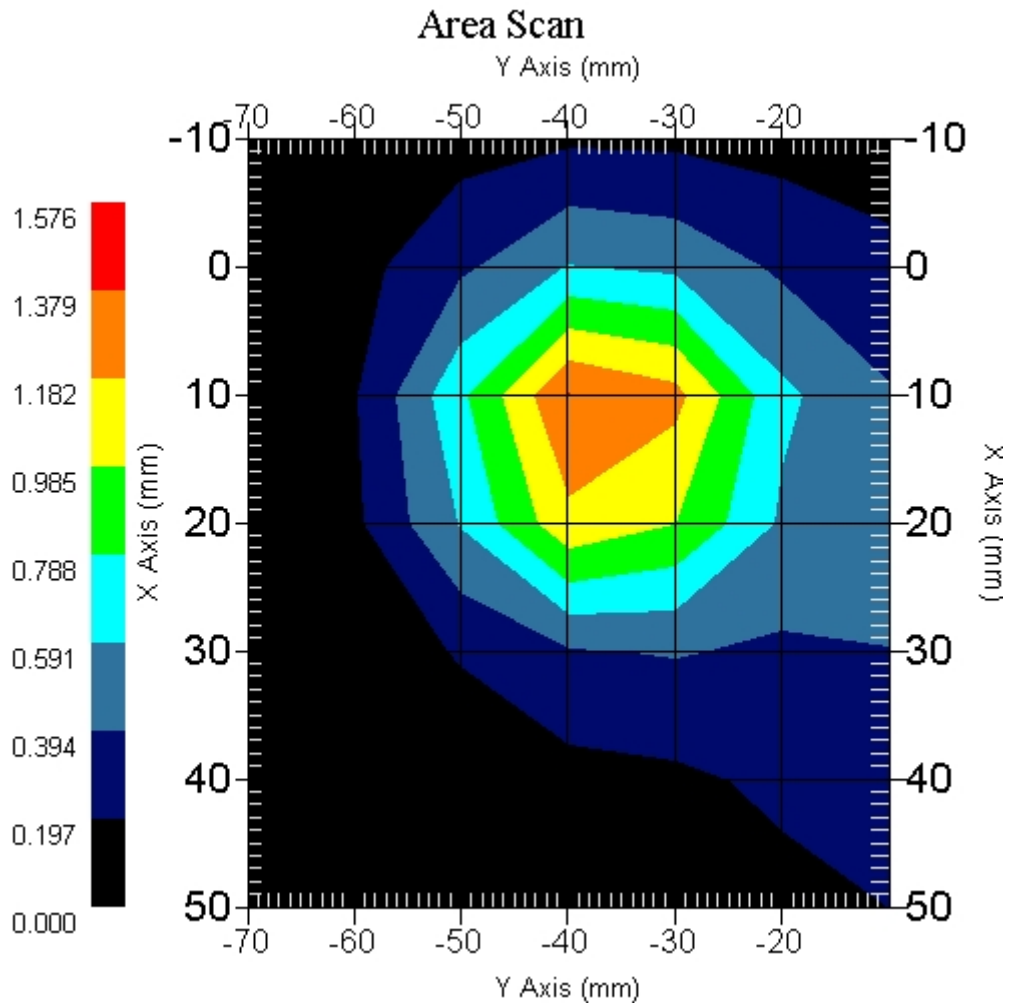
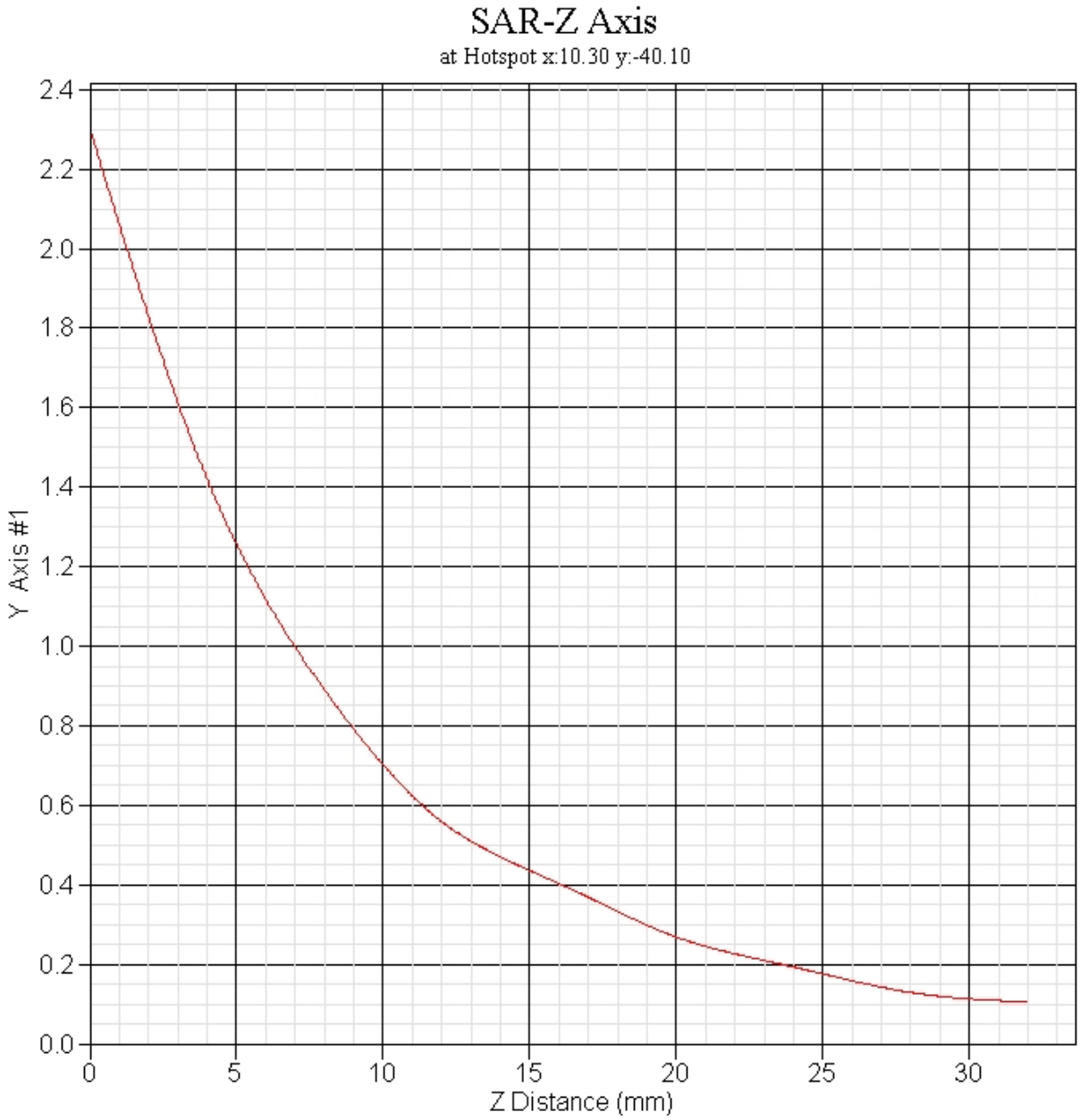
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 28-Apr-2006
Set-up Time       : 8:03:59 AM
Area Scan         : 7x7x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Rotated Right 90°
Separation        : 0
Channel           : High - 1175
```



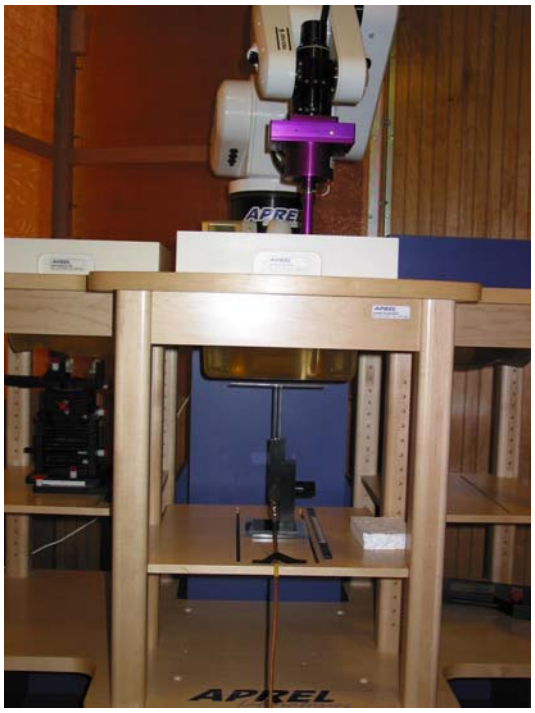

```
1 gram SAR value    : 1.230 W/kg
10 gram SAR value   : 0.626 W/kg
Area Scan Peak SAR  : 1.381 W/kg
Zoom Scan Peak SAR  : 2.302 W/kg
```


This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

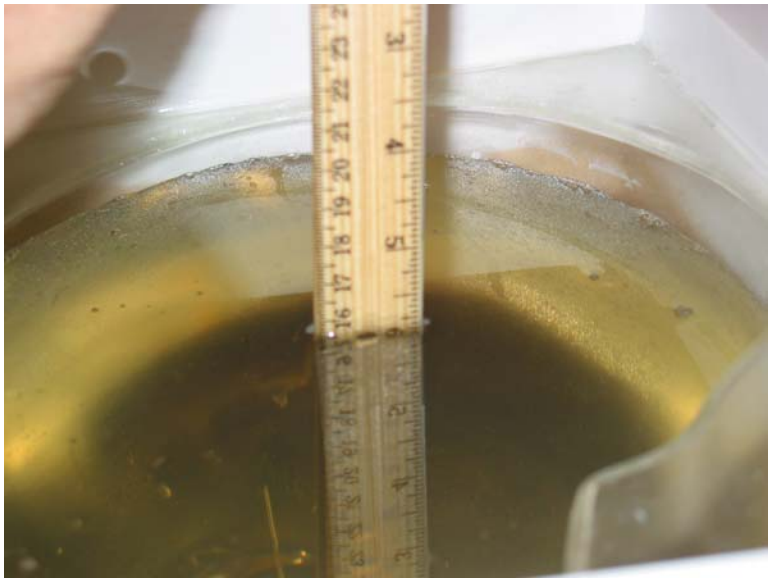


This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Appendix C – SAR Test Setup Photos

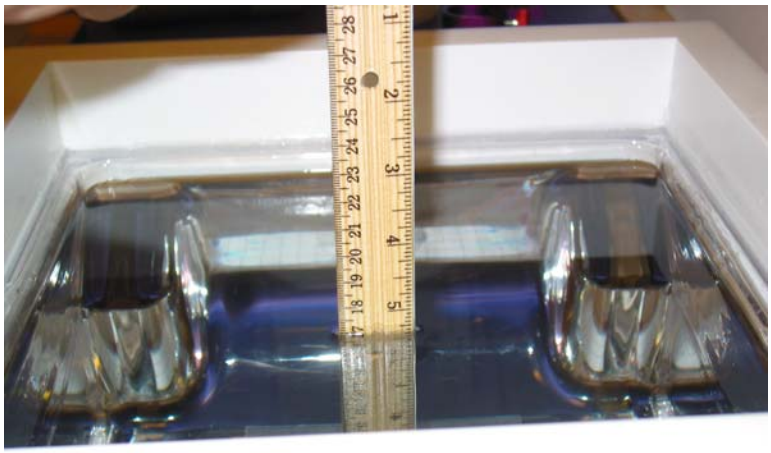


System Body Configuration



Head Tissue Depth

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.



Body Tissue Depth

Right Head Touch Front View

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Right Head Touch Side View

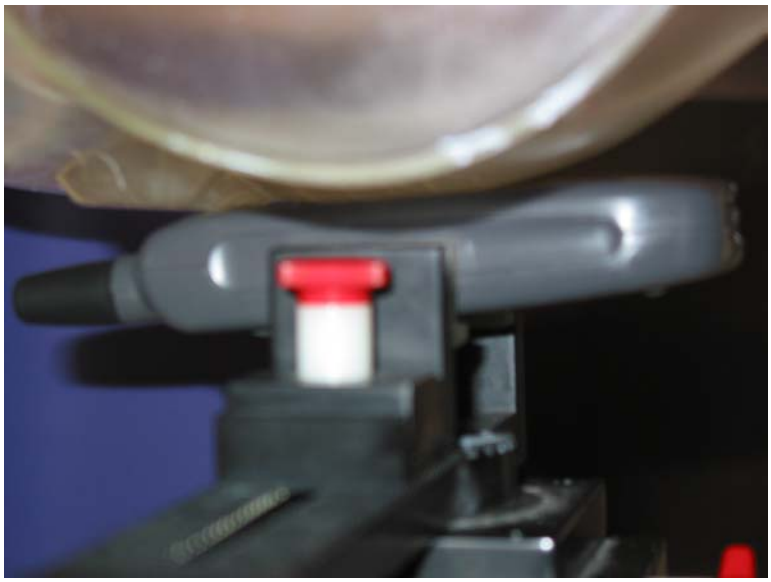
Right Head Tilt Front View

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

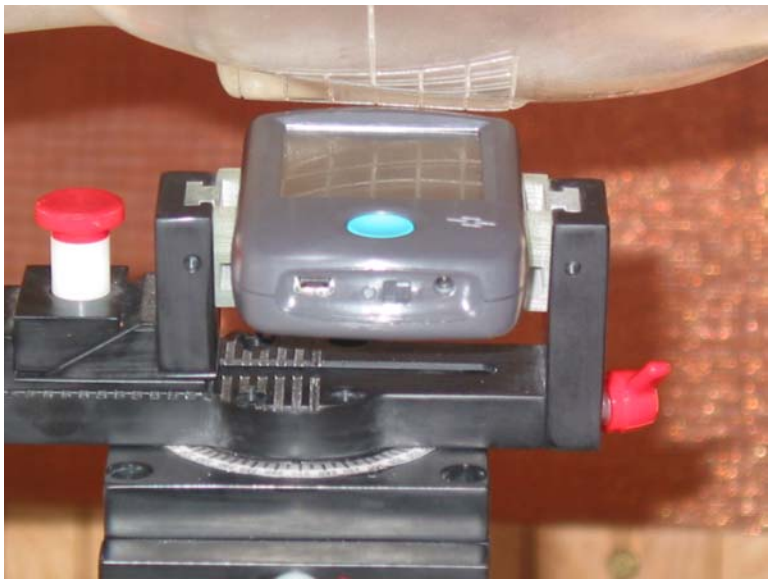
Right Head Tilt Side View

Left Head Touch Front View

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.



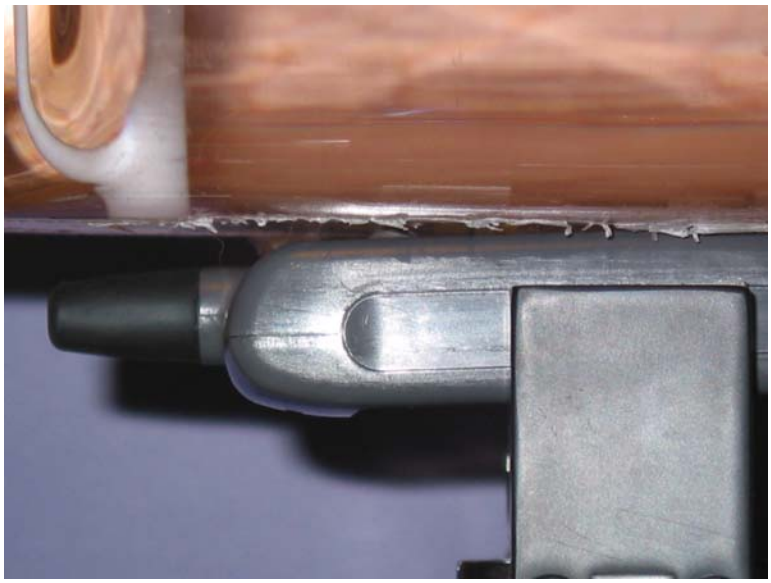
Left Head Touch Side View



Left Head Tilt Front View

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Left Head Tilt Side View



Body Front View

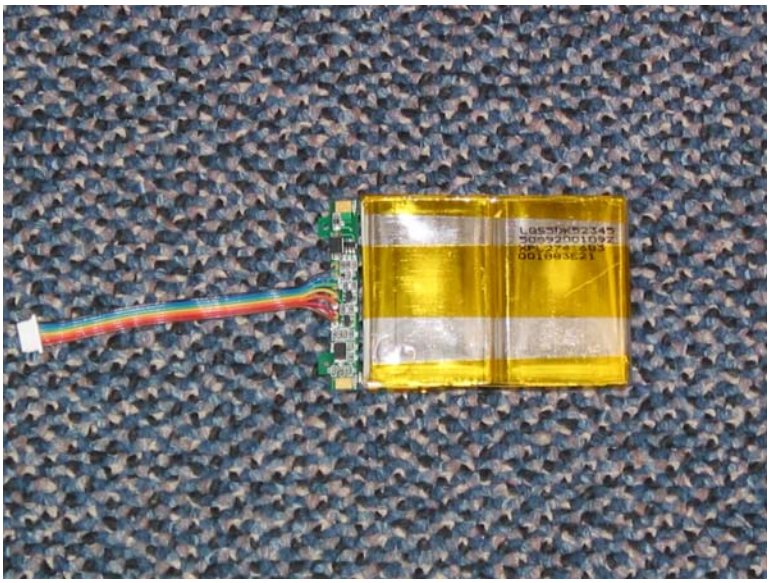
This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Body Side View

Front of Unit

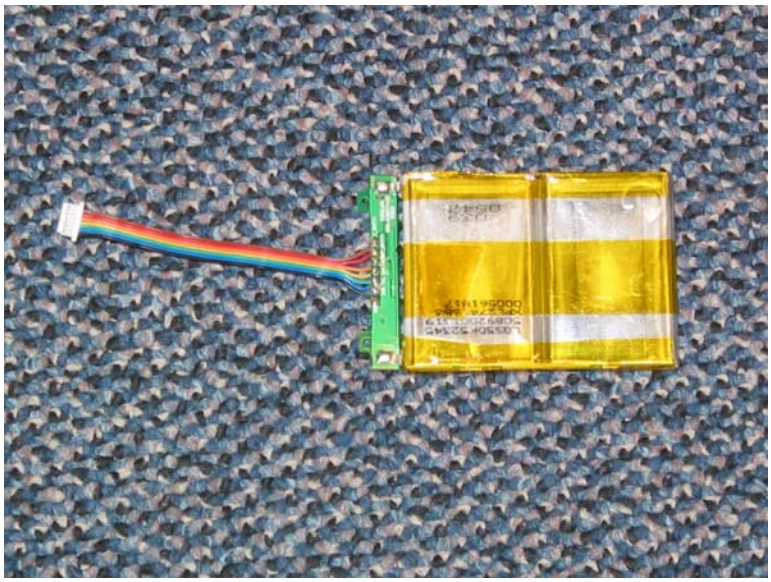
This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Back of Unit



Front of Battery

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.



