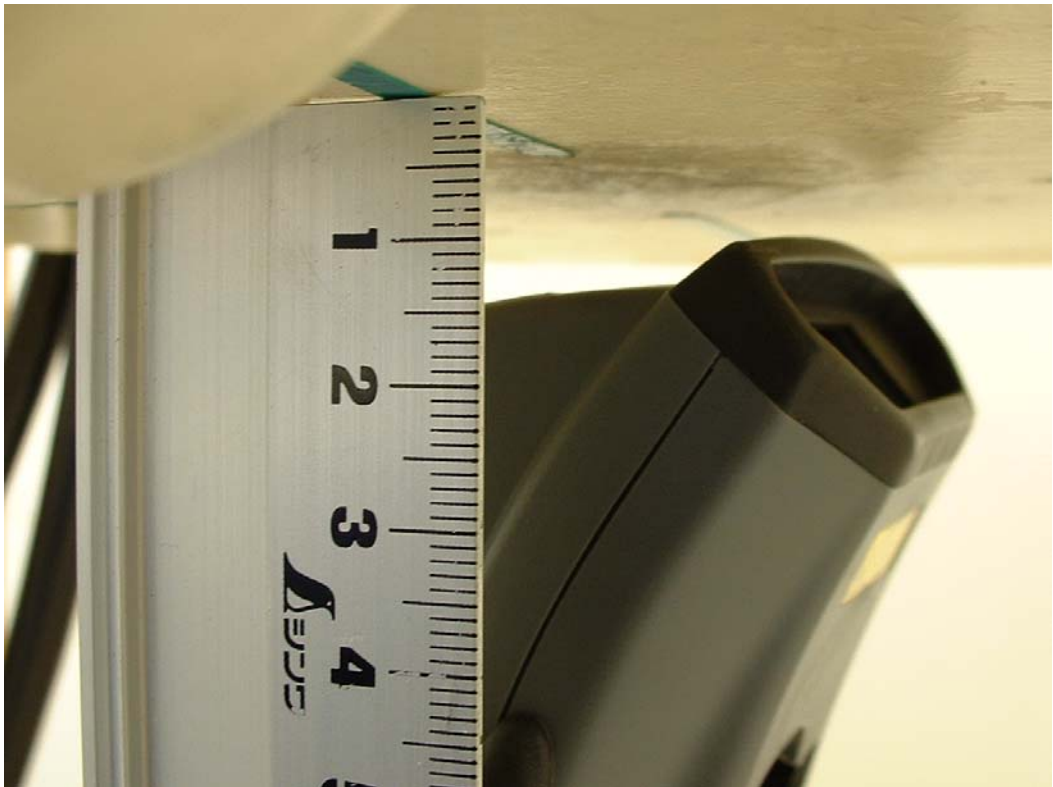


Top 15mm



APPENDIX 2 : SAR Measurement data

KCS / Body / Face / 2437MHz

Crest factor: 1
Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Reference Value = 4.29 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0542 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.0998 W/kg

SAR(1 g) = 0.0526 mW/g; SAR(10 g) = 0.0267 mW/g

Maximum value of SAR = 0.0553 mW/g

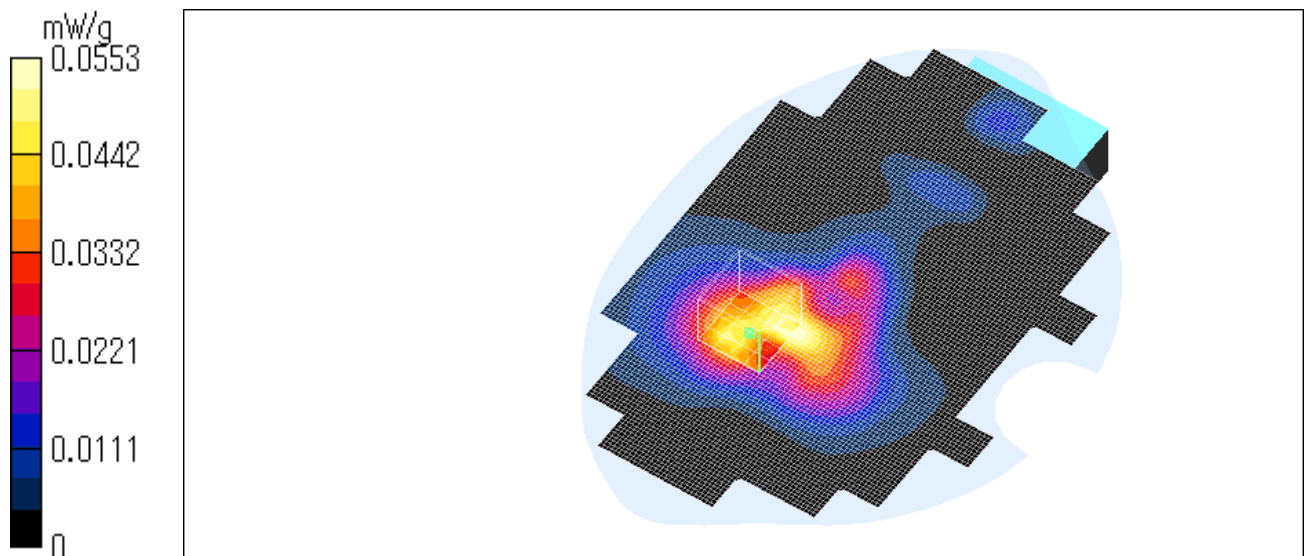
Test date = 11 / 28 / 03

Reference Value = 4.29 V/m

Power Drift = -0.2 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.7 degree.C , After 22.7 degree.C



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KCS / Body / Back / 2437MHz

Crest factor: 1
Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

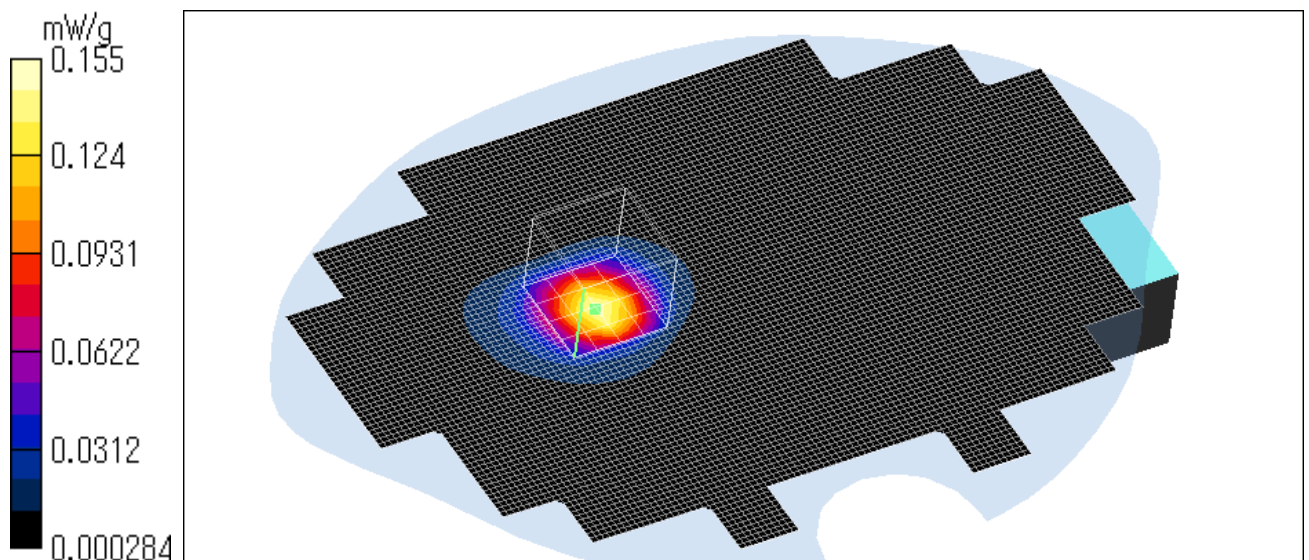
- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.157 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.286 W/kg
SAR(1 g) = 0.145 mW/g; SAR(10 g) = 0.0734 mW/g
Maximum value of SAR = 0.155 mW/g

Test date = 11 / 28 / 03
Reference Value = 0.483 V/m
Power Drift = -0.2 dB

Ambient Temperature = 24.5 degree.c
Liquid Temperature = Before 22.6 degree.C , After 22.6 degree.C



KCS / Body / Right side / 2437MHz

Crest factor: 1
Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Reference Value = 0.993 V/m

Power Drift = -0.2 dB

Maximum value of SAR = 0.0656 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.109 W/kg

