Celltech Labs 1900 MHz Dipole Verification History

Summary of Data Provided:

Description	Probe Type - Serial Number	SAR @ 0.25 W forward Power
2008 IEEE Extended Validation - January 2008	Probe: EX3DV4 - SN3600	10.5
2007 Validation/Dipole Calibration - June 2007	Probe: EX3DV4 - SN3600	10.8
2007 Validation/Dipole Calibration - March 2007	Probe: EX3DV4 - SN3600	10.5
2006 Validation/Dipole Calibration - June 2006	Probe: EX3DV4 - SN3547	10.5

System/Probe Validation (per IEEE 1528-2003 Section 8.3.6)

Validation Date - January 15, 2008

a) 1900 MHz SAR Evaluation:

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
9.93	+/- 10%	10.5	+5.7%	39.7	+/- 10%	42.0	+5.8%
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
5.13	+/- 10%	5.39	+5.1%	20.5	+/- 10%	21.6	+5.4%

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

Celltech Labs
Test Result for UIM Dielectric Parameter
15/Jan/2008
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

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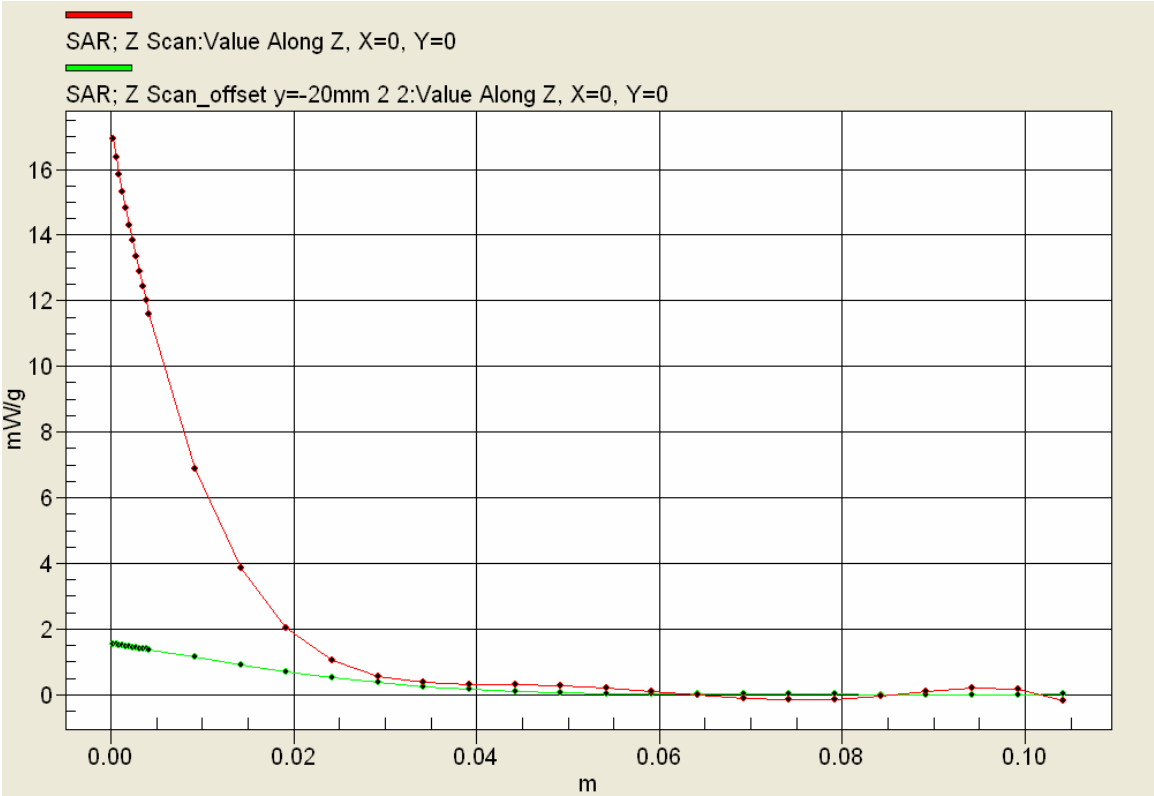
Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.8000	40.00	1.40	38.82	1.34
1.8100	40.00	1.40	38.82	1.36
1.8200	40.00	1.40	38.73	1.36
1.8300	40.00	1.40	38.64	1.39
1.8400	40.00	1.40	38.58	1.39
1.8500	40.00	1.40	38.56	1.39
1.8600	40.00	1.40	38.53	1.40
1.8700	40.00	1.40	38.52	1.42
1.8800	40.00	1.40	38.42	1.42
1.8900	40.00	1.40	38.41	1.44
1.9000	40.00	1.40	38.27	1.44
1.9100	40.00	1.40	38.35	1.46
1.9200	40.00	1.40	38.30	1.47
1.9300	40.00	1.40	38.27	1.47
1.9400	40.00	1.40	38.21	1.49
1.9500	40.00	1.40	38.15	1.49
1.9600	40.00	1.40	37.99	1.51
1.9700	40.00	1.40	38.04	1.51
1.9800	40.00	1.40	37.98	1.53
1.9900	40.00	1.40	38.00	1.54
2.0000	40.00	1.40	37.88	1.56

b) Extrapolation Routine:



SAR; Z Scan:Value Along Z, X=0, Y=0	16.9371
SAR; Z Scan_offset y=-20mm 2 2:Value Along Z, X=0, Y=0	1.539

Measurement Location	Measured SAR mW/g	SAR 1W Normalized	Peak Target mW/g	Deviation %	System Validation Uncertainty +-%
Feed Point	16.9	67.6	72.1	+6.2	19.14
2 cm Offset	1.54	6.2	6.6	-6.1	19.14

c) Probe Linearity:

Measured SAR mW/g	Forward Power	SAR 1W Normalized	Deviation	System Validation Uncertainty +-%
10.5	250 mW	42	0.0%	4.7
2.05	50 mW	41	-2.4%	4.7
0.40	10 mW	39.9	-4.7%	4.7

Test Date: January 15, 2008

System/Probe Validation - 1900 MHz Dipole - EX3DV4 Probe

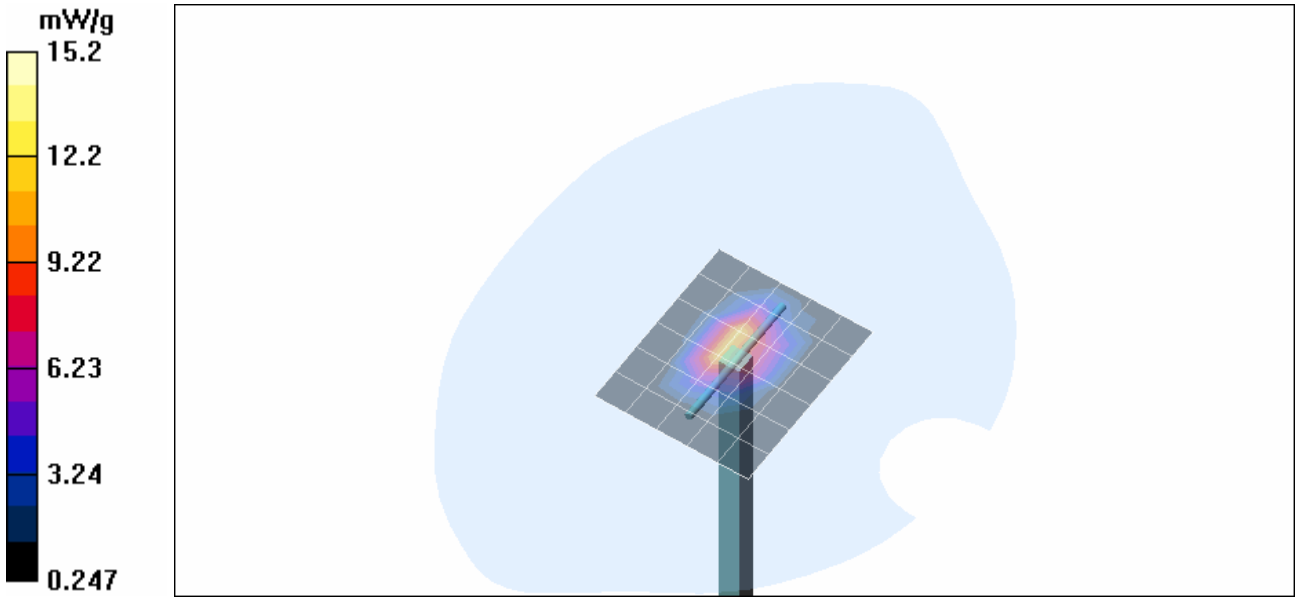
Ambient Temp: 24.5°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 13/03/2007
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

IEEE Std Step A, Pin=250 mW/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 11.6 mW/g

IEEE Std Step A, Pin=250 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.0 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 19.6 W/kg
SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.39 mW/g
Maximum value of SAR (measured) = 15.2 mW/g



Test Date: January 15, 2008

System/Probe Validation - 1900 MHz Dipole - EX3DV4 Probe

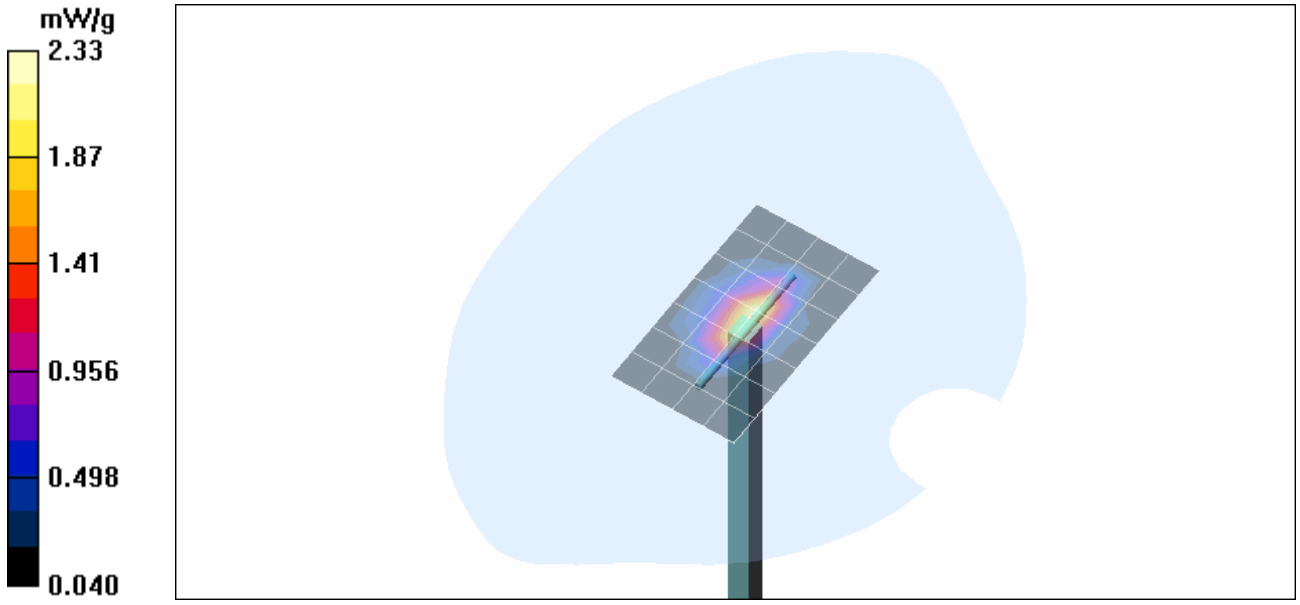
Ambient Temp: 24.5°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 13/03/2007
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

