Appendix A – SAR MEASUREMENT DATA

Mid Ch Face Held with Stubby Antenna

Date/Time: 4/3/2006 11:45:57 AM

DUT: Kenwood; Type: TK-3200; Serial: Not Specified

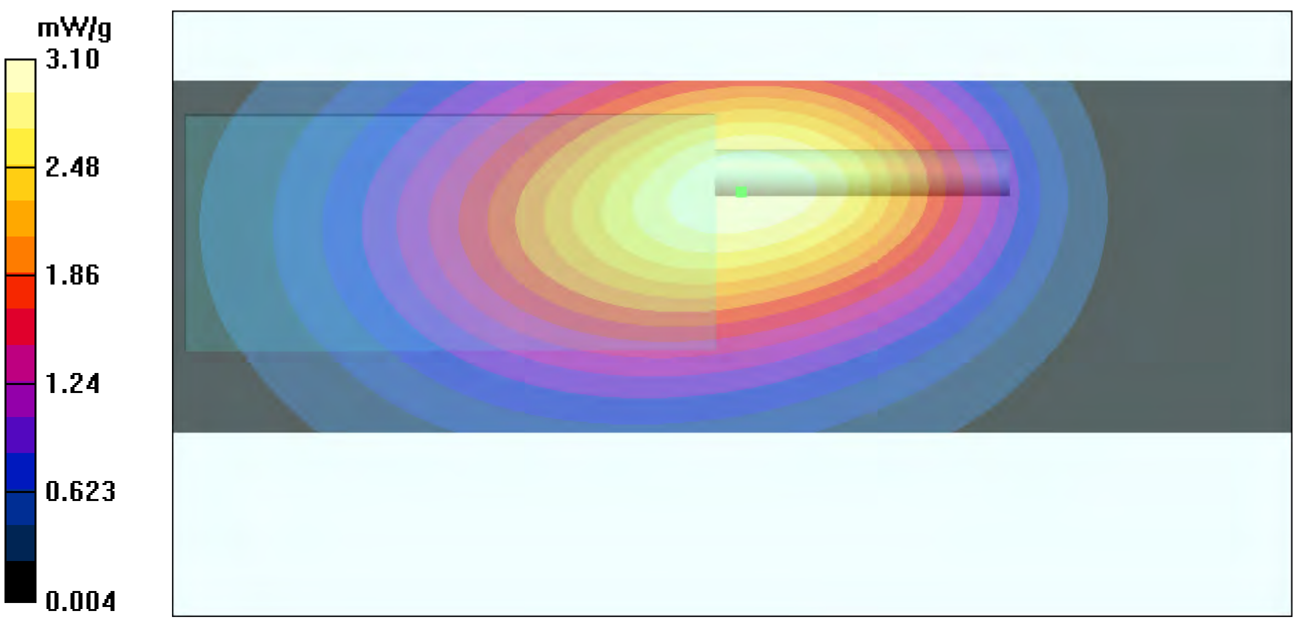
Medium Notes: Ambient Temp: 23 deg C; Fluid Temp: 22.6 deg C

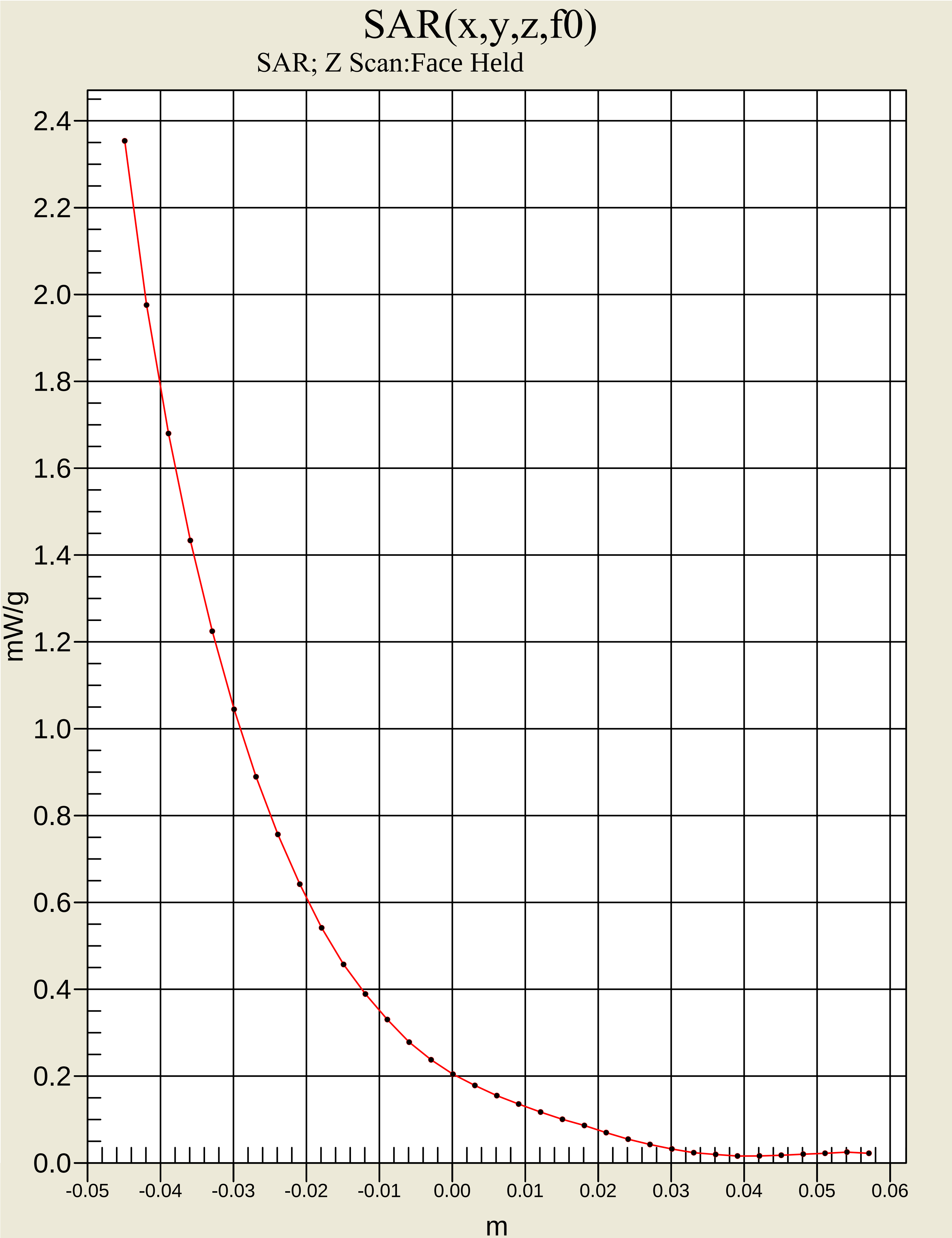
Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz head Medium parameters used: f = 450 MHz; σ = 0.83 mho/m; ε_r = 45.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Probe: ET3DV6 - SN1793; ConvF(7.6, 7.6, 7.6); Calibrated: 9/20/2005
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn584; Calibrated: 9/22/2005
Phantom: Twin Box HSL; Type: HSL; Serial: 001
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x201x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.10 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.4 V/m; Power Drift = -0.254 dB
Peak SAR (extrapolated) = 4.54 W/kg
SAR(1 g) = 2.92 mW/g; SAR(10 g) = 2.1 mW/g
Maximum value of SAR (measured) = 3.04 mW/g





SAR(x,y,z,f0)
SAR; Z Scan:Face Held
mW/g
m
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
-0.05
-0.04
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06

