DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

KENWOOD USA CORPORATION
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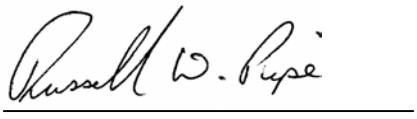
Rule Part(s):	**FCC 47 CFR §2.1093; IC RSS-102 Issue 1 (Provisional)**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (01-01)**
FCC ID:	**ALH36913210**
Model:	**TK-2202**
DUT Type:	**Portable VHF PTT Radio Transceiver**
Modulation:	**FM (VHF)**
Tx Frequency Range:	**136 - 174 MHz**
Max. RF Output Power Tested:	**37.68 dBm Conducted (136 MHz)** **37.76 dBm Conducted (155 MHz)** **37.73 dBm Conducted (174 MHz)**
Antenna Type(s) Tested:	**1. Stubby 136-150 MHz (P/N: KRA22M3)** **2. Stubby 146-162 MHz (P/N: KRA22M)** **3. Stubby 162-174 MHz (P/N: KRA22M2)** **4. Whip 136-150 MHz (P/N: W22-1700-05 (M3))** **5. Whip 146-162 MHz (P/N: W22-1698-05 (M))** **6. Whip 162-174 MHz (P/N: W22-1699-05 (M2))** **7. Long Whip 136-174 MHz (P/N: KRA-25)**
Battery Type(s) Tested:	**NiMH 7.5V, 1500mAh (P/N: KNB-29N)** **NiCd 7.5V, 1100mAh (P/N: KNB-30A)**
Body-Worn Accessories:	**Speaker-Microphone, Belt-Clip**
Max. SAR Measured:	**Face-held: 1.57 W/kg (50% Duty Cycle)** **Body-worn: 1.77 W/kg (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
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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Kenwood USA Corporation Model: TK-2202 Portable VHF PTT Radio Transceiver FCC ID: ALH36913210 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 (Edition 01-01)			
Device Type	Portable VHF PTT Radio Transceiver			
FCC ID	ALH36913210			
Model No.	TK-2202			
Serial No.	B12 (Identical Prototype)			
Modulation	FM (VHF)			
Tx Frequency Range	136 - 174 MHz			
Max. RF Output Power Tested	136 MHz	37.68 dBm	Conducted	
	155 MHz	37.76 dBm	Conducted	
	174 MHz	37.73 dBm	Conducted	
Battery Type(s) Tested	NiMH	7.5V, 1500mAh	P/N: KNB-29N	
	NiCd	7.5V, 1100mAh	P/N: KNB-30A	
Antenna Type(s) Tested	Stubby	136-150 MHz	P/N: KRA22M3	Length: 114 mm
	Stubby	146-162 MHz	P/N: KRA22M	Length: 114 mm
	Stubby	162-174 MHz	P/N: KRA22M2	Length: 114 mm
	Whip	136-150 MHz	P/N: W22-1700-05 (M3)	Length: 170 mm
	Whip	146-162 MHz	P/N: W22-1698-05 (M)	Length: 170 mm
	Whip	162-174 MHz	P/N: W22-1699-05 (M2)	Length: 170 mm
	Long Whip	136-174 MHz	P/N: KRA-25	Length: 252 mm
Body-Worn Accessories Tested	Belt-Clip			
	Speaker-Microphone			

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	Antenna Type	Antenna Part No.	Separation Distance to Planar Phantom	Measured SAR 1g (W/kg)		Max. Cond. Power Drift (dB)	Scaled SAR 1g (W/kg)	
			Before (dBm)	After (dBm)	Drift (dB)					Duty Cycle			Duty Cycle	
										100%	50%		100%	50%
155	Mid	CW	37.56	37.02	-0.54	NiMH	Stubby	KRA22M	2.5 cm	1.64	0.820	-0.68	1.92	0.959
155	Mid	CW	37.56	37.01	-0.55	NiCd	Stubby	KRA22M	2.5 cm	1.62	0.810	-0.68	1.89	0.947
136	Low	CW	37.61	36.93	-0.68	NiMH	Stubby	KRA22M3	2.5 cm	0.357	0.179	-0.68	0.418	0.209
174	High	CW	37.69	37.14	-0.55	NiMH	Stubby	KRA22M2	2.5 cm	1.30	0.650	-0.68	1.52	0.760
155	Mid	CW	37.68	37.14	-0.54	NiMH	Whip	W22M	2.5 cm	2.15	1.08	-0.79	2.58	1.29
155	Mid	CW	37.75	37.17	-0.58	NiCd	Whip	W22M	2.5 cm	1.81	0.905	-0.79	2.17	1.09
136	Low	CW	37.62	36.83	-0.79	NiMH	Whip	W22M3	2.5 cm	0.428	0.214	-0.79	0.513	0.257
174	High	CW	37.72	37.11	-0.61	NiMH	Whip	W22M2	2.5 cm	2.25	1.13	-0.79	2.70	1.35
155	Mid	CW	37.61	37.21	-0.40	NiMH	Long Whip	KRA-25	2.5 cm	2.29	1.15	-0.68	2.68	1.34
155	Mid	CW	37.76	37.10	-0.66	NiCd	Long Whip	KRA-25	2.5 cm	2.68	1.34	-0.68	3.13	1.57

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

Test Date	12/23/03		**Ambient Temperature**	24.1 °C
Measured Fluid Type	150 MHz Brain		**Fluid Temperature**	21.3 °C
Dielectric Constant ε_r	**IEEE Target**	**Measured**	**Fluid Depth**	≥ 15 cm
	52.3 (± 5%)	53.6	**Relative Humidity**	33%
Conductivity σ **(mho/m)**	**IEEE Target**	**Measured**	**Atmospheric Pressure**	95.6 kPa
	0.76 (± 5%)	0.73	**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. The SAR evaluations were initially performed with both NiMH and NiCd batteries at the mid channel. The worst-case battery was subsequently tested at the low and high channels (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 conducted power levels measured after the SAR evaluations were > 5% from the measured start power. The maximum conducted power drift measured for each antenna type was subsequently added to the corresponding measured SAR levels to show scaled SAR results as listed in the above table. The maximum conducted power drift for the long whip antenna (P/N: KRA-25) listed in the table above was measured during the body-worn SAR evaluation.
4. 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.
5. 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	Antenna Part No.	Body-worn Accessories	Separation Distance to Planar Phantom	Measured SAR 1g (W/kg)		Max. Cond. Power Drift (dB)	Scaled SAR 1g (W/kg)	
			Before (dBm)	After (dBm)	Drift (dB)					Duty Cycle			Duty Cycle	
										100%	50%		100%	50%
155	Mid	CW	37.62	37.01	-0.61	NiMH	KRA22M	Belt-Clip Speaker-Mic	1.1 cm	1.25	0.625	-0.68	1.46	0.731
155	Mid	CW	37.64	37.02	-0.62	NiCd	KRA22M	Belt-Clip Speaker-Mic	1.1 cm	1.02	0.510	-0.68	1.19	0.596
136	Low	CW	37.57	37.17	-0.40	NiMH	KRA22M3	Belt-Clip Speaker-Mic	1.1 cm	P 1.66	0.830	-0.68	P 1.94	0.971
										S 1.44	0.720		S 1.68	0.842
174	High	CW	37.64	37.27	-0.37	NiMH	KRA22M2	Belt-Clip Speaker-Mic	1.1 cm	1.10	0.550	-0.68	1.29	0.643
155	Mid	CW	37.60	37.00	-0.60	NiMH	W22M	Belt-Clip Speaker-Mic	1.1 cm	1.44	0.720	-0.79	1.73	0.864
155	Mid	CW	37.63	36.97	-0.66	NiCd	W22M	Belt-Clip Speaker-Mic	1.1 cm	1.48	0.740	-0.79	1.78	0.888
136	Low	CW	37.68	37.10	-0.58	NiCd	W22M3	Belt-Clip Speaker-Mic	1.1 cm	P 2.95	1.48	-0.79	P 3.54	1.77
										S 2.49	1.25		S 2.99	1.49
174	High	CW	37.73	37.20	-0.53	NiCd	W22M2	Belt-Clip Speaker-Mic	1.1 cm	1.91	0.955	-0.79	2.29	1.15
155	Mid	CW	37.59	37.04	-0.55	NiMH	KRA-25	Belt-Clip Speaker-Mic	1.1 cm	1.99	0.995	-0.68	2.33	1.16
155	Mid	CW	37.62	36.94	-0.68	NiCd	KRA-25	Belt-Clip Speaker-Mic	1.1 cm	2.23	1.12	-0.68	2.61	1.30

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

Test Date	12/24/03		Ambient Temperature	24.9 °C
Measured Fluid Type	150 MHz Body		Fluid Temperature	20.9 °C
Dielectric Constant ε_r	IEEE Target	Measured	Fluid Depth	≥ 15 cm
	61.9 (± 5%)	62.8	Relative Humidity	34%
Conductivity σ (mho/m)	IEEE Target	Measured	Atmospheric Pressure	97.4 kPa
	0.80 (± 5%)	0.77	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. Secondary peak SAR locations within 2dB of the primary peak SAR location were evaluated and reported as shown in the above table (P = Primary, S = Secondary) and Appendix A (SAR Test Plots).
3. The SAR evaluations were initially performed with both NiMH and NiCd batteries at the mid channel. The worst-case battery was subsequently tested at the low and high channels (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])).
4. The conducted power levels measured after the SAR evaluations were > 5% from the measured start power. The maximum conducted power drift measured for each antenna type was subsequently added to the corresponding measured SAR levels to show scaled SAR results as listed in the above table. The maximum conducted power drifts for the stubby antenna (P/N: KRA22) and whip antenna (P/N: W22) listed in the table above were measured during the face-held SAR evaluations.
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).

5.0 DETAILS OF SAR EVALUATION

The Kenwood USA Corporation Model: TK-2202 Portable VHF PTT Radio Transceiver FCC ID: ALH36913210 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. The DUT was evaluated for face-held SAR with the stubby, whip, and long whip antenna types.
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 1.1 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 and with the stubby, whip, and long whip antenna types.
3. The DUT was tested with fully charged NiMH and NiCd batteries.
4. The conducted power levels were measured before and after each test according to the procedures described in FCC 47 CFR §2.1046. The conducted power levels measured after the SAR evaluations were > 5% from the measured start power. The maximum conducted power drift measured for each antenna type was added to the corresponding measured SAR levels to show scaled SAR results as shown in the test data table (page 5-6).
5. 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.
6. The SAR evaluations were performed using a Plexiglas planar phantom.
7. A stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.
8. 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.
9. The dielectric properties 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).

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).

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a system check was performed using a planar phantom with a 300MHz dipole (see Appendix C for system validation procedure). The dielectric parameters of the simulated tissue fluid 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						
12/23/03	Brain	0.750 (±10%)	0.781 (+4.1%)	45.3 ±5%	44.2	0.87 ±5%	0.85	1000	23.9	20.9	≥ 15	33	95.6
12/24/03	Brain	0.750 (±10%)	0.788 (+5.1%)	45.3 ±5%	44.9	0.87 ±5%	0.87	1000	25.5	21.1	≥ 15	34	97.4

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.

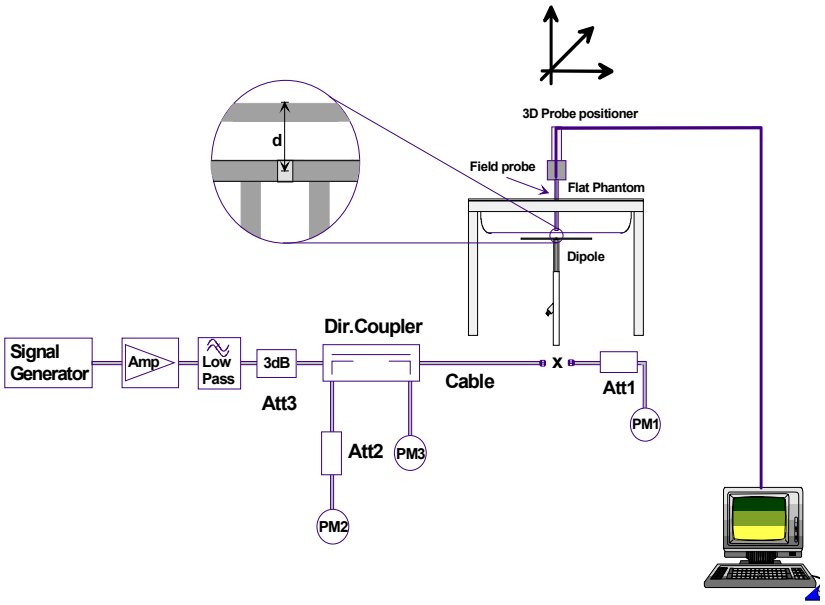


Figure 1. 300MHz System Performance Check Setup Diagram

300MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 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	**300MHz Brain (%) (System Check)**	**150MHz Brain (%) (DUT Evaluation)**	**150MHz 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.: 1387
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

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 DASY4 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	1387	Feb 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	Feb 2003
Power Sensor 80701A	1833699	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 1528-200X (Draft - 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 1528-200X (Draft - 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 Standards Coordinating Committee 34, Std 1528-200X, “DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

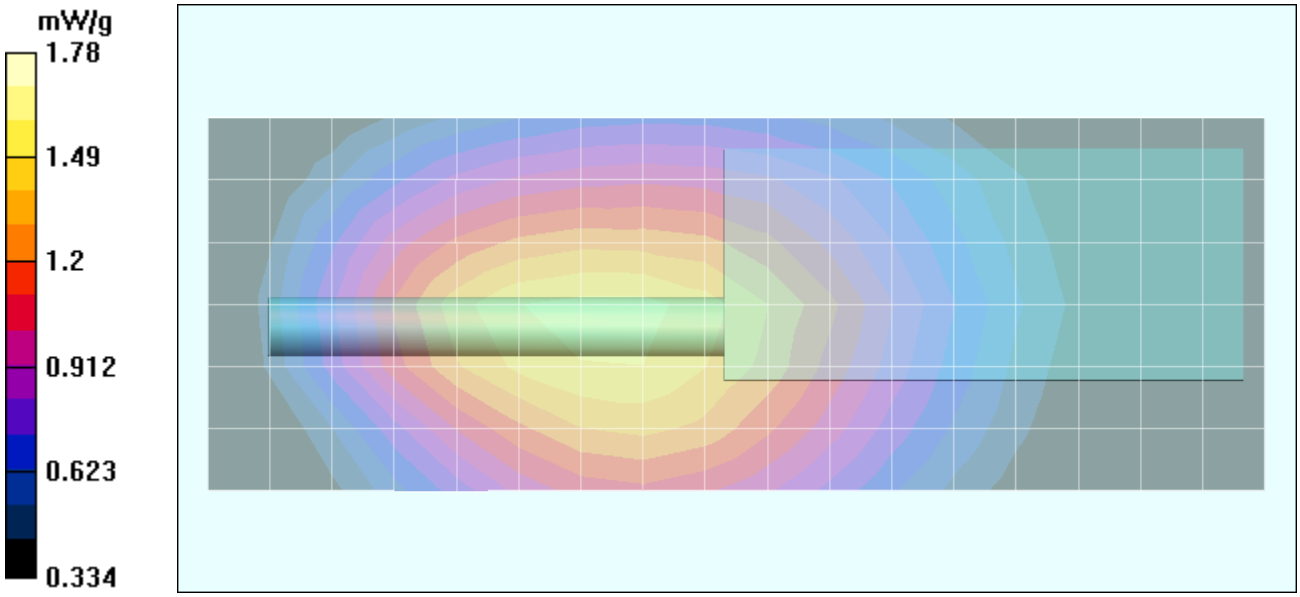
7.5 V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.56 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Stubby Antenna (P/N: KRA22M) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Stubby Antenna (P/N: KRA22M) - 2.5 cm Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.7 W/kg
SAR(1 g) = 1.64 mW/g; SAR(10 g) = 1.19 mW/g
Reference Value = 47.2 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

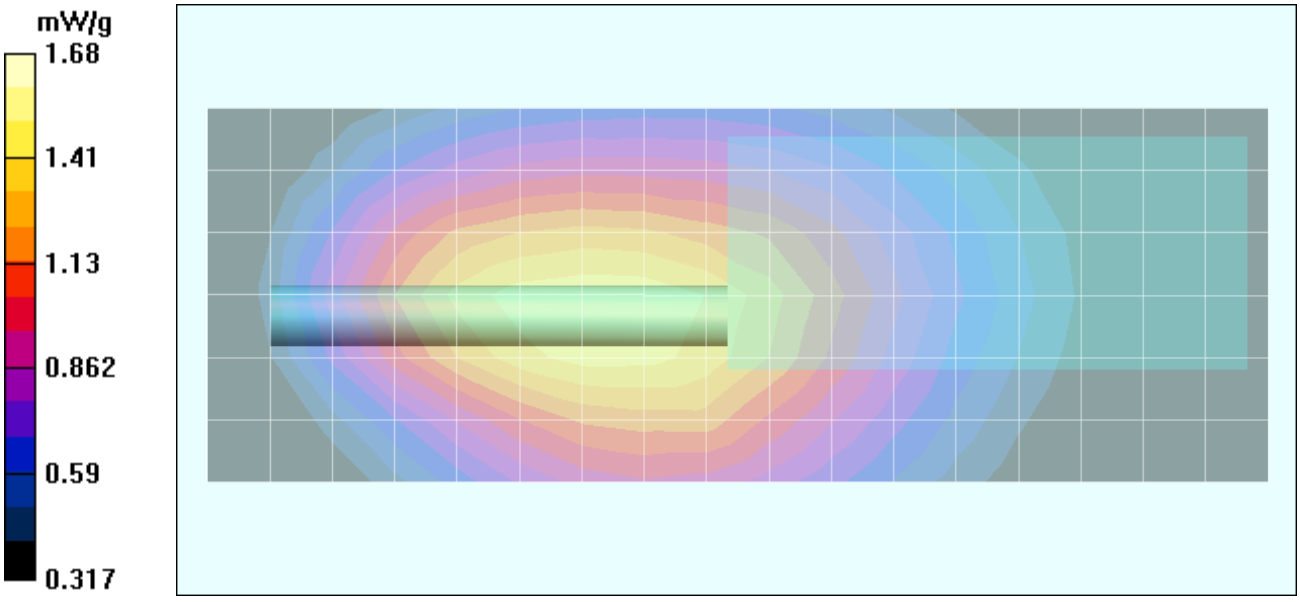
7.5V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.56 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Stubby Antenna (P/N: KRA22M) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Stubby Antenna (P/N: KRA22M) - 2.5 cm Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.58 W/kg
SAR(1 g) = 1.62 mW/g; SAR(10 g) = 1.18 mW/g
Reference Value = 43.9 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

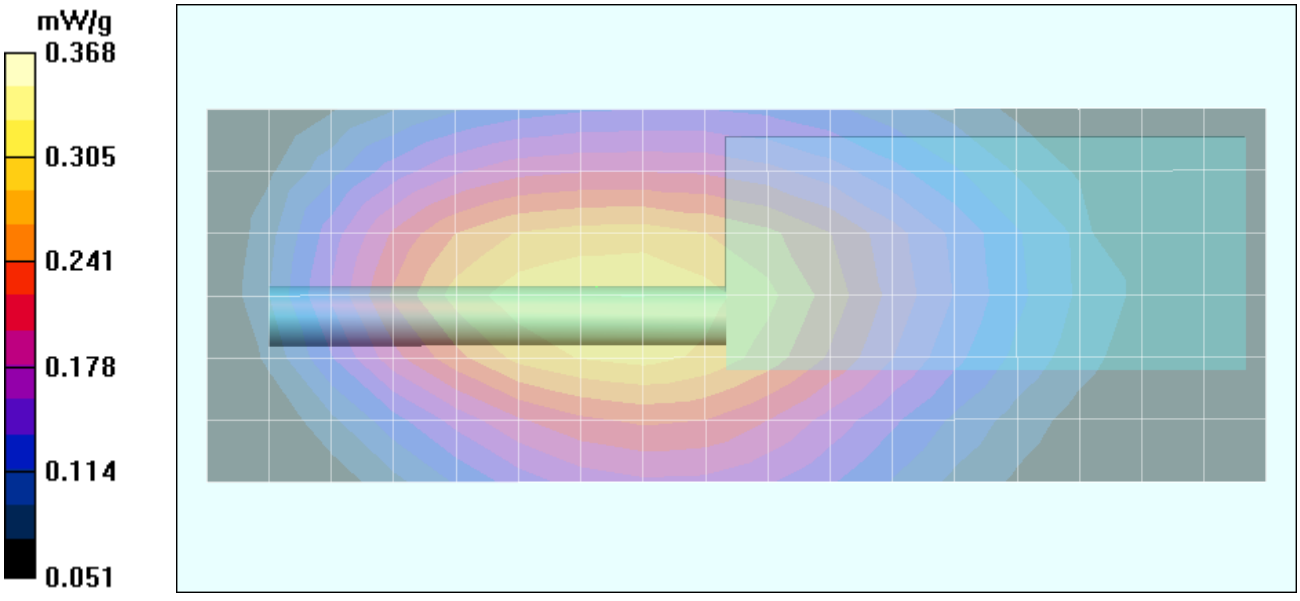
7.5 V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 136 MHz; Duty Cycle: 1:1
RF Output Power: 37.61 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Stubby Antenna (P/N: KRA22M3) - 2.5 cm Separation Distance - Low Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Stubby Antenna (P/N: KRA22M3) - 2.5 cm Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.576 W/kg
SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.261 mW/g
Reference Value = 18.5 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

