



## Exhibit 11: SAR Test Report IHDT56CL1

**Date of test:** December 10 – 15, 2002  
**Date of Report:** December 19, 2002

**Laboratory:** Motorola Personal Communications Sector Product Safety & Compliance Laboratory  
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Room: AS228  
Harvard, Illinois 60033

**Test Responsible:** Steven Hauswirth  
Principal Staff Engineer

**Accreditation:** This laboratory is accredited to ISO/IEC 17025-1999 to perform the following electromagnetic exposure tests:  
System Validation & Interlaboratory Comparison  
Simulated Tissue Specifications and Procedure  
EME Cellular Phone Testing Procedure



On the following types of products:  
Wireless Communications Devices (Examples): Two Way Radios; Portable Phones (including Cellular, Licensed Non-Broadcast and PCS); Low Frequency Readers; and Pagers

A2LA certificate #1651-01

**Statement of Compliance:** Motorola declares under its sole responsibility that portable cellular telephone FCC ID IHDT56CL1 to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines (FCC 47 CFR §2.1093). It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

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The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Motorola encourages all feedback, both positive and negative, on this test report.

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### 1. Introduction

The Motorola Personal Communications Sector Product Safety Laboratory has performed measurements of the maximum potential exposure to the user of portable cellular phone (FCC ID IHDT56CL1). The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with FCC OET Bulletin 65 Supplement C 01-01.

### 2. Description of the Device Under Test

#### Antenna description

<b>Type</b>	Stubby	
<b>Location</b>	Right Side	
<b>Dimensions</b>	Length	17mm
	Width	6mm
<b>Configuration</b>	Stubby	

#### Device description

<b>FCC ID Number</b>	IHDT56CL1	
<b>Serial number</b>	770472C0 & 770472BC	
<b>Mode(s) of Operation</b>	CDMA800	CDMA1900
<b>Modulation Mode(s)</b>	CDMA	CDMA
<b>Maximum Output Power Setting</b>	25.00 dBm	24.67 dBm
<b>Duty Cycle</b>	1:1	1:1
<b>Transmitting Frequency Rang(s)</b>	824.70 – 848.31 MHz	1851.25 – 1908.75 MHz
<b>Production Unit or Identical Prototype (47 CFR §2.908)</b>	Identical Prototype	
<b>Device Category</b>	Portable	
<b>RF Exposure Limits</b>	General Population / Uncontrolled	

### 3. Test Equipment Used

#### 3.1 Dosimetric System

The Motorola Personal Communications Sector Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy3™ v3.1d) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The overall RSS uncertainty of the measurement system is ±11.7% (K=1) with an expanded uncertainty of ±23.0% (K=2). The measurement uncertainty budget is given in Appendix 6. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg. The list of calibrated equipment used for the measurements is shown below.

Description	Serial Number	Cal Due Date
DASY3 DAE V1	SN434	13-Feb-03
E-Field Probe ETDV6	SN1522	25-Apr-03
Dipole Validation Kit, DV900V2	SN096	3-Jan-03
S.A.M. Phantom used for 800MHz	TP-1157	
Dipole Validation Kit, DV1800V2	SN259TR	25-Jan-04
S.A.M. Phantom used for 1900MHz	TP-1157	

### 3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04633	11-Oct-04
Power Meter E4419B	GB39511088	18-Jan-03
Power Sensor #1 – E9301A	US39210917	23-Feb-03
Power Sensor #2 - E9301A	US39210934	14-Feb-03
Network Analyzer HP8753ES	US39171846	2-May-03
Dielectric Probe Kit HP85070B	US99360074	N/A

### 4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , and the conductivity,  $\sigma$ , of the tissue simulating liquids were measured with the HP85070 Dielectric Probe Kit. These values, along with the temperature of the tissue simulate are shown in the table below. The recommended limits for maximum permittivity and minimum conductivity are also shown. These come from the Federal Communication Commission, OET Bulletin 65 Supplement C 01-01. It is seen that the measured parameters are satisfactory for compliance testing.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			$\epsilon_r$	$\sigma$ (S/m)	Temp (°C)
835	Head	Measured, 11-Dec-02	42.7	0.93	23
		Recommended Limits	41.5	0.90	20-25
	Head	Measured, 13-Dec-02	40.9	0.91	23
		Recommended Limits	41.5	0.90	20-25
	Body	Measured, 14-Dec-02	54.8	0.96	23
		Recommended Limits	55.2	0.97	20-25
1880	Head	Measured, 10-Dec-02	38.1	1.47	23
		Recommended Limits	40	1.40	20-25
	Body	Measured, 11-Dec-02	51.2	1.59	23
		Recommended Limits	53.3	1.52	20-25
	Body	Measured, 15-Dec-02	52.0	1.58	23
		Recommended Limits	53.3	1.52	20-25

The list of ingredients and the percent composition used for the tissue simulates are indicated in the table below.

Ingredient	800MHz Head	800MHz Body	1900MHz Head	1900MHz Body
Sugar	57.0	44.9	47.0	30.80
DGBE	--	--	52.8	68.91
Water	40.45	53.06	0.2	0.29
Salt	1.45	0.94	--	--
HEC	1.0	1.0	--	--
Bact.	0.1	0.1	--	--

### 5. System Accuracy Verification

A system accuracy verification of the DASY3 was performed using the measurement equipment listed in Section 3.1. The daily system accuracy verification occurs within center section of the SAM phantom.

A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR indicated on the dipole certification sheet. These tests were done at 900MHz and/or 1800MHz. These frequencies are within 100MHz of the mid-band frequency of the test device. This is within the allowable window given in Supplement C 01-01 *Appendix D System Verification* section item #5. The test was conducted on the same days as the measurement of the DUT. Recommended limits for maximum permittivity, minimum conductivity are shown in the table below. These come from the Federal Communication Commission, OET Bulletin 65 Supplement C 01-01. The obtained results from the system accuracy verification are displayed in the table below. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0cm ±0.5cm. Z-axis scans showing the SAR penetration are also included in Appendix 1. SAR values are normalized to 1W forward power delivered to the dipole.

Daily, prior to conducting tests, measurements were made with the RF sources powered off to determine the system noise level. The highest system noise was 0.000 W/kg, which is below the recommended limit.

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Ambien t Temp (°C)	Tissue Temp (°C)
			ε <sub>r</sub>	σ (S/m)		
900	Measured, 11-Dec-02	11.75	41.9	1.00	23	22.5
	Measured, 13-Dec-02	11.35	40.2	0.96	23	22
	Measured, 14-Dec-02	11.78	39.7	0.96	23	22.1
	Recommended Limits	11.40	40.3	0.95	20-25	20-25
1800	Measured, 10-Dec-02	39.68	39.0	1.36	23	22
	Measured, 11-Dec-02	40.71	38.6	1.38	23	21.3
	Measured, 15-Dec-02	39.68	39.0	1.37	23	21.6
	Recommended Limits	39.30	39.6	1.37	20-25	20-25

The following probe conversion factors were used on the E-Field probe(s) used for the system accuracy verification measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ETDV6	SN1522	900	4.5	2 of 8
		1800	3.4	2 of 8

### 6. Test Results

The test sample was operated in a test mode that allows control of the transmitter without the need to place actual phone calls. For the purposes of this test the unit is commanded to test mode and manually set to the proper channel, transmitter power level and transmit mode of operation. The phone was tested in the configurations stipulated in OET Bulletin 65 Supplement C 01-01. Motorola also followed the requirements in Supplement. C / Appendix D: SAR Measurement Procedures, section titled “*Devices Operating Next To A Person’s Ear* “. These directions state “The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the

middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).“

The DASY v3.1d SAR measurement system specified in section 3.1 was utilized within the intended operations as set by the SPEAG™ setup. The phone was positioned into the measurement configurations using the positioner supplied with the DASY 3.1d SAR measurement system. The measured dielectric constant of the material used for the positioner is less than 2.9 and the loss tangent is less than 0.02 (± 30%) at 850MHz. The default settings for the “coarse” and “cube” scans were chosen and use for measurements. The grid spacing of the course scan was set to 15cm as shown in the SAR plots included in appendix 2 and 3. Please refer to the DASY manual for additional information on SAR scanning procedures and algorithms used.

The Cellular Phone (FCC ID IHDT56CL1) has the SNN5725A as the only available battery option. This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

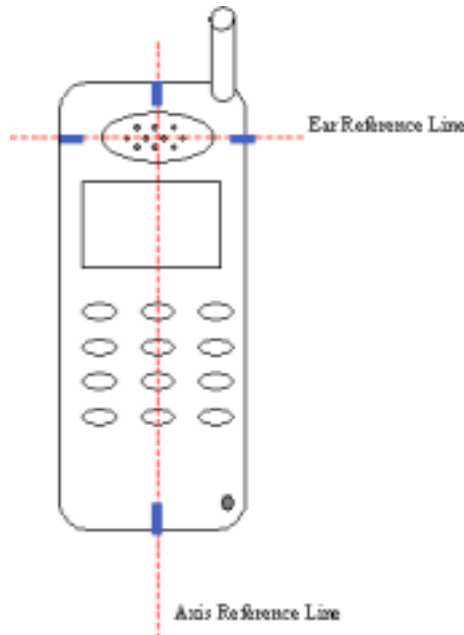
All secondary RF hot spots were evaluated to be not within 2.0dB of the highest peak identified. Thus secondary hot spots were not SAR measured. This follows the guidelines within Supplement C, “**Procedures to search for peak sar locations**” section.

### 6.1 Head Adjacent Test Results

To aid in positioning repeatability, the ear reference line of the device and the axis reference line of the device have been physically added using a non-metallic marker.

- Per Figure 1, the "Ear Reference Line" is centered vertically through the center of the listening area (as defined by the speaker holes in the housing).
- The "Axis Reference Line" bisects the front surface of the device at its top and bottom edges.
- The intersection of these two lines defines the location of the "Ear Reference Point".

The lines drawn on the device extended to the outside edges, as shown in blue in the figure below, & wrap around the sides of the device.



The SAR results shown in tables 1 through 4 are maximum SAR values averaged over 1 gram of phantom tissue. Also shown are the measured conducted output powers, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $New\ SAR = Old\ SAR * 10^{(drift/10)}$ . The SAR reported at the end of the measurement process by

the DASY™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. The test conditions indicated as bold numbers in the following table are included in Appendix 2. All other test conditions measured lower SAR values than those included. The phone has two different housings: “C333” and “C332”. All the required testes were performed with the “C333” and spot-checked with the “C332”.

The SAR measurements were performed using the SAM phantoms listed in section 3.1. Since same phantoms and tissue simulate are used for the system accuracy verification as the device SAR measurements, the Z-axis scans included in within Appendix 1 are applicable for verification of tissue simulate depth to be 15.0cm ±0.5cm. All other test conditions measured lower SAR values than those included in Appendix 2.

The following probe conversion factors were used on the E-Field probe(s) used for the head adjacent measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ETDV6	SN1522	835	4.6	2 of 2
		1900	3.4	2 of 8

f (MHz)	Description	Conducted Output Power (dBm)	C333 (Cheek / Touch Position)										
			Left Head					Right Head					
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	
Digital 800 MHz	Channel 1013	24.97	1.11	-0.04	1.12	23	22.1						
	Channel 384	24.97	1.00	0.37	1.00	23	22.1	0.719	0.05	0.72	23	21.8	
	Channel 777	25.05	0.865	-0.25	0.92	23	22.1						
Digital 1900 MHz	Channel 25	24.75											
	Channel 600	24.61	<b>0.687</b>	<b>0.28</b>	<b>0.69</b>	<b>23</b>	<b>20.8</b>	0.603	-0.27	0.64	23	20.8	
	Channel 1175	24.70											

**Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the head in the Cheek/Touch Position.**

f (MHz)	Description	Conducted Output Power (dBm)	C333 (15° Tilt Position)									
			Left Head					Right Head				
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 800 MHz	Channel 1013	24.97	<b>1.17</b>	<b>0.03</b>	<b>1.17</b>	23	<b>22.2</b>	0.906	-0.27	0.96	23	21.8
	Channel 384	24.97	1.14	0.02	1.14	23	22.2	0.879	0.10	0.88	23	21.8
	Channel 777	25.05	0.982	-0.03	0.99	23	22.2	0.79	-0.41	0.87	23	21.8
Digital 1900 MHz	Channel 25	24.75	<b>1.33</b>	<b>0.11</b>	<b>1.33</b>	23	<b>20.8</b>	1.21	-0.03	1.22	23	20.8
	Channel 600	24.61	1.00	0.09	1.00	23	20.8	0.843	-0.10	0.86	23	20.7
	Channel 1175	24.70	1.21	-0.10	1.21	23	20.9	1.09	0.03	1.09	23	21.0

**Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the left head in the 15° Tilt Position.**

f (MHz)	Description	Conducted Output Power (dBm)	C332 (Cheek / Touch Position)									
			Left Head					Right Head				
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 800 MHz	Channel 1013	24.97	<b>1.11</b>	<b>-0.23</b>	<b>1.17</b>	23	<b>22.2</b>	0.942	-0.19	0.98	23	22.2
	Channel 384	24.97	0.892	0.27	0.89	23	22.2	0.838	-0.19	0.88	23	22.2
	Channel 777	25.05	0.904	-0.26	0.96	23	22.2	0.737	-0.35	0.80	23	22.2
Digital 1900 MHz	Channel 25	24.75										
	Channel 600	24.61	0.71	-0.16	0.74	23	-0.16	0.612	-0.1	0.63	23	21.0
	Channel 1175	24.70										

**Table 3: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the head in the Cheek/Touch Position.**

f (MHz)	Description	Conducted Output Power (dBm)	C332 (15° Tilt Position)									
			Left Head					Right Head				
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 800 MHz	Channel 1013	24.97	1.16	-0.07	1.18	23	22.2	0.943	-0.14	0.97	23	21.8
	Channel 384	24.97	1.13	0.12	1.13	23	22.2	0.854	0.20	0.85	23	21.5
	Channel 777	25.05	0.953	-0.26	1.01	23	22.2	0.798	0.03	0.80	23	21.6
Digital 1900 MHz	Channel 25	24.75	1.15	-0.03	0.81	23	21.0					
	Channel 600	24.61	0.81	-0.15	0.84	23	22.1	0.658	-0.03	0.66	23	21.0
	Channel 1175	24.70	1.06	-0.11	1.09	23	21.0					

**Table 4: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the left head in the 15° Tilt Position.**

### 6.2 Body-Worn Test Results

The SAR results shown in tables 5 & 6 are the maximum SAR values averaged over 1 gram of phantom tissue. Also shown are the measured conducted output powers, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $New\ SAR = Old\ SAR * 10^{(drift/10)}$ . The SAR reported at the end of the measurement process by the DASY™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test. The test conditions indicated as bold numbers in the following table are included in Appendix 3. Note that 800MHz digital mode SAR measurements were performed in accordance with OET Bulletin 65 Supplement C 01-01. All other test conditions measured lower SAR values than those included in Appendix 3.

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0mm. It measures 52.7cm(long) x 26.7cm(wide) x 21.2cm(tall). The measured dielectric constant of the material used is less than 2.3 and the loss tangent is less than 0.0046 all the way up to 2.184GHz.

The tissue stimulant depth was verified to be 15.0cm ±0.5cm. The same device holder described in section 6 was used for positioning the phone. The functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories’, testing was

performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

*(There are no Body-Worn Accessories available for this phone hence the device was tested per the supplement C testing guidelines for devices that do not have body worn accessories. The back part of the phone was placed 1 inch away from a flat phantom per the supplement C standard guidelines to perform SAR measurement. Placing the back of the phone towards the user in this configuration causes the antenna to be closer than with the front of the phone towards the users).*

The following probe conversion factors were used on the E-Field probe(s) used for the body worn measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ETDV6	SN1522	835	4.4	2 of 2
		1900	3.1	2 of 2

f (MHz)	Description	Conducted Output Power (dBm)	C333 (Body Worn)										
			Back of Phone 1" From Phantom					Front of Phone 1" from Phantom					
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	
Digital 800 MHz	Channel 1013	24.97											
	Channel 384	24.97	0.182	0.17	0.18	23	22.3	0.252	0.09	0.25	23	22.1	
	Channel 777	25.05											
Digital 1900 MHz	Channel 25	24.75											
	Channel 600	24.61	<b>0.162</b>	<b>0.05</b>	<b>0.16</b>	<b>23</b>	<b>21.4</b>	<b>0.112</b>	<b>-0.02</b>	<b>0.11</b>	<b>23</b>	<b>21.5</b>	
	Channel 1175	24.70											

**Table 5: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the body.**

f (MHz)	Description	Conducted Output Power (dBm)	C332 (Body Worn)									
			Back of Phone 1" From Phantom					Front of Phone 1" from Phantom				
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)	Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Amb. Temp (°C)	Simulate Temp (°C)
Digital 800 MHz	Channel 1013	24.97										
	Channel 384	24.97	<b>0.526</b>	<b>0.02</b>	<b>0.53</b>	<b>23</b>	<b>22.4</b>	<b>0.439</b>	<b>0.23</b>	<b>0.44</b>	<b>23</b>	<b>22.4</b>
	Channel 777	25.05										
Digital 1900 MHz	Channel 25	24.75										
	Channel 600	24.61	0.153	-0.13	0.16	23	20.0	0.0997	-0.11	0.10	23	20.0
	Channel 1175	24.70										

**Table 6: SAR measurement results for the portable cellular telephone FCC ID IHDT56CL1 at highest possible output power. Measured against the body.**

## **Appendix 1**

### **SAR distribution comparison for the system accuracy verification**

# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr

Forward Power = 252 Reflected Power = -21.31dB

Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22

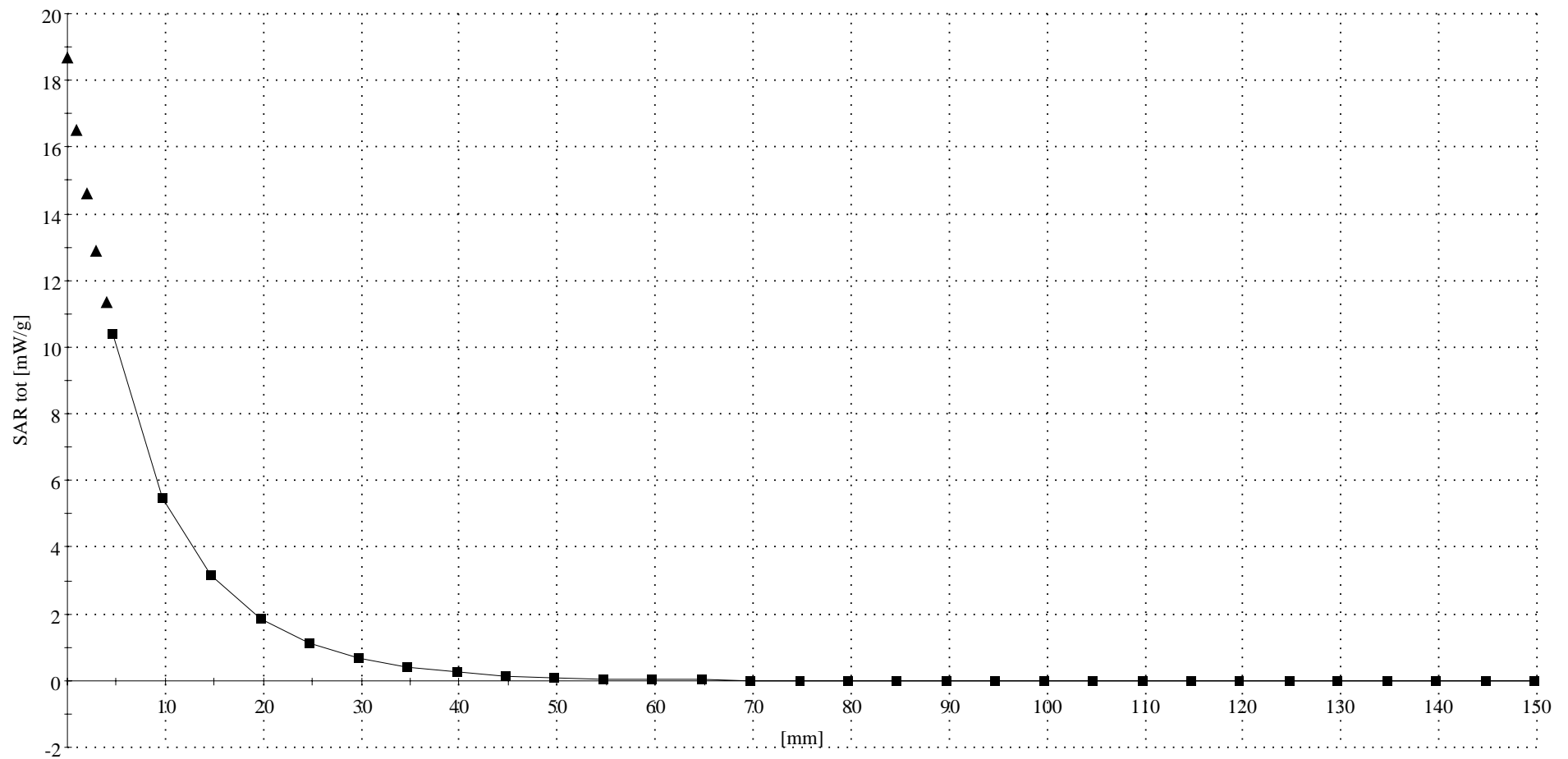
R3 Gycol TP-1157 (rev. 4) 26Apr02 Phantom; Section; Position; ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.36$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

: , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.2 (7.8, 9.1) [mm]



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr

Forward Power = 250mw Reflected Power = -22.73dB

Room Temp at time of measurement = 23°C Simulant Temp at time of measurement = 21.6°C

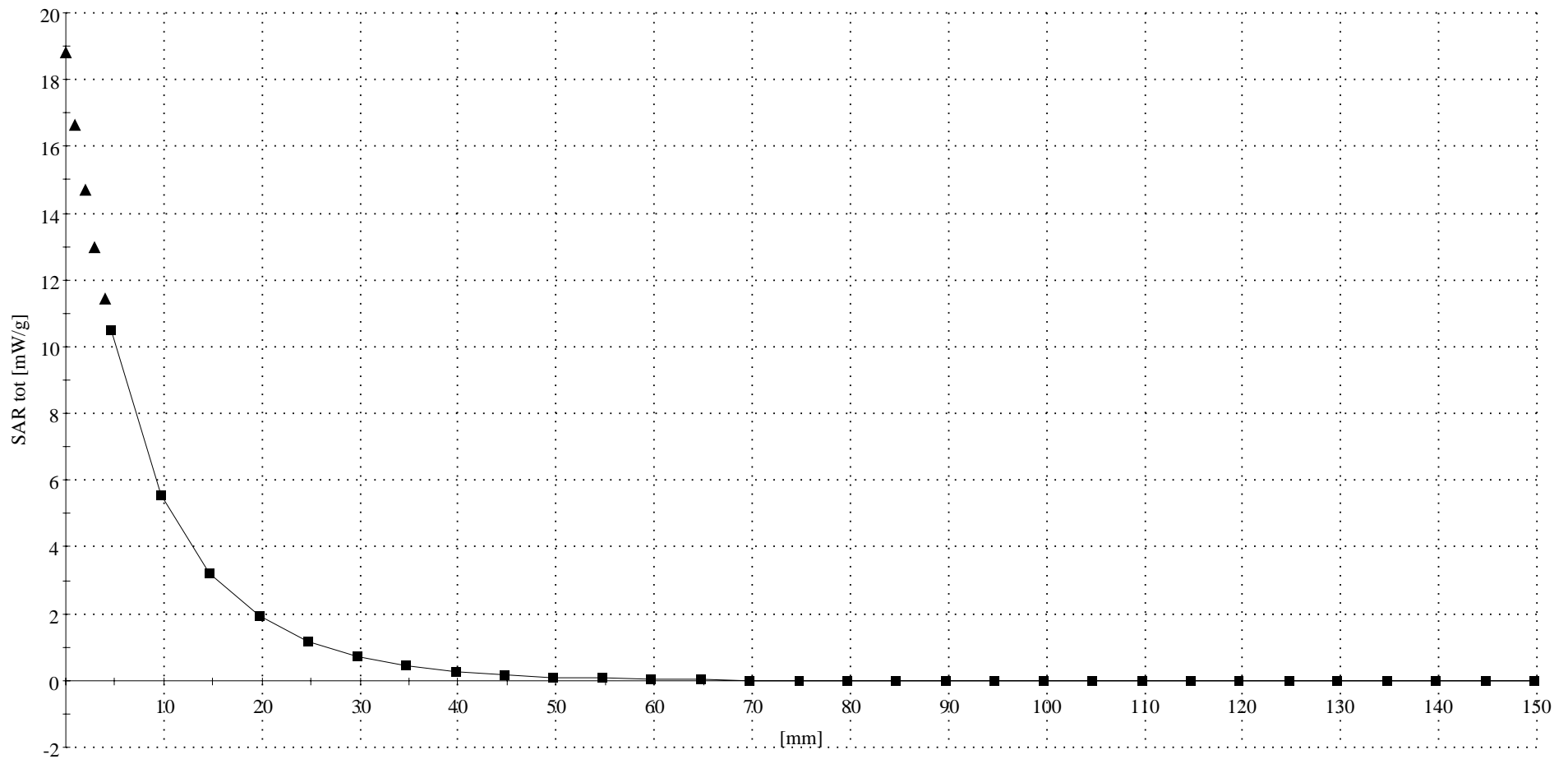
R3 Gycol TP-1157 (rev. 4) 26Apr02 Phantom; Section; Position; ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.37$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

: , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.3 (7.9, 9.2) [mm]



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 247 Reflected Power = -23.12dB

Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22.1

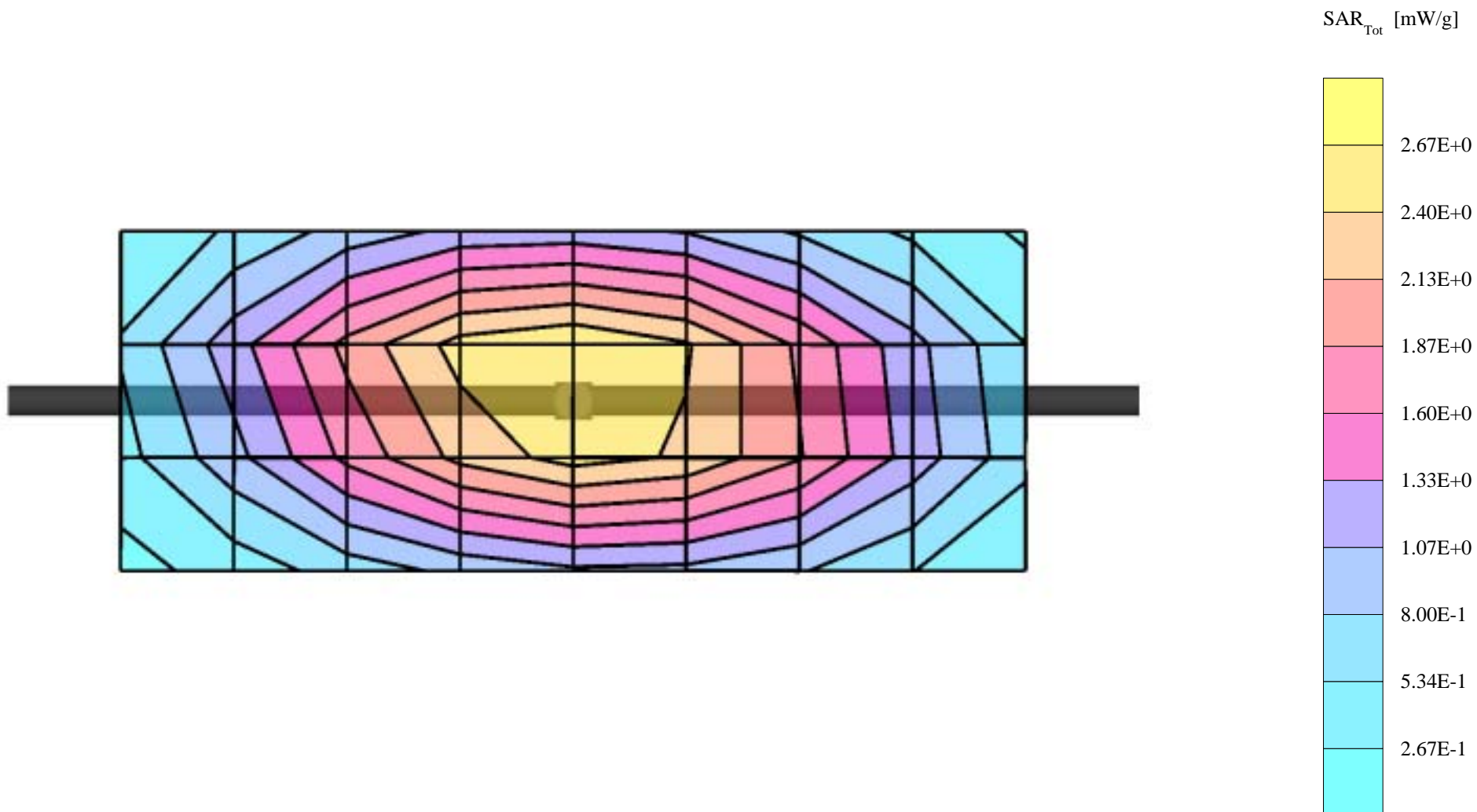
R3 Suger TP-1157 SAM (rev. 4) 26Apr02; Flat

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 39.7$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 4.60 mW/g  $\pm 0.10$  dB, SAR (1g): 2.91 mW/g  $\pm 0.10$  dB, SAR (10g): 1.84 mW/g  $\pm 0.10$  dB, (Worst-case extrapolation)

Penetration depth: 11.6 (10.7, 12.9) [mm]

Powerdrift: 0.09 dB



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 247 Reflected Power = -23.12dB

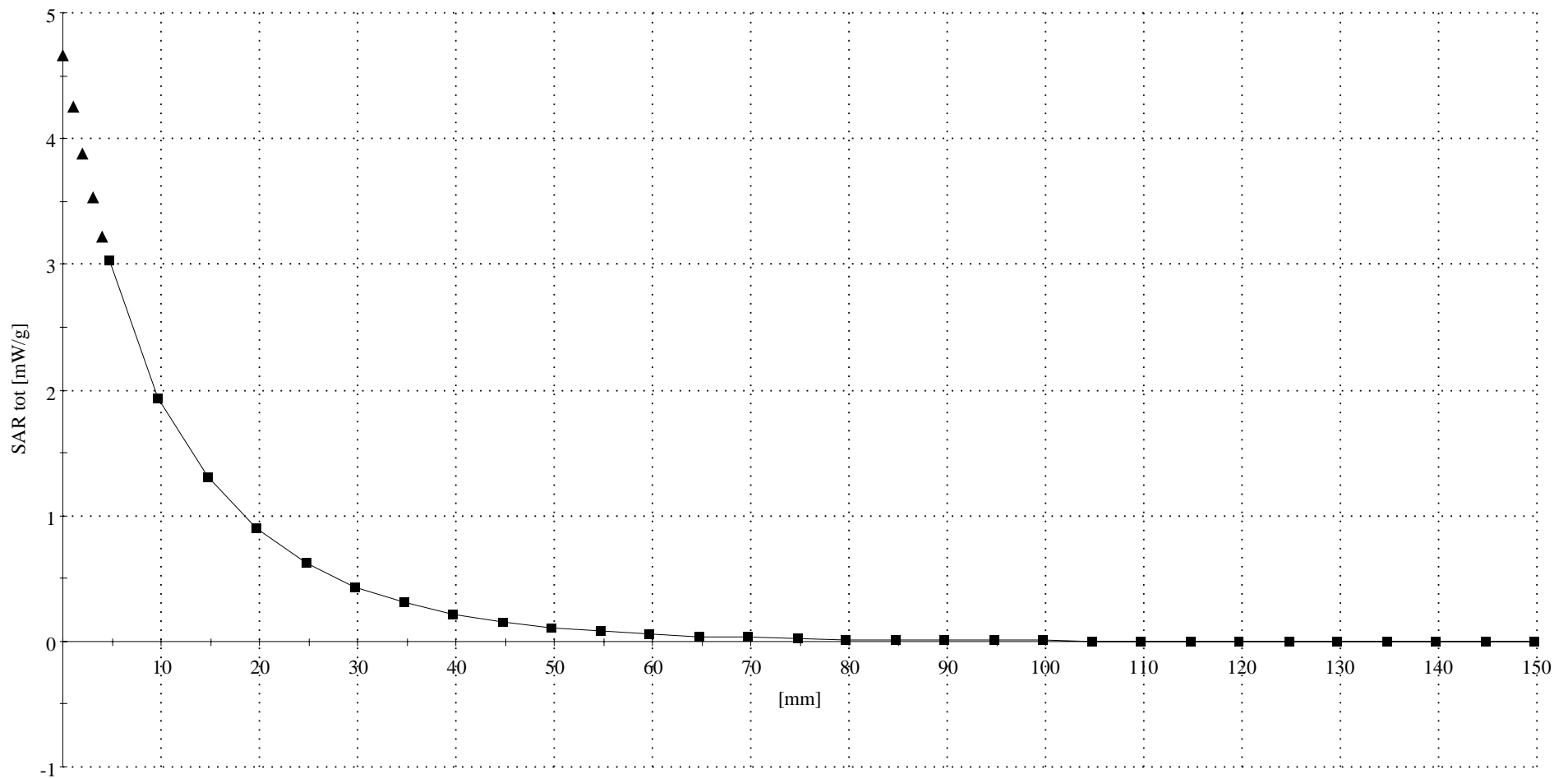
Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22.1

R3 Suger TP-1157 SAM (rev. 4) 26Apr02;

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 39.7$   $\rho = 1.00$  g/cm<sup>3</sup>

: , ()

Penetration depth: 11.8 (11.0, 12.9) [mm]



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 252 Reflected Power = -23.77dB

Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22

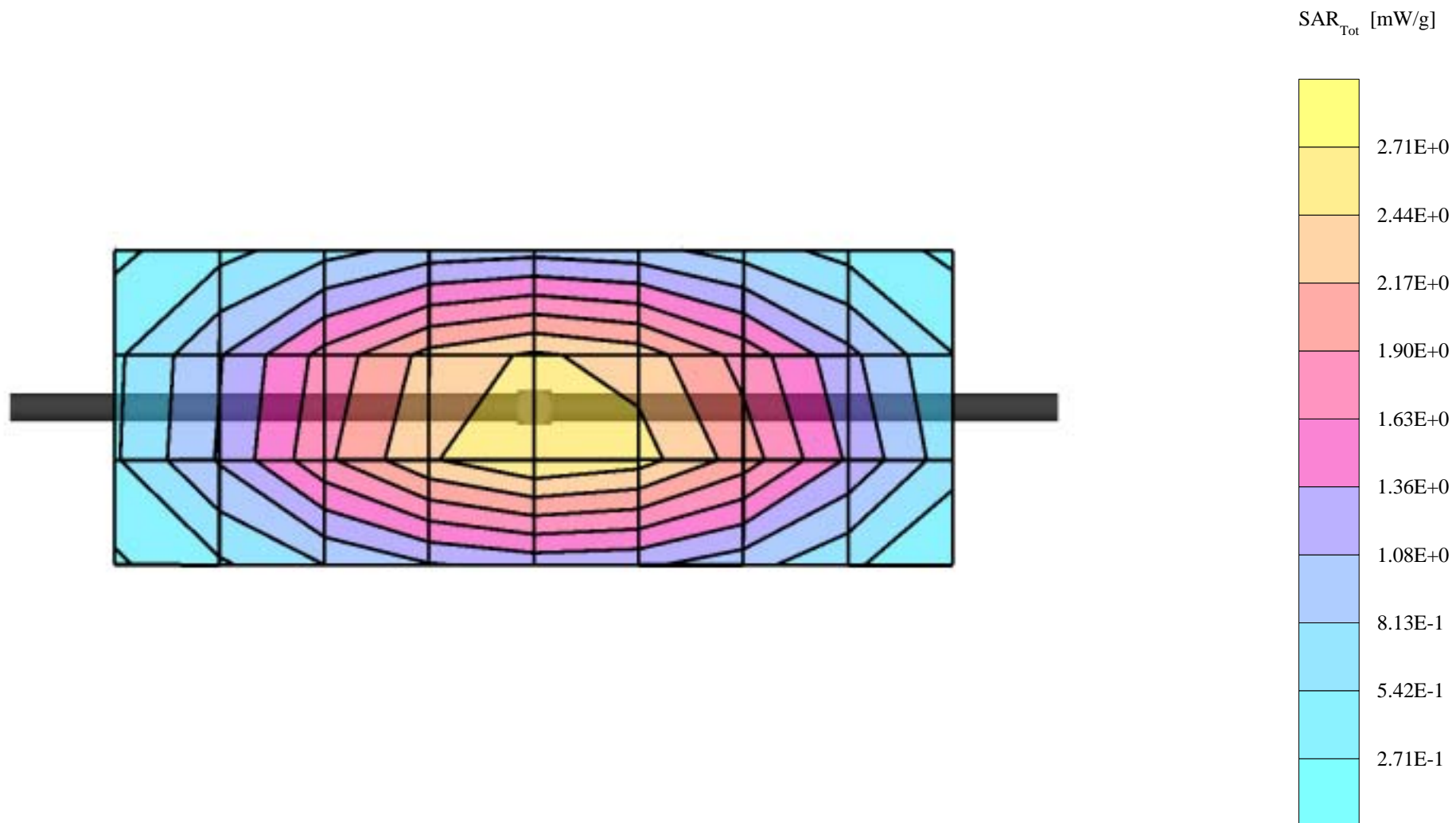
R3 Suger TP-1157 SAM (rev. 4) 26Apr02; Flat

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 40.2$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 4.52 mW/g  $\pm 0.11$  dB, SAR (1g): 2.86 mW/g  $\pm 0.12$  dB, SAR (10g): 1.81 mW/g  $\pm 0.12$  dB, (Worst-case extrapolation)

Penetration depth: 11.6 (10.8, 12.8) [mm]

Powerdrift: 0.03 dB



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 252 Reflected Power = -23.77dB

Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22

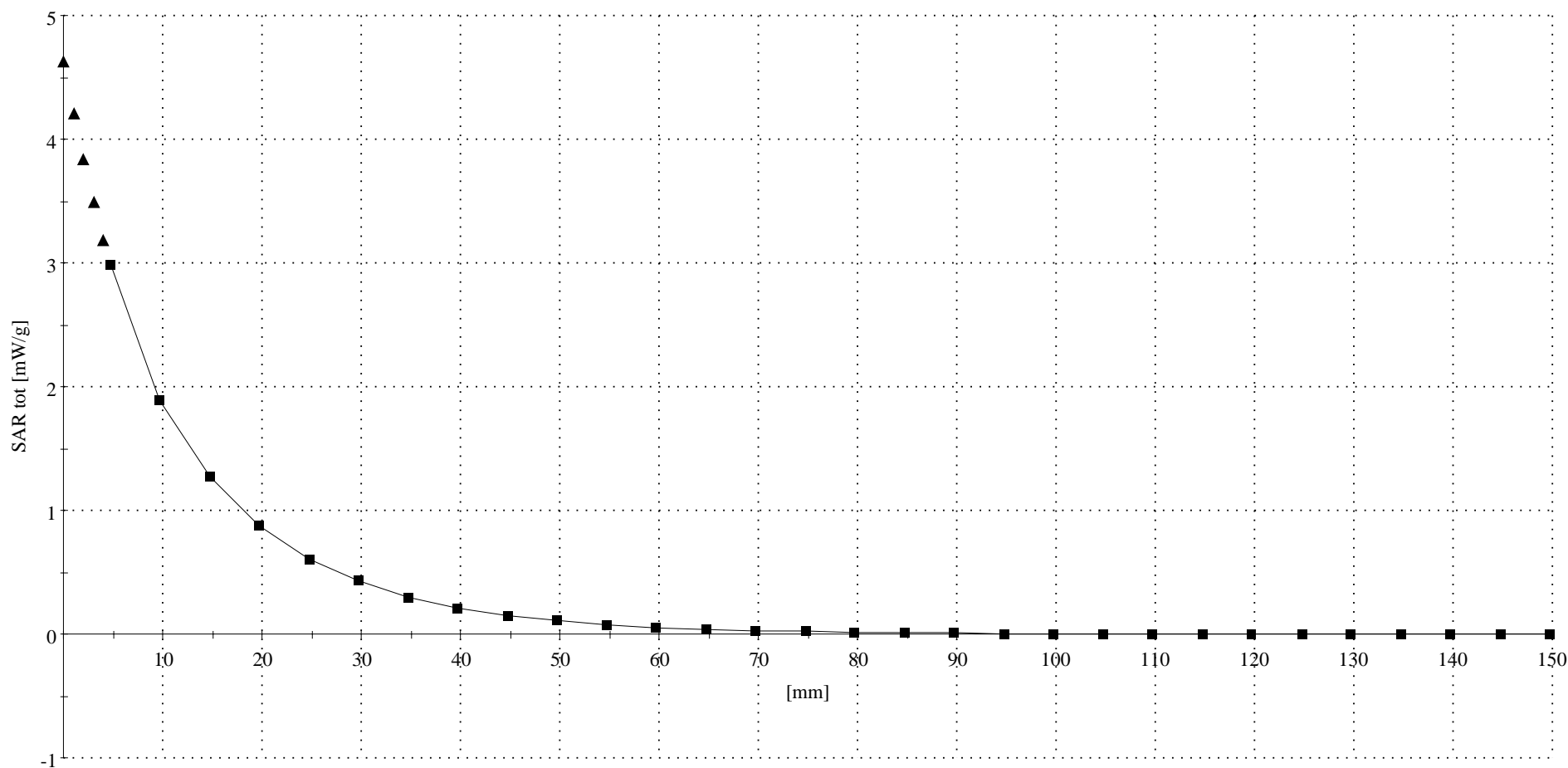
R3 Suger TP-1157 SAM (rev. 4) 26Apr02 Phantom; Section; Position: ; Frequency: 900 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 40.2$   $\rho = 1.00$  g/cm<sup>3</sup>

: , , ()

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 11.6 (10.8, 12.8) [mm]



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 251mW Reflected Power = -23.55dB

Room Temp at time of measurement = 23 C. Simulant Temp at time of measurement = 22.5 C.

