SAR TEST REPORT

REPORT NO.:	SA911129R01
MODEL NO.:	WPC-8110
RECEIVED:	Dec. 10, 2002
TESTED:	Dec. 06, 2002

APPLICANT:	SendFar Technology Co.,Ltd.
ADDRESS:	15F, No. 866-2, Jung Jeng Rd., Junghe City, Taipei, Taiwan, R.O.C.
ISSUED BY:	Advance Data Technology Corporation
LAB LOCATION:	47 14th Lin, Chiapau Tsun, Linko, Taipei, Taiwan, R.O.C.

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Table of Contents

1. CERTIFICATION

PRODUCT :	Wireless LAN Card
MODEL NO. :	WPC-8110
BRAND :	SendFar
APPLICANT :	SendFar Technology Co., Ltd.
STANDARDS :	47 CFR Part 2 (Section 2.1093), FCC OET Bulletin 65, Supplement C (01-01)

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility on 6th Dec. 2002. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts for the measurements of the sample's EMC characteristics under the conditions herein specified.

CHECKED BY: Rennie Wang, **DATE:** December 11, 2002

APPROVED BY: Dr. Alan Lane, Manager, **DATE:** December 11, 2002

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless LAN Card
MODEL NO.	WPC-8110
POWER SUPPLY	3.3VDC powered by host
MODULATION TYPE	DBPSK, QPSK, CCK
RADIO TECHNOLOGY	DSSS
TRANSFER RATE	1/2/5.5/11Mbps
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11
CONDUCTED OUTPUT POWER	20.87 dBm (122.18 mW)
ANTENNA TYPE	Printed antenna
PEAK SAR	1.55 W/kg
DATA CABLE	NA
I/O PORTS	PCMCIA
ASSOCIATED DEVICES	NA

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC CFR 47 Part 2 (2.1093)
FCC OET Bulletin 65, Supplement C (01- 01)

All tests have been performed and recorded as per the above standards.

2.3 GENERAL INOFRMATION OF THE TEST SYSTEM

ET3DV6 ISOTROPIC E-FIELD PROBE

Construction	Symmetrical design with triangular core. Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., glycolether).
Calibration	Basic Broad Band Calibration in air: 10-2500 MHz Conversion Factors (CF) for HSL 900 and HSL 1800 CF-Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	Overall length: 337 mm (Tip Length: 10 mm) Tip diameter: 7.0 mm (Body diameter: 10 mm) Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetric measurements up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (ET3DV6)

TWIN SAM V4.0

Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Height: 810 mm; Length: 1000 mm; Width: 500 mm

SYSTEM VALIDATION KITS: D900V2 – D2450V2

Construction	Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor
Calibration	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions
Frequency	900, 1800, 1900, 2450 MHz
Return Loss	> 20 dB at specified validation position
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
Options	Dipoles for other frequencies or solutions and other calibration conditions upon request
Dimensions	D900V2: dipole length: 149 mm; overall height: 330 mm D1800V2: dipole length: 72 mm; overall height: 300 mm D1900V2: dipole length: 68 mm; overall height: 300 mm D2450V2: dipole length: 51.5 mm; overall height: 300 mm

3. DESCRIPTION OF TEST MODES AND CONFIGURATIONS

CARRIER MODULATION UNDER TEST	Un-modulated CW Carrier
CREST FACTOR	1.0
CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	Ch. 1: 2412MHz / 20.87 dBm Ch. 6: 2437MHz / 20.62 dBm Ch. 11: 2462MHz / 20.18 dBm
ANTENNA CONFIGURATION	Printed
EUT POWER SOURCE	From Host Notebook
HOST POWER SOURCE	Fully Charged Battery

The following test configurations have been applied in this test report:

Mode 1, 1-a, 1-I: EUT in the bottom PCMCIA slot of the notebook, the bottom of the notebook contact the bottom of the flat phantom with 0 cm separation distance.

Mode 2, 2-b, 2-II: EUT in the bottom PCMCIA slot of the notebook, the keyboard face of the notebook is perpendicular to the bottom of the flat phantom and the EUT is located between notebook and phantom. The separation distance is 1.5 cm between the tip of the EUT and the bottom of the flat phantom.

Note 1: Testing has been carried out in 3 different notebooks. Mode 1 & 2 is for notebook Compaq 1500, 1-a & 2-b is for notebook Dell C600, 1-I & 2-II is for notebook Compaq N800.

Note 2: Please reference “APPENDIX A” for the photos of test configuration.

Note 3: The output power of the un-modulated CW carrier has been adjusted to be the same with that of modulated signal.

4. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	COMPAQ	1500		FCC DoC APPROVED
2	NOTEBOOK	DELL	C600		FCC DoC APPROVED
3	NOTEBOOK	COMPAQ	N800		FCC DoC APPROVED

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

5. TEST RESULTS

5.1 TEST PROCEDURES

The SAR value was calculated via the 3D spline interpolation algorithm which has been implemented in the software of DASY3 SAR measurement system manufactured and calibrated by Schmid & Partner.

A coarse scan with 20mm x 20mm grid was performed for the highest spatial SAR location. A fine scan with 32mm x 32mm x 30mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

5.2 MEASURED SAR RESULT

ENVIRONMENTAL CONDICTION	24 degree C 58 % Humidity	TESTED BY	Bunny Yao
CHANNEL	**FREQUENCY (MHz)**	**MODE**	**MEASURED 1g SAR (W/kg)**
1	2412	1	1.550
6	2437	1	1.010
11	2462	1	0.852
1	2412	2	0.144
6	2437	2	0.105
11	2462	2	0.146
1	2412	1-a	1.200
6	2437	1-a	1.130
11	2462	1-a	0.888
1	2412	2-b	0.213
6	2437	2-b	0.237
11	2462	2-b	0.219
1	2412	1-I	1.250
6	2437	1-I	1.340
11	2462	1-I	1.010
1	2412	2-II	0.205

6	2437	2-II	0.303
11	2462	2-II	0.306

Note: Test configuration of each mode is described in section 3.

Note: In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.

Note: Please see the Appendix for the photo of the test configuration and also the data.

5.3 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / controlled Exposure Environment)
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	**1.6**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

5.4 EUT CONDUCTED POWER VARIATION

The variation of the EUT conducted power measured before and after SAR testing should not over 5%. The test procedures for conducted power level is described in FCC rule part 2.1046.

The maximum variation in this testing is listed in the following table.

Channel	Mode	Conducted Power (Before)	Conducted Power (After)	Variation (%)
1	1	20.87 dBm	20.75 dBm	0.3

5.5 TISSUE

The tissue of 2450MHz for brain and body was well prepared according to the standard procedures. The required and measured dielectric parameters are listed in this table.

	Brain		Muscle	
	Required	**Measured**	**Required**	**Measured**
Permitivity (ε_r)	39.2±5%	NA	52.7±5%	52.86
Conductivity (σ)	1.8±5%	NA	1.95±5%	1.965

The measured parameters of the used tissue.

Tissue Prepared and Measured on 11th Dec. 2002				
	Brain		**Muscle**	
	Value	**Freq. (MHz)**	**Value**	**Freq.(MHz)**
Max Permitivity	NA	NA	53.06	2400
Min. Permitivity	NA	NA	52.75	2500
Max Conductivity	NA	NA	2.033	2500
Min Conductivity	NA	NA	1.899	2400

5.6 TEST EQUIPMENT FOR TISSUE PROPERTY

Item	Name	Provider	Type	Series No.	Calibrated Until
1	Network Analyzer	Agilent	8720ES	NA	May 6, 2003
2	Dielectric Probe	Agilent	85070C	NA	NA

6. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue, and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 50mW RF input power was used instead of 250mW used by Schmid & Partner, then the measured SAR will be linearly extrapolated to that of 250mW RF power.

6.1 TEST EQUIPMENT

Item	Name	Provider	Type	Series No.	Calibrated Until
1	SAM Phantom	S & P	QD000 P40 CA	PT-1150	NA
2	Validation Dipole	S & P	D2450V2	716	Sept. 25, 2004
3	Signal Generator	R & S	SMP04	10001	May 5, 2003
4	E-Field Probe	S & P	ET3DV6	1687	Sept. 27, 2003
5	DAE	S & P	DAE3 V1	510	April 10, 2004
6	Robot Positioner	Staubli Unimation	NA	NA	NA

6.2 VALIDATION RESULT

Environmental Condition	24 degree C 58 % Humidity	Test Engineer	Bunny Yao
2450MHz System Validation Test in Body Tissue			
Required	Measured	Deviation (%)	Separation Distance
14.30 (1g)	13.75	3.8	1.0 cm
6.74 (10g)	6.60	2.1	1.0 cm

Note: Please see Appendix for the photo of system validation test.

7. MEASUREMENT UNCERTAINTIES

	Uncertainty Value	Probability Distribution	Divisor	C_i	Stantard Uncertainty
Test Sample Related					
Test Sample Positioning	±6%	Normal	1	1	±6%
Drift of Output Power	±5%	Rectangular	$\sqrt{3}$	1	±2.9%
Phantom and Setup					
Phantom Uncertainty	±0%	Rectangular	$\sqrt{3}$	1	±0%
Liquid Conductivity(target)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
Liqiuid Conductivity(meas)	±10%	Rectangular	$\sqrt{3}$	0.5	±2.9%
Liquid Permittivity(target)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
Liquid Permittivity(meas)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
RF Ambient Conditions	±3%	Rectangular	$\sqrt{3}$	1	±1.7%
System Check					
Calibration	± 2.6 %	normal	1	1	± 2.6 %
Axial isotropy	± 2.3 %	rectangular	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	± 0.9 %
Hemispherical isotropy	± 9.6 %	rectangular	$\sqrt{3}$	$\sqrt{cp}$	± 3.9 %
Spatial resolution	± 0.5 %	rectangular	$\sqrt{3}$	1	± 0.3 %
Boundary effect	± 4.0 %	rectangular	$\sqrt{3}$	1	± 6.4 %
Linearity	± 4.7 %	rectangular	$\sqrt{3}$	1	± 2.7 %
Detection Limit	± 2.0 %	rectangular	$\sqrt{3}$	1	± 1.2 %
Readout Electronics	± 1.0 %	normal	1	1	± 1.0 %
Mechanical Constrains of Robot	± 0.4 %	normal	1	1	± 0.4 %
Probe positioning	± 5.0 %	rectangular	$\sqrt{3}$	1	± 2.9 %
Extrapolation/Integration	± 3.9 %	rectangular	$\sqrt{3}$	1	± 2.3 %
Dipole/Liquid Distance	± 1.0 %	rectangular	$\sqrt{3}$	1	± 0.6 %
Dipole Input Power	± 4.7 %		1	1	± 4.7 %
Liquid conductivity (target)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %
Liquid conductivity (meas.)	± 10 %	rectangular	$\sqrt{3}$	0.6	± 3.5 %
Liquid permittivity (target)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %
Liquid permittivity (meas.)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %

RF Ambient condition	± 3.0 %	normal	1	1	± 1.7 %
Combined Standard Uncertainty					±12.4 %
Expanded Uncertainty (K=2)					±24.9 %

8. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
R.O.C.	BSMI, DGT, CNLA

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:
www.adt.com.tw/index.5/phtml.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

APPENDIX A: TEST CONFIGURATIONS AND TEST DATA

A1: TEST CONFIGURATION

Mode 1

Separation distance 12mm(The bottom of EUT to the flat phantom)

Mode 2

Separation distance 15mm(The tip of EUT to the flat phantom)

Mode 1-a

Separation distance 10mm(The bottom of EUT to the flat phantom)

Mode 2-b

Separation distance 15mm(The tip of EUT to the flat phantom)

Mode 1-I

Separation distance 11mm(The bottom of EUT to the flat phantom)