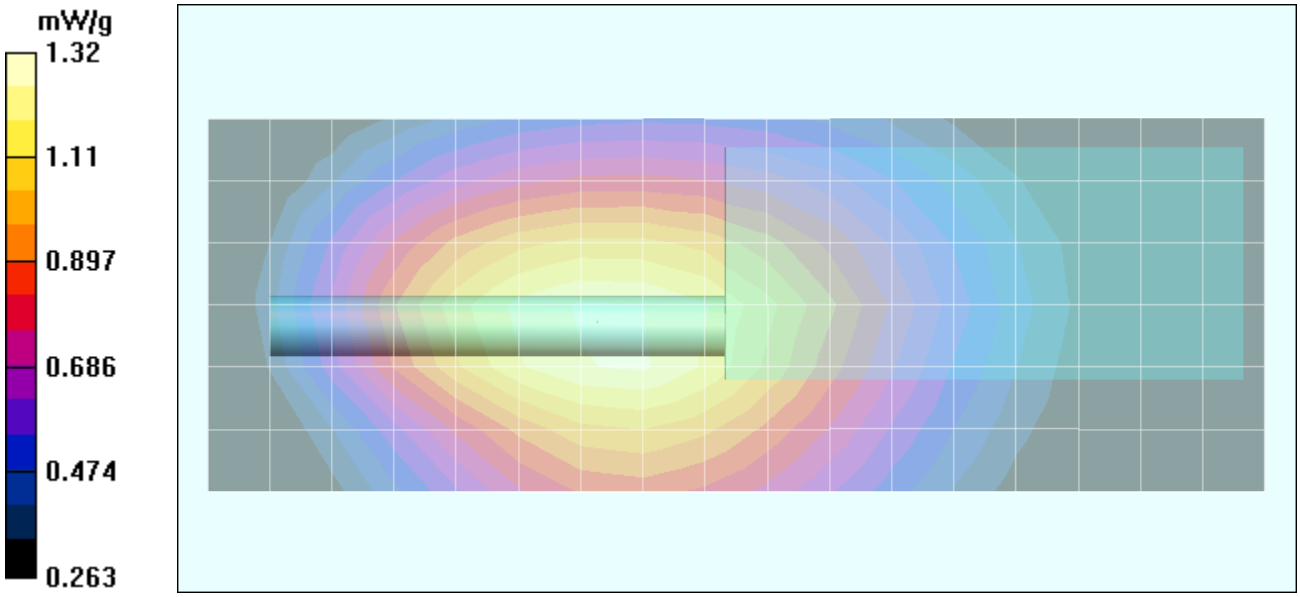
7.5 V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 37.69 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Stubby Antenna (P/N: KRA22M2) - 2.5 cm Separation Distance - High Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Stubby Antenna (P/N: KRA22M2) - 2.5 cm Separation Distance - High Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.08 W/kg
SAR(1 g) = 1.30 mW/g; SAR(10 g) = 0.942 mW/g
Reference Value = 41.7 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

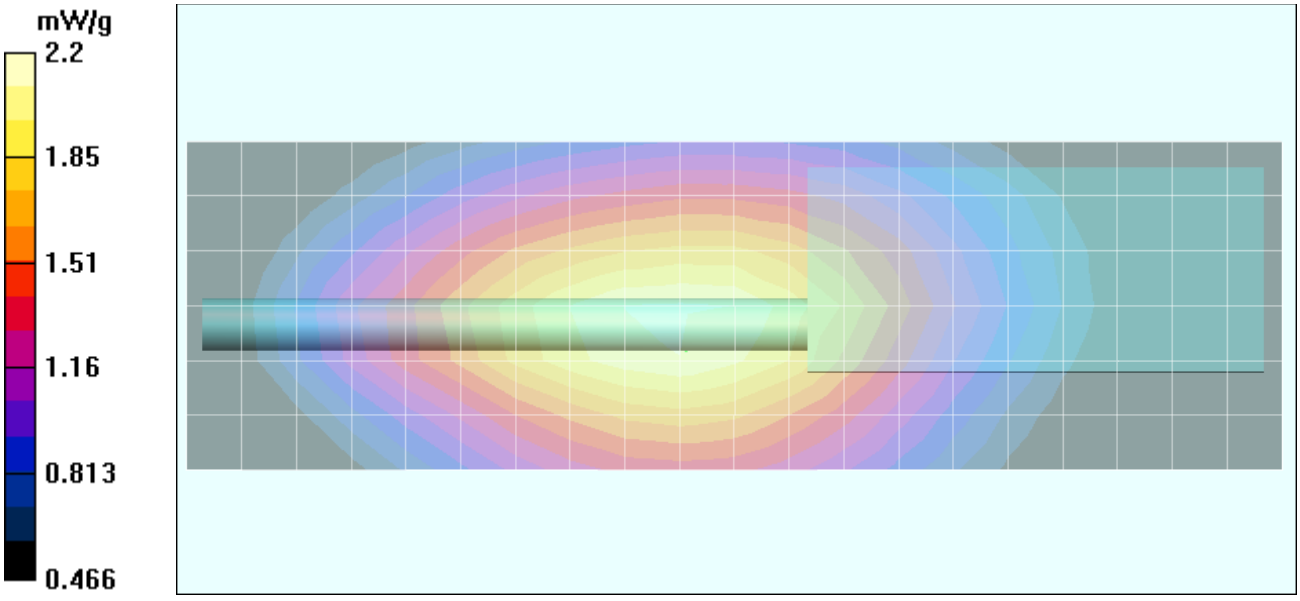
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.68 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Whip Antenna (P/N: W22M) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Whip Antenna (P/N: W22M) - 2.5 cm Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.42 W/kg
SAR(1 g) = 2.15 mW/g; SAR(10 g) = 1.55 mW/g
Reference Value = 49.7 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

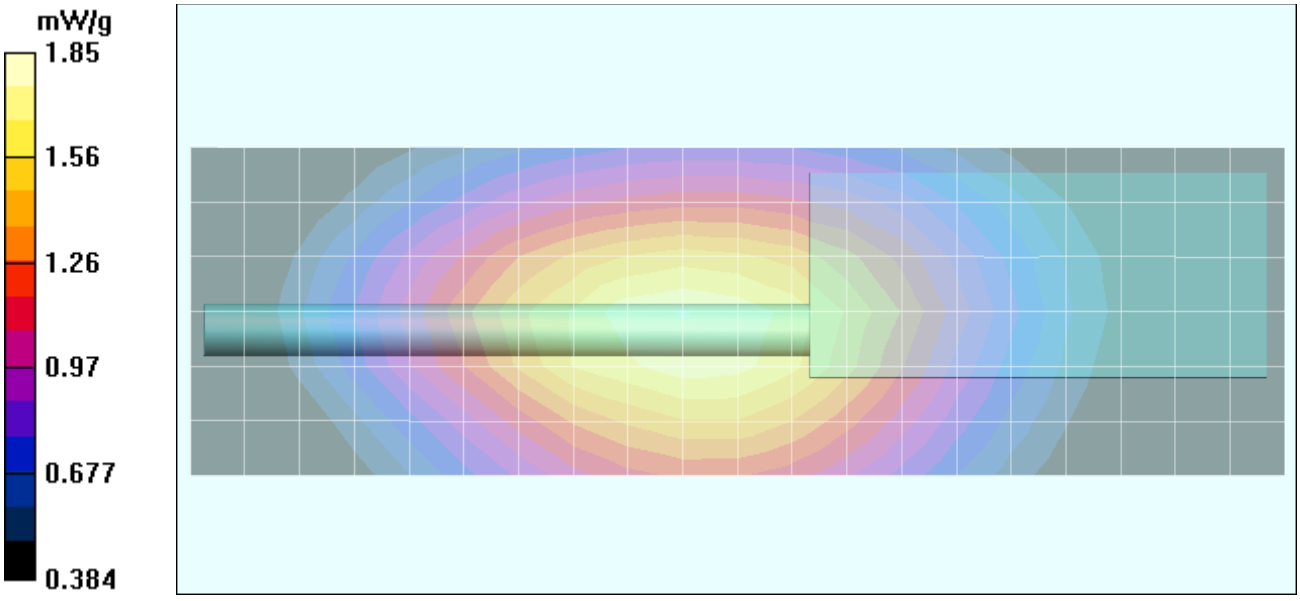
7.5V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.75 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Whip Antenna (P/N: W22M) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Whip Antenna (P/N: W22M) - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.8 W/kg
SAR(1 g) = 1.81 mW/g; SAR(10 g) = 1.33 mW/g
Reference Value = 48.8 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

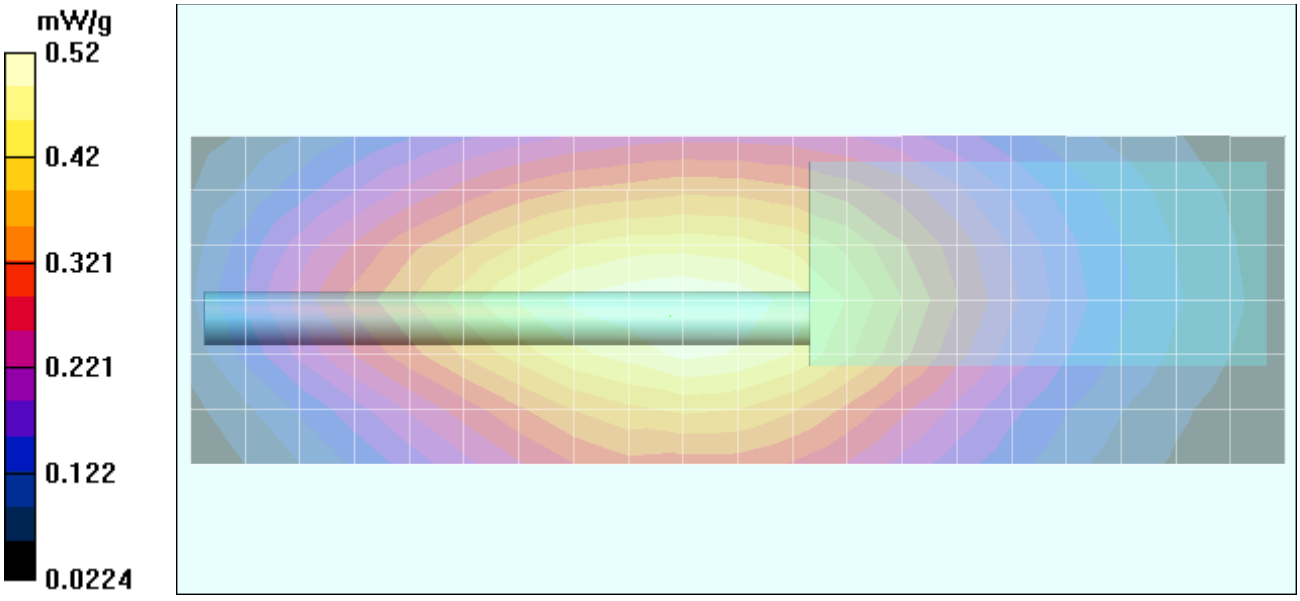
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 136 MHz; Duty Cycle: 1:1
RF Output Power: 37.62 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Whip Antenna (P/N: W22M3) - 2.5 cm Separation Distance - Low Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Whip Antenna (P/N: W22M3) - 2.5 cm Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.683 W/kg
SAR(1 g) = 0.428 mW/g; SAR(10 g) = 0.315 mW/g
Reference Value = 24.8 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

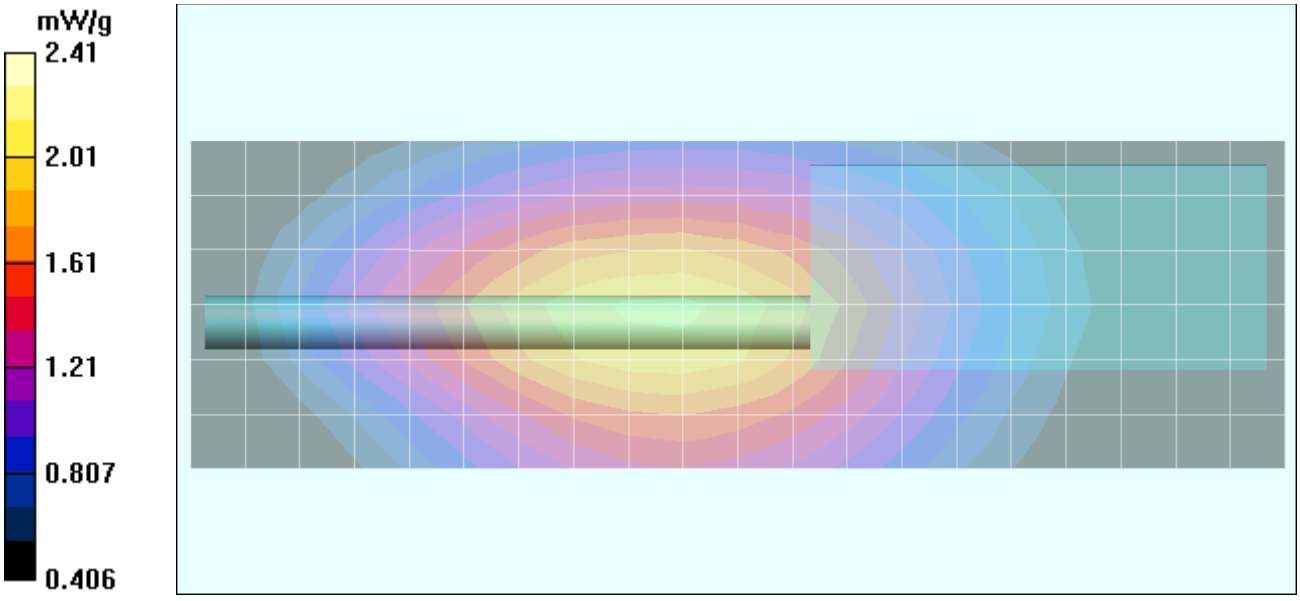
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 37.72 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Whip Antenna (P/N: W22M2) - 2.5 cm Separation Distance - High Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Whip Antenna (P/N: W22M2) - 2.5 cm Separation Distance - High Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.6 W/kg
SAR(1 g) = 2.25 mW/g; SAR(10 g) = 1.6 mW/g
Reference Value = 51.6 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

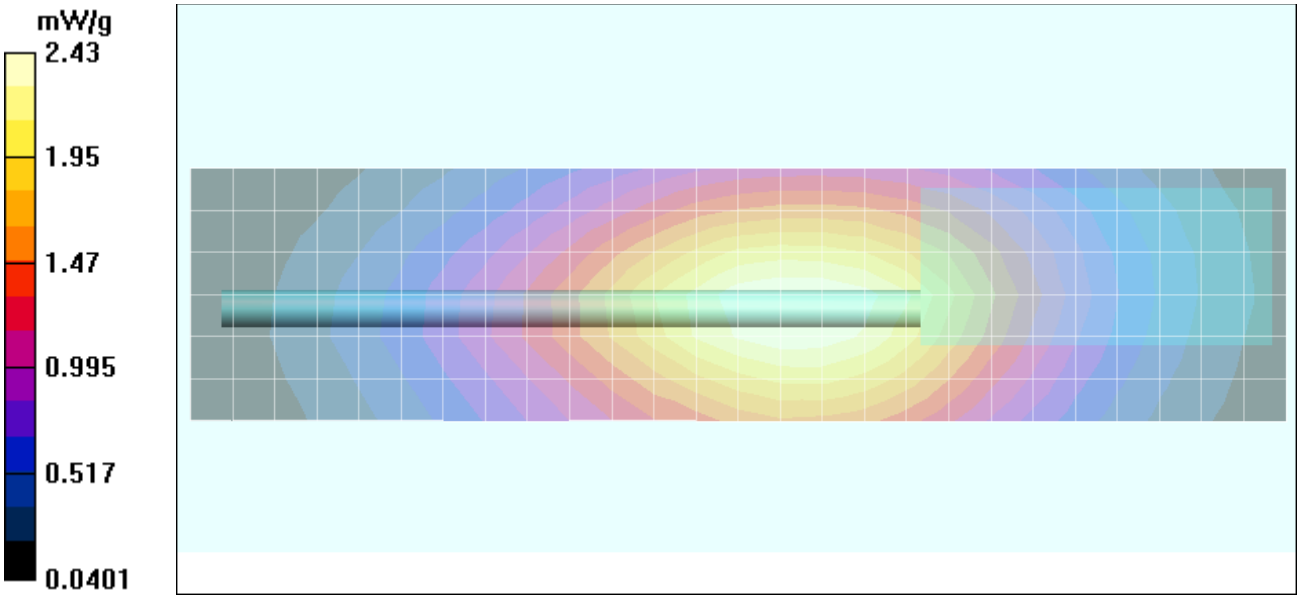
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.61 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Long Whip Antenna (P/N: KRA-25) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x27x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Long Whip Antenna (P/N: KRA-25) - 2.5 cm Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.59 W/kg
SAR(1 g) = 2.29 mW/g; SAR(10 g) = 1.69 mW/g
Reference Value = 53.7 V/m



Date Tested: 12/23/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.1 °C; Fluid Temp: 21.3 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

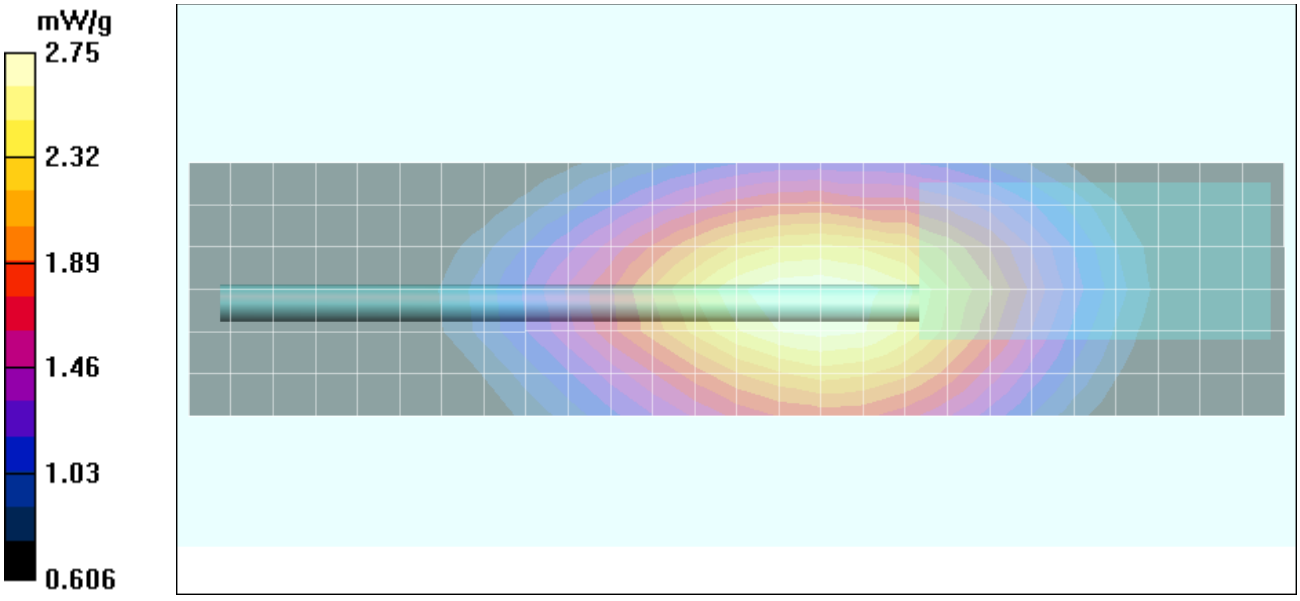
7.5 V NiCd Battery Pack (P/N: KNB-30A)

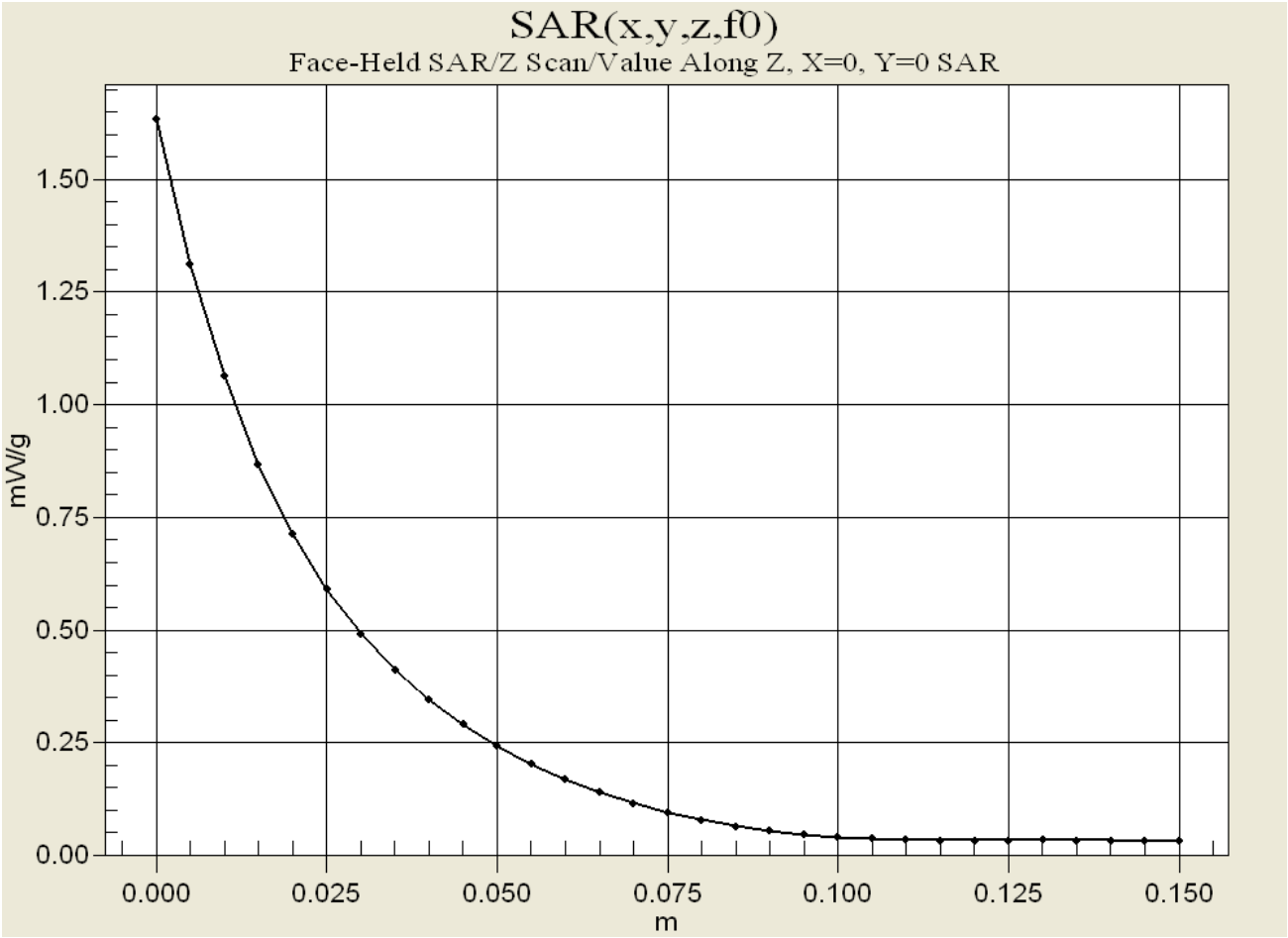
Communication System: VHF 136-174
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.76 dBm (Conducted)
Medium: HSL150 (σ = 0.73 mho/m, ε_r = 53.6, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(9.1, 9.1, 9.1); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Face-Held - Long Whip Antenna (P/N: KRA-25) - 2.5 cm Separation Distance - Mid Ch/Area Scan (7x27x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held - Long Whip Antenna (P/N: KRA-25) - 2.5 cm Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.2 W/kg
SAR(1 g) = 2.68 mW/g; SAR(10 g) = 1.98 mW/g
Reference Value = 60.3 V/m




