DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

VERTEX STANDARD CO., LTD.
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Japan

Rule Part(s):	**FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (Edition 01-01)**
Device Classification:	**Licensed Non-Broadcast Transmitter Held to Face (TNF)**
Device Type:	**Portable FM UHF PTT Radio Transceiver**
FCC IDENTIFIER:	**K6610504420**
Model(s):	**VX-417-4-5 / VX-427-4-5**
Modulation:	**FM (UHF)**
Tx Frequency Range:	**450.0 - 490.0 MHz**
Max. RF Output Power Tested:	**5.19 Watts Conducted (450.0 MHz)** **5.45 Watts Conducted (470.0 MHz)** **5.25 Watts Conducted (490.0 MHz)**
Antenna Type(s) Tested:	**Whip**
Battery Type(s) Tested:	**NiCd 7.2 V, 1100mAh, Intrinsically Safe (P/N: FNB-V57IS)** **NiCd 7.2 V, 700mAh (P/N: FNB-64)** **Alkaline 1.5 V AA x6 (Battery Case P/N: FBA-25)** **(1. Duracell Procell 2850 mAh, 2. Energizer E-Squared 3135 mAh)**
Body-Worn Accessories:	**Belt-Clip (P/N: BA0102700112KA), Speaker-Microphone (P/N: MH-45)**
Class II Permissive Change(s):	**1. Add NiCd 7.2V, 1100mAh, Intrinsically Safe Battery (P/N: FNB-V57IS)** **2. Add NiCd 7.2V, 700mAh Battery (P/N: FNB-64)** **3. Add 9V Alkaline Battery Case (P/N: FBA-25)**
Max. SAR Measured:	**4.71 W/kg - Face-held (50% Duty Cycle)** **7.21 W/kg - Body-worn (50% Duty Cycle)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 1 (Provisional) for the Occupational / Controlled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Russell W. Pipe
Senior Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates that the Vertex Standard Co., Ltd. Models: VX-417-4-5 / VX-427-4-5 Portable FM UHF PTT Radio Transceiver FCC ID: K6610504420, with the Class II Permissive Change(s) described, complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada's Safety Code 6 (see reference [2]) for the Occupational / Controlled Exposure environment. The measurement procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]) and IC RSS-102 Issue 1 (Provisional) (see reference [4]), were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

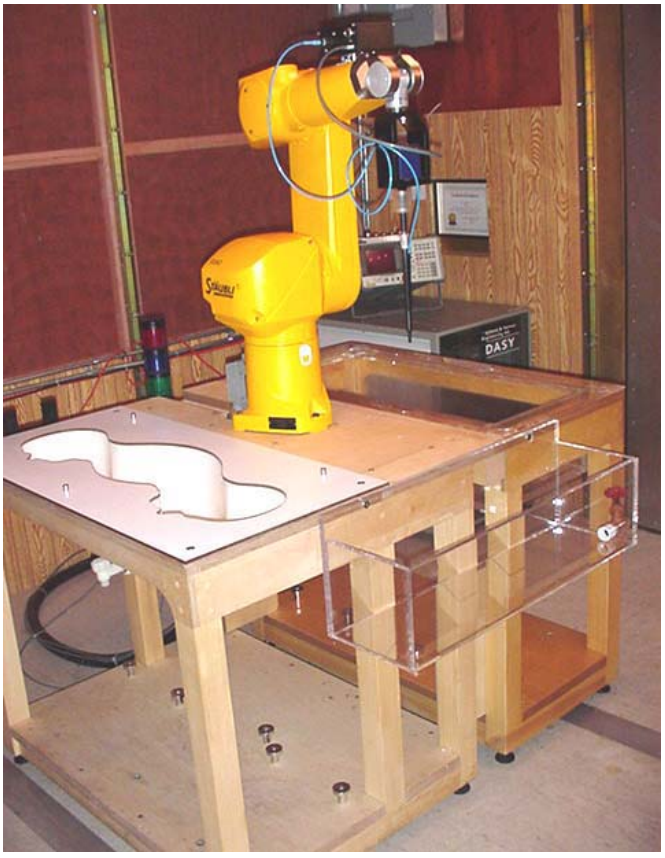
2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

FCC Rule Part(s)	47 CFR §2.1093			
IC Rule Part(s)	RSS-102 Issue 1 (Provisional)			
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)			
Device Type	Portable FM UHF PTT Radio Transceiver			
FCC ID	K6610504420			
Model(s)	VX-417-4-5 / VX-427-4-5			
Serial No.	3M000012 (Identical Prototype)			
Modulation	FM (UHF)			
Tx Frequency Range	450.0 - 490.0 MHz			
Max. RF Output Power Tested	450.0 MHz	5.19 Watts	Conducted	
	470.0 MHz	5.45 Watts	Conducted	
	490.0 MHz	5.25 Watts	Conducted	
Antenna Type(s) Tested	Whip (Length: 151 mm)			
Battery Type(s) Tested	NiCd	7.2V, 700mAh		P/N: FNB-64
	NiCd	7.2V, 1100mAh, Intrinsically Safe		P/N: FNB-V57IS
	Alkaline	1.5 V AA (x6)	Procell 2850 mAh	Battery Case P/N: FBA-25
			Energizer 3135 mAh	
Body-Worn Accessories Tested	Belt-Clip (P/N: BA0102700112KA)			
	Speaker-Microphone (P/N: MH-45)			
Class II Permissive Change(s)	1. Add NiCd 7.2V, 1100mAh, Intrinsically Safe Battery (P/N: FNB-V57IS)			
	2. Add NiCd 7.2V, 700mAh Battery (P/N: FNB-64)			
	3. Add 9V Alkaline Battery Case (P/N: FBA-25)			

3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

DASY4 SAR Measurement System with validation phantom



DASY4 SAR Measurement System with Plexiglas planar phantom

4.0 MEASUREMENT SUMMARY

FACE-HELD SAR EVALUATION RESULTS

Freq (MHz)	Chan.	Test Mode	Measured Conducted RF Output Power			Battery Type	Separation Distance to Planar Phantom (cm)	Measured SAR 1g (W/kg)		SAR Drift (dB)	Scaled SAR 1g (W/kg)	
								Duty Cycle			Duty Cycle	
			Before (Watts)	After (Watts)	Drift (dB)			100%	50%		100%	50%
470.0	Mid	CW	5.39	4.86	-0.53	NiCd 700 mAh	2.5	7.30	3.65	-0.599	8.38	4.19
450.0	Low	CW	5.18	4.49	-0.69	NiCd 700 mAh	2.5	7.40	3.70	-0.784	8.86	4.43
490.0	High	CW	5.25	4.33	-0.92	NiCd 700 mAh	2.5	6.73	3.37	-0.801	8.09	4.05
470.0	Mid	CW	5.44	4.74	-0.70	NiCd 1100 mAh IS	2.5	6.97	3.49	-0.709	8.21	4.10
450.0	Low	CW	5.17	4.41	-0.76	NiCd 1100 mAh IS	2.5	7.68	3.84	-0.887	9.42	4.71
490.0	High	CW	5.23	4.30	-0.93	NiCd 1100 mAh IS	2.5	6.83	3.42	-0.884	8.37	4.19
470.0	Mid	CW	5.32	4.56	-0.76	Duracell Alkaline	2.5	5.56	2.78	-1.36	7.60	3.80

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
Spatial Peak - Controlled Exposure / Occupational
BRAIN: 8.0 W/kg (averaged over 1 gram)

Test Date	02/17/04		Ambient Temperature	25.0 °C
Measured Fluid Type	450 MHz Brain		Fluid Temperature	21.0 °C
Dielectric Constant ε_r	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	43.5 (± 5%)	42.5	Relative Humidity	30%
Conductivity σ (mho/m)	IEEE Target	Measured	Atmospheric Pressure	108.8 KPa
	0.87 (± 5%)	0.84	ρ (Kg/m^3)	1000

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the SAR measurements performed at the mid channel were ≥ 3dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]).
3. The DUT was evaluated for SAR with NiCd batteries and Duracell Procell alkaline batteries. To show a SAR comparison between alternate alkaline battery types, an additional evaluation was performed for the highest SAR level configuration (body-worn, low channel) using Energizer E-Squared batteries (see test data table next page).
4. The power drifts measured by the DASY system over the duration of the SAR evaluations were >5%. The drifts were subsequently added to the measured SAR levels to report scaled SAR results as shown in the above table.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR EVALUATION RESULTS

Freq (MHz)	Chan.	Test Mode	Measured Conducted RF Output Power			Battery Type	Body-Worn Accessory	Separation Distance to Planar Phantom (cm)	Measured SAR 1g (W/kg)		SAR Drift (dB)	Scaled SAR 1g (W/kg)	
									Duty Cycle			Duty Cycle	
			Before (Watts)	After (Watts)	Drift (dB)				100%	50%		100%	50%
470.0	Mid	CW	5.37	4.82	-0.55	NiCd 700 mAh	Belt-Clip Speaker-Mic	1.3	10.2	5.10	-0.637	11.8	5.91
450.0	Low	CW	5.19	4.63	-0.56	NiCd 700 mAh	Belt-Clip Speaker-Mic	1.3	12.1	6.05	-0.642	14.0	7.01
490.0	High	CW	5.19	4.32	-0.87	NiCd 700 mAh	Belt-Clip Speaker-Mic	1.3	11.6	5.80	-0.798	13.9	6.97
470.0	Mid	CW	5.45	4.78	-0.67	NiCd IS 1100 mAh	Belt-Clip Speaker-Mic	1.3	10.2	5.10	-0.626	11.8	5.90
450.0	Low	CW	5.19	4.42	-0.77	NiCd IS 1100 mAh	Belt-Clip Speaker-Mic	1.3	12.5	6.25	-0.621	14.4	7.21
490.0	High	CW	5.20	4.31	-0.89	NiCd IS 1100 mAh	Belt-Clip Speaker-Mic	1.3	11.4	5.70	-0.844	13.8	6.92
470.0	Mid	CW	5.30	4.47	-0.83	Duracell Alkaline	Belt-Clip Speaker-Mic	1.3	8.34	4.17	-1.23	11.1	5.55
450.0	Low	CW	5.15	4.45	-0.70	Duracell Alkaline	Belt-Clip Speaker-Mic	1.3	9.84	4.92	-1.25	13.1	6.56
490.0	High	CW	5.18	4.26	-0.92	Duracell Alkaline	Belt-Clip Speaker-Mic	1.3	8.69	4.35	-1.33	11.8	5.90
470.0	Low	CW	5.14	4.58	-0.56	Energizer Alkaline	Belt-Clip Speaker-Mic	1.3	8.81	4.41	-1.28	11.8	5.91

ANSI / IEEE C95.1 1992 - SAFETY LIMIT
Spatial Peak - Controlled Exposure / Occupational
BODY: 8.0 W/kg (averaged over 1 gram)

Test Date	02/18/04		**Ambient Temperature**	25.2 °C
Measured Fluid Type	450 MHz Body		**Fluid Temperature**	22.2 °C
Dielectric Constant ε_r	**IEEE Target**	**Measured**	**Fluid Depth**	≥ 15 cm
	56.7 (± 5%)	57.3	**Relative Humidity**	31%
Conductivity σ **(mho/m)**	**IEEE Target**	**Measured**	**Atmospheric Pressure**	108.2 kPa
	0.94 (± 5%)	0.92	**ρ (Kg/m^3)**	1000

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the SAR measurements performed at the mid channel were ≥ 3dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]).
3. The DUT was evaluated for SAR with NiCd batteries and Duracell Procell alkaline batteries. To show a SAR comparison between alternate alkaline battery types, an additional evaluation was performed for the highest SAR level configuration (body-worn, low channel) using Energizer E-Squared batteries (see above data table).
4. The power drifts measured by the DASY system over the duration of the SAR evaluations were >5%. The drifts were subsequently added to the measured SAR levels to report scaled SAR results as shown in the above table.
5. SAR versus Time drift evaluations were performed for the duration of the area scan measurement in the test configurations that produced the highest SAR level for each battery type tested. A SAR versus Time drift evaluation was also performed using external power connected to the DUT for the highest SAR level configuration. See Appendix A (SAR Test Plots) for SAR versus Time drift evaluation plots.
6. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures listed were consistent for all measurement periods.
7. The dielectric parameters of the simulated tissue mixture were measured prior to the evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).

5.0 DETAILS OF SAR EVALUATION

The Vertex Standard Co., Ltd. Models: VX-417-4-5 / VX-427-4-5 Portable FM UHF PTT Radio Transceiver FCC ID: K6610504420, with the Class II Permissive Change(s) described in this report, were found to be compliant for localized Specific Absorption Rate (Occupational/Controlled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix F.

1. The DUT was evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm separation distance was maintained between the front side of the DUT and the outer surface of the planar phantom for the duration of the tests.
2. The DUT was evaluated in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached belt-clip was touching the planar phantom and provided a 1.3 cm separation distance between the back of the DUT and the outer surface of the planar phantom. The DUT was tested for body-worn SAR with the speaker-microphone accessory connected.
3. The conducted power levels were measured before and after each test using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046.
4. The power drifts measured by the DASY system during the SAR evaluations were >5%. The drifts were subsequently added to the measured SAR levels to report scaled SAR results as shown in test data table (pages 5 & 6).
5. SAR versus time drift evaluations were performed for the duration of the area scan in the test configurations that produced the highest SAR level for each battery type tested. A SAR versus Time drift evaluation was also performed using external power connected to the DUT for the highest SAR level configuration. The SAR versus time drift evaluation plots are shown in Appendix A (SAR Test Plots).
6. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down to room temperature and the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
7. The DUT was evaluated for SAR with fully charged NiCd battery packs and Duracell Procell alkaline batteries. To show a SAR comparison between alternate alkaline battery types, an additional evaluation was performed for the highest SAR level configuration (body-worn, low channel) using Energizer E-Squared batteries (see test data table, page 6).
8. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
9. The SAR evaluations were performed using a Plexiglas planar phantom.
10. A stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.

6.0 EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away form the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix D). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed using a Plexiglas planar phantom with a 450MHz dipole (see Appendix C for system validation procedure). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of ±10% (see Appendix B for system performance check test plot).

SYSTEM PERFORMANCE CHECK

Test Date	450MHz Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant ε_r		Conductivity σ (mho/m)		ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
02/17/04	Brain	1.23 (±10%)	1.27 (+3.3%)	43.5 ±5%	42.5	0.87 ±5%	0.84	1000	24.0	21.0	≥ 15	30	108.8
02/18/04	Brain	1.23 (±10%)	1.19 (-3.2%)	43.5 ±5%	42.1	0.87 ±5%	0.83	1000	24.5	22.7	≥ 15	31	108.2

Note(s):
1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.

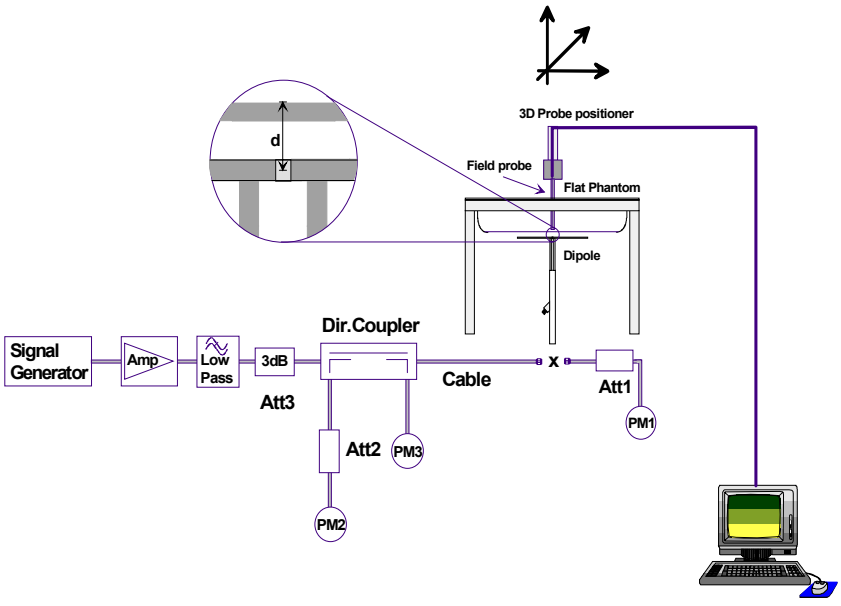


Figure 1. System Performance Check Setup Diagram

450MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 450MHz brain and body simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures, and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURES		
INGREDIENT	**450MHz Brain (System Check & DUT Evaluation)**	**450MHz Body (DUT Evaluation)**
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.50 %
Bactericide	0.19 %	0.10 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)	4.0	20.0

Notes:
1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

POSITIONER:	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability:	0.02 mm
No. of axis:	6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor:	AMD Athlon XP 2400+
Clock Speed:	2.0 GHz
Operating System:	Windows XP Professional

Data Converter

Features:	Signal Amplifier, multiplexer, A/D converter, and control logic
Software:	DASY4 software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock

DASY4 Measurement Server

Function:	Real-time data evaluation for field measurements and surface detection
Hardware:	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections:	COM1, COM2, DAE, Robot, Ethernet, Service Interface

E-Field Probe

Model:	ET3DV6
Serial No.:	1590
Construction:	Triangular core fiber optic detection system
Frequency:	10 MHz to 6 GHz
Linearity:	±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Evaluation Phantom

Type:	Planar Phantom
Shell Material:	Plexiglas
Bottom Thickness:	2.0 mm ± 0.1 mm
Outer Dimensions:	75.0 cm (L) x 22.5 cm (W) x 20.5 cm (H); Back Plane: 25.7 cm (H)

Validation Phantom (≤ 450MHz)

Type:	Planar Phantom
Shell Material:	Plexiglas
Bottom Thickness:	6.2 mm ± 0.1 mm
Outer Dimensions:	86.0 cm (L) x 39.5 cm (W) x 21.8 cm (H)

11.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detection:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of mobile phone

ET3DV6 E-Field Probe

12.0 PLANAR PHANTOM

The planar phantom is constructed of Plexiglas material with a 2.0 mm shell thickness for face-held and body-worn SAR evaluations of handheld radio transceivers. The planar phantom is mounted on the side of the DASY4 system table.

Plexiglas Planar Phantom

13.0 VALIDATION PLANAR PHANTOM

The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at 450MHz and below. The validation planar phantom is mounted in the table of the DASY4 compact system.

Validation Planar Phantom

14.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Holder

15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	SERIAL NO.	CALIBRATION DATE
Schmid & Partner DASY4 System	-	-
DASY4 Measurement Server	1078	N/A
-Robot	599396-01	N/A
-ET3DV6 E-Field Probe	1590	May 2003
-300MHz Validation Dipole	135	Oct 2003
-450MHz Validation Dipole	136	Nov 2003
-900MHz Validation Dipole	054	June 2003
-1800MHz Validation Dipole	247	June 2003
-2450MHz Validation Dipole	150	Sept 2003
-Planar Phantom	161	N/A
-Validation Planar Phantom	137	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2003
Gigatronics 8652A Power Meter	1835267	April 2003
Power Sensor 80701A	1833542	April 2003
Power Sensor 80701A	1834350	April 2003
HP E4408B Spectrum Analyzer	US39240170	Dec 2003
HP 8594E Spectrum Analyzer	3543A02721	April 2003
HP 8753E Network Analyzer	US38433013	May 2003
HP 8648D Signal Generator	3847A00611	May 2003
Amplifier Research 5S1G4 Power Amplifier	26235	N/A

16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 13.3**	
Expanded Uncertainty (k=2)					**± 26.6**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION

Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty ±% (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input Power	± 4.7	Rectangular	√3	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 9.9**	
Expanded Uncertainty (k=2)					**± 19.8**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

17.0 REFERENCES

[1] Federal Communications Commission, “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093: 1999.

[2] Health Canada, “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6.

[3] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[4] Industry Canada, “Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada’s Safety Code 6 for Exposure of Humans to Radio Frequency Fields”, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

[5] IEEE Std 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”.

