

## **CERTIFICATE OF COMPLIANCE** **SAR EVALUATION**

**Test Lab:****CELLTECH RESEARCH INC.**

Testing and Engineering Lab

1955 Moss Court

Kelowna, B.C.

Canada V1Y 9L3

Phone: 250 - 860-3130

Fax: 250 - 860-3110

Toll Free: 1-877-545-6287

e-mail: info@celltechlabs.com

web site: www.celltechlabs.com

**Applicant Information:****KENWOOD COMMUNICATIONS CORP.**

3975 Johns Creek Court, Suite 300

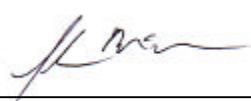
Suwanee, GA 30024

|                                  |                                          |
|----------------------------------|------------------------------------------|
| <b>FCC Rule Part(s):</b>         | <b>2.1093; ET Docket 96-326</b>          |
| <b>FCC ID:</b>                   | <b>ALH33063110</b>                       |
| <b>Model(s):</b>                 | <b>TK-5400</b>                           |
| <b>EUT Type(s):</b>              | <b>Portable FM PTT Radio Transceiver</b> |
| <b>Modulation:</b>               | <b>FM</b>                                |
| <b>Tx Frequency Range(s):</b>    | <b>806 - 824 MHz</b>                     |
| <b>Rated RF Conducted Power:</b> | <b>3 Watts</b>                           |
| <b>Antenna Type(s):</b>          | <b>1/2 Wave Whip Antenna</b>             |
| <b>Battery Type(s):</b>          | <b>7.2 VDC NiMH Battery (KNB-22N)</b>    |

Celltech Research Inc. declares under its sole responsibility that this device was found to be in compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in OET Bulletin 65, Supplement C, Edition 01-01 (Occupational/Controlled Exposure), and was tested in accordance with the appropriate measurement standards, guidelines, and recommended practices specified in American National Standards Institute C95.1-1992.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

*This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Research Inc. The results and statements contained in this report pertain only to the device(s) evaluated.*



**Shawn McMillen**  
**General Manager**  
**Celltech Research Inc.**



## **TABLE OF CONTENTS**

|      |                                           |     |
|------|-------------------------------------------|-----|
| 1.0  | INTRODUCTION.....                         | 1   |
| 2.0  | DESCRIPTION OF EQUIPMENT UNDER TEST.....  | 1   |
| 3.0  | SAR MEASUREMENT SYSTEM .....              | 2   |
| 4.0  | MEASUREMENT SUMMARY.....                  | 3-4 |
| 5.0  | DETAILS OF SAR EVALUATION.....            | 5   |
| 6.0  | EVALUATION PROCEDURES.....                | 6   |
| 7.0  | SYSTEM VALIDATION.....                    | 7   |
| 8.0  | TISSUE PARAMETERS.....                    | 7   |
| 9.0  | SIMULATED TISSUES.....                    | 8   |
| 10.0 | SAR SAFETY LIMITS .....                   | 8   |
| 11.0 | ROBOT SYSTEM SPECIFICATIONS.....          | 9   |
| 12.0 | PROBE SPECIFICATION.....                  | 10  |
| 13.0 | PLANAR PHANTOM.....                       | 10  |
| 14.0 | DEVICE HOLDER.....                        | 10  |
| 15.0 | TEST EQUIPMENT LIST.....                  | 11  |
| 16.0 | MEASUREMENT UNCERTAINTIES.....            | 12  |
| 17.0 | REFERENCES.....                           | 13  |
|      | APPENDIX A - SAR MEASUREMENT DATA.....    | 14  |
|      | APPENDIX B - DIPOLE VALIDATION.....       | 15  |
|      | APPENDIX C - DIPOLE CALIBRATION.....      | 16  |
|      | APPENDIX D - PROBE CALIBRATION.....       | 17  |
|      | APPENDIX E - SAR SENSITIVITIES.....       | 18  |
|      | APPENDIX F - SAR AND EUT PHOTOGRAPHS..... | 19  |

## ***1.0 INTRODUCTION***

This measurement report shows that the KENWOOD COMMUNICATIONS CORP. Model: TK-5400 Portable FM PTT Radio Transceiver FCC ID: ALH33063110 complies with FCC Part 2.1093, ET Docket 96-326 Rules for mobile and portable devices (controlled exposure). The test procedures, as described in American National Standards Institute C95.1-1992 (see reference [1]), and FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

## ***2.0 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

|                                        |                                         |
|----------------------------------------|-----------------------------------------|
| <b>FCC Rule Part(s)</b>                | 2.1093; ET Docket 96.326                |
| <b>EUT Type</b>                        | Portable FM PTT Radio Transceiver       |
| <b>FCC ID</b>                          | ALH33063110                             |
| <b>Model(s)</b>                        | TK-5400                                 |
| <b>Serial No.</b>                      | Pre-production                          |
| <b>Modulation</b>                      | FM                                      |
| <b>Tx Frequency Range (MHz)</b>        | 806 - 824 MHz                           |
| <b>Rated RF Conducted Output Power</b> | 3 Watts                                 |
| <b>Antenna Type(s)</b>                 | 1/2 Wave Whip Antenna                   |
| <b>Antenna Length</b>                  | 17.5 cm                                 |
| <b>Body-Worn Accessories</b>           | Speaker-Microphone<br>Plastic Belt-Clip |
| <b>Battery Type(s)</b>                 | 7.2 VDC 2100mAh NiMH (KNB-22N)          |

### **3.0 SAR MEASUREMENT SYSTEM**

Celltech Research SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, SAM phantom, and various planar phantoms for brain 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). A cell controller system contains 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 PC plug-in card. The DAE3 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 PC-card 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. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



*DASY3 SAR Measurement System with small planar phantom*

#### 4.0 MEASUREMENT SUMMARY

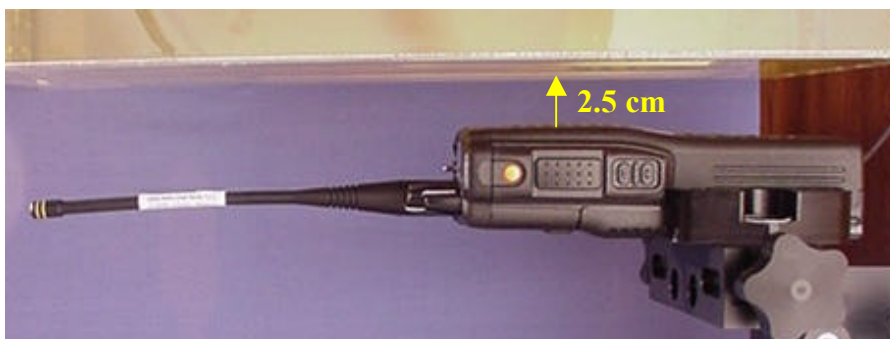
The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in Appendix A.

#### Face-Held SAR Measurement Results

| Freq.<br>(MHz)                                                                       | Channel | Mode | Conducted<br>Power<br>Before<br>(W)                                                                                                 | Conducted<br>Power<br>After<br>(W) | Separation<br>Distance<br>(cm) | SAR<br>(w/kg)      |                   |
|--------------------------------------------------------------------------------------|---------|------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|--------------------|-------------------|
|                                                                                      |         |      |                                                                                                                                     |                                    |                                | 100%<br>Duty Cycle | 50%<br>Duty Cycle |
| 806.0500                                                                             | Low     | CW   | 3.11                                                                                                                                | 2.98                               | 2.5                            | 1.79               | 0.895             |
| 815.0000                                                                             | Mid     | CW   | 2.99                                                                                                                                | 2.87                               | 2.5                            | 2.16               | 1.08              |
| 823.9875                                                                             | High    | CW   | 2.99                                                                                                                                | 2.98                               | 2.5                            | 2.58               | 1.29              |
| Mixture Type: Brain<br>Dielectric Constant: 41.4<br>Conductivity: 0.90<br>(Measured) |         |      | ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak: Controlled Exposure / Occupational<br>BRAIN: 8.0 W/kg (averaged over 1 gram) |                                    |                                |                    |                   |

#### Notes:

1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest face-held SAR value found was 2.58 w/kg (100% duty cycle).
3. The EUT was tested for face-held SAR with a 2.5cm separation distance between the front of the EUT and the outer surface of the small planar phantom.
4. Ambient TEMPERATURE: 21.1 °C  
Relative HUMIDITY: 35 %  
Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature  $\approx$  21.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.



Face-held SAR Test Setup - 2.5cm Separation Distance

## **Body-Worn SAR Measurement Results**

| Freq.<br>(MHz)                                                                      | Channel | Mode | Conducted<br>Power<br>Before<br>(W)                                                                                                | Conducted<br>Power<br>After<br>(W) | Belt-Clip<br>Separation<br>Distance<br>(cm) | SAR<br>(w/kg)      |                   |
|-------------------------------------------------------------------------------------|---------|------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------|--------------------|-------------------|
|                                                                                     |         |      |                                                                                                                                    |                                    |                                             | 100%<br>Duty Cycle | 50%<br>Duty Cycle |
| 806.0500                                                                            | Low     | CW   | 3.11                                                                                                                               | 2.96                               | 1.2                                         | 4.33               | 2.17              |
| 815.0000                                                                            | Mid     | CW   | 2.99                                                                                                                               | 2.94                               | 1.2                                         | 5.49               | 2.75              |
| 823.9875                                                                            | High    | CW   | 2.99                                                                                                                               | 2.81                               | 1.2                                         | 6.66               | 3.33              |
| Mixture Type: Body<br>Dielectric Constant: 55.4<br>Conductivity: 0.97<br>(Measured) |         |      | ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak Controlled Exposure / Occupational<br>BRAIN: 8.0 W/kg (averaged over 1 gram) |                                    |                                             |                    |                   |

### Notes:

1. The highest SAR value found was below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest body-worn SAR value found was 6.66 w/kg (100% duty cycle).
3. The EUT was tested for body-worn SAR with speaker-microphone and plastic belt-clip accessories. The belt-clip provided a 1.2cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
4. Ambient TEMPERATURE: 21.1 °C  
Relative HUMIDITY: 35 %  
Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature  $\approx$  21.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

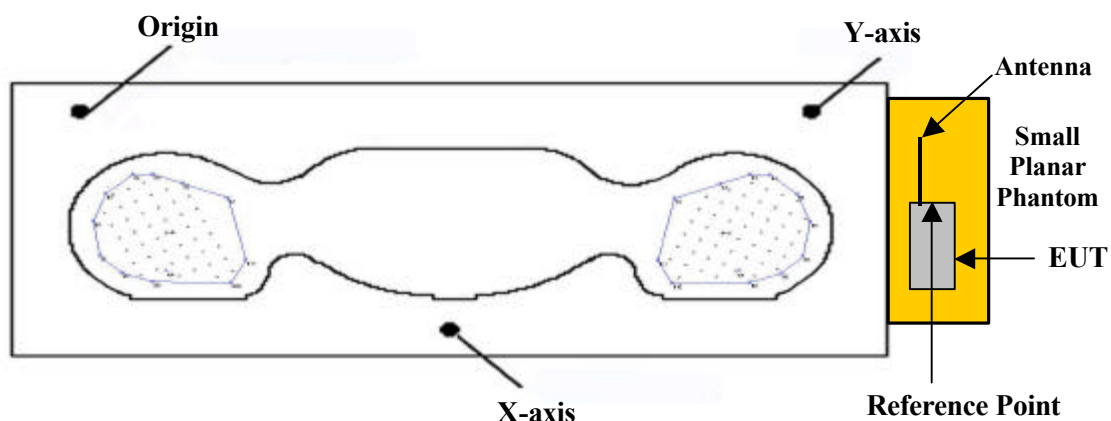


Body-worn SAR Test Setup - 1.2cm Belt-Clip Separation Distance

## 5.0 DETAILS OF SAR EVALUATION

The KENWOOD COMMUNICATIONS CORP. Model: TK-5400 Portable FM PTT Radio Transceiver FCC ID: ALH33063110 was found to be compliant for localized Specific Absorption Rate (controlled exposure) based on the following test provisions and conditions:

1. The EUT was evaluated in a face-held configuration with the front of the device placed parallel to the outer surface of the small planar phantom. A 2.5cm separation distance was maintained between the front of the EUT and the outer surface of the small planar phantom for the duration of the test.
2. The EUT was tested in a body-worn configuration with speaker-microphone and plastic belt-clip accessories. The attached belt-clip was positioned touching the outer surface of the planar phantom, and provided a 1.2cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
3. The EUT was evaluated for SAR at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimize drift. The conducted power levels were checked before and after each test. If the conducted power level deviated more than 5% of the initial power level, then the EUT was retested. Any unusual anomalies over the course of the test also warranted a re-evaluation.
4. The conducted power was measured according to the procedures described in FCC Part 2.1046.
5. The EUT was tested with the transmitter in continuous operation (100% duty cycle) throughout the SAR evaluation. As this is a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
6. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
7. The EUT was tested with a fully charged battery.



