

	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

<b>SAR TEST REPORT (FCC/IC)</b>			
<b>RF EXPOSURE EVALUATION</b>		<b>SPECIFIC ABSORPTION RATE</b>	
<b>APPLICANT / MANUFACTURER</b>	<b>UNIDEN AMERICA CORPORATION</b>		
<b>DEVICE UNDER TEST (DUT)</b>	<b>PORTABLE GMRS/FRS PTT RADIO TRANSCEIVER</b>		
<b>DUT FREQUENCY RANGE(S)</b>	<b>462.5500 - 462.7250 MHz</b>	<b>GMRS Channels 15-22</b>	
	<b>462.5625 - 462.7125 MHz</b>	<b>GMRS/FRS Channels 1-7</b>	
	<b>467.5625 - 467.7125 MHz</b>	<b>FRS Channels 8-14</b>	
<b>DUT MODEL(S)</b>	<b>GMR2875</b>	<b>GMR2872</b>	
<b>DEVICE IDENTIFIER(S)</b>	<b>FCC ID:</b> <b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>
<b>APPLICATION TYPE</b>	<b>FCC/IC Certification</b>		
<b>STANDARD(S) APPLIED</b>	<b>FCC 47 CFR §2.1093</b>		
	<b>Health Canada Safety Code 6</b>		
<b>PROCEDURE(S) APPLIED</b>	<b>FCC OET Bulletin 65, Supplement C (Edition 01-01)</b>		
	<b>FCC Mobile &amp; Portable RF Exp. Proc. (KDB 447498 D01 v03r03)</b>		
	<b>Industry Canada RSS-102 Issue 3</b>		
	<b>IEEE 1528-2003</b>	<b>IEC 62209-2 (Draft)</b>	
<b>RF EXPOSURE CATEGORY</b>	<b>General Population / Uncontrolled</b>		
<b>RF EXPOSURE EVALUATION(S)</b>	<b>Face-held</b>		
<b>DATE(S) OF EVALUATION(S)</b>	<b>July 08, 2009</b>		
<b>TEST REPORT SERIAL NO.</b>	<b>070709AMW-T972-S95U</b>		
<b>TEST REPORT REVISION NO.</b>	<b>Revision 1.1</b>	<b>Add Model Listing GMR2872</b>	<b>Aug. 12, 2009</b>
	<b>Revision 1.0</b>	<b>Initial Release</b>	<b>July 20, 2009</b>
<b>TEST REPORT SIGNATORIES</b>	<b>Testing Performed By</b>		<b>Test Report Prepared By</b>
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<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
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## DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

<b>Test Lab Information</b>	<b>Name</b>	CELLTECH LABS INC.				
	<b>Address</b>	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada				
<b>Applicant Information</b>	<b>Name</b>	UNIDEN AMERICA CORPORATION				
	<b>Address</b>	4700 Amon Carter Boulevard, Fort Worth, Texas 76155 United States				
<b>Standard(s) Applied</b>	<b>FCC</b>	47 CFR §2.1093	<b>IC</b>	Health Canada Safety Code 6		
<b>Procedure(s) Applied</b>	<b>FCC</b>	OET Bulletin 65, Supplement C (Edition 01-01)				
		Mobile & Portable RF Exposure Procedures (KDB 447498 D01 v03r03)				
	<b>IC</b>	RSS-102 Issue 3	<b>IEEE</b>	1528-2003	<b>IEC</b>	62209-2 (Draft)
<b>Device Identifier(s)</b>	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042		
<b>Device Model(s) Tested</b>	GMR2875					
<b>Additional Device Model(s)</b>	GMR2872 (The only model difference is enclosure color and vibrate alert function on GMR2875)					
<b>Test Sample Serial No.(s)</b>	1 (Identical Prototype)					
<b>Device Description</b>	Portable FM UHF GMRS/FRS Push-To-Talk (PTT) Radio Transceiver (Submersible)					
<b>Transmit Frequency Range(s)</b>	462.5500 - 462.7250 MHz (GMRS Channels 15-22)					
	462.5625 - 462.7125 MHz (GMRS/FRS Channels 1-7)					
	467.5625 - 467.7125 MHz (FRS Channels 8-14)					
<b>RF Output Power Measured</b>	1.4 Watts	31.46 dBm	Conducted	462.5625 MHz	GMRS Ch. 1 (Boost Mode)	
<b>Manufacturer's Rated Power</b>	1.4 Watts	31.46 dBm	Conducted	Nominal	GMRS Boost Mode	
	0.8 Watts	29.03 dBm	Conducted	Nominal	GMRS Normal Mode	
	0.45 Watts	26.53 dBm	Conducted	Nominal	FRS Normal Mode	
	NiMH Battery Pack		4.8 V	700 mAh	Model: BP38	
<b>Battery Type(s) Tested</b>						
<b>Antenna Type(s) Tested</b>	External Non-detachable					
<b>Antenna Gain Specification</b>	0.5 dBi					
<b>Body-worn Accessories Tested</b>	None (Plastic Belt-Clip accessory for carrying purpose only)					
<b>Audio Accessories Tested</b>	None (DUT does not have provision for external audio input)					
<b>Max. SAR Level(s) Evaluated</b>	Face-held	0.752 W/kg	1g	50% PTT duty cycle	General Population / Uncontrolled RF Exposure Environment	
<b>FCC/IC Spatial Peak SAR Limit</b>	Head/Face	1.6 W/kg	1g	50% PTT duty cycle		
<p>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 for the General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 3, IEEE Standard 1528-2003 and International Standard IEC 62209-2 (Draft). All measurements were performed in accordance with the SAR system manufacturer recommendations.</p>						
<p>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.</p>						
<p>The results and statements contained in this report pertain only to the device(s) evaluated.</p>						
<p>This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.</p>						
<b>Test Report Approved By</b>			<b>Sean Johnston</b>	<b>Celltech Labs Inc.</b>		



<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
<b>Model(s):</b>	GMR2875, GMR2872	Portable GMRS/FRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

<b>TABLE OF CONTENTS</b>	
<b>1.0 INTRODUCTION</b>	<b>4</b>
<b>2.0 SAR MEASUREMENT SYSTEM</b>	<b>4</b>
<b>3.0 MEASUREMENT SUMMARY</b>	<b>5</b>
<b>4.0 DETAILS OF SAR EVALUATION</b>	<b>6</b>
<b>5.0 EVALUATION PROCEDURES</b>	<b>6</b>
<b>6.0 SYSTEM PERFORMANCE CHECK</b>	<b>7</b>
<b>7.0 SAR PROBE CALIBRATION &amp; MEASUREMENT FREQUENCIES</b>	<b>8</b>
<b>8.0 SIMULATED EQUIVALENT TISSUES</b>	<b>8</b>
<b>9.0 SAR LIMITS</b>	<b>8</b>
<b>10.0 ROBOT SYSTEM SPECIFICATIONS</b>	<b>9</b>
<b>11.0 PROBE SPECIFICATION (ET3DV6)</b>	<b>10</b>
<b>12.0 SIDE PLANAR PHANTOM</b>	<b>10</b>
<b>13.0 VALIDATION PLANAR PHANTOM</b>	<b>10</b>
<b>14.0 DEVICE HOLDER</b>	<b>10</b>
<b>15.0 TEST EQUIPMENT LIST</b>	<b>11</b>
<b>16.0 MEASUREMENT UNCERTAINTIES</b>	<b>12</b>
<b>17.0 REFERENCES</b>	<b>13</b>
<b>APPENDIX A - SAR MEASUREMENT DATA</b>	<b>14</b>
<b>APPENDIX B - SYSTEM PERFORMANCE CHECK DATA</b>	<b>18</b>
<b>APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS</b>	<b>21</b>
<b>APPENDIX D - SAR TEST SETUP PHOTOGRAPHS</b>	<b>23</b>
<b>APPENDIX E - DIPOLE CALIBRATION (FCC KDB 250418) &amp; PROBE CALIBRATION</b>	<b>25</b>

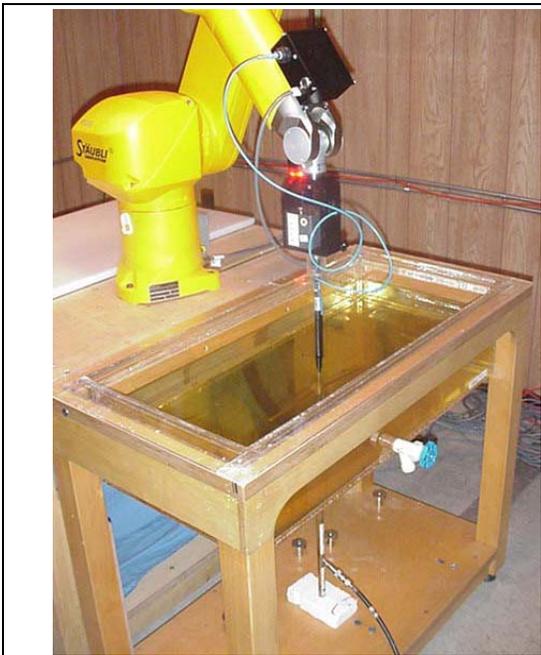
	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 1.0 INTRODUCTION

This measurement report demonstrates compliance of the Uniden America Corporation Model(s): GMR2875, GMR2872 Portable FM GMRS/FRS PTT Radio Transceiver 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]), IC RSS-102 Issue 3 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and International Standard IEC 62209-2 Draft (see reference [6]) 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 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 Body 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 utilizes a controller with built in VME-bus computer.



**DASY4 SAR System with Plexiglas validation phantom**



**DASY4 SAR System with Plexiglas side planar phantom**

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<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

### 3.0 MEASUREMENT SUMMARY

## SAR EVALUATION RESULTS

Test Type	Freq. MHz	Channel		Test Mode	Battery Type	DUT Position to Planar Phantom	DUT Spacing to Planar Phantom		Cond. Power Before Test Watts	Measured SAR 1g (W/kg)		SAR Drift During Test dB	Scaled SAR with droop 1g (W/kg)	
							DUT	Antenna		PTT Duty Cycle			PTT Duty Cycle	
										100%	50%		100%	50%
Face	462.5625	1	GMRS	CW	NiMH	Front Side	2.5 cm	4.3 cm	1.4 Boost	1.31	0.655	-0.597	1.50	0.752
SAR LIMIT(S)						HEAD	SPATIAL PEAK		RF EXPOSURE CATEGORY					
FCC 47 CFR 2.1093		Health Canada Safety Code 6				1.6 W/kg		averaged over 1 gram		General Population / Uncontrolled				
Test Date(s)		July 08, 2009						Atmospheric Pressure		101.1		kPa		
Measured Fluid		450 MHz Head		460 MHz Head		Relative Humidity		35		%				
Dielectric Constant $\epsilon_r$		IEEE Target		Measured	Deviation	Ambient Temperature		23.0		°C				
		43.5	± 5%	44.6	+2.6%	Fluid Temperature		22.5		°C				
Conductivity $\sigma$ (mho/m)		IEEE Target		Measured	Deviation	Fluid Depth		≥ 15		cm				
		0.87	± 5%	0.86	-1.2%	$\rho$ (Kg/m <sup>3</sup> )		1000						

**Notes**

1. Device Model Tested: GMR2875 (Note: The only model differences are enclosure color and vibrate alert function on GMR2875)
2. Detailed measurement plots showing the maximum SAR location of the DUT are reported in Appendix A.
3. The transmission band of the DUT is less than 10 MHz; therefore single channel data only is required to be reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
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 the scaled SAR result as shown in the above test data table. A SAR-versus-Time power droop evaluation was also performed and the evaluation plot is shown in Appendix A (SAR Test Plots).
5. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the PTT depressed.

6.	<b>SAR Evaluation Power Thresholds for PTT Devices, <math>f \leq 0.5</math> GHz (FCC KDB 447498 D01 v03r03 Section 5)b(i))</b>						<b>Measured RF Conducted Output Power</b>			
							<b>GMRS Boost Mode</b>		<b>FRS Mode</b>	
							PTT Duty Cycle		PTT Duty Cycle	
	<b>Exposure Conditions</b>		<b>P mW (General Population)</b>		<b>P mW (Occupational)</b>		100%	50%	100%	50%
	Held to face, $d \geq 2.5$ cm		250		1250		1.4 W	0.7 W	0.45 W	0.225 W
	Body-worn, $d \geq 1.5$ cm		200		1000		[REDACTED]			
Body-worn, $d \geq 1.0$ cm		150		750						
<ol style="list-style-type: none"> <li>1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds.</li> <li>2. The closest distance between the user and the device or its antenna is used to determine the power thresholds.</li> </ol>										

	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 4.0 DETAILS OF SAR EVALUATION

The Uniden America Corporation Model(s): GMR2875, GMR2872 Portable FM GMRS/FRS PTT Radio Transceiver 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.

- 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 spacing was maintained between the front of the DUT and the outer surface of the planar phantom.
- The DUT was not evaluated for body-worn SAR due to the radio does not have provision for external audio input. The customer-supplied plastic belt-clip accessory is for carrying/storage purpose only.
- The RF conducted output power of the DUT was measured by Celltech Labs Inc. prior to the SAR evaluations at the internal antenna connector using an RF cable and Gigatronics 8652A Universal Power Meter in accordance with the requirements of FCC 47 CFR §2.1046 and IC RSS-Gen.
- The area scan evaluation was performed with a fully charged battery pack. After the area scan was completed the battery pack was replaced with a fully charged battery pack prior to the zoom scan evaluation.
- The DUT was tested at the maximum power setting (boost mode) on GMRS Channel 1 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.
- The fluid temperature was measured prior to and after the SAR evaluations to ensure the temperature remained within  $\pm 2^{\circ}\text{C}$  of the fluid temperature reported during the dielectric parameter measurements.
- The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

## 5.0 EVALUATION PROCEDURES

- 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.
  - For body-worn and face-held devices a planar phantom was used.
- 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:
- 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.
- 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:
- 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 E). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- 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).
- 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  $\geq 800$  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.

