TCC
San Diego

SAR Compliance Test Report

Test report no.:	SD-01-04	**Date of report:**	Jan 21 2004
Template version:	11-2003	**Number of pages:**	61
Testing laboratory:	Nokia Mobile Phones, Inc 12278 Scripps Summit Drive San Diego, CA 92131 Tel. 1-858-831-4695 Fax 1-858-831-6507	**Client:**	Nokia Mobile Phones, Inc 12278 Scripps Summit Drive San Diego, CA 92131 Tel. 1-858-831-5000 Fax 1-858-831-6500
Responsible test engineer:	Dan Laramie	**Product contact person:**	
Measurements made by:	Julian Kim		
Tested device:	RM-11		
FCC ID (USA):	QMNRM-11	**Industry Canada ID:**	661X-RM11

Testing has been carried out in accordance with:

47CFR §2.1093
Radiofrequency Radiation Exposure Evaluation: Portable Devices

FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01)
Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

RSS-102
Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields

IEEE P1528/D1.2, April 21, 2003
Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques

Documentation: The documentation of the testing performed on the tested devices is archived for 15 years at TCC San Diego.

Test results: **The tested device complies with the requirements in respect of all parameters subject to the test.** The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.

Date and signatures: January 21, 2004

For the contents:

Esa Kontkanen
Engineering Manager

Dan Laramie
Test Engineer

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CONTENTS

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Summary of SAR Test Report

1.1 Test Details

Period of test	Dec 16 2003 to Jan 16 2004
SN, HW and SW numbers of tested device	060/09510465, HWID 3.000f, H125 03W24 01.nbr
Batteries used in testing	BLD-3
Headsets used in testing	HDS-3, HDB-4
Other accessories used in testing	None
State of sample	prototype
Notes	

1.2 Maximum Results

The maximum measured SAR values for Head configuration and Body Worn configuration are given in section 1.2.1 and 1.2.2 respectively. The device conforms to the requirements of the standard(s) when the maximum measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / *f* (MHz)	ERP/EIRP	Position	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
AMPS	384/836.52	25.43 dBm	Left, Cheek	1.6 W/kg	1.28 W/kg	PASSED
CDMA 800	384/836.52	23.73 dBm	Left, Cheek	1.6 W/kg	0.95 W/Kg	PASSED
CDMA 1900	600/1880.00	25.55 dBm	Left, Cheek	1.6 W/kg	1.29 W/Kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / *f* (MHz)	ERP/EIRP	Separation distance	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
AMPS	991/824.04	24.83 dBm	2.2 cm	1.6 W/kg	0.70 W/kg	PASSED
CDMA 800	384/836.52	23.73 dBm	2.2 cm	1.6 W/kg	0.67 W/Kg	PASSED
CDMA 1900	600/1880.00	25.55 dBm	2.2 cm	1.6 W/kg	0.48 W/Kg	PASSED

1.2.3 Maximum Drift

Maximum drift during measurements	-0.33 dB

1.2.4 Measurement Uncertainty

Extended Uncertainty (k=2) 95%	± 29.1 %

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2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	portable
Exposure environment	general population/uncontrolled

Modes and Bands of Operation	AMPS 800	CDMA 800 (IS-95/IS-2000)	CDMA1900 (IS-95/IS-2000)
Modulation Mode	FM	QPSK	QPSK
Duty Cycle	1	1	1
Transmitter Frequency Range (MHz)	824.04 - 848.97	824.70 – 848.31	1851.25 – 1908.75

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2.1 Picture of the Device

2.2 Description of the Antenna

The device has an internal patch antenna located near the top on the battery (back) side of the phone.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Period of measurement:	Dec 16 2003 to Jan 16 2004
Ambient temperature (°C):	20 °C to 24 ° C
Ambient humidity (RH %):	30 % to 60 %

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3.2 Test Signal, Frequencies, and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

In all operating bands the measurements were performed on the lowest, middle and highest channels.

The power output was measured by a separate accredited test laboratory on the same unit as used for SAR testing.

4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement System and Components

The measurements were performed using an automated near-field scanning system, DASY 3 software version 13.1 4-3100, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements on the device was the 'worst-case extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DASY3 DAE V1	604	12 months	10/2004
E-field Probe ET3DV6	1516	12 months	02/2004
Dipole Validation Kit, D835V2	479	24 months	11/2005
Dipole Validation Kit, D1800V2	534	24 months	09/2005

Additional test equipment used in testing:

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Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	Agilent E4436B	US39260114	24 months	03/2004
Amplifier	Milmega AS0822-8L	1004832	-	-
Power Meter	Agilent E4417A	GB41290918	12 months	11/2004
Power Sensor	Agilent E9327A	US40440897	12 months	11/2004
Power Sensor	Agilent E9327A	US40440896	12 months	11/2004
Vector Network Analyzer	8753 ES	MY40002861	12 months	07/2004
Dielectric Probe Kit	HP85070D	US01440005	-	-
Call Tester	HP 8285A	US39220140	24 months	09/2005

4.1.1 Isotropic E-field Probe SN 1516

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., butyl diglycol)
Calibration	Calibration certificate in Appendix A
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
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
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

The phantom used for all tests i.e. for both validation testing and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE P1528/D1.2, April 21, 2003 (as established by sub committee SCC-34/SC-2).

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Validation tests were performed using the flat section, while Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

The SPEAG device holder (see Section 5.1) was used to position the device in all tests while a tripod was used to position the validation dipoles against the flat section of phantom.

4.3 Simulating Liquids

Recommended values for the dielectric parameters of the simulating liquids are given in IEEE P1528/D1.2, April 21, 2003 and FCC Supplement C to OET Bulletin 65. All tests were carried out using liquids whose dielectric parameters were within ± 5% of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters. The body and head liquid tissue simulants were manufactured by SPEAG, but kept within specification by Nokia San Diego.

The depth of the liquid was 15.0 ± 0.5 cm measured from the ear reference point during validation and device measurements.

4.3.1 Liquid tissue

The following liquids were used for Head and Body liquids:

800MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	51.07	65.45
HEC	0.23	-
Sugar	47.31	34.31
Preservative	0.24	0.10
Salt	1.15	0.62

1900MHz band

Liquid Supplier	Head (% by weight)	Body (% by weight)
Deionised Water	54.88%	69.02
Butyl Diglycol	44.91	30.76
Salt	0.21	0.22

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4.3.2 Verification of the System

The manufacturer calibrates the probes annually. Dielectric parameters of the simulating liquids were measured every day using the dielectric probe kit and the network analyser. A SAR measurement was made following the determination of the dielectric parameters of the liquids, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The validation results (dielectric parameters and SAR values) are given in the table below.

System verification, head tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ε_r	σ [S/m]	
835	Reference result	2.31	41.22	0.88	N/A
	± 10% window	2.08 to 2.54			
	12/18/03	2.36	42.6	0.89	20.2
	12/19/03	2.42	42.3	0.91	20.3
	1/06/04	2.42	41.4	0.89	20.8
	1/07/04	2.43	41.6	0.90	21.1
	1/08/04	2.43	41.8	0.90	21.1
1900	Reference result	10.1	40.17	1.46	N/A
	± 10% window	9.09 to 11.11			
	12/22/03	10.7	40.4	1.45	20.3
	12/23/03	10.8	40.1	1.44	23
	1/13/04	10.8	38.6	1.46	22.3

System verification, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ε_r	σ [S/m]	
835	Reference result	2.48	54.98	0.98	N/A
	± 10% window	2.23 to 2.73			
	12/31/03	2.45	55.0	0.96	20.3
	1/05/04	2.51	55.6	0.98	20.2
1900	Reference result	10.5	50.87	1.60	N/A
	± 10% window	9.45 to 11.55			
	12/24/03	10.4	53.2	1.58	22.6
	1/14/03	10.8	53.2	1.60	21.2

Plots of the Verification scans are given in Appendix A.

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4.3.3 Tissue Simulants used in the Measurements

Head tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
836.5	Recommended value	41.5	0.90	N/A
	± 5% window	39.4 to 43.6	0.86 to 0.95	
	12/18/03	42.54	0.90	20.2
	12/19/03	42.24	0.91	20.3
	1/6/04	41.4	0.89	20.8
	1/7/04	41.6	0.90	21.1
	1/8/04	41.85	0.90	21.1
1880	Recommended value	40.0	1.40	N/A
	± 5% window	38.0 to 42.0	1.33 to 1.47	
	12/22/03	40.52	1.44	20.3
	12/23/03	38.67	1.42	23
	1/13/04	38.67	1.45	22.3

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
836.5	Recommended value	55.2	0.97	N/A
	± 5% window	52.4 to 58.0	0.92 to 1.02	
	12/31/03	54.99	0.96	20.3
	1/05/04	55.53	0.99	20.2
1880	Recommended value	53.3	1.52	N/A
	± 5% window	50.6 to 56.0	1.44 to 1.60	
	12/24/03	53.3	1.57	22.6
	1/14/03	53.31	1.60	21.2

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5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.

Device holder supplied by SPEAG

A Nokia designed spacer (illustrated below) was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.

Nokia spacer

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5.2 Test Positions

5.2.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE P1528/D1.2 April 21 2003 "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”.

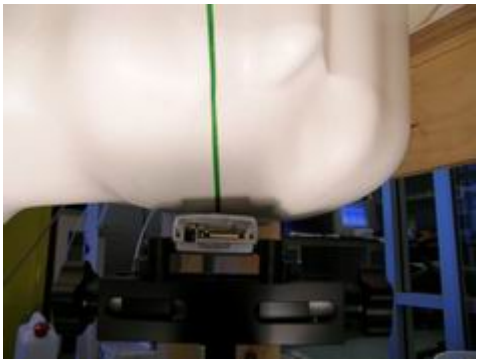

Photo of the device in “cheek” position

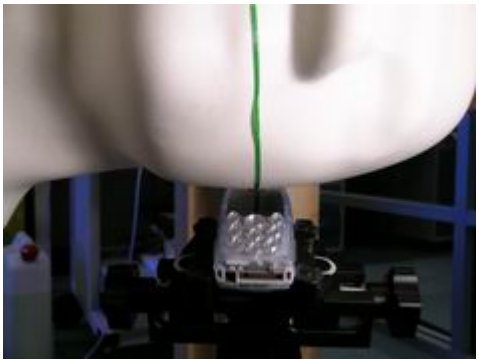

Photo of the device in “tilt” position

5.2.2 Body Worn Configuration

The device was placed in the SPEAG holder using the Nokia spacer and placed below the flat section of the phantom. The distance between the device and the phantom was kept at 2.2 cm using a separate flat spacer that was removed before the start of the measurements. The device was oriented with its antenna facing the phantom since this orientation gave higher results.

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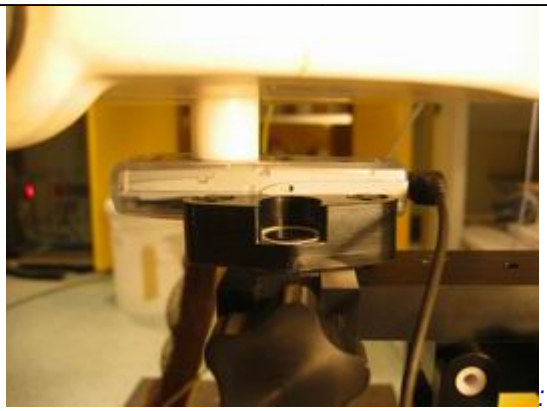

Photo of the device positioned for Body SAR measurement. The spacer was removed for the tests.

5.3 Scan Procedures

First coarse scans were used for determination of the field distribution. Next a cube scan, 5x5x7 was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the coarse scan and again at the end of the cube scan.

5.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation of the points was done with a 3d-Spline. The 3d-Spline comprised three one-dimensional splines with the "Not a knot" -condition [W. Gander, Computermathematik, p. 141-150] (x, y and z -directions) [Numerical Recipes in C, Second Edition, p 123].

The extrapolation was based on least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 30 mm in all z-axis, a fourth order polynomial was calculated. This polynomial was then used to evaluate the points between the phantom surface and the probe tip. The points, calculated from the phantom surface, were at 1mm spacing.

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6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation

Uncertainty Component	P1528 Sec	Tol. (%)	Prob Dist	Div	c_i	u_i (%)	v_i
Measurement System							
Probe Calibration	E2.1	±4.8	N	1	1	±4.8	∞
Axial Isotropy	E2.2	±4.7	R	√3	$(1\text{-}c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	E2.2	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	E2.3	±8.3	R	√3	1	±4.8	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Readout Electronics	E2.6	±1.0	N	1	1	±1.0	∞
Response Time	E2.7	±0.8	R	√3	1	±0.5	∞
Integration Time	E2.8	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	E6.1	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	E6.1	±3.0	R	√3	1	±1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	±0.4	R	√3	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	±2.9	R	√3	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5.2	±3.9	R	√3	1	±2.3	∞
Test sample Related							
Test Sample Positioning	E4.2.1	±6.0	N	1	1	±6.0	11
Device Holder Uncertainty	E4.1.1	±5.0	N	1	1	±5.0	7
Output Power Variation - SAR drift measurement	6.6.3	±10.0	R	√3	1	±5.8	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Liquid Conductivity Target - tolerance	E3.2	±5.0	R	√3	0.64	±1.8	∞
Liquid Conductivity - measurement uncertainty	E3.3	±5.5	N	1	0.64	±3.5	5
Liquid Permittivity Target tolerance	E3.2	±5.0	R	√3	0.6	±1.7	∞
Liquid Permittivity - measurement uncertainty	E3.3	±2.9	N	1	0.6	±1.7	5
Combined Standard Uncertainty			RSS			±14.5	187
Coverage Factor for 95%			k=2				
Expanded Standard Uncertainty						±29.1	

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7. RESULTS

The measured Head SAR values for the test device are tabulated below:

Head SAR results

Mode and Band	Position		SAR, averaged over 1g (W/kg)		
			Ch 991 824.04 MHz	Ch 384 836.52 MHz	Ch 799 848.97 MHz
AMPS 800	Power level		24.83 dBm	25.43 dBm	24.73 dBm
	Left	Cheek	0.95	1.28	1.02
		Tilt	0.68	0.67	0.54
	Right	Cheek	0.87	1.14	0.96
		Tilt	0.66	0.67	0.57
CDMA 800			Ch 1013 824.73 MHz	Ch 384 836.52 MHz	Ch 777 848.31 MHz
	Power level		23.43 dBm	23.73 dBm	23.23 dBm
	Left	Cheek	0.76	0.95	0.79
		Tilt	0.48	0.54	0.43
	Right	Cheek	0.83	0.90	0.75
		Tilt	0.50	0.61	0.44
CDMA 1900			Ch 25 1851.2 MHz	Ch 600 1880 MHz	Ch 1175 1908.8MHz
	Power level		25.88 dBm	25.55 dBm	25.02 dBm
	Left	Cheek	1.28	1.29	0.78
		Tilt	1.12	1.14	0.68
	Right	Cheek	1.01	0.97	0.65
		Tilt	0.88	0.88	0.67

The measured Body SAR values for the test device are tabulated below:

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Body SAR results

Mode and Band	Body-worn location setup	SAR, averaged over 1g (W/kg)		
AMPS 800		Ch 991 824.04 MHz	Ch 384 836.52 MHz	Ch 799 848.97 MHz
	Power Level	24.83 dBm	25.43 dBm	24.73 dBm
	Headset HDS-3 with 22 mm space	0.70	0.62	0.66
	Optional headset HDB-4 with 22 mm space	0.52	0.65	0.68
CDMA 800		Ch 1013 824.73 MHz	Ch 384 836.52 MHz	Ch 777 848.31 MHz
	Power Level	23.43 dBm	23.73 dBm	23.23 dBm
	Headset HDS-3 with 22 mm space	0.56	0.65	0.57
	Optional headset HDB-4 with 22 mm space	0.58	0.67	0.53
CDMA 1900		Ch 25 1851.25 MHz	Ch 600 1880 MHz	Ch 1175 1908.75MHz
	Power Level	25.88 dBm	25.55 dBm	25.02 dBm
	Headset HDS-3 with 22 mm space	0.42	0.44	0.38
	Optional headset HDB-4 with 22 mm space	0.42	0.48	0.43

Plots of the Measurement scans are given in Appendix B.

