

# SAR DATA SUMMARY

Mixture Type: 150MHz Brain

14.1 MEASUREMENT RESULTS (150 MHz Face SAR)									
FREQUENCY		Modulation	Begin / End POWER <sup>†</sup>			Separation Distance (cm) <sup>**</sup>	Antenna Position	SAR (W/kg) 100% Duty Cycle	SAR (W/kg) 50% Duty Cycle
MHz	Ch.		(dBm)		Battery				
156.050	01	FM	37.06	36.90	Ni-MH	2.5	Fixed	2.130	1.065
156.800	16	FM	37.08	36.92	Ni-MH	2.5	Fixed	2.200	1.100
157.425	88	FM	37.10	36.93	Ni-MH	2.5	Fixed	2.400	1.200
<b>ANSI / IEEE C95.1 1992 - SAFETY LIMIT</b>						<b>Brain</b>			
Spatial Peak						1.6 W/kg (mW/g)			
Uncontrolled Exposure/General Population						averaged over 1 gram			

**NOTES:**

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Battery is fully charged for all readings.
 

<sup>†</sup> Power Measured	<input checked="" type="checkbox"/> Conducted	<input type="checkbox"/> ERP	<input type="checkbox"/> EIRP
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4. SAR Measurement System
 

<input checked="" type="checkbox"/> DASY4	<input type="checkbox"/> IDX
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5. Phantom Configuration
 

<input type="checkbox"/> Left Head	<input checked="" type="checkbox"/> Flat Phantom	<input type="checkbox"/> Right Head
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6. SAR Configuration
 

<input checked="" type="checkbox"/> Face	<input type="checkbox"/> Body	<input type="checkbox"/> Hand
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7. Test Signal Call Mode
 

<input checked="" type="checkbox"/> Manu. Test Codes	<input type="checkbox"/> Base Station Simulator
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8. <sup>\*\*</sup>Test Configuration
 

<input type="checkbox"/> With Belt clip	<input checked="" type="checkbox"/> Without Belt clip
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9. Tissue parameters and temperatures are listed on the SAR plots.
9. Liquid tissue depth is 21.8 cm. ± 0.1

Alfred

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**Alfred Cirwithian**  
Vice President Engineering



**Figure 14.1 Face SAR Test Setup**

PCTEST SAR REPORT	FCC CERTIFICATION			Reviewed by: Quality Manager
SAR Filename: SAR-231229004.AMW	Test Dates: January 20-21, 2004	EUT Type: VHF Marine Radio		Page 18 of 22

# SAR DATA SUMMARY (Continued)

Mixture Type: 150MHz Muscle

<b>14.2 MEASUREMENT RESULTS (150 MHz Body SAR w/ Belt Clip)</b>									
FREQUENCY		Modulation	Begin / End POWER <sup>†</sup>			Separation Distance (cm) <sup>††</sup>	Antenna Position	SAR (W/kg) 100% Duty Cycle	SAR (W/kg) 50% Duty Cycle
MHz	Ch.		(dBm)		Battery				
156.050	01	FM	37.10	36.95	Ni-MH	2.4	Fixed	2.780	1.390
156.800	16	FM	37.12	36.98	Ni-MH	2.4	Fixed	2.910	1.455
157.425	88	FM	37.03	36.94	Ni-MH	2.4	Fixed	2.740	1.370
<b>ANSI / IEEE C95.1 1992 - SAFETY LIMIT</b>						<b>Muscle</b>			
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>			
<b>Uncontrolled Exposure/General Population</b>						averaged over 1 gram			

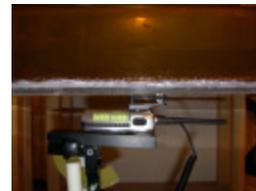
**NOTES:**

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
  2. All modes of operation were investigated, and worst-case results are reported.
  3. Battery is fully charged for all readings.
- |                           |  |  |                                     |
|---------------------------|--|--|-------------------------------------|
| †Power Measured           | <input checked="" type="checkbox"/> Conducted        | <input type="checkbox"/> ERP                     | <input type="checkbox"/> EIRP       |
| 4. SAR Measurement System | <input checked="" type="checkbox"/> DASY4            | <input type="checkbox"/> IDX                     |                                     |
| Phantom Configuration     | <input type="checkbox"/> Left Head                   | <input checked="" type="checkbox"/> Flat Phantom | <input type="checkbox"/> Right Head |
| 5. SAR Configuration      | <input type="checkbox"/> Face                        | <input checked="" type="checkbox"/> Body         | <input type="checkbox"/> Hand       |
| 6. Test Signal Call Mode  | <input checked="" type="checkbox"/> Manu. Test Codes | <input type="checkbox"/> Base Station Simulator  |                                     |
| 7. ††Test Configuration   | <input checked="" type="checkbox"/> With Belt clip   | <input type="checkbox"/> Without Belt clip       |                                     |
8. Tissue parameters and temperatures are listed on the SAR plots.
  9. Liquid tissue depth is 21.8 cm. ± 0.1

Alfred

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**Alfred Cirwithian**  
Vice President Engineering



**Figure 14.2 Body SAR Test Setup -- w/ Belt clip --**

<b>PCTEST SAR REPORT</b>	<b>FCC CERTIFICATION</b>			<b>Under</b>	Reviewed by: Quality Manager
SAR Filename: SAR-231229004.AMW	Test Dates: January 20-21, 2004	EUT Type: VHF Marine Radio	FCC ID: AMWUT919		Page 19 of 22

## 15. SAR TEST EQUIPMENT

### Equipment Calibration

**Table 15.1 Test Equipment Calibration**

EQUIPMENT SPECIFICATIONS			
Type	Calibration Date	Serial Number	
Stäubli Robot RX60L	February 2003	599131-01	
Stäubli Robot Controller	February 2003	PCT592	
Stäubli Teach Pendant (Joystick)	February 2003	3323-00161	
Micron Computer, 450 MHz Pentium III, Windows NT	February 2003	PCT577	
SPEAG EDC3	February 2003	321	
SPEAG DAE3	February 2003	330	
SPEAG E-Field Probe ET3DV6	September 2003	1560	
SPEAG Dummy Probe	February 2003	PCT583	
SPEAG Plexiglas Planar Phantom V1.0	February 2003	PCT150	
SPEAG Light Alignment Sensor	February 2003	205	
PCTEST Validation Dipole D300V2	September 2003	PCT301	
SPEAG Validation Dipole D835V2	February 2003	PCT512	
SPEAG Validation Dipole D1900V2	February 2003	PCT613	
Brain Equivalent Matter (150MHz)	January 2004	PCTBEM501	
Muscle Equivalent Matter (150MHz)	January 2004	PCTMEM501	
Brain Equivalent Matter (300MHz)	January 2004	PCTBEM601	
Muscle Equivalent Matter (300MHz)	January 2004	PCTMEM701	
Microwave Amp. Model: 5S1G4, (800MHz - 4.2GHz)	January 2004	22332	
Gigatronics 8651A Power Meter	January 2004	1835299	
HP-8648D (9kHz ~ 4GHz) Signal Generator	January 2004	PCT530	
Amplifier Research 5S1G4 Power Amp	January 2004	PCT540	
HP-8753E (30kHz ~ 3GHz) Network Analyzer	January 2004	PCT552	
HP85070B Dielectric Probe Kit	January 2004	PCT501	
Ambient Noise/Reflection, etc.	January 2004	January 2003	Anechoic Room PCT01

**NOTE:**

The E-field probe was calibrated by SPEAG, by waveguide technique procedure. Dipole Validation measurement is performed by PCTEST Lab. before each test. The brain simulating material is calibrated by PCTEST using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

<b>PCTEST SAR REPORT</b>	<b>FCC CERTIFICATION</b>		<b>Uniden</b>	<b>Reviewed by:</b> Quality Manager
<b>SAR Filename:</b> SAR-231229004.AMW	<b>Test Dates:</b> January 20-21, 2004	<b>EUT Type:</b> VHF Marine Radio	<b>FCC ID:</b> AMWUT919	Page 20 of 22

## 16. CONCLUSION

### Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.[3]

PCTEST SAR REPORT	 <b>FCC CERTIFICATION</b>				<b>Reviewed by:</b> Quality Manager
<b>SAR Filename:</b> SAR-231229004.AMW	<b>Test Dates:</b> January 20-21, 2004	<b>EUT Type:</b> VHF Marine Radio	<b>FCC ID:</b> AMWUT919	Page 21 of 22	

## 17. REFERENCES

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1 - 1991, *American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz*, New York: IEEE, Aug. 1992.
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- [4] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, July 2001.
- [5] IEEE Standards Coordinating Committee 34 – IEEE Std. P1528 D1.2 (April 2003), *Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques*.
- [6] NCRP, National Council on Radiation Protection and Measurements, *Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields*, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [7] T. Schmid, O. Egger, N. Kuster, *Automated E-field scanning system for dosimetric assessments*, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
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- [9] K. Poković, T. Schmid, and N. Kuster, *E-field Probe with improved isotropy in brain simulating liquids*, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
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- [13] G. Hartsgrove, A. Kraszewski, A. Surowiec, *Simulated Biological Materials for Electromagnetic Radiation Absorption Studies*, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
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- [15] W. Gander, *Computermathematick*, Birkhaeuser, Basel, 1992.
- [16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, *Numerical Recipes in C*, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [17] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.
- [18] N. Kuster, R. Kastle, T. Schmid, *Dosimetric evaluation of mobile communications equipment with known precision*, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [19] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [20] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.

