Exhibit 11: SAR Test Report IHDT56CD1 Class 2 Permissive Change

Date of test: November 12, 2002
Date of Report: December 10, 2002

Laboratory: Motorola Personal Communications Sector Product Safety & Compliance Laboratory
2001 N. Division
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 IHDT56CD1 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)

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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References:

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 IHDT56CD1) using the newly developed body-worn accessories for this product. 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	External	
Location	Upper Left	
Dimensions	Length	15mm
	Width	10mm
Configuration	Helix	

Device description

FCC ID Number	IHDT56CD1				
Serial number	77A0011				
Mode(s) of Operation	EGSM900	GSM 1800	GSM 1900	UMTS	BlueTooth
Modulation Mode(s)	GSM	GSM	GSM	WCDMA	BlueTooth
Maximum Output Power Setting	32.50dBm	29.50dBm	29.50dBm	21.00dBm	0dBm
Duty Cycle	1:8	1:8	1:8	1:1	
Transmitting Frequency Rang(s)	880.2-914.8MHz	1710.2-1784.8MHz	1850.2-1909.8MHz	1920.3-1979.7MHz	2400.0-2483.5MHz
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. 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. The list of calibrated equipment used for the measurements is shown below.

Description	Serial Number	Cal Due Date
DASY3 DAE V1	SN440	26-Aug-03
E-Field Probe ETDV6	SN1514	25-Jul-03
Dipole Validation Kit, DV1800V2	SN258TR	24-Dep-04

3.2 Additional Equipment

Description	Serial Number	Cal Due Date
Signal Generator HP8648C	N120299-23	10-Oct-04
Power Meter E4419B	N120299-27	18-Jan-03
Power Sensor #1 – E9301A	N120299-25	14-Feb-03
Power Sensor #2 - E9301A	N120299-28	15-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, 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.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	Temp (°C)
1880	**Body**	**Measured,** 12-Nov-02	52.3	1.57	22.8
		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 0.0001 W/kg, which is below the recommended limit.

f (MHz)	Description	SAR (W/kg), 1gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ε_r	σ (S/m)		
1800	**Measured,** 12-Nov-02	39.05	38.7	1.36	24	21.8
	Recommended Limits	38.60	40.3	1.36	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	SN1514	1800	5.20	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 IHDT56CD1) has the SNN5639A as the only available battery option. The phone was placed in the SAR measurement system with a fully charged battery.

The Cellular Phone (FCC ID IHDT56CD1) has an optional camera that may be attached to the back of the phone. To evaluate the SAR impact of the optional camera, a complete set of SAR measurements were taken without the camera attached and then the worst case conditions were remeasured with the camera attached.

6.1 Head Adjacent Test Results

No change from previous test report because new 2 new body-worn accessories were developed. These new accessories are used for body-worn configurations only.

6.2 Body-Worn Test Results

The SAR results shown in tables 1 and 2 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 2. All other test conditions measured lower SAR values than those included in Appendix 2.

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 two Body-Worn Accessories available for this phone:
A Villa Pouch and Belt Clip: Model #MOTPQ0433K
A Leather Case with Belt Clip: Model #MOTFL0515T

Since these two accessories differ in metal content, both accessories were used for 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	SN1514	1900	4.60	2 of 2

f (MHz)	Description	Conducted Output Power (dBm)	Body Worn w/MOTFL0515T									
			w/o Camera					w/ Camera				
			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 1900MHz	Channel 512	29.55										
	Channel 661	29.55	**0.461**	**-0.13**	**0.48**	**24.0**	**20.6**	**0.513**	**0.12**	**0.51**	**24.0**	**20.7**
	Channel 810	29.55										

Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56CD1 at highest possible output power. Measured against the body.

f (MHz)	Description	Conducted Output Power (dBm)	Body Worn w/MOTPQ0433K									
			w/o Camera					w/ Camera				
			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 1900MHz	Channel 512	29.55										
	Channel 661	29.55	0.27	-0.28	0.29	24.0	20.7	0.197	0.45	0.20	24.0	20.6
	Channel 810	29.55										

Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56CD1 at highest possible output power. Measured against the body.

f (MHz)	Description	Conducted Output Power (dBm)	Body Worn w/MOTFL0515T									
			w/o Camera					w/ Camera				
			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 1900MHz	Channel 512	29.55										
	Channel 661	29.55						**0.367**	**-0.04**	**0.37**	**24.0**	**21.2**
	Channel 810	29.55										

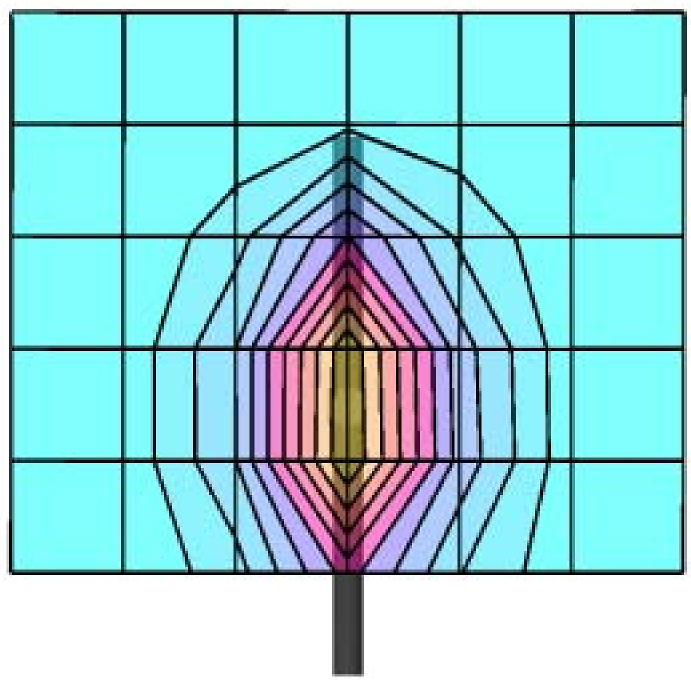
Table 3: SAR measurement results for the portable cellular telephone FCC ID IHDT56CD1 at highest possible output power. Measured against the body with Bluetooth co-located transmitter functioning.

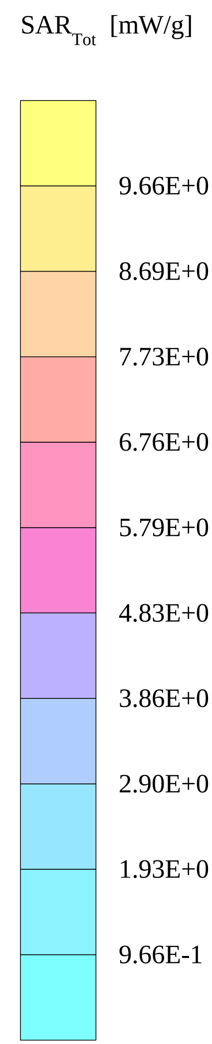
Appendix 1

SAR distribution comparison for the system accuracy verification

Dipole 1800 MHz

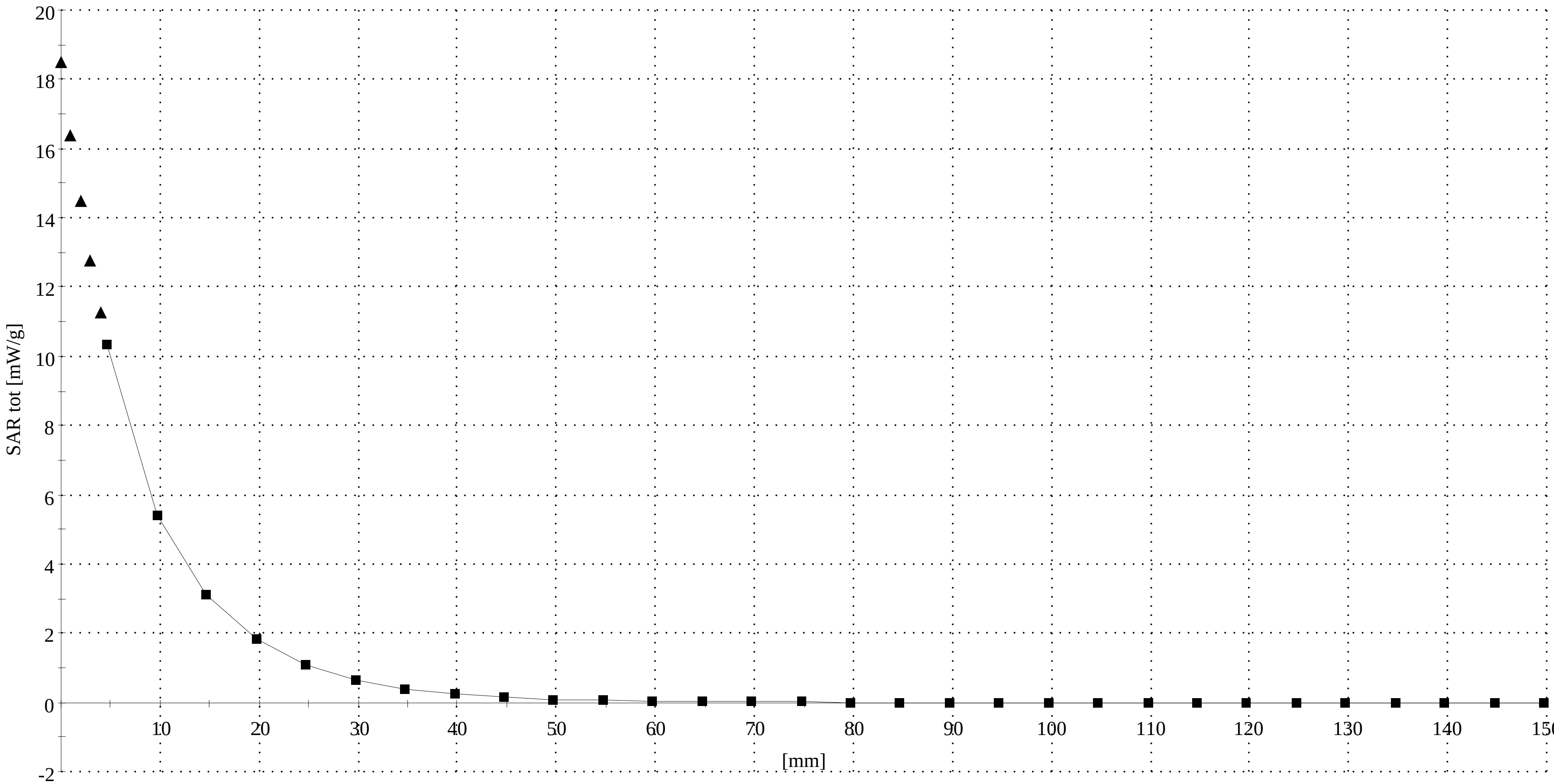
1800 MHz Dipole Validation / Dipole Sn# 258TR
Forward Power = 252mW   Reflected Power = -22.00dB
Room Temp at time of measurement = 24C   Simulant Temp at time of measurement = 21.8C
R5 Amy Twin Phantom Rev.4 (22Aug02); section 1
Probe: ET3DV6 - SN1514 - VALIDATION; ConvF(5.20,5.20,5.20); Crest factor: 1.0; 1800 MHz VALIDATION: σ = 1.36 mho/m ε_r = 38.7 ρ = 1.00 g/cm^3
Cubes (2): Peak: 18.3 mW/g ± 0.07 dB, SAR (1g): 9.84 mW/g ± 0.07 dB, SAR (10g): 5.14 mW/g ± 0.06 dB, (Worst-case extrapolation)
Penetration depth: 8.2 (7.9, 9.0) [mm]
Powerdrift: 0.00 dB





Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 258TR
Forward Power = 252mW Reflected Power = -22.00dB
Room Temp at time of measurement = 24C Simulant Temp at time of measurement = 21.8C
R5 Amy Twin Phantom Rev.4 (22Aug02);
Probe: ET3DV6 - SN1514 - VALIDATION; ConvF(5.20,5.20,5.20); Crest factor: 1.0; 1800 MHz VALIDATION: σ = 1.36 mho/m ε_r = 38.7 ρ = 1.00 g/cm³
: , , ()
Penetration depth: 8.2 (7.8, 9.0) [mm]

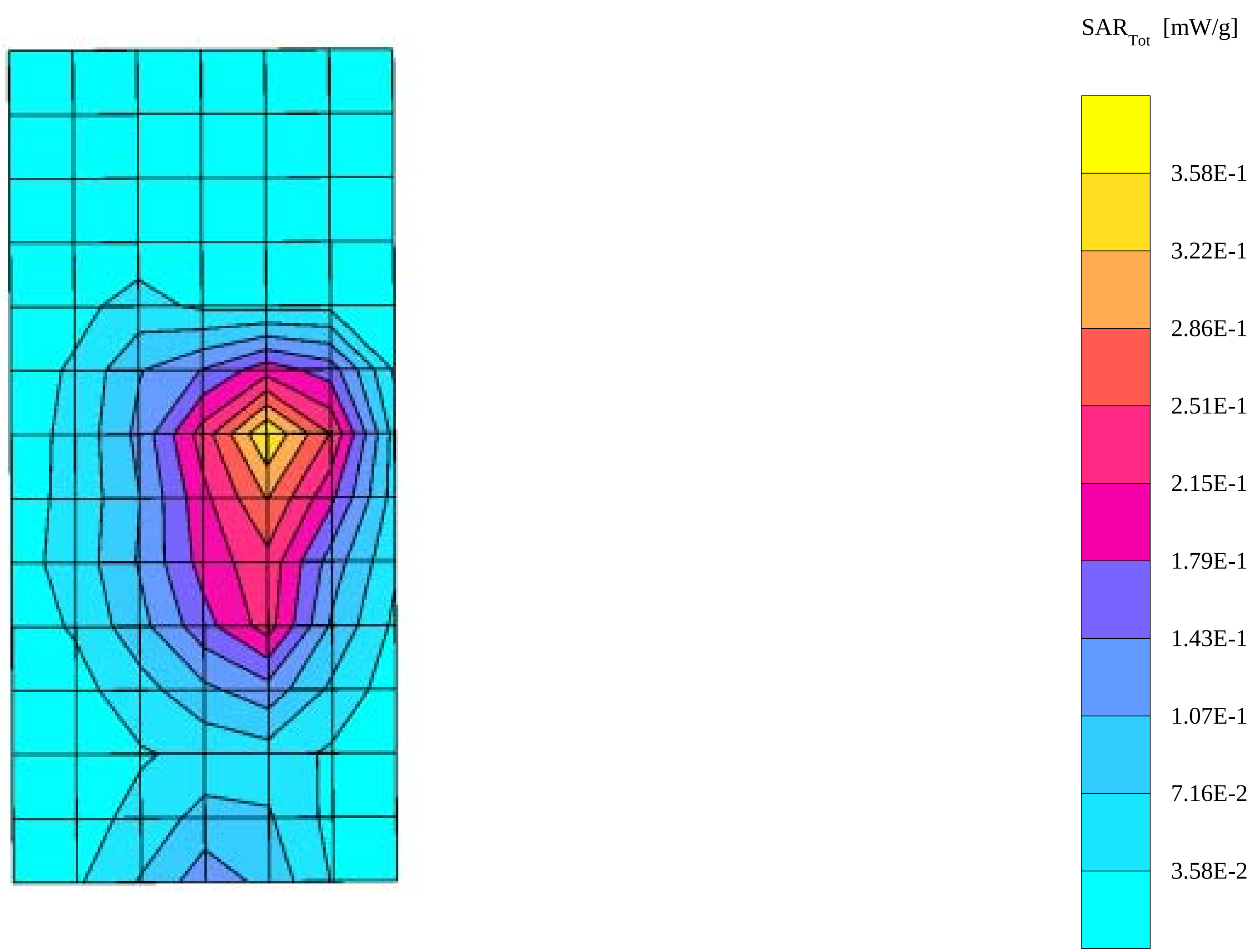


Appendix 2

SAR distribution plots for Body Worn Configuration

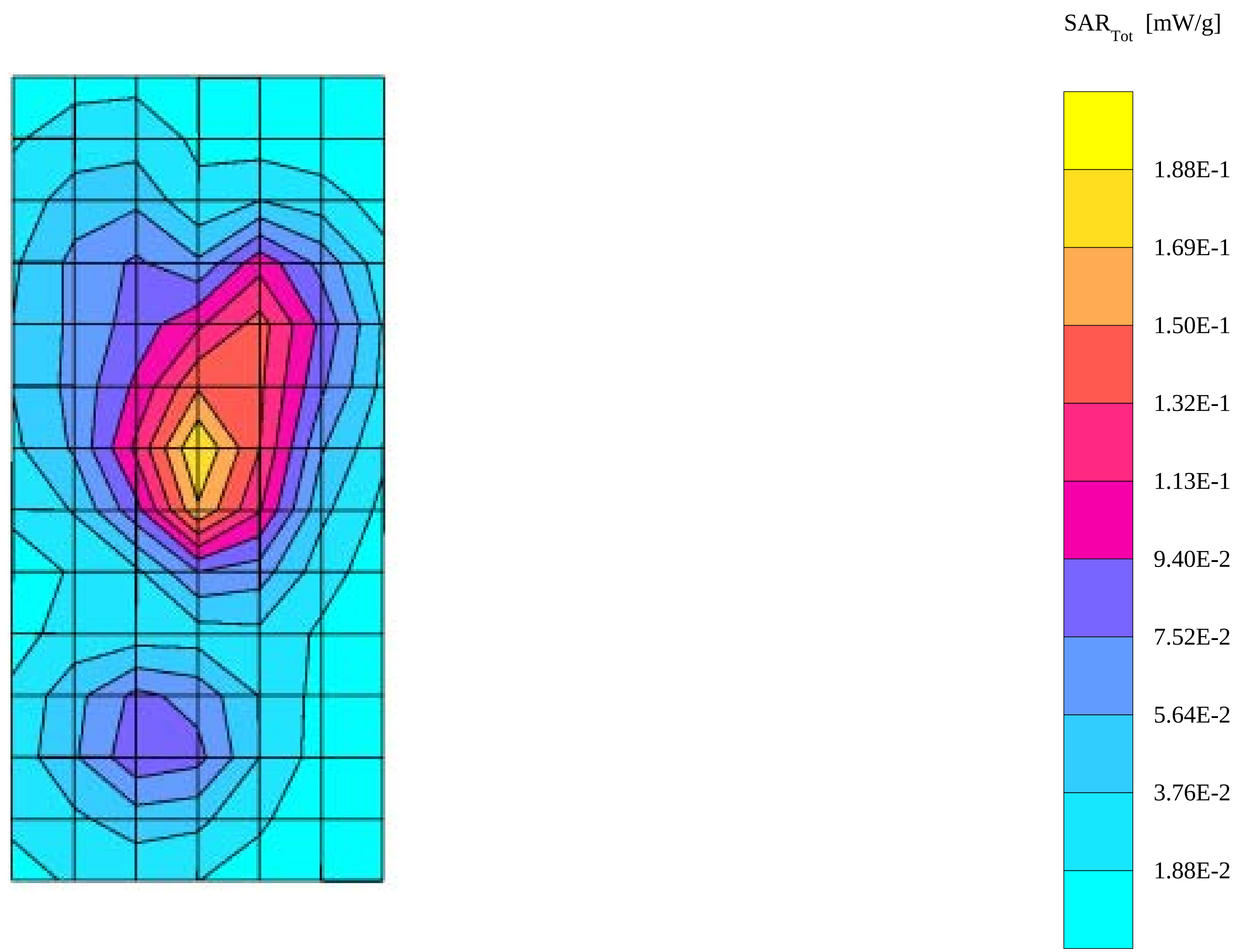
s/n: 77A0011

Ch# 661 / Pwr Step: 0 / Type of Modulation: GSM1900 / Battery Model #: SNN5639A
Accessory Model #: Camera Attached / Bluetooth Transmitting / Leather Case MOTFL0515T
R1 Amy Twin Phantom Rev.3 Phantom; section 2 Section; Position: (0°,0°); Frequency: 1851 MHz
Probe: ET3DV6 - SN1398 - FCC Body; ConvF(4.90,4.90,4.90); Crest factor: 8.0; 1880 MHz Head & Body: σ = 1.59 mho/m ε_r = 51.2 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.367 mW/g, SAR (10g): 0.206 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 8.9 (8.3, 10.0) [mm]
Powerdrift: -0.04 dB



