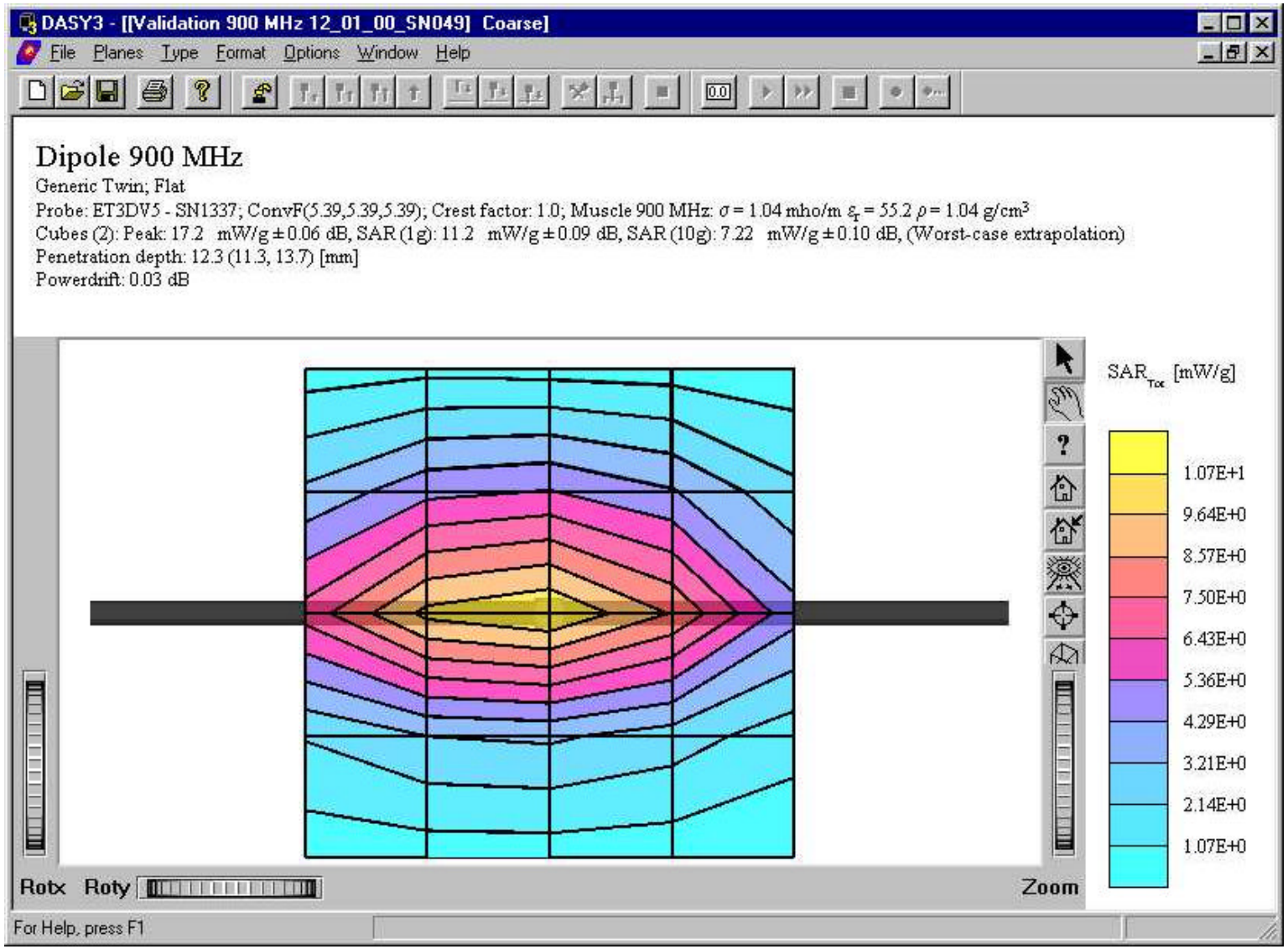
