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Appendix B Calibration Reports



NCL CALIBRATION LABORATORIES

Calibration File No: DC-596
Project Number: APREL-ALSAS10U

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.

APREL Validation Dipole

Manufacturer: APREL Laboratories

Part number: ALS-D-2450-S-2

Frequency: 2450 MHz

Serial No: 2450-220-00754

Customer: APREL

Calibrated: 4th March 2006
Released on: 4th March 2006

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4162

NCL CALIBRATION LABORATORIES

Calibration File No: DC-597
Project Number: APREL-ALSAS10U

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.

APREL Validation Dipole

Manufacturer: APREL Laboratories

Part number: ALS-D-5200-S-2

Frequency: 5200 MHz

Serial No: 5200-230-00803

Customer: APREL

Calibrated: 4th March 2006
Released on: 4th March 2006

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4162

NCL Calibration Laboratories

Division of APREL Laboratories.

Conditions

Dipole 5200-230-00803 was new and 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 device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

D. Brooks
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

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

Mechanical Dimensions

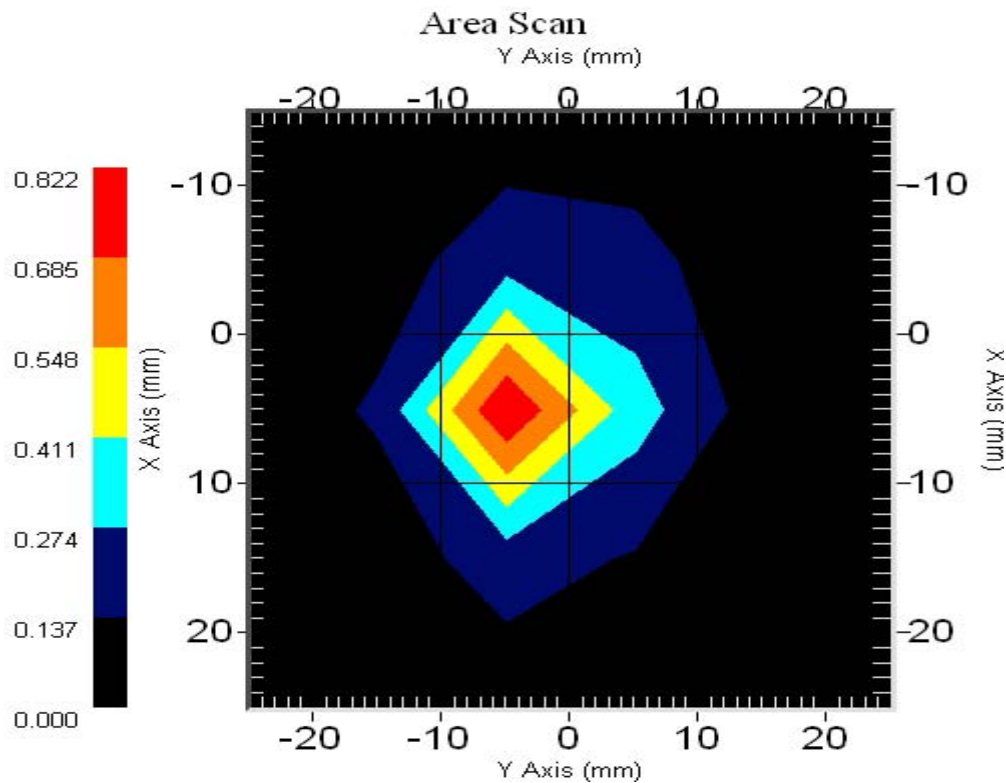
Length: 23.6 mm
Height: 14.0 mm

Electrical Specification

SWR: 1.12 U
Return Loss: -24.9 dB
Impedance: 55.8 Ω

System Validation Results

Frequency	1 Gram	10 Gram	Peak
5200 MHz	62.9	17.9	223.1



Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 5200-230-00803. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue 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"

Conditions

Dipole 5200-230-00803 was new taken from stock.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
23.6 mm	14.0 mm	23.4 mm	16.6 mm