IEEE Std Step C2 50 mW (SAR1g=2W/kg)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.59 mW/g

IEEE Std Step C2 50 mW (SAR1g=2W/kg)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 40.0 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 3.88 W/kg
SAR(1 g) = 2.05 mW/g; SAR(10 g) = 1.05 mW/g
Maximum value of SAR (measured) = 2.33 mW/g



Test Date: January 15, 2008

System/Probe Validation - 1900 MHz Dipole - EX3DV4 Probe

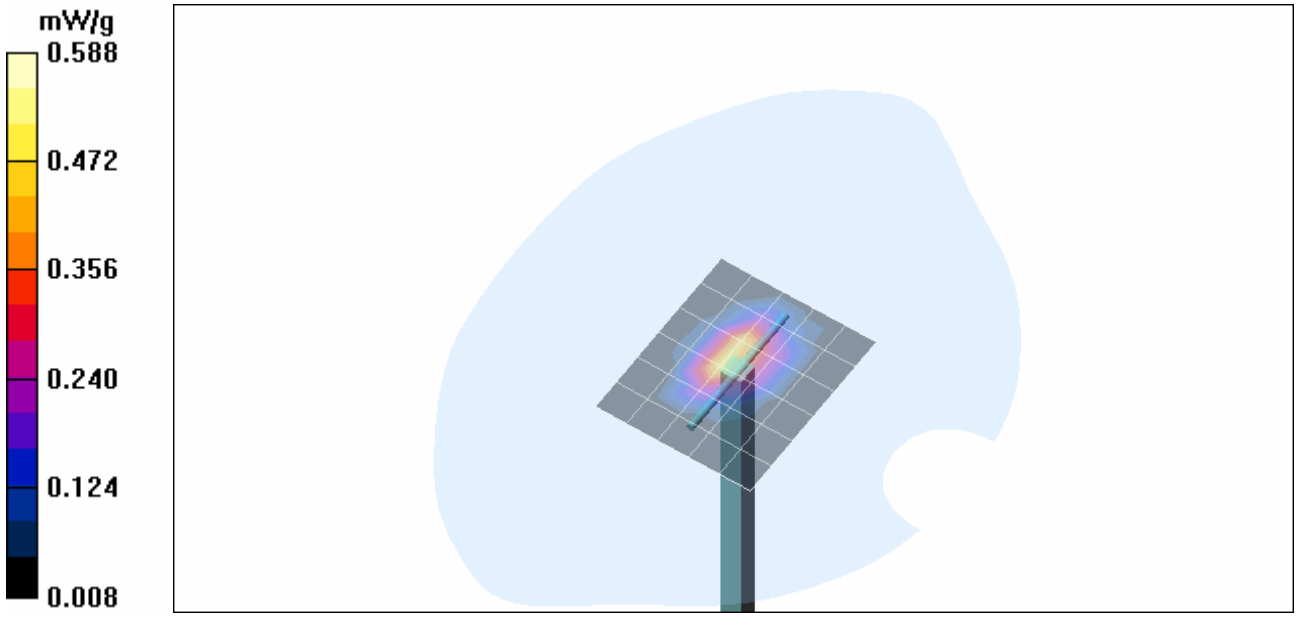
Ambient Temp: 24.5°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 13/03/2007
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

IEEE Std Step C3 10 mW (SAR1g=0.4W/kg)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.492 mW/g

IEEE Std Step C3 10 mW (SAR1g=0.4W/kg)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.8 V/m; Power Drift = -0.102 dB
Peak SAR (extrapolated) = 0.769 W/kg
SAR(1 g) = 0.399 mW/g; SAR(10 g) = 0.202 mW/g
Maximum value of SAR (measured) = 0.588 mW/g



d) Modulation Response: Pulse Modulated duty factor of 0.1 @ 10 Hz
Target 42.0 mW/g

Measured SAR mW/g	Forward Power	SAR 1W Normalized and duty factor 1	Deviation	System Validation Uncertainty
8.86	2.16 W	41.0	-2.4%	19.14%

Test Date: January 15, 2008

System/Probe Validation - 1900 MHz Dipole - EX3DV4 Probe

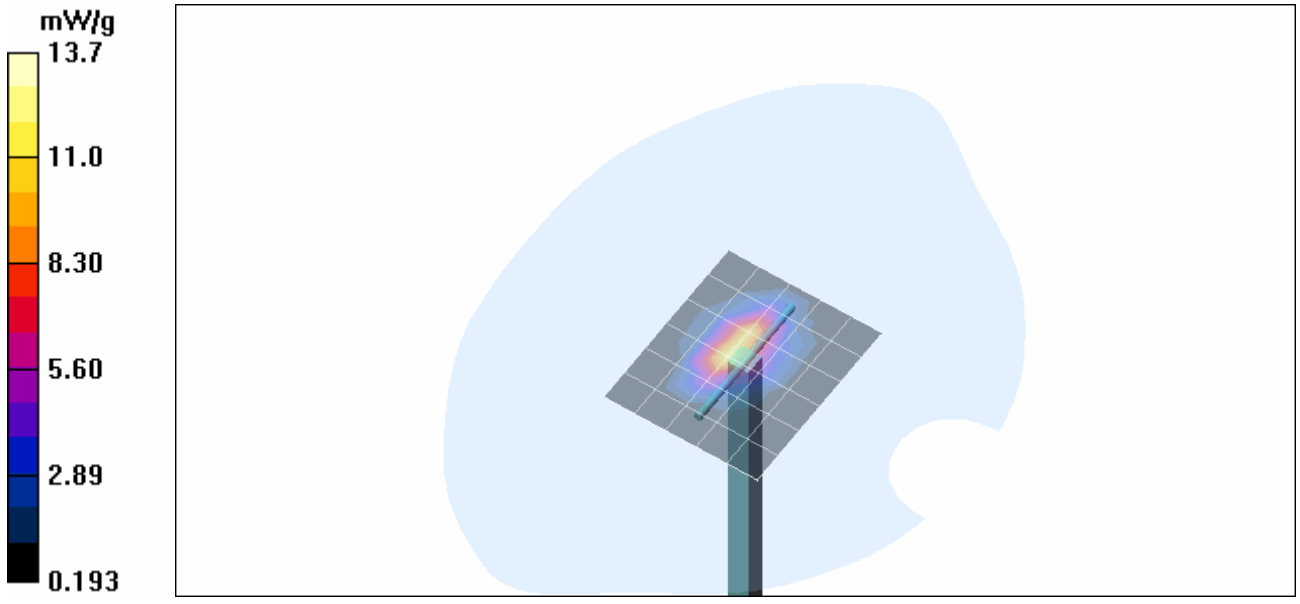
Ambient Temp: 24.5°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 13/03/2007
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

IEEE Std Step D (2.16W)(SAR1g=8W/kg)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 12.1 mW/g

IEEE Std Step D (2.16W)(SAR1g=8W/kg)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.7 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 18.6 W/kg
SAR(1 g) = 8.86 mW/g; SAR(10 g) = 4.47 mW/g
Maximum value of SAR (measured) = 13.7 mW/g



e) System Offset:
Target 42.0 mW/g

Measured SAR mW/g	Forward Power	SAR 1W Normalized	Deviation	System Validation Uncertainty
0.0495	1.25 mW	39.6	-5.7%	19.14%

Test Date: January 15, 2008

System/Probe Validation - 1900 MHz Dipole - EX3DV4 Probe

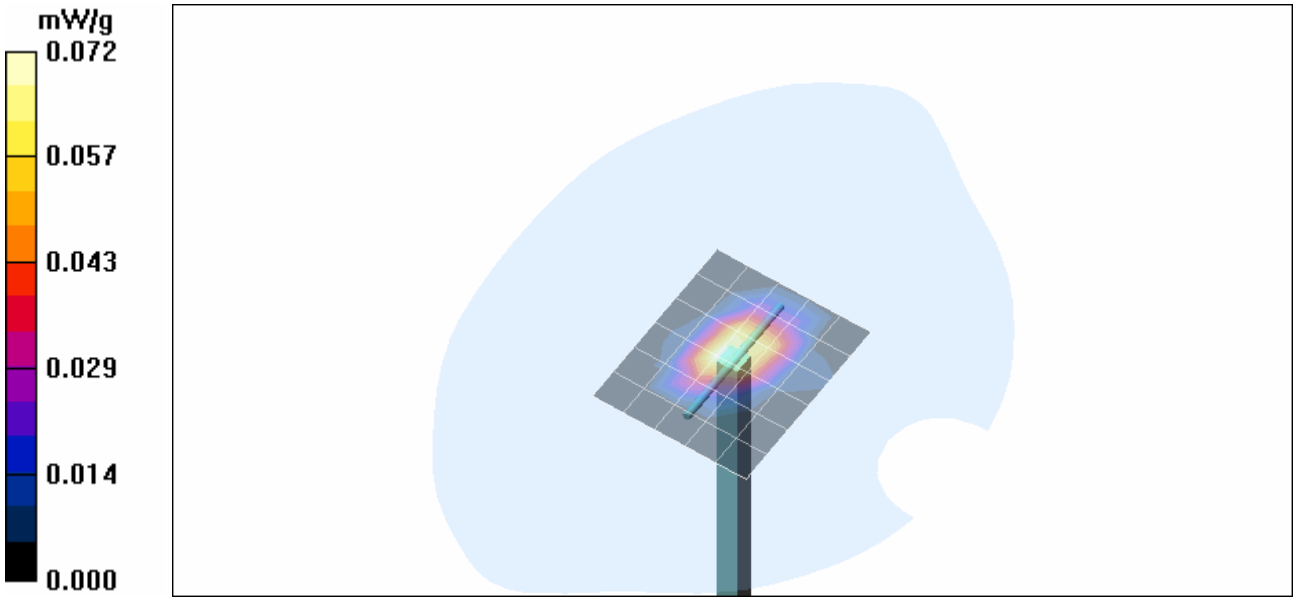
Ambient Temp: 24.5°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

