RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

UNIDEN AMERICA CORPORATION

PORTABLE UHF FRS/GMRS PTT RADIO TRANSCEIVER

MODEL(S): 21-1936

FCC ID: AMWUT022

(FCC OET BULLETIN 65 SUPPLEMENT C)

Test Report Serial Number

052306AMW-T752-S95U

Test Report Revision Number

Revision 1.0 (Initial Release)

Test Lab

Celltech Compliance Testing & Engineering Lab
(Celltech Labs Inc.)
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DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Location

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Company Information

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FCC IDENTIFIER:	**AMWUT022**
Model(s):	**21-1936**
Test Requirement(s):	**FCC 47 CFR §2.1093; Health Canada Safety Code 6**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (Edition 01-01)** **Industry Canada RSS-102 Issue 2**
Device Description:	**Portable UHF FRS/GMRS PTT Radio Transceiver**
Modulation Type:	**FM (UHF)**
Transmit Frequency Range(s):	**462.5500 - 462.7250 MHz (GMRS Channels 15-22)** **462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7)** **467.5625 - 467.7125 MHz (FRS Channels 8-14)**
Max. RF Output Power Tested:	**1.00 Watts (30.01 dBm) ERP (462.5625 MHz) GMRS Ch. 1 (Boost Mode)**
Power Mode(s) Tested:	**Boost Mode (for face-held operation with NIMH battery only)** **Normal Mode**
Antenna Type(s) Tested:	**Fixed External**
Battery Type(s) Tested:	**NiMH Battery Pack 4.8 V, 700 mAh (Model: BP38)** **Alkaline Duracell Procell AAA x4 (1.5 V, 1150 mAh)**
Body-Worn Accessories Tested:	**Plastic Belt-Clip (P/N: UT-018A)**
Audio Accessories Tested:	**Headset-Microphone with PTT (P/N: n/a)**
Max. SAR Level(s) Evaluated:	**Face-Held: 1.39 W/kg (1g) - 50% duty cycle** **Body-Worn: 0.900 W/kg (1g) - 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 2 for the General Population / Uncontrolled 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.

Test Report Approved By:
Sean Johnston
Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Uniden America Corporation Model(s): 21-1936 Portable UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT022 with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]) and IC RSS-102 Issue 2 (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 provisions of the rules are included within this test report.

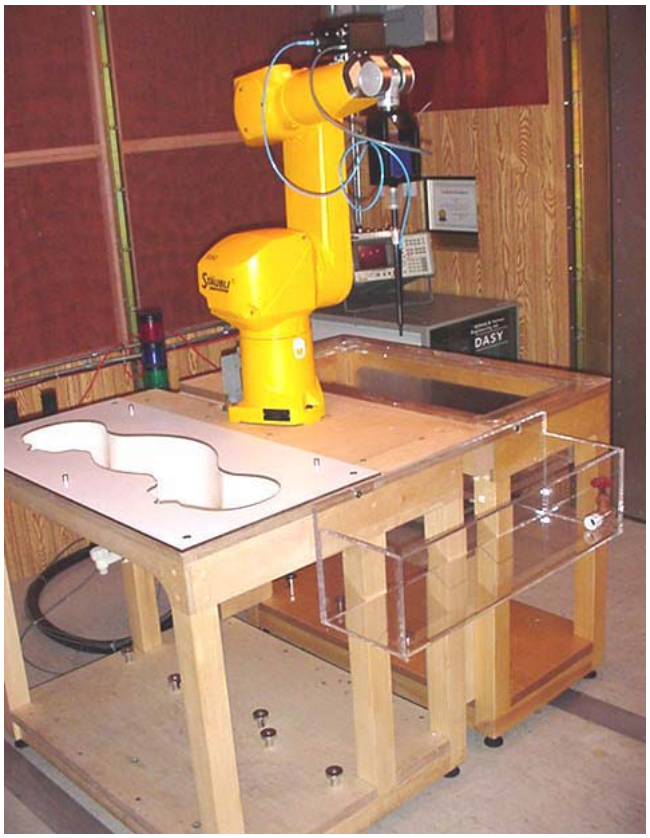
2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

Test Requirement(s)	FCC Rule Part 47 CFR §2.1093				
	Health Canada Safety Code 6				
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)				
	Industry Canada RSS-102 Issue 2				
Device Description	Portable FM UHF FRS/GMRS PTT Radio Transceiver				
RF Exposure Category	General Population / Uncontrolled Environment				
FCC IDENTIFIER	AMWUT022				
Model(s)	21-1936				
Test Sample Serial No.	None		Identical Prototype		
Modulation Type	FM (UHF)				
Transmit Frequency Range(s)	462.5500 - 462.7250 MHz		GMRS Channels 15-22		
	462.5625 - 462.7125 MHz		FRS/GMRS Channels 1-7		
	467.5625 - 467.7125 MHz		FRS Channels 8-14		
Power Mode(s) Tested	Boost		Normal		
	Note: Boost Mode does not operate with alkaline batteries or with audio accessory connected				
Max. RF Output Power Tested	**Max. ERP Measured**		**Power Mode**	**Frequency**	**GMRS Channel**
	1.00 Watts	30.01 dBm	Boost Mode	462.5625 MHz	1
	0.532 Watts	27.26 dBm	Normal Mode		
Antenna Type(s) Tested	Fixed External				
Battery Type(s) Tested	NiMH Battery Pack		4.8 V, 700 mAh	Model: BP38	
	Alkaline AAA (x4)		1.5 V, 1150 mAh	Duracell Procell	
Body-Worn Accessories Tested	Plastic Belt-Clip (1.3 cm thickness)		P/N: UT-018A		
Audio Accessories Tested	Headset-Microphone with PTT		P/N: n/a		

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 Plexiglas validation phantom



DASY4 SAR Measurement System with Plexiglas side planar phantom

4.0 MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Freq.	Chan.	Test Mode	Power Mode	Battery Type	Antenna Position	Accessory Type(s)	Separation Distance to Planar Phantom	ERP Start Power	Measured SAR 1g (W/kg)		SAR Drift During Test	Scaled SAR 1g (W/kg)	
							Body-Worn			Duty Cycle			Duty Cycle	
	MHz						Audio	cm	Watts	100%	50%	dB	100%	50%
Face	462.5625	1	CW	Boost	NiMH	Fixed	--	2.5	1.00	2.35	1.18	-0.715	2.77	**1.39**
Face	462.5625	1	CW	Normal	Alkaline	Fixed	--	2.5	0.532	1.25	0.625	0.411	--	--
Body	462.5625	1	CW	Normal	NiMH	Fixed	Belt-Clip	1.3	0.513	1.80	**0.900**	0.698	--	--
							Headset-Mic							
Body	462.5625	1	CW	Normal	Alkaline	Fixed	Belt-Clip	1.3	0.525	1.40	0.700	0.699	--	--
							Headset-Mic							

ANSI / IEEE C95.1 1999 - SAFETY LIMIT	BRAIN / BODY: 1.6 W/kg (averaged over 1 gram)	Spatial Peak Uncontrolled Exposure / General Population

Test Date(s)	May 26, 2006				May 26, 2006				Measured Fluid Type	Brain	Body	Unit
Dielectric Constant ε_r	450 MHz Brain				450 MHz Body				Atmospheric Pressure	101.1	101.1	kPa
	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	Relative Humidity	33	33	%
	43.5	± 5%	42.4	-2.5%	56.7	± 5%	56.1	-1.1%	Ambient Temperature	23.0	23.0	°C
Conductivity σ (mho/m)	450 MHz Brain				450 MHz Body				Fluid Temperature	22.0	22.0	°C
	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	Fluid Depth	≥ 15	≥ 15	cm
	0.87	± 5%	0.83	-4.6%	0.94	± 5%	0.92	-2.1%	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 transmission band of the DUT is less than 10 MHz; therefore single channel data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
3. The area scan evaluation was performed with fully charged batteries. After the area scan was completed the radio was cooled down and the batteries were replaced with fully charged batteries prior to the zoom scan evaluation.
4. The power droop measured by the DASY4 system for the duration of the SAR evaluation (boost mode) was added to the measured SAR level to report a scaled SAR result as shown in the above test data table. A SAR-versus-Time power droop evaluation was performed and the evaluation plot is shown in Appendix A (SAR Test Plots).
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
7. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

ERP Measurements

Celltech Testing and Engineering Services Lab

Project Number: 752
Company: Uniden
Model: 21-1936
Test Start Date: 24-May-06
Test End Date: 25-May-06

Configuration					Polarity	Distance	Carrier Channel	Frequency	Corrected Field Strength	Substituted SA Signal Level (uncorrected)	Power Applied to Antenna	Antenna Gain	Measured ERP Carrier Level	
DUT#	Orientation	Power Source	Accessory	Mode		m		MHz	dBuV/m	dBuV	dBm	dBd	dBm	milliWatts
1	Face Up	NiMH	none	Boost	H	3	1	462.5625	130.37	109.90	30.20	-0.19	30.01	1002.25
1	Short Edge Up	NiMH	none	Boost	H	3	1	462.5625	117.47	97.00	17.13	-0.19	16.94	49.43
1	Long Edge Up	NiMH	none	Boost	H	3	1	462.5625	130.27	109.80	30.10	-0.19	29.91	979.43
1	Face Up	NiMH	none	Boost	V	3	1	462.5625	119.67	99.20	17.21	-0.19	17.02	50.35
1	Short Edge Up	NiMH	none	Boost	V	3	1	462.5625	131.17	110.70	28.96	-0.19	28.77	753.31
1	Long Edge Up	NiMH	none	Boost	V	3	1	462.5625	119.97	99.50	17.50	-0.19	17.31	53.82
1	Face Up	Alkaline	none	Normal	H	3	1	462.5625	119.67	99.20	27.45	-0.19	27.26	532.08
1	Face Up	Alkaline	Ear-Mic	Normal	H	3	1	462.5625	127.27	106.80	27.15	-0.19	26.96	496.56
1	Face Up	NiMH	Ear-Mic	Normal	H	3	1	462.5625	127.27	106.80	27.15	-0.19	26.96	496.56
1	Short Edge Up	Alkaline	none	Normal	V	3	1	462.5625	129.57	109.10	27.39	-0.19	27.20	524.78
1	Short Edge Up	Alkaline	Ear-Mic	Normal	V	3	1	462.5625	129.57	109.10	27.39	-0.19	27.20	524.78
1	Short Edge Up	NiMH	Ear-Mic	Normal	V	3	1	462.5625	129.47	109.00	27.29	-0.19	27.10	512.83

Measurement made at a 3 meter distance, with the EUT placed 1 meter above the ground plane

5.0 DETAILS OF SAR EVALUATION

The Uniden America Corporation Model(s): 21-1936 Portable FM UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT022 was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

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 of the DUT and the outer surface of the planar phantom.
2. The DUT was tested in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached plastic belt-clip accessory was touching the planar phantom and provided a 1.3 cm separation distance from the back of the DUT to the outer surface of the planar phantom. The DUT was evaluated for body-worn SAR with the headset-microphone audio accessory connected to the audio port.
3. The RF conducted output power of the DUT could not be measured due to a non-detachable antenna. The DUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer.
4. The DUT was evaluated for SAR at the maximum ERP level measured prior to the SAR evaluations at Celltech Labs' 3-meter Open Area Test Site using the signal substitution method in accordance with ANSI/TIA-603-C-2004 (see reference [6]).
5. The power drift of the DUT during the SAR evaluation was measured by the DASY4 system.
6. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down 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 SAR evaluations were performed using a Plexiglas planar phantom.
9. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
10. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
11. The SAR evaluations were performed within 24 hours of the system performance check.

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 from 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 F). 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 evaluations a system check was performed using a Plexiglas planar phantom and 450MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using an ALS-PR-DIEL Dielectric Probe Kit and HP 8753ET Network Analyzer (see Appendix C). A forward power of 250 mW 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 EVALUATION

Test Date	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)
	Freq. MHz	IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.						
5/26/06	Brain 450	1.23 ±10%	1.23	0.0%	43.5 ±5%	42.4	-2.5%	0.87 ±5%	0.83	-4.6%	1000	23.0	22.0	≥ 15	33	101.1
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.														

