

## SAR EVALUATION RESULTS WITH EXTERNAL POWER SUPPLY

| Test Type | Freq. (MHz) | Chan. | Test Mode | DUT Type | Antenna Type | Body-Worn Accessories | Power Source         | Separation Distance to Planar Phantom (cm) | Cond. Power Before Test (dBm) | Measured SAR 1g (W/kg) |      | SAR Drift During Test (dB) | Scaled SAR 1g (W/kg) |      |
|-----------|-------------|-------|-----------|----------|--------------|-----------------------|----------------------|--------------------------------------------|-------------------------------|------------------------|------|----------------------------|----------------------|------|
|           |             |       |           |          |              |                       |                      |                                            |                               | Duty Cycle             |      |                            | Duty Cycle           |      |
|           |             |       |           |          |              |                       |                      |                                            |                               | 100%                   | 50%  |                            | 100%                 | 50%  |
| Face      | 480         | Mid   | CW        | Radio    | Whip         | —                     | Ext. Power (to NiMH) | 2.5                                        | 36.57                         | 2.22                   | 1.11 | -0.487                     | 2.48                 | 1.24 |
| Body      | 480         | Mid   | CW        | SMA      | Whip         | Lapel-Clip            | Ext. Power (to NiMH) | 1.2                                        | 36.75                         | 8.48                   | 4.24 | -0.658                     | 9.87                 | 4.93 |

**ANSI / IEEE C95.1 1999 - SAFETY LIMIT**  
**BRAIN / BODY: 8.0 W/kg (averaged over 1 gram)**  
**Spatial Peak - Controlled Exposure / Occupational**

| Test Date(s)                        | February 11, 2005 |           |          | February 11, 2005 |           |          | Measured Fluid Type         | Brain     | Body      | Unit |
|-------------------------------------|-------------------|-----------|----------|-------------------|-----------|----------|-----------------------------|-----------|-----------|------|
| Dielectric Constant<br>$\epsilon_r$ | 450 MHz Brain     |           |          | 450 MHz Body      |           |          | Relative Humidity           | 30        | 30        | %    |
|                                     | IEEE Target       |           | Measured | IEEE Target       |           | Measured | Atmospheric Pressure        | 102.2     | 101.6     | kPa  |
|                                     | 43.5              | $\pm 5\%$ | 42.2     | 56.7              | $\pm 5\%$ | 56.6     | Ambient Temperature         | 21.8      | 23.8      | °C   |
| Conductivity<br>$\sigma$ (mho/m)    | 450 MHz Brain     |           |          | 450 MHz Body      |           |          | Fluid Temperature           | 21.4      | 22.3      | °C   |
|                                     | IEEE Target       |           | Measured | IEEE Target       |           | Measured | Fluid Depth                 | $\geq 15$ | $\geq 15$ | cm   |
|                                     | 0.87              | $\pm 5\%$ | 0.84     | 0.94              | $\pm 5\%$ | 0.91     | $\rho$ (Kg/m <sup>3</sup> ) | 1000      |           |      |

Note(s):

- To determine conservative SAR results from the original evaluations, the above tests were performed in the worst-case power drift configurations previously tested by using an external power supply connected to the NiMH battery terminals with a ferrite dampener on the power leads. SAR-versus-Time power drift evaluations were also performed with the external power supply. See page(s) below for the SAR test plots and SAR-versus-Time power drift evaluation data.
- The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR levels as shown in the above table.
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
- The dielectric parameters of the simulated tissue mixtures were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
- The SAR evaluations were performed within 24 hours of the system performance check.
- Abbreviation(s): SMA - Speaker-Microphone with Antenna.

## SYSTEM PERFORMANCE CHECK

| Test Date | 450MHz Equiv. Tissue | SAR 1g (W/kg)       |          | Dielectric Constant $\epsilon_r$ |          | Conductivity $\sigma$ (mho/m) |          | $\rho$ (Kg/m <sup>3</sup> ) | Amb. Temp. (°C) | Fluid Temp. (°C) | Fluid Depth (cm) | Humid. (%) | Barom. Press. (kPa) |
|-----------|----------------------|---------------------|----------|----------------------------------|----------|-------------------------------|----------|-----------------------------|-----------------|------------------|------------------|------------|---------------------|
|           |                      | IEEE Target         | Measured | IEEE Target                      | Measured | IEEE Target                   | Measured |                             |                 |                  |                  |            |                     |
| 02/11/05  | Brain                | 1.23 ( $\pm 10\%$ ) | 1.23     | 43.5 $\pm 5\%$                   | 42.2     | 0.87 $\pm 5\%$                | 0.84     | 1000                        | 21.8            | 21.4             | $\geq 15$        | 30         | 102.2               |

Note(s):

- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures reported in the table above were consistent for all measurement periods.

Date Tested: 02/11/05

## Face-Held SAR - Radio Transceiver - External Power Supply to Radio Battery Terminals

**DUT: E.F. Johnson Model: 4140; Type: Portable FM UHF PTT Radio Transceiver; Serial: n/a (Identical Prototype)**

Ambient Temp: 21.8 °C; Fluid Temp: 21.4 °C; Barometric Pressure: 102.2 kPa; Humidity: 30%

Communication System: FM UHF

Frequency: 480 MHz; Duty Cycle: 1:1

RF Output Power: 36.57 dBm (Conducted)

8.0V External Power Supply to NiMH Battery Terminals

Medium: HSL450 ( $\sigma = 0.84$  mho/m;  $\epsilon_r = 42.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DAS4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