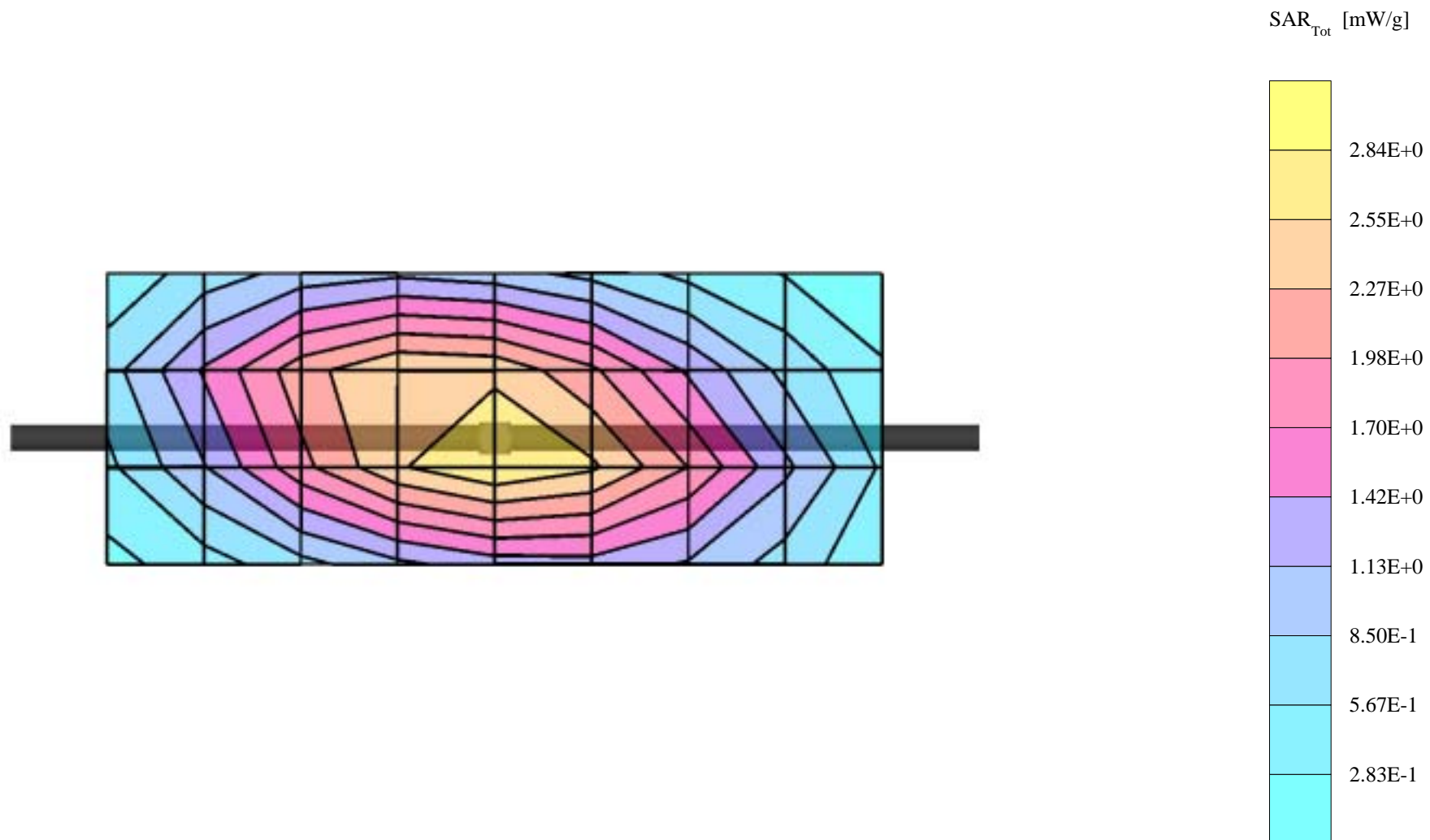
R3 Suger TP-1157 SAM (rev. 4) 26Apr02; Flat

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 1.00$  mho/m  $\epsilon_r = 41.9$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 4.65 mW/g  $\pm 0.09$  dB, SAR (1g): 2.95 mW/g  $\pm 0.10$  dB, SAR (10g): 1.87 mW/g  $\pm 0.10$  dB, (Worst-case extrapolation)

Penetration depth: 11.7 (10.8, 12.8) [mm]

Powerdrift: 0.03 dB



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 96

Forward Power = 251mW Reflected Power = -23.55dB

Room Temp at time of measurement = 23 C. Simulant Temp at time of measurement = 22.5 C.

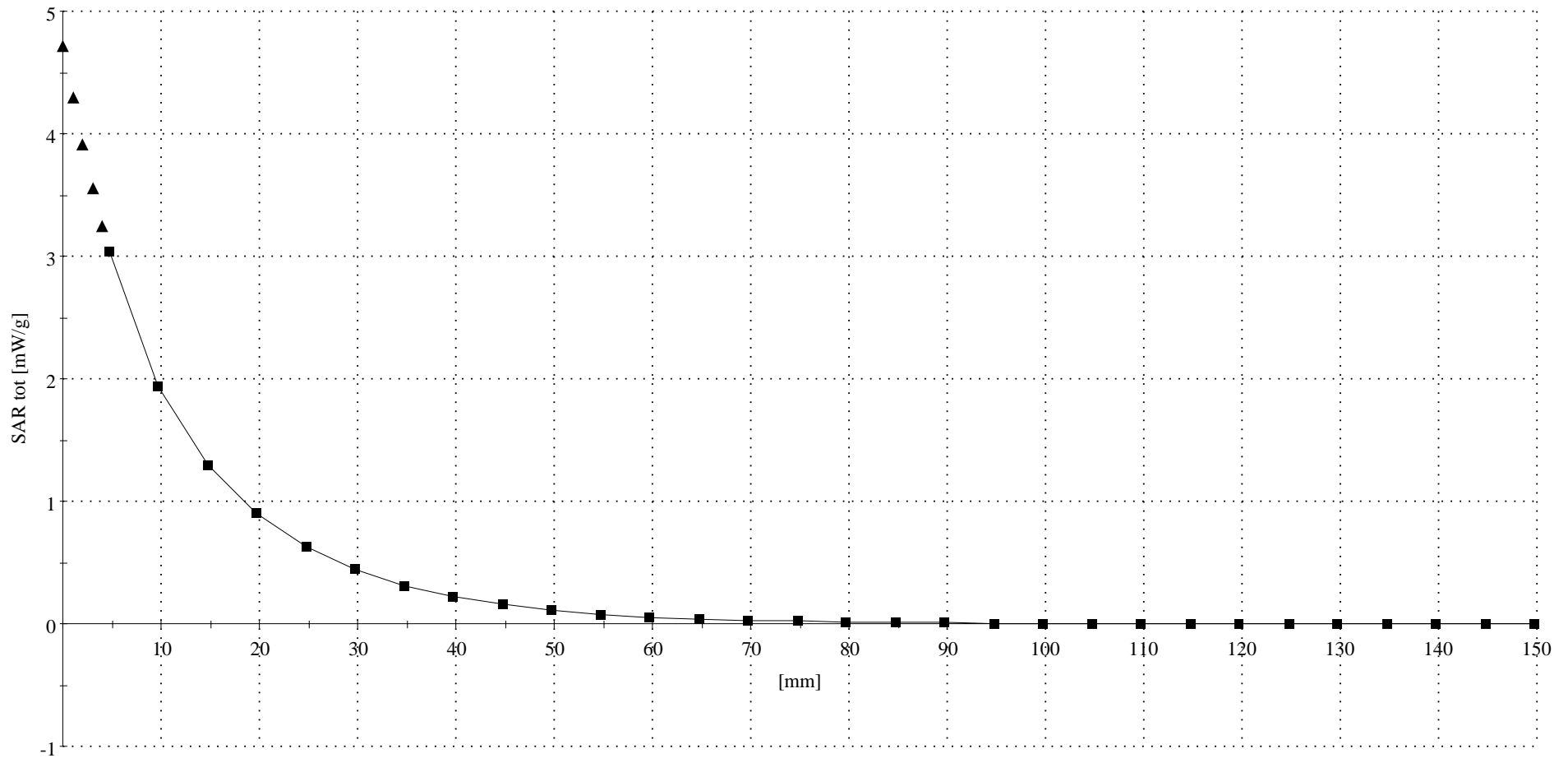
R3 Suger TP-1157 SAM (rev. 4) 26Apr02 Phantom; Section; Position: ; Frequency: 900 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 1.00$  mho/m  $\epsilon_r = 41.9$   $\rho = 1.00$  g/cm<sup>3</sup>

: , ()

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 11.7 (10.9, 12.8) [mm]



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259TR

Forward Power = 253mW Reflected Power = -21.86dB

Room Temp at time of measurement = 23C Simulant Temp at time of measurement = 21.3C

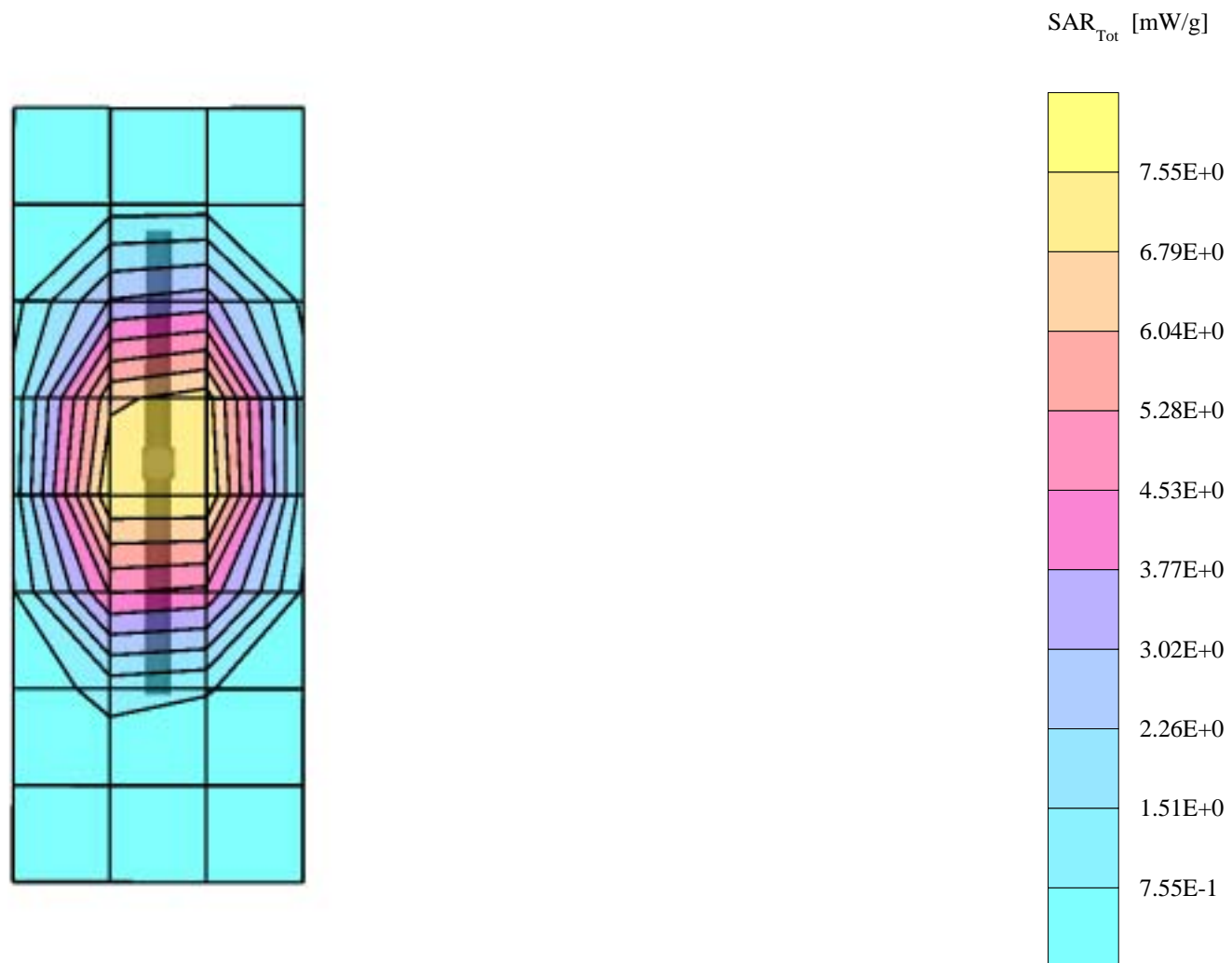
R3 Amy Twin Phantom Rev.4 (22Aug02); section 1

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.38$  mho/m  $\epsilon_r = 38.6$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 19.0 mW/g  $\pm 0.13$  dB, SAR (1g): 10.3 mW/g  $\pm 0.13$  dB, SAR (10g): 5.46 mW/g  $\pm 0.13$  dB, (Worst-case extrapolation)

Penetration depth: 8.3 (7.9, 9.2) [mm]

Powerdrift: 0.01 dB



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259TR

Forward Power = 253mW Reflected Power = -21.86dB

Room Temp at time of measurement = 23C Simulant Temp at time of measurement = 21.3C

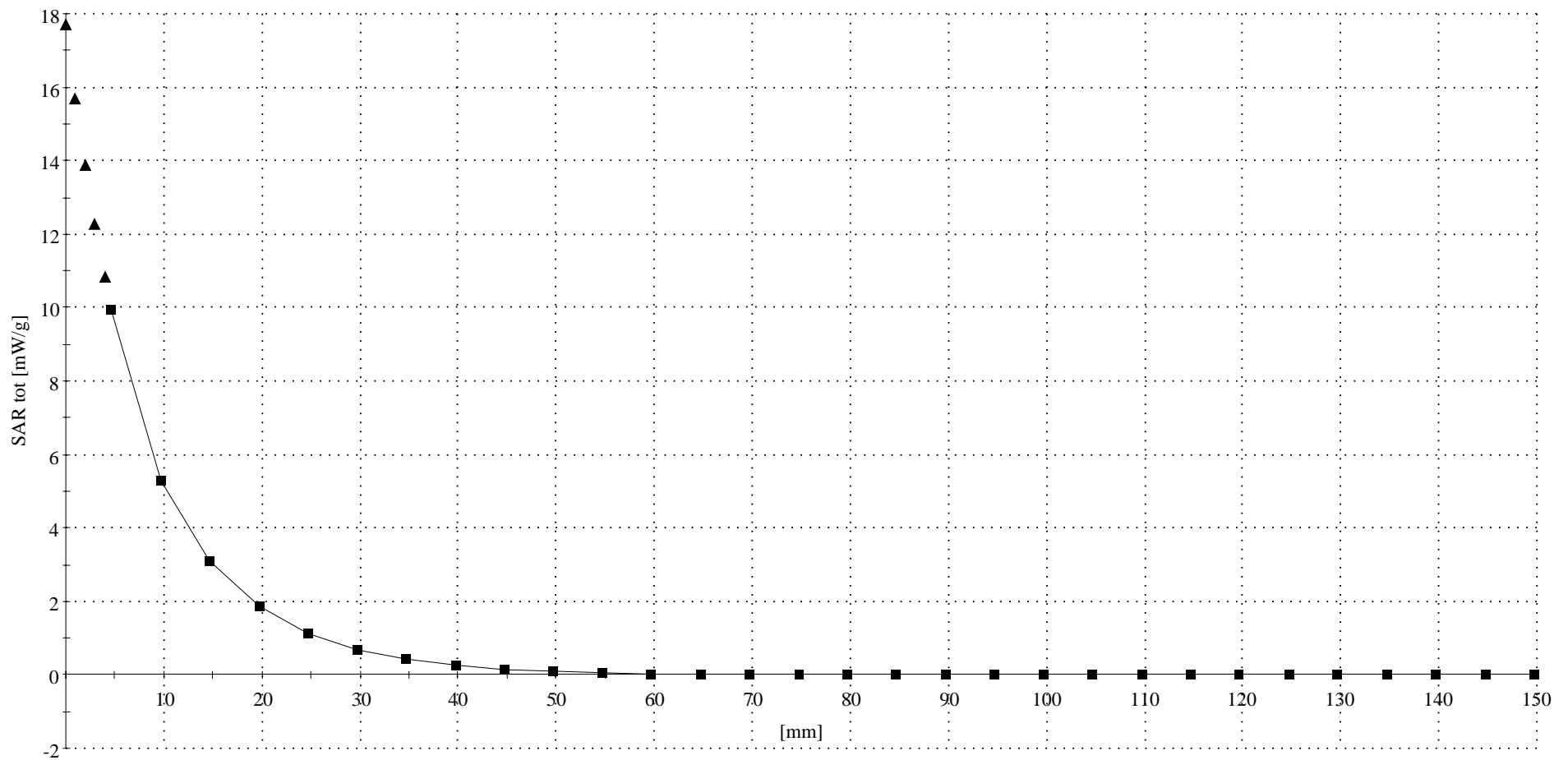
R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.38$  mho/m  $\epsilon_r = 38.6$   $\rho = 1.00$  g/cm<sup>3</sup>

: , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.4 (8.0, 9.3) [mm]



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr

Forward Power = 252 Reflected Power = -21.31dB

Room Temp at time of measurement = 23 Simulant Temp at time of measurement = 22

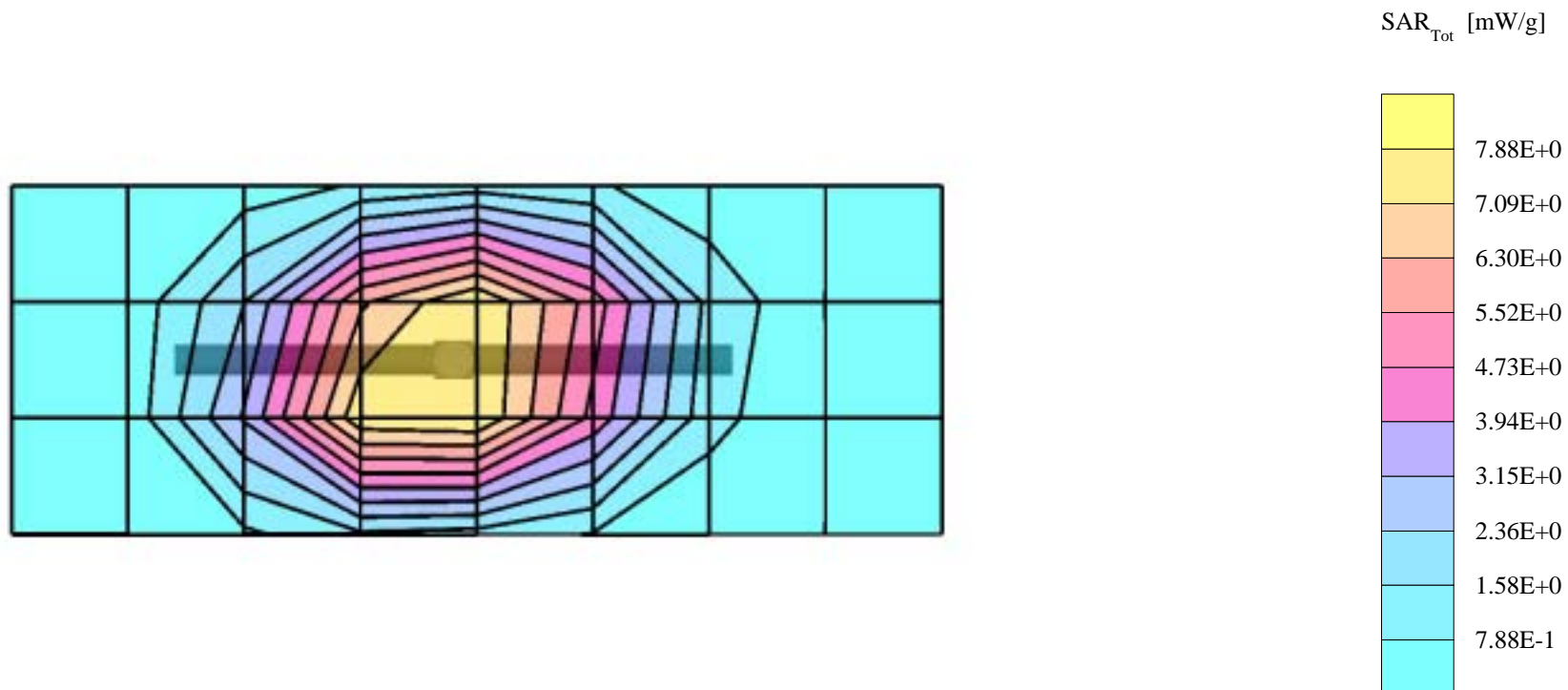
R3 Gycol TP-1157 (rev. 4) 26Apr02; Flat

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.36$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 18.6 mW/g  $\pm 0.13$  dB, SAR (1g): 10.0 mW/g  $\pm 0.13$  dB, SAR (10g): 5.26 mW/g  $\pm 0.15$  dB, (Worst-case extrapolation)

