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RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
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Second addendum to “SAR Test Report: A1228ds”

Date of test: August 22, 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

Accreditation: 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 that the product

Ericsson A1228ds
(AXATR-388-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 in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

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

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RT/EUS/VR/X Mark Douglas 919-472-6334		EUS/VR-00:1873/REP		
Approved	Checked	Date	Rev	File
EUS/VR/X Mark Douglas	MGD	2000-08-23	A	U:\FCC_TRNS\Fcc_388 Dolly Linda Lite\Exhibit11\A1228ds body, all cases.doc

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1. Introduction

This test report is an addendum to report EUS/VR-00:1417/REP "SAR Test Report: A1228ds". In this report compliance of the Ericsson A1228ds portable telephone with RF safety guidelines is demonstrated while the device is used against the body (applicable RF safety guidelines are given in [1]) using additional belt clips/holsters. 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	A1228ds	
Serial number	UA2019JJDQ	
Mode	800 AMPS	800 D-AMPS
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	

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 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
E-field probe ETDV5	1324	2/01
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.

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	7/01
Power meter HP 437B	3125U13729	2/01
Power sensor HP 8482H	3318A07097	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 values for permittivity, conductivity and 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)
835	Measured	56.2	0.98	1.00
	Recommended Values [3]	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 procedures given by the system manufacturer for adjusting the original reference data, since that data uses different dielectric parameters from those listed below. 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			Chamber Temp. (°C)
			ε_r	σ (S/m)	ρ (g/cm^3)	
900	Measured	10.6	55.7	1.05	1.00	24
	Reference	10.5	55.5	1.05	1.00	24

6. Test results

To represent the situation when the device is worn on the body, the device was positioned against a flat phantom using all carry cases designed for the device. The list of carry accessories, including combinations, is given below. Photographs of these accessories are provided in an appendix.

Serial Number(s)	Description
KRY 104 1004	Holster with belt clip
KRY104 1293	Holster with belt clip
BKB 193 123 [3]	650 mAh battery with belt clip
KRY 104 1292 + BKB 193 123 [3]	650 mAh battery with belt clip and case
SXK 107 6820	Swivel belt clip
KRY 104 1292 + SXK 107 6820	Swivel belt clip and case

[3] BKB 193 123 was not known about at the time of writing of report EUS/VR-00:1727/REP, ‘Addendum to “SAR Test Report: A1228ds”’

The measured SAR values and conducted output powers are shown in Table 1 for all cases except for KRY 104 1004, which was given previously in report EUS/VR-00:1727/REP 'Addendum to "SAR Test Report: A1228ds"'. Measurements were made at the lowest, middle and highest frequencies of the transmit band. The SAR results shown are maximum SAR values averaged over 1 g of tissue while the device is in AMPS mode. For D-AMPS mode, the maximum power is significantly lower than that of AMPS mode, therefore SAR values are also lower.

Test commands were 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 24.0 ± 1 °C, and the depth of the tissue simulating liquid was 15.2 cm.

accessory	***f* (MHz)**	**Output Power (dBm)** [4]	**SAR, 1g (W/kg)**	
			measured	**calculated to max. power**
KRY104 1293	824	26.16	1.15	**1.18**
	837	26.13	1.13	1.16
	849	26.20	1.07	1.10
BKB 193 123	824	26.16	1.37	1.41
	837	26.13	1.41	**1.45**
	849	26.20	1.24	1.27
KRY 104 1292 + BKB 193 123	824	26.16	1.39	1.43
	837	26.13	1.42	**1.46**
	849	26.20	1.25	1.29
SXK 107 6820	824	26.16	0.488	0.50
	837	26.13	0.509	**0.52**
	849	26.20	0.460	0.47
KRY 104 1292 + SXK 107 6820	824	26.16	0.574	**0.59**
	837	26.13	0.528	0.54
	849	26.20	0.506	0.52

Table 1: SAR measurement results for the Ericsson A1228ds telephone at highest possible output power. Measured against the user's body with several carry cases.

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] The output power of the device under test was intentionally set higher than normal so that SAR measurement could be performed using a device near the upper power limit, including the factory tolerance.

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Appendix 1: SAR distribution comparison for system accuracy verification

