


MOTOROLA

Exhibit 11: SAR Test Report IHDT5DL1

Date of test: 05/28/2003 – 06/05/2003
Date of Report: 06/30/2003

Laboratory: Motorola Personal Communications Sector Product Safety & Compliance Laboratory
 600 N. US Highway 45
 Room: MW113
 Libertyville, Illinois 60048

Test Responsible: Firass Badaruzzaman
 Senior RF Engineer

Accreditation: This laboratory is accredited to ISO/IEC 17025-1999 to perform the following tests:



Tests:
 Electromagnetic Specific Absorption Rate

Procedures:
 ANSI/IEEE C95.1-1992, 1999
 (SAR) IEEE C95.3-1991
 IEEE P1528 (DRAFT)
 FCC OET Bulletin 65 (including Supplements A, B, C)
 Australian Communications Authority Radio
 Communications (Electromagnetic Radiation – Human
 Exposure) Standard 1999
 CENELEC EN 50361 (2001)
 APP-0247
 DOI-0876, 0900, 0902, 0904, 0915

Simulated Tissue Preparation
 RF Power Measurement

On the following products or 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 IHDT5DL1 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)

©Motorola, Inc. 2003

This test report shall not be reproduced except in full, without written approval of the laboratory.

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.

Table of Contents

1) Introduction	3
2) Description of the Device Under Test	3
Antenna description	3
Device description	3
3) Test Equipment	3
3.1 Dosimetric system	3
3.2 Additional equipment used	4
4) Electrical parameters of the tissue simulating liquid	4
5) System Accuracy Verification	4
6) Test Results	5
6.1 Head Adjacent Test Results	6
6.2 Body-Worn Test Results	8

References:

Appendix 1: SAR distribution comparison for the system accuracy verification	10
Appendix 2: SAR distribution plots for Phantom Head Adjacent Use	11
Appendix 3: SAR distribution plots for Body Worn Configuration	13
Appendix 4. Probe Calibration Certificate	15
Appendix 5. Dipole Characterization Certificate	16
Appendix 6: Measurement Uncertainty Budget	17
Appendix 7. Photographs of the device under test	20

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 IHDT5DL1). 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

Type	Stubby	
Location	Right Hand Side	
Dimensions	Length	25 mm
	Width	8 mm
Configuration	Helix	

Device description

FCC ID Number	IHDT5DL1	
Serial number	3990321507	
Mode(s) of Operation	AMPS 800	TDMA 800
Modulation Mode(s)	AMPS	TDMA
Maximum Output Power Setting	26.30 dBm	27.30 dBm
Duty Cycle	1:1	1:3
Transmitting Frequency Rang(s)	824.04 – 848.97 MHz	824.70 – 848.31 MHz
Production Unit or Identical Prototype (47 CFR §2.908)	Identical Prototype	
Device Category	Portable	
RF Exposure Limits	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. All the SAR measurements are taken within a shielded enclosure. The overall RSS uncertainty of the measurement system is $\pm 11.7\%$ (K=1) with an expanded uncertainty of $\pm 23.0\%$ (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	SN 383	09/02/2003
E-Field Probe ET3DV6	SN1523	01/17/2004
Dipole Validation Kit, D900V2	SN425tr	11/13/2004
S.A.M. Phantom used for 800MHz	TP-1005	

3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	3847A04633	10/11/2004
Power Meter E4419B	US39250622	11/05/2003
Power Sensor #1 - 8481A	US37296475	11/05/2003
Power Sensor #2 - 8481A	3318A25036	11/05/2003
Network Analyzer HP8753ES	US39172529	18-Jun-03
Dielectric Probe Kit HP85070B	US99360070	N/A

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ϵ_r , and the conductivity, σ , 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.

<i>f</i> (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	Temp (°C)
835	Head	Measured, 05/28/2003	40.9	0.89	20.9 - 21.40
		Recommended Limits	41.5	0.9	20-25
		Measured, 05/29/2003	42.9	0.92	20.9 - 21.40
		Recommended Limits	41.5	0.9	20-25
	Body	Measured, 05/29/2003	54.7	0.98	20.9 - 21.40
		Recommended Limits	55.2	0.97	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	--	30.80
DGBE	--	--	47.0	--
Water	40.45	53.06	52.8	68.91
Salt	1.45	0.94	0.2	0.29
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 $\pm$ 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.

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ϵ_r	σ (S/m)		
900	Measured, 05/28/2003	9.72	40.9	0.89	21	21.3
	Recommended Limits	10.04	41.9	0.89	n/a	n/a
	Measured, 05/29/2003	9.99	42.9	0.92	21	21.4
	Recommended Limits	10.04	41.9	0.89	n/a	n/a

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	SN1523	835	6.5	2 of 10

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 ($\pm$ 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 IHDT5DL1) has the following battery options:

SNN5588A - Battery used to test the 800 AMPS / 800 TDMA Bands

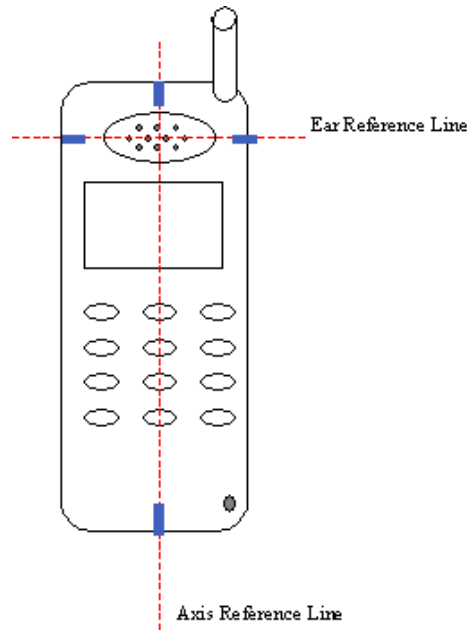
This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

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 $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$. 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

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 $15.0\text{cm} \pm 0.5\text{cm}$. All other test conditions measured lower SAR values than those included in Appendix 2. Note that 800MHz digital mode SAR measurements were performed in accordance with Supplement C.

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	SN1523	835	6.5	2 of 10

f (MHz)	Description	Conducted Output Power (dBm)	Left Head (Cheek / Touch Position)			
			Ant Fixed			
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Simulate Temp (°C)
Analog 800MHz	Channel 991	26.37	1.46	0.08	1.46	21.30
	Channel 384	26.38	1.45	0.07	1.45	21.30
	Channel 799	26.39	1.43	-0.04	1.43	21.30
Digital 800MHz	Channel 1013	27.26	1.29	0.01	1.29	21.30
	Channel 384	27.38	1.26	-0.06	1.28	21.30
	Channel 779	27.46	1.30	-0.04	1.30	21.30

Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT5DL1 at highest possible output power. Measured against the left head in the Cheek/Touch Position.

f (MHz)	Description	Conducted Output Power (dBm)	Right Head (Cheek / Touch Position)			
			Ant Fixed			
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Simulate Temp (°C)
Analog 800MHz	Channel 991	26.37	1.33	0.07	1.33	21.30
	Channel 384	26.38	1.34	-0.03	1.35	21.30
	Channel 799	26.39	1.33	-0.07	1.35	21.30
Digital 800MHz	Channel 1013	27.26	1.26	0.05	1.26	21.30
	Channel 384	27.38	1.26	0.03	1.26	21.30
	Channel 779	27.46	1.25	0.02	1.25	21.30

Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT5DL1 at highest possible output power. Measured against the right head in the Cheek/Touch Position.

f (MHz)	Description	Conducted Output Power (dBm)	Left Head (15° Tilt Position)			
			Ant Fixed			
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Simulate Temp (°C)
Analog 800MHz	Channel 991	26.37	0.972	-0.06	0.99	21.30
	Channel 384	26.38	1.01	0.00	1.01	21.30
	Channel 799	26.39	0.997	-0.15	0.997	21.30
Digital 800MHz	Channel 1013	27.26	0.917	-0.04	0.93	21.30
	Channel 384	27.38	0.932	-0.04	0.94	21.30
	Channel 779	27.46	0.911	-0.05	0.92	21.30

Table 3: SAR measurement results for the portable cellular telephone FCC ID IHDT5DL1 at highest possible output power. Measured against the left head in the 15° Tilt Position.

f (MHz)	Description	Conducted Output Power (dBm)	Right Head (15° Tilt Position)			
			Ant Fixed			
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Simulate Temp (°C)
Analog 800MHz	Channel 991	26.37	0.947	0.09	0.947	21.30
	Channel 384	26.38	0.954	0.09	0.954	21.30
	Channel 799	26.39	0.938	0.06	0.938	21.30
Digital 800MHz	Channel 1013	27.26	0.827	0.05	0.827	21.30
	Channel 384	27.38	0.872	0.09	0.872	21.30
	Channel 779	27.46	0.873	-0.01	0.873	21.30

Table 4: SAR measurement results for the portable cellular telephone FCC ID IHDT5DL1 at highest possible output power. Measured against the right head in the 15° Tilt Position.

6.2 Body-Worn Test Results

The SAR results shown in table 5 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 $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$. 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. There are no Body-Worn Accessories available for this phone at the time of testing hence the device was tested per the supplement C testing guidelines for devices that do not have body worn accessories. The phone was placed 1 inch away from a flat phantom per the supplement C standard guidelines to perform SAR measurement. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

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	SN1523	835	6.2	8 of 10

f (MHz)	Description	Conducted Output Power (dBm)	Body Worn			
			Ant Fixed			
			Measured (W/kg)	Drift (dB)	Extrapolated (W/kg)	Simulate Temp (°C)
Analog 800MHz	Channel 991	26.37				
	Channel 384	26.38	0.308	0.05	0.308	21.10
	Channel 799	26.39				
Digital 800MHz	Channel 1013	27.26				
	Channel 384	27.38	0.285	-0.01	0.29	21.10
	Channel 779	27.46				

Table 5: SAR measurement results for the portable cellular telephone FCC ID IHDT5DL1 at highest possible output power. Measured against the body.

