

	Date(s) of Evaluation Nov 27 & 28, 2013	Test Report Serial No. 111813AMW-1269	Test Report Revision No. Rev. 1.0 (1st Release)	
	Test Report Issue Date December 9, 2013	Description of Test(s) Specific Absorption Rate	RF Exposure Category Gen. Pop. / Uncontrolled	

DECLARATION OF COMPLIANCE		SAR RF EXPOSURE EVALUATION			FCC & IC
Test Lab Information	Name	CELLTECH LABS INC.			
	Address	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
Test Lab Accreditation(s)	A2LA	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)			
Applicant Information	Name	UNIDEN AMERICA CORPORATION			
	Address	4700 Amon Carter Boulevard, Fort Worth, Texas 76155 United States			
Application Type(s)	FCC	TCB Certification	IC	CB Certification	
Standard(s) Applied	FCC	47 CFR §2.1093	IC	Health Canada Safety Code 6	
Procedure(s) Applied	FCC	KDB 447498 D01v05r01	FCC	KDB 643646 D01v01r01	
	FCC	KDB 865664 D02v01r01	IC	RSS-102 Issue 4	
	FCC	KDB 865664 D01v01r02			
	IEEE	1528-2013	IEC	62209-1:2005, 62209-2:2010	
Device Classification(s)	FCC	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
	IC	Maritime Radio Transmitter and Receiver (RSS-182)			
Device RF Exposure Category	FCC/IC	General Population / Uncontrolled Environment			
Device Identifier(s)	FCC ID:	AMWUT647			
	IC:	513C-UT647			
Device Model(s)	Model(s)	Atlantis 270			
Test Sample Serial No.	None (Identical Prototype)				
Date of Sample Receipt	November 18, 2013	Date(s) of Evaluations	November 27 & 28, 2013		
Test Sample Hardware Rev. No.	n/a	Test Sample Firmware Rev. No.	n/a		
Device-Under-Test Description (DUT)	Portable FM VHF Push-To-Talk (PTT) Marine Radio Transceiver				
VHF Transmit Frequency Range(s)	156.025 - 157.425 MHz (VHF Marine Band)				
Manuf. Rated Output Power	5.7 Watts Conducted	+0.25 W / -0.35 W	Hi Power (Boost mode)		
Measured RF Output Power	5.54 Watts	37.4 dBm	Conducted	156.8 MHz (Ch. 16)	
Battery Type Tested	Li-ion Polymer	7.4 V	1100 mAh	P/N: BT-1035	
Antenna Type Tested	Stub (Non-detachable)				P/N: n/a
Body-worn Accessory Tested	Belt-Clip is for carrying purposes only				
Max. SAR Level(s) Evaluated	Face-held (FCC)	0.152 W/kg	1g	50% PTT duty factor	General Population / Uncontrolled
	Face-held (IC)	0.159 W/kg	1g	50% PTT duty factor	
FCC/IC Spatial Peak SAR Limit	HEAD	1.6 W/kg	1g	50% PTT duty factor	
<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 Safety Code 6 for the General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement procedures specified in KDB 447498, Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2013 and IEC International Standard 62209-2:2010. 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>					
Test Report Approved By		Art Voss	Engineering Technologist	Celltech Labs Inc.	

Applicant:	Uniden America Corporation	FCC ID:	AMWUT647	IC:	513C-UT647	
Model(s):	Atlantis 270	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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REVISION HISTORY			
REVISION NO.	DESCRIPTION	IMPLEMENTED BY	RELEASE DATE
1.0	1st Release	Art Voss	December 09, 2013

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Art Voss	Cheri Frangiadakis	Art Voss	Art Voss

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
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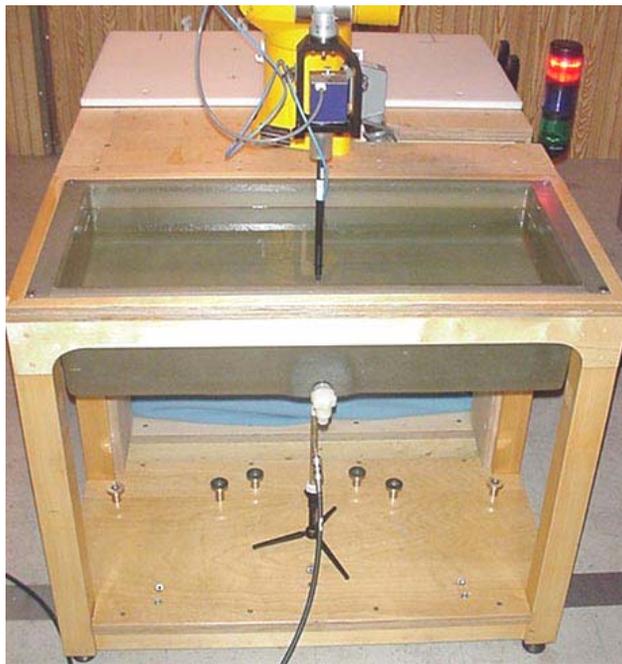
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## 1.0 INTRODUCTION

This measurement report demonstrates that the Uniden America Corporation Model: Atlantis 270 Portable VHF PTT Marine Radio Transceiver complies 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 measurement procedures described in KDB 447498 (see reference [8]), KDB 865664 (see reference [9]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2013 (see reference [5]) and IEC Standard 62209-2:2010 (see reference [6]) were employed. A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used and the various provisions of the rules are included within this test report.

## 2.0 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 Head 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 Barski Fiberglass Planar Phantom

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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### 3.0 RF CONDUCTED OUTPUT POWER MEASUREMENT

Band	Frequency	Channel	Mode	Measured Power Level		Method
				dBm	Watts	
VHF	156.05 MHz	01A	CW	37.43	5.53	Average Conducted
	156.7 MHz	14		37.44	5.54	
	156.8 MHz	16		37.44	5.54	
	157.4 MHz	28		37.26	5.32	
	157.425 MHz	88		37.3	5.37	

#### Notes

- The test channel was selected in accordance with the procedures specified in FCC KDB 447498 (see reference [7]).
- The RF conducted output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the external antenna connector of the radio in accordance with FCC 47 CFR §2.1046 (see reference [15]) and IC RSS-Gen (see reference [16]).

### 4.0 NO. OF TEST CHANNELS ( $N_c$ )

Device Frequency Range	Band	$N_c$	Test Frequencies (MHz)
156.025 - 157.425 MHz	VHF Marine	1	156.8 MHz

Note: The number of test channels ( $N_c$ ) was calculated in accordance with the procedures specified in FCC KDB 447498 (see reference [8]).

### 5.0 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	$\pm 25$ MHz $\leq$ 300 MHz
150 MHz	156.8 MHz	6.8 MHz	< 25 MHz

Note: The probe calibration and measurement frequency interval is < 25 MHz; therefore additional steps were not required.

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## 6.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 11/27&28/2013		Frequency: 150 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.050	67.16	0.72	52.3	0.76	28.41%	-5.26%
0.060	70.76	0.7	52.3	0.76	35.30%	-7.89%
0.070	49.05	0.71	52.3	0.76	-6.21%	-6.58%
0.080	55.26	0.71	52.3	0.76	5.66%	-6.58%
0.090	64.07	0.74	52.3	0.76	22.50%	-2.63%
0.100	53.8	0.72	52.3	0.76	2.87%	-5.26%
0.110	52.79	0.73	52.3	0.76	0.94%	-3.95%
0.120	56.35	0.74	52.3	0.76	7.74%	-2.63%
0.130	50.68	0.75	52.3	0.76	-3.10%	-1.32%
0.140	51.12	0.76	52.3	0.76	-2.26%	0.00%
0.150	51.45	0.77	52.3	0.76	-1.63%	1.32%
0.1568*	50.5	0.784	52.3	0.76	-3.44%	3.16%
0.160	49.99	0.79	52.3	0.76	-4.42%	3.95%
0.170	51.48	0.8	52.3	0.76	-1.57%	5.26%
0.180	50.03	0.81	52.3	0.76	-4.34%	6.58%
0.190	48.23	0.82	52.3	0.76	-7.78%	7.89%
0.200	47.14	0.82	52.3	0.76	-9.87%	7.89%
0.210	47.94	0.83	52.3	0.76	-8.34%	9.21%
0.220	46.44	0.85	52.3	0.76	-11.20%	11.84%
0.230	47.07	0.85	52.3	0.76	-10.00%	11.84%
0.240	46.52	0.86	52.3	0.76	-11.05%	13.16%
0.250	46.88	0.88	52.3	0.76	-10.36%	15.79%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Nov 27	150 Head	22 °C	21.2 °C	≥ 15 cm	102.9 kPa	31%	1000
Nov 28	150 Head	26 °C	22.8 °C	≥ 15 cm	102.8 kPa	14%	1000

