



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*  
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## **Dosimetric Assessment Test Report**

for the

**Hospira, Inc.  
PlumA + with MedNet Wireless Enabled Infuser**

**Tested and Evaluated In Accordance With  
FCC OET 65 Supplement C: 01-01**

Prepared for

**Hospira, Inc.  
755 Jarvis Drive  
Morgan Hill, CA 95037**

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures specified in Supplement C to OET Bulletin 65 of the Federal Communications Commission (FCC) Guidelines [FCC 2001] and Industry Canada RSS-102 for uncontrolled exposure. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment evaluated is capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1-1999.



## ***SAR Evaluation Certificate of Compliance***

FCC ID: STJ-20677  
APPLICANT: Hospira, Inc.

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**Applicant Name and Address:** Hospira, Inc.  
755 Jarvis Drive  
Morgan Hill, CA 95037  
USA

**Test Location:** MET Laboratories, Inc.  
4855 Patrick Henry Dr. Bldg #6  
Santa Clara, CA 95054  
USA

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|                                                      |                                                                                            |                |          |
|------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------|----------|
| <b>EUT:</b>                                          | PlumA + with MedNet Wireless Enabled Infuser                                               |                |          |
| <b>Date of Receipt:</b>                              | December 29, 2004                                                                          |                |          |
| <b>Device Category:</b>                              | FCC 15.247, RSS-102                                                                        |                |          |
| <b>RF exposure environment:</b>                      | Uncontrolled Exposure/General Population                                                   |                |          |
| <b>RF exposure category:</b>                         | Portable                                                                                   |                |          |
| <b>Power supply:</b>                                 | Primary Power: 120 Vac, 60 Hz<br>Secondary: 6V 4.2Ah Rechargeable Sealed Lead-Acid Battery |                |          |
| <b>Antenna:</b>                                      | Surface Mount Ring Type Inverted F                                                         |                |          |
| <b>Production/prototype:</b>                         | Production                                                                                 |                |          |
| <b>Modulation:</b>                                   | DTS                                                                                        |                |          |
| <b>Crest Factor:</b>                                 | 1:90                                                                                       |                |          |
| <b>TX Range:</b>                                     | 2412.0 – 2462.0MHz                                                                         |                |          |
| <b>Maximum RF Power Output<br/>2400MHz DTS Mode:</b> | 2412.0 MHz                                                                                 | Peak Conducted | 18.05dBm |
|                                                      | 2437.0 MHz                                                                                 | Peak Conducted | 19.10dBm |
|                                                      | 2462.0 MHz                                                                                 | Peak Conducted | 19.59dBm |
| <b>Maximum SAR Measurement</b>                       | <b>0.015mW/g</b>                                                                           |                |          |

Shawn McMillen  
Senior Engineer





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## **INTRODUCTION**

This measurement report demonstrates that the Hospira, Inc., Pluma + with MedNet Wireless Enabled Infuser FCC ID: STJ-20677 described within this report complies with the Specific Absorption Rate (SAR) RF exposure requirements specified in ANSI/IEEE Std. C95.1-1999 and FCC 47 CFR §2.1093 for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 were employed.

A description of the device under test, device operating configuration and test conditions, measurement and site description, methodology and procedures used in the evaluation, equipment used, detailed summary of the test results and the various provisions of the rules are included in this dosimetric assessment test report.

## **SAR DEFINITION**

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy ( $dU$ ) absorbed by (dissipated in) an incremental mass ( $dm$ ) contained in a volume element ( $dV$ ) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 1.1).

$$SAR = \frac{d}{dt} \left( \frac{dU}{dm} \right) = \frac{d}{dt} \left( \frac{dU}{\rho dv} \right)$$

**Figure 1.1**  
**SAR Mathematical Equation**

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \sigma E^2 / \rho$$

where:

- $\sigma$  - conductivity of the tissue - simulant material (S/m)
- $\rho$  - mass density of the tissue - simulant material (kg/m<sup>3</sup>)
- E - Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.



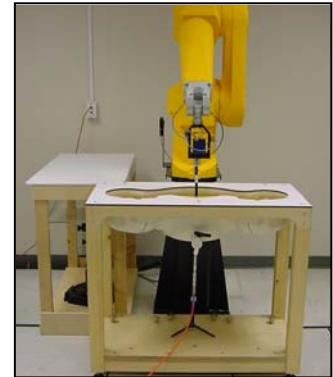
## **DESCRIPTION OF DEVICE UNDER TEST (EUT)**

|                                                          |                                                                                            |                |            |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------|------------|
| <b>Applicant:</b>                                        | Hospira, Inc.                                                                              |                |            |
| <b>Description of Test Item:</b>                         | PlumA + with MedNet Wireless Enabled Infuser                                               |                |            |
| <b>FCC ID:</b>                                           | STJ-20677                                                                                  |                |            |
| <b>IC ID:</b>                                            | 5627A-20677                                                                                |                |            |
| <b>with MedNet Wireless Enabled Infuser Part Number:</b> | 840-9S205-001                                                                              |                |            |
| <b>Serial Number:</b>                                    | D075087-003                                                                                |                |            |
| <b>Supply Voltage:</b>                                   | Primary Power: 120 Vac, 60 Hz<br>Secondary: 6V 4.2Ah Rechargeable Sealed Lead-Acid Battery |                |            |
| <b>Antenna Type(s) Tested:</b>                           | Surface Mount Ring Type Inverted F                                                         |                |            |
| <b>Modes and Bands of Operation:</b>                     | DTS 2450MHz                                                                                |                |            |
| <b>Maximum Duty Cycle Tested:</b>                        | 10%                                                                                        |                |            |
| <b>Transmitter Frequency Range (MHz)</b>                 | 2412.0 – 2462.0MHz                                                                         |                |            |
| <b>Tested Frequency (MHz)</b>                            | 2412.0 MHz                                                                                 | 2437.0 MHz     | 2462.0 MHz |
| <b>Maximum RF Power Output 2400MHz DTS Mode:</b>         | 2412.0 MHz                                                                                 | Peak Conducted | 18.05dBm   |
|                                                          | 2437.0 MHz                                                                                 | Peak Conducted | 19.10dBm   |
|                                                          | 2462.0 MHz                                                                                 | Peak Conducted | 19.59dBm   |
| <b>Maximum SAR Measured</b>                              | 0.015mW/g @ mid channel                                                                    |                |            |
| <b>Application Type:</b>                                 | Certification                                                                              |                |            |
| <b>Exposure Category:</b>                                | Uncontrolled Environment / General Population                                              |                |            |
| <b>FCC and IC Rule Part(s):</b>                          | FCC 47 CFR §2.1093, Part 15.247 Subpart C, RSS-102                                         |                |            |
| <b>Standards:</b>                                        | IEEE Std. 1528-2003, FCC OET Bulletin 65, Supplement C, Edition 01-01                      |                |            |



## **SAR MEASUREMENT SYSTEM**

MET Laboratories, Inc SAR measurement facility utilizes the DASY4 Professional Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland for performing SAR compliance tests. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). The Cell controller system contain the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit.



Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



## MEASUREMENT SUMMARY

| <b>BODY SAR MEASUREMENT RESULTS (2450MHz) Band</b>                                                                                                           |             |                  |                                           |                     |                     |                          |                                |                                        |                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|-------------------------------------------|---------------------|---------------------|--------------------------|--------------------------------|----------------------------------------|-------------------------------|
| <b>Freq (MHz)</b>                                                                                                                                            | <b>Chan</b> | <b>Test Mode</b> | <b>Conducted Power Before/After (dBm)</b> | <b>Power Supply</b> | <b>Antenna Type</b> | <b>EUT Test Position</b> | <b>Phantom Section</b>         | <b>Antenna housing Sep. Dist. (cm)</b> | <b>Measured SAR 1g (W/kg)</b> |
| 2437.0                                                                                                                                                       | 6           | DTS              | 19.10                                     | AC                  | Ring                | Back                     | Planar                         | 0.0                                    | 0.014                         |
| 2437.0                                                                                                                                                       | 6           | DTS              | 19.10                                     | Lead Acid           | Ring                | Back                     | Planar                         | 0.0                                    | 0.015                         |
| 2437.0                                                                                                                                                       | 6           | DTS              | 19.10                                     | Lead Acid           | Ring                | Top                      | Planar                         | 0.0                                    | 0.007                         |
| 2437.0                                                                                                                                                       | 6           | DTS              | 19.10                                     | Lead Acid           | Ring                | Side                     | Planar                         | 0.0                                    | 0.00447                       |
| <b>ANSI/IEEE C95.1 1992 – SAFETY LIMIT</b><br><b>BODY: 1.6 W/kg (averaged over 1 gram)</b><br><b>Spatial Peak – Uncontrolled Exposure/General Population</b> |             |                  |                                           |                     |                     |                          |                                |                                        |                               |
| <b>Measured Mixture Type</b>                                                                                                                                 |             |                  | 2450 MHz Body                             |                     |                     | <b>Date Tested</b>       |                                | December 29, 2004                      |                               |
| <b>Dielectric Constant <math>\epsilon_r</math></b>                                                                                                           |             |                  | <b>IEEE Target</b>                        |                     | <b>Measured</b>     |                          | <b>Crest Factor</b>            |                                        | 90                            |
|                                                                                                                                                              |             |                  | 52.7                                      |                     | 54.2                |                          | <b>Ambient Temperature (C)</b> |                                        | 21.6                          |
| <b>Conductivity <math>\sigma</math> (mho/m)</b>                                                                                                              |             |                  | <b>IEEE Target</b>                        |                     | <b>Measured</b>     |                          | <b>Fluid Temperature (C)</b>   |                                        | 20.9                          |
|                                                                                                                                                              |             |                  | 1.95                                      |                     | 2.04                |                          | <b>Fluid Depth</b>             |                                        | $\geq 15\text{cm}$            |



## **DETAILS OF SAR EVALUATION**

The Hospira, Inc., PlumA + with MedNet Wireless Enabled Infuser was determined to be compliant for localized Specific Absorption Rate based on the test provisions and conditions described below.

1. The EUT was tested for body SAR in three different orientations. The EUT was placed with the back, top and side of the EUT next to the planar section of the phantom in order to facilitate a 0.0cm separation between the antenna housing and the phantom surface. The EUT was tested at the mid channel of the TX band. If the mid channel SAR values were  $>3\text{dB}$  from the limit, low and high channels were considered optional.
2. The EUT was placed into a test mode using software at a data rate of 11mb/sec which produced the highest conducted power level. The unit communicated with the base station over the course of the evaluation. The duty cycle was set to 10%. The conducted power levels were measured before and after each test using an Anritsu Power Meter ML2488A according to the procedures described in FCC 47 CFR 2.1046.
3. The SAR evaluations were performed with AC power and a fully charged battery.
4. The dielectric parameters of the simulated body fluid were measured prior to the evaluation using an 85070D Dielectric Probe Kit and an 8722D Network Analyzer.
5. The fluid temperature was measured prior to and after each SAR evaluation to ensure the temperature remained within  $\pm 2$  deg C of the temperature of the fluid when the dielectric properties were measured.
6. During the SAR evaluations if a distribution produced several hotspots over the course of the area scan, each hotspot was evaluated separately.
7. The measurement results were either at or near the noise floor of the SAR system. The antenna type produced obscure SAR results. In order to verify that the measurement results were accurate, various scans were performed at different sampling durations. An initial area and zoom scan was performed using a 0.5 second sampling duration. An additional area and zoom scan was performed using a sampling duration of 2.0 seconds. Both plots produced the same SAR distribution. It is therefore assumed that the SAR plots represent the actual RF exposure for this device.



## **EVALUATION PROCEDURES**

The evaluation was performed in the applicable area of the phantom depending on the type of device being tested.

- (i) For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
- (ii) For body-worn and face-held devices a planar phantom was used.

The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

Based on the area scan, a 32mm x 32mm x 34mm (7x7x7 data points) zoom scan was assessed at the position where the greatest V/m was detected. The data at the surface was extrapolated since the distance from the probes sensors to the surface is 3.9cm. A least squares fourth-order polynomial was used to generate points between the probe detector and the inner surface of the phantom.

Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

Z-Scan was determined as follows:

The Z-scan measures points along a vertical straight line. The line runs along a line normal to the inner surface of the phantom surface.



