DECLARATION OF COMPLIANCE - SAR RF EXPOSURE EVALUATION (FCC/IC)

Test Lab Information	**Name**	**CELLTECH LABS INC.**		
	Address	21-364 Lougheed Road, Kelowna, British Columbia 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**	Class II Permissive Change	**IC**	New Certification
Standard(s) Applied	**FCC**	47 CFR §2.1093		
	IC	Health Canada Safety Code 6		
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C (Edition 01-01)		
		KDB 447498 D01v04; KDB 178919 D01v04r04		
	IC	RSS-102 Issue 4		
	IEEE	1528-2003		
	IEC	62209-1:2005		
Device Identifier(s)	**FCC ID:**	AMWUT030		
	IC:	513C-UT055		
Date of Sample Receipt	December 21, 2010			
Date(s) of Evaluation	January 10, 2011			
Device Model(s)	GMR1636 (New Model with Headset Audio Accessory Connector)			
Test Sample Serial No.	None (Identical Prototype)			
Hardware / Firmware Revision No.s	**Hardware**	No. 1	**Firmware**	Ver. 1.00
Device Description	Portable FM UHF GMRS/FRS Push-To-Talk (PTT) Radio Transceiver			
Transmit Frequency Range(s)	462.5500 - 462.7250 MHz (GMRS Channels 15-22)			
	462.5625 - 462.7125 MHz (GMRS/FRS Channels 1-7)			
	467.5625 - 467.7125 MHz (FRS Channels 8-14)			

RF Output Power Measured	Ni-MH	0.45 W	26.53 dBm	Conducted Average	462.5625 MHz	GMRS Ch. 1
	Alkaline	0.58 W	27.63 dBm	Conducted Average	462.5625 MHz	GMRS Ch. 1
Battery Type(s) Tested	Ni-MH AAA x3 (1.2 V, 300 mAh)					
	Alkaline Energizer AAA x3 (1.5 V)					
Antenna Type(s) Tested	External Non-detachable (-2.3 dBi Gain)					
Body-worn Accessory Tested	Plastic Belt-Clip (supplied with DUT)					
Audio Accessory Tested	Headset-Microphone (P/N: ZA-133)					

Max. SAR Level(s) Evaluated	Face-held	**0.431 W/kg**	1g	50% PTT duty cycle	General Population / Uncontrolled Environment
	Body-worn	**1.12 W/kg**	1g	50% PTT duty cycle	
FCC/IC Spatial Peak SAR Limit	Head/Body	1.6 W/kg	1g	50% PTT 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 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 International Standard IEC 62209-1:2005. 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.

Test Report Approved By		**Sean Johnston**	**Lab Manager**	**Celltech Labs Inc.**

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REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	Initial Release	Jon Hughes	January 25, 2011

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	**REPORT PREPARED BY**	**QA REVIEW BY**	**REPORT APPROVED BY**
Scott Kulifaj	Scott Kulifaj	Jon Hughes	Sean Johnston

1.0 INTRODUCTION

This measurement report demonstrates that the Uniden America Corporation Model: GMR1636 Portable FM GMRS/FRS Push-To-Talk Radio Transceiver (FCC ID: AMWUT030 / IC: 513C-UT055) 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 test procedures described in FCC OET Bulletin 65, Supplement C Edition 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and International Standard IEC 62209-1:2005 (see reference [6]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the provisions of the rules are included within this test report.

2.0 SAR MEASUREMENT SYSTEM

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

3.0 REFERENCE OUTPUT POWER MEASUREMENT

RF OUTPUT POWER MEASUREMENT

Battery	Test Frequency	Band	Mode	dBm	Watts	Method
Ni-MH	462.5625 MHz	GMRS	CW	26.53	0.45	Conducted Average
Alkaline	462.5625 MHz	GMRS	CW	27.63	0.58	Conducted Average

Notes

1. The RF conducted average output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter in accordance with the procedures described in FCC 47 CFR §2.1046 (see reference [12]) and IC RSS-Gen (see reference [13]).

4.0 FCC POWER THRESHOLDS FOR PTT DEVICES ($f \leq 0.5$ GHz)

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz*			Manufacturer's Rated RF Output Power	
Exposure Conditions	***P* mW (General Population)**	***P* mW (Occupational)**	**100% PTT Duty Cycle**	**50% PTT Duty Cycle**
Held to face, $d \geq 2.5$ cm	250	1250	0.580 Watts	0.290 Watts
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 [7]).			The conducted output power level of the DUT exceeds the FCC power threshold and therefore SAR evaluation is required.	

5.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

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

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

6.0 SAR MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Freq.	Channel		Test Mode	Batt. Type	Accessories		DUT Spacing to Planar Phantom		Cond. Power	Measured SAR 1g (W/kg) PTT Duty Cycle		SAR Drift During Test	Scaled SAR with droop 1g (W/kg) PTT Duty Cycle	
	MHz					Body	Audio	DUT	Antenna	Watts	100%	50%	dB	100%	50%
FACE	462.5625	1	GMRS	CW	Ni-MH	n/a	n/a	2.5 cm	3.2 cm	0.45	0.515	0.258	-0.038	0.520	0.260
	462.5625	1	GMRS	CW	Alkaline	n/a	n/a	2.5 cm	3.2 cm	0.58	0.652	0.326	-1.21	0.861	**0.431**
BODY	462.5625	1	GMRS	CW	Ni-MH	Belt-Clip	Headset	0.7 cm	1.1 cm	0.45	0.916	0.458	-0.302	0.982	0.491
	462.5625	1	GMRS	CW	Alkaline	Belt-Clip	Headset	0.7 cm	1.1 cm	0.58	1.81	0.905	-0.926	2.24	**1.12**

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

Test Date(s)	January 10, 2011				January 10, 2011				Evaluation Type	Face	Body	Unit
Measured Fluid	450 MHz HEAD				450 MHz BODY				Atmospheric Pressure	101.1	101.1	kPa
									Relative Humidity	35	35	%
Dielectric Constant ε_r	IEEE Target		462.5625*	Dev.	IEEE Target		462.5625*	Dev.	Ambient Temperature	24.0	24.0	°C
	43.5	± 5%	44.9	+3.2%	56.7	± 5%	57.8	+1.9%	Fluid Temperature	22.5	22.3	°C
Conductivity σ (mho/m)	IEEE Target		462.5625*	Dev.	IEEE Target		462.5625*	Dev.	Fluid Depth	≥ 15	≥ 15	cm
	0.87	± 5%	0.87	0.0%	0.94	± 5%	0.91	-3.2%	ρ (Kg/m^3)	1000		

Notes

1. Detailed measurement plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. The number of test channels was selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).
3. The power droop measured by the DASY4 system for the duration of the SAR evaluation was added to the measured SAR level to report the scaled SAR result as shown in the above test data table.
4. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the PTT depressed.
5. The fluid temperature was measured prior to and after the SAR evaluations to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements. The measured fluid remained within +/-2°C.
6. 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).
7. * MHz (interpolated using DASY4 Software)

7.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 01/10/2011		Frequency: 450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	46.34	0.75	43.5	0.87	6.53%	-13.79%
0.360	46.46	0.79	43.5	0.87	6.80%	-9.20%
0.370	46.13	0.78	43.5	0.87	6.05%	-10.34%
0.380	46.33	0.79	43.5	0.87	6.51%	-9.20%
0.390	45.86	0.80	43.5	0.87	5.43%	-8.05%
0.400	46.07	0.81	43.5	0.87	5.91%	-6.90%
0.410	45.20	0.81	43.5	0.87	3.91%	-6.90%
0.420	44.66	0.82	43.5	0.87	2.67%	-5.75%
0.430	45.19	0.84	43.5	0.87	3.89%	-3.45%
0.440	44.74	0.84	43.5	0.87	2.85%	-3.45%
0.450	45.11	0.85	43.5	0.87	3.70%	-2.30%
0.460	45.06	0.87	43.5	0.87	3.59%	0.00%
0.4625625*	44.90	0.87	43.5	0.87	3.22%	0.00%
0.470	44.56	0.87	43.5	0.87	2.44%	0.00%
0.480	44.74	0.88	43.5	0.87	2.85%	1.15%
0.490	44.54	0.89	43.5	0.87	2.39%	2.30%
0.500	43.82	0.90	43.5	0.87	0.74%	3.45%
0.510	43.69	0.89	43.5	0.87	0.44%	2.30%
0.520	43.41	0.91	43.5	0.87	-0.21%	4.60%
0.530	43.68	0.93	43.5	0.87	0.41%	6.90%
0.540	43.68	0.94	43.5	0.87	0.41%	8.05%
0.550	43.41	0.94	43.5	0.87	-0.21%	8.05%

*interpolated using DASY4 software

FLUID DIELECTRIC PARAMETERS (CONT.)

FLUID DIELECTRIC PARAMETERS

Date: 01/10/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	59.24	0.83	56.7	0.94	4.48%	-11.70%
0.360	59.30	0.85	56.7	0.94	4.59%	-9.57%
0.370	58.79	0.85	56.7	0.94	3.69%	-9.57%
0.380	58.45	0.86	56.7	0.94	3.09%	-8.51%
0.390	58.93	0.85	56.7	0.94	3.93%	-9.57%
0.400	58.56	0.85	56.7	0.94	3.28%	-9.57%
0.410	57.84	0.86	56.7	0.94	2.01%	-8.51%
0.420	58.04	0.86	56.7	0.94	2.36%	-8.51%
0.430	57.96	0.87	56.7	0.94	2.22%	-7.45%
0.440	58.28	0.87	56.7	0.94	2.79%	-7.45%
0.450	57.94	0.90	56.7	0.94	2.19%	-4.26%
0.460	57.68	0.91	56.7	0.94	1.73%	-3.19%
0.4625625*	57.80	0.91	56.7	0.94	1.94%	-3.19%
0.470	58.13	0.91	56.7	0.94	2.52%	-3.19%
0.480	57.72	0.93	56.7	0.94	1.80%	-1.06%
0.490	58.17	0.93	56.7	0.94	2.59%	-1.06%
0.500	57.65	0.92	56.7	0.94	1.68%	-2.13%
0.510	58.05	0.92	56.7	0.94	2.38%	-2.13%
0.520	56.90	0.93	56.7	0.94	0.35%	-1.06%
0.530	57.20	0.95	56.7	0.94	0.88%	1.06%
0.540	56.80	0.94	56.7	0.94	0.18%	0.00%
0.550	57.08	0.96	56.7	0.94	0.67%	2.13%

*interpolated using DASY4 software

8.0 DETAILS OF SAR EVALUATION

The Uniden America Corporation Model: GMR1636 Portable FM GMRS/FRS PTT Radio Transceiver (FCC ID: AMWUT030 / IC: 513C-UT055) 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 planar phantom. A 2.5 cm spacing was maintained between the front of the DUT and the planar phantom.
2. The DUT was evaluated in a body-worn configuration with the back of the radio placed parallel to the planar phantom and the plastic belt-clip touching the planar phantom. The belt-clip accessory provided a 0.7 cm spacing from the back of the DUT to the planar phantom. The body-worn SAR evaluation was performed with the customer-supplied headset-microphone audio accessory connected to the audio jack of the DUT.
3. The area scan evaluation was performed with fully charged or new batteries. After the area scan was completed the batteries were replaced with fully charged or new batteries prior to the zoom scan evaluation.
4. The SAR droop of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. The measured SAR droop was added to the measured SAR levels to report scaled SAR levels as shown in the SAR test data tables. A SAR-versus-Time power droop evaluation was performed in the test configuration that reported the maximum measured SAR level. See Appendix A (SAR Test Plots) for SAR-versus-Time power droop evaluation plot.
5. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the PTT button depressed.
6. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.

