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SAR Test Report: A2218z

Date of test: April 12, 2000

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
mark.douglas@ericsson.com
(919) 472-6334

Statement of Compliance

Ericsson, Inc. declares under its sole responsibility that the that the product

Ericsson A2218z

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)

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.

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1. Introduction

In this test report, compliance of the Ericsson A2218z 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* [2].

2. Device Under Test

2.1 Antenna description

Type	Fixed stub	
Location	Left side	
Dimensions	length	30 mm
	width at base	10 mm
Configuration	Helix	

2.2 Device description

Device model	A2218z
Serial number	UA2017RT93
Mode	1900 GSM
Multiple Access Scheme	TDMA
Maximum Output Power Setting [1]	29.5 dBm
Factory Tolerance in Power Setting	± 0.25
Maximum Peak Output Power [2]	29.75 dBm
Duty Cycle	1 / 8
Transmitting Frequency Range	1850 – 1910 MHz
Prototype or Production Unit [3]	Prototype

3. Test equipment

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 Febuary, 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	345	4/01
E-field probe ETDV5	1324	4/01
Dipole Validation Kit, D1800V2	217	12/01

[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.
[3] It shall be understood that a statement of compliance for a prototype unit also applies to production units [3].

3.2 Additional equipment

Description	Serial Number	Due Date
Signal Generator HP8648C	3537A01598	9/00
Dielectric probe kit HP 85070B	US33020256	8/00
Network analyzer HP 8752C	3410A03105	7/00
Power meter HP 437B	3125U13729	2/01
Power sensor HP 8482H	3318A07097	2/01
Radio communications analyzer Anritsu MT8801B	MB12477	2/01

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 [3]. It is seen that the measured parameters result in an overestimation of SAR compared to the recommended values.

f (MHz)	Limits / Measured	Dielectric Parameters		
		ε_r	σ (S/m)	ρ (g/cm^3)
1800	**Measured**	41.18	1.71	1.00
	Recommended Limits [3]	43.54	1.15	1.03

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 [4]. The distributions of SAR compare well with those of the reference measurements (see Appendix 1).

f (MHz)	Measured / Reference	SAR (W/kg), 1 gram	Dielectric Parameters			Temp. (°C)
			ε_r	σ (S/m)	ρ (g/cm^3)	
1800	**Measured**	40.2	41.18	1.71	1.00	24
	Reference [4]	40.0	40.0	1.72	1.00	?

6. Test results

The measured SAR values and conducted output powers are shown in Table 1. The device was tested on both the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom. The SAR results shown are maximum SAR values averaged over 1 g of tissue.

A base station simulator was used to control the device during the SAR measurements. The phone was supplied with a fully-charged battery for the tests. The temperature of the test facility during the tests was 23.5 ± 1 °C, and the depth of the tissue simulating liquid was 15.4 cm.

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mode	*f* (MHz)	Output Power (dBm)[4]	SAR, 1g (W/kg)	
			left-hand	right-hand
1900 GSM	1850	29.85	0.400	0.442
	1880	29.75	0.489	0.519
	1910	29.75	0.611	0.655

Table 1: SAR measurement results for the Ericsson A2218z telephone at highest possible output power.

References

[1] C. Törnevik, "Ericsson SAR measurement specifiction, part 1: Introduction and Purpose," Internal Document ERA/T/U-98:446, February, 1999.
[2] C. Törnevik, M. Siegbahn, T. Persson, M. Douglas, and R. Plicanic, "Ericsson SAR measurement specification", Internal Document ERA/T/U-98:442, February 1999.
[3] Federal Communications Commission, "Tissue Dielectric Properties," http://www.fcc.gov/fcc-bin/dielec.sh.
[4] Schmid and Partner Engineering AG, "DASY Dipole Validation Kit," Type: D1800V2, S/N: 217, February, 2000.

[4] Output power was measured at Ericsson by personnel outside the scope and control of the SAR testing laboratory.