## **DATA EVALUATION PROCEDURES**

The DASY4 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

|                    |                            |                                  |
|--------------------|----------------------------|----------------------------------|
| Probe Parameters:  | - Sensitivity              | $Norm_i, a_{i0}, a_{i1}, a_{i2}$ |
|                    | - Conversion Factor        | $ConvF_i$                        |
|                    | - Dipole Compression Point | $dcp_i$                          |
| Device parameters: | - Frequency                | $f$                              |
|                    | - Crest factor             | $cf$                             |
| Media parameters:  | - Conductivity             | $\sigma$                         |
|                    | - Density                  | $\rho$                           |

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC - transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

With  $V_i$  = Compensated signal of channel i (i = x, y, z)  
 $U_i$  = Input signal of channel i (i = x, y, z)  
 $cf$  = Crest factor of exciting field (DASY parameter)  
 $dcp_i$  = Diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E - fieldprobes : } E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H - fieldprobes : } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

with  $V_i$  = Compensated signal of channel i (i = x, y, z)  
 $Norm_i$  = Sensor sensitivity of channel i (i = x, y, z)  
 $\mu V/(V/m)^2$  for E-field probes  
 $ConvF$  = Sensitivity enhancement in solution  
 $a_{ij}$  = Sensor sensitivity factors for H-field probes  
 $f$  = Carrier frequency (GHz)  
 $E_i$  = Electric field strength of channel i in V/m  
 $H_i$  = Magnetic field strength of channel i in A/m



The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

with  $SAR$  = local specific absorption rate in mW/g  
 $E_{tot}$  = total field strength in V/m  
 $\sigma$  = conductivity in [mho/m] or [Siemens/m]  
 $\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with  $P_{pwe}$  = Equivalent power density of a plane wave in mW/cm<sup>2</sup>  
 $E_{tot}$  = total electric field strength in V/m  
 $H_{tot}$  = total magnetic field strength in A/m

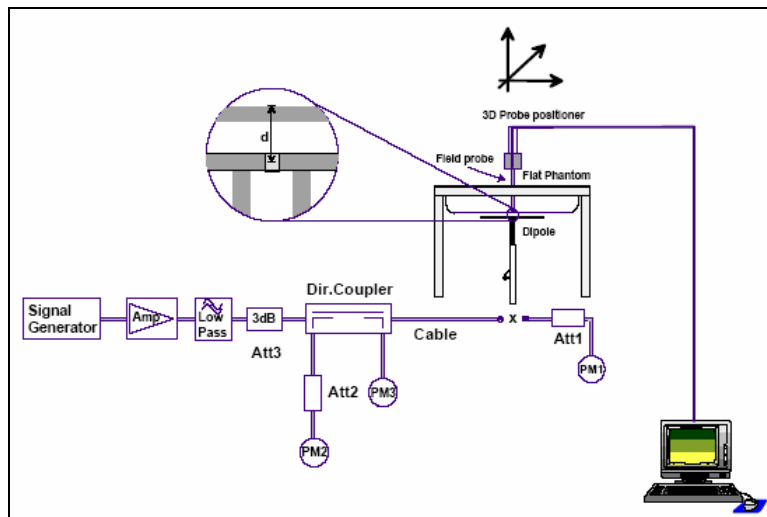


## SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed in the planar section of the SAM phantom with a 2450 MHz dipole. The dielectric parameters of the simulated brain fluid were measured prior to the system performance check using an 85070D Dielectric Probe Kit and an 8722D Network Analyzer. A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of +10%.

| Test Date | 2450MHz Equivalent Tissue | SAR 1g (W/kg)     |          | Permittivity Constant $\epsilon_r$ |          | Conductivity $\sigma$ (mho/m) |          | Ambient Temp. (C) | Fluid Temp. (C) | Fluid Depth (cm) |
|-----------|---------------------------|-------------------|----------|------------------------------------|----------|-------------------------------|----------|-------------------|-----------------|------------------|
|           |                           | Calibrated Target | Measured | IEEE Target                        | Measured | IEEE Target                   | Measured |                   |                 |                  |
| 12/29/04  | Head                      | 50.4±5%           | 49.2     | 39.2 ±5%                           | 38.9     | 1.80±10%                      | 1.83     | 21.6              | 20.9            | ≥15              |

Note: The ambient and fluid temperatures were measured prior to the fluid parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.



## SIMULATED EQUIVALENT TISSUES

| Simulated Tissue Mixture |                         |                  |
|--------------------------|-------------------------|------------------|
| Ingredient               | 2450MHz Head Validation | 2450MHz Body EUT |
| Water                    | 46.7%                   | 73.3%            |
| DGMBE                    | 53.3%                   | 26.7%            |



### **SAR SAFETY LIMITS**

| <b>EXPOSURE LIMITS</b>                                       | <b>SAR (W/kg)</b>                                               |                                                         |
|--------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------|
|                                                              | <b>(General Population / Uncontrolled Exposure Environment)</b> | <b>(Occupational / Controlled Exposure Environment)</b> |
| Spatial Average<br>(averaged over the whole body)            | 0.08                                                            | 0.4                                                     |
| Spatial Peak<br>(averaged over any 1g of tissue)             | 1.60                                                            | 8.0                                                     |
| Spatial Peak<br>(hands/wrists/feet/ankles averaged over 10g) | 4.0                                                             | 20.0                                                    |

Notes:

1. Uncontrolled exposure environments are locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled exposure environments are locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.



## **ROBOT SYSTEM SPECIFICATIONS**

### **1.1. SPECIFICATIONS**

Positioner:

|                |                                           |
|----------------|-------------------------------------------|
| Robot:         | Staubli Unimation Corp. Robot Model: RX90 |
| Repeatability: | 0.02 mm                                   |
| No. of axis:   | 6                                         |

### **1.2. DATA ACQUISITION ELECTRONIC (DAE) SYSTEM:**

Cell Controller

|            |                                           |
|------------|-------------------------------------------|
| Processor: | Compaq Evo                                |
|            | Clock Speed: 2.4 GHz                      |
|            | Operating System: Windows XP Professional |

Data Converter

|                   |                                                                                     |
|-------------------|-------------------------------------------------------------------------------------|
| Features:         | Signal Amplifier, multiplexer, A/D converter, and control logic                     |
| Software:         | DASY4 software                                                                      |
| Connecting Lines: | Optical downlink for data and status info.<br>Optical uplink for commands and clock |

Dasy4 Measurement Server

|              |                                                                        |
|--------------|------------------------------------------------------------------------|
| Function:    | Real-time data evaluation for field measurements and surface detection |
| Hardware:    | PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM                   |
| Connections: | COM1, COM2, DAE, Robot, Ethernet, Service Interface                    |

E-Field Probe

|               |                                              |
|---------------|----------------------------------------------|
| Model:        | ET3DV6                                       |
| Serial No.:   | 1793                                         |
| Construction: | Triangular core fiber optic detection system |
| Frequency:    | 10 MHz to 6 GHz                              |
| Linearity:    | $\pm 0.2$ dB (30 MHz to 3 GHz)               |

EX-Probe

|               |                                |
|---------------|--------------------------------|
| Model:        | EX3DV3                         |
| Serial No.    | 3511                           |
| Construction: | Triangular core                |
| Frequency:    | 10 MHz to > 6 GHz              |
| Linearity:    | $\pm 0.2$ dB (30 MHz to 3 GHz) |

### **1.3. PHANTOM(S):**

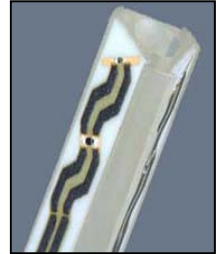
Validation & Evaluation Phantom

|                 |                   |
|-----------------|-------------------|
| Type:           | SAM V4.0C         |
| Shell Material: | Fiberglass        |
| Thickness:      | 2.0 0.1 mm        |
| Volume:         | Approx. 20 liters |



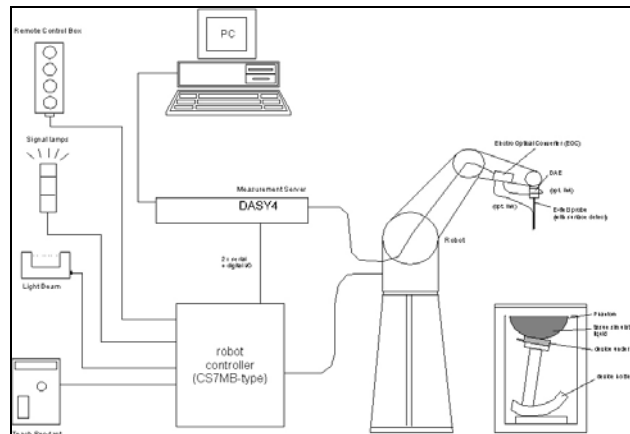
### **PROBE SPECIFICATIONS (ET3DV6)**

|                    |                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction:      | Symmetrical design with triangular core<br>Built-in optical fiber for surface detection system<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g. glycolether) |
| Calibration:       | Basic Broadband calibration in air from 10 MHz to 3 GHz                                                                                                                                                                  |
| Frequency:         | 10 MHz to 3 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)                                                                                                                                                               |
| Directivity:       | $\pm 0.2$ dB in HSL (rotation around probe axis)<br>$\pm 0.4$ dB in HSL (rotation normal to probe axis)                                                                                                                  |
| Dynamic Range:     | $5 \mu$ W/g to $> 100$ mW/g; Linearity: $\pm 0.2$ dB                                                                                                                                                                     |
| Surface Detection: | $\pm 0.2$ mm repeatability in air and clear liquid over diffuse reflecting surfaces                                                                                                                                      |
| Dimensions:        | Overall length: 330 mm (Tip: 16 mm)<br>Tip diameter (including protective cover): 6.8 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.7 mm                                                              |
| Application:       | General dosimetric measurements up to 3 GHz<br>Compliance tests of mobile phones<br>Fast automatic scanning in arbitrary phantoms                                                                                        |





## SAR Measurement System



**Measurement System Diagram**

### **1.4. RX90BL ROBOT**

The Stäubli RX90BL Robot is a standard high precision 6-axis robot with an arm extension for accommodating the data acquisition electronics (DAE).

### **1.5. ROBOT CONTROLLER**

The CS7MB Robot Controller system drives the robot motors. The system consists of a power supply, robot controller, and remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.

### **1.6. LIGHT BEAM SWITCH**

The Light Beam Switch (Probe alignment tool) allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured as well as the probe length and the horizontal probe offset. The software then corrects all movements, so that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



### **1.7. DATA ACQUISITION ELECTRONICS**

The Data Acquisition Electronics consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain switching multiplexer, a fast 16-bit A/D converter and a command decoder and control logic unit. Some of the tasks the DAE performs are signal amplification, signal multiplexing, A/D conversion, and offset measurements. The DAE also contains the mechanical probe-mounting device, which contains two different sensor systems for frontal and sideways probe contacts used for probe collision detection and mechanical surface detection for controlling the distance between the probe and the inner surface of the phantom shell. Transmission from the DAE to the measurement server, via the EOC, is through an optical downlink for data and status information as well as an optical uplink for commands and the clock.





### 1.8. ELECTO-OPTICAL CONVERTER (EOC)

The Electro-Optical Converter performs the conversion between the optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC connects to, and transfers data to, the DASY4 measurement server. The EOC also contains the fiber optical surface detection system for controlling the distance between the probe and the inner surface of the phantom shell.



### 1.9. MEASUREMENT SERVER

The Measurement Server performs time critical tasks such as signal filtering, all real-time data evaluation for field measurements and surface detection, controls robot movements, and handles safety operation. The PC-operating system cannot interfere with these time critical processes. A watchdog supervises all connections, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements.



### 1.10. DOSIMETRIC PROBE

Dosimetric Probe is a symmetrical design with triangular core that incorporates three 3 mm long dipoles arranged so that the overall response is close to isotropic. The probe sensors are covered by an outer protective shell, which is resistant to organic solvents i.e. glycol. The probe is equipped with an optical multi-fiber line, ending at the front of the probe tip, for optical surface detection. This line connects to the EOC box on the robot arm and provides automatic detection of the phantom surface. The optical surface detection works in transparent liquids and on diffuse reflecting surfaces with a repeatability of better than  $\pm 0.1\text{mm}$ .



### 1.11. SAM PHANTOM

The SAM (Specific Anthropomorphic Mannequin) twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm) integrated into a wooden table. The shape of the shell corresponds to the phantom defined by SCC34-SC2. It enables the dosimetric evaluation of left hand, right hand phone usage as well as body mounted usage at the flat phantom region. The flat section is also used for system validation and the length and width of the flat section are at least  $0.75\lambda_0$  and  $0.6\lambda_0$  respectively at frequencies of 824 MHz and above ( $\lambda_0$  = wavelength in air).

Reference markings on the phantom top allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. A white cover is provided to cover the phantom during off-periods preventing water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible. The phantom is filled with a tissue simulating liquid to a depth of at least 15 cm at each ear reference point. The bottom plate of the wooden table contains three pair of bolts for locking the device holder.



### 1.12. PLANAR PHANTOM

The planar phantom is constructed of Plexiglas material with a 2.0 mm shell thickness for face-held and body-worn SAR evaluations of handheld radio transceivers. The planar phantom is mounted on the wooden table of the DASY4 system.



### 1.13. VALIDATION PLANAR PHANTOM

The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for system validations at 450MHz and below. The validation planar phantom is mounted on the wooden table of the DASY4 system.





#### **1.14. DEVICE HOLDER**

The device holder is designed to cope with the different measurement positions in the three sections of the SAM phantom given in the standard. It has two scales, one for device rotation (with respect to the body axis) and one for device inclination (with respect to the line between the ear openings). The rotation center for both scales is the ear opening, thus the device needs no repositioning when changing the angles. The plane between the ear openings and the mouth tip has a rotation angle of  $65^\circ$ .

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity  $\epsilon = 3$  and loss tangent  $\delta = 0.02$ . The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



The dielectric properties of the liquid conform to all the tabulated values [2-5]. Liquids are prepared according to Annex A and dielectric properties are measured according to Annex B.