APPENDIX A - SAR MEASUREMENT DATA

Face-Held SAR - NiCd 700mAh Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

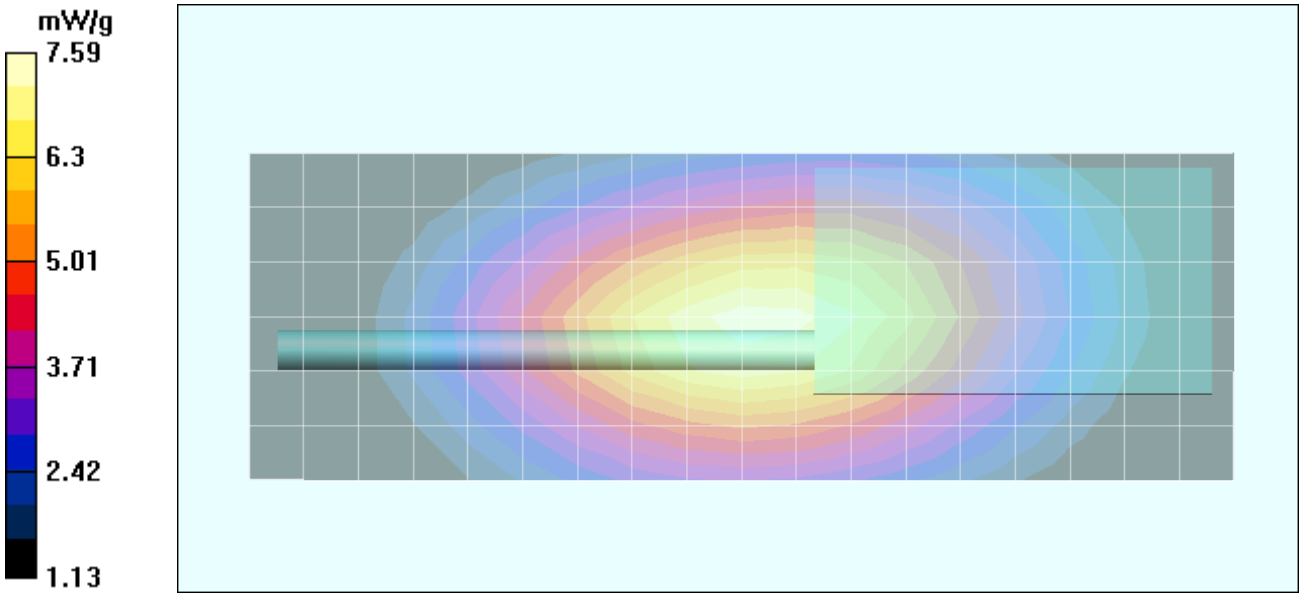
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.39 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 11.1 W/kg
SAR(1 g) = 7.30 mW/g; SAR(10 g) = 5.26 mW/g
Reference Value = 94.8 V/m
Power Drift = -0.599 dB



Face-Held SAR - NiCd 700mAh Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

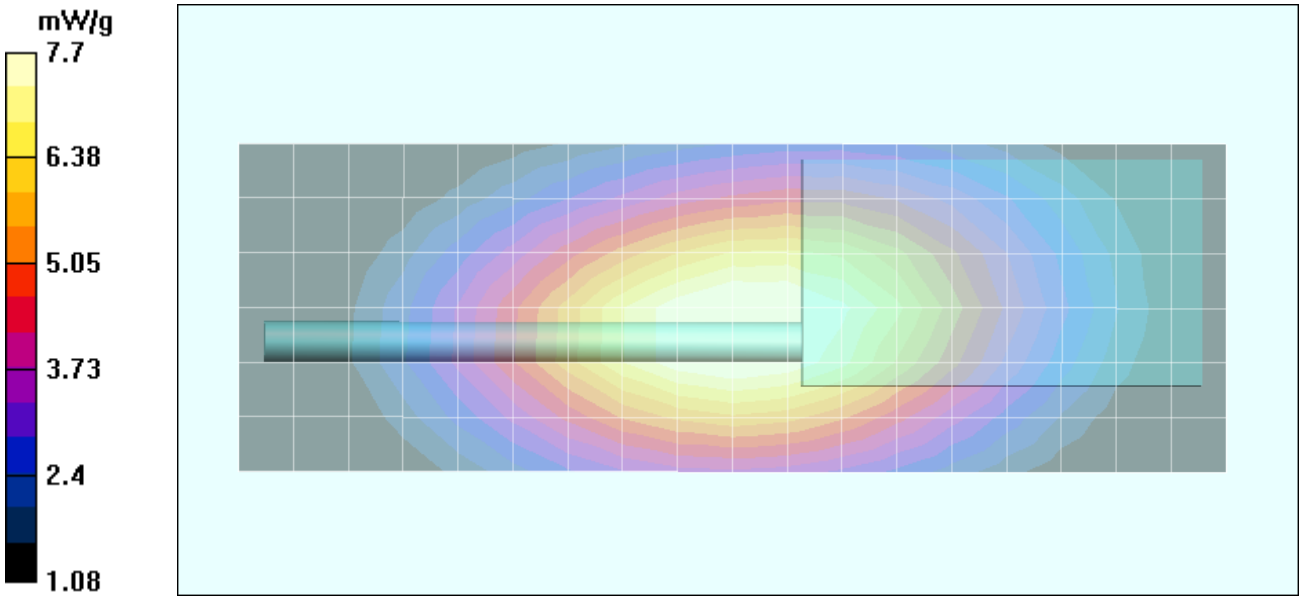
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.18 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 11.3 W/kg
SAR(1 g) = 7.40 mW/g; SAR(10 g) = 5.33 mW/g
Reference Value = 97.4 V/m
Power Drift = -0.784 dB



Face-Held SAR - NiCd 700mAh Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

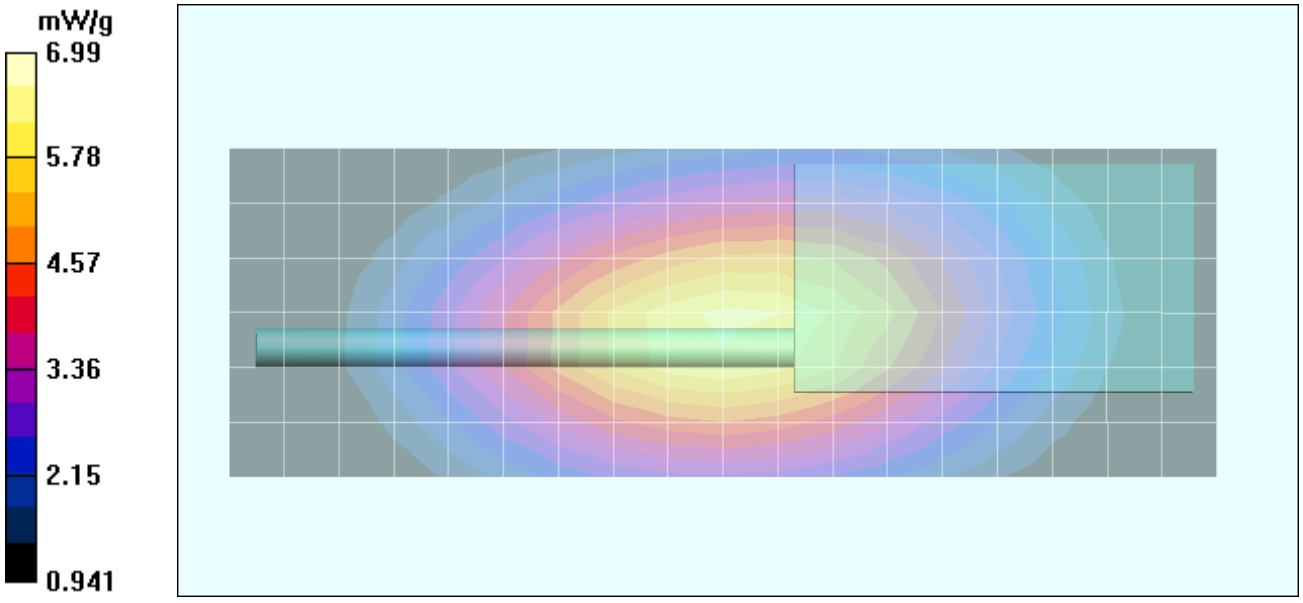
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 490 MHz; Duty Cycle: 1:1
RF Output Power: 5.25 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - High Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - High Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 10.3 W/kg
SAR(1 g) = 6.73 mW/g; SAR(10 g) = 4.82 mW/g
Reference Value = 92.5 V/m
Power Drift = -0.801 dB



Face-Held SAR - NiCd 1100mAh Intrinsically Safe Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

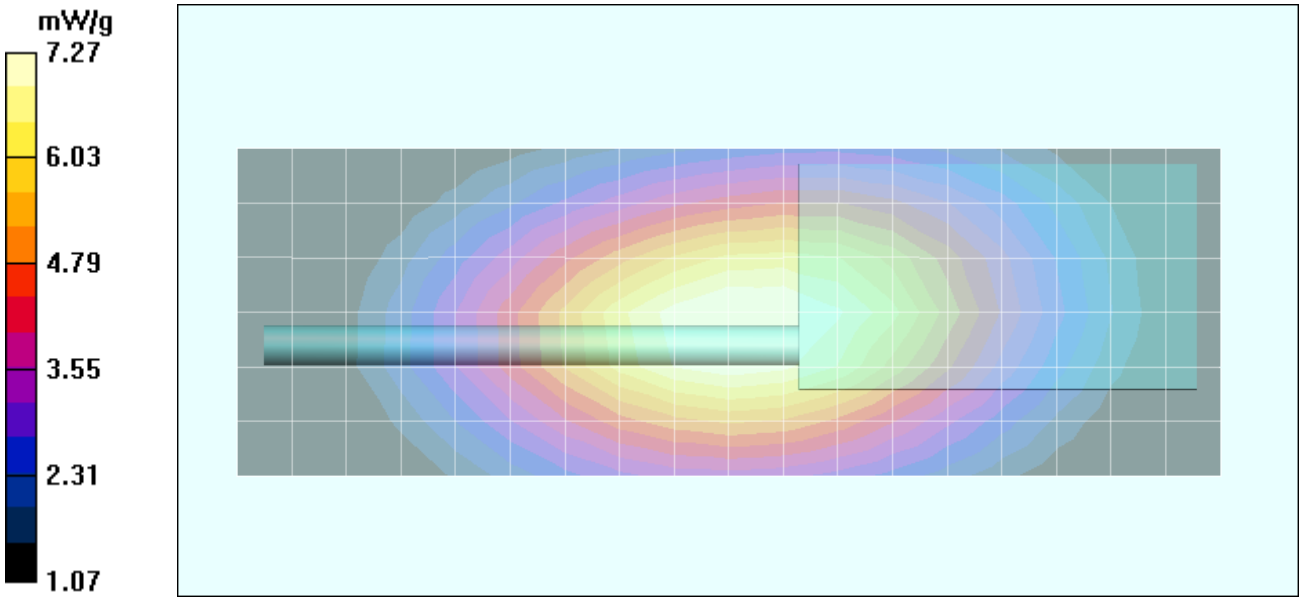
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.44 Watts (Conducted)
7.2V 1100mAh NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 10.7 W/kg
SAR(1 g) = 6.97 mW/g; SAR(10 g) = 5.01 mW/g
Reference Value = 93.4 V/m
Power Drift = -0.709 dB



Face-Held SAR - NiCd 1100mAh Intrinsically Safe Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

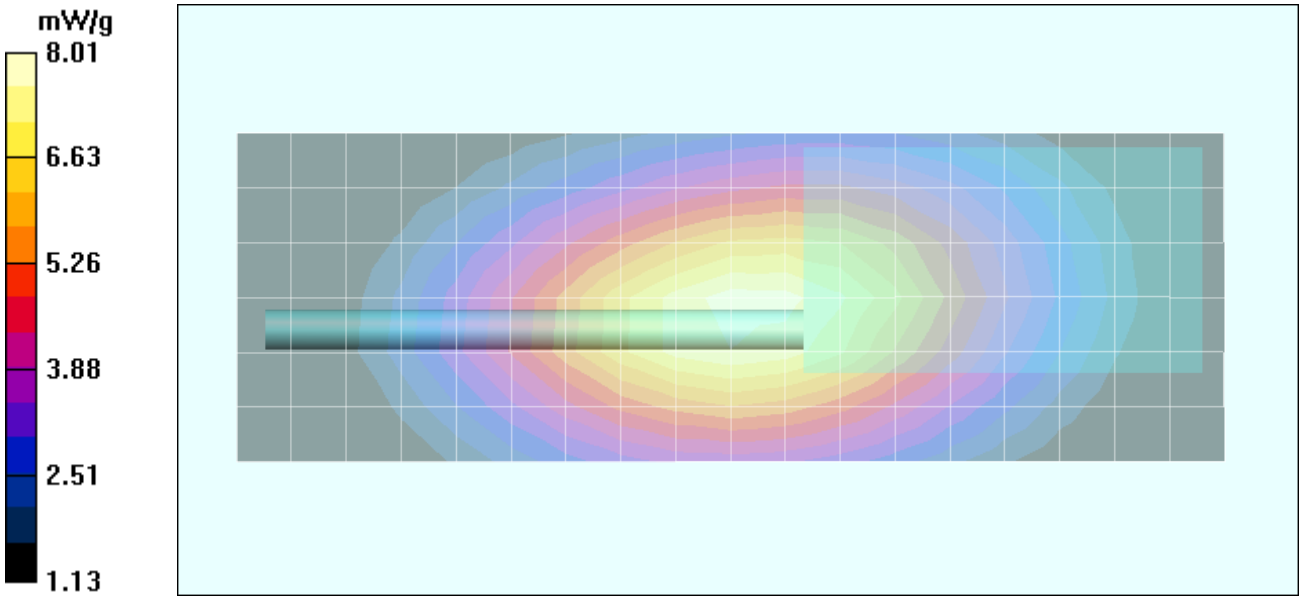
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.17 Watts (Conducted)
7.2V 1100mAh NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

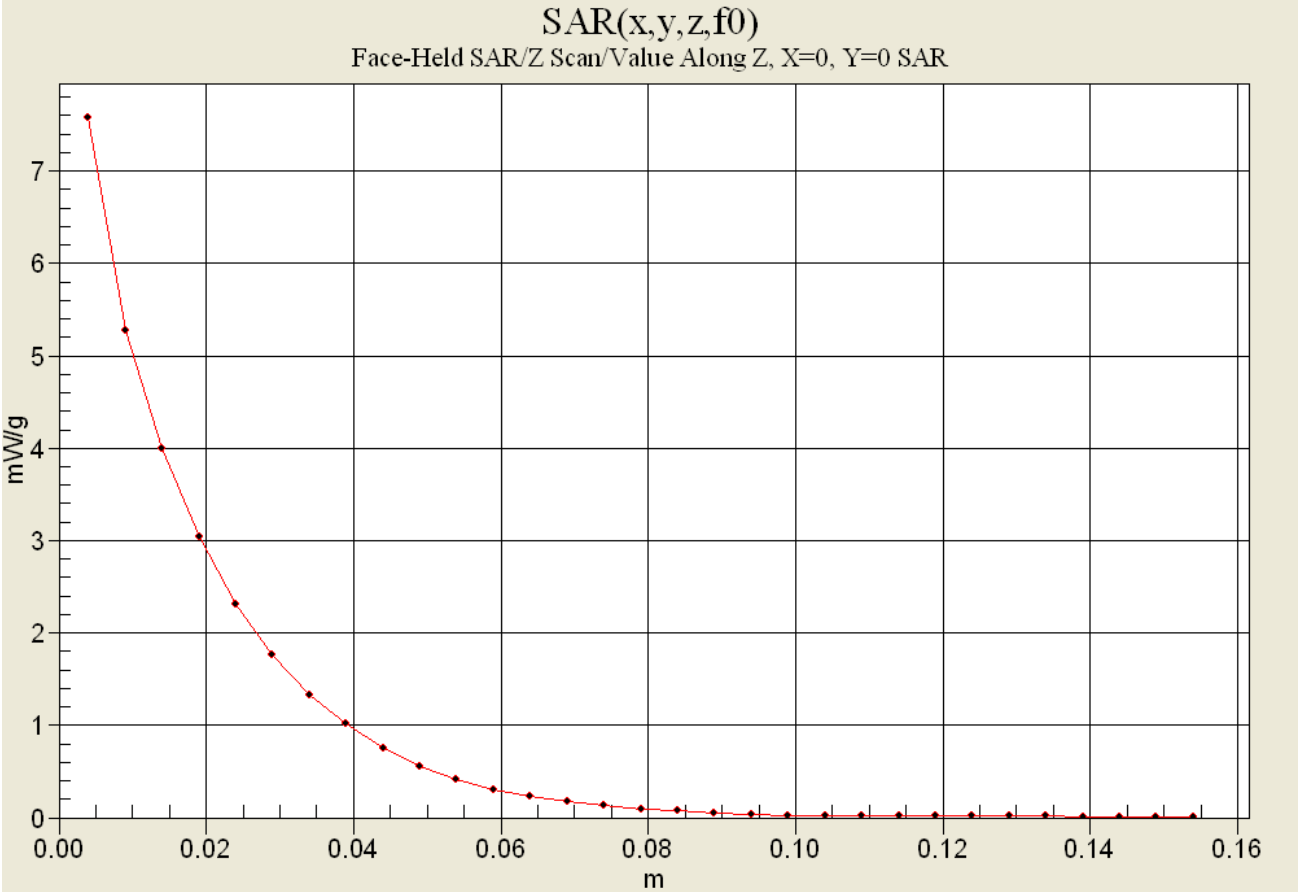
- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 11.8 W/kg
SAR(1 g) = 7.68 mW/g; SAR(10 g) = 5.52 mW/g
Reference Value = 100.1 V/m
Power Drift = -0.887 dB



Z-Axis Scan


SAR(x,y,z,f0)
Face-Held SAR/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0
1
2
3
4
5
6
7
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Face-Held SAR - NiCd 1100mAh Intrinsically Safe Battery

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

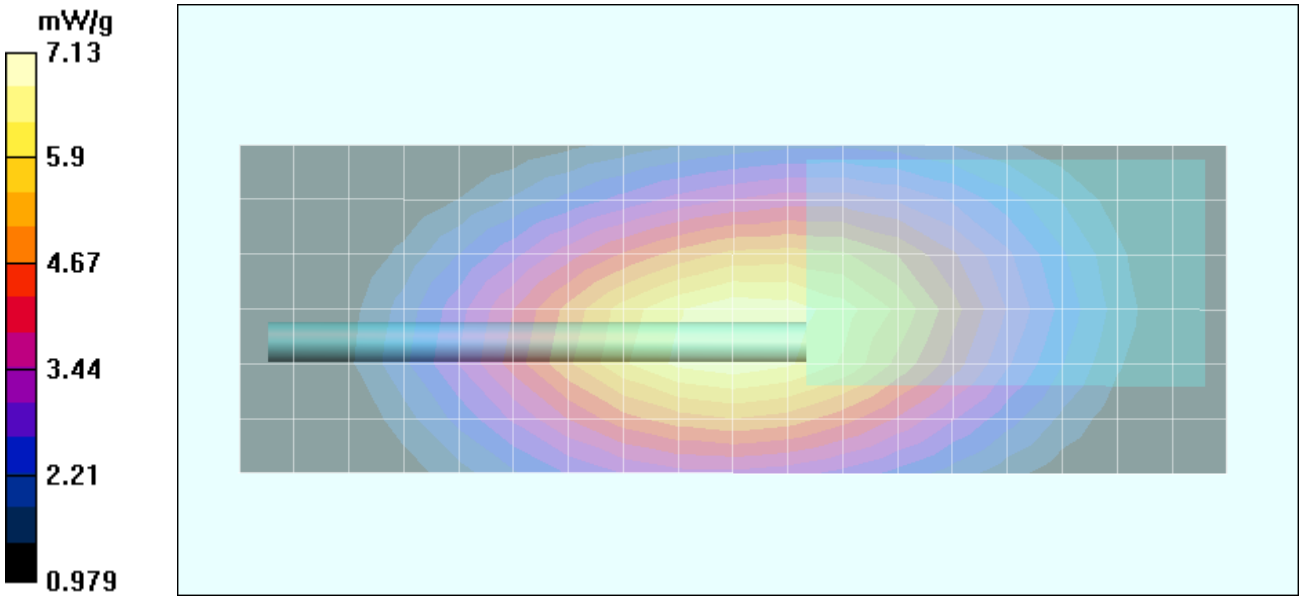
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 490 MHz; Duty Cycle: 1:1
RF Output Power: 5.23 Watts (Conducted)
7.2V 1100mAH NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - High Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - High Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 10.4 W/kg
SAR(1 g) = 6.83 mW/g; SAR(10 g) = 4.85 mW/g
Reference Value = 86.9 V/m
Power Drift = -0.884 dB



Face-Held SAR - Alkaline 2850mAh Battery (Duracell ProCell)

Date Tested: 02/17/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

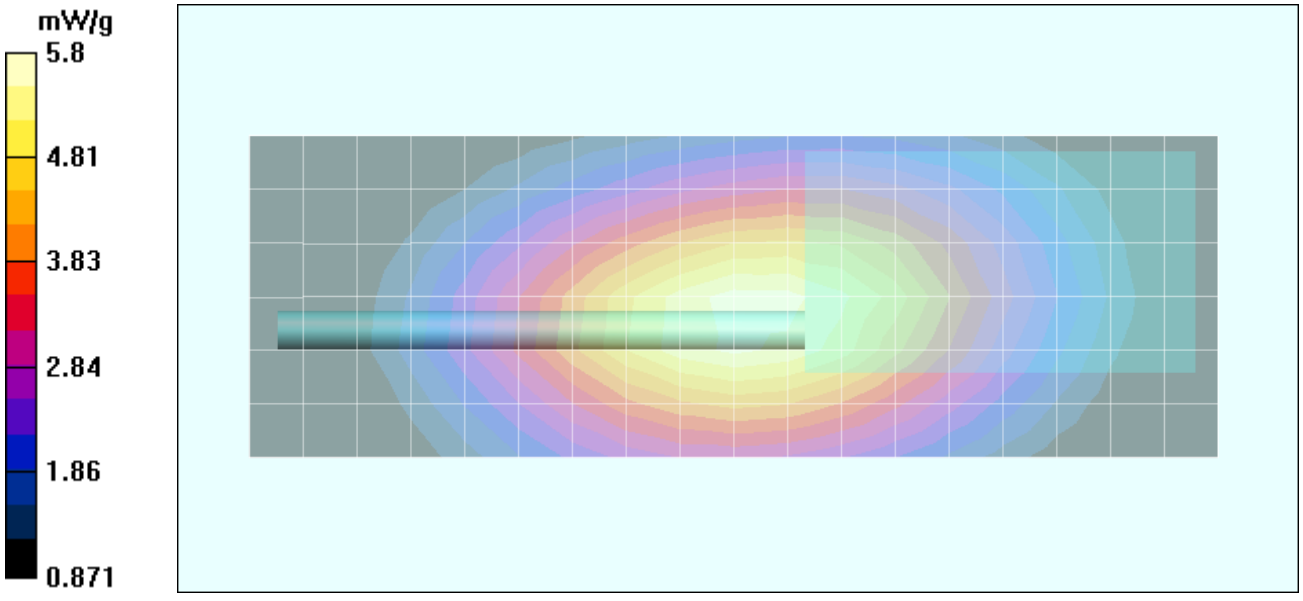
Ambient Temp: 25.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.32 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5 cm Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 8.53 W/kg
SAR(1 g) = 5.56 mW/g; SAR(10 g) = 4.01 mW/g
Reference Value = 89.1 V/m
Power Drift = -1.36 dB



