Supplemental SAR Test Report

On

Dual-band CDMA 800/1900 PCMCIA Card

FCC Part 22 & 24 Certification	
FCC ID:	**OVFKWC-KPC650**
Model:	**KPC 650**
Date:	**September 28, 2004**

STATEMENT OF COMPLIANCE

Kyocera Wireless Corp declares under its sole responsibility that the product, FCC ID: OVFKWC-KPC650 to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices.

Any deviations from these standards, guidelines and recommended practices are noted: NONE.

Date of Test:	September 28, 2004
Test performed by:	Kyocera Wireless Corp 10300 Campus Point Drive CA 92121
Report Prepared by:	Fernando Calimbahin, Engineer
Report Reviewed by:	C. K. Li, Engineer, Senior Staff/Manager

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1 HOST DEVICES

The SAR evaluation was performed on the following hosts:

Host #	Description	Manufacturer	Model	Overall Dimension
4	Laptop Computer	Dell	Latitude D600	32cm x 26cm x 3.5cm

2 MAXIMUM RESULTS FOUND DURING SAR EVALUATION

The equipment is deemed to fulfil the requirements if the measured values are less than or equal to the limit (1.6 mW/g). The Dell Latitude D600 maximum SAR results are below the maximum values listed in the original SAR report.

Configuration	Mode	Ch/f(MHz)	Conducted Power (dBm)	Measured (mW/g)	Result
1. Dell Latitude	CDMA-800	383 / 836.49	25.15	0.59	**PASSED**
D600	CDMA-1900	600 / 1880	23.58	0.13	**PASSED**

3 DESCRIPTION OF THE TEST EQUIPMENT

3.1 Dosimetric System

The measurements were performed with an automated near-field scanning system, DASY4, manufactured by Schmid & Partner Engineering AG (SPEAG) of Zurich, Switzerland. The system is comprised of high precision robot, robot controller, computer, near-field probe, probe alignment sensor and the SAM phantom containing brain or muscle equivalent material. The overall RSS uncertainty of the measurement system is ±12.23% with an expanded uncertainty of ±24.47% (K=2). The measurement uncertainty budget is given in section 6. Below is a list of the calibrated equipment used for the measurements:

Test Equipment	Serial Number	Cal. Due Date
DASY4 DAE3 V1	493	11-25-04
E-field Probe ET3DV6	1618	10-10-05
Dipole Validation kit, D835V2	454	04-20-06
Dipole Validation kit, D1900V2	5d003	04-15-06

The calibration records of E-field probe are in Appendix C.

3.2 Additional equipment needed in validation

Test Equipment	Serial Number	Cal. Due Date
Signal Generator, HP E4421B	US38440337	04-08-05
Power meter, Giga-tronics 8541C	1832573	10-14-04
Power Sensor, Giga-tronics 80601A	1831178	01-23-05
Vector Network Analyzer, Agilent 8752C	3410A03621	06-08-05
Dielectric Probe Kit, HP 85070B	3033A03145	Calibration not required
Thermometer, Digi-sense	186700	02-23-05

4 SYSTEM VALIDATION

The probes are calibrated annually by the manufacturer. Dielectric parameters of the stimulating liquids are measured with an automated Hewlett Packard 85070B dielectric probe in conjunction with an Agilent 8753C-network analyser.

The SAR measurements of the device were done within 24 hours of system accuracy verification, which was done using the dipole validation kit. Power level of 20dBm was supplied to a dipole antenna placed under the flat section of SAM phantom. The validation results are in the table below and printouts of the validation test are attached in Appendix A. All the measured parameters were within the specification.

Note since the validation reference in muscle liquid is not available, the system validation with head tissues was done for the device testing in muscle. Based on OET 65 Supplement C EAB Part 22/24 SAR review Reminder Sheet 01/2002, this is a valid test.

Tissue	Freq. (MHz)	Description	Validation SAR (mW/g), 1g	Dielectric Parameters		Temp. (°C)	Test date	Comments
				ε_r	σ (S/m)			Validation testing -
Head	835	Measured	1.00	**41.8**	**0.93**	22±1	9-28-04	for device testing in muscle
		SPEAG Reference	1.02	42.8	.94	--	4-20-04	
		FCC Reference*	--	41.5	0.90	20-26	--	
	1900	Measured	4.03	**40.7**	**1.36**	22±1	9-28-04	for device testing in muscle
		SPEAG Reference	3.93	40.1	1.45	--	4-15-04	
		FCC Reference*	--	40.0	1.40	20-26	--	
Muscle	835	Measured	--	**56.3**	**0.94**	22±1	9-28-04	for device testing in muscle
		FCC Reference*	--	55.2	0.97	--	--	
	1900	Measured	--	**53.3**	**1.47**	22±1	9-28-04	for device testing in muscle
		FCC Reference*	--	53.3	1.52	20-26	--	

FCC reference values are adopted from OET Bulletin 65 (97-01) Supplement C (01-01).

5 TEST DATA

5.1 BODY SAR Test Results

The following tables list the SAR results in each configuration and operating mode. The channels tested for each configuration have similar SAR distributions. SAR plots for each configuration is provided in Appendix B.

CDMA 800 BODY	**Channel:**	1013	383	777
	Frequency (MHz):	824.70	836.49	848.31
	Power before Test (dBm):	25.06	25.15	25.01
	Power after Test (dBm):	24.90	25.17	24.95
Configuration		**SAR, 1g (W/kg)**		
1. Dell Latitude D600 with battery and cord		--	0.59	--

Note: -- SAR measured at the middle channel is at least 3dB lower than the SAR limit, testing at the low and high channels are optional for this test configuration.

CDMA 1900 BODY	**Channel:**	25	600	1175
	Frequency (MHz):	1851.25	1880	1908.75
	Power before Test (dBm):	23.56	23.58	23.47
	Power after Test (dBm):	--	23.40	--
Configuration		**SAR, 1g (W/kg)**		
1. Dell Latitude D600 with battery and cord		--	0.13	**--**

Note: -- SAR measured at the middle channel is at least 3dB lower than the SAR limit, testing at the low and high channels are optional for this test configuration.

6 TEST SETUP PHOTOS

Figure 10.2 Dell Latitude D600

Appendix A: Validation test printout

Date/Time: 09/28/04 09:54:04

Test Laboratory: Kyocera

835Mhz Validation Probe 1618, DAE 493, Dipole 454, 09-28-04

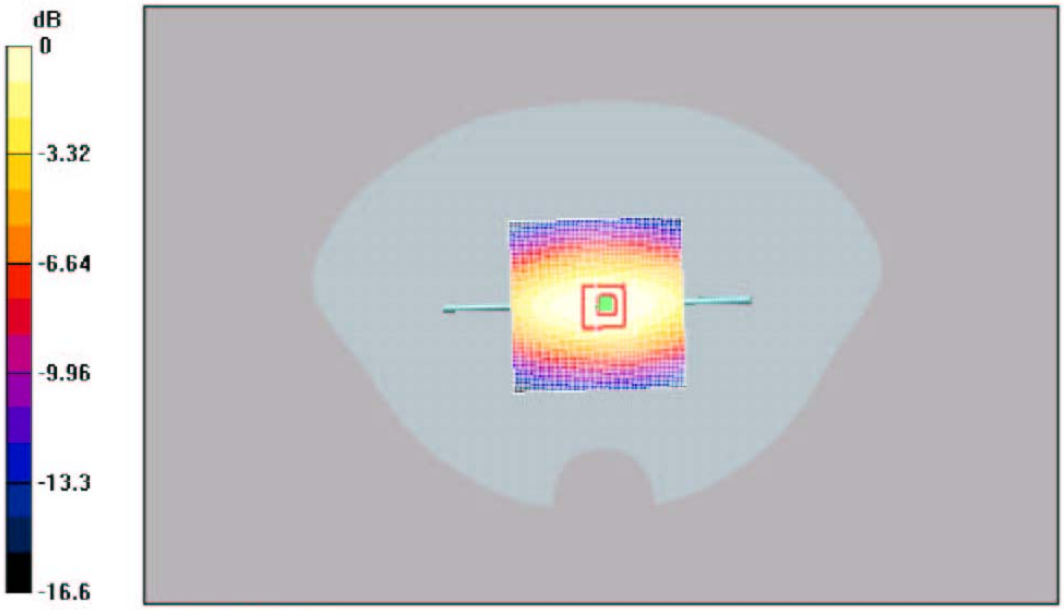
Communication System: CW, Frequency: 835 MHz, Duty Cycle: 1:1
Medium: HSL900, Medium parameters used: f = 835 MHz, σ = 0.926 mho/m; ε_r = 41.8; ρ = 1000 kg/m^3
Phantom: SAM 12, Phantom section: Flat Section

DASY4 Configuration:
Probe: ET3DV6 - SN1618, ConvF(6.9, 6.9, 6.9), Calibrated: 10/10/2003
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection),
Electronics: DAE3 Sn493, Calibrated: 11/25/2003
Measurement SW: DASY4, V4.2 Build 44
Postprocessing SW: SEMCAD, V1.8 Build 112

Temperature:
Room T = 21.8 +/- 1 deg C, Liquid T = 22.0 +/- 1 deg C

835MHz validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 35.7 V/m; Power Drift = -0.009 dB
Maximum value of SAR (measured) = 1.09 mW/g
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 1 mW/g; SAR(10 g) = 0.658 mW/g



