SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION — SPECIFIC ABSORPTION RATE

APPLICANT	NORTHFIELD TELECOMMUNICATIONS, INC. D/B/A ADVANCED WIRELESS COMMUNICATIONS			
DEVICE UNDER TEST (DUT)	PORTABLE UHF PUSH-TO-TALK (PTT) RADIO TRANSCEIVER			
DEVICE FREQUENCY RANGE	460 - 470 MHz			
DEVICE MODEL(S)	AWR391			
DEVICE IDENTIFIER(S)	FCC ID:	Q9SAWR391	IC:	4651A-AWR391
APPLICATION TYPE	Certification			
STANDARD(S) APPLIED	FCC 47 CFR §2.1093			
	Health Canada Safety Code 6			
PROCEDURE(S) APPLIED	FCC OET Bulletin 65, Supplement C (01-01)			
	Industry Canada RSS-102 Issue 2			
	IEEE 1528-2003			
	IEC 62209-1:2005			
RF EXPOSURE CATEGORY	General Population / Uncontrolled			
RF EXPOSURE EVALUATION(S)	Face-held & Body-worn			
DATE(S) OF EVALUATION(S)	August 20 & 28, 2008			
TEST REPORT SERIAL NO.	081808Q9S-T922-S90U			
TEST REPORT REVISION NO.	Revision 1.0	Initial Release	September 08, 2008	
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By	
	Sean Johnston Celltech Labs Inc.		Jonathan Hughes Celltech Labs Inc.	
TEST LAB AND LOCATION	Celltech Compliance Testing and Engineering Lab			
	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
TEST LAB CONTACT INFO.	Tel.: 250-765-7650		Fax: 250-765-7645	
	info@celltechlabs.com		www.celltechlabs.com	
TEST LAB ACCREDITATION(S)	Test Lab Certificate No. 2470.01			

DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab Information	**Name**	**CELLTECH LABS INC.**				
	Address	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada				
Applicant Information	**Name**	**NORTHFIELD TELECOMMUNICATIONS, INC. D/B/A ADVANCED WIRELESS COMMUNICATIONS**				
	Address	20809 Kensington Blvd., Lakeville, MN 55044 United States				
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)				
	IC	RSS-102 Issue 2				
	IEEE	1528-2003				
	IEC	62209-1:2005				
Device RF Exposure Category	**Portable**	General Population / Uncontrolled Environment				
Device Identifier(s)	**FCC ID:**	Q9SAWR391				
	IC:	4651A-AWR391				
	Model(s)	AWR391				
	Serial No.	20080621001 (Identical Prototype)				
Application Type	**FCC/IC**	Certification				
Transmit Frequency Range(s)	460 - 470 MHz					
Antenna Type(s) Tested	Fixed External (Non-detachable)					
Max. RF Output Power Tested	603 mW	27.8 dBm	ERP	460.0125 MHz	Channel 5	
	234 mW	23.7 dBm	ERP	469.9875 MHz	Channel 6	
Battery Type(s) Tested	Lithium-ion		3.7 V	720 mAh	Model: AWB-391	
Body-worn Accessories Tested	Lanyard		Model: AWL391	contains metallic component(s)		
	Magnetic Clothing Clip		Model: AWM-391	contains metallic component(s)		
	Belt-Clip Holster Swivel		Model: AWHOL-391	contains metallic component(s)		
Audio Accessories Tested	Earbud Headset		Model: AWEH391			
Max. SAR Level(s) Evaluated	Face-held	**0.760 W/kg**	1g	50% duty cycle	General Population / Uncontrolled	
	Body-worn	**0.831 W/kg**	1g	50% duty cycle	General Population / Uncontrolled	
FCC/IC Spatial Peak SAR Limit	Head/Body	1.6 W/kg	1g	50% duty cycle	General Population / Uncontrolled	

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 standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 2, IEEE 1528-2003 and 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.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

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

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1.0 INTRODUCTION

This measurement report demonstrates compliance of the Advanced Wireless Communications Model: AWR391 Portable FM UHF PTT Radio Transceiver with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]), IC RSS-102 Issue 2 (see reference [4]), IEEE 1528-2003 (see reference [5]) and 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 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 System with Plexiglas validation phantom

DASY4 System with Plexiglas side planar phantom

3.0 MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Test Date	Freq.	Ch.	Batt. Type	Accessories			DUT Position to Planar Phantom	DUT Start Power (ERP)	Measured SAR 1g (W/kg) Duty Cycle		SAR Drift During Test	Scaled SAR with droop 1g (W/kg) Duty Cycle	
		MHz			Body-worn	Spacing	Audio		mW	100%	50%	dB	100%	50%
Face	Aug 20	460.0125	5	Li-ion	--	2.5 cm	--	Front Side	603	1.43	0.715	-0.265	1.52	**0.760**
Body	Aug 20	460.0125	5	Li-ion	Lanyard	0.0 cm	Earbud-Mic	Front Side	603	1.03	0.515	-0.844	1.25	0.625
Body	Aug 20	460.0125	5	Li-ion	Lanyard	0.0 cm	Earbud-Mic	Back Side	603	1.12	0.560	-0.278	1.19	0.597
Body	Aug 28	460.0125	5	Li-ion	Magnetic Clothing Clip	0.6 cm	Earbud-Mic	Back Side	603	1.19	0.595	0.153	1.19	0.595
Body	Aug 20	460.0125	5	Li-ion	Belt-Clip Holster P1[8]	2.0 cm	Earbud-Mic	Back Side	603	1.26	0.630	-0.353	1.37	0.683
Body	Aug 28	460.0125	5	Li-ion	Belt-Clip Holster P2[8]	2.0 cm	Earbud-Mic	Back Side	603	1.57	0.785	-0.249	1.66	**0.831**
Body	Aug 28	460.0125	5	Li-ion	Belt-Clip Holster P3[8]	2.0 cm	Earbud-Mic	Back Side	603	1.40	0.700	-0.189	1.46	0.731
Body	Aug 28	469.9875	6	Li-ion	Belt-Clip Holster P2[8]	2.0 cm	Earbud-Mic	Back Side	234	0.471	0.236	-0.289	0.503	0.252

SAR LIMIT(S)		BRAIN	BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	1.6 W/kg	1.6 W/kg	averaged over 1 gram	General Population / Uncontrolled

Test Date	August 20, 2008				August 20, 2008				August 28, 2008			
Fluid Type	450 MHz Brain				450 MHz Body				450 MHz Body			
Dielectric Constant ε_r	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
	43.5	± 5%	44.3	+1.8%	56.7	± 5%	56.2	-0.9%	56.7	± 5%	57.0	+0.6%
Conductivity σ (mho/m)	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
	0.87	± 5%	0.89	+2.3%	0.94	± 5%	0.93	-1.0%	0.94	± 5%	0.93	-1.0%

Test Date	Fluid Type	Ambient Temp.	Fluid Temp.	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
August 20	Brain	22.5 °C	21.8 °C	≥ 15 cm	101.1 kPa	34 %	1000
August 20	Body	22.8 °C	22.0 °C	≥ 15 cm	101.1 kPa	35 %	1000
August 28	Body	23.0 °C	22.2 °C	≥ 15 cm	101.1 kPa	35 %	1000

Notes

1. Detailed measurement data and plots showing the maximum SAR location of the DUT are shown in Appendix A.
2. The SAR evaluations were performed at the low channel of the frequency band based on the maximum ERP level measured by Timco Engineering. A worst-case SAR evaluation was also performed at the high channel of the frequency band.
3. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
4. The power drift of the DUT during the SAR evaluations was measured by the DASY4 system. The measured power droops were added to the measured SAR level to report scaled SAR results as shown in the above test data table. A SAR-versus-Time power droop evaluation was performed in the maximum SAR level configuration and the evaluation plot is shown in Appendix A (SAR Test Plots).
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.
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. The SAR evaluations were performed within 24 hours of the system performance check.
8. Belt-Clip Swivel Position 1 = Belt-Clip 0 degrees | Belt-Clip Swivel Position 2 = Belt-Clip -90 degrees | Belt-Clip Swivel Position 3 = Belt-Clip 90 degrees

4.0 DETAILS OF SAR EVALUATION

The Advanced Wireless Communications Model: AWR391 Portable FM UHF PTT Radio Transceiver was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

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 tested in a body-worn configuration with the customer-supplied lanyard accessory attached to the radio. The DUT was evaluated consecutively with the front side and back side of the radio placed parallel to, and touching, the planar phantom. The lanyard accessory supports operation of the radio when worn around the neck.
3. The DUT was tested in a body-worn configuration with the adhesive section of the metal magnetic clothing clip accessory mounted to the back side of the radio placed parallel to the outer surface of the planar phantom. The back side of the radio with magnetic clothing clip was magnetically attached to the non-adhesive section of the metal magnetic clothing clip and the non-adhesive section of the metal magnetic clothing clip was touching the planar phantom. The adhesive and non-adhesive sections of the magnetic clothing clip accessory provided a combined spacing of 0.6 cm from the back side of the radio to the planar phantom.
4. The DUT was tested in a body-worn configuration with the radio placed inside the belt-clip holster swivel accessory. The back side of the belt-clip holster swivel accessory was touching the planar phantom and provided a 2.0 cm spacing from the back side of the radio to the planar phantom. The DUT with belt-clip holster swivel accessory was evaluated in (3) alternate test configurations (see footnote 7 page 5 for configuration description).
5. The body-worn SAR evaluations were performed with the customer-supplied earbud headset audio accessory connected to the headset jack on the DUT.
6. 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.
7. The output power levels (ERP) of the DUT referenced in this report were measured by Timco Engineering Inc. prior to the SAR evaluations.
8. The DUT was tested at maximum power setting 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.

5.0 EVALUATION PROCEDURES

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

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

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

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1g and 10g spatial peak SAR was determined as follows:

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

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

g. A zoom scan volume of 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.

6.0 SYSTEM PERFORMANCE CHECK

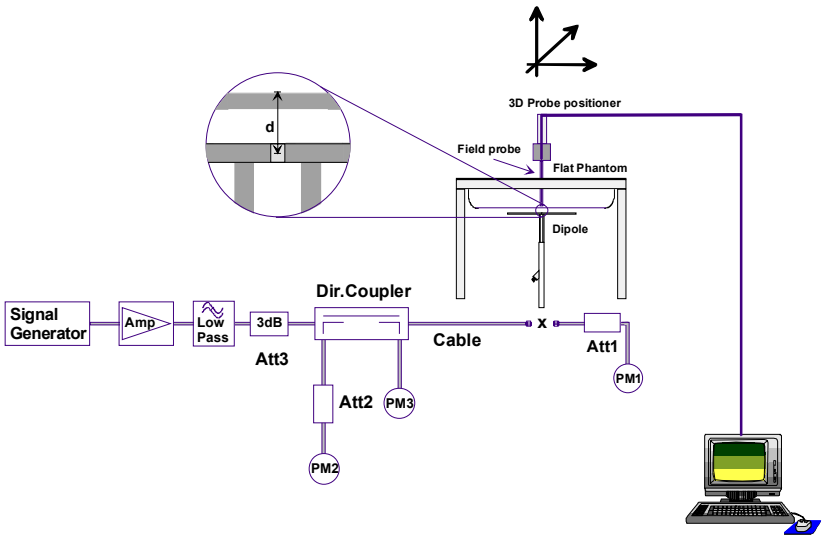
Prior to the SAR evaluations a system check was performed using a Plexiglas planar phantom and 450 MHz dipole (see Appendix B for system performance check test plot). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the system validation target SAR value (see Appendix E for system validation procedures).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue Freq. MHz	SAR 1g (W/kg) Sys. Val Target	Meas.	Dev.	Dielectric Constant ε_r Sys. Val Target	Meas.	Dev.	Conductivity σ (mho/m) Sys. Val Target	Meas.	Dev.	ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
Aug 20	Brain 450	1.18 ±10%	1.29	+9.3%	43.4 ±5%	44.3	+2.1%	0.89 ±5%	0.89	0.0%	1000	22.5	21.8	≥ 15	101.1	34
Aug 28	Brain 450	1.18 ±10%	1.30	+10%	43.4 ±5%	43.3	-0.2%	0.89 ±5%	0.86	-3.4%	1000	23.0	22.3	≥ 15	101.1	35

Note(s)

1. The target SAR value is referenced from the System Validation procedure performed by Celltech Labs Inc. (see Appendix E).
2. The target dielectric parameters are referenced from the System Validation procedure performed by Celltech Labs Inc. (see Appendix E).
3. The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements.
4. The SAR evaluations were performed within 24 hours of the system performance check.