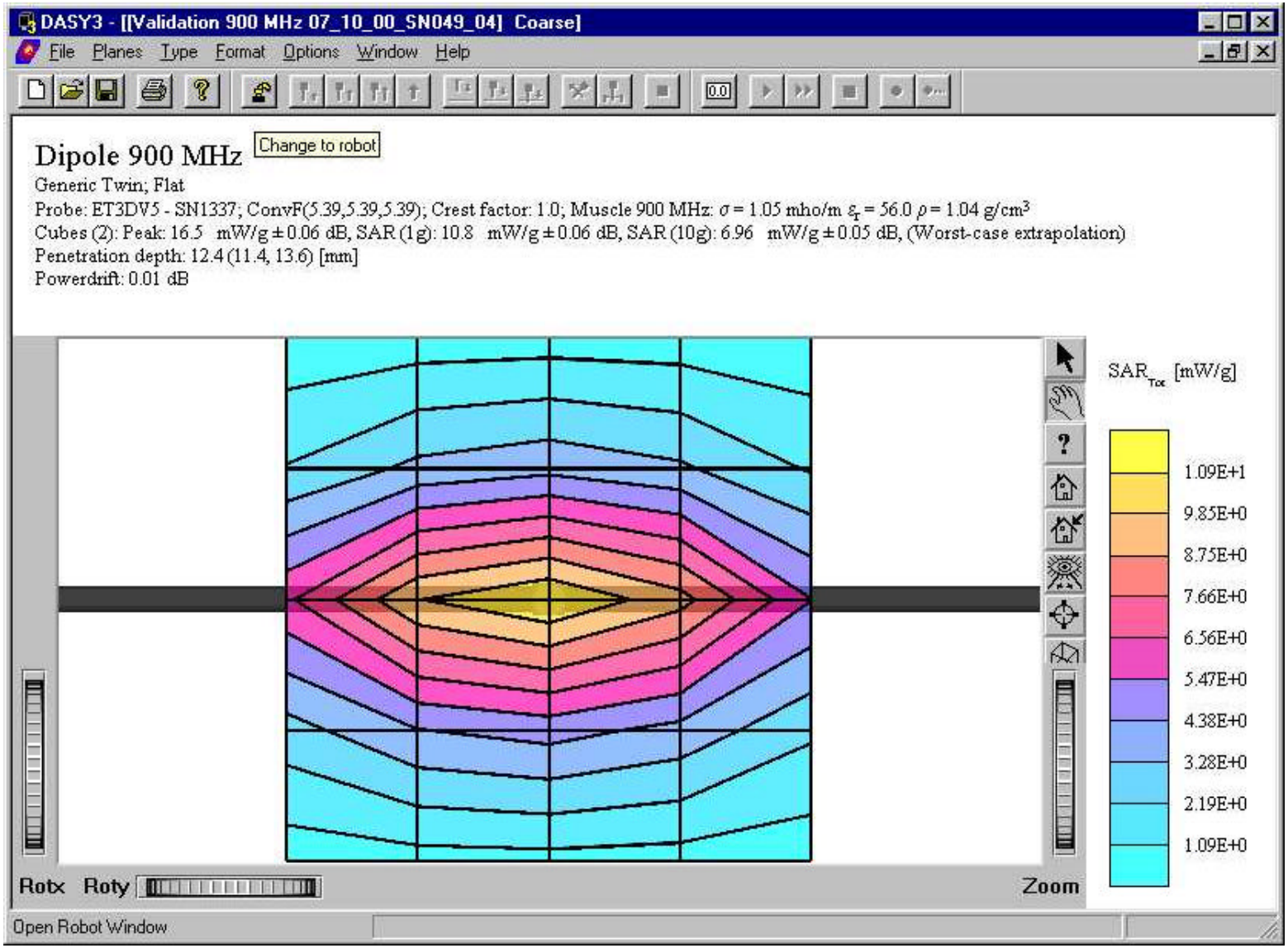


