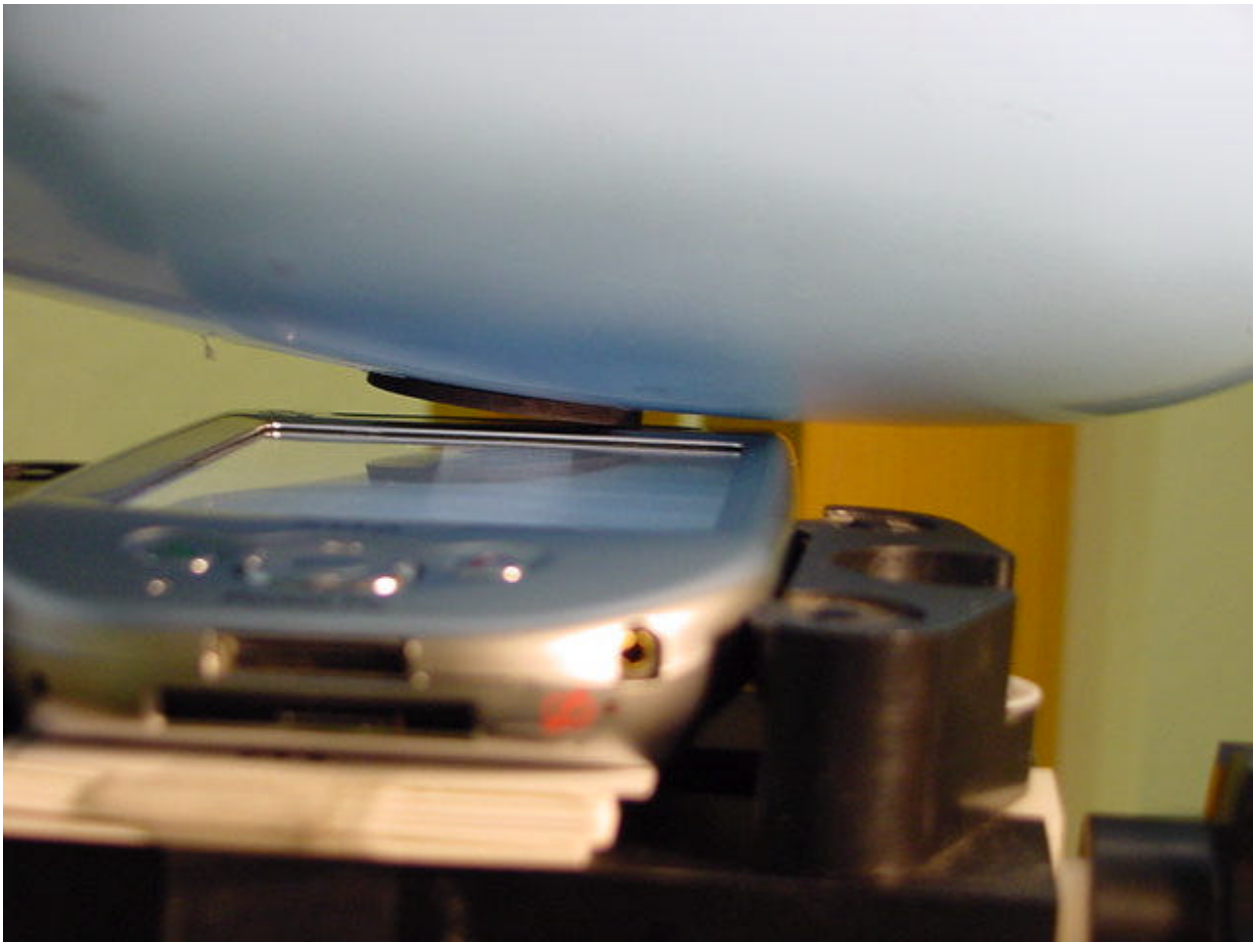
2.2 Configuration Photographs (Continued)

SAR Measurement Test Setup

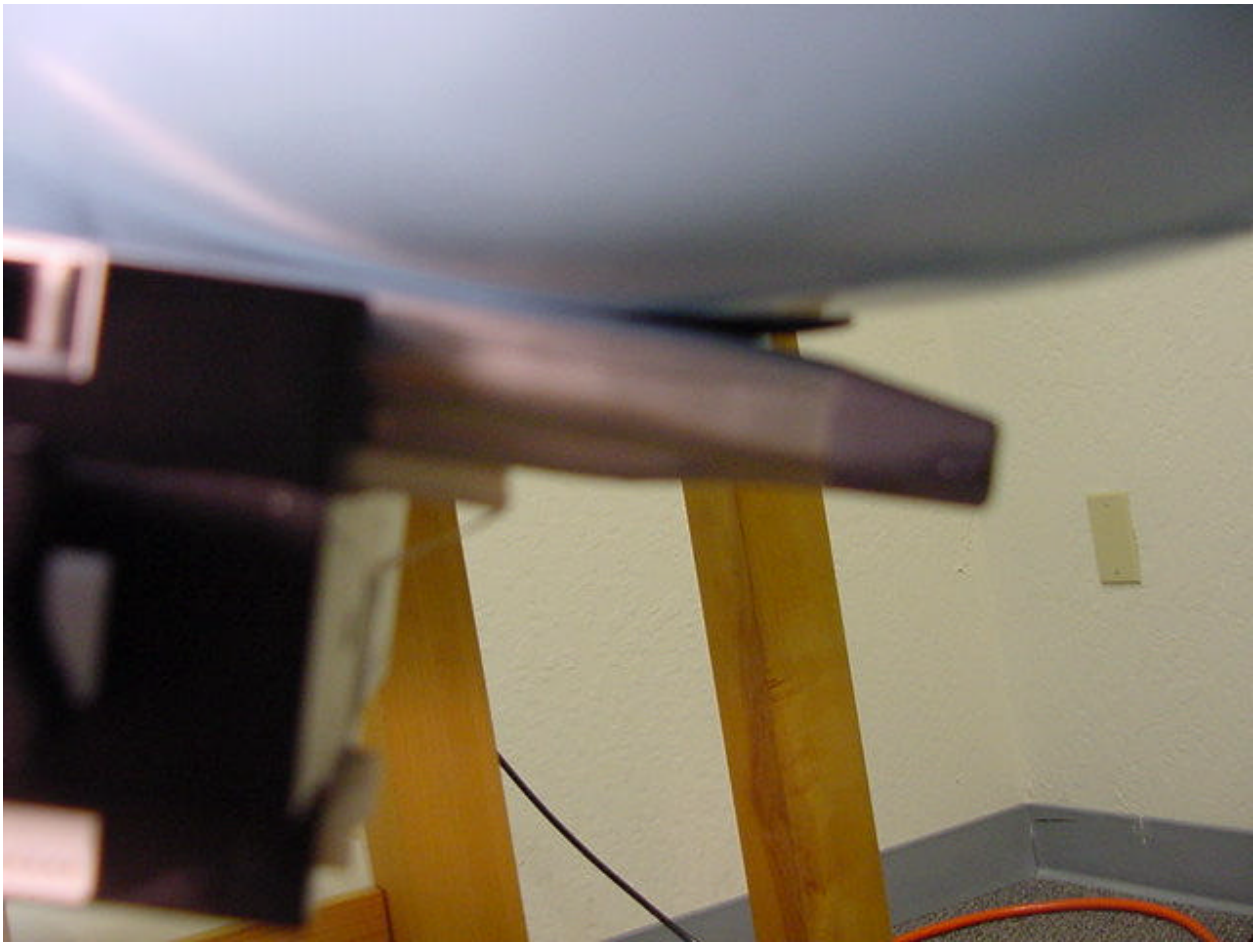
Right Tilt Position



2.2 Configuration Photographs (Continued)

SAR Measurement Test Setup

Right Cheek Position



2.2 Configuration Photographs (Continued)

EUT Photo

2.2 Configuration Photographs (Continued)

EUT Photo

2.3 System Verification

Prior to the assessment, the system was verified to the ±10% of the specifications by using the system validation kit. The validation was performed at 1800 MHz.

