| Prepared (also subject responsible if other) | | No. | |
|---|---|---|---|
| RT/EUS/VR/X Mark Douglas 919-472-6334 | | EUS/VR-00:1417/REP | |
| Approved | Checked | Date | Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 | A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN

# SAR Test Report: A1228ds

**Date of test:** June 27, 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 A1228ds**

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, Inc. 2000
This test report shall not be reproduced except in full, without written approval of the laboratory.

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.

| Prepared (also subject responsible if other) | | No. | | |
|---|---|---|---|---|
| RT/EUS/VR/X Mark Douglas 919-472-6334 | | EUS/VR-00:1417/REP | | |
| Approved | Checked | Date | Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 | A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN

## Table of Contents

Prepared (also subject responsible if other)
RT/EUS/VR/X Mark Douglas 919-472-6334
No.
EUS/VR-00:1417/REP
Approved
EUS/VR/X Mark Douglas
Checked
MGD
Date
2000-07-07
Rev
A
File
U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc
EN

## 1. Introduction

In this test report, compliance of the Ericsson A1228ds 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*** | A1228ds | |
| ***Serial number*** | UA2019JJF1 | |
| ***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 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 | 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 | 7/00 |
| Power meter HP 437B | 3125U13729 | 2/01 |
| Power sensor HP 8482H | 3318A07097 | 2/01 |
| Anritsu MT8801B | MB12477 | 2/01 |

## 4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, $\varepsilon_r$, and the conductivity, $\sigma$, of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density, $\rho$, 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 | | |
|---|---|---|---|---|
| | | $\varepsilon_r$ | $\sigma$ (S/m) | $\rho$ (g/cm$^3$) |
| **835** | **Measured** | 41.0 | 0.91 | 1.00 |
| | **Recommended Limits [3]** | 46.1 | 0.74 | 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. Reference values are based on an analysis performed at the laboratory using the dielectric parameters specified 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 | | | Temp. (°C) |
|---|---|---|---|---|---|---|
| | | | $\varepsilon_r$ | $\sigma$ (S/m) | $\rho$ (g/cm$^3$) | |
| **900** | **Measured** | 10.5 | 40.3 | 0.96 | 1.00 | 23 |
| | **Reference** | 10.2 | 40.0 | 0.95 | 1.00 | 23 |

## 6. Test results

The measured SAR values and conducted output powers are shown in Table 1. For AMPS mode, the device was tested at the lowest, middle and highest frequencies of the transmit band. It was also tested on both the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom. For 800 D-AMPS mode, the maximum power is significantly lower than that of AMPS mode, therefore SAR values are also lower. Table 1 shows SAR results for this mode for the single case that gives the highest SAR in AMPS mode. 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 22.5 ± 1 °C, and the depth of the tissue simulating liquid was 15.1 cm.

Prepared (also subject responsible if other)
RT/EUS/VR/X Mark Douglas 919-472-6334
No.
EUS/VR-00:1417/REP
Approved
EUS/VR/X Mark Douglas
Checked
MGD
Date
2000-07-07
Rev
A
File
U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc
EN