Back of Battery

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Appendix D – Probe Calibration Data Sheets

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-601

Client.: RFEL

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 835 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 215

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: RFEL-Probe-215-Calibration-5166

Calibrated: 10th June 2005
Released on: 10th June 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: Signature On File

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 215.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 215 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

Janusz Lokaj
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	215
Frequency:	835 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	**<**5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Sensitivity in Head Tissue

Frequency: 835 MHz

Epsilon: 41.5 (+/-5%) **Sigma:** 0.90 S/m (+/-10%)

ConvF

Channel X: 5.49

Channel Y: 5.49

Channel Z: 5.49

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

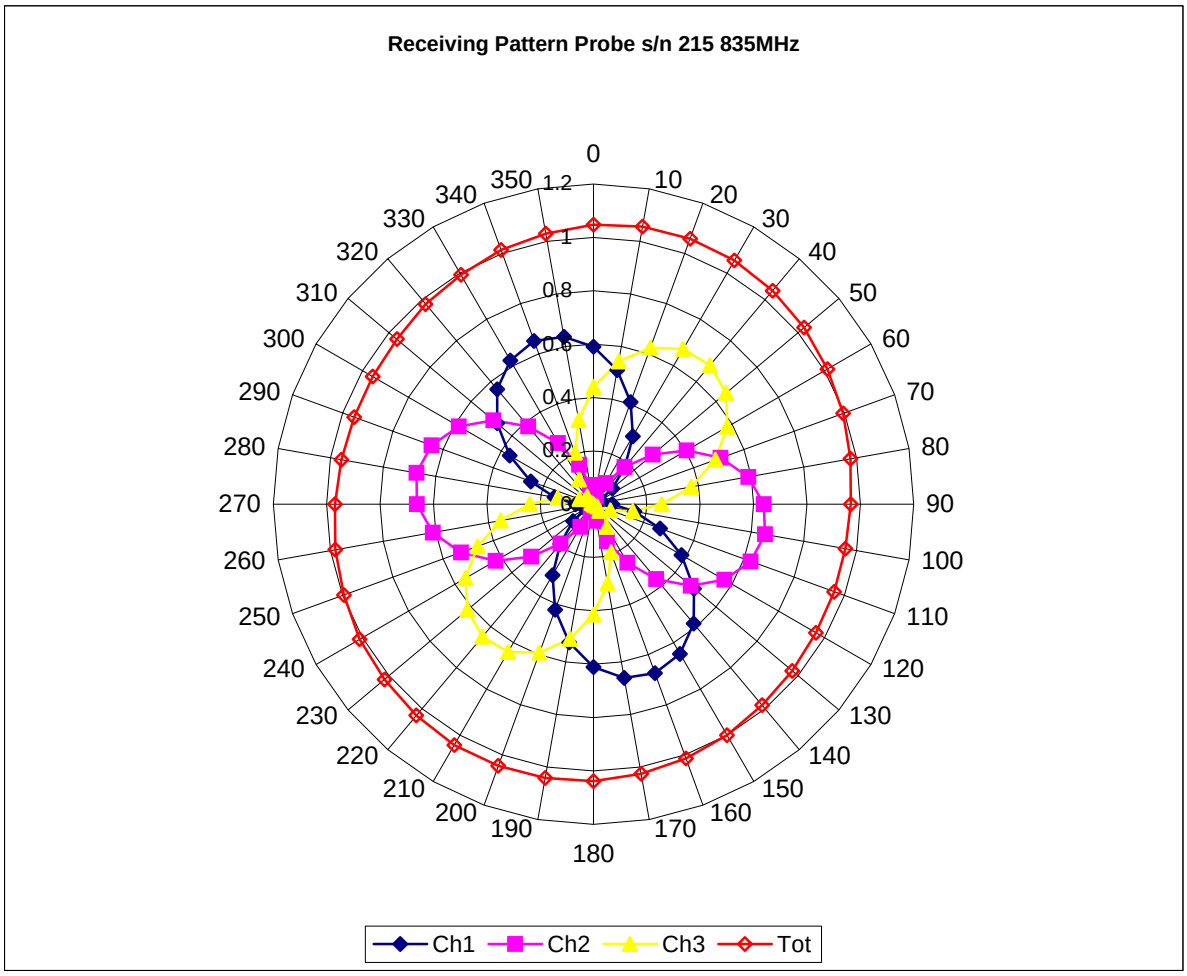
Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

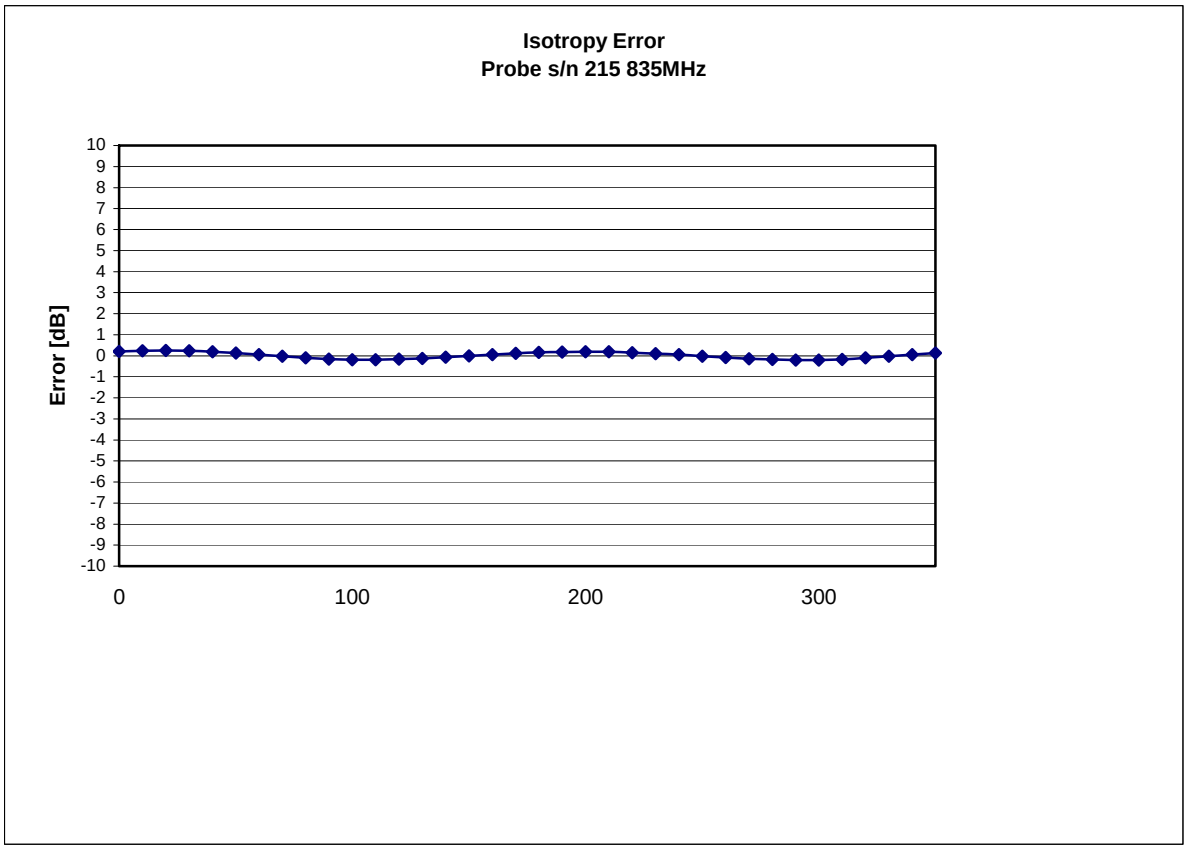
Spatial Resolution:

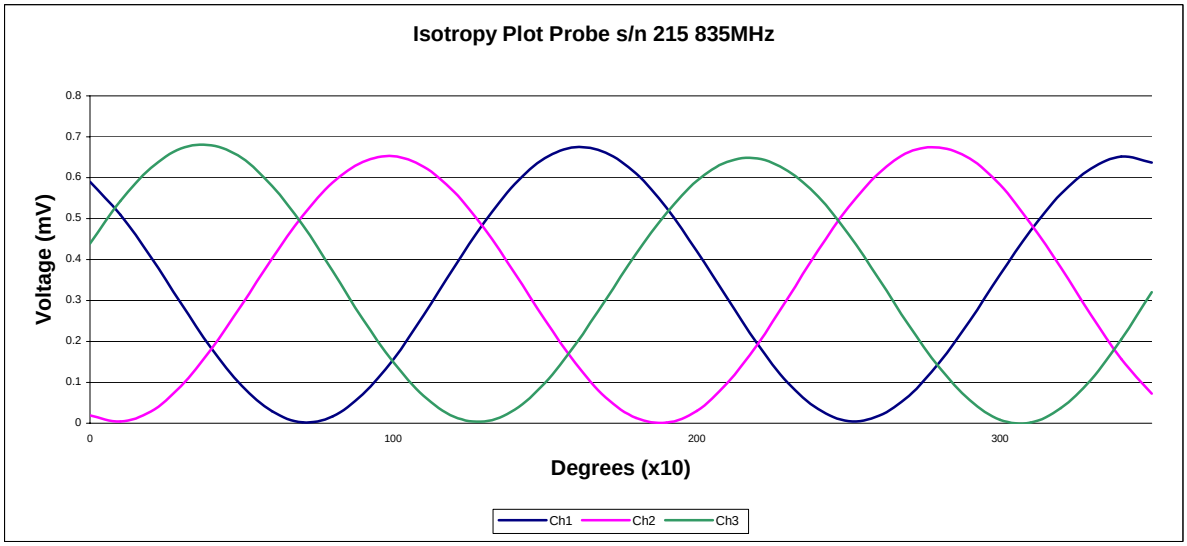
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 835 MHz (Air)



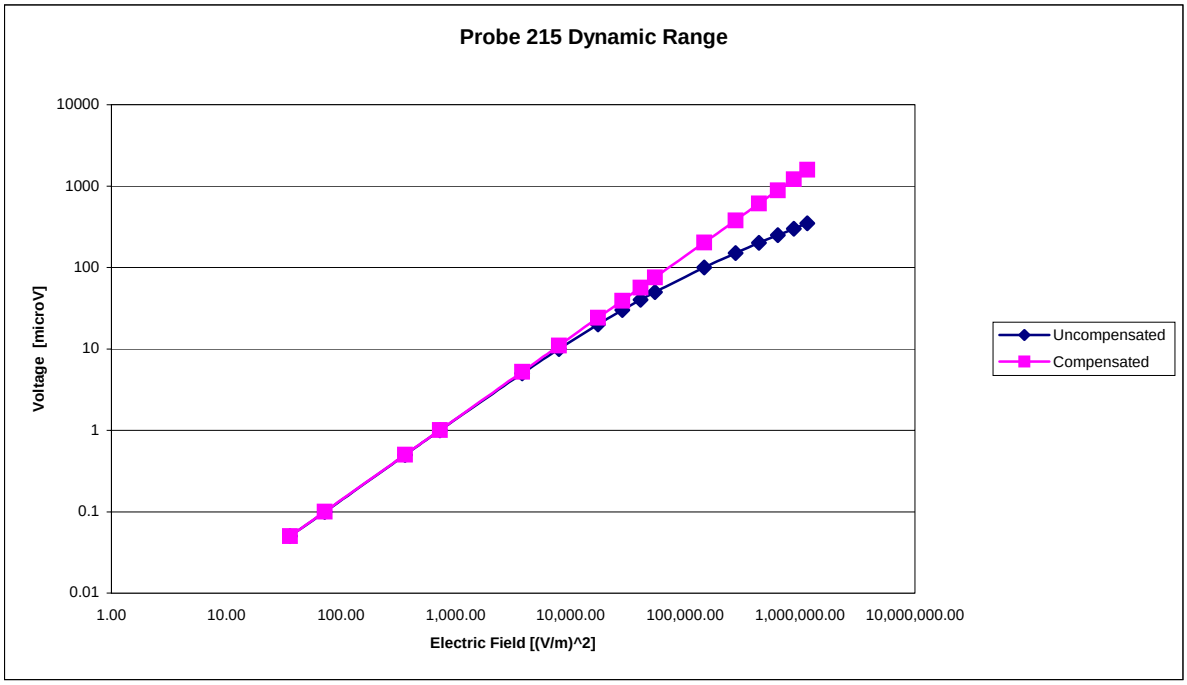
Isotropy Error 835 MHz (Air)



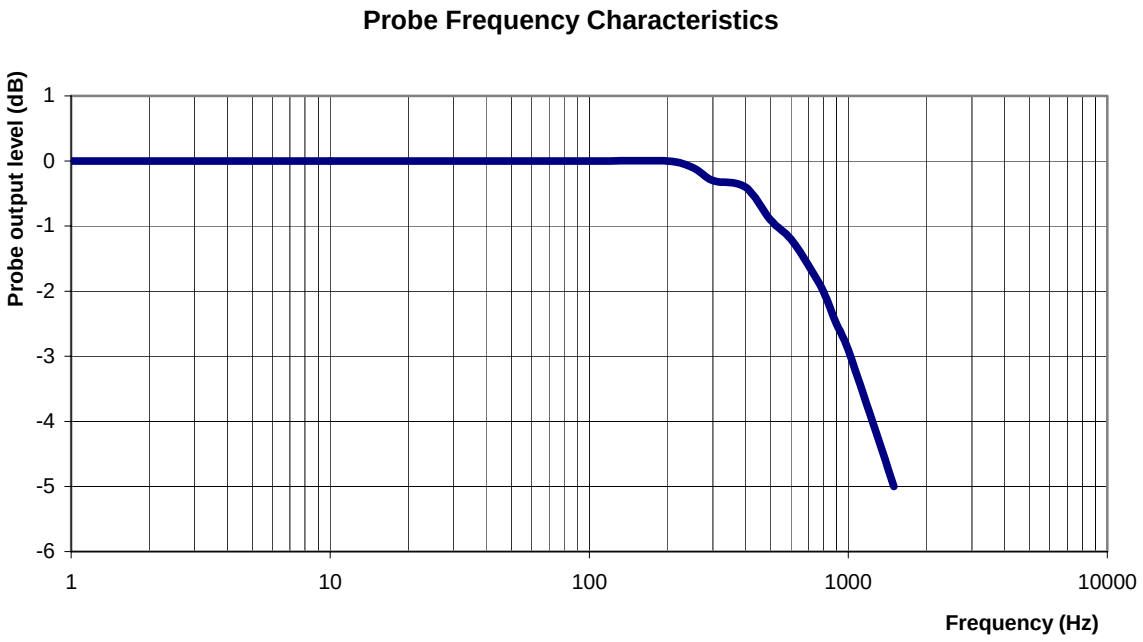


Isotropicity Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz	1 dB
Video Bandwidth at 1.02 KHz:	3 dB

Conversion Factor Uncertainty Assessment

Frequency:		835MHz	
Epsilon:	41.5 (+/-5%)	**Sigma:**	0.90 S/m (+/-10%)
ConvF			
Channel X:	5.49	7%(K=2)	
Channel Y:	5.49	7%(K=2)	
Channel Z:	5.49	7%(K=2)	

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.5mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2005.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-604

Client.: RFEL

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 835 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 215

BODY Calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: RFEL-Probe-215-Calibration-5166

Calibrated: 10th June 2005