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<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
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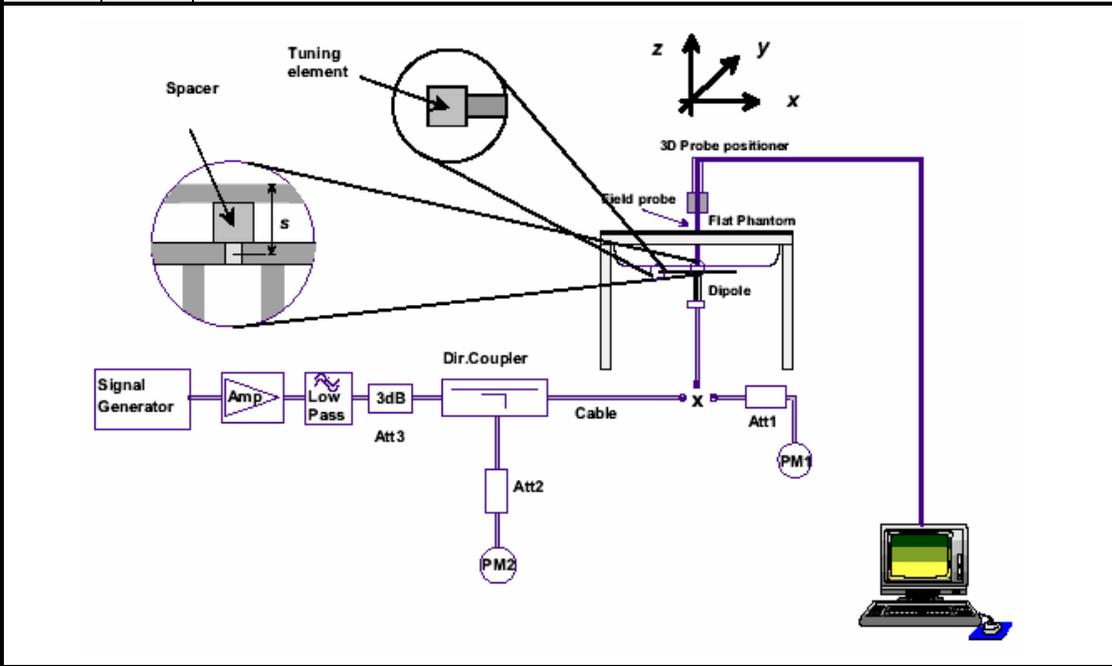
## 6.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluation a daily system check was performed using a Plexiglas planar phantom and 450 MHz dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$  from the system validation target SAR value (see Appendix E for system validation target SAR value listed on page 10 of the dipole calibration report).

### SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue Freq. (MHz)	SAR 1g (W/kg)			Dielectric Constant $\epsilon_r$			Conductivity $\sigma$ (mho/m)			$\rho$ (Kg/m <sup>3</sup> )	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.						
Jul 08	Head 450	1.22 $\pm 10\%$	1.18	-3.2%	43.8 $\pm 5\%$	44.0	+0.5%	0.86 $\pm 5\%$	0.85	-1.0%	1000	23.0	22.5	$\geq 15$	35	101.1

- |              |    |  |
|--------------|----|--|
| <b>Notes</b> | 1. | The target SAR value is referenced from the System Validation performed by Celltech Labs Inc. (see Appendix E).  |
|              | 2. | The target dielectric parameters are referenced from the System Validation performed by Celltech Labs Inc. (see Appendix E).   |
|              | 3. | The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within $\pm 2^\circ\text{C}$ of the fluid temperature reported during the dielectric parameter measurements. |
|              | 4. | The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).  |



System Performance Check Measurement Setup (IEEE 1528-2003)
450 MHz Validation Dipole Setup

	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 7.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within  $\pm 50$  MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within  $\pm 100$  MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals,  $\pm 25$  MHz < 300 MHz and  $\pm 50$  MHz  $\geq 300$  MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [9]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	$\pm 50$ MHz $\geq$ 300 MHz
450 MHz	462.5625 MHz	12.5625 MHz	< 50 MHz
The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps are not required.			

## 8.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see reference [10]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

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

## 9.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	General Population	Occupational
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		1.6 W/kg	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
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.			

Applicant:	Uniden America Corporation	FCC ID:	AMWUT042	IC:	513C-UT042	
Model(s):	GMR2875, GMR2872	Portable GMRS/FRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 10.0 ROBOT SYSTEM SPECIFICATIONS

<u>Specifications</u>	
<b>Positioner</b>	Stäubli Unimation Corp. Robot Model: RX60L
<b>Repeatability</b>	0.02 mm
<b>No. of axis</b>	6
<u>Data Acquisition Electronic (DAE) System</u>	
<u>Cell Controller</u>	
<b>Processor</b>	AMD Athlon XP 2400+
<b>Clock Speed</b>	2.0 GHz
<b>Operating System</b>	Windows XP Professional
<u>Data Converter</u>	
<b>Features</b>	Signal Amplifier, multiplexer, A/D converter, and control logic
<b>Software</b>	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
<b>Connecting Lines</b>	Optical downlink for data and status info., Optical uplink for commands and clock
<u>DASY4 Measurement Server</u>	
<b>Function</b>	Real-time data evaluation for field measurements and surface detection
<b>Hardware</b>	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
<b>Connections</b>	COM1, COM2, DAE, Robot, Ethernet, Service Interface
<u>E-Field Probe</u>	
<b>Model</b>	ET3DV6
<b>Serial No.</b>	1590
<b>Construction</b>	Triangular core fiber optic detection system
<b>Frequency</b>	10 MHz to 6 GHz
<b>Linearity</b>	±0.2 dB (30 MHz to 3 GHz)
<u>Evaluation Phantom</u>	
<b>Type</b>	Side Planar Phantom
<b>Shell Material</b>	Plexiglas
<b>Bottom Thickness</b>	2.0 mm ± 0.1 mm
<b>Outer Dimensions</b>	75.0 cm (L) x 22.5 cm (W) x 20.5 cm (H); Back Plane: 25.7 cm (H)
<u>Validation Phantom (≤ 450MHz)</u>	
<b>Type</b>	Planar Phantom
<b>Shell Material</b>	Plexiglas
<b>Bottom Thickness</b>	6.2 mm ± 0.1 mm
<b>Outer Dimensions</b>	86.0 cm (L) x 39.5 cm (W) x 21.8 cm (H)

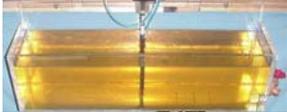
<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
<b>Model(s):</b>	GMR2875, GMR2872	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 11.0 PROBE SPECIFICATION (ET3DV6)

<p><b>Construction:</b> Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)</p> <p><b>Calibration:</b> In air from 10 MHz to 2.5 GHz In Body simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy <math>\pm 8\%</math>)</p> <p><b>Frequency:</b> 10 MHz to &gt; 6 GHz; Linearity: <math>\pm 0.2</math> dB (30 MHz to 3 GHz)</p> <p><b>Directivity:</b> <math>\pm 0.2</math> dB in Body tissue (rotation around probe axis) <math>\pm 0.4</math> dB in Body tissue (rotation normal to probe axis)</p> <p><b>Dynamic Range:</b> 5 <math>\mu</math>W/g to &gt; 100 mW/g; Linearity: <math>\pm 0.2</math> dB</p> <p><b>Surface Detect:</b> <math>\pm 0.2</math> mm repeatability in air and clear liquids over diffuse reflecting surfaces</p> <p><b>Dimensions:</b> 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</p> <p><b>Application:</b> General dosimetry up to 3 GHz Compliance tests of mobile phone</p>	
<b>ET3DV6 E-Field Probe</b>	

## 12.0 SIDE PLANAR PHANTOM

<p>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.</p>	
<b>Plexiglas Side Planar Phantom</b>	

## 13.0 VALIDATION PLANAR PHANTOM

<p>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.</p>	
<b>Plexiglas Validation Planar Phantom</b>	

## 14.0 DEVICE HOLDER

<p>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.</p>	
<b>Device Holder</b>	

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 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	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	28Apr09	28Apr10
x	-ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
x	-Celltech 450 MHz Validation Dipole	00024	136	19Jan09	19Jan10
x	-Plexiglas Side Planar Phantom	00156	161	CNR	CNR
x	-Plexiglas Validation Planar Phantom	00157	137	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	23Apr08	21Jul09
x	Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	21Jul09
x	HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr10
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 16.0 MEASUREMENT UNCERTAINTIES

### UNCERTAINTY BUDGET FOR DEVICE EVALUATION

Uncertainty Component	IEEE 1528 Section	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value $\pm\%$ (1g)	Uncertainty Value $\pm\%$ (10g)	$V_i$ or $V_{eff}$
<b>Measurement System</b>									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	$\infty$
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	$\infty$
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	$\infty$
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	$\infty$
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	$\infty$
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	$\infty$
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	$\infty$
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
<b>Test Sample Related</b>									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	5	Rectangular	1.732050808	1	1	2.9	2.9	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	$\infty$
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	$\infty$
Liquid Conductivity (measured)	E.3.3	1.2	Normal	1	0.64	0.43	0.8	0.5	$\infty$
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	$\infty$
Liquid Permittivity (measured)	E.3.3	2.6	Normal	1	0.6	0.49	1.6	1.3	$\infty$
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>11.14</b>	<b>10.96</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>22.28</b>	<b>21.92</b>	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## 17.0 REFERENCES

- [1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.
- [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 (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 3: June 2009.
- [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] International Standard IEC 62209-2 Draft (106-62209-2-CDV\_090323) - "Human exposure to radio frequency fields from hand-held & body-mounted wireless comm. devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (30 MHz to 6 GHz)".
- [7] International Standard IEC 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."
- [8] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01 v03r03: January 2009.
- [9] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.
- [10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.

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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

**APPENDIX A - SAR MEASUREMENT DATA**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

Date Tested: 07/08/2009

**Face-held SAR - GMRS - Boost Mode - Channel 1 - 462.5625 MHz**

**DUT: Uniden; Model: GMR2875; Type: Portable GMRS/FRS PTT Radio Transceiver; Serial: 1 (Pre-production)**

Ambient Temp: 23.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF FM (CW)

Frequency: 462.5625 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 462.5625 \text{ MHz}$ ;  $\sigma = 0.86 \text{ mho/m}$ ;  $\epsilon_r = 44.6$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- 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**

**Area Scan (8x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.54 mW/g

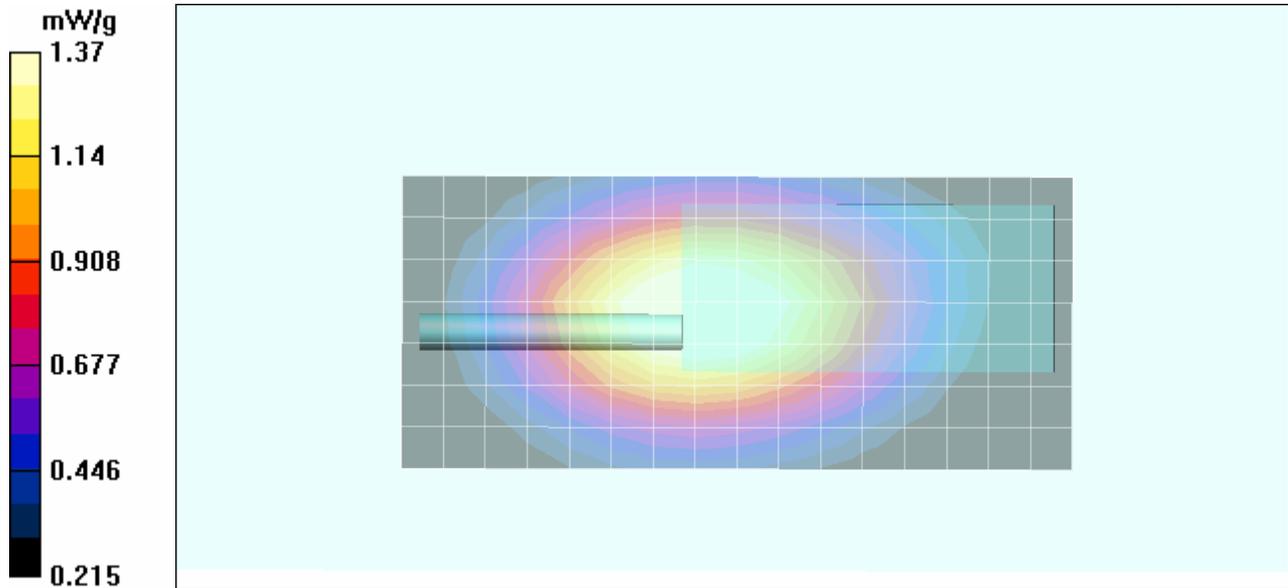
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 42.1 V/m; Power Drift = -0.597 dB

Peak SAR (extrapolated) = 1.83 W/kg

**SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.959 mW/g**

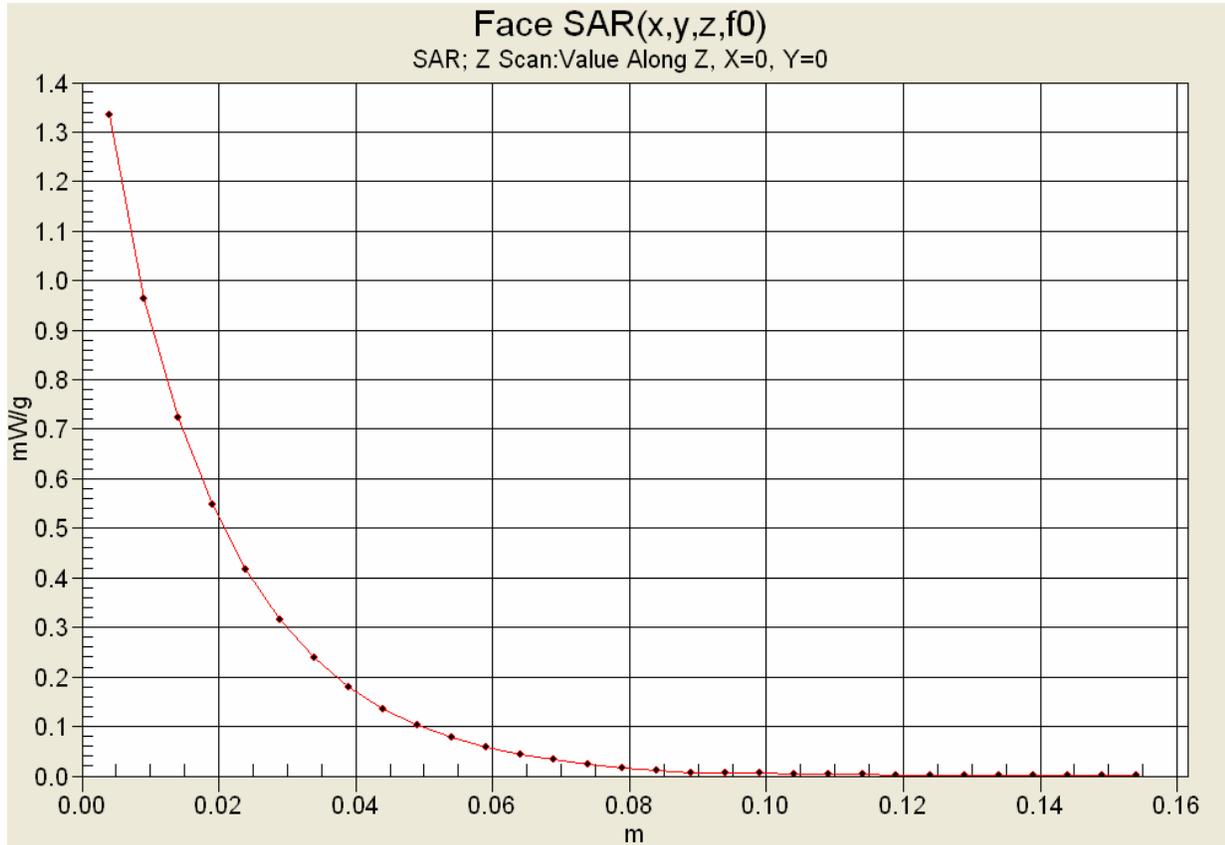
Maximum value of SAR (measured) = 1.37 mW/g



<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
<b>Model(s):</b>	GMR2875, GMR2872	Portable GMRS/FRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## Z-Axis Scan