Tissue Validation

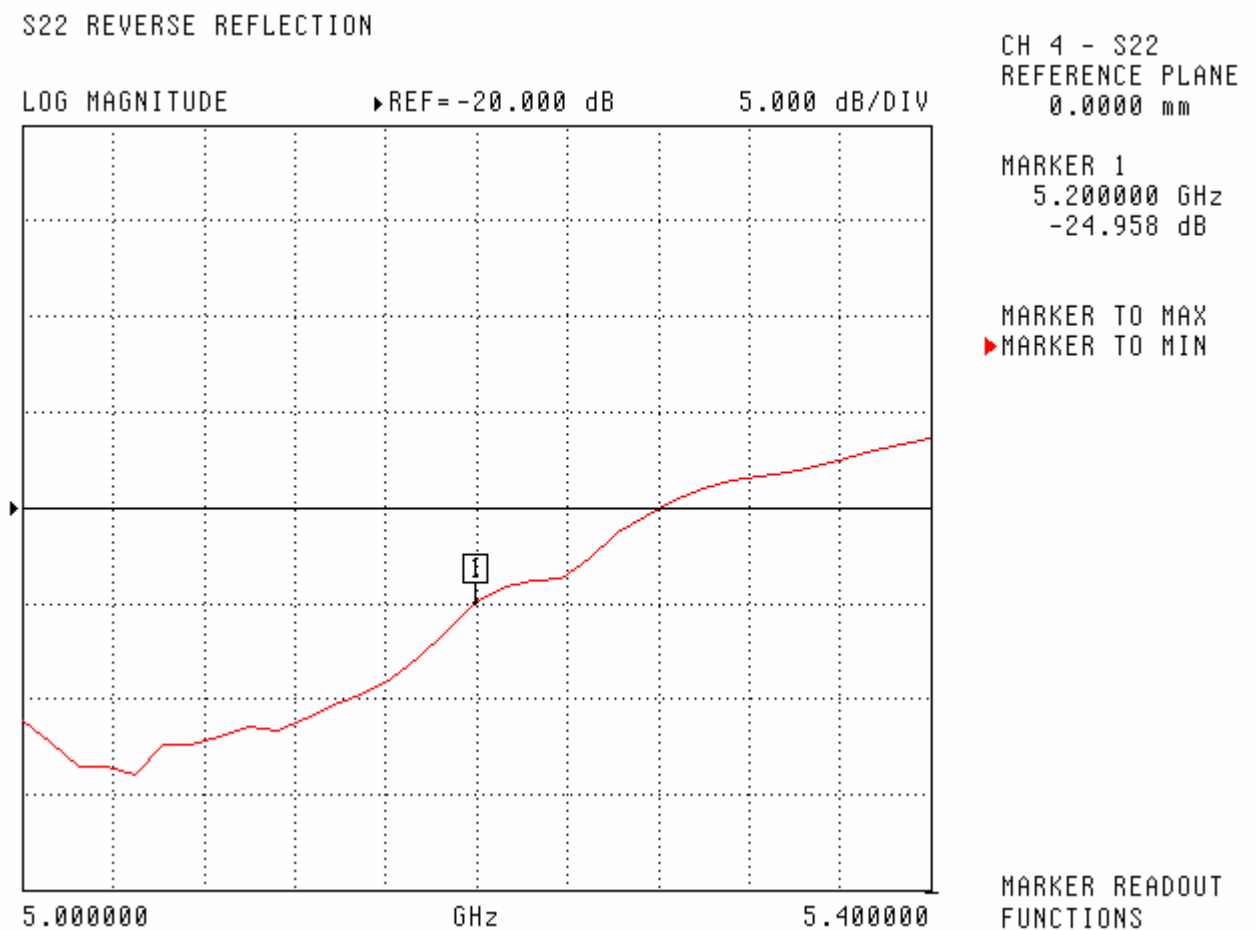
Head Tissue 5200 MHz	Measured
Dielectric constant, ϵ_r	35.3
Conductivity, σ [S/m]	5.30

Electrical Calibration

Test	Result
S11 R/L	-24.9 dB
SWR	1.12 U
Impedance	55.8 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