9.0 SAR EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.

(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.

An area scan was determined as follows:

c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix E). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

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

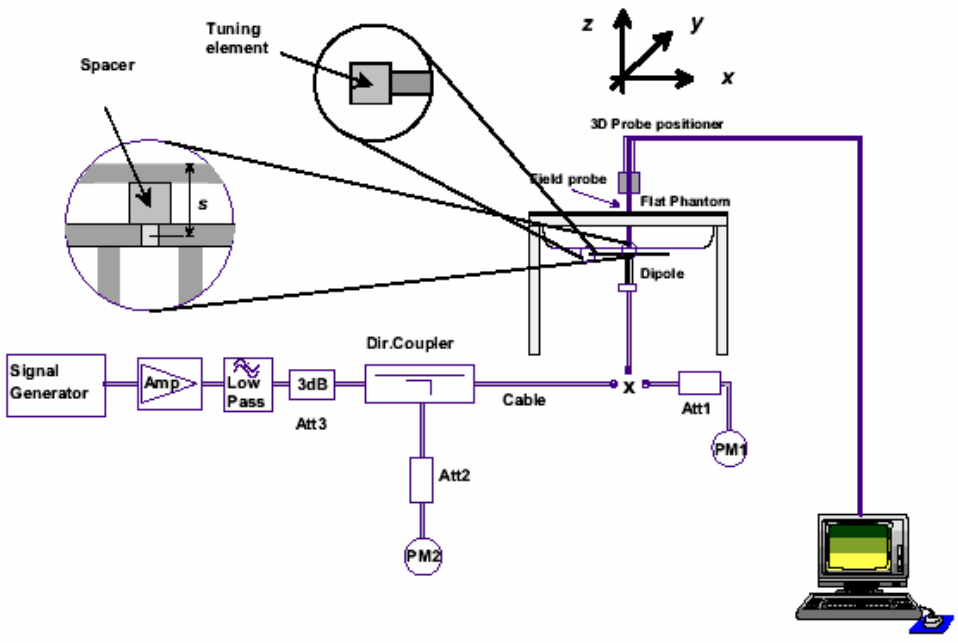
10.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a daily system check was performed with a planar phantom and 450 MHz dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 398 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the SAR system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

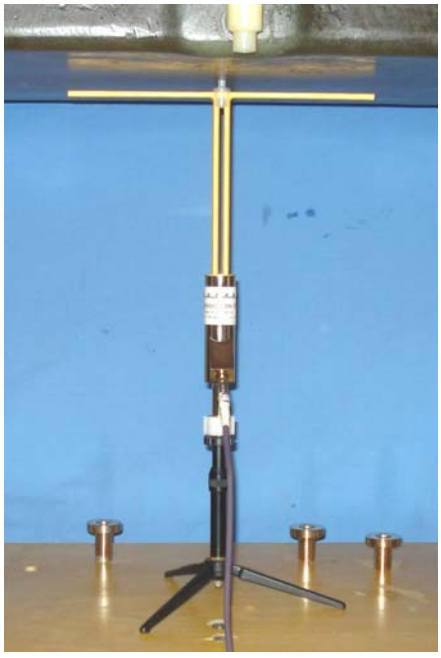
SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.						
Jan 10	Body 450	1.78 ±10%	1.81	+1.7%	56.7 ±5%	57.9	+2.1%	0.94 ±5%	0.90	-4.3%	1000	24.0	22.3	≥ 15	35	101.1

Notes		
	1.	The target SAR value is the measured values from the SAR system manufacturer's dipole calibration (see Appendix E).
	2.	The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
	3.	The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements. The measured fluid temperature remained within +/-2°C.
	4.	The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



System Performance Check Measurement Setup (IEEE Standard 1528-2003)



450 MHz Validation Dipole Setup

11.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see references [10] and [11]) 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	**450 MHz HEAD**	**450 MHz BODY**
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 %

12.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	**Health Canada Safety Code 6**	**General Population**	**Occupational)**
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		**1.6 W/kg**	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
The Spatial Average value of the SAR averaged over the whole body.			
The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.			
Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.			

13.0 ROBOT SYSTEM SPECIFICATIONS

Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
DASY4 Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	ET3DV6
Serial No.	1590
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Evaluation Phantom	
Type	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters
Validation Phantom	
Type	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters

14.0 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 head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in head tissue (rotation around probe axis) ± 0.4 dB in head tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone

ET3DV6 E-Field Probe

15.0 BARKSI PLANAR PHANTOM

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

Barski Planar Phantom

16.0 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

17.0 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	27Apr10	Annual
x	-ET3DV6 E-Field Probe	00017	1590	15Jul10	Annual
x	-SPEAG D450V3 Validation Dipole	000217	1068	18Jan10	Biennial
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	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

18.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION

Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V_i or V_{eff}
Measurement System									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	∞
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measured)	E.3.3	3.2	Normal	1	0.64	0.43	2.0	1.4	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	3.2	Normal	1	0.6	0.49	1.9	1.6	∞
Combined Standard Uncertainty			**RSS**				**11.36**	**11.07**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**22.71**	**22.14**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

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

19.0 REFERENCES

[1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.

[2] Health Canada - "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.

[3] Federal Communications Commission - "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[4] Industry Canada - "Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 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.

[6] International Standard IEC 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."

[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.

[8] Federal Communications Commission, Office of Engineering and Technology - "Permissive Change Policies"; KDB 178919 D01v04r04: August 2009.

[9] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.

[10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.

[11] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.

[12] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."

[13] ANSI/TIA-603-C, "Land Mobile FM or PM Communications Equipment - Measurement and Performance Standards": December 2004.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 01/10/2011

Face-held SAR - GMRS - Channel 1 - 462.5625 MHz - Ni-MH Battery (AAA x3)

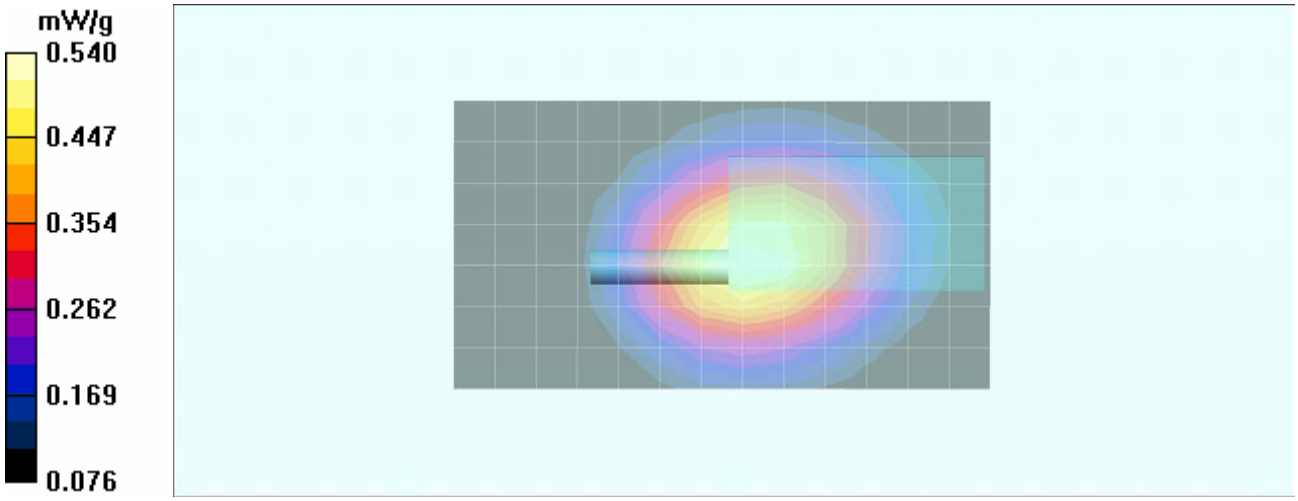
DUT: Uniden GMR1636; Type: Portable GMRS/FRS PTT Radio Transceiver; Serial: None (Pre-production)

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 462.5625 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used (interpolated): f = 462.5625 MHz; σ = 0.87 mho/m; ε_r = 44.9; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front of DUT to Planar Phantom
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.541 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 23.7 V/m; Power Drift = -0.038 dB
Peak SAR (extrapolated) = 0.719 W/kg
SAR(1 g) = 0.515 mW/g; SAR(10 g) = 0.372 mW/g
Maximum value of SAR (measured) = 0.540 mW/g



Date Tested: 01/10/2011

Face-held SAR - GMRS - Channel 1 - 462.5625 MHz - Alkaline Battery (AAA x3)

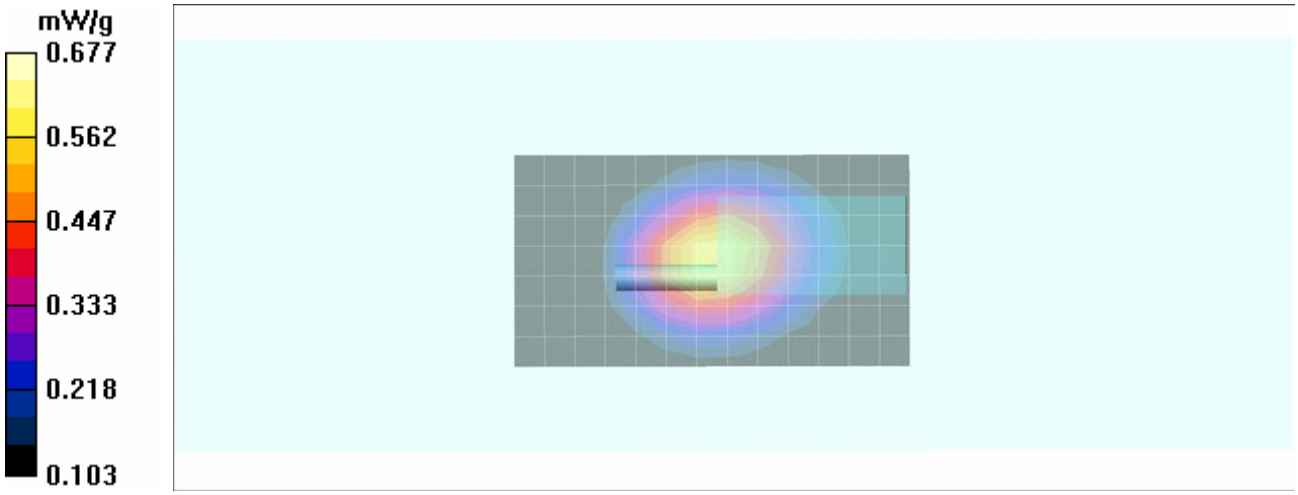
DUT: Uniden GMR1636; Type: Portable GMRS/FRS PTT Radio Transceiver; Serial: None (Pre-production)