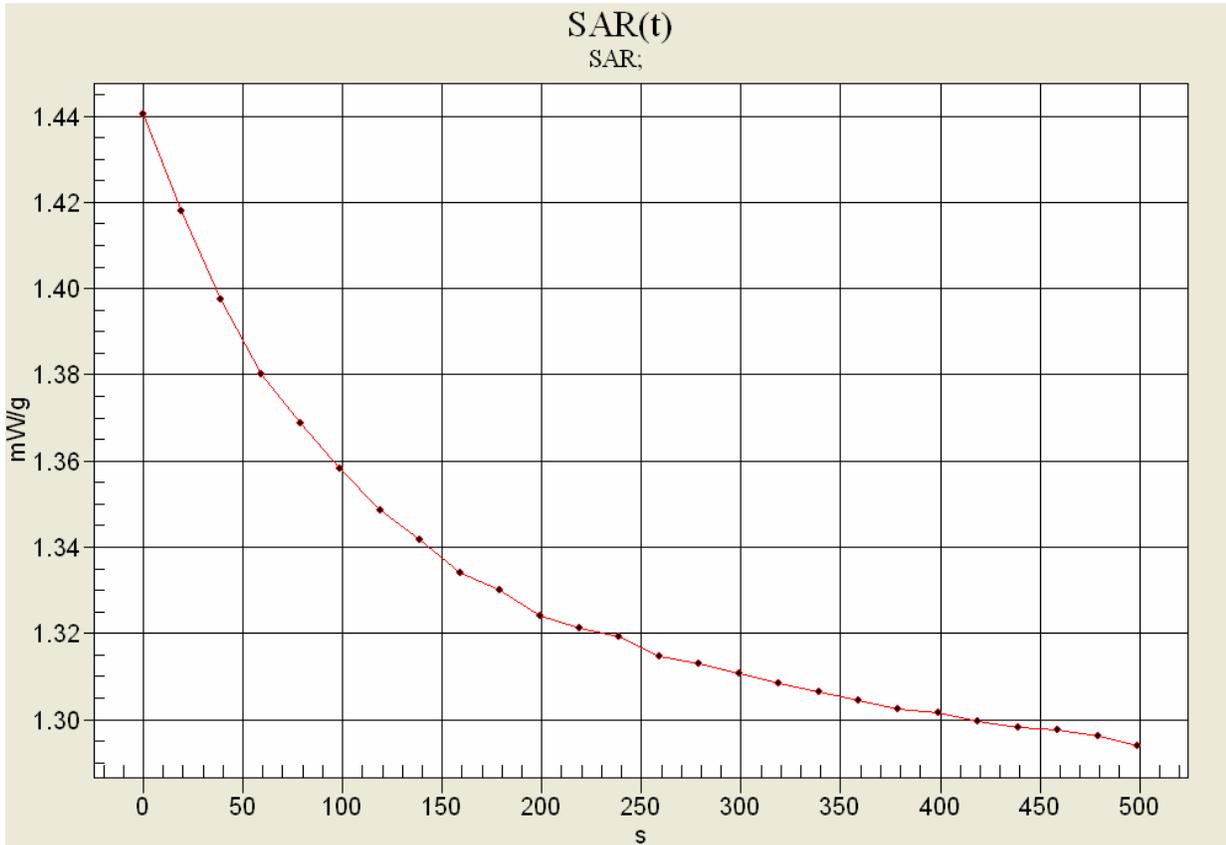


<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

### SAR-versus-Time Droop Evaluation

Face-held Configuration  
GMRS Boost Mode  
Ch. 1 (462.5625 MHz)  
NiMH Battery Pack



Start SAR: 1.44038 mW/g  
End SAR: 1.29395 mW/g (-0.466 dB)  
SAR after 340s: 1.30632 mW/g (-0.424 dB)  
(340s = Zoom Scan Duration)  
(500s = Area Scan Duration)

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

**APPENDIX B - SYSTEM PERFORMANCE CHECK DATA**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

Date Tested: 07/08/2009

## System Performance Check - 450 MHz Dipole - HSL

**DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Calibration: 01/19/2009**

Ambient Temp: 23.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 44$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### System Performance Check - 450 MHz Dipole

**Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.21 mW/g

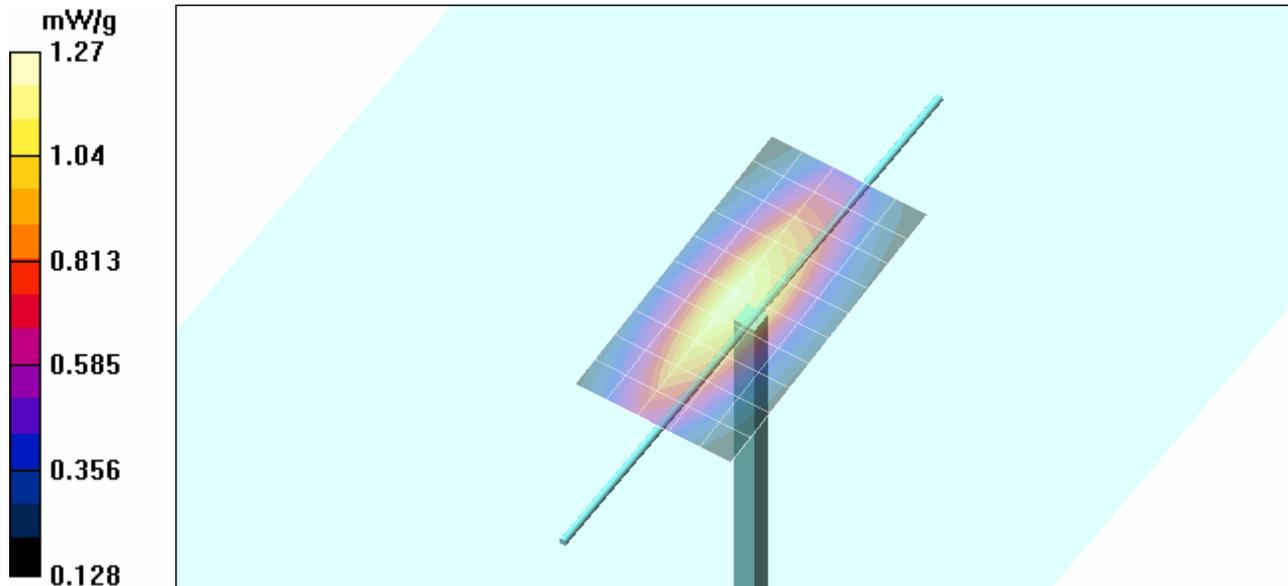
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 38.6 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 1.89 W/kg

**SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.772 mW/g**

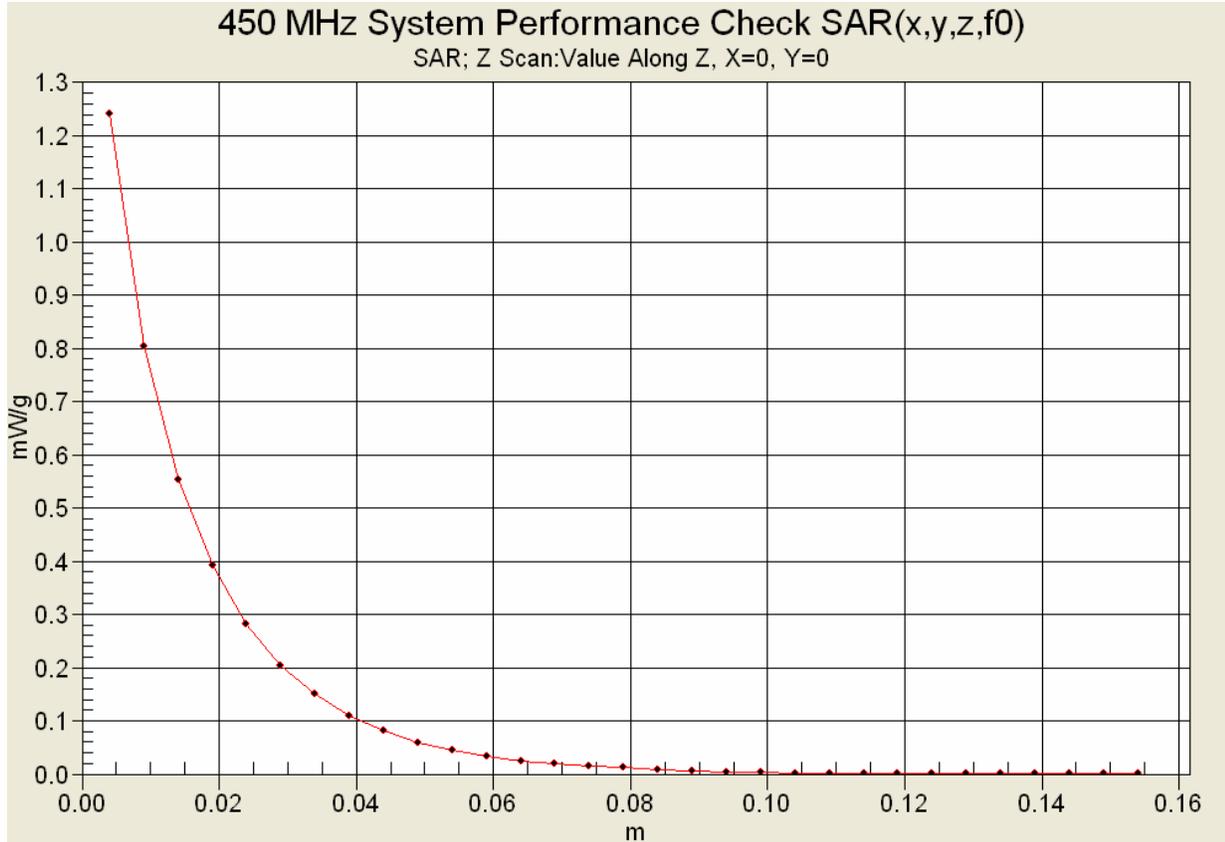
Maximum value of SAR (measured) = 1.27 mW/g



<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
<b>Model(s):</b>	GMR2875, GMR2872	Portable GMRS/FRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

### Z-Axis Scan



	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT042	<b>IC:</b>	513C-UT042	
<b>Model(s):</b>	GMR2875, GMR2872	Portable GMRS/FRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

### 450 MHz System Performance Check & 460 MHz DUT Evaluation (Head)

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
08/Jul/2009  
Frequency (GHz)  
FCC\_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon  
FCC\_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eHFCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.83
0.3600	44.58	0.87	46.44
0.3700	44.46	0.87	45.44
0.3800	44.34	0.87	45.57
0.3900	44.22	0.87	45.14
0.4000	44.10	0.87	45.20
0.4100	43.98	0.87	44.51
0.4200	43.86	0.87	44.57
0.4300	43.74	0.87	44.90
0.4400	43.62	0.87	44.48
0.4500	43.50	0.87	44.02
0.4600	43.45	0.87	44.55
0.4700	43.40	0.87	44.11
0.4800	43.34	0.87	43.68
0.4900	43.29	0.87	42.97
0.5000	43.24	0.87	43.14
0.5100	43.19	0.87	43.14
0.5200	43.14	0.88	42.55
0.5300	43.08	0.88	42.46
0.5400	43.03	0.88	42.63
0.5500	42.98	0.88	42.33

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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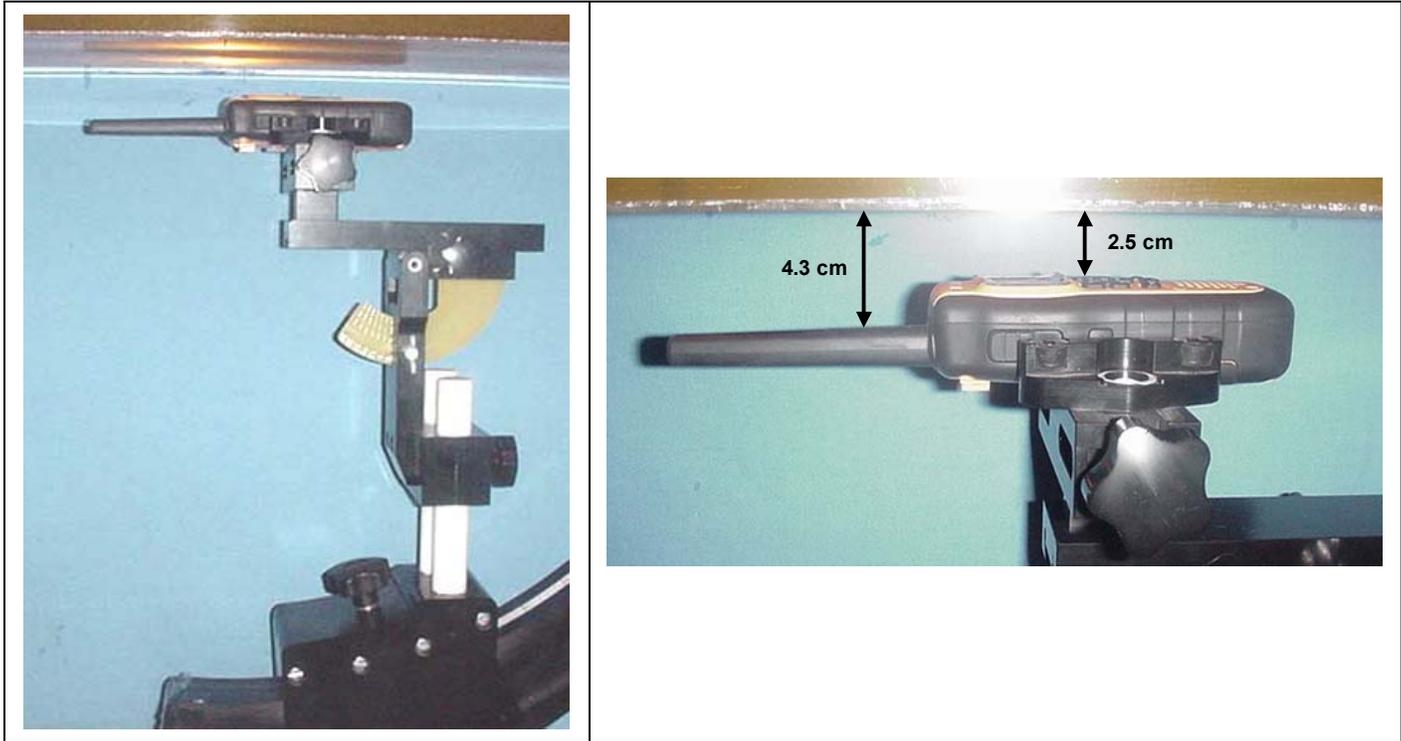
	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

**APPENDIX D - SAR TEST SETUP PHOTOGRAPHS**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>	<b>462.5500 - 467.7125 MHz</b>			
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

**FACE-HELD SAR TEST SETUP PHOTOGRAPHS**  
2.5 cm Spacing from Front of DUT to Planar Phantom



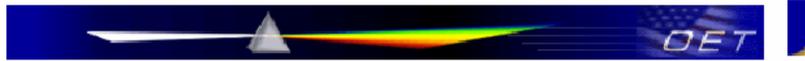
<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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	<u>Date(s) of Evaluation</u> July 08, 2009	<u>Test Report Serial No.</u> 070709AMW-T972-S95U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> August 12, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> General Population	

## APPENDIX E - DIPOLE CALIBRATION (FCC KDB 250418) & PROBE CALIBRATION



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### Office of Engineering and Technology

**Inquiry:**

Uploading 300 MHz and 450 MHz Dipole Calibration Reports

**Response:**

FCC confirmation attached for Celltech Labs Dipoles with following identifications:

Serial #: 136 / 450 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010  
 Serial #: 135 / 300 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010

A copy of the confirmation and corresponding Dipole Report(s) are required to be included in SAR reports of applicable equipment certification filings. Each filing must have KDB tracking number 250418 included on 731 Form.