SAR(x,y,z,f0)
Face-Held SAR/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

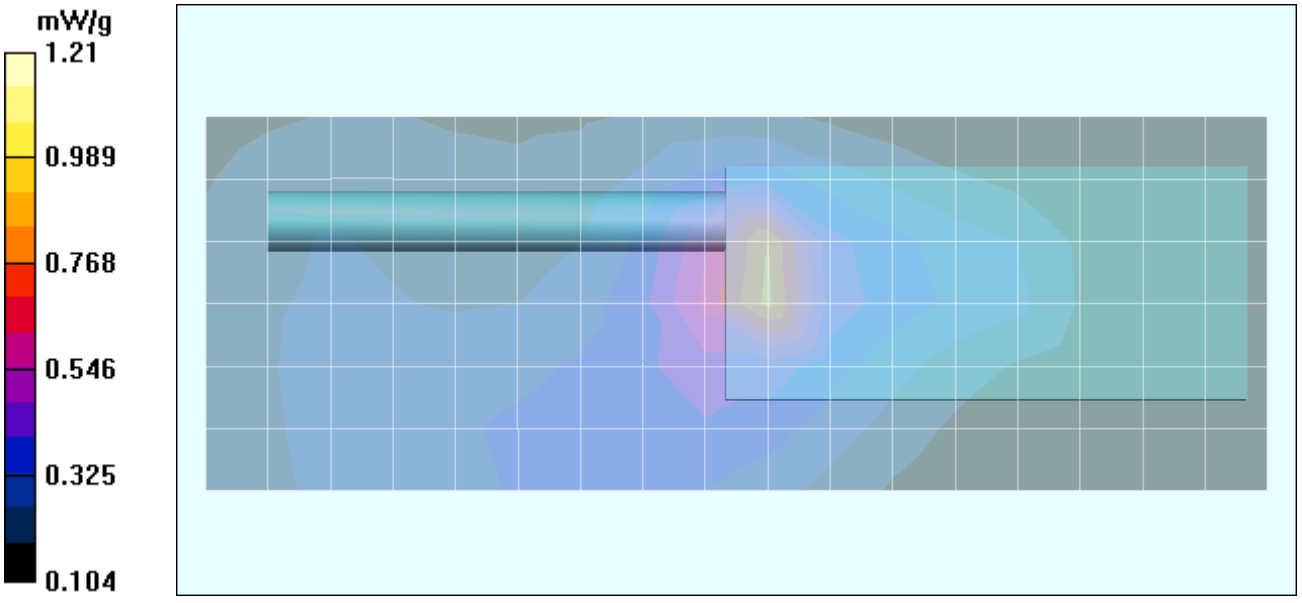
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.62 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Stubby Antenna (P/N: KRA22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Stubby Antenna (P/N: KRA22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.77 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.658 mW/g
Reference Value = 30.2 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

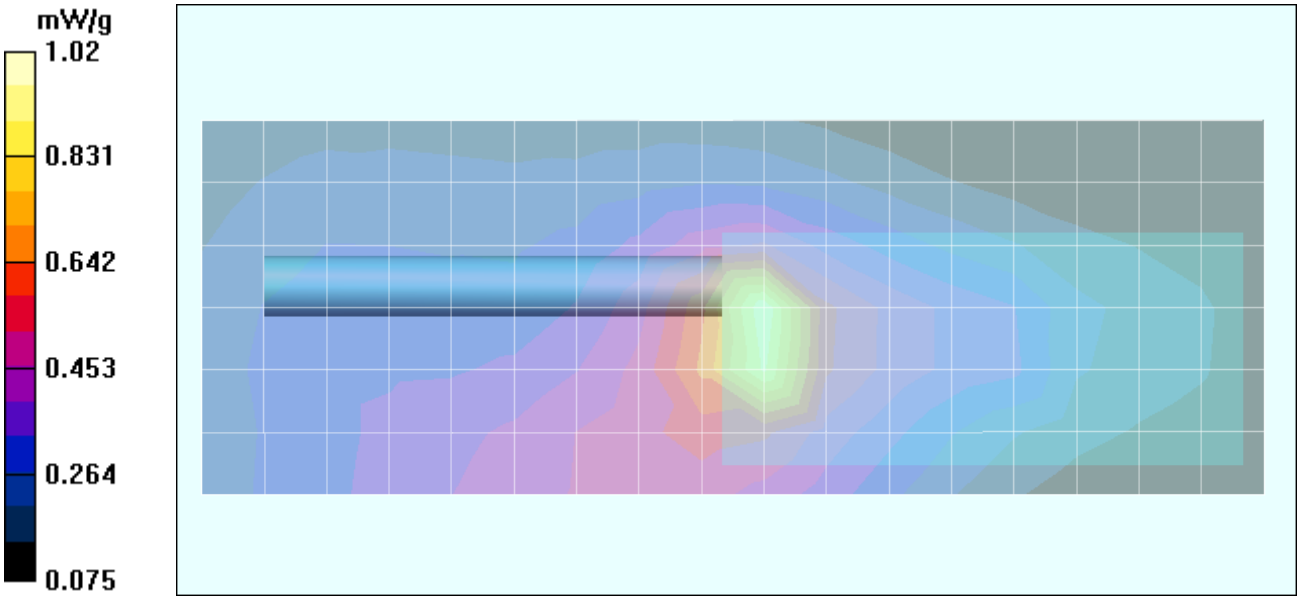
7.5V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.64 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Stubby Antenna (P/N: KRA22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Stubby Antenna (P/N: KRA22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.08 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.532 mW/g
Reference Value = 32.6 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

7.5V NiMH Battery Pack (P/N: KNB-29N)

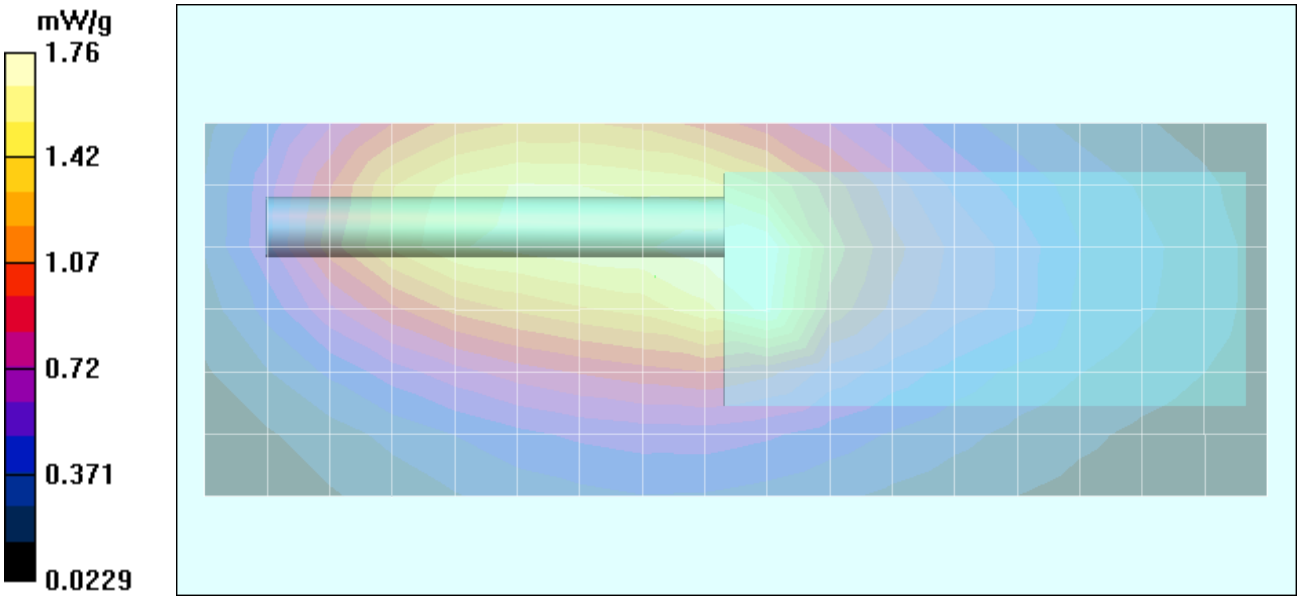
Communication System: FM VHF
Frequency: 136 MHz; Duty Cycle: 1:1
RF Output Power: 37.57 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Stubby Antenna (P/N: KRA22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Stubby Antenna (P/N: KRA22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.86 W/kg
SAR(1 g) = 1.66 mW/g; SAR(10 g) = 1.02 mW/g
Reference Value = 52.5 V/m

Body-Worn - Stubby Antenna (P/N: KRA22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 1:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.43 W/kg
SAR(1 g) = 1.44 mW/g; SAR(10 g) = 1.04 mW/g
Reference Value = 52.5 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

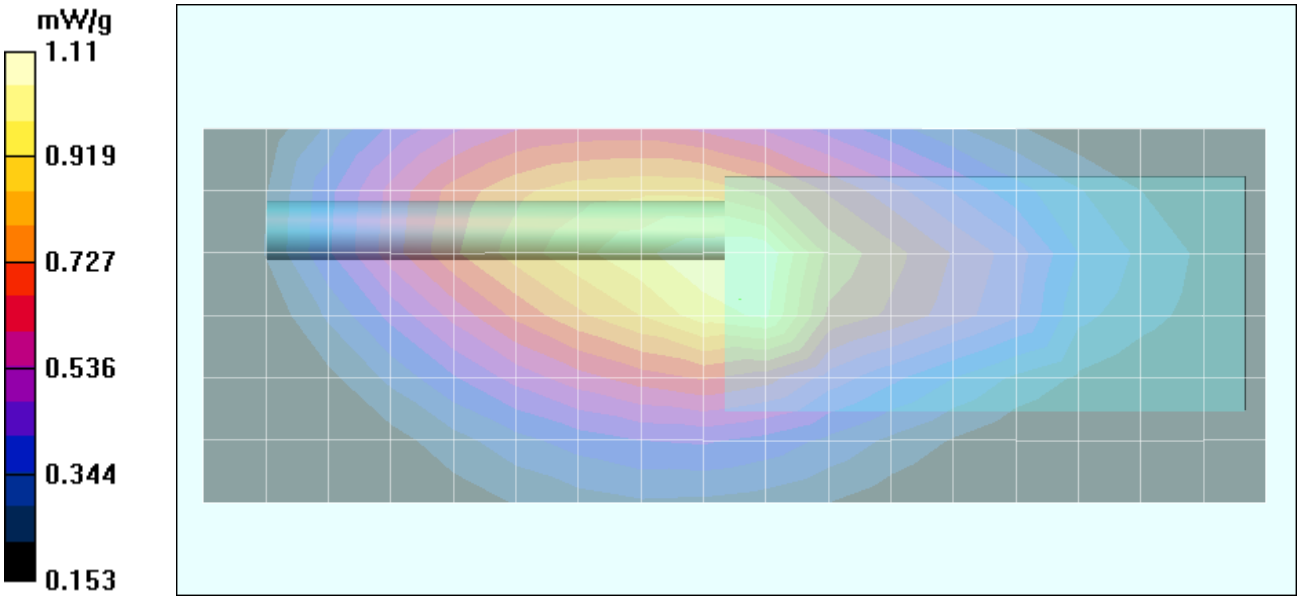
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 37.64 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Stubby Antenna (P/N: KRA22M2) - 1.1 cm Belt-Clip Separation Distance - High Ch/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Stubby Antenna (P/N: KRA22M2) - 1.1 cm Belt-Clip Separation Distance - High Ch/Zoom Scan 2 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 1.10 mW/g; SAR(10 g) = 0.717 mW/g
Reference Value = 40.4 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

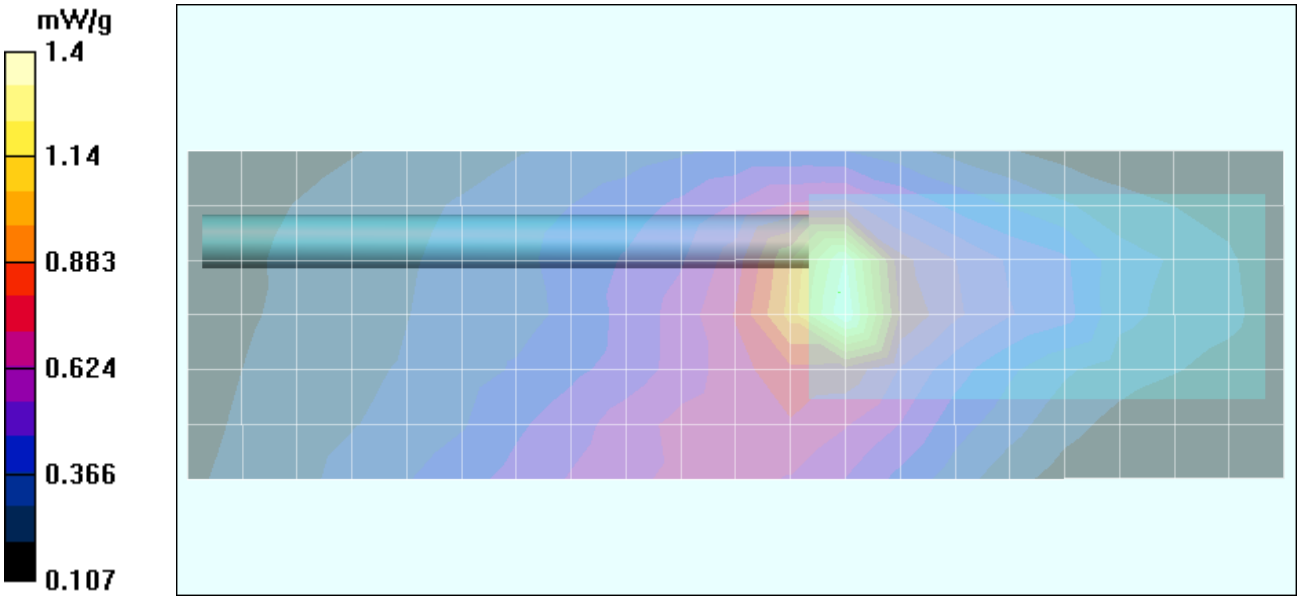
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.60 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Whip Antenna (P/N: W22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Whip Antenna (P/N: W22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.65 W/kg
SAR(1 g) = 1.44 mW/g; SAR(10 g) = 0.728 mW/g
Reference Value = 39.6 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

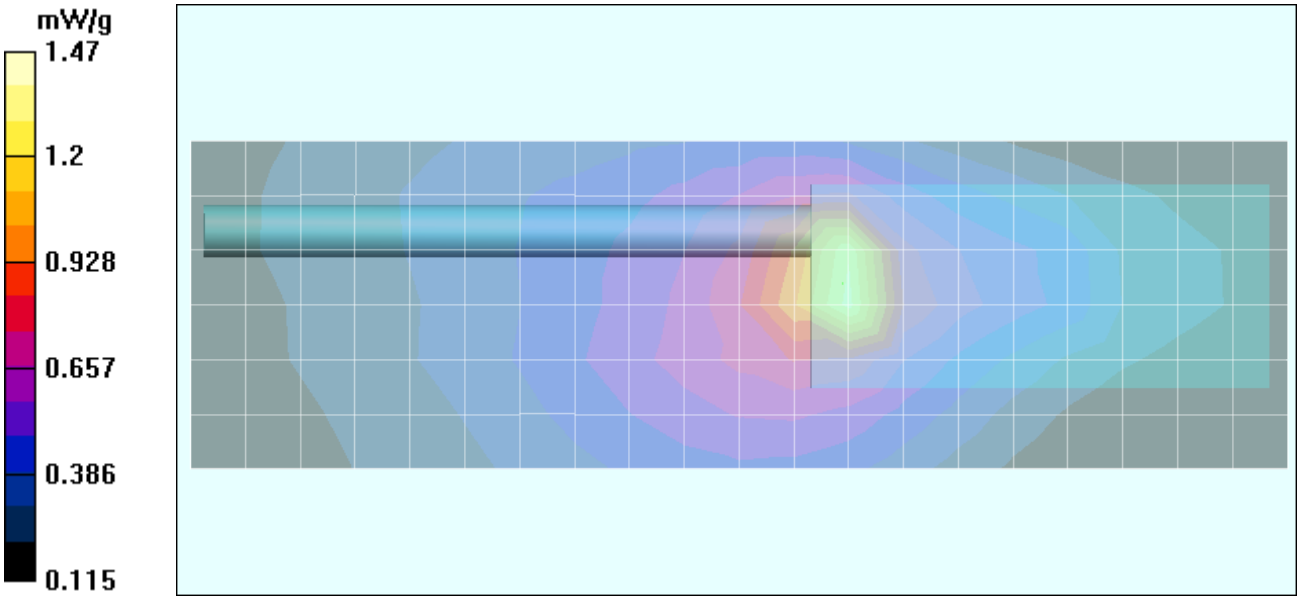
7.5V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.63 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Whip Antenna (P/N: W22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Whip Antenna (P/N: W22M) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.67 W/kg
SAR(1 g) = 1.48 mW/g; SAR(10 g) = 0.755 mW/g
Reference Value = 42.5 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

7.5V NiCd Battery Pack (P/N: KNB-30A)

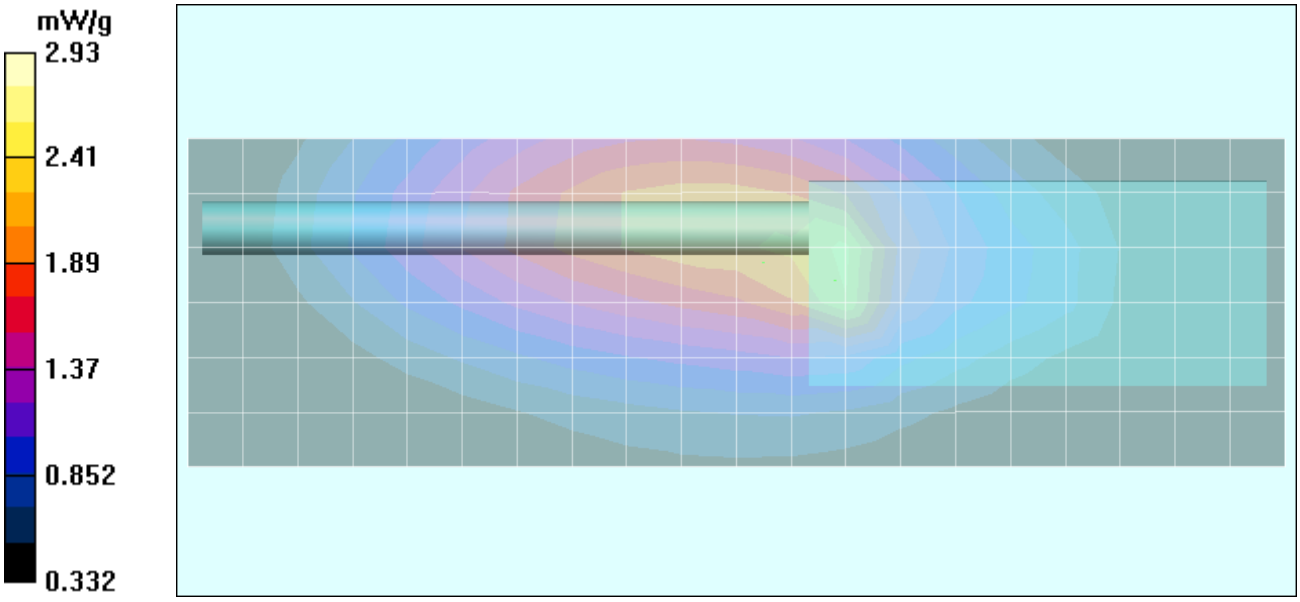
Communication System: FM VHF
Frequency: 136 MHz; Duty Cycle: 1:1
RF Output Power: 37.68 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

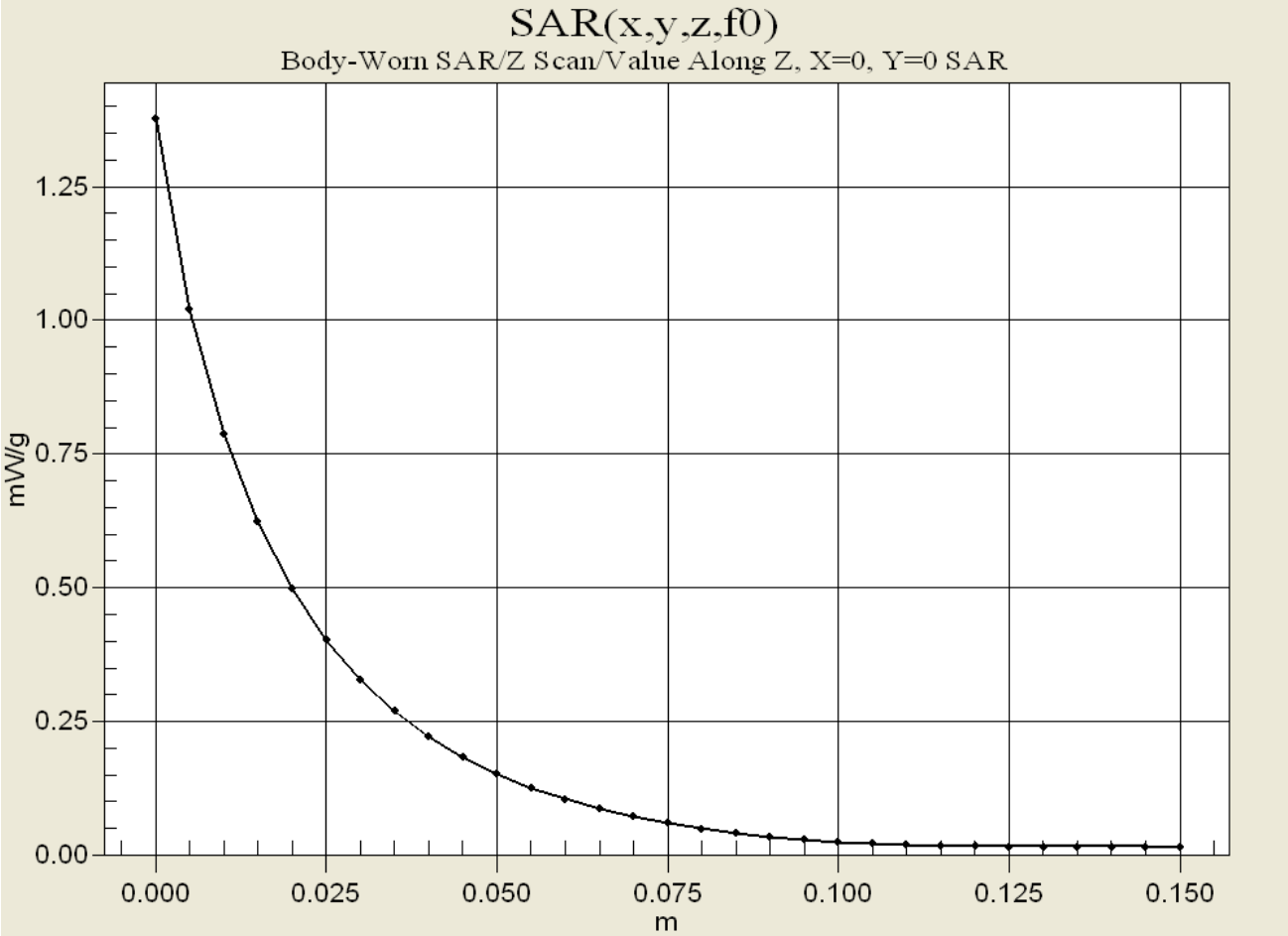
- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Whip Antenna (P/N: W22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Whip Antenna (P/N: W22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 7.32 W/kg
SAR(1 g) = 2.95 mW/g; SAR(10 g) = 1.78 mW/g
Reference Value = 57.3 V/m