Dipole 900 MHz

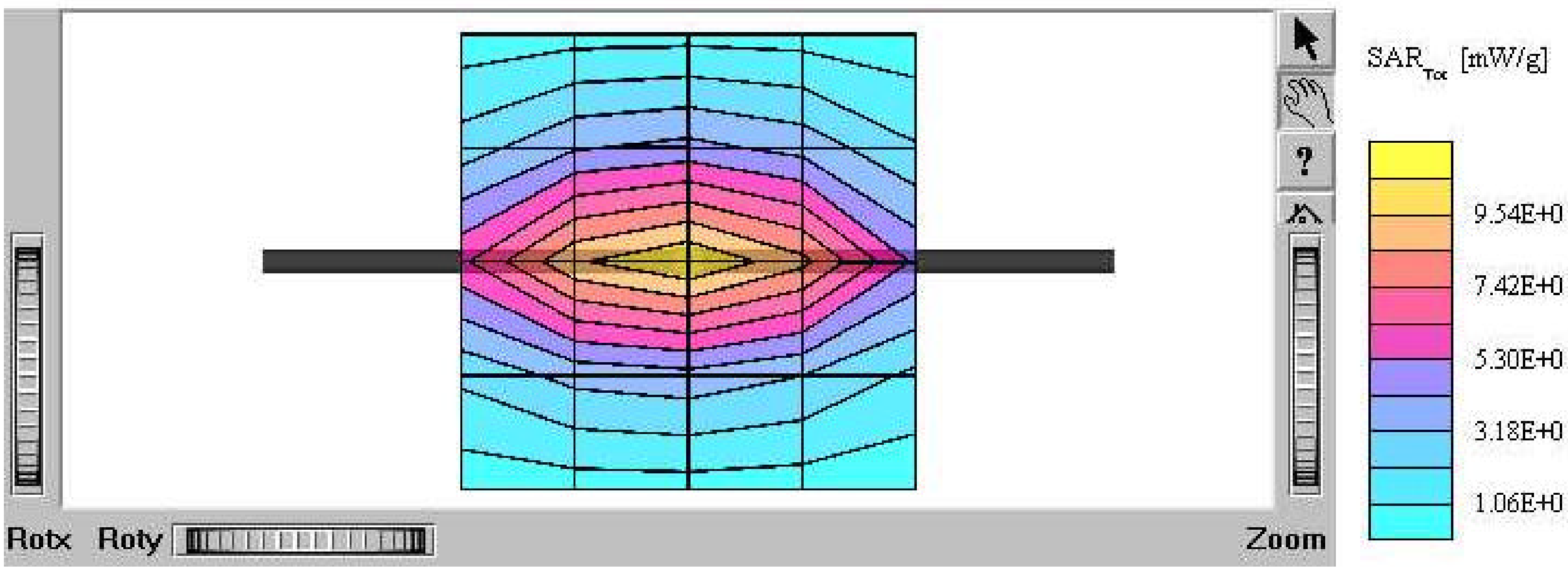
Generic Twin; Flat

Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 900 MHz: $\sigma = 1.05$ mho/m $\varepsilon_r = 55.7$ $\rho = 1.00$ g/cm^3

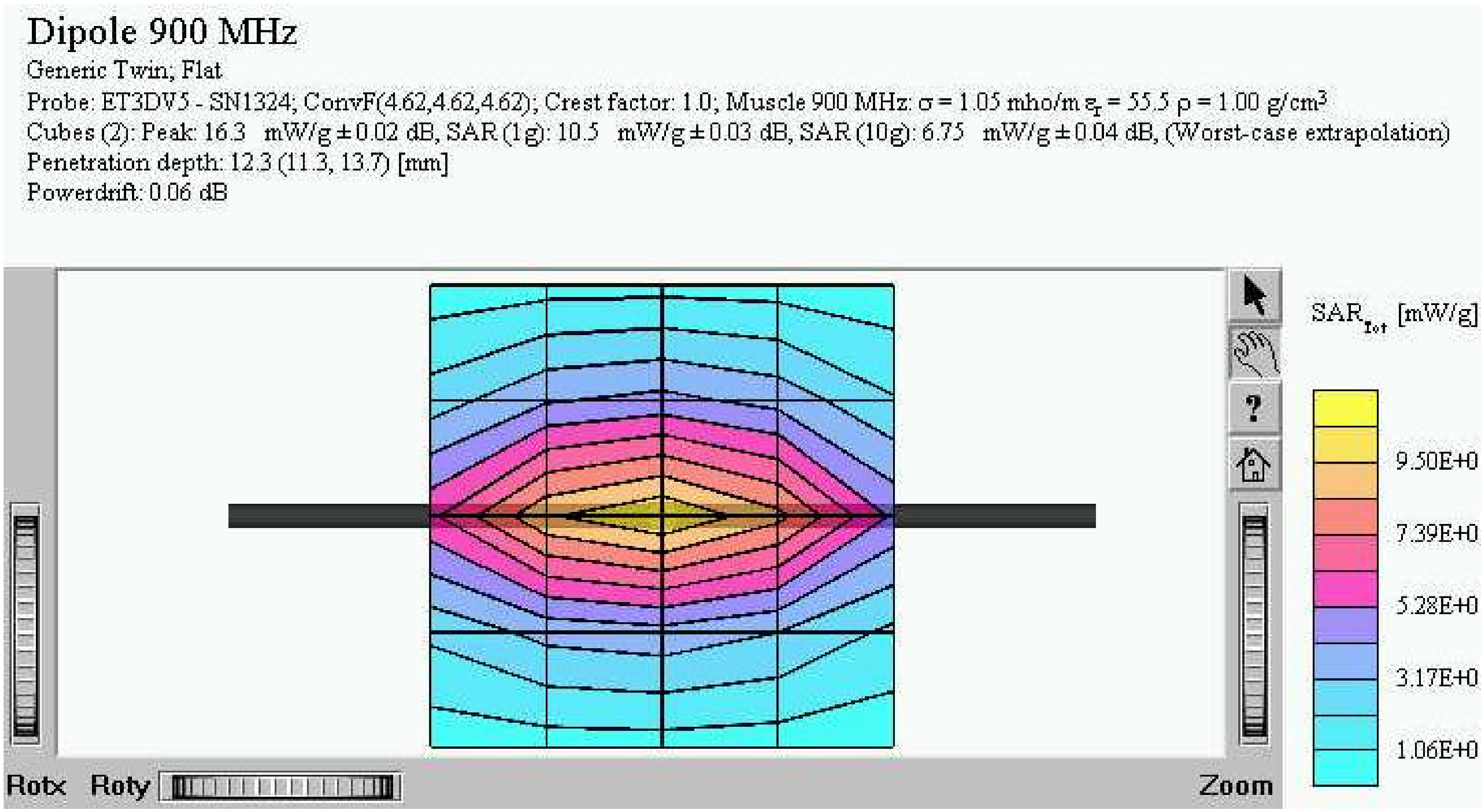
Cubes (2): Peak: 16.4 mW/g ± 0.02 dB, SAR (1g): 10.6 mW/g ± 0.03 dB, SAR (10g): 6.78 mW/g ± 0.04 dB, (Worst-case extrapolation)

