

Question 7 Attachment

5.8 GHz Validation Dipole Kit

Dipole Specification:

Model: D-5800S

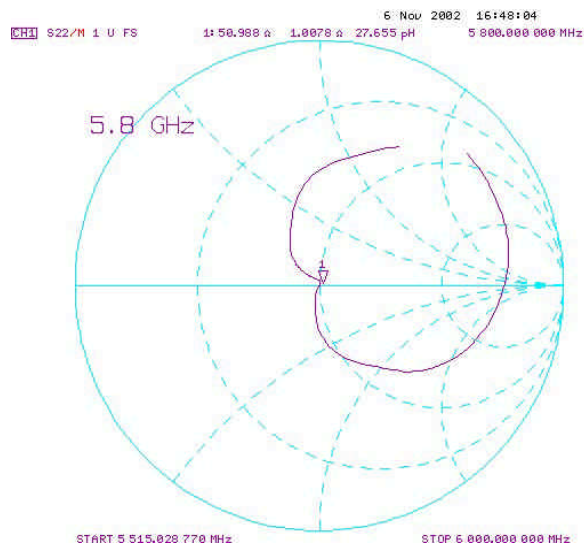
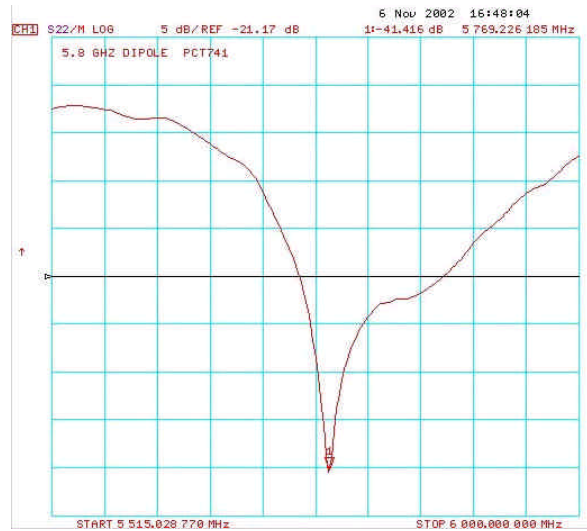
Serial Number: PCT-741