The dipoles listed below have prior coordination with the FCC Lab for use in SAR system validation and verification by Celltech Labs through February 2010. The SAR target values, specific operating parameters and identifications are indicated below. SAR measurements using these dipoles must be in accordance with the parameters specified below; for example, phantom shell and tissue dielectric requirements etc. These will be verified during each equipment certification by the FCC or TCB, according to measurement protocols required for testing the specific device and wireless technology, to support the test methodologies and measurement results.

This confirmation and copies of the dipole calibration reports are required to be included in SAR reports for equipment certification containing SAR system verification results involving these dipoles. The information is available and can be verified through the KDB inquiry tracking number provided to Celltech Labs. The same tracking number must also be included on the 731 Form of the corresponding equipment certifications.

Dipole Serial Number	136	135
Calibration Document No.	DC450H-021209-R1.2	DC300H-021209-R1.2
Frequency	450 MHz	300 MHz
Dipole Impedance	58.21 + j 5.69 Ohms	46.39 + j 6.25 Ohms
Dipole Return Loss	-20.7 dB	- 22.6 dB
Tissue-Equivalent Dielectric Type	Head	
Tissue Dielectric Constant	43.5	45.3
Tissue Conductivity	0.87 S/m	0.87 S/m
Phantom Shell Thickness	6.0 mm Plexiglas	
Phantom Shell Dielectric Constant	2.7	
Dipole Axis to Tissue Medium Separation Distance	15.175 mm	
Numerical Simulation:	FDTD	
1-g SAR Target Value	4.893 W/kg @ 1.0 W	3.019 W/kg @ 1.0 W
10-g SAR Target Value	3.263 W/kg @ 1.0 W	2.051 W/kg @ 1.0 W
SAR at Phantom Surface above Dipole Feed-Point	6.845 W/kg @ 1.0 W	4.046 W/kg @ 1.0 W
SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point	3.101 W/kg @ 1.0 W	2.049 W/kg @ 1.0 W
Experimental Verification:	SAR Measurements	
1-g SAR Target Value	1.21 ~ 1.23 W/kg @ 0.25 W	0.753 ~ 0.765 W/kg @ 0.25 W
10-g SAR Target Value	0.787 ~ 0.803 W/kg @ 0.25W	0.503 ~ 0.509 W/kg @ 0.25 W
SAR at Phantom Surface above Dipole Feed-Point	1.93 W/kg (average) @ 0.25 W	1.20 W/kg (average) @ 0.25 W
SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point	0.79 W/kg @ 0.25 W	0.56 W/kg @ 0.25 W

Expires February 2010

Celltech Labs Inc.

February 13, 2009

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT042</b>	<b>IC:</b>	<b>513C-UT042</b>	
<b>Model(s):</b>	<b>GMR2875, GMR2872</b>	<b>Portable GMRS/FRS PTT Radio Transceiver</b>		<b>462.5500 - 467.7125 MHz</b>		
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	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:

## 450 MHz Dipole Calibration

Type:

**450 MHz Validation Dipole**

Asset Number:

**00024**

Serial Number:

**136**

Place of Calibration:

**Celltech Labs Inc.**

Date(s) of Calibration:

**Jan. 19 & Feb. 09, 2009**

**Celltech Labs Inc. certifies that the 450 MHz Dipole Calibration was performed on the date(s) indicated above.**

Calibrated by:

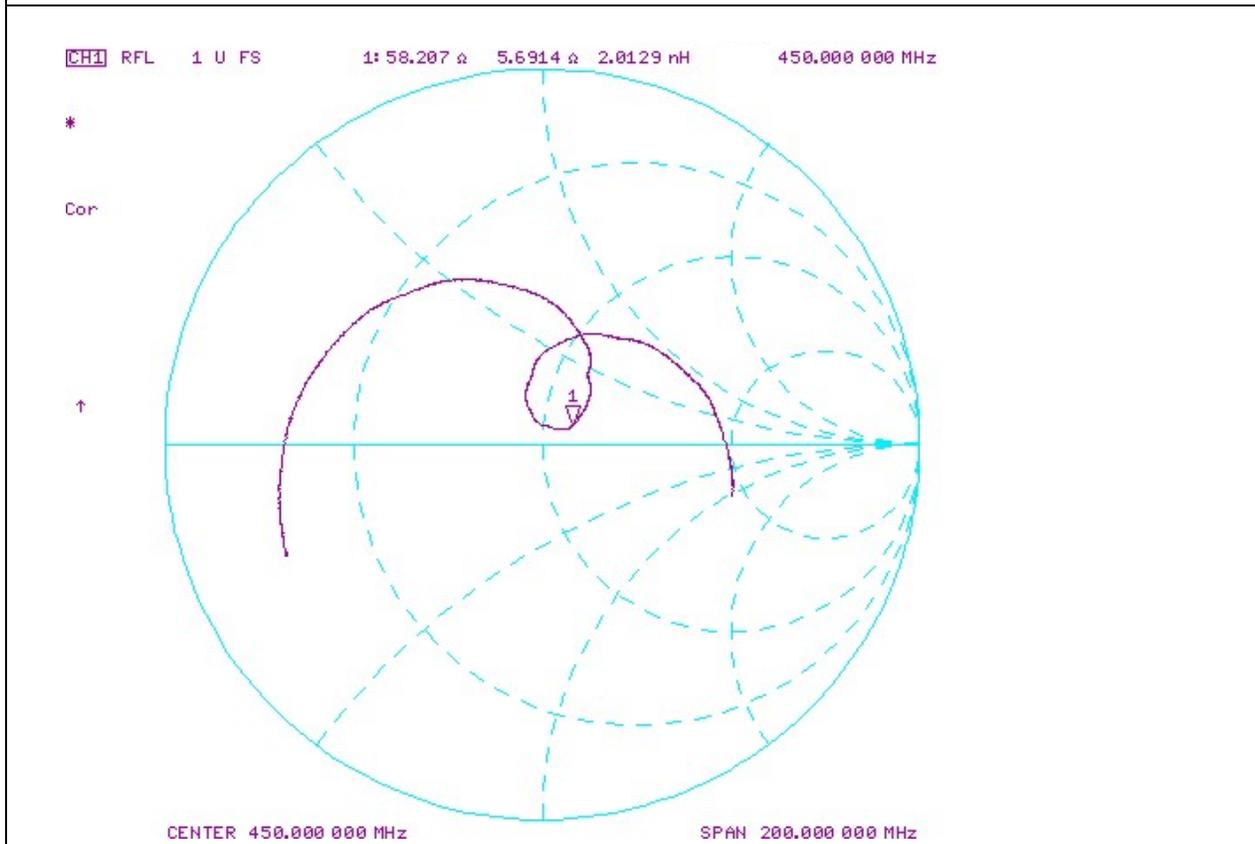
**Sean Johnston**

Signature:





## 2. Validation Dipole VSWR Data



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type: Head

### 3. Validation Dipole Dimensions

Dimension	IEEE 1528 (mm)	Measured (mm)	Difference (mm)	Tolerance (1528 1%)
L (mm)	270.0	272.7	+2.7	+1%
h (mm)	166.7	167.0	+0.3	+0.2%
d (mm)	6.35	6.36	+0.01	+0.2%

The L, h and d dimensions should be within  $\pm 1\%$  tolerance per 1528-2003.

### 4. Validation Phantom

The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material. The dielectric constant used for the numerical analysis was 2.7. The typical range of 2.5 - 3 was selected and the mean of this value was used for the simulation.

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  $6.0 \pm 0.1\text{mm}$  Plexiglas.

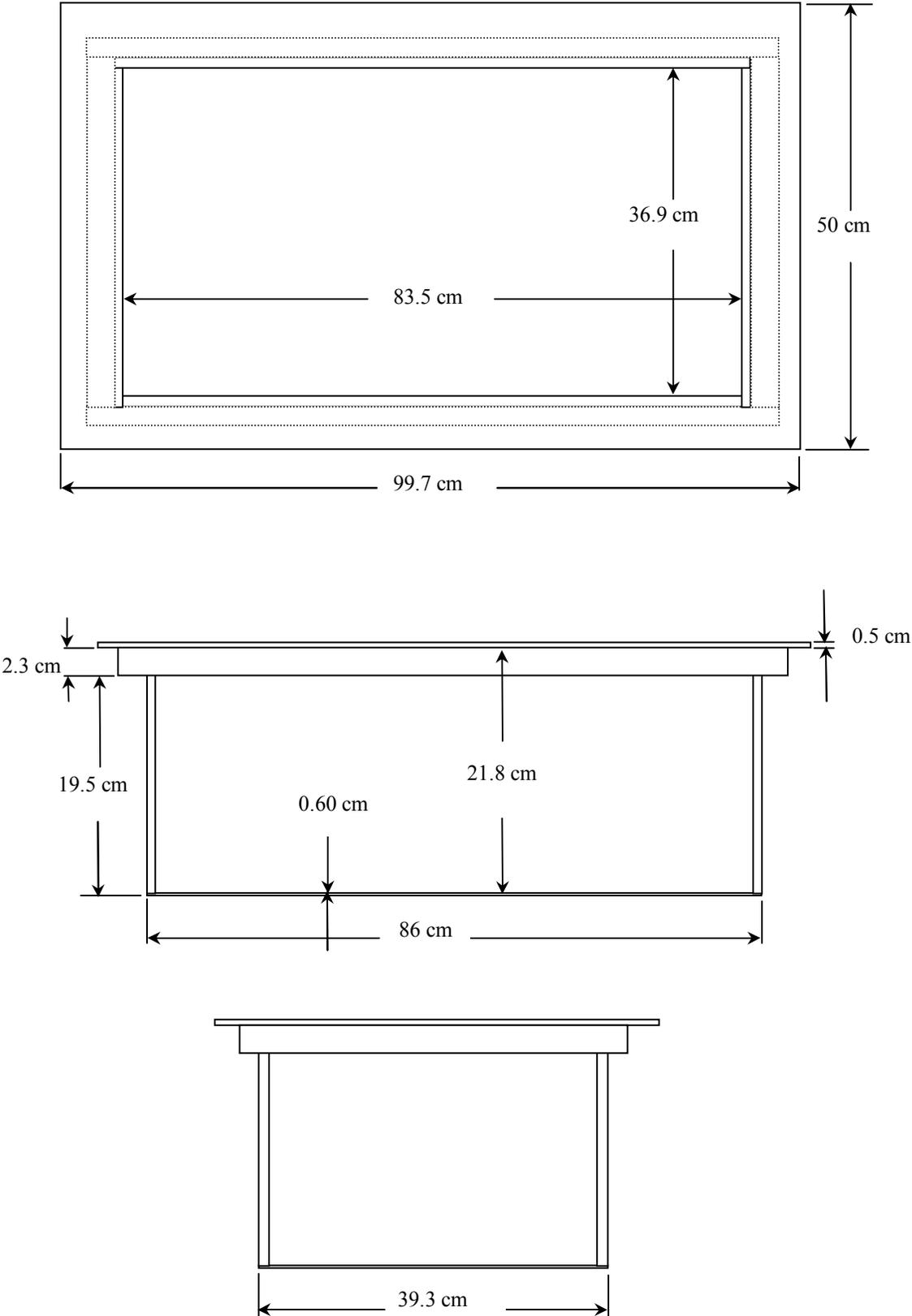
$$s = 3.175\text{mm}(d/2) + 6.0\text{mm}(\text{phantom}) + 6.0\text{mm}(\text{spacer}) = 15.175\text{mm}$$

### 5. Test Equipment List

TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE OF CAL.	CAL. DUE DATE
SPEAG DASY4 Measurement Server	00158	1078	CNR	CNR
SPEAG Robot	00046	599396-01	CNR	CNR
SPEAG DAE4	00019	353	22Apr08	22Apr09
SPEAG ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
Plexiglas Validation Planar Phantom	00157	137	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835272	23Apr08	23Apr09
Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	23Apr09
HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr09
HP 8648D Signal Generator	00005	3847A00611	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
CNR = Calibration Not Required				

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:

**6. Dimensions of Plexiglas Planar Validation Phantom**



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

**7. Plexiglas Planar Validation Phantom**



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

**8. 450 MHz Validation Dipole**



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type: Head

## 9. SAR Target Validation

Parameter															Result					
	Frequency (MHz)	Shell thickness (mm)	Shell permittivity	Shell permeability	Shell Conductivity ( $\sigma$ ) (S/m)	Phantom dimensions (mm) [x, y, z]	Liquid Relative permittivity	Liquid Conductivity ( $\sigma$ ) (S/m)	Liquid permeability	Reference dipole distances from the liquid (mm)	Spacer (mm)	Dipole L (mm)	Dipole h (mm)	Dipole d (mm)	Distance between dipole feedpoint gap S1 (mm)	Distance between dipole balun elements S2 (mm)	1 g SAR (1 Watt)	10 g SAR (1 Watt)	Local SAR at surface (above feed-point)	Local SAR at surface (y = 2 cm offset from feed-point)
SEMCAD Simulation	450	6	2.7	1	0	700, 600, 170	43.5	0.87	1	15.175	6	270	166.7	6.35	1	4	4.893	3.263	6.845	3.101
<b>CELLTECH TARGET</b>																	1.223 W/kg		1g	0.25 W
																	0.816 W/kg		10g	0.25 W

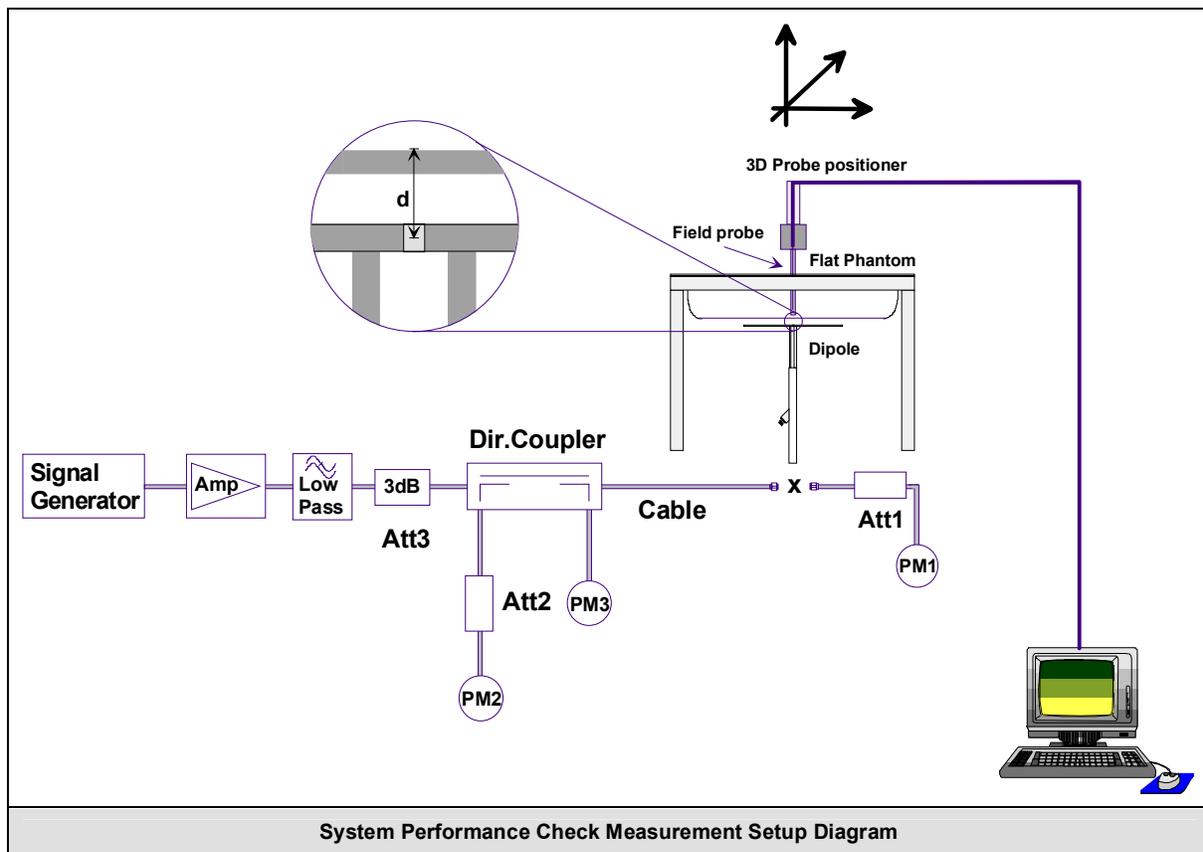
- Standard dipole dimensions used in simulation per 1528-2003 mechanical dimensions of the reference dipole.
- Reference distance from liquid is actual measured distance.