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

Powerdrift: 0.06 dB



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

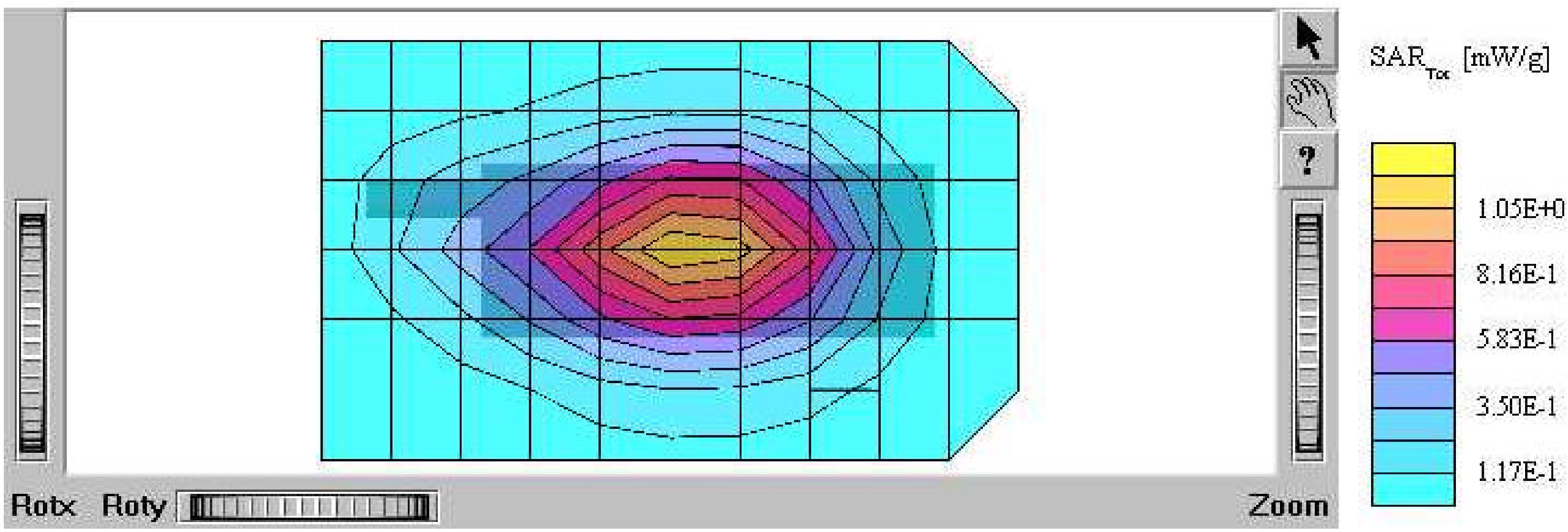


900 MHz SAR distribution of validation dipole antenna from reference measurement.

Appendix 2: SAR distribution plots

A2218ds back side

Generic Twin Phantom; Flat Section; Position: (90°,270°); Frequency: 824 MHz
Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 835 MHz: $\sigma = 0.98$ mho/m $\varepsilon_r = 56.2$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: SAR (1g): 1.15 mW/g, SAR (10g): 0.820 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.02 dB
SN: UA2019JJDQ Blue holster w/belt clip KRY-104-1293



Distribution of maximum SAR in 800 AMPS band using KRY104 1293.

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RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
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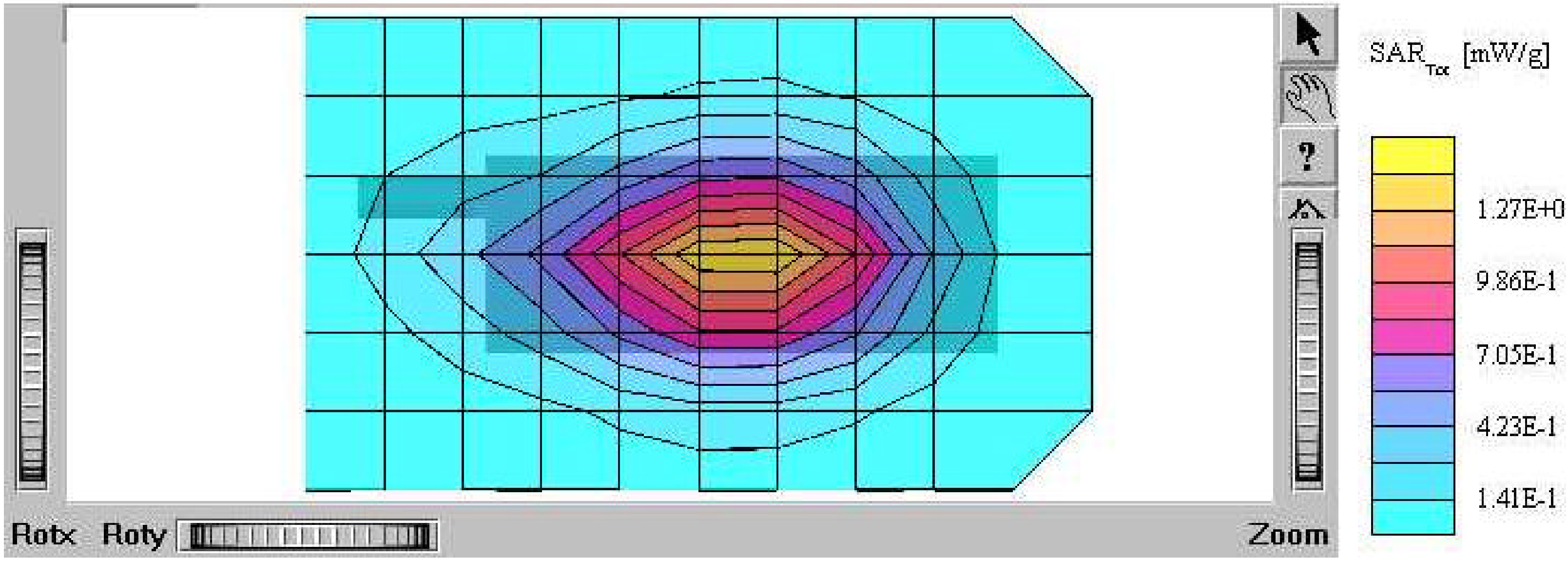
A2218ds back side

Generic Twin Phantom; Flat Section; Position: (90°,270°); Frequency: 837 MHz
Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 835 MHz: $\sigma = 0.98$ mho/m $\varepsilon_r = 56.2$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: SAR (1g): 1.41 mW/g, SAR (10g): 0.972 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.15 dB
SN: UA2019JJDQ 650mAh battery w/belt clip



Distribution of maximum SAR in 800 AMPS band using BKB 193 123.

