RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

UNIDEN AMERICA CORPORATION

PORTABLE UHF FRS/GMRS PTT RADIO TRANSCEIVER

MODEL(S): GMR1035

IDENTIFIER(S)	FCC ID: AMWUT030	IC: 513C-UT030
Test Standard(s) and Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)	
	Industry Canada RSS-102 Issue 2	

Test Report Serial No.

032107AMW-T824-S95U

Test Report Revision No.

Revision 1.0 (Initial Release)

Test Lab and Location

Celltech Compliance Testing & Engineering Lab
(Celltech Labs Inc.)
1955 Moss Court
Kelowna, BC
Canada
V1Y 9L3

ilac-MRA A2LA ACCREDITED

Certificate No. 2470.01

Test Report Prepared By:	Test Report Reviewed By:
Cheri Frangiadakis Test Report Writer Celltech Labs Inc.	Jonathan Hughes General Manager Celltech Labs Inc.

DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab and Location

CELLTECH LABS INCORPORATED
Testing and Engineering Services
1955 Moss Court
Kelowna, B.C.
Canada V1Y 9L3
Phone: 250-448-7047
Fax: 250-448-7046
e-mail: info@celltechlabs.com
web site: www.celltechlabs.com

Company Information

UNIDEN AMERICA CORPORATION
Engineering Services Office
181 N. Country Club Road
Lake City, SC 29560
United States

FCC IDENTIFIER:	**AMWUT030**
IC IDENTIFIER:	**513C-UT030**
Model(s):	**GMR1035**
Rule Part(s) Applied:	**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 FM UHF FRS/GMRS PTT Radio Transceiver**
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:	**230 mW (23.6 dBm) ERP (462.5625 MHz) GMRS Ch. 1**
Antenna Type(s) Tested:	**External Fixed Stubby**
Battery Type(s) Tested:	**Alkaline AAA x3 (4.5 V)**
Body-Worn Accessories Tested:	**n/a (radio does not have provision for body-worn transmit operation)**
Audio Accessories Tested:	**n/a (radio does not have provision for audio accessory)**
Max. SAR Level(s) Evaluated:	**Face-held: 0.437 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
SAR Lab Manager
Celltech Labs Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION

This measurement report demonstrates compliance of the Uniden America Corporation Model(s): GMR1035 Portable UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT030 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.

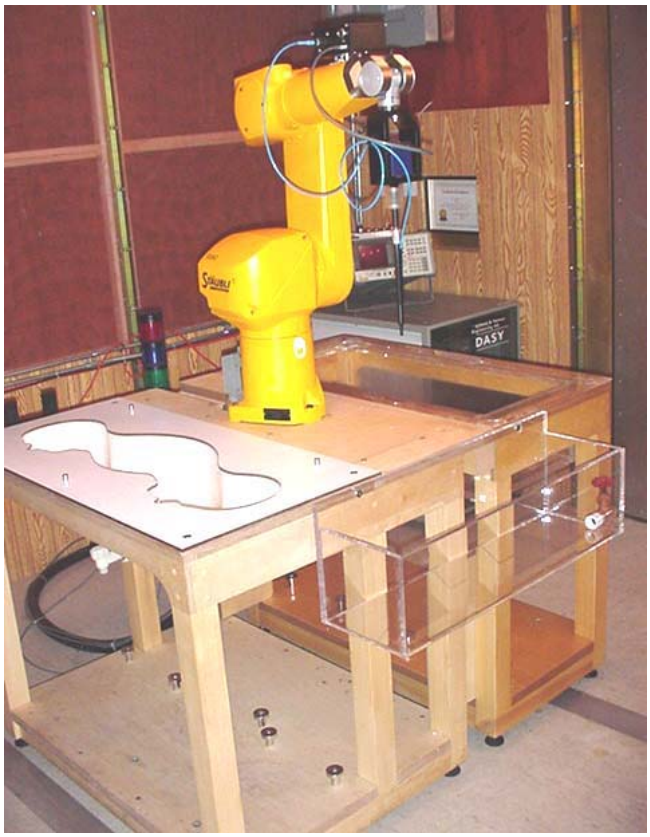
2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

Rule Part(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	AMWUT030				
IC IDENTIFIER	513C-UT030				
Device Model(s)	GMR1035				
Test Sample Serial No.	None		Identical Prototype		
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	230 mW	23.6 dBm	ERP	462.5625 MHz	GMRS Ch. 1
Antenna Type(s) Tested	External Fixed Stubby				
Battery Type(s) Tested	Alkaline AAA (x3)		4.5 V		
Body-Worn Accessories Tested	n/a - radio does not have provision for body-worn transmit operation				
	(belt-clip accessory supplied with radio for carry/storage purpose only)				
Audio Accessories Tested	n/a - radio does not have provision for audio accessory				

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	Test Freq.	Channel		Test Mode	Battery Type	DUT Position to Planar Phantom	DUT Spacing to Planar Phantom	Start Power (ERP)	Measured SAR 1g (W/kg)		SAR Drift During Test	Scaled SAR with droop 1g (W/kg)	
									Duty Cycle			Duty Cycle	
	MHz							mW	100%	50%	dB	100%	50%
Face-held	462.5625	1	GMRS	CW	Alkaline	Front Side	2.5 cm	230	0.806	0.403	-0.348	**0.873**	**0.437**

ANSI / IEEE C95.1 2005 - SAFETY LIMIT	BRAIN: 1.6 W/kg (averaged over 1 gram)	Spatial Peak Uncontrolled Exposure / General Population

Test Date(s)	March 23, 2007				**Atmospheric Pressure**	101.9	**kPa**
Measured Fluid Type	**450 MHz Brain**				**Relative Humidity**	31	**%**
Dielectric Constant ε_r	**IEEE Target**		**Measured**	**Deviation**	**Ambient Temperature**	22.4	**°C**
	43.5	**± 5%**	44.4	+2.1%	**Fluid Temperature**	21.3	**°C**
Conductivity σ **(mho/m)**	**IEEE Target**		**Measured**	**Deviation**	**Fluid Depth**	≥ 15	**cm**
	0.87	**± 5%**	0.88	+1.2%	**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 was added to the measured SAR level to report a scaled SAR result as shown in the above test data table.
	5.	A SAR-versus-Time power droop evaluation was performed and the test plot is shown in Appendix A.
	6.	The fluid temperature was measured prior to and after the SAR evaluation to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements.
	7.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
	8.	The SAR evaluation was performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The Uniden America Corporation Model(s): GMR1035 Portable FM UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT030 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 does not have an audio connector and therefore does not support body-worn operation. The supplied belt-clip is for carry/storage purpose only.
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 by the manufacturer prior to the SAR evaluation.
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 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.
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 evaluation was performed using a Plexiglas side-planar phantom.

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 evaluation 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.						
Mar 23	Brain 450	1.23 ±10%	1.29	+4.9%	43.5 ±5%	44.4	+2.1%	0.87 ±5%	0.88	+1.2%	1000	22.4	21.3	≥ 15	31	101.9
Note(s)		1. The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements.														
		2. The SAR evaluation was performed within 24 hours of the system performance check.														

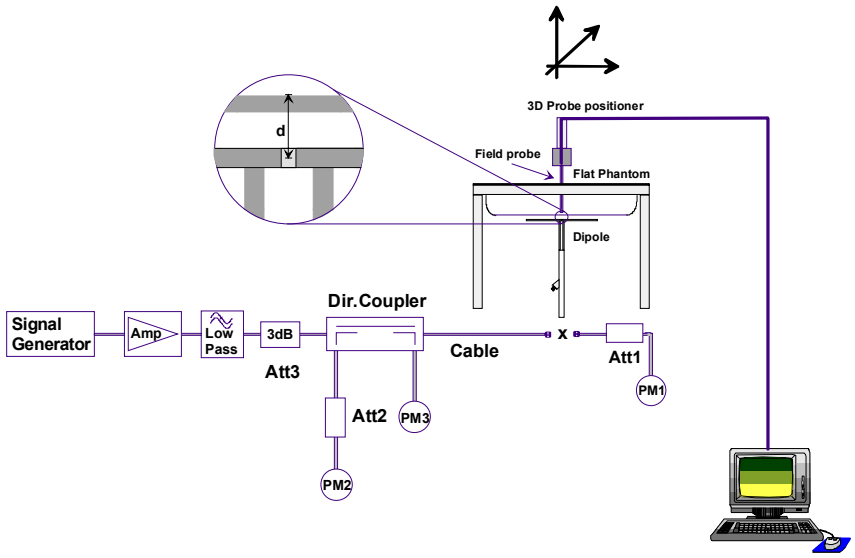
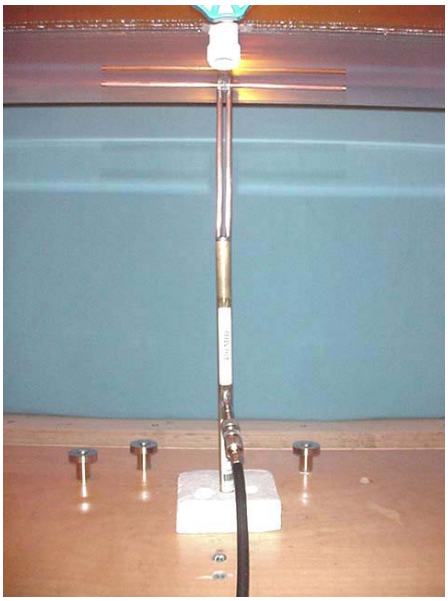


Figure 1. System Performance Check Setup Diagram



450 MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

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

SIMULATED TISSUE MIXTURE	
INGREDIENT	**450 MHz Brain** System Performance Check & DUT Evaluation
Water	38.56 %
Sugar	56.32 %
Salt	3.95 %
HEC	0.98 %
Bactericide	0.19 %

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
The Spatial Average value of the SAR averaged over the whole body.		
The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.		
The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.		
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	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
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.