SAR(1 g) = 0.0586 mW/g; SAR(10 g) = 0.0317 mW/g

Maximum value of SAR = 0.0631 mW/g

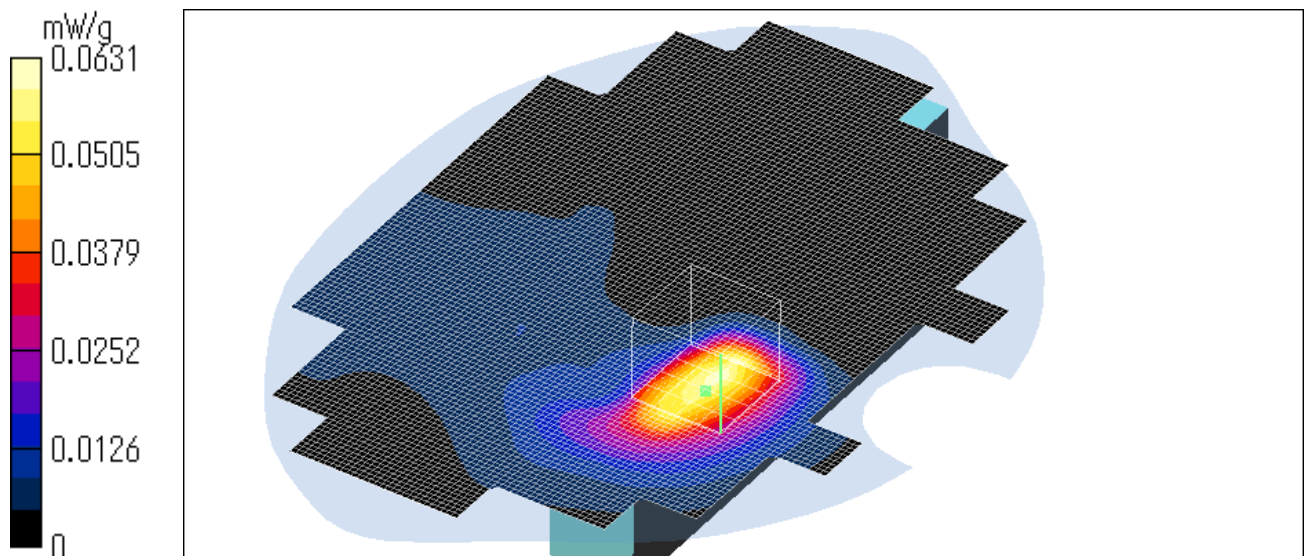
Test date = 11 / 28 / 03

Reference Value = 0.993 V/m

Power Drift = -0.2 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.6 degree.C , After 22.6 degree.C



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KCS / Body / Left side / 2437MHz

Crest factor: 1
Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Reference Value = 4.75 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.0763 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.148 W/kg

SAR(1 g) = 0.0714 mW/g; SAR(10 g) = 0.0361 mW/g

Maximum value of SAR = 0.0751 mW/g

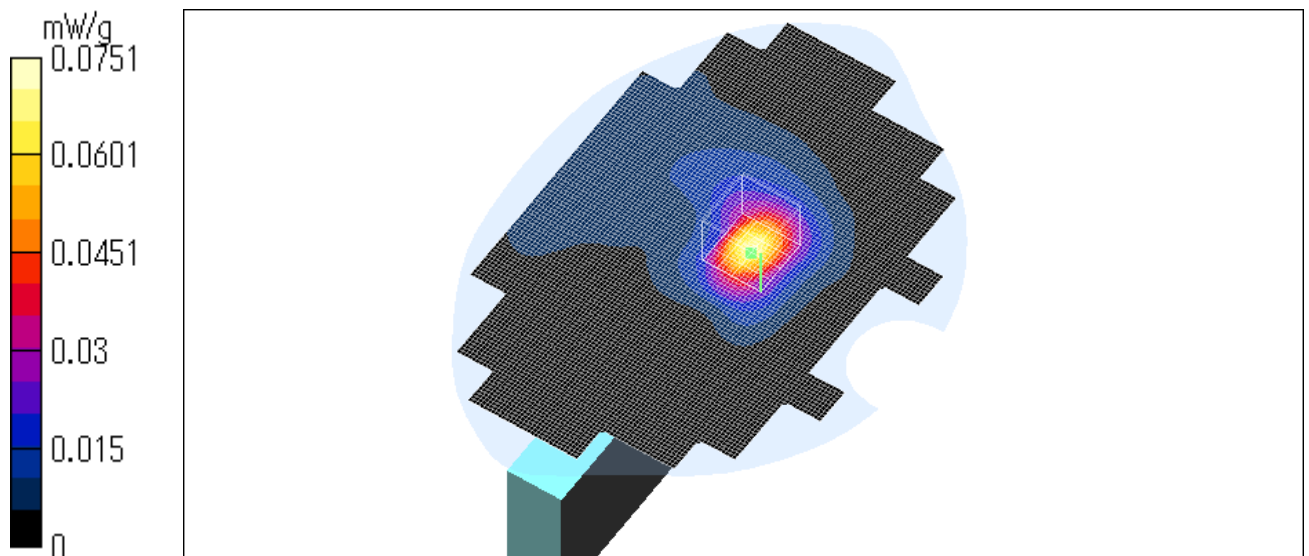
Test date = 11 / 28 / 03

Reference Value = 4.75 V/m

Power Drift = -0.1 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.6 degree.C , After 22.6 degree.C



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KCS / Body / Top 0mm/ 2437MHz

Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Reference Value = 11.2 V/m

Power Drift = 0.1 dB

Maximum value of SAR = 0.199 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.483 W/kg

SAR(1 g) = 0.194 mW/g; SAR(10 g) = 0.082 mW/g

Maximum value of SAR = 0.207 mW/g

Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.45 W/kg

SAR(1 g) = 0.21 mW/g; SAR(10 g) = 0.0978 mW/g

Maximum value of SAR = 0.23 mW/g

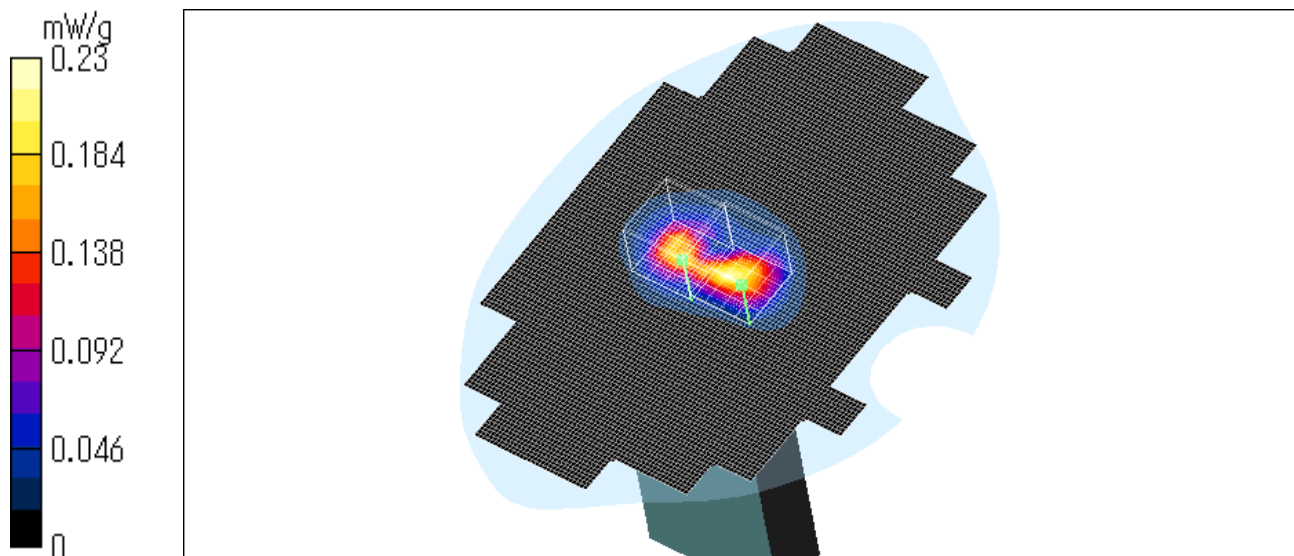
Test date = 11 / 28 / 03

Reference Value = 11.2 V/m

Power Drift = 0.1 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.7 degree.C , After 22.6 degree.C



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KCS / Body / Top 0mm/ 2412MHz

Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.221 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.65 W/kg

SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.115 mW/g

Maximum value of SAR = 0.265 mW/g

Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.544 W/kg

SAR(1 g) = 0.254 mW/g; SAR(10 g) = 0.117 mW/g

Maximum value of SAR = 0.268 mW/g

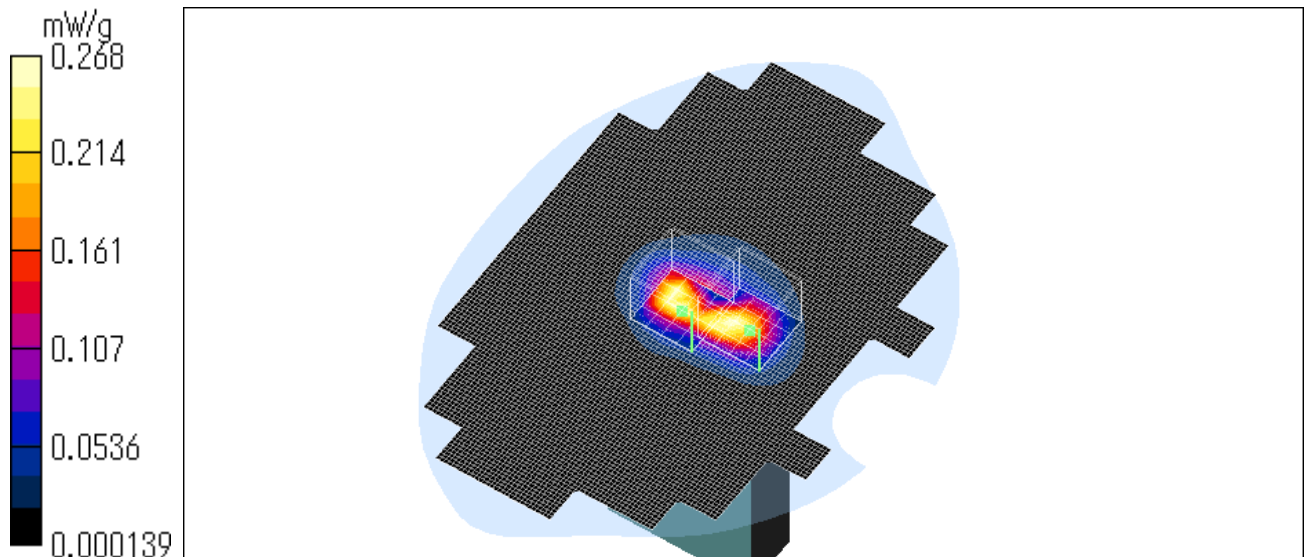
Test date = 11 / 28 / 03

Reference Value = 11 V/m

Power Drift = -0.3 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.6 degree.C , After 22.6 degree.C



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Z-axis scan at max SAR location

KCS / Body / Top 0mm / 2412MHz

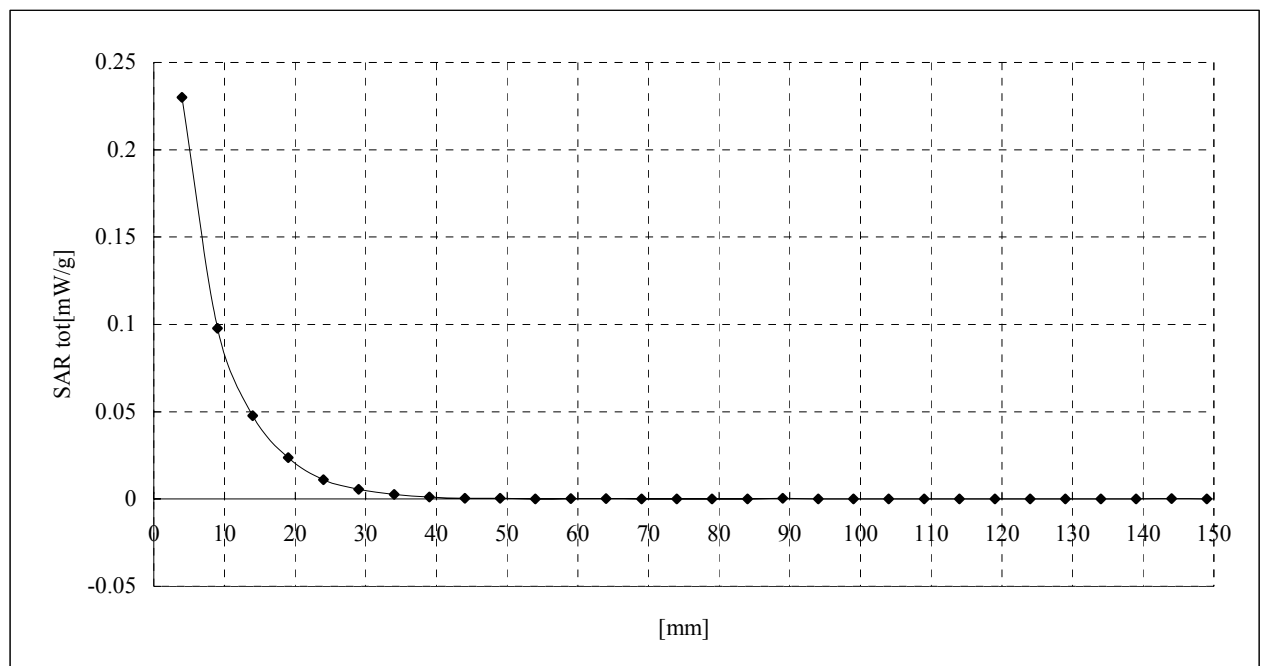
Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115



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KCS / Body / Top 0mm/ 2462MHz

Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (91x131x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.156 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.418 W/kg

SAR(1 g) = 0.19 mW/g; SAR(10 g) = 0.0875 mW/g

Maximum value of SAR = 0.189 mW/g

Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.395 W/kg

SAR(1 g) = 0.156 mW/g; SAR(10 g) = 0.0649 mW/g

Maximum value of SAR = 0.173 mW/g

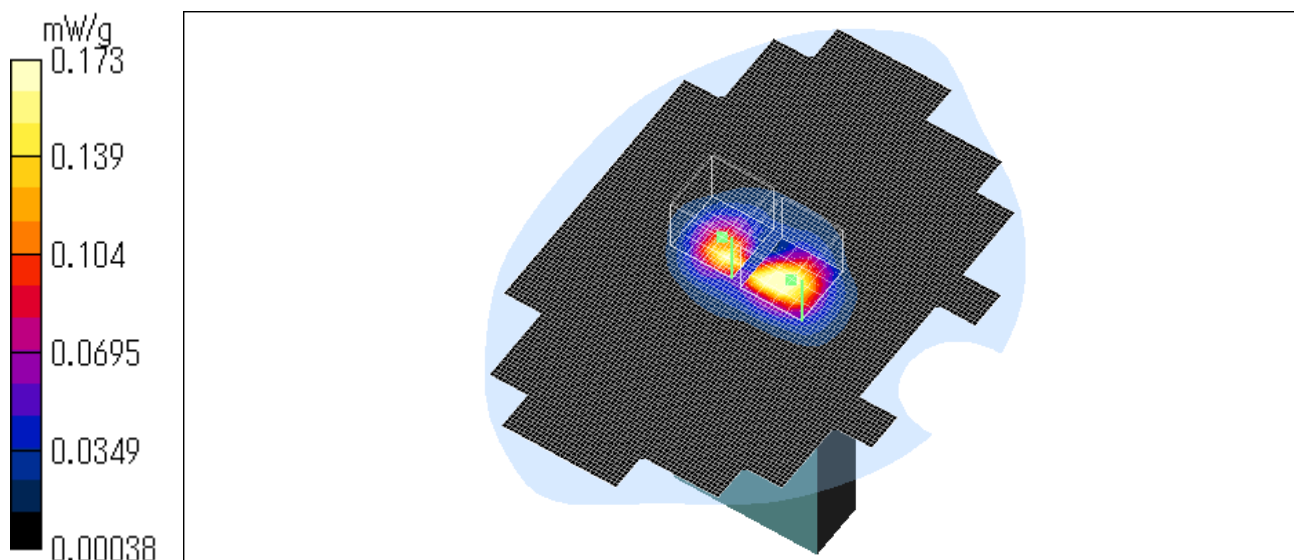
Test date = 11 / 28 / 03

Reference Value = 10.2 V/m

Power Drift = 0.06 dB

Ambient Temperature = 24.5 degree.c

Liquid Temperature = Before 22.9 degree.C , After 22.9 degree.C



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KCS / Body / Top 5mm/ 2412MHz

Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (81x111x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.187 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.507 W/kg