Prepared (also subject responsible if other)		No.		
RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
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A2218ds back side

Generic Twin Phantom; Flat Section; Position: (90°,270°); Frequency: 837 MHz

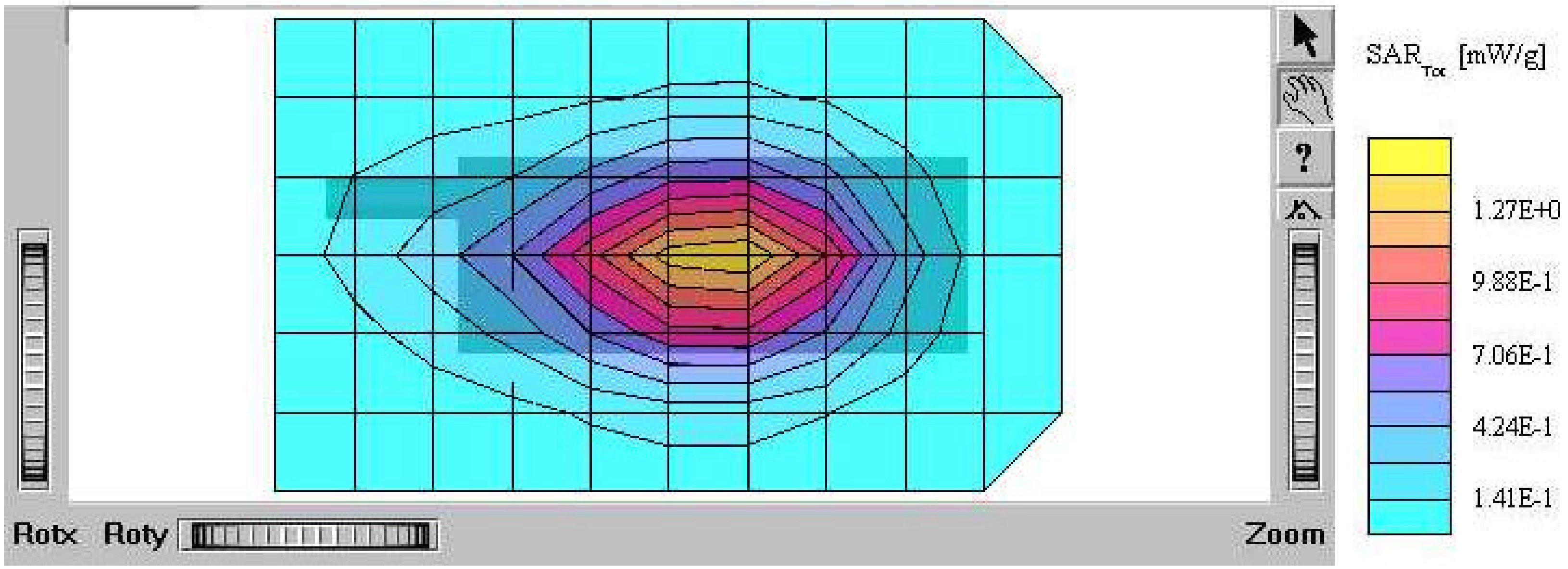
Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 835 MHz: σ = 0.98 mho/m ε_r = 56.2 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 1.42 mW/g, SAR (10g): 0.973 mW/g, (Worst-case extrapolation)

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.04 dB

SN: UA2019JJDQ 650mAh battery w/belt clip in holster KRY-104-1292



Distribution of maximum SAR in 800 AMPS band using KRY 104 1292 + BKB 193 123.

Prepared (also subject responsible if other)		No.		File
RT/EUS/VR/X Mark Douglas 919-472-6334		EUS/VR-00:1873/REP		
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EUS/VR/X Mark Douglas	MGD	2000-08-23	A	U:\FCC_TRNS\Fcc_388 Dolly Linda Lite\Exhibit11\A1228ds body, all cases.doc

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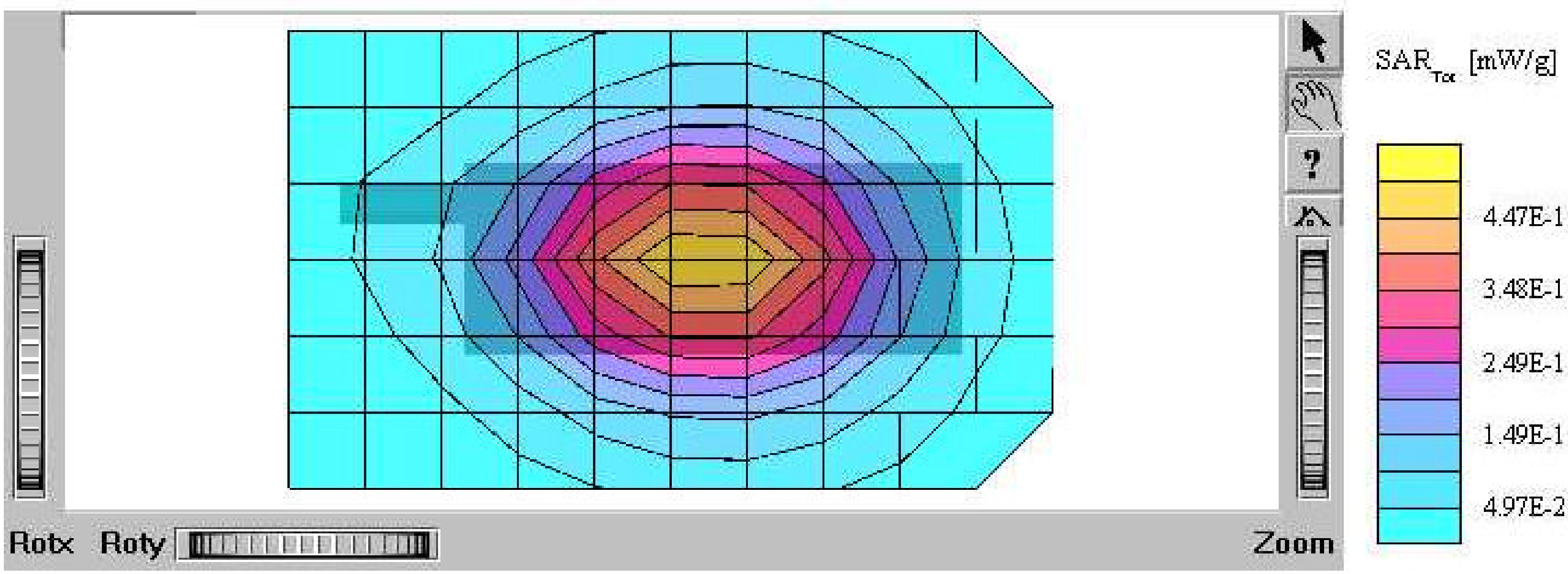
A2218ds back side

Generic Twin Phantom; Flat Section; Position: (90°,270°); Frequency: 837 MHz
Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 835 MHz: σ = 0.98 mho/m ε_r = 56.2 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.509 mW/g, SAR (10g): 0.369 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.01 dB
SN: UA2019JJDQ Swivel belt clip: SXK-107-6820



Distribution of maximum SAR in 800 AMPS band using SXK 107 6820.