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	21Jun06		21Jun07
x	-ET3DV6 E-Field Probe	00016	1387	16Mar07		16Mar08
	-EX3DV4 E-Field Probe	00213	3600	24Jan07		24Jan08
	-300MHz Validation Dipole	00023	135	23Oct06		23Oct07
x	-450MHz Validation Dipole	00024	136	23Mar07		23Mar08
	-835MHz Validation Dipole	00022	411	**Brain**	28Mar06	28Mar07
				Body	18Jan07	18Jan08
	-900MHz Validation Dipole	00020	054	**Brain**	06Jun06	06Jun07
				Body	06Jun06	06Jun07
	-1640MHz Validation Dipole	00212	0175	**Brain**	14Aug06	14Aug07
	-1800MHz Validation Dipole	00021	247	**Brain**	08Jun06	08Jun07
				Body	21Mar07	21Mar08
	-1900MHz Validation Dipole	00032	151	**Brain**	20Mar07	20Mar08
				Body	02Feb07	02Feb08
	-2450MHz Validation Dipole	00025	150	**Body**	24Apr06	24Apr07
	5GHz Validation Dipole -5200MHz	00126	1031	**Body**	18Jul06	18Jul07
	5GHz Validation Dipole -5500MHz			**Body**	14Nov06	14Nov07
	5GHz Validation Dipole -5800MHz			**Brain**	27Feb07	27Feb08
				Body	18Jul06	18Jul07
	-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	00008	1835267	22Jan07		22Jan08
x	Gigatronics 80701A Power Sensor	00012	1834350	22Jan07		22Jan08
	Gigatronics 80701A Power Sensor	00014	1833699	22Jan07		22Jan08
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	05Feb07		05Feb08
	Anritsu Radio Communication Analyzer	00208	6200241241	06Jun06		06Jun07

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 (450 MHz)	8.0	Normal	1	1	8.0	∞
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)	5	Normal	1	0.64	3.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	5	Normal	1	0.6	3.0	∞
Combined Standard Uncertainty					**12.65**	
Expanded Uncertainty (k=2)					**25.31**	

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 (450 MHz)	8.0	Normal	1	1	8.0	∞
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)	5	Normal	1	0.64	3.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	5	Normal	1	0.6	3.0	∞
Combined Standard Uncertainty					**11.20**	
Expanded Uncertainty (k=2)					**22.39**	

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/IEEE C95.1-2005 - “American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz”, New York: IEEE, April 2006.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 03/23/2007

Face-Held SAR - 462.5625 MHz - Channel 1 (GMRS)

DUT: Uniden GMR1035; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: Prototype

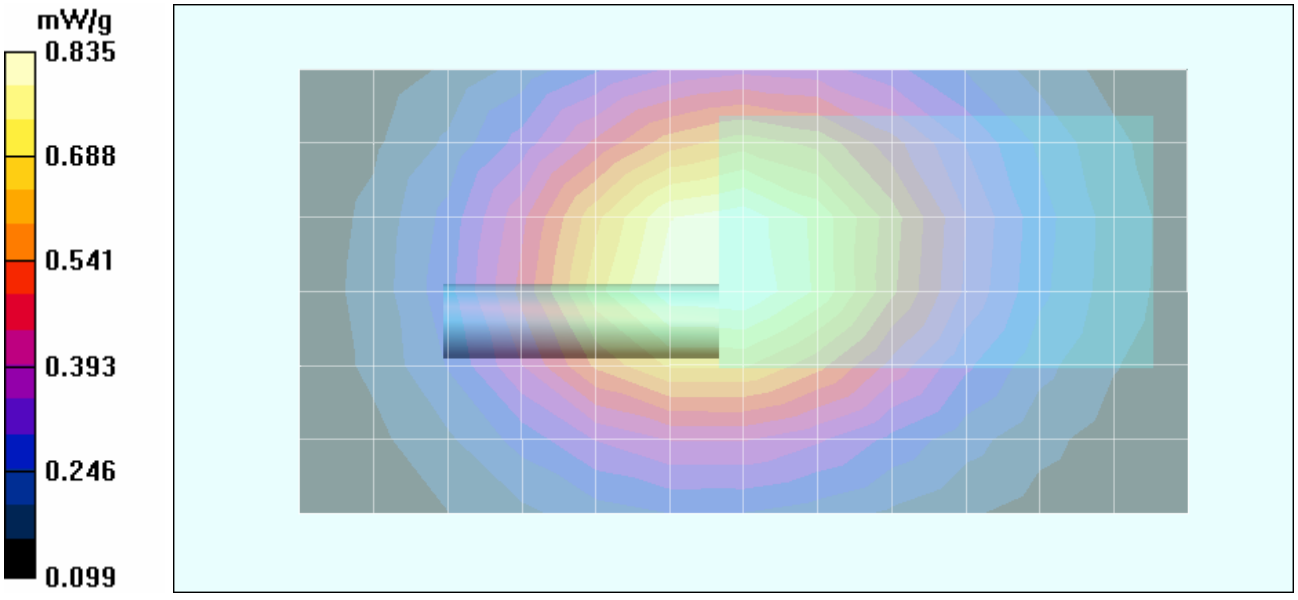
Ambient Temp: 22.4ºC; Fluid Temp: 21.3ºC; Barometric Pressure: 101.9 kPa; Humidity: 31%

Communication System: FM UHF
AAA Alkaline Batteries x3 (4.5 V)
RF Output Power: 230 mW (ERP)
Frequency: 462.5625 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 462.563 MHz; σ = 0.88 mho/m; ε_r = 44.4; ρ = 1000 kg/m^3

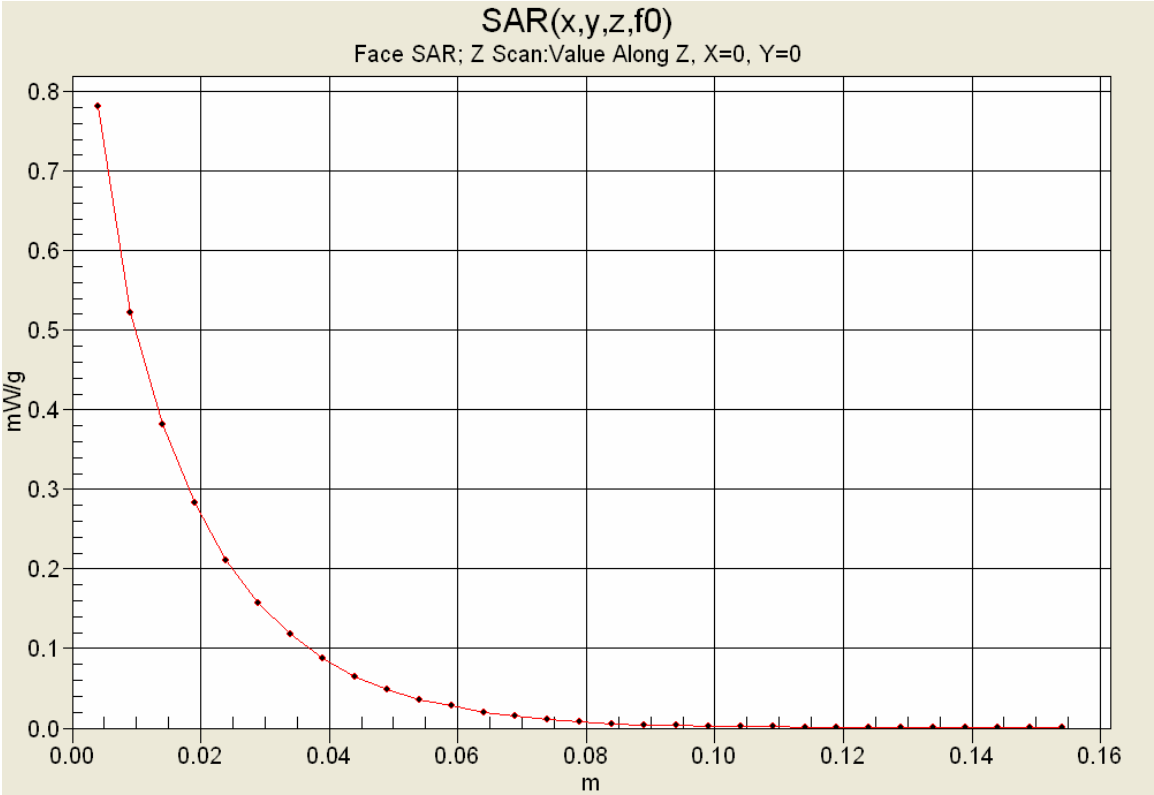
- Probe: ET3DV6 - SN1387; ConvF(7, 7, 7); Calibrated: 16/03/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-Held SAR - 2.5 cm Spacing from Front of DUT to Planar Phantom - GMRS Channel 1
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Face-Held SAR - 2.5 cm Spacing from Front of DUT to Planar Phantom - GMRS Channel 1
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 31.3 V/m; Power Drift = -0.348 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.806 mW/g; SAR(10 g) = 0.557 mW/g
Maximum value of SAR (measured) = 0.835 mW/g