Body-Worn - Whip Antenna (P/N: W22M3) - 1.1 cm Belt-Clip Separation Distance - Low Ch/Zoom Scan (7x7x7)/Cube 1:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.02 W/kg
SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.8 mW/g
Reference Value = 57.3 V/m




SAR(x,y,z,f0)
Body-Worn SAR/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
1.25
1.00
0.75
0.50
0.25
0.00
0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

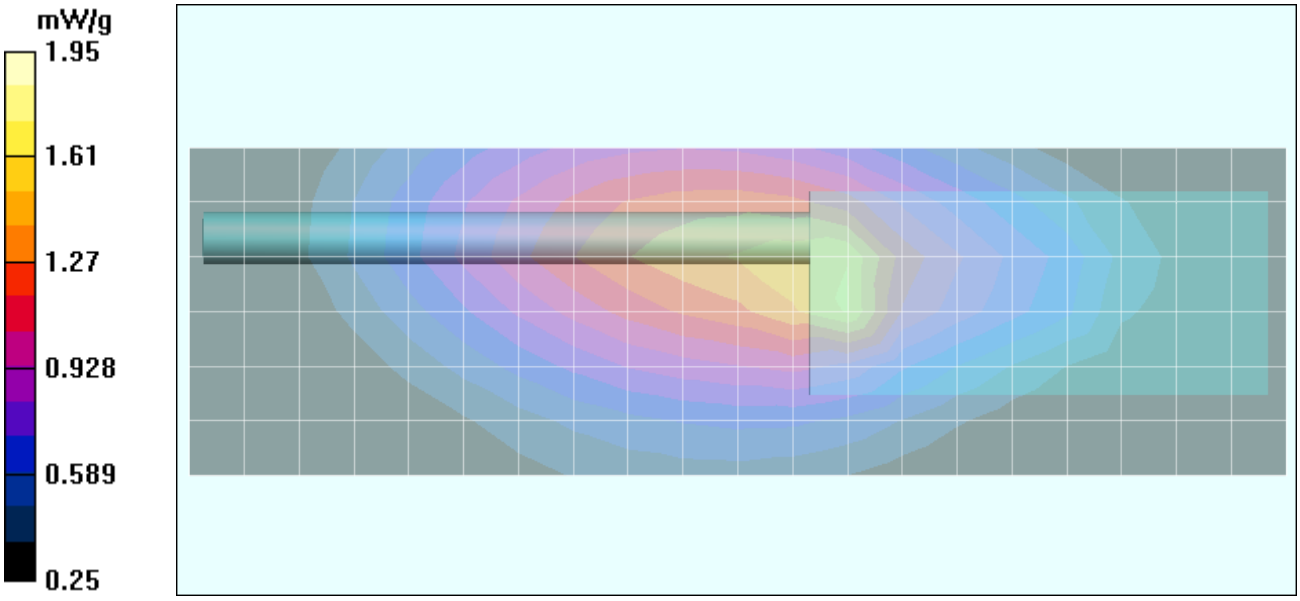
7.5V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 174 MHz; Duty Cycle: 1:1
RF Output Power: 37.73 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Whip Antenna (P/N: W22M2) - 1.1 cm Belt-Clip Separation Distance - High Ch/Area Scan (7x21x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Whip Antenna (P/N: W22M2) - 1.1 cm Belt-Clip Separation Distance - High Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.95 W/kg
SAR(1 g) = 1.91 mW/g; SAR(10 g) = 1.22 mW/g
Reference Value = 48.5 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

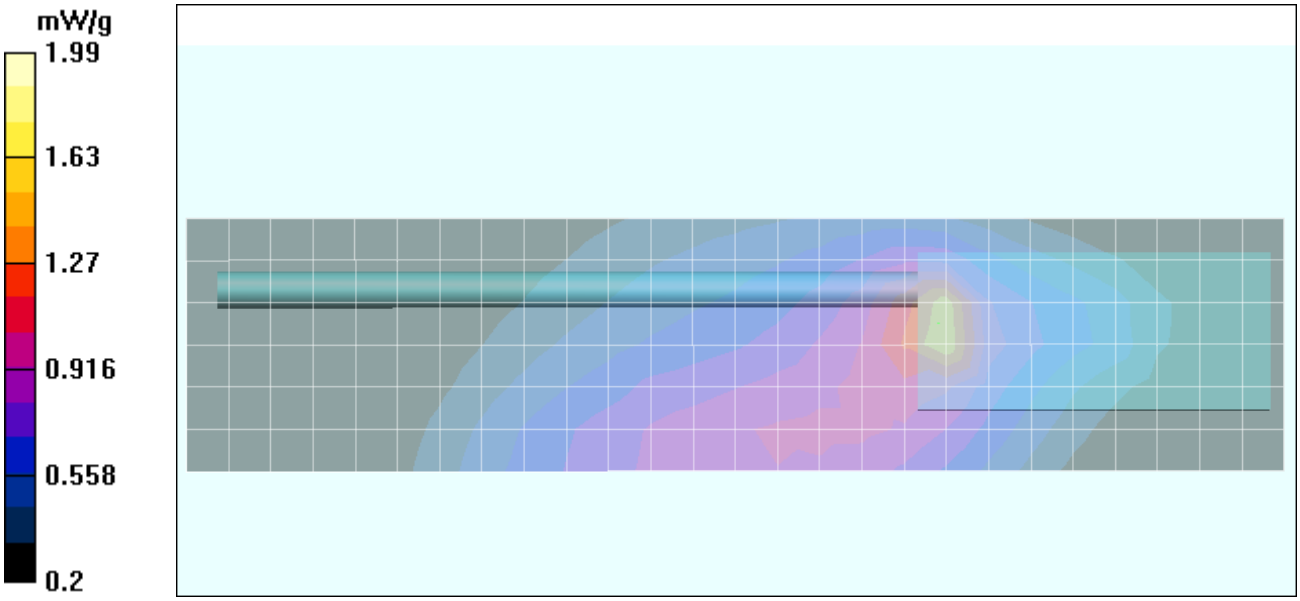
7.5V NiMH Battery Pack (P/N: KNB-29N)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.59 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Long Whip Antenna (P/N: KRA-25) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x27x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Long Whip Antenna (P/N: KRA-25) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 5.07 W/kg
SAR(1 g) = 1.99 mW/g; SAR(10 g) = 1.15 mW/g
Reference Value = 40 V/m



Date Tested: 12/24/03

DUT: Kenwood Model: TK-2202; Type: Portable VHF PTT Radio Transceiver; Serial: B12

Ambient Temp: 24.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

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

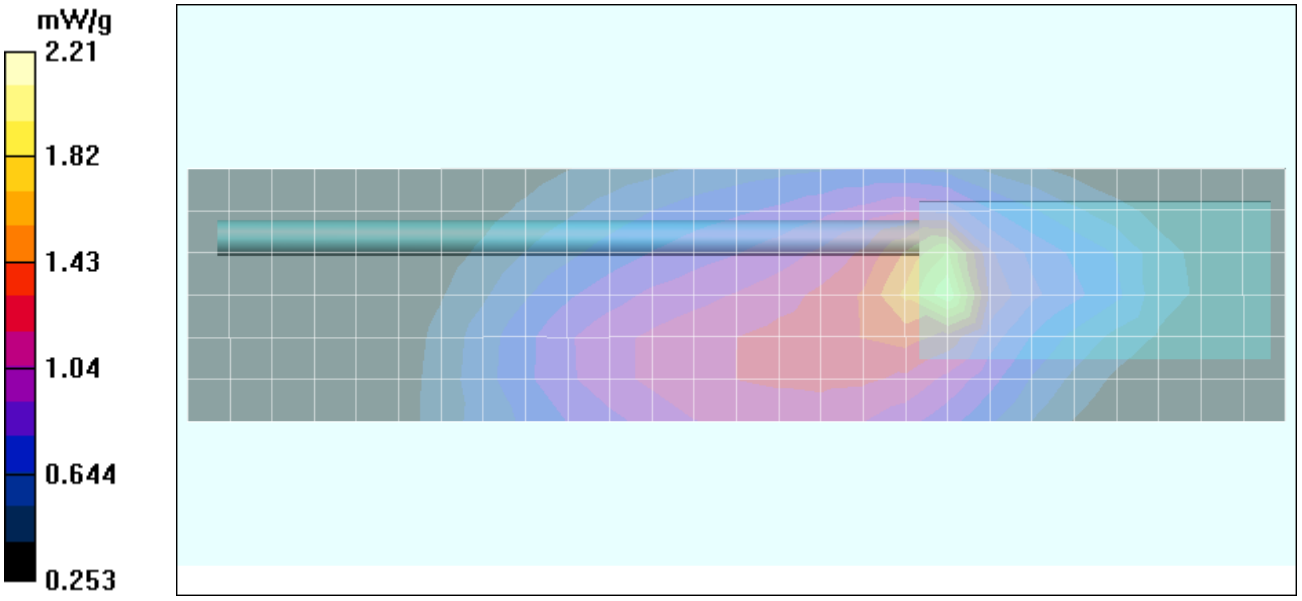
7.5 V NiCd Battery Pack (P/N: KNB-30A)

Communication System: FM VHF
Frequency: 155 MHz; Duty Cycle: 1:1
RF Output Power: 37.62 dBm (Conducted)
Medium: M150 (σ = 0.77 mho/m, ε_r = 62.8, ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(8.8, 8.8, 8.8); Calibrated: 26/02/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 19/05/2003
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Body-Worn - Long Whip Antenna (P/N: KRA-25) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Area Scan (7x27x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - Long Whip Antenna (P/N: KRA-25) - 1.1 cm Belt-Clip Separation Distance - Mid Ch/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 5.73 W/kg
SAR(1 g) = 2.23 mW/g; SAR(10 g) = 1.31 mW/g
Reference Value = 52.5 V/m



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 12/23/03

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

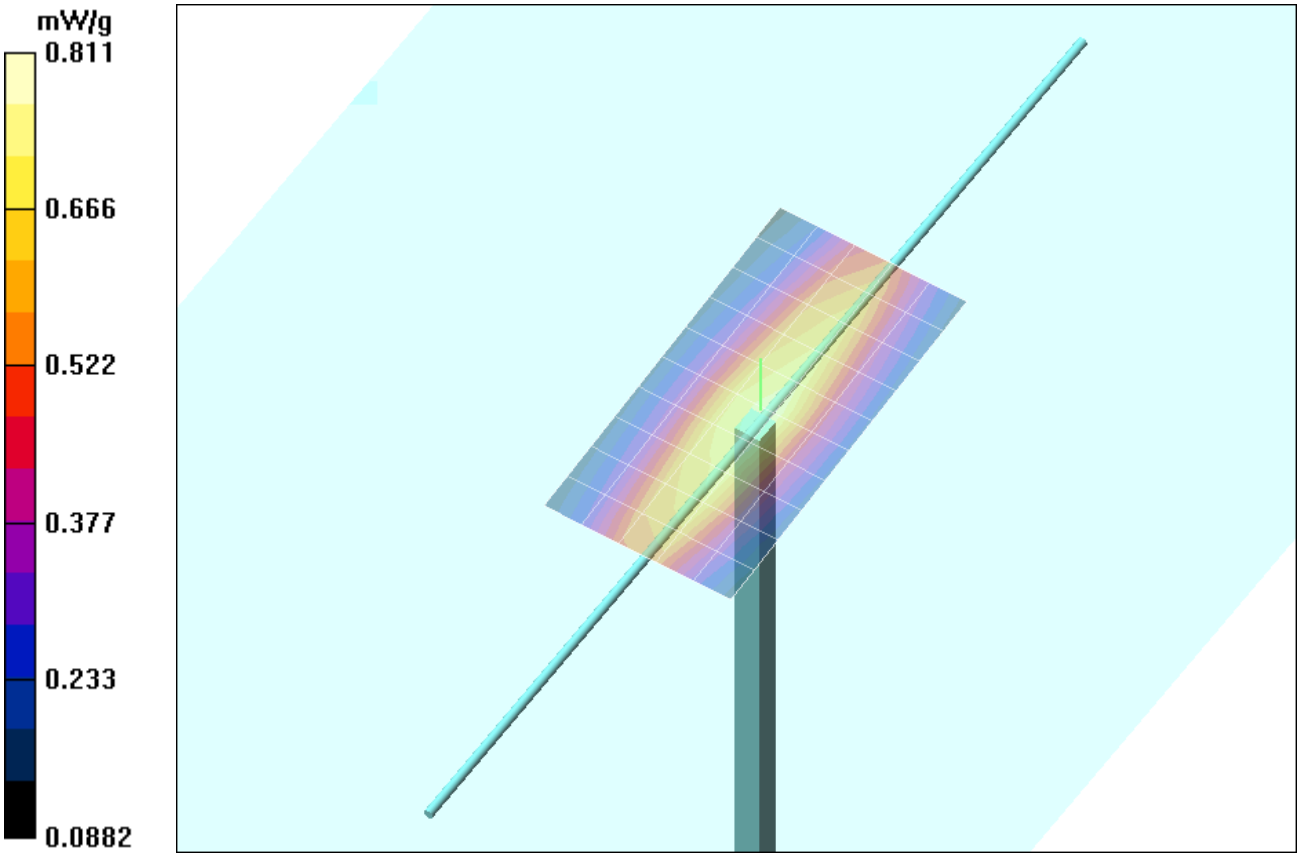
Ambient Temp: 23.9 °C; Fluid Temp: 20.9 °C; Barometric Pressure: 95.6 kPa; Humidity: 33%

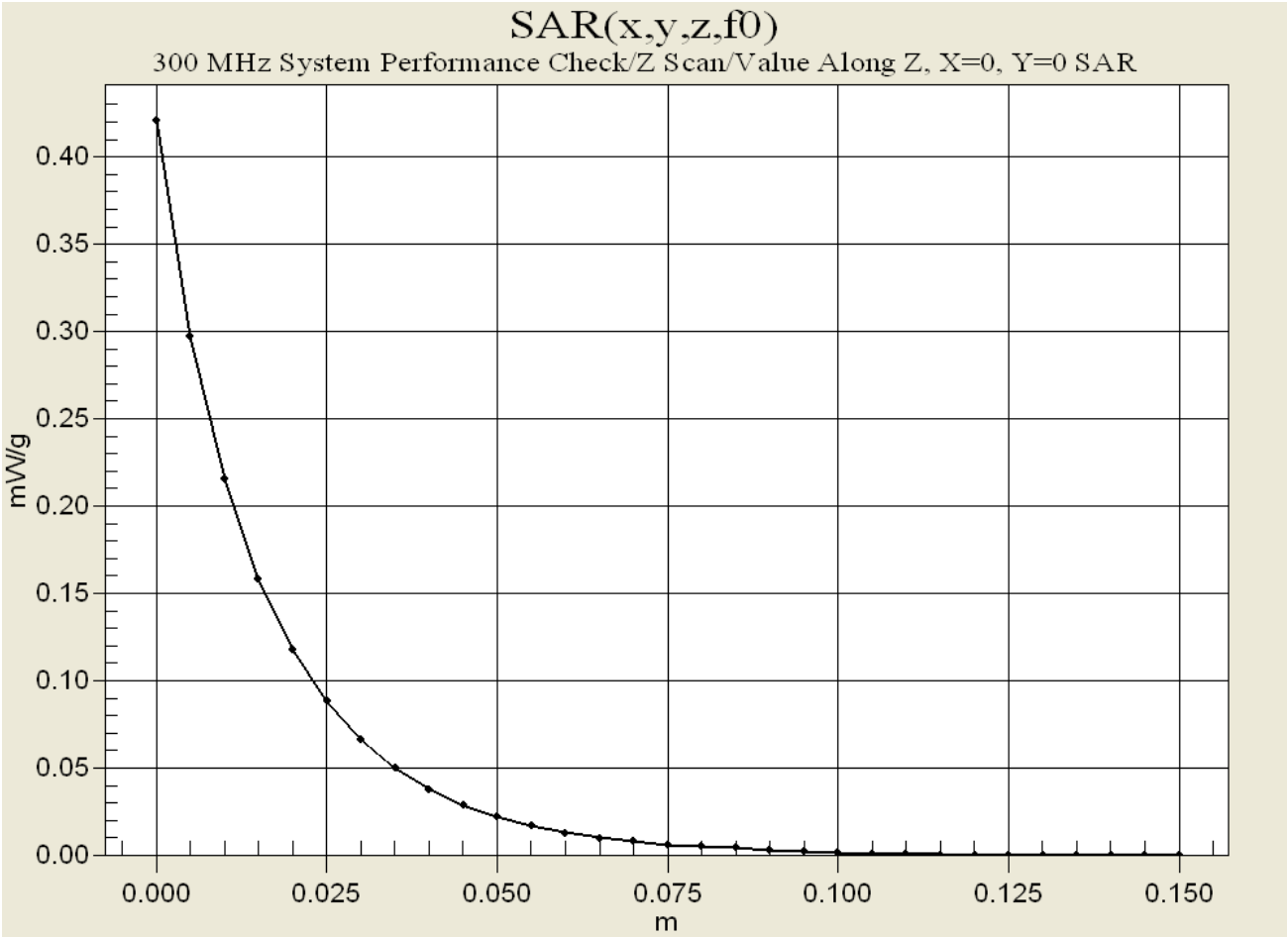
Communication System: CW
Forward Conducted Power: 250mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.85 mho/m, ε_r = 44.2, ρ = 1000 kg/m^3)

- 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 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) = 1.39 W/kg
SAR(1 g) = 0.781 mW/g; SAR(10 g) = 0.498 mW/g
Reference Value = 30.8 V/m
Power Drift = -0.06 dB




SAR(x,y,z,f0)
300 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

Date Tested: 12/24/03

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

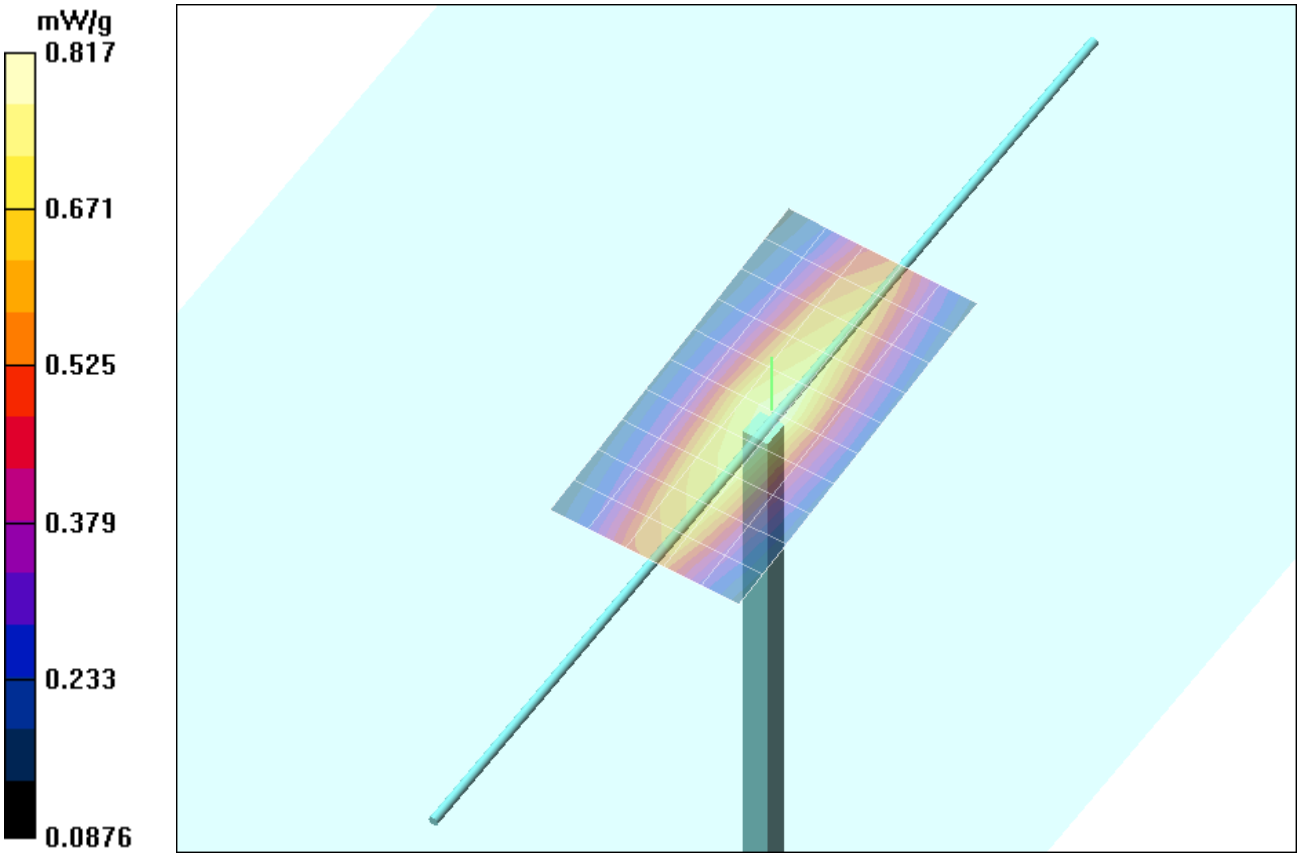
Ambient Temp: 25.5 °C; Fluid Temp: 21.1 °C; Barometric Pressure: 97.4 kPa; Humidity: 34%