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APPENDIX A: VALIDATION SCANS

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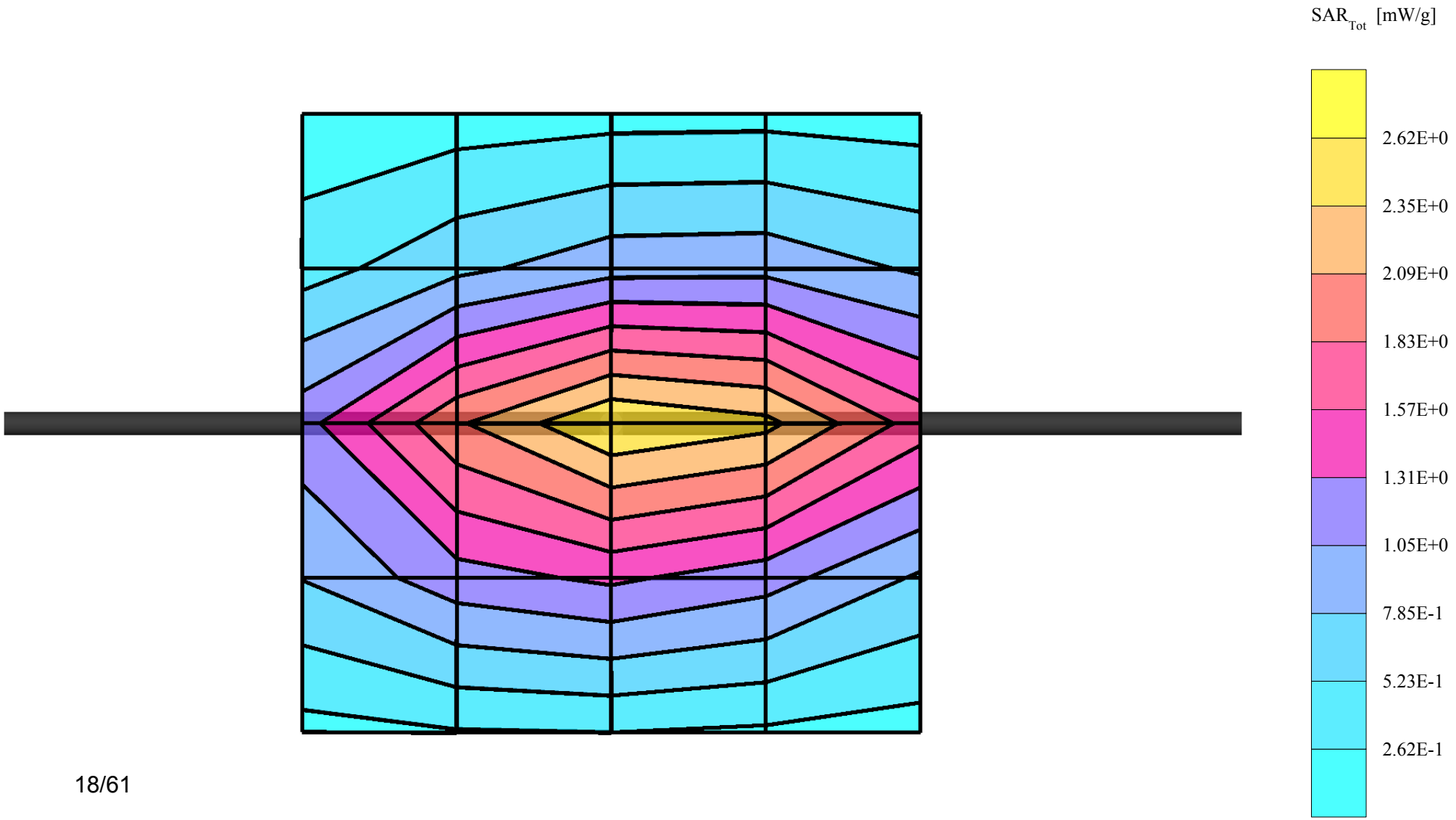
Dipole 835 MHz, Head Validation

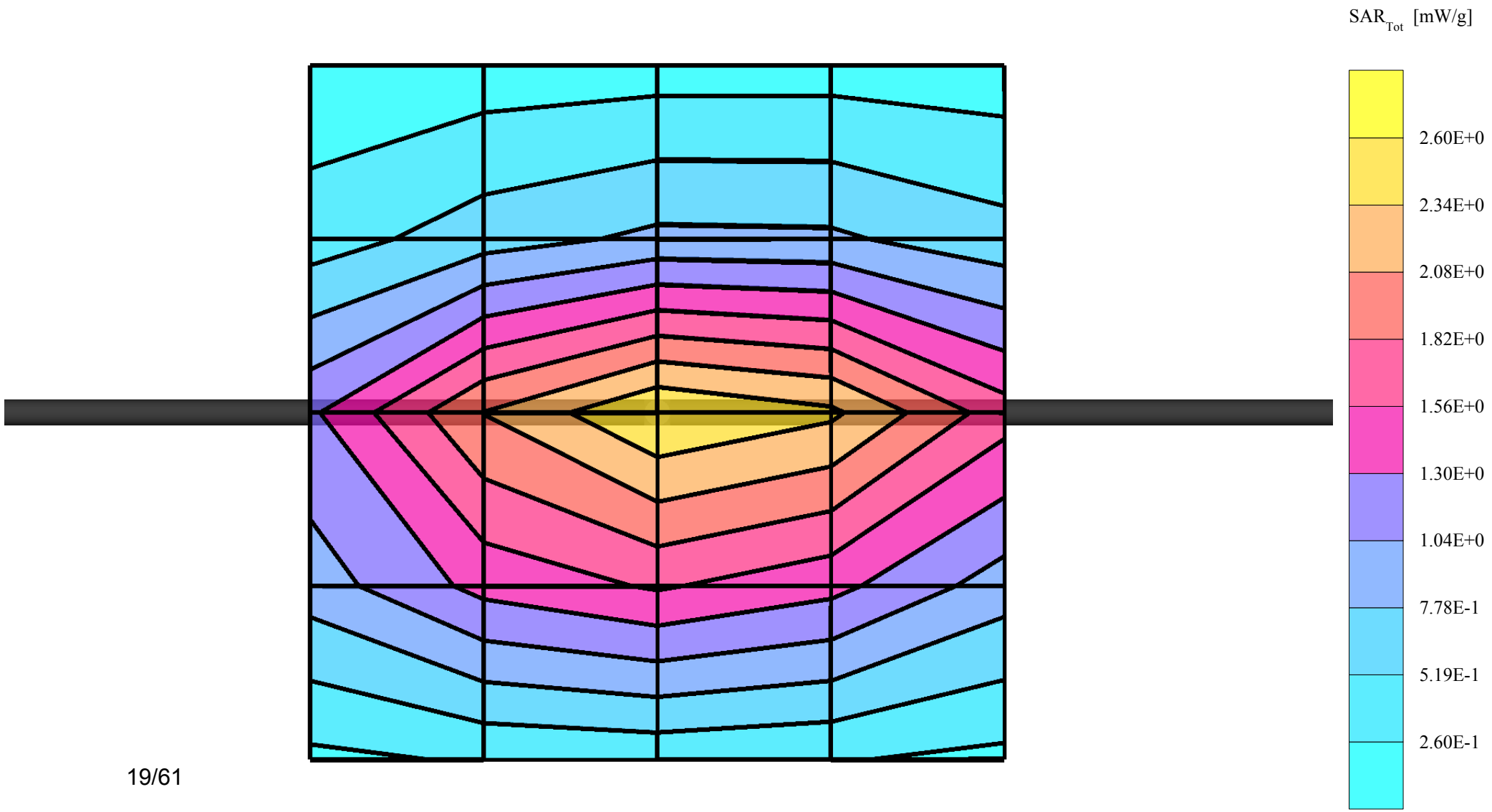
SAM 1 (Cellular - Brain Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Brain Tissue: $\sigma = 0.89$ mho/m $\varepsilon_r = 42.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cubes (2): Peak: 3.50 mW/g ± 0.05 dB, SAR (1g): 2.36 mW/g ± 0.05 dB, SAR (10g): 1.55 mW/g ± 0.04 dB, (Advanced extrapolation)
Penetration depth: 13.2 (12.7, 13.8) [mm]
Powerdrift: -0.03 dB
Liquid Temperature (degree C): 20.2



18/61

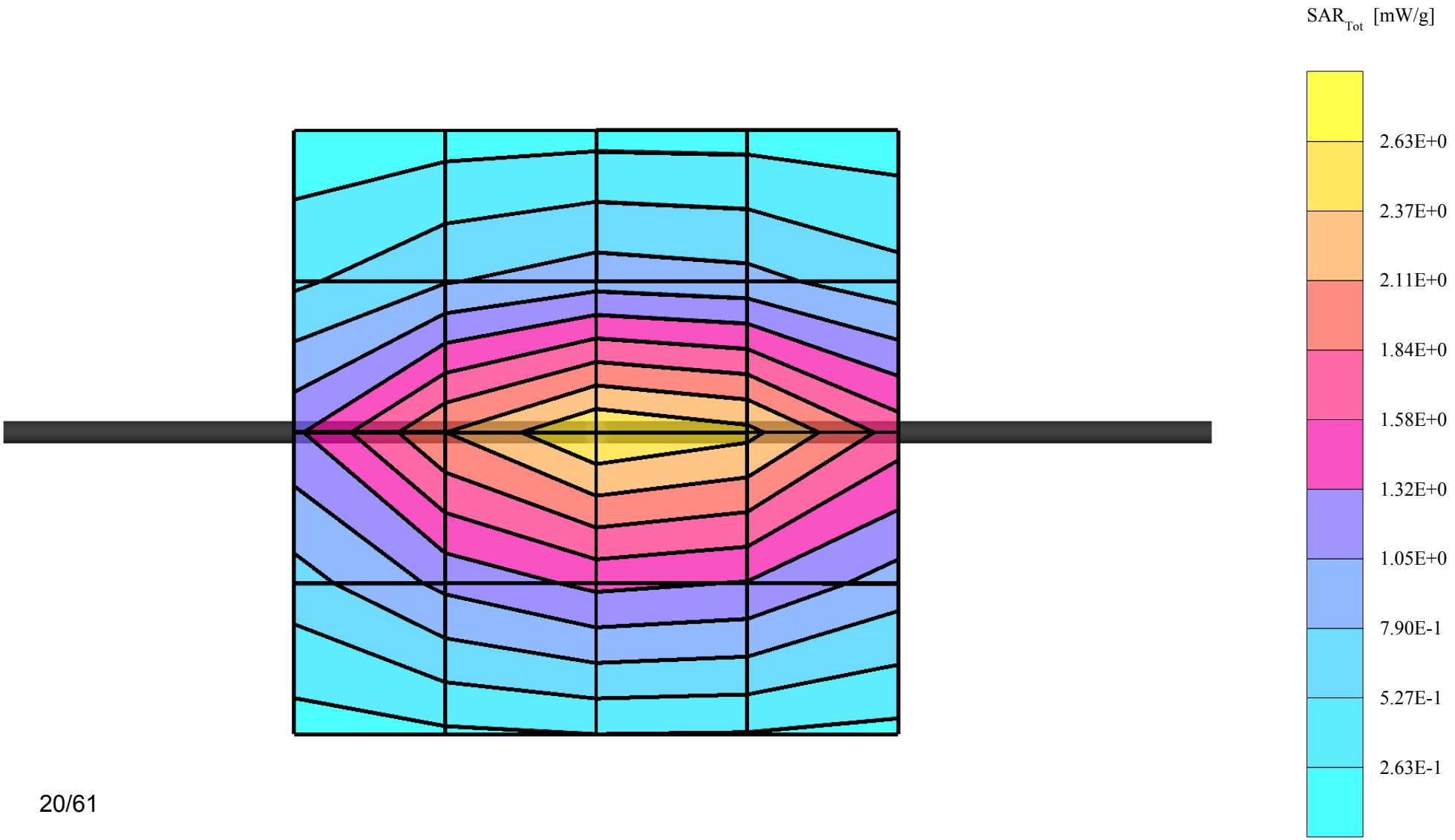
Dipole 835 MHz, Head Validation

SAM 1 (Cellular - Brain Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Brain Tissue: $\sigma = 0.91$ mho/m $\varepsilon_r = 42.3$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cubes (2): Peak: 3.59 mW/g ± 0.04 dB, SAR (1g): 2.42 mW/g ± 0.04 dB, SAR (10g): 1.59 mW/g ± 0.03 dB, (Advanced extrapolation)
Penetration depth: 13.3 (12.8, 13.9) [mm]
Powerdrift: -0.02 dB
Liquid Temperature (degree C): 20.3



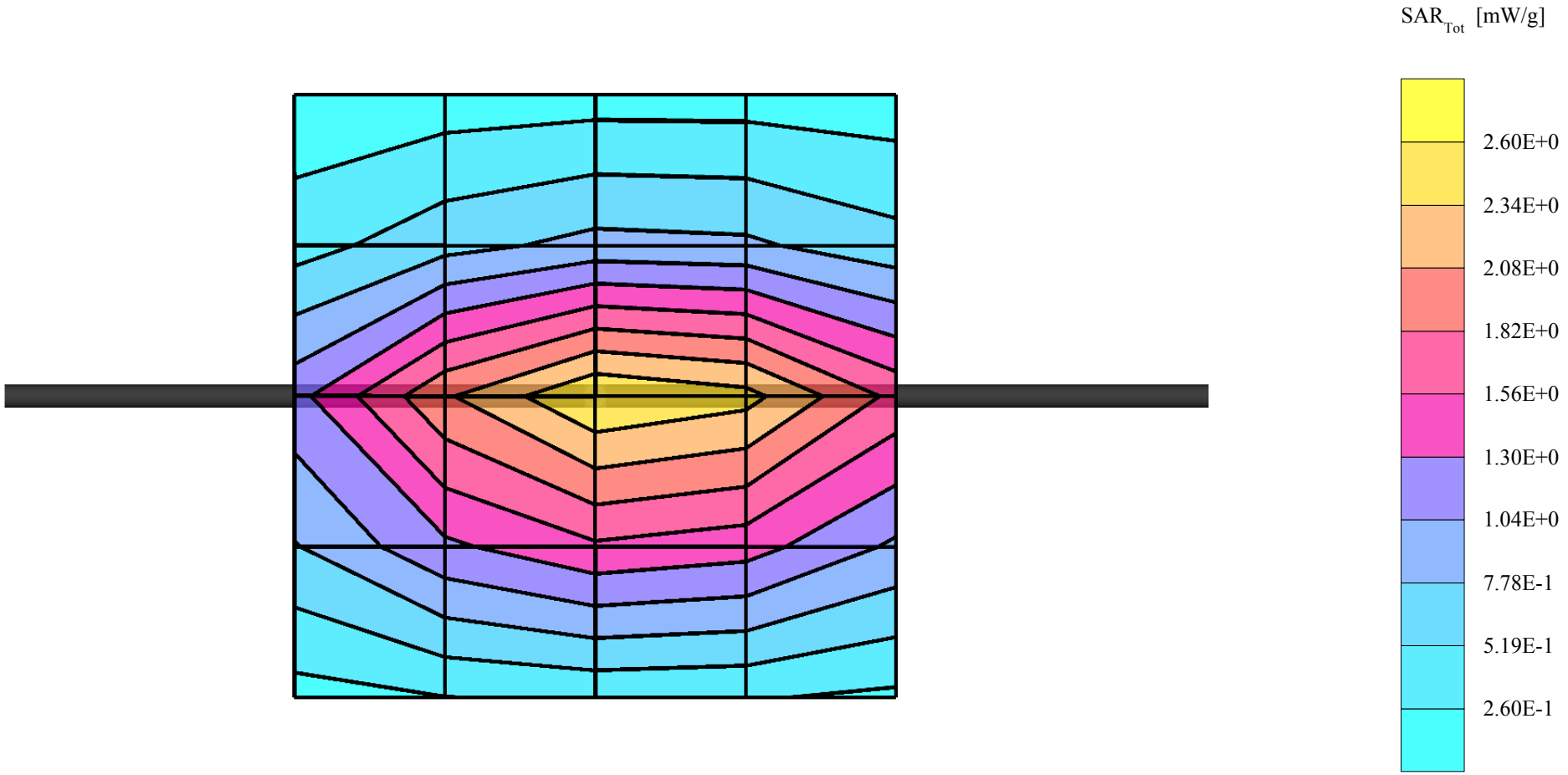
Dipole 835 MHz, Head Validation

SAM 1 (Cellular - Brain Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Brain Tissue: $\sigma = 0.89$ mho/m $\varepsilon_r = 41.4$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cubes (2): Peak: 3.62 mW/g ± 0.05 dB, SAR (1g): 2.42 mW/g ± 0.06 dB, SAR (10g): 1.58 mW/g ± 0.06 dB, (Advanced extrapolation)
Penetration depth: 13.0 (12.4, 13.7) [mm]
Powerdrift: -0.02 dB
Liquid Temperature (degree C): 20.8



