Date/Time: 04/13/04 17:38:56

Test Laboratory: Advance Data Technology

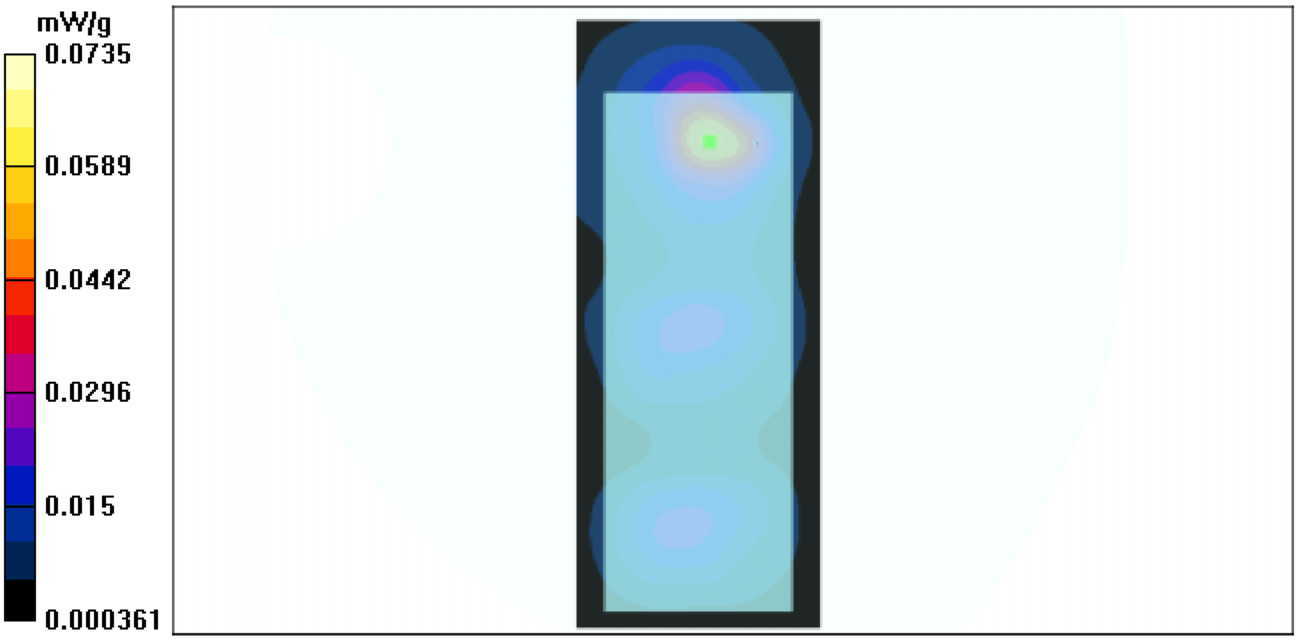
DB-6654-BodySide

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2462 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 2.012 mho/m, ε_r = 51.7742, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The front side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-**Ch 11 0mm position Front- Low/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.42 V/m
Power Drift = 0.2 dB
Maximum value of SAR = 0.0515 mW/g

Ch 11 0mm position Front- Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.186 W/kg
SAR(1 g) = 0.0618 mW/g; SAR(10 g) = 0.0286 mW/g
Reference Value = 5.42 V/m
Power Drift = 0.2 dB
Maximum value of SAR = 0.0735 mW/g



Date/Time: 04/13/04 18:05:36

Test Laboratory: Advance Data Technology

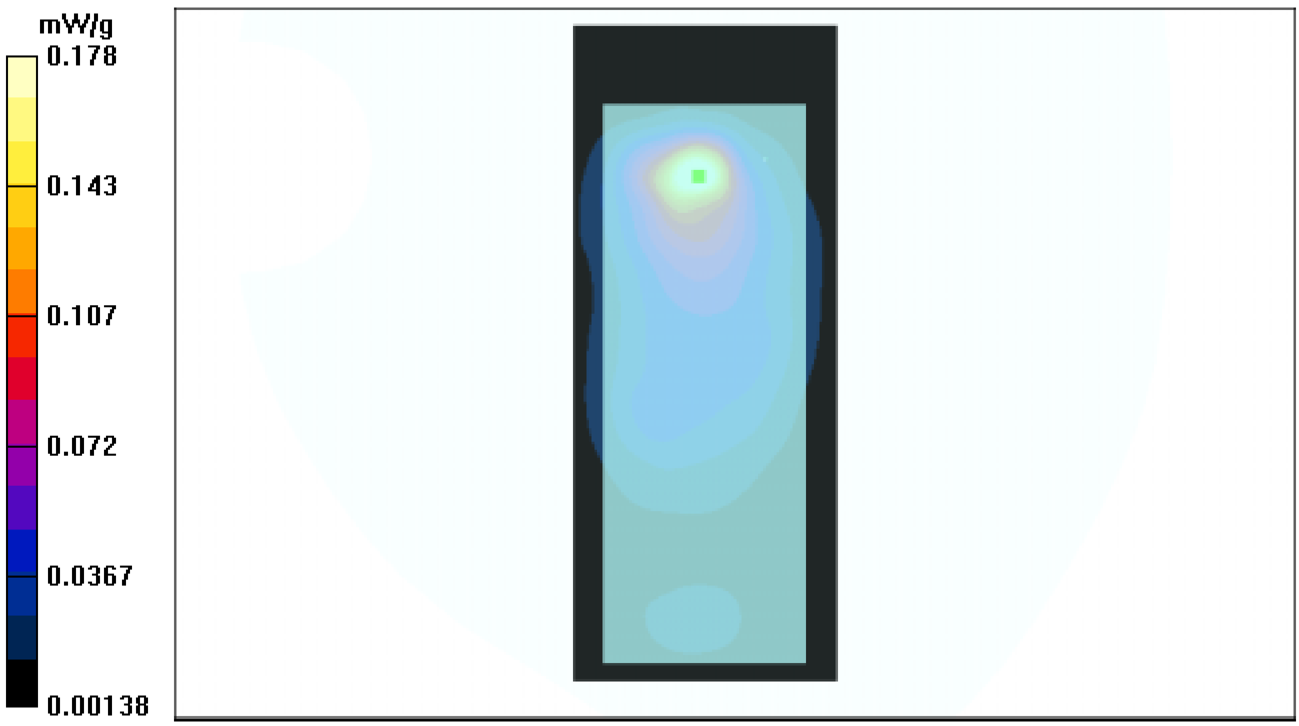
DB-6654-BodySide

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2412 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 1.971 mho/m, ε_r = 52.0218, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The bottom side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-Ch 01 0mm position bottom- Low/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 9.17 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.21 mW/g

Ch 01 0mm position bottom- Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.357 W/kg
SAR(1 g) = 0.154 mW/g; SAR(10 g) = 0.0655 mW/g
Reference Value = 9.17 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.178 mW/g



Date/Time: 04/13/04 18:31:23

Test Laboratory: Advance Data Technology

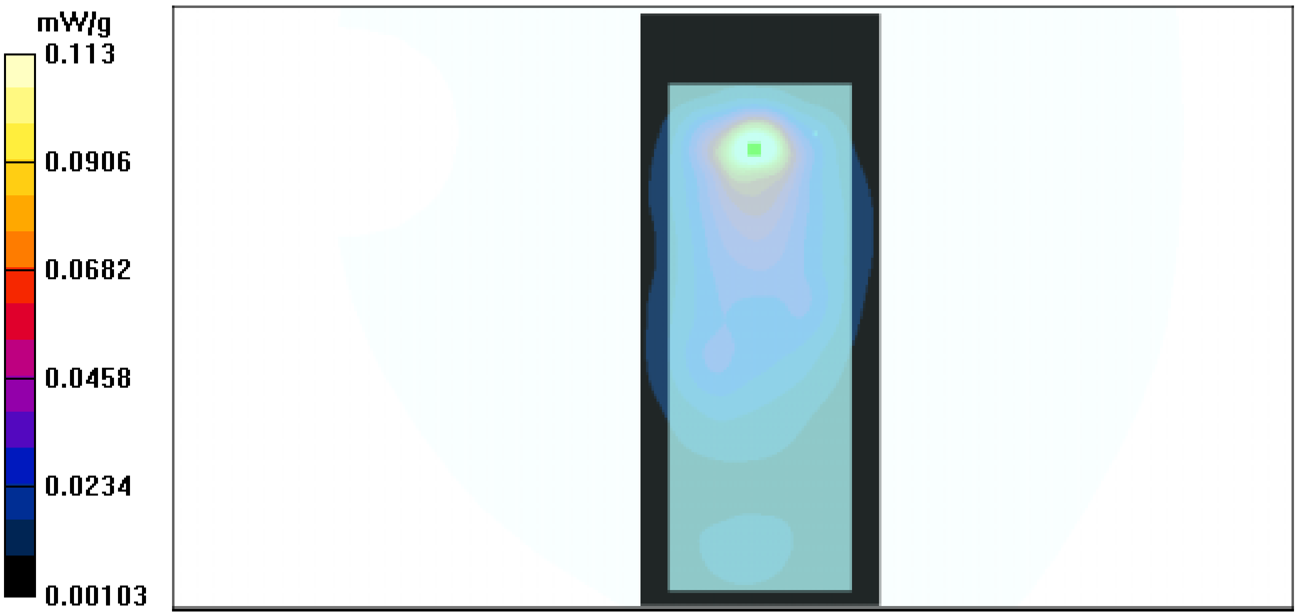
DB-6654-BodySide

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2437 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 1.973 mho/m, ε_r = 51.7897, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The bottom side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-Ch 06 0mm position bottom- Mid/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 7.79 V/m
Power Drift = -0.5 dB
Maximum value of SAR = 0.145 mW/g