Validation kit	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)	Plot #
D1800V2, S/N #: 224	9.77	9.22	7

2.4 Evaluation Procedures

The SAR evaluation was performed with the following procedures:

a. SAR was measured at a fixed location above the reference point and used as a reference value for the assessing the power drop.

b. The SAR distribution at the exposed side of the flat Phantom was measured at a distance of 30 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

c. Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   i) The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measurement point is 1.6 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   ii) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y and z directions). The volume was integrated with the trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

   iii) All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

d. Re-measurements of the SAR value at the same location as in step a. above. If the value changed by more than 5 %, the evaluation was repeated.

2.5 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detail measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Measurement Results

Trade Name:	Wallaby	**Model No.:**	HTC Wallaby PW20
Serial No.:	Not Labeled	**Test Engineer:**	Suresh Kondapalli

TEST CONDITIONS			
Ambient Temperature	23.0 °C	Relative Humidity	54 %
Liquid Temperature	22°C ? 0.5°C	Liquid depth	14.8 cm
Test Signal Source	Test Mode	Signal Modulation	GSM
Output Power Before SAR Test	See Page 6	Output Power After SAR Test	Changes within ?0.35 dB
Test Duration	20 Min. each test	Number of Battery Change	New battery for every scan

Brain 1800 MHz Band					
Plot No	**Frequency MHz**	**Operating Mode**	**Crest Factor**	**Position**	**Measured SAR_{1g} (mW/g)**
1	1880	GSM	8	Left Hand, Cheek Position	0.983
2	1880	GSM	8	Left Hand, Tilt Position	0.700
5	1880	GSM	8	Right Hand, Cheek Position	0.471
6	1880	GSM	8	Right Hand, Tilt Position	0.411
3	1910	GSM	8	Left Hand, Cheek Position	1.13
4	1850	GSM	8	Left Hand, Cheek Position	0.902

Dipole, System Verification					
Frequency MHz	**Operating Mode**	**Crest Factor**	**Measured SAR_{1g} (mW/g)**	**Measured SAR_{10g} (mW/g)**	**Plot Number**
1800	CW	1	9.22	4.92	7

Note: a) Worst case data were reported
b) Duty cycle factor included in the measured SAR data
c) Uncertainty of the system is not included

3.0 TEST EQUIPMENT

3.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the SPEAG model DASY 3 automated near-field scanning system, which is a package, optimized for dosimetric evaluation of mobile radios [3].

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	SPECIFICATIONS	S/N #	LAST CAL. DATE
Robot	**Stäubli RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: 0.806×10^{-3} degree Number of Axes: 6		
Controller	**DASY 3 PC- board**		
	24 bit 66 MHz Digital Signal Processor 96 x 24 bit 12ns memory –bank		
E-Field Probe	**ET3DV5**	1333	04/23/01
	Frequency Range: 10 MHz to 6 GHz Linearity: ± 0.2 dB Directivity: ± 0.1 dB in brain tissue Probe outer diameter: 6.5 mm Length: 34.5 cm Distance between the probe tip and the dipole center: 2.7 mm		
Data Acquisition	**DAE3**	317	N/A
	16 bit A/D Converter Measurement Range: 1µV to >200mV Input offset Voltage: < 1µV (with auto zero) Input Resistance: 200 M Common Mode Rejection > 80dB		
Phantom	**Generic Twin V3.0**	N/A	N/A
	Type: Generic Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.1 mm Capacity: 20 liter Ear spacer: 4 mm (between EUT ear piece and tissue simulating liquid)		

Device holder	Non-conductive holder supplied with DASY3, dielectric constant less than 5.0	N/A	N/A
Simulated Tissue	**Mixture** Please see section 6.2 for details	N/A	01/18/02
Power Meter	**HP 8900D** w/ 84811A sensor	3607U00673	08/08/01
	Frequency Range: 100kHz to 18 GHz Power Range: 300µW to 3W		

3.2 Brain Tissue Simulating Liquid

Brain Ingredients Frequency (1800 MHz)	
DGBE Dilethylene Glycol	44.92%
Toniton X-100 (Polyethylene Glycol Mono) Ether	0.1%
Salt	0.18%
Water	54.8%

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	ε_r *****	σ ***(mho/m)**	ρ ****(kg/m^3)**
1880	40.4	1.44	1000

* *Worst case uncertainty of the HP 85070A dielectric probe kit*
** *Worst case assumption*

3.3 E-Field Probe Calibration

Probes were calibrated by the manufacturer in the TEM cell ifi 110. To ensure consistency, a strict protocol was followed. The conversion factor (ConF) between this calibration and the measurement in the tissue simulation solution was performed by comparison with temperature measurement and computer simulations. Probe calibration factors are included in Appendix C.

3.4 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [5] and the NIST 1297 [6] documents and is given in the following table. The extended uncertainty (K=2) was assessed to be 23.5 %

UNCERTAINTY BUDGET				
Uncertainty Description	**Error**	**Distrib.**	**Weight**	**Std.Dev.**
Probe Uncertainty				
Axial isotropy	±0.2 dB	U-shape	0.5	±2.4 %
Spherical isotropy	±0.4 dB	U-shape	0.5	±4.8 %
Isotropy from gradient	±0.5 dB	U-shape	0	
Spatial resolution	±0.5 %	Normal	1	±0.5 %
Linearity error	±0.2 dB	Rectang.	1	±2.7 %
Calibration error	±3.3 %	Normal	1	±3.3 %
SAR Evaluation Uncertainty				
Data acquisition error	±1 %	Rectang.	1	±0.6 %
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %
Conductivity assessment	±10 %	Rectang.	1	±5.8 %
Spatial Peak SAR Evaluation Uncertainty				
Extrapol boundary effect	±3 %	Normal	1	±3 %
Probe positioning error	±0.1 mm	Normal	1	±1 %
Integrat. and cube orient	±3 %	Normal	1	±3 %
Cube shape inaccuracies	±2 %	Rectang.	1	±1.2 %
Device positioning	±6 %	Normal	1	±6 %
Combined Uncertainties				**±11.7 %**

3.5 Measurement Tractability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

4.0 WARNING LABEL INFORMATION - USA

See Users Manual.

5.0 REFERENCES

1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

5] NIS81, NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

6] Barry N. Tayor and Chris E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.