PCTEST SAR REPORT	 <b>FCC CERTIFICATION</b> 			Reviewed by: Quality Manager
SAR Filename: SAR-231229004.AMW	Test Dates: January 20-21, 2004	EUT Type: VHF Marine Radio	FCC ID: AMWUT919	Page 22 of 22

## **ATTACHMENT A – SAR TEST DATA**

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# PCTEST ENGINEERING LABORATORY, INC.

**DUT:FCC ID: AMWUT919; Model: MHS350; Type: VHF Marine Radio; SN: FCC/S**

Communication System: 156MHz VHF Marine Radio; Frequency: 157.425 MHz;Duty Cycle: 1:1

Medium: 150 Brain ( $\sigma = 0.77$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Center Flat

Test Date: 01-20-2004; Ambient Temp: 22.9°C; Tissue Temp: 20.3°C

Probe: ES3DV2 - SN3022; ConvF(8.5, 8.5, 8.5); Calibrated: 9/23/2003

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE3 Sn445; Phantom: Plexiglas Planar V1.0; SN: PCT150

Measurement SW: DAS4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

**Face, 2.5cm.space, Ch.88, Fixed Antenna, Battery: Ni-MH**

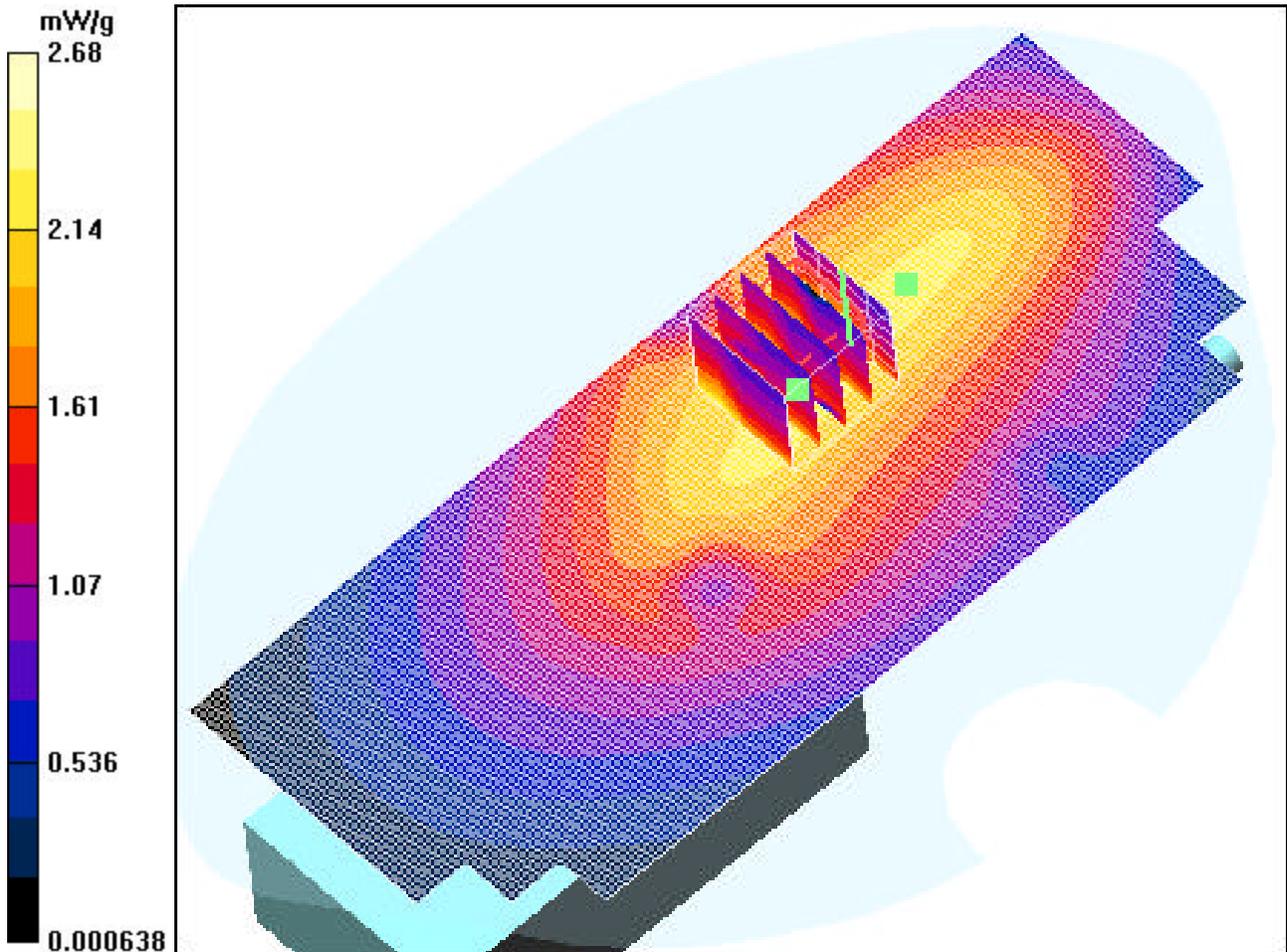
**Area Scan (71x171x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 3.26 W/kg

**SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.75 mW/g**

Reference Value = 49.8 V/m



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: AMWUT919; Model: MHS350; Type: VHF Marine Radio; SN: FCC/S**

Communication System: 156MHz VHF Marine Radio; Frequency: 156.8 MHz; Duty Cycle: 1:1

Medium: 150 Muscle ( $\sigma = 0.81$  mho/m;  $\epsilon_r = 61.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Center Flat

Test Date: 01-20-2004; Ambient Temp: 22.9°C; Tissue Temp: 20.4°C

Probe: ES3DV2 - SN3022; ConvF(8, 8, 8); Calibrated: 9/23/2003

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE3 Sn445; Phantom: Plexiglas Planar V1.0; SN: PCT150

Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

**Body, 2.4cm.space, Ch.16, Fixed Antenna, Battery: Ni-MH**

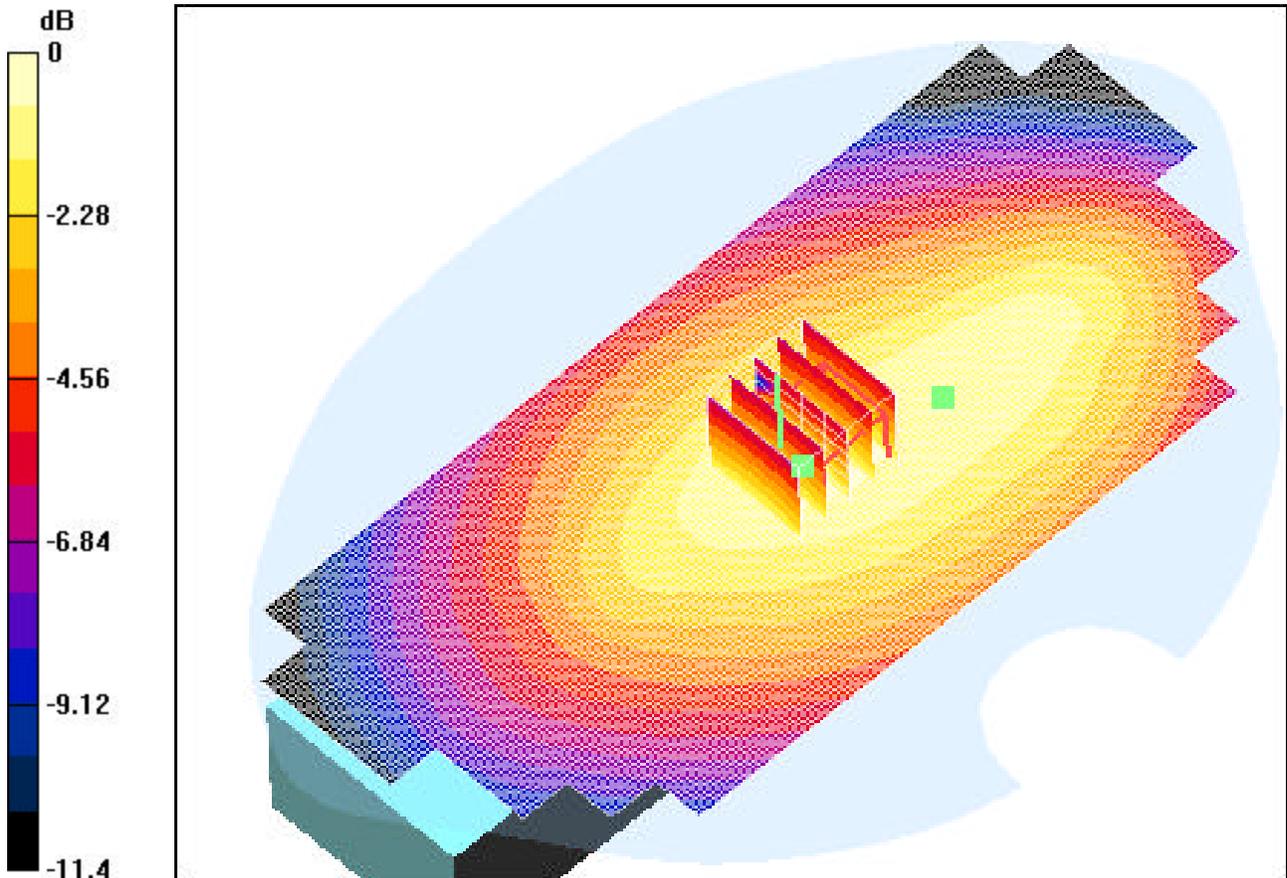
**Area Scan (71x171x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 4.52 W/kg

**SAR(1 g) = 2.91 mW/g; SAR(10 g) = 1.98 mW/g**

Reference Value = 63.3 V/m



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: FCC ID: AMWUT919; Model: MHS350; Type: VHF Marine Radio; SN: FCC/S**