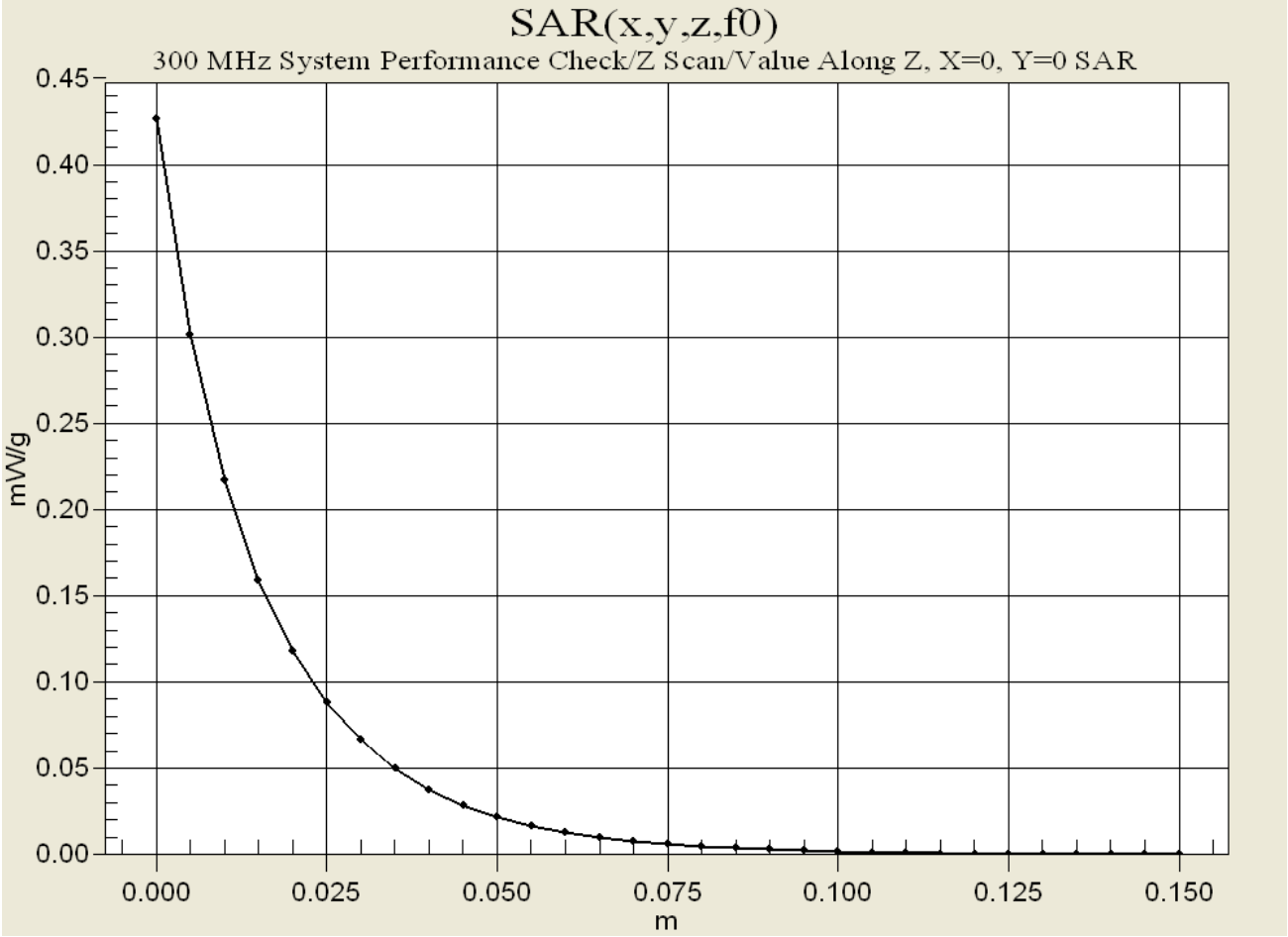
Communication System: CW
Forward Conducted Power: 250mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.87 mho/m, ε_r = 44.9, ρ = 1000 kg/m^3)

- 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 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) = 1.39 W/kg
SAR(1 g) = 0.788 mW/g; SAR(10 g) = 0.503 mW/g
Reference Value = 30.6 V/m
Power Drift = -0.1 dB




SAR(x,y,z,f0)
300 MHz System Performance Check/Z Scan/Value Along Z, X=0, Y=0 SAR
mW/g
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.025
0.050
0.075
0.100
0.125
0.150
m

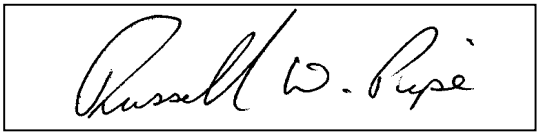
APPENDIX C - SYSTEM VALIDATION

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: 

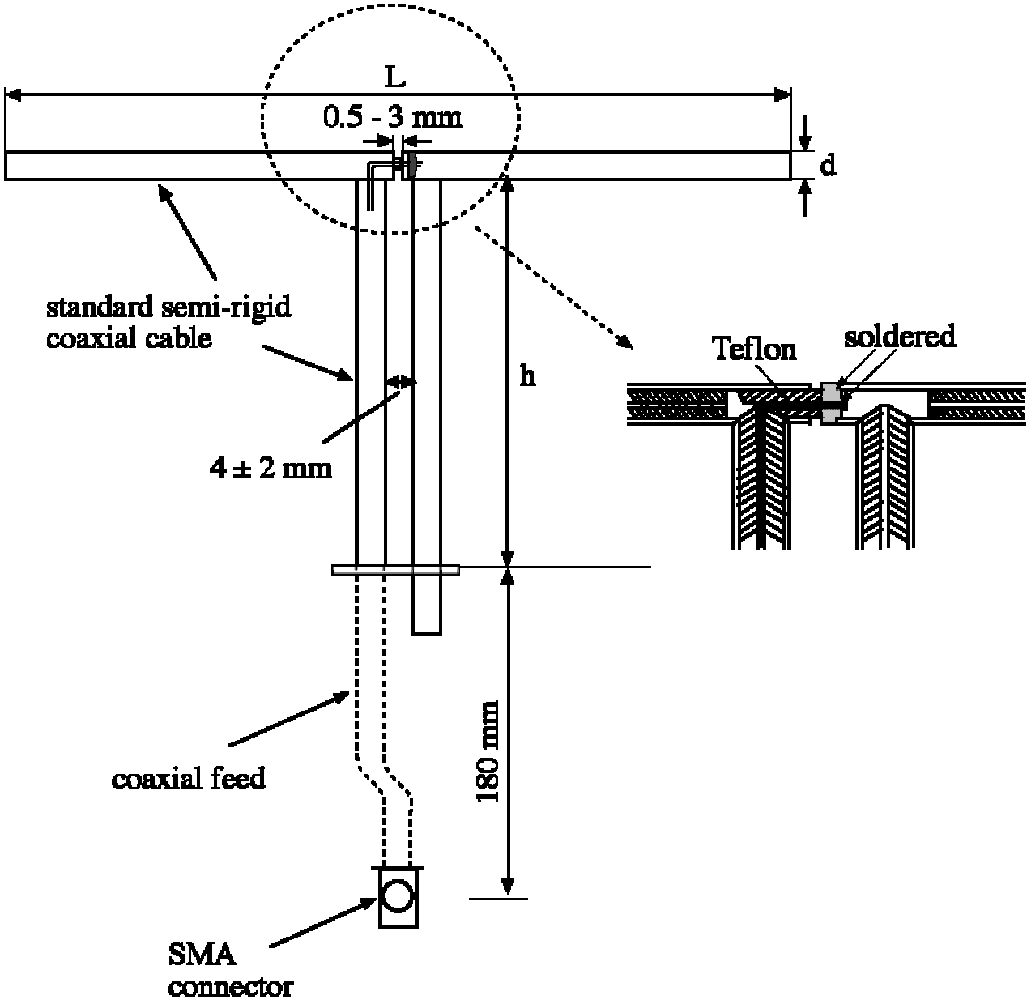
Approved by: 

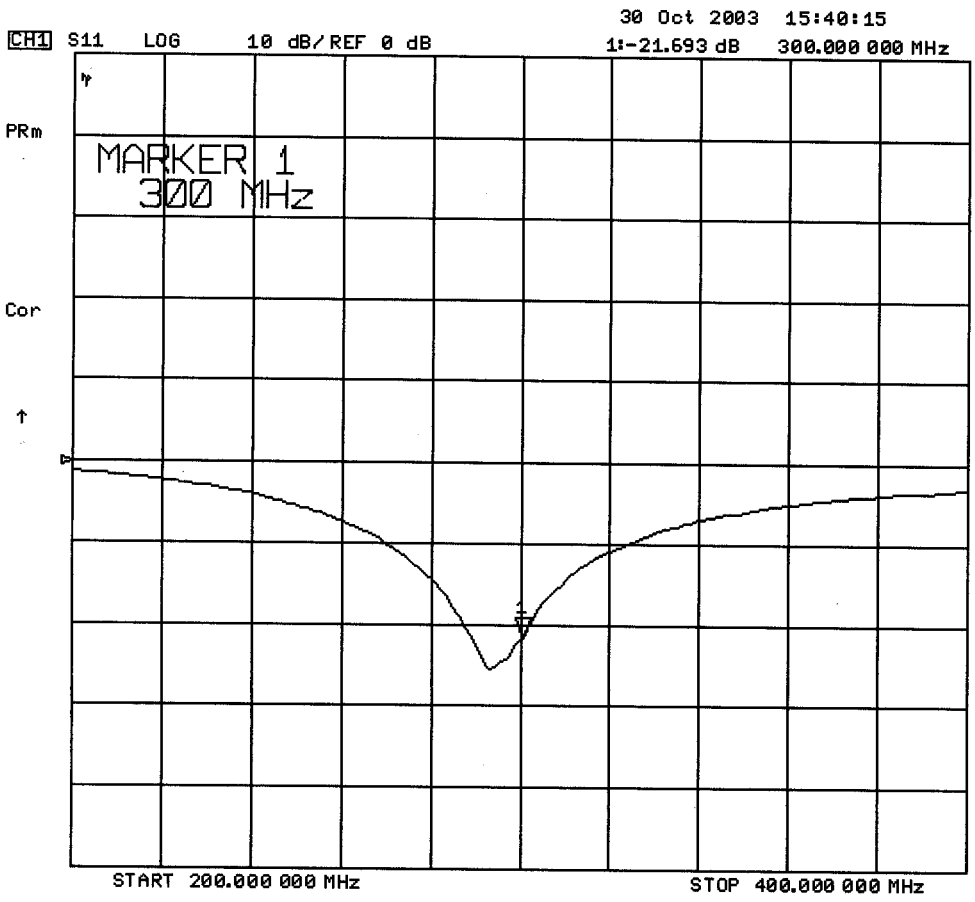
Celltech Labs Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
Tel. 250-448-7047 • Fax. 250-448-7046 • e-mail: info@celltechlabs.com
www.celltechlabs.com

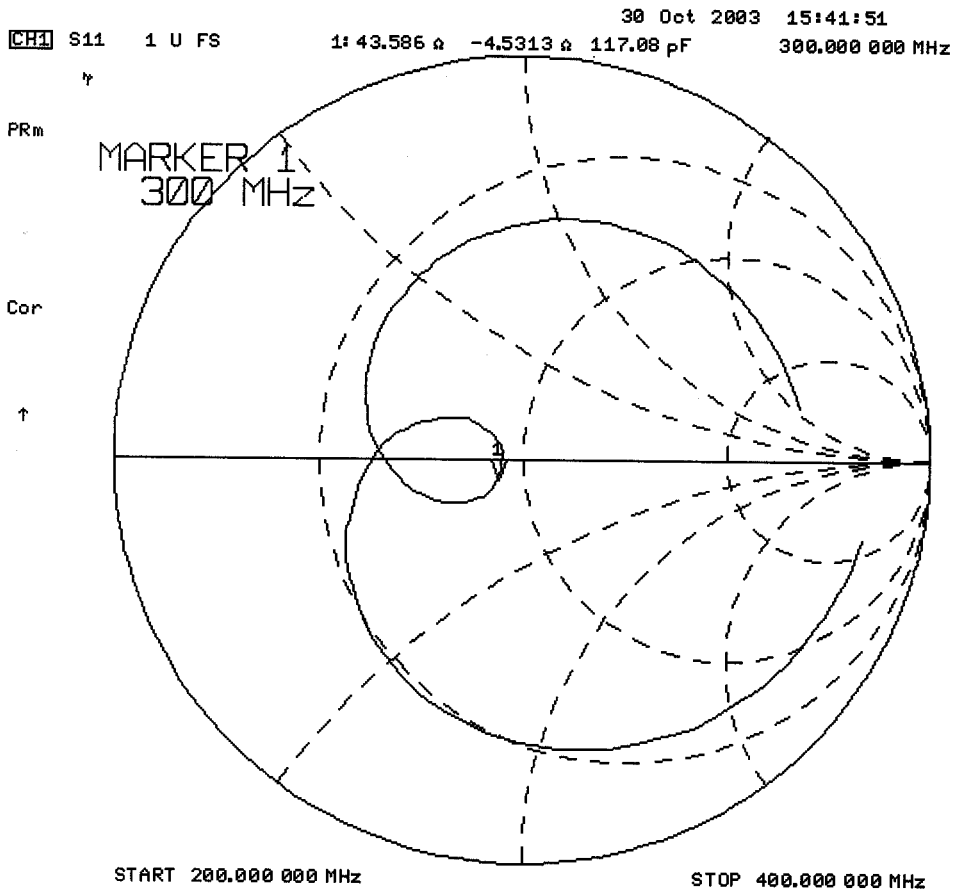
1. Validation Dipole Construction & Electrical Characteristics

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




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

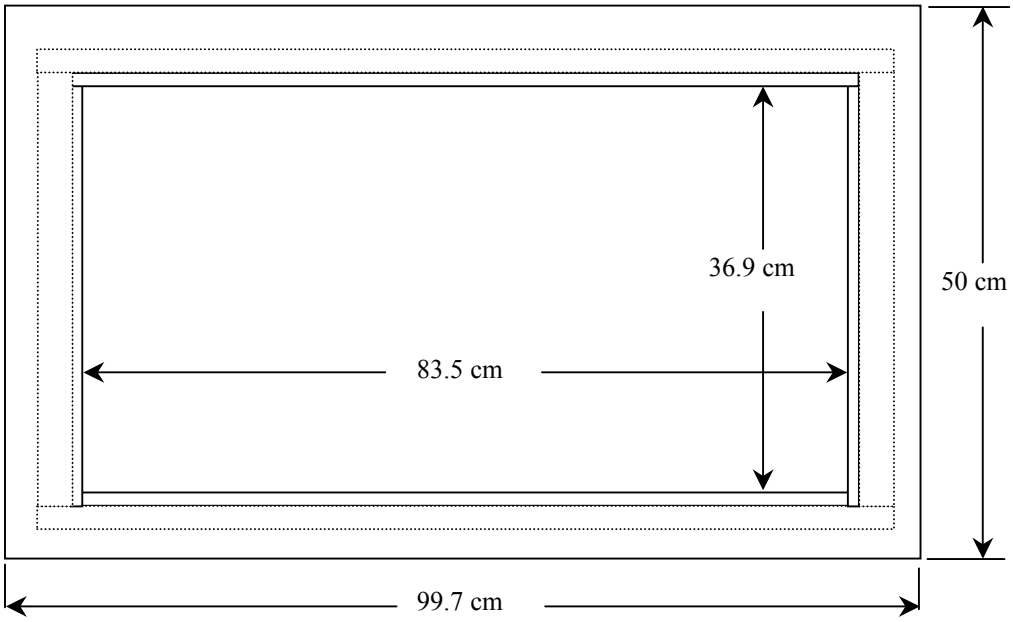
3. Validation Phantom

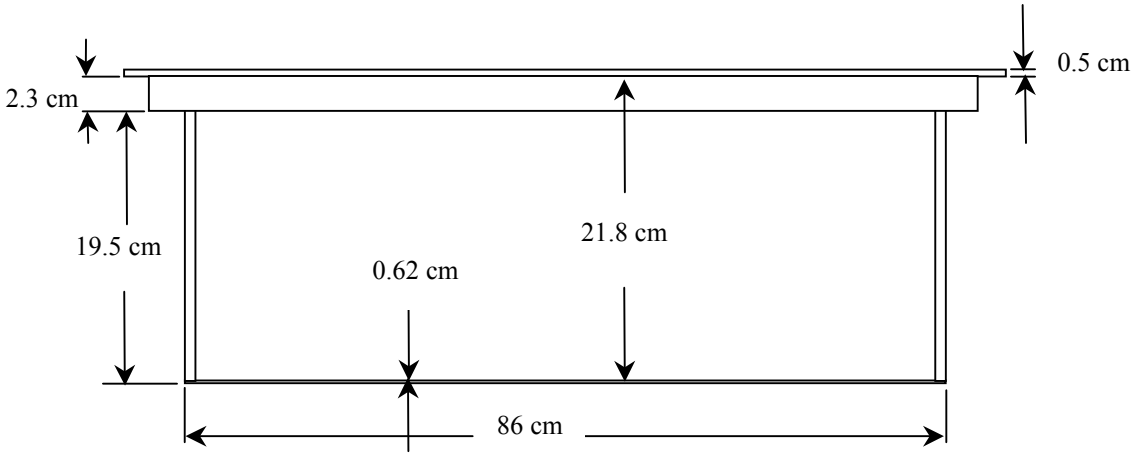
The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The inner dimensions of the phantom are as follows:

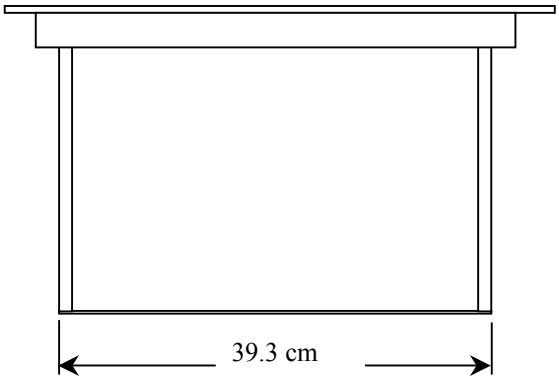
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

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

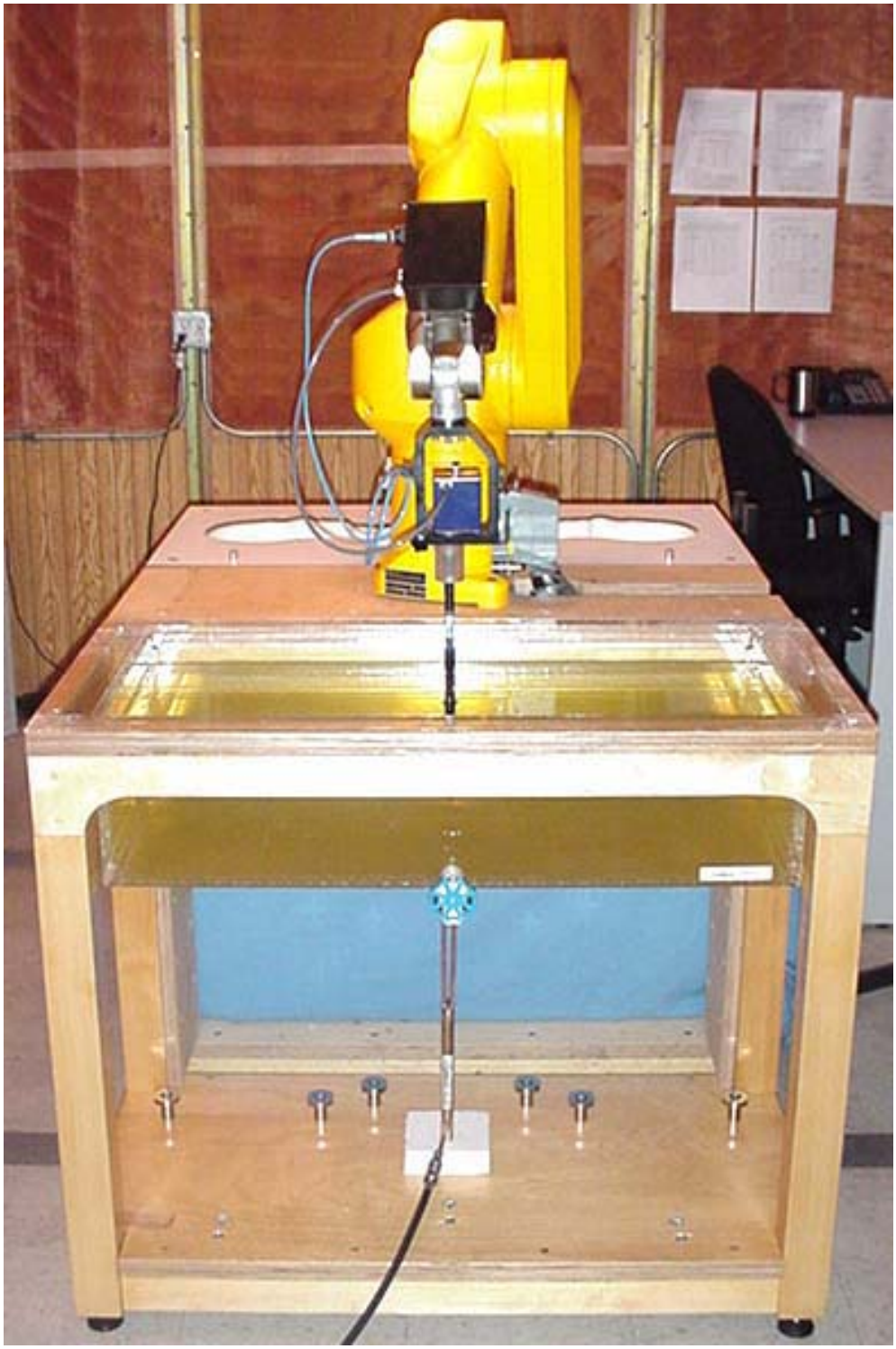
4. Dimensions of Plexiglas Planar Phantom