Appendix 1

SAR distribution comparison for the system accuracy verification

Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 425tr / Forward Power =252mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement =21.3 C

R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz

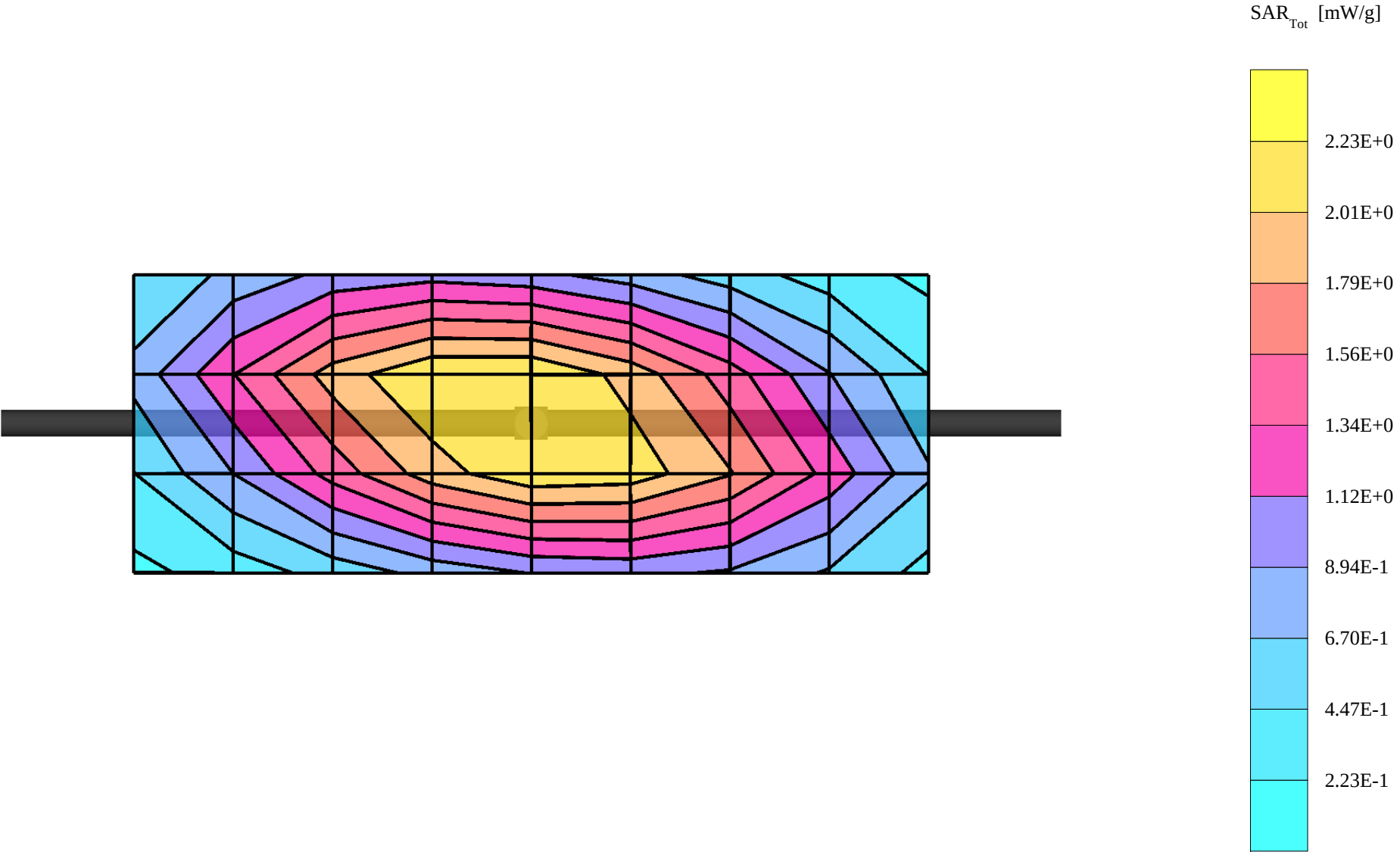
Probe: ET3DV6 - SN1523 - Validation.2; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma = 0.89 \text{ mho/m}$ $\epsilon_r = 40.9$ $\rho = 1.00 \text{ g/cm}^3$

Cubes (2): SAR (1g): 2.45 mW/g $\pm 0.06 \text{ dB}$, SAR (10g): 1.57 mW/g $\pm 0.06 \text{ dB}$, (Worst-case extrapolation)

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

Penetration depth: 12.1 (11.1, 13.4) [mm]

Powerdrift: -0.03 dB



Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 425tr / Forward Power =252mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement =21.3 C

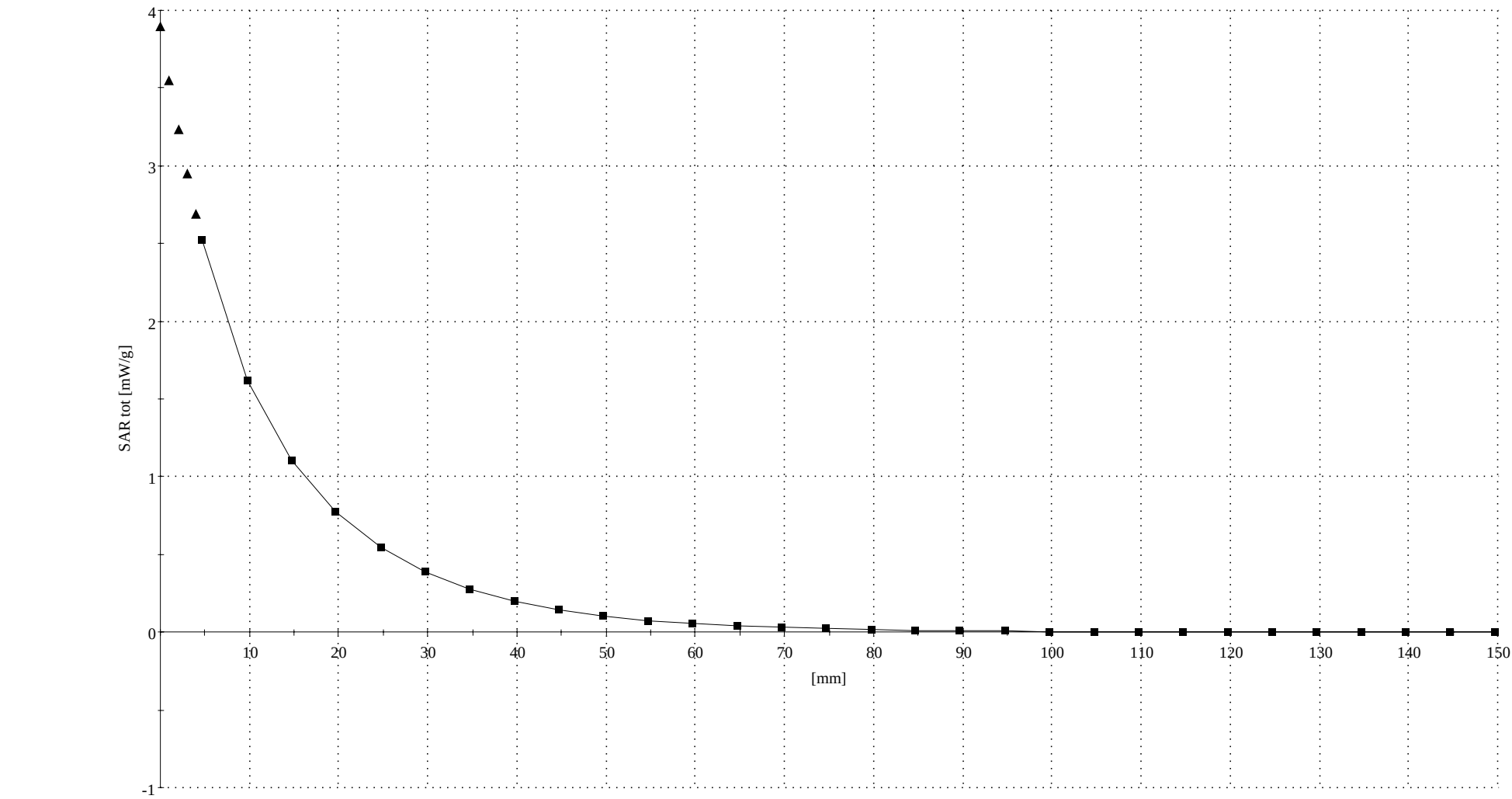
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Section; Position: ; Frequency: 835 MHz

Probe: ET3DV6 - SN1523 - Validation.2; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma = 0.89$ mho/m $\epsilon_r = 40.9$ $\rho = 1.00$ g/cm³

∴, 0

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

Penetration depth: 12.0 (11.0, 13.4) [mm]



Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 425tr / Forward Power =251mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement = 21.4 C

R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz

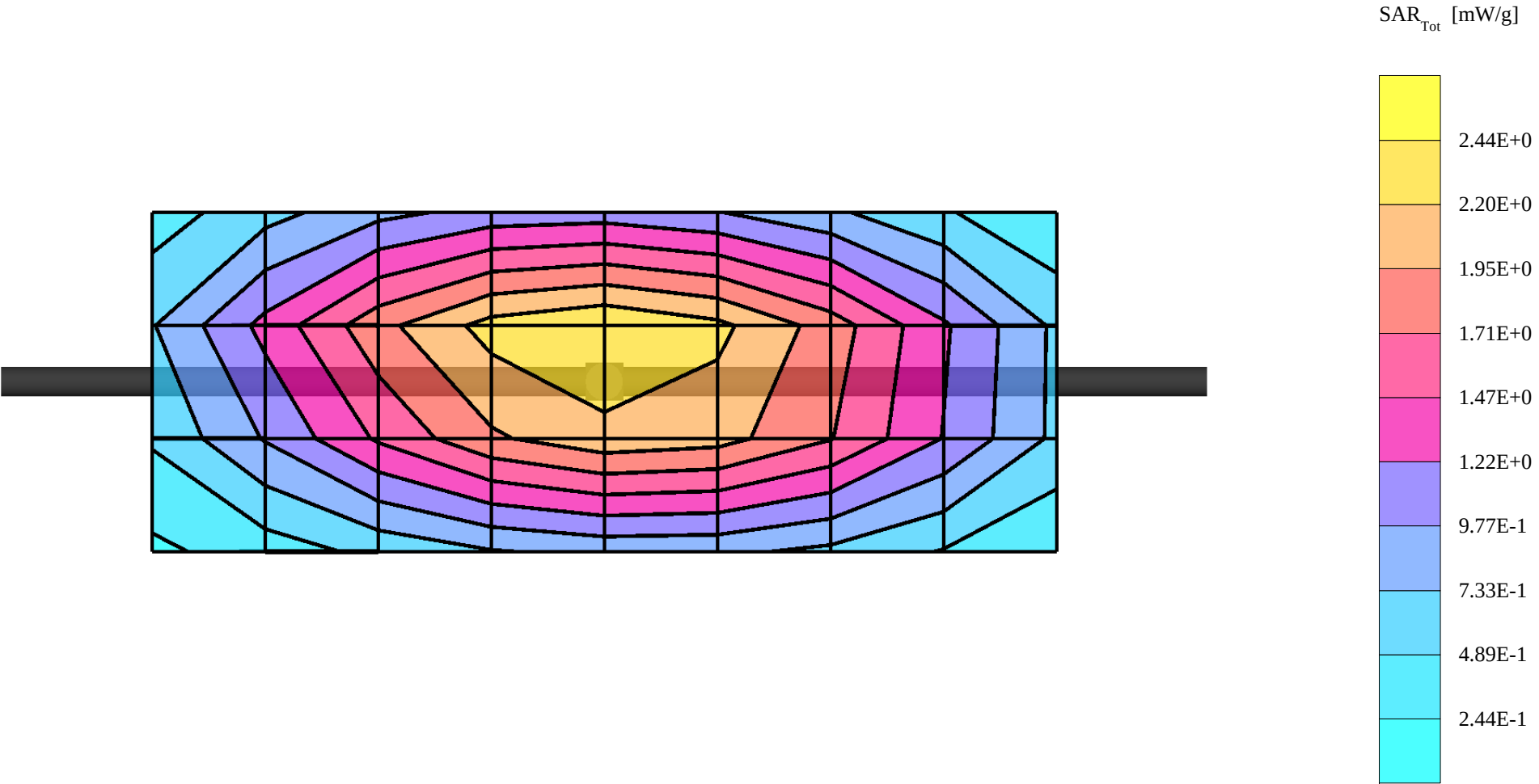
Probe: ET3DV6 - SN1523 - Validation.2; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma = 0.92 \text{ mho/m}$ $\epsilon_r = 42.9$ $\rho = 1.00 \text{ g/cm}^3$