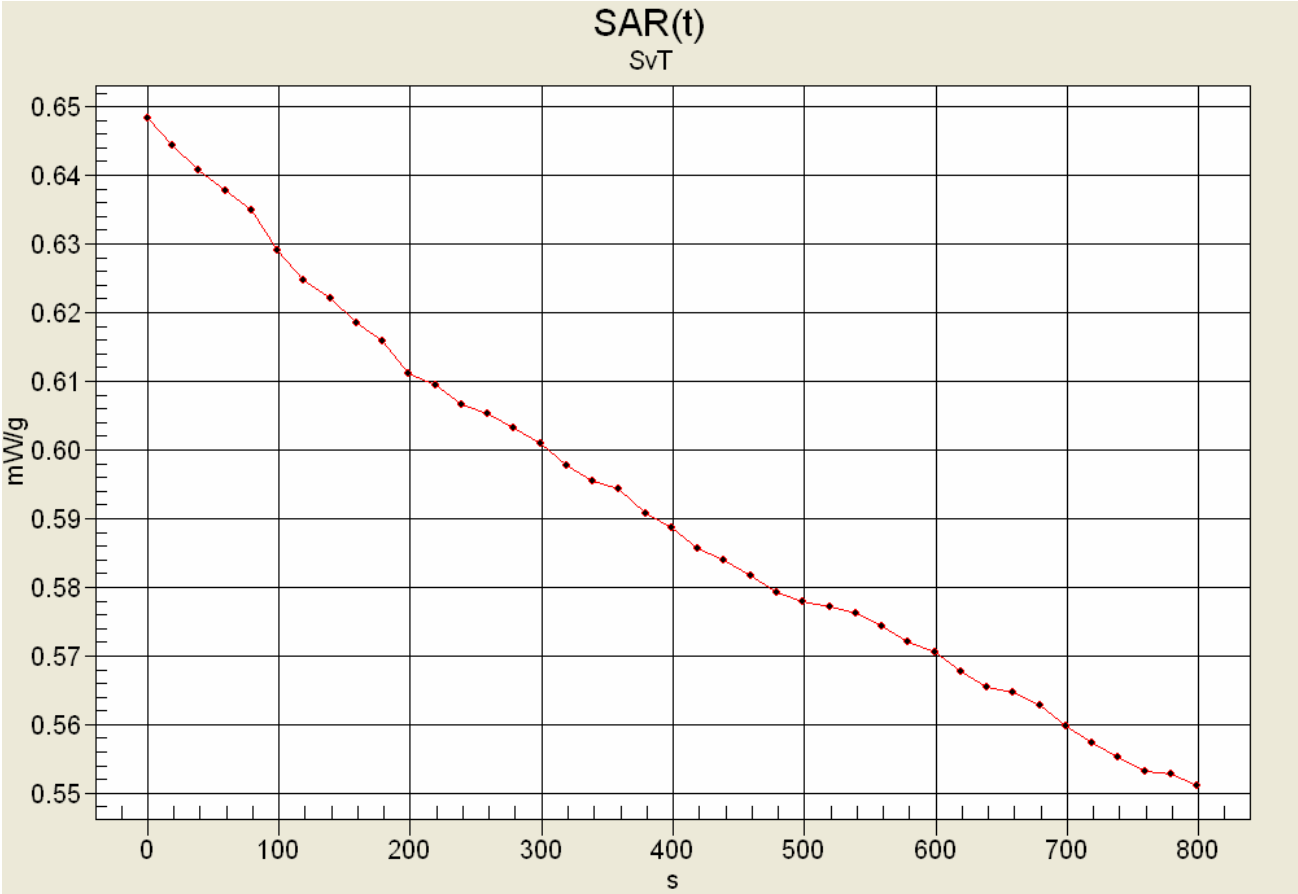


Z-Axis Scan



SAR-versus-Time Power Droop Evaluation

Face-Held Configuration
Alkaline Batteries (4.5 V)
Fixed Stubby Antenna
Channel 1 - 462.5625 MHz



Max. SAR: 0.648 mW/g
Min. SAR: 0.551 mW/g (-0.704 dB)
SAR after 340s: 0.595 mW/g (-0.371 dB)
(340s = Zoom Scan Duration)
(800s = Area Scan Duration)

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 03/23/2007

System Performance Check - 450 MHz Dipole

DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Validation: 03/23/2007

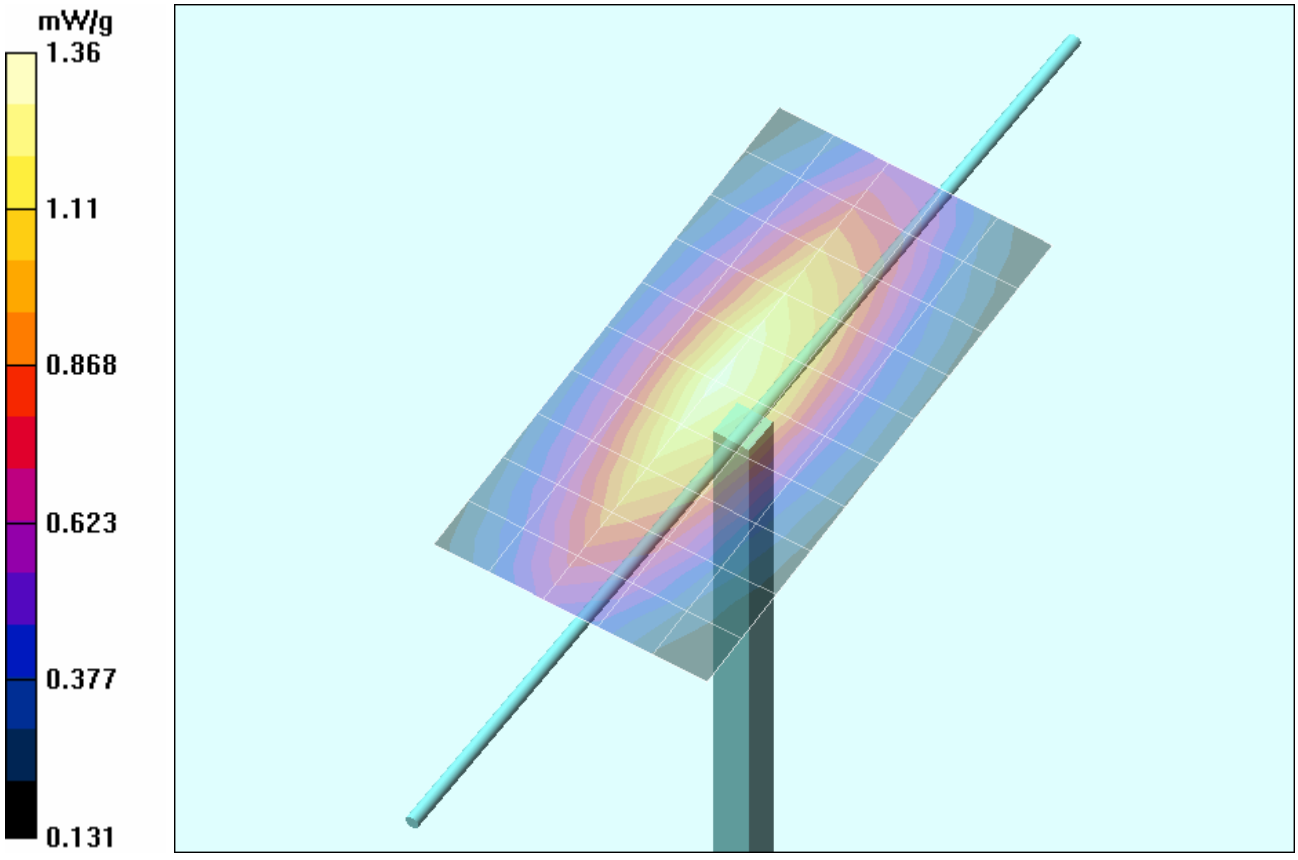
Ambient Temp: 22.4ºC; Fluid Temp: 21.3ºC; Barometric Pressure: 101.9 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.88 mho/m; ε_r = 44.4; ρ = 1000 kg/m^3

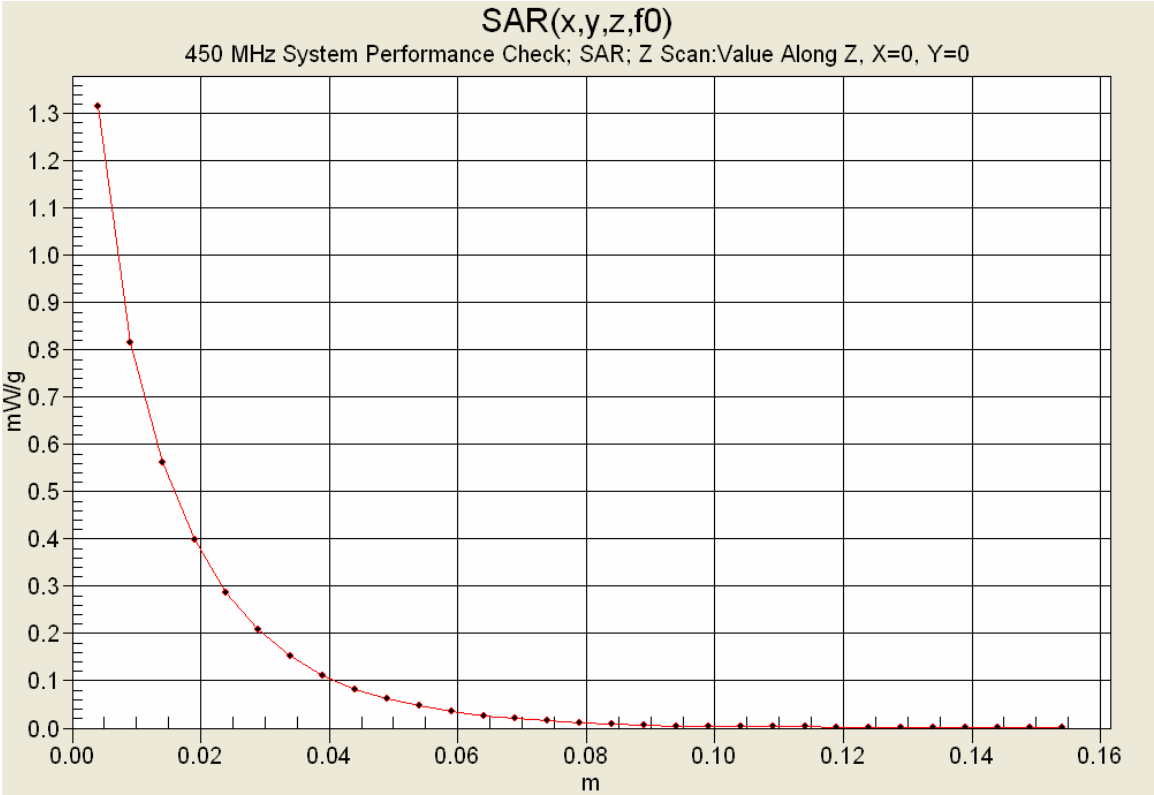
- Probe: ET3DV6 - SN1387; ConvF(7, 7, 7); Calibrated: 16/03/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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 = 38.7 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 2.27 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.824 mW/g
Maximum value of SAR (measured) = 1.36 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz System Performance Check & DUT Evaluation (Brain)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 23/Mar/2007
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