#### **1.15. SYSTEM VALIDATION KITS**

Power Capability:  $> 100 \text{ W}$  ( $f < 1\text{GHz}$ );  $> 40 \text{ W}$  ( $f > 1\text{GHz}$ )

Construction: Symmetrical dipole with  $1/4$  balun Enables measurement of feed point impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 300, 450, 835, 1900, 2450 MHz

Return loss:  $>20 \text{ dB}$  at specified validation position

Dimensions:

|                  |                                                           |
|------------------|-----------------------------------------------------------|
| 300 MHz Dipole:  | Length: 396mm; Overall Height: 430 mm; Diameter: 6 mm     |
| 450 MHz Dipole:  | Length: 270 mm; Overall Height: 347 mm; Diameter: 6 mm    |
| 835 MHz Dipole:  | Length: 161 mm; Overall Height: 270 mm; Diameter: 3.6 mm  |
| 1900 MHz Dipole: | Length: 68 mm; Overall Height: 219 mm; Diameter: 3.6 mm   |
| 2450 MHz Dipole: | Length: 51.5 mm; Overall Height: 300 mm; Diameter: 3.6 mm |





## TEST EQUIPMENT LIST

| Test Equipment                                                                                                                                                                                            | Serial Number                                                                                  | Calibration Date                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| DASY4 System<br>Robot<br>ETVDV6<br>EX3DV3<br>DAE3<br>300MHz Dipole<br>450MHz Dipole<br>835MHz Dipole<br>1900MHz Dipole<br>2450MHz Dipole<br>SAM Phantom V4.0C<br>EUT Planar Phantom<br>Validation Phantom | FO3/SX19A1/A/01<br>1793<br>3511<br>584<br>003<br>004<br>493<br>001<br>002<br>N/A<br>N/A<br>N/A | N/A<br>Sept 2003<br>Jan 2004<br>Sept 2003<br>Dec 2004<br>Dec 2004<br>Sept 2003<br>Feb 2004<br>Feb 2004<br>N/A<br>N/A<br>N/A |
| 85070D Dielectric Probe Kt                                                                                                                                                                                | N/A                                                                                            | N/A                                                                                                                         |
| 83650B Signal Generator                                                                                                                                                                                   | 3844A00910                                                                                     | June 2004                                                                                                                   |
| HP E4418B Power Meter                                                                                                                                                                                     | GB40205140                                                                                     | June 2004                                                                                                                   |
| HP 8482A Power Sensor                                                                                                                                                                                     | 2607A11286                                                                                     | June 2004                                                                                                                   |
| HP 8722D Vector Network Analyzer                                                                                                                                                                          | 3S36140188                                                                                     | March 2004                                                                                                                  |
| Anritsu Power Meter ML2488A                                                                                                                                                                               | 6K00001832                                                                                     | June 2004                                                                                                                   |
| Anritsu Power Sensor                                                                                                                                                                                      | 030864                                                                                         | Jan 2004                                                                                                                    |
| Mini-Circuits Power Amplifier                                                                                                                                                                             | D111903#8                                                                                      | N/A                                                                                                                         |



## MEASUREMENT UNCERTAINTIES

### UNCERTAINTY ASSESSMENT FOR EUT

| Error Description               | Uncertainty Value<br>$\pm\%$ | Probability Distribution | Divisor    | $C_i$<br>1g | Standard Uncertainty<br>$\pm\%$ (1g) | $v_i$ or<br>$v_{eff}$ |
|---------------------------------|------------------------------|--------------------------|------------|-------------|--------------------------------------|-----------------------|
| Measurement System              |                              |                          |            |             |                                      |                       |
| Probe calibration               | $\pm 4.8$                    | Normal                   | 1          | 1           | $\pm 4.8$                            | $\infty$              |
| Axial isotropy of the probe     | $\pm 4.6$                    | Rectangular              | $\sqrt{3}$ | (1-cp)1/2   | $\pm 1.9$                            | $\infty$              |
| Spherical isotropy of the probe | $\pm 9.7$                    | Rectangular              | $\sqrt{3}$ | (cp)1/2     | $\pm 3.9$                            | $\infty$              |
| Boundary effects                | $\pm 8.5$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 4.8$                            | $\infty$              |
| Probe linearity                 | $\pm 4.5$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.7$                            | $\infty$              |
| Detection limit                 | $\pm 0.9$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.6$                            | $\infty$              |
| Readout electronics             | $\pm 1.0$                    | Normal                   | 1          | 1           | $\pm 1.0$                            | $\infty$              |
| Response time                   | $\pm 0.9$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.5$                            | $\infty$              |
| Integration time                | $\pm 1.2$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.8$                            | $\infty$              |
| RF ambient conditions           | $\pm 0.54$                   | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.43$                           | $\infty$              |
| Mech. constraints of robot      | $\pm 0.5$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.2$                            | $\infty$              |
| Probe positioning               | $\pm 2.7$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 1.7$                            | $\infty$              |
| Extrapolation & integration     | $\pm 4.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$              |
| <b>Test Sample Related</b>      |                              |                          |            |             |                                      |                       |
| Device positioning              | $\pm 2.2$                    | Normal                   | 1          | 1           | $\pm 2.23$                           | 11                    |
| Device holder uncertainty       | $\pm 5.0$                    | Normal                   | 1          | 1           | $\pm 5.0$                            | 7                     |
| Power drift                     | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ |             | $\pm 2.9$                            | $\infty$              |
| <b>Phantom and Setup</b>        |                              |                          |            |             |                                      |                       |
| Phantom uncertainty             | $\pm 4.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$              |
| Liquid conductivity (target)    | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$              |
| Liquid conductivity (measured)  | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 3.5/1.7$                        | $\infty$              |
| Liquid permittivity (target)    | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$              |
| Liquid permittivity (measured)  | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$              |
|                                 |                              |                          |            |             |                                      |                       |
| Combined Standard Uncertainty   |                              |                          |            |             | $\pm 12.14/11.76$                    |                       |
| Coverage Factor for 95%         |                              | Kp=2                     |            |             |                                      |                       |
| Expanded Uncertainty (k=2)      |                              |                          |            |             | $\pm 24.29/23.51$                    |                       |

Table: Worst-case uncertainty for DASY4 assessed according to IEEE P1528.

The budget is valid for the frequency range 300MHz to 6GHz and represents a worst-case analysis.



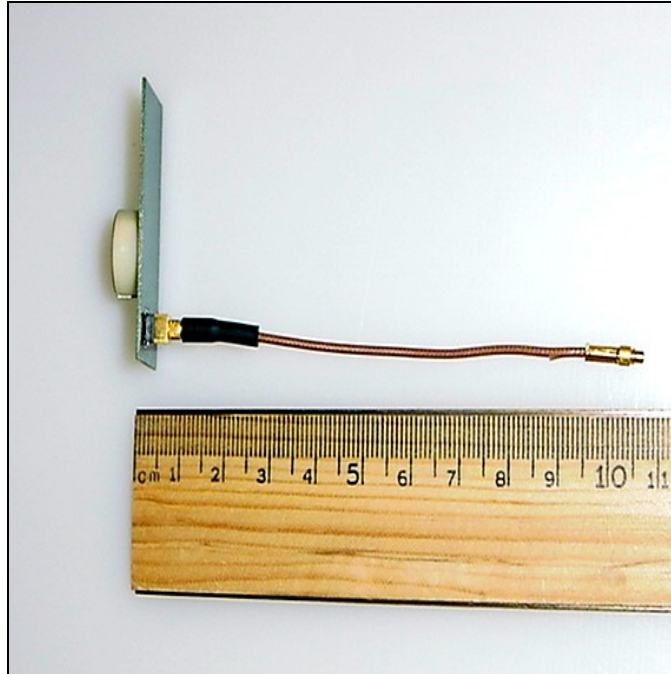
### UNCERTAINTY ASSESSMENT FOR SYSTEM VALIDATION

| Error Description               | Uncertainty Value<br>$\pm\%$ | Probability Distribution | Divisor    | $C_i$<br>1g | Standard Uncertainty<br>$\pm\%$ (1g) | $v_i$ or $v_{eff}$ |
|---------------------------------|------------------------------|--------------------------|------------|-------------|--------------------------------------|--------------------|
| Measurement System              |                              |                          |            |             |                                      |                    |
| Probe calibration               | $\pm 4.8$                    | Normal                   | 1          | 1           | $\pm 4.8$                            | $\infty$           |
| Axial isotropy of the probe     | $\pm 4.7$                    | Rectangular              | $\sqrt{3}$ | $(1-cp)1/2$ | $\pm 2.7$                            | $\infty$           |
| Spherical isotropy of the probe | $\pm 9.6$                    | Rectangular              | $\sqrt{3}$ | $(cp)1/2$   | $\pm 3.8$                            | $\infty$           |
| Boundary effects                | $\pm 1.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.0$                            | $\infty$           |
| Probe linearity                 | $\pm 4.7$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 3.2$                            | $\infty$           |
| Detection limit                 | $\pm 1.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.6$                            | $\infty$           |
| Readout electronics             | $\pm 1.0$                    | Normal                   | 1          | 1           | $\pm 1.0$                            | $\infty$           |
| Response time                   | $\pm 0.8$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.5$                            | $\infty$           |
| Integration time                | $\pm 1.3$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.8$                            | $\infty$           |
| RF ambient conditions           | $\pm 3.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 1.7$                            | $\infty$           |
| Mech. constraints of robot      | $\pm 0.4$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.2$                            | $\infty$           |
| Probe positioning               | $\pm 1.4$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 1.7$                            | $\infty$           |
| Extrapolation & integration     | $\pm 4.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$           |
| <b>Dipole</b>                   |                              |                          |            |             |                                      |                    |
| Dipole Axis to liquid distance  | $\pm 2.0$                    | Normal                   | 1          | 1           | $\pm 1.2$                            | 11                 |
| Input Power                     | $\pm 5.0$                    | Normal                   | 1          | 1           | $\pm 2.7$                            | 7                  |
| <b>Phantom and Setup</b>        |                              |                          |            |             |                                      |                    |
| Phantom uncertainty             | $\pm 4.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$           |
| Liquid conductivity (target)    | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
| Liquid conductivity (measured)  | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
| Liquid permittivity (target)    | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
| Liquid permittivity (measured)  | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
|                                 |                              |                          |            |             |                                      |                    |
| Combined Standard Uncertainty   |                              |                          |            |             | $\pm 9.8$                            |                    |
| Coverage Factor for 95%         |                              | Kp=2                     |            |             |                                      |                    |
| Expanded Uncertainty (k=2)      |                              |                          |            |             | $\pm 19.7$                           |                    |

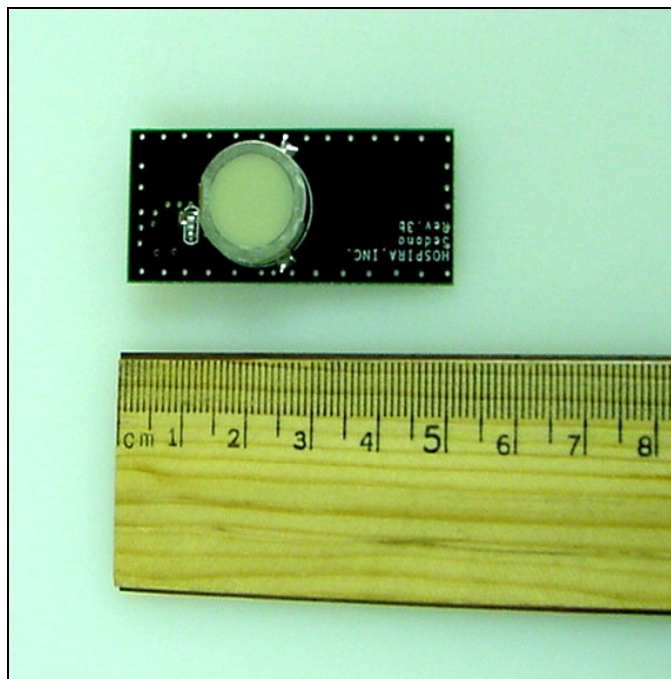
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**EUT PHOTOS**



Antenna and coaxial cable



Top view of antenna



RF board with Cans removed



RF board with Cans



Antenna mounted in housing



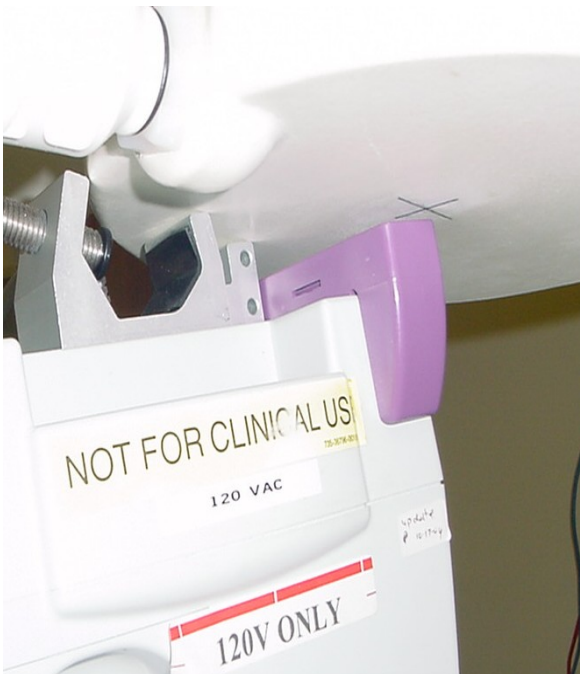
## TEST SET-UP



Side with AC power



Side with Battery Power



Back of EUT



Top of EUT



## **APPENDIX A - SAR MEASUREMENT DATA**

DUT: PlumA + Sedona Wireless Enabled Infuser;

Type: DTS; Serial: D075087-003

Date/Time: 12/29/04 10:08:06

Mid Channel 2437MHz; Back of EUT; AC Pwr; Cond Pwr: 19.10dBm

Communication System: DTS ; ; Frequency: 2437 MHz;Duty Cycle: 1:90

Medium: M2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.04$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Medium Notes: Ambient Temp: 21.6 deg C, Fluid Temp 20.9 deg C.