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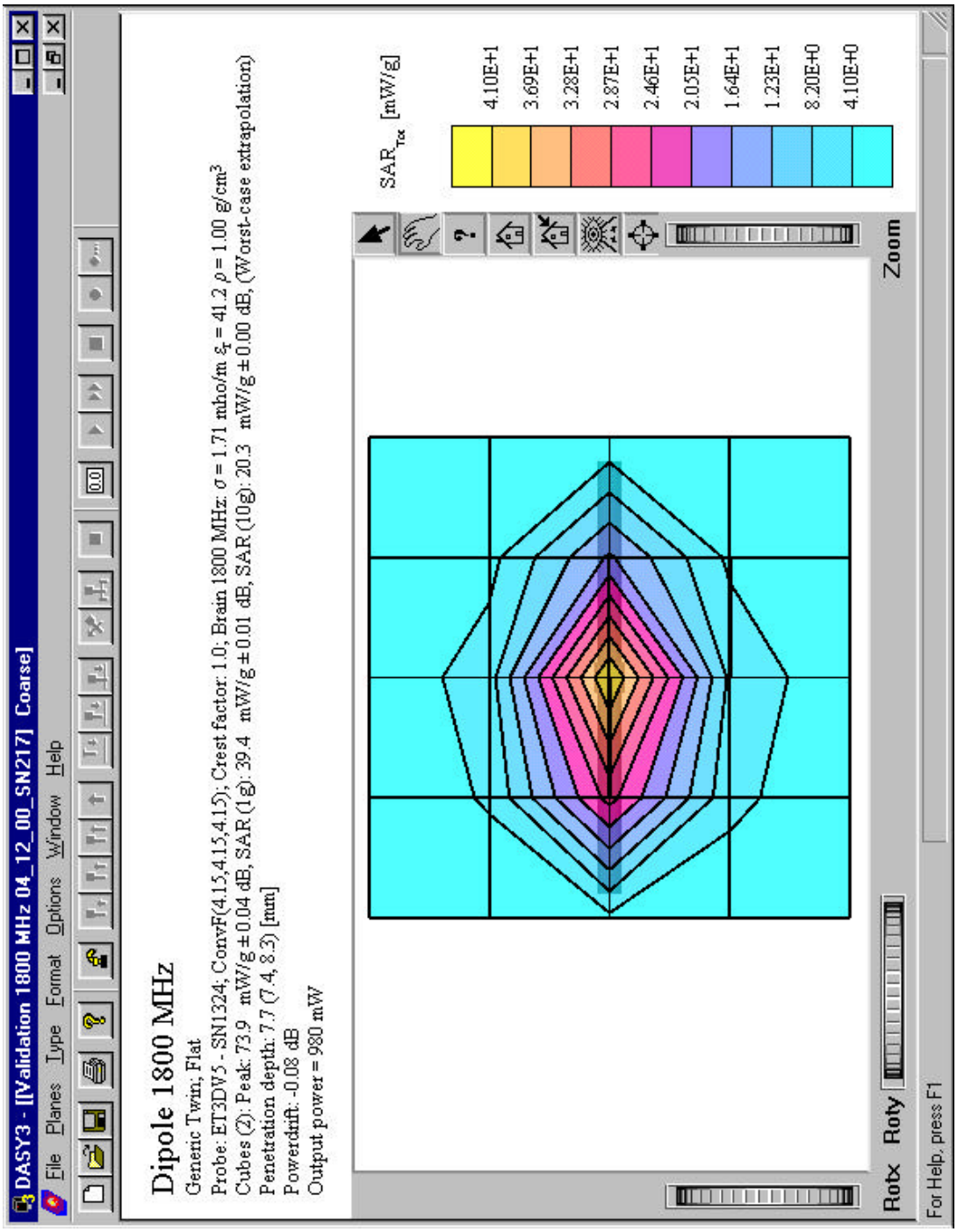
Appendix 1: SAR distribution comparison for system accuracy verification



