

PCTEST ENGINEERING LABORATORY, INC.

PCTEST Calibration Laboratory

6660-B Dobbin Road
Columbia, Maryland 21045
U.S.A.

Calibration File No.: PCT486A-0201

CERTIFICATE OF CALIBRATION

It is hereby certified that the identified equipment below has been calibrated in PCTEST Calibration Laboratory by qualified personnel following recognized procedures and using transfer standards traceable to US NIST.

EQUIPMENT: Miniature Isotropic RF Probe

MANUFACTURER: IDX Robotics Inc.

SERIAL NO.: PCT486A

Calibration Procedure: IEEE Std. 1528 (Draft 3 – Aug. 2000)

Date of Calibration: 02 Feb 2001

Calibration Due Date: 03 Feb 2002

REMARKS: none

Calibrated By: Al Cirwithian

CALIBRATION RECORD

EQUIPMENT: _____ Miniature Isotropic RF Probe _____

MANUFACTURER: _____ IDX Robotics Inc. _____

SERIAL NO.: _____ PCT486A _____

Calibration Procedure: _____ IEEE Std. 1528 (Draft 3 – Aug. 2000) _____

Date of Calibration: _____ 02 Feb 2001 _____

Calibration Due Date: _____ 03 Feb 2002 _____

Environmental Conditions:

Temperature: _____ 25 ±2 C _____

Humidity: _____ 30-60 % _____

TEST EQUIPMENT:

1. RF Power Meter – HP 437B
2. RF Power Sensor – HP 8481H
3. Precision Dual-Channel Thermometer - Guildline Model 5150 S/N: 66145
4. Precision Thermistor Sensor – Guildline 51502
5. Near-Field Broadband Measuring System – IDX
6. Signal Generator – HP 8648D (9kHz-4 GHz)
7. RF Power Amplifier – Amplified Research 5SIG4 (800MHz-4.2GHz) 5Watts
8. Dipole Validation Antennas 835MHz – SPEAG
9. Dipole Validation Antennas 1900MHz – SPEAG
10. Network Analyzer HP 8753E
11. TEM Cell – IFI CC-110
12. Directional Coupler – HP 767D