- Probe: EX3DV3 - SN3511; ConvF(7.66, 7.66, 7.66); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

**Area Scan (91x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.048 mW/g

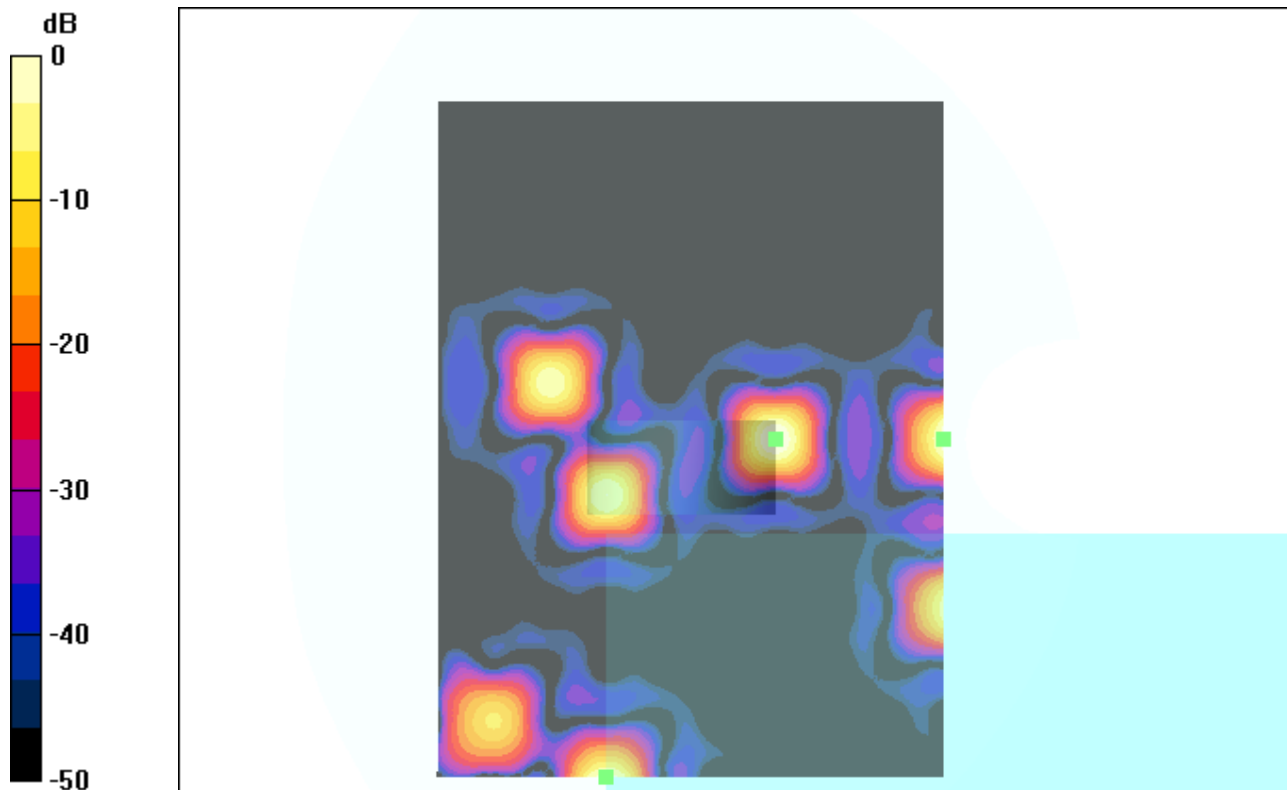
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.36 V/m; Power Drift = -0.2 dB

Peak SAR (extrapolated) = 0.184 W/kg

**SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00687 mW/g**

Maximum value of SAR (measured) = 0.158 mW/g



0 dB = 0.048mW/g

DUT: PlumA + Sedona Wireless Enabled Infuser;

Type: DTS; Serial: D075087-003

Date/Time: 12/29/04 11:18:06

Mid Channel 2437MHz; Back of EUT; Battery Pwr; Cond Pwr: 19.10dBm

Communication System: DTS ; ; Frequency: 2437 MHz;Duty Cycle: 1:90

Medium: M2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.04$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Medium Notes: Ambient Temp: 21.6 deg C, Fluid Temp 20.9 deg C.

- Probe: EX3DV3 - SN3511; ConvF(7.66, 7.66, 7.66); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

**Area Scan (91x121x1):** Measurement grid:  $dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.042 mW/g

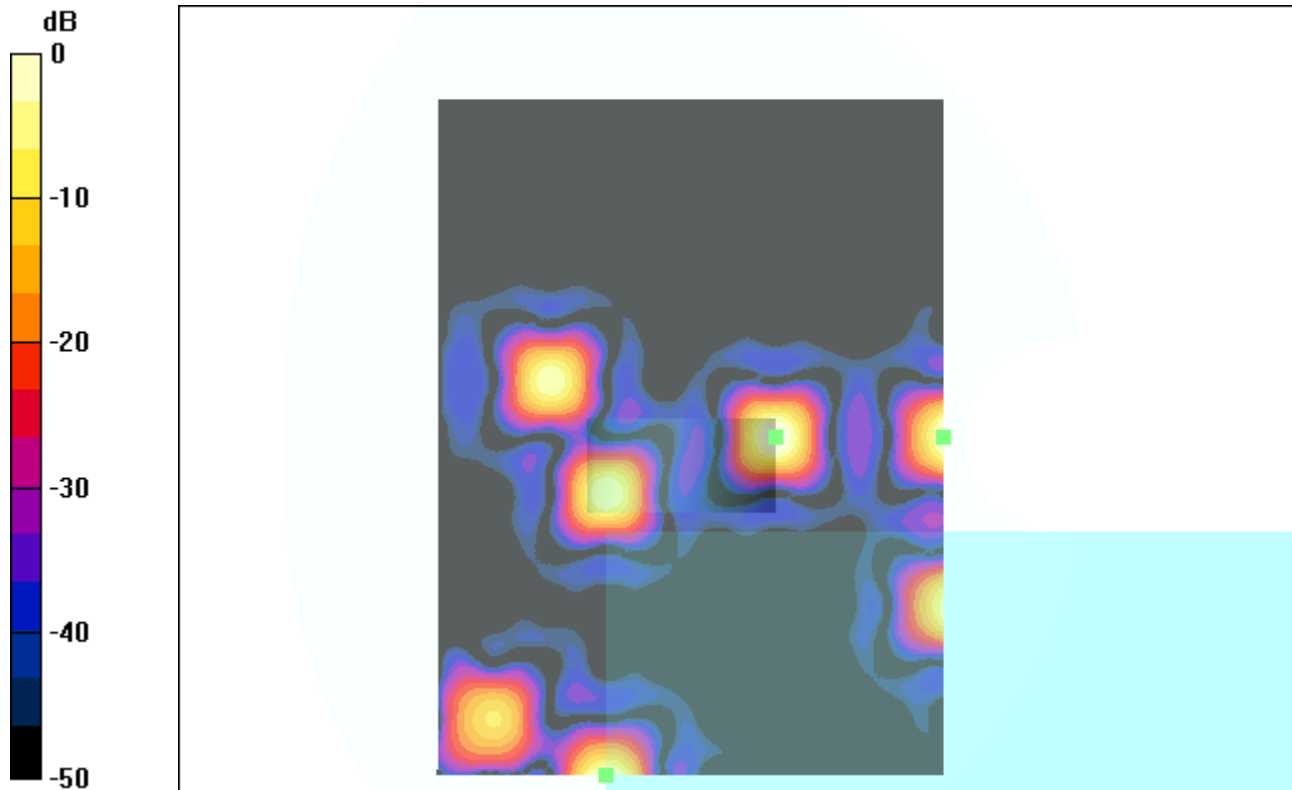
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 1.18V/m; Power Drift = -0.5dB

Peak SAR (extrapolated) = 0.158 W/kg

**SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00589 mW/g**

Maximum value of SAR (measured) = 0.138 mW/g



0 dB = 0.035mW/g

DUT: PlumA + Sedona Wireless Enabled Infuser;

Type: DTS; Serial: D075087-003

Date/Time: 12/29/04 15:08:02

Mid Channel 2437MHz; Top of EUT; Battery Pwr; Cond Pwr: 19.10dBm

Communication System: DTS ; ; Frequency: 2450 MHz;Duty Cycle: 1:90

Medium: M2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.04$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Medium Notes: Ambient Temp: 21.6 deg C, Fluid Temp 20.9 deg C.

- Probe: EX3DV3 - SN3511; ConvF(7.66, 7.66, 7.66); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

**Area Scan (91x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.00545 mW/g

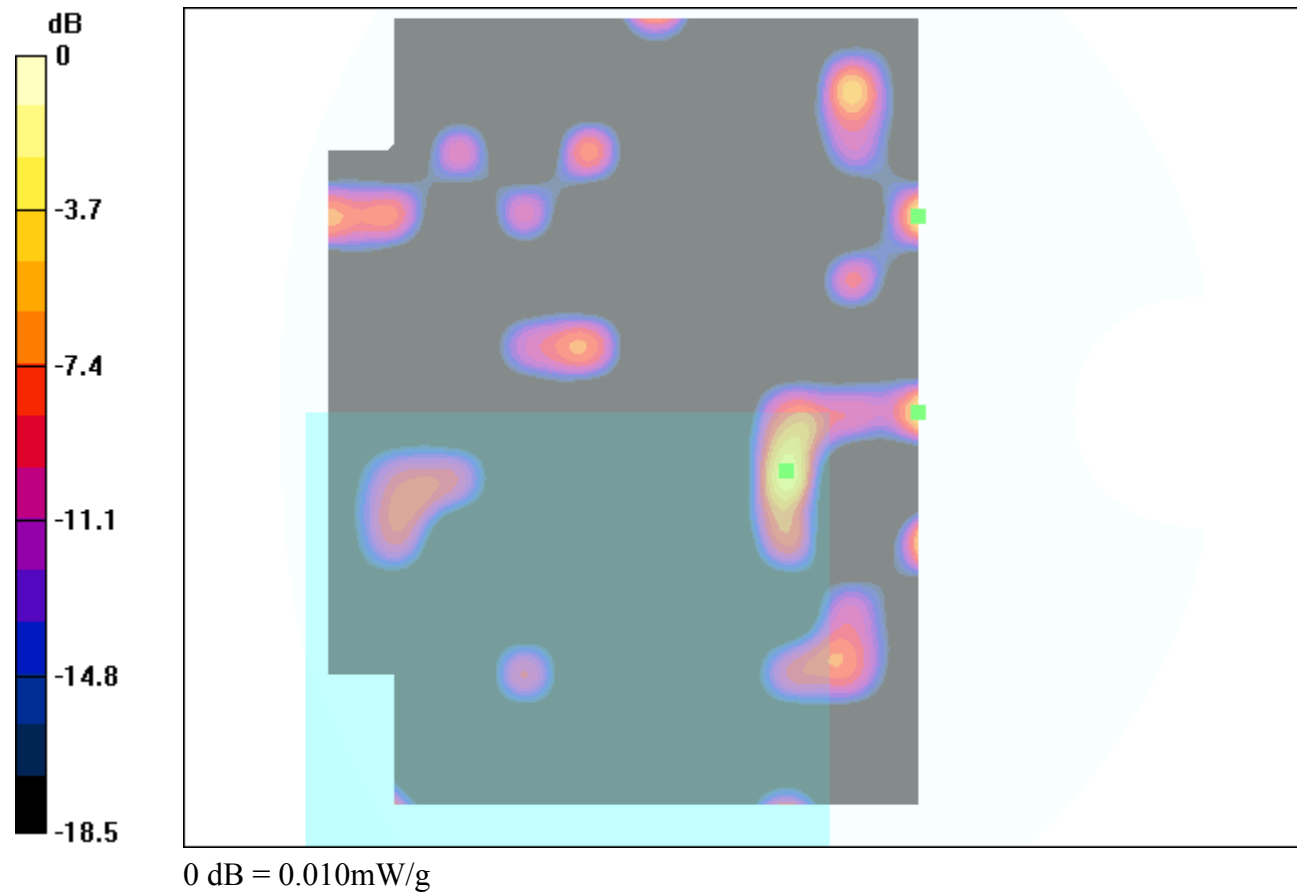
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.641 V/m; Power Drift = -0.3 dB

Peak SAR (extrapolated) = 0.092 W/kg

**SAR(1 g) = 0.007 mW/g; SAR(10 g) = 0.00351 mW/g**

Maximum value of SAR (measured) = 0.010 mW/g



DUT: PlumA + Sedona Wireless Enabled Infuser;

Type: DTS; Serial: D075087-003

Date/Time: 12/29/04 13:07:25

Mid Channel 2437MHz; Side of EUT; Battery Pwr; Cond Pwr: 19.10dBm

Communication System: DTS ; ; Frequency: 2450 MHz;Duty Cycle: 1:90

Medium: M2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.04$  mho/m;  $\epsilon_r = 54.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Medium Notes: Ambient Temp: 21.6 deg C, Fluid Temp 20.9 deg C.