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## 7.0 SAR MEASUREMENT SUMMARY

### SAR EVALUATION RESULTS

Test Config.	Test Date	Freq.	Ch.	Battery Type	Cond. Power Before Test	Accessories		Device Distance to Planar Phantom		Measured SAR (before droop) 1g (W/kg)		SAR Drift During Test	Scaled SAR (with droop) 1g (W/kg)	
		MHz			Watts	Body-worn	Audio	DUT	Antenna	PTT Duty Factor			PTT Duty Factor	
														100%
FACE	Nov 18	156.8	16	Li-ion	5.54	-	-	2.5 cm	4.5 cm	0.293	0.147	-0.194	0.306	0.153
<b>SAR LIMIT(S)</b>					<b>HEAD</b>			<b>SPATIAL PEAK</b>		<b>RF EXPOSURE CATEGORY</b>				
FCC 47 CFR 2.1093		Health Canada Safety Code 6			1.6 W/kg			averaged over 1 gram		General Population / Uncontrolled				

#### Notes

- Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
- The SAR droop measured by the DAS4 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.

## 8.0 SAR SCALING (MANUFACTURER TOLERANCE)

### SCALING OF MAXIMUM SAR LEVELS TO MANUFACTURER'S TUNE-UP TOLERANCE SPECIFICATION

Test Config.	Test Freq. (MHz)	Cond. Power	Drift	SAR Level 1g (50% PTT d/f)	Scaling up to Manuf. Upper Tol. Power Spec.	Scaled SAR (50% PTT d/f) 1g (W/kg)
		dBm	dB	W/kg		
<b>FCC (scaled without drift)</b>						
Face-Held	156.8	37.44	-0.194	0.147	+0.16 dB	0.152
<b>IC (scaled with drift)</b>						
Face-Held	156.8	37.44	-0.194	0.147	+0.16 dB	0.159

#### Notes:

- Only the highest SAR values for face and body per frequency band are scaled.
- The resulting value is the reported SAR.
- The scaled SAR levels are below the FCC/IC General Population SAR Limit of 1.6 W/kg.
- IC requires that the reported SAR also be scaled for the measured drift, therefore the above table calculates the SAR separately for IC.

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## 9.0 DETAILS OF SAR EVALUATION

The DUT was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

1. The face-held SAR evaluation was performed with the front of the DUT placed parallel to the outer surface of the planar phantom. A 2.5 cm spacing was maintained between the front side of the DUT and the outer surface of the planar phantom.
2. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was allowed to cool for 10 minutes prior to the zoom scan evaluation.
3. The DUT was evaluated for SAR in an 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.
4. The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluation and a SAR-versus-Time power droop evaluation was performed (see Appendix A).
5. The fluid temperature remained within  $\pm 2^{\circ}\text{C}$  from the fluid dielectric parameter measurement to the completion of the SAR evaluation.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

## 10.0 SAR EVALUATION PROCEDURES

- a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.  
(ii) For body-worn and face-held devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.  
An area scan was determined as follows:
  - c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
  - d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are  $>2$  dB from the global maximum. The remaining maxima are then used to position the cube scans.  
A 1g and 10g spatial peak SAR was determined as follows:
    - e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix F). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
    - f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
    - g. A zoom scan volume of 30 mm x 30 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>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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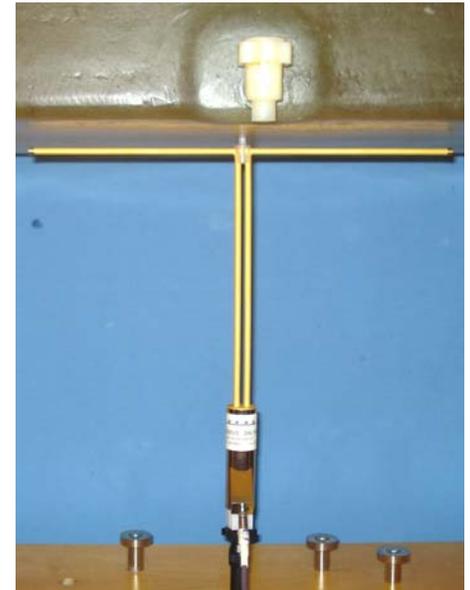
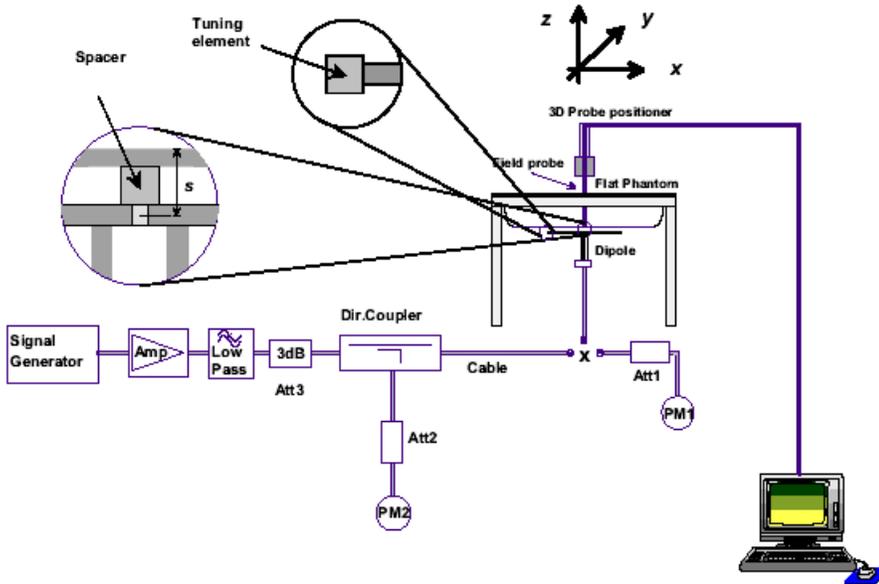
## 11.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, system verifications were performed with a planar phantom and SPEAG 300 MHz dipole (see Appendix B) in accordance with the procedures described in FCC KDB 865664 (see reference [9]). The system was verified to meet the internally generated SAR target using 150MHz tissue-equivalent medium with a 300 MHz validation dipole transmitting at 300 MHz (see Appendix E). 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 398 mW was applied to the dipole for 150 Head.

### 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)
		Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Nov 27	Head 150	0.953	0.989	+3.8%	52.3 ±5%	51.5	-1.5%	0.76 ±5%	0.77	+1.3%	1000	22	21.2	≥ 15	31	102.9

- Notes**
- The 150MHz SAR values have a coefficient of variation < 3%.
  - The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
  - The fluid temperature was measured prior to and after the system performance check evaluations. The fluid temperature remained within +/-2°C during the system performance check evaluations.
  - 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 Standard 1528-2003)

SPEAG 300 MHz Validation Dipole Setup

Applicant:	Uniden America Corporation	FCC ID:	AMWUT647	IC:	513C-UT647	
Model(s):	Atlantis 270	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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## 12.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipes in the table below are derived from the SAR system manufacturer's suggested recipes in the DASY4 manual (see references [12] and [13]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2013 (see reference [5]) and IEC Standard 62209-1:2005 (see reference [6]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

SIMULATED TISSUE MIXTURES	
INGREDIENT	150 MHz HEAD
Water	38.35 %
Sugar	55.5%
Salt	5.15%
HEC	0.9%
Bactericide	0.1%

## 13.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	(General Population / Uncontrolled Exposure)	(Occupational / Controlled Exposure)
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		<b>1.6 W/kg</b>	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.			