Calibrated Date: 11/2002

Reference Dipole Dimension (mm): 22.0 x 13.5 x 3.75

Connection Type: SMA

Reference Dipole distance s (mm) from the liquid: 10 mm



Derivation of Validation Targets

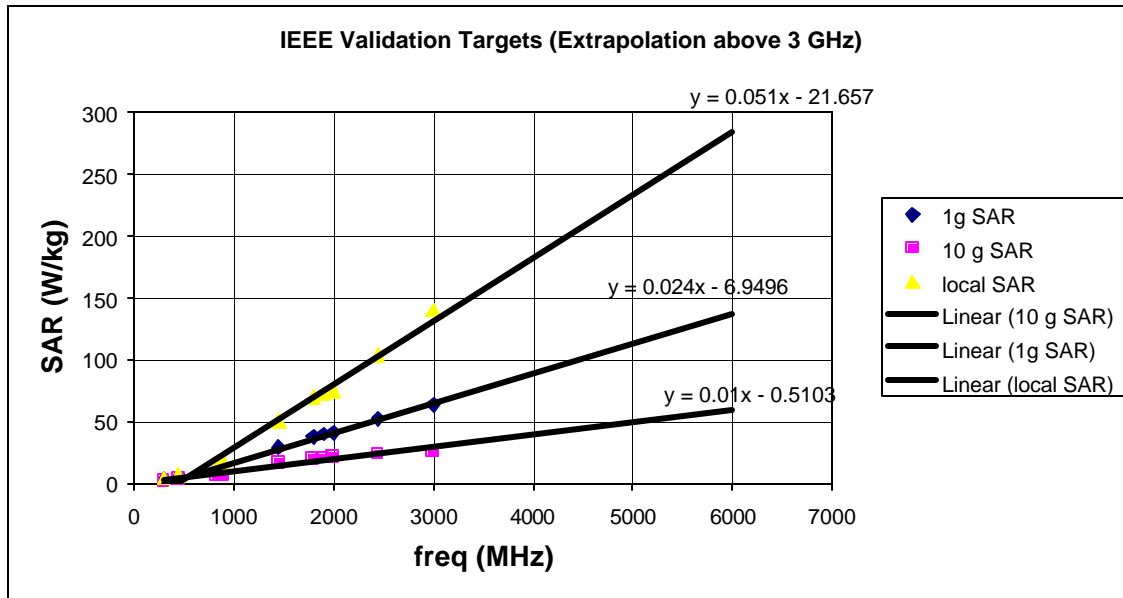


Figure A

Assuming the validation targets were related linearly with frequency, we characterized the validation targets with frequency in the above scatter plot. A linear extrapolation was then used to derive validation targets for 5300 and 5800 MHz. By substitution method, we obtained the following results:

For SAR normalized to a forward power of 1 W,

5300 MHz:

Local SAR = 248.64 W/kg

1g SAR = 120.25 W/kg

10g SAR = 52.49 W/kg

5800 MHz:

Local SAR = 274.14 W/kg

1g SAR = 132.25 W/kg

10g SAR = 57.49 W/kg

For our validations, we normalized both 5300 MHz and 5800 MHz targets from a 50 mW forward power. The 1g SAR targets normalized to 50 mW are:

$$SAR_{1g}(f=5300 \text{ MHz}, P=0.05 \text{ W}) = 120.25 * 0.05 = \mathbf{6.01 \text{ W/kg}}$$

$$SAR_{1g}(f=5800 \text{ MHz}, P=0.05 \text{ W}) = 132.25 * 0.05 = \mathbf{6.61 \text{ W/kg}}$$

Question 8 Attachment

SAR Data Report 03020507

Start : 5-Feb-03 11:46:02 am
End : 5-Feb-03 11:50:55 am
Code Version : 4.12
Robot Version: 4.08
Serial Number: 1068

Product Data:

Type : Dipole
Frequency : 5800 MHz
Transmit Pwr : 0.050 W
Antenna Type : Dipole
Antenna Posn. : Validation

Measurement Data:

Phantom Name : SAM FLAT
Phantom Type : Uniphantom
Tissue Type : Brain
Tissue Dielectric : 36.500
Tissue Conductivity : 5.300
Tissue Density : 1.000
Crest Factor : 1.000
Robot Name : CRS

Probe Data:

Probe Name : PCT002
Probe Type : E Fld Triangle
Frequency : 5800 MHz
Tissue Type : Brain
Calibrated Dielectric : 35.300
Calibrated Conductivity : 5.270
Probe Offset : 2.400 mm
Conversion Factor : 2.400
Diode Compression Pt : 76.0 mV
Probe Sensitivity : 0.683 0.796 0.774 mV/(V/m)^2
Amplifier Gains : 20.00 20.00 20.00
Chan. Offset (mV) : 1.47 2.16 2.25

Sample:

Rate: 6000 Samples/Sec
Count: 1000 Samples
NIDAQ Gain: 5
Scan Time: 166.7 msec

Comments:

5800 MHz Validation
100% Duty Cycle
Amb. Temp.= 22.1 'C; Liq. Temp.= 22.0'C

Area Scan - Max Local SAR Value at x=0.0 y=0.0 = 6.18 W/kg

Zoom Scan - Max Local SAR Value at x=0.0 y=0.0 z=0.0 = 18.02 W/kg

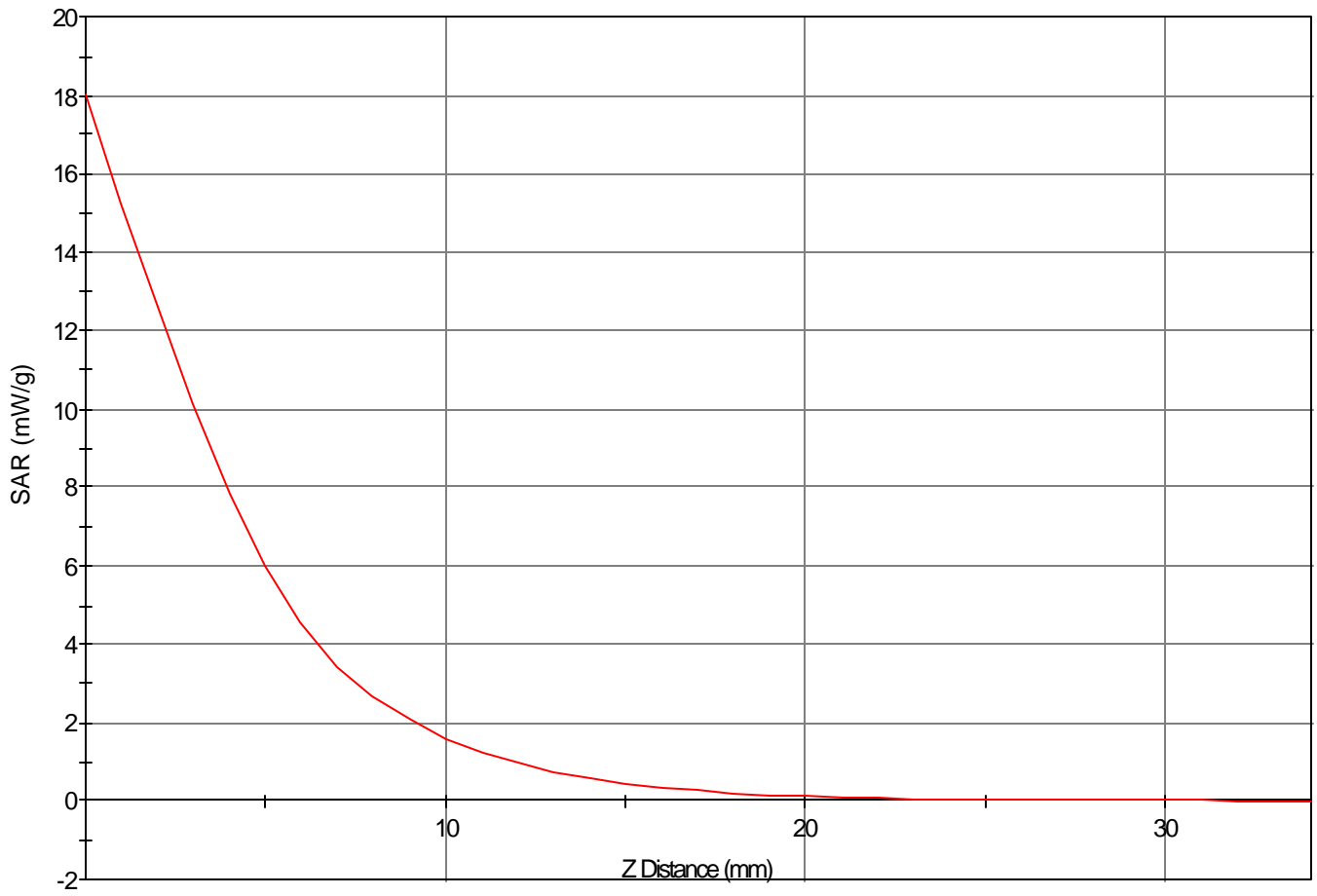
Max 1g SAR at x=1.0 y=1.0 z=0.0 = 6.91 W/kg