System Performance Check Measurement Setup Diagram

450 MHz Validation Dipole Setup

7.0 SIMULATED EQUIVALENT TISSUES

The 450 MHz 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 %

8.0 SAR LIMITS

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

9.0 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	Side Planar Phantom
Shell Material	Plexiglas
Bottom Thickness	2.0 mm ± 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 (≤ 450MHz)	
Type	Planar Phantom
Shell Material	Plexiglas
Bottom Thickness	6.2 mm ± 0.1 mm
Outer Dimensions	86.0 cm (L) x 39.5 cm (W) x 21.8 cm (H)

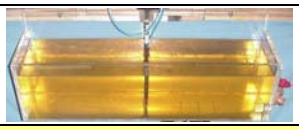
10.0 PROBE SPECIFICATION (ET3DV6)

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 brain 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 brain tissue (rotation around probe axis) ± 0.4 dB in brain 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

11.0 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

12.0 VALIDATION PLANAR PHANTOM

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

Plexiglas Validation Planar Phantom

13.0 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

14.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION DUE DATE
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	NA	NA
x	-Robot	00046	599396-01	NA	NA
x	-DAE4	00019	353	22Apr08	22Apr09
x	-ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
x	-450 MHz Validation Dipole	00024	136	25Jul08	25Jul09
	-SAM Phantom V4.0C	00154	1033	NA	NA
	-Barski Planar Phantom	00155	03-01	NA	NA
x	-Plexiglas Side Planar Phantom	00156	161	NA	NA
x	-Plexiglas Validation Planar Phantom	00157	137	NA	NA
	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	NA	NA
x	HP 85070C Dielectric Probe Kit	00033	US39240170	NA	NA
x	Gigatronics 8652A Power Meter	00007	1835272	23Apr08	23Apr09
x	Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	23Apr09
x	HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr09
x	HP 8648D Signal Generator	00005	3847A00611	NR	NR
	Rohde & Schwarz SMR20 Signal Generator	00006	100104	NR	NR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	NR	NR
	Amplifier Research 10W1000C Power Amplifier	00041	27887	NR	NR
	Nextec NB00383 Microwave Amplifier	00151	0535	NR	NR
Abbr.	NA = Not Applicable		NR = Not Required		

15.0 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 (450 MHz)	6.65	Normal	1	1	6.65	∞
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	0.8	Rectangular	1.732050808	1	0.5	∞
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)	2.3	Normal	1	0.64	1.5	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	1.8	Normal	1	0.6	1.1	∞
Combined Standard Uncertainty					**11.15**	
Expanded Uncertainty (k=2)					**22.30**	
Measurement Uncertainty Table in accordance with IEEE 1528-2003 and IEC 62209-1:2005						

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 (450 MHz)	6.65	Normal	1	1	6.65	∞
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	0.8	Rectangular	1.732050808	1	0.5	∞
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	∞
Dipole						
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)	3.4	Normal	1	0.64	2.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.1	Normal	1	0.6	1.3	∞
Combined Standard Uncertainty					**9.62**	
Expanded Uncertainty (k=2)					**19.24**	
Measurement Uncertainty Table in accordance with IEEE 1528-2003 and IEC 62209-1:2005						

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

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 08/20/2008

Face-held SAR - Channel 5 - 460.0125 MHz

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

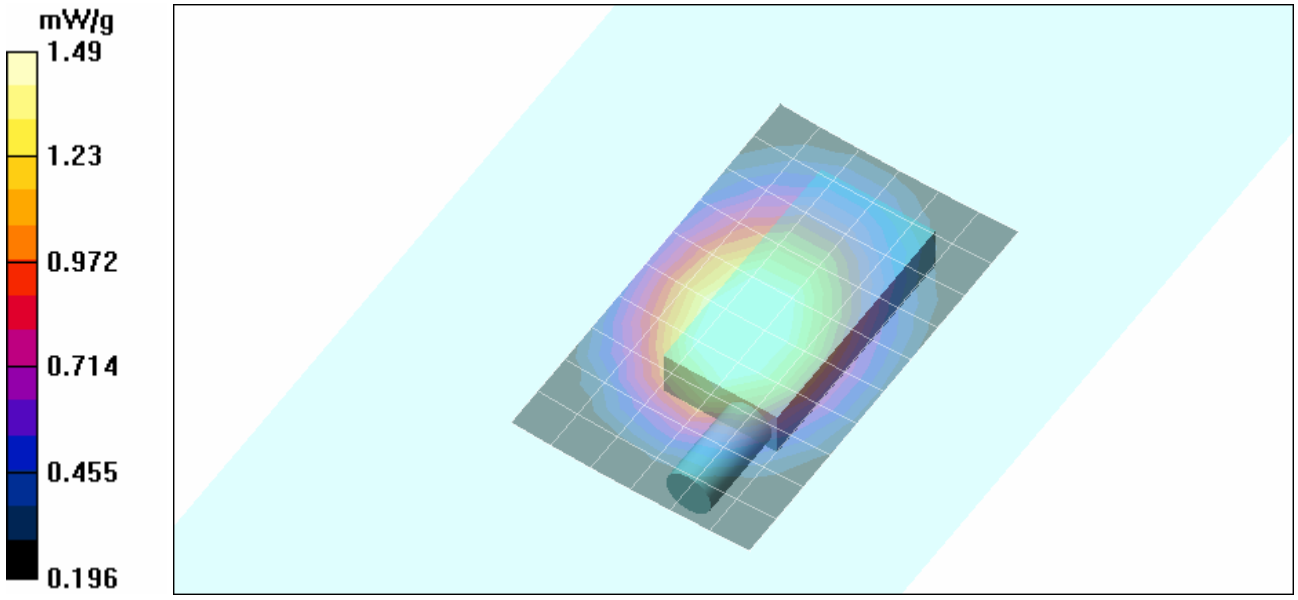
Ambient Temp: 22.5°C; Fluid Temp: 21.8°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.89 mho/m; ε_r = 44.3; ρ = 1000 kg/m^3

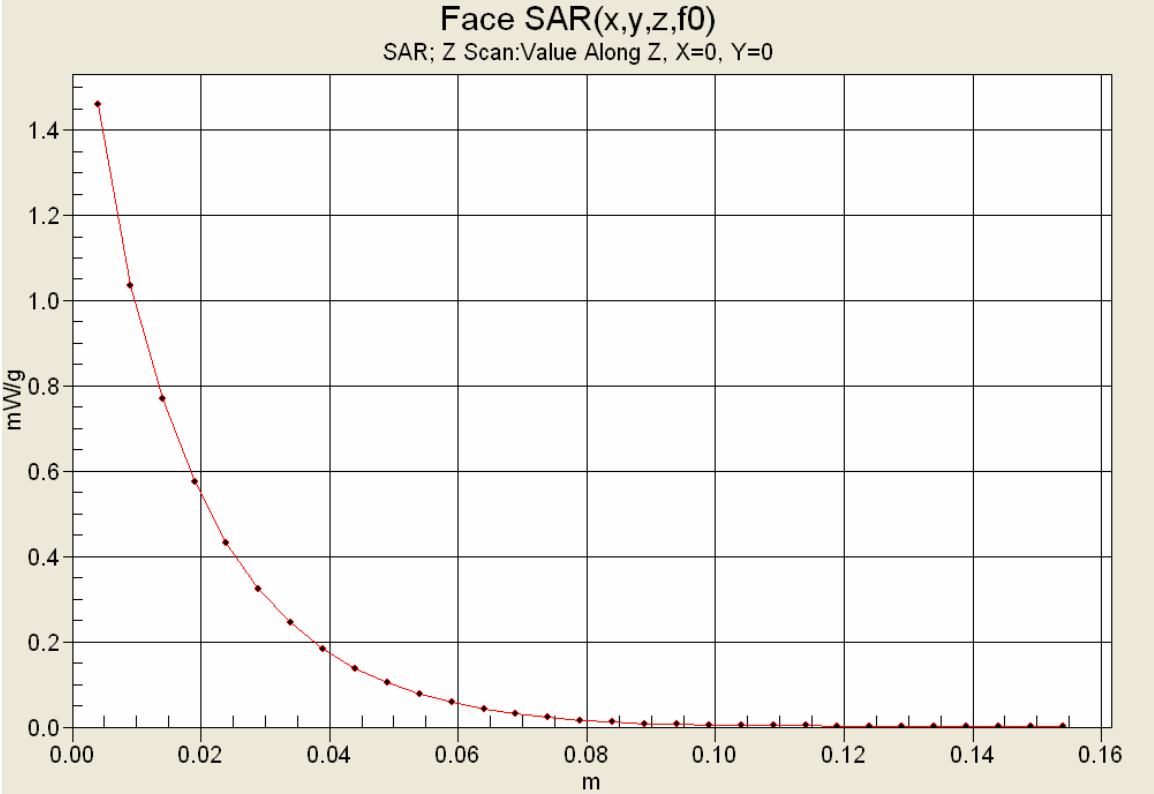
- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.64 mW/g

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 43.0 V/m; Power Drift = -0.265 dB
Peak SAR (extrapolated) = 2.33 W/kg
SAR(1 g) = 1.43 mW/g; SAR(10 g) = 1.02 mW/g
Maximum value of SAR (measured) = 1.49 mW/g



Z-Axis Scan



Date Tested: 08/20/2008

Body-worn SAR - Front Side of DUT with Lanyard Accessory - Channel 5 - 460.0125 MHz

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Lanyard (AWL391); Audio Accessory: Earbud Headset (AWEH391)

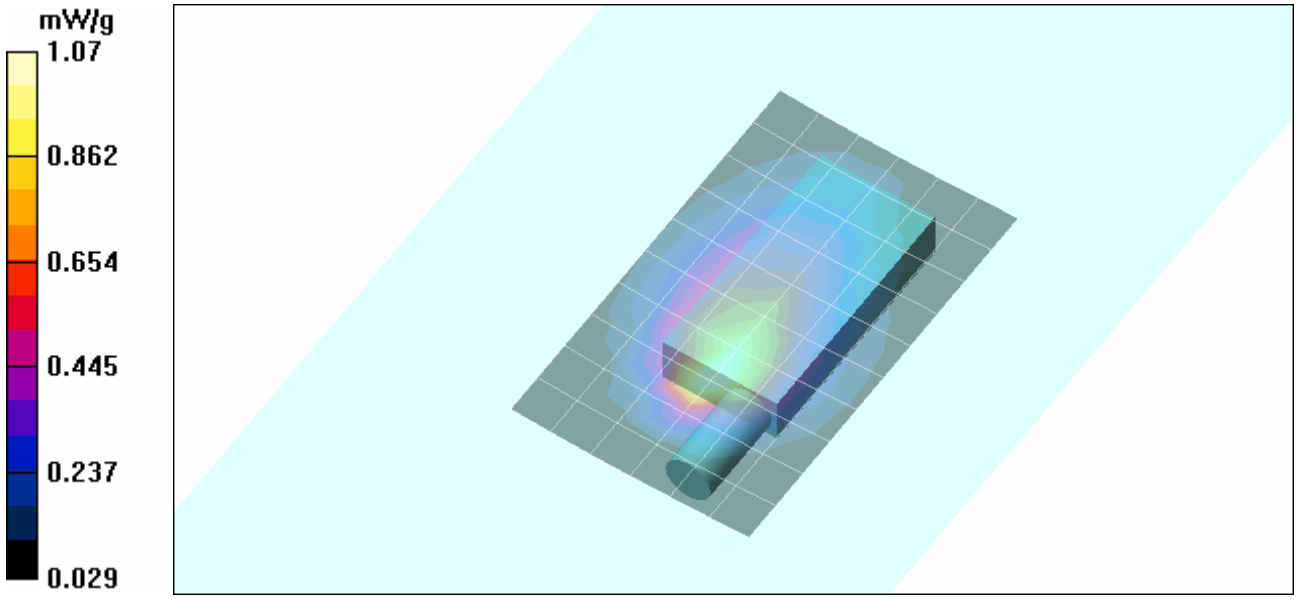
Ambient Temp: 22.8°C; Fluid Temp: 22°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 56.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