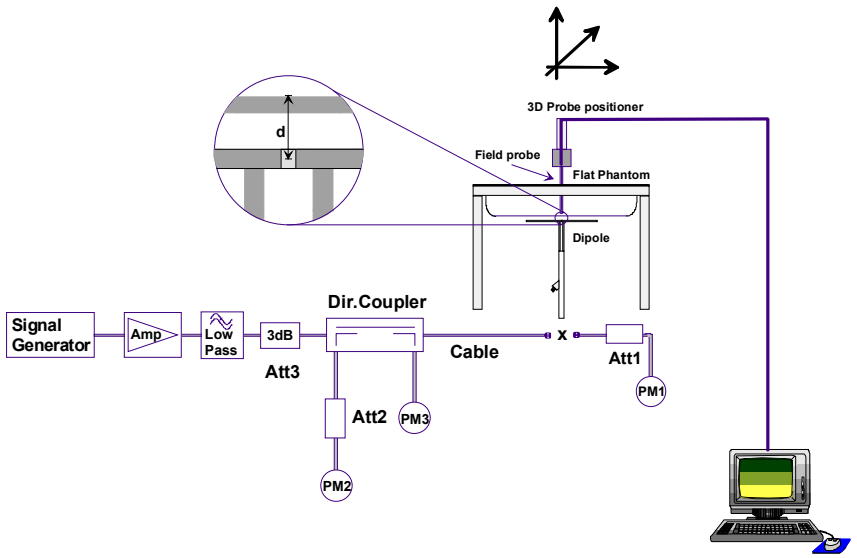
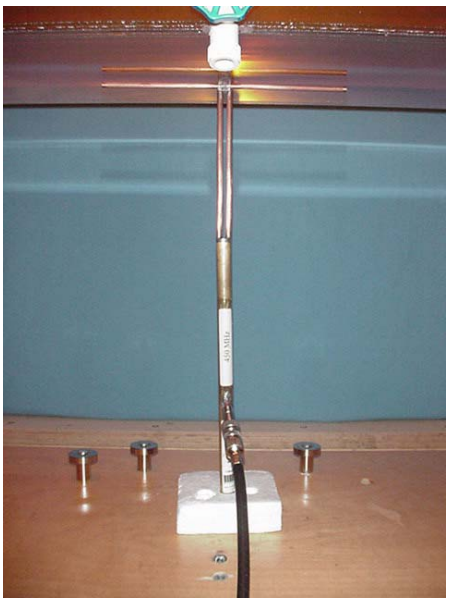


Figure 1. System Performance Check Setup Diagram



450 MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

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

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

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	**(Occupational / Controlled Exposure Environment)**
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.		
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: Side 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, 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 Detect:	± 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 SIDE PLANAR PHANTOM

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

Plexiglas Side 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 to 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		ASSET NO.	SERIAL NO.	DATE CALIBRATED		CALIBRATION DUE DATE
USED	DESCRIPTION					
x	Schmid & Partner DASY4 System	-	-	-		-
x	-DASY4 Measurement Server	00158	1078	N/A		N/A
x	-Robot	00046	599396-01	N/A		N/A
x	-DAE4	00019	353	15Jun05		15Jun06
	-DAE3	00018	370	08Feb06		08Feb07
x	-ET3DV6 E-Field Probe	00016	1387	16Mar06		16Mar07
	-EX3DV4 E-Field Probe	00125	3547	14Feb06		14Feb07
	-300MHz Validation Dipole	00023	135	25Oct05		25Oct06
x	-450MHz Validation Dipole	00024	136	25Oct05		25Oct06
	-835MHz Validation Dipole	00022	411	**Brain**	28Mar06	28Mar07
				Body	27Mar06	27Mar07
	-900MHz Validation Dipole	00020	054	**Brain**	10Jun05	10Jun06
				Body	10Jun05	10Jun06
	-1800MHz Validation Dipole	00021	247	**Brain**	14Jun05	14Jun06
				Body	14Jun05	14Jun06
	-1900MHz Validation Dipole	00032	151	**Brain**	17Jun05	17Jun06
				Body	25Apr06	25Apr07
	-2450MHz Validation Dipole	00025	150	**Brain**	20Sep05	20Sep06
				Body	24Apr06	24Apr07
	-5800MHz Validation Dipole	00126	1031	**Brain**	15Mar06	15Mar07
	-SAM Phantom V4.0C	00154	1033	N/A		N/A
	-Barski Planar Phantom	00155	03-01	N/A		N/A
x	-Plexiglas Side Planar Phantom	00156	161	N/A		N/A
x	-Plexiglas Validation Planar Phantom	00157	137	N/A		N/A
x	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A		N/A
x	Gigatronics 8652A Power Meter	00110	1835801	12Apr06		12Apr07
	Gigatronics 8652A Power Meter	00007	1835272	03Feb06		03Feb07
x	Gigatronics 80701A Power Sensor	00011	1833542	03Feb06		03Feb07
x	Gigatronics 80701A Power Sensor	00012	1834350	12Sep05		12Sep06
	Gigatronics 80701A Power Sensor	00013	1833713	03Feb06		03Feb07
	Gigatronics 80701A Power Sensor	00014	1833699	07Sep05		07Sep06
x	HP 8753ET Network Analyzer	00134	US39170292	18Apr06		18Apr07
x	HP 8648D Signal Generator	00005	3847A00611	N/A		N/A
	Rohde & Schwarz SMR40 Signal Generator	00006	100104	06Apr06		06Apr07
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	N/A		N/A
	HP E4408B Spectrum Analyzer	00015	US39240170	02-Feb-06		02-Feb-07

16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration	4.0	Normal	1	1	4.0	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	0.7	1.9	∞
Spherical isotropy of the probe	9.6	Rectangular	1.732050808	0.7	3.9	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0.8	Rectangular	1.732050808	1	0.5	∞
Integration time	2.6	Rectangular	1.732050808	1	1.5	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Device positioning	2.9	Normal	1	1	2.9	12
Device holder uncertainty	3.6	Normal	1	1	3.6	8
Power drift	5	Rectangular	1.732050808	1	2.9	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**9.88**	
Expanded Uncertainty (k=2)					**19.77**	

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	ci 1g	Uncertainty Value ±% (1g)	V_i or V_{eff}
Measurement System						
Probe calibration	4.0	Normal	1	1	4.0	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	1	2.7	∞
Spherical isotropy of the probe	0	Rectangular	1.732050808	1	0.0	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0	Rectangular	1.732050808	1	0.0	∞
Integration time	0	Rectangular	1.732050808	1	0.0	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Dipole Positioning	2	Normal	1.732050808	1	1.2	∞
Power & Power Drift	4.7	Normal	1.732050808	1	2.7	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**7.93**	
Expanded Uncertainty (k=2)					**15.87**	

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: 1999.

[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, “Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, Radio Standards Specification RSS-102 Issue 2: November 2005.

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

[6] ANSI/TIA-603-C, “Land Mobile FM or PM Communications Equipment - Measurement and Performance Standards”: December 2004.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 05/26/2006

Face-Held SAR - NiMH Battery Pack - Boost Mode - GMRS - Channel 1 - 462.5625 MHz

DUT: Uniden Model: 21-1936; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

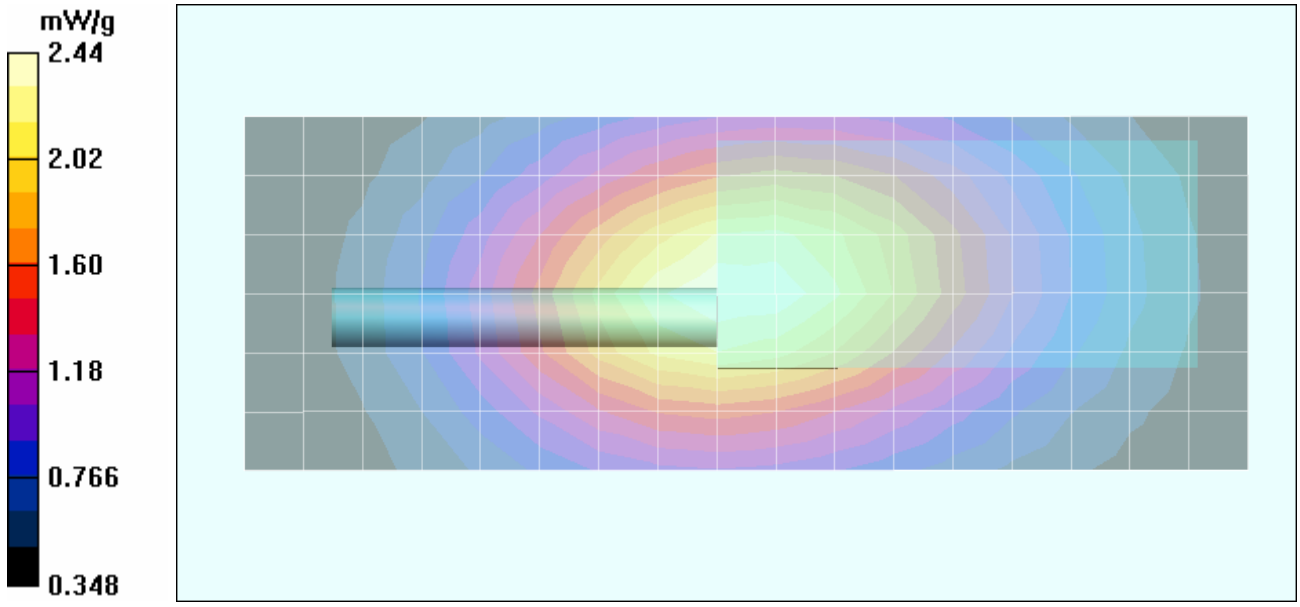
Ambient Temp: 23.0 °C; Fluid Temp: 22.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 33%

Communication System: FM UHF
RF Output Power: 1.00 Watts (ERP)
4.8V, 700mAh NiMH Battery Pack (Model: BP38)
Frequency: 462.5625 MHz; Channel 1; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.83 mho/m; ε_r = 42.4; ρ = 1000 kg/m^3)

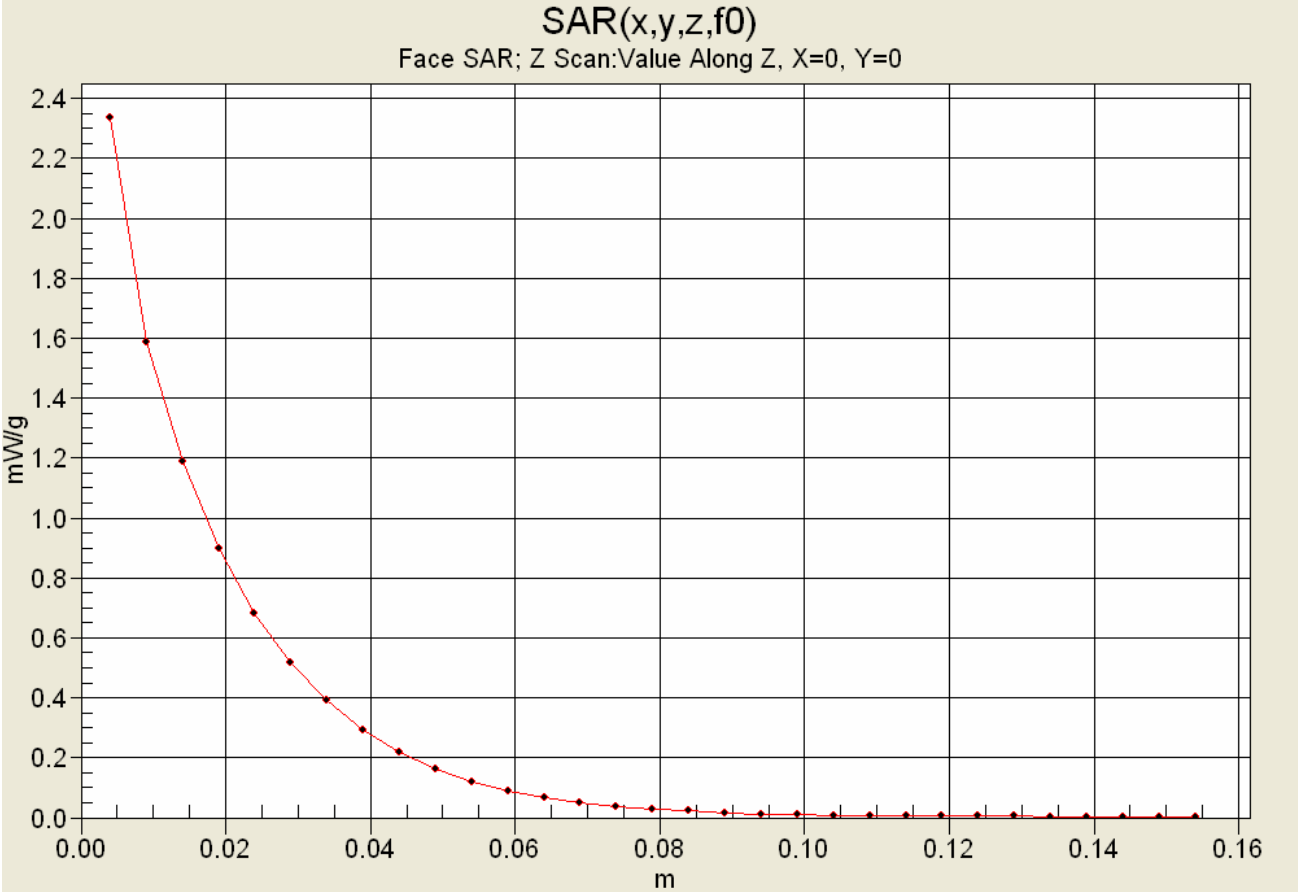
- Probe: ET3DV6 - SN1387; ConvF(7.4, 7.4, 7.4); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 55.8 V/m; Power Drift = -0.715 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.66 mW/g



Z-Axis Scan



SAR-versus-Time Power Droop Evaluation

Face-Held Configuration
NiMH Battery Pack (Boost Mode)
GMRS Channel 1 - 462.5625 MHz

Highest SAR: 2.40441 mW/g
Lowest SAR: 2.07501 mW/g (-0.640 dB)
SAR after 340s: 2.12179 mW/g (-0.543 dB)
(340s = Zoom Scan Duration)
(480s = Area Scan Duration)

Date Tested: 05/26/2006

Face-Held SAR - Alkaline Batteries - Normal Mode - GMRS - Channel 1 - 462.5625 MHz