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 10. SAR Measurement

Measurements were made using a dosimetric E-field probe ET3DV6 (S/N: 1590, Conversion Factor 7.66). 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 procedures described below.

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.



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 11. Measurement Conditions

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

Relative Permittivity: 43.8 (+0.7% deviation from target)  
 Conductivity: 0.86 mho/m (-1.1% deviation from target)  
 Fluid Temperature: 22.1°C (Start of Test) / 22.3°C (End of Test)  
 Fluid Depth: ≥ 15.0 cm

Environmental Conditions:

Ambient Temperature: 23.1°C  
 Barometric Pressure: 101.1 kPa  
 Humidity: 35%

The 450 MHz Head 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%	
<b>IEEE/IEC Target Dielectric Parameters (450 MHz):</b>	<b><math>\epsilon_r = 43.5 (+/- 5\%)</math></b>	<b><math>\sigma = 0.87 \text{ S/m } (+/- 5\%)</math></b>

## 12. System Performance Check SAR Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
Validation Target (450)		Measured	Deviation	Validation Target (450)		Measured	Deviation
1.223	+/- 10%	1.216	-0.57%	4.892	+/- 10%	4.864	-0.57%
SAR @ 0.25W Input averaged over 10g (W/kg)				SAR @ 1W Input averaged over 10g (W/kg)			
Validation Target (450)		Measured	Deviation	Validation Target (450)		Measured	Deviation
0.816	+/- 10%	0.799	-2.08%	3.264	+/- 10%	3.196	-2.08%

450 MHz System Performance Check @ 250mW (1g)					
	SAR 1g (mW/g)	Deviation From 450 MHz Numerical Simulation (1.223 mW/g)	STDEV	Mean	Coefficient of Variation
Test 1	1.21	-1.06%	0.008	1.216	0.007
Test 2	1.22	-0.25%			
Test 3	1.22	-0.25%			
Test 4	1.21	-1.06%			
Test 5	1.22	-0.25%			
Test 6	1.20	-1.88%			
Test 7	1.22	-0.25%			
Test 8	1.22	-0.25%			
Test 9	1.23	0.57%			
Test 10	1.21	-1.06%			
	1.216	-0.57%			

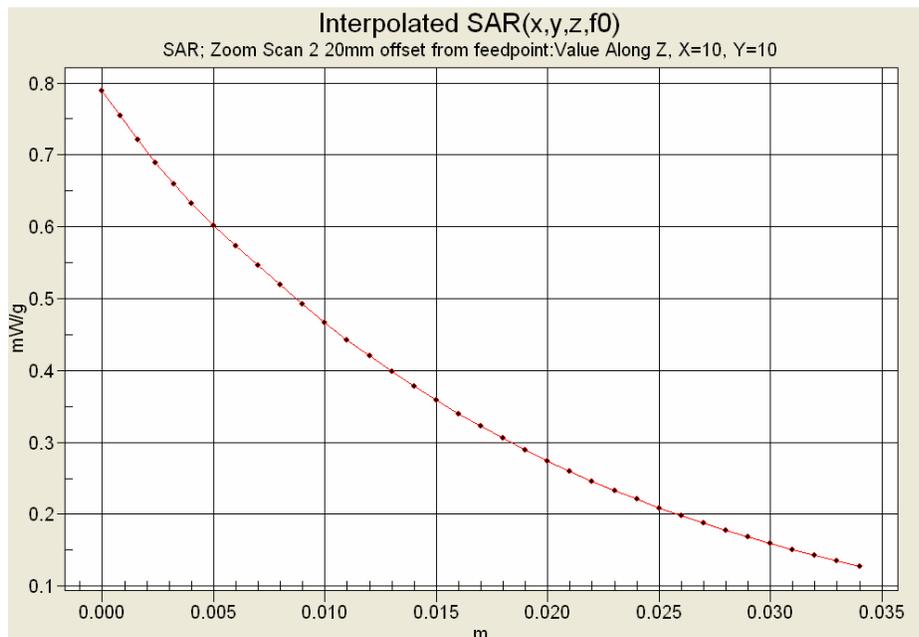
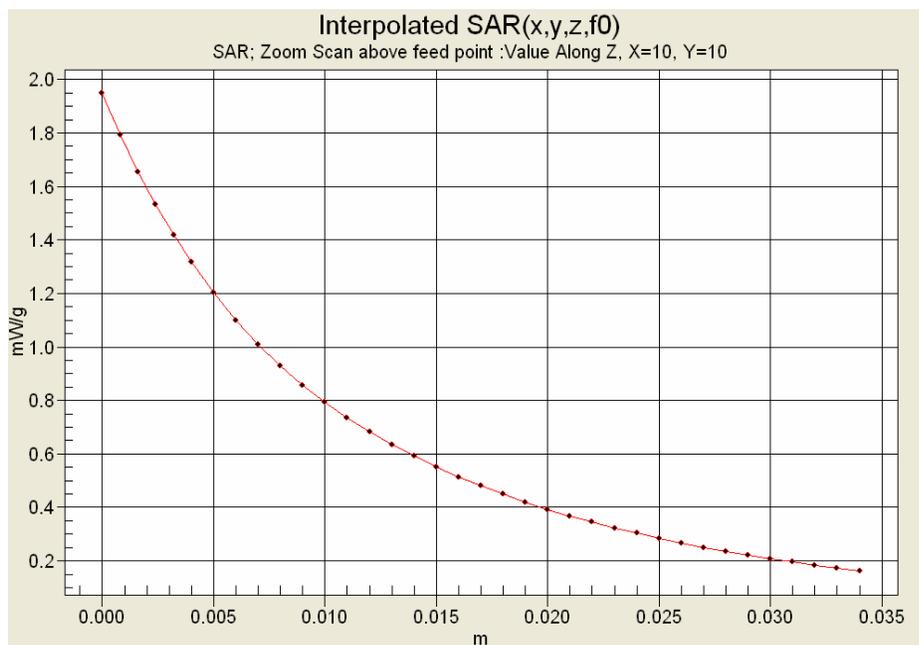
450 MHz System Performance Check @ 250mW (10g)					
	SAR 10g (mW/g)	Deviation From 450 MHz Numerical Simulation (0.816 mW/g)	STDEV	Mean	Coefficient of Variation
Test 1	0.799	-2.08%	0.006	0.799	0.007
Test 2	0.800	-1.96%			
Test 3	0.803	-1.59%			
Test 4	0.796	-2.45%			
Test 5	0.801	-1.84%			
Test 6	0.793	-2.82%			
Test 7	0.802	-1.72%			
Test 8	0.802	-1.72%			
Test 9	0.807	-1.10%			
Test 10	0.787	-3.55%			
	0.799	-2.08%			

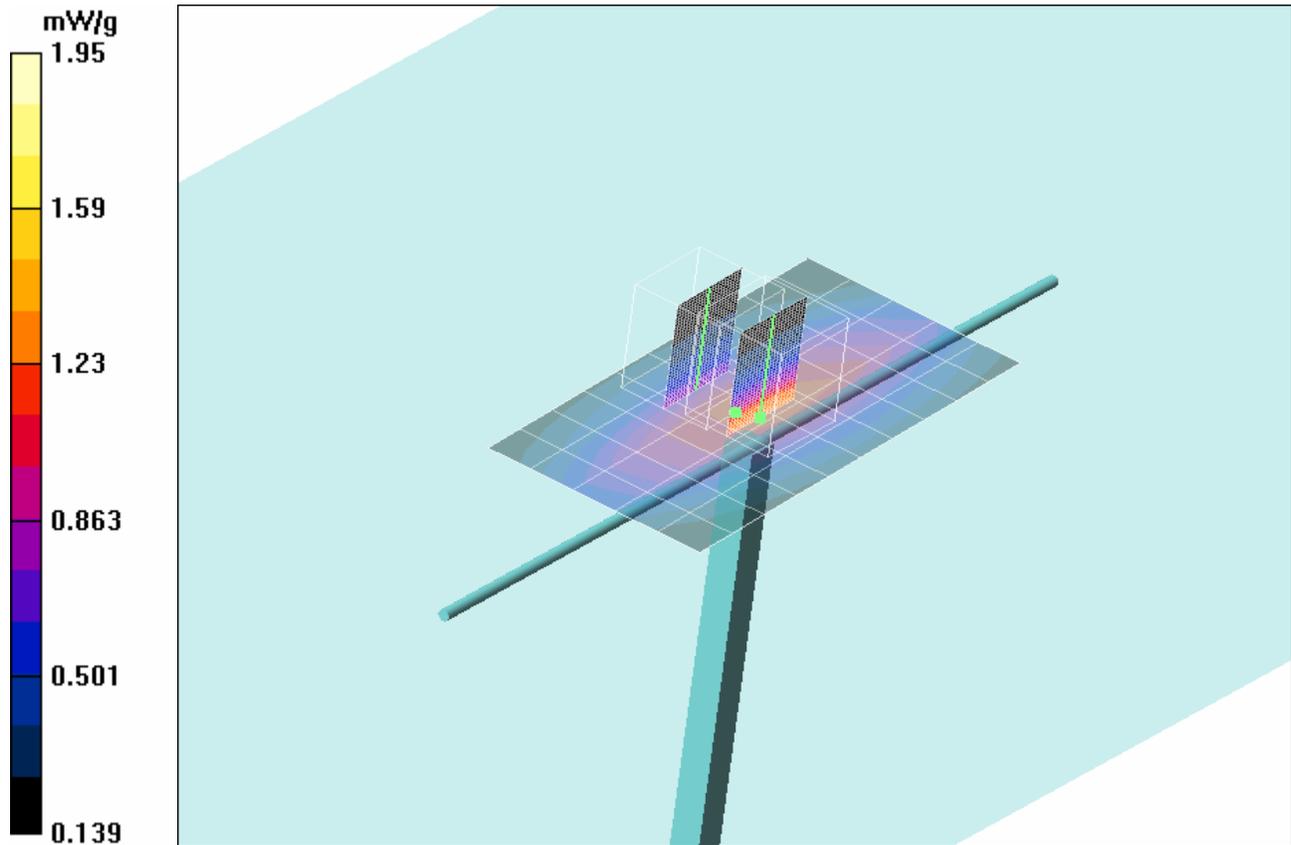
**b) Extrapolation Routine:**

The zoom scan routine was used to extrapolate the peak SAR above the feed point and offset at 20mm. Two zoom scans were used, the first centered above the feedpoint and the second offset 20mm. The interpolated SAR at these points are shown in the table below. Note: Center point of zoom scan located at  $x=10, y=10$ .

Measurement Location	Measured SAR mW/g	SAR 1W Normalized	Peak Target mW/g	Deviation	System Performance Check Expanded Uncertainty +/-%
Feed Point	1.93*	7.72	6.85	12.7%	17.86
2 cm Offset	0.79	3.16	3.10	1.9%	17.86

\*Note: measured SAR level is the average from the 10 evaluations





	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## System Performance Check - 450 MHz Dipole - HSL

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

Ambient Temp: 23.1°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450$  MHz;  $\sigma = 0.86$  mho/m;  $\epsilon_r = 43.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn353; Calibrated: 22/04/2008

- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137

- Measurement SW: DASy4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Maximum value of SAR (measured) = 1.20 mW/g

**450 MHz Zoom Scan 1 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.6 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.799 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.5 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 1.93 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.800 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 3 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.4 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.803 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 4 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.3 V/m; Power Drift = 0.001 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.796 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g

**450 MHz Zoom Scan 5 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.5 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.94 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.801 mW/g**

Maximum value of SAR (measured) = 1.32 mW/g

**450 MHz Zoom Scan 6 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.3 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 1.90 W/kg

**SAR(1 g) = 1.20 mW/g; SAR(10 g) = 0.793 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g

**450 MHz Zoom Scan 7 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.4 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.94 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.802 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz Zoom Scan 8 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.7 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 1.93 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.802 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 9 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.6 V/m; Power Drift = -0.009 dB

Peak SAR (extrapolated) = 1.95 W/kg

**SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.807 mW/g**

Maximum value of SAR (measured) = 1.32 mW/g

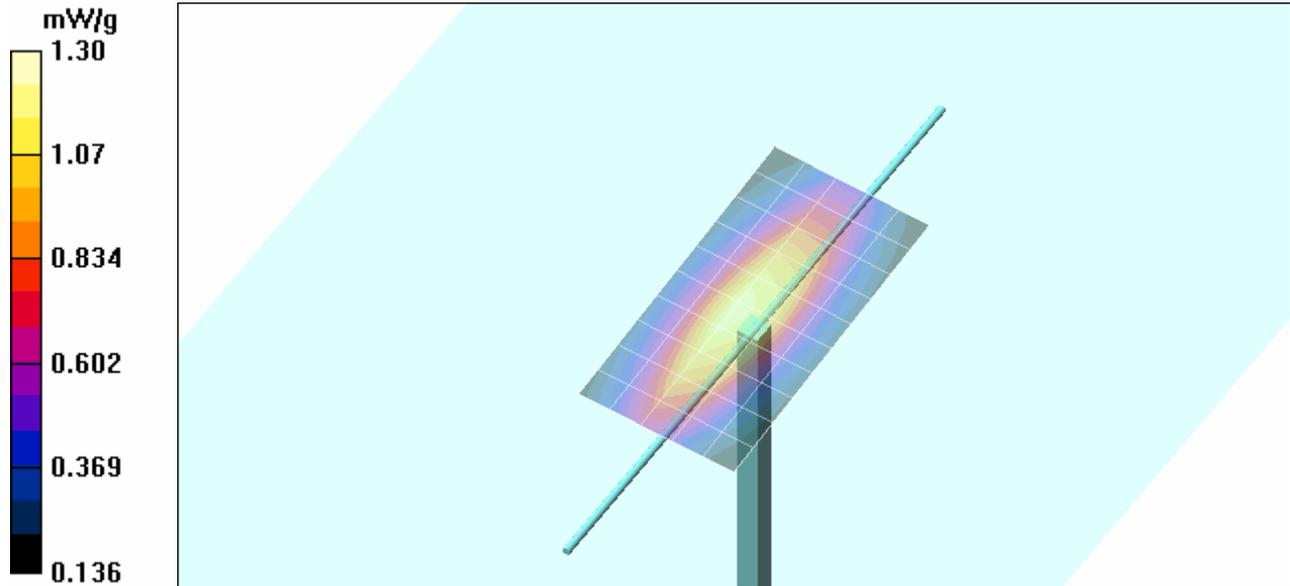
**450 MHz Zoom Scan 10 (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.3 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.787 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g