Cubes (2): SAR (1g): 2.51 mW/g $\pm 0.14 \text{ dB}$, SAR (10g): 1.61 mW/g $\pm 0.15 \text{ dB}$, (Worst-case extrapolation)

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

Penetration depth: 12.0 (11.0, 13.3) [mm]

Powerdrift: -0.05 dB



Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 425tr / Forward Power =251mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement = 21.4 C

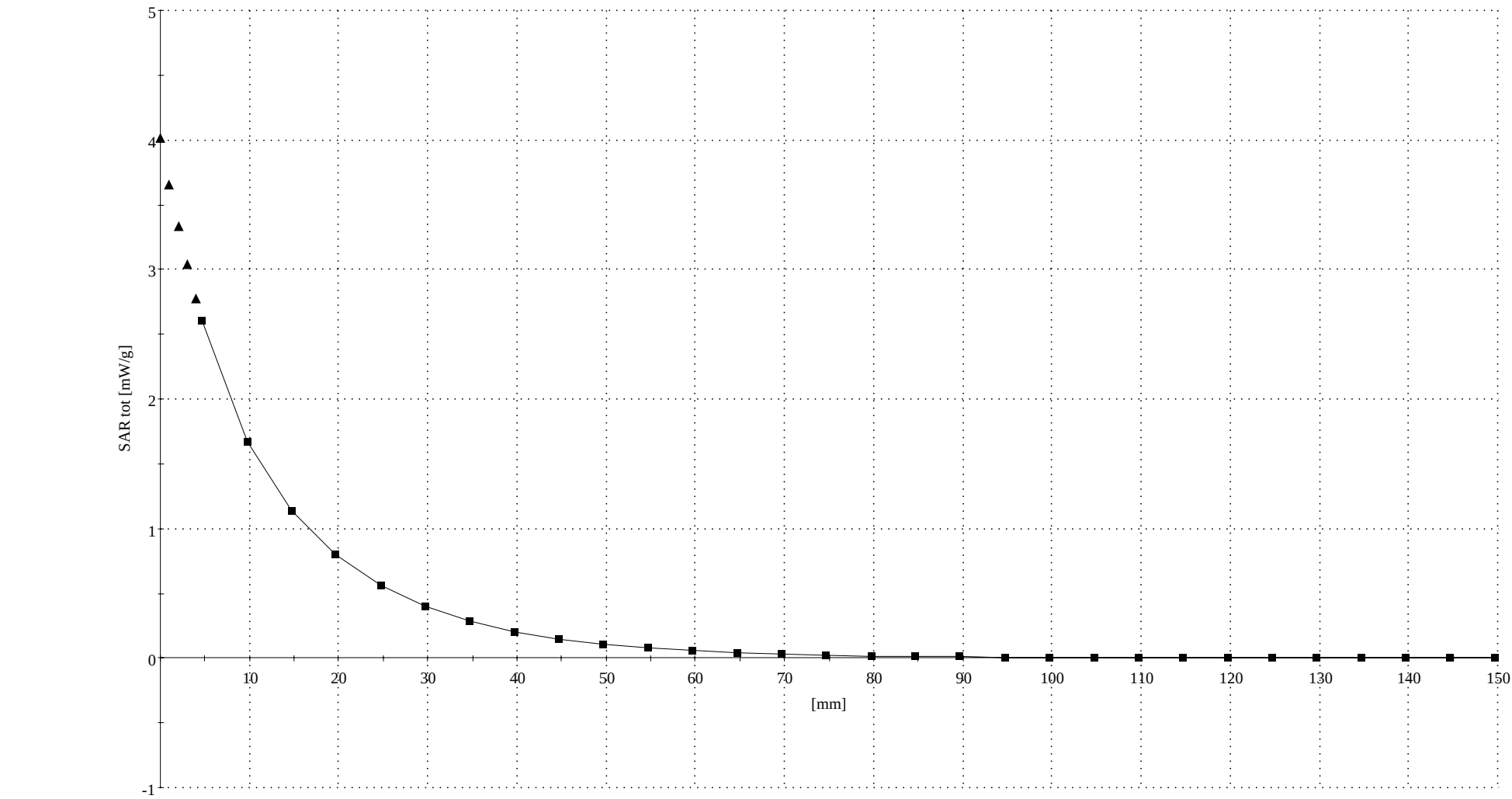
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Section; Position; ; Frequency: 835 MHz

Probe: ET3DV6 - SN1523 - Validation.2; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma = 0.92 \text{ mho/m}$ $\epsilon_r = 42.9$ $\rho = 1.00 \text{ g/cm}^3$

$\therefore, ()$

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

Penetration depth: 12.0 (11.0, 13.3) [mm]