1800 MHz SAR distribution of validation dipole antenna from system accuracy verification test.

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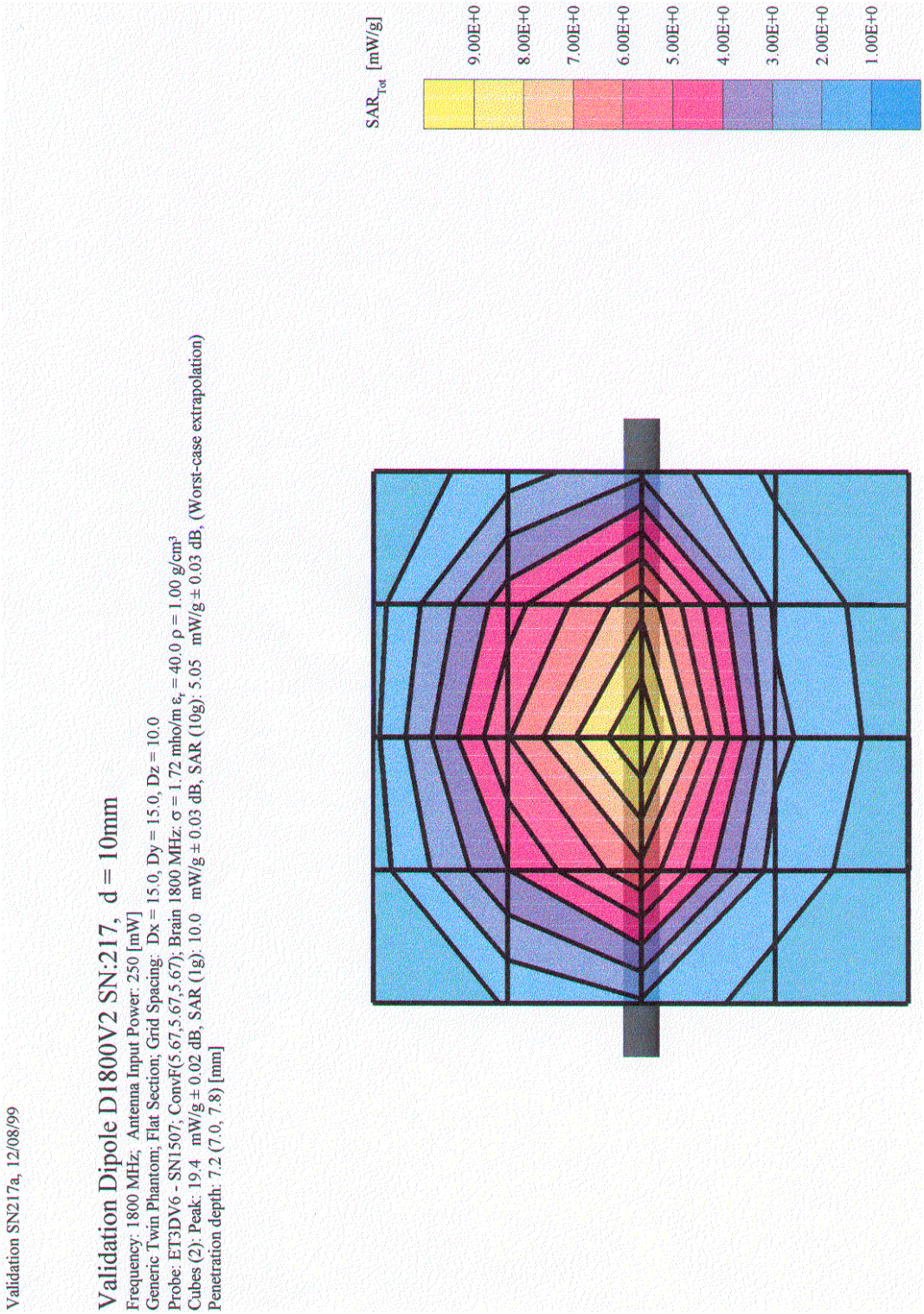