Prepared (also subject responsible if other)		No.		
RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
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EUS/VR/X Mark Douglas	MGD	2000-08-23	A	U:\FCC_TRNS\Fcc_388 Dolly Linda Lite\Exhibit11\A1228ds body, all cases.doc

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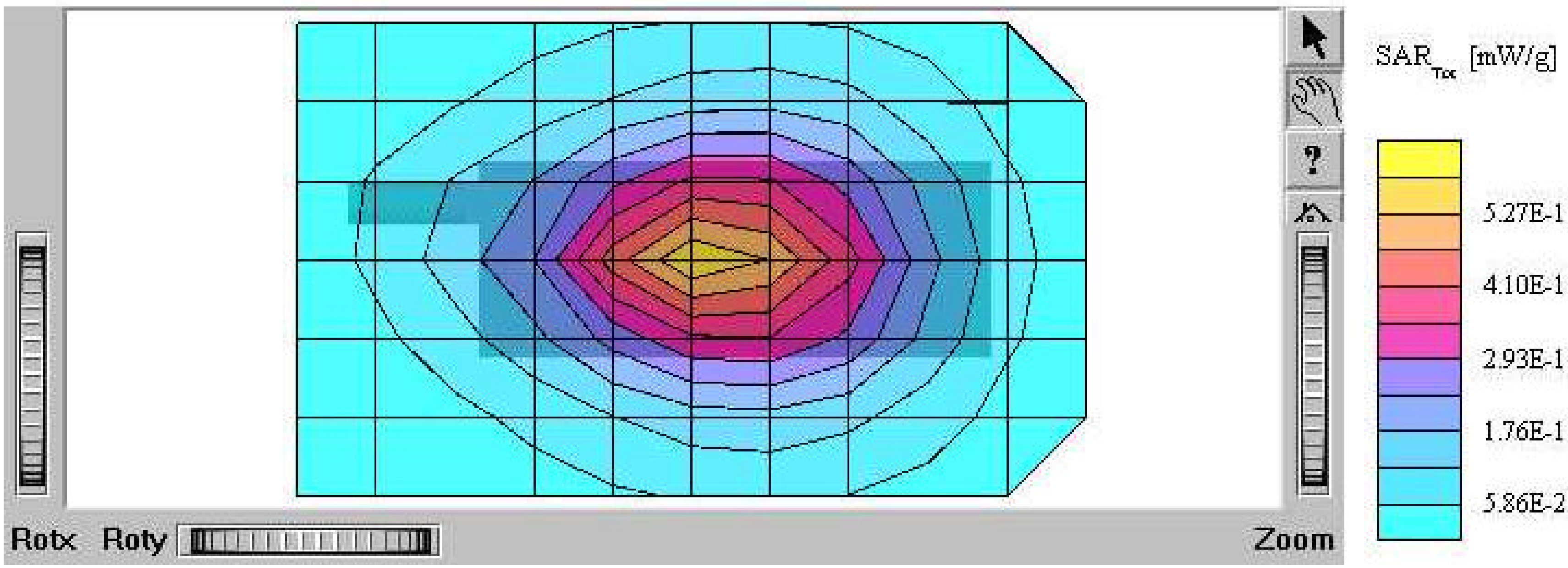
A2218ds back side

Generic Twin Phantom; Flat Section; Position: (90°,270°); Frequency: 824 MHz
Probe: ET3DV5 - SN1324; ConvF(4.62,4.62,4.62); Crest factor: 1.0; Muscle 835 MHz: σ = 0.98 mho/m ε_r = 56.2 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.574 mW/g, SAR (10g): 0.404 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.11 dB
SN: UA2019JJDQ Swivel belt clip 6820 in case KR4-104-1292



Distribution of maximum SAR in 800 AMPS band using KRY 104 1292 + SXK 107 6820.

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Appendix 3: Photographs of Device Under Test

DUT with KRY 104 1004 (left) and KRY 104 1293 (right)

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DUT with BKB 193 123 (left) and KRY 104 1292 + BKB 193 123 (right)

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DUT with SXK 107 6820 (left) and KRY 104 1292 + SXK 107 6820 (right)