Penetration depth: 8.2 (7.8, 9.1) [mm]

Powerdrift: -0.01 dB



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr

Forward Power = 250mw Reflected Power = -22.73dB

Room Temp at time of measurement = 23°C Simulant Temp at time of measurement = 21.6°C

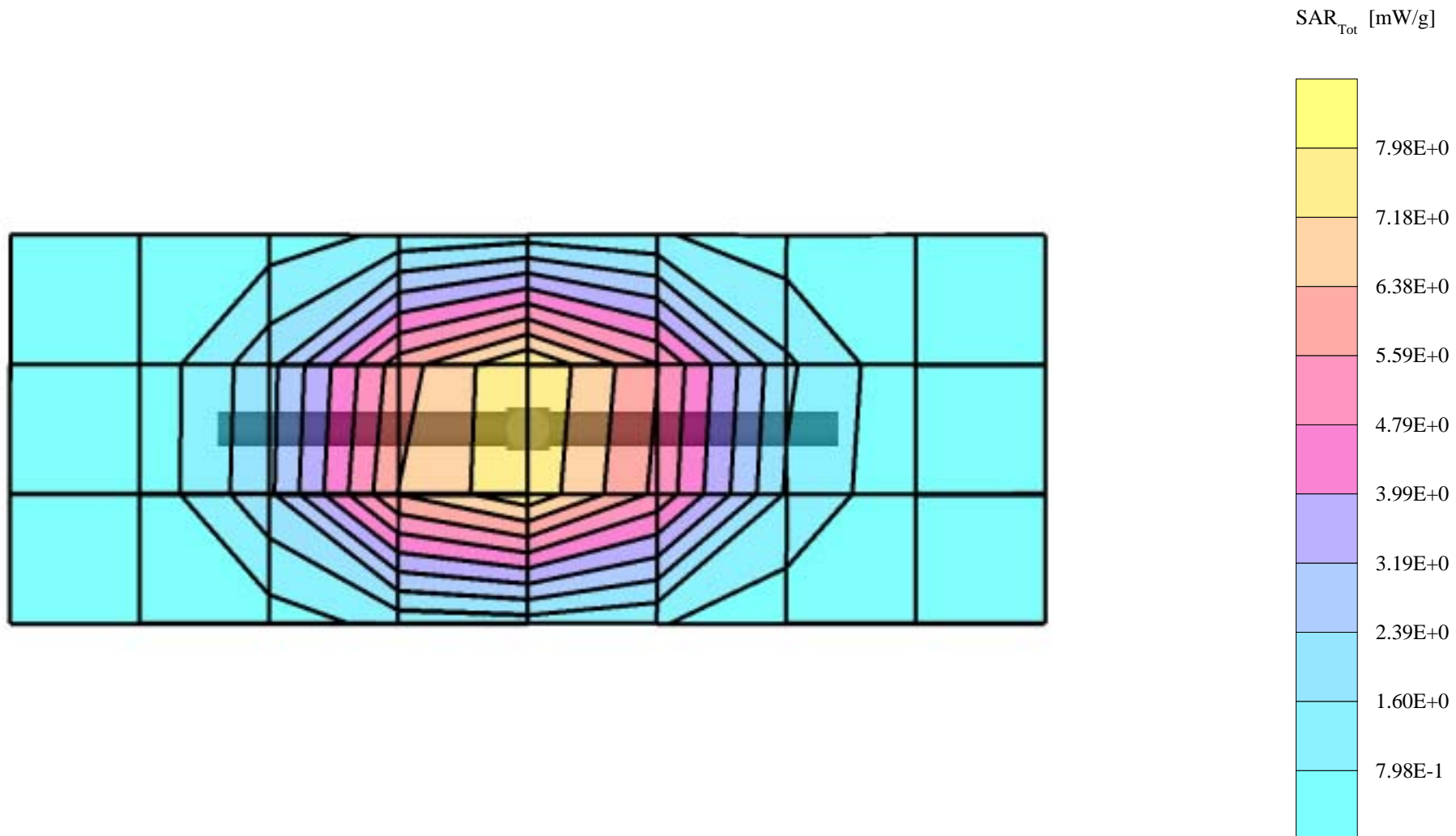
R3 Gycol TP-1157 (rev. 4) 26Apr02; Flat

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.37$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): Peak: 18.3 mW/g  $\pm 0.13$  dB, SAR (1g): 9.92 mW/g  $\pm 0.12$  dB, SAR (10g): 5.23 mW/g  $\pm 0.11$  dB, (Worst-case extrapolation)

Penetration depth: 8.3 (7.9, 9.2) [mm]

Powerdrift: 0.01 dB



## Appendix 2

### SAR distribution plots for Phantom Head Adjacent Use

s/n: 770472C0

Ch# 1013 / Pwr Step: 02 / Battery Model #: SNN5725 A

DEVICE POSITION (cheek or rotated): cheek

R3 Sugar TP-1157 SAM (rev. 4) 26Apr02 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 825 MHz

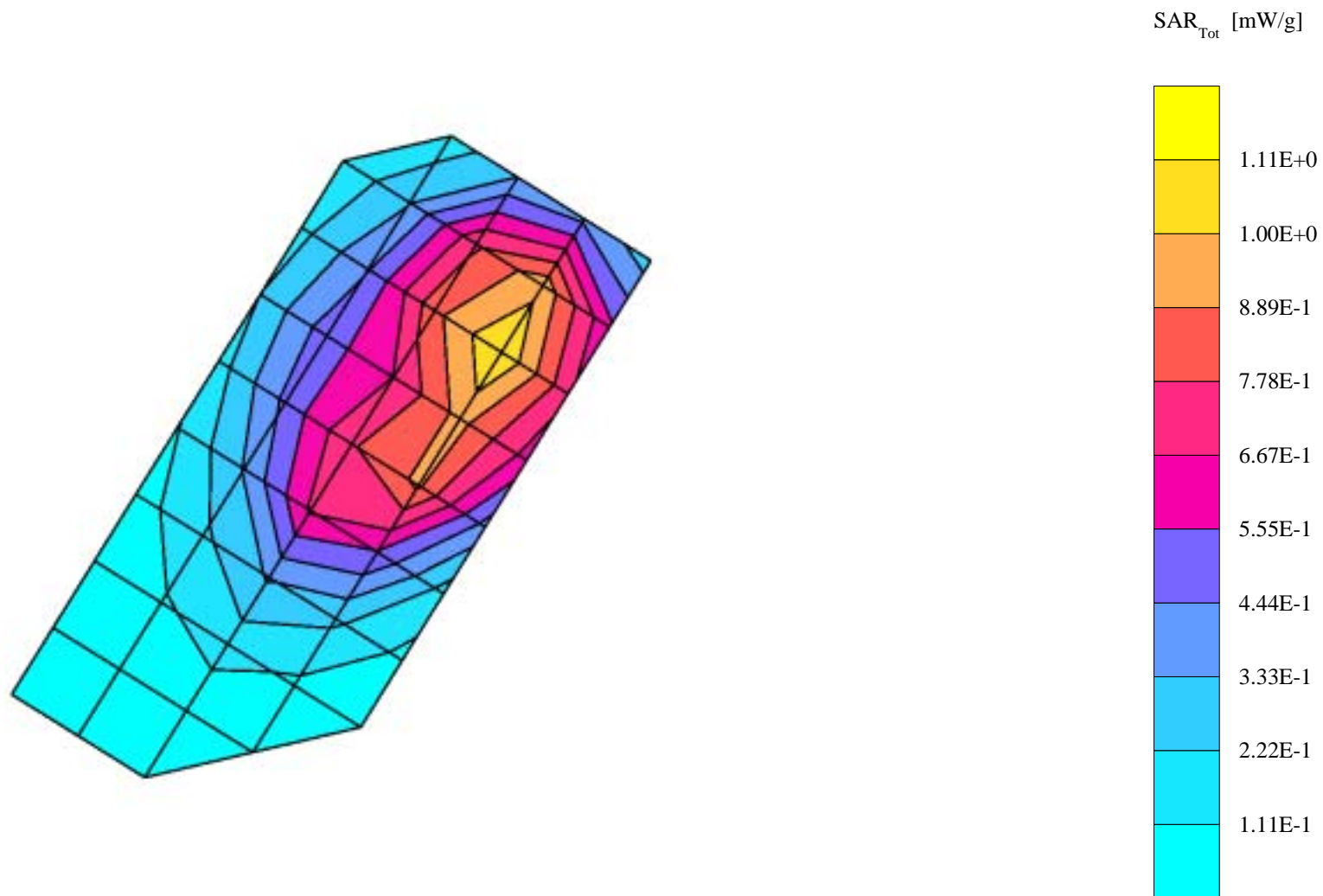
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.91$  mho/m  $\epsilon_r = 40.9$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 1.11 mW/g, SAR (10g): 0.715 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 12.1 (11.4, 13.2) [mm]

Powerdrift: -0.23 dB



s/n: 770472BC

Ch# 600 / Pwr Step: Always Up / Battery Model #: SNN5725A

DEVICE POSITION (cheek or rotated): Cheek

R3 Gycol TP-1157 (rev. 4) 26Apr02 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz

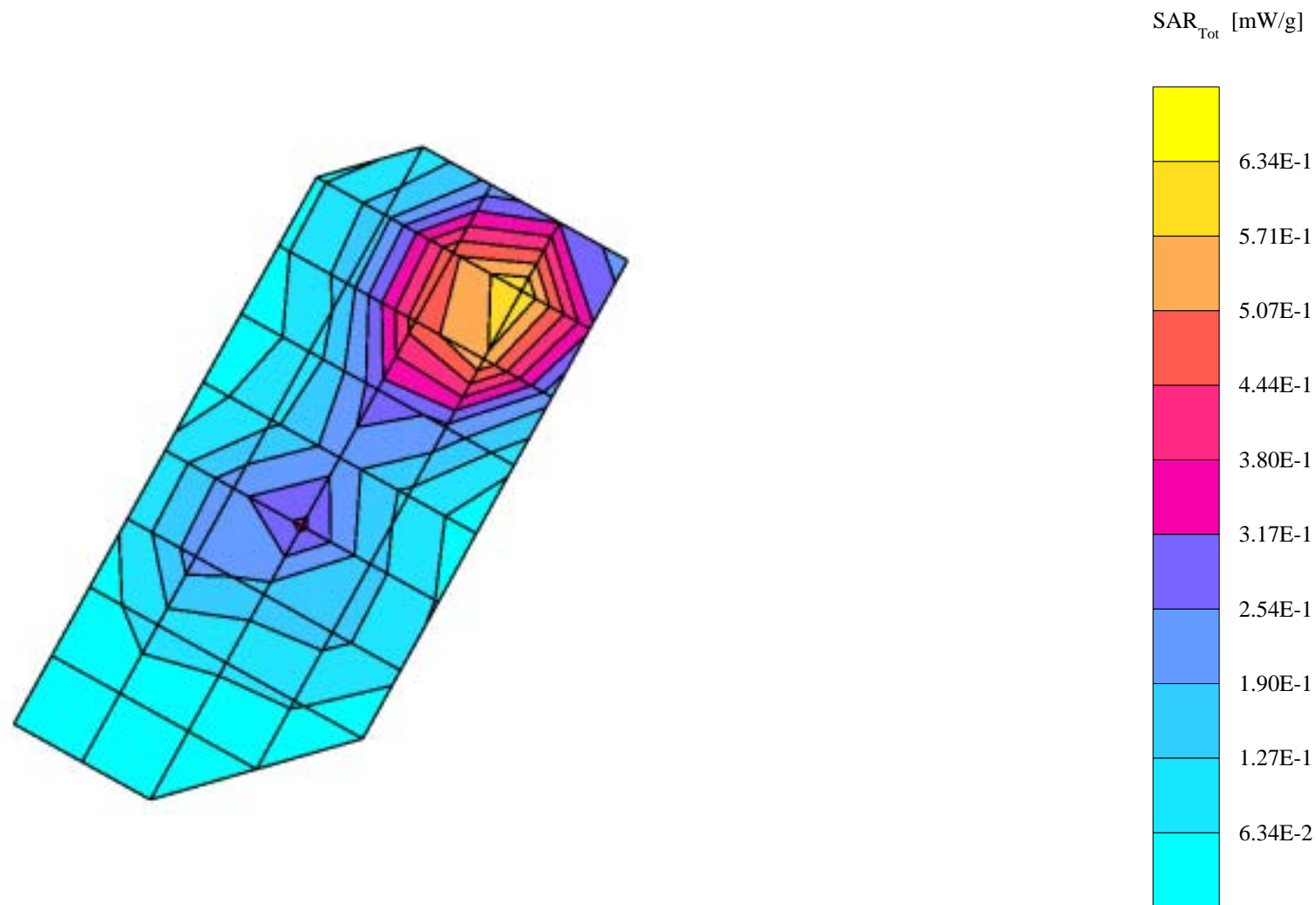
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1880 MHz Head & Body:  $\sigma = 1.47$  mho/m  $\epsilon_r = 38.1$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.687 mW/g, SAR (10g): 0.386 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 9.0 (8.4, 10.0) [mm]

Powerdrift: 0.28 dB



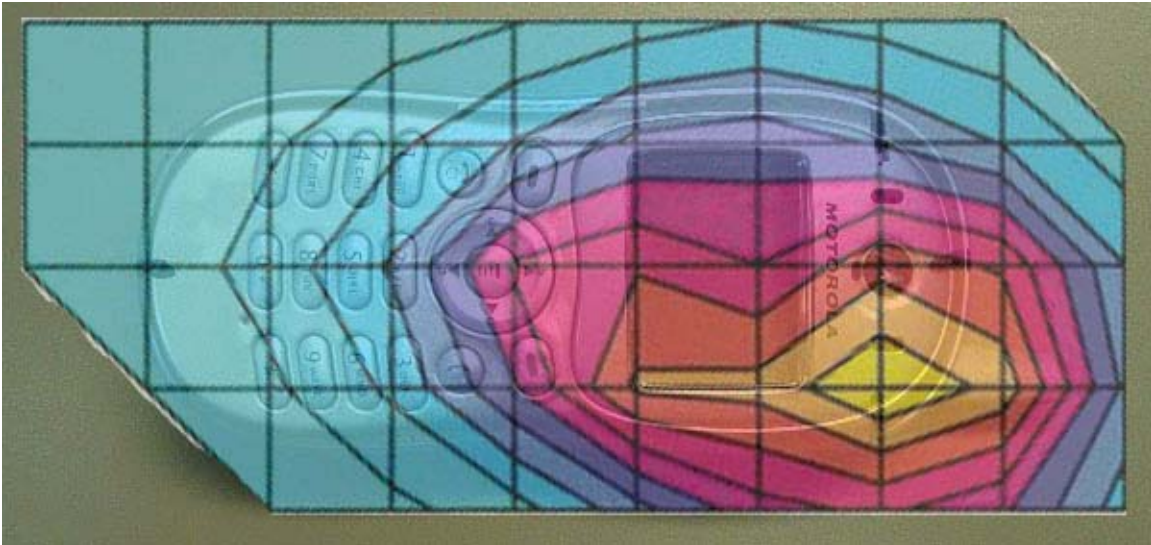


Figure 1. Typical 800MHz Head Adjacent Contour Overlaid on Phone with Antenna Fixed (Cheek Touch)

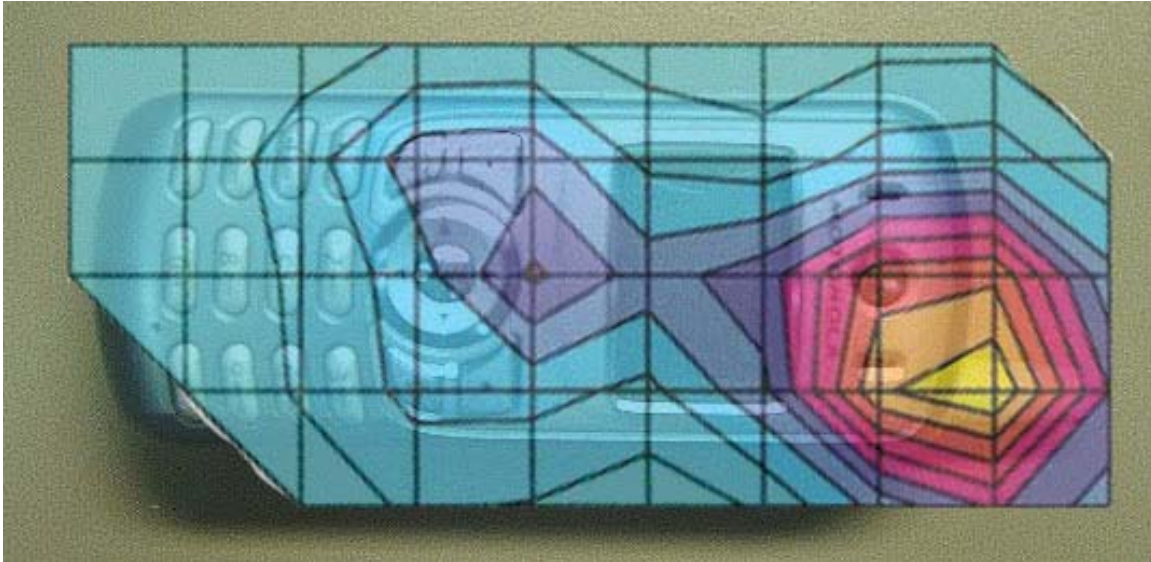


Figure 2. Typical 1900MHz Head Adjacent Contour Overlaid on Phone with Antenna Fixed (Cheek Touch)

s/n: 770472C0

Ch#1013 / Pwr Step: Always Up / Battery Model #: SNN5725A

DEVICE POSITION (cheek or rotated):Tilted

R3 Sugar TP-1157 SAM (rev. 4) 26Apr02 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 825 MHz

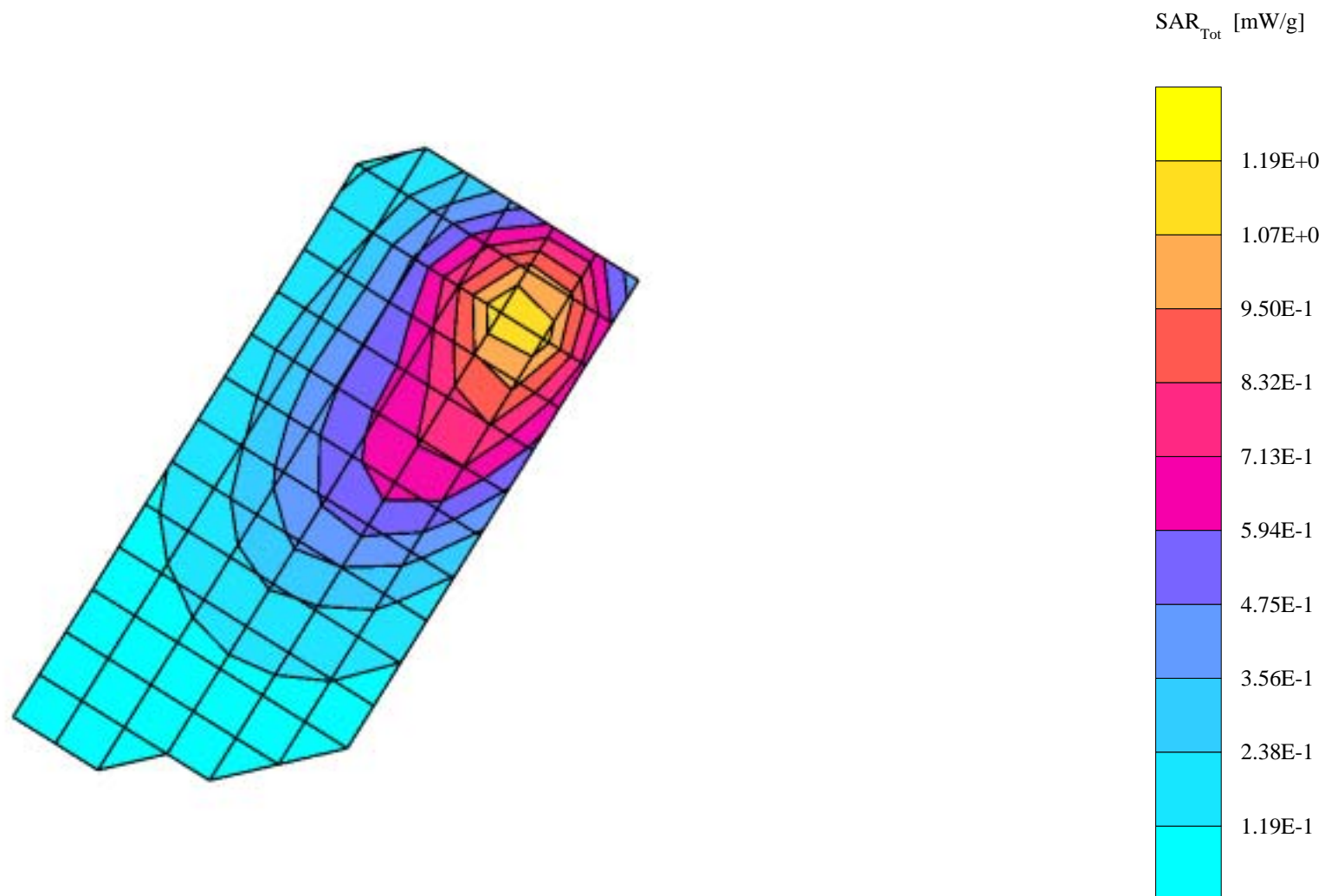
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.93$  mho/m  $\epsilon_r = 42.7$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 1.17 mW/g, SAR (10g): 0.715 mW/g, (Worst-case extrapolation)