### Face-Held - 2.5 cm Separation Distance - Mid Channel/Area Scan (8x22x1):

Measurement grid: dx=15mm, dy=15mm

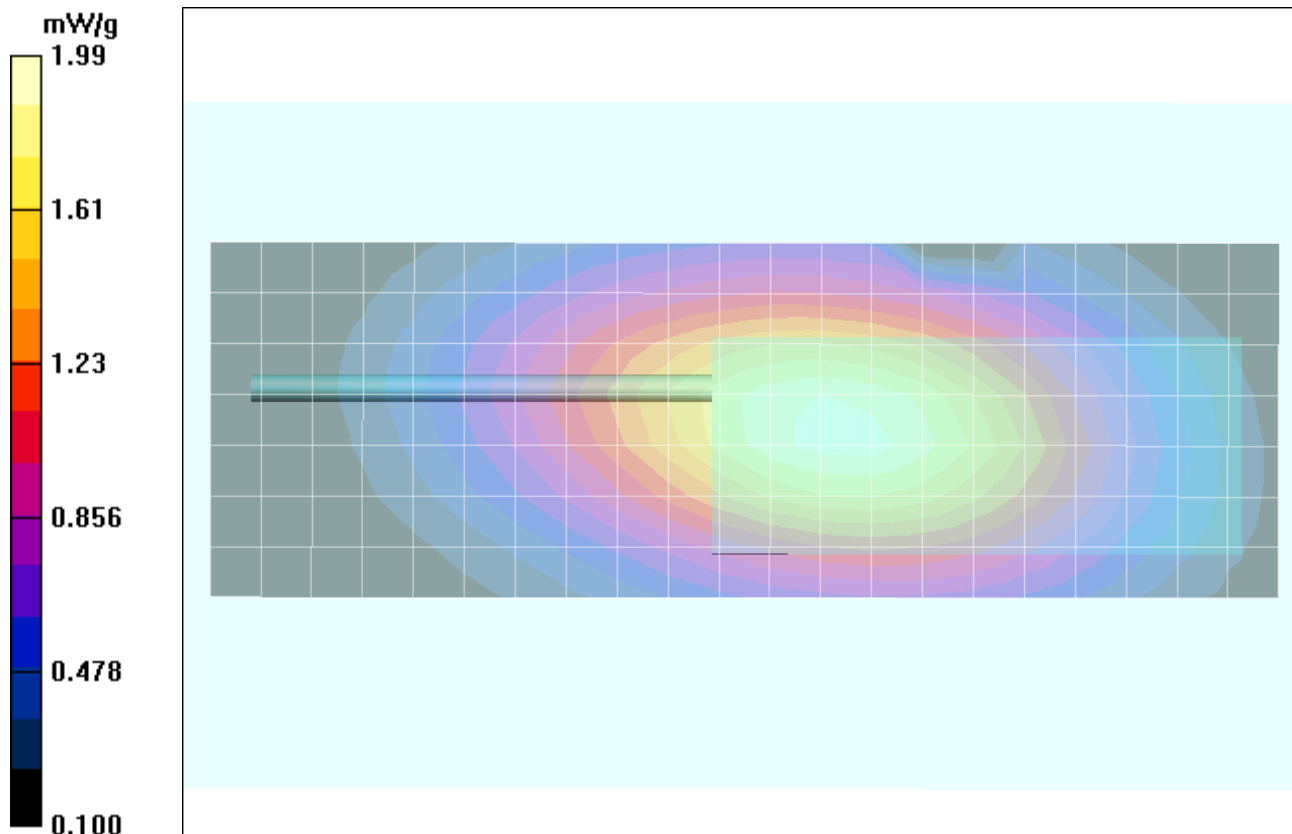
### Face-Held - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

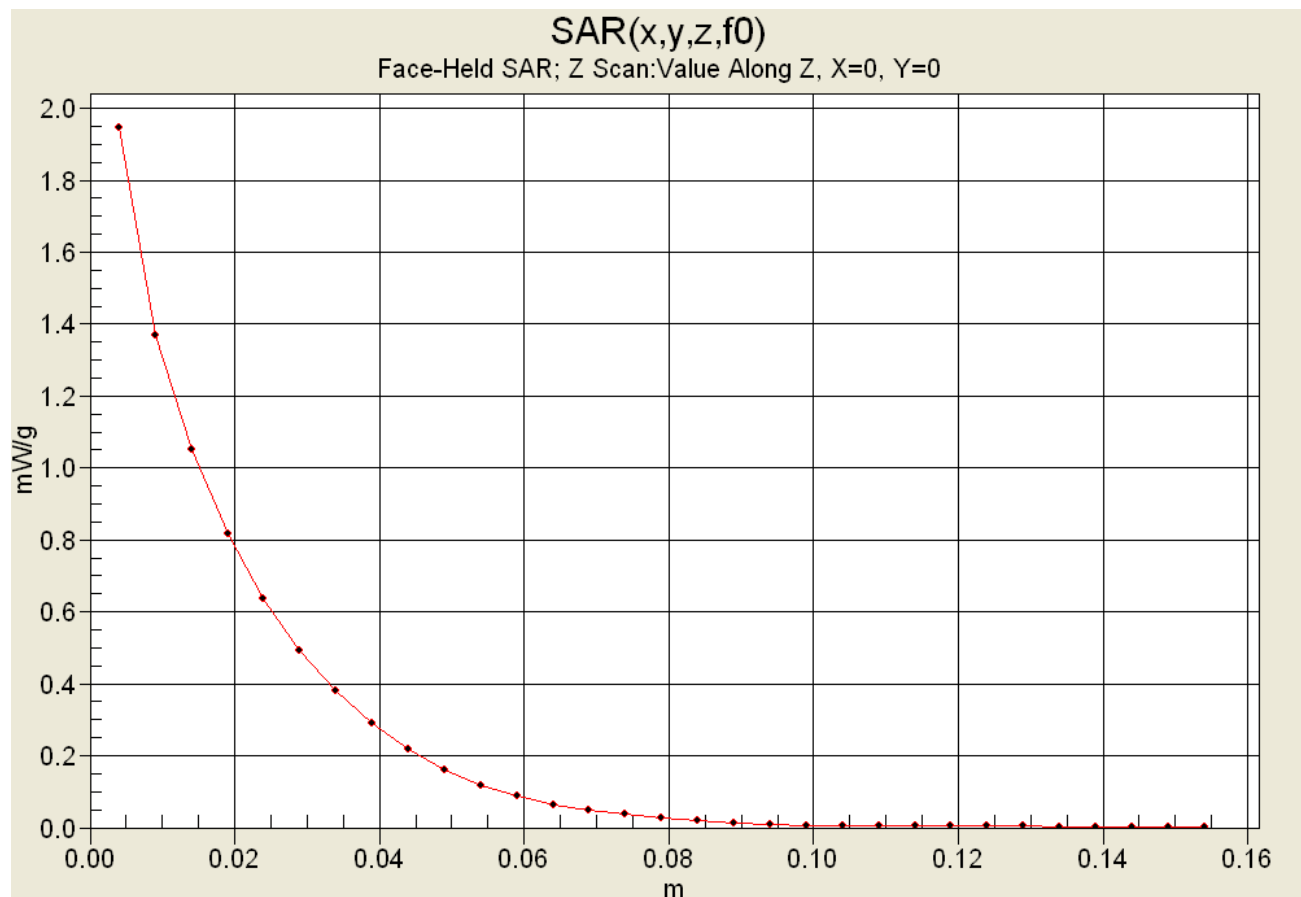
Reference Value = 47.5 V/m; Power Drift = -0.487 dB