SAR(1 g) = 0.216 mW/g; SAR(10 g) = 0.0938 mW/g

Maximum value of SAR = 0.221 mW/g

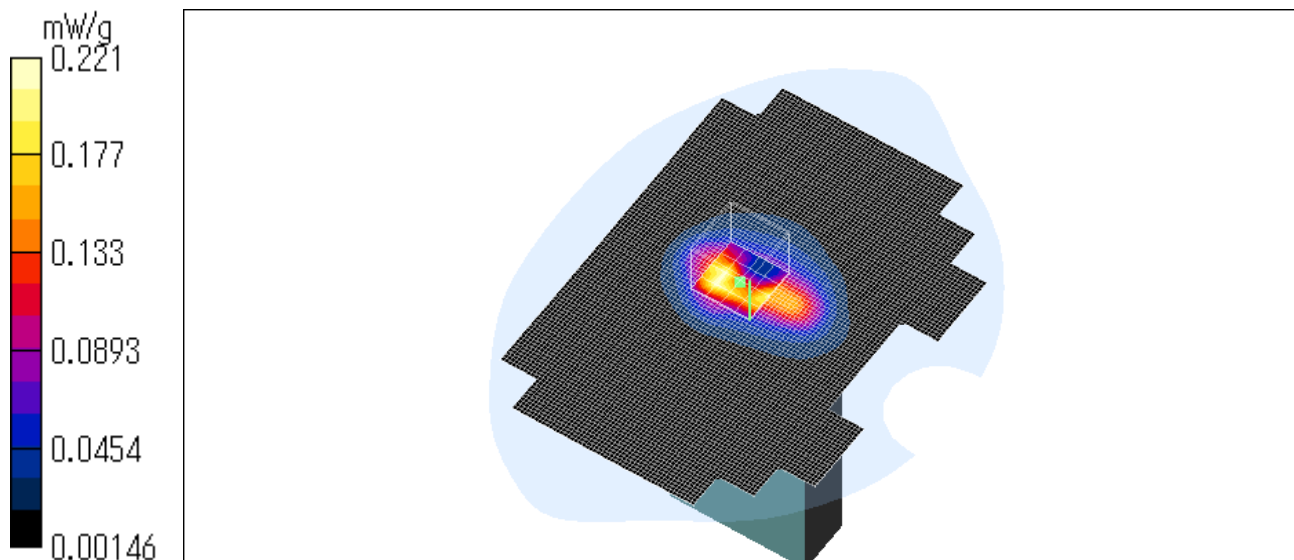
Test date = 11 / 28 / 03

Reference Value = 9.97 V/m

Power Drift = -0.04 dB

Ambient Temperature : 24.5 degree.c

Liquid Temperature : Before 22.6 degree.C , After 22.6 degree.C



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KCS / Body / Top 10mm / 2412MHz

Crest factor: 1

Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (81x111x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 0.119 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.267 W/kg

SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.0525 mW/g

Maximum value of SAR = 0.125 mW/g

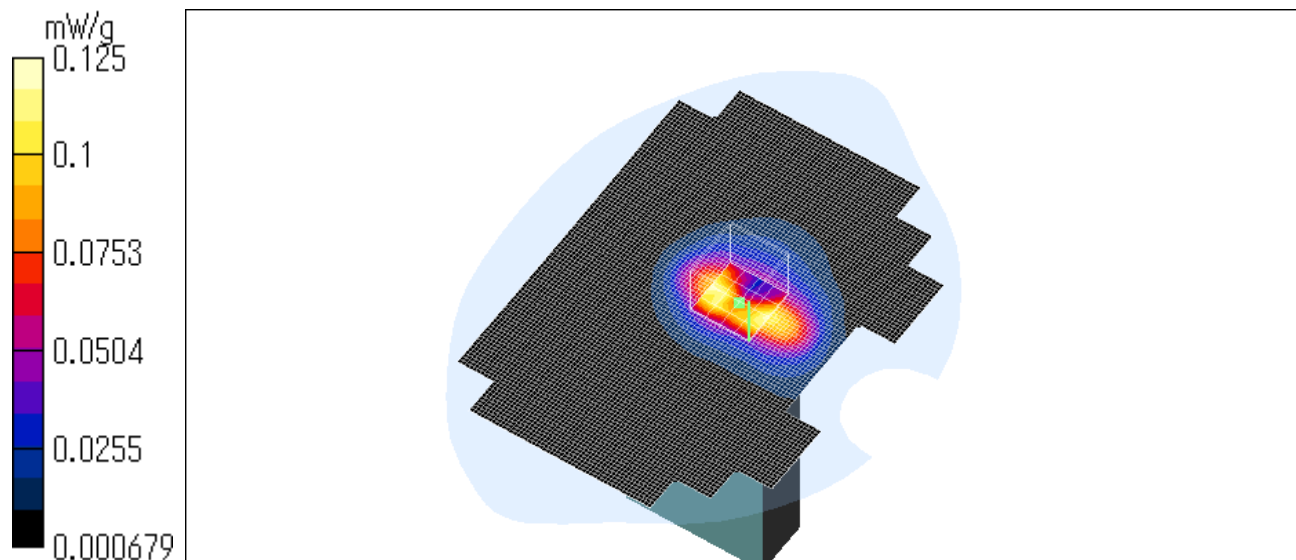
Test date = 11 / 28 / 03

Reference Value = 7.53 V/m

Power Drift = 0.009 dB

Ambient Temperature : 24.5 degree.c

Liquid Temperature : Before 22.6 degree.C , After 22.6degree.C



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KCS / Body / Top 15mm/ 2412MHz

Crest factor: 1
Medium: M2450 ($\sigma = 1.93$ mho/m, $\epsilon_r = 50.2$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.3, 4.3, 4.3); Calibrated: 2003/10/10
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Phantom: SAM 1196
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

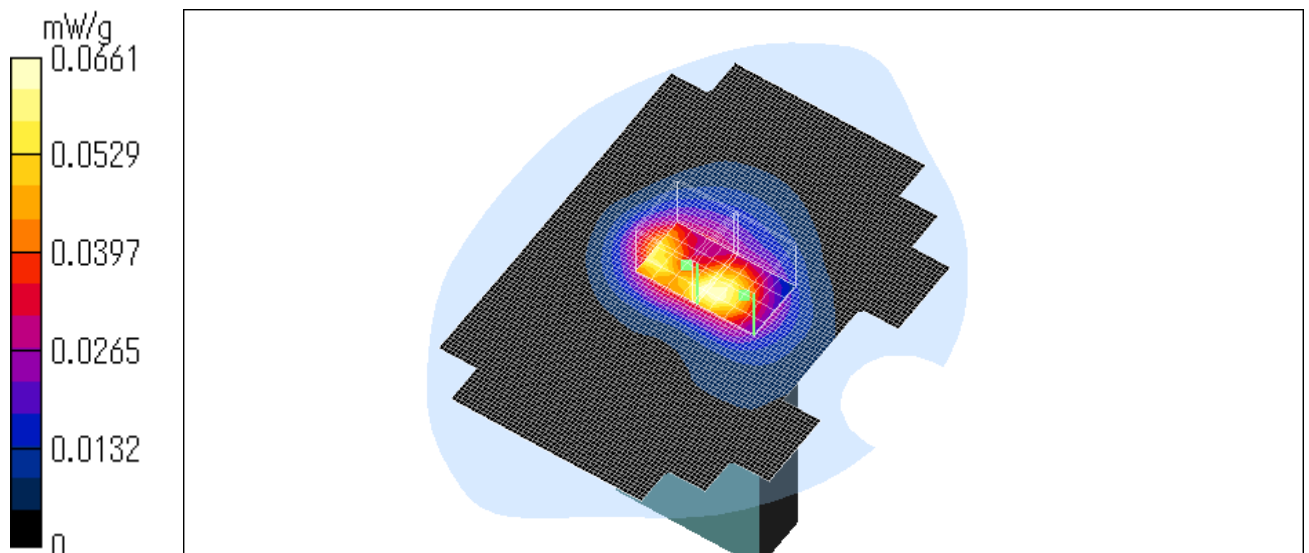
Area Scan (81x111x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR = 0.054 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.131 W/kg
SAR(1 g) = 0.0579 mW/g; SAR(10 g) = 0.0287 mW/g
Maximum value of SAR = 0.07 mW/g

Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 0.126 W/kg
SAR(1 g) = 0.0635 mW/g; SAR(10 g) = 0.0321 mW/g
Maximum value of SAR = 0.0661 mW/g

Test date = 11 / 28 / 03
Reference Value = 6.14V/m
Power Drift = 0.09 dB

Ambient Temperature : 24.5 degree.c
Liquid Temperature : Before 22.6 degree.C , After 22.6 degree.C



APPENDIX 3 : Validation Measurement data

System Validation / Dipole 2450 MHz / Forward Conducted Power : 250mW

Crest factor: 1

Medium: HSL2450 ($\sigma = 1.87$ mho/m, $\epsilon_r = 35.9$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

Dipole 2450 MHz;

- Type: D2450V2; SN:713

DASY4 Configuration:

- Probe: ET3DV6 - SN1685; ConvF(4.7, 4.7, 4.7); Calibrated: 2003/10/10

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

- Phantom: SAM 1196

- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR = 16.4 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 28.4 W/kg

SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.19 mW/g

Maximum value of SAR = 14.9 mW/g

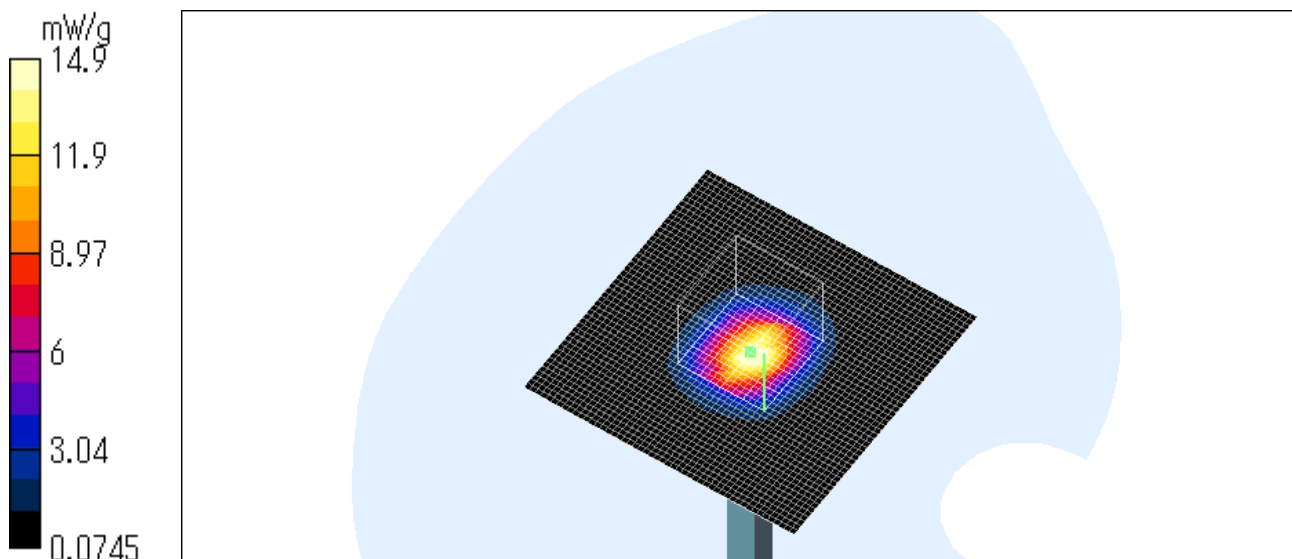
Test date = 11 / 28 / 03

Reference Value = 95 V/m

Power Drift = 0.02 dB

Ambient Temperature = 24.8 degree.c

Liquid Temperature = Before 23.3 degree.C , After 23.3 degree.C



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APPENDIX 4 : System Validation Dipole (D2450V2,S/N: 713)

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Calibration Certificate

2450 MHz System Validation Dipole

Type:

D2450V2

Serial Number:

713

Place of Calibration:

Zurich

Date of Calibration:

November 15, 2002

Calibration Interval:

24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

D. Vetter

Approved by:

Robert Kofe

UL Apex Co., Ltd.

Head Office EMC Lab.

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**Schmid & Partner
Engineering AG**

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

DASY

Dipole Validation Kit

Type: D2450V2

Serial: 713

Manufactured: July 5, 2002
Calibrated: November 15, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 2450 MHz:

Relative permittivity	38.0	$\pm 5\%$
Conductivity	1.87 mho/m	$\pm 10\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 5.0 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse 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-measurements 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 averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm³ (1 g) of tissue: **54.4 mW/g**

averaged over 10 cm³ (10 g) of tissue: **24.2 mW/g**

3. Dipole impedance and return loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay: **1.158 ns** (one direction)
Transmission factor: **0.997** (voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 2450 MHz: $\text{Re}\{Z\} = \mathbf{51.3\ \Omega}$

$\text{Im}\{Z\} = \mathbf{2.4\ \Omega}$

Return Loss at 2450 MHz **- 31.4 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with body simulating solution of the following electrical parameters at 2450 MHz:

Relative permittivity **51.2** $\pm 5\%$
Conductivity **1.96 mho/m** $\pm 10\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, conversion factor 4.5 at 2450 MHz) was used for the measurements.

The dipole feedpoint was positioned below the center marking and oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse 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.

Date/Time: 11/13/02 21:52:22

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN713_SN1507_HSL2450_131102.da4

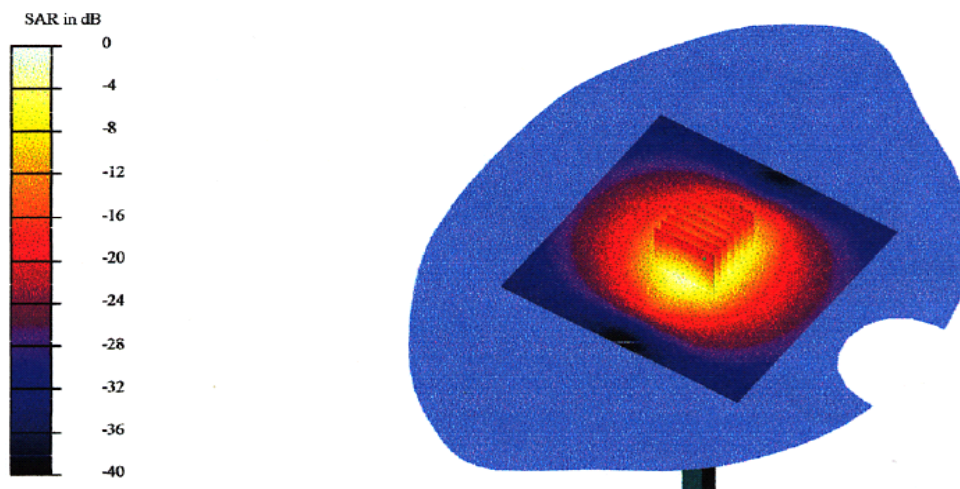
DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN713
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL 2450 MHz ($\sigma = 1.87$ mho/m, $\epsilon = 38.03$, $\rho = 1000$ kg/m³)
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5, 5, 5); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 94.4 V/m
Peak SAR = 29.6 mW/g
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.04 mW/g
Power Drift = 0.01 dB



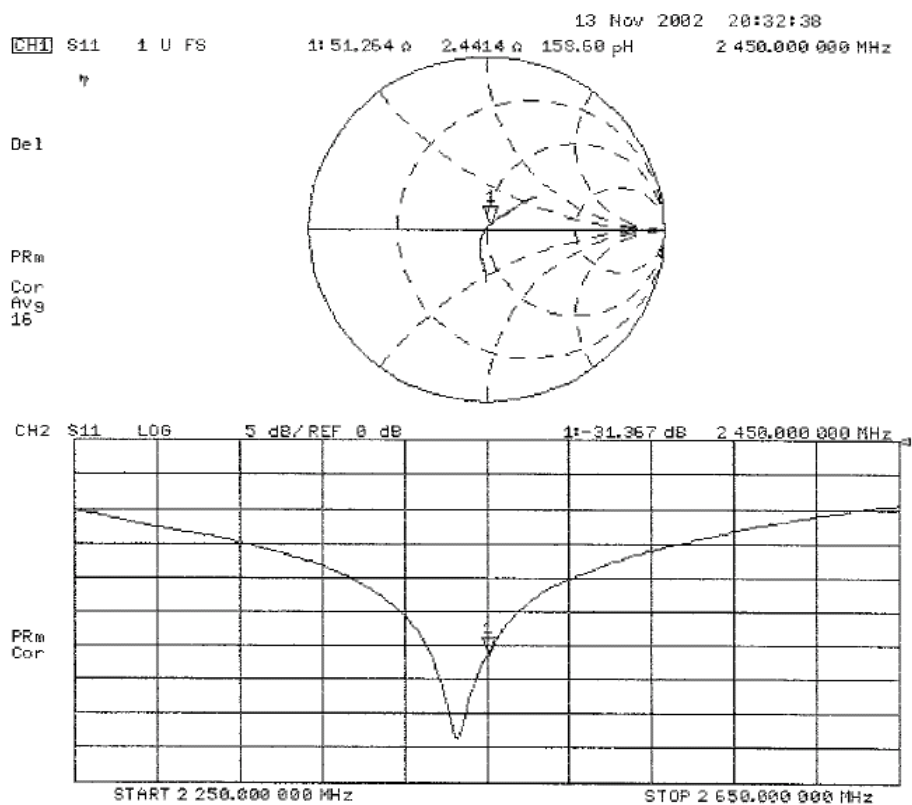
UL Apex Co., Ltd.