Ch 06 0mm position bottom- Mid/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.206 W/kg
SAR(1 g) = 0.0995 mW/g; SAR(10 g) = 0.0422 mW/g
Reference Value = 7.79 V/m
Power Drift = -0.5 dB
Maximum value of SAR = 0.113 mW/g



Date/Time: 04/13/04 18:56:12

Test Laboratory: Advance Data Technology

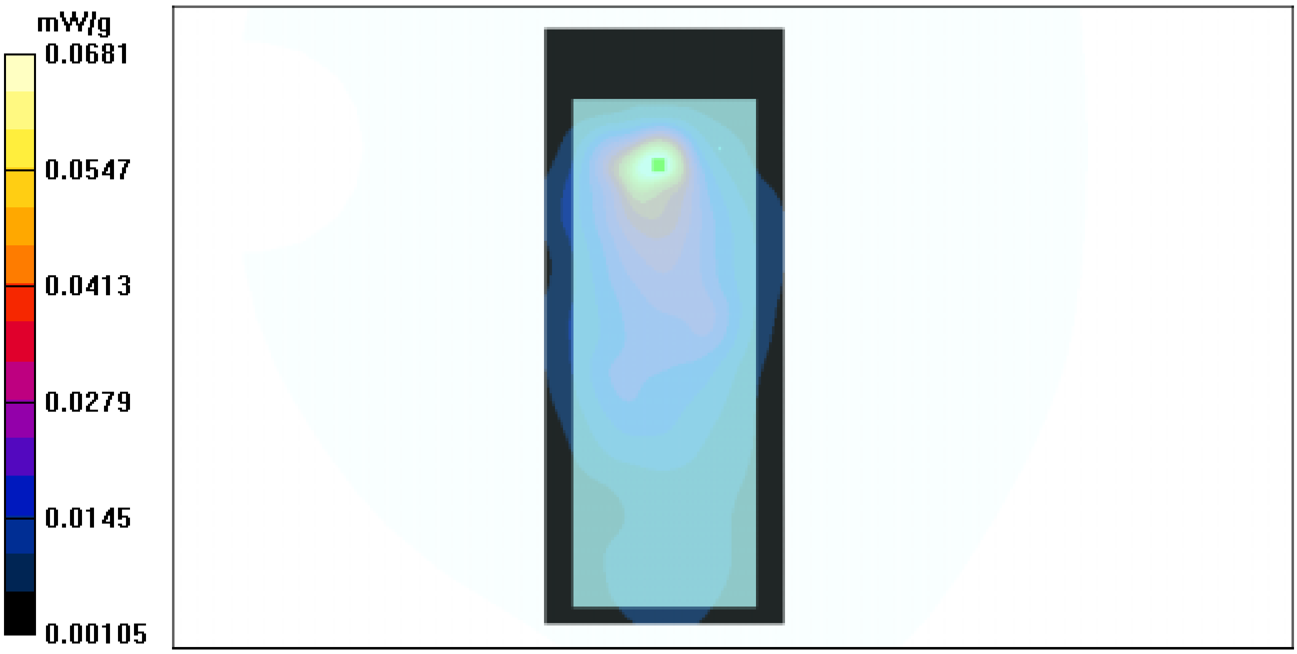
DB-6654-BodySide

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2462 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 2.012 mho/m, ε_r = 51.7742, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The bottom side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-Ch 11 0mm position bottom- High/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 5.34 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.0745 mW/g

Ch 11 0mm position bottom- High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.158 W/kg
SAR(1 g) = 0.0603 mW/g; SAR(10 g) = 0.025 mW/g
Reference Value = 5.34 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.0681 mW/g



Date/Time: 04/13/04 19:21:32

Test Laboratory: Advance Data Technology

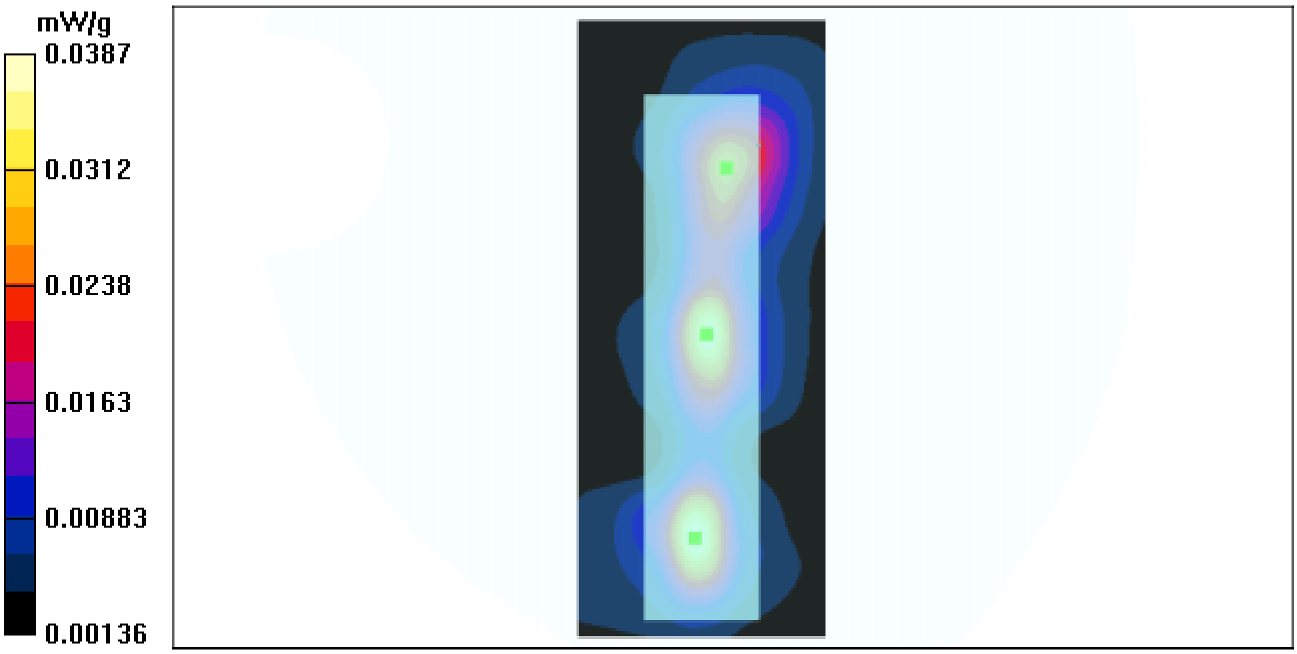
DB-6654-BodySide-lateral Side

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2412 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 1.971 mho/m, ε_r = 52.0218, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The lateral side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-Ch 01 0mm position lateral side- low/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 3.23 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0375 mW/g

Ch 01 0mm position lateral side- low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0763 W/kg
SAR(1 g) = 0.0339 mW/g; SAR(10 g) = 0.0159 mW/g
Reference Value = 3.23 V/m
Power Drift = -0.05 dB
Maximum value of SAR = 0.0387 mW/g



Date/Time: 04/13/04 19:48:31

Test Laboratory: Advance Data Technology

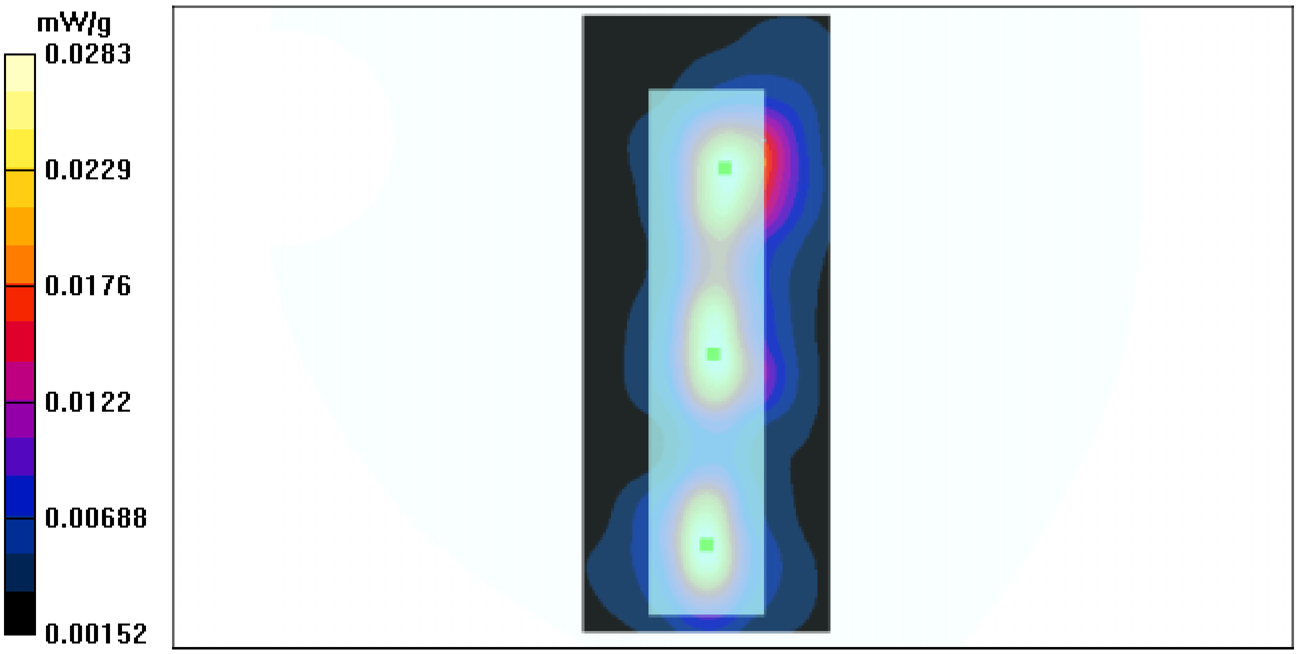
DB-6654-BodySide-lateral side

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2437 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 1.973 mho/m, ε_r = 51.7897, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The lateral side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-**Ch 06 0mm position lateral side- Mid/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm
Reference Value = 3.02 V/m
Power Drift = -0.08 dB
Maximum value of SAR = 0.0291 mW/g