Communication System: 156MHz VHF Marine Radio; Frequency: 157.425 MHz; Duty Cycle: 1:1

Medium: 150 Brain ( $\sigma = 0.77$  mho/m,  $\epsilon_r = 51.8$ ,  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Center Flat

Test Date: 01-20-2004; Ambient Temp: 22.9°C; Tissue Temp: 20.3°C

Probe: ES3DV2 - SN3022; ConvF(8.5, 8.5, 8.5); Calibrated: 9/23/2003

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE3 Sn445; Phantom: Plexiglas Planar V1.0; SN: PCT150

Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

**Face, 2.5cm.space, Ch.88, Fixed Antenna, Battery: Ni-MH**

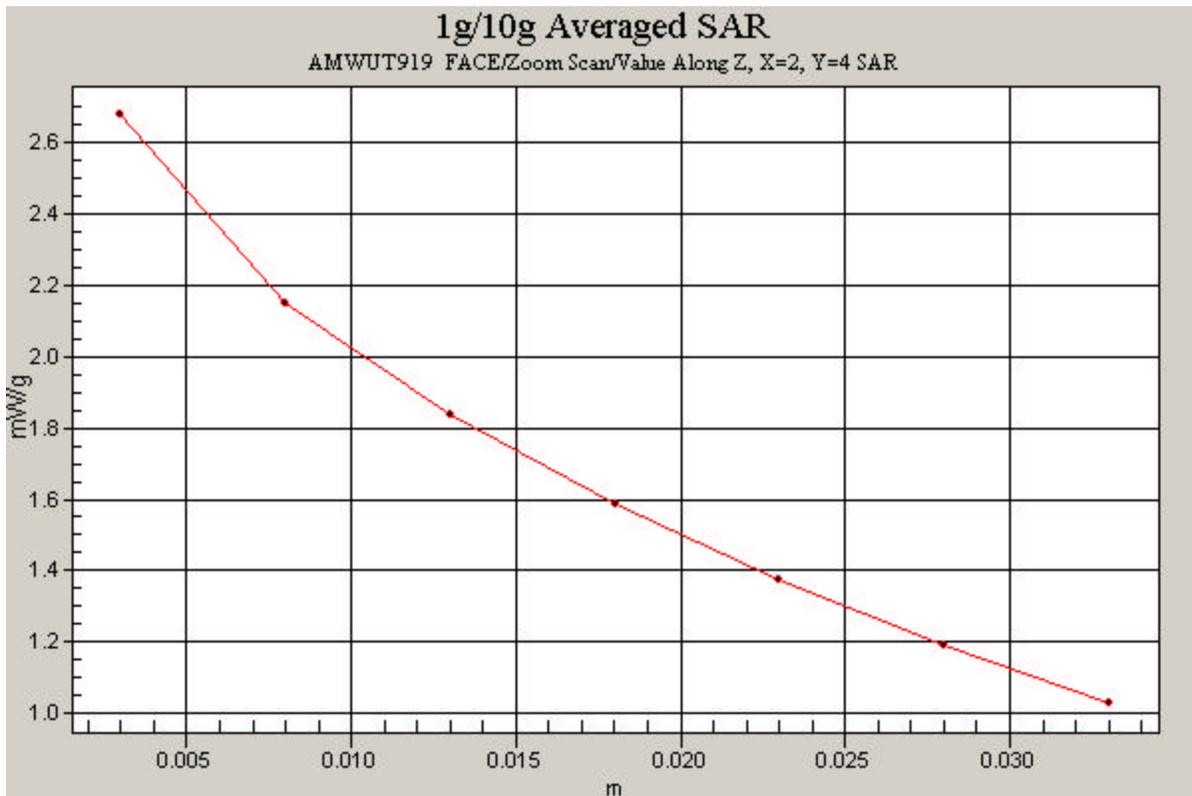
**Area Scan (71x171x1):** Measurement grid: dx=15mm, dy=15mm

**Ch.88, Face/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 3.26 W/kg

**SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.75 mW/g**

Reference Value = 49.8 V/m



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: AMWUT919; Model: MHS350; Type: VHF Marine Radio; SN: FCC/S**

Communication System: 156MHz VHF Marine Radio; Frequency: 156.8 MHz; Duty Cycle: 1:1

Medium: 150 Muscle ( $\sigma = 0.81$  mho/m;  $\epsilon_r = 61.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

Phantom section: Center Flat

Test Date: 01-20-2004; Ambient Temp: 22.9°C; Tissue Temp: 20.4°C

Probe: ES3DV2 - SN3022; ConvF(8, 8, 8); Calibrated: 9/23/2003

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE3 Sn445; Phantom: Plexiglas Planar V1.0; SN: PCT150

Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

**Body, 2.4cm.space, Ch.16, Fixed Antenna, Battery: Ni-MH**

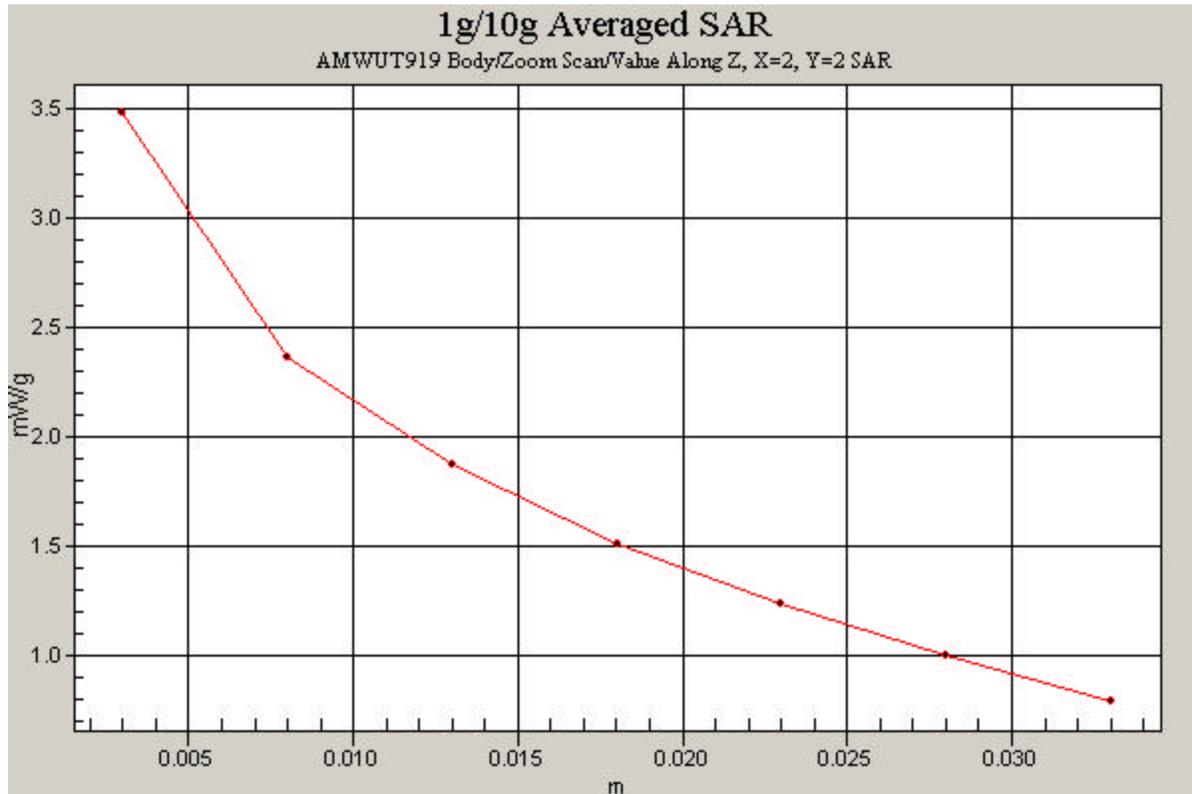
**Area Scan (71x171x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 4.52 W/kg

**SAR(1 g) = 2.91 mW/g; SAR(10 g) = 1.98 mW/g**

Reference Value = 63.3 V/m



## **ATTACHMENT B – SAR TEST SETUP PHOTOGRAPHS**

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## **ATTACHMENT C – PROBE CALIBRATION**

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Client **PC Test**

**CALIBRATION CERTIFICATE**

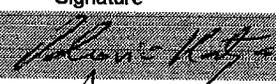
Object(s) **ES3DV2 - SN:3022**  
 Calibration procedure(s) **QA CAL-01 v2  
Calibration procedure for dosimetric E-field probes**  
 Calibration date: **September 23, 2003**  
 Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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

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

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	In house check: Oct 03
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Niels Kuster	Quality Manager	

Date issued: October 5, 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 ES3DV2

**SN:3022**

Manufactured: April 15, 2003  
Last calibration: September 23, 2003

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

# DASY - Parameters of Probe: ES3DV2 SN:3022

## Sensitivity in Free Space

NormX	<b>1.00</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>1.04</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>0.98</b> $\mu\text{V}/(\text{V}/\text{m})^2$

## Diode Compression

DCP X	<b>95</b>	mV
DCP Y	<b>95</b>	mV
DCP Z	<b>95</b>	mV

## Sensitivity in Tissue Simulating Liquid

**Head**                      **900 MHz**                       $\epsilon_r = 41.5 \pm 5\%$                        $\sigma = 0.97 \pm 5\% \text{ mho/m}$   
**Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

ConvF X	<b>6.1</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>6.1</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.32</b>
ConvF Z	<b>6.1</b> $\pm 9.5\%$ (k=2)	Depth <b>1.65</b>