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RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
Approved	Checked	Date	Rev	File
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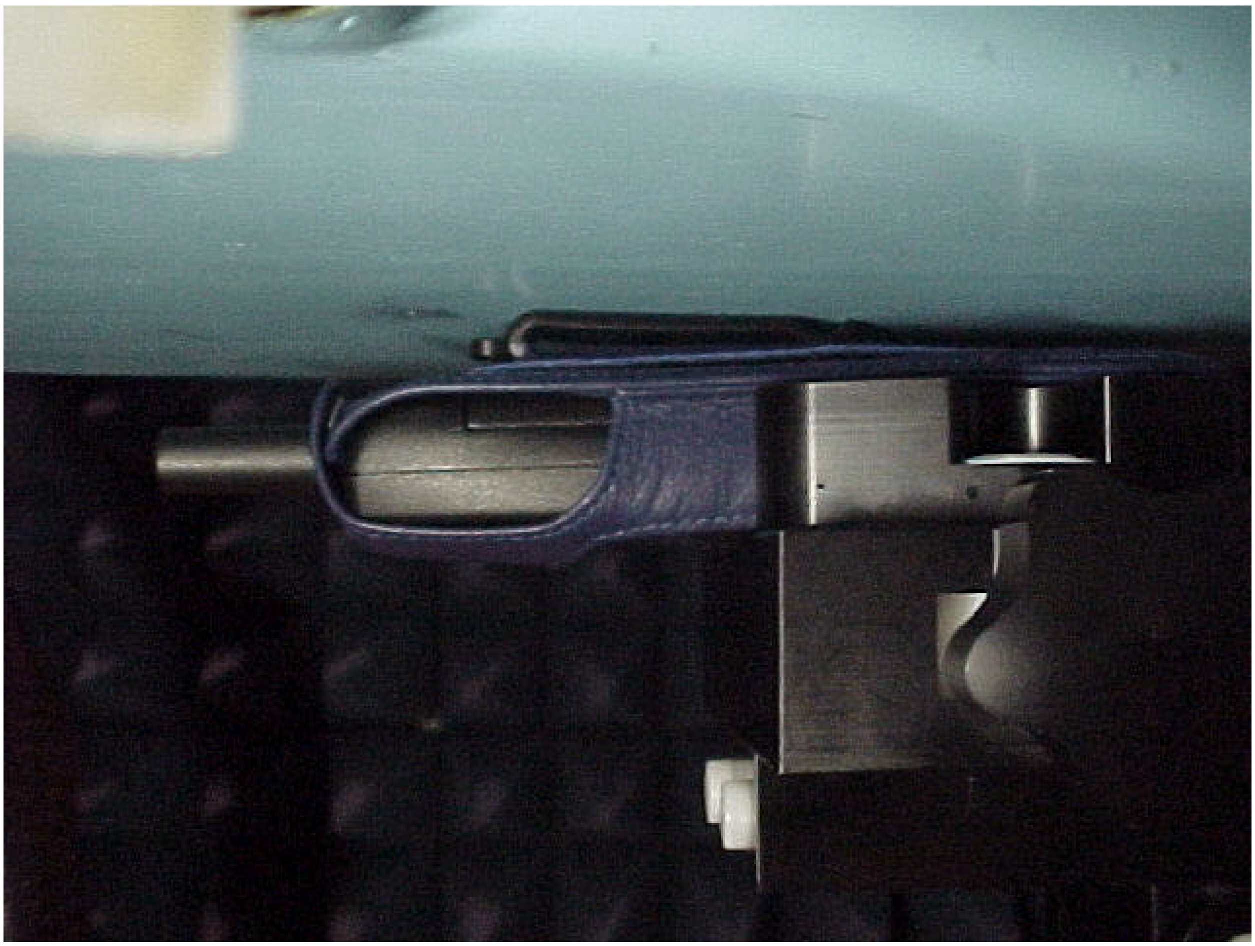
Appendix 4: Position of Device on Phantom



Against flat phantom with KRY 104 1293.

Prepared (also subject responsible if other)		No.		File
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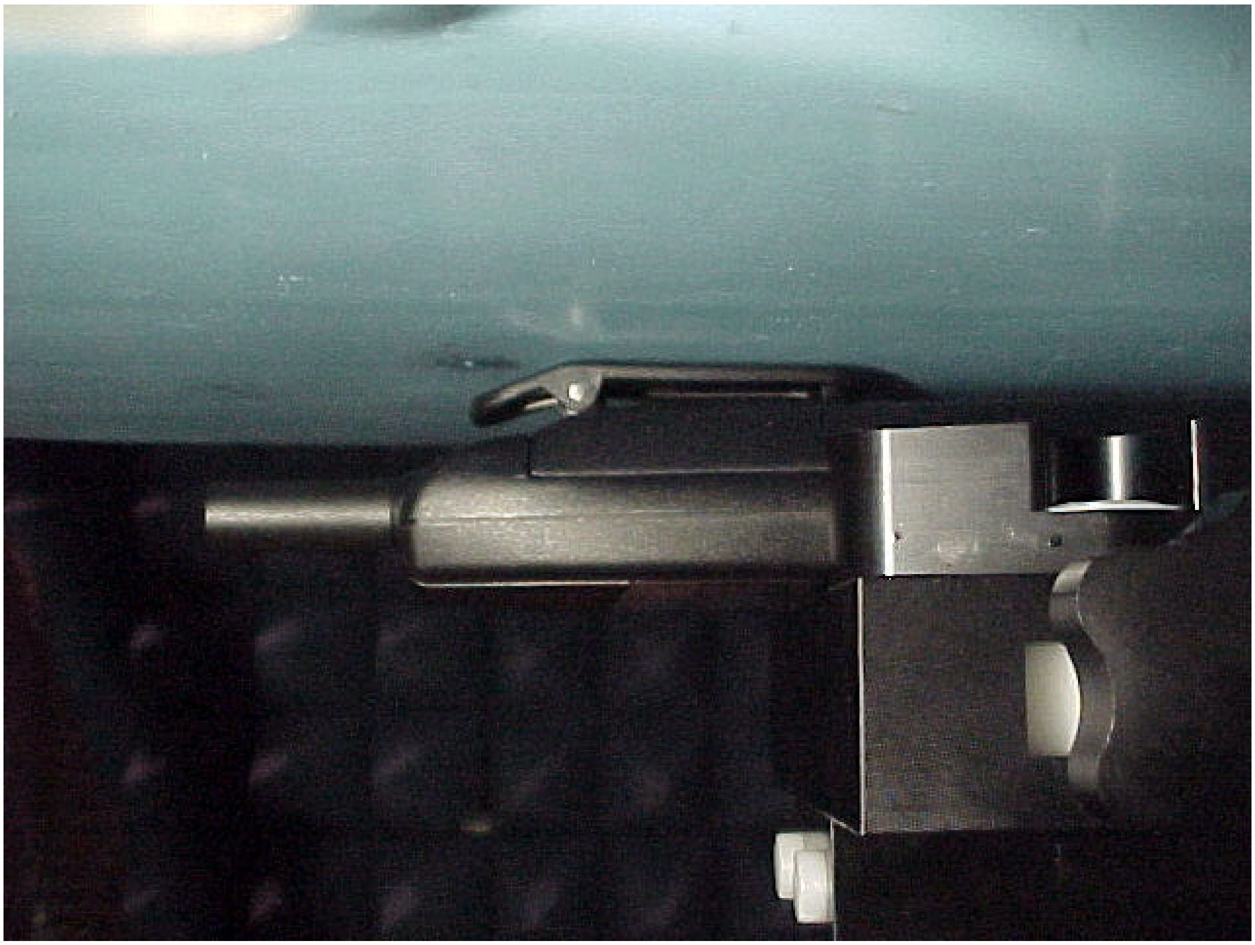

Against flat phantom with BKB 193 123.