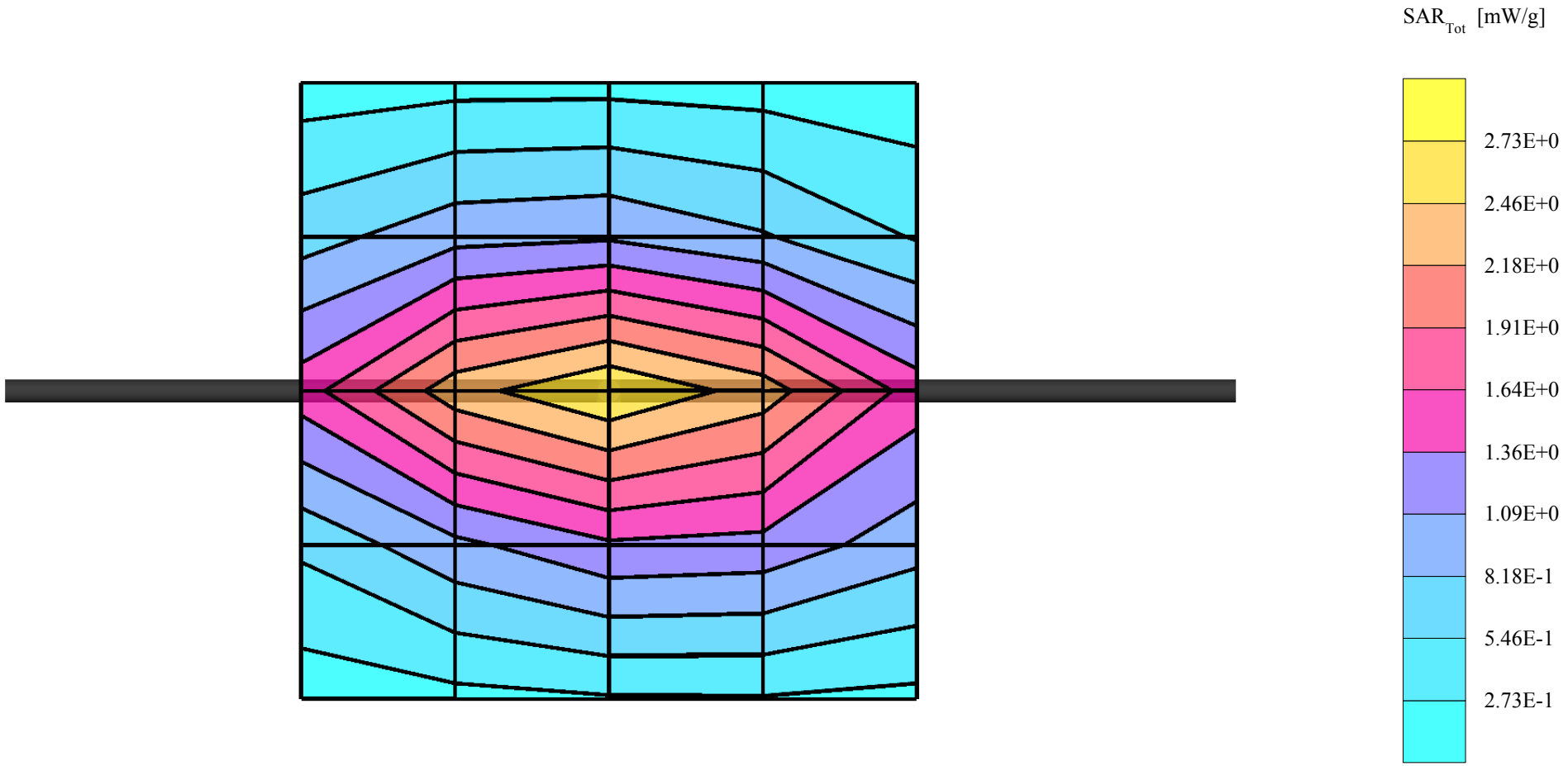
Dipole 835 MHz, Head Validation

SAM 1 (Cellular - Brain Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Brain Tissue: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cubes (2): Peak: 3.61 mW/g ± 0.06 dB, SAR (1g): 2.43 mW/g ± 0.05 dB, SAR (10g): 1.59 mW/g ± 0.05 dB, (Advanced extrapolation)
Penetration depth: 13.1 (12.6, 13.8) [mm]
Powerdrift: -0.03 dB
Liquid Temperature (degree C): 21.1



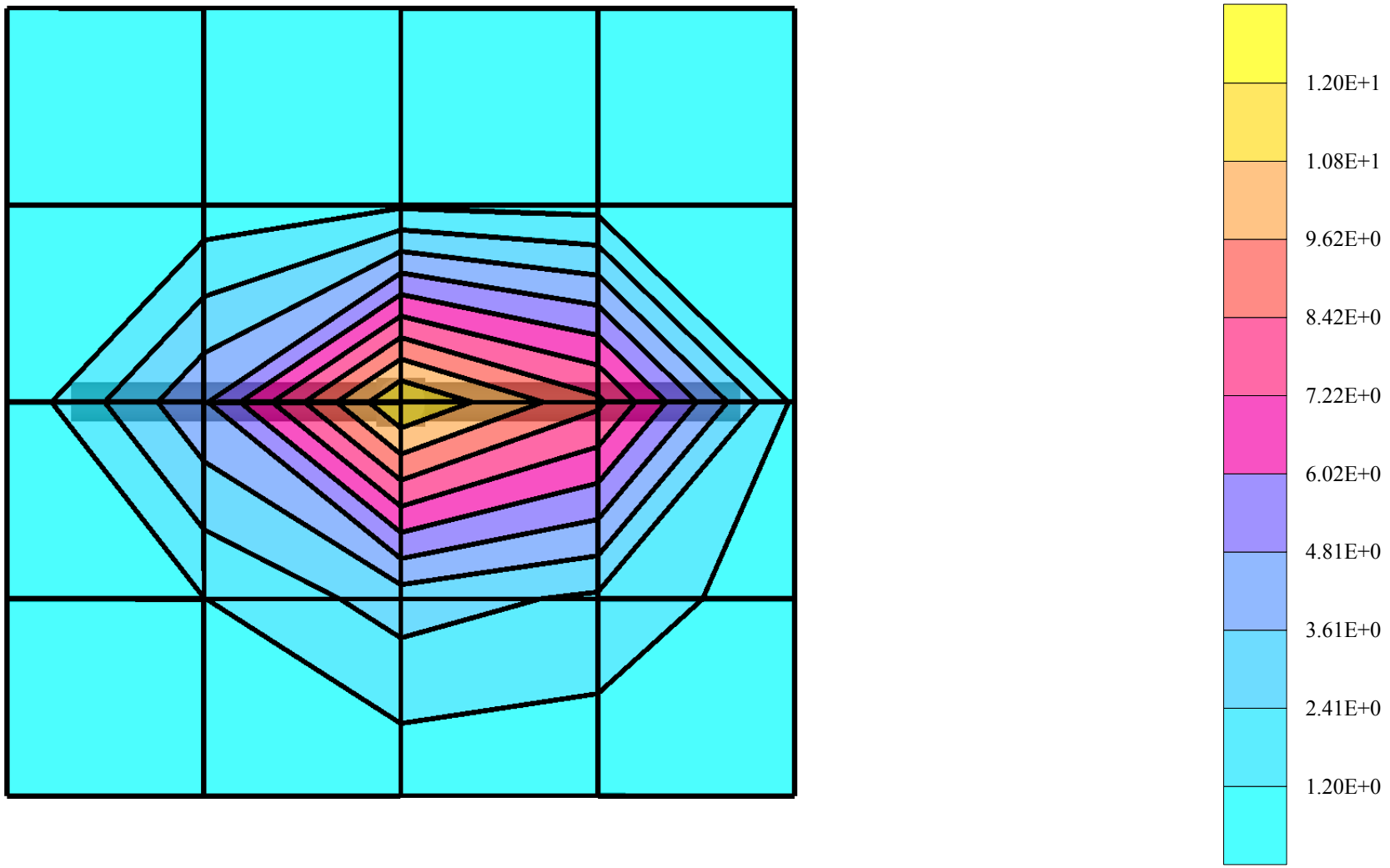
Dipole 835 MHz, Head Validation

SAM 1 (Cellular - Brain Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Brain Tissue: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.8$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cubes (2): Peak: 3.62 mW/g ± 0.02 dB, SAR (1g): 2.43 mW/g ± 0.03 dB, SAR (10g): 1.59 mW/g ± 0.04 dB, (Advanced extrapolation)
Penetration depth: 13.0 (12.5, 13.7) [mm]
Powerdrift: -0.02 dB
Liquid Temperature (degree C): 21.1



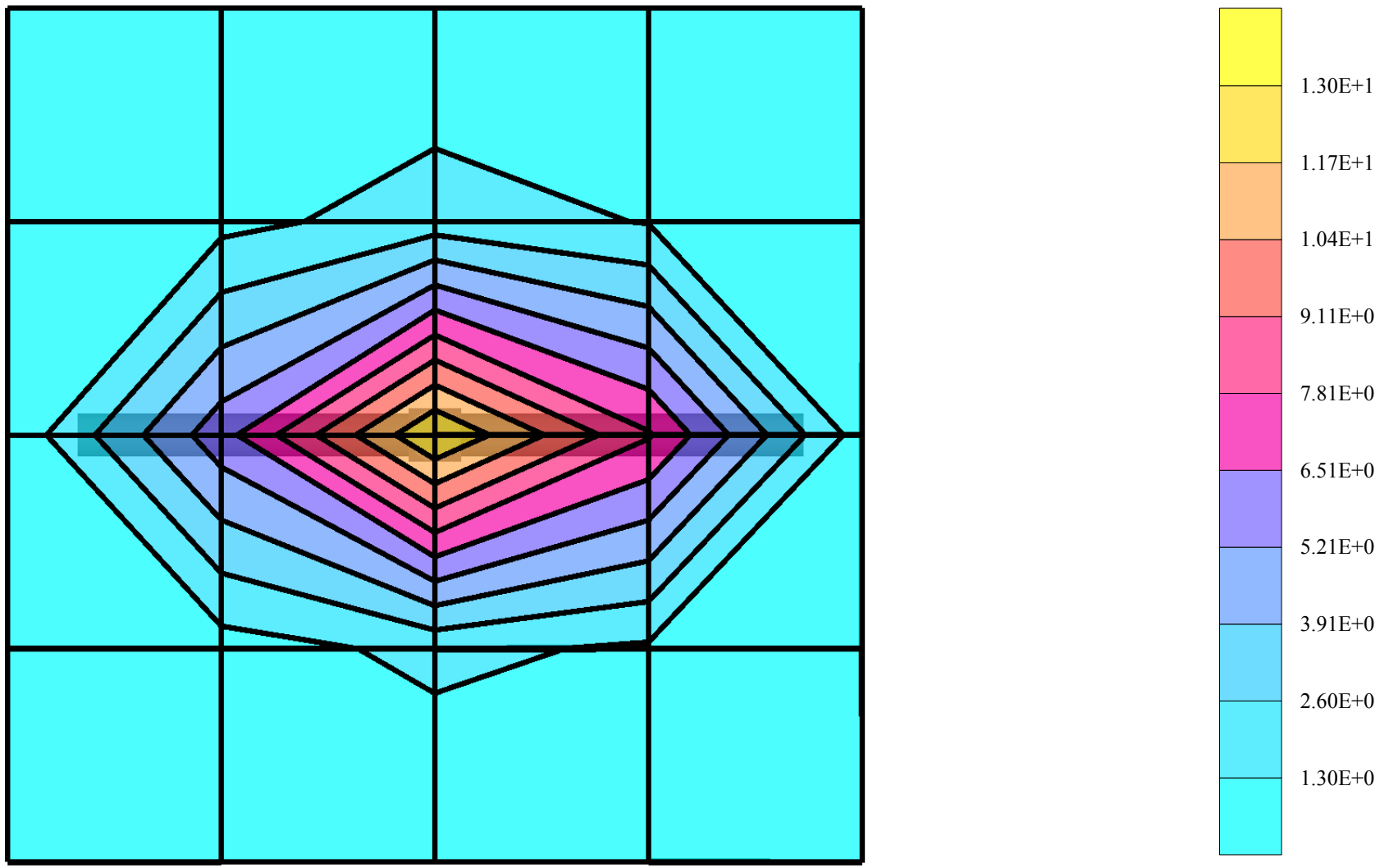
Dipole 1900 MHz, Head Validation

SAM 1 (PCS - Brain Tissue)
Frequency: 1900 MHz; Crest factor: 1.0
Validation 1900 MHz - Brain Tissue: σ = 1.45 mho/m ε_r = 40.4 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cubes (2): Peak: 19.0 mW/g ± 0.09 dB, SAR (1g): 10.7 mW/g ± 0.07 dB, SAR (10g): 5.66 mW/g ± 0.05 dB, (Advanced extrapolation)
Penetration depth: 8.8 (8.7, 9.0) [mm]
Powerdrift: 0.00 dB
Liquid Temperature (degree C): 20.3



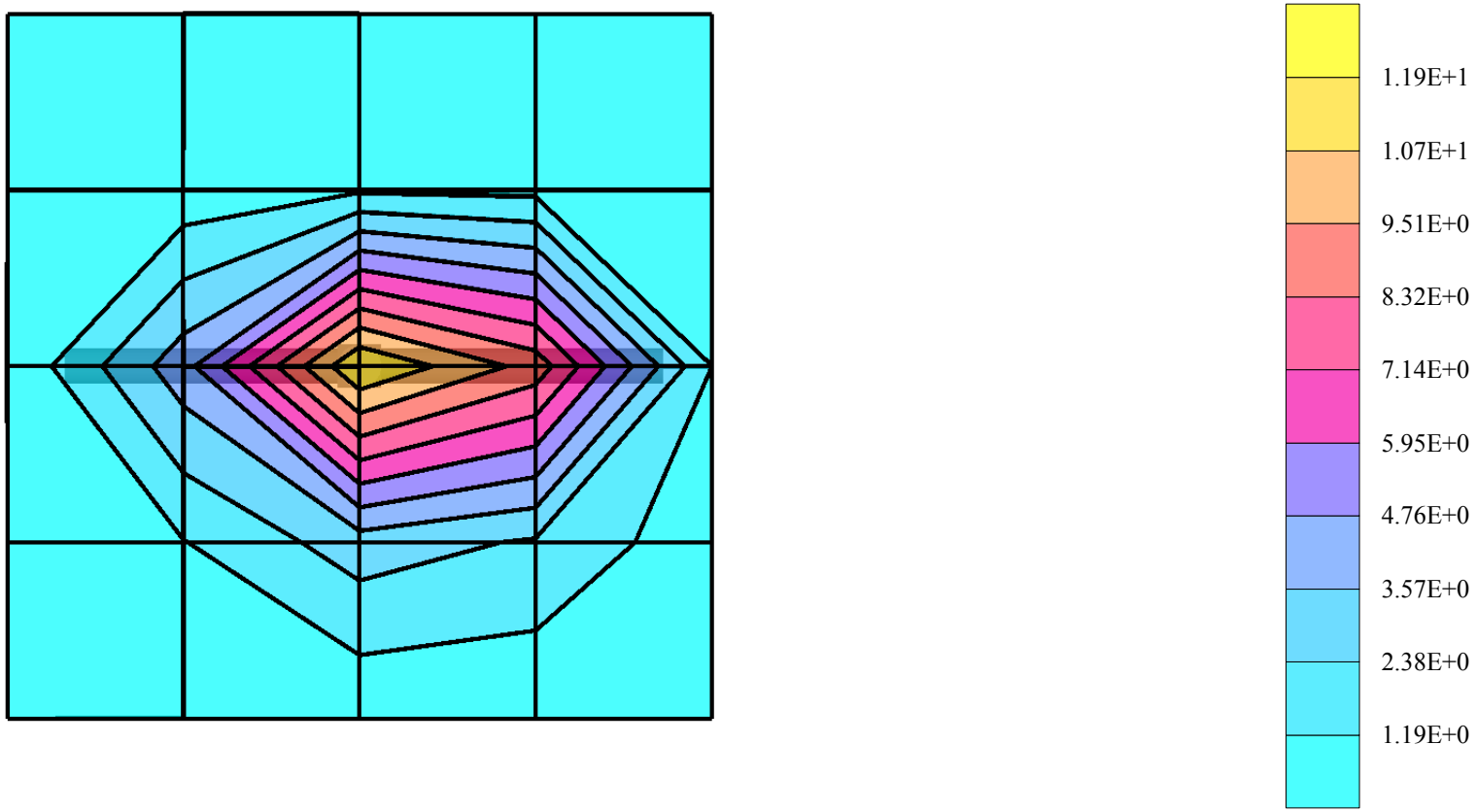
Dipole 1900 MHz, Head Validation

SAM 1 (PCS - Brain Tissue)
Frequency: 1900 MHz; Crest factor: 1.0
Validation 1900 MHz - Brain Tissue: $\sigma = 1.44$ mho/m $\varepsilon_r = 40.1$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cubes (2): Peak: 19.4 mW/g ± 0.05 dB, SAR (1g): 10.8 mW/g ± 0.06 dB, SAR (10g): 5.59 mW/g ± 0.07 dB, (Advanced extrapolation)
Penetration depth: 8.4 (8.3, 8.7) [mm]
Powerdrift: 0.00 dB
Liquid Temperature (degree C): 23.0



