DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

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FCC IDENTIFIER:	**MIVGSM0110**
Model No.:	**GSM0110**
Model Name:	**Orion**
Rule Part(s):	**FCC 47 CFR §2.1093**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (01-01)**
Device Classification:	**PCS Licensed Transmitter (PCB)**
Device Description:	**Dual-Band GSM GPRS Compact Flash Card (with PCMCIA Adapter)**
Tx Frequency Range(s):	**1850.2 - 1909.8 MHz (PCS GSM)** **824.2 - 848.8 MHz (Cellular GSM)**
RF Output Power Tested:	**28.0 dBm (PCL 0) - Peak Conducted (PCS GPRS)** **31.0 dBm (PCL 5) - Peak Conducted (Cellular GPRS)**
Power Source(s) Tested:	**Li-ion 3.7 V, 1000 mAh External Battery (Model: GWBC100)** **Host Laptop PC AC Power** **Host PDA Battery Power**
Antenna Type(s) Tested:	**External ¼ λ**
Host Laptop PCs Tested:	**Dell Inspiron 3800 (Bottom PCMCIA slot - Left Side of PC)** **Compaq Armada M300 (Single PCMCIA slot - Right Side of PC)** **Sony VAIO PCG-955A (Bottom PCMCIA slot - Left Side of PC)**
Host PDAs Tested:	**Casio Cassiopeia E-125 (Compact Flash slot)** **Casio Cassiopeia E-200 (Compact Flash slot)** **HP iPAQ H2200 Series (Compact Flash slot)**
Max. SAR Level(s) Evaluated:	**0.751 W/kg (1g) - PCS GPRS (Dell Inspiron Laptop PC)** **0.911 W/kg (1g) - PCS GPRS (HP iPAQ PDA)** **0.689 W/kg (1g) - Cellular GPRS (Sony VAIO Laptop PC)** **0.668 W/kg (1g) - Cellular GPRS (Casio E-200 PDA)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was found to be in compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

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

Performed By:

Spencer Watson
Compliance Technologist
Celltech Labs Inc.

Reviewed By:

Russell W. Pipe
Senior Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates that the Enfora Model: GSM0110 Dual-Band PCS/Cellular GSM GPRS Compact Flash Card (with PCMCIA Adapter) FCC ID: MIVGSM0110 for Laptop PCs and PDAs complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Device Under Test (DUT)

FCC Rule Part(s)	47 CFR §2.1093						
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)						
Device Classification	PCS Licensed Transmitter (PCB)						
Device Description	Dual-Band PCS/Cellular GSM GPRS Compact Flash Card (with PCMCIA Adapter)						
FCC IDENTIFER	MIVGSM0110						
Compact Flash Card	**Manufacturer**	Enfora L.P.	**Model No.**	GSM0110	**Serial No.**	0110430410292	
			Model Name	Orion		Identical Prototype	
PCMCIA Adapter	**Manufacturer**	Growell Telecom Co., Ltd.	**Model**	Type II	**Serial No.**	n/a	
						Production	
Modulation Scheme	GMSK						
Tx Frequency Range(s)	1850.2 - 1909.8 MHz			PCS GSM			
	824.2 - 848.8 MHz			Cellular GSM			
RF Output Power Tested	28.0 dBm	PCL 0		Peak Conducted		PCS GPRS	
	31.0 dBm	PCL 5		Peak Conducted		Cellular GPRS	
Antenna Type(s) Tested	External ¼ λ						
Power Source(s) Tested	Li-ion 3.7 V, 1000 mAh External Battery (Model: GWBC100)						
	Host Laptop AC Power			Host PDA Battery			

Host Device Tested	**Manufacturer / Model**	**Serial No.**	**Power Supply**	**Slot Type**	**Slot-to-Base**
Laptop PCs	Dell Inspiron 3800	9D2SH01	AC Power	Dual PCMCIA	8 mm
	Compaq Armada M300	AM3 P3500T1X12C6458	AC Power	Single PCMCIA	7 mm
	Sony VAIO PCG-955A	28318330 3628016	AC Power	Dual PCMCIA	7 mm
PDAs	Casio Cassiopeia E-125	J650EAU-2BB12-074495	Li-ion Battery 3.7V, 1400mAh	Compact Flash	4 mm
	Casio Cassiopeia E-200	JX710AAU-5AP122-00008788	Li-ion Battery 3.7V, 950mAh	Compact Flash	1 mm
	HP iPAQ H2200 Series	TWC33801GV	Li-ion Battery 3.7V, 900mAh	Compact Flash	1 mm

3.0 SAR MEASUREMENT SYSTEM

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

DASY4 SAR Measurement System with SAM Phantom

DASY4 SAR Measurement System with Planar Phantom

4.0 MEASUREMENT SUMMARY

BODY SAR MEASUREMENT RESULTS - PCS GPRS MODE - DUT WITH PCMCIA ADAPTER & HOST LAPTOP PCs (x3)

Freq. (MHz)	Ch.	Test Mode	Power Source	Host Laptop PC	PCMCIA Slot	Laptop Position to Planar Phantom	Antenna Position to Planar Phantom	Sep. Dist. from DUT to Planar Phantom (mm)	Conducted Power Before Test		Measured SAR 1g (W/kg)		SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)	
									dBm	PCL					
1880.0	662	GPRS	Laptop PC AC Power	Sony VAIO	Bottom	Bottom Side	Perpendicular	6	28.0	0	P	0.431	-0.0432	P	0.435
											S	0.283		S	0.286
1880.0	662	GPRS	Ext. Li-ion DUT Battery	Sony VAIO	Bottom	Bottom Side	Perpendicular	20	28.0	0	0.701		0.162	0.701	
1880.0	662	GPRS	Laptop PC AC Power	Compaq Armada	Single	Bottom Side	Perpendicular	5	28.0	0	0.292		-0.0353	0.294	
1880.0	662	GPRS	Ext. Li-ion DUT Batt.	Compaq Armada	Single	Bottom Side	Perpendicular	17	28.0	0	0.594		0.117	0.594	
1880.0	662	GPRS	Laptop PC AC Power	Dell Inspiron	Bottom	Bottom Side	Perpendicular	6	28.0	0	0.434		-0.0210	0.436	
1880.0	662	GPRS	Ext. Li-ion DUT Batt.	Dell Inspiron	Bottom	Bottom Side	Perpendicular	18	28.0	0	0.719		-0.190	0.751	

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	March 09, 2005			Ambient Temperature	23.6	°C
Measured Fluid Type	1880 MHz		Body	Fluid Temperature	22.5	°C
Dielectric Constant ε_r	IEEE Target		Measured	Atmospheric Pressure	102.8	kPa
	53.3	±5%	52.2	Relative Humidity	30	%
Conductivity σ (mho/m)	IEEE Target		Measured	Fluid Depth	≥ 15	cm
	1.52	±5%	1.53	ρ (Kg/m^3)	1000	

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the scaled SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. Secondary peak SAR levels measured within 2 dB of the primary were reported (P = Primary, S = Secondary).
4. The power droops measured by the DASY4 system during the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the test data table above.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
7. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - PCS GPRS MODE - DUT WITH HOST PDAs (x3) - LAP-HELD CONFIGURATION

Test Date	Freq. (MHz)	Ch.	Test Mode	Power Source	Host PDA	PDA Position to Planar Phantom	Antenna Position to Planar Phantom	Sep. Dist. from DUT to Planar Phantom (mm)	Conducted Power Before Test		Measured SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)
									dBm	PCL			
Mar 8	1880.0	662	GPRS	PDA Battery	Casio E-125	Bottom Side	Perpendicular	2	28.0	0	0.720	-0.130	0.742
Mar 8	1880.0	662	GPRS	Ext. Li-ion DUT Battery	Casio E-125	Bottom Side	Perpendicular	15	28.0	0	0.536	0.0605	0.536
Mar 8	1880.0	662	GPRS	PDA Battery	Casio E-200	Bottom Side	Perpendicular	0	28.0	0	0.799	0.0429	0.799
Mar 8	1850.2	512	GPRS	PDA Battery	Casio E-200	Bottom Side	Perpendicular	0	28.0	0	0.727	-0.0184	0.730
Mar 8	1909.8	810	GPRS	PDA Battery	Casio E-200	Bottom Side	Perpendicular	0	28.0	0	P 0.742 S 0.558	-0.206	P 0.778 S 0.585
Mar 8	1880.0	662	GPRS	Ext. Li-ion DUT Battery	Casio E-200	Bottom Side	Perpendicular	15	28.0	0	0.516	-0.0539	0.522
Mar 8	1880.0	662	GPRS	PDA Battery	HP iPAQ	Bottom Side	Perpendicular	0	28.0	0	0.879	-0.157	0.911
Mar 8	1850.2	512	GPRS	PDA Battery	HP iPAQ	Bottom Side	Perpendicular	0	28.0	0	0.853	-0.129	0.879
Mar 8	1909.8	810	GPRS	PDA Battery	HP iPAQ	Bottom Side	Perpendicular	0	28.0	0	P 0.820 S 0.769	-0.0170	P 0.823 S 0.772
Mar 9	1880.0	662	GPRS	Ext. Li-ion DUT Battery	HP iPAQ	Bottom Side	Perpendicular	15	28.0	0	0.719	0.0274	0.719

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	March 08, 2005			March 09, 2005			Test Date(s)	Mar 8	Mar 9	Unit
Dielectric Constant ε_r	1880 MHz		Body	1880 MHz		Body	Ambient Temperature	24.9	23.6	°C
	IEEE Target		Measured	IEEE Target		Measured	Fluid Temperature	22.0	22.5	°C
	53.3	±5%	52.2	53.3	±5%	52.2	Atmospheric Pressure	102.4	102.8	kPa
Conductivity σ (mho/m)	1880 MHz		Body	1880 MHz		Body	Relative Humidity	30	30	%
	IEEE Target		Measured	IEEE Target		Measured	Fluid Depth	≥ 15	≥ 15	cm
	1.52	±5%	1.53	1.52	±5%	1.53	ρ (Kg/m^3)	1000		

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the scaled SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. Secondary peak SAR levels measured within 2 dB of the primary were reported (P = Primary, S = Secondary).
4. The power droops measured by the DASY4 system during the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the test data table above.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
7. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - CELLULAR GPRS MODE - DUT WITH PCMCIA ADAPTER & HOST LAPTOP PCs (x3)

Test Date	Freq. (MHz)	Ch.	Test Mode	Power Source	Host Laptop PC	PCMCIA Slot	Laptop Position to Planar Phantom	Antenna Position to Planar Phantom	Sep. Dist. from DUT to Planar Phantom (mm)	Conducted Power Before Test		Meas. SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)
										dBm	PCL			
Mar 4	836.6	190	GPRS	Laptop PC AC Power	Dell Inspiron	Bottom	Bottom Side	Perpendicular	6	31.0	5	0.462	-0.124	0.475
Mar 4	836.6	190	GPRS	Ext. Li-ion DUT Batt.	Dell Inspiron	Bottom	Bottom Side	Perpendicular	18	31.0	5	0.233	-0.0793	0.237
Mar 7	836.6	190	GPRS	Laptop PC AC Power	Sony VAIO	Bottom	Bottom Side	Perpendicular	6	31.0	5	0.686	-0.0183	0.689
Mar 7	836.6	190	GPRS	Ext. Li-ion DUT Batt.	Sony VAIO	Bottom	Bottom Side	Perpendicular	20	31.0	5	0.266	0.175	0.266
Mar 7	836.6	190	GPRS	Laptop PC AC Power	Compaq Armada	Single	Bottom Side	Perpendicular	5	31.0	5	0.580	-0.109	0.595
Mar 7	836.6	190	GPRS	Ext. Li-ion DUT Batt.	Compaq Armada	Single	Bottom Side	Perpendicular	17	31.0	5	0.325	-0.0579	0.329

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	March 04, 2005			March 07, 2005			Test Date(s)	Mar 4	Mar 7	Unit
Dielectric Constant ε_r	835 MHz		Body	835 MHz		Body	Ambient Temperature	25.0	24.1	°C
	IEEE Target		Measured	IEEE Target		Measured	Fluid Temperature	21.3	23.2	°C
	55.2	±5%	52.6	55.2	±5%	54.0	Atmospheric Pressure	102.3	102.3	kPa
Conductivity σ (mho/m)	835 MHz		Body	835 MHz		Body	Relative Humidity	30	30	%
	IEEE Target		Measured	IEEE Target		Measured	Fluid Depth	≥ 15	≥ 15	cm
	0.97	±5%	0.98	0.97	±5%	1.01	ρ (Kg/m^3)	1000		

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the scaled SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. The power droops measured by the DASY4 system during the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the test data table above.
4. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
5. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
6. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY SAR MEASUREMENT RESULTS - CELLULAR GPRS MODE - DUT WITH HOST PDAs (x3) - LAP-HELD CONFIGURATION

Freq. (MHz)	Ch.	Test Mode	Power Source	Host PDA	PDA Position to Planar Phantom	Antenna Position to Planar Phantom	Sep. Dist. from DUT to Planar Phantom (mm)	Cond. Power Before Test dBm	Cond. Power Before Test PCL	Measured SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)
836.6	190	GPRS	PDA Battery	HP iPAQ	Bottom Side	Perpendicular	0	31.0	5	0.543	0.0228	0.543
836.6	190	GPRS	Ext. Li-ion DUT Battery	HP iPAQ	Bottom Side	Perpendicular	15	31.0	5	0.341	0.096	0.341
836.6	190	GPRS	PDA Battery	Casio E-200	Bottom Side	Perpendicular	0	31.0	5	0.668	0.244	0.668
836.6	190	GPRS	Ext. Li-ion DUT Battery	Casio E-200	Bottom Side	Perpendicular	15	31.0	5	0.280	0.133	0.280
836.6	190	GPRS	PDA Battery	Casio E-125	Bottom Side	Perpendicular	2	31.0	5	0.583	0.00189	0.583
836.6	190	GPRS	Ext. Li-ion DUT Battery	Casio E-125	Bottom Side	Perpendicular	15	31.0	5	P 0.221 S 0.221	-0.0334	P 0.223 S 0.223

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BODY: 1.6 W/kg (averaged over 1 gram)
Spatial Peak - Uncontrolled Exposure / General Population

Test Date(s)	March 08, 2005		Ambient Temperature	23.6	°C
Measured Fluid Type	835 MHz	Body	Fluid Temperature	22.5	°C
Dielectric Constant ε_r	IEEE Target	Measured	Atmospheric Pressure	102.8	kPa
	55.2 ±5%	53.4	Relative Humidity	30	%
Conductivity σ (mho/m)	IEEE Target	Measured	Fluid Depth	≥ 15	cm
	0.97 ±5%	0.99	ρ (Kg/m^3)	1000	

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the scaled SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. Secondary peak SAR levels measured within 2 dB of the primary were reported (P = Primary, S = Secondary).
4. The power droops measured by the DASY4 system during the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the test data table above.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the evaluations using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
7. The SAR evaluations were performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The Enfora Model: GSM0110 Dual-Band PCS/Cellular GSM GPRS Compact Flash Card (with PCMCIA Adapter) FCC ID: MIVGSM0110 for Laptop PCs and PDAs was compliant for localized Specific Absorption Rate (SAR) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