Released on: 10th June 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: Signature On File

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 215.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 215 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

Janusz Lokaj
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	215
Frequency:	835 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	**<**5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Sensitivity in Body Tissue

Frequency: 835 MHz

Epsilon: 56.1 (+/-5%) **Sigma:** 0.95 S/m (+/-10%)

ConvF

Channel X: 6.07

Channel Y: 6.07

Channel Z: 6.07

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

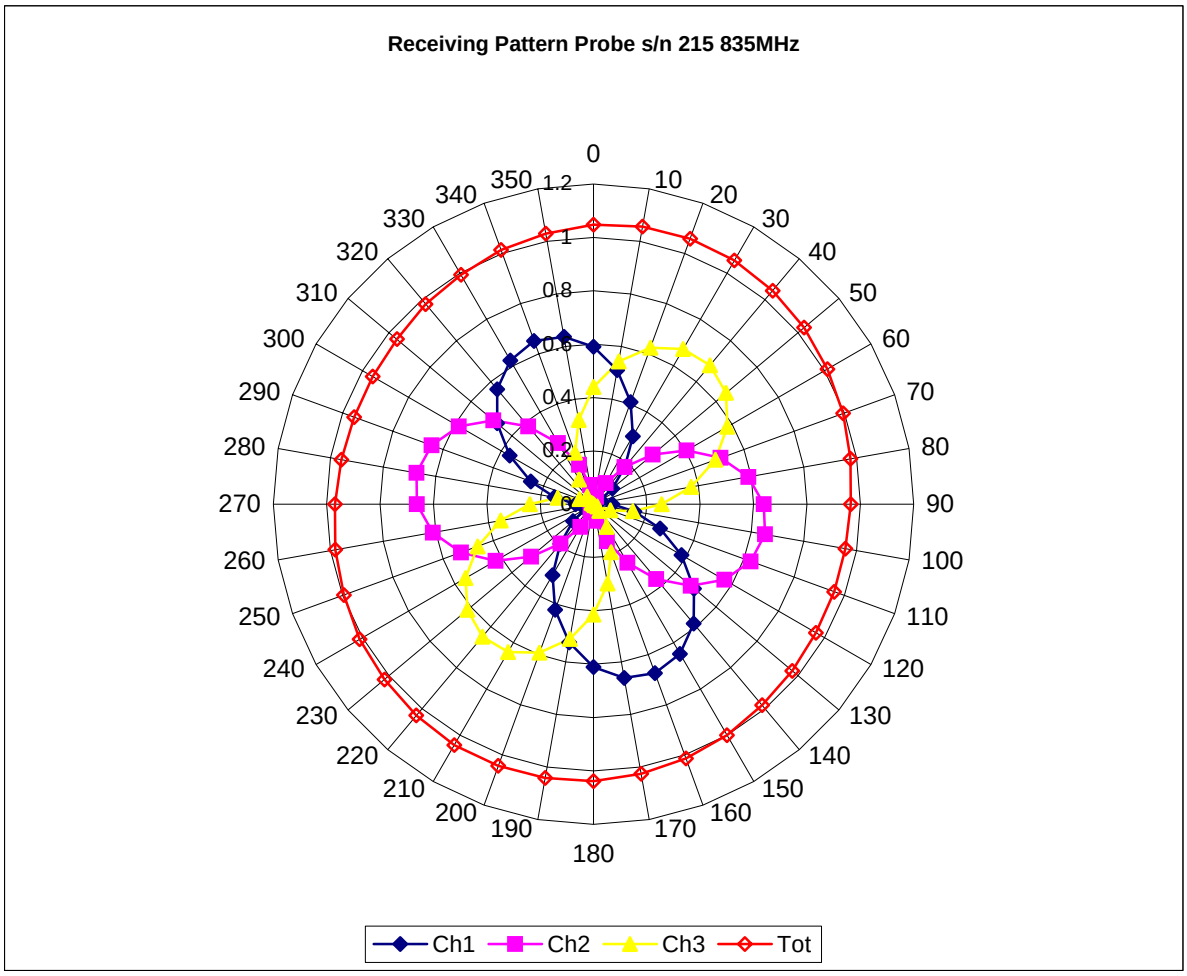
Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

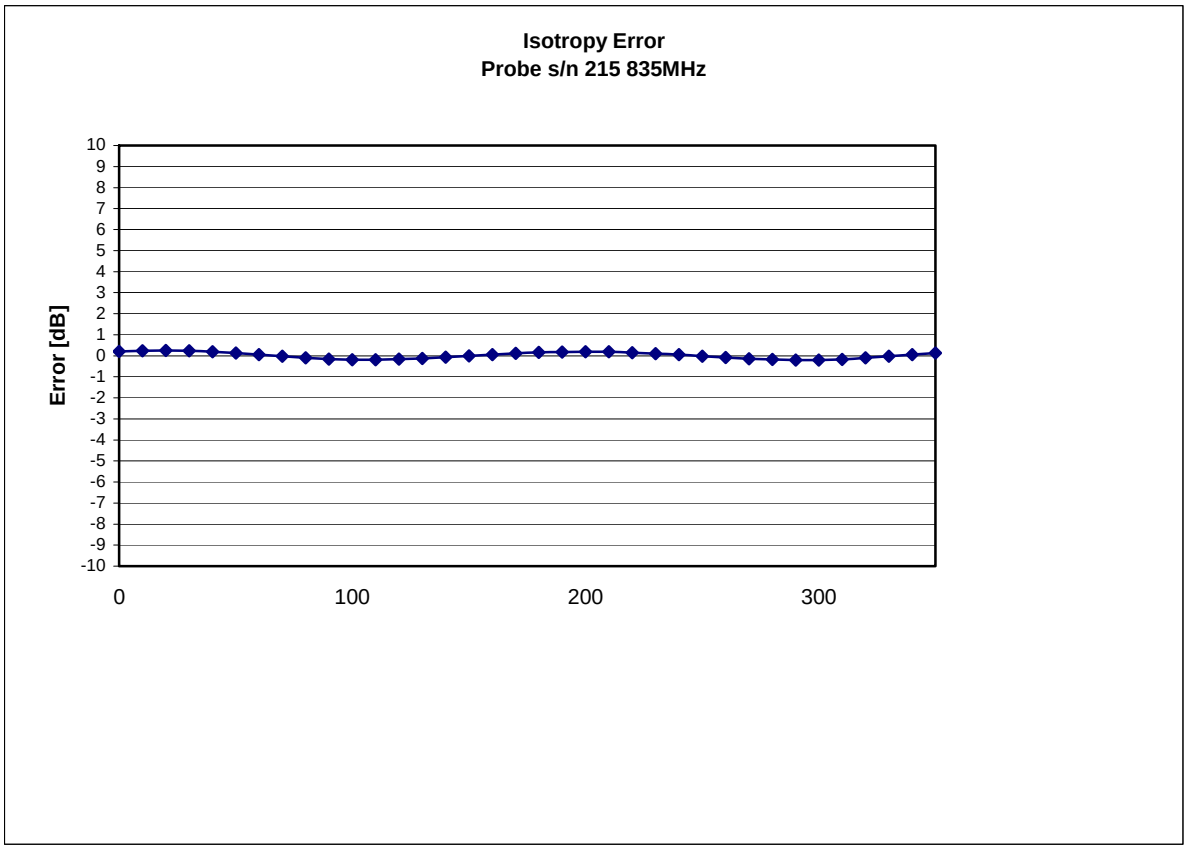
Spatial Resolution:

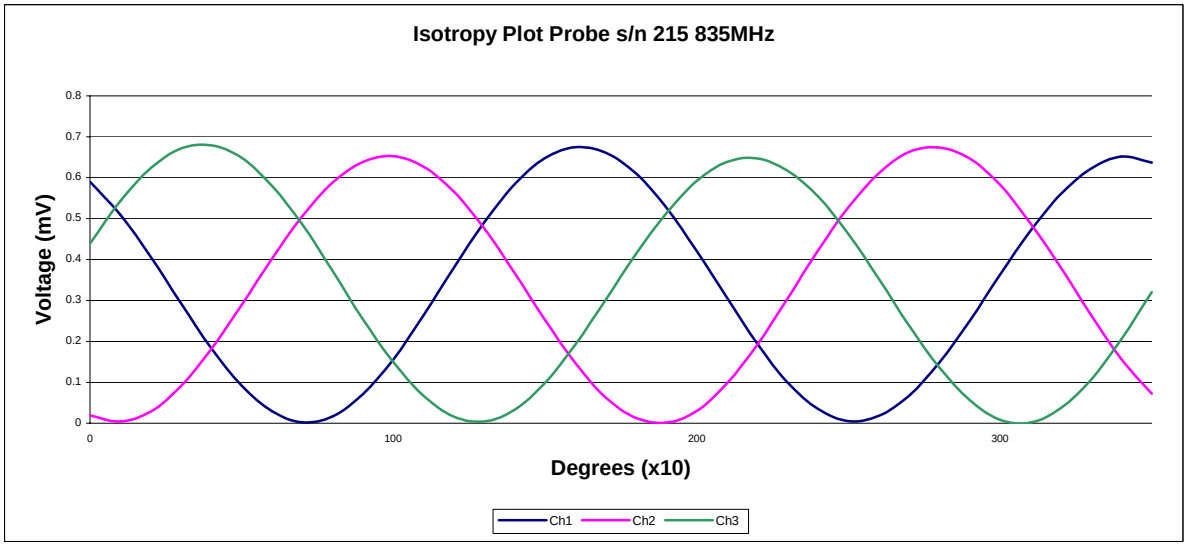
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 835 MHz (Air)



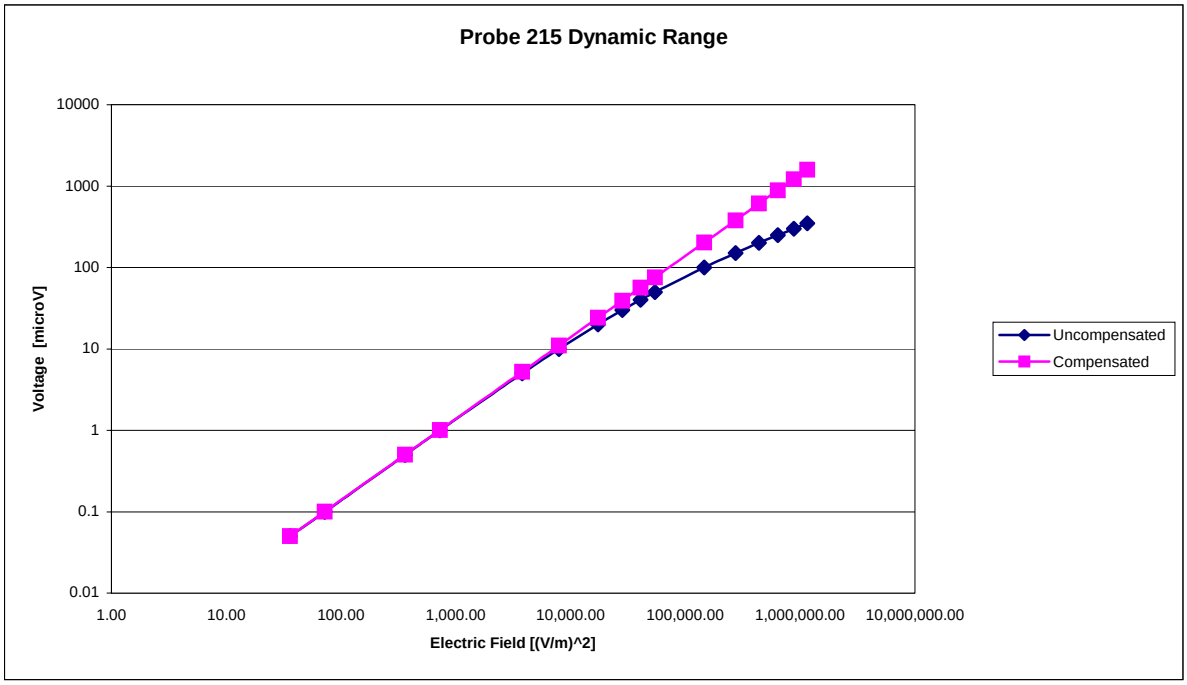
Isotropy Error 835 MHz (Air)



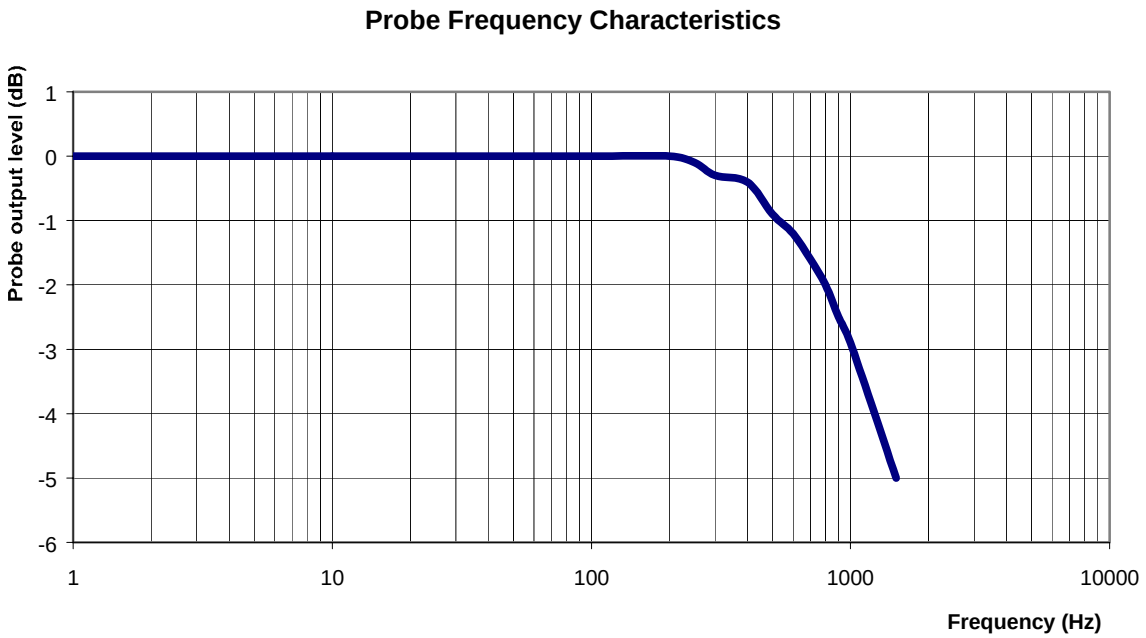


Isotropicity in Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1.02 KHz: 3 dB

Conversion Factor Uncertainty Assessment

Frequency:		835MHz	
Epsilon:	56.1 (+/-5%)	**Sigma:**	0.95 S/m (+/-10%)
ConvF			
Channel X:	6.07	7%(K=2)	
Channel Y:	6.07	7%(K=2)	
Channel Z:	6.07	7%(K=2)	

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2005.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-602

Client.: RFEL

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 215

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: RFEL-Probe-215-Calibration-5166

Calibrated: 10th June 2005
Released on: 10th June 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: Signature On File

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 215.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 215 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

Janusz Lokaj
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	215
Frequency:	1900 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	**<**5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Sensitivity in Head Tissue

Frequency: 1900 MHz

Epsilon: 40.0 (+/-5%) **Sigma:** 1.40 S/m (+/-10%)

ConvF

Channel X: 4.5

Channel Y: 4.5

Channel Z: 4.5