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

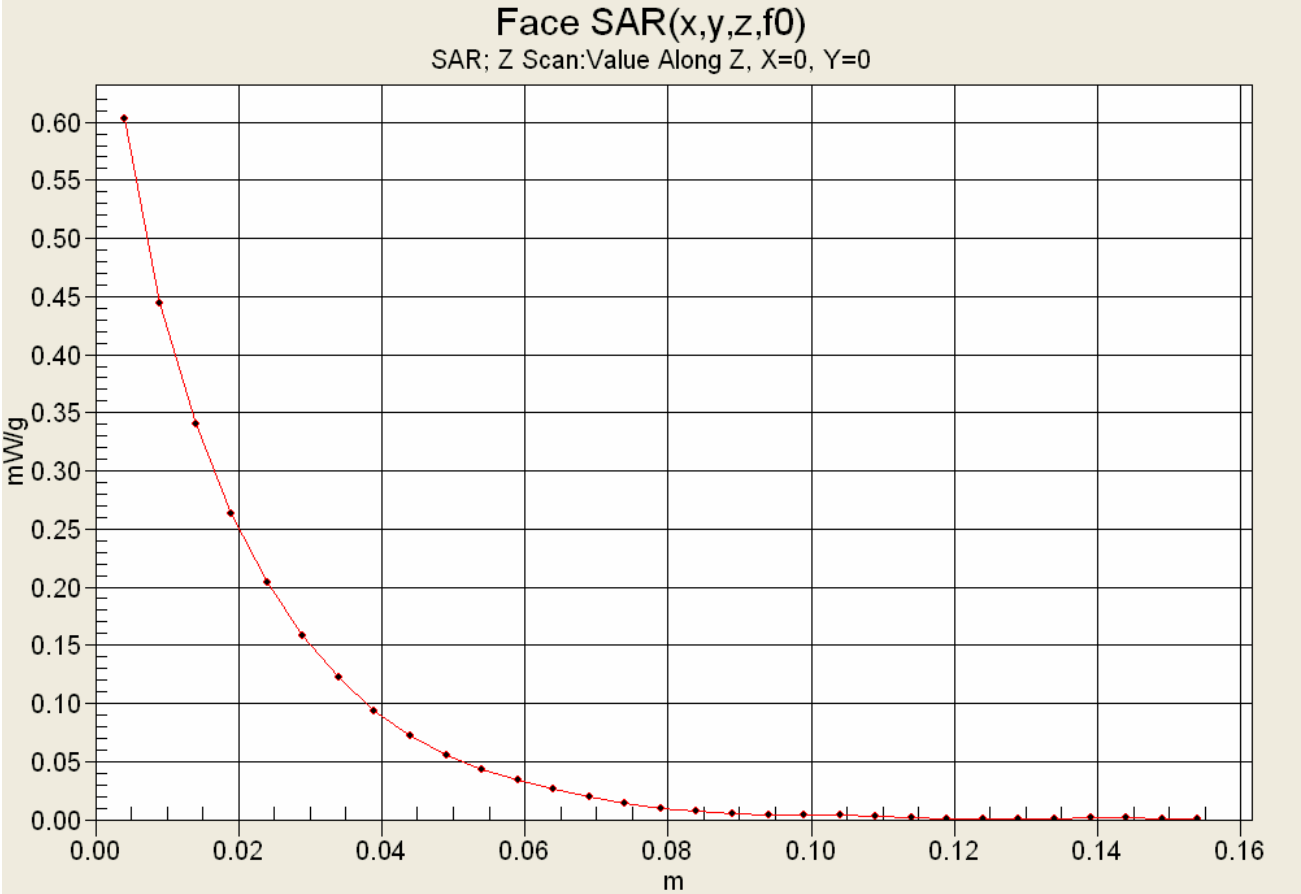
Communication System: CW
Frequency: 462.5625 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used (interpolated): f = 462.5625 MHz; σ = 0.87 mho/m; ε_r = 44.9; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front of DUT to Planar Phantom
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.596 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 31.0 V/m; Power Drift = -1.21 dB
Peak SAR (extrapolated) = 0.902 W/kg
SAR(1 g) = 0.652 mW/g; SAR(10 g) = 0.480 mW/g
Maximum value of SAR (measured) = 0.677 mW/g



Z-Axis Scan



Date Tested: 01/10/2011

Body-worn SAR - GMRS - Channel 1 - 462.5625 MHz - Ni-MH Battery (AAA x3)

DUT: Uniden GMR1636; Type: Portable GMRS/FRS PTT Radio Transceiver; Serial: None (Pre-production)

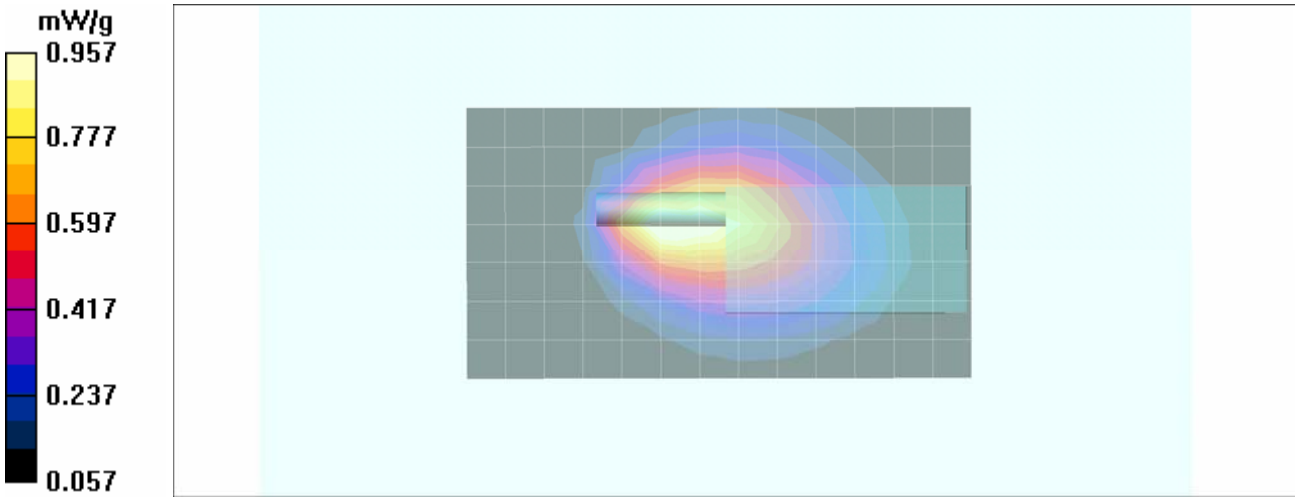
Body-worn Accessory: Plastic Belt-Clip; Audio Accessory: Headset-Microphone (P/N: ZA-133)

Ambient Temp: 24.0°C; Fluid Temp: 22.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 462.5625 MHz; Duty Cycle: 1:1
Medium: M450 Medium parameters used (interpolated): f = 462.5625 MHz; σ = 0.91 mho/m; ε_r = 57.8; ρ = 1000 kg/m^3

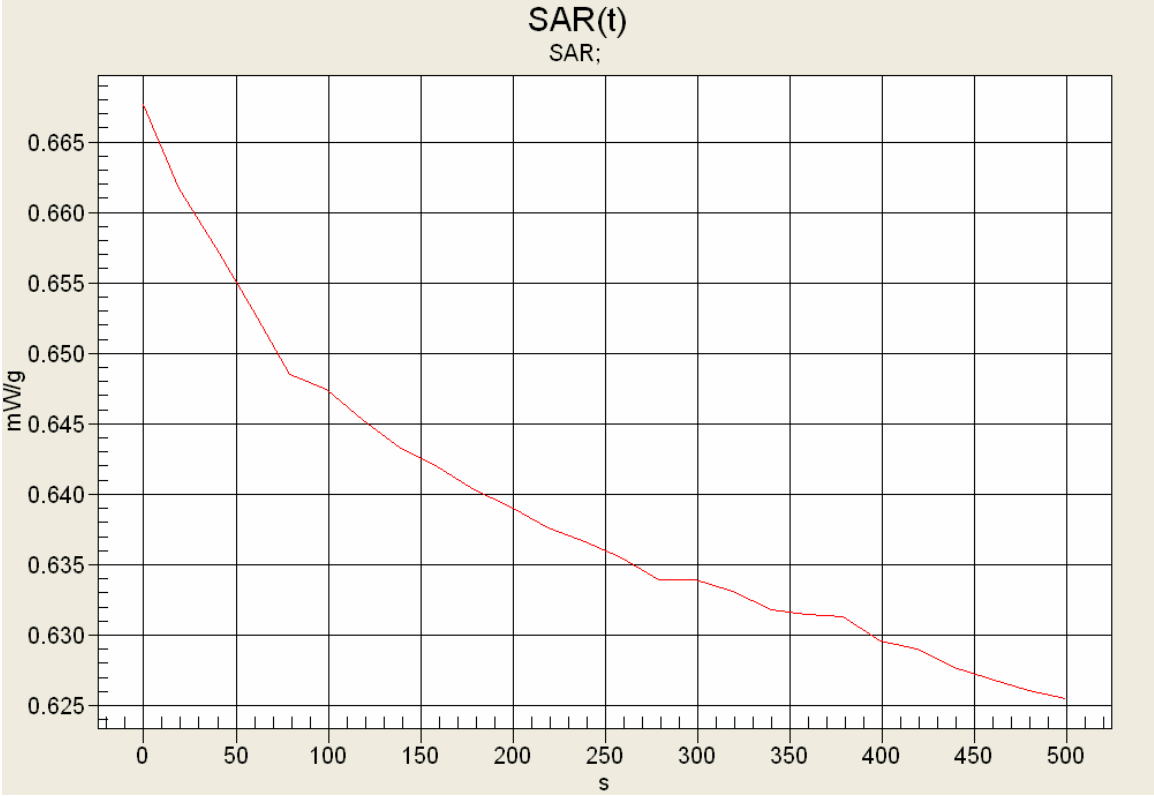
- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR – 0.7 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.06 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.6 V/m; Power Drift = -0.302 dB
Peak SAR (extrapolated) = 1.94 W/kg
SAR(1 g) = 0.916 mW/g; SAR(10 g) = 0.576 mW/g
Maximum value of SAR (measured) = 0.957 mW/g



SAR Droop Evaluation (SAR-versus-Time)

Body-worn Configuration
Test Freq. 462.5625 MHz
Ni-MH Battery (AAA x3)
Belt-Clip accessory
Headset accessory



SAR - 0s – 0.668 mW/g
SAR - 340s – 0.632 mW/g (-0.241 dB)
SAR - 500s – 0.626 mW/g (-0.282 dB)

Date Tested: 01/10/2011

Body-worn SAR - GMRS - Channel 1 - 462.5625 MHz - Alkaline Battery (AAA x3)