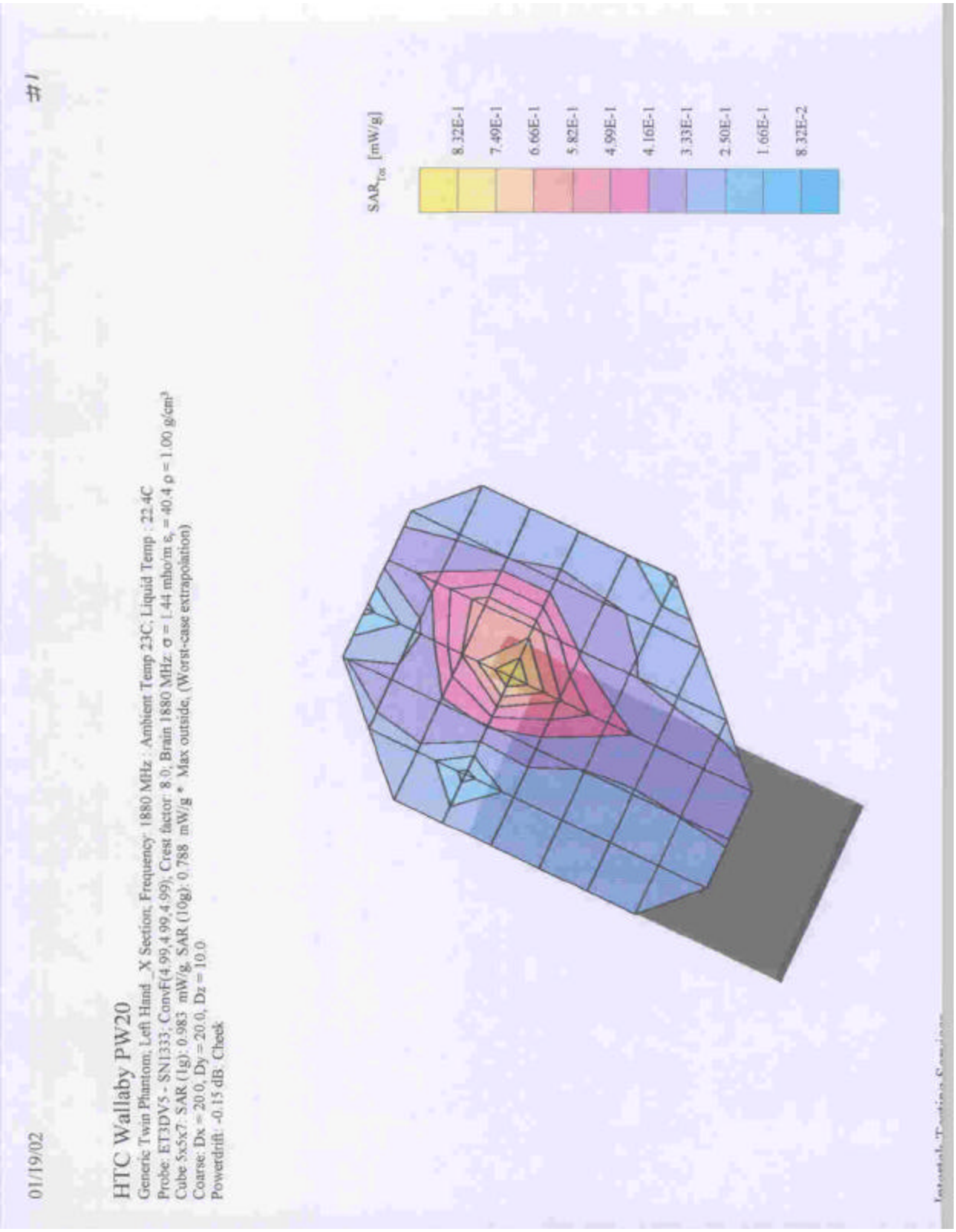
5.0 DOCUMENT HISTORY

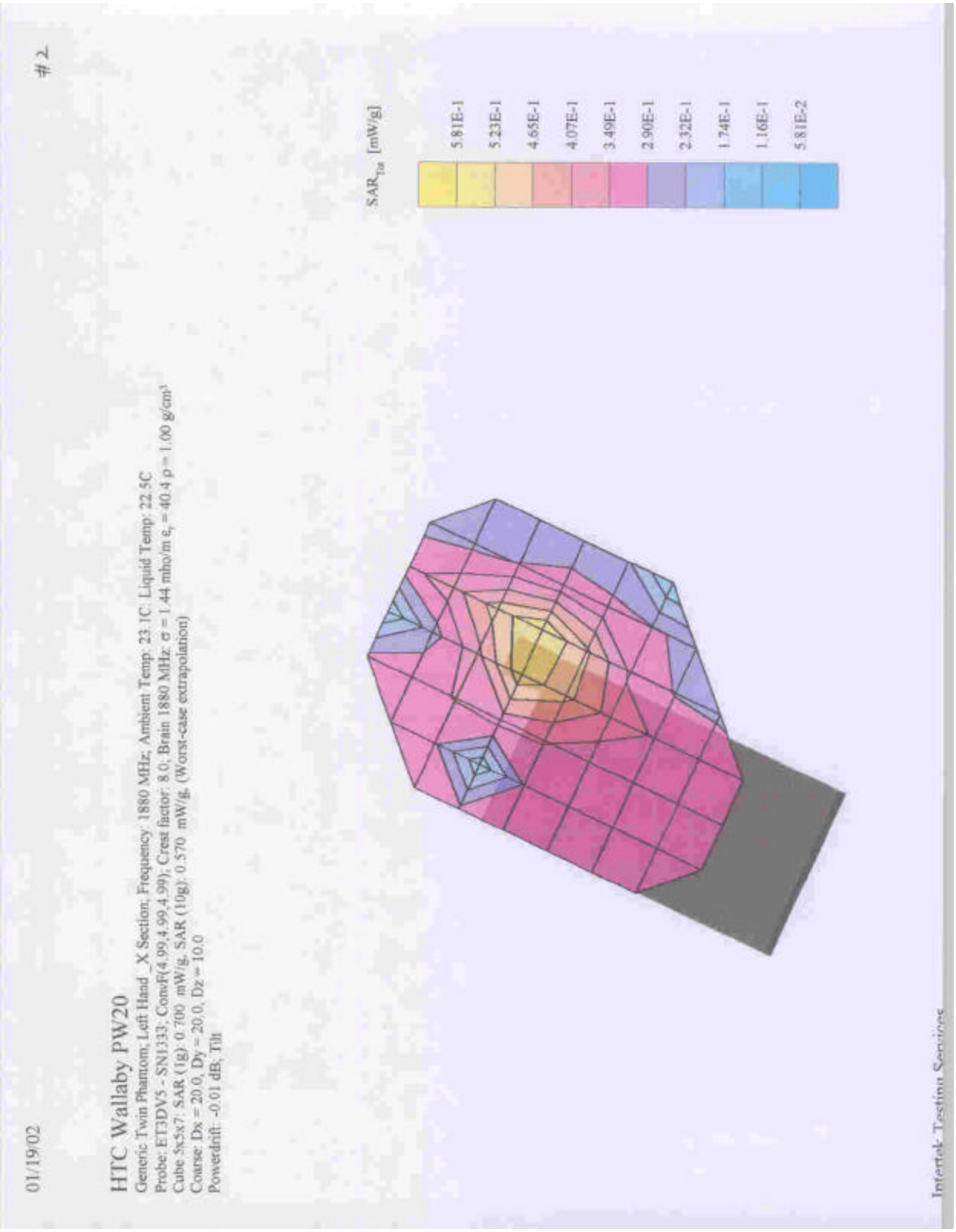
Revision/ Job Number	Writer Initials	Date	Change
1.0 /3017977	SS	April 24, 2002	Original document
2.0/3017977	DC	June 20, 2002	revision
3.0/3017977	SK	August 9, 2002	revision