Body-Worn SAR - NiCd 700mAh Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

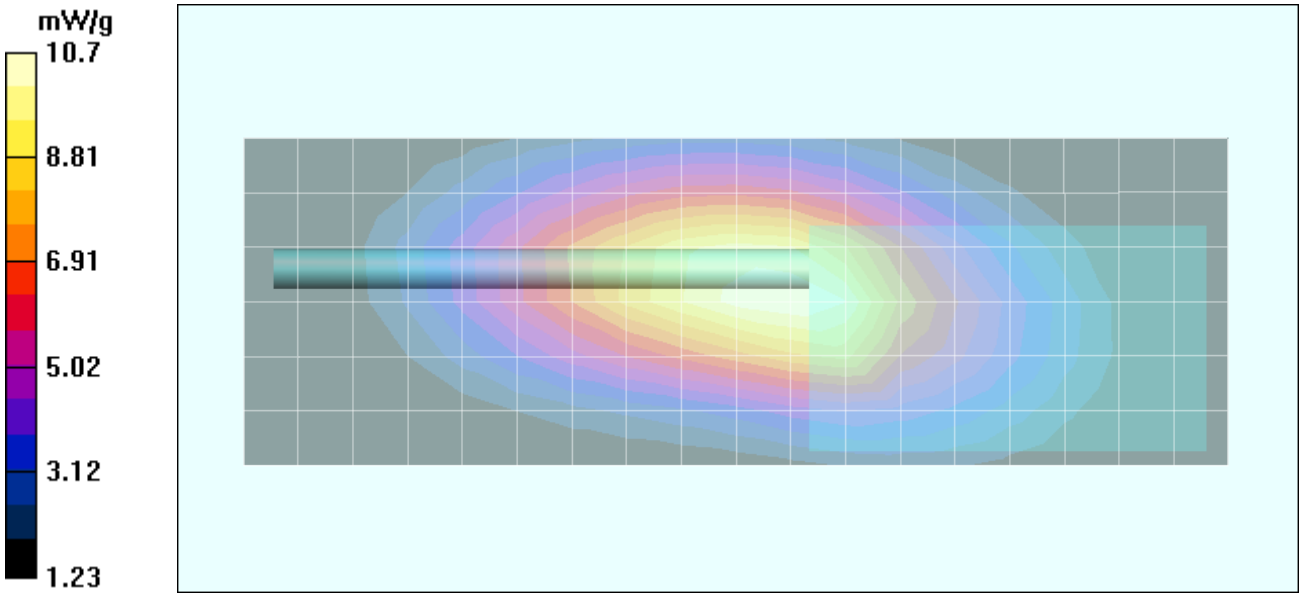
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.37 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 7.2 mW/g
Reference Value = 103.9 V/m
Power Drift = -0.637 dB



Body-Worn SAR - NiCd 700mAh Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

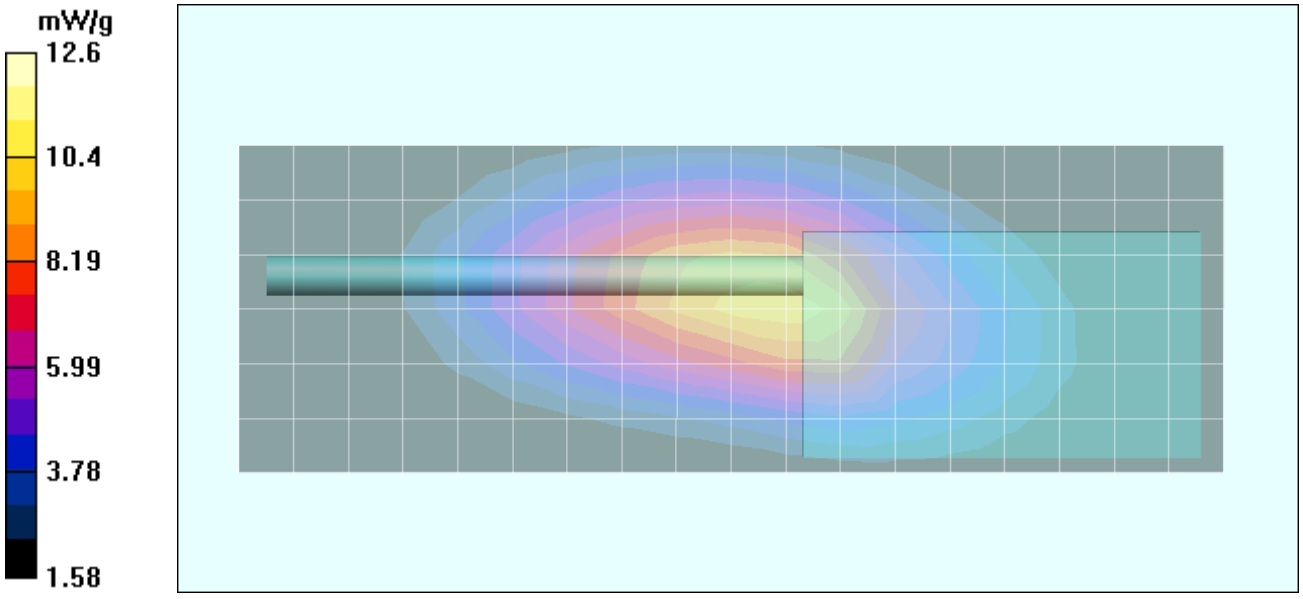
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.19 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

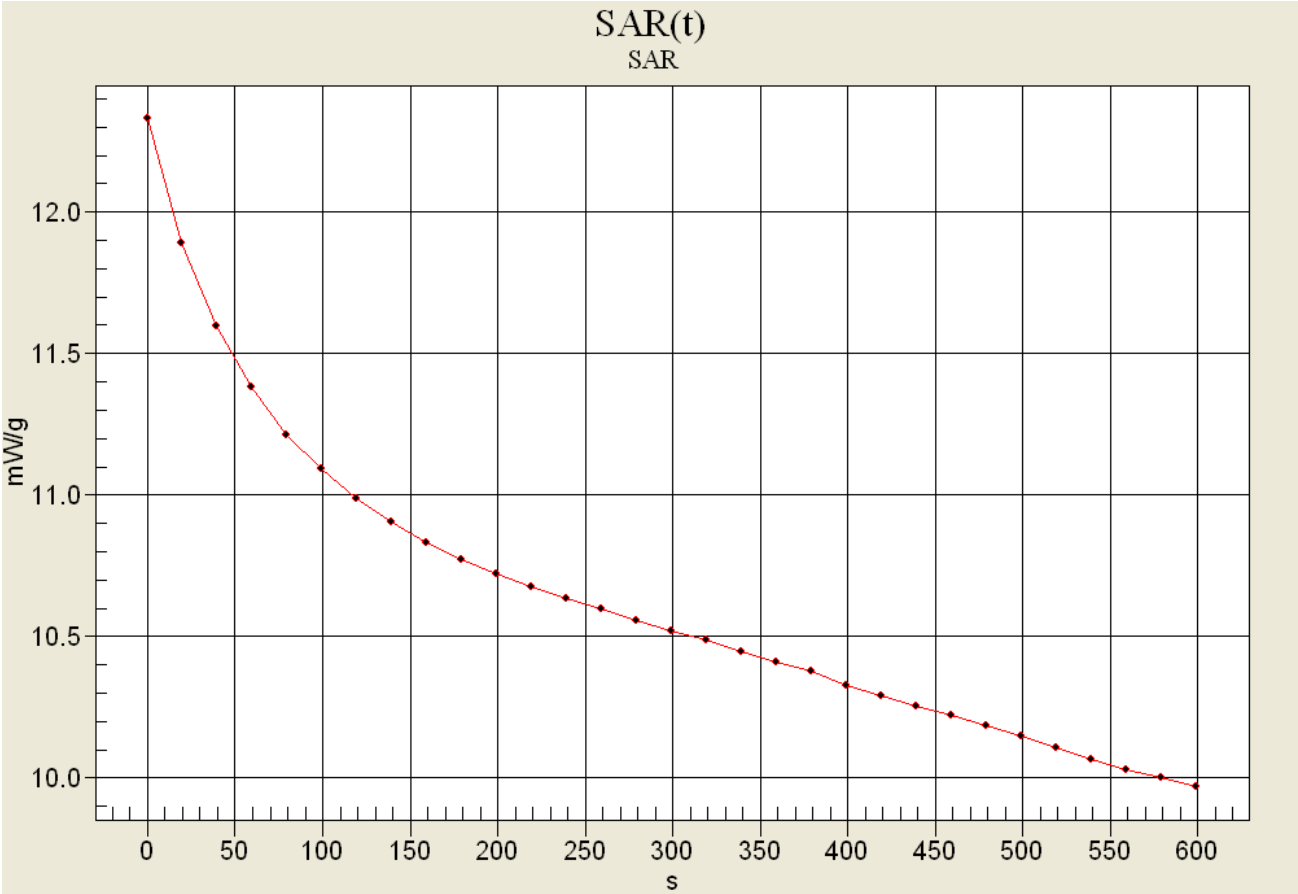
- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 12.1 mW/g; SAR(10 g) = 8.56 mW/g
Reference Value = 114.9 V/m
Power Drift = -0.642 dB



SAR versus Time Drift - 10 Minutes - NiCd 700mAh Battery



Initial: 12.337 mW/g
6:40: 10.339 mW/g (-0.767 dB)
Final: 9.981 mW/g (-0.920 dB)

Body-Worn SAR - NiCd 700mAh Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

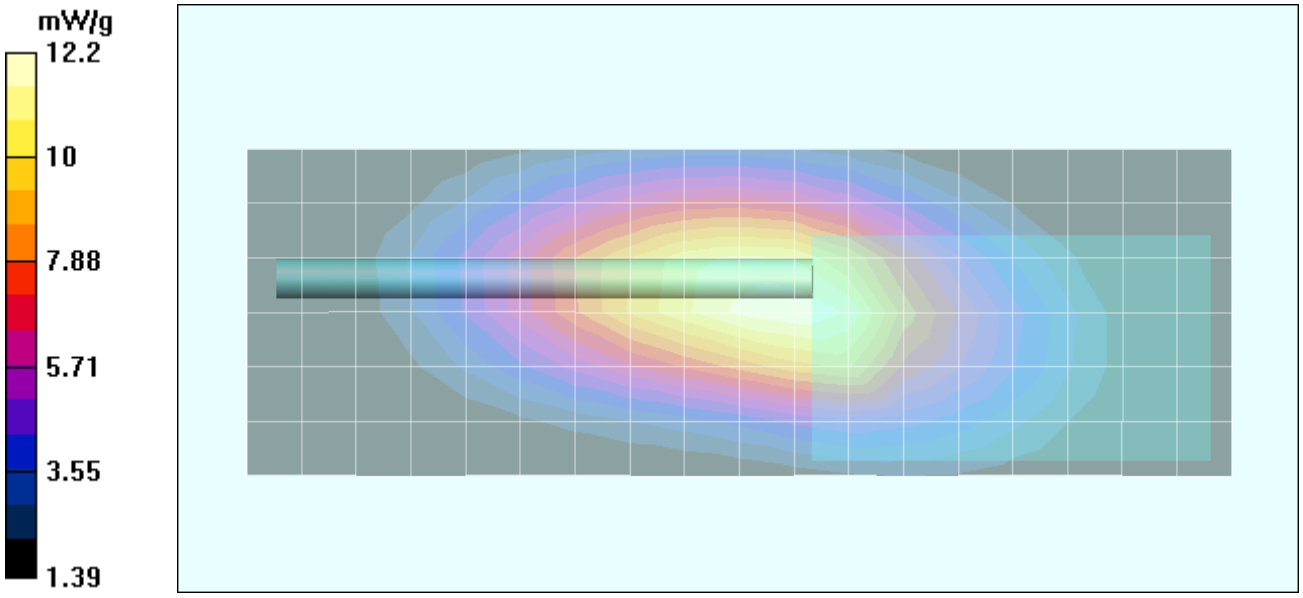
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 490 MHz; Duty Cycle: 1:1
RF Output Power: 5.19 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 11.6 mW/g; SAR(10 g) = 8.17 mW/g
Reference Value = 113.8 V/m
Power Drift = -0.798 dB



Body-Worn SAR - NiCd 1100mAh Intrinsically Safe Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

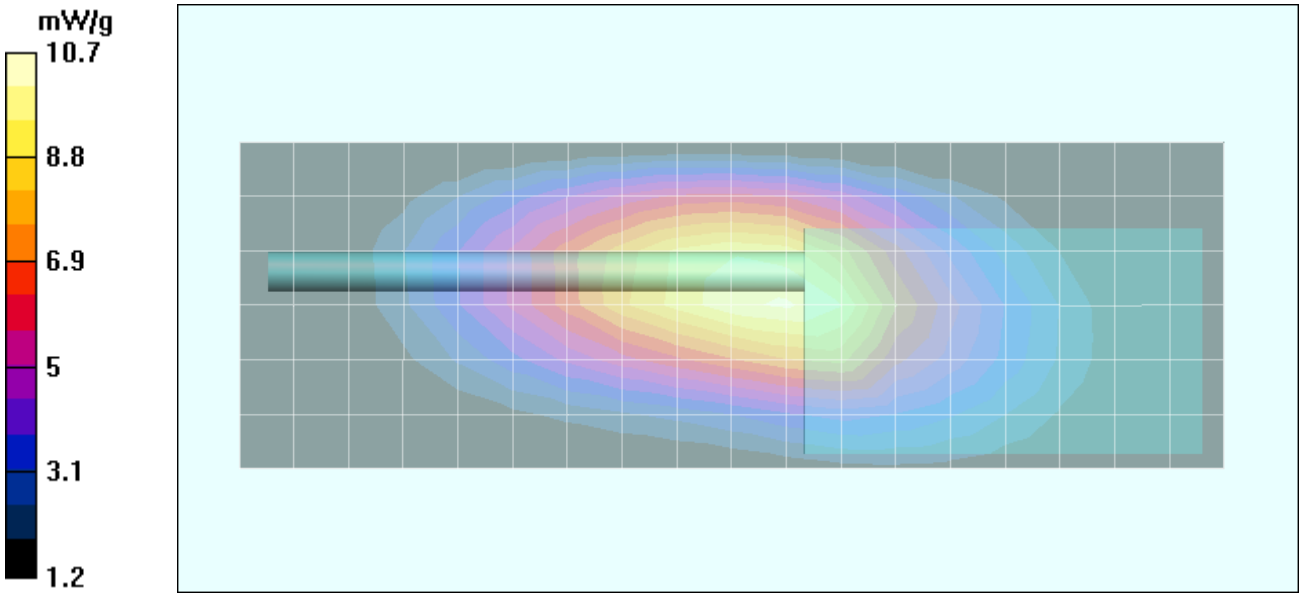
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.45 Watts (Conducted)
7.2V 1100mAH NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 15.7 W/kg
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 7.29 mW/g
Reference Value = 107.2 V/m
Power Drift = -0.626 dB



Body-Worn SAR - NiCd 1100mAh Intrinsically Safe Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

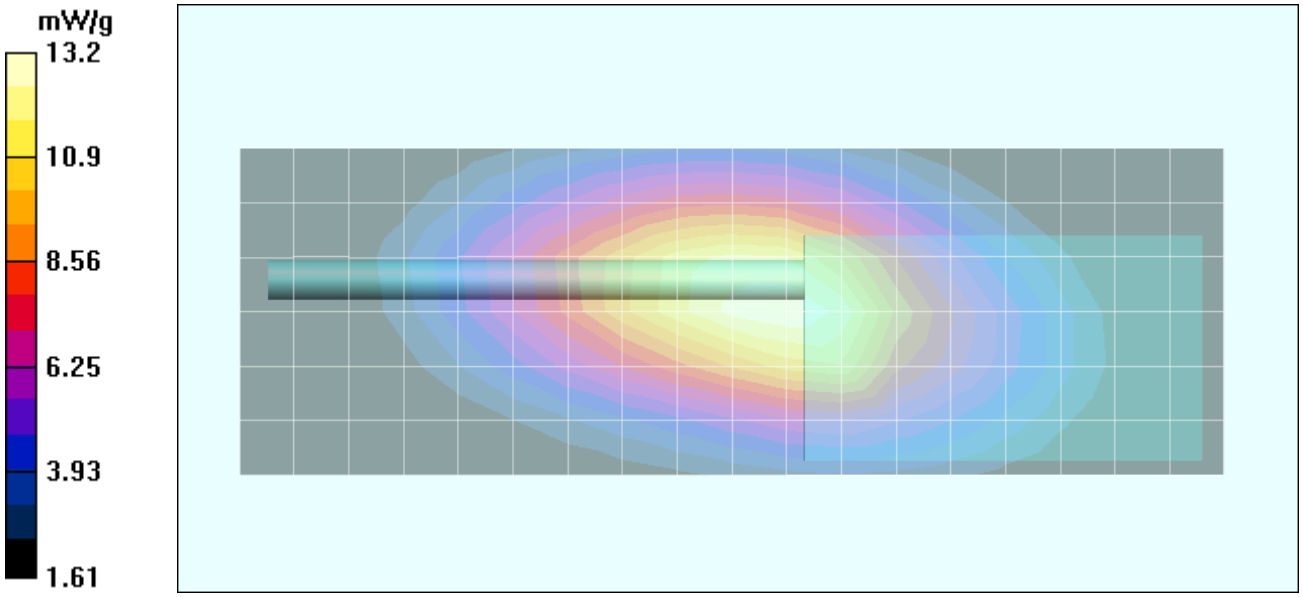
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.19 Watts (Conducted)
7.2V 1100mAH NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

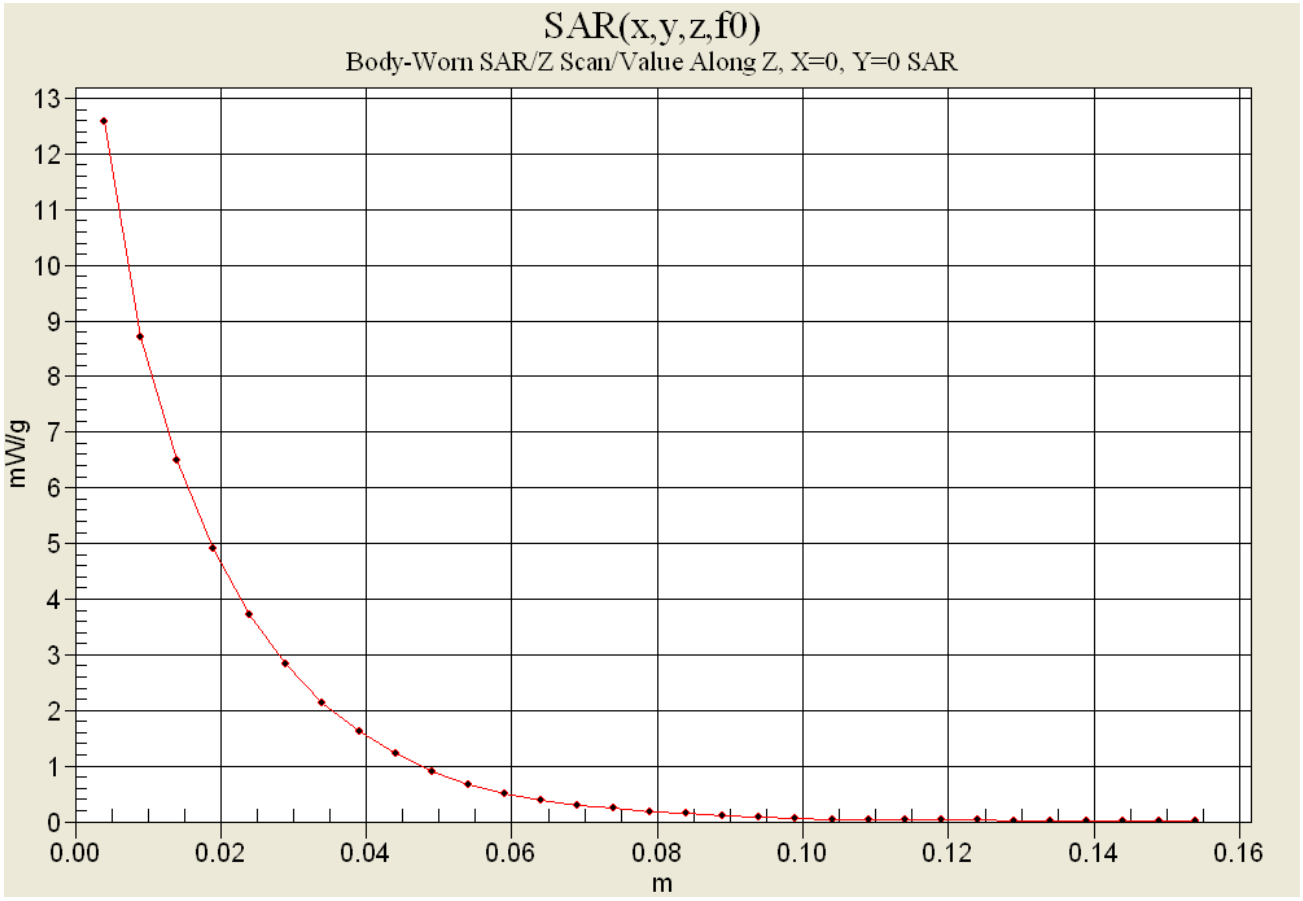
- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