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

Penetration depth: 11.2 (10.4, 12.2) [mm]

Powerdrift: 0.03 dB



s/n: 770472BC

Ch#25 / Pwr Step: Always Up / Battery Model #: SNN5725A

DEVICE POSITION (cheek or rotated):Tilted

R3 Gycol TP-1157 (rev. 4) 26Apr02 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1851 MHz

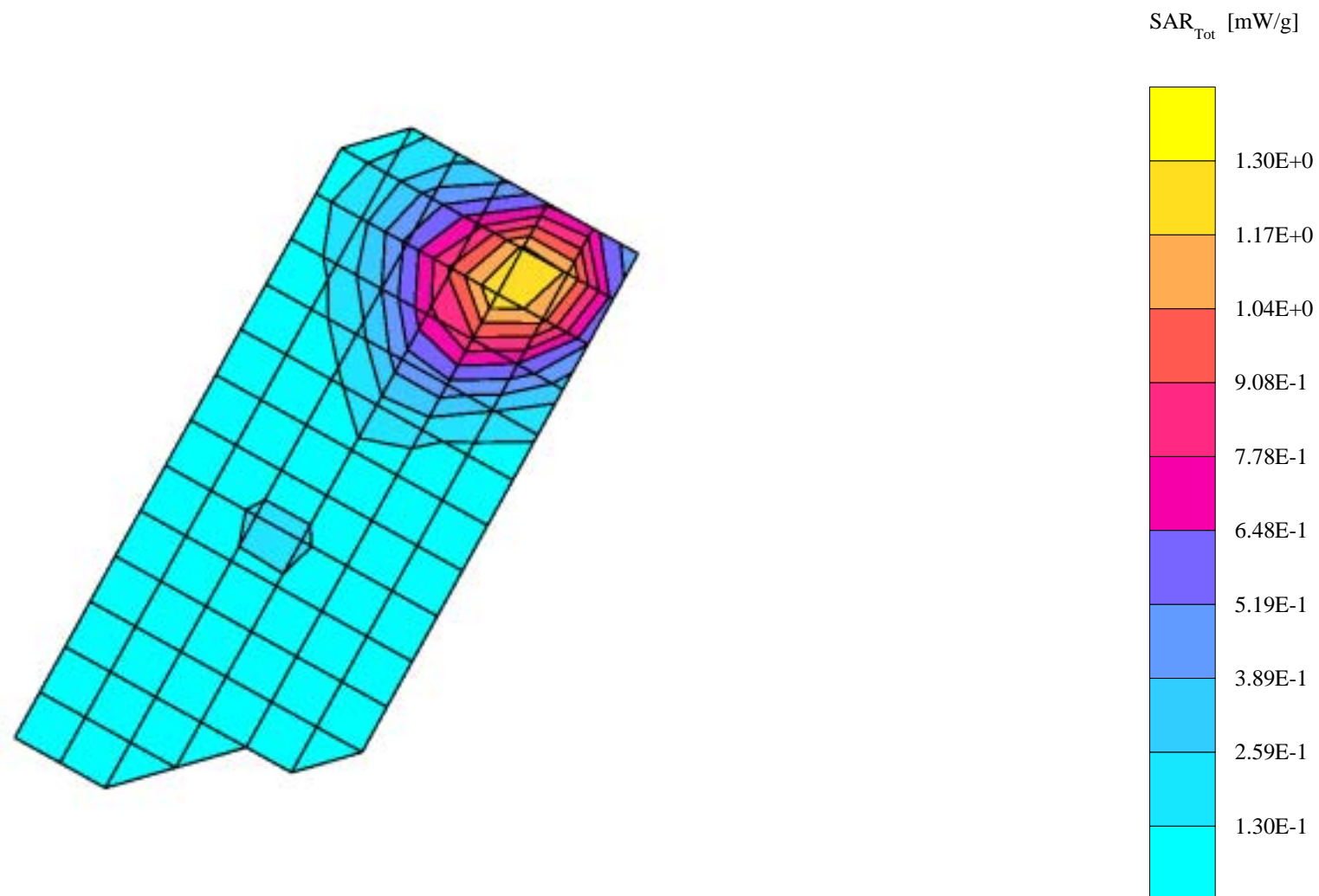
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1880 MHz Head & Body:  $\sigma = 1.47$  mho/m  $\epsilon_r = 38.1$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 1.33 mW/g, SAR (10g): 0.724 mW/g, (Worst-case extrapolation)

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

Penetration depth: 8.7 (8.1, 9.7) [mm]

Powerdrift: 0.11 dB



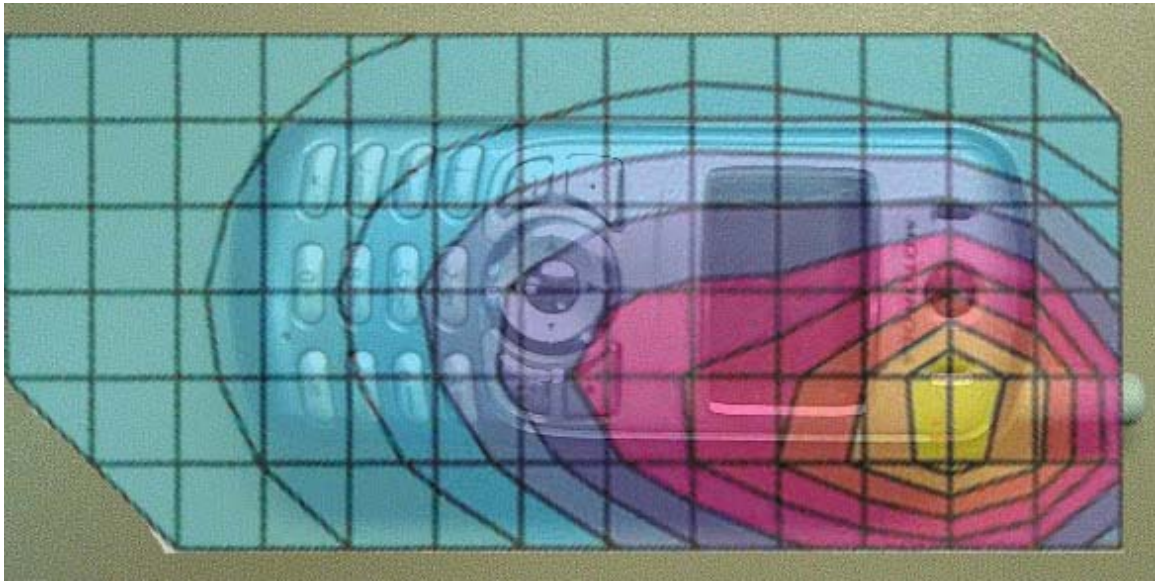


Figure 3. Typical 800MHz Head Adjacent Contour Overlaid on Phone with Antenna Fixed (15 ° Tilt)

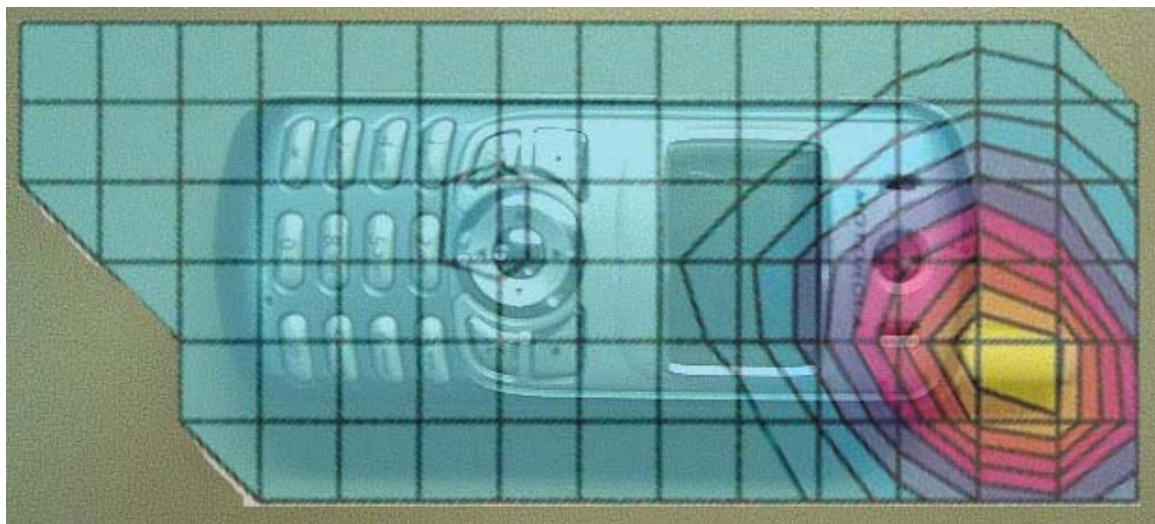


Figure 4. Typical 1900MHz Head Adjacent Contour Overlaid on Phone with Antenna Fixed (15 ° Tilt)

### **Appendix 3**

#### **SAR distribution plots for Body Worn Configuration**

s/n: 770472C0

CCh# 384 / Pwr Step: Always up / Battery Model #: SNN5725A

Accessory Model #: 1 inch Back

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 848 MHz

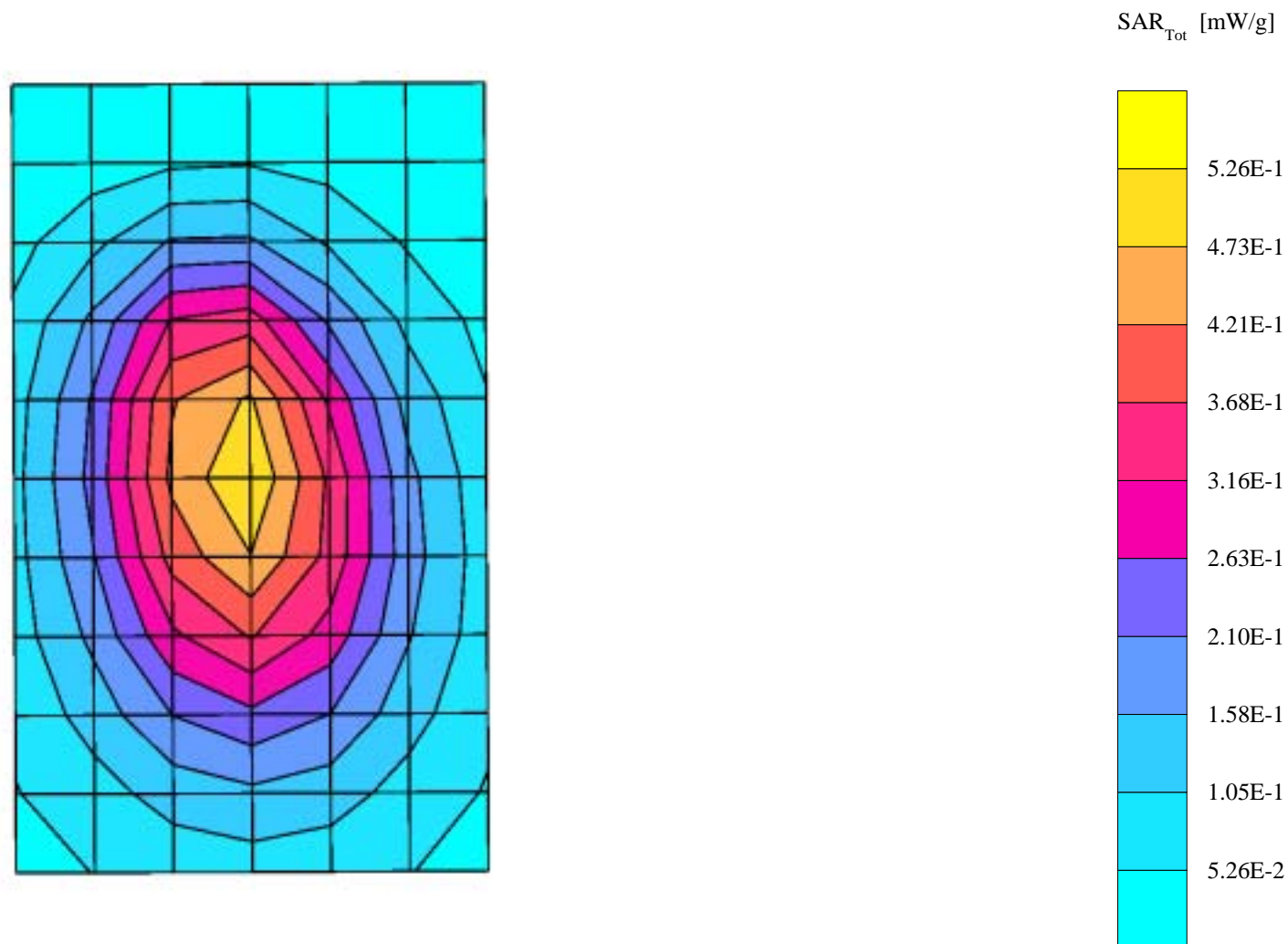
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(4.40,4.40,4.40); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.96$  mho/m  $\epsilon_r = 54.8$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.526 mW/g, SAR (10g): 0.365 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 15.3 (14.8, 16.1) [mm]

Powerdrift: 0.02 dB



s/n: 770472BC

Ch# 600 / Pwr Step: Always Up / Battery Model #: SNN5727A

Accessory Model #: Back of Phone 1 Inch Away from Phantom

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

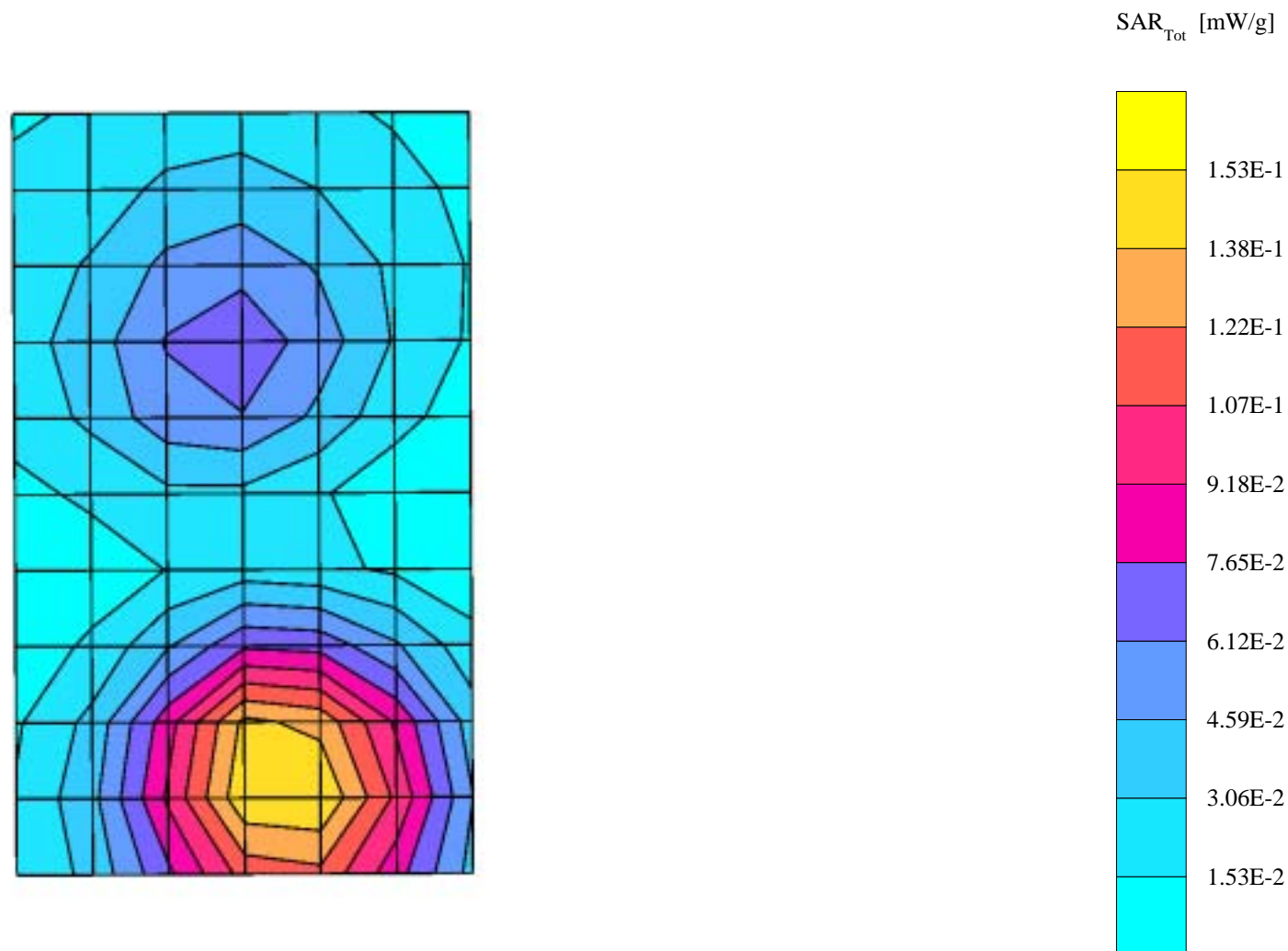
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(3.10,3.10,3.10); Crest factor: 1.0; 1880 MHz Head & Body:  $\sigma = 1.59$  mho/m  $\epsilon_r = 51.2$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.162 mW/g, SAR (10g): 0.0998 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.2 (9.0, 11.8) [mm]

Powerdrift: 0.05 dB



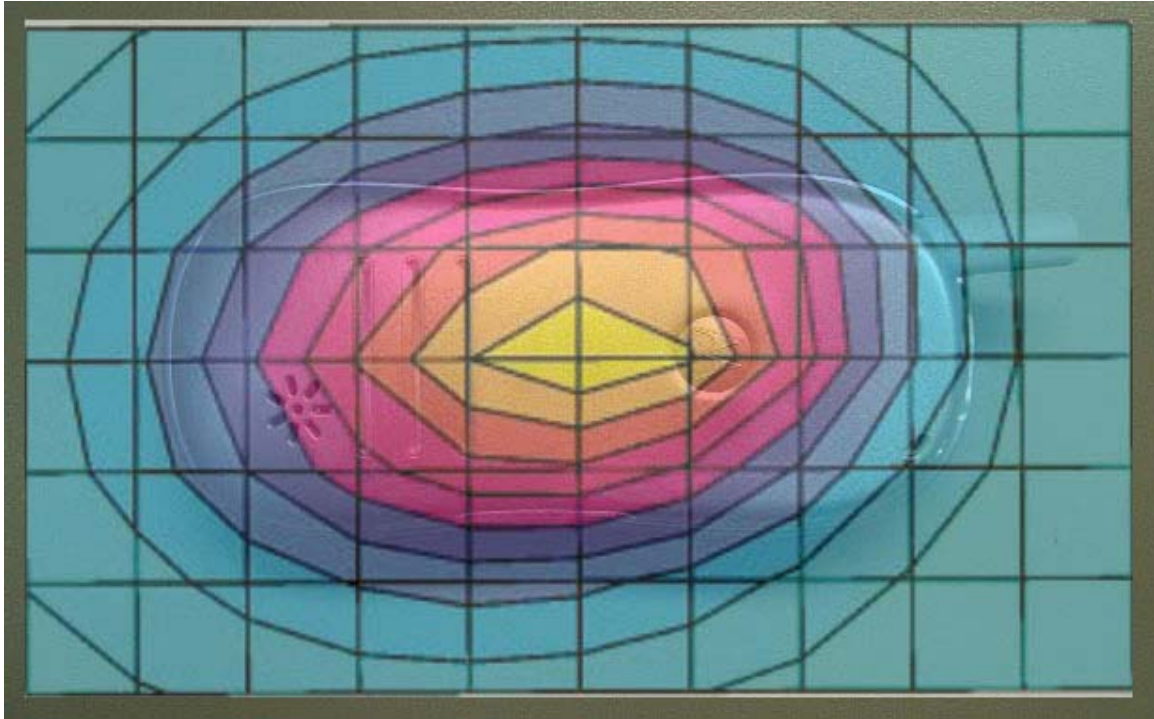


Figure 5. Typical 800 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed (Back of Phone Towards Phantom)