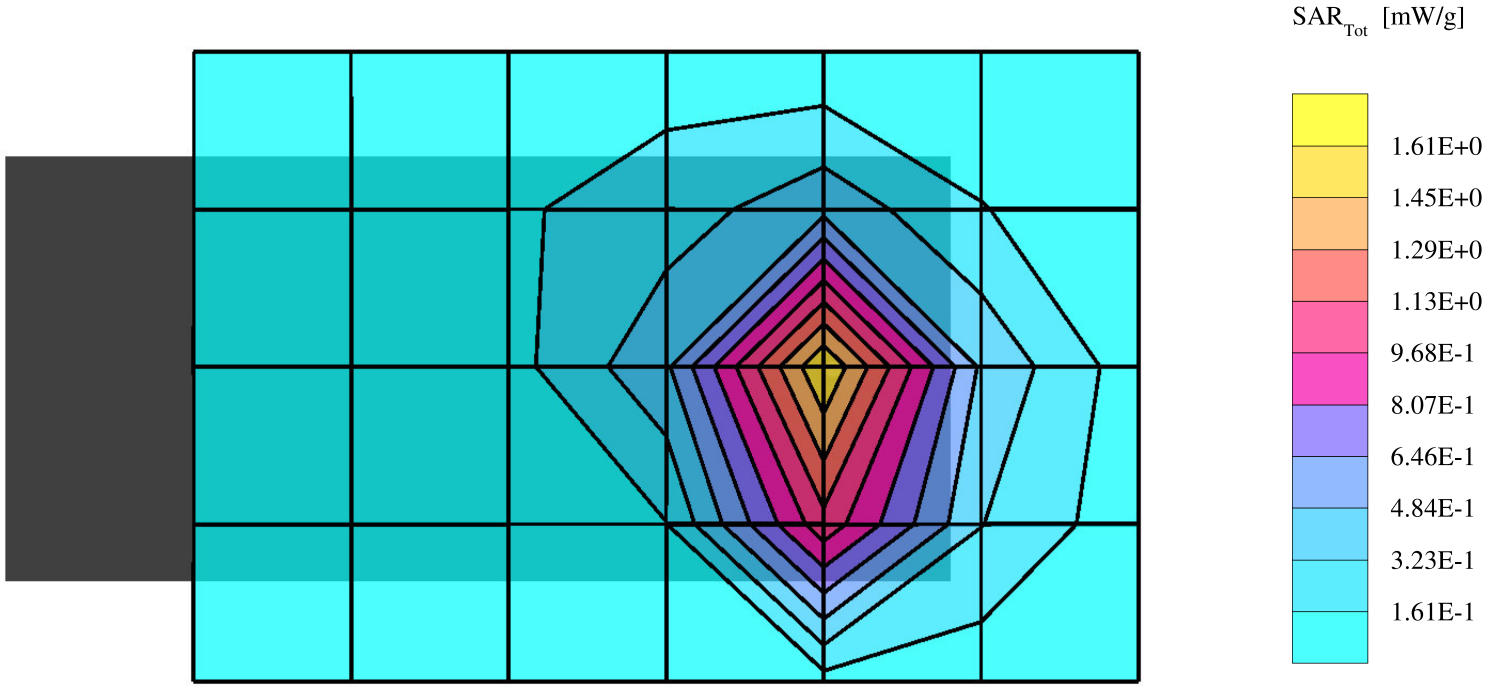
Mode 2-II

Separation distance 15mm(The tip of EUT to the flat phantom)

A2: TEST DATA

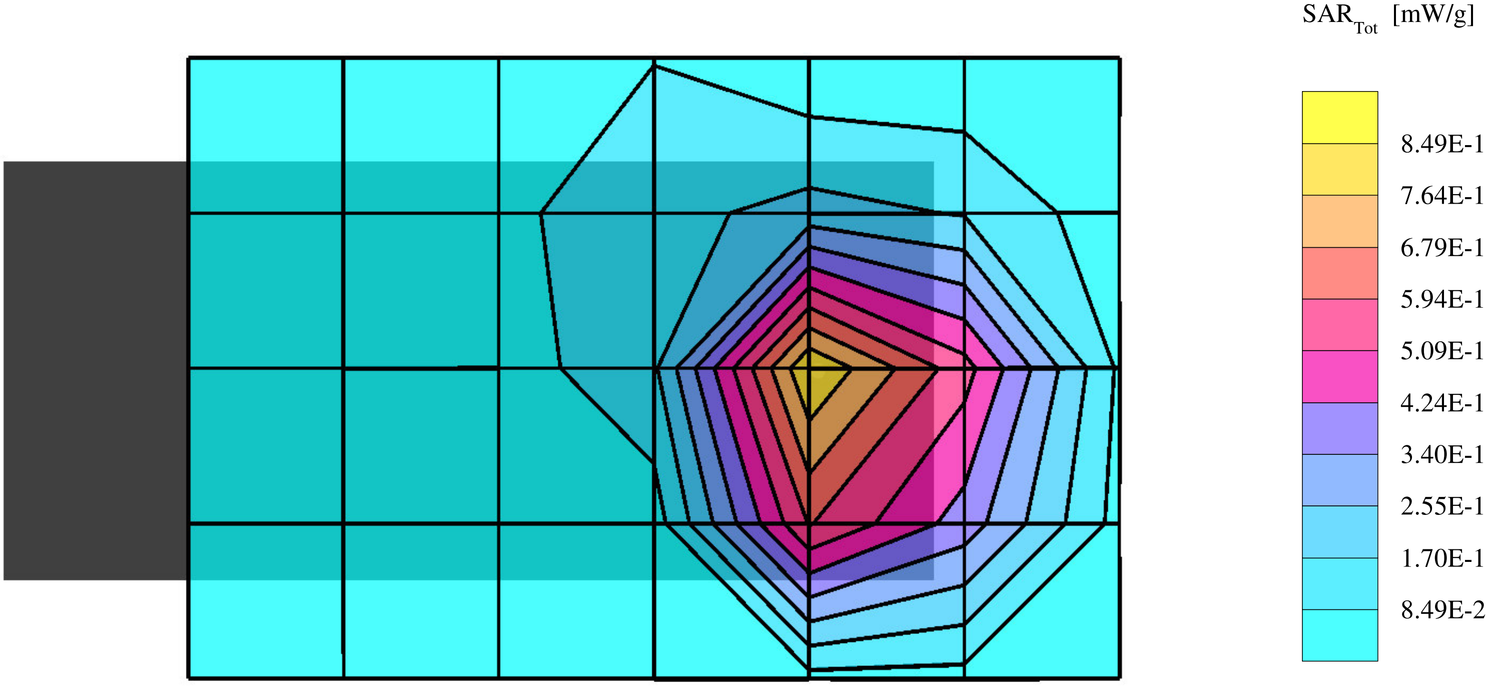
Wireless LAN Card Mode 1

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,180°); Frequency: 2412 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.55 mW/g, SAR (10g): 0.818 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.12 dB



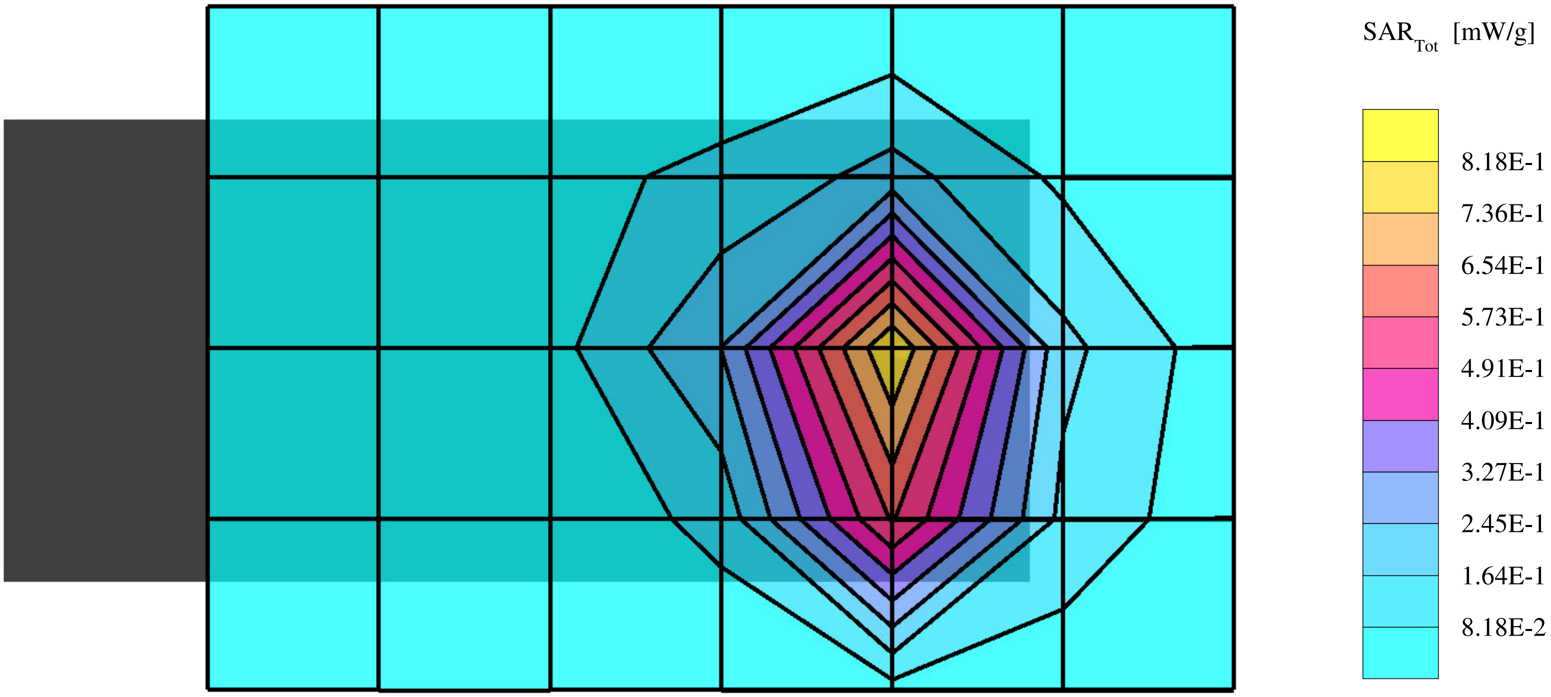
Wireless LAN Card Mode 1

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,180°); Frequency: 2437 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 1.01 mW/g, SAR (10g): 0.540 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.02 dB



Wireless LAN Card Mode 1

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,180°); Frequency: 2462 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.852 mW/g, SAR (10g): 0.447 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.05 dB



WLAN CardBus Mode 2

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade

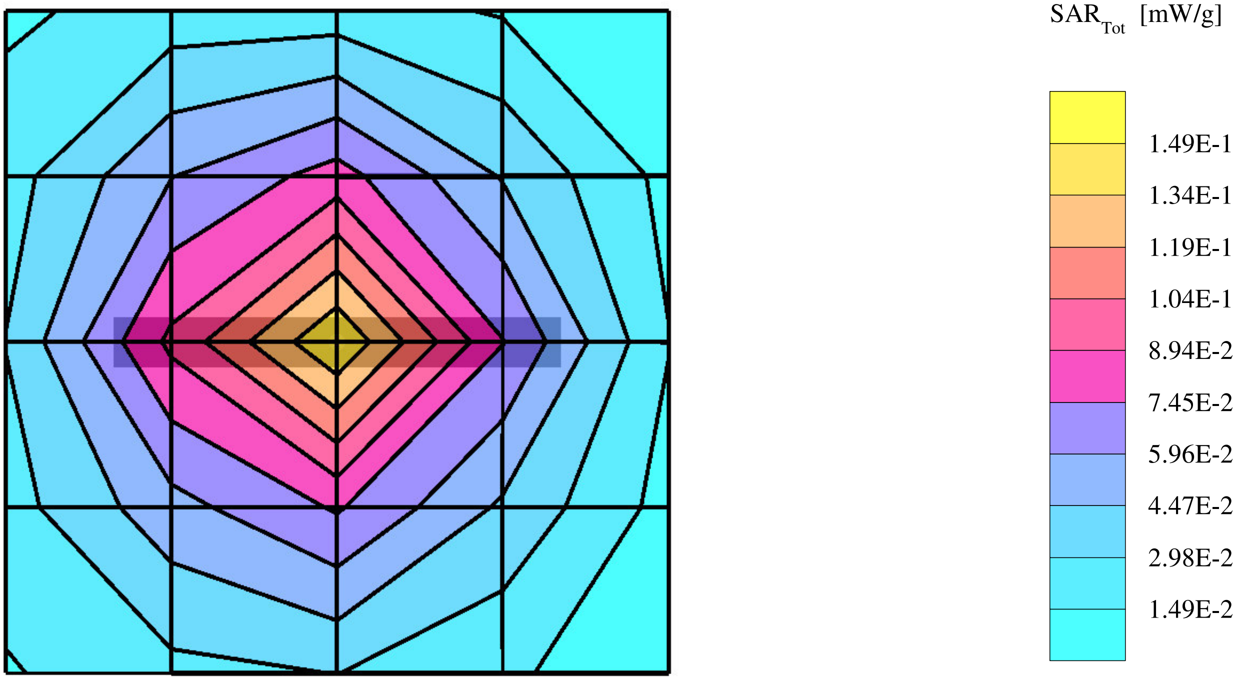
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2412 MHz; Antenna type: Patch

Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 0.144 mW/g, SAR (10g): 0.0829 mW/g, (Worst-case extrapolation)