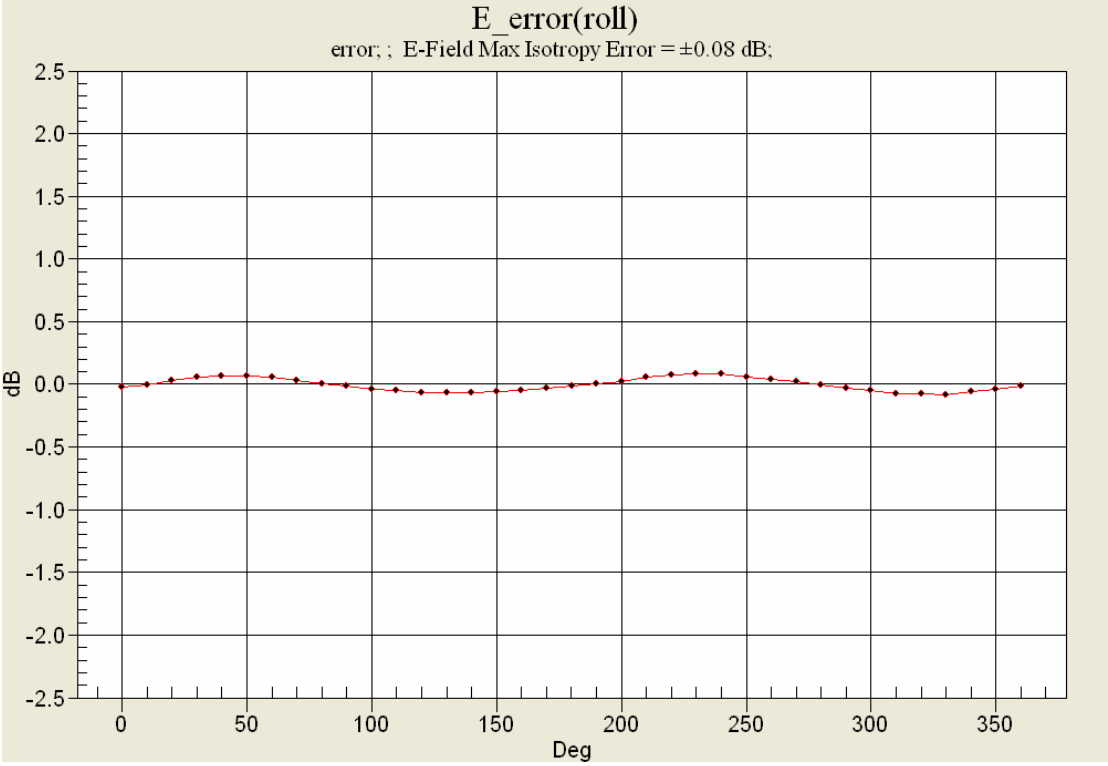
- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 13/03/2007
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

IEEE Std Step E (1.25W)(SAR1g=0.05W/kg)/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.052 mW/g

IEEE Std Step E (1.25W)(SAR1g=0.05W/kg)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.02 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 0.096 W/kg
SAR(1 g) = 0.049 mW/g; SAR(10 g) = 0.025 mW/g
Maximum value of SAR (measured) = 0.072 mW/g



f) Probe Axial Isotropy:



Measured Max Deviation	System Validation Uncertainty
0.08 dB	0.21 dB

1900 MHz SYSTEM VALIDATION

Type:	**1900 MHz Validation Dipole**
Asset Number:	**00032**
Serial Number:	**151**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**June 06, 2007**

Celltech Labs Inc. certifies that the 1900 MHz System Validation was performed on the date indicated above.

Performed by:	**Cheri Frangiadakis**
Approved by:	**Jon Hughes**

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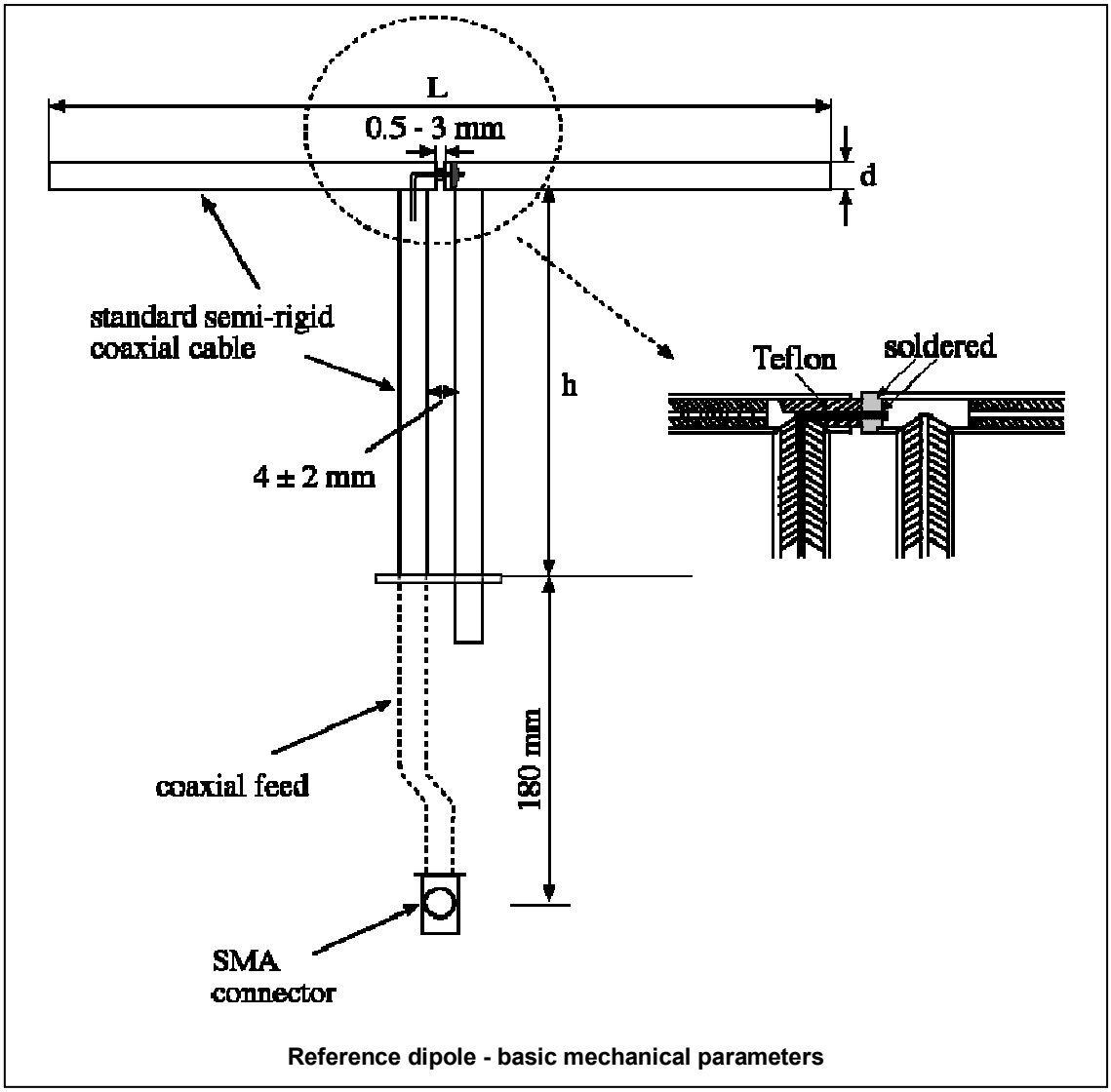
1. Dipole Construction & Electrical Characteristics

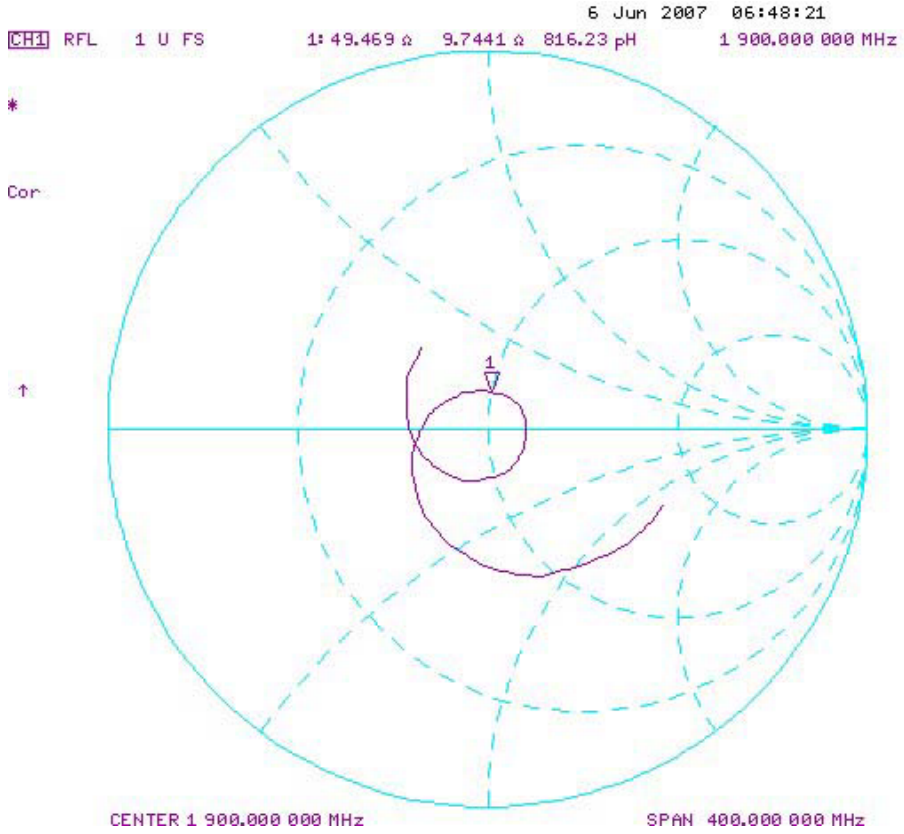
The validation dipole was constructed in accordance with the requirements specified in IEEE Standard 1528-2003 and International Standard IEC 62209-1:2005. The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 10.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 1900 MHz	Re{Z} = 49.469Ω
	Im{Z} = 9.7441Ω
Return Loss at 1900 MHz	-20.247dB



Reference dipole - basic mechanical parameters

2. Validation Dipole VSWR Data



3. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	h (mm)	d (mm)
300	396.0	250.0	6.0
450	270.0	167.0	6.0
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	**68.0**	**39.5**	**3.6**
2000	64.5	37.5	3.6
2450	51.5	30.4	3.6
3000	41.5	25.0	3.6

4. Validation Phantom

The validation phantom 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. 25 liters
Dimensions: 50 cm (W) x 100 cm (L)

SAM Phantom

Fluid Depth (≥ 15.0 cm)