Prepared (also subject responsible if other)		No.		
RT/EUS/VR/X Mark Douglas	919-472-6334	EUS/VR-00:1873/REP		
Approved	Checked	Date	Rev	File
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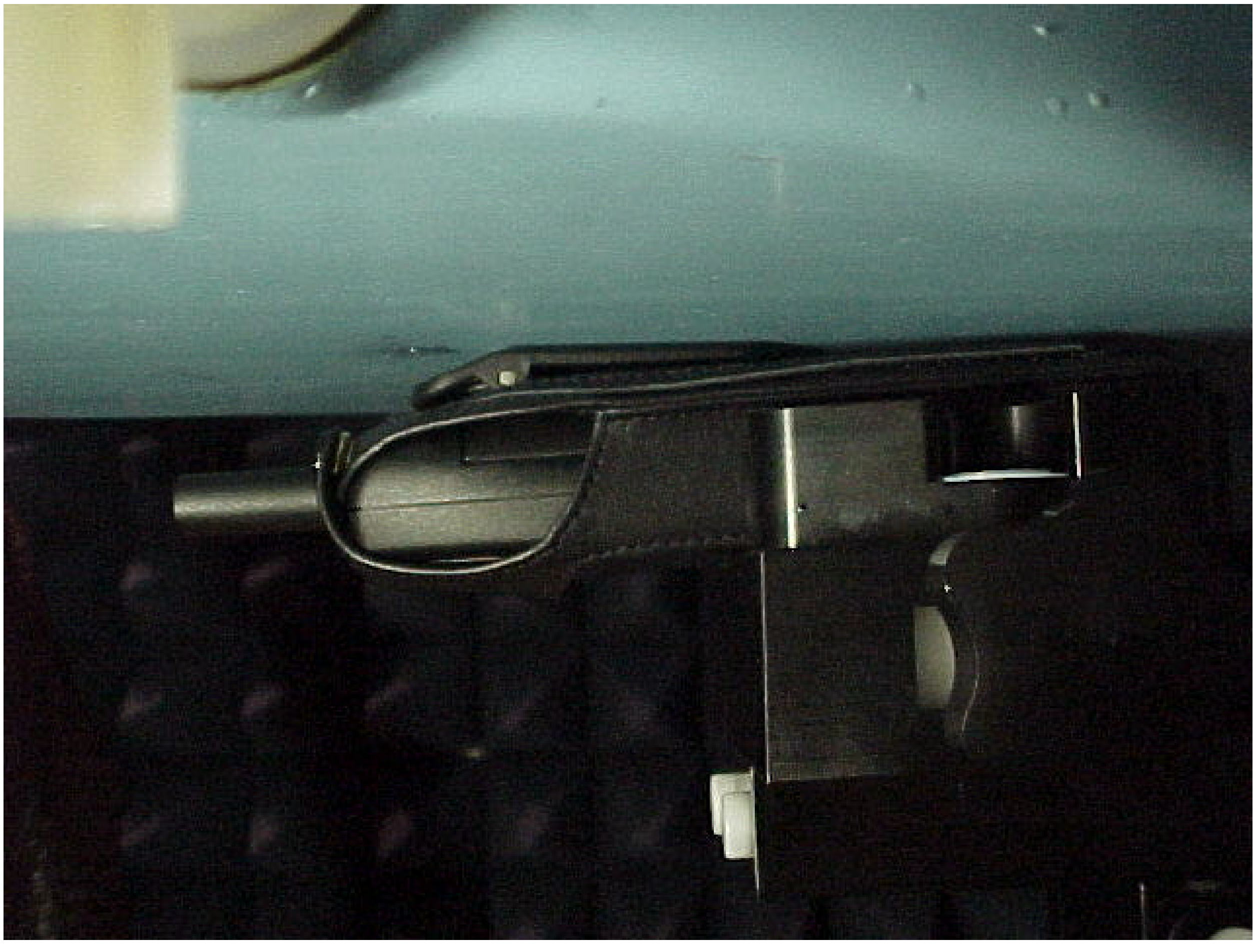

Against flat phantom with KRY 104 1292 + BKB 193 123.

Prepared (also subject responsible if other)		No.		File
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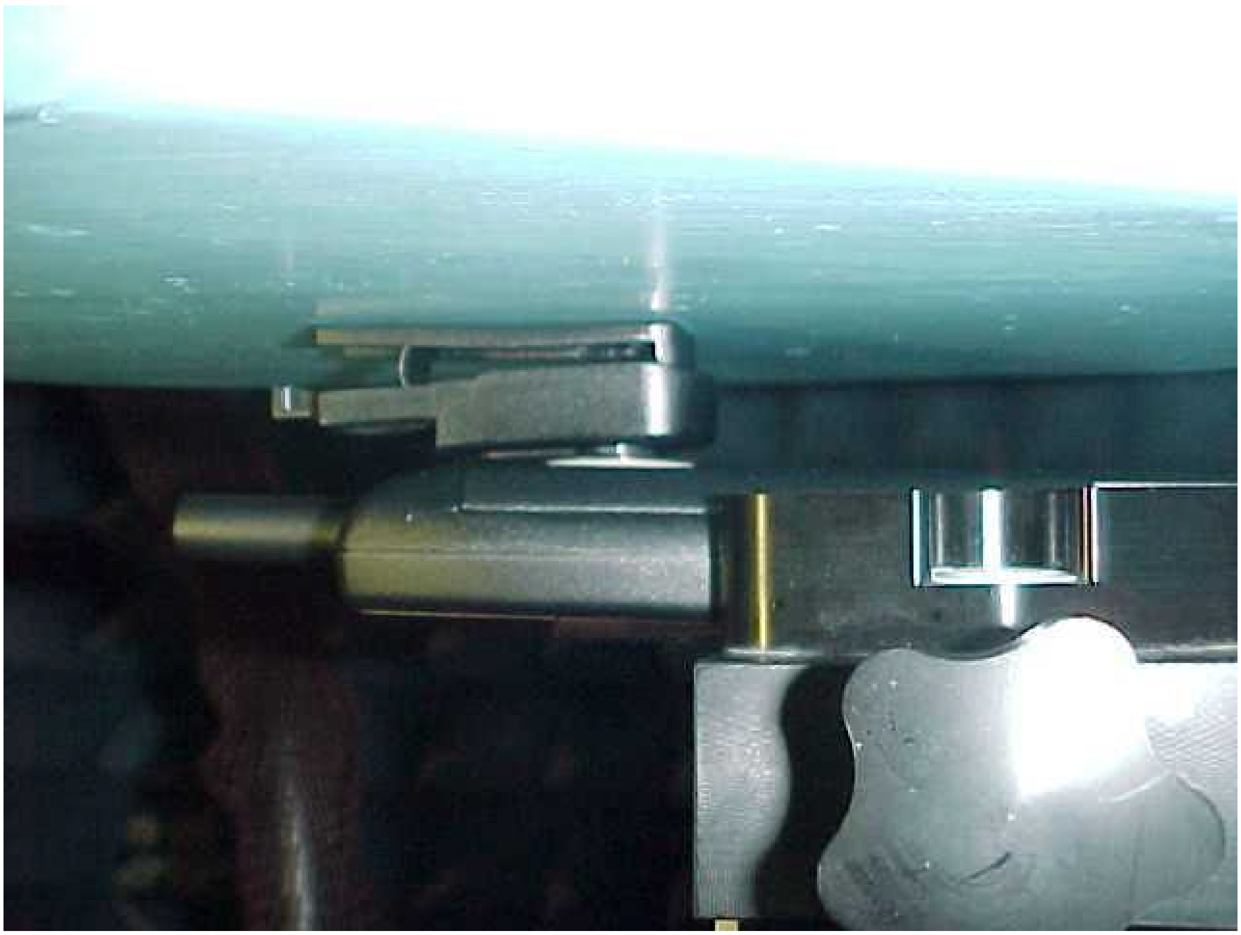

