DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

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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 VHF PTT Radio Transceiver**
FCC IDENTIFIER:	**K6610503220**
Model(s):	**VX-414-2-5 / VX-424-2-5**
Modulation:	**FM (VHF)**
Tx Frequency Range:	**146.0 - 174.0 MHz**
Max. RF Output Power Tested:	**5.30 Watts Conducted (146.0 MHz)** **4.49 Watts Conducted (174.0 MHz)**
Antenna Type(s) Tested:	**Whip 146 MHz (ATV-8A)** **Whip 174 MHz (ATV-8C)**
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)**
Maximum SAR Levels:	**1.76 W/kg - Face-Held (50% Duty Cycle)** **3.65 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.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.

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-414-2-5, VX-424-2-5 Portable FM VHF PTT Radio Transceiver FCC ID: K6610503220, with the Class II Permissive Change(s) described in this report, complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada Safety Code 6 (see reference [2]) for the Occupational / Controlled Exposure environment. The test 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 and 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.

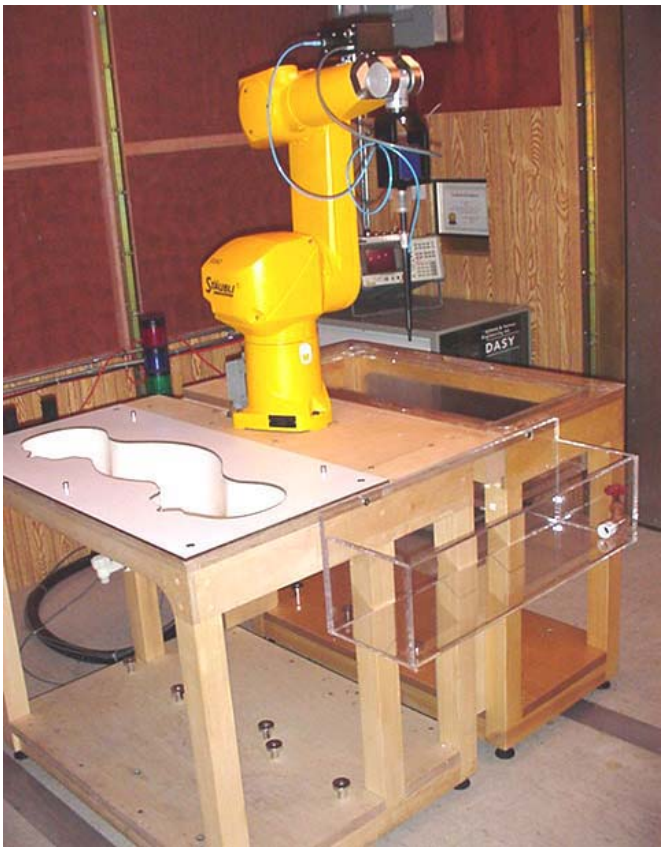
2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

FCC Rule Part(s)	FCC 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 Classification	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
Device Type	Portable FM VHF PTT Radio Transceiver			
FCC ID	K6610503220			
Model No.(s)	VX-414-2-5 / VX-424-2-5			
Serial No.(s)	3K000002 (Identical Prototype)			
Modulation	FM (VHF)			
Tx Frequency Range	146.0 - 174.0 MHz			
Max. RF Output Power Tested	5.30 Watts	Conducted	146.0 MHz	
	4.49 Watts	Conducted	174.0 MHz	
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	
Antenna Type(s) Tested	Whip	146 MHz	154 mm	P/N: ATV-8A
	Whip	174 MHz	158 mm	P/N: ATV-8C
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

SAR EVALUATION RESULTS

Test Type	Freq (MHz)	Chan.	Test Mode	Measured Conducted RF Output Power			Battery Type	Antenna Part No.	Body-Worn Accessory	Separation Distance to Planar Phantom (cm)	Measured SAR 1g (W/kg) Duty Cycle		SAR Drift (dB)	Scaled SAR 1g (W/kg) Duty Cycle	
				Before (W)	After (W)	Drift (dB)					100%	50%		100%	50%
Face	146.0	Low	CW	5.08	5.29	0.21	NiCd 700 mAh	ATV-8A	-	2.5	2.67	1.34	-1.05	3.40	1.70
Face	146.0	Low	CW	5.07	5.30	0.23	NiCd 1100 mAh IS	ATV-8A	-	2.5	2.80	1.40	-0.983	3.51	1.76
Face	146.0	Low	CW	5.18	5.24	0.06	Duracell Alkaline	ATV-8A	-	2.5	2.42	1.21	-0.197	2.53	1.27
Body	174.0	High	CW	4.48	4.41	-0.07	NiCd 700 mAh	ATV-8C	Belt-Clip Speaker-Mic	1.3	5.39	2.70	-0.943	6.70	3.35
Body	174.0	High	CW	4.49	4.45	-0.04	NiCd 1100 mAh IS	ATV-8C	Belt-Clip Speaker-Mic	1.3	4.75	2.38	-0.814	5.73	2.86
Body	174.0	High	CW	4.46	4.28	-0.18	Duracell Alkaline	ATV-8C	Belt-Clip Speaker-Mic	1.3	5.65	2.83	-1.11	7.30	3.65
Body	174.0	High	CW	4.43	4.30	-0.13	Energizer Alkaline	ATV-8C	Belt-Clip Speaker-Mic	1.3	4.53	2.27	-1.10	5.84	2.92

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

Dielectric Constant ε_r	150 MHz Brain		150 MHz Body		Ambient Temperature	Brain: 25.5 °C	Body: 25.1°C
	IEEE Target	Measured	IEEE Target	Measured	Fluid Temperature	Brain: 22.1 °C	Body: 23.1°C
	52.3 (± 5%)	53.2	61.9 (± 5%)	60.3	Fluid Depth	≥ 15 cm	
Conductivity σ (mho/m)	150 MHz Brain		150 MHz Body		ρ (Kg/m^3)	1000	
	IEEE Target	Measured	IEEE Target	Measured	Relative Humidity	31%	
	0.76 (± 5%)	0.73	0.80 (± 5%)	0.78	Atmospheric Pressure	Brain: 107.8 kPa	Body: 107.1 kPa

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 test configurations were determined based on the worst-case SAR results from the original filing. For the face-held evaluations in the original filing, the low channel with the 146 MHz whip antenna (P/N: ATV-8A) resulted in considerably higher SAR, therefore only the 146 MHz whip antenna (P/N: ATV-8A) was tested for face-held SAR in this evaluation. For the body-worn evaluations in the original filing, the high channel with the 174 MHz whip antenna (P/N: ATV-8C) resulted in considerably higher SAR, therefore only the 174 MHz whip antenna (P/N: ATV-8C) was tested for body-worn SAR in this evaluation.
4. 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, high channel) using Energizer E-Squared batteries (see above table).
5. 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.
6. SAR versus time drift evaluations were performed for the duration of the area scan measurement in the test configuration that produced the highest SAR level for each battery type tested. A SAR versus time drift evaluation was also performed using external power source connected to the DUT for the highest SAR level configuration. See Appendix A (SAR Test Plots) for SAR versus Time drift evaluation plots.
7. 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.
8. The dielectric parameters of the simulated tissue mixtures 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-414-2-5 / VX-424-2-5 Portable FM VHF PTT Radio Transceiver FCC ID: K6610503220, with the Class II Permissive Change(s) described in this report, was 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 an ear-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 the test data table (pages 5).
5. SAR versus time drift evaluations were performed for the duration of the area scan measurement in the test configuration that produced the highest SAR level for each battery type tested. A SAR versus time drift evaluation was also performed using external power source 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 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.
8. The DUT was tested with fully charged batteries.
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 300MHz dipole (see Appendix C for system validation procedure). The dielectric parameters of the simulated brain tissue 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	300MHz 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						
02/24/04	Brain	0.750 ±10%	0.750 (+0.0%)	45.3 ±5%	45.8	0.87 ±5%	0.89	1000	25.0	23.0	≥ 15	31%	107.2

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.

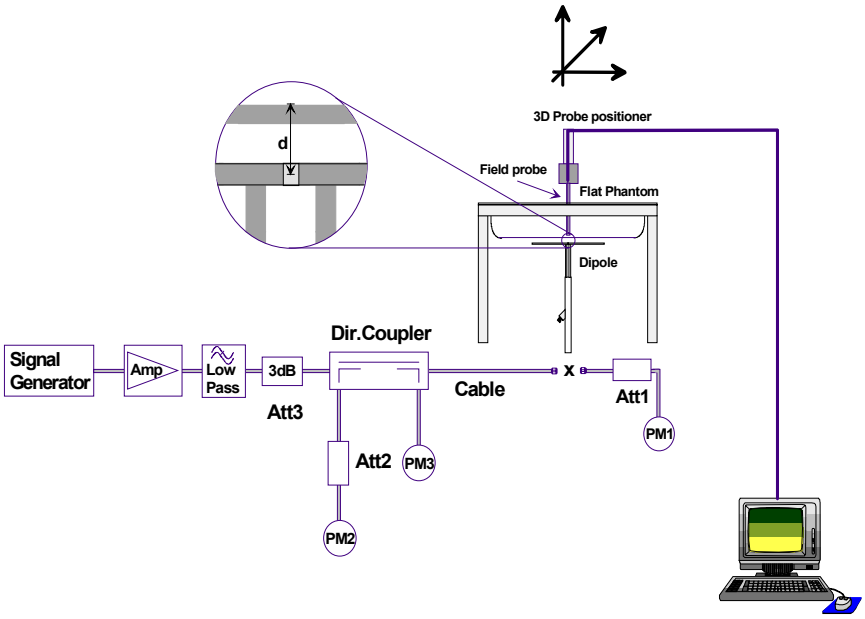


Figure 1. System Performance Check Setup Diagram

300 MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 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	**300 MHz Brain (%) (System Check)**	**150 MHz Brain (%) (DUT Evaluation)**	**150 MHz Body (%) (DUT Evaluation)**
Water	37.56	38.35	46.6
Sugar	55.32	55.5	49.7
Salt	5.95	5.15	2.6
HEC	0.98	0.9	1.0
Bactericide	0.19	0.1	0.1

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)

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 and body-worn 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 system 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
-Plexiglas 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 - 146 MHz Antenna (P/N: ATV-8A)

Dated Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

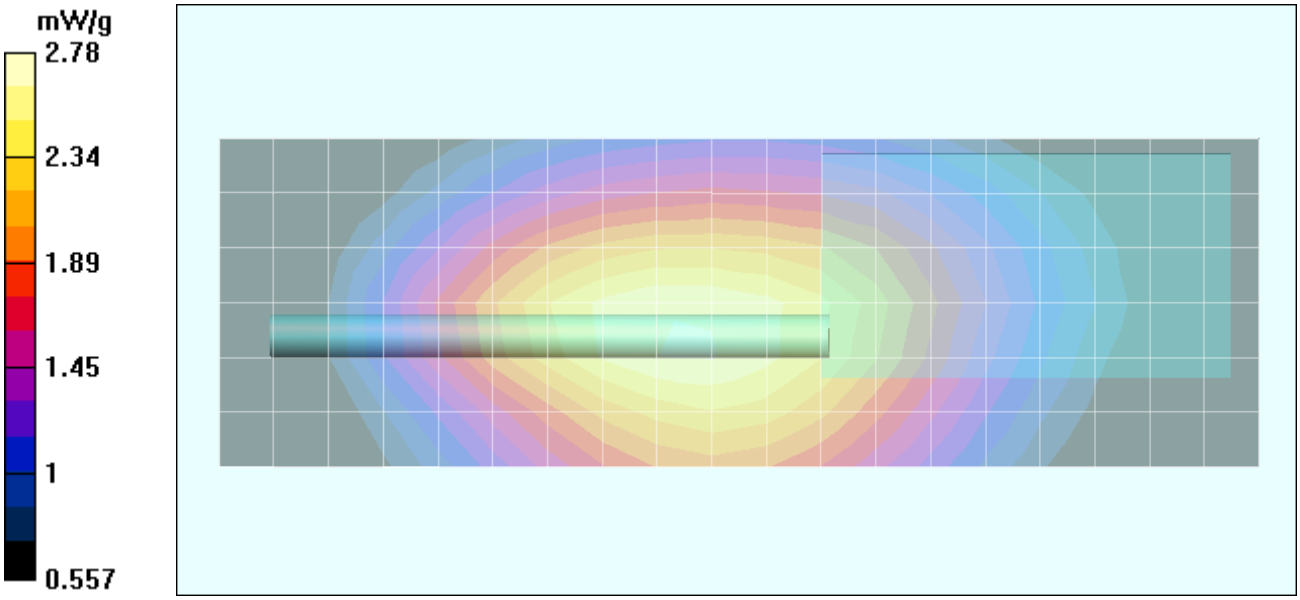
Ambient Temp: 25.5 °C; Fluid Temp: 22.1 °C; Barometric Pressure: 107.8 kPa; Humidity: 31%

Communication System: FM VHF
Frequency: 146 MHz; Duty Cycle: 1:1
RF Output Power: 5.29 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: HSL150 (σ = 0.73 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(9.6, 9.6, 9.6); 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 -2.5cm Separation Distance - Low Channel/Area Scan (7x20x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5cm Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 4.05 W/kg
SAR(1 g) = 2.67 mW/g; SAR(10 g) = 2 mW/g
Reference Value = 61 V/m
Power Drift = -1.05 dB



Face-Held SAR - NiCd 1100mAh Intrinsically Safe Battery - 146 MHz Antenna (P/N: ATV-8A)

Dated Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

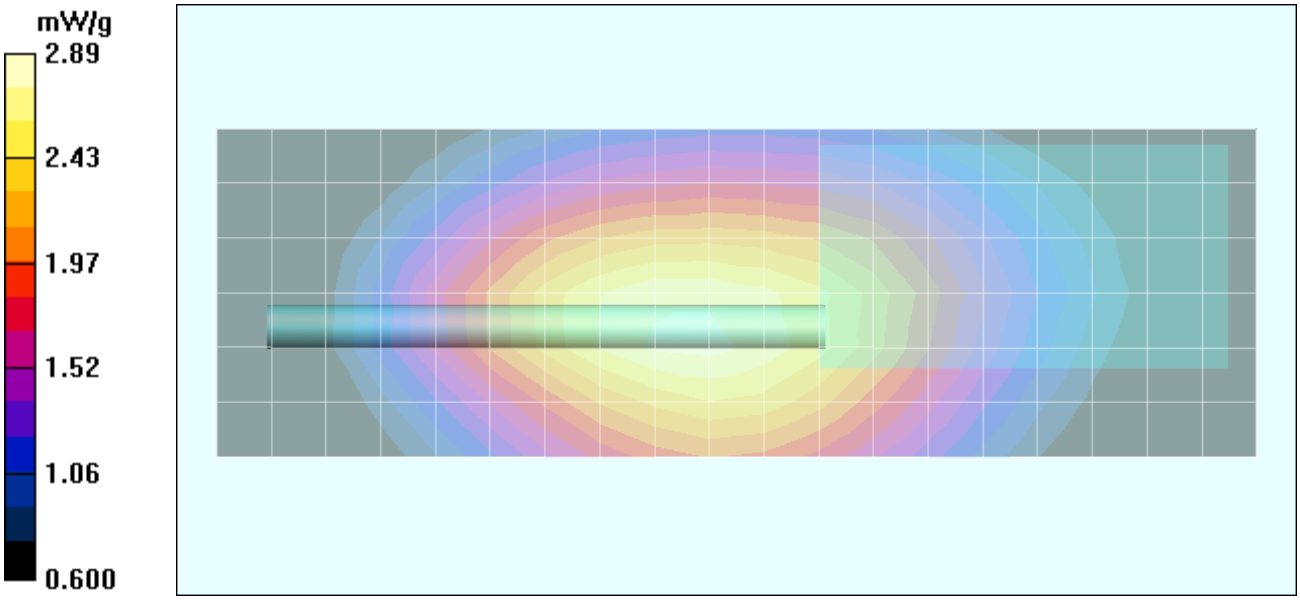
Ambient Temp: 25.5 °C; Fluid Temp: 22.1 °C; Barometric Pressure: 107.8 kPa; Humidity: 31%

Communication System: FM VHF
Frequency: 146 MHz; Duty Cycle: 1:1
RF Output Power: 5.30 Watts (Conducted)
7.2V 1100mAh NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: HSL150 (σ = 0.73 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3)