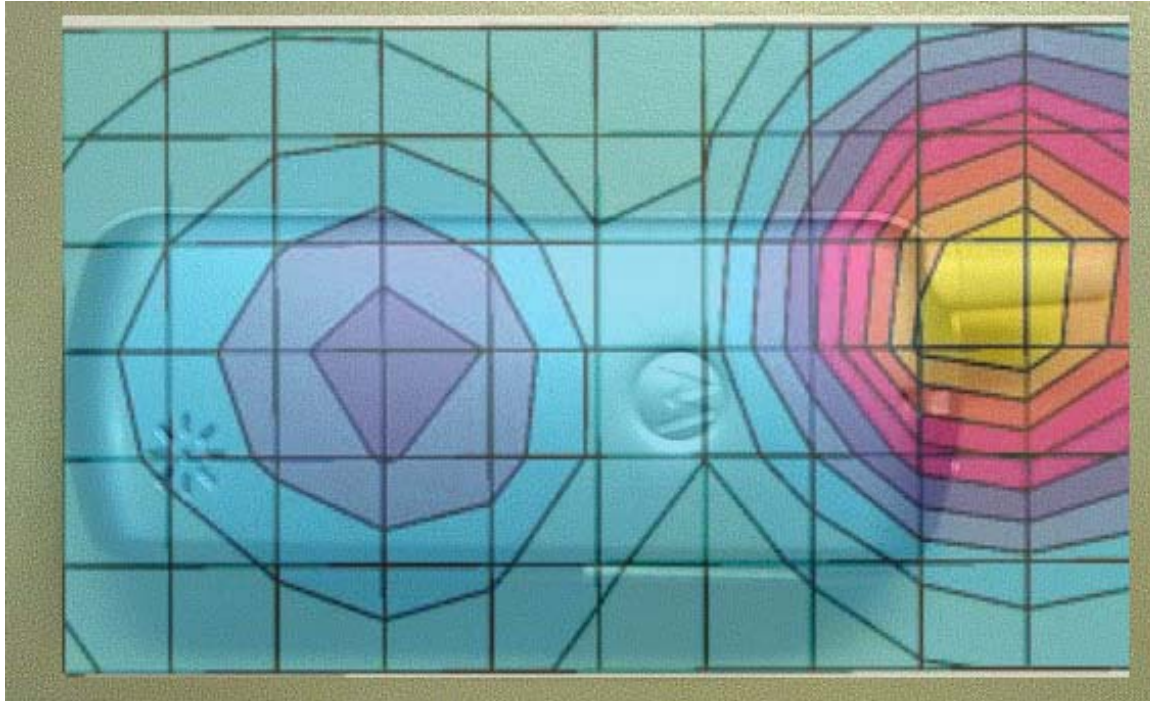


Figure 6. Typical 1900 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed (Back of Phone Towards Phantom)

s/n: 770472C0

Ch# 384 / Pwr Step: Always up / Battery Model #: SNN5725A

Accessory Model #: 1 inch front up

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 848 MHz

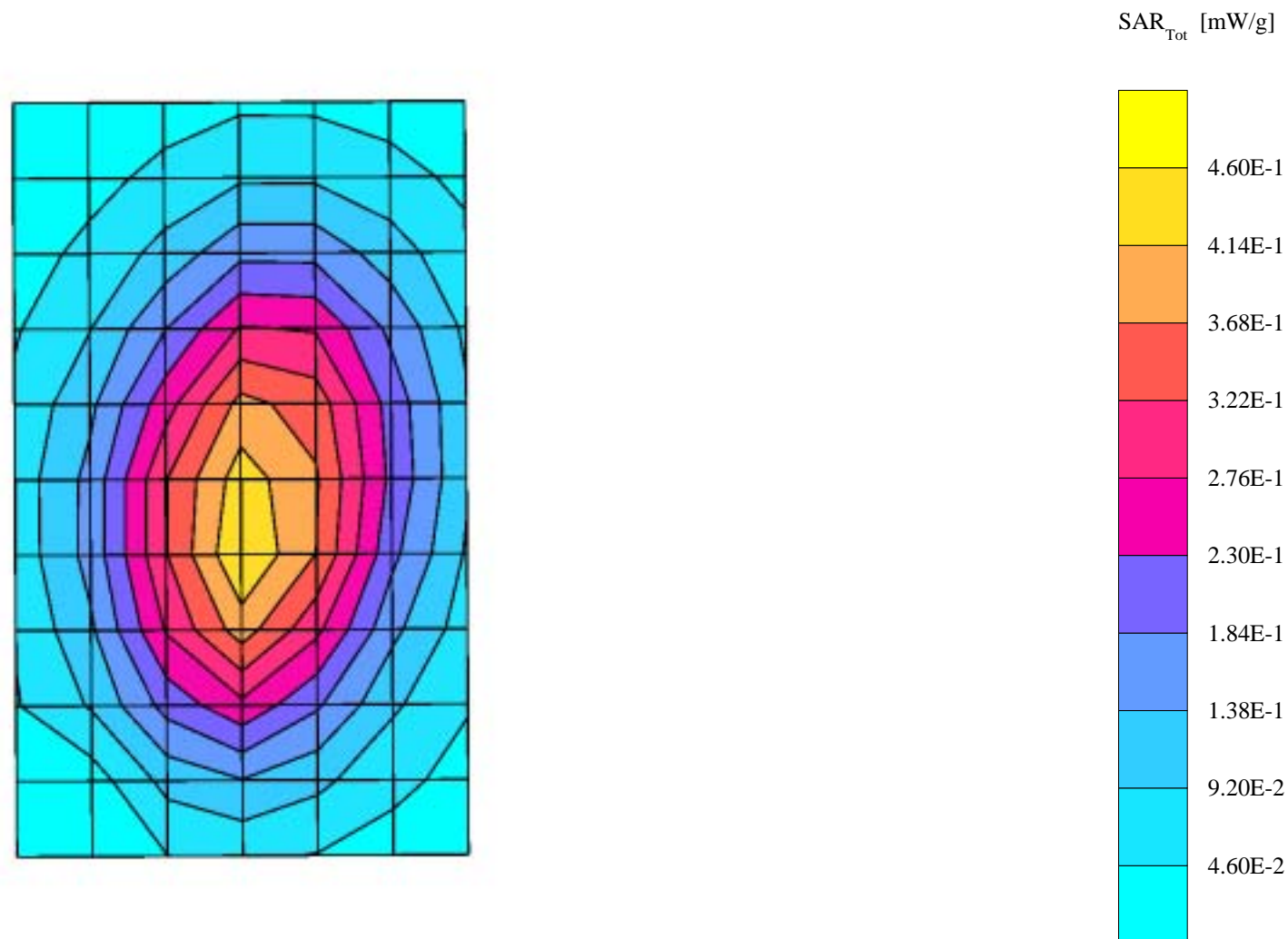
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(4.40,4.40,4.40); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.96$  mho/m  $\epsilon_r = 54.8$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.439 mW/g, SAR (10g): 0.318 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 16.7 (15.2, 18.3) [mm]

Powerdrift: 0.23 dB



s/n: 770472BC

Ch# 600 Pwr Step: Always Up / Battery Model #: SNN5725A

Accessory Model #: Front of Phone 1in Away from Phantom

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

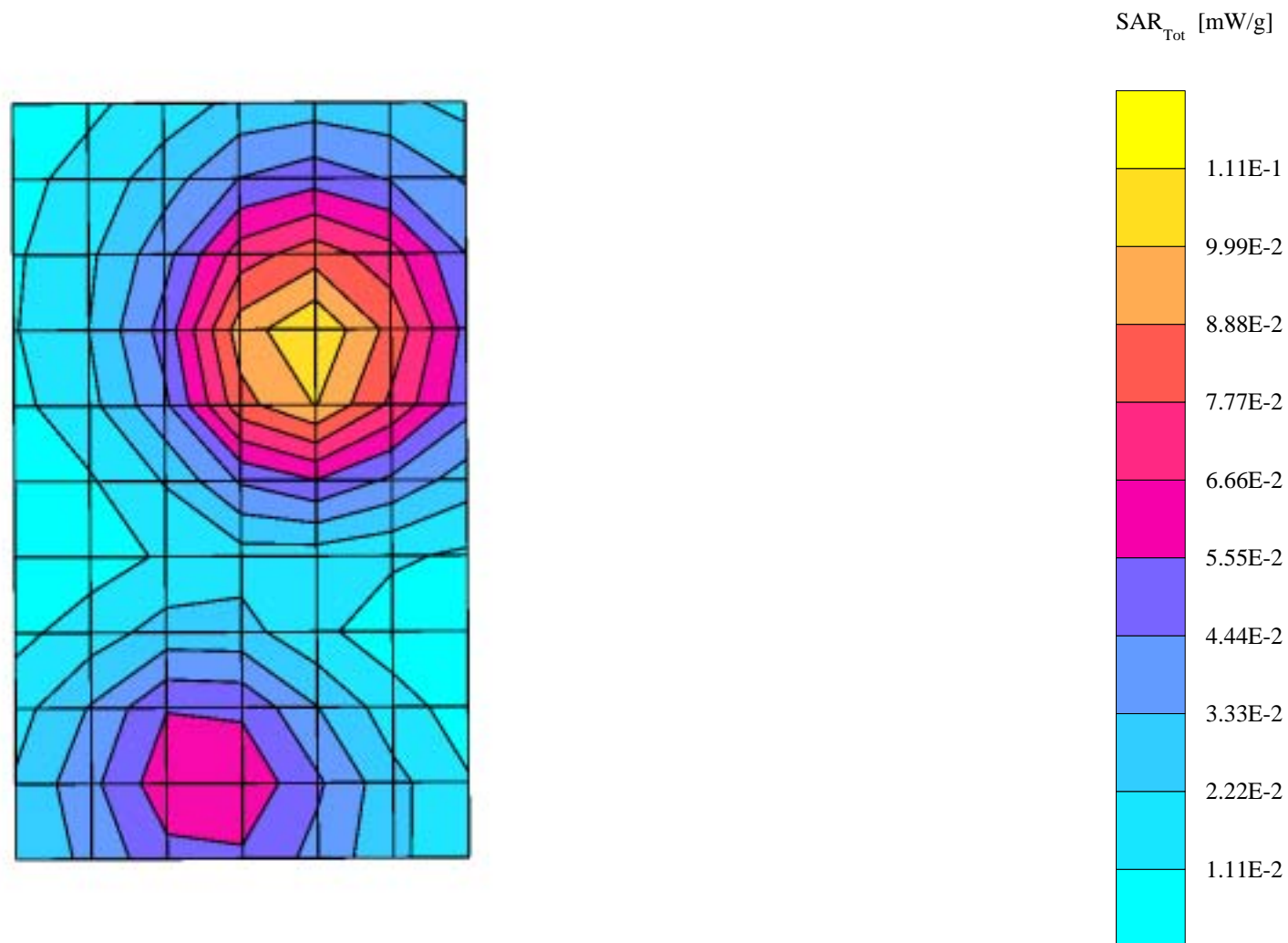
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(3.10,3.10,3.10); Crest factor: 1.0; 1880 MHz Head & Body:  $\sigma = 1.58$  mho/m  $\epsilon_r = 52.0$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.112 mW/g, SAR (10g): 0.0690 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 10.2 (9.0, 11.9) [mm]

Powerdrift: -0.02 dB



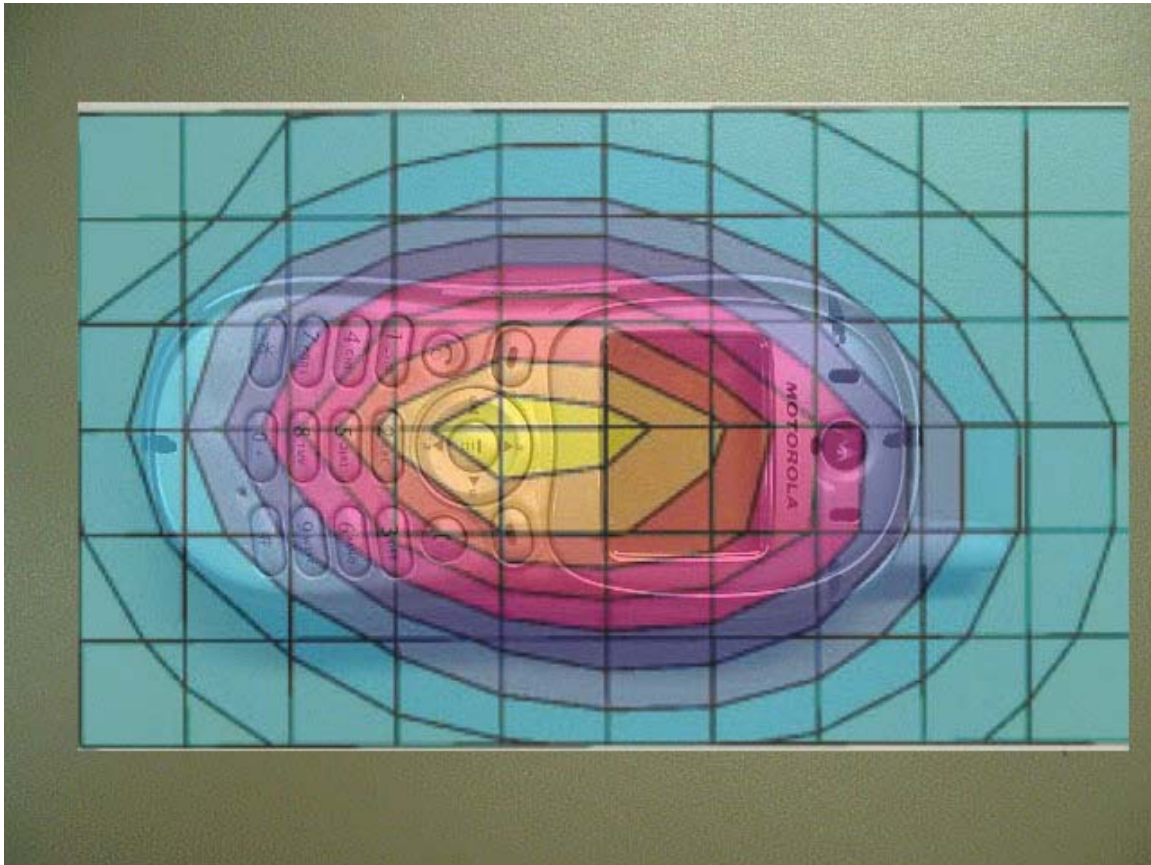


Figure 7. Typical 800 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed (Front of Phone Towards Phantom)

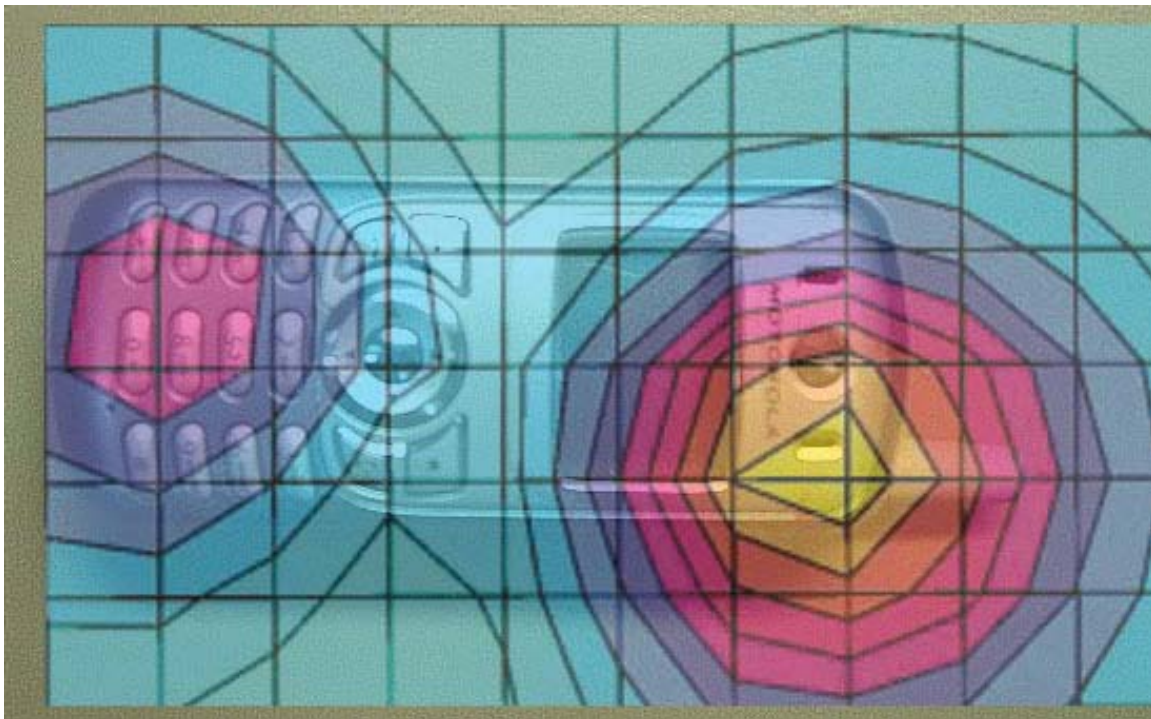


Figure 8. Typical 1900 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed (Front of Phone Towards Phantom)

**Appendix 4**  
**Probe Calibration Certificate**

# 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:

**ET3DV6R**

Serial Number:

**1522**

Place of Calibration:

**Zurich**

Date of Calibration:

**April 25, 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:

*U. Vella*

Approved by:

*Marie Kutz*

# Probe ET3DV6R

## SN:1522

Manufactured:	March 21, 2000
Last calibration:	May 11, 2001
Remade ET3DV6R:	April 12, 2002
Recalibrated:	April 25, 2002

Calibrated for System DASY3

**DASY3 - Parameters of Probe: ET3DV6R SN:1522****Sensitivity in Free Space**

NormX	1.41 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.26 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.29 $\mu\text{V}/(\text{V}/\text{m})^2$

**Diode Compression**

DCP X	96	mV
DCP Y	96	mV
DCP Z	96	mV

**Sensitivity in Tissue Simulating Liquid**

Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	4.5 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	4.5 $\pm 9.5\%$ (k=2)	Alpha 0.50
	ConvF Z	4.5 $\pm 9.5\%$ (k=2)	Depth 1.97
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	3.4 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	3.4 $\pm 9.5\%$ (k=2)	Alpha 0.46
	ConvF Z	3.4 $\pm 9.5\%$ (k=2)	Depth 2.74