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

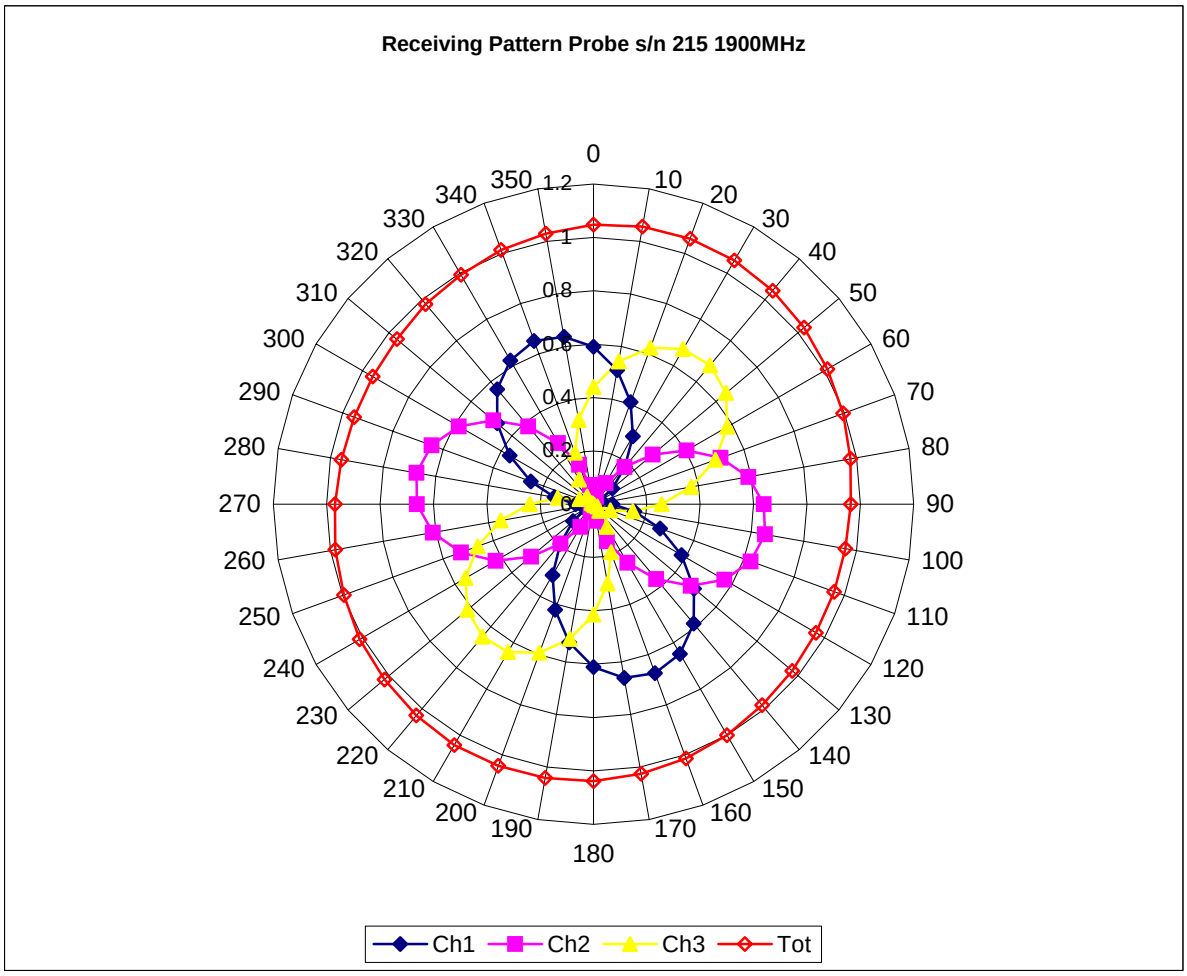
Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

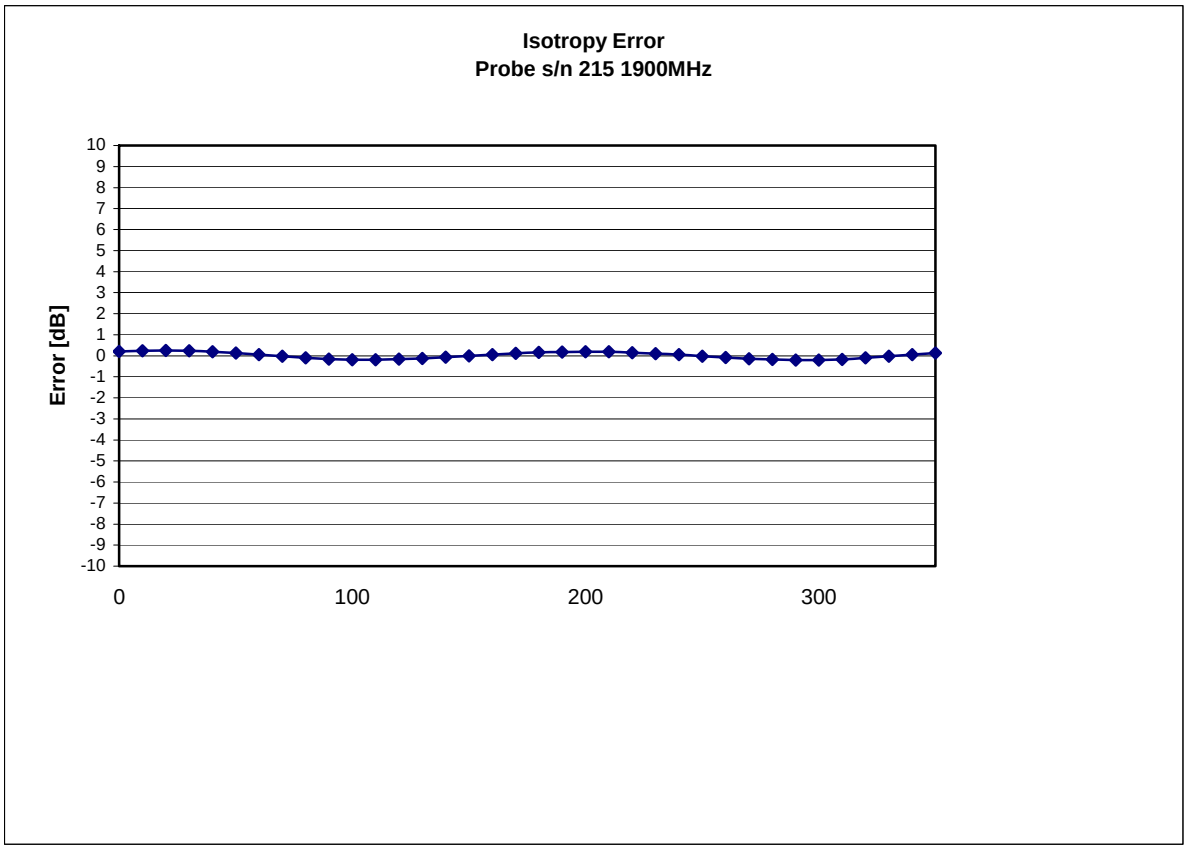
Spatial Resolution:

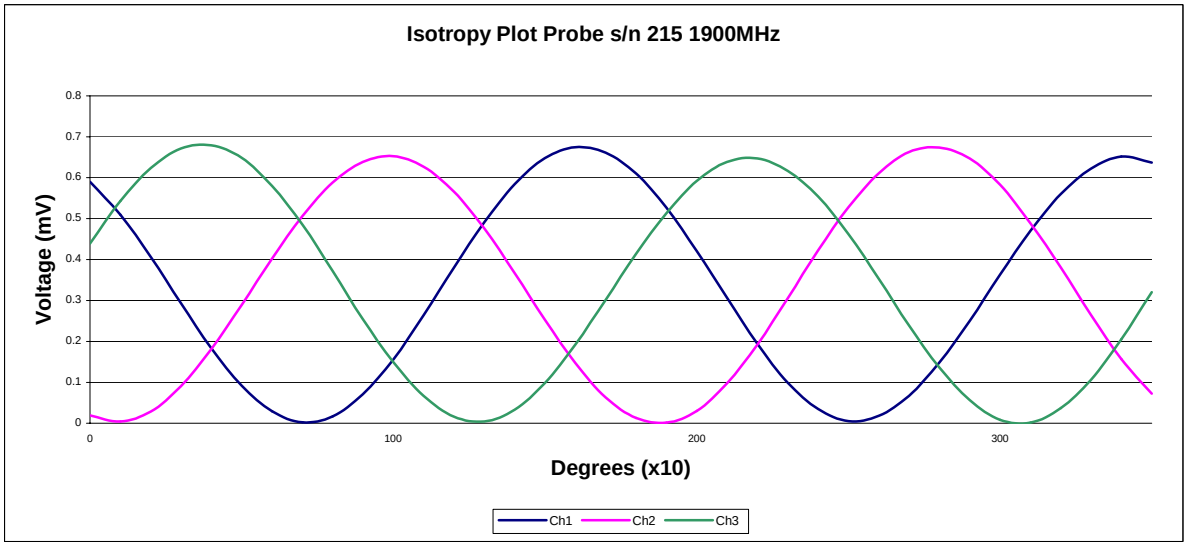
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 1900 MHz (Air)



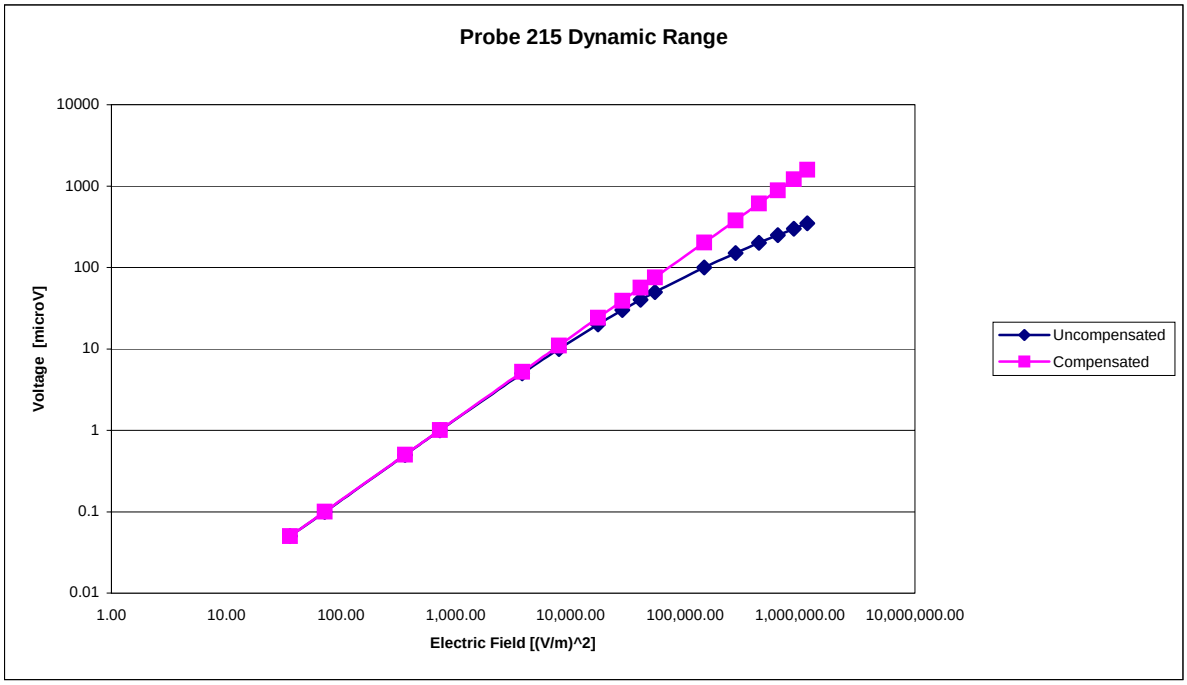
Isotropy Error 1900 MHz (Air)



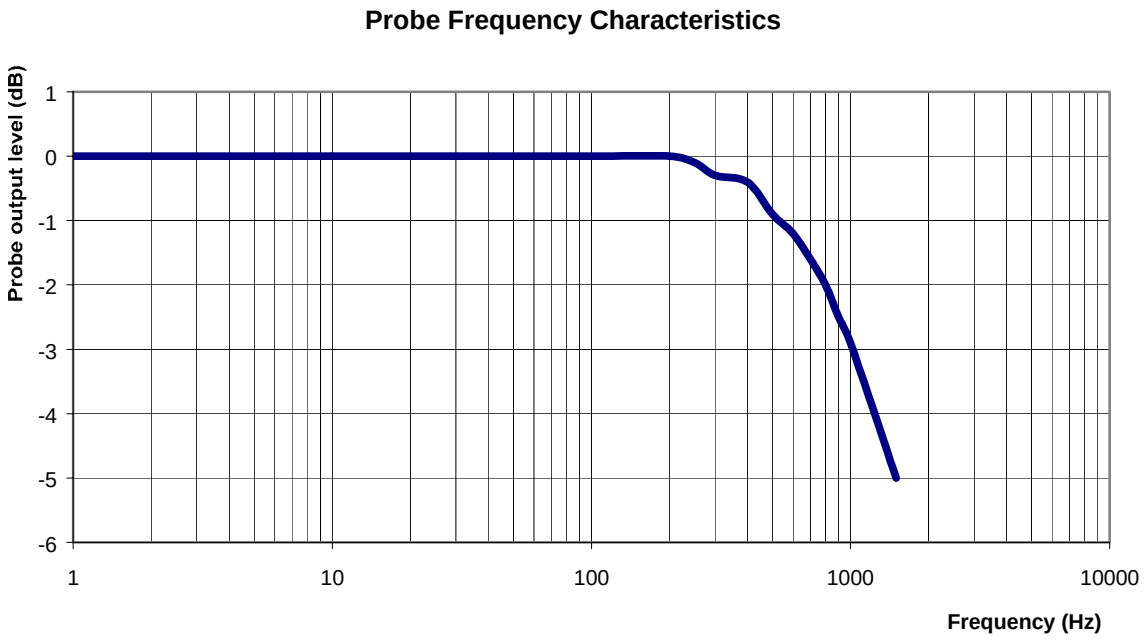


Isotropicity in Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1.02 KHz: 3 dB

Conversion Factor Uncertainty Assessment

Frequency:		1900MHz	
Epsilon:	40.0 (+/-5%)	**Sigma:**	1.40 S/m (+/-10%)
ConvF			
Channel X:	4.5	7%(K=2)	
Channel Y:	4.5	7%(K=2)	
Channel Z:	4.5	7%(K=2)	

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2005.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-605

Client.: RFEL

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe 1900 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 215

BODY Calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: RFEL-Probe-215-Calibration-5166

Calibrated: 10th June 2005
Released on: 10th June 2005

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: Signature On File

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 215.

References

SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”
SSI-TP-011 Tissue Calibration Procedure

Conditions

Probe 215 was a new probe taken from stock prior to calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this probe has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

Janusz Lokaj
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	215
Frequency:	1900 MHz
Sensor Offset:	1.56 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Ertalyte*
Tip Diameter:	**<**5 mm
Tip Length:	60 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Sensitivity in Body Tissue

Frequency: 1900 MHz

Epsilon: 53.3 (+/-5%) **Sigma:** 1.52 S/m (+/-10%)

ConvF

Channel X: 3.8

Channel Y: 3.8

Channel Z: 3.8

Tissue sensitivity values were calculated using the load impedance of the APREL Laboratories Daq-Paq.

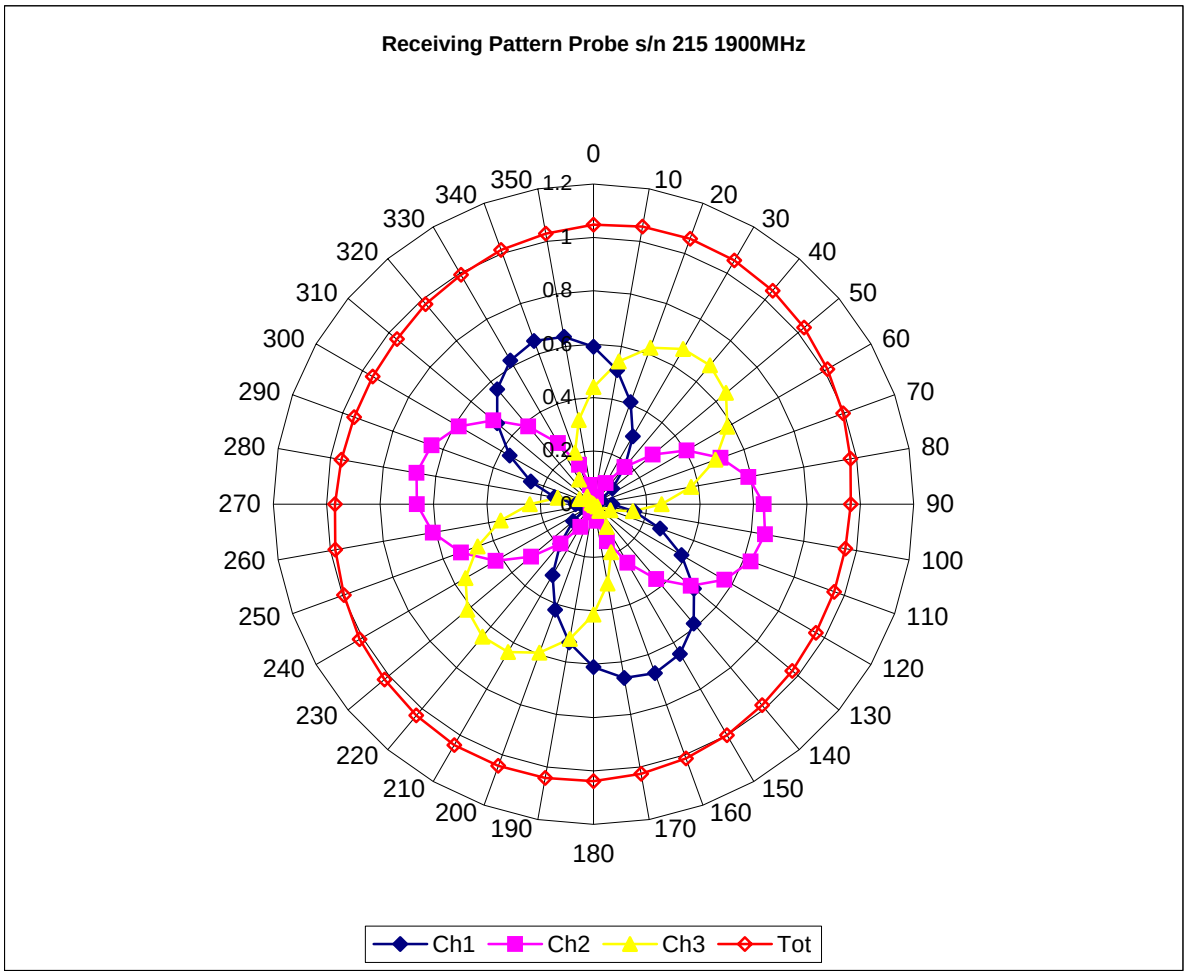
Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2% for the distance between the tip of the probe and the tissue boundary, when less than 2.44mm.