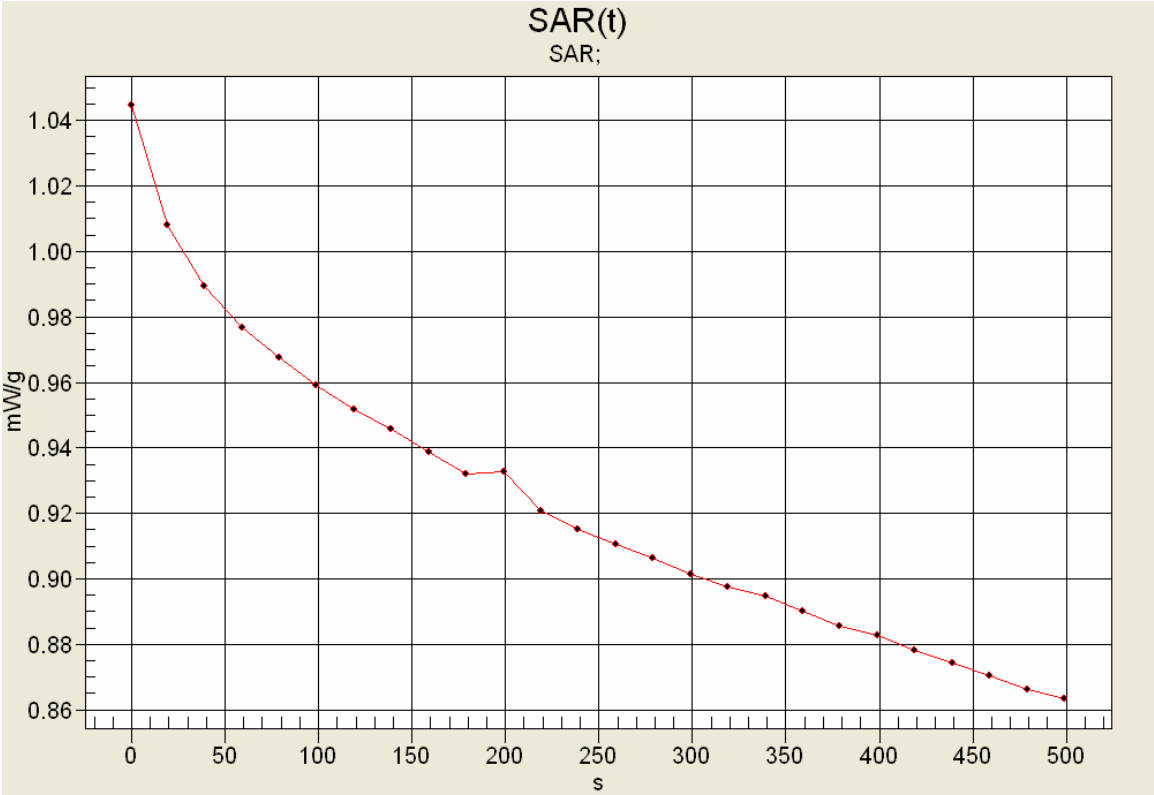
Body-worn SAR - Lanyard Accessory - Front Side of DUT Touching Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.21 mW/g

Body-worn SAR - Lanyard Accessory - Front Side of DUT Touching Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 29.6 V/m; Power Drift = -0.844 dB
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.535 mW/g
Maximum value of SAR (measured) = 1.07 mW/g



SAR-versus-Time Power Droop Evaluation

Body-worn Configuration
Channel 5 - 460.0125 MHz



Max SAR: 1.044 mW/g
Low SAR: 0.863 mW/g (-0.827 dB)
SAR after 340s: 0.894 mW/g (-0.674 dB)
(340s = Zoom Scan Duration)
(500s = Area Scan Duration)

Date Tested: 08/20/2008

Body-worn SAR - Back Side of DUT with Lanyard Accessory - Channel 5 - 460.0125 MHz

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Lanyard (AWL391); Audio Accessory: Earbud Headset (AWEH391)

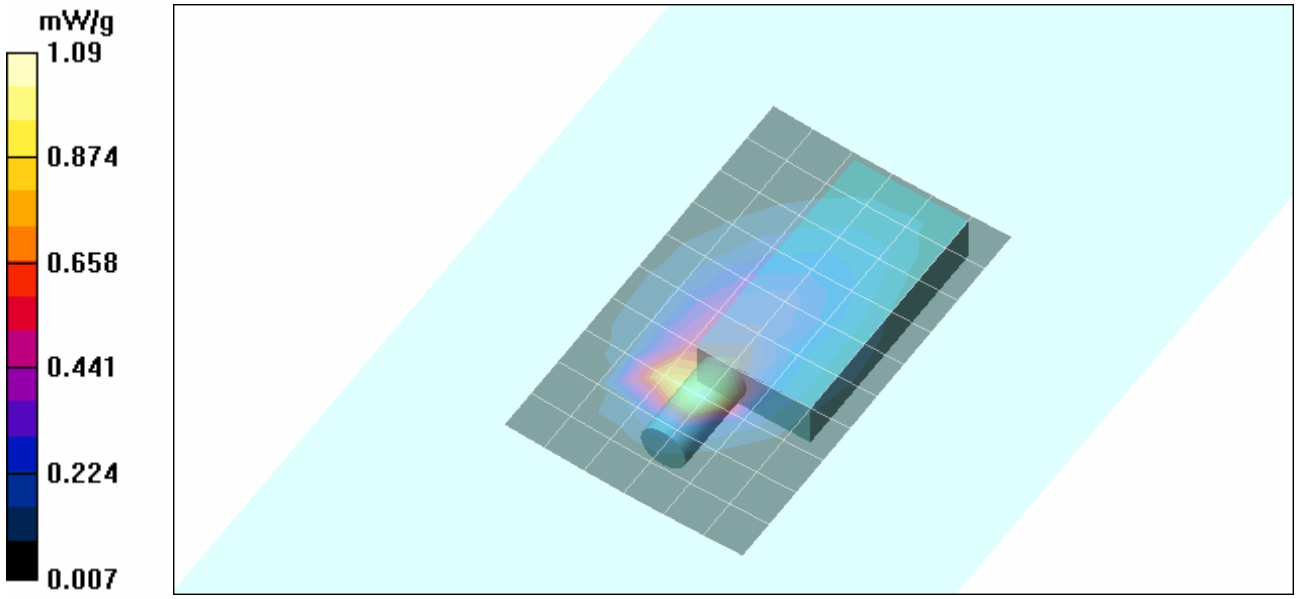
Ambient Temp: 22.8°C; Fluid Temp: 22°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 56.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Lanyard Accessory - Back Side of DUT Touching Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.737 mW/g

Body-worn SAR - Lanyard Accessory - Back Side of DUT Touching Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.1 V/m; Power Drift = -0.278 dB
Peak SAR (extrapolated) = 6.05 W/kg
SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.396 mW/g
Maximum value of SAR (measured) = 1.09 mW/g



Date Tested: 08/28/2008

Body-worn SAR - Back Side of DUT with Magnetic Clothing Clip - Channel 5 - 460.0125 MHz

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Magnetic Clothing Clip (AWM-391); Audio Accessory: Earbud Headset (AWEH391)

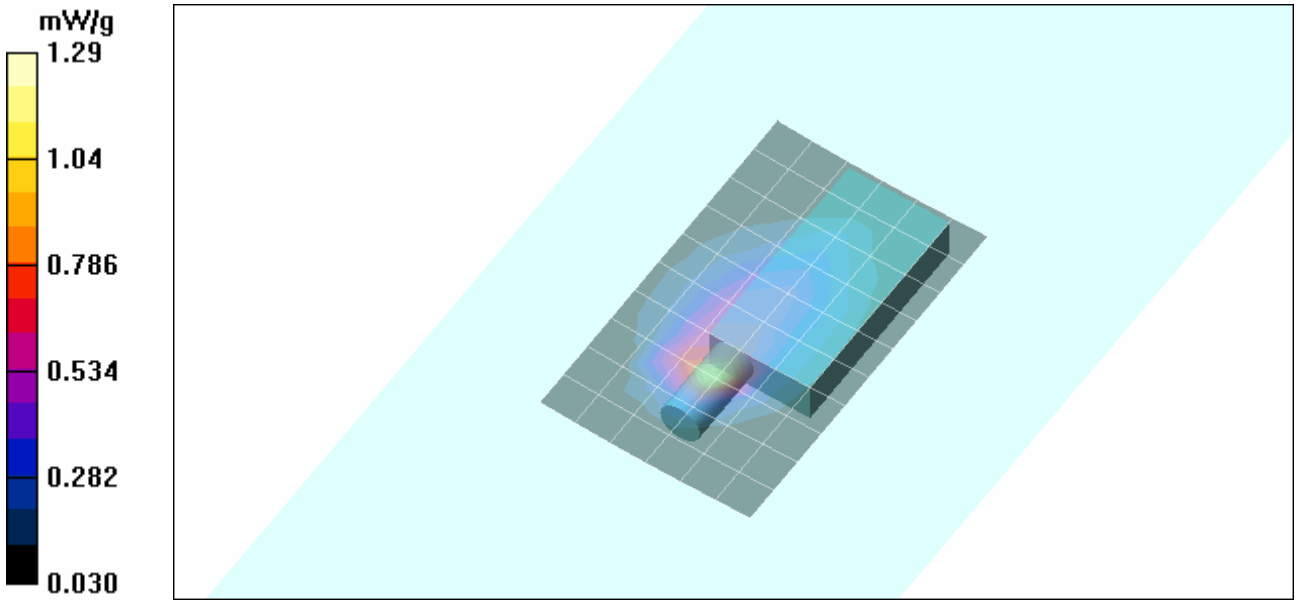
Ambient Temp: 23°C; Fluid Temp: 22.2°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 57; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Magnetic Clothing Clip Accessory - 0.6 cm Spacing from Back Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.03 mW/g

Body-worn SAR - Magnetic Clothing Clip Accessory - 0.6 cm Spacing from Back Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 21.8 V/m; Power Drift = 0.153 dB
Peak SAR (extrapolated) = 3.04 W/kg
SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.625 mW/g
Maximum value of SAR (measured) = 1.29 mW/g



Date Tested: 08/20/2008

Body-worn SAR - Back Side of DUT with Belt-Clip Holster Swivel - Channel 5 - 460.0125 MHz Swivel Belt-Clip Position #1: 0 Degrees

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Belt-Clip Holster Swivel (AWHOL-391); Audio Accessory: Earbud Headset (AWEH391)

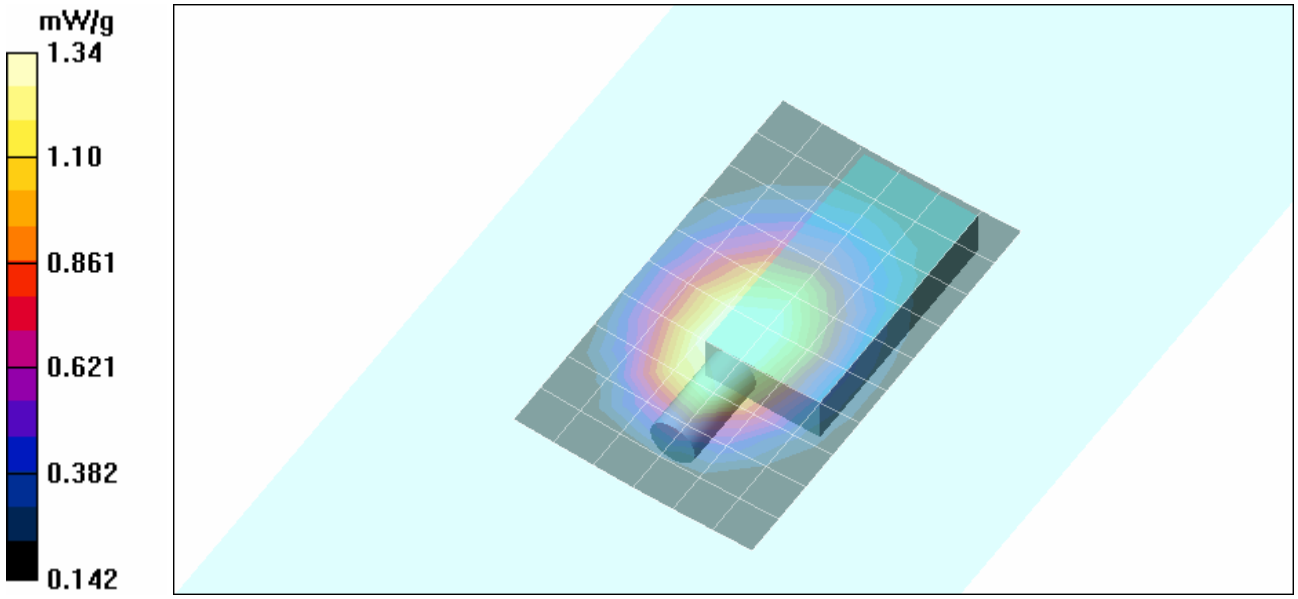
Ambient Temp: 22.8°C; Fluid Temp: 22°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 56.2; ρ = 1000 kg/m^3