1. The DUT was tested for body SAR (lap-held) with the bottom side of the Sony VAIO Laptop PC placed parallel to, and touching, the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the bottom PCMCIA card slot of the Laptop PC. The DUT was powered from the Laptop PC. The separation distance from the bottom of the DUT to the outer surface of the planar phantom was 6 mm.
2. The DUT was tested for body SAR (lap-held) with the bottom side of the Sony VAIO Laptop PC placed parallel to the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the bottom PCMCIA card slot of the Laptop PC. The DUT was powered from the external battery. The external battery was folded underneath the bottom of the Laptop PC (intended normal operating position) and provided a 13 mm separation distance from the bottom of the Laptop PC to the outer surface of the planar phantom. The external battery provided a 20 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
3. The DUT was tested for body SAR (lap-held) with the bottom side of the Compaq Armada Laptop PC placed parallel to, and touching, the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the single PCMCIA card slot of the Laptop PC. The DUT was powered from the Laptop PC. The separation distance from the bottom of the DUT to the outer surface of the planar phantom was 5 mm.
4. The DUT was tested for body SAR (lap-held) with the bottom side of the Compaq Armada Laptop PC placed parallel to the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the single PCMCIA card slot of the Laptop PC. The DUT was powered from the external battery. The external battery was folded underneath the bottom of the Laptop PC (intended normal operating position) and provided a 13 mm separation distance from the bottom of the Laptop PC to the outer surface of the planar phantom. The external battery provided a 17 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
5. The DUT was tested for body SAR (lap-held) with the bottom side of the Dell Inspiron Laptop PC placed parallel to, and touching, the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the bottom PCMCIA card slot of the Laptop PC. The DUT was powered from the Laptop PC. The separation distance from the bottom of the DUT to the outer surface of the planar phantom was 6 mm.
6. The DUT was tested for body SAR (lap-held) with the bottom side of the Dell Inspiron Laptop PC placed parallel to the outer surface of the planar phantom. The DUT was connected to the PCMCIA adapter and evaluated in the bottom PCMCIA card slot of the Laptop PC. The DUT was powered from the external battery. The external battery was folded underneath the bottom of the Laptop PC (intended normal operating position) and provided a 13 mm separation distance from the bottom of the Laptop PC to the outer surface of the planar phantom. The external battery provided an 18 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
7. The DUT was tested for body SAR (lap-held) with the bottom side of the Casio E-125 placed parallel to, and touching, the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot and powered from the PDA. The separation distance from the bottom of the DUT to the outer surface of the planar phantom was 2 mm.
8. The DUT was tested for body SAR (lap-held) with the bottom side of the Casio E-125 placed parallel to the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot of the PDA and powered from the external battery connected to the DUT. The external battery was folded underneath the bottom of the PDA (intended normal operating position) and provided a 13 mm separation distance from the bottom of the PDA to the outer surface of the planar phantom. The external battery provided a 15 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
9. The DUT was tested for body SAR (lap-held) with the bottom side of the HP iPAQ Pocket PC placed parallel to, and touching, the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot and powered from the PDA. The bottom of the DUT was touching the outer surface of the planar phantom.
10. The DUT was tested for body SAR (lap-held) with the bottom side of the HP iPAQ Pocket PC placed parallel to the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot of the PDA and powered from the external battery connected to the DUT. The external battery was folded underneath the bottom of the PDA (intended normal operating position) and provided a 13 mm separation distance from the bottom of the PDA to the outer surface of the planar phantom. The external battery provided a 15 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
11. The DUT was tested for body SAR (lap-held) with the bottom side of the Casio E-200 Pocket PC placed parallel to, and touching, the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot and powered from the PDA. The bottom of the DUT was touching the outer surface of the planar phantom.

DETAILS OF SAR EVALUATION (Cont.)

12. The DUT was tested for body SAR (lap-held) with the bottom side of the Casio E-200 Pocket PC placed parallel to the outer surface of the planar phantom. The DUT was evaluated in the Compact Flash card slot of the PDA and powered from the external battery connected to the DUT. The external battery was folded underneath the bottom of the PDA (intended normal operating position) and provided a 13 mm separation distance from the bottom of the PDA to the outer surface of the planar phantom. The external battery provided a 15 mm separation distance from the bottom of the DUT to the outer surface of the planar phantom.
13. For all SAR evaluations the antenna was in the vertical upright position (normal operating position) perpendicular to the planar phantom.
14. The power levels were set prior to the SAR evaluations using the PCTM software program provided by the manufacturer. The PCS band (1900 MHz) was set to the maximum power level (PL0). The cellular band (850 MHz) was set to the maximum power level (PL5).
15. The power droops measured by the DASY4 system during the SAR evaluations were subsequently added to the measured SAR levels to report scaled SAR results as shown in the test data tables (pages 5-8).
16. The DUT was evaluated in GPRS data mode at maximum power in 1 time slot (crest factor: 8.3).
17. The DUT was tested with a fully charged external battery, and a fully charged battery in the host PDA (test configurations without external DUT battery). The host Laptop PCs were powered by AC power supply.
18. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
19. The dielectric parameters of the simulated tissue mixture were measured prior to the evaluations using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters.
20. The SAR evaluations with the DUT were performed using the Barski planar phantom.
21. The SAR evaluations were performed within 24 hours of the daily system performance check.

6.0 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 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 form 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 D). 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.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a daily system check was performed using the planar section of the SAM phantom with a 1900MHz dipole and an 835MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance checks using an HP 85070C Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C for printout of 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% (see Appendix B for system performance check test plots).

SYSTEM PERFORMANCE CHECK

Test Date	Brain Mixture	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.	IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
03/04/05	**835**	**2.38 (±10%)**	2.60 (+9.2%)	**41.5 ±5%**	41.2	**0.90 ±5%**	0.91	1000	23.4	22.3	≥ 15	30	102.4
03/07/05	**835**	**2.38 (±10%)**	2.44 (+2.5%)	**41.5 ±5%**	41.7	**0.90 ±5%**	0.93	1000	23.3	22.2	≥ 15	30	102.3
03/08/05	**835**	**2.38 (±10%)**	2.53 (+6.3%)	**41.5 ±5%**	40.4	**0.90 ±5%**	0.90	1000	23.0	22.5	≥ 15	30	102.8
03/08/05	**1900**	**9.93 (±10%)**	10.1 (+1.7%)	**40.0 ±5%**	38.1	**1.40 ±5%**	1.38	1000	24.7	22.4	≥ 15	30	102.5

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

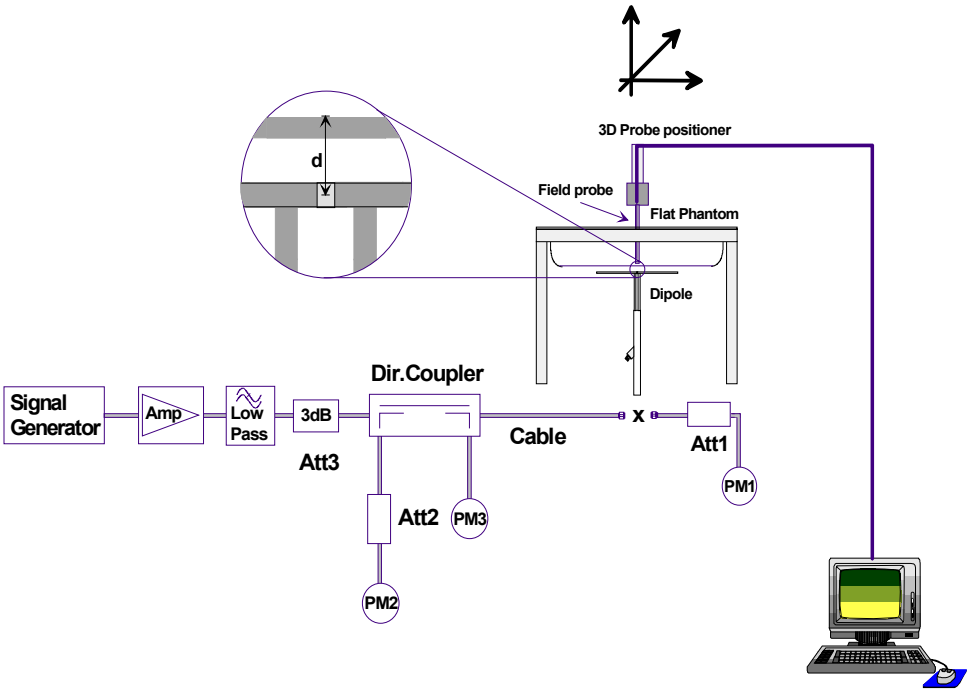


Figure 1. System Performance Check Setup Diagram

1900MHz Dipole Setup

835MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 1880MHz and 1900MHz simulated tissue mixtures consist of Glycol-monobutyl, water, and salt. The 835MHz simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide was added and visual inspection was made to ensure air bubbles were not trapped during the mixing process. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

1880/1900 MHz SIMULATED EQUIVALENT TISSUE MIXTURES		
INGREDIENT	1900 MHz Brain	1880 MHz Body
	System Performance Check	DUT Evaluation
Water	55.85 %	69.85 %
Glycol Monobutyl	44.00 %	29.89 %
Salt	0.15%	0.26 %

835 MHz SIMULATED EQUIVALENT TISSUE MIXTURES		
INGREDIENT	835 MHz Brain	835 MHz Body
	System Performance Check	DUT Evaluation
Water	40.71 %	53.79 %
Sugar	56.63 %	45.13 %
Salt	1.48 %	0.98 %
HEC	0.99 %	--
Bactericide	0.19 %	0.10 %

9.0 SAR SAFETY LIMITS

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

Notes:
1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

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

Data Acquisition Electronic (DAE) System

Cell Controller

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

Data Converter

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

DASY4 Measurement Server

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

E-Field Probe

Model: ET3DV6
Serial No.: 1590
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2 dB (30 MHz to 3 GHz)

Phantom(s)

Type 1: SAM V4.0C
Shell Material: Fiberglass
Thickness: 2.0 ±0.1 mm
Volume: Approx. 25 liters

Type 2: Planar Phantom
Shell Material: Fiberglass
Thickness: 2.0 ±0.1 mm
Volume: Approx. 72 liters

11.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 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 Detection:	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of mobile phone

ET3DV6 E-Field Probe

12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a Fiberglass shell phantom with a 2.0 mm (+/-0.2 mm) shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the Fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections (see Appendix F for specifications of the SAM phantom V4.0C).

SAM Phantom

13.0 PLANAR PHANTOM

The 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 such as Laptop PCs. The planar phantom is integrated in a wooden table (see Appendix H for dimensions and specifications of the planar phantom).

Planar Phantom

14.0 DEVICE HOLDER

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

Device Holder

15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT	SERIAL NO.	DATE CALIBRATED	CALIBRATION DUE DATE
Schmid & Partner DASY4 System	-	-	-
-DASY4 Measurement Server	1078	N/A	N/A
-Robot	599396-01	N/A	N/A
-DAE3	353	July 2004	July 2005
-DAE3	370	January 2005	January 2006
-ET3DV6 E-Field Probe	1387	March 2005	March 2006
-ET3DV6 E-Field Probe	1590	May 2004	May 2005
-EX3DV4 E-Field Probe	3547	January 2005	January 2006
-300MHz Validation Dipole	135	October 2004	October 2005
-450MHz Validation Dipole	136	November 2004	November 2005
-835MHz Validation Dipole	411	March 2004	March 2005
		March 2005	March 2006
-900MHz Validation Dipole	054	June 2004	June 2005
-1800MHz Validation Dipole	247	June 2004	June 2005
-1900MHz Validation Dipole	151	June 2004	June 2005
-2450MHz Validation Dipole	150	September 2004	September 2005
-5000MHz Validation Dipole	1031	January 2005	January 2006
-SAM Phantom V4.0C	1033	N/A	N/A
-Barski Planar Phantom	03-01	N/A	N/A
-Plexiglas Planar Phantom	161	N/A	N/A
-Validation Planar Phantom	137	N/A	N/A
HP 85070C Dielectric Probe Kit	N/A	N/A	N/A
Gigatronics 8651A Power Meter	8650137	April 2004	April 2005
Gigatronics 8652A Power Meter	1835267	April 2004	April 2005
Gigatronics 80701A Power Sensor	1833535	April 2004	April 2005
Gigatronics 80701A Power Sensor	1833542	April 2004	April 2005
Gigatronics 80701A Power Sensor	1834350	April 2004	April 2005
HP 8594E Spectrum Analyzer	3543A02721	April 2004	April 2005
HP 8753ET Network Analyzer	US39170292	February 2005	February 2006
HP 8648D Signal Generator	3847A00611	April 2004	April 2005
Amplifier Research 5S1G4 Power Amplifier	26235	N/A	N/A

16.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration (835 MHz)	± 5.95	Normal	1	1	± 5.95	∞
Probe calibration (1900 MHz)	± 4.85	Normal	1	1	± 4.85	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty						
835 MHz					**± 13.76**	
1900 MHz					**± 13.32**	
Expanded Uncertainty (k=2)						
835 MHz					**± 27.51**	
1900 MHz					**± 26.64**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION

Error Description	Uncertainty Value ±%	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty ±% (1g)	v_i or v_{eff}
Measurement System						
Probe calibration (835 MHz)	± 5.95	Normal	1	1	± 5.95	∞
Probe calibration (1900 MHz)	± 4.85	Normal	1	1	± 4.85	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input Power	± 4.7	Rectangular	√3	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty						
835 MHz					**± 10.54**	
1900 MHz					**± 9.97**	
Expanded Uncertainty (k=2)						
835 MHz					**± 21.09**	
1900 MHz					**± 19.93**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

17.0 REFERENCES

[1] Federal Communications Commission, “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093: 1999.

[2] 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.