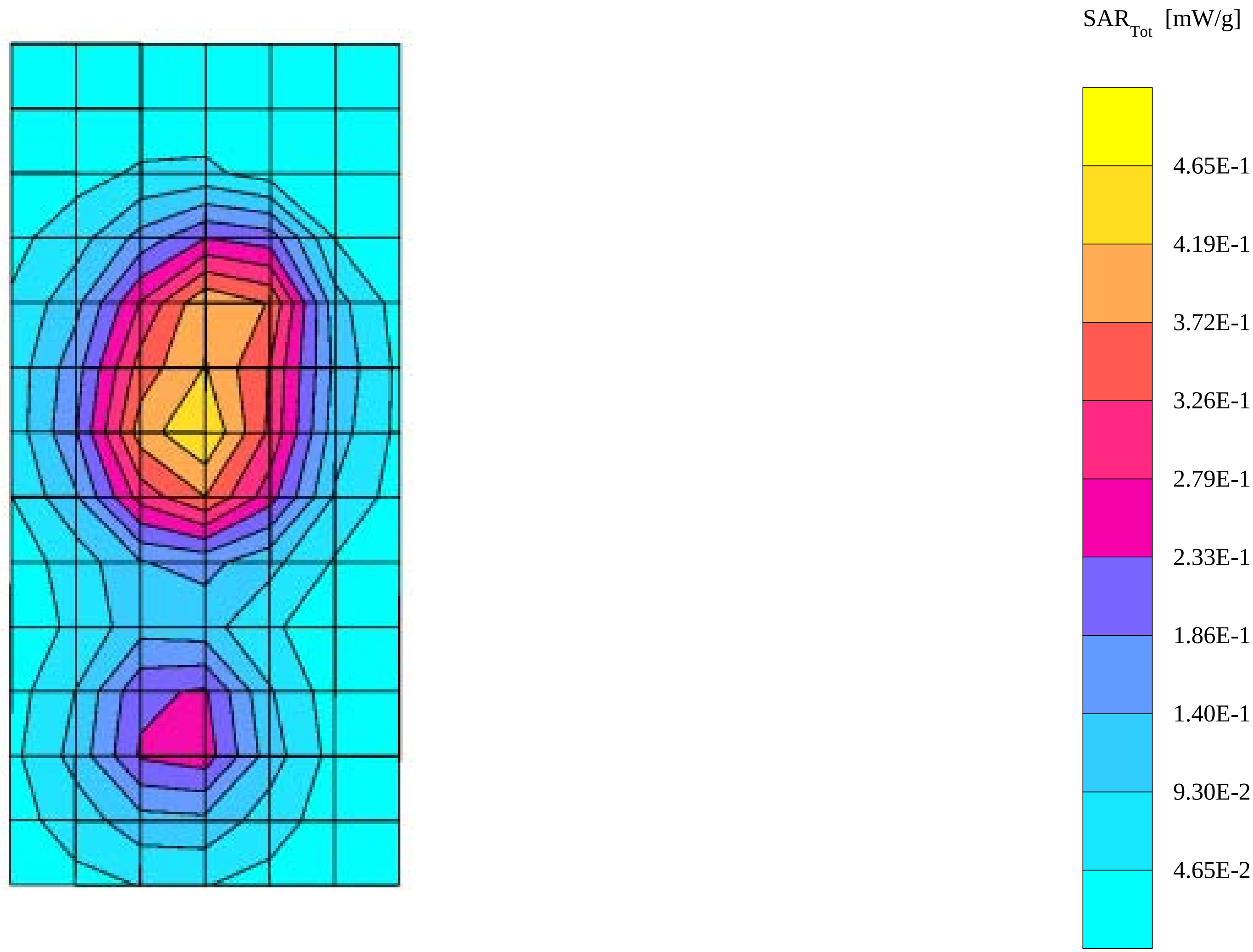
s/n 77A0011

Ch# 661 / Pwr Step: 00 / Type of Modulation: 1900 GSM / Battery Model #: SNN5639A
Accessory Model # : Villa Pouch MOTPQ0433K w/Camera
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6 - SN1514 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 1880 MHz Head & Body: σ = 1.57 mho/m ε_r = 52.3 ρ = 1.00 g/cm³
Cube 7x7x7: SAR (1g): 0.197 mW/g, SAR (10g): 0.118 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 10.3 (9.6, 11.3) [mm]
Powerdrift: 0.45 dB



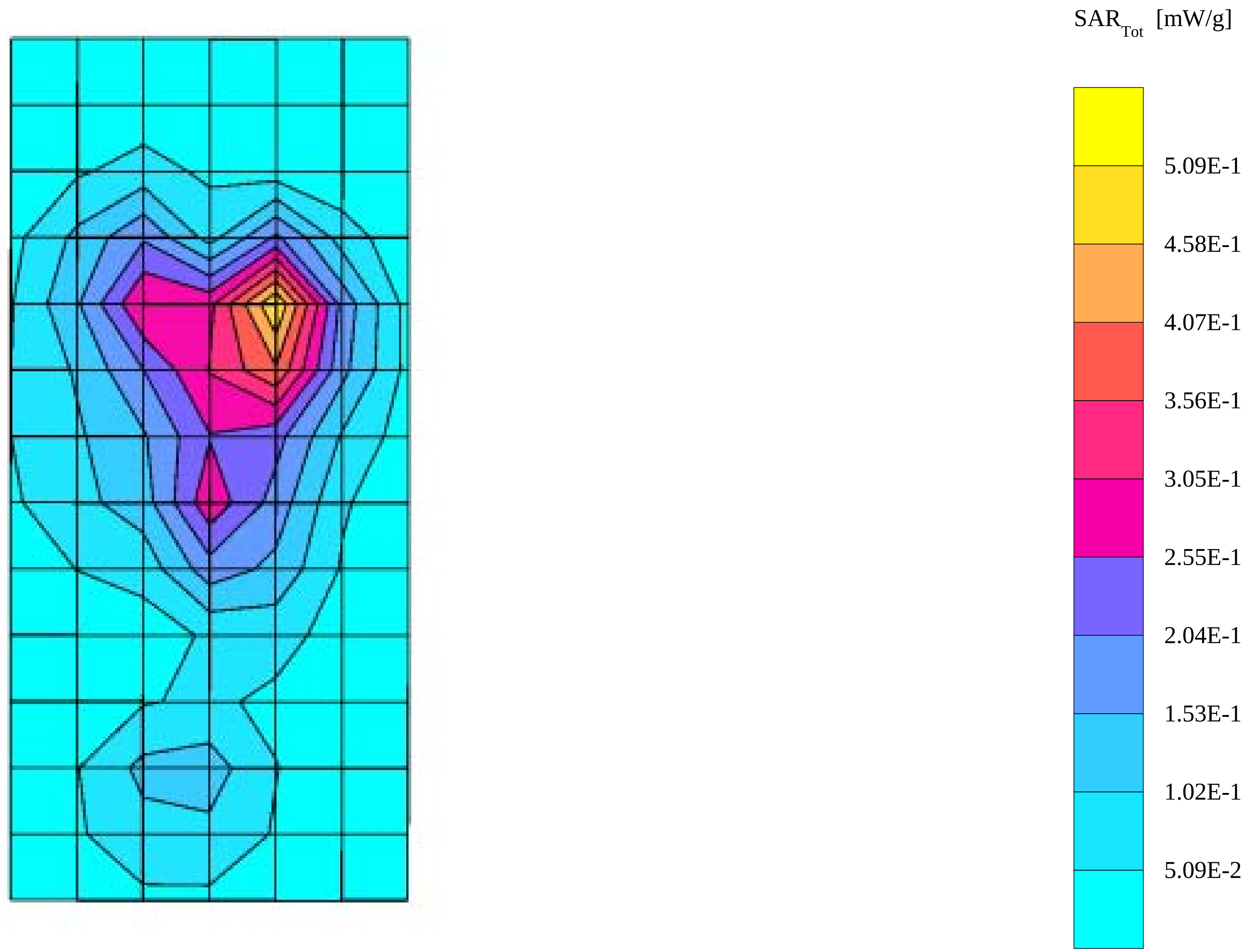
s/n: 77A0011

Ch# 661 / Pwr Step: 00 / Type of Modulation: 1900 GSM / Battery Model #: SNN5639A
Accessory Model # =MOTFL0515T Leather case
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6 - SN1514 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 1880 MHz Head & Body: σ = 1.57 mho/m ε_r = 52.3 ρ = 1.00 g/cm³
Cube 7x7x7: SAR (1g): 0.461 mW/g, SAR (10g): 0.291 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 11.1 (10.4, 12.1) [mm]
Powerdrift: -0.13 dB



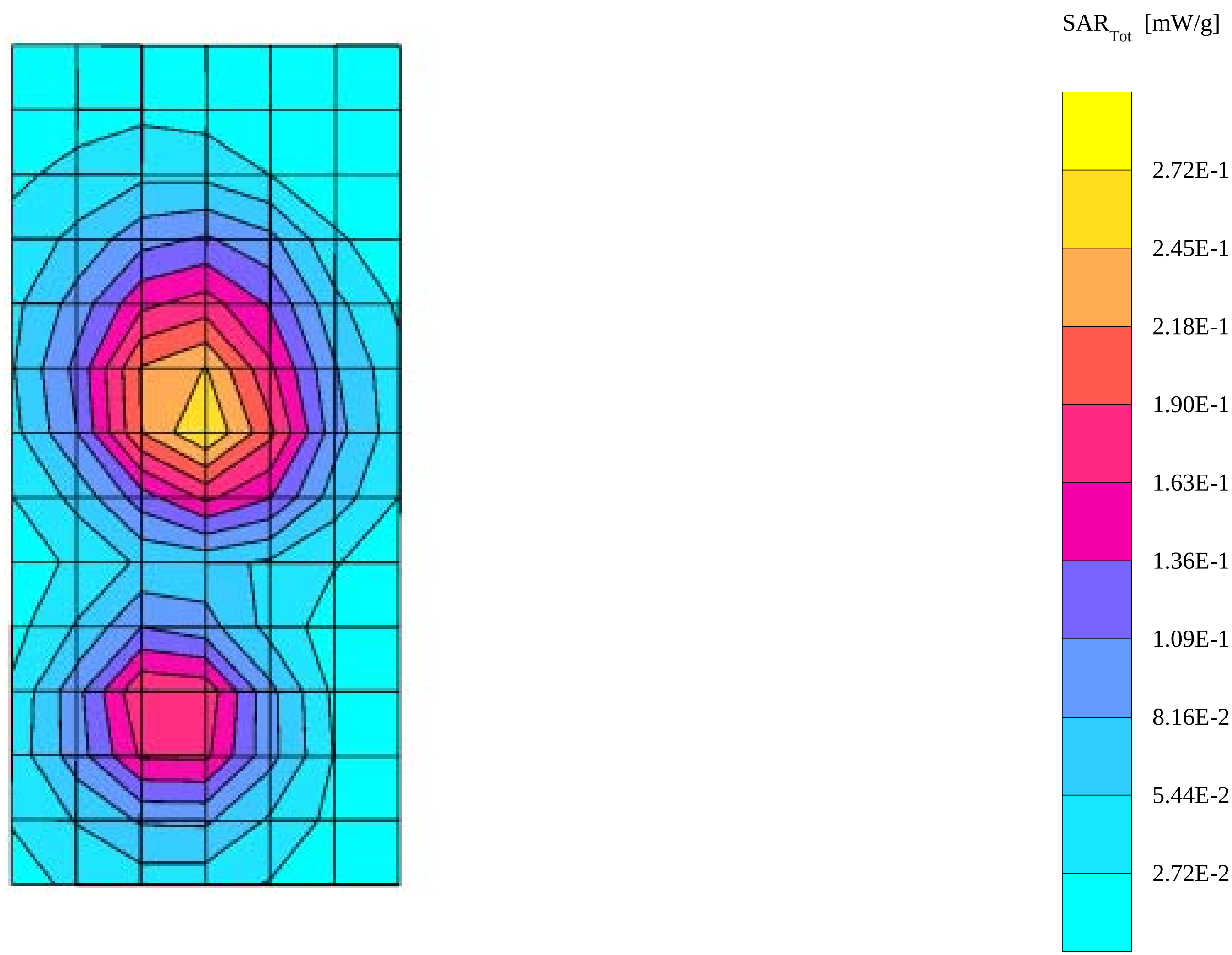
s/n 77A0011

Ch# 661 / Pwr Step: 00 / Type of Modulation: 1900 GSM / Battery Model #: SNN5639A
Accessory Model # =MOTFL0515T Leather case w/Camera Attached
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6 - SN1514 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 1880 MHz Head & Body: σ = 1.57 mho/m ε_r = 52.3 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.513 mW/g, SAR (10g): 0.277 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 9.0 (8.6, 9.6) [mm]
Powerdrift: 0.12 dB



s/n 77A0011

Ch# 661 / Pwr Step: 00 / Type of Modulation: 1900 GSM / Battery Model #: SNN5639A
Accessory Model # : Villa Pouch MOTPQ0433K
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6 - SN1514 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 1880 MHz Head & Body: σ = 1.57 mho/m ε_r = 52.3 ρ = 1.00 g/cm^3
Cube 7x7x7: SAR (1g): 0.270 mW/g, SAR (10g): 0.166 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 10.6 (10.0, 11.6) [mm]
Powerdrift: -0.28 dB