0 dB = 1.09mW/g

Date/Time: 09/28/04 13:31:52

Test Laboratory: Kyocera

1900Mhz Validation Probe 1618, DAE 493, Dipole 5d003, 09-28-04

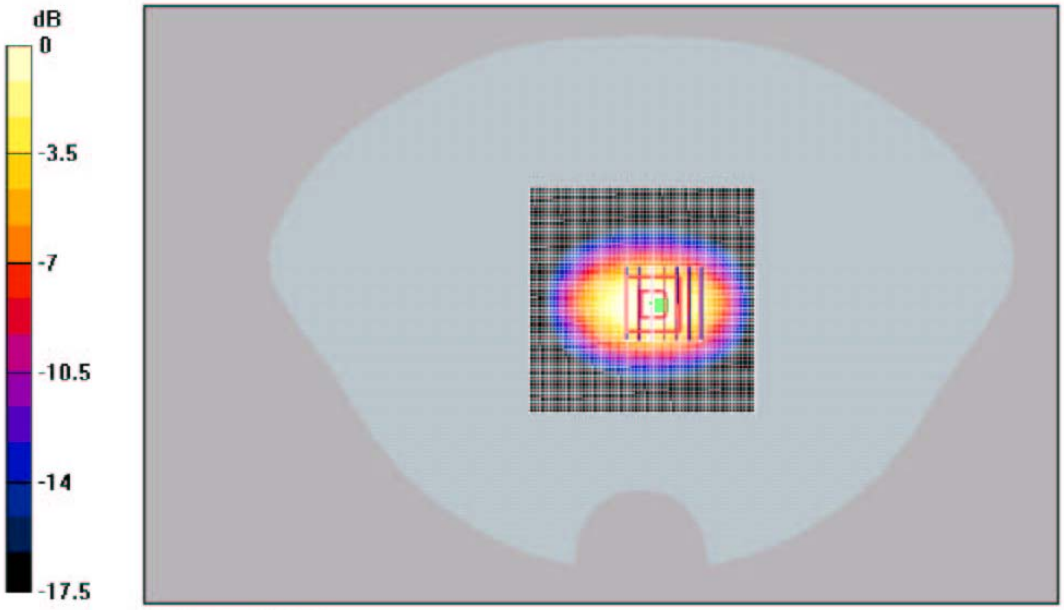
Communication System: CW, Frequency: 1900 MHz, Duty Cycle: 1:1
Medium: HSL1800, Medium parameters used (interpolated): f = 1900 MHz, σ = 1.36 mho/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom: SAM 12, Phantom section: Flat Section

DASY4 Configuration:
Probe: ET3DV6 - SN1618, ConvF(5.3, 5.3, 5.3), Calibrated: 10/10/2003
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection),
Electronics: DAE3 Sn493, Calibrated: 11/25/2003
Measurement SW: DASY4, V4.2 Build 44
Postprocessing SW: SEMCAD, V1.8 Build 112

Temperature:
Room T = 21.8 +/- 1 deg C, Liquid T = 22.0 +/- 1 deg C

1900MHz Validation @20dBm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.2 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 4.52 mW/g
Peak SAR (extrapolated) = 6.83 W/kg
SAR(1 g) = 4.03 mW/g; SAR(10 g) = 2.16 mW/g



0 dB = 4.52mW/g

Appendix B: SAR distribution printout

Date/Time: 09/28/04 18:02:54

Test Laboratory: Kyocera

KPC650 #2FZJ, CDMA-800 FLAT #2 position with DELL Latitude D600 and Power Cord, Ch383

Communication System: CDMA-800, Frequency: 836.49 MHz, Duty Cycle: 1:1

Medium: M900,Medium parameters used (interpolated): f = 836.49 MHz; σ = 0.941 mho/m; ϵ_r = 56.3; ρ = 1000 kg/m^3

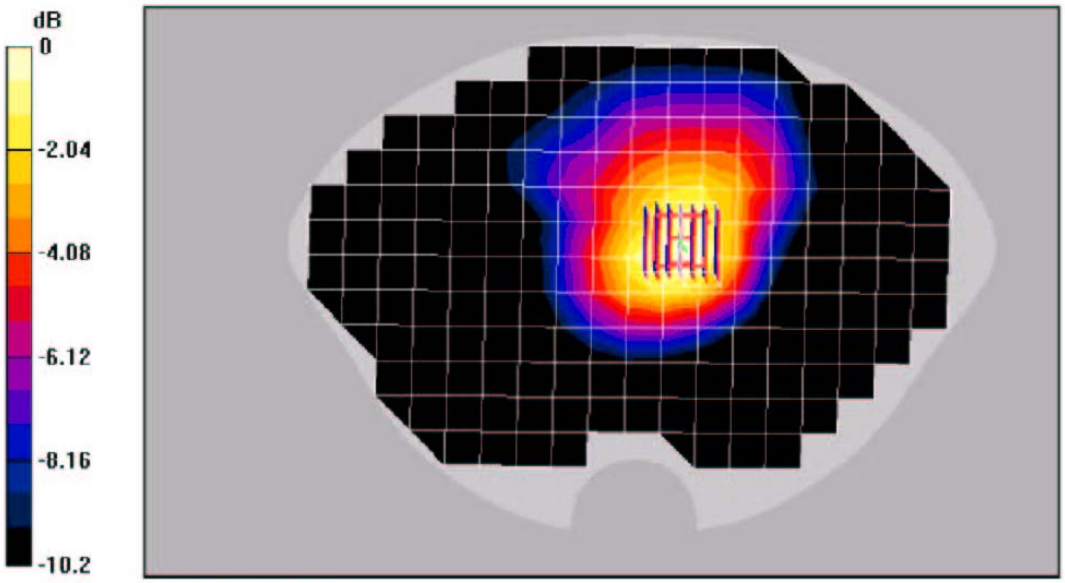
Phantom: SAM 12,Phantom section: Flat Section

DASY4 Configuration:
Probe: ET3DV6 - SN1618, ConvF(6.6, 6.6, 6.6), Calibrated: 10/10/2003
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection),
Electronics: DAE3 Sn493,Calibrated: 11/25/2003
Measurement SW: DASY4, V4.2 Build 44
Postprocessing SW: SEMCAD, V1.8 Build 112

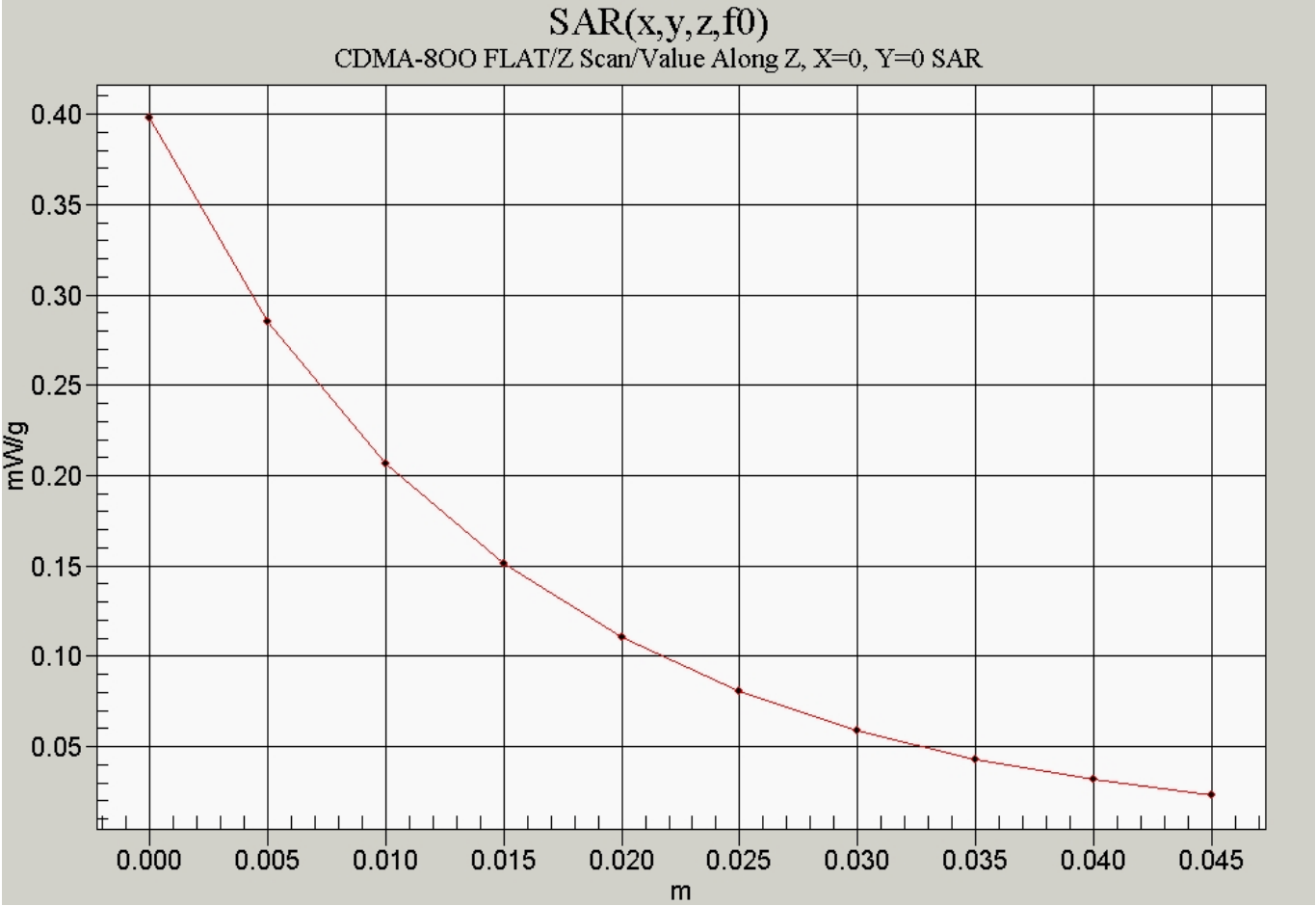
Temperature:
Room T = 21.8 +/- 1 deg C, Liquid T = 22.0 +/- 1 deg C