Max 10g SAR at x=1.0 y=1.0 z=0.0 = 2.08 W/kg

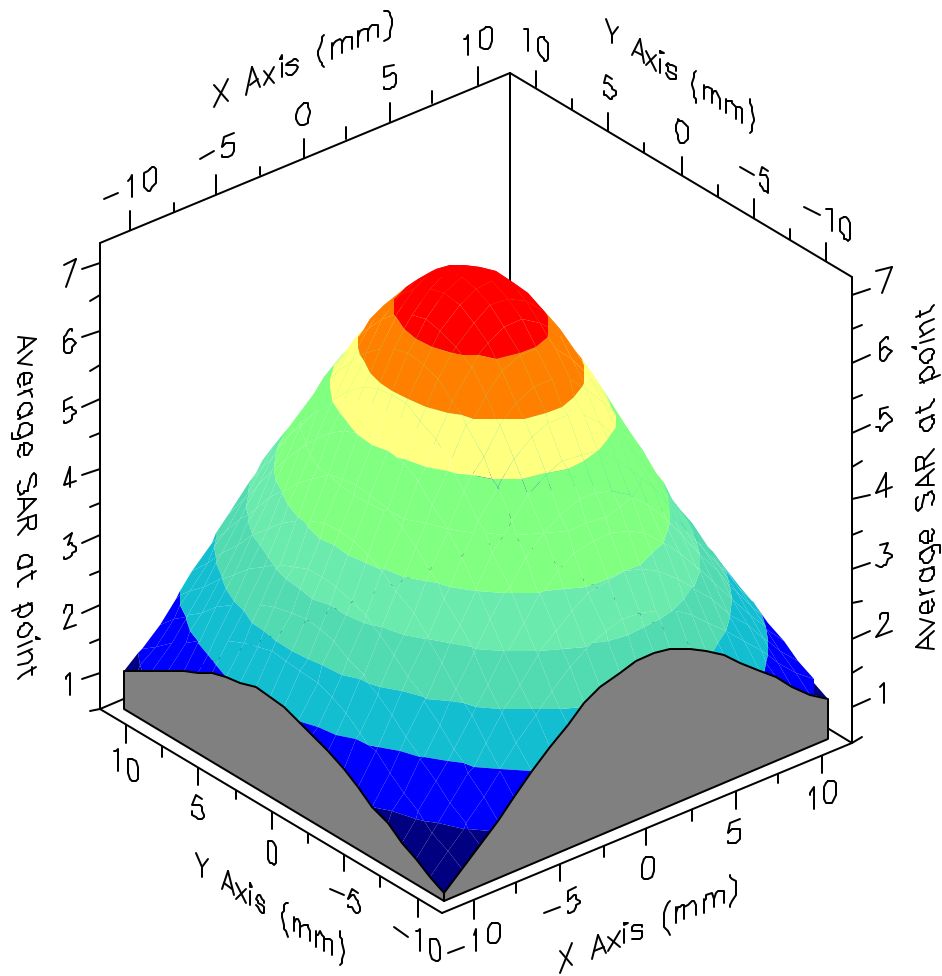
Validation Results at 0.05 W:

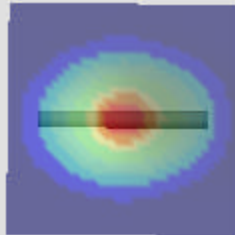
1g Nominal = 6.6, Error: 4.53 %

SAR - Z Axis
at Hotspot x:0.0 y:0.0



1g SAR Values





SAR Data Report 03020511

Start : 5-Feb-03 12:11:17 pm
End : 5-Feb-03 12:16:10 pm
Code Version : 4.12
Robot Version: 4.08
Serial Number: 1068

Product Data:

Type : Dipole
Frequency : 5800 MHz
Transmit Pwr : 0.050 W
Antenna Type : Dipole
Antenna Posn. : Validation

Measurement Data:

Phantom Name : SAM FLAT
Phantom Type : Uniphantom
Tissue Type : Brain
Tissue Dielectric : 36.500
Tissue Conductivity : 5.300
Tissue Density : 1.000
Crest Factor : 4.000
Robot Name : CRS

Probe Data:

Probe Name : PCT002
Probe Type : E Fld Triangle
Frequency : 5800 MHz
Tissue Type : Brain
Calibrated Dielectric : 35.300
Calibrated Conductivity : 5.270
Probe Offset : 2.400 mm
Conversion Factor : 2.400
Diode Compression Pt : 76.0 mV
Probe Sensitivity : 0.683 0.796 0.774 mV/(V/m)^2
Amplifier Gains : 20.00 20.00 20.00
Chan. Offset (mV) : 1.47 2.16 2.25

Sample:

Rate: 6000 Samples/Sec
Count: 1000 Samples
NIDAQ Gain: 5
Scan Time: 166.7 msec

Comments:

5800 MHz Validation
25% Duty Cycle (10ms frame)
Amb. Temp.= 22.1 'C; Liq. Temp.= 22.0'C

Area Scan - Max Local SAR Value at x=0.0 y=0.0 = 1.54 W/kg

Zoom Scan - Max Local SAR Value at x=0.0 y=0.0 z=0.0 = 4.87 W/kg

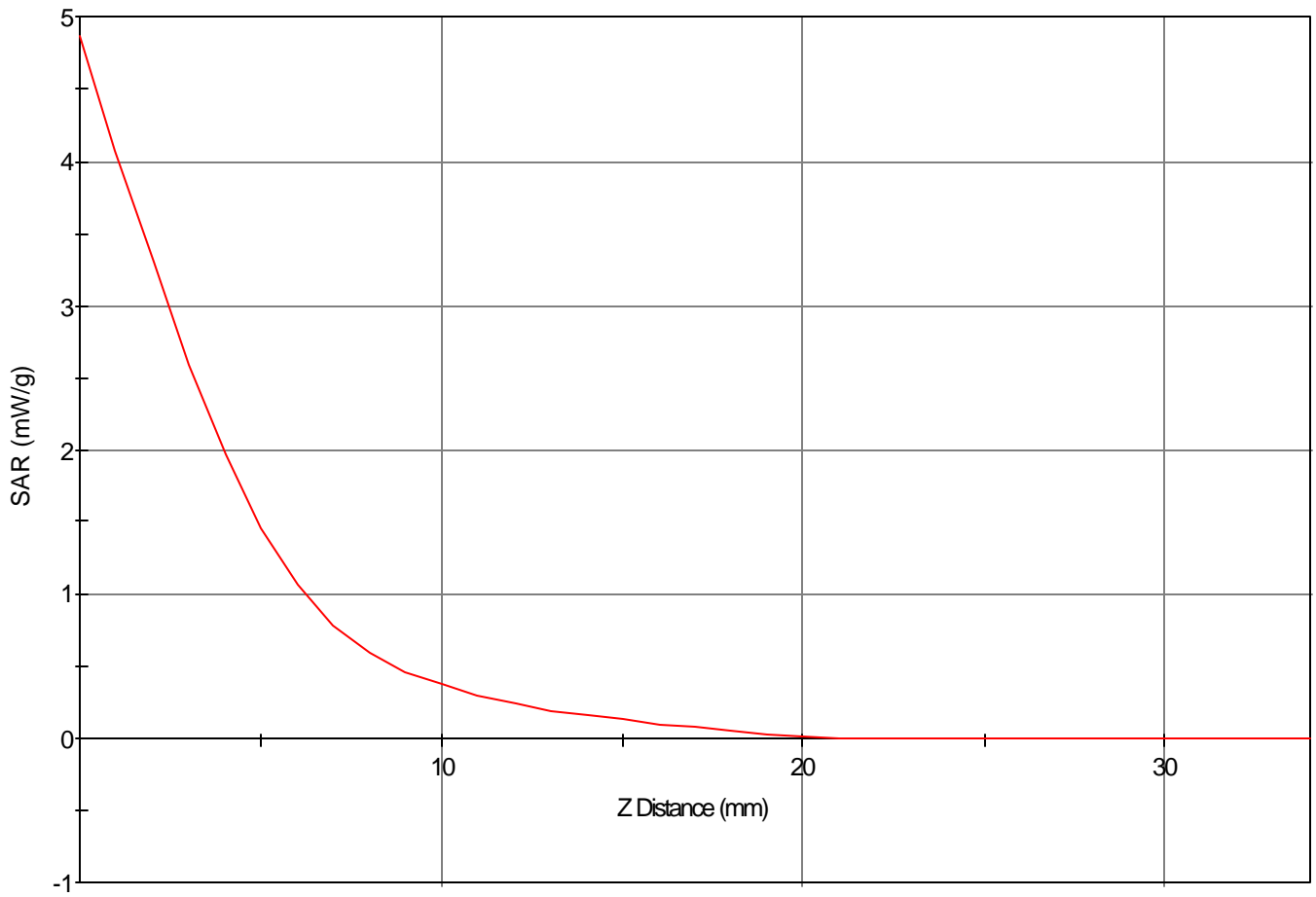
Max 1g SAR at x=0.0 y=1.0 z=0.0 = 1.74 W/kg