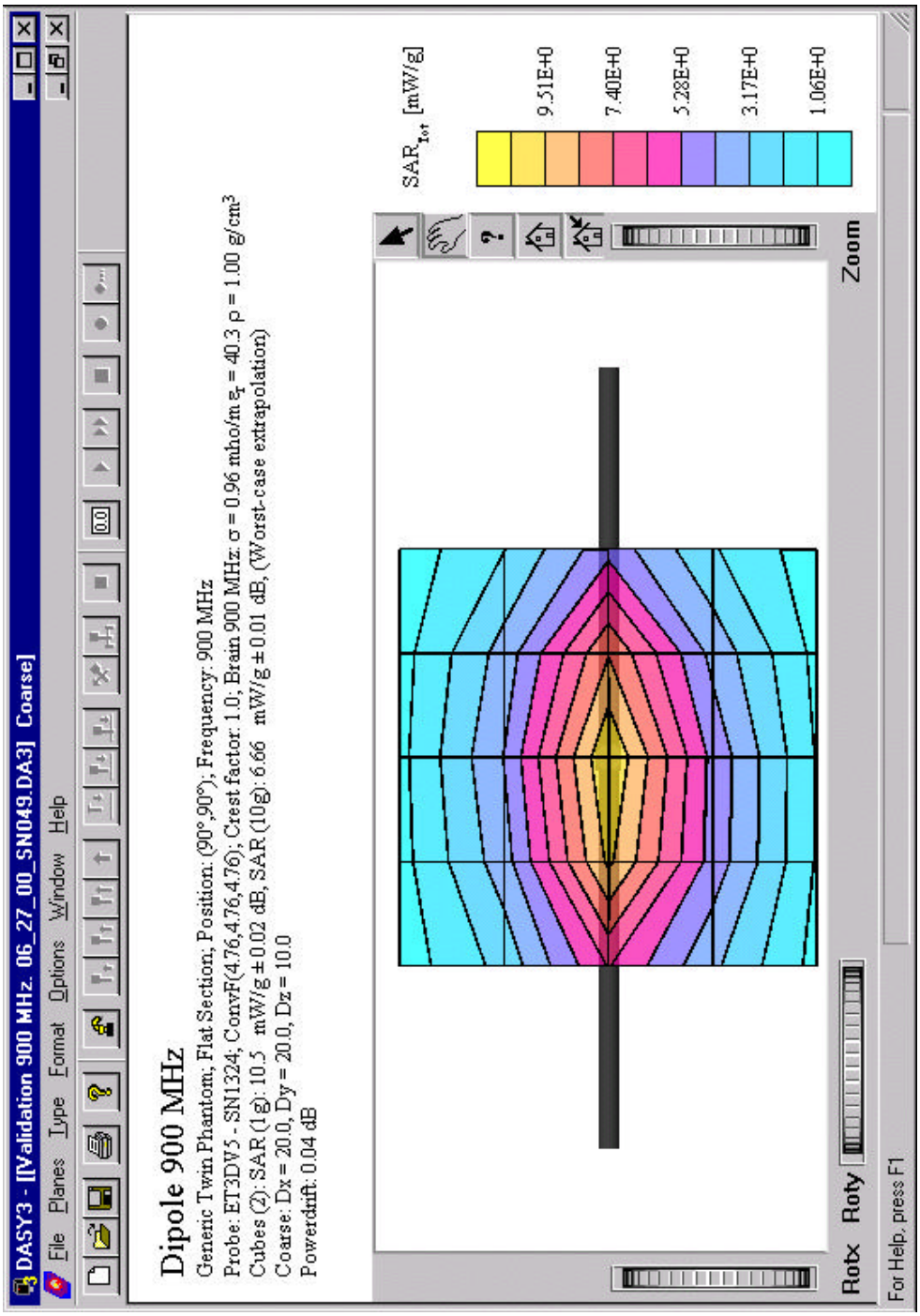
| mode | *f* (MHz) | Output Power (dBm) | SAR, 1g (W/kg) | | | |
|---|---|---|---|---|---|---|
| | | | left-hand | | right-hand | |
| | | | measured | calculated to max. power | measured | calculated to max. power |
| 800 AMPS | 824 | 26.20 | 1.09 | 1.08 | 1.27 | 1.26 |
| | 837 | 26.30 | 1.16 | 1.15 | 1.34 | **1.32** |
| | 849 | 26.15 | 0.939 | 0.928 | 1.15 | 1.14 |
| 800 D-AMPS | 837 | 25.70 | -- | -- | 0.445 | 0.505 |

**Table 1: SAR measurement results for the Ericsson A1228ds 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.

## Appendix 1: SAR distribution comparison for system accuracy verification



Prepared (also subject responsible if other)
RT/EUS/VR/X Mark Douglas 919-472-6334