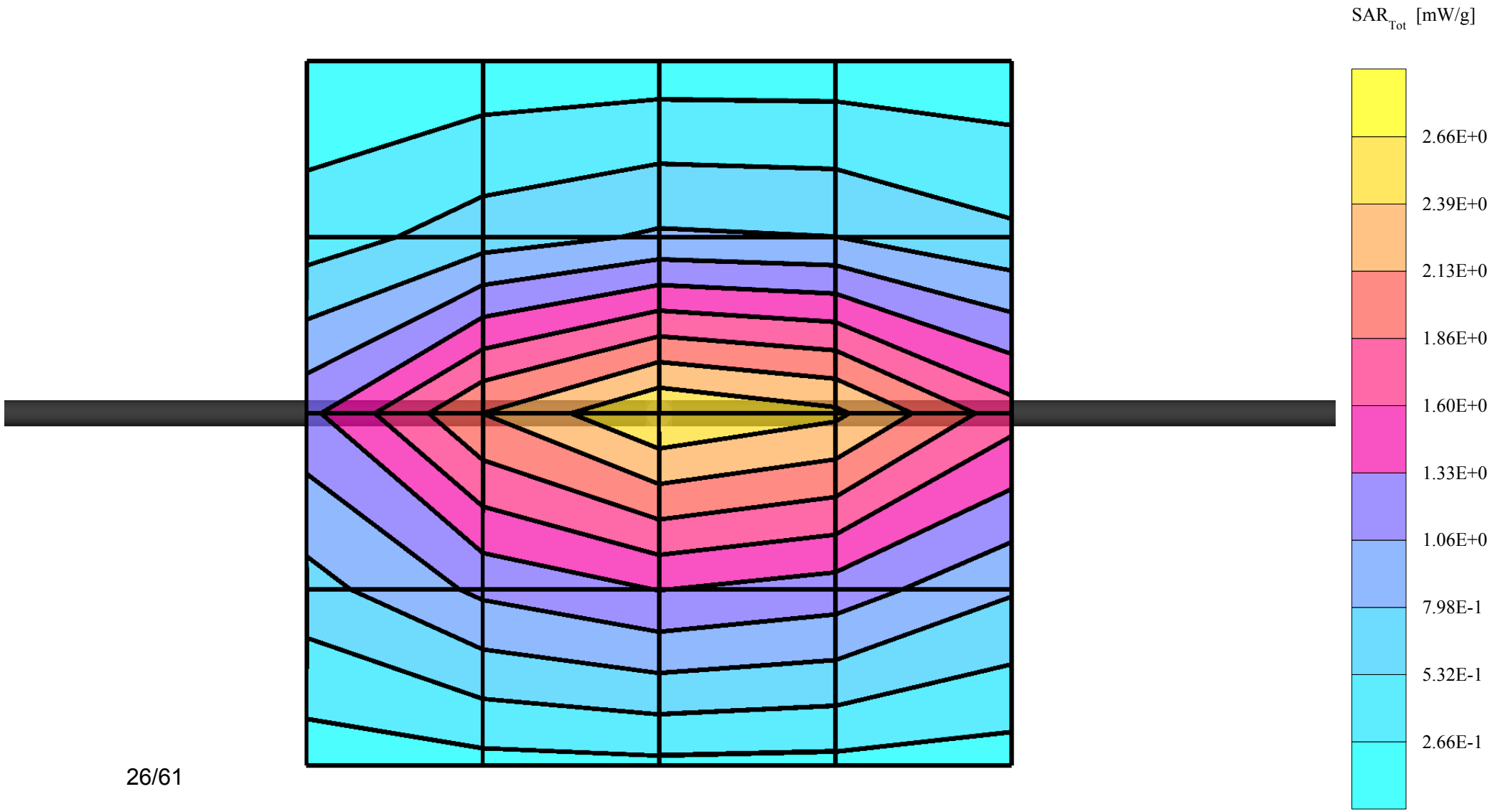
Dipole 1900 MHz, Head Validation

SAM 1 (PCS - Brain Tissue)
Frequency: 1900 MHz; Crest factor: 1.0
Validation 1900 MHz - Brain Tissue: σ = 1.46 mho/m ε_r = 38.6 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cubes (2): Peak: 19.2 mW/g ± 0.10 dB, SAR (1g): 10.8 mW/g ± 0.07 dB, SAR (10g): 5.61 mW/g ± 0.04 dB, (Advanced extrapolation)
Penetration depth: 8.5 (8.4, 8.7) [mm]
Powerdrift: -0.02 dB
Liquid Temperature (degree C): 22.3



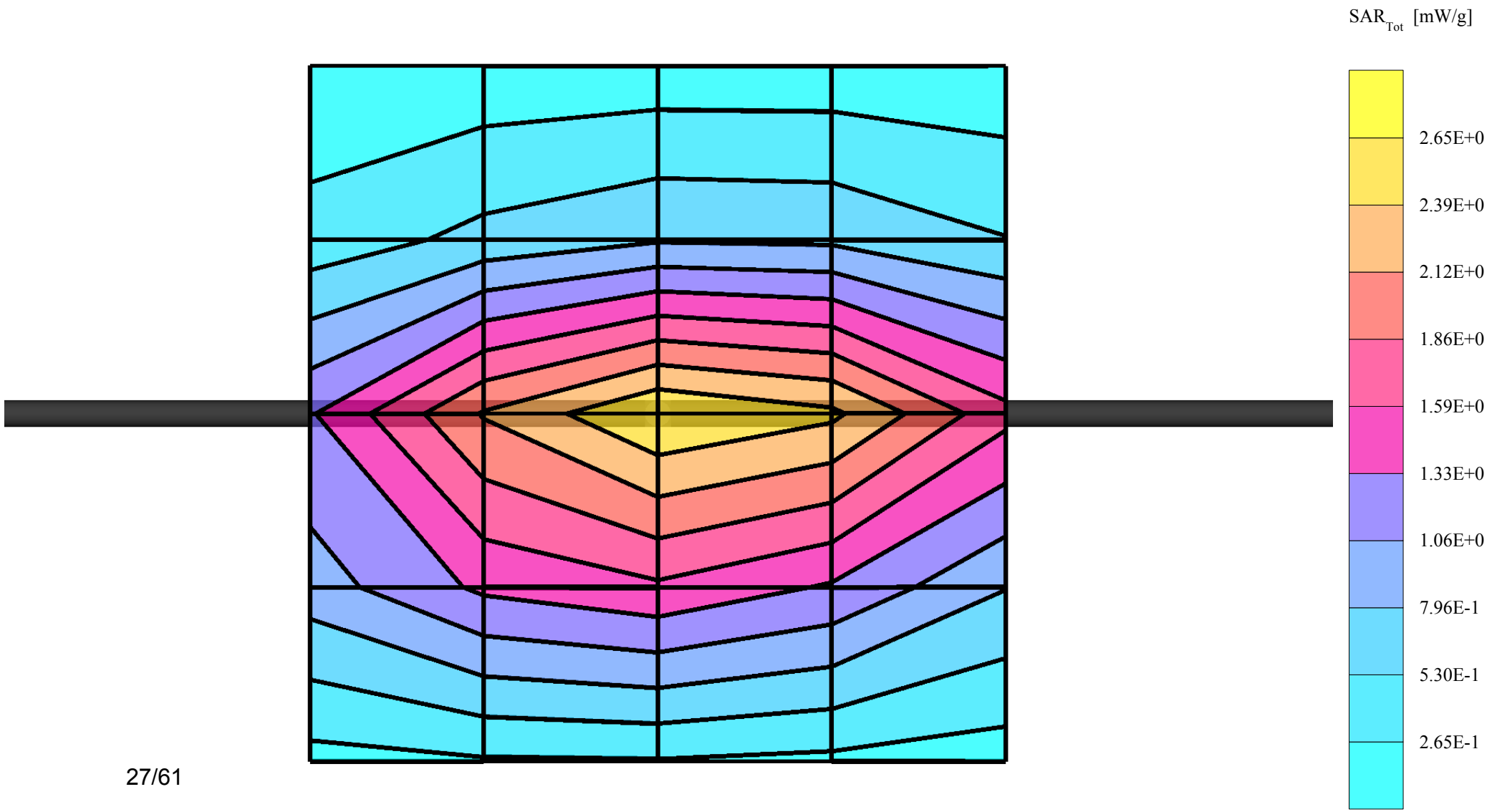
Dipole 835 MHz, Body Validation

SAM 1 (Cellular - Muscle Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Muscle Tissue: $\sigma = 0.96$ mho/m $\varepsilon_r = 55.0$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.50,6.50,6.50)
Cubes (2): Peak: 3.61 mW/g ± 0.05 dB, SAR (1g): 2.45 mW/g ± 0.05 dB, SAR (10g): 1.62 mW/g ± 0.05 dB, (Advanced extrapolation)
Penetration depth: 13.6 (13.0, 14.4) [mm]
Powerdrift: 0.02 dB
Liquid Temperature (degree C): 20.3



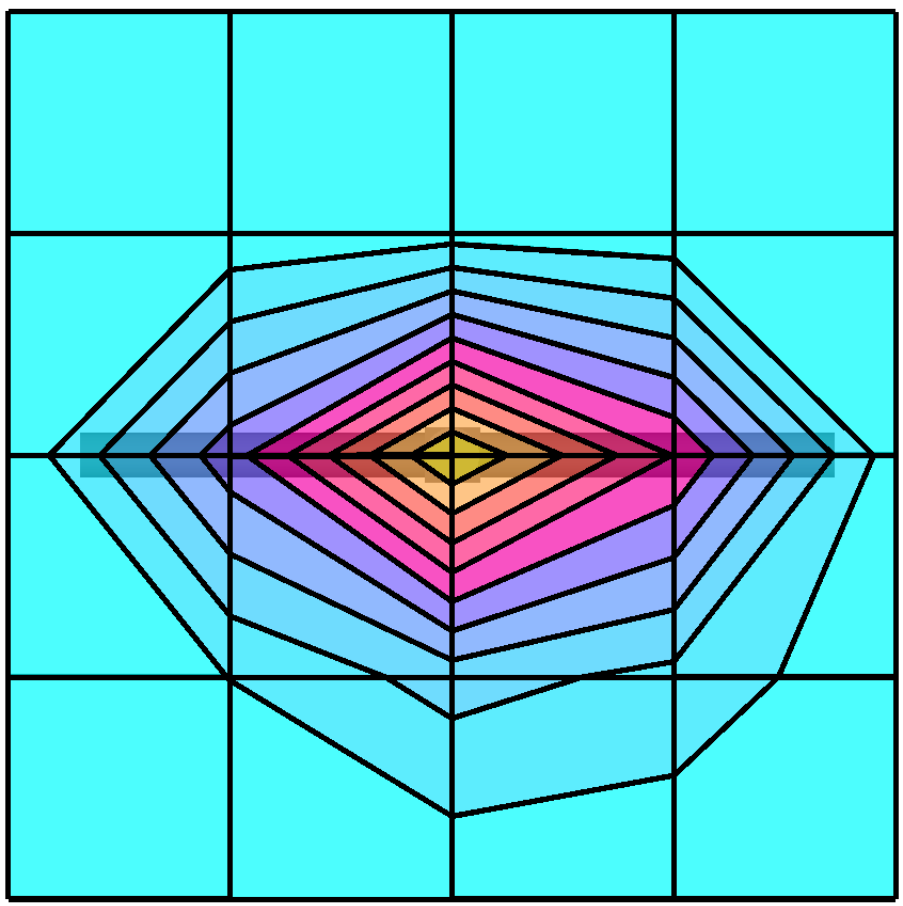
Dipole 835 MHz, Body Validation

SAM 1 (Cellular - Muscle Tissue)
Frequency: 835 MHz; Crest factor: 1.0
Validation 835 MHz - Muscle Tissue: $\sigma = 0.98$ mho/m $\varepsilon_r = 55.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.50,6.50,6.50)
Cubes (2): Peak: 3.68 mW/g ± 0.03 dB, SAR (1g): 2.51 mW/g ± 0.04 dB, SAR (10g): 1.66 mW/g ± 0.05 dB, (Advanced extrapolation)
Penetration depth: 13.7 (13.2, 14.4) [mm]
Powerdrift: -0.01 dB
Liquid Temperature (degree C): 20.2



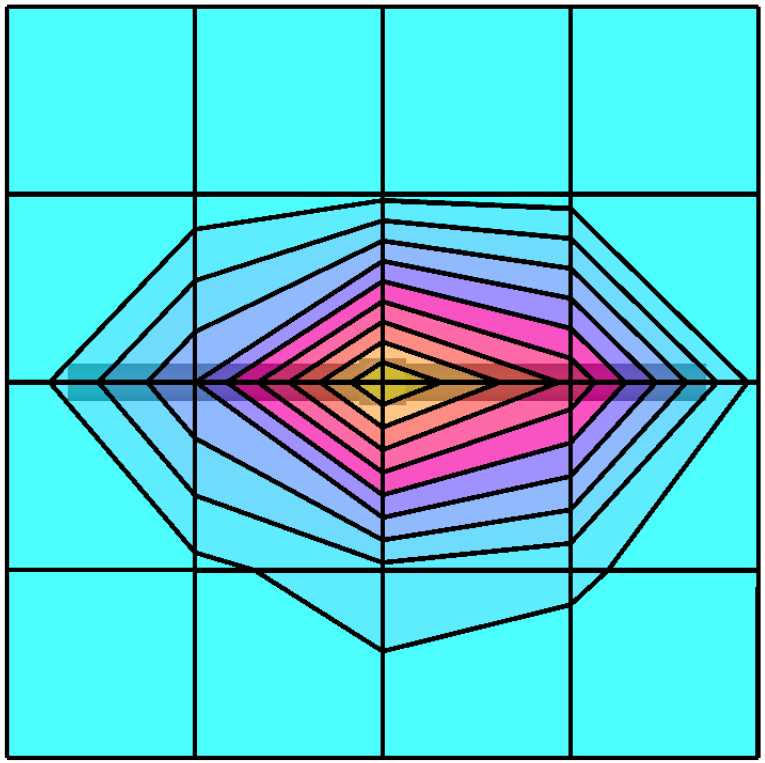
Dipole 1900 MHz, Body Validation

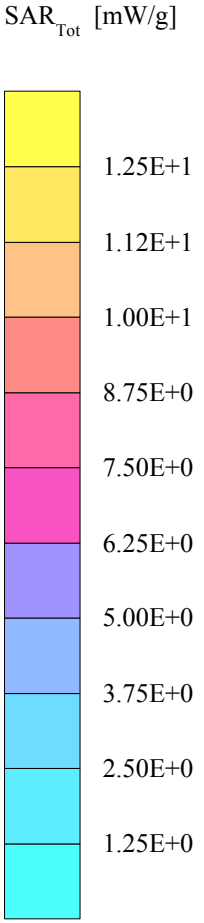
SAM 1 (PCS - Muscle Tissue)
Frequency: 1900 MHz; Crest factor: 1.0
Validation 1900 MHz - Muscle Tissue: σ = 1.58 mho/m ε_r = 53.2 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(4.80,4.80,4.80)
Cubes (2): Peak: 18.1 mW/g ± 0.14 dB, SAR (1g): 10.4 mW/g ± 0.10 dB, SAR (10g): 5.56 mW/g ± 0.06 dB, (Advanced extrapolation)
Penetration depth: 9.6 (9.4, 10.0) [mm]
Powerdrift: 0.01 dB
Liquid temperature (degree C): 22.6



Dipole 1900 MHz, Body Validation

SAM1 (PCS - Muscle Tissue)
Frequency: 1900 MHz; Crest factor: 1.0
Validation 1900 MHz - Muscle Tissue: σ = 1.60 mho/m ε_r = 53.2 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(4.80,4.80,4.80)
Cubes (2): Peak: 19.0 mW/g ± 0.09 dB, SAR (1g): 10.8 mW/g ± 0.07 dB, SAR (10g): 5.68 mW/g ± 0.05 dB, (Advanced extrapolation)
Penetration depth: 9.2 (9.0, 9.6) [mm]
Powerdrift: -0.00 dB
Liquid temperature (degree C): 21.2