**Head**                      **1800 MHz**                       $\epsilon_r = 40.0 \pm 5\%$                        $\sigma = 1.40 \pm 5\% \text{ mho/m}$   
**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

ConvF X	<b>5.0</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>5.0</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.25</b>
ConvF Z	<b>5.0</b> $\pm 9.5\%$ (k=2)	Depth <b>2.30</b>

## Boundary Effect

**Head**                      **900 MHz**                      **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		<b>1 mm</b>	<b>2 mm</b>
SAR <sub>be</sub> [%] Without Correction Algorithm		5.5	2.5
SAR <sub>be</sub> [%] With Correction Algorithm		0.1	0.4

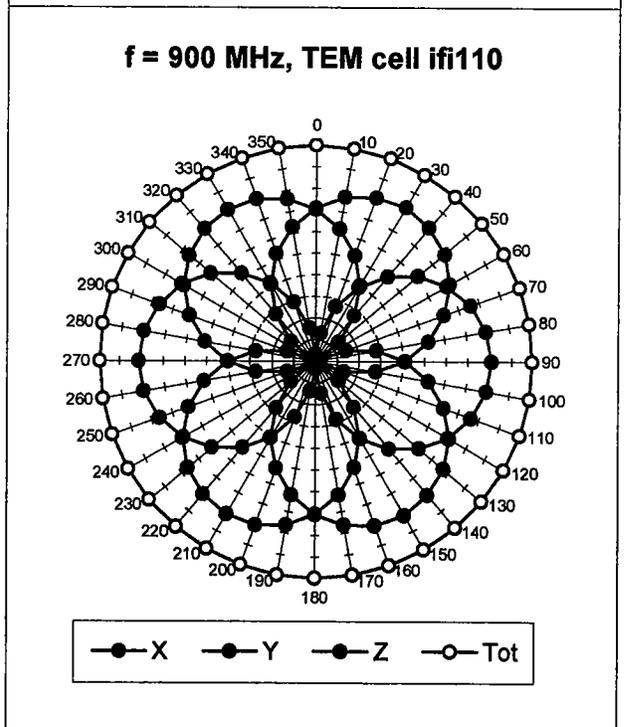
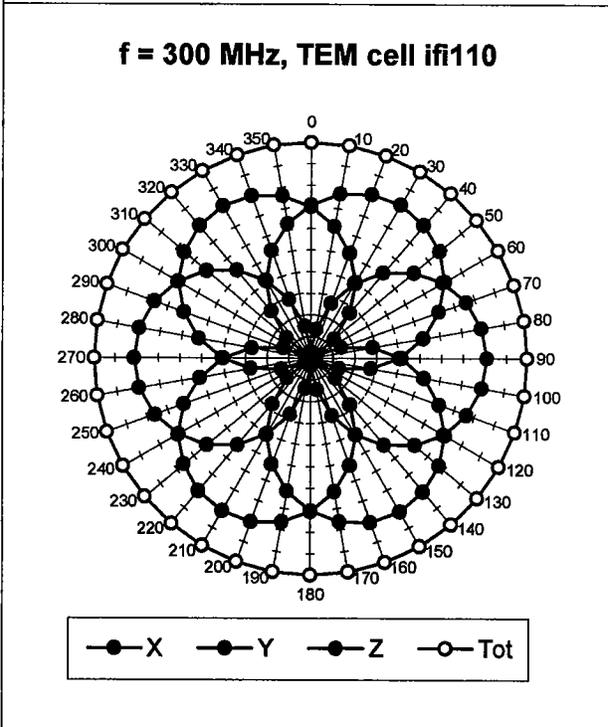
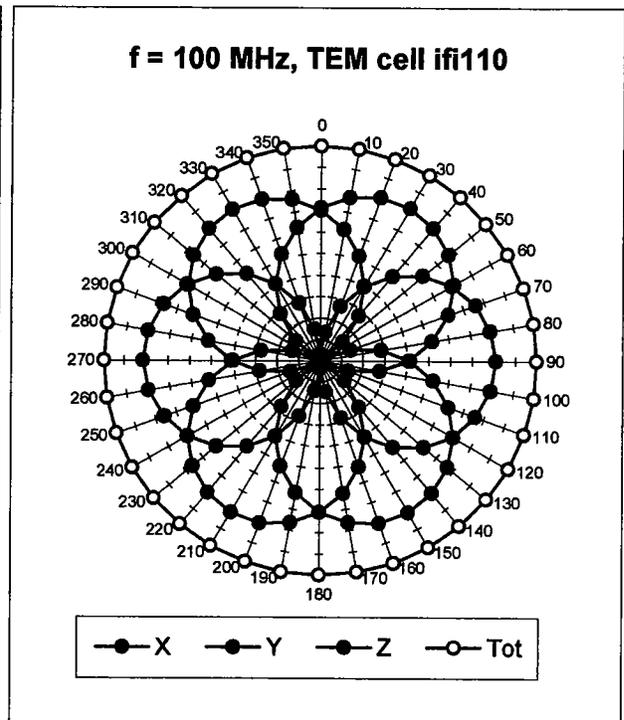
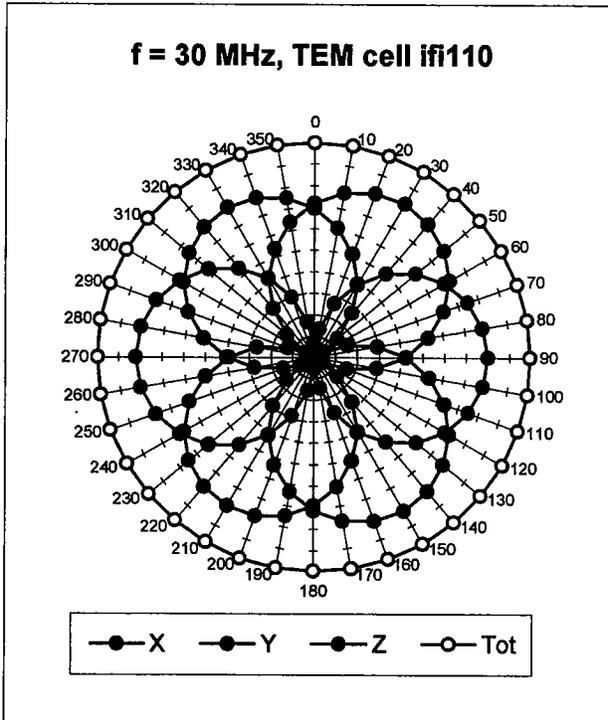
**Head**                      **1800 MHz**                      **Typical SAR gradient: 10 % per mm**

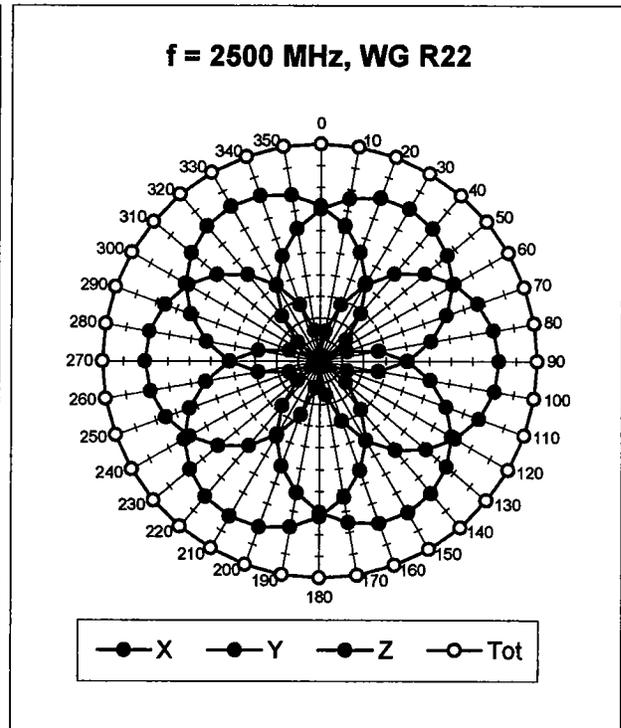
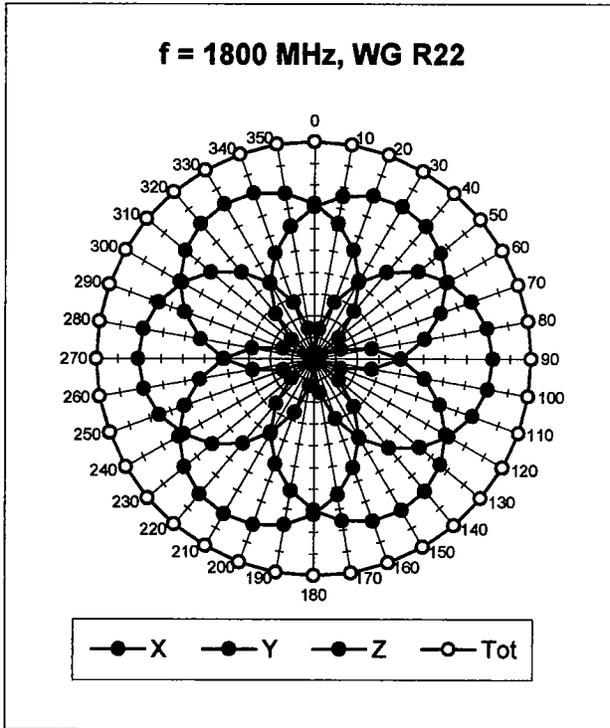
Probe Tip to Boundary		<b>1 mm</b>	<b>2 mm</b>
SAR <sub>be</sub> [%] Without Correction Algorithm		7.1	4.4
SAR <sub>be</sub> [%] With Correction Algorithm		0.0	0.1