**Phantom Reference Point & EUT Positioning**

## 6.0 EVALUATION PROCEDURES

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation both the left and right ear positions were evaluated at the low, middle, and high frequencies of the band at maximum power, and with the device antenna in both the extended and extracted positions as applicable. The positioning of the ear-held device relative to the phantom was performed in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom.

(ii) For face-held and body-worn devices a planar phantom was used. Depending on the phantom used for the evaluation, all other phantoms were drained of fluid.

b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface using uniform grid spacing.

c. A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

d. The depth of the simulating tissue in the phantom used for the SAR evaluation was no less than 15.0cm.

e. The target tissue parameters for 835MHz were used in the SAR evaluation software. If there was any appreciable variation in the measured tissue parameters from the target values specified then the SAR was adjusted using the sensitivities to SAR (see "Appendix E - SAR Sensitivities").

f. The E-field probe conversion factors outside the calibrated points were determined as follows:

- In brain and body tissue between 750MHz and 1GHz, the conversion factor decreases approximately 1.3% per 100MHz frequency increase.
- In brain and body tissue between 1.6GHz and 2GHz, the conversion factor decreases approximately 1% per 100MHz frequency increase.

For body tissue around 900MHz (permittivity about 30% higher and conductivity about 15% higher than brain tissue):

- The conversion factor in body tissue is approximately 3% lower than for brain tissue for the same frequency.



Face-held SAR Test Setup with small planar phantom



Body-worn SAR Test Setup with small planar phantom

## 7.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in a planar phantom with a 900MHz dipole. A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$ . The applicable verifications are as follows (see Appendix B for validation test plots):

| Dipole Validation Kit | Target SAR<br>1g (w/kg) | Measured SAR<br>1g (w/kg) | Fluid Temperature              | Ambient Temperature    | Validation Date |
|-----------------------|-------------------------|---------------------------|--------------------------------|------------------------|-----------------|
| D900V2                | 2.78                    | 2.77                      | $\approx 21.0^{\circ}\text{C}$ | $21.1^{\circ}\text{C}$ | 12/20/01        |

## 8.0 TISSUE PARAMETERS

The dielectric parameters of the fluids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer. The dielectric parameters of the fluid are as follows:

| TISSUE PARAMETERS FOR DIPOLE VALIDATION |                                     |                           |                            |
|-----------------------------------------|-------------------------------------|---------------------------|----------------------------|
| Brain Equivalent Tissue                 | Dielectric Constant<br>$\epsilon_r$ | Conductivity<br>s (mho/m) | $\rho$ ( $\text{Kg/m}^3$ ) |
| 900MHz (Target)                         | $41.5 \pm 5\%$                      | $0.97 \pm 5\%$            | 1000                       |
| 900MHz (Measured)<br>12/20/01           | 41.4                                | 0.97                      | 1000                       |

| TISSUE PARAMETERS FOR EUT EVALUATION |                                     |                           |                            |
|--------------------------------------|-------------------------------------|---------------------------|----------------------------|
| Brain Equivalent Tissue              | Dielectric Constant<br>$\epsilon_r$ | Conductivity<br>s (mho/m) | $\rho$ ( $\text{Kg/m}^3$ ) |
| 835MHz (Target)                      | $41.5 \pm 5\%$                      | $0.90 \pm 5\%$            | 1000                       |
| 835MHz (Measured)<br>12/20/01        | 41.4                                | 0.90                      | 1000                       |

| TISSUE PARAMETERS FOR EUT EVALUATION |                                     |                           |                            |
|--------------------------------------|-------------------------------------|---------------------------|----------------------------|
| Body Equivalent Tissue               | Dielectric Constant<br>$\epsilon_r$ | Conductivity<br>s (mho/m) | $\rho$ ( $\text{Kg/m}^3$ ) |
| 835MHz (Target)                      | $55.2 \pm 5\%$                      | $0.97 \pm 5\%$            | 1000                       |
| 835MHz (Measured)<br>12/20/01        | 55.4                                | 0.97                      | 1000                       |

## 9.0 SIMULATED TISSUES

The brain and body mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

| <b>TISSUE MIXTURE</b><br><b>Dipole Validation &amp; EUT Evaluation</b> |                                                |                                                |                                               |
|------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|-----------------------------------------------|
| <b>INGREDIENT</b>                                                      | <b>900MHz Validation<br/>Brain Mixture (%)</b> | <b>835MHz Evaluation<br/>Brain Mixture (%)</b> | <b>835MHz Evaluation<br/>Body Mixture (%)</b> |
| Water                                                                  | 40.71                                          | 40.71                                          | 53.70                                         |
| Sugar                                                                  | 56.63                                          | 56.63                                          | 45.10                                         |
| Salt                                                                   | 1.48                                           | 1.48                                           | 0.97                                          |
| HEC                                                                    | 1.00                                           | 1.00                                           | 0.13                                          |
| Bactericide                                                            | 0.18                                           | 0.18                                           | 0.10                                          |

## 10.0 SAR SAFETY LIMITS

| <b>EXPOSURE LIMITS</b>                                          | <b>SAR (W/Kg)</b>                                                       |                                                             |
|-----------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|
|                                                                 | <b>(General Population /<br/>Uncontrolled Exposure<br/>Environment)</b> | <b>(Occupational / Controlled<br/>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<br>averaged over 10g) | 4.0                                                                     | 20.0                                                        |

Notes:

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

## ***11.0 ROBOT SYSTEM SPECIFICATIONS***

### **Specifications**

**POSITIONER:** Stäubli Unimation Corp. Robot Model: RX60L  
**Repeatability:** 0.02 mm  
**No. of axis:** 6

### **Data Acquisition Electronic (DAE) System**

#### **Cell Controller**

**Processor:** Pentium III  
**Clock Speed:** 450 MHz  
**Operating System:** Windows NT  
**Data Card:** DASY3 PC-Board

#### **Data Converter**

**Features:** Signal Amplifier, multiplexer, A/D converter, and control logic  
**Software:** DASY3 software  
**Connecting Lines:** Optical downlink for data and status info.  
Optical uplink for commands and clock

### **PC Interface Card**

**Function:** 24 bit (64 MHz) DSP for real time processing  
Link to DAE3  
16-bit A/D converter for surface detection system  
serial link to robot  
direct emergency stop output for robot

### **E-Field Probe**

**Model:** ET3DV6  
**Serial No.:** 1590  
**Construction:** Triangular core fiber optic detection system  
**Frequency:** 10 MHz to 6 GHz  
**Linearity:**  $\pm 0.2$  dB (30 MHz to 3 GHz)

### **Phantom**

**Type:** Small Planar Phantom  
**Shell Material:** Plexiglas  
**Bottom Thickness:** 2.0 mm  $\pm$  0.1mm  
**Dimensions:** Box: 36.5cm (L) x 22.5cm (W) x 20.3cm (H); Back Plane: 25.3cm (H)

## 12.0 PROBE SPECIFICATION (ET3DV6)

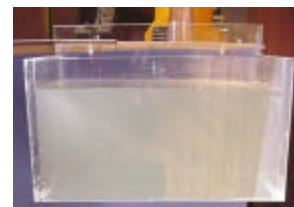
|                |                                                                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction:  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g. glycol) |
| Calibration:   | In air from 10 MHz to 2.5 GHz<br>In brain simulating tissue at frequencies of 900 MHz<br>and 1.8 GHz (accuracy $\pm 8\%$ )                                   |
| Frequency:     | 10 MHz to $> 6$ GHz; Linearity: $\pm 0.2$ dB<br>(30 MHz to 3 GHz)                                                                                            |
| Directivity:   | $\pm 0.2$ dB in brain tissue (rotation around probe axis)<br>$\pm 0.4$ dB in brain tissue (rotation normal to probe axis)                                    |
| Dynam. Rnge:   | 5 $\mu\text{W/g}$ to $> 100$ mW/g; Linearity: $\pm 0.2$ dB                                                                                                   |
| Srfce. Detect. | $\pm 0.2$ mm repeatability in air and clear liquids over<br>diffuse reflecting surfaces                                                                      |
| Dimensions:    | Overall length: 330 mm<br>Tip length: 16 mm<br>Body diameter: 12 mm<br>Tip diameter: 6.8 mm<br>Distance from probe tip to dipole centers: 2.7 mm             |
| Application:   | General dosimetry up to 3 GHz<br>Compliance tests of mobile phone                                                                                            |



ET3DV6 E-Field Probe

## 13.0 SMALL PLANAR PHANTOM

The small planar phantom is constructed of Plexiglas material with a 2.0mm shell thickness for face-held and body-worn SAR evaluations. The small planar phantom is mounted onto the outer left hand section of the DASY3 system.



Small Planar Phantom

## 14.0 DEVICE HOLDER

The DASY3 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of  $65^\circ$ . The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.