Mdd Ch Face Held With Whip Antenna

Date/Time: 4/3/2006 11:19:57 AM

DUT: Kenwood; Type: TK-3200; Serial: Not Specified

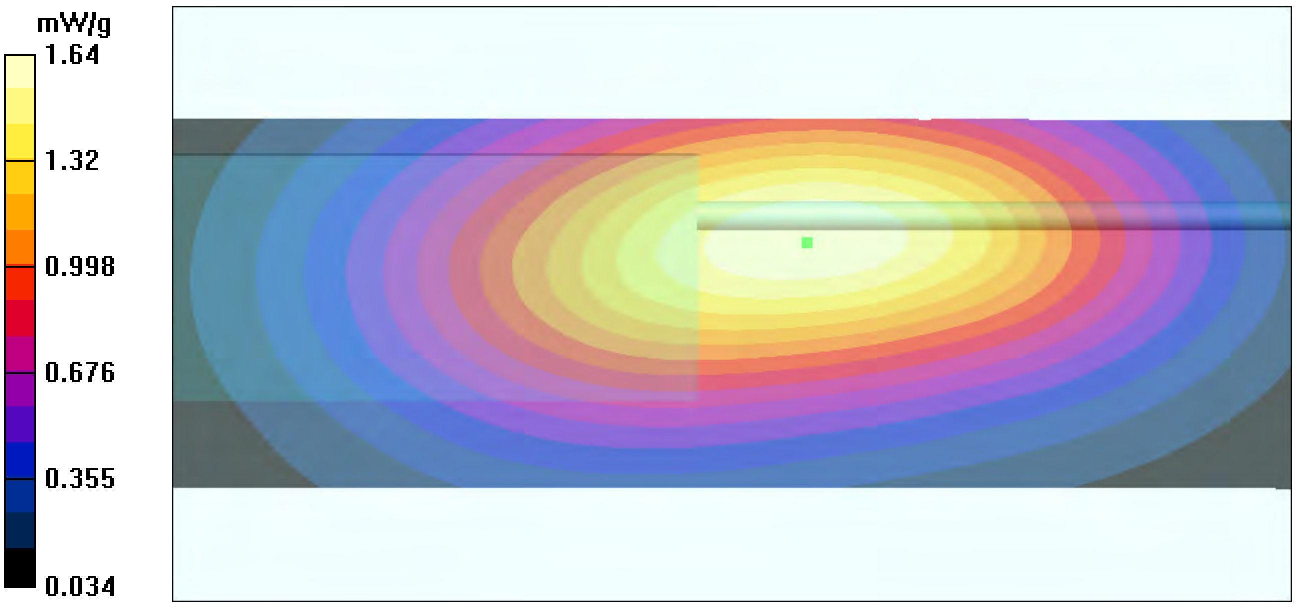
Medium Notes: Ambient Temp: 23 deg C; Fluid Temp: 22.6 deg C

Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz head Medium parameters used: f = 450 MHz; σ = 0.83 mho/m; ε_r = 45.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Probe: ET3DV6 - SN1793; ConvF(7.6, 7.6, 7.6); Calibrated: 9/20/2005
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn584; Calibrated: 9/22/2005
Phantom: Twin Box HSL; Type: HSL; Serial: 001
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x201x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.64 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 42.5 V/m; Power Drift = -0.235 dB
Peak SAR (extrapolated) = 2.46 W/kg
SAR(1 g) = 1.56 mW/g; SAR(10 g) = 1.12 mW/g
Maximum value of SAR (measured) = 1.63 mW/g



Mid Ch Body Worn with stubby Antenna and speaker mic

Date/Time: 4/3/2006 10:47:20 AM

DUT: Kenwood; Type: TK-3202; Serial: Not Specified

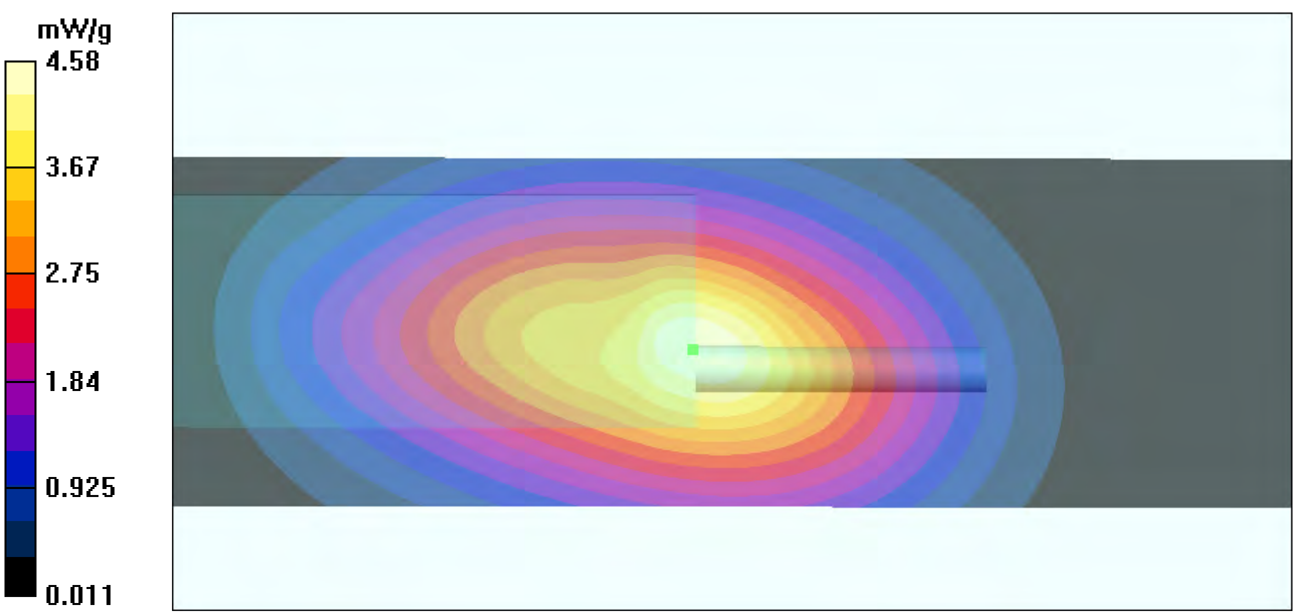
Medium Notes: Fluid Temp: 22.0 deg C; Ambient Temp: 23.1 deg C

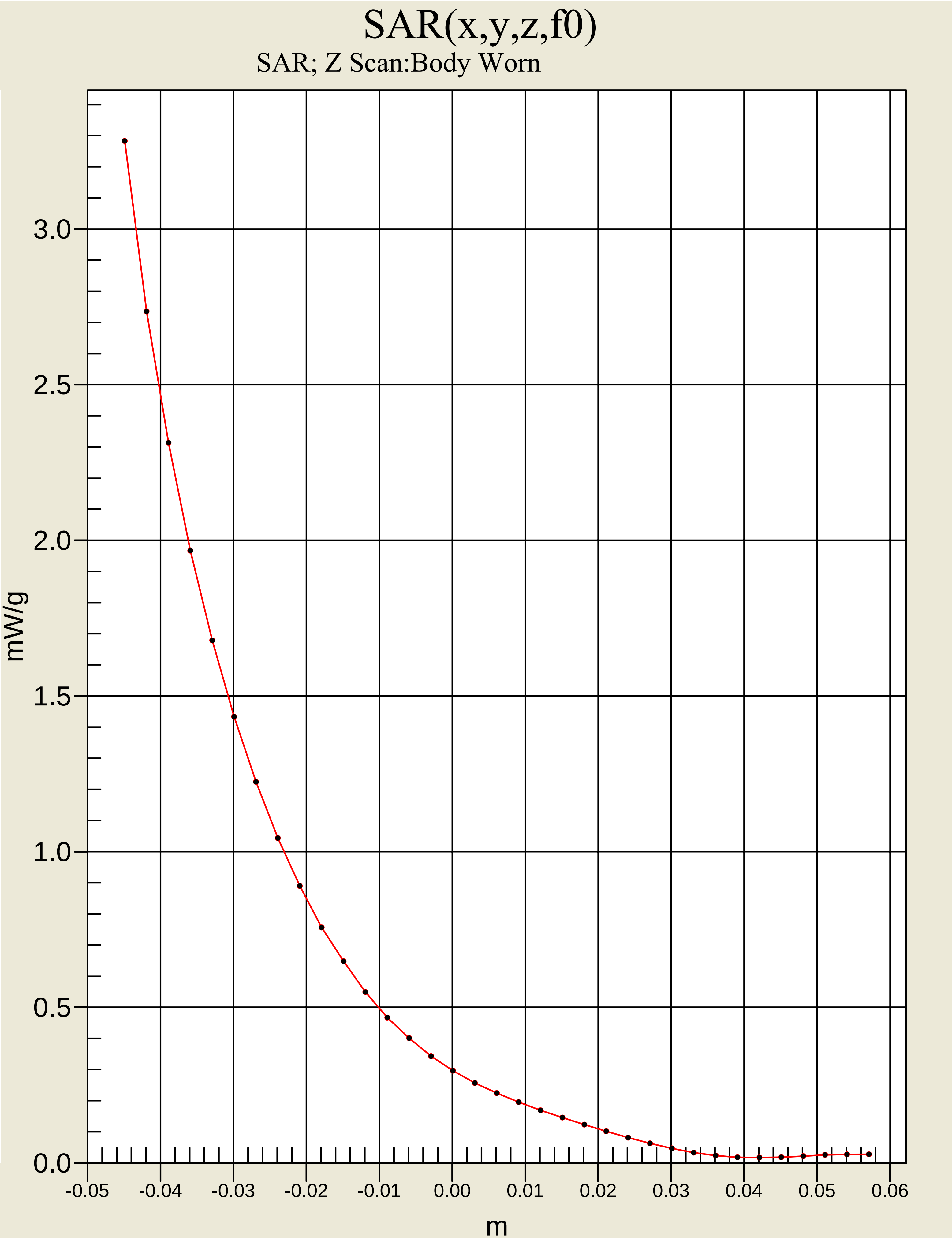
Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz Body Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 57.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