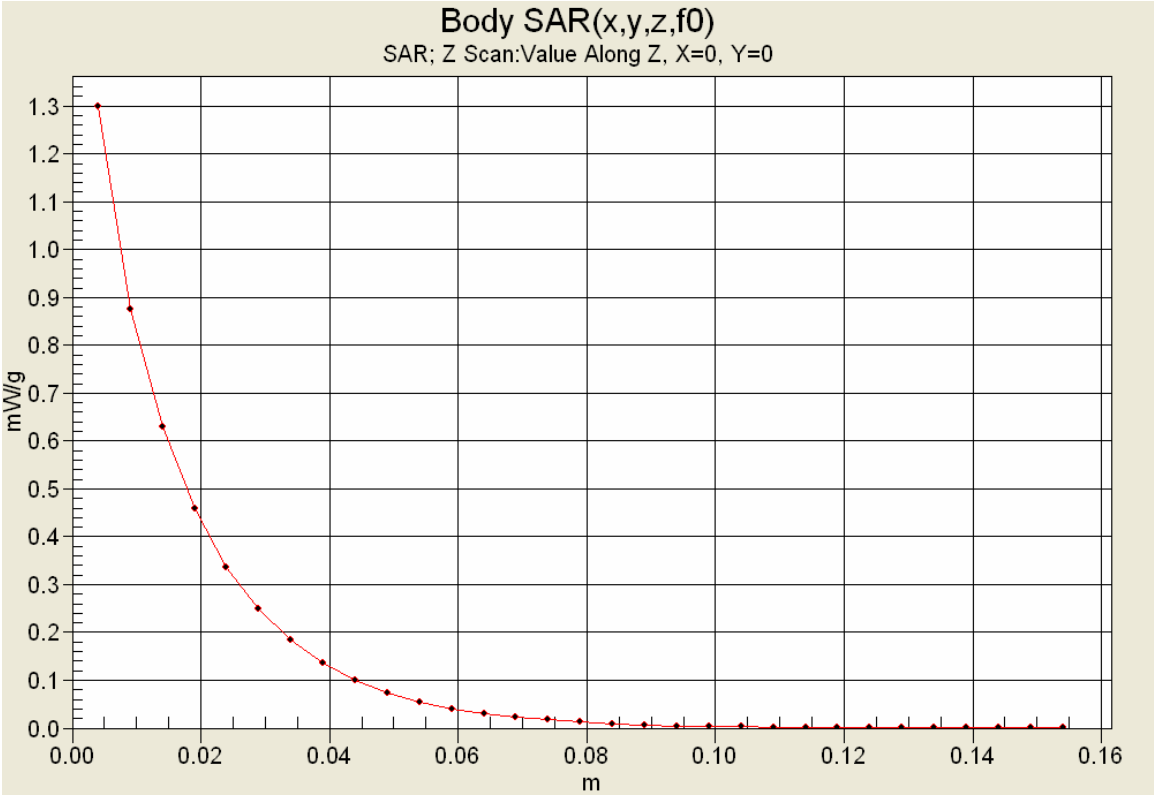
- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.41 mW/g

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37.2 V/m; Power Drift = -0.353 dB
Peak SAR (extrapolated) = 1.92 W/kg
SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.876 mW/g
Maximum value of SAR (measured) = 1.34 mW/g



Z-Axis Scan



Date Tested: 08/28/2008

Body-worn SAR - Back Side of DUT with Belt-Clip Holster Swivel - Channel 5 - 460.0125 MHz Swivel Belt-Clip Position #2: -90 Degrees

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Belt-Clip Holster Swivel (AWHOL-391); Audio Accessory: Earbud Headset (AWEH391)

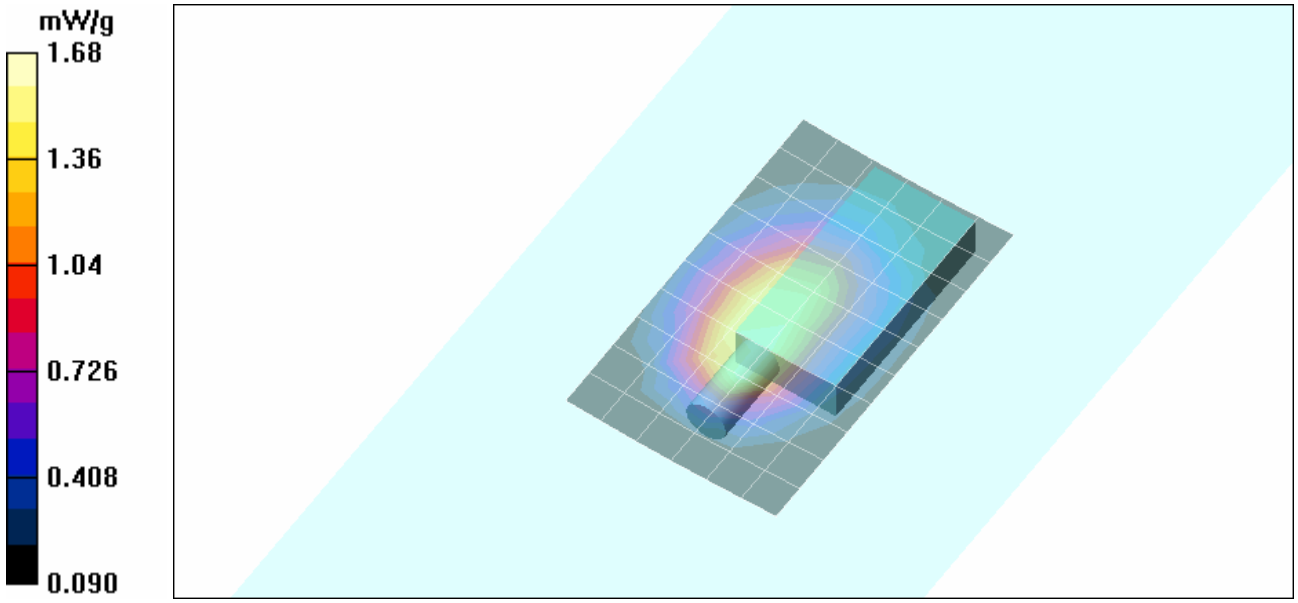
Ambient Temp: 23°C; Fluid Temp: 22.2°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 57; ρ = 1000 kg/m^3

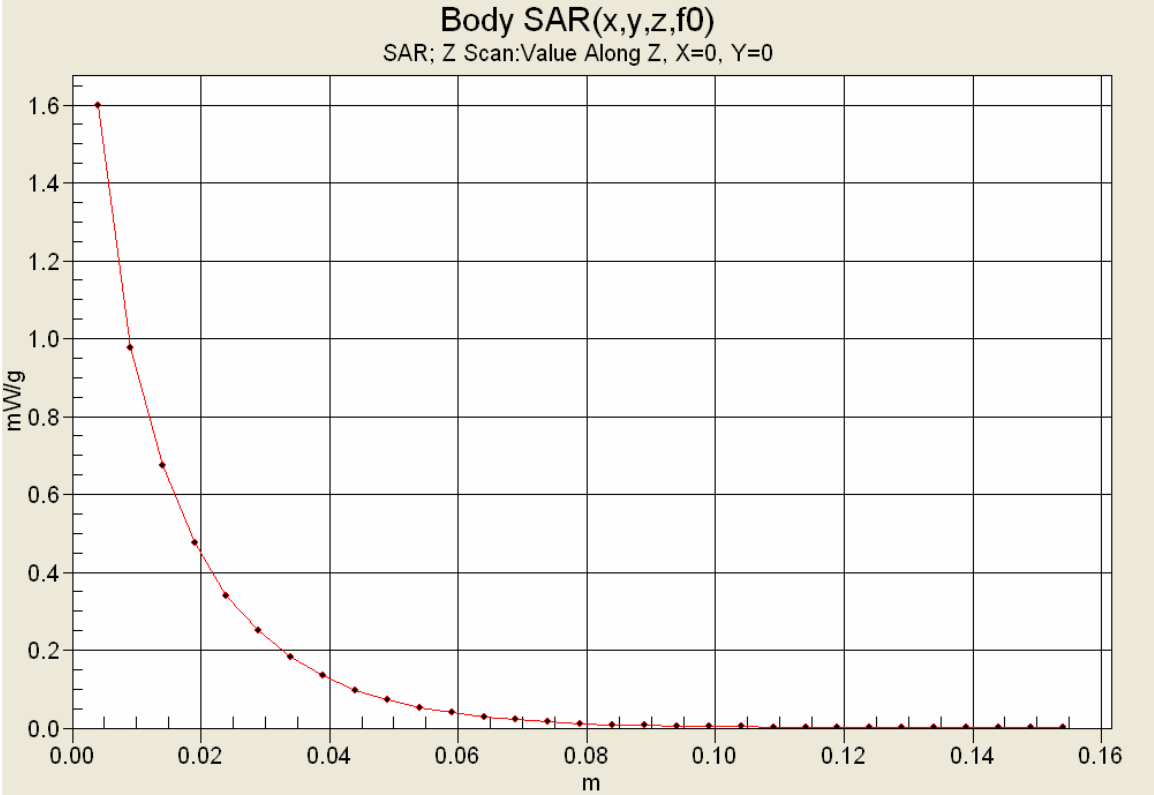
- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.56 mW/g

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 37.8 V/m; Power Drift = -0.249 dB
Peak SAR (extrapolated) = 3.02 W/kg
SAR(1 g) = 1.57 mW/g; SAR(10 g) = 1.01 mW/g
Maximum value of SAR (measured) = 1.68 mW/g



Z-Axis Scan



Date Tested: 08/28/2008

Body-worn SAR - Back Side of DUT with Belt-Clip Holster Swivel - Channel 5 - 460.0125 MHz Swivel Belt-Clip Position #3: 90 Degrees

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Belt-Clip Holster Swivel (AWHOL-391); Audio Accessory: Earbud Headset (AWEH391)

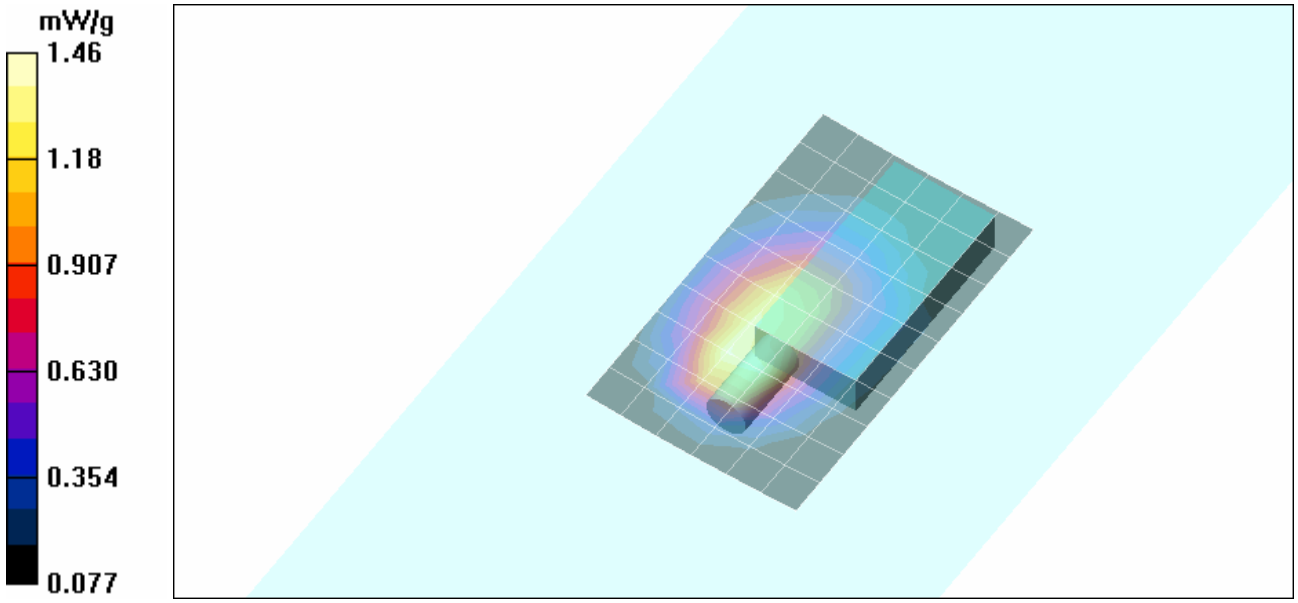
Ambient Temp: 23°C; Fluid Temp: 22.2°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.603 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 460 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 57; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.39 mW/g

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 31.3 V/m; Power Drift = -0.189 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.861 mW/g
Maximum value of SAR (measured) = 1.46 mW/g



Date Tested: 08/28/2008

Body-worn SAR - Back Side of DUT with Belt-Clip Holster Swivel - Channel 6 - 469.9875 MHz Swivel Belt-Clip Position #2: -90 Degrees

DUT: Advanced Wireless AWR391; Type: Portable FM UHF PTT Radio Transceiver; Serial: 20080621001

Body-worn Accessory: Belt-Clip Holster Swivel (AWHOL-391); Audio Accessory: Earbud Headset (AWEH391)