1800 MHz SAR distribution of validation dipole antenna from reference measurement.

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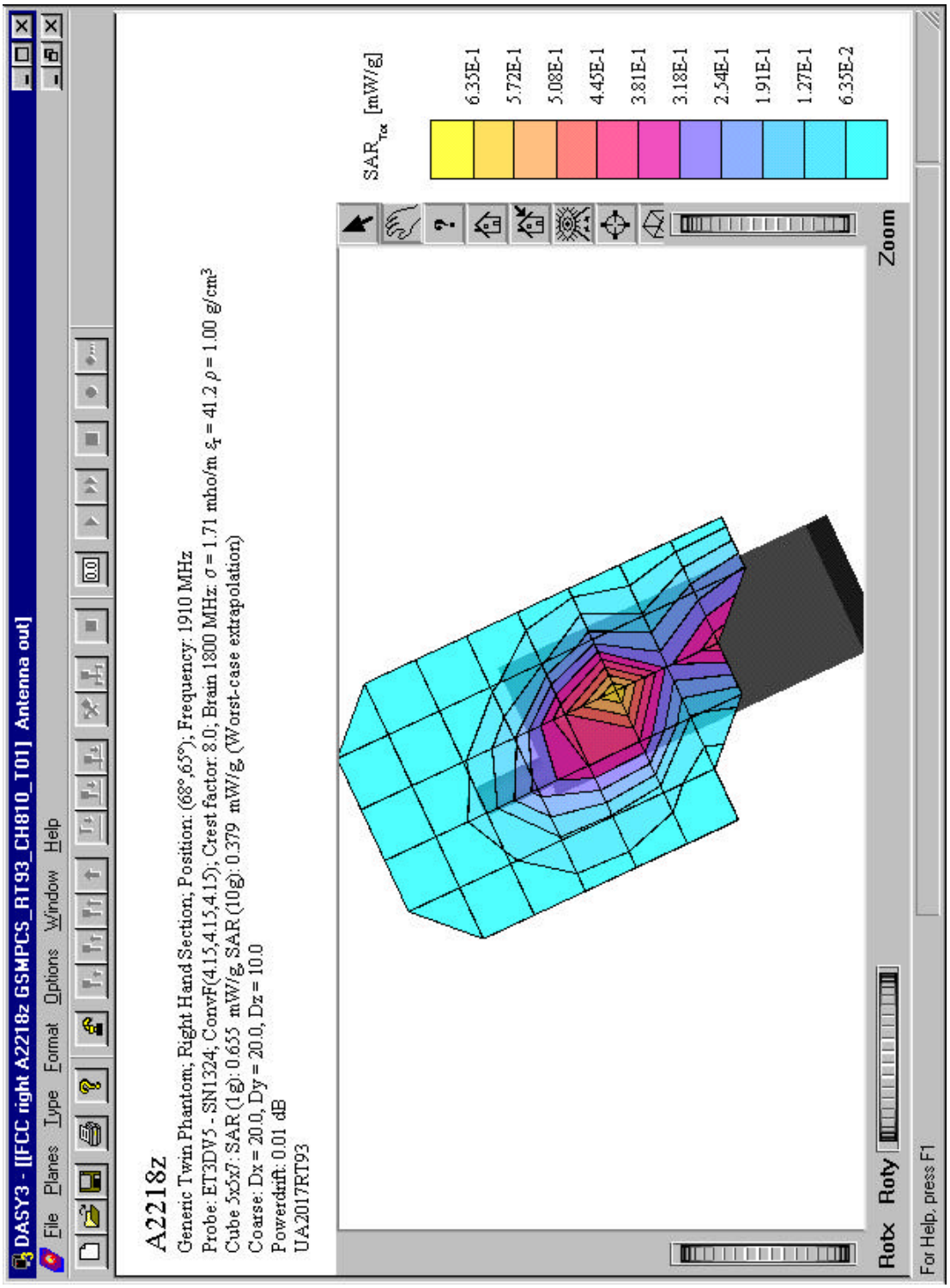
Appendix 2: SAR distribution plots



Distribution of maximum SAR in 1800 GSM band.

Appendix 3: Photographs of the device under test

Front view of device.

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Side view of device.