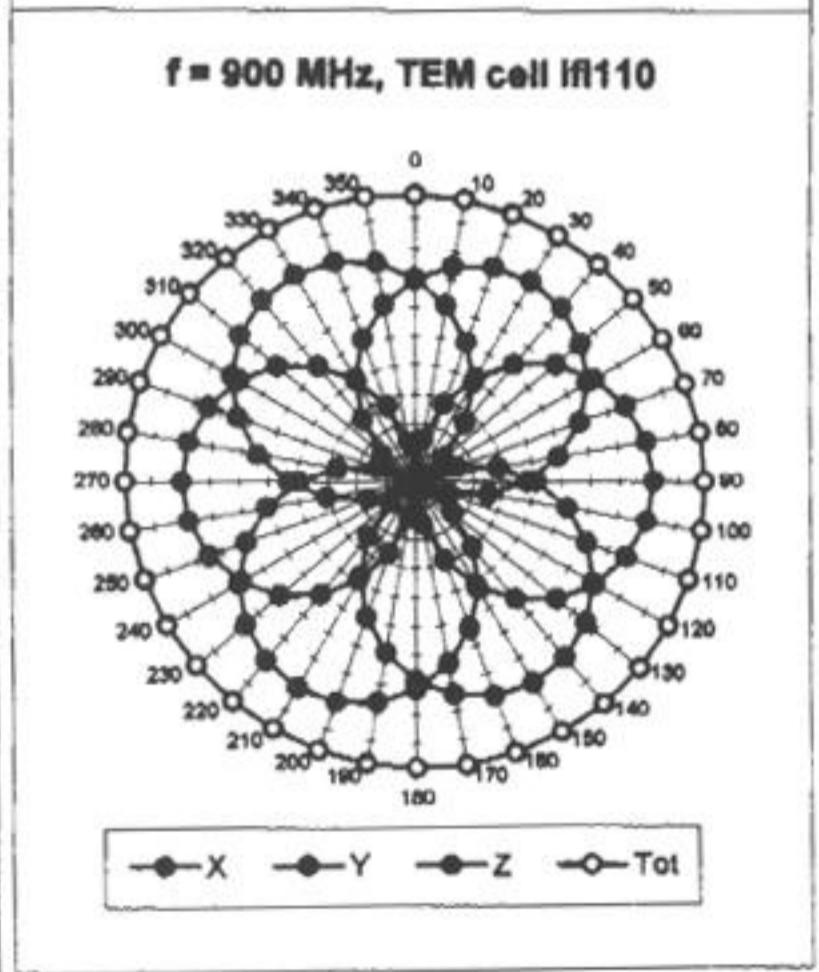
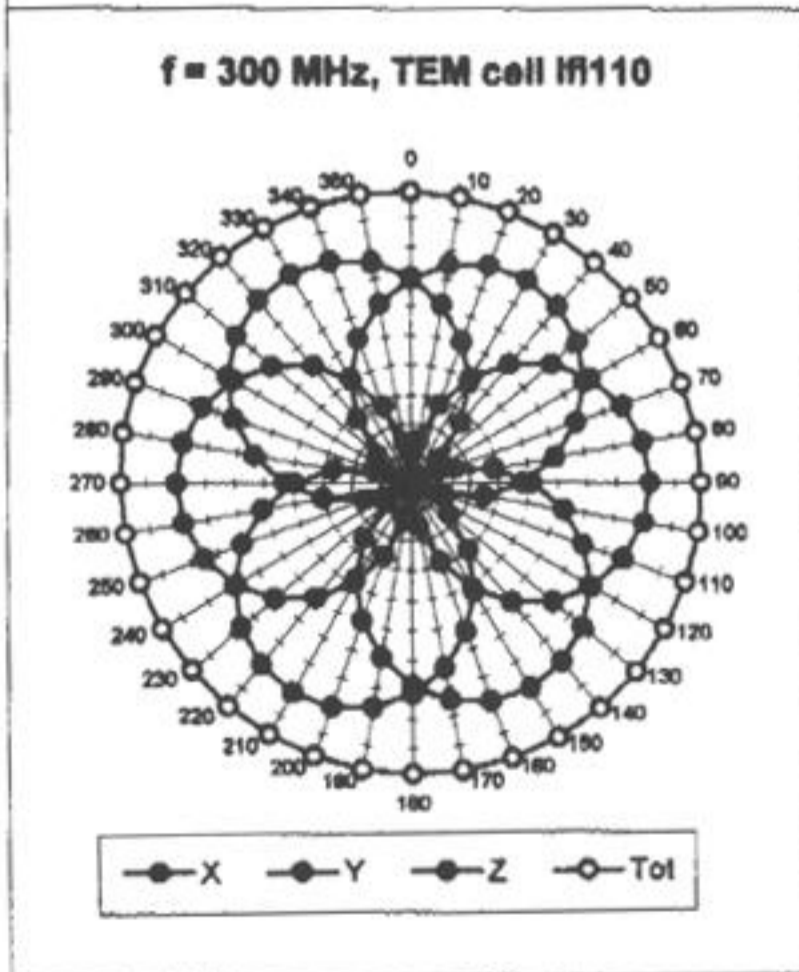
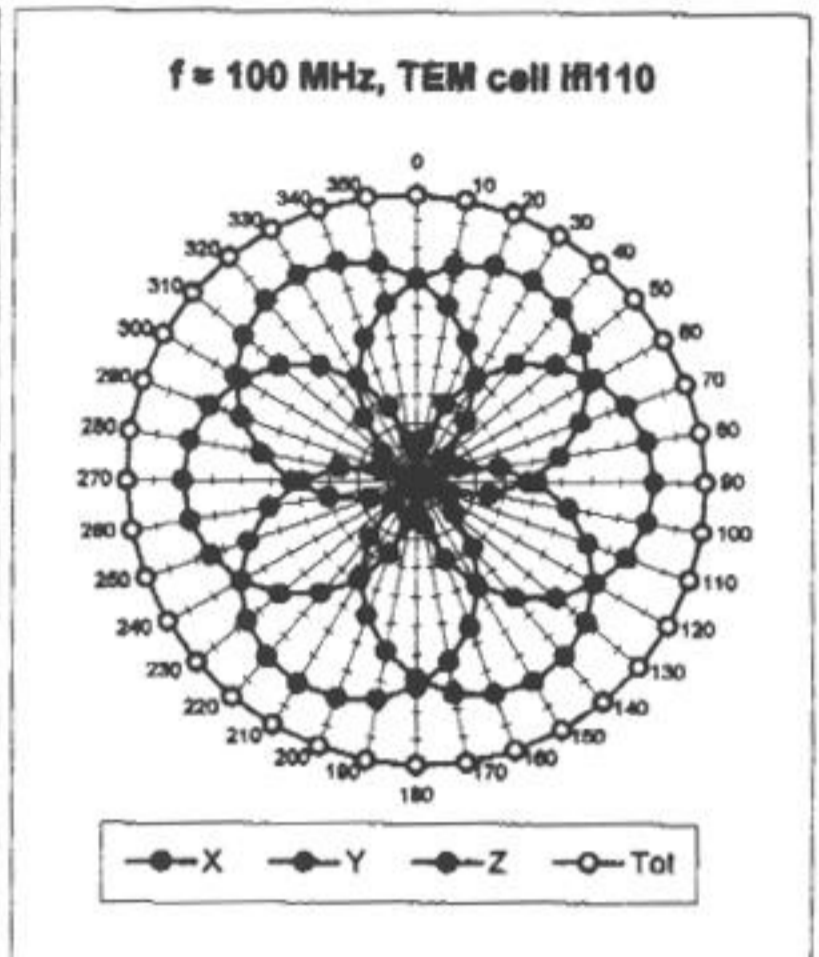
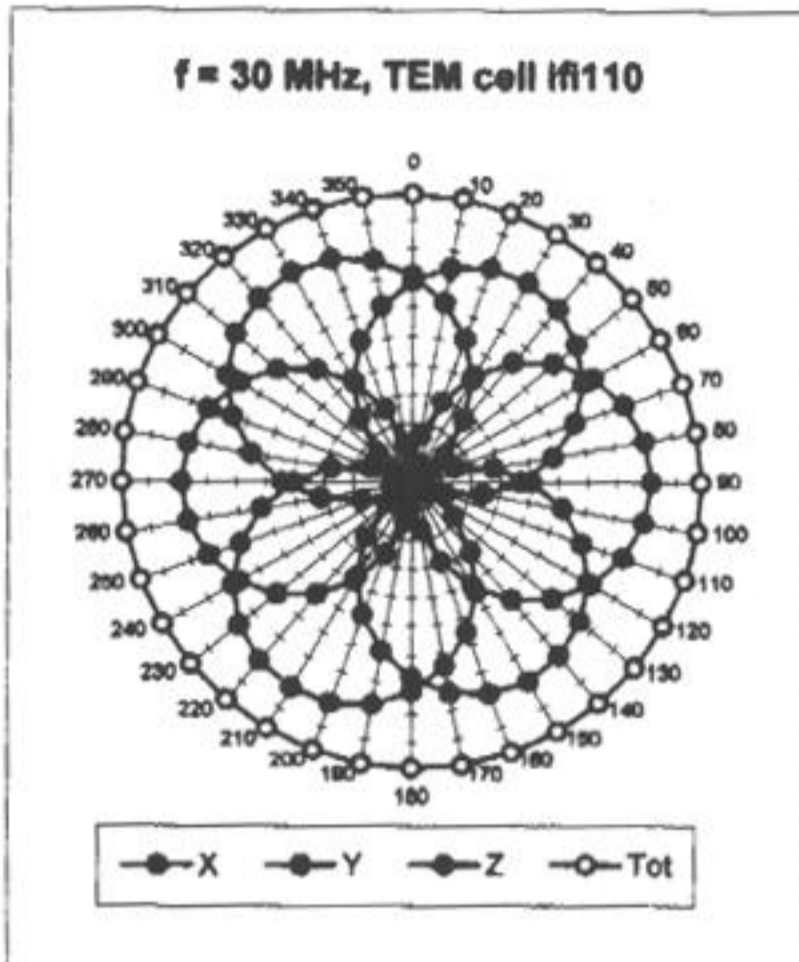
**Boundary Effect**

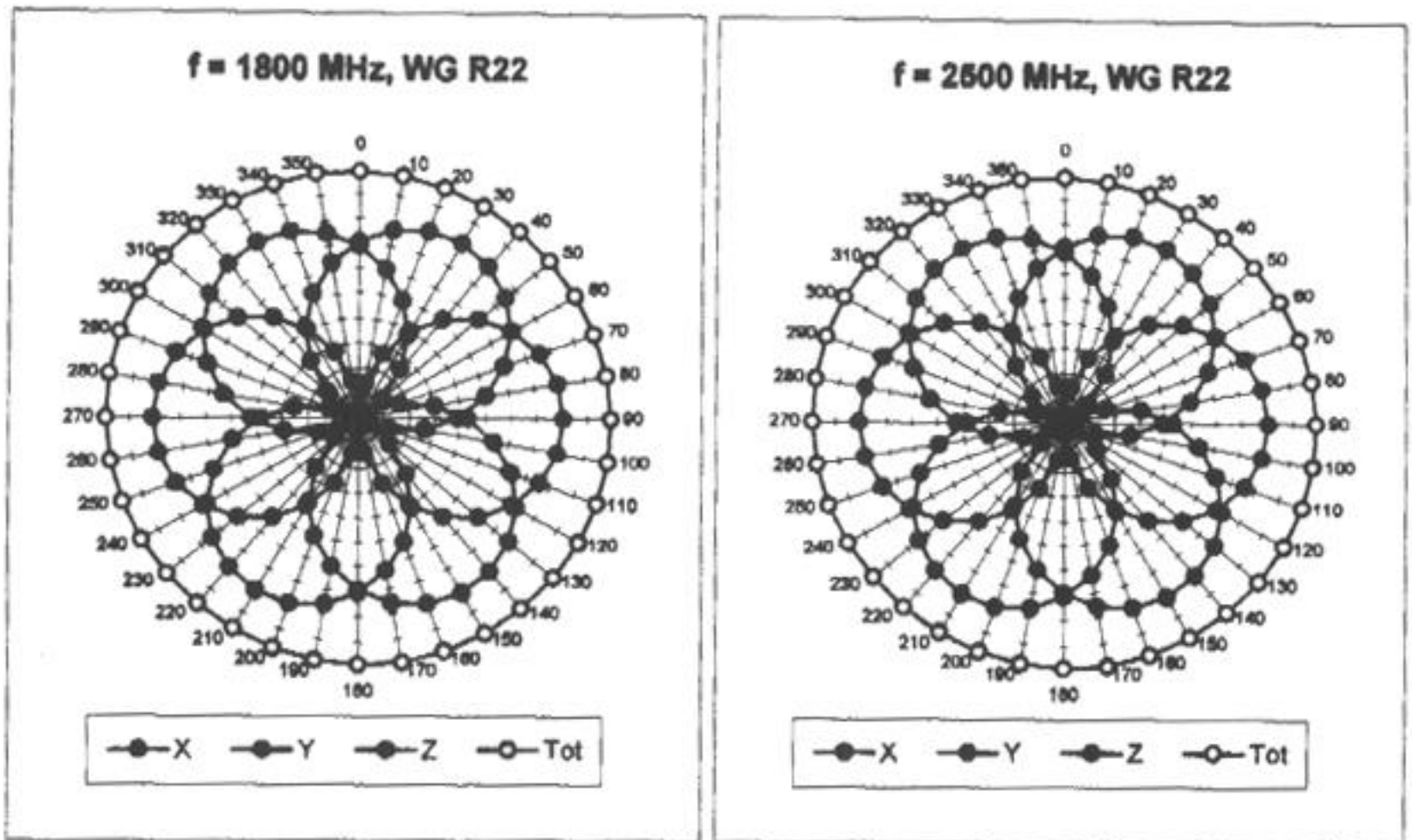
Head	900 MHz	Typical SAR gradient: 5 % per mm	
	Probe Tip to Boundary	1 mm	2 mm
	SAR <sub>ba</sub> [%] Without Correction Algorithm	8.3	4.8
	SAR <sub>ba</sub> [%] With Correction Algorithm	0.0	0.1
Head	1800 MHz	Typical SAR gradient: 10 % per mm	
	Probe Tip to Boundary	1 mm	2 mm
	SAR <sub>ba</sub> [%] Without Correction Algorithm	13.1	9.6
	SAR <sub>ba</sub> [%] With Correction Algorithm	0.4	0.5

**Sensor Offset**

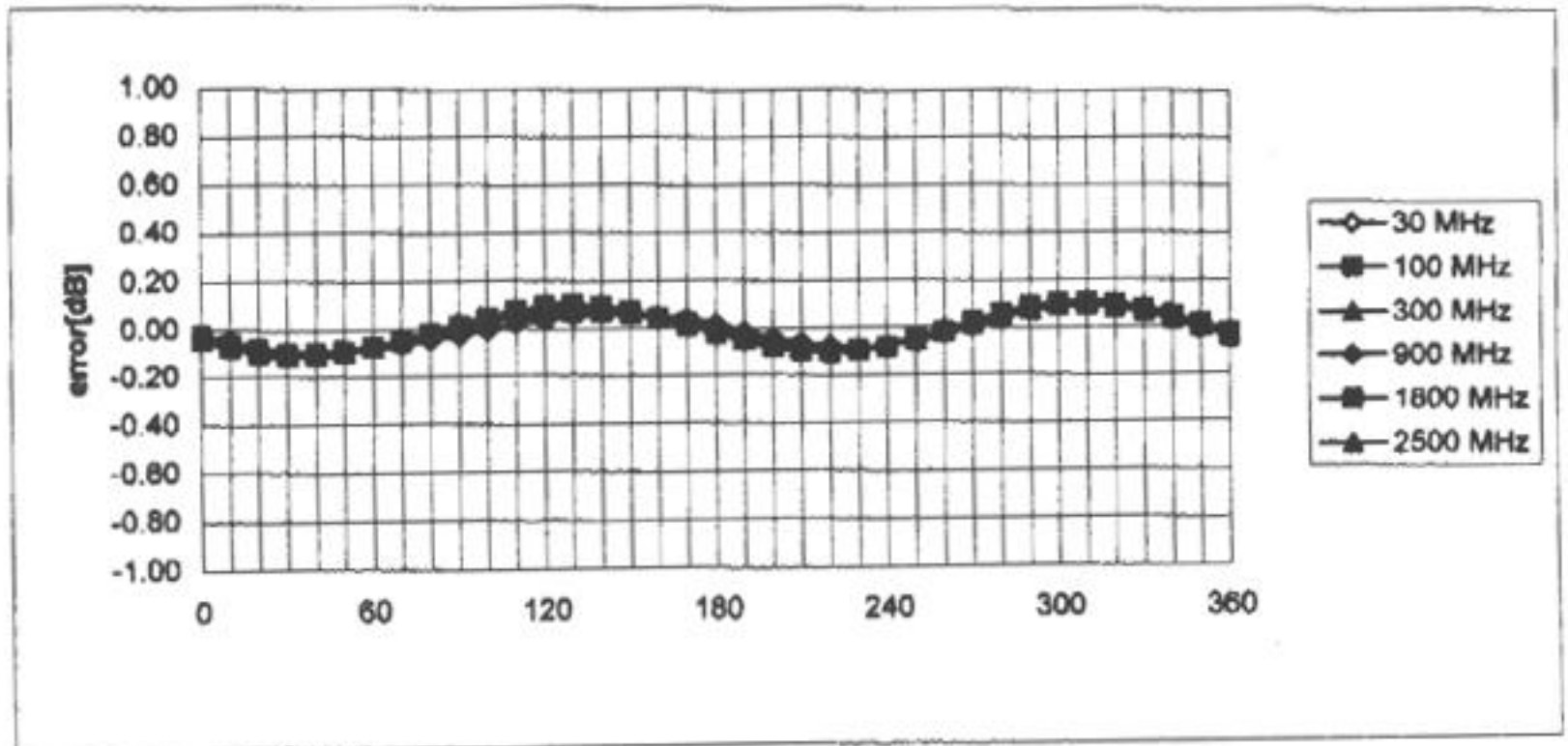
Probe Tip to Sensor Center	2.7	mm
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### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