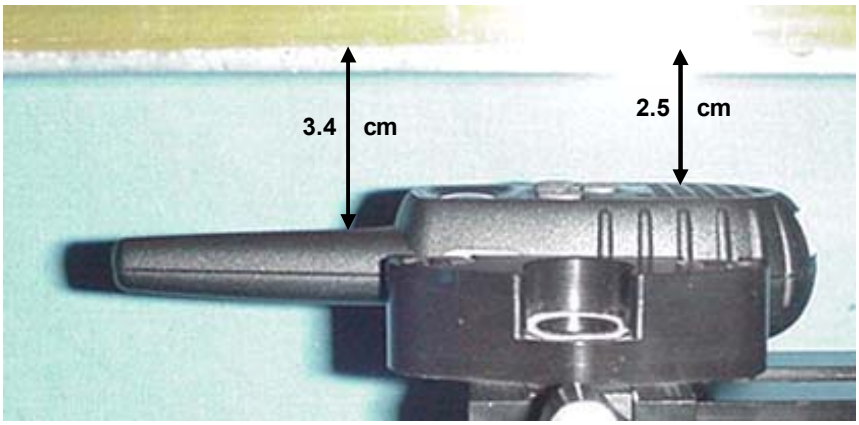
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.82	0.80
0.3600	44.58	0.87	46.59	0.81
0.3700	44.46	0.87	46.27	0.82
0.3800	44.34	0.87	45.81	0.83
0.3900	44.22	0.87	45.85	0.84
0.4000	44.10	0.87	45.51	0.84
0.4100	43.98	0.87	45.18	0.85
0.4200	43.86	0.87	45.02	0.86
0.4300	43.74	0.87	44.83	0.86
0.4400	43.62	0.87	44.57	0.88
0.4500	43.50	0.87	44.41	0.88
0.4600	43.45	0.87	44.34	0.89
0.4700	43.40	0.87	43.95	0.90
0.4800	43.34	0.87	43.87	0.91
0.4900	43.29	0.87	43.73	0.92
0.5000	43.24	0.87	43.31	0.93
0.5100	43.19	0.87	42.86	0.93
0.5200	43.14	0.88	43.11	0.94
0.5300	43.08	0.88	42.67	0.94
0.5400	43.03	0.88	42.90	0.95
0.5500	42.98	0.88	42.40	0.97

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

2.5 cm Spacing from Front of DUT to Planar Phantom



DUT PHOTOGRAPHS

Front of DUT

Back of DUT

Back of DUT with Plastic Belt-Clip
Belt-clip for carry/storage purpose only
DUT does not support body-worn transmit operation

Top end of DUT

Bottom end of DUT

DUT PHOTOGRAPHS

Left Side of DUT

Right Side of DUT

DUT Battery Compartment

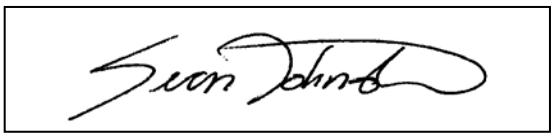
DUT with Alkaline AAA Batteries

APPENDIX E - SYSTEM VALIDATION

450 MHz SYSTEM VALIDATION

Type:	**450 MHz Validation Dipole**
Asset Number:	**00024**
Serial Number:	**136**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**March 23, 2007**

Celltech Labs Inc. hereby certifies that the system validation was performed on the date indicated above.

Validated by: 

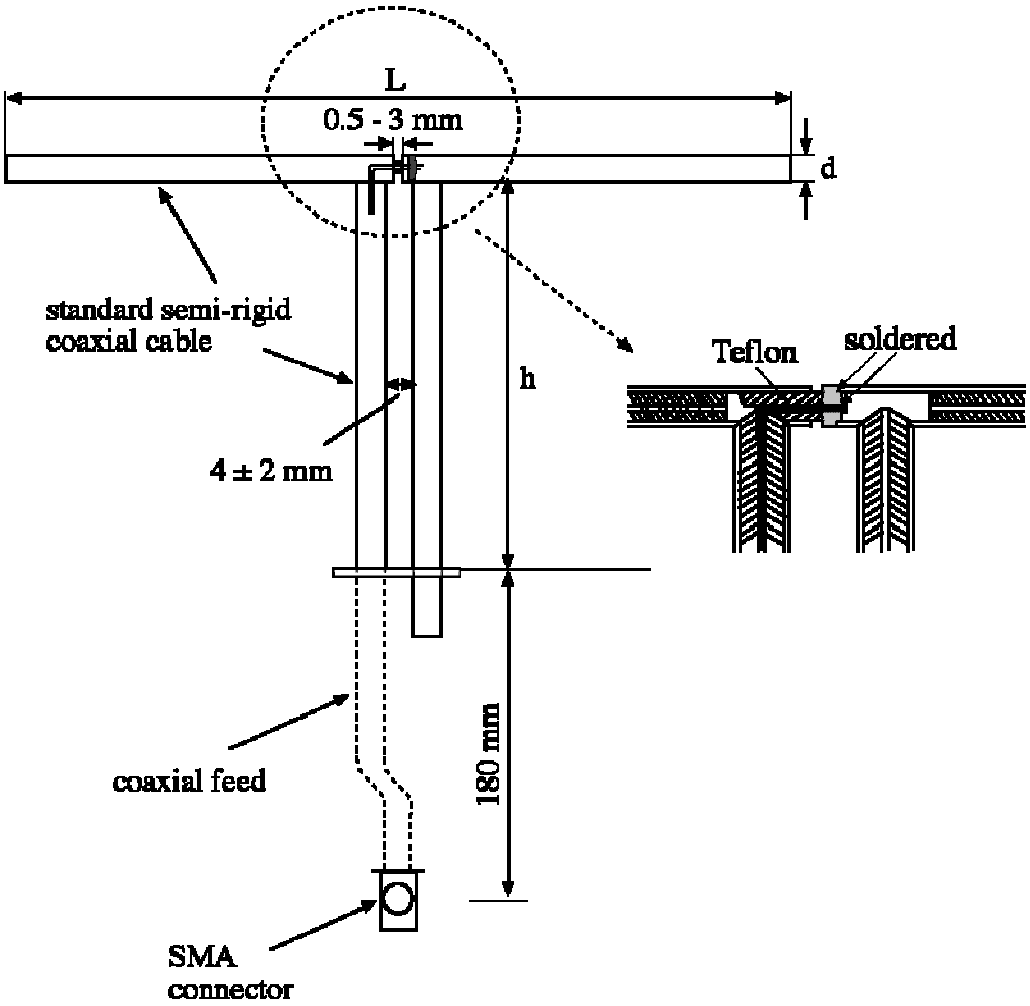
Approved by: 

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

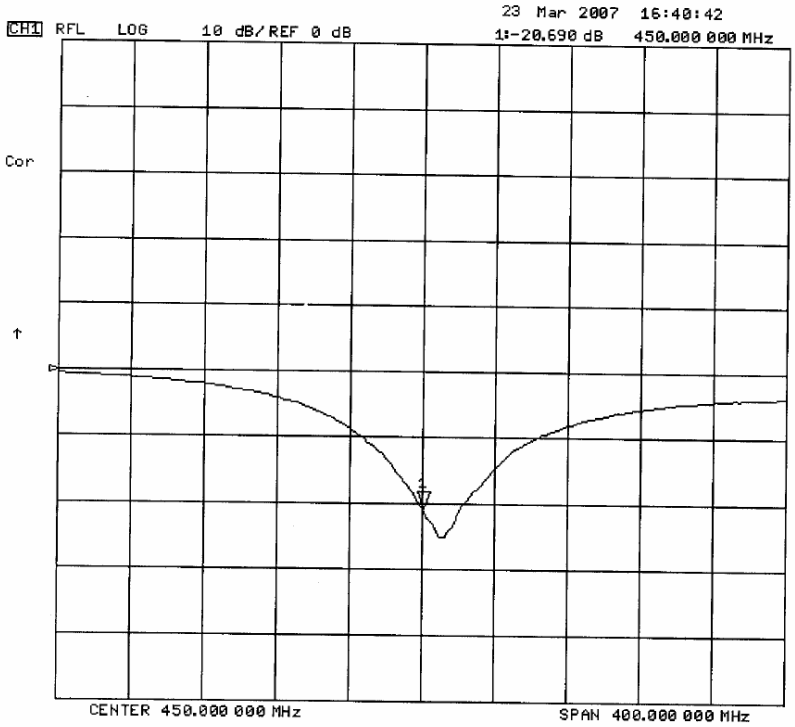
1. Dipole Construction & Electrical Characteristics