DUT: Uniden GMR1636; Type: Portable GMRS/FRS PTT Radio Transceiver; Serial: None (Pre-production)

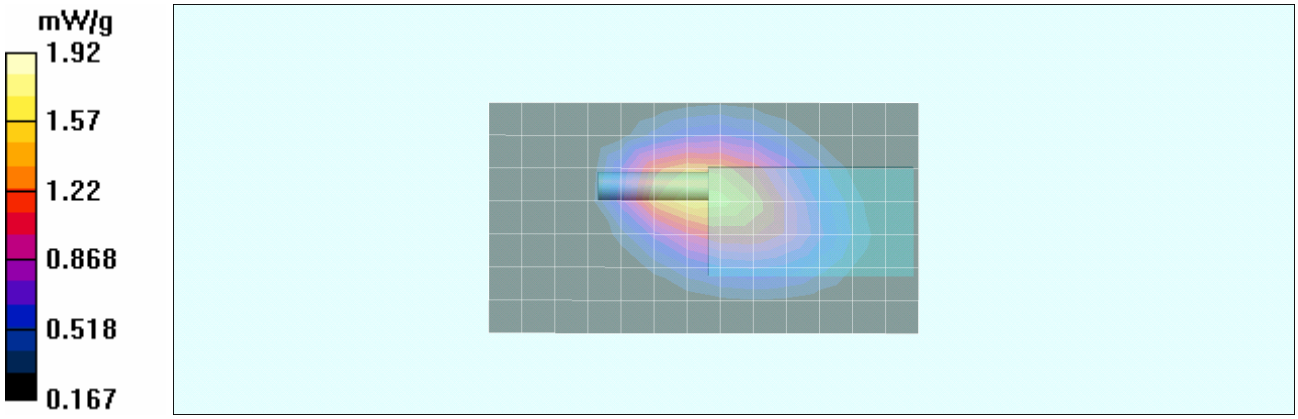
Body-worn Accessory: Plastic Belt-Clip; Audio Accessory: Headset-Microphone (P/N: ZA-133)

Ambient Temp: 24.0°C; Fluid Temp: 22.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

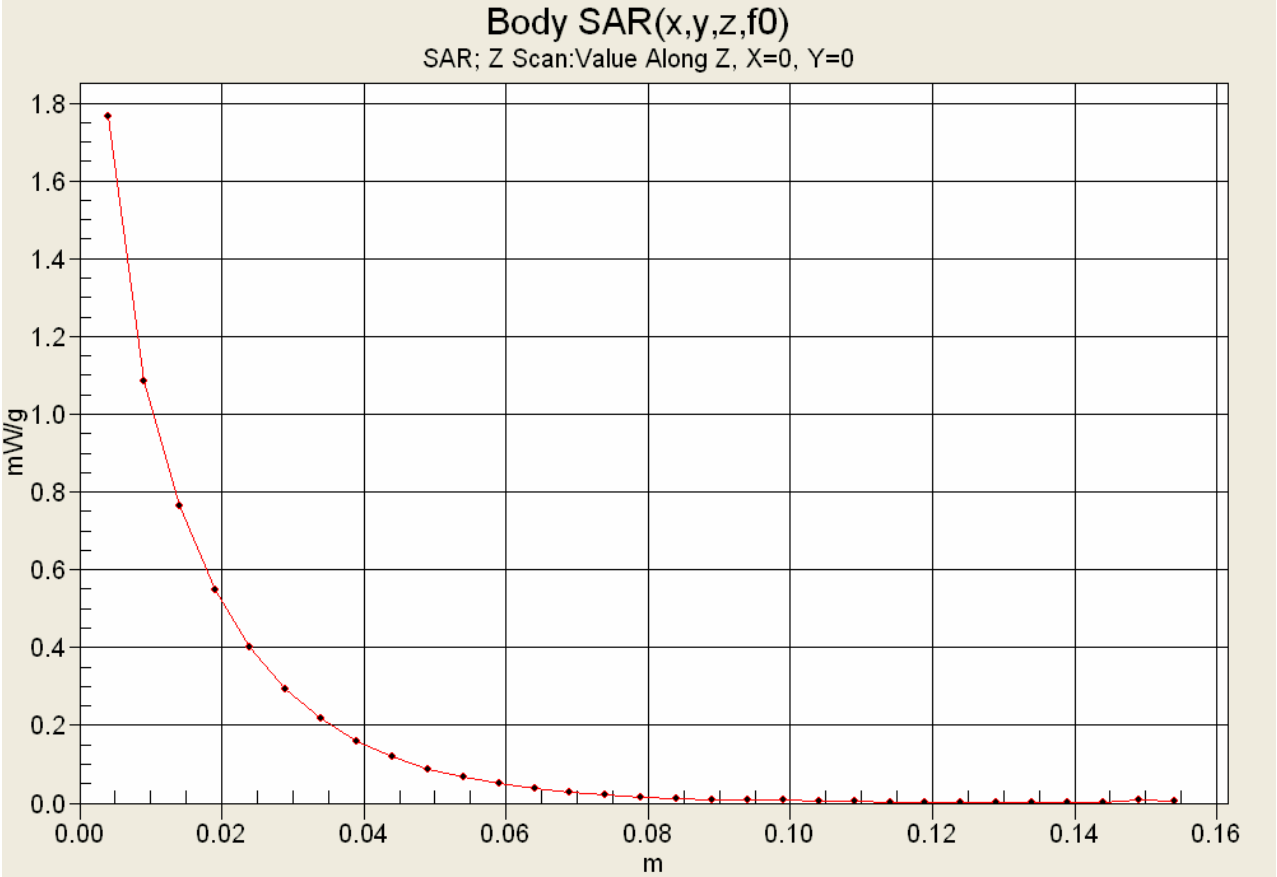
Communication System: CW
Frequency: 462.5625 MHz; Duty Cycle: 1:1
Medium: M450 Medium parameters used (interpolated): f = 462.5625 MHz; σ = 0.91 mho/m; ε_r = 57.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR – 0.7 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.55 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 43.6 V/m; Power Drift = -0.926 dB
Peak SAR (extrapolated) = 3.23 W/kg
SAR(1 g) = 1.81 mW/g; SAR(10 g) = 1.23 mW/g
Maximum value of SAR (measured) = 1.92 mW/g



Z-Axis Scan



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 01/10/2011

System Performance Check - 450 MHz Dipole - Body

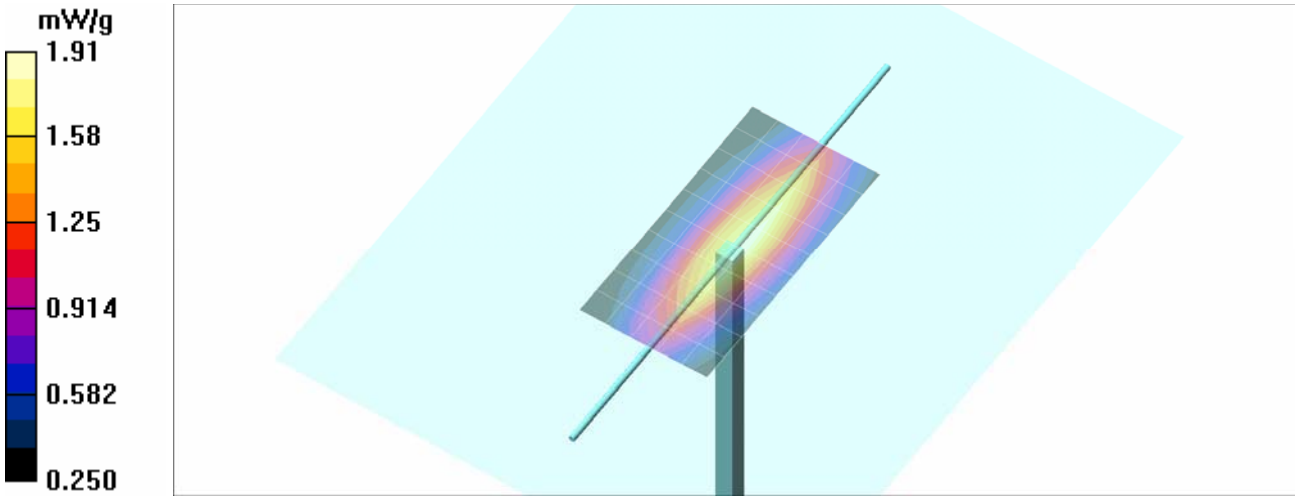
DUT: Dipole D450V3; Asset: 000217; Serial: 1068; Calibration: 01/18/2010

Ambient Temp: 24.0°C; Fluid Temp: 22.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

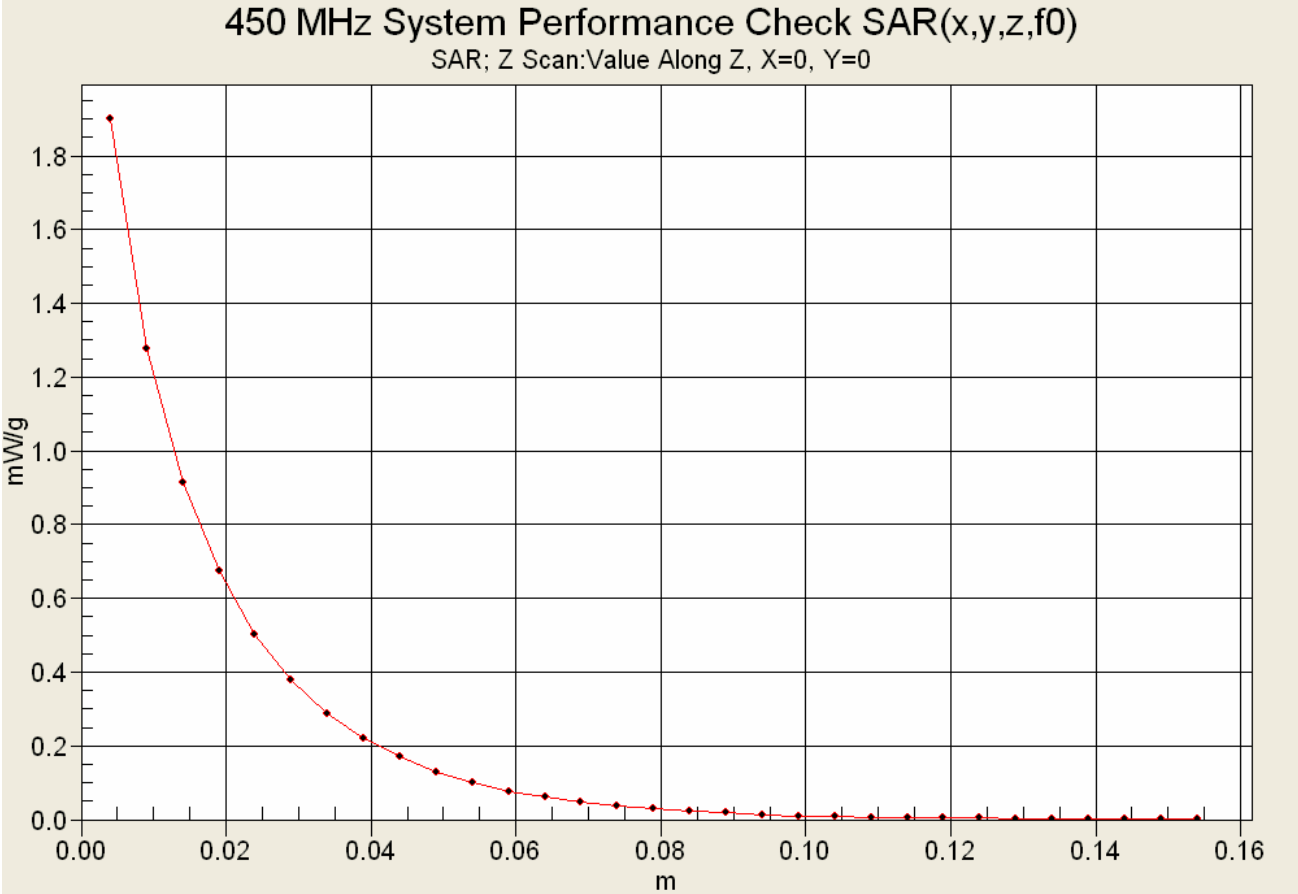
Communication System: CW
Forward Conducted Power: 398 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 57.9; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.90 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 45.1 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 2.82 W/kg
SAR(1 g) = 1.81 mW/g; SAR(10 g) = 1.22 mW/g
Maximum value of SAR (measured) = 1.91 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
10/Jan/2011
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 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	46.34	0.75
0.3600	44.58	0.87	46.46	0.79
0.3700	44.46	0.87	46.13	0.78
0.3800	44.34	0.87	46.33	0.79
0.3900	44.22	0.87	45.86	0.80
0.4000	44.10	0.87	46.07	0.81
0.4100	43.98	0.87	45.20	0.81
0.4200	43.86	0.87	44.66	0.82
0.4300	43.74	0.87	45.19	0.84
0.4400	43.62	0.87	44.74	0.84
0.4500	43.50	0.87	45.11	0.85
0.4600	43.45	0.87	45.06	0.87
0.4700	43.40	0.87	44.56	0.87
0.4800	43.34	0.87	44.74	0.88
0.4900	43.29	0.87	44.54	0.89
0.5000	43.24	0.87	43.82	0.90
0.5100	43.19	0.87	43.69	0.89
0.5200	43.14	0.88	43.41	0.91
0.5300	43.08	0.88	43.68	0.93
0.5400	43.03	0.88	43.68	0.94
0.5500	42.98	0.88	43.41	0.94