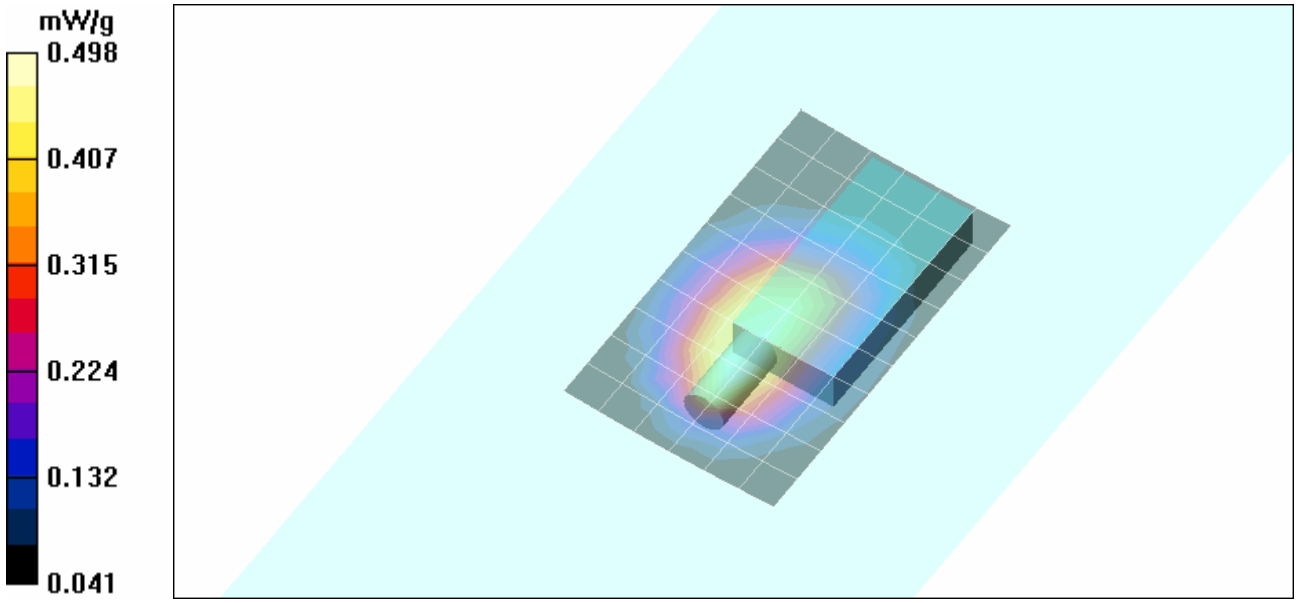
Ambient Temp: 23°C; Fluid Temp: 22.2°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

RF Output Power: 0.234 W (ERP)
3.7V, 720mAh Li-ion Battery Pack
Frequency: 470 MHz; Duty Cycle: 1:1
Communication System: FM UHF (CW)
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.93 mho/m; ε_r = 57; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.531 mW/g

Body-worn SAR - Belt-Clip Holster Swivel Accessory - 2.0 cm Spacing from Back Side of DUT to Planar Phantom
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 21.5 V/m; Power Drift = -0.289 dB
Peak SAR (extrapolated) = 0.861 W/kg
SAR(1 g) = 0.471 mW/g; SAR(10 g) = 0.310 mW/g
Maximum value of SAR (measured) = 0.498 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

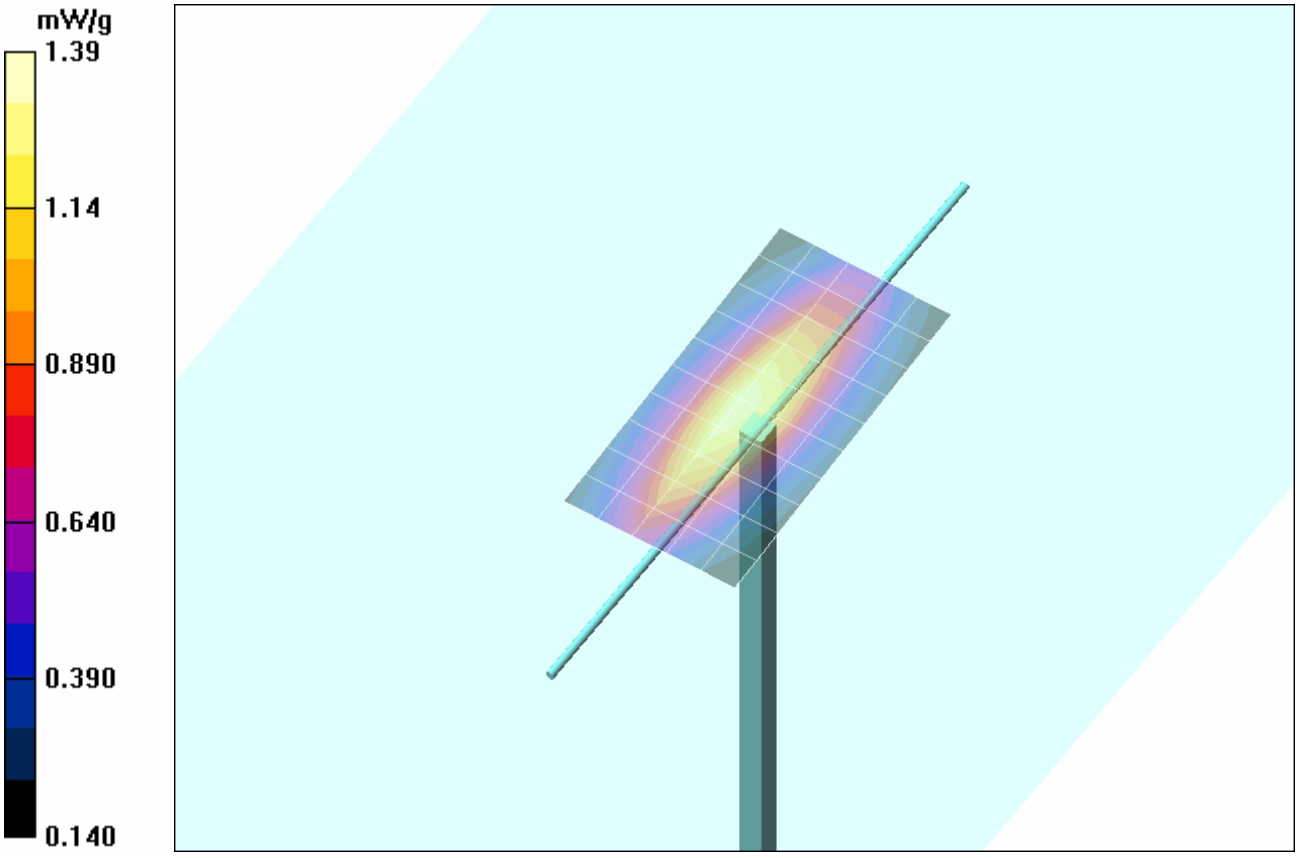
Date Tested: 08/20/2008

System Performance Check - 450 MHz Dipole - HSL

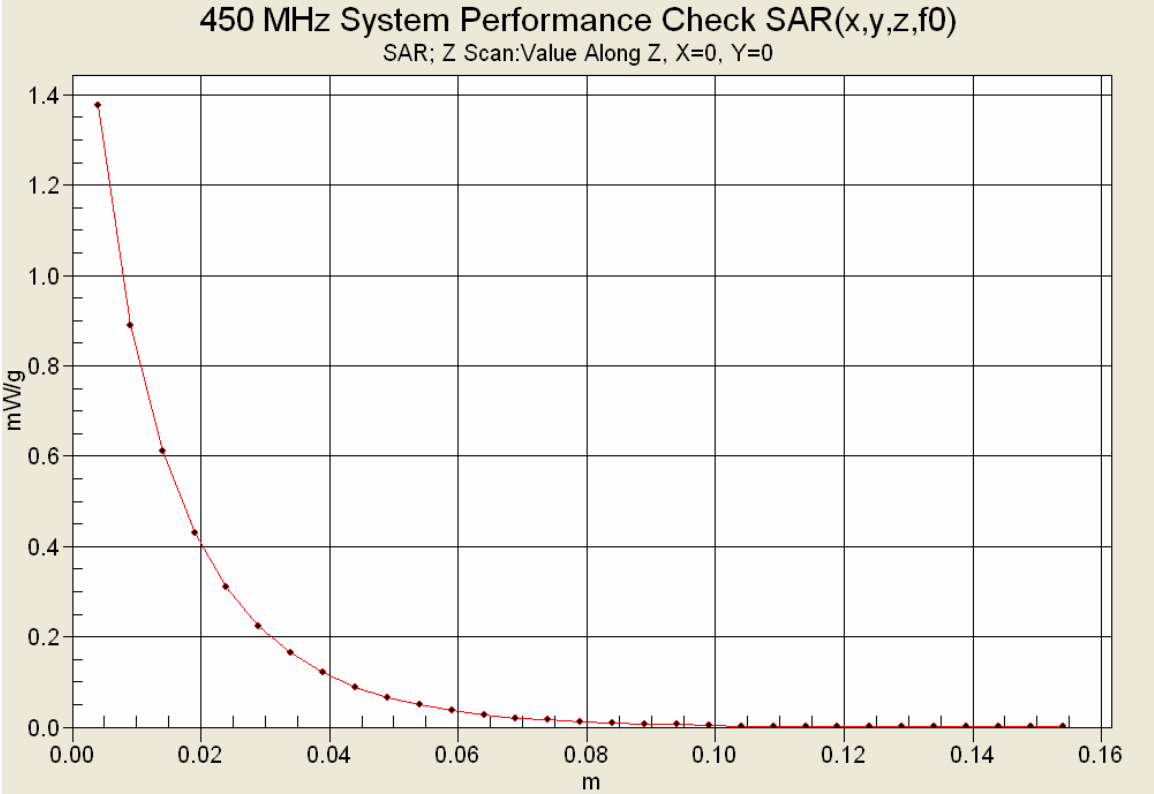
DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Validation: 07/25/2008

Ambient Temp: 22.5°C; Fluid Temp: 21.8°C; Barometric Pressure: 101.1 kPa; Humidity: 34%
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.89 mho/m; ε_r = 44.3; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.31 mW/g
System Performance Check - 450 MHz Dipole
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 40.0 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 2.07 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.848 mW/g
Maximum value of SAR (measured) = 1.39 mW/g