CDMA-8OO Ch383/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.7 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.636 mW/g
Peak SAR (extrapolated) = 0.793 W/kg
SAR(1 g) = 0.594 mW/g; SAR(10 g) = 0.414 mW/g



0 dB = 0.636mW/g


SAR(x,y,z,f0)
CDMA-8OO FLAT/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.040
0.045
m

Date/Time: 09/28/04 15:06:17

Test Laboratory: Kyocera

KPC650 #2FZJ, PCS FLAT #2 position with Dell D600 and Power Cord, Ch 600

Communication System: PCS-1900, Frequency: 1880 MHz, Duty Cycle: 1:1
Medium: M1800,Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ϵ_r = 53.3; ρ = 1000 kg/m^3
Phantom: SAM 12,Phantom section: Flat Section

DASY4 Configuration:
Probe: ET3DV6 - SN1618, ConvF(4.9, 4.9, 4.9), Calibrated: 10/10/2003
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection),
Electronics: DAE3 Sn493,Calibrated: 11/25/2003
Measurement SW: DASY4, V4.2 Build 44
Postprocessing SW: SEMCAD, V1.8 Build 112

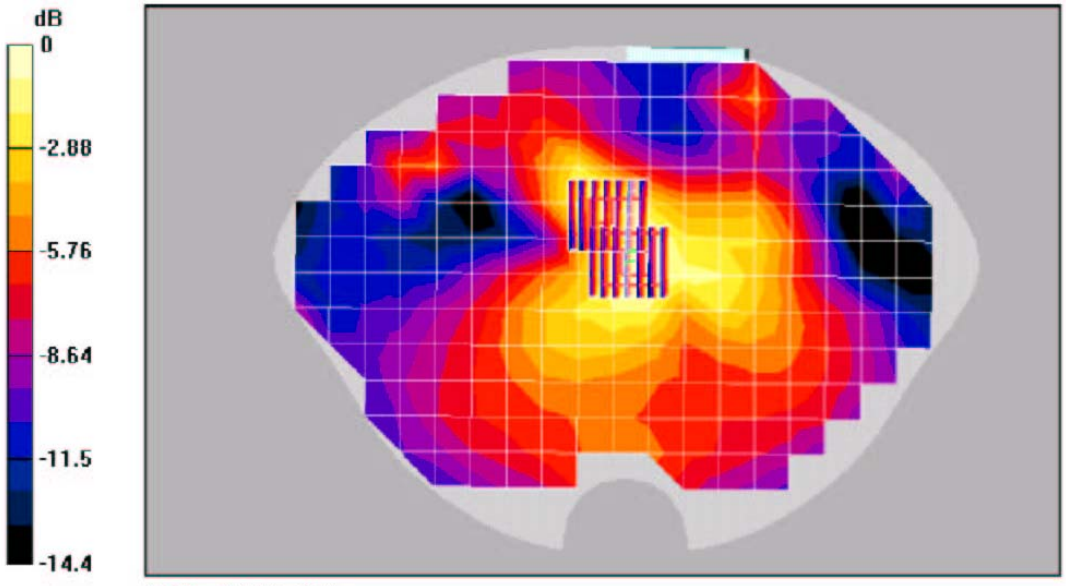
Temperature:
Room T = 21.8 +/- 1 deg C, Liquid T = 22.0 +/- 1 deg C

PCS ch600/Zoom Scan (7x7x7)/Cube 0:

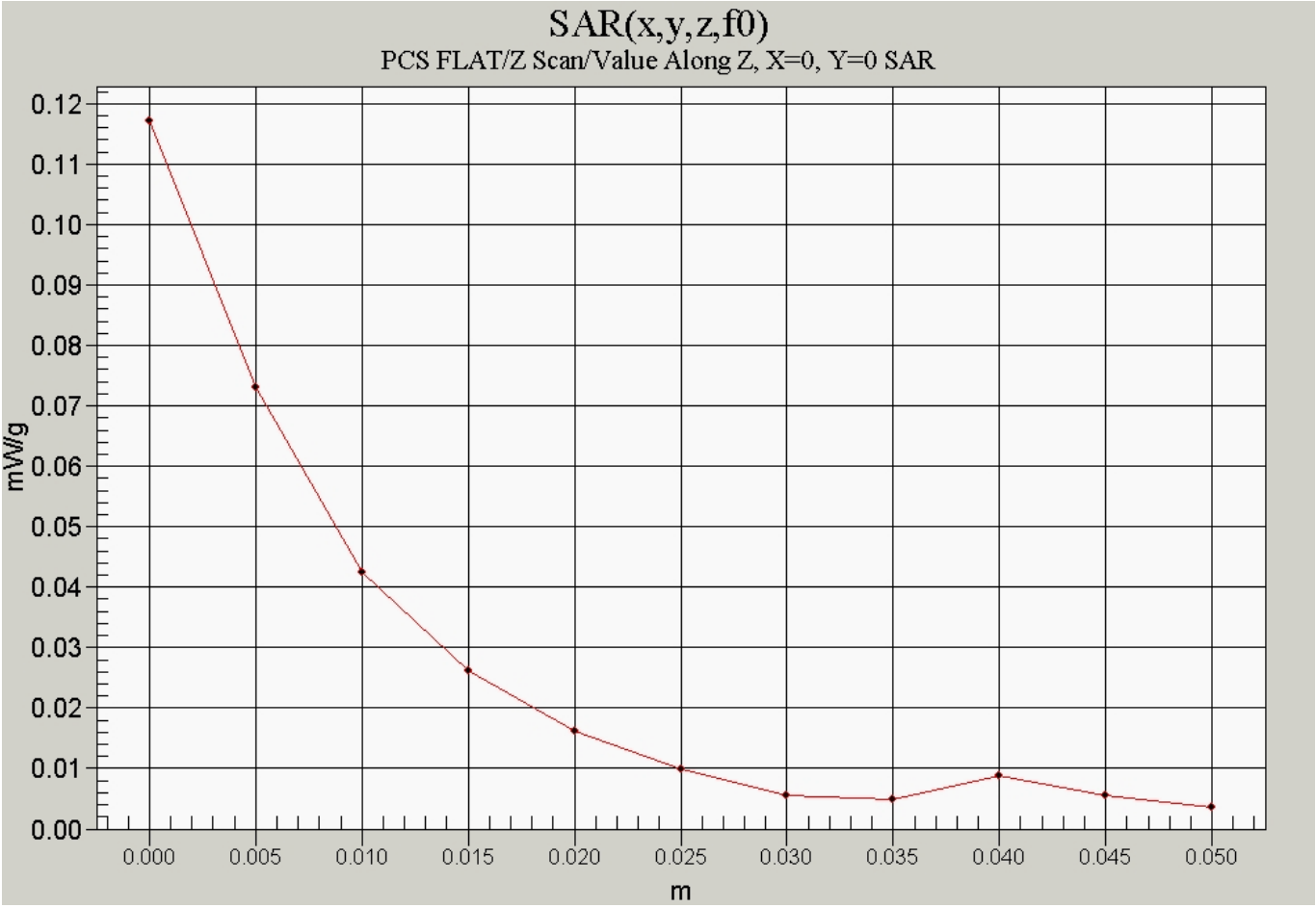
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.21 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.148 mW/g
Peak SAR (extrapolated) = 0.218 W/kg
SAR(1 g) = 0.134 mW/g; SAR(10 g) = 0.082 mW/g

PCS ch600/Zoom Scan (7x7x7)/Cube 1:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.21 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.135 mW/g
Peak SAR (extrapolated) = 0.192 W/kg
SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.075 mW/g



0 dB = 0.135mW/g


SAR(x,y,z,f0)
PCS FLAT/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.040
0.045
0.050
m

Appendix C: probe calibration parameters

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

Probe ET3DV6

SN:1618

Manufactured:	January 25, 2002
Last calibration:	March 24, 2003
Repaired:	September 26, 2003
Recalibrated:	October 10, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1618

Sensitivity in Free Space

Diode Compression

NormX	**1.59** $\mu V/(V/m)^2$	DCP X	**95**	mV
NormY	**1.77** $\mu V/(V/m)^2$	DCP Y	**95**	mV
NormZ	**1.85** $\mu V/(V/m)^2$	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	**6.9** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.9** ± 9.5% (k=2)	Alpha	**0.25**
ConvF Z	**6.9** ± 9.5% (k=2)	Depth	**3.72**