450 MHz Body

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
10/Jan/2011
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC 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_eH	FCC_sH	Test_e	Test_s
0.3500	57.70	0.93	59.24	0.83
0.3600	57.60	0.93	59.30	0.85
0.3700	57.50	0.93	58.79	0.85
0.3800	57.40	0.93	58.45	0.86
0.3900	57.30	0.93	58.93	0.85
0.4000	57.20	0.93	58.56	0.85
0.4100	57.10	0.93	57.84	0.86
0.4200	57.00	0.94	58.04	0.86
0.4300	56.90	0.94	57.96	0.87
0.4400	56.80	0.94	58.28	0.87
0.4500	56.70	0.94	57.94	0.90
0.4600	56.66	0.94	57.68	0.91
0.4700	56.62	0.94	58.13	0.91
0.4800	56.58	0.94	57.72	0.93
0.4900	56.54	0.94	58.17	0.93
0.5000	56.51	0.94	57.65	0.92
0.5100	56.47	0.94	58.05	0.92
0.5200	56.43	0.95	56.90	0.93
0.5300	56.39	0.95	57.20	0.95
0.5400	56.35	0.95	56.80	0.94
0.5500	56.31	0.95	57.08	0.96

APPENDIX D - SAR TEST SETUP PHOTOGRAPHS

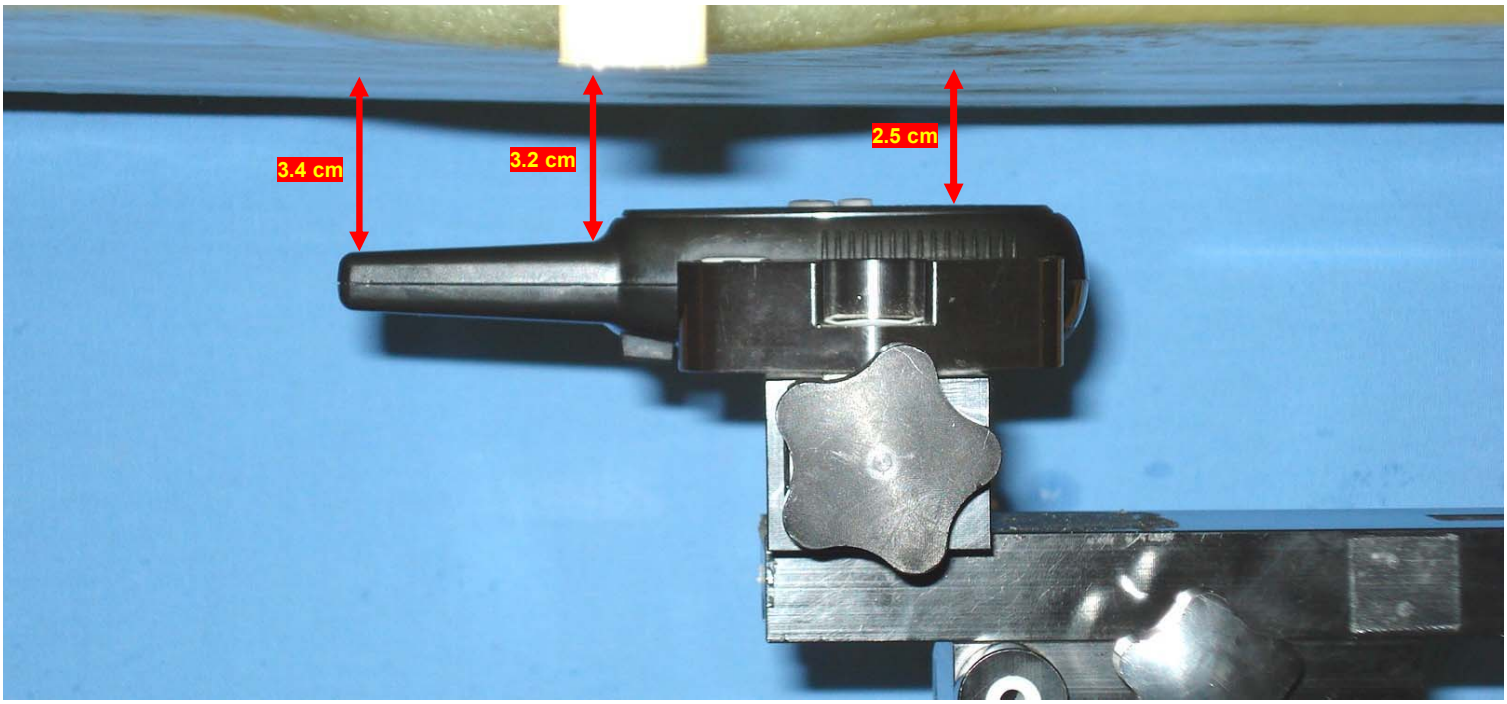
FACE-HELD SAR TEST SETUP PHOTOGRAPHS

2.5 cm Spacing from Front of DUT to Planar Phantom

Face-held Configuration - DUT with 2.5 cm spacing from front keypad side of radio to planar phantom

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

2.5 cm Spacing from Front of DUT to Planar Phantom



Face-Held Configuration (Keypad Side Parallel to Phantom) - 2.5 cm Spacing from Front of DUT to Planar Phantom

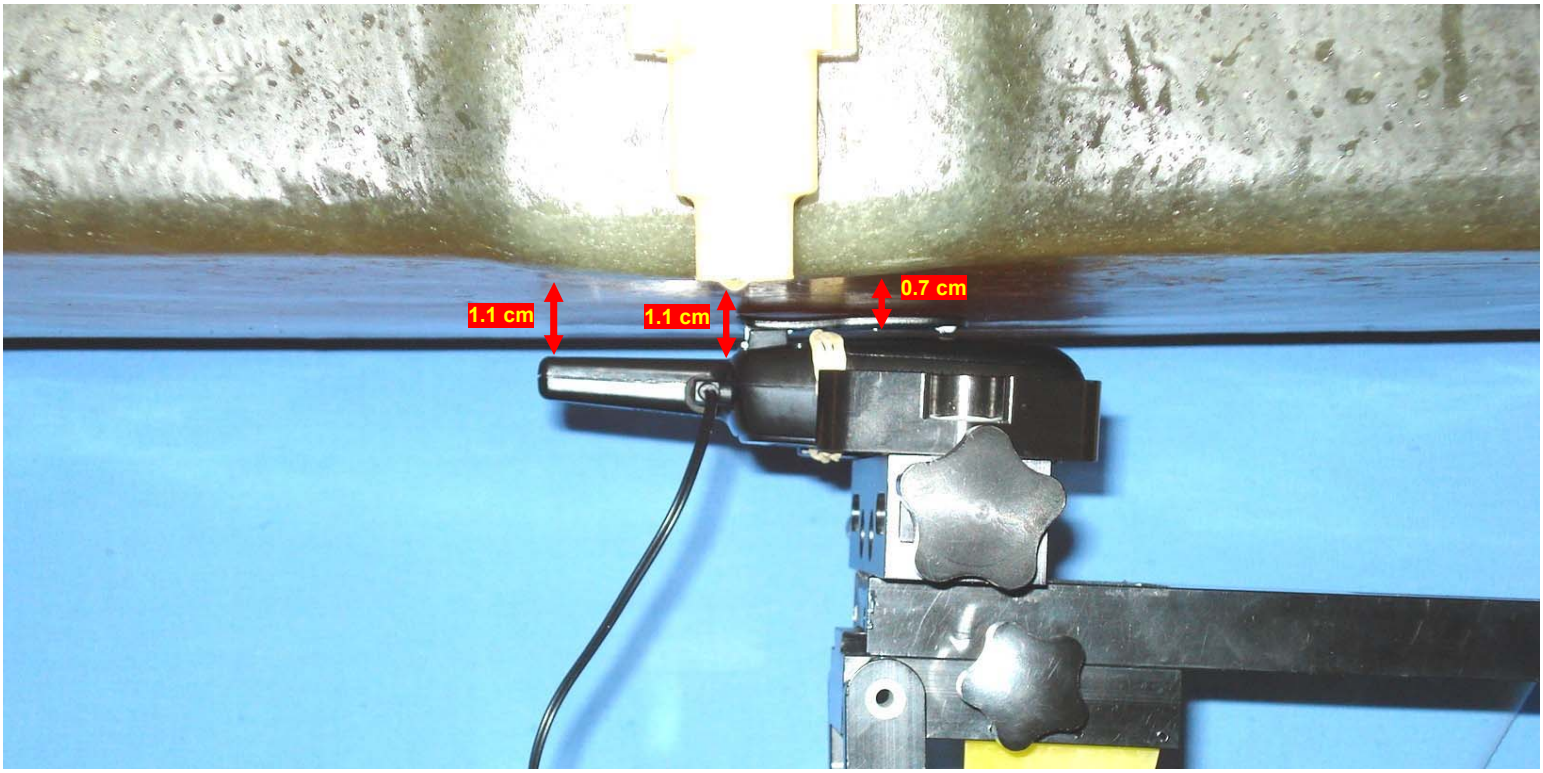
BODY-WORN SAR TEST SETUP PHOTOGRAPHS

0.7 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
DUT with Headset-Microphone Audio Accessory (PN: ZA-133)