Z-Axis Scan



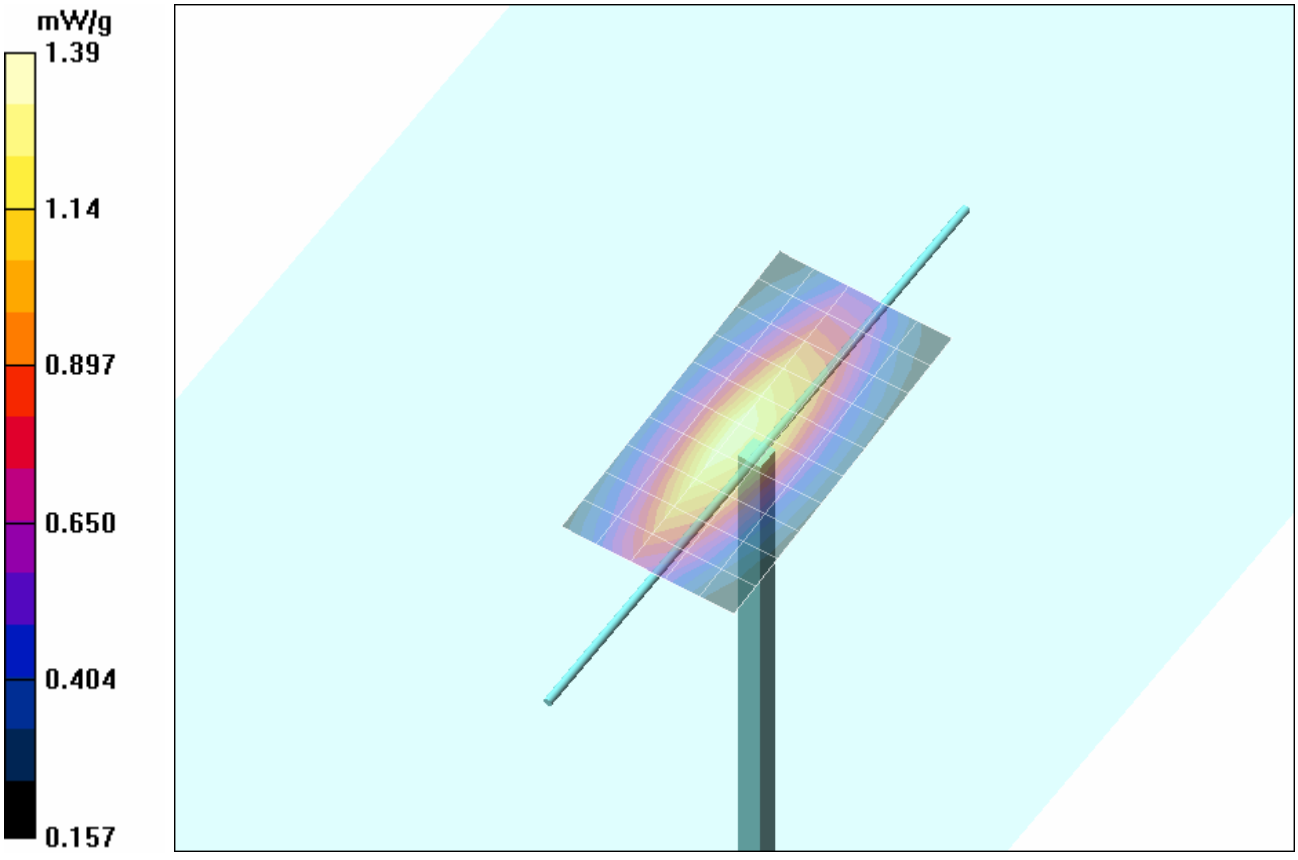
Date Tested: 08/28/2008

System Performance Check - 450 MHz Dipole - HSL

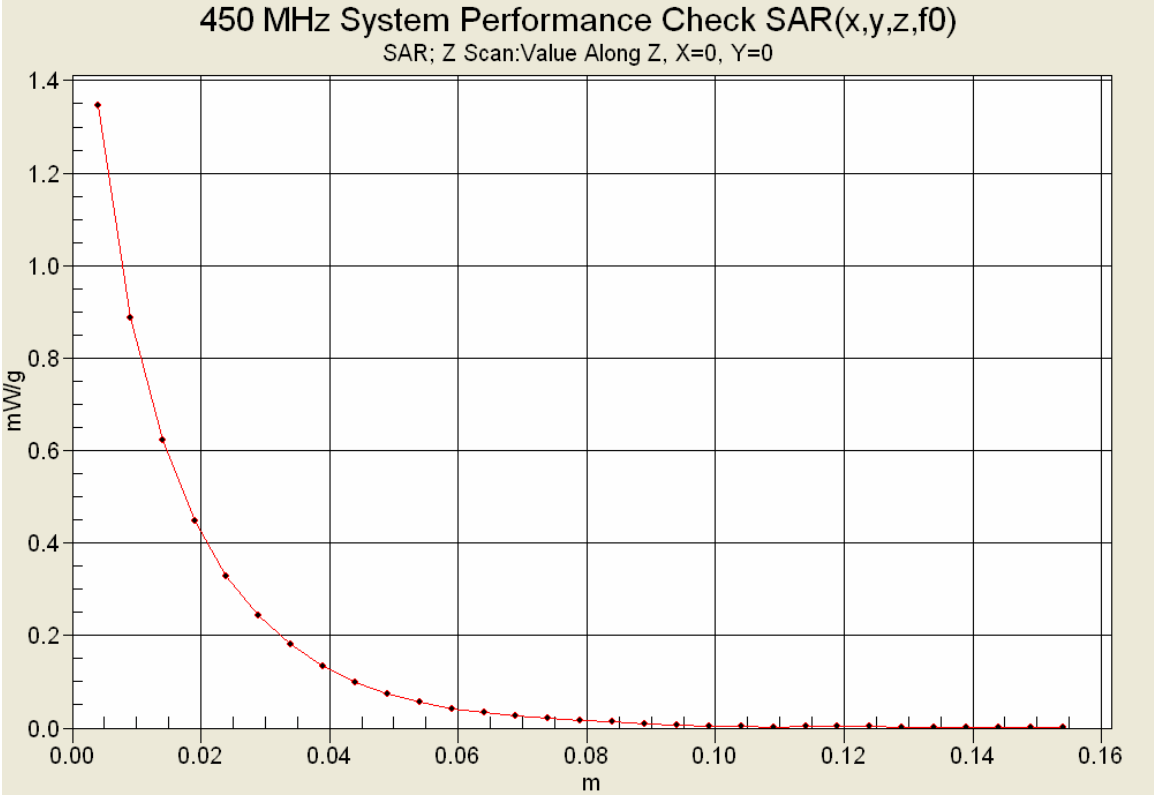
DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Validation: 07/25/2008

Ambient Temp: 23.0°C; Fluid Temp: 22.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 43.3; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.31 mW/g
System Performance Check - 450 MHz Dipole
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 40.8 V/m; Power Drift = -0.008 dB
Peak SAR (extrapolated) = 2.05 W/kg
SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.858 mW/g
Maximum value of SAR (measured) = 1.39 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz System Performance Check & DUT Evaluation (Brain)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
20/Aug/2008
Frequency (GHz)
IEEE_eH 1528-2003 Limits for Head Epsilon
IEEE_sH 1528-2003 Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	IEEE_eH	IEEE_sH	Test_e	Test_s
0.3500	44.70	0.87	47.36	0.79
0.3600	44.58	0.87	46.68	0.80
0.3700	44.46	0.87	45.61	0.82
0.3800	44.34	0.87	46.20	0.83
0.3900	44.22	0.87	45.77	0.82
0.4000	44.10	0.87	46.06	0.83
0.4100	43.98	0.87	45.27	0.83
0.4200	43.86	0.87	45.62	0.85
0.4300	43.74	0.87	45.23	0.85
0.4400	43.62	0.87	44.90	0.87
0.4500	43.50	0.87	44.26	0.89
0.4600	43.45	0.87	44.15	0.89
0.4700	43.40	0.87	44.37	0.90
0.4800	43.34	0.87	44.33	0.91
0.4900	43.29	0.87	43.70	0.92
0.5000	43.24	0.87	43.42	0.91
0.5100	43.19	0.87	43.18	0.93
0.5200	43.14	0.88	43.31	0.93
0.5300	43.08	0.88	42.95	0.94
0.5400	43.03	0.88	43.25	0.96
0.5500	42.98	0.88	43.09	0.97

450 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
20/Aug/2008
Frequency (GHz)
IEEE_eB 1528-2003 Limits for Body Epsilon
IEEE_sB 1528-2003 Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	IEEE_eB	IEEE_sB	Test_e	Test_s
0.3500	57.70	0.93	57.76	0.85
0.3600	57.60	0.93	58.22	0.84
0.3700	57.50	0.93	57.73	0.85
0.3800	57.40	0.93	57.79	0.86
0.3900	57.30	0.93	57.34	0.87
0.4000	57.20	0.93	57.08	0.88
0.4100	57.10	0.93	57.66	0.90
0.4200	57.00	0.94	57.43	0.91
0.4300	56.90	0.94	56.67	0.90
0.4400	56.80	0.94	56.80	0.92
0.4500	56.70	0.94	56.21	0.93
0.4600	56.66	0.94	56.54	0.91
0.4700	56.62	0.94	56.18	0.94
0.4800	56.58	0.94	56.37	0.95
0.4900	56.54	0.94	55.46	0.94
0.5000	56.51	0.94	56.19	0.96
0.5100	56.47	0.94	55.97	0.98
0.5200	56.43	0.95	55.19	0.98
0.5300	56.39	0.95	55.88	0.99
0.5400	56.35	0.95	55.43	1.00
0.5500	56.31	0.95	55.46	1.01

450 MHz System Performance Check (Brain)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
28/Aug/2008
Frequency (GHz)
IEEE_eH 1528-2003 Limits for Head Epsilon
IEEE_sH 1528-2003 Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	IEEE_eH	IEEE_sH	Test_e	Test_s
0.3500	44.70	0.87	45.13	0.76
0.3600	44.58	0.87	45.20	0.79
0.3700	44.46	0.87	44.93	0.79
0.3800	44.34	0.87	44.48	0.79
0.3900	44.22	0.87	44.43	0.82
0.4000	44.10	0.87	44.06	0.84
0.4100	43.98	0.87	43.92	0.84
0.4200	43.86	0.87	43.18	0.83
0.4300	43.74	0.87	43.37	0.83
0.4400	43.62	0.87	42.99	0.86
0.4500	43.50	0.87	43.30	0.86
0.4600	43.45	0.87	42.31	0.87
0.4700	43.40	0.87	42.22	0.88
0.4800	43.34	0.87	42.47	0.89
0.4900	43.29	0.87	42.42	0.89
0.5000	43.24	0.87	42.34	0.90
0.5100	43.19	0.87	41.58	0.92
0.5200	43.14	0.88	41.98	0.93
0.5300	43.08	0.88	41.37	0.93
0.5400	43.03	0.88	41.10	0.93
0.5500	42.98	0.88	41.15	0.95

450 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
28/Aug/2008
Frequency (GHz)
IEEE_eB 1528-2003 Limits for Body Epsilon
IEEE_sB 1528-2003 Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

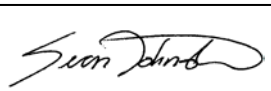
Freq	IEEE_eB	IEEE_sB	Test_e	Test_s
0.3500	57.70	0.93	58.43	0.87
0.3600	57.60	0.93	58.98	0.87
0.3700	57.50	0.93	58.12	0.87
0.3800	57.40	0.93	58.39	0.89
0.3900	57.30	0.93	57.43	0.90
0.4000	57.20	0.93	58.04	0.90
0.4100	57.10	0.93	57.49	0.91
0.4200	57.00	0.94	57.54	0.92
0.4300	56.90	0.94	57.22	0.93
0.4400	56.80	0.94	57.30	0.93
0.4500	56.70	0.94	57.01	0.93
0.4600	56.66	0.94	57.83	0.94
0.4700	56.62	0.94	57.16	0.96
0.4800	56.58	0.94	57.09	0.97
0.4900	56.54	0.94	57.07	0.97
0.5000	56.51	0.94	56.51	0.98
0.5100	56.47	0.94	56.10	0.98
0.5200	56.43	0.95	56.21	0.99
0.5300	56.39	0.95	56.10	0.99
0.5400	56.35	0.95	55.73	1.02
0.5500	56.31	0.95	55.80	1.03

APPENDIX E - SYSTEM VALIDATION

450 MHz SYSTEM VALIDATION

Type:	**450 MHz Validation Dipole**
Asset Number:	**00024**
Serial Number:	**136**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**July 25, 2008**

Celltech Labs Inc. certifies that the 450 MHz System Validation was performed on the date indicated above.

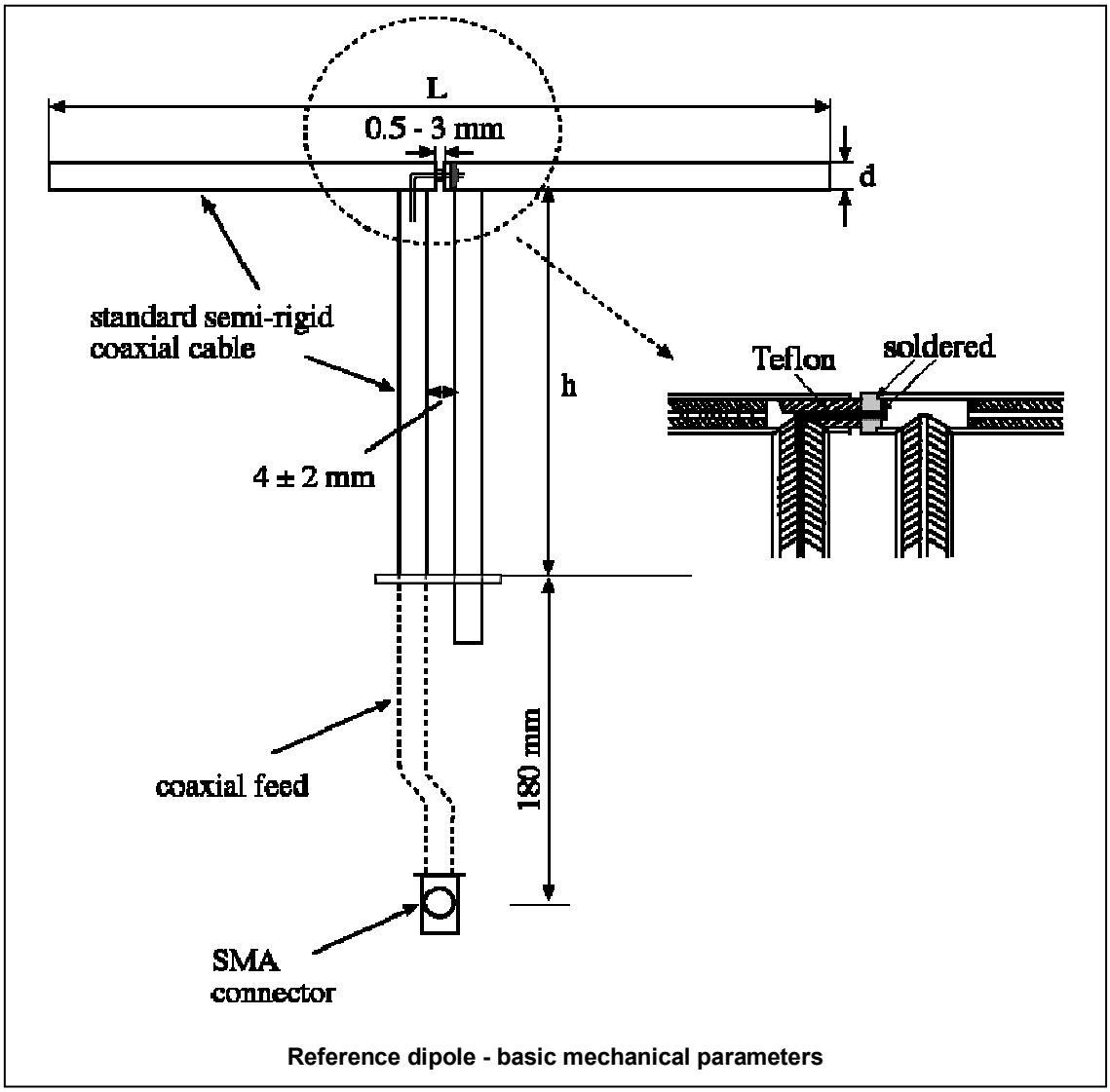
Validated by:	**Sean Johnston**
Signature:	

Celltech Labs Inc. 21-364 Lougheed Rd., Kelowna, B.C. V1X 7R8 Canada
Tel. 250-765-7650 • Fax. 250-765-7645 • e-mail: info@celltechlabs.com
www.celltechlabs.com