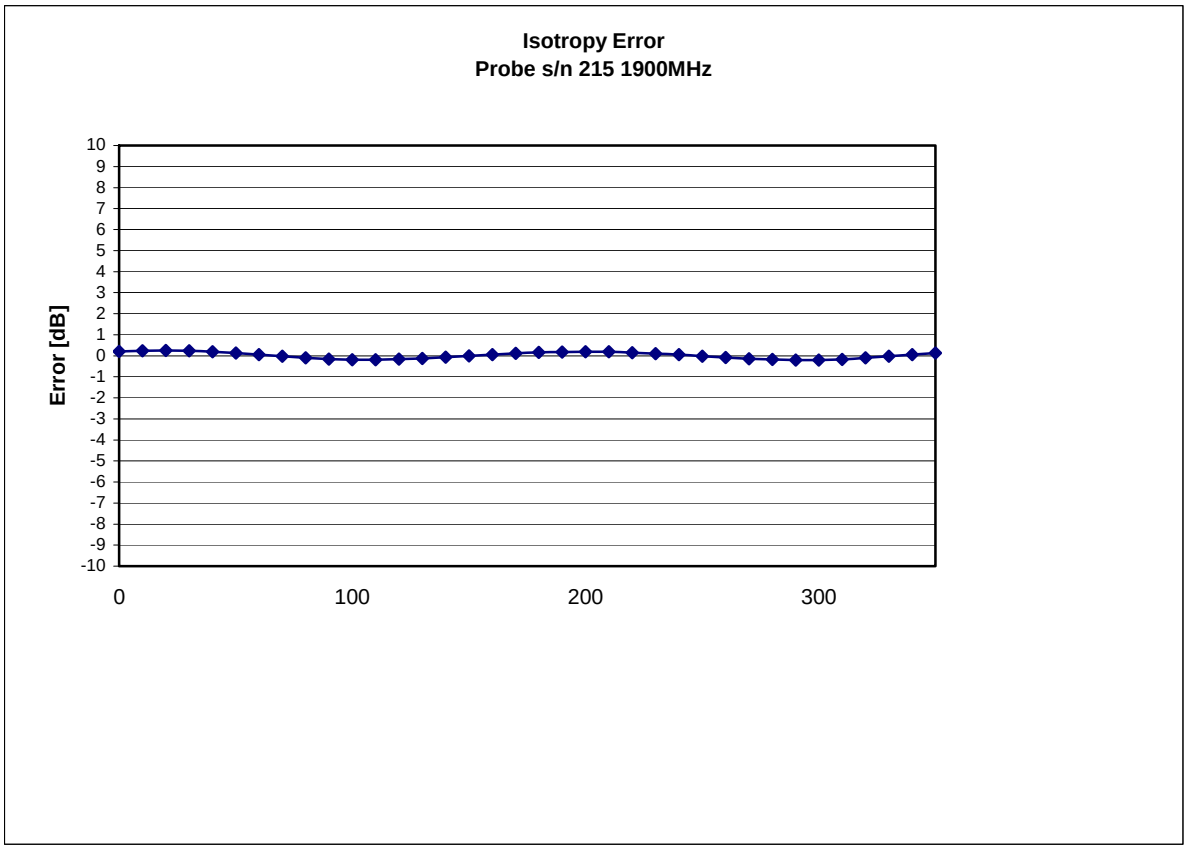
Spatial Resolution:

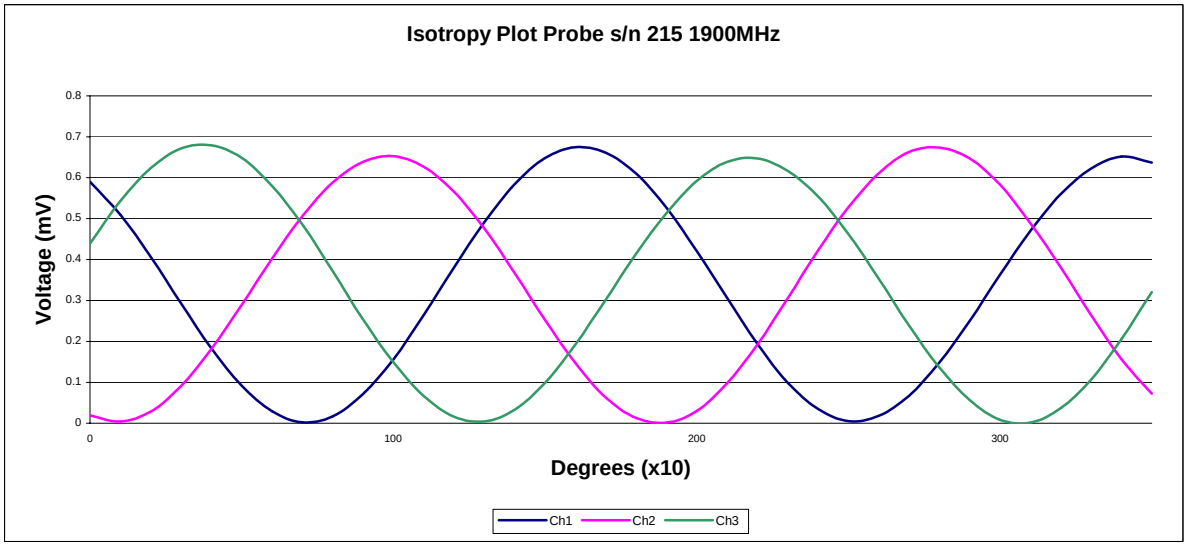
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 1900 MHz (Air)



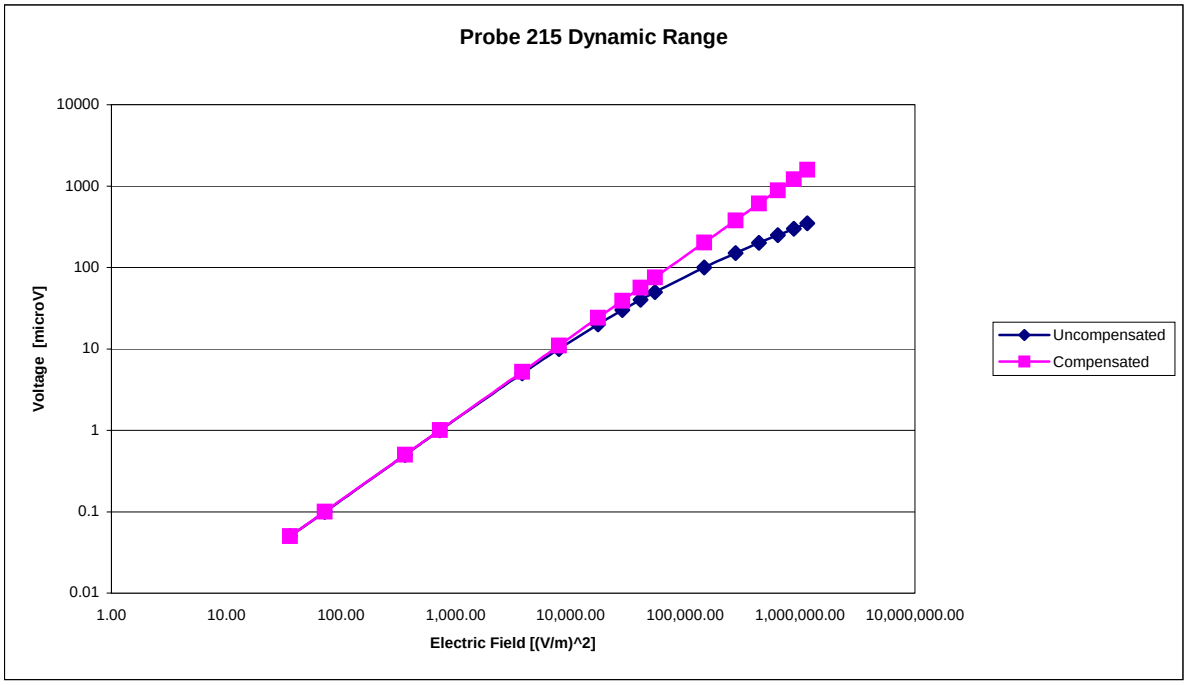
Isotropy Error 1900 MHz (Air)



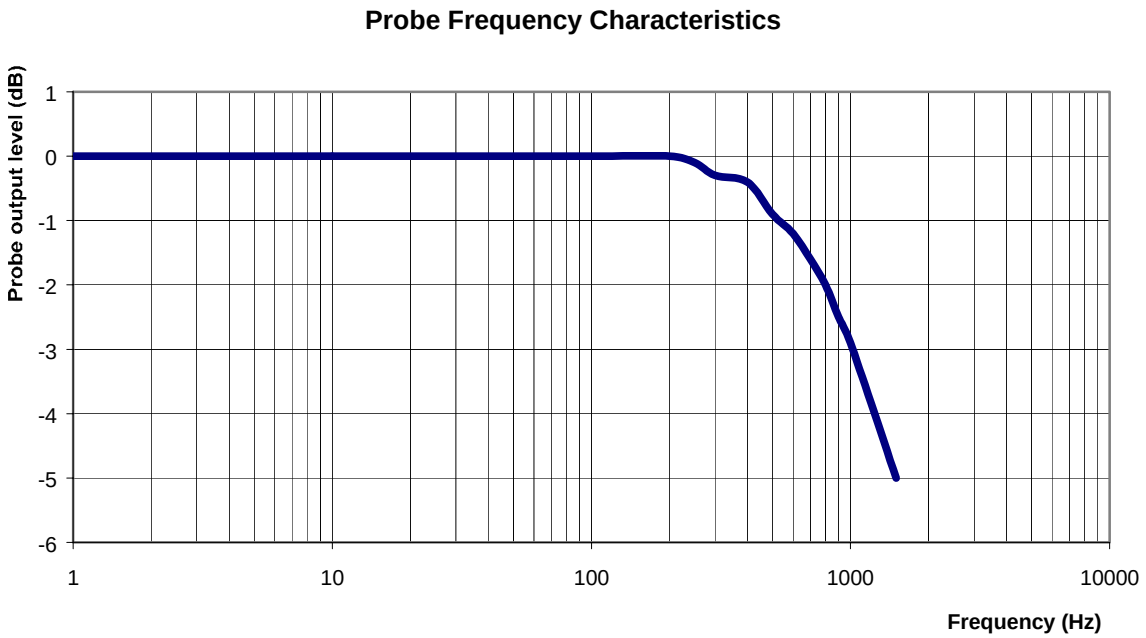


Isotropicity in Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz 1 dB
Video Bandwidth at 1.02 KHz: 3 dB

Conversion Factor Uncertainty Assessment

Frequency:		1900MHz	
Epsilon:	53.3 (+/-5%)	**Sigma:**	1.52 S/m (+/-10%)
ConvF			
Channel X:	3.8	7%(K=2)	
Channel Y:	3.8	7%(K=2)	
Channel Z:	3.8	7%(K=2)	

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

For a distance of 2.4mm the evaluated uncertainty (increase in the probe sensitivity) is less than 2%.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2005.

Appendix E – Dipole Calibration Data Sheets

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RF Exposure Lab, LLC

Calibration File No: CAL.20060202

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated at RF Exposure Lab, LLC by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole

Manufacturer: APREL Laboratories

Part Number: ALS-D-835-S-2

Frequency: 835 MHz

Serial No: RFE-274

Manufactured: 20 February 2004
Calibrated: 16 February 2006

Calibrated By: Signature on File
Jay Moulton – Technical Manager

Approved By: Signature on File
Tamara Moulton – Quality Manager

RF EXPOSURE LAB, LLC

2867 Progress Place, Suite 4D
Escondido, CA 92029

Tel: (760) 737-3131
FAX: (760) 737-9131

Calibration Results Summary

The following results relate to the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 161.8 mm
Height: 91.1 mm

Electrical Specifications

Head

SWR: 1.1357 U
Return Loss: -25.165 dB
Impedance: 49.691 Ω

System Validation Results

Frequency	1 Gram	10 Gram
1.9 GHz	9.820	6.360

Body

SWR: 1.1539 U
Return Loss: -23.122 dB
Impedance: 51.514 Ω

System Validation Results

Frequency	1 Gram	10 Gram
1.9 GHz	9.072	5.944

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Head Measurement Conditions

The measurements were performed in the Uni-Phantom filled with head simulating liquid of the following electrical parameters at 835 MHz:

Relative Dielectricity	40.88	± 5%
Conductivity	0.88 mho/m	± 5%

The APREL Laboratories ALSAS system with a dosimetric E-field probe E-020 (SN:215, Conversion factor 5.49 at 835 MHz) was used for the measurements.

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from the dipole center to the solution surface.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. The 5x5x8 fine cube was chosen for cube integration. The dipole input power (forward power) was 250mW ± 3%. The results are normalized to 1W input power.

The laboratories environmental conditions were as follows during the calibration sequence.

Ambient Temperature of the Laboratory:	21 ºC ± 1.0 ºC
Temperature of the Tissue:	20 ºC ± 1.0 ºC
Relative Humidity:	42%

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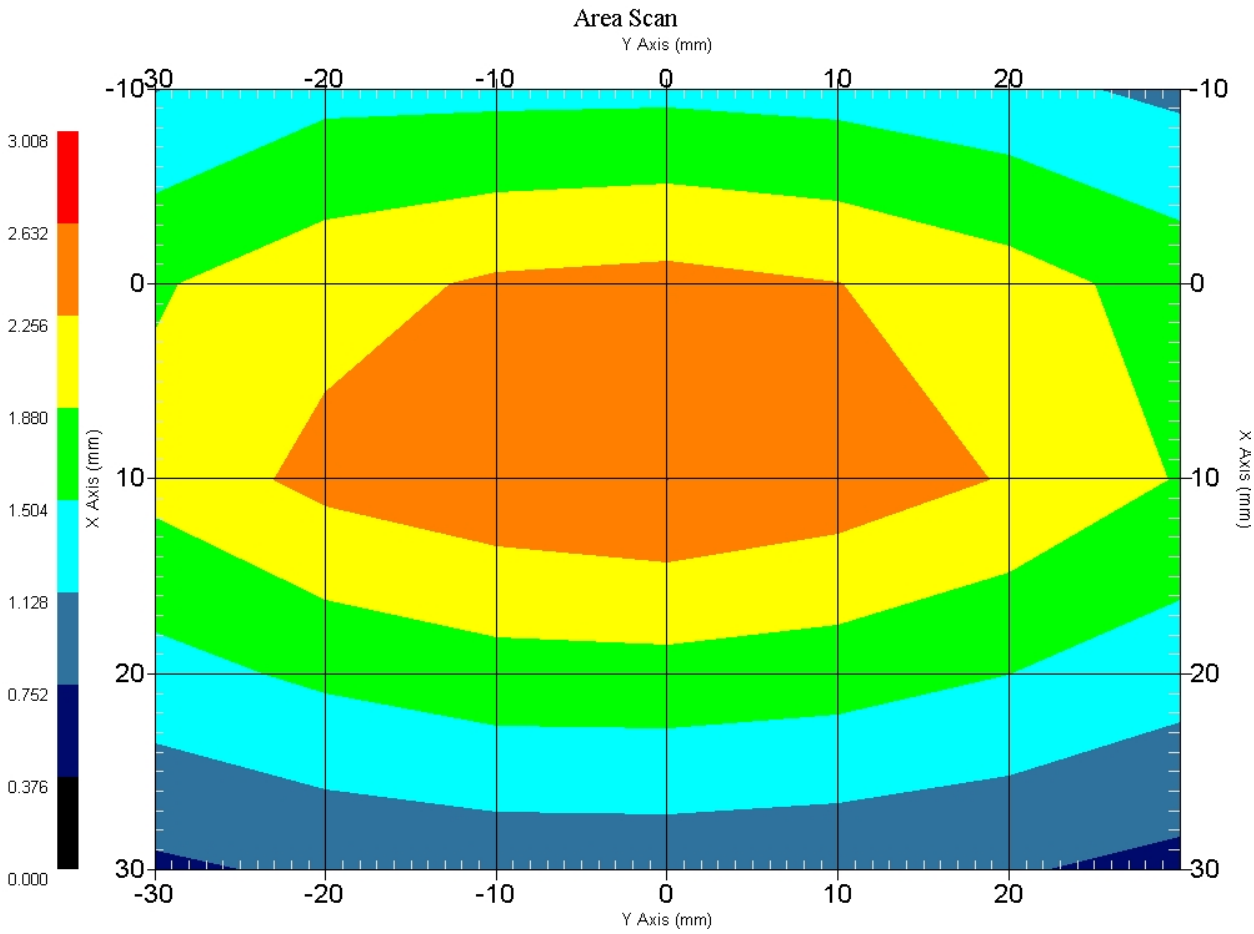
SAR Measurement

Standard SAR measurements were performed according to the measurement conditions described above. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR values measured with the dosimetric probe E-020 SN:215 and applying the advanced extrapolation are:

Averaged over 1 cm^3 (1 g) of tissue:	9.820 mW/g ± 19.0% (k=2)[1]
Averaged over 10 cm^3 (10 g) of tissue:	6.360 mW/g ± 18.5% (k=2)[1]



1 gram SAR value : 2.455 W/kg
10 gram SAR value : 1.590 W/kg
Area Scan Peak SAR : 2.632 W/kg
Zoom Scan Peak SAR : 3.693 W/kg

[1] validation uncertainty

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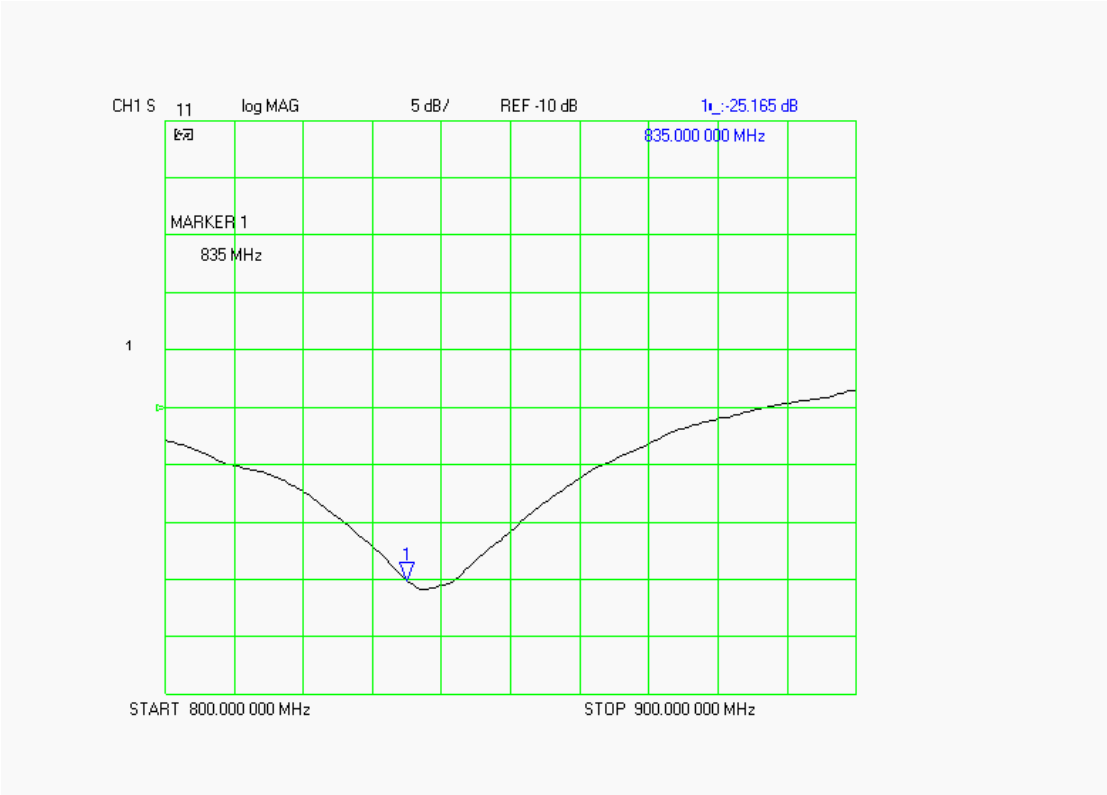
Dipole Impedance and Return Loss

The impedance was measured at the SMA connector with a network analyzer. The dipole was positioned at the flat phantom sections according to measurement conditions stated above during impedance measurements.