Device Holder

## 15.0 TEST EQUIPMENT LIST

| SAR MEASUREMENT SYSTEM                                                                                                                                                                                                     |                                                             |                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------|
| <u>EQUIPMENT</u>                                                                                                                                                                                                           | <u>SERIAL NO.</u>                                           | <u>DATE CALIBRATED</u>                                                          |
| <b>DASY3 System</b><br>-Robot<br>-ET3DV6 E-Field Probe<br>-300MHz Validation Dipole<br>-450MHz Validation Dipole<br>-900MHz Validation Dipole<br>-1800MHz Validation Dipole<br>-SAM Phantom V4.0C<br>-Small Planar Phantom | 599396-01<br>1590<br>135<br>136<br>054<br>247<br>N/A<br>N/A | N/A<br>Mar 2001<br>Oct 2001<br>Oct 2001<br>June 2001<br>June 2001<br>N/A<br>N/A |
| <b>85070C Dielectric Probe Kit</b>                                                                                                                                                                                         | N/A                                                         | N/A                                                                             |
| <b>Gigatronics 8652A Power Meter</b><br>-Power Sensor 80701A<br>-Power Sensor 80701A                                                                                                                                       | 1835272<br>1833535<br>1833542                               | Oct 2001<br>Jan 2001<br>Feb 2001                                                |
| <b>E4408B Spectrum Analyzer</b>                                                                                                                                                                                            | US39240170                                                  | Nov 2001                                                                        |
| <b>8594E Spectrum Analyzer</b>                                                                                                                                                                                             | 3543A02721                                                  | Mar 2001                                                                        |
| <b>8753E Network Analyzer</b>                                                                                                                                                                                              | US38433013                                                  | Nov 2001                                                                        |
| <b>8648D Signal Generator</b>                                                                                                                                                                                              | 3847A00611                                                  | Aug 2001                                                                        |
| <b>5S1G4 Amplifier Research Power Amplifier</b>                                                                                                                                                                            | 26235                                                       | N/A                                                                             |

## 16.0 MEASUREMENT UNCERTAINTIES

| Uncertainty Description                        | Error   | Distribution | Weight | Standard Deviation | Offset |
|------------------------------------------------|---------|--------------|--------|--------------------|--------|
| <b>Probe Uncertainty</b>                       |         |              |        |                    |        |
| Axial isotropy                                 | ±0.2 dB | U-Shaped     | 0.5    | ±2.4 %             |        |
| Spherical isotropy                             | ±0.4 dB | U-Shaped     | 0.5    | ±4.8 %             |        |
| Isotropy from gradient                         | ±0.5 dB | U-Shaped     | 0      | ±                  |        |
| Spatial resolution                             | ±0.5 %  | Normal       | 1      | ±0.5 %             |        |
| Linearity error                                | ±0.2 dB | Rectangle    | 1      | ±2.7 %             |        |
| Calibration error                              | ±3.3 %  | Normal       | 1      | ±3.3 %             |        |
| <b>SAR Evaluation Uncertainty</b>              |         |              |        |                    |        |
| Data acquisition error                         | ±1 %    | Rectangle    | 1      | ±0.6 %             |        |
| ELF and RF disturbances                        | ±0.25 % | Normal       | 1      | ±0.25 %            |        |
| Conductivity assessment                        | ±5 %    | Rectangle    | 1      | ±5.8 %             |        |
| <b>Spatial Peak SAR Evaluation Uncertainty</b> |         |              |        |                    |        |
| Extrapolated boundary effect                   | ±3 %    | Normal       | 1      | ±3 %               | ±5 %   |
| Probe positioning error                        | ±0.1 mm | Normal       | 1      | ±1 %               |        |
| Integrated and cube orientation                | ±3 %    | Normal       | 1      | ±3 %               |        |
| Cube Shape inaccuracies                        | ±2 %    | Rectangle    | 1      | ±1.2 %             |        |
| Device positioning                             | ±6 %    | Normal       | 1      | ±6 %               |        |
| <b>Combined Uncertainties</b>                  |         |              |        | ±11.7 %            | ±5 %   |

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental.

According to ANSI/IEEE C95.3, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of  $\pm 1$  to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least  $\pm 2$ dB can be expected.

According to CENELEC, typical worst-case uncertainty of field measurements is  $\pm 5$  dB. For well-defined modulation characteristics the uncertainty can be reduced to  $\pm 3$  dB.

## **17.0 REFERENCES**

- (1) ANSI, *ANSI/IEEE C95.1: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 Ghz*, The Institute of Electrical and Electronics Engineers, Inc., New York, NY: 1992.
- (2) Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C, Edition 01-01 - FCC, Washington, D.C. 20554: June 2001.
- (3) Thomas Schmid, Oliver Egger, and Niels Kuster, “Automated E-field scanning system for dosimetric assessments”, *IEEE Transaction on Microwave Theory and Techniques*, Vol. 44, pp. 105-113: January 1996.
- (4) Niels Kuster, Ralph Kastle, and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, *IEICE Transactions of Communications*, vol. E80-B, no. 5, pp. 645 – 652: May 1997.

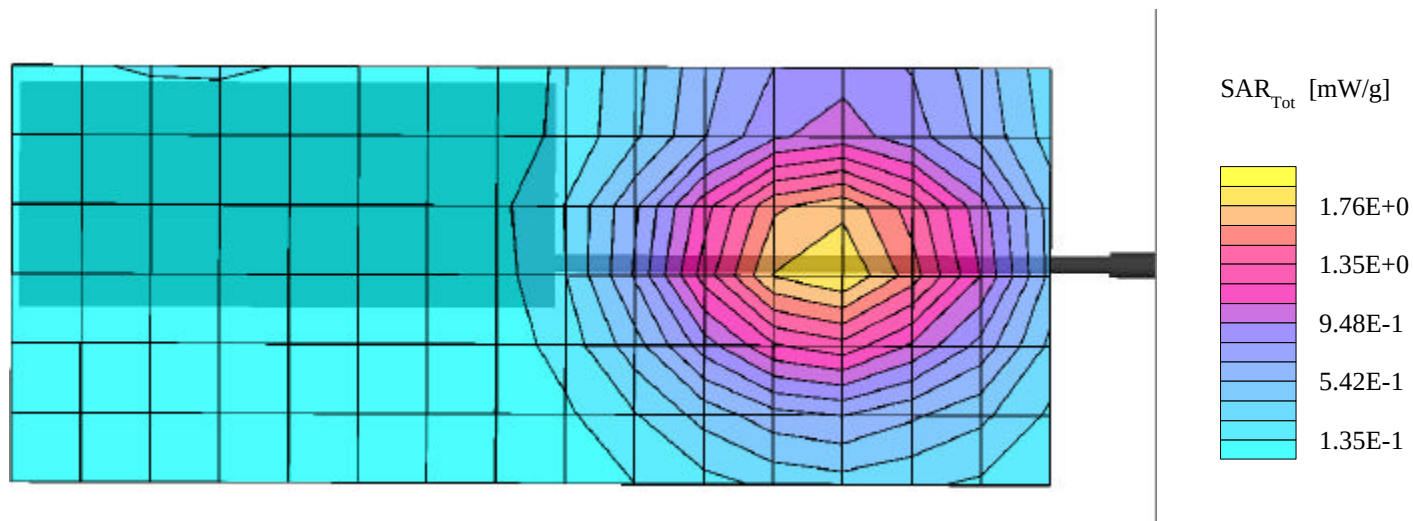
***APPENDIX A - SAR MEASUREMENT DATA***

## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0  
835 MHz Brain:  $\sigma = 0.90$  mho/m  $\epsilon_r = 41.5$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7 Powerdrift: -0.20 dB  
SAR (1g): 1.79 mW/g, SAR (10g): 1.29 mW/g

Face SAR at 2.5cm Separation Distance

Kenwood Model: TK-5400  
Continuous Wave Mode  
Low Channel [806.0500 MHz]  
Conducted Power: 3.11 Watts  
Date Tested: Dec. 20, 2001

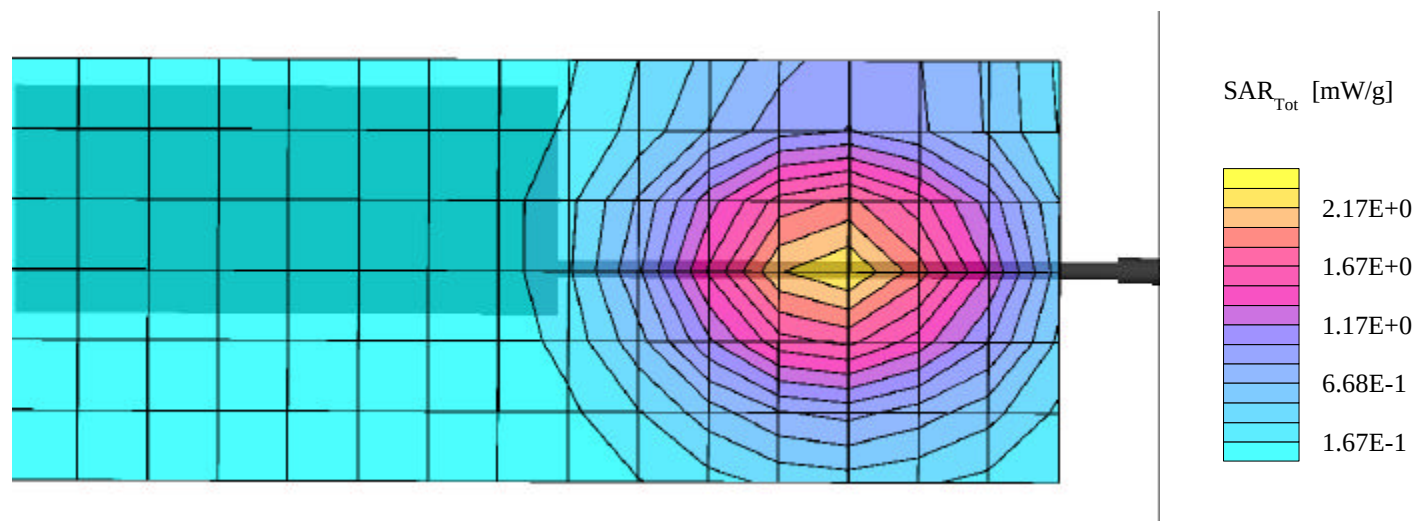


## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0  
835 MHz Brain:  $\sigma = 0.90$  mho/m  $\epsilon_r = 41.5$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7 Powerdrift: -0.22 dB  
SAR (1g): 2.16 mW/g, SAR (10g): 1.56 mW/g

Face SAR at 2.5cm Separation Distance

Kenwood Model: TK-5400  
Continuous Wave Mode  
Mid Channel [815.0000 MHz]  
Conducted Power: 2.99 Watts  
Date Tested: Dec. 20, 2001

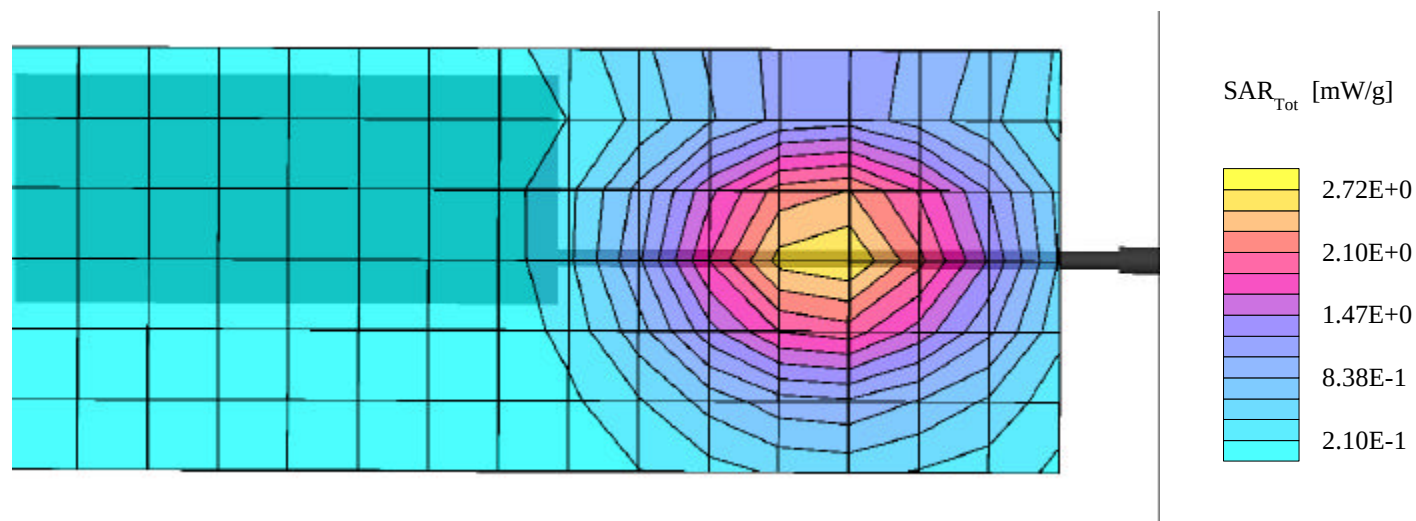


## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0  
835 MHz Brain:  $\sigma = 0.90$  mho/m  $\epsilon_r = 41.5$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7; Powerdrift: 0.03 dB  
SAR (1g): 2.58 mW/g, SAR (10g): 1.86 mW/g

