

Prepared (also subject responsible if other) SEM/CV/PF/P William Stewart		No. EUS/CV/R-02:0029/REP	
Approved SEM/CV/PF/P Dulce Altabella	Checked DA	2002-1-22	A U:\FCC Submittals\Fcc_419 HP Nicole\XHIBIT11\Source\T61g_T61z_head.doc

SAR Test Report: T61g and T61z (PXITR-419-A2)

Date of test: December 5,7, 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: Dulce Altabella
Staff Engineer, 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

T61g and T61z
FCC ID: PXITR-419-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:

None

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1. Introduction

In this report, compliance of the T61g and T61z wireless handsets with RF safety guidelines is demonstrated while the device is held next to the ear of a person. The T61g model is a dual band phone, which operates in the 850 MHz and 1900 MHz frequency bands. Conversely, the T61z model is a single band phone operating in the 1900 MHz band only. 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	38 mm
	Maximum width	51 mm
Configuration	Patch antenna	

2.2 Device description

Device model	T61g and T61z	
FCC ID	PXITR-419-A2	
Serial number	UA2020LXTZ	
Maximum Size	Length	121 mm
	Width	54 mm
	Thickness	24 mm
Modes	800 GSM	1900 GSM
Multiple Access Scheme	TDMA	TDMA
Maximum Output Power Setting	29.0 dBm	30.0 dBm
Factory Tolerance in Power Setting	+1 / -2	+1 / -2
Maximum Peak Output Power	30.0 dBm	31.0 dBm
Duty Cycle	1 / 8	1 / 8
Transmitting Frequency Range	824 – 849 MHz	1850 – 1910 MHz
Prototype or Production Unit	Prototype	
Device Category	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 phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The measurement uncertainty of the system is given in [1]. Below is a list of the calibrated equipment.

Description	Serial Number	Due Date
DASY3 DAE V1	431	05 / 2002
E-field probe ET3DV6	1538	06 / 2002
Dipole Validation Kit, D835V2	428	12 / 2002
Dipole Validation Kit, D1900V2	536	05 / 2003



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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	6/2002
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 / Probe	350078/99172351	10/2002
Thermometer / Probe	21117674/21117824	11/2002
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 are tabulated below. A mass density of $\rho = 1.00 \text{ g/cm}^3$ was entered into the DASY3 program in all cases. The temperatures of the tissue simulants during measurements are also given. During the tests, the ambient temperature of the laboratory was in the range 22.2 – 24.2 °C, the relative humidity was 35.9 – 39.9% and the liquid depth above the ear reference points was 154 – 158 mm. It can be seen that the measured parameters are within tolerance of the recommended limits [1].

f (MHz)	Tissue type	Date	Dielectric Parameters		Simulant Temp (°C)
			ϵ_r	σ (S/m)	
835	Head	05DEC01	41.17	0.89	23.0
1900	Head	07DEC01	39.22	1.43	22.6

5. System performance check

A system performance check of the DASY3 was performed using the dipole validation kits listed in Section 3.1. System performance checks were 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). During the tests, the ambient temperature of the laboratory was in the range 22.4 – 24.6 °C, the relative humidity was 35.9 – 39.2% and the liquid depth above the ear reference points was 154 – 158 mm. 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 both the 835MHz and 1900MHz head simulant. The SAR distributions are shown in Appendix 1.

Daily, prior to conducting tests, measurements were made with RF sources powered off to determine system noise. The highest system noise value was 0.0001 W/kg, which is below the recommended limit [2].

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<i>f</i> MHz	Tissue type	Measured / Reference	SAR (W/kg) 1 g/10 g	Dielectric Parameters		Simulant Temp. (°C)
				ϵ_r	S (S/m)	
835	Head	Measured, 12/05/01	9.70 / 6.30	41.17	0.89	23.3
		Reference (IEEE P1528)	9.5 / 6.2	41.5	0.90	+/-2.0 of value in §4
1900	Head	Measured, 12/07/01	38.8/20.16	39.22	1.43	22.8
		Reference (IEEE P1528)	39.7/20.5	40.0	1.40	+/-2.0 of value in §4

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 in the ranges 33.7% - 39.2% and 22.8 – 24.9°C respectively. Test commands were used to control the device during the SAR measurements.

SAR measured against the side of the head, using battery BKB-193-1052 (900mAh) is presented in Table 1 and 2. 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 both 800 and 1900 GSM modes, the device was tested at the lowest, middle, and highest frequencies of the transmit band.

Mode / Battery	<i>f</i> (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 GSM/ BKB-193-1052	824	29.41	23.6	0.87/0.54	0.91/0.57	23.2	0.83/0.52	0.87/0.55	
	837	29.78	23.7	0.77/0.49	0.81/0.51	22.9	0.68/0.43	0.71/0.45	
	849	29.74	24.0	0.74/0.48	0.78/0.50	22.7	0.66/0.43	0.69/0.45	
				Left hand (TILT)			Right hand (TILT)		
	824	29.41	23.7	0.34/0.23	0.36/0.24	23.1	0.27/0.18	0.28/0.19	
	837	29.78	23.7	0.26/0.17	0.27/0.18	23.0	0.24/0.16	0.25/0.16	
	849	29.74	24.1	0.26/0.175	0.28/0.18	22.7	0.24/0.16	0.25/0.17	

**Table 1: SAR measurement results for the T61g telephone at highest possible output power.
GSM800 mode**

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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	
1900GSM / BKB-193-1052	1850	30.86	22.3	0.62/0.36	0.64/0.37	22.5	0.56/0.35	0.58/0.36	
	1880	30.85	22.3	0.44/0.27	0.46/0.28	22.5	0.43/0.26	0.45/0.27	
	1910	30.73	22.5	0.32/0.20	0.33/0.20	22.6	0.35/0.21	0.36/0.22	
				Left hand (TILT)			Right hand (TILT)		
	1850	30.86	22.3	0.36/0.22	0.37/0.23	22.5	0.42/0.25	0.44/0.26	
	1880	30.85	22.3	0.36/0.21	0.37/0.22	22.6	0.32/0.20	0.33/0.20	
	1910	30.73	22.4	0.30/0.18	0.31/0.19	22.6	0.31/0.19	0.32/0.19	