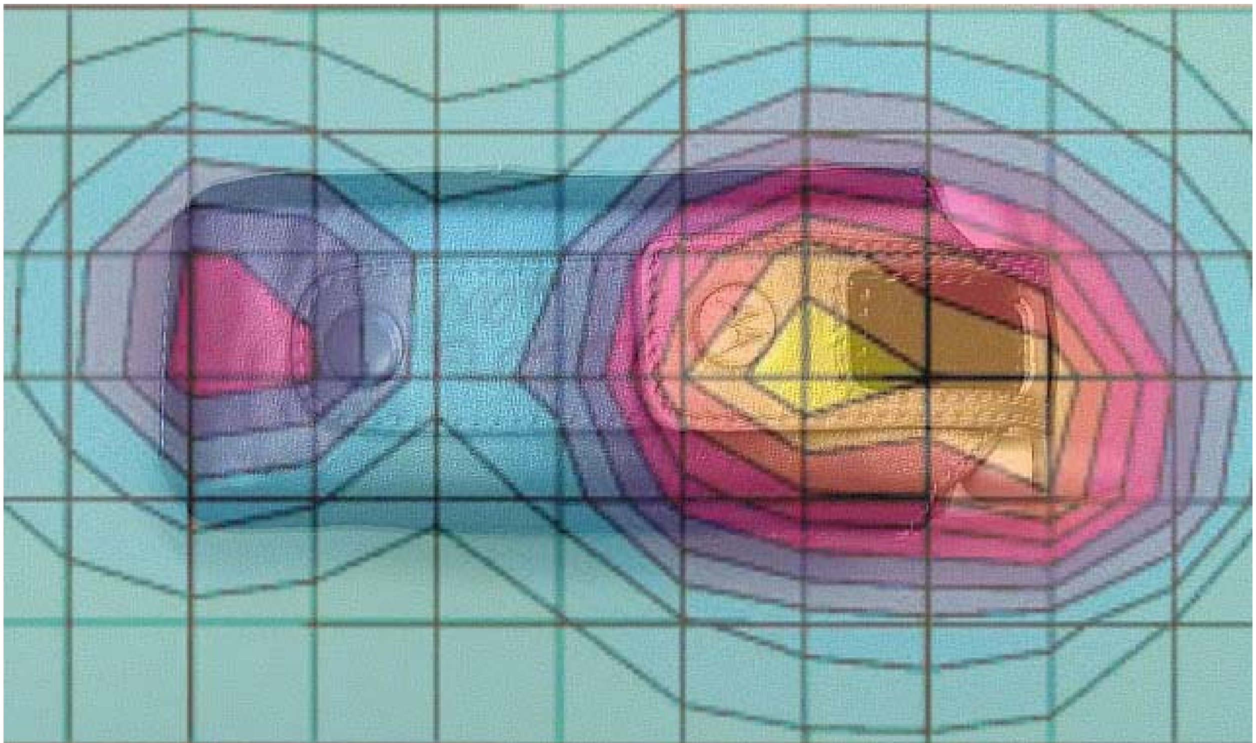


Figure 1.Typical 1900 MHz Body-Worn Contour Overlaid on Phone using MOTFL0515T

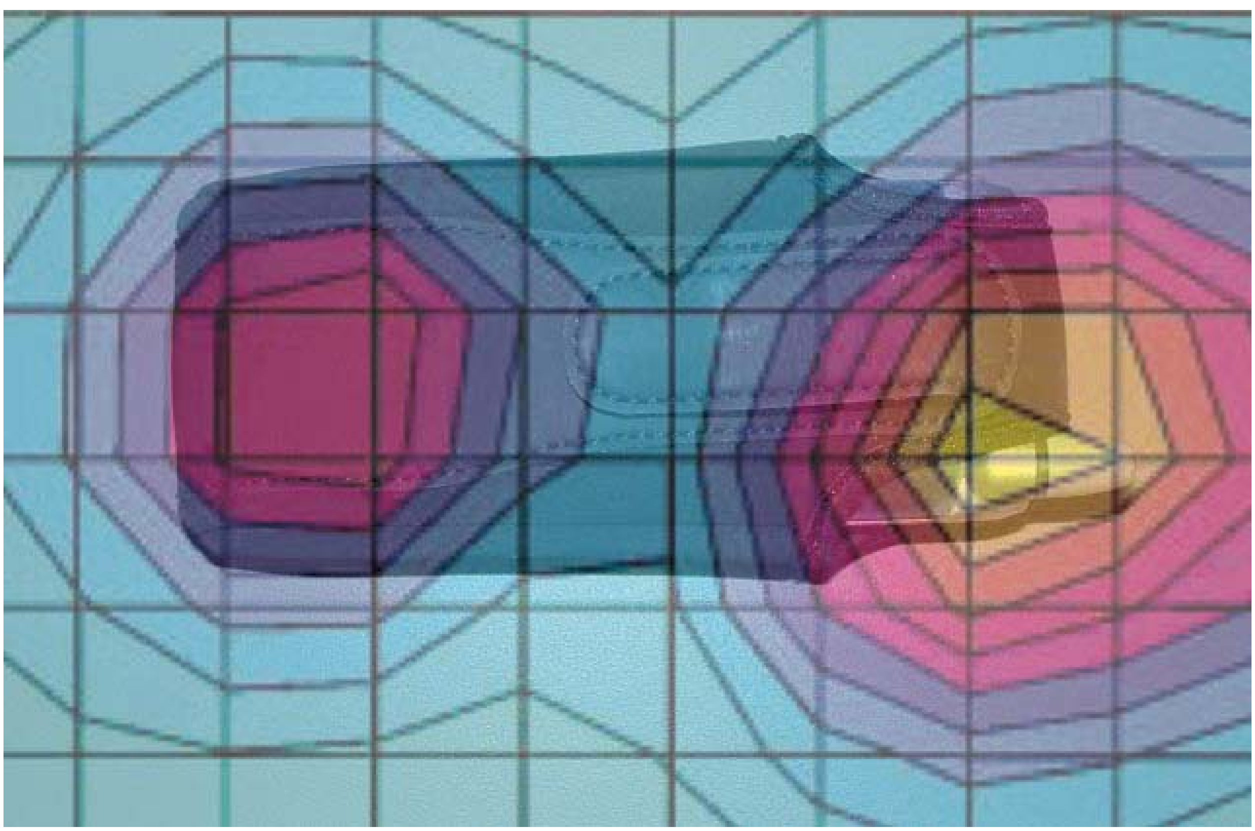


Figure 2.Typical 1900 MHz Body-Worn Contour Overlaid on Phone using #MOTPQ0433K

Appendix 3

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:	**ET3DV6**
Serial Number:	**1514**
Place of Calibration:	**Zurich**
Date of Calibration:	**October 25, 2001**
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: N. Kuster Neviana

Approved by: [signature]

Schmid & Partner
Engineering AG

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

Probe ET3DV6

SN:1514

Manufactured:	November 24, 1999
Remade:	October 11, 2001
Recalibrated:	October 25, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1514

Sensitivity in Free Space

NormX	**1.68**	$\mu V/(V/m)^2$
NormY	**1.81**	$\mu V/(V/m)^2$
NormZ	**1.76**	$\mu V/(V/m)^2$

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** e_r **= 40.4 ± 5%** s **= 0.87 ± 5% mho/m**

ConvF X	**6.88**	extrapolated	Boundary effect:	
ConvF Y	**6.88**	extrapolated	Alpha	**0.33**
ConvF Z	**6.88**	extrapolated	Depth	**2.37**

Head **900 MHz** e_r **= 41.5 ± 5%** s **= 0.97 ± 5% mho/m**
Head **835 MHz** e_r **= 41.5 ± 5%** s **= 0.90 ± 5% mho/m**

ConvF X	**6.37**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.37**	± 9.5% (k=2)	Alpha	**0.40**
ConvF Z	**6.37**	± 9.5% (k=2)	Depth	**2.31**

Head **1500 MHz** e_r **= 40.4 ± 5%** s **= 1.23 ± 5% mho/m**

ConvF X	**5.70**	interpolated	Boundary effect:	
ConvF Y	**5.70**	interpolated	Alpha	**0.51**
ConvF Z	**5.70**	interpolated	Depth	**2.24**

Head **1800 MHz** e_r **= 40.0 ± 5%** s **= 1.40 ± 5% mho/m**
Head **1900 MHz** e_r **= 40.0 ± 5%** s **= 1.40 ± 5% mho/m**

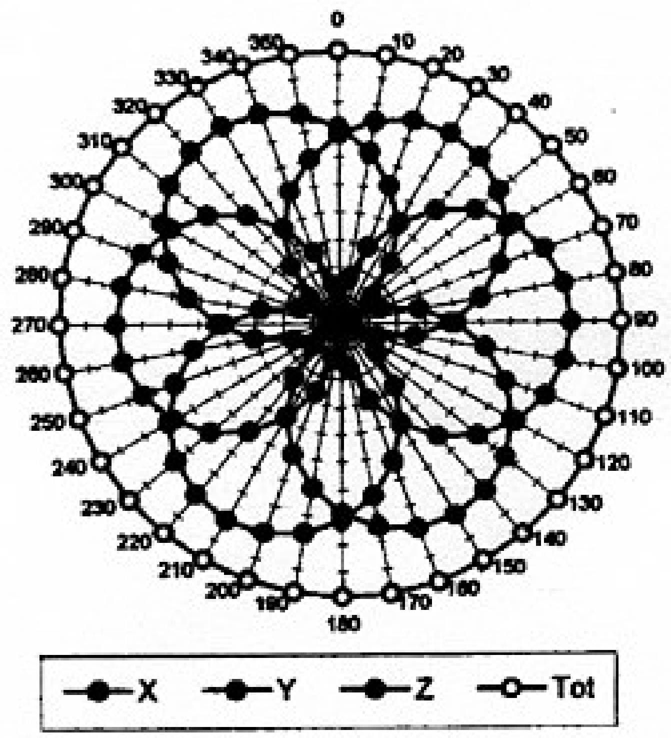
ConvF X	**5.36**	± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.36**	± 9.5% (k=2)	Alpha	**0.56**
ConvF Z	**5.36**	± 9.5% (k=2)	Depth	**2.20**