Ch 06 0mm position lateral side- Mid/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0735 W/kg
SAR(1 g) = 0.0271 mW/g; SAR(10 g) = 0.0127 mW/g
Reference Value = 3.02 V/m
Power Drift = -0.08 dB
Maximum value of SAR = 0.0283 mW/g



Date/Time: 04/13/04 20:35:33

Test Laboratory: Advance Data Technology

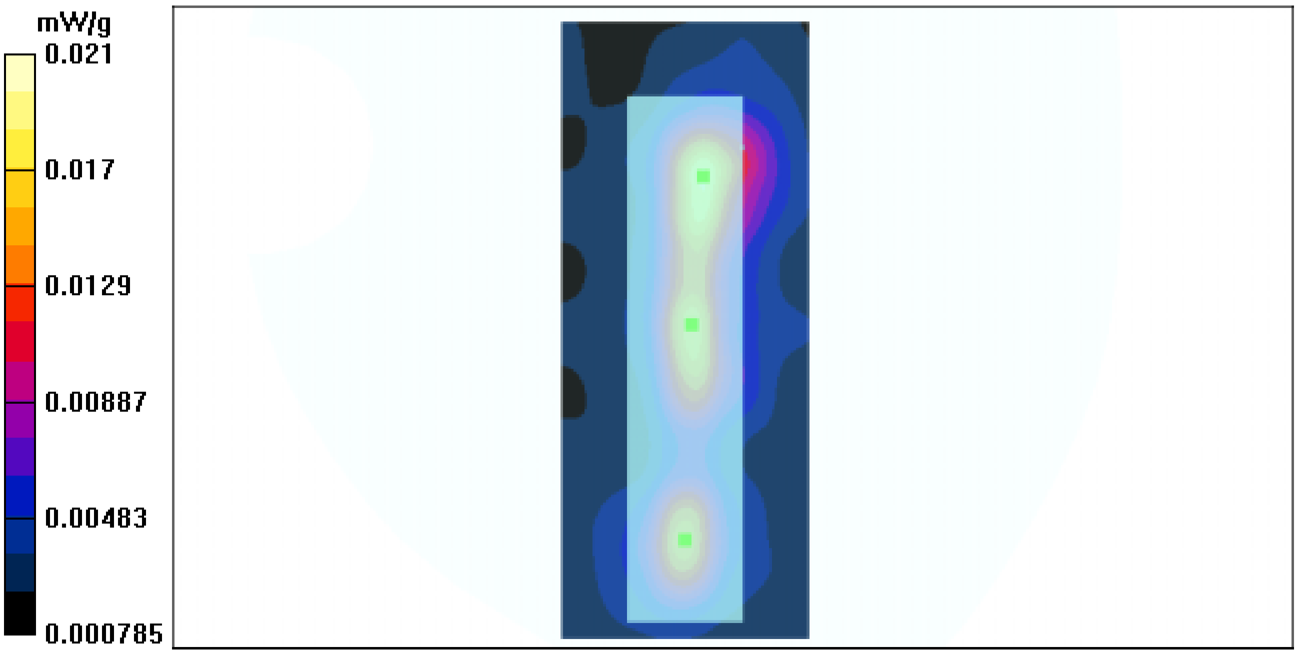
DB-6654-BodySide-lateral side

DUT: VOIP phone

Communication System: 802.11b ; Frequency: 2462 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 2.012 mho/m, ε_r = 51.7742, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
Separation Distance : 0mm(The lateral side of the EUT to the Phantom)
DASY4 Configuration:
- Probe: ET3DV6 - SN1687;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

-Ch 11 0mm position lateral side- High/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 2.62 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.0187 mW/g

Ch 11 0mm position lateral side- High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.0393 W/kg
SAR(1 g) = 0.0163 mW/g; SAR(10 g) = 0.00894 mW/g
Reference Value = 2.62 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.021 mW/g



Date/Time: 04/13/04 18:05:36

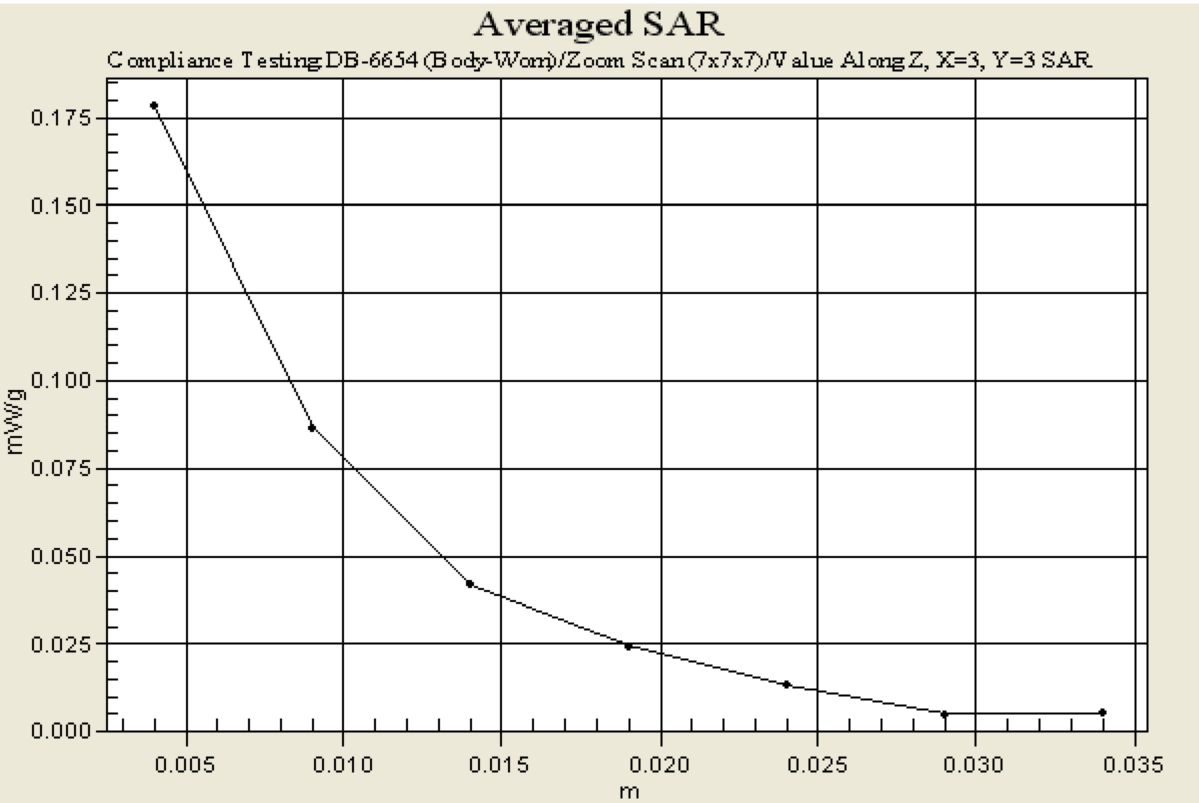
Test Laboratory: Advance Data Technology

DB-6654-BodySide

DUT: VOIP phone
Communication System: 802.11b ; Frequency: 2412 MHz; Duty Cycle: 1:1;
Medium: MSL2450 (σ = 1.973 mho/m, ε_r = 52.0218, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; DUT test position : Body Worm ; Modulation type: CCK
Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees
DASY4 Configuration:
- Probe: ET3DV6 - SN1687; ConvF(4.6, 4.6, 4.6); Calibrated: 11/24/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 6/2/2003
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Separation 0mm position bottom- Low/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 9.17 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.21 mW/g

Separation 0mm position bottom- Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.357 W/kg
SAR(1 g) = 0.154 mW/g; SAR(10 g) = 0.0655 mW/g
Reference Value = 9.17 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.178 mW/g