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	**2.81**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.1	7.0
SAR_{be} [%]	With Correction Algorithm	0.7	0.7

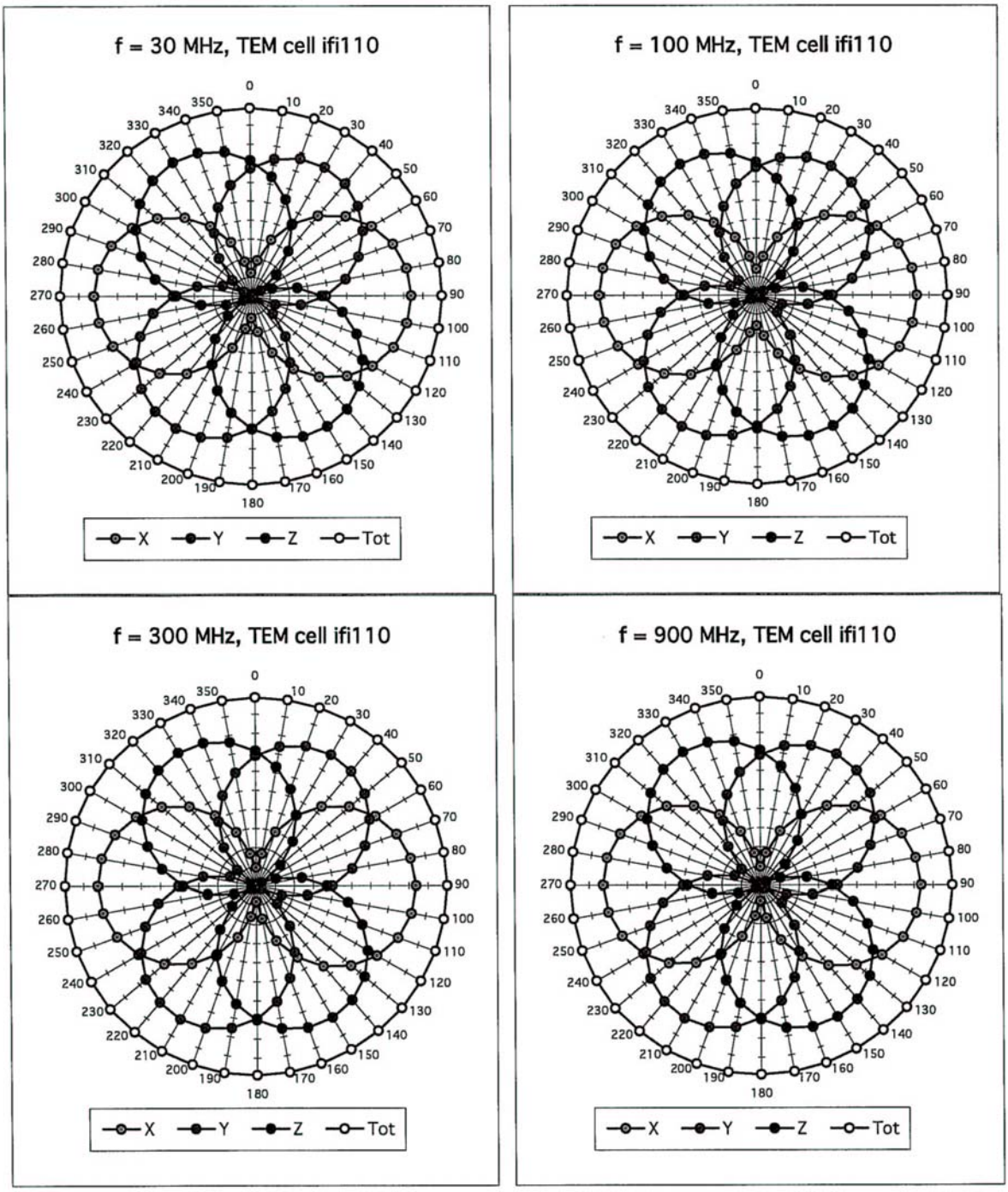
Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	13.3	9.3
SAR_{be} [%]	With Correction Algorithm	0.2	0.2

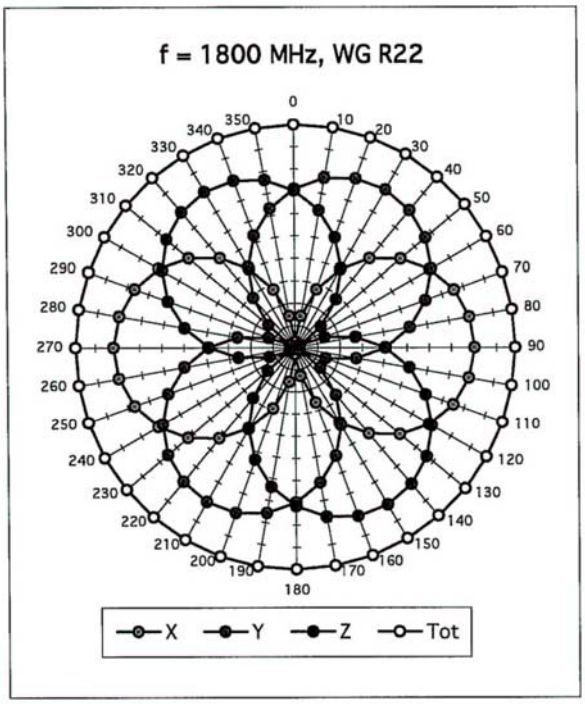
Sensor Offset

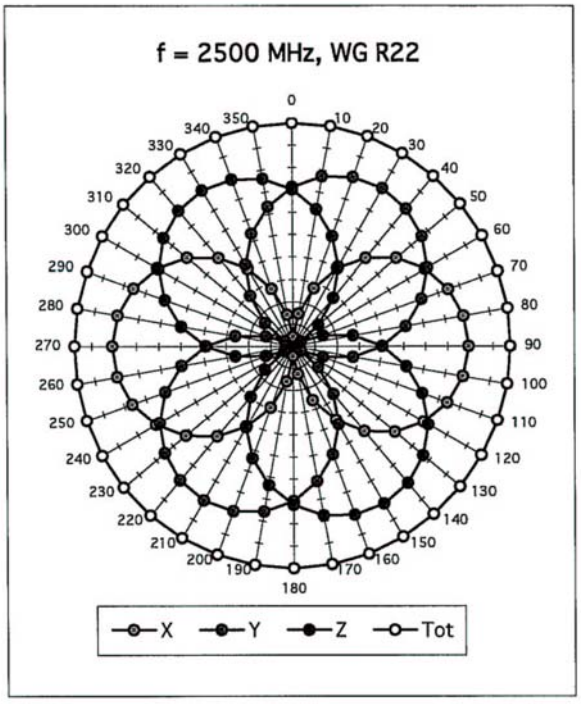
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.6 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