CALIBRATION DATA

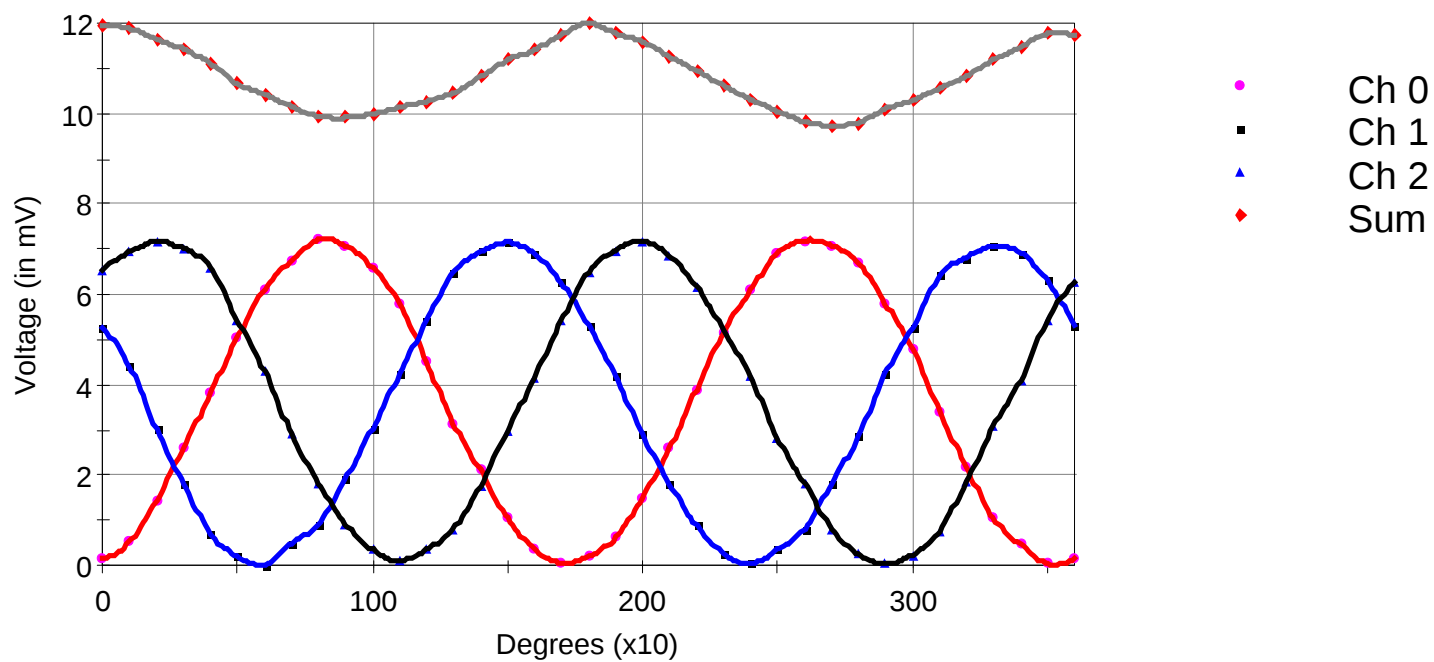
PROBE CALIBRATION PARAMETERS

PROBE: IDX # PCT486A

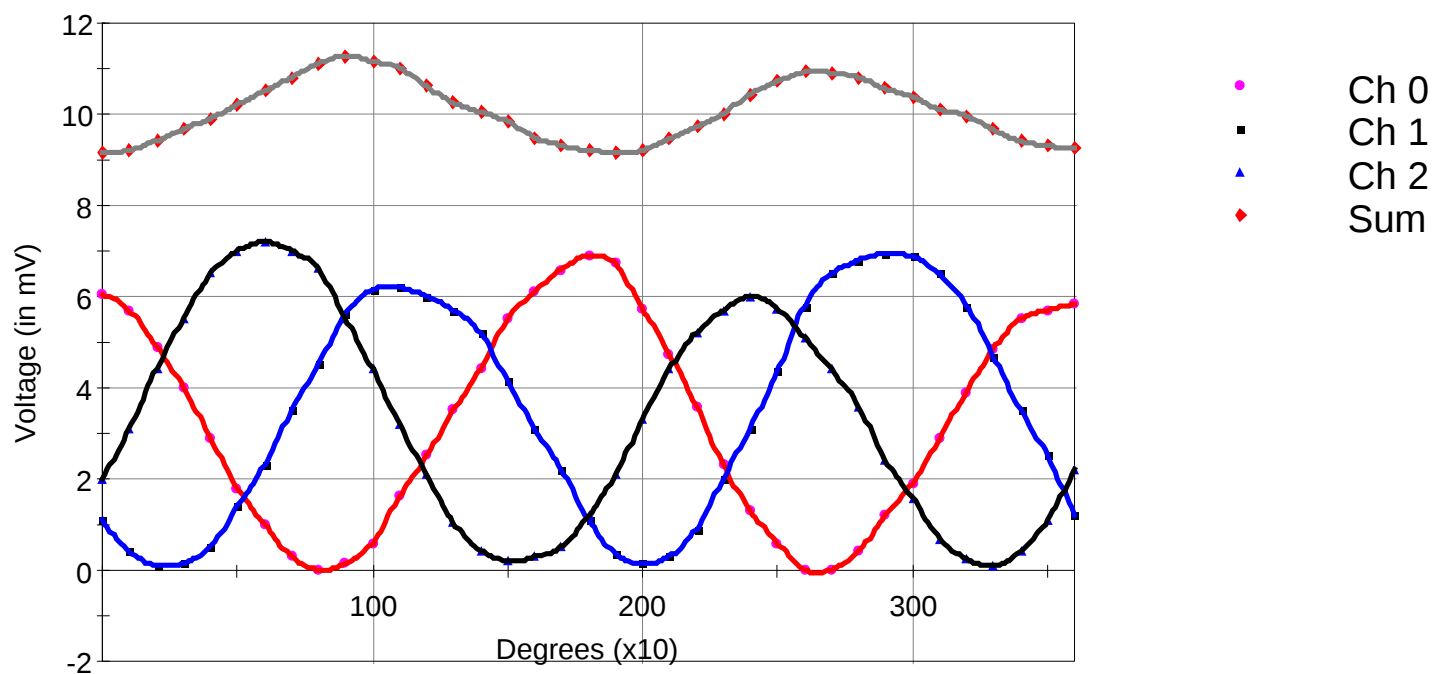
TISSUE TYPE	FREQUENCY (MHz)	DIELECTRIC CONSTANT	CONDUCTIVITY ^S (S/m)	CONVERSION FACTOR (W/kg)
Brain	835	41.5 ±5%	0.90 ±5%	0.788 ±7% (k=2)
Brain	1900	41.3 ±5%	1.65 ±5%	1.201 ±7% (k=2)
Muscle	835	51.7 ±5%	1.10 ±5%	0.894 ±7% (k=2)
Muscle	1900	54.2 ±5%	1.85 ±5%	1.378 ±7% (k=2)