A3 : SYSTEM VALIDATION

Date/Time: 04/13/04 09:26:38

Test Laboratory: Advance Data Technology

SystemPerformanceCheck-HSL 2450-2004-04-13

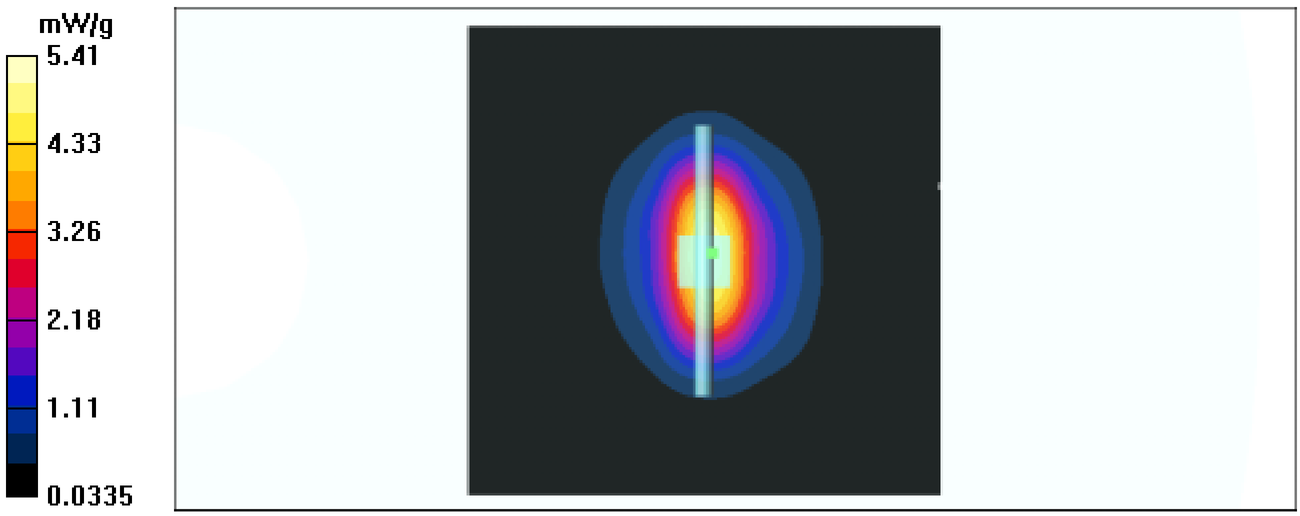
DUT: Dipole 2450 MHz ; Type: D2450V2

Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: HSL2450 (σ = 1.846 mho/m, ε_r = 39.5963, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; Separation distance : 10mm(The feetpoint of the dipole to the Phantom)
Air temp. : 22.0 degrees ; Liquid temp. : 21 degrees

DASY4 Configuration:
- Probe: ET3DV6 - SN1687; ConvF(4.9, 4.9, 4.9); Calibrated: 11/24/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

d=10mm, Pin=100mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 55.2 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 4.93 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 9.94 W/kg
SAR(1 g) = 5.22 mW/g; SAR(10 g) = 2.45 mW/g
Reference Value = 55.2 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 5.54 mW/g



Date/Time: 04/13/04 16:15:58

Test Laboratory: Advance Data Technology

SystemPerformanceCheck-MSL 2450-2004-04-13

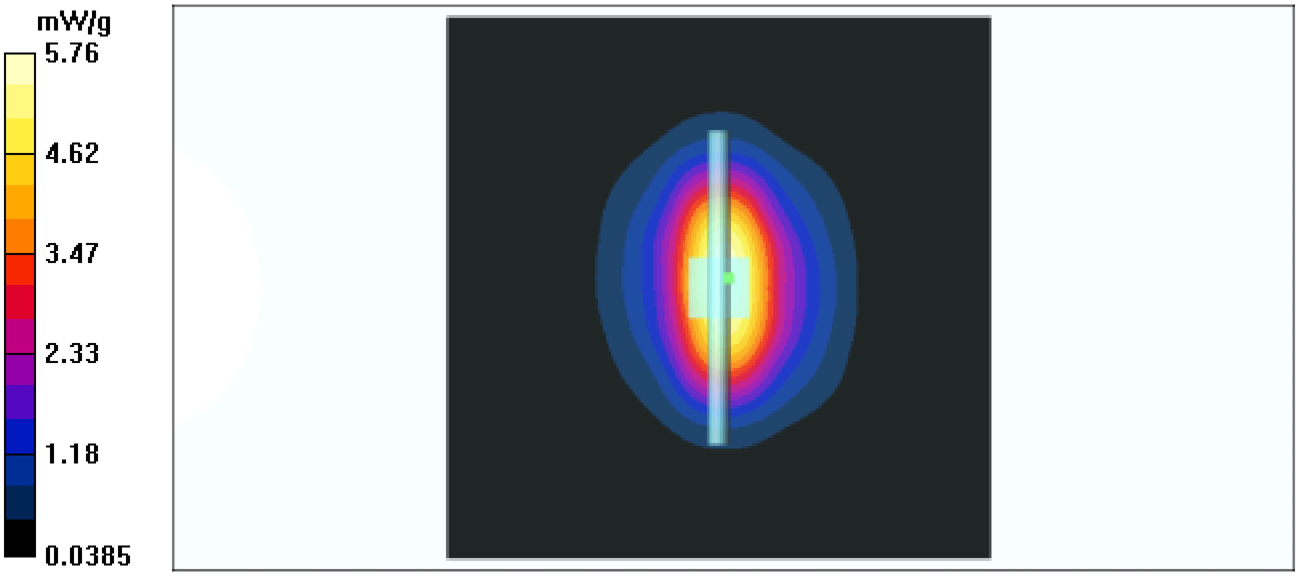
DUT: Dipole 2450 MHz ; Type: D2450V2

Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL2450 (σ = 1.992 mho/m, ε_r = 51.78, ρ = 1000 kg/m^3) ; Liquid level : 155mm
Phantom section: Flat Section ; Separation distance : 10mm(The feetpoint of the dipole to the Phantom)
Air temp. : 22.0 degrees ; Liquid temp. : 21 degrees

DASY4 Configuration:
- Probe: ET3DV6 - SN1687; ConvF(4.6, 4.6, 4.6); Calibrated: 11/24/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510;
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1150
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

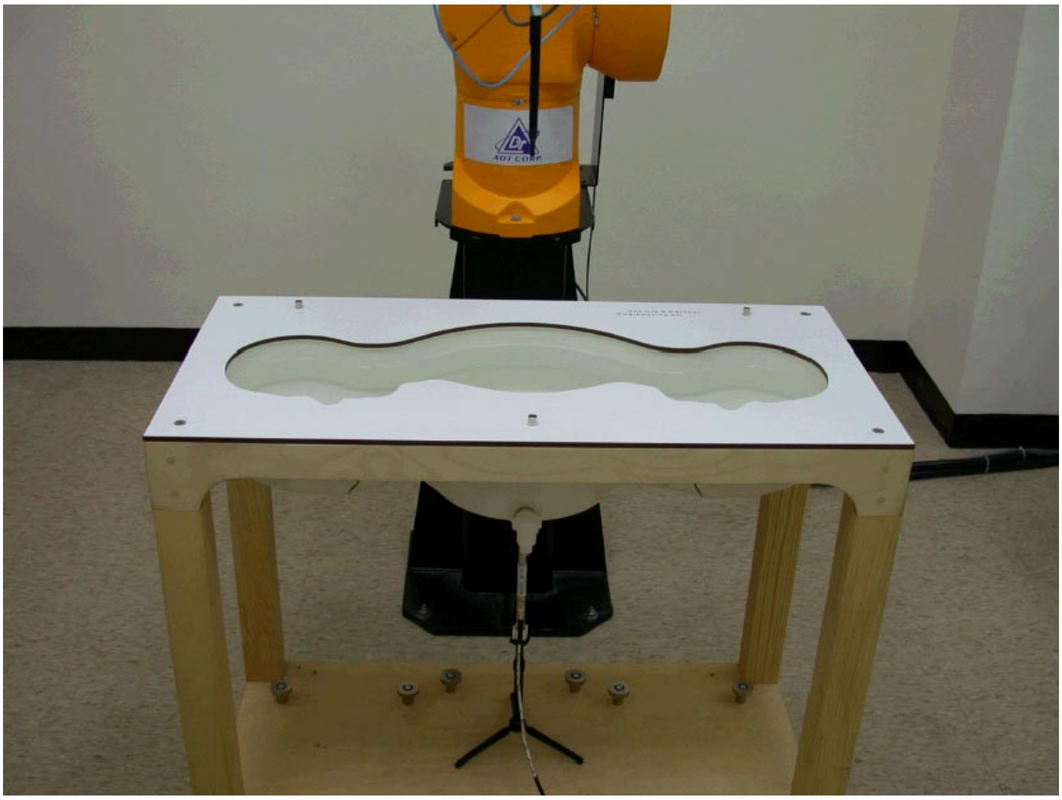
d=10mm, Pin=100mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 56.3 V/m
Power Drift = -0.04 dB
Maximum value of SAR = 5.68 mW/g

d=10mm, Pin=100mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.2 W/kg
SAR(1 g) = 5.31 mW/g; SAR(10 g) = 2.47 mW/g
Reference Value = 56.3 V/m
Power Drift = -0.04 dB
Maximum value of SAR = 5.76 mW/g



APPENDIX B: ADT SAR MEASUREMENT SYSTEM

APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION



APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: SAM PHANTOM

Schmid & Partner Engineering AG

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

Certificate of conformity / First Article Inspection

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

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

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

Date 28.02.2002

Signature / Stamp

F. Bomholt

Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

D2: 900MHz AND 1800MHz SYSTEM VALIDATION DIPOLE

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

Client ADT (Auden)

CALIBRATION CERTIFICATE

Object(s)	D900V2 - SN:156
Calibration procedure(s)	QA CAL-05 v2 Calibration procedure for dipole validation kits
Calibration date:	June 3, 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
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: June 3, 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

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D900V2

Serial: 156

Manufactured: February 28, 2002
Calibrated: June 3, 2003

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 900 MHz:

Relative Dielectricity	**42.1**	± 5%
Conductivity	**0.95 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.6 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance spacer 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 250 mW ± 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 cm^3 (1 g) of tissue:	**10.7 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**6.84 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

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:	**1.399 ns**	(one direction)
Transmission factor:	**0.976**	(voltage transmission, one direction)

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

Feedpoint impedance at 900 MHz:	Re{Z} = **51.0 Ω**
	Im {Z} = **-4.9 Ω**
Return Loss at 900 MHz	**-26.2 dB**

4. Handling

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

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 06/03/03 14:01:52

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN156_SN1507_HSL900_030603.da4

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN156
Program: Dipole Calibration

