




 Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> 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	OET Bulletin 65, Supplement C	FCC	KDB 447498 D01v04	
	IC	RSS-102 Issue 4	IEEE	Standard 1528-2003	
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:	AMWUT645			
	IC:	513C-UT645			
Device Model(s)	Model(s)	MHS235			
Test Sample Serial No.	None (Identical Prototype)				
Date of Sample Receipt	Nov. 06, 2012		Date(s) of Evaluations		Nov. 13 & 27, 2012
Test Sample Hardware Revision No.	PCB Rev. Z2		Test Sample Firmware Rev. No.		Ver. 0.12
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	+0.2 W / -0.0 W		Hi Power (Boost mode)	
Measured RF Output Power	5.7 Watts	37.56 dBm		Conducted	156.7 MHz
Battery Type Tested	Lithium-ion	7.4 V		1150 mAh	M/N: BT897
Antenna Type Tested	Flexible Whip (external detachable)				P/N: AT-565
	Note: Per applicant, the above-listed antenna is the only antenna supplied with the device				
Body-worn Accessory Tested	Swivel Belt-Clip (contains metal)				P/N: 14225304
	Note: Per applicant, the above-listed belt-clip is the only body-worn accessory supplied with the device				
Audio Accessory Tested	Speaker-Microphone				P/N: SM81
Max. SAR Level(s) Evaluated	Face-held	0.880 W/kg	1g	50% PTT duty factor	General Population / Uncontrolled
	Body-worn	0.466 W/kg	1g	50% PTT duty actor	
FCC/IC Spatial Peak SAR Limit	Head/Body	1.6 W/kg	1g	50% PTT duty factor	
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 FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2003 and IEC International Standard 62209-2:2010. All measurements were performed in accordance with the SAR system manufacturer recommendations.					
I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.					
The results and statements contained in this report pertain only to the device(s) evaluated.					
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Test Report Approved By			Mike Meaker	Engineering Technologist	Celltech Labs Inc.



Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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Model(s):	MHS235	DUT Type:	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	Mike Meaker	Dec. 14, 2012

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Glen Westwell	Mike Meaker

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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## 1.0 INTRODUCTION

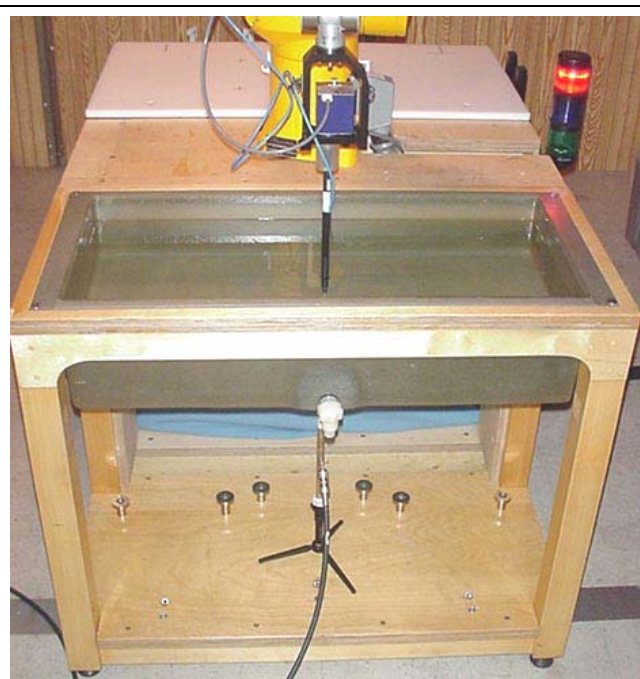
This measurement report demonstrates that the Uniden America Corporation Model: MHS235 Portable VHF PTT Marine Radio Transceiver complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The measurement procedures described in FCC OET Bulletin 65, Supplement C 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (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 Plexiglas side planar phantom



DASY4 SAR System with Barski Fiberglass Planar Phantom

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<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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### 3.0 FCC POWER THRESHOLDS FOR PTT DEVICES ( $f \leq 0.5$ GHz)

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz *		
Exposure Conditions	P mW (General Population)	P mW (Occupational)
Held to face, $d \geq 2.5$ cm	250	1250
Body-worn, $d \geq 1.5$ cm	200	1000
Body-worn, $d \geq 1.0$ cm	150	750
1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds. 2. The closest distance between the user and the device or its antenna is used to determine the power thresholds. * Per FCC KDB 447498 D01v04 Section 5)b)i) (see reference [8]).		

### 4.0 RF CONDUCTED OUTPUT POWER MEASUREMENT

Band	Frequency	Channel	Mode	Power Setting	Measured Power Level		Method
					dBm	Watts	
VHF	156.7 MHz	14	CW	Hi	37.54	5.68	Average Conducted
<b>Notes</b> 1. The test channels were selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]). 2. 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 antenna connector of the radio in accordance with FCC 47 CFR §2.1046 (see reference [12]) and IC RSS-Gen (see reference [13]).							


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



Device Frequency Range	Band	$N_c$	Test Frequencies (MHz)
156.025 - 157.425 MHz	VHF Marine	1	156.7 MHz
Note: The number of test channels ( $N_c$ ) was calculated in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).			

### 6.0 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 [8]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	$\pm 25$ MHz $\leq 300$ MHz
150 MHz	156.7 MHz	6.7 MHz	$< 25$ MHz
Note: The probe calibration and measurement frequency interval is $< 25$ MHz; therefore additional steps were not required.			

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## 7.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 11/13/2012		Frequency: 300 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.200	50.61	0.76	45.3	0.87	11.72%	-12.64%
0.210	50.34	0.77	45.3	0.87	11.13%	-11.49%
0.220	50.13	0.77	45.3	0.87	10.66%	-11.49%
0.230	49.94	0.77	45.3	0.87	10.24%	-11.49%
0.240	48.37	0.78	45.3	0.87	6.78%	-10.34%
0.250	48.93	0.8	45.3	0.87	8.01%	-8.05%
0.260	48.58	0.81	45.3	0.87	7.24%	-6.90%
0.270	48.48	0.81	45.3	0.87	7.02%	-6.90%
0.280	47.57	0.82	45.3	0.87	5.01%	-5.75%
0.290	47.32	0.84	45.3	0.87	4.46%	-3.45%
0.300	46.58	0.85	45.3	0.87	2.83%	-2.30%
0.310	46.9	0.86	45.3	0.87	3.53%	-1.15%
0.320	46.88	0.85	45.3	0.87	3.49%	-2.30%
0.330	46.18	0.88	45.3	0.87	1.94%	1.15%
0.340	45.52	0.88	45.3	0.87	0.49%	1.15%
0.350	45.19	0.89	45.3	0.87	-0.24%	2.30%
0.360	45.4	0.9	45.3	0.87	0.22%	3.45%
0.370	44.76	0.9	45.3	0.87	-1.19%	3.45%
0.380	44.34	0.91	45.3	0.87	-2.12%	4.60%
0.390	44.12	0.92	45.3	0.87	-2.60%	5.75%
0.400	43.72	0.93	45.3	0.87	-3.49%	6.90%

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Nov 13	300 Head	22.0 °C	21.0 °C	≥ 15 cm	101.1 kPa	30%	1000

Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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Test Lab Certificate No. 2470.01

FLUID DIELECTRIC PARAMETERS						
Date: 11/13/2012		Frequency: 150 MHz			Tissue: Head	
Freq	Test e	Test s	Target e	Target s	Deviation Permittivity	Deviation Conductivity
0.050	99.89	0.7	52.3	0.76	90.99%	-7.89%
0.060	78.77	0.65	52.3	0.76	50.61%	-14.47%
0.070	73.2	0.67	52.3	0.76	39.96%	-11.84%
0.080	66.11	0.71	52.3	0.76	26.41%	-6.58%
0.090	65.55	0.7	52.3	0.76	25.33%	-7.89%
0.100	54	0.74	52.3	0.76	3.25%	-2.63%
0.110	58.65	0.73	52.3	0.76	12.14%	-3.95%
0.120	57.59	0.74	52.3	0.76	10.11%	-2.63%
0.130	54.36	0.75	52.3	0.76	3.94%	-1.32%
0.140	54.1	0.76	52.3	0.76	3.44%	0.00%
0.150	55.53	0.75	52.3	0.76	6.18%	-1.32%
0.1567*	54.2	0.77	52.3	0.76	3.63%	1.32%
0.160	53.48	0.78	52.3	0.76	2.26%	2.63%
0.170	54.06	0.78	52.3	0.76	3.37%	2.63%
0.180	52.25	0.79	52.3	0.76	-0.10%	3.95%
0.190	52.82	0.78	52.3	0.76	0.99%	2.63%
0.200	51.86	0.8	52.3	0.76	-0.84%	5.26%
0.210	50.58	0.8	52.3	0.76	-3.29%	5.26%
0.220	49.93	0.81	52.3	0.76	-4.53%	6.58%
0.230	50.62	0.81	52.3	0.76	-3.21%	6.58%
0.240	48.76	0.83	52.3	0.76	-6.77%	9.21%
0.250	49.24	0.84	52.3	0.76	-5.85%	10.53%

\*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 13	150 Head	21.0 °C	20.9 °C	≥ 15 cm	101.1 kPa	30%	1000


<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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FLUID DIELECTRIC PARAMETERS						
Date: 11/27/2012		Frequency: 300 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.200	51.62	0.75	45.3	0.87	13.95%	-13.79%
0.210	50.79	0.77	45.3	0.87	12.12%	-11.49%
0.220	50.5	0.78	45.3	0.87	11.48%	-10.34%
0.230	48.95	0.79	45.3	0.87	8.06%	-9.20%
0.240	48.18	0.79	45.3	0.87	6.36%	-9.20%
0.250	49.02	0.79	45.3	0.87	8.21%	-9.20%
0.260	48.8	0.81	45.3	0.87	7.73%	-6.90%
0.270	47.84	0.82	45.3	0.87	5.61%	-5.75%
0.280	48.37	0.82	45.3	0.87	6.78%	-5.75%
0.290	47.11	0.84	45.3	0.87	4.00%	-3.45%
0.300	47.56	0.85	45.3	0.87	4.99%	-2.30%
0.310	46.38	0.86	45.3	0.87	2.38%	-1.15%
0.320	46.46	0.86	45.3	0.87	2.56%	-1.15%
0.330	45.93	0.87	45.3	0.87	1.39%	0.00%
0.340	45.46	0.87	45.3	0.87	0.35%	0.00%
0.350	45.08	0.88	45.3	0.87	-0.49%	1.15%
0.360	44.86	0.91	45.3	0.87	-0.97%	4.60%
0.370	44.36	0.89	45.3	0.87	-2.08%	2.30%
0.380	43.99	0.91	45.3	0.87	-2.89%	4.60%
0.390	43.93	0.92	45.3	0.87	-3.02%	5.75%
0.400	44.08	0.93	45.3	0.87	-2.69%	6.90%

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Nov 27	300 Body	21.0 °C	20.1 °C	≥ 15 cm	101.1 kPa	30%	1000

Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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FLUID DIELECTRIC PARAMETERS						
Date: 11/27/2012		Frequency: 150 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.050	79.98	0.68	61.9	0.8	29.21%	-15.00%
0.060	85.73	0.75	61.9	0.8	38.50%	-6.25%
0.070	77.8	0.71	61.9	0.8	25.69%	-11.25%
0.080	76.82	0.73	61.9	0.8	24.10%	-8.75%
0.090	69.35	0.74	61.9	0.8	12.04%	-7.50%
0.100	66.49	0.74	61.9	0.8	7.42%	-7.50%
0.110	67.31	0.75	61.9	0.8	8.74%	-6.25%
0.120	61.67	0.75	61.9	0.8	-0.37%	-6.25%
0.130	64.48	0.74	61.9	0.8	4.17%	-7.50%
0.140	62.72	0.76	61.9	0.8	1.32%	-5.00%
0.150	63.26	0.76	61.9	0.8	2.20%	-5.00%
0.1567*	64.8	0.767	61.9	0.8	4.68%	-4.13%
0.160	65.63	0.77	61.9	0.8	6.03%	-3.75%
0.170	62.42	0.77	61.9	0.8	0.84%	-3.75%
0.180	61.65	0.79	61.9	0.8	-0.40%	-1.25%
0.190	63.02	0.78	61.9	0.8	1.81%	-2.50%
0.200	62.7	0.8	61.9	0.8	1.29%	0.00%
0.210	62.04	0.82	61.9	0.8	0.23%	2.50%
0.220	60.95	0.8	61.9	0.8	-1.53%	0.00%
0.230	60.77	0.82	61.9	0.8	-1.83%	2.50%
0.240	60.51	0.81	61.9	0.8	-2.25%	1.25%
0.250	59.94	0.83	61.9	0.8	-3.17%	3.75%

\*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 Body	21.0 °C	21.7 °C	≥ 15 cm	101.1 kPa	30%	1000

Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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## 8.0 SAR MEASUREMENT SUMMARY



SAR EVALUATION RESULTS														
Test Config.	Test Date	Freq.	Ch.	Batt. 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)	
		PTT Duty Factor								PTT Duty Factor				
		MHz			Watts	Body-worn	Audio	DUT	Antenna	100%	50%		dB	100%
FACE	Nov 13	156.7	14	Li-ion	5.68	n/a	n/a	2.5 cm	4.2 cm	1.76	0.880	-0.401	1.93	0.965
BODY	Nov 27	156.7	14	Li-ion	5.68	Belt-Clip	Spkr-Mic	2.6 cm	3.4 cm	0.932	0.466	0.146	n/a	n/a
SAR LIMIT(S)							HEAD / BODY		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			
Notes														
1.	Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.													
2.	The SAR 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.													

## 9.0 SAR SCALING (MANUFACTURER TUNE-UP TOLERANCE)

SAR SCALING TO MANUFACTURER'S MAX. UPPER TOLERANCE SPEC.						
Test Config.	Test Freq. (MHz)	Chan.	Measured Conducted Power (Watts)	Measured SAR Level 1g (W/kg)*	Scaling to Max. Conducted Power Level inc. Upper Power Tolerance (5.9 Watts)	Scaled SAR Level 1g (W/kg)*
Face-held	156.7	14	5.68	0.880	+ 0.165 dB	0.914
Body-worn	156.7	14	5.68	0.466	+ 0.165 dB	0.484

\* Note: 50% PTT duty factor (before droop)

Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
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## 10.0 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 body-worn SAR evaluation was performed with the swivel belt-clip body-worn accessory attached to the back of the DUT in a parallel-touch position to the outer surface of the planar phantom.
3. The body-worn SAR evaluation was performed with the customer-supplied speaker-microphone audio accessory connected to the DUT.
4. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down and the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
5. The radio contains a Boost function that enables the user to select a transmitter power of 5.7W (max. power). The radio was evaluated for SAR at the maximum transmitter power setting.
6. 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.
7. The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. A SAR-versus-Time power droop evaluation was performed.
8. The fluid temperature remained within  $\pm 2^{\circ}\text{C}$  from the fluid dielectric parameter measurement to the completion of each SAR test.
9. 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).

## 11.0 SAR EVALUATION PROCEDURES

- (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.
- 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 F). 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 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>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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## 12.0 SYSTEM PERFORMANCE CHECK

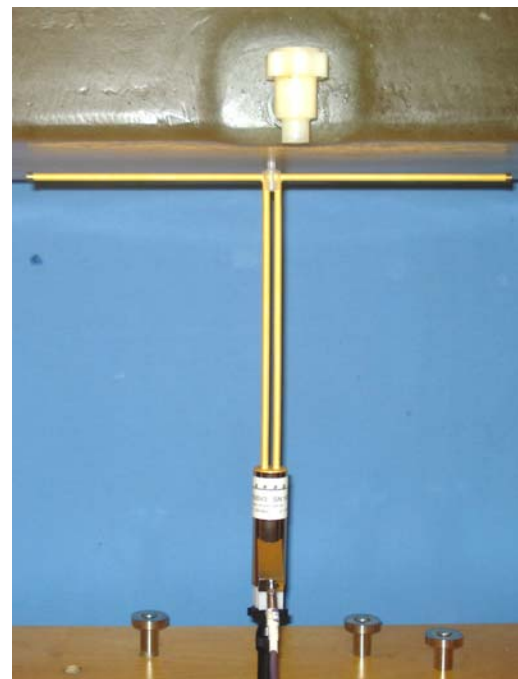
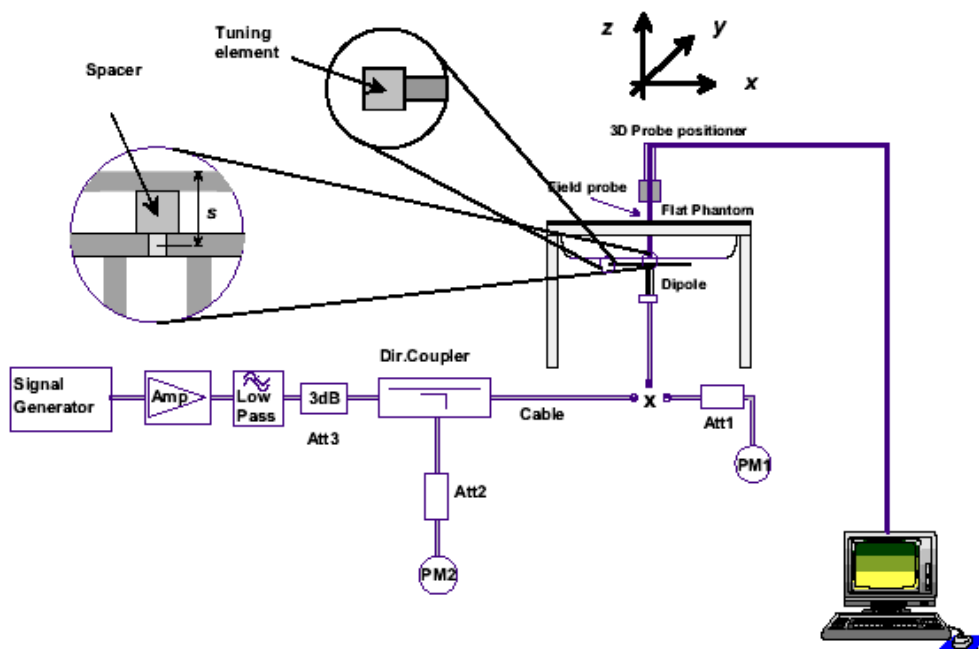
Prior to the SAR evaluations a daily system check was performed with a planar phantom and 300 MHz SPEAG validation dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the 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 398 mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$  from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

### 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 13	Head 300	1.17 $\pm 10\%$	1.11	-5.1%	45.3 $\pm 5\%$	46.6	+2.9%	0.87 $\pm 5\%$	0.85	-2.3%	1000	22.0	21.0	$\geq 15$	30	101.1
Nov 27	Head 300	1.17 $\pm 10\%$	1.15	-1.7%	45.3 $\pm 5\%$	47.56	+5.0%	0.87 $\pm 5\%$	0.85	-2.3%	1000	21.0	20.1	$\geq 15$	30	101.1


#### Notes



- The target SAR values are the measured values from the SAR system manufacturer's dipole calibration (see Appendix E).
- The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
- The fluid temperature remained within  $\pm 2^\circ\text{C}$  from the fluid dielectric parameter measurement to the completion of the system performance check.
- 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

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Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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## 13.0 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 [9] and [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 MIXTURES							
INGREDIENT	Water	300 MHz Head Tissue Mixture	37.56 %	150 MHz Head Tissue Mixture	38.35 %	150 MHz Body Tissue Mixture	46.6 %
	Sugar		55.32 %		55.5%		49.7 %
	Salt		5.95 %		5.15%		2.6 %
	HEC		0.98 %		0.9%		1.0 %
	Bactericide		0.19 %		0.1%		0.1 %

## 14.0 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)		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:	AMWUT645	IC:	513C-UT645	
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## 15.0 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 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</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


Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
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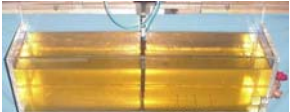
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## 16.0 PROBE SPECIFICATION (ET3DV6)

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

## 17.0 SIDE PLANAR PHANTOM

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

## 18.0 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.	
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Barski Planar Phantom

## 19.0 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.	
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Device Holder


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## 20.0 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-12	Annual
x	-D300V3 Validation Dipole	00220	1009	17-Apr-12	Triennial
x	Side Planar Phantom	00156	161	CNR	CNR
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>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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### UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC 62209-2:2010)

Source of Uncertainty	IEC 62209-2 Section	Tolerance / Uncertainty $\pm\%$	Probability Distribution	Divisor	ci 1g	ci 10g	Standard Uncertainty $\pm\%$ (1g)	Standard Uncertainty $\pm\%$ (10g)	$V_i$ or $V_{eff}$
<b>Measurement System</b>									
Probe Calibration (150 MHz)	7.2.2.1	10.0	Normal	1	1	1	10.0	10.0	$\infty$
Isotropy	7.2.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
Boundary Effect	7.2.2.6	2.7	Rectangular	1.732050808	1	1	1.6	1.6	$\infty$
Linearity	7.2.2.3	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
Detection Limits	7.2.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Readout Electronics	7.2.2.7	0.3	Normal	1	1	1	0.3	0.3	$\infty$
Response Time	7.2.2.8	0.8	Rectangular	1.732050808	1	1	0.5	0.5	$\infty$
Integration Time	7.2.2.9	2.6	Rectangular	1.732050808	1	1	1.5	1.5	$\infty$
RF Ambient Conditions	7.2.4.5	3	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Probe Positioner Mechanical Restrictions	7.2.3.1	0.4	Rectangular	1.732050808	1	1	0.2	0.2	$\infty$
Probe Positioning wrt Phantom Shell	7.2.3.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Post-processing	7.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
<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	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	7.2.3.2	4	Rectangular	1.732050808	1	1	2.3	2.3	$\infty$
SAR Correction Algorithm for deviations in permittivity and conductivity	7.2.4.3	1.9	Normal	1	1	0.81	1.9	1.54	$\infty$
Liquid Conductivity (measured)	7.2.4.3	4.13	Normal	1	0.78	0.71	3.2	2.9	$\infty$
Liquid Permittivity (measured)	7.2.4.3	4.68	Normal	1	0.23	0.26	1.1	1.2	$\infty$
Liquid Permittivity - temp. uncertainty	7.2.4.4	1.04	Rectangular	1.732050808	0.78	0.71	0.5	0.4	$\infty$
Liquid Conductivity - temp. uncertainty	7.2.4.4	1.97	Rectangular	1.732050808	0.23	0.26	0.3	0.3	$\infty$
<b>Combined Standard Uncertainty</b>	<b>7.3.1</b>		<b>RSS</b>				<b>12.98</b>	<b>12.87</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>	<b>7.3.2</b>		<b>k=2</b>				<b>25.95</b>	<b>25.74</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


Applicant:	Uniden America Corporation		FCC ID:	AMWUT645	IC:	513C-UT645	
Model(s):	MHS235	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01


## 22.0 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.
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- [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 1528-2003 - "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques": December 2003.
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- [7] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01v04: November 2009.
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- [9] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.
- [10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [11] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."
- [12] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [13] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 3: December 2010.



<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX A - SAR MEASUREMENT PLOTS

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Date Tested: 11/13/2012

## Face-held SAR - Channel 14 - 156.7 MHz

**DUT: Uniden MHS235; Type: VHF PTT Radio Transceiver; Serial: Not Specified**

Program Notes: Ambient Temp: 21C; Fluid Temp: 20.9C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Procedure Notes:

Communication System: VHF Marine

Frequency: 156.7 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used (interpolated):  $f = 156.7 \text{ MHz}$ ;  $\sigma = 0.77 \text{ mho/m}$ ;  $\epsilon_r = 54.2$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(9.3, 9.3, 9.3); Calibrated: 24/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Side Planar; Type: Plexiglass; Serial: 161
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Ch.14/Area Scan (7x20x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.94 mW/g

**Ch.14/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

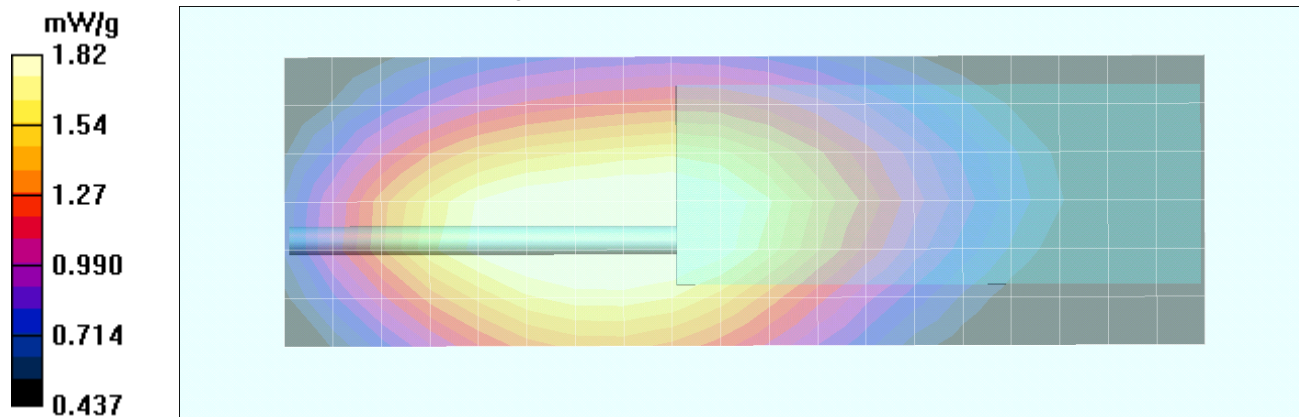
Reference Value = 49.1 V/m; Power Drift = -0.401 dB


Peak SAR (extrapolated) = 2.55 W/kg



**SAR(1 g) = 1.76 mW/g; SAR(10 g) = 1.33 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

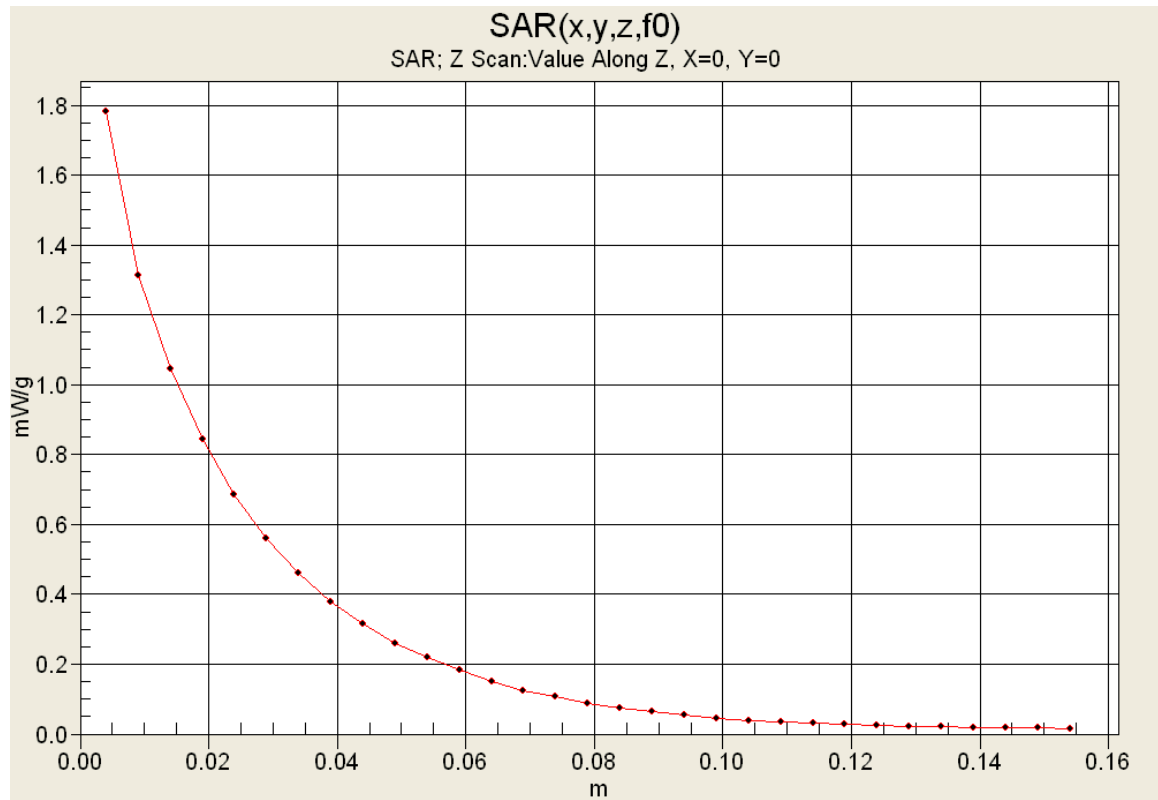
Maximum value of SAR (measured) = 1.82 mW/g






<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-Axis Scan



<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Date Tested: 11/27/2012

## Body-worn SAR - Channel 14 - 156.7 MHz

**DUT: Uniden MHS235; Type: VHF PTT Radio Transceiver; Serial: Not Specified**

Program Notes: Ambient Temp: 21C; Fluid Temp: 21.7C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Procedure Notes:

Communication System: VHF Marine

Frequency: 156.7 MHz; Duty Cycle: 1:1

Medium: M150 Medium parameters used (interpolated):  $f = 156.7 \text{ MHz}$ ;  $\sigma = 0.767 \text{ mho/m}$ ;  $\epsilon_r = 64.8$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.6, 8.6, 8.6); Calibrated: 24/04/2012
- 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: Side Planar; Type: Plexiglass; Serial: 161
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Ch.14 - Belt-clip - Speaker-mic/Area Scan (7x20x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.933 mW/g

**Ch.14 - Belt-clip - Speaker-mic/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

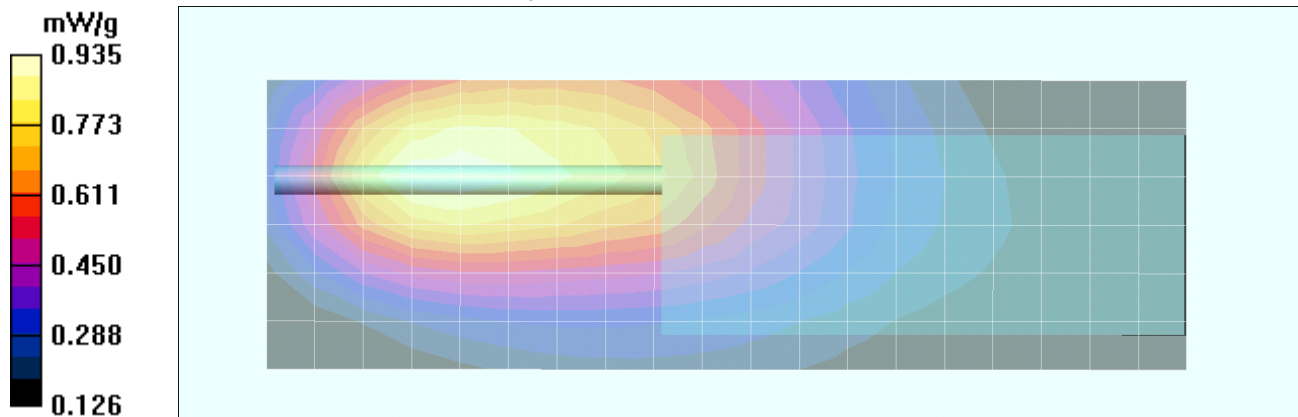
Reference Value = 28.7 V/m; Power Drift = 0.146 dB


Peak SAR (extrapolated) = 1.98 W/kg



**SAR(1 g) = 0.932 mW/g; SAR(10 g) = 0.639 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

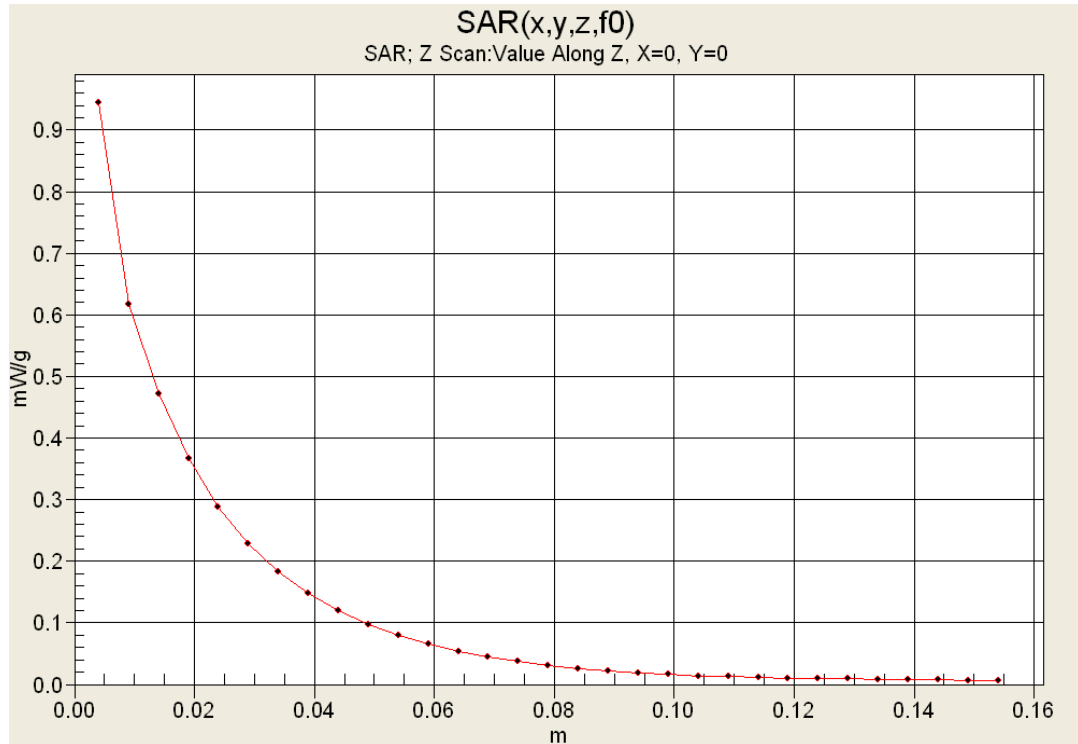
Maximum value of SAR (measured) = 0.935 mW/g



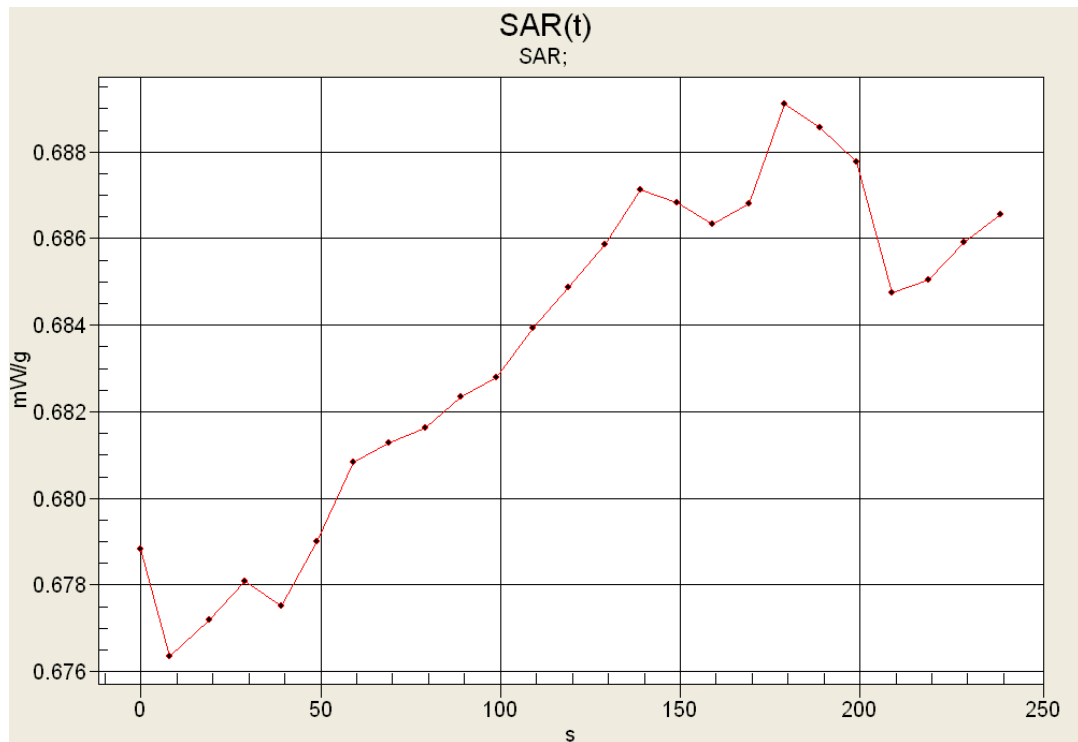
<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	



## Z-Axis Scan




## SAR vs. TIME





<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX B - SYSTEM PERFORMANCE CHECK PLOT

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Date Tested: 11/13/2012

## System Performance Check - 300 MHz Dipole - Head

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

Program Notes: Ambient Temp: 22.0C; Fluid Temp: 21.0C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Procedure Notes:

Communication System: CW

Frequency: 300 MHz; Duty Cycle: 1:1

Medium: 300 HSL Medium parameters used:  $f = 300 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 46.6$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.3, 8.3, 8.3); Calibrated: 24/04/2012
- Sensor-Surface: 5mm (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) = 1.01 mW/g

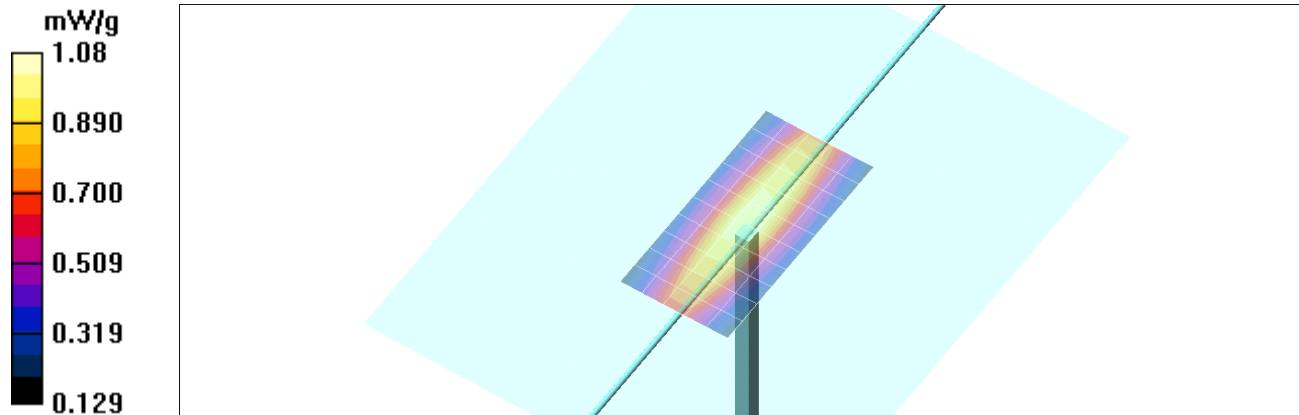
**Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm


Reference Value = 36.0 V/m; Power Drift = -0.099 dB

Peak SAR (extrapolated) = 1.78 W/kg



**SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.743 mW/g**

Maximum value of SAR (measured) = 1.08 mW/g

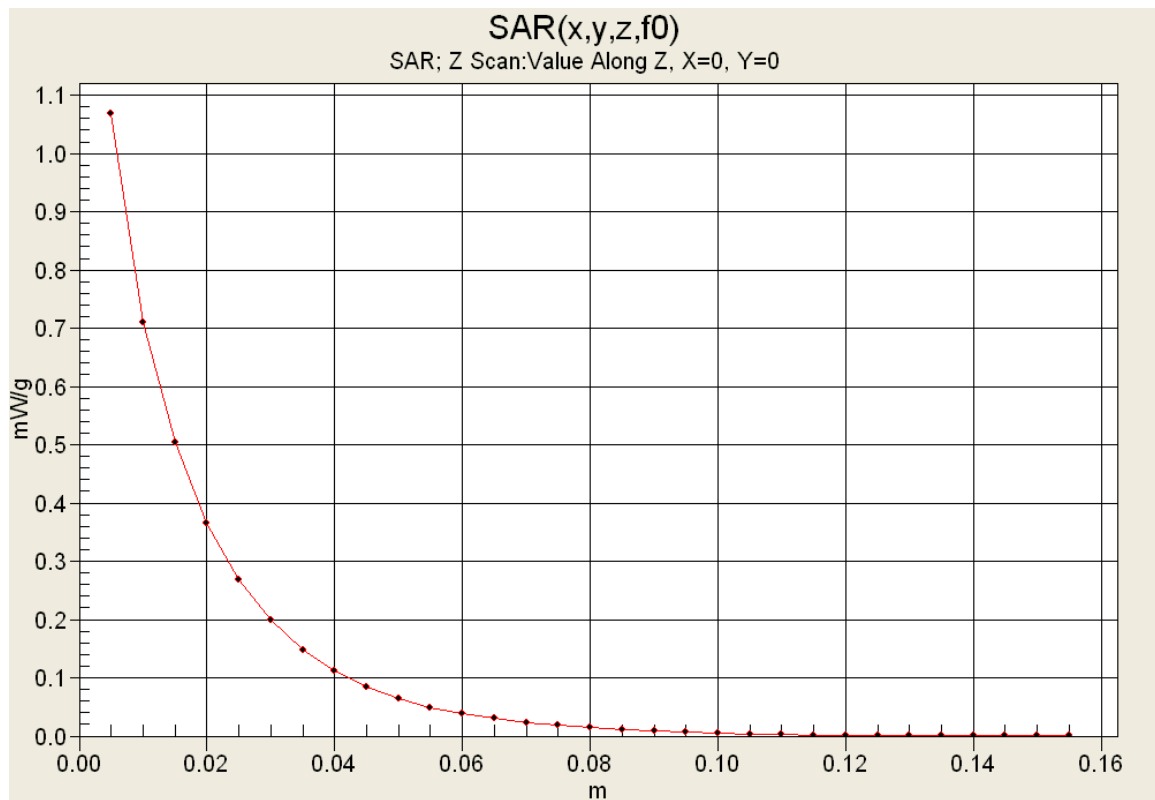



<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-Axis Scan



<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Date Tested: 11/27/2012

## System Performance Check - 300 MHz Dipole - Head

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

Program Notes: Ambient Temp: 21.0C; Fluid Temp: 20.1C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Procedure Notes:

Communication System: CW

Frequency: 300 MHz; Duty Cycle: 1:1

Medium: 300 HSL Medium parameters used:  $f = 300 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 47.56$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.3, 8.3, 8.3); Calibrated: 24/04/2012
- Sensor-Surface: 5mm (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) = 1.06 mW/g

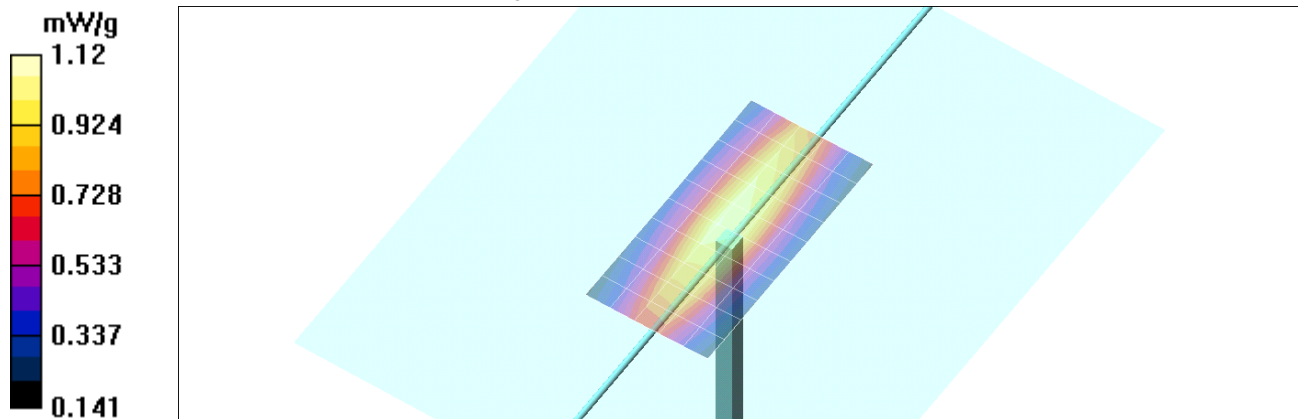
**Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm


Reference Value = 36.1 V/m; Power Drift = 0.018 dB



Peak SAR (extrapolated) = 1.83 W/kg

**SAR(1 g) = 1.15 mW/g; SAR(10 g) = 0.775 mW/g**

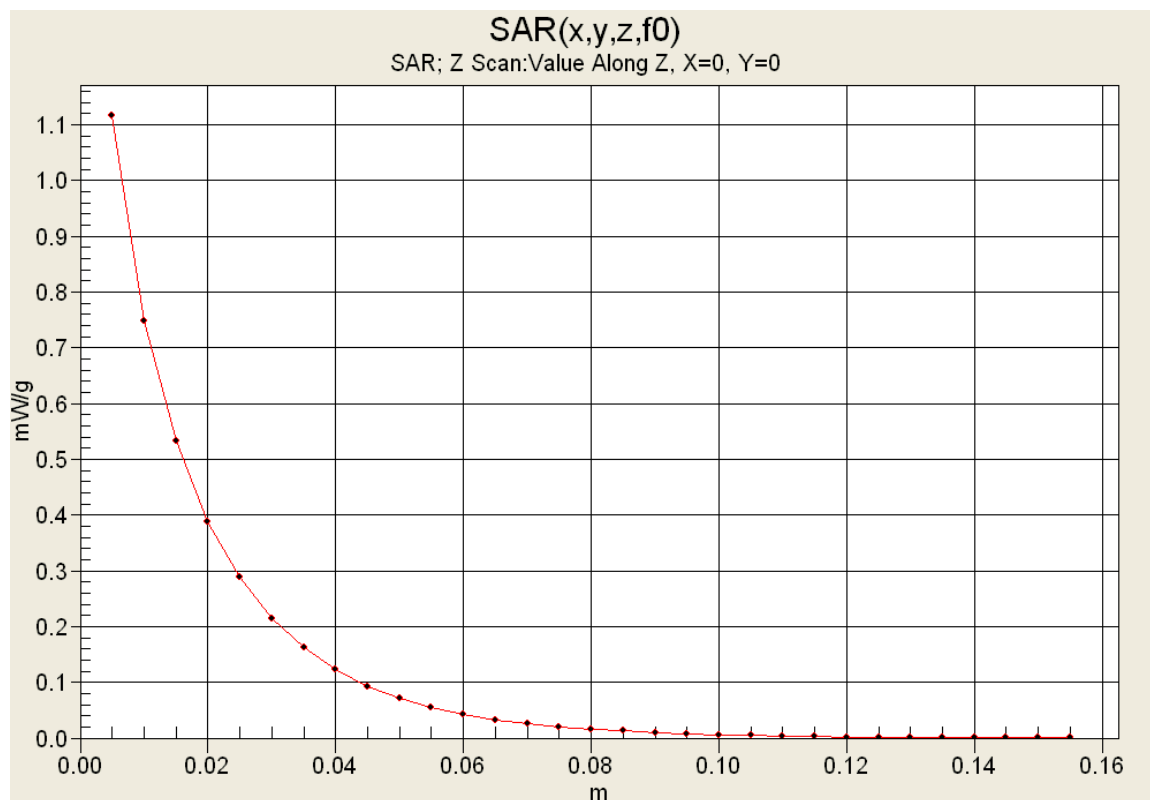
Maximum value of SAR (measured) = 1.12 mW/g






<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	


## Z-Axis Scan





<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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## APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

### 300 MHz Head

\*\*\*\*\*

Celltech Labs

Test Result for UIM Dielectric Parameter

13/Nov/2012

Freq 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_eHF	FCC_sH	Test_e	Test_s
0.2000	49.97	0.80	50.61	0.76
0.2100	49.50	0.80	50.34	0.77
0.2200	49.03	0.81	50.13	0.77
0.2300	48.57	0.82	49.94	0.77
0.2400	48.10	0.83	48.37	0.78
0.2500	47.63	0.83	48.93	0.80
0.2600	47.17	0.84	48.58	0.81
0.2700	46.70	0.85	48.48	0.81
0.2800	46.23	0.86	47.57	0.82
0.2900	45.77	0.86	47.32	0.84
0.3000	45.30	0.87	46.58	0.85
0.3100	45.18	0.87	46.90	0.86
0.3200	45.06	0.87	46.88	0.85
0.3300	44.94	0.87	46.18	0.88
0.3400	44.82	0.87	45.52	0.88
0.3500	44.70	0.87	45.19	0.89
0.3600	44.58	0.87	45.40	0.90
0.3700	44.46	0.87	44.76	0.90
0.3800	44.34	0.87	44.34	0.91
0.3900	44.22	0.87	44.12	0.92
0.4000	44.10	0.87	43.72	0.93

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

### 150 MHz Head

\*\*\*\*\*

Celltech Labs

Test Result for UIM Dielectric Parameter

13/Nov/2012

Freq 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_eHF	FCC_sH	Test_e	Test_s
0.0500	56.97	0.69	99.89	0.70
0.0600	56.50	0.69	78.77	0.65
0.0700	56.03	0.70	73.20	0.67
0.0800	55.57	0.71	66.11	0.71
0.0900	55.10	0.72	65.55	0.70
0.1000	54.63	0.72	54.00	0.74
0.1100	54.17	0.73	58.65	0.73
0.1200	53.70	0.74	57.59	0.74
0.1300	53.23	0.75	54.36	0.75
0.1400	52.77	0.75	54.10	0.76
0.1500	52.30	0.76	55.53	0.75
0.1600	51.83	0.77	53.48	0.78
0.1700	51.37	0.77	54.06	0.78
0.1800	50.90	0.78	52.25	0.79
0.1900	50.43	0.79	52.82	0.78
0.2000	49.97	0.80	51.86	0.80
0.2100	49.50	0.80	50.58	0.80
0.2200	49.03	0.81	49.93	0.81
0.2300	48.57	0.82	50.62	0.81
0.2400	48.10	0.83	48.76	0.83
0.2500	47.63	0.83	49.24	0.84

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

### 300 MHz Head

\*\*\*\*\*

Celltech Labs

Test Result for UIM Dielectric Parameter

27/Nov/2012

Freq 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_eHF	FCC_sH	Test_e	Test_s
0.2000	49.97	0.80	51.62	0.75
0.2100	49.50	0.80	50.79	0.77
0.2200	49.03	0.81	50.50	0.78
0.2300	48.57	0.82	48.95	0.79
0.2400	48.10	0.83	48.18	0.79
0.2500	47.63	0.83	49.02	0.79
0.2600	47.17	0.84	48.80	0.81
0.2700	46.70	0.85	47.84	0.82
0.2800	46.23	0.86	48.37	0.82
0.2900	45.77	0.86	47.11	0.84
0.3000	45.30	0.87	47.56	0.85
0.3100	45.18	0.87	46.38	0.86
0.3200	45.06	0.87	46.46	0.86
0.3300	44.94	0.87	45.93	0.87
0.3400	44.82	0.87	45.46	0.87
0.3500	44.70	0.87	45.08	0.88
0.3600	44.58	0.87	44.86	0.91
0.3700	44.46	0.87	44.36	0.89
0.3800	44.34	0.87	43.99	0.91
0.3900	44.22	0.87	43.93	0.92
0.4000	44.10	0.87	44.08	0.93

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01


### 150 MHz Body



\*\*\*\*\*

Celltech Labs  
Test Result for UIM Dielectric Parameter  
27/Nov/2012  
Freq      Frequency(GHz)  
FCC\_eB FCC Limits for Body Epsilon  
FCC\_sB FCC Limits for Body Sigma  
Test\_e    Epsilon of UIM  
Test\_s    Sigma of UIM


\*\*\*\*\*



Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.0500	64.37	0.72	79.98	0.68
0.0600	64.12	0.73	85.73	0.75
0.0700	63.87	0.74	77.80	0.71
0.0800	63.63	0.74	76.82	0.73
0.0900	63.38	0.75	69.35	0.74
0.1000	63.13	0.76	66.49	0.74
0.1100	62.89	0.77	67.31	0.75
0.1200	62.64	0.78	61.67	0.75
0.1300	62.39	0.78	64.48	0.74
0.1400	62.15	0.79	62.72	0.76
0.1500	61.90	0.80	63.26	0.76
0.1600	61.65	0.81	65.63	0.77
0.1700	61.41	0.82	62.42	0.77
0.1800	61.16	0.82	61.65	0.79
0.1900	60.91	0.83	63.02	0.78
0.2000	60.67	0.84	62.70	0.80
0.2100	60.42	0.85	62.04	0.82
0.2200	60.17	0.86	60.95	0.80
0.2300	59.93	0.86	60.77	0.82
0.2400	59.68	0.87	60.51	0.81
0.2500	59.43	0.88	59.94	0.83

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>		<b>156.025-157.425 MHz</b>		
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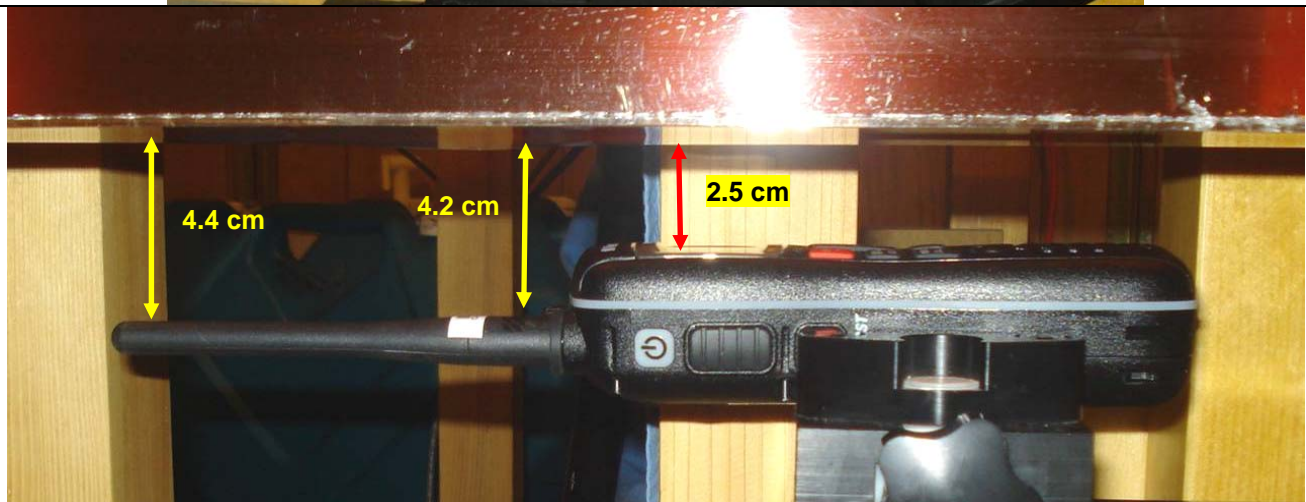
	<u>Date(s) of Evaluation</u> Nov. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure 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>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	



## FACE-HELD SAR TEST SETUP PHOTOGRAPHS



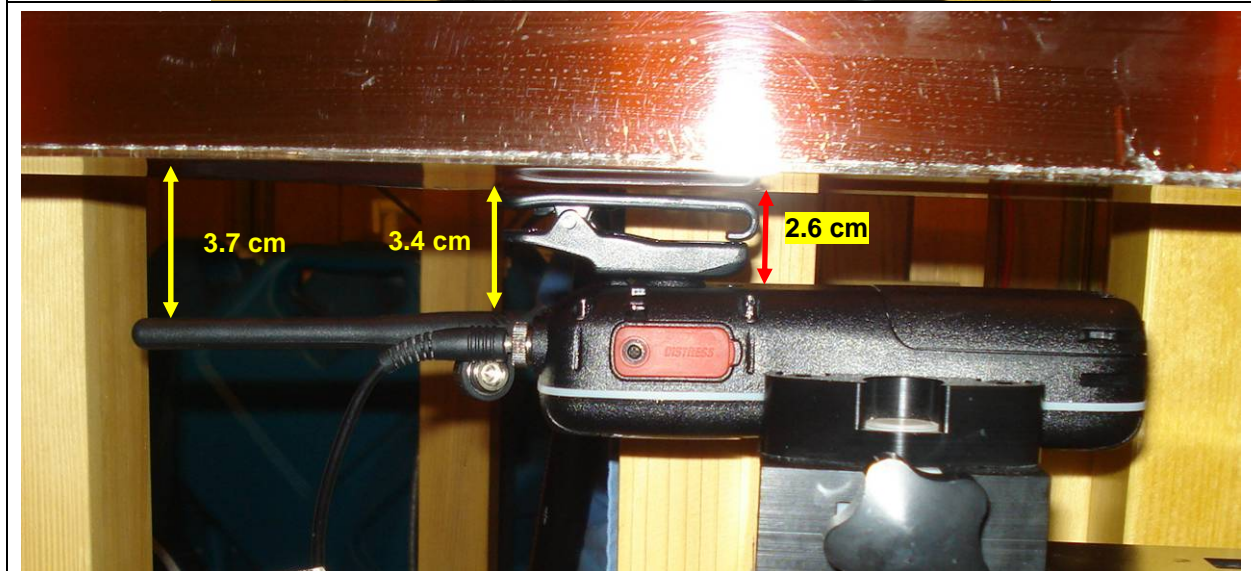
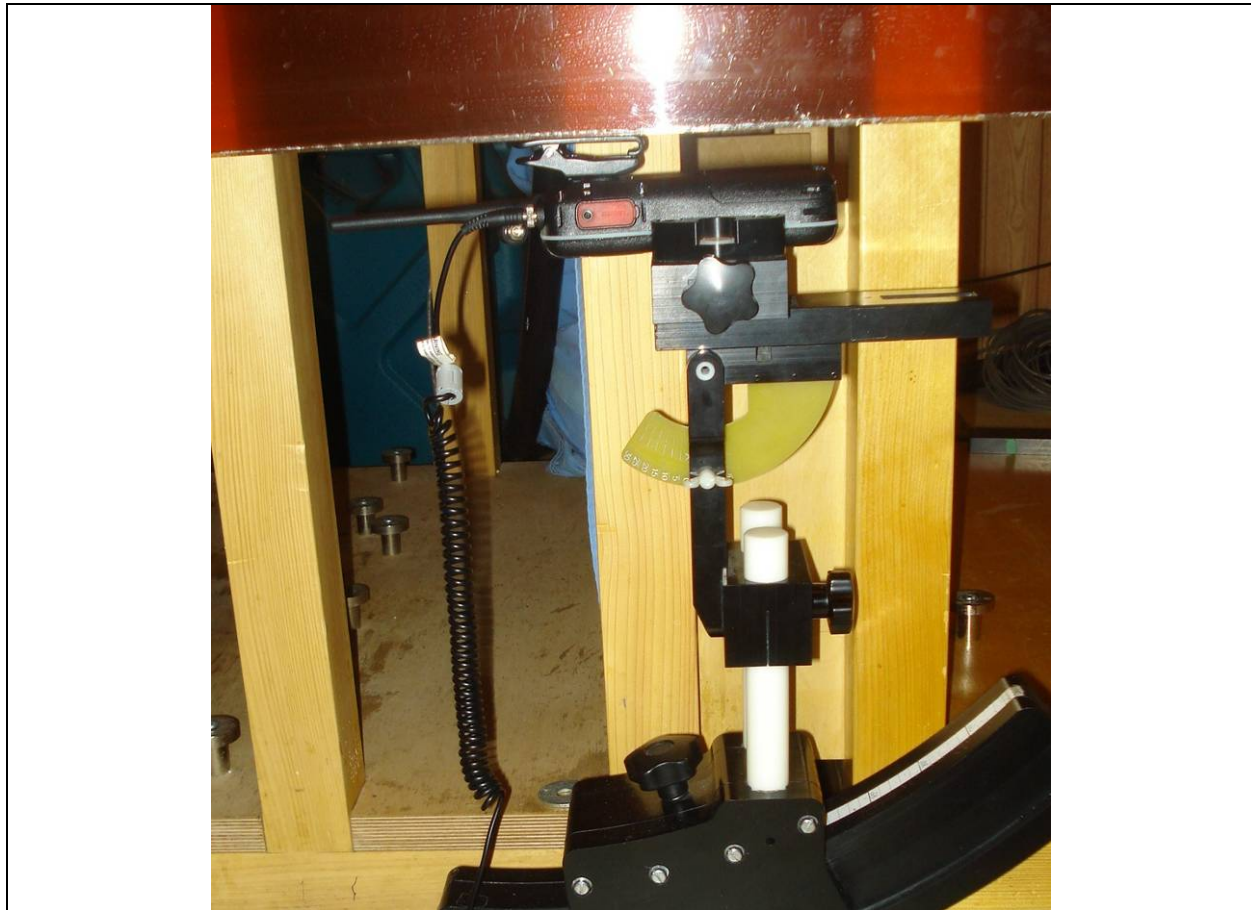
Face-held Test Setup

<b>Applicant:</b>	Uniden America Corporation		<b>FCC ID:</b>	AMWUT645	<b>IC:</b>	513C-UT645	
<b>Model(s):</b>	MHS235	<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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	



## BODY-WORN SAR TEST SETUP PHOTOGRAPHS



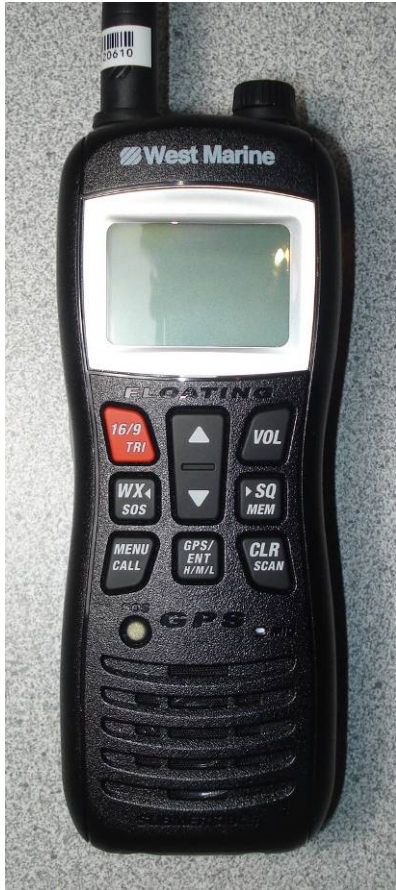
Body-worn Test Setup - DUT with Swivel Belt-clip and Speaker-Microphone accessories

<b>Applicant:</b>	Uniden America Corporation		<b>FCC ID:</b>	AMWUT645	<b>IC:</b>	513C-UT645	
<b>Model(s):</b>	MHS235	<b>DUT Type:</b>	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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 Testing and Engineering Services Lab	<u>Date(s) of Evaluation</u> Nov. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## DUT PHOTOGRAPHS



DUT Front



DUT Left Side



DUT Back with battery




DUT Right Side





DUT Top end



DUT Bottom end

<b>Applicant:</b>	Uniden America Corporation		<b>FCC ID:</b>	AMWUT645	<b>IC:</b>	513C-UT645	
<b>Model(s):</b>	MHS235	<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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	


## DUT PHOTOGRAPHS





Flexible Whip Antenna



Swivel Belt-clip accessory

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## DUT PHOTOGRAPHS




Front of Li-Ion Battery





Back of Li-Ion Battery




Back of DUT with battery removed

<b>Applicant:</b>	<b>Uniden America Corporation</b>		<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 14, 2012	<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>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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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 **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 ( $22 \pm 3$ )°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:**

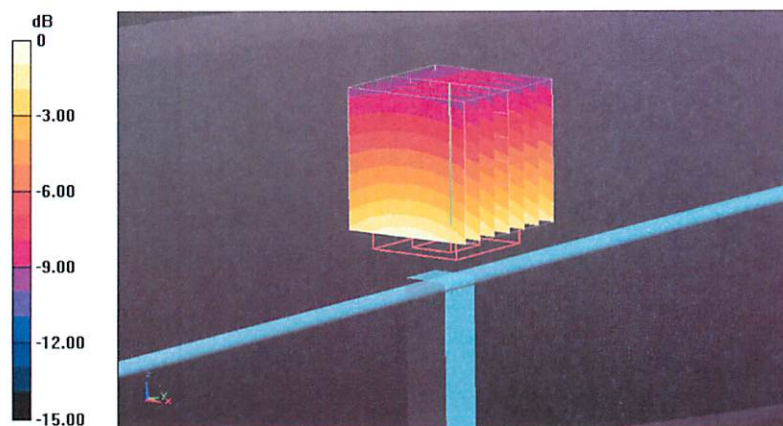
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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**

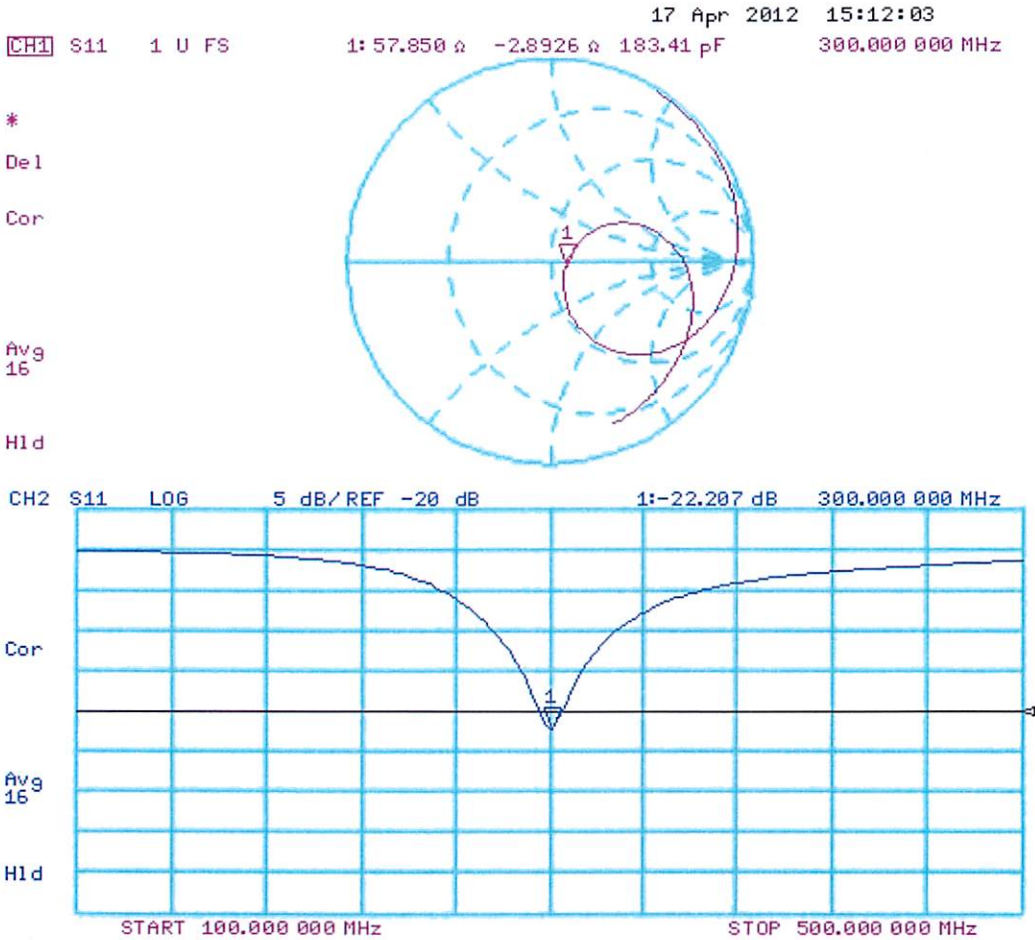
Maximum value of SAR (measured) = 1.24 mW/g





0 dB = 1.24 mW/g = 1.87 dB mW/g




Impedance Measurement Plot for Head TSL



	<u>Date(s) of Evaluation</u> Nov. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

## APPENDIX F - PROBE CALIBRATION

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</b>	<b>DUT Type:</b>	<b>Portable VHF PTT Marine Radio Transceiver</b>	<b>156.025-157.425 MHz</b>		
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Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Client **Celltech**

Certificate No: **ET3-1590\_Apr12**

## 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, 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  $(22 \pm 3)^{\circ}\text{C}$  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
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	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 26, 2012			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	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  $E^2$ -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>; VR<sub>x,y,z</sub>**: A, B, C 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, 2012

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>	1.79	1.92	1.60	± 10.1 %
DCP (mV) <sup>B</sup>	94.8	98.4	88.8	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	0.00	X	0.00	0.00	1.00	143.4	±4.6 %
			Y	0.00	0.00	1.00	150.1	
			Z	0.00	0.00	1.00	179.4	

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 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	7.54	7.54	7.54	0.20	2.16	± 13.4 %
750	41.9	0.89	7.11	7.11	7.11	0.29	3.00	± 12.0 %
835	41.5	0.90	6.77	6.77	6.77	0.27	3.00	± 12.0 %
900	41.5	0.97	6.67	6.67	6.67	0.29	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

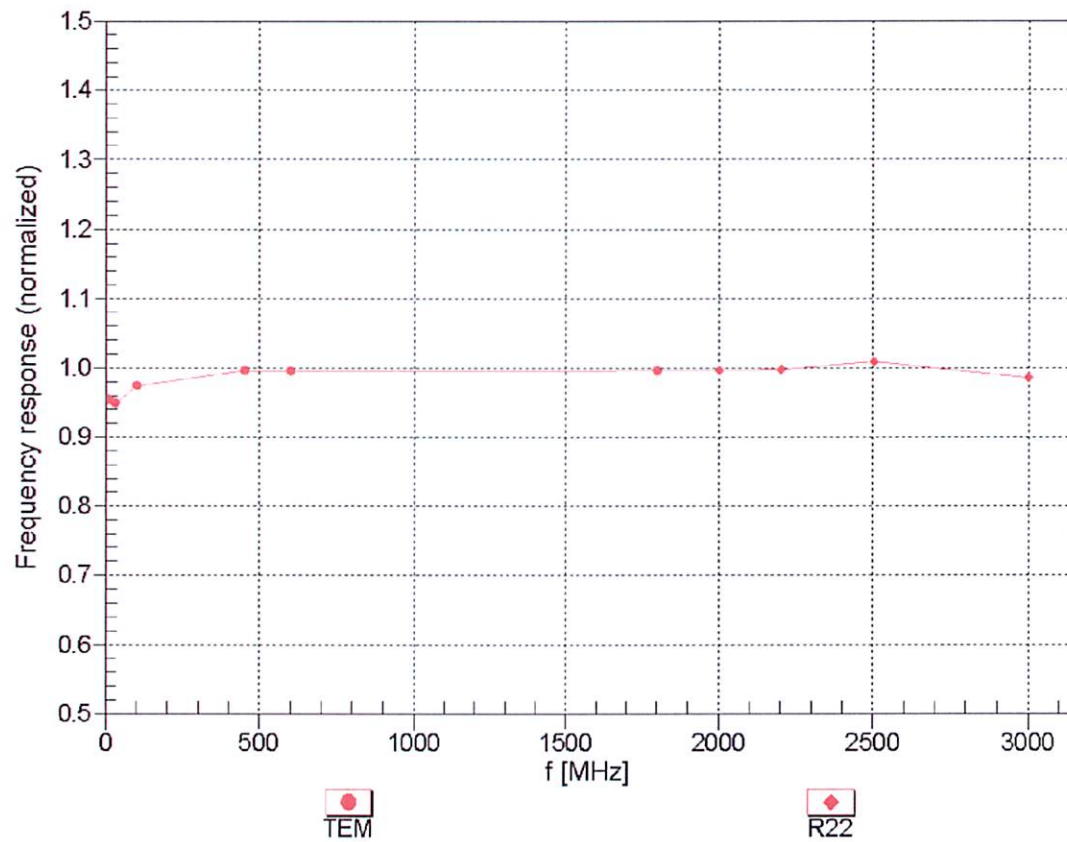
f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.93	7.93	7.93	0.12	2.07	± 13.4 %
750	55.5	0.96	6.71	6.71	6.71	0.22	3.00	± 12.0 %
835	55.2	0.97	6.54	6.54	6.54	0.27	3.00	± 12.0 %
900	55.0	1.05	6.51	6.51	6.51	0.29	2.92	± 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

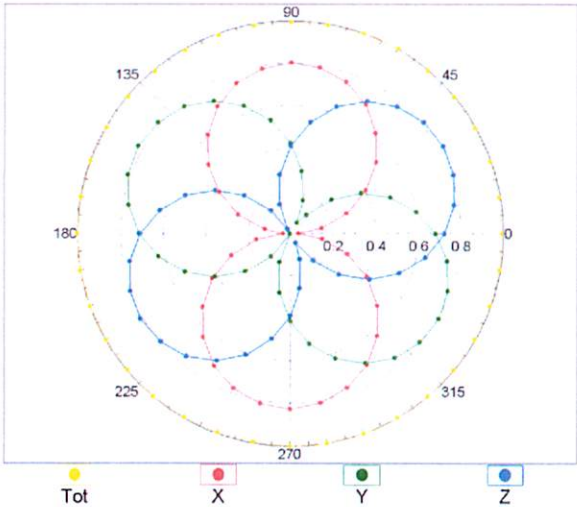
(TEM-Cell: ifi110 EXX, Waveguide: R22)



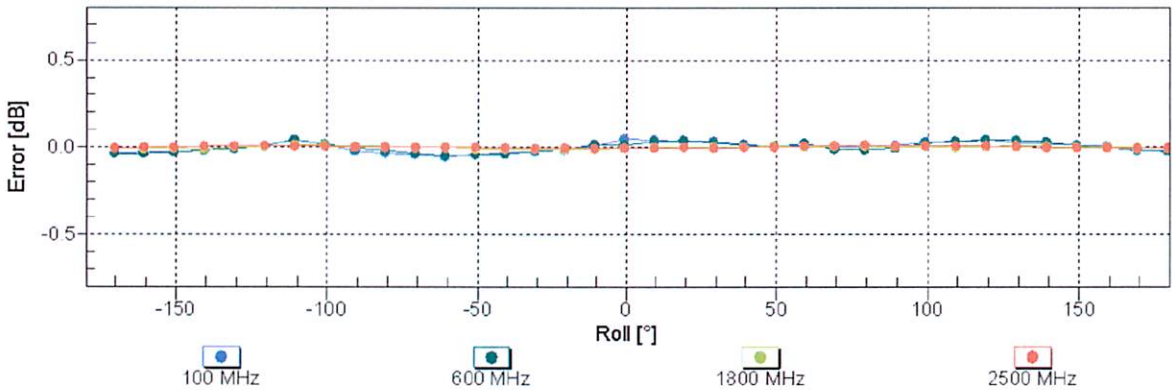
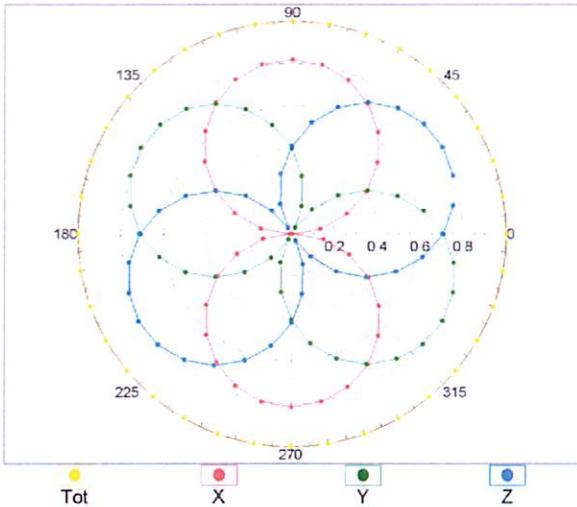
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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

f=600 MHz,TEM

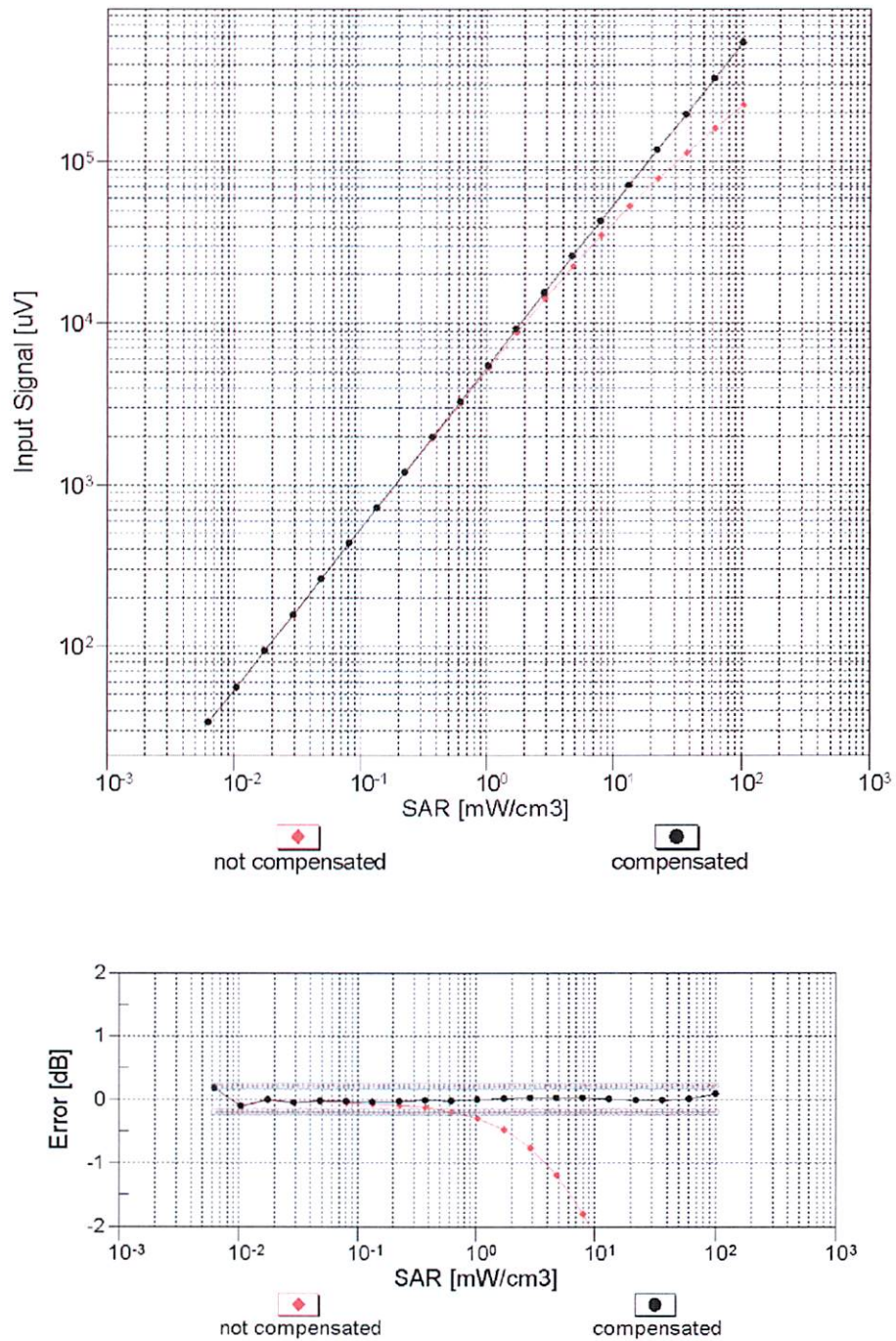


f=1800 MHz,R22



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

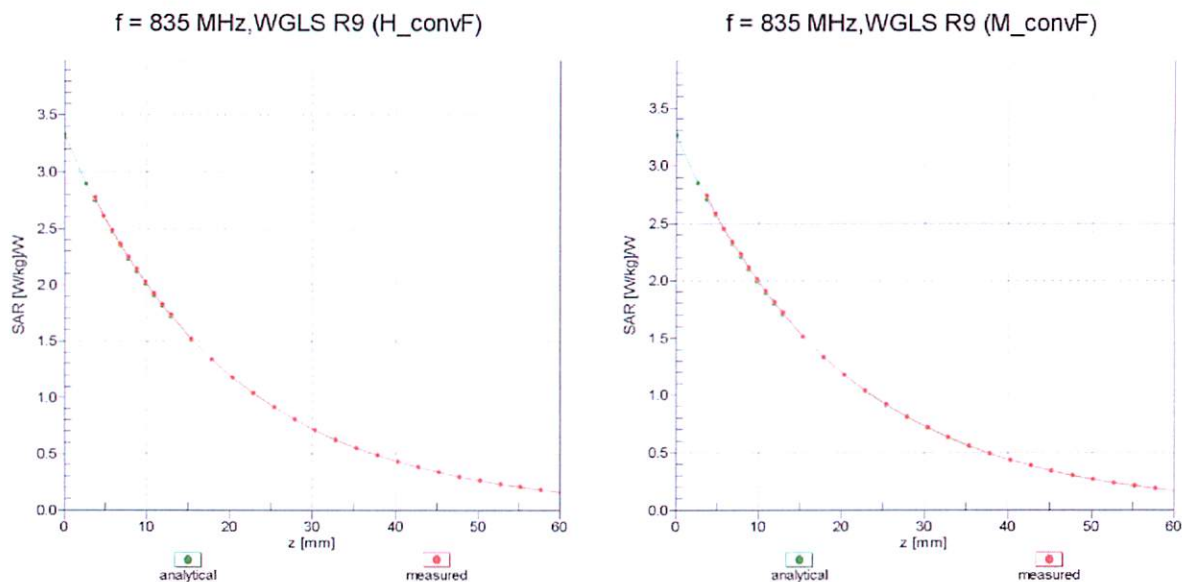
## Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$ )



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

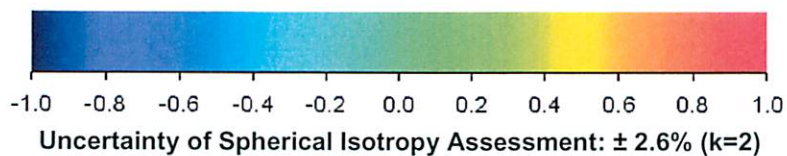
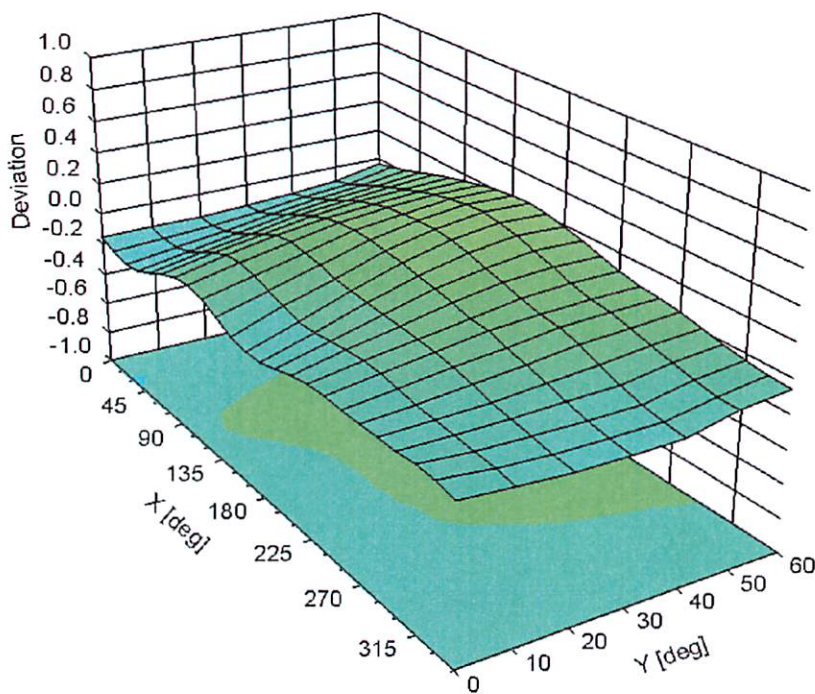


## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \vartheta$ ),  $f = 900 \text{ MHz}$



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

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-170.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
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:

**ET3DV6**

Serial Number:

**1590**

Place of Assessment:

**Zurich**

Date of Assessment:

**May 21, 2012**

Probe Calibration Date:

**April 24, 2012**

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)

$300 \pm 50$  MHz

*ConvF*

$8.3 \pm 9\%$

$\epsilon_r = 45.3 \pm 5\%$



$\sigma = 0.87 \pm 5\%$  mho/m

(head 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. 13 & 27, 2012	<u>Test Report Serial No.</u> 110612AMW-T1206-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 14, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

## APPENDIX G - BARSKI PHANTOM CERTIFICATE OF CONFORMITY

<b>Applicant:</b>	<b>Uniden America Corporation</b>	<b>FCC ID:</b>	<b>AMWUT645</b>	<b>IC:</b>	<b>513C-UT645</b>	
<b>Model(s):</b>	<b>MHS235</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  
V1Z-2V2



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**



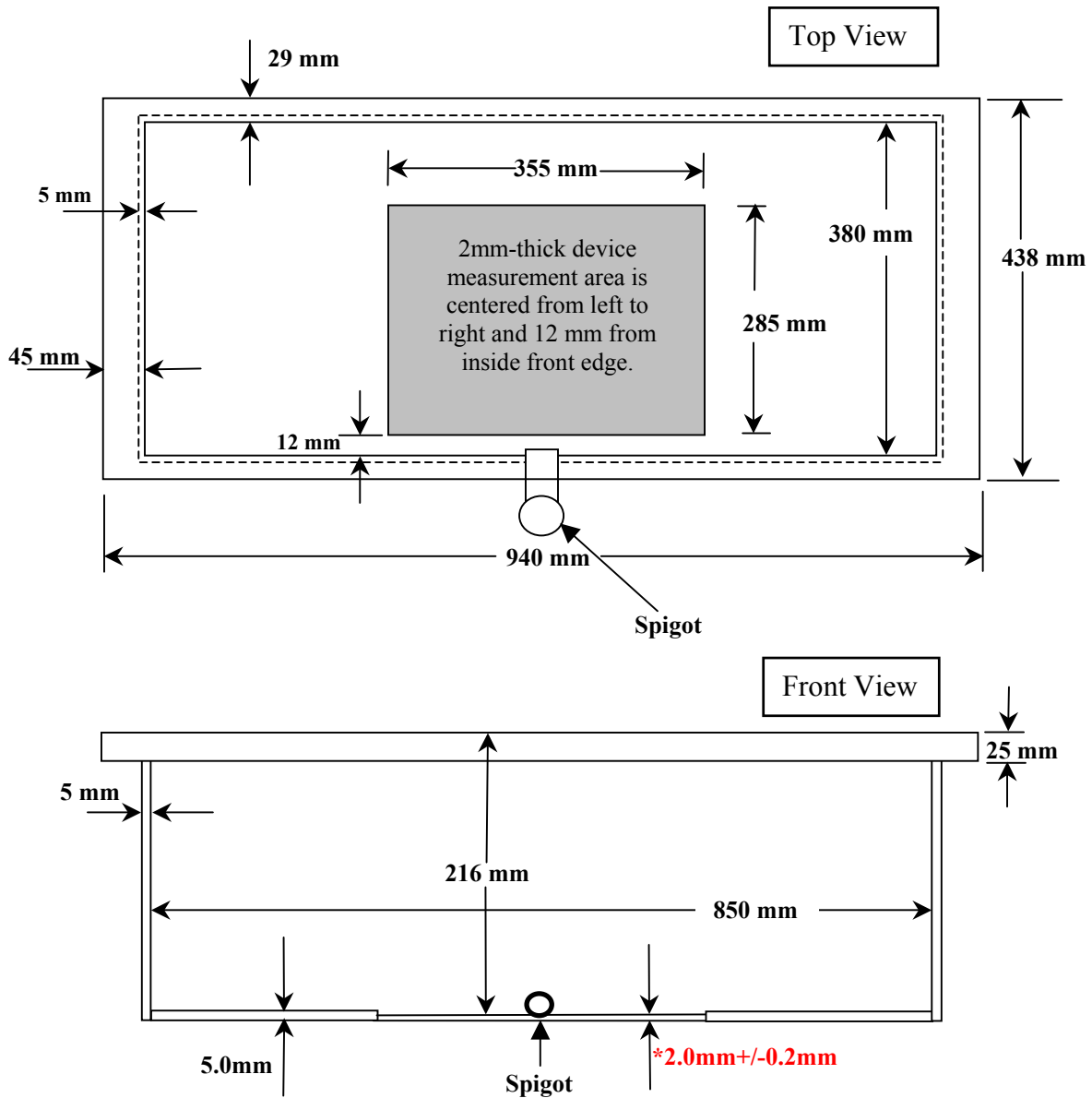
**Fiberglass Planar Phantom - Back View**



**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.**