Against flat phantom with SXK 107 6820.

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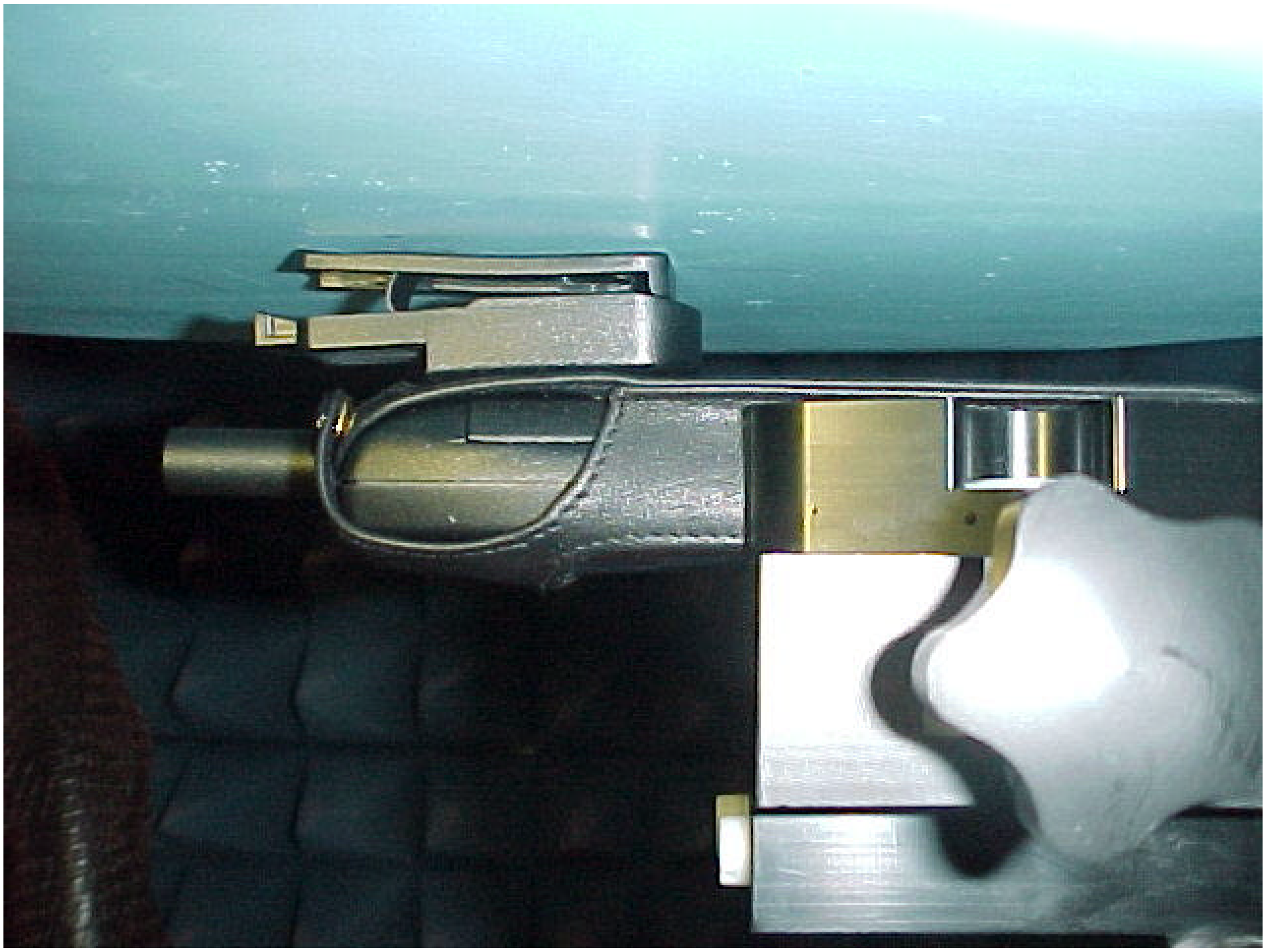

Against flat phantom with KRY 104 1292 + SXK 107 6820.

Appendix 5: Probe calibration parameters

DASY3 - Parameters of Probe: ET3DV5 SN:1324

Sensitivity in Free Space

NormX	**1.51** $\mu V/(V/m)^2$
NormY	**1.73** $\mu V/(V/m)^2$
NormZ	**1.52** $\mu V/(V/m)^2$

Diode Compression

DCP X	**104** mV
DCP Y	**104** mV
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