FREQUENCY (MHz)	PROBE OFFSET (cm)	ISOTROPICITY	
		(%)	(dB)
835	0.25	9.54	0.402
1900	0.25	9.65	0.405

File: 02-02-2001.cal
Date: 2-FEB-01 05:30:12 pm
Probe Name: PCTEST
Frequency: 835 MHz
Comment: PCTEST TEM CAL
Amp 1 Setting: 0.166
Amp 2 Setting: 0.135
Amp 3 Setting: 0.132



File: 02-03-2001.cal
Date: 3-FEB-01 04:38:12 pm
Probe Name: PCTEST
Frequency: 1900 MHz
Comment: PCTEST TEM CAL
Amp 1 Setting: 0.245
Amp 2 Setting: 0.231
Amp 3 Setting: 0.224



File : c:/idx3/SYSTEM/SARMEAS3/data/Normal/01031301_ZOOM.VLT
Start : 13-March-101 10:38:35 am End : 13-March-101 10:50:02 am

Radio Type : Validation
Model Number :
Serial Number : 1
Frequency : 1900 MHz
Peak Trans. Pwr : 0.250 W
Start Trans. Pwr: 0.250 W
Antenna Type : Helical
Antenna Posn. : Internal
Phantom Type : Flat
Phantom Posn. : E Field
Scan Type : ZOOM/SAR
Probe Name : PCTEST
Field Type : E Field
Orientation : 0 Degrees

Mixture Type = Muscle
Mixture Dielectric Constant = 54.200
Mixture Conductivity = 1.850

Comment :
Dipole Validation at 1900 MHz
SN:02

Robot : PCTEST

Probe Offset = 0.25 cm
Sensor Factor = 0.0108
Conversion Factor = 1.378

PCTEST2 Amplifier Channel Settings : 0.245 0.231 0.224

Max Location : X = 0.500, Y = -0.750, Z = 0.000 (cm) Value = 95.900

Measured Values (volts) =
9.135E-002 5.262E-002 3.455E-002 2.272E-002 1.597E-002 1.120E-002
7.900E-003 5.732E-003 4.028E-003 2.902E-003 2.118E-003 1.716E-003
1.381E-003 1.023E-003 6.591E-004 5.114E-004 5.060E-004 5.787E-004
5.890E-004 4.280E-004 3.602E-004