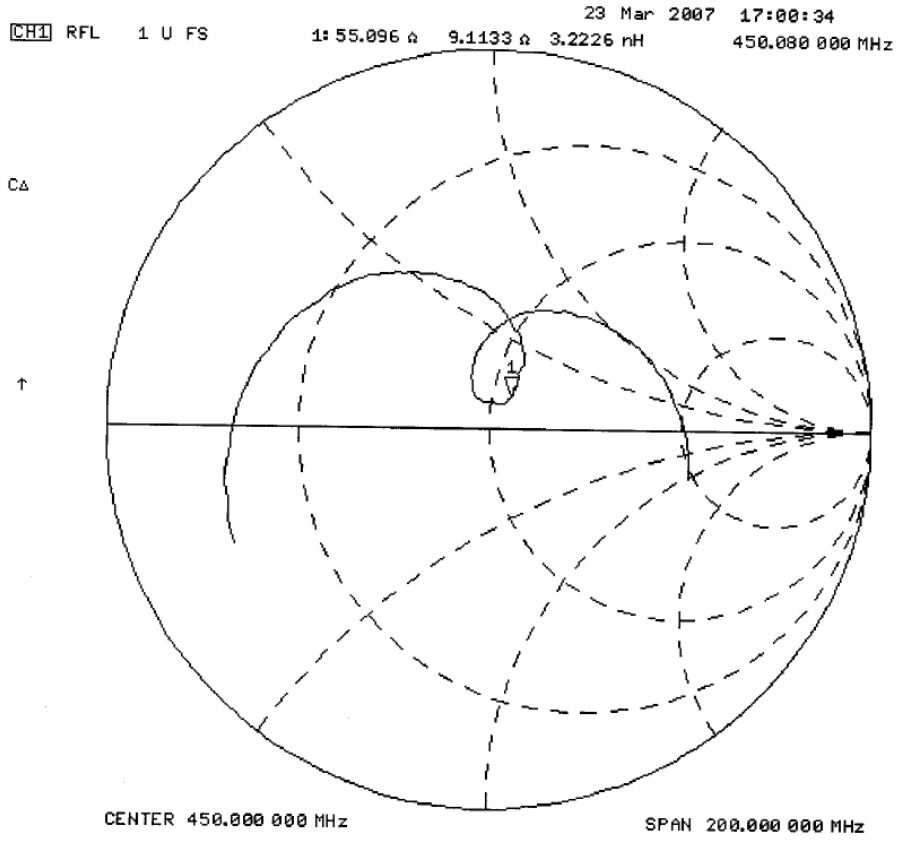
The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753ET Network 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} = 55.096Ω
	Im{Z} = 9.1133Ω
Return Loss at 450MHz	-20.690dB



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

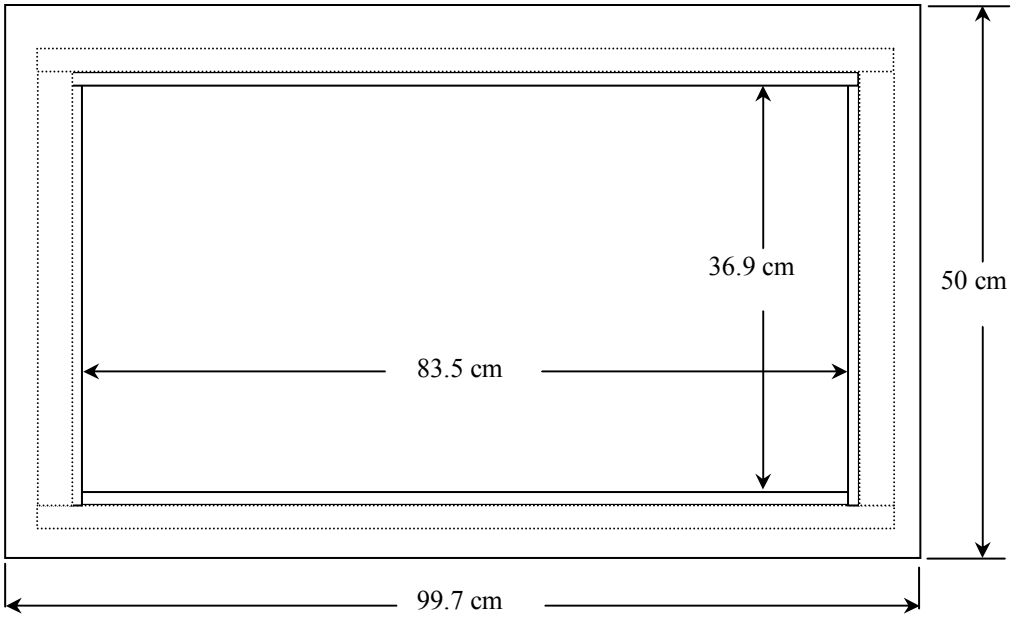
The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material.

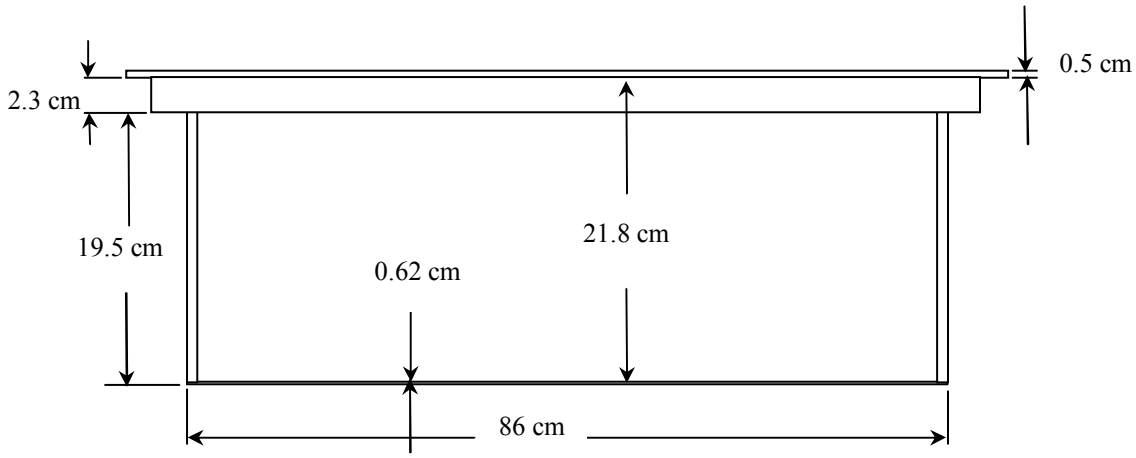
The inner dimensions of the validation phantom are as follows:

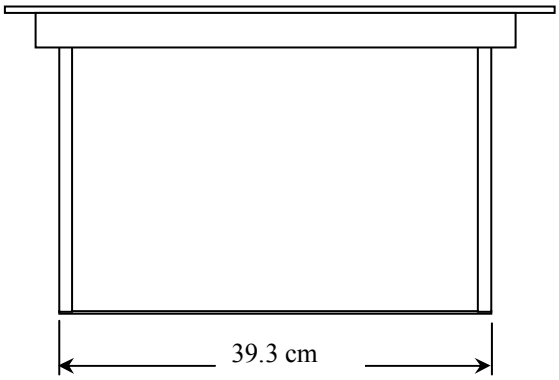
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

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

5. Dimensions of Plexiglas Planar Phantom





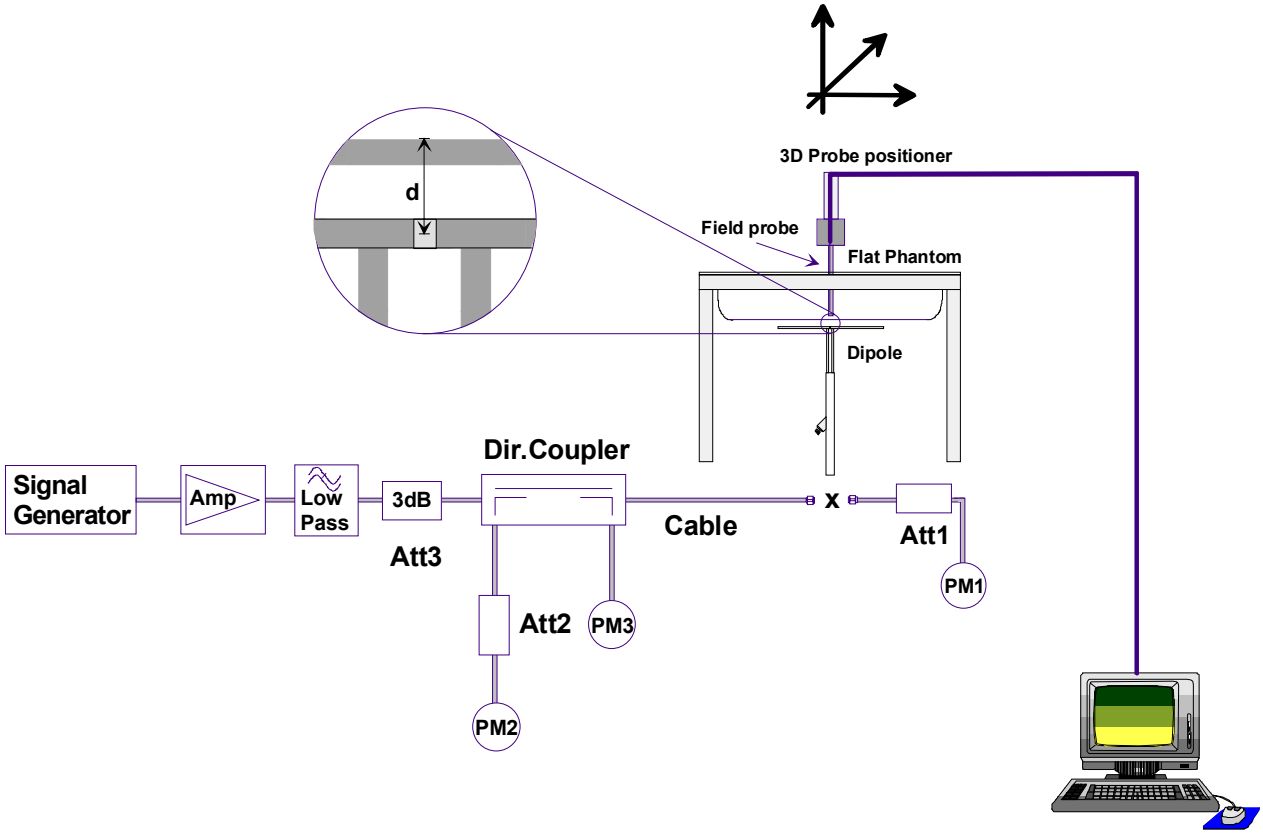


6. 450 MHz System Validation Setup

7. 450 MHz Validation Dipole Setup

8. 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.