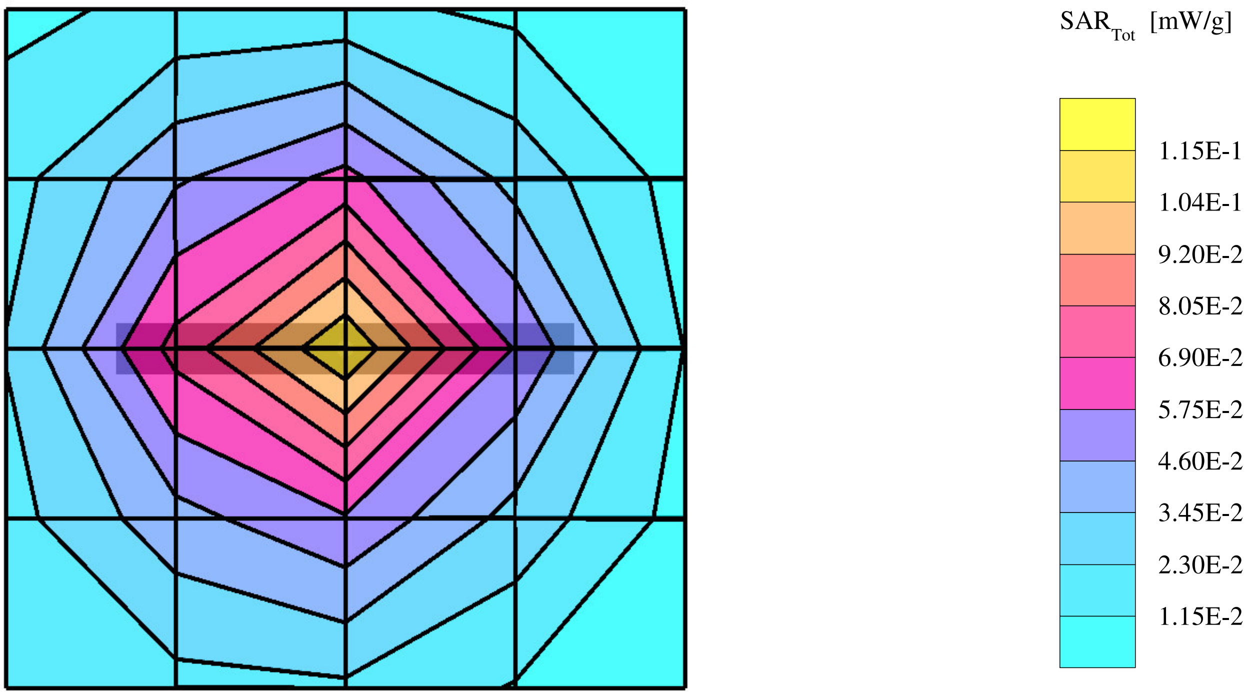
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.10 dB



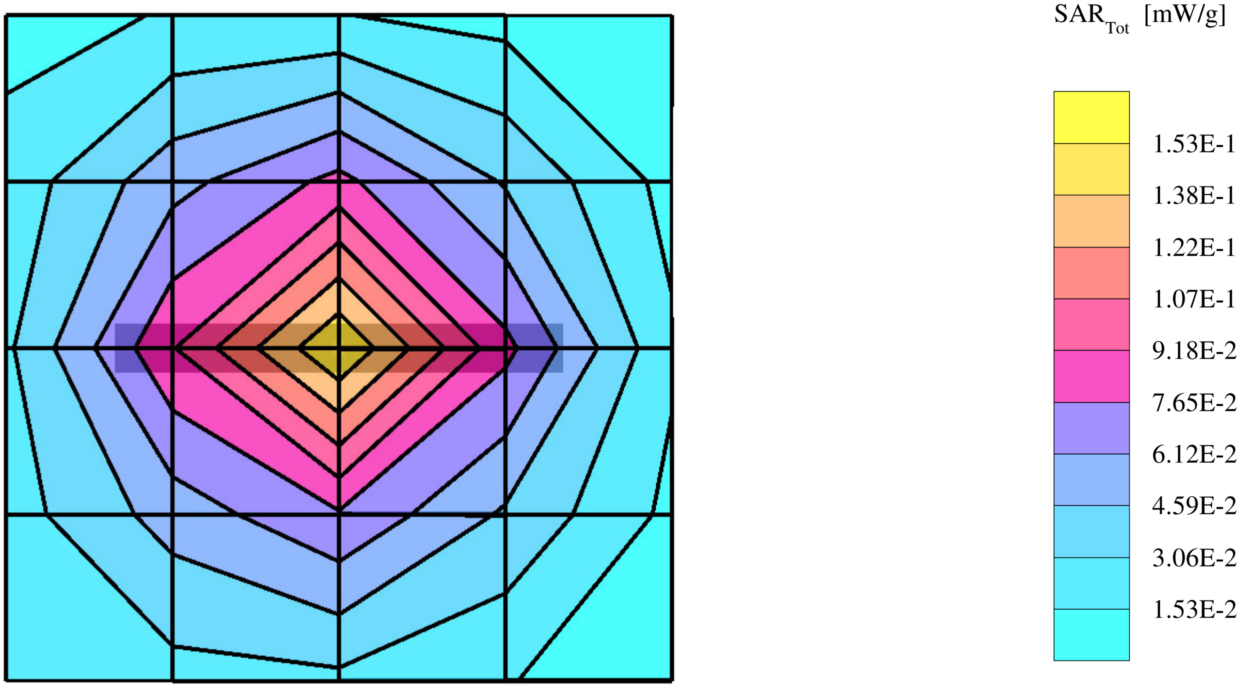
Wireless LAN Card Mode 2

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.105 mW/g, SAR (10g): 0.0598 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.03 dB



Wireless LAN Card Mode 2

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.146 mW/g, SAR (10g): 0.0822 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.10 dB



Wireless LAN Card Mode 1-a

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade

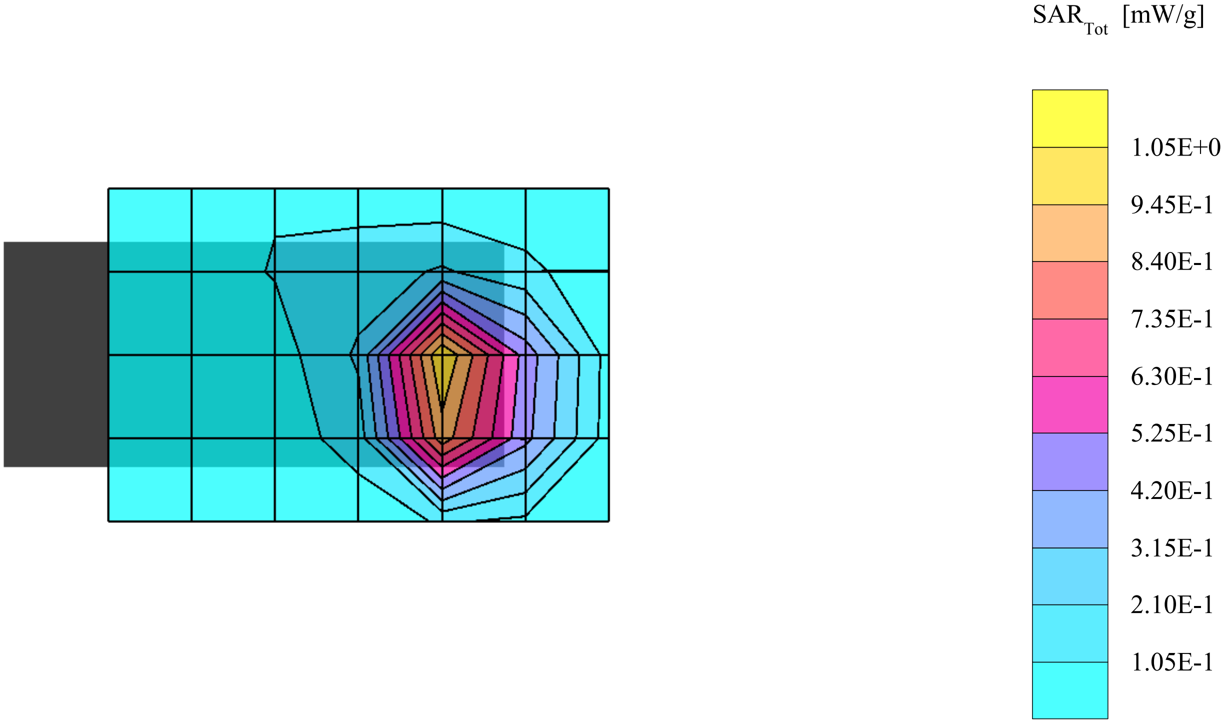
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2412 MHz; Antenna type: Patch

Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm³

Cube 5x5x7: SAR (1g): 1.20 mW/g, SAR (10g): 0.642 mW/g, (Worst-case extrapolation)

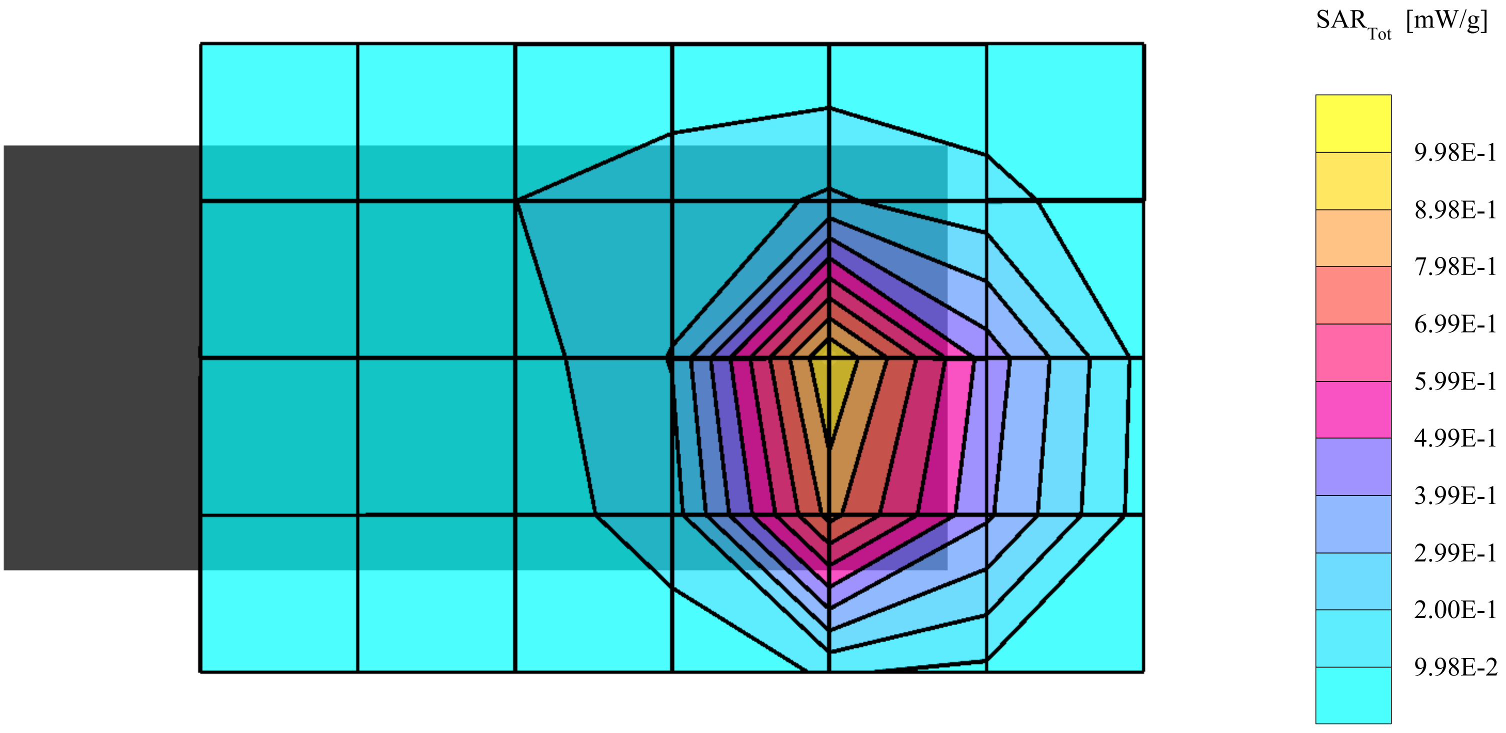
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.00 dB