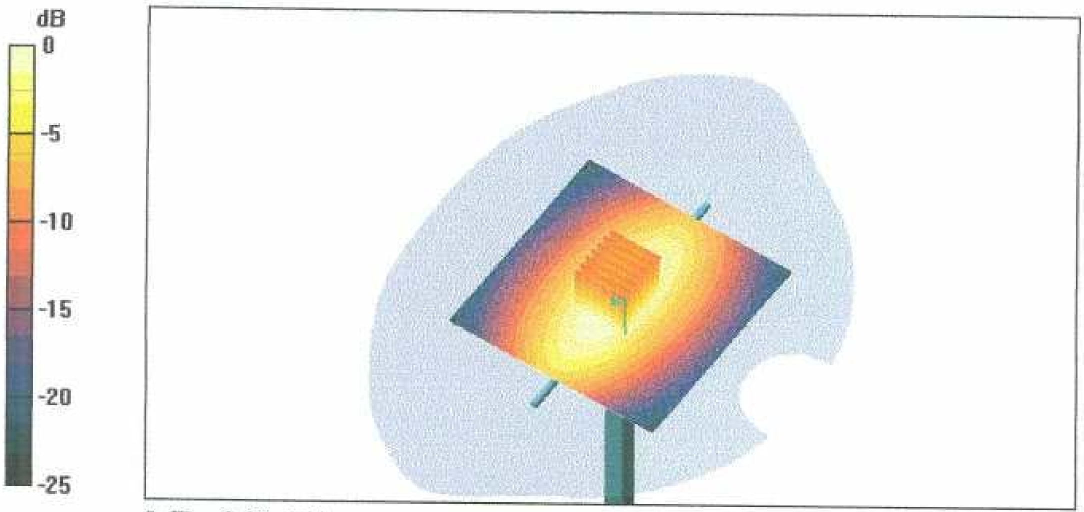
Communication System: CW-900; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL 900 MHz (σ = 0.95 mho/m, ε_r = 42.07, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

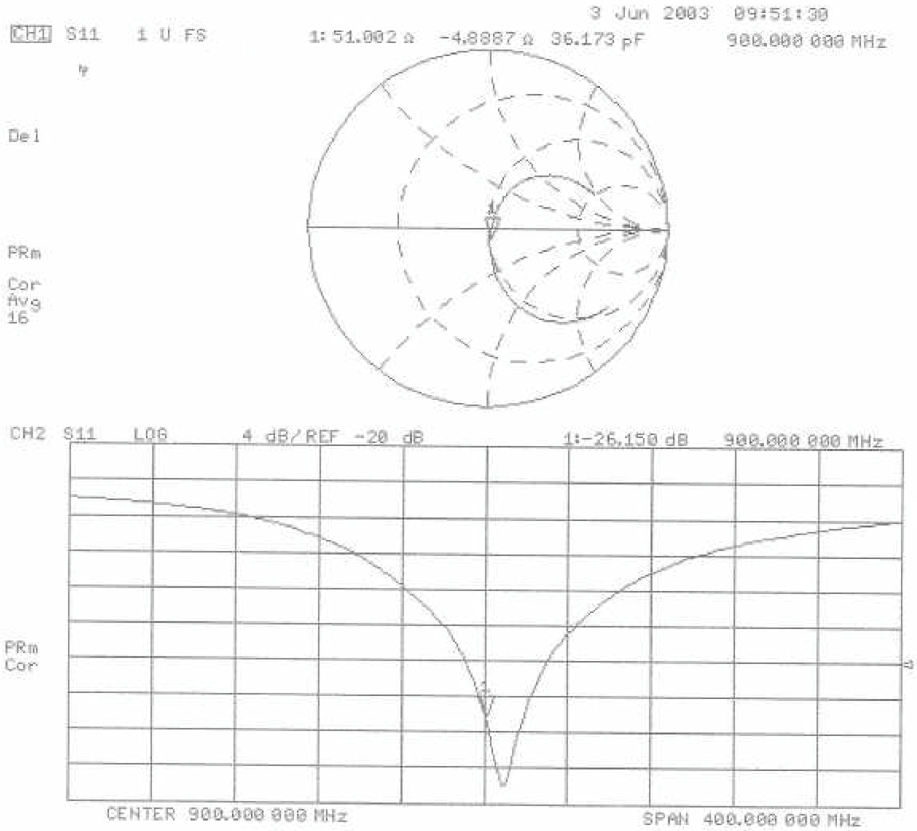
- Probe: ET3DV6 - SN1507; ConvF(6.6, 6.6, 6.6); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: *DASY4, V4.1 Build 47*; Postprocessing SW: *SEMCAD, V1.6 Build 115*

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 57.3 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 2.85 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.92 W/kg
SAR(1 g) = 2.67 mW/g; SAR(10 g) = 1.71 mW/g
Reference Value = 57.3 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 2.85 mW/g



0 dB = 2.85mW/g


3 Jun 2003 09:51:30
CH1 S11 1 U FS
1: 51.002 Ω -4.8887 Ω 36.173 pF
900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 4 dB/ REF -20 dB
1:-26.150 dB 900.000 000 MHz
PRm
Cor
CENTER 900.000 000 MHz
SPAN 400.000 000 MHz

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

Client ADT (Auden)

CALIBRATION CERTIFICATE

Object(s)	D1800V2 - SN:2d041
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	June 4, 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
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	i.V. F. Bomholt
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: June 4, 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

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D1800V2

Serial: 2d041

Manufactured: March 27, 2002
Calibrated: June 4, 2003

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 1800 MHz:

Relative Dielectricity	**39.2**	± 5%
Conductivity	**1.36 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.3 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance spacer 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 ± 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 cm^3 (1 g) of tissue:	**39.3 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**20.8 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

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:	**1.204 ns**	(one direction)
Transmission factor:	**0.991**	(voltage transmission, one direction)

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

Feedpoint impedance at 1800 MHz:	Re{Z} = **49.5 Ω**
	Im {Z} = **-2.9 Ω**
Return Loss at 1800 MHz	**-30.6 dB**

4. Handling

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

5. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 06/04/03 16:31:02

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN2d041_SN1507_HSL1800_040603.da4

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN2d041
Program: Dipole Calibration

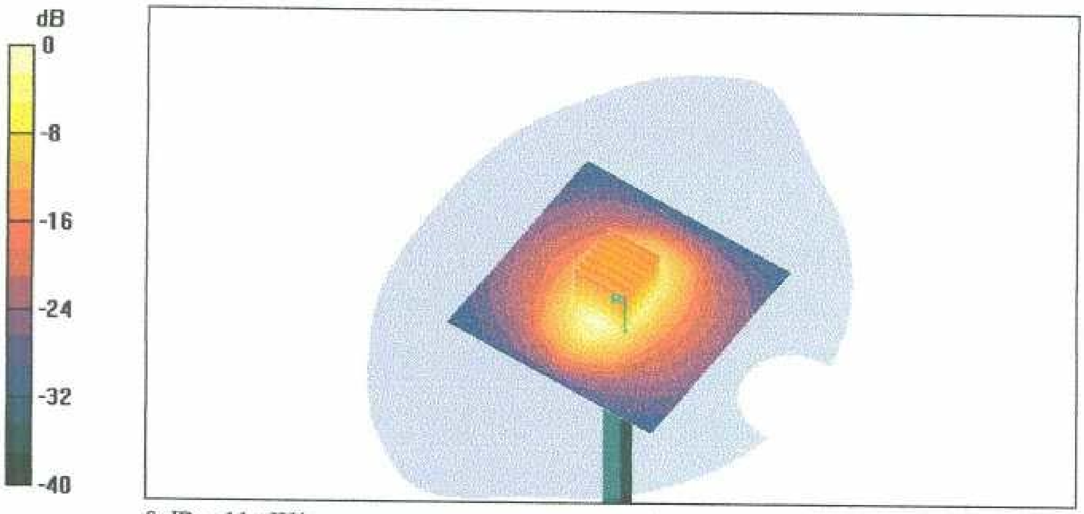
Communication System: CW-1800; Frequency: 1800 MHz;Duty Cycle: 1:1
Medium: HSL 1800 MHz (σ = 1.36 mho/m, ε_r = 39.22, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.3, 5.3, 5.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: *DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115*

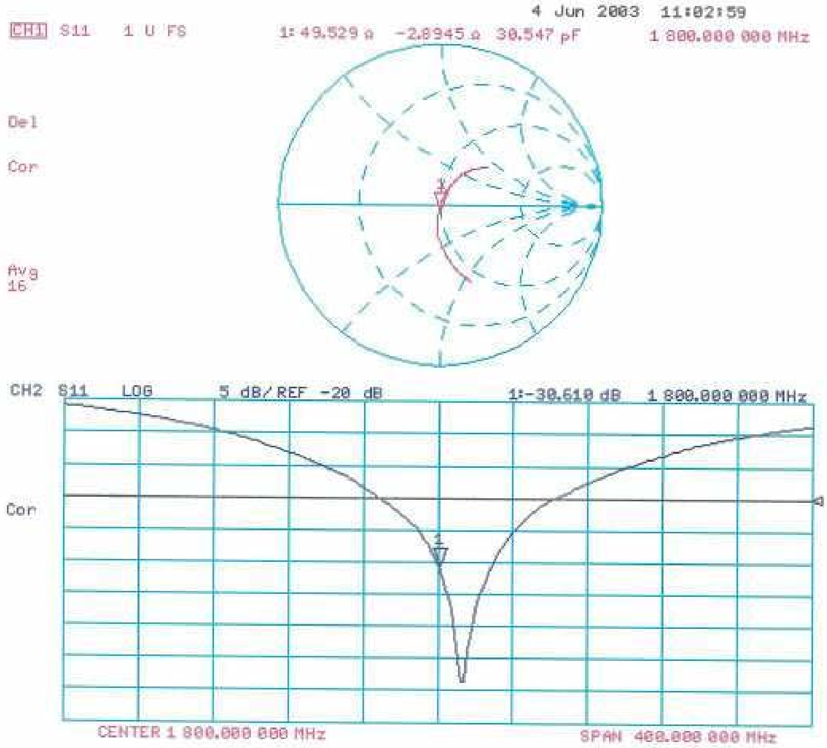
Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 94.3 V/m
Power Drift = 0.06 dB
Maximum value of SAR = 10.8 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.2 mW/g
Reference Value = 94.3 V/m
Power Drift = 0.06 dB
Maximum value of SAR = 11 mW/g