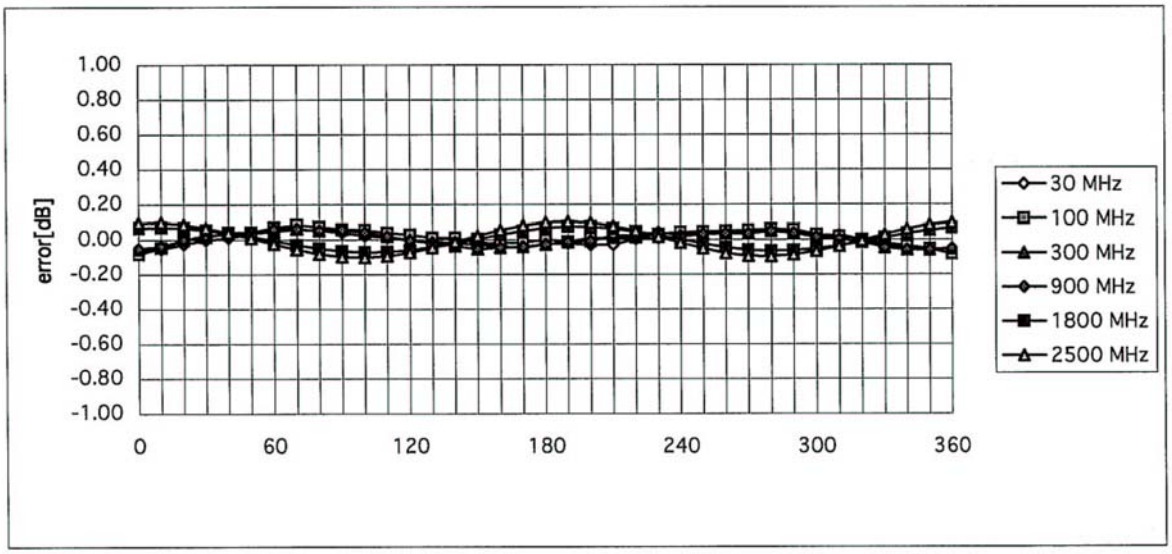


ET3DV6 SN:1618 **October 10, 2003**



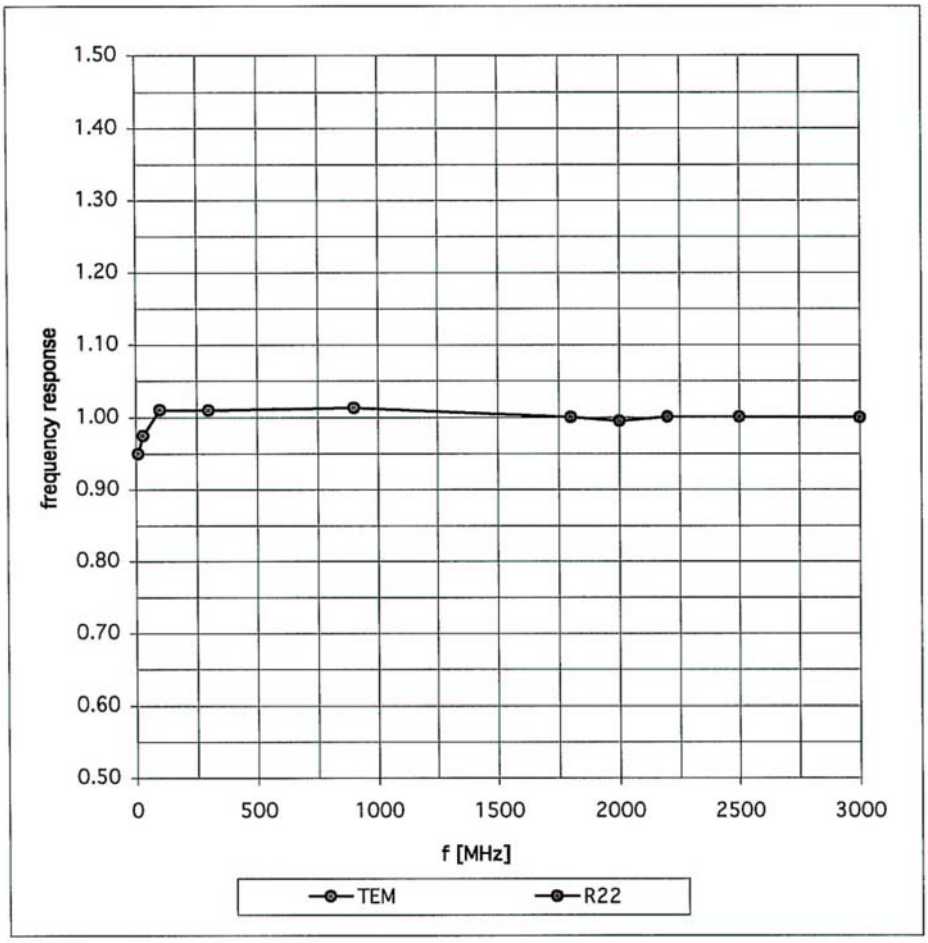


Isotropy Error (ϕ), θ = 0°



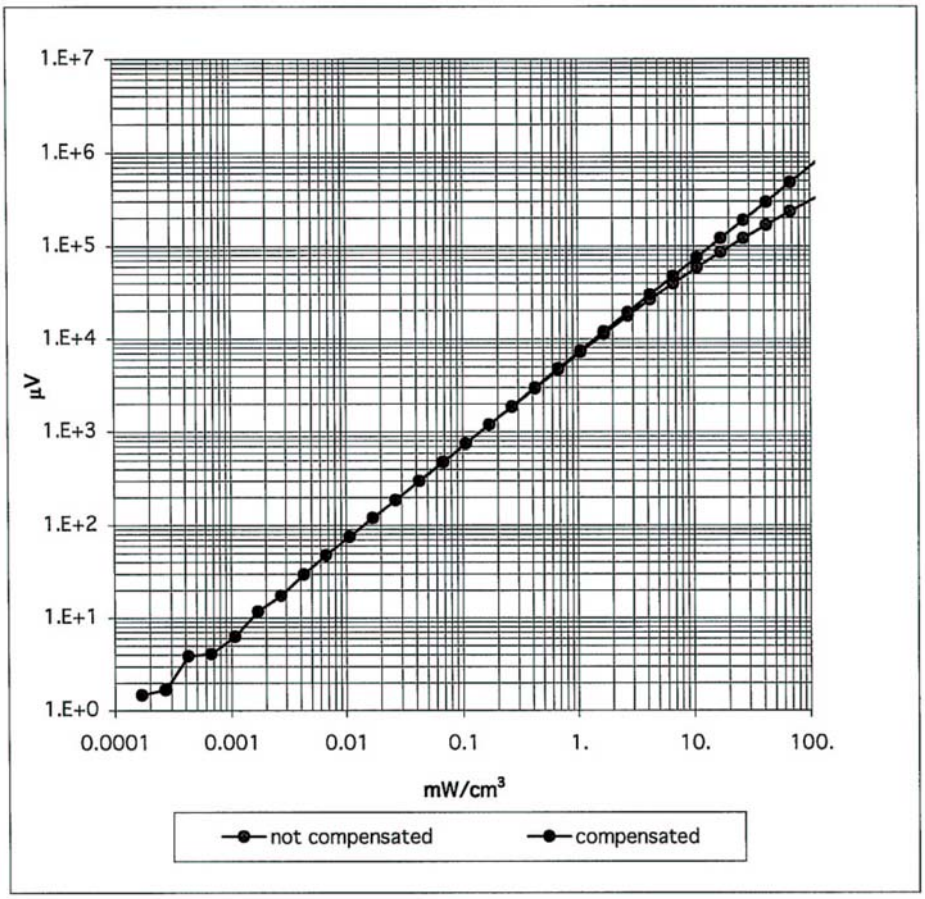
Frequency Response of E-Field

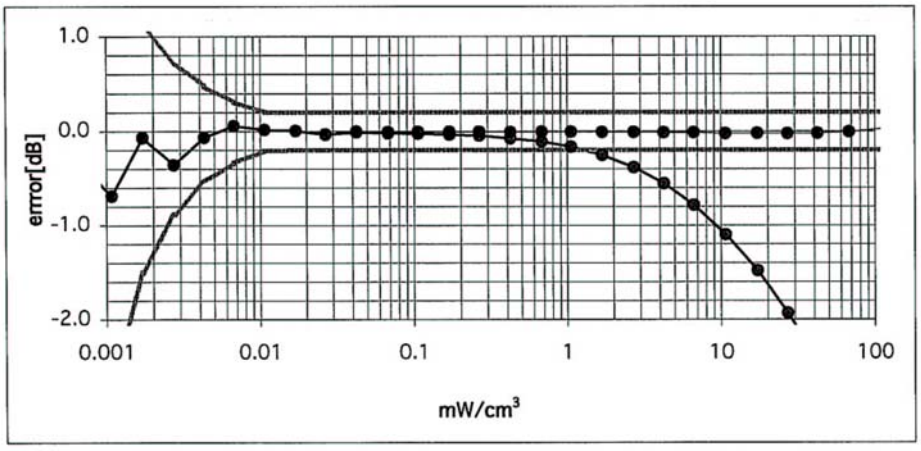
(TEM-Cell:ifi110, Waveguide R22)



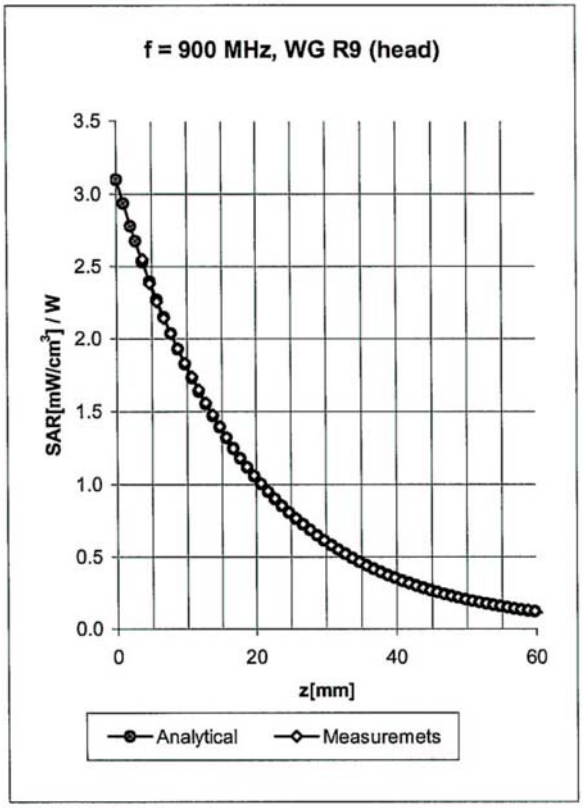
Dynamic Range f(SARhead)

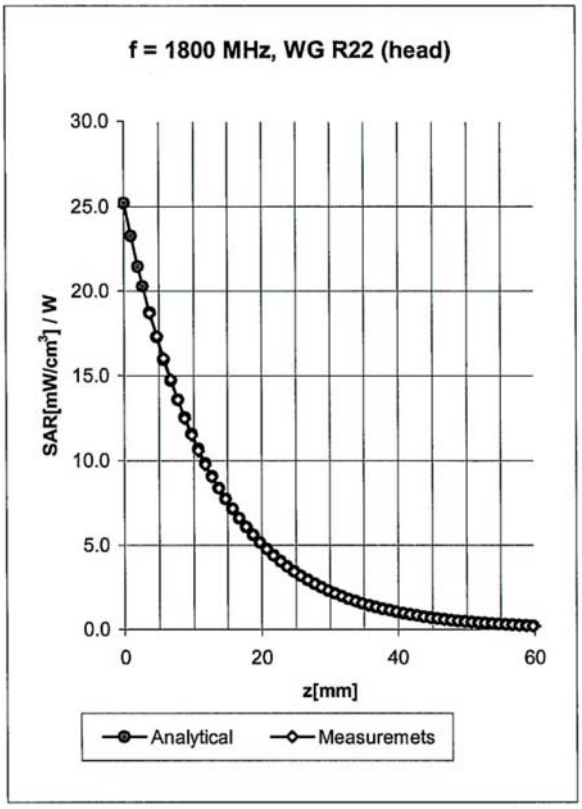
(Waveguide R22)