Peak SAR (extrapolated) = 5.39 W/kg

**SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.44 mW/g**



## Z-Axis Scan

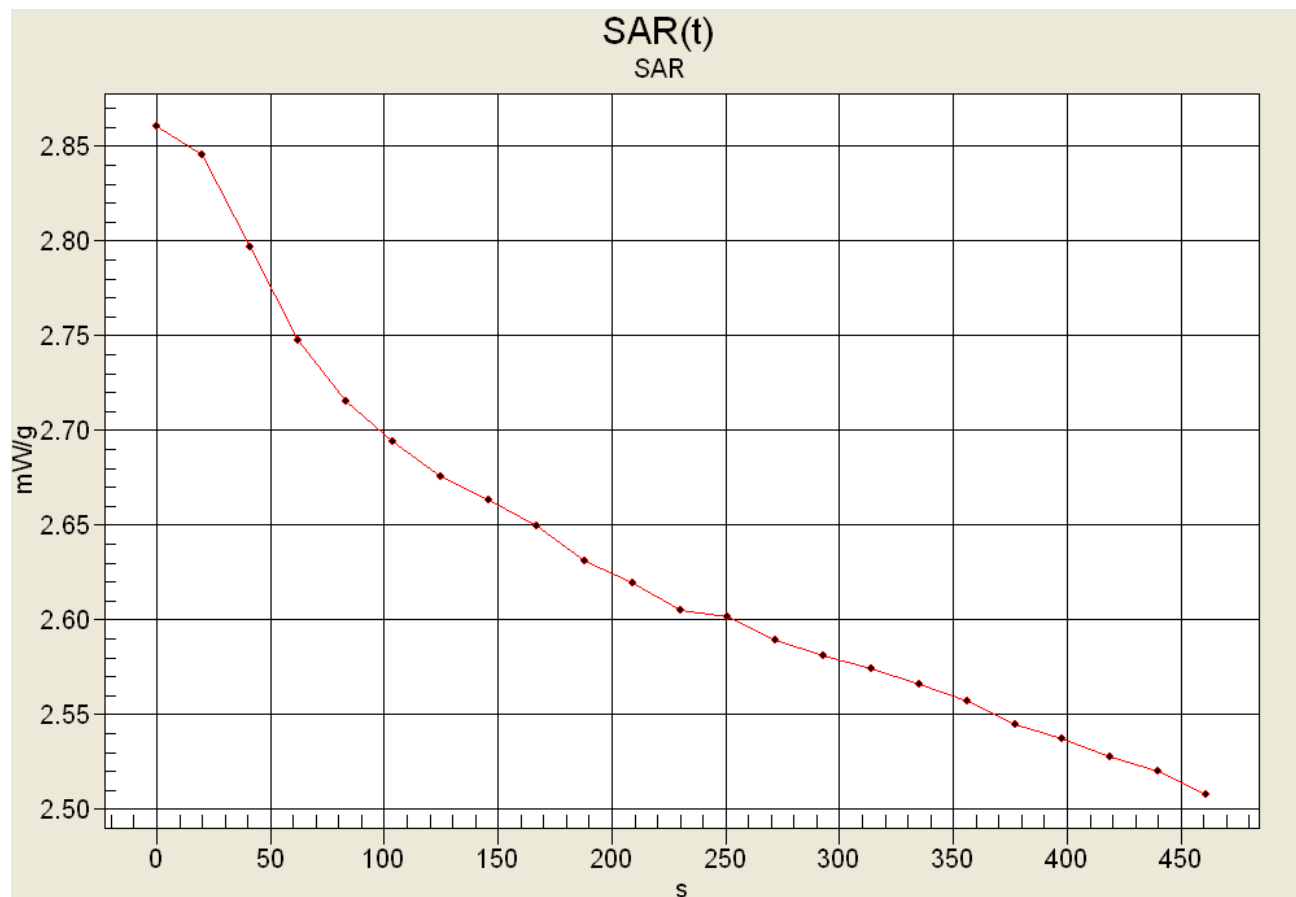


## SAR-versus-Time Power Drift Evaluation

Face-Held Configuration

8V External Power Supply to NiMH Battery Terminals

Mid Channel - 480 MHz



Start SAR: 2.86042 mW/g

End SAR: 2.50793 mW/g (-0.571 dB)

SAR after 340s: 2.5658 mW/g (-0.472 dB)

(340s = Zoom Scan Duration)

Date Tested: 02/11/05

## Body-Worn SAR - Speaker-Microphone with Antenna - External Power Supply to Battery Terminals

**DUT: E.F. Johnson Model: 4140; Type: Portable FM PTT Speaker-Microphone with Antenna & Lapel-Clip; P/N: 589-0015-058**

Ambient Temp: 23.8 °C; Fluid Temp: 22.3 °C; Barometric Pressure: 101.6 kPa; Humidity: 30%

Communication System: FM UHF

Frequency: 480 MHz; Duty Cycle: 1:1

RF Output Power: 36.75 dBm (Conducted)

8.0V External Power Supply to NiMH Battery Terminals

Medium: M450 ( $\sigma = 0.91$  mho/m;  $\epsilon_r = 56.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1387; ConvF(7.6, 7.6, 7.6); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