0 dB = 11mW/g

2d041



4 Jun 2003 11:02:59
CH1 S11 1 U FS
1: 49.529 Ω -2.8945 Ω 30.547 pF 1 800.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -20 dB 1:-30.610 dB 1 800.000 000 MHz
Cor
CENTER 1 800.000 000 MHz
SPAN 400.000 000 MHz

D3: DOSIMETRIC E-FIELD PROBE

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

Client ADT (Auden)

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1686
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	June 18, 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
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	N. Vetterli
Approved by:	Katja Pokovic	Laboratory Director	Pokovic Katja

Date issued: June 18, 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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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

SN:1686

Manufactured:	May 28, 2002
Last calibration:	June 5, 2002
Repaired:	June 12, 2003
Recalibrated:	June 18, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1686

Sensitivity in Free Space

NormX	**2.05**	$\mu V/(V/m)^2$
NormY	**1.80**	$\mu V/(V/m)^2$
NormZ	**1.73**	$\mu V/(V/m)^2$

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

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

ConvF X	6.7	± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.7	± 9.5% (k=2)	Alpha	**0.40**
ConvF Z	6.7	± 9.5% (k=2)	Depth	**2.18**

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

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

ConvF X	5.3	± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3	± 9.5% (k=2)	Alpha	**0.45**
ConvF Z	5.3	± 9.5% (k=2)	Depth	**2.62**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.1	4.6
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

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

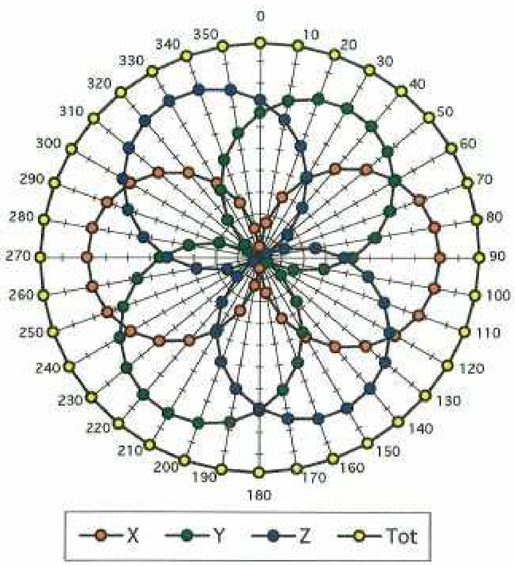
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.0	8.2
SAR_{be} [%]	With Correction Algorithm	0.2	0.2

Sensor Offset

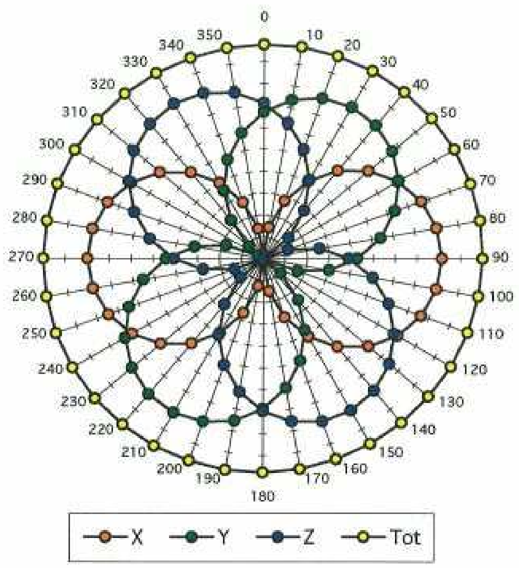
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