900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on December 1, 2000. Using muscle tissue.



900 MHz SAR distribution of validation dipole antenna from reference measurement. Using muscle tissue. Reference for 11/30/00 and 12/01/00 measurements.

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EUS/CV/RF/P Mark Douglas		EUS/CV/R-00:0386/REP		
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EUS/CV/RF/P Mark Douglas	MGD	2001-02-02	C	U:\FCC_TRNS\FCC_416 doly emilia2 lite\XHIBIT11\sar new.doc

Dipole 900 MHz

Generic Twin A; Flat

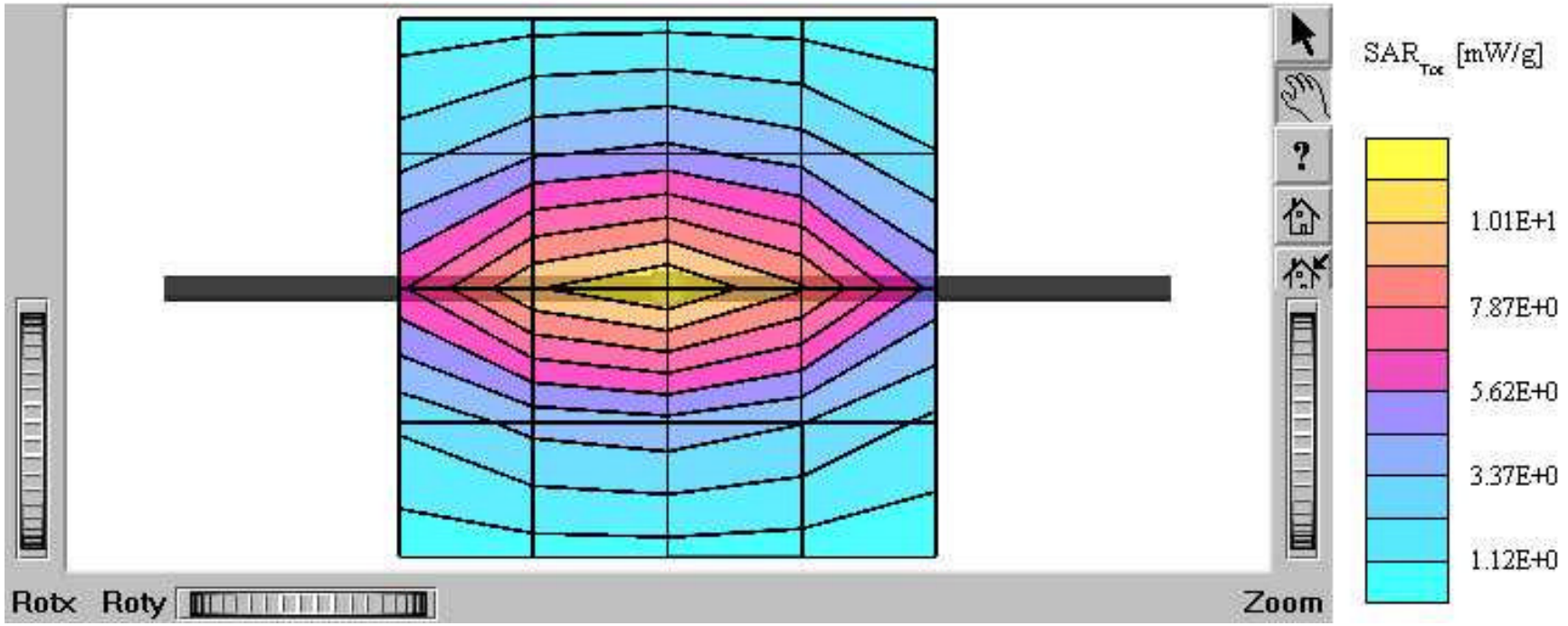
Probe: ET3DV5 - SN1337; ConvF(5.39,5.39,5.39); Crest factor: 1.0; Muscle 900 MHz: $\sigma = 1.04$ mho/m $\varepsilon_r = 55.1$ $\rho = 1.00$ g/cm^3

Cubes (2): Peak: 17.1 mW/g ± 0.08 dB, SAR (1g): 11.0 mW/g ± 0.09 dB, SAR (10g): 7.09 mW/g ± 0.09 dB, (Worst-case extrapolation)

Penetration depth: 12.3 (11.3, 13.7) [mm]

Powerdrift: 0.03 dB

File name: Validation 900 MHz 02_02_01_SN035, Date: 02/02/01



900 MHz SAR distribution of validation dipole antenna from system accuracy verification test on February 2, 2001. Using muscle tissue.