9. Measurement Conditions

The validation phantom was filled with 450 MHz brain tissue simulant.

Relative Permittivity:	44.4 (+2.1% deviation from target)
Conductivity:	0.88 mho/m (+1.2% deviation from target)
Fluid Temperature:	21.3°C
Fluid Depth:	≥ 15.0 cm
Environmental Conditions:	
Ambient Temperature:	22.4°C
Humidity:	31 %
Barometric Pressure:	101.9kPa

The 450 MHz brain tissue simulant consisted 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 (+/- 5%) σ = 0.87 S/m (+/- 5%)

10. 450 MHz System Validation Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
IEEE Target		Measured	Deviation	IEEE Target		Measured	Deviation
1.23	**+/- 10%**	1.28	+4.1%	**4.92**	**+/- 10%**	5.12	+4.1%
SAR @ 0.25W Input averaged over 10g (W/kg)				**SAR @ 1W Input averaged over 10g (W/kg)**			
IEEE Target		Measured	Deviation	IEEE Target		Measured	Deviation
0.825	**+/- 10%**	0.820	-0.60%	**3.30**	**+/- 10%**	3.28	-0.60%
The results have been normalized to 1W (forward power) into the dipole.							

450 MHz - System Validation - 450 MHz Dipole - March 23, 2007

DUT: Dipole 450 MHz; Asset: 00024; Serial: 136

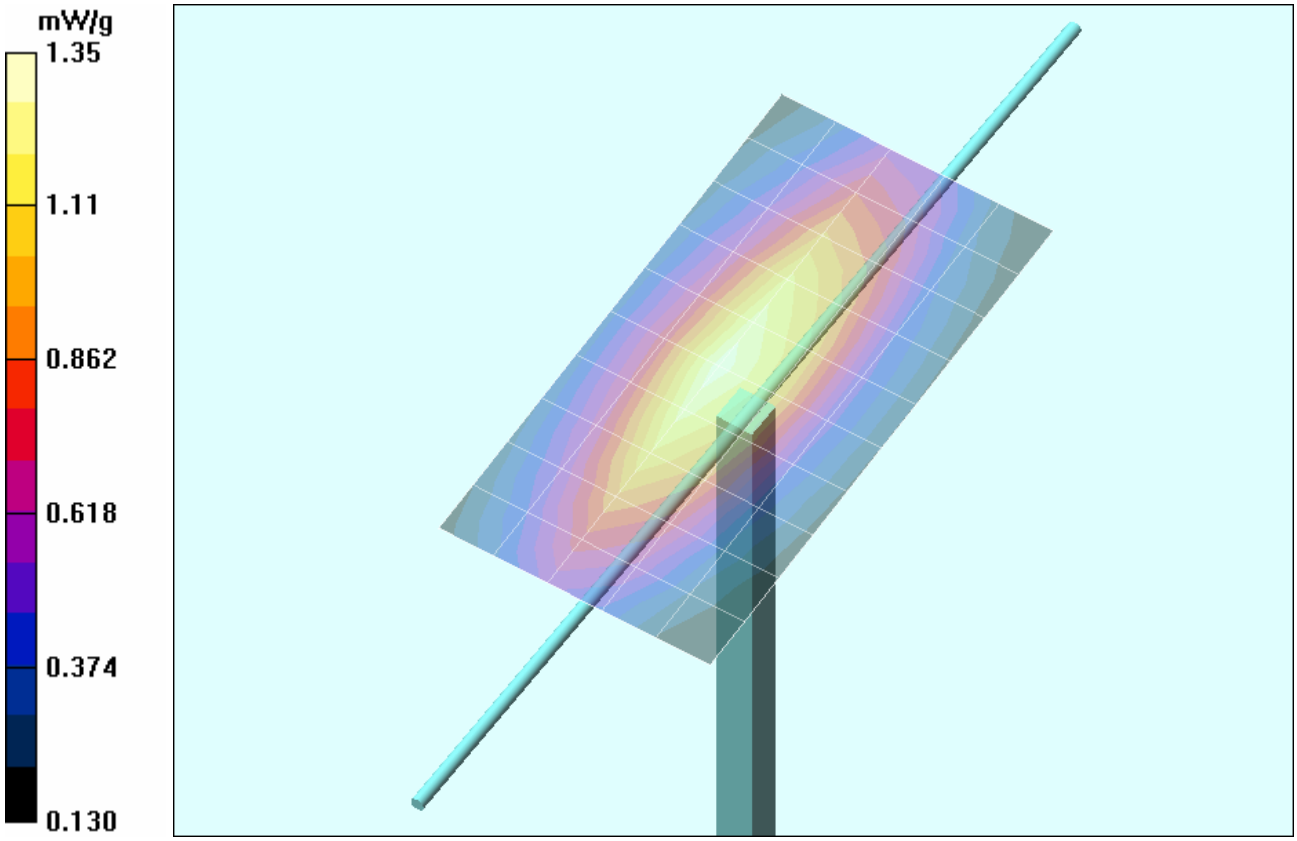
Ambient Temp: 22.4ºC; Fluid Temp: 21.3ºC; Barometric Pressure: 101.9 kPa; Humidity: 31%

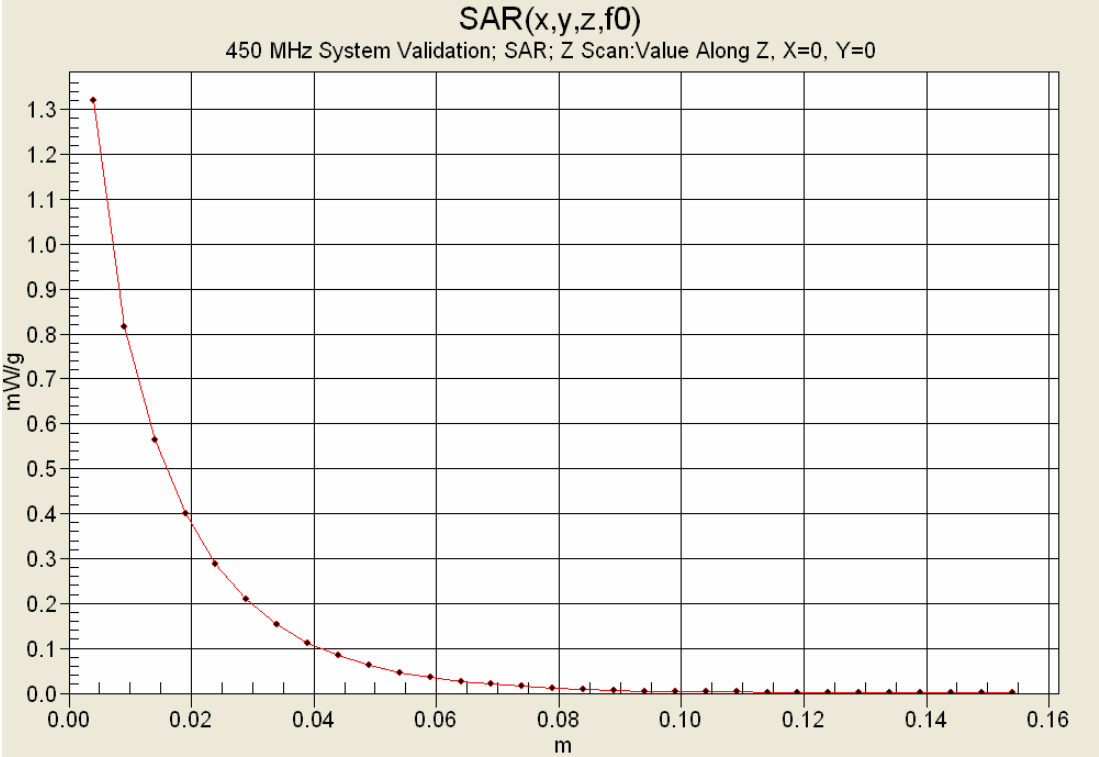
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.88 mho/m; ε_r = 44.4; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1387; ConvF(7, 7, 7); Calibrated: 16/03/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

450 MHz System Validation/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 38.7 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.820 mW/g
Maximum value of SAR (measured) = 1.35 mW/g