No.
EUS/VR-00:1417/REP

Approved
EUS/VR/X Mark Douglas

Checked
MGD

Date
2000-07-07

Rev
A

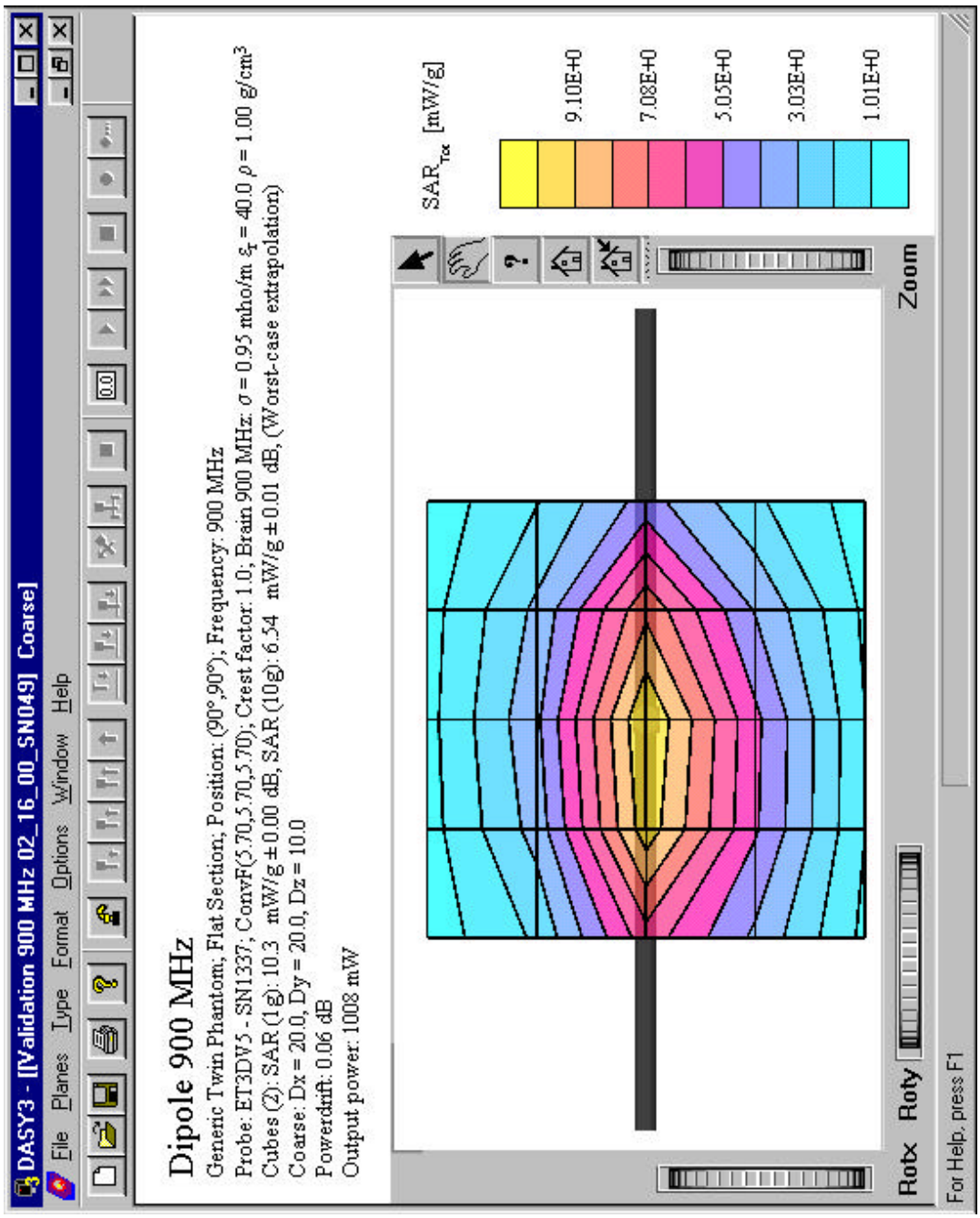
File
U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc

EN

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

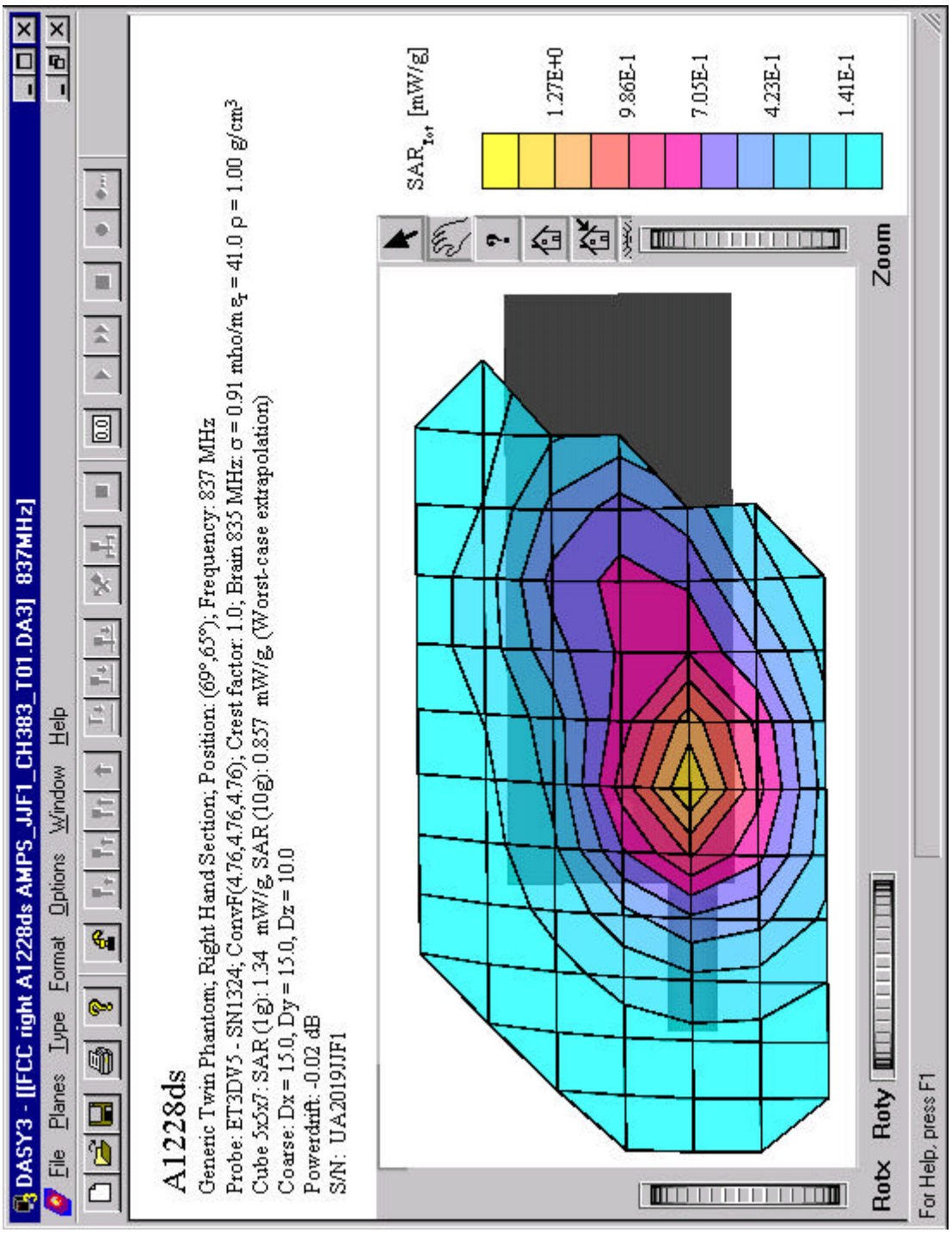
| Prepared (also subject responsible if other) | | No. | |
|---|---|---|---|
| RT/EUS/VR/X Mark Douglas | 919-472-6334 | EUS/VR-00:1417/REP | |
| Approved | Checked | Date / Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 / A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN




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

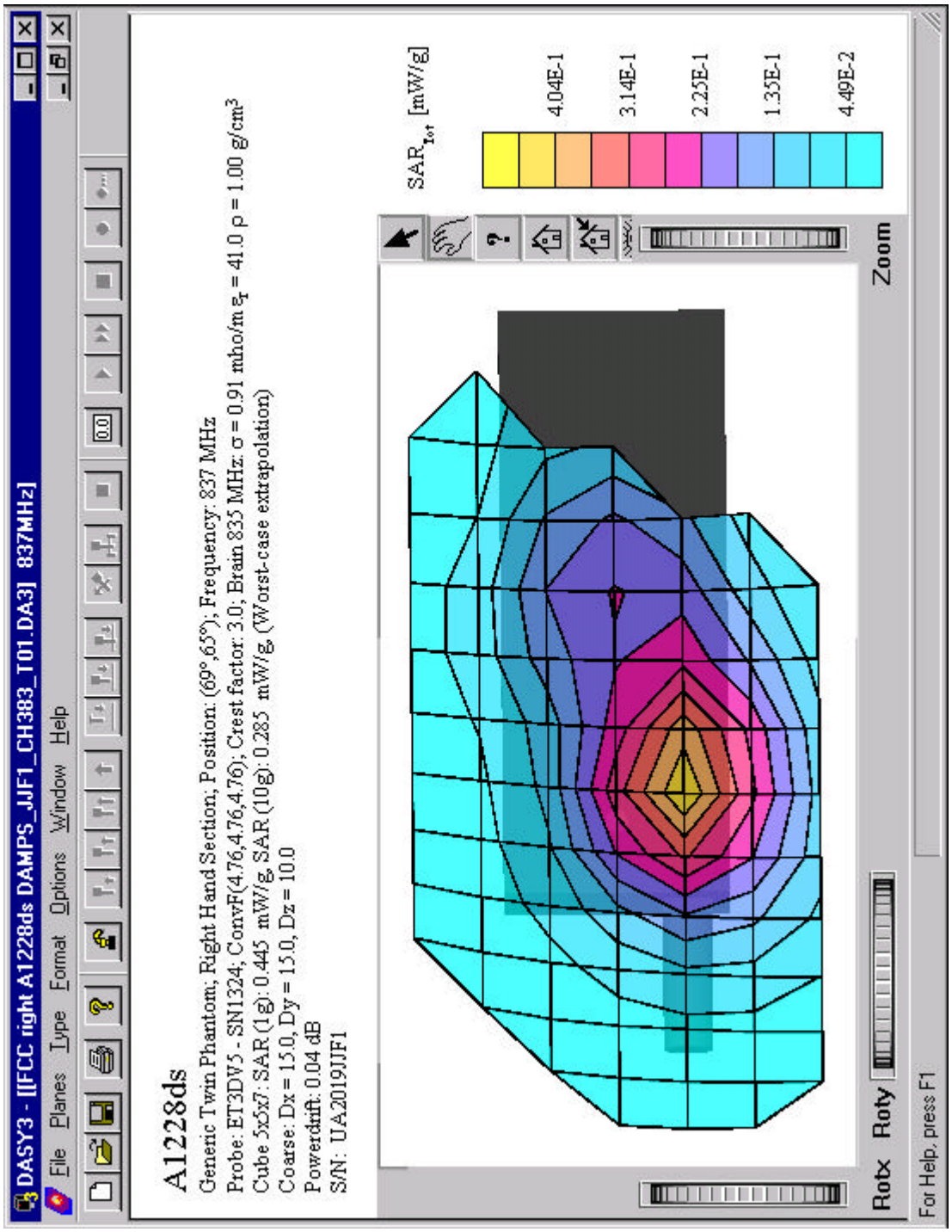
## Appendix 2: SAR distribution plots




**Distribution of maximum SAR in 800 AMPS band.**

| Prepared (also subject responsible if other) | | No. | |
|---|---|---|---|
| RT/EUS/VR/X Mark Douglas | 919-472-6334 | EUS/VR-00:1417/REP | |
| Approved | Checked | Date | Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 | A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN




**Distribution of maximum SAR in 800 D-AMPS band.**

## Appendix 3: Photographs of the device under test

**Front view of device.**

| Prepared (also subject responsible if other) | | No. | |
|---|---|---|---|
| RT/EUS/VR/X Mark Douglas | 919-472-6334 | EUS/VR-00:1417/REP | |
| Approved | Checked | Date / Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 / A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN

**Side view of device.**

Prepared (also subject responsible if other)
RT/EUS/VR/X Mark Douglas 919-472-6334