- Probe: EX3DV3 - SN3511; ConvF(7.66, 7.66, 7.66); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

**Area Scan (91x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.007 mW/g

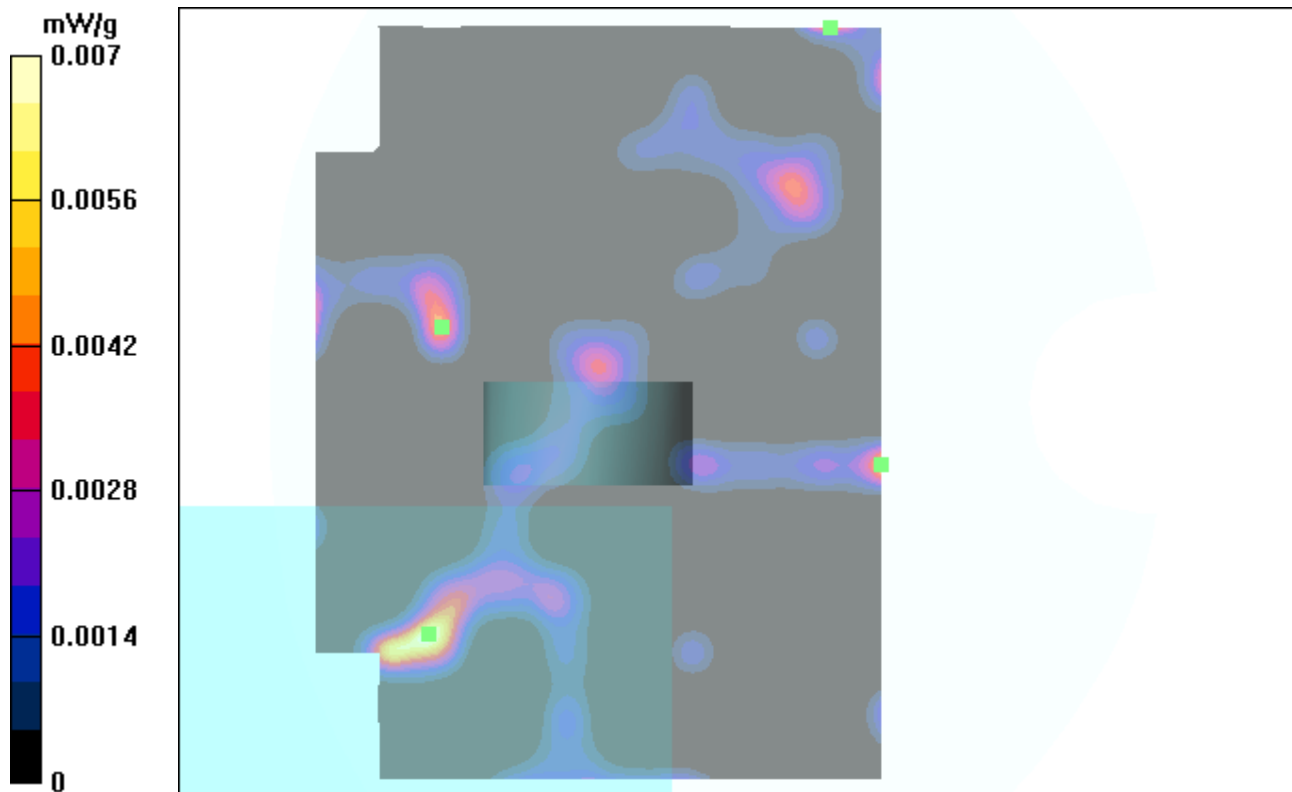
**Unnamed procedure/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.662 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 0.011 W/kg

**SAR(1 g) = 0.00447 mW/g; SAR(10 g) = 0.00211 mW/g**

Maximum value of SAR (measured) = 0.0068 mW/g





## **APPENDIX B - SYSTEM PERFORMANCE CHECK**

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: SN:002

Date/Time: 12/29/04 08:51:21

## 2450MHz System Validation

Communication System: CW; ; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.83$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Medium Notes: Ambient Temp: 21.6 deg C, Fluid Temp: 20.9 deg C

- Probe: EX3DV3 - SN3511; ConvF(7.5, 7.5, 7.5); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

**Area Scan (61x81x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 14.6 mW/g

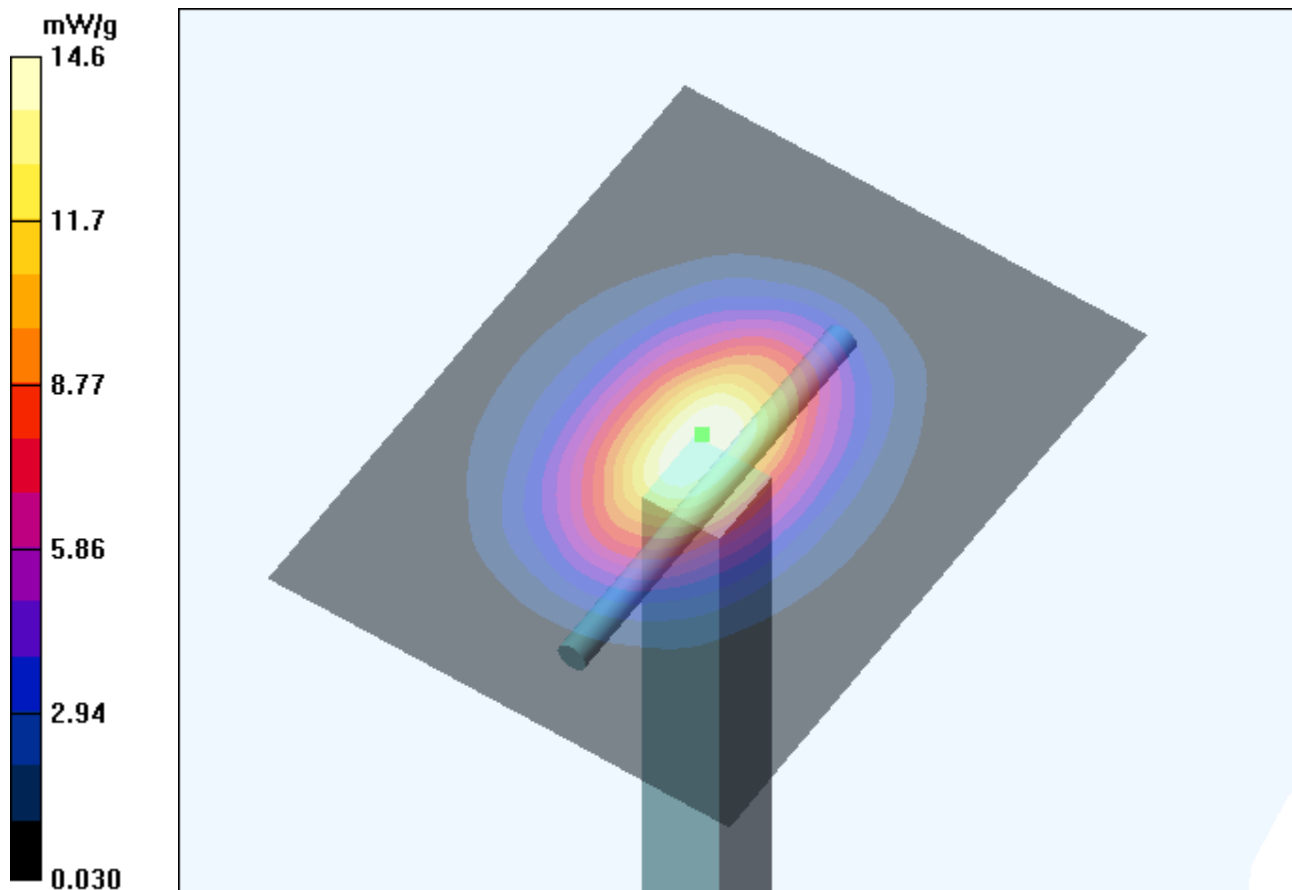
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.2 V/m; Power Drift = 0.0 dB

Peak SAR (extrapolated) = 26.6 W/kg

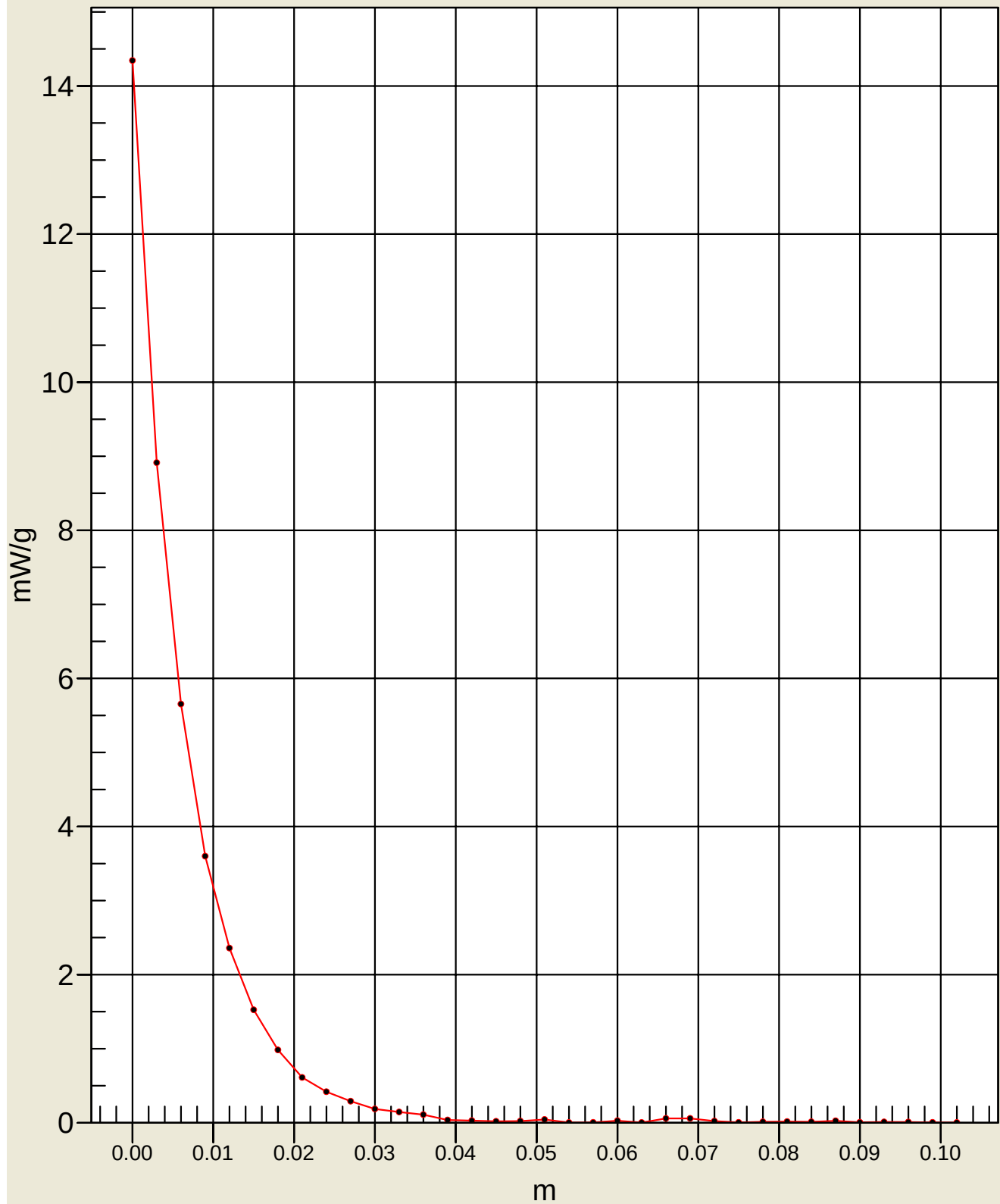
**SAR(1 g) = 12.3 mW/g; SAR(10 g) = 5.55 mW/g**

Maximum value of SAR (measured) = 14.1 mW/g



# SAR(x,y,z,f0)

SAR;Z Scan:2450MHz Validation





## **APPENDIX C – PROBE CALIBRATION CERTIFICATE**

**Client**                      **MET Laboratories EMC**

## CALIBRATION CERTIFICATE

Object(s)                      **EX3DV3 - SN:3511**

Calibration procedure(s)                      **QA CAL-01.v2**  
**Calibration procedure for dosimetric E-field probes**

Calibration date:                      **January 23, 2004**

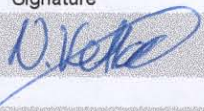
Condition of the calibrated item                      **In Tolerance (according to the specific calibration document)**

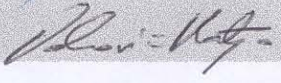
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type                        | ID #           | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|-----------------------------------|----------------|-------------------------------------------|------------------------|
| Power meter EPM E4419B            | GB41293874     | 2-Apr-03 (METAS, No 252-0250)             | Apr-04                 |
| Power sensor E4412A               | MY41495277     | 2-Apr-03 (METAS, No 252-0250)             | Apr-04                 |
| Reference 20 dB Attenuator        | SN: 5086 (20b) | 3-Apr-03 (METAS, No. 251-0340)            | Apr-04                 |
| Fluke Process Calibrator Type 702 | SN: 6295803    | 8-Sep-03 (Sintrel SCS No. E-030020)       | Sep-04                 |
| Power sensor HP 8481A             | MY41092180     | 18-Sep-02 (SPEAG, in house check Oct-03)  | In house check: Oct 05 |
| RF generator R&S SMT06            | 100058         | 23-May-01 (SPEAG, in house check May-03)  | In house check: May-05 |
| Network Analyzer HP 8753E         | US37390585     | 18-Oct-01 (SPEAG, in house check Oct-03)  | In house check: Oct 05 |

|                |               |            |                                                                                       |
|----------------|---------------|------------|---------------------------------------------------------------------------------------|
|                | Name          | Function   | Signature                                                                             |
| Calibrated by: | Nico Vetterli | Technician |  |

|              |               |                     |                                                                                       |
|--------------|---------------|---------------------|---------------------------------------------------------------------------------------|
|              | Name          | Function            | Signature                                                                             |
| Approved by: | Katja Pokovic | Laboratory Director |  |

Date issued: January 26, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# Probe EX3DV3

SN:3511

|                  |                   |
|------------------|-------------------|
| Manufactured:    | December 15, 2003 |
| Last calibrated: | January 23, 2004  |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: EX3DV3 SN:3511

### Sensitivity in Free Space

|       |                                          |
|-------|------------------------------------------|
| NormX | $0.77 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | $0.64 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | $0.65 \mu\text{V}/(\text{V}/\text{m})^2$ |

### Diode Compression<sup>A</sup>

|       |    |    |
|-------|----|----|
| DCP X | 97 | mV |
| DCP Y | 97 | mV |
| DCP Z | 97 | mV |

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

### Boundary Effect

Head                      5500 MHz      Typical SAR gradient: 28 % per mm

|                                                         |        |        |
|---------------------------------------------------------|--------|--------|
| Sensor Center to Phantom Surface Distance               | 2.0 mm | 3.0 mm |
| SAR <sub>be</sub> [%]      Without Correction Algorithm | 16.0   | 8.6    |
| SAR <sub>be</sub> [%]      With Correction Algorithm    | 0.0    | 0.0    |

