	Date of Evaluation:	March 23, 2007	Document Issue No.:	SV450B-032307-R1.1	
	Evaluation Type:	System Validation	Validation Dipole:	450 MHz	Fluid Type:

450 MHz SYSTEM VALIDATION

Type:

450 MHz Validation Dipole

Asset Number:

00024

Serial Number:

136

Place of Validation:

Celltech Labs Inc.

Date of Validation:

March 23, 2007

Celltech Labs Inc. hereby certifies that the system validation was performed on the date indicated above.

Validated by:



Approved by:

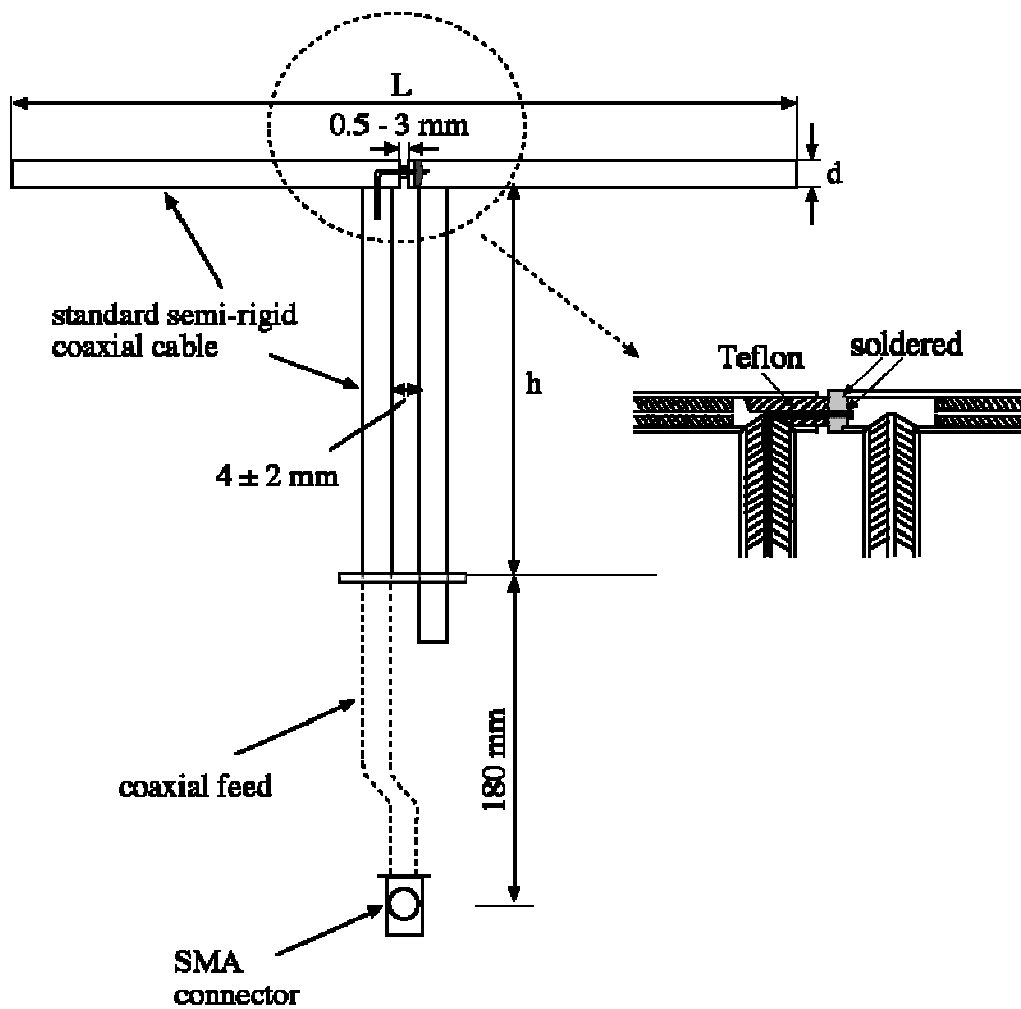


1. Dipole Construction & Electrical Characteristics

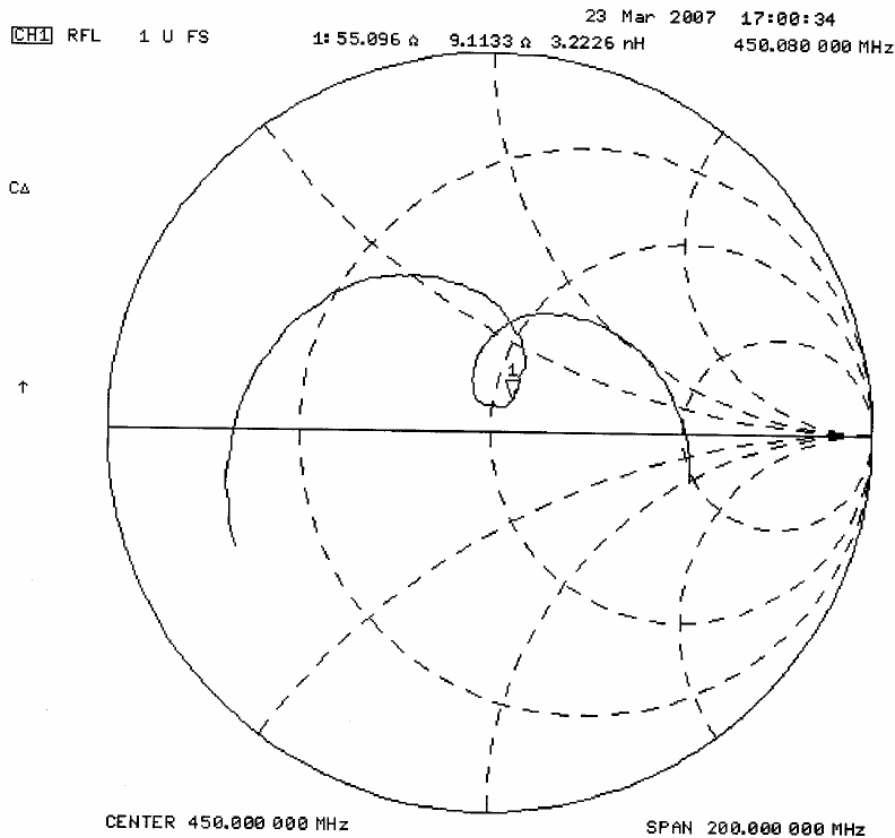
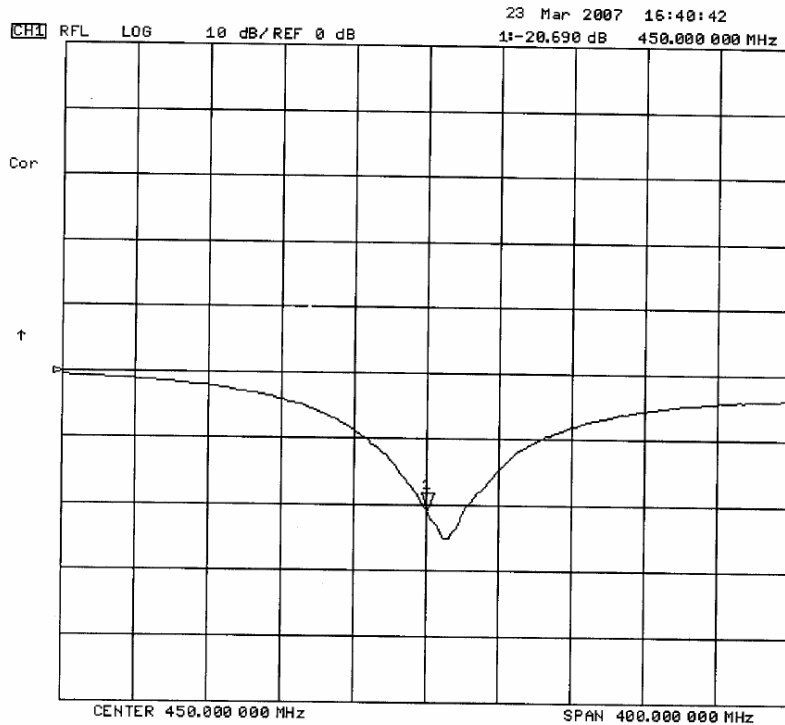
The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753ET Network 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 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 450MHz $\text{Re}\{Z\} = 55.096\Omega$
 $\text{Im}\{Z\} = 9.1133\Omega$