Probe: ET3DV6 - SN1793; ConvF(7.5, 7.5, 7.5); Calibrated: 9/20/2005
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn584; Calibrated: 9/22/2005
Phantom: Twin Box HSL; Type: HSL; Serial: 001
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x201x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.58 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 70.9 V/m; Power Drift = -0.306 dB
Peak SAR (extrapolated) = 7.30 W/kg
SAR(1 g) = 4.35 mW/g; SAR(10 g) = 2.98 mW/g
Maximum value of SAR (measured) = 4.56 mW/g




SAR(x,y,z,f0)
SAR; Z Scan:Body Worn
mW/g
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.05
-0.04
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
m

Mid Ch Body Worn with Whip Antenna and speaker mic

Date/Time: 4/3/2006 10:20:15 AM

DUT: Kenwood; Type: TK-3200; Serial: Not Specified

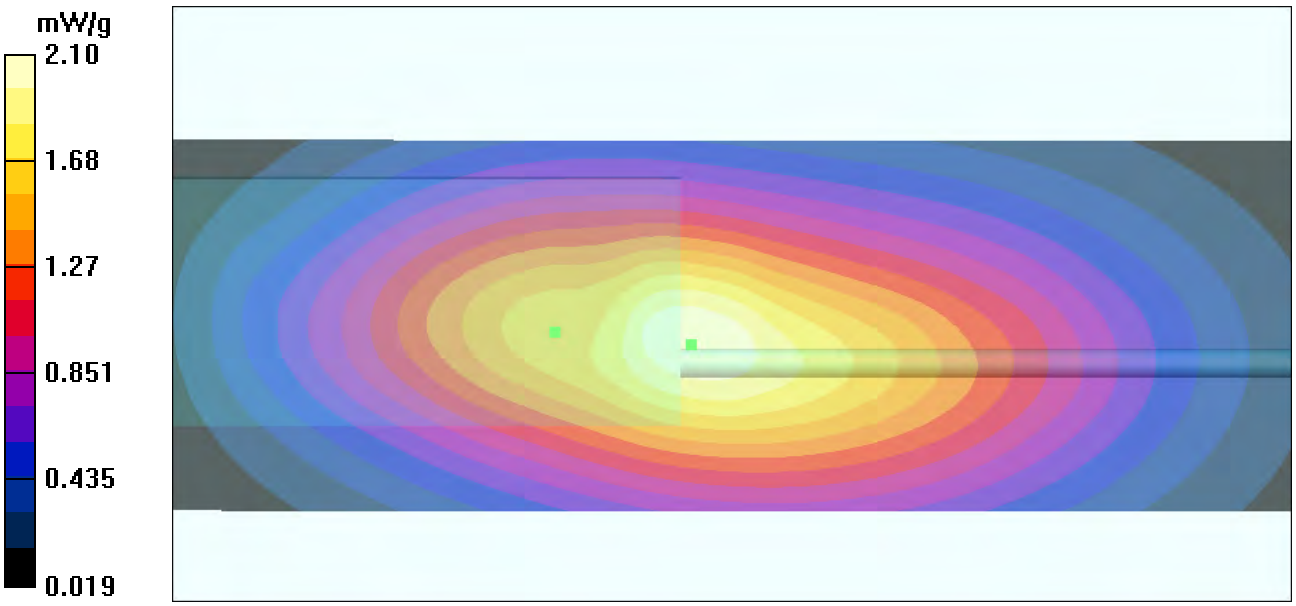
Medium Notes: Fluid Temp: 22.0 deg C; Ambient Temp: 23.1 deg C

Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz Body Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 57.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

Probe: ET3DV6 - SN1793; ConvF(7.5, 7.5, 7.5); Calibrated: 9/20/2005
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn584; Calibrated: 9/22/2005
Phantom: Twin Box HSL; Type: HSL; Serial: 001
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x201x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.10 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 48.4 V/m; Power Drift = -0.335 dB
Peak SAR (extrapolated) = 3.28 W/kg
SAR(1 g) = 1.98 mW/g; SAR(10 g) = 1.38 mW/g
Maximum value of SAR (measured) = 2.06 mW/g



Appendix B – SYSTEM VALIDATION

450MHz Validation

Date/Time: 04/03/2006 09:28:25 AM

DUT: Dipole 450 MHz; Type: D450V2; Serial: D450V2 -SN:004

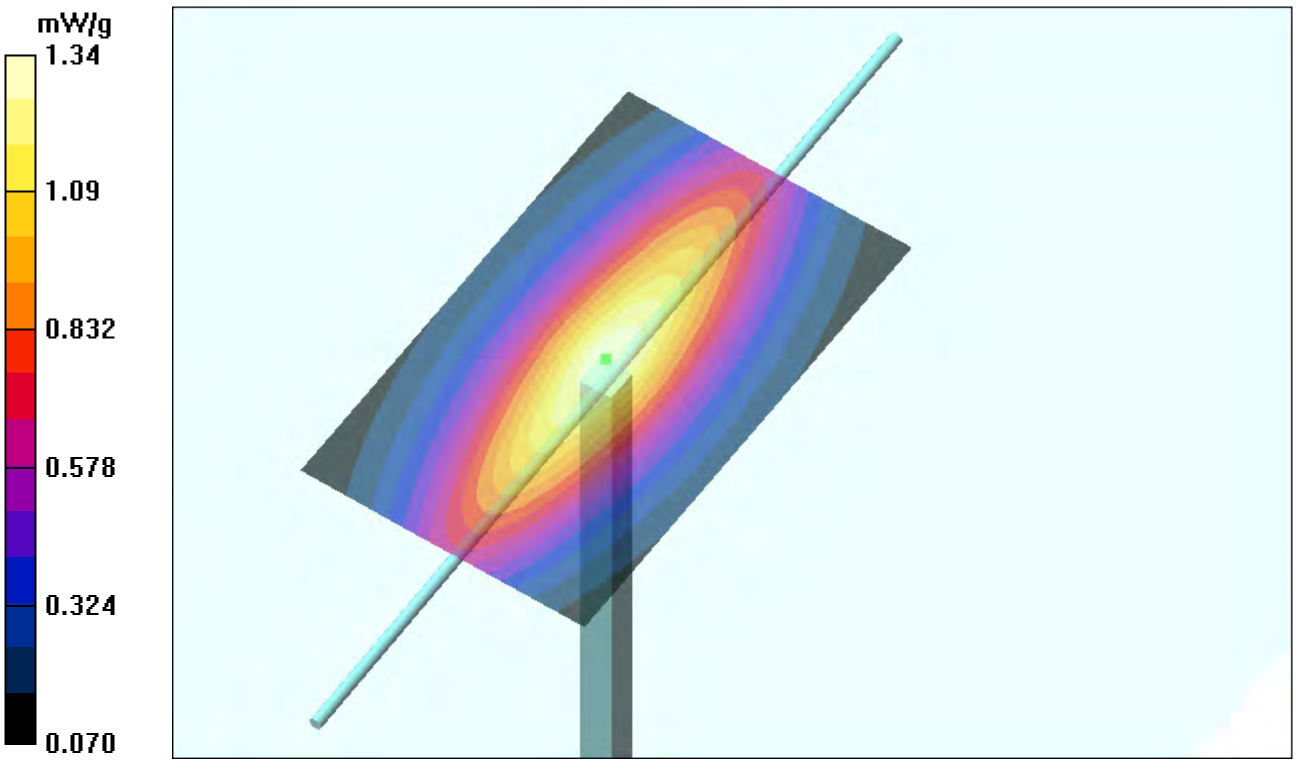
Medium Notes: Ambient Temp: 23.0 deg C; Fluid Temp: 22.0 deg C