### Sensor Offset

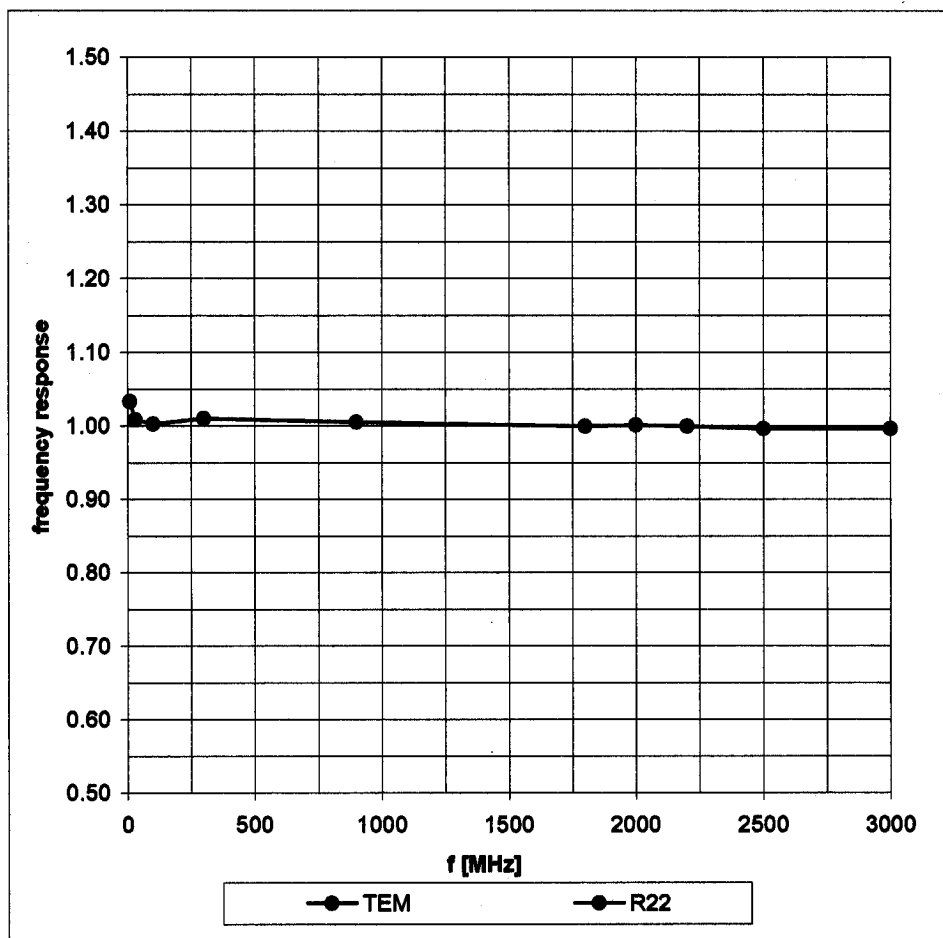
Probe Tip to Sensor Center                      1.0      mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

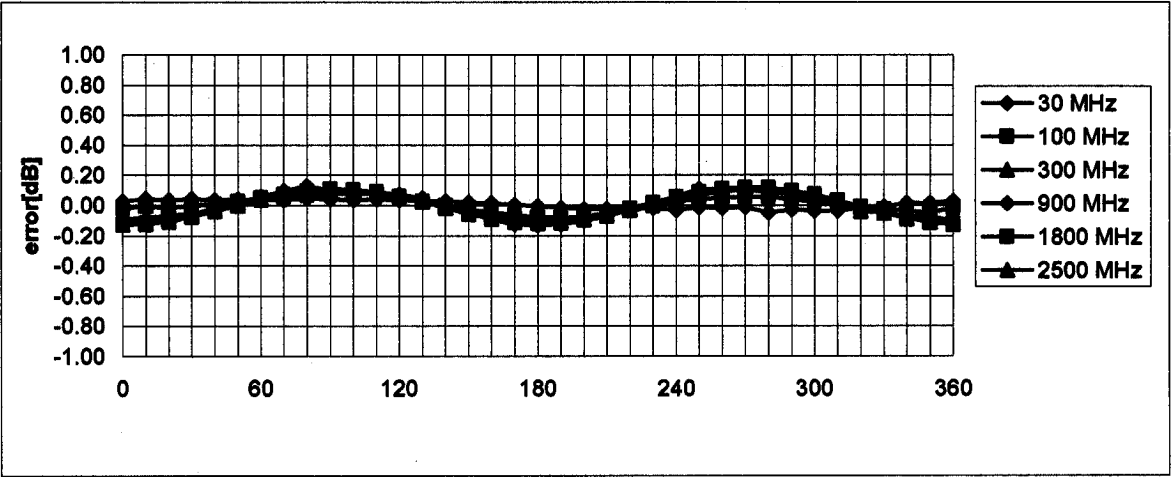
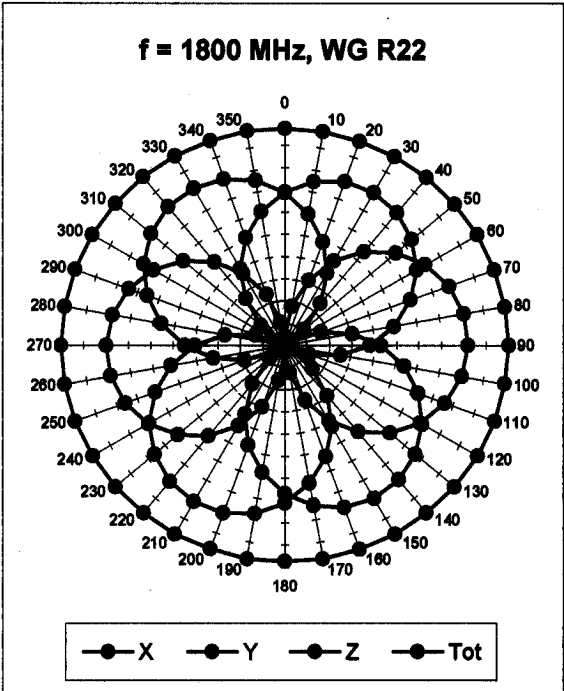
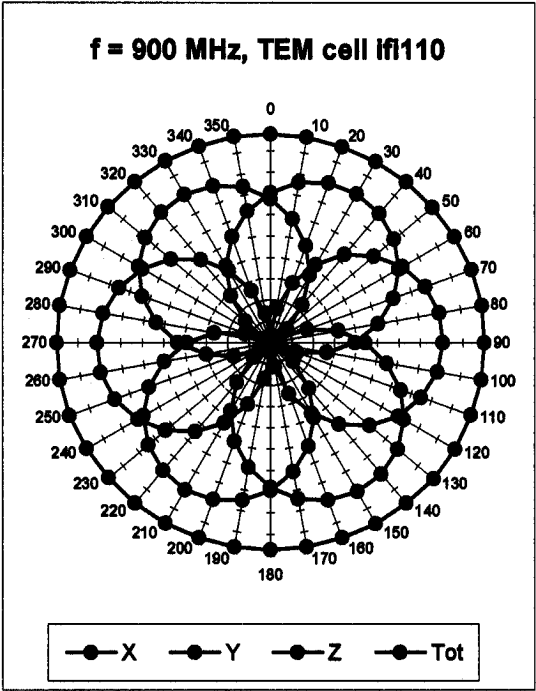
<sup>A</sup> numerical linearization parameter: uncertainty not required

## Frequency Response of E-Field

( TEM-Cell:iff110, Waveguide R22)

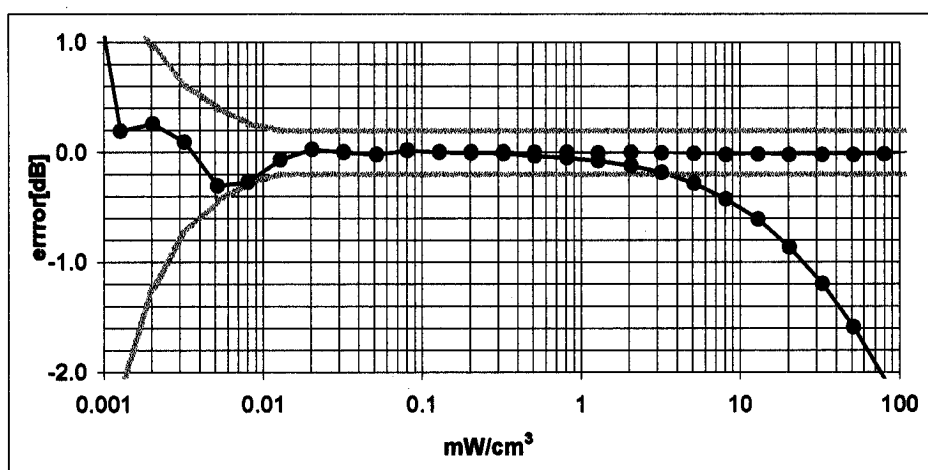
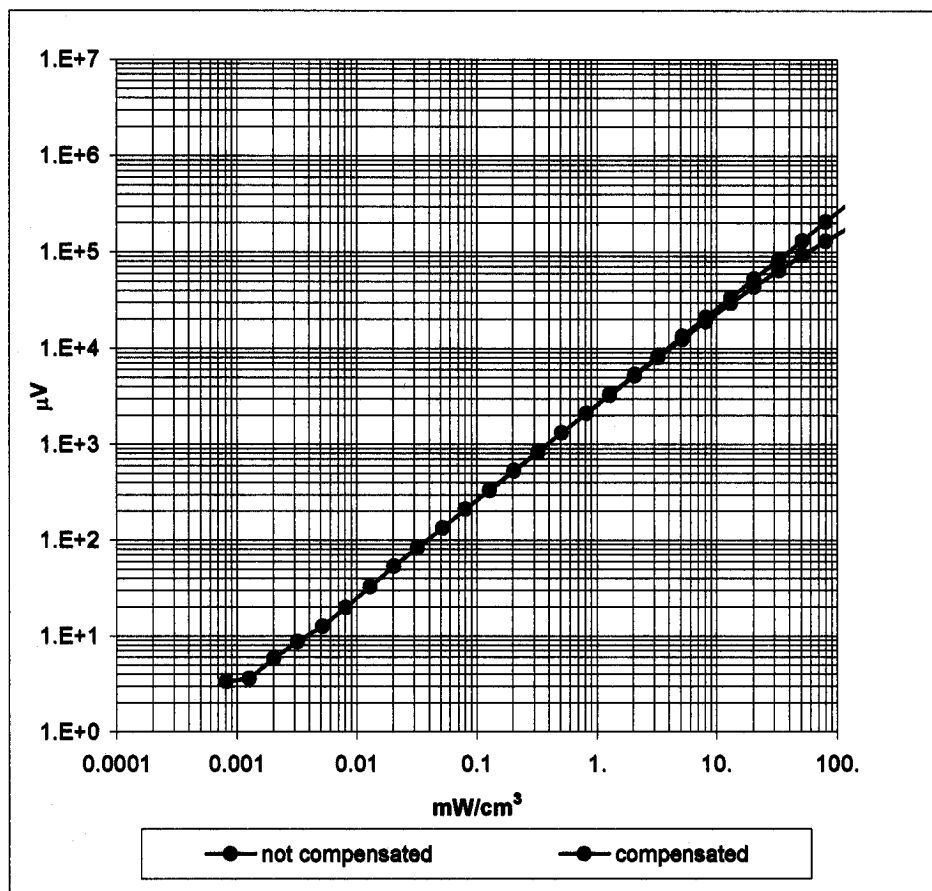


Receiving Pattern ( $\phi$ ) ,  $\theta = 0^\circ$



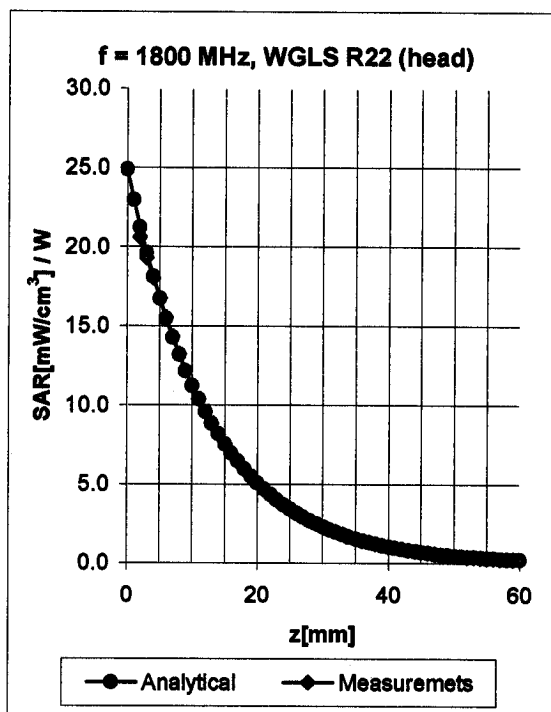
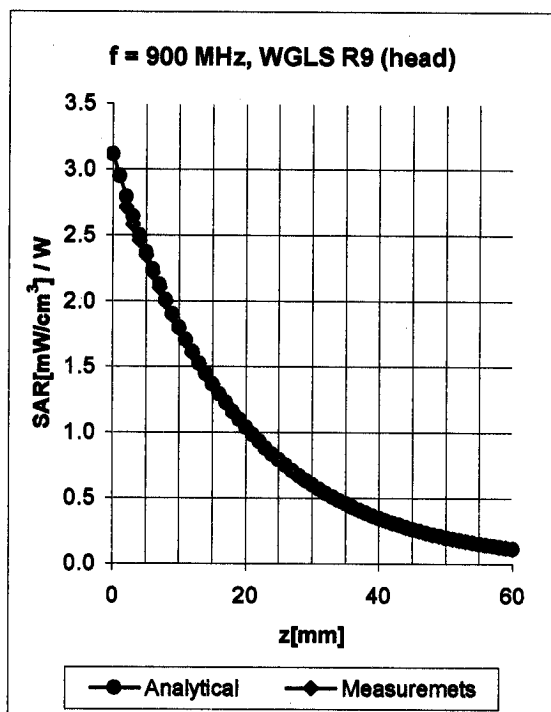
Axial Isotropy Error <  $\pm 0.2$  dB