Body-worn Configuration - DUT with Belt-Clip Accessory & Headset-Microphone Audio Accessory (PN: ZA-133)

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

0.7 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
DUT with Headset-Microphone Audio Accessory (PN: ZA-133)



Body-worn Configuration - DUT with Belt-Clip Accessory & Headset-Microphone Audio Accessory (PN: ZA-133)

EXTERNAL DUT PHOTOGRAPHS

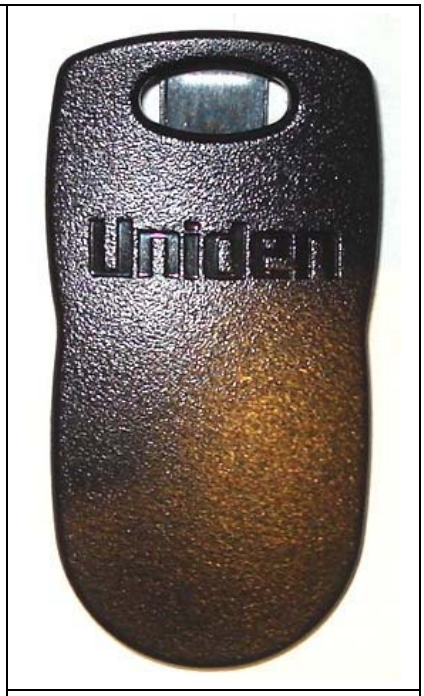
Front Side of DUT

Back Side of DUT

Back Side of DUT with Plastic Belt-Clip

EXTERNAL DUT PHOTOGRAPHS

DUT with Headset/Boom-Microphone audio accessory (P/N: ZA-133)



Plastic Belt-Clip accessory

EXTERNAL DUT PHOTOGRAPHS

Top end of DUT with Belt-Clip

Bottom end of DUT with Belt-Clip

Left and Right Sides of DUT with Belt-Clip

EXTERNAL DUT PHOTOGRAPHS

DUT with Ni-MH Batteries installed (AAA x3)

DUT with Alkaline Batteries installed (AAA x3)

APPENDIX E - DIPOLE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss 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: D450V3-1068_Jan10

CALIBRATION CERTIFICATE

Object: D450V3 - SN: 1068

Calibration procedure(s): QA CAL-15.v5
Calibration Procedure for dipole validation kits below 800 MHz

Calibration date: January 18, 2010

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ET3DV6 (LF)	SN: 1507	03-Jul-09 (No. ET3-1507_Jul09)	Jul-10
DAE4	SN: 654	04-May-09 (No. DAE4-654_May09)	May-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

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

Issued: January 20, 2010

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) 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:

d) DASY4 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.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	44.2 ± 6 %	0.86 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	398 mW input power	1.87 mW / g
SAR normalized	normalized to 1W	4.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**4.76 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.25 mW / g
SAR normalized	normalized to 1W	3.14 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**3.17 mW / g ± 17.6 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	0.90 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	398 mW input power	1.78 mW / g
SAR normalized	normalized to 1W	4.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**4.58 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	398 mW input power	1.19 mW / g
SAR normalized	normalized to 1W	2.99 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**3.06 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.5 Ω - 5.9 jΩ
Return Loss	- 21.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.8 Ω - 9.3 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 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.
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	July 16, 2009

Date/Time: 1/18/2010 10:59:37 AM

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068

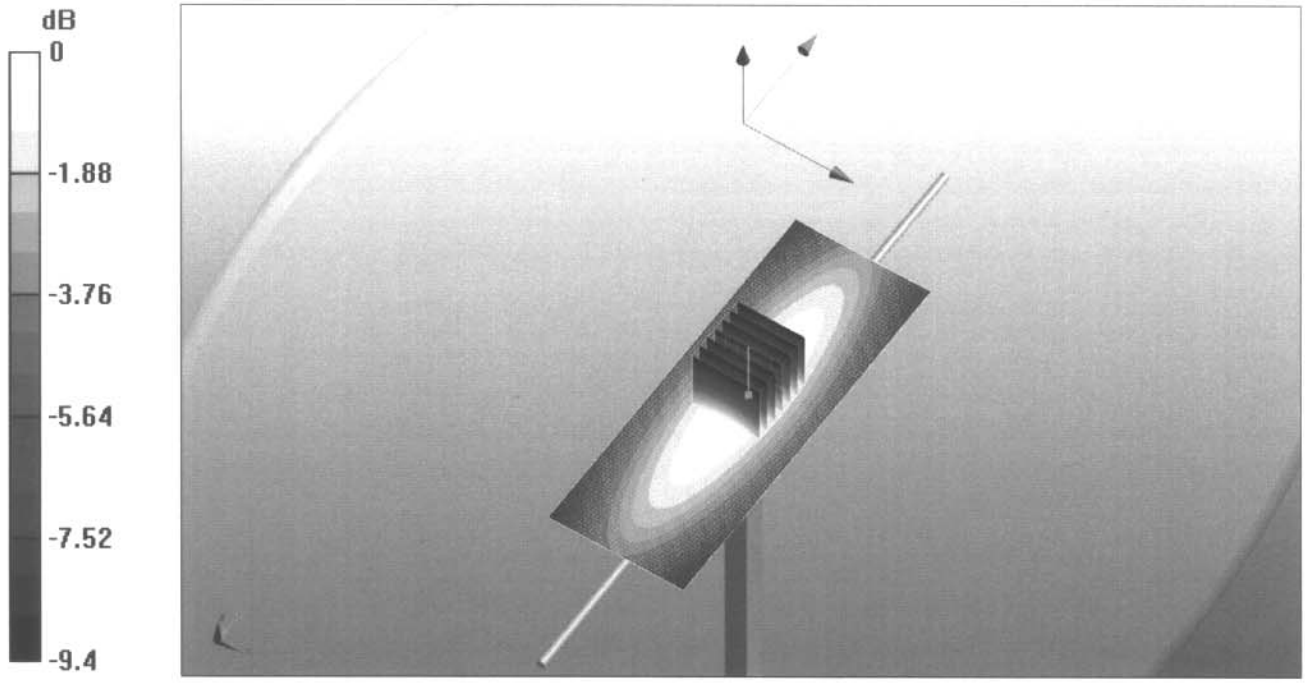
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 44.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(6.66, 6.66, 6.66); Calibrated: 7/3/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 5/4/2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

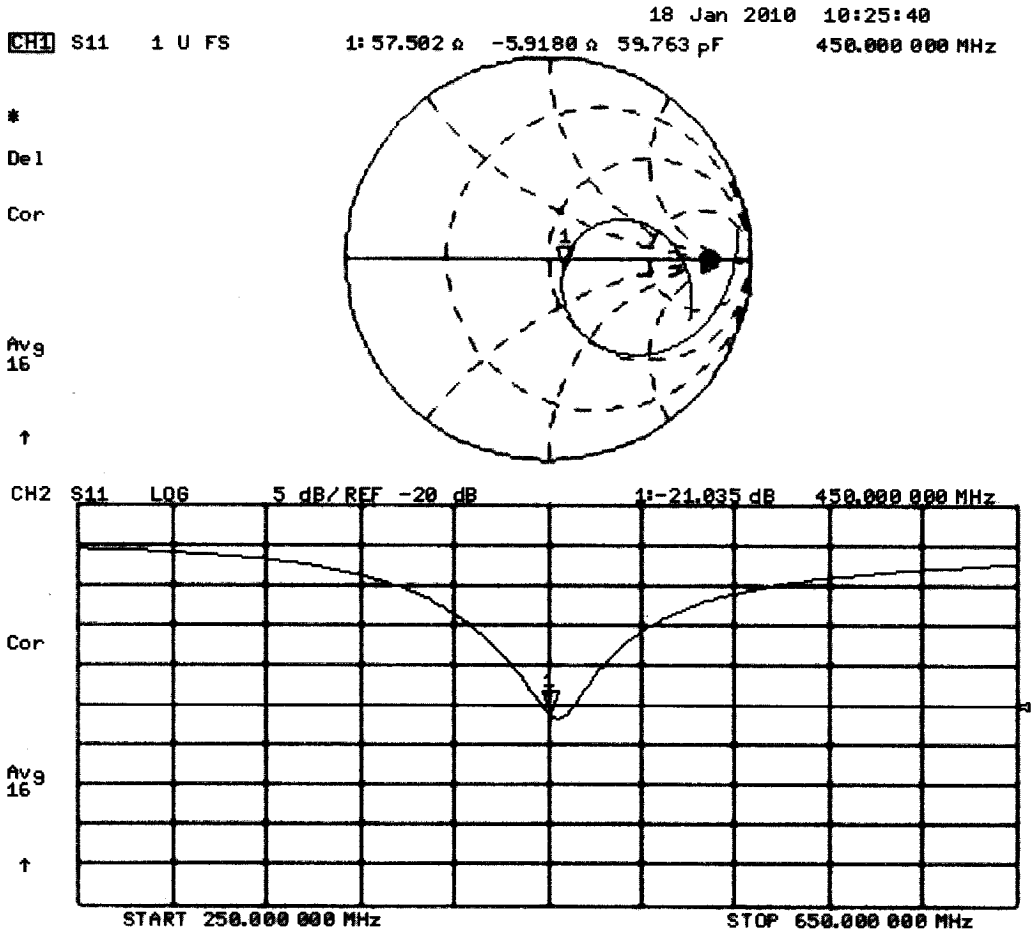
Head/d=15mm, Pin=398mW/Area Scan (41x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.99 mW/g

Head/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.2 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.25 mW/g
Maximum value of SAR (measured) = 2 mW/g



