



Test Report Serial No.:	021606K66-T723-S90U	Report Issue No.:	S723-031306-R0
Date(s) of Evaluation:	February 24 & 27, 2006	Report Issue Date:	March 13, 2006
Description of Tests:	RF Exposure      SAR	FCC 47 CFR §2.1093	IC RSS-102 Issue 2

## APPENDIX E - SYSTEM VALIDATION

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6610334821	IC ID:	511B-10334821	Freq.:	380 - 450 MHz
Model(s):	VX-P921-G8-5, VX-P924-G8-5, VX-P929-G8-5 VX-P971-G8-5, VX-P974-G8-5, VX-P979-G8-5	Portable FM UHF PTT Radio Transceiver					
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**450 MHz SYSTEM VALIDATION DIPOLE**

Type:

**450 MHz Validation Dipole**

Asset Number:

**00024**

Serial Number:

**136**

Place of Calibration:

**Celltech Labs Inc.**

Date of Calibration:

**October 25, 2005****Celltech Labs Inc. hereby certifies that this device has been calibrated on the date indicated above.**

Calibrated by:



Approved by:



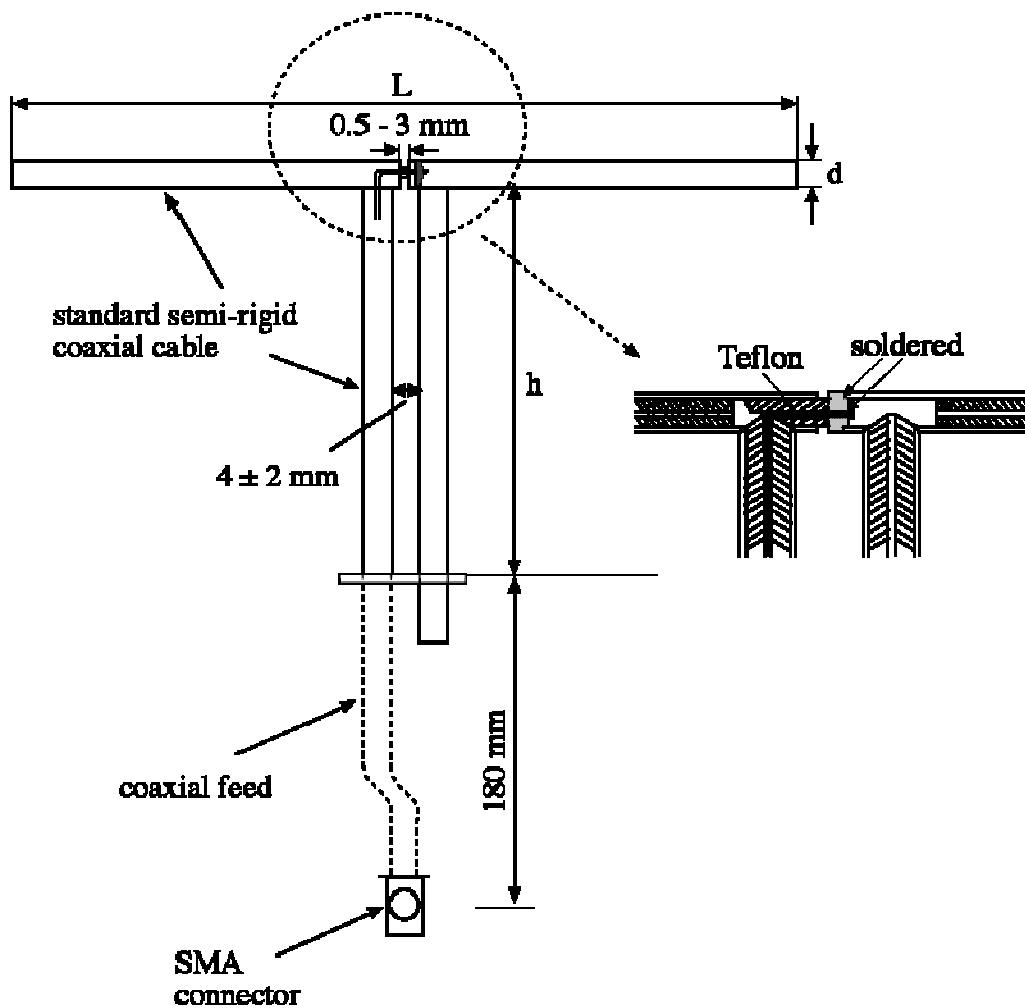
## 1. Dipole Construction & Electrical Characteristics