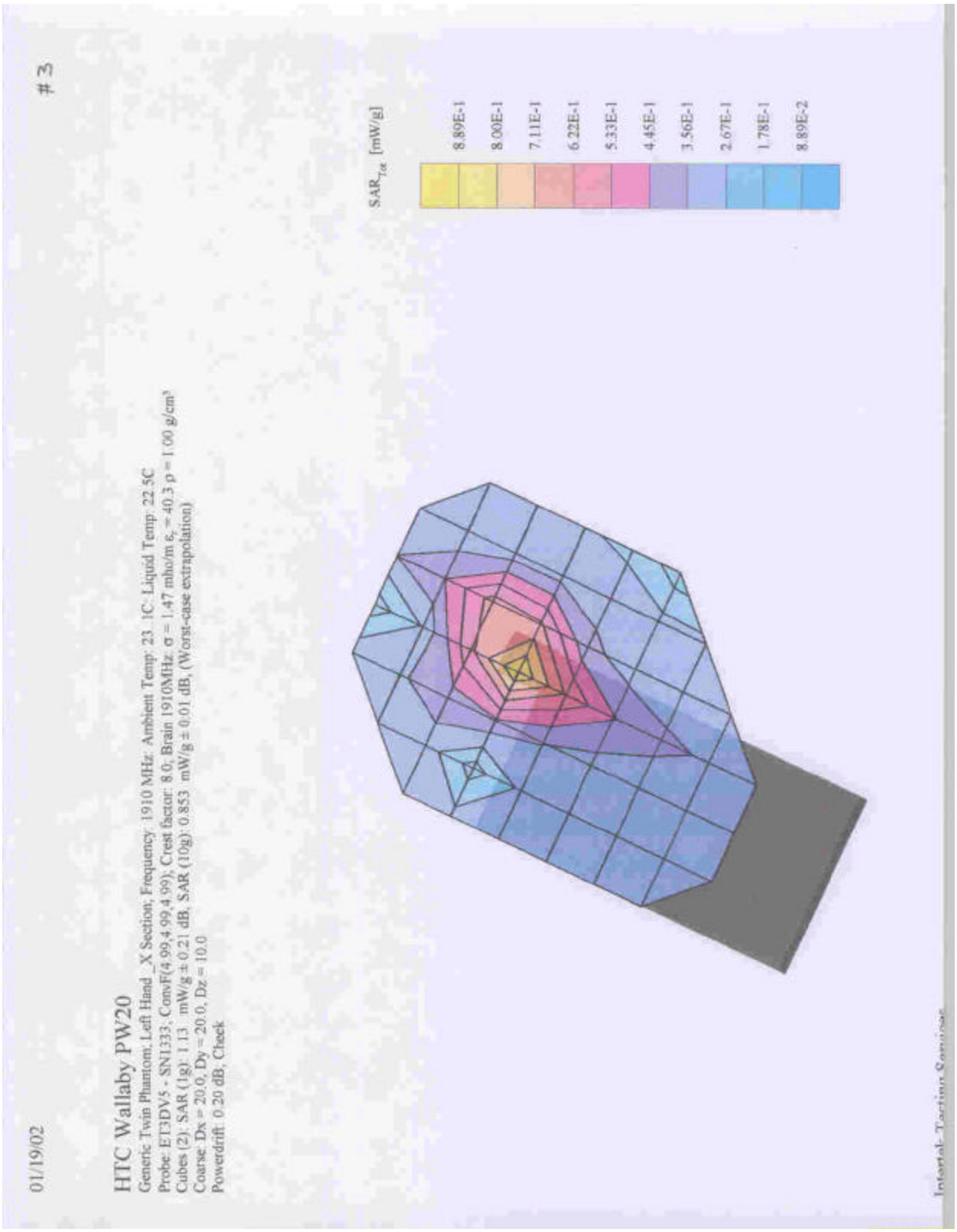
APPENDIX A - SAR Evaluation Data

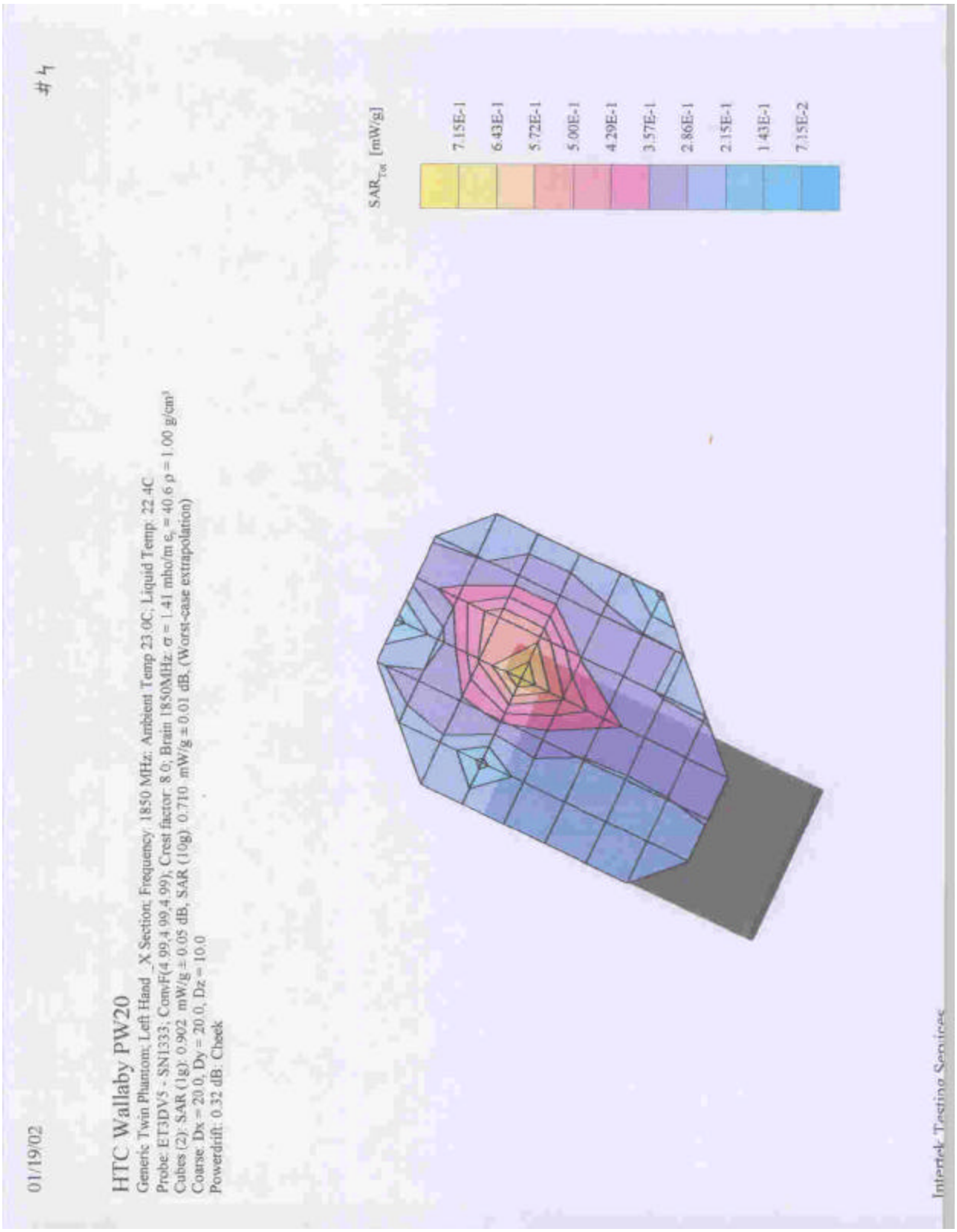
Please note that the graphical visualization of the phone position onto the SAR distribution gives only limited information on the current distribution of the device, since the curvature of the head results in graphical distortion. Full information can only be obtained either by H-field scans in free space or SAR evaluation with a flat phantom.