## Dynamic Range $f(\text{SAR}_{\text{head}})$ ( Waveguide R22 )



Probe Linearity  $< \pm 0.2 \text{ dB}$

## Conversion Factor Assessment

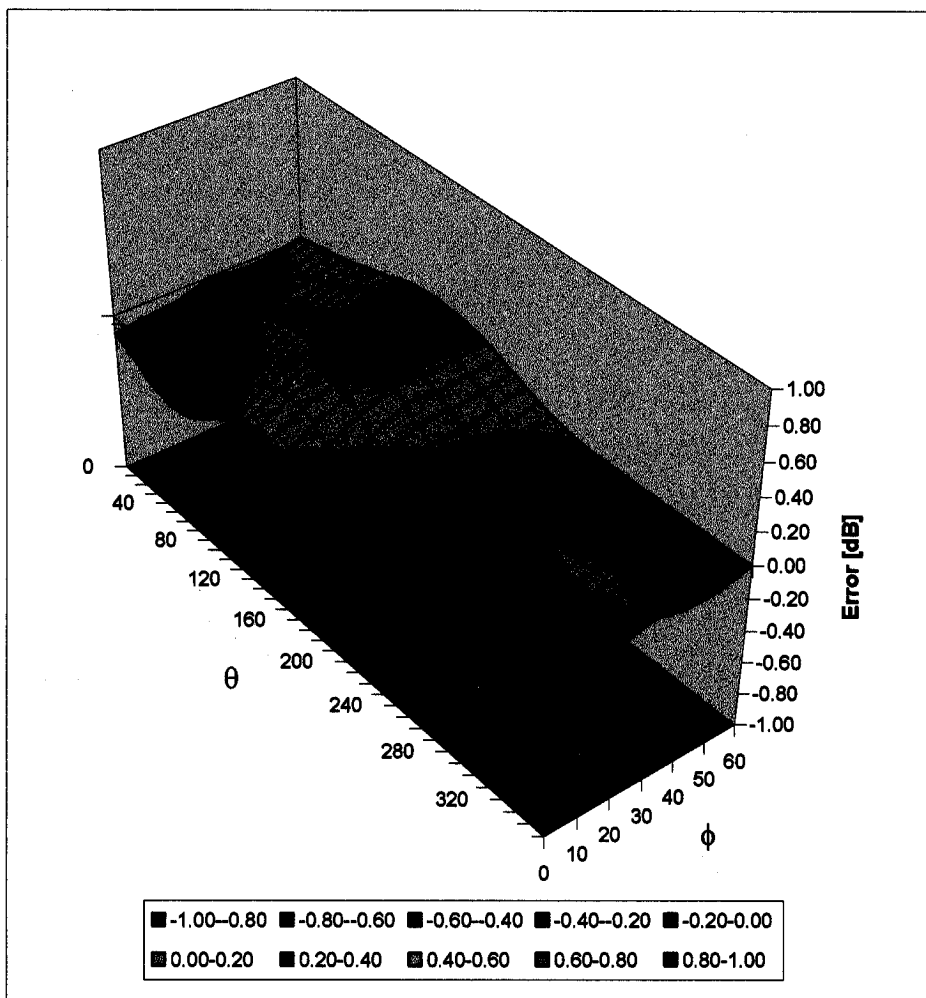


| f [MHz] | Validity [MHz] <sup>B</sup> | Tissue | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|--------|--------------|--------------|-------|-------|--------------------|
| 900     | 800-1000                    | Head   | 41.5 ± 5%    | 0.97 ± 5%    | 0.18  | 1.60  | 9.43 ± 11.3% (k=2) |
| 1800    | 1710-1910                   | Head   | 40.0 ± 5%    | 1.40 ± 5%    | 0.20  | 2.00  | 8.11 ± 11.7% (k=2) |
| 2450    | 2400-2500                   | Head   | 39.2 ± 5%    | 1.80 ± 5%    | 0.15  | 2.00  | 7.50 ± 9.7% (k=2)  |
| 5500    | 5225-5775                   | Head   | 35.6 ± 5%    | 4.96 ± 5%    | 0.42  | 1.80  | 4.46 ± 22.6% (k=2) |
| 2450    | 2400-2500                   | Body   | 52.7 ± 5%    | 1.95 ± 5%    | 0.15  | 2.00  | 7.66 ± 9.7% (k=2)  |
| 5500    | 5225-5775                   | Body   | 48.6 ± 5%    | 5.65 ± 5%    | 0.45  | 1.90  | 3.84 ± 22.6% (k=2) |

<sup>B</sup> The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

## Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz



**Spherical Isotropy Error <  $\pm 0.4$  dB**



## **APPENDIX D – DIPOLE CALIBRATION CERTIFICATE**



## 2400 MHz System Validation Dipole

|       |         |
|-------|---------|
| Type: | 2450Mhz |
|-------|---------|

|                |     |
|----------------|-----|
| Serial Number: | 002 |
|----------------|-----|

|                       |                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------|
| Place of Calibration: | <b>MET Laboratories, Inc.</b><br>4855 Patrick Henry Dr. Bldg #6<br>Santa Clara, CA 95054USA |
|-----------------------|---------------------------------------------------------------------------------------------|

|                      |                  |
|----------------------|------------------|
| Date of Calibration: | 09 February 2004 |
|----------------------|------------------|

**MET Laboratories, Inc certifies that this device has been calibrated on the date indicated above.**

:

**Approved By:**

  
\_\_\_\_\_  
**Shawn McMillen**  
**SAR Compliance Manager**



## **1. Measurement Conditions**

The DASY4 System with a dosimetric E-Field probe EX3DV3 (3511), Conversion factor 7.5 at 2450 MHz was used for the measurements.

The measurements were performed in the flat section of the SAM twin phantom filled with head tissue simulating solution of the following electrical parameters at 1900 MHz:

|                               |      |           |
|-------------------------------|------|-----------|
| <b>Relative Dielectricity</b> | 38   | $\pm 5\%$ |
| <b>Conductivity</b>           | 1.88 | $\pm 5\%$ |

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to solution surface. A loss-less dielectric spacer was used during measurements for accurate distance positioning.

The course grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration. The dipole input power (forward power) was 250mW  $\pm 3\%$ . The results are normalized to 1W input power.

## **2. SAR Measurement with DASY4 System**

Standard SAR measurement were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting average SAR values measured with the dosimetric probe EX3DV3 (3511), and applying advanced extrapolation are:

|                                                  |           |
|--------------------------------------------------|-----------|
| Averaged over 1cm <sup>3</sup> (1g) of tissue:   | 50.4 mW/g |
| Averaged over 10cm <sup>3</sup> (10g) of tissue: | 22.8 mW/g |

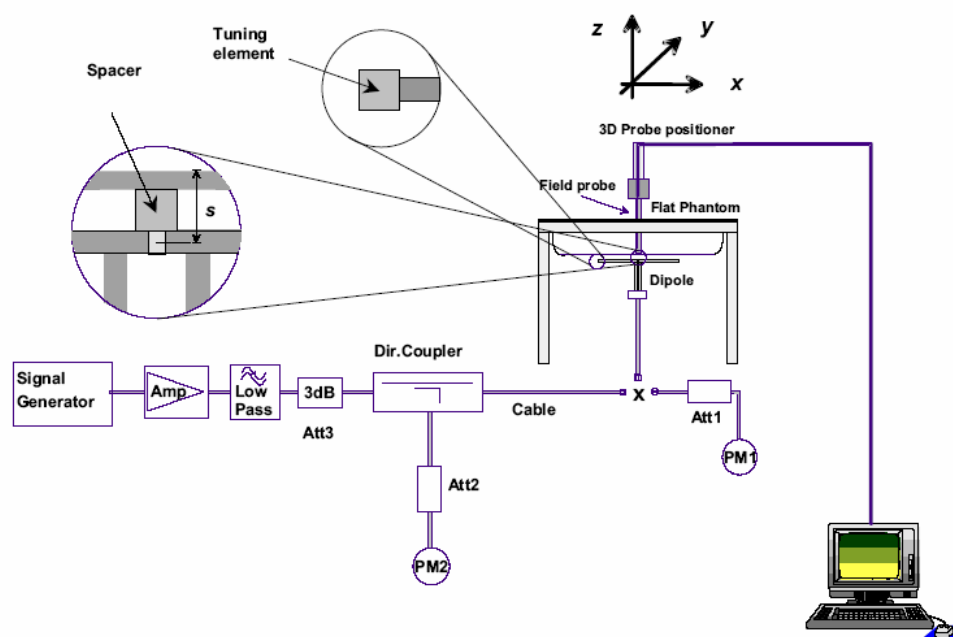
## **3. Dipole Impedance and Return Loss**

The dipole was positioned at the flat phantom sections according to section 1 with the 10mm spacer. The impedance and return loss measurements are

|                               |                                  |
|-------------------------------|----------------------------------|
| Complex impedance at 1900 MHz | $\text{Re}\{Z\} = 47.568 \Omega$ |
|                               | $\text{Im}\{Z\} = 1.4141 \Omega$ |
| Return Loss at 1900 MHz       | -30.849 dB                       |

#### 4. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



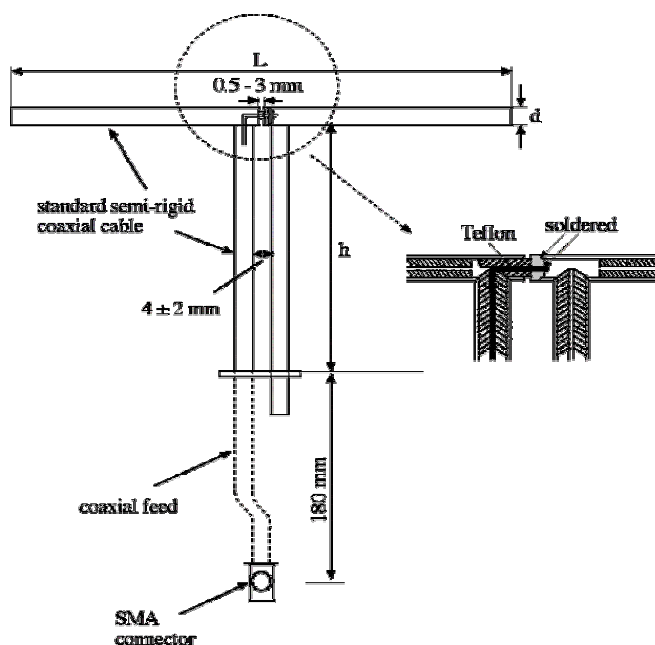
First the power meter PM1 (including attenuator Att1) is connected to the RF cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. The matching of the dipole should be checked using a network analyzer to ensure that the reflected power is at least 20 dB below the forward power.

#### 4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feed point leading to a damage of the dipole.

#### 5. Design

The validation dipole is made of standard semi ridged coaxial cable and is constructed in accordance with the IEEE Std “Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.



| Frequency (MHz) | L (mm) | h (mm) | d (mm) |
|-----------------|--------|--------|--------|
| 300             | 396.0  | 250.0  | 6.35   |
| 450             | 270.0  | 166.7  | 6.35   |
| 835             | 161.0  | 89.8   | 3.6    |
| 900             | 149.0  | 83.3   | 3.6    |
| 1450            | 89.1   | 51.7   | 3.6    |
| 1800            | 72.0   | 41.7   | 3.6    |
| 1900            | 68.0   | 39.5   | 3.6    |
| 2000            | 64.5   | 37.5   | 3.6    |
| 2450            | 51.8   | 30.4   | 3.6    |
| 3000            | 41.5   | 25.0   | 3.6    |

**Validation Dipole Dimensions**

**File Name:** 2450MHz

02/09/04

2450MHz Dipole

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:002

Communication System: CW; ; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.88$  mho/m;  $\epsilon_r = 38.0$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Ambient Temp 24.2 deg C; Fluid Temp 23.9deg C

- Probe: EX3DV3 - SN3511; ConvF(7.5, 7.5, 7.5); Calibrated: 1/23/2004

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn584; Calibrated: 9/16/2003

- Phantom: SAM with CRP; Type: SAM; Serial: TP 1310

- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

**Area Scan (61x81x1):** Measurement grid: dx=10mm, dy=10mm

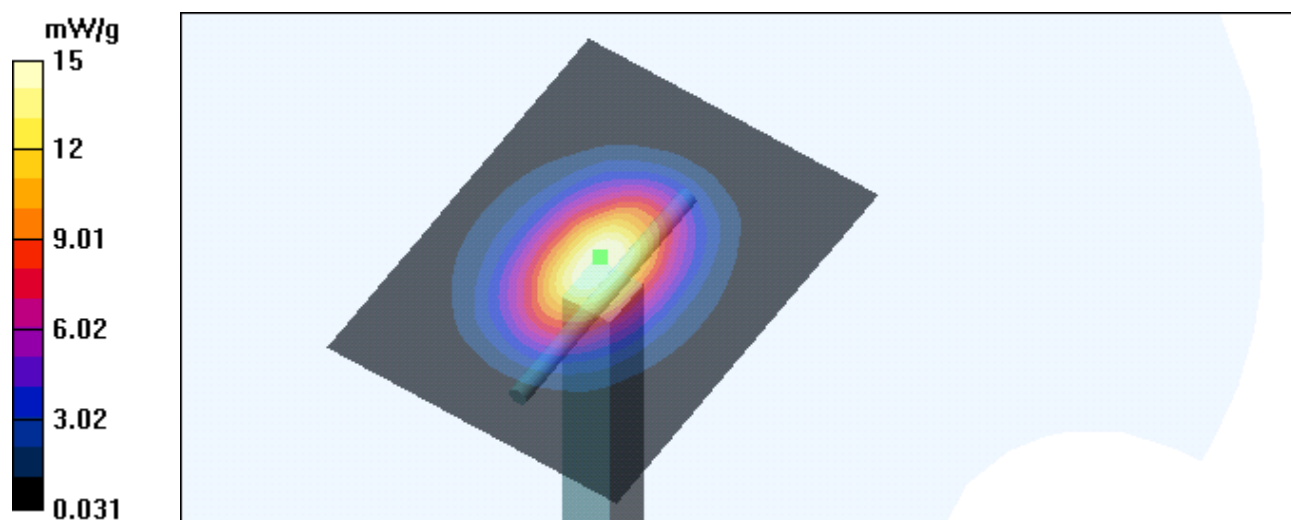
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.3 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 14.5 mW/g