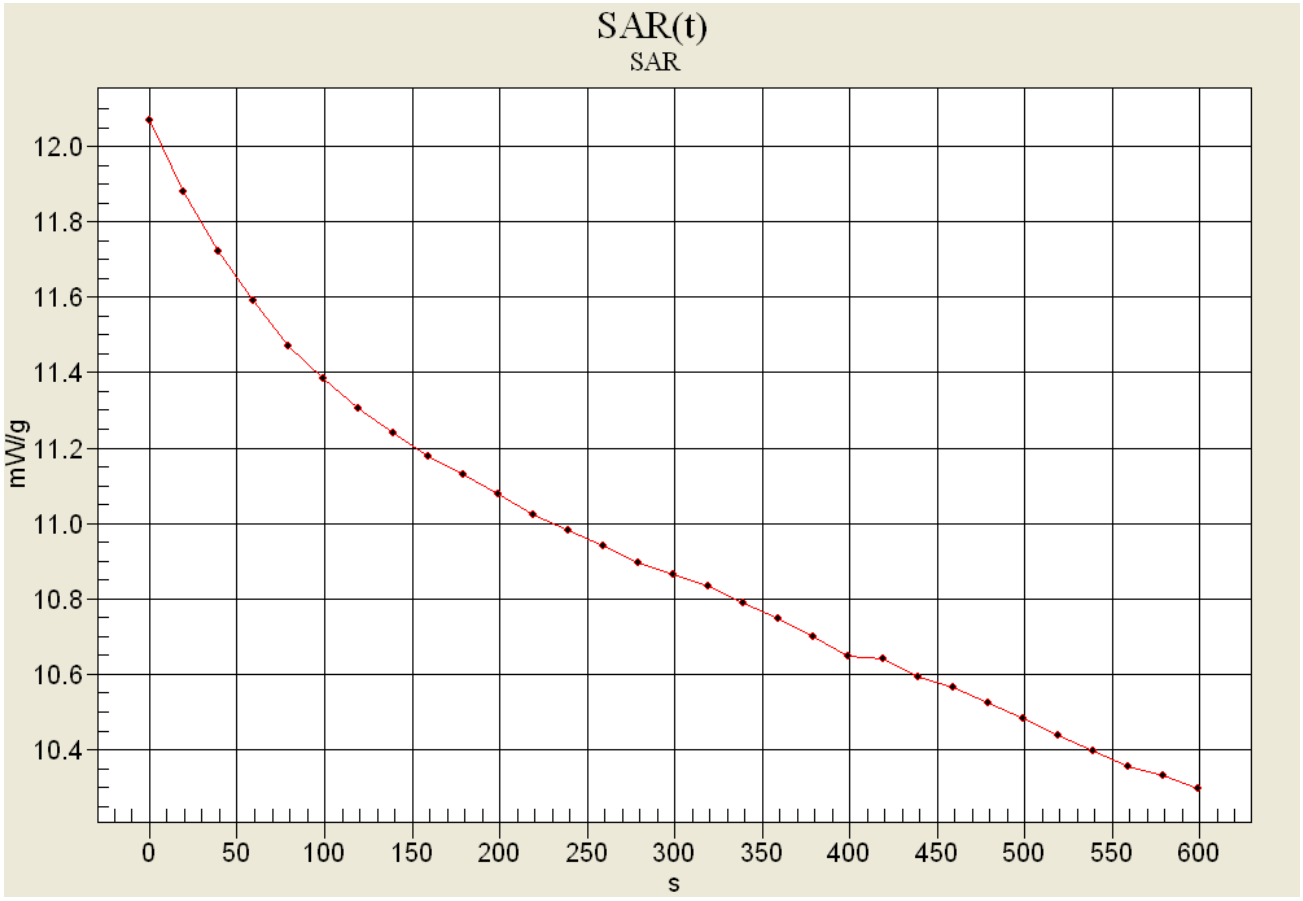
Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 12.5 mW/g; SAR(10 g) = 8.91 mW/g
Reference Value = 118.9 V/m
Power Drift = -0.621 dB



Z-Axis Scan - NiCd 1100mAh Intrinsically Safe Battery

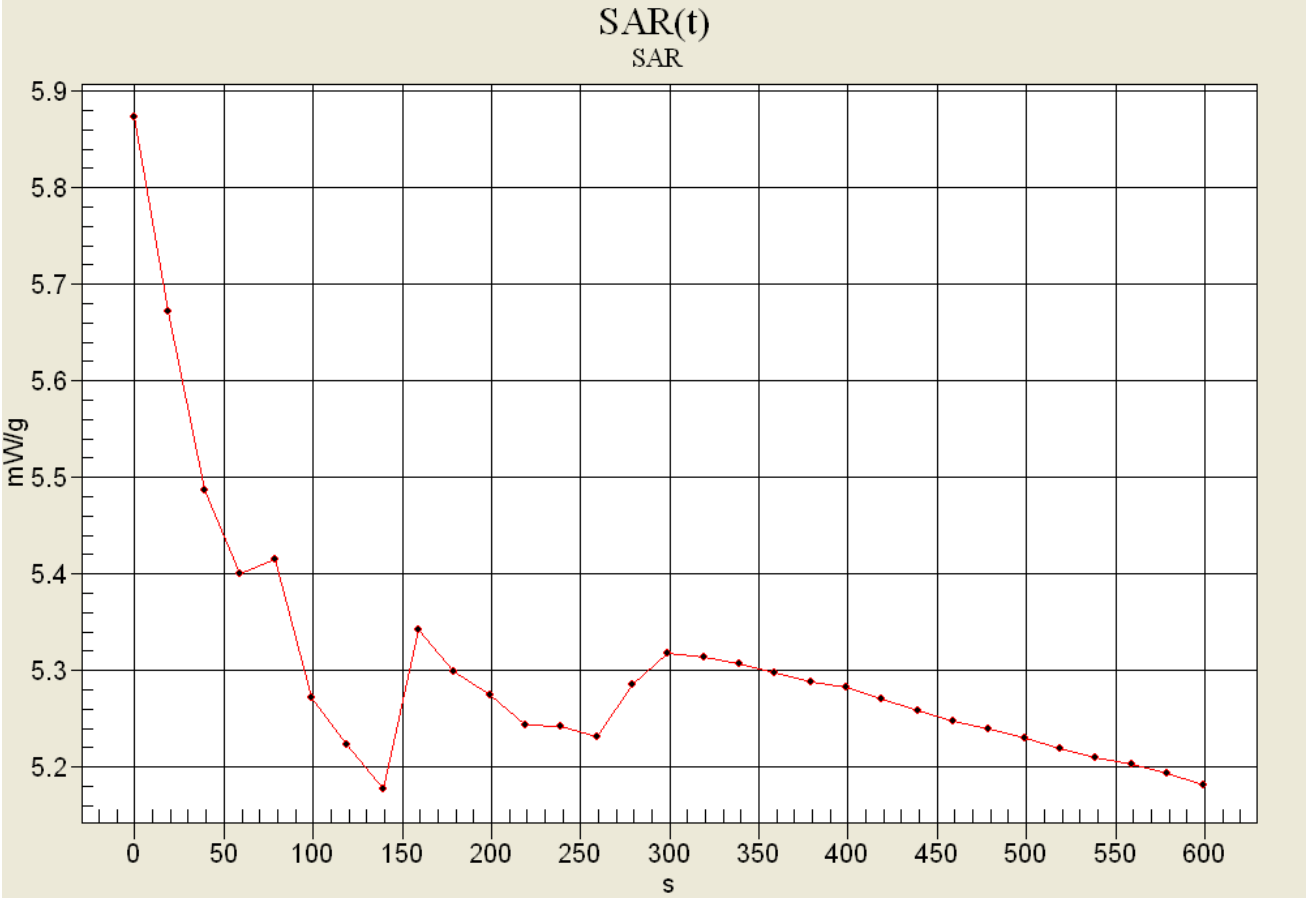


SAR versus Time - 10 Minutes - NiCd 1100mAh Intrinsically Safe Battery



Initial: 12.073 mW/g
6:40: 10.653 mW/g (-0.543 dB)
Final: 10.306 mW/g (-0.687 dB)

SAR versus Time - 10 Minutes - External Power



Initial: 5.87 mW/g
6:40: 5.28 mW/g (-0.460 dB)
Final: 5.18 mW/g (-0.543 dB)

Body-Worn SAR - NiCd 1100mAh Intrinsically Safe Battery

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

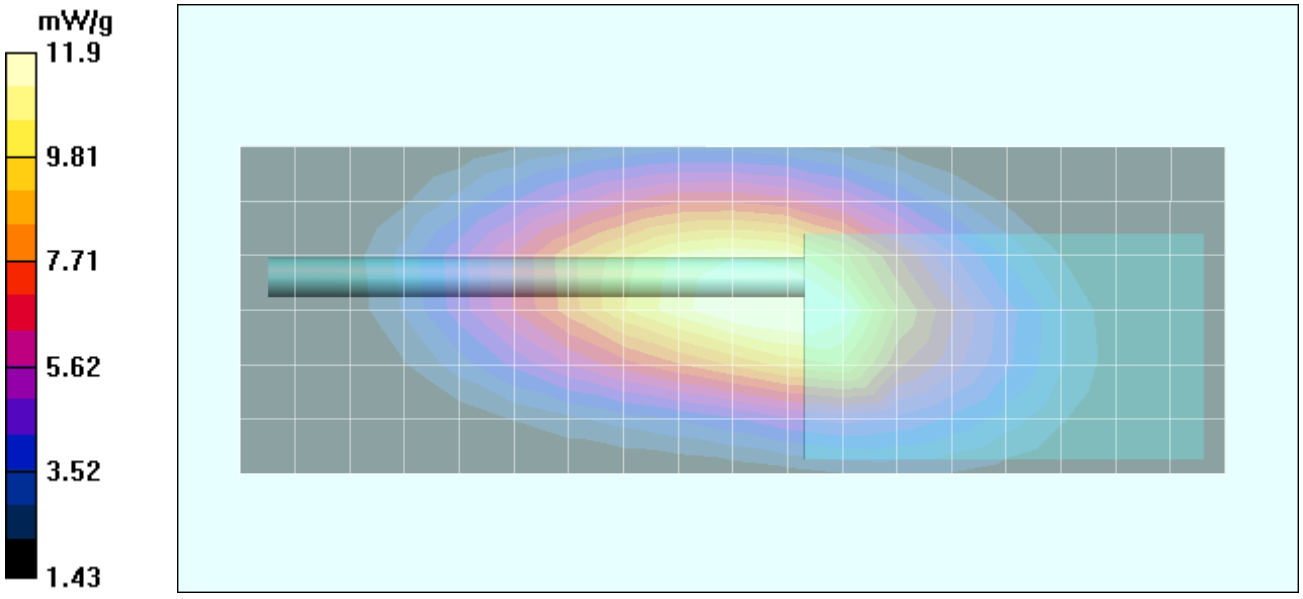
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 490 MHz; Duty Cycle: 1:1
RF Output Power: 5.20 Watts (Conducted)
7.2V 1100mAH NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 11.4 mW/g; SAR(10 g) = 8.05 mW/g
Reference Value = 122.6 V/m
Power Drift = -0.844 dB



Body-Worn SAR - Alkaline 2850mAh Battery (Duracell ProCell)

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

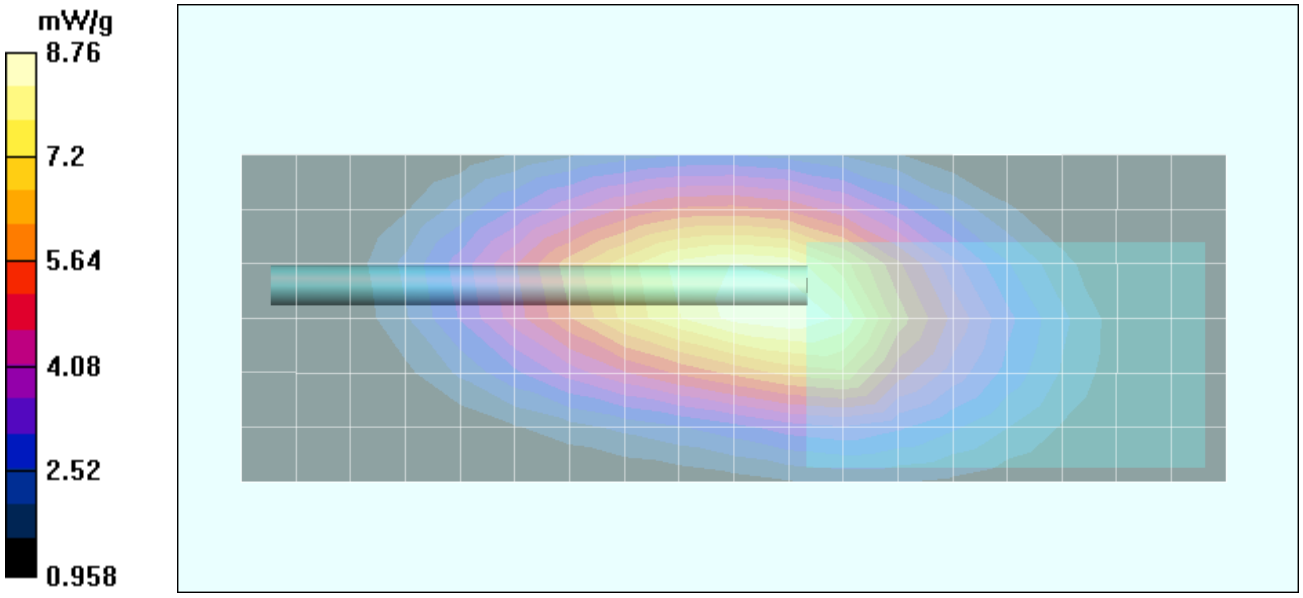
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 470 MHz; Duty Cycle: 1:1
RF Output Power: 5.30 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 12.9 W/kg
SAR(1 g) = 8.34 mW/g; SAR(10 g) = 5.91 mW/g
Reference Value = 98.7 V/m
Power Drift = -1.23 dB



Body-Worn SAR - Alkaline 2850mAh Battery (Duracell ProCell)

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

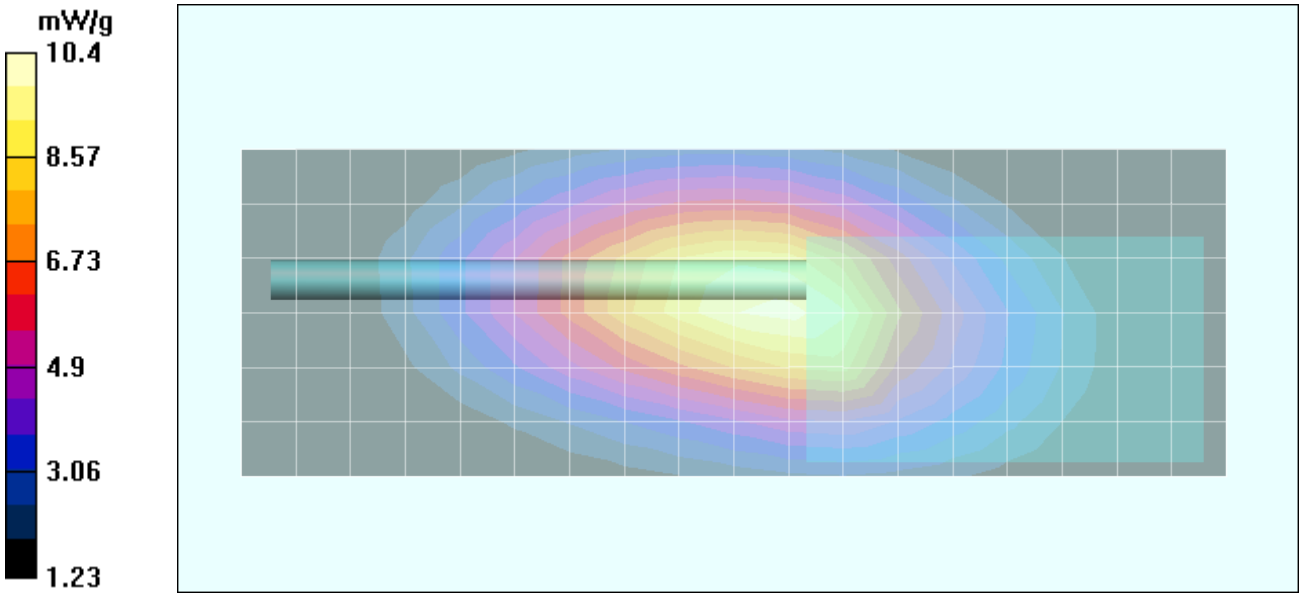
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.15 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

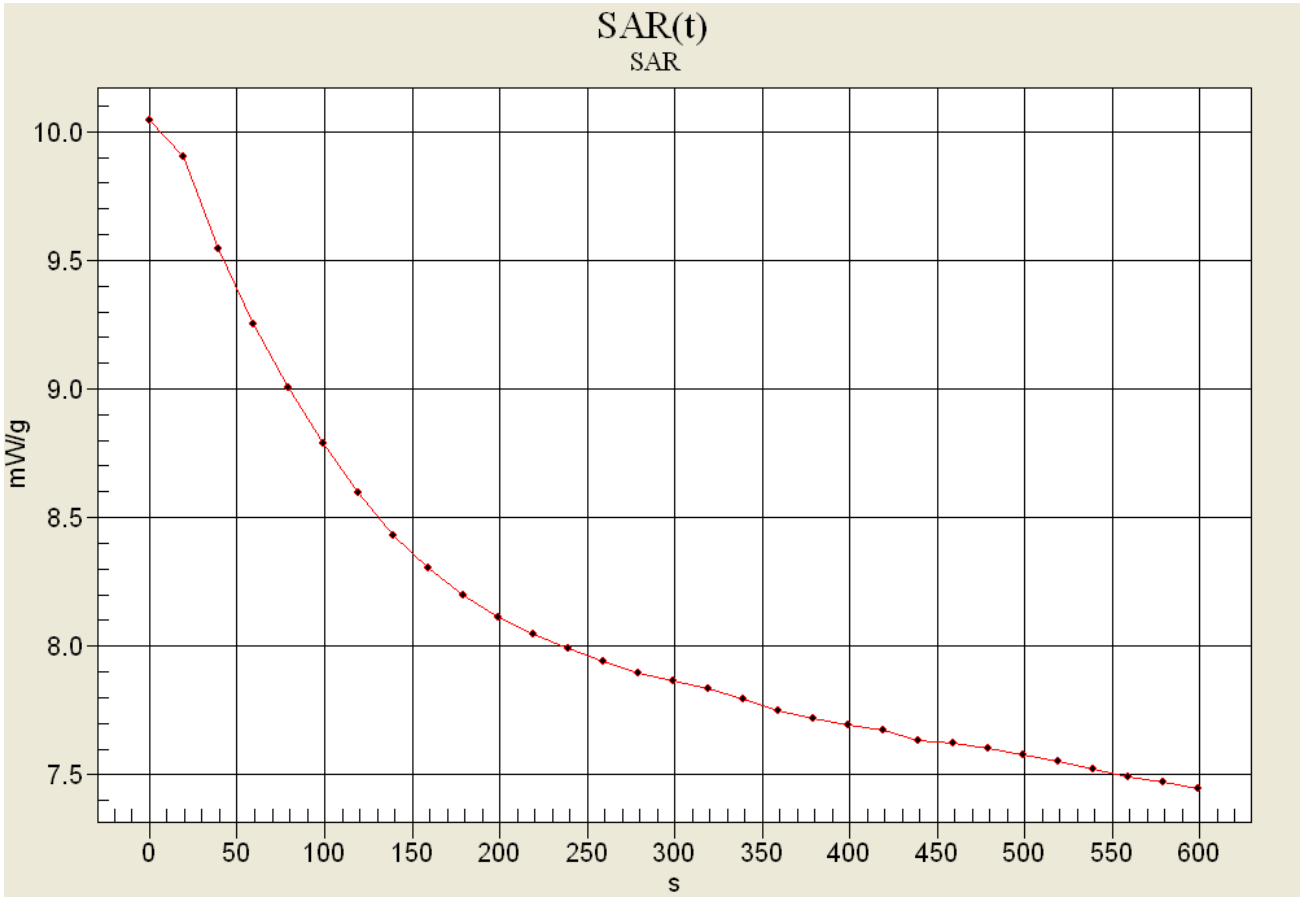
- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 15.1 W/kg
SAR(1 g) = 9.84 mW/g; SAR(10 g) = 7.04 mW/g
Reference Value = 110.8 V/m
Power Drift = -1.25 dB



SAR versus Time - 10 Minutes - Alkaline 2850mAh Battery (Duracell Procell)



Initial: 10.050 mW/g
6:40: 7.699 mW/g (-1.16 dB)
Final: 7.459 mW/g (-1.29 dB)

Body-Worn SAR - Alkaline 2850mAh Battery (Duracell ProCell)

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

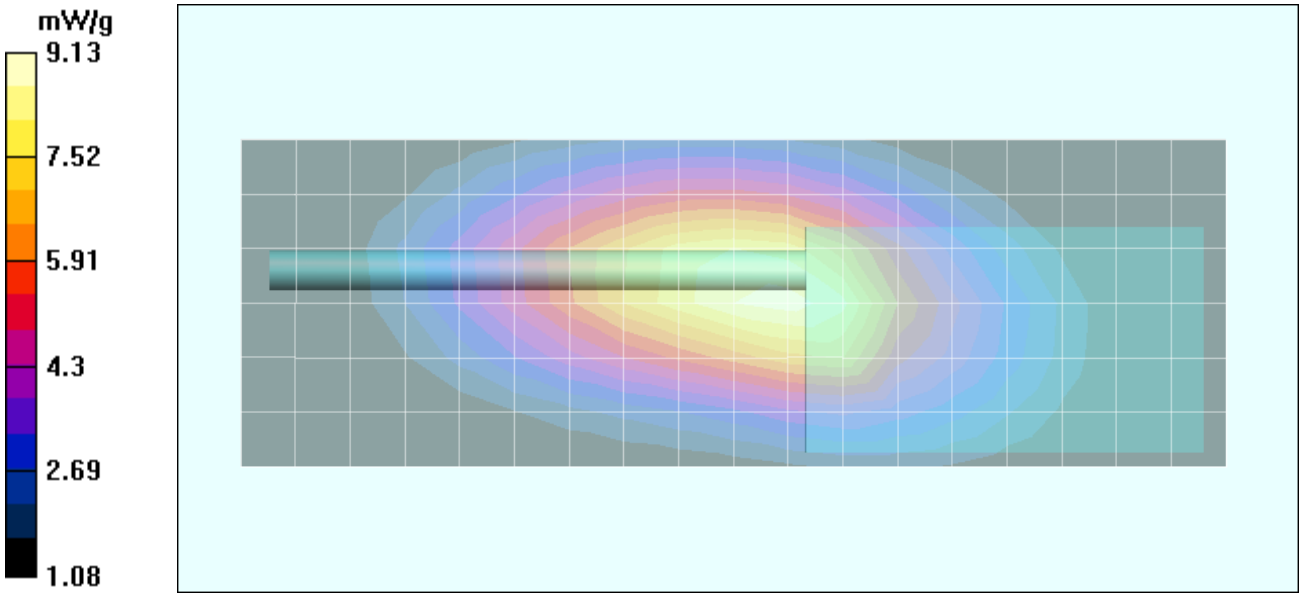
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 490 MHz; Duty Cycle: 1:1
RF Output Power: 5.18 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 13.6 W/kg
SAR(1 g) = 8.69 mW/g; SAR(10 g) = 6.16 mW/g
Reference Value = 104.2 V/m
Power Drift = -1.33 dB



Body-Worn SAR - Alkaline 3135mAh Battery (Energizer E-Squared)

Dated Tested: 02/18/04

DUT: Vertex Standard Model: VX-427-4-5; Type: Portable FM UHF PTT Radio Transceiver; Serial: 3M000012

Ambient Temp: 25.2 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

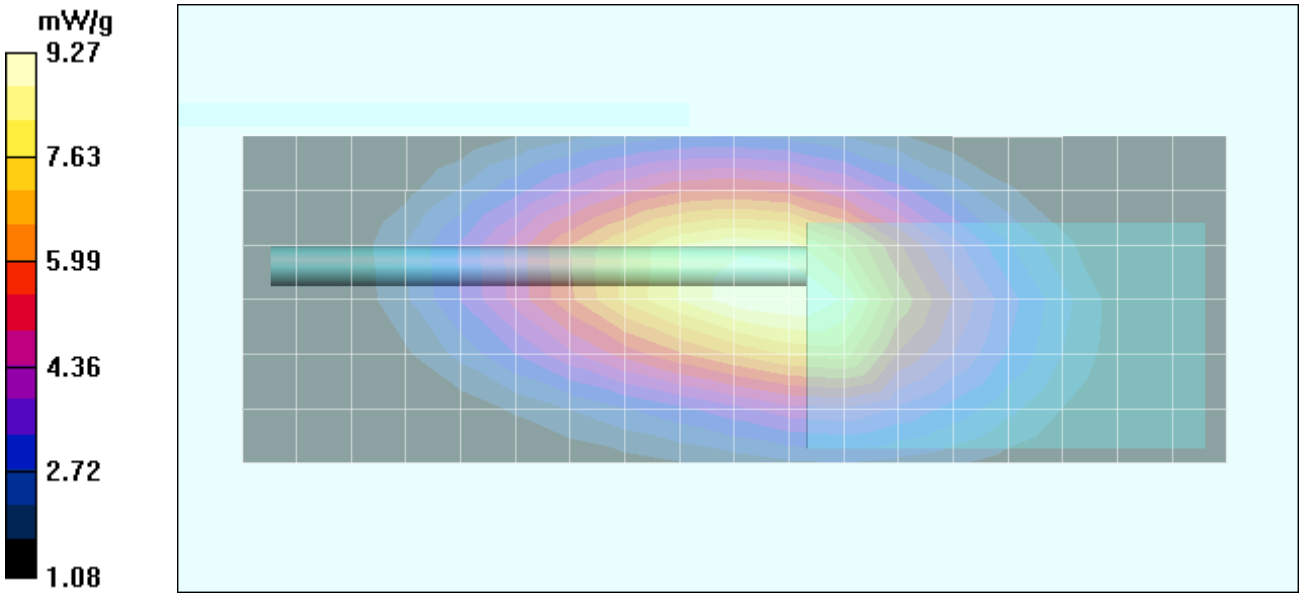
Body-Worn Accessories: Belt-Clip, Speaker-Microphone

Communication System: FM UHF
Frequency: 450 MHz; Duty Cycle: 1:1
RF Output Power: 5.14 Watts (Conducted)
9V AA Alkaline Energizer E-Squared Battery Pack (P/N: FBA-25)
Medium: M450 (σ = 0.92 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.1, 8.1, 8.1); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Area Scan (7x19x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 1.3 cm Belt-Clip Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 13.6 W/kg
SAR(1 g) = 8.81 mW/g; SAR(10 g) = 6.27 mW/g
Reference Value = 105.1 V/m
Power Drift = -1.28 dB



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

System Performance Check - 450 MHz Dipole

Date Tested: 02/17/04

DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136

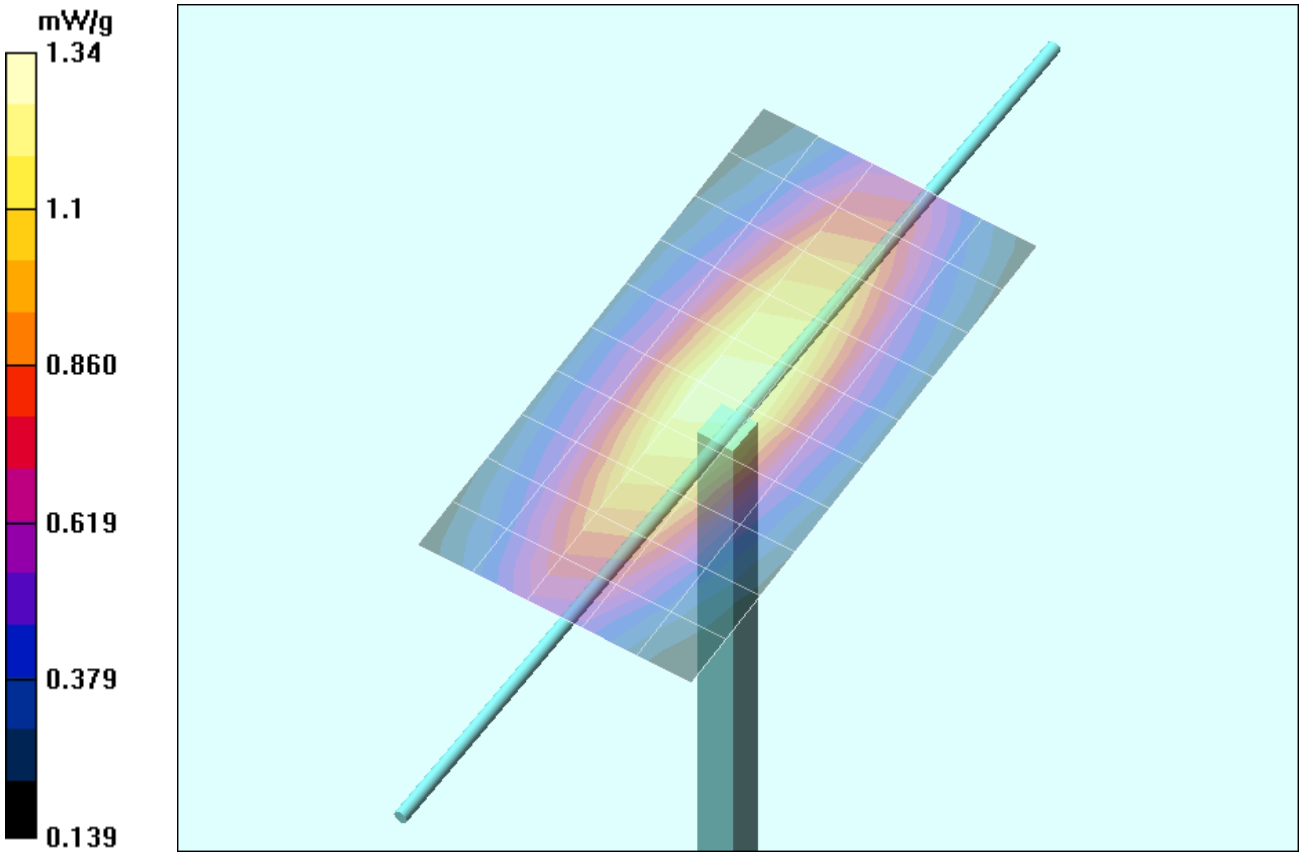
Ambient Temp: 24.0 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 108.8 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3)

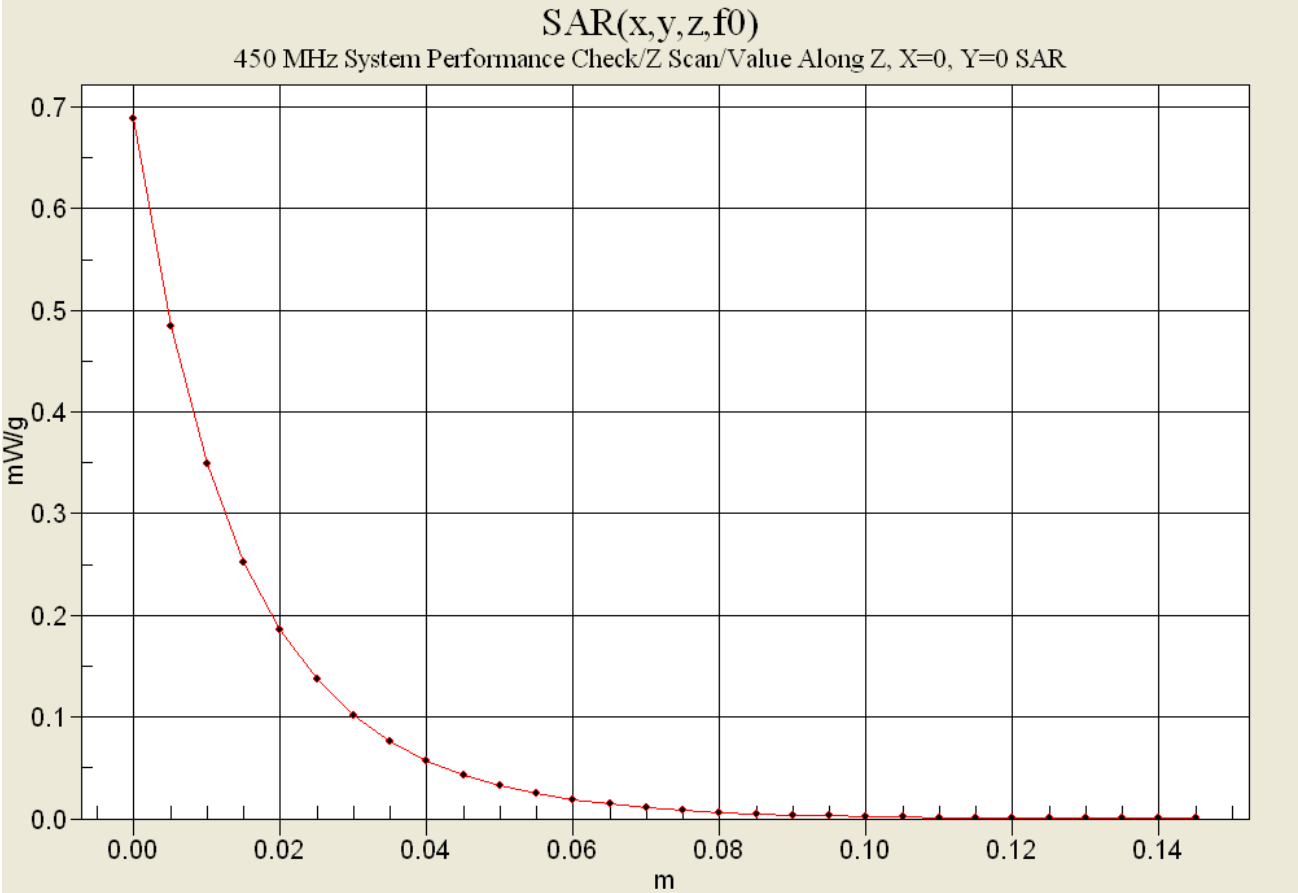
- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

450 MHz System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

450 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.19 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.825 mW/g
Reference Value = 40.4 V/m
Power Drift = -0.1 dB



Z-Axis Scan


SAR(x,y,z,f0)
450 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
m

System Performance Check - 450 MHz Dipole

Dated Tested: 02/18/04

DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136

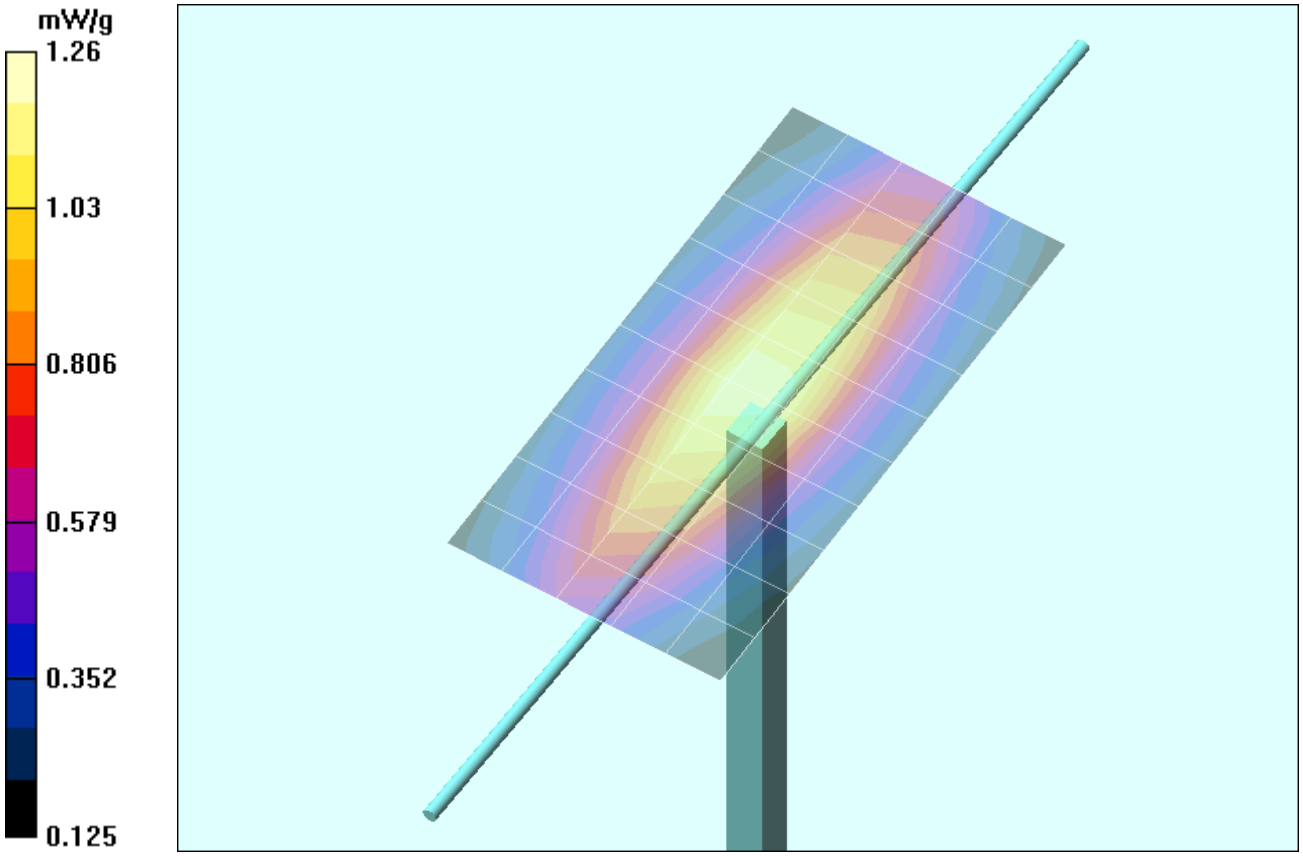
Ambient Temp: 24.5 °C; Fluid Temp: 22.7 °C; Barometric Pressure: 108.2 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.83 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3)

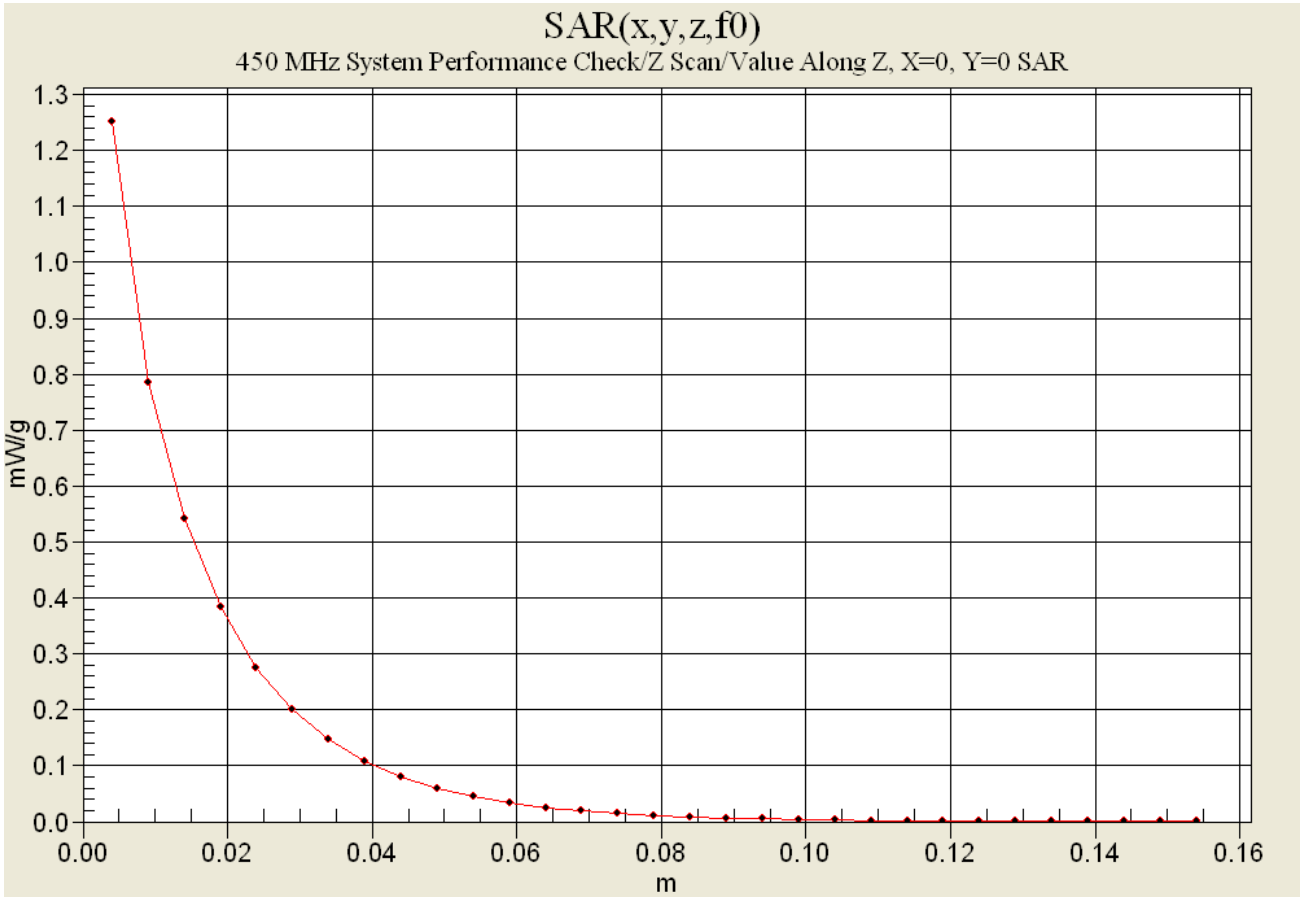
- Probe: ET3DV6 - SN1590; ConvF(7.9, 7.9, 7.9); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

450 MHz System Performance Check/Area Scan (6x11x1):
Measurement grid: dx=15mm, dy=15mm

450 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.771 mW/g
Reference Value = 39.2 V/m
Power Drift = -0.0 dB



Z-Axis Scan

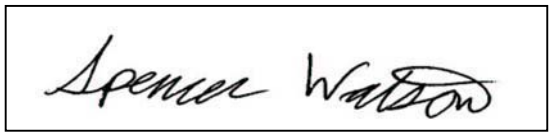

SAR(x,y,z,f0)
450 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

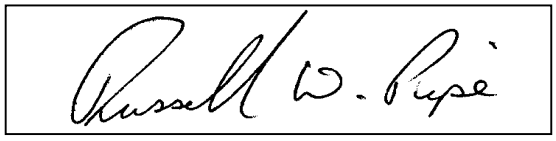
APPENDIX C - SYSTEM VALIDATION

450MHz SYSTEM VALIDATION DIPOLE

Type:	**450MHz Validation Dipole**
Serial Number:	**136**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**November 4, 2003**

Celltech Labs Inc. hereby certifies that this device has been calibrated on the date indicated above.

Calibrated by: 

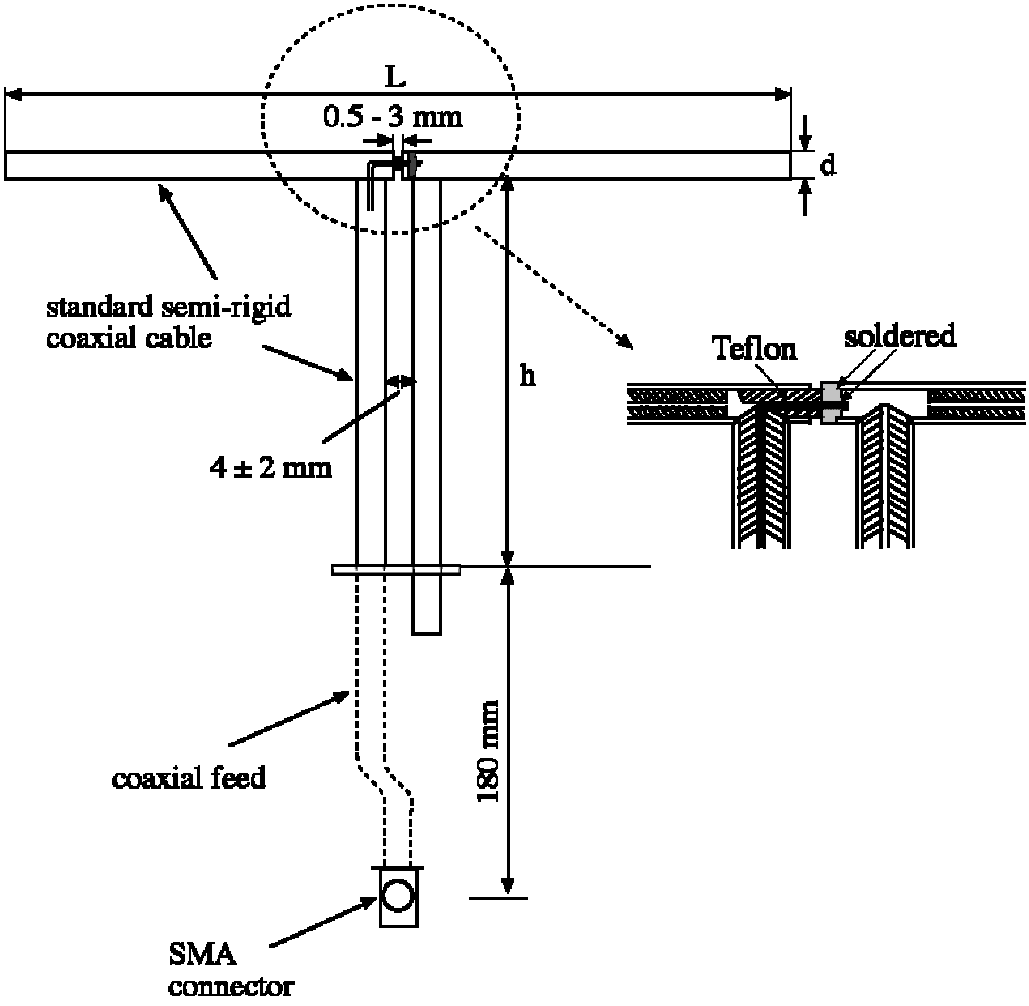
Approved by: 

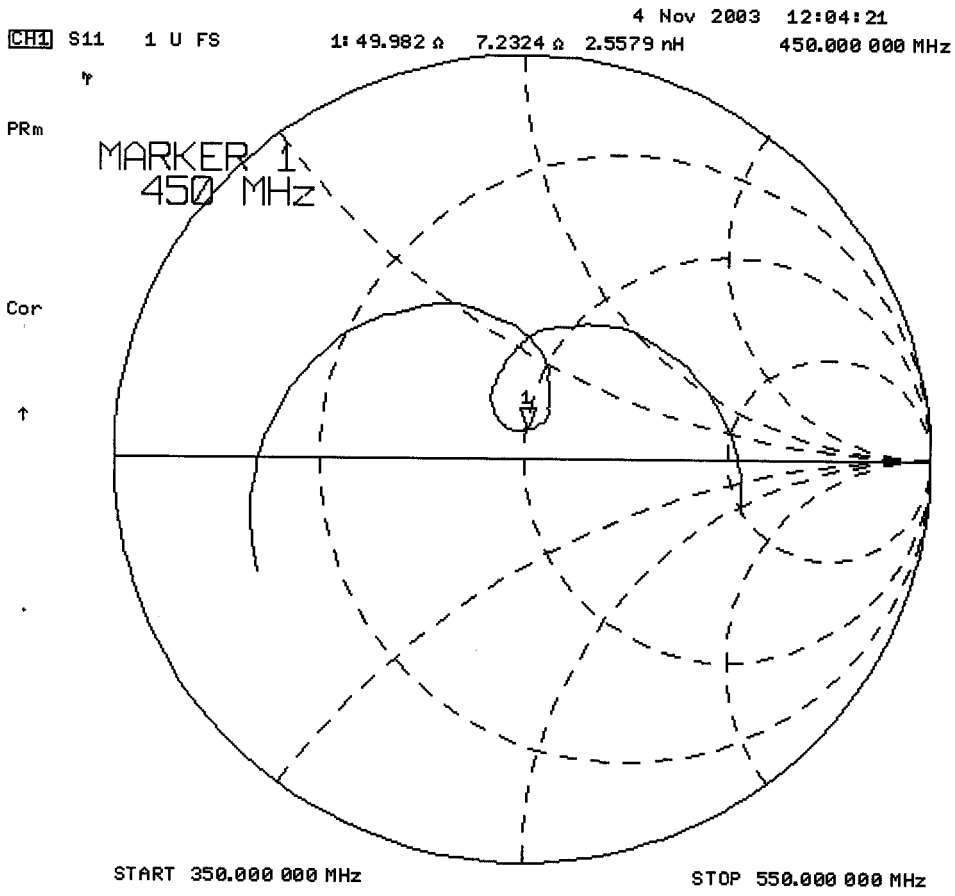
Celltech Labs Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

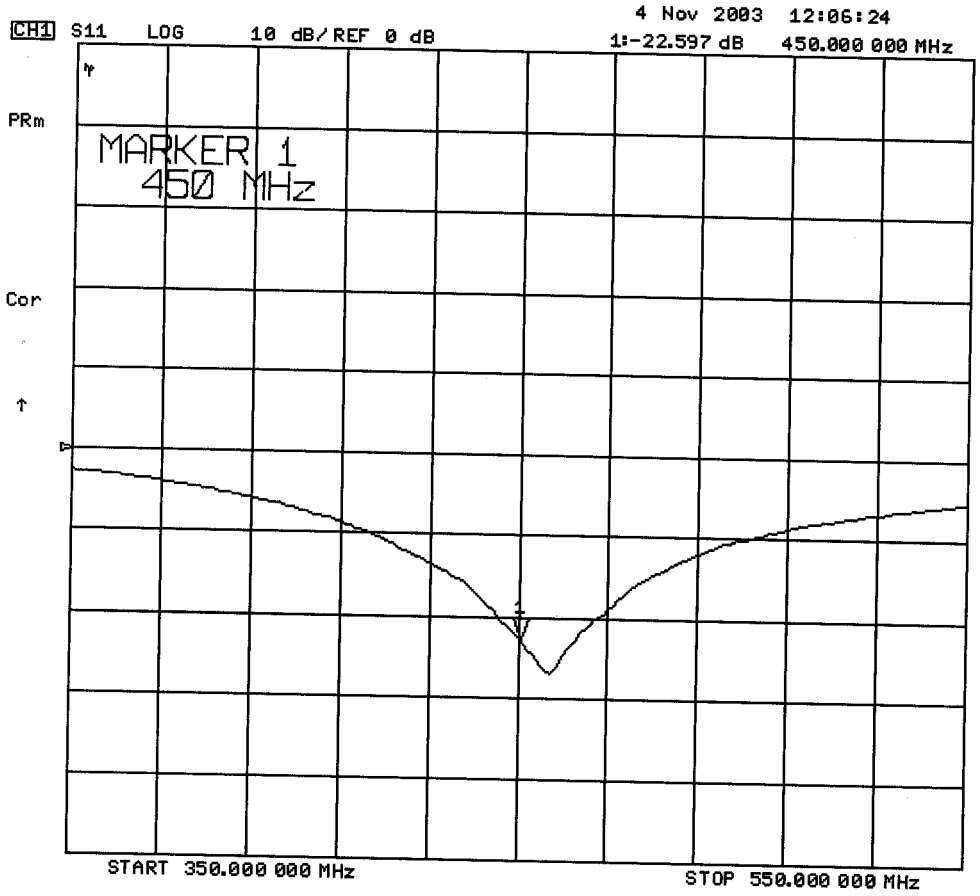
1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 450MHz	Re{Z} = 49.982Ω
	Im{Z} = 7.2324Ω
Return Loss at 450MHz	-22.597dB




4 Nov 2003 12:04:21
CH1 S11 1 U FS
1: 49.982 Ω 7.2324 Ω 2.5579 nH
450.000 000 MHz
PRm
MARKER 1
450 MHz
Cor
START 350.000 000 MHz
STOP 550.000 000 MHz


CH1 S11 LOG 10 dB/ REF 0 dB
4 Nov 2003 12:06:24
1:-22.597 dB 450.000 000 MHz
PRm
MARKER 1
450 MHz
Cor
START 350.000 000 MHz
STOP 550.000 000 MHz

2. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	420.0	250.0	6.2
450	288.0	167.0	6.2
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.6	3.6
3000	41.5	25.0	3.6

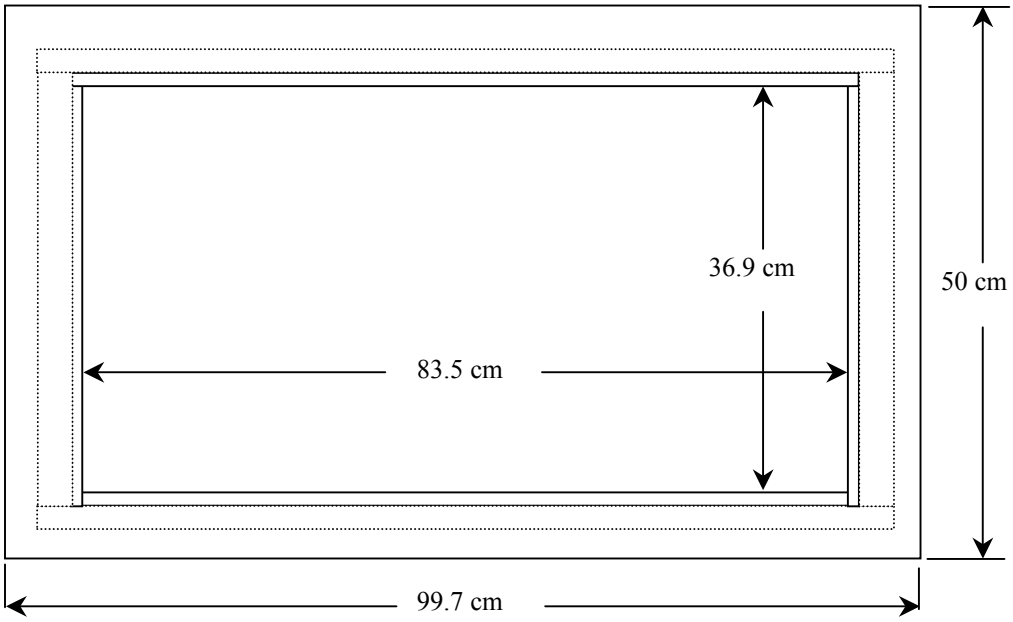
3. Validation Phantom

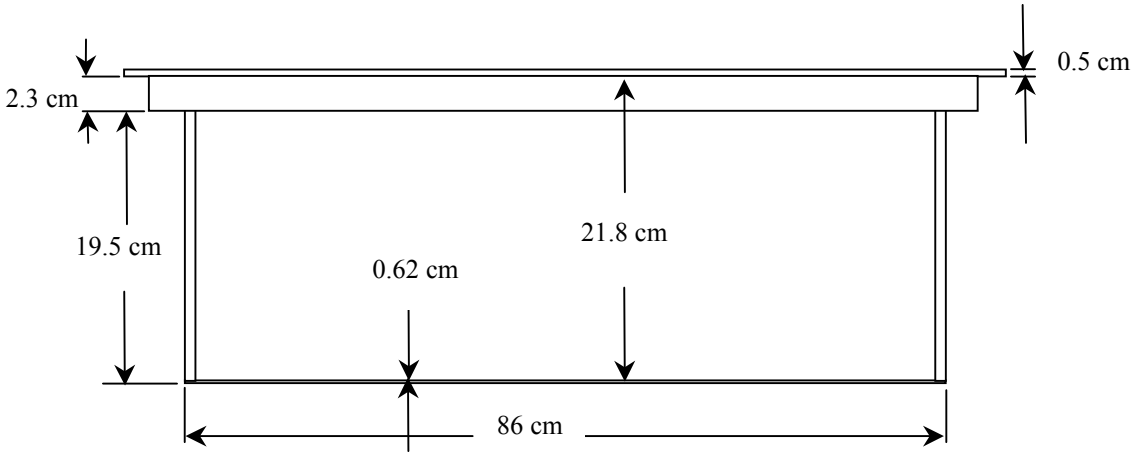
The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The inner dimensions of the phantom are as follows:

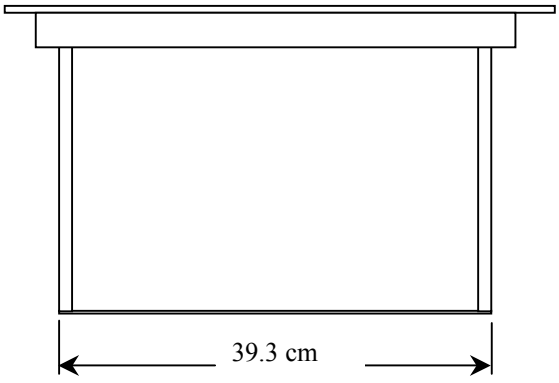
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

The bottom section of the validation phantom is constructed of 6.2 ± 0.1mm Plexiglas.

4. Dimensions of Plexiglas Planar Phantom







5. 450MHz System Validation Setup

450MHz System Validation Setup

6. Measurement Conditions

The planar phantom was filled with brain simulating tissue having the following parameters at 450MHz:

Relative Permittivity:	43.7
Conductivity:	0.88 mho/m
Fluid Temperature:	22.0 °C
Fluid Depth:	≥ 15.0 cm

Environmental Conditions:

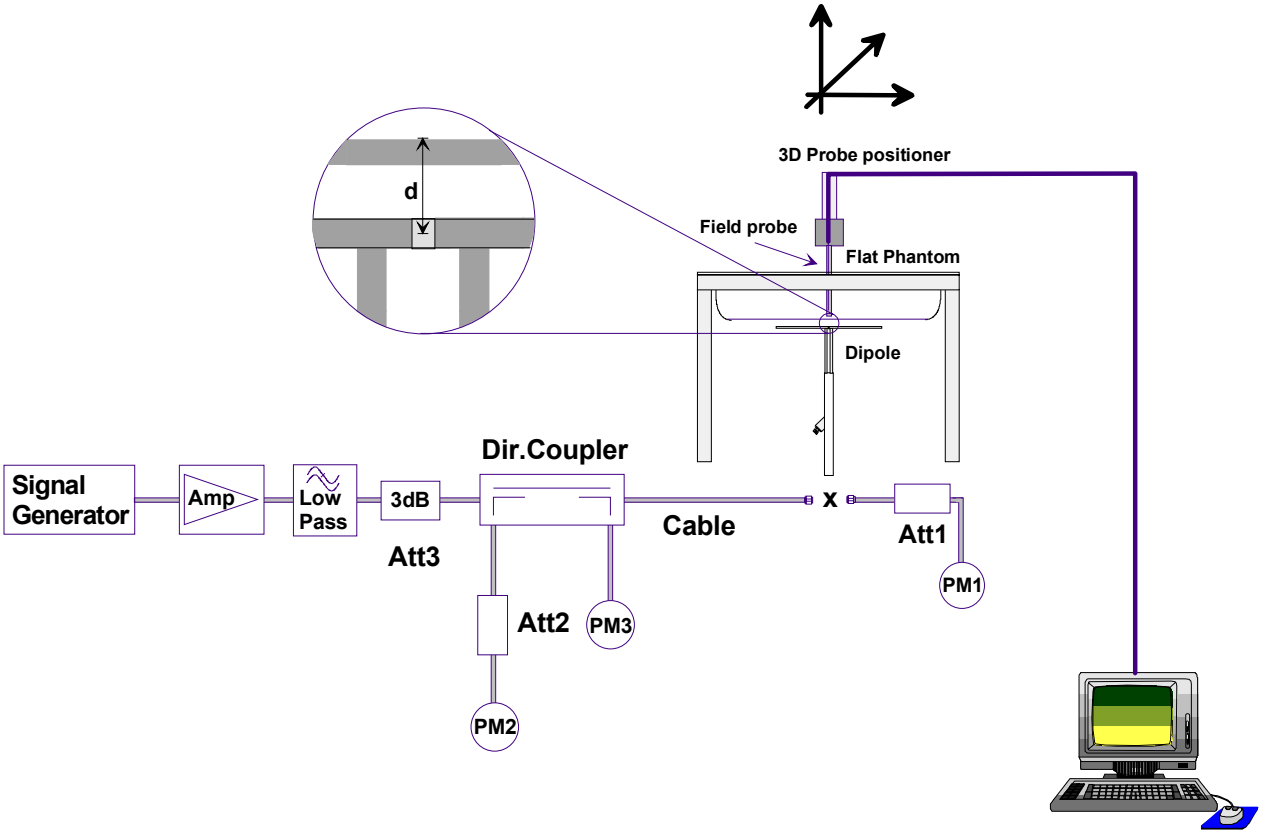
Ambient Temperature:	22.1 °C
Humidity:	49 %
Barometric Pressure:	102.8 kPa

The 450MHz simulated brain tissue mixture consists of the following ingredients:

Ingredient	Percentage by weight
Water	38.56%
Sugar	56.32%
Salt	3.95%
HEC	0.98%
Dowicil 75	0.19%
450MHz Target Dielectric Parameters at 22 °C	ε_r = 43.5 σ = 0.87 S/m

7. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

8. Validation Dipole SAR Test Results

Ten SAR measurements were performed in order to achieve repeatability and to establish an average target value.

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	1.29	5.16	0.810	3.24	2.28
Test 2	1.31	5.24	0.827	3.31	2.31
Test 3	1.30	5.20	0.823	3.29	2.29
Test 4	1.30	5.20	0.822	3.29	2.29
Test 5	1.29	5.16	0.819	3.28	2.28
Test 6	1.30	5.20	0.826	3.30	2.28
Test 7	1.31	5.24	0.826	3.30	2.30
Test 8	1.31	5.24	0.829	3.32	2.30
Test 9	1.30	5.20	0.822	3.29	2.28
Test 10	1.31	5.24	0.822	3.29	2.33
Average Value	1.30	5.21	0.823	3.29	2.29

The results have been normalized to 1W (forward power) into the dipole.

IEEE Target over $1cm^3$ (1g) of tissue: 1.23 mW/g (+/- 10%)

Averaged over 1cm (1g) of tissue: 5.21 mW/g

Averaged over 10cm (10g) of tissue: 3.29 mW/g

Test Date: 11/04/03

DUT: Dipole 450MHz; Model: D450V2; Type: System Performance Check; Serial: 136

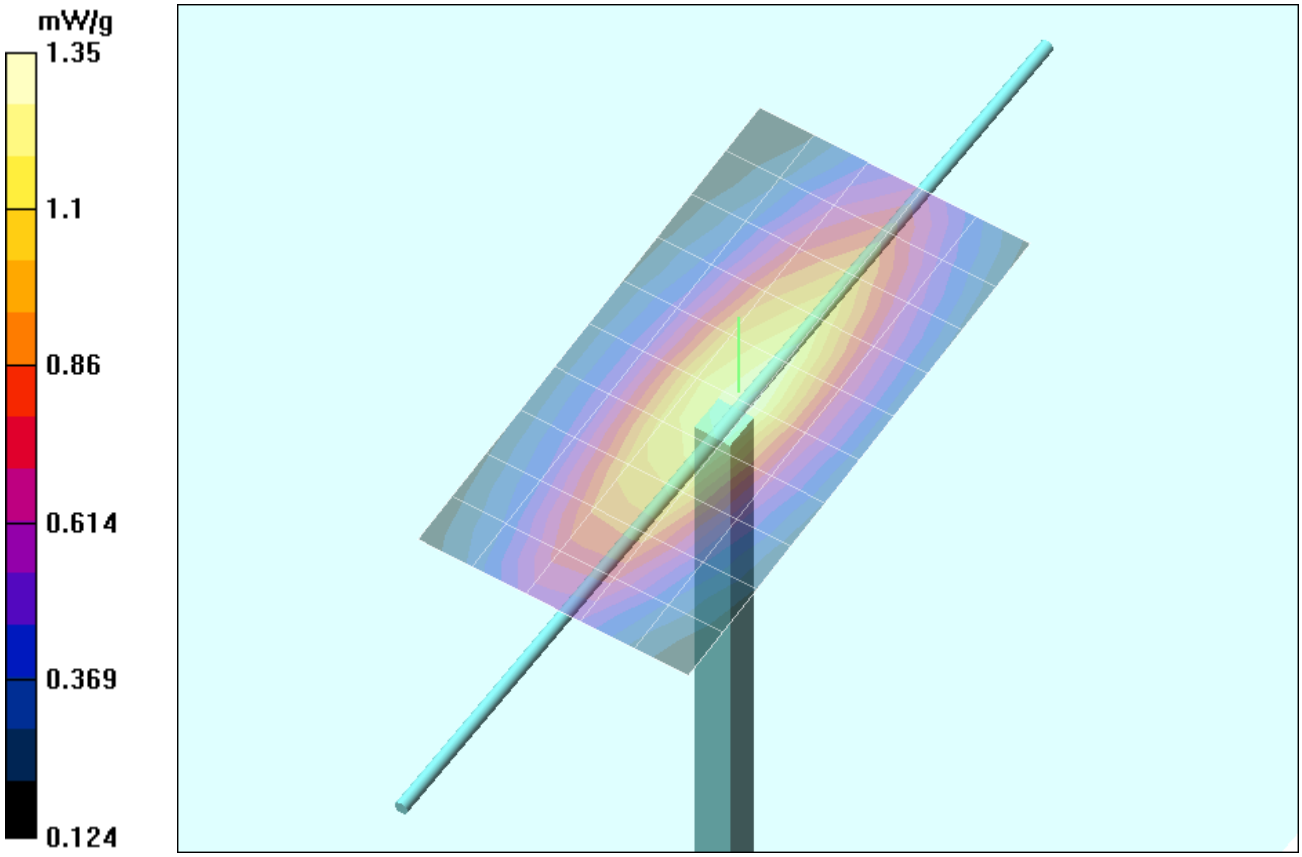
Ambient Temp: 22.1°C; Fluid Temp: 22.0°C; Barometric Pressure: 102.8 kPa; Humidity: 49%