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Date/Time: 11/15/02 14:25:17

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN713_SN1507_M2450_141102.da4

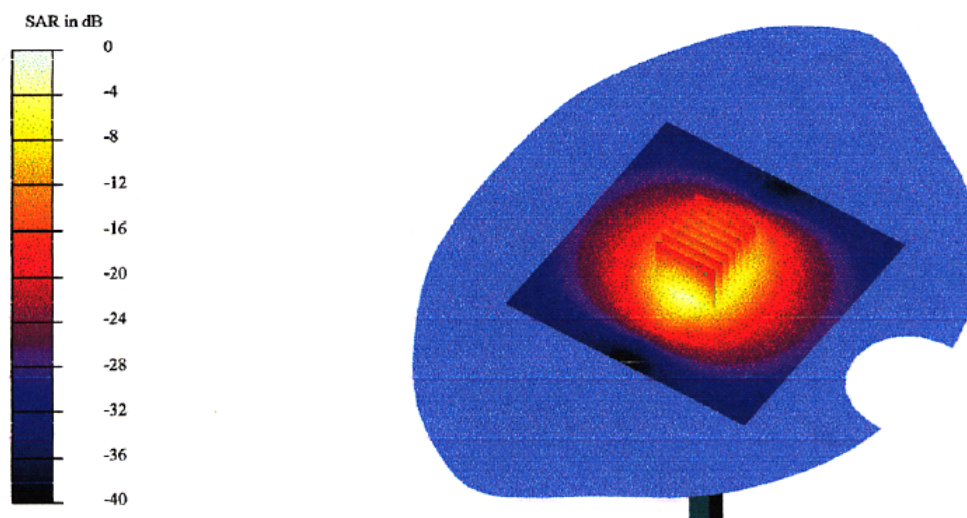
DUT: Dipole 2450 MHz Type & Serial Number: D2450V2 - SN713
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Muscle 2450 MHz ($\sigma = 1.96$ mho/m, $\epsilon = 51.15$, $\rho = 1000$ kg/m³)
Phantom section: FlatSection

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.5, 4.5, 4.5); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 95.2 V/m
Peak SAR = 25 mW/g
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.99 mW/g
Power Drift = 0.02 dB



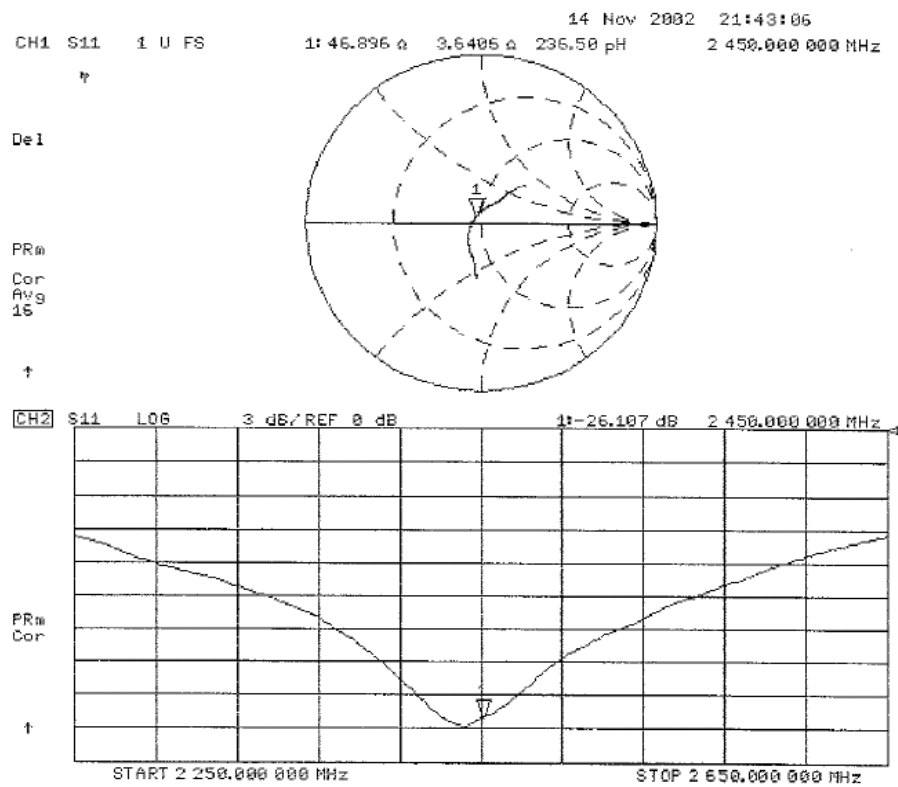
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APPENDIX 5 : Dosimetric E-Field Probe Calibration (ET3DV6,S/N: 1685)

Schmid & Partner Engineering AG

s p e a g

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info@speag.com, <http://www.speag.com>

IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Glycol Monobuthy Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:

- ET3DV6
- ET3DV6R
- ES3DV2
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:

The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

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Schmid & Partner Engineering AG

Technical Note 01.06.15-1

June 2002

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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **UL Apex (MTT)**

CALIBRATION CERTIFICATE			
Object(s)	ET3DV6 - SN:1685		
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes		
Calibration date:	October 10, 2003		
Condition of the calibrated item	In Tolerance (according to the specific calibration document)		
This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.			
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 (Agilent, No. 20020918)	In house check: Oct 03
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Calibrated by:	Name Nico Vetterli	Function Technician	Signature 
Approved by:	Name Katja Pokovic	Function Laboratory Director	Signature 
Date issued: October 23, 2003			
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.			

Schmid & Partner Engineering AG

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info@speag.com, <http://www.speag.com>

Probe ET3DV6

SN:1685

Manufactured:	April 3, 2002
Last calibration:	May 10, 2002
Recalibrated:	October 10, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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ET3DV6 SN:1685

October 10, 2003

DASY - Parameters of Probe: ET3DV6 SN:1685

Sensitivity in Free Space

NormX	1.60 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.65 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.56 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	95	mV
DCP Y	95	mV
DCP Z	95	mV

Sensitivity in Tissue Simulating Liquid

Head **900 MHz** $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m
Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha 0.26
ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth 3.07

Head **1800 MHz** $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m
Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha 0.41
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth 2.77

Boundary Effect

Head **900 MHz** Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%] Without Correction Algorithm		8.9	5.4
SAR _{pe} [%] With Correction Algorithm		0.4	0.5

Head **1800 MHz** Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR _{pe} [%] Without Correction Algorithm		11.8	8.4
SAR _{pe} [%] With Correction Algorithm		0.4	0.2

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 $\pm$ 0.2	mm

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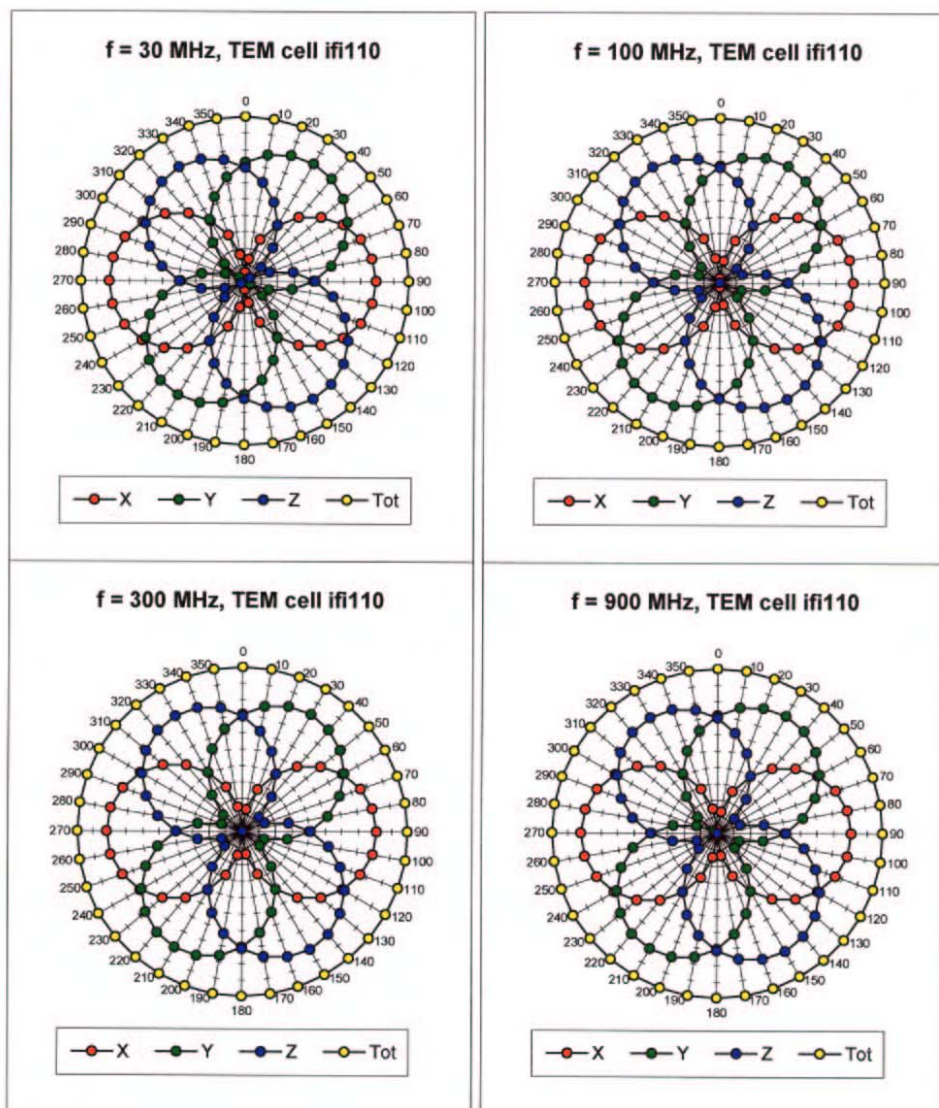
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Receiving Pattern ($\phi, \theta = 0^\circ$)