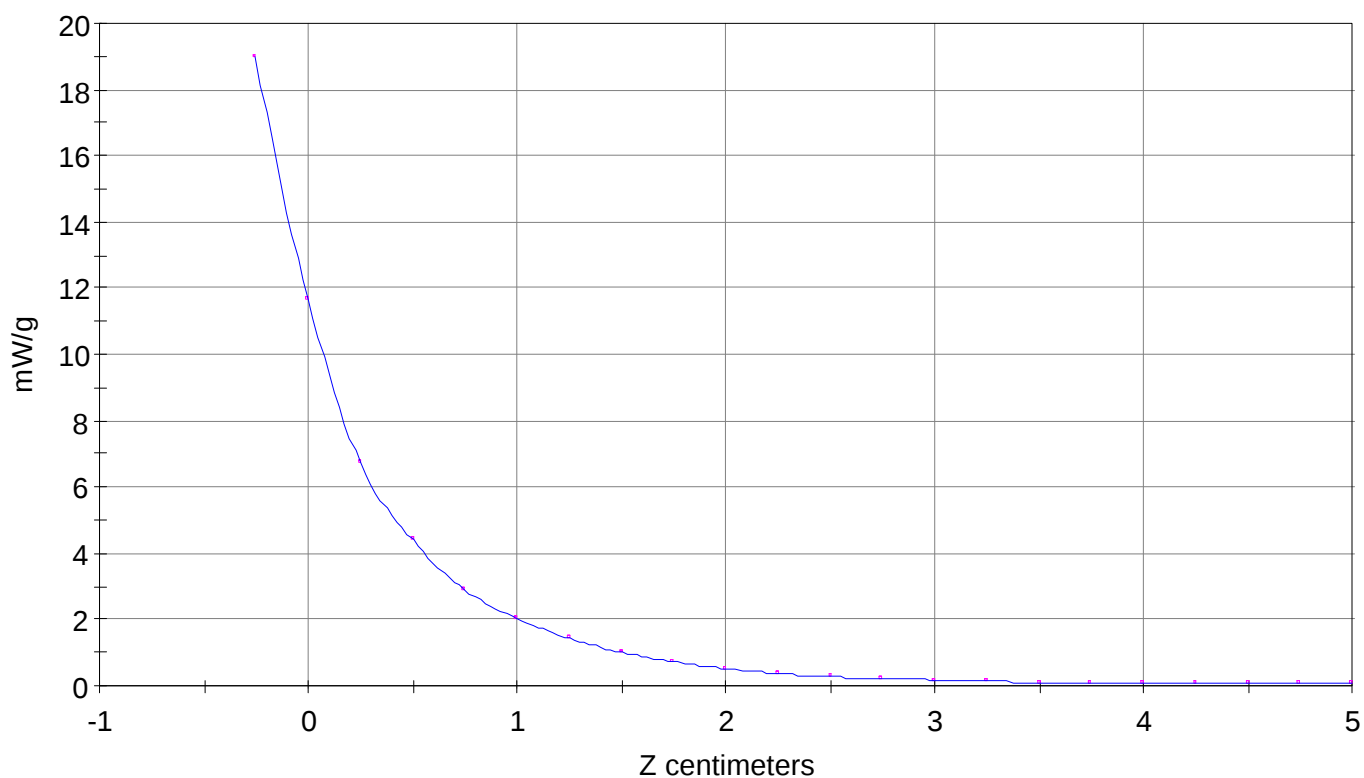
Calc. Voltage @ Surface (Vs) = 0.1489

Voltage @ 1.00 cm (Vt) = 0.0227

Ave. Voltage (Vs+Vt)/2 = 0.0858

Ave. SAR over 1 g (mW/g) = 10.9462 W/kg (Measured) Targeted = 10.7 W/kg (2.3% deviation)

SAR Scan
File : 01031301_ZOOM
Start : 13-March-101 10:38:35 am End : 13-March-101 10:50:02 am
Validation//1;1900MHz;W;Helical/Internal;
Flat/E Field;ZOOM/SAR;PCTEST/E Field/0 DegreesMuscle/54.200/1.850