11. Measured Fluid Dielectric Parameters

System Validation - 450 MHz Dipole

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 23/Mar/2007
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	46.82	0.80
0.3600	44.58	0.87	46.59	0.81
0.3700	44.46	0.87	46.27	0.82
0.3800	44.34	0.87	45.81	0.83
0.3900	44.22	0.87	45.85	0.84
0.4000	44.10	0.87	45.51	0.84
0.4100	43.98	0.87	45.18	0.85
0.4200	43.86	0.87	45.02	0.86
0.4300	43.74	0.87	44.83	0.86
0.4400	43.62	0.87	44.57	0.88
0.4500	43.50	0.87	44.41	0.88
0.4600	43.45	0.87	44.34	0.89
0.4700	43.40	0.87	43.95	0.90
0.4800	43.34	0.87	43.87	0.91
0.4900	43.29	0.87	43.73	0.92
0.5000	43.24	0.87	43.31	0.93
0.5100	43.19	0.87	42.86	0.93
0.5200	43.14	0.88	43.11	0.94
0.5300	43.08	0.88	42.67	0.94
0.5400	43.03	0.88	42.90	0.95
0.5500	42.98	0.88	42.40	0.97

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_Mar07

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1387
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	March 16, 2007
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	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-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 Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: March 19, 2007

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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

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 16, 2006
Recalibrated:	March 16, 2007

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	**1.68** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**91** mV
NormY	**1.73** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.73** ± 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 **835 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.2	3.7
SAR_{be} [%]	With Correction Algorithm	0.8	0.9

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

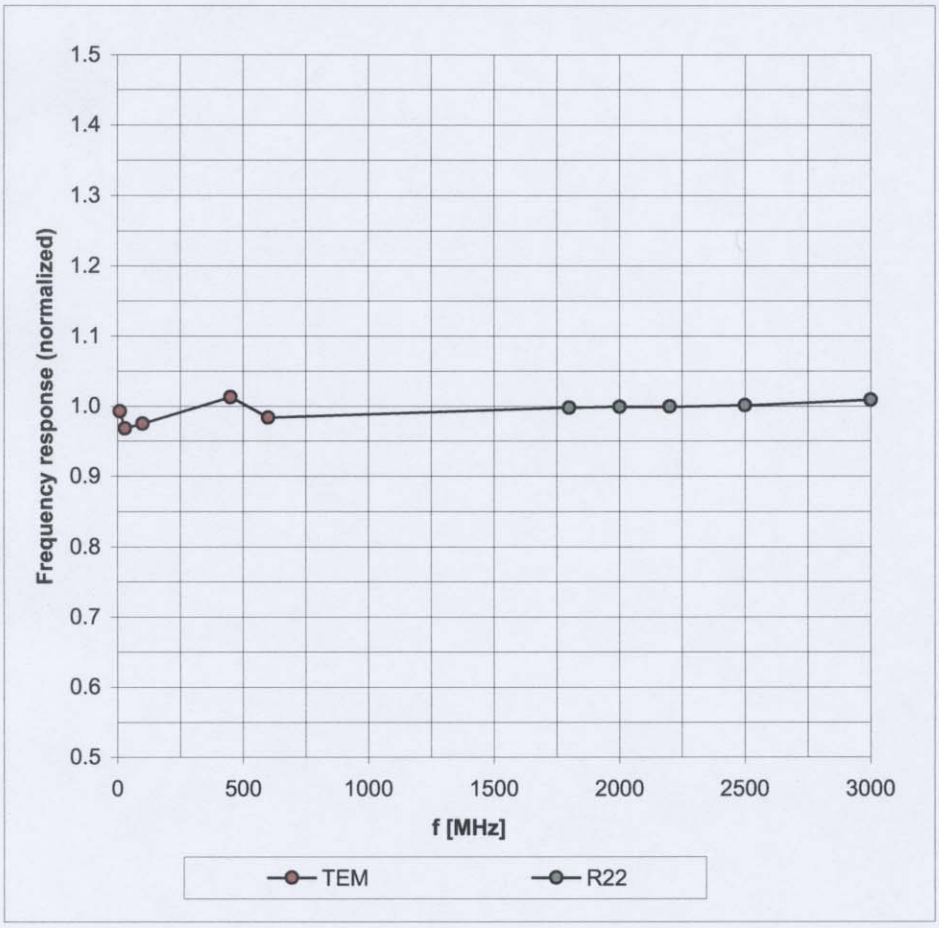
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[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.

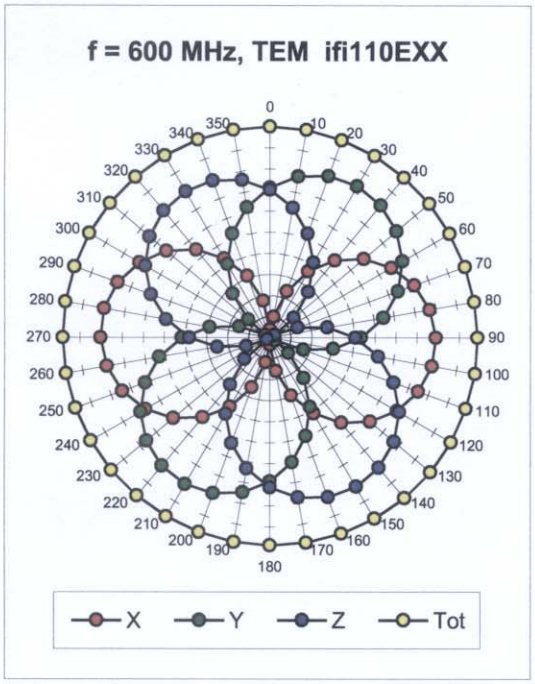
Frequency Response of E-Field

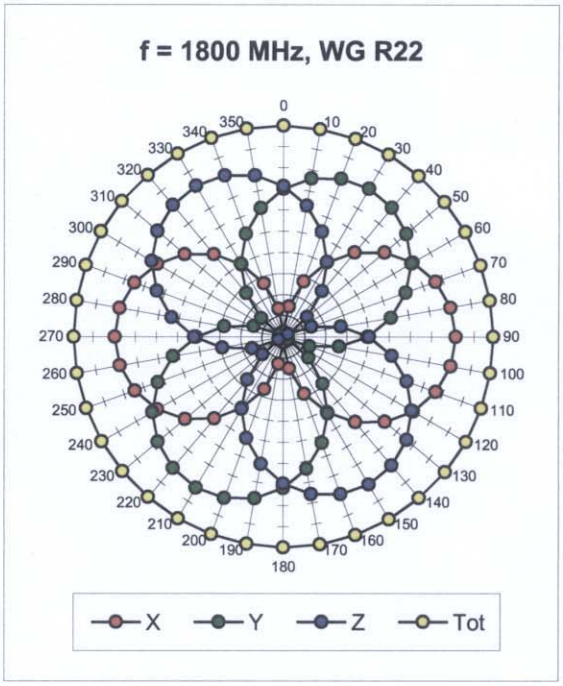
(TEM-Cell:ifi110 EXX, Waveguide: R22)