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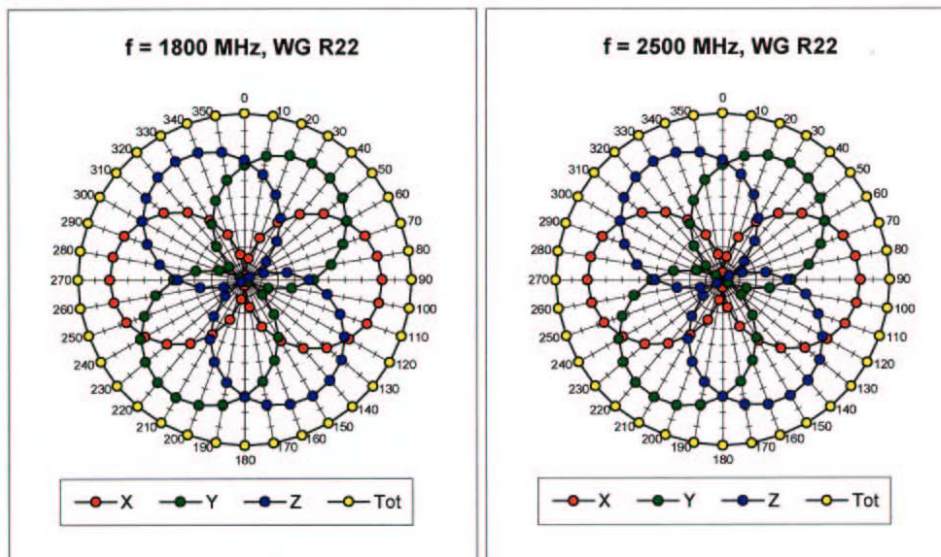
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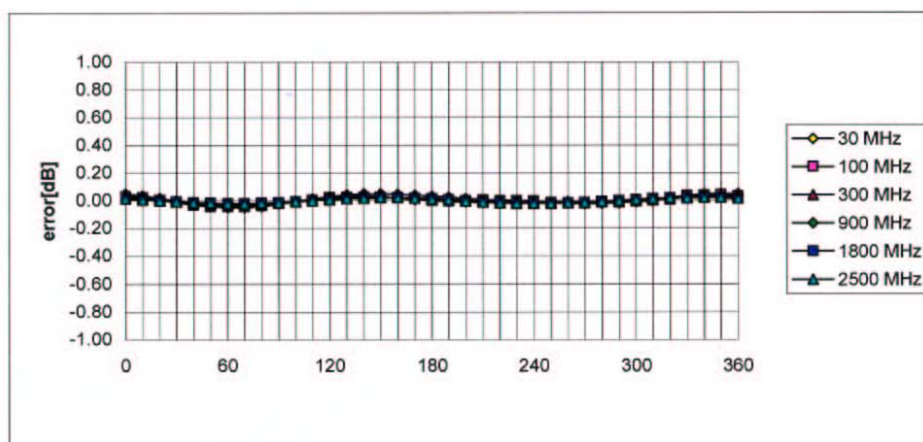
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Isotropy Error (ϕ), $\theta = 0^\circ$



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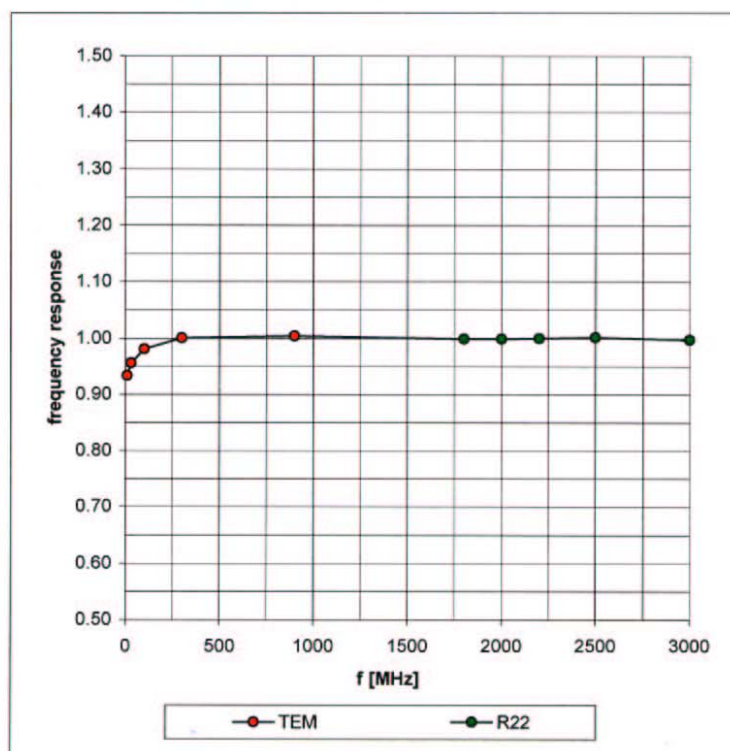
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Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



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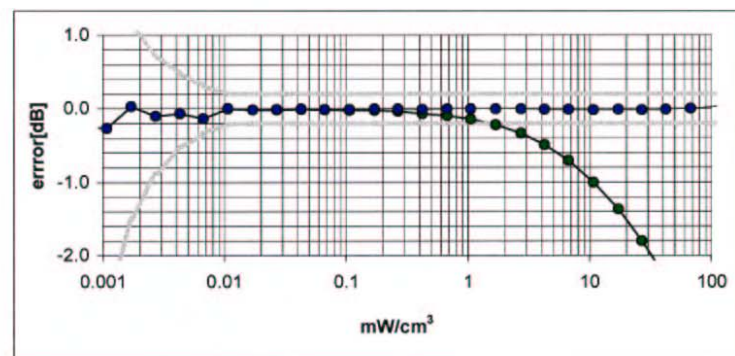
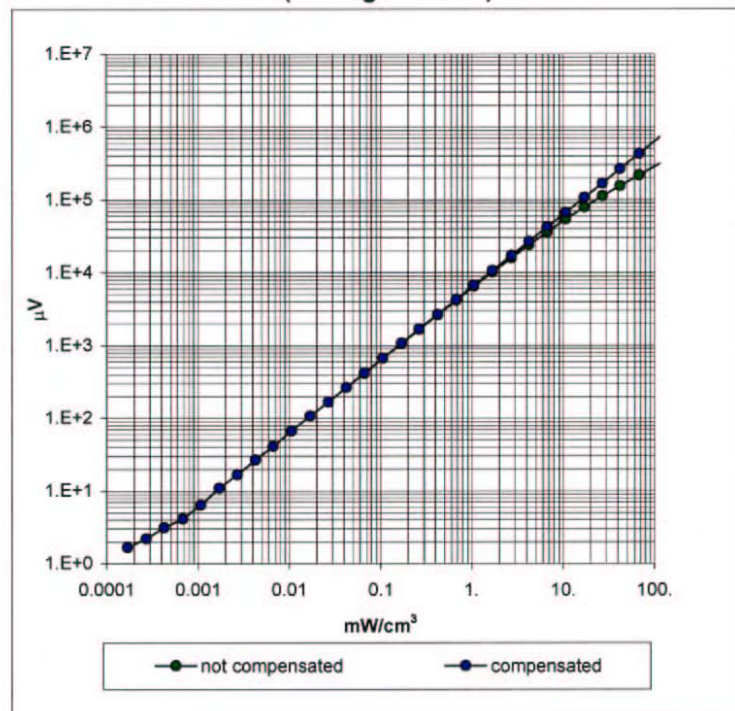
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Dynamic Range f(SAR_{brain})
(Waveguide R22)