### Body-Worn - 1.2 cm Lapel-Clip Separation Distance - Mid Channel/Area Scan (8x17x1):

Measurement grid: dx=15mm, dy=15mm

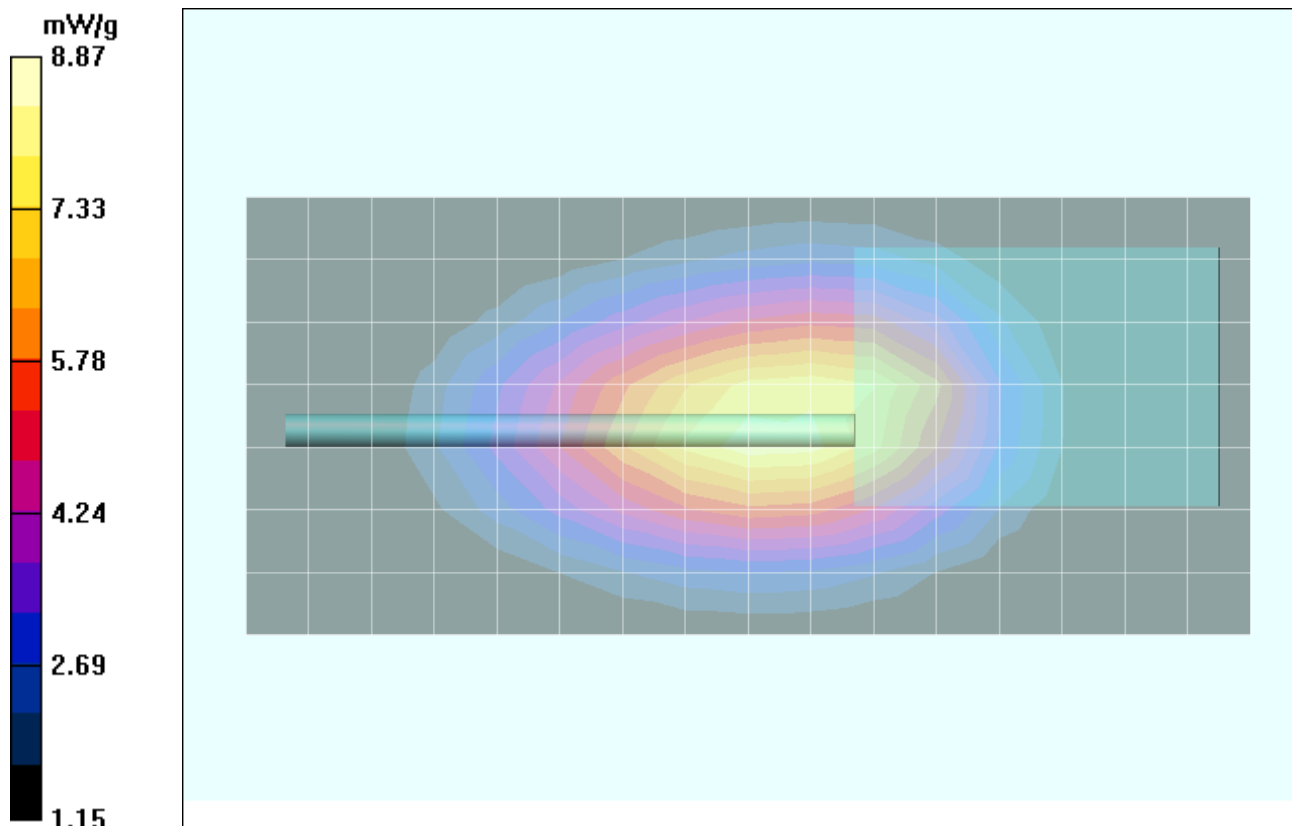
### Body-Worn - 1.2 cm Lapel-Clip Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

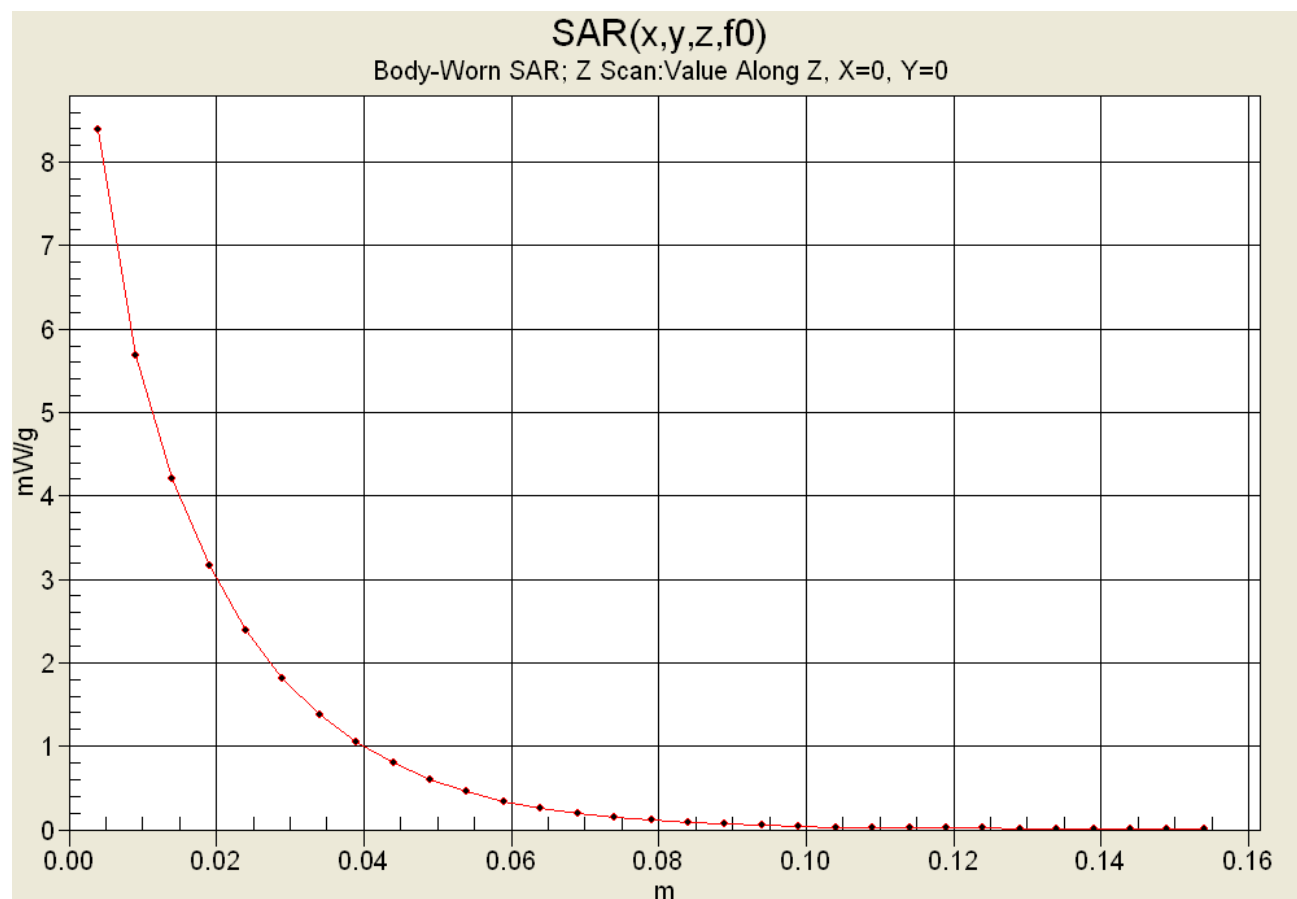
Reference Value = 97.3 V/m; Power Drift = -0.658 dB