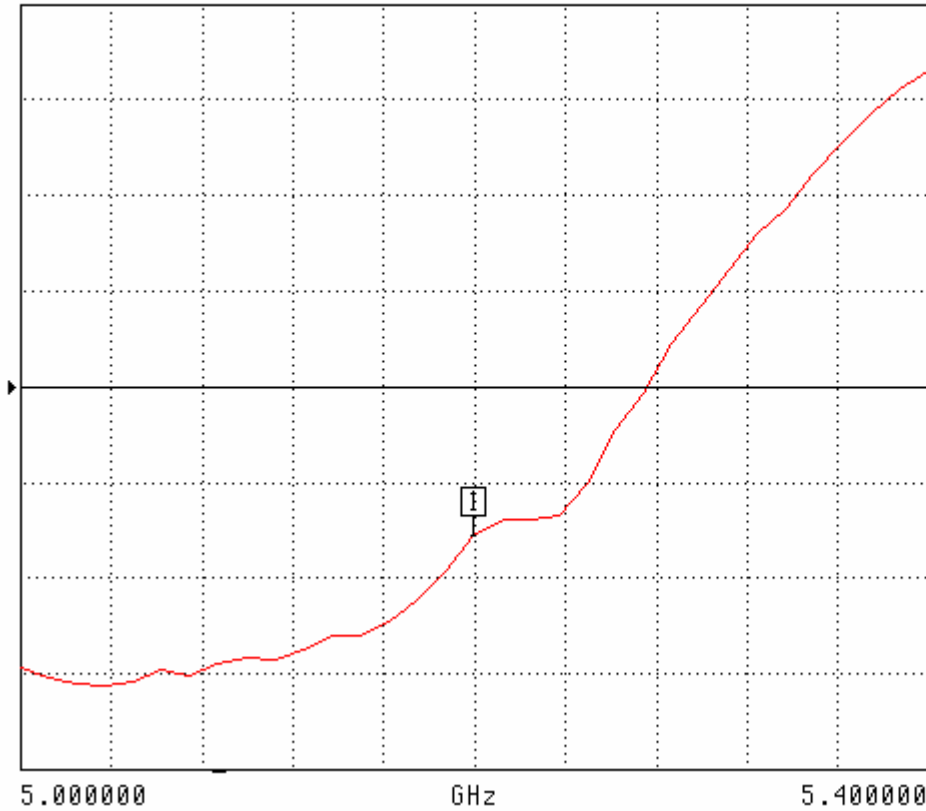
S11 Parameter Return Loss



SWR

S22 REVERSE REFLECTION

SWR ▶REF=1.200 U 50.000 mU/DIV



CH 4 - S22
REFERENCE PLANE
0.0000 mm

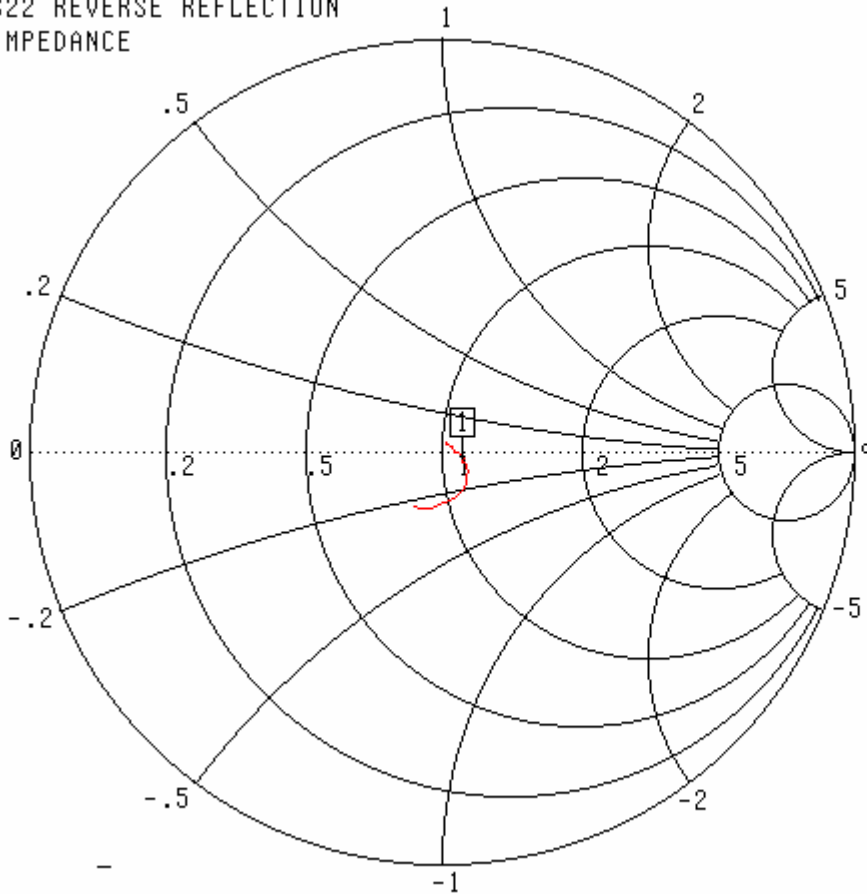
MARKER 1
5.200000 GHz
1.122 U

MARKER TO MAX
▶ MARKER TO MIN

MARKER READOUT
FUNCTIONS

Smith Chart Dipole Impedance

S22 REVERSE REFLECTION
IMPEDANCE



CH 4 - S22
REFERENCE PLANE
0.0000 mm

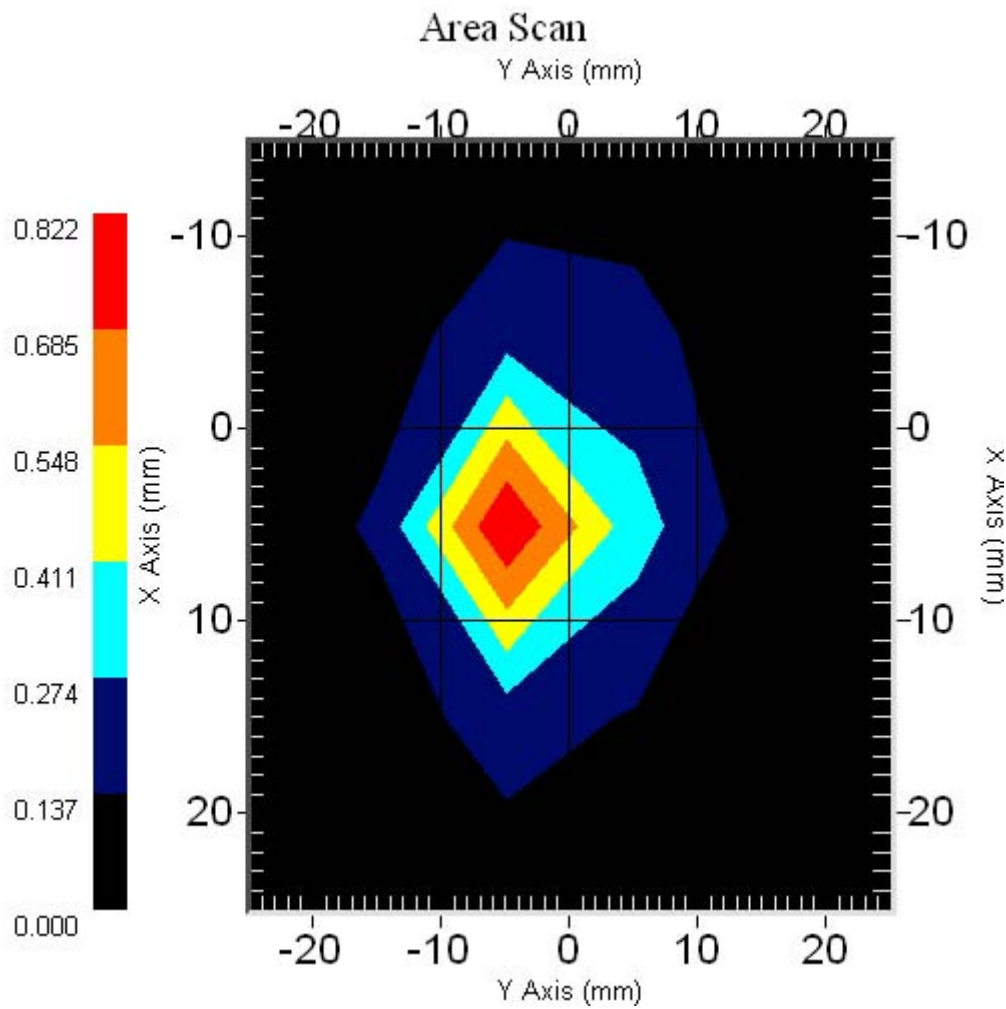
MARKER 1
5.200000 GHz
55.763 Ω
-1.570 $j\Omega$