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

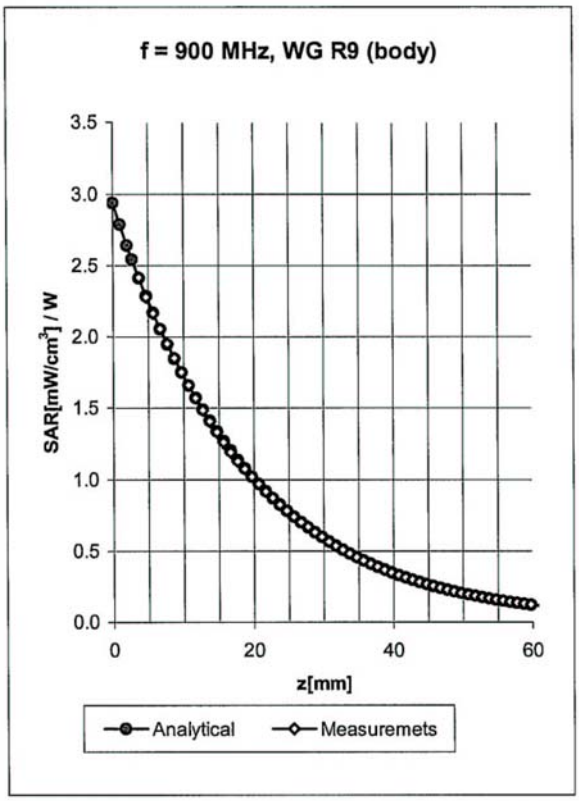
ConvF X	6.9 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.9 ± 9.5% (k=2)	Alpha	**0.25**
ConvF Z	6.9 ± 9.5% (k=2)	Depth	**3.72**

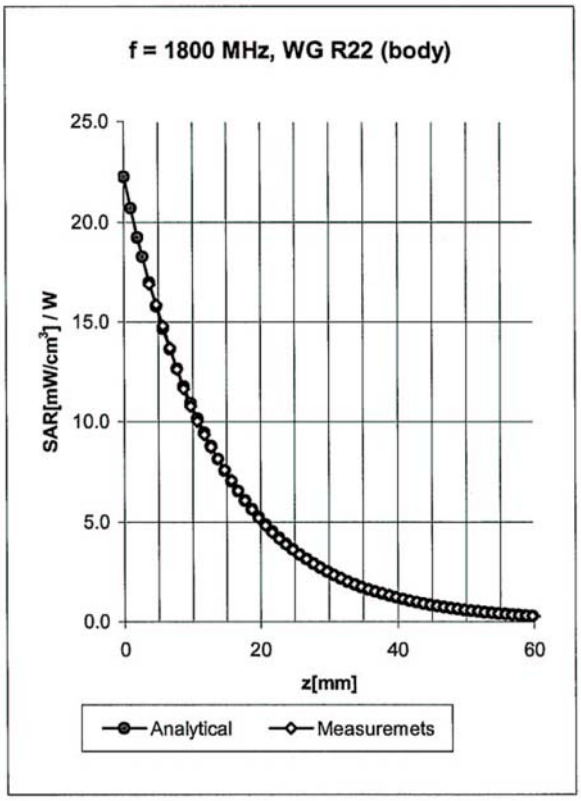
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

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	**2.81**

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	**0.38**
ConvF Z	6.6 ± 9.5% (k=2)	Depth	**2.52**

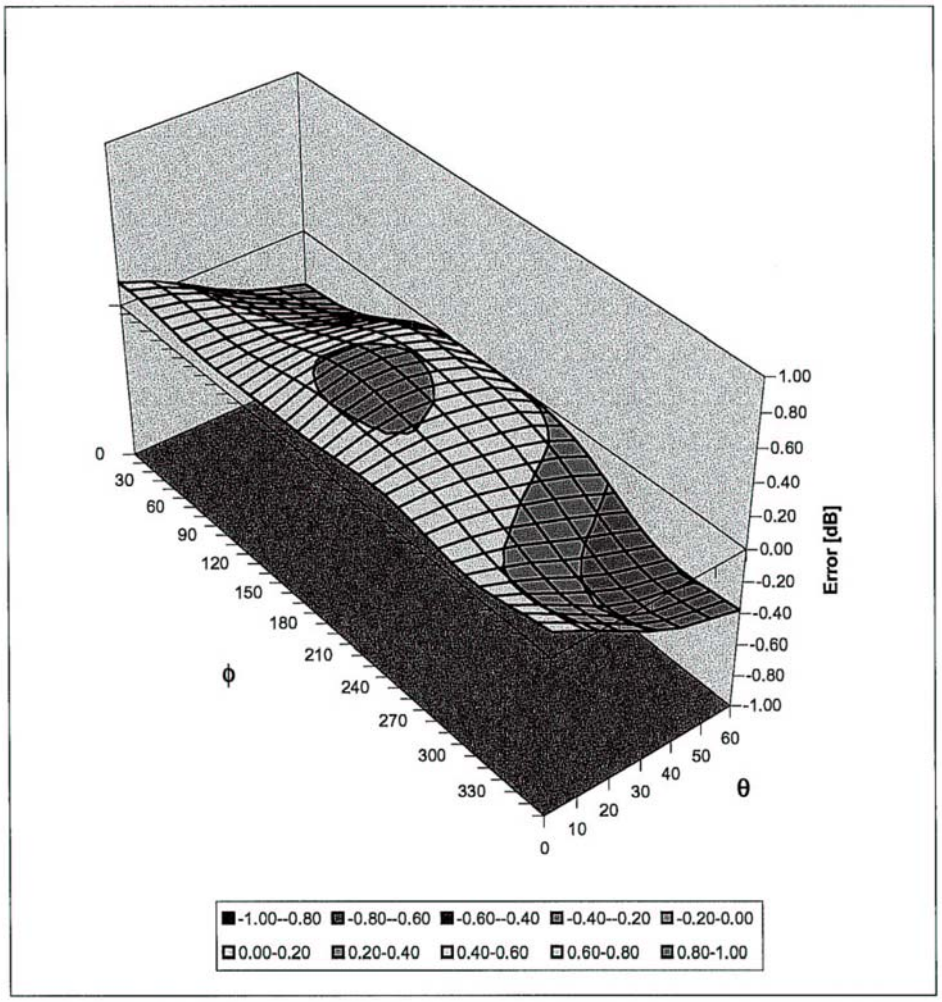
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

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

ConvF X	4.9 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	4.9 ± 9.5% (k=2)	Alpha	**0.52**
ConvF Z	4.9 ± 9.5% (k=2)	Depth	**2.76**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Appendix D: dipole calibration parameters

Schmid & Partner Engineering AG

s p e a g

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

DASY

Dipole Validation Kit

Type: D835V2

Serial: 454

Manufactured: January 31, 2002
Calibrated: April 20, 2004

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 835 MHz:

Relative Dielectricity	**42.8**	± 5%
Conductivity	**0.94 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.3 at 835 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: **10.2 mW/g** ± 16.8 % (k=2)[1]

averaged over 10 cm^3 (10 g) of tissue: **6.64 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:	**1.378 ns**	(one direction)
Transmission factor:	**0.988**	(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 835 MHz:	Re{Z} = **50.9 Ω**
	Im {Z} = **-2.2 Ω**
Return Loss at 835 MHz	**-32.3 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 835 MHz:

Relative Dielectricity	**55.5**	± 5%
Conductivity	**0.99 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.13 at 835 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.

5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. 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:	**10.1 mW/g** ± 16.8 % (k=2)[2]
averaged over 10 cm^3 (10 g) of tissue:	**6.64 mW/g** ± 16.2 % (k=2)[2]

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 835 MHz:	Re{Z} = **47.2 Ω**
	Im {Z} = **-1.1 Ω**
Return Loss at 835 MHz	**-29.6 dB**

7. 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.

8. 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.