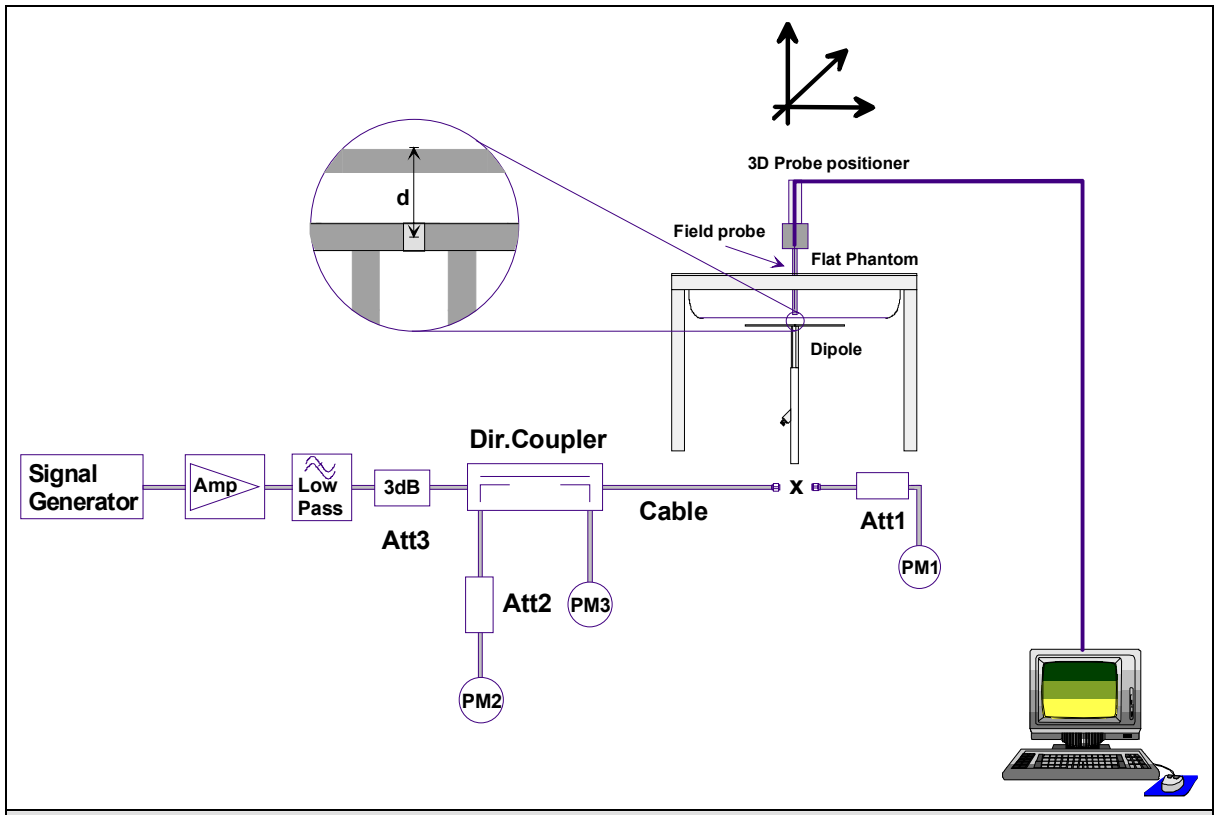
5. 1900 MHz System Validation Setup

6. 1900 MHz Validation Dipole Setup

7. SAR Measurement

Measurements were made using a dosimetric E-field probe EX3DV4 (S/N: 3600, Conversion Factor 6.59). The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the procedures described below.

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



System Validation Measurement Setup Diagram

8. Measurement Conditions

The SAM phantom was filled with 1900 MHz Brain tissue simulant.

Relative Permittivity: 38.4 (-4.0% deviation from target)
Conductivity: 1.41 mho/m (+0.8% deviation from target)
Fluid Temperature: 21.2 °C (Start of Test) / 21.2 °C (End of Test)
Fluid Depth: ≥ 15.0 cm

Environmental Conditions:
Ambient Temperature: 21.2 °C
Barometric Pressure: 95.9 kPa
Humidity: 40%

The 1900 MHz Brain tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight	
Water	55.85%	
Glycol	44.00%	
Salt	0.15%	
IEEE Target Dielectric Parameters:	**ε_r = 40.0 (+/-5%)**	**σ = 1.40 S/m (+/-5%)**

9. System Validation SAR Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
IEEE/IEC Target		Measured	Deviation	IEEE/IEC Target		Measured	Deviation
9.93	**+/- 10%**	10.8	+8.8%	**39.7**	**+/- 10%**	43.2	+8.8%
SAR @ 0.25W Input averaged over 10g (W/kg)				**SAR @ 1W Input averaged over 10g (W/kg)**			
IEEE/IEC Target		Measured	Deviation	IEEE/IEC Target		Measured	Deviation
5.13	**+/- 10%**	5.45	+6.3%	**20.5**	**+/- 10%**	21.8	+6.3%

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

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

System Validation - 1900 MHz Dipole - June 6, 2007

DUT: Dipole 1900 MHz; Asset: 00032; Serial: 151

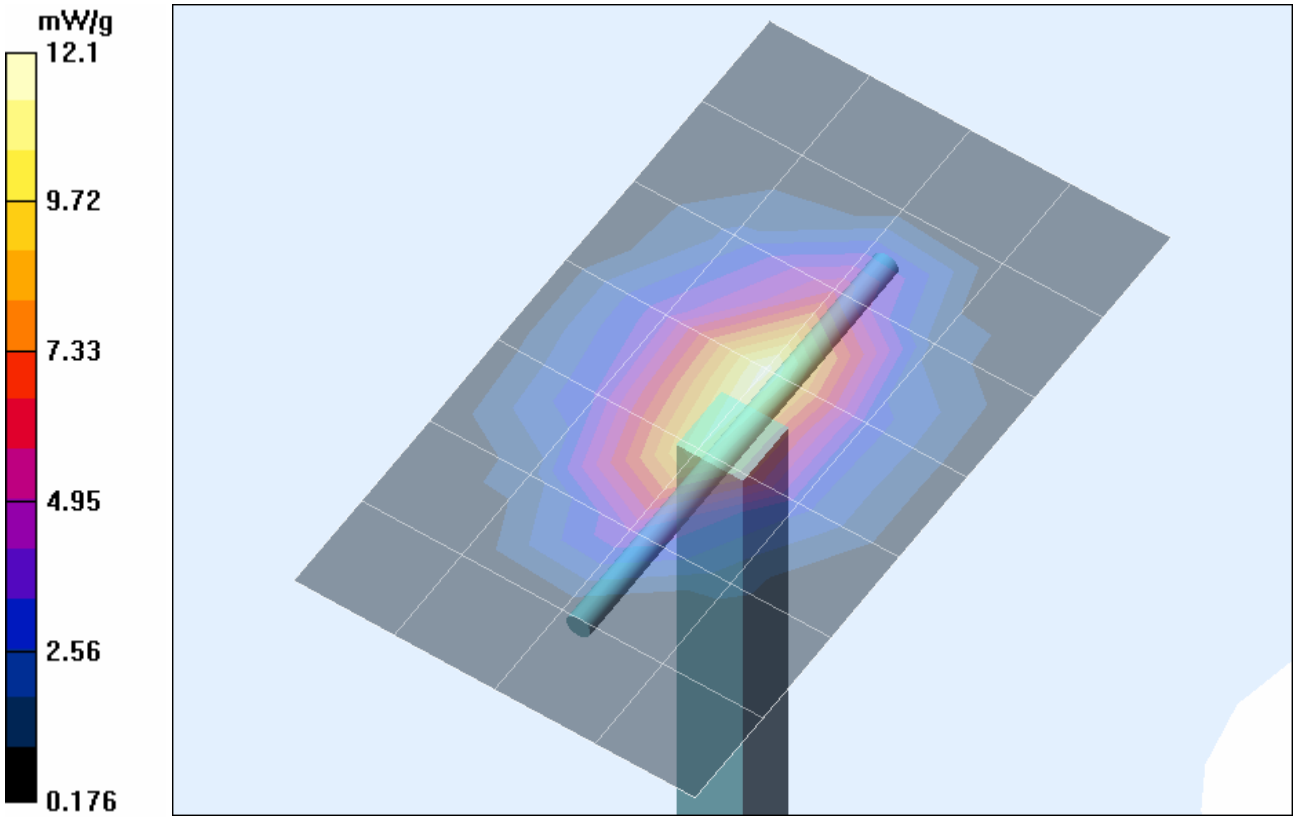
Ambient Temp: 21.2ºC; Fluid Temp: 21.2ºC; Barometric Pressure: 95.9 kPa; Humidity: 40%

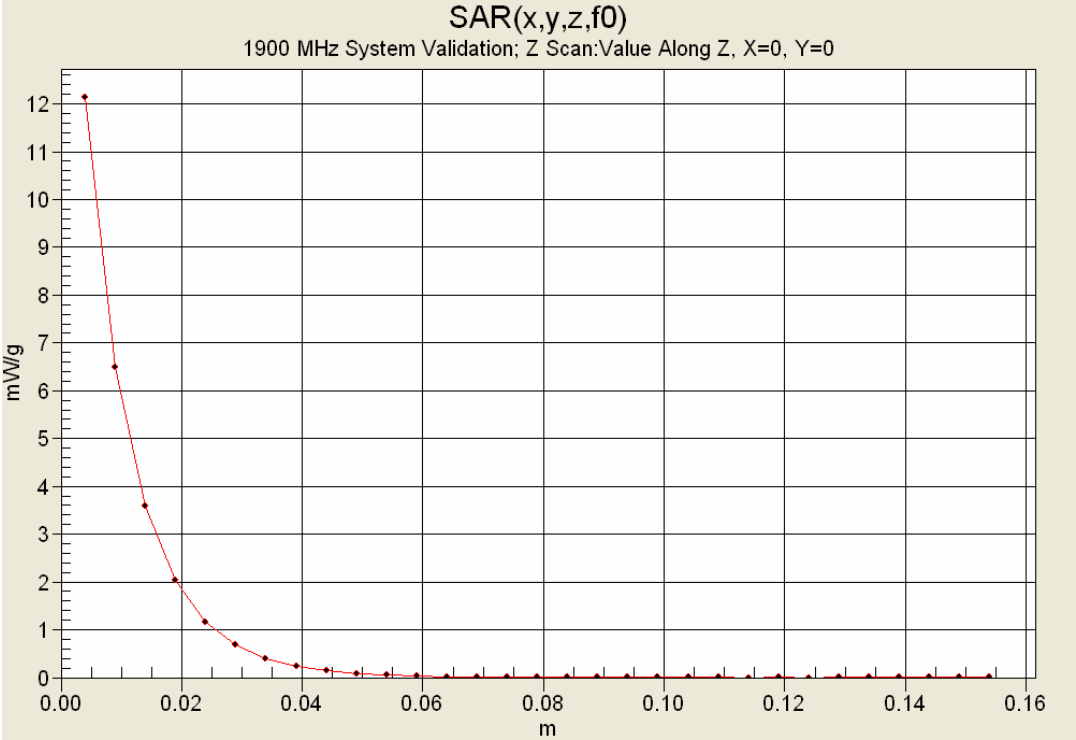
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

1900 MHz System Validation/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 11.7 mW/g

1900 MHz System Validation/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.0 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 21.0 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.45 mW/g
Maximum value of SAR (measured) = 12.1 mW/g





10. Measured Fluid Dielectric Parameters

System Validation - 1900 MHz (Brain)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Wed 06/Jun/2007
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

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Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.8000	40.00	1.40	38.49	1.30
1.8100	40.00	1.40	38.70	1.31
1.8200	40.00	1.40	38.62	1.32
1.8300	40.00	1.40	38.57	1.33
1.8400	40.00	1.40	38.57	1.34
1.8500	40.00	1.40	38.46	1.35
1.8600	40.00	1.40	38.51	1.37
1.8700	40.00	1.40	38.51	1.38
1.8800	40.00	1.40	38.38	1.38
1.8900	40.00	1.40	38.42	1.39
1.9000	40.00	1.40	38.38	1.41
1.9100	40.00	1.40	38.33	1.42
1.9200	40.00	1.40	38.27	1.43
1.9300	40.00	1.40	38.23	1.44
1.9400	40.00	1.40	38.17	1.45
1.9500	40.00	1.40	38.16	1.47
1.9600	40.00	1.40	38.17	1.47
1.9700	40.00	1.40	38.04	1.48
1.9800	40.00	1.40	38.02	1.49
1.9900	40.00	1.40	37.98	1.50
2.0000	40.00	1.40	37.90	1.51

11. Measurement Uncertainties

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration (1950 MHz)	5.5	Normal	1	1	5.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	1	2.7	∞
Spherical isotropy of the probe	0	Rectangular	1.732050808	1	0.0	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0	Rectangular	1.732050808	1	0.0	∞
Integration time	0	Rectangular	1.732050808	1	0.0	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Dipole						
Dipole Positioning	2	Normal	1.732050808	1	1.2	∞
Power & Power Drift	4.7	Normal	1.732050808	1	2.7	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	5	Normal	1	0.64	3.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	5	Normal	1	0.6	3.0	∞
Combined Standard Uncertainty					**9.57**	
Expanded Uncertainty (k=2)					**19.14**	
Note(s)	**1. Measurement Uncertainty Table in accordance with IEEE 1528-2003 and IEC 62209-1:2005.**					

12. Test Equipment List

TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE OF CAL.	CAL. DUE DATE
SPEAG DASY4 Measurement Server	00158	1078	N/A	N/A
SPEAG Robot	00046	599396-01	N/A	N/A
SPEAG DAE4	00019	353	21Jun06	21Jun07
SPEAG EX3DV4 E-Field Probe	00213	3600	24Jan07	24Jan08
1900 MHz Validation Dipole	00032	151	06Jun07	06Jun08
SPEAG SAM Phantom V4.0C	00154	1033	N/A	N/A
ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A	N/A
Gigatronics 8652A Power Meter	00007	1835272	26Mar07	26Mar08
Gigatronics 80701A Power Sensor	00014	1833699	22Jan07	22Jan08
Gigatronics 80701A Power Sensor	00109	1834366	26Mar07	26Mar08
HP 8753ET Network Analyzer	00134	US39170292	20Apr07	20Apr08
HP 8648D Signal Generator	00005	3847A00611	NCR	NCR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	NCR	NCR

1900 MHz SYSTEM VALIDATION

Type:	**1900 MHz Validation Dipole**
Asset Number:	**00032**
Serial Number:	**151**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**March 20, 2007**

Celltech Labs Inc. certifies that the 1900 MHz System Validation (Brain) was performed on the date indicated above.

Performed by:	**Sean Johnston**
Approved by:	**Spencer Watson**

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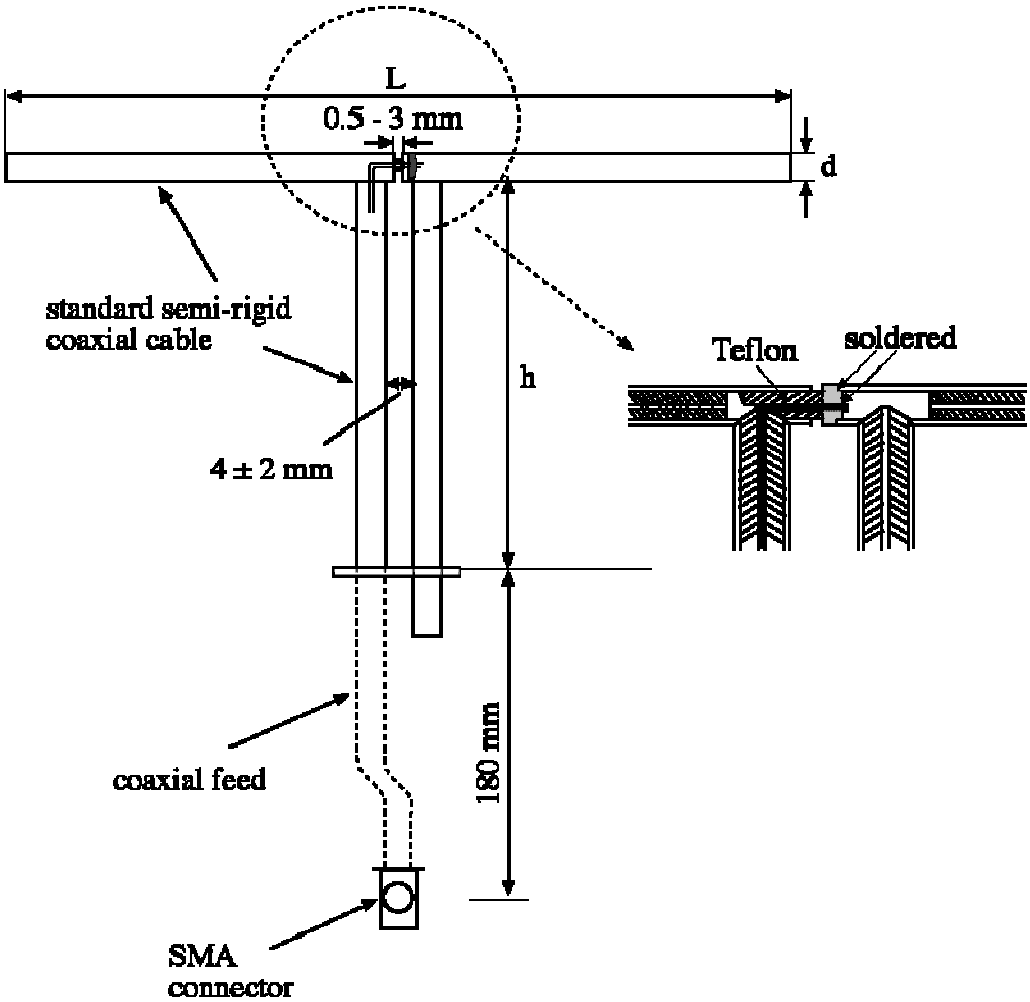
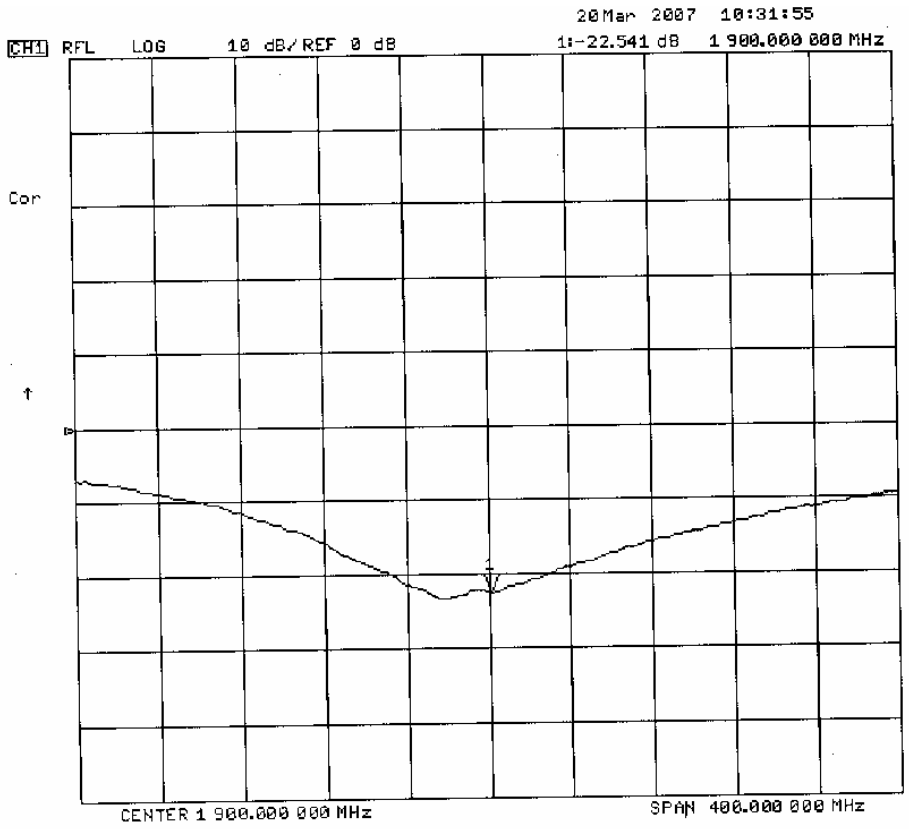
1. Dipole Construction & Electrical Characteristics

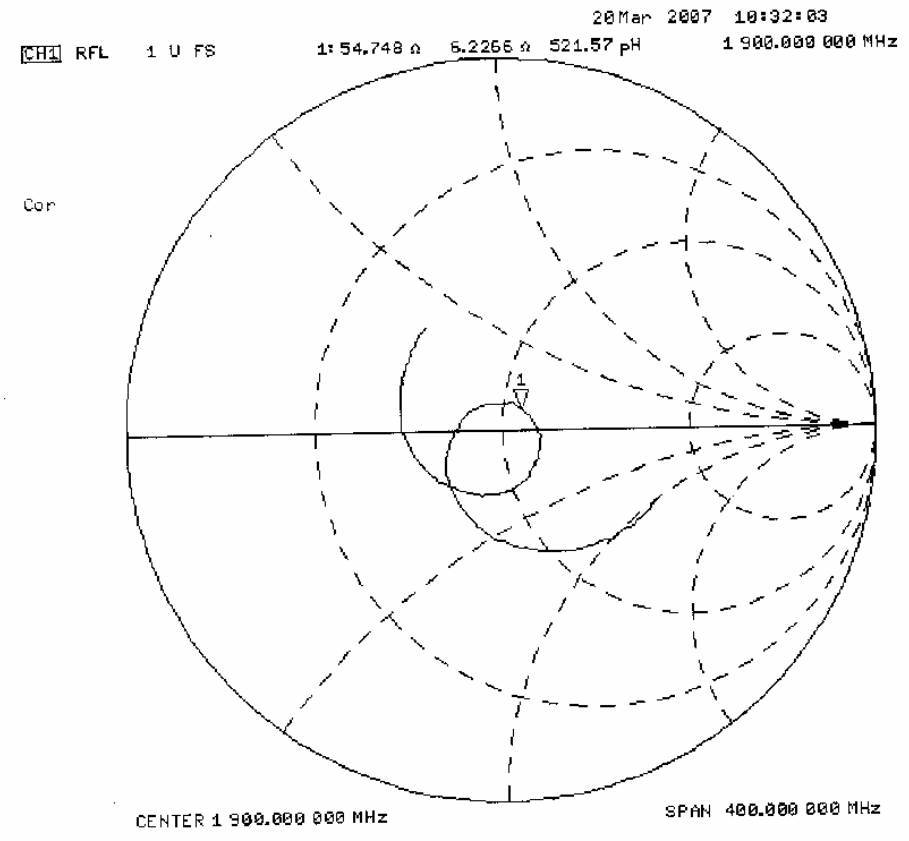
The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector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

Feed point impedance at 1900 MHz	Re{Z} = 54.748Ω
	Im{Z} = 6.2266Ω
Return Loss at 1900 MHz	-22.541dB



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 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.

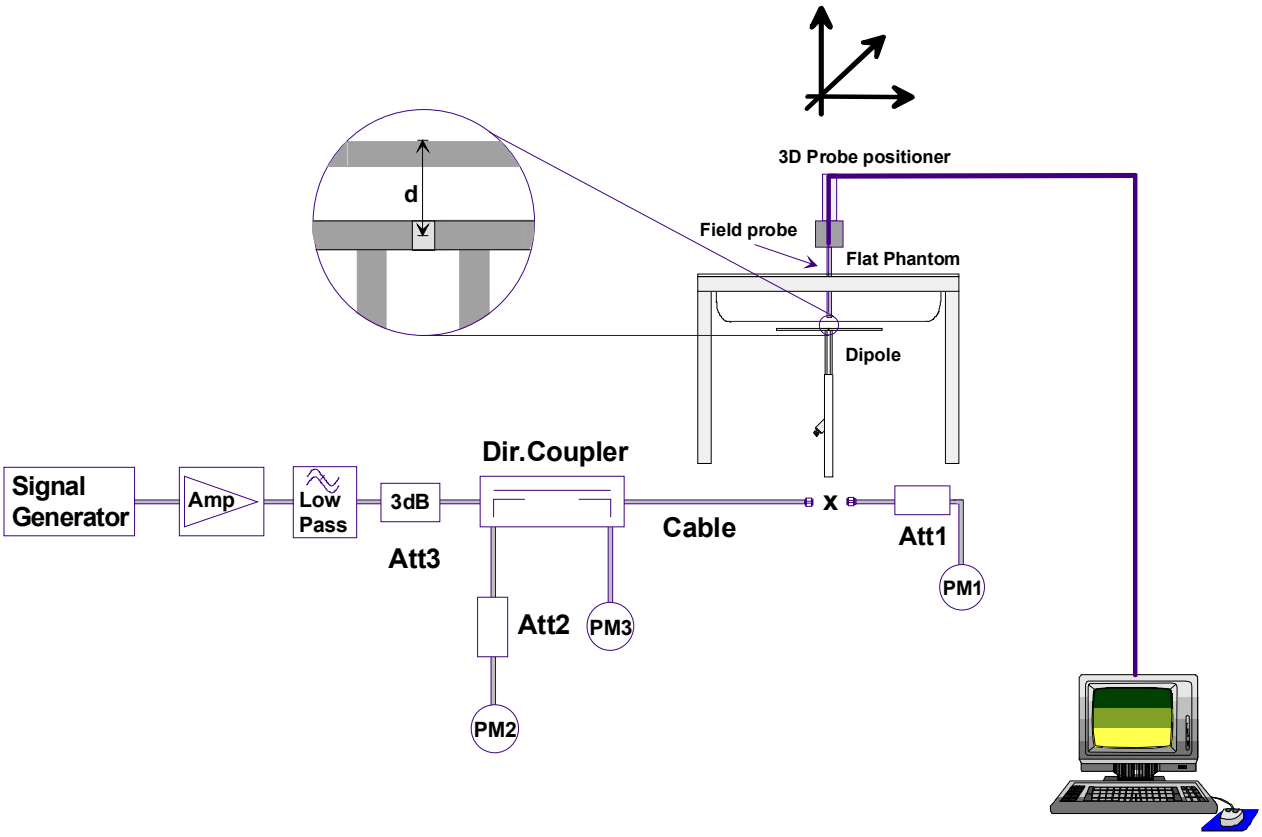
Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 25 liters
Dimensions: 50 cm (W) x 100 cm (L)

5. 1900 MHz System Validation Setup

6. 1900 MHz Dipole Setup

7. SAR Measurement

Measurements were made using a dosimetric E-field probe EX3DV4 (S/N: 3600, Conversion Factor 6.59). The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the procedures described below.



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

8. Measurement Conditions

The SAM phantom was filled with 1900 MHz Brain tissue simulant.

Relative Permittivity: 38.3 (-4.2% deviation from target)
Conductivity: 1.45 mho/m (+3.6% deviation from target)
Fluid Temperature: 21.2 °C
Fluid Depth: ≥ 15.0 cm

Environmental Conditions:
Ambient Temperature: 22.5 °C
Barometric Pressure: 101.2 kPa
Humidity: 30%

The 1900 MHz Brain tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight
Water	55.85%
Glycol	44.00%
Salt	0.15%
Target Dielectric Parameters at 25 °C	ε_r = 40.0 σ = 1.40 S/m

9. System Validation SAR 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
9.93	**+/- 10%**	10.5	+5.8%	**39.72**	**+/- 10%**	42.02	+5.8%
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
5.13	**+/- 10%**	5.33	+3.9%	**20.52**	**+/- 10%**	21.32	+3.9%
The results have been normalized to 1W (forward power) into the dipole.							

Date Tested: 03/20/2007

System Validation - 1900 MHz Dipole

DUT: Dipole 1900 MHz; Asset: 00032; Serial: 151

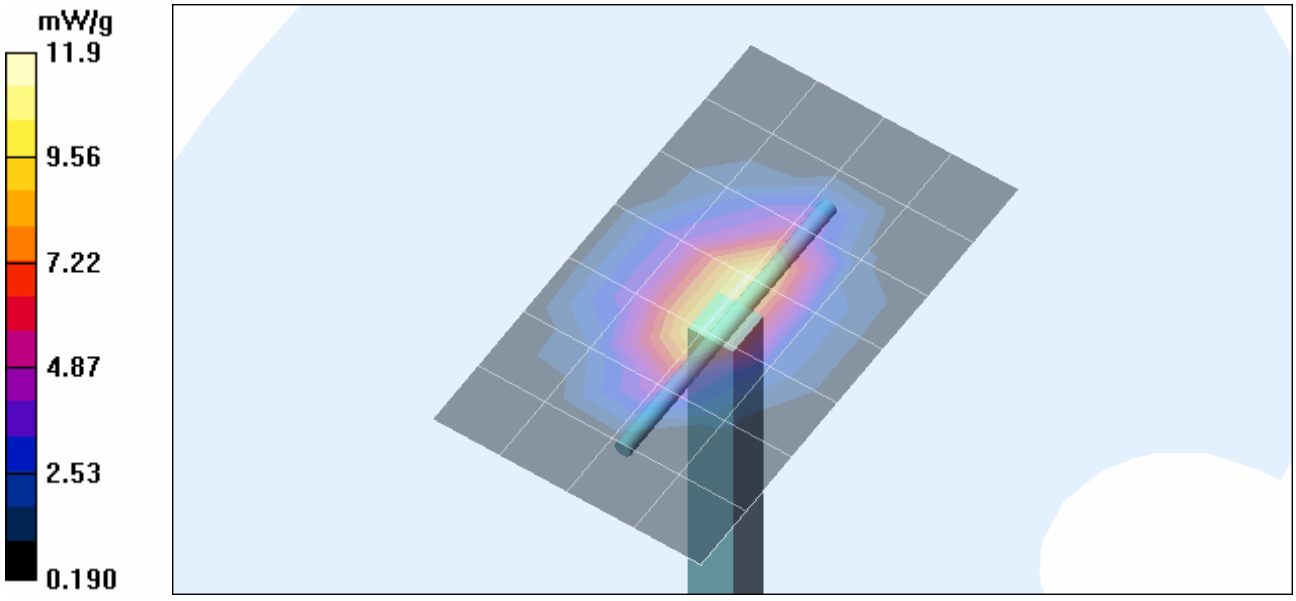
Ambient Temp: 22.5ºC; Fluid Temp: 21.2ºC; Barometric Pressure: 101.2 kPa; Humidity: 30%

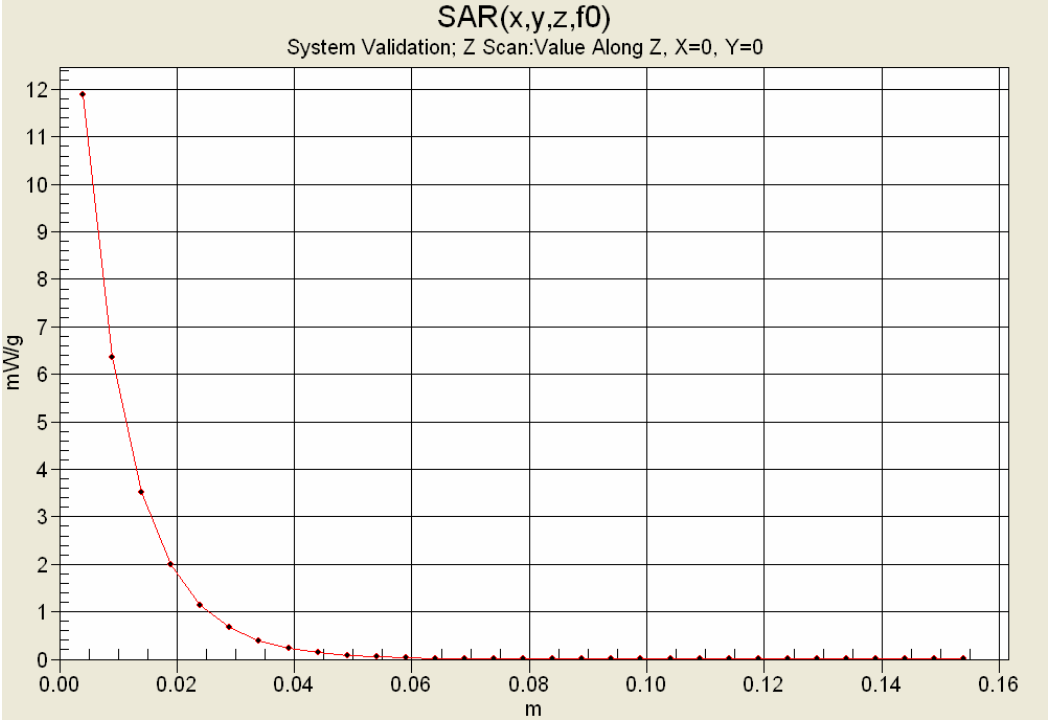
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.59, 6.59, 6.59); Calibrated: 24/01/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

1900 MHz Dipole - System Validation
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.0 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 20.3 W/kg
SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.33 mW/g
Maximum value of SAR (measured) = 11.9 mW/g





10. Measured Fluid Dielectric Parameters

1900 MHz System Validation (Brain)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Tue 20/Mar/2007
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
1.8000	40.00	1.40	38.82	1.34
1.8100	40.00	1.40	38.82	1.36
1.8200	40.00	1.40	38.73	1.36
1.8300	40.00	1.40	38.64	1.39
1.8400	40.00	1.40	38.58	1.39
1.8500	40.00	1.40	38.56	1.39
1.8600	40.00	1.40	38.53	1.40
1.8700	40.00	1.40	38.52	1.42
1.8800	40.00	1.40	38.42	1.42
1.8900	40.00	1.40	38.41	1.44
1.9000	40.00	1.40	38.27	1.45
1.9100	40.00	1.40	38.35	1.46
1.9200	40.00	1.40	38.30	1.47
1.9300	40.00	1.40	38.27	1.47
1.9400	40.00	1.40	38.21	1.49
1.9500	40.00	1.40	38.15	1.49
1.9600	40.00	1.40	37.99	1.51
1.9700	40.00	1.40	38.04	1.51
1.9800	40.00	1.40	37.98	1.53
1.9900	40.00	1.40	38.00	1.54
2.0000	40.00	1.40	37.88	1.56

1900 MHz SYSTEM VALIDATION

Type:	**1900 MHz Validation Dipole**
Asset Number:	**00032**
Serial Number:	**151**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**June 09, 2006**

Celltech Labs Inc. hereby certifies that the 1900 MHz System Validation was performed on the date indicated above.

Performed by:	**Sean Johnston**
Approved by:	**Spencer Watson**

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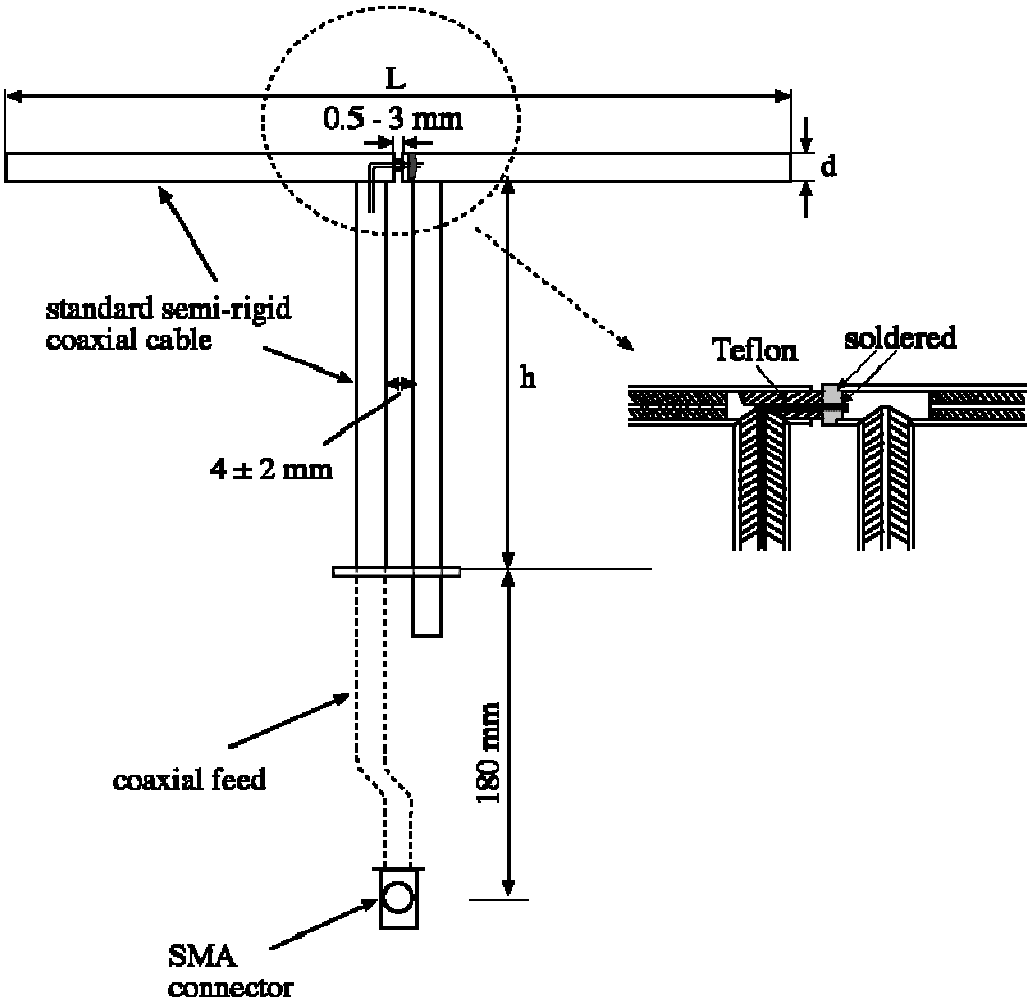
www.celltechlabs.com

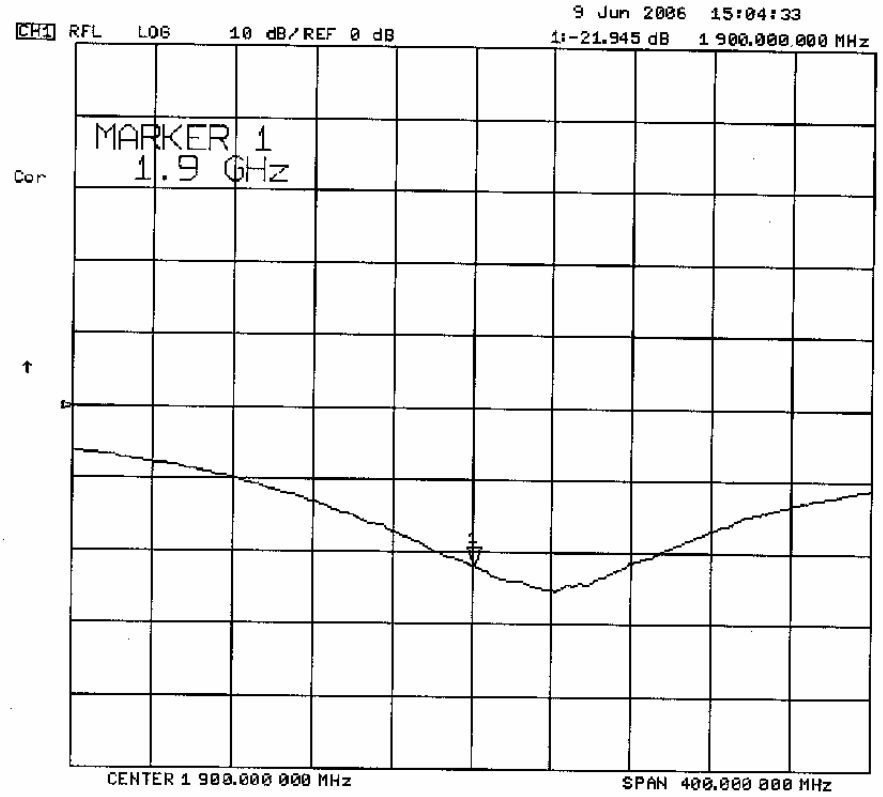
1. Dipole Construction & Electrical Characteristics

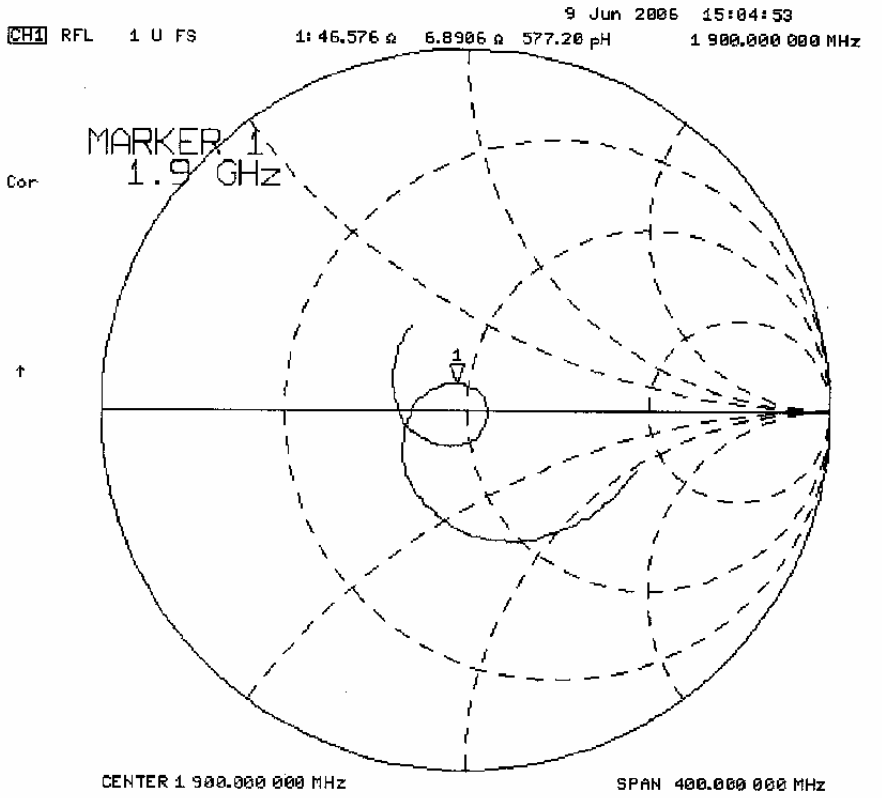
The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector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

Feed point impedance at 1900MHz	Re{Z} = 46.576Ω
	Im{Z} = 6.8906Ω
Return Loss at 1900MHz	-21.945 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 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. 25 liters
Dimensions: 50 cm (W) x 100 cm (L)

5. 1900 MHz System Validation Setup

6. 1900 MHz System Validation Dipole

7. Measurement Conditions

The phantom was filled with 1900 MHz Brain tissue simulant.

Relative Permittivity: 39.7 (-0.7% deviation from target)
Conductivity: 1.42 mho/m (+1.5% deviation from target)
Fluid Temperature: 23.5 °C
Fluid Depth: ≥ 15.0 cm

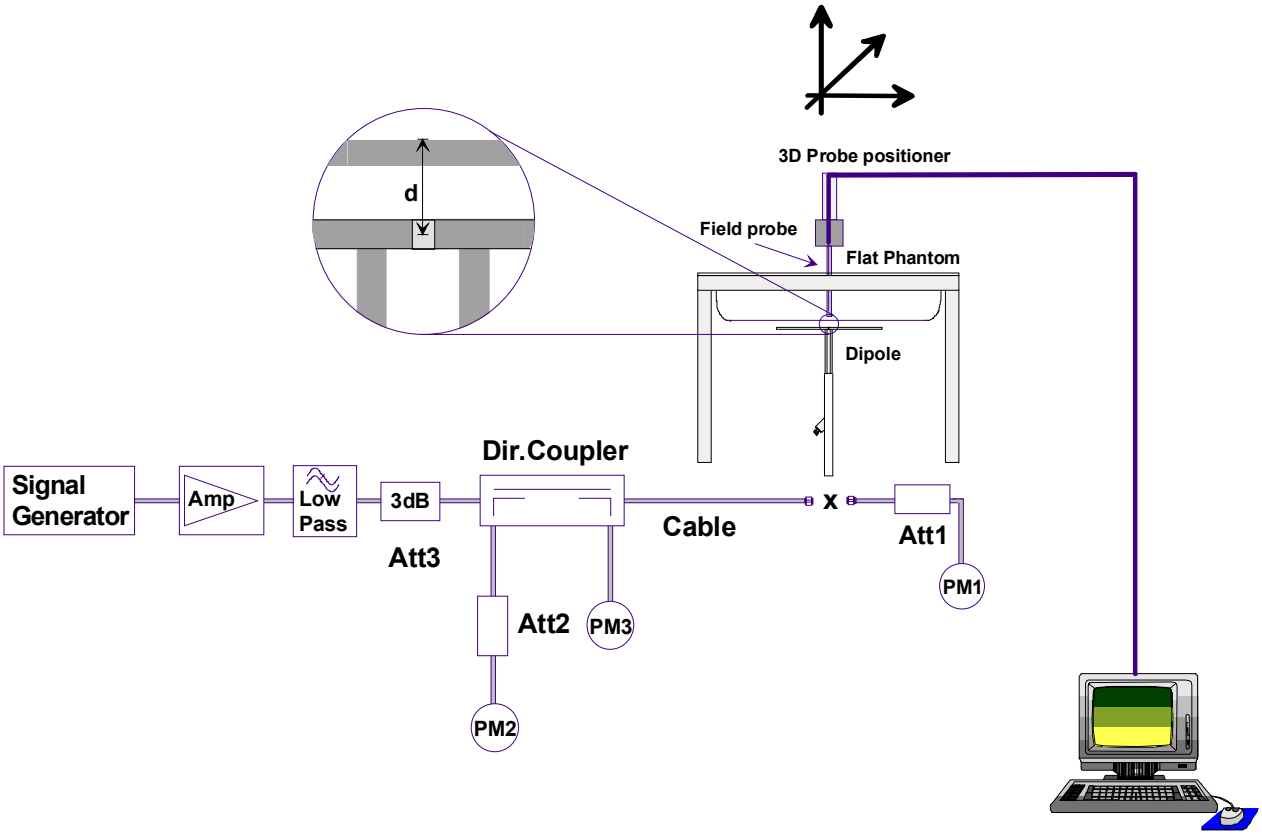
Environmental Conditions:
Ambient Temperature: 24.6 °C
Barometric Pressure: 101.2 kPa
Humidity: 35 %

The 1900 MHz Brain tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight
Water	55.85%
Glycol	44.00%
Salt	0.15%
Target Dielectric Parameters at 25 °C	ε_r = 40.0 (+/- 5%) σ = 1.40 S/m (+/- 5%)

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 50dB below the forward power.

9. 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	10.70	42.80	5.51	22.04	12.10
Test 2	10.40	41.60	5.37	21.48	11.80
Test 3	10.30	41.20	5.33	21.32	11.60
Test 4	10.30	41.20	5.31	21.24	11.60
Test 5	10.40	41.60	5.39	21.56	11.80
Test 6	10.60	42.40	5.40	21.60	11.80
Test 7	10.60	42.40	5.40	21.60	11.80
Test 8	10.40	41.60	5.32	21.28	11.60
Test 9	10.40	41.60	5.32	21.28	11.60
Test 10	10.40	41.60	5.31	21.24	11.60
Average	**10.45**	**41.80**	**5.37**	**21.46**	**11.73**

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		Deviation from Target	Target SAR @ 1 Watt Input averaged over 10 grams (W/kg)		Measured SAR @ 1 Watt Input averaged over 10 grams		Deviation from Target
39.7	+/- 10%	**41.8**	W/kg	+5.3%	20.5	+/- 10%	**21.46**	W/kg	+4.7%

System Validation (Brain) - 1900 MHz Dipole - June 9, 2006

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 151; Asset: 00032
Ambient Temp: 24.6 °C; Fluid Temp: 23.5 °C; Barometric Pressure: 101.2 kPa; Humidity: 35%
Communication System: CW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 (σ = 1.42 mho/m; ε_r = 39.7; ρ = 1000 kg/m^3)
- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 08/02/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

1900 MHz System Validation/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm

1900 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.7 V/m; Power Drift = 0.037 dB
SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.51 mW/g
Maximum value of SAR (measured) = 12.1 mW/g

1900 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.8 V/m; Power Drift = 0.003 dB
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.37 mW/g
Maximum value of SAR (measured) = 11.8 mW/g

1900 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.7 V/m; Power Drift = 0.020 dB
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.33 mW/g
Maximum value of SAR (measured) = 11.6 mW/g

1900 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.2 V/m; Power Drift = 0.041 dB
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.31 mW/g
Maximum value of SAR (measured) = 11.6 mW/g

1900 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.1 V/m; Power Drift = 0.036 dB
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.39 mW/g
Maximum value of SAR (measured) = 11.8 mW/g

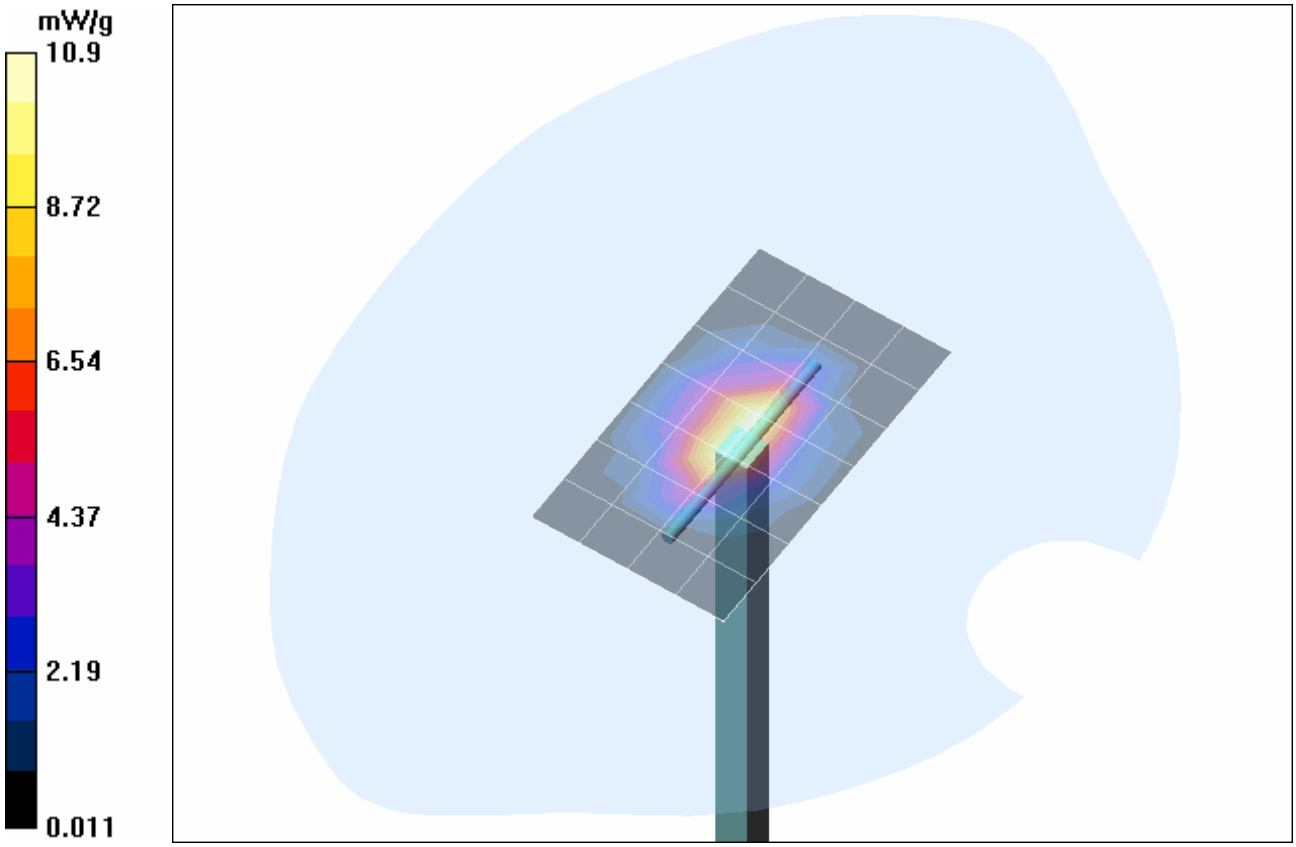
1900 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.2 V/m; Power Drift = 0.009 dB
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.4 mW/g
Maximum value of SAR (measured) = 11.8 mW/g

1900 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.4 V/m; Power Drift = -0.015 dB
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.4 mW/g
Maximum value of SAR (measured) = 11.8 mW/g

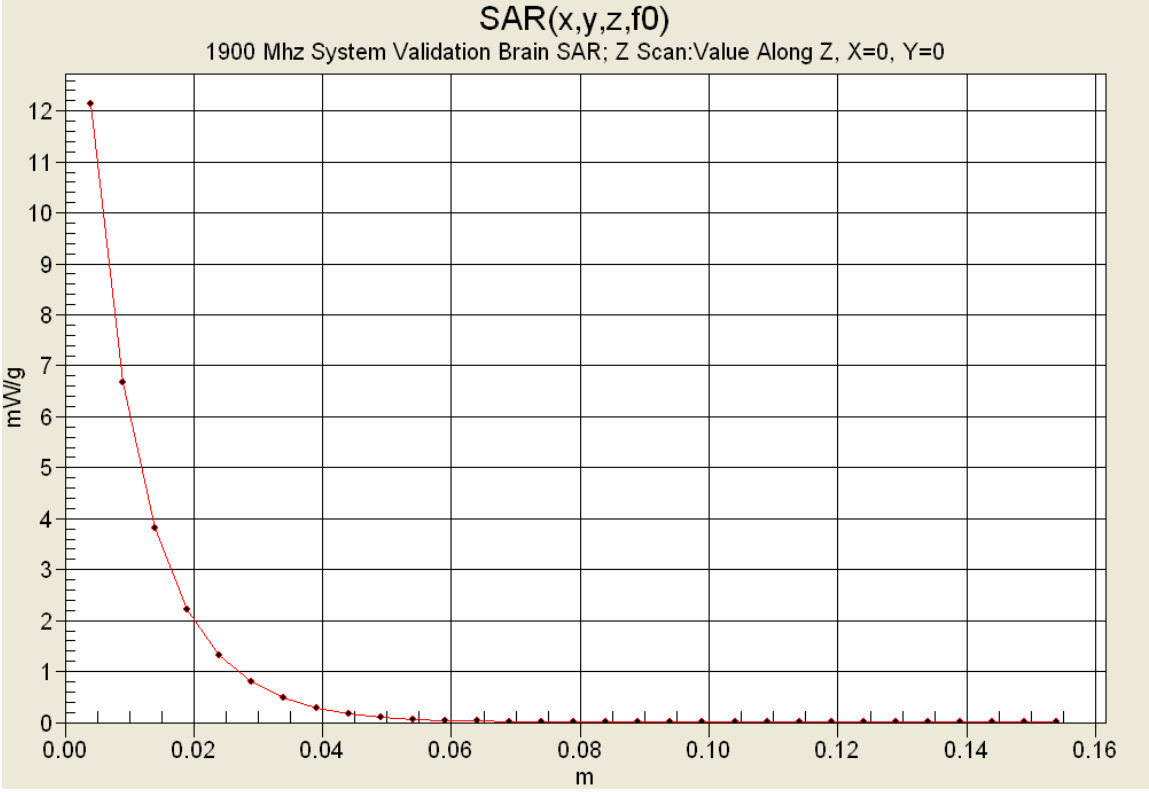
1900 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.6 V/m; Power Drift = -0.009 dB
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.32 mW/g
Maximum value of SAR (measured) = 11.6 mW/g

1900 MHz System Validation/Zoom Scan 10 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.5 V/m; Power Drift = 0.002 dB
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.32 mW/g
Maximum value of SAR (measured) = 11.6 mW/g

1900 MHz System Validation/Zoom Scan 11 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.4 V/m; Power Drift = 0.005 dB
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.31 mW/g
Maximum value of SAR (measured) = 11.6 mW/g



1 g average of 10 measurements: 10.45 mW/g
10 g average of 10 measurements: 5.37 mW/g



10. Measured Fluid Dielectric Parameters

1900 MHz System Validation (Brain)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 09/Jun/2006
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
1.8000	40.00	1.40	40.27	1.31
1.8100	40.00	1.40	40.15	1.32
1.8200	40.00	1.40	40.10	1.33
1.8300	40.00	1.40	40.01	1.33
1.8400	40.00	1.40	39.93	1.35
1.8500	40.00	1.40	39.90	1.36
1.8600	40.00	1.40	39.84	1.37
1.8700	40.00	1.40	39.77	1.39
1.8800	40.00	1.40	39.81	1.39
1.8900	40.00	1.40	39.73	1.41
1.9000	40.00	1.40	39.65	1.42
1.9100	40.00	1.40	39.71	1.42
1.9200	40.00	1.40	39.61	1.43
1.9300	40.00	1.40	39.67	1.43
1.9400	40.00	1.40	39.52	1.44
1.9500	40.00	1.40	39.61	1.45
1.9600	40.00	1.40	39.44	1.46
1.9700	40.00	1.40	39.46	1.46
1.9800	40.00	1.40	39.41	1.48
1.9900	40.00	1.40	39.32	1.50
2.0000	40.00	1.40	39.31	1.51