### 13. Measured Fluid Dielectric Parameters

#### 450 MHz (Head)

\*\*\*\*\*

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

19/Jan/2009

Frequency (GHz)

IEEE\_eH IEEE 1528-2003 Limits for Head Epsilon

IEEE\_sH IEEE 1528-2003 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	44.61	0.78
0.3600	44.58	0.87	46.57	0.79
0.3700	44.46	0.87	45.58	0.79
0.3800	44.34	0.87	44.52	0.80
0.3900	44.22	0.87	44.68	0.82
0.4000	44.10	0.87	44.30	0.83
0.4100	43.98	0.87	43.79	0.84
0.4200	43.86	0.87	44.67	0.85
0.4300	43.74	0.87	43.93	0.86
0.4400	43.62	0.87	43.86	0.86
0.4500	43.50	0.87	43.79	0.86
0.4600	43.45	0.87	43.00	0.86
0.4700	43.40	0.87	42.82	0.88
0.4800	43.34	0.87	42.69	0.89
0.4900	43.29	0.87	42.38	0.91
0.5000	43.24	0.87	42.02	0.90
0.5100	43.19	0.87	42.04	0.92
0.5200	43.14	0.88	42.26	0.95
0.5300	43.08	0.88	41.66	0.94
0.5400	43.03	0.88	41.84	0.95
0.5500	42.98	0.88	41.33	0.96

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 14. Measurement Uncertainties

UNCERTAINTY BUDGET FOR SYSTEM PERFORMANCE CHECK									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value $\pm\%$ (1g)	Uncertainty Value $\pm\%$ (10g)	$V_i$ or $V_{eff}$
<b>Measurement System</b>									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	$\infty$
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
Hemispherical Isotropy	E.2.2	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	$\infty$
Response Time	E.2.7	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
Integration Time	E.2.8	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	$\infty$
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
<b>Dipole</b>									
Dipole Positioning	E.4.2	2	Normal	1.732050808	1	1	1.2	1.2	$\infty$
SAR Drift Measurement	6.6.2	0.5	Normal	1.732050808	1	1	0.3	0.3	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	$\infty$
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	$\infty$
Liquid Conductivity (measured)	E.3.3	1.1	Normal	1	0.64	0.43	0.7	0.5	$\infty$
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	$\infty$
Liquid Permittivity (measured)	E.3.3	0.7	Normal	1	0.6	0.49	0.4	0.3	$\infty$
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>8.93</b>	<b>8.75</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>17.86</b>	<b>17.50</b>	
<b>Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005</b>									

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 15. Dipole Calibration History

450 MHz Dipole Calibration History										
Dipole Calibration Date	SAR Probe Information			Celltech Measured Data						
	Serial Number	Calibration Factor	Calibration Procedure	SAR (W/kg) Measured at 250 mW	% Deviation from IEEE 1528 Target (4.9 W/kg @ 1 W)	% Deviation from Target validated by Celltech (4.893 W/kg @ 1 W)	Dielectric Parameters		RL (dB)	Impedance
							$\epsilon_r$	$\sigma$		
2003	1387	7.50	Numerical	1.30	6.12		43.70	0.88	-22.60	49.98
2004	1387	7.50	Numerical	1.23	0.41		42.90	0.85	-23.74	54.04
2005	1387	7.50	Numerical	1.24	1.22		43.20	0.84	-20.40	58.50
2006	1387	7.40	Numerical	1.27	3.67		44.70	0.90	-21.60	56.17
2007	1387	7.00	Numerical	1.29	5.31		43.10	0.85	-22.20	55.20
2008	1387	7.32	Measured	1.19		-2.72	43.60	0.86	-23.10	55.60
2008	1590	7.66	Measured	1.18		-3.53	43.44	0.89	-20.70	58.20
2008	1590	7.66	Measured	1.22		-0.26	43.80	0.86	-20.70	58.20

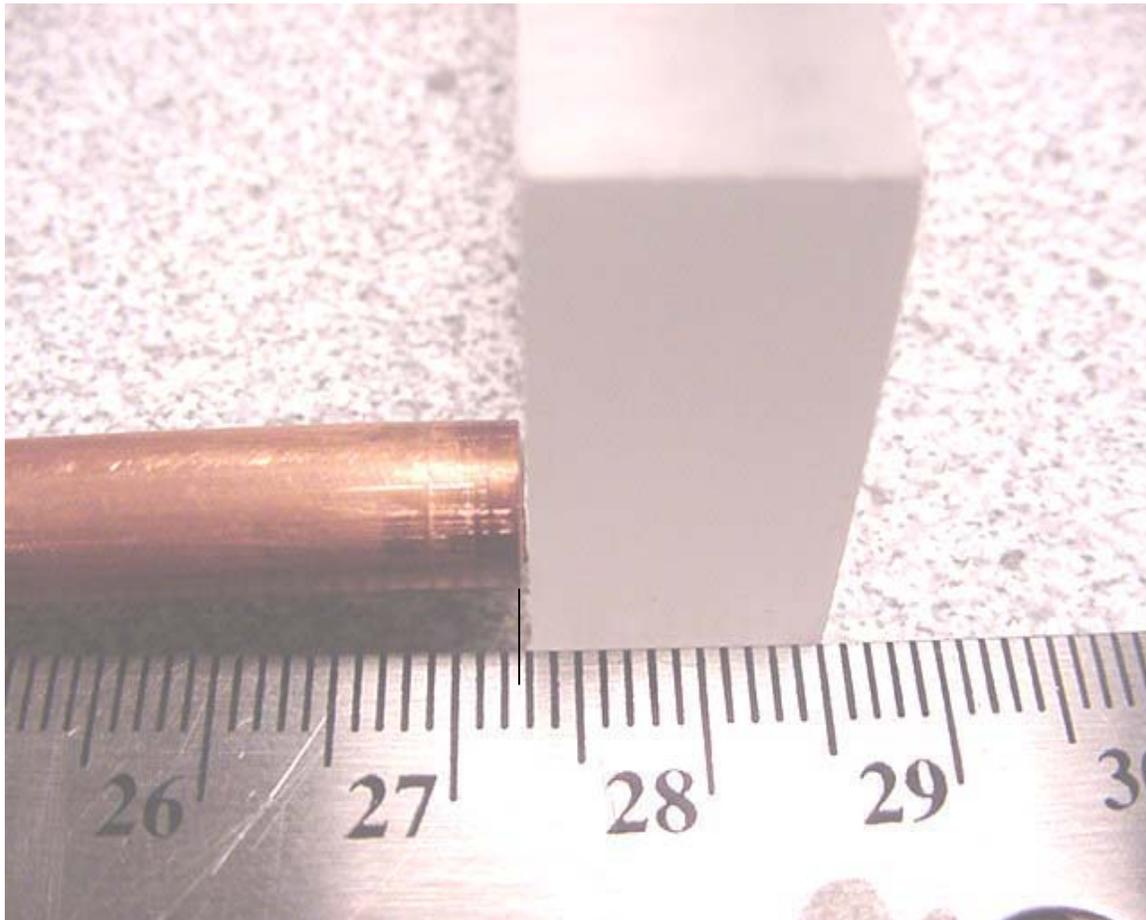
Target Dielectric Parameters:  $\epsilon_r = 43.5$ ,  $\sigma = 0.87$  s/m

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

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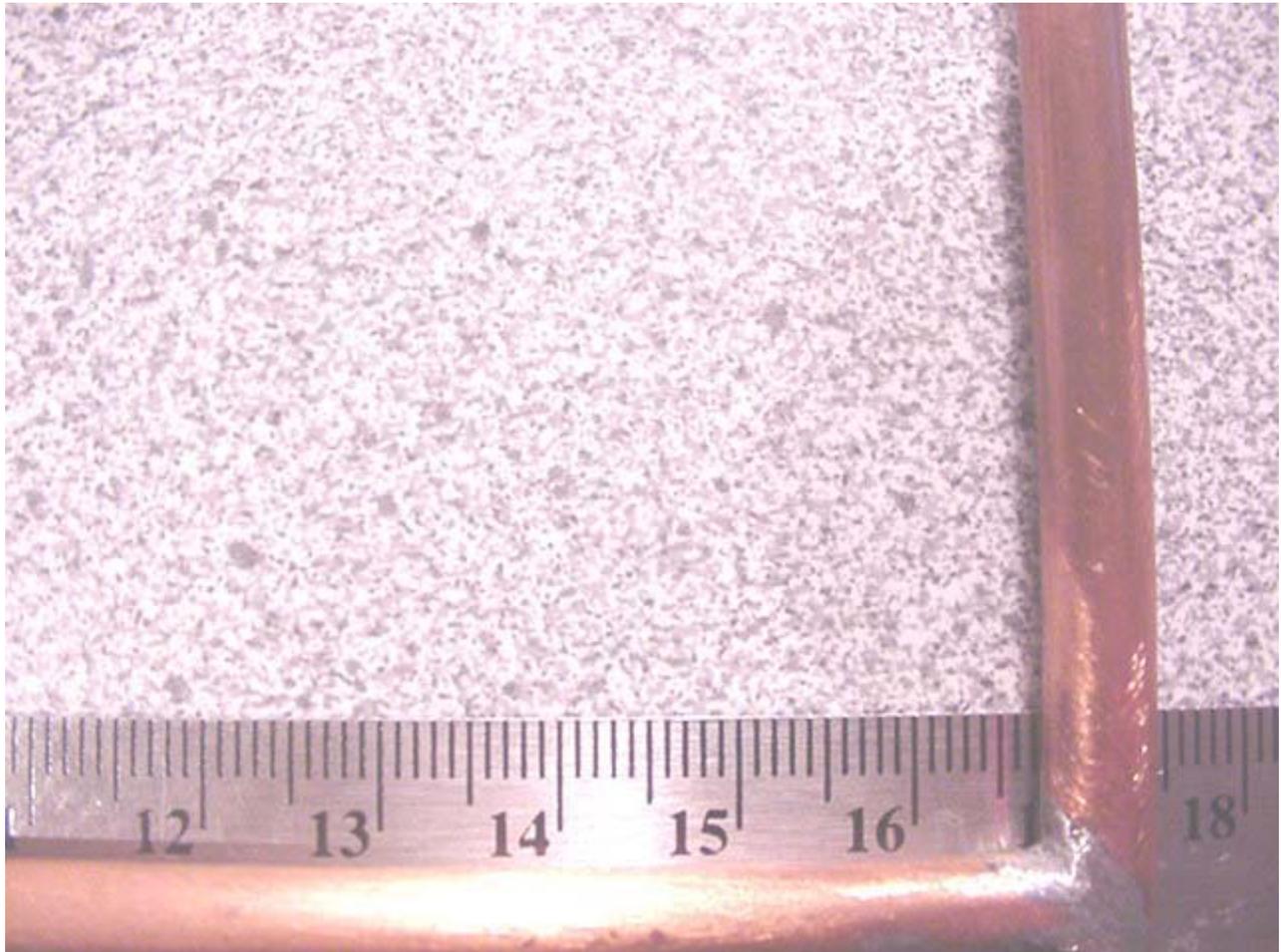
## APPENDIX A - PHOTOGRAPHS

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type: Head



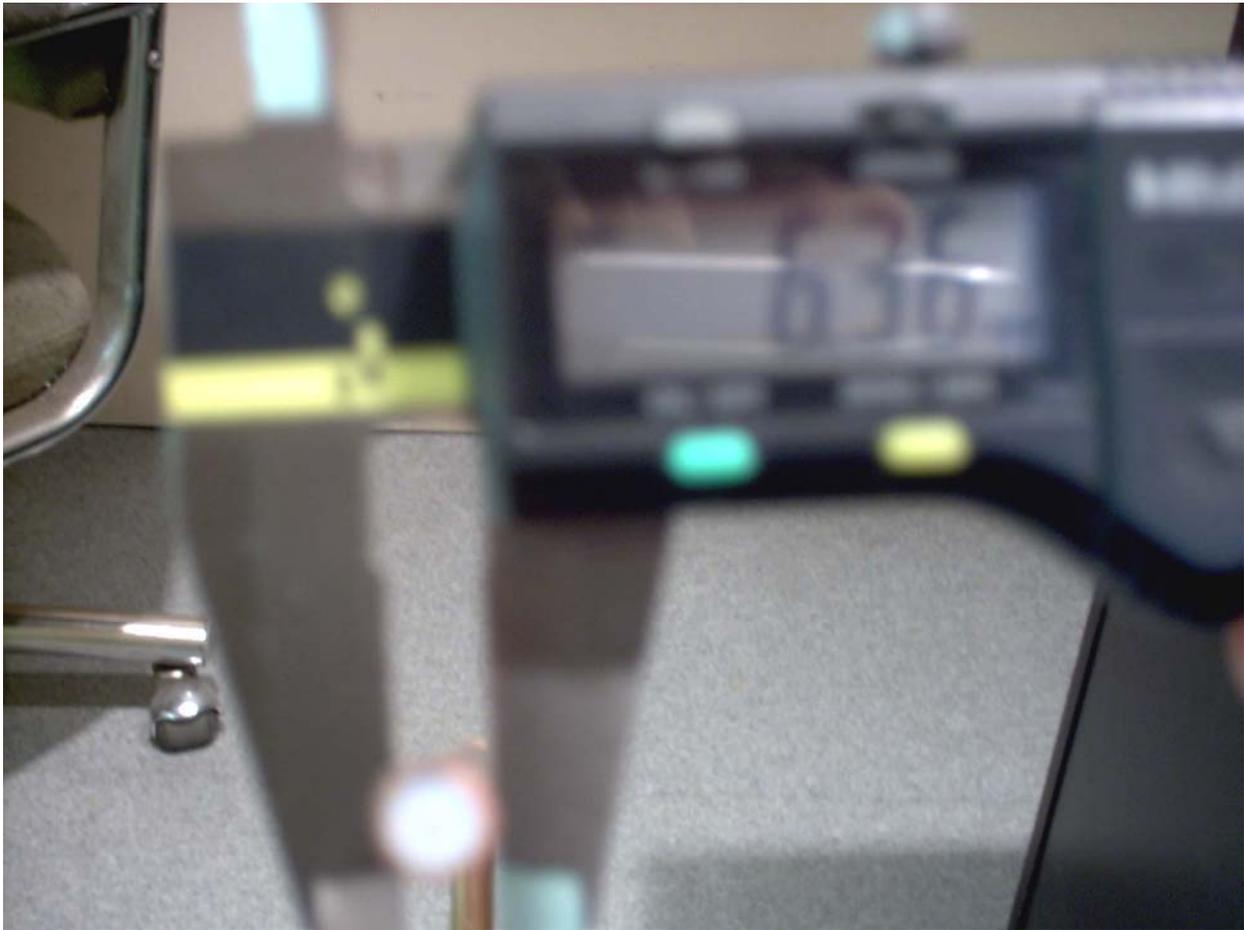
**Dipole Dimension L = 272.7mm**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