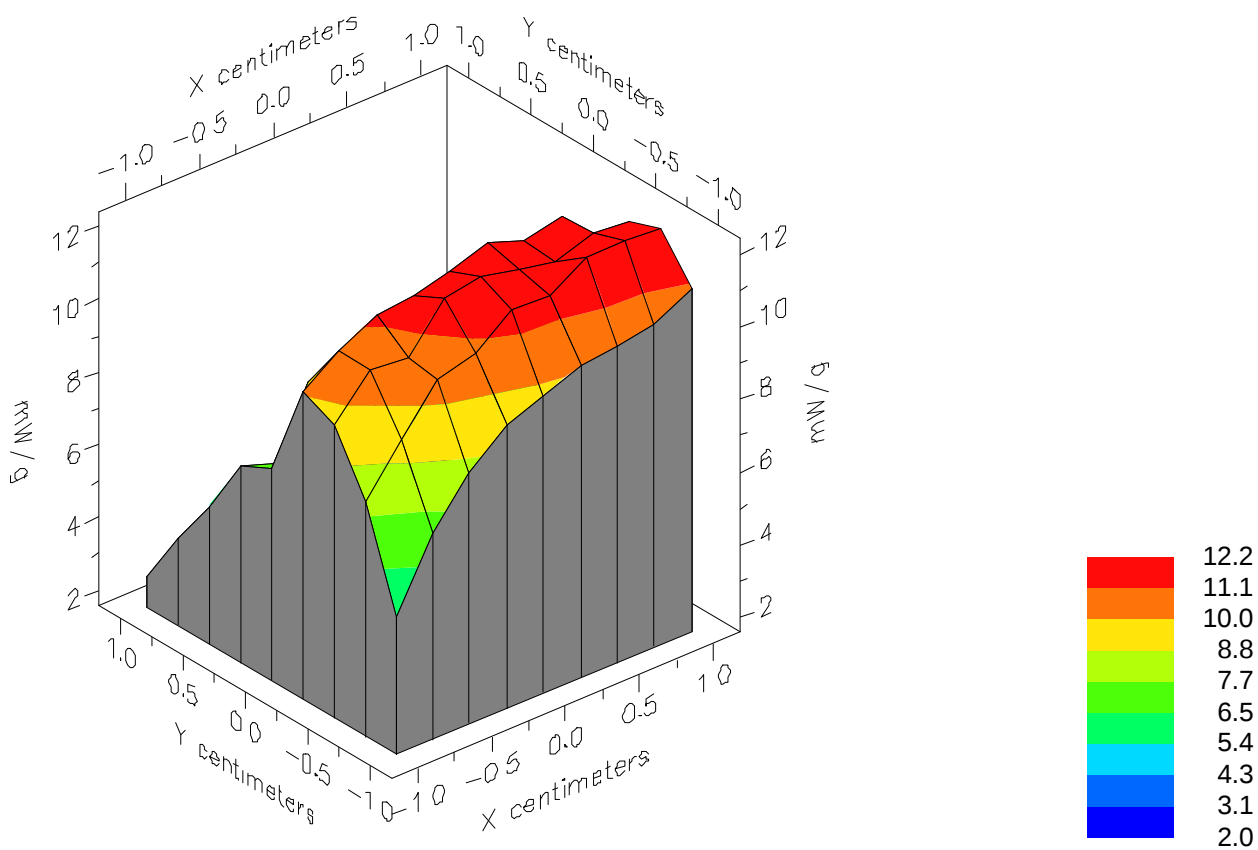


File : 01031301_ZOOM

Start : 13-March-101 10:38:35 am End : 13-March-101 10:50:02 am

Validation//1;1900MHz;W;Helical/Internal;