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

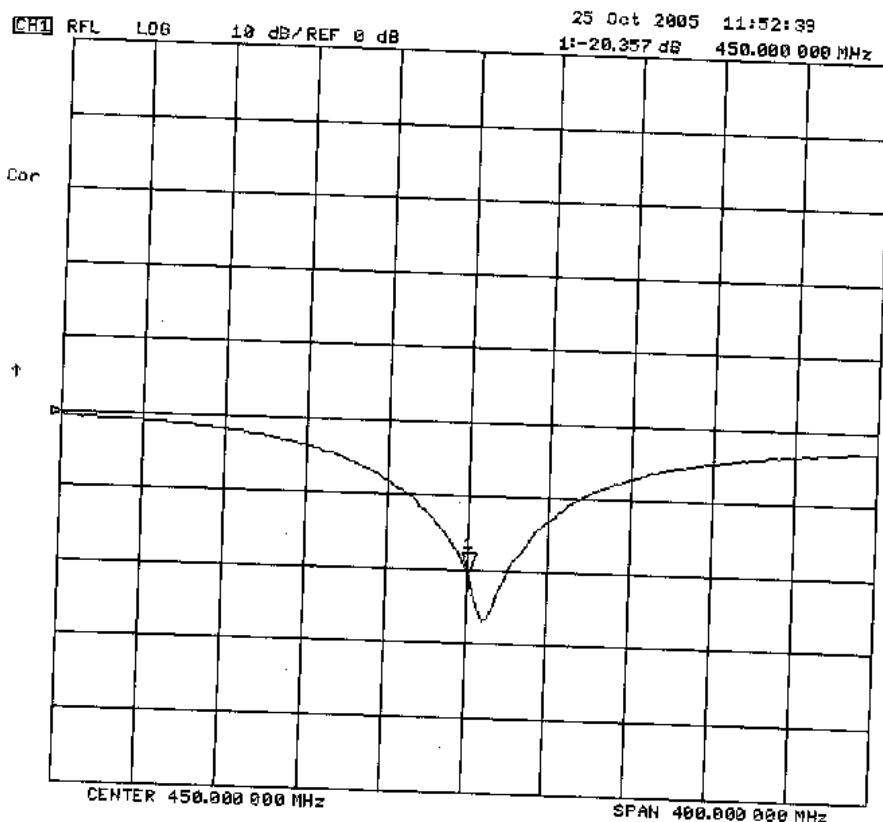
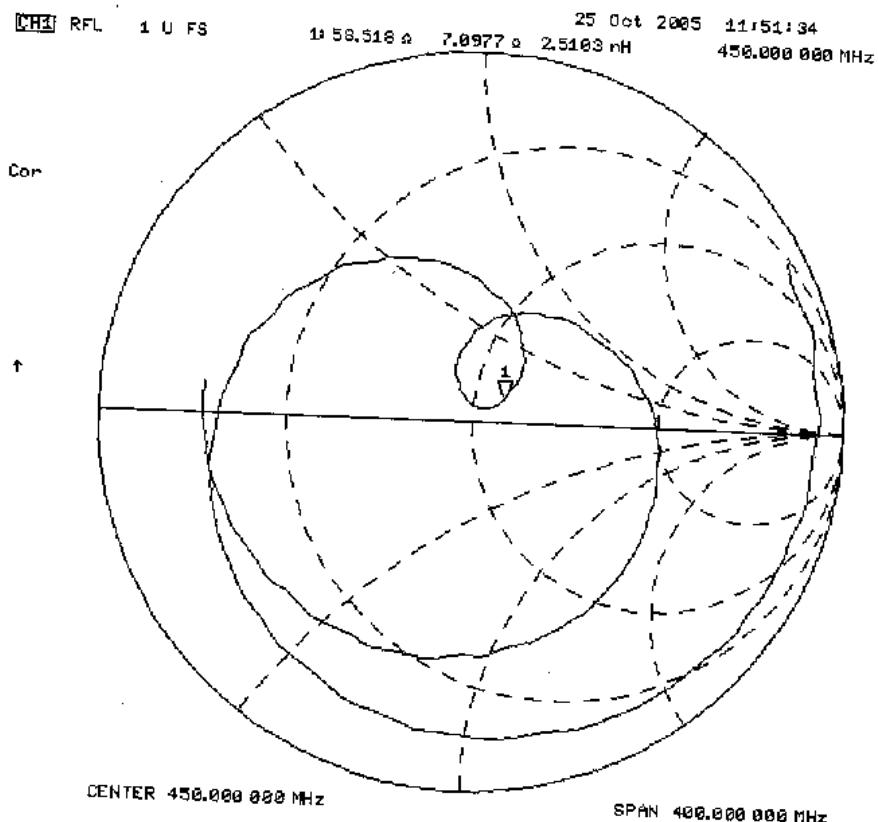
Feed point impedance at 450MHz  $\text{Re}\{Z\} = 58.518\Omega$