Face SAR at 2.5cm Separation Distance

Kenwood Model: TK-5400  
Continuous Wave Mode  
High Channel [823.9875 MHz]  
Conducted Power: 2.99 Watts  
Date Tested: Dec. 20, 2001



## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Section  
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0;  
835 MHz Brain:  $\sigma = 0.90$  mho/m  $\epsilon_r = 41.5$   $\rho = 1.00$  g/cm<sup>3</sup>

### Z-Axis Extrapolation at Peak SAR Location

Face SAR at 2.5cm Separation Distance

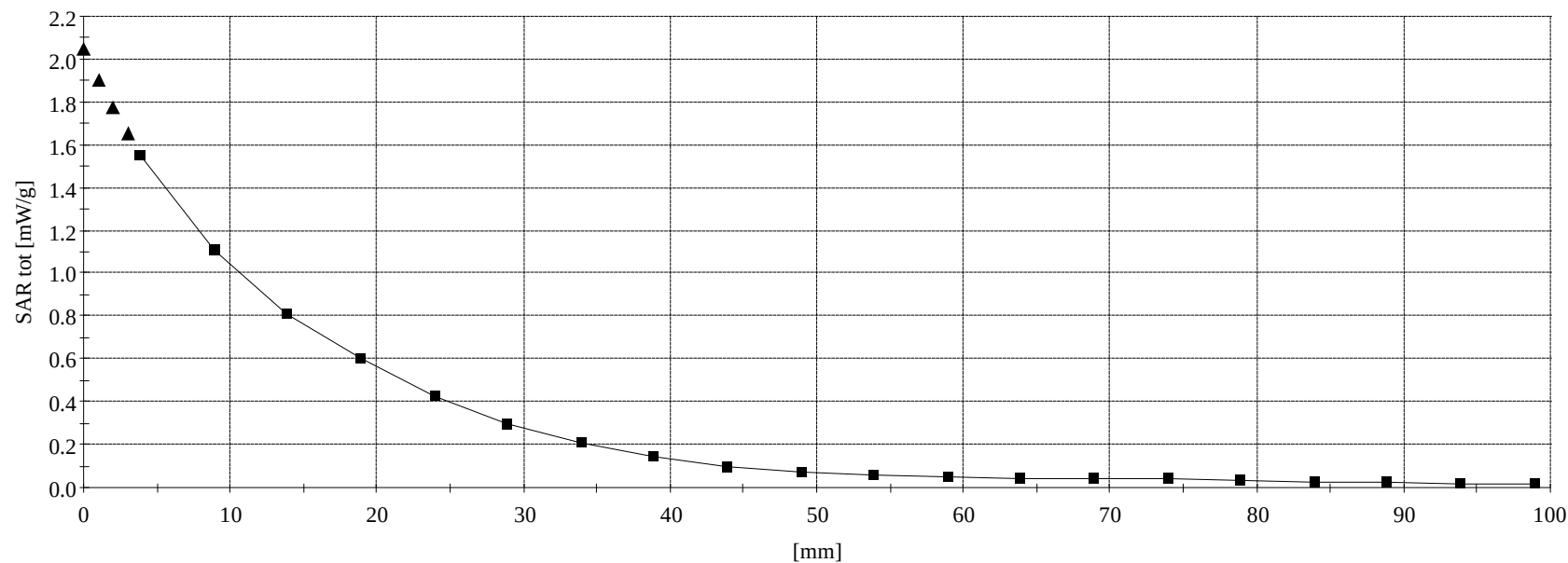
Kenwood Model: TK-5400

Continuous Wave Mode

High Channel [823.9875 MHz]

Conducted Power: 2.99 Watts

Date Tested: Dec. 20, 2001

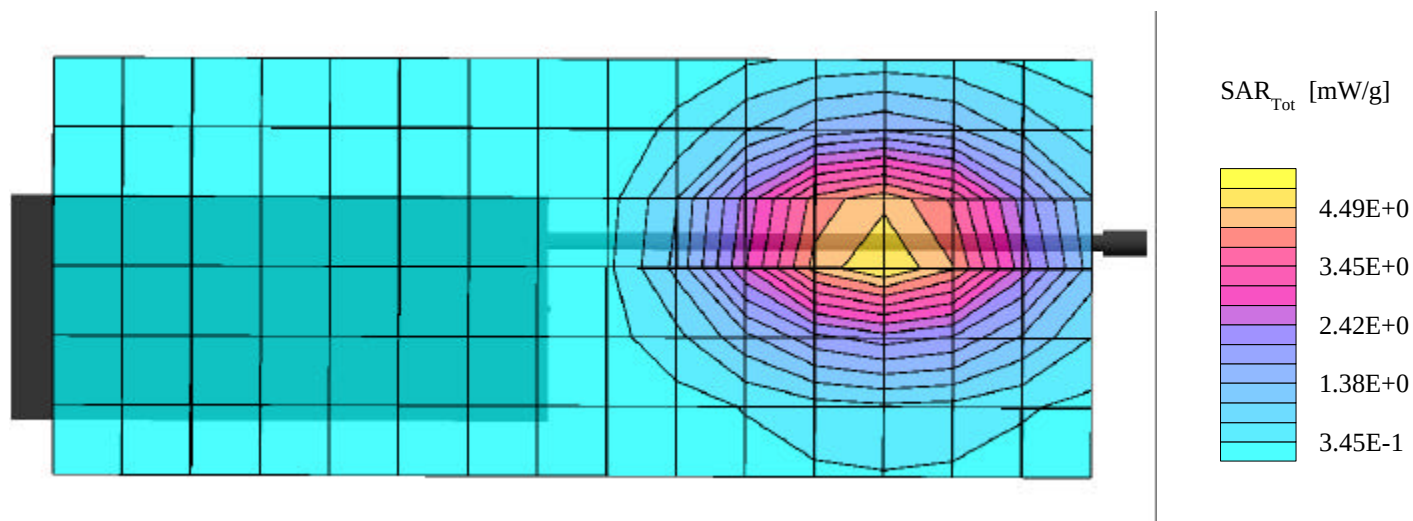


## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0  
835 MHz Muscle:  $\sigma = 0.97$  mho/m  $\epsilon_r = 55.2$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7 Powerdrift: -0.17 dB  
SAR (1g): 4.33 mW/g, SAR (10g): 3.06 mW/g

Body-Worn SAR with 1.2cm Belt-Clip Separation

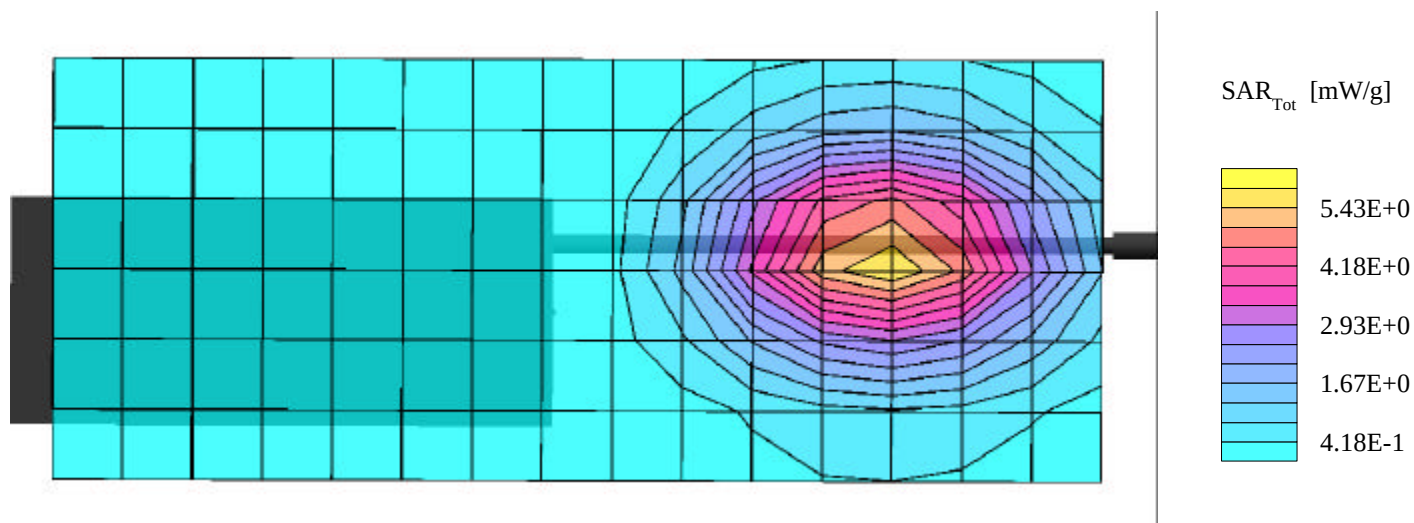
Kenwood Model: TK-5400  
Continuous Wave Mode  
Low Channel [806.0500 MHz]  
Conducted Power: 3.11 Watts  
Date Tested: Dec. 20, 2001



## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0  
835 MHz Muscle:  $\sigma = 0.97$  mho/m  $\epsilon_r = 55.2$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7 Powerdrift: -0.12 dB  
SAR (1g): 5.49 mW/g, SAR (10g): 3.86 mW/g

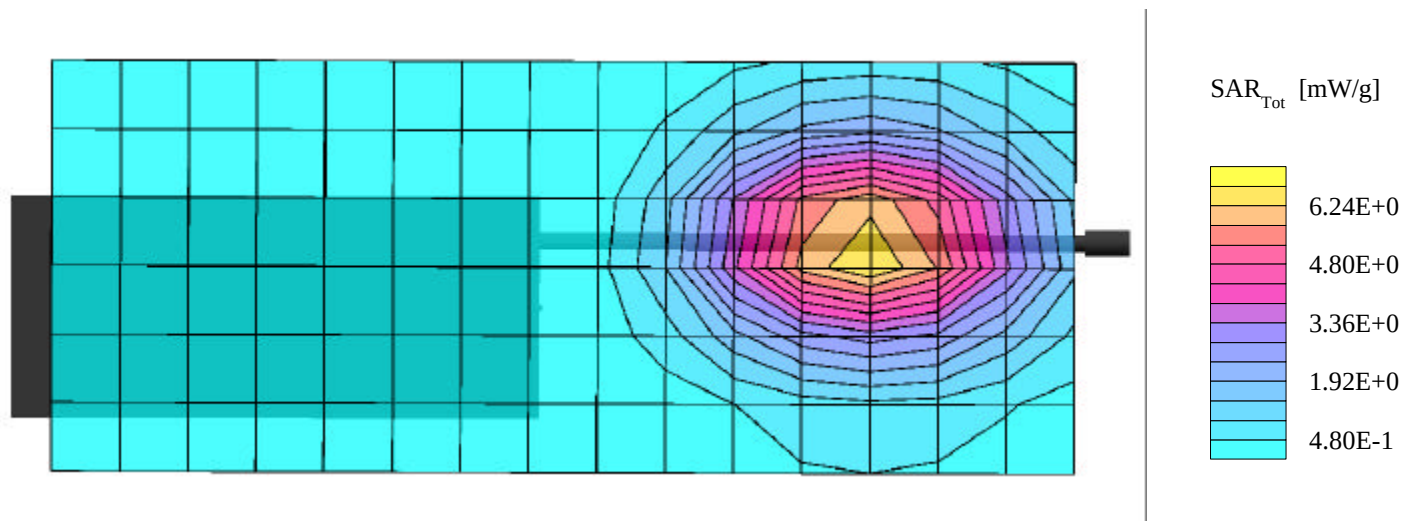
Body-Worn SAR with 1.2cm Belt-Clip Separation  
Kenwood Model: TK-5400  
Continuous Wave Mode  
Mid Channel [815.0000 MHz]  
Conducted Power: 2.99 Watts  
Date Tested: Dec. 20, 2001



## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)  
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0  
835 MHz Muscle:  $\sigma = 0.97$  mho/m  $\epsilon_r = 55.2$   $\rho = 1.00$  g/cm<sup>3</sup>  
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0  
Cube 5x5x7 Powerdrift: -0.13 dB  
SAR (1g): 6.66 mW/g, SAR (10g): 4.68 mW/g

Body-Worn SAR with 1.2cm Belt-Clip Separation  
Kenwood Model: TK-5400  
Continuous Wave Mode  
High Channel [823.9875 MHz]  
Conducted Power: 2.99 Watts  
Date Tested: Dec. 20, 2001



## Kenwood FCC ID: ALH33063110

Small Planar Phantom; Section  
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0;  
835 MHz Muscle:  $\sigma = 0.97$  mho/m  $\epsilon_r = 55.2$   $\rho = 1.00$  g/cm<sup>3</sup>

Z-Axis Extrapolation at Peak SAR Location

Body-Worn SAR with 1.2cm Belt-Clip Separation

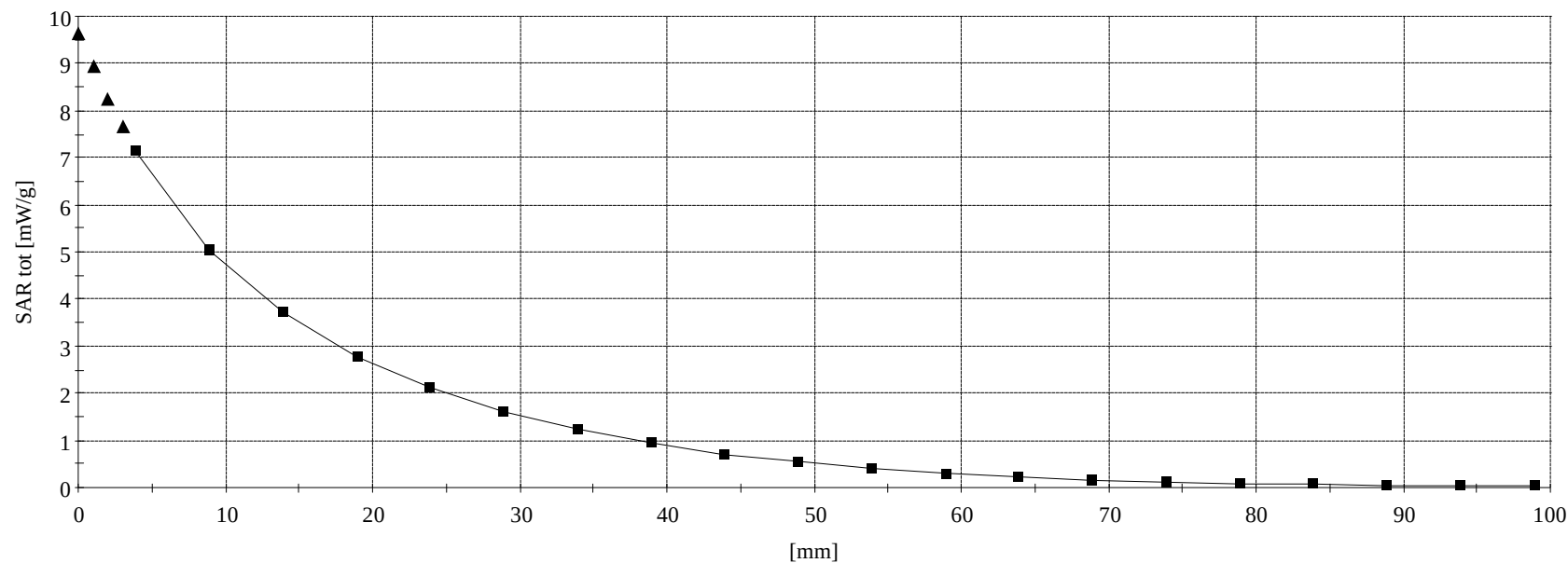
Kenwood Model: TK-5400

Continuous Wave Mode

High Channel [823.9875 MHz]

Conducted Power: 2.99 Watts

Date Tested: Dec. 20, 2001



## ***APPENDIX B - DIPOLE VALIDATION***

## Dipole 900 MHz

Frequency: 300 MHz; Conducted Input Power: 250 [mW]

Small Planar Phantom; Planar Section

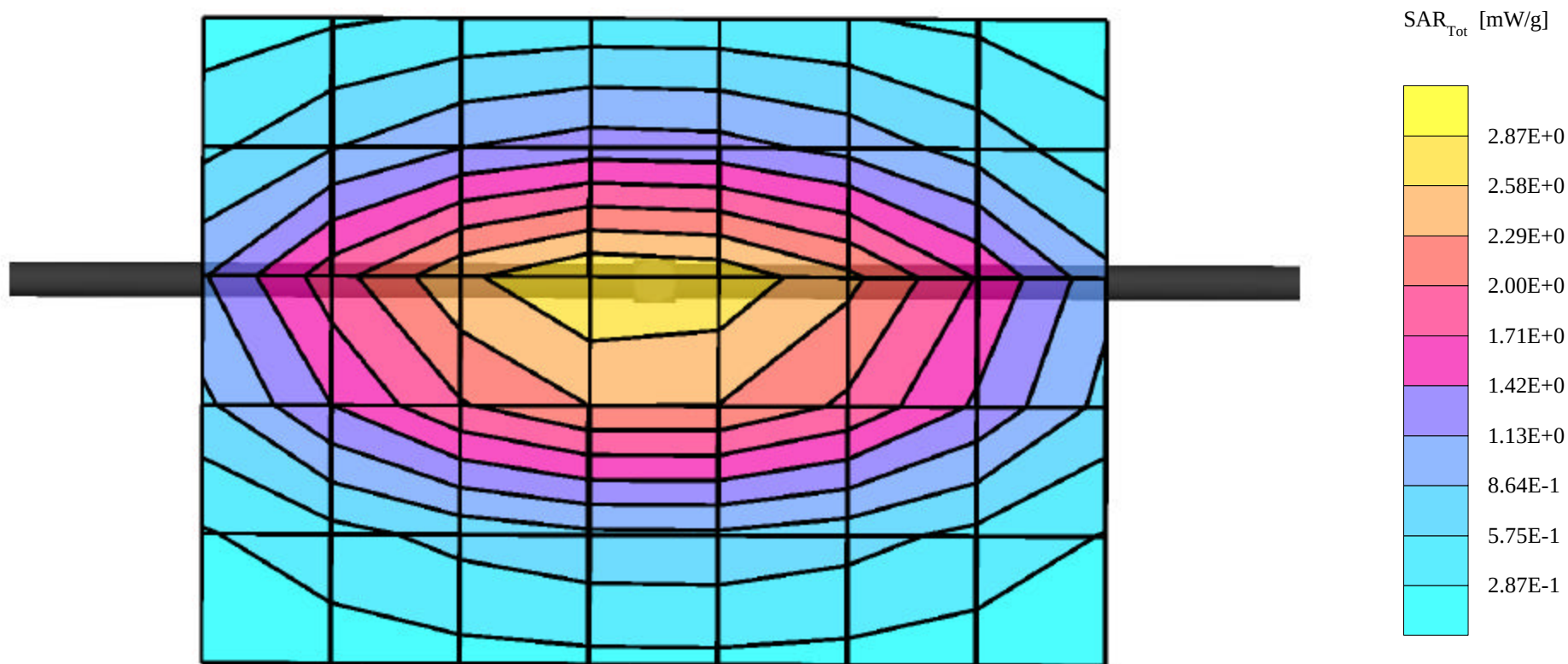
Probe: ET3DV6 - SN1590; ConvF(6.83,6.83,6.83); Crest factor: 1.0; 900 MHz Brain:  $\sigma = 0.97$  mho/m  $\epsilon_r = 41.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 5x5x7: Peak: 4.51 mW/g, SAR (1g): 2.77 mW/g, SAR (10g): 1.75 mW/g, (Worst-case extrapolation)

Penetration depth: 11.4 (10.3, 12.8) [mm]

Powerdrift: -0.02 dB

Calibration Date: Dec. 20, 2001



## ***APPENDIX C - DIPOLE CALIBRATION***

## Validation Dipole D900V2 SN:054, d = 15 mm

Frequency: 900 MHz; Antenna Input Power: 250 [mW]

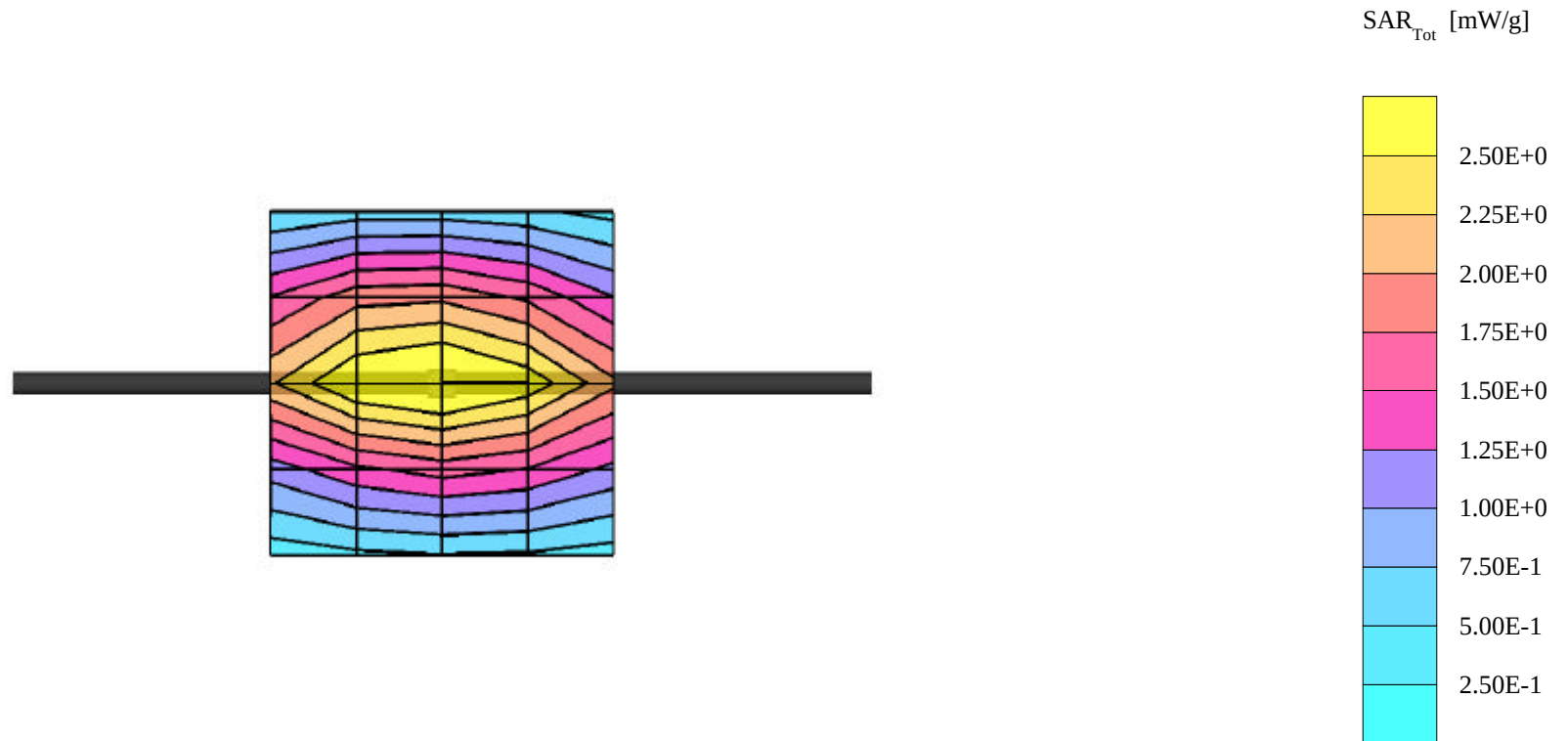
Generic Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0