Max 10g SAR at x=1.0 y=1.0 z=0.0 = 0.49 W/kg

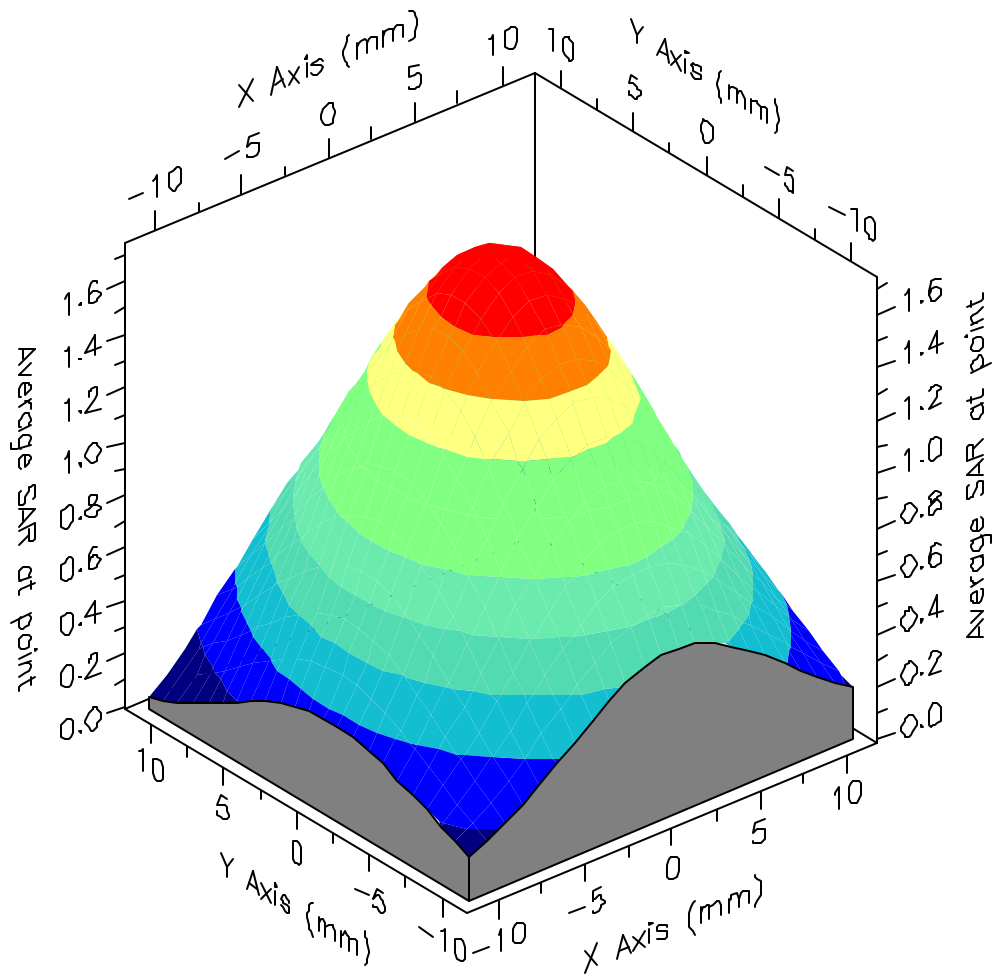
Validation Results at 0.05 W:

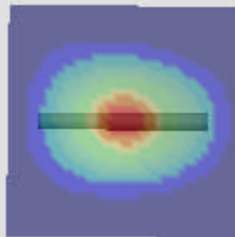
1g Nominal = 6.6, Error: -73.67 %

SAR - Z Axis
at Hotspot x:0.0 y:0.0



1g SAR Values





Question 9 Attachment

5.8 GHz Brain Tissue Simulant

Program=3601
Sweep mode=2050
Number of points=50
Start Frequency=5000000000.000000
Stop Frequency=6000000000.000000
Data Sensitivity=1

frequency	e'	e''	data sens
5000000000	37.07	16.037	1.50
5020408163	36.86	16.042	1.51
5040816327	36.63	16.160	1.51
5061224490	36.80	16.331	1.52
5081632653	37.09	16.292	1.51
5102040816	37.41	16.219	1.50
5122448980	37.53	15.891	1.49
5142857143	37.26	15.965	1.50
5163265306	37.09	15.899	1.50
5183673469	36.95	16.081	1.51
5204081633	36.95	15.983	1.50
5224489796	36.76	15.945	1.50
5244897959	36.76	15.947	1.50
5265306122	36.60	16.021	1.51
5285714286	36.71	15.983	1.51
5306122449	36.52	16.207	1.52
5326530612	36.59	16.301	1.52
5346938776	36.70	16.353	1.52
5367346939	37.07	16.172	1.51
5387755102	36.76	16.165	1.51
5408163265	36.89	15.957	1.50
5428571429	36.79	15.918	1.50
5448979592	36.62	15.935	1.51
5469387755	36.28	15.973	1.51
5489795918	36.29	16.201	1.52
5510204082	36.30	16.318	1.53
5530612245	36.59	16.229	1.52
5551020408	36.95	15.953	1.51
5571428571	36.77	15.672	1.50
5591836735	36.37	15.795	1.51
5612244898	36.16	16.125	1.52
5632653061	35.92	16.401	1.54
5653061224	35.83	16.518	1.55
5673469388	36.13	16.738	1.55
5693877551	36.36	16.453	1.54
5714285714	36.39	16.292	1.53
5734693878	36.25	16.245	1.53
5755102041	36.19	16.558	1.54
5775510204	36.25	16.667	1.55
5795918367	36.39	16.518	1.54
5816326531	36.50	16.402	1.54
5836734694	36.42	16.377	1.54
5857142857	36.15	16.237	1.54
5877551020	36.04	16.397	1.54
5897959184	35.91	16.253	1.54
5918367347	35.66	16.590	1.56