Sensor Offset

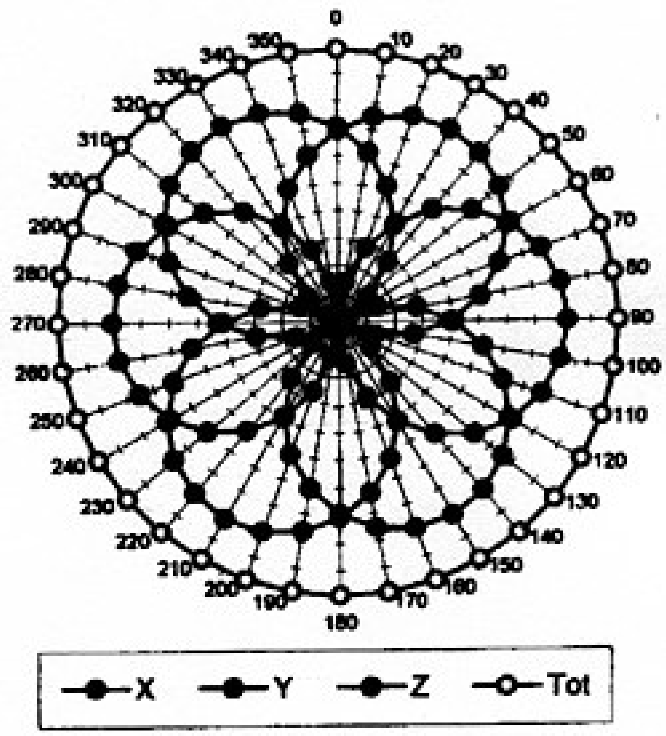
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.7 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