Probe: ET3DV6 - SN1507; ConvF(6.27,6.27,6.27); Crest factor: 1.0; IEEE1528 900 MHz:  $\sigma = 0.97$  mho/m  $\epsilon_r = 42.4$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 4.47 mW/g  $\pm 0.05$  dB, SAR (1g): 2.78 mW/g  $\pm 0.04$  dB, SAR (10g): 1.76 mW/g  $\pm 0.02$  dB, (Worst-case extrapolation)

Penetration depth: 11.5 (10.3, 13.2) [mm]

Powerdrift: -0.00 dB



## ***APPENDIX D - PROBE CALIBRATION***

# Probe ET3DV6

## SN:1590

|               |                |
|---------------|----------------|
| Manufactured: | March 19, 2001 |
| Calibrated:   | March 26, 2001 |

Calibrated for System DASY3

## DASY3 - Parameters of Probe: ET3DV6 SN:1590

### Sensitivity in Free Space

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>1.77</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.91</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.67</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |

### Diode Compression

|       |               |
|-------|---------------|
| DCP X | <b>100</b> mV |
| DCP Y | <b>100</b> mV |
| DCP Z | <b>100</b> mV |

### Sensitivity in Tissue Simulating Liquid

Head                      450 MHz                       $\epsilon_r = 43.5 \pm 5\%$                        $s = 0.87 \pm 10\%$  mho/m

|         |                          |                  |             |
|---------|--------------------------|------------------|-------------|
| ConvF X | <b>7.36</b> extrapolated | Boundary effect: |             |
| ConvF Y | <b>7.36</b> extrapolated | Alpha            | <b>0.29</b> |
| ConvF Z | <b>7.36</b> extrapolated | Depth            | <b>2.72</b> |

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

|         |                             |                  |             |
|---------|-----------------------------|------------------|-------------|
| ConvF X | <b>6.83</b> $\pm 7\%$ (k=2) | Boundary effect: |             |
| ConvF Y | <b>6.83</b> $\pm 7\%$ (k=2) | Alpha            | <b>0.37</b> |
| ConvF Z | <b>6.83</b> $\pm 7\%$ (k=2) | Depth            | <b>2.48</b> |

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

|         |                          |                  |             |
|---------|--------------------------|------------------|-------------|
| ConvF X | <b>6.13</b> interpolated | Boundary effect: |             |
| ConvF Y | <b>6.13</b> interpolated | Alpha            | <b>0.47</b> |
| ConvF Z | <b>6.13</b> interpolated | Depth            | <b>2.17</b> |

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

|         |                             |                  |             |
|---------|-----------------------------|------------------|-------------|
| ConvF X | <b>5.78</b> $\pm 7\%$ (k=2) | Boundary effect: |             |
| ConvF Y | <b>5.78</b> $\pm 7\%$ (k=2) | Alpha            | <b>0.53</b> |
| ConvF Z | <b>5.78</b> $\pm 7\%$ (k=2) | Depth            | <b>2.01</b> |

### Sensor Offset

|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.2 <math>\pm</math> 0.2</b> | mm |

ET3DV6 SN:1590

## DASY3 - Parameters of Probe: ET3DV6 SN: 1590

**Body**                      **450 MHz**                       $\epsilon_r = 56.7 \pm 5\%$                        $\sigma = 0.94 \pm 10\% \text{ mho/m}$

ConvF X                      **7.23** extrapolated

ConvF Y                      **7.23** extrapolated

ConvF Z                      **7.23** extrapolated

**Body**                      **900 MHz**                       $\epsilon_r = 55.0 \pm 5\%$                        $\sigma = 1.05 \pm 10\% \text{ mho/m}$

ConvF X                      **6.61**  $\pm 7\%$  (k=2)

ConvF Y                      **6.61**  $\pm 7\%$  (k=2)

ConvF Z                      **6.61**  $\pm 7\%$  (k=2)

**Body**                      **1500 MHz**                       $\epsilon_r = 54.0 \pm 5\%$                        $\sigma = 1.30 \pm 10\% \text{ mho/m}$

ConvF X                      **5.78** interpolated

ConvF Y                      **5.78** interpolated

ConvF Z                      **5.78** interpolated

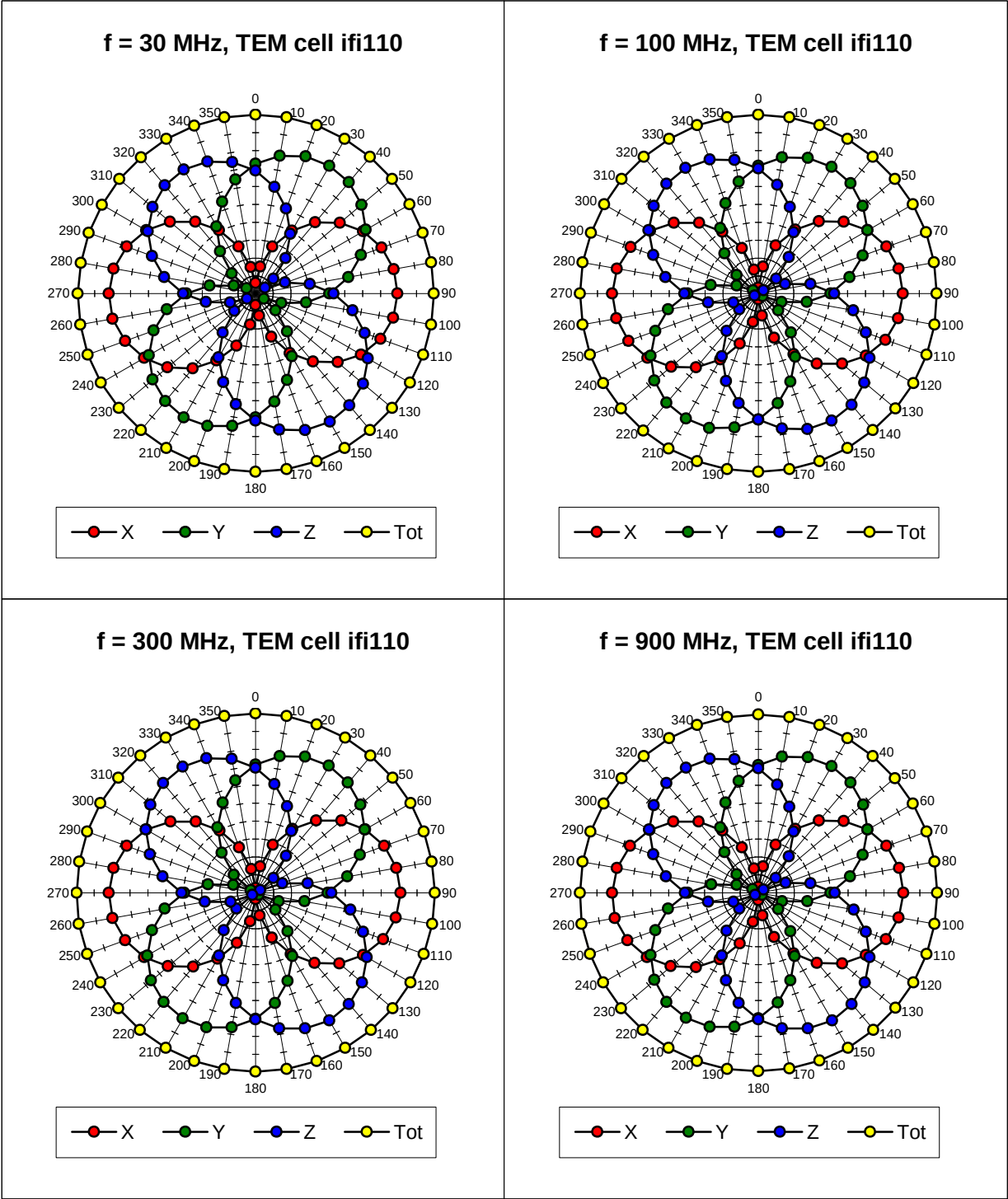
**Body**                      **1800 MHz**                       $\epsilon_r = 53.3 \pm 5\%$                        $\sigma = 1.52 \pm 10\% \text{ mho/m}$

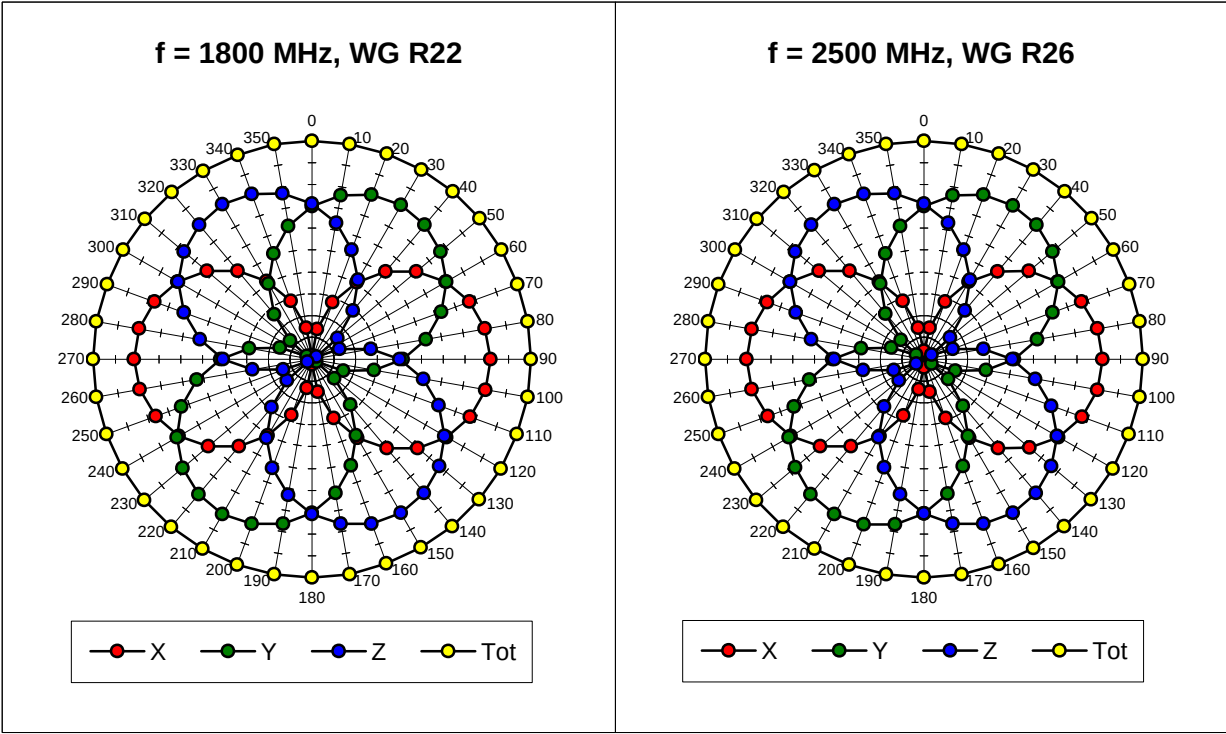
ConvF X                      **5.36**  $\pm 7\%$  (k=2)

ConvF Y                      **5.36**  $\pm 7\%$  (k=2)