Peak SAR (extrapolated) = 13.5 W/kg

**SAR(1 g) = 8.48 mW/g; SAR(10 g) = 5.92 mW/g**



## Z-Axis Scan

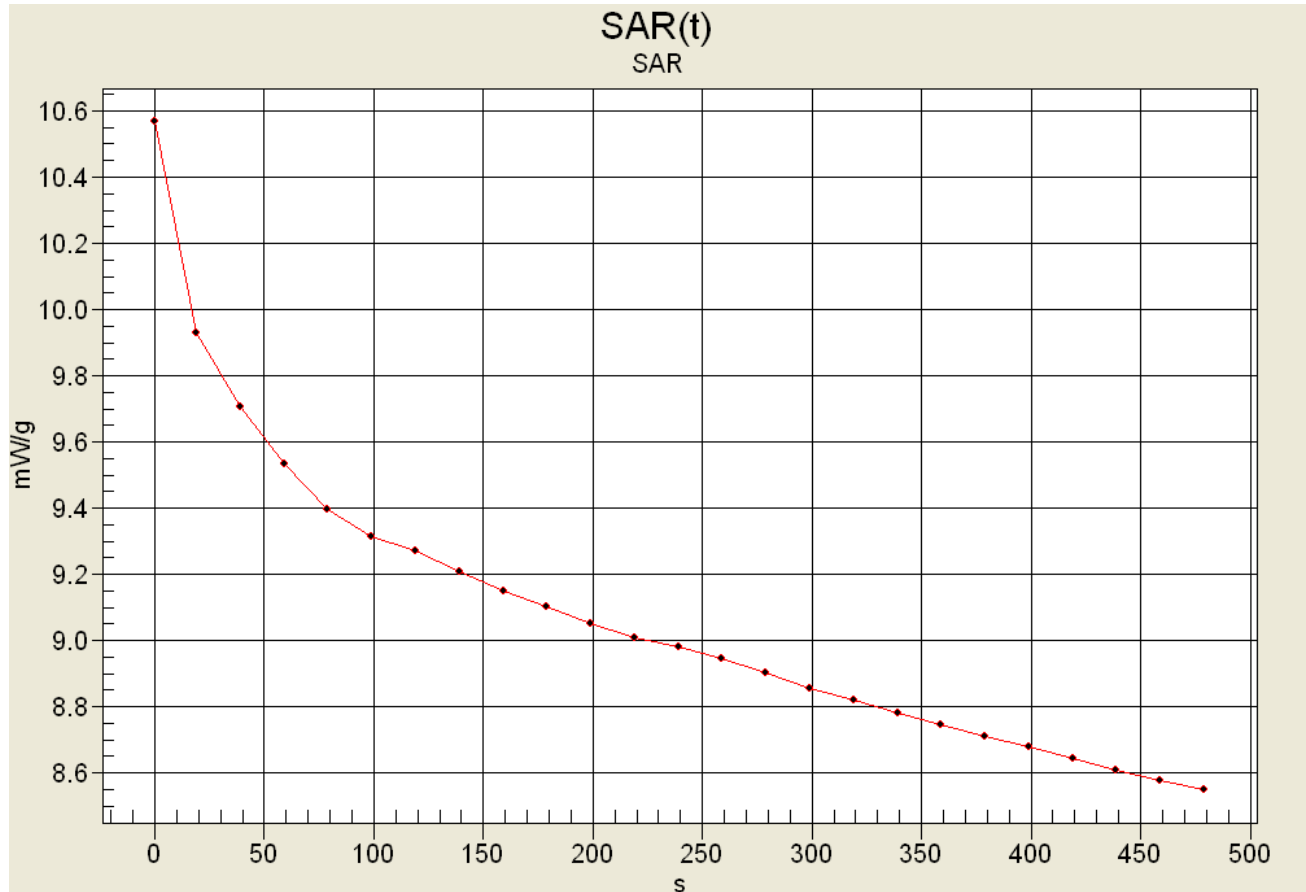


## SAR-versus-Time Power Drift Evaluation

Body-Worn Configuration with Speaker-Microphone Antenna

8V External Power Supply to NiMH Battery Terminals

Mid Channel - 480 MHz



Start SAR: 10.554 mW/g

End SAR: 8.5372 mW/g (-0.921 dB)

SAR after 340s: 8.76686 mW/g (-0.805 dB)

(340s = Zoom Scan Duration)

Date Tested: 02/11/05

## System Performance Check - 450 MHz Dipole

**DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136; Calibrated: 11/04/2004**

Ambient Temp: 21.8 °C; Fluid Temp: 21.4 °C; Barometric Pressure: 102.2 kPa; Humidity: 30%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.84$  mho/m;  $\epsilon_r = 42.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