No.
EUS/VR-00:1417/REP

Approved
EUS/VR/X Mark Douglas

Checked
MGD

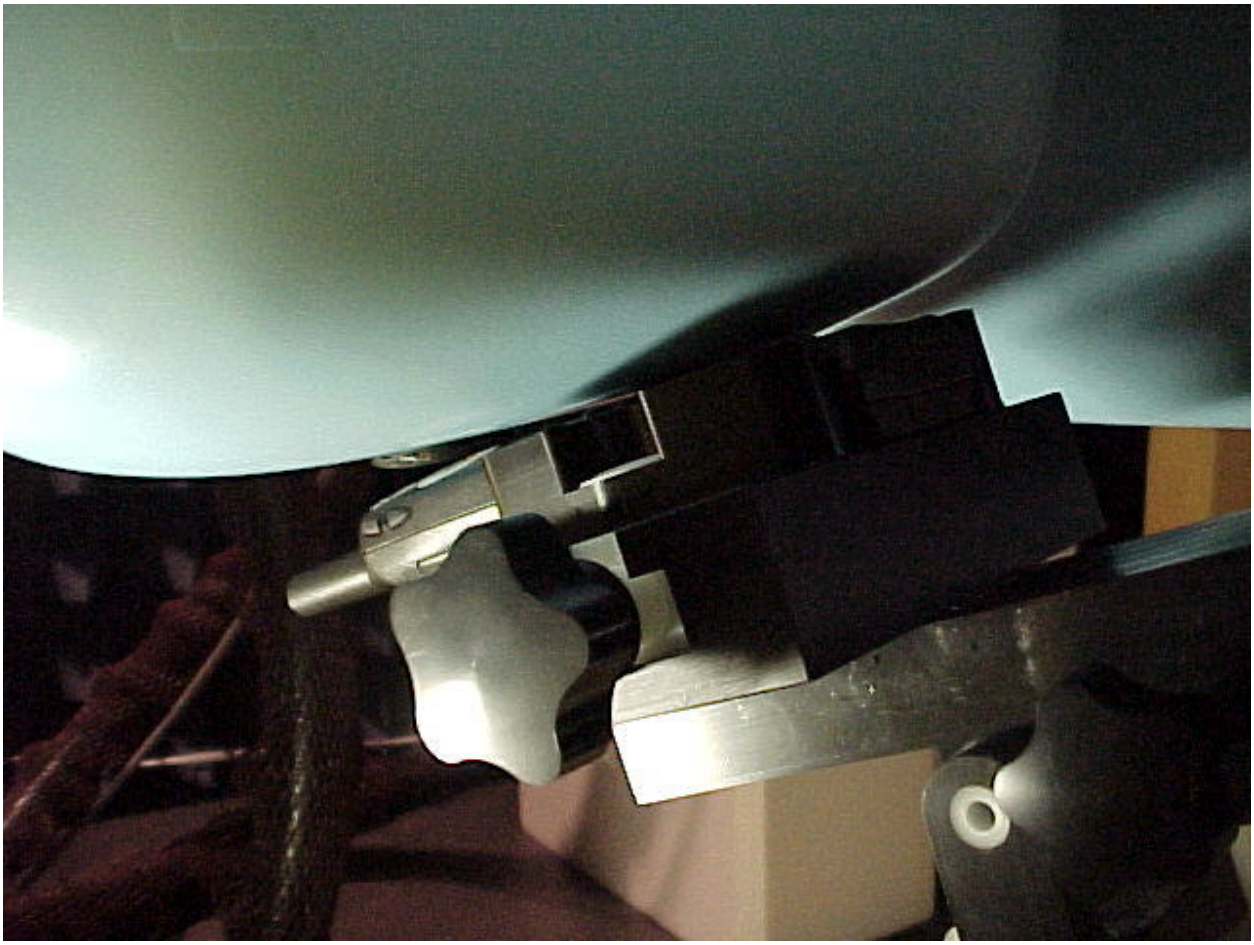
Date
2000-07-07

Rev
A

File
U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc

EN

## Appendix 4: Position of device on Generic Twin Phantom



| Prepared (also subject responsible if other) | | No. | | |
|---|---|---|---|---|
| RT/EUS/VR/X Mark Douglas 919-472-6334 | | EUS/VR-00:1417/REP | | |
| Approved | Checked | Date | Rev | File |
| EUS/VR/X Mark Douglas | MGD | 2000-07-07 | A | U:\FCC_TRNS\Fcc_388 Dolly Lite\Exhibit11\388-11.doc |

EN

## 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** $\varepsilon_r$ **= 48 ± 5%** $\sigma$ **= 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** $\varepsilon_r$ **= 42.5 ± 5%** $\sigma$ **= 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** $\varepsilon_r$ **= 41 ± 5%** $\sigma$ **= 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** $\varepsilon_r$ **= 41 ± 5%** $\sigma$ **= 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 |