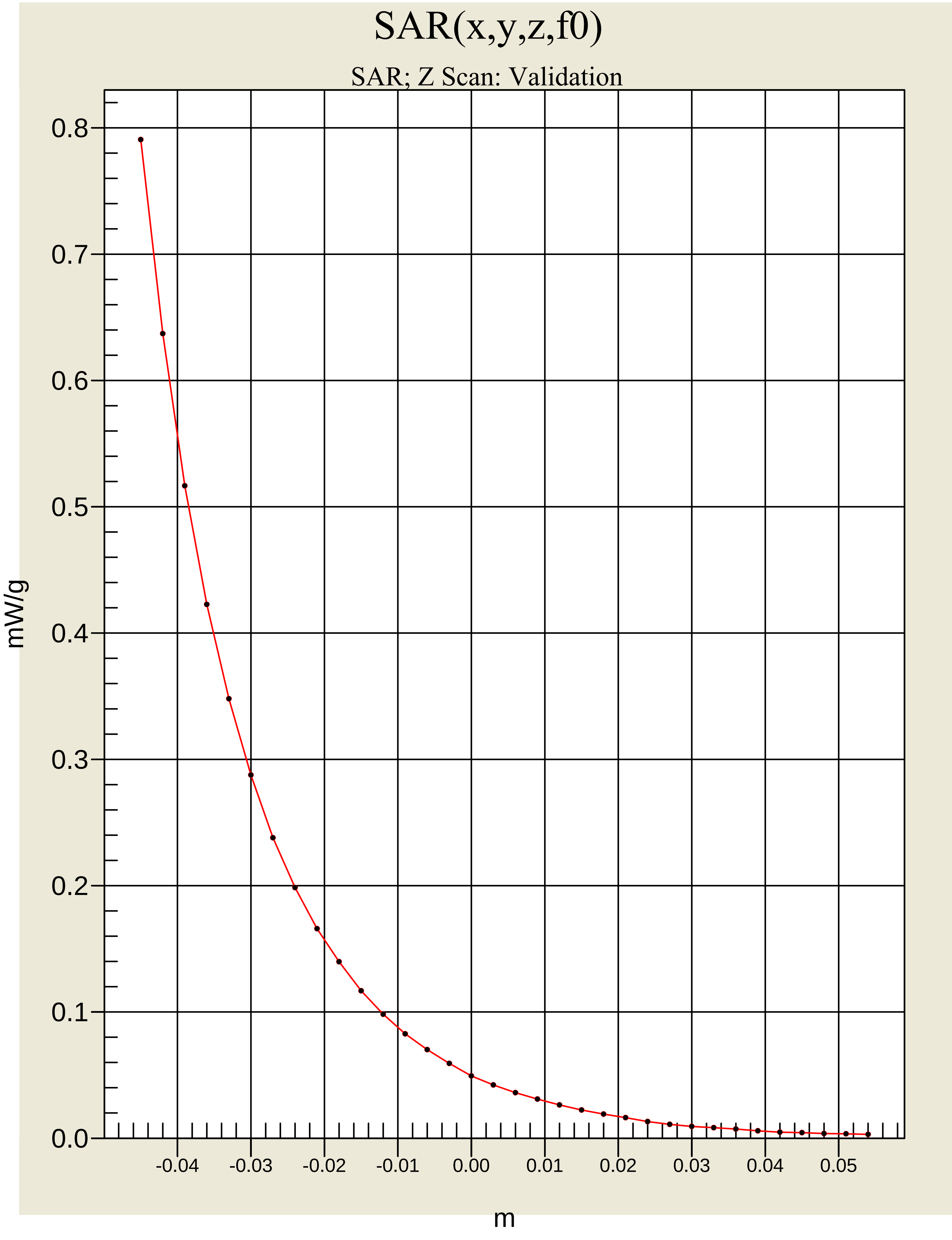
Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz HSL Medium parameters used: f = 450 MHz; σ = 0.83 mho/m; ε_r = 45.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Probe: ET3DV6 - SN1793; ConvF(7.6, 7.6, 7.6); Calibrated: 9/20/2005
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn584; Calibrated: 9/22/2005
Phantom: Validation Phantom in front of RX90; Type: Plexiglas; Serial: 001
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (101x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.34 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.9 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.815 mW/g
Maximum value of SAR (measured) = 1.33 mW/g


mW/g
1.34
1.09
0.832
0.578
0.324
0.070


SAR(x,y,z,f0)
SAR; Z Scan: Validation
mW/g
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.04
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
m

Appendix C – PROBE CALIBRATION CERTIFICATE

15 2441

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

S **Schweizerischer Kalibrierdienst**
C **Service suisse d'étalonnage**
S **Servizio svizzero di taratura**
Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **MET Laboratories**

Certificate No: ET3-1793_Sep05

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1793
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	September 20, 2005
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
DAE4	SN: 654	29-Nov-04 (SPEAG, No. DAE4-654_Nov04)	Nov-05

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

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

Issued: September 21, 2005

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1793

Manufactured:	May 28, 2005
Last calibrated:	September 15, 2003
Recalibrated:	September 20, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1793

Sensitivity in Free Space[A]

NormX	**1.72** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.71** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.76** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**93** mV
DCP Y	**93** mV
DCP Z	**93** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.3	4.4
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	12.7	8.6
SAR_{be} [%]	With Correction Algorithm	0.9	0.1

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

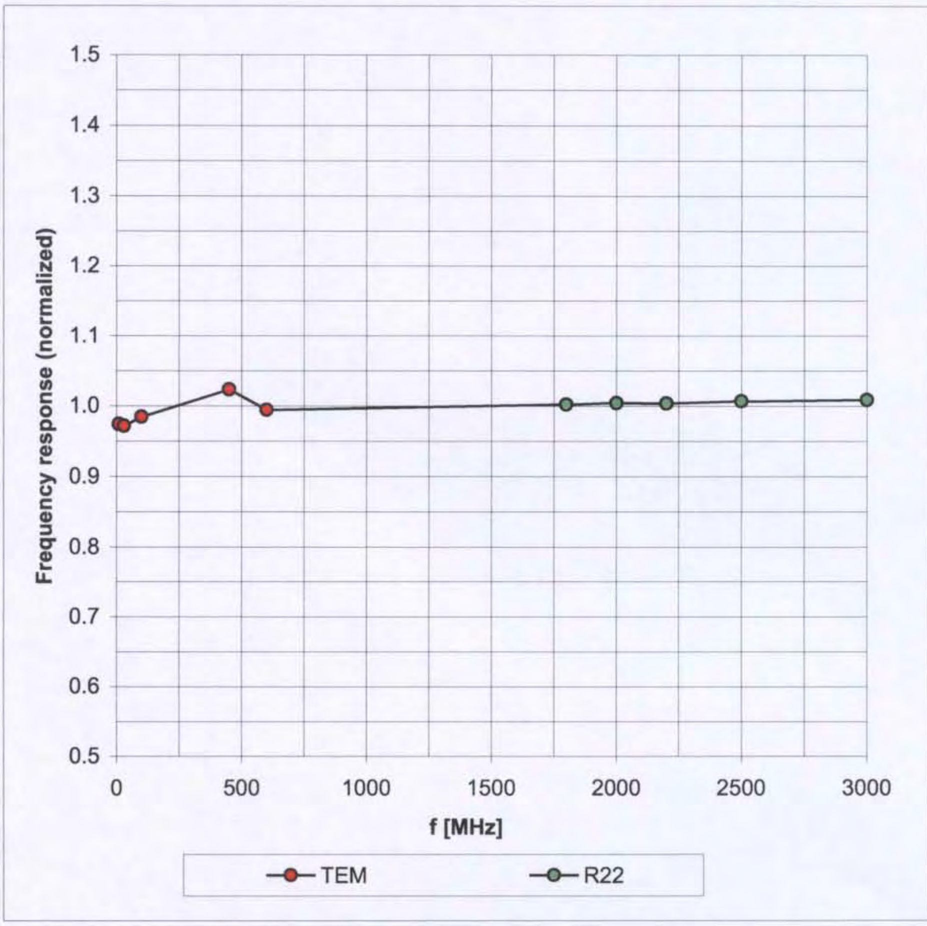
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

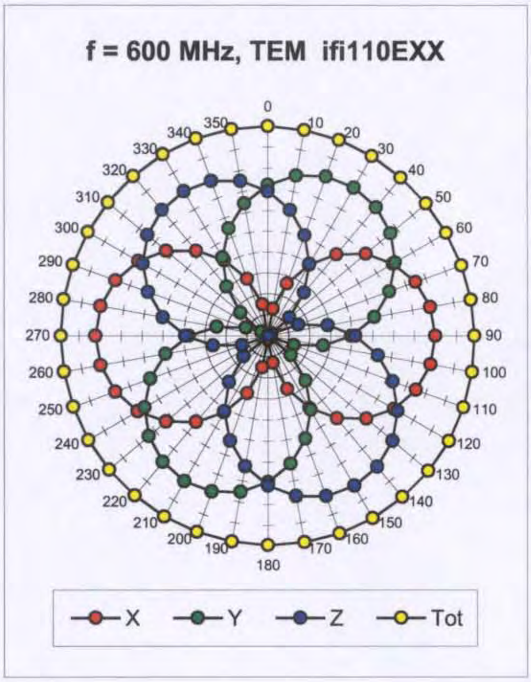
Frequency Response of E-Field

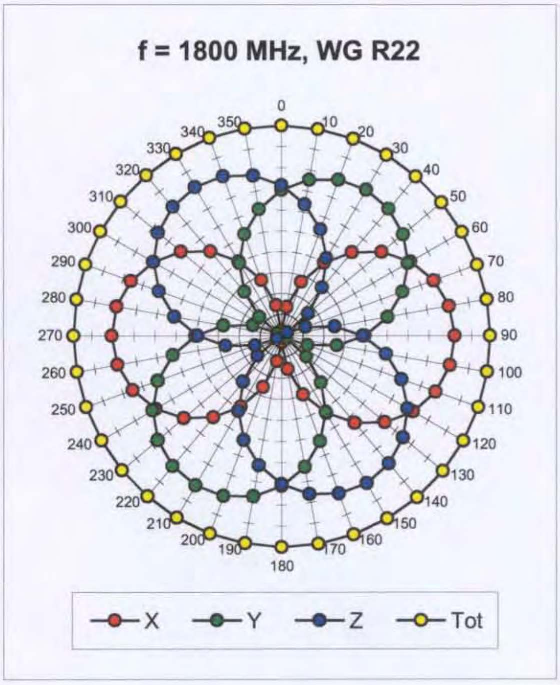
(TEM-Cell:ifi110 EXX, Waveguide: R22)