## Sensor Offset

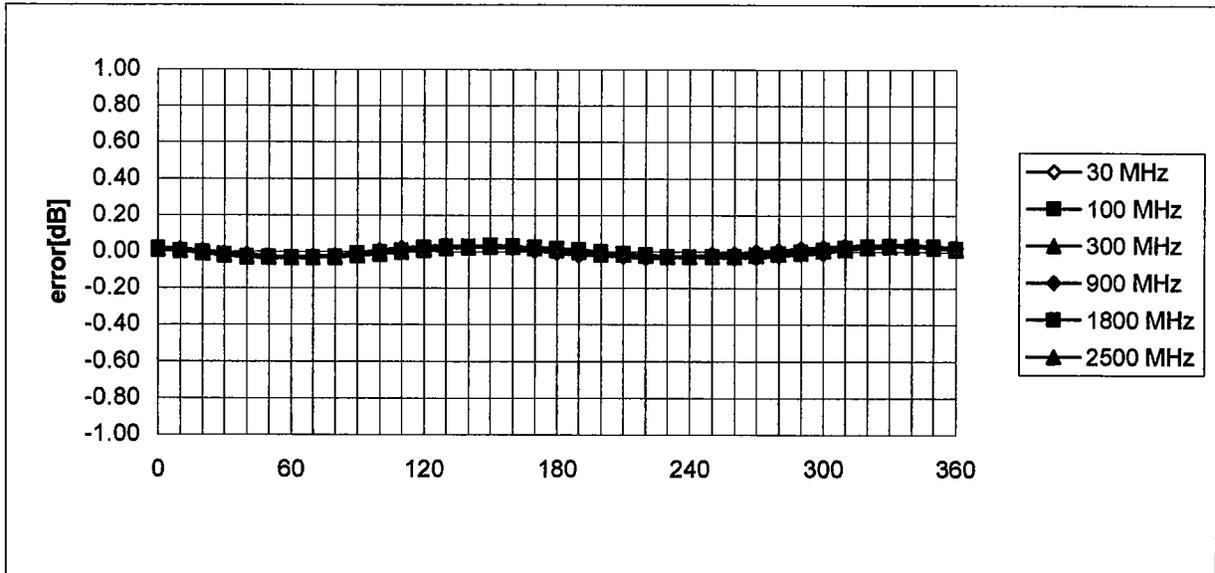
Probe Tip to Sensor Center	<b>2.0</b>	mm
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### Receiving Pattern ( $\phi$ , $\theta = 0^\circ$ )



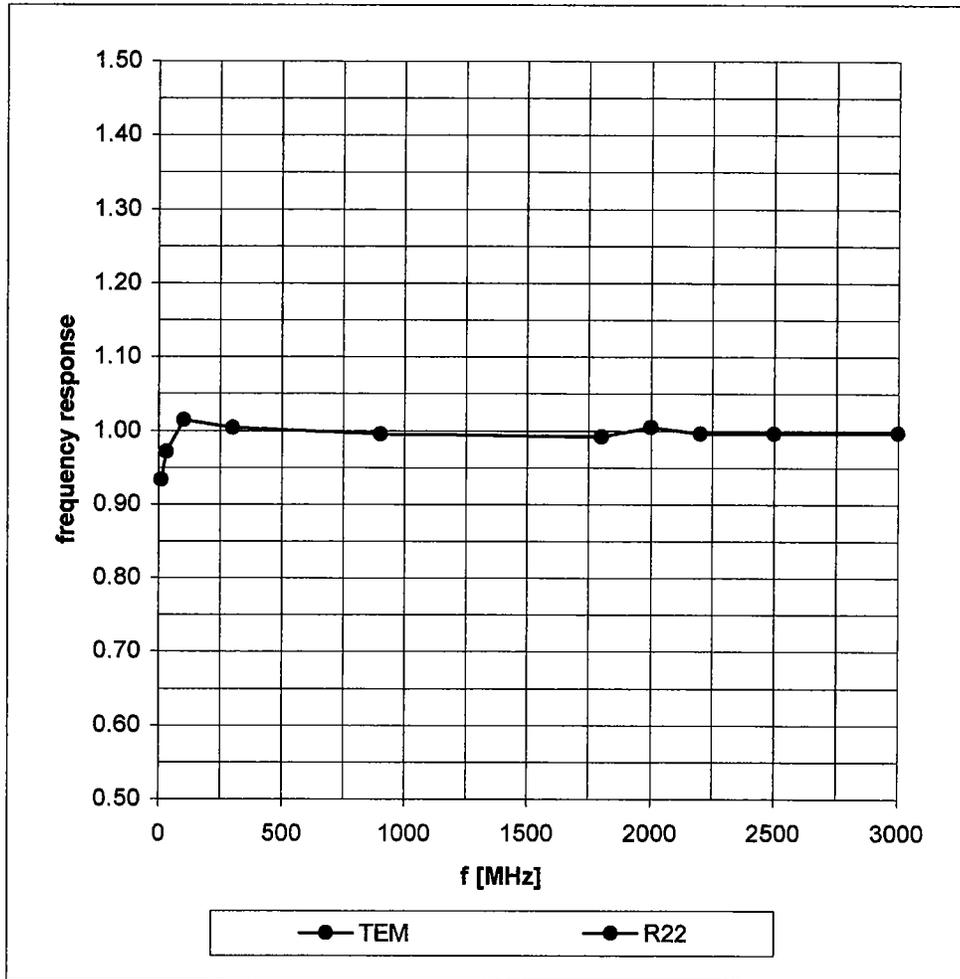


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

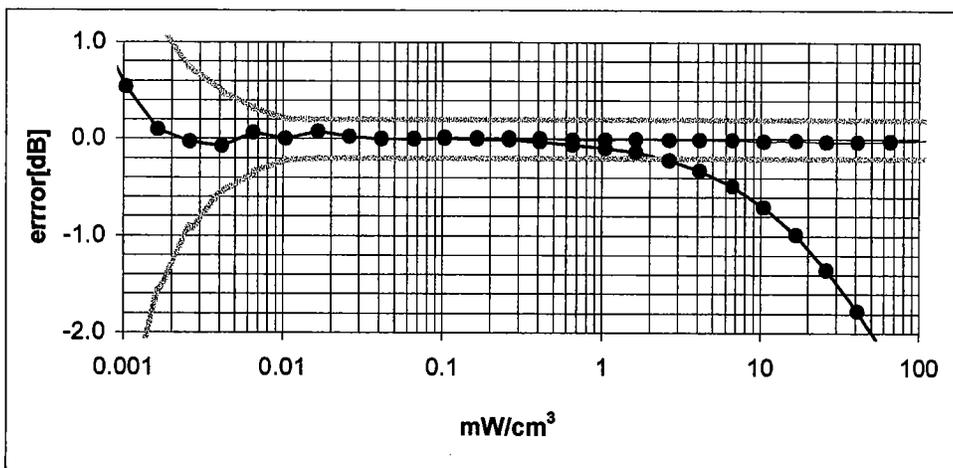
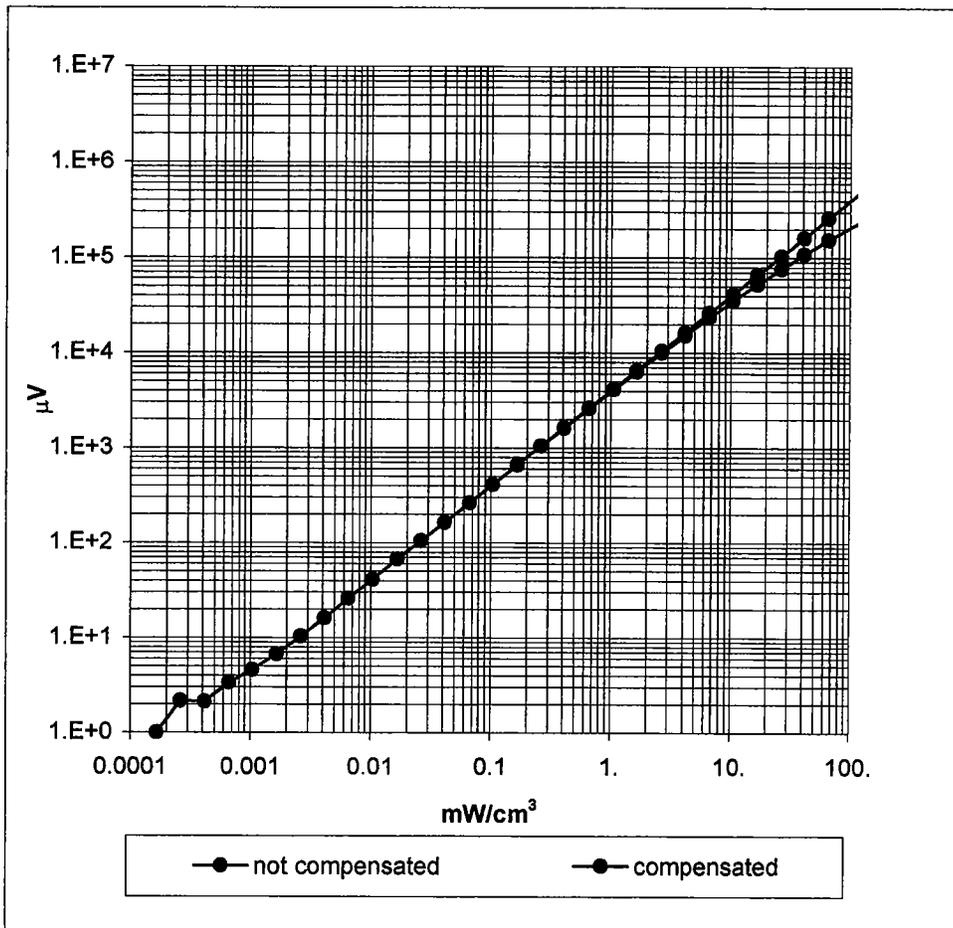