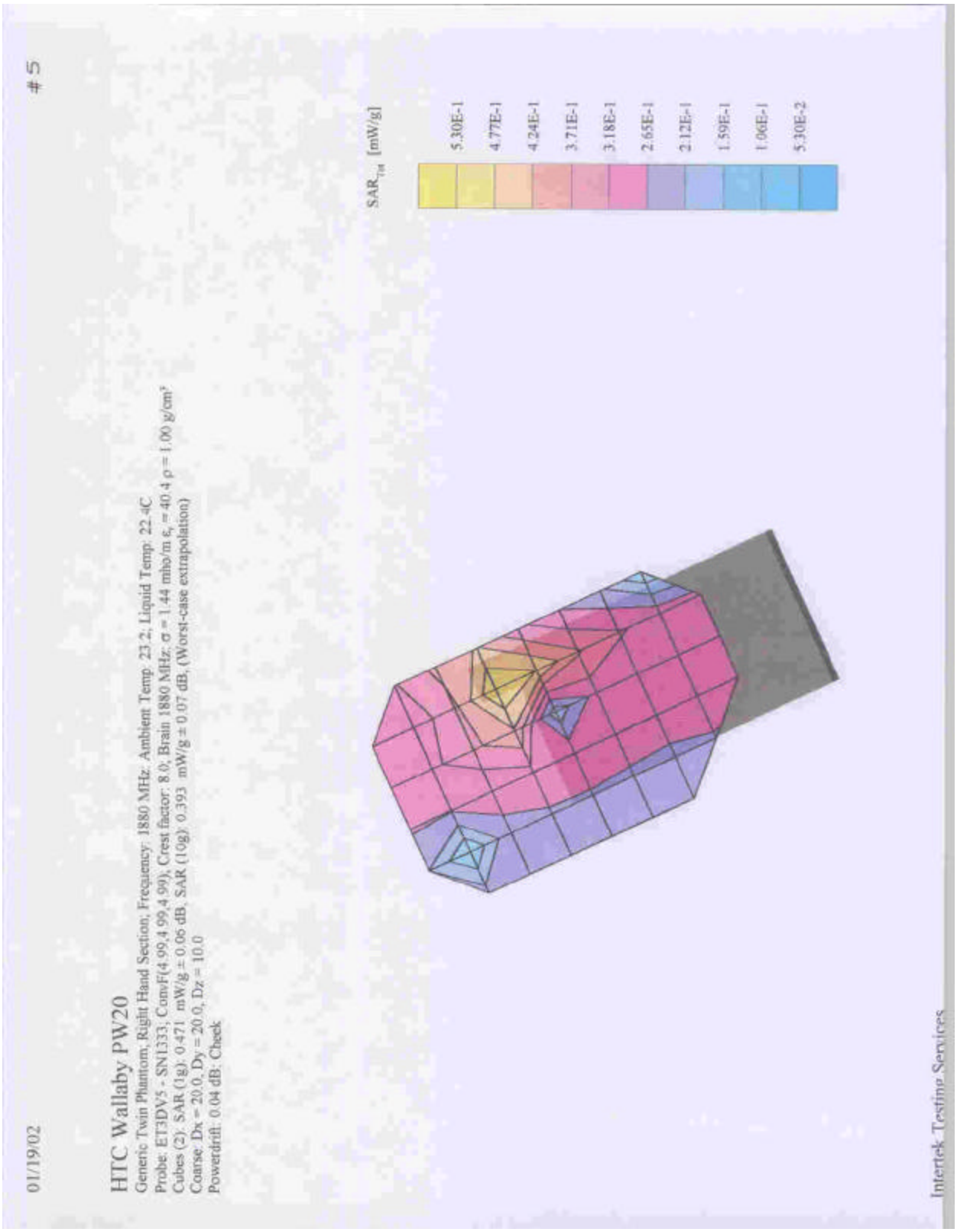
Power drift is the measurement of power drift of the device over one complete SAR scan.


#1
SAR_{1g} [mW/g]
8.32E-1
7.49E-1
6.66E-1
5.82E-1
4.99E-1
4.16E-1
3.33E-1
2.50E-1
1.66E-1
8.32E-2
01/19/02
HTC Wallaby PW20
Generic Twin Phantom, Left Hand _X Section; Frequency: 1880 MHz ; Ambient Temp 23C; Liquid Temp : 22.4C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1880 MHz: σ = 1.44 mho/m εr = 40.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.983 mW/g, SAR (10g): 0.788 mW/g * Max outside, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.15 dB Cheek


#2
01/19/02
HTC Wallaby PW20
Generic Twin Phantom; Left Hand _X Section; Frequency: 1880 MHz; Ambient Temp: 23.1C; Liquid Temp: 22.5C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1880 MHz: σ = 1.44 mho/m εr = 40.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.700 mW/g, SAR (10g): 0.570 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.01 dB; Tilt
SAR tot [mW/g]
5.81E-1
5.23E-1
4.65E-1
4.07E-1
3.49E-1
2.90E-1
2.32E-1
1.74E-1
1.16E-1
5.81E-2
Intertek Testing Services


#3
01/19/02
HTC Wallaby PW20
Generic Twin Phantom; Left Hand _X Section; Frequency: 1910 MHz; Ambient Temp: 23 :C; Liquid Temp: 22 5C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1910MHz: σ = 1.47 mho/m εr = 40.3 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 1.13 mW/g ± 0.21 dB, SAR (10g): 0.853 mW/g ± 0.01 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.20 dB, Check
SAR_Tot [mW/g]
8.89E-1
8.00E-1
7.11E-1
6.22E-1
5.33E-1
4.45E-1
3.56E-1
2.67E-1
1.78E-1
8.89E-2
Intertek Testing Services