Test	Result
S11 R/L	-25.165 dB
SWR	1.1357 U
Impedance	49.691 Ω

The following graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



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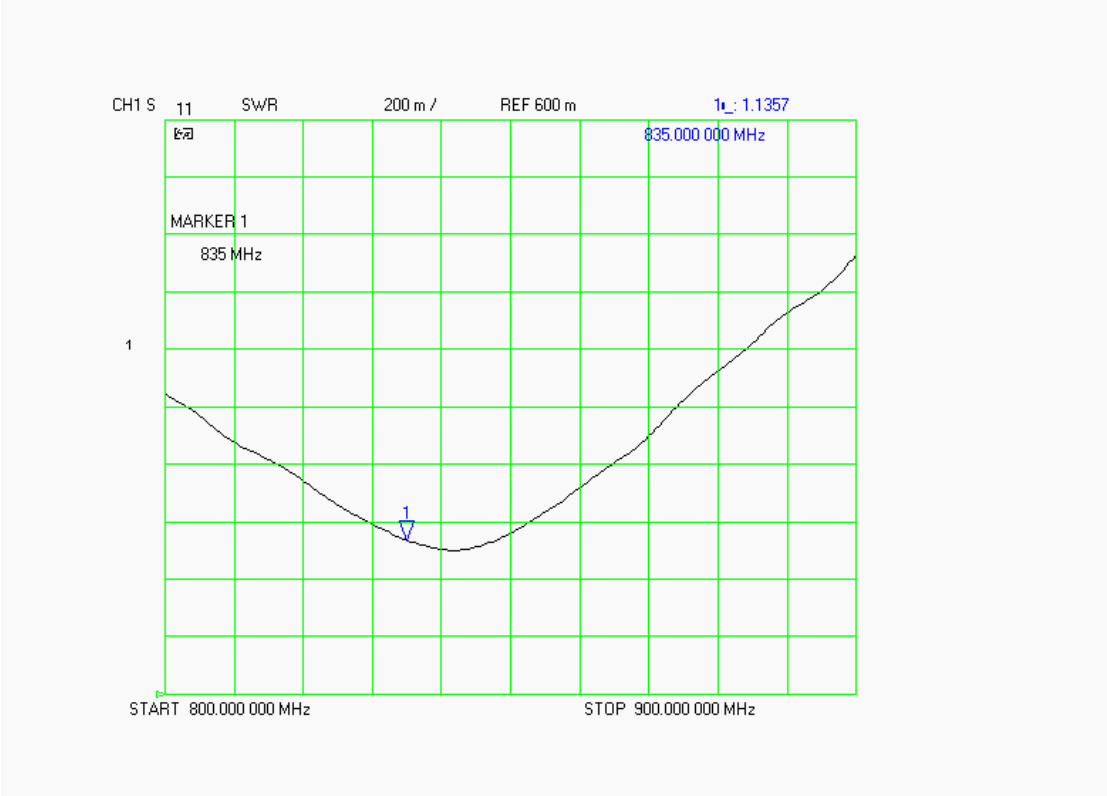
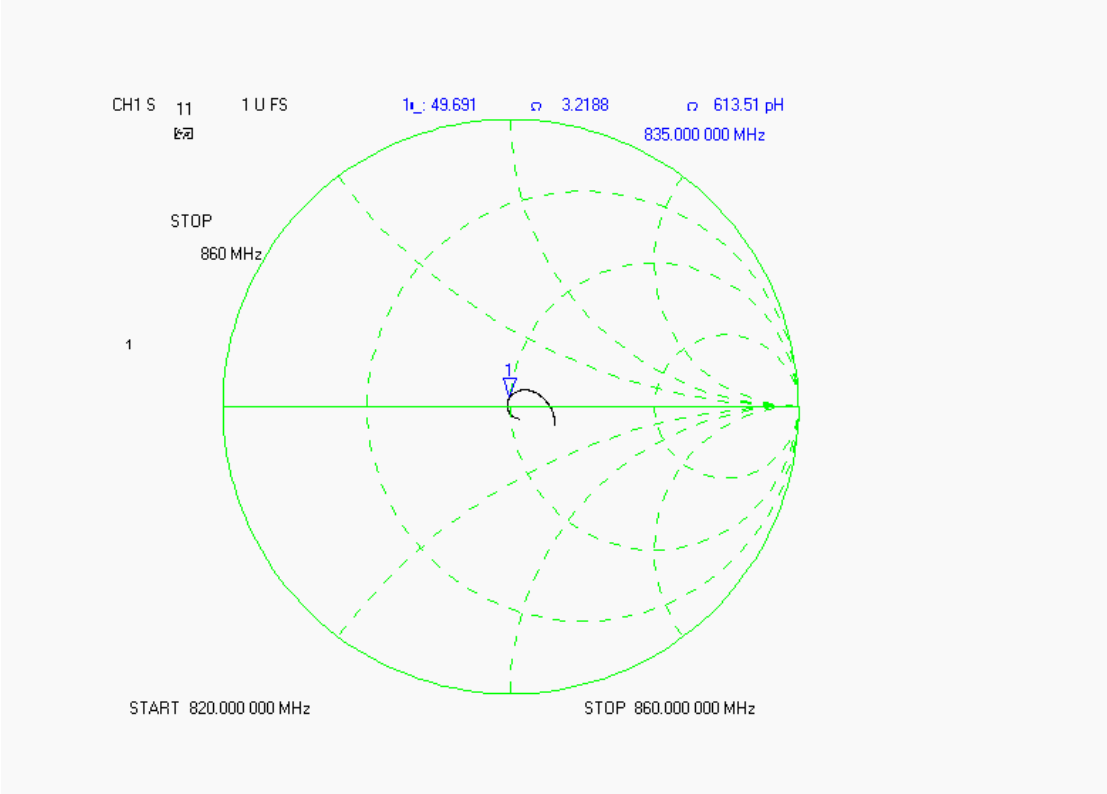
SWR



Smith Chart Dipole Impedance



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Body Measurement Conditions

The measurements were performed in the Uni-Phantom filled with body simulating liquid of the following electrical parameters at 835 MHz:

Relative Dielectricity	54.03	± 5%
Conductivity	0.96 mho/m	± 5%

The APREL Laboratories ALSAS system with a dosimetric E-field probe E-020 (SN:215, Conversion factor 6.07 at 835 MHz) was used for the measurements.

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from the dipole center to the solution surface.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. The 5x5x8 fine cube was chosen for cube integration. The dipole input power (forward power) was 250mW ± 3%. The results are normalized to 1W input power.

The laboratories environmental conditions were as follows during the calibration sequence.

Ambient Temperature of the Laboratory:	22 ºC ± 1.0 ºC
Temperature of the Tissue:	20 ºC ± 1.0 ºC
Relative Humidity:	42%

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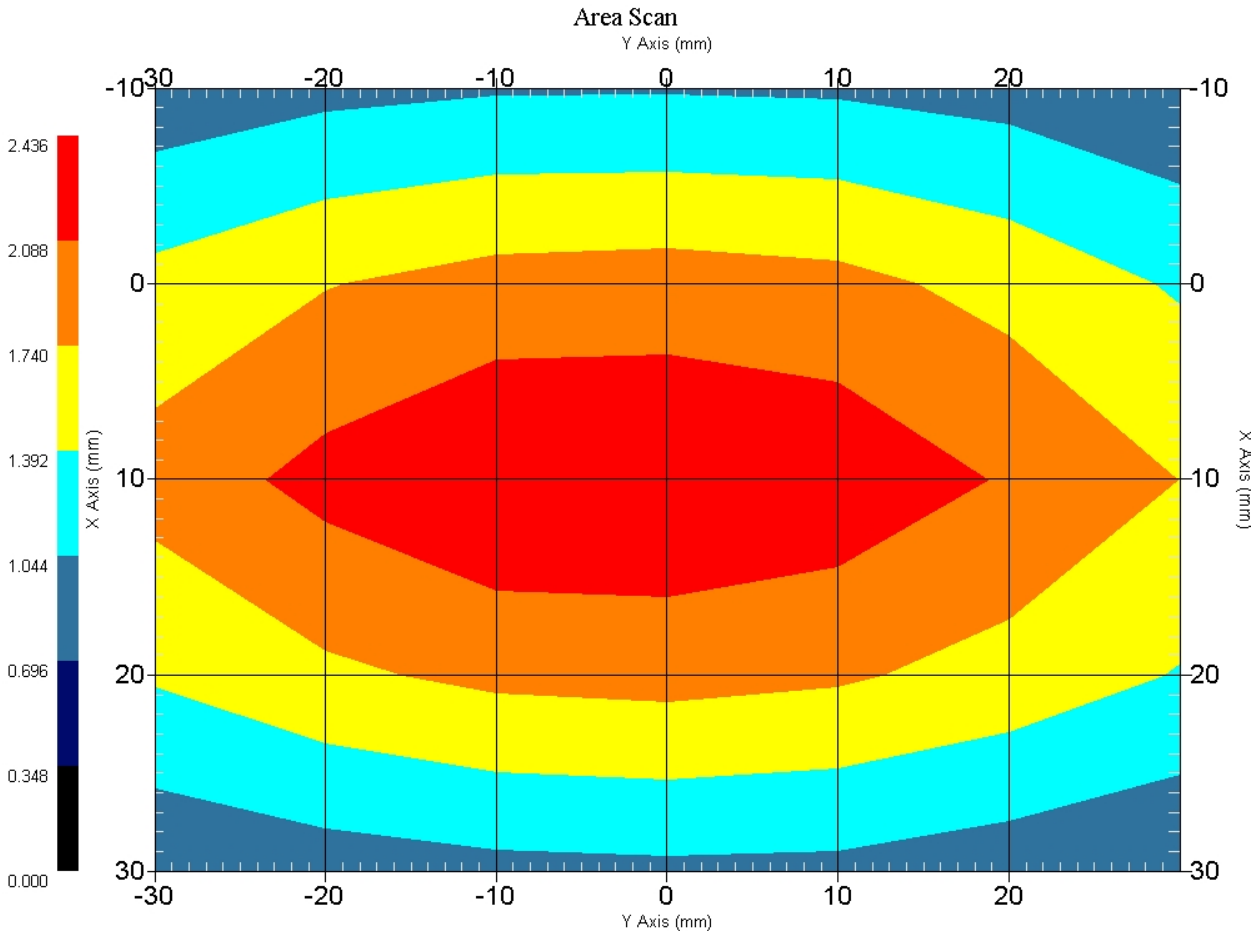
SAR Measurement

Standard SAR measurements were performed according to the measurement conditions described above. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR values measured with the dosimetric probe E-020 SN:215 and applying the advanced extrapolation are:

Averaged over 1 cm^3 (1 g) of tissue:	9.072 mW/g ± 19.1% (k=2)[1]
Averaged over 10 cm^3 (10 g) of tissue:	5.944 mW/g ± 18.6% (k=2)[1]



1 gram SAR value : 2.268 W/kg
10 gram SAR value : 1.486 W/kg
Area Scan Peak SAR : 2.435 W/kg
Zoom Scan Peak SAR : 3.413 W/kg

[1] validation uncertainty

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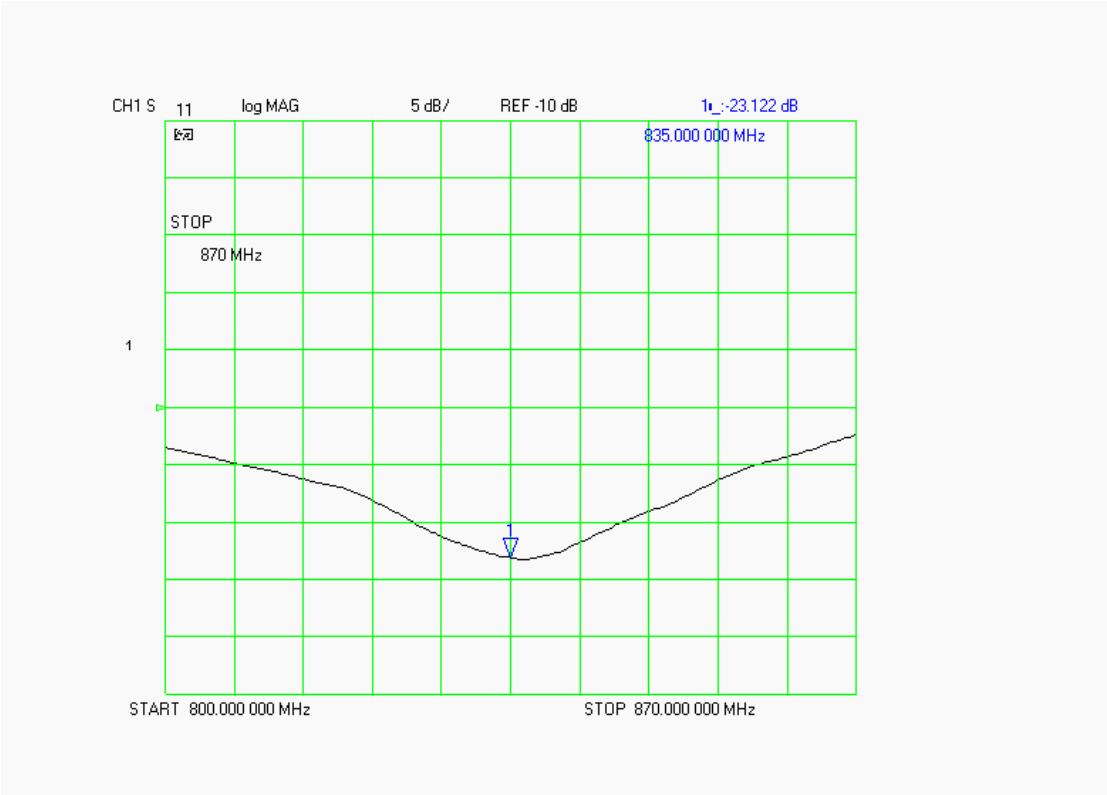
Dipole Impedance and Return Loss

The impedance was measured at the SMA connector with a network analyzer. The dipole was positioned at the flat phantom sections according to measurement conditions stated above during impedance measurements.

Test	Result
S11 R/L	-23.122 dB
SWR	1.1539 U
Impedance	51.514 Ω

The following graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



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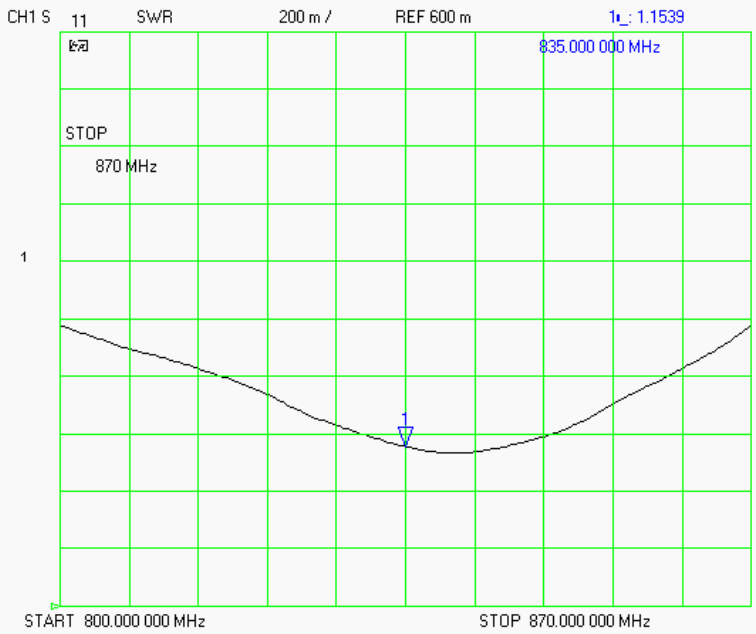
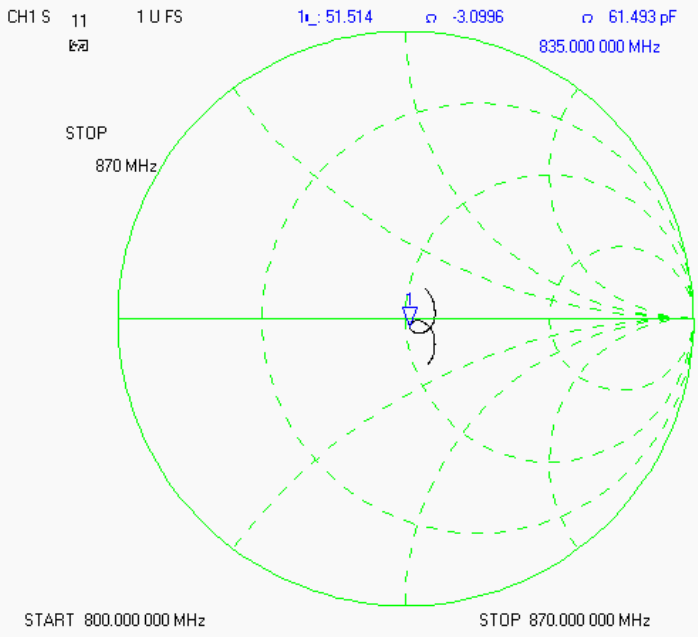
SWR



Smith Chart Dipole Impedance



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Test Equipment List

Type	Calibration Due Date	Serial Number
ThermoCRS Robot	N/A	RAF0338198
ThermoCRS Controller	N/A	RCF0338224
ThermoCRS Teach Pendant (Joystick)	N/A	STP0334405
IBM Computer, 2.66 MHz P4	N/A	8189D8U KCPR08N
Aprel E-Field Probe ALS-E020	06/10/2006	RFE-215
Aprel E-Field Probe ALS-E020	01/25/2007	
Aprel UniPhantom	N/A	RFE-273
Agilent (HP) 437B Power Meter	12/12/2006	3125U08837
Agilent (HP) 8481B Power Sensor	12/19/2006	3318A05384
Agilent (HP) 8350B Signal Generator	03/03/2006	2749A10226
Agilent (HP) 83525A RF Plug-In	03/03/2006	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	02/02/2007	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	02/02/2007	2904A00595
Aprel Dielectric Probe Assembly	N/A	0011
Microwave Power Devices 510-10E Amplifier	03/03/2006	6063-001
Microwave Power Devices 1020-9E Amplifier	03/03/2006	5618-1
Brain Equivalent Matter (835 MHz)	N/A	N/A
Brain Equivalent Matter (1900 MHz)	N/A	N/A
Brain Equivalent Matter (900 MHz)	N/A	N/A
Muscle Equivalent Matter (835 MHz)	N/A	N/A
Muscle Equivalent Matter (1900 MHz)	N/A	N/A
Muscle Equivalent Matter (900 MHz)	N/A	N/A
Muscle Equivalent Matter (2450 MHz)	N/A	N/A
Muscle Equivalent Matter (5200 MHz)	N/A	N/A

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RF Exposure Lab, LLC

Calibration File No: CAL.20060201

C E R T I F I C A T E O F C A L I B R A T I O N

It is certified that the equipment identified below has been calibrated at RF Exposure Lab, LLC by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole

Manufacturer: APREL Laboratories

Part Number: ALS-D-1900-S-2

Frequency: 1.9 GHz

Serial No: RFE-277

Manufactured: 20 February 2004
Calibrated: 15 February 2006

Calibrated By: Signature on File
Jay Moulton – Technical Manager

Approved By: Signature on File
Tamara Moulton – Quality Manager

RF EXPOSURE LAB, LLC

2867 Progress Place, Suite 4D
Escondido, CA 92029

Tel: (760) 737-3131
FAX: (760) 737-9131

Calibration Results Summary

The following results relate to the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 68.0 mm
Height: 37.5 mm

Electrical Specifications

Head

SWR: 1.0776 U
Return Loss: -30.532 dB
Impedance: 49.666 Ω

System Validation Results

Frequency	1 Gram	10 Gram
1.9 GHz	40.636	20.424

Body

SWR: 1.0927 U
Return Loss: -33.755 dB
Impedance: 53.652 Ω

System Validation Results

Frequency	1 Gram	10 Gram
1.9 GHz	41.336	21.464

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Head Measurement Conditions

The measurements were performed in the Uni-Phantom filled with head simulating liquid of the following electrical parameters at 1900 MHz:

Relative Dielectricity	39.24	± 5%
Conductivity	1.43 mho/m	± 5%

The APREL Laboratories ALSAS system with a dosimetric E-field probe E-020 (SN:215, Conversion factor 4.5 at 1900 MHz) was used for the measurements.

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from the dipole center to the solution surface.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. The 5x5x8 fine cube was chosen for cube integration. The dipole input power (forward power) was 250mW ± 3%. The results are normalized to 1W input power.