[3] IEEE Std 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.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 03/04/05

System Performance Check - 835 MHz Dipole

DUT: Dipole 835 MHz; Model: D835V2; Type: System Performance Check; Serial: 411; Calibrated: 03/16/2004

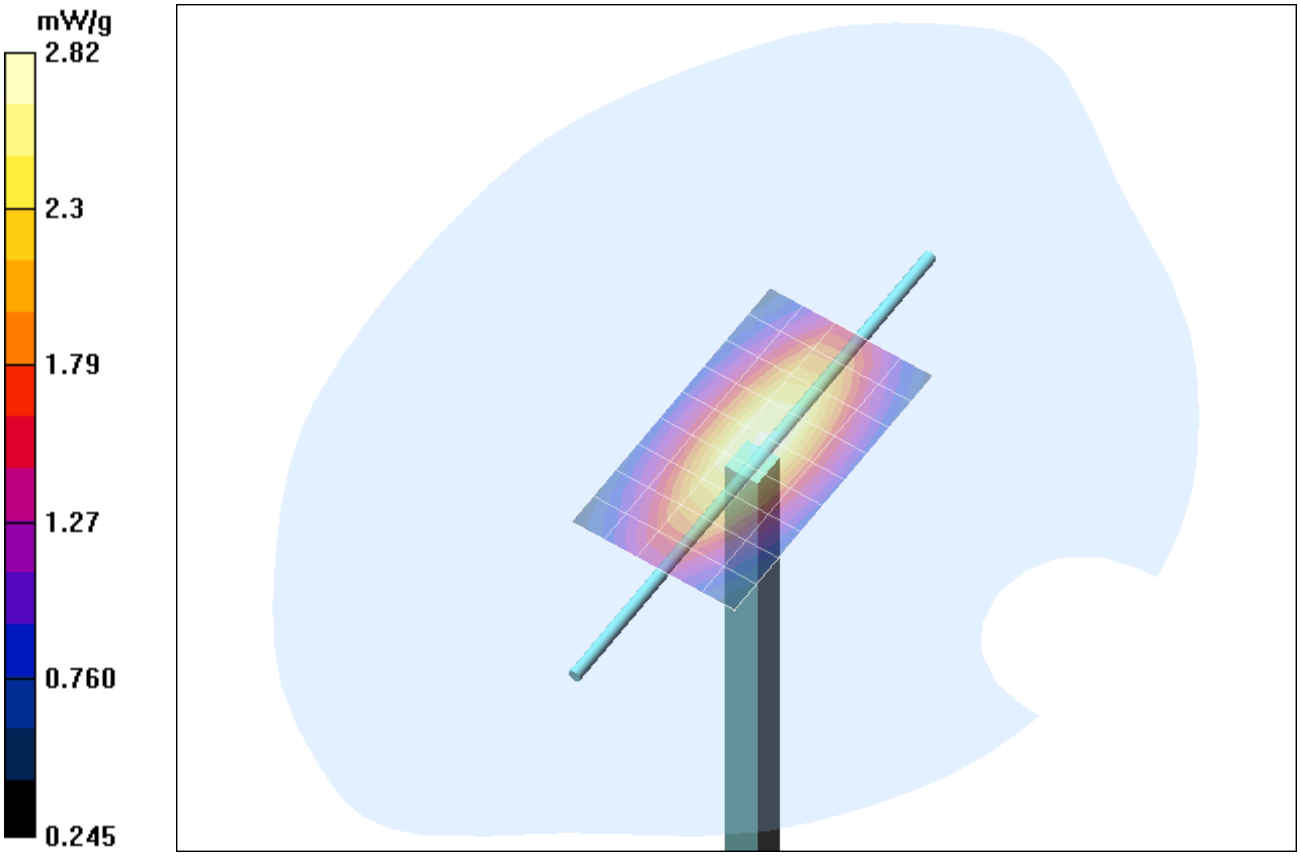
Ambient Temp: 23.4 °C; Fluid Temp: 22.3 °C; Barometric Pressure: 102.4 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 (σ = 0.91 mho/m; ε_r = 41.2; ρ = 1000 kg/m^3)

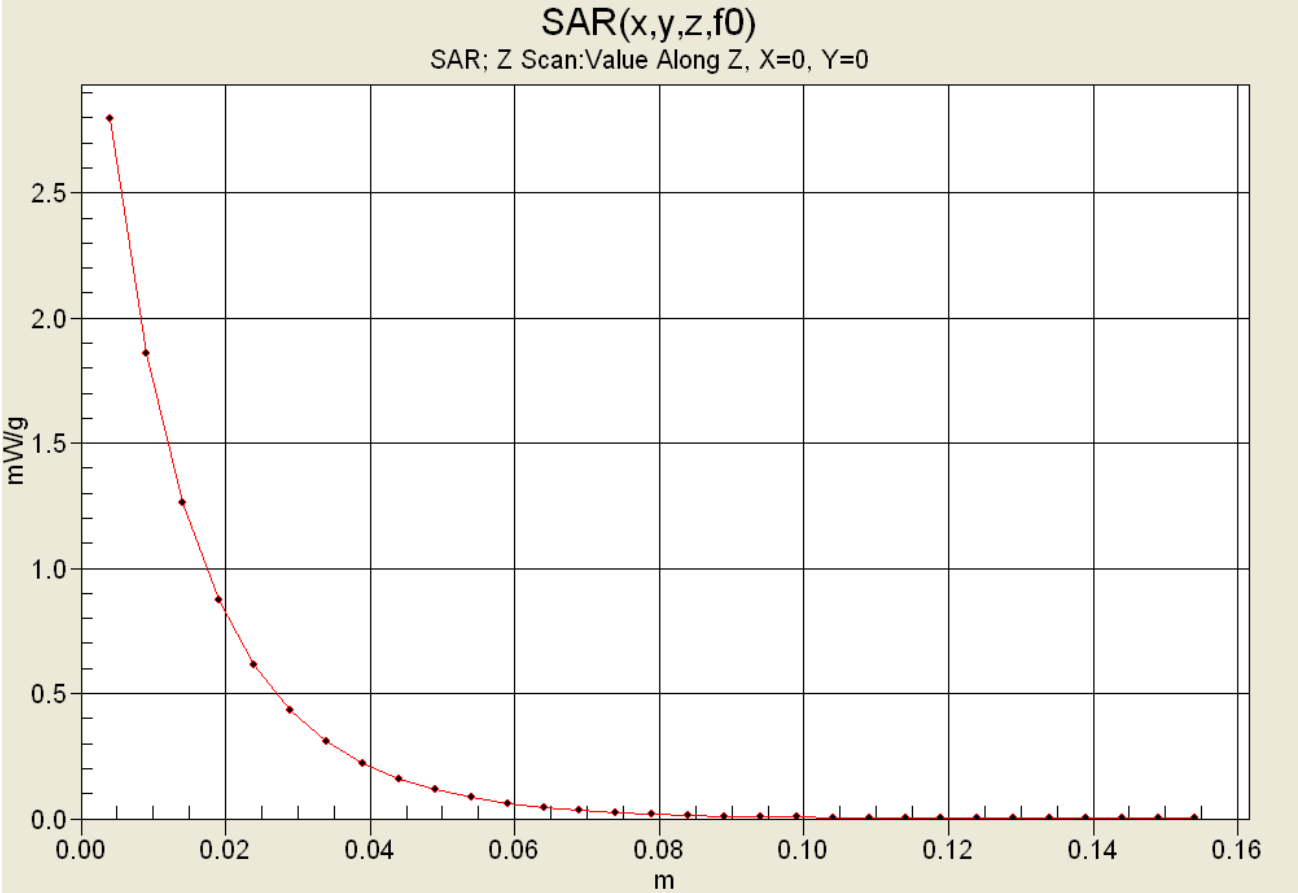
- Probe: ET3DV6 - SN1590; ConvF(6.71, 6.71, 6.71); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

835 MHz Dipole - System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

835 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.7 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 3.93 W/kg
SAR(1 g) = 2.60 mW/g; SAR(10 g) = 1.69 mW/g



Z-Axis Scan



Date Tested: 03/07/05

System Performance Check - 835 MHz Dipole

DUT: Dipole 835 MHz; Model: D835V2; Type: System Performance Check; Serial: 411; Calibrated: 03/16/2004

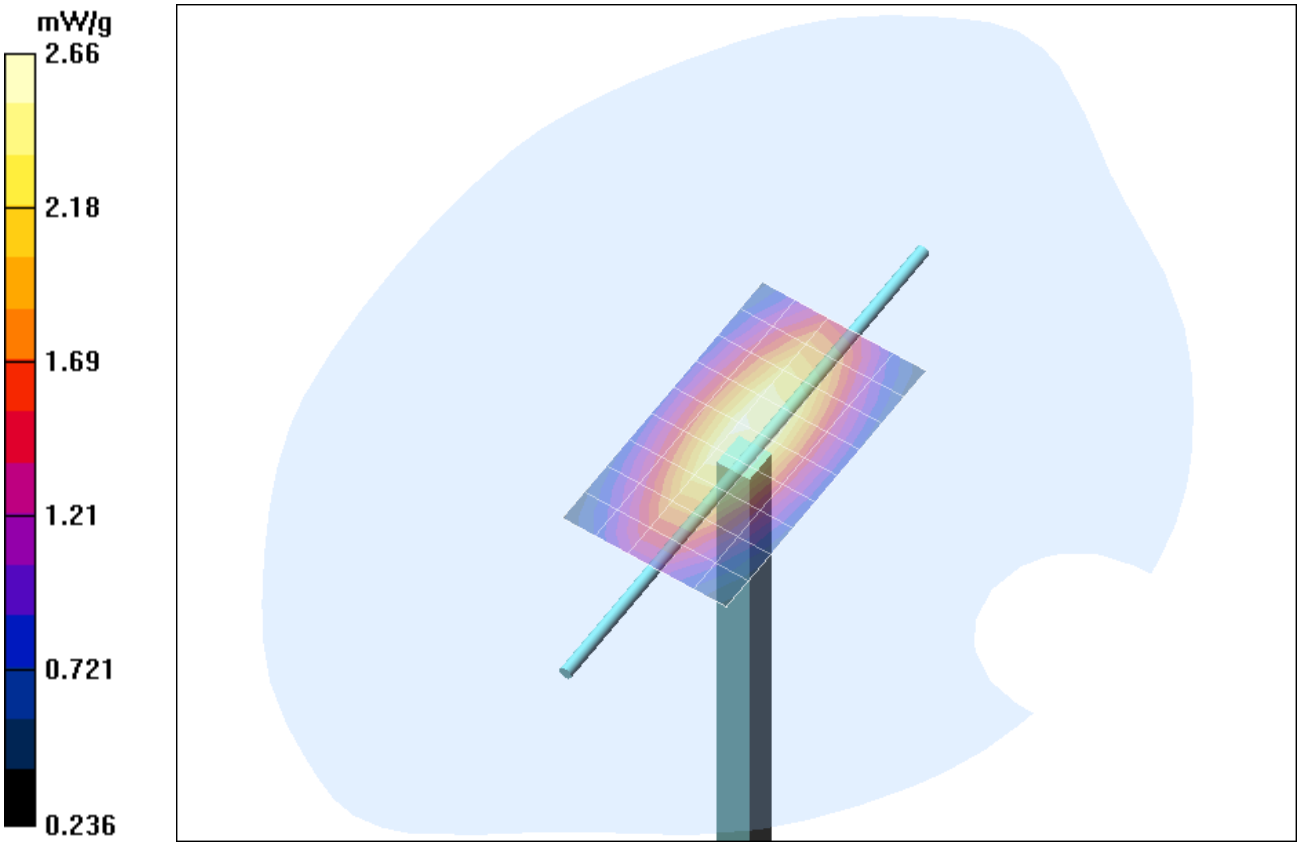
Ambient Temp: 23.3 °C; Fluid Temp: 22.2 °C; Barometric Pressure: 102.3 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: (σ = 0.93 mho/m; ε_r = 41.7; ρ = 1000 kg/m^3)

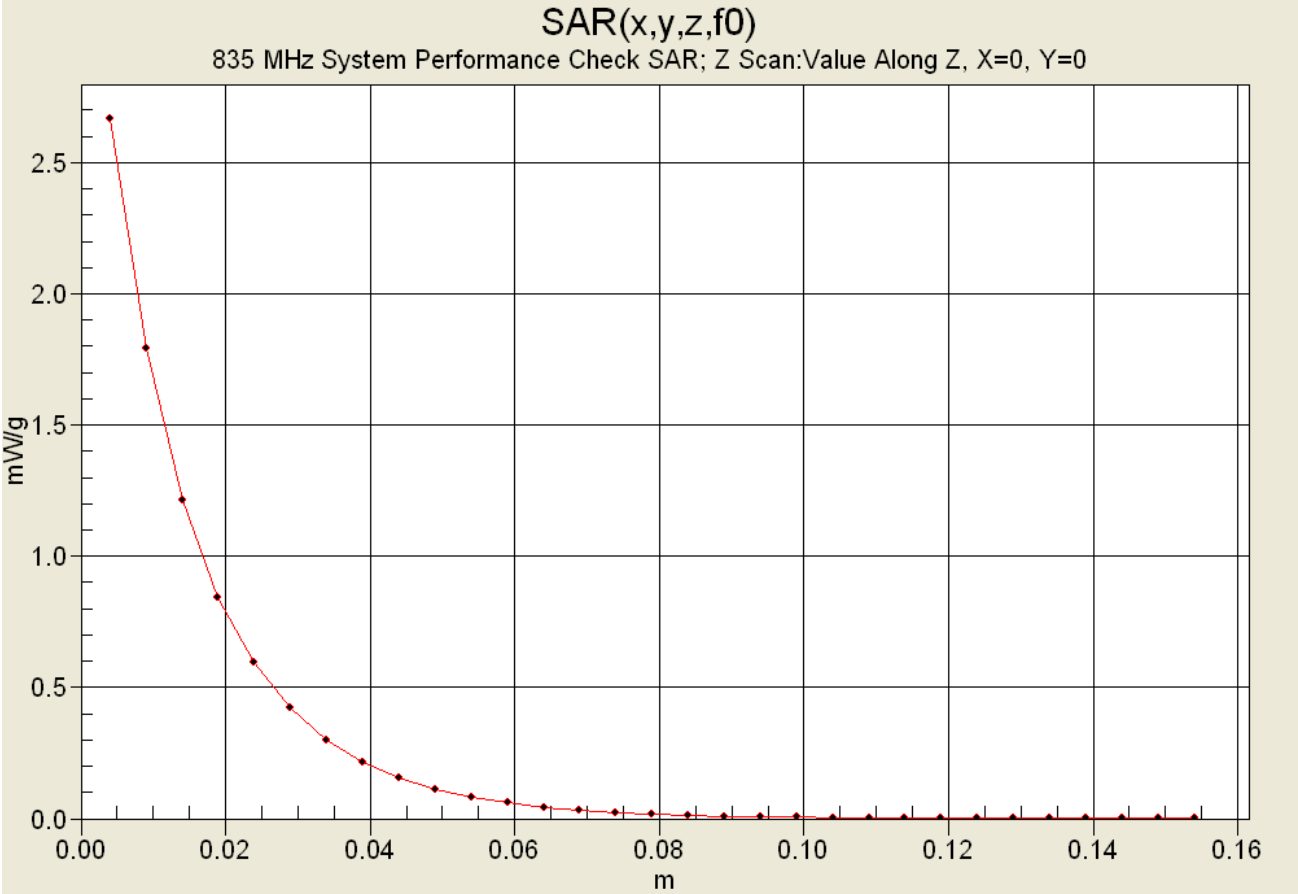
- Probe: ET3DV6 - SN1590; ConvF(6.71, 6.71, 6.71); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

835 MHz Dipole - System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

835 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.3 V/m; Power Drift = 0.0008 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g



Z-Axis Scan



Date Tested: 03/08/05

System Performance Check - 835 MHz Dipole

DUT: Dipole 835 MHz; Model: D835V2; Type: System Performance Check; Serial: 411; Calibrated: 03/16/2004