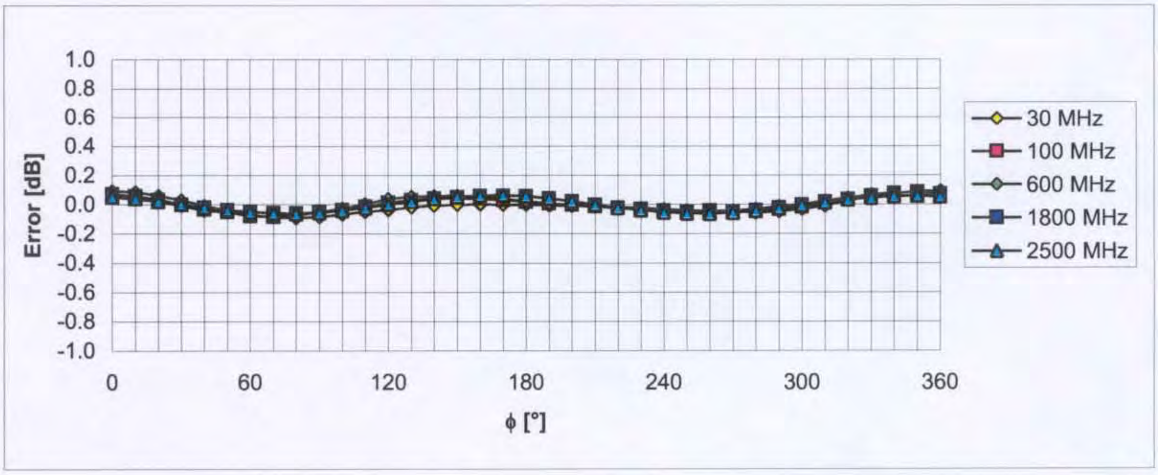


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



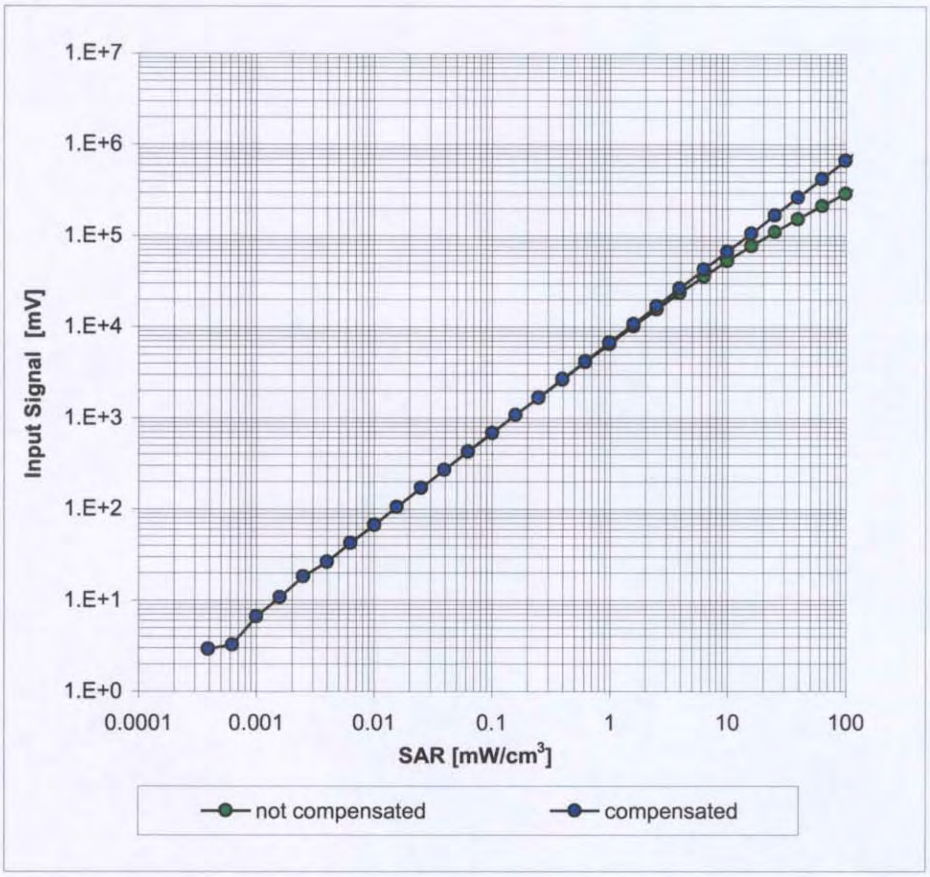


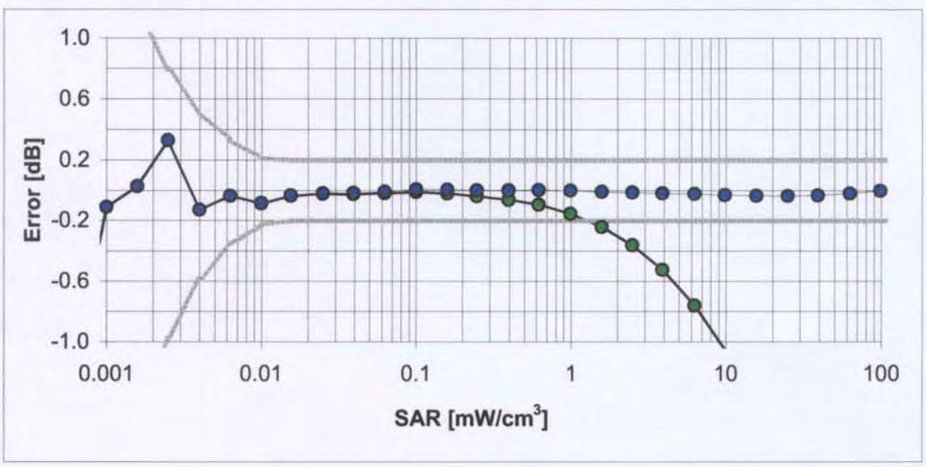


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

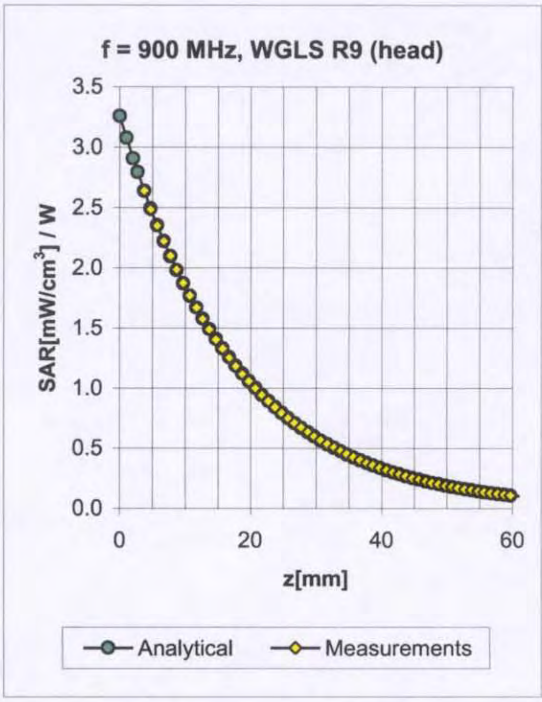
(Waveguide R22, f = 1800 MHz)