9. Power Test

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

[2] validation uncertainty

Date/Time: 04/20/04 12:55:03

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN454

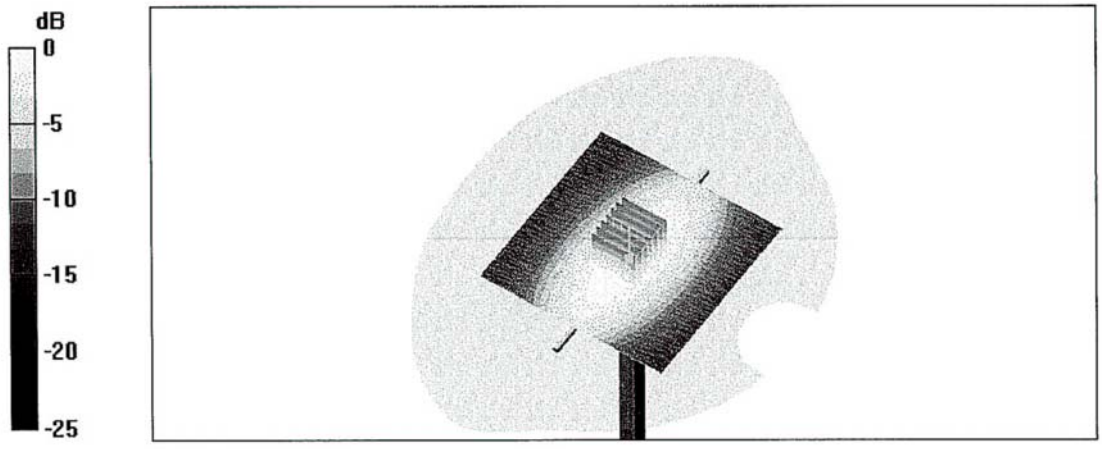
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 MHz;
Medium parameters used: f = 835 MHz; σ = 0.94 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

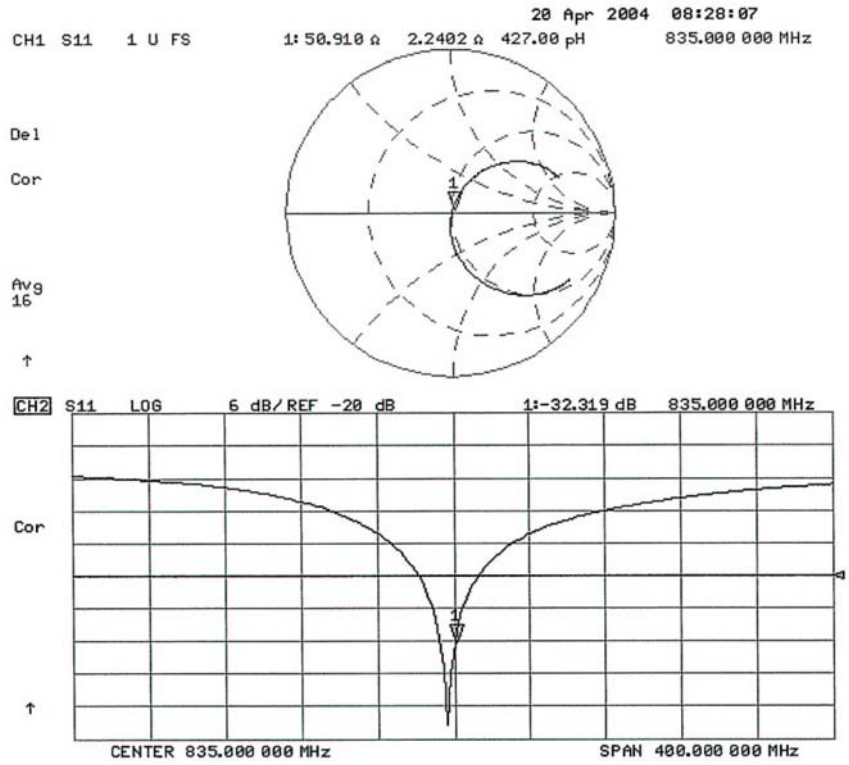
- Probe: ET3DV6 - SN1507; ConvF(6.3, 6.3, 6.3); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 55.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 2.75 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 2.76 mW/g
Peak SAR (extrapolated) = 3.88 W/kg
SAR(1 g) = 2.56 mW/g; SAR(10 g) = 1.66 mW/g



0 dB = 2.76mW/g


20 Apr 2004 08:28:07
CH1 S11 1 U FS
1: 50.910 Ω 2.2402 Ω 427.00 pH
835.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 6 dB/ REF -20 dB
1:-32.319 dB 835.000 000 MHz
Cor
CENTER 835.000 000 MHz
SPAN 400.000 000 MHz

Date/Time: 04/16/04 13:28:44

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN454

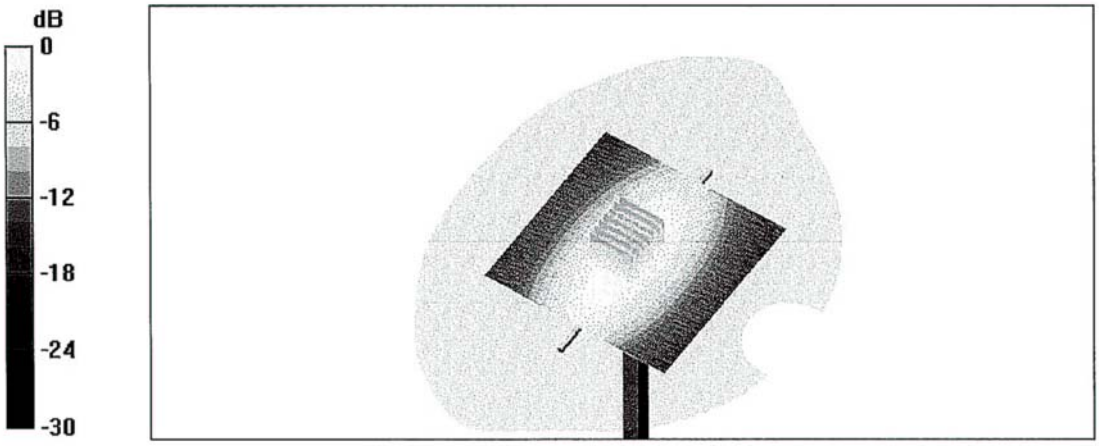
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: Muscle 835 MHz;
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.13, 6.13, 6.13); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

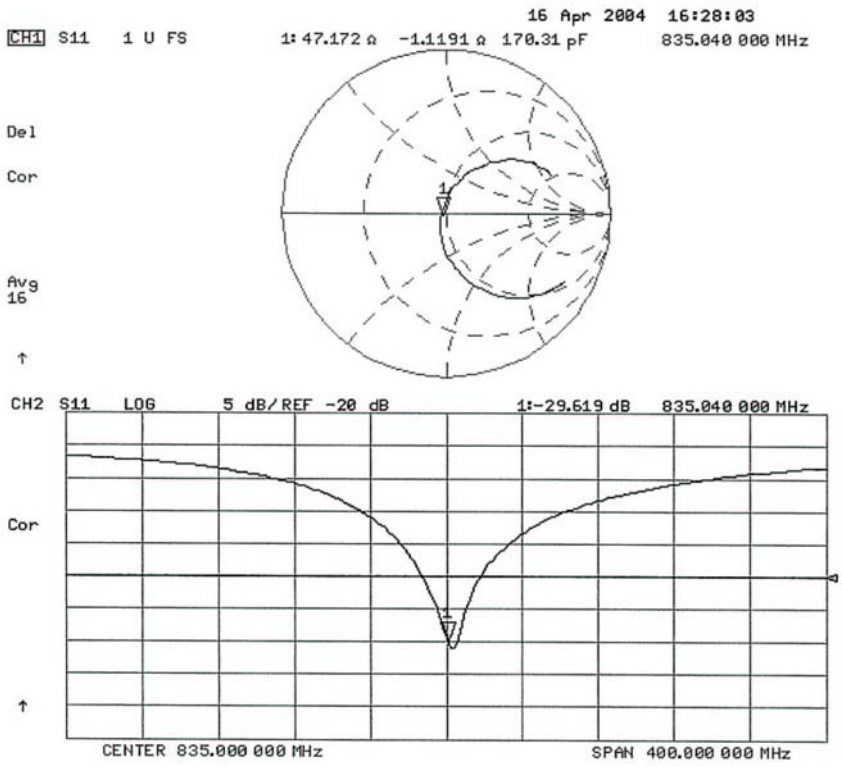
Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 54.2 V/m; Power Drift = 0.004 dB
Maximum value of SAR (interpolated) = 2.74 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.2 V/m; Power Drift = 0.004 dB
Maximum value of SAR (measured) = 2.72 mW/g
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.52 mW/g; SAR(10 g) = 1.66 mW/g



0 dB = 2.72mW/g

Body


16 Apr 2004 16:28:03
CH1 S11 1 U FS
1: 47.172 Ω -1.1191 Ω 170.31 pF
835.040 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -20 dB
1:-29.619 dB 835.040 000 MHz
Cor
CENTER 835.000 000 MHz
SPAN 400.000 000 MHz

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s p e a g

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

DASY

Dipole Validation Kit

Type: D1900V2

Serial: 5d003

Manufactured: February 14, 2002
Calibrated: April 15, 2004

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **head simulating liquid** of the following electrical parameters at 1900 MHz:

Relative Dielectricity	**40.1**	± 5%
Conductivity	**1.45 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 4.96 at 1900 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:	**20.6 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:	**1.188 ns**	(one direction)
Transmission factor:	**0.973**	(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 1900 MHz:	Re{Z} = **50.2 Ω**
	Im {Z} = **1.1 Ω**
Return Loss at 1900 MHz	**-39.3 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **body simulating tissue** of the following electrical parameters at 1900 MHz:

Relative Dielectricity	**52.2**	± 5%
Conductivity	**1.58 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 4.57 at 1900 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.

5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. 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:	**41.6 mW/g** ± 16.8 % (k=2)[2]
averaged over 10 cm^3 (10 g) of tissue:	**21.9 mW/g** ± 16.2 % (k=2)[2]

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 1900 MHz:	Re{Z} = **46.9 Ω**
	Im {Z} = **1.4 Ω**
Return Loss at 1900 MHz	**-28.9 dB**

7. 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.