#4
01/19/02
HTC Wallaby PW20
Generic Twin Phantom; Left Hand _X Section; Frequency: 1850 MHz; Ambient Temp 23 0C; Liquid Temp: 22 4C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1850MHz: σ = 1.41 mho/m εr = 40.6 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.902 mW/g ± 0.05 dB, SAR (10g): 0.710 mW/g ± 0.01 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.32 dB: Cheek
SAR_tot [mW/g]
7.15E-1
6.43E-1
5.72E-1
5.00E-1
4.29E-1
3.57E-1
2.86E-1
2.15E-1
1.43E-1
7.15E-2
Intertek Testing Services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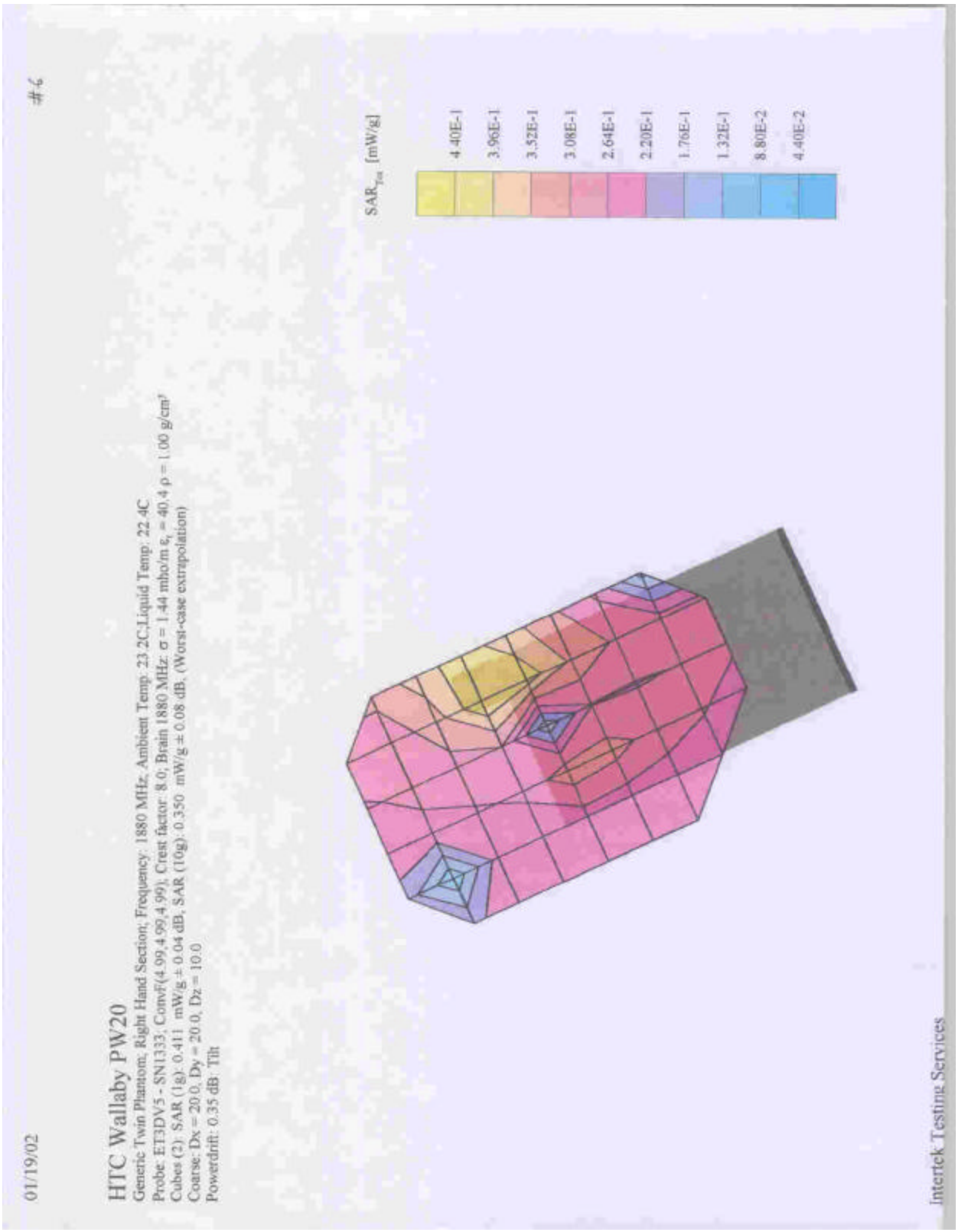
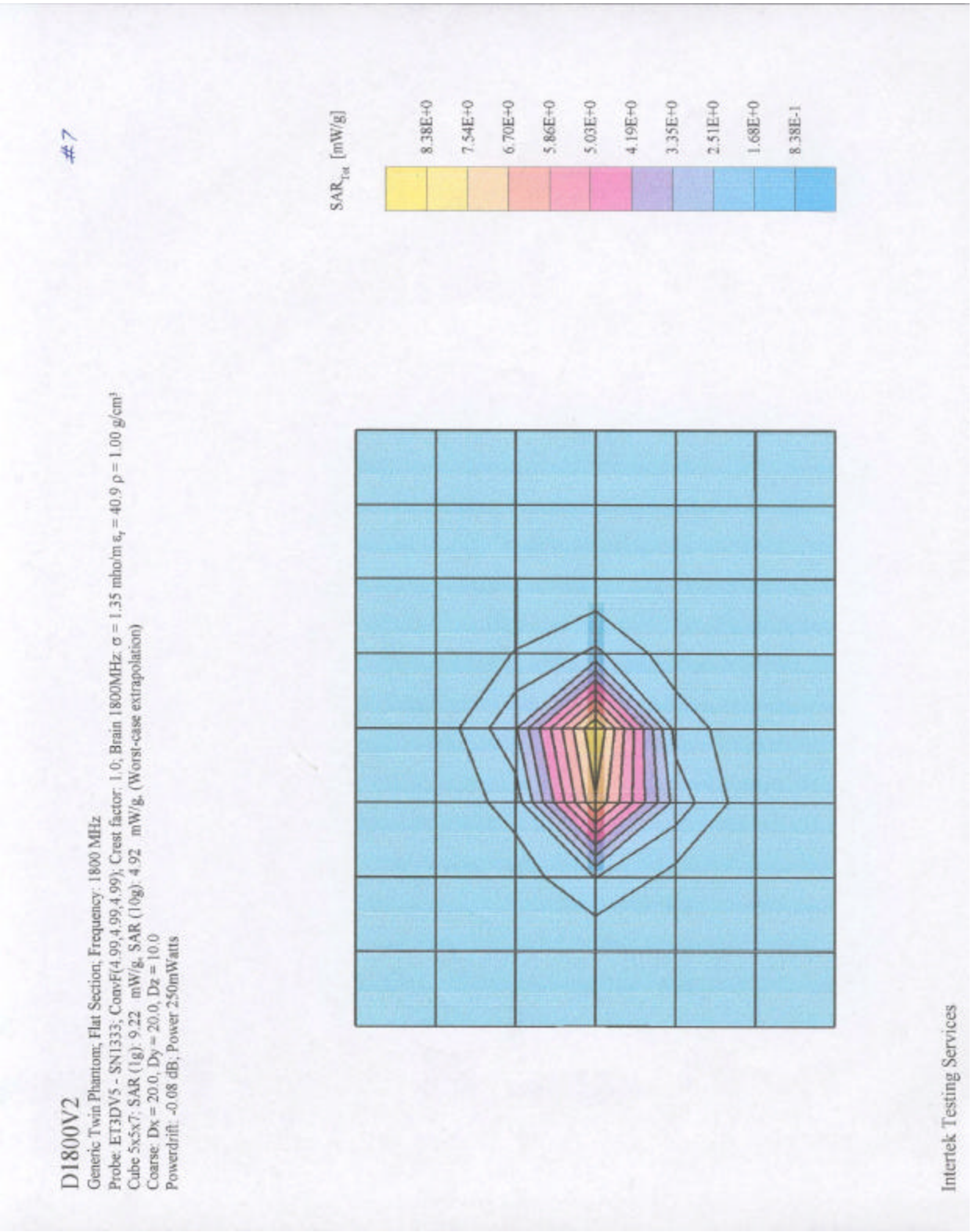
01/19/02
HTC Wallaby PW20
Generic Twin Phantom; Right Hand Section; Frequency: 1880 MHz; Ambient Temp: 23.2; Liquid Temp: 22.4C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1880 MHz: σ = 1.44 mho/m ε_r = 40.4 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.471 mW/g ± 0.06 dB, SAR (10g): 0.393 mW/g ± 0.07 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.04 dB: Check
SAR_1g [mW/g]
5.30E-1
4.77E-1
4.24E-1
3.71E-1
3.18E-1
2.65E-1
2.12E-1
1.59E-1
1.06E-1
5.30E-2
Intertek Testing Services


#6
01/19/02
HTC Wallaby PW20
Generic Twin Phantom; Right Hand Section; Frequency: 1880 MHz; Ambient Temp: 23.2C;Liquid Temp: 22.4C
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Brain 1880 MHz: σ = 1.44 mho/m ε_r = 40.4 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.411 mW/g ± 0.04 dB, SAR (10g): 0.350 mW/g ± 0.08 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.35 dB Tilt
SAR_tot [mW/g]
4.40E-1
3.96E-1
3.52E-1
3.08E-1
2.64E-1
2.20E-1
1.76E-1
1.32E-1
8.80E-2
4.40E-2
Intertek Testing Services


#7
SAR_{Tot} [mW/g]
8.38E+0
7.54E+0
6.70E+0
5.86E+0
5.03E+0
4.19E+0
3.35E+0
2.51E+0
1.68E+0
8.38E-1
D1800V2
Generic Twin Phantom; Flat Section; Frequency: 1800 MHz
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 1.0; Brain 1800MHz: σ = 1.35 mho/m ε_r = 40.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 9.22 mW/g, SAR (10g): 4.92 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.08 dB; Power 250mWatts
Intertek Testing Services

APPENDIX B - E-Field Probe Calibration Data

See attached.

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:	**ET3DV5**
Serial Number:	**1333**
Place of Calibration:	**Zurich**
Date of Calibration:	**April 23, 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:	Nikolova, Neviana
Approved by:	Jelusic Katja

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland, Telephone +41 1 245 97 00, Fax +41 1 245 97 79

Probe ET3DV5

SN:1333

Manufactured:	December 20, 1997
Last calibration:	April 10, 2000
Recalibrated:	April 23, 2001

Calibrated for System DASY3

Page 1 of 7

ET3DV5 SN:1333

DASY3 - Parameters of Probe: ET3DV5 SN:1333

Sensitivity in Free Space

NormX	2.37 $\mu V/(V/m)^2$
NormY	2.38 $\mu V/(V/m)^2$
NormZ	2.33 $\mu V/(V/m)^2$

Diode Compression

DCP X	100 mV
DCP Y	100 mV
DCP Z	100 mV

Sensitivity in Tissue Simulating Liquid

Head 450 MHz ε_r = 43.5 ± 5% σ = 0.87 ± 10% mho/m

ConvF X	6.25 extrapolated	Boundary effect:	
ConvF Y	6.25 extrapolated	Alpha	0.19
ConvF Z	6.25 extrapolated	Depth	3.06

Head 900 MHz ε_r = 42 ± 5% σ = 0.97 ± 10% mho/m

ConvF X	5.83 ± 7% (k=2)	Boundary effect:	
ConvF Y	5.83 ± 7% (k=2)	Alpha	0.38
ConvF Z	5.83 ± 7% (k=2)	Depth	2.70