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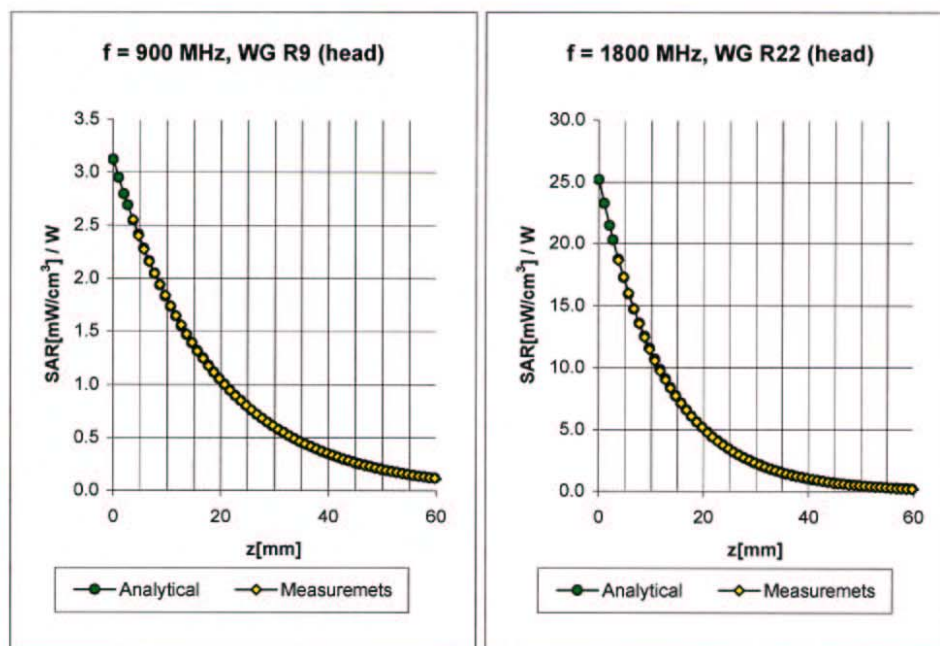
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Conversion Factor Assessment



Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.6 $\pm 9.5\%$ (k=2)	Alpha	0.26
ConvF Z	6.6 $\pm 9.5\%$ (k=2)	Depth	3.07

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.41
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.77

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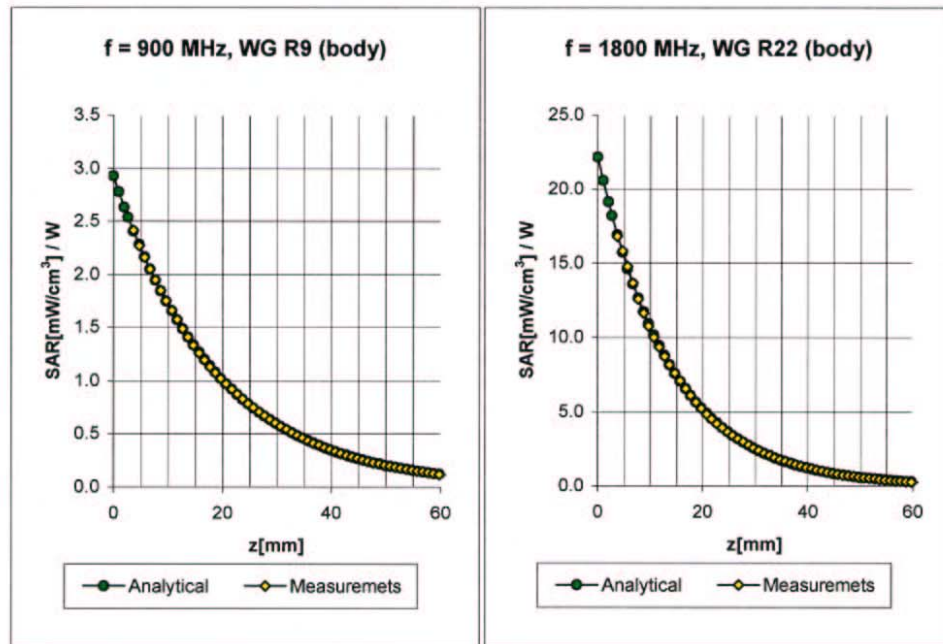
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Conversion Factor Assessment



Body 900 MHz $\epsilon_r = 55.0 \pm 5\%$ $\sigma = 1.05 \pm 5\%$ mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	6.4 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.4 $\pm 9.5\%$ (k=2)	Alpha 0.27
ConvF Z	6.4 $\pm 9.5\%$ (k=2)	Depth 3.22

Body 1800 MHz $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\%$ mho/m

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.7 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	4.7 $\pm 9.5\%$ (k=2)	Alpha 0.48
ConvF Z	4.7 $\pm 9.5\%$ (k=2)	Depth 2.94

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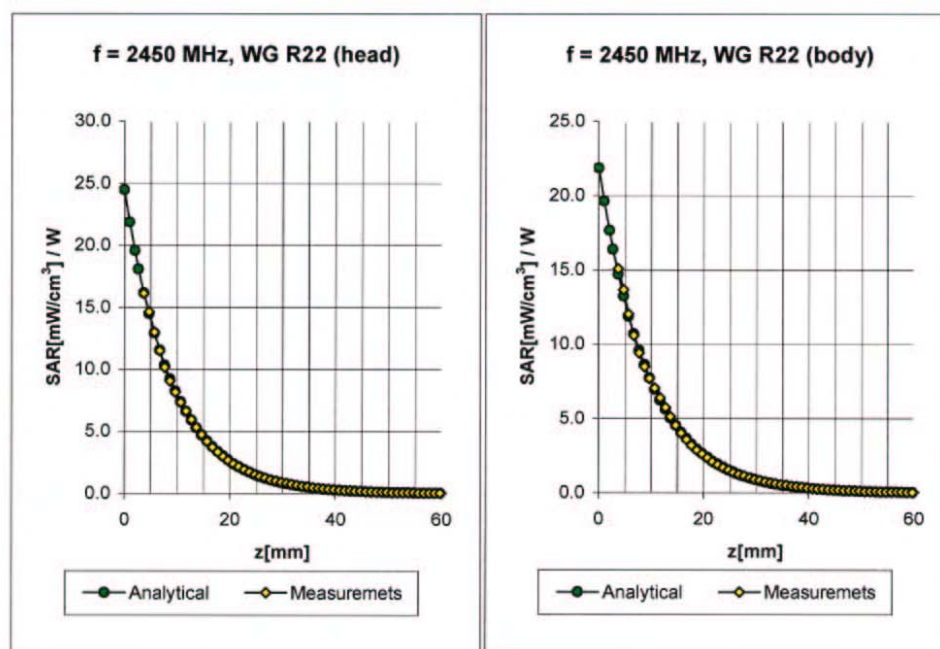
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Conversion Factor Assessment



Head **2450 MHz** $\epsilon_r = 39.2 \pm 5\%$ $\sigma = 1.80 \pm 5\% \text{ mho/m}$

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	4.7 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.7 $\pm 9.5\%$ (k=2)	Alpha	0.78
ConvF Z	4.7 $\pm 9.5\%$ (k=2)	Depth	2.04

Body **2450 MHz** $\epsilon_r = 52.7 \pm 5\%$ $\sigma = 1.95 \pm 5\% \text{ mho/m}$

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.3 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	4.3 $\pm 9.5\%$ (k=2)	Alpha	0.80
ConvF Z	4.3 $\pm 9.5\%$ (k=2)	Depth	1.89

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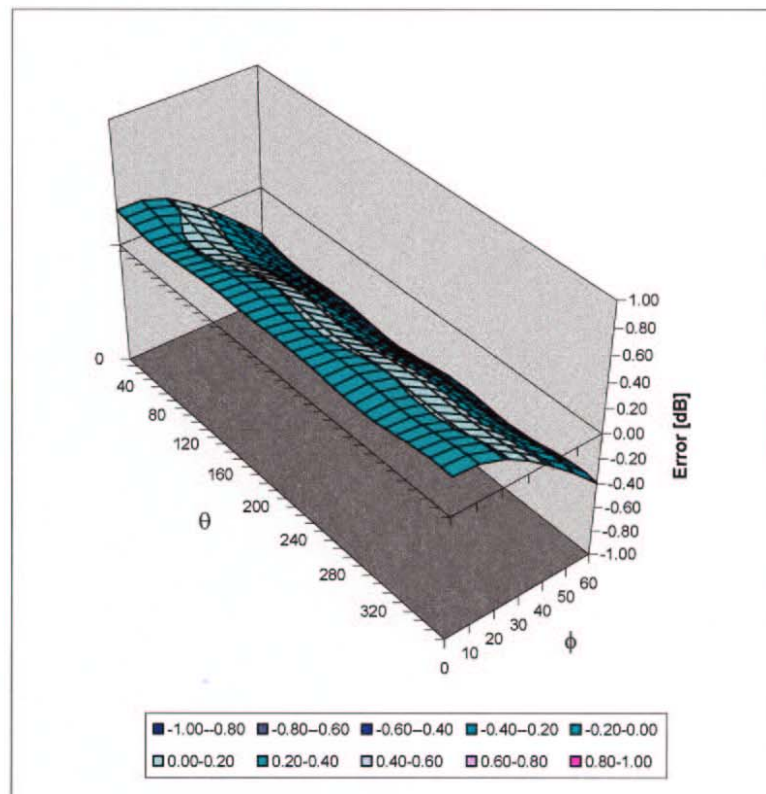
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Deviation from Isotropy in HSL

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



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