0 dB = 2mW/g

Impedance Measurement Plot for Head TSL



Date/Time: 1/18/2010 1:24:11 PM

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068

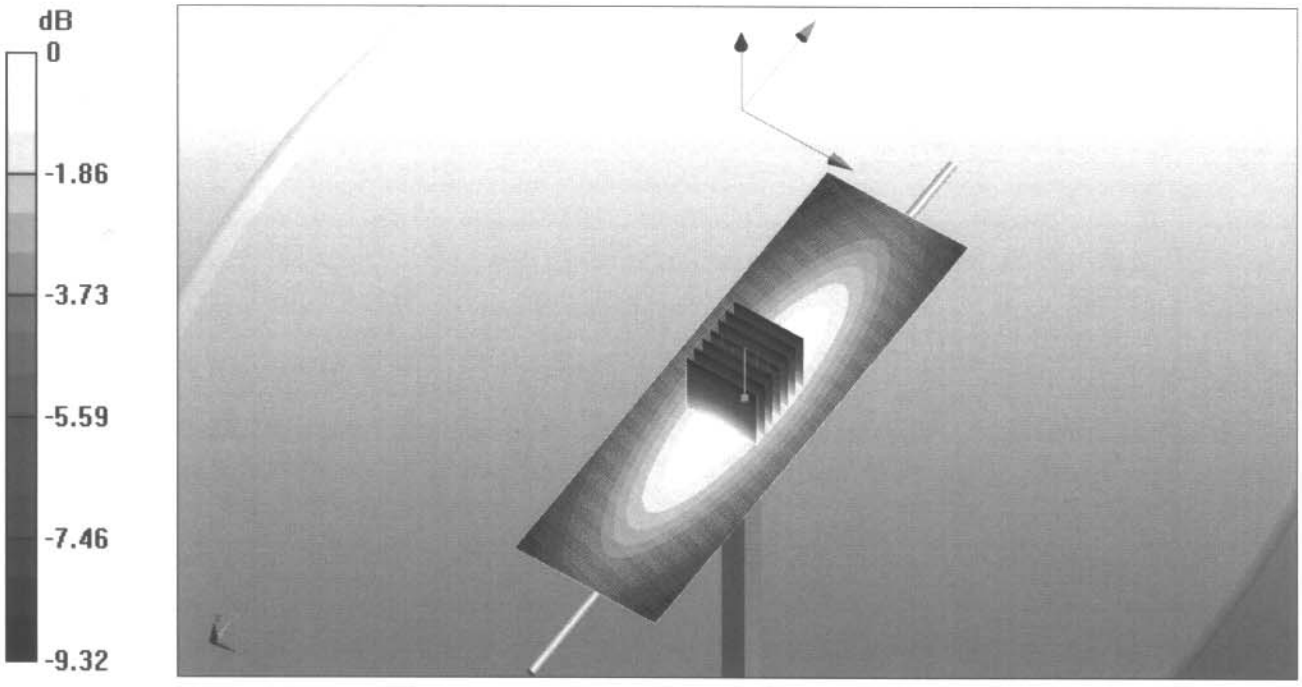
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: MSL450
Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(7.11, 7.11, 7.11); Calibrated: 7/3/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 5/4/2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

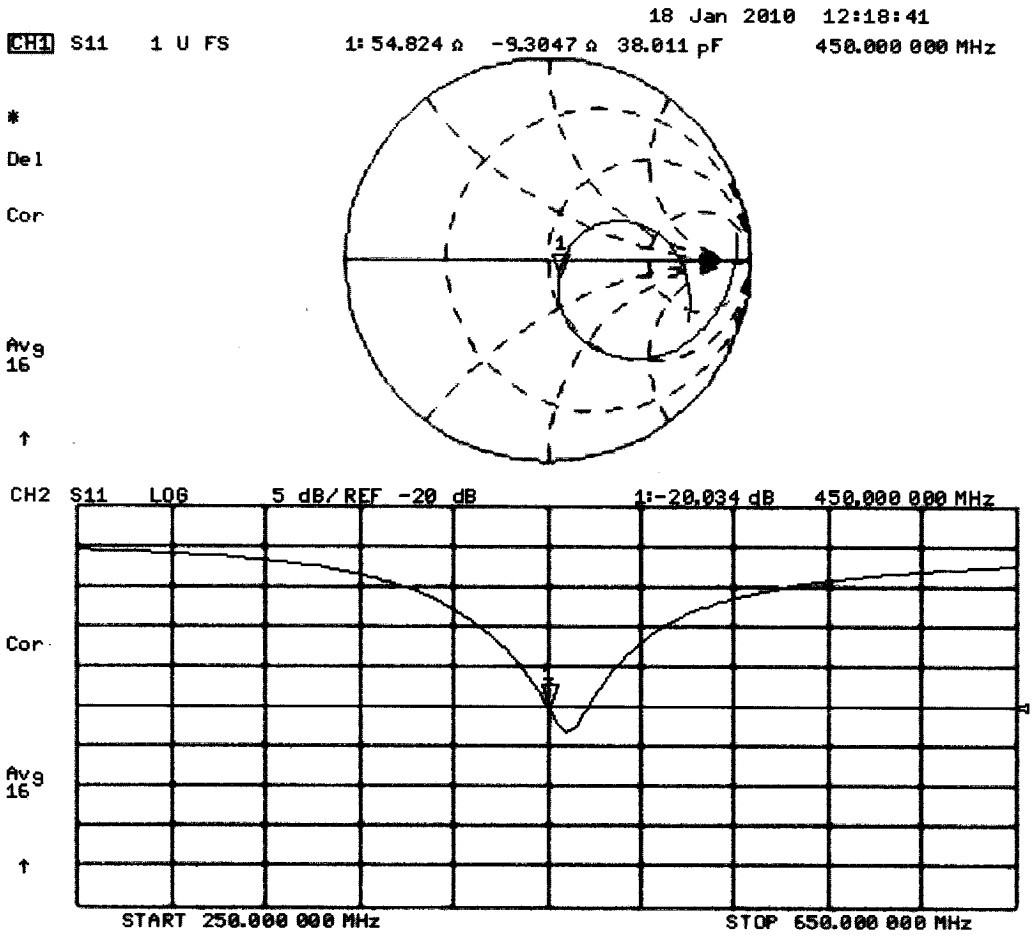
Body/d=15mm, Pin=398mW/Area Scan (61x201x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.9 mW/g

Body/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 47.4 V/m; Power Drift = -0.034 dB
Peak SAR (extrapolated) = 2.71 W/kg
SAR(1 g) = 1.78 mW/g; SAR(10 g) = 1.19 mW/g
Maximum value of SAR (measured) = 1.9 mW/g



0 dB = 1.9mW/g

Impedance Measurement Plot for Body TSL



APPENDIX F - PROBE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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Accreditation No.: SCS 108

Client **Celltech**

Certificate No: ET3-1590_Jul10

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2**
Calibration procedure for dosimetric E-field probes

Calibration date: **July 15, 2010**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: July 15, 2010

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: 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 $f \le 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibrated:	July 16, 2009
Recalibrated:	July 15, 2010

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 ($\mu V/(V/m)^2$)[A]	1.86	2.06	1.77	± 10.1%
DCP (mV)[B]	91.4	92.4	83.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum 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]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	7.25	7.25	7.25	0.20	2.19 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.27	6.27	6.27	0.32	2.49 ± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	6.12	6.12	6.12	0.27	2.86 ± 11.0%

[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

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

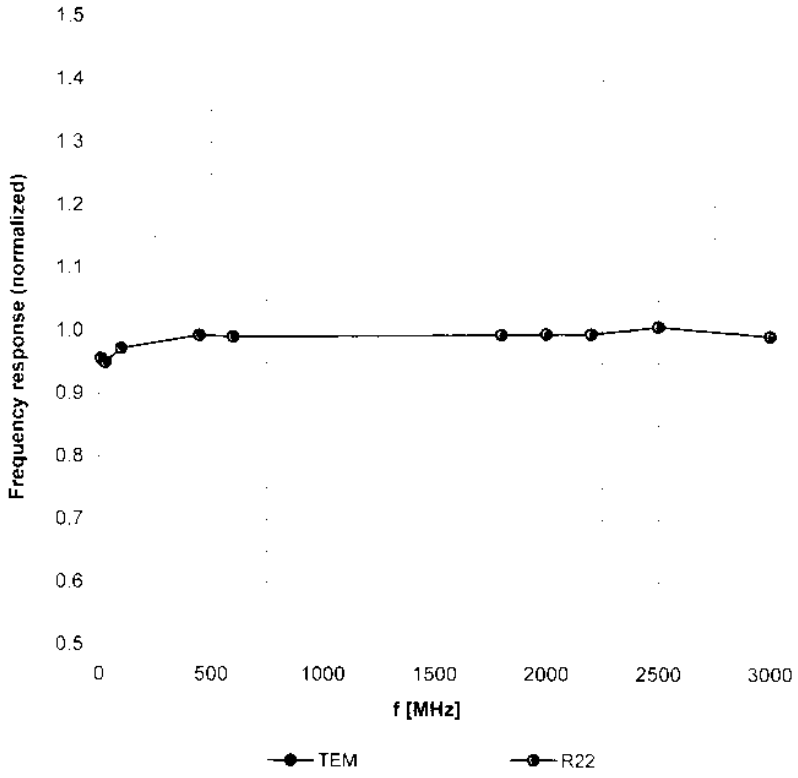
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	7.73	7.73	7.73	0.13	2.06 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.33	6.33	6.33	0.22	3.60 ± 11.0%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	6.15	6.15	6.15	0.28	2.94 ± 11.0%

[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.

Frequency Response of E-Field

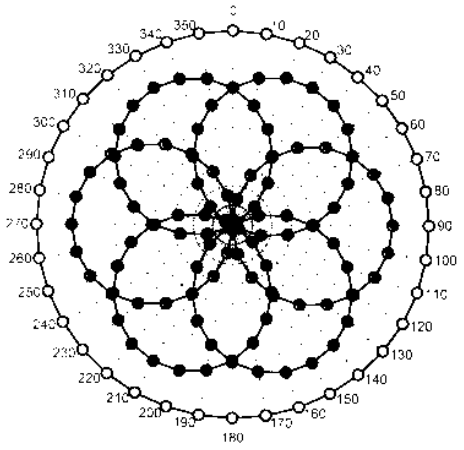
(TEM-Cell:ifi110 EXX, Waveguide: R22)



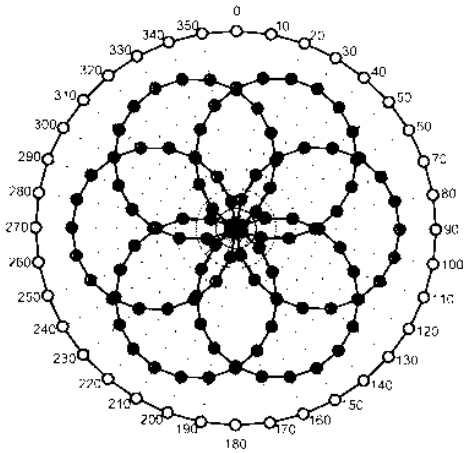
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