The laboratories environmental conditions were as follows during the calibration sequence.

Ambient Temperature of the Laboratory:	22 ºC ± 1.0 ºC
Temperature of the Tissue:	20 ºC ± 1.0 ºC
Relative Humidity:	41%

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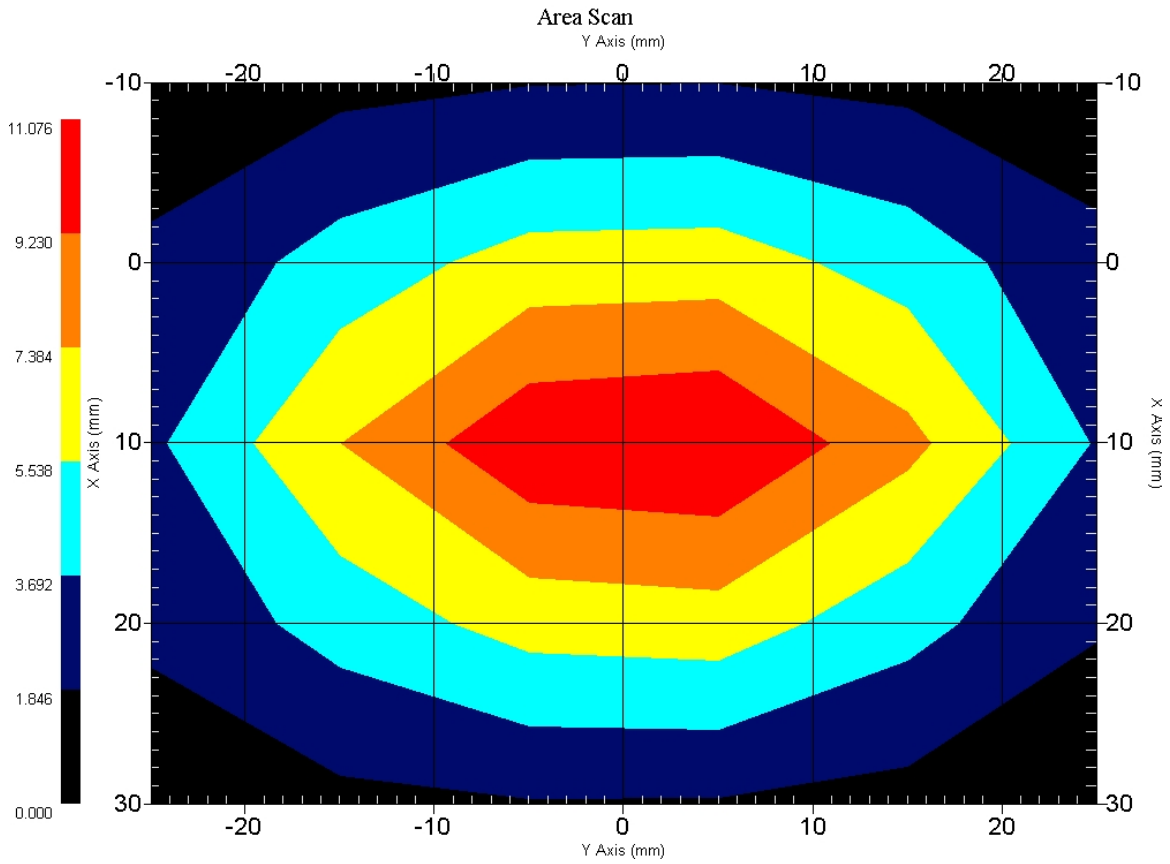
SAR Measurement

Standard SAR measurements were performed according to the measurement conditions described above. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR values measured with the dosimetric probe E-020 SN:215 and applying the advanced extrapolation are:

Averaged over 1 cm^3 (1 g) of tissue:	40.636 mW/g ± 19.2% (k=2)[1]
Averaged over 10 cm^3 (10 g) of tissue:	20.424 mW/g ± 18.8% (k=2)[1]



1 gram SAR value : 10.159 W/kg
10 gram SAR value : 5.106 W/kg
Area Scan Peak SAR : 11.075 W/kg
Zoom Scan Peak SAR : 17.815 W/kg

[1] validation uncertainty

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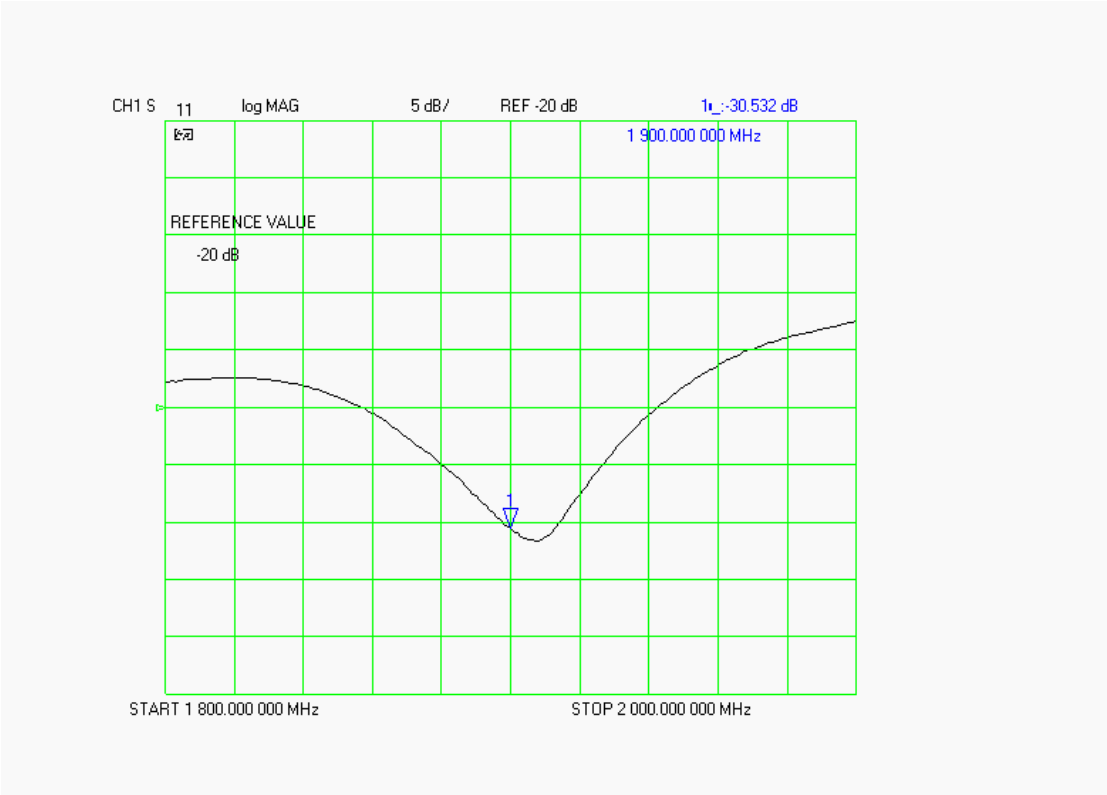
Dipole Impedance and Return Loss

The impedance was measured at the SMA connector with a network analyzer. The dipole was positioned at the flat phantom sections according to measurement conditions stated above during impedance measurements.

Test	Result
S11 R/L	-30.532 dB
SWR	1.0776 U
Impedance	49.666 Ω

The following graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



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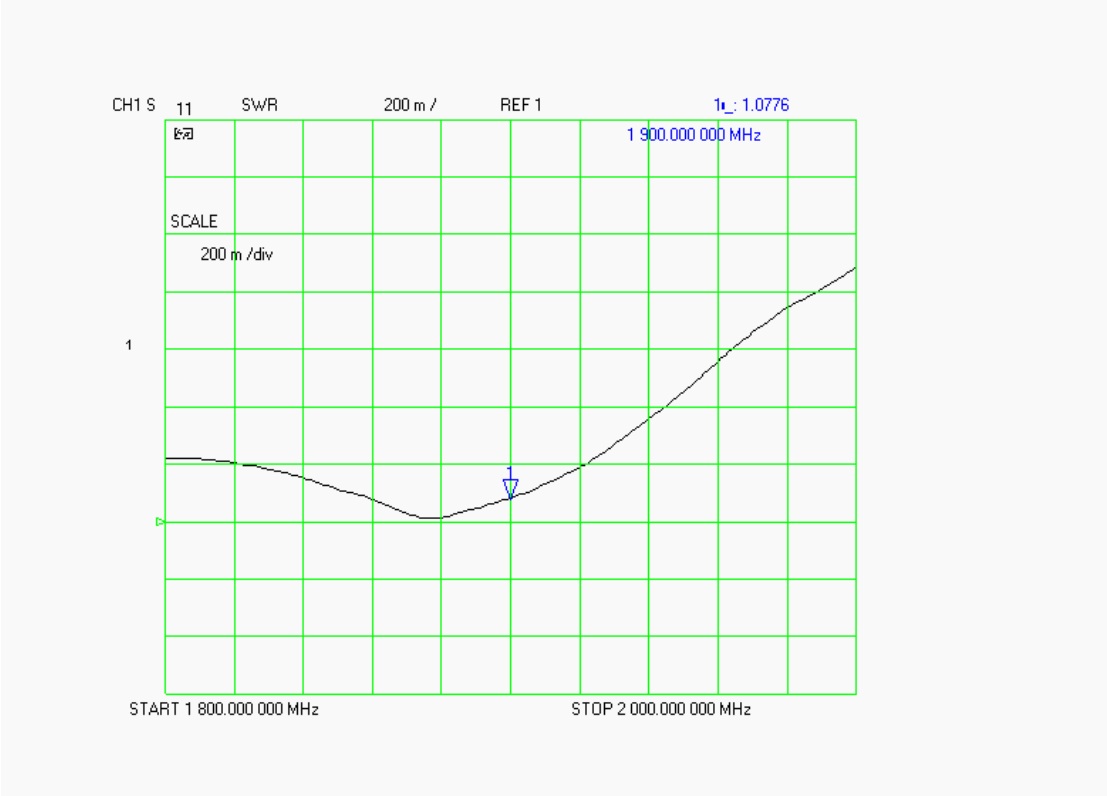
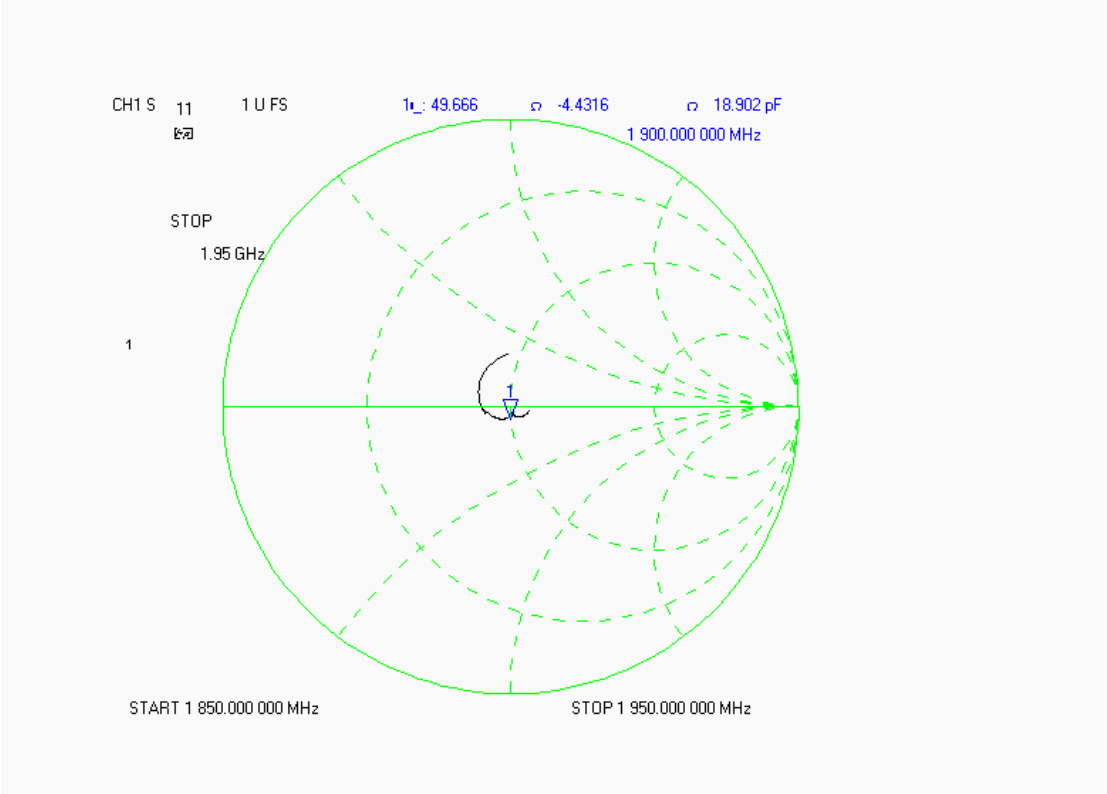
SWR



Smith Chart Dipole Impedance



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Body Measurement Conditions

The measurements were performed in the Uni-Phantom filled with body simulating liquid of the following electrical parameters at 1900 MHz:

Relative Dielectricity	52.91	± 5%
Conductivity	1.49 mho/m	± 5%

The APREL Laboratories ALSAS system with a dosimetric E-field probe E-020 (SN:215, Conversion factor 3.8 at 1900 MHz) was used for the measurements.

The dipole was mounted so that the dipole feed point was positioned below the center marking of the flat phantom and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from the dipole center to the solution surface.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. The 5x5x8 fine cube was chosen for cube integration. The dipole input power (forward power) was 250mW ± 3%. The results are normalized to 1W input power.

The laboratories environmental conditions were as follows during the calibration sequence.

Ambient Temperature of the Laboratory:	23 ºC ± 1.0 ºC
Temperature of the Tissue:	20 ºC ± 1.0 ºC
Relative Humidity:	44%

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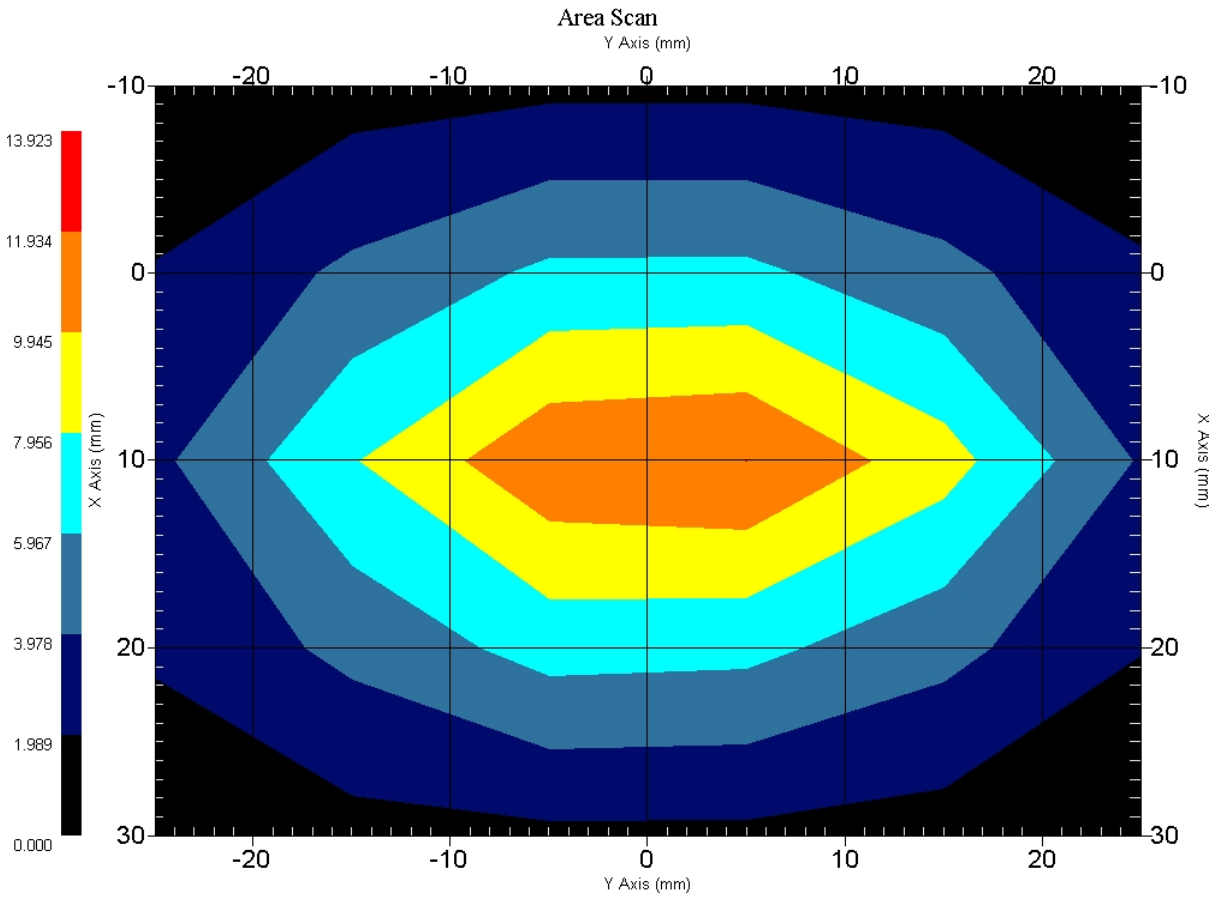
SAR Measurement

Standard SAR measurements were performed according to the measurement conditions described above. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR values measured with the dosimetric probe E-020 SN:215 and applying the advanced extrapolation are:

Averaged over 1 cm^3 (1 g) of tissue:	41.336 mW/g ± 18.9% (k=2)[1]
Averaged over 10 cm^3 (10 g) of tissue:	21.464 mW/g ± 18.5% (k=2)[1]



1 gram SAR value : 10.334 W/kg
10 gram SAR value : 5.366 W/kg
Area Scan Peak SAR : 11.936 W/kg
Zoom Scan Peak SAR : 18.616 W/kg

[1] validation uncertainty

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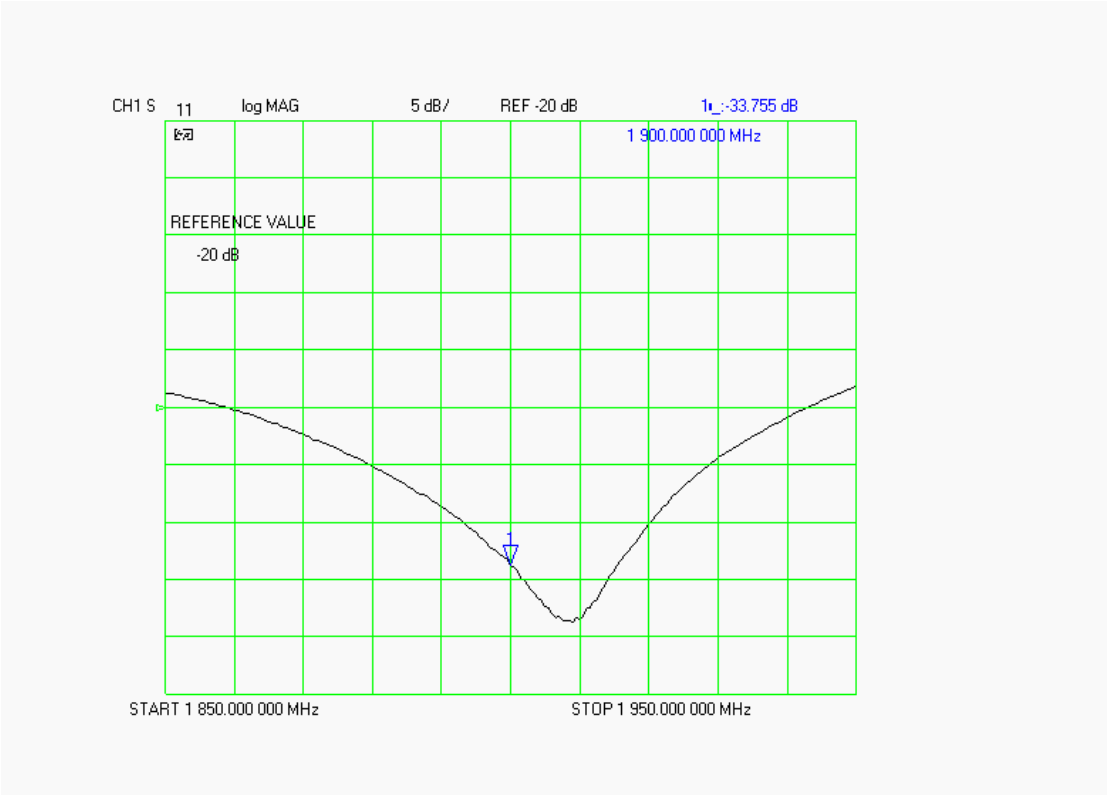
Dipole Impedance and Return Loss

The impedance was measured at the SMA connector with a network analyzer. The dipole was positioned at the flat phantom sections according to measurement conditions stated above during impedance measurements.