5. 300MHz System Validation Setup



300MHz System Validation Setup

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:

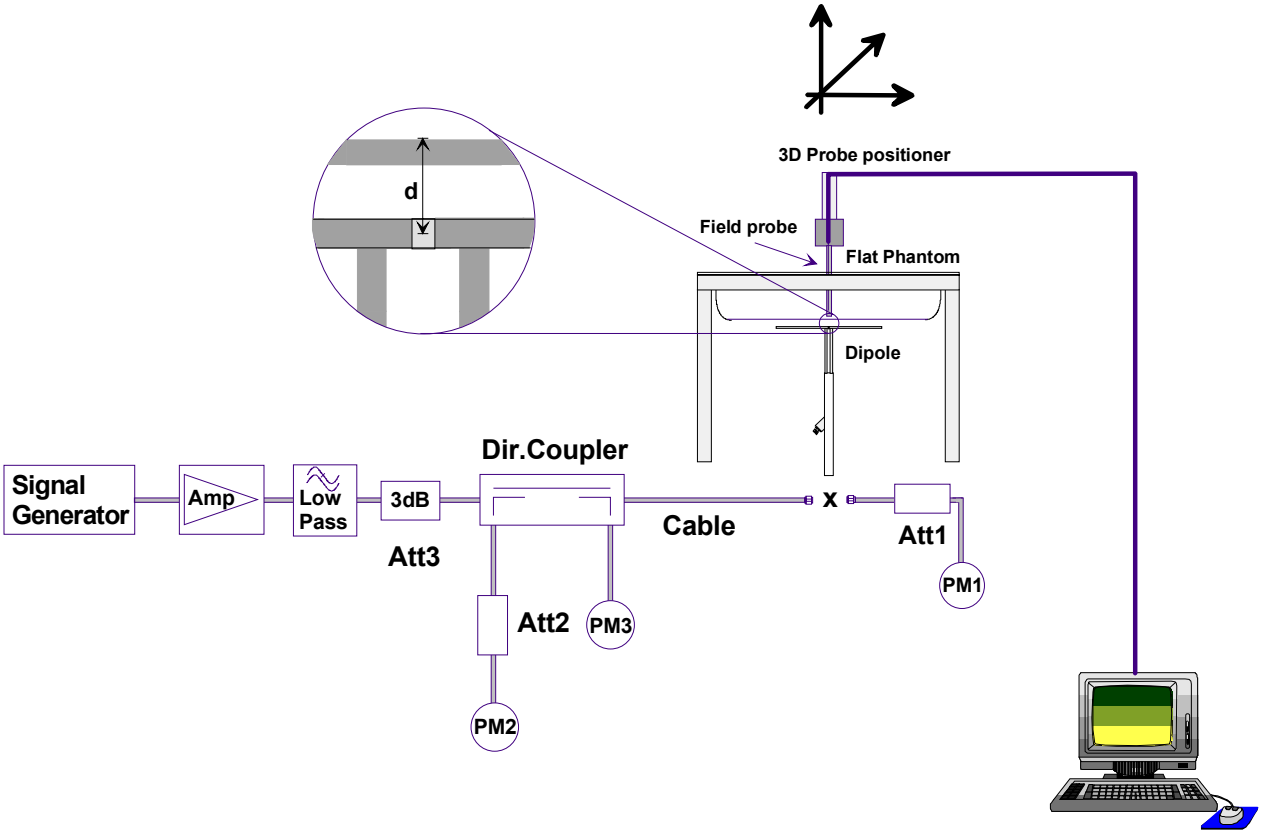
Ambient Temperature:	22.1°C
Humidity:	56%
Barometric Pressure:	103.4 kPa

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

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	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

Test Date: 10/30/03

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

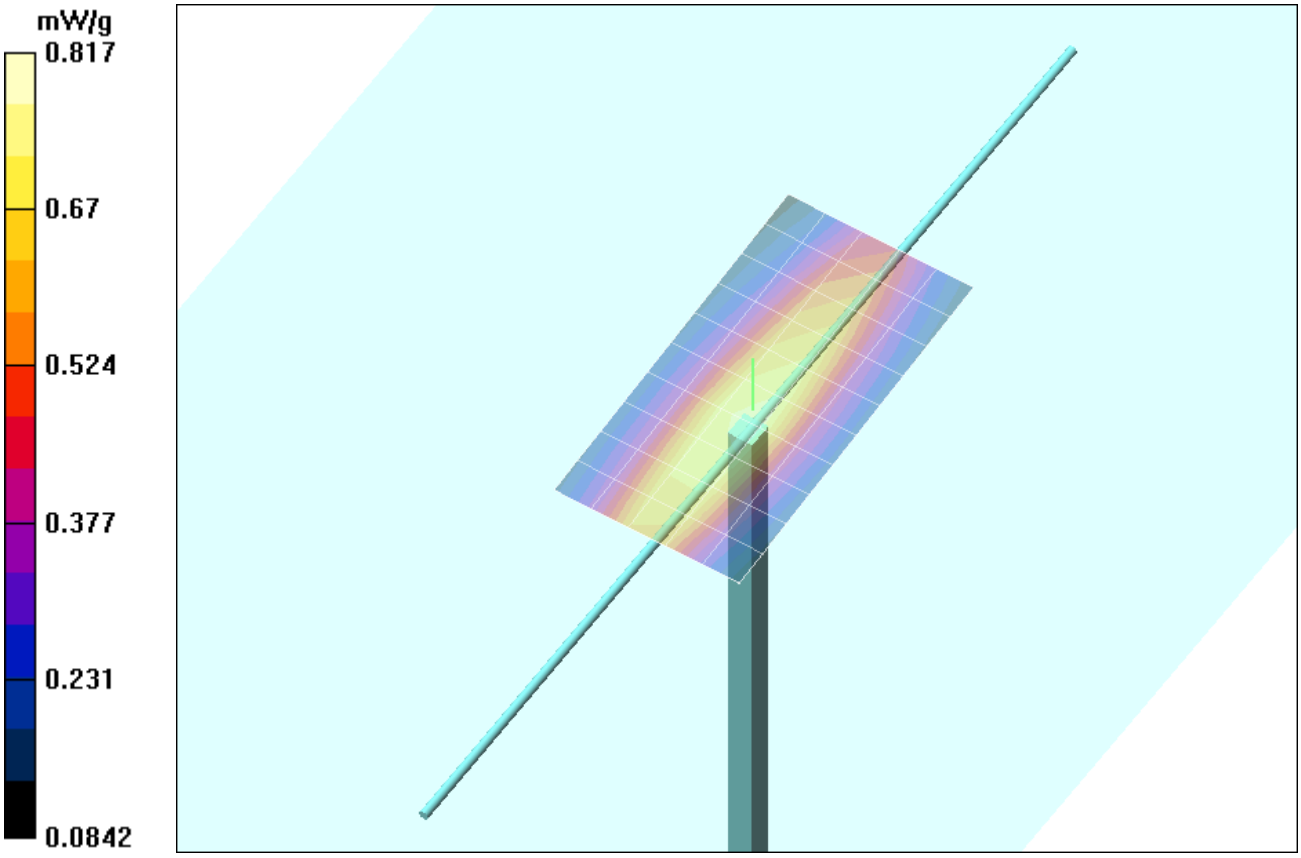
Ambient Temp: 22.1°C; Fluid Temp: 22.2°C; Barometric Pressure: 103.4 kPa; Humidity: 56%

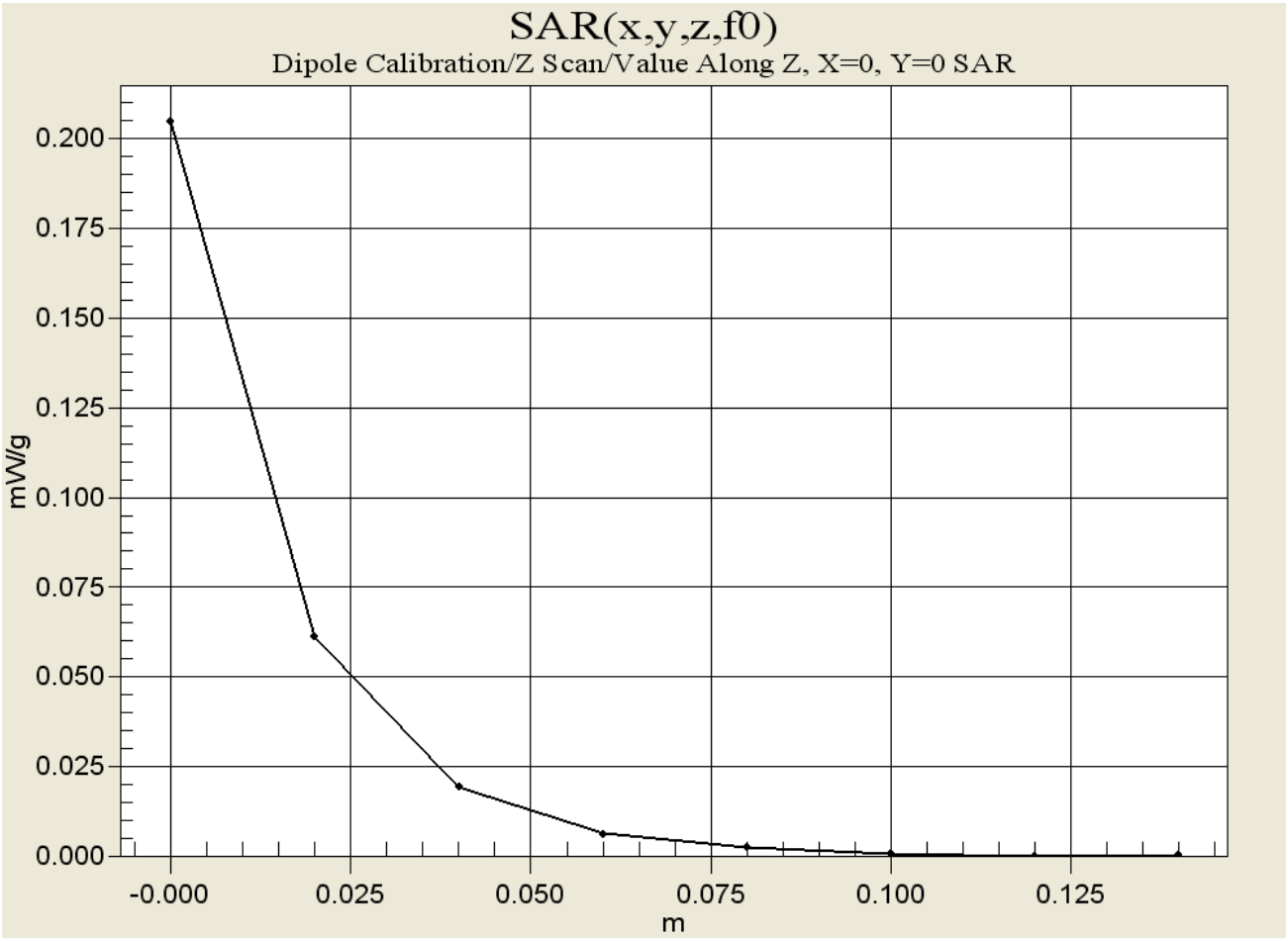
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 300 MHz; Duty Cycle: 1:1
Medium: 300 HSL (σ = 0.88 mho/m, ε_r = 45.7, ρ = 1000 kg/m^3)

- 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





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:1387
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	February 26, 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	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: February 26, 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

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibration:	February 22, 2002
Recalibrated:	February 26, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space

NormX	**1.55**	$\mu V/(V/m)^2$	DCP X	**92**	mV
NormY	**1.65**	$\mu V/(V/m)^2$	DCP Y	**92**	mV
NormZ	**1.64**	$\mu V/(V/m)^2$	DCP Z	**92**	mV

Sensitivity in Tissue Simulating Liquid

Head	**900 MHz**	ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**	
Head	**835 MHz**	ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**	
	ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.37**
	ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.61**
Head	**1800 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
Head	**1900 MHz**	ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**	
	ConvF X	**5.2** ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	**5.2** ± 9.5% (k=2)	Alpha	**0.50**
	ConvF Z	**5.2** ± 9.5% (k=2)	Depth	**2.73**

Boundary Effect

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

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.2	5.9
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

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

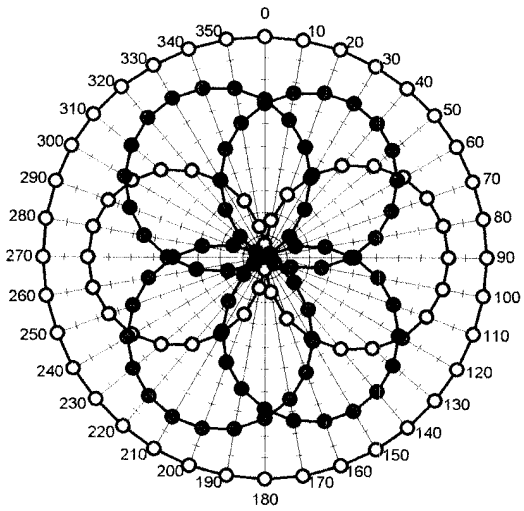
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	14.6	9.8
SAR_{be} [%]	With Correction Algorithm	0.2	0.0

Sensor Offset

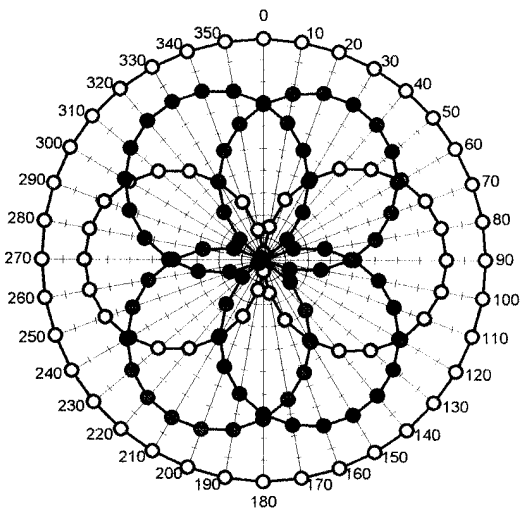
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