APPENDIX B: MEASUREMENT SCANS

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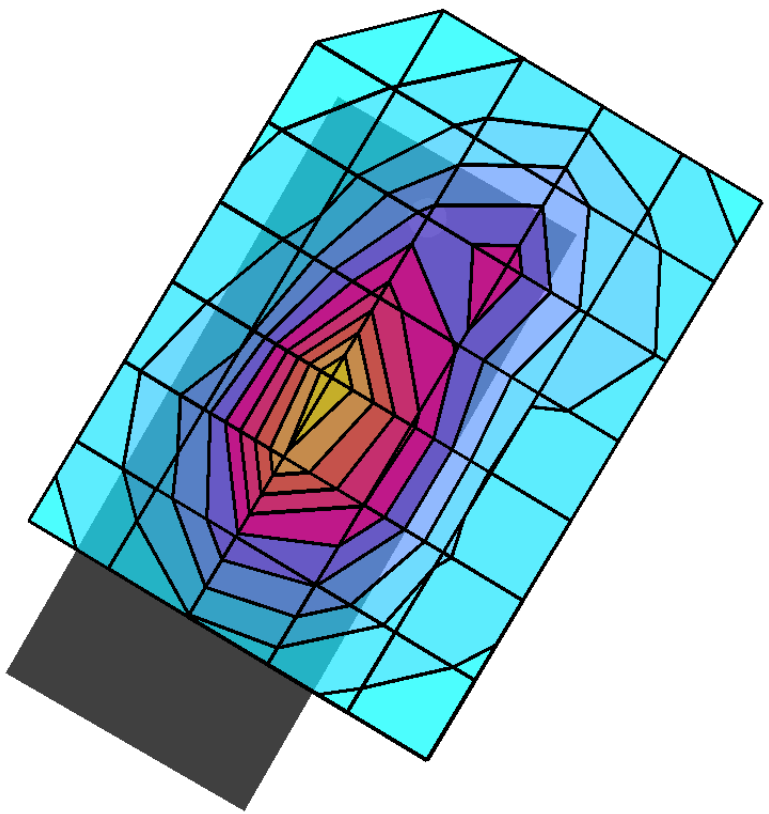
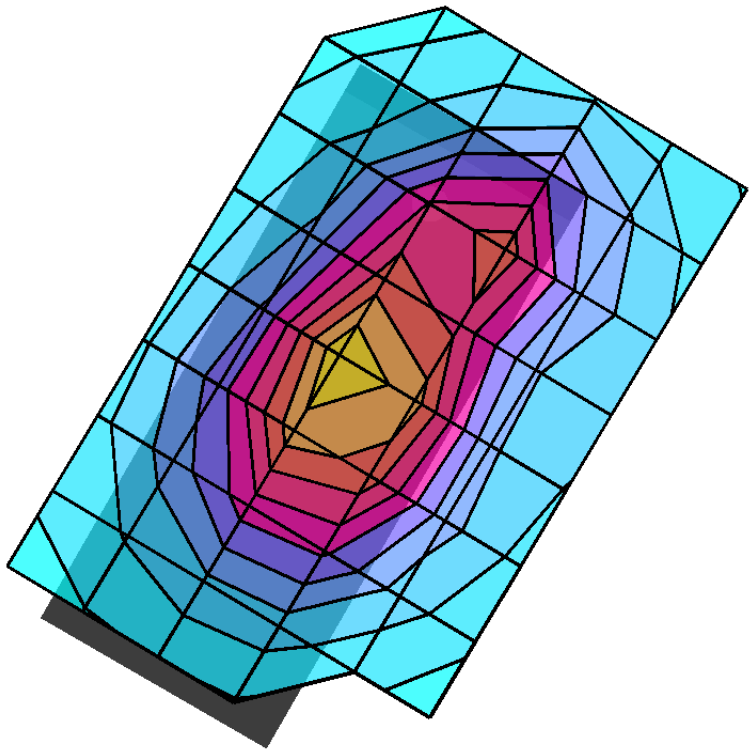
RM-11, AMPS, Channel 384, Left Touch Position

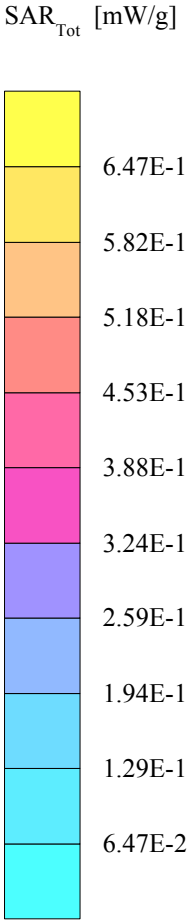
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.91$ mho/m $\varepsilon_r = 42.2$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 1.28 mW/g, SAR (10g): 0.705 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: 0.01 dB
Liquid Temperature (°C): 20.3



RM-11, AMPS, Channel 991, Left Tilt Position

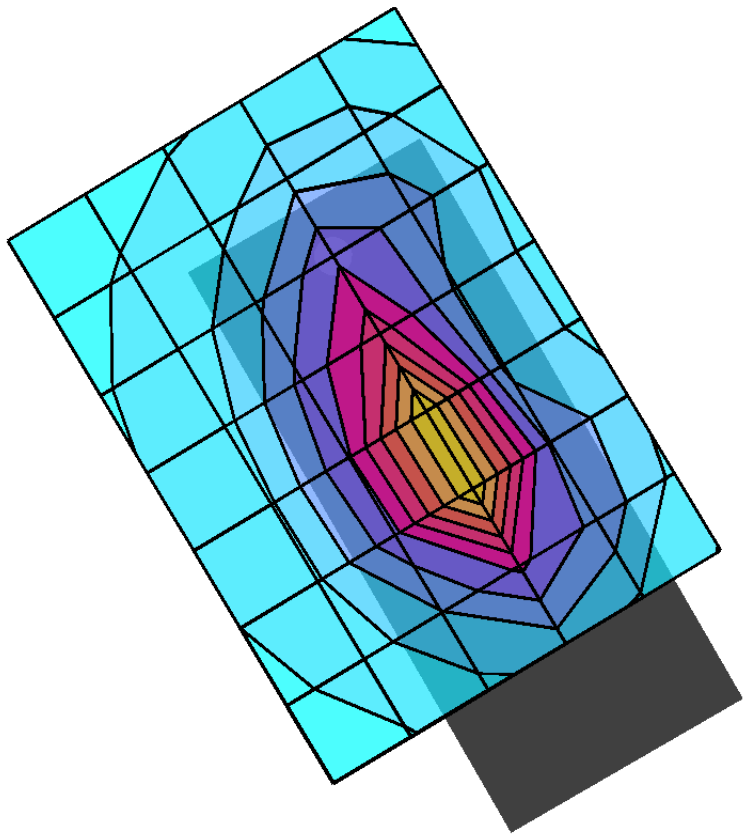
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 824 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: σ = 0.89 mho/m ε_r = 41.4 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.677 mW/g, SAR (10g): 0.419 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.05 dB
Liquid Temperature (°C): 20.8





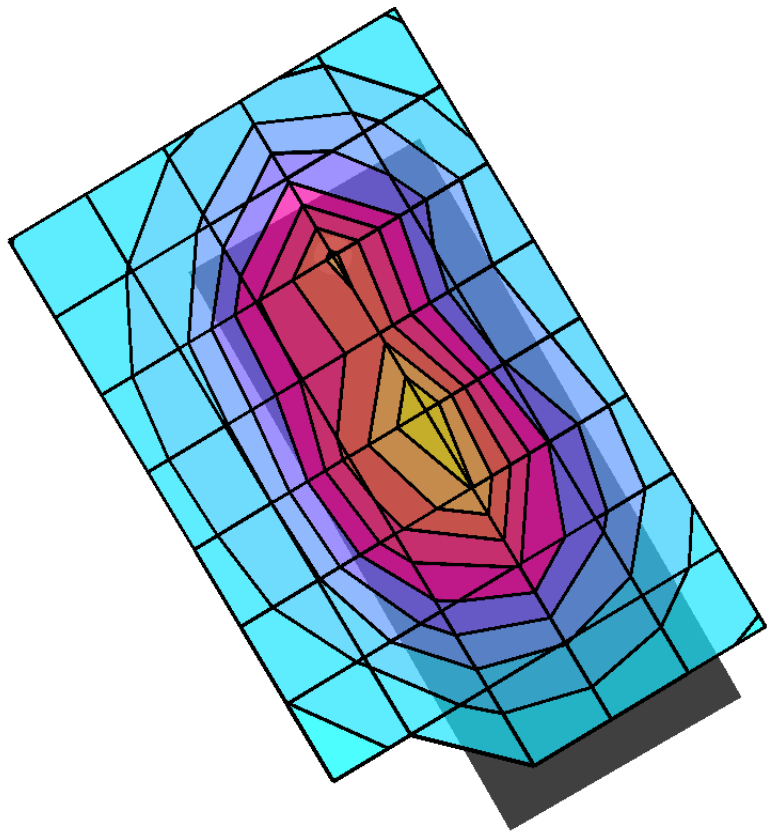
RM-11, AMPS, Channel 384, Right Touch Position

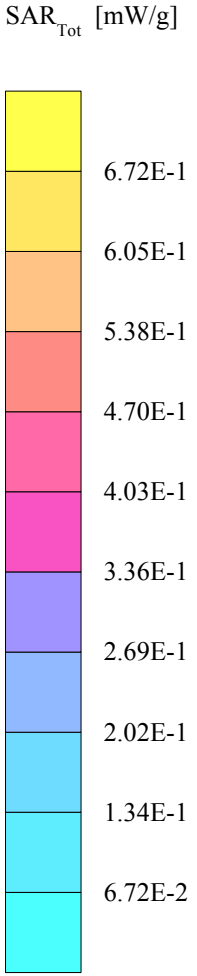
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.91$ mho/m $\varepsilon_r = 42.2$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 1.14 mW/g, SAR (10g): 0.634 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.05 dB
Liquid Temperature (°C): 20.3



RM-11, AMPS, Channel 384, Right Tilt Position

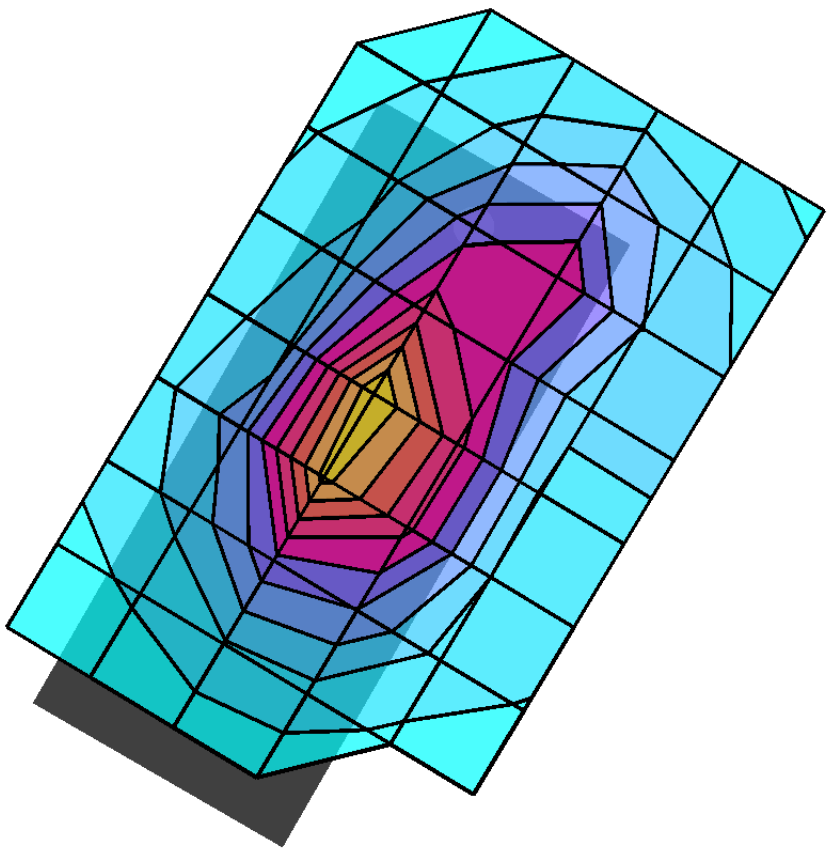
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: σ = 0.89 mho/m ε_r = 41.4 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.671 mW/g, SAR (10g): 0.416 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.01 dB
Liquid Temperature (°C): 20.8





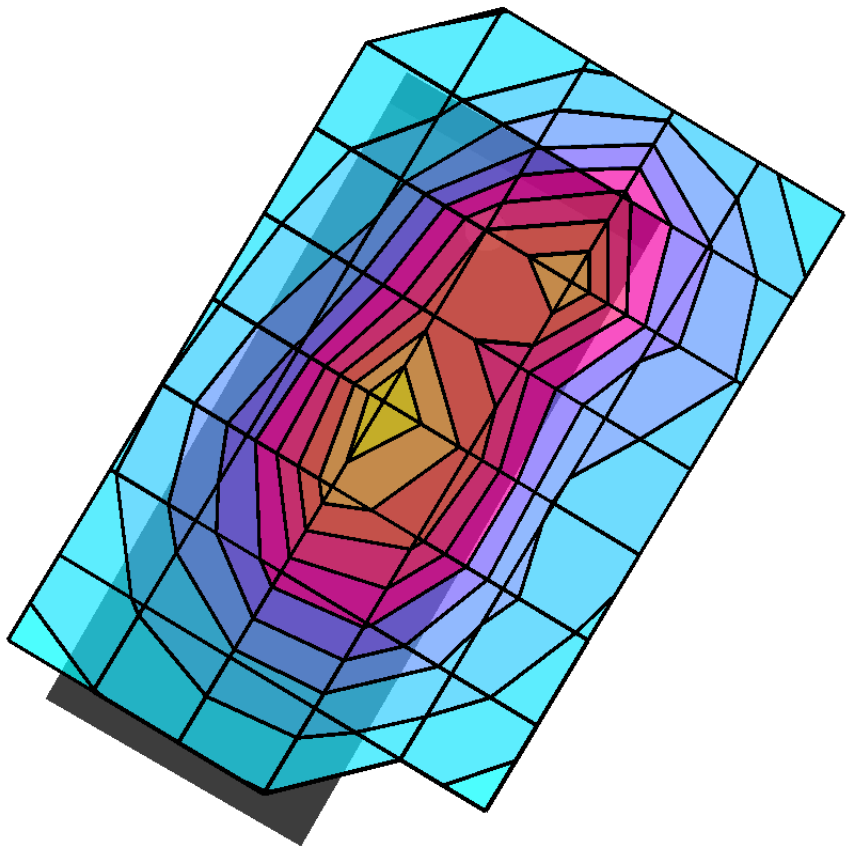
RM-11, CDMA 800, Channel 384, Left Touch Position

SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.946 mW/g, SAR (10g): 0.515 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.02 dB
Liquid Temperature (°C): 21.1



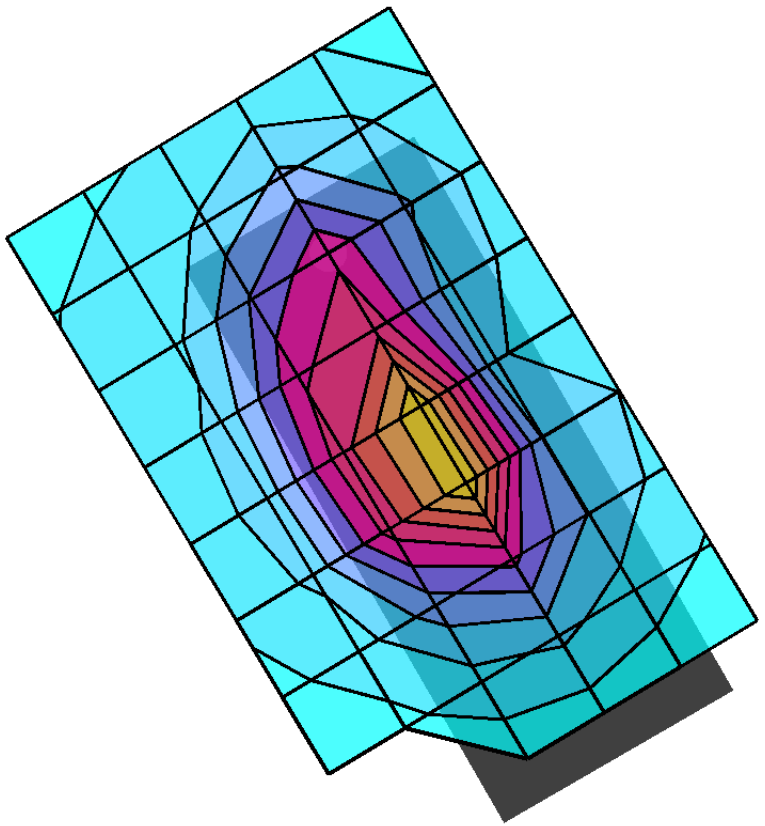
RM-11, CDMA 800, Channel 384, Left Tilt Position

SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.542 mW/g, SAR (10g): 0.331 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.03 dB
Liquid Temperature (°C): 21.1