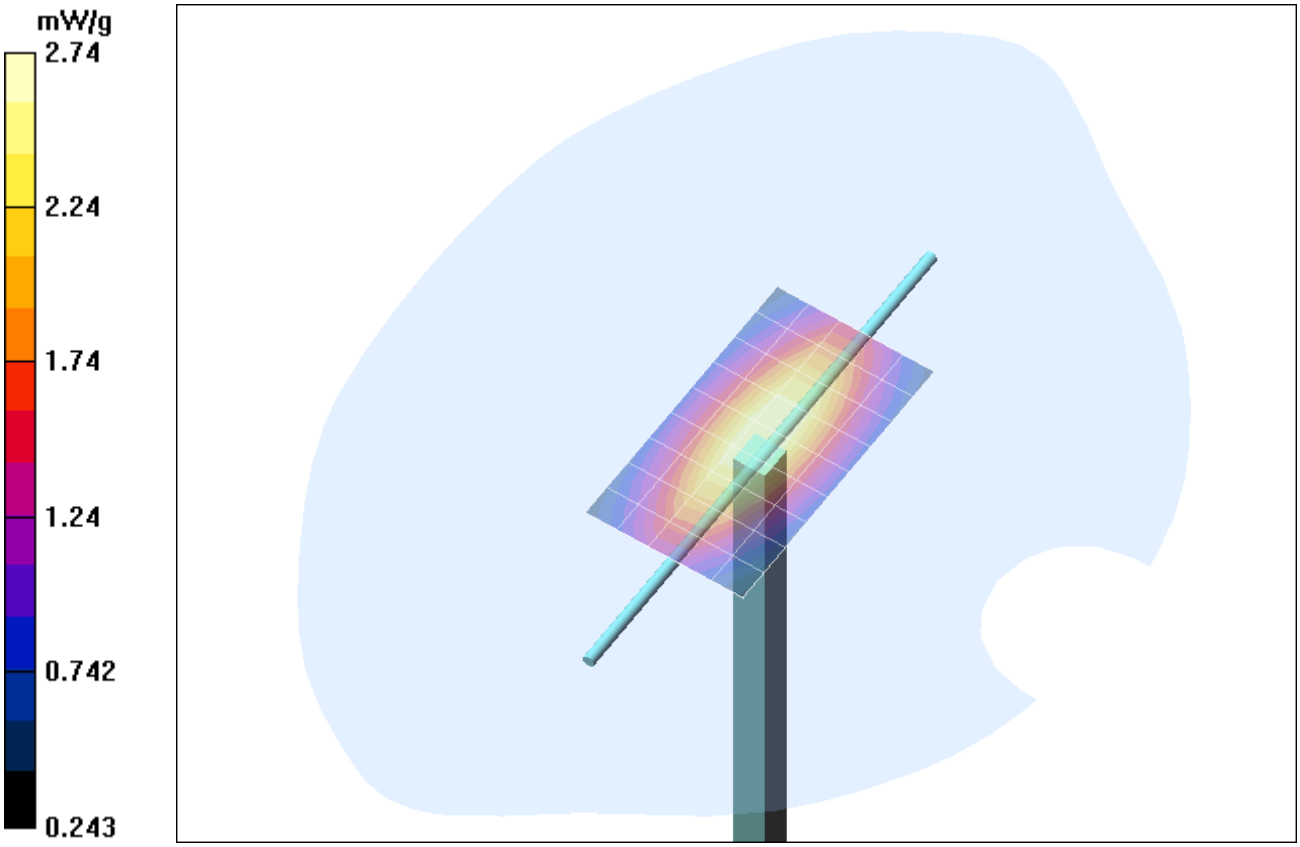
Ambient Temp: 23.0 °C; Fluid Temp: 22.5 °C; Barometric Pressure: 102.8 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 (σ = 0.90 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3)

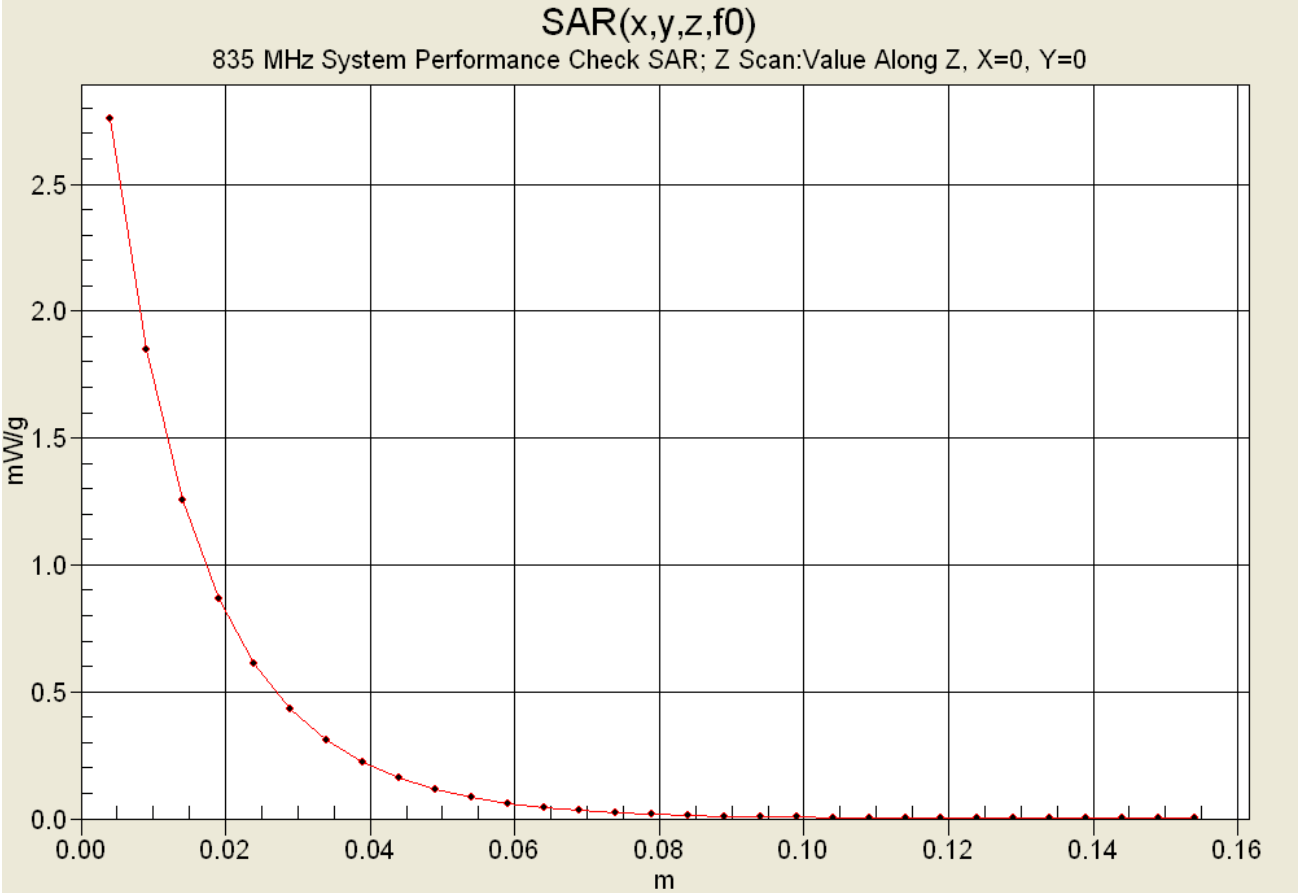
- Probe: ET3DV6 - SN1590; ConvF(6.71, 6.71, 6.71); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

835 MHz Dipole - System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

835 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.2 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 3.74 W/kg
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.66 mW/g



Z-Axis Scan



Date Tested: 03/08/05

System Performance Check - 1900 MHz Dipole

DUT: Dipole 1900 MHz; Model: D1900V2; Type: System Performance Check; Serial: 151; Calibrated: 06/18/2004

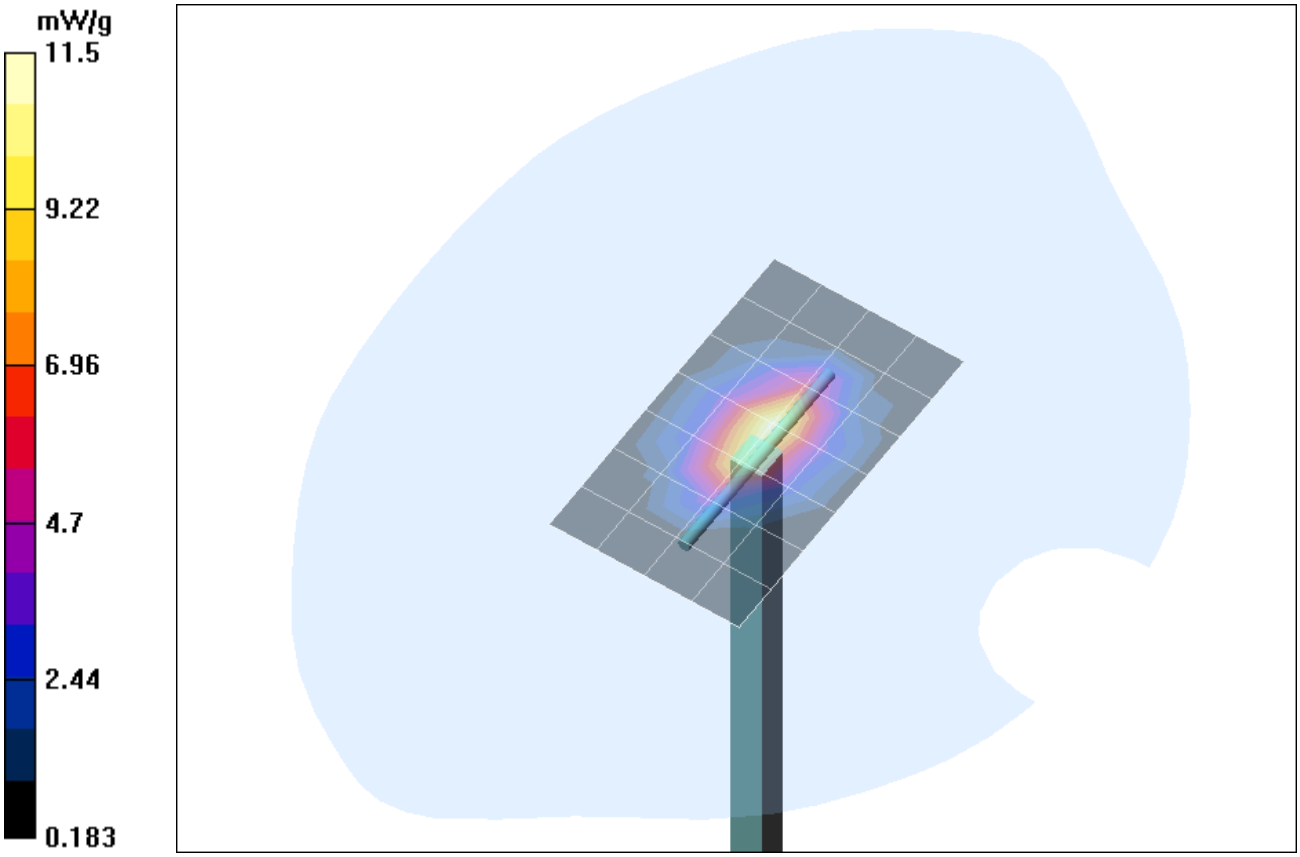
Ambient Temp: 24.7 °C; Fluid Temp: 22.4 °C; Barometric Pressure: 102.5 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 (σ = 1.38 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3)

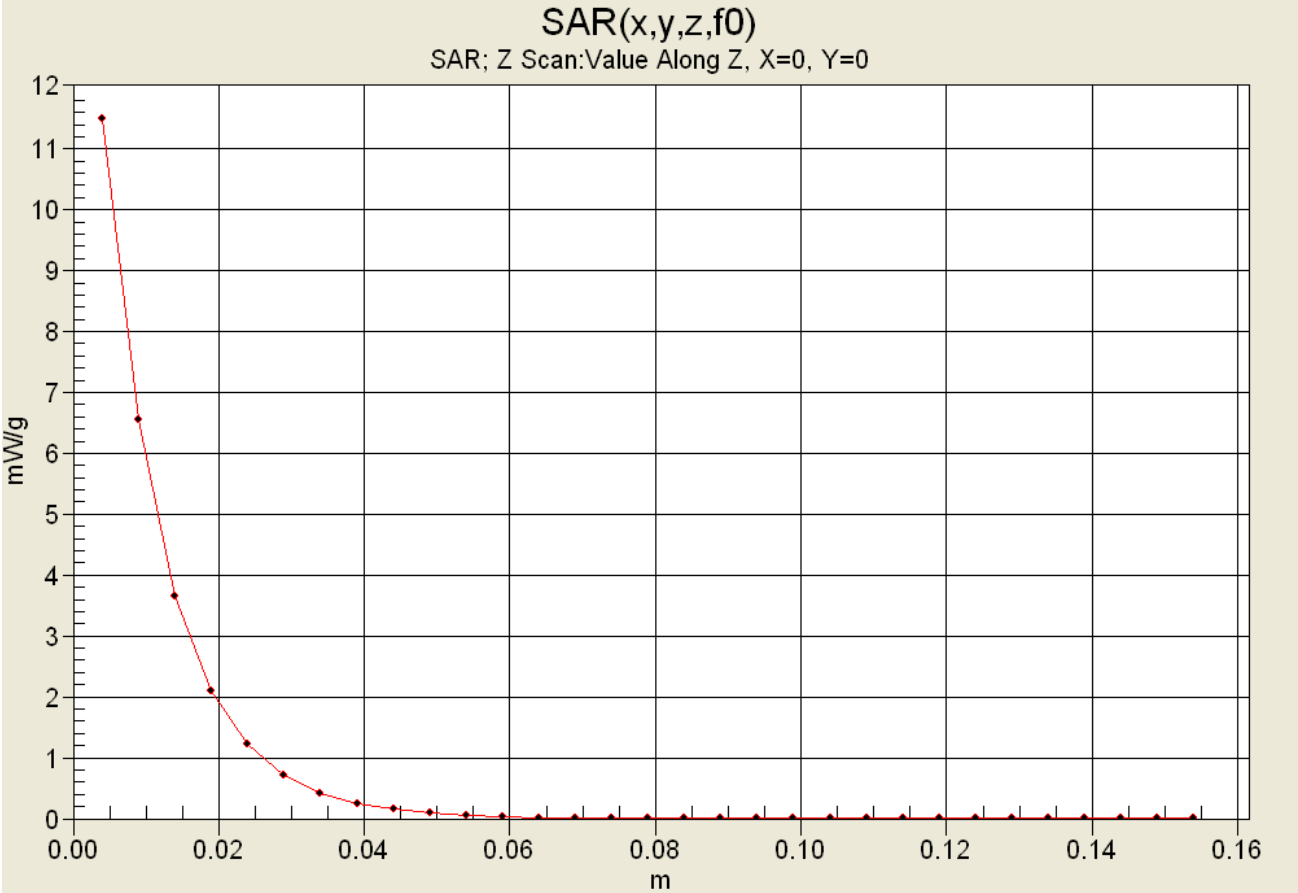
- Probe: ET3DV6 - SN1590; ConvF(5.03, 5.03, 5.03); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

1900 MHz Dipole - System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm

1900 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.31 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

835 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 04, 2005

Frequency	e'	e"
735.000000 MHz	53.6218	21.5981
745.000000 MHz	53.5365	21.4975
755.000000 MHz	53.4494	21.4528
765.000000 MHz	53.3648	21.3846
775.000000 MHz	53.2824	21.2588
785.000000 MHz	53.2297	21.2462
795.000000 MHz	53.0473	21.2094
805.000000 MHz	52.9515	21.1446
815.000000 MHz	52.8450	21.1017
825.000000 MHz	52.6195	21.1019
835.000000 MHz	52.5563	21.1066
845.000000 MHz	52.4221	21.0388
855.000000 MHz	52.3404	20.9700
865.000000 MHz	52.2896	20.9767
875.000000 MHz	52.2446	20.9172
885.000000 MHz	52.1439	20.8425
895.000000 MHz	52.1296	20.7940
905.000000 MHz	51.9977	20.7027
915.000000 MHz	51.8738	20.7029
925.000000 MHz	51.7615	20.6689
935.000000 MHz	51.6111	20.6307