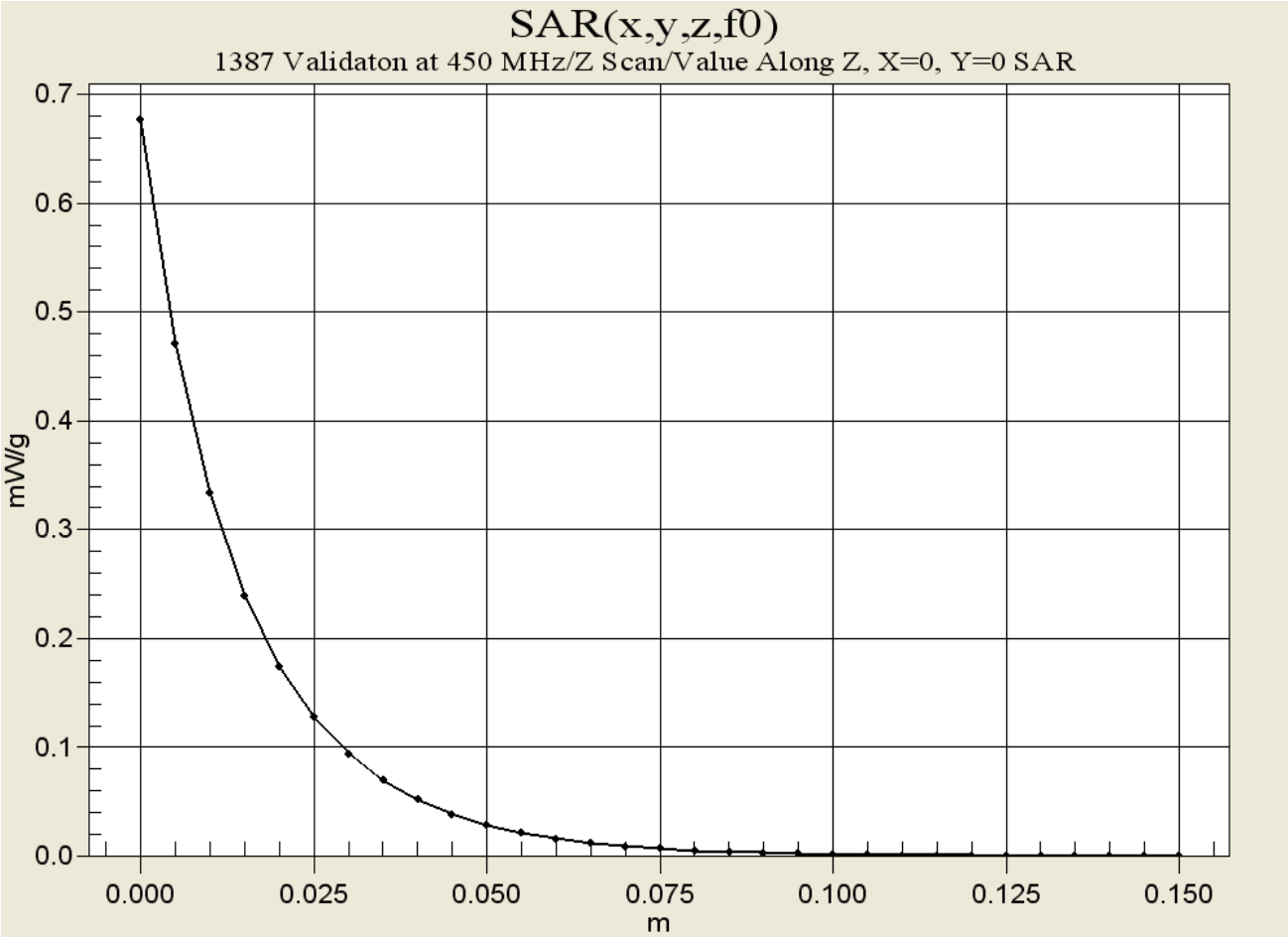
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.88 mho/m, ε_r = 43.7, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

450 MHz Validation/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 39 V/m
Power Drift = -0.08 dB
Maximum value of SAR = 1.3 mW/g

450 MHz Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.28 W/kg
SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.822 mW/g
Reference Value = 39 V/m
Power Drift = 0.08 dB





450MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

November 04, 2003

Frequency	e'	e"
350.000000 MHz	46.2660	40.8224
360.000000 MHz	45.9937	40.0986
370.000000 MHz	45.7556	39.4543
380.000000 MHz	45.5625	38.7387
390.000000 MHz	45.2820	38.1140
400.000000 MHz	45.0146	37.4981
410.000000 MHz	44.7508	36.9734
420.000000 MHz	44.5046	36.4917
430.000000 MHz	44.2494	35.9460
440.000000 MHz	43.9621	35.5647
450.000000 MHz	43.7384	35.2106
460.000000 MHz	43.5513	34.7930
470.000000 MHz	43.2846	34.3970
480.000000 MHz	43.0654	33.9576
490.000000 MHz	42.8566	33.6391
500.000000 MHz	42.6744	33.2270
510.000000 MHz	42.5036	32.8459
520.000000 MHz	42.3492	32.5261
530.000000 MHz	42.1783	32.1727
540.000000 MHz	41.9985	31.7385
550.000000 MHz	41.8097	31.4862

APPENDIX D - PROBE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Celltech Labs**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1590
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	May 15, 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
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US38432426	3-May-00 (Agilent, No. 8702K064602)	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: May 15, 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.

Schmid & Partner Engineering AG

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibration:	April 26, 2002
Recalibrated:	May 15, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

Diode Compression

NormX	**1.76** $\mu V/(V/m)^2$	DCP X	**92**	mV
NormY	**1.91** $\mu V/(V/m)^2$	DCP Y	**92**	mV
NormZ	**1.66** $\mu V/(V/m)^2$	DCP Z	**92**	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

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

ConvF X	**7.0** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**7.0** ± 9.5% (k=2)	Alpha	**0.33**
ConvF Z	**7.0** ± 9.5% (k=2)	Depth	**2.56**

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

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

ConvF X	**5.5** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.5** ± 9.5% (k=2)	Alpha	**0.44**
ConvF Z	**5.5** ± 9.5% (k=2)	Depth	**2.69**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	8.7	5.0
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

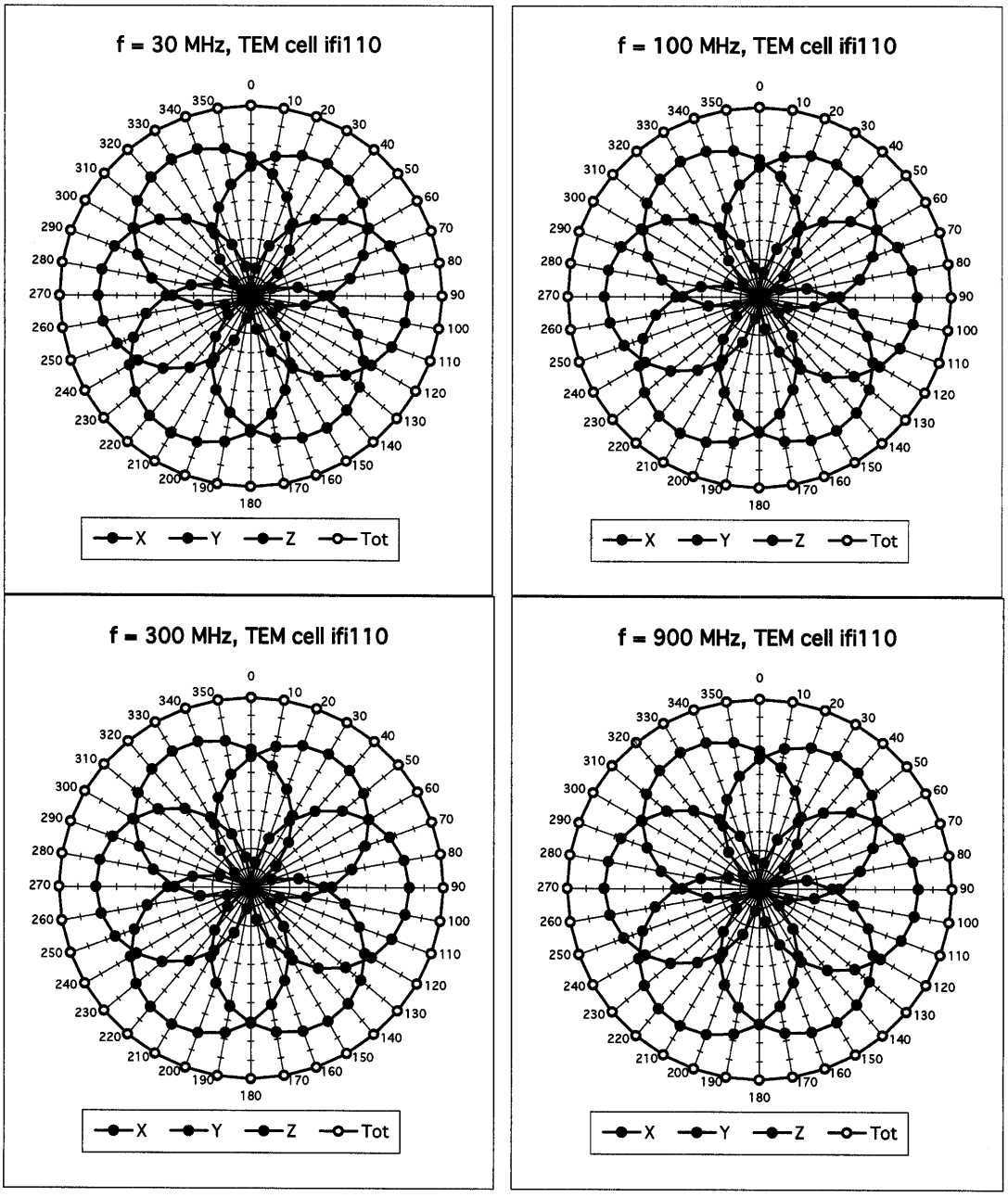
Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

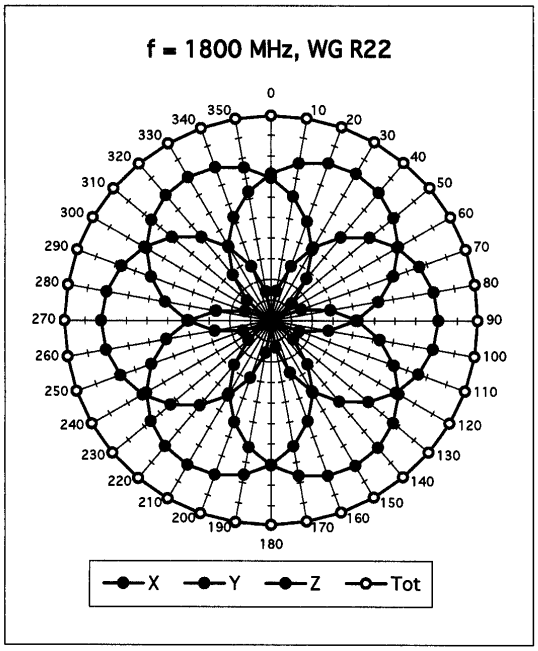
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.5
SAR_{be} [%]	With Correction Algorithm	0.2	0.1

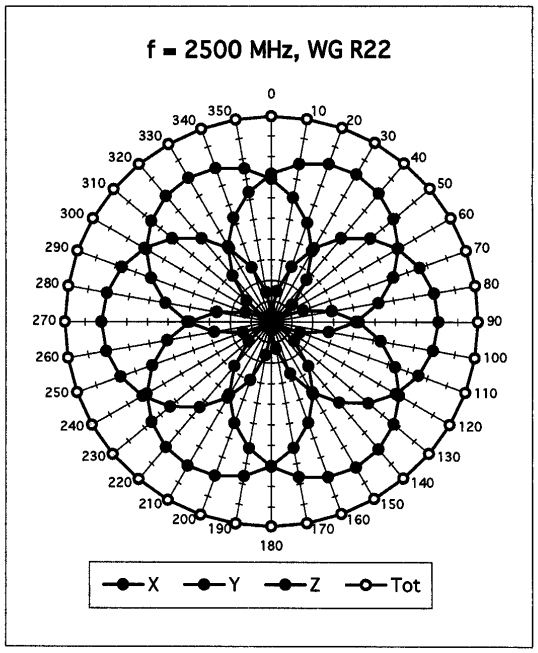
Sensor Offset

Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

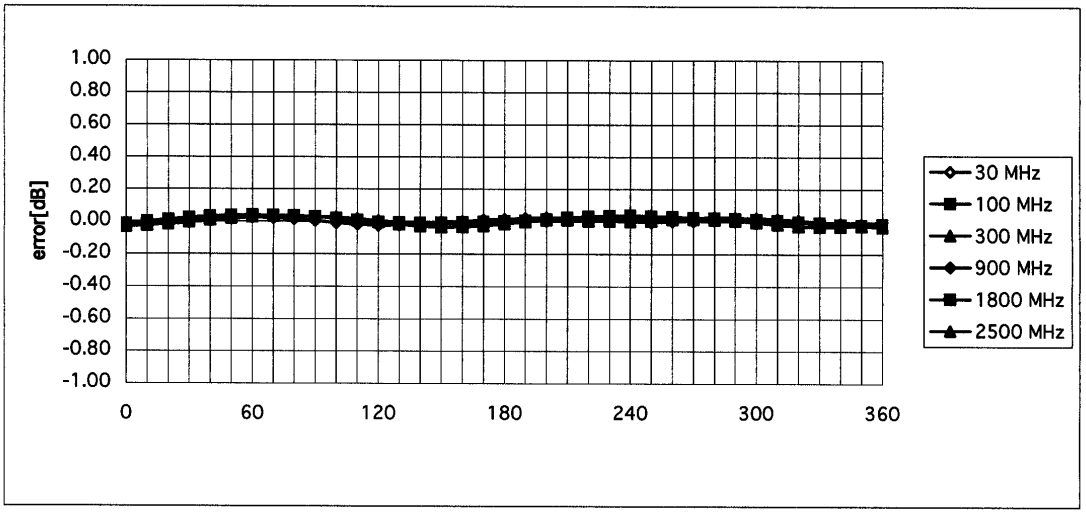
Receiving Pattern (ϕ), θ = 0°





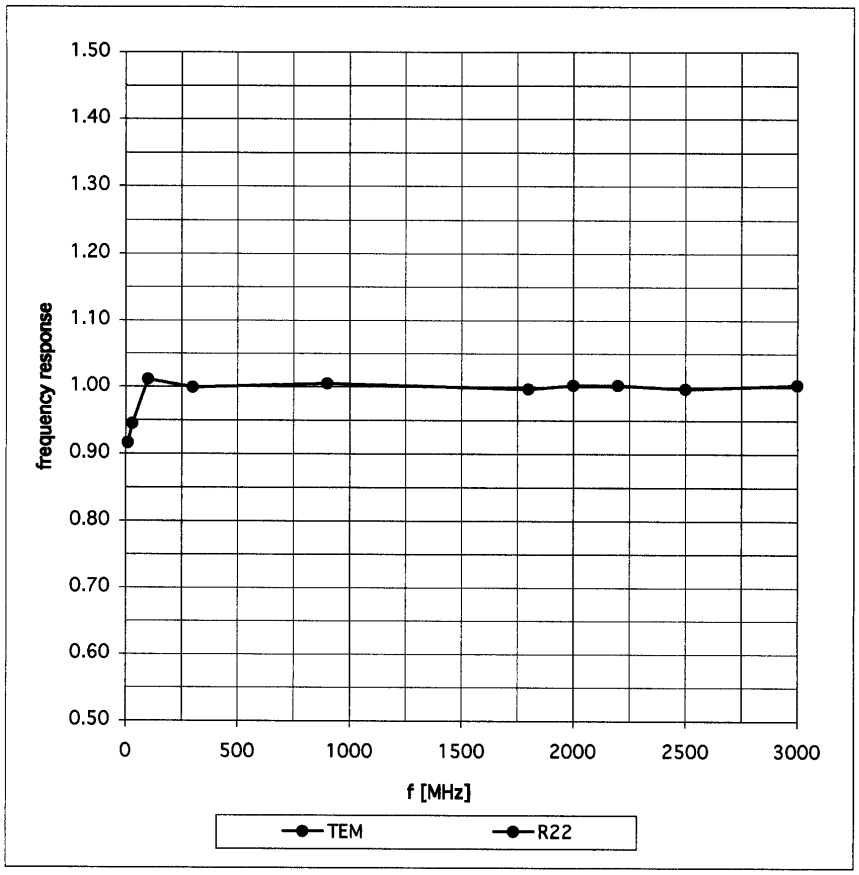


Isotropy Error (ϕ), θ = 0°



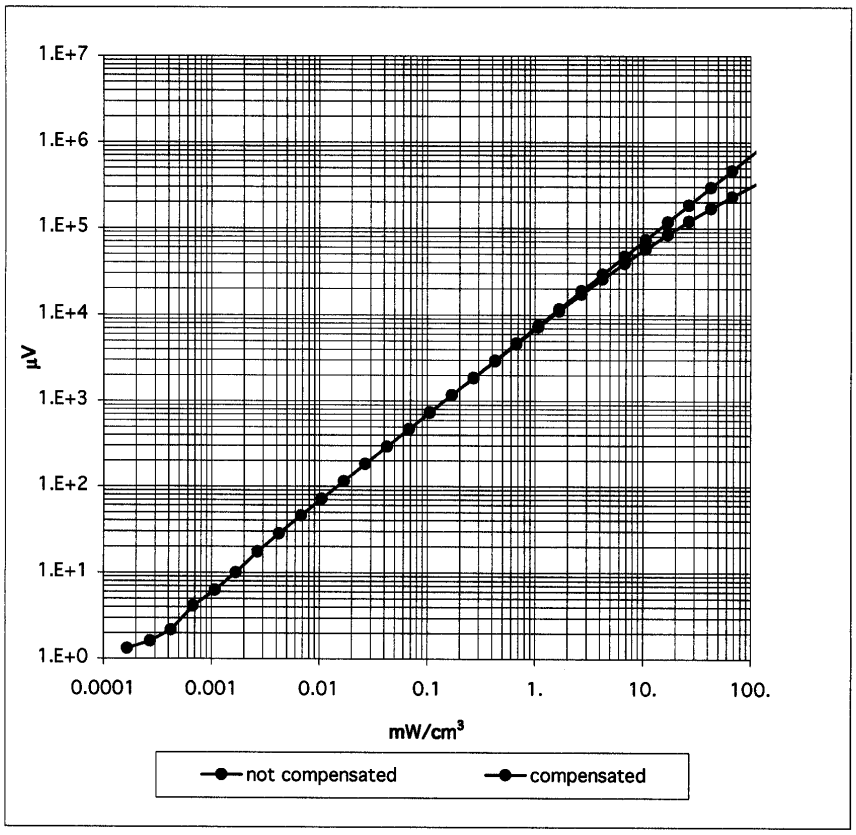
Frequency Response of E-Field

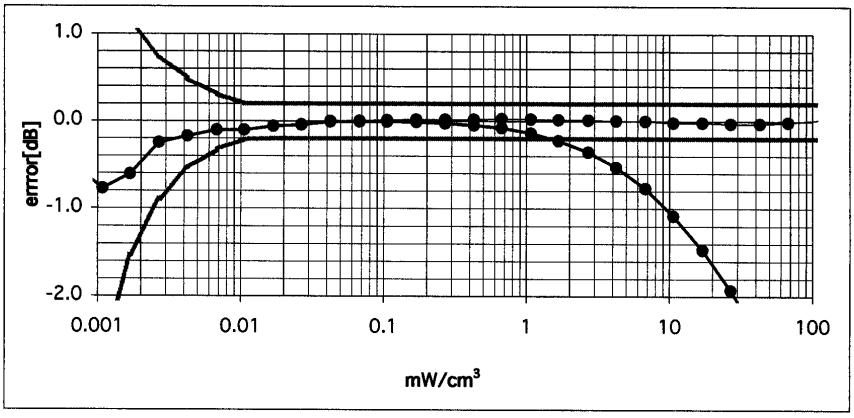
(TEM-Cell:ifi110, Waveguide R22)



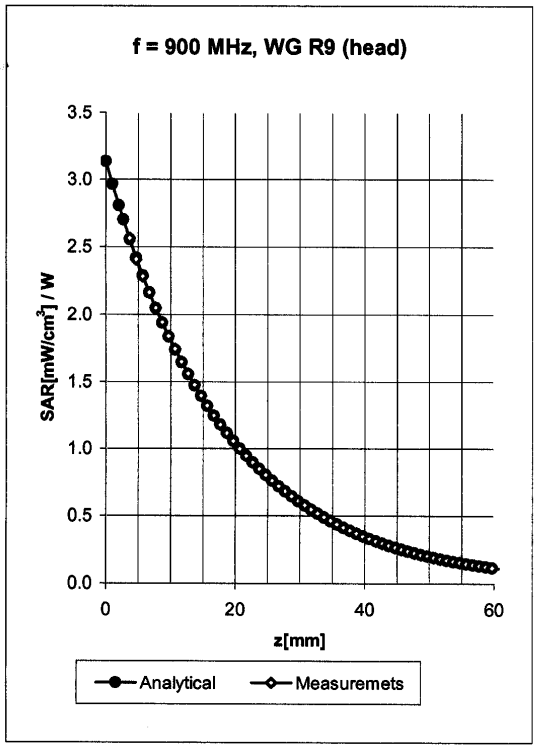
Dynamic Range f(SAR_{brain})

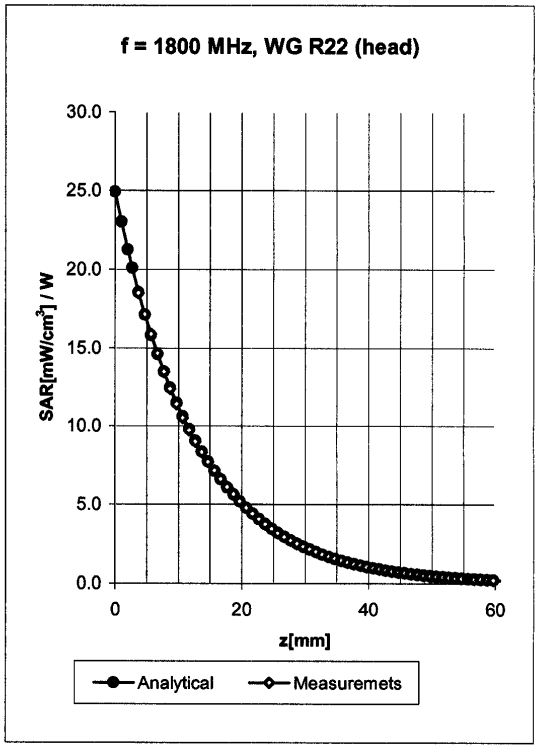
(Waveguide R22)