1. Dipole Construction & Electrical Characteristics

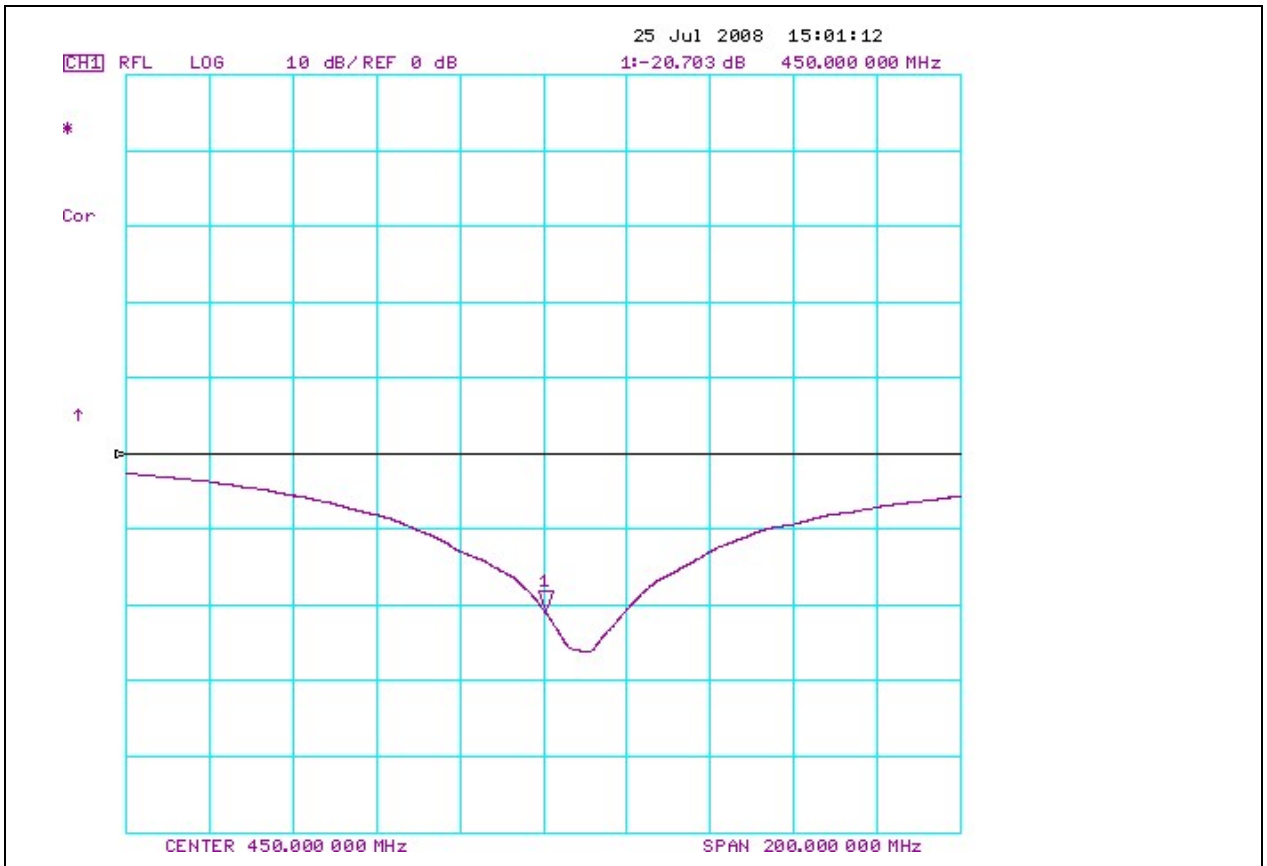
The validation dipole was constructed in accordance with the requirements specified in IEEE Standard 1528-2003 and International Standard IEC 62209-1:2005. The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0 mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

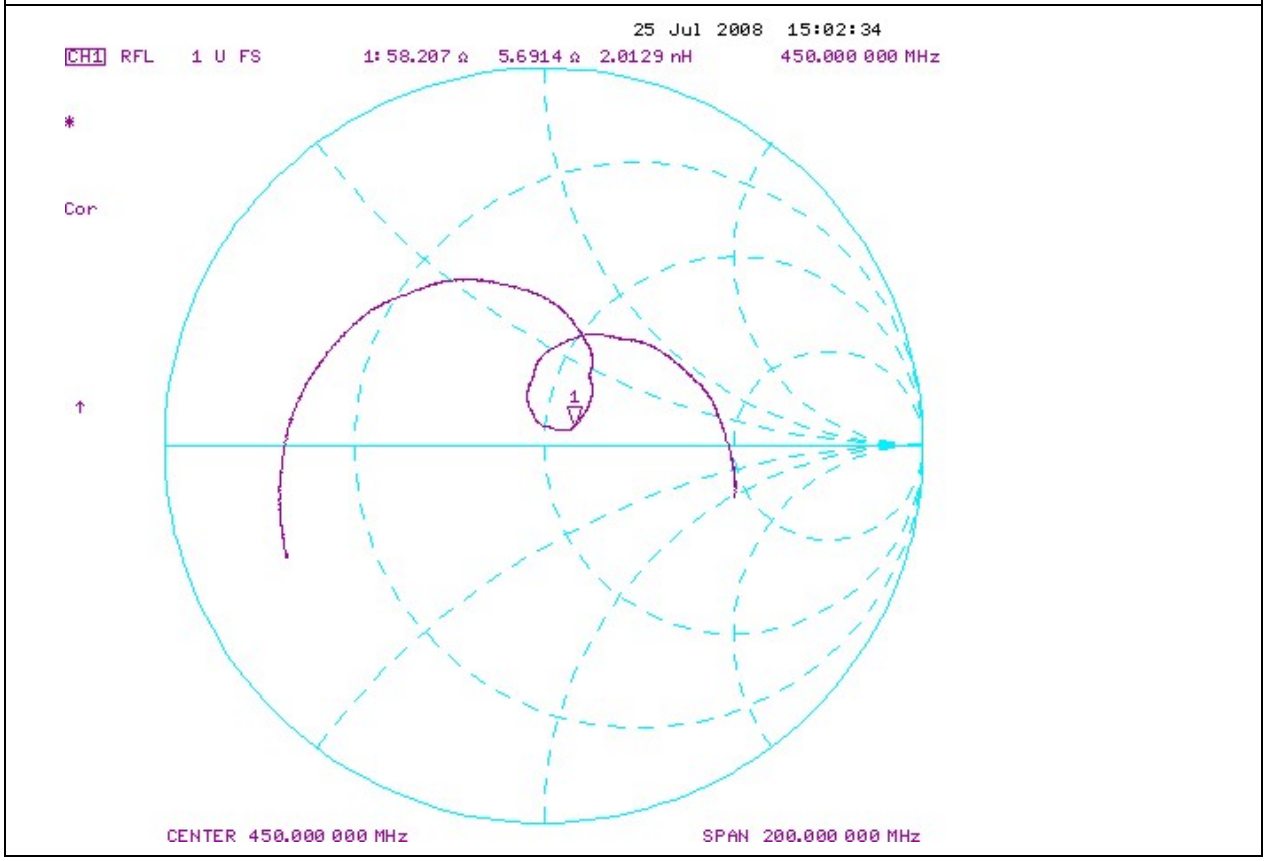
Feed point impedance at 450 MHz	Re{Z} = 58.207 Ω
	Im{Z} = 5.6914 Ω
Return Loss at 450 MHz	-20.703 dB



Reference dipole - basic mechanical parameters

2. Validation Dipole VSWR Data





3. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	396.0	250.0	6.0
450	**270.0**	**167.0**	**6.0**
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	51.5	30.4	3.6
3000	41.5	25.0	3.6

4. Validation Phantom

The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material.

The inner dimensions of the validation phantom are as follows:

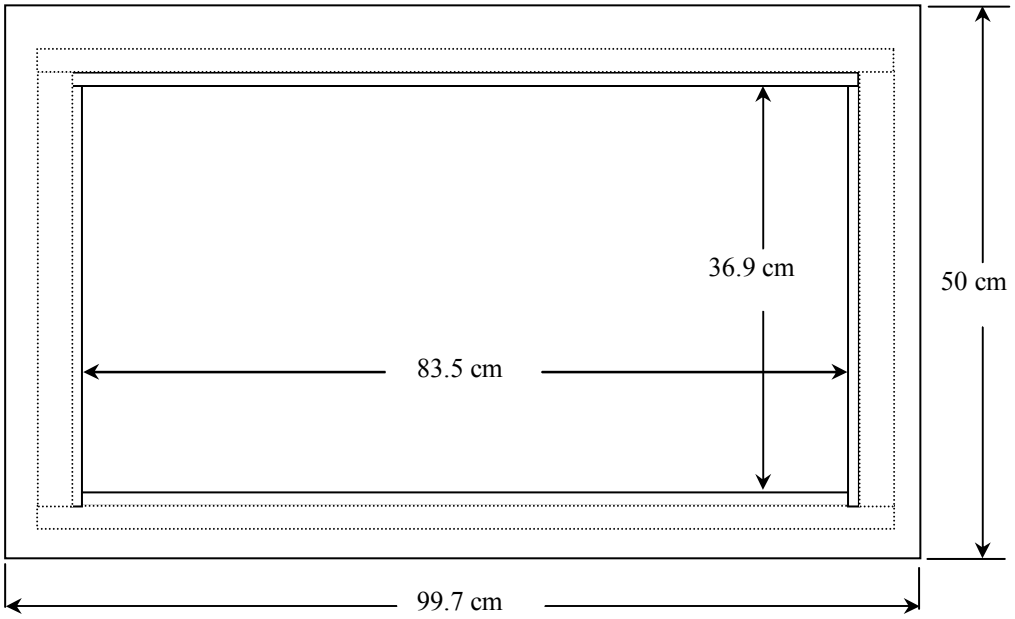
Length: 83.5 cm
Width: 36.9 cm
Height: 21.8 cm

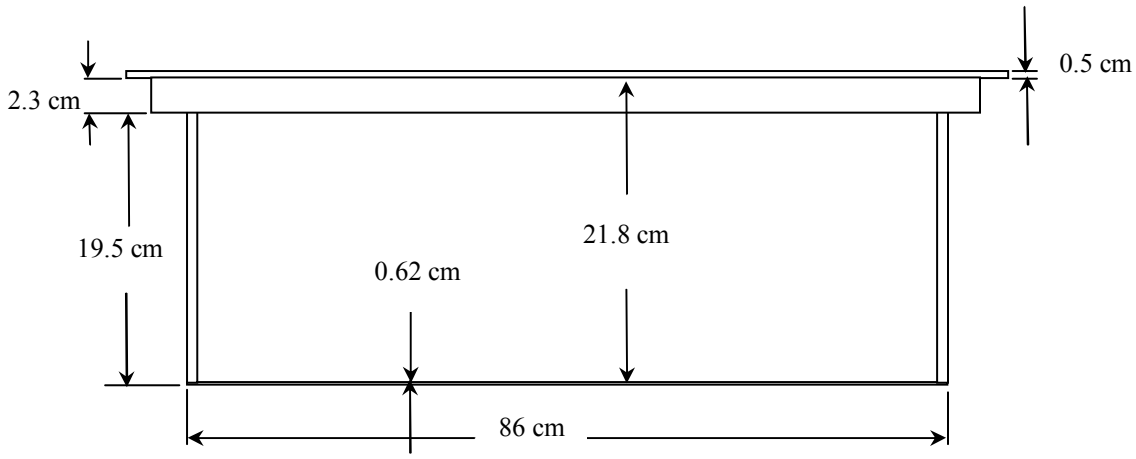
The bottom section of the validation phantom is constructed of 6.2 ± 0.1mm Plexiglas.