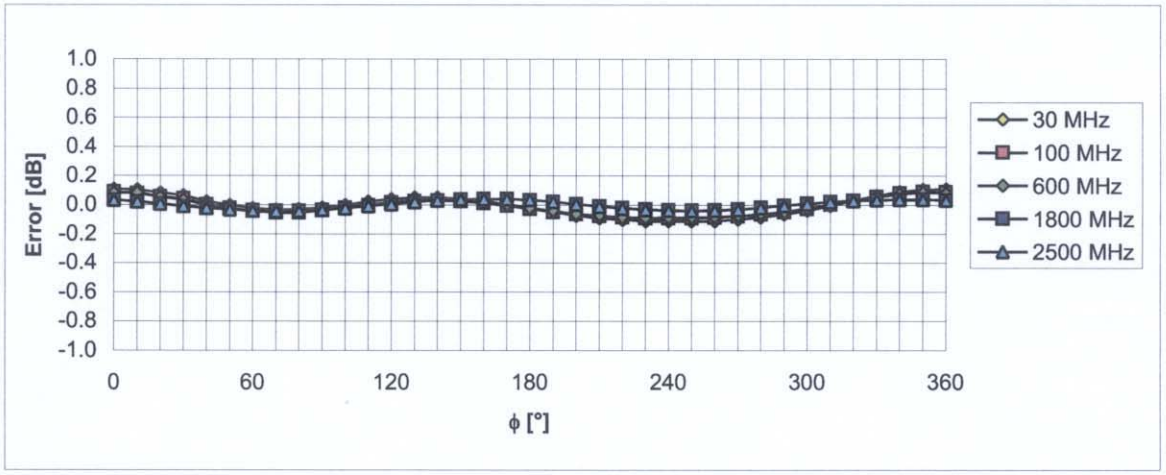


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



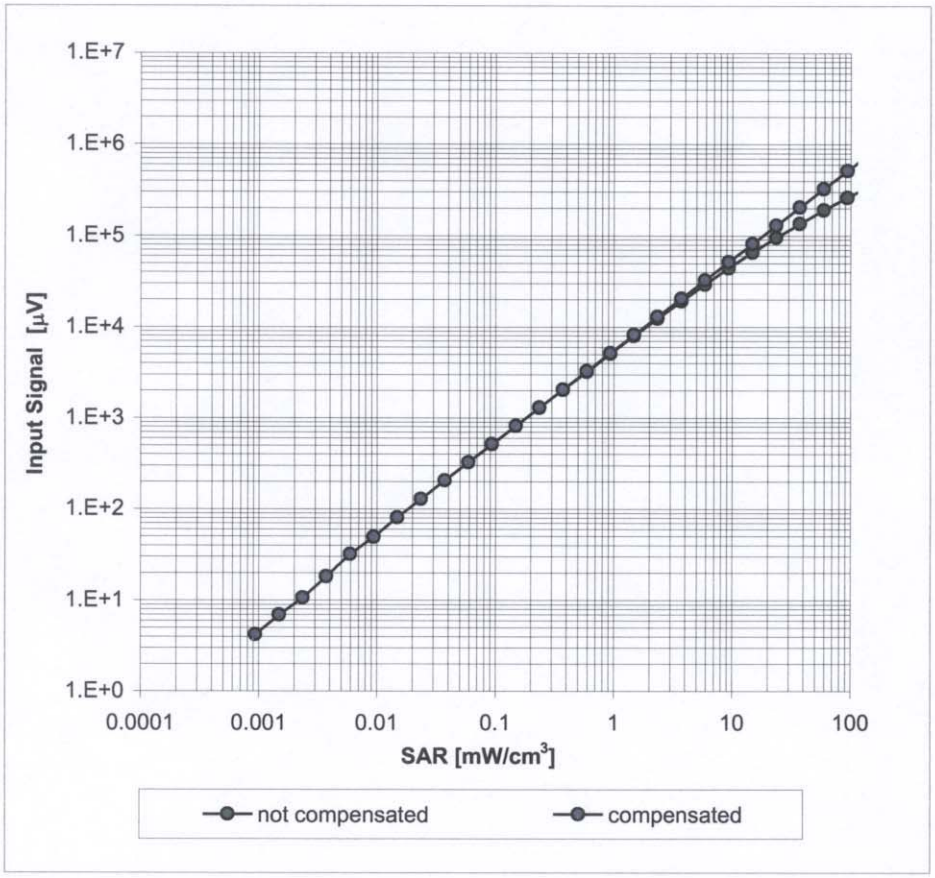


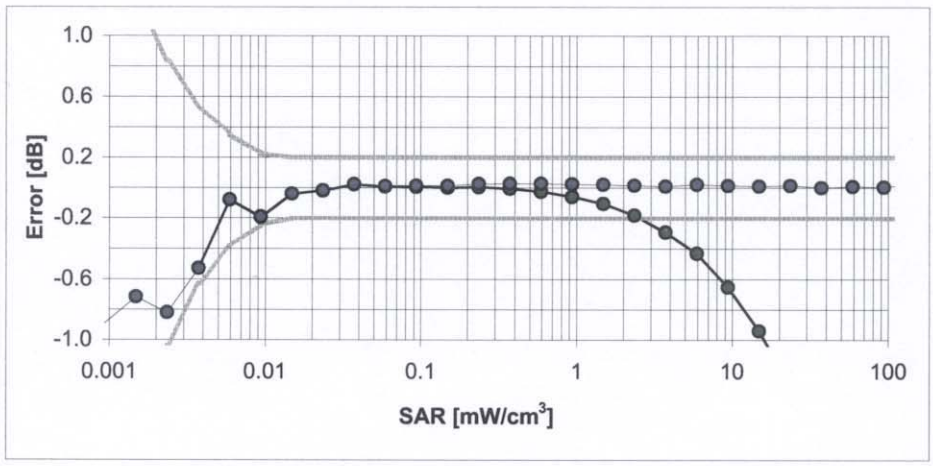


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

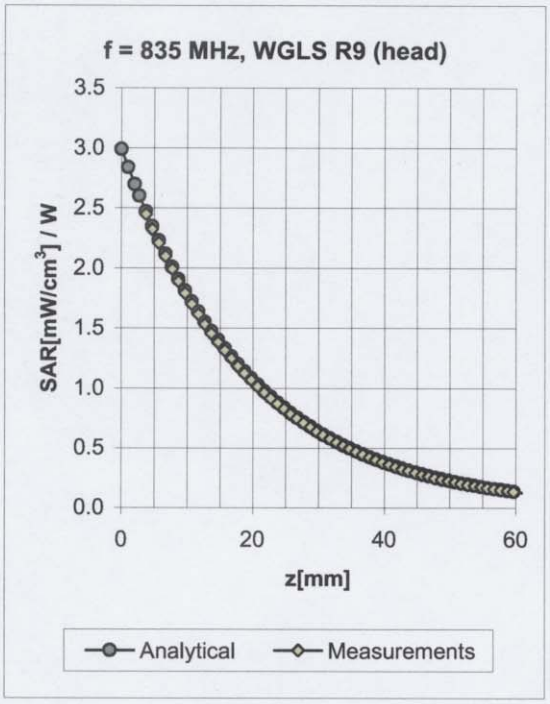
(Waveguide R22, f = 1800 MHz)

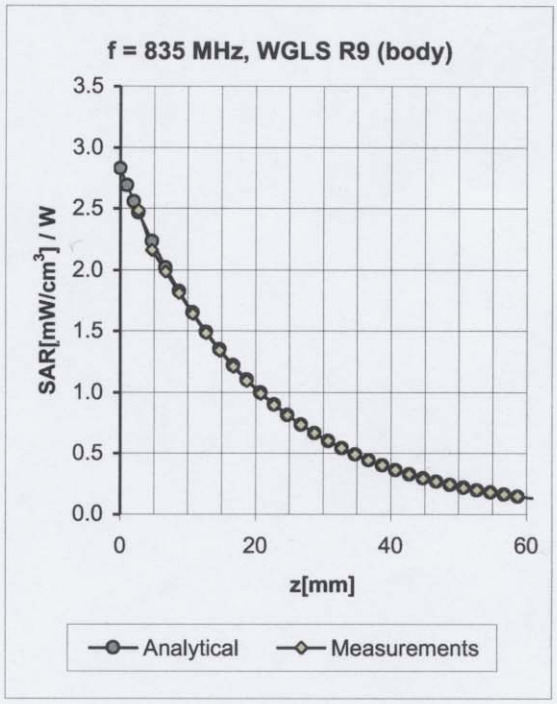




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



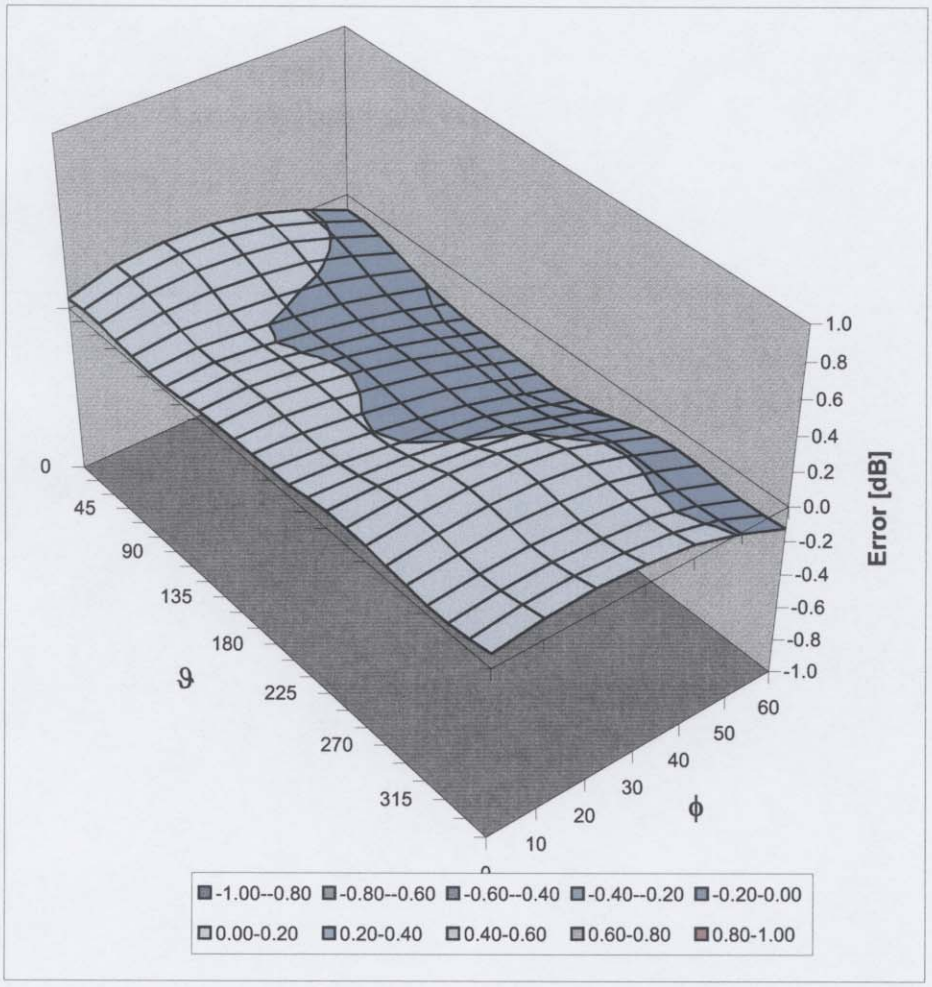


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.36	2.45	6.25 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.34	2.66	6.18 ± 11.0% (k=2)

[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

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

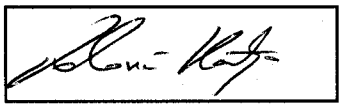
Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**March 20, 2007**
Probe Calibration Date:	**March 16, 2007**

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.

Assessed by:



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

Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

f = 150 MHz	ConvF	**7.8 ± 10%**	**ε_r = 52.3 ± 5%** **σ = 0.76 ± 5% mho/m** (head tissue)
f = 300 MHz	ConvF	**7.3 ± 9%**	**ε_r = 45.3 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
f = 450 MHz	ConvF	**7.0 ± 8%**	**ε_r = 43.5 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)
f =750 MHz	ConvF	**6.3 ± 8%**	**ε_r = 41.8 ± 5%** **σ = 0.89 ± 5% mho/m** (head tissue)
f = 150 MHz	ConvF	**7.8 ± 10%**	**ε_r = 61.9 ± 5%** **σ = 0.80 ± 5% mho/m** (body tissue)
f = 450 MHz	ConvF	**6.9 ± 8%**	**ε_r = 56.7 ± 5%** **σ = 0.94 ± 5% mho/m** (body tissue)
f = 750 MHz	ConvF	**6.0 ± 8%**	**ε_r = 55.4 ± 5%** **σ = 0.96 ± 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.