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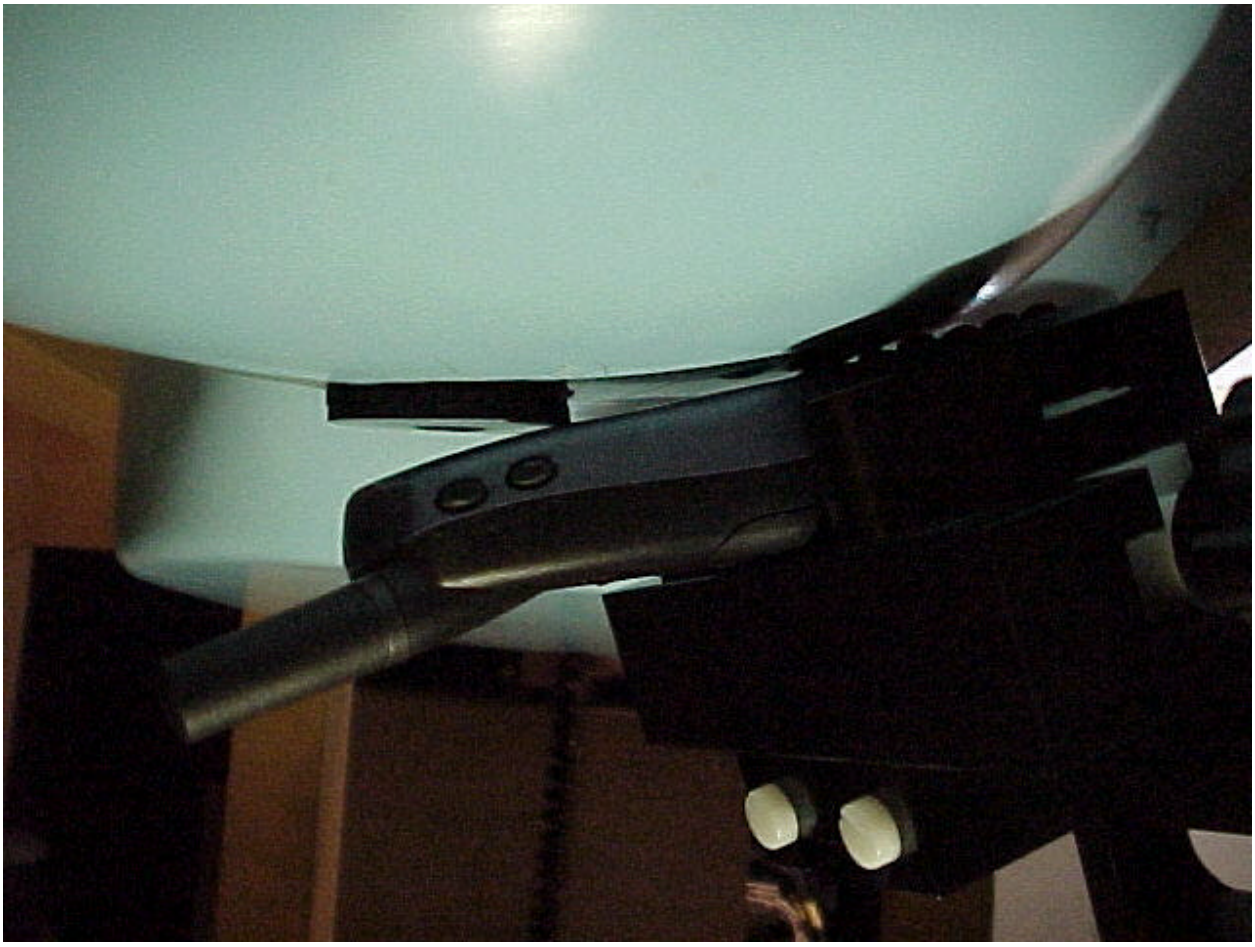
Appendix 4: Position of device on Generic Twin Phantom



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Appendix 5: Probe calibration parameters for ET3DV5 SN:1324

DASY3 - Parameters of Probe: ET3DV5 SN:1324

Sensitivity in Free Space

Diode Compression

NormX	**1.51** $\mu V/(V/m)^2$	DCP X	**104** mV
NormY	**1.73** $\mu V/(V/m)^2$	DCP Y	**104** mV
NormZ	**1.52** $\mu V/(V/m)^2$	DCP Z	**104** mV

Sensitivity in Tissue Simulating Liquid

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

ConvF X	**5.07** extrapolated	Boundary effect:	
ConvF Y	**5.07** extrapolated	Alpha	**0.07**
ConvF Z	**5.07** extrapolated	Depth	**4.22**

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

ConvF X	**4.76** ± 7% (k=2)	Boundary effect:	
ConvF Y	**4.76** ± 7% (k=2)	Alpha	**0.27**
ConvF Z	**4.76** ± 7% (k=2)	Depth	**3.47**

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

ConvF X	**4.35** interpolated	Boundary effect:	
ConvF Y	**4.35** interpolated	Alpha	**0.54**
ConvF Z	**4.35** interpolated	Depth	**2.48**

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

ConvF X	**4.15** ± 7% (k=2)	Boundary effect:	
ConvF Y	**4.15** ± 7% (k=2)	Alpha	**0.68**
ConvF Z	**4.15** ± 7% (k=2)	Depth	**1.98**

Sensor Offset

Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**2.0 ± 0.2**	mm