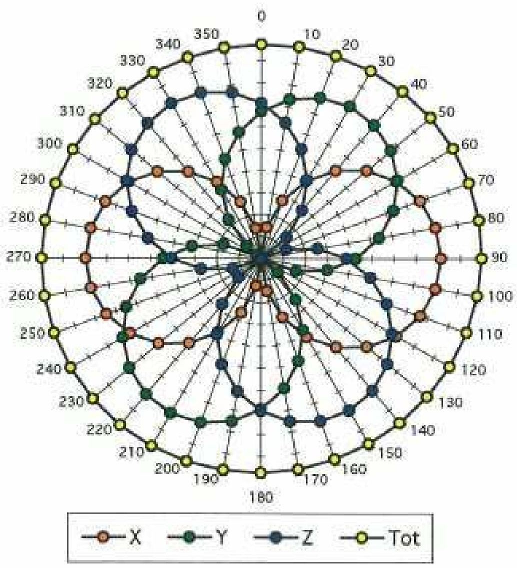
f = 30 MHz, TEM cell ifi110



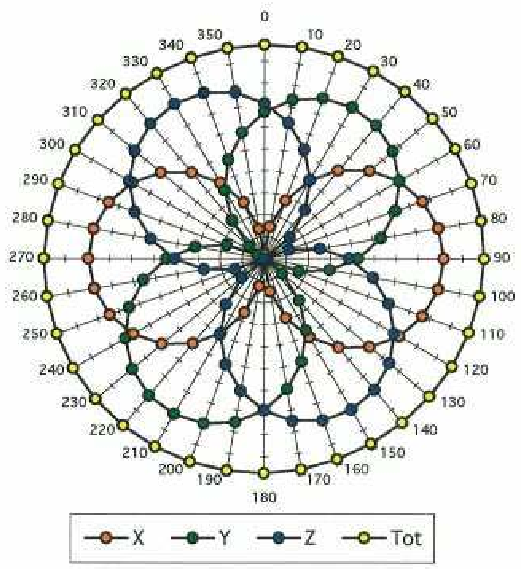
f = 100 MHz, TEM cell ifi110

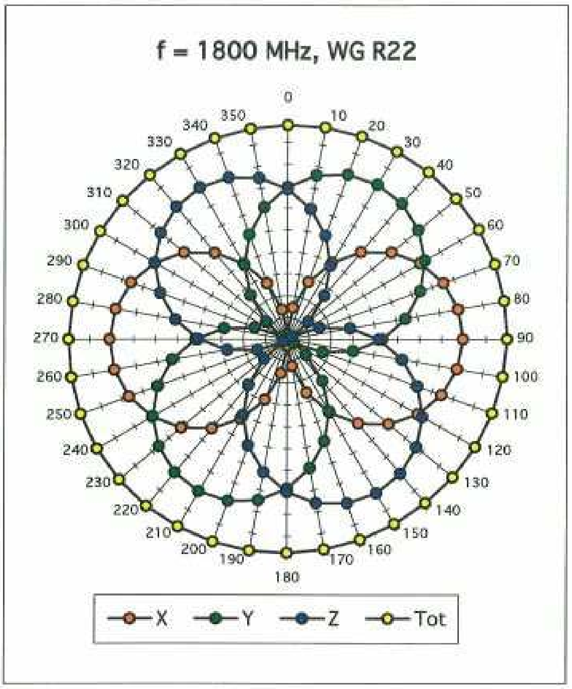


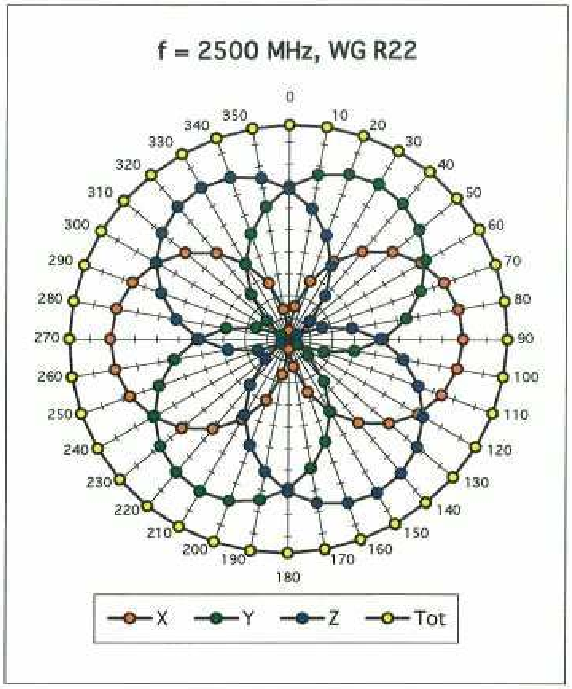
f = 300 MHz, TEM cell ifi110



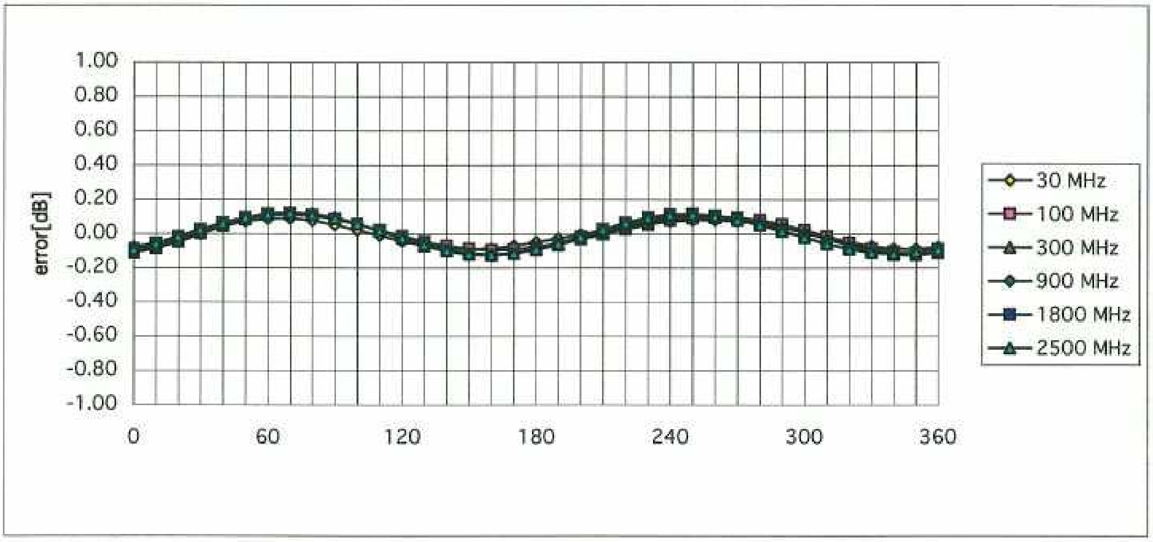
f = 900 MHz, TEM cell ifi110





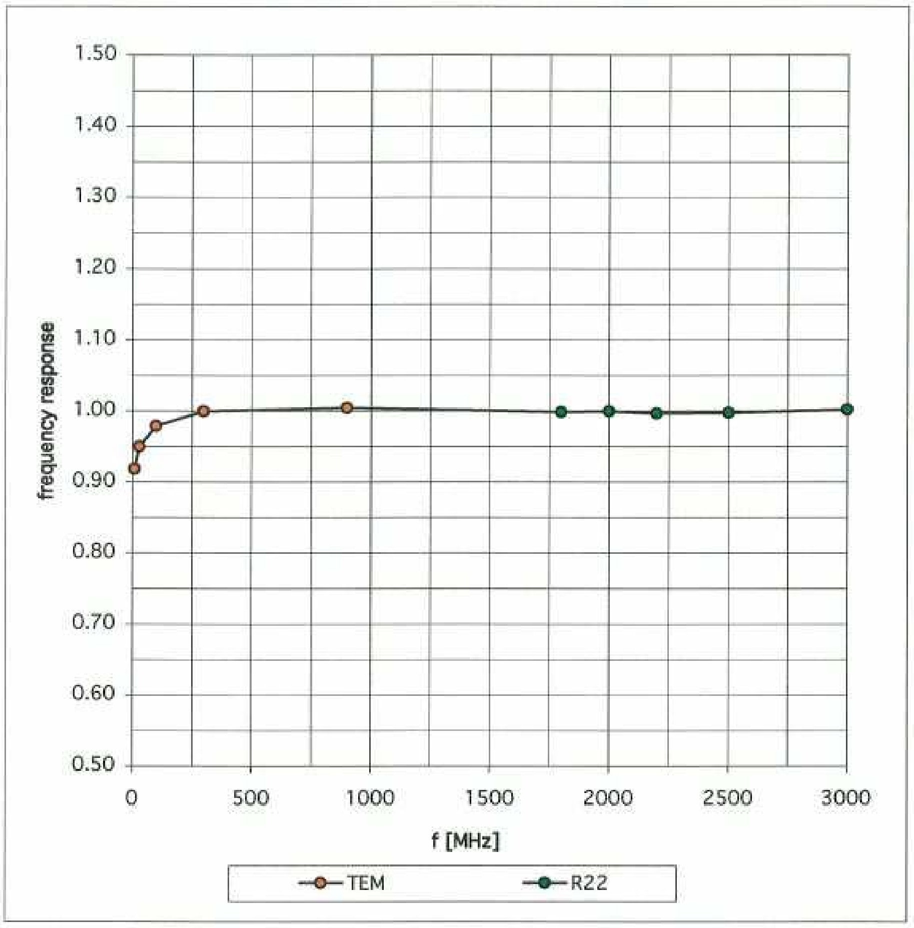


Isotropy Error (ϕ), θ = 0°



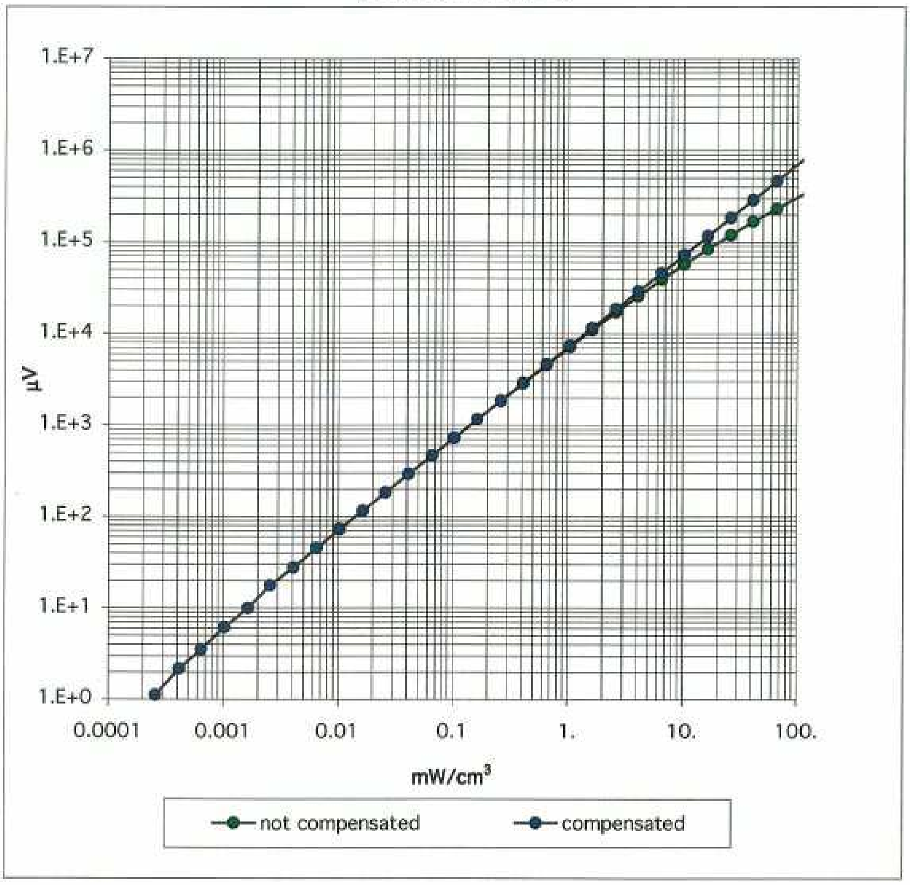
Frequency Response of E-Field

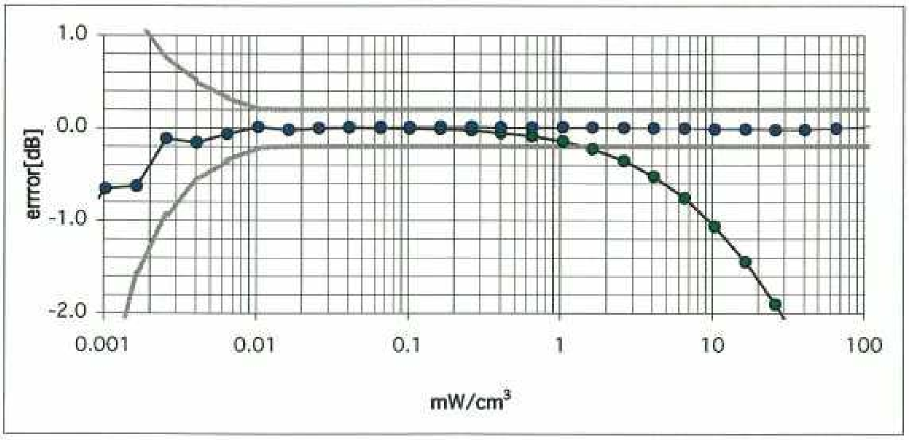
(TEM-Cell:ifi110, Waveguide R22)



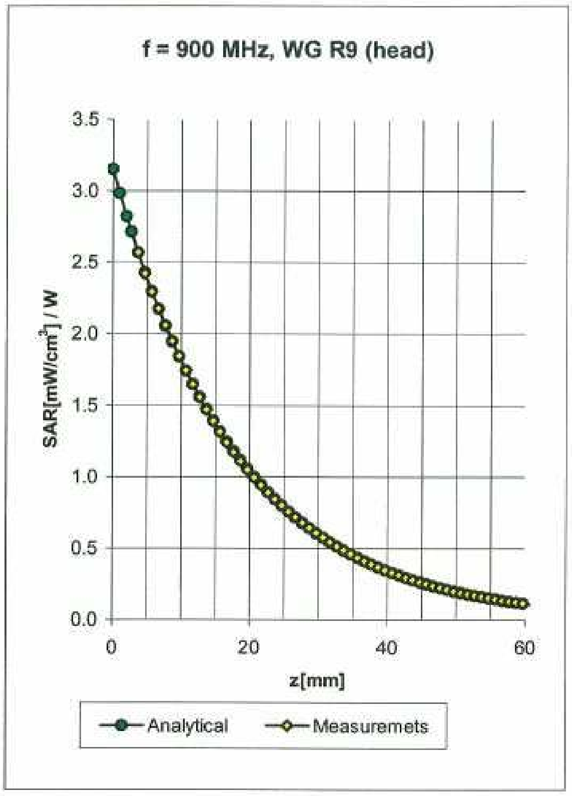
Dynamic Range f(SAR_{brain})