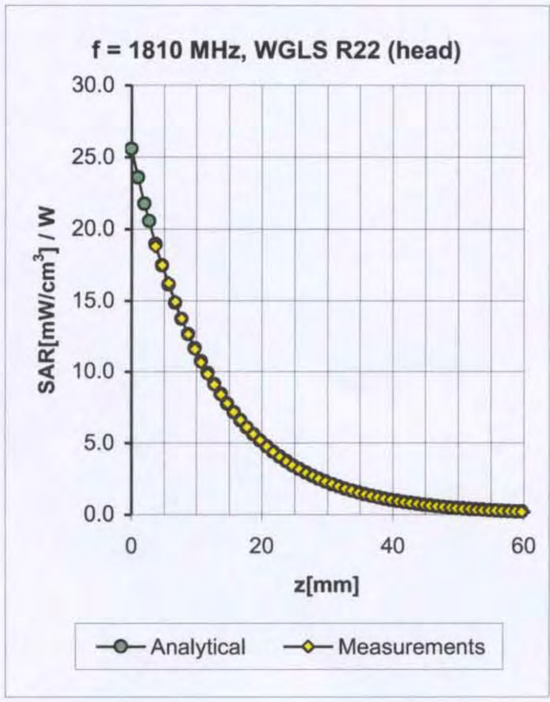




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



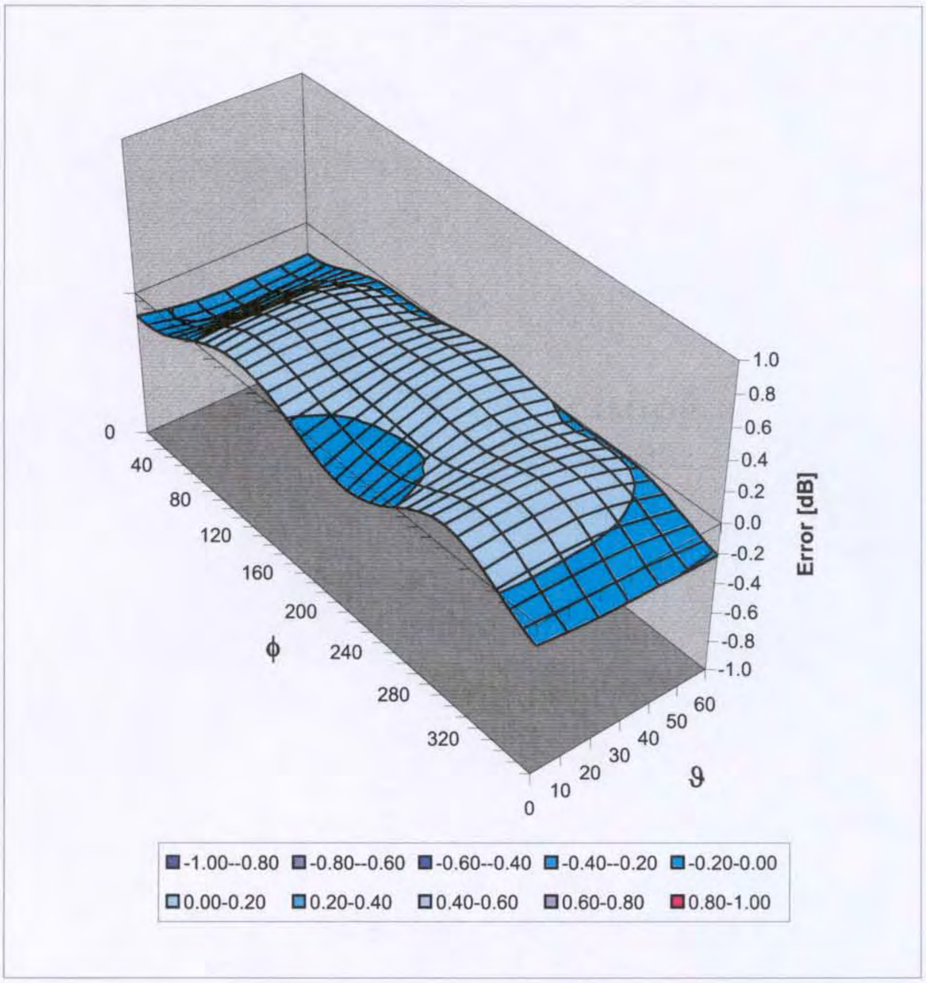


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.55	1.86	6.27	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	2.29	5.22	± 11.0% (k=2)

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Schmid & Partner Engineering AG

s p e a g

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

Dosimetric E-Field Probe ET3DV6 SN:1793

Conversion factor (± standard deviation)

450 MHz	ConvF	**7.6 ± 8%**	**ε_r = 43.5 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
450 MHz	ConvF	**7.5 ± 8%**	**ε_r = 56.7 ± 5%** **σ = 0.94 ± 5% mho/m** (body tissue)
900 MHz	ConvF	**6.3 ± 8%**	**ε_r = 55.0 ± 5%** **σ = 1.05 ± 5% mho/m** (body tissue)
1800 MHz	ConvF	**4.8 ± 8%**	**ε_r = 53.3 ± 5%** **σ = 1.52 ± 5% mho/m** (body tissue)

Appendix D – DIPOLE CALIBRATION CERTIFICATE

CALIBRATION CERTIFICATE

Object: 450MHz Validation Dipole; serial # 004

Calibration Procedure: Calibration procedure for a validation dipole

Calibration Date: December 9, 2004

Condition of the Calibrated Item: In Tolerance

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

All calibrations have been conducted in a closed laboratory facility: environment temperature (21 ± 3) ^{o}C and humidity < 70%

Calibration equipment used

Model Type	Serial Number	MET Asset #	Cal Date
Anritsu Power Meter ML2488A	6K00001832	1S2430	June 2005
Anritsu Power Sensor	030864	1S2432	June 2005
HP E4418B Power Meter	GB40205140	1S2276	June 2005
HP 8482A Power Sensor	2607A11286	1S2140	June 2005
83650B Signal Generator	3844A00910	1S2278	June 2005
HP 8722D Vector Network Analyzer	3S36140188	1S2272	March 2005

Calibrated by: Shawn McMillen (Name) Senior Engineer (Function) Signature

This calibration certificate shall not be reproduced except in full

Date of Issue: December 9, 2004

Calibration procedure for validation dipole

Calibration is performed according to the following standards:

a) IEEE Std 1528-2003, “IEEE Recommended Practice for Determining the Peak Spatial Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques”, December 2003
b) CENELEC EN 50361, “Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions”, Bulletin 65 Supplement C (Edition01-01).

Additional Documents

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All Figures stated in the certificate are valid at the frequency indicated.
- Antenna flatness: The antenna is checked for straightness using a straight edge place parallel to the dipole arms.
- Antenna Parameters with Tissue Simulating Liquid (TSL): The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Vector Network Analyzer: The network analyzer is calibrated as per the user’s manual.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. A Return Loss >20dB ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No Uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1W at the antenna connector. No Uncertainty required
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the SAR results.

Measurement Conditions

DASY system configuration

DASY Version	DASY4	V4.4
Extrapolation	Advanced Extrapolation	
Phantom	Planar Validation Phantom	1S2450
Dipole Spacer		
Distance Dipole Center-TSL	15.14mm ± 0.2mm	With spacer
Area Scan resolution	dx, dy = 10mm	
Zoom Scan resolution	dx, dy, dz = 5mm	
Frequency	450MHz ± 1MHz	

Head TSL Parameters

The following parameters and calculations were applied

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL Parameters	22.0 °C	43.5	0.87
Measured Head TSL Parameters		43.5 ±5%	0.87 ±5%
Head TSL Temperature during Test	20.8 °C	--	--

Measurement Uncertainty of Dipole Calibration

Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	c_i **1g**	**Standard Uncertainty ±% (1g)**
Anritsu Power Meter ML2488A	± 1.4	normal	2	1	± 0.7
Anritsu Power Sensor	± 1.4	normal	2	1	± 0.7
HP E4418B Power Meter	± 0.2	normal	2	1	± 0.1
HP 8482A Power Sensor	± 0.8	normal	2	1	± 0.4
83650B Signal Generator	± 2.0	normal	2	1	± 1.0
HP 8722D Vector Network Analyzer	± 2.0	normal	2	1	± 1.0
Combined Standard Uncertainty					± 3.9

SAR results with Head TSL and system uncertainty

SAR averaged over 1 cm^3 (1g) of Head TSL	Condition	
SAR Normalized	Normalized to 1 W	5.24 mW/g
SAR for nominal Head TSL Parameters	Normalized to 1W	5.24 ± 24.29% mW/g (k=2)

SAR averaged over 1 cm^3 (10g) of Head TSL	Condition	
SAR Normalized	Normalized to 1 W	3.51 mW/g
SAR for nominal Head TSL Parameters	Normalized to 1W	3.51 ± 23.51% mW/g (k=2)

450 MHz System Validation Dipole

Type:	450Mhz

Serial Number:	004

Place of Calibration:	**MET Laboratories, Inc.** 4855 Patrick Henry Dr. Bldg #6 Santa Clara, CA 95054USA

Date of Calibration:	December 9, 2004

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

:

Approved By:

Shawn McMillen
SAR Compliance Manager

1. Measurement Conditions

The DASY4 System with a dosimetric E-Field probe ET3DV6 (SN1793, Conversion factor 7.6 at 450 MHz) was used for the measurements.

The target dielectric parameters for the head simulating solution used for the calibration at 450MHz is:

Relative Dielectricity	43.5 ±5%
Conductivity	0.87 ±5%

The measurements were performed in an 82x40x22cm flat Plexiglas Phantom filled with head stimulant tissue.

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to solution surface. A loss-less dielectric spacer was used during measurements for accurate distance positioning.

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

2. SAR Measurement with DASY4 System

Standard SAR measurement were performed according to the measurement conditions described in section 1. The resulting average SAR values measured with the dosimetric probe ET3DV6 (SN1793) and applying advanced extrapolation are:

Averaged over $1cm^3$ (1g) of tissue:	5.24 mW/g
Averaged over $10cm^3$ (10g) of tissue:	3.51 mW/g

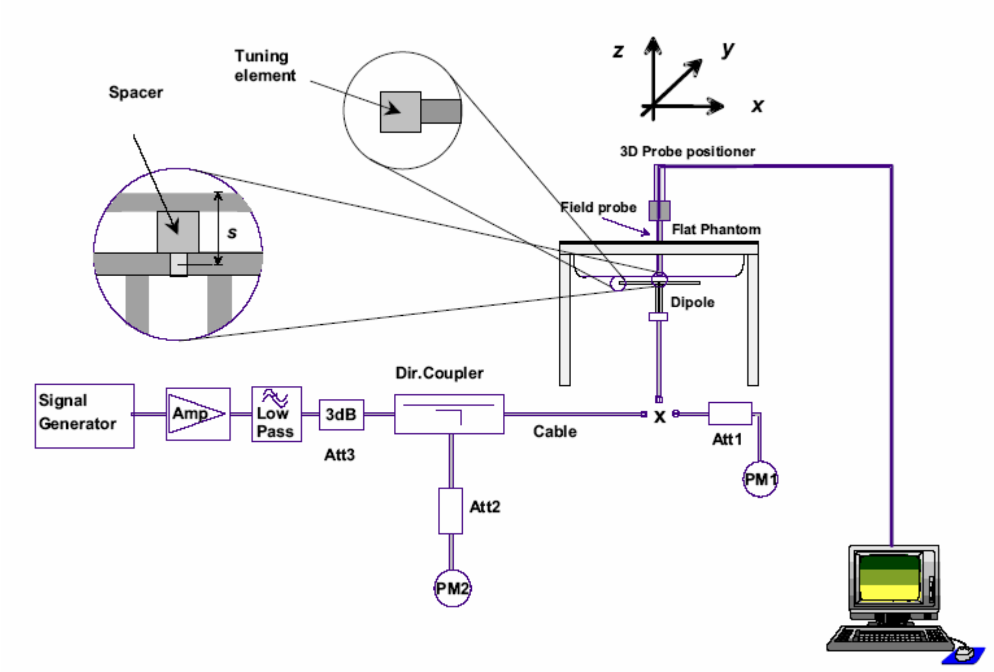
3. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 1 with the 15mm spacer. The impedance and return loss measurements are

Complex impedance at 450 MHz	Re{Z}= 58.014 Ω
	Im {Z}= 6.4277 Ω
Return Loss at 450 MHz	-20.467 dB

4. SAR Measurement

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



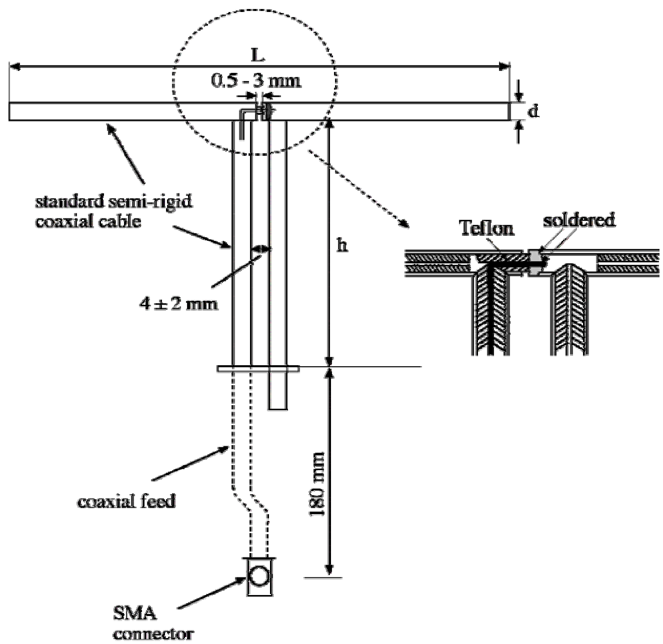
First the power meter PM1 (including attenuator Att1) is connected to the RF cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by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

4. Handling

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

5. Design

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



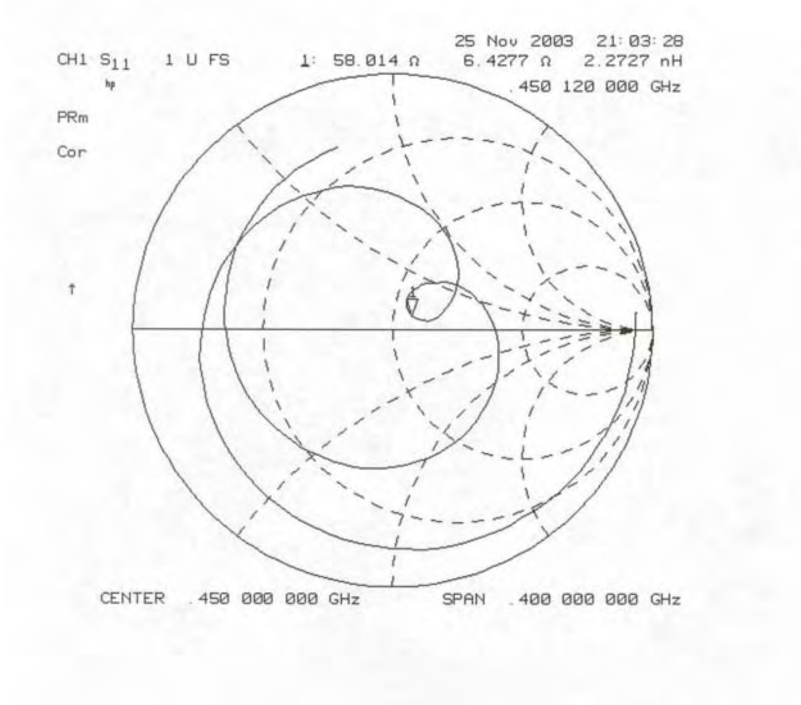
Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	396.0	250.0	6.35
450	270.0	166.7	6.35
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.4	3.6
3000	41.5	25.0	3.6

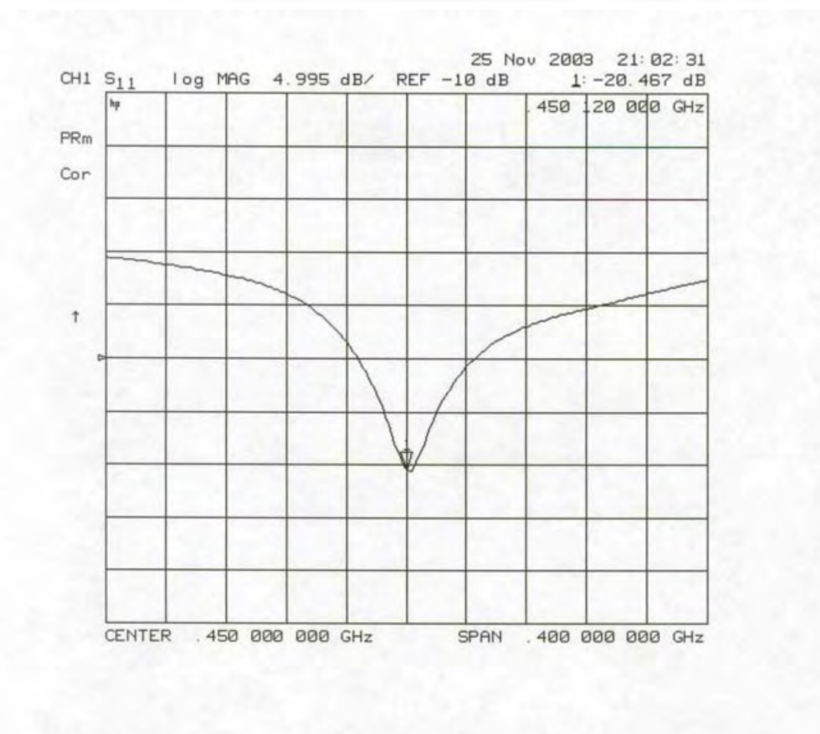
Validation Dipole Dimensions

6. Determination of Target SAR number

A total of 10 test runs were carried out. The fluid dielectric parameters were measured prior to each run. After each run the dipole was removed from the phantom surface, the forward dipole power reset and the dipole repositioned next to the phantom surface.