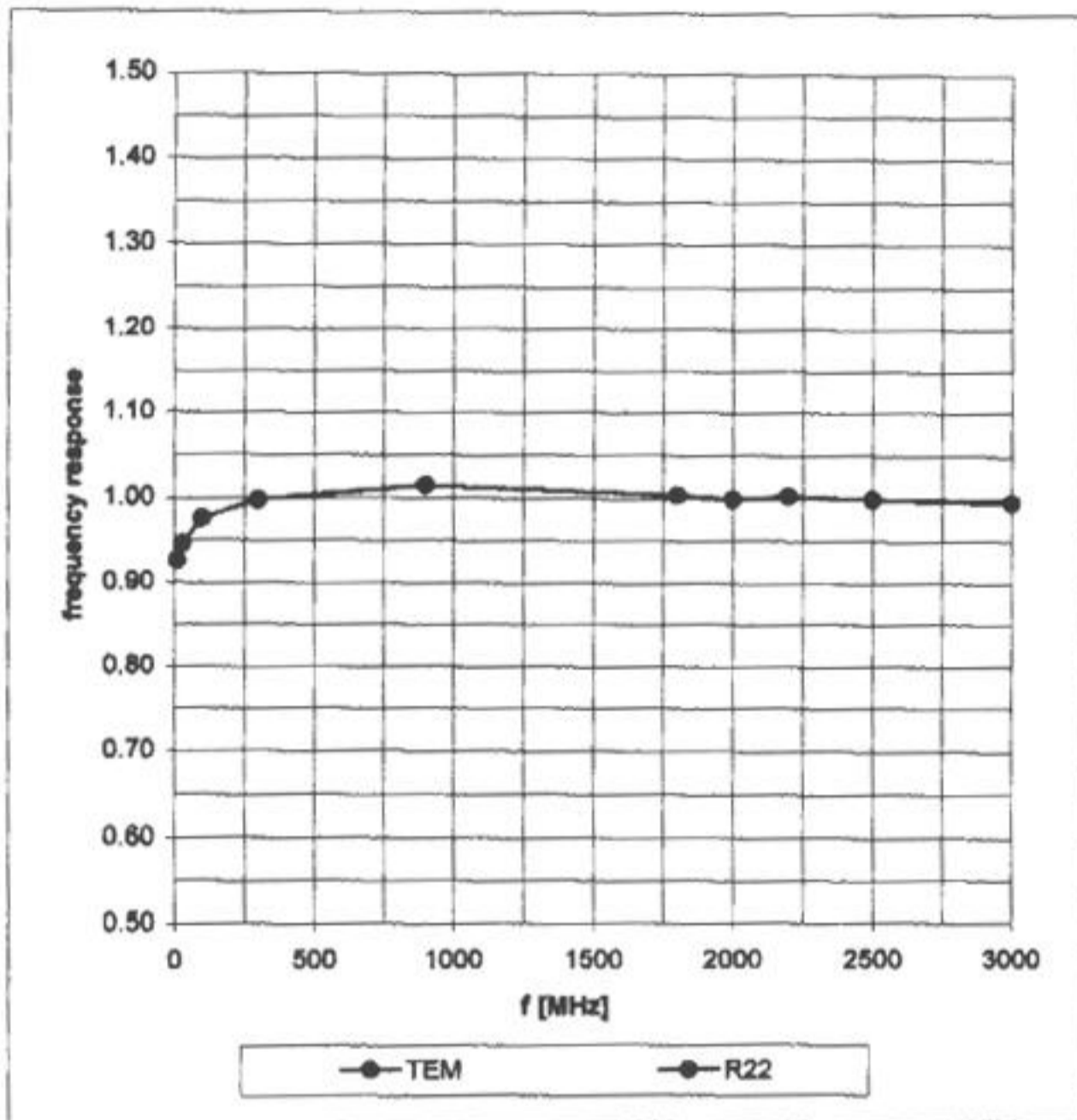


**Isotropy Error ( $\phi$ ),  $\theta = 0^\circ$**

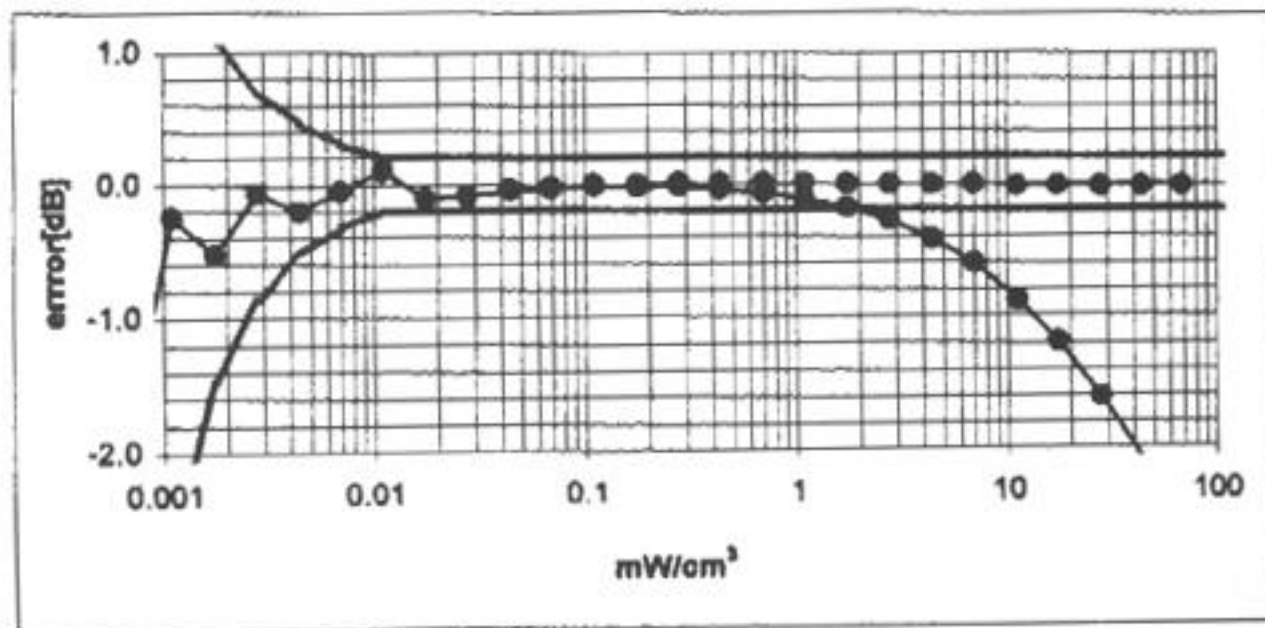
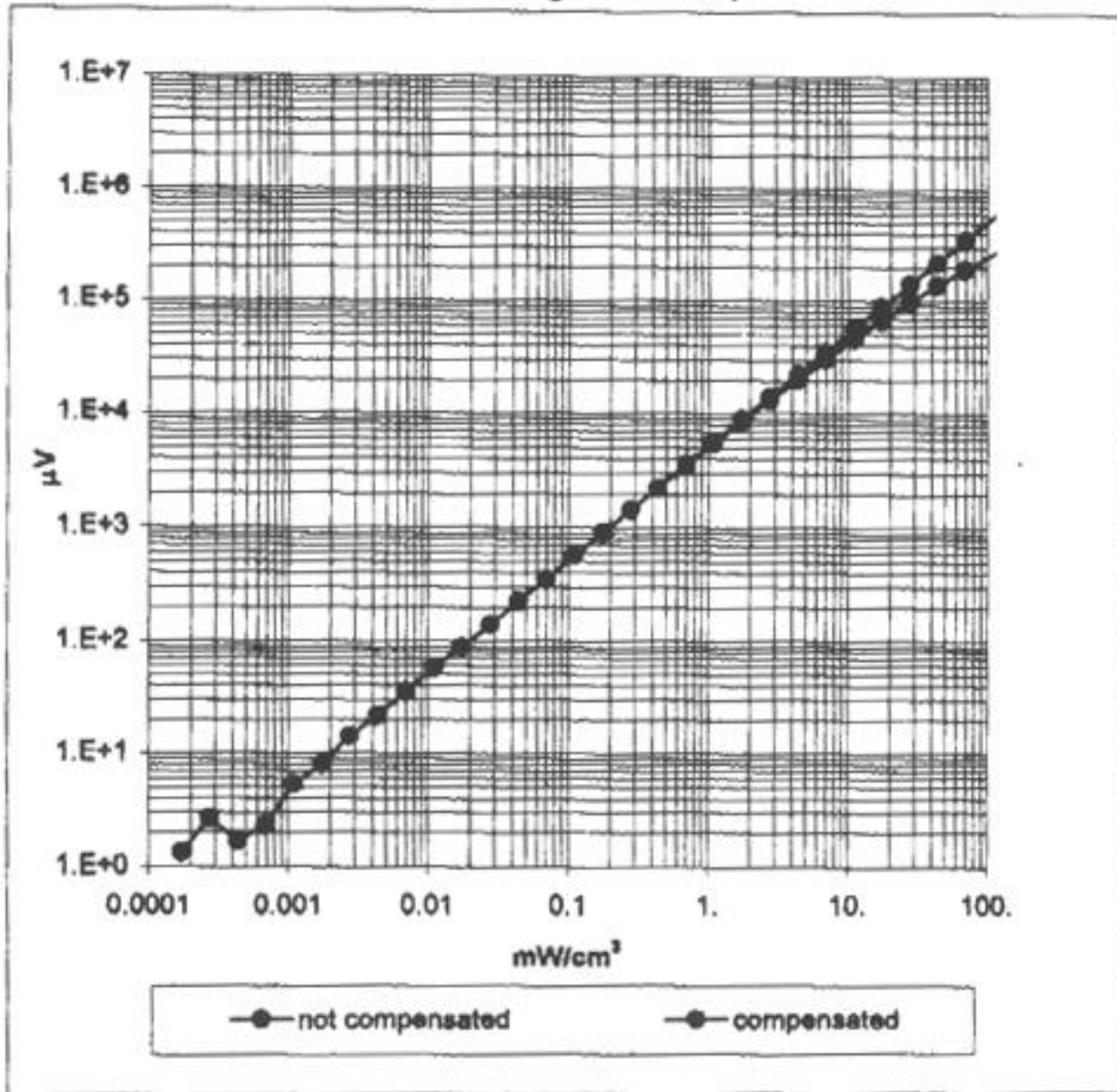


# Frequency Response of E-Field

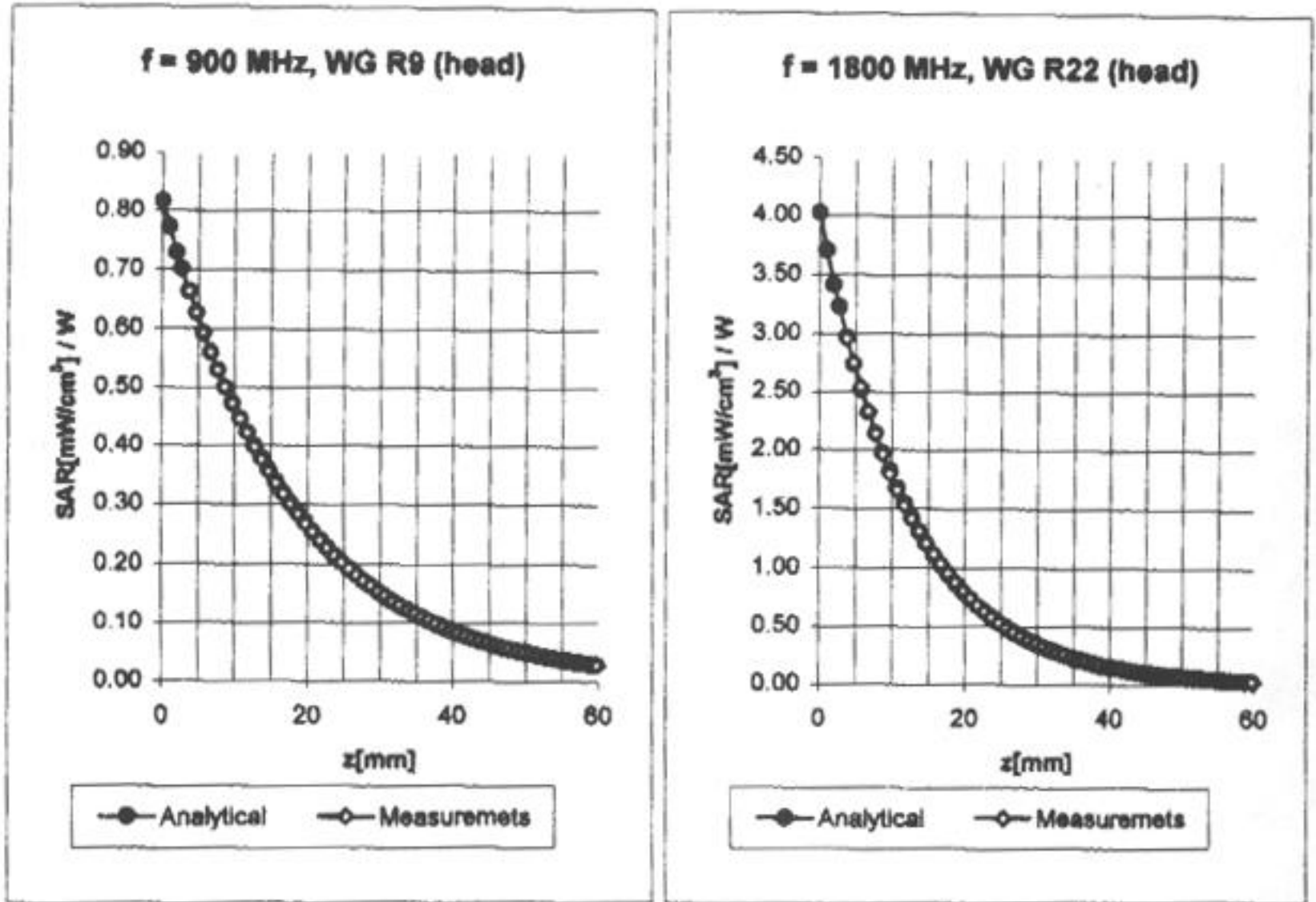
( TEM-Cell:ifl110, Waveguide R22)



### Dynamic Range f(SAR<sub>brain</sub>) ( Waveguide R22 )



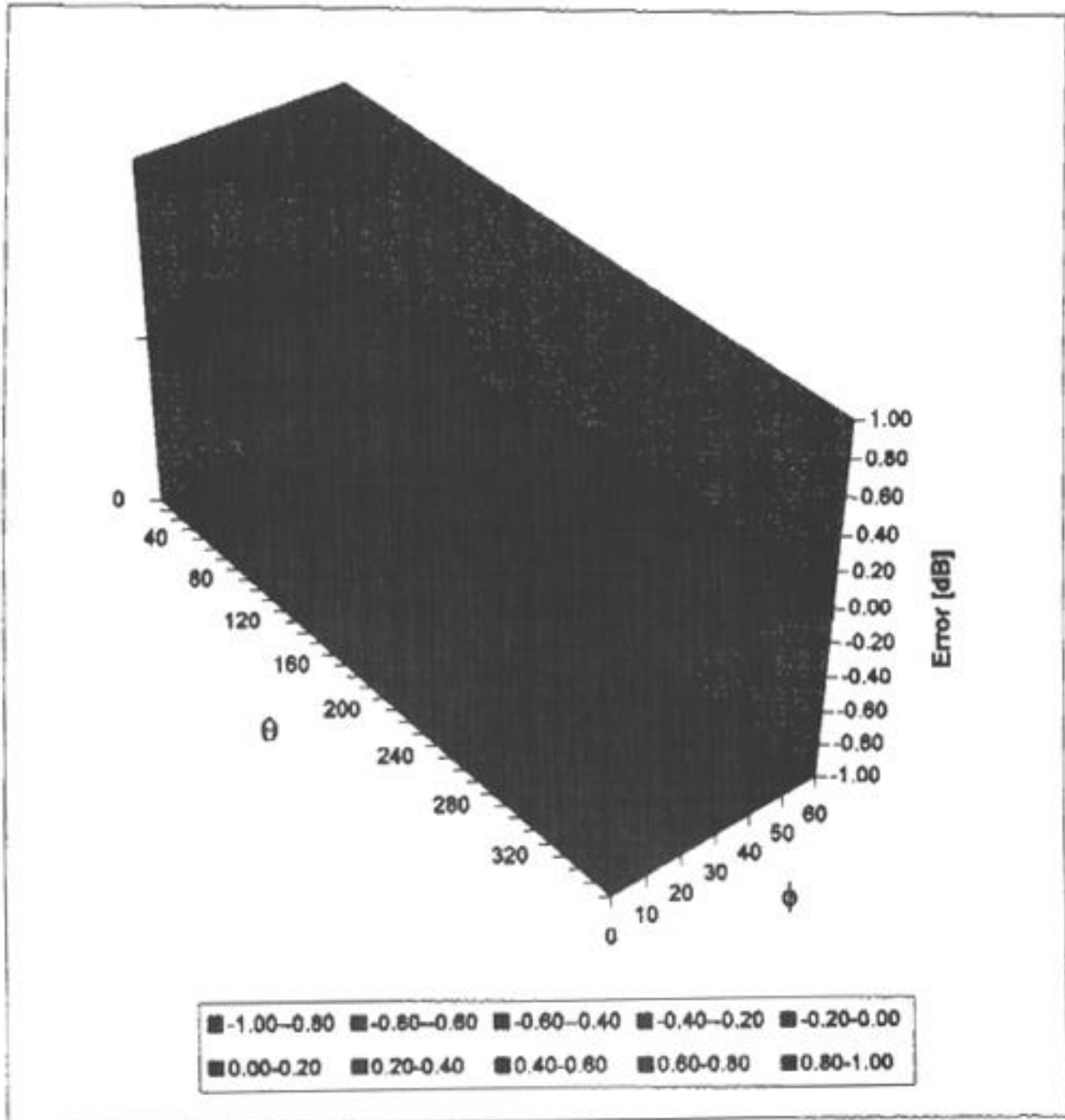
## Conversion Factor Assessment



<b>Head</b>	<b>900 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
<b>Head</b>	<b>835 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
	ConvF X	<b>4.5</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>4.5</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.50</b>
	ConvF Z	<b>4.5</b> $\pm 9.5\%$ (k=2)	Depth <b>1.97</b>
<b>Head</b>	<b>1800 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
<b>Head</b>	<b>1900 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	<b>3.4</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>3.4</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.46</b>
	ConvF Z	<b>3.4</b> $\pm 9.5\%$ (k=2)	Depth <b>2.74</b>

### Deviation from Isotropy in HSL

Error ( $\theta, \phi$ ),  $f = 900$  MHz



## Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6R

Serial Number:

1522

Place of Assessment:

Zurich

Date of Assessment:

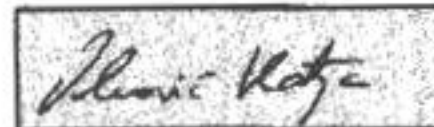
May 8, 2002

Probe Calibration Date:

April 25, 2002

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



# Dosimetric E-Field Probe ET3DV6R SN:1522

Conversion factor ( $\pm$  standard deviation)

835 MHz      ConvF       $4.6 \pm 8\%$

$\epsilon_r = 41.5 \pm 5\%$   
 $\sigma = 0.90 \pm 5\% \text{ mho/m}$   
(head tissue)

1950 MHz      ConvF       $3.2 \pm 8\%$

$\epsilon_r = 40.0 \pm 5\%$   
 $\sigma = 1.40 \pm 5\% \text{ mho/m}$   
(head tissue)

835 MHz      ConvF       $4.4 \pm 8\%$

$\epsilon_r = 55.2 \pm 5\%$   
 $\sigma = 0.97 \pm 5\% \text{ mho/m}$   
(body tissue)

900 MHz      ConvF       $4.3 \pm 8\%$

$\epsilon_r = 55.0 \pm 5\%$   
 $\sigma = 1.05 \pm 5\% \text{ mho/m}$   
(body tissue)

1800 MHz      ConvF       $3.1 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$   
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$   
(body tissue)

1950 MHz      ConvF       $3.0 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$   
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$   
(body tissue)

**Appendix 5**  
**Dipole Characterization Certificate**

# Interim Dipole Correlation Certificate

FCD-0359, Rev.001

Dipole Serial Number: **096** Last Calibration Date: **3-Jan-01**  
Dipole Type (MHz): **900 MHz** Calibration Due: **3-Jan-03**  
Manufacturer: **SPEAG**

## -Manufacturer's Original Calibration Information-

Dipole to be correlated: [Serial Number: 096]

1g SAR normalized to 1W forward power (mW/g):	10.16 mW/g
Relative Dielectric:	40.6
Conductivity:	0.85
Probe Serial Number:	SN 1507
Forward Power:	250mW +/-3%

Primary Dipole Referenced: [Serial Number: 077]

1g SAR normalized to 1W forward power (mW/g):	11.4 mW/g
Relative Dielectric:	40.3
Conductivity:	0.95
Probe Serial Number:	SN 1507
Forward Power:	250mW +/-3%

## -Correlation Method Utilized- per DOI-1265

(select one)

By Similarity:  By Transfer Calibration:

## -Measured Data-

Probe S/N: **SN 1515** Conductivity (meas.): **0.97**  
Robot Cell #: **HVD #8** Permittivity (meas.): **42.5**

Primary Standard (average of 0-degree & 90-degree 1g cubes):

**2.875 mW/g** **N/R** **N/R**  
(if required) (if required)

Secondary Standard (average of 0-degree & 90-degree 1g cubes):

**2.80 mW/g** **N/R** **N/R**  
(if required) (if required)

## -NEW Correlated Target-

1g SAR normalized to 1W forward power (mW/g):	11.4 mW/g
Relative Dielectric:	40.3
Conductivity:	0.95

Approved by: *Antonio Feneane*

Date: **11/13/2001**

Comments:

Secondary dipole measured -1.2% from primary dipole.

**Appendix 6**  
**Measurement Uncertainty Budget**

<b>Uncertainty Budget for Device Under Test</b>									
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e = f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h = c x f / e</i>	<i>i = c x g / e</i>	<i>k</i>
<b>Uncertainty Component</b>	Sec.	Tol. (± %)	Prob. Dist.	Div.	<i>c<sub>i</sub></i> (1 g)	<i>c<sub>i</sub></i> (10 g)	1 g <i>u<sub>i</sub></i> (±%)	10 g <i>u<sub>i</sub></i> (±%)	<i>v<sub>i</sub></i>
<b>Measurement System</b>									
Probe Calibration	E.2.1	9.5	N	2.00	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	5.8	R	1.73	1	1	3.3	3.3	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1.0	N	1.00	1	1	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	1.3	R	1.73	1	1	0.8	0.8	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.3	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	1.1	R	1.73	1	1	0.6	0.6	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	3.9	R	1.73	1	1	2.3	2.3	∞
<b>Test sample Related</b>									
Test Sample Positioning	E.4.2	3.6	N	1.00	1	1	3.6	3.6	29
Device Holder Uncertainty	E.4.1	2.8	N	1.00	1	1	2.8	2.8	8
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	10.0	R	1.73	0.64	0.43	3.7	2.5	∞
Liquid Permittivity - deviation from target values	E.3.2	10.0	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity - measurement uncertainty	E.3.3	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
<b>Combined Standard Uncertainty</b>			RSS				11.72	11.09	1363
<b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b>			<i>k</i> =2				22.98	21.75	

**Uncertainty Budget for System Performance Check (dipole & flat phantom)**

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e = f(d,k)</i>	<i>f</i>	<i>g</i>	<i>h = c x f / e</i>	<i>i = c x g / e</i>	<i>k</i>
<b>Uncertainty Component</b>	Sec.	Tol. (± %)	Prob. Dist.	Div.	<i>c<sub>i</sub></i> (1 g)	<i>c<sub>i</sub></i> (10 g)	1 g <i>u<sub>i</sub></i> (±%)	10 g <i>u<sub>i</sub></i> (±%)	<i>v<sub>i</sub></i>
<b>Measurement System</b>									
Probe Calibration	E.2.1	9.5	N	2.00	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	5.8	R	1.73	1	1	3.3	3.3	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1.0	N	1.00	1	1	1.0	1.0	∞
Response Time	E.2.7	0.0	R	1.73	1	1	0.0	0.0	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.3	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	1.1	R	1.73	1	1	0.6	0.6	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	3.9	R	1.73	1	1	2.3	2.3	∞
<b>Dipole</b>									
Dipole Axis to Liquid Distance	8, E.4.2	1.0	R	1.73	1	1	0.6	0.6	∞
Input Power and SAR Drift Measurement	8, 6.6.2	4.7	R	1.73	1	1	2.7	2.7	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	10.0	R	1.73	0.64	0.43	3.7	2.5	∞
Liquid Permittivity - deviation from target values	E.3.2	10.0	R	1.73	0.6	0.49	3.5	2.8	∞
Liquid Permittivity - measurement uncertainty	E.3.3	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
<b>Combined Standard Uncertainty</b>			RSS				10.16	9.43	99999
<b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b>			<i>k=2</i>				19.92	18.48	

## **Appendix 7**

### **Photographs of the device under test**