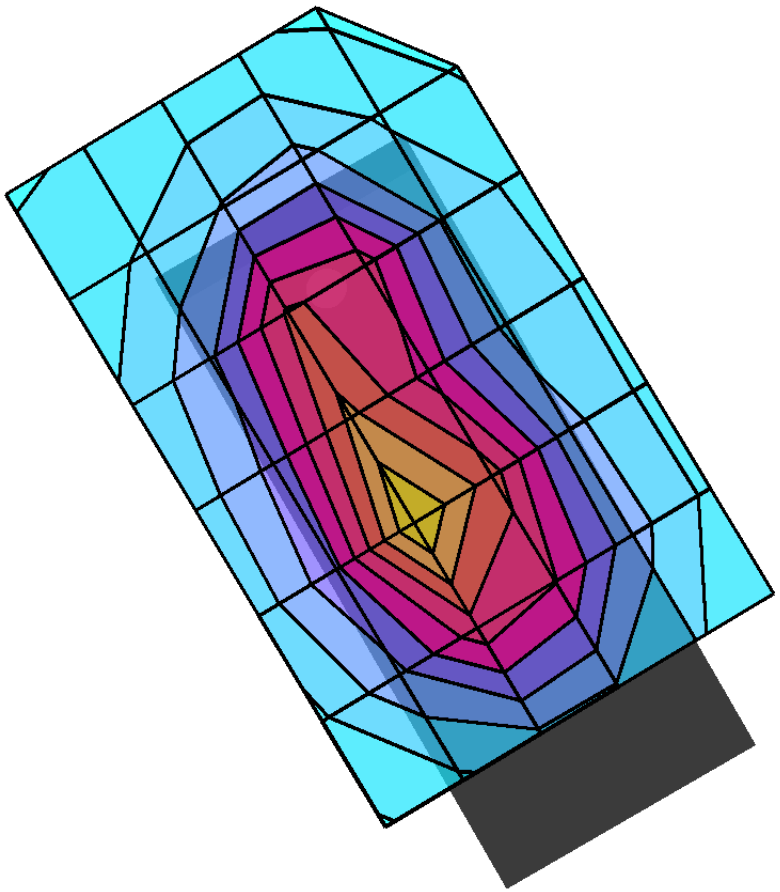
RM-11, CDMA 800, Channel 384, Right Touch Position

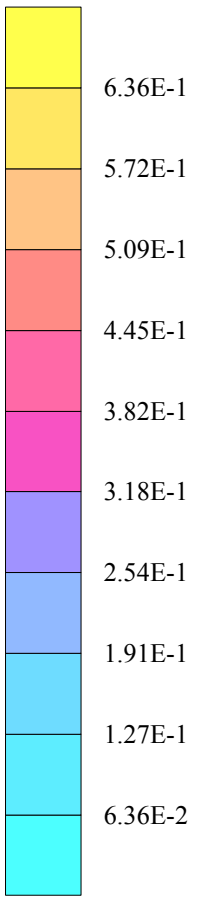
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: σ = 0.90 mho/m ε_r = 41.6 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.896 mW/g, SAR (10g): 0.490 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.05 dB
Liquid Temperature (°C): 21.1



RM-11, CDMA 800, Channel 384, Right Tilt Position

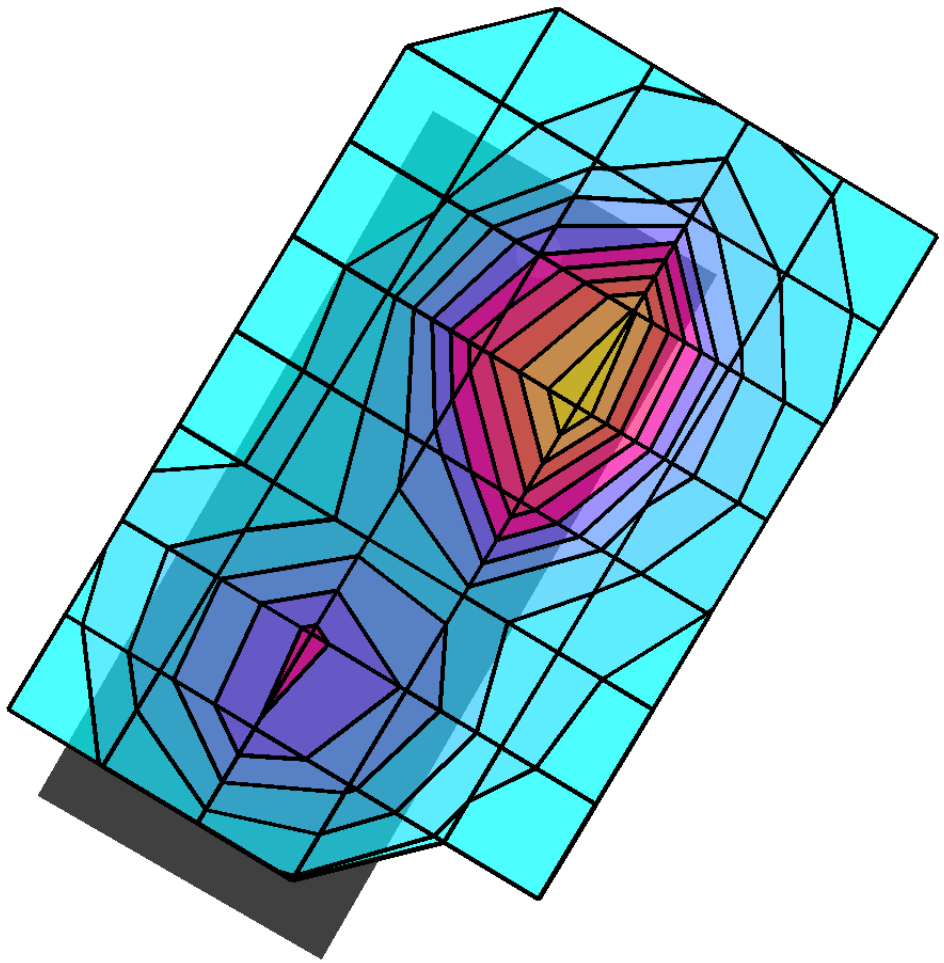
SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.6$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 0.607 mW/g, SAR (10g): 0.377 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 19.0, Dy = 14.0, Dz = 10.0
Powerdrift: -0.02 dB
Liquid Temperature (°C): 21.1





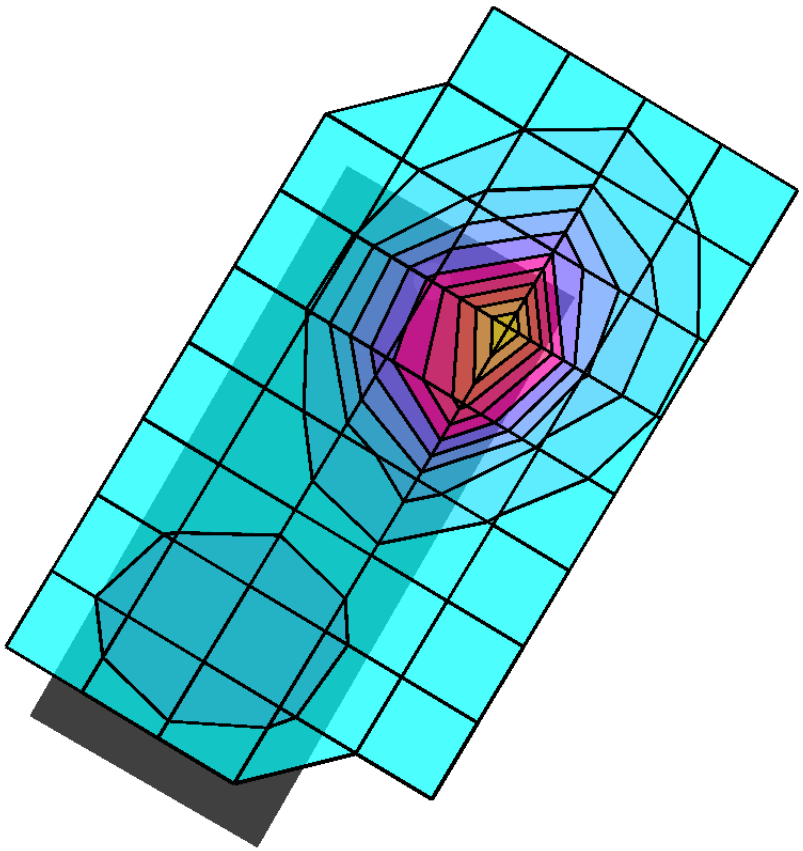
RM-11, CDMA 1900, Channel 600, Left Touch Position

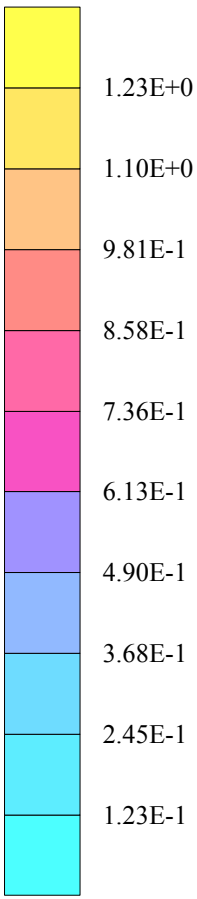
SAM 1 (PCS - Brain Tissue) Phantom
Frequency: 1880 MHz; Crest factor: 1.0
PCS Band - Brain Tissue: σ = 1.45 mho/m ε_r = 38.7 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cube 5x5x7: SAR (1g): 1.29 mW/g, SAR (10g): 0.695 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.11 dB
Liquid Temperature (°C): 22.3



RM-11, CDMA 1900, Channel 600, Left Tilt Position

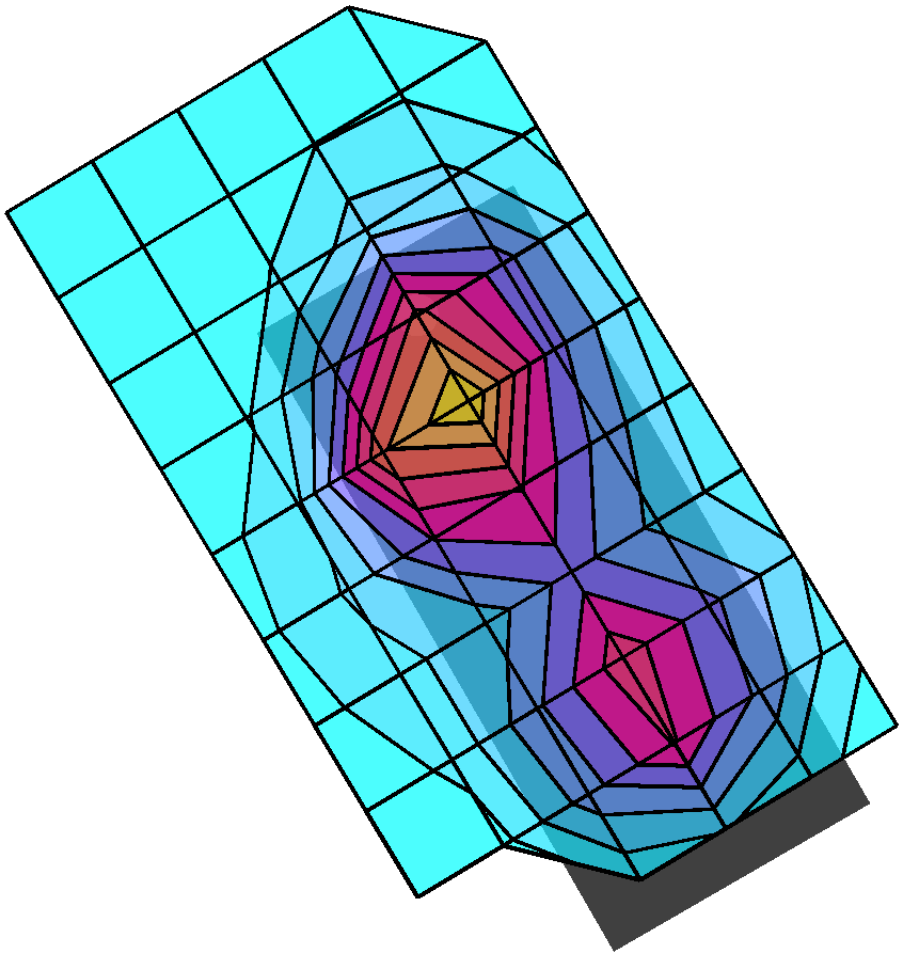
SAM 1 (PCS - Brain Tissue) Phantom
Frequency: 1880 MHz; Crest factor: 1.0
PCS Band - Brain Tissue: σ = 1.42 mho/m ε_r = 38.7 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cube 5x5x7: SAR (1g): 1.14 mW/g, SAR (10g): 0.610 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.10 dB
Liquid Temperature (°C): 23.0





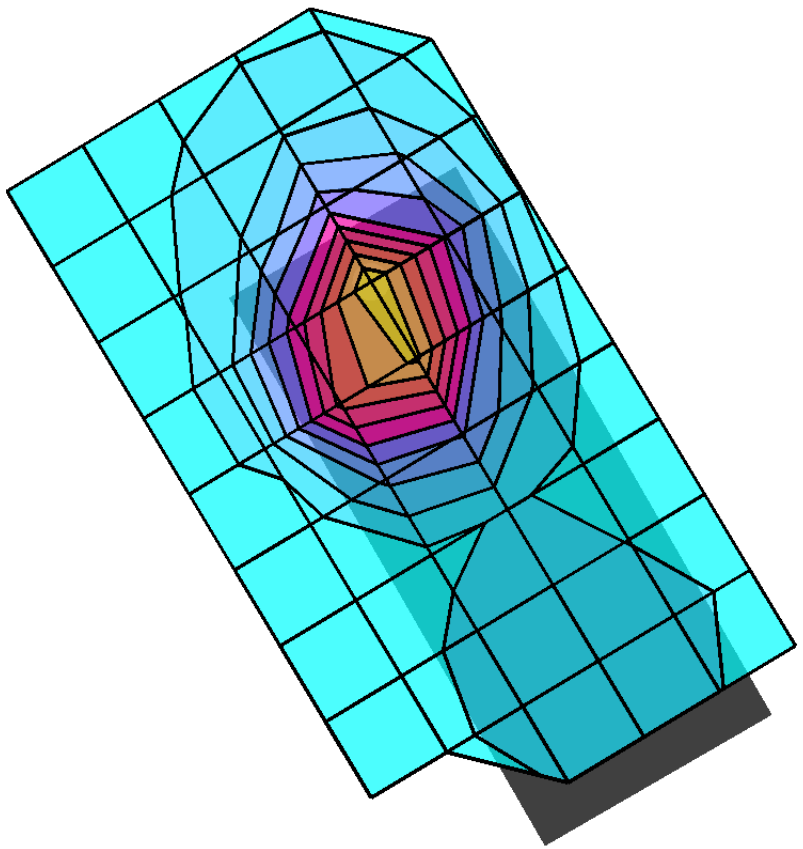
RM-11, CDMA 1900, Channel 25, Right Touch Position

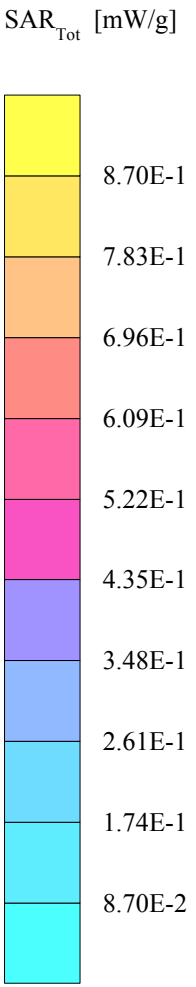
SAM 1 (PCS - Brain Tissue) Phantom
Frequency: 1851 MHz; Crest factor: 1.0
PCS Band - Brain Tissue: σ = 1.44 mho/m ε_r = 40.5 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cube 5x5x7: SAR (1g): 1.01 mW/g, SAR (10g): 0.587 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.01 dB
Liquid Temperature (°C): 20.3



RM-11, CDMA 1900, Channel 25, Right Tilt Position

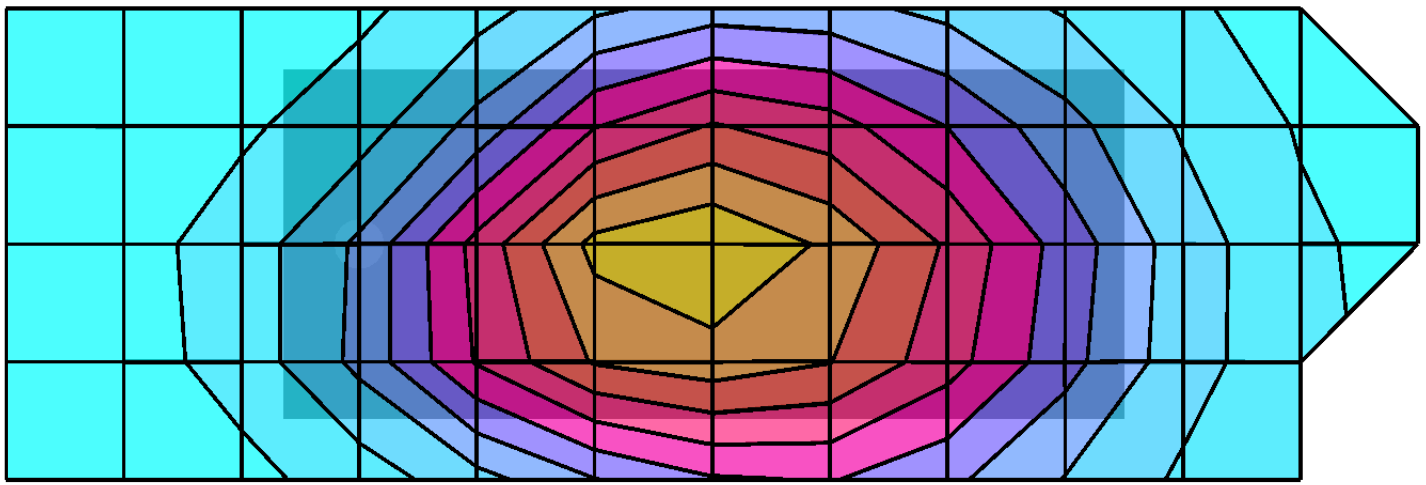
SAM 1 (PCS - Brain Tissue) Phantom
Frequency: 1851 MHz; Crest factor: 1.0
PCS Band - Brain Tissue: σ = 1.42 mho/m ε_r = 38.7 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cube 5x5x7: SAR (1g): 0.875 mW/g, SAR (10g): 0.499 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.03 dB
Liquid Temperature (°C): 23.0

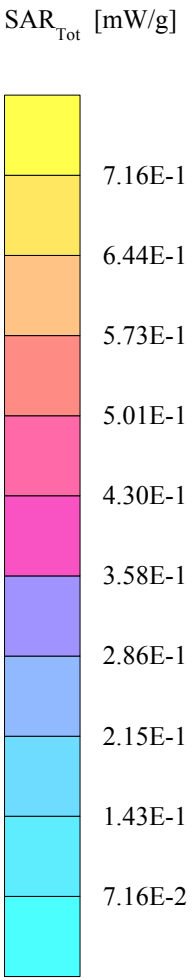




RM-11, AMPS, Channel 991, Body Position with 2.2cm Spacer, and HDS-3.