# Frequency Response of E-Field

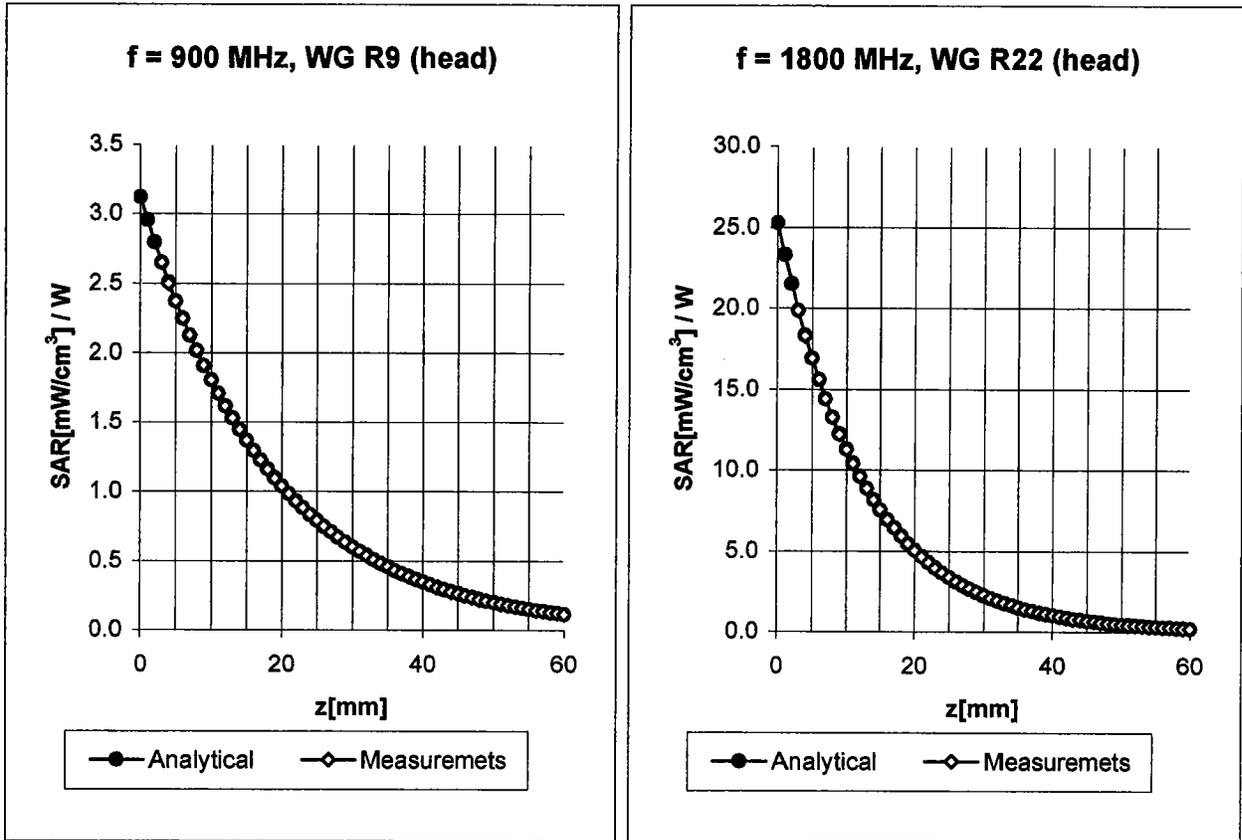
( TEM-Cell:ifi110, Waveguide R22)



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



## Conversion Factor Assessment



**Head                      900 MHz                       $\epsilon_r = 41.5 \pm 5\%$                        $\sigma = 0.97 \pm 5\%$  mho/m**

**Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

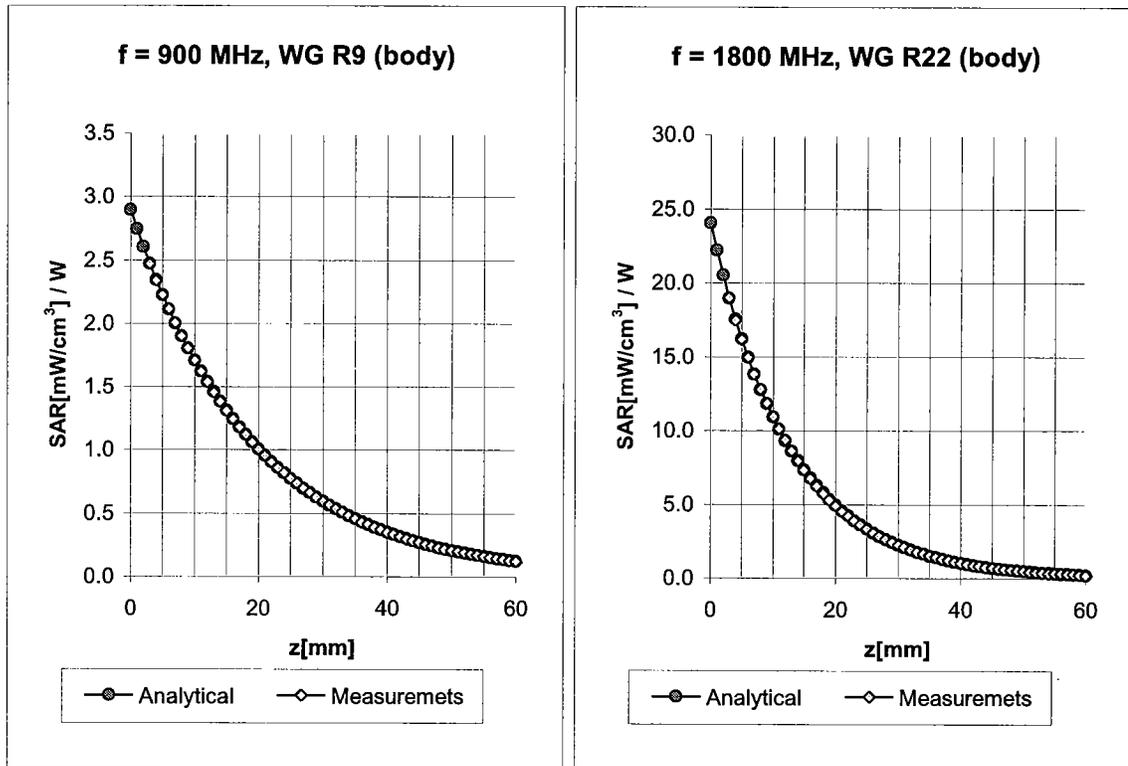
ConvF X	<b>6.1</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>6.1</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.32</b>
ConvF Z	<b>6.1</b> $\pm 9.5\%$ (k=2)	Depth <b>1.65</b>

**Head                      1800 MHz                       $\epsilon_r = 40.0 \pm 5\%$                        $\sigma = 1.40 \pm 5\%$  mho/m**

**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

ConvF X	<b>5.0</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>5.0</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.25</b>
ConvF Z	<b>5.0</b> $\pm 9.5\%$ (k=2)	Depth <b>2.30</b>

## Conversion Factor Assessment



**Body**                      **900 MHz**                       $\epsilon_r = 55.0 \pm 5\%$                        $\sigma = 1.05 \pm 5\%$  mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

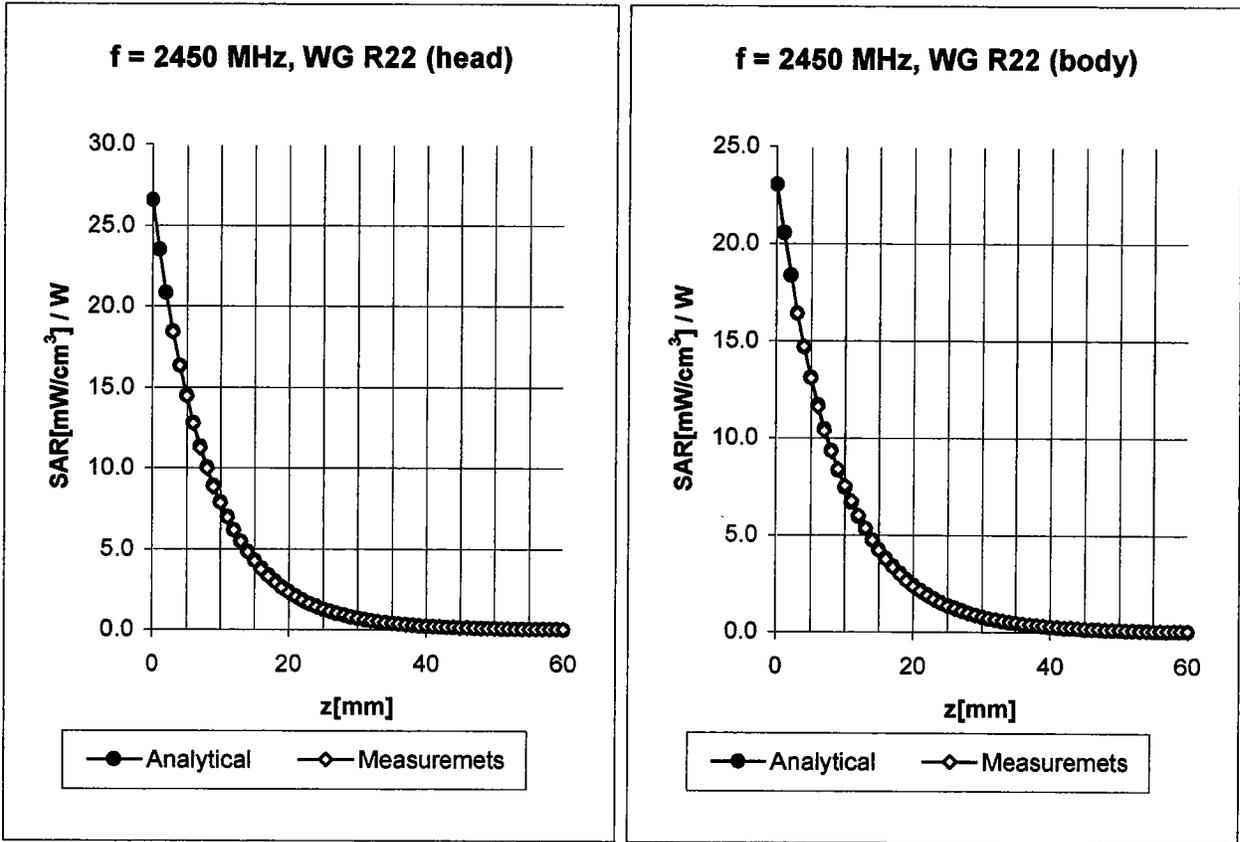
ConvF X	<b>6.0</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>6.0</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.38</b>
ConvF Z	<b>6.0</b> $\pm 9.5\%$ (k=2)	Depth <b>1.47</b>