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EUS/CV/RF/P Mark Douglas		EUS/CV/R-00:0386/REP		
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EUS/CV/RF/P Mark Douglas	MGD	2001-02-02	C	U:\FCC_TRNS\FCC_416 doly emilia2 lite\XHIBIT11\sar new.doc

Dipole 900 MHz

Generic Twin; Flat

Probe: ET3DV5 - SN1337; ConvF(5.39,5.39,5.39); Crest factor: 1.0; Muscle 900 MHz: $\sigma = 1.04$ mho/m $\varepsilon_r = 55.2$ $\rho = 1.00$ g/cm^3

Cubes (2): Peak: 17.2 mW/g ± 0.02 dB, SAR (1g): 11.0 mW/g ± 0.01 dB, SAR (10g): 7.07 mW/g ± 0.01 dB, (Worst-case extrapolation)

Penetration depth: 12.4 (11.3, 13.8) [mm]

Powerdrift: 0.00 dB

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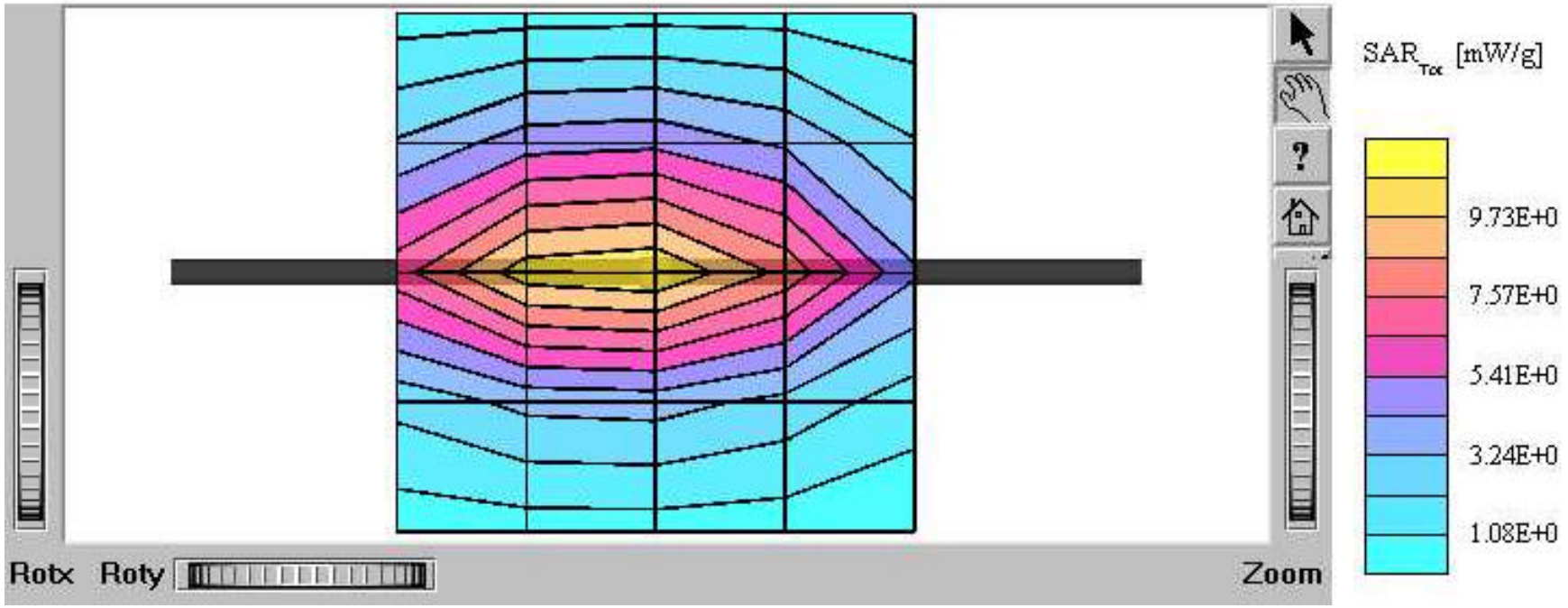
Pin-=1000mW



900 MHz SAR distribution of validation dipole antenna from reference measurement. Using muscle tissue. Reference for 02/02/01 measurement.