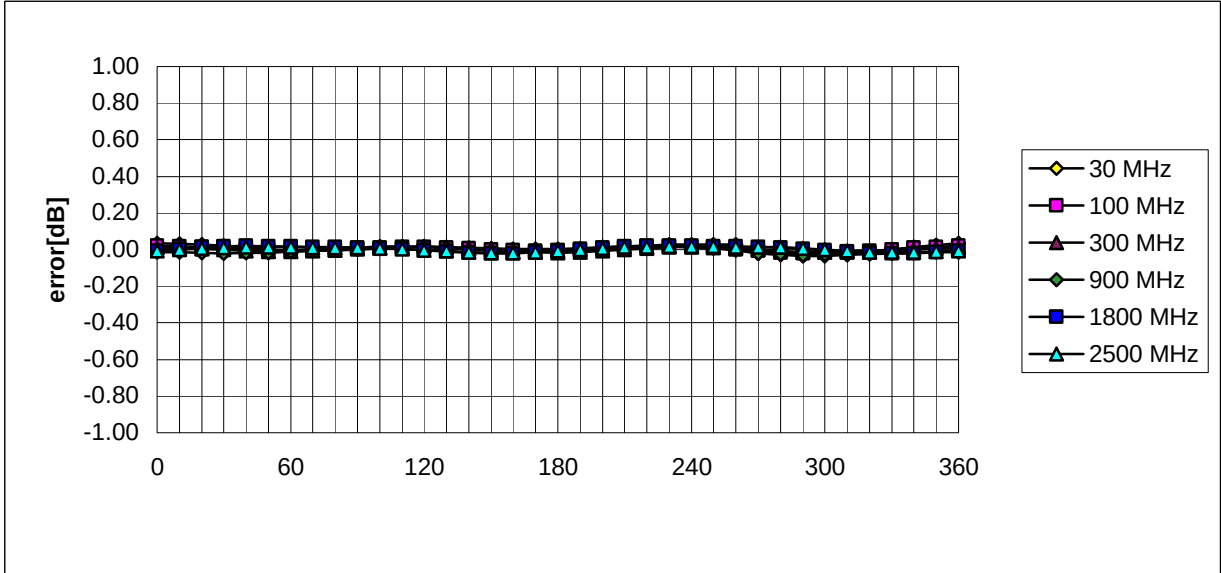
ConvF Z                      **5.36**  $\pm 7\%$  (k=2)

Receiving Pattern (f) , q = 0°

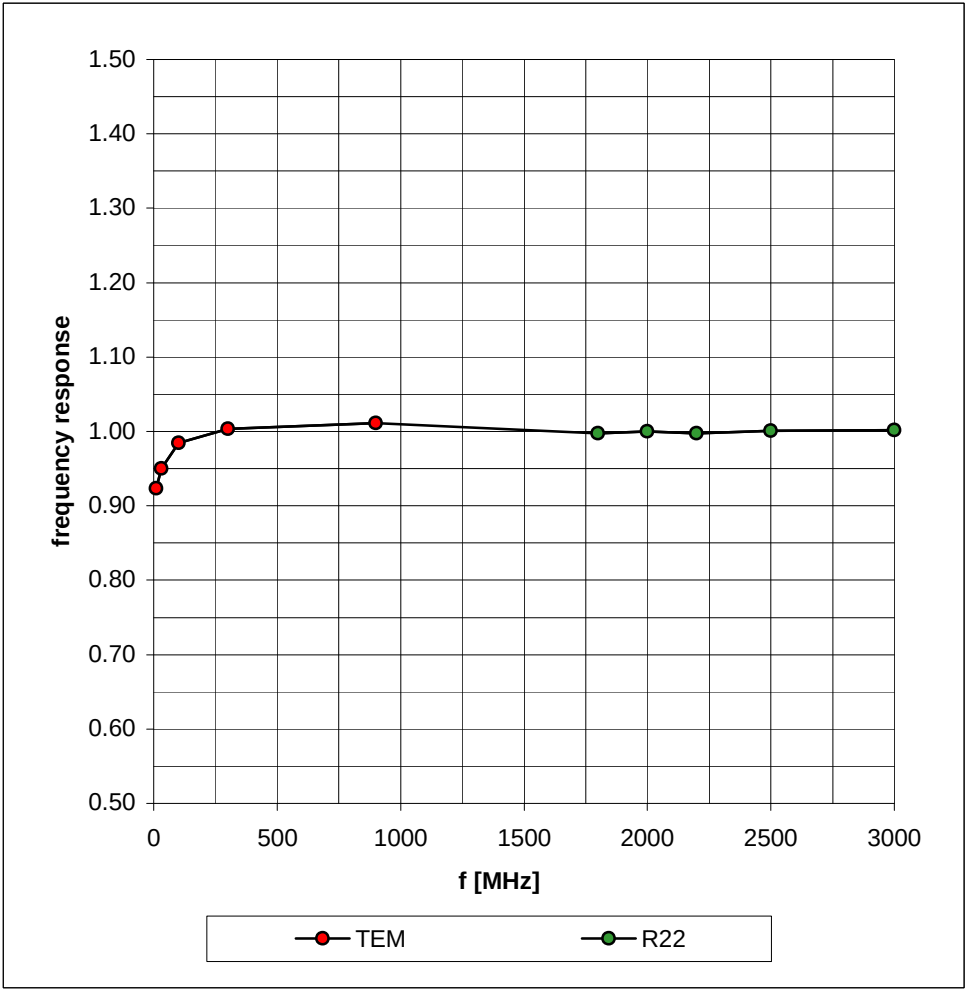




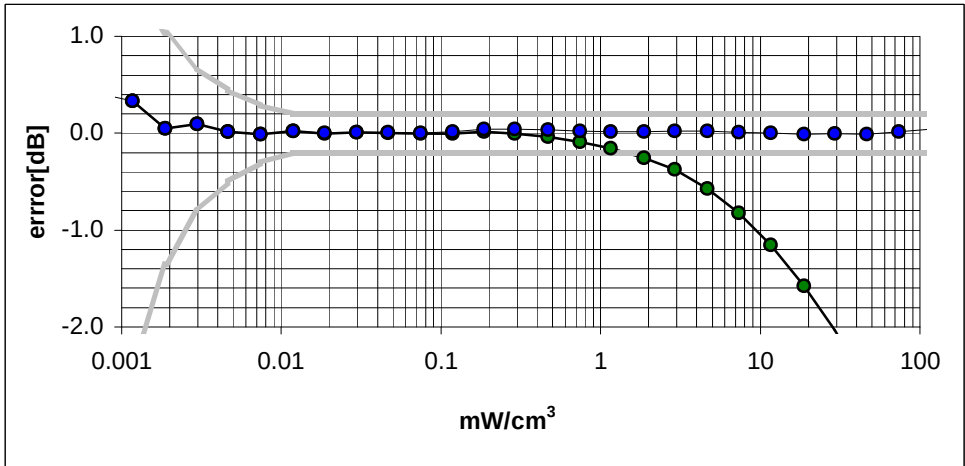
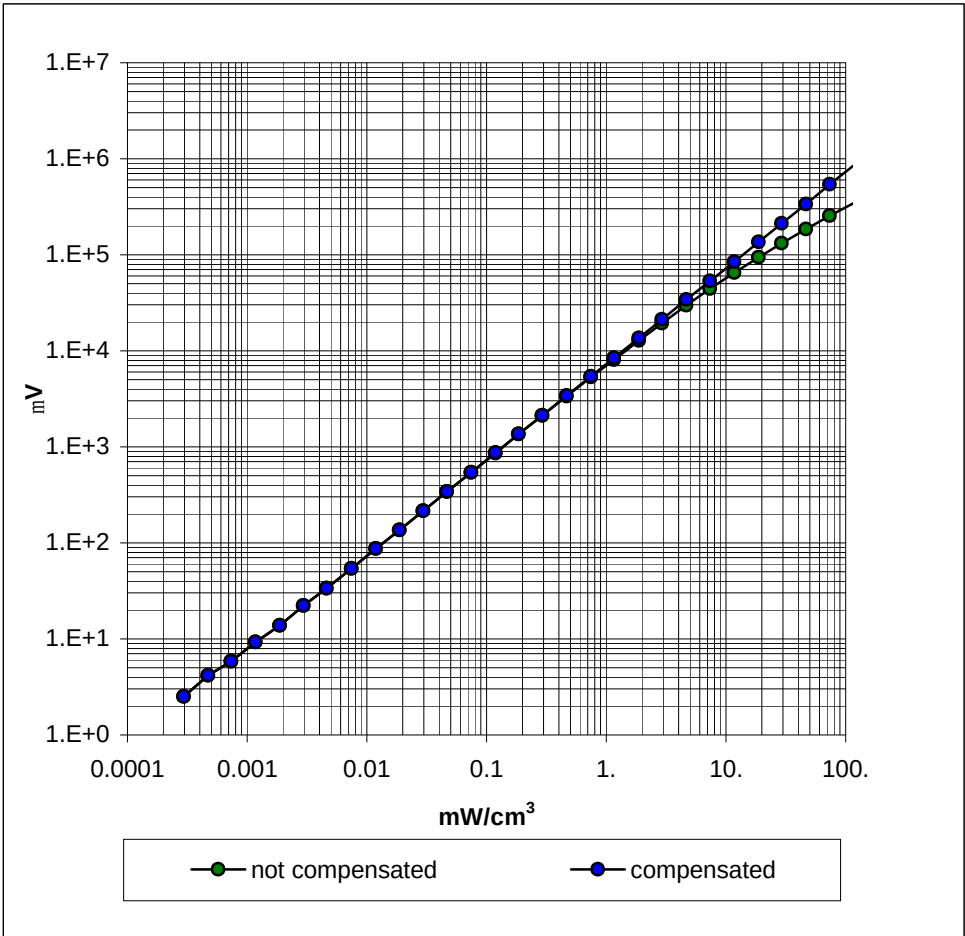
Isotropy Error (f), q = 0°



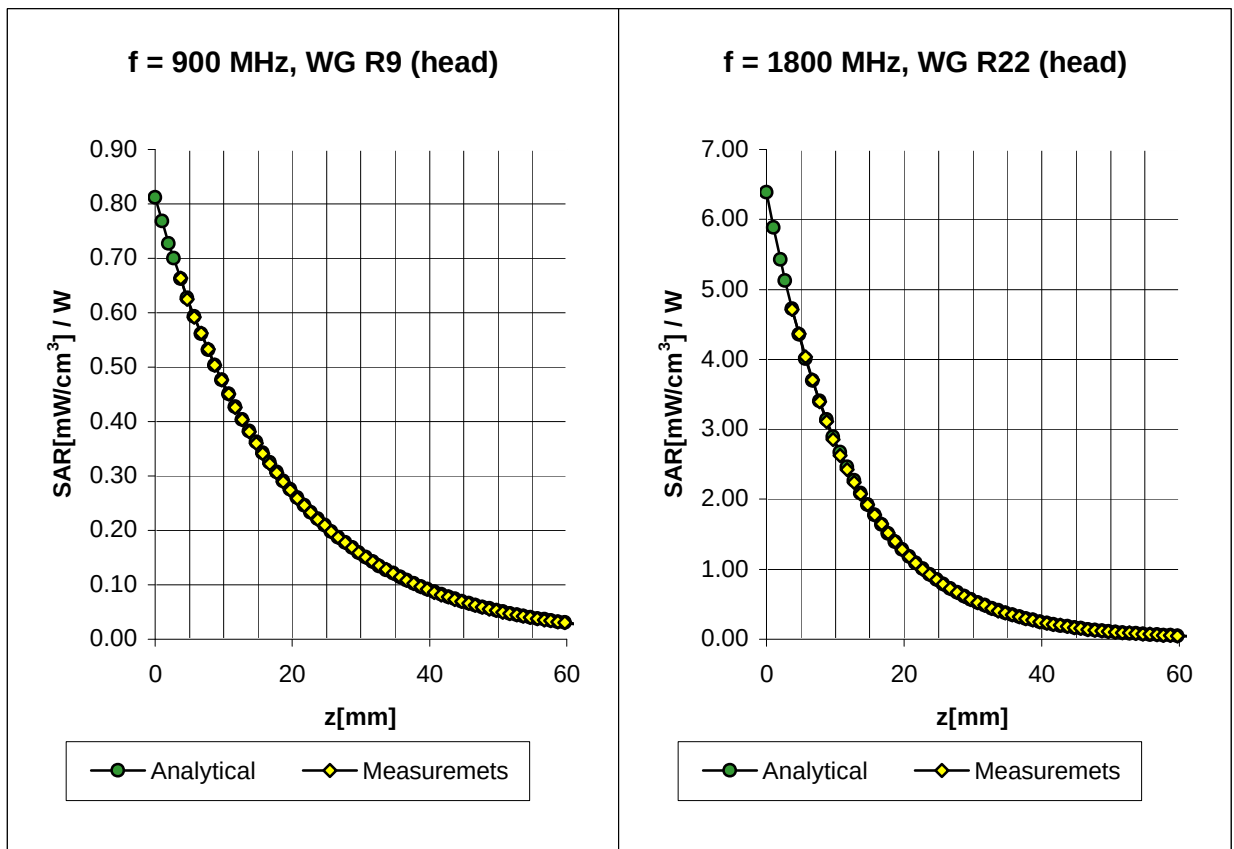
Frequency Response of E-Field  
( TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR<sub>brain</sub>)  
( TEM-Cell:ifi110 )