Brain 1500 MHz ε_r = 41 ± 5% σ = 1.32 ± 10% mho/m

ConvF X	5.27 interpolated	Boundary effect:	
ConvF Y	5.27 interpolated	Alpha	0.63
ConvF Z	5.27 interpolated	Depth	2.23

Brain 1800 MHz ε_r = 41 ± 5% σ = 1.69 ± 10% mho/m

ConvF X	4.99 ± 7% (k=2)	Boundary effect:	
ConvF Y	4.99 ± 7% (k=2)	Alpha	0.75
ConvF Z	4.99 ± 7% (k=2)	Depth	1.99

Sensor Offset

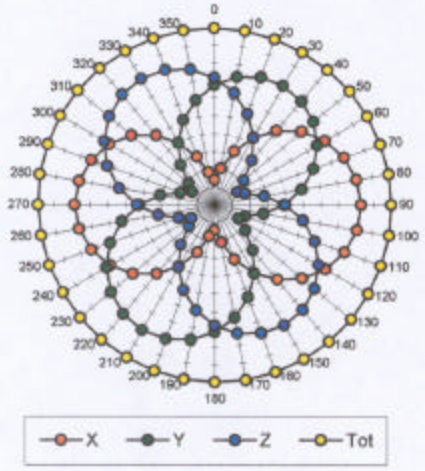
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 ± 0.2	mm