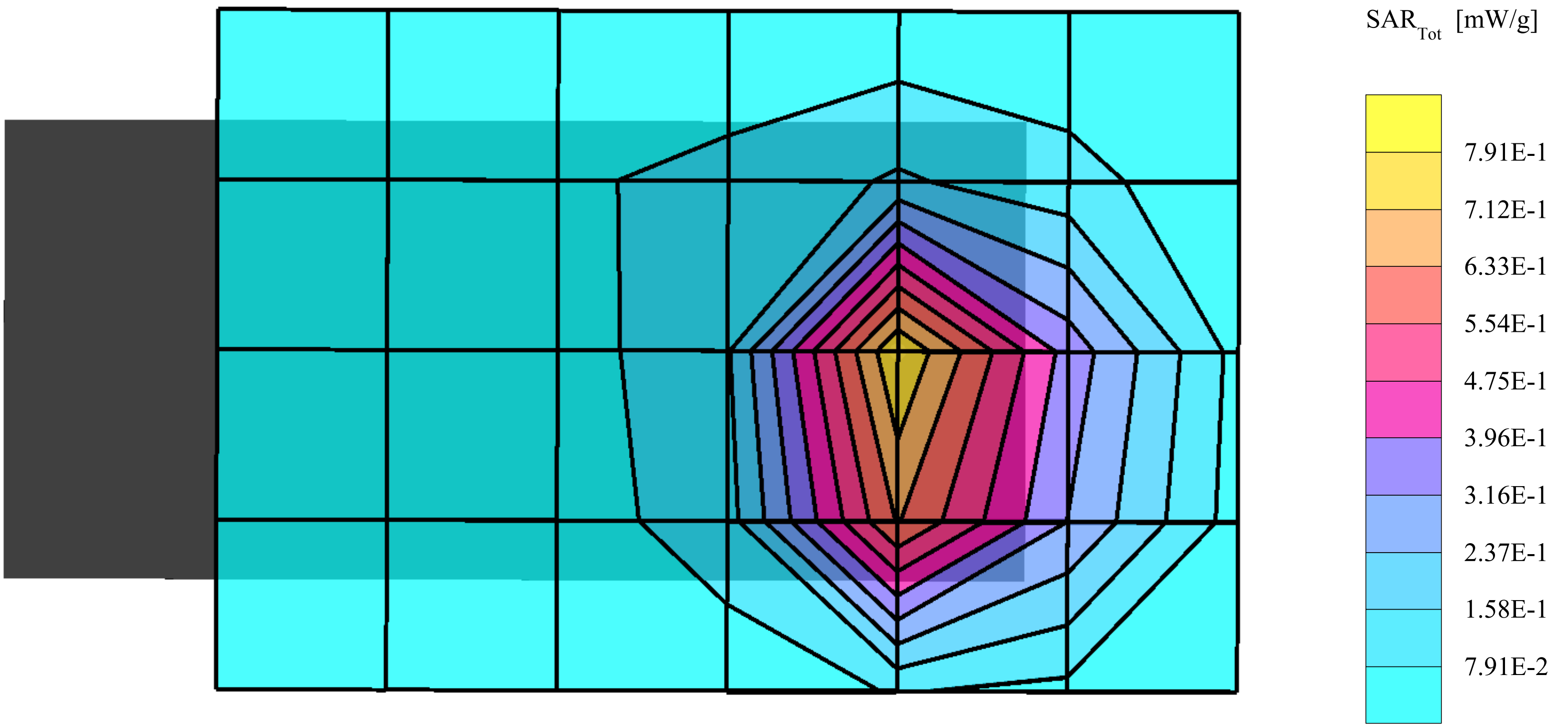
Wireless LAN Card Mode 1-a

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.13 mW/g, SAR (10g): 0.604 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.00 dB



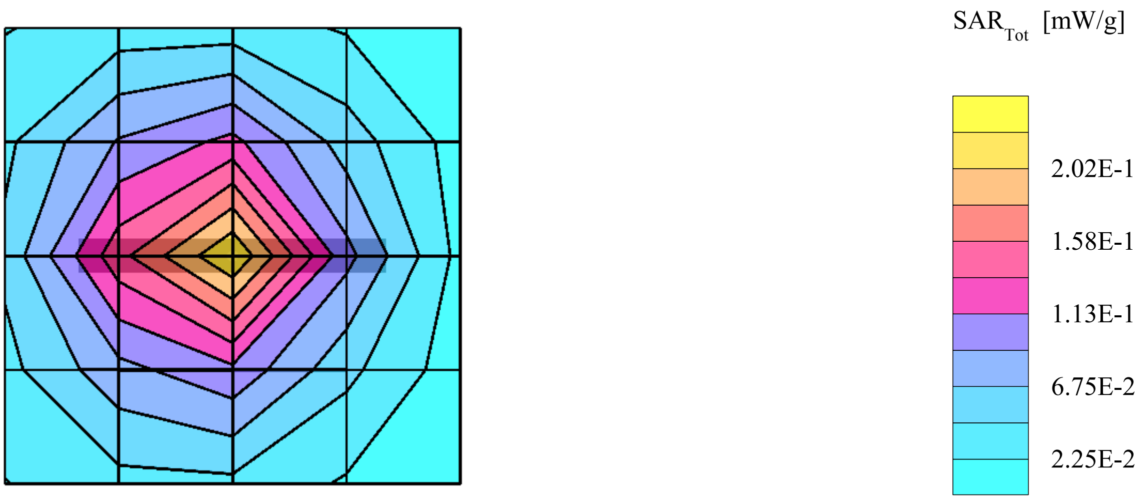
Wireless LAN Card Mode 1-a

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.888 mW/g, SAR (10g): 0.470 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.08 dB



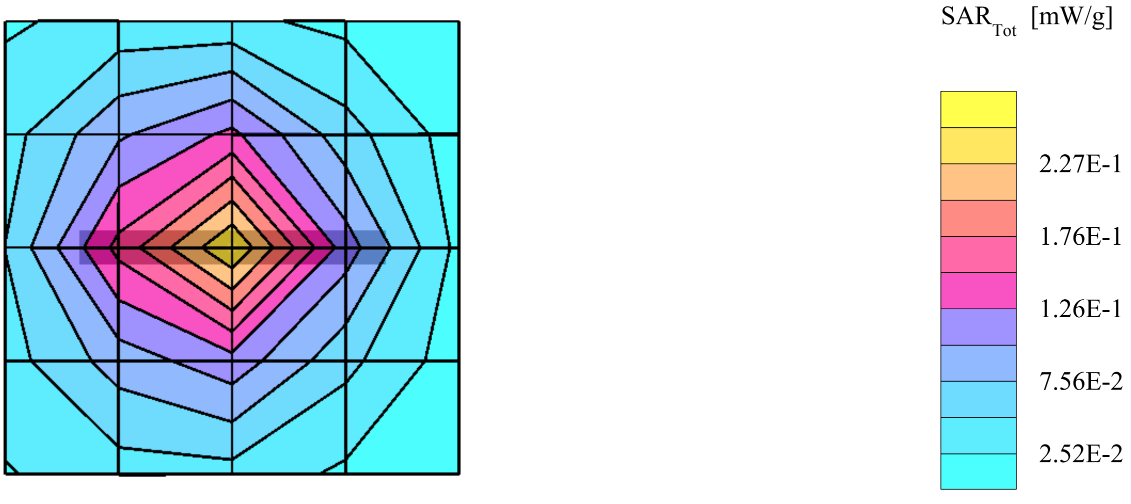
Wireless LAN Card Mode 2-b

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2412 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.213 mW/g, SAR (10g): 0.121 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.01 dB



Wireless LAN Card Mode 2-b

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.237 mW/g, SAR (10g): 0.133 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.05 dB



Wireless LAN Card Mode 2-b

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade

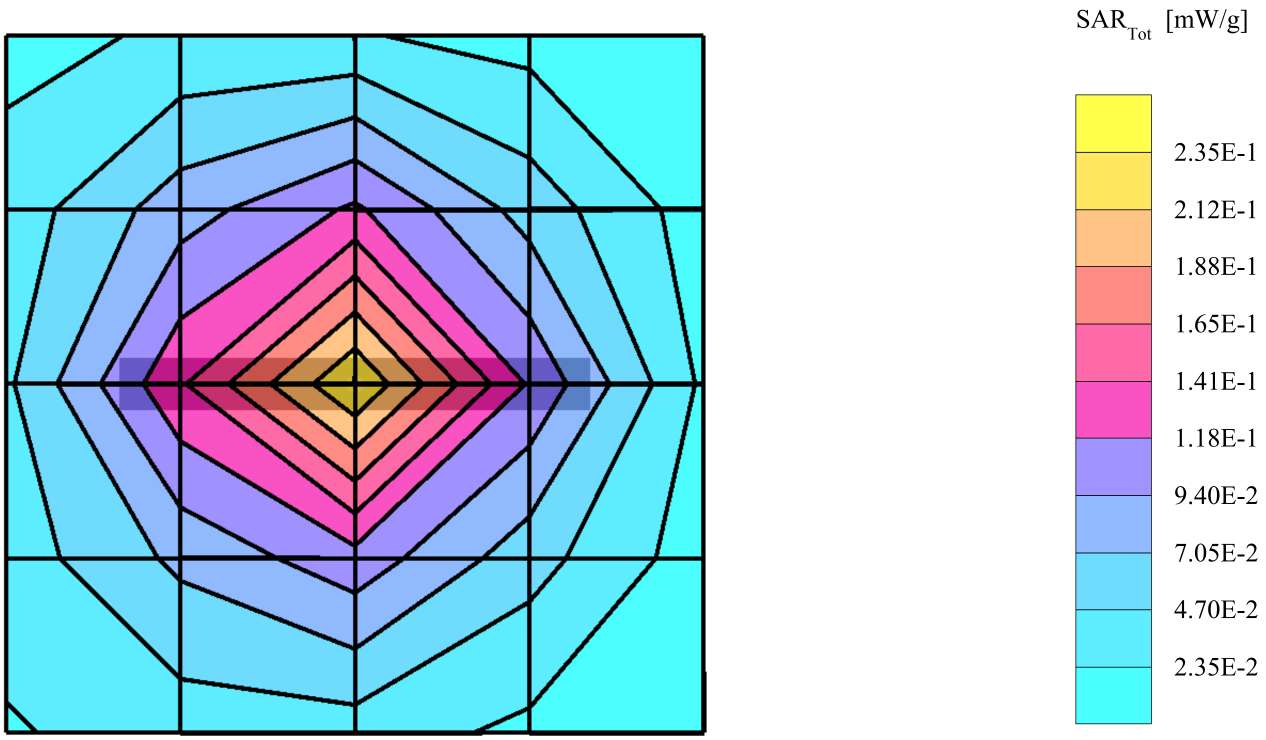
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz; Antenna type: Patch

Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 0.219 mW/g, SAR (10g): 0.124 mW/g, (Worst-case extrapolation)

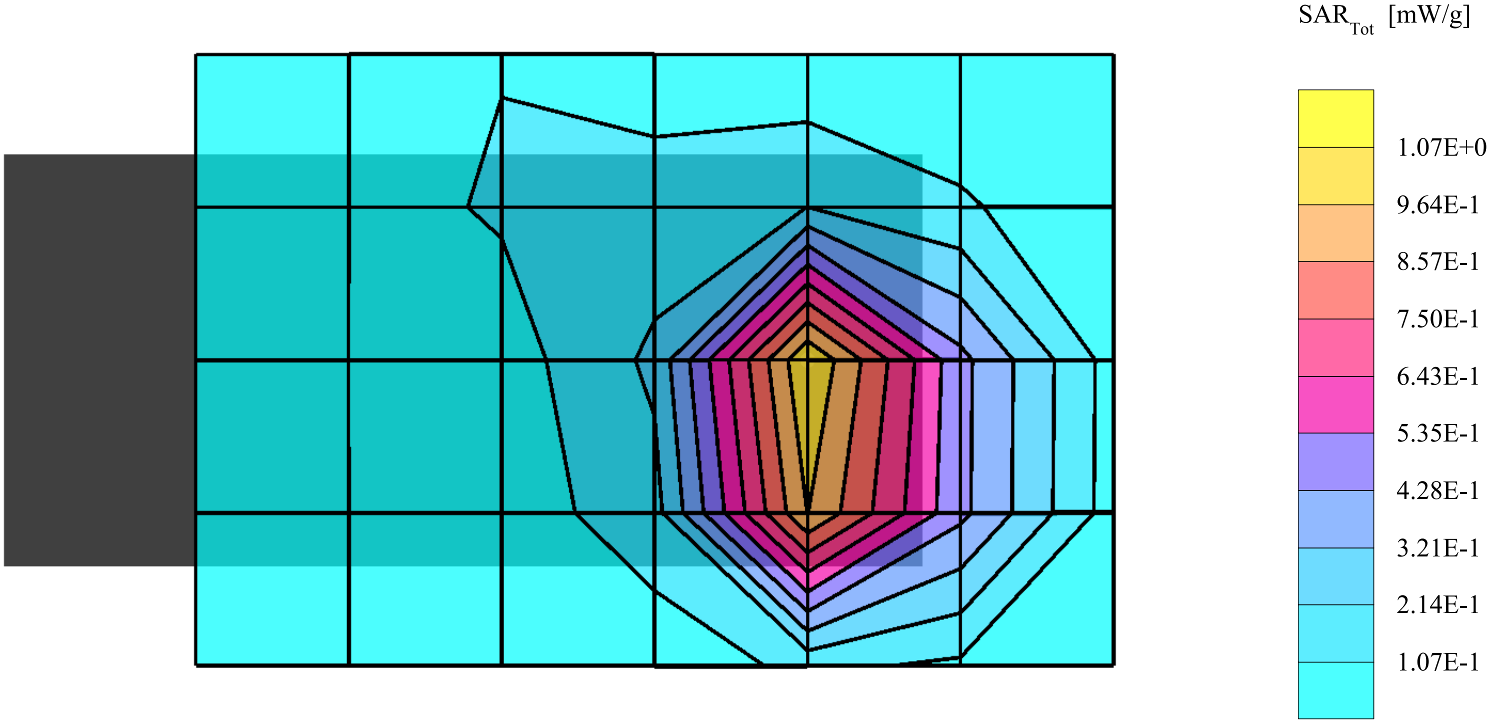
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.05 dB