**Body**                      **1800 MHz**                       $\epsilon_r = 53.3 \pm 5\%$                        $\sigma = 1.52 \pm 5\%$  mho/m

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	<b>4.5</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>4.5</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.22</b>
ConvF Z	<b>4.5</b> $\pm 9.5\%$ (k=2)	Depth <b>3.42</b>

## Conversion Factor Assessment



**Head                      2450 MHz                       $\epsilon_r = 39.2 \pm 5\%$                        $\sigma = 1.80 \pm 5\%$  mho/m**

**Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

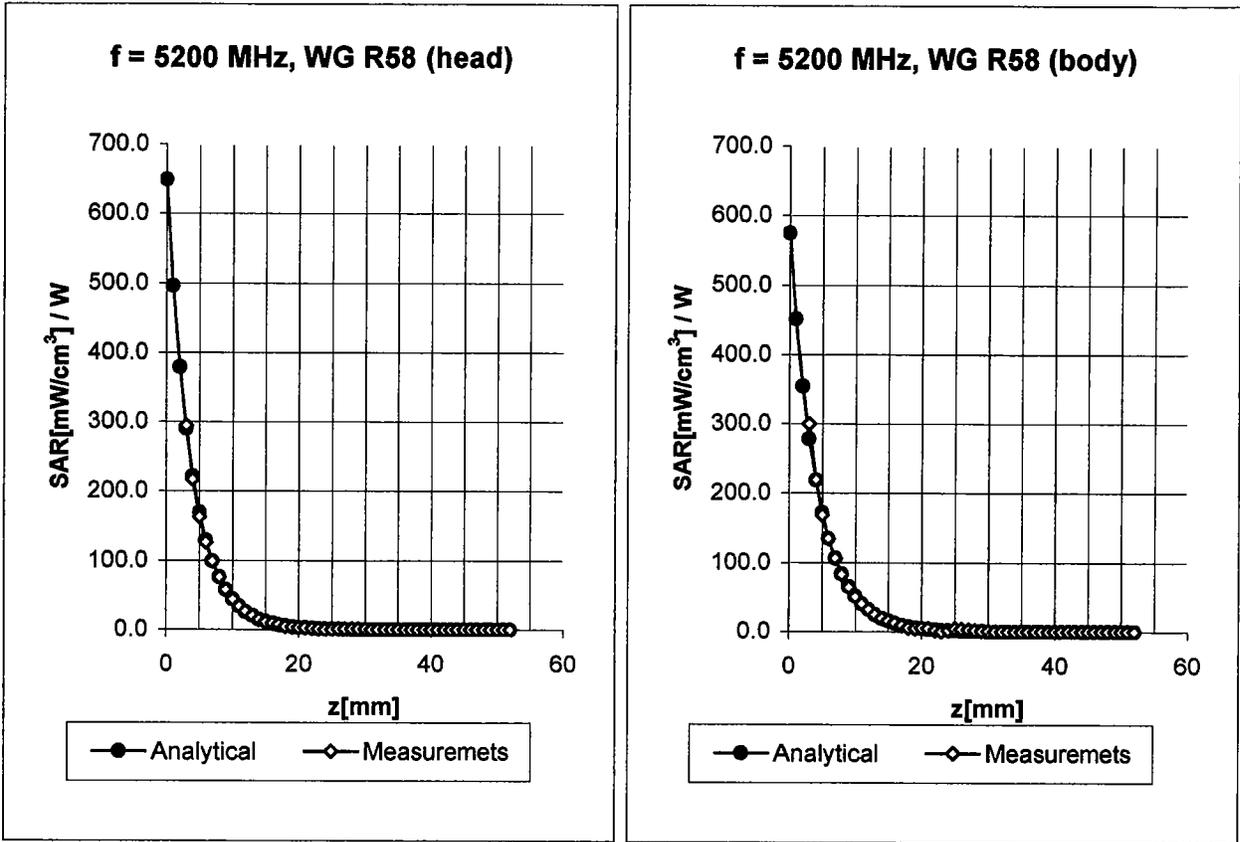
ConvF X	<b>4.5</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>4.5</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.42</b>
ConvF Z	<b>4.5</b> $\pm 9.5\%$ (k=2)	Depth <b>1.56</b>

**Body                      2450 MHz                       $\epsilon_r = 52.7 \pm 5\%$                        $\sigma = 1.95 \pm 5\%$  mho/m**

**Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C**

ConvF X	<b>4.2</b> $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	<b>4.2</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.42</b>
ConvF Z	<b>4.2</b> $\pm 9.5\%$ (k=2)	Depth <b>1.65</b>

## Conversion Factor Assessment



**Head                      5200 MHz                       $\epsilon_r = 36.0 \pm 5\%$                        $\sigma = 4.66 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Head Tissue Simulating Liquid according to OET65-SuppC**

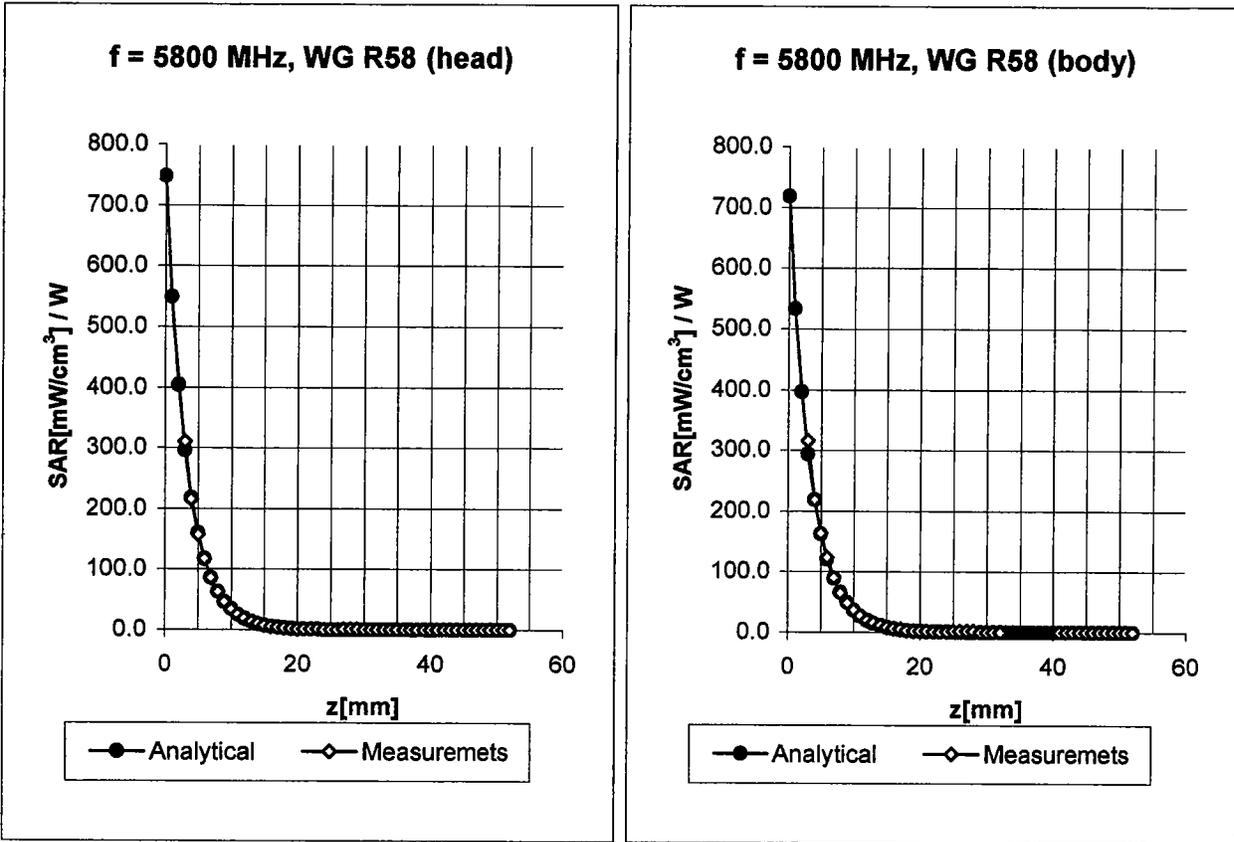
ConvF X	<b>2.60</b> $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	<b>2.60</b> $\pm 16.6\%$ (k=2)	Alpha <b>0.93</b>
ConvF Z	<b>2.60</b> $\pm 16.6\%$ (k=2)	Depth <b>1.50</b>