Page 2 of 7

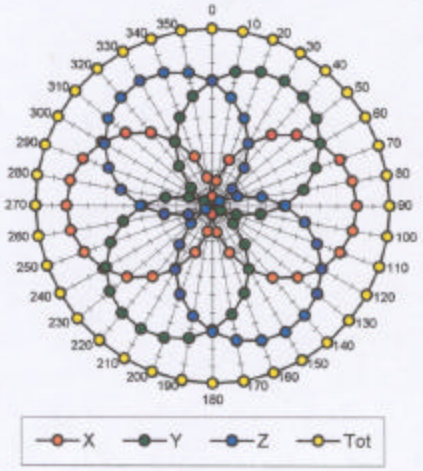
ET3DV5 SN:1333

Receiving Pattern (ϕ), θ = 0°

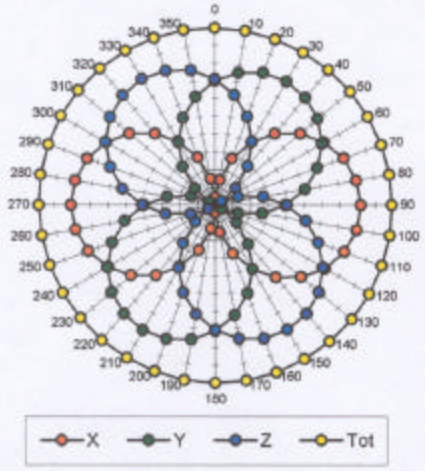
f = 30 MHz, TEM cell ifi110



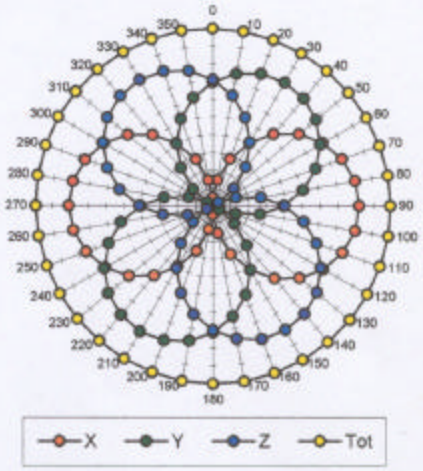
f = 100 MHz, TEM cell ifi110



f = 300 MHz, TEM cell ifi110

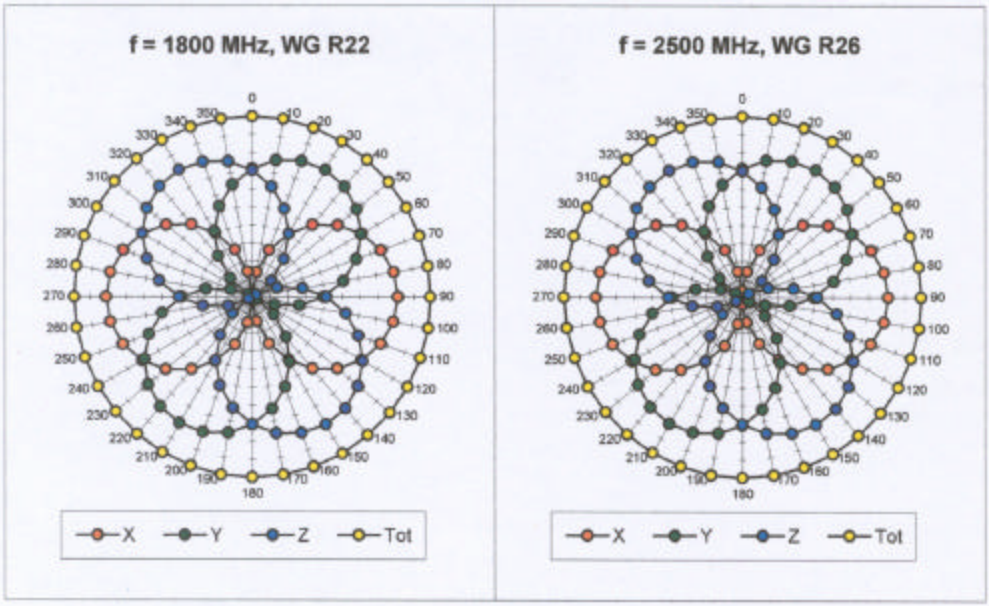


f = 900 MHz, TEM cell ifi110

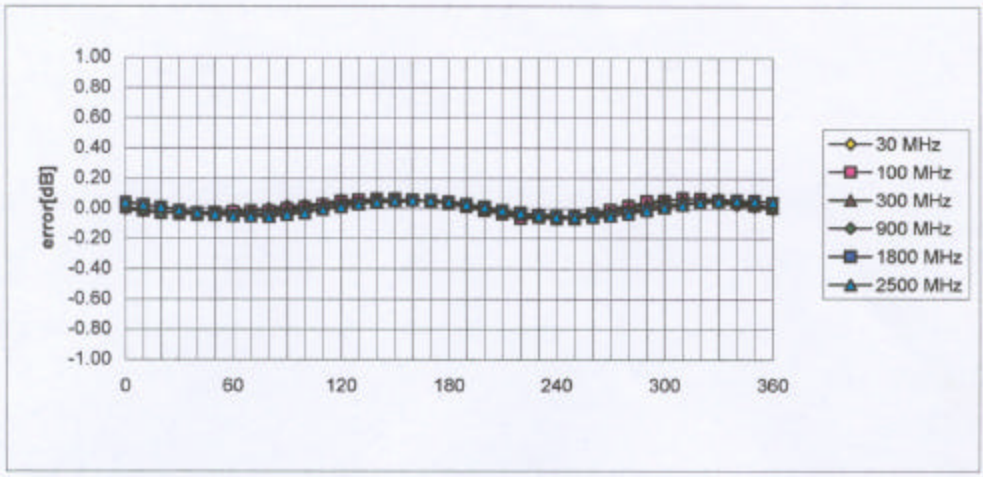


Page 3 of 7

ET3DV5 SN:1333



Isotropy Error (ϕ), θ = 0°

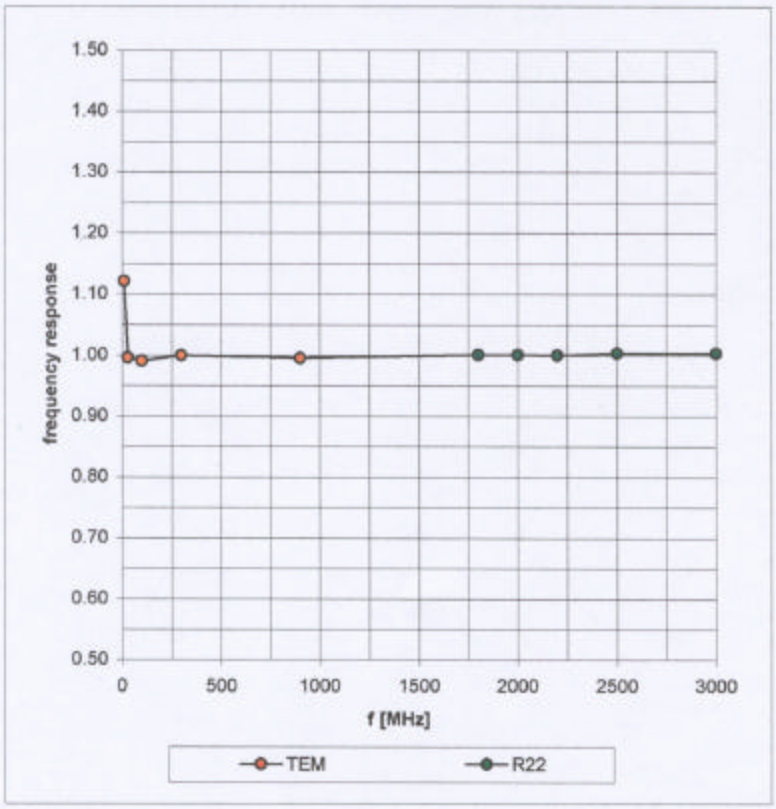


Page 4 of 7

ET3DV5 SN:1333

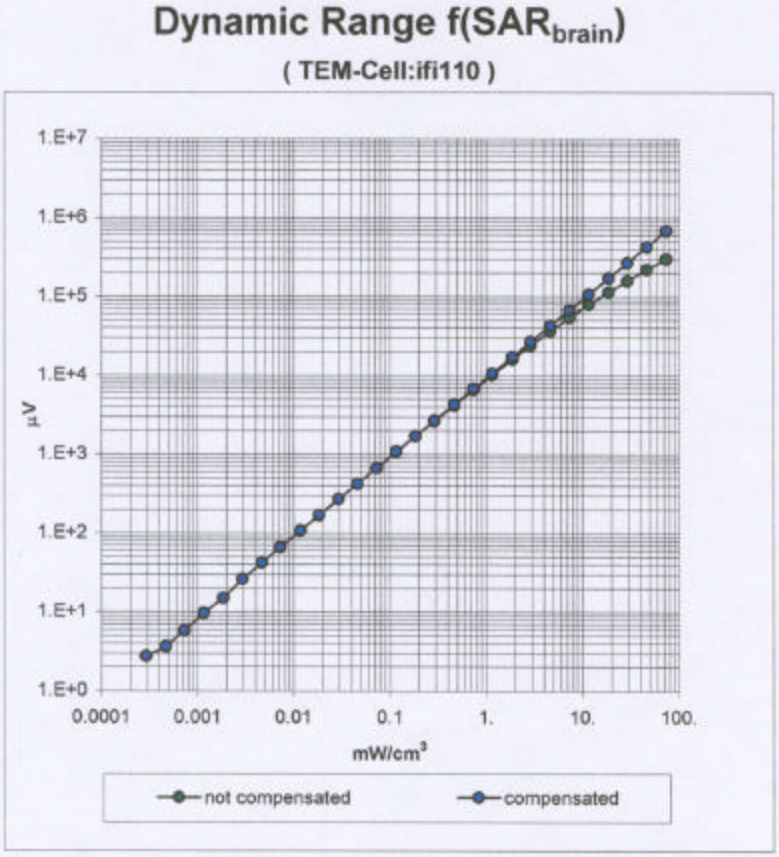
Frequency Response of E-Field

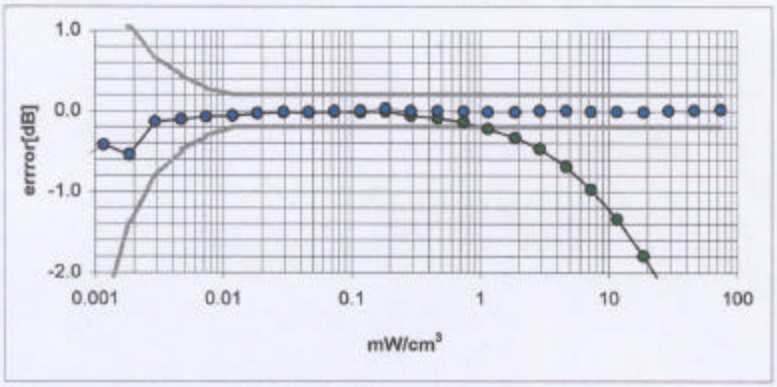
(TEM-Cell:ifi110, Waveguide R22)



Page 5 of 7

ET3DV5 SN:1333

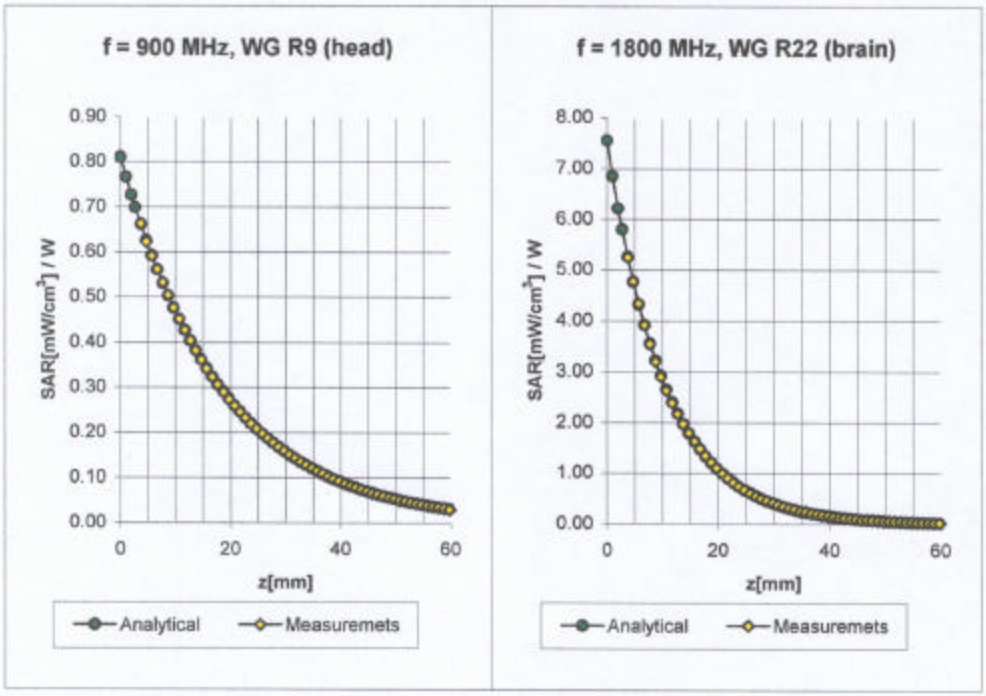




Page 6 of 7

ET3DV5 SN:1333

Conversion Factor Assessment



Head **900 MHz** ε_r **= 42 ± 5%** σ **= 0.97 ± 10% mho/m**

ConvF X	**5.83** ± 7% (k=2)	Boundary effect:	
ConvF Y	**5.83** ± 7% (k=2)	Alpha	**0.38**
ConvF Z	**5.83** ± 7% (k=2)	Depth	**2.70**

Brain **1800 MHz** ε_r **= 41 ± 5%** σ **= 1.69 ± 10% mho/m**

ConvF X	**4.99** ± 7% (k=2)	Boundary effect:	
ConvF Y	**4.99** ± 7% (k=2)	Alpha	**0.75**
ConvF Z	**4.99** ± 7% (k=2)	Depth	**1.99**

Page 7 of 7