DUT: Uniden Model: 21-1936; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

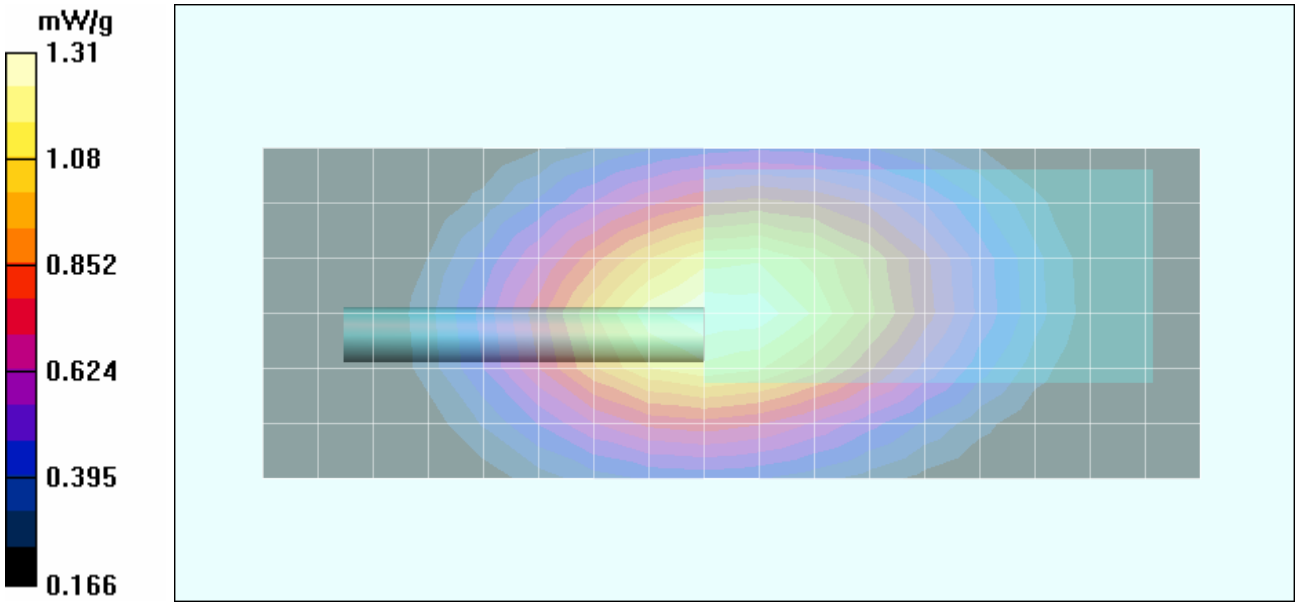
Ambient Temp: 23.0 °C; Fluid Temp: 22.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 33%

Communication System: FM UHF
RF Output Power: 0.532 Watts (ERP)
Frequency: 462.5625 MHz; Channel 1; Duty Cycle: 1:1
1.5V 1150mAh Alkaline (Duracell Procell) AAA Batteries (x4)
Medium: HSL450 (σ = 0.83 mho/m; ε_r = 42.4; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(7.4, 7.4, 7.4); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 36.2 V/m; Power Drift = 0.411 dB
Peak SAR (extrapolated) = 1.96 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.885 mW/g



Date Tested: 05/26/2006

Body-Worn SAR - NiMH Battery Pack - Normal Mode - GMRS - Channel 1 - 462.5625 MHz

DUT: Uniden Model: 21-1936; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Body-Worn Accessory: Plastic Belt-Clip; Audio Accessory: Headset-Microphone with PTT

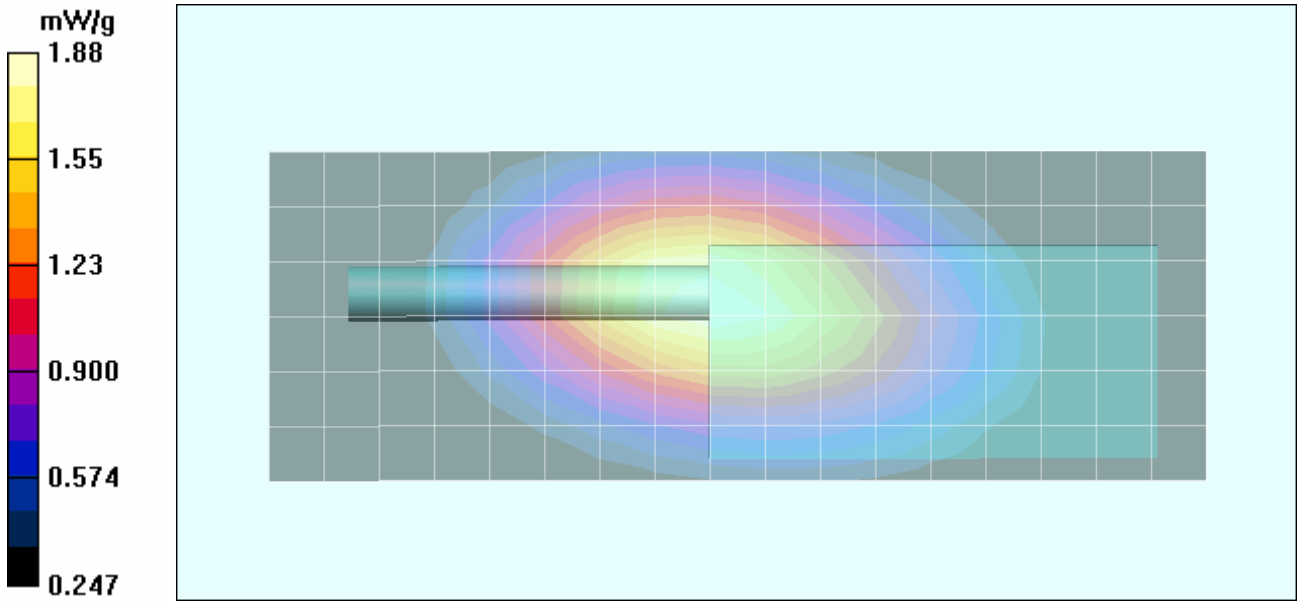
Ambient Temp: 23.0 °C; Fluid Temp: 22.0 °C; Barometric Pressure: 101.1kPa; Humidity: 33%

Communication System: FM UHF
RF Output Power: 0.513 Watts (ERP)
4.8V, 700mAh NiMH Battery Pack (Model: BP38)
Frequency: 462.5625 MHz; Channel 1; Duty Cycle: 1:1
Medium: M450 (σ = 0.92 mho/m; ε_r = 56.1; ρ = 1000 kg/m^3)

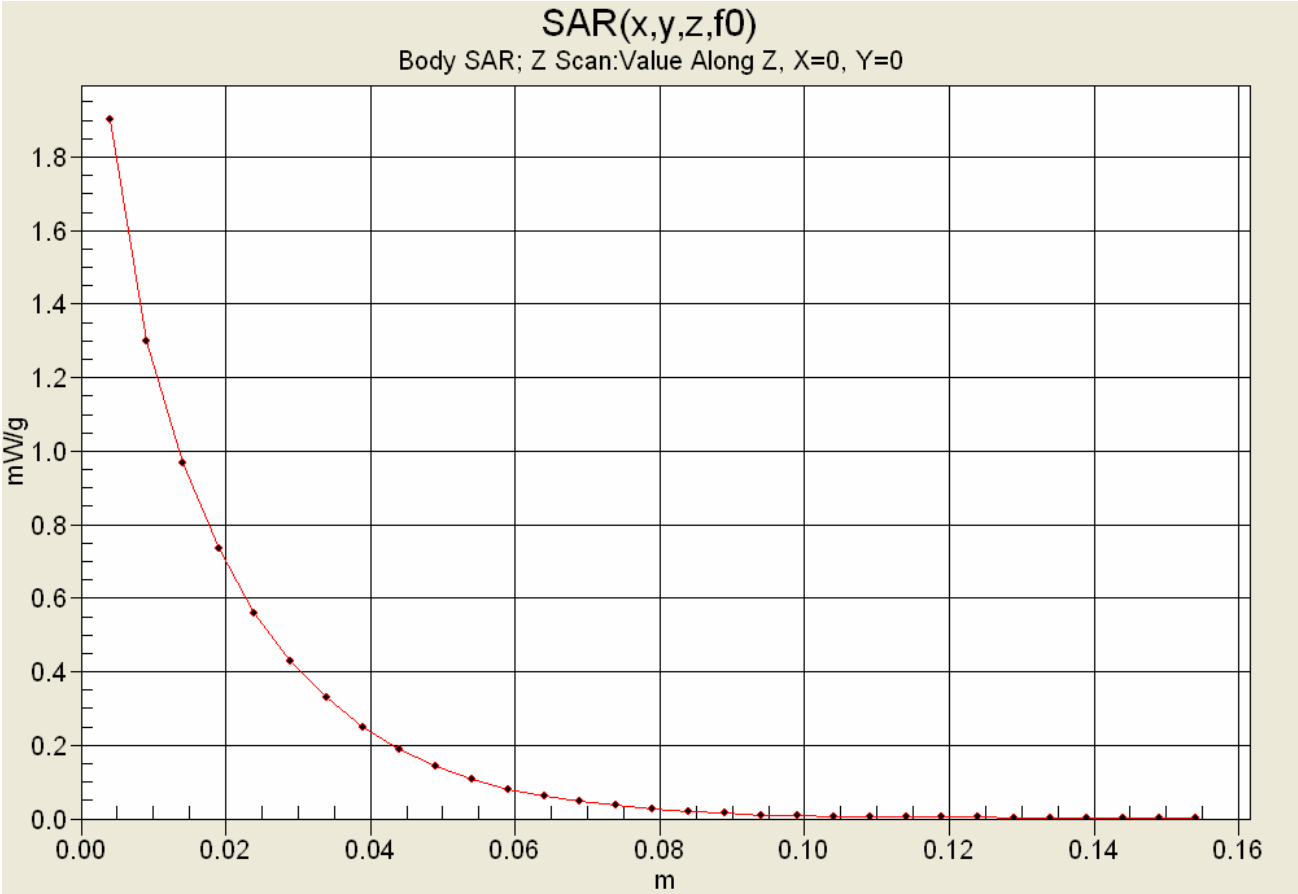
- Probe: ET3DV6 - SN1387; ConvF(7.3, 7.3, 7.3); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 1/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 1/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 38.9 V/m; Power Drift = 0.698 dB
Peak SAR (extrapolated) = 2.79 W/kg
SAR(1 g) = 1.80 mW/g; SAR(10 g) = 1.27 mW/g



Z-Axis Scan



Date Tested: 05/26/2006

Body-Worn SAR - Alkaline Batteries - Normal Mode - GMRS - Channel 1 - 462.5625 MHz

DUT: Uniden Model: 21-1936; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Body-Worn Accessory: Plastic Belt-Clip; Audio Accessory: Headset-Microphone with PTT

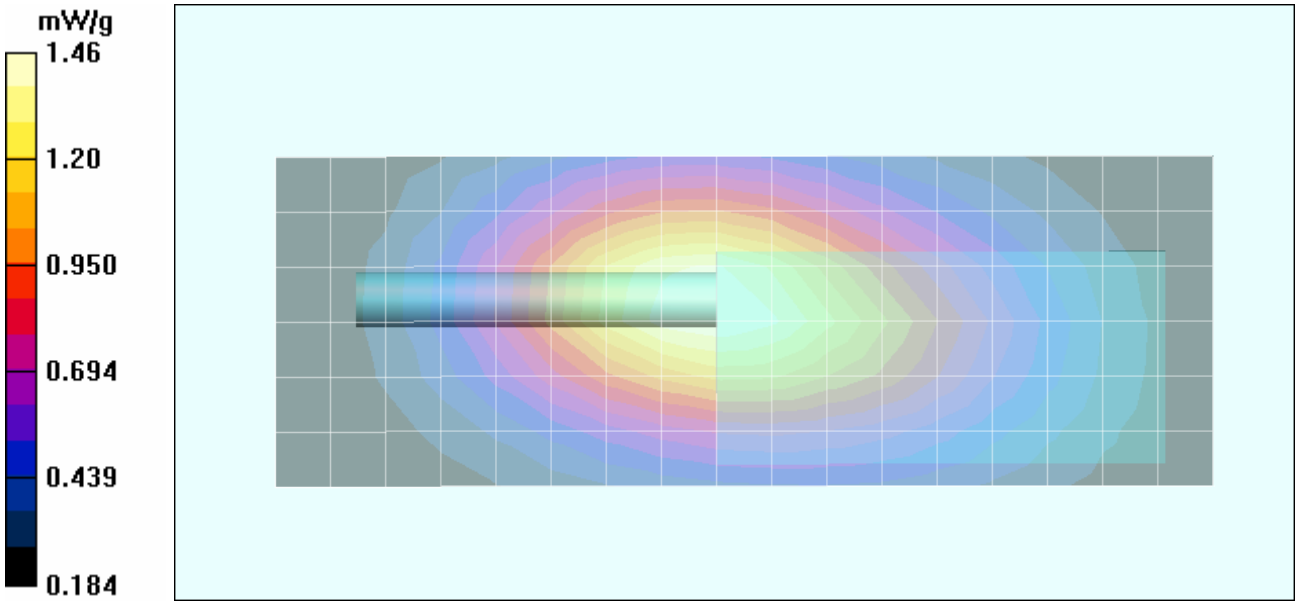
Ambient Temp: 23.0 °C; Fluid Temp: 22.0 °C; Barometric Pressure: 101.1kPa; Humidity: 33%

Communication System: FM UHF
RF Output Power: 0.525 Watts (ERP)
Frequency: 462.563 MHz; Duty Cycle: 1:1
1.5V 1150mAh Alkaline (Duracell Procell) AAA Batteries (x4)
Medium: M450 (σ = 0.92 mho/m; ε_r = 56.1; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(7.3, 7.3, 7.3); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 1/Area Scan (7x18x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 1/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 33.3 V/m; Power Drift = 0.699 dB
Peak SAR (extrapolated) = 2.18 W/kg
SAR(1 g) = 1.40 mW/g; SAR(10 g) = 0.980 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 05/26/2006

System Performance Check (Brain) - 450 MHz Dipole

DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136; Validation: 10/25/2005

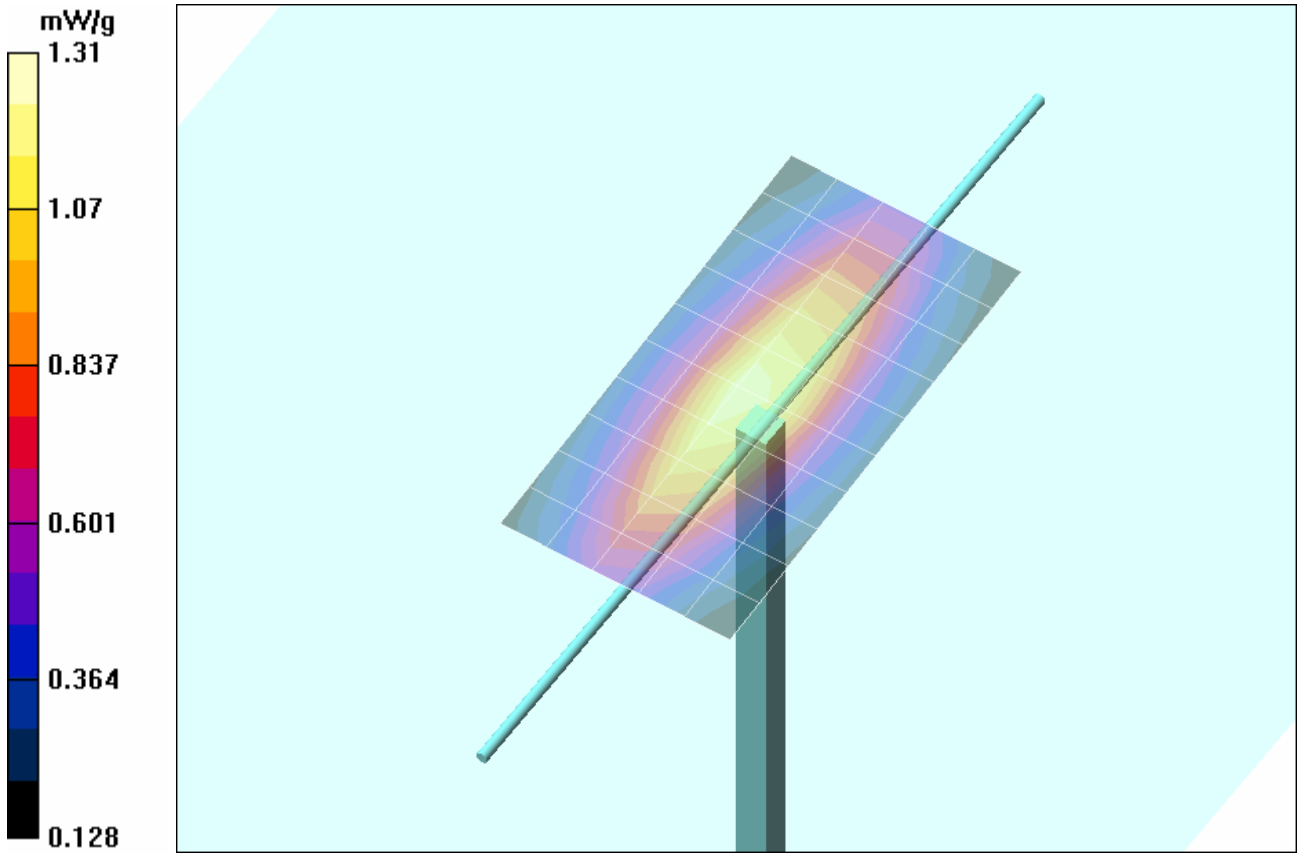
Ambient Temp: 23.0 °C; Fluid Temp: 22.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 33%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.83 mho/m; ε_r = 42.4; ρ = 1000 kg/m^3)

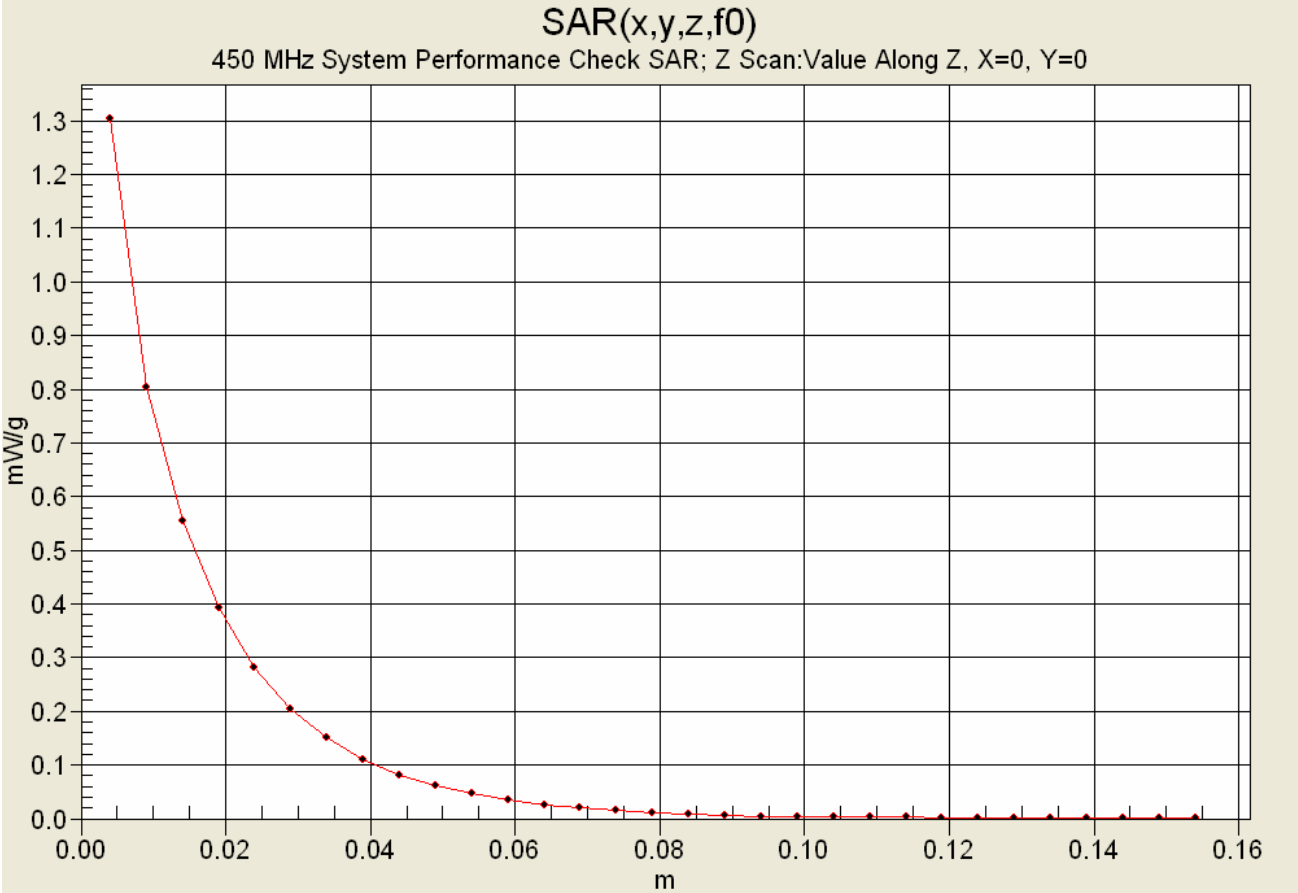
- Probe: ET3DV6 - SN1387; ConvF(7.4, 7.4, 7.4); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

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

450 MHz Dipole - System Performance Check/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 39.8 V/m; Power Drift = -0.017 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.792 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz System Performance Check & DUT Evaluation (Face)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 26/May/2006
Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	44.78	0.74
0.3600	44.58	0.87	44.30	0.75
0.3700	44.46	0.87	44.04	0.76
0.3800	44.34	0.87	44.10	0.77
0.3900	44.22	0.87	43.61	0.78
0.4000	44.10	0.87	43.46	0.78
0.4100	43.98	0.87	43.50	0.79
0.4200	43.86	0.87	43.16	0.80
0.4300	43.74	0.87	42.99	0.81
0.4400	43.62	0.87	42.55	0.82
0.4500	43.50	0.87	42.44	0.83
0.4600	43.45	0.87	42.12	0.84
0.4700	43.40	0.87	41.99	0.85
0.4800	43.34	0.87	41.76	0.85
0.4900	43.29	0.87	41.69	0.86
0.5000	43.24	0.87	41.21	0.87
0.5100	43.19	0.87	41.23	0.88
0.5200	43.14	0.88	40.95	0.89
0.5300	43.08	0.88	40.65	0.90
0.5400	43.03	0.88	40.61	0.91
0.5500	42.98	0.88	40.61	0.92

450 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 26/May/2006
Frequency(GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

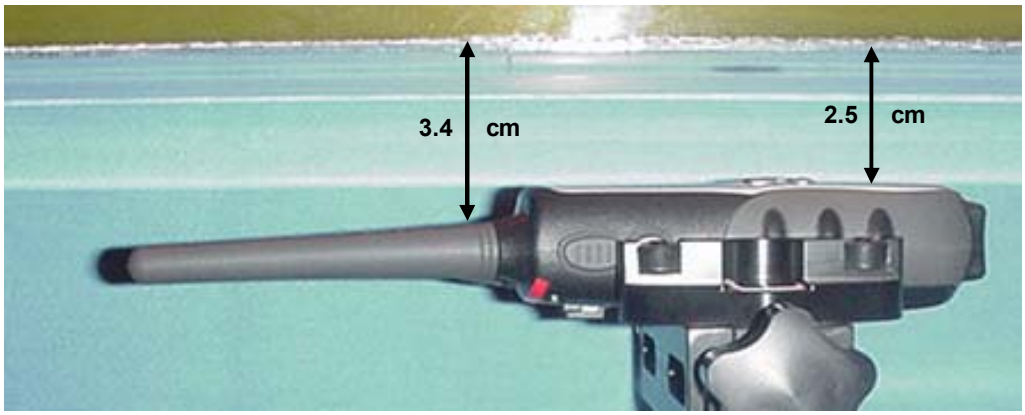
****

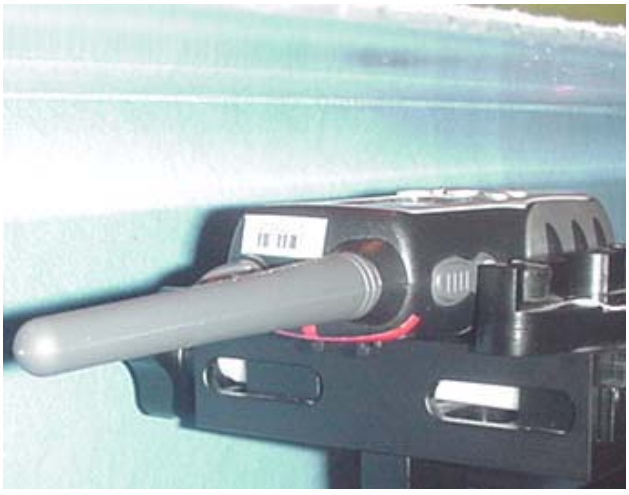
Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	57.57	0.84
0.3600	57.60	0.93	57.42	0.86
0.3700	57.50	0.93	57.35	0.86
0.3800	57.40	0.93	57.49	0.87
0.3900	57.30	0.93	57.03	0.88
0.4000	57.20	0.93	56.94	0.89
0.4100	57.10	0.93	56.71	0.90
0.4200	57.00	0.94	56.43	0.90
0.4300	56.90	0.94	56.64	0.91
0.4400	56.80	0.94	56.31	0.92
0.4500	56.70	0.94	56.07	0.92
0.4600	56.66	0.94	55.74	0.93
0.4700	56.62	0.94	55.81	0.95
0.4800	56.58	0.94	55.62	0.95
0.4900	56.54	0.94	55.51	0.96
0.5000	56.51	0.94	55.33	0.97
0.5100	56.47	0.94	55.05	0.98
0.5200	56.43	0.95	55.02	0.99
0.5300	56.39	0.95	54.74	1.00
0.5400	56.35	0.95	54.78	1.00
0.5500	56.31	0.95	54.56	1.02

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

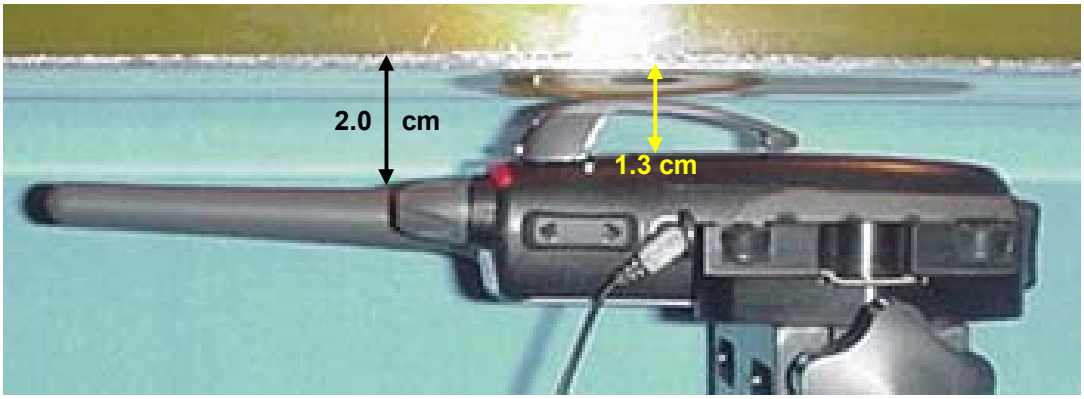
2.5 cm Separation Distance from Front of DUT to Planar Phantom





BODY-WORN SAR TEST SETUP PHOTOGRAPHS

1.3 cm Belt-Clip Separation Distance from Back of DUT to Planar Phantom
With Headset-Microphone Audio Accessory



DUT PHOTOGRAPHS

Front of DUT

Back of DUT

Back of DUT with Belt-Clip

Top end of DUT

Bottom end of DUT

DUT PHOTOGRAPHS

Left Side of DUT with Belt-Clip

Right Side of DUT with Belt-Clip

Plastic Belt-Clip Accessory (P/N: UT-018A)

DUT PHOTOGRAPHS

DUT with PTT Headset-Microphone Audio Accessory

DUT PHOTOGRAPHS

DUT Battery Compartment

DUT with NiMH Battery Pack

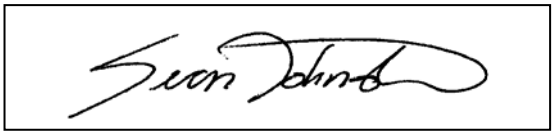
DUT with Alkaline Batteries

APPENDIX E - SYSTEM VALIDATION

450 MHz SYSTEM VALIDATION DIPOLE

Type:	**450 MHz Validation Dipole**
Asset Number:	**00024**
Serial Number:	**136**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**October 25, 2005**

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

Calibrated by: 

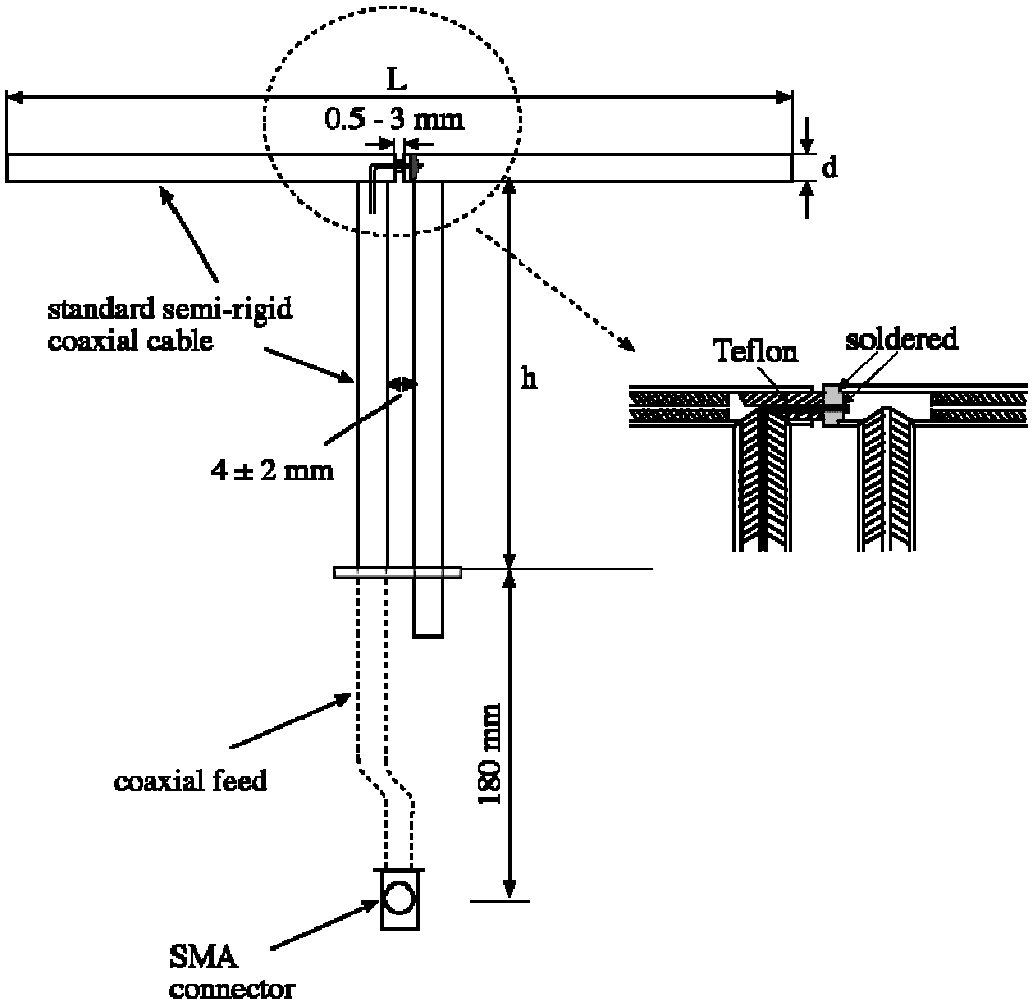
Approved by: 

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

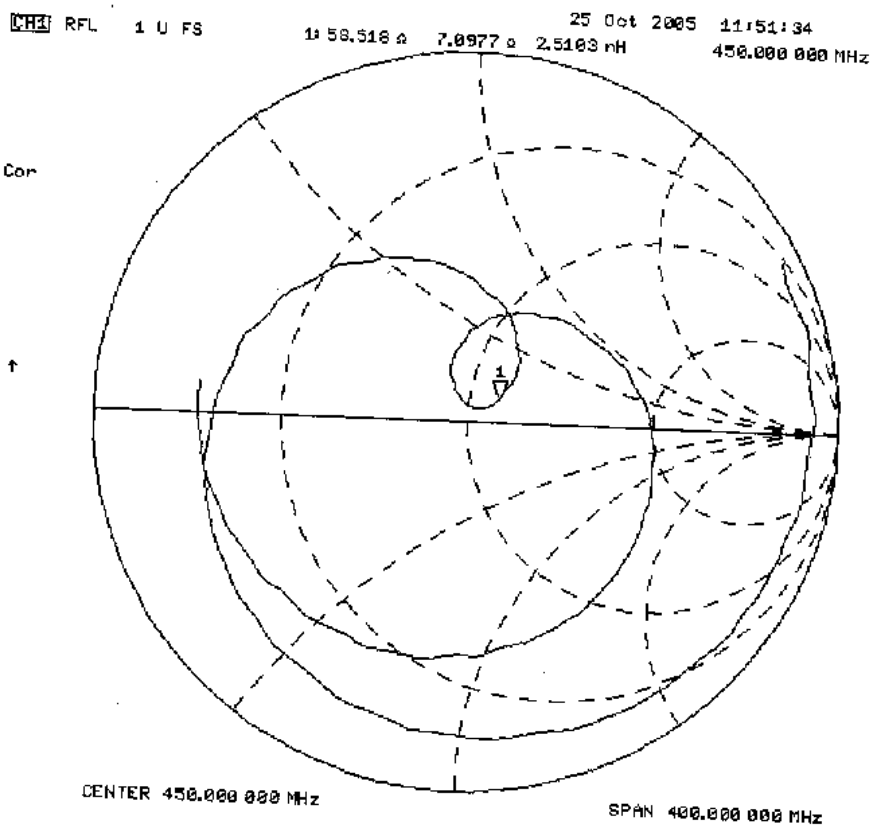
1. Dipole Construction & Electrical Characteristics

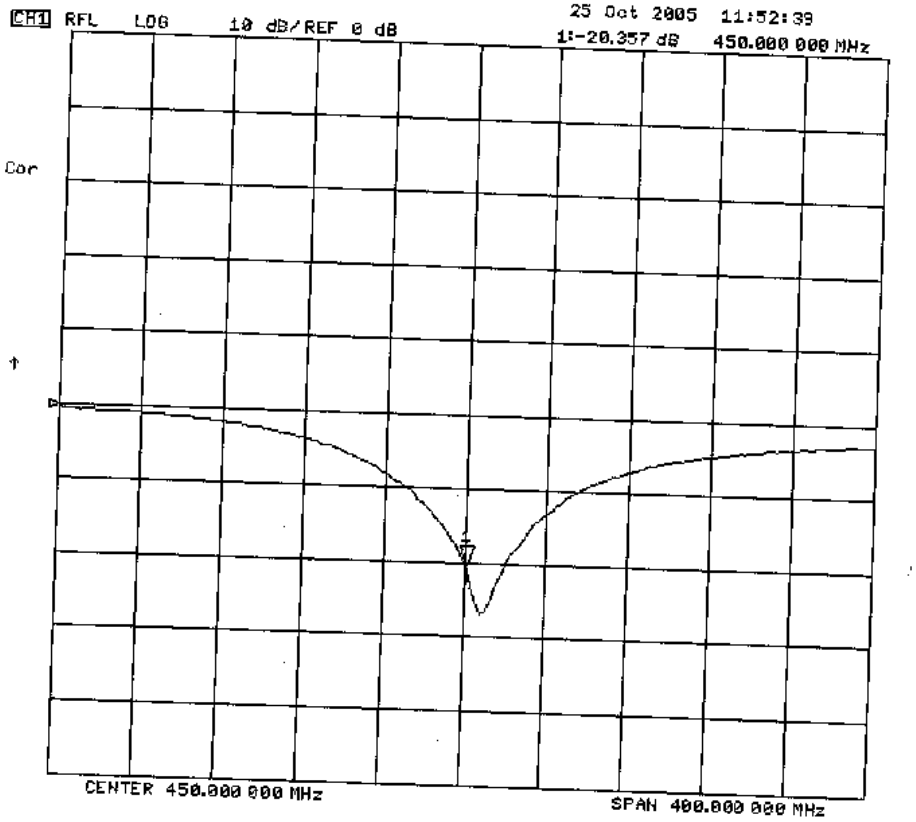
The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753E Network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

Feed point impedance at 450MHz	Re{Z} = 58.518Ω
	Im{Z} = 7.0977Ω
Return Loss at 450MHz	-20.357dB



2. Validation Dipole VSWR Data





3. 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

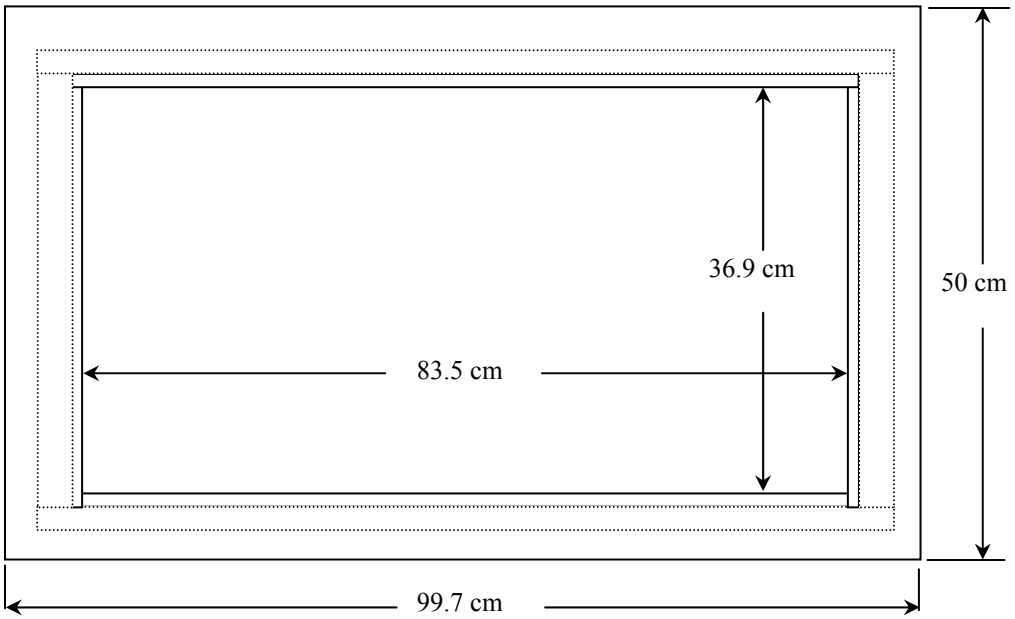
4. Validation Phantom

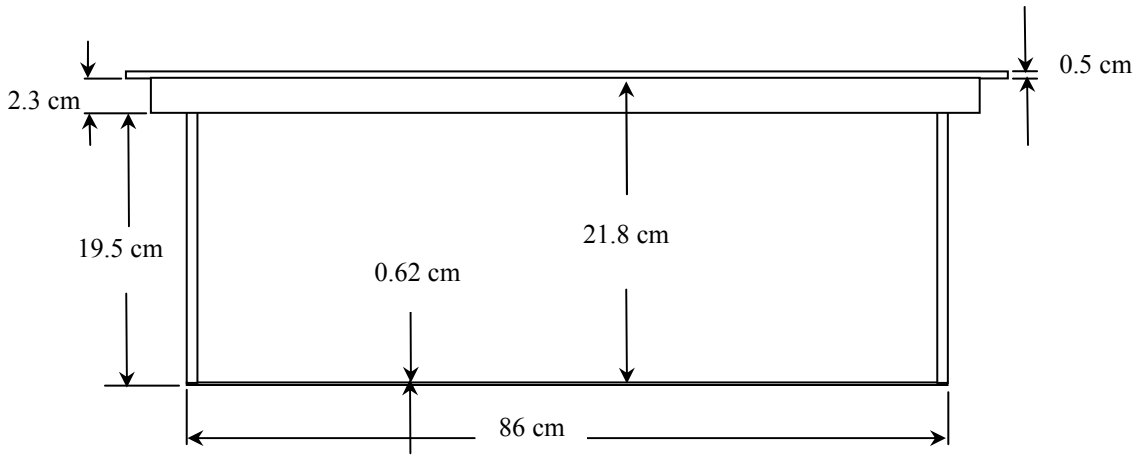
The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The inner dimensions of the phantom are as follows:

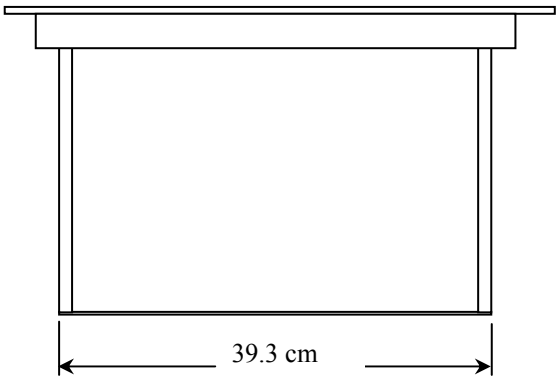
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

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

5. Dimensions of Plexiglas Planar Phantom

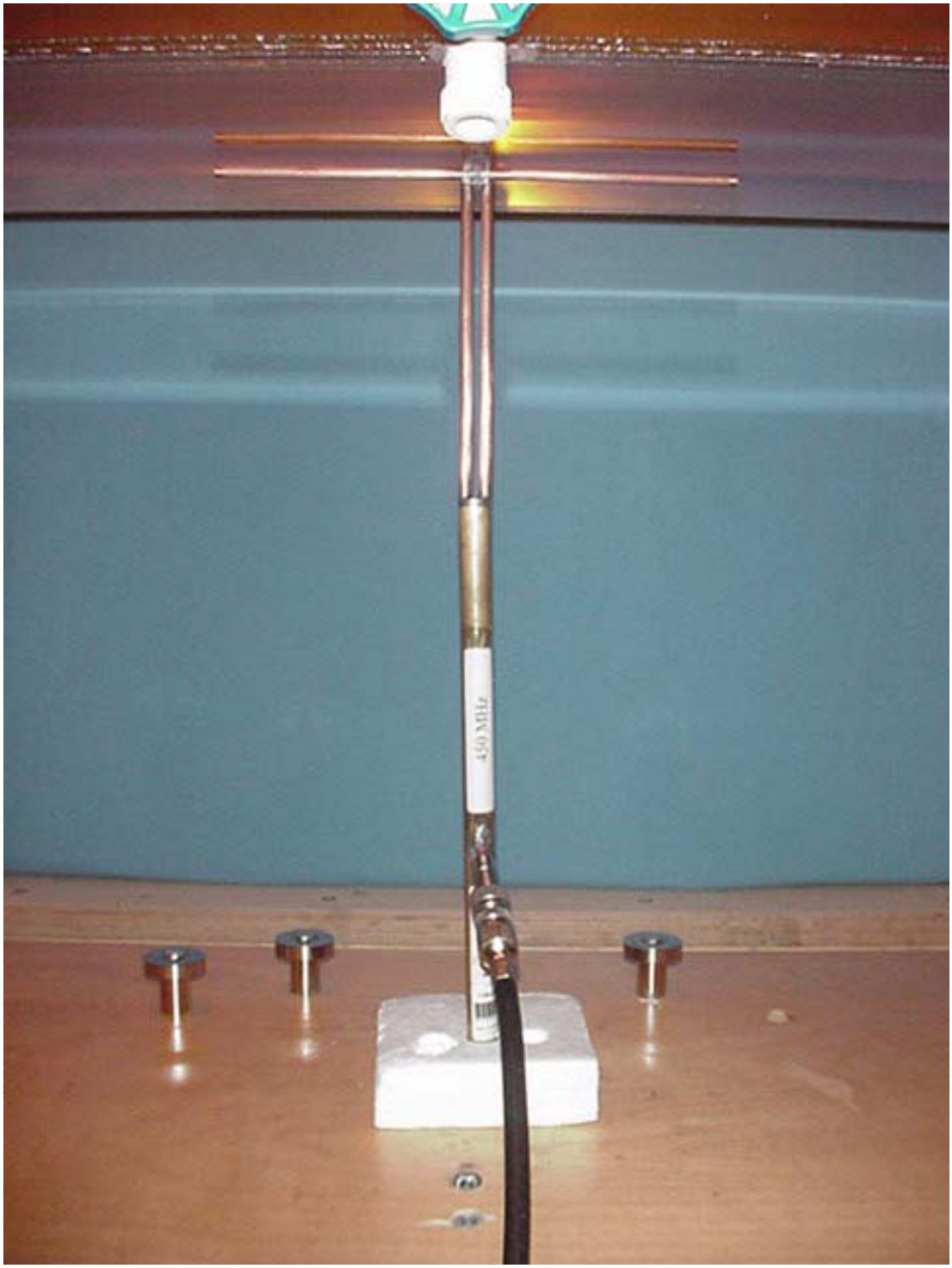






6. 450 MHz System Validation Setup

7. 450 MHz Validation Dipole Setup



8. Measurement Conditions

The planar phantom was filled with 450 MHz brain tissue simulant with the following parameters:

Relative Permittivity:	43.2
Conductivity:	0.84 mho/m
Fluid Temperature:	22.5 °C
Fluid Depth:	≥ 15.0 cm

Environmental Conditions:

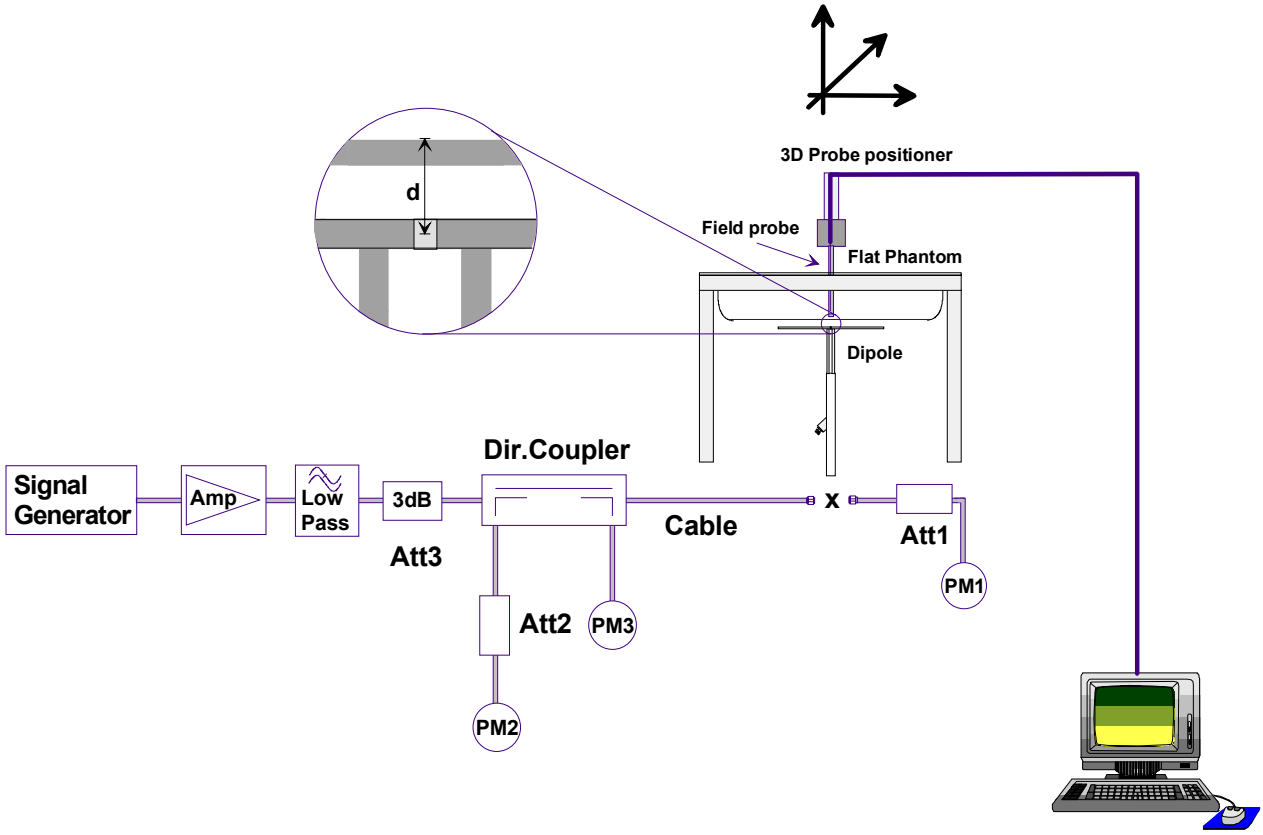
Ambient Temperature:	23.5 °C
Humidity:	34 %
Barometric Pressure:	101.4 kPa

The 450 MHz brain tissue simulant consists of the following ingredients:

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

9. 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.

10. Validation Dipole SAR Test Results

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

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	1.24	4.96	0.800	3.200	1.31
Test 2	1.24	4.96	0.798	3.192	1.31
Test 3	1.24	4.96	0.798	3.192	1.31
Test 4	1.24	4.96	0.799	3.196	1.31
Test 5	1.24	4.96	0.799	3.196	1.31
Test 6	1.24	4.96	0.799	3.196	1.31
Test 7	1.24	4.96	0.801	3.204	1.31
Test 8	1.24	4.96	0.802	3.208	1.31
Test 9	1.25	5.00	0.807	3.228	1.31
Test 10	1.25	5.00	0.806	3.224	1.31
Average Value	1.24	4.97	0.801	3.204	1.31

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

Target SAR @ 1 Watt Input averaged over 1 gram (W/kg)		Measured SAR @ 1 Watt Input averaged over 1 gram (W/kg)	Deviation from Target (%)	Target SAR @ 1 Watt Input averaged over 10 grams (W/kg)		Measured SAR @ 1 Watt Input averaged over 10 grams (W/kg)	Deviation from Target (%)
4.90	+/- 10%	4.97	+1.4%	3.30	+/- 10%	3.204	-2.9%

450 MHz System Validation (Brain) - October 25, 2005

DUT: Dipole 450 MHz; Model: D450V2; Serial: 136; Calibrated: 10/25/2005
Ambient Temp: 23.5 °C; Fluid Temp: 22.5 °C; Barometric Pressure: 101.4 kPa; Humidity: 34%
Communication System: CW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 (σ = 0.84 mho/m; ε_r = 43.2; ρ = 1000 kg/m^3)
- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

450 MHz System Validation/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.27 mW/g

450 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.3 V/m; Power Drift = -0.025 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.800 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.1 V/m; Power Drift = 0.004 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.798 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.0 V/m; Power Drift = 0.014 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.798 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.0 V/m; Power Drift = 0.040 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

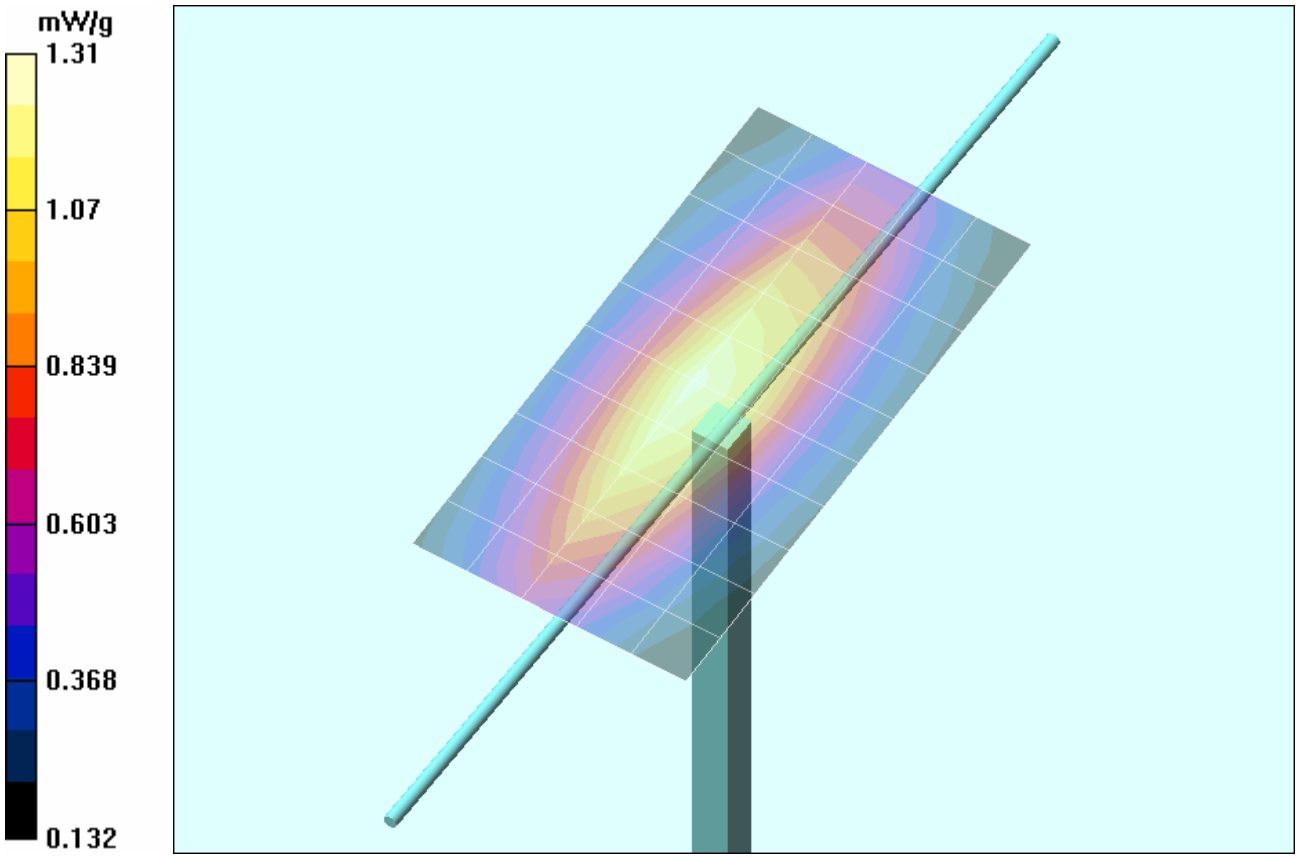
450 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.0 V/m; Power Drift = 0.014 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.1 V/m; Power Drift = 0.016 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

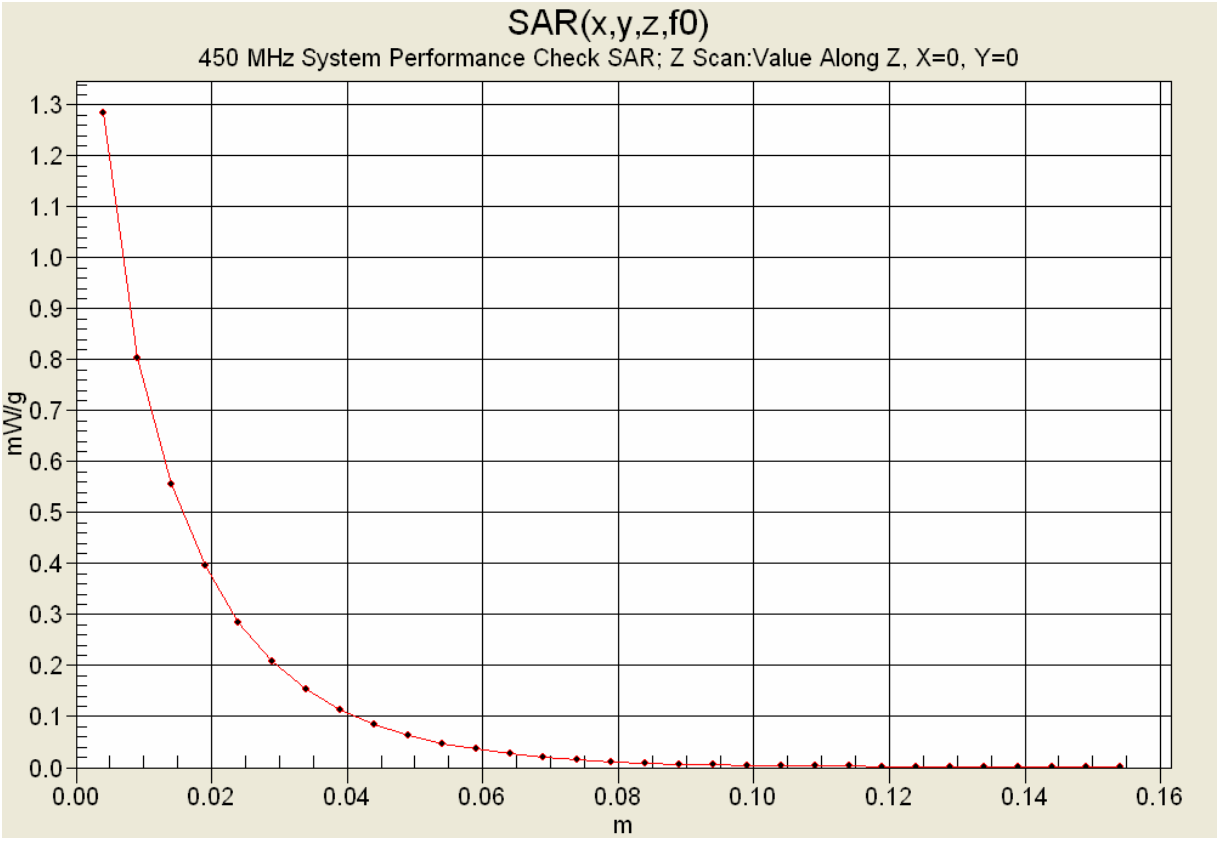
450 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.1 V/m; Power Drift = 0.008 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.801 mW/g
Maximum value of SAR (measured) = 1.31 mW/g
450 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.6 V/m; Power Drift = -0.031 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.802 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.2 V/m; Power Drift = 0.016 dB
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.807 mW/g
Maximum value of SAR (measured) = 1.31 mW/g

450 MHz System Validation/Zoom Scan 10 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.2 V/m; Power Drift = -0.010 dB
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.806 mW/g
Maximum value of SAR (measured) = 1.31 mW/g



1 g average of 10 measurements: 1.24 mW/g
10 g average of 10 measurements: 0.801 mW/g



11. Measured Fluid Dielectric Parameters

System Validation (Brain) - 450 MHz Dipole

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Tue 25/Oct/2005 12:07:39
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.08	0.7567
0.3600	44.58	0.87	45.12	0.7628
0.3700	44.46	0.87	45.10	0.7809
0.3800	44.34	0.87	45.43	0.7839
0.3900	44.22	0.87	43.97	0.7737
0.4000	44.10	0.87	43.78	0.7898
0.4100	43.98	0.87	43.52	0.8094
0.4200	43.86	0.87	43.40	0.8252
0.4300	43.74	0.87	43.32	0.8299
0.4400	43.62	0.87	43.32	0.8412
0.4500	43.50	0.87	43.20	0.8371
0.4600	43.45	0.87	42.91	0.8381
0.4700	43.40	0.87	42.76	0.8474
0.4800	43.34	0.87	42.33	0.8578
0.4900	43.29	0.87	42.63	0.8839
0.5000	43.24	0.87	42.19	0.8784
0.5100	43.19	0.87	41.77	0.8958
0.5200	43.14	0.88	41.64	0.8896
0.5300	43.08	0.88	41.13	0.9037
0.5400	43.03	0.88	40.85	0.9328
0.5500	42.98	0.88	40.94	0.9272

APPENDIX F - PROBE CALIBRATION

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Celltech Labs

Certificate No: ET3-1387_Mar06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1387
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	March 16, 2006
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

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

Issued: March 16, 2006

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibrated:	March 18, 2005
Recalibrated:	March 16, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.62** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**92** mV
NormY	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**92** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	9.3	5.0
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

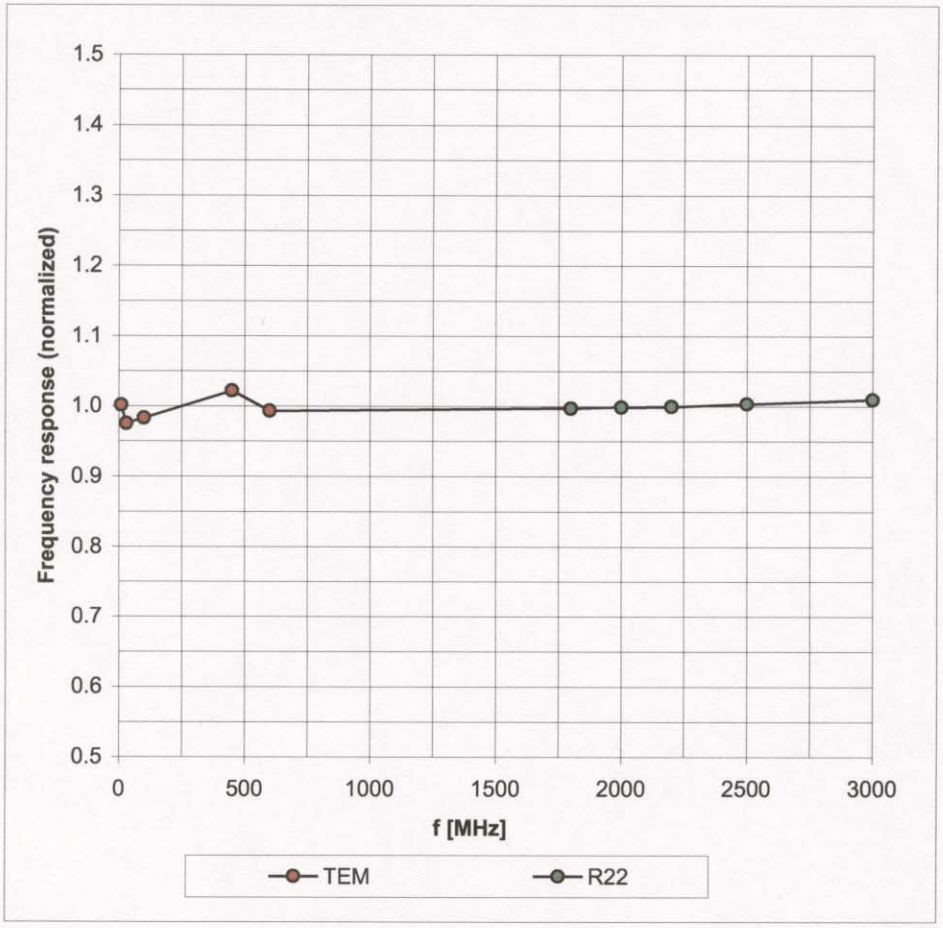
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

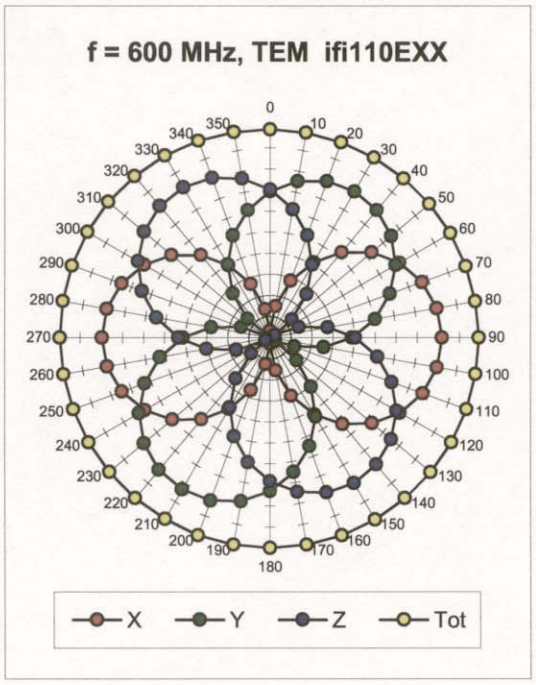
Frequency Response of E-Field

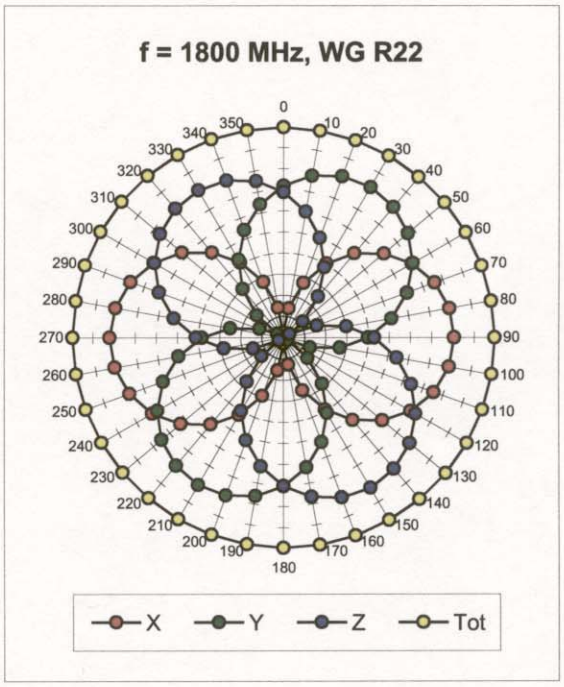
(TEM-Cell:ifi110 EXX, Waveguide: R22)

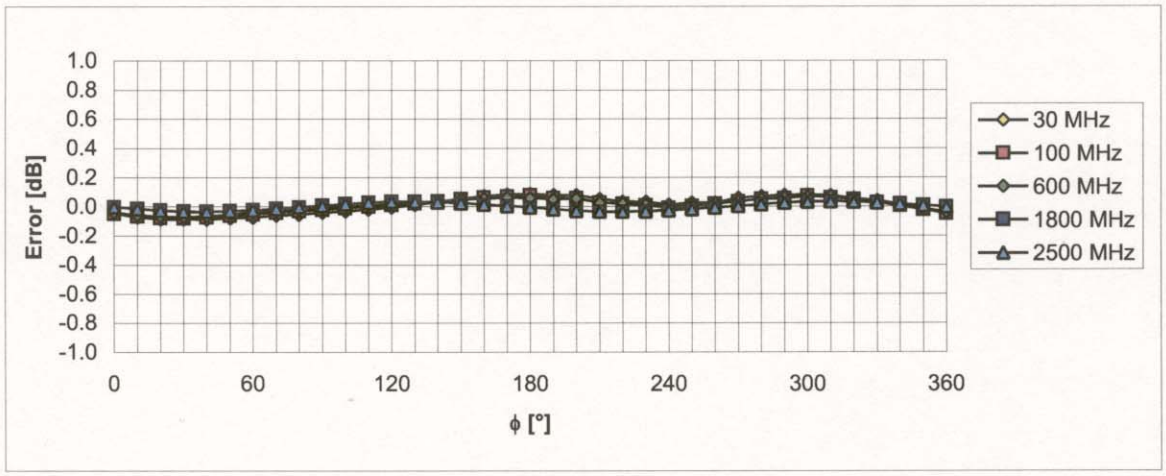


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



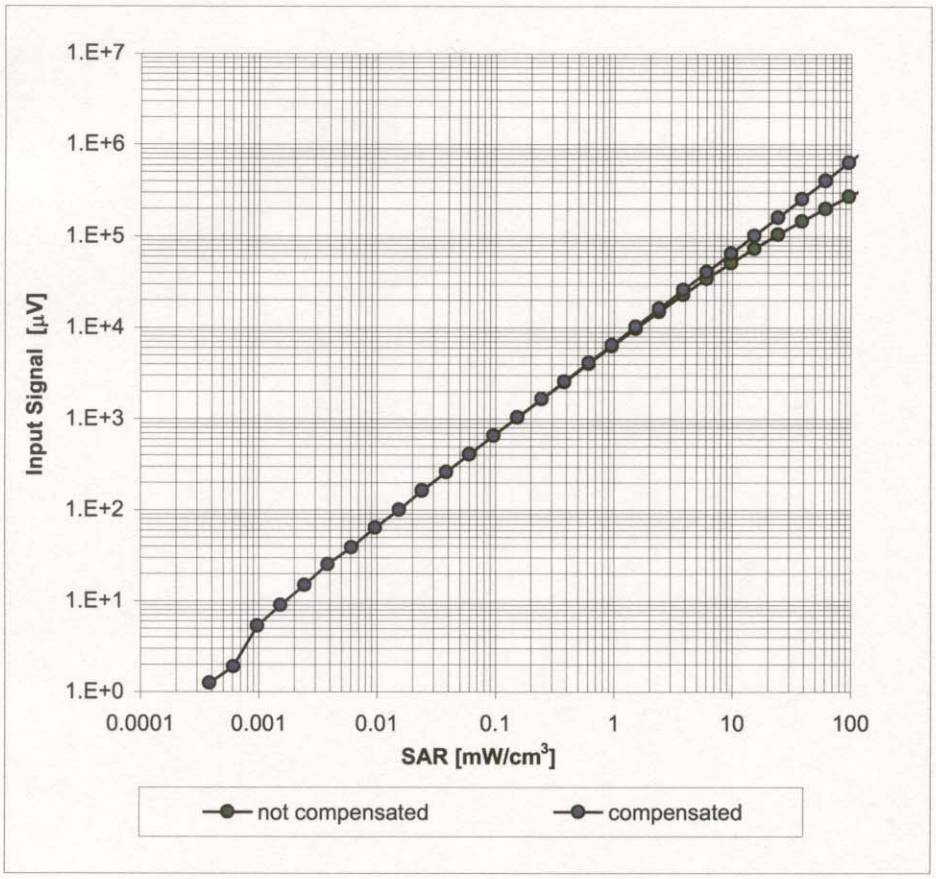


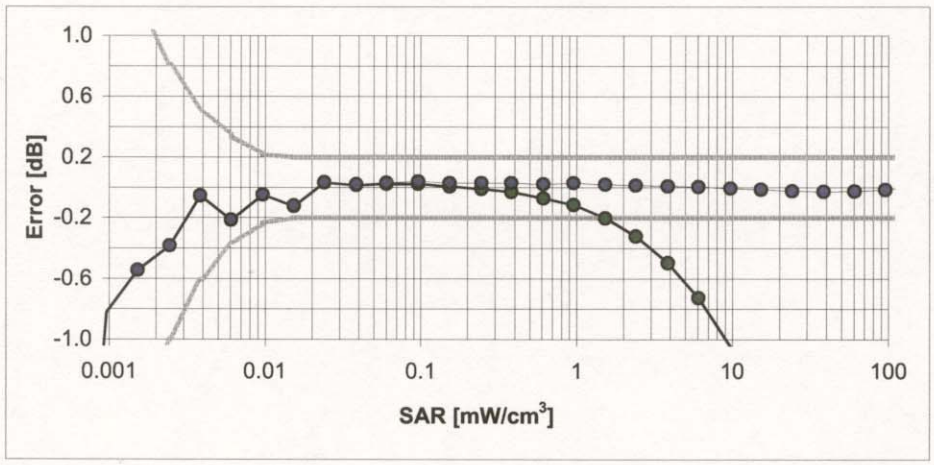


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

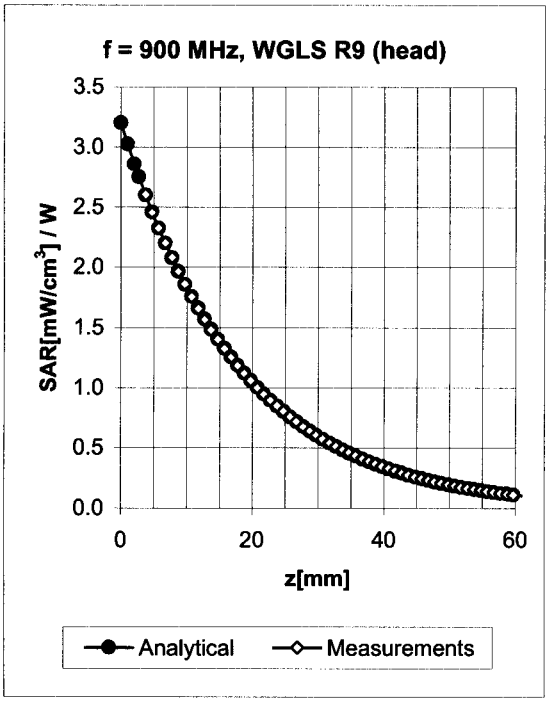
(Waveguide R22, f = 1800 MHz)

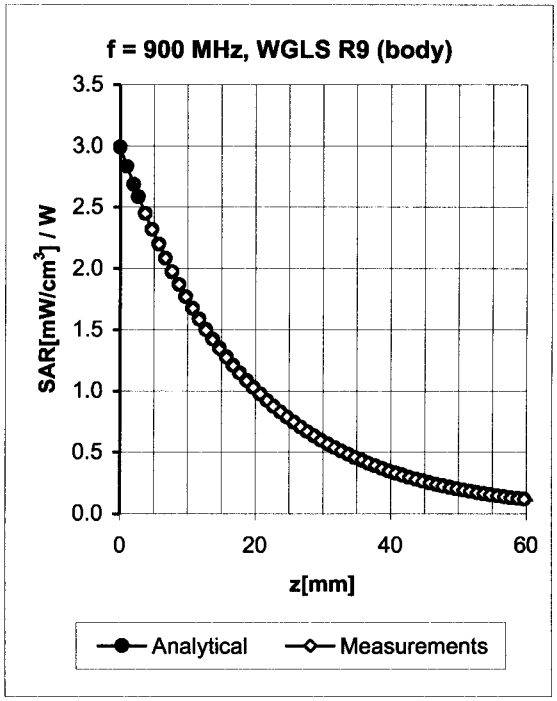




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



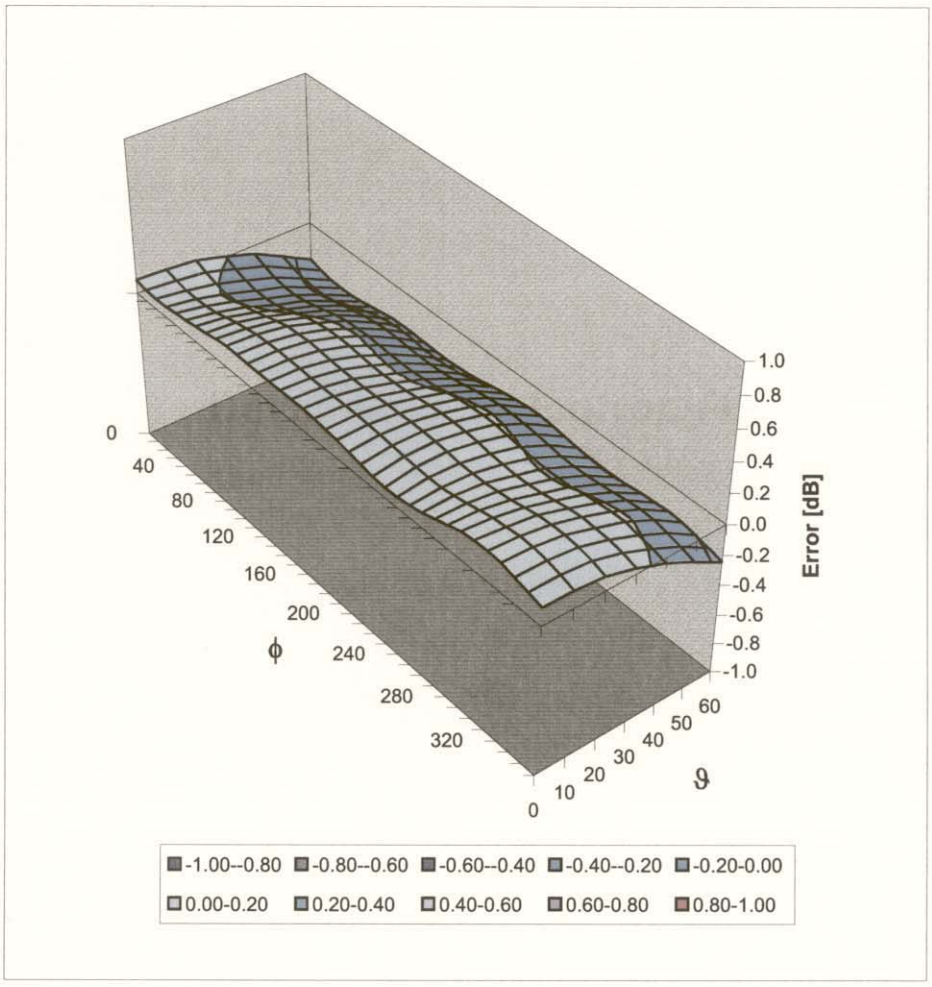


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.62	1.86	6.35 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.59	1.97	6.04 ± 11.0% (k=2)

[C] **The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.**

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Schmid & Partner Engineering AG

s p e a g

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

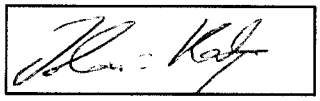
Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**March 18, 2006**
Probe Calibration Date:	**March 16, 2006**

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:



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s p e a g

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Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

150 ± 50 MHz	ConvF	**8.6 ± 10%**	**ε_r = 52.3 ± 5%** **σ = 0.76 ± 5% mho/m** (head tissue)
150 ± 50 MHz	ConvF	**8.2 ± 10%**	**ε_r = 61.9 ± 5%** **σ = 0.80 ± 5% mho/m** (body tissue)
300 ± 50 MHz	ConvF	**7.8 ± 9%**	**ε_r = 45.3 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
450 ± 50 MHz	ConvF	**7.4 ± 8%**	**ε_r = 43.5 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
450 ± 50 MHz	ConvF	**7.3 ± 8%**	**ε_r = 56.7 ± 5%** **σ = 0.94 ± 5% mho/m** (body tissue)
750 ± 50 MHz	ConvF	**6.6± 7%**	**ε_r = 41.8 ± 5%** **σ = 0.89 ± 5% mho/m** (head tissue)
750 ± 50 MHz	ConvF	**6.4 ± 7%**	**ε_r = 55.4 ± 5%** **σ = 0.96 ± 5% mho/m** (body tissue)
1925 ± 50 MHz	ConvF	**5.0 ± 7%**	**ε_r = 39.8 ± 5%** **σ = 1.48 ± 5% mho/m** (head tissue)
1925 ± 50 MHz	ConvF	**4.7 ± 7%**	**ε_r = 53.2 ± 5%** **σ = 1.60 ± 5% mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.
Please see also Section 4.7 of the DASY4 Manual.