Test	Result
S11 R/L	-33.755 dB
SWR	1.0927 U
Impedance	53.652 Ω

The following graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



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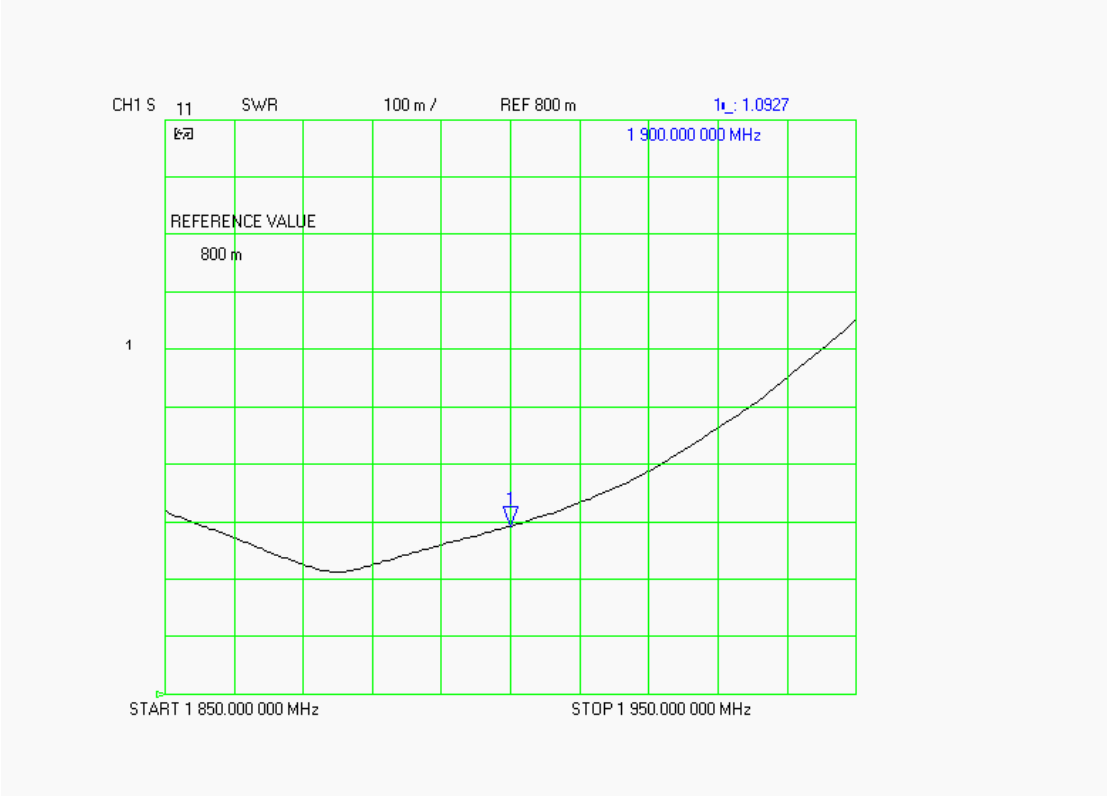
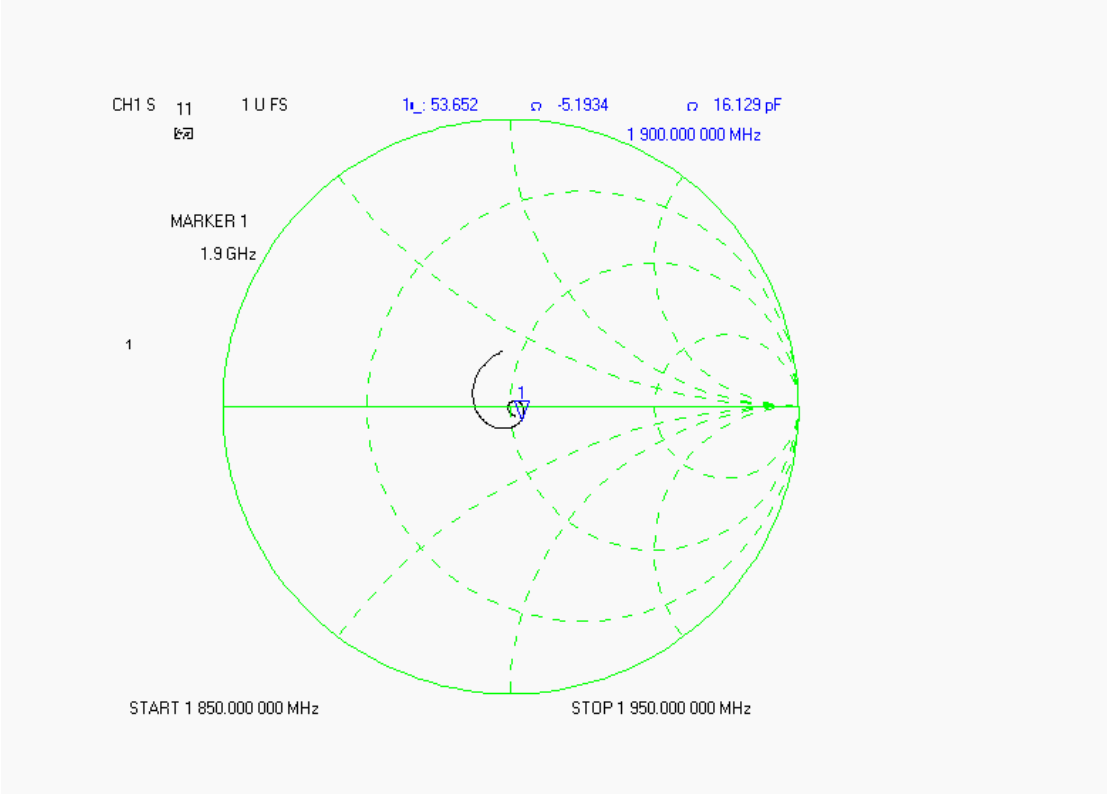
SWR



Smith Chart Dipole Impedance



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Test Equipment List

Type	Calibration Due Date	Serial Number
ThermoCRS Robot	N/A	RAF0338198
ThermoCRS Controller	N/A	RCF0338224
ThermoCRS Teach Pendant (Joystick)	N/A	STP0334405
IBM Computer, 2.66 MHz P4	N/A	8189D8U KCPR08N
Aprel E-Field Probe ALS-E020	06/10/2006	RFE-215
Aprel E-Field Probe ALS-E020	01/25/2007	
Aprel UniPhantom	N/A	RFE-273
Agilent (HP) 437B Power Meter	12/12/2006	3125U08837
Agilent (HP) 8481B Power Sensor	12/19/2006	3318A05384
Agilent (HP) 8350B Signal Generator	03/03/2006	2749A10226
Agilent (HP) 83525A RF Plug-In	03/03/2006	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	02/02/2007	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	02/02/2007	2904A00595
Aprel Dielectric Probe Assembly	N/A	0011
Microwave Power Devices 510-10E Amplifier	03/03/2006	6063-001
Microwave Power Devices 1020-9E Amplifier	03/03/2006	5618-1
Brain Equivalent Matter (835 MHz)	N/A	N/A
Brain Equivalent Matter (1900 MHz)	N/A	N/A
Brain Equivalent Matter (900 MHz)	N/A	N/A
Muscle Equivalent Matter (835 MHz)	N/A	N/A
Muscle Equivalent Matter (1900 MHz)	N/A	N/A
Muscle Equivalent Matter (900 MHz)	N/A	N/A
Muscle Equivalent Matter (2450 MHz)	N/A	N/A
Muscle Equivalent Matter (5200 MHz)	N/A	N/A

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Appendix F – Phantom Calibration Data Sheets

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NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-268

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to National Standards.

Unit serial number: RFE-268

MEASUREMENTS OF THE PINNA

Right SAM Head

MB0	NF6	**1.96**
MB0	NF8	**1.99**
MB -30	NF6	**1.98**
MB +30	NF6	**2.00**
MB0	NF0	**5.80**
MB +30	NF0	**4.46**
MB -30	NF0	**11.56**
MB0	NF -2	**5.6**

NOTE: Lowest value was recorded.

Calibrated By: Karim K Date: Feb 17/04.

NCL CALIBRATION LABORATORIES

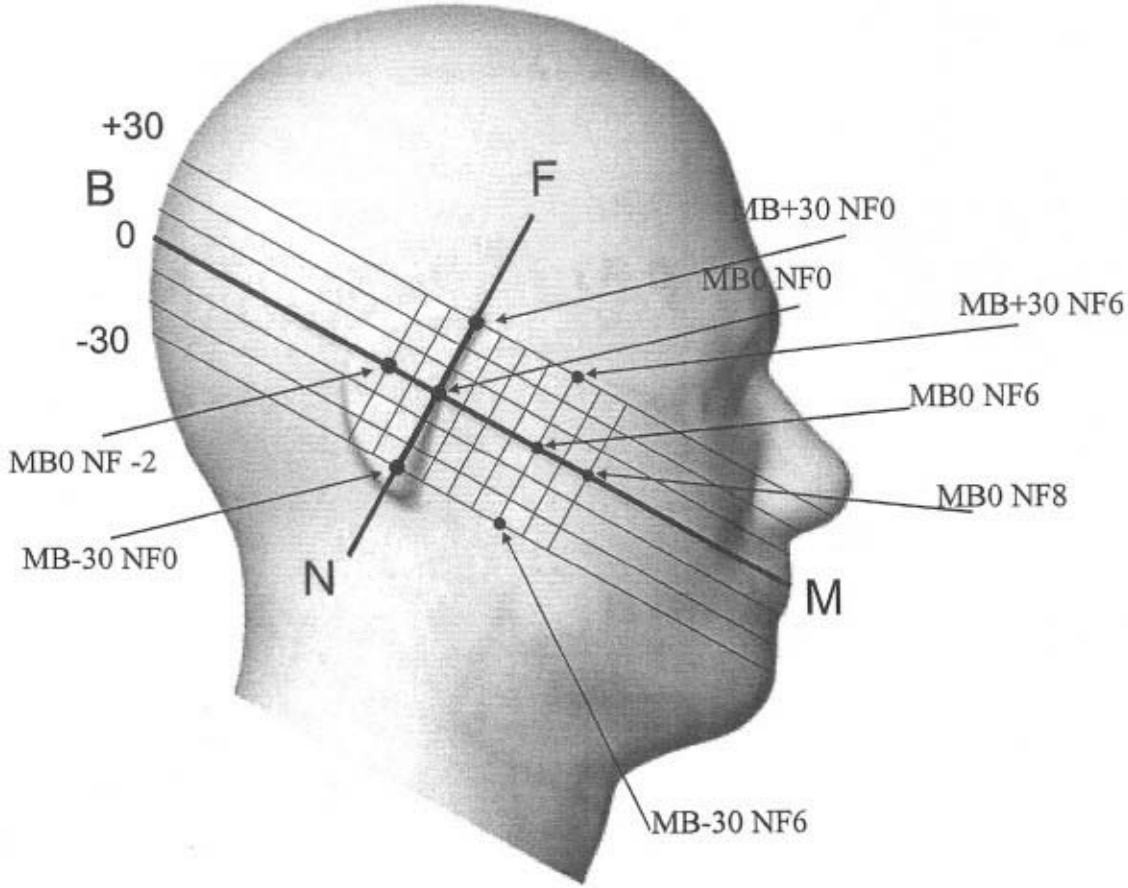
51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Laboratories.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-268

CERTIFICATE OF CALIBRATION



NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-267

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to National Standards.

Unit serial number: RFE-267

MEASUREMENTS OF THE PINNA

Left SAM Head

MB0	NF6	2.00
MB0	NF8	2.01
MB -30	NF6	2.00
MB +30	NF6	1.98
MB0	NF0	5.68
MB +30	NF0	4.68
MB -30	NF0	1.52
MB0	NF -2	5.61

NOTE: Lowest value was recorded.

Calibrated By: Karim K Date: Feb 17/04

NCL CALIBRATION LABORATORIES

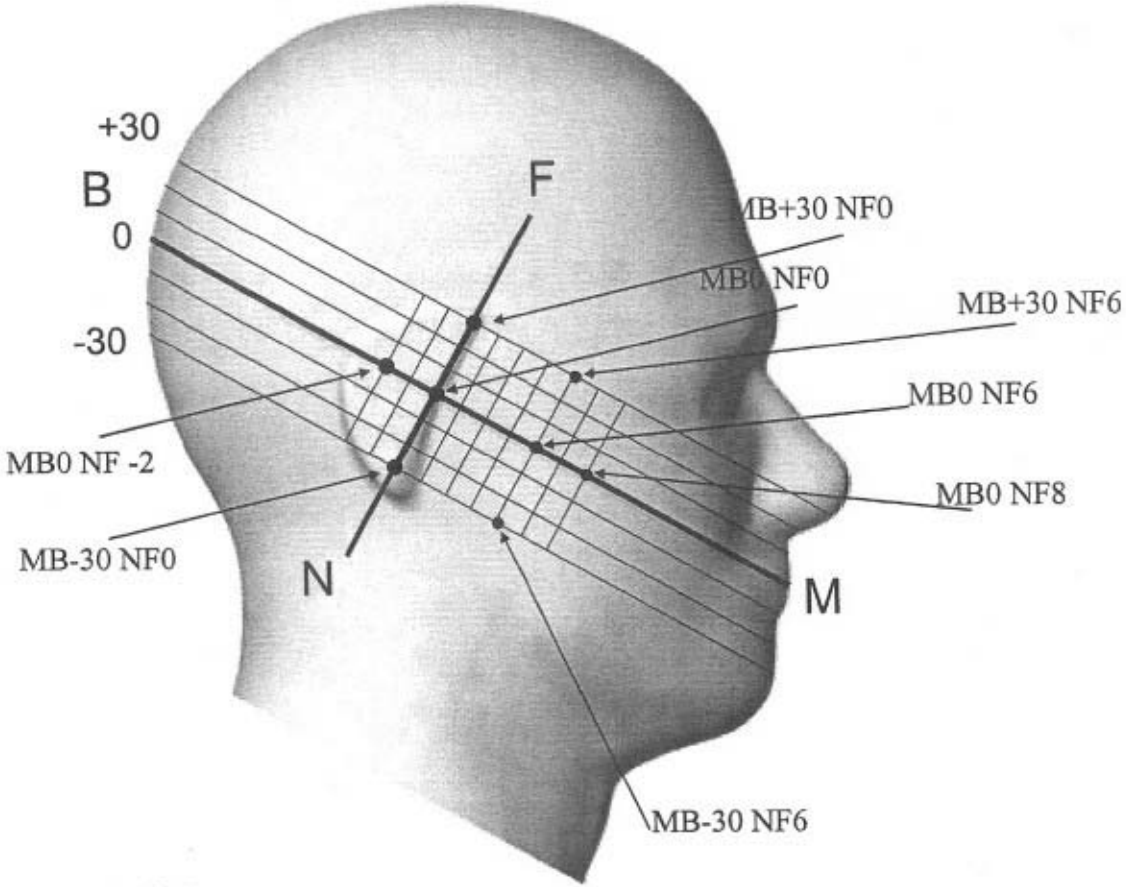
51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Laboratories.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-267

CERTIFICATE OF CALIBRATION



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51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-273

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to National Standards.

Thickness of the UniPhantom is 2 mm ± 10%
Pinna thickness is 6 mm ± 10%

Resolution:	0.01 mm	Calibrated to:	0.0 mm
Stability:	OK	Accuracy:	< 0.1 mm

Calibrated By: Karen K. Feb 17/04.

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161