Test Run	Relative Dielectricity	Conductivity mho/m	SAR@250mW Over 1g	SAR@250mW Over 10g
Run #1	44.5	0.88	1.31	0.876
Run #2	43.7	0.89	1.33	0.877
Run #3	44.6	0.88	1.32	0.878
Run #4	44.6	0.86	1.29	0.876
Run #5	43.9	0.88	1.30	0.874
Run #6	44.5	0.87	1.32	0.877
Run #7	43.8	0.89	1.33	0.875
Run #8	44.9	0.88	1.32	0.880
Run #9	43.7	0.88	1.29	0.875
Run # 10	44.4	0.87	1.31	0.877
		Target Average	1.31	0.877


25 Nov 2003 21:03:28
CH1 S11 1 U FS 1: 58.014 Ω 6.4277 Ω 2.2727 nH
.450 120 000 GHz
PRm
Cor
CENTER .450 000 000 GHz SPAN .400 000 000 GHz


25 Nov 2003 21:02:31
CH1 S11 log MAG 4.995 dB/ REF -10 dB 1:-20.467 dB
.450 120 000 GHz
PRm
Cor
CENTER .450 000 000 GHz SPAN .400 000 000 GHz

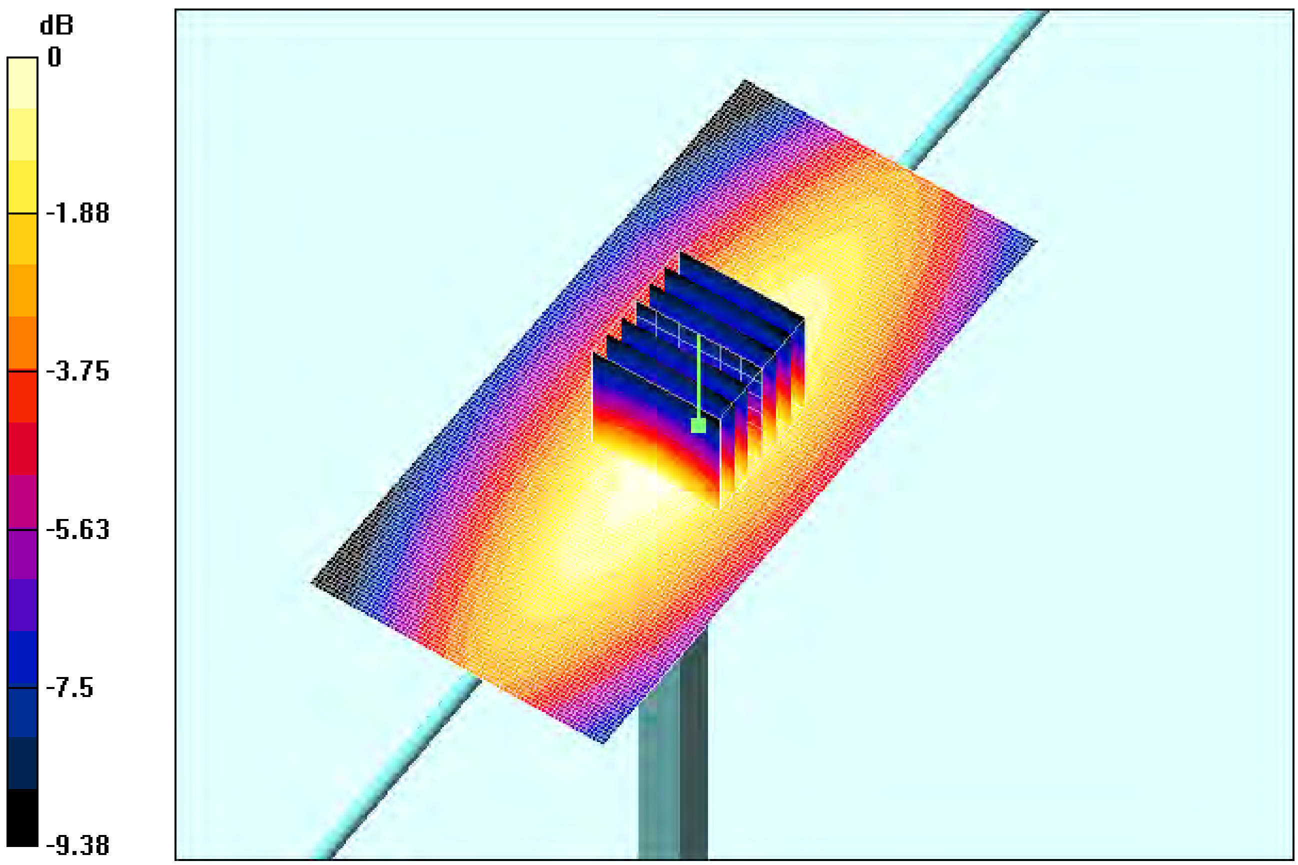
DUT: Dipole 450 MHz; Type: D450V2; Serial: D450V2 - SN:004

Communication System: CW; ; Frequency: 450 MHz;Duty Cycle: 1:1
Medium: 450MHz HSL Medium parameters used: f = 450 MHz; σ = 0.87 mho/m; ε_r = 44.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

- Probe: ET3DV6 - SN1793; ConvF(7.1, 7.1, 7.1); Calibrated: 9/15/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn584; Calibrated: 9/16/2003
- Phantom: Validation Phantom in front of RX90; Type: Plexiglas; Serial: 001
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Area Scan (151x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.4 mW/g

/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 40.1 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 2.01 W/kg
SAR(1 g) = 1.32 mW/g; SAR(10 g) = 0.877 mW/g
Maximum value of SAR (measured) = 1.41 mW/g



0 dB = 1.41mW/g

Appendix E – MEASURED FLUID DIELECTRIC PARAMETERS

450MHz Head

April 3, 2006 08:50 AM

Frequency	e'	e''
400.000000 MHz	45.7264	34.9102
402.000000 MHz	45.7466	34.3793
404.000000 MHz	46.1032	34.4624
406.000000 MHz	45.5726	34.1121
408.000000 MHz	45.5580	34.3216
410.000000 MHz	45.5940	34.1155
412.000000 MHz	45.3777	33.8479
414.000000 MHz	45.8240	34.2283
416.000000 MHz	45.5763	34.1479
418.000000 MHz	45.5197	34.2594
420.000000 MHz	45.6964	33.6782
422.000000 MHz	45.5259	33.4322
424.000000 MHz	45.0048	33.4589
426.000000 MHz	44.9626	33.5109
428.000000 MHz	45.2601	33.6081
430.000000 MHz	44.9808	33.3844
432.000000 MHz	45.0371	33.1886
434.000000 MHz	45.0193	33.1408
436.000000 MHz	44.7604	33.5152
438.000000 MHz	44.8698	33.0452
440.000000 MHz	44.6141	32.8077
442.000000 MHz	44.7112	32.7541
444.000000 MHz	44.8020	32.8432
446.000000 MHz	44.6712	32.9008
448.000000 MHz	44.6320	32.8780
450.000000 MHz	44.4256	32.5651
452.000000 MHz	44.5441	32.6489
454.000000 MHz	44.5013	32.4247
456.000000 MHz	44.3443	32.4050
458.000000 MHz	44.2878	32.2044
460.000000 MHz	44.0654	32.1055
462.000000 MHz	44.5059	32.0454
464.000000 MHz	44.0526	31.8592
466.000000 MHz	44.1791	31.8871
468.000000 MHz	43.7881	32.0534
470.000000 MHz	44.0584	31.6448
472.000000 MHz	43.9321	31.7680
474.000000 MHz	44.0751	32.0061
476.000000 MHz	44.1485	31.8282
478.000000 MHz	44.1607	31.3971
480.000000 MHz	43.9845	31.7305
482.000000 MHz	43.8529	31.5374
484.000000 MHz	43.6107	31.3038
486.000000 MHz	43.8643	31.0667
488.000000 MHz	43.5571	31.5147

450MHz Body

April 3, 2006 08:56 AM

Frequency	e'	e''
400.000000 MHz	58.3303	38.4142
402.000000 MHz	58.2840	38.3508
404.000000 MHz	58.2492	38.2334
406.000000 MHz	58.2111	38.0969
408.000000 MHz	58.1867	38.0317
410.000000 MHz	58.1166	37.9965
412.000000 MHz	58.0833	37.9340
414.000000 MHz	58.0477	37.7495
416.000000 MHz	57.9646	37.6370
418.000000 MHz	57.9685	37.5495
420.000000 MHz	57.8440	37.4268
422.000000 MHz	57.8297	37.2437
424.000000 MHz	57.7690	37.1314
426.000000 MHz	57.7471	37.0625
428.000000 MHz	57.6836	36.9825
430.000000 MHz	57.6591	36.8460
432.000000 MHz	57.6006	36.7371
434.000000 MHz	57.5617	36.6252
436.000000 MHz	57.4856	36.6197
438.000000 MHz	57.4777	36.4642
440.000000 MHz	57.4085	36.3417
442.000000 MHz	57.3883	36.2683
444.000000 MHz	57.3575	36.2362
446.000000 MHz	57.3269	36.1564
448.000000 MHz	57.3281	36.0898
450.000000 MHz	57.2824	36.1190
452.000000 MHz	57.2619	35.9911
454.000000 MHz	57.2423	35.9584
456.000000 MHz	57.1976	35.8936
458.000000 MHz	57.1533	35.8293
460.000000 MHz	57.0731	35.6797
462.000000 MHz	57.0674	35.7946
464.000000 MHz	57.0453	35.6528
466.000000 MHz	57.0030	35.5901
468.000000 MHz	56.9538	35.4926
470.000000 MHz	56.9066	35.2308
472.000000 MHz	56.8906	35.2014
474.000000 MHz	56.8563	35.0853
476.000000 MHz	56.7803	34.9429
478.000000 MHz	56.7839	34.8747
480.000000 MHz	56.7133	34.7960
482.000000 MHz	56.7281	34.6547
484.000000 MHz	56.7218	34.5813
486.000000 MHz	56.7307	34.4962
488.000000 MHz	56.6759	34.4433