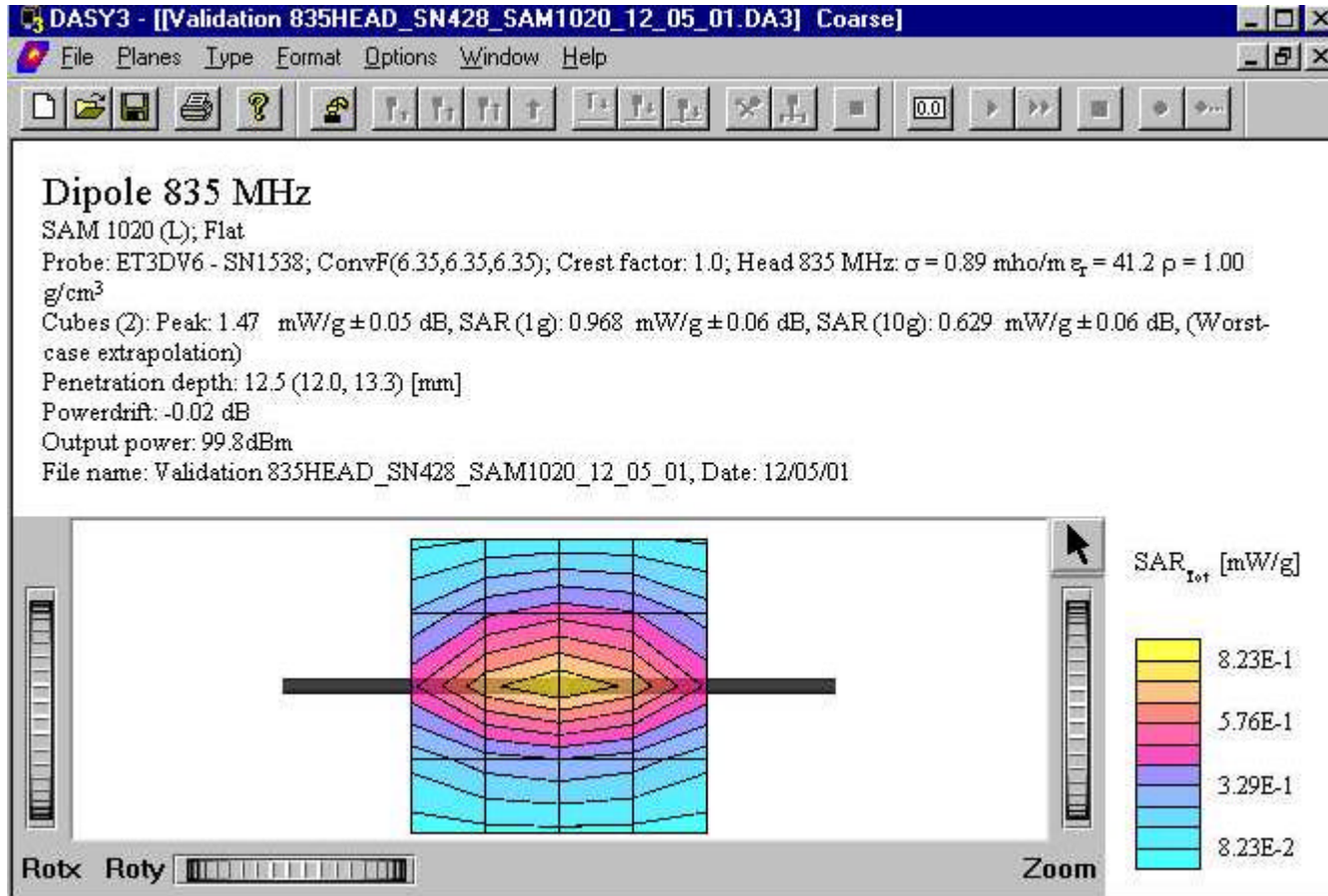
Table 2: SAR measurement results for the T61g and T61z telephone at highest possible output power. GSM1900 mode.

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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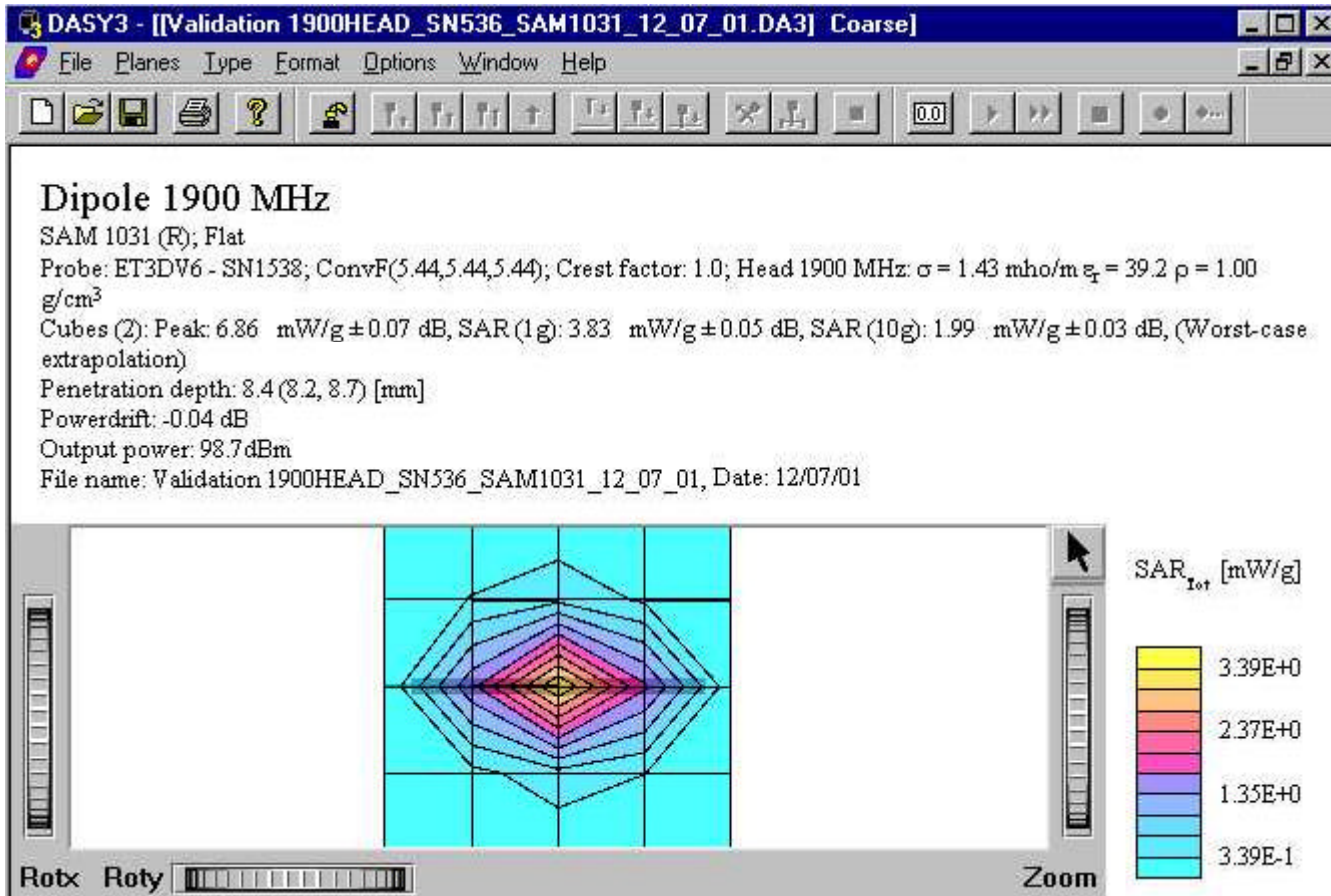
Appendix 1: SAR distribution comparison for system performance check



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**835 MHz SAR distribution of validation dipole antenna from system performance check on December 5, 2001.
Using head tissue.**

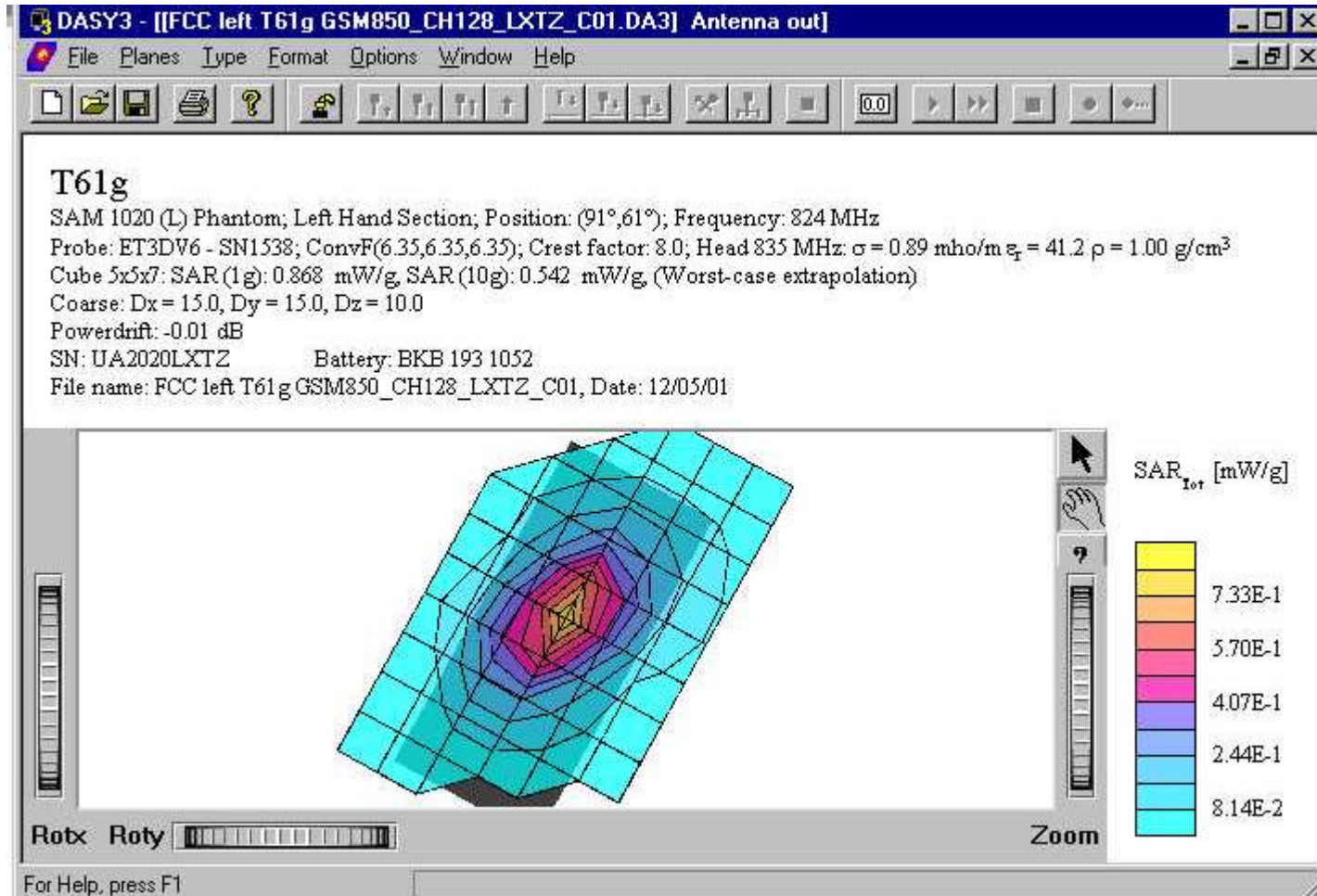
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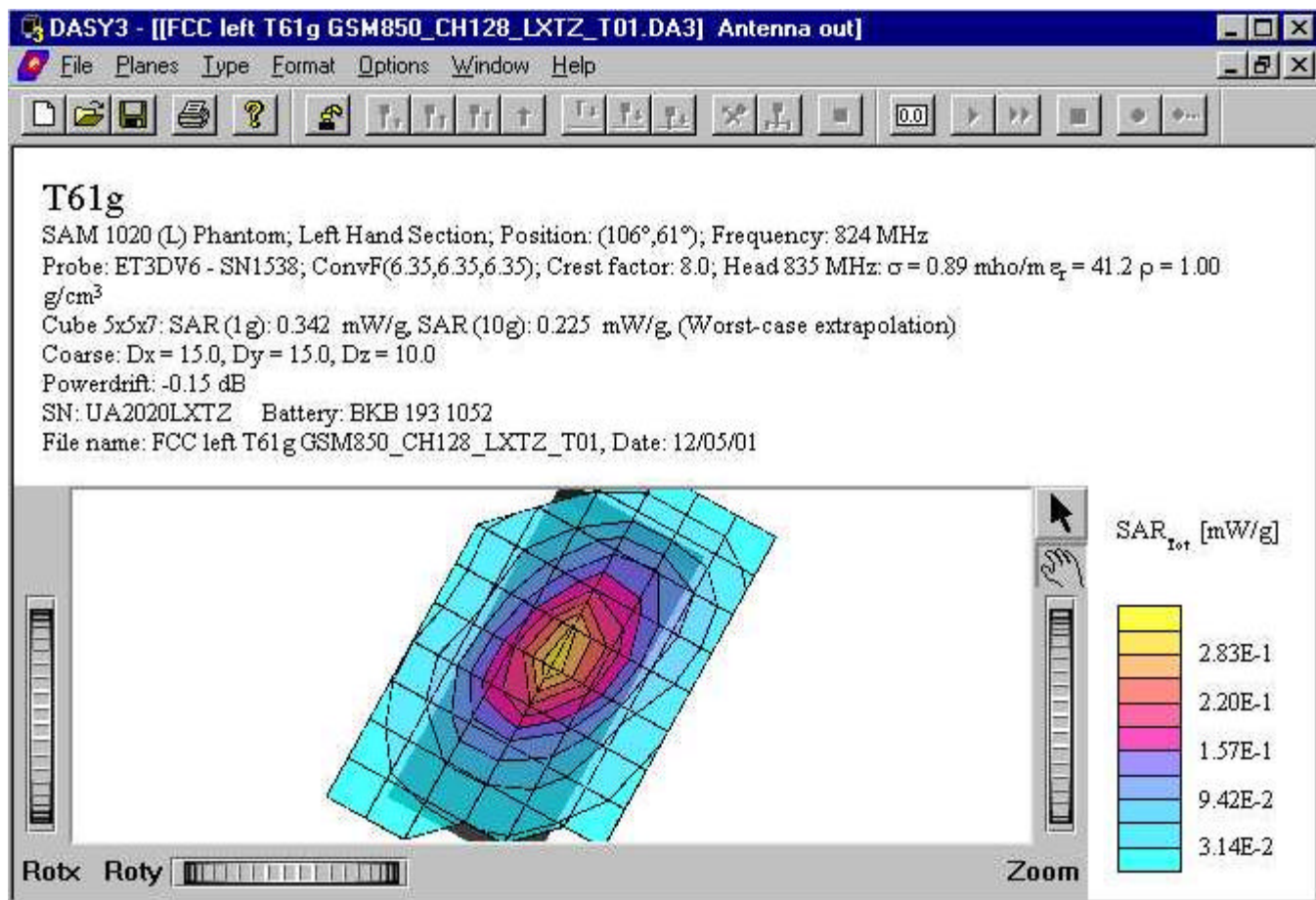
1900 MHz SAR distribution of validation dipole antenna from system performance check on December 7, 2001.
Using head tissue.

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Appendix 2: SAR distribution plots



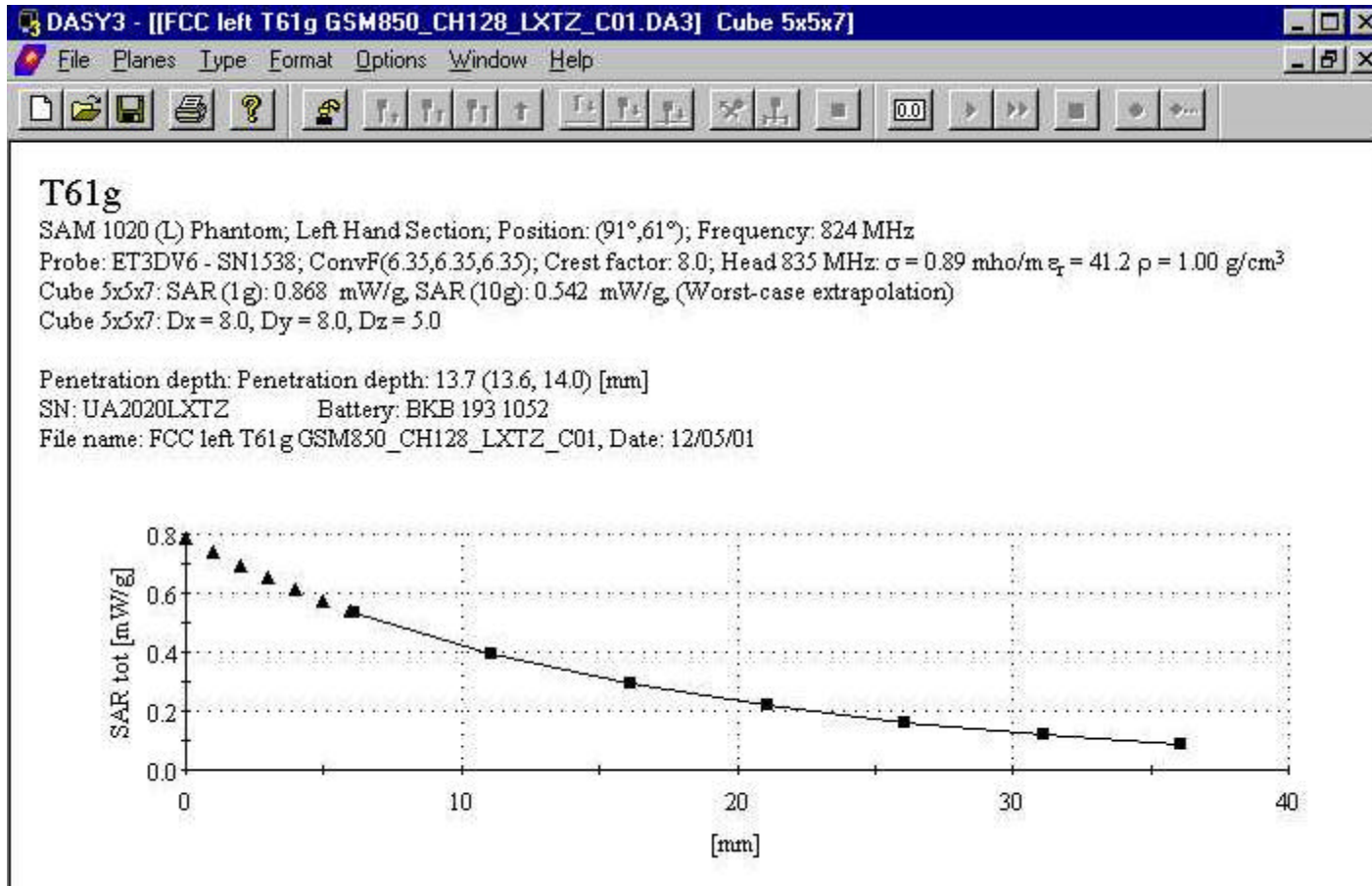
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Approved SEM/CV/PF/P Dulce Altabella	Checked DA	2002-1-22	A U:\FCC Submittals\Fcc_419 HP Nicole\XHIBIT11\Source\T61g_T61z_head.doc



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

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Distribution of maximum SAR in 800 GSM band. Measured against the head in the “Tilt” position.

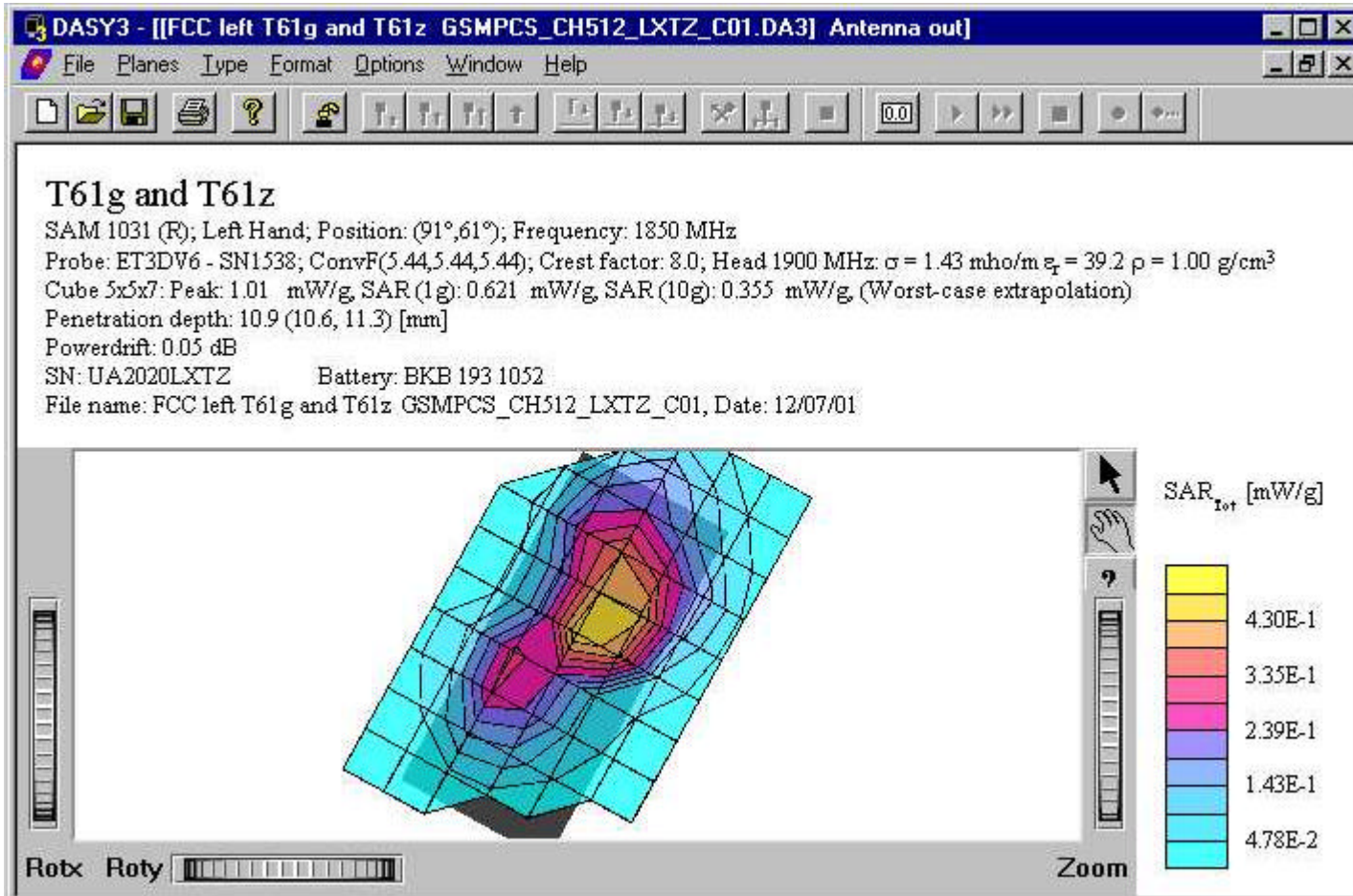


SAR Extrapolation to the phantom inner surface. Measured for maximum SAR in 800 GSM band, while phone

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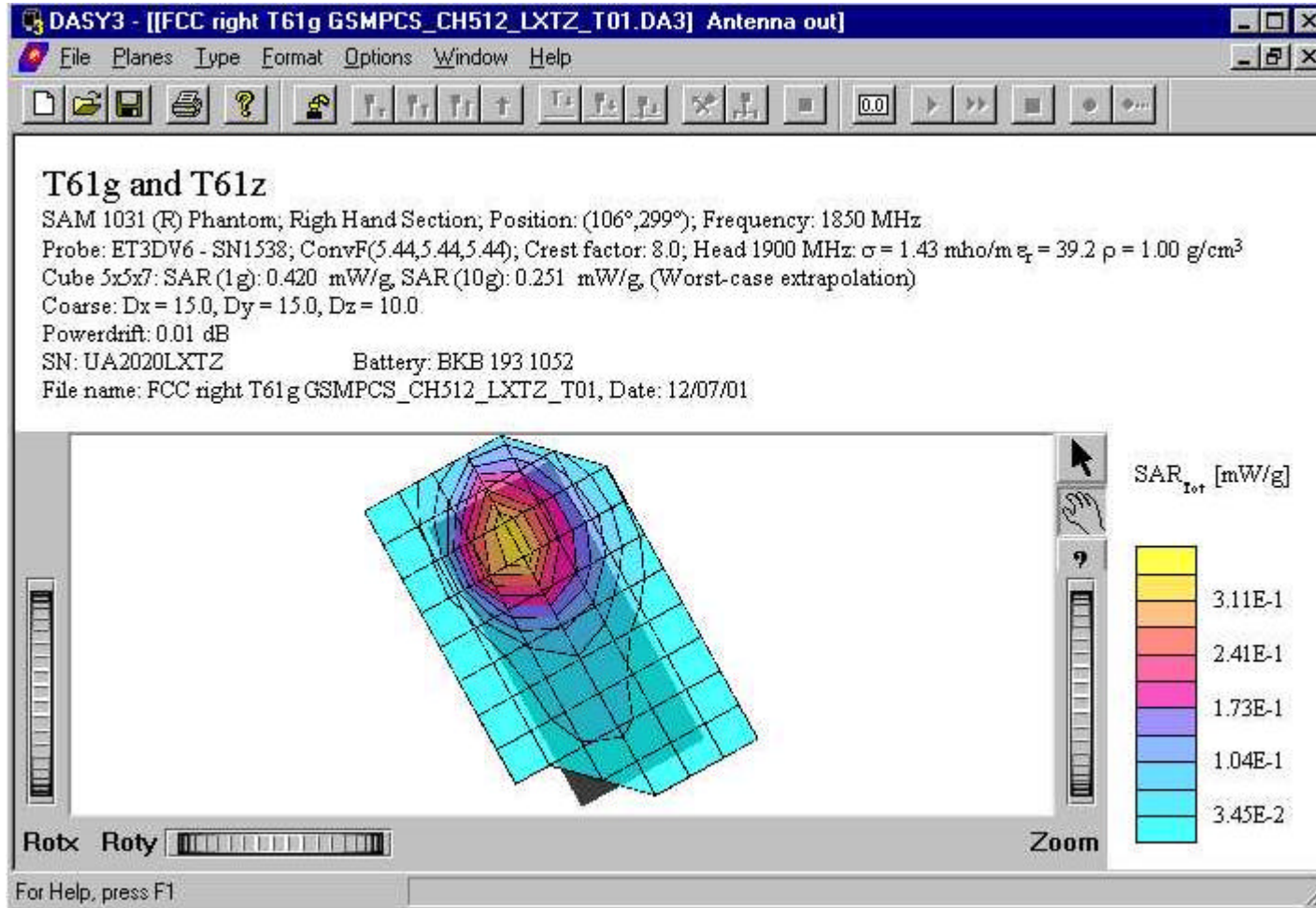
is against the head in the “cheek” position.

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Distribution of maximum SAR in 1900 GSM band. Measured against the head in the “Check” position.

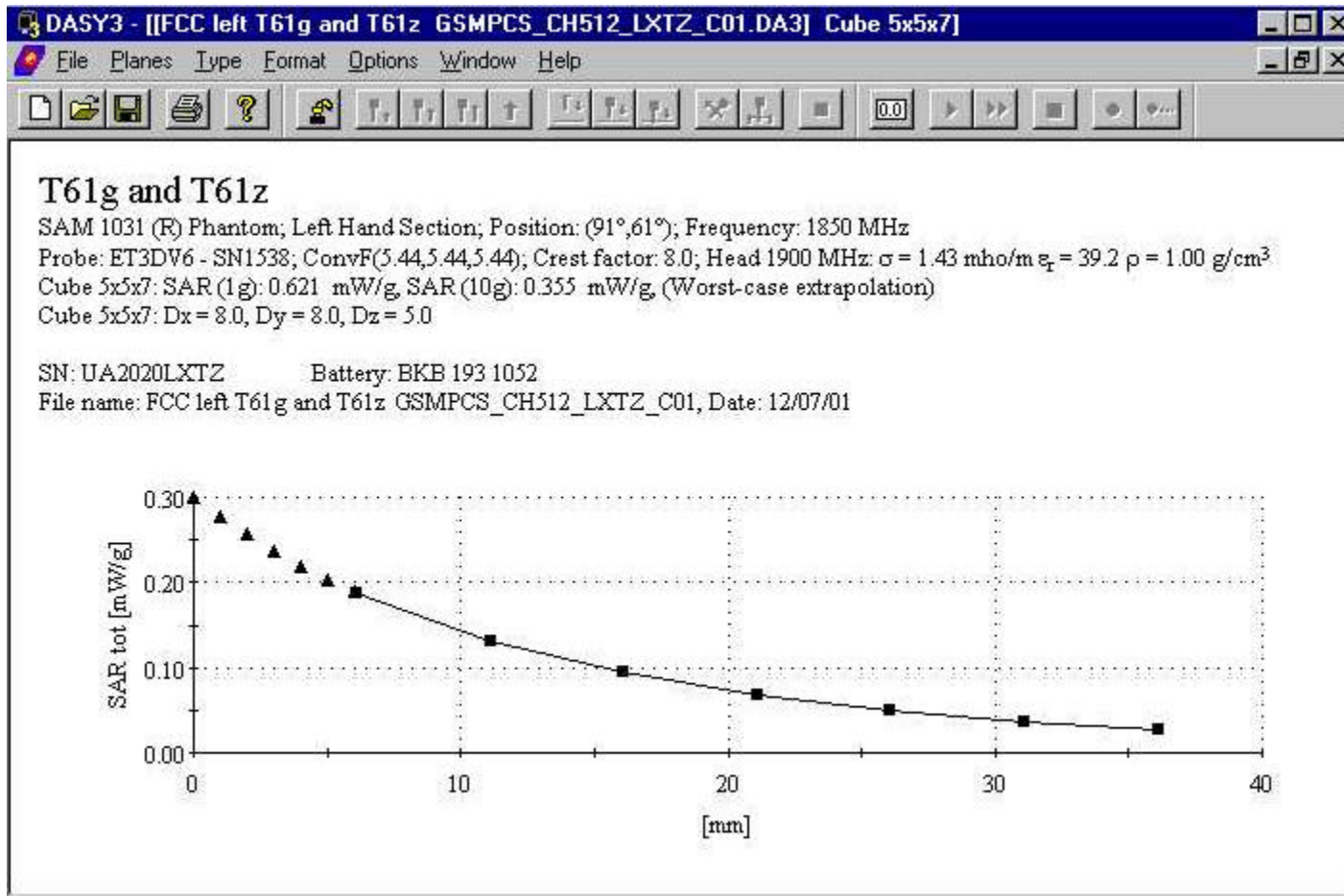
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Distribution of maximum SAR in 1900 GSM band. Measured against the head in the “Tilt” position.

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SAR Extrapolation to the phantom inner surface. Measured for maximum SAR in 1900 GSM band, while phone is against the head in the “cheek” position.

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Appendix 3: Photographs of Device Under Test



Front view of device



Back view of device

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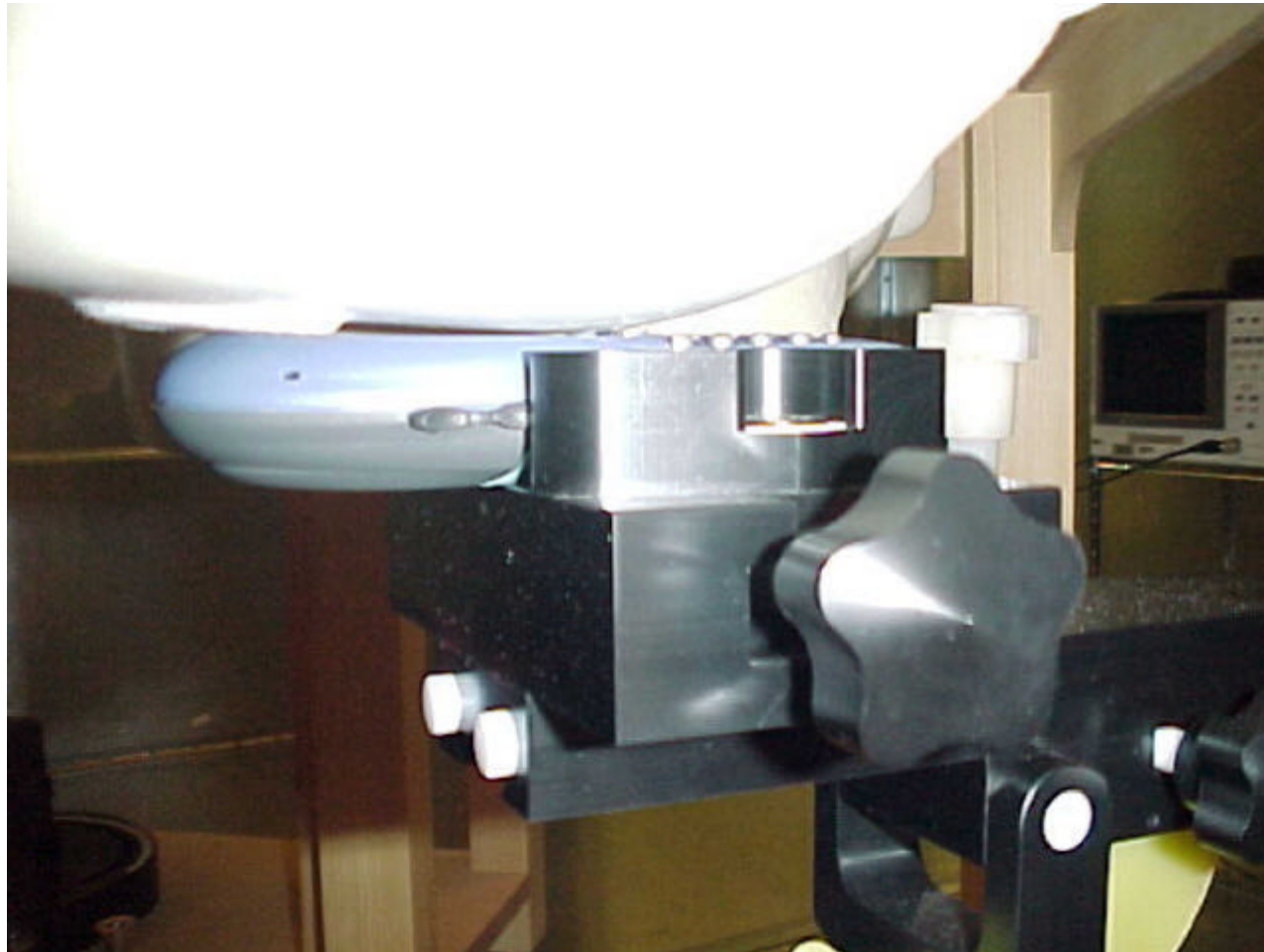


Side view of device.

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Appendix 4: Position of Device on Phantom

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

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

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Appendix 5: Probe calibration parameters
ET3DV6 SN:1538
DASY3 - Parameters of Probe: ET3DV6 SN:1538
Sensitivity in Free Space

NormX	1.32 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.13 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.39 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	101 mV
DCP Y	101 mV
DCP Z	101 mV

Sensitivity in Tissue Simulating Liquid
Head 450 MHz $\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 10\%$ mho/m

ConvF X	6.81 extrapolated	Boundary effect:
ConvF Y	6.81 extrapolated	Alpha 1.00
ConvF Z	6.81 extrapolated	Depth 1.06

Head 900 MHz $\epsilon_r = 42 \pm 5\%$ $\sigma = 0.97 \pm 10\%$ mho/m

ConvF X	6.35 $\pm 7\%$ (k=2)	Boundary effect:
ConvF Y	6.35 $\pm 7\%$ (k=2)	Alpha 1.00
ConvF Z	6.35 $\pm 7\%$ (k=2)	Depth 1.45

Head 1500 MHz $\epsilon_r = 40.4 \pm 5\%$ $\sigma = 1.23 \pm 10\%$ mho/m

ConvF X	5.74 interpolated	Boundary effect:
ConvF Y	5.74 interpolated	Alpha 0.71
ConvF Z	5.74 interpolated	Depth 1.97

Head 1800 MHz $\epsilon_r = 40 \pm 5\%$ $\sigma = 1.40 \pm 10\%$ mho/m

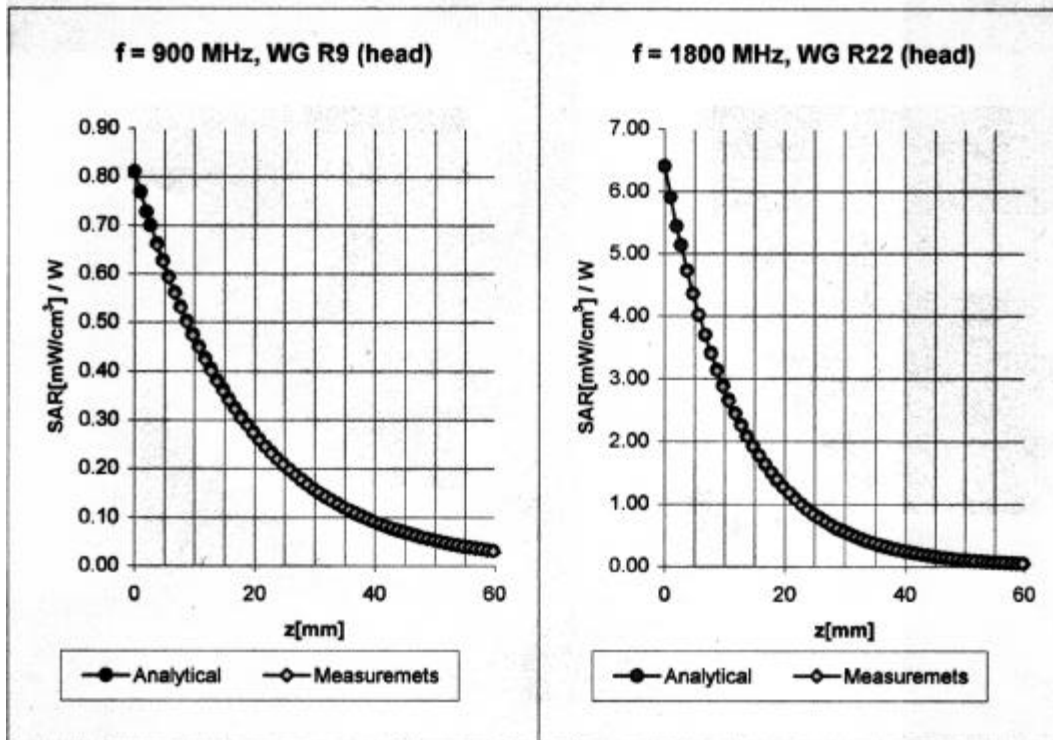
ConvF X	5.44 $\pm 7\%$ (k=2)	Boundary effect:
ConvF Y	5.44 $\pm 7\%$ (k=2)	Alpha 0.56
ConvF Z	5.44 $\pm 7\%$ (k=2)	Depth 2.23

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 \pm 0.2	mm

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Conversion Factor Assessment



Head	900 MHz	$\epsilon_r = 42 \pm 5\%$	$\sigma = 0.97 \pm 10\% \text{ mho/m}$
	ConvF X	6.35 $\pm 7\%$ (k=2)	Boundary effect:
	ConvF Y	6.35 $\pm 7\%$ (k=2)	Alpha 1.00
	ConvF Z	6.35 $\pm 7\%$ (k=2)	Depth 1.45
Head	1800 MHz	$\epsilon_r = 40 \pm 5\%$	$\sigma = 1.40 \pm 10\% \text{ mho/m}$
	ConvF X	5.44 $\pm 7\%$ (k=2)	Boundary effect:
	ConvF Y	5.44 $\pm 7\%$ (k=2)	Alpha 0.56
	ConvF Z	5.44 $\pm 7\%$ (k=2)	Depth 2.23