Program=3601

Sweep mode=2050

Number of points=50

Start Frequency=5000000000.000000

Stop Frequency=6000000000.000000

Data Sensitivity=1

5.8 GHz Muscle Tissue Simulant

frequency	e'	e''	data sens
5000000000	48.01	17.239	1.432453
5020408163	48.02	17.354	1.436976
5040816327	47.65	17.326	1.439512
5061224490	47.96	17.411	1.441479
5081632653	48.17	17.273	1.437689
5102040816	48.62	17.289	1.437148
5122448980	48.45	16.800	1.425092
5142857143	48.15	17.173	1.438516
5163265306	48.04	17.105	1.438509
5183673469	47.86	17.445	1.450647
5204081633	47.97	17.262	1.446348
5224489796	47.69	17.034	1.442119
5244897959	47.76	17.160	1.446818
5265306122	47.68	17.234	1.450892
5285714286	47.86	17.143	1.448875
5306122449	47.57	17.283	1.455697
5326530612	47.57	17.468	1.462645
5346938776	47.66	17.611	1.468071
5367346939	48.05	17.522	1.465485
5387755102	47.78	17.240	1.459503
5408163265	47.85	17.231	1.460453
5428571429	47.75	17.250	1.462952
5448979592	47.62	17.333	1.467522
5469387755	47.26	17.331	1.470499
5489795918	47.30	17.466	1.476013
5510204082	47.30	17.707	1.484971
5530612245	47.63	17.632	1.48328
5551020408	48.07	17.115	1.468216
5571428571	47.78	16.876	1.462873
5591836735	47.29	17.152	1.474537
5612244898	47.24	17.686	1.492648
5632653061	47.11	17.826	1.4995
5653061224	46.85	17.896	1.504465
5673469388	47.23	18.308	1.517282
5693877551	47.47	18.034	1.51037
5714285714	47.58	17.617	1.498765
5734693878	47.36	17.572	1.499472
5755102041	47.27	17.848	1.510065
5775510204	47.32	18.010	1.516926
5795918367	47.52	17.921	1.515564
5816326531	47.50	17.795	1.513504
5836734694	47.34	17.992	1.521883
5857142857	47.27	17.922	1.521887
5877551020	47.22	17.993	1.526107
5897959184	47.24	17.721	1.519539
5918367347	46.82	18.073	1.533721
5938775510	46.78	18.200	1.539781
5959183673	47.11	18.415	1.547575
5979591837	47.15	18.599	1.555566
6000000000	47.02	18.454	1.553417

Question 10 Attachment

Uncertainty Budget for Thermal Calibration of E-field Probe

Uncertainty Description	Uncertainty ± %	Distribution	Weight	Standard Deviation S_{n-1}
Liquid Conductivity	1.0	Rectangular	$\sqrt{3}$	1.15
E-Field Differential				
Probe Positioning	0.4	Rectangular	$\sqrt{3}$	0.23
RF Ambient Conditions	1.2	Rectangular	$\sqrt{3}$	0.69
Readout Electronics	1.0	Rectangular	$\sqrt{3}$	0.58
Temperature Differential				
Thermistor Response Time to 99% ($t = 0.2$ sec)	0.6	Rectangular	$\sqrt{3}$	0.46
Thermistor Resolution in Calibration	0.5	Rectangular	$\sqrt{3}$	0.58
Combined Standard Uncertainty (k=1)				
				3.7
Expanded Uncertainty (k=2)				
(95% confidence level)				
				7.4