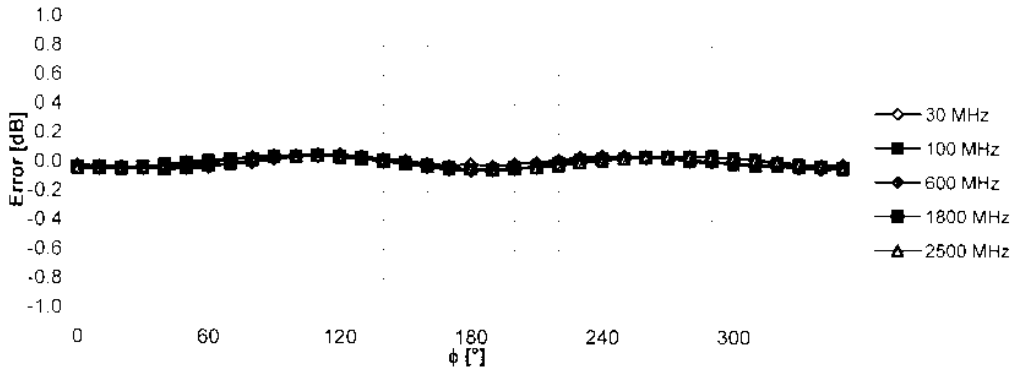
Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX



f = 1800 MHz, WG R22

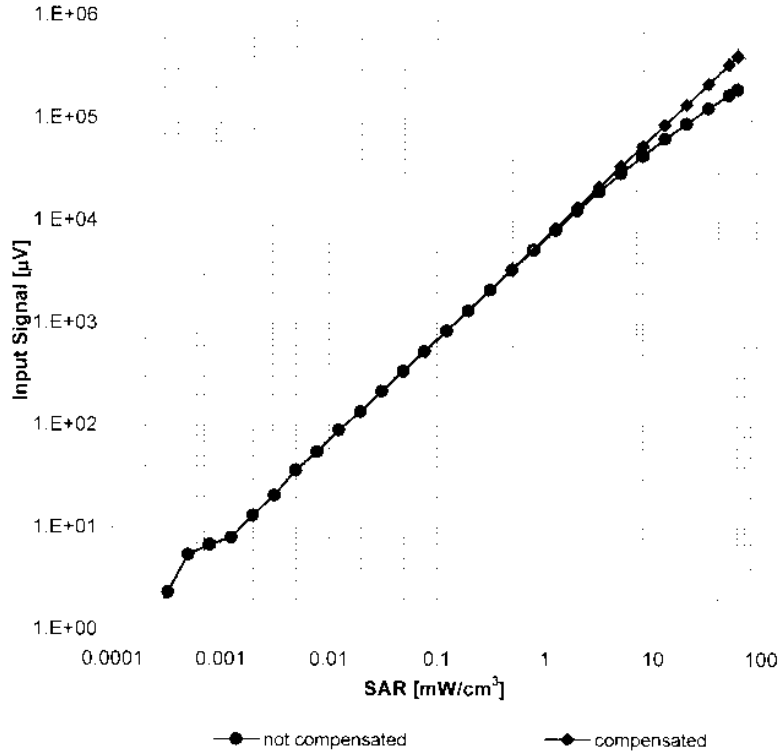


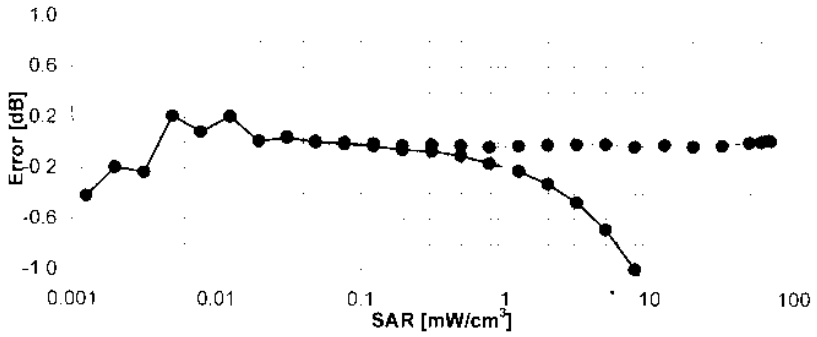


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

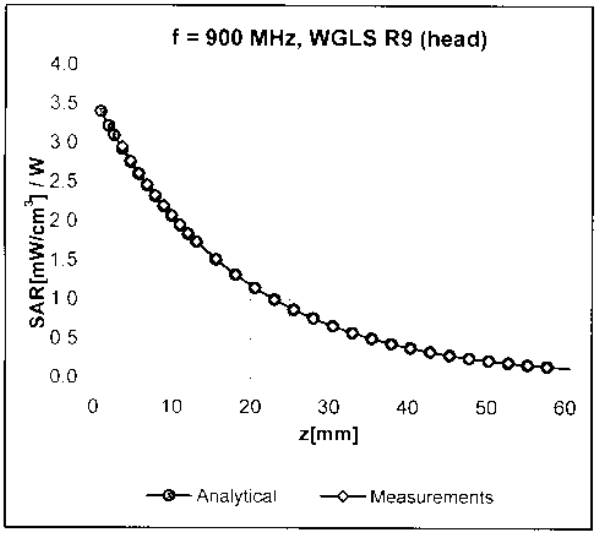
(Waveguide R22, f = 1800 MHz)

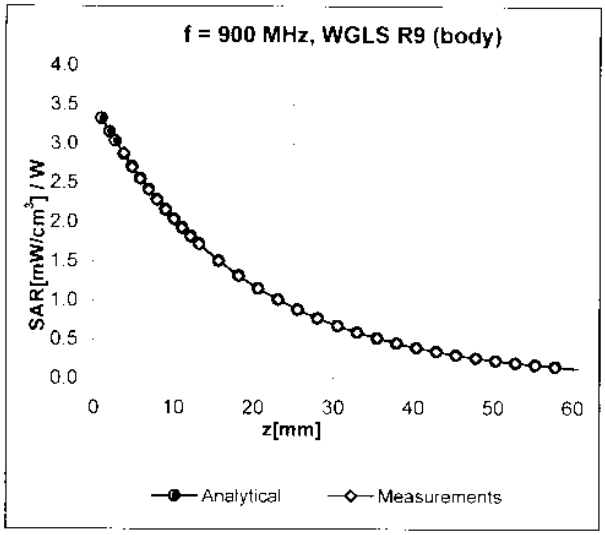




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

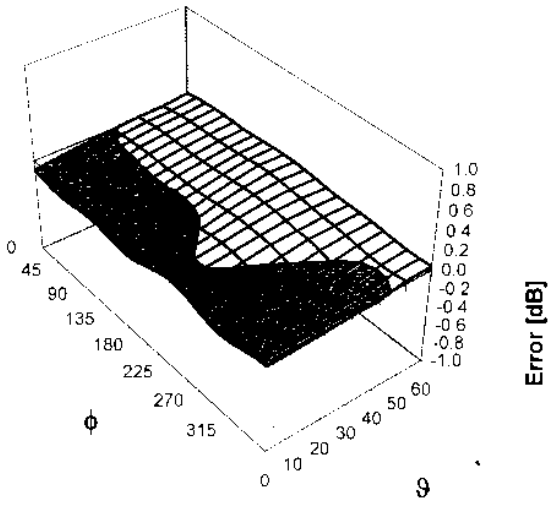
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



■-1.00--0.80 ■-0.80--0.60 ■ 0.60--0.40 ■-0.40--0.20 ■-0.20-0.00
□0.00-0.20 ■0.20-0.40 □0.40-0.60 ■0.60-0.80 ■0.80 1.00

Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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

APPENDIX G - BARSKI PLANAR PHANTOM CERTIFICATE OF CONFORMITY

2378 Westlake Road
Kelowna, B.C. Canada
V1Z-2V2

BARSKI INDUSTRIES (1985) LTD.

Ph. # 250-769-6848
Fax # 250-769-6334
E-mail: barskiind@shaw.ca
Web: 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: _____

Daniel Chailler

Fiberglass Planar Phantom - Top View

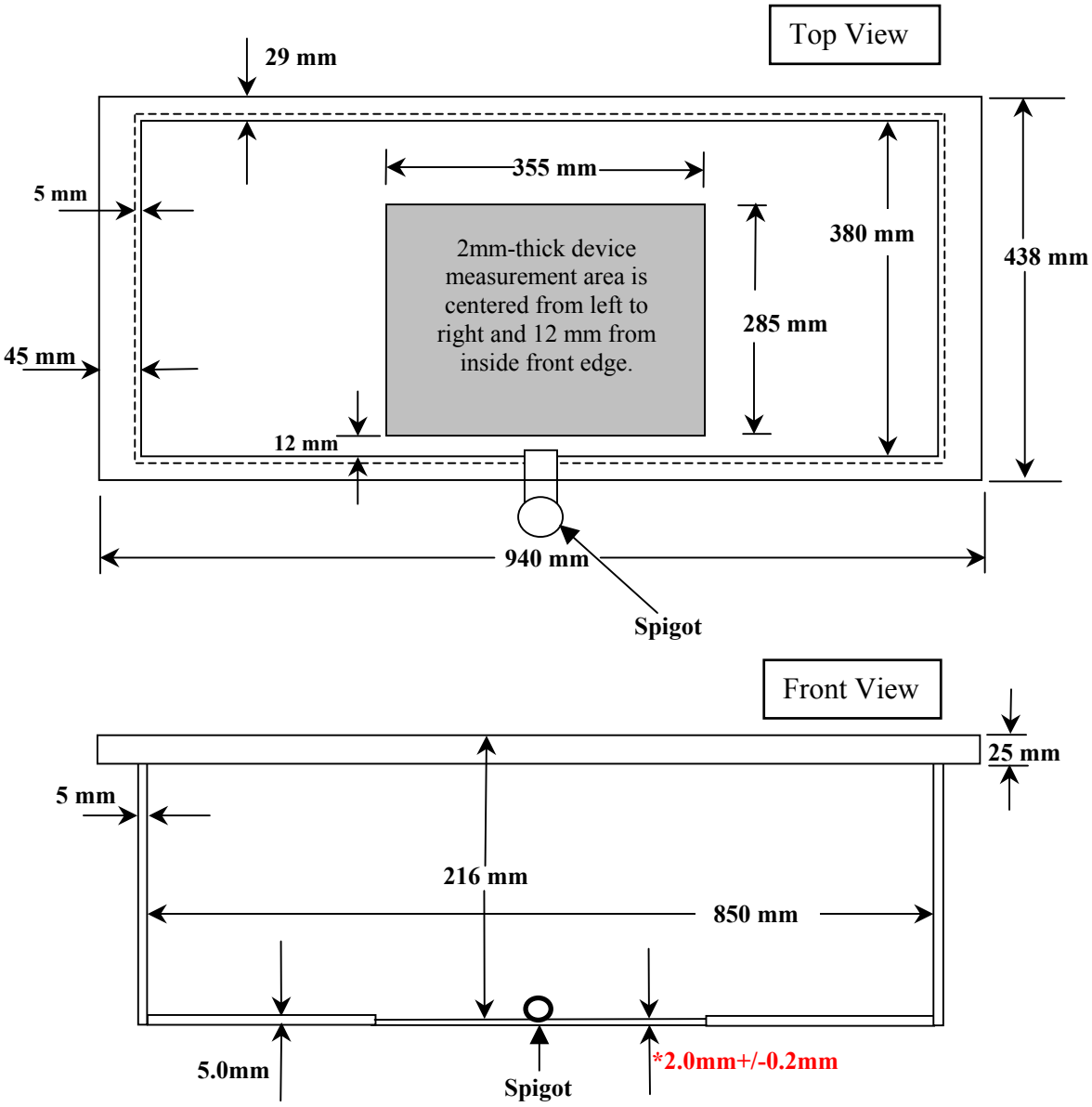
Fiberglass Planar Phantom - Front View

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.