Receiving Pattern (ϕ), θ = 0°

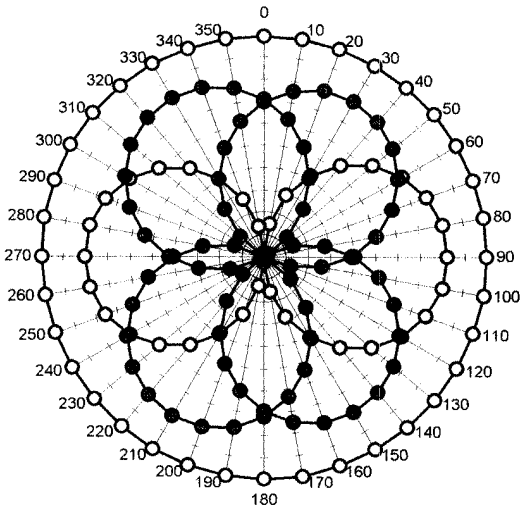
f = 30 MHz, TEM cell ifi110



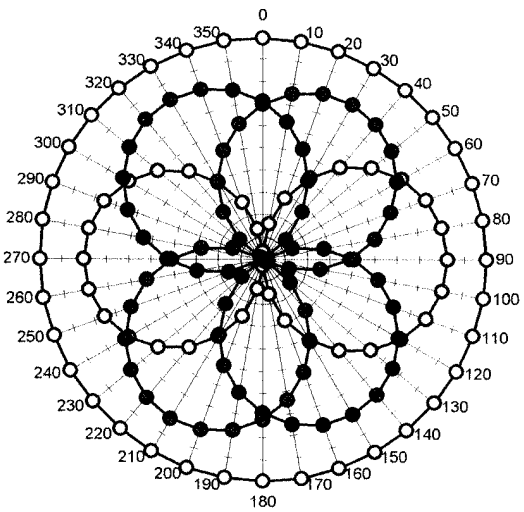
f = 100 MHz, TEM cell ifi110

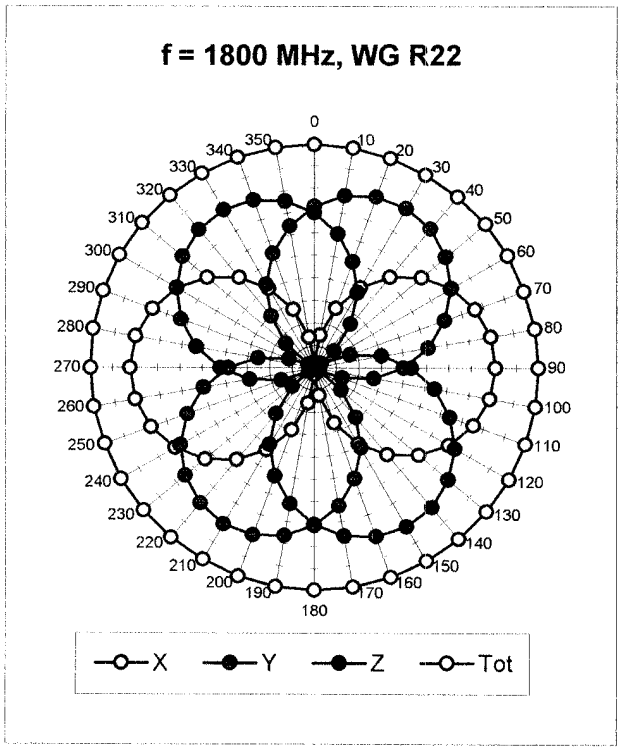


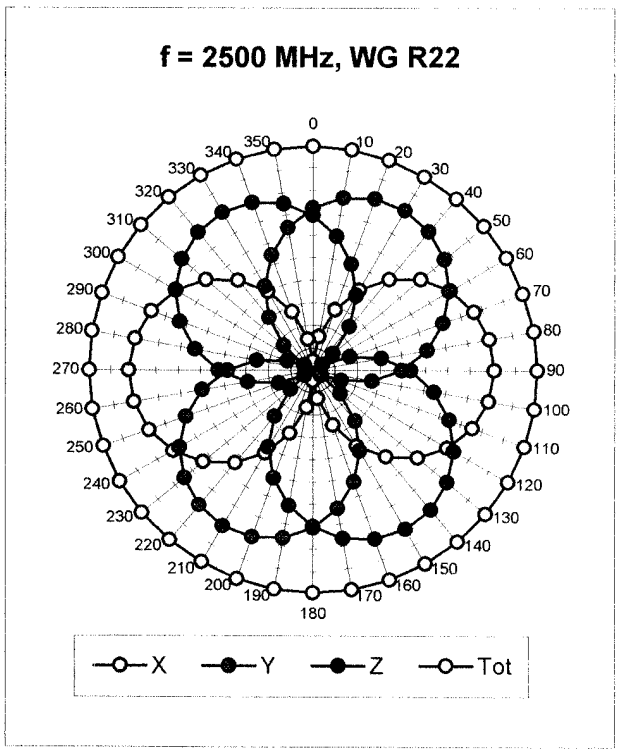
f = 300 MHz, TEM cell ifi110



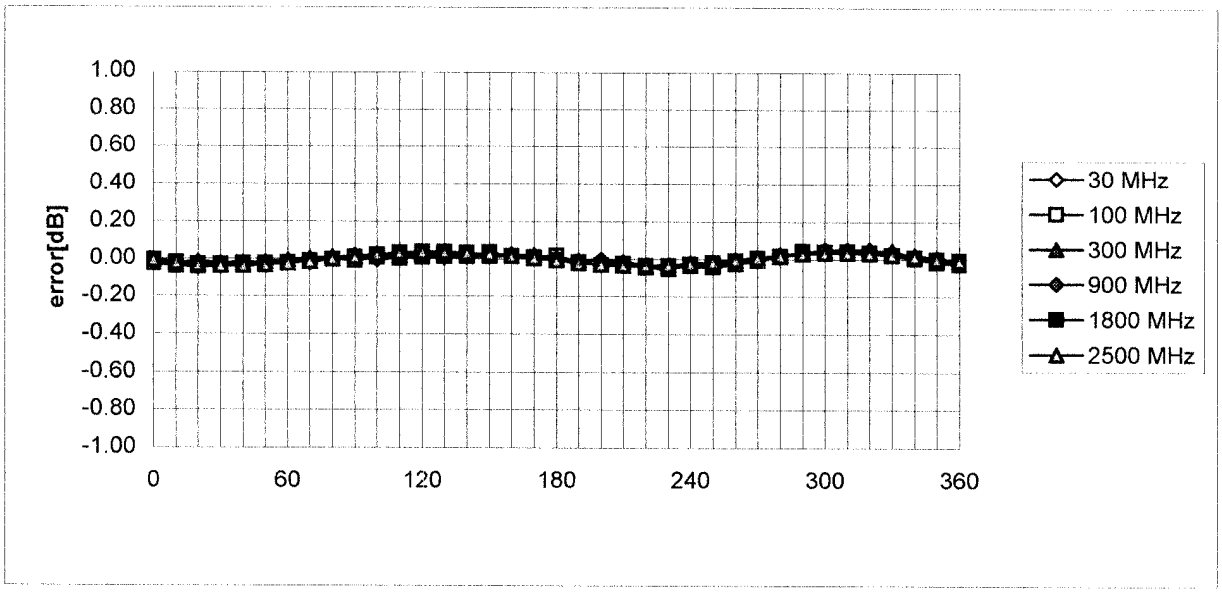
f = 900 MHz, TEM cell ifi110





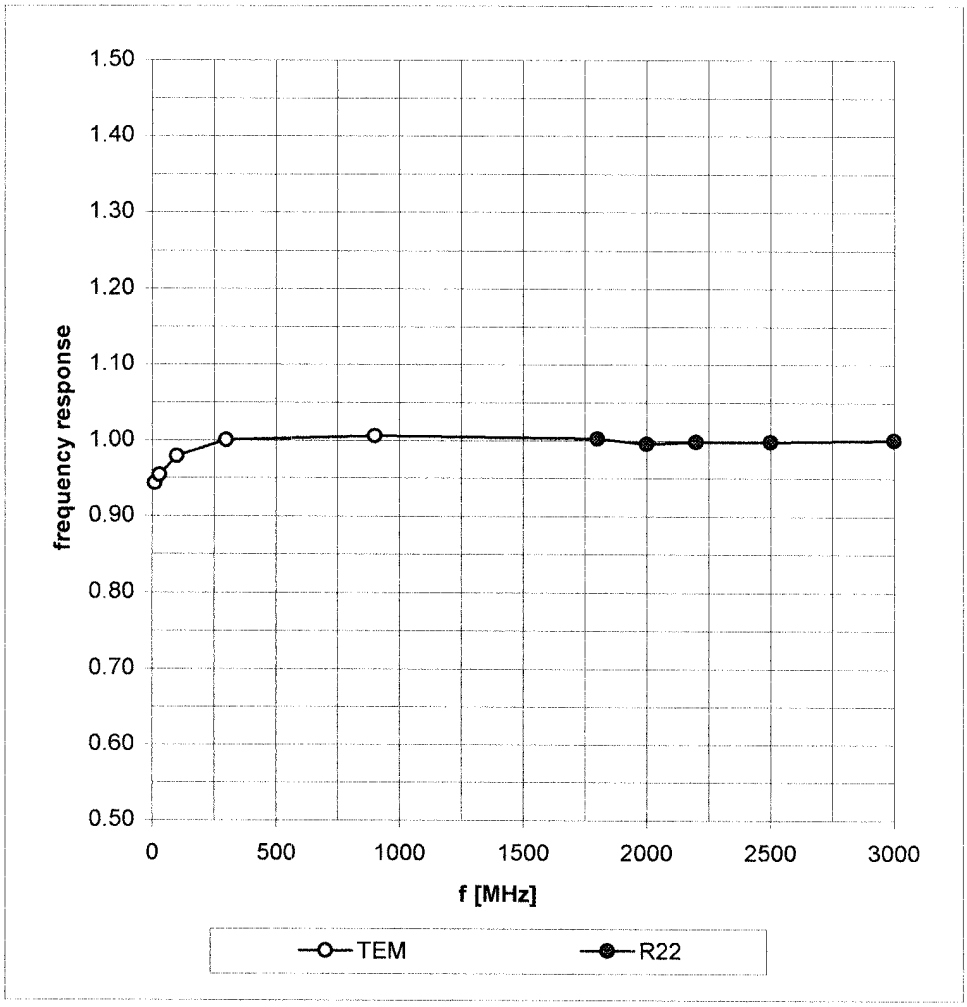


Isotropy Error (ϕ), θ = 0°



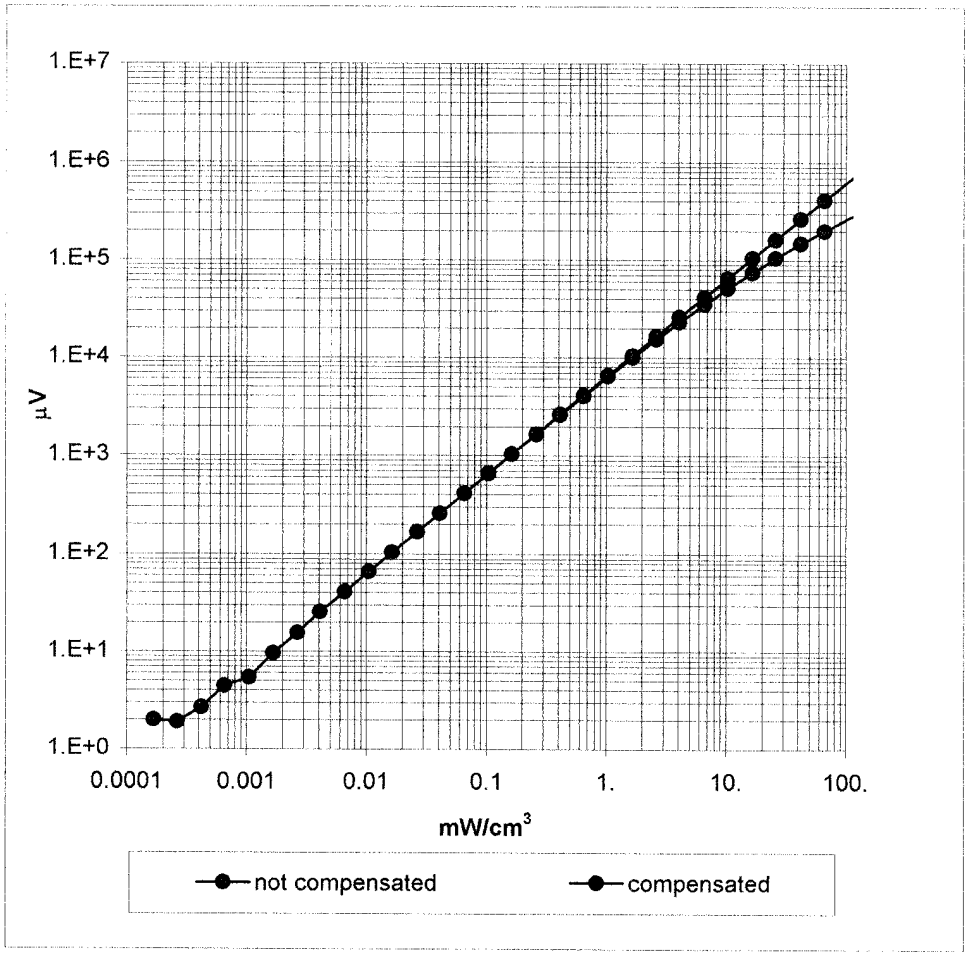
Frequency Response of E-Field

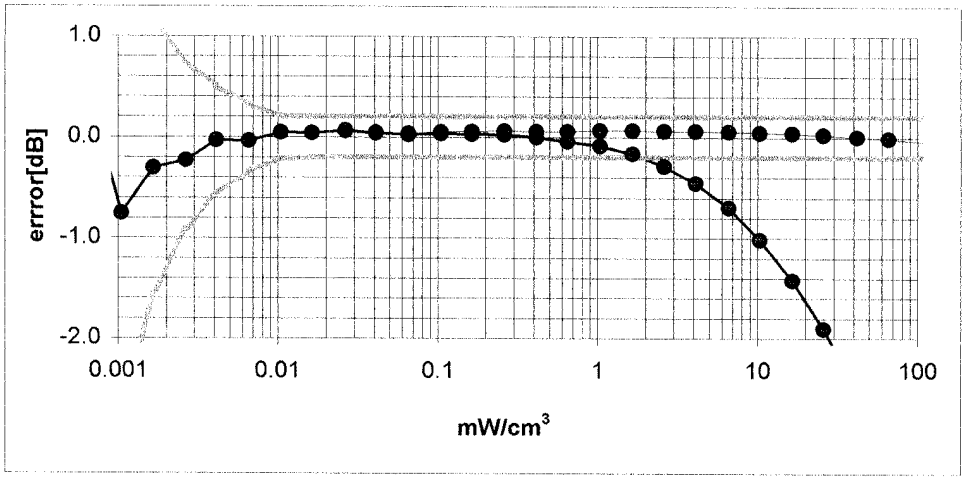
(TEM-Cell:ifi110, Waveguide R22)



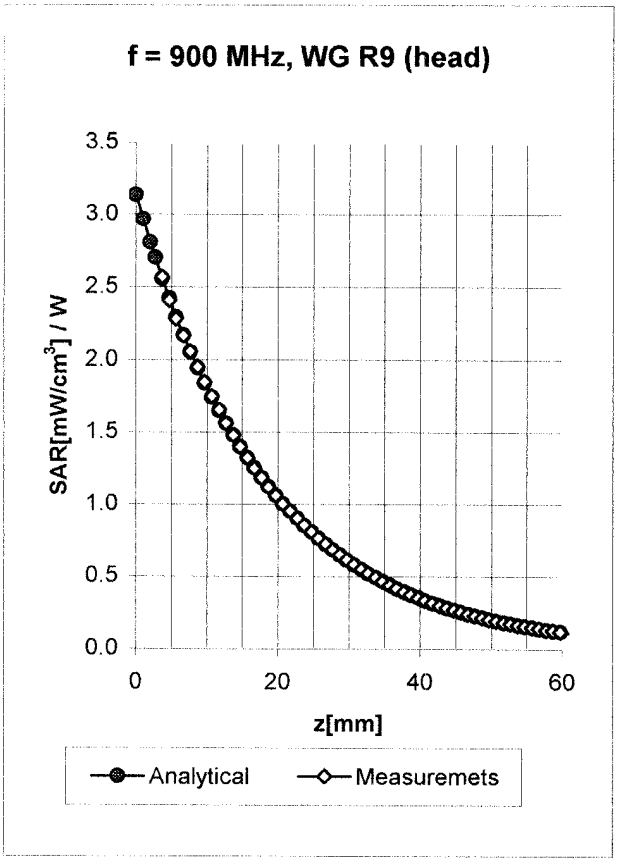
Dynamic Range f(SAR_{brain})

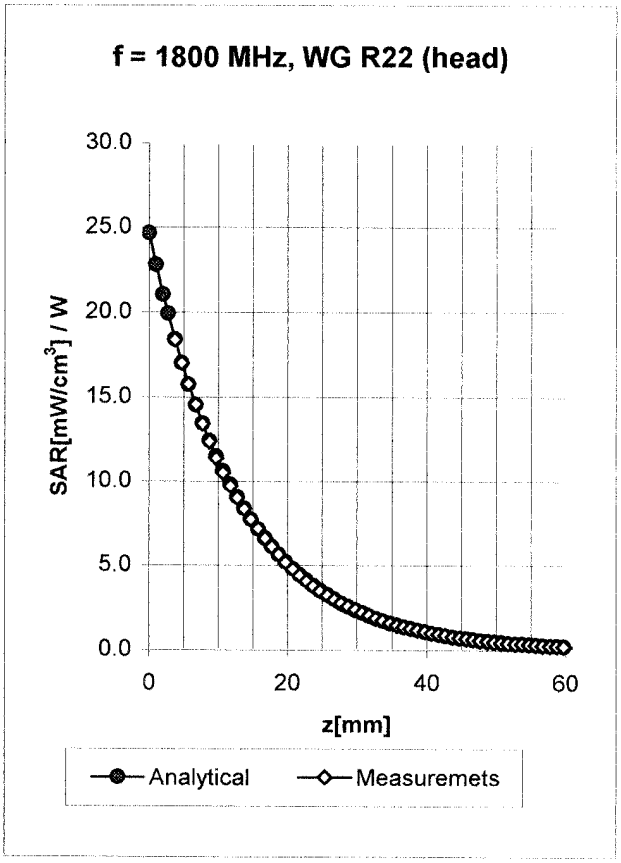
(Waveguide R22)





Conversion Factor Assessment

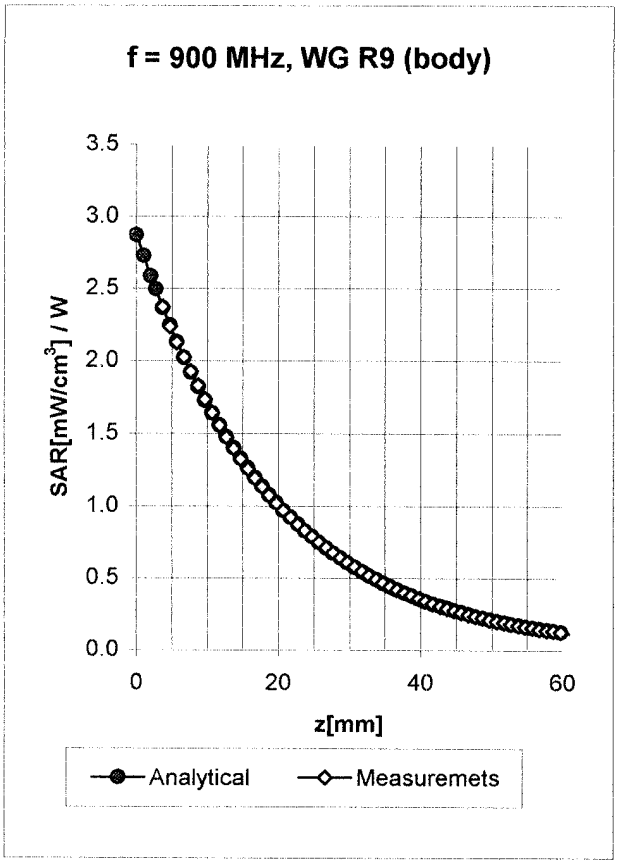


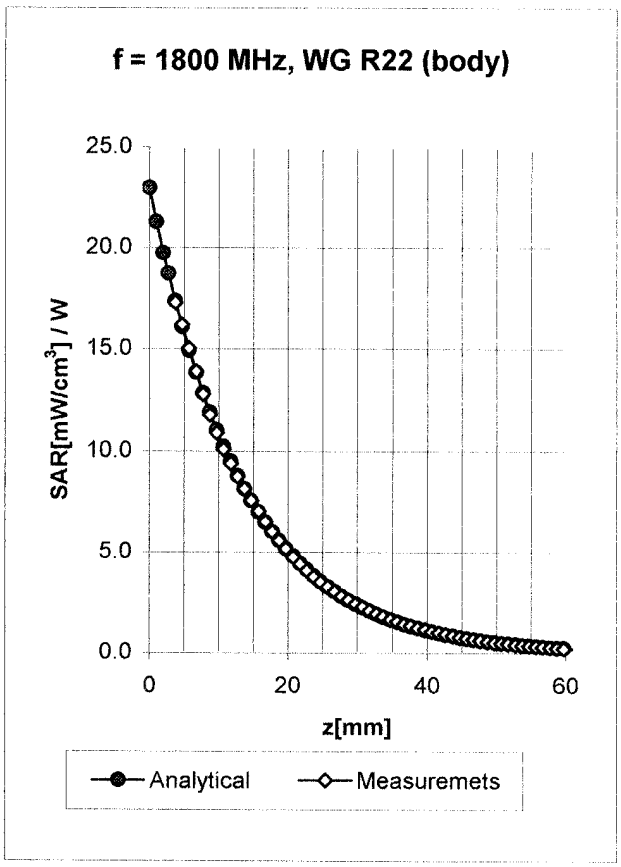


Head	**900 MHz**		ε_r = **41.5 ± 5%**	σ = **0.97 ± 5% mho/m**
Head	**835 MHz**		ε_r = **41.5 ± 5%**	σ = **0.90 ± 5% mho/m**
	ConvF X	**6.6** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**6.6** ± 9.5% (k=2)		Alpha **0.37**
	ConvF Z	**6.6** ± 9.5% (k=2)		Depth **2.61**

Head	**1800 MHz**		ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**
Head	**1900 MHz**		ε_r = **40.0 ± 5%**	σ = **1.40 ± 5% mho/m**
	ConvF X	**5.2** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**5.2** ± 9.5% (k=2)		Alpha **0.50**
	ConvF Z	**5.2** ± 9.5% (k=2)		Depth **2.73**

Conversion Factor Assessment

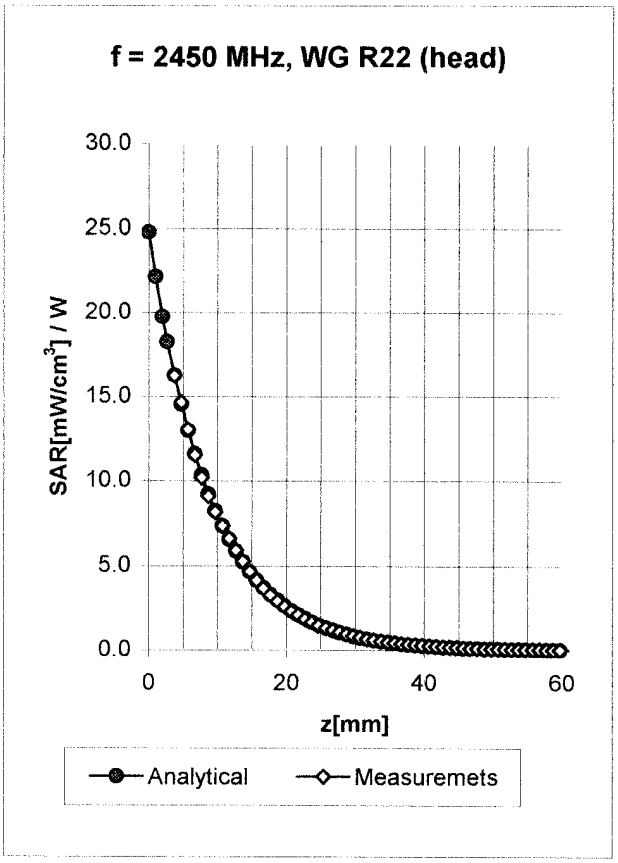


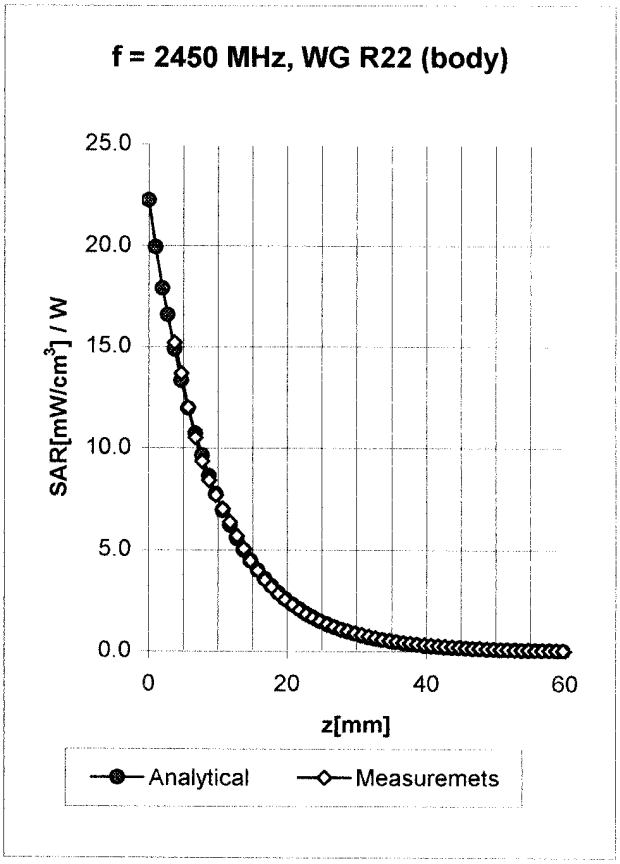


Body	**900 MHz**		ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**
Body	**835 MHz**		ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**
	ConvF X	**6.4** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**6.4** ± 9.5% (k=2)		Alpha **0.45**
	ConvF Z	**6.4** ± 9.5% (k=2)		Depth **2.35**

Body	**1800 MHz**		ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**
Body	**1900 MHz**		ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**
	ConvF X	**4.9** ± 9.5% (k=2)		Boundary effect:
	ConvF Y	**4.9** ± 9.5% (k=2)		Alpha **0.60**
	ConvF Z	**4.9** ± 9.5% (k=2)		Depth **2.59**

Conversion Factor Assessment





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

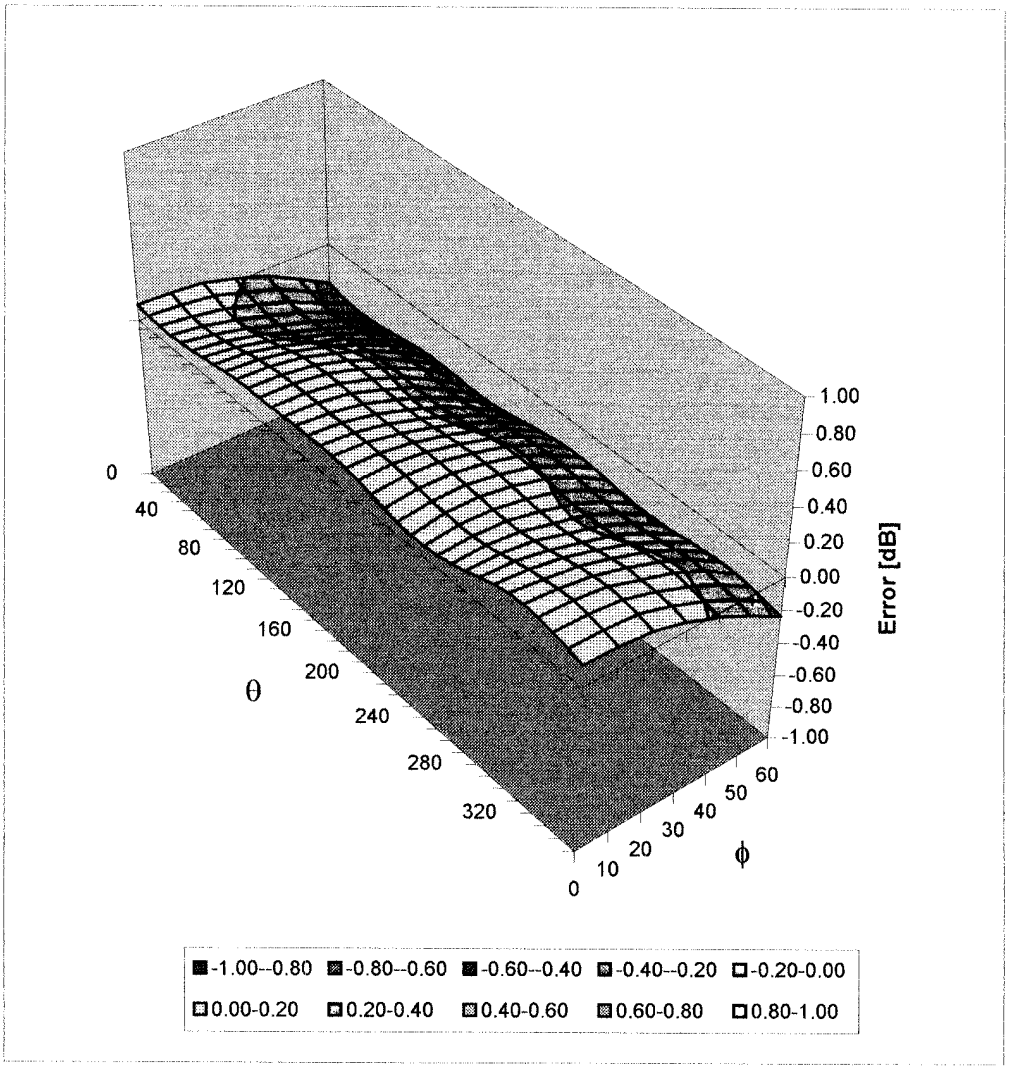
ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**1.04**
ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**1.85**