Return Loss at 450MHz -20.690dB



2. Validation Dipole VSWR Data



3. Validation Dipole Dimensions

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

4. Validation Phantom

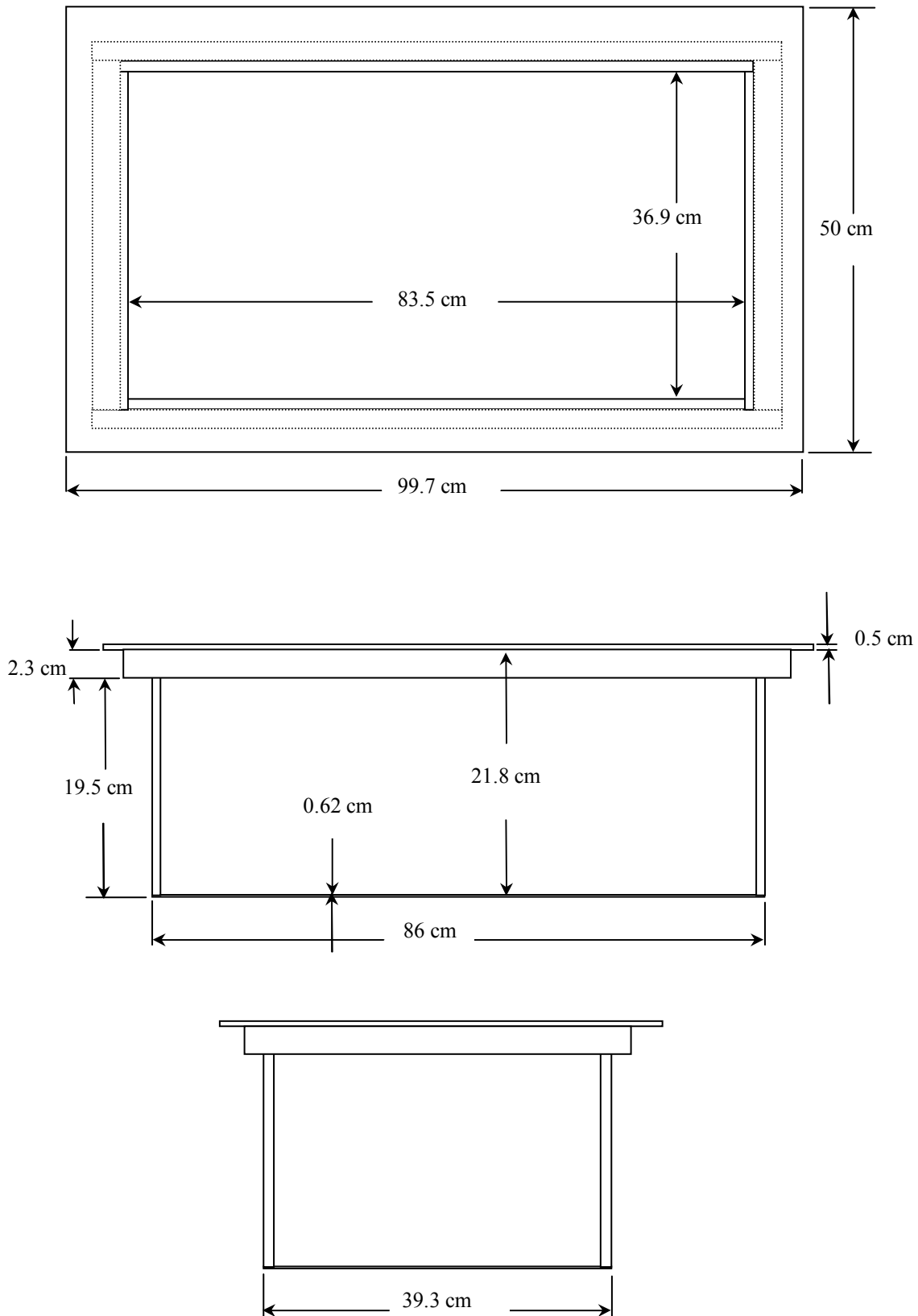
The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material.

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 ± 0.1 mm Plexiglas.

5. Dimensions of Plexiglas Planar Phantom



6. 450 MHz System Validation Setup

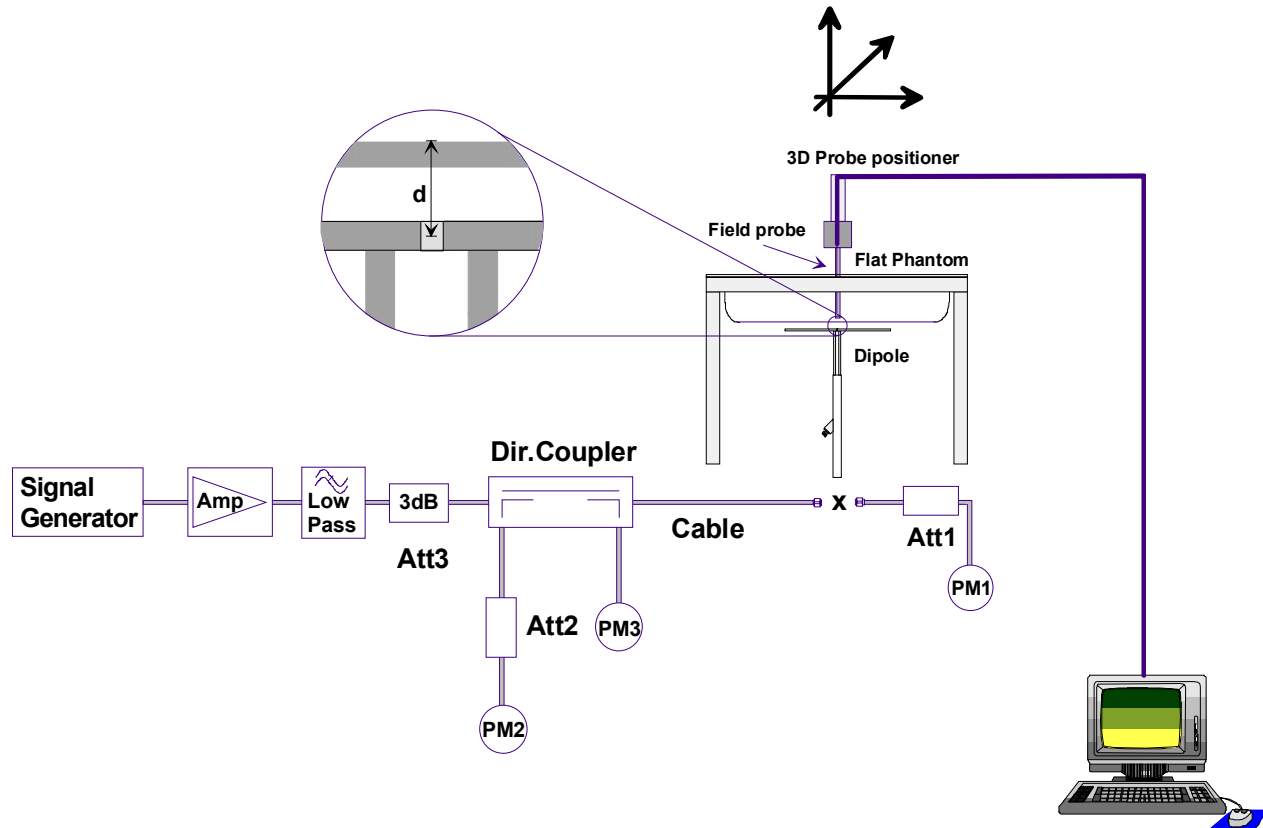


7. 450 MHz Validation Dipole Setup



8. 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.

9. Measurement Conditions

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

Relative Permittivity: 44.4 (+2.1% deviation from target)
 Conductivity: 0.88 mho/m (+1.2% deviation from target)
 Fluid Temperature: 21.3°C
 Fluid Depth: ≥ 15.0 cm
 Environmental Conditions:
 Ambient Temperature: 22.4°C
 Humidity: 31 %
 Barometric Pressure: 101.9kPa


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 Target Dielectric Parameters:	$\epsilon_r = 43.5$ (+/- 5%)	$\sigma = 0.87$ S/m (+/- 5%)

10. 450 MHz System Validation Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
IEEE Target		Measured	Deviation	IEEE Target		Measured	Deviation
1.23	+/- 10%	1.28	+4.1%	4.92	+/- 10%	5.12	+4.1%
SAR @ 0.25W Input averaged over 10g (W/kg)				SAR @ 1W Input averaged over 10g (W/kg)			
IEEE Target		Measured	Deviation	IEEE Target		Measured	Deviation
0.825	+/- 10%	0.820	-0.60%	3.30	+/- 10%	3.28	-0.60%

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

	Date of Evaluation:	March 23, 2007	Document Issue No.:	SV450B-032307-R1.1
	Evaluation Type:	System Validation	Validation Dipole:	450 MHz
			Fluid Type:	Brain

450 MHz - System Validation - 450 MHz Dipole - March 23, 2007

DUT: Dipole 450 MHz; Asset: 00024; Serial: 136

Ambient Temp: 22.4°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.9 kPa; Humidity: 31%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used: $f = 450 \text{ MHz}$; $\sigma = 0.88 \text{ mho/m}$; $\epsilon_r = 44.4$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1387; ConvF(7, 7, 7); Calibrated: 16/03/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

450 MHz System Validation/Area Scan (6x11x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

450 MHz System Validation/Zoom Scan (5x5x7)/Cube 0:

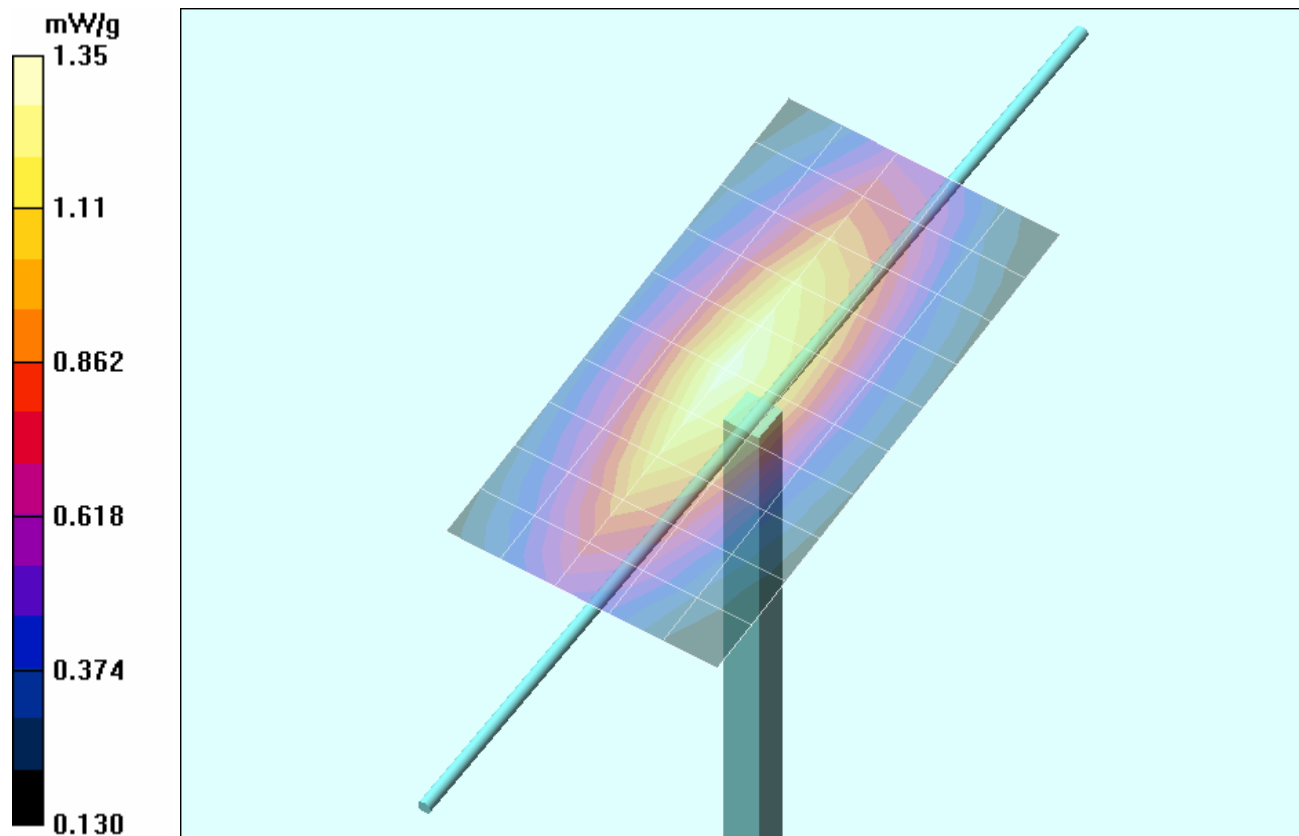
Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

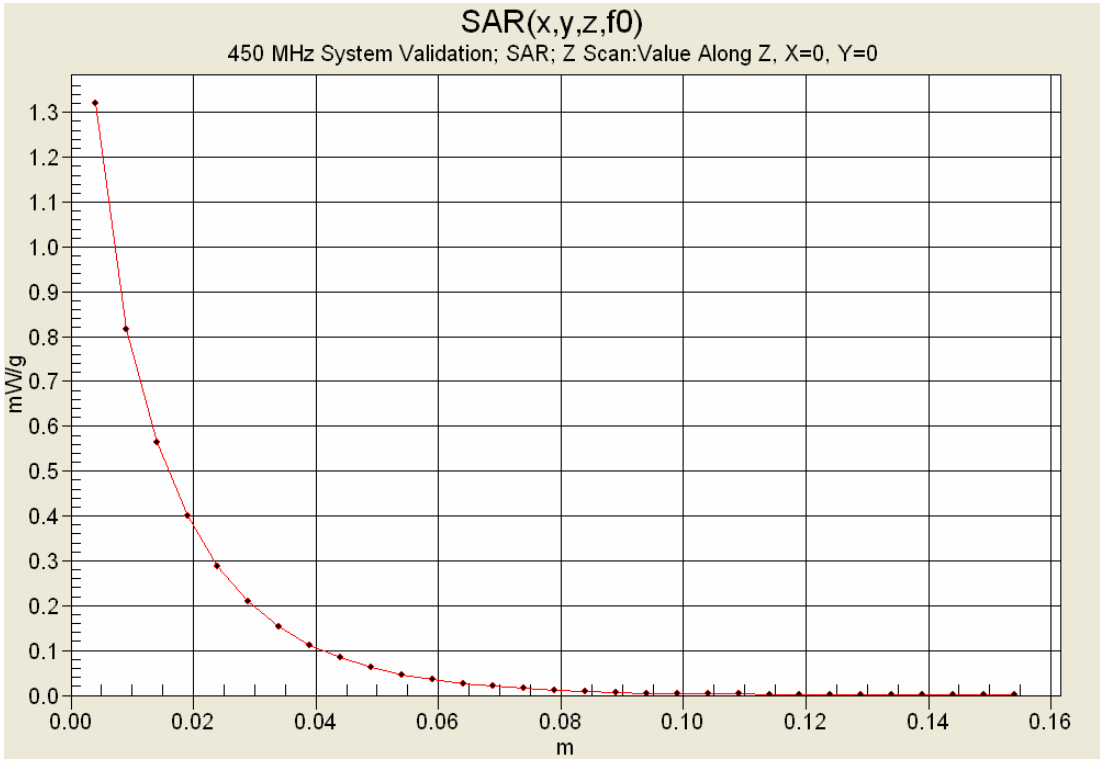
Reference Value = 38.7 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 2.24 W/kg

SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.820 mW/g

Maximum value of SAR (measured) = 1.35 mW/g





11. Measured Fluid Dielectric Parameters

System Validation - 450 MHz Dipole

Celltech Labs Inc.
 Test Result for UIM Dielectric Parameter
 Fri 23/Mar/2007
 Freq Frequency (GHz)
 FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
 FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
 Test_e Epsilon of UIM
 Test_s Sigma of UIM

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.82	0.80
0.3600	44.58	0.87	46.59	0.81
0.3700	44.46	0.87	46.27	0.82
0.3800	44.34	0.87	45.81	0.83
0.3900	44.22	0.87	45.85	0.84
0.4000	44.10	0.87	45.51	0.84
0.4100	43.98	0.87	45.18	0.85
0.4200	43.86	0.87	45.02	0.86
0.4300	43.74	0.87	44.83	0.86
0.4400	43.62	0.87	44.57	0.88
0.4500	43.50	0.87	44.41	0.88
0.4600	43.45	0.87	44.34	0.89
0.4700	43.40	0.87	43.95	0.90
0.4800	43.34	0.87	43.87	0.91
0.4900	43.29	0.87	43.73	0.92
0.5000	43.24	0.87	43.31	0.93
0.5100	43.19	0.87	42.86	0.93
0.5200	43.14	0.88	43.11	0.94
0.5300	43.08	0.88	42.67	0.94
0.5400	43.03	0.88	42.90	0.95
0.5500	42.98	0.88	42.40	0.97