Flat/E Field;ZOOM/SAR;PCTEST/E Field/0 DegreesMuscle/54.200/1.850

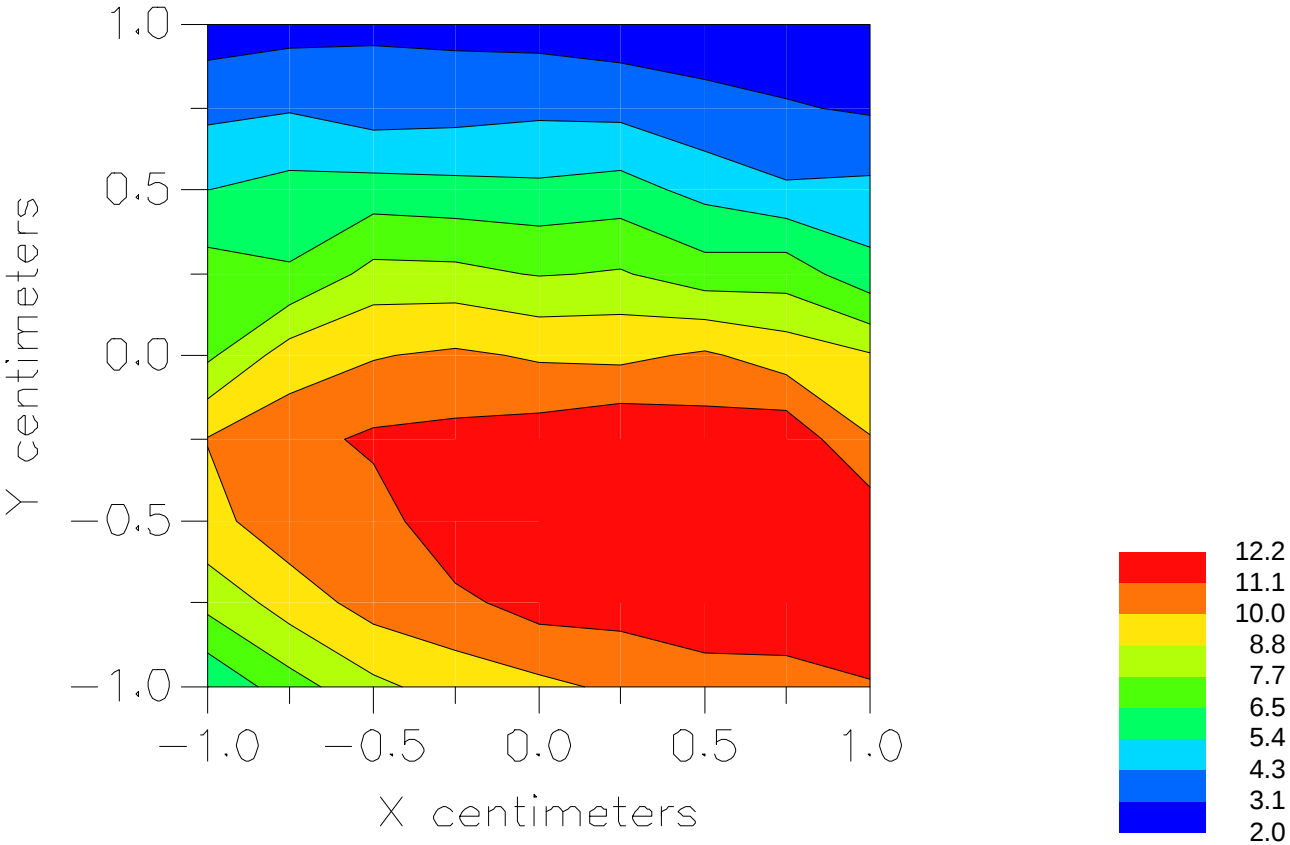


File : 01031301_ZOOM

Start : 13-March-101 10:38:35 am End : 13-March-101 10:50:02 am

Validation//1;1900MHz;W;Helical/Internal;

Flat/E Field;ZOOM/SAR;PCTEST/E Field/0 DegreesMuscle/54.200/1.850



Tissue	Frequency MHz.	Target $\pm$ 5%		Reading		Calibration Date	Calibrated By
		Perm.	Cond.	Perm.	Cond.		
Brain	835	41.5	0.9	41.82	0.88	Feb. 01, 2001	
Perm. -5%=39.42, +5%=43.58 Cond. -5%= 0.86, +5%= 0.94							
Brain	1880	40.4	1.82	39.67	1.86	Feb. 01, 2001	
Perm. -5%=38.38, +5%=42.42 Cond. -5%= 1.73, +5%= 1.91							
Muscle	835	56.2	0.95	55.46	0.94	Feb. 01, 2001	
Perm. -5%=53.39, +5%=59.01 Cond. -5%= 0.90, +5%= 1.0							
Muscle	1880	54.2	1.85	53.36	1.89	Feb. 01, 2001	
Perm. -5%=51.49, +5%=56.91 Cond. -5%= 1.76, +5%=1.94							
Brain	835	41.5	0.9	41.93	0.89	Feb. 06, 2001	
Perm. -5%=39.42, +5%=43.58 Cond. -5%= 0.86, +5%= 0.94							
Brain	1880	40.4	1.82	38.79	1.85	Feb. 06, 2001	
Perm. -5%=38.38, +5%=42.42 Cond. -5%= 1.73, +5%= 1.91							
Muscle	835	56.2	0.95	54.49	0.98	Feb. 06, 2001	
Perm. -5%=53.39, +5%=59.01 Cond. -5%= 0.90, +5%= 1.0							
Muscle	1880	54.2	1.85	53.45	1.91	Feb. 06, 2001	
Perm. -5%=51.49, +5%=56.91 Cond. -5%= 1.76, +5%=1.94							
Brain	835	41.5	0.9	43.41	0.88	Feb. 12, 2001	
Perm. -5%=39.42, +5%=43.58 Cond. -5%= 0.86, +5%= 0.94							
Brain	1880	40.4	1.82	38.3	1.87	Feb. 12, 2001	
Perm. -5%=38.38, +5%=42.42 Cond. -5%= 1.73, +5%= 1.91							
Muscle	835	56.2	0.95	53.44	1	Feb. 12, 2001	
Perm. -5%=53.39, +5%=59.01 Cond. -5%= 0.90, +5%= 1.0							
Muscle	1880	54.2	1.85	57.36	1.85	Feb. 12, 2001	
Perm. -5%=51.49, +5%=56.91 Cond. -5%= 1.76, +5%=1.94							
Brain	835	41.5	0.9	42.89	0.87	Feb. 19, 2001	
Perm. -5%=39.42, +5%=43.58 Cond. -5%= 0.86, +5%= 0.94							
Brain	1880	40.4	1.82	41.32	1.88	Feb. 19, 2001	
Perm. -5%=38.38, +5%=42.42 Cond. -5%= 1.73, +5%= 1.91							
Muscle	835	56.2	0.95	53.35	0.92	Feb. 19, 2001	
Perm. -5%=53.39, +5%=59.01 Cond. -5%= 0.90, +5%= 1.0							
Muscle	1880	54.2	1.85	58.03	1.88	Feb. 19, 2001	
Perm. -5%=51.49, +5%=56.91 Cond. -5%= 1.76, +5%=1.94							
Calibration Form by: JVS '01							