Peak SAR (extrapolated) = 27.4 W/kg

**SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.69 mW/g**



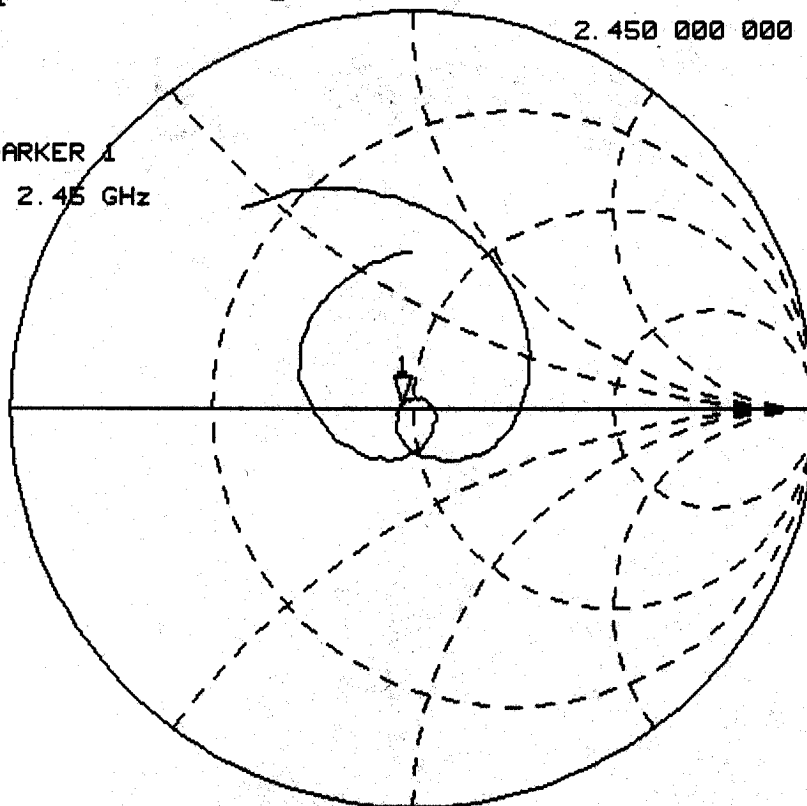
CH1 S<sub>11</sub> 1 U FS 1: 47.617  $\Omega$  1.3691  $\Omega$  88.941 pH  
2.450 000 000 GHz

PRm

Cor

MARKER 1  
2.45 GHz

↑



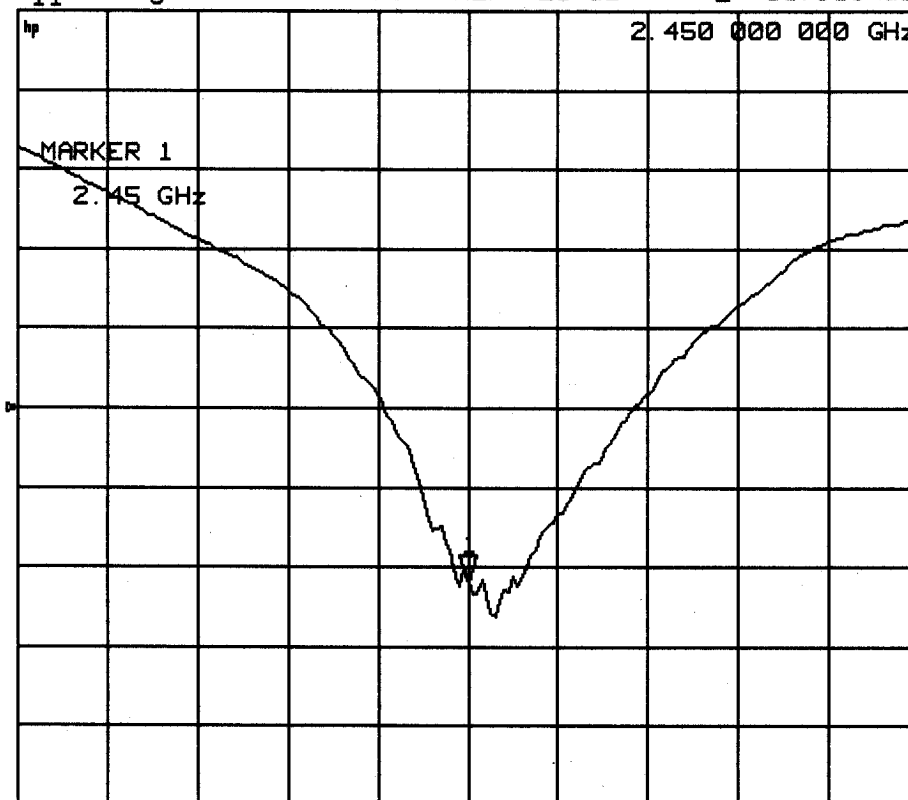
CENTER 2.450 000 000 GHz SPAN .600 000 000 GHz

CH1 S<sub>11</sub> log MAG 5 dB/ REF -20 dB 1: -30.939 dB  
2.450 000 000 GHz

PRm

Cor

MARKER 1  
2.45 GHz



CENTER 2.450 000 000 GHz SPAN .600 000 000 GHz



## **APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS**

# 2450MHz Head

December 29, 2004 08:34 AM

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2.400000000 GHz | 39.0605 | 13.4191 |
| 2.402000000 GHz | 39.0629 | 13.4285 |
| 2.404000000 GHz | 39.0715 | 13.4384 |
| 2.406000000 GHz | 39.0677 | 13.4471 |
| 2.408000000 GHz | 39.0674 | 13.4529 |
| 2.410000000 GHz | 39.0522 | 13.4511 |
| 2.412000000 GHz | 39.0338 | 13.4348 |
| 2.414000000 GHz | 39.0000 | 13.4171 |
| 2.416000000 GHz | 39.0001 | 13.4198 |
| 2.418000000 GHz | 38.9951 | 13.4267 |
| 2.420000000 GHz | 38.9582 | 13.4258 |
| 2.422000000 GHz | 38.9494 | 13.4245 |
| 2.424000000 GHz | 38.9335 | 13.4319 |
| 2.426000000 GHz | 38.9511 | 13.4316 |
| 2.428000000 GHz | 38.9499 | 13.4327 |
| 2.430000000 GHz | 38.9490 | 13.4476 |
| 2.432000000 GHz | 38.9388 | 13.4617 |
| 2.434000000 GHz | 38.9137 | 13.4542 |
| 2.436000000 GHz | 38.9165 | 13.4632 |
| 2.438000000 GHz | 38.8986 | 13.4611 |
| 2.440000000 GHz | 38.9021 | 13.4640 |
| 2.442000000 GHz | 38.9150 | 13.4646 |
| 2.444000000 GHz | 38.9039 | 13.4909 |
| 2.446000000 GHz | 38.9057 | 13.4782 |
| 2.448000000 GHz | 38.8958 | 13.4921 |
| 2.450000000 GHz | 38.8879 | 13.4846 |
| 2.452000000 GHz | 38.8859 | 13.4807 |
| 2.454000000 GHz | 38.8758 | 13.4977 |
| 2.456000000 GHz | 38.8763 | 13.5002 |
| 2.458000000 GHz | 38.8682 | 13.5128 |
| 2.460000000 GHz | 38.8591 | 13.5205 |
| 2.462000000 GHz | 38.8491 | 13.5205 |
| 2.464000000 GHz | 38.8539 | 13.5279 |
| 2.466000000 GHz | 38.8401 | 13.5368 |
| 2.468000000 GHz | 38.8441 | 13.5534 |
| 2.470000000 GHz | 38.8318 | 13.5639 |
| 2.472000000 GHz | 38.8189 | 13.5635 |
| 2.474000000 GHz | 38.8226 | 13.5662 |
| 2.476000000 GHz | 38.8115 | 13.5644 |
| 2.478000000 GHz | 38.7993 | 13.5749 |
| 2.480000000 GHz | 38.8048 | 13.5930 |
| 2.482000000 GHz | 38.8137 | 13.6083 |
| 2.484000000 GHz | 38.7967 | 13.6398 |
| 2.486000000 GHz | 38.7806 | 13.6253 |
| 2.488000000 GHz | 38.7787 | 13.6243 |

# 2450MHz Body

December 29, 2004 08:40 AM

| Frequency       | e'      | e''     |
|-----------------|---------|---------|
| 2.400000000 GHz | 54.4041 | 14.7667 |
| 2.402000000 GHz | 54.3991 | 14.8025 |
| 2.404000000 GHz | 54.3894 | 14.8047 |
| 2.406000000 GHz | 54.3846 | 14.8165 |
| 2.408000000 GHz | 54.3242 | 14.8225 |
| 2.410000000 GHz | 54.2989 | 14.8217 |
| 2.412000000 GHz | 54.2942 | 14.8094 |
| 2.414000000 GHz | 54.2949 | 14.8460 |
| 2.416000000 GHz | 54.2764 | 14.8683 |
| 2.418000000 GHz | 54.3097 | 14.8693 |
| 2.420000000 GHz | 54.2971 | 14.8959 |
| 2.422000000 GHz | 54.2792 | 14.9095 |
| 2.424000000 GHz | 54.2685 | 14.8894 |
| 2.426000000 GHz | 54.2374 | 14.9049 |
| 2.428000000 GHz | 54.2259 | 14.9021 |
| 2.430000000 GHz | 54.2680 | 14.9033 |
| 2.432000000 GHz | 54.2620 | 14.9374 |
| 2.434000000 GHz | 54.2539 | 14.9460 |
| 2.436000000 GHz | 54.2248 | 14.9390 |
| 2.438000000 GHz | 54.1931 | 14.9715 |
| 2.440000000 GHz | 54.2146 | 14.9483 |
| 2.442000000 GHz | 54.2118 | 14.9903 |
| 2.444000000 GHz | 54.2183 | 15.0035 |
| 2.446000000 GHz | 54.2192 | 15.0243 |
| 2.448000000 GHz | 54.2107 | 15.0500 |
| 2.450000000 GHz | 54.1808 | 15.0362 |
| 2.452000000 GHz | 54.1609 | 15.0533 |
| 2.454000000 GHz | 54.1592 | 15.0778 |
| 2.456000000 GHz | 54.1517 | 15.0982 |
| 2.458000000 GHz | 54.1351 | 15.1028 |
| 2.460000000 GHz | 54.1579 | 15.1303 |
| 2.462000000 GHz | 54.1151 | 15.1305 |
| 2.464000000 GHz | 54.1190 | 15.1233 |
| 2.466000000 GHz | 54.1108 | 15.1369 |
| 2.468000000 GHz | 54.0953 | 15.1686 |
| 2.470000000 GHz | 54.1076 | 15.1823 |
| 2.472000000 GHz | 54.1286 | 15.1963 |
| 2.474000000 GHz | 54.1340 | 15.2196 |
| 2.476000000 GHz | 54.1181 | 15.2155 |
| 2.478000000 GHz | 54.1044 | 15.2247 |
| 2.480000000 GHz | 54.0848 | 15.2177 |
| 2.482000000 GHz | 54.0855 | 15.2314 |
| 2.484000000 GHz | 54.0779 | 15.2566 |
| 2.486000000 GHz | 54.0832 | 15.2559 |
| 2.488000000 GHz | 54.0628 | 15.2747 |



## **APPENDIX F – PHANTOM CERTIFICATE OF CONFORMITY**

## Certificate of conformity / First Article Inspection

|                       |                                                                          |
|-----------------------|--------------------------------------------------------------------------|
| Item                  | SAM Twin Phantom V4.0                                                    |
| Type No               | QD 000 P40 C                                                             |
| Series No             | TP-1150 and higher                                                       |
| Manufacturer / Origin | Untersee Composites<br>Hauptstr. 69<br>CH-8559 Fruthwilen<br>Switzerland |

### Tests

The series production process used allows the limitation to test of first articles.

Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

| Test                 | Requirement                                                                                                                                  | Details                                                              | Units tested                             |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------|
| Shape                | Compliance with the geometry according to the CAD model.                                                                                     | IT'IS CAD File (*)                                                   | First article, Samples                   |
| Material thickness   | Compliant with the requirements according to the standards                                                                                   | 2mm +/- 0.2mm in specific areas;<br>6mm +/- 0.2mm at ERP             | First article, Samples                   |
| Material parameters  | Dielectric parameters for required frequencies                                                                                               | 200 MHz – 3 GHz<br>Relative permittivity < 5<br>Loss tangent < 0.05. | Material sample<br>TP 104-5              |
| Material resistivity | The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions | DEGMBE based<br>simulating liquids                                   | Pre-series,<br>First article,<br>Samples |

### Standards

[1] CENELEC EN 50361

[2] IEEE Std 1528-200x Draft CD 1.1 (Dec 02)

[3] IEC 62209/CD (Nov 02)

(\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date

7.8.2003

### Signature / Stamp

**s p e a g**

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