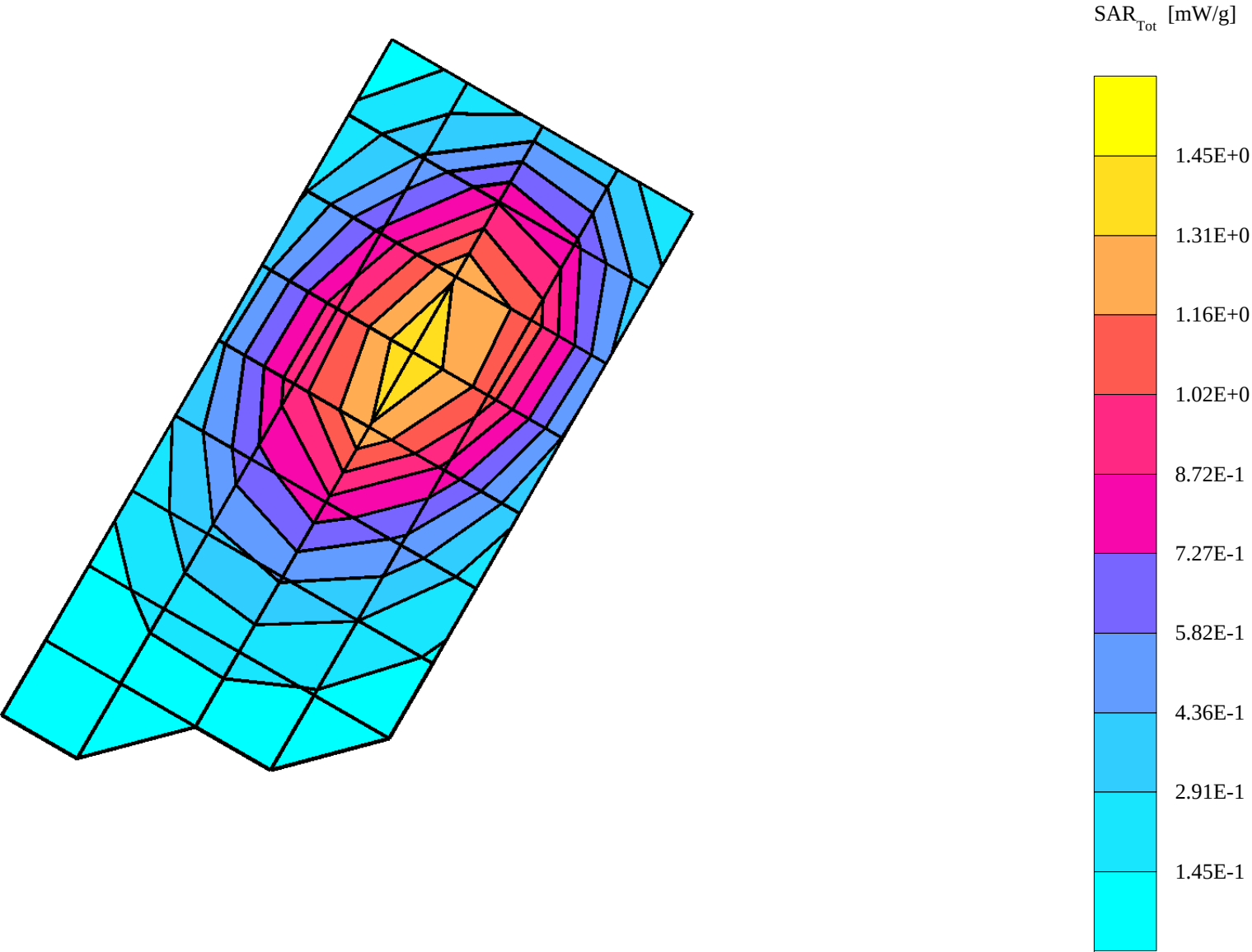


Appendix 2

SAR distribution plots for Phantom Head Adjacent Use

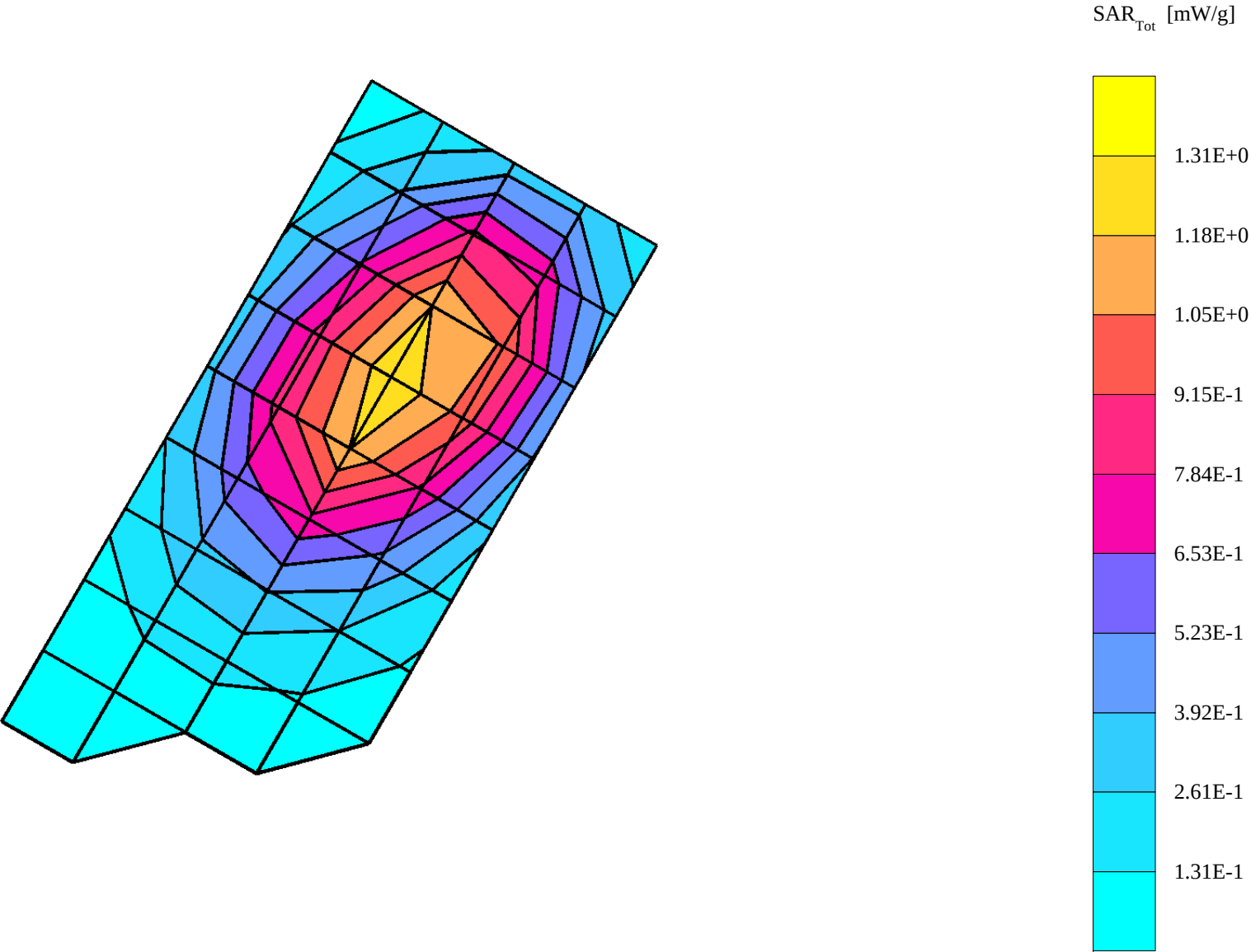
SN# 3990321507

Ch#991 / Pwr Step:02 / Antenna Position:Fixed / Battery Model #: SNN5588A / DEVICE POSITION (cheek or rotated): Cheek
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 824 MHz
Probe: ET3DV6 - SN1523 - IEEE Head; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz Head & Body: $\sigma = 0.89$ mho/m $\epsilon_r = 40.9$ $\rho = 1.00$ g/cm³
Cube 7x7x7: SAR (1g): 1.46 mW/g, SAR (10g): 0.997 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 14.6 (14.0, 15.4) [mm]
Powerdrift: 0.08 dB



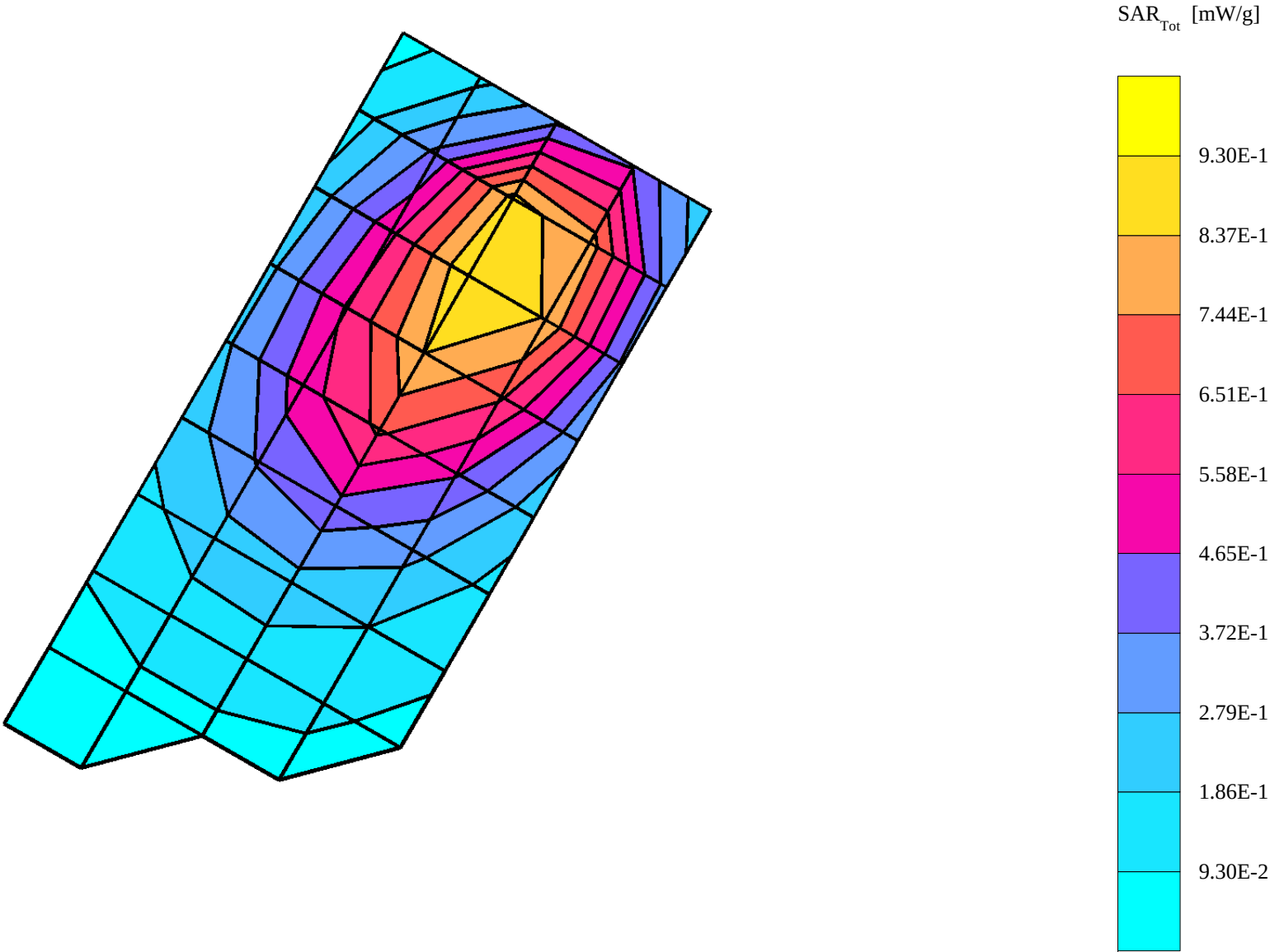
SN# 3990321507

Ch# 799 / Pwr Step: 2 / Antenna Position: FIXED / Battery Model #: SNN5588A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 849 MHz
Probe: ET3DV6 - SN1523 - IEEE Head; ConvF(6.50,6.50,6.50); Crest factor: 3.0; 835 MHz Head & Body: $\sigma = 0.89$ mho/m $\epsilon_r = 40.9$ $\rho = 1.00$ g/cm³
Cube 7x7x7: SAR (1g): 1.30 mW/g, SAR (10g): 0.885 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 14.6 (14.0, 15.3) [mm]
Powerdrift: -0.01 dB



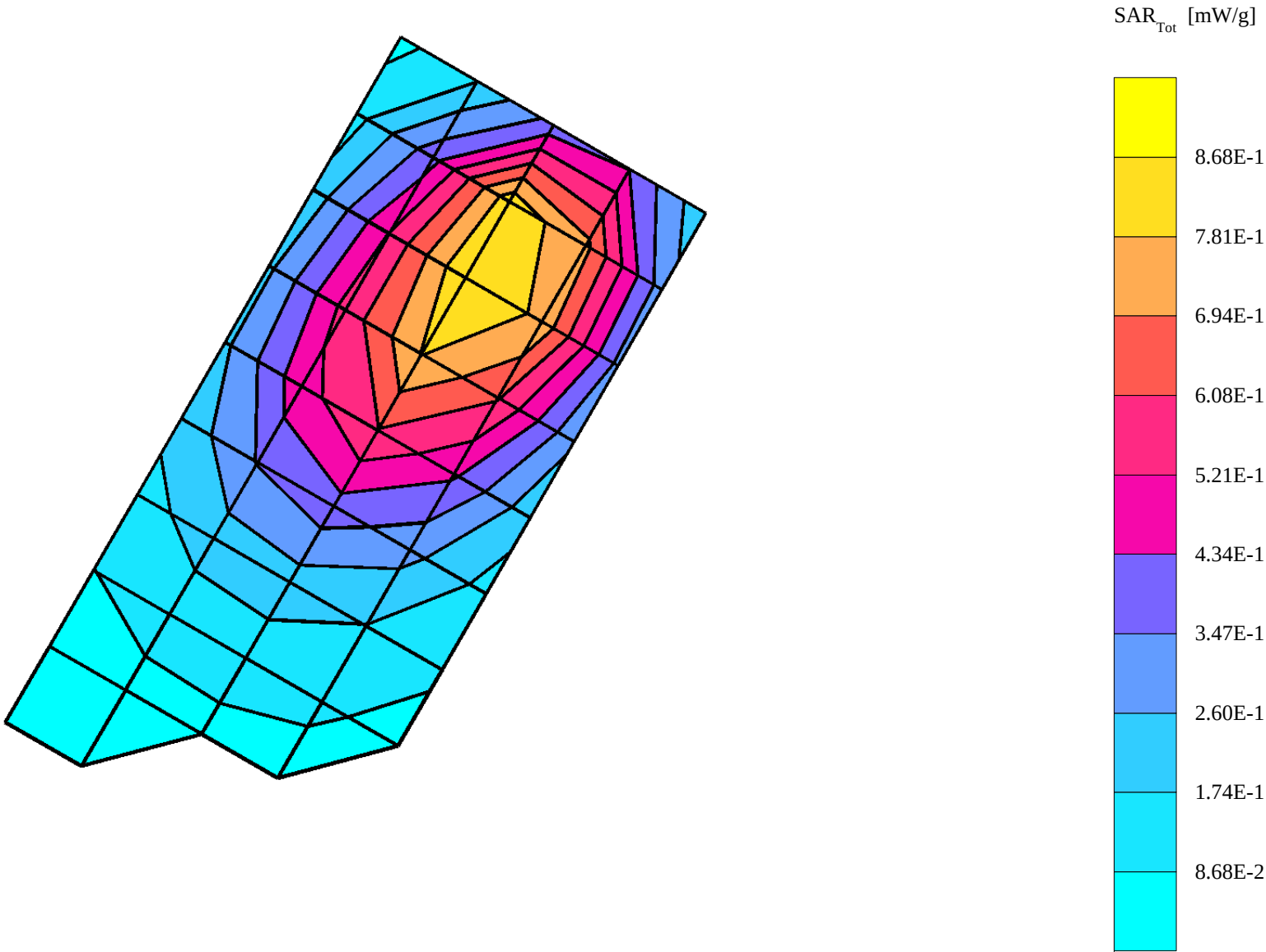
SN# 3990321507

Ch# 383 / Pwr Step: 2 / Antenna Position: FIXED / Battery Model #: SNN5588A / DEVICE POSITION (cheek or rotated): TILT
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 836 MHz
Probe: ET3DV6 - SN1523 - IEEE Head; ConvF(6.50,6.50,6.50); Crest factor: 1.0; 835 MHz Head & Body: $\sigma = 0.89$ mho/m $\epsilon_r = 40.9$ $\rho = 1.00$ g/cm³
Cube 7x7x7: SAR (1g): 1.01 mW/g, SAR (10g): 0.658 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 12.7 (12.1, 13.4) [mm]
Powerdrift: -0.00 dB



SN# 3990321507

Ch# 383 / Pwr Step: 02 / Antenna Position:Fixed / Battery Model #: SNN5588A / DEVICE POSITION (cheek or rotated):Tilted
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 836 MHz
Probe: ET3DV6 - SN1523 - IEEE Head; ConvF(6.50,6.50,6.50); Crest factor: 3.0; 835 MHz Head & Body: $\sigma = 0.92$ mho/m $\epsilon_r = 42.9$ $\rho = 1.00$ g/cm³
Cube 7x7x7: SAR (1g): 0.932 mW/g, SAR (10g): 0.612 mW/g * Max outside, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 12.6 (12.0, 13.3) [mm]
Powerdrift: -0.04 dB



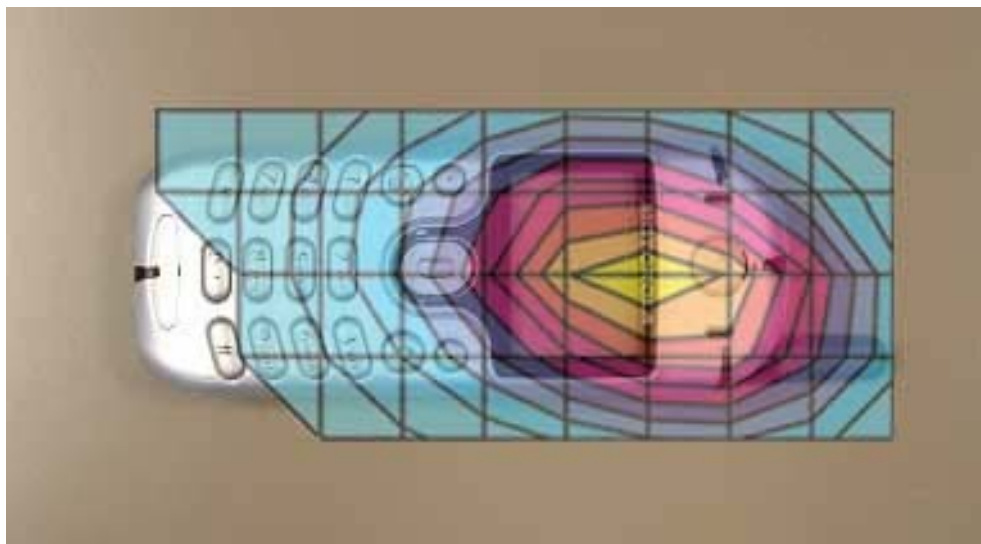


Figure 1. Typical 800MHz Left Head Adjacent Contour Overlaid on Phone with Antenna Fixed (Cheek Touch)

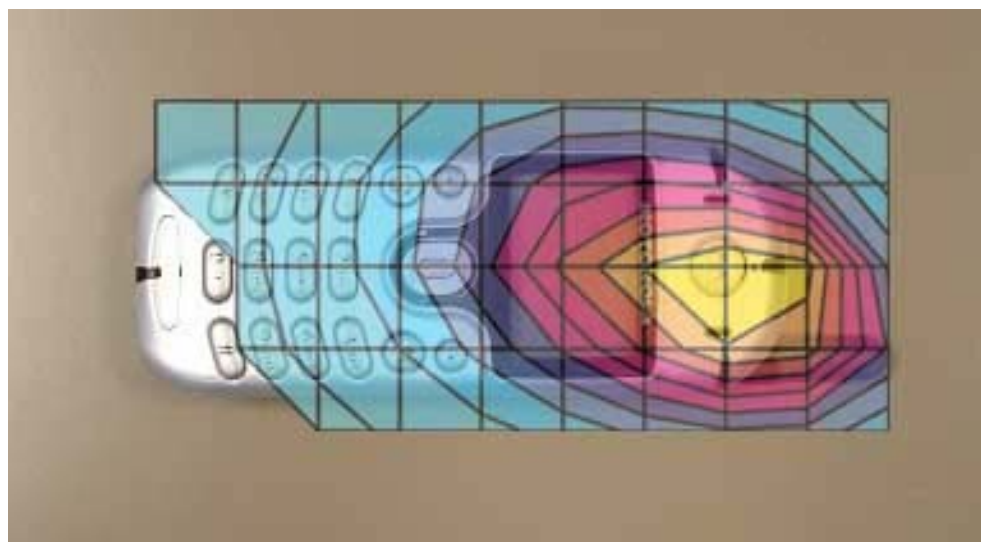


Figure 2. Typical 800MHz Left Head Adjacent Contour Overlaid on Phone with Antenna Fixed (15 ° Tilt)

Appendix 3

SAR distribution plots for Body Worn Configuration

SN# 3990321507

Ch# 383 / Pwr Step: 2 / Antenna Position: FIXED / Battery Model #: SNN5588A / Back of phone 1 inch away from flat phantom

R1 Amy Twin Phantom Rev.3 Phantom; section 1 Section; Position: (0°,0°); Frequency: 836 MHz

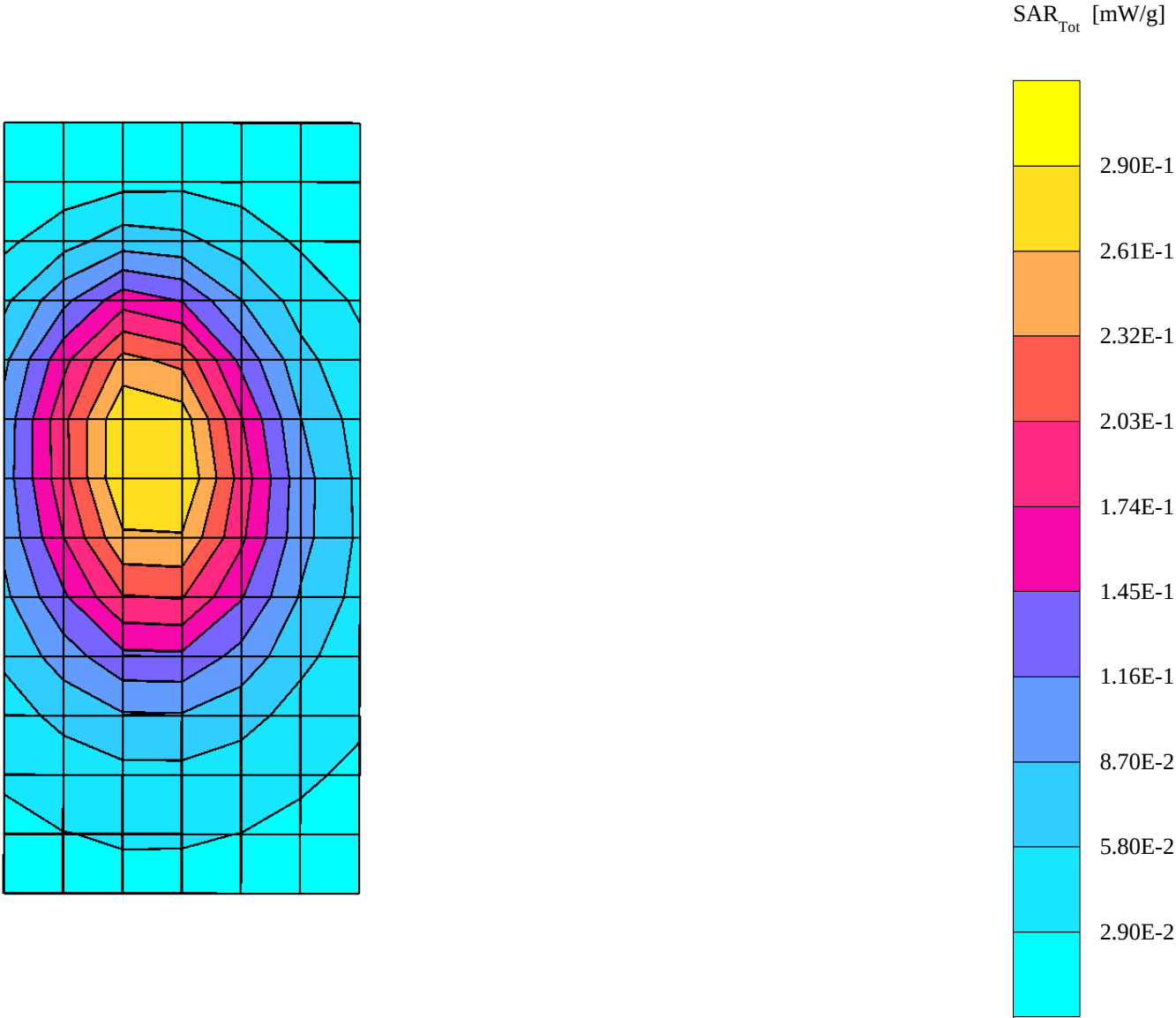
Probe: ET3DV6 - SN1523 - FCC Body; ConvF(6.20,6.20,6.20); Crest factor: 1.0; 835 MHz Head & Body: $\sigma = 0.98 \text{ mho/m}$ $\epsilon_r = 54.7$ $\rho = 1.00 \text{ g/cm}^3$

Cube 7x7x7: SAR (1g): 0.308 mW/g, SAR (10g): 0.219 mW/g, (Worst-case extrapolation)

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

Penetration depth: 16.3 (14.9, 17.9) [mm]

Powerdrift: 0.05 dB



SN# 3990321507

Ch# 383 / Pwr Step: 02 / Antenna Position: FIXED / Battery Model #: SNN5588A / Back of phone 1 inch away from flat phantom

R1 Amy Twin Phantom Rev.3 Phantom; section 1 Section; Position: (0°,0°); Frequency: 836 MHz

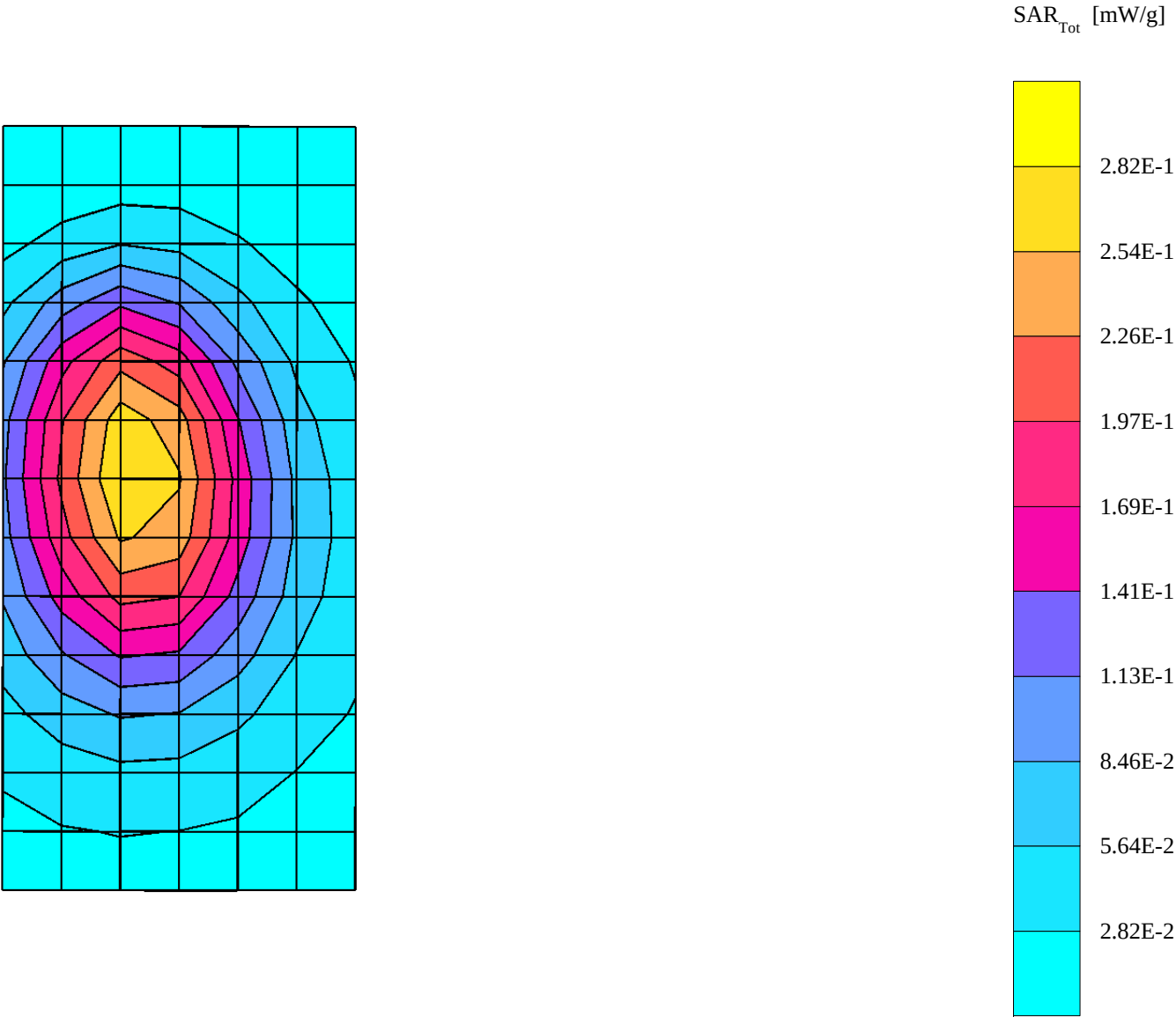
Probe: ET3DV6 - SN1523 - FCC Body; ConvF(6.20,6.20,6.20); Crest factor: 3.0; 835 MHz Head & Body: $\sigma = 0.98$ mho/m $\epsilon_r = 54.7$ $\rho = 1.00$ g/cm³

Cube 7x7x7: SAR (1g): 0.285 mW/g, SAR (10g): 0.205 mW/g, (Worst-case extrapolation)

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

Penetration depth: 16.3 (15.1, 17.7) [mm]

Powerdrift: -0.01 dB



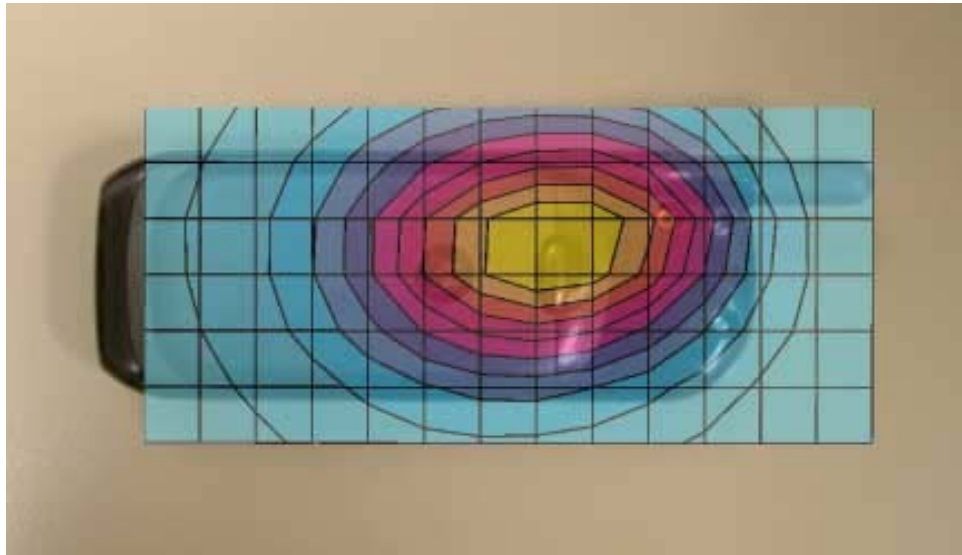


Figure 3. Typical 800 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed

Appendix 4
Probe Calibration Certificate

Client **Motorola MRO (Harvard)**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN 1523**

Calibration procedure(s) **QA CAL-01 v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 17, 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: January 17, 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.

Probe ET3DV6

SN:1523

Manufactured:	March 21, 2000
Last calibration:	January 25, 2002
Recalibrated:	January 17, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1523**Sensitivity in Free Space**

NormX	1.59 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.51 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.53 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	94	mV
DCP Y	94	mV
DCP Z	94	mV

Sensitivity in Tissue Simulating Liquid

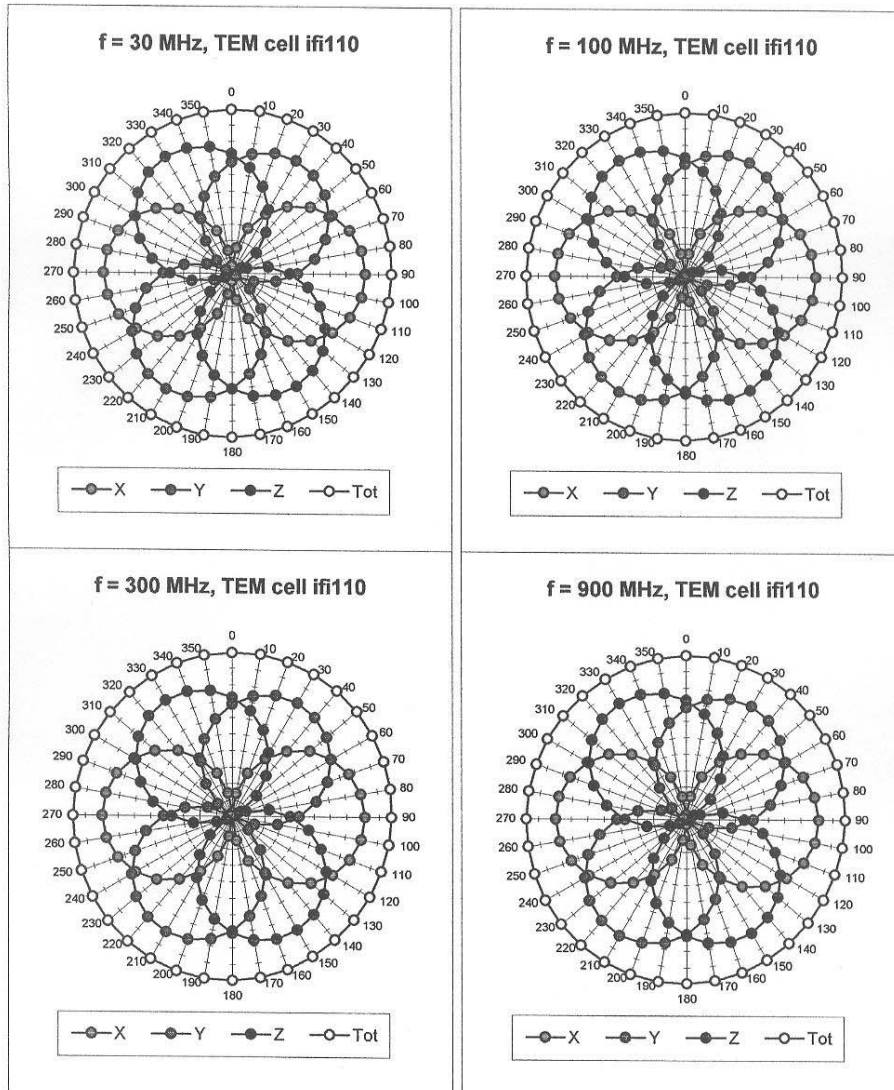
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha	0.52
ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth	2.06
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	5.3 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.3 $\pm 9.5\%$ (k=2)	Alpha	0.51
ConvF Z	5.3 $\pm 9.5\%$ (k=2)	Depth	2.66

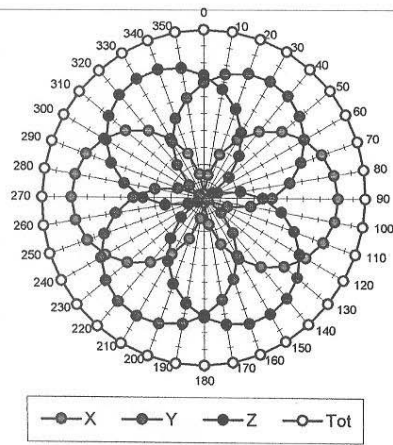
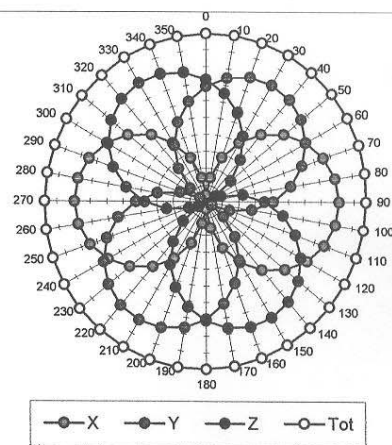
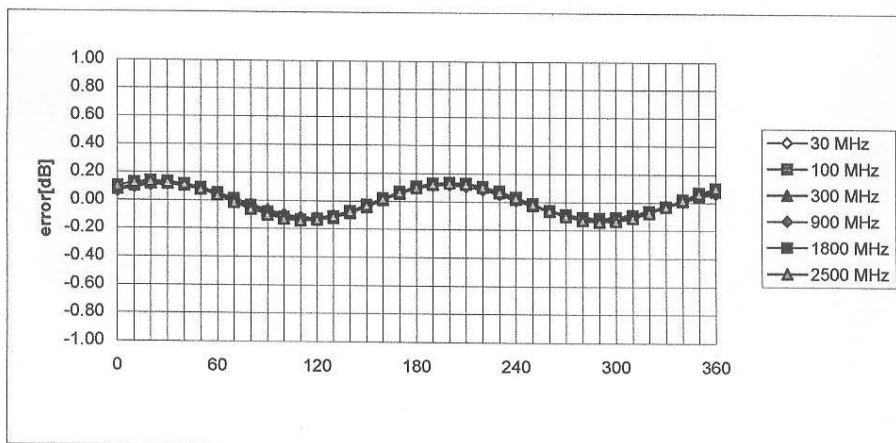
Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm		
	Probe Tip to Boundary	1 mm	2 mm	
	SAR _{be} [%] Without Correction Algorithm	9.7	5.1	
	SAR _{be} [%] With Correction Algorithm	0.2	0.4	
Head	1800 MHz	Typical SAR gradient: 10 % per mm		
	Probe Tip to Boundary	1 mm	2 mm	
	SAR _{be} [%] Without Correction Algorithm	14.2	9.5	
	SAR _{be} [%] With Correction Algorithm	0.2	0.0	

Sensor Offset

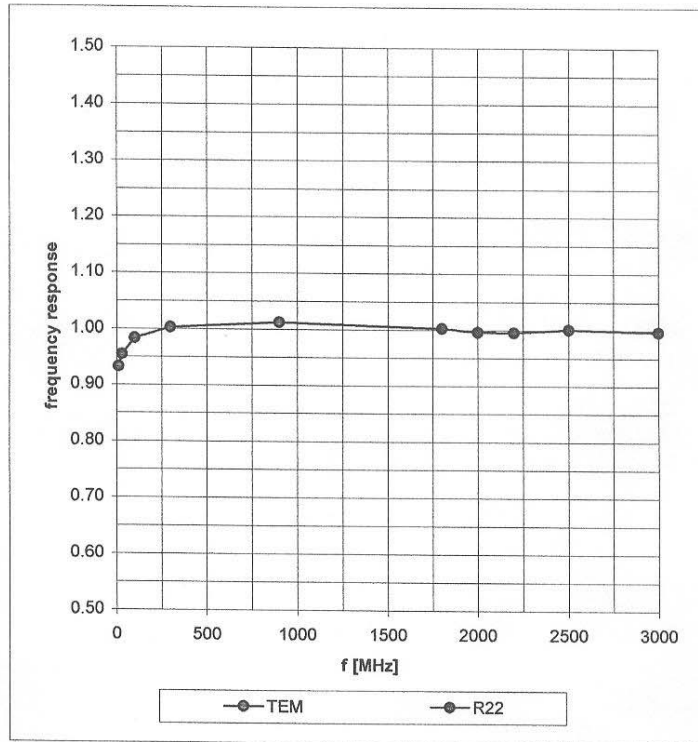
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 $\pm$ 0.2	mm

Receiving Pattern (ϕ), $\theta = 0^\circ$ 

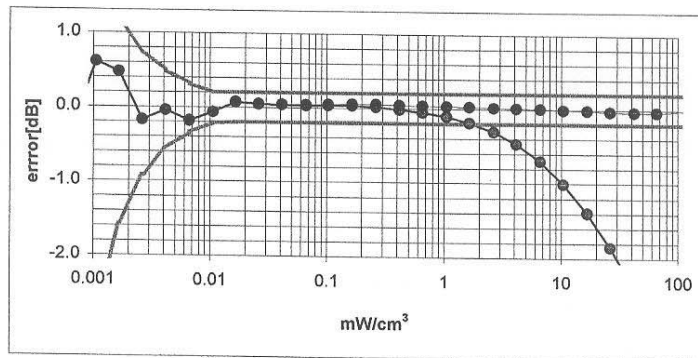
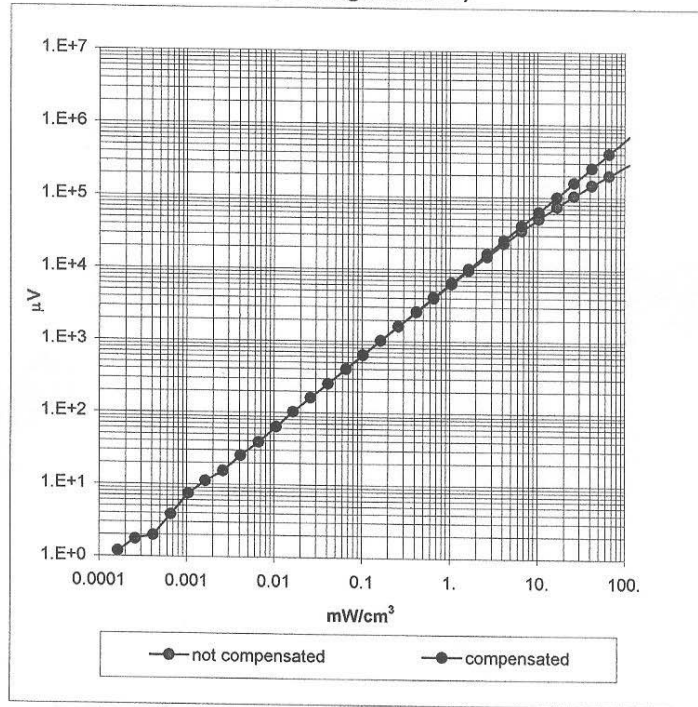
f = 1800 MHz, WG R22**f = 2500 MHz, WG R22****Isotropy Error (ϕ), $\theta = 0^\circ$** 

Frequency Response of E-Field

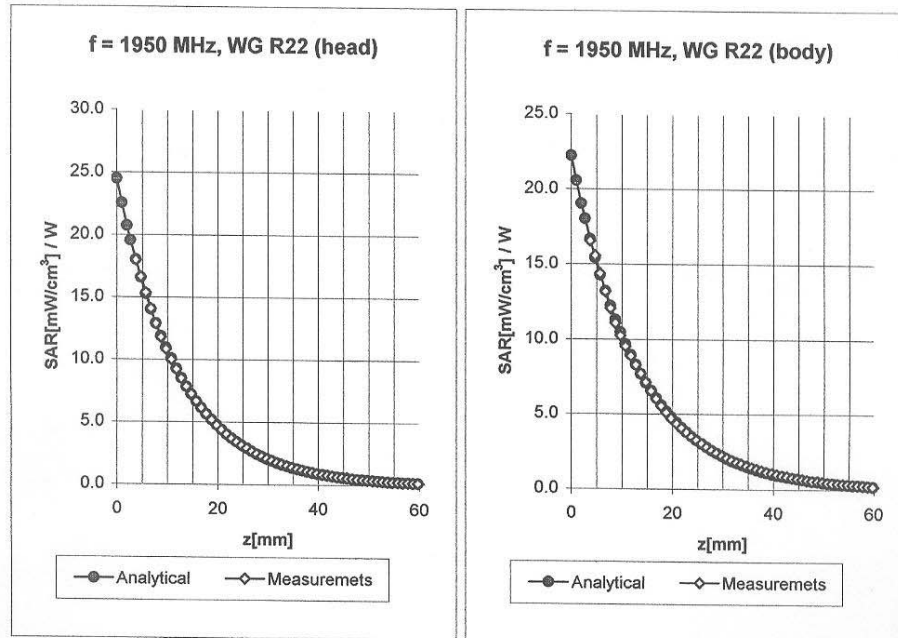
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range $f(\text{SAR}_{\text{brain}})$ (Waveguide R22)

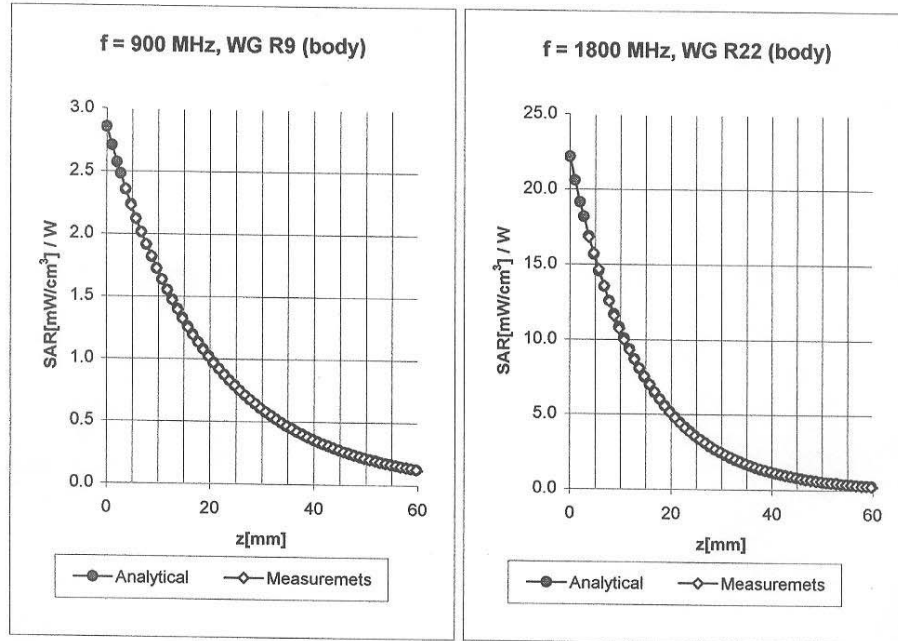


Conversion Factor Assessment



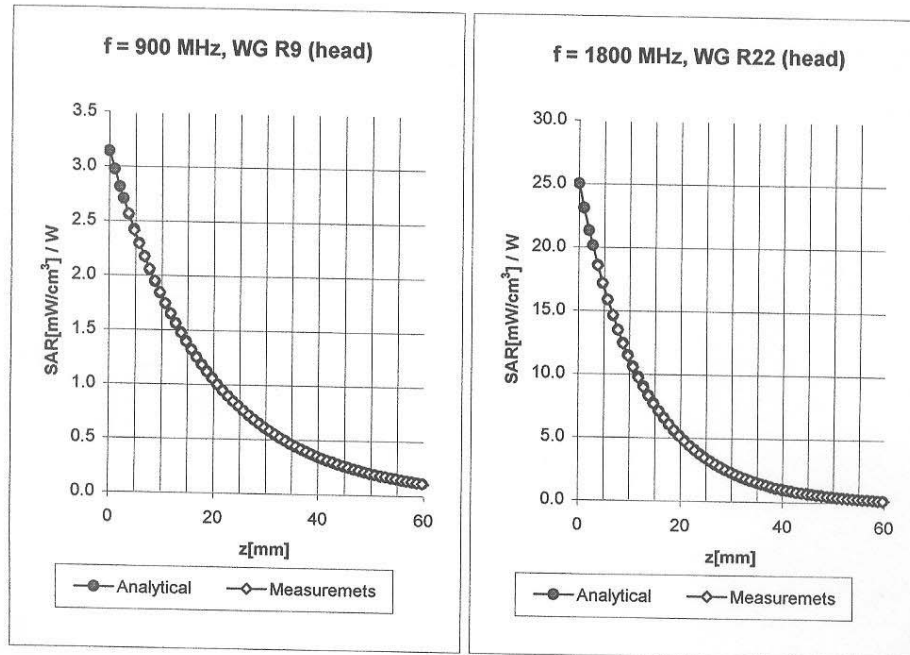
Head	1950	MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
ConvF X	4.9	$\pm 8.9\% (k=2)$	Boundary effect:	
ConvF Y	4.9	$\pm 8.9\% (k=2)$	Alpha	0.54
ConvF Z	4.9	$\pm 8.9\% (k=2)$	Depth	2.57
Body	1950	MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
ConvF X	4.5	$\pm 8.9\% (k=2)$	Boundary effect:	
ConvF Y	4.5	$\pm 8.9\% (k=2)$	Alpha	0.75
ConvF Z	4.5	$\pm 8.9\% (k=2)$	Depth	2.23