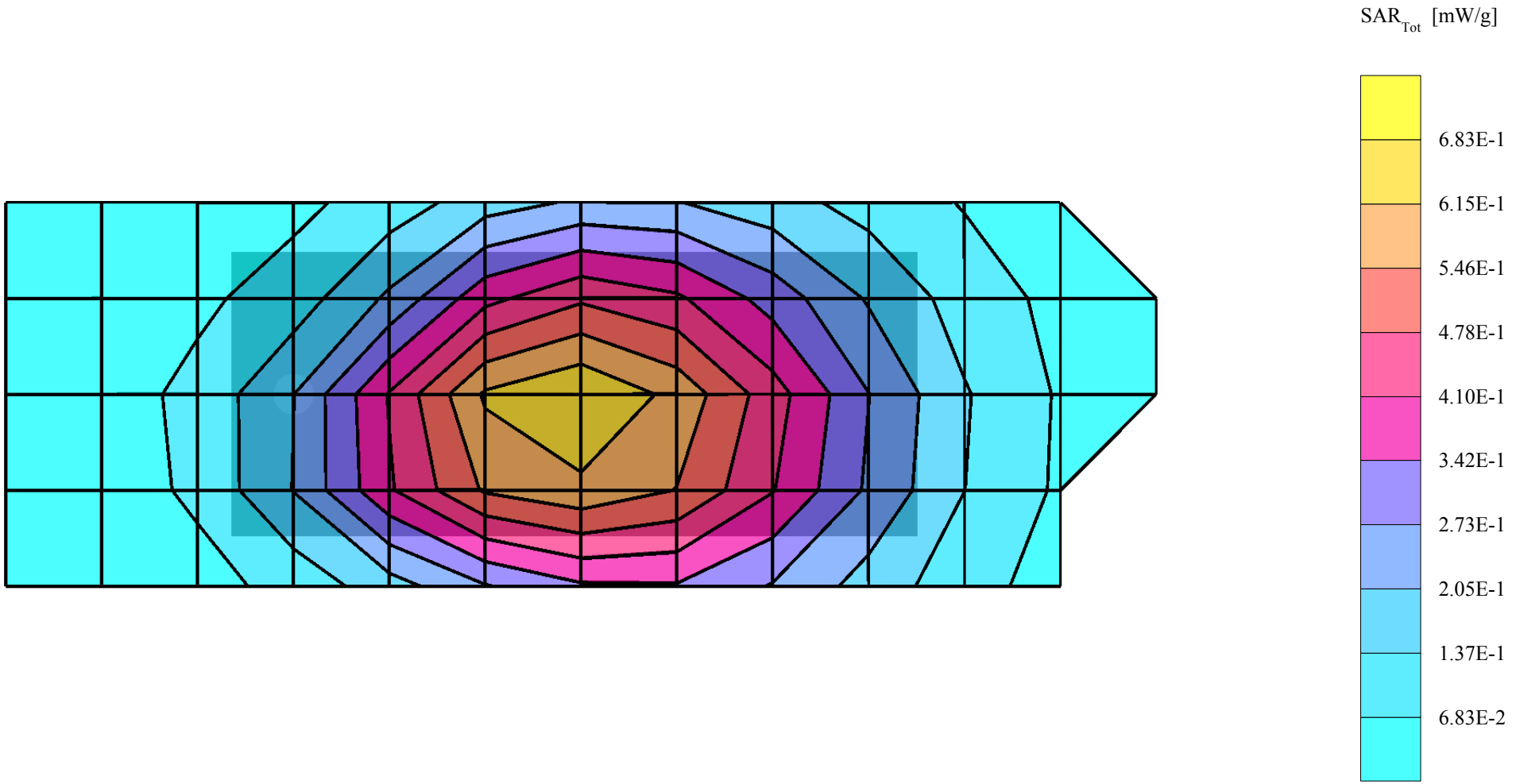
SAM 1 (Cellular - Muscle Tissue) Phantom
Frequency: 824 MHz; Crest factor: 1.0
Cellular Band - Muscle Tissue: σ = 0.99 mho/m ε_r = 55.5 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.50,6.50,6.50)
Cube 5x5x7: SAR (1g): 0.701 mW/g, SAR (10g): 0.493 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.01 dB
Liquid Temperature (°C): 20.2





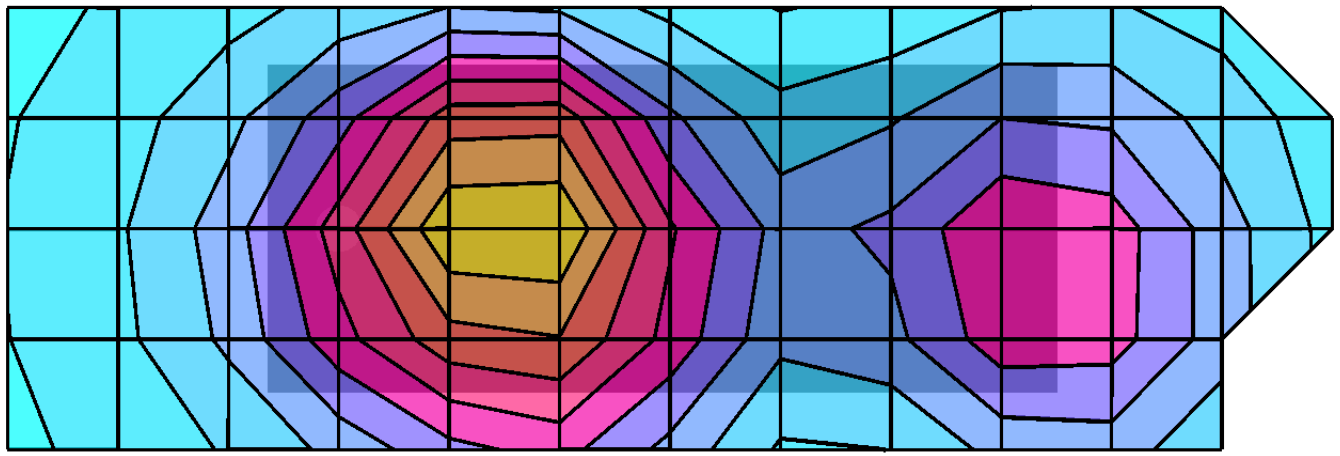
RM-11, CDMA 800, Channel 384, Body Position with 2.2cm Spacer, and HDB-4.

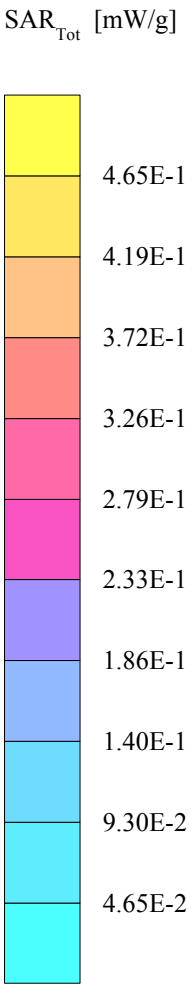
SAM 1 (Cellular - Muscle Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Muscle Tissue: σ = 0.99 mho/m ε_r = 55.5 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.50,6.50,6.50)
Cube 5x5x7: SAR (1g): 0.667 mW/g, SAR (10g): 0.466 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: 0.01 dB
Liquid Temperature (°C): 20.2



RM-11, CDMA 1900, Channel 600, Body Position with 2.2cm Spacer and HDB-4

SAM 1 (PCS - Muscle Tissue) Phantom
Frequency: 1880 MHz; Crest factor: 1.0
PCS Band - Muscle Tissue: σ = 1.60 mho/m ε_r = 53.3 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(4.80,4.80,4.80)
Cube 5x5x7: SAR (1g): 0.480 mW/g, SAR (10g): 0.288 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.10 dB
Liquid Temperature (°C): 21.2



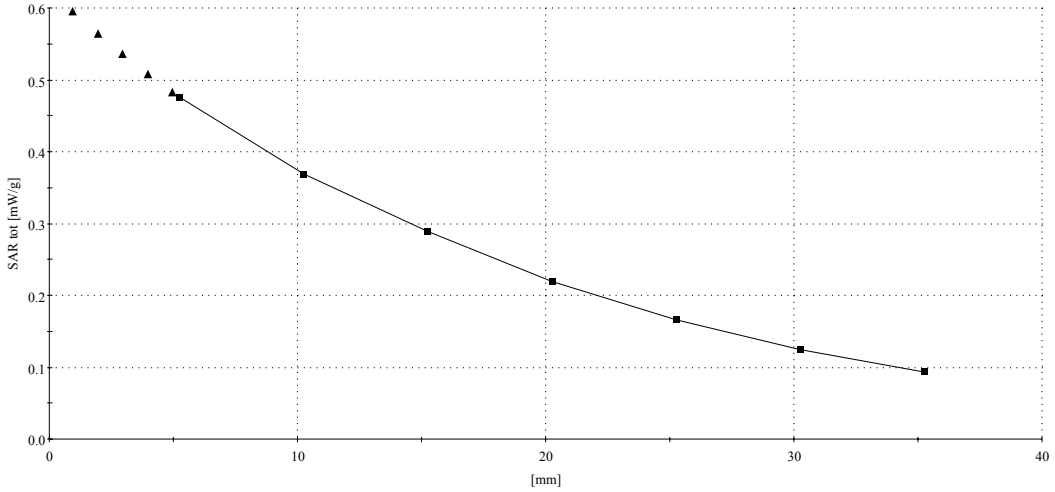


12/19/03

RM-11, AMPS, Channel 384, Left Touch Position

SAM 1 (Cellular - Brain Tissue) Phantom
Frequency: 837 MHz; Crest factor: 1.0
Cellular Band - Brain Tissue: $\sigma = 0.91$ mho/m $\varepsilon_r = 42.2$ $\rho = 1.00$ g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.60,6.60,6.60)
Cube 5x5x7: SAR (1g): 1.28 mW/g, SAR (10g): 0.705 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Liquid Temperature (°C): 20.3



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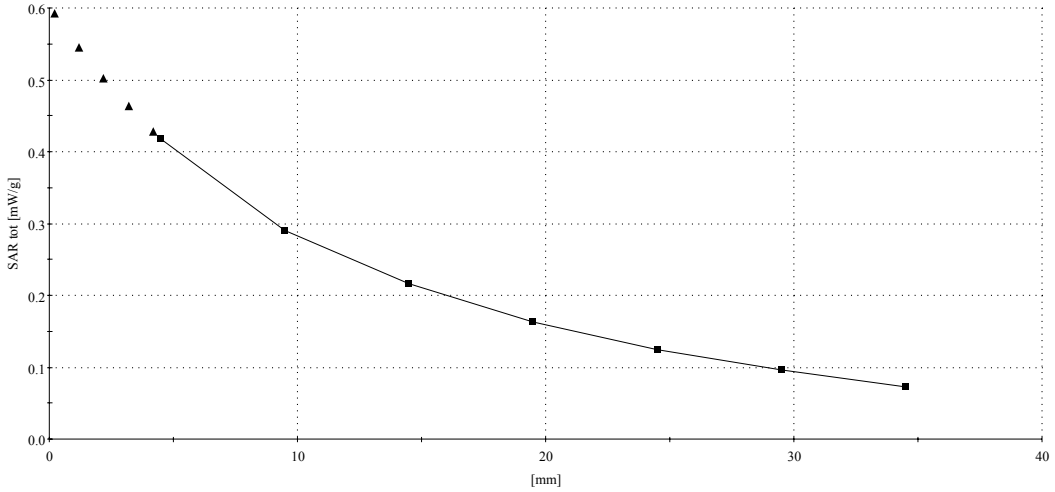
01/05/04

RM-11, AMPS, Channel 991, Body Position, 2.2cm Spacer, and HDS-3.

SAM 1 (Cellular - Muscle Tissue) Phantom
Frequency: 824 MHz; Crest factor: 1.0
Cellular Band - Muscle Tissue: σ = 0.99 mho/m ε_r = 55.5 ρ = 1.00 g/cm^3
Probe: ET3DV6 - SN1516; ConvFConvF(6.50,6.50,6.50)
Cube 5x5x7: SAR (1g): 0.701 mW/g, SAR (10g): 0.493 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Liquid Temperature (°C): 20.2



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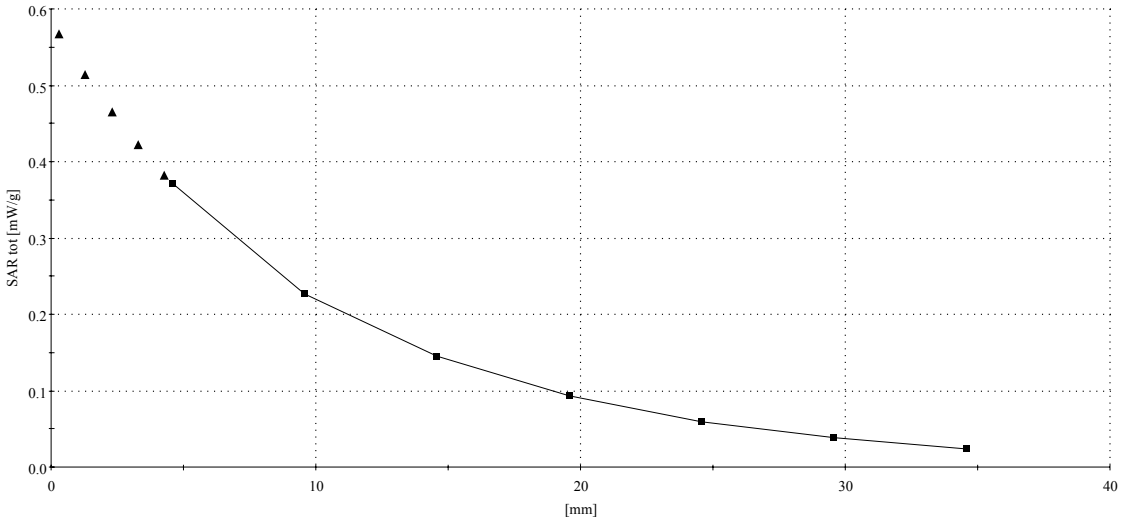
01/13/04

RM-11, CDMA 1900, Channel 600, Left Touch Position

SAM 1 (PCS - Brain Tissue) Phantom
Frequency: 1880 MHz; Crest factor: 1.0
PCS Band - Brain Tissue: σ = 1.45 mho/m ε_r = 38.7 ρ = 1.00 g/cm³
Probe: ET3DV6 - SN1516; ConvFConvF(5.00,5.00,5.00)
Cube 5x5x7: SAR (1g): 1.29 mW/g, SAR (10g): 0.695 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Liquid Temperature (°C): 22.3