**Dipole Dimension  $h = 167\text{mm}$**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



**Dipole Dimension  $d = 6.36\text{mm}$**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:



**Dipole Spacer Dimension = 6.0mm**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

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## **APPENDIX B - SEMCAD SIMULATION LOG FILE**



Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

iSolve X, Version 13.4, Build 34, 64Bit Windows, Single Precision  
Simulation name 'Dielec Const = 2.7, Low Conduct'  
Maxwell Solver started the 2009-Feb-09 10:40:20.  
Initializing FDTD (x1 CFL) Harmonic Simulation at 450 MHz

Overall discretization:

Smallest number of cells per wavelength = 20.202, largest = 422.988, average = 113.419  
Simulation time-step = 9.781e-013 s  
Simulation time-step / minimum of CFL criteria = 0.999938  
Maximum of CFL criteria / minimum of CFL criteria = 64.6059  
Average of CFL criteria / minimum of CFL criteria = 9.92029

Discretization by solids:

Background: epsr = 1, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 133.241, largest = 422.988, average = 145.219  
Phantom/Shell: epsr = 2.7, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 81.0879, largest = 237.738, average = 120.104  
Phantom/Liquid: epsr = 43.5, mur = 1, sigma = 0.87, sigma\* = 0 - smallest number of cells per wavelength = 20.202, largest = 55.4378, average = 23.1303

Boundary conditions:

Side X-: U-PML(8)  
Side X+: U-PML(8)  
Side Y-: U-PML(8)  
Side Y+: U-PML(8)  
Side Z-: U-PML(8)  
Side Z+: U-PML(8)

Grid:

Number of nodes=285x233x175, number of voxels=11464512

Excitations:

Initializing (Voltage) edge source Quelle  
Overall duration : 3.33333e-008 s or 34080 iterations

Probes & Sensors:

Initializing near-field sensor lg  
Initializing near-field sensor lg  
Initializing near to far field transformation  
Initializing near-field sensor Overall Field  
Initializing near-field sensor Unnamed  
Initializing port sensor Sensor of Quelle  
Initializing port sensor TDSensor  
Initializing port sensor FDSensor  
Initializing port sensor ObererSensor

Enable monitoring:

Sensor of Quelle, V(t)  
Sensor of Quelle, I(t)  
TDSensor, V(t)  
TDSensor, I(t)  
FDSensor, V(t)  
FDSensor, I(t)  
ObererSensor, V(t)  
ObererSensor, I(t)

Checking out the license feature ISOLVEX\_SOLVER\_FDTD, expiring the 1-mar-2009, version 10.0, (1).

Calculating update coefficients:

Created thread pool with 2 thread(s).  
Calculating update coefficients: completed. Time: 17.8 seconds.

Hardware acceleration not used, please contact SPEAG for more information.

Yee (explicit) iterations starting using U-PML Boundary Condition.

0% - iterations: 8 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:34:02  
0% - iterations: 16 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:11:34  
0% - iterations: 24 / 34079 - [8.34 MCells/s] - Estimated time to completion: 13:00:25  
0% - iterations: 32 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:11:10  
0% - iterations: 43 / 34079 - [11.5 MCells/s] - Estimated time to completion: 09:27:16  
0% - iterations: 53 / 34079 - [10.4 MCells/s] - Estimated time to completion: 10:23:48  
0% - iterations: 62 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:32:56

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

0% - iterations: 70 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:59:22  
0% - iterations: 77 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:50:31  
0% - iterations: 84 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:11:17  
0% - iterations: 91 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:50:09  
0% - iterations: 100 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:32:09  
0% - iterations: 110 / 34079 - [10.4 MCells/s] - Estimated time to completion: 10:22:45  
0% - iterations: 118 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:58:16  
0% - iterations: 126 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:08:49  
0% - iterations: 133 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:49:03  
0% - iterations: 140 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:52  
0% - iterations: 147 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:41  
0% - iterations: 154 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:30  
0% - iterations: 161 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:19  
0% - iterations: 170 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:30:44  
1% - iterations: 179 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:30:33  
1% - iterations: 186 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:47:40  
1% - iterations: 191 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:42:33  
1% - iterations: 198 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:08:01  
1% - iterations: 203 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:35:02  
1% - iterations: 208 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:34:50  
1% - iterations: 214 / 34079 - [6.25 MCells/s] - Estimated time to completion: 17:14:45  
1% - iterations: 221 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:07:22  
1% - iterations: 228 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:46:34  
1% - iterations: 235 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:06:58  
1% - iterations: 243 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:55:24  
1% - iterations: 252 / 34079 - [7.94 MCells/s] - Estimated time to completion: 13:34:21  
1% - iterations: 257 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:40:08  
1% - iterations: 262 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:39:57  
1% - iterations: 269 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:45:30  
1% - iterations: 277 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:54:37  
1% - iterations: 286 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:30:57  
1% - iterations: 290 / 34079 - [3.82 MCells/s] - Estimated time to completion: 28:09:27  
1% - iterations: 295 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:31:21  
1% - iterations: 300 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:31:09  
1% - iterations: 305 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:38:22  
1% - iterations: 313 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:53:48  
1% - iterations: 320 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:44:09  
1% - iterations: 327 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:43:58  
1% - iterations: 339 / 34079 - [12.5 MCells/s] - Estimated time to completion: 08:35:28  
1% - iterations: 347 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:53:01  
1% - iterations: 355 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:52:50  
1% - iterations: 362 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:03:20  
1% - iterations: 369 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:42:52  
1% - iterations: 376 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:02:56  
1% - iterations: 383 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:42:30  
1% - iterations: 391 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:02:12  
1% - iterations: 400 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:28:25  
1% - iterations: 407 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:41:53  
1% - iterations: 415 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:51:28  
1% - iterations: 424 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:25:33  
1% - iterations: 433 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:27:41  
1% - iterations: 442 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:25:11  
1% - iterations: 449 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:40:47  
1% - iterations: 456 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:00:39  
1% - iterations: 461 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:32:39  
1% - iterations: 468 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:00:18  
1% - iterations: 475 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:40:06  
1% - iterations: 481 / 34079 - [6.25 MCells/s] - Estimated time to completion: 17:06:36  
1% - iterations: 486 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:23:43  
1% - iterations: 491 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:31:33  
1% - iterations: 498 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:39:30  
1% - iterations: 504 / 34079 - [5.73 MCells/s] - Estimated time to completion: 18:39:10  
1% - iterations: 510 / 34079 - [5.29 MCells/s] - Estimated time to completion: 20:12:12  
2% - iterations: 516 / 34079 - [5.73 MCells/s] - Estimated time to completion: 18:38:46  
2% - iterations: 523 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:38:50  
2% - iterations: 531 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:48:48  
2% - iterations: 539 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:48:37  
2% - iterations: 548 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:23:02  
2% - iterations: 557 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:22:51  
2% - iterations: 566 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:24:44  
2% - iterations: 575 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:22:29

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

62% - iterations: 21213 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:22:05  
62% - iterations: 21221 / 34079 - [7.64 MCells/s] - Estimated time to completion: 05:21:27  
62% - iterations: 21229 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:54:28  
62% - iterations: 21238 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:45:21  
62% - iterations: 21246 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:54:05  
62% - iterations: 21254 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:53:54  
62% - iterations: 21263 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:21:03  
62% - iterations: 21271 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:53:31  
62% - iterations: 21280 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:44:25  
62% - iterations: 21289 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:32  
62% - iterations: 21298 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:21  
63% - iterations: 21307 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:10  
63% - iterations: 21316 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:59  
63% - iterations: 21329 / 34079 - [13.5 MCells/s] - Estimated time to completion: 02:59:48  
63% - iterations: 21340 / 34079 - [10.5 MCells/s] - Estimated time to completion: 03:51:37  
63% - iterations: 21349 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:18  
63% - iterations: 21358 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:07  
63% - iterations: 21367 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:18:56  
63% - iterations: 21376 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:18:45  
63% - iterations: 21383 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:32:30  
63% - iterations: 21390 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:32  
63% - iterations: 21397 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:20  
63% - iterations: 21404 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:08  
63% - iterations: 21411 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:46  
63% - iterations: 21418 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:35  
63% - iterations: 21425 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:24  
63% - iterations: 21433 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:49:48  
63% - iterations: 21442 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:17:25  
63% - iterations: 21451 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:17:14  
63% - iterations: 21457 / 34079 - [6.25 MCells/s] - Estimated time to completion: 06:25:40  
63% - iterations: 21462 / 34079 - [5.21 MCells/s] - Estimated time to completion: 07:42:37  
63% - iterations: 21467 / 34079 - [5.21 MCells/s] - Estimated time to completion: 07:42:26  
63% - iterations: 21473 / 34079 - [5.29 MCells/s] - Estimated time to completion: 07:35:13  
63% - iterations: 21482 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:36  
63% - iterations: 21491 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:25  
63% - iterations: 21499 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:48:17  
63% - iterations: 21508 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:04  
63% - iterations: 21516 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:47:54  
63% - iterations: 21525 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:38:58  
63% - iterations: 21534 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:15:32  
63% - iterations: 21546 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:11:28  
63% - iterations: 21557 / 34079 - [11.5 MCells/s] - Estimated time to completion: 03:28:42  
63% - iterations: 21569 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:11:07  
63% - iterations: 21581 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:10:56

Steady state detected at iteration: 21585 - the simulation will end shortly.  
Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

97% - iterations: 21585 / 22153 - [0.0356 MCells/s] - Estimated time to completion: 50:45:54  
97% - iterations: 21592 / 22153 - [6.69 MCells/s] - Estimated time to completion: 00:16:01  
98% - iterations: 21600 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:12:40  
98% - iterations: 21609 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:11:04  
98% - iterations: 21618 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:53  
98% - iterations: 21627 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:42  
98% - iterations: 21636 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:31  
98% - iterations: 21644 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:11:39  
98% - iterations: 21653 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:11  
98% - iterations: 21662 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:00  
98% - iterations: 21671 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:10:42  
98% - iterations: 21680 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:38  
98% - iterations: 21689 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:27  
98% - iterations: 21698 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:16  
98% - iterations: 21706 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:11:10  
98% - iterations: 21713 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:11:31  
98% - iterations: 21720 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:11:20  
98% - iterations: 21727 / 22153 - [6.69 MCells/s] - Estimated time to completion: 00:12:10

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

98% - iterations: 21735 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:34  
98% - iterations: 21743 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:23  
98% - iterations: 21751 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:12  
98% - iterations: 21760 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:44  
98% - iterations: 21769 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:32  
98% - iterations: 21778 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:20  
98% - iterations: 21786 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:24  
98% - iterations: 21794 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:13  
98% - iterations: 21802 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:02  
98% - iterations: 21810 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:51  
98% - iterations: 21818 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:40  
99% - iterations: 21826 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:29  
99% - iterations: 21834 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:18  
99% - iterations: 21841 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:08:10  
99% - iterations: 21849 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:07:36  
99% - iterations: 21857 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:47  
99% - iterations: 21865 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:07:12  
99% - iterations: 21873 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:25  
99% - iterations: 21881 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:14  
99% - iterations: 21889 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:06:36  
99% - iterations: 21897 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:52  
99% - iterations: 21905 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:41  
99% - iterations: 21913 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:30  
99% - iterations: 21921 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:19  
99% - iterations: 21929 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:08  
99% - iterations: 21938 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:04:46  
99% - iterations: 21947 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:04:11  
99% - iterations: 21956 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:04:22  
99% - iterations: 21965 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:49  
99% - iterations: 21972 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:04:44  
99% - iterations: 21981 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:30  
99% - iterations: 21990 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:19  
99% - iterations: 22001 / 22153 - [11.5 MCells/s] - Estimated time to completion: 00:02:32  
99% - iterations: 22012 / 22153 - [11.5 MCells/s] - Estimated time to completion: 00:02:21  
99% - iterations: 22021 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:41  
99% - iterations: 22030 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:02:44  
99% - iterations: 22039 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:19  
100% - iterations: 22048 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:08  
100% - iterations: 22056 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:02:13  
100% - iterations: 22065 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:01:47  
100% - iterations: 22072 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:02:07  
100% - iterations: 22078 / 22153 - [6.25 MCells/s] - Estimated time to completion: 00:02:17  
100% - iterations: 22084 / 22153 - [6.25 MCells/s] - Estimated time to completion: 00:02:06  
100% - iterations: 22092 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:01:23  
100% - iterations: 22101 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:01:03  
100% - iterations: 22109 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:01:00  
100% - iterations: 22118 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:00:42  
100% - iterations: 22126 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:00:37  
100% - iterations: 22135 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:00:22  
100% - iterations: 22144 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:00:12  
Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

100% - iterations: 22153 / 22153 - [0.0834 MCells/s] - Estimated time to completion: 00:00:00

Convert time-domain data to frequency-domain data.

Maxwell Solver run ended the 2009-Feb-09 21:12:38. Total simulation time was 10:32:18 (hh:mm:ss, wall-clock time).

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

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## **APPENDIX C - PROBE CALIBRATION REPORT**



Accredited by the Swiss Accreditation Service (SAS)  
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 **Calltech**

Certificate No: **ET3-1590\_Jul08**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3  
Calibration procedure for dosimetric E-field probes**

Calibration date: **July 21, 2008**

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 (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	<b>Katja Pokovic</b>	<b>Technical Manager</b>	
Approved by:	<b>Niels Kuster</b>	<b>Quality Manager</b>	

Issued: July 21, 2008

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)  
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
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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:

- 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
- 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:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *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*.
- DCP<sub>x,y,z</sub>**: 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 NORM<sub>x,y,z</sub> \* *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  $\pm 50$  MHz to  $\pm 100$  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:1590

Manufactured:	March 19, 2001
Last calibrated:	May 20, 2005
Recalibrated:	July 21, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ET3DV6 SN:1590****Sensitivity in Free Space<sup>A</sup>**

NormX	1.81 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	2.00 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.72 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

**Diode Compression<sup>B</sup>**

DCP X	87 mV
DCP Y	92 mV
DCP Z	85 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		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	10.7	7.2
SAR <sub>be</sub> [%]	With Correction Algorithm	0.8	0.5

**Sensor Offset**

Probe Tip to Sensor Center                      **2.7 mm**

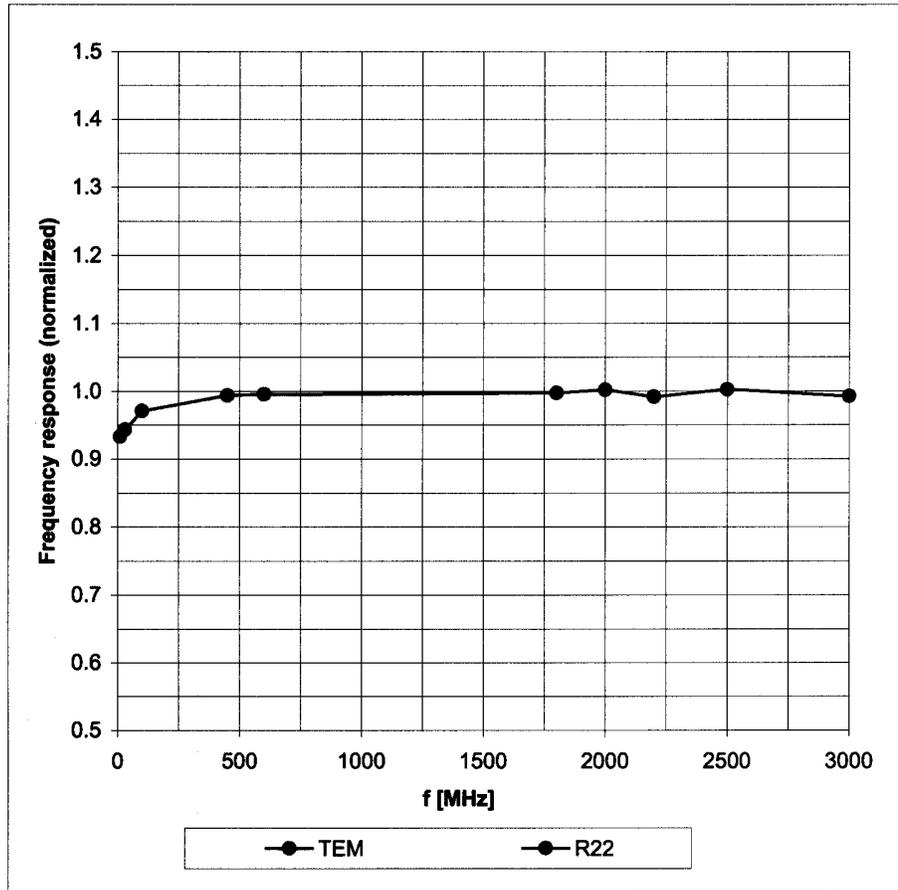
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

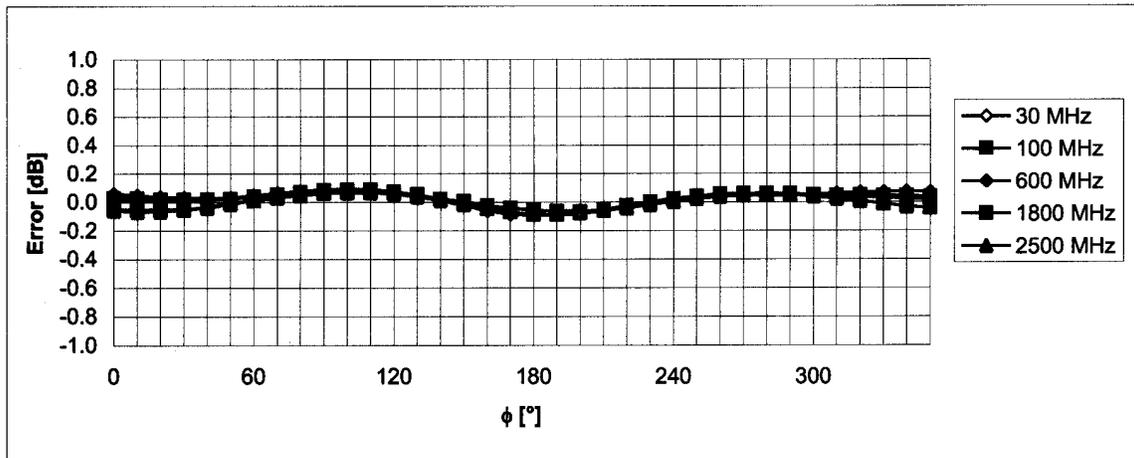
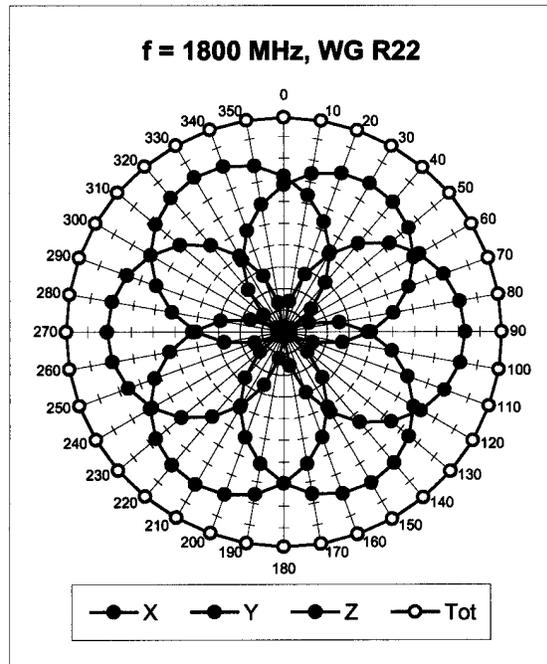
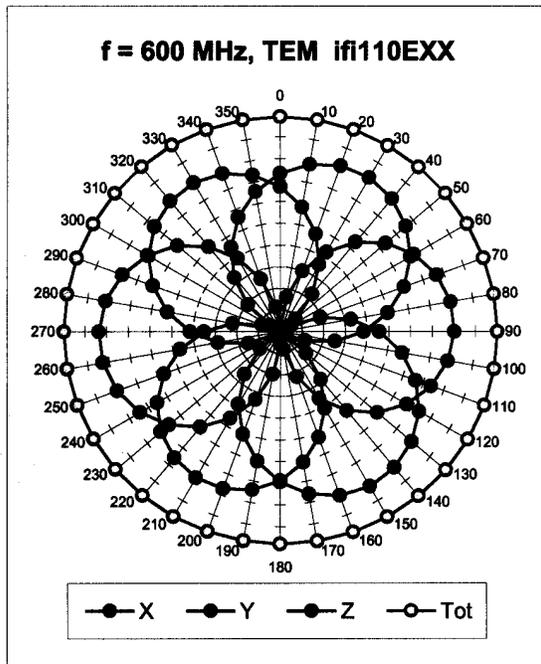
# Frequency Response of E-Field

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



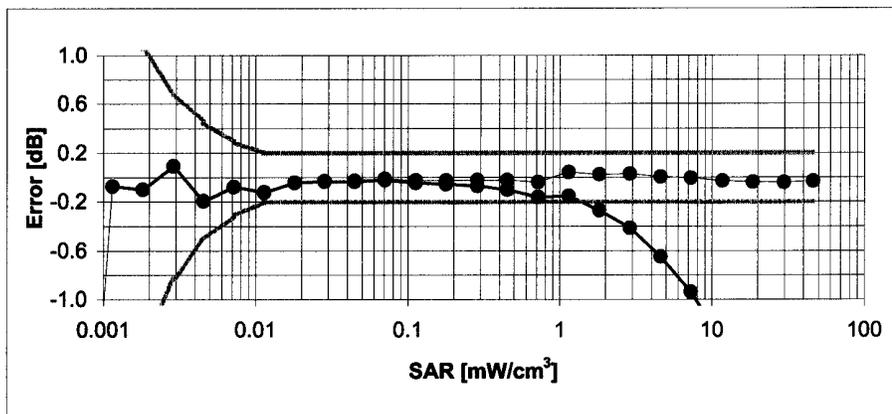
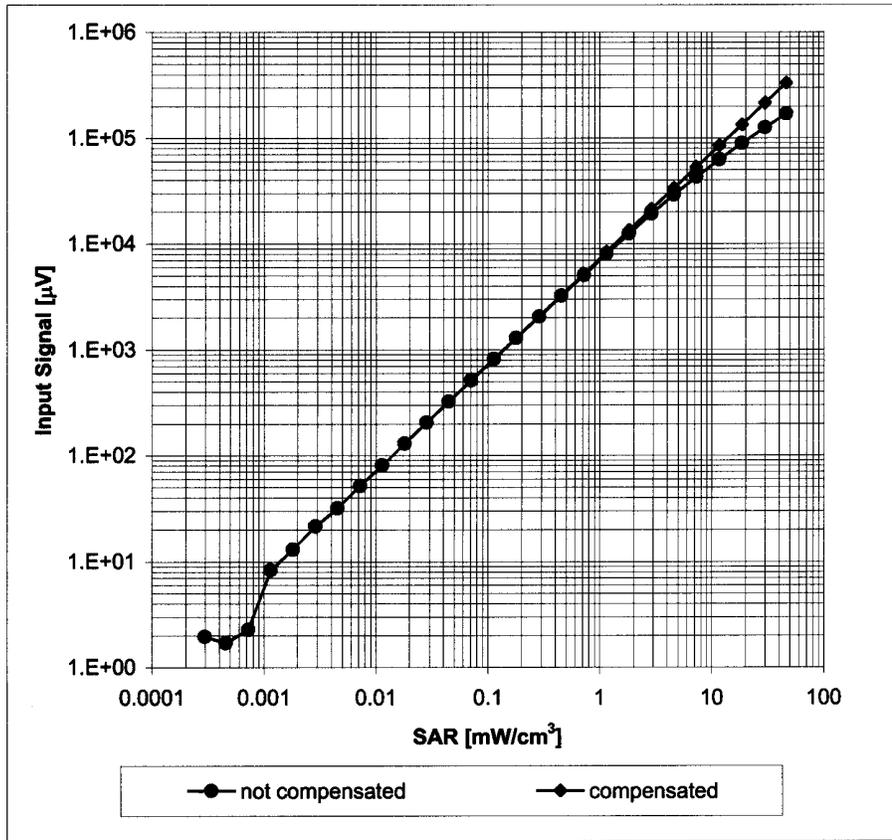
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

### Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



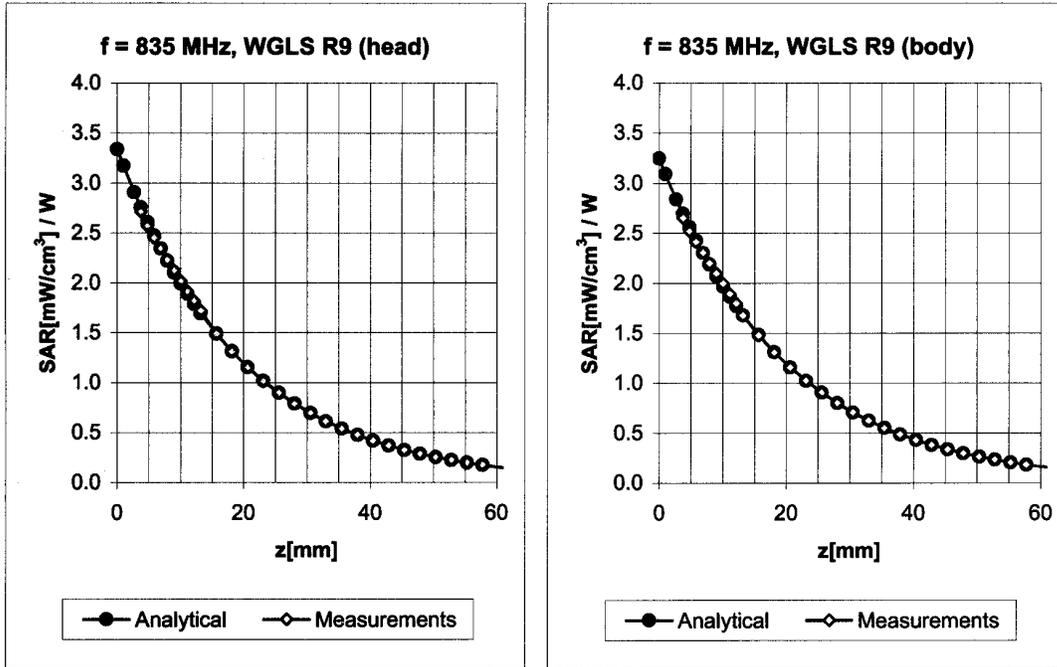
**Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )**

### Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$ )



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment

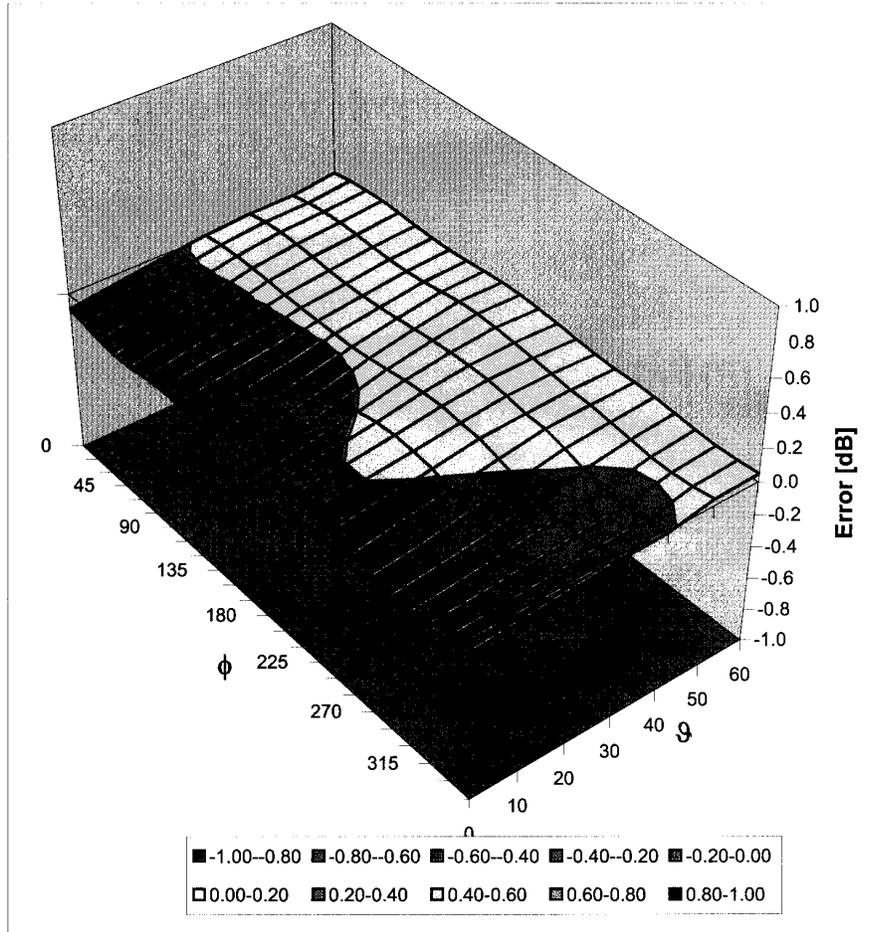


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.34	1.75	7.66 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.32	3.52	6.54 ± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.28	1.77	8.27 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.36	3.31	6.39 ± 11.0% (k=2)

<sup>c</sup> 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 ( $\phi, \vartheta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )