APPENDIX E - SYSTEM VALIDATION

835 MHz SYSTEM VALIDATION

Type:	**835 MHz Validation Dipole**
Asset Number:	**00022**
Serial Number:	**411**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**January 18, 2007**

Celltech Labs Inc. hereby certifies that the 835 MHz System Validation (Body) was performed on the date indicated above.

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

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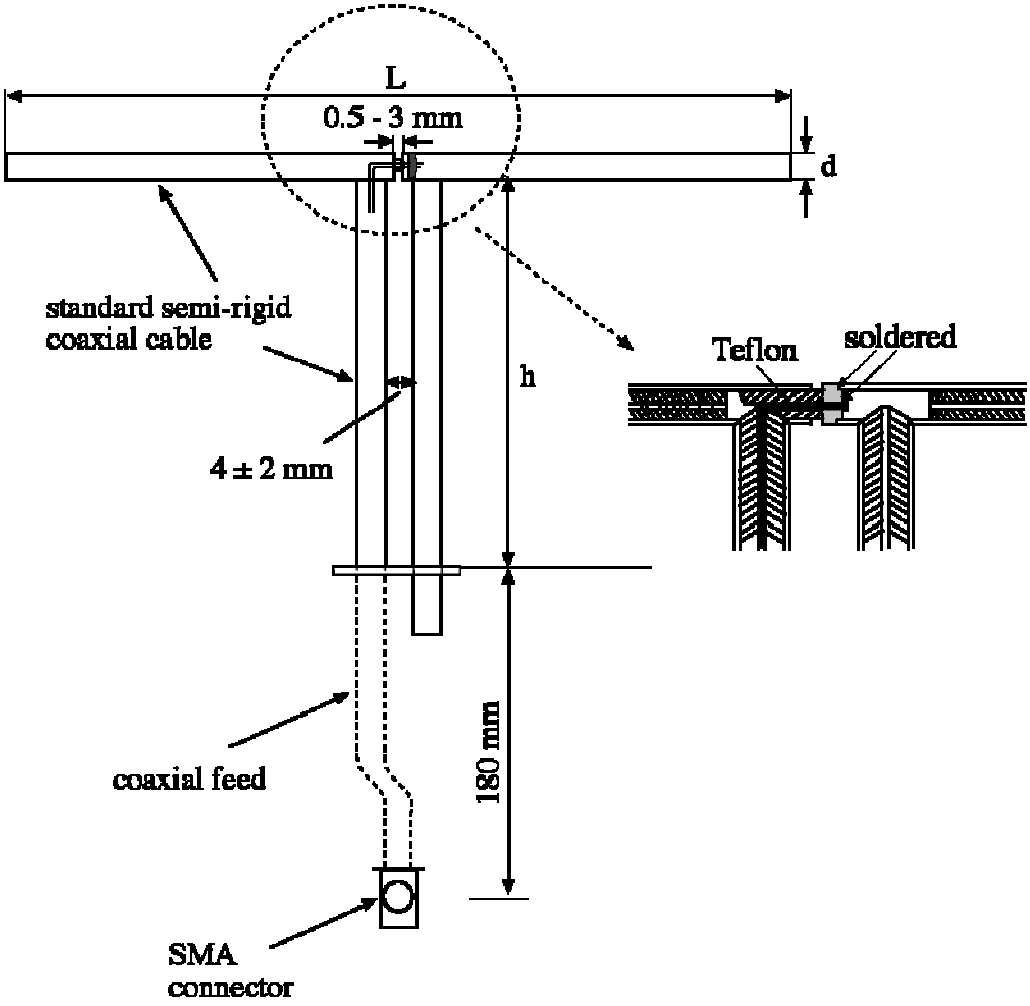
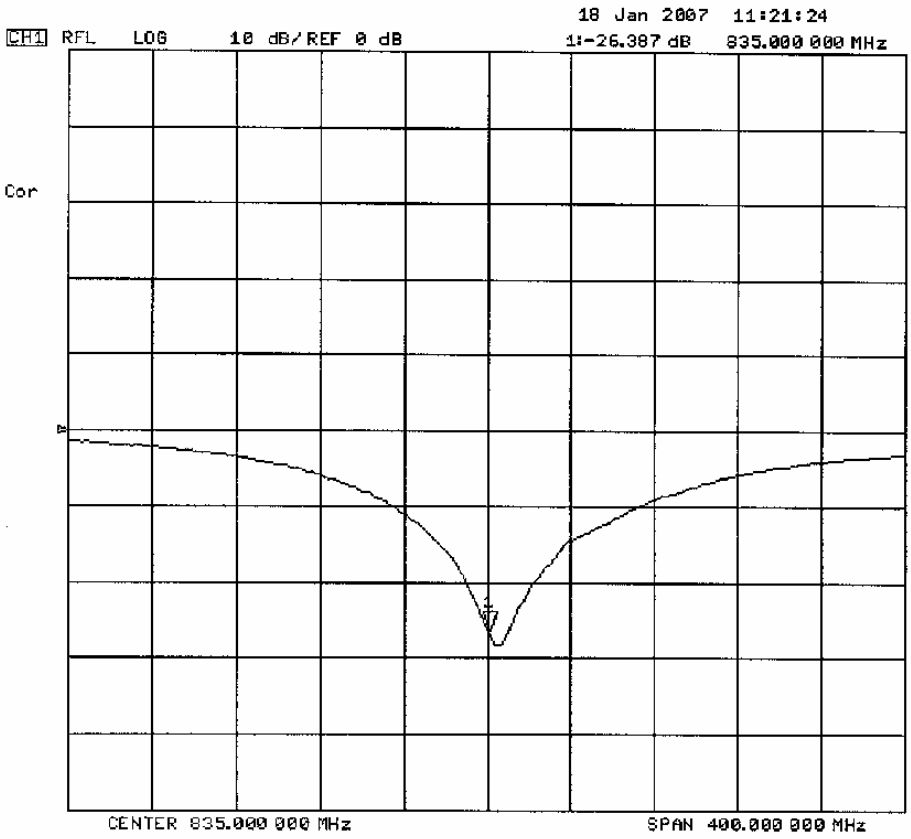
1. Validation Dipole Construction & Electrical Characteristics

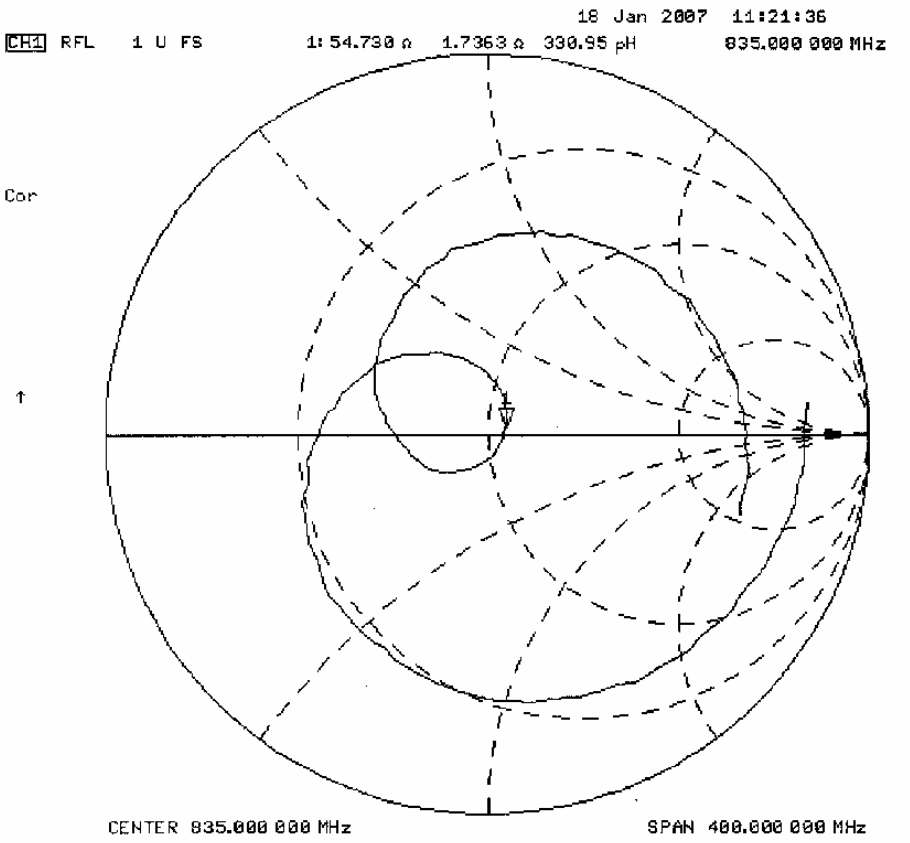
The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector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

Feed point impedance at 835 MHz	Re{Z} = 54.730Ω
	Im{Z} = 1.7363Ω
Return Loss at 835 MHz	-26.387dB



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 a Fiberglass shell planar phantom manufactured by Barski Industries Ltd. The phantom is in conformance with the requirements defined by IEEE SCC34-SC2 for the dosimetric evaluations of body-worn and lap-held operating configurations. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids.

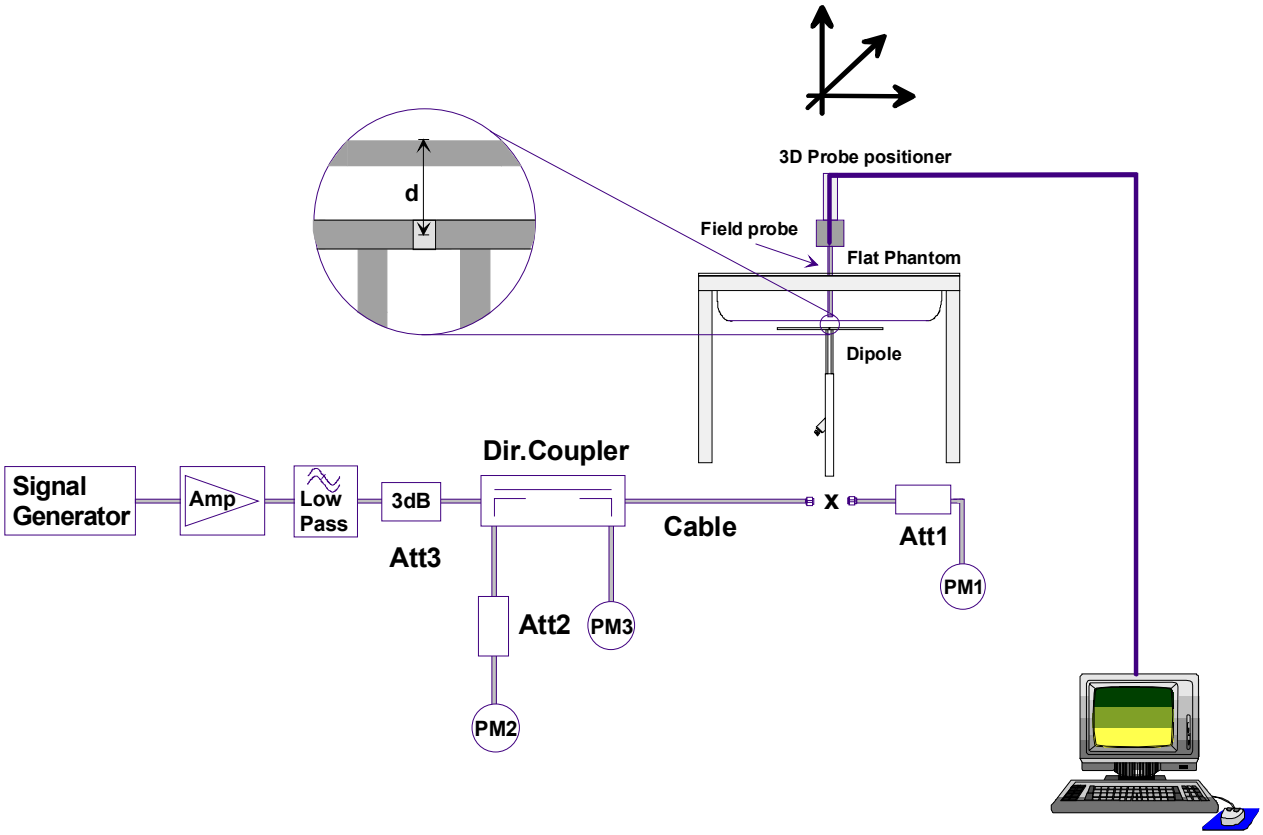
Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 55 liters
Dimensions: 44 cm (W) x 94 cm (L)

5. 835 MHz System Validation Setup

6. 835 MHz Validation Dipole Setup

7. SAR Measurement

Measurements were made using a dosimetric E-field probe ET3DV6 (S/N: 1387, Conversion Factor 6.04). 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.

8. Measurement Conditions

The planar phantom was filled with 835 MHz body tissue simulant.

Relative Permittivity: 57.3 (+3.8% from target)
Conductivity: 0.99 mho/m (+2.1% from target)
Fluid Temperature: 22.8 °C
Fluid Depth: ≥ 15.0 cm

Environmental Conditions:
Ambient Temperature: 24.1 °C
Barometric Pressure: 103.4 kPa
Humidity: 33 %

The 835 MHz body tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight
Water	53.79%
Sugar	45.13%
Salt	0.98%
Dowicil 75	0.10%
Target Dielectric Parameters at 22 °C	ε_r = 55.2 (+/- 5%) σ = 0.97 S/m (+/- 5%)

9. Validation Dipole SAR Test Results

SAR @ 0.25W Input averaged over 1g				SAR @ 1W Input averaged over 1g			
SPEAG Target		Measured	Deviation	SPEAG Target		Measured	Deviation
2.43	**+/- 10%**	2.63	+8.23%	**9.71**	**+/- 10%**	10.52	+8.34%
SAR @ 0.25W Input averaged over 10g				**SAR @ 1W Input averaged over 10g**			
SPEAG Target		Measured	Deviation	SPEAG Target		Measured	Deviation
1.60	**+/- 10%**	1.72	+7.50%	**6.38**	**+/- 10%**	6.88	+7.84%
The results have been normalized to 1W (forward power) into the dipole.							

Dipole Type	Distance [mm]	Frequency [MHz]	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D300V2	15	300	3.02	2.06	4.36
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1500V2	10	1500	30.8	17.1	52.1
D1640V2	10	1640	34.4	18.7	59.4
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6
D3000V2	10	3000	61.9	24.8	136.7

Table 32.1: Numerical reference SAR values for SPEAG dipoles and flat phantom filled with body-tissue simulating liquid. Note: All SAR values normalized to 1 W forward power.

System Validation - 835 MHz Dipole - January 18, 2007

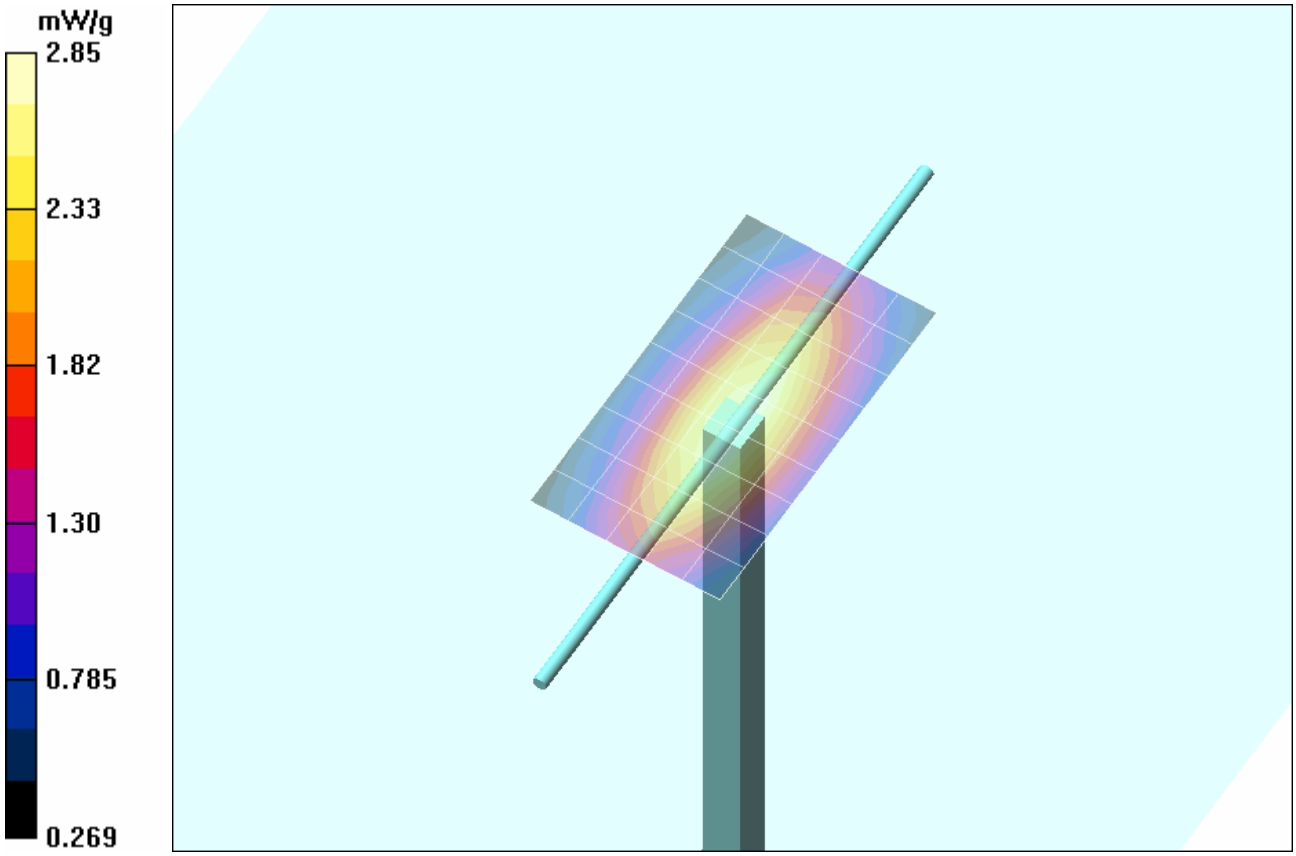
DUT: Dipole 835 MHz; Asset: 00022; Serial: 411

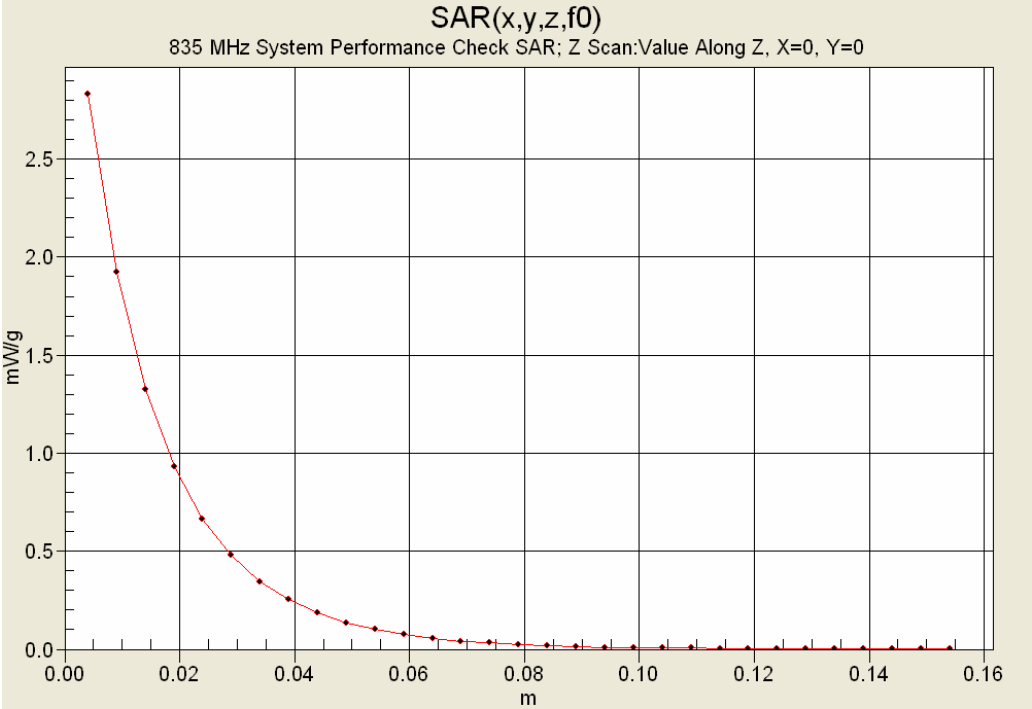
Ambient Temp: 24.1°C; Fluid Temp: 22.8°C; Barometric Pressure: 103.4 kPa; Humidity: 33%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 57.3; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1387; ConvF(6.04, 6.04, 6.04); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Validation/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.86 mW/g

835 MHz System Validation/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.8 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 3.85 W/kg
SAR(1 g) = 2.63 mW/g; SAR(10 g) = 1.72 mW/g
Maximum value of SAR (measured) = 2.85 mW/g





10. Measured Fluid Dielectric Parameters

835 MHz System Validation (Body)

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Celltech Labs Inc
Test Result for UIM Dielectric Parameter
Thu 18/Jan/2007
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

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Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	57.72	0.90
0.7450	55.55	0.96	57.59	0.91
0.7550	55.51	0.96	57.54	0.91
0.7650	55.47	0.96	57.45	0.93
0.7750	55.43	0.97	57.51	0.93
0.7850	55.39	0.97	57.53	0.94
0.7950	55.36	0.97	57.25	0.95
0.8050	55.32	0.97	57.28	0.96
0.8150	55.28	0.97	57.34	0.96
0.8250	55.24	0.97	57.17	0.97
0.8350	55.20	0.97	57.26	0.99
0.8450	55.17	0.98	57.06	0.99
0.8550	55.14	0.99	57.00	1.00
0.8650	55.11	1.01	56.99	1.01
0.8750	55.08	1.02	56.91	1.02
0.8850	55.05	1.03	56.96	1.02
0.8950	55.02	1.04	56.82	1.03
0.9050	55.00	1.05	56.97	1.04
0.9150	55.00	1.06	56.81	1.05
0.9250	54.98	1.06	56.77	1.06
0.9350	54.96	1.07	56.81	1.07

1900 MHz SYSTEM VALIDATION

Type:	**1900 MHz Validation Dipole**
Asset Number:	**00032**
Serial Number:	**151**
Place of Validation:	**Celltech Labs Inc.**
Date of Validation:	**February 2, 2007**

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

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

Celltech Labs Inc. 1955 Moss Court, Kelowna, B.C. Canada V1Y 9L3
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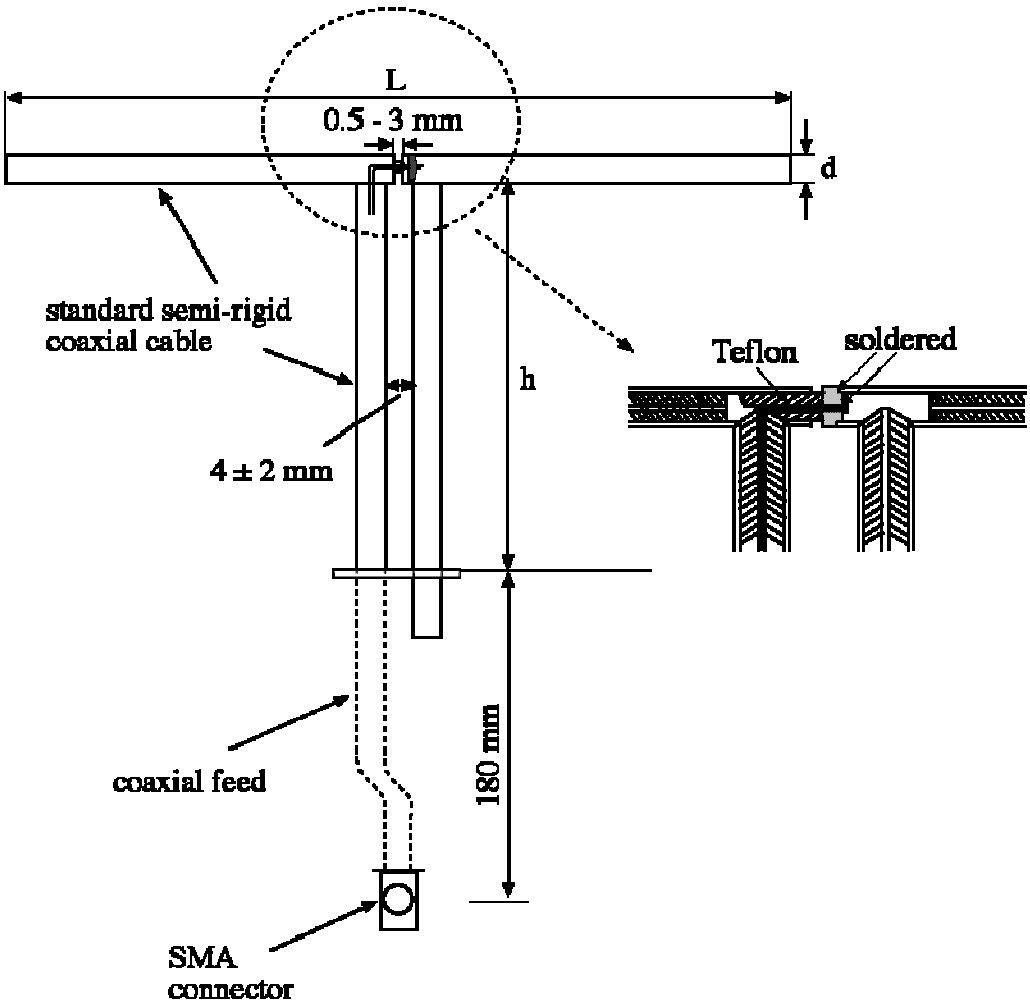
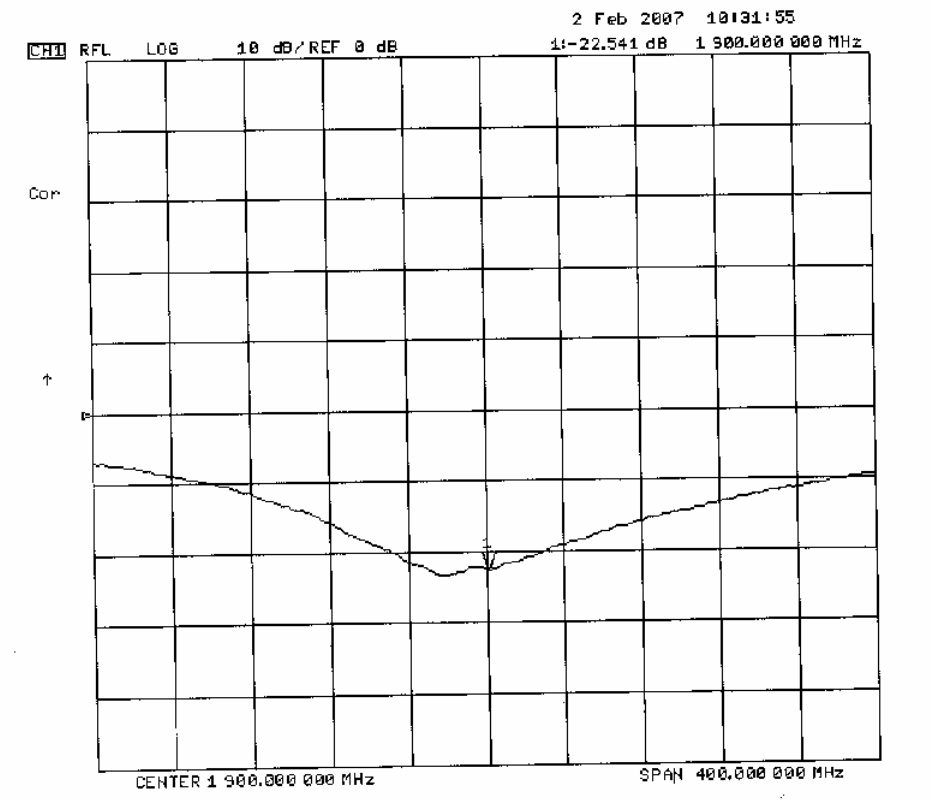
1. Dipole Construction & Electrical Characteristics

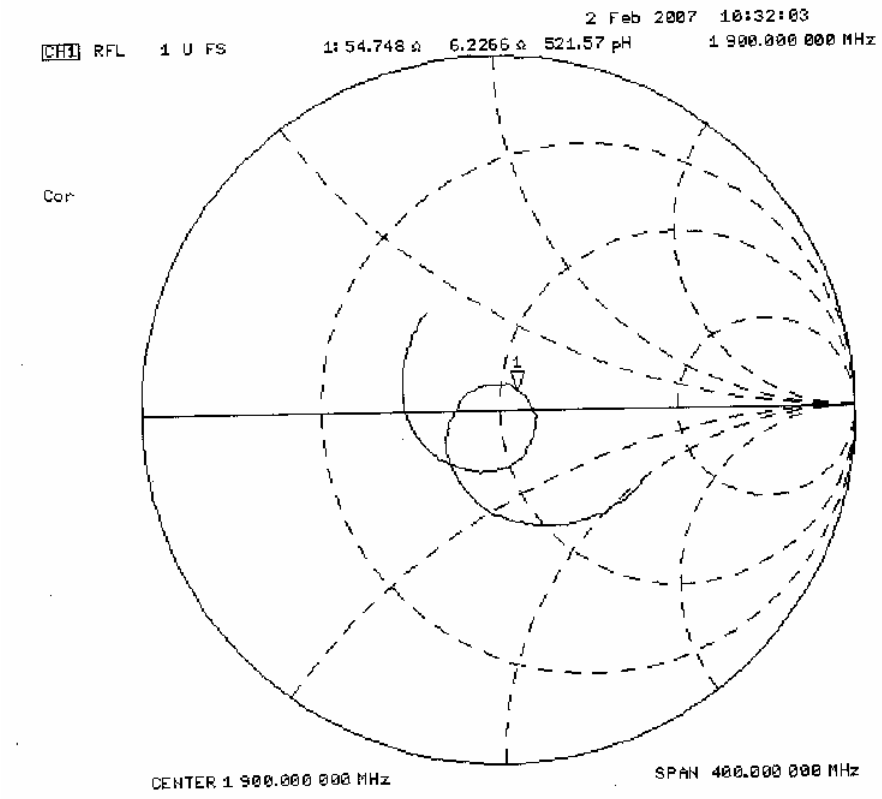
The validation dipole was constructed in accordance with the IEEE Standard "Annex G (informative) Reference dipoles for use in system validation". The electrical properties were measured using an HP 8753ET Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector 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

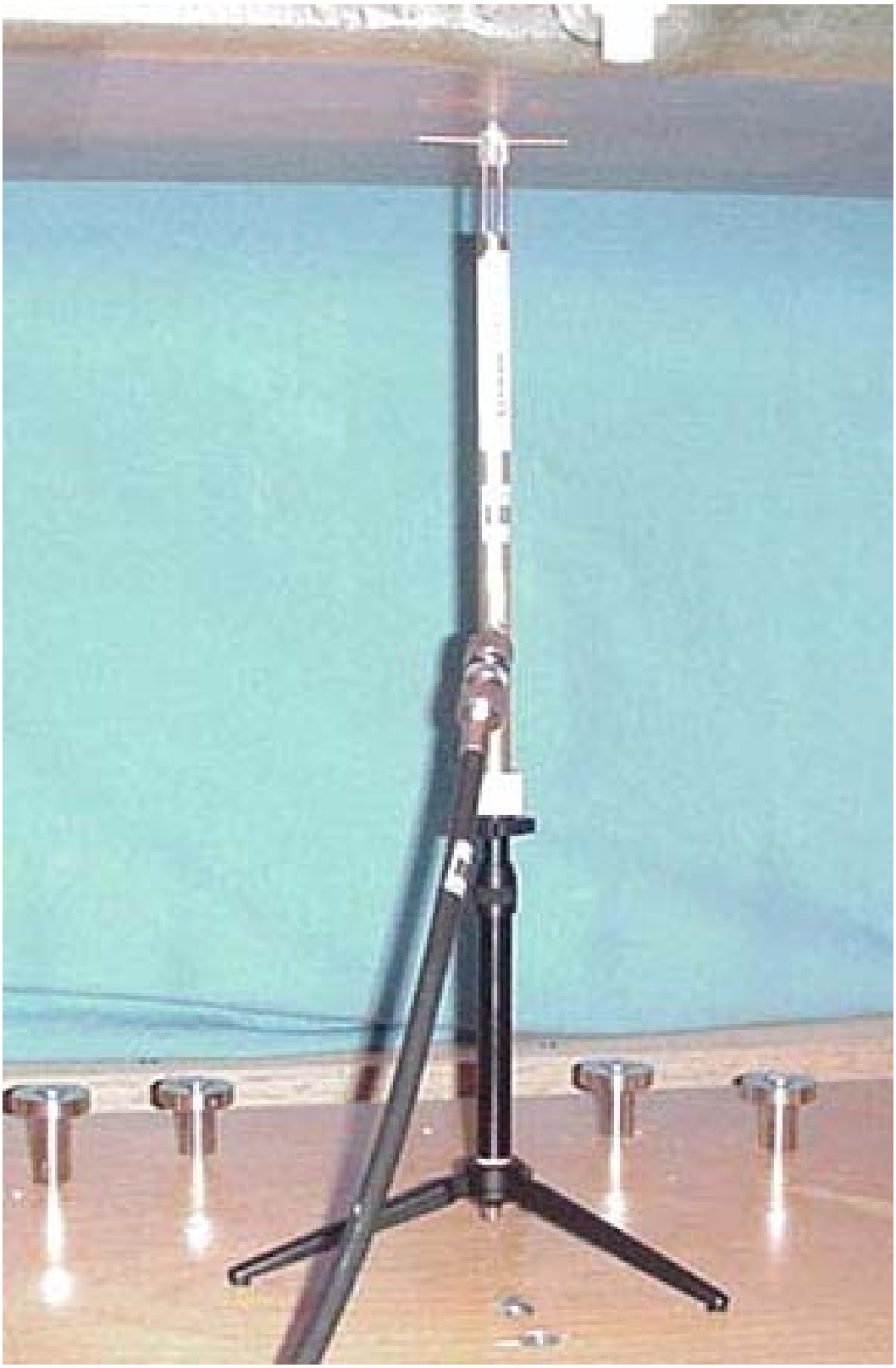
4. Validation Phantom

The validation phantom is a Fiberglass shell planar phantom manufactured by Barski Industries Ltd. The phantom is in conformance with the requirements defined by IEEE SCC34-SC2 for the dosimetric evaluations of body-worn and lap-held operating configurations. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids.

Shell Thickness: 2.0 ± 0.1 mm
Filling Volume: Approx. 55 liters
Dimensions: 44 cm (W) x 94 cm (L)

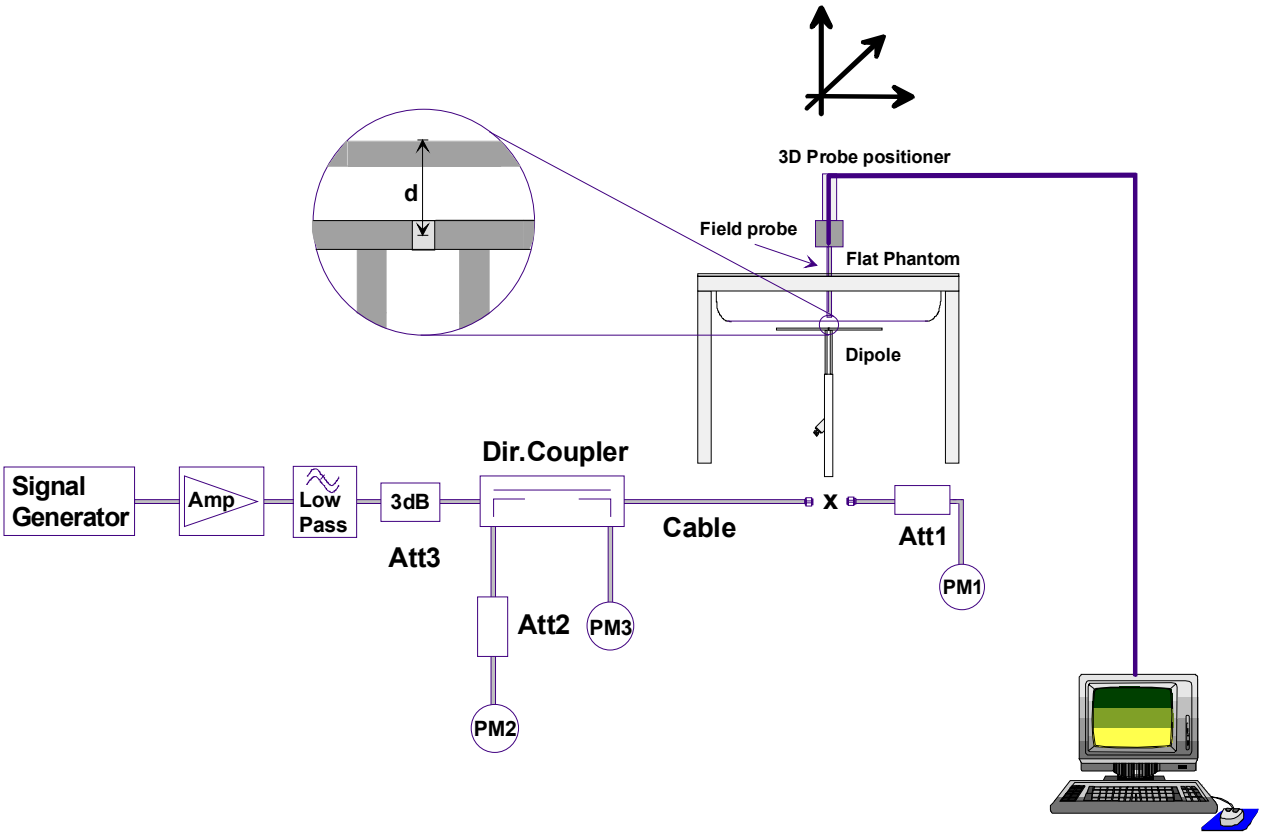
5. 1900 MHz System Validation Setup

6. 1900 MHz Dipole Setup



7. SAR Measurement

Measurements were made using a dosimetric E-field probe EX3DV4 (S/N: 3600, Conversion Factor 6.85). 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 planar phantom was filled with 1900 MHz Body tissue simulant.

Relative Permittivity: 51.6 (-3.2% deviation from target)
Conductivity: 1.53 mho/m (+0.7% deviation from target)
Fluid Temperature: 22.5 °C
Fluid Depth: ≥ 15.0 cm

Environmental Conditions:
Ambient Temperature: 23.4 °C
Barometric Pressure: 102.2 kPa
Humidity: 36%

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

Ingredient	Percentage by weight
Water	69.85%
Glycol	29.89%
Salt	0.26%
Target Dielectric Parameters at 25 °C	ε_r = 53.3 (+/-5%) σ = 1.52 S/m (+/-5%)

9. Validation Dipole SAR Test Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
SPEAG Target		Measured	Deviation	SPEAG Target		Measured	Deviation
9.95	+/- 10%	10.1	+1.5%	39.8	+/- 10%	40.4	+1.5%
SAR @ 0.25W Input averaged over 10g				SAR @ 1W Input averaged over 10g			
SPEAG Target		Measured	Deviation	SPEAG Target		Measured	Deviation
5.20	+/- 10%	5.16	-0.77%	20.8	+/- 10%	20.64	-0.77%
The results have been normalized to 1W (forward power) into the dipole.							

Dipole Type	Distance [mm]	Frequency [MHz]	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D300V2	15	300	3.02	2.06	4.36
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1500V2	10	1500	30.8	17.1	52.1
D1640V2	10	1640	34.4	18.7	59.4
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6
D3000V2	10	3000	61.9	24.8	136.7

Table 32.1: Numerical reference SAR values for SPEAG dipoles and flat phantom filled with body-tissue simulating liquid. Note: All SAR values normalized to 1 W forward power.

System Validation - 1900 MHz Dipole - Feb 02, 2006

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 151; Asset: 00032

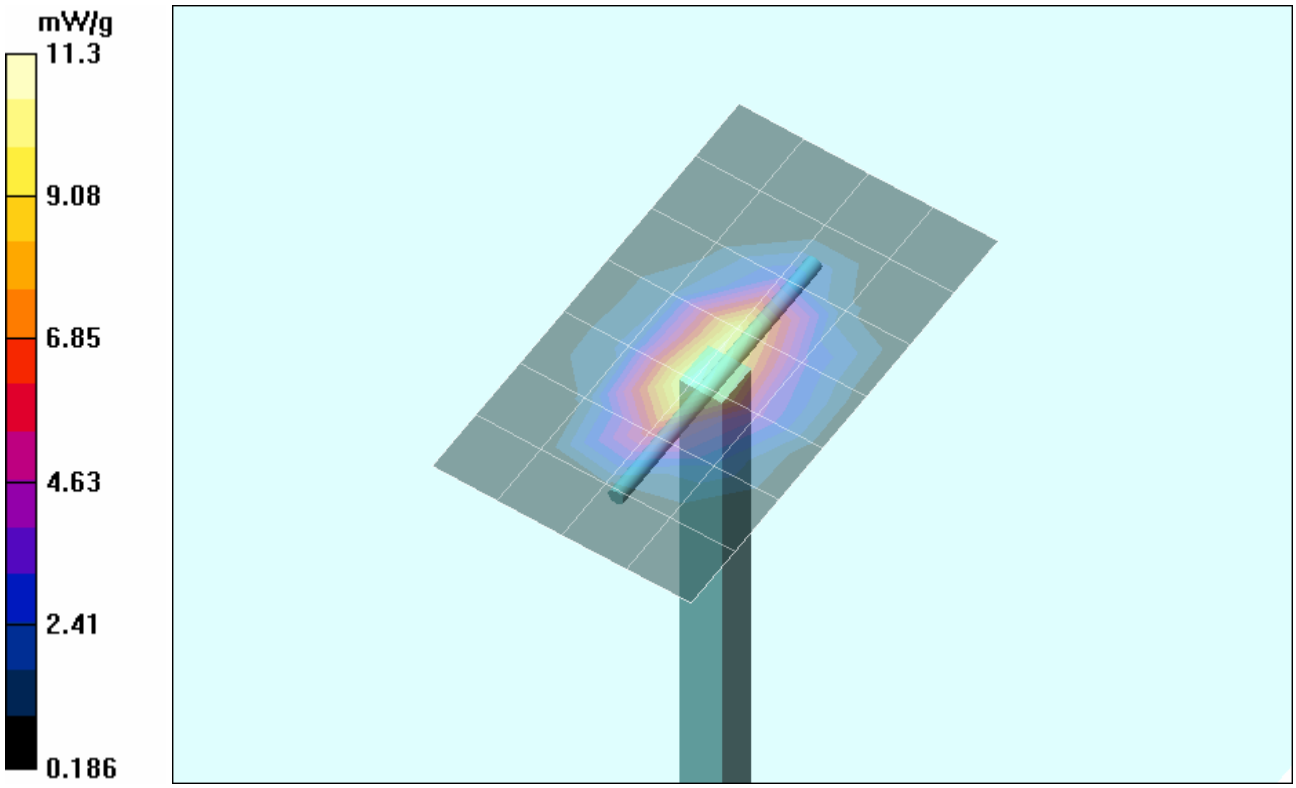
Ambient Temp: 23.4°C; Fluid Temp: 22.5°C; Barometric Pressure: 102.2 kPa; Humidity: 36%

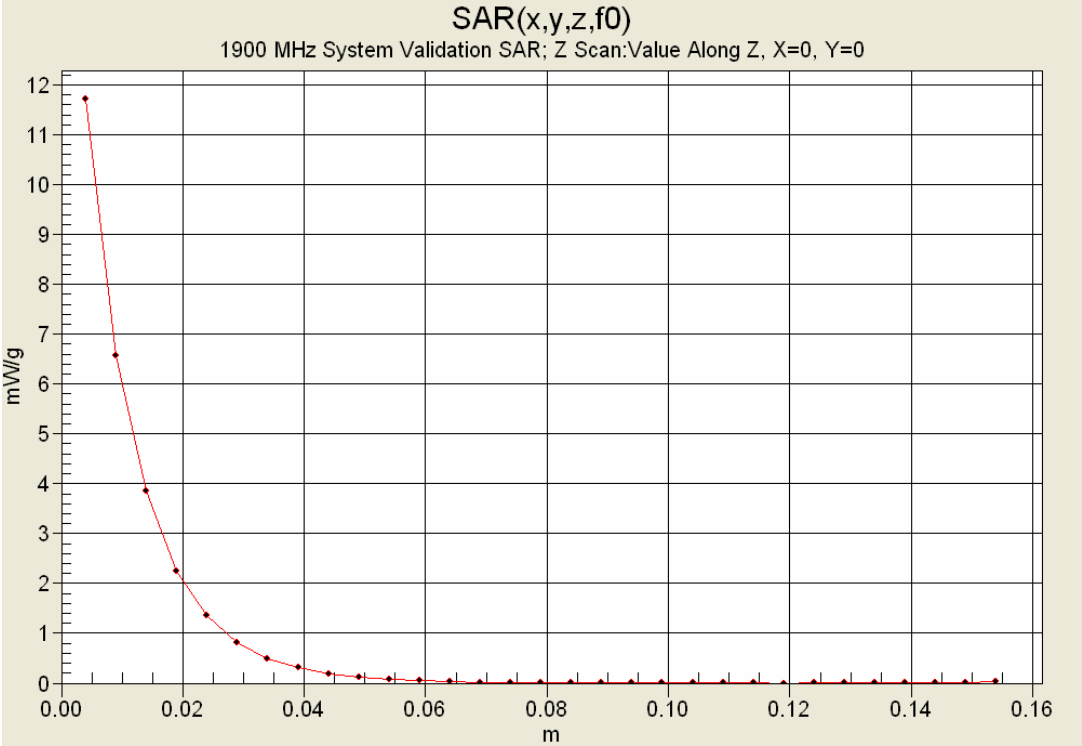
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: M1900 Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; ε_r = 51.6; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.85, 6.85, 6.85); Calibrated: 24/01/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- 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) = 11.2 mW/g

1900 MHz System Validation/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.0 V/m; Power Drift = -0.152 dB
Peak SAR (extrapolated) = 18.8 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.16 mW/g
Maximum value of SAR (measured) = 11.3 mW/g





10. Measured Fluid Dielectric Parameters

1900 MHz Dipole System Validation (Body)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 02/Feb/2007
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

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Freq	FCC_eB	FCC_sB	Test_e	Test_s
1.8000	53.30	1.52	51.97	1.43
1.8100	53.30	1.52	51.94	1.44
1.8200	53.30	1.52	51.94	1.45
1.8300	53.30	1.52	51.85	1.46
1.8400	53.30	1.52	51.88	1.48
1.8500	53.30	1.52	51.81	1.49
1.8600	53.30	1.52	51.75	1.49
1.8700	53.30	1.52	51.72	1.50
1.8800	53.30	1.52	51.61	1.50
1.8900	53.30	1.52	51.58	1.52
1.9000	53.30	1.52	51.55	1.53
1.9100	53.30	1.52	51.54	1.55
1.9200	53.30	1.52	51.47	1.56
1.9300	53.30	1.52	51.38	1.56
1.9400	53.30	1.52	51.41	1.58
1.9500	53.30	1.52	51.32	1.59
1.9600	53.30	1.52	51.26	1.59
1.9700	53.30	1.52	51.33	1.60
1.9800	53.30	1.52	51.35	1.63
1.9900	53.30	1.52	51.31	1.63
2.0000	53.30	1.52	51.17	1.64