**Body                      5200 MHz                       $\epsilon_r = 49.0 \pm 5\%$                        $\sigma = 5.30 \pm 5\%$  mho/m**

**Valid for f=4940-5460 MHz with Body Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>1.80</b> $\pm 16.6\%$ (k=2)	Boundary effect:
ConvF Y	<b>1.80</b> $\pm 16.6\%$ (k=2)	Alpha <b>1.05</b>
ConvF Z	<b>1.80</b> $\pm 16.6\%$ (k=2)	Depth <b>1.60</b>

## Conversion Factor Assessment



**Head                      5800 MHz                       $\epsilon_r = 35.3 \pm 5\%$                        $\sigma = 5.27 \pm 5\%$  mho/m**

**Valid for f=5510-6090 MHz with Head Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>2.15</b> $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	<b>2.15</b> $\pm 16.6\%$ (k=2)	Alpha	<b>1.04</b>
ConvF Z	<b>2.15</b> $\pm 16.6\%$ (k=2)	Depth	<b>1.50</b>

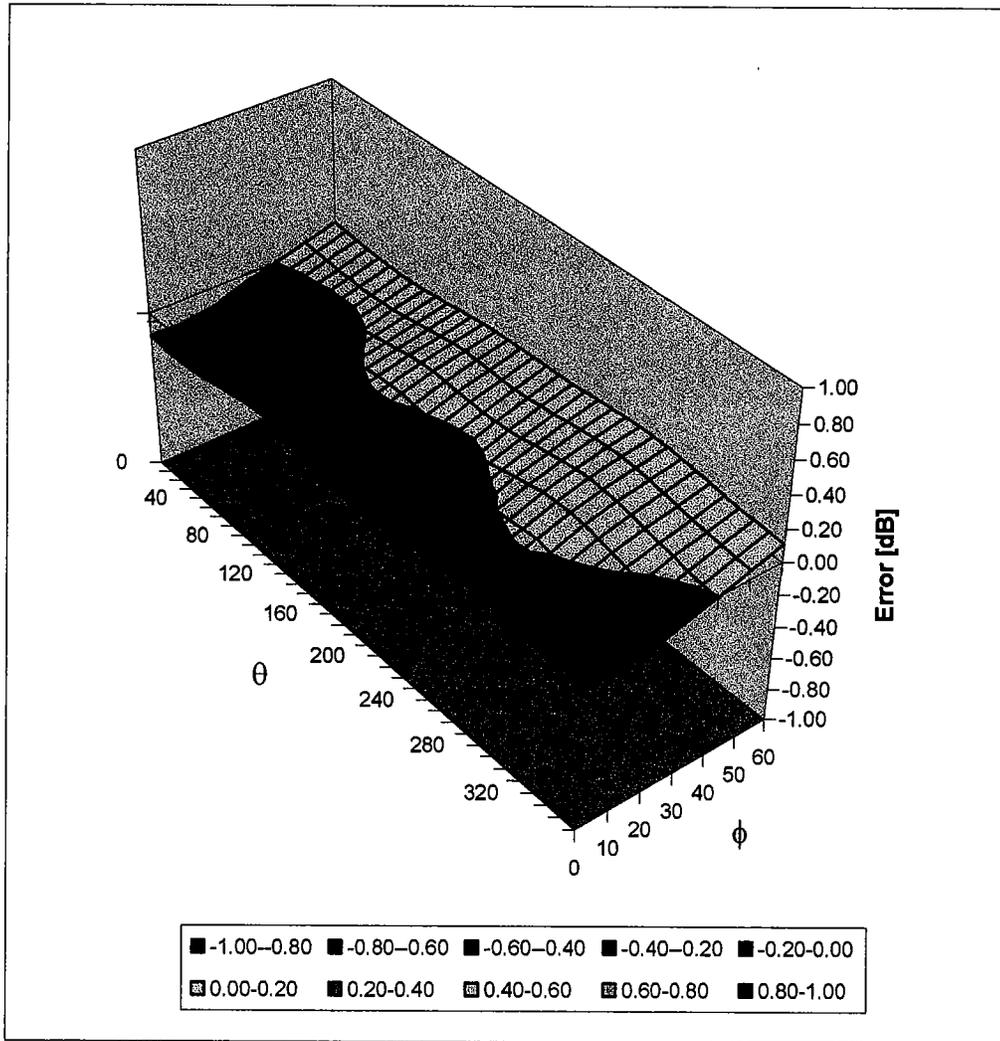
**Body                      5800 MHz                       $\epsilon_r = 48.2 \pm 5\%$                        $\sigma = 6.0 \pm 5\%$  mho/m**

**Valid for f=5510-6090 MHz with Body Tissue Simulating Liquid according to OET65-SuppC**

ConvF X	<b>1.57</b> $\pm 16.6\%$ (k=2)	Boundary effect:	
ConvF Y	<b>1.57</b> $\pm 16.6\%$ (k=2)	Alpha	<b>1.15</b>
ConvF Z	<b>1.57</b> $\pm 16.6\%$ (k=2)	Depth	<b>1.70</b>

# Deviation from Isotropy in HSL

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



## **Additional Conversion Factors**

**for Dosimetric E-Field Probe**

Type:

**ES3DV2**

Serial Number:

**3022**

Place of Assessment:

**Zurich**

Date of Assessment:

**December 3, 2003**

Probe Calibration Date:

**September 23, 2003**

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

Assessed by:

## Dosimetric E-Field Probe ES3DV2 SN:3022

Conversion factor ( $\pm$  standard deviation)

**1950 MHz**                  ConvF                  **4.7  $\pm$  9.5%**

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

**1950 MHz**                  ConvF                  **4.3  $\pm$  9.5%**

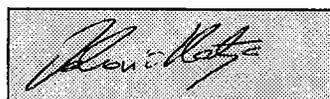
$\epsilon = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$ (body tissue)
---

## Additional Conversion Factors for Dosimetric E-Field Probe

Type:	<b>ES3DV2</b>
Serial Number:	<b>3022</b>
Place of Assessment:	<b>Zurich</b>
Date of Assessment:	<b>October 3, 2003</b>
Probe Calibration Date:	<b>September 23, 2003</b>

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

Assessed by:



## Dosimetric E-Field Probe ES3DV2 SN:3022

Conversion factor ( $\pm$  standard deviation)

150 MHz	ConvF	8.5 $\pm$ 8%	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\%$ mho/m (head tissue)
150 MHz	ConvF	8.0 $\pm$ 8%	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\%$ mho/m (body tissue)
450 MHz	ConvF	7.1 $\pm$ 8%	$\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
450 MHz	ConvF	7.2 $\pm$ 8%	$\epsilon_r = 56.7 \pm 5\%$ $\sigma = 0.94 \pm 5\%$ mho/m (body tissue)

## **Additional Conversion Factors**

**for Dosimetric E-Field Probe**

Type:

**ES3DV2**

Serial Number:

**3022**

Place of Assessment:

**Zurich**

Date of Assessment:

**November 28, 2003**

Probe Calibration Date:

**September 23, 2003**

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

Assessed by:

## Dosimetric E-Field Probe ES3DV2 SN:3022

Conversion factor ( $\pm$  standard deviation)

<b>1600 MHz</b>	ConvF	<b>5.2 <math>\pm</math> 8%</b>	$\square = 40.3 \pm 5\%$ $\square = 1.29 \pm 5\%$ mho/m (head tissue)
<b>1600 MHz</b>	ConvF	<b>4.9 <math>\pm</math> 8%</b>	$\square = 53.8 \pm 5\%$ $\square = 1.40 \pm 5\%$ mho/m (body tissue)

## **Additional Conversion Factors**

**for Dosimetric E-Field Probe**

Type:

**ES3DV2**

Serial Number:

**3022**

Place of Assessment:

**Zurich**

Date of Assessment:

**December 9, 2003**

Probe Calibration Date:

**September 23, 2003**

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

Assessed by:

## **Dosimetric E-Field Probe ES3DV2 SN:3022**

Conversion factor ( $\pm$  standard deviation)

**2140 MHz**                  ConvF                  **4.5  $\pm$  8%**

$\square = 39.8 \pm 5\%$ $\square = 1.49 \pm 5\%$ mho/m (brain tissue)
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## **ATTACHMENT D – DIPOLE VALIDATION**

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# PCTEST ENGINEERING LABORATORY, INC.

**DUT: 300 MHz. Dipole; Type: D300V2; Serial: 301**  
**Program: 300 MHz. Dipole Validation**

Communication System: 300MHz.; Frequency: 300 MHz;Duty Cycle: 1:1  
Medium: 300MHz. Brain ( $\sigma = 0.84$  mho/m,  $\epsilon_r = 45.2$ ,  $\rho = 1300$  kg/m<sup>3</sup>)  
Phantom section: Flat Section

Test Date: 01-20-2004; Ambient Temp: 22.9°C; Tissue Temp: 20.3°C

Probe: ES3DV2 - SN3022; ConvF(8.5, 8.5, 8.5); Calibrated: 9/23/2003  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE3 Sn445; Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1197  
Phantom: SAM 12b; Type: SAM 4.0; Serial: TP:1197  
Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 93

## 300MHz. CW Dipole Validation @ 250mW

**Area Scan (51x111x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Peak SAR (extrapolated) = 3.61 W/kg  
SAR(1 g) = 0.784 mW/g; SAR(10 g) = 0.86 mW/g  
Reference Value = 52.8 V/m