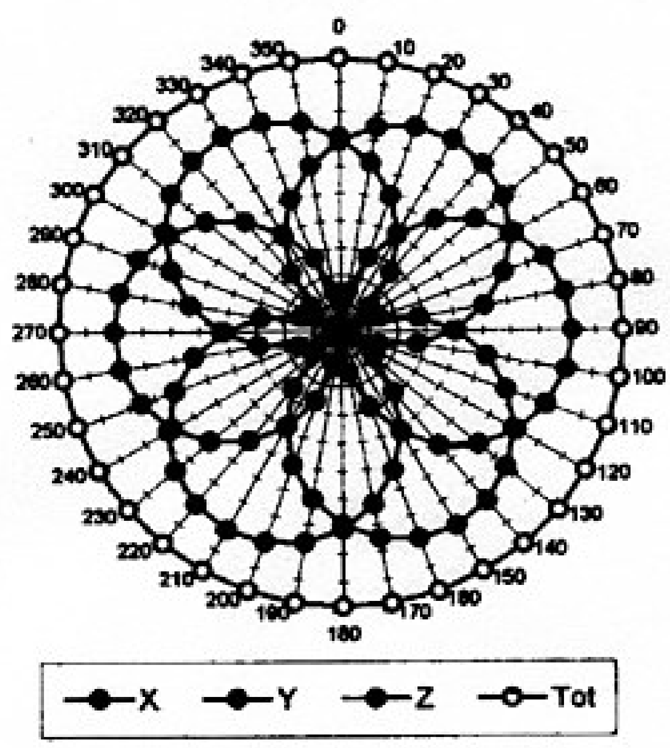
f = 30 MHz, TEM cell ifi110



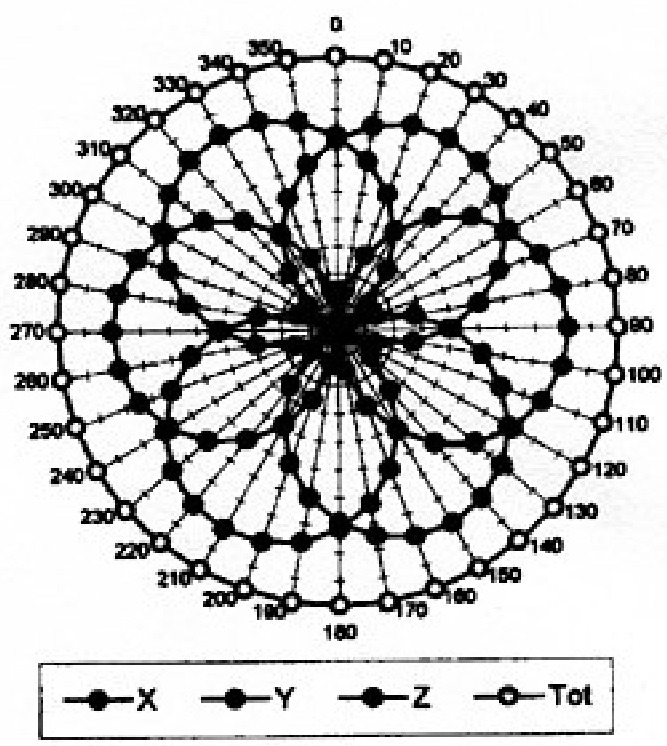
f = 100 MHz, TEM cell ifi110

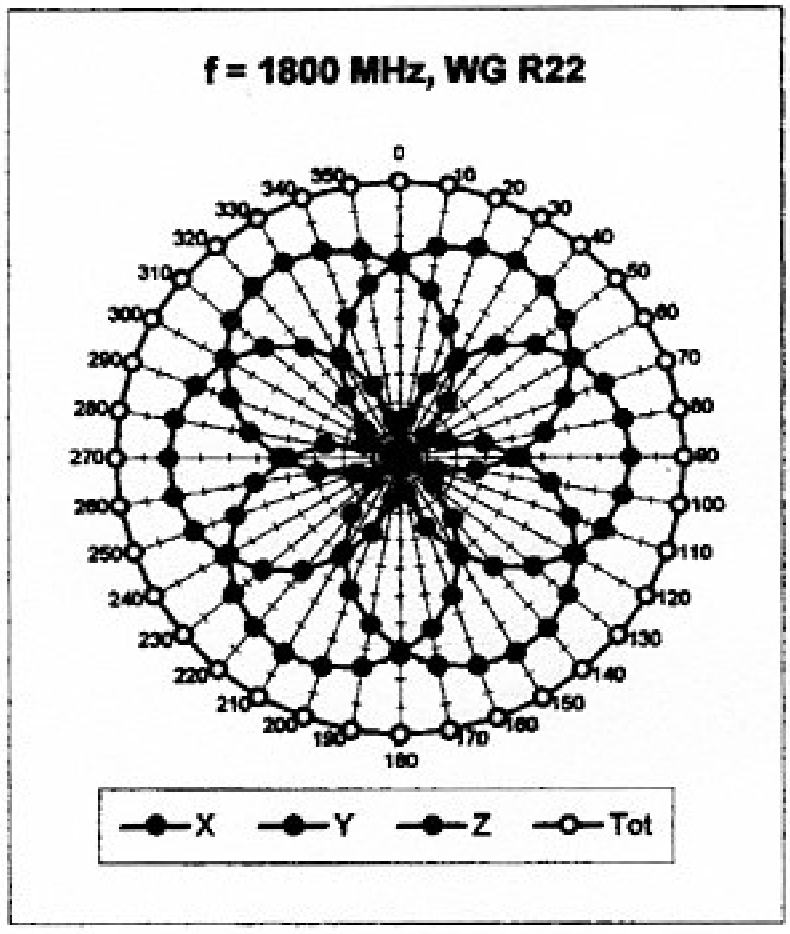


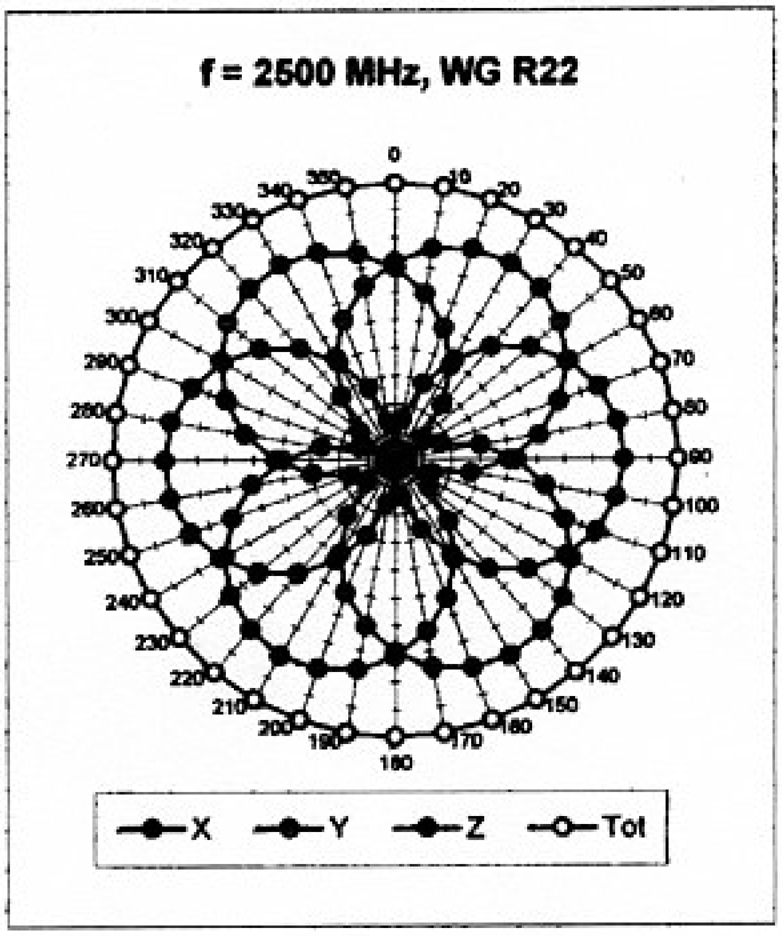
f = 300 MHz, TEM cell ifi110



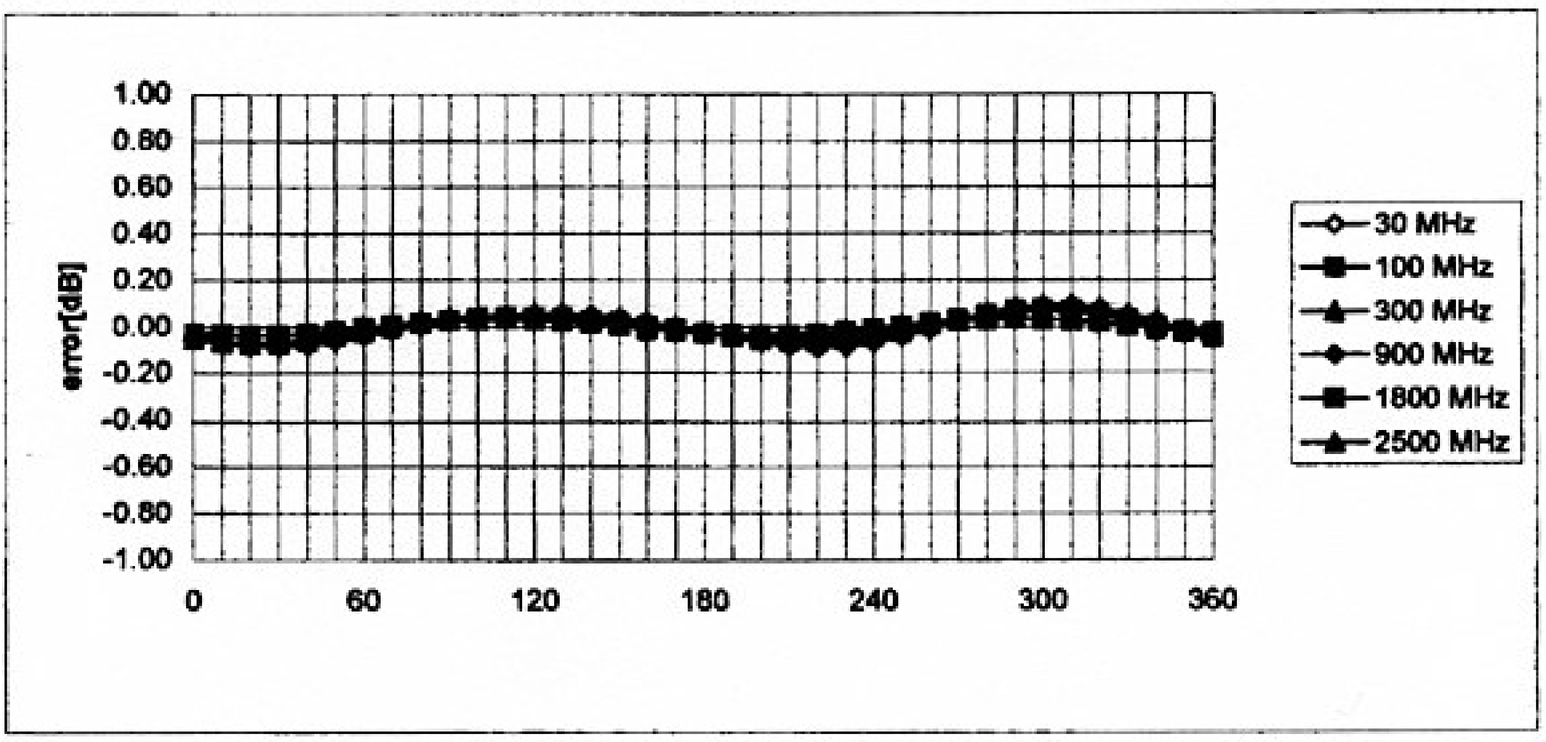
f = 900 MHz, TEM cell ifi110





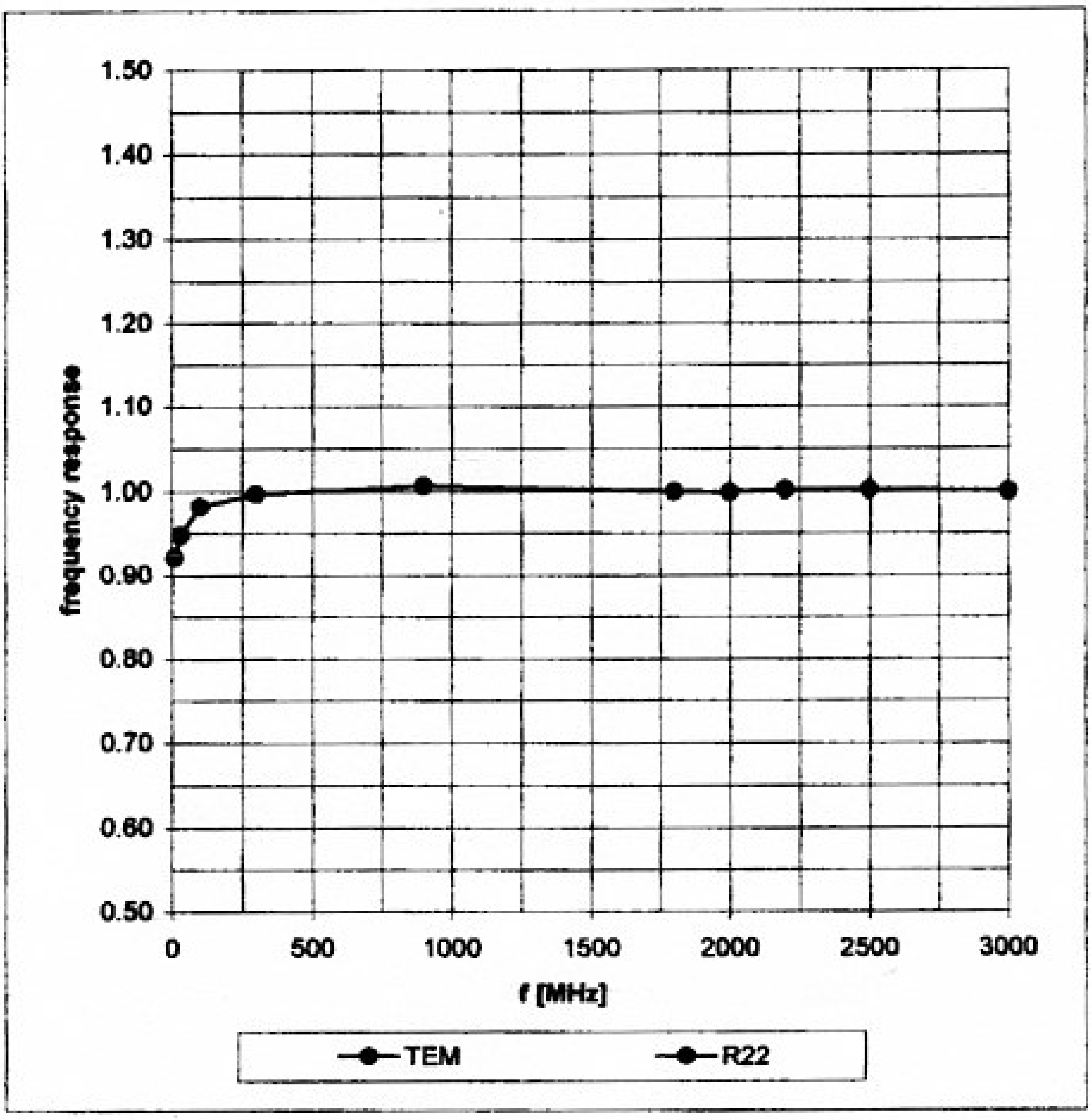


Isotropy Error (φ), θ = 0°



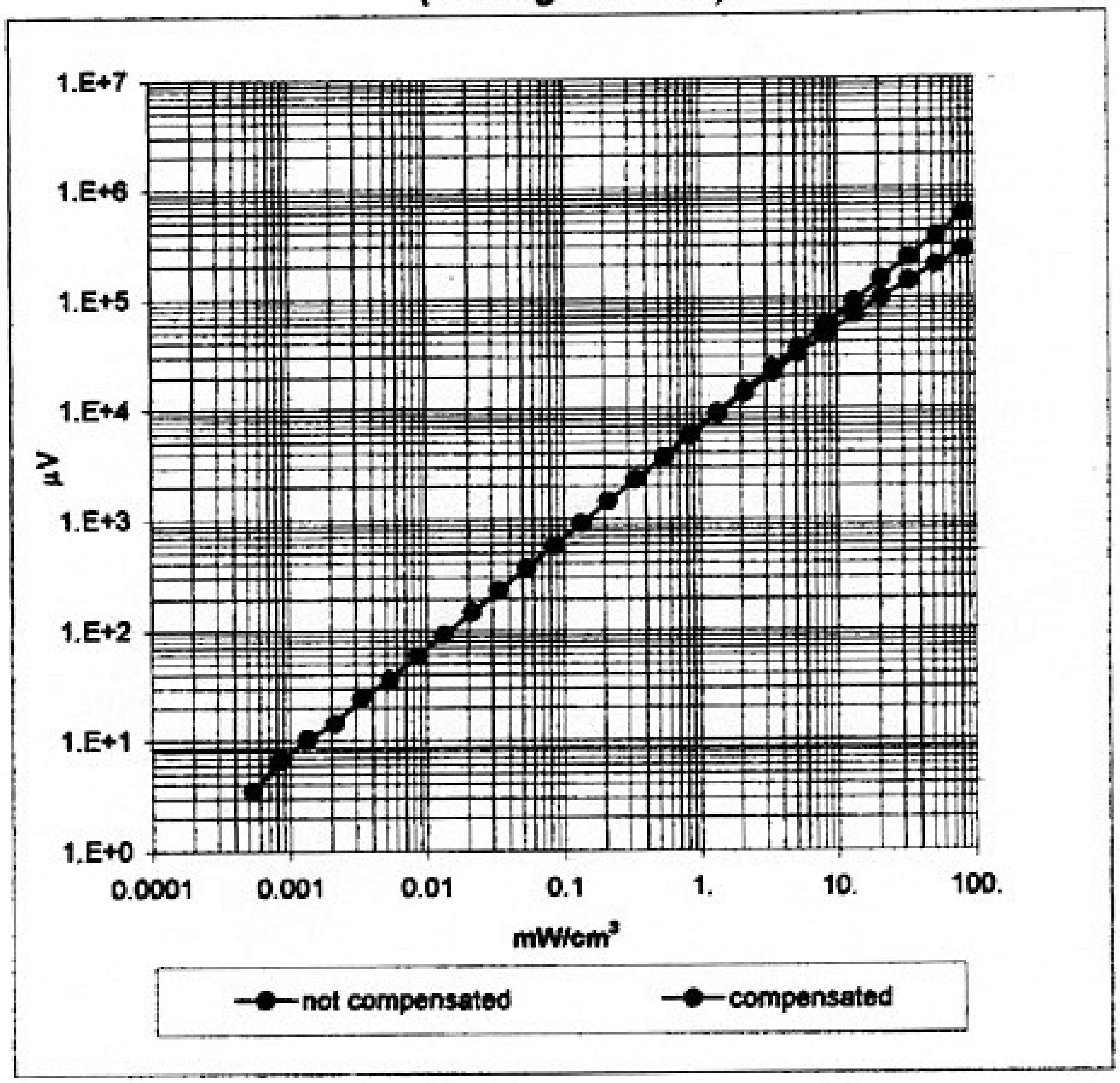
Frequency Response of E-Field