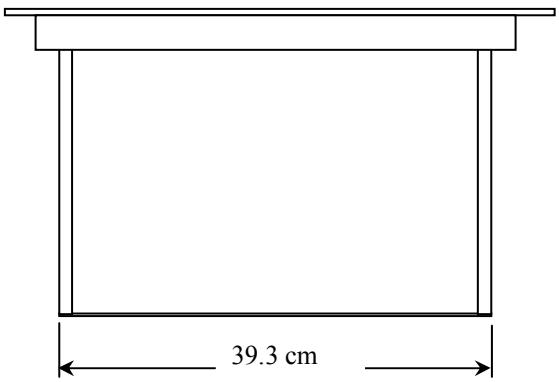
5. Test Equipment List

TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE OF CAL.	CAL. DUE DATE
SPEAG DASY4 Measurement Server	00158	1078	N/A	N/A
SPEAG Robot	00046	599396-01	N/A	N/A
SPEAG DAE4	00019	353	22Apr08	22Apr09
SPEAG ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
450 MHz Validation Dipole	00024	136	25Jul08	25Jul09
Plexiglas Validation Planar Phantom	00157	137	N/A	N/A
HP 85070C Dielectric Probe Kit	00033	US39240170	N/A	N/A
Gigatronics 8652A Power Meter	00007	1835272	23Apr08	23Apr09
Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	23Apr09
HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr09
HP 8648D Signal Generator	00005	3847A00611	NCR	NCR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	NCR	NCR

6. Dimensions of Plexiglas Planar Phantom







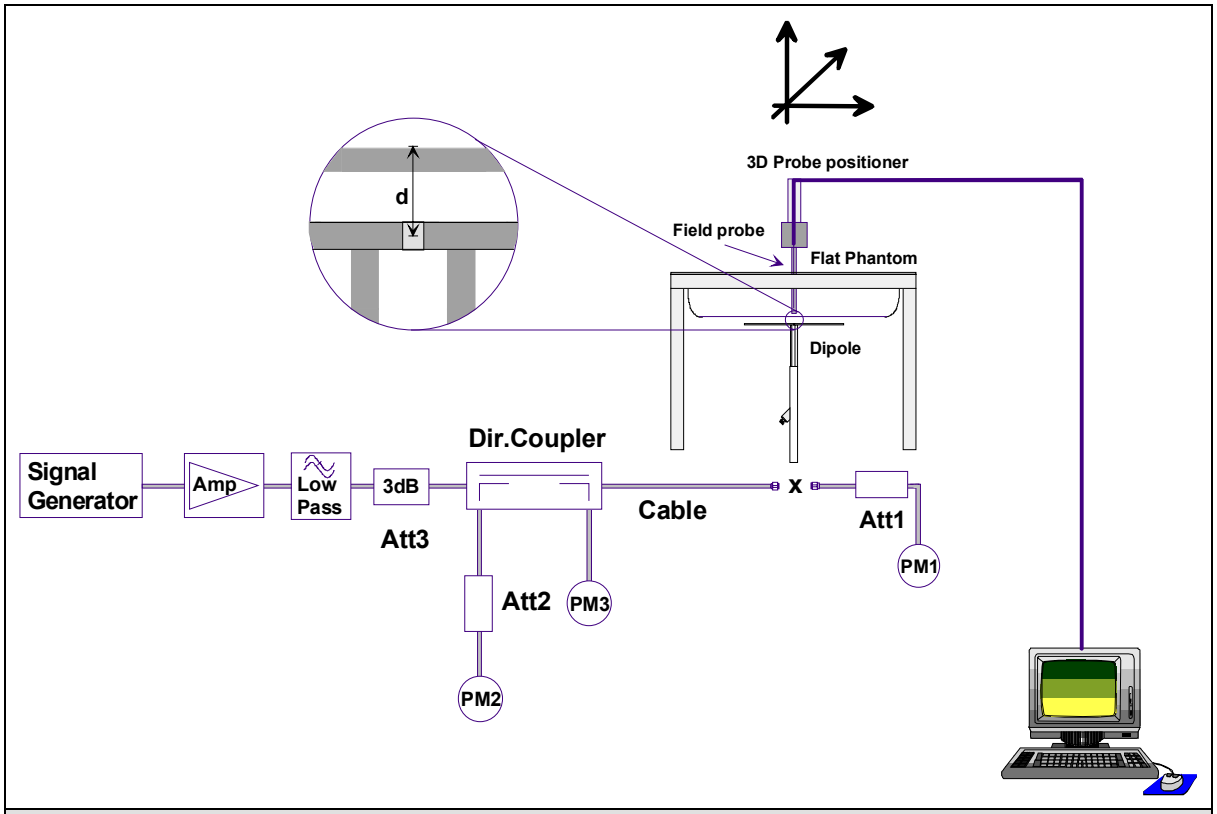
7. 450 MHz System Validation Setup

8. 450 MHz Validation Dipole Setup

9. SAR Measurement

Measurements were made using a dosimetric E-field probe ET3DV6 (S/N: 1590, Conversion Factor 7.66). The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the procedures described below.

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



System Validation Measurement Setup Diagram

10. Measurement Conditions

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

Relative Permittivity: 43.4 (-0.2% deviation from target)
Conductivity: 0.89 mho/m (+2.3% deviation from target)
Fluid Temperature: 23.1°C (Start of Test) / 23.2°C (End of Test)
Fluid Depth: ≥ 15.0 cm

Environmental Conditions:
Ambient Temperature: 24.1°C
Barometric Pressure: 100.9 kPa
Humidity: 31%

The 450 MHz Brain tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight	
Water	38.56%	
Sugar	56.32%	
Salt	3.95%	
HEC	0.98%	
Dowicil 75	0.19%	
IEEE/IEC Target Dielectric Parameters (450 MHz):	**ε_r = 43.5 (+/- 5%)**	**σ = 0.87 S/m (+/- 5%)**

11. System Validation SAR Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
IEEE/IEC Target		Measured	Deviation	IEEE/IEC Target		Measured	Deviation
1.23	**+/- 10%**	1.18	-4.0%	**4.92**	**+/- 10%**	4.72	-4.0%
SAR @ 0.25W Input averaged over 10g (W/kg)				**SAR @ 1W Input averaged over 10g (W/kg)**			
IEEE/IEC Target		Measured	Deviation	IEEE/IEC Target		Measured	Deviation
0.825	**+/- 10%**	0.775	-6.1%	**3.30**	**+/- 10%**	3.10	-6.1%

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed-point)	Local SAR at surface (y = 2 cm offset from feed-point)[a]
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	4.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2000	41.1	21.1	74.6	6.5
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

Numerical reference SAR values for reference dipole and flat phantom normalized to 1 W (IEEE 1528-2003; IEC 62209-1:2005)

Date Tested: 07/25/2008

System Validation - 450 MHz Dipole - HSL

DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Validation: 07/25/2008

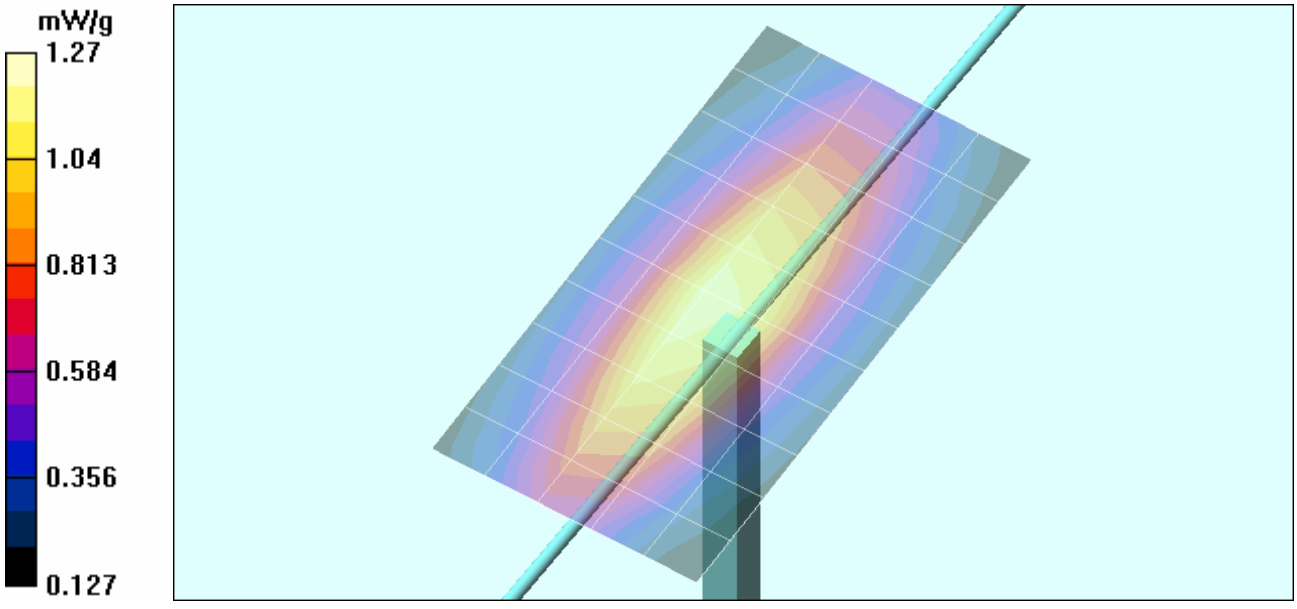
Ambient Temp: 24.1°C; Fluid Temp: 23.1°C; Barometric Pressure: 100.9 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.89 mho/m; ε_r = 43.4; ρ = 1000 kg/m^3

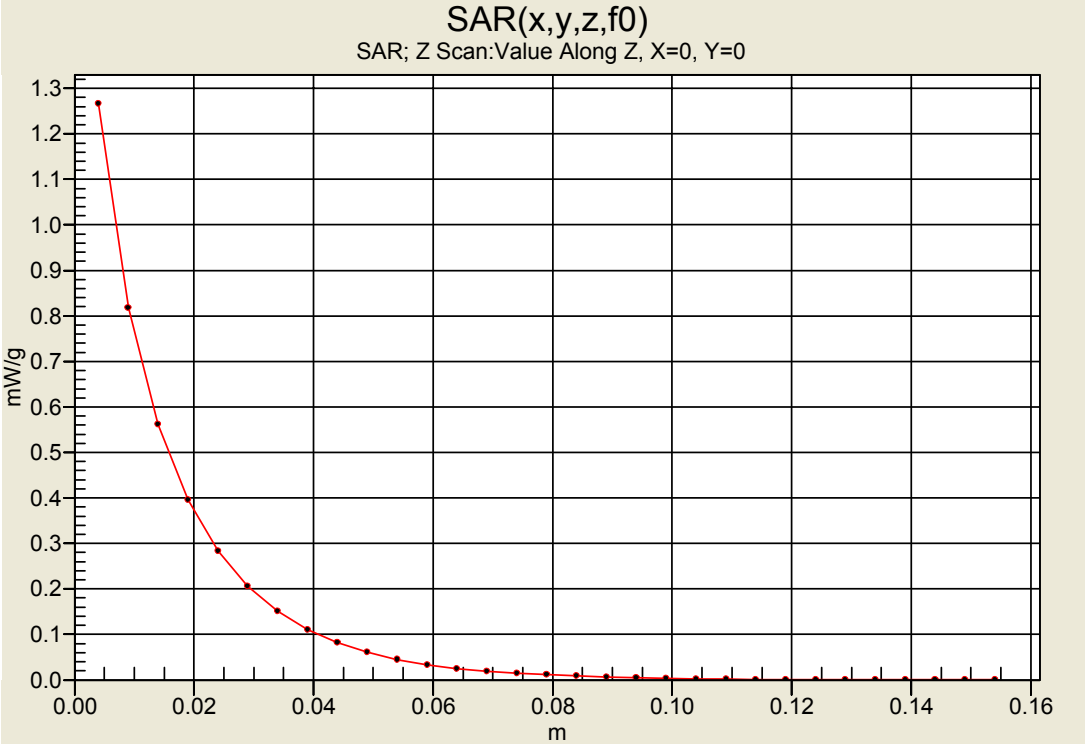
- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

450 MHz Dipole - System Validation
Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.18 mW/g

450 MHz Dipole - System Validation
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 38.3 V/m; Power Drift = 0.000 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.775 mW/g
Maximum value of SAR (measured) = 1.27 mW/g



Z-Axis Scan



12. Measured Fluid Dielectric Parameters

System Validation - 450 MHz (Brain)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 25/Jul/2008
Frequency (GHz)
IEEE_eH IEEE 1528-2003 Limits for Head Epsilon
IEEE_sH IEEE 1528-2003 Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	IEEE_eH	IEEE_sH	Test_e	Test_s
0.3500	44.70	0.87	46.31	0.80
0.3600	44.58	0.87	45.65	0.82
0.3700	44.46	0.87	45.27	0.82
0.3800	44.34	0.87	45.47	0.83
0.3900	44.22	0.87	44.76	0.84
0.4000	44.10	0.87	44.57	0.87
0.4100	43.98	0.87	44.63	0.86
0.4200	43.86	0.87	44.66	0.86
0.4300	43.74	0.87	43.79	0.89
0.4400	43.62	0.87	43.68	0.87
0.4500	43.50	0.87	43.44	0.89
0.4600	43.45	0.87	43.27	0.90
0.4700	43.40	0.87	43.17	0.90
0.4800	43.34	0.87	43.66	0.91
0.4900	43.29	0.87	42.68	0.92
0.5000	43.24	0.87	42.39	0.95
0.5100	43.19	0.87	42.24	0.94
0.5200	43.14	0.88	41.96	0.95
0.5300	43.08	0.88	42.42	0.95
0.5400	43.03	0.88	41.99	0.97
0.5500	42.98	0.88	41.92	0.98

13. Measurement Uncertainties

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 (450 MHz)	6.65	Normal	1	1	6.65	∞
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	0.8	Rectangular	1.732050808	1	0.5	∞
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	∞
Dipole						
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)	2.3	Normal	1	0.64	1.5	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	0.2	Normal	1	0.6	0.1	∞
Combined Standard Uncertainty					**9.40**	
Expanded Uncertainty (k=2)					**18.80**	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 and IEC 62209-1:2005						