### 450 MHz Dipole - System Performance Check/Area Scan (6x11x1):

Measurement grid: dx=15mm, dy=15mm

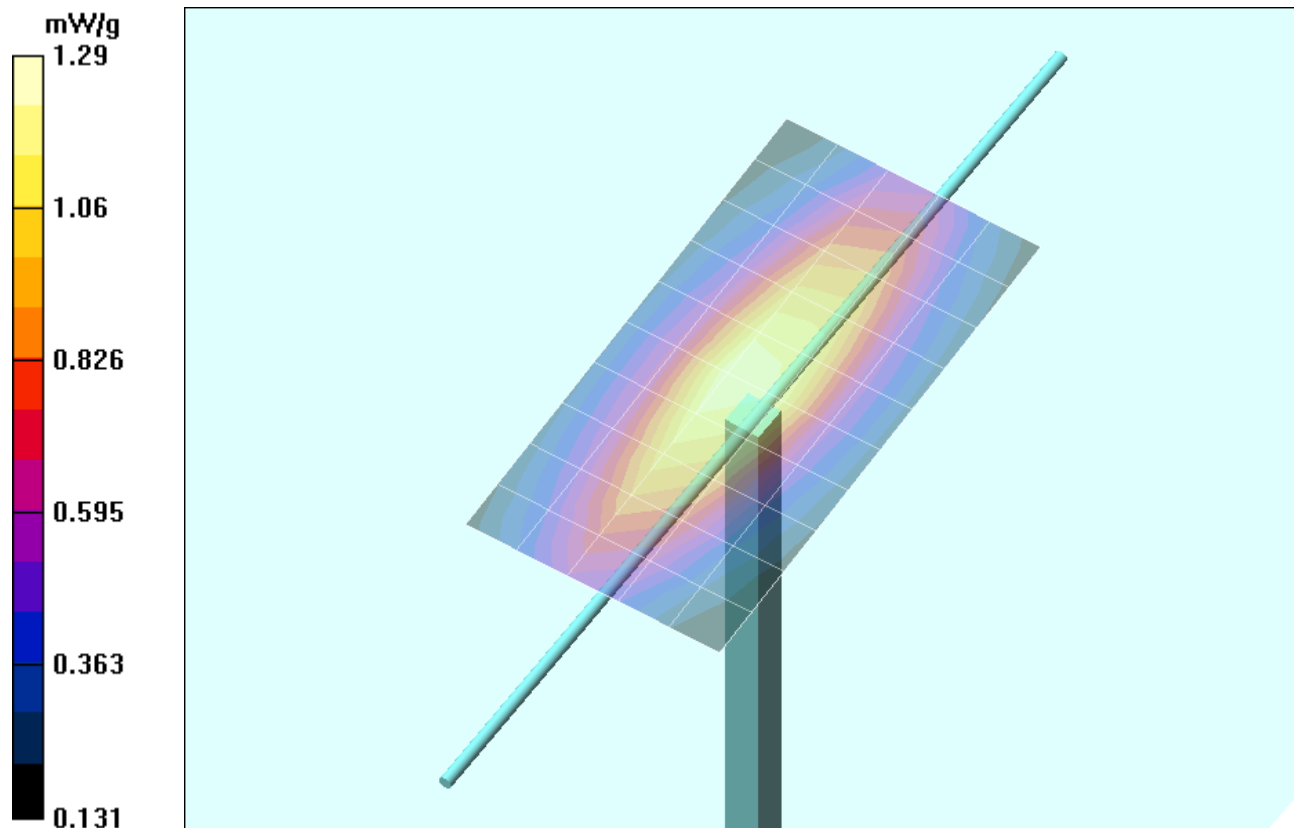
### 450 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

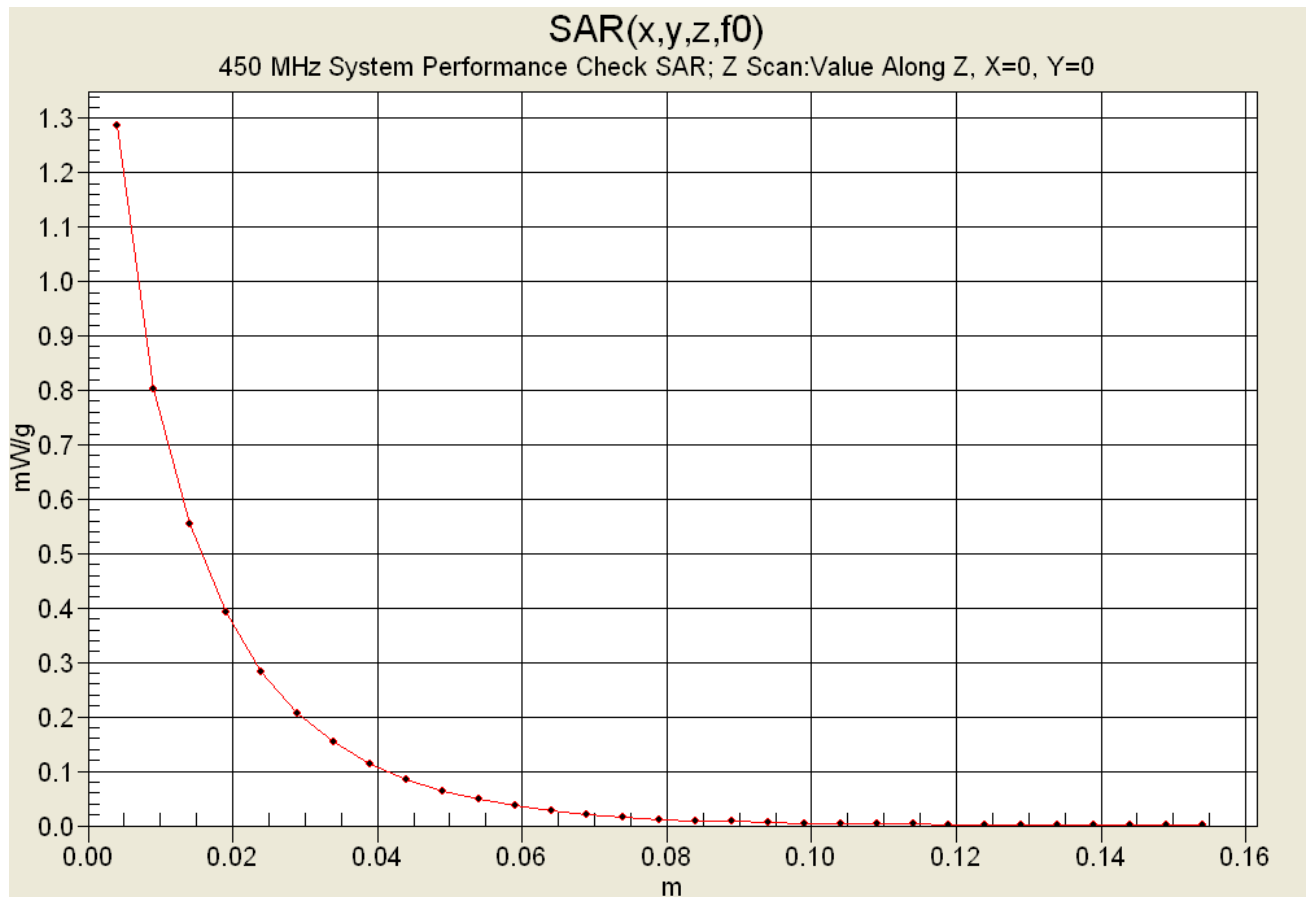
Reference Value = 39.4 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 2.13 W/kg

**SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.792 mW/g**



## Z-Axis Scan



## 450 MHz System Performance Check & DUT Evaluation (Face)

### Measured Fluid Dielectric Parameters (Brain)

February 11, 2005

| Frequency      | e'      | e''     |
|----------------|---------|---------|
| 350.000000 MHz | 44.6871 | 38.9261 |
| 360.000000 MHz | 44.3243 | 38.3421 |
| 370.000000 MHz | 44.1458 | 37.6551 |
| 380.000000 MHz | 43.8749 | 37.1248 |
| 390.000000 MHz | 43.6523 | 36.5410 |
| 400.000000 MHz | 43.4224 | 35.9873 |
| 410.000000 MHz | 43.2058 | 35.4588 |
| 420.000000 MHz | 42.8844 | 34.9704 |
| 430.000000 MHz | 42.6107 | 34.4503 |
| 440.000000 MHz | 42.3942 | 34.0509 |
| 450.000000 MHz | 42.1514 | 33.6643 |
| 460.000000 MHz | 41.9479 | 33.2893 |
| 470.000000 MHz | 41.7346 | 32.9141 |
| 480.000000 MHz | 41.5079 | 32.5131 |
| 490.000000 MHz | 41.3141 | 32.1583 |
| 500.000000 MHz | 41.0882 | 31.8741 |
| 510.000000 MHz | 40.9378 | 31.4895 |
| 520.000000 MHz | 40.7256 | 31.1953 |
| 530.000000 MHz | 40.5305 | 30.8618 |
| 540.000000 MHz | 40.4217 | 30.4866 |
| 550.000000 MHz | 40.1716 | 30.2192 |

## 450 MHz DUT Evaluation (Body)

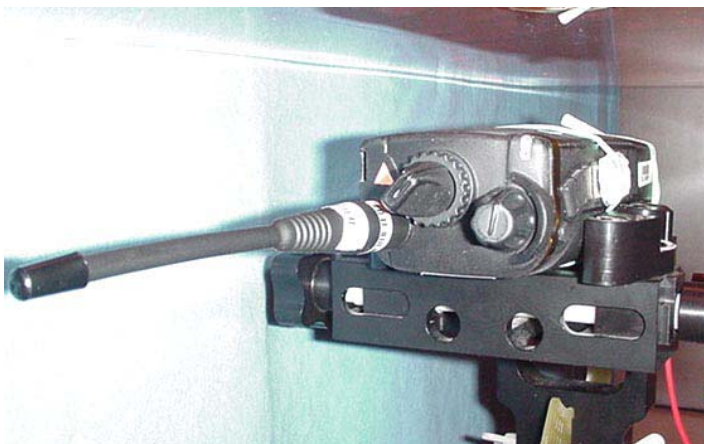
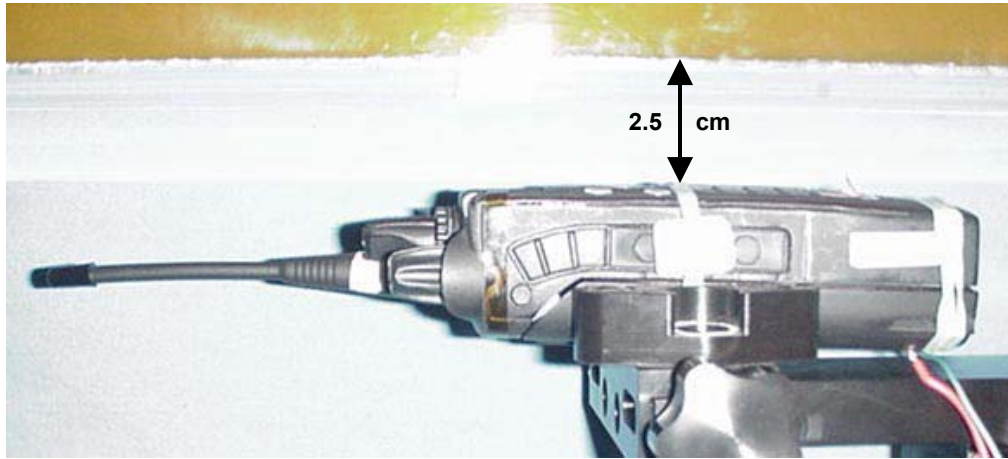
### Measured Fluid Dielectric Parameters (Muscle)