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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## 14.0 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 80
	Postprocessing Software: SEMCAD, V1.8 Build 186
<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>Phantom</u>	
<b>Type</b>	Barski Planar Phantom
<b>Shell Material</b>	Fiberglass
<b>Thickness</b>	2.0 ±0.1 mm
<b>Volume</b>	Approx. 70 liters

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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## 15.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In Body simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$ )
Frequency:	10 MHz to > 6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)
Directivity:	$\pm 0.2$ dB in Body tissue (rotation around probe axis) $\pm 0.4$ dB in Body tissue (rotation normal to probe axis)
Dynamic Range:	5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB
Surface Detect:	$\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of mobile phone



ET3DV6 E-Field Probe

## 16.0 BARSKI PLANAR PHANTOM

The Barski planar phantom is a fiberglass shell phantom with a 2.0 mm (+/-0.2mm) thick device measurement area at the center of the phantom for SAR evaluations of devices with a larger surface area than the planar section of the SAM phantom. The planar phantom is integrated in a wooden table. The planar phantom was used for the DUT SAR evaluations and the system performance check evaluations. See Appendix G for dimensions and specifications of the Barski planar phantom.



Barski Planar Phantom

## 17.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Face-held SAR evaluations (PTT radios) are performed with the device holder in the body axis.



Device Holder

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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## 18.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
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	19-Apr-12	Biennial
x	-ET3DV6 E-Field Probe	00017	1590	24-Apr-13	Annual
x	-D300V3 Validation Dipole	00216	1009	17-Apr-12 / 8-Jan-13	Triennial
x	-Barski Planar Phantom	00155	03-01	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	03-May-12	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833542	03-May-12	Biennial
x	Gigatronics 80334A Power Sensor	-	1837001	03-May-12	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	26-Apr-12	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	02-May-12	Biennial
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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## 19.0 MEASUREMENT UNCERTAINTIES (IC ONLY)

### UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC 62209-2:2010)

Source of Uncertainty	IEC 62209-2 Section	Tolerance / Uncertainty ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Standard Uncertainty ±% (1g)	Standard Uncertainty ±% (10g)	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
Probe Calibration (150 MHz)	7.2.2.1	10.0	Normal	1	1	1	10.0	10.0	∞
Isotropy	7.2.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Boundary Effect	7.2.2.6	2.5	Rectangular	1.732050808	1	1	1.4	1.4	∞
Linearity	7.2.2.3	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Detection Limits	7.2.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	7.2.2.7	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	7.2.2.8	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	7.2.2.9	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	7.2.4.5	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Restrictions	7.2.3.1	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	7.2.3.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Post-processing	7.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
<b>Test Sample Related</b>									
Test Sample Positioning	7.2.3.4.3	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	7.2.3.4.2	3.6	Normal	1	1	1	3.6	3.6	8
Drift of Output Power (meas. SAR drift)	7.2.2.10	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	7.2.3.2	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Algorithm for deviations in permittivity and conductivity	7.2.4.3	1.9	Normal	1	1	0.81	1.9	1.54	∞
Liquid Conductivity (measured)	7.2.4.3	3.16	Normal	1	0.78	0.71	2.5	2.2	∞
Liquid Permittivity (measured)	7.2.4.3	3.44	Normal	1	0.23	0.26	0.8	0.9	∞
Liquid Permittivity - temp. uncertainty	7.2.4.4	1.04	Rectangular	1.732050808	0.78	0.71	0.5	0.4	∞
Liquid Conductivity - temp. uncertainty	7.2.4.4	1.97	Rectangular	1.732050808	0.23	0.26	0.3	0.3	∞
<b>Combined Standard Uncertainty</b>	<b>7.3.1</b>		<b>RSS</b>				<b>13.10</b>	<b>13.02</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>	<b>7.3.2</b>		<b>k=2</b>				<b>26.19</b>	<b>26.03</b>	

**Measurement Uncertainty Table in accordance with International Standard IEC 62209-2:2010**

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

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<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>	
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## 20.0 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.
- [4] Industry Canada - "Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 4: March 2010.
- [5] IEEE Standard 1528-2013 - "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] IEC International Standard 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."
- [7] International Standard IEC 62209-2 Edition 1.0 2010-03 - "Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)".
- [8] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01 v05: October 2012.
- [9] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurement Requirements for 100 MHz to 6 GHz"; KDB 865664 D01v01: October 2012.
- [10] Federal Communications Commission, Office of Engineering and Technology - "SAR Test Reduction Considerations for Occupational PTT Radios", KDB 643646 D01v01: December 2010.
- [12] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.
- [13] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [14] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."
- [15] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [16] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 3: December 2010.

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**APPENDIX A - SAR MEASUREMENT PLOTS**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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Date Tested: 11/28/2013

## Face-held SAR - Channel 16 - 156.8 MHz

**DUT: Atlantis 270; Type: VHF PTT Radio Transceiver; Serial: Not Specified**

Program Notes: Ambient Temp: 26C; Fluid Temp: 22.8C; Barometric Pressure: 102.8 kPa; Humidity: 14%

Procedure Notes:

Communication System: VHF

Frequency: 156.8 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used (interpolated):  $f = 156.8 \text{ MHz}$ ;  $\sigma = 0.784 \text{ mho/m}$ ;  $\epsilon_r = 50.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(9.31, 9.31, 9.31); Calibrated: 24/04/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Head 156.8MHz/Area Scan 2 (6x17x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.379 mW/g

**Head 156.8MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

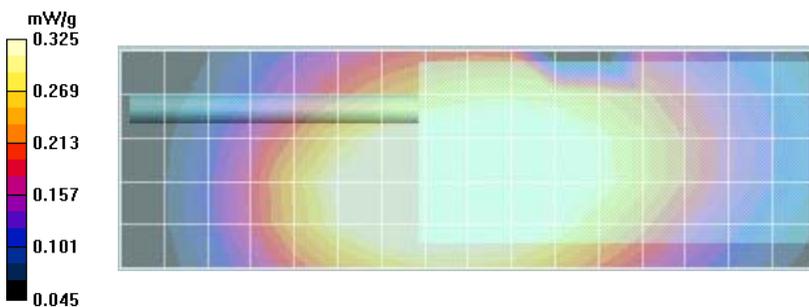
Reference Value = 20.5 V/m; Power Drift = -0.194 dB

Peak SAR (extrapolated) = 0.464 W/kg

**SAR(1 g) = 0.293 mW/g; SAR(10 g) = 0.203 mW/g**

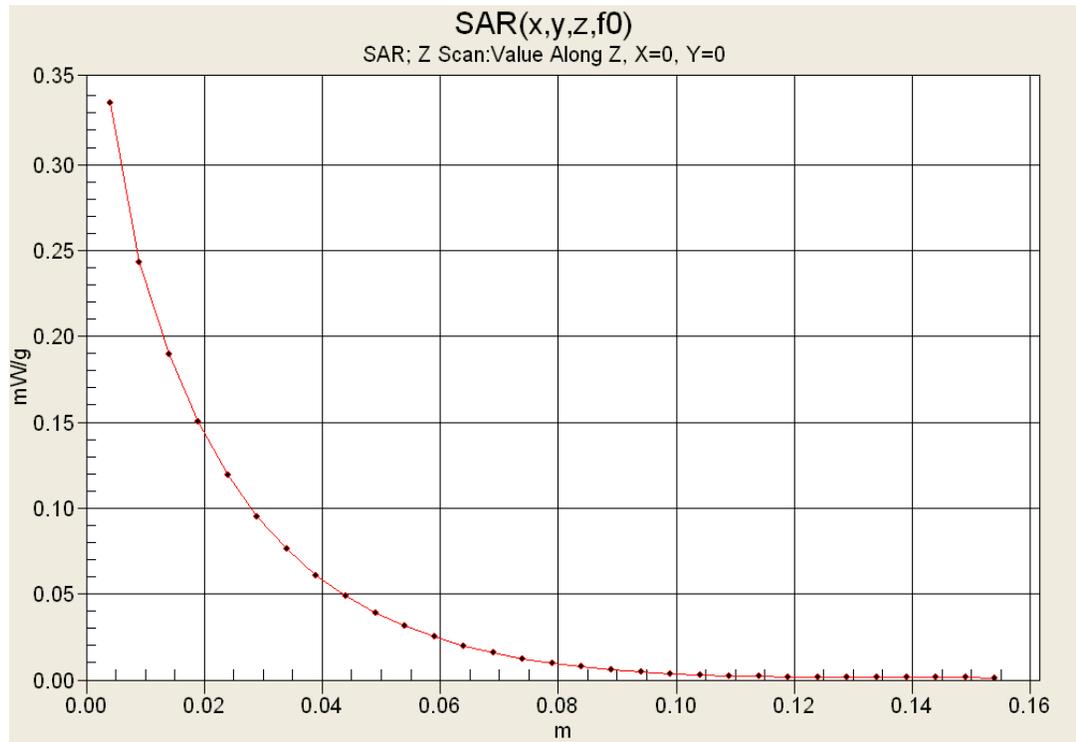
Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.325 mW/g

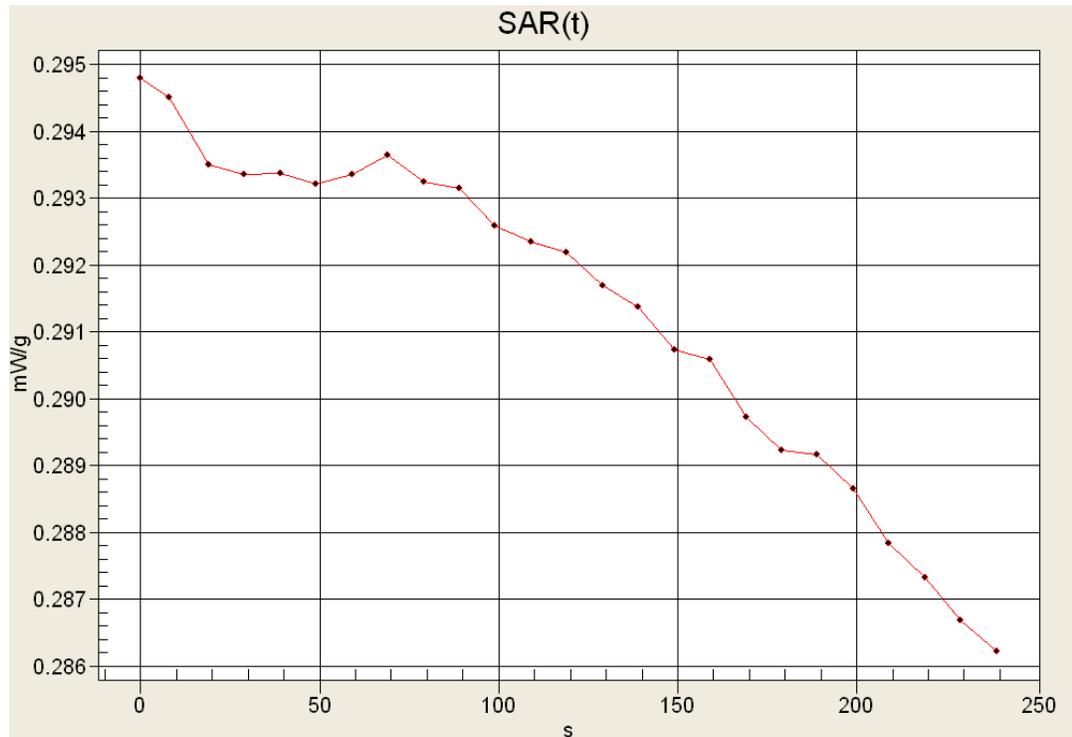


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### Z-Axis Scan



### SAR-Vs-Time



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**APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
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Date Tested: 11/27/2013

### System Performance Check - 300 MHz Dipole - 150 MHz Head Fluid

**DUT: Dipole 300 MHz; Type: D300V3; Serial: 1009; Calibrated: 17/04/2012**

Program Notes: Ambient Temp: 22C; Fluid Temp: 21.2C; Barometric Pressure: 102.9 kPa; Humidity: 31%

Procedure Notes: 300 MHz Dipole transmitting at 300 MHz using 150 MHz SAR probe calibration and 150 MHz tissue dielectric parameters

Communication System: CW

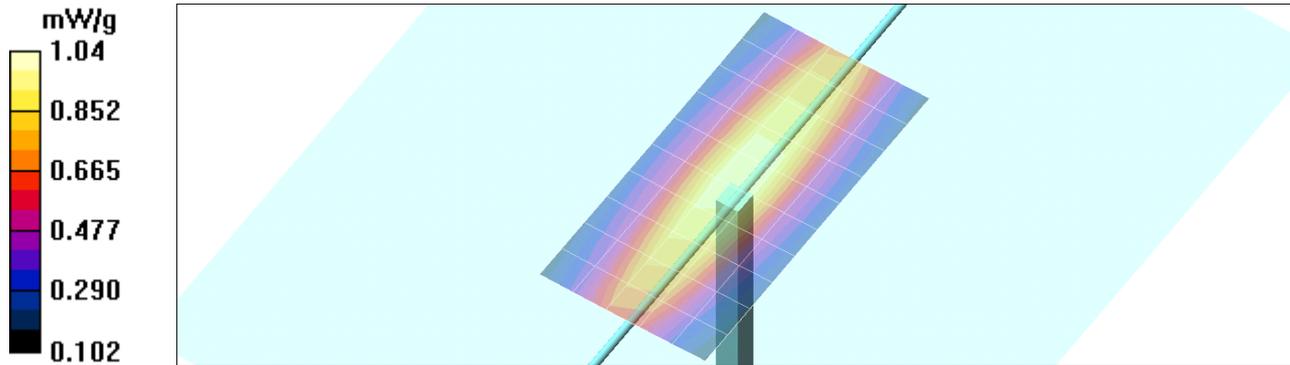
Frequency: 150 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used:  $f = 150 \text{ MHz}$ ;  $\sigma = 0.77 \text{ mho/m}$ ;  $\epsilon_r = 51.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(9.31, 9.31, 9.31); Calibrated: 24/04/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Head d=15mm, Pin = 398mW/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.963 mW/g

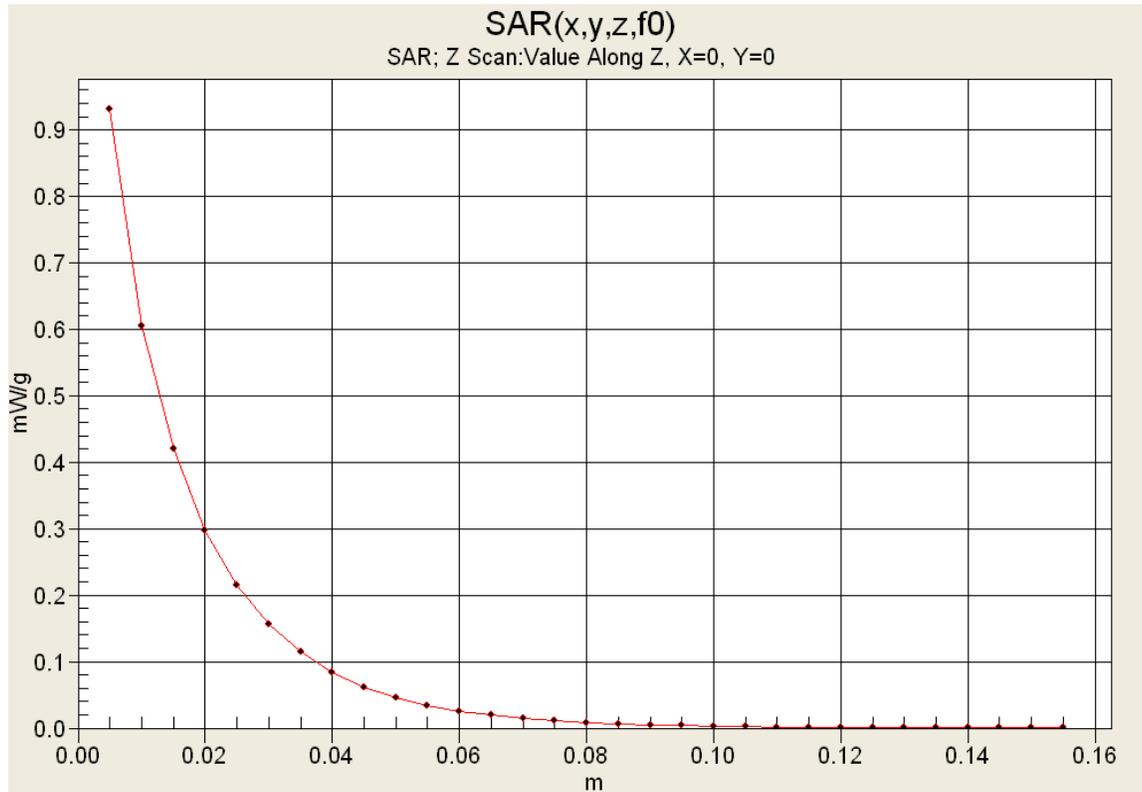
**Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 37.1 V/m; Power Drift = -0.104 dB  
Peak SAR (extrapolated) = 1.69 W/kg  
**SAR(1 g) = 0.989 mW/g; SAR(10 g) = 0.644 mW/g**  
Maximum value of SAR (measured) = 1.04 mW/g



<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-Axis Scan



<b>Applicant:</b> Uniden America Corporation	<b>FCC ID:</b> AMWUT647	<b>IC:</b> 513C-UT647	
<b>Model(s):</b> Atlantis 270	<b>DUT Type:</b> Portable VHF PTT Marine Radio Transceiver	<b>156.025-157.425 MHz</b>	
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	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 150 MHz Head

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
27&28/Nov/2013  
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
0.0500	56.97 0.69	67.16	0.72
0.0600	56.50 0.69	70.76	0.70
0.0700	56.03 0.70	49.05	0.71
0.0800	55.57 0.71	55.26	0.71
0.0900	55.10 0.72	64.07	0.74
0.1000	54.63 0.72	53.80	0.72
0.1100	54.17 0.73	52.79	0.73
0.1200	53.70 0.74	56.35	0.74
0.1300	53.23 0.75	50.68	0.75
0.1400	52.77 0.75	51.12	0.76
0.1500	52.30 0.76	51.45	0.77
0.1600	51.83 0.77	49.99	0.79
0.1700	51.37 0.77	51.48	0.80
0.1800	50.90 0.78	50.03	0.81
0.1900	50.43 0.79	48.23	0.82
0.2000	49.97 0.80	47.14	0.82
0.2100	49.50 0.80	47.94	0.83
0.2200	49.03 0.81	46.44	0.85
0.2300	48.57 0.82	47.07	0.85
0.2400	48.10 0.83	46.52	0.86
0.2500	47.63 0.83	46.88	0.88

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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**FACE-HELD SAR TEST SETUP PHOTOGRAPHS**



	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**DUT PHOTOGRAPHS**



DUT Front side

DUT Left side

DUT Back side

DUT Right side

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**DUT PHOTOGRAPHS**



Shown with Battery / Battery Cover Removed



Sample used for Conductive Power Measurement

<b>Applicant:</b>	Uniden America Corporation	<b>FCC ID:</b>	AMWUT647	<b>IC:</b>	513C-UT647	
<b>Model(s):</b>	Atlantis 270	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX E - DIPOLE CALIBRATION**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **D300V3-1009\_Apr12**

## CALIBRATION CERTIFICATE

Object **D300V3 - SN: 1009**

Calibration procedure(s) **QA CAL-15.v6  
Calibration procedure for dipole validation kits below 700 MHz**

Calibration date: **April 17, 2012**

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ET3DV6	SN: 1507	30-Dec-11 (No. ET3-1507_Dec11)	Dec-12
DAE4	SN: 900	11-Apr-12 (No. DAE4-900_Apr12)	Apr-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 27, 2012

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Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

### 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
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

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%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

<b>DASY Version</b>	DASY5	V52.8.1
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	ELI4 Flat Phantom	Shell thickness: $2 \pm 0.2$ mm
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	300 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	45.3	0.87 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	44.9 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	398 mW input power	1.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>2.88 mW / g <math>\pm</math> 18.1 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	398 mW input power	0.770 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>1.90 mW / g <math>\pm</math> 17.6 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.8 $\Omega$ - 2.9 j $\Omega$
Return Loss	- 22.2 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.748 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 26, 2009

## DASY5 Validation Report for Head TSL

Date: 17.04.2012

Test Laboratory: SPEAG

**DUT: Dipole 300 MHz; Type: D300V3; Serial: D300V3 - SN: 1009**

Communication System: CW; Frequency: 300 MHz

Medium parameters used:  $f = 300$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 44.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.59, 6.59, 6.59); Calibrated: 30.12.2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn900; Calibrated: 11.04.2012
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

### **Dipole Calibration for Head Tissue/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0:**

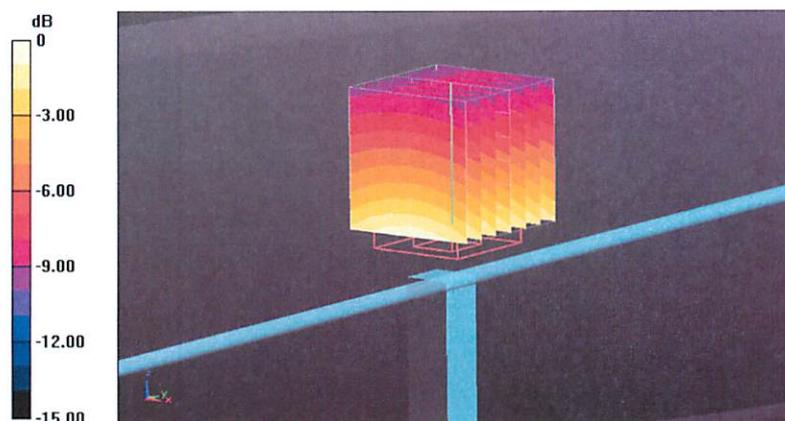
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 37.838 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.974 mW/g

**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.770 mW/g**

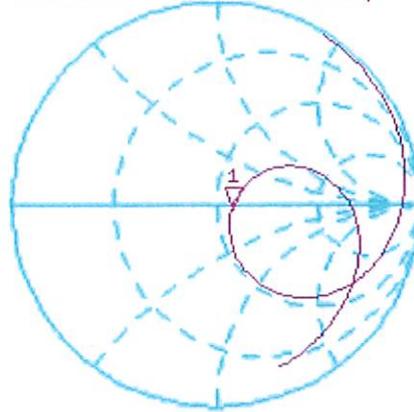
Maximum value of SAR (measured) = 1.24 mW/g



# Impedance Measurement Plot for Head TSL

17 Apr 2012 15:12:03  
[CH1] S11 1 U FS 1: 57.850  $\Omega$  -2.8926  $\Omega$  183.41 pF 300.000 000 MHz

\*  
De l  
Cor



Avg  
16

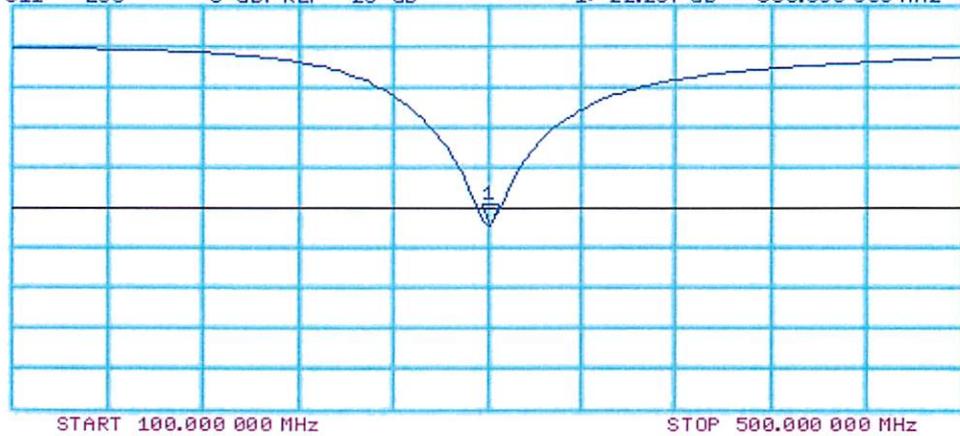
H1 d

CH2 S11 LOG 5 dB/REF -20 dB 1:-22.207 dB 300.000 000 MHz

Cor

Avg  
16

H1 d



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	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX F - PROBE CALIBRATION**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **ET3-1590\_Apr13**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **April 24, 2013**

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:	Name <b>Claudio Leubler</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: April 27, 2013

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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
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
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 affect 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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; A, B, C, D** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- 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  
Calibrated: April 24, 2013

**Calibrated for DASY/EASY Systems**  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.73	1.85	1.61	$\pm 10.1 \%$
DCP (mV) <sup>B</sup>	94.7	99.4	88.0	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	186.7	$\pm 2.7 \%$
		Y	0.0	0.0	1.0		151.0	
		Z	0.0	0.0	1.0		171.2	

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  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.53	7.53	7.53	0.21	2.23	± 13.4 %
750	41.9	0.89	7.24	7.24	7.24	0.25	3.00	± 12.0 %
835	41.5	0.90	6.84	6.84	6.84	0.26	3.00	± 12.0 %
900	41.5	0.97	6.68	6.68	6.68	0.28	3.00	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

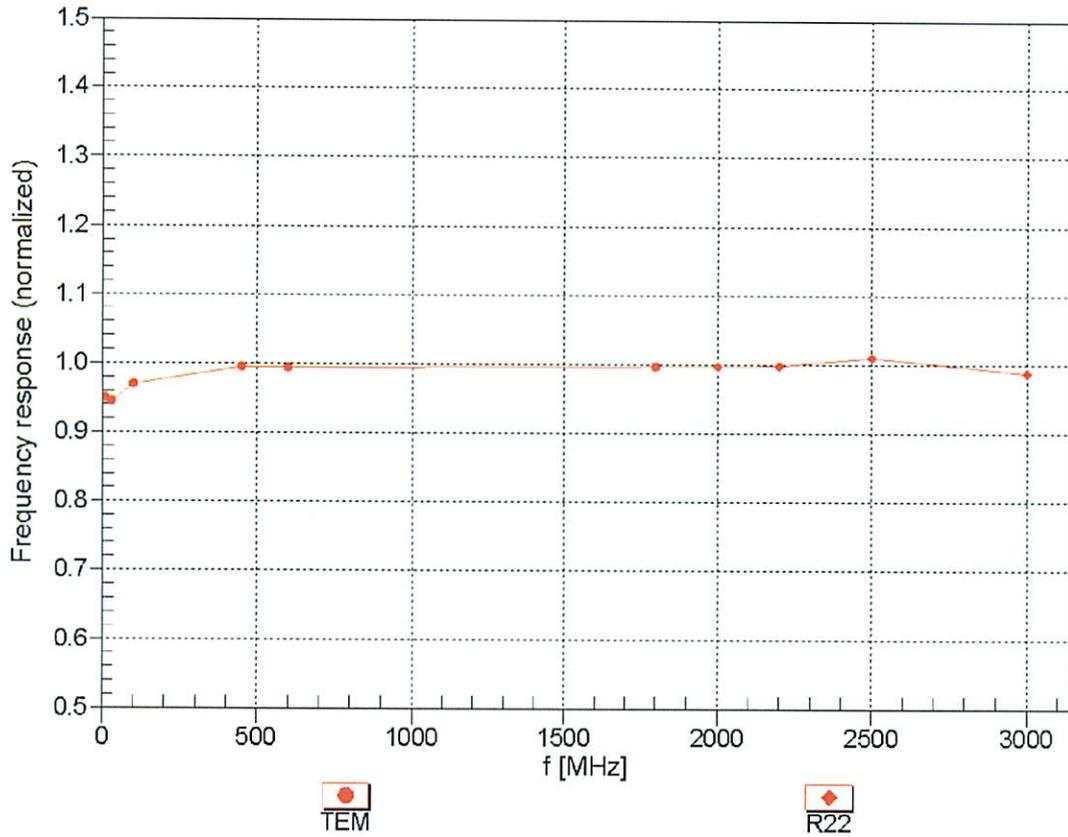
### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.98	7.98	7.98	0.13	2.14	± 13.4 %
750	55.5	0.96	6.84	6.84	6.84	0.31	2.49	± 12.0 %
835	55.2	0.97	6.67	6.67	6.67	0.29	2.67	± 12.0 %
900	55.0	1.05	6.63	6.63	6.63	0.26	3.00	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

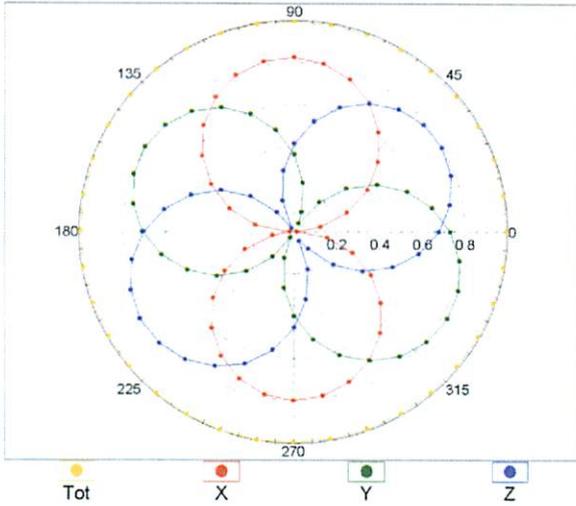
## Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



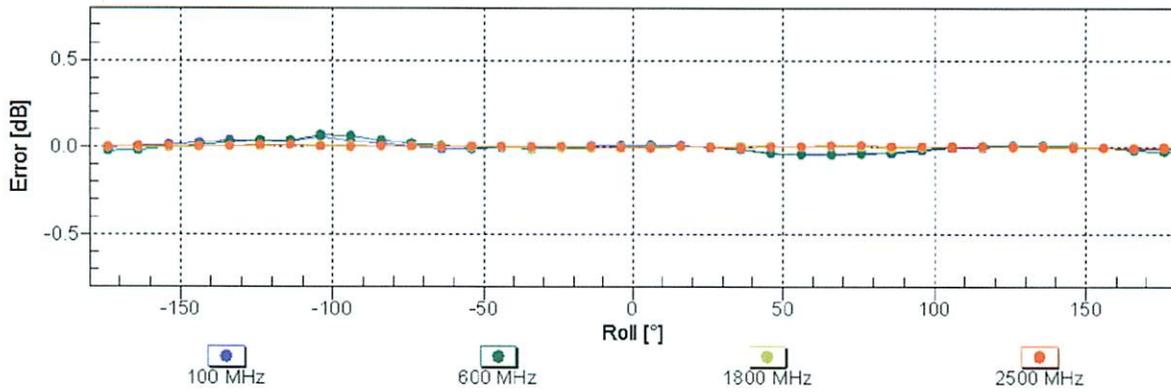
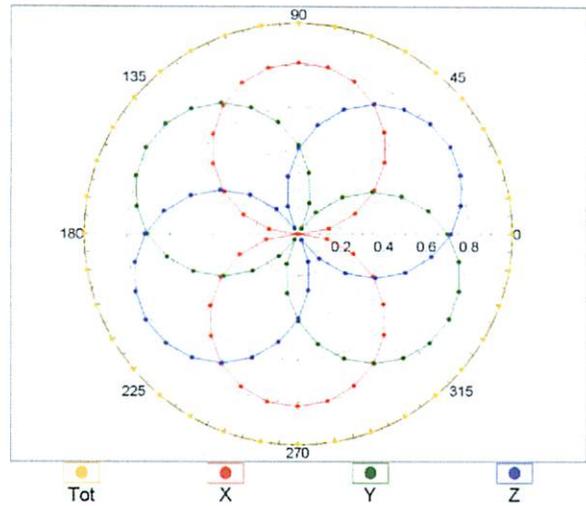
**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

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

f=600 MHz,TEM

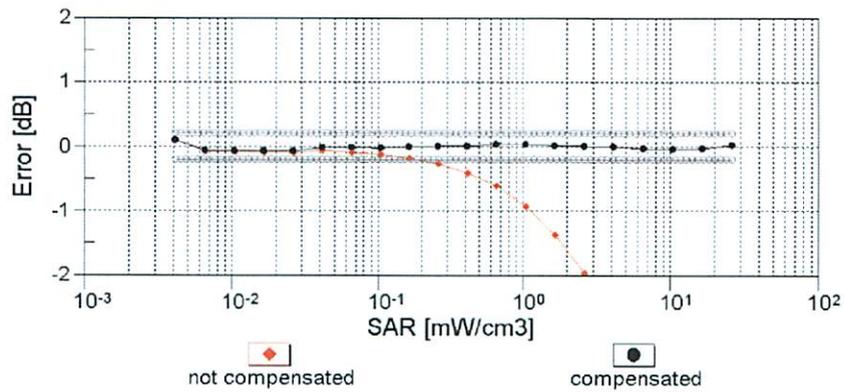
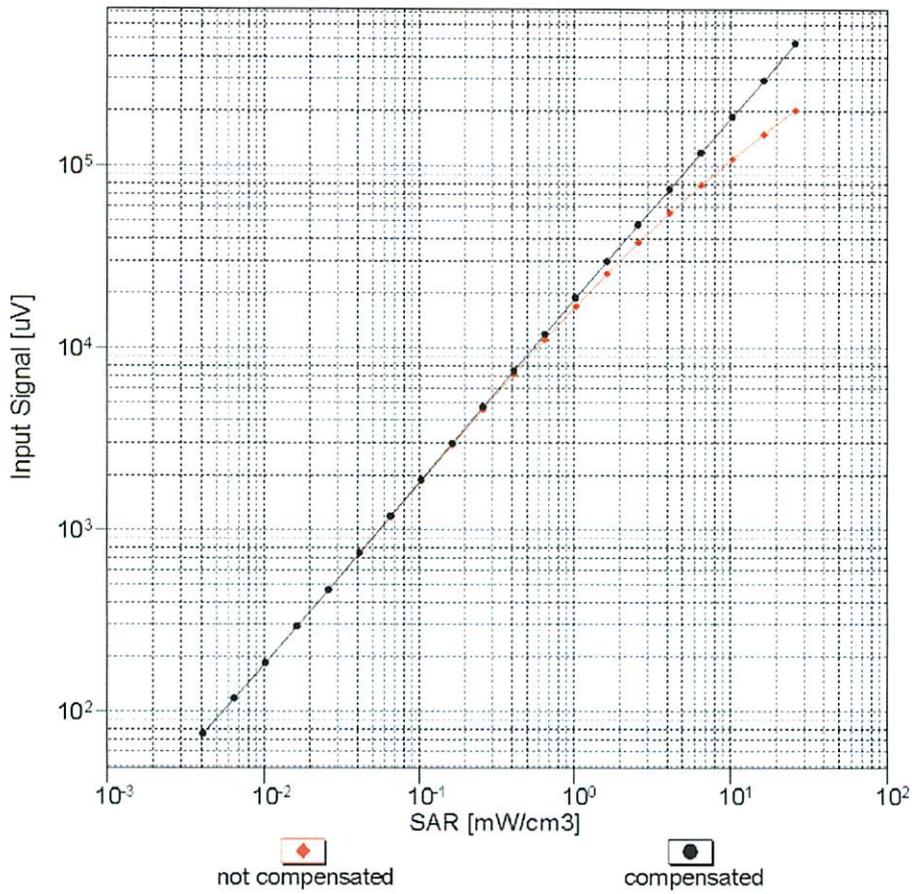


f=1800 MHz,R22



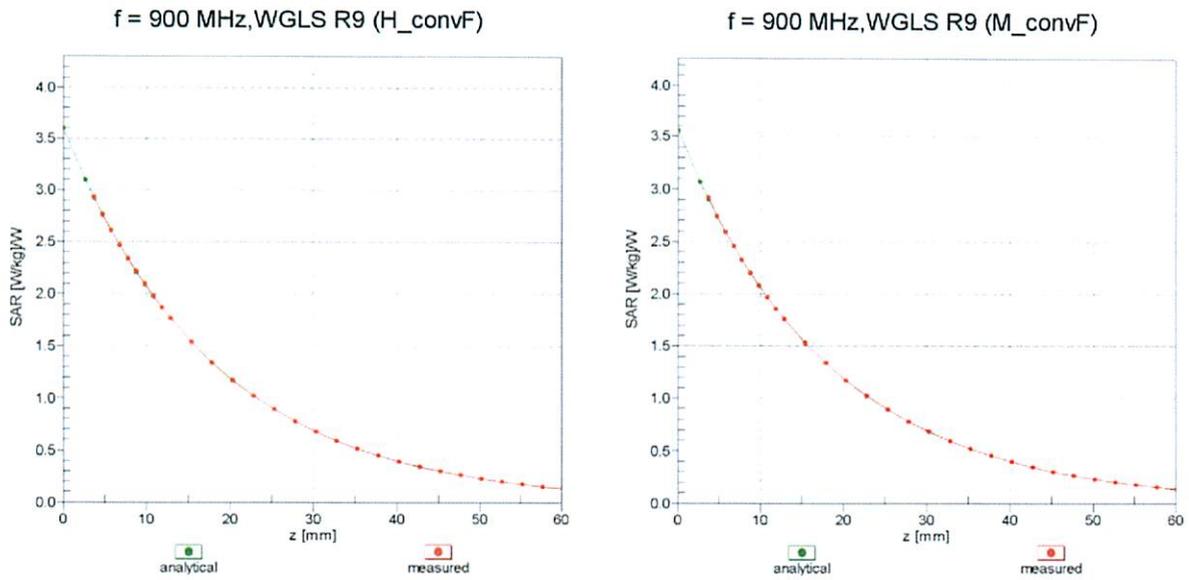
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range $f(SAR_{head})$ (TEM cell , $f = 900$ MHz)

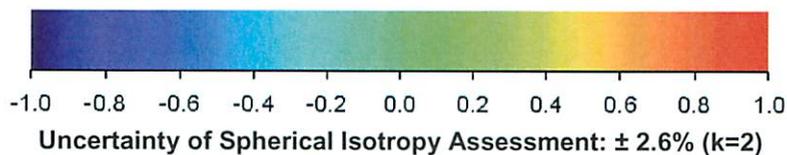
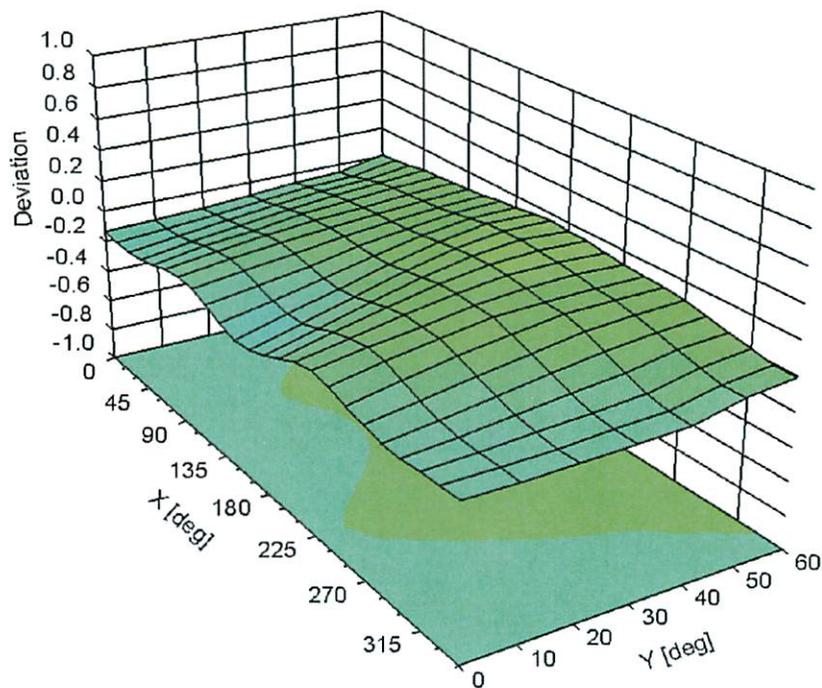


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

## Additional Conversion Factors for Dosimetric E-Field Probe

Type:	<b>ET3DV6</b>
Serial Number:	<b>1590</b>
Place of Assessment:	<b>Zurich</b>
Date of Assessment:	<b>April 29, 2013</b>
Probe Calibration Date:	<b>April 24, 2013</b>

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 450, 835 and 900 MHz.

Assessed by:



## Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor ( $\pm$  standard deviation)

150  $\pm$  50 MHz      *ConvF*      9.31  $\pm$  10%

$\epsilon_r = 52.3 \pm 5\%$   
 $\sigma = 0.76 \pm 5\%$  mho/m  
 (head tissue)

300  $\pm$  50 MHz      *ConvF*      8.36  $\pm$  9%

$\epsilon_r = 45.3 \pm 5\%$   
 $\sigma = 0.87 \pm 5\%$  mho/m  
 (head tissue)

150  $\pm$  50 MHz      *ConvF*      8.65  $\pm$  10%

$\epsilon_r = 61.9 \pm 5\%$   
 $\sigma = 0.80 \pm 5\%$  mho/m  
 (body tissue)

300  $\pm$  50 MHz      *ConvF*      8.41  $\pm$  9%

$\epsilon_r = 58.2 \pm 5\%$   
 $\sigma = 0.92 \pm 5\%$  mho/m  
 (body tissue)

### Important Note:

**For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.**

**Please see also DASY Manual.**

	<u>Date(s) of Evaluation</u> Nov 27 & 28, 2013	<u>Test Report Serial No.</u> 111813AMW-1269	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> December 9, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX G - BARSKI PHANTOM CERTIFICATE OF CONFORMITY**

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT647</b>	<b>IC:</b>	<b>513C-UT647</b>	
<b>Model(s):</b>	<b>Atlantis 270</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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2378 Westlake Road  
Kelowna, B.C. Canada  
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Ph. # 250-769-6848  
Fax # 250-769-6334  
E-mail: [barskiind@shaw.ca](mailto:barskiind@shaw.ca)  
Web: [www.bcfiberglass.com](http://www.bcfiberglass.com)

## FIBERGLASS FABRICATORS

### Certificate of Conformity

Item : Flat Planar Phantom Unit # 03-01  
Date: June 16, 2003  
Manufacturer: Barski Industries (1985 Ltd)

Test	Requirement	Details
Shape	Compliance to geometry according to drawing	Supplied CAD drawing
Material Thickness	Compliant with the requirements	2mm +/- 0.2mm in measurement area
Material Parameters	Dielectric parameters for required frequencies Based on Dow Chemical technical data	100 MHz-5 GHz Relative permittivity<5 Loss Tangent<0.05

#### Conformity

Based on the above information, we certify this product to be compliant to the requirements specified.

Signature: \_\_\_\_\_

A handwritten signature in black ink, appearing to read 'Daniel Chailier', is written over a horizontal line.

Daniel Chailier



**Fiberglass Planar Phantom - Top View**



**Fiberglass Planar Phantom - Front View**



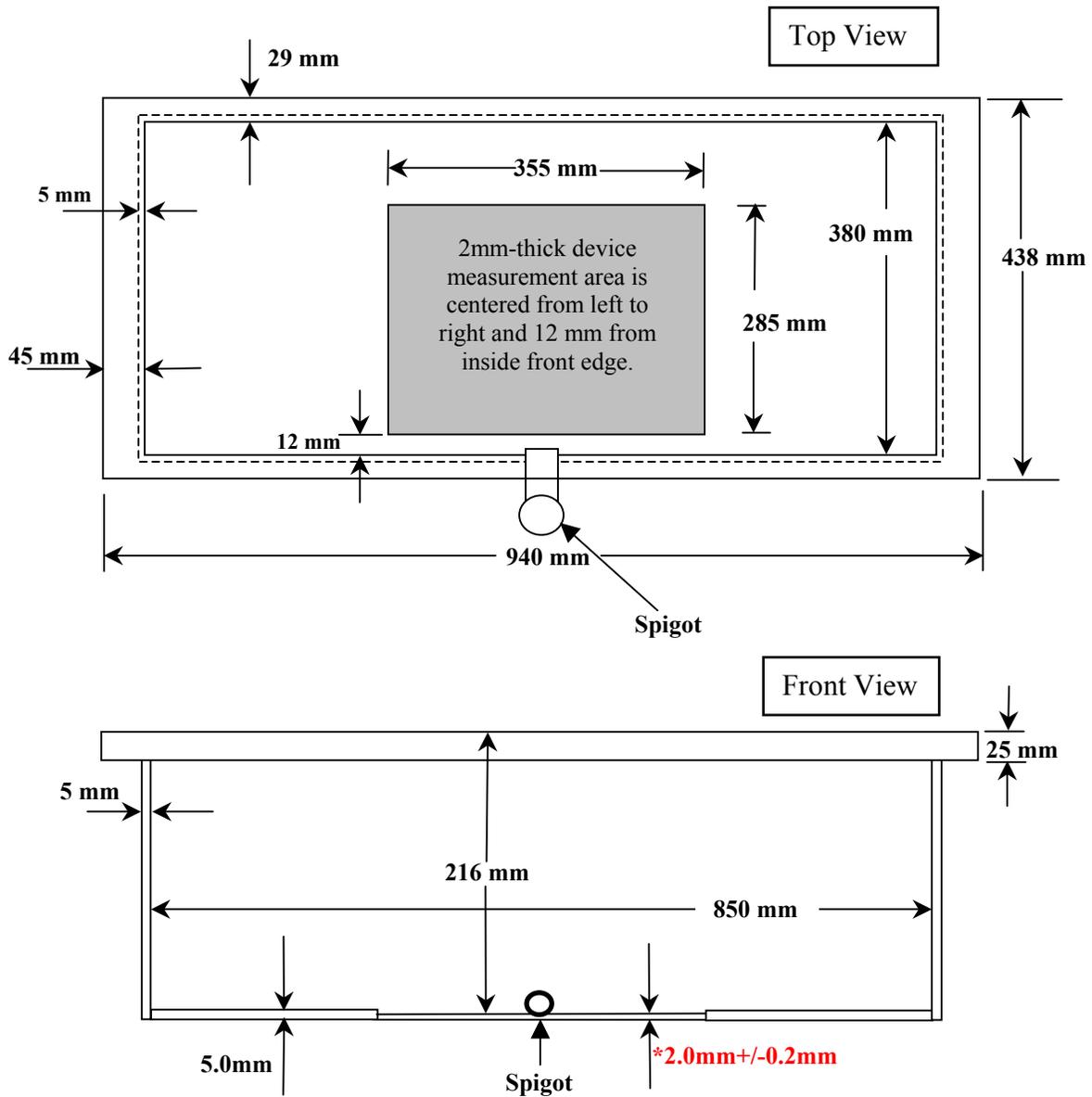
**Fiberglass Planar Phantom - Back View**



**Fiberglass Planar Phantom - Bottom View**

## Dimensions of Fiberglass Planar Phantom

(Manufactured by Barski Industries Ltd. - Unit# 03-01)



**Note: Measurements that aren't repeated for the opposite sides are the same as the side measured.  
This drawing is not to scale.**