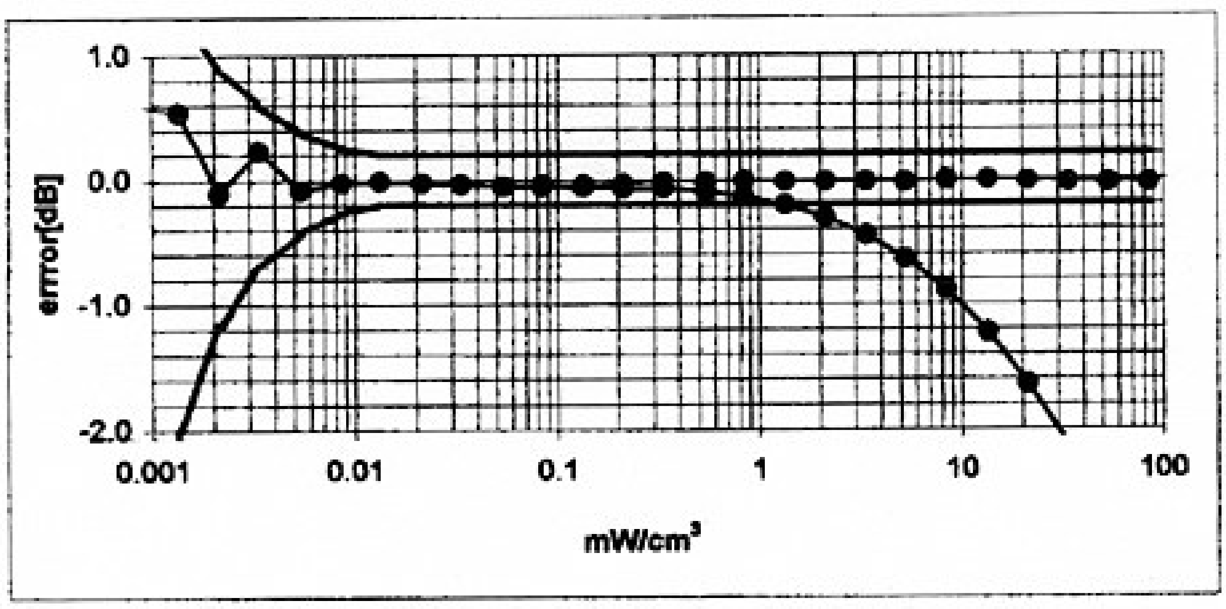
(TEM-Cell:ifi110, Waveguide R22)



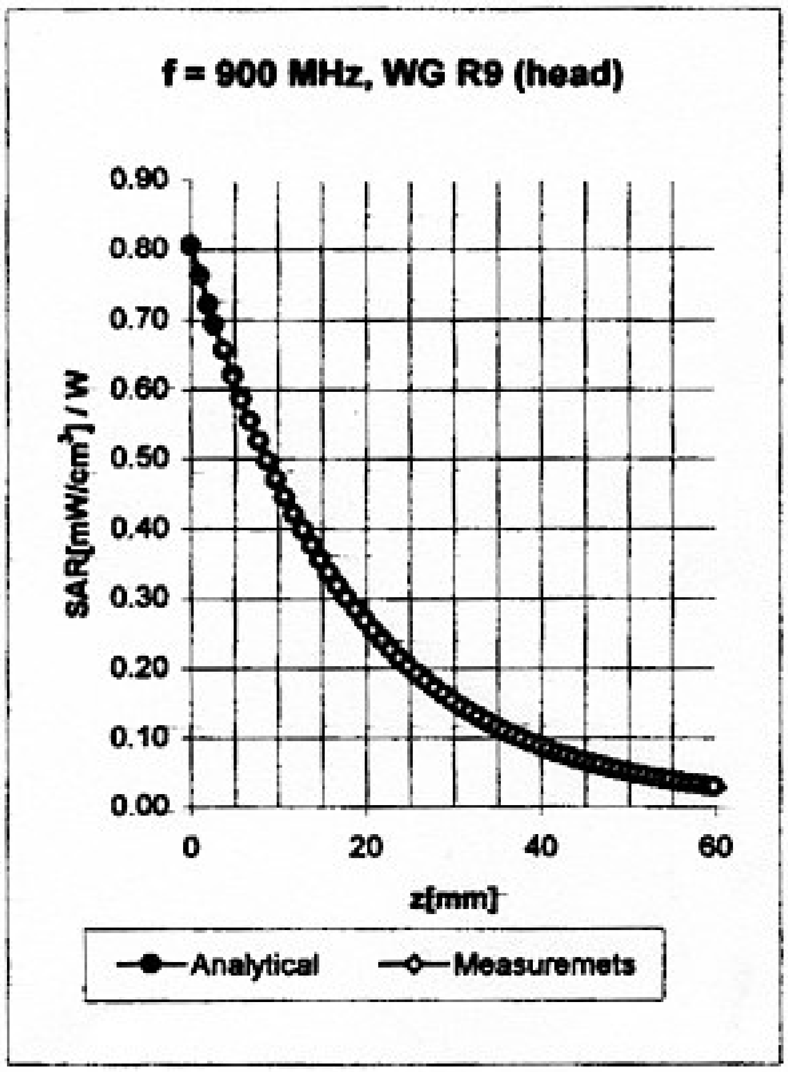
Dynamic Range f(SAR_{brain})

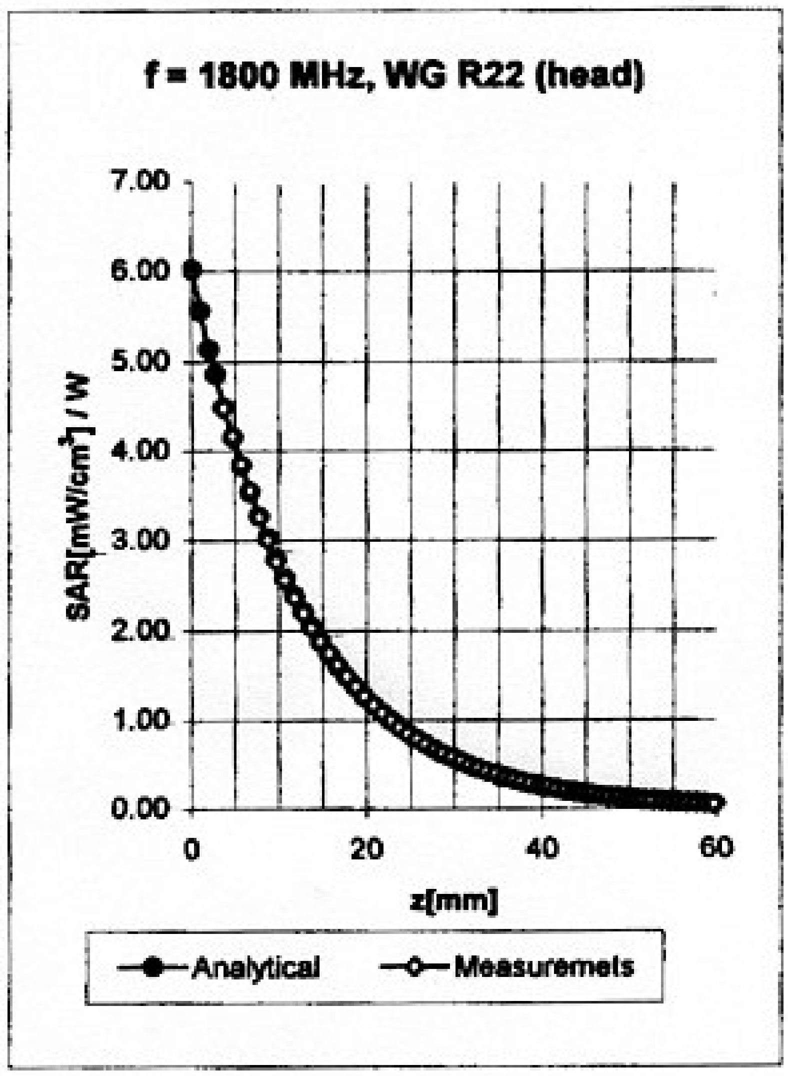
(Waveguide R22)





Conversion Factor Assessment



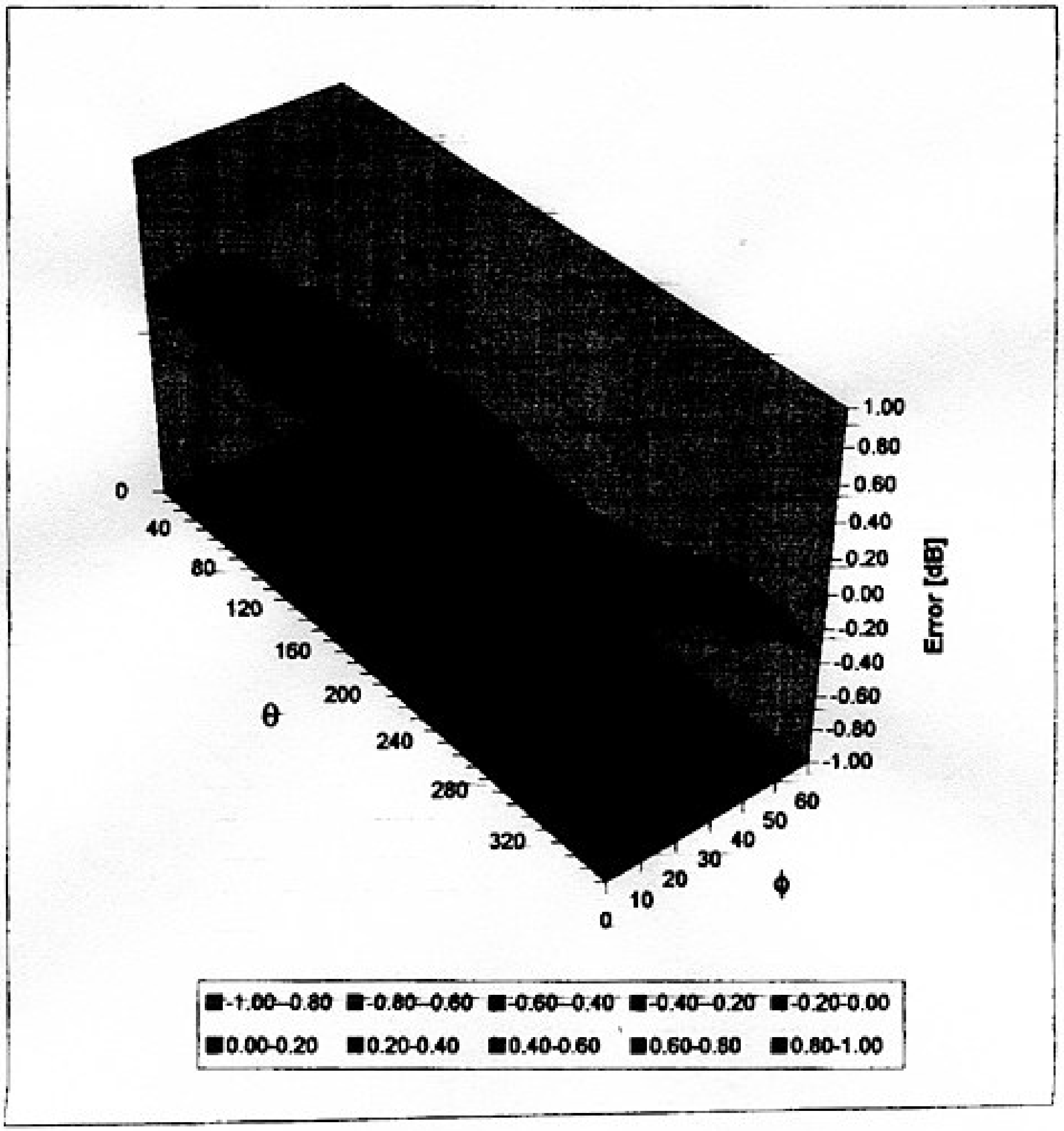


Head	**800 - 1000 MHz**		ε_r = 39.0 - 43.5	σ = 0.80 - 1.10 mho/m	
	ConvF X	**6.37** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.37** ± 9.5% (k=2)		Alpha	**0.40**
	ConvF Z	**6.37** ± 9.5% (k=2)		Depth	**2.31**