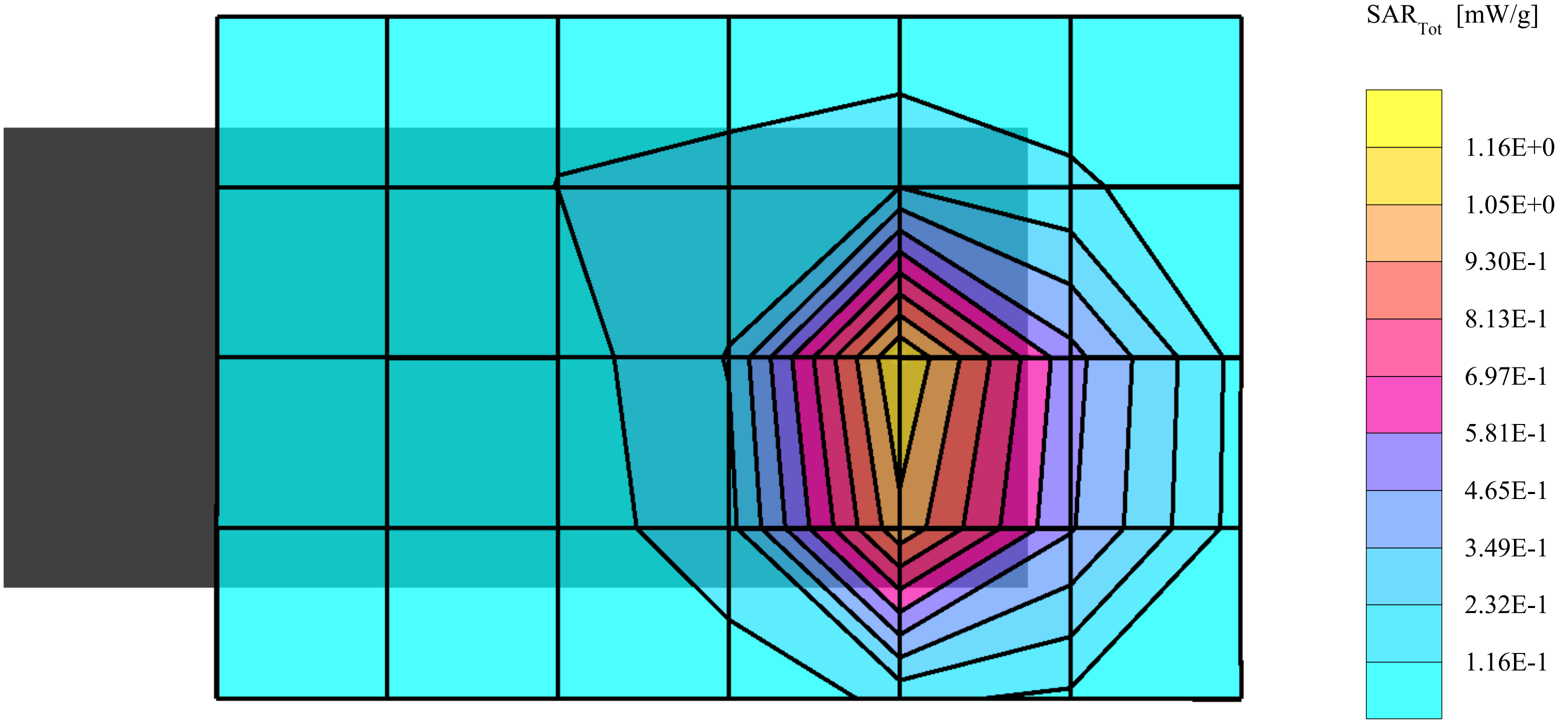
Wireless LAN Card Mode 1-I

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2412 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.25 mW/g, SAR (10g): 0.665 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.06 dB



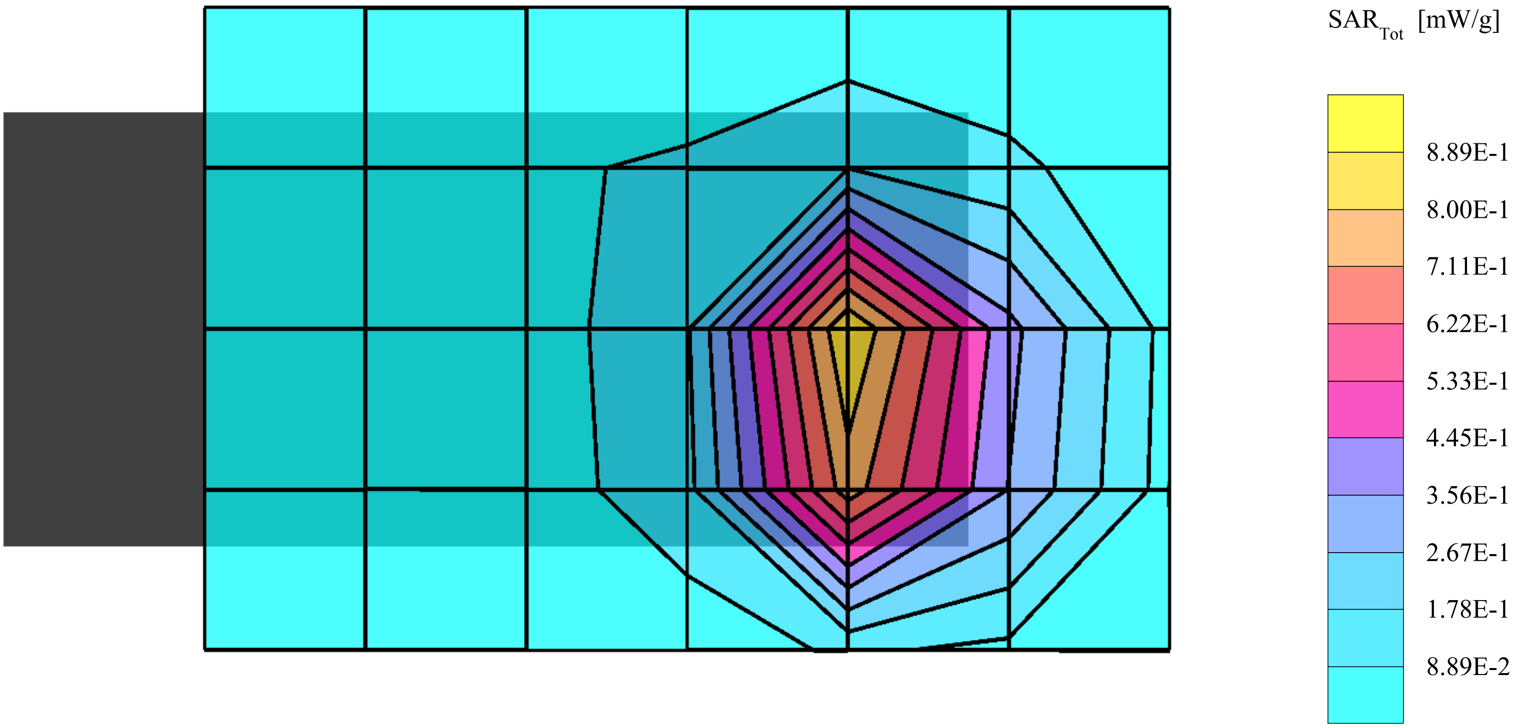
Wireless LAN Card Mode 1-I

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 1.34 mW/g, SAR (10g): 0.707 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.09 dB



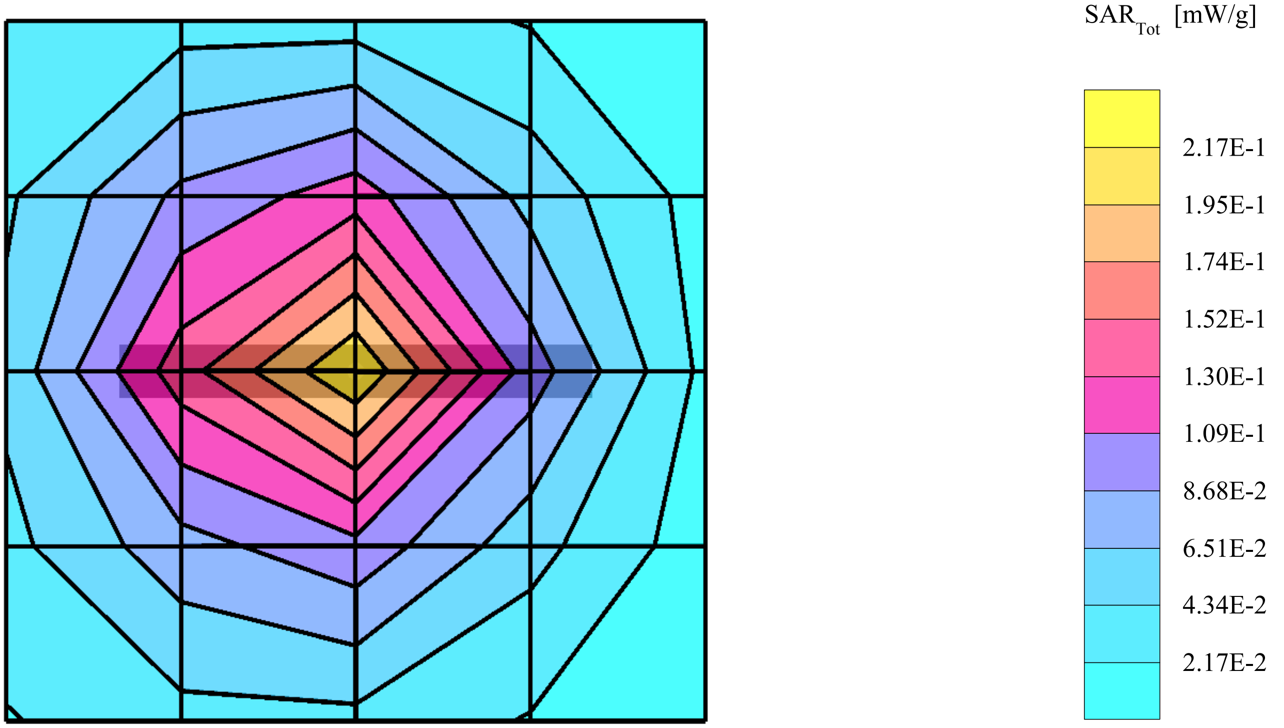
Wireless LAN Card Mode 1-I

Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.01 mW/g, SAR (10g): 0.535 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.05 dB



Wireless LAN Card Mode 2-II

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2412 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.205 mW/g, SAR (10g): 0.116 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.10 dB



Wireless LAN Card Mode 2-II

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade

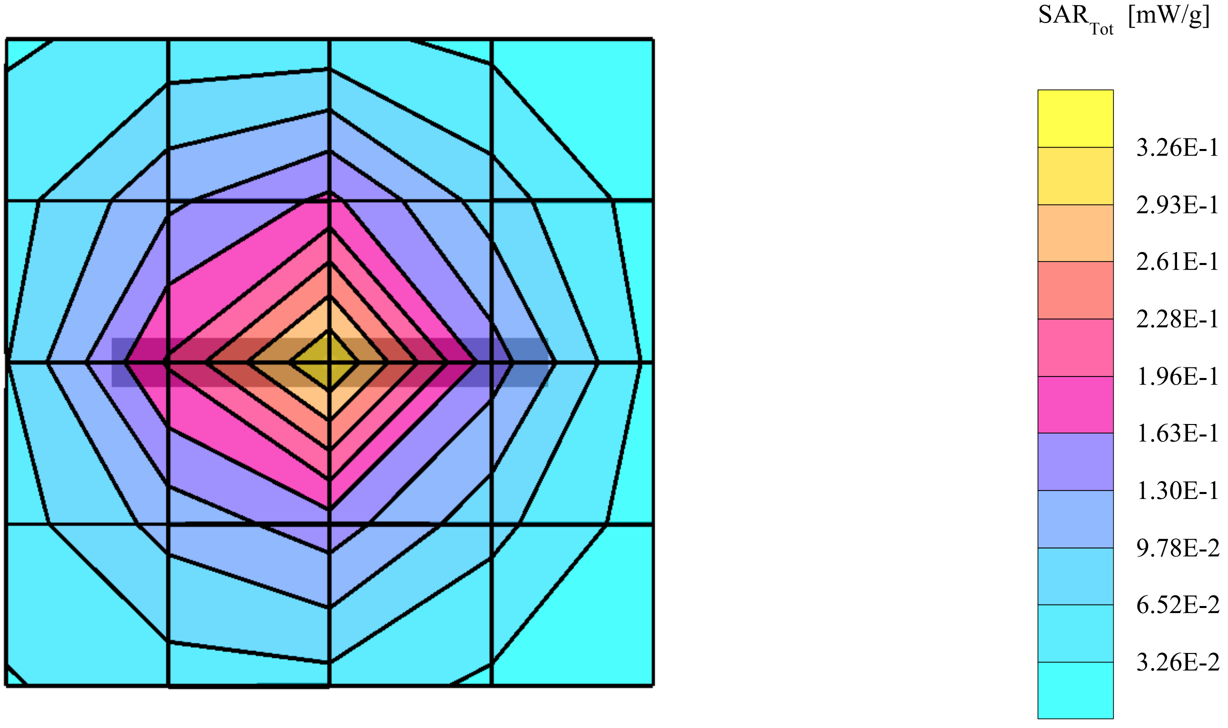
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2437 MHz; Antenna type: Patch

Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2437 MHz: σ = 1.95 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3

Cube 5x5x7: SAR (1g): 0.303 mW/g, SAR (10g): 0.171 mW/g, (Worst-case extrapolation)

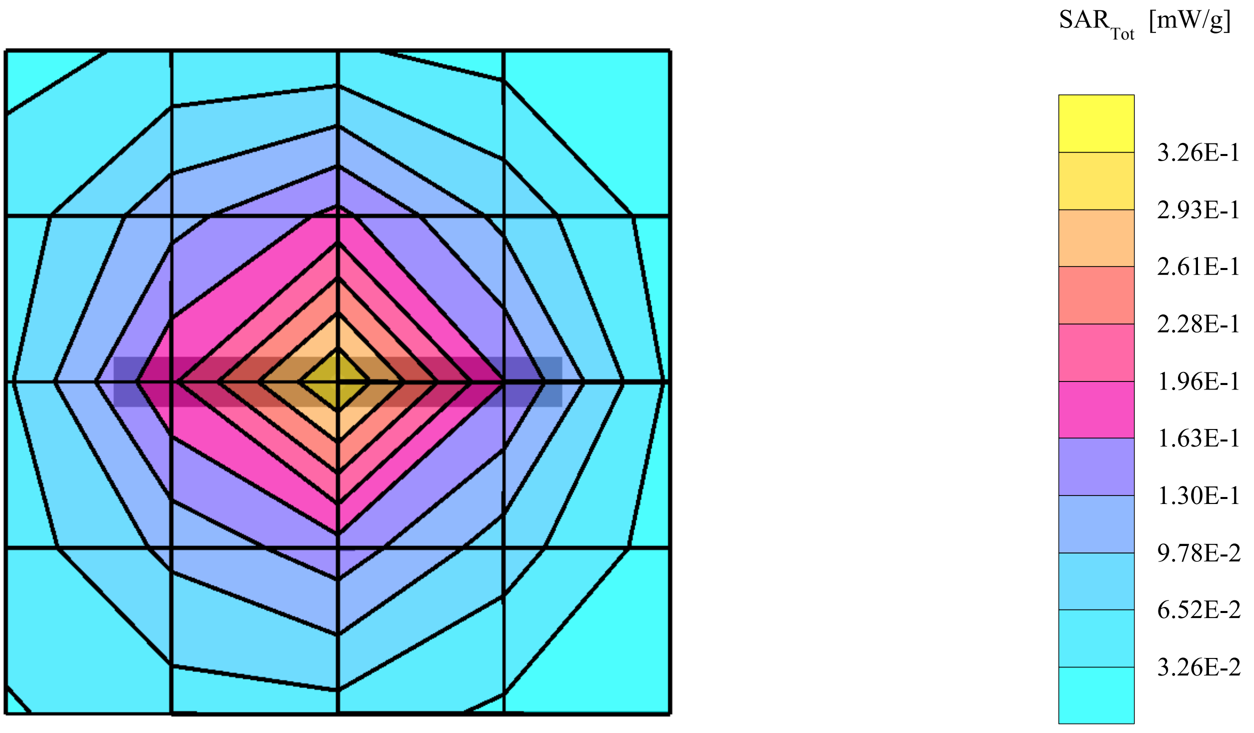
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.06 dB



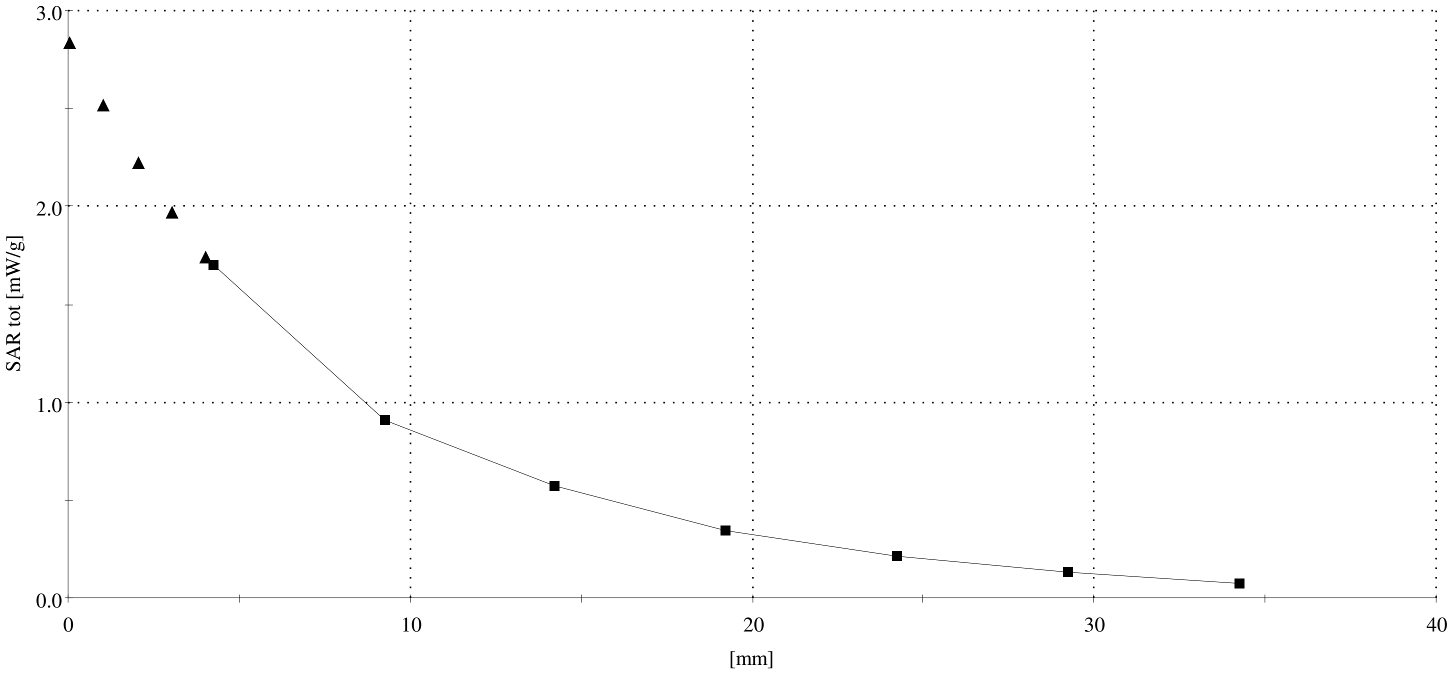
Wireless LAN Card Mode 2-II

Distance=15mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 2462 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2462 MHz: σ = 1.98 mho/m ε_r = 52.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.306 mW/g, SAR (10g): 0.173 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.00 dB



Wireless LAN Card Mode 1

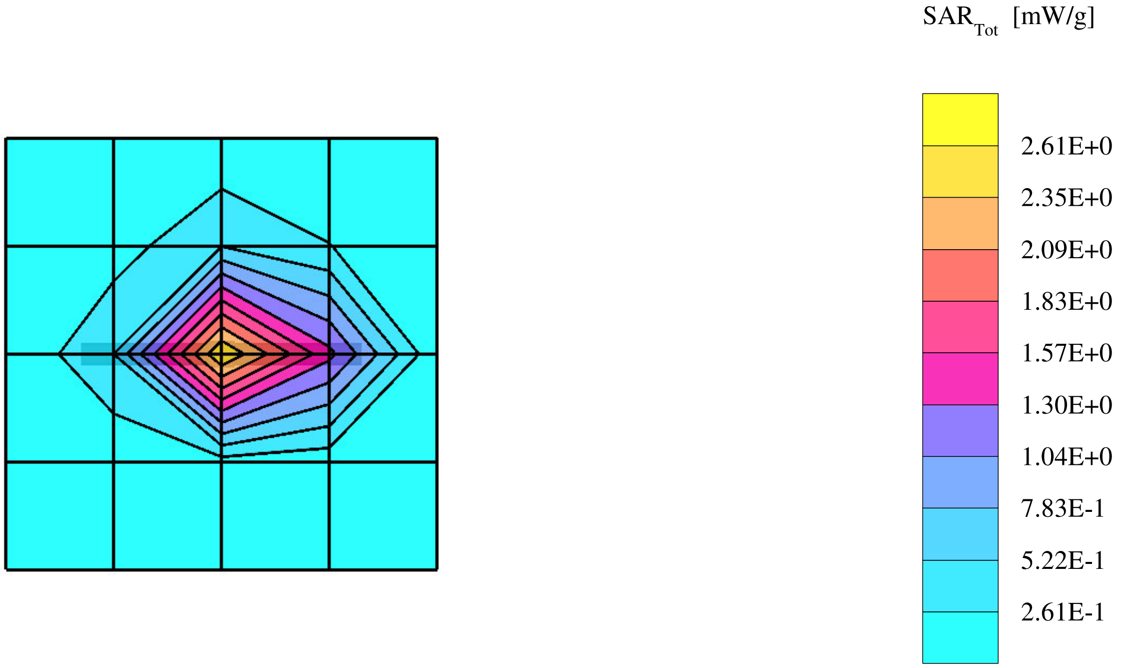
Distance=0mm; Air temperature:24 degrees centigrade; Liquid temperature:22.8 degrees centigrade
SAM Phantom; Flat Section; Position: (90°,180°); Frequency: 2412 MHz; Antenna type: Patch
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2412 MHz: σ = 1.91 mho/m ε_r = 53.0 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 1.55 mW/g, SAR (10g): 0.818 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0



A3: VALIDATION TEST DATA

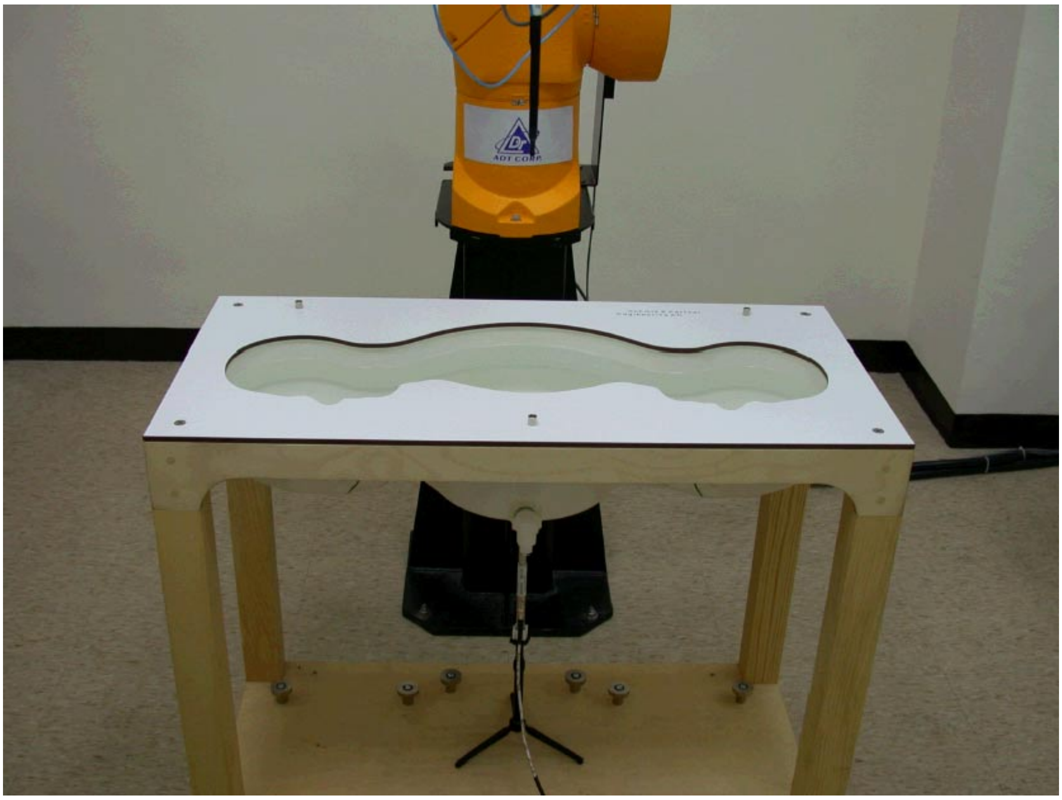
Dipole 2450 MHz

Antenna Input Power : 50mW
SAM; Flat
Probe: ET3DV6 - SN1687; ConvF(4.40,4.40,4.40); Crest factor: 1.0; Body 2450 MHz: σ = 1.96 mho/m ε_r = 52.9 ρ = 1.00 g/cm^3
Cubes (2): Peak: 5.37 mW/g ± 0.14 dB, SAR (1g): 2.75 mW/g ± 0.08 dB, SAR (10g): 1.32 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 8.1 (7.5, 9.3) [mm]
Powerdrift: -0.01 dB