835 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 04, 2005

Frequency	e'	e"
735.000000 MHz	42.4564	20.0828
745.000000 MHz	42.3893	20.0200
755.000000 MHz	42.1642	19.9763
765.000000 MHz	42.0636	19.8858
775.000000 MHz	41.9045	19.8802
785.000000 MHz	41.7719	19.8078
795.000000 MHz	41.7220	19.8251
805.000000 MHz	41.6099	19.7610
815.000000 MHz	41.4248	19.7509
825.000000 MHz	41.3291	19.7177
835.000000 MHz	41.1874	19.6772
845.000000 MHz	41.0796	19.6498
855.000000 MHz	40.9652	19.6046
865.000000 MHz	40.8464	19.5315
875.000000 MHz	40.6902	19.5117
885.000000 MHz	40.5966	19.4500
895.000000 MHz	40.5097	19.4527
905.000000 MHz	40.3576	19.3910
915.000000 MHz	40.2494	19.3820
925.000000 MHz	40.1791	19.3915
935.000000 MHz	40.0383	19.3166

835 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 07, 2005

Frequency	e'	e''
735.000000 MHz	55.0425	22.3618
745.000000 MHz	54.9375	22.2852
755.000000 MHz	54.9087	22.1727
765.000000 MHz	54.7465	22.1661
775.000000 MHz	54.6669	22.0737
785.000000 MHz	54.5186	22.0068
795.000000 MHz	54.4134	21.9499
805.000000 MHz	54.3155	21.8690
815.000000 MHz	54.2176	21.8406
825.000000 MHz	54.1101	21.8500
835.000000 MHz	54.0159	21.7606
845.000000 MHz	53.9328	21.7513
855.000000 MHz	53.8023	21.7055
865.000000 MHz	53.7431	21.6506
875.000000 MHz	53.6033	21.6004
885.000000 MHz	53.5438	21.5264
895.000000 MHz	53.4204	21.5520
905.000000 MHz	53.3057	21.5067
915.000000 MHz	53.2264	21.4228
925.000000 MHz	53.0968	21.4634
935.000000 MHz	52.9996	21.3687

835 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 07, 2005

Frequency	e'	e''
735.000000 MHz	43.0048	20.4425
745.000000 MHz	42.8546	20.3880
755.000000 MHz	42.7892	20.3537
765.000000 MHz	42.6131	20.2754
775.000000 MHz	42.5009	20.2279
785.000000 MHz	42.3762	20.2020
795.000000 MHz	42.2297	20.1611
805.000000 MHz	42.0880	20.1206
815.000000 MHz	41.9763	20.0951
825.000000 MHz	41.8850	20.0330
835.000000 MHz	41.7186	19.9935
845.000000 MHz	41.6061	19.9616
855.000000 MHz	41.4658	19.8922
865.000000 MHz	41.3601	19.8765
875.000000 MHz	41.1896	19.8704
885.000000 MHz	41.1407	19.8502
895.000000 MHz	40.9796	19.7636
905.000000 MHz	40.9144	19.7699
915.000000 MHz	40.7819	19.7228
925.000000 MHz	40.6291	19.6933
935.000000 MHz	40.5414	19.6745

835 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 08, 2005

Frequency	e'	e''
735.000000 MHz	54.3602	21.9316
745.000000 MHz	54.2383	21.8460
755.000000 MHz	54.1230	21.7484
765.000000 MHz	54.0424	21.6886
775.000000 MHz	53.9259	21.7178
785.000000 MHz	53.8224	21.6327
795.000000 MHz	53.6897	21.6167
805.000000 MHz	53.6146	21.4909
815.000000 MHz	53.5017	21.5043
825.000000 MHz	53.4129	21.4146
835.000000 MHz	53.3585	21.3804
845.000000 MHz	53.2130	21.3416
855.000000 MHz	53.1117	21.2772
865.000000 MHz	53.0018	21.2658
875.000000 MHz	52.8651	21.2279
885.000000 MHz	52.8339	21.1779
895.000000 MHz	52.6921	21.1602
905.000000 MHz	52.6547	21.1449
915.000000 MHz	52.5624	21.0736
925.000000 MHz	52.3953	21.0640
935.000000 MHz	52.2841	21.0032

835 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 08, 2005

Frequency	e'	e''
735.000000 MHz	41.5858	19.8027
745.000000 MHz	41.4510	19.7822
755.000000 MHz	41.3062	19.7027
765.000000 MHz	41.1899	19.6297
775.000000 MHz	41.1146	19.5930
785.000000 MHz	40.9623	19.5882
795.000000 MHz	40.8301	19.5572
805.000000 MHz	40.7422	19.4727
815.000000 MHz	40.5363	19.5179
825.000000 MHz	40.4754	19.4082
835.000000 MHz	40.3699	19.4177
845.000000 MHz	40.1574	19.3633
855.000000 MHz	40.0970	19.3004
865.000000 MHz	39.9677	19.2936
875.000000 MHz	39.8226	19.2518
885.000000 MHz	39.7496	19.2213
895.000000 MHz	39.6360	19.2130
905.000000 MHz	39.5335	19.1287
915.000000 MHz	39.4207	19.1176
925.000000 MHz	39.2998	19.1000
935.000000 MHz	39.1658	19.0586

1880 MHz DUT Evaluation (Body)

Measured Fluid Dielectric Parameters (Muscle)

March 08, 2005

Frequency	e'	e"
1.780000000 GHz	52.6168	14.3678
1.790000000 GHz	52.5689	14.3786
1.800000000 GHz	52.5187	14.4570
1.810000000 GHz	52.4845	14.4495
1.820000000 GHz	52.4443	14.4584
1.830000000 GHz	52.3735	14.5050
1.840000000 GHz	52.3440	14.5343
1.850000000 GHz	52.3208	14.5728
1.860000000 GHz	52.2784	14.5994
1.870000000 GHz	52.2254	14.6322
1.880000000 GHz	52.1789	14.6417
1.890000000 GHz	52.1799	14.7065
1.900000000 GHz	52.1197	14.6966
1.910000000 GHz	52.1139	14.7174
1.920000000 GHz	52.0471	14.7325
1.930000000 GHz	52.0528	14.7934
1.940000000 GHz	52.0403	14.7776
1.950000000 GHz	51.9537	14.8161
1.960000000 GHz	51.9529	14.8366
1.970000000 GHz	51.9128	14.8977
1.980000000 GHz	51.9108	14.9054

1900 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 08, 2005

Frequency	e'	e"
1.800000000 GHz	38.5410	12.8257
1.810000000 GHz	38.5102	12.8530
1.820000000 GHz	38.4758	12.8823
1.830000000 GHz	38.4196	12.9277
1.840000000 GHz	38.3627	12.9350
1.850000000 GHz	38.3160	12.9867
1.860000000 GHz	38.2940	13.0235
1.870000000 GHz	38.2431	13.0396
1.880000000 GHz	38.2295	13.1005
1.890000000 GHz	38.1650	13.0667
1.900000000 GHz	38.1189	13.1182
1.910000000 GHz	38.0961	13.1583
1.920000000 GHz	38.0463	13.1949
1.930000000 GHz	38.0003	13.2030
1.940000000 GHz	37.9536	13.2177
1.950000000 GHz	37.9231	13.2425
1.960000000 GHz	37.8932	13.2987
1.970000000 GHz	37.8359	13.3004
1.980000000 GHz	37.8030	13.3299
1.990000000 GHz	37.7421	13.3631
2.000000000 GHz	37.6962	13.3955

APPENDIX E - SYSTEM VALIDATION

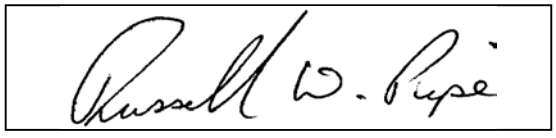
Celltech
Testing and Engineering Services Lab

835 MHz SYSTEM VALIDATION DIPOLE

Type:	**835 MHz Validation Dipole**
Serial Number:	**411**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**March 16, 2004**

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

Calibrated by: 

Approved by: 

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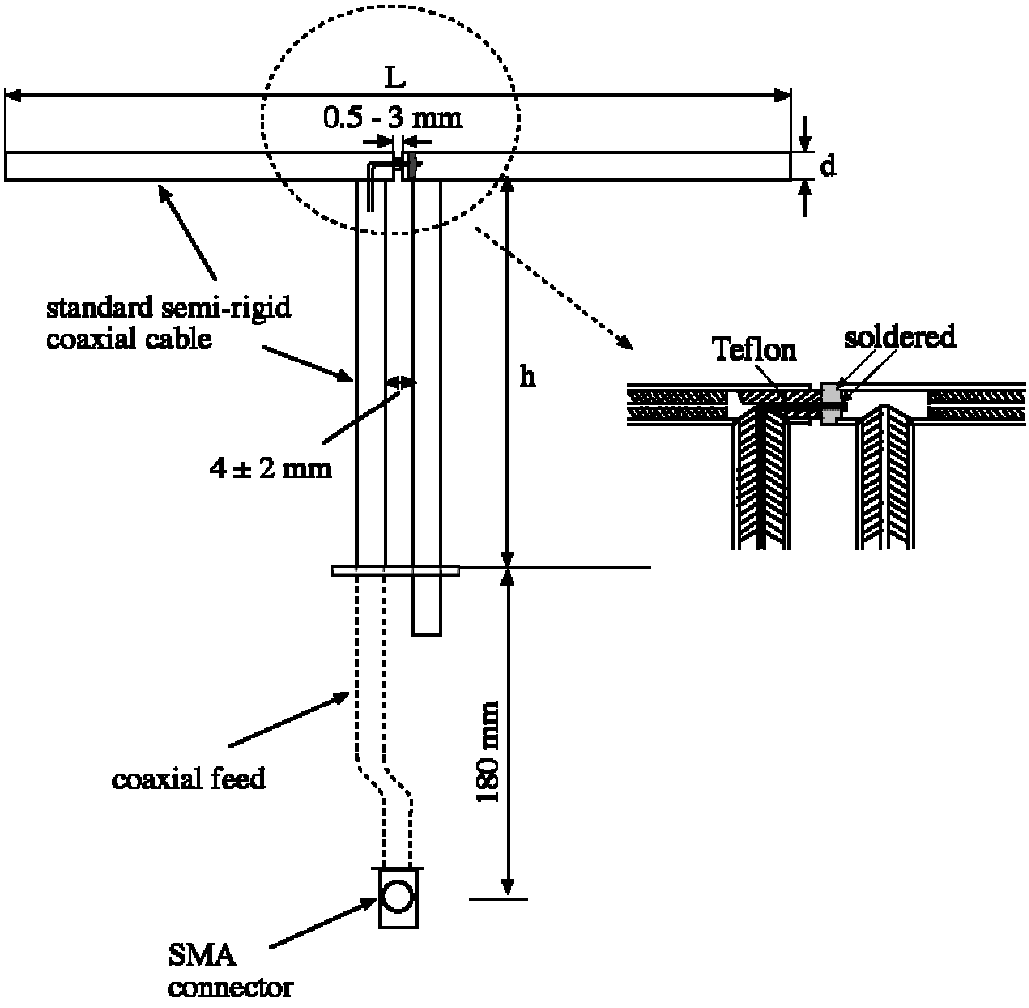
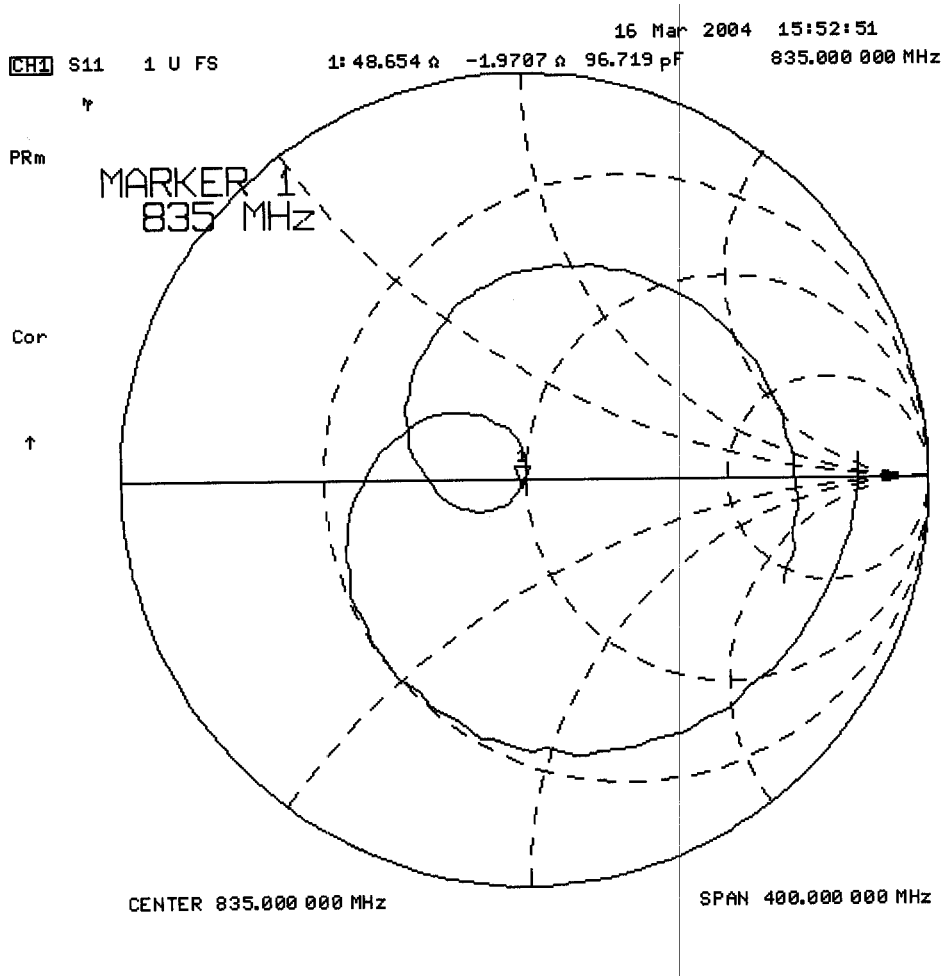
www.celltechlabs.com

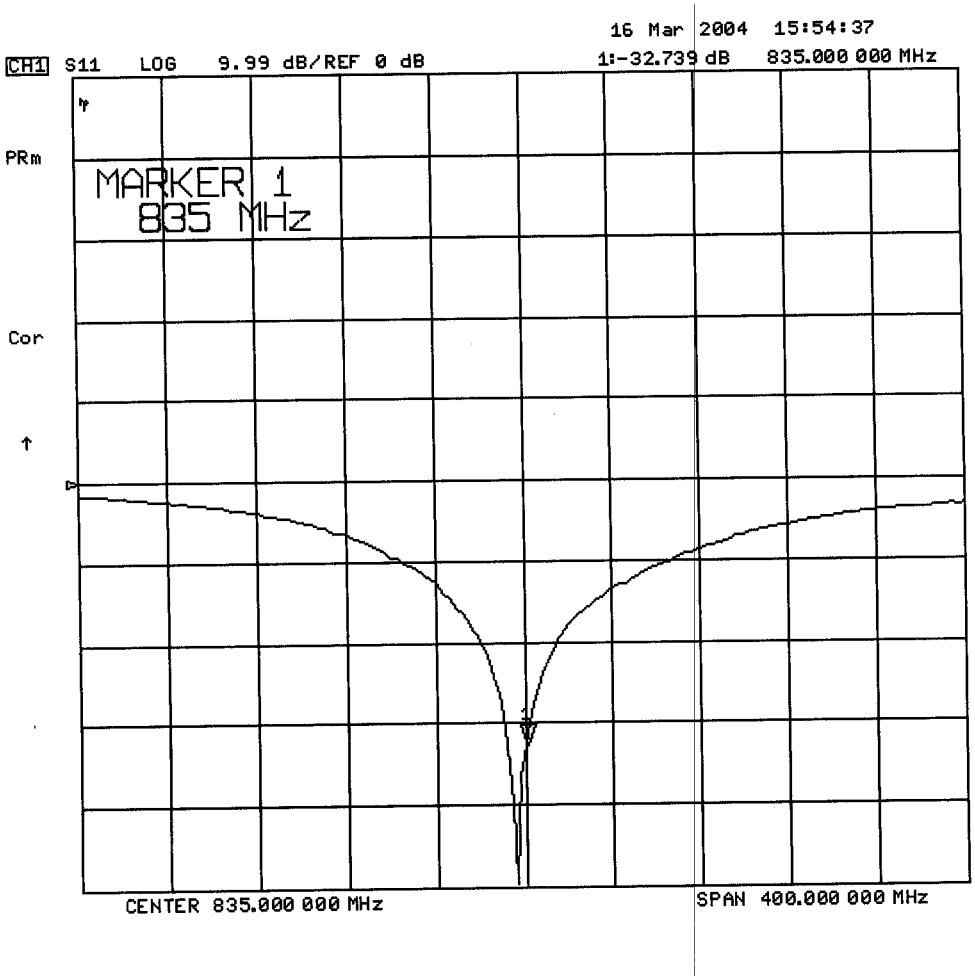
1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 835MHz	Re{Z} = 48.654Ω
	Im{Z} = -1.9707Ω
Return Loss at 835MHz	-32.739dB




16 Mar 2004 15:52:51
CH1 S11 1 U FS
1: 48.654 Ω -1.9707 Ω 96.719 pF
835.000 000 MHz
PRm
MARKER 1
835 MHz
Cor
CENTER 835.000 000 MHz
SPAN 400.000 000 MHz


16 Mar 2004 15:54:37
CH1 S11 LOG 9.99 dB/REF 0 dB
1:-32.739 dB 835.000 000 MHz
PRm
MARKER 1
835 MHz
Cor
CENTER 835.000 000 MHz
SPAN 400.000 000 MHz

Validation Dipole Dimensions

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

2. Validation Phantom

The validation phantom is the SAM (Specific Anthropomorphic Mannequin) phantom manufactured by Schmid & Partner Engineering AG. The SAM phantom is a Fiberglass shell integrated in a wooden table. The shape of the shell corresponds to the phantom defined by SCC34-SC2. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 20 liters
Dimensions: 50 cm (W) x 100 cm (L)

835 MHz System Validation Setup

835 MHz System Validation Setup

3. Measurement Conditions

The SAM phantom was filled with 835 MHz brain simulating tissue.

Relative Permittivity:	42.6
Conductivity:	0.94 mho/m
Ambient Temperature:	24.6 °C
Fluid Temperature:	21.9 °C
Fluid Depth:	≥ 15.0 cm
Barometric Pressure:	101.6 kPa
Humidity:	31%

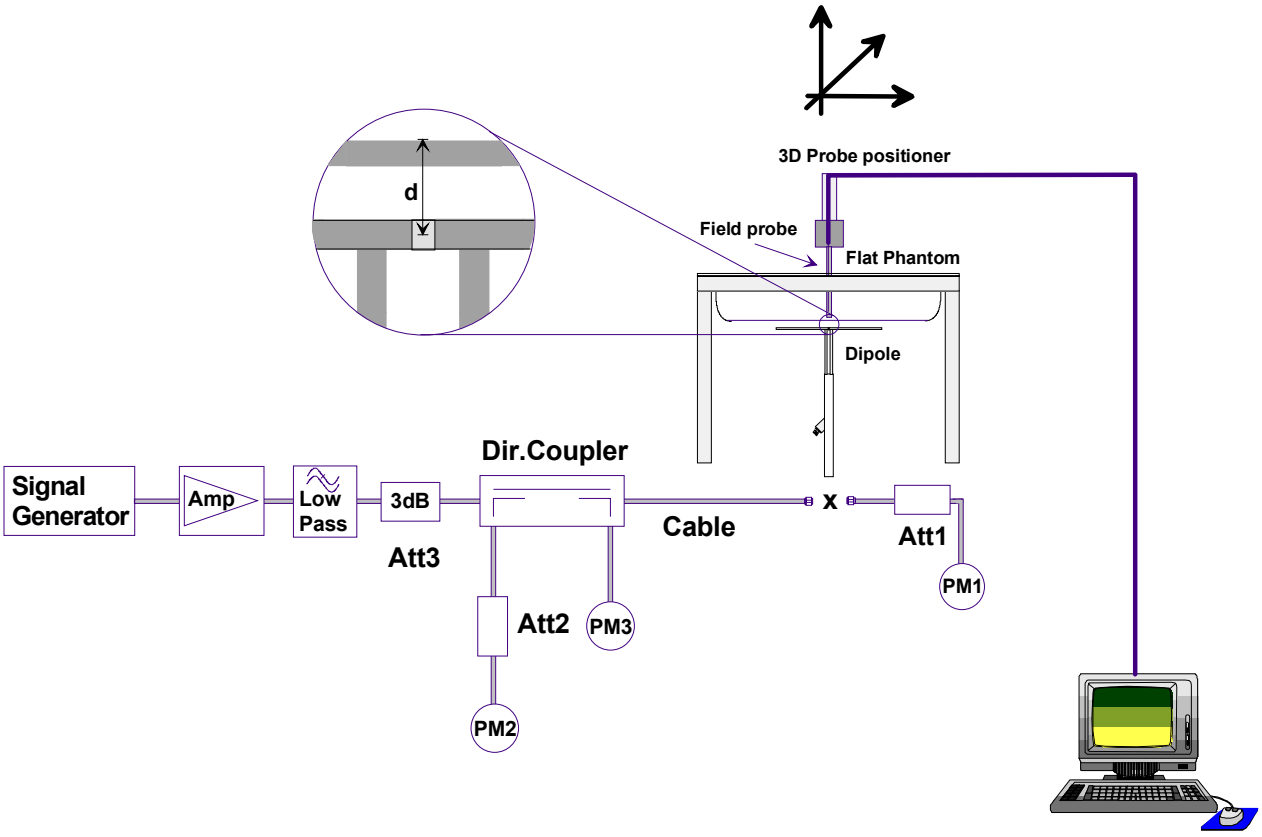
The 835 MHz simulating tissue consists of the following ingredients:

Ingredient	Percentage by weight
Water	40.71%
Sugar	56.63%
Salt	1.48%
HEC	0.99%
Dowicil 75	0.19%
Target Dielectric Parameters at 22 °C	ε_r = 41.5 σ = 0.90 S/m

Measurements were taken in the flat section of the SAM phantom using a dosimetric E-field probe ET3DV6 (s/n: 1590, conversion factor 7.0).

4. SAR Measurement

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



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

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

Validation Dipole SAR Test Results

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	2.46	9.84	1.61	6.44	3.56
Test 2	2.45	9.80	1.60	6.40	3.56
Test 3	2.45	9.80	1.61	6.44	3.56
Test 4	2.44	9.76	1.60	6.40	3.55
Test 5	2.43	9.72	1.60	6.40	3.53
Test 6	2.44	9.76	1.60	6.40	3.53
Test 7	2.44	9.76	1.60	6.40	3.55
Test 8	2.44	9.76	1.60	6.40	3.54
Test 9	2.47	9.88	1.62	6.48	3.58
Test10	2.47	9.88	1.62	6.48	3.62
Average Value	2.45	9.80	1.61	6.42	3.56

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

Averaged over 1cm (1g) of tissue: 9.80 mW/g

Averaged over 10cm (10g) of tissue: 6.42 mW/g

835 MHz System Validation - March 16, 2004

DUT: Dipole 835 MHz; Type: D835V2; Serial: 411
Ambient Temp: 24.6°C; Fluid Temp: 21.9°C; Barometric Pressure: 101.6 kPa; Humidity: 31%

Communication System: CW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 (σ = 0.94 mho/m; ε_r = 42.6; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1590; ConvF(7, 7, 7); Calibrated: 15/05/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 19/12/2003
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

835 MHz System Validation/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB

835 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.61 mW/g

835 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.6 mW/g

835 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.61 mW/g

835 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.55 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

835 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.6 mW/g

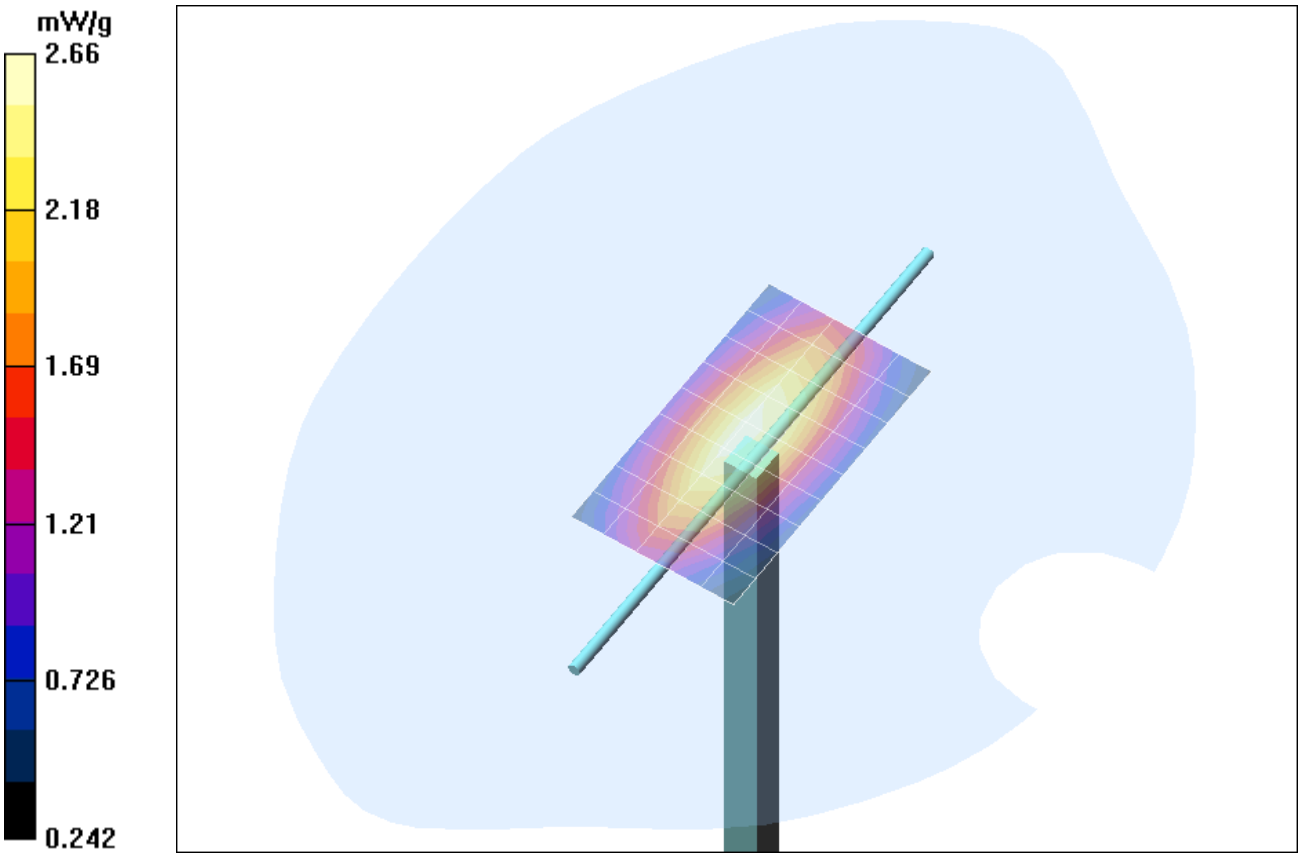
835 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

835 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.55 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

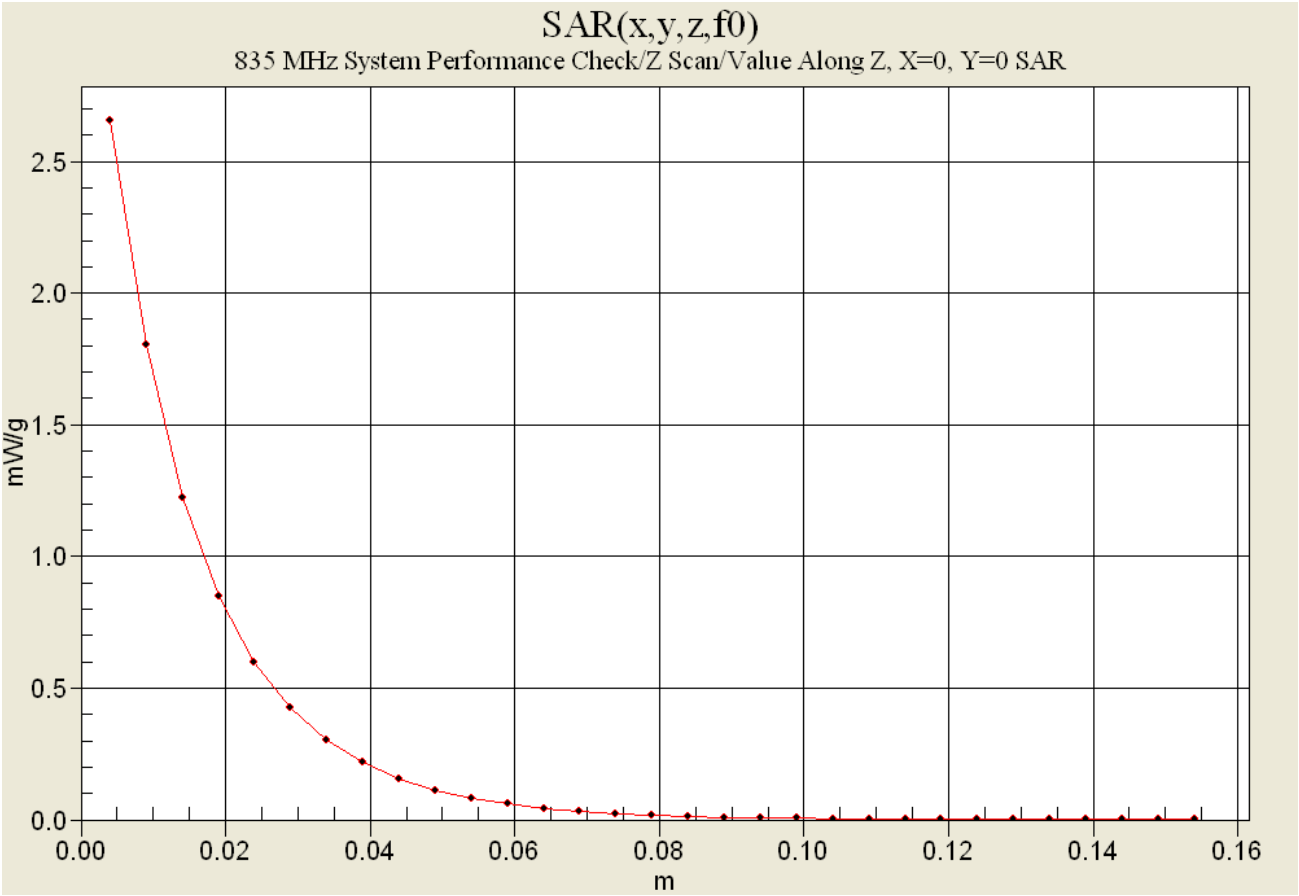
835 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