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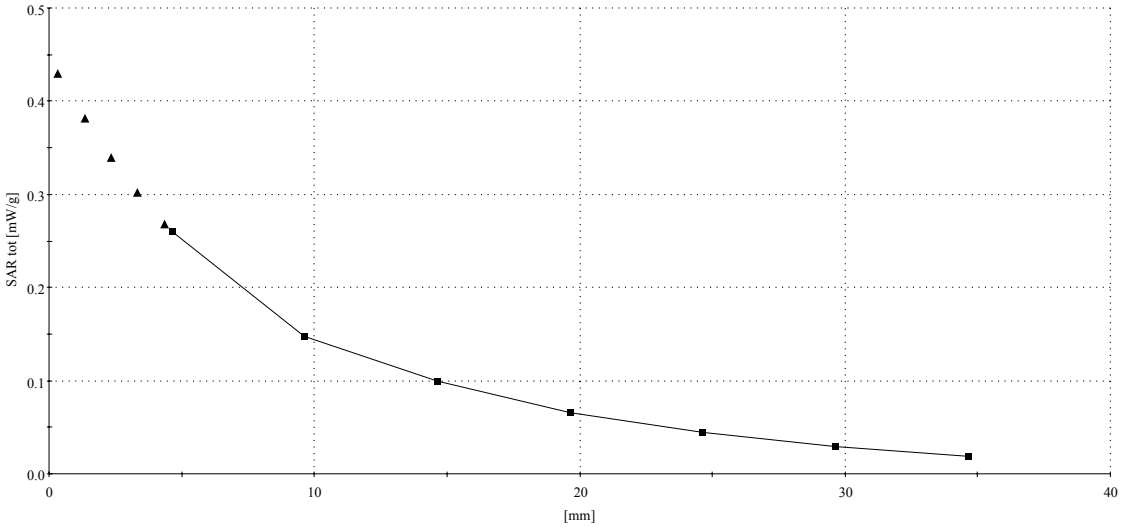
01/14/04

RM-11, CDMA 1900, Channel 600, Body Position with 2.2cm Spacer and HDB-4

SAM 1 (PCS - Muscle Tissue) Phantom
Frequency: 1880 MHz; Crest factor: 1.0
PCS Band - Muscle Tissue: σ = 1.60 mho/m ε_r = 53.3 ρ = 1.00 g/cm³
Probe: ET3DV6 - SN1516; ConvFConvF(4.80,4.80,4.80)
Cube 5x5x7: SAR (1g): 0.480 mW/g, SAR (10g): 0.288 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Liquid Temperature (°C): 21.2



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APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

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

Client **Nokia Mobile Phones (San Diego)**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1516
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	February 26, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: February 26, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 (1)

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ET3DV6 SN:1516 February 26, 2003

DASY - Parameters of Probe: ET3DV6 SN:1516

Sensitivity in Free Space

NormX	**1.67** $\mu V/(V/m)^2$	DCP X	**95**	mV
NormY	**1.52** $\mu V/(V/m)^2$	DCP Y	**95**	mV
NormZ	**1.69** $\mu V/(V/m)^2$	DCP Z	**95**	mV

Sensitivity in Tissue Simulating Liquid

Head	**835 MHz**	ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**		
Head	**900 MHz**	ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**		
	ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:		
	ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.35**	
	ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.76**	
Head	**1900 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**		
Head	**1800 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**		
	ConvF X	**5.0** ± 9.5% (k=2)	Boundary effect:		
	ConvF Y	**5.0** ± 9.5% (k=2)	Alpha	**0.57**	
	ConvF Z	**5.0** ± 9.5% (k=2)	Depth	**2.57**	

Boundary Effect

Head **835 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	6.1
SAR_{be} [%]	With Correction Algorithm	0.5	0.7

Head **1900 MHz** **Typical SAR gradient: 10 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	15.4	10.4
SAR_{be} [%]	With Correction Algorithm	0.2	0.3

Sensor Offset

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

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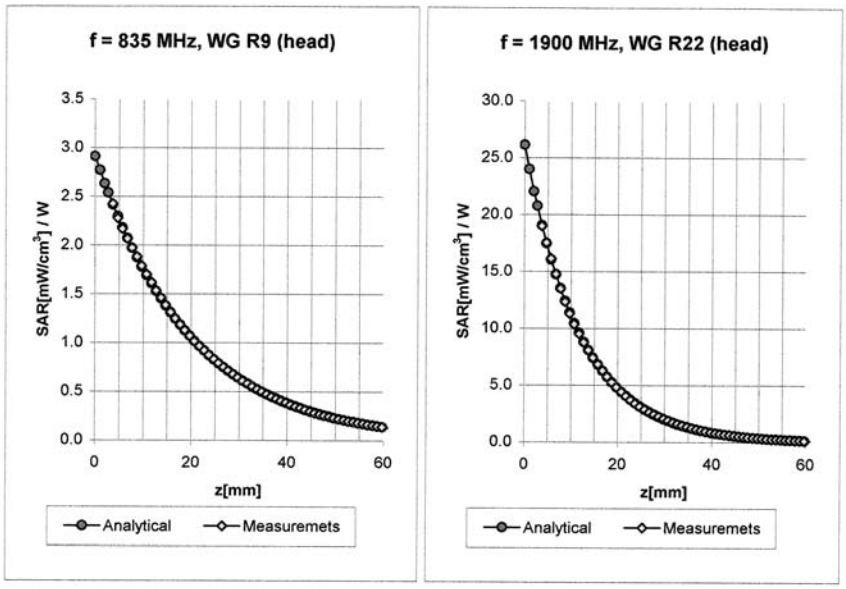
ET3DV6 SN:1516 **February 26, 2003**

Conversion Factor Assessment



Head	**835 MHz**	ε_r **= 41.5 ± 5%**	**σ = 0.90 ± 5% mho/m**	
Head	**900 MHz**	ε_r **= 41.5 ± 5%**	**σ = 0.97 ± 5% mho/m**	
	ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.35**
	ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.76**

Head	**1900 MHz**	ε_r **= 40.0 ± 5%**	**σ = 1.40 ± 5% mho/m**	
Head	**1800 MHz**	ε_r **= 40.0 ± 5%**	**σ = 1.40 ± 5% mho/m**	
	ConvF X	**5.0** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.0** ± 9.5% (k=2)	Alpha	**0.57**
	ConvF Z	**5.0** ± 9.5% (k=2)	Depth	**2.57**

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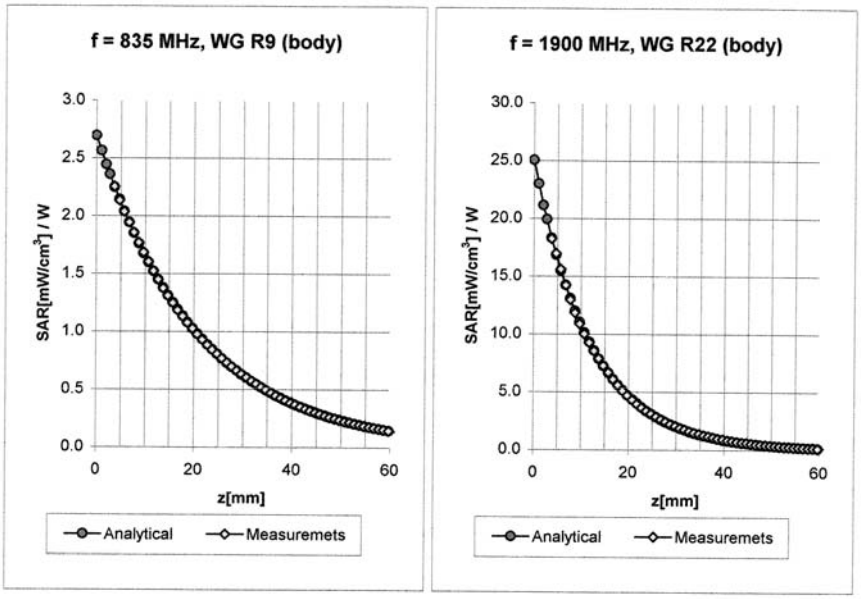
ET3DV6 SN:1516 **February 26, 2003**

Conversion Factor Assessment



Body	**835 MHz**	ε_r **= 55.2 ± 5%**	σ **= 0.97 ± 5% mho/m**	
Body	**900 MHz**	ε_r **= 55.0 ± 5%**	σ **= 1.05 ± 5% mho/m**	
	ConvF X	**6.5** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.5** ± 9.5% (k=2)	Alpha	**0.52**
	ConvF Z	**6.5** ± 9.5% (k=2)	Depth	**2.12**

Body	**1900 MHz**	ε_r **= 53.3 ± 5%**	σ **= 1.52 ± 5% mho/m**	
Body	**1800 MHz**	ε_r **= 53.3 ± 5%**	σ **= 1.52 ± 5% mho/m**	
	ConvF X	**4.8** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**4.8** ± 9.5% (k=2)	Alpha	**0.71**
	ConvF Z	**4.8** ± 9.5% (k=2)	Depth	**2.32**

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APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)

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Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Nokia San Diego**

CALIBRATION CERTIFICATE

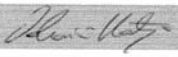
Object(s)	D835V2 - SN:479
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	November 18, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	US37292783	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Oct 05

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

Date issued: November 20, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 (1)

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ConvF(6.7, 6.7, 6.7)Date/Time: 11/18/03 18:03:34

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN479

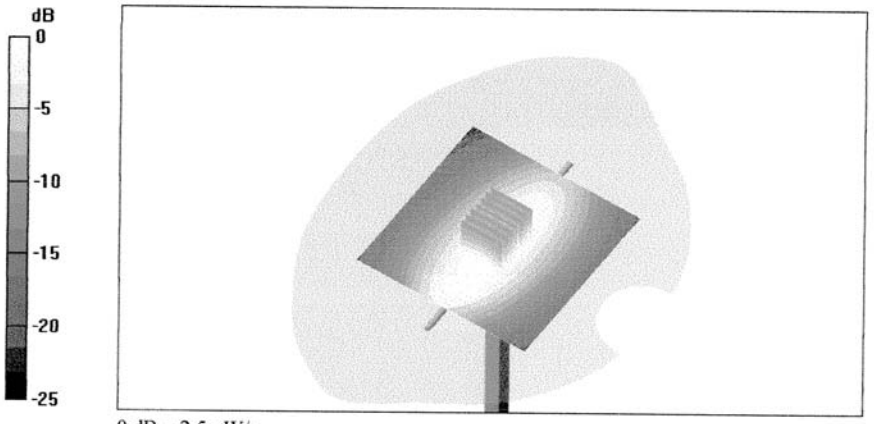
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 MHz (σ = 0.88 mho/m, ε_r = 41.22, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.7, 6.7, 6.7); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 60

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 54.6 V/m
Power Drift = 0.0 dB
Maximum value of SAR = 2.47 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.49 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g
Reference Value = 54.6 V/m
Power Drift = 0.0 dB
Maximum value of SAR = 2.5 mW/g



0 dB = 2.5mW/g

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ConvF(6.3, 6.3, 6.3)Date/Time: 11/17/03 14:27:52

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN479

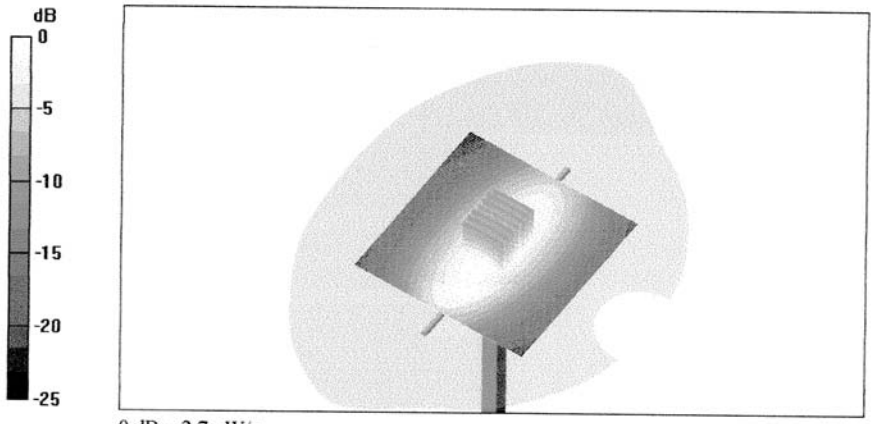
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: Muscle 835 MHz (σ = 0.98 mho/m, ε_r = 54.98, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.3, 6.3, 6.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 60

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): *Measurement grid:* dx=15mm, dy=15mm
Reference Value = 54.4 V/m
Power Drift = -0.006 dB
Maximum value of SAR = 2.67 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.66 W/kg
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.63 mW/g
Reference Value = 54.4 V/m
Power Drift = -0.006 dB
Maximum value of SAR = 2.7 mW/g



0 dB = 2.7mW/g

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Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Nokia Inc., San Diego**

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:534
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	September 15, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

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

Date issued: September 15, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 (1)

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Date/Time: 09/15/03 16:31:55

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN534_SN1507_HSL1900_150903.da4

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN534
Program: Dipole Calibration

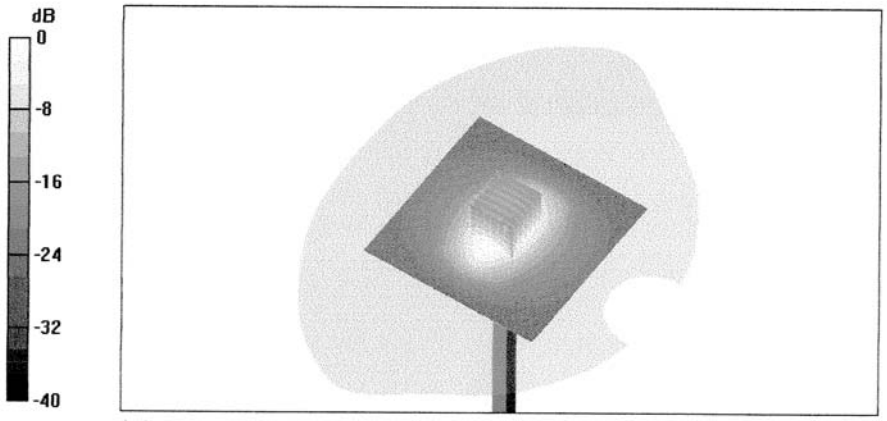
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL 1900 MHz (σ = 1.46 mho/m, ε_r = 40.17, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): *Measurement grid: dx=15mm, dy=15mm*
Reference Value = 93.7 V/m
Power Drift = 0.01 dB
Maximum value of SAR = 11.3 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.24 mW/g
Reference Value = 93.7 V/m
Power Drift = 0.01 dB
Maximum value of SAR = 11.3 mW/g



0 dB = 11.3mW/g

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Date/Time: 09/11/03 17:15:09

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN534_SN1507_M1900_110903.da4

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN534
Program: Dipole Calibration

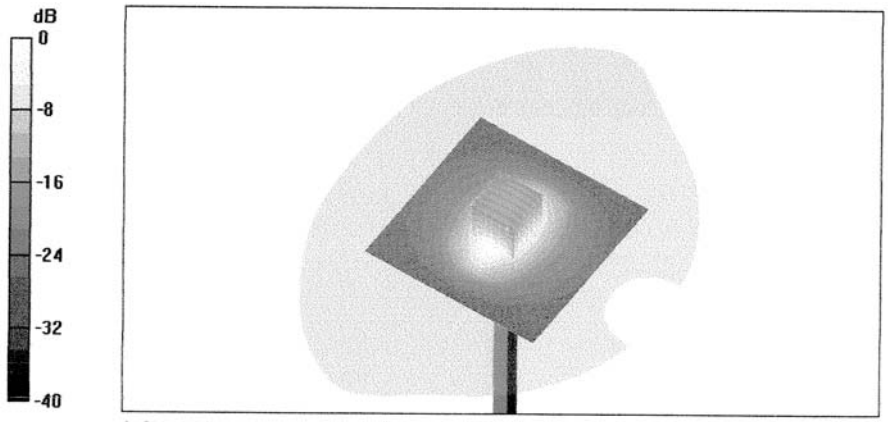
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Muscle 1900 MHz (σ = 1.6 mho/m, ε_r = 50.87, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.8, 4.8, 4.8); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): *Measurement grid: dx=15mm, dy=15mm*
Reference Value = 91.7 V/m
Power Drift = -0.007 dB
Maximum value of SAR = 11.7 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 18.1 W/kg
SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.43 mW/g
Reference Value = 91.7 V/m
Power Drift = -0.007 dB
Maximum value of SAR = 11.6 mW/g



0 dB = 11.6mW/g

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