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

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

F. Bomholt

D2: 2450MHZ SYSTEM VALIDATION DIPOLE

Schmid & Partner
Engineering AG

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

Calibration Certificate

2450 MHz System Validation Dipole

Type:	D2450V2
Serial Number:	716
Place of Calibration:	Zurich
Date of Calibration:	September 26, 2002
Calibration Interval:	24 months

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

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

Calibrated by:	N. Vetter
Approved by:	[signature]

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D2450V2

Serial: 716

Manufactured: September 10, 2002
Calibrated: September 26, 2002

1. Measurement Conditions

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

Relative permitivity	**37.7**	± 5%
Conductivity	**1.88 mho/m**	± 10%

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

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

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2.1. SAR Measurement with DASY3 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 worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **57.2 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **26.4 mW/g**

2.2 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: **54.0 mW/g**

averaged over 10 cm^3 (10 g) of tissue: **25.2 mW/g**

3. Dipole impedance and return loss

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

Electrical delay:	**1.148 ns**	(one direction)
Transmission factor:	**0.982**	(voltage transmission, one direction)

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

Feedpoint impedance at 2450 MHz:	Re{Z} = **54.1 Ω**
	Im {Z} = **2.4 Ω**
Return Loss at 2450 MHz	**- 26.8 dB**

4. Measurement Conditions

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

Relative permitivity	**52.4**	± 5%
Conductivity	**1.99 mho/m**	± 10%

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

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

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5.1. SAR Measurement with DASY3 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 worst-case extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**57.2 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**27.0 mW/g**

5.2 SAR Measurement with DASY4 System

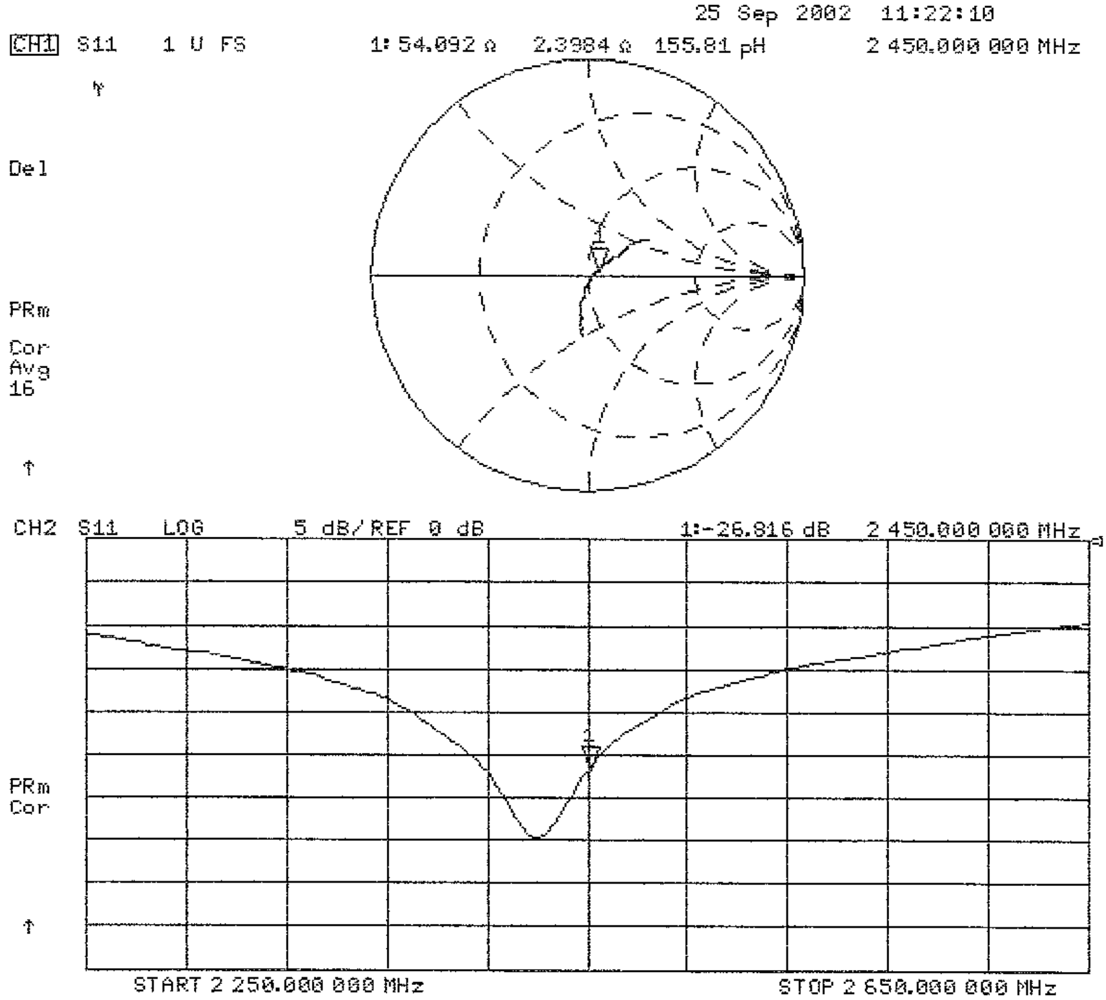
Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**51.6 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**25.0 mW/g**

6. Dipole impedance and return loss

The dipole was positioned at the flat phantom sections according to section 4 (with body tissue inside the phantom) and the distance holder was in place during impedance measurements.

Feedpoint impedance at 2450 MHz:	Re{Z} = **49.6 Ω**
	Im {Z} = **4.2 Ω**
Return Loss at 2450 MHz	**- 27.5 dB**


25 Sep 2002 11:22:10
CH1 S11 1 U FS
1: 54.092 Ω 2.3984 Ω 155.81 pH 2 450.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB 1:-26.816 dB 2 450.000 000 MHz
PRm
Cor
START 2 250.000 000 MHz
STOP 2 650.000 000 MHz

D3: DOSIMETRIC E-FIELD PROBE

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1687**
Place of Calibration:	**Zurich**
Date of Calibration:	**June 5, 2002**
Calibration Interval:	**12 months**

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

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

Calibrated by:	D.Vetter
Approved by:	[signature]

Schmid & Partner
Engineering AG

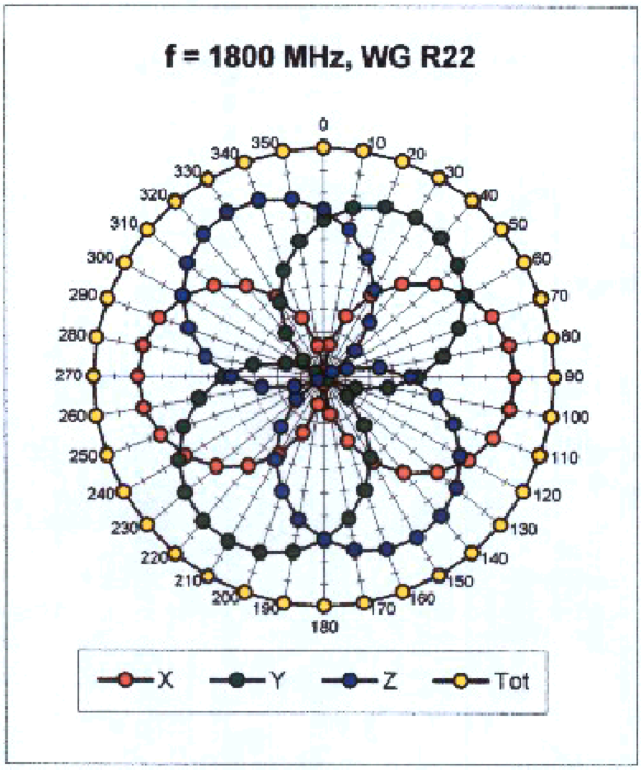
Zeughausstrasse 43, 8004 Zurich, Switzerland, Telephone +41 1 245 97 00, Fax +41 1 245 97 79

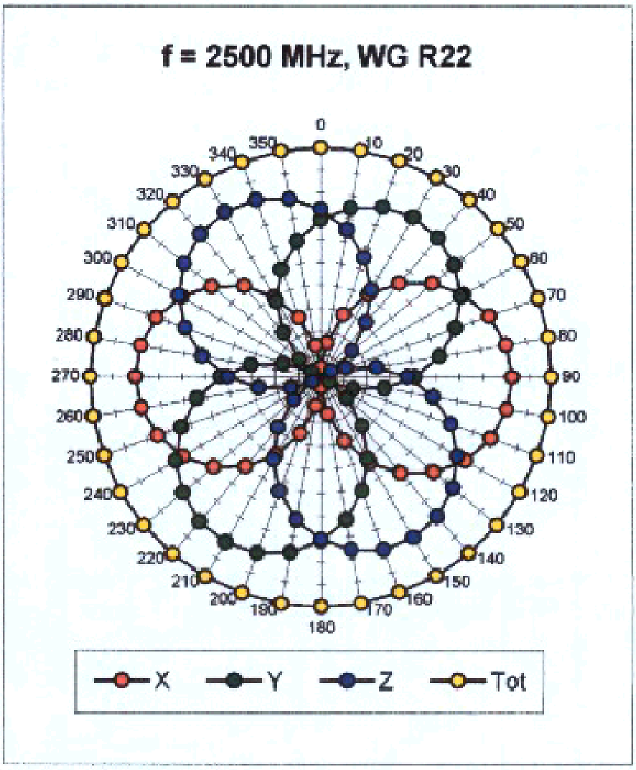
Probe ET3DV6

SN:1687

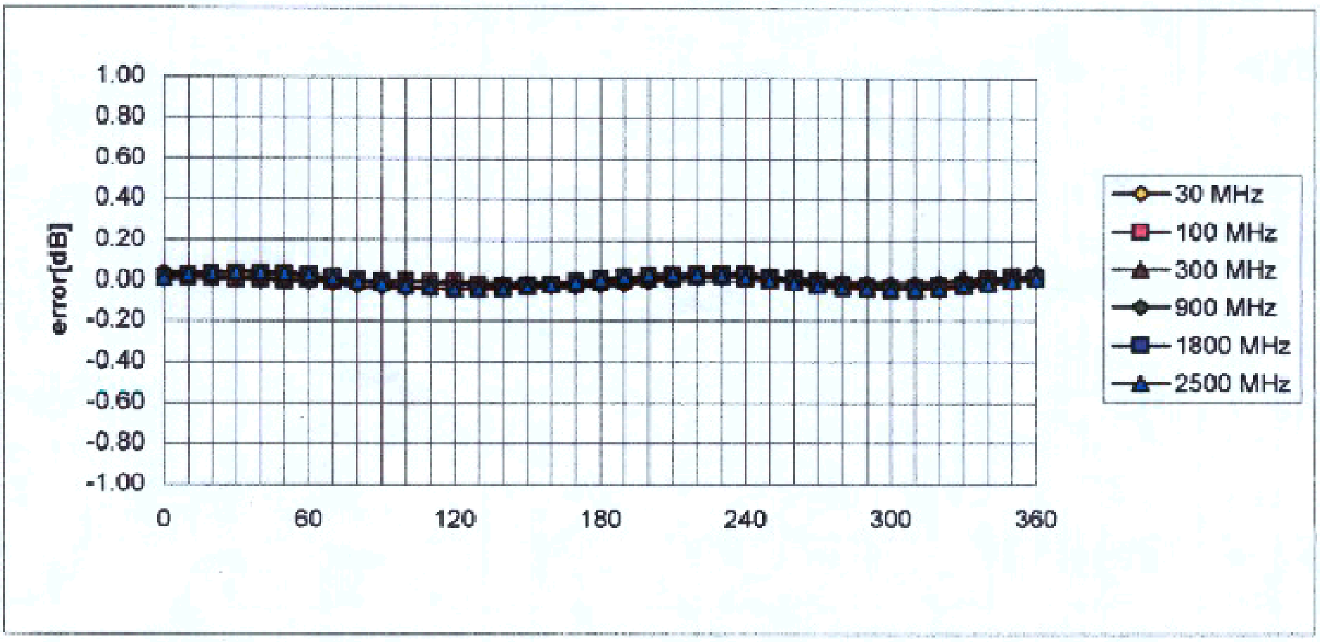
Manufactured:	May 28, 2002
Last calibration:	June 5, 2002

Calibrated for System DASY3



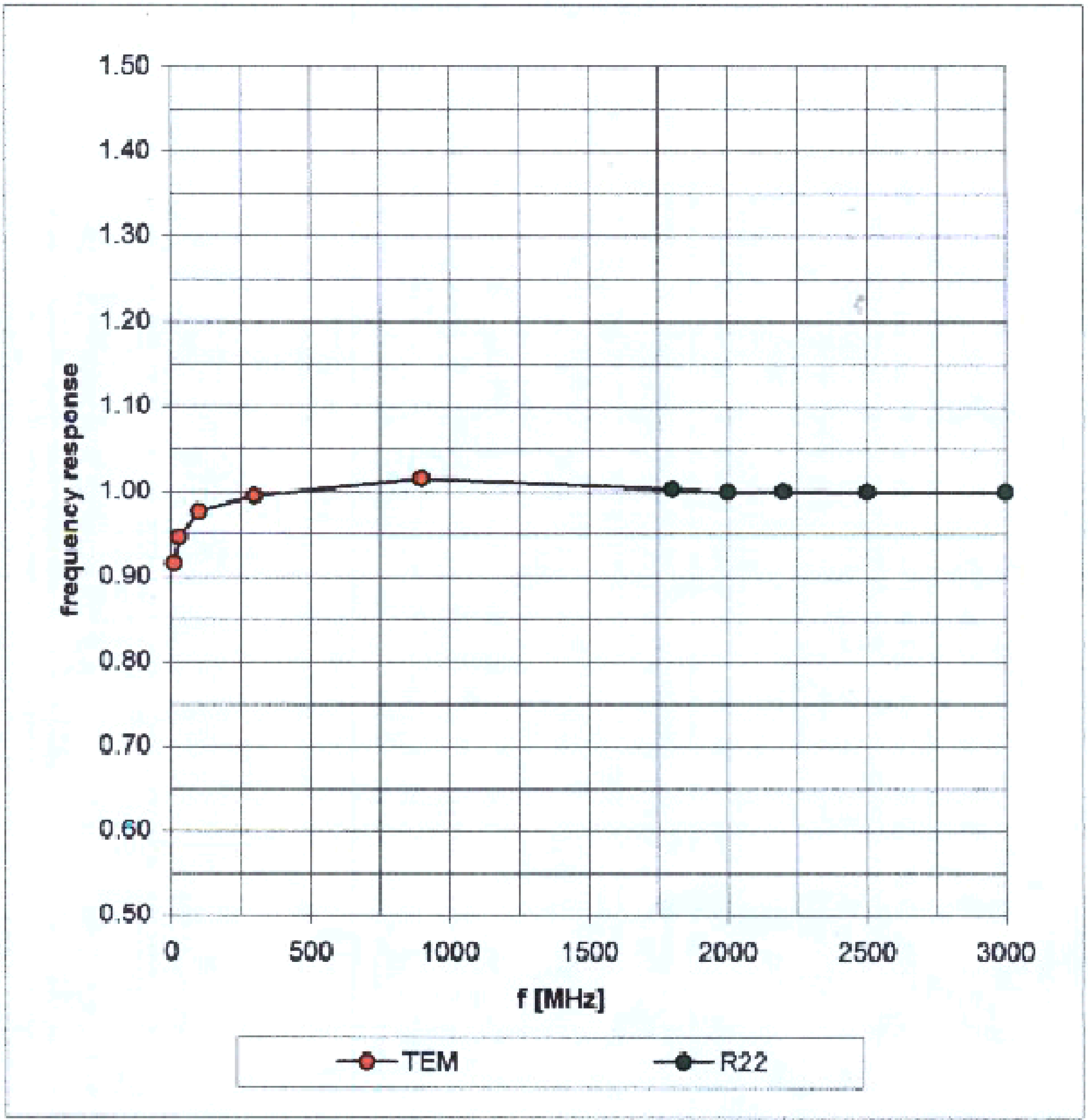


Isotropy Error (Φ), θ = 0°



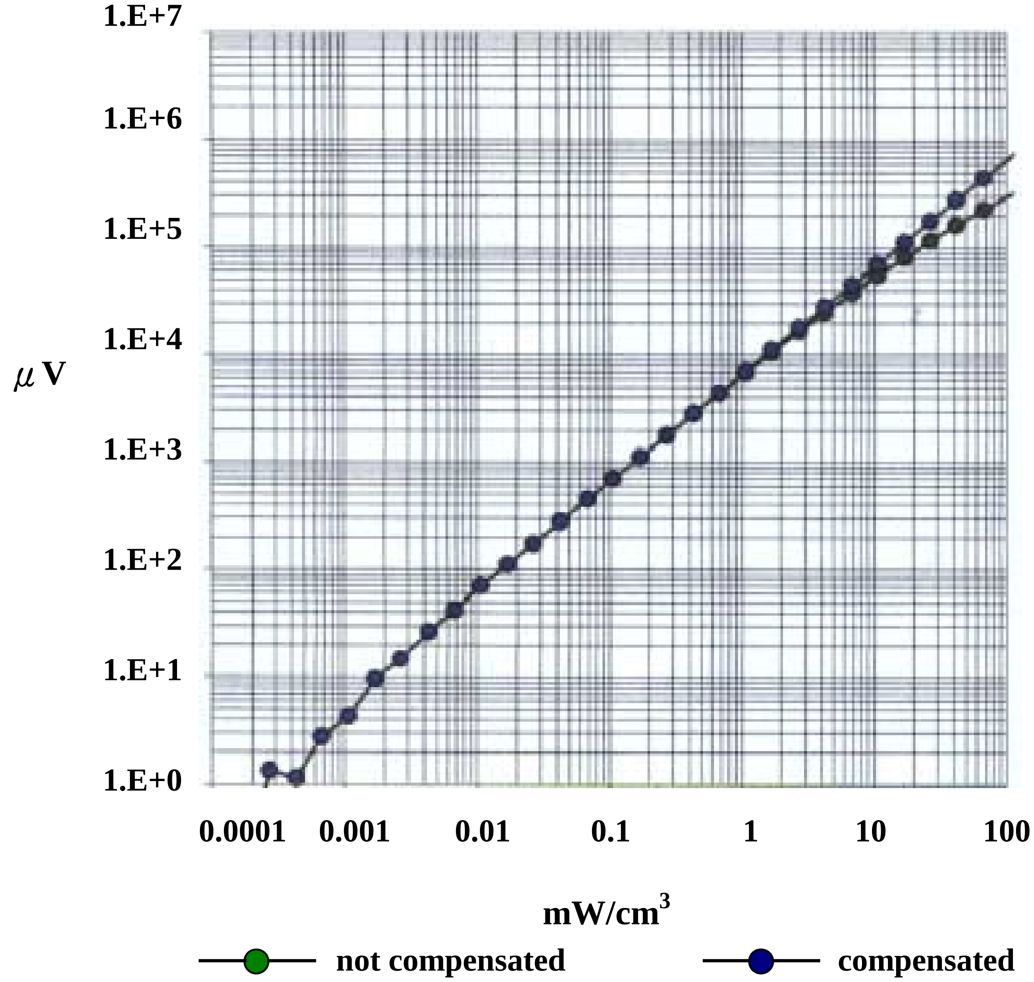
Frequency Response of E-Field

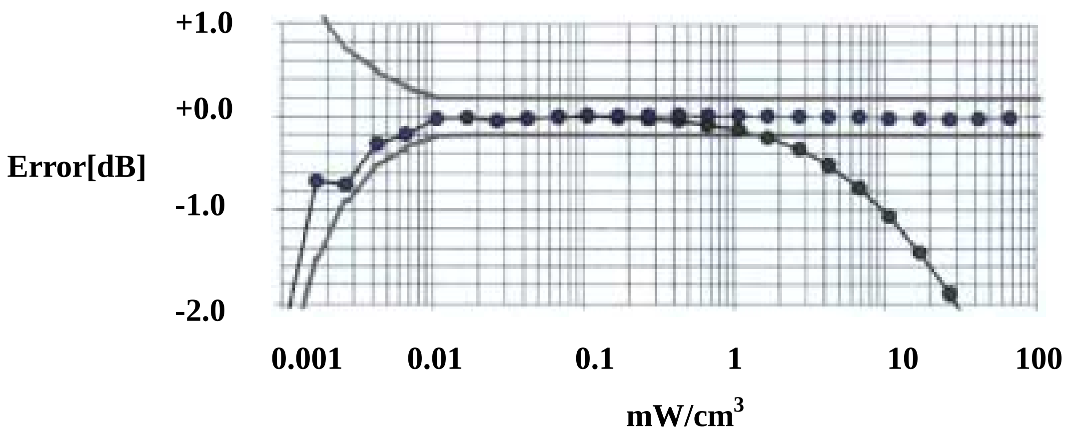
(TEM – Cell:ifi110, Waveguide R22)



Dynamic Range f (SAR $_{brain}$)

(Waveguide R22)





Schmid & Partner
Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:	ET3DV6
Serial Number:	1687
Place of Calibration:	Zurich
Date of Calibration:	September 28, 2002
Calibration Interval:	12 months

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

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

Calibrated by: D. Vetter

Approved by: [signature]

Schmid & Partner
Engineering AG

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

Probe ET3DV6

SN:1687

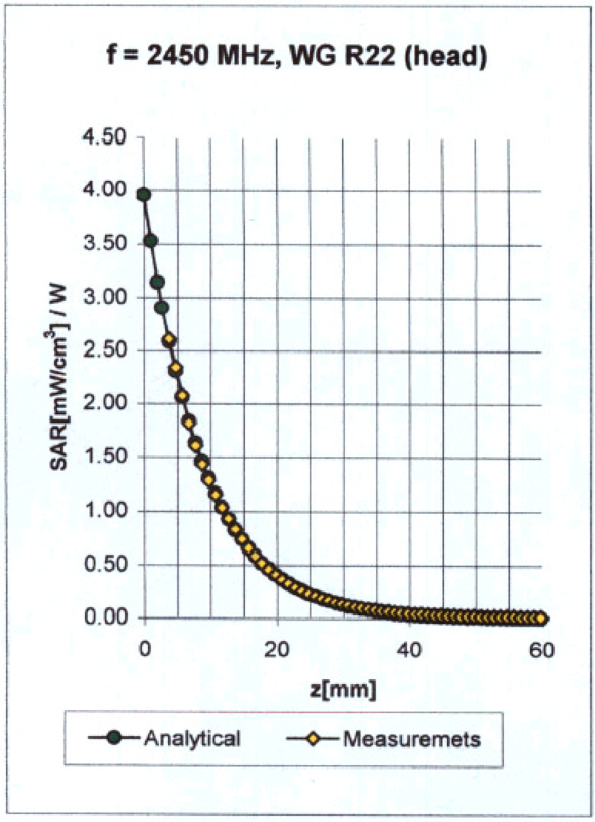
Additonal Conversion Factors

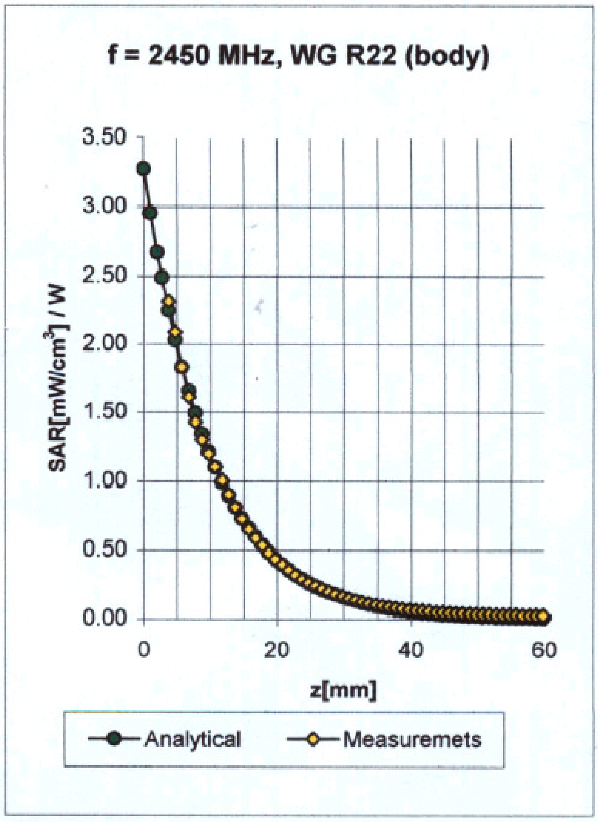
Calibrated: September 28, 2002

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Conversion Factor Assessment





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

ConvF X	**4.9** ± 8.9% (k=2)		Boundary effect:	
ConvF Y	**4.9** ± 8.9% (k=2)		Alpha	**1.00**
ConvF Z	**4.9** ± 8.9% (k=2)		Depth	**1.70**

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

ConvF X	**4.4** ± 8.9% (k=2)		Boundary effect:	
ConvF Y	**4.4** ± 8.9% (k=2)		Alpha	**1.00**
ConvF Z	**4.4** ± 8.9% (k=2)		Depth	**1.65**