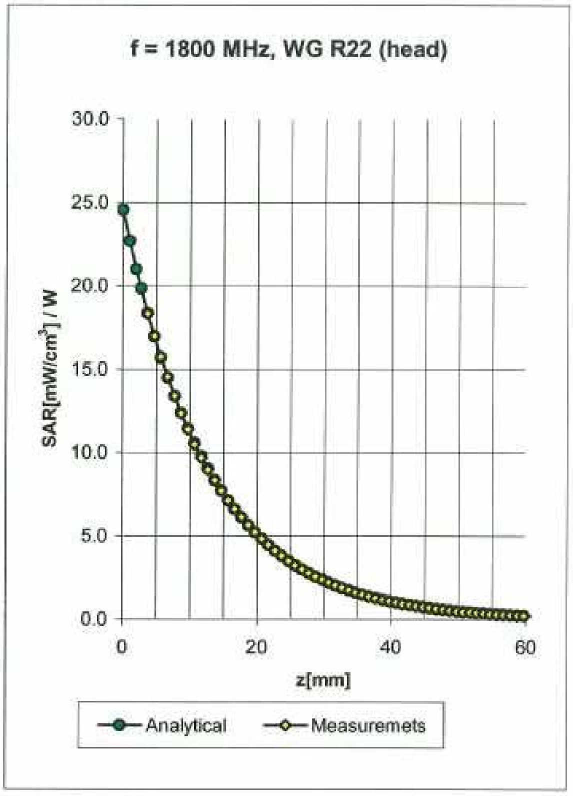
(Waveguide R22)





Conversion Factor Assessment





Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m

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

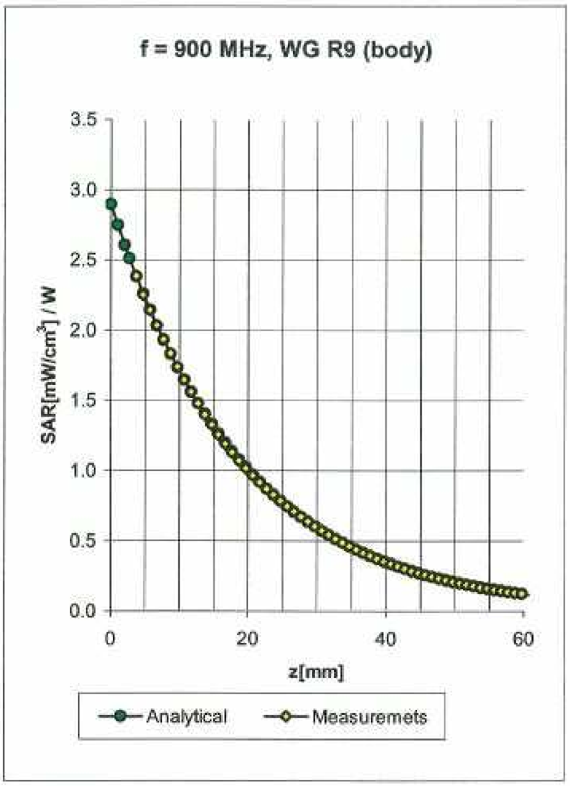
ConvF X	6.7 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.7 ± 9.5% (k=2)	Alpha	0.40
ConvF Z	6.7 ± 9.5% (k=2)	Depth	2.18

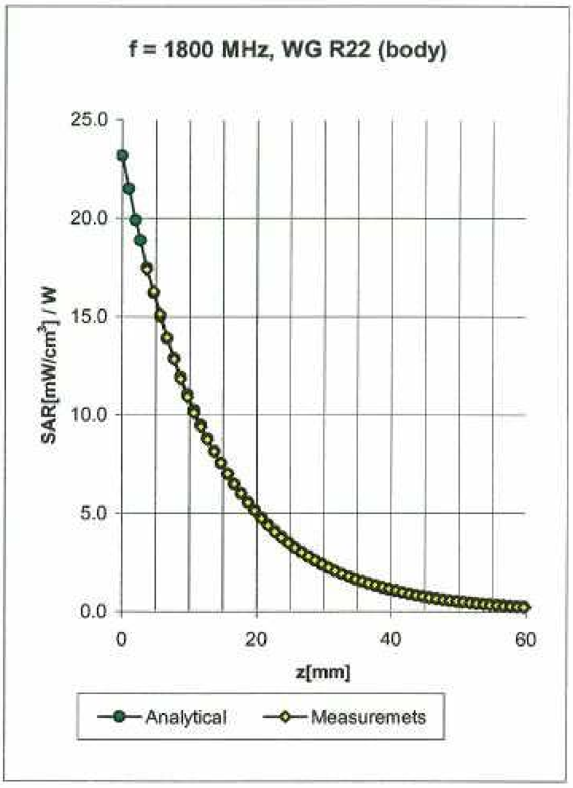
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

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

ConvF X	5.3 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3 ± 9.5% (k=2)	Alpha	0.45
ConvF Z	5.3 ± 9.5% (k=2)	Depth	2.62

Conversion Factor Assessment





Body 900 MHz ε_r = 55.0 ± 5% σ = 1.05 ± 5% mho/m

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

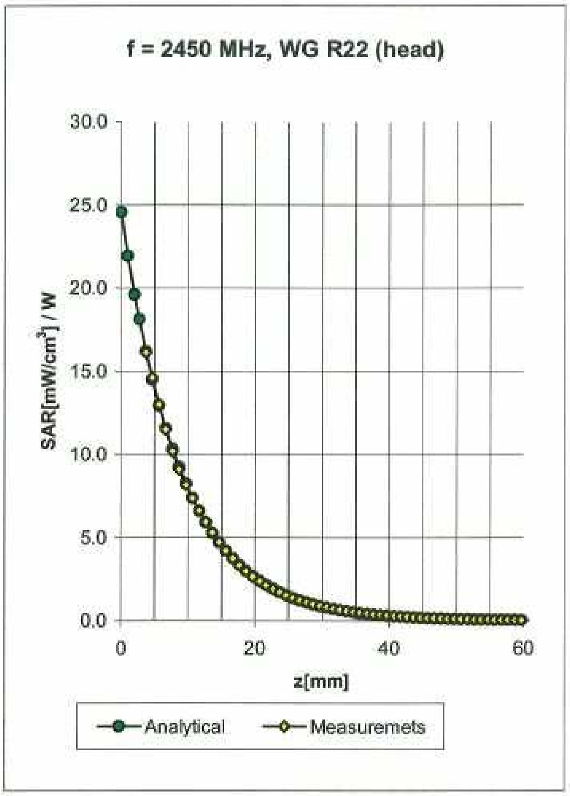
ConvF X	**6.6**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6**	± 9.5% (k=2)	Alpha	**0.35**
ConvF Z	**6.6**	± 9.5% (k=2)	Depth	**2.51**

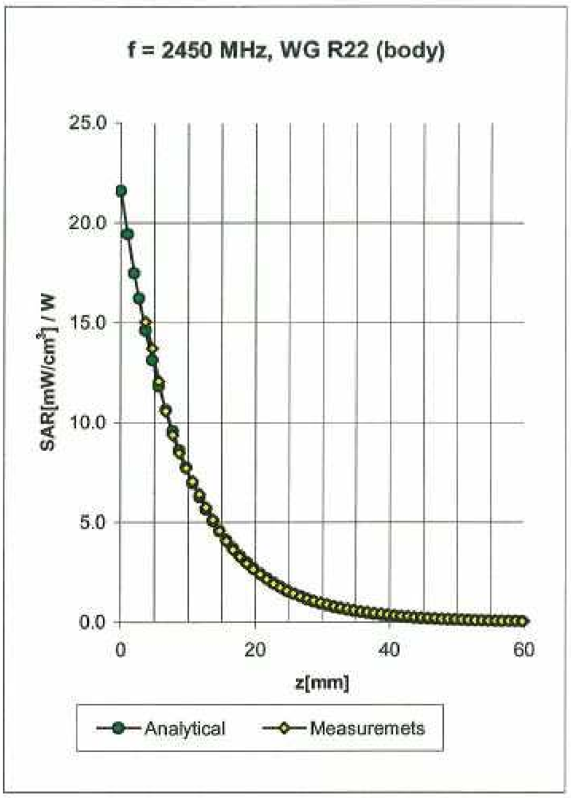
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

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

ConvF X	**5.0**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.0**	± 9.5% (k=2)	Alpha	**0.51**
ConvF Z	**5.0**	± 9.5% (k=2)	Depth	**2.80**

Conversion Factor Assessment





Head	2450	MHz	ε_r = 39.2 ± 5%	σ = 1.80 ± 5% mho/m

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

ConvF X	4.9	± 8.9% (k=2)	Boundary effect:	
ConvF Y	4.9	± 8.9% (k=2)	Alpha	0.86
ConvF Z	4.9	± 8.9% (k=2)	Depth	1.98

Body	2450	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m

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

ConvF X	4.5	± 8.9% (k=2)	Boundary effect:	
ConvF Y	4.5	± 8.9% (k=2)	Alpha	1.40
ConvF Z	4.5	± 8.9% (k=2)	Depth	1.45

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz