	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

UNIDEN AMERICA CORPORATION

PORTABLE FM UHF FRS/GMRS PTT RADIO TRANSCEIVER

MODEL(S): GMR1558(XX)

FCC ID: AMWUT017

IC: 513C-UT017

Test Report Serial Number

011806AMW-T713-S95U

Test Report Issue No.

S713-020806-R0

Test Lab

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Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

Test Lab CELLTECH LABS INC. Testing and Engineering Services 1955 Moss Court Kelowna, B.C. Canada V1Y 9L3 Phone: 250-448-7047 Fax: 250-448-7046 e-mail: info@celltechlabs.com web site: www.celltechlabs.com		Applicant Information UNIDEN AMERICA CORPORATION Engineering Services Office 181 N. Country Club Road Lake City, SC 29560 United States	
FCC IDENTIFIER: IC IDENTIFIER: Model(s):		AMWUT017 513C-UT017 GMR1558(XX)	
SAR Test Requirement(s): SAR Test Procedure(s): Device Description: Modulation Type:		FCC 47 CFR §2.1093; Health Canada Safety Code 6 FCC OET Bulletin 65, Supplement C (Edition 01-01) Industry Canada RSS-102 Issue 2 Portable UHF FRS/GMRS PTT Radio Transceiver FM (UHF)	
Transmit Frequency Range(s): Max. RF Output Power Measured: Power Mode(s) Tested: Antenna Type(s) Tested: Battery Type(s) Tested:		462.5500 - 462.7250 MHz (GMRS Channels 15-22) 462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7) 467.5625 - 467.7125 MHz (FRS Channels 8-14) 1.63 Watts (32.12 dBm) ERP (462.5625 MHz) GMRS Ch. 1 (Boost Mode) Boost Mode (face-held operation with NiMH battery only) Normal Mode Fixed External NiMH Battery Pack 4.8 V, 700 mAh (Model: BP38) Alkaline Duracell Procell AAA x4 (1.5 V, 1150 mAh)	
Body-Worn Accessories Tested: Audio Accessories Tested:		Plastic Belt-Clip (P/N: UT018ZH) Headset-Microphone with PTT (P/N: n/a)	
Max. SAR Level(s) Evaluated:		Face-Held: 1.11 W/kg (1g) - 50% duty cycle Body-Worn: 0.775 W/kg (1g) - 50% duty cycle	


Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 2 for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc. The results and statements contained in this report pertain only to the device(s) evaluated.

Tested By:  Sean Johnston Compliance Technologist Celltech Labs Inc.	Reviewed By:  Spencer Watson Senior Compliance Technologist Celltech Labs Inc.
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Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Uniden America Corporation Model(s): GMR1558(XX) Portable UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT017 with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]), and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]) and IC RSS-102 Issue 2 (see reference [4]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the provisions of the rules are included within this test report.

2.0 DESCRIPTION OF DEVICE UNDER TEST (DUT)

SAR Test Requirement(s)	FCC Rule Part 47 CFR §2.1093				
	Health Canada Safety Code 6				
SAR Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)				
	Industry Canada RSS-102 Issue 2				
Device Description	Portable FM UHF FRS/GMRS PTT Radio Transceiver				
RF Exposure Category	General Population / Uncontrolled Environment				
FCC IDENTIFIER	AMWUT017				
IC IDENTIFIER	513C-UT017				
Model(s)	GMR1558(XX)				
Test Sample Serial No.	None		Identical Prototype		
Modulation Type	FM (UHF)				
Transmit Frequency Range(s)	462.5500 - 462.7250 MHz		GMRS Channels 15-22		
	462.5625 - 462.7125 MHz		FRS/GMRS Channels 1-7		
	467.5625 - 467.7125 MHz		FRS Channels 8-14		
Power Mode(s) Tested	Boost		Normal		
	Note: Boost Mode does not operate with alkaline batteries or with audio accessory connected				
Max. RF Output Power Tested	Max. ERP Measured		Power Mode	Frequency	Channel
	1.63 Watts	32.12 dBm	Boost Mode	462.5625 MHz	1 (GMRS)
	1.12 Watts	30.50 dBm	Boost Mode	462.7250 MHz	22 (GMRS)
	0.557 Watts	27.46 dBm	Normal Mode		
Antenna Type(s) Tested	Fixed External				
Battery Type(s) Tested	NiMH Battery Pack	4.8 V, 700 mAh		Model: BP38	
	Alkaline AAA (x4)	1.5 V 1150 mAh		Duracell Procell	
Body-Worn Accessories Tested	Plastic Belt-Clip (1.3 cm thickness)		P/N: UT018ZH		
Audio Accessories Tested	Headset-Microphone with PTT		P/N: n/a		

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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3.0 SAR MEASUREMENT SYSTEM


Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.




DASY4 SAR Measurement System with Plexiglas validation phantom



DASY4 SAR Measurement System with Plexiglas side planar phantom

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
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4.0 MEASUREMENT SUMMARY


SAR EVALUATION RESULTS

Test Type	Freq. (MHz)	GMRS Chan.	Test Mode	Power Mode	Battery Type	Antenna Position	Accessories Tested	Separation Distance to Planar Phantom (cm)	ERP Start Power (Watts)	Measured SAR 1g (W/kg)		SAR Drift During Test (dB)	Scaled SAR with droop 1g (W/kg)	
							Body-Worn			Duty Cycle			Duty Cycle	
							Audio			100%	50%		100%	50%
Face	462.7250	22	CW	Boost	NiMH	Fixed	--	2.5	1.12	2.01	1.01	-0.426	2.22	1.11
Face	462.7250	22	CW	Normal	Alkaline	Fixed	--	2.5	0.557	1.22	0.610	0.0317	-	-
Face	462.5625	1	CW	Boost	NiMH	Fixed	--	2.5	1.63	1.94	0.970	-0.370	2.11	1.06
Body	462.7250	22	CW	Normal	NiMH	Fixed	Belt-Clip	1.3	0.557	1.41	0.705	0.0207	-	-
							Headset							
Body	462.7250	22	CW	Normal	Alkaline	Fixed	Belt-Clip	1.3	0.557	1.55	0.775	0.276	-	-
							Headset							
ANSI / IEEE C95.1 1999 - SAFETY LIMIT					BRAIN / BODY: 1.6 W/kg (averaged over 1 gram)					Spatial Peak Uncontrolled Exposure / General Population				
Test Date(s)		January 26, 2006				January 26, 2006				Measured Fluid Type		Brain	Body	Unit
Dielectric Constant ϵ_r		450 MHz Brain				450 MHz Body				Atmospheric Pressure		100.9	100.9	kPa
		IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	Relative Humidity		30	30	%
		43.5	\pm 5%	43.5	0.0%	56.7	\pm 5%	56.2	-0.9%	Ambient Temperature		22.1	21.7	°C
Conductivity σ (mho/m)		450 MHz Brain				450 MHz Body				Fluid Temperature		21.0	21.1	°C
		IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	Fluid Depth		\geq 15	\geq 15	cm
		0.87	\pm 5%	0.86	-1.1%	0.94	\pm 5%	0.91	-3.2%	ρ (Kg/m ³)		1000	1000	

Note(s):

- The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
- The transmission band of the DUT is less than 10 MHz; therefore testing three channels (low, mid, high) was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
- It was determined that the ERP level measured by the EMC lab for Channel 1 (462.5625 MHz) boost mode was higher than the ERP level measured for Channel 22 (462.7250 MHz) boost mode by Celltech Labs; therefore a face-held SAR evaluation was also performed on Channel 1 to show compliance at the higher power level as shown in the above test data table. Celltech Labs did not measured ERP on Channel 1. It should be noted that the test sample measured by Celltech Labs and the EMC lab is the same test sample.
- The area scan evaluation was performed with fully charged batteries. After the area scan was completed the radio was cooled down and the batteries were replaced with fully charged batteries prior to the zoom scan evaluation.
- The power droops measured by the DASY4 system for the duration of the SAR evaluations were added to the corresponding measured SAR levels to report scaled SAR results as shown in the above test data table.
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
- The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
- The SAR evaluations were performed within 24 hours of the system performance check.

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
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5.0 DETAILS OF SAR EVALUATION


The Uniden America Corporation Model(s): GMR1558(XX) Portable FM UHF FRS/GMRS PTT Radio Transceiver FCC ID: AMWUT017 was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

1. The DUT was evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm separation distance was maintained between the front of the DUT and the outer surface of the planar phantom.
2. The DUT was tested in a body-worn configuration with the back of the radio placed parallel to the outer surface of the planar phantom. The attached plastic belt-clip accessory was touching the planar phantom and provided a 1.3 cm separation distance from the back of the DUT to the outer surface of the planar phantom. The DUT was evaluated for body-worn SAR with the headset-microphone audio accessory connected to the audio port.
3. The RF conducted output power of the DUT could not be measured due to a non-detachable antenna. The DUT was evaluated for SAR at the maximum conducted power level preset by the manufacturer.
4. The DUT was evaluated for SAR at the maximum ERP level(s) measured prior to the SAR evaluations on a 3-meter Open Area Test Site using the signal substitution method in accordance with ANSI/TIA-603-C-2004 (see reference [6]).
5. The power drift of the DUT during the SAR evaluations was measured by the DASY4 system. A SAR-versus-Time power drift evaluation was performed in the test configuration that reported the maximum-scaled SAR level. See Appendix A (SAR Test Plots) for SAR-versus-Time power drift evaluation plot.
6. The power droops measured by the DASY4 system for the duration of the SAR evaluations were added to the corresponding measured SAR levels to report a scaled SAR result as shown in the test data table (Page 6).
7. 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.
8. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
9. The SAR evaluations were performed using a Plexiglas planar phantom.
10. The SAR evaluations were performed within 24 hours of the system performance check.

6.0 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 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

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7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a system check was performed using a Plexiglas planar phantom and 450MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using an ALS-PR-DIEL Dielectric Probe Kit and HP 8753ET Network Analyzer (see Appendix C). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$ (see Appendix B for system performance check test plot).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	450MHz Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ϵ_r			Conductivity σ (mho/m)			ρ (Kg/m ³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.						
1/26/06	Brain	1.23 $\pm 10\%$	1.20	-2.4%	43.5 $\pm 5\%$	43.5	0.0%	0.87 $\pm 5\%$	0.86	-1.1%	1000	22.1	21.0	≥ 15	30	100.9

Note(s):

1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.

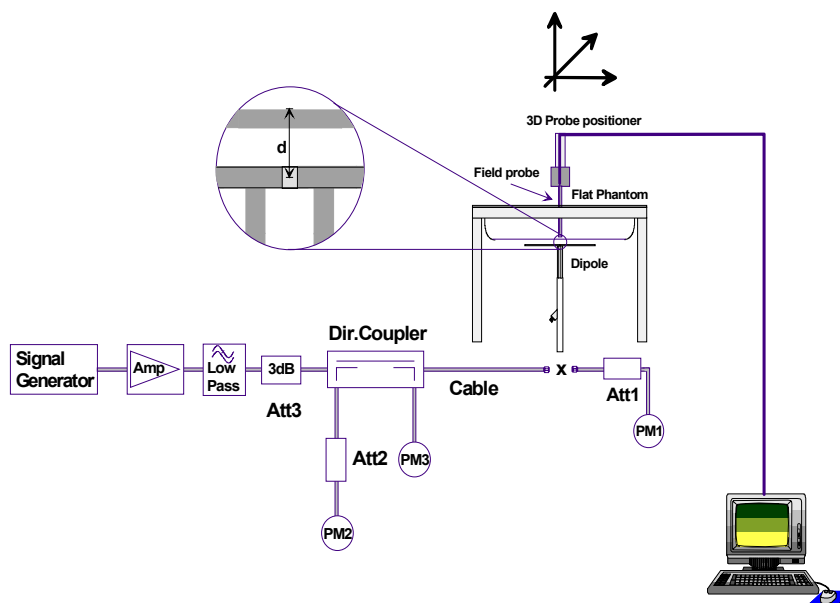




Figure 1. System Performance Check Setup Diagram



450 MHz Dipole Setup

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8.0 SIMULATED EQUIVALENT TISSUES

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


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


9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)	4.0	20.0

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. 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.

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10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

POSITIONER: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability: 0.02 mm
No. of axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: AMD Athlon XP 2400+
Clock Speed: 2.0 GHz
Operating System: Windows XP Professional

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY4 software
Connecting Lines: Optical downlink for data and status info.
 Optical uplink for commands and clock

DASY4 Measurement Server

Function: Real-time data evaluation for field measurements and surface detection
Hardware: PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections: COM1, COM2, DAE, Robot, Ethernet, Service Interface

E-Field Probe

Model: ET3DV6
Serial No.: 1387
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Phantom(s)


Evaluation Phantom

Type: Side Planar Phantom
Shell Material: Plexiglas
Bottom Thickness: 2.0 mm \pm 0.1 mm
Outer Dimensions: 75.0 cm (L) x 22.5 cm (W) x 20.5 cm (H); Back Plane: 25.7 cm (H)

Validation Phantom (≤ 450 MHz)

Type: Planar Phantom
Shell Material: Plexiglas
Bottom Thickness: 6.2 mm \pm 0.1 mm
Outer Dimensions: 86.0 cm (L) x 39.5 cm (W) x 21.8 cm (H)

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11.0 PROBE SPECIFICATION (ET3DV6)

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



**ET3DV6
E-Field Probe**

12.0 SIDE PLANAR PHANTOM

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



Plexiglas Side Planar Phantom

13.0 VALIDATION PLANAR PHANTOM

The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at 450MHz and below. The validation planar phantom is mounted in the table of the DASY4 compact system.




Validation Planar Phantom


14.0 DEVICE HOLDER

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




Device Holder


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver	462.5500 - 467.7125 MHz			
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	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

15.0 TEST EQUIPMENT LIST

USED	TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE CALIBRATED		CALIBRATION DUE DATE
	DESCRIPTION					
x	Schmid & Partner DASY4 System	-	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	N/A	N/A	N/A
x	-Robot	00046	599396-01	N/A	N/A	N/A
x	-DAE4	00019	353	15Jun05	15Jun06	15Jun06
x	-ET3DV6 E-Field Probe	00016	1387	18Mar05	18Mar06	18Mar06
	-ET3DV6 E-Field Probe	00017	1590	20May05	20May06	20May06
	-300MHz Validation Dipole	00023	135	25Oct05	25Oct06	25Oct06
x	-450MHz Validation Dipole	00024	136	25Oct05	25Oct06	25Oct06
	-835MHz Validation Dipole	00022	411	Brain	30Mar05	30Mar06
				Body	12Apr05	12Apr06
	-900MHz Validation Dipole	00020	054	Brain	10Jun05	10Jun06
				Body	10Jun05	10Jun06
	-1800MHz Validation Dipole	00021	247	Brain	14Jun05	14Jun06
				Body	14Jun05	14Jun06
	-1900MHz Validation Dipole	00032	151	Brain	17Jun05	17Jun06
				Body	22Apr05	22Apr06
	-2450MHz Validation Dipole	00025	150	Brain	20Sep05	20Sep06
				Body	22Apr05	22Apr06
	-SAM Phantom V4.0C	00154	1033	N/A	N/A	N/A
	-Barski Planar Phantom	00155	03-01	N/A	N/A	N/A
x	-Plexiglas Side Planar Phantom	00156	161	N/A	N/A	N/A
x	-Plexiglas Validation Planar Phantom	00157	137	N/A	N/A	N/A
	HP 85070C Dielectric Probe Kit	00033	N/A	N/A	N/A	N/A
x	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A	N/A	N/A
	Gigatronics 8652A Power Meter	00110	1835801	16Apr05	16Apr06	16Apr06
x	Gigatronics 8652A Power Meter	00008	1835267	29Apr05	29Apr06	29Apr06
x	Gigatronics 80701A Power Sensor	00012	1834350	12Sep05	12Sep06	12Sep06
x	Gigatronics 80701A Power Sensor	00014	1833699	07Sep05	07Sep06	07Sep06
	Gigatronics 80701A Power Sensor	00109	1834366	16Apr05	16Apr06	16Apr06
x	HP 8753ET Network Analyzer	00134	US39170292	04May05	04May06	04May06
x	HP 8648D Signal Generator	00005	3847A00611	29Apr05	29Apr06	29Apr06
x	Rohde & Schwarz SMR40 Signal Generator	00006	100104	12Apr05	12Apr06	12Apr06
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	N/A	N/A	N/A


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver	462.5500 - 467.7125 MHz			
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16.0 MEASUREMENT UNCERTAINTIES

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

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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MEASUREMENT UNCERTAINTIES (Cont.)

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


Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):		RF Exposure SAR	FCC 47 CFR §2.1093		IC RSS-102 Issue 2


17.0 REFERENCES


- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Health Canada, "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.
- [3] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [4] Industry Canada, "Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 2: November 2005.
- [5] IEEE Standard 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques": December 2003.
- [6] ANSI/TIA-603-C, "Land Mobile FM or PM Communications Equipment - Measurement and Performance Standards": December 2004.

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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APPENDIX A - SAR MEASUREMENT DATA

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

Face-Held SAR - NiMH Battery Pack - Boost Mode - GMRS - Channel 22 - 462.7250 MHz

DUT: Uniden Model: GMR1558(XX); Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Ambient Temp: 22.1 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: FM UHF

RF Output Power: 1.12 Watts (ERP) - Boost Mode

Frequency: 462.7250 MHz; Channel 22; Duty Cycle: 1:1

4.8V, 700mAh NiMH Battery Pack (Model: BP38)

Medium: HSL450 ($\sigma = 0.86$ mho/m; $\epsilon_r = 43.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 22/Area Scan (7x14x1):

Measurement grid: dx=15mm, dy=15mm

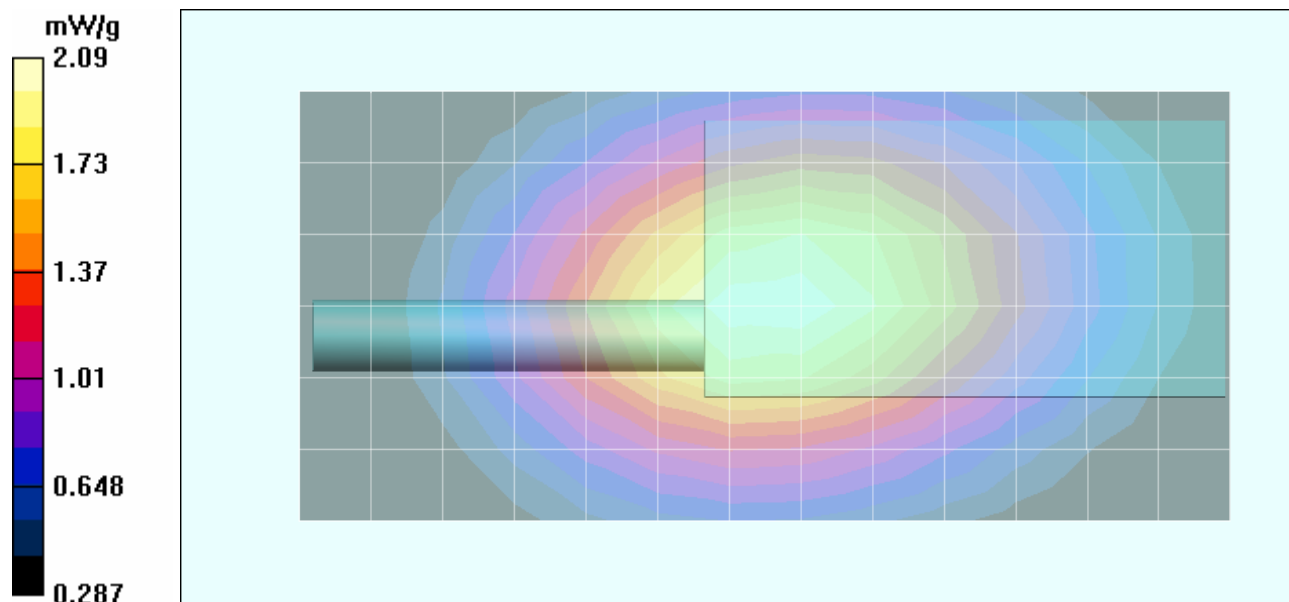
Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 22/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 47.4 V/m; Power Drift = -0.426 dB

Peak SAR (extrapolated) = 3.14 W/kg

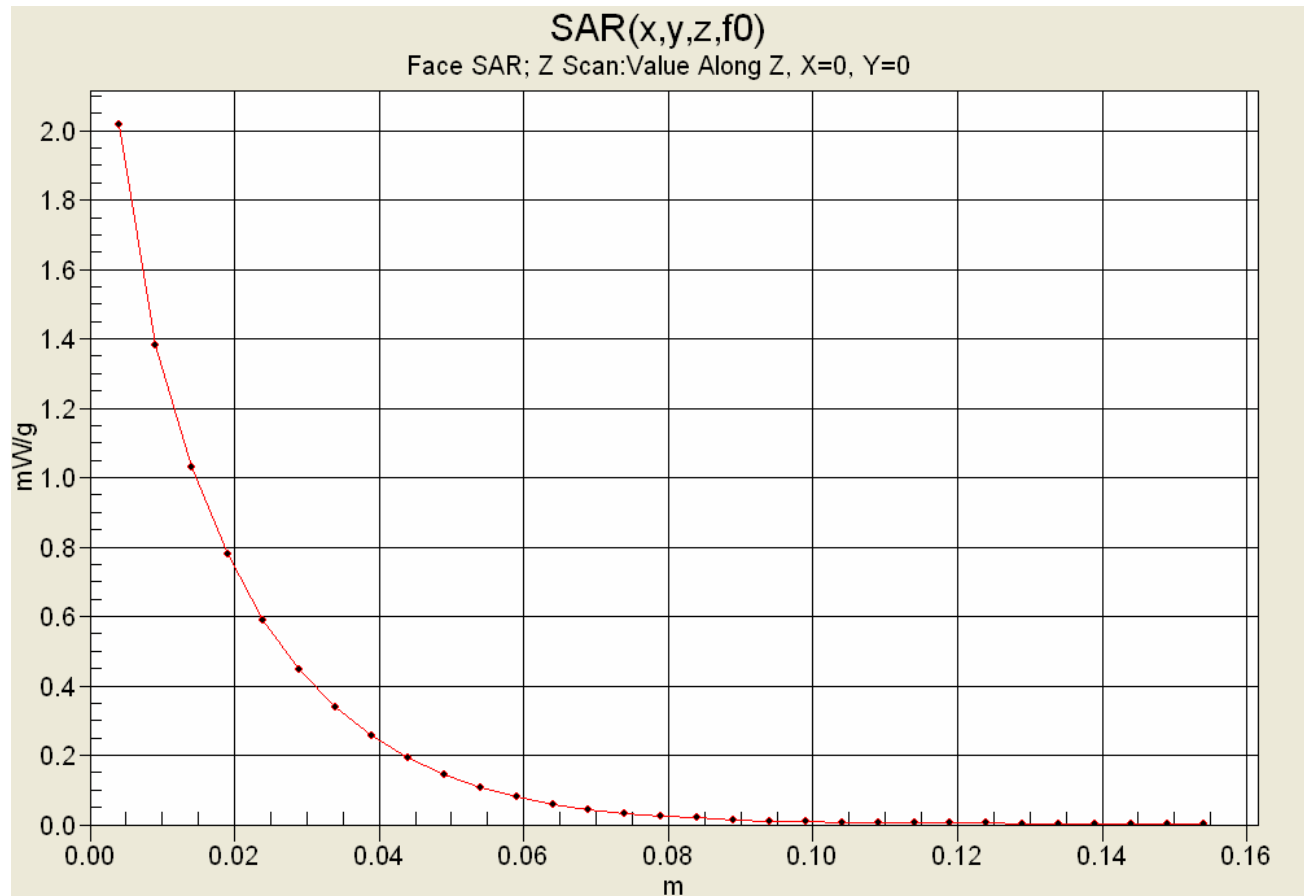
SAR(1 g) = 2.01 mW/g; SAR(10 g) = 1.42 mW/g





Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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Z-Axis Scan



Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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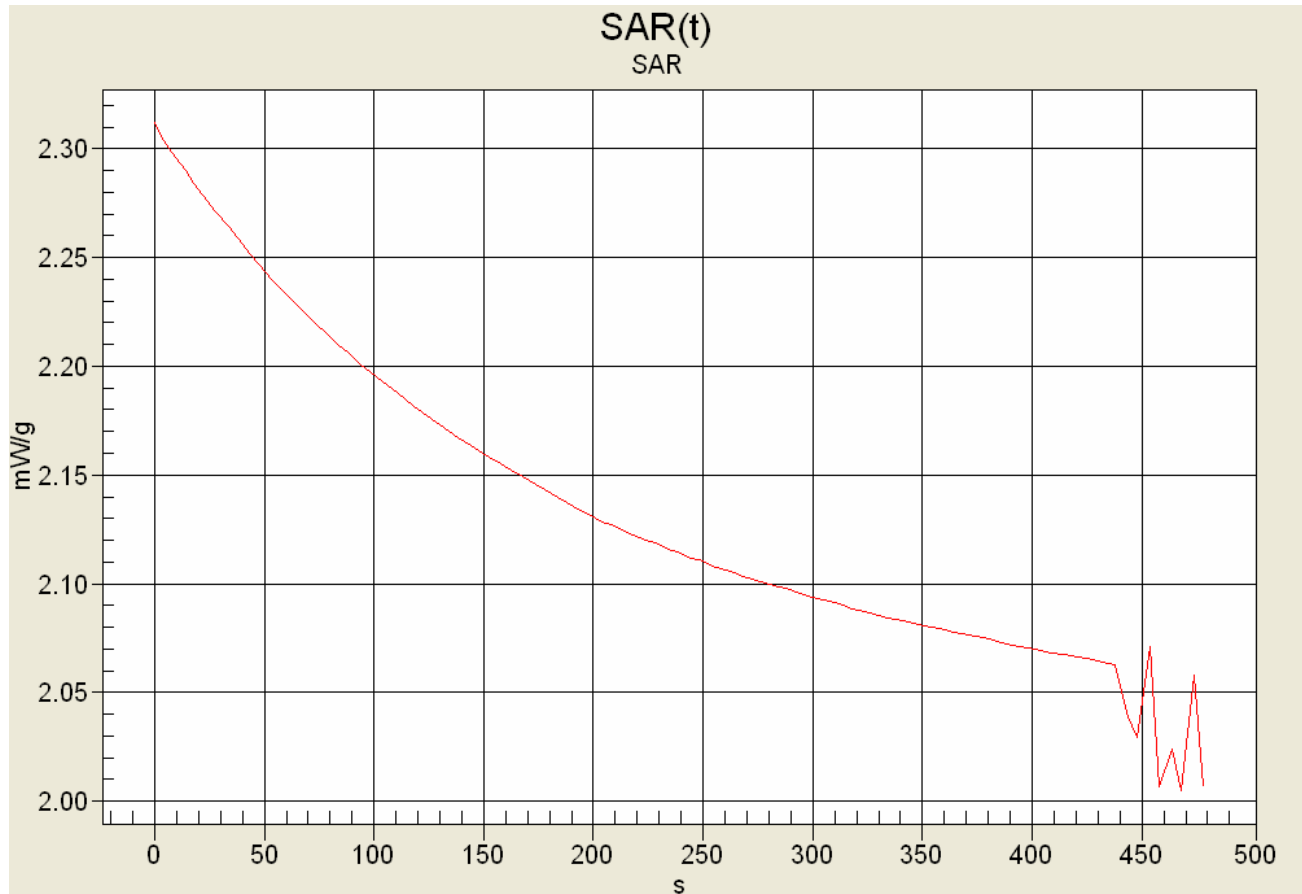
	Test Report Serial No.: 011806AMW-T713-S95U		Report Issue Date: February 08, 2006	
	Date(s) of Evaluation: January 26, 2006		Report Issue No.: S713-020806-R0	
	Description of Test(s): RF Exposure SAR		FCC 47 CFR §2.1093	IC RSS-102 Issue 2

SAR-versus-Time Power Drift Evaluation

Face-held Configuration

NiMH Battery Pack (Boost Mode)

GMRS Channel 22 - 462.7250 MHz




Max SAR: 2.31199 mW/g


Low SAR: 2.00659 mW/g (-0.6153 dB)

SAR after 340s: 2.08349 mW/g (- 0.4519 dB)

(340s = Zoom Scan Duration)

(480s = Area Scan Duration)

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

Face-Held SAR - Alkaline Batteries - Normal Mode - GMRS - Channel 22 - 462.7250 MHz

DUT: Uniden Model: GMR1558(XX); Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Ambient Temp: 22.1 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: FM UHF

RF Output Power: 0.557 Watts (ERP) - Normal Mode

Frequency: 462.7250 MHz; Channel 22; Duty Cycle: 1:1

1.5V 1150mAh Alkaline (Duracell Procell) AAA Batteries (x4)

Medium: HSL450 ($\sigma = 0.86$ mho/m; $\epsilon_r = 43.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 22/Area Scan (7x14x1):

Measurement grid: dx=15mm, dy=15mm

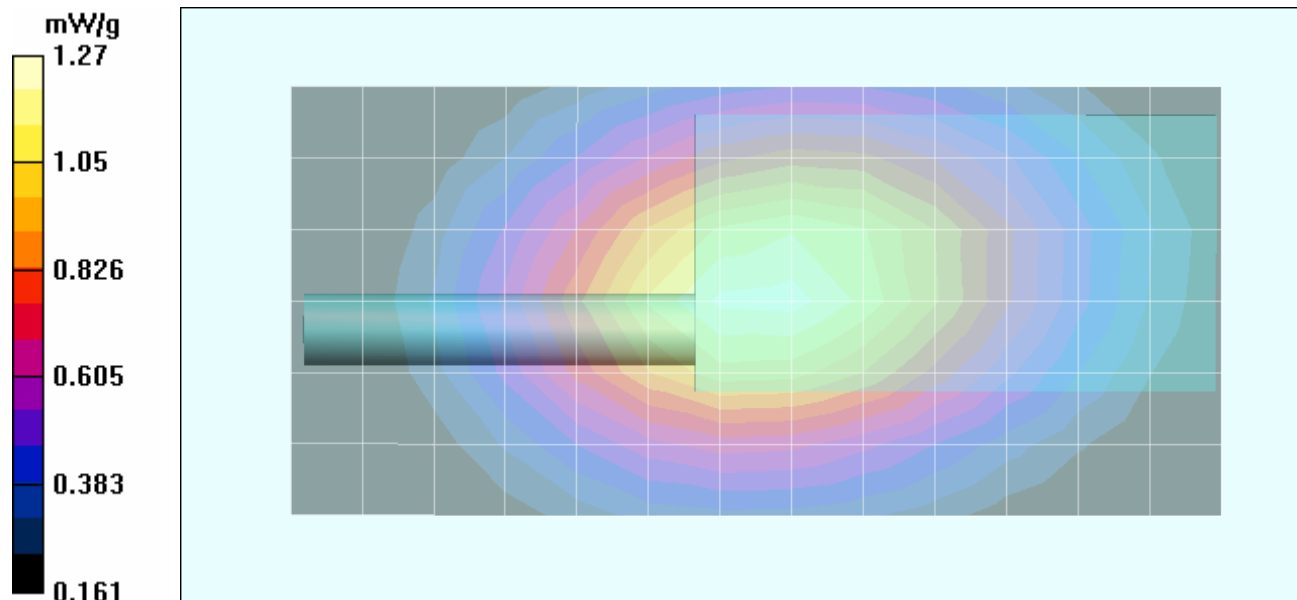
Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 22/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 35.9 V/m; Power Drift = 0.0317 dB

Peak SAR (extrapolated) = 1.92 W/kg

SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.863 mW/g



Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

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

DUT: Uniden Model: GMR1558(XX); Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Ambient Temp: 22.1 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: FM UHF

RF Output Power: 1.63 Watts (ERP) - Boost Mode

Frequency: 462.5625 MHz; Channel 1; Duty Cycle: 1:1

4.8V, 700mAh NiMH Battery Pack (Model: BP38)

Medium: HSL450 ($\sigma = 0.86$ mho/m; $\epsilon_r = 43.5$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Area Scan (7x14x1):

Measurement grid: dx=15mm, dy=15mm

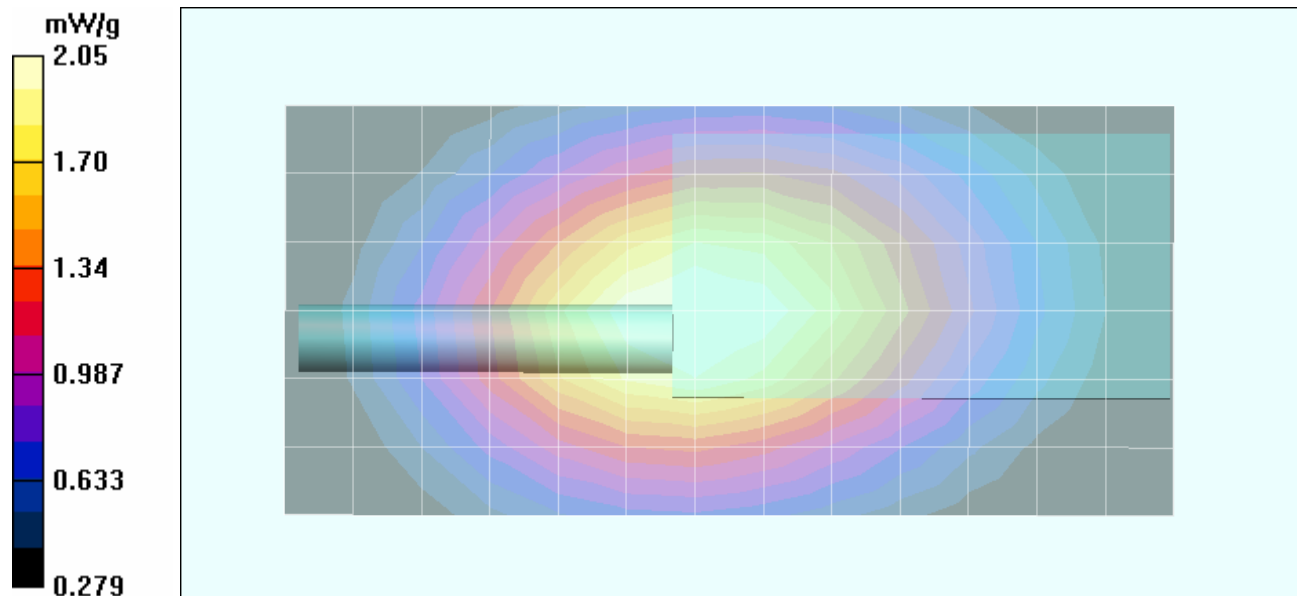
Face-Held SAR - 2.5 cm Separation Distance to Planar Phantom - Channel 1/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 47.7 V/m; Power Drift = -0.370 dB

Peak SAR (extrapolated) = 2.93 W/kg

SAR(1 g) = 1.94 mW/g; SAR(10 g) = 1.38 mW/g



Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

Body-Worn SAR - NiMH Battery Pack - Normal Mode - GMRS - Channel 22 - 462.7250 MHz

DUT: Uniden Model: GMR1558(XX); Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Body-Worn Accessory: Plastic Belt-Clip (P/N: UT018ZH); Audio Accessory: Headset-Microphone with PTT

Ambient Temp: 21.7 °C; Fluid Temp: 21.1 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: FM UHF

RF Output Power: 0.557 Watts (ERP) - Normal Mode

Frequency: 462.7250 MHz; Channel 22; Duty Cycle: 1:1

4.8V, 700mAh NiMH Battery Pack (Model: BP38)

Medium: M450 ($\sigma = 0.91$ mho/m; $\epsilon_r = 56.2$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 22/Area Scan (7x14x1):

Measurement grid: dx=15mm, dy=15mm

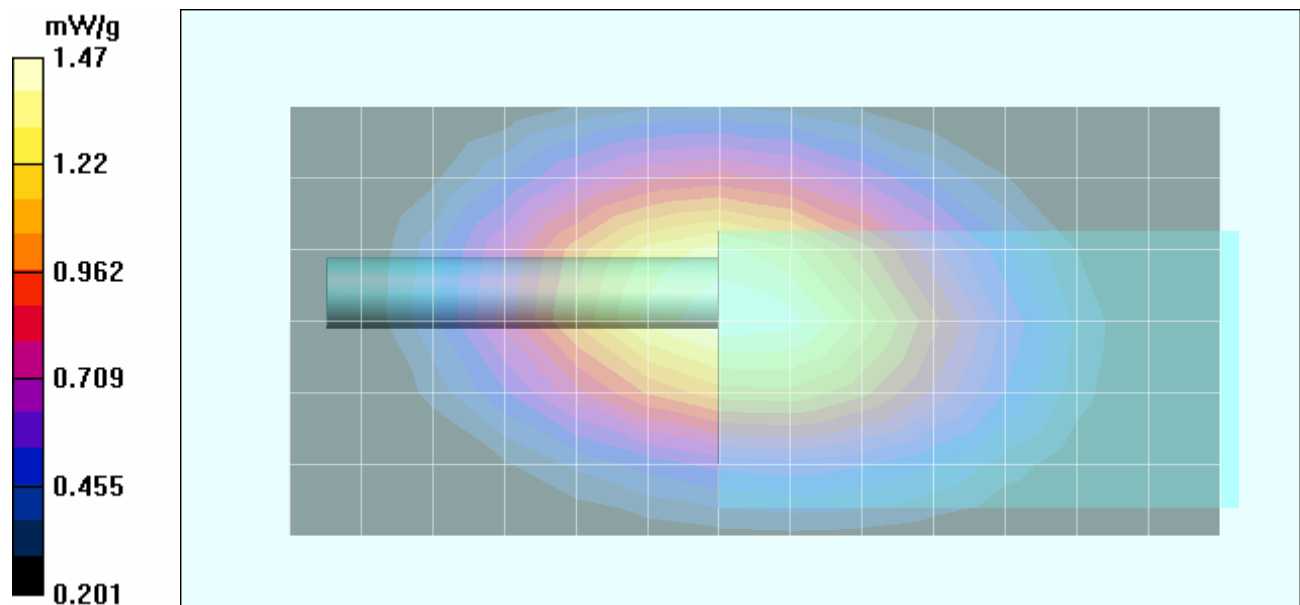
Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 22/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 36.5 V/m; Power Drift = 0.0207 dB

Peak SAR (extrapolated) = 2.21 W/kg

SAR(1 g) = 1.41 mW/g; SAR(10 g) = 0.993 mW/g



Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

Body-Worn SAR - Alkaline Batteries - Normal Mode - GMRS - Channel 22 - 462.7250 MHz

DUT: Uniden Model: GMR1558(XX); Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: None

Body-Worn Accessory: Plastic Belt-Clip (P/N: UT018ZH); Audio Accessory: Headset-Microphone with PTT

Ambient Temp: 21.7 °C; Fluid Temp: 21.1 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: FM UHF

RF Output Power: 0.557 Watts (ERP) - Normal Mode

Frequency: 462.7250 MHz; Channel 22; Duty Cycle: 1:1

1.5V 1150mAh Alkaline (Duracell Procell) AAA Batteries (x4)

Medium: M450 ($\sigma = 0.91$ mho/m; $\epsilon_r = 56.2$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005

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

- Electronics: DAE4 Sn353; Calibrated: 15/06/2005

- Phantom: Side Planar; Type: Plexiglas; Serial: 161

- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 22/Area Scan (7x14x1):

Measurement grid: dx=15mm, dy=15mm

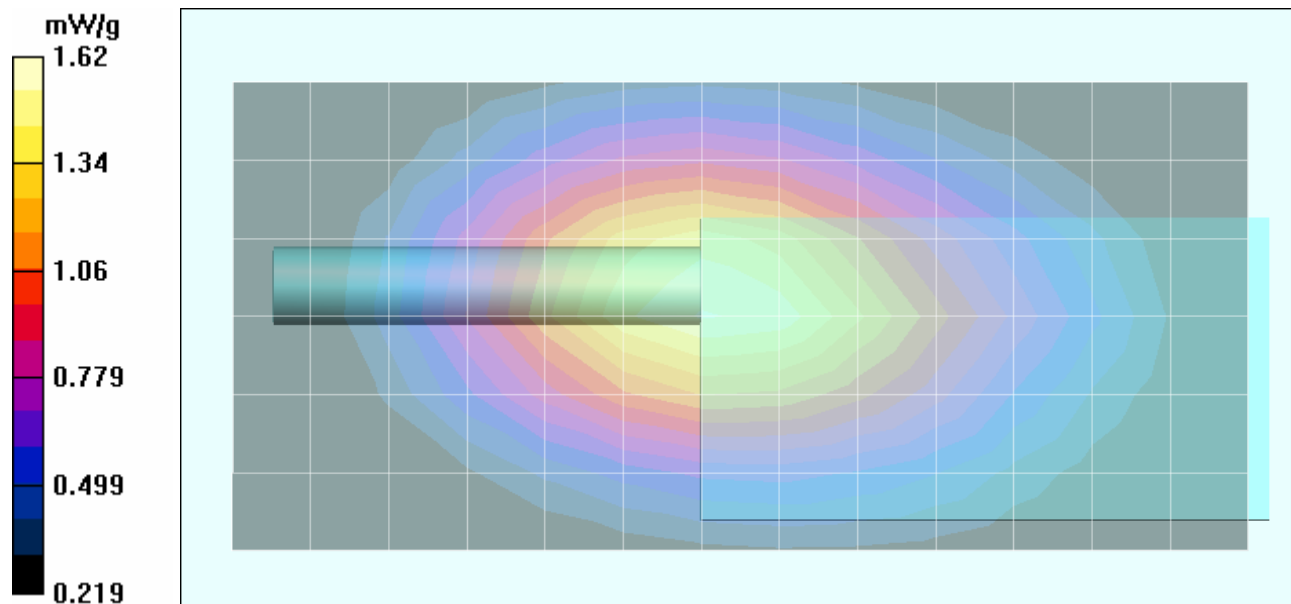
Body-Worn SAR - 1.3 cm Belt-Clip Separation Distance to Planar Phantom - Channel 22/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 36.7 V/m; Power Drift = 0.276 dB

Peak SAR (extrapolated) = 2.43 W/kg

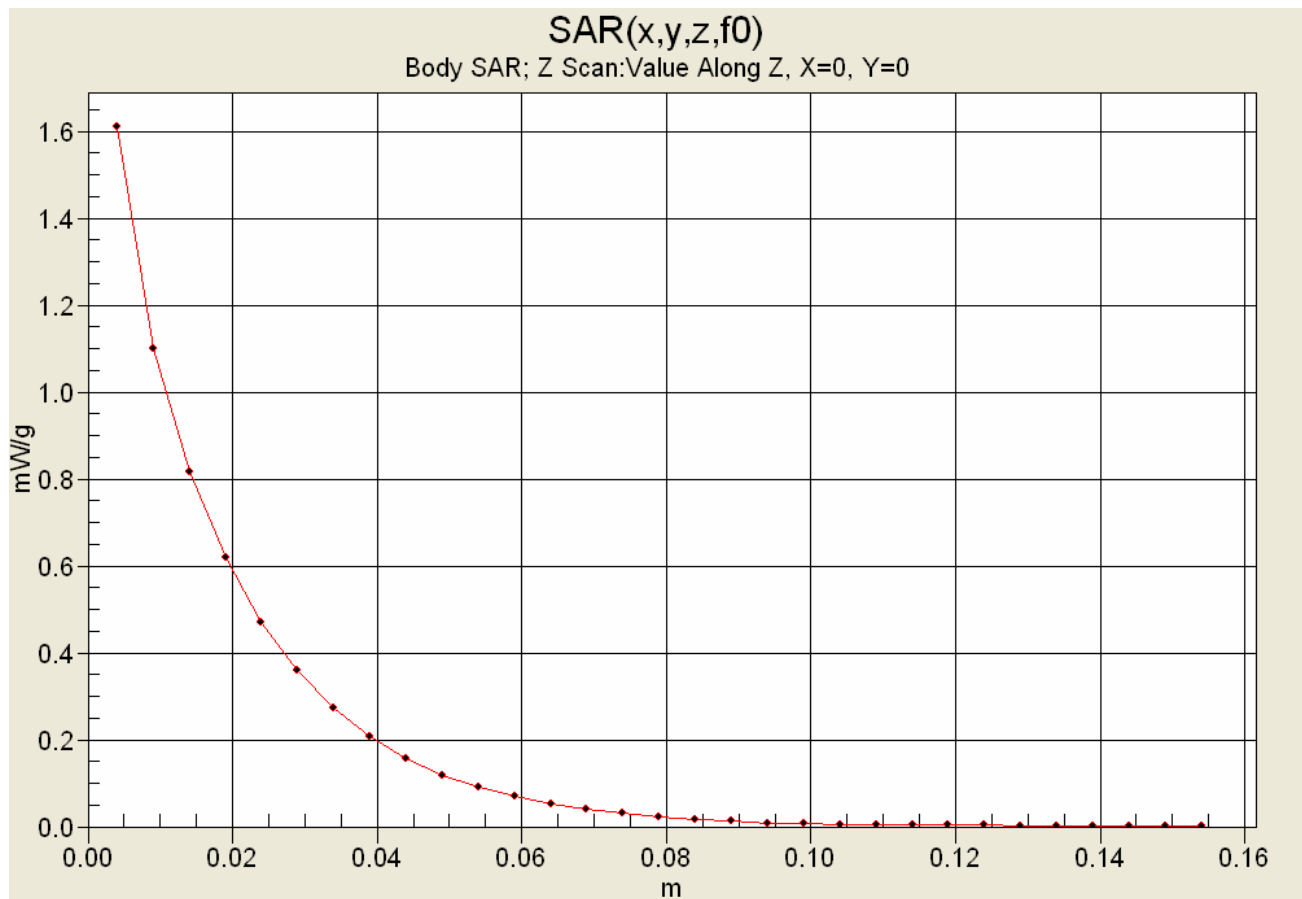
SAR(1 g) = 1.55 mW/g; SAR(10 g) = 1.09 mW/g





Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Date(s) of Evaluation: January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


Z-Axis Scan




Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U		Report Issue Date:	February 08, 2006
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	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

Date Tested: 01/26/2006

System Performance Check (Brain) - 450 MHz Dipole

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

Ambient Temp: 22.1 °C; Fluid Temp: 21.0 °C; Barometric Pressure: 100.9 kPa; Humidity: 30%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ($\sigma = 0.86 \text{ mho/m}$; $\epsilon_r = 43.5$; $\rho = 1000 \text{ kg/m}^3$)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

450 MHz Dipole - System Performance Check/Area Scan (6x11x1):

Measurement grid: dx=15mm, dy=15mm

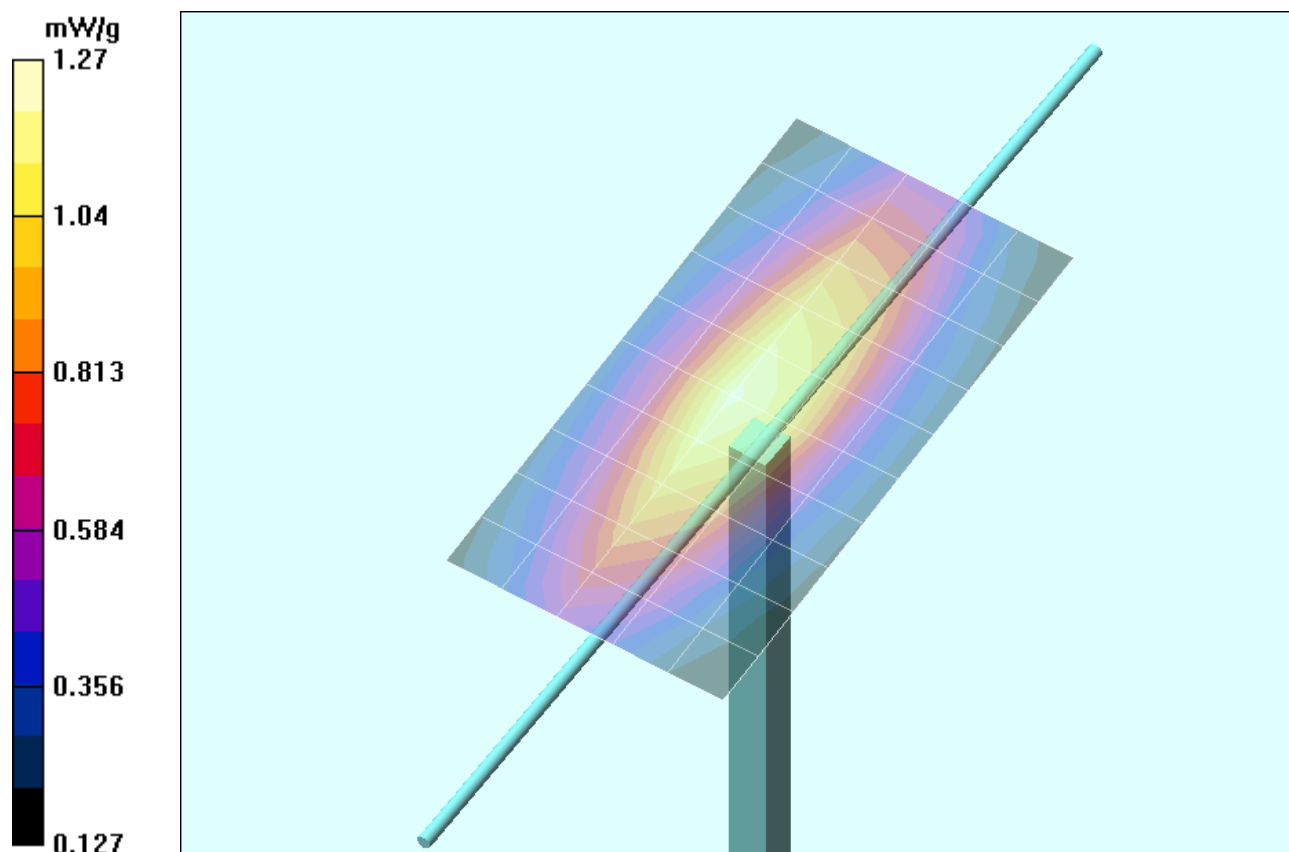
450 MHz Dipole - System Performance Check/Zoom Scan (5x5x7)/Cube 0:


Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm


Reference Value = 38.8 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 2.11 W/kg

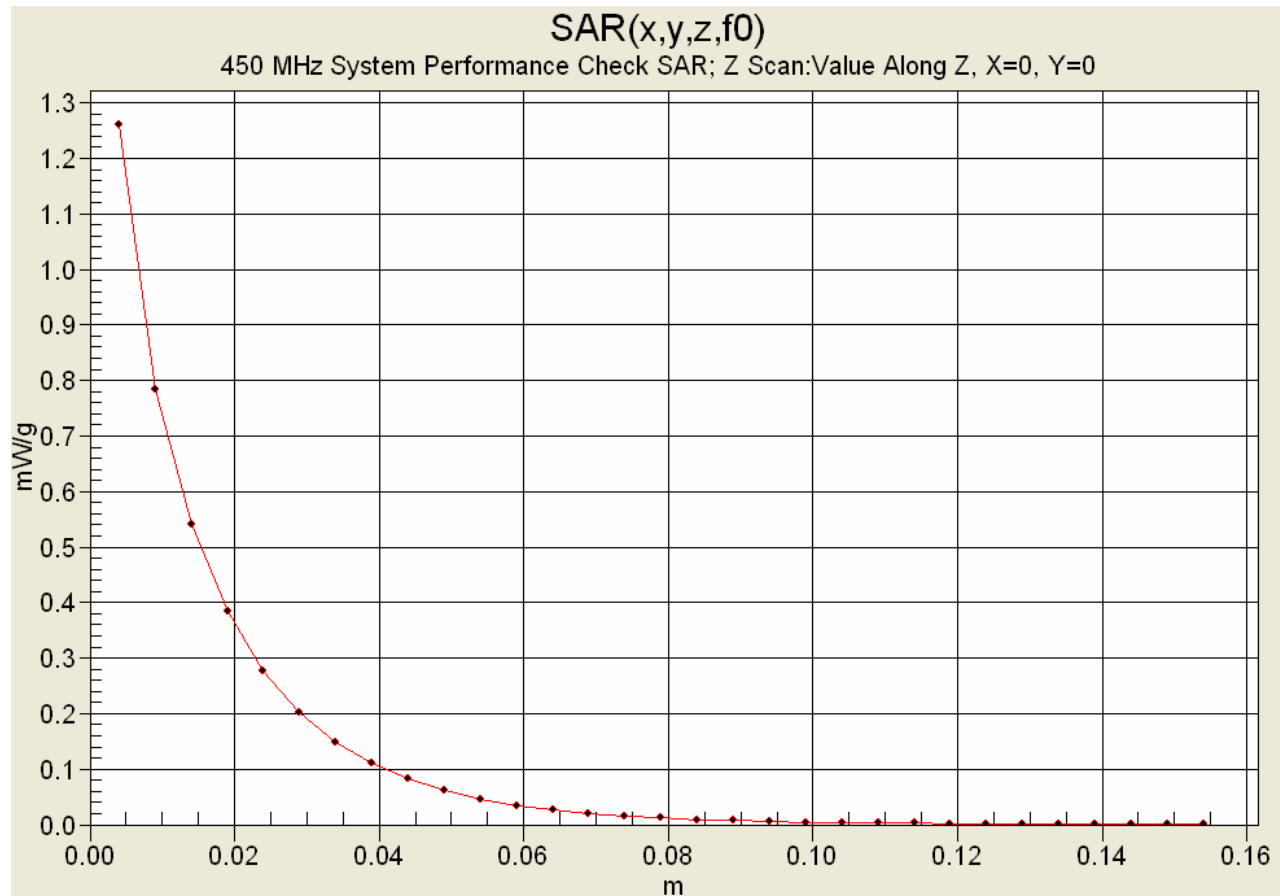
SAR(1 g) = 1.20 mW/g; SAR(10 g) = 0.774 mW/g





Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver	462.5500 - 467.7125 MHz			
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	Test Report Serial No.: 011806AMW-T713-S95U		Report Issue Date:	February 08, 2006
	Date(s) of Evaluation: January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


Z-Axis Scan




Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U		Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U		Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

450 MHz System Performance Check & DUT Evaluation (Brain)

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

Thu 26/Jan/2006

Frequency(GHz)


FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon


FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma

Test_e Epsilon of UIM

Test_s Sigma of UIM

Freq	FCC_eHFCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.04 0.77
0.3600	44.58	0.87	45.57 0.77
0.3700	44.46	0.87	45.45 0.79
0.3800	44.34	0.87	45.35 0.79
0.3900	44.22	0.87	44.78 0.80
0.4000	44.10	0.87	44.53 0.81
0.4100	43.98	0.87	44.38 0.82
0.4200	43.86	0.87	44.31 0.83
0.4300	43.74	0.87	43.90 0.84
0.4400	43.62	0.87	43.62 0.85
0.4500	43.50	0.87	43.46 0.86
0.4600	43.45	0.87	43.40 0.87
0.4700	43.40	0.87	43.32 0.87
0.4800	43.34	0.87	42.70 0.88
0.4900	43.29	0.87	42.49 0.88
0.5000	43.24	0.87	42.42 0.89
0.5100	43.19	0.87	42.01 0.90
0.5200	43.14	0.88	41.96 0.91
0.5300	43.08	0.88	41.85 0.92
0.5400	43.03	0.88	41.69 0.93
0.5500	42.98	0.88	41.40 0.94

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Date(s) of Evaluation: January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

450 MHz DUT Evaluation (Body)

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

Thu 26/Jan/2006

Frequency(GHz)

FCC_eHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon

FCC_sHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma


FCC_eB FCC Limits for Body Epsilon


FCC_sB FCC Limits for Body Sigma

Test_e Epsilon of UIM


Test_s Sigma of UIM


Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	58.42	0.83
0.3600	57.60	0.93	58.04	0.83
0.3700	57.50	0.93	57.96	0.84
0.3800	57.40	0.93	58.06	0.85
0.3900	57.30	0.93	57.53	0.86
0.4000	57.20	0.93	57.24	0.87
0.4100	57.10	0.93	57.20	0.88
0.4200	57.00	0.94	57.35	0.88
0.4300	56.90	0.94	56.74	0.89
0.4400	56.80	0.94	56.69	0.90
0.4500	56.70	0.94	56.24	0.91
0.4600	56.66	0.94	56.24	0.92
0.4700	56.62	0.94	56.11	0.92
0.4800	56.58	0.94	55.75	0.94
0.4900	56.54	0.94	55.75	0.93
0.5000	56.51	0.94	55.38	0.95
0.5100	56.47	0.94	55.34	0.96
0.5200	56.43	0.95	55.31	0.96
0.5300	56.39	0.95	55.11	0.97
0.5400	56.35	0.95	55.03	0.98

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Date(s) of Evaluation:		January 26, 2006	Report Issue No.:		S713-020806-R0
	Description of Test(s):		RF Exposure SAR	FCC 47 CFR §2.1093		IC RSS-102 Issue 2

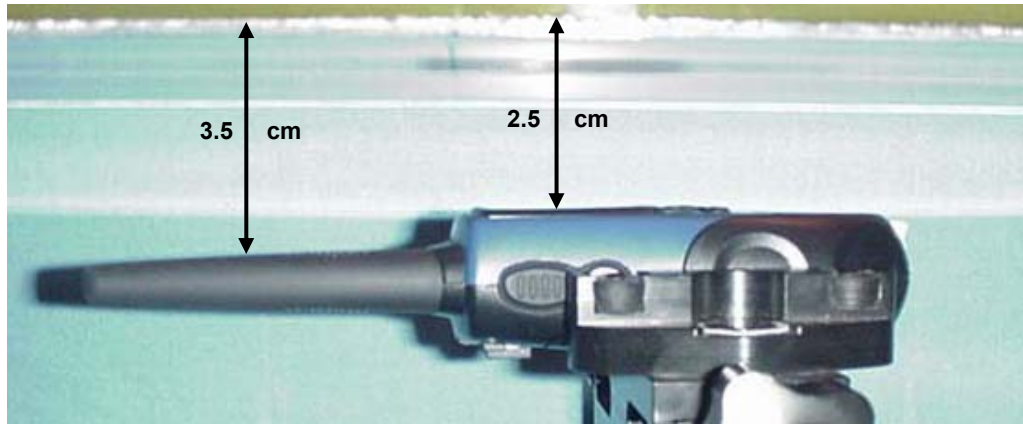
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

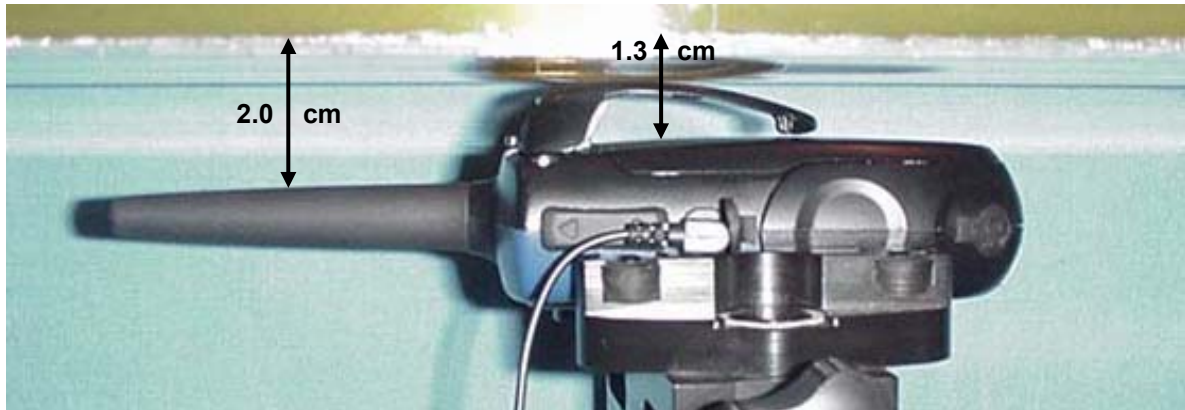
2.5 cm Separation Distance from Front of DUT to Planar Phantom





Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

BODY-WORN SAR TEST SETUP PHOTOGRAPHS
1.3 cm Belt-Clip Separation Distance from Back of DUT to Planar Phantom
With Headset-Microphone Audio Accessory



Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2


SAR TEST SETUP PHOTOGRAPHS




Face-Held SAR Test Setup Configuration



Body-Worn SAR Test Setup Configuration

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006	Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

DUT PHOTOGRAPHS



Front of DUT



Back of DUT




Back of DUT with Plastic Belt-Clip




Top end of DUT



Bottom end of DUT

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver	462.5500 - 467.7125 MHz			
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DUT PHOTOGRAPHS




Left Side of DUT with Plastic Belt-Clip




Right Side of DUT with Plastic Belt-Clip



Plastic Belt-Clip Accessory (1.3 cm thickness)


Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Description of Test(s):	RF Exposure SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

DUT PHOTOGRAPHS



DUT with PTT Headset-Microphone Audio Accessory

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Test Report Serial No.:	011806AMW-T713-S95U	Report Issue Date:	February 08, 2006
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DUT PHOTOGRAPHS




DUT Battery Compartment




DUT with NiMH Battery Pack




DUT with Alkaline Batteries

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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	Date(s) of Evaluation:		January 26, 2006	Report Issue No.:		S713-020806-R0
	Description of Test(s):		RF Exposure SAR	FCC 47 CFR §2.1093		IC RSS-102 Issue 2

APPENDIX E - SYSTEM VALIDATION

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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450 MHz SYSTEM VALIDATION DIPOLE

Type:

450 MHz Validation Dipole

Asset Number:

00024

Serial Number:

136

Place of Calibration:

Celltech Labs Inc.

Date of Calibration:

October 25, 2005

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

Calibrated by:



Approved by:



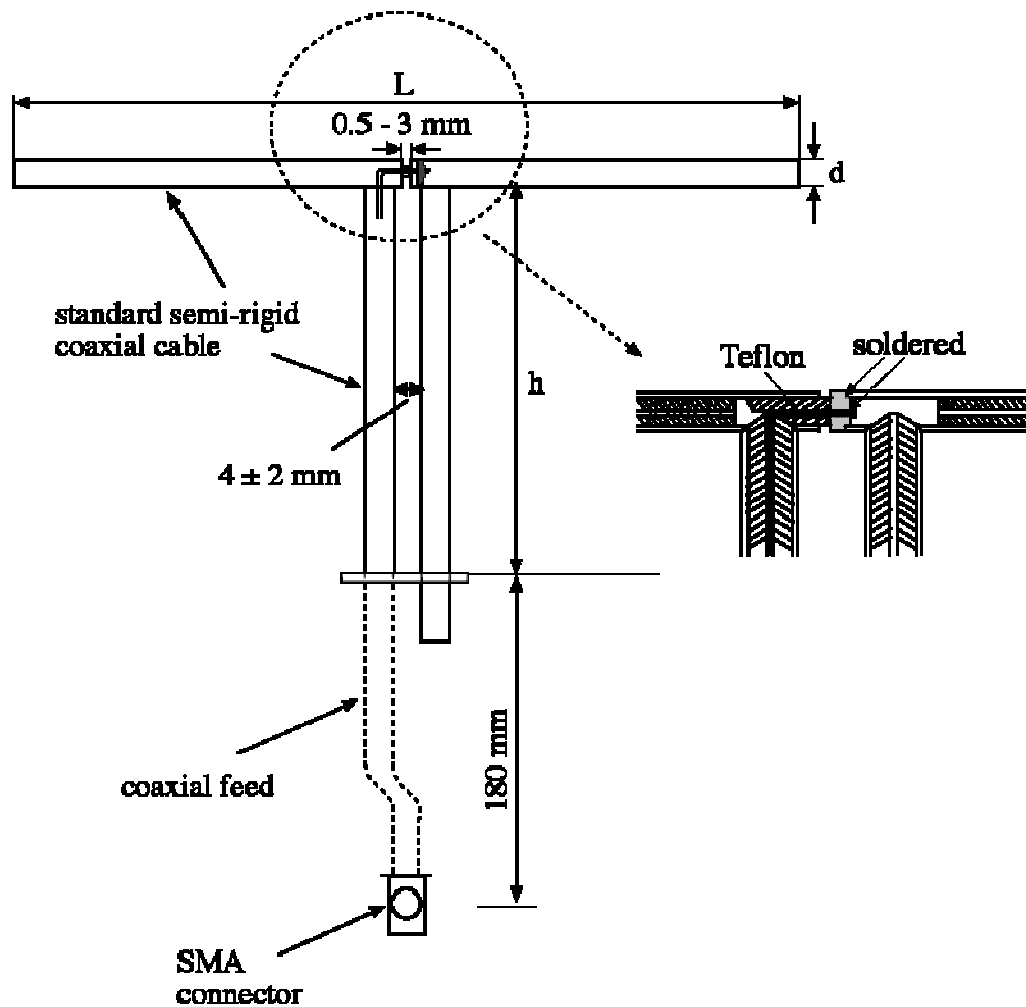
1. Dipole Construction & Electrical Characteristics

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

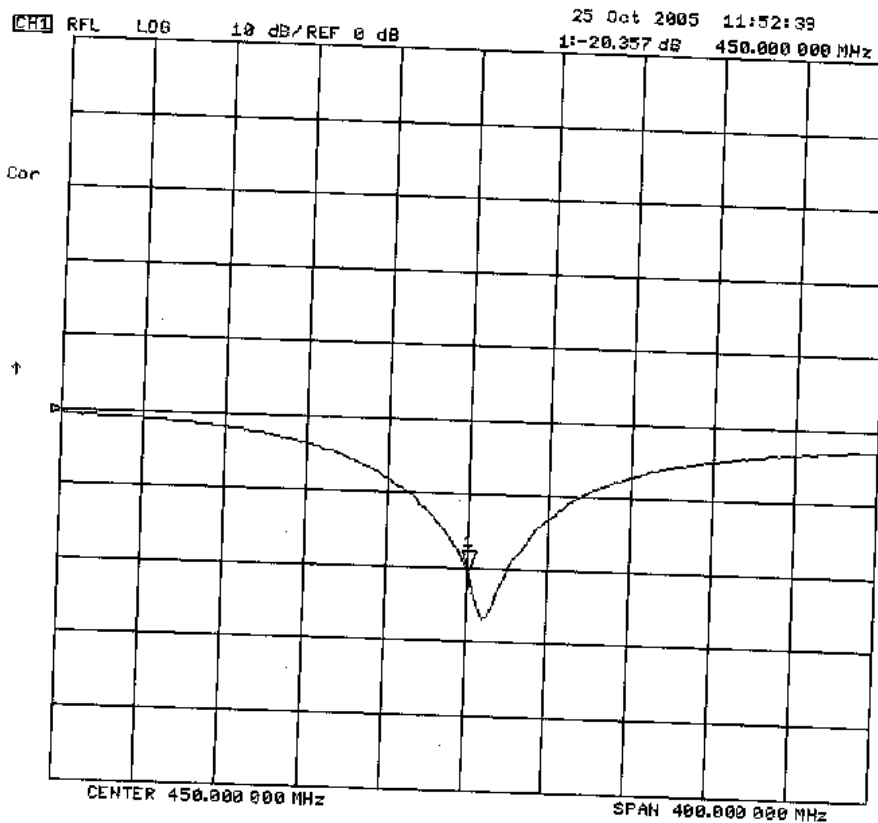
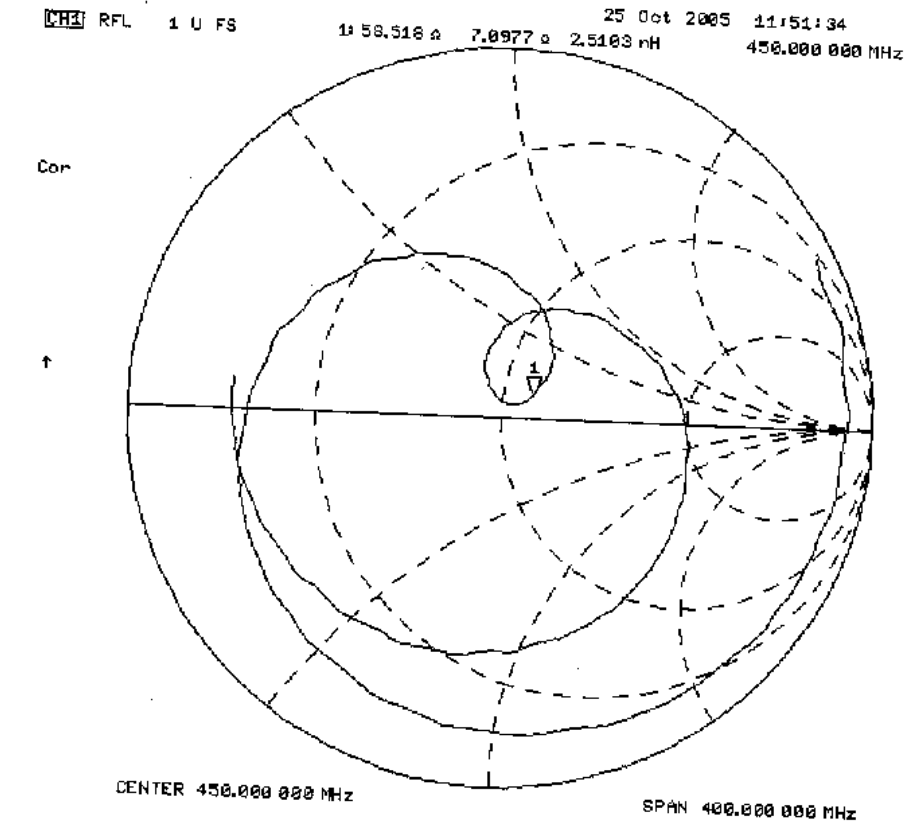
Feed point impedance at 450MHz $\text{Re}\{Z\} = 58.518\Omega$

$\text{Im}\{Z\} = 7.0977\Omega$

Return Loss at 450MHz -20.357dB



2. Validation Dipole VSWR Data



3. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	420.0	250.0	6.2
450	288.0	167.0	6.2
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.6	3.6
3000	41.5	25.0	3.6

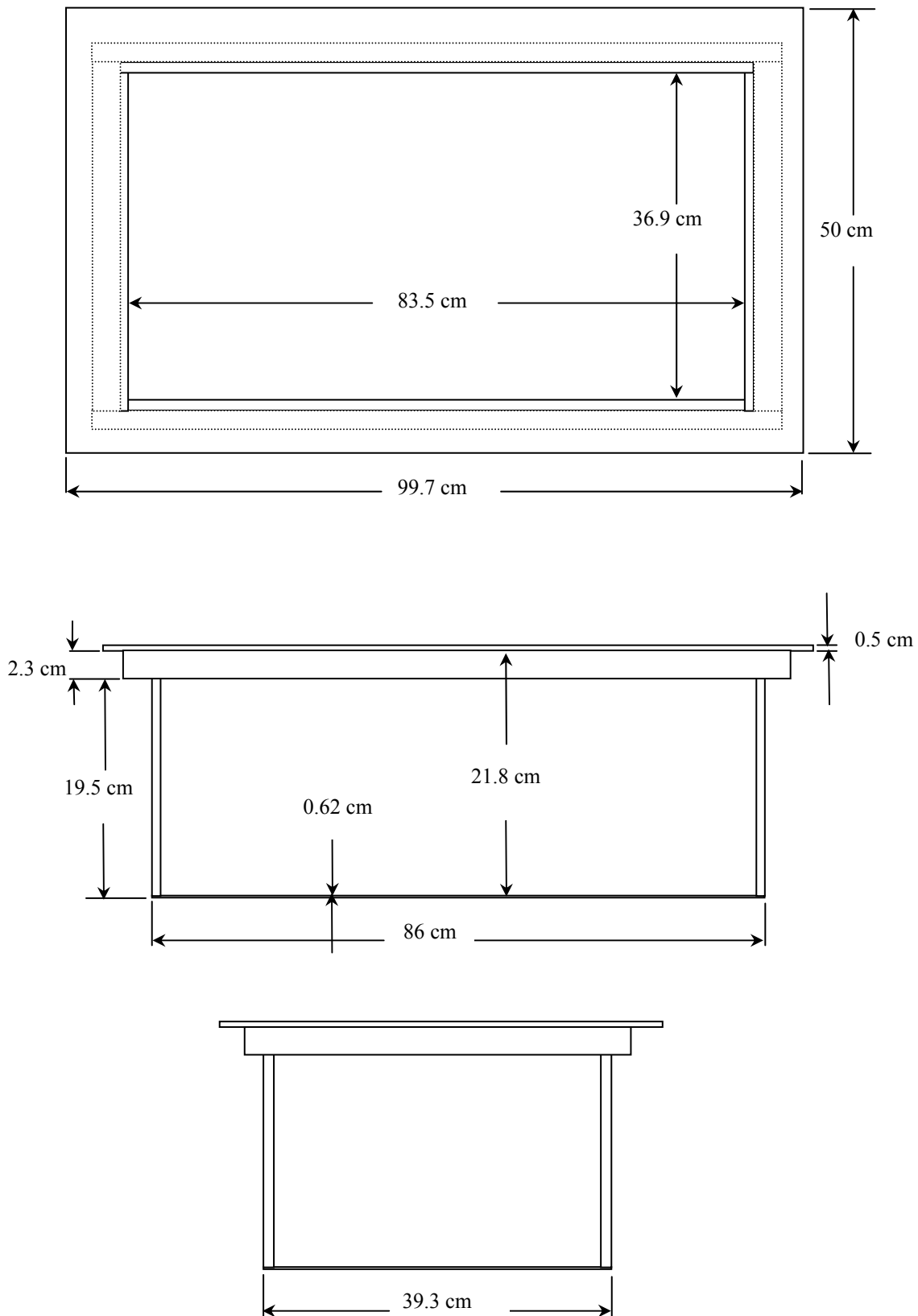
4. Validation Phantom

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

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

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

5. Dimensions of Plexiglas Planar Phantom



6. 450 MHz System Validation Setup



7. 450 MHz Validation Dipole Setup



8. Measurement Conditions

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

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

Environmental Conditions:

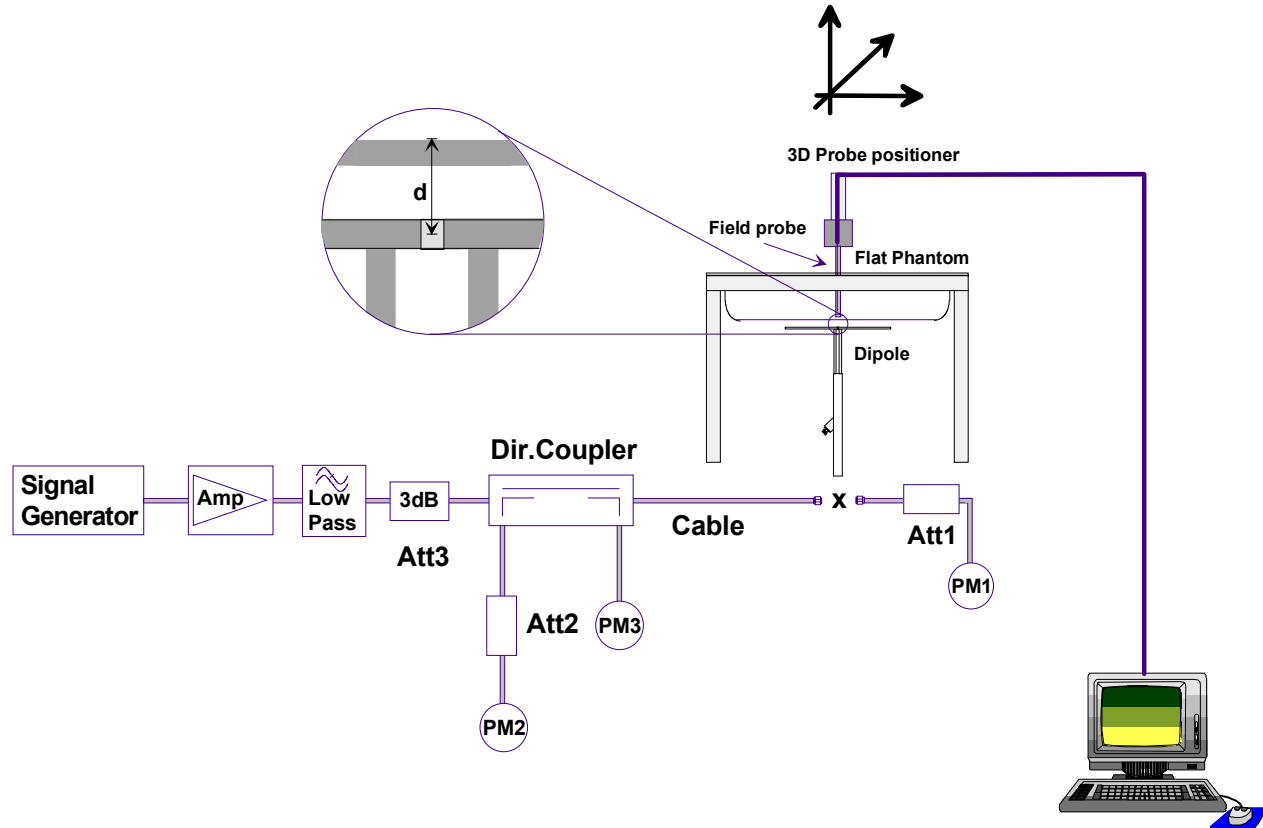
Ambient Temperature: 23.5 °C
Humidity: 34 %
Barometric Pressure: 101.4 kPa

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

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

9. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

10. Validation Dipole SAR Test Results

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

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

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

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

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

DUT: Dipole 450 MHz; Model: D450V2; Serial: 136; Calibrated: 10/25/2005
 Ambient Temp: 23.5 °C; Fluid Temp: 22.5 °C; Barometric Pressure: 101.4 kPa; Humidity: 34%
 Communication System: CW
 Frequency: 450 MHz; Duty Cycle: 1:1
 Medium: HSL450 ($\sigma = 0.84$ mho/m; $\epsilon_r = 43.2$; $\rho = 1000$ kg/m³)
 - Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2005
 - Sensor-Surface: 4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn353; Calibrated: 15/06/2005
 - Phantom: Validation Planar; Type: Plexiglas; Serial: 137
 - Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

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

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

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

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

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

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

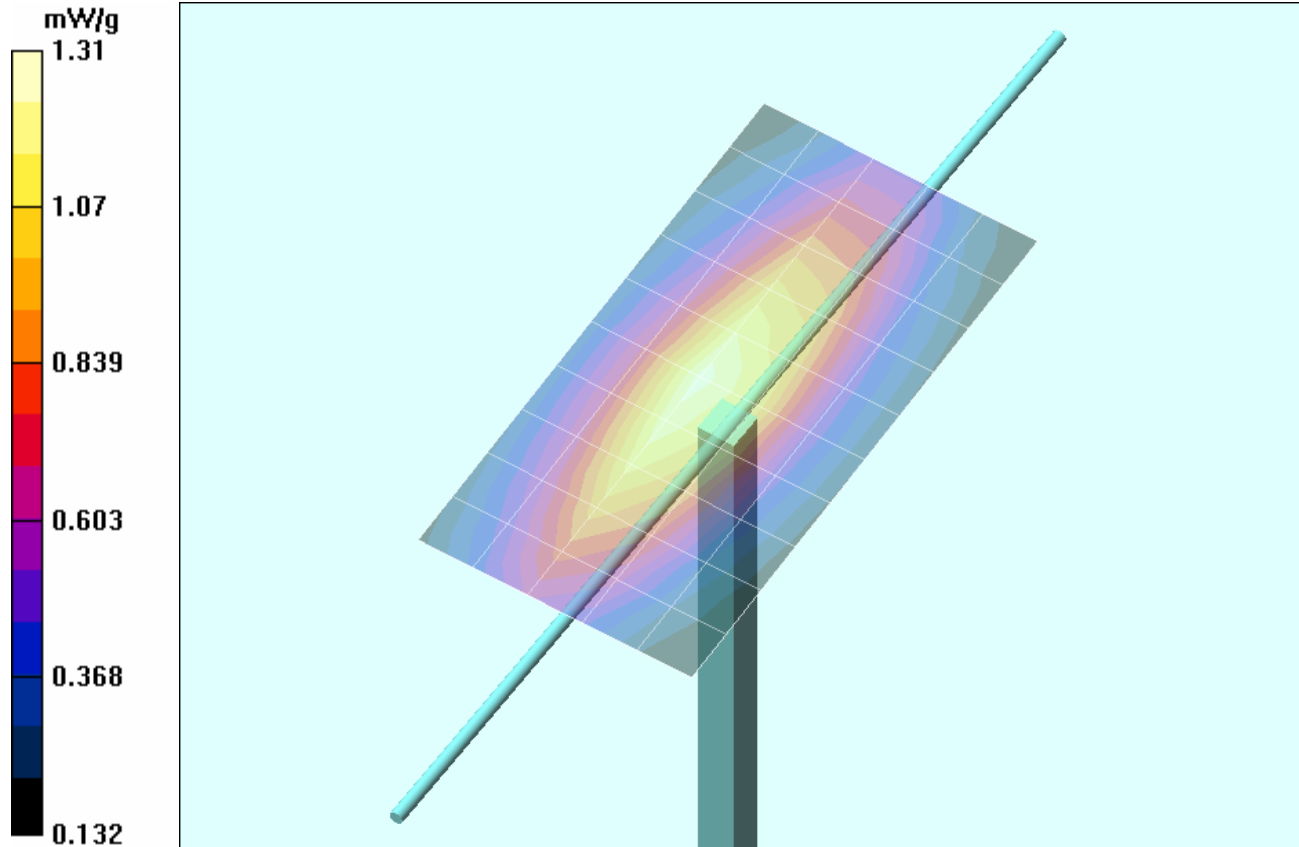
450 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 39.1 V/m; Power Drift = 0.016 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g
 Maximum value of SAR (measured) = 1.31 mW/g

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

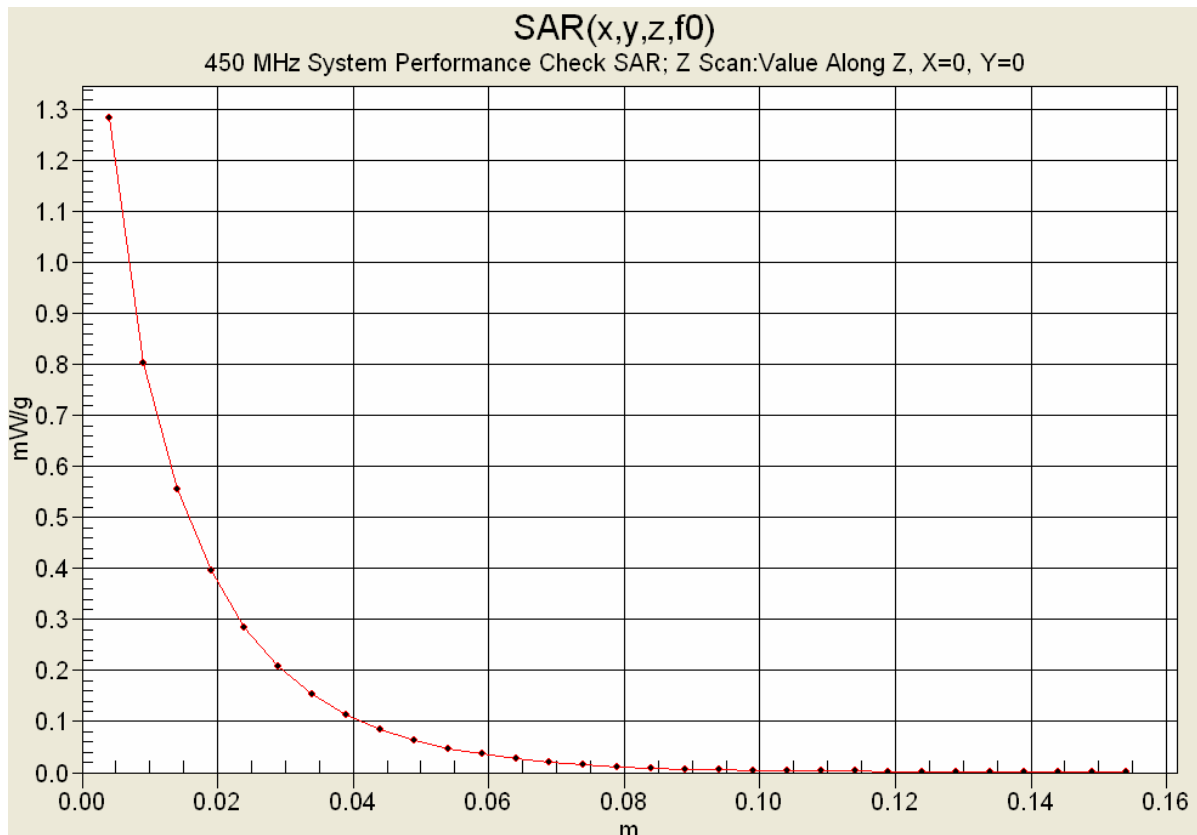
450 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 39.6 V/m; Power Drift = -0.031 dB
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.802 mW/g
 Maximum value of SAR (measured) = 1.31 mW/g

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

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



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



11. Measured Fluid Dielectric Parameters

System Validation (Brain) - 450 MHz Dipole

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

Tue 25/Oct/2005 12:07:39

Freq Frequency(GHz)


FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon

FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma


Test_e Epsilon of UIM

Test_s Sigma of UIM

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

	Test Report Serial No.:	011806AMW-T713-S95U		Report Issue Date:	February 08, 2006
	Date(s) of Evaluation:	January 26, 2006		Report Issue No.:	S713-020806-R0
	Description of Test(s):	RF Exposure	SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

APPENDIX F - PROBE CALIBRATION

Applicant:	Uniden America Corporation	FCC ID:	AMWUT017	IC ID:	513C-UT017	
Model(s):	GMR1558(XX)	Portable FRS/GMRS PTT Radio Transceiver		462.5500 - 467.7125 MHz		
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Accredited by the Swiss Federal Office of Metrology and Accreditation
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech Labs**

Certificate No: **ET3-1387_Mar05**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1387**

Calibration procedure(s) **QA CAL-01.v5**
Calibration procedure for dosimetric E-field probes

Calibration date: **March 18, 2005**

Condition of the calibrated item **In Tolerance**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-04 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-04 (METAS, No. 251-00404)	Aug-05
Reference Probe ES3DV2	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
DAE4	SN: 617	19-Jan-05 (SPEAG, No. DAE4-617_Jan05)	Jan-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 18, 2005

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



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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibrated:	March 18, 2004
Recalibrated:	March 18, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.61 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	92 mV
NormY	1.70 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	92 mV
NormZ	1.70 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.4	4.9
SAR _{be} [%]	With Correction Algorithm	0.1	0.3

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	14.3	9.6
SAR _{be} [%]	With Correction Algorithm	0.6	0.1

Sensor Offset

Probe Tip to Sensor Center **2.7 mm**

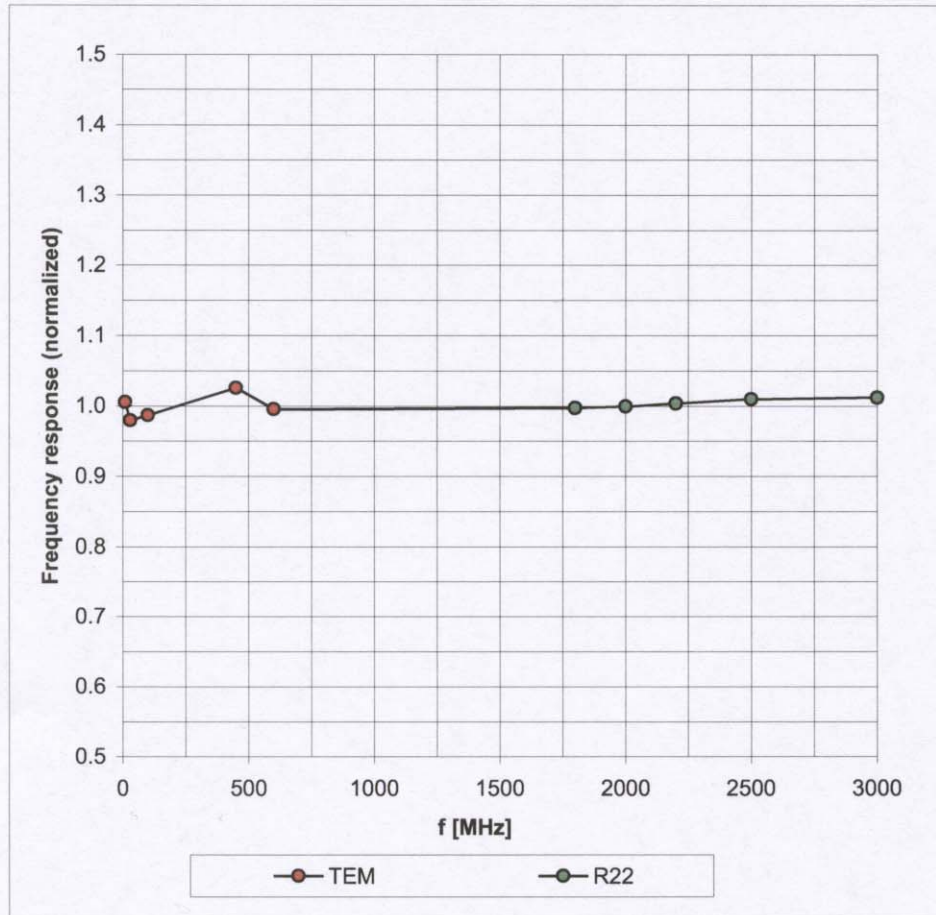
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

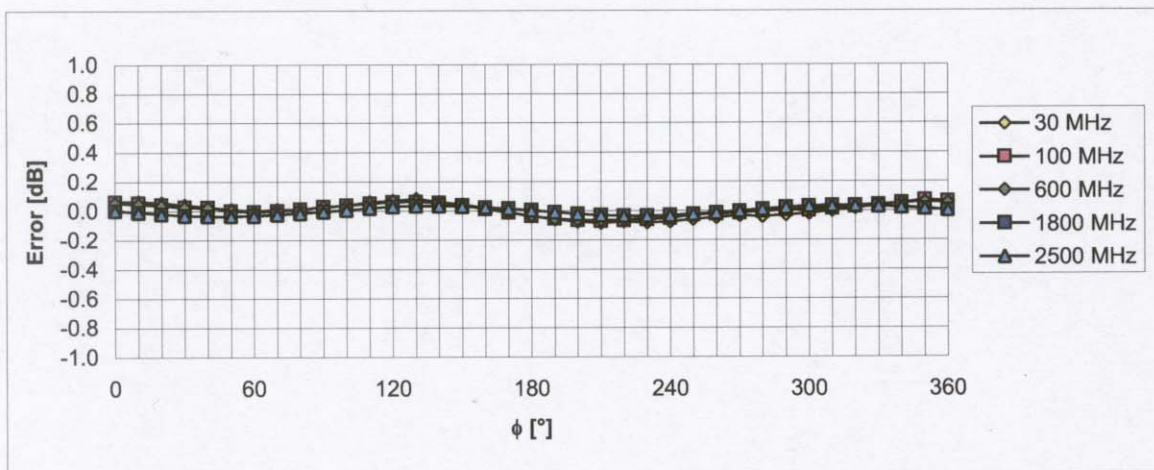
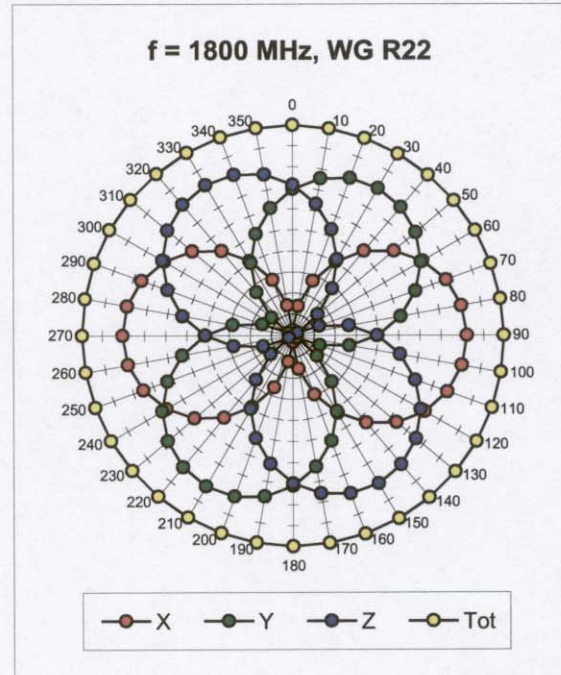
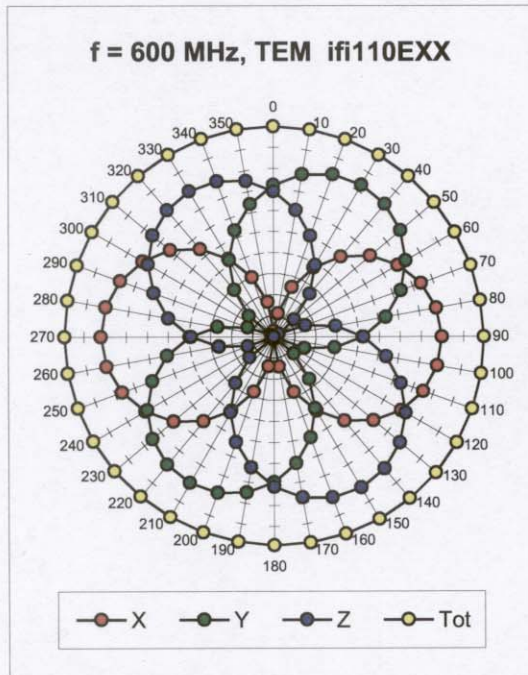
^B Numerical linearization parameter: uncertainty not required.

Frequency Response of E-Field

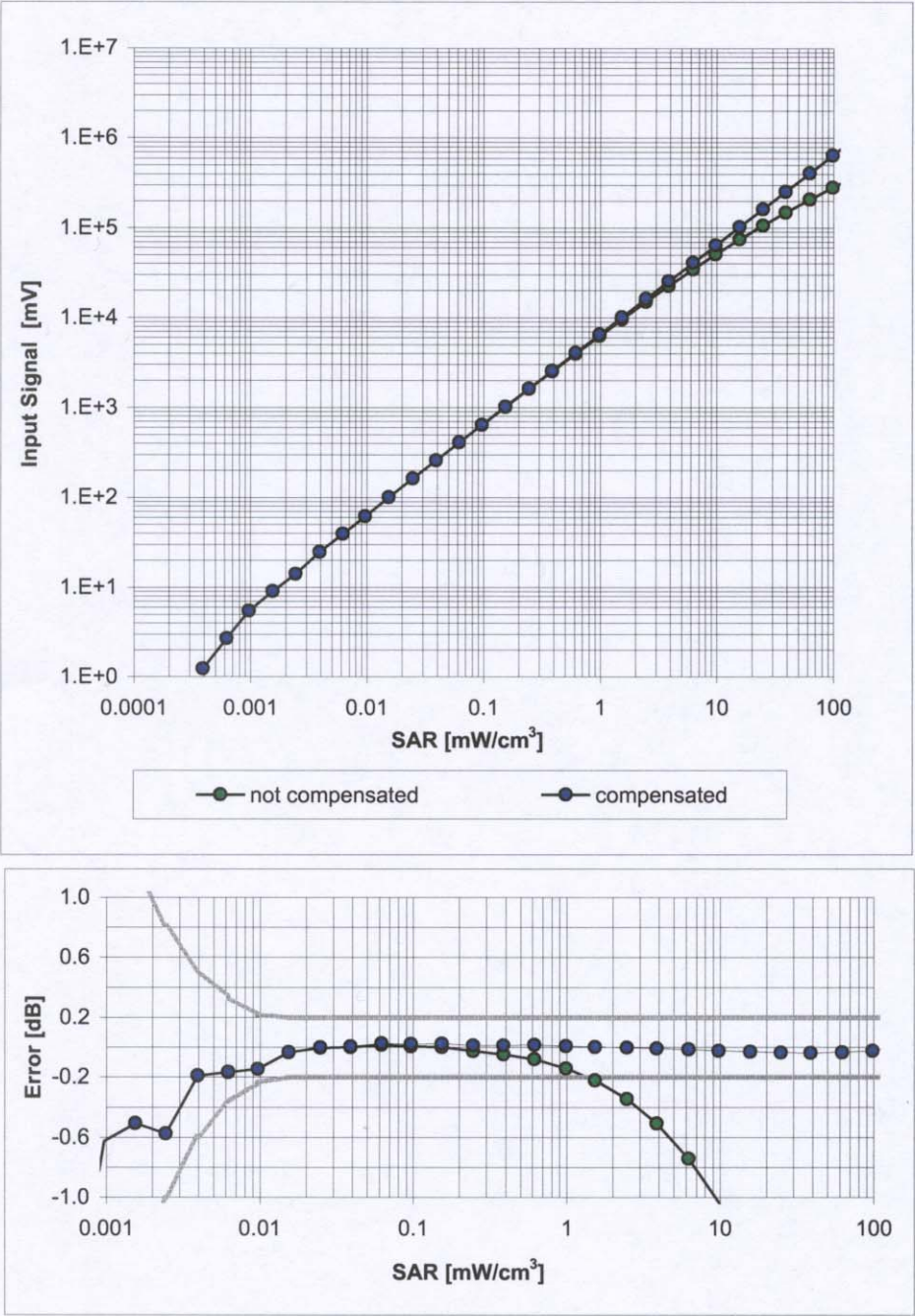
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

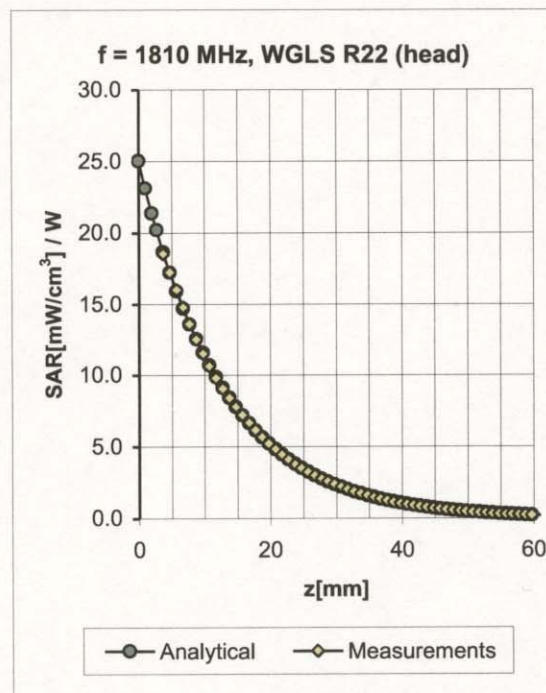
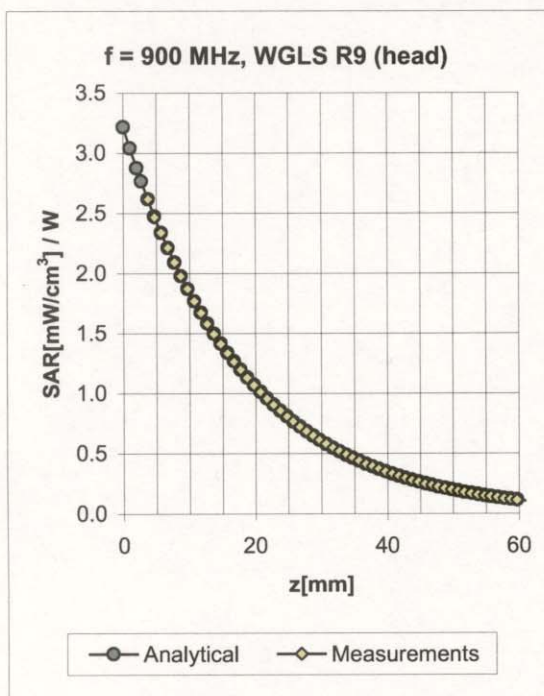
Receiving Pattern (ϕ), $\theta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range f(SAR_{head})
(Waveguide R22, f = 1800 MHz)



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

Conversion Factor Assessment

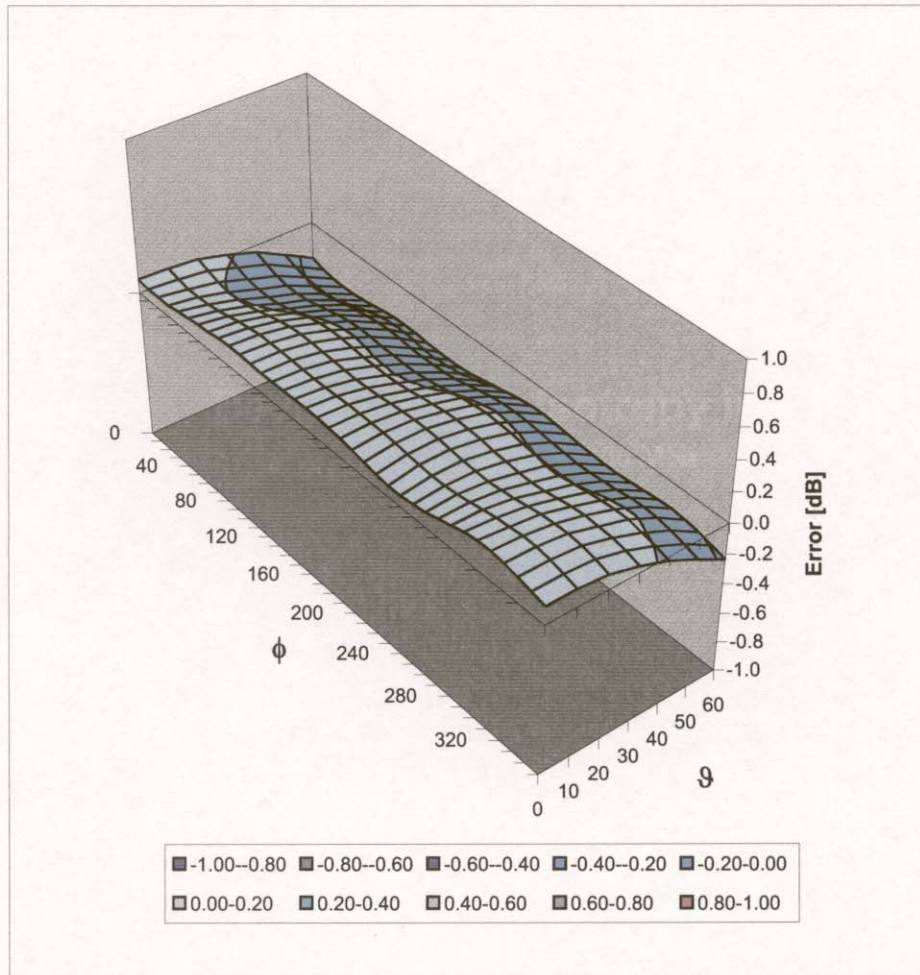


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.65	1.81	6.47 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.62	2.39	5.18 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.76	2.09	4.56 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.60	2.01	6.10 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.60	2.67	4.75 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.82	1.82	4.30 ± 11.8% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1387

Place of Assessment:

Zurich

Date of Assessment:

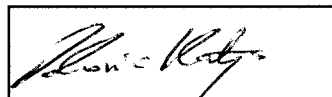
March 21, 2005

Probe Calibration Date:

March 18, 2005

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (\pm standard deviation)

f = 150 MHz	ConvF	8.8 \pm 10%	$\epsilon_r = 52.3 \pm 5\%$ $\sigma = 0.76 \pm 5\%$ mho/m (head tissue)
f = 300 MHz	ConvF	7.9 \pm 9%	$\epsilon_r = 45.3 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
f = 450 MHz	ConvF	7.5 \pm 8%	$\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)
f = 150 MHz	ConvF	8.4 \pm 10%	$\epsilon_r = 61.9 \pm 5\%$ $\sigma = 0.80 \pm 5\%$ mho/m (body tissue)
f = 450 MHz	ConvF	7.5 \pm 8%	$\epsilon_r = 56.7 \pm 5\%$ $\sigma = 0.94 \pm 5\%$ 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 Section 4.7 of the DASY4 Manual.