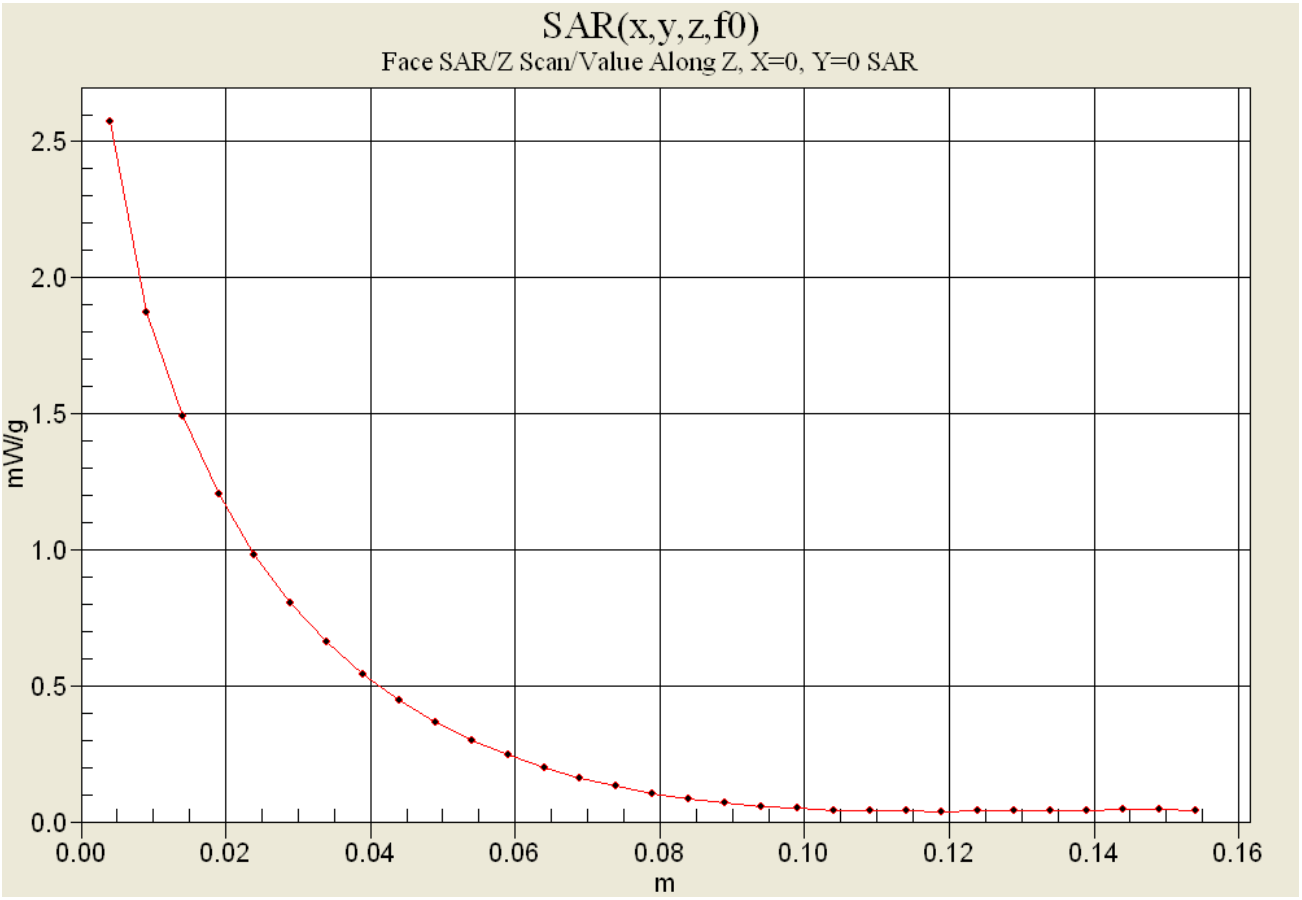
- Probe: ET3DV6 - SN1590; ConvF(9.6, 9.6, 9.6); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Face-Held - 2.5cm Separation Distance - Low Channel/Area Scan (7x20x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5cm Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 4.25 W/kg
SAR(1 g) = 2.80 mW/g; SAR(10 g) = 2.1 mW/g
Reference Value = 61.6 V/m
Power Drift = -0.983 dB



Z-Axis Scan


SAR(x,y,z,f0)
Face SAR/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Face-Held SAR - 2850mAh Alkaline Battery (Duracell ProCell) - 146 MHz Antenna (P/N: ATV-8A)

Dated Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

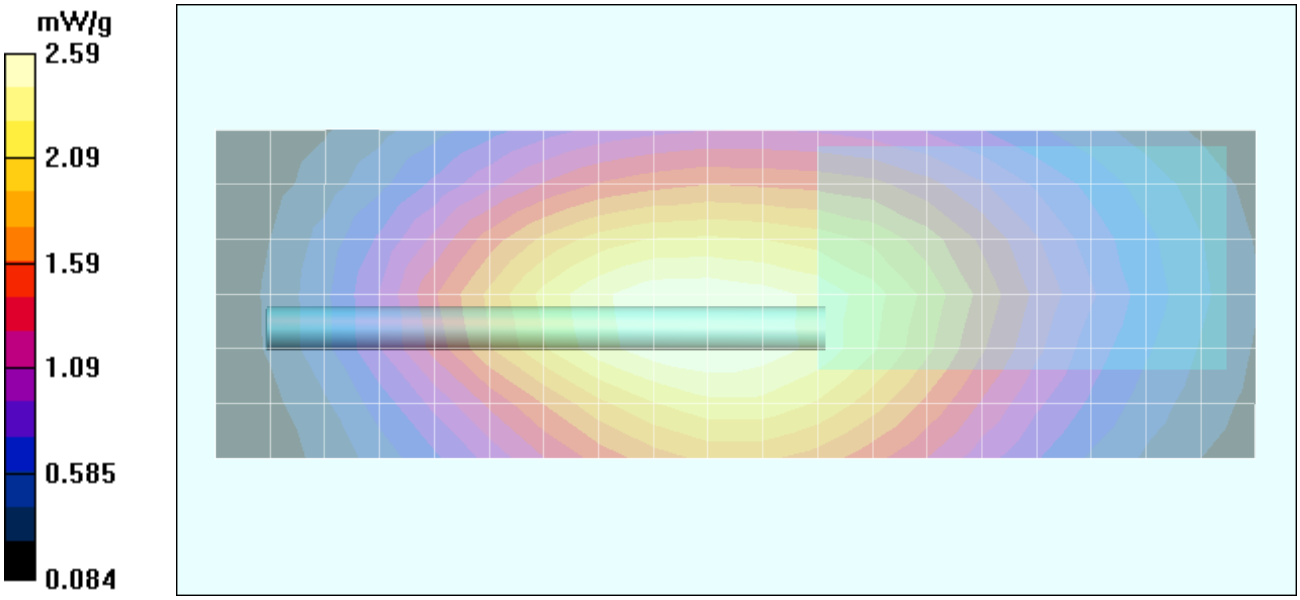
Ambient Temp: 25.5 °C; Fluid Temp: 22.1 °C; Barometric Pressure: 107.8 kPa; Humidity: 31%

Communication System: FM VHF
Frequency: 146 MHz; Duty Cycle: 1:1
RF Output Power: 5.24 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: HSL150 (σ = 0.73 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(9.6, 9.6, 9.6); 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 - 2.5cm Separation Distance - Low Channel/Area Scan (7x20x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - 2.5cm Separation Distance - Low Channel/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.83 mW/g
Reference Value = 53 V/m
Power Drift = -0.197 dB



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Body-Worn SAR - 700mAh NiCd Battery - 174 MHz Antenna (P/N: ATV-8C)

Date Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

Ambient Temp: 25.1 °C; Fluid Temp: 23.1 °C; Barometric Pressure: 107.1 kPa; Humidity: 31%

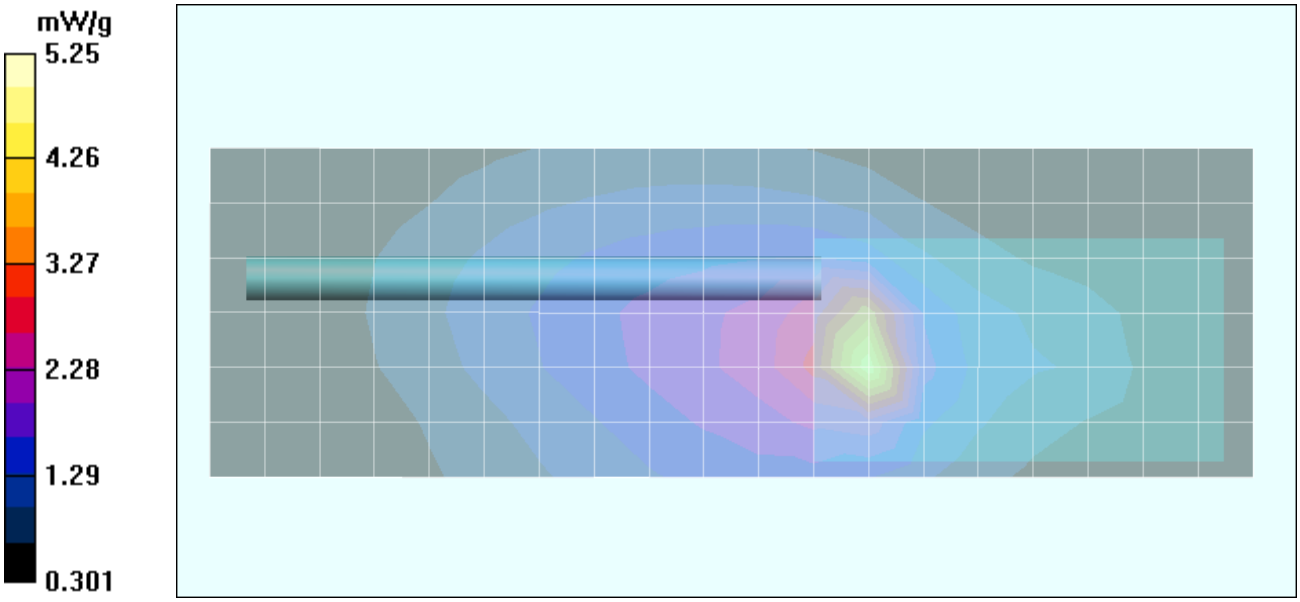
Body-Worn Accessories: Belt-Clip (P/N: BA0102700112KA), Speaker-Microphone (P/N: MH-45)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 4.48 Watts (Conducted)
7.2V 700mAh NiCd Battery Pack (P/N: FNB-64)
Medium: M150 (σ = 0.78 mho/m; ε_r = 60.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(9.2, 9.2, 9.2); 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 (7x20x1):
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) = 19.1 W/kg
SAR(1 g) = 5.39 mW/g; SAR(10 g) = 2.71 mW/g
Reference Value = 70.6 V/m
Power Drift = -0.943 dB



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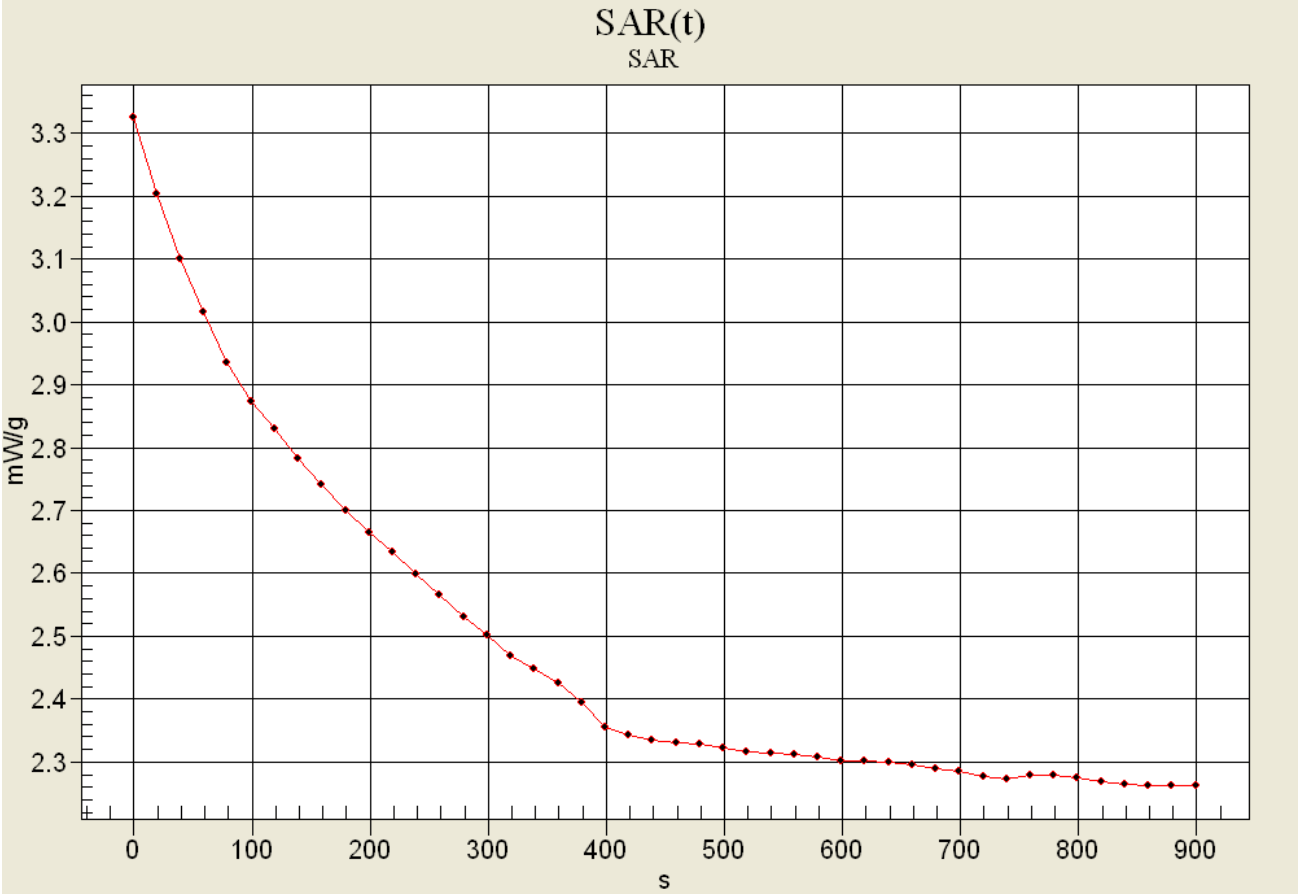
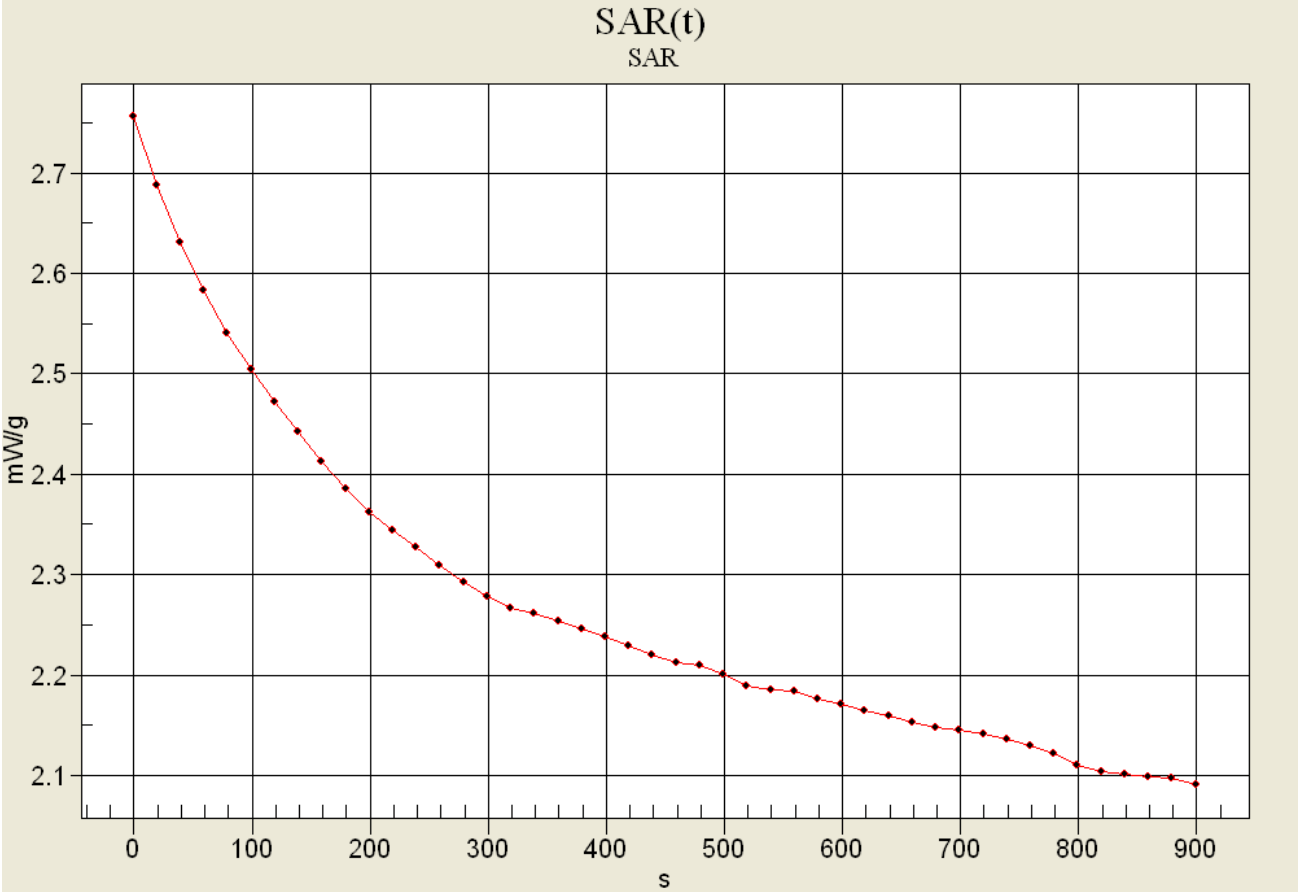
SAR versus Time - 15 Minutes - NiCd 700mAh Battery - 174 MHz Antenna (P/N: ATV-8C)



Initial Level: 3.328 mW/g
6:40 Level: 2.358 mW/g (-1.50 dB)
Final Level: 2.268 mW/g (-1.67 dB)

SAR versus Time - 15 minutes - External Power - 174 MHz Antenna (P/N: ATV-8C)



Initial Level: 2.758 mW/g
6:40 Level: 2.240 mW/g (-0.903 dB)
Final Level: 2.091 mW/g (-1.20 dB)