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

ConvF X	**4.6** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**4.6** ± 8.9% (k=2)	Alpha	**1.20**
ConvF Z	**4.6** ± 8.9% (k=2)	Depth	**1.60**

Deviation from Isotropy in HSL

Error (θ,φ), f = 900 MHz



Schmid & Partner
Engineering AG

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

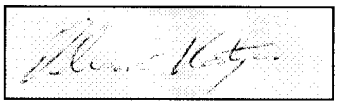
Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**February 28, 2003**
Probe Calibration Date:	**February 26, 2003**

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

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

150 MHz	ConvF	**9.1 ± 8%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
300 MHz	ConvF	**7.9 ± 8%**	**ε_r = 45.3** **σ = 0.87 mho/m** (head tissue)
450 MHz	ConvF	**7.5 ± 8%**	**ε_r = 43.5** **σ = 0.87 mho/m** (head tissue)
150 MHz	ConvF	**8.8 ± 8%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
300 MHz	ConvF	**8.0 ± 8%**	**ε_r = 58.2** **σ = 0.92 mho/m** (body tissue)
450 MHz	ConvF	**7.7 ± 8%**	**ε_r = 56.7** **σ = 0.94 mho/m** (body tissue)

APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

December 23, 2003

Frequency	e'	e"
200.000000 MHz	48.3561	68.3705
210.000000 MHz	47.9031	65.7320
220.000000 MHz	47.5788	63.4340
230.000000 MHz	47.1354	61.2364
240.000000 MHz	46.6544	59.3108
250.000000 MHz	46.2169	57.5525
260.000000 MHz	45.6877	56.0820
270.000000 MHz	45.3188	54.6609
280.000000 MHz	44.9182	53.3152
290.000000 MHz	44.5827	52.1138
300.000000 MHz	44.2252	50.8006
310.000000 MHz	43.8675	49.7071
320.000000 MHz	43.5005	48.6054
330.000000 MHz	43.2237	47.5865
340.000000 MHz	42.8910	46.6216
350.000000 MHz	42.6910	45.6369
360.000000 MHz	42.4160	44.7501
370.000000 MHz	42.2674	43.8731
380.000000 MHz	41.9865	43.1467
390.000000 MHz	41.7910	42.3171
400.000000 MHz	41.5761	41.6156

150 MHz DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

December 23, 2003

Frequency	e'	e"
50.000000 MHz	65.6124	231.6455
60.000000 MHz	63.1324	195.2168
70.000000 MHz	61.9541	169.2044
80.000000 MHz	60.6566	150.3404
90.000000 MHz	58.9364	135.4541
100.000000 MHz	57.5261	123.4114
110.000000 MHz	56.5994	113.4609
120.000000 MHz	55.6568	105.6053
130.000000 MHz	54.7987	98.7954
140.000000 MHz	54.1926	92.5336
150.000000 MHz	53.6246	87.6165
160.000000 MHz	52.9646	83.0358
170.000000 MHz	52.3898	79.0102
180.000000 MHz	52.0945	75.1812
190.000000 MHz	51.6263	71.8492
200.000000 MHz	51.1798	68.9899
210.000000 MHz	50.6038	66.3923
220.000000 MHz	50.2940	64.0640
230.000000 MHz	49.8198	61.9503
240.000000 MHz	49.2882	60.0352
250.000000 MHz	48.8704	58.2799

300 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

December 24, 2003

Frequency	e'	e"
200.000000 MHz	49.2035	70.2797
210.000000 MHz	48.7118	67.4913
220.000000 MHz	48.2328	65.1986
230.000000 MHz	47.6921	62.8948
240.000000 MHz	47.1744	60.8851
250.000000 MHz	46.6986	59.1827
260.000000 MHz	46.3428	57.6010
270.000000 MHz	45.9148	56.1897
280.000000 MHz	45.6335	54.8060
290.000000 MHz	45.2783	53.5537
300.000000 MHz	44.9370	52.2582
310.000000 MHz	44.4955	51.1387
320.000000 MHz	44.2097	50.0341
330.000000 MHz	43.9759	48.9394
340.000000 MHz	43.6627	47.8310
350.000000 MHz	43.3449	46.8832
360.000000 MHz	43.0499	45.9154
370.000000 MHz	42.8543	45.0106
380.000000 MHz	42.6518	44.1759
390.000000 MHz	42.4053	43.3675
400.000000 MHz	42.1686	42.7259

150 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

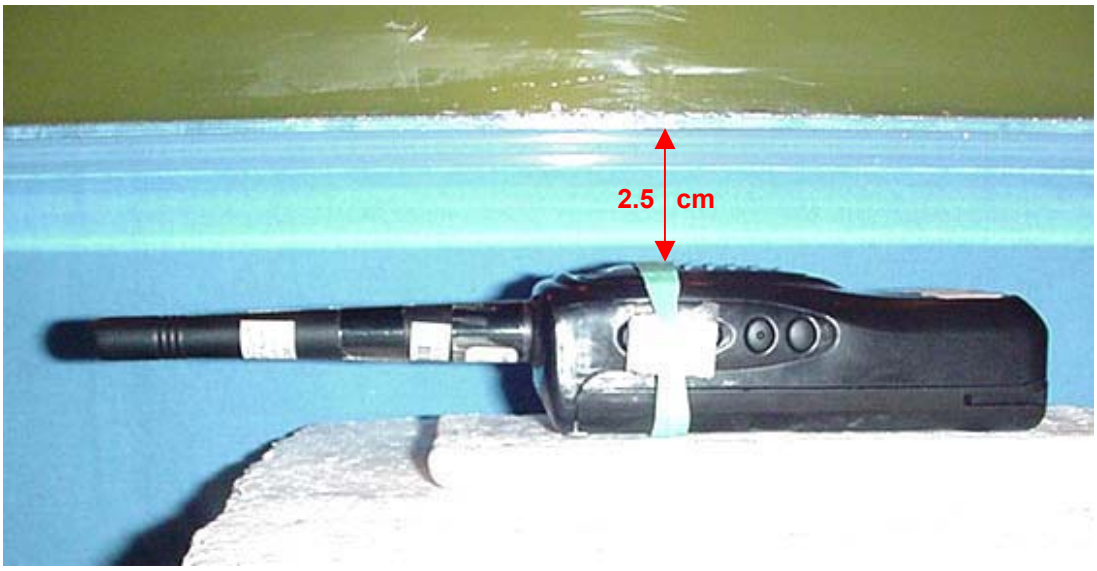
December 24 2003

Frequency	e'	e"
50.000000 MHz	74.4011	253.8847
60.000000 MHz	71.3988	213.1015
70.000000 MHz	69.7976	184.1441
80.000000 MHz	68.1921	162.1552
90.000000 MHz	67.1693	144.8331
100.000000 MHz	66.0380	131.8630
110.000000 MHz	64.9313	121.0926
120.000000 MHz	64.0930	112.1972
130.000000 MHz	63.6789	104.1930
140.000000 MHz	63.3272	97.6944
150.000000 MHz	62.8333	92.3341
160.000000 MHz	62.5382	87.2851
170.000000 MHz	62.2927	83.2028
180.000000 MHz	61.9385	78.9535
190.000000 MHz	61.7394	75.4330
200.000000 MHz	61.3655	72.1056
210.000000 MHz	60.8594	69.3388
220.000000 MHz	60.4696	66.7139
230.000000 MHz	60.0544	64.3877
240.000000 MHz	59.7016	62.2971
250.000000 MHz	59.3876	60.4155

APPENDIX F - SAR TEST SETUP & DUT PHOTOGRAPHS

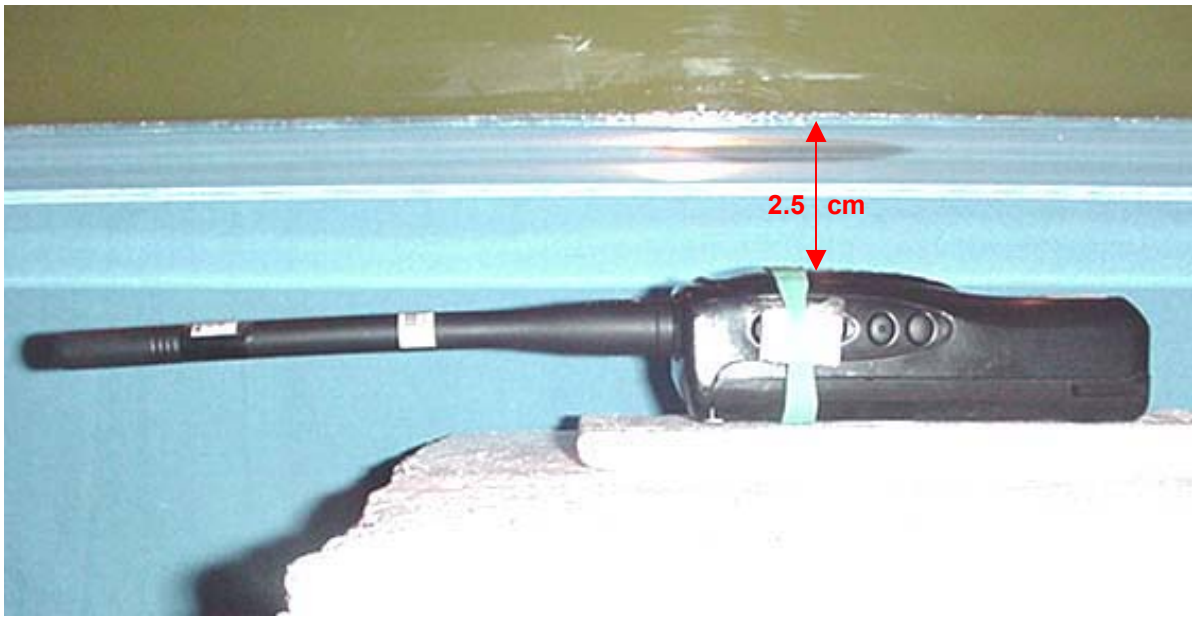
FACE-HELD SAR TEST SETUP PHOTOGRAPHS

2.5 cm Separation Distance from Front of Radio to Planar Phantom with Stubby Antenna (P/N: KRA22)



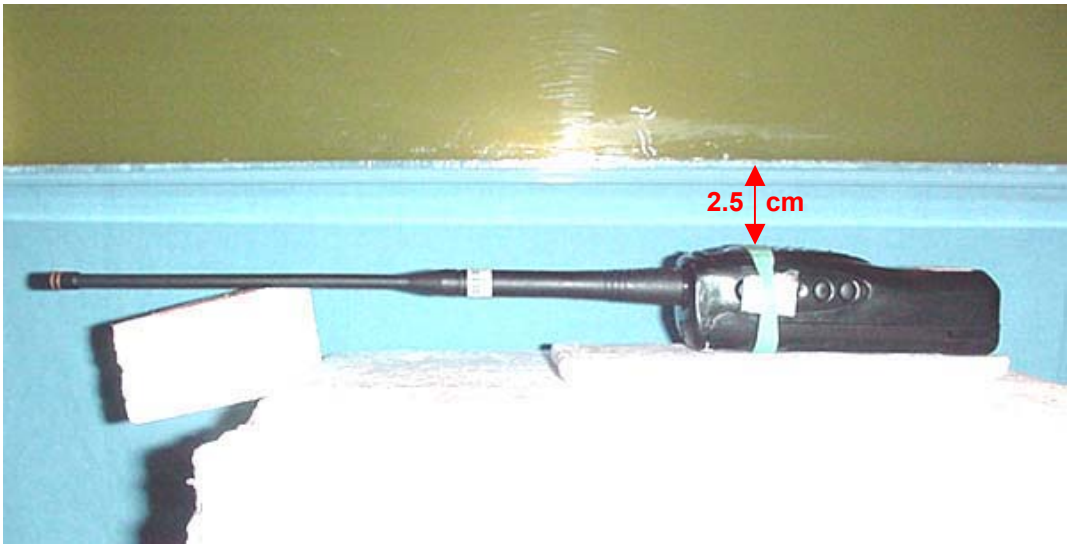
FACE-HELD SAR TEST SETUP PHOTOGRAPHS

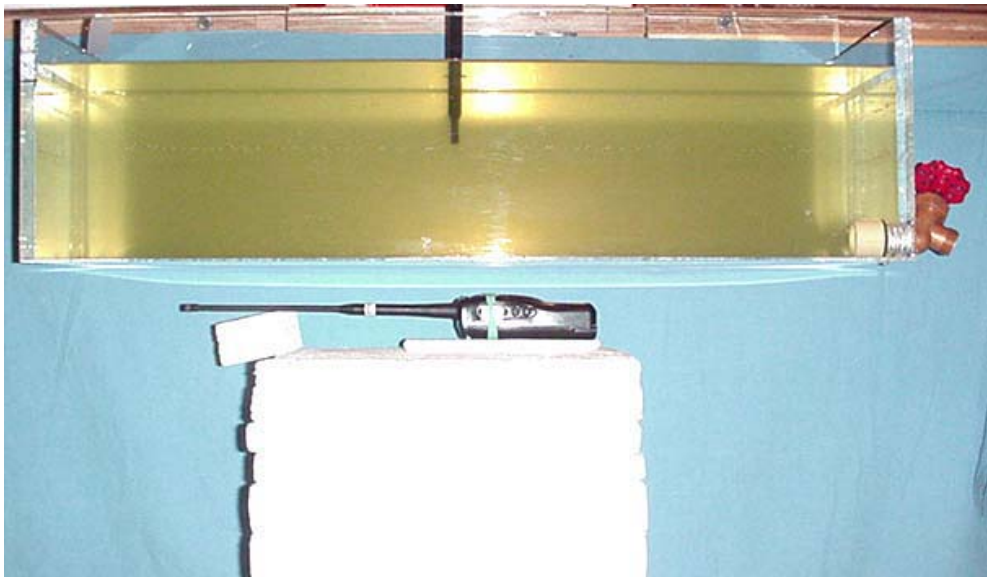
2.5 cm Separation Distance from Front of Radio to Planar Phantom with Whip Antenna (P/N: W22)



FACE-HELD SAR TEST SETUP PHOTOGRAPHS

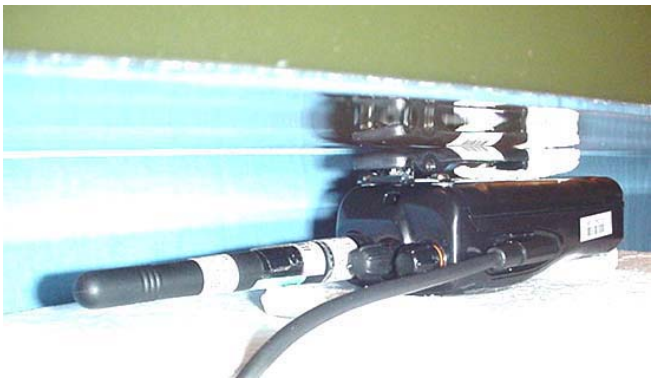
2.5 cm Separation Distance from Front of Radio to Planar Phantom with Long Whip Antenna (P/N: KRA-25)





BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.1 cm Belt-Clip Separation Distance to Planar Phantom
with Stubby Antenna (P/N: KRA22) & Speaker-Microphone Accessory

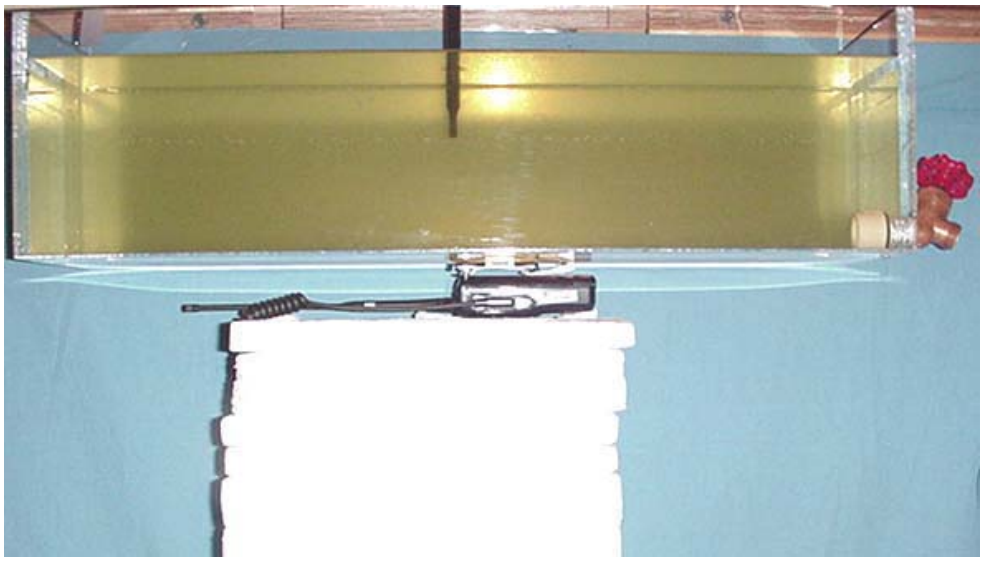


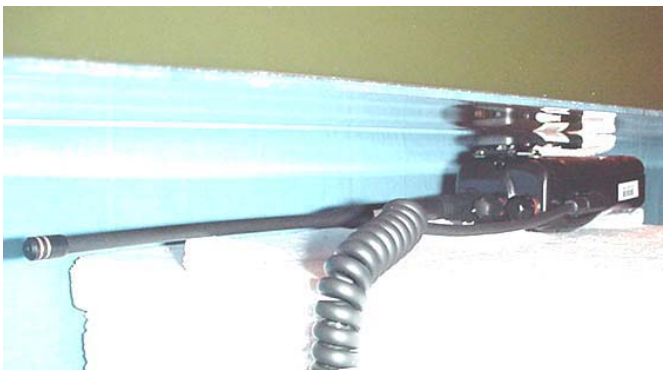
BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.1 cm Belt-Clip Separation Distance to Planar Phantom
with Whip Antenna (P/N: W22) & Speaker-Microphone Accessory

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.1 cm Belt-Clip Separation Distance to Planar Phantom
with Long Whip Antenna (P/N: KRA-25) & Speaker-Microphone Accessory





DUT PHOTOGRAPHS

Front of DUT
Long Whip Antenna

Front of DUT
Whip Antenna

Front of DUT
Stubby Antenna

Bottom End of DUT

Top End of DUT

DUT PHOTOGRAPHS

Back of Radio - Battery Removed

NiMH Battery Pack

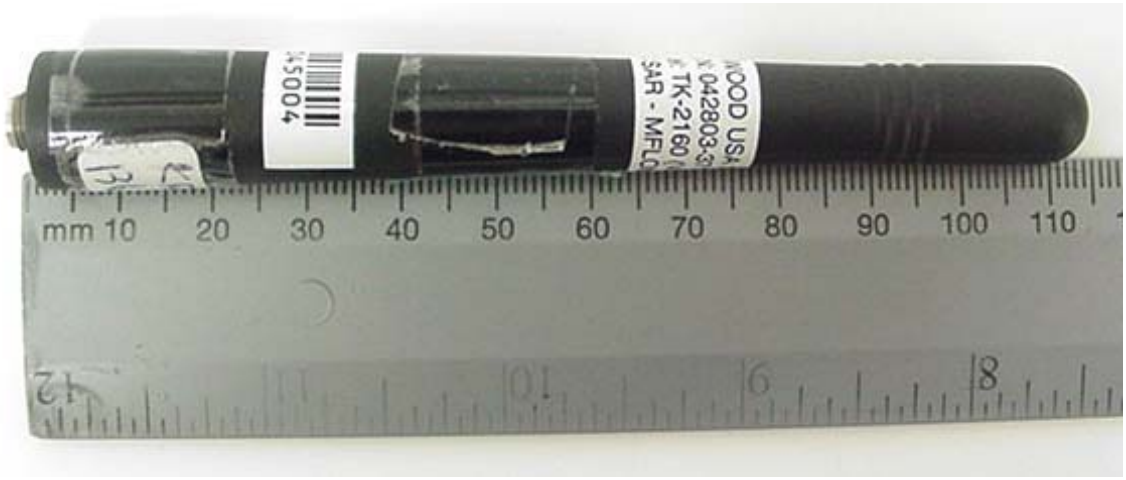
NiCd Battery Pack

Back of Radio with Belt-Clip

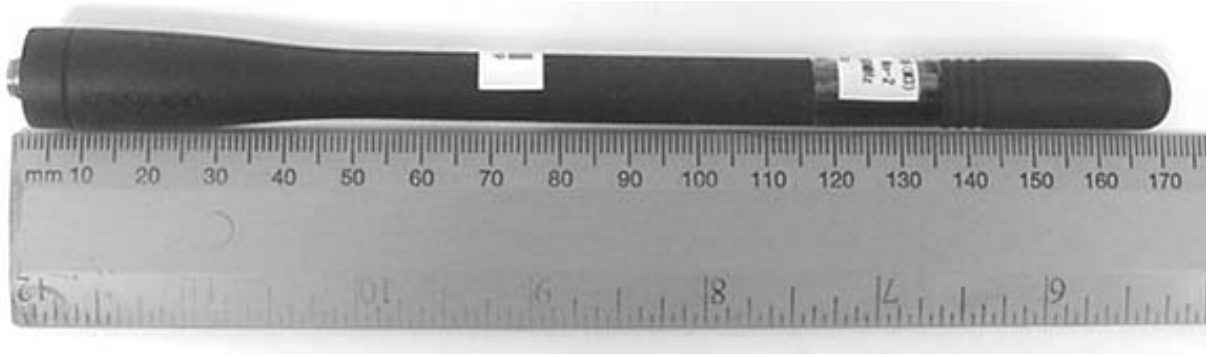
Left Side of Radio with Belt-Clip

Right Side of Radio with Belt-Clip

DUT PHOTOGRAPHS



Stubby Antenna (P/N: KRA22)



Whip Antenna (P/N: W22)

Long Whip Antenna (P/N: KRA-25)

DUT PHOTOGRAPHS

Front of Radio with Speaker-Microphone Accessory

Front of Speaker-Microphone Accessory

Back of Speaker-Microphone Accessory