835 MHz System Validation/Zoom Scan 11 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

835 MHz System Validation/Zoom Scan 12 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g



1 g average of 10 measurements: 2.449 mW/g
10 g average of 10 measurements: 1.606 mW/g



835 MHz System Performance Check

Measured Fluid Dielectric Parameters (Brain)

March 16, 2004

Frequency	e'	e"
735.000000 MHz	43.8577	20.6938
745.000000 MHz	43.6899	20.6481
755.000000 MHz	43.5341	20.5840
765.000000 MHz	43.4161	20.5576
775.000000 MHz	43.3026	20.5312
785.000000 MHz	43.2065	20.5122
795.000000 MHz	43.1067	20.5061
805.000000 MHz	43.0154	20.4762
815.000000 MHz	42.8927	20.4182
825.000000 MHz	42.7420	20.3806
835.000000 MHz	42.6206	20.2993
845.000000 MHz	42.4357	20.2595
855.000000 MHz	42.2984	20.1872
865.000000 MHz	42.1422	20.1432
875.000000 MHz	42.0082	20.1253
885.000000 MHz	41.8996	20.1110
895.000000 MHz	41.8514	20.0192
905.000000 MHz	41.7550	20.0083
915.000000 MHz	41.6535	19.9701
925.000000 MHz	41.5521	19.9380
935.000000 MHz	41.4477	19.9175

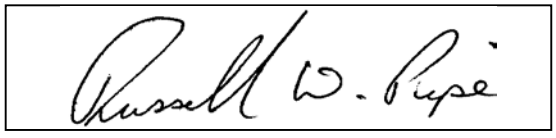
Celltech
Testing and Engineering Services Lab

1900 MHz SYSTEM VALIDATION DIPOLE

Type:	**1900 MHz Validation Dipole**
Serial Number:	**151**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**June 18, 2004**

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

Calibrated by: 

Approved by: 

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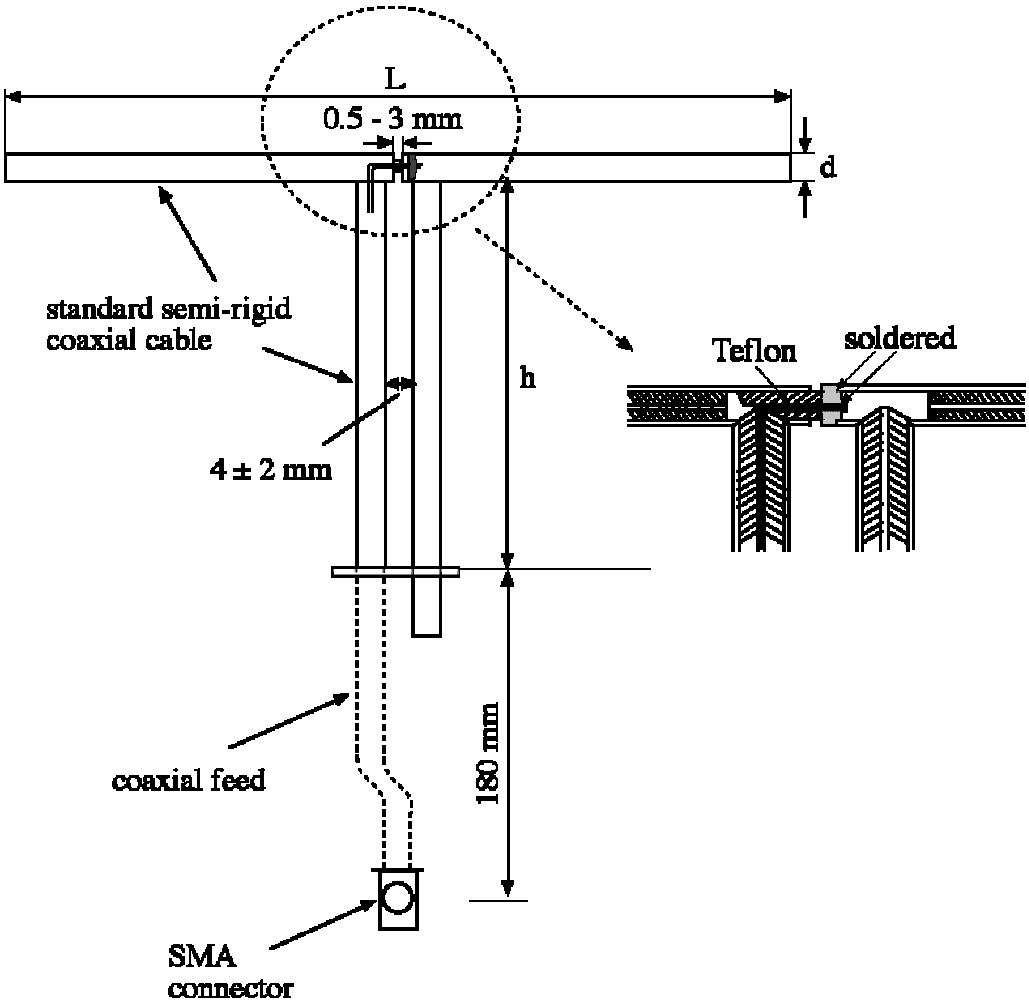
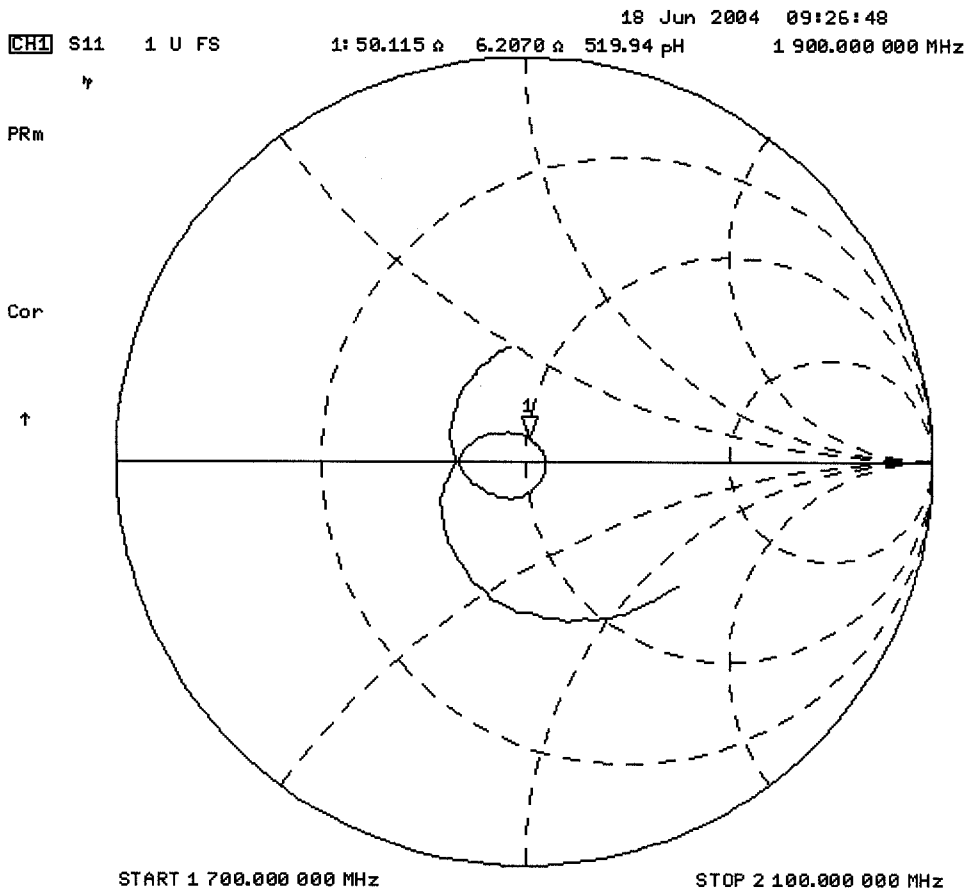
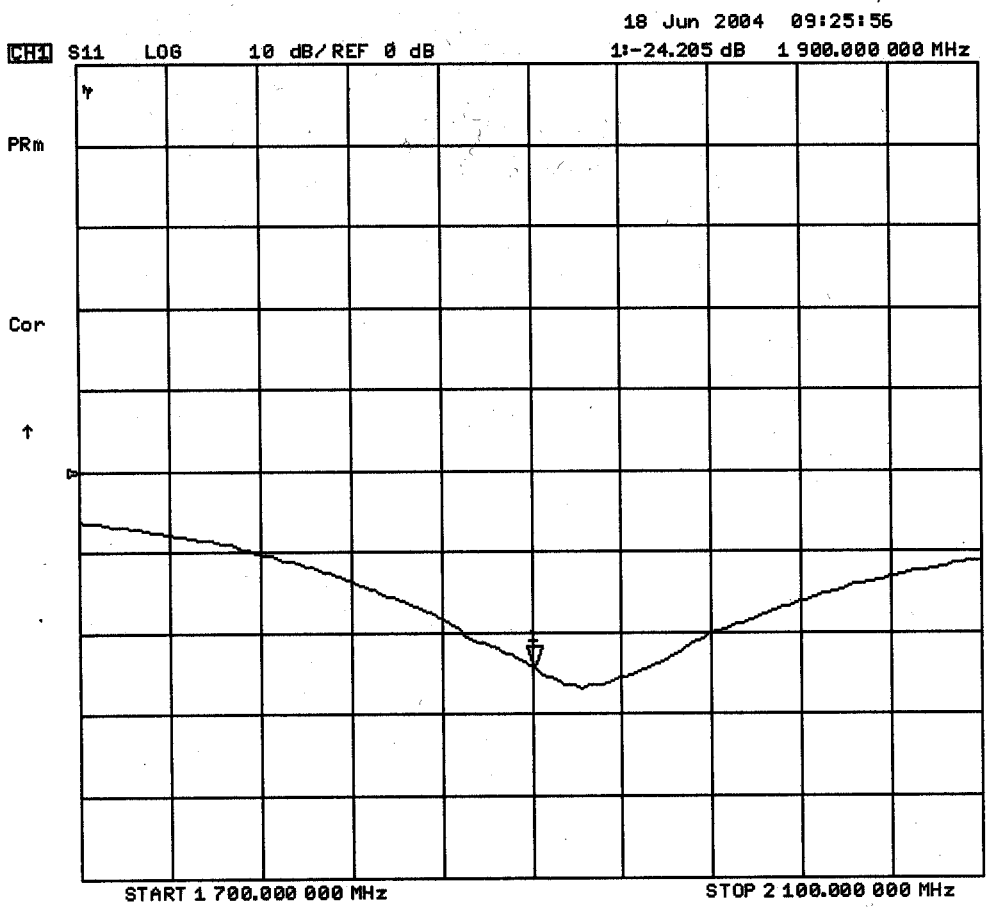
1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 10.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 1900MHz	Re{Z} = 50.115Ω
	Im{Z} = 6.2070Ω
Return Loss at 1900MHz	-24.205dB




18 Jun 2004 09:26:48
CH1 S11 1 U FS
1: 50.115 Ω 6.2070 Ω 519.94 pH
1 900.000 000 MHz
PRm
Cor
1
START 1 700.000 000 MHz
STOP 2 100.000 000 MHz


18 Jun 2004 09:25:56
CH1 S11 LOG 10 dB/ REF 0 dB
1:-24.205 dB 1 900.000 000 MHz
PRm
Cor
START 1 700.000 000 MHz
STOP 2 100.000 000 MHz

Validation Dipole Dimensions

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

2. Validation Phantom

The validation phantom is the SAM (Specific Anthropomorphic Mannequin) phantom manufactured by Schmid & Partner Engineering AG. The SAM phantom is a Fiberglass shell integrated in a wooden table. The shape of the shell corresponds to the phantom defined by SCC34-SC2. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 20 liters
Dimensions: 50 cm (W) x 100 cm (L)

1900 MHz System Validation Setup

1900 MHz System Validation Setup

3. Measurement Conditions

The SAM phantom was filled with 1900 MHz brain simulating tissue.

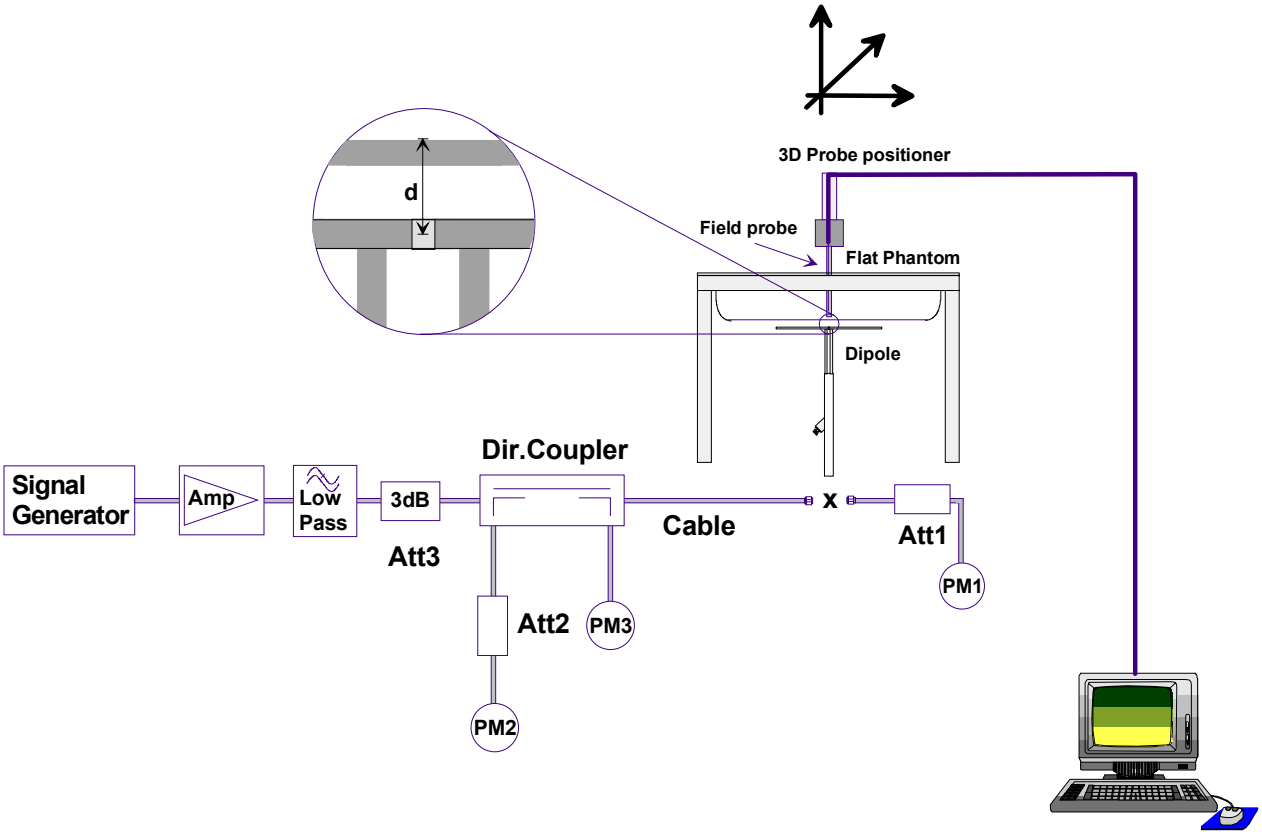
Relative Permittivity:	38.3
Conductivity:	1.43 mho/m
Ambient Temperature:	24.0 °C
Fluid Temperature:	22.6 °C
Fluid Depth:	≥ 15.0 cm
Barometric Pressure:	103.0 kPa
Humidity:	37%

The 1900 MHz tissue simulant consists of the following ingredients:

Ingredient	Percentage by weight
Water	55.85%
Glycol	44.00%
Salt	0.15%
Target Dielectric Parameters at 22 °C	ε_r = 40.0 σ = 1.40 S/m

4. SAR Measurement

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



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 50dB below the forward power.

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

Validation Dipole SAR Test Results

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	10.1	40.40	5.30	21.20	17.4
Test 2	9.93	39.72	5.21	20.84	17.2
Test 3	9.98	39.92	5.23	20.92	17.3
Test 4	9.99	39.96	5.21	20.84	17.4
Test 5	9.97	39.88	5.22	20.88	17.4
Test 6	9.90	39.60	5.20	20.80	17.1
Test 7	9.93	39.72	5.21	20.84	17.2
Test 8	9.96	39.84	5.20	20.80	17.3
Test 9	9.94	39.76	5.20	20.80	17.2
Test 10	9.96	39.84	5.21	20.84	17.2
Average	9.966	39.864	5.219	20.876	17.27

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

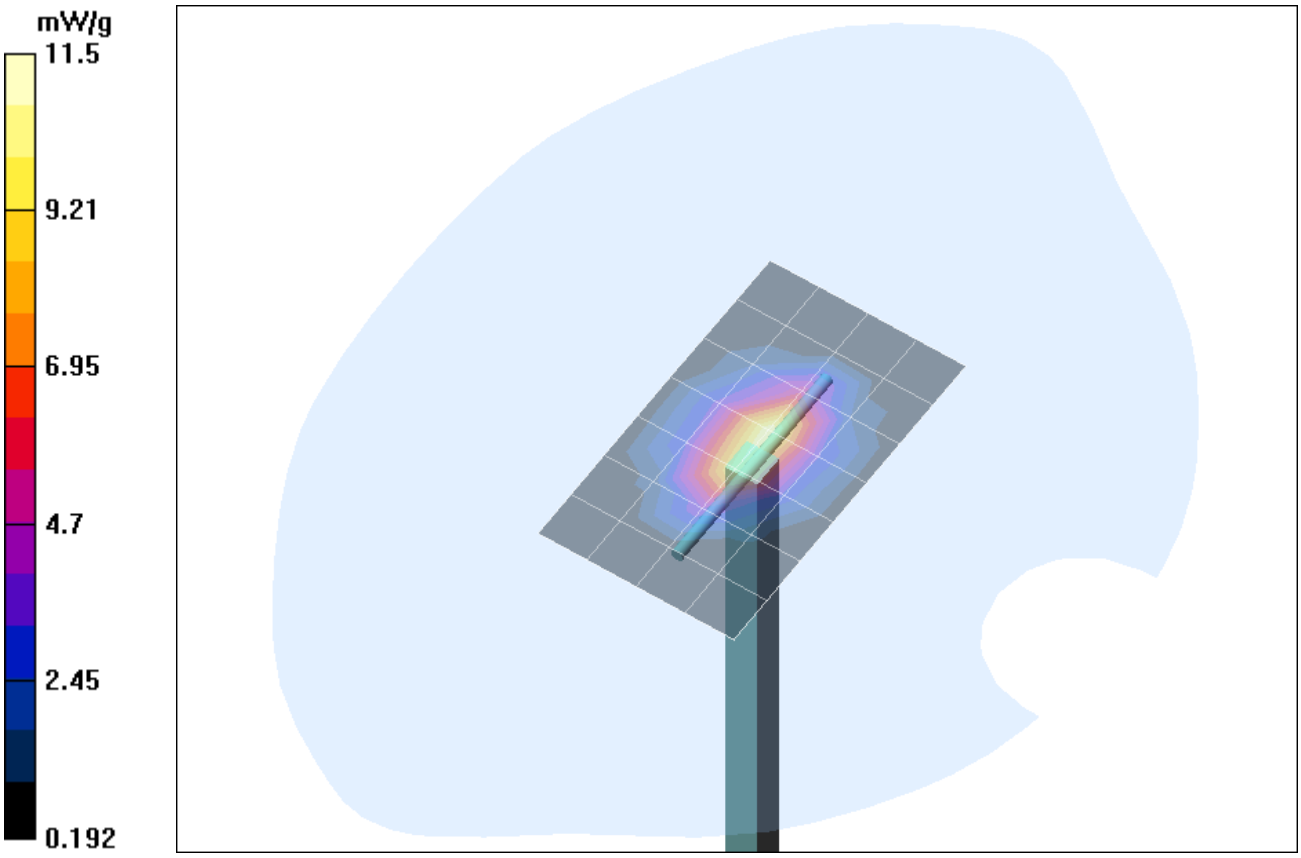
1g/10g Averaged	Average Measured SAR @ 1W Input	IEEE Target SAR @ 1W Input	Deviation (%)
1 gram	39.864	39.7	+ 0.413
10 gram	20.876	20.5	+ 1.835

1900 MHz System Validation - June 18, 2004

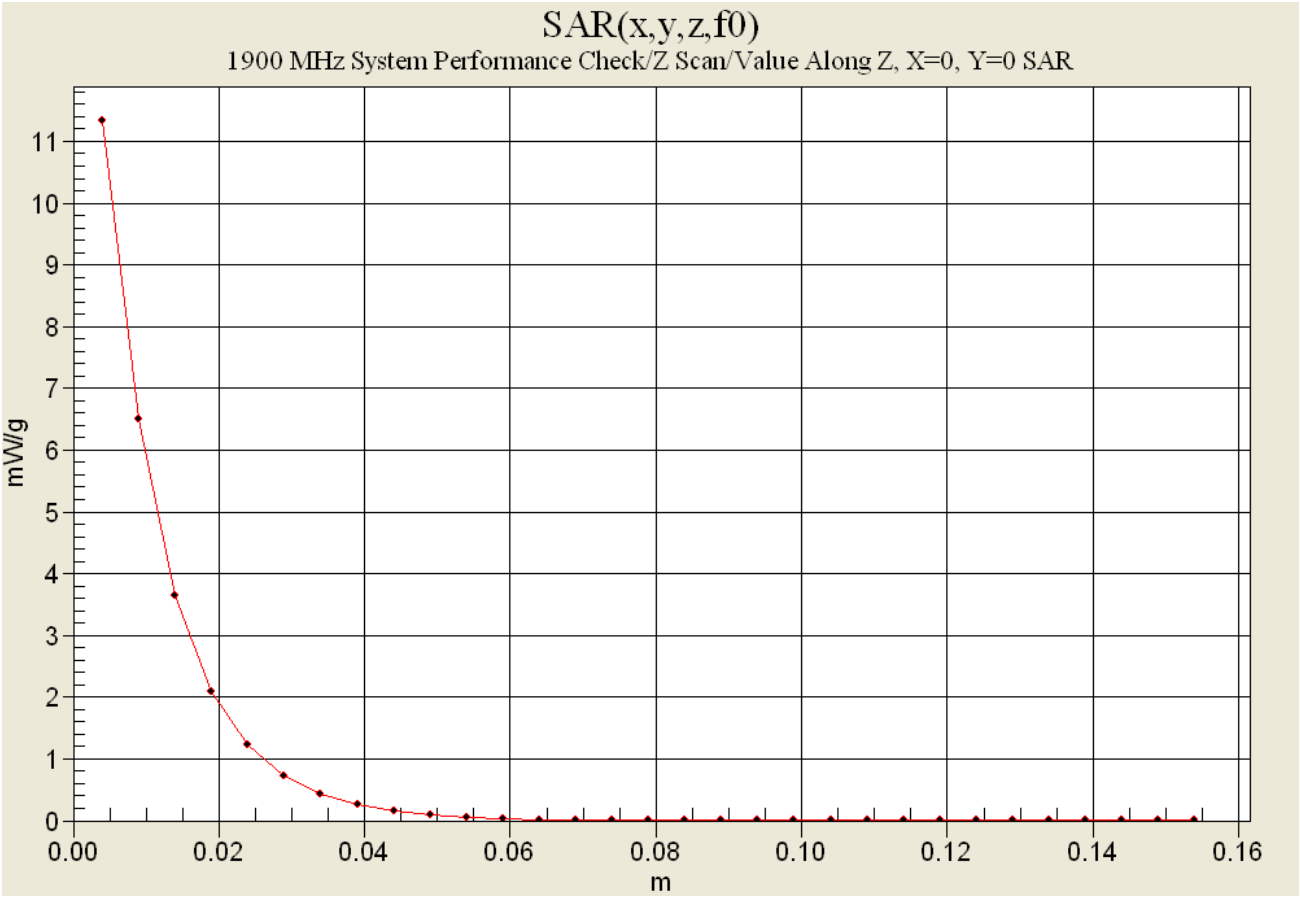
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 151
Ambient Temp: 24.0°C; Fluid Temp: 22.6°C; Barometric Pressure: 103.0 kPa; Humidity: 37%
Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 (σ = 1.43 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.25, 5.25, 5.25); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 14/05/2004
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

1900 MHz System Validation/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 96.9 V/m; Power Drift = 0.1 dB
1900 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.9 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.3 mW/g
1900 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.8 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.21 mW/g
1900 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.2 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 9.98 mW/g; SAR(10 g) = 5.23 mW/g
1900 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.9 V/m; Power Drift = 0.001 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.99 mW/g; SAR(10 g) = 5.21 mW/g
1900 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.2 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.97 mW/g; SAR(10 g) = 5.22 mW/g
1900 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.8 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 9.9 mW/g; SAR(10 g) = 5.2 mW/g
1900 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.8 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.21 mW/g
1900 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.1 V/m; Power Drift = -0.007 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 9.96 mW/g; SAR(10 g) = 5.2 mW/g
1900 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.7 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.94 mW/g; SAR(10 g) = 5.2 mW/g
1900 MHz System Validation/Zoom Scan 10 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.1 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.96 mW/g; SAR(10 g) = 5.21 mW/g



1 g average of 10 measurements: 9.966 mW/g
10 g average of 10 measurements: 5.219 mW/g



1900 MHz System Validation

Measured Fluid Dielectric Parameters (Brain)

June 18, 2004

Frequency	e'	e"
1.800000000 GHz	38.7685	13.2945
1.810000000 GHz	38.7232	13.3253
1.820000000 GHz	38.6647	13.3519
1.830000000 GHz	38.6047	13.3737
1.840000000 GHz	38.5593	13.4078
1.850000000 GHz	38.5136	13.4244
1.860000000 GHz	38.4736	13.4289
1.870000000 GHz	38.4328	13.4399
1.880000000 GHz	38.3934	13.4856
1.890000000 GHz	38.3637	13.4872
1.900000000 GHz	38.3205	13.5178
1.910000000 GHz	38.2981	13.5327
1.920000000 GHz	38.2590	13.5755
1.930000000 GHz	38.2344	13.5976
1.940000000 GHz	38.2172	13.6297
1.950000000 GHz	38.1838	13.6574
1.960000000 GHz	38.1575	13.6807
1.970000000 GHz	38.1070	13.6962
1.980000000 GHz	38.0516	13.7296
1.990000000 GHz	38.0093	13.7634
2.000000000 GHz	37.9485	13.7978

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

APPENDIX H - 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

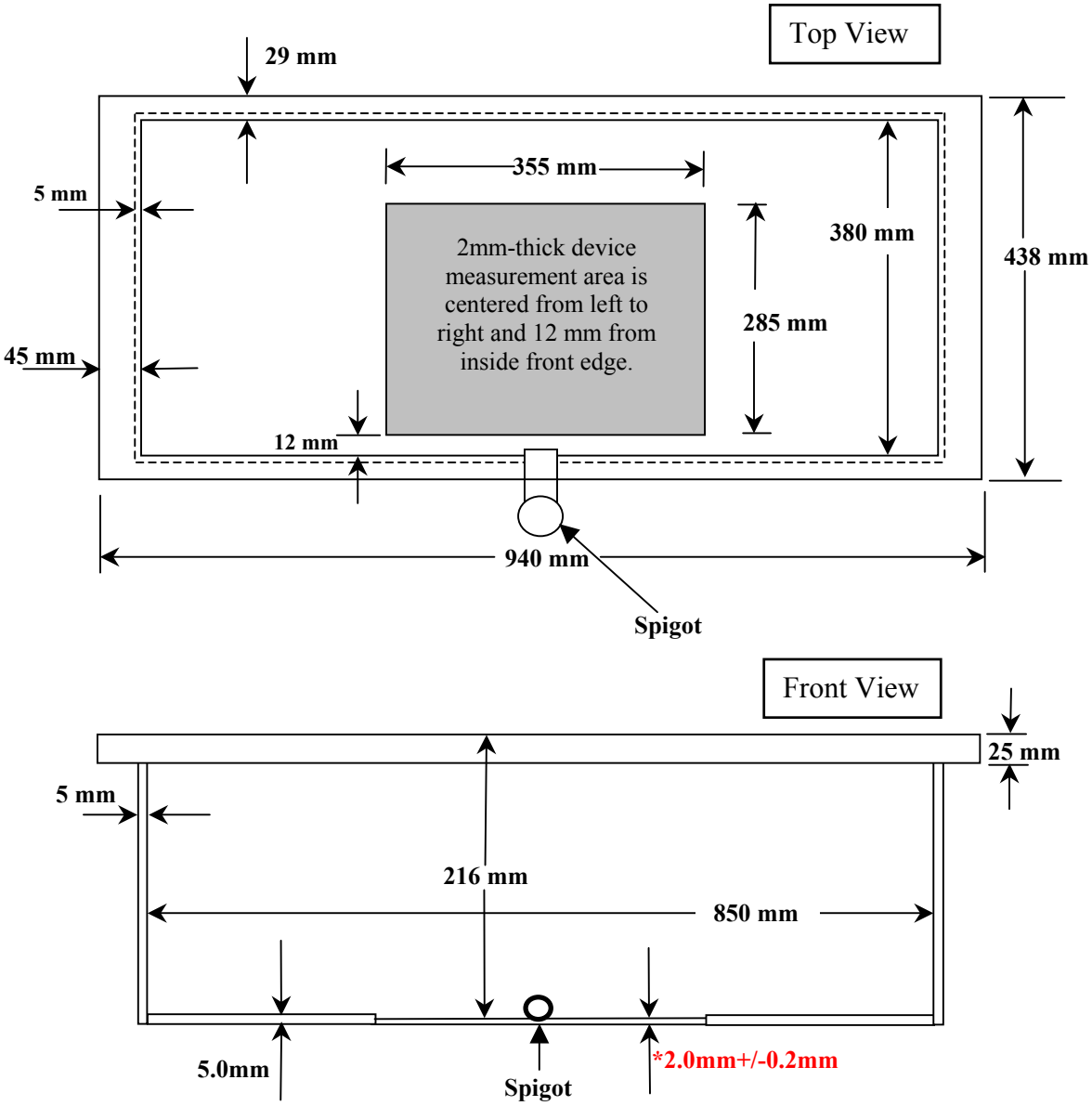
Fiberglass Planar Phantom - Front View

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.