Body-Worn SAR - 1100 mAh NiCd Intrinsically Safe Battery - 174 MHz Antenna (P/N: ATV-8C)

Date Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

Ambient Temp: 25.1 °C; Fluid Temp: 23.1 °C; Barometric Pressure: 107.1 kPa; Humidity: 31%

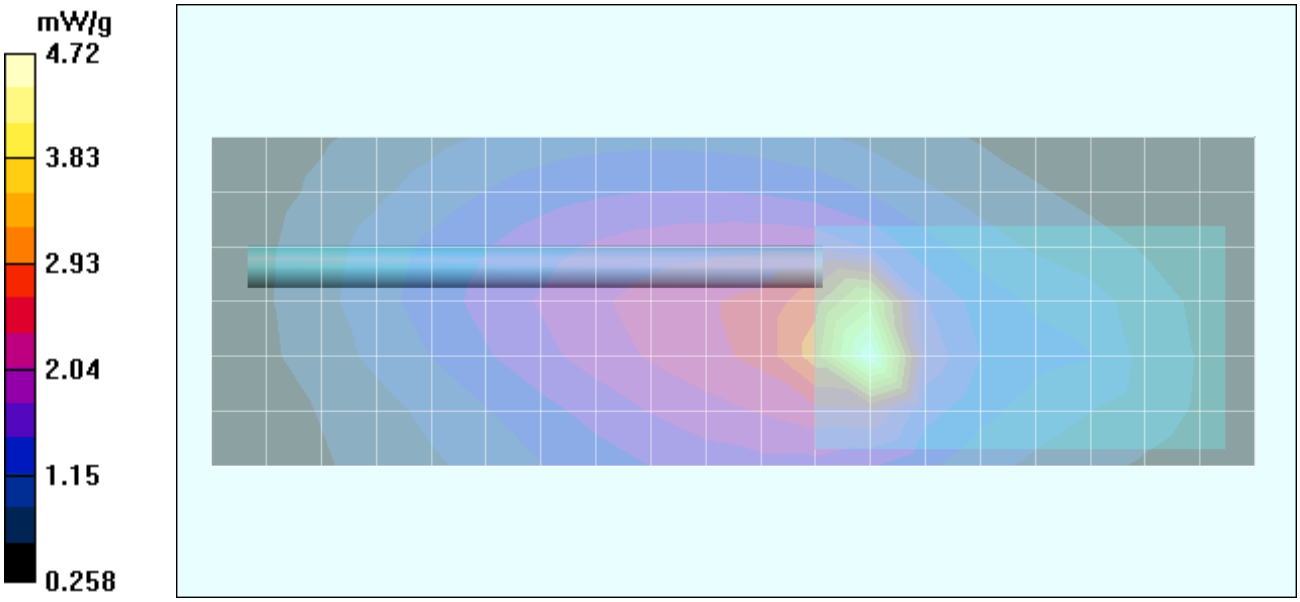
Body-Worn Accessories: Belt-Clip (P/N: BA0102700112KA), Speaker-Microphone (P/N: MH-45)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 4.49 Watts (Conducted)
7.2V 1100mAH NiCd IS Battery Pack (P/N: FNB-V57IS)
Medium: M150 (σ = 0.78 mho/m; ε_r = 60.3; ρ = 1000 kg/m^3)

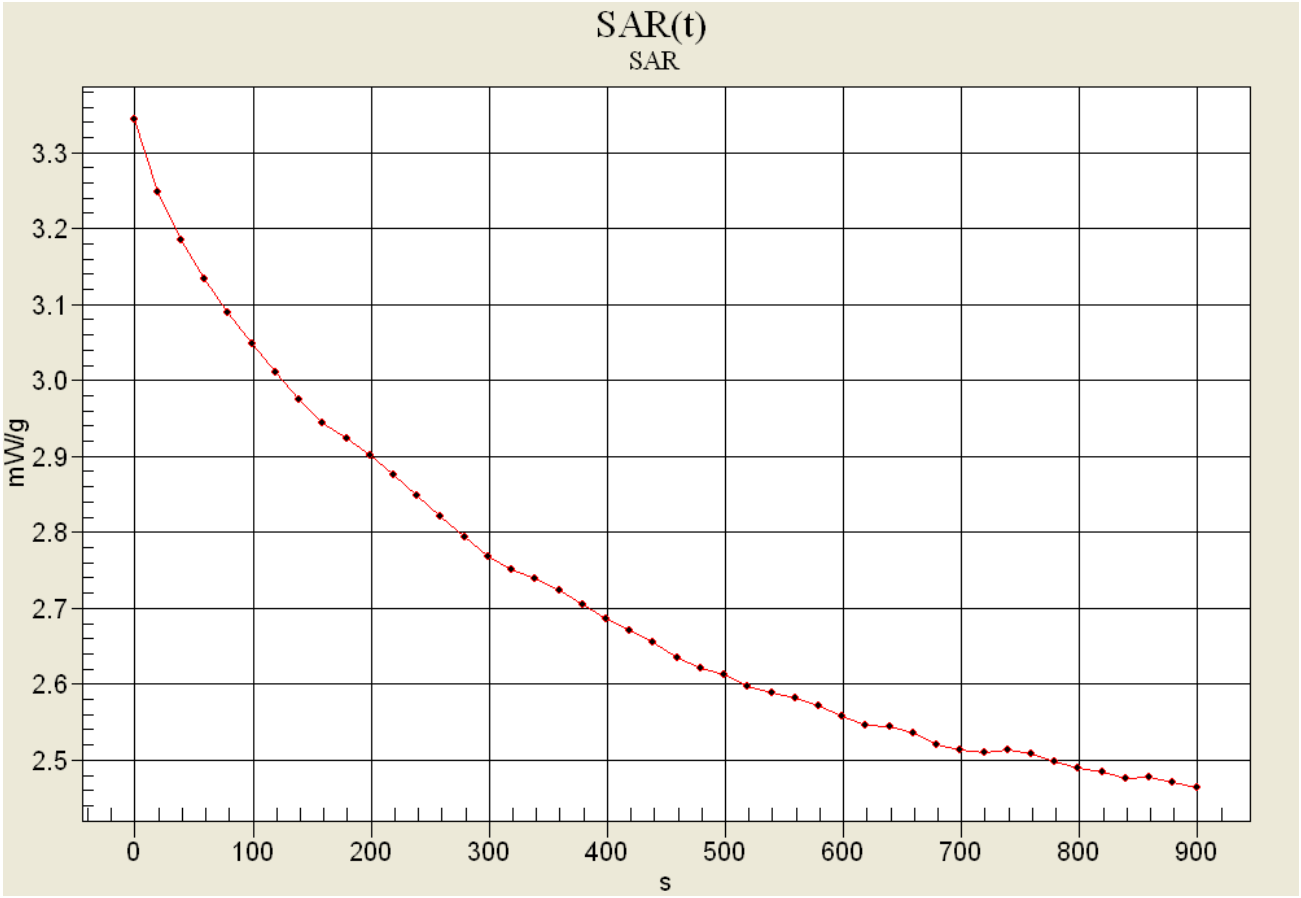
- Probe: ET3DV6 - SN1590; ConvF(9.2, 9.2, 9.2); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.2 Build 12; Postprocessing SW: SEMCAD, V1.8 Build 94

Body-Worn - 1.3 cm Belt-Clip Separation Distance - High Channel/Area Scan (7x20x1):
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) = 17.6 W/kg
SAR(1 g) = 4.75 mW/g; SAR(10 g) = 2.34 mW/g
Reference Value = 64.2 V/m
Power Drift = -0.814 dB



SAR versus Time - 15 Minutes - NiCd 1100mAh IS Battery - 174 MHz Antenna (P/N: ATV-8C)



Initial Level: 3.348 mW/g
6:40 Level: 2.689 mW/g (-0.952 dB)
Final Level: 2.468 mW/g (-1.32 dB)

Body-Worn SAR - 2850mAh Alkaline Battery (Duracell ProCell) - 174 MHz Antenna (P/N: ATV-8C)

Date Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

Ambient Temp: 25.1 °C; Fluid Temp: 23.1 °C; Barometric Pressure: 107.1 kPa; Humidity: 31%

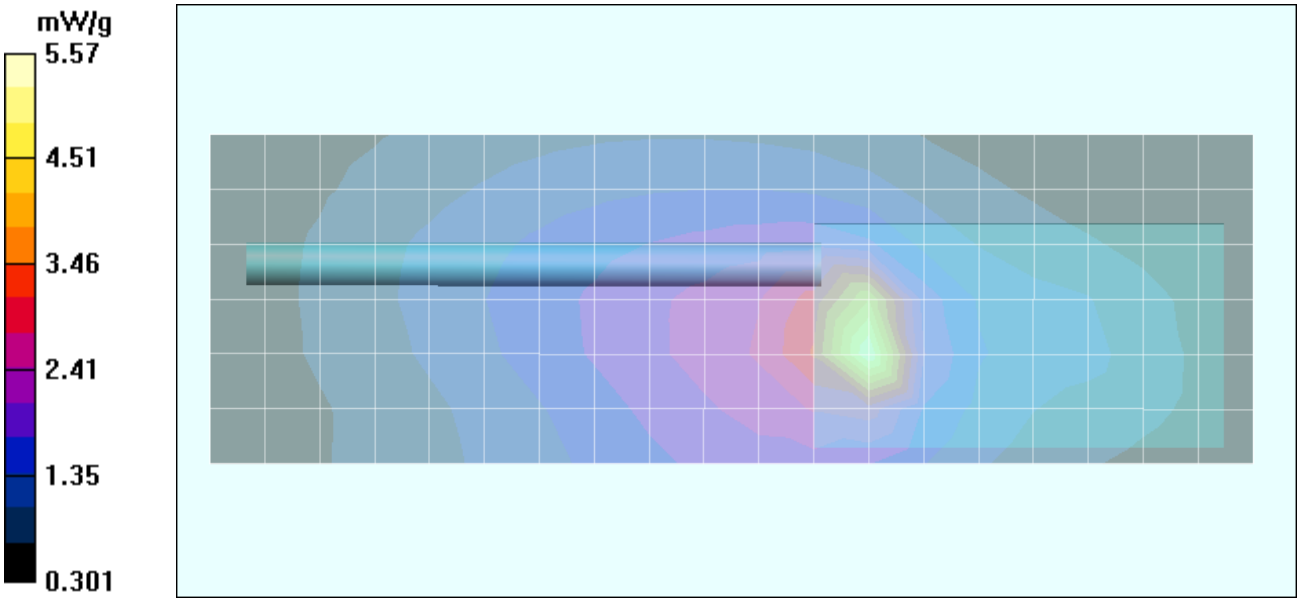
Body-Worn Accessories: Belt-Clip (P/N: BA0102700112KA), Speaker-Microphone (P/N: MH-45)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 4.46 Watts (Conducted)
9V AA Alkaline Duracell ProCell Battery Pack (Battery Case P/N: FBA-25)
Medium: M150 (σ = 0.78 mho/m; ε_r = 60.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(9.2, 9.2, 9.2); 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 (7x20x1):
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) = 20.7 W/kg
SAR(1 g) = 5.65 mW/g; SAR(10 g) = 2.8 mW/g
Reference Value = 70.9 V/m
Power Drift = -1.11 dB



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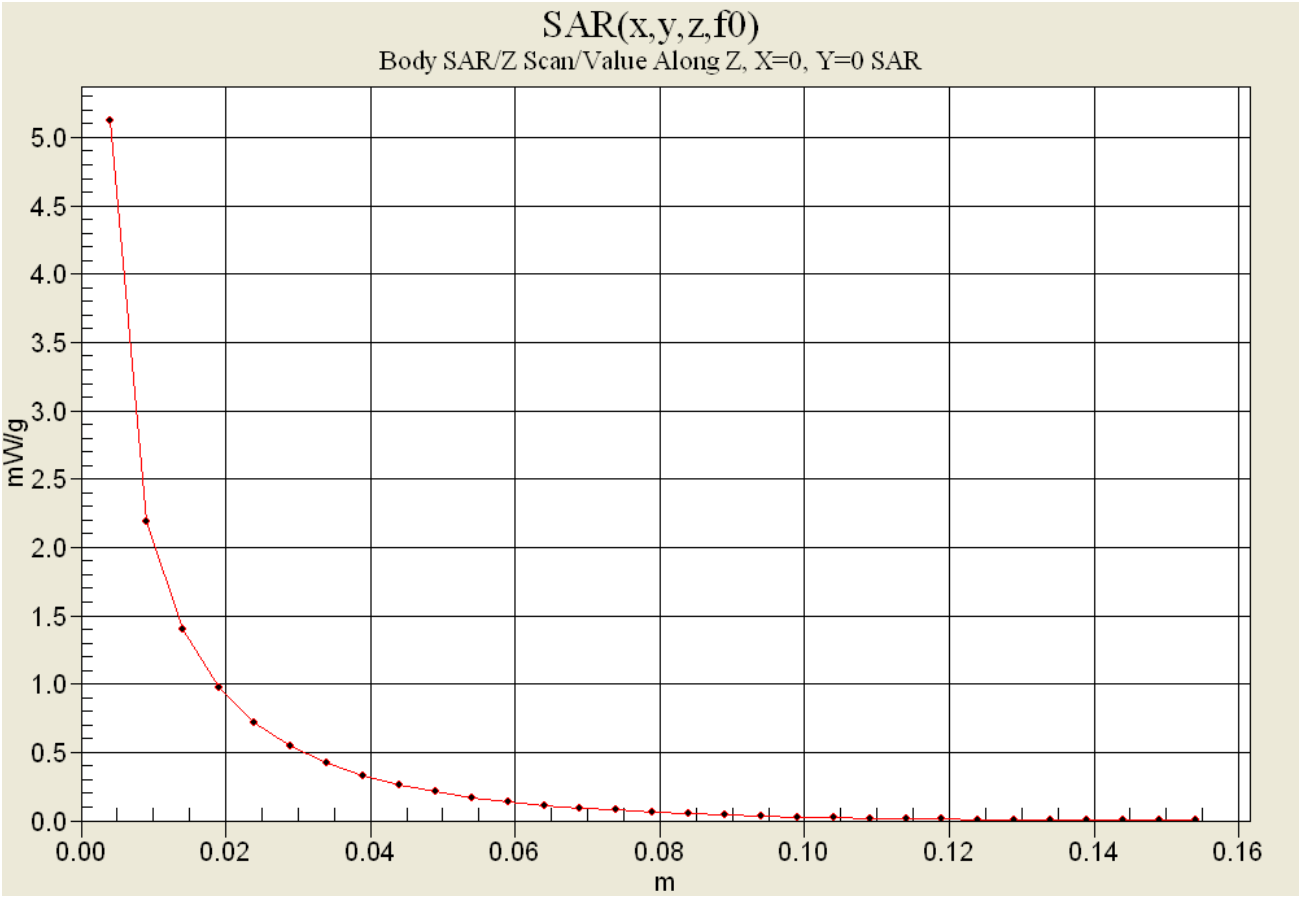
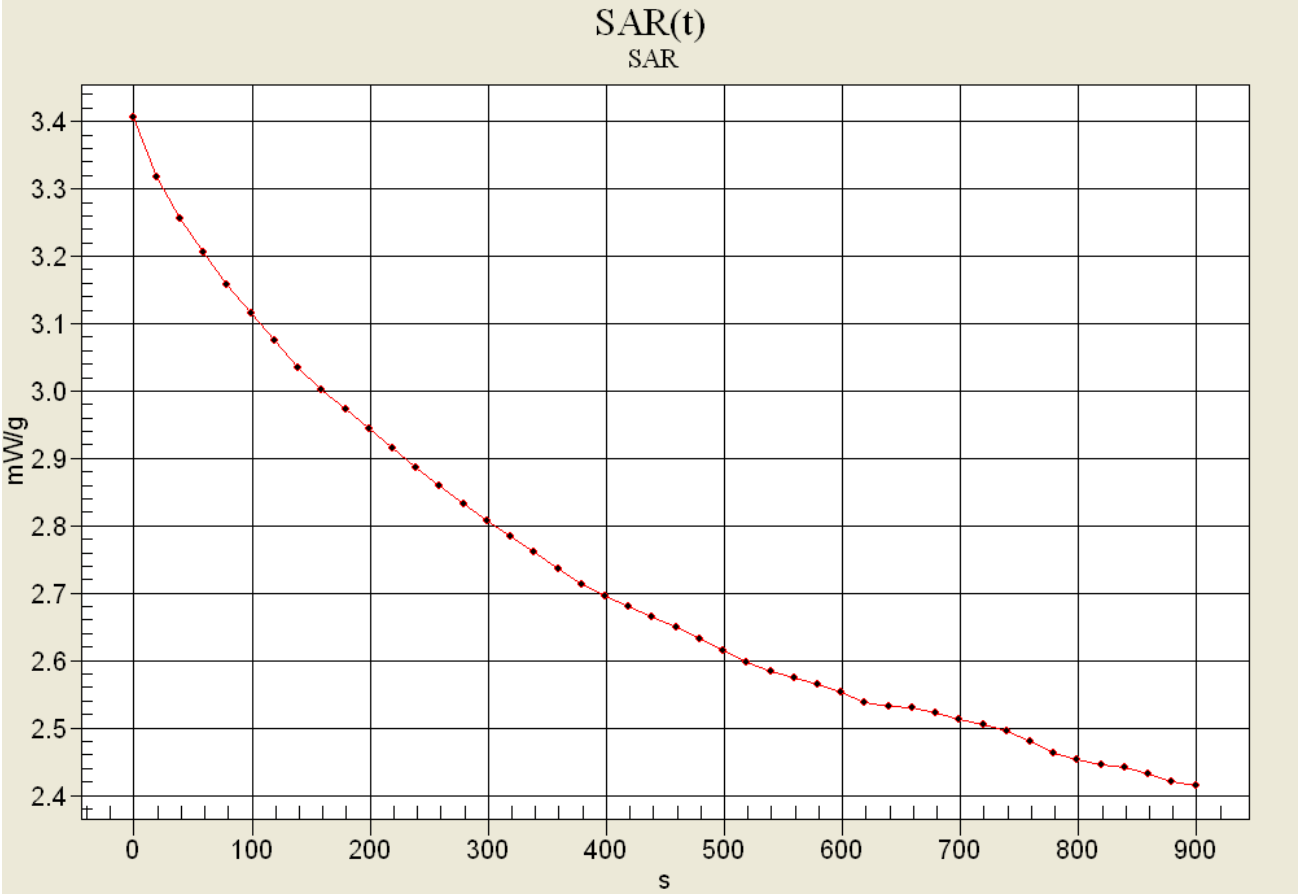
Z-Axis Scan


SAR(x,y,z,f0)
Body SAR/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

SAR versus Time Drift - 15 Minutes - Alkaline 2850mAh Battery (Duracell Procell)

174 MHz Antenna (P/N: ATV-8C)



Initial Level: 3.408 mW/g
6:40 Level: 2.701 mW/g (-1.01 dB)
Final Level: 2.415 mW/g (-1.50 dB)

Body-Worn SAR - Alkaline 3135mAh Battery (Energizer E-Squared) - 174 MHz Antenna (P/N: ATV-8C)

Date Tested: 02/24/04

DUT: Vertex Standard Model: VX-414-2-5; Type: Portable FM VHF PTT Radio Transceiver; Serial: 3K000002

Ambient Temp: 25.1 °C; Fluid Temp: 23.1 °C; Barometric Pressure: 107.1 kPa; Humidity: 31%

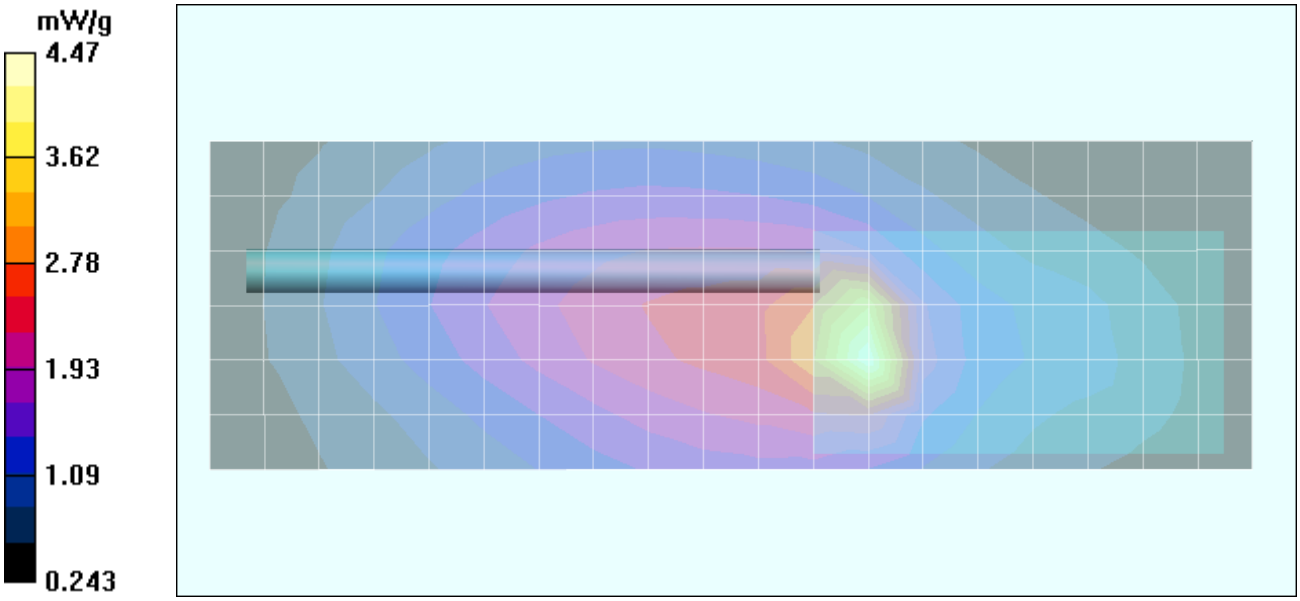
Body-Worn Accessories: Belt-Clip (P/N: BA0102700112KA), Speaker-Microphone (P/N: MH-45)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 4.43 Watts (Conducted)
9V AA Alkaline Energizer E-Squared Battery Pack (P/N: FBA-25)
Medium: M150 (σ = 0.78 mho/m; ε_r = 60.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(9.2, 9.2, 9.2); 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 (7x20x1):
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) = 16.8 W/kg
SAR(1 g) = 4.53 mW/g; SAR(10 g) = 2.24 mW/g
Reference Value = 63 V/m
Power Drift = -1.10 dB



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APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

System Performance Check - 300 MHz Dipole

Date Tested: 02/24/04

DUT: Dipole 300 MHz; Model: D300V2; System Performance Check; Serial: 135

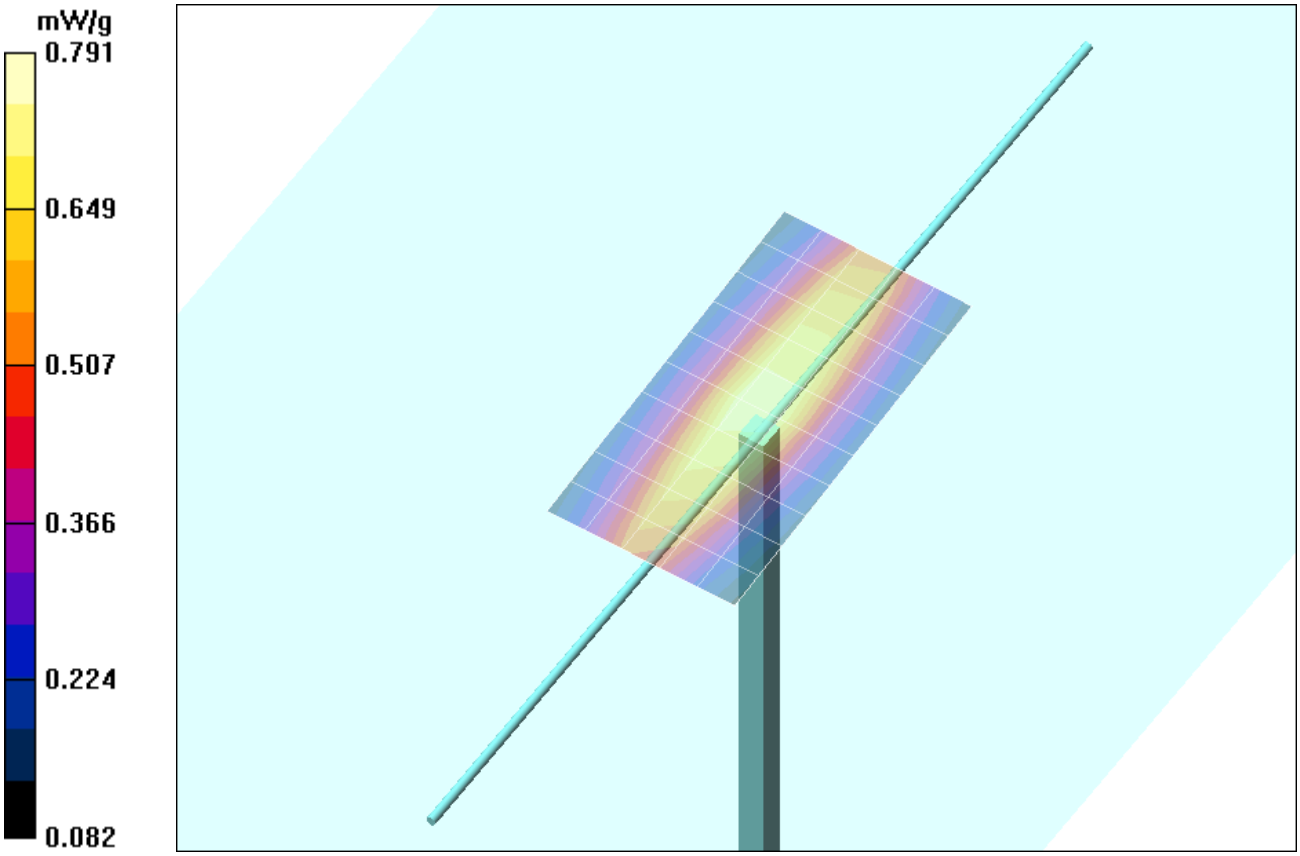
Ambient Temp: 25.0 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 107.2 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.89 mho/m; ε_r = 45.8; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(8.3, 8.3, 8.3); 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

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

300 MHz System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.750 mW/g; SAR(10 g) = 0.486 mW/g
Reference Value = 30.2 V/m
Power Drift = -0.1 dB



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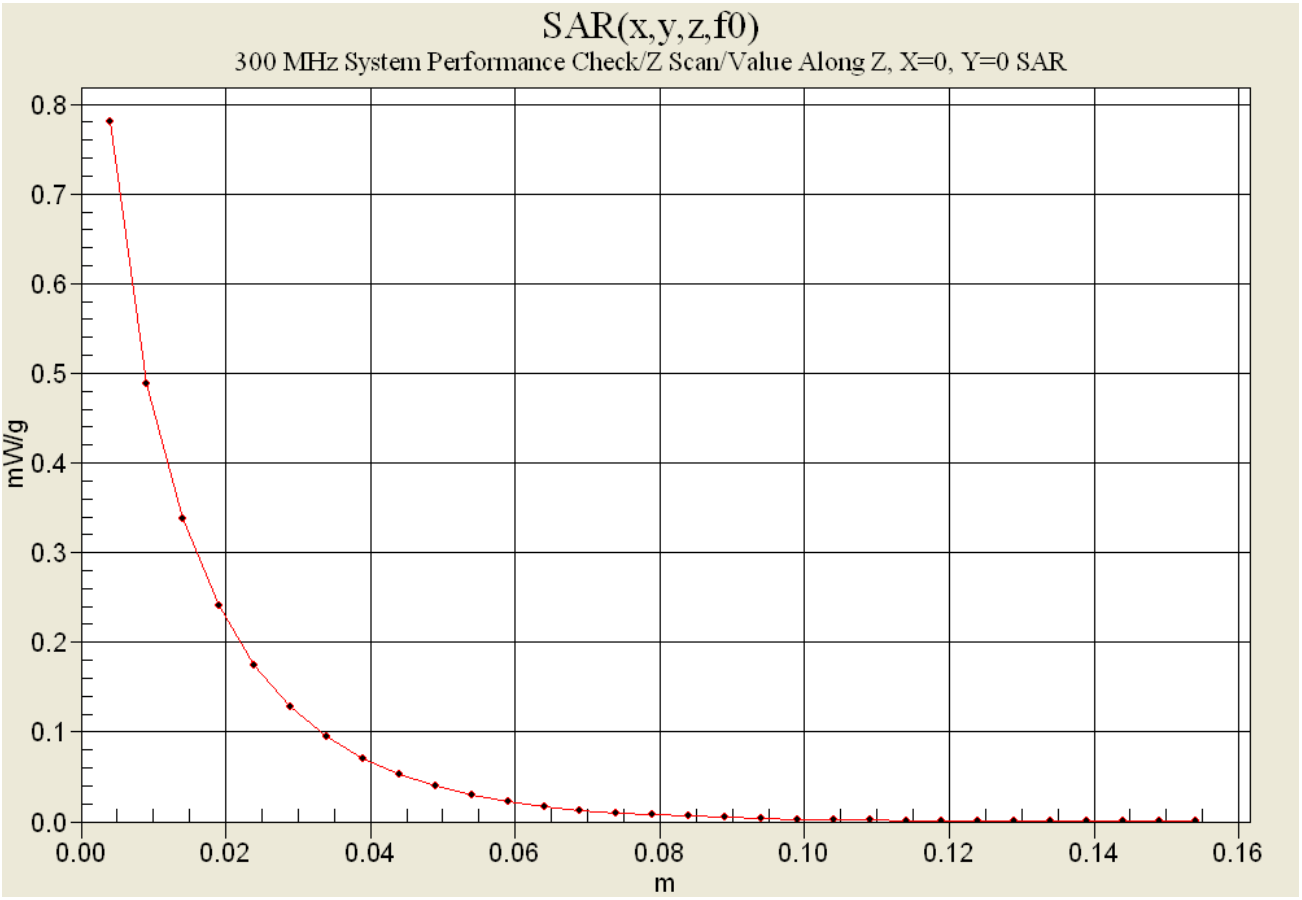
Z-Axis Scan


SAR(x,y,z,f0)
300 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
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

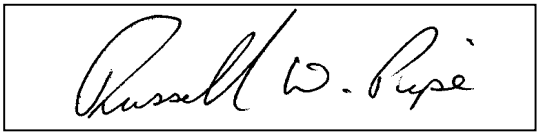
APPENDIX C - SYSTEM VALIDATION

300MHz SYSTEM VALIDATION DIPOLE

Type:	**300MHz Validation Dipole**
Serial Number:	**135**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**October 30, 2003**

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

Calibrated by: 

Approved by: 

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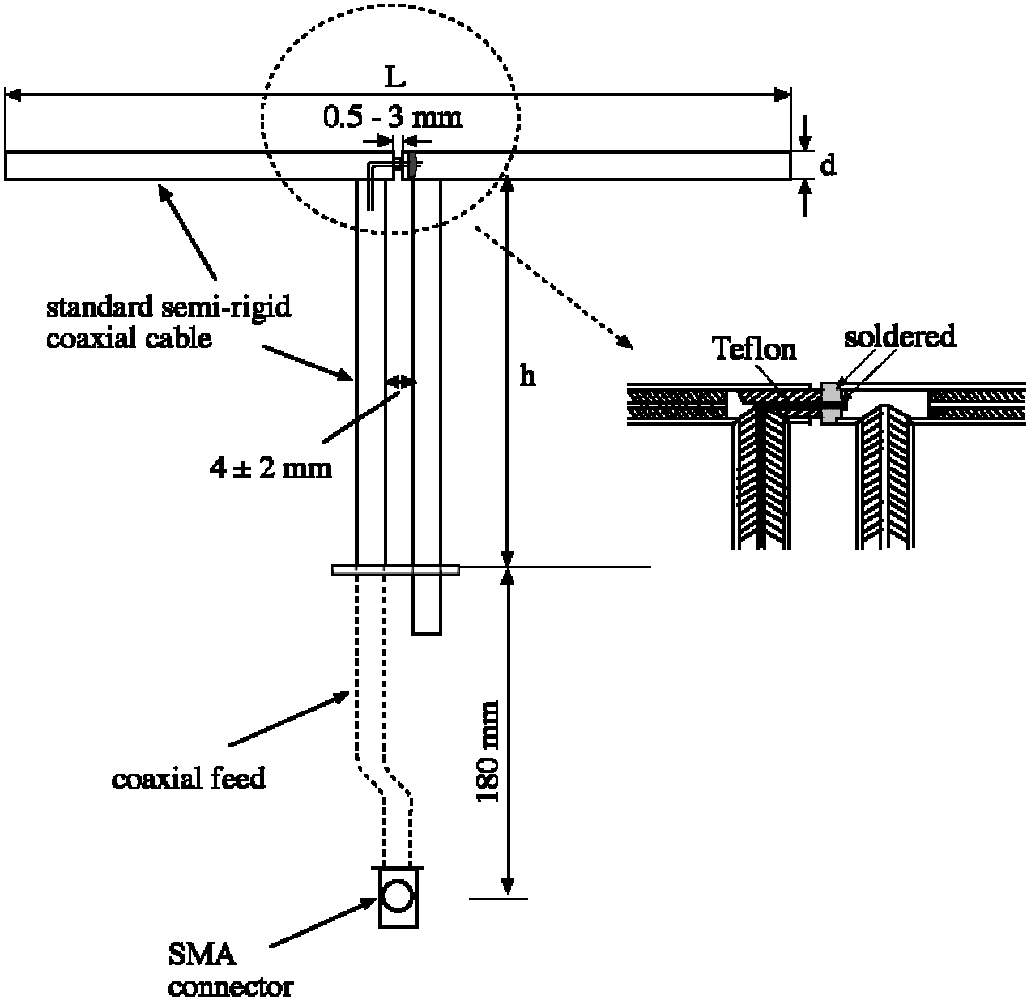
1. Validation Dipole Construction & Electrical Characteristics

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 300MHz	Re{Z} = 43.586Ω
	Im{Z} = -4.5313Ω
Return Loss at 300MHz	-21.693dB



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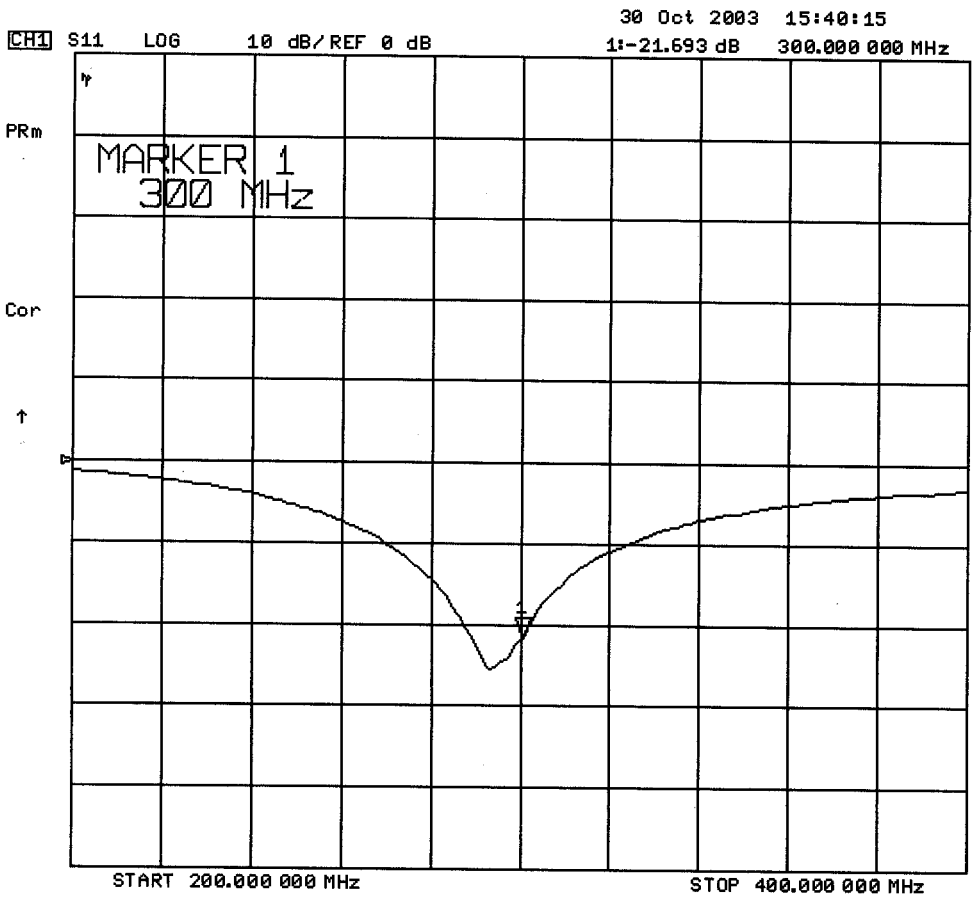
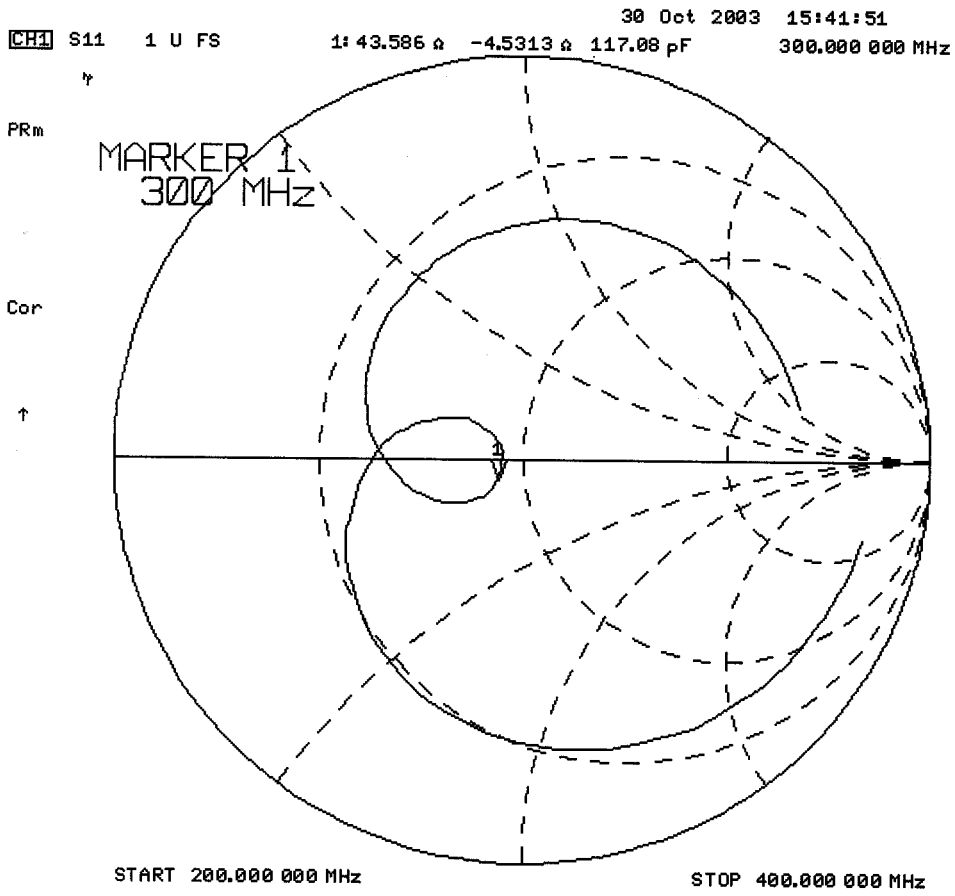

30 Oct 2003 15:40:15
CH1 S11 LOG 10 dB/ REF 0 dB
1:-21.693 dB 300.000 000 MHz
PRm
MARKER 1
300 MHz
Cor
START 200.000 000 MHz
STOP 400.000 000 MHz


30 Oct 2003 15:41:51
CH1 S11 1 U FS
1: 43.586 Ω -4.5313 Ω 117.08 pF
300.000 000 MHz
PRm
MARKER 1
300 MHz
Cor
START 200.000 000 MHz
STOP 400.000 000 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.

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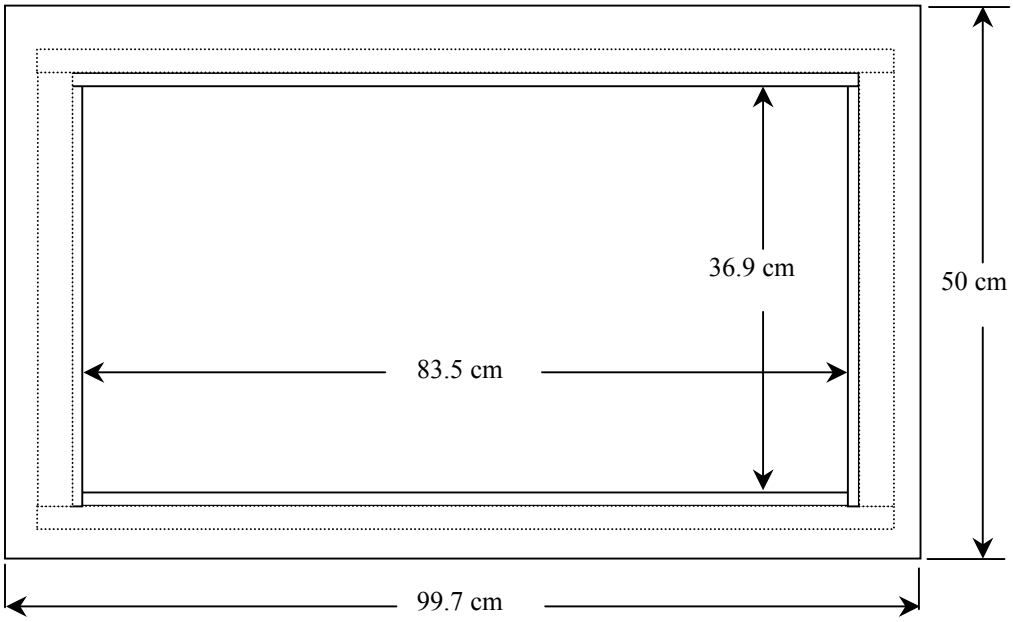
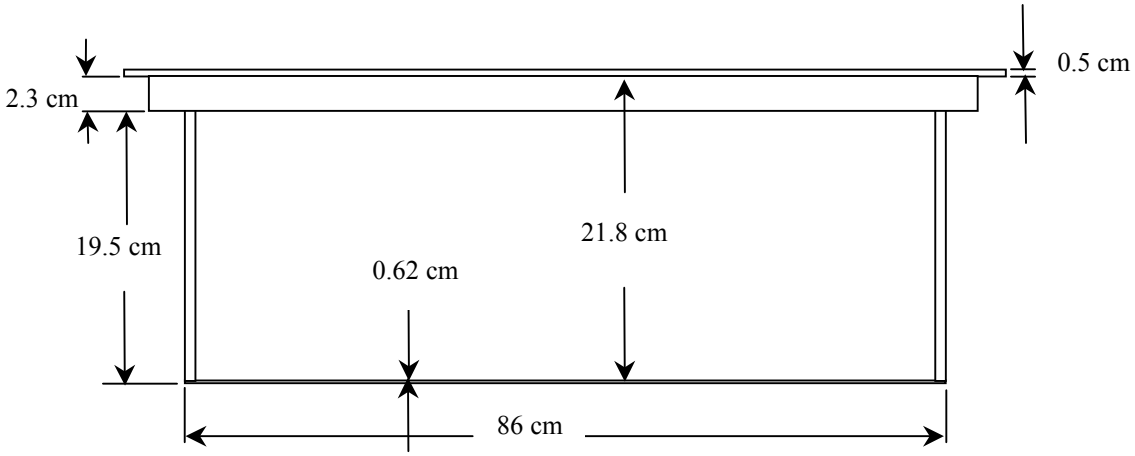
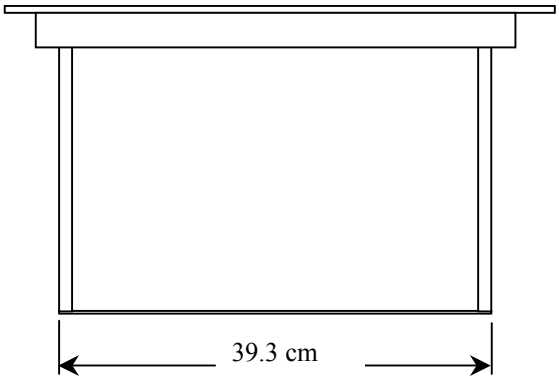
4. Dimensions of Plexiglas Planar Phantom







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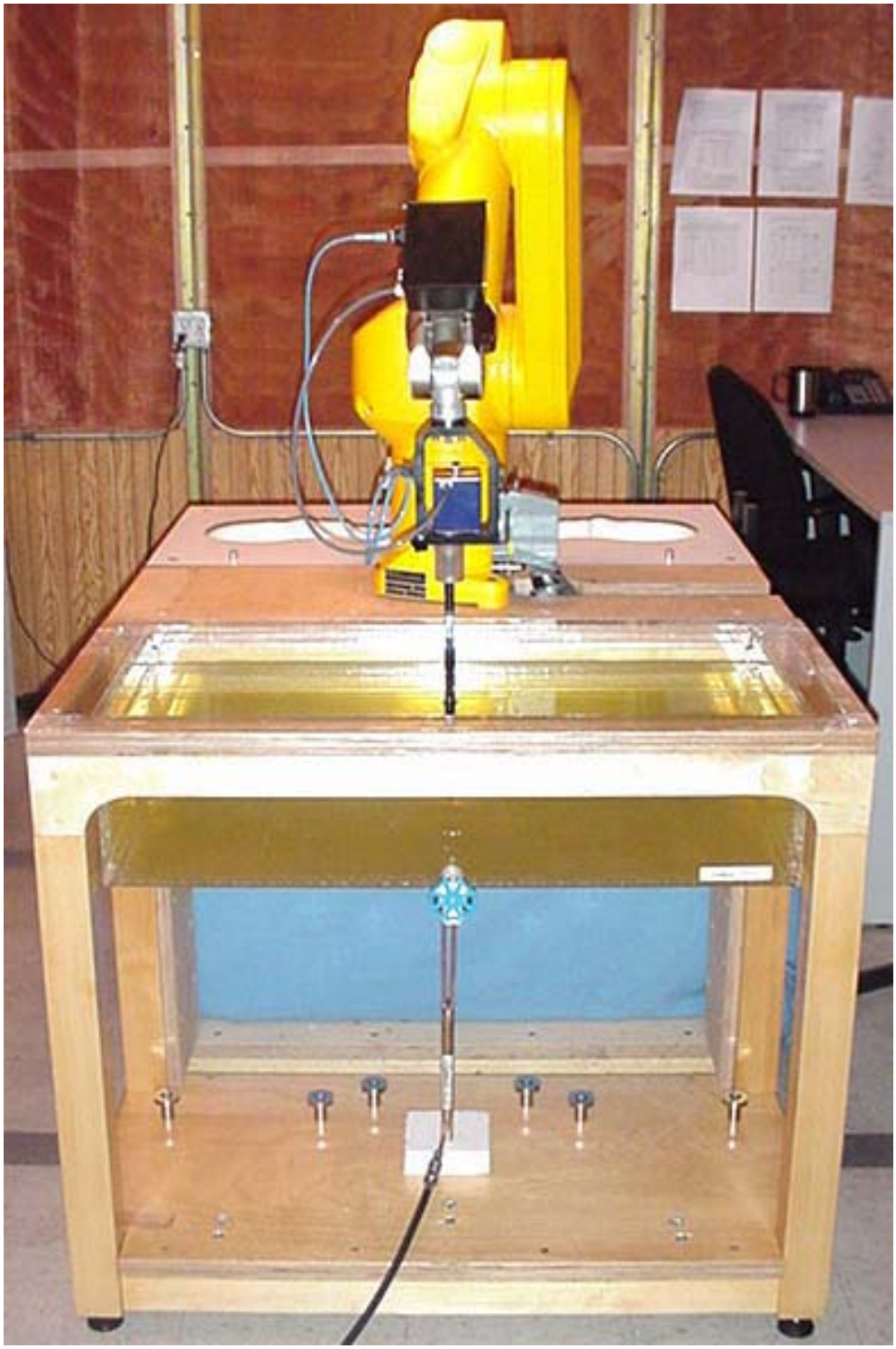
5. 300MHz System Validation Setup



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300MHz System Validation Setup

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6. Measurement Conditions

The planar phantom was filled with simulated brain tissue having the following parameters at 300MHz:

Relative Permittivity:	45.7
Conductivity:	0.88 mho/m
Fluid Temperature:	22.2°C
Fluid Depth:	≥ 15cm

Environmental Conditions:

Ambient Temperature:	22.1°C
Humidity:	56%
Barometric Pressure:	103.4 kPa

The 300MHz simulated tissue mixture consists of the following ingredients:

Ingredient	Percentage by weight
Water	37.56%
Sugar	55.32%
Salt	5.95%
HEC	0.98%
Dowicil 75	0.19%
300MHz Target Dielectric Parameters at 22°C	ε_r = 45.3 σ = 0.87 S/m

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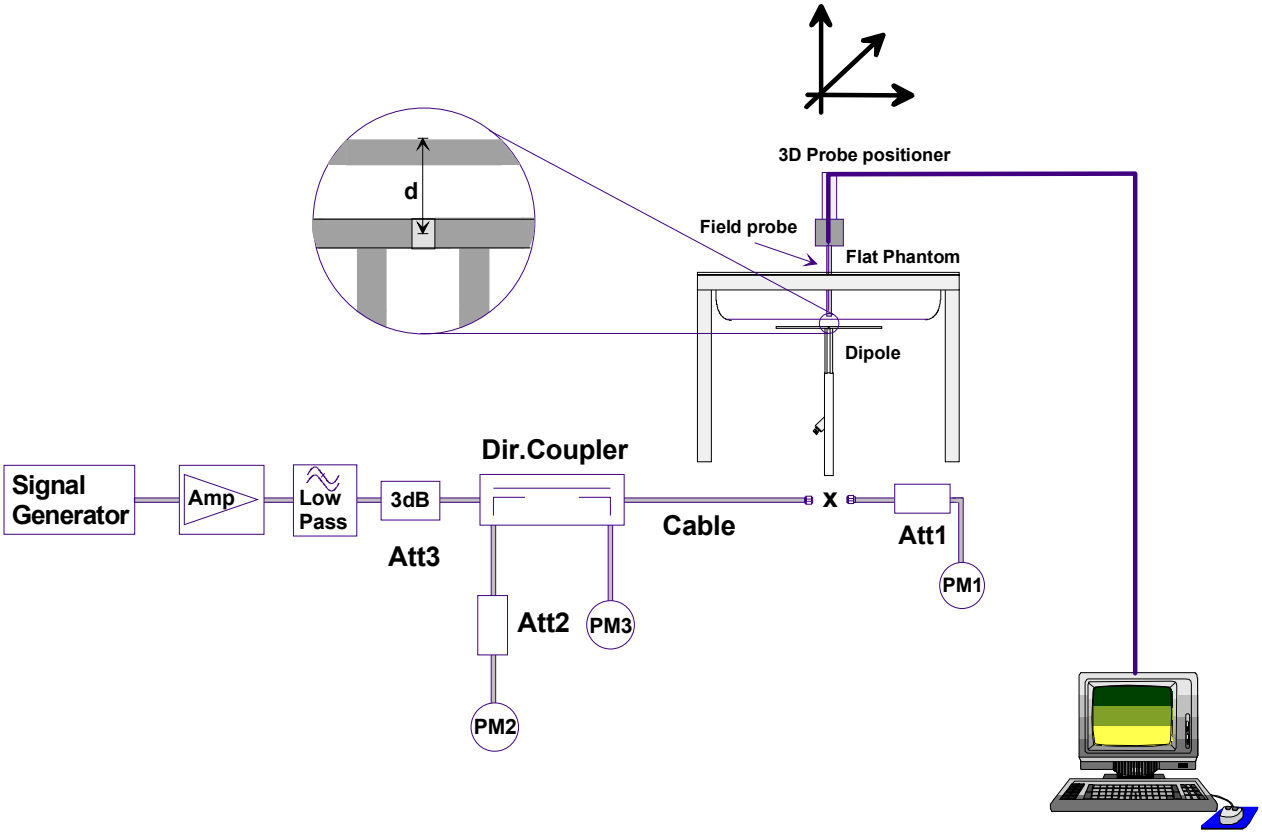
7. SAR Measurement

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.

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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	0.781	3.12	0.497	1.99	1.39
Test 2	0.779	3.12	0.495	1.98	1.39
Test 3	0.780	3.12	0.496	1.98	1.38
Test 4	0.788	3.15	0.501	2.00	1.41
Test 5	0.787	3.15	0.498	1.99	1.39
Test 6	0.780	3.12	0.492	1.97	1.38
Test 7	0.776	3.10	0.494	1.98	1.37
Test 8	0.784	3.14	0.500	2.00	1.39
Test 9	0.785	3.14	0. 500	2.00	1.39
Test 10	0.784	3.14	0.496	1.98	1.40
Average Value	0.782	3.13	0.497	1.99	1.39

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

IEEE Target over $1cm^3$ (1g) of tissue: 0.750 mW/g (+/- 10%)

Averaged over $1cm^3$ (1g) of tissue: 3.13 mW/g

Averaged over $10cm^3$ (10g) of tissue: 1.99 mW/g

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Test Date: 10/30/03

DUT: Dipole 300 MHz; Model: D300V2; Type: System Validation; Serial: 135

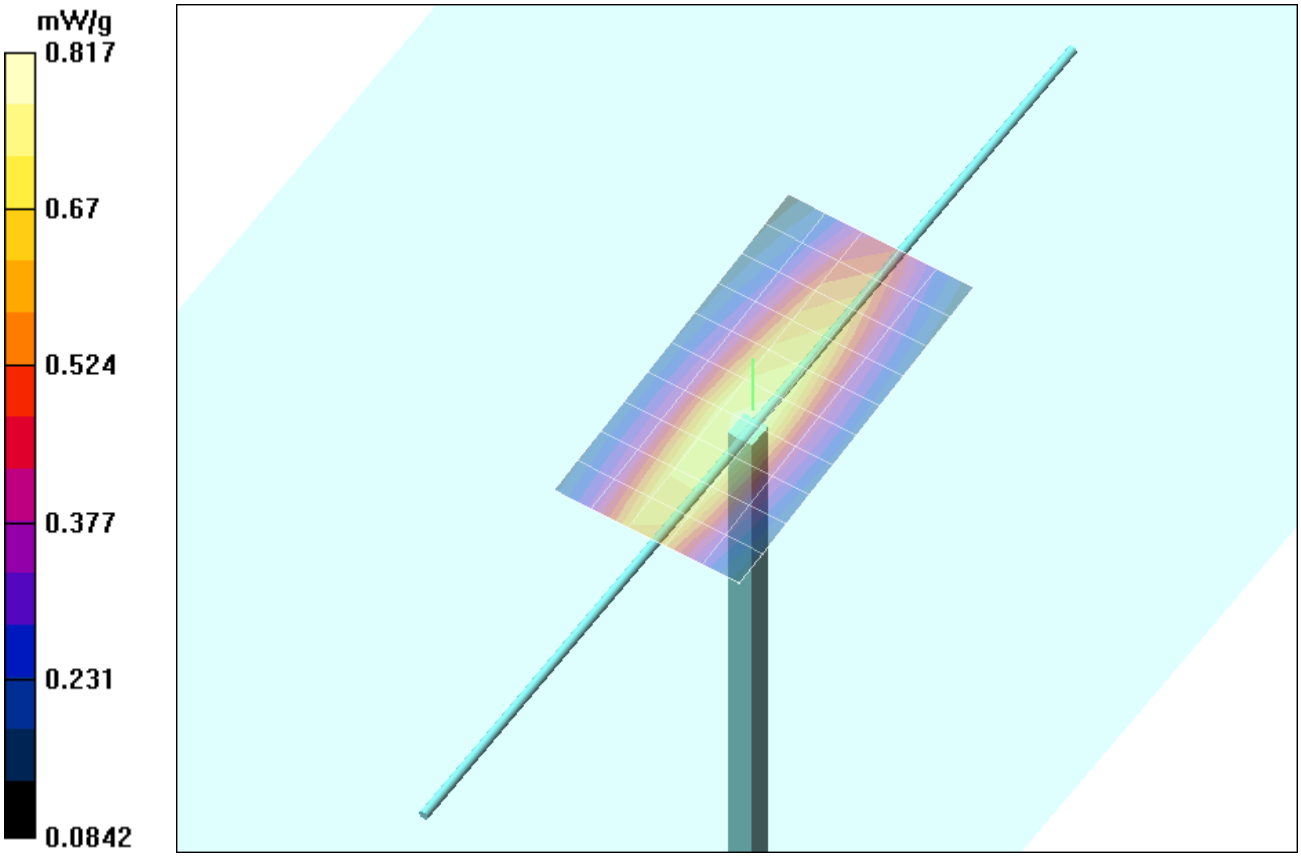
Ambient Temp: 22.1°C; Fluid Temp: 22.2°C; Barometric Pressure: 103.4 kPa; Humidity: 56%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.88 mho/m, ε_r = 45.7, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(7.9, 7.9, 7.9); 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

300 MHz Validation/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 30.4 V/m
Power Drift = -0.1 dB

300 MHz Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.781 mW/g; SAR(10 g) = 0.497 mW/g
Reference Value = 30.4 V/m
Power Drift = -0.1 dB



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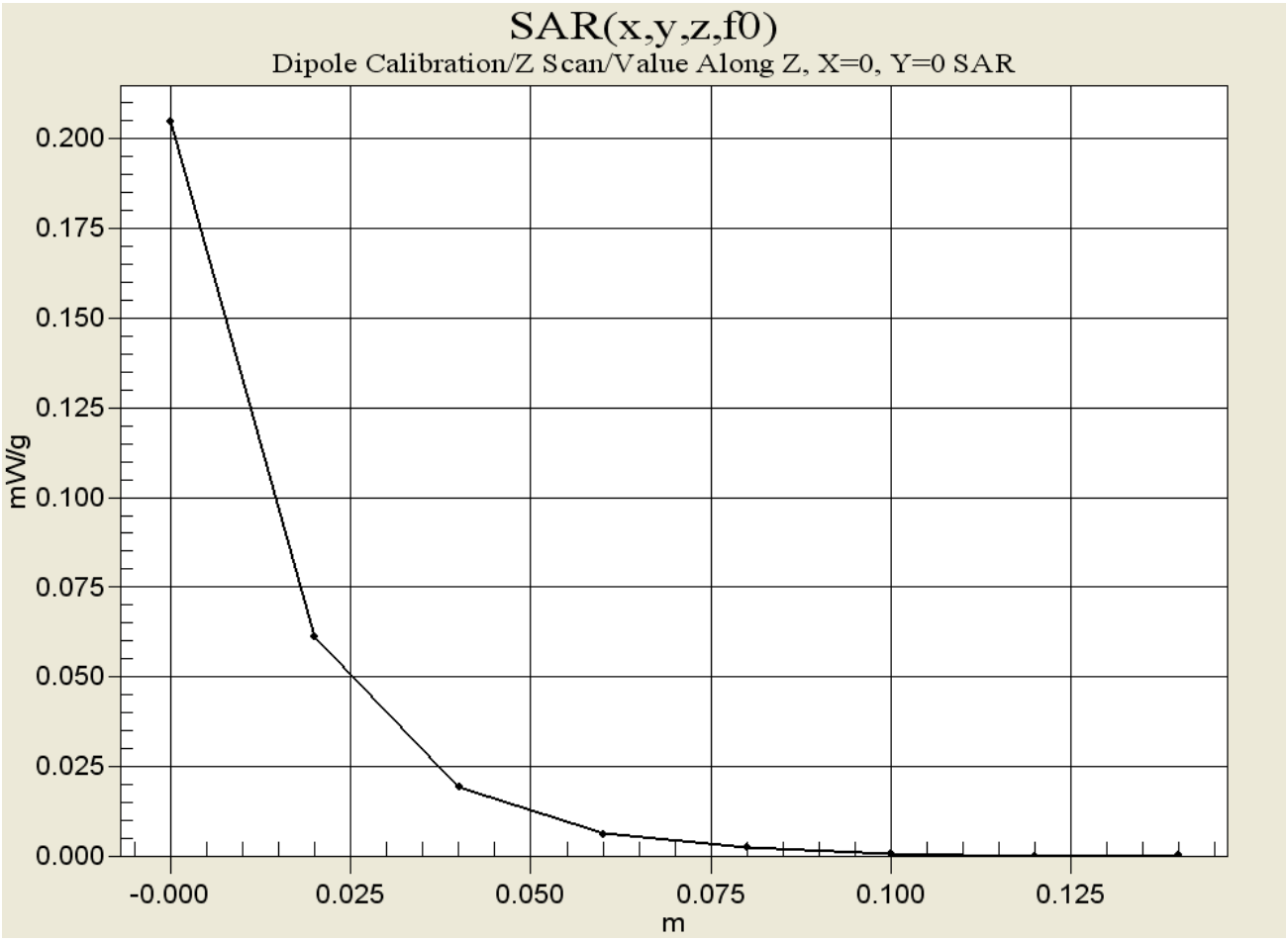

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300MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

October 30, 2003

Frequency	e'	e"
200.000000 MHz	49.8336	71.7361
210.000000 MHz	49.2398	69.1403
220.000000 MHz	48.9026	66.6656
230.000000 MHz	48.4363	64.3972
240.000000 MHz	47.9018	62.2373
250.000000 MHz	47.4646	60.4416
260.000000 MHz	47.0839	58.8112
270.000000 MHz	46.6772	57.3352
280.000000 MHz	46.4143	55.8759
290.000000 MHz	46.0204	54.5734
300.000000 MHz	45.6863	52.9882
310.000000 MHz	45.3261	51.7924
320.000000 MHz	44.9882	50.6430
330.000000 MHz	44.6549	49.5121
340.000000 MHz	44.3168	48.5356
350.000000 MHz	44.0824	47.5910
360.000000 MHz	43.7780	46.7661
370.000000 MHz	43.5461	45.8627
380.000000 MHz	43.3671	45.0444
390.000000 MHz	43.1052	44.2129
400.000000 MHz	42.8360	43.5735

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

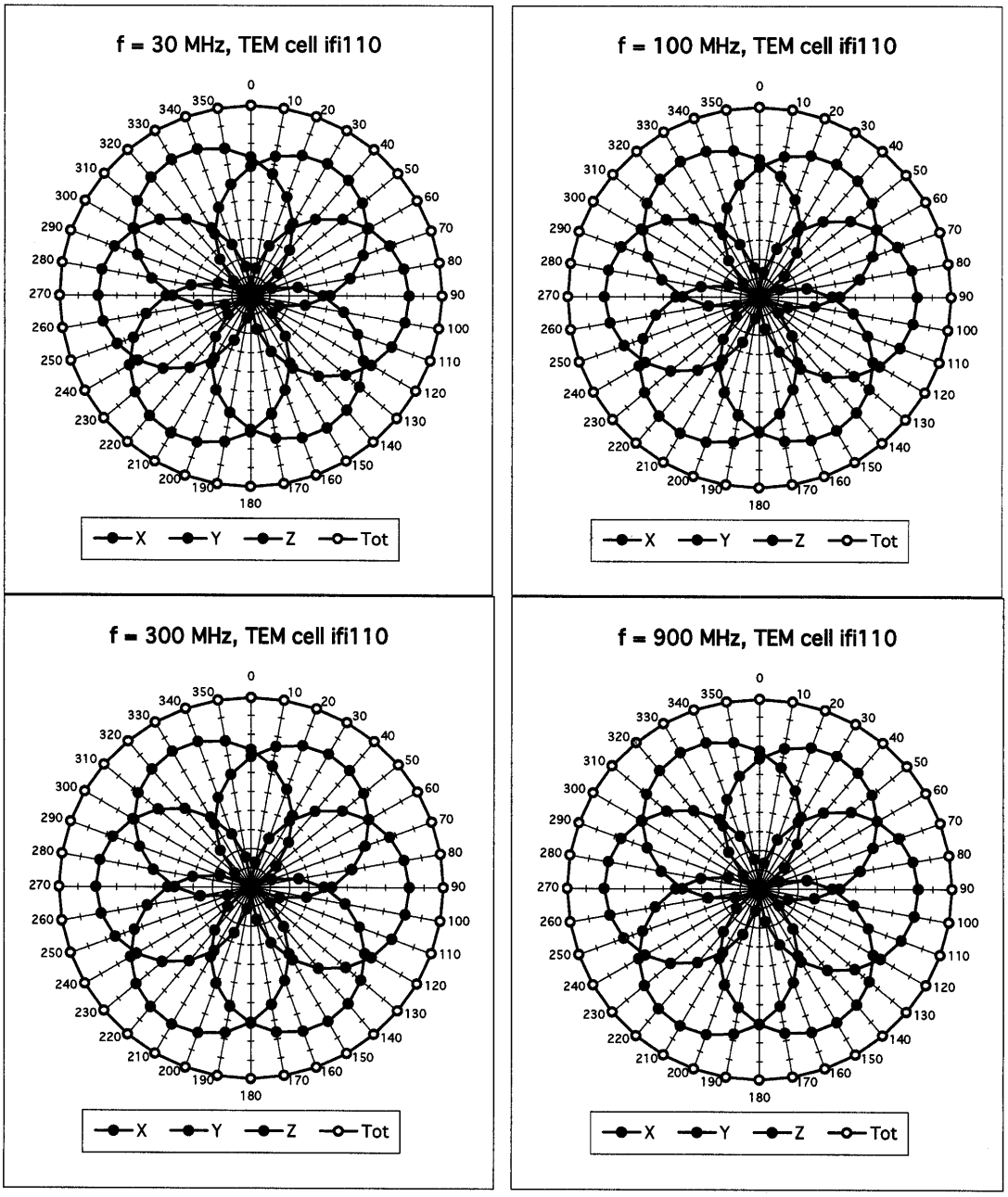
Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

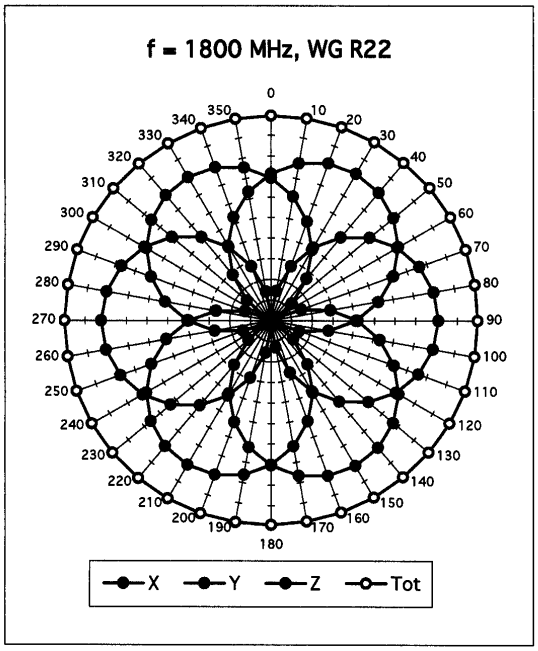
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.5
SAR_{be} [%]	With Correction Algorithm	0.2	0.1

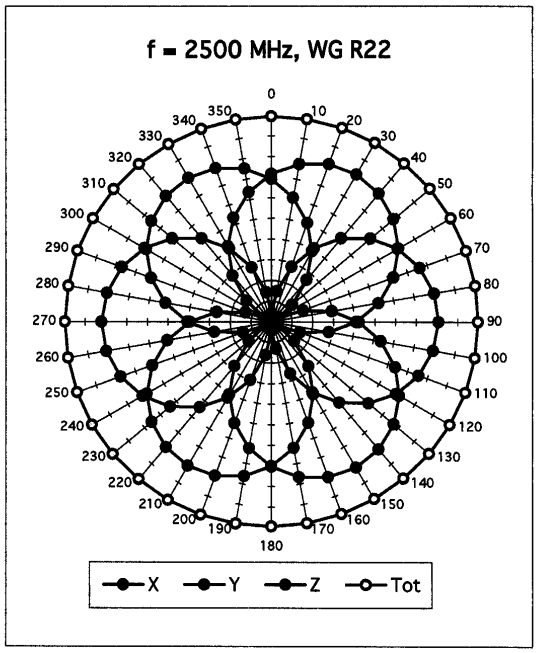
Sensor Offset

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

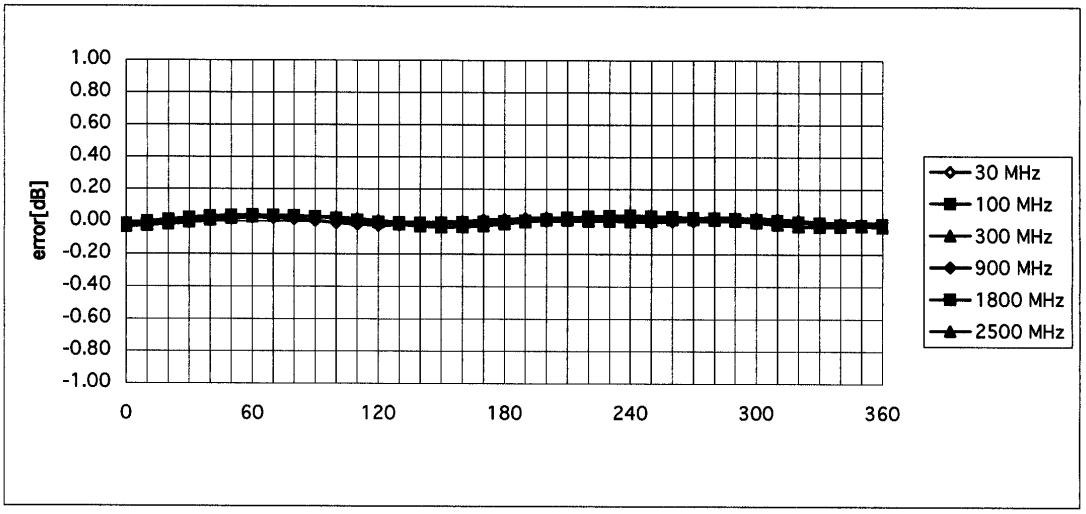
Receiving Pattern (ϕ), θ = 0°





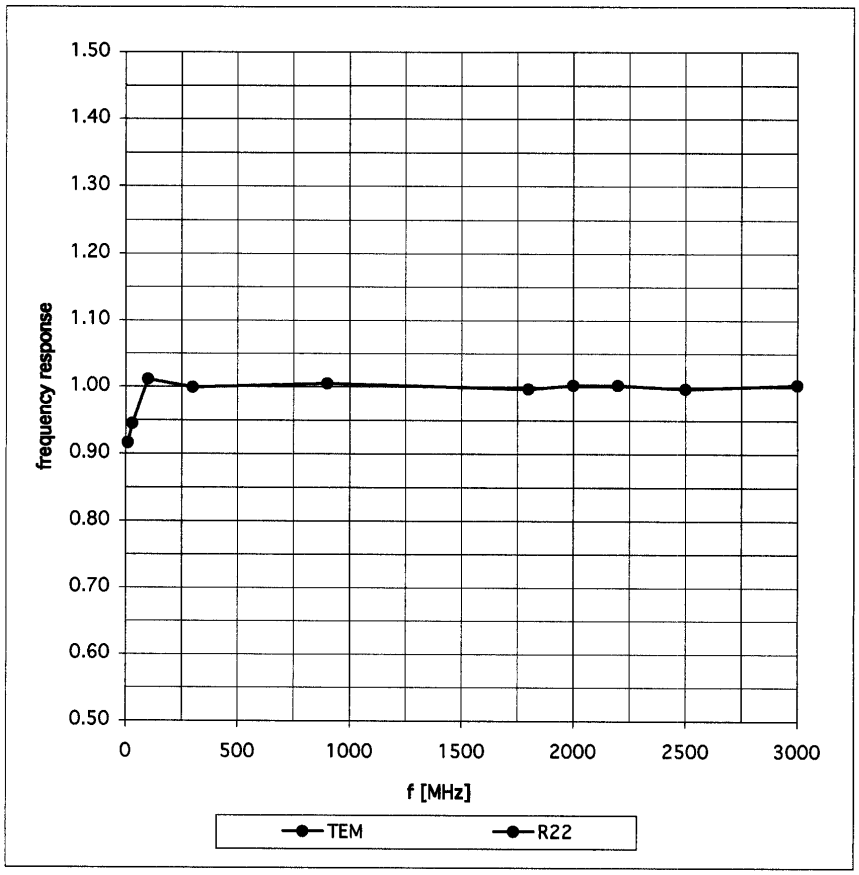


Isotropy Error (ϕ), θ = 0°



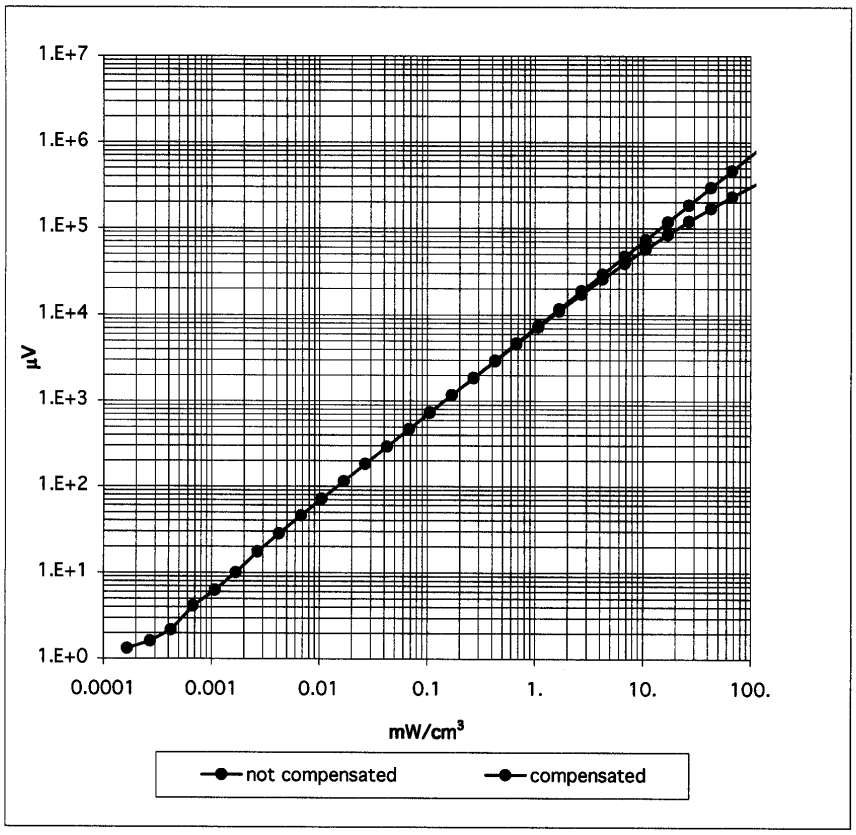
Frequency Response of E-Field

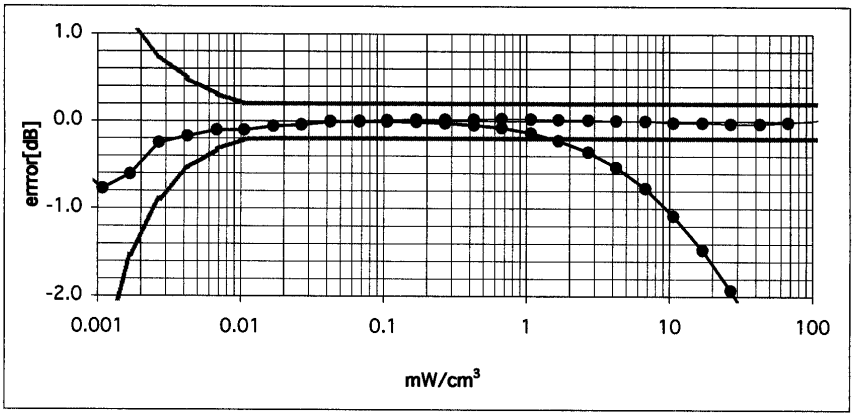
(TEM-Cell:ifi110, Waveguide R22)



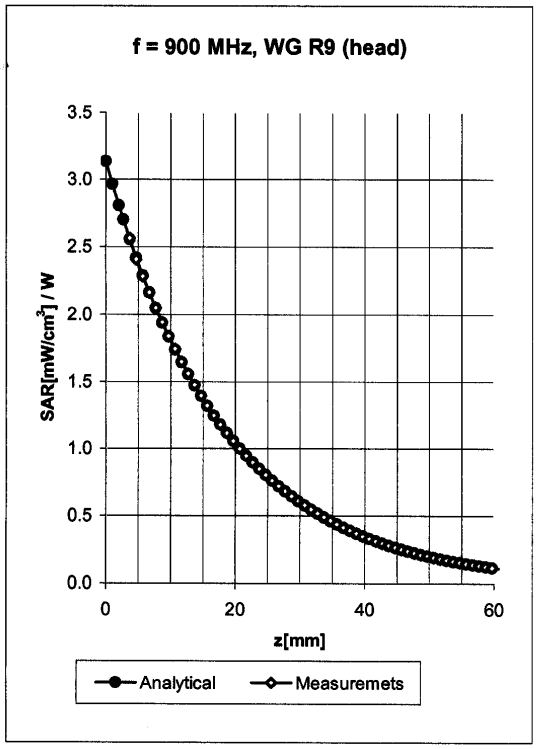
Dynamic Range f(SAR_{brain})

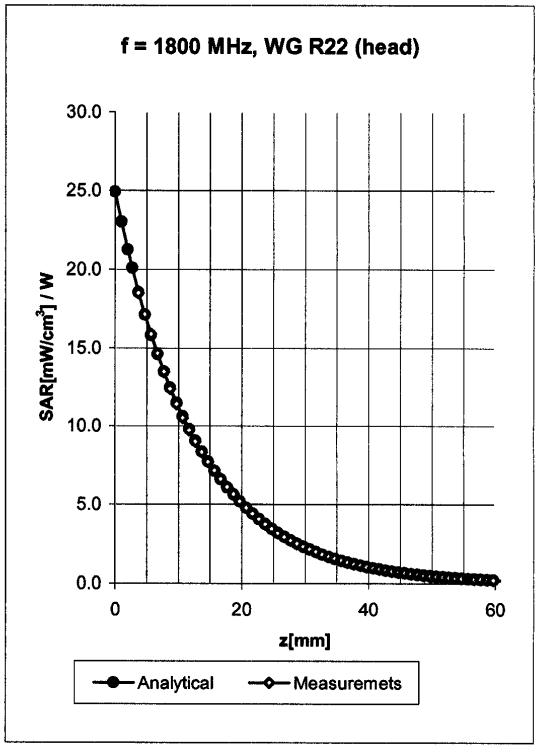
(Waveguide R22)





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

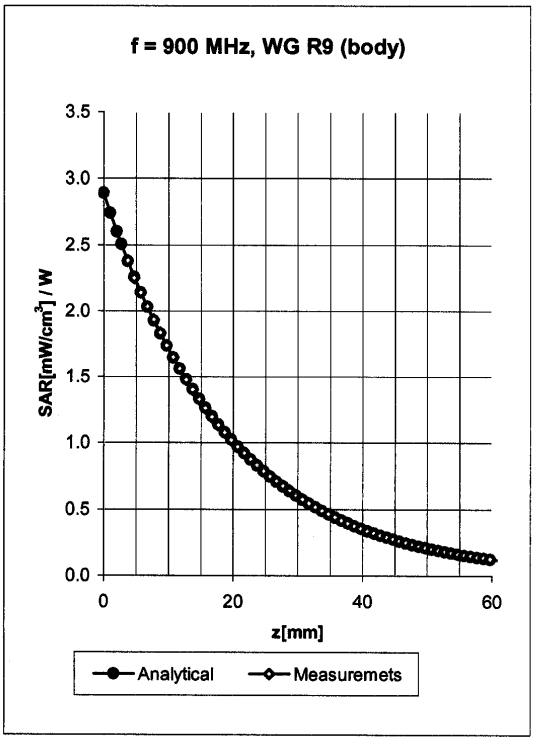
ConvF X	7.0 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	7.0 ± 9.5% (k=2)	Alpha	**0.33**
ConvF Z	7.0 ± 9.5% (k=2)	Depth	**2.56**

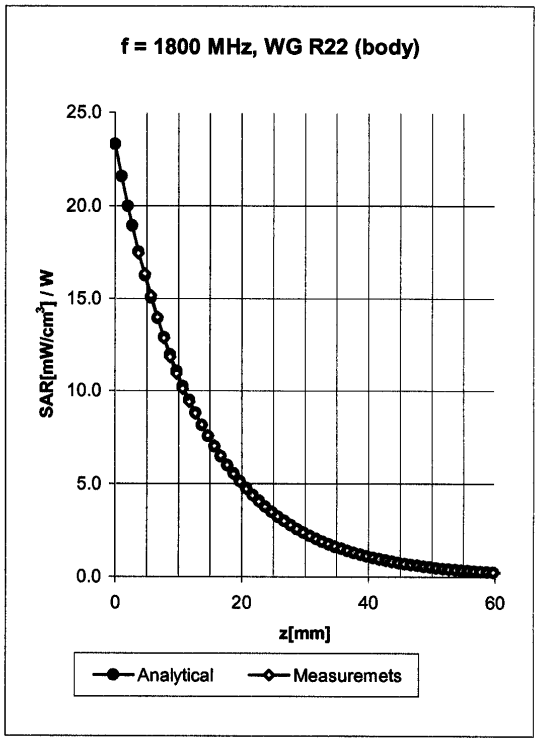
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

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

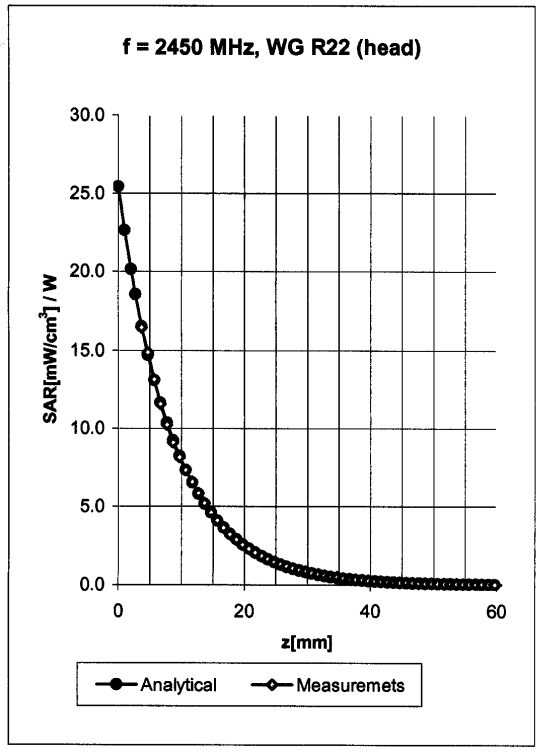
ConvF X	6.8 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.8 ± 9.5% (k=2)	Alpha	**0.34**
ConvF Z	6.8 ± 9.5% (k=2)	Depth	**2.61**

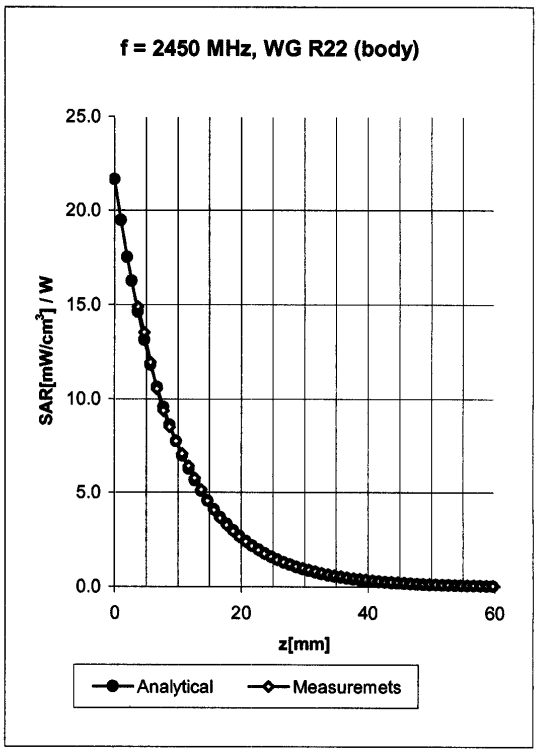
Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

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**

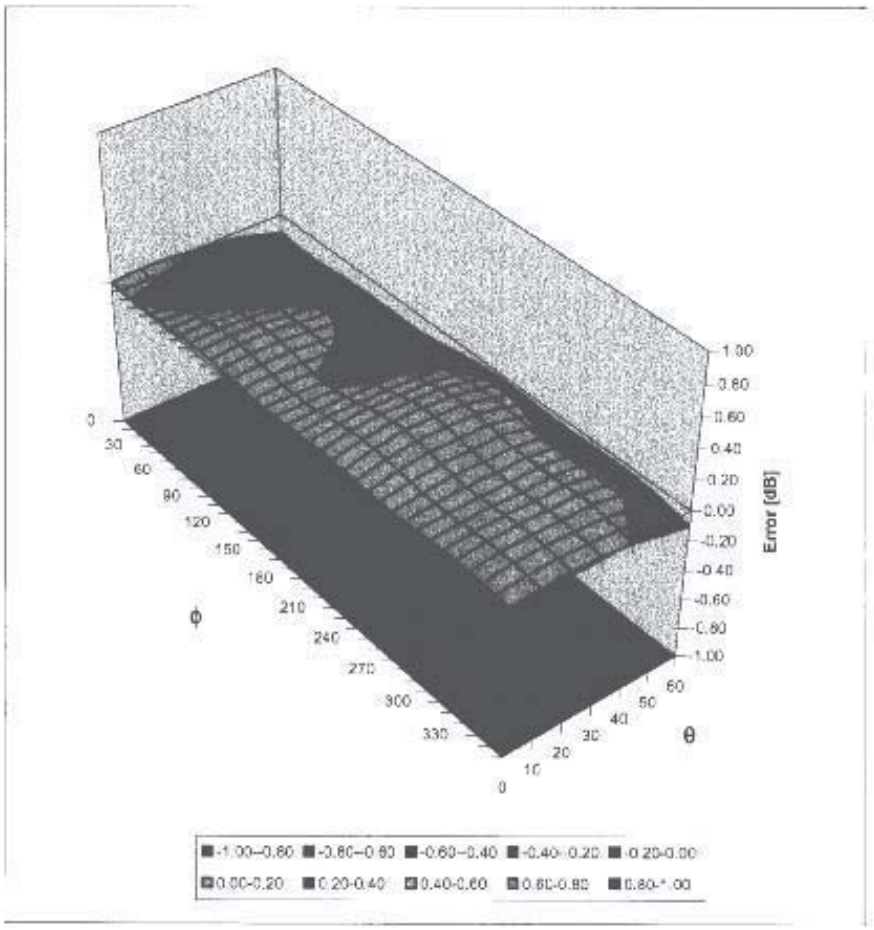
Body	2450	MHz	ε_r = 52.7 ± 5%	σ = 1.95 ± 5% mho/m

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

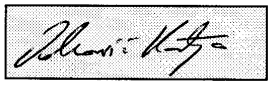
Additional Conversion Factors

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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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

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

February 24, 2004

Frequency	e'	e"
200.000000 MHz	50.2290	72.5521
210.000000 MHz	49.4935	69.8292
220.000000 MHz	49.0178	67.3531
230.000000 MHz	48.3150	65.2747
240.000000 MHz	47.7189	63.2765
250.000000 MHz	47.2538	61.3947
260.000000 MHz	46.8965	59.6962
270.000000 MHz	46.6125	58.0849
280.000000 MHz	46.4072	56.5348
290.000000 MHz	46.0830	55.0297
300.000000 MHz	45.8354	53.5881
310.000000 MHz	45.4572	52.3613
320.000000 MHz	45.1659	51.1626
330.000000 MHz	44.8293	50.1311
340.000000 MHz	44.4619	49.1275
350.000000 MHz	44.1611	48.1378
360.000000 MHz	43.7385	47.3012
370.000000 MHz	43.5219	46.4858
380.000000 MHz	43.2652	45.6400
390.000000 MHz	43.0961	44.8042
400.000000 MHz	42.8116	44.0250

150 MHz DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

February 24, 2004

Frequency	e'	e"
50.000000 MHz	61.8922	234.2374
60.000000 MHz	60.5058	197.3109
70.000000 MHz	60.3364	170.8169
80.000000 MHz	58.6800	151.5277
90.000000 MHz	58.1075	136.0738
100.000000 MHz	56.9173	124.2908
110.000000 MHz	55.9873	114.5249
120.000000 MHz	55.1410	106.1072
130.000000 MHz	54.6395	99.3059
140.000000 MHz	53.8977	92.9593
150.000000 MHz	53.2435	88.0495
160.000000 MHz	52.8172	83.5061
170.000000 MHz	52.2369	79.5756
180.000000 MHz	51.8175	75.7490
190.000000 MHz	51.3986	72.5374
200.000000 MHz	50.9163	69.5463
210.000000 MHz	50.4906	66.9121
220.000000 MHz	50.1430	64.6966
230.000000 MHz	49.5700	62.5663
240.000000 MHz	49.2305	60.5238
250.000000 MHz	48.7144	58.7265

150 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

February 24, 2004

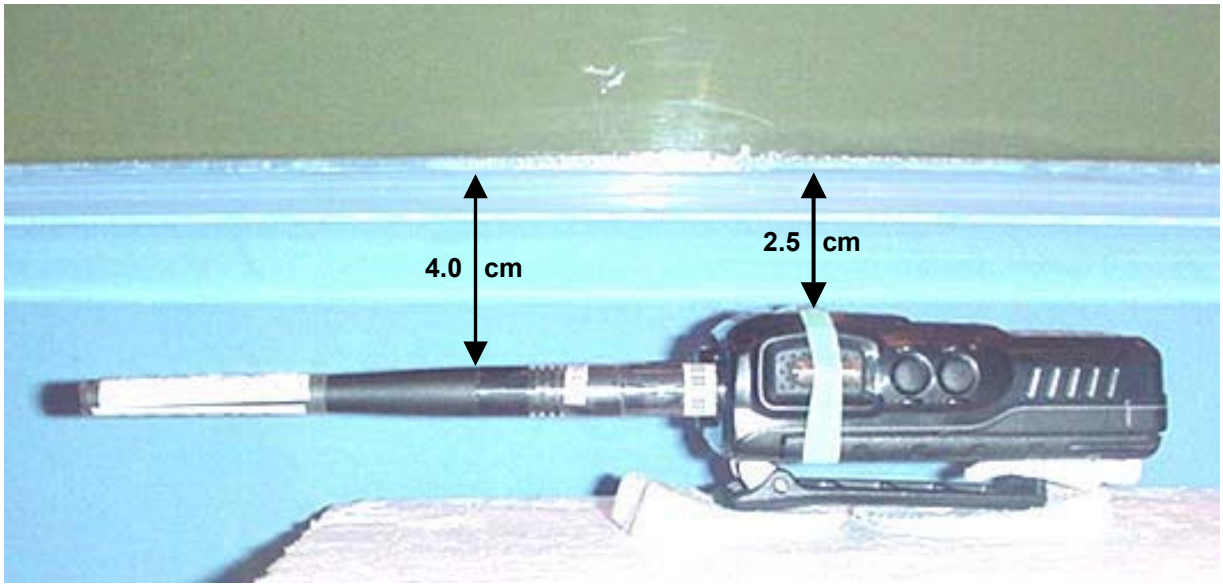
Frequency	e'	e"
50.000000 MHz	68.3357	260.8900
60.000000 MHz	66.9113	219.0172
70.000000 MHz	66.0652	188.5930
80.000000 MHz	64.7419	166.1757
90.000000 MHz	63.5530	148.9941
100.000000 MHz	62.4997	135.4370
110.000000 MHz	62.0802	124.0418
120.000000 MHz	61.7828	114.6928
130.000000 MHz	60.9614	106.6090
140.000000 MHz	60.6141	99.6422
150.000000 MHz	60.3110	93.8633
160.000000 MHz	59.8681	88.7289
170.000000 MHz	59.5694	84.3492
180.000000 MHz	59.4170	80.0673
190.000000 MHz	59.0601	76.3955
200.000000 MHz	58.7512	73.1625
210.000000 MHz	58.4880	70.3452
220.000000 MHz	58.1326	67.6924
230.000000 MHz	57.8125	65.2620
240.000000 MHz	57.4677	63.1540
250.000000 MHz	57.1974	61.1361

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

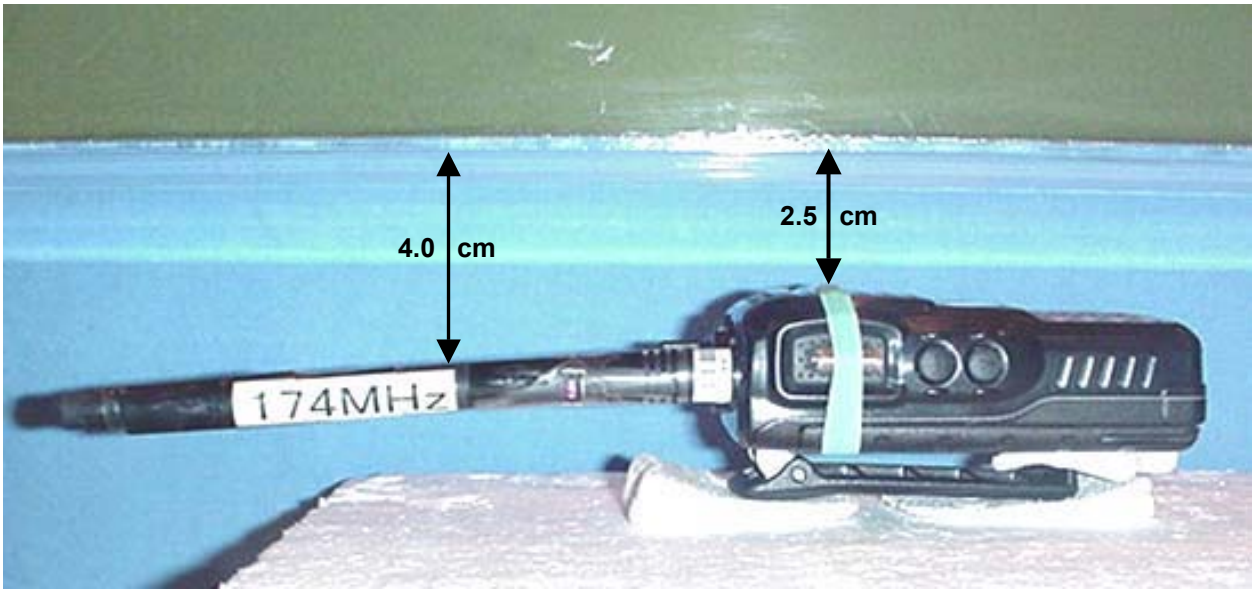
146 MHz Antenna (P/N: ATV-8A)



FACE-HELD SAR TEST SETUP PHOTOGRAPHS

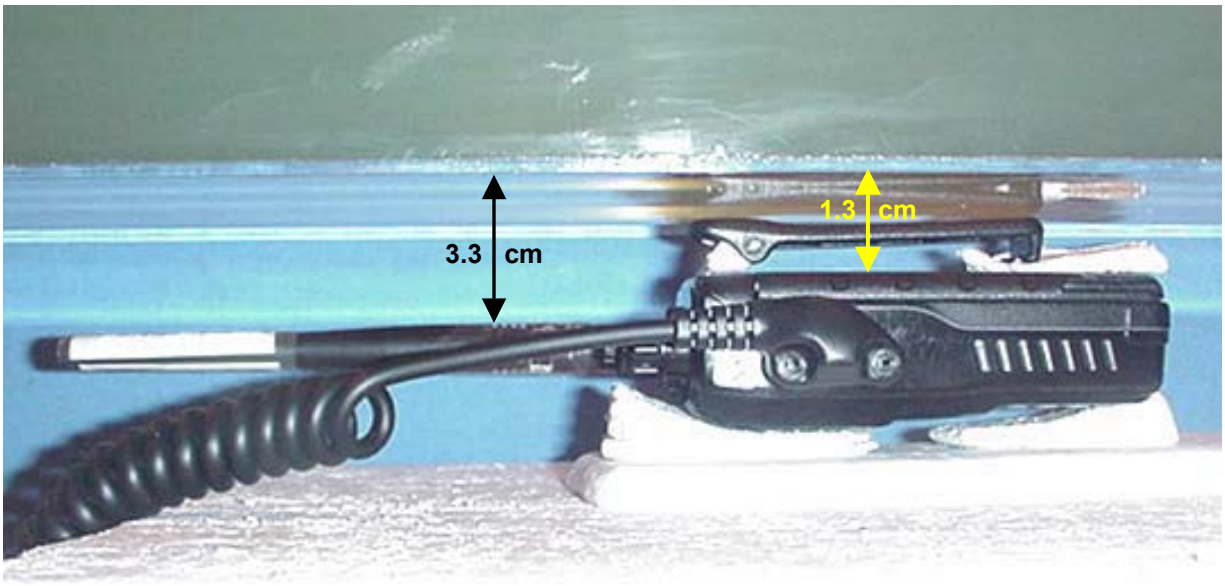
2.5 cm Separation Distance from Front of Radio to Planar Phantom

174 MHz Antenna (P/N: ATV-8C)



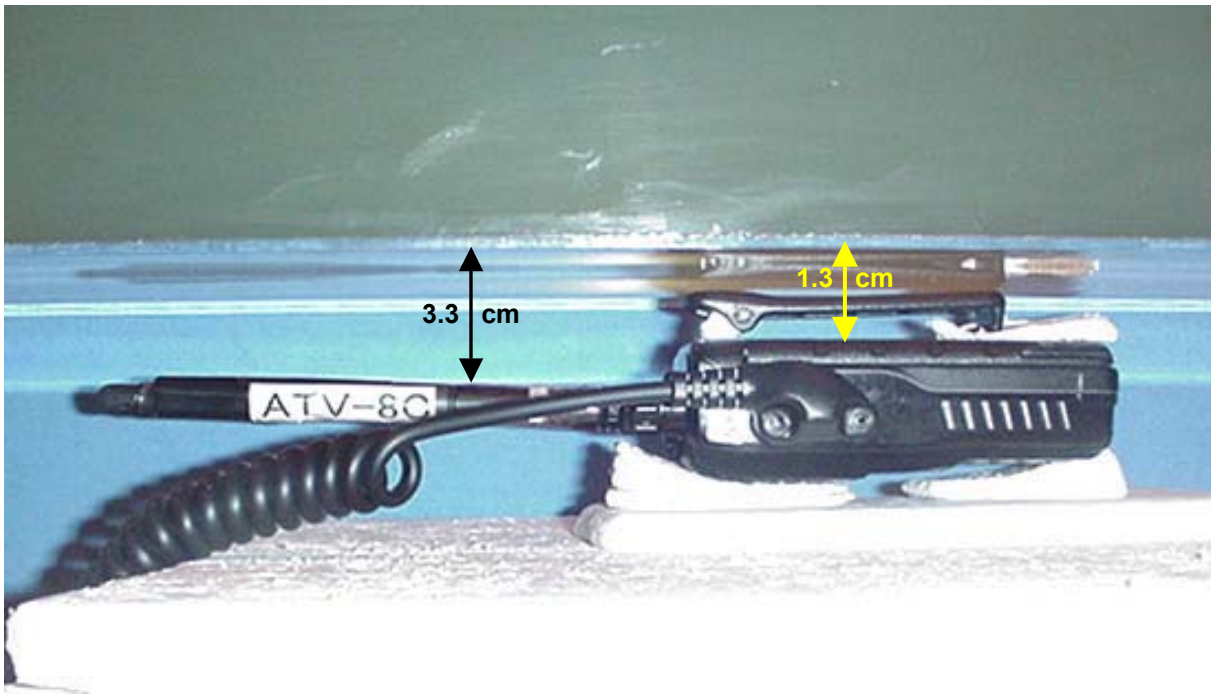
BODY-WORN SAR TEST SETUP PHOTOGRAPHS

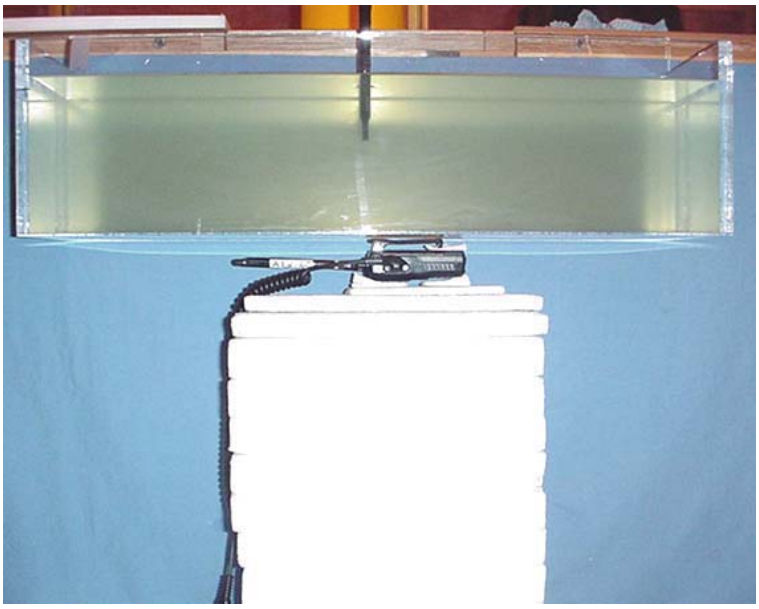
1.3 cm Belt-Clip Separation Distance to Planar Phantom
with 146 MHz Antenna (P/N: ATV-8A) & Speaker-Microphone Accessory (P/N: MH-45)



BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.3 cm Belt-Clip Separation Distance to Planar Phantom
with 174 MHz Antenna (P/N: ATV-8C) & Speaker-Microphone Accessory (P/N: MH-45)





DUT PHOTOGRAPHS

with 146 MHz Whip Antenna

with 160 MHz Whip Antenna

with 174 MHz Whip Antenna

Back of DUT with Belt-Clip

DUT PHOTOGRAPHS

Front of DUT

Back of DUT

Top of DUT

Bottom of DUT

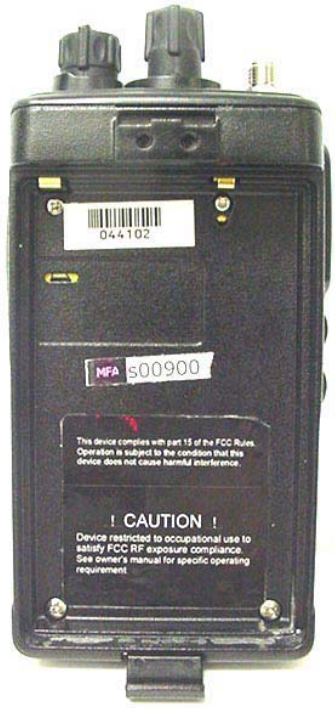
DUT PHOTOGRAPHS

Left Side of DUT with Belt-Clip

Right Side of DUT with Belt-Clip

Belt-Clip Accessory (P/N: BA0102700112KA)

DUT PHOTOGRAPHS



Battery Compartment

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

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

9V Alkaline Battery Case (P/N: FBA-25)

Duracell Procell Alkaline Batteries (2850 mAh)

Energizer E-Squared Alkaline Batteries (3135 mAh)

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DUT PHOTOGRAPHS

146 MHz Whip Antenna (P/N: ATV-8A)

160 MHz Whip Antenna (P/N: ATV-8B)

174 MHz Whip Antenna (P/N: ATV-8C)

DUT PHOTOGRAPHS

Speaker-Microphone

Speaker-Microphone

Speaker-Microphone

Speaker-Microphone

with Speaker-Microphone Accessory (P/N: MH-45)