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

Return Loss at 450MHz  $-20.357\text{dB}$



## 2. Validation Dipole VSWR Data



### 3. Validation Dipole Dimensions

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

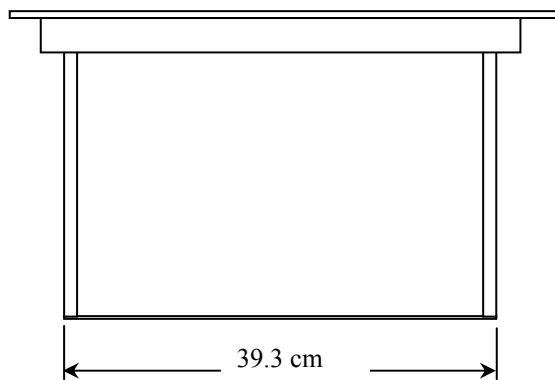
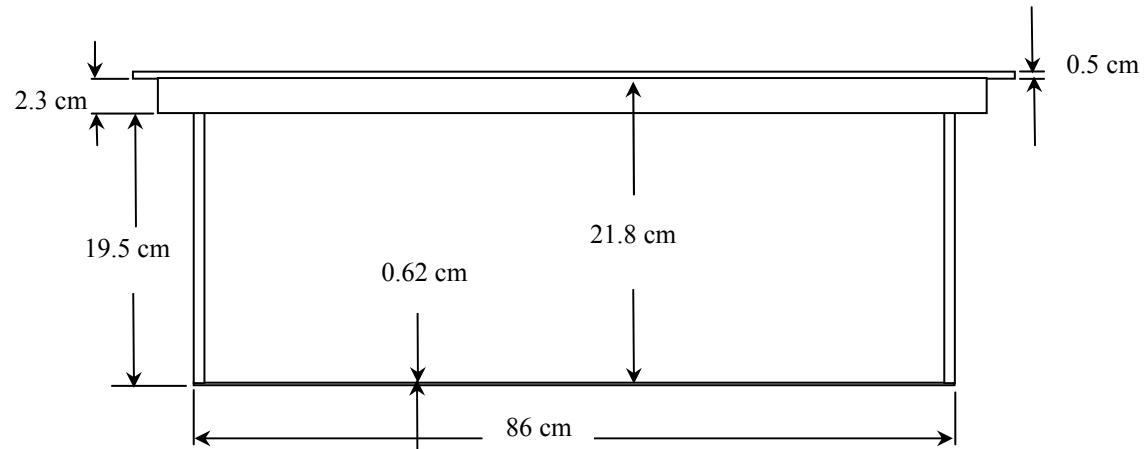
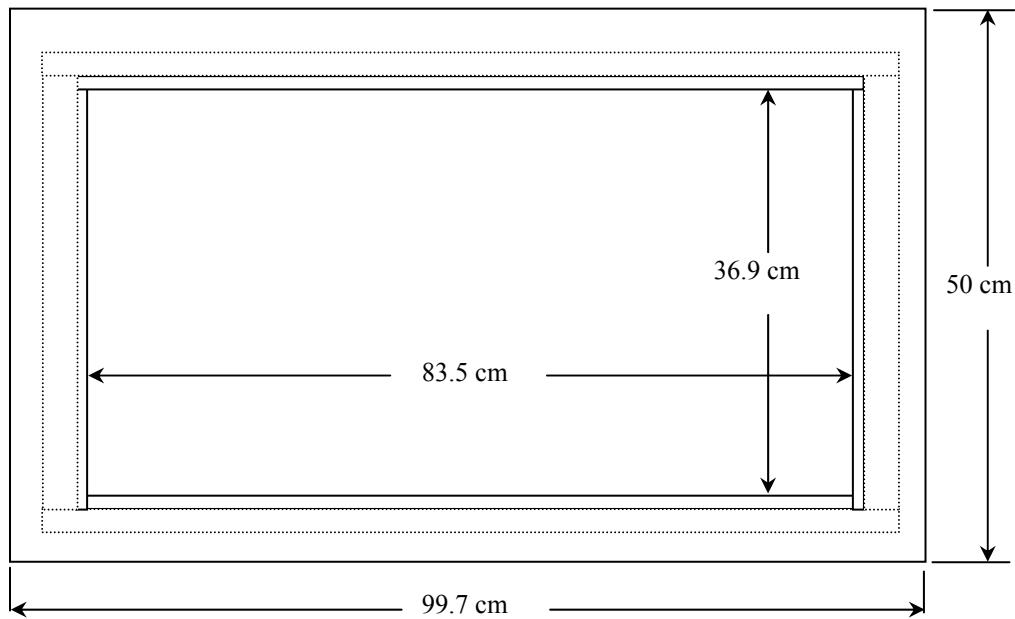
### 4. Validation Phantom

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

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

The bottom section of the validation phantom is constructed of  $6.2 \pm 0.1$ mm Plexiglas.

## 5. Dimensions of Plexiglas Planar Phantom



## 6. 450 MHz System Validation Setup



**7. 450 MHz Validation Dipole Setup**



## 8. Measurement Conditions

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

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

Environmental Conditions:

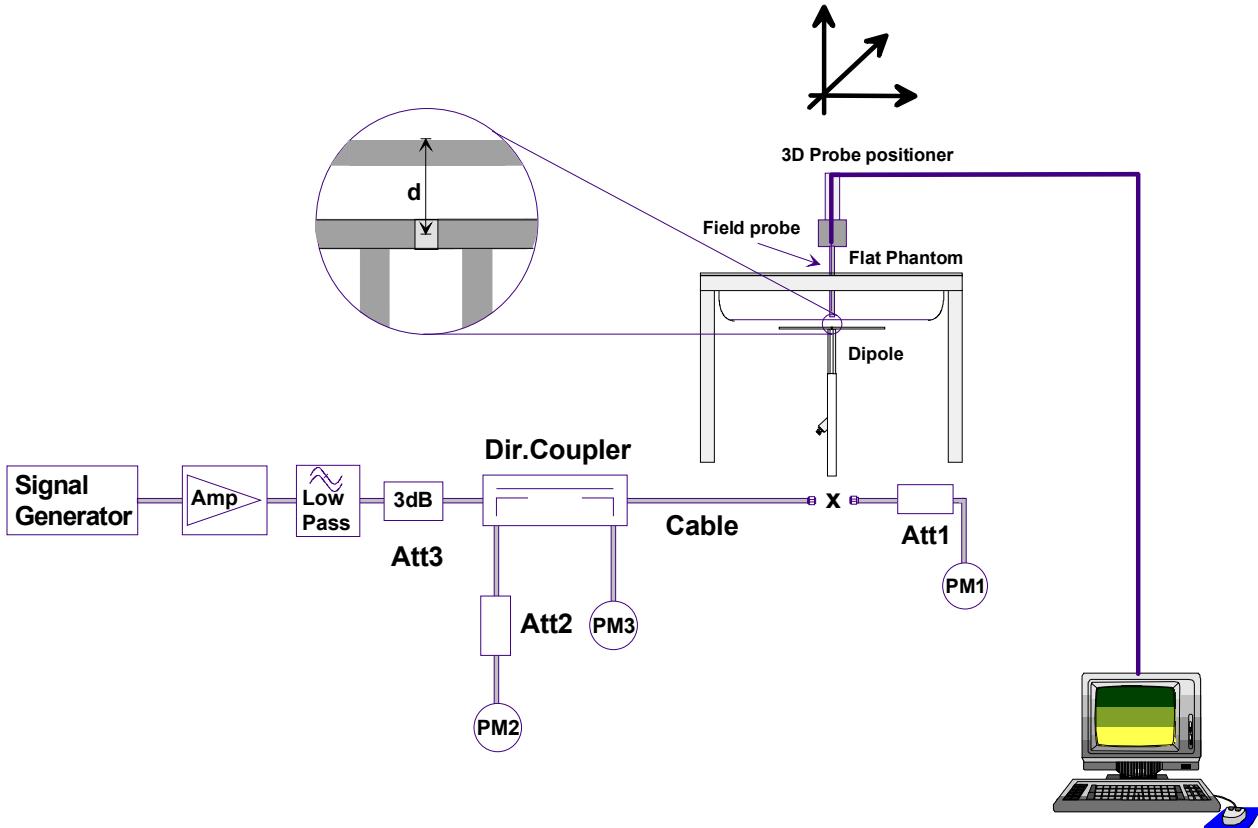
Ambient Temperature: 23.5 °C  
 Humidity: 34 %  
 Barometric Pressure: 101.4 kPa

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

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

## 9. SAR Measurement

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



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

## 10. Validation Dipole SAR Test Results

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

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

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

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

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

DUT: Dipole 450 MHz; Model: D450V2; Serial: 136; Calibrated: 10/25/2005

Ambient Temp: 23.5 °C; Fluid Temp: 22.5 °C; Barometric Pressure: 101.4 kPa; Humidity: 34%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ( $\sigma = 0.84$  mho/m;  $\epsilon_r = 43.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>)

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

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

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

- Phantom: Validation Planar; Type: Plexiglas; Serial: 137

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

**450 MHz System Validation/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.27 mW/g

**450 MHz System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.3 V/m; Power Drift = -0.025 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.800 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.1 V/m; Power Drift = 0.004 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.798 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.0 V/m; Power Drift = 0.014 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.798 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.0 V/m; Power Drift = 0.040 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.0 V/m; Power Drift = 0.014 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.1 V/m; Power Drift = 0.016 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.799 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.1 V/m; Power Drift = 0.008 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.801 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.6 V/m; Power Drift = -0.031 dB

**SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.802 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.2 V/m; Power Drift = 0.016 dB

**SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.807 mW/g**

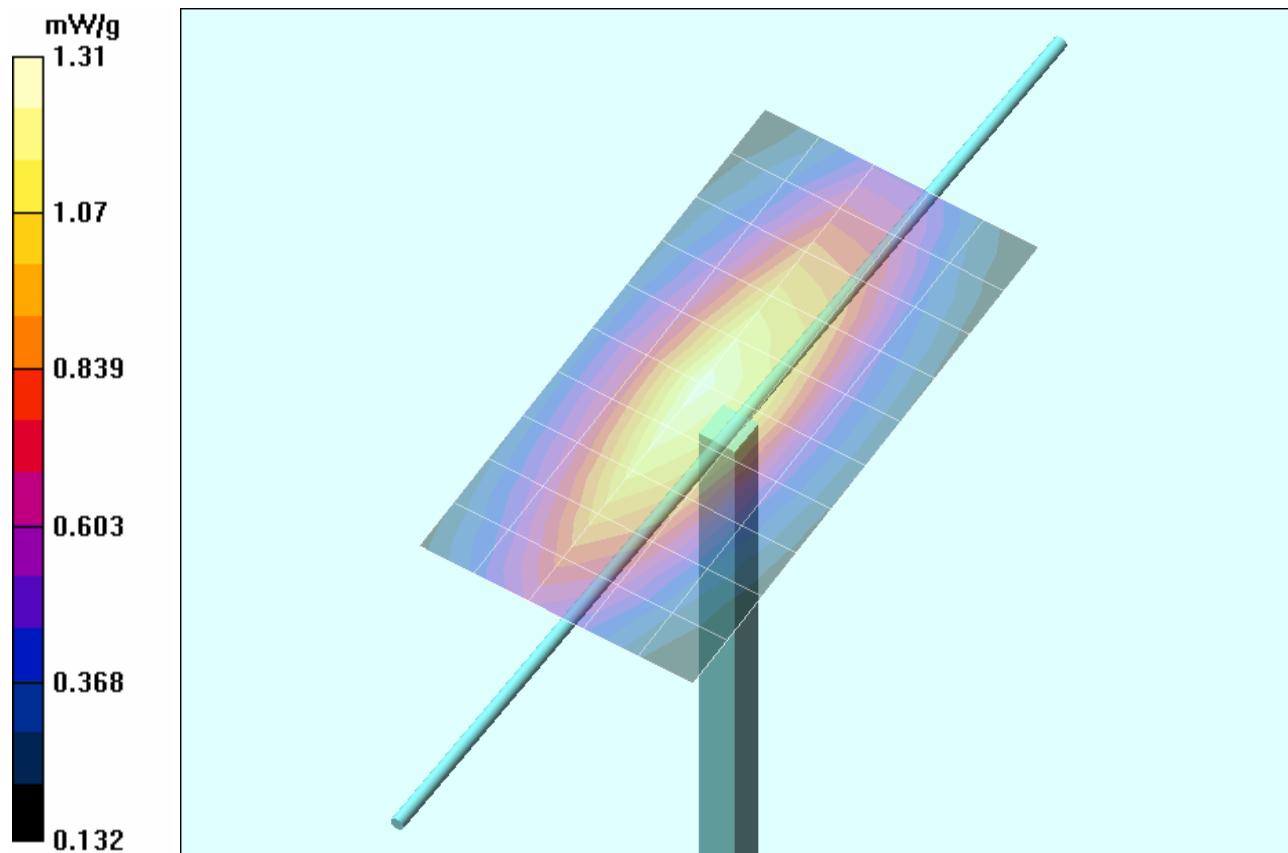
Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz System Validation/Zoom Scan 10 (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

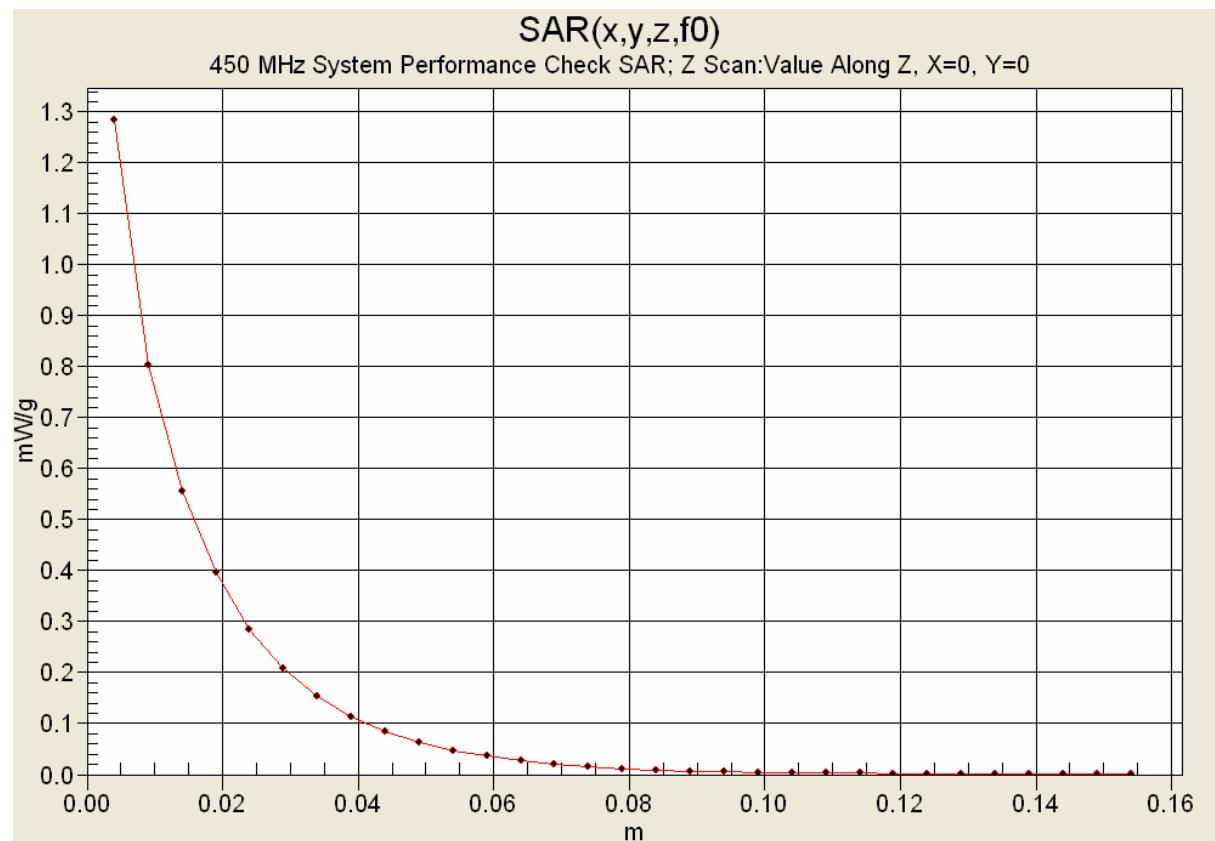
Reference Value = 39.2 V/m; Power Drift = -0.010 dB

**SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.806 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g



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



## 11. Measured Fluid Dielectric Parameters

### System Validation (Brain) - 450 MHz Dipole

\*\*\*\*\*  
 Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

Tue 25/Oct/2005 12:07:39

Freq Frequency(GHz)

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

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

Test\_e Epsilon of UIM

Test\_s Sigma of UIM

\*\*\*\*\*

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