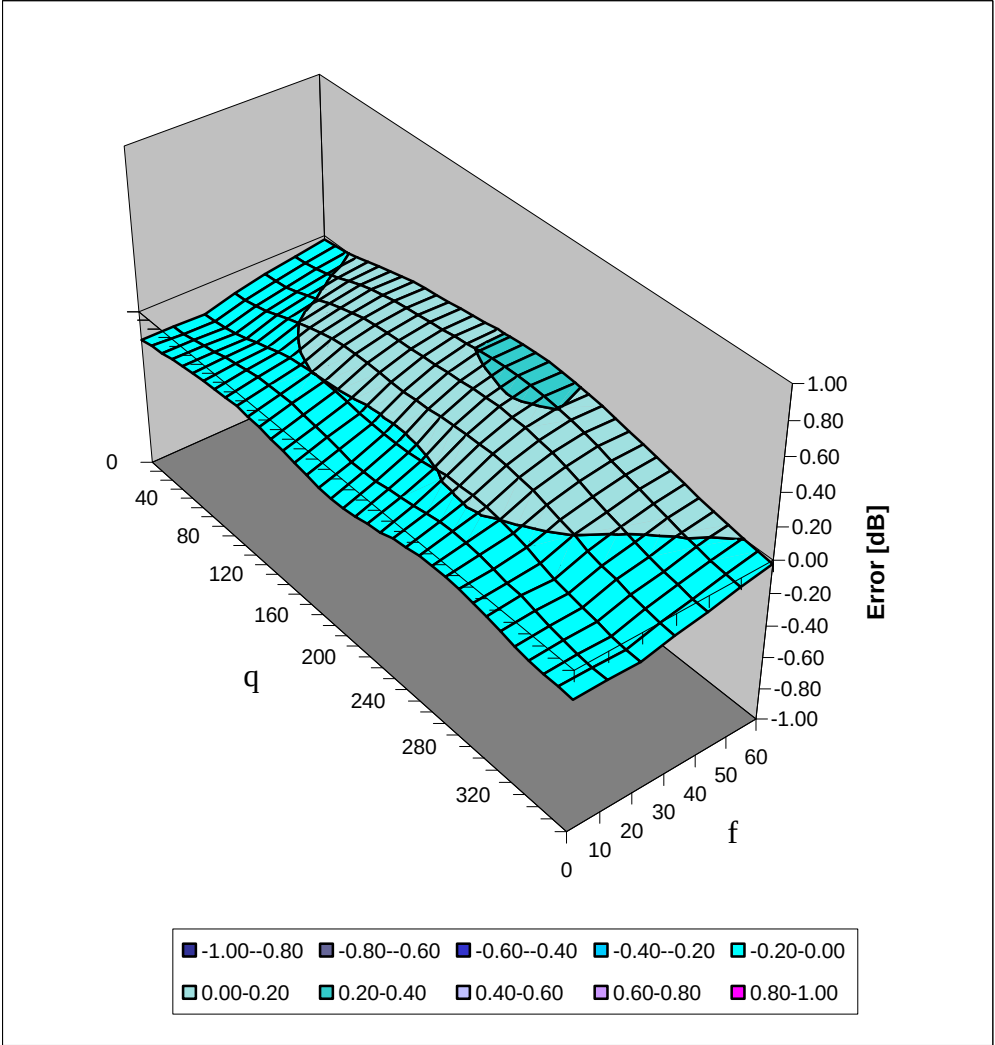
## Conversion Factor Assessment



ET3DV6 SN:1590

# Deviation from Isotropy in HSL

Error ( $q, f$ ),  $f = 900$  MHz



## ***APPENDIX E - SAR SENSITIVITIES***

# Application Note: SAR Sensitivities

## Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{d \text{ SAR} / \text{ SAR}}{d x / x}$$

The controlling parameters x are:

- $\epsilon$  : permittivity
- $\sigma$  : conductivity
- $\rho$  : brain density (= one over integration volume)

For example: If The liquid permittivity increases by 2 percent and the sensitivity of the SAR to permittivity is -0.6 then the SAR will decrease by 1.2 percent.

The sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 10mm (for frequencies below 1000 MHz) and 15mm (for frequencies above 1000 MHz) from the liquid surface.

Liquid parameters are as proposed in the new standards (e.g., IEEE 1528).

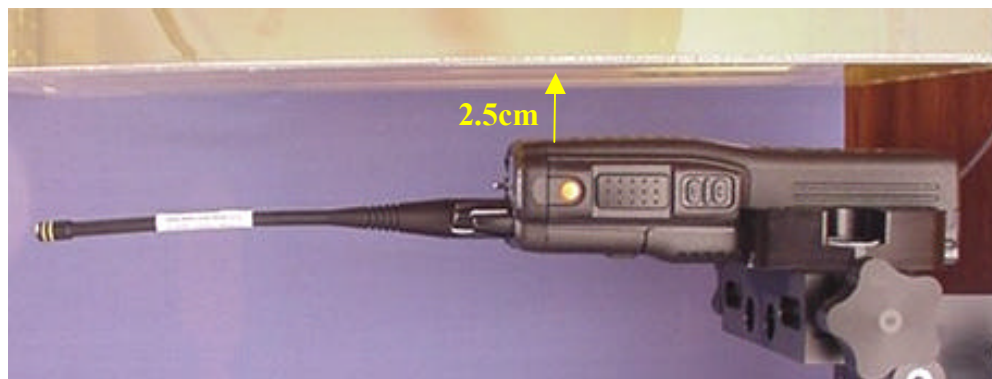
## References

- [1] N. Kuster and Q. Balzano, "Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz", *IEEE Transactions on Vehicular Technology*, vol. 41(1), pp. 17-23, 1992.

| Parameter                                                                                                              | $\epsilon$ | $\sigma$ | $\rho$ |
|------------------------------------------------------------------------------------------------------------------------|------------|----------|--------|
| <b>f=300 MHz (<math>\epsilon_r=45.3</math>, <math>\sigma=0.87\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b>  |            |          |        |
| <b>d=15mm: Surface</b>                                                                                                 | - 0.41     | + 0.48   | —      |
| <b>1 g</b>                                                                                                             | - 0.33     | + 0.28   | 0.08   |
| <b>10 g</b>                                                                                                            | - 0.26     | + 0.09   | 0.16   |
| <b>f=450 MHz (<math>\epsilon_r=43.5</math>, <math>\sigma=0.87\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b>  |            |          |        |
| <b>d=15mm: Surface</b>                                                                                                 | - 0.56     | + 0.67   | —      |
| <b>1 g</b>                                                                                                             | - 0.46     | + 0.43   | 0.09   |
| <b>10 g</b>                                                                                                            | - 0.37     | + 0.22   | 0.17   |
| <b>f=835 MHz (<math>\epsilon_r=41.5</math>, <math>\sigma=0.90\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b>  |            |          |        |
| <b>d=15mm: Surface</b>                                                                                                 | - 0.70     | + 0.86   | —      |
| <b>1 g</b>                                                                                                             | - 0.57     | + 0.59   | 0.10   |
| <b>10 g</b>                                                                                                            | - 0.45     | + 0.35   | 0.18   |
| <b>f=900 MHz (<math>\epsilon_r=41.5</math>, <math>\sigma=0.97\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b>  |            |          |        |
| <b>d=15mm: Surface</b>                                                                                                 | - 0.69     | + 0.86   | —      |
| <b>1 g</b>                                                                                                             | - 0.55     | + 0.57   | 0.10   |
| <b>10 g</b>                                                                                                            | - 0.44     | + 0.32   | 0.19   |
| <b>f=1450 MHz (<math>\epsilon_r=40.5</math>, <math>\sigma=1.20\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.73     | + 0.91   | —      |
| <b>1 g</b>                                                                                                             | - 0.55     | + 0.55   | 0.12   |
| <b>10 g</b>                                                                                                            | - 0.42     | + 0.27   | 0.22   |
| <b>f=1800 MHz (<math>\epsilon_r=40.0</math>, <math>\sigma=1.40\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.73     | + 0.92   | —      |
| <b>1 g</b>                                                                                                             | - 0.52     | + 0.51   | 0.14   |
| <b>10 g</b>                                                                                                            | - 0.38     | + 0.21   | 0.24   |
| <b>f=1900 MHz (<math>\epsilon_r=40.0</math>, <math>\sigma=1.40\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.73     | + 0.93   | —      |
| <b>1 g</b>                                                                                                             | - 0.53     | + 0.51   | 0.14   |
| <b>10 g</b>                                                                                                            | - 0.39     | + 0.22   | 0.24   |
| <b>f=2000 MHz (<math>\epsilon_r=40.0</math>, <math>\sigma=1.40\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.74     | + 0.94   | —      |
| <b>1 g</b>                                                                                                             | - 0.53     | + 0.52   | 0.14   |
| <b>10 g</b>                                                                                                            | - 0.39     | + 0.22   | 0.24   |
| <b>f=2450 MHz (<math>\epsilon_r=39.2</math>, <math>\sigma=1.80\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.74     | + 0.93   | —      |
| <b>1 g</b>                                                                                                             | - 0.49     | + 0.41   | 0.17   |
| <b>10 g</b>                                                                                                            | - 0.34     | + 0.12   | 0.28   |
| <b>f=3000 MHz (<math>\epsilon_r=38.5</math>, <math>\sigma=2.40\text{S/m}</math>, <math>\rho=1\text{g/cm}^3</math>)</b> |            |          |        |
| <b>d=10mm: Surface</b>                                                                                                 | - 0.75     | + 0.90   | —      |
| <b>1 g</b>                                                                                                             | - 0.45     | + 0.28   | 0.21   |
| <b>10 g</b>                                                                                                            | - 0.32     | + 0.02   | 0.31   |

***APPENDIX F - SAR AND EUT PHOTOGRAPHS***

## FACE-HELD SAR TEST SETUP PHOTOGRAPHS



## BODY-WORN SAR TEST SETUP PHOTOGRAPHS



## EUT PHOTOGRAPHS