Conversion Factor Assessment





Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m

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

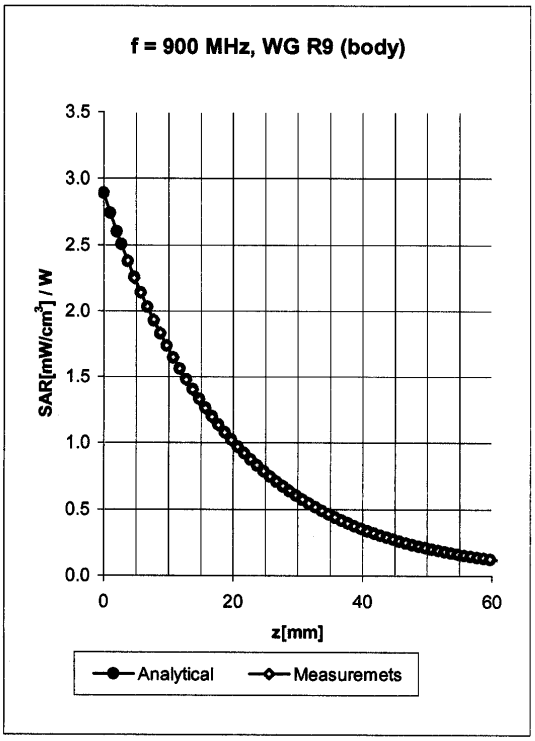
ConvF X	7.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	7.0 ± 9.5% (k=2)	Alpha	**0.33**
ConvF Z	7.0 ± 9.5% (k=2)	Depth	**2.56**

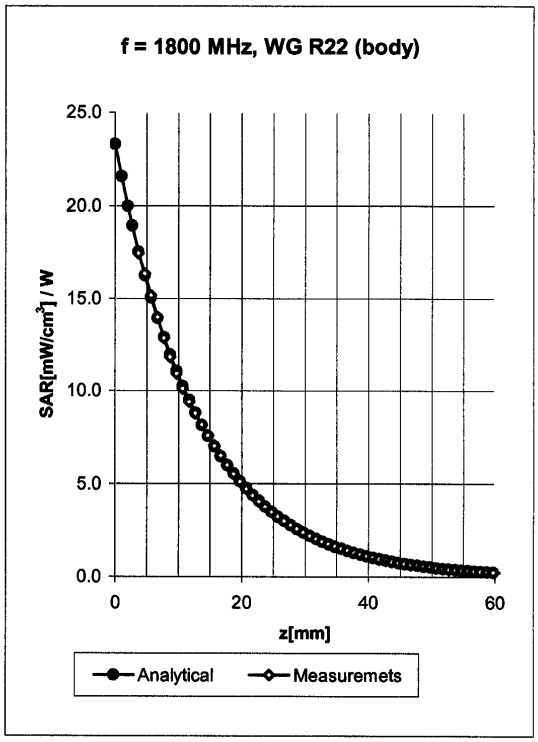
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

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

ConvF X	5.5 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.5 ± 9.5% (k=2)	Alpha	**0.44**
ConvF Z	5.5 ± 9.5% (k=2)	Depth	**2.69**

Conversion Factor Assessment





Body 900 MHz ε_r = 55.0 ± 5% σ = 1.05 ± 5% mho/m

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

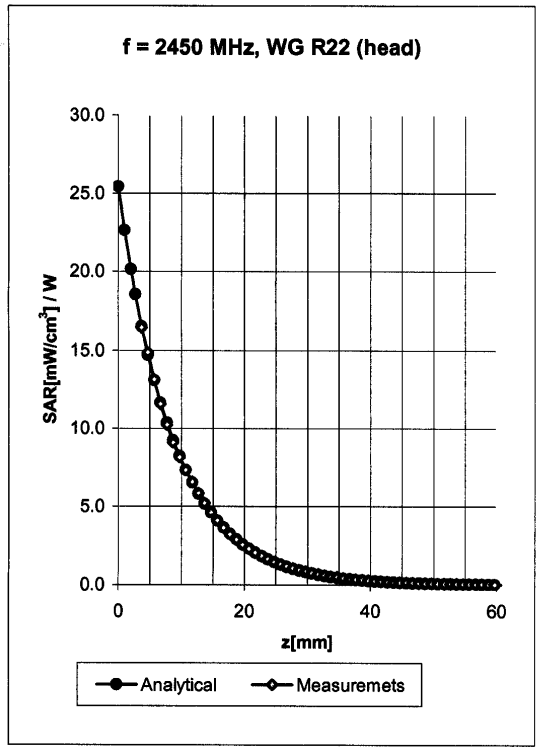
ConvF X	6.8 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.8 ± 9.5% (k=2)	Alpha	**0.34**
ConvF Z	6.8 ± 9.5% (k=2)	Depth	**2.61**

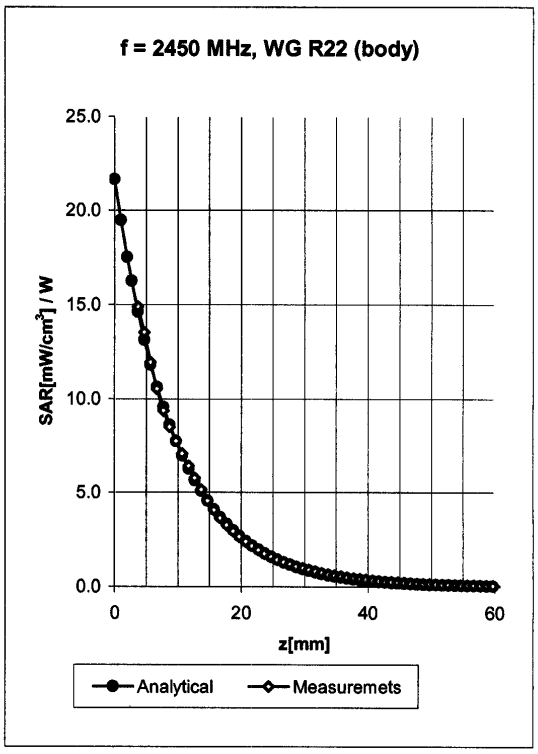
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

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

ConvF X	5.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.0 ± 9.5% (k=2)	Alpha	**0.52**
ConvF Z	5.0 ± 9.5% (k=2)	Depth	**2.69**

Conversion Factor Assessment





Head	2450	MHz	ε_r = 39.2 ± 5%	σ = 1.80 ± 5% mho/m

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

ConvF X	5.0 ± 8.9% (k=2)	Boundary effect:	
ConvF Y	5.0 ± 8.9% (k=2)	Alpha	**0.88**
ConvF Z	5.0 ± 8.9% (k=2)	Depth	**1.92**

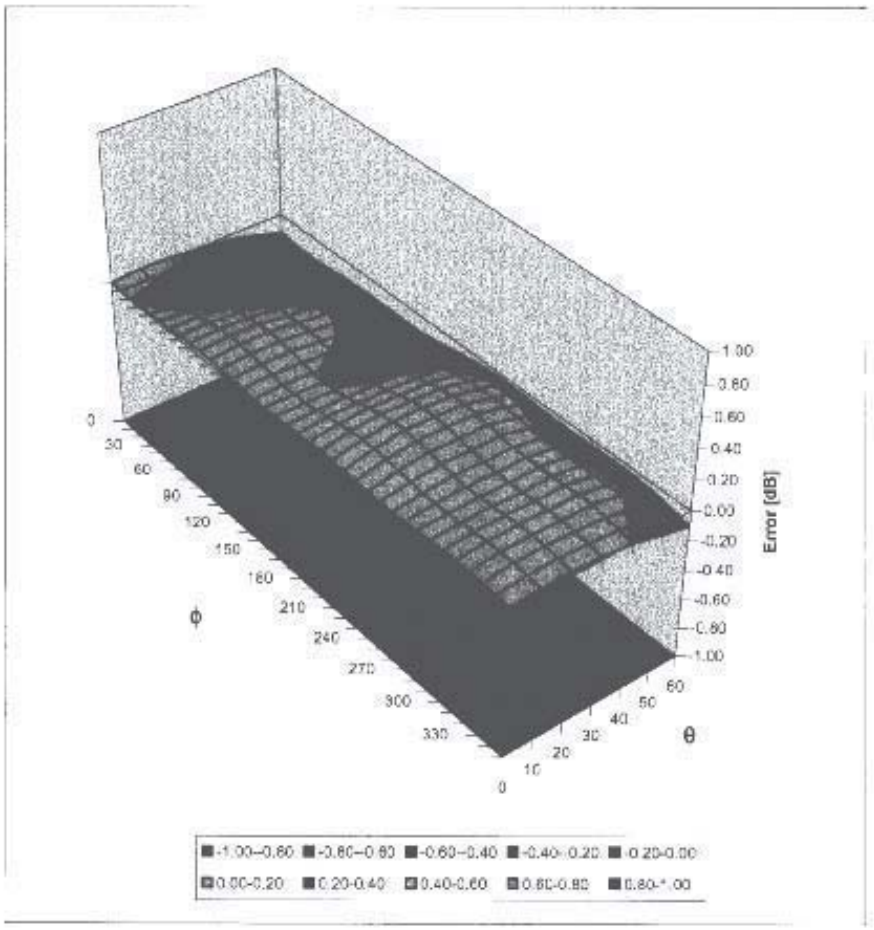
Body	2450	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m

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

ConvF X	4.4 ± 8.9% (k=2)	Boundary effect:	
ConvF Y	4.4 ± 8.9% (k=2)	Alpha	**0.90**
ConvF Z	4.4 ± 8.9% (k=2)	Depth	**1.87**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



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info@speag.com, http://www.speag.com

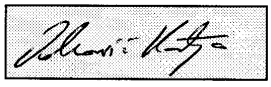
Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1590**
Place of Assessment:	**Zurich**
Date of Assessment:	**May 19, 2003**
Probe Calibration Date:	**May 15, 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:



Schmid & Partner Engineering AG

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Zeughausstrasse 43, 8004 Zurich, Switzerland
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info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.6 ± 8%**	**ε_r = 52.3 ± 5%** **σ = 0.76 ± 5% mho/m** (head tissue)
300 MHz	ConvF	**8.3 ± 8%**	**ε_r = 45.3 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
450 MHz	ConvF	**7.9 ± 8%**	**ε_r = 43.5 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
150 MHz	ConvF	**9.2 ± 8%**	**ε_r = 61.9 ± 5%** **σ = 0.80 ± 5% mho/m** (body tissue)
450 MHz	ConvF	**8.1 ± 8%**	**ε_r = 56.7 ± 5%** **σ = 0.94 ± 5% mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz System Performance Check & DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

February 17, 2004

Frequency	e'	e"
350.000000 MHz	45.0620	38.8083
360.000000 MHz	44.7242	38.1415
370.000000 MHz	44.4720	37.5788
380.000000 MHz	44.2071	36.9930
390.000000 MHz	43.9818	36.4535
400.000000 MHz	43.7116	35.9680
410.000000 MHz	43.5509	35.4506
420.000000 MHz	43.3110	35.0284
430.000000 MHz	43.0542	34.5510
440.000000 MHz	42.7725	34.1567
450.000000 MHz	42.5151	33.7214
460.000000 MHz	42.2926	33.3277
470.000000 MHz	41.9881	32.9283
480.000000 MHz	41.7908	32.5209
490.000000 MHz	41.5580	32.1707
500.000000 MHz	41.3690	31.8281
510.000000 MHz	41.1755	31.5166
520.000000 MHz	40.9963	31.2478
530.000000 MHz	40.7890	30.9623
540.000000 MHz	40.6862	30.5987
550.000000 MHz	40.5042	30.3861

450 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

February 18, 2004

Frequency	e'	e"
350.000000 MHz	44.5609	38.4816
360.000000 MHz	44.2923	37.9094
370.000000 MHz	44.0271	37.3456
380.000000 MHz	43.8020	36.7411
390.000000 MHz	43.6430	36.1584
400.000000 MHz	43.3455	35.5814
410.000000 MHz	43.1296	35.0624
420.000000 MHz	42.8855	34.5623
430.000000 MHz	42.6300	34.0485
440.000000 MHz	42.3920	33.6510
450.000000 MHz	42.1456	33.2545
460.000000 MHz	41.9274	32.9174
470.000000 MHz	41.6532	32.6218
480.000000 MHz	41.4698	32.2728
490.000000 MHz	41.2284	31.9476
500.000000 MHz	41.0727	31.5715
510.000000 MHz	40.8570	31.2033
520.000000 MHz	40.6880	30.8746
530.000000 MHz	40.4800	30.5651
540.000000 MHz	40.3263	30.1636
550.000000 MHz	40.1475	29.9050

450 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

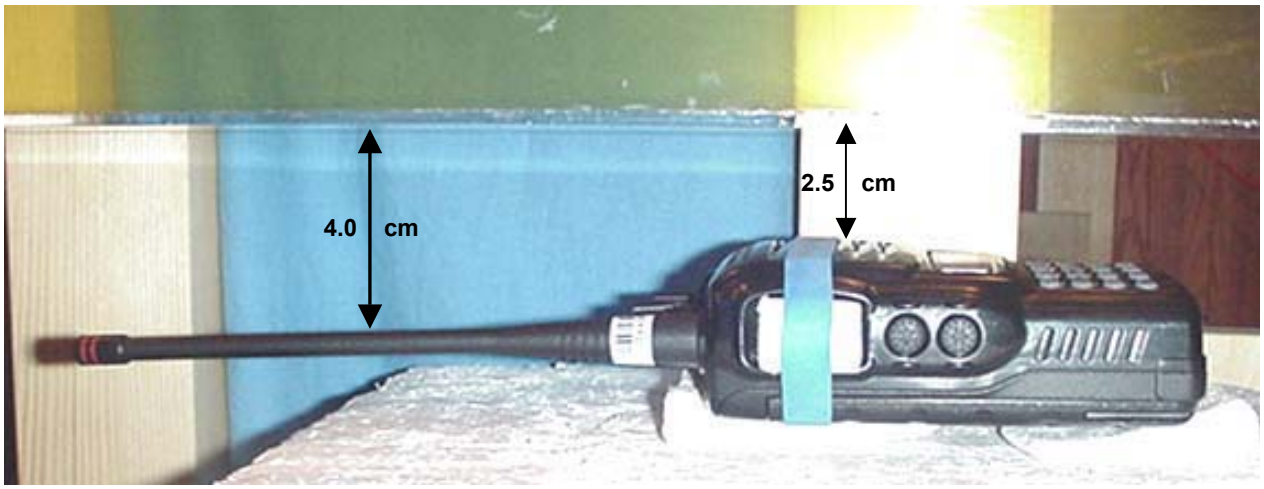
February 18, 2004

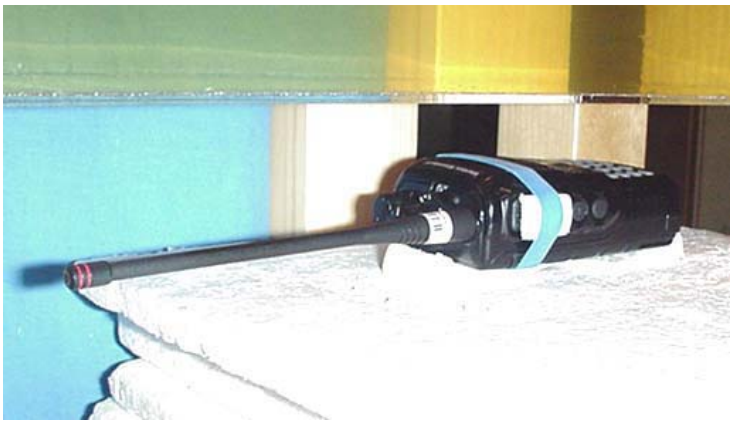
Frequency	e'	e"
350.000000 MHz	59.0373	43.1738
360.000000 MHz	58.7255	42.4204
370.000000 MHz	58.6119	41.6731
380.000000 MHz	58.3889	40.9805
390.000000 MHz	58.2729	40.2261
400.000000 MHz	58.1449	39.5079
410.000000 MHz	58.0323	38.9642
420.000000 MHz	57.8623	38.4139
430.000000 MHz	57.7360	37.8488
440.000000 MHz	57.5472	37.3388
450.000000 MHz	57.3310	36.8462
460.000000 MHz	57.1580	36.4308
470.000000 MHz	56.9842	35.9769
480.000000 MHz	56.7667	35.5411
490.000000 MHz	56.5738	35.0995
500.000000 MHz	56.3725	34.7463
510.000000 MHz	56.2231	34.3606
520.000000 MHz	56.1091	34.0309
530.000000 MHz	56.0151	33.6247
540.000000 MHz	55.9343	33.2282
550.000000 MHz	55.8241	32.9314

APPENDIX F - SAR TEST SETUP & DUT PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

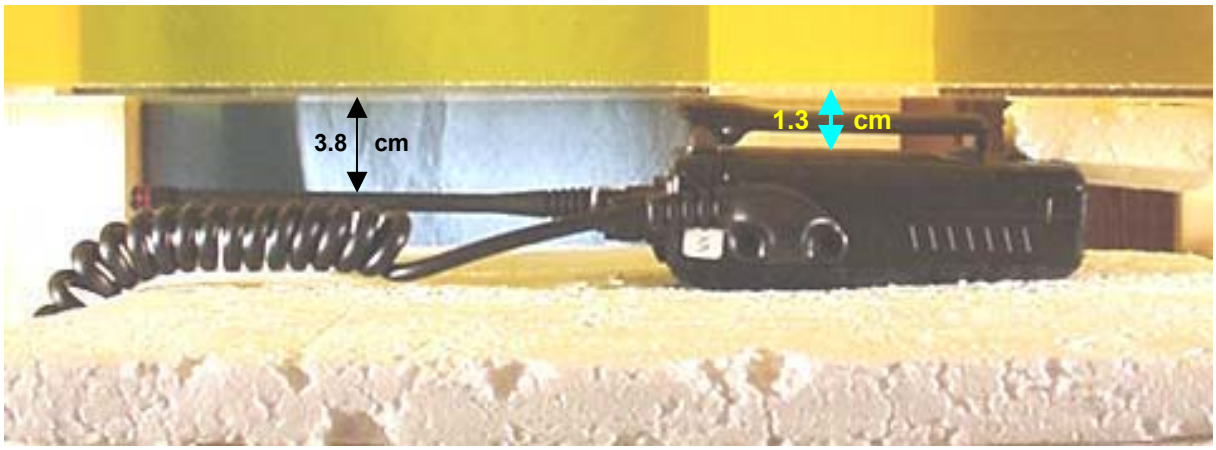
2.5 cm Separation Distance from Front of Radio to Planar Phantom

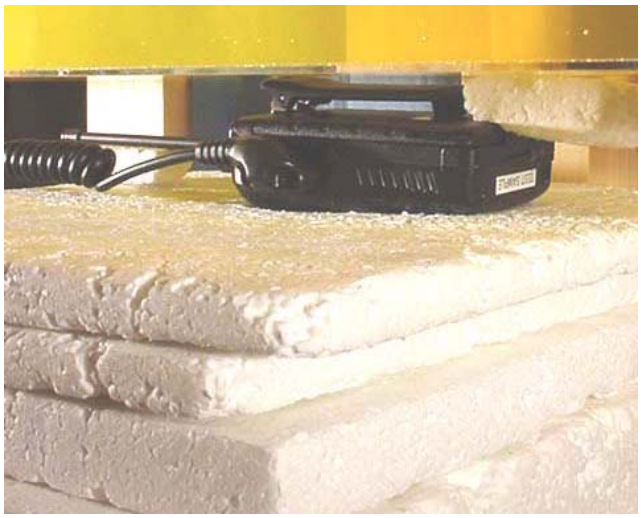




BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.3 cm Belt-Clip Separation Distance to Planar Phantom with Speaker-Microphone Accessory





DUT PHOTOGRAPHS

DUT PHOTOGRAPHS

with Speaker-Microphone

with Belt-Clip

with Belt-Clip

DUT PHOTOGRAPHS

Battery Compartment

NiCd 1100mAh IS Battery Pack
(P/N: FNB-V57IS)

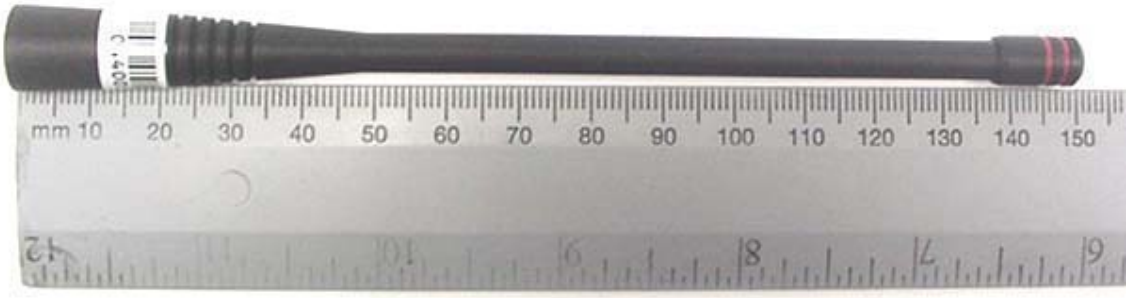
NiCd 700mAh Battery Pack
(P/N: FNB-64)

Alkaline Battery Case (P/N: FBA-25)

Duracell Procell 2850mAh
AA Alkaline Batteries

Energizer E-Squared 3135mAh
AA Alkaline Batteries

DUT PHOTOGRAPHS



Speaker-Microphone

Speaker-Microphone

Speaker-Microphone

Speaker-Microphone