February 11, 2005

| Frequency      | e'      | e''     |
|----------------|---------|---------|
| 350.000000 MHz | 58.3207 | 42.6169 |
| 360.000000 MHz | 58.0903 | 41.9169 |
| 370.000000 MHz | 57.9983 | 41.1609 |
| 380.000000 MHz | 57.8319 | 40.4759 |
| 390.000000 MHz | 57.6642 | 39.7474 |
| 400.000000 MHz | 57.4161 | 39.1311 |
| 410.000000 MHz | 57.1957 | 38.4971 |
| 420.000000 MHz | 57.0855 | 37.9725 |
| 430.000000 MHz | 56.8827 | 37.4081 |
| 440.000000 MHz | 56.7423 | 36.8750 |
| 450.000000 MHz | 56.5558 | 36.3728 |
| 460.000000 MHz | 56.4434 | 35.9695 |
| 470.000000 MHz | 56.2877 | 35.5538 |
| 480.000000 MHz | 56.1414 | 35.1520 |
| 490.000000 MHz | 55.9832 | 34.7501 |
| 500.000000 MHz | 55.8174 | 34.3649 |
| 510.000000 MHz | 55.7056 | 33.9645 |
| 520.000000 MHz | 55.5194 | 33.6620 |
| 530.000000 MHz | 55.4030 | 33.2718 |
| 540.000000 MHz | 55.2739 | 32.8812 |
| 550.000000 MHz | 55.1621 | 32.5792 |

## FACE-HELD SAR TEST SETUP PHOTOGRAPHS

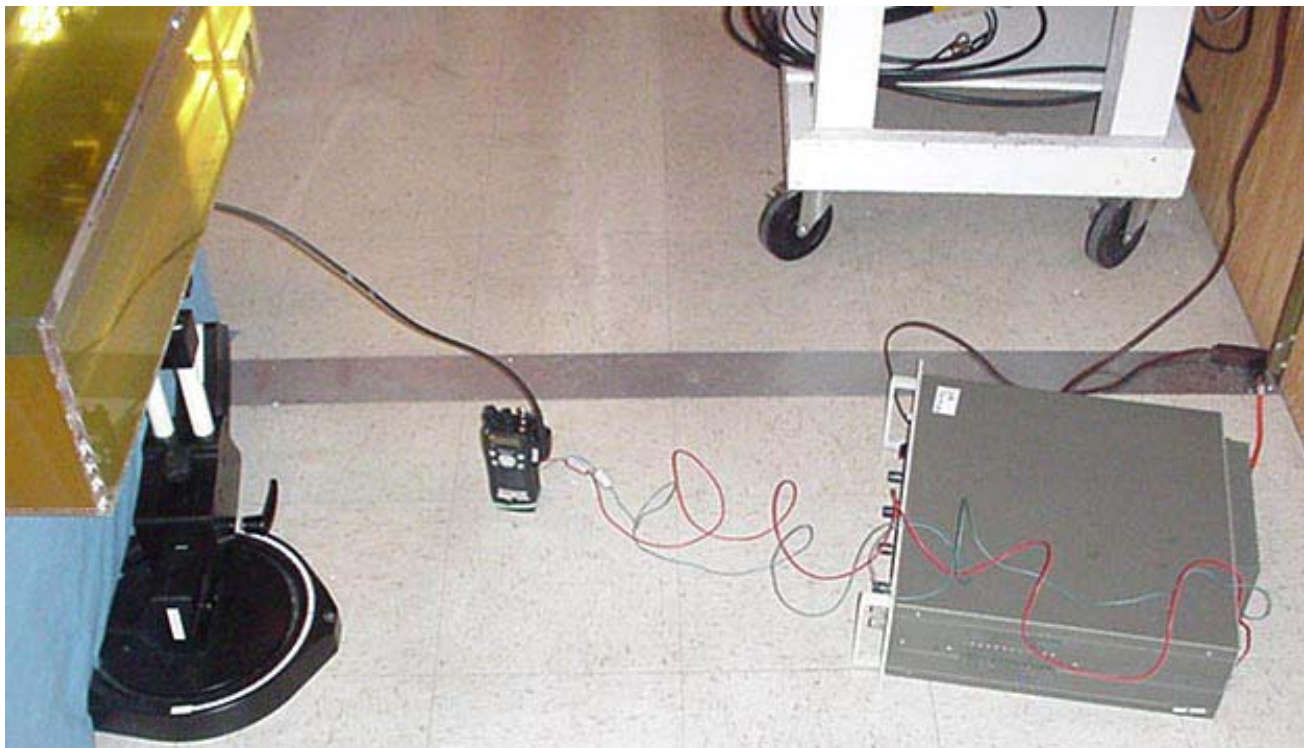
Radio Transceiver with External Power Supply connected to NiMH Battery Terminals  
2.5 cm Separation Distance from Front of DUT to Planar Phantom



|                         |                                       |                                                                                                                |      |                  |               |        |                                                                                       |
|-------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------|------|------------------|---------------|--------|---------------------------------------------------------------------------------------|
| Applicant:              | E.F. Johnson Co.                      | Model(s):                                                                                                      | 4140 | FCC ID:          | ATH2424140    | IC ID: | 933B-2424140                                                                          |
| Device Type:            | Portable FM UHF PTT Radio Transceiver |                                                                                                                |      | Frequency Range: | 450 - 512 MHz |        |  |
| 2005 Celltech Labs Inc. |                                       | This document is not to be reproduced in whole or in part without the written permission of Celltech Labs Inc. |      |                  |               |        | 12 of 13                                                                              |

### BODY-WORN SAR TEST SETUP PHOTOGRAPHS

Speaker-Microphone Antenna with External Power Supply connected to NiMH Battery Terminals  
1.2 cm Lapel-Clip Separation Distance from Back of DUT to Planar Phantom



|                         |                                       |                                                                                                                |      |                  |               |        |                                                                                       |
|-------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------|------|------------------|---------------|--------|---------------------------------------------------------------------------------------|
| Applicant:              | E.F. Johnson Co.                      | Model(s):                                                                                                      | 4140 | FCC ID:          | ATH2424140    | IC ID: | 933B-2424140                                                                          |
| Device Type:            | Portable FM UHF PTT Radio Transceiver |                                                                                                                |      | Frequency Range: | 450 - 512 MHz |        |  |
| 2005 Celltech Labs Inc. |                                       | This document is not to be reproduced in whole or in part without the written permission of Celltech Labs Inc. |      |                  |               |        | 13 of 13                                                                              |