8. 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.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

9. Power Test

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

[2] validation uncertainty

Date/Time: 04/15/04 15:14:36

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN5d003

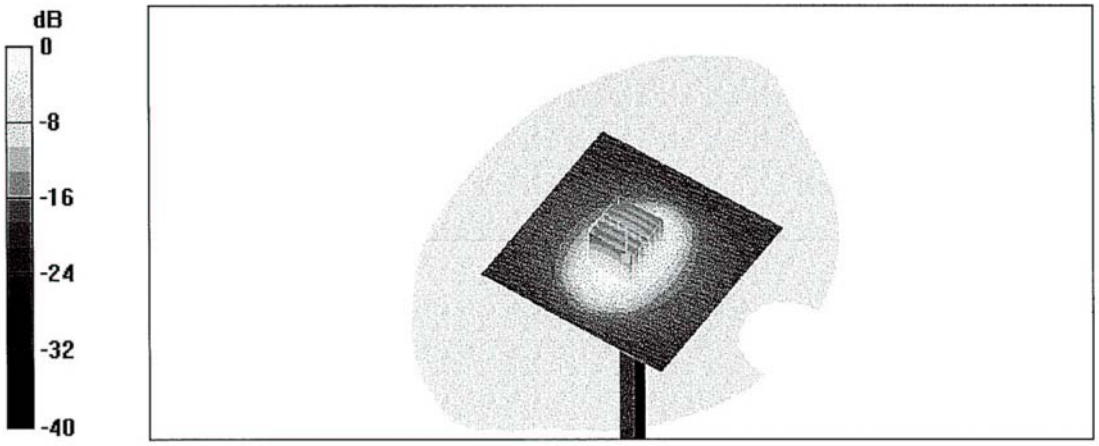
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL 1900 MHz;
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

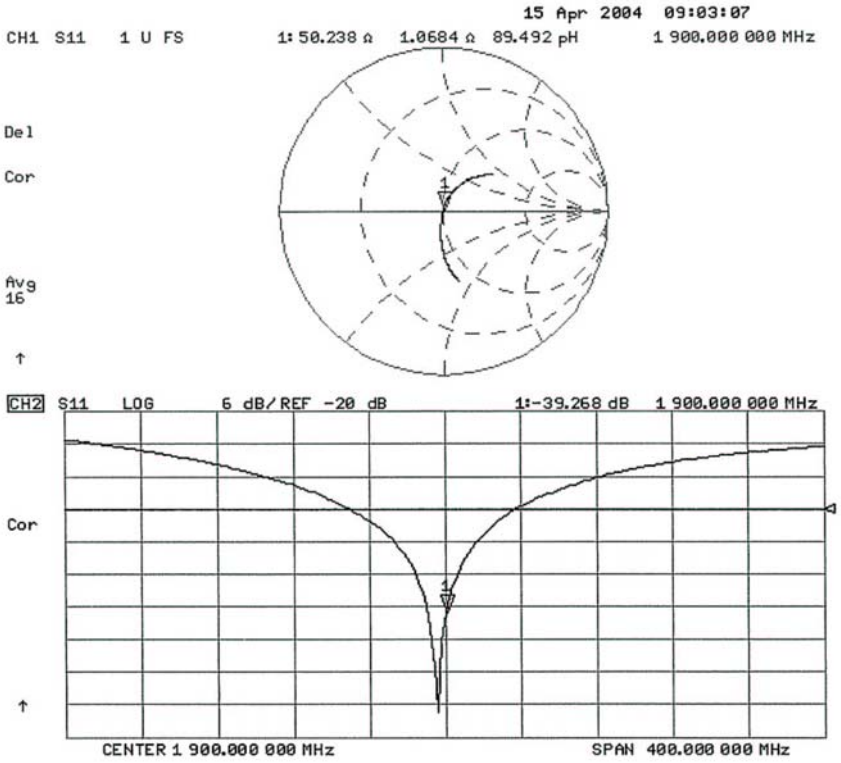
- Probe: ET3DV6 - SN1507; ConvF(4.96, 4.96, 4.96); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 91.1 V/m; Power Drift = -0.002 dB
Maximum value of SAR (interpolated) = 11.4 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.1 V/m; Power Drift = -0.002 dB
Maximum value of SAR (measured) = 11.1 mW/g
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.83 mW/g; SAR(10 g) = 5.16 mW/g



0 dB = 11.1mW/g


15 Apr 2004 09:03:07
CH1 S11 1 U FS
1: 50.238 Ω 1.0684 Ω 89.492 pH
1 900.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG
6 dB/ REF -20 dB
1:-39.268 dB 1 900.000 000 MHz
Cor
CENTER 1 900.000 000 MHz
SPAN 400.000 000 MHz

Date/Time: 04/14/04 12:04:25

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN5d003

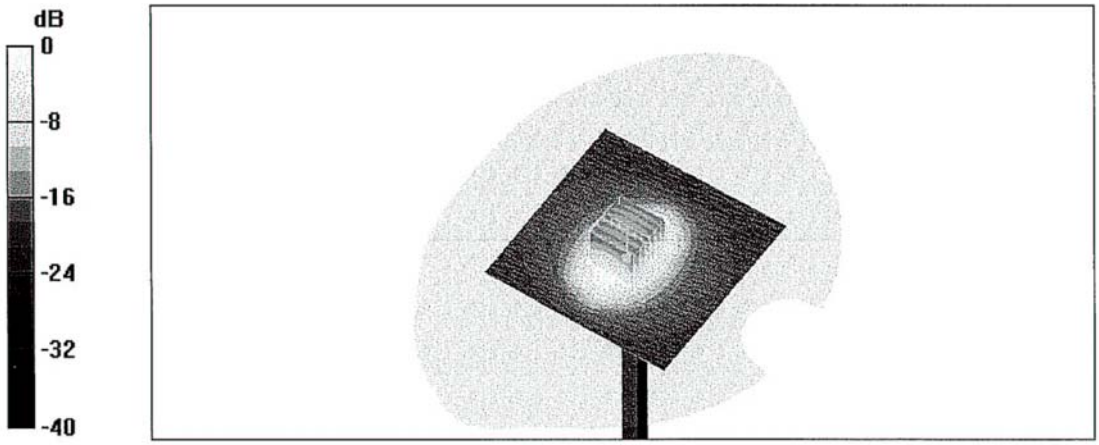
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Muscle 1900 MHz;
Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

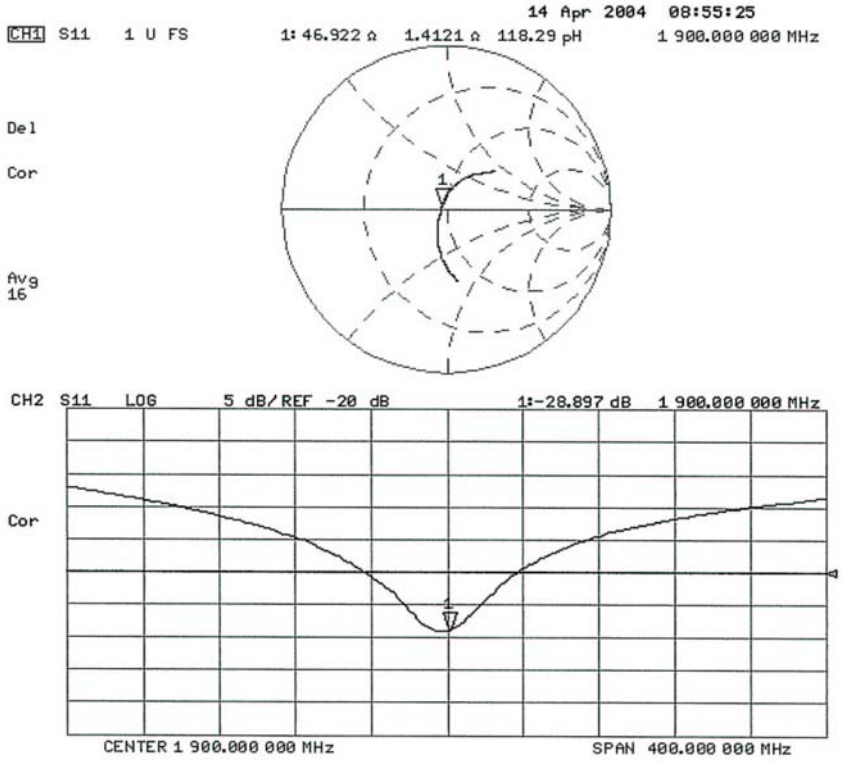
- Probe: ET3DV6 - SN1507; ConvF(4.57, 4.57, 4.57); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 89.5 V/m; Power Drift = 0.0 dB
Maximum value of SAR (interpolated) = 12 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 11.7 mW/g
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.47 mW/g



0 dB = 11.7mW/g


14 Apr 2004 08:55:25
CH1 S11 1 U FS
1: 46.922 Ω 1.4121 Ω 118.29 pH
1 900.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG
5 dB/ REF -20 dB
1:-28.897 dB 1 900.000 000 MHz
Cor
CENTER 1 900.000 000 MHz
SPAN 400.000 000 MHz