Head	**1700 - 1910 MHz**		ε_r = 39.5 - 41.0	σ = 1.20 - 1.55 mho/m	
	ConvF X	**5.36** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.36** ± 9.5% (k=2)		Alpha	**0.56**
	ConvF Z	**5.36** ± 9.5% (k=2)		Depth	**2.20**

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



Schmid & Partner Engineering AG

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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1514**
Place of Assessment:	**Zurich**
Date of Assessment:	**November 14, 2001**
Probe Calibration Date:	**October 25, 2001**

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: [signature]

Dosimetric E-Field Probe ET3DV6 SN:1514

Conversion factor (± standard deviation)

835 MHz	ConvF	**6.5 ± 8%**	**ε_r = 41.5** **σ = 0.90 mho/m** (head tissue)
1950 MHz	ConvF	**5.1 ± 8%**	**ε_r = 40.0** **σ = 1.40 mho/m** (head tissue)
835 MHz	ConvF	**6.3 ± 8%**	**ε_r = 55.2** **σ = 0.97 mho/m** (body tissue)
900 MHz	ConvF	**6.2 ± 8%**	**ε_r = 55.0** **σ = 1.05 mho/m** (body tissue)
1800 MHz	ConvF	**4.9 ± 8%**	**ε_r = 53.3** **σ = 1.52 mho/m** (body tissue)
1950 MHz	ConvF	**4.7 ± 8%**	**ε_r = 53.3** **σ = 1.52 mho/m** (body tissue)

Appendix 4

Dipole Characterization Certificate

Schmid & Partner
Engineering AG

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Calibration Certificate

1800 MHz System Validation Dipole

Type:	D1800V2
Serial Number:	258
Place of Calibration:	Zurich
Date of Calibration:	September 24, 2002
Calibration Interval:	24 months

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

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

Calibrated by: D. Vetter

Approved by: [signature]

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D1800V2

Serial: 258

Manufactured: November 20, 1999
Calibrated: September 24, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with head simulating glycol solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	**40.3**	± 5%
Conductivity	**1.36 mho/m**	± 5%

The DASY System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.3 at 1800 MHz) was used for the measurements.

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

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

2.1. SAR Measurement with DASY3 System

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

averaged over 1 cm^3 (1 g) of tissue:	**38.6 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**20.4 mW/g**

2.2 SAR Measurement with DASY4 System

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

averaged over 1 cm^3 (1 g) of tissue:	**35.5 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**19.2 mW/g**

3. Dipole Impedance and Return Loss

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

Electrical delay:	**1.199 ns**	(one direction)
Transmission factor:	**0.980**	(voltage transmission, one direction)

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

Feedpoint impedance at 1800 MHz:	Re{Z} = **52.0 Ω**
	Im {Z} = **5.9 Ω**
Return Loss at 1800 MHz	**-24.2 dB**

4. Modification

Small end caps (3 mm in length) made of Teflon have been added to the dipole arms by the Client.

5. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

6. Design

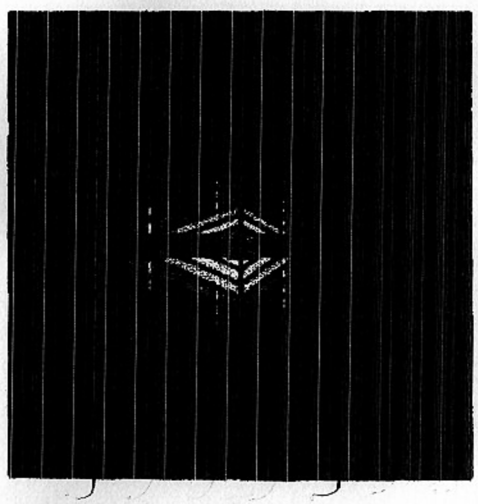
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

7. Power Test

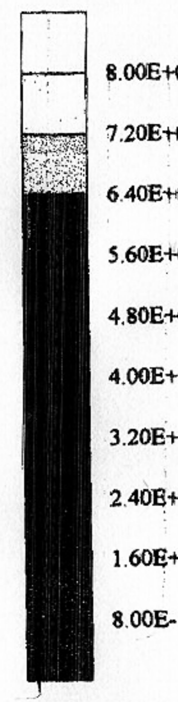
After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Validation Dipole D1800V2 SN:258, d = 10 mm

Frequency: 1800 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.30,5.30,5.30) at 1800 MHz; IEEE1528 1800 MHz: σ = 1.36 mho/m ϵ_r = 40.3 ρ = 1.00 g/cm³
Cubes (2): Peak: 17.7 mW/g ± 0.03 dB, SAR (1g): 9.64 mW/g ± 0.00 dB, SAR (10g): 5.11 mW/g ± 0.03 dB, (Worst-case extrapolation)
Penetration depth: 8.5 (8.1, 9.3) [mm]
Powerdrift: -0.01 dB

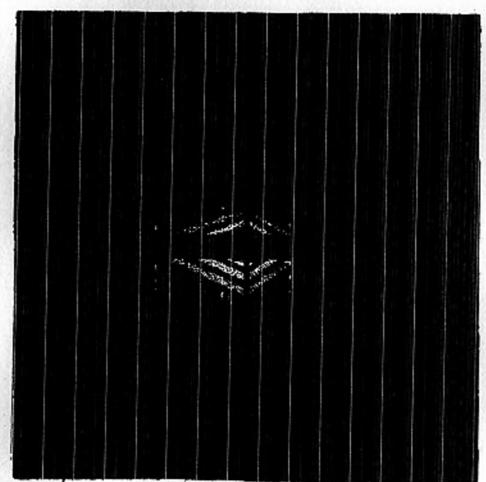


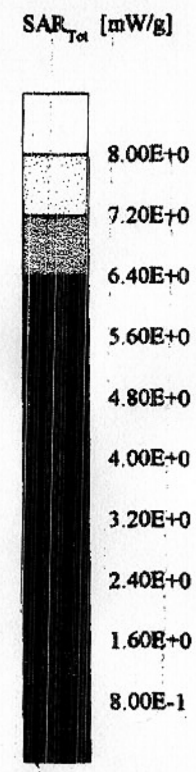
SAR$_{Tot}$ [mW/g]

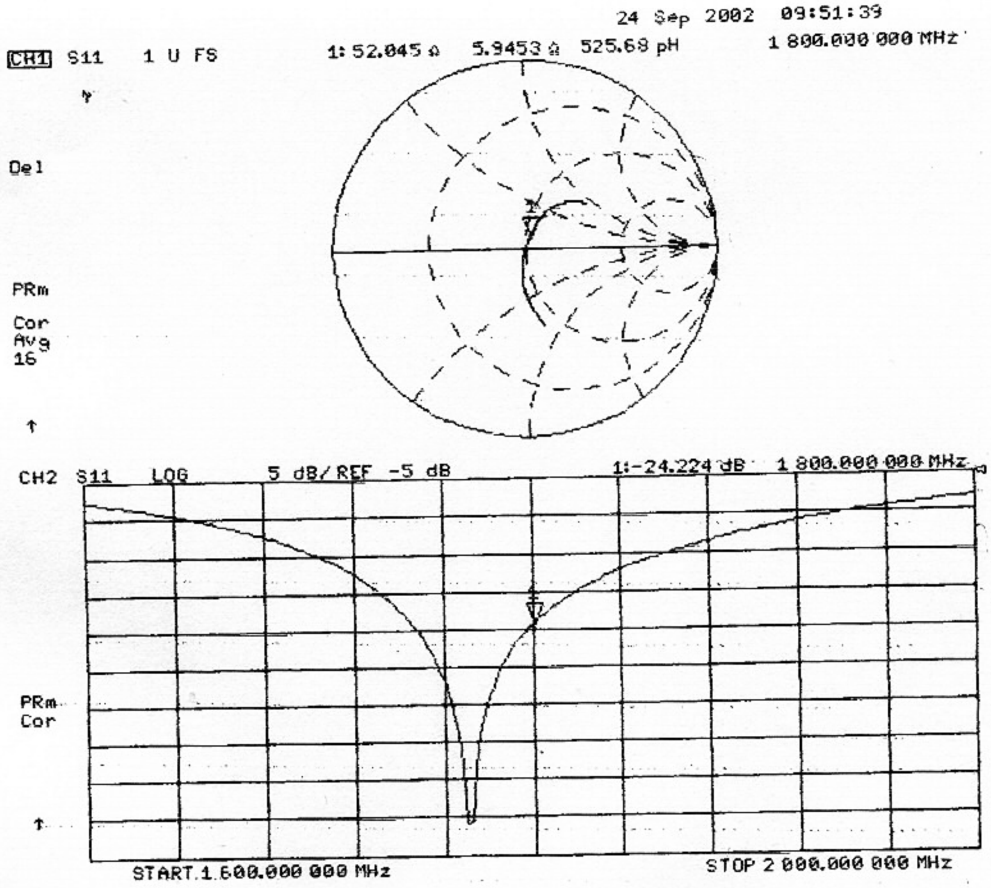


Validation Dipole D1800V2 SN:258, d = 10 mm

Frequency: 1800 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.30,5.30,5.30) at 1800 MHz; IEEE1528 1800 MHz: $\sigma = 1.36$ mho/m $\varepsilon_r = 40.3$ $\rho = 1.00$ g/cm^3
Cubes (2): Peak: 15.4 mW/g ± 0.03 dB, SAR (1g): 8.87 mW/g ± 0.00 dB, SAR (10g): 4.81 mW/g ± 0.03 dB, (Advanced extrapolation)
Penetration depth: 9.2 (9.1, 9.5) [mm]
Powerdrift: -0.01 dB






24 Sep 2002 09:51:39
CH1 S11 1 U FS
1: 52.045 Ω 5.9453 Ω 525.68 pH 1 800.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -5 dB 1:-24.224 dB 1 800.000 000 MHz
PRm
Cor
START 1 600.000 000 MHz
STOP 2 000.000 000 MHz

Appendix 5

Measurement Uncertainty Budget

Uncertainty Budget for Device Under Test

a	b	c	d	e = f(d,k)	f	g	h = c x f / e	i = c x g / e	k
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	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)			*k* =2				22.98	21.75	

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

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
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 6

Photographs of the device under test