Conversion Factor Assessment



Body	900 MHz	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
Body	835 MHz	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	ConvF X	$6.2 \pm 9.5\% (k=2)$	Boundary effect:
	ConvF Y	$6.2 \pm 9.5\% (k=2)$	Alpha 0.46
	ConvF Z	$6.2 \pm 9.5\% (k=2)$	Depth 2.35
Body	1800 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
Body	1900 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
	ConvF X	$4.8 \pm 9.5\% (k=2)$	Boundary effect:
	ConvF Y	$4.8 \pm 9.5\% (k=2)$	Alpha 0.57
	ConvF Z	$4.8 \pm 9.5\% (k=2)$	Depth 2.65

Conversion Factor Assessment



Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\% \text{ mho/m}$
	ConvF X	$6.5 \pm 9.5\% (k=2)$	Boundary effect:
	ConvF Y	$6.5 \pm 9.5\% (k=2)$	Alpha 0.52
	ConvF Z	$6.5 \pm 9.5\% (k=2)$	Depth 2.06
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	$5.3 \pm 9.5\% (k=2)$	Boundary effect:
	ConvF Y	$5.3 \pm 9.5\% (k=2)$	Alpha 0.51
	ConvF Z	$5.3 \pm 9.5\% (k=2)$	Depth 2.66

Appendix 5
Dipole Characterization Certificate

Interim Dipole Correlation Certificate

FCD-0359, Rev.001

Dipole Serial Number:	425(TR)	Last Calibration Date:	13-Nov-02
Dipole Type (MHz):	835MHz dipole with Teflon rings	Calibration Due:	13-Nov-04
		Manufacturer:	SPEAG

-Manufacturer's Original Calibration Information-

Dipole to be correlated: [Serial Number: 425TR]

1g SAR normalized to 1W forward power (mW/g):	9.2 mW/g
Relative Dielectric:	43.05
Conductivity:	0.90
Probe Serial Number:	1507
Forward Power:	250 mW

Primary Dipole Referenced: [Serial Number: 423tr]

1g SAR normalized to 1W forward power (mW/g):	10.04 mW/g
Relative Dielectric:	41.9
Conductivity:	0.89
Probe Serial Number:	1507
Forward Power:	250mW

-Correlation Method Utilized- per DOI-1265

(select one)

By Similarity: ☒

By Transfer Calibration: ☐

-Measured Data-

Probe S/N:	1522	Conductivity (meas.):	0.94
Robot Cell #:	PCS-3	Permittivity (meas.):	43.1

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

2.79 mW/g (1W)		
	(if required)	(if required)

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

2.76 mW/g (1W)		
	(if required)	(if required)

-NEW Correlated Target-

1g SAR normalized to 1W forward power (mW/g):	10.04 mW/g
Relative Dielectric:	41.9
Conductivity:	0.89

Approved by:

Antonio Fereira

Date:

12/12/2002

Comments:

Correlated to get worst case extrapolation targets. Secondary measured within 1% of the primary standard.

Appendix 6
Measurement Uncertainty Budget

Uncertainty Budget for Device Under Test									
<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>
Uncertainty Component	Sec.	Tol. (± %)	Prob. Dist.	Div.	<i>c_i</i> (1 g)	<i>c_i</i> (10 g)	1 g <i>u_i</i> (±%)	10 g <i>u_i</i> (±%)	<i>v_i</i>
Measurement System									
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	∞
Test sample Related									
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	∞
Phantom and Tissue Parameters									
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	∞
Combined Standard Uncertainty			RSS				11.72	11.09	1363
Expanded Uncertainty (95% CONFIDENCE LEVEL)			<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>	$e = f(d, k)$	<i>f</i>	<i>g</i>	$h = c \times f / e$	$i = c \times g / e$	<i>k</i>
Uncertainty Component	Sec.	Tol. (± %)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (±%)	10 g u_i (±%)	v_i
Measurement System									
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	∞
Dipole									
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	∞
Phantom and Tissue Parameters									
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	∞
Combined Standard Uncertainty			RSS				10.16	9.43	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			$k=2$				19.92	18.48	

Appendix 7

Photographs of the device under test



Figure 4. Front of Phone



Figure 5. Back of Phone

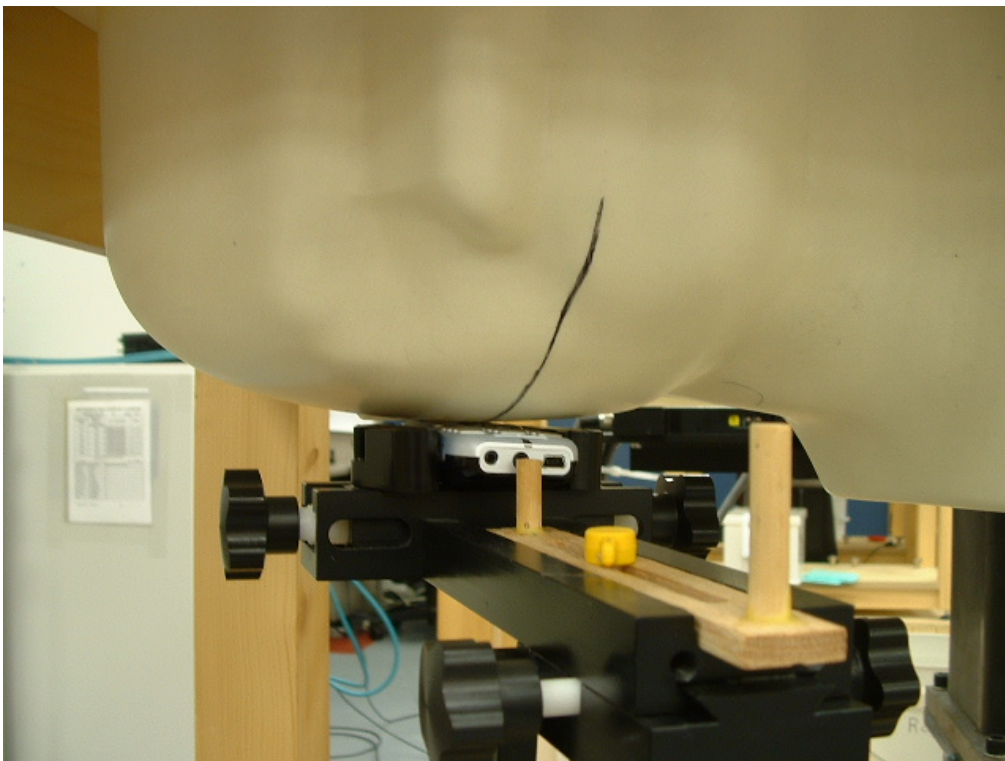


Figure 6. Phone against the Head Cheek Touch (Front View)



Figure 7. Phone against the Head Cheek Touch (Back View)

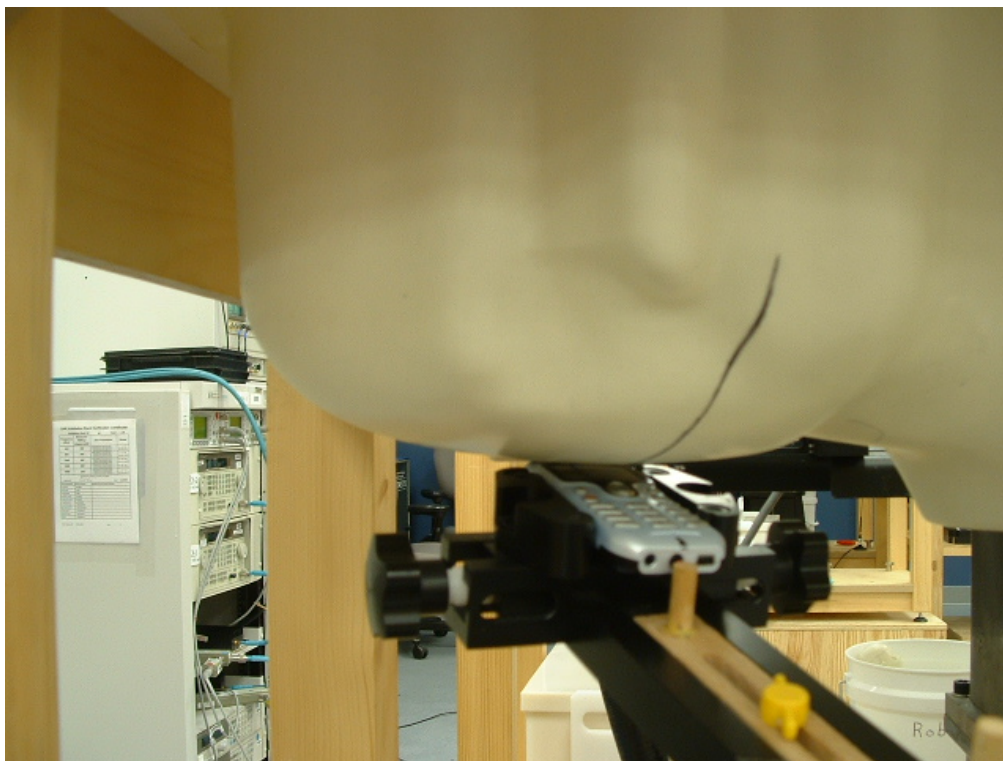


Figure 8. Phone against the Head 15° Tilt (Front View)



Figure 9. Phone against the Head 15° Tilt (Back View)



Figure10. Phone against the flat phantom 2.5 cm separation distance (Body worn position)