MARKER TO MAX
▶ MARKER TO MIN

MARKER READOUT
FUNCTIONS

System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
5200 MHz	62.9	17.9	223.1



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 2006.

NCL Calibration Laboratories

Division of APREL Laboratories.

Conditions

Dipole 2450-220-00754 was new and 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 device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

D. Brooks
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

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

Mechanical Dimensions

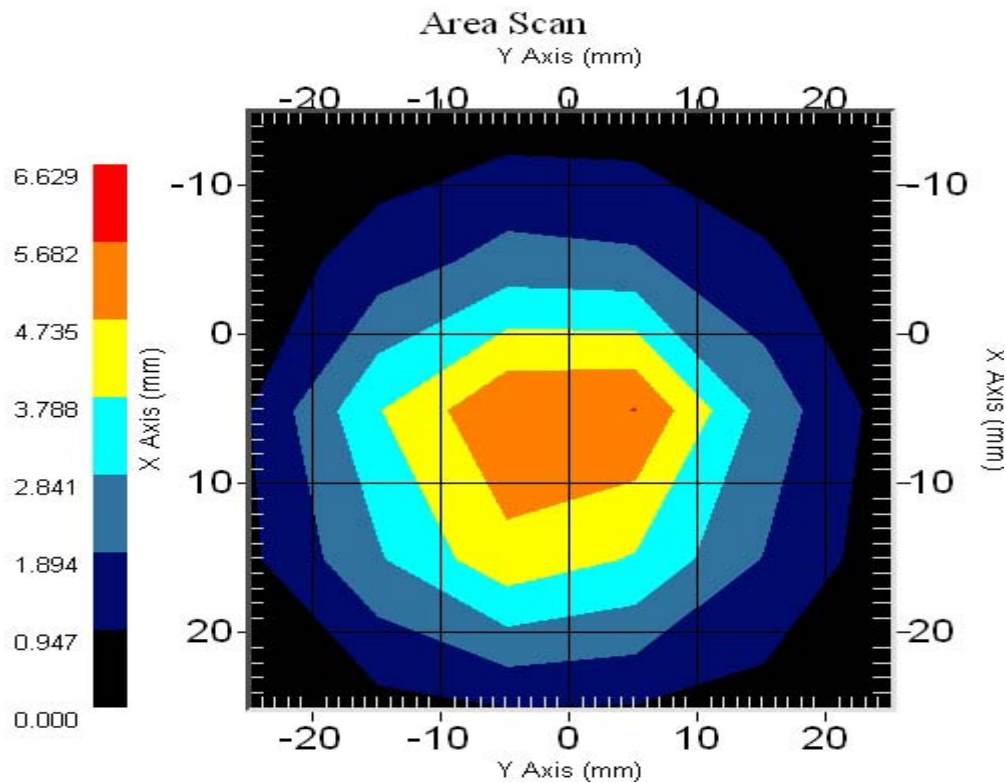
Length: 51.5 mm
Height: 30.4 mm

Electrical Specification

SWR: 1.16 U
Return Loss: -22.7 dB
Impedance: 48.7 Ω

System Validation Results

Frequency	1 Gram	10 Gram	Peak
2450 MHz	53.1	24.4	105.8



Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 2450-220-00754. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure

SSI-TP-016 Tissue 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"

Conditions

Dipole 2450-220-00754 was new taken from stock.

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

Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
51.5 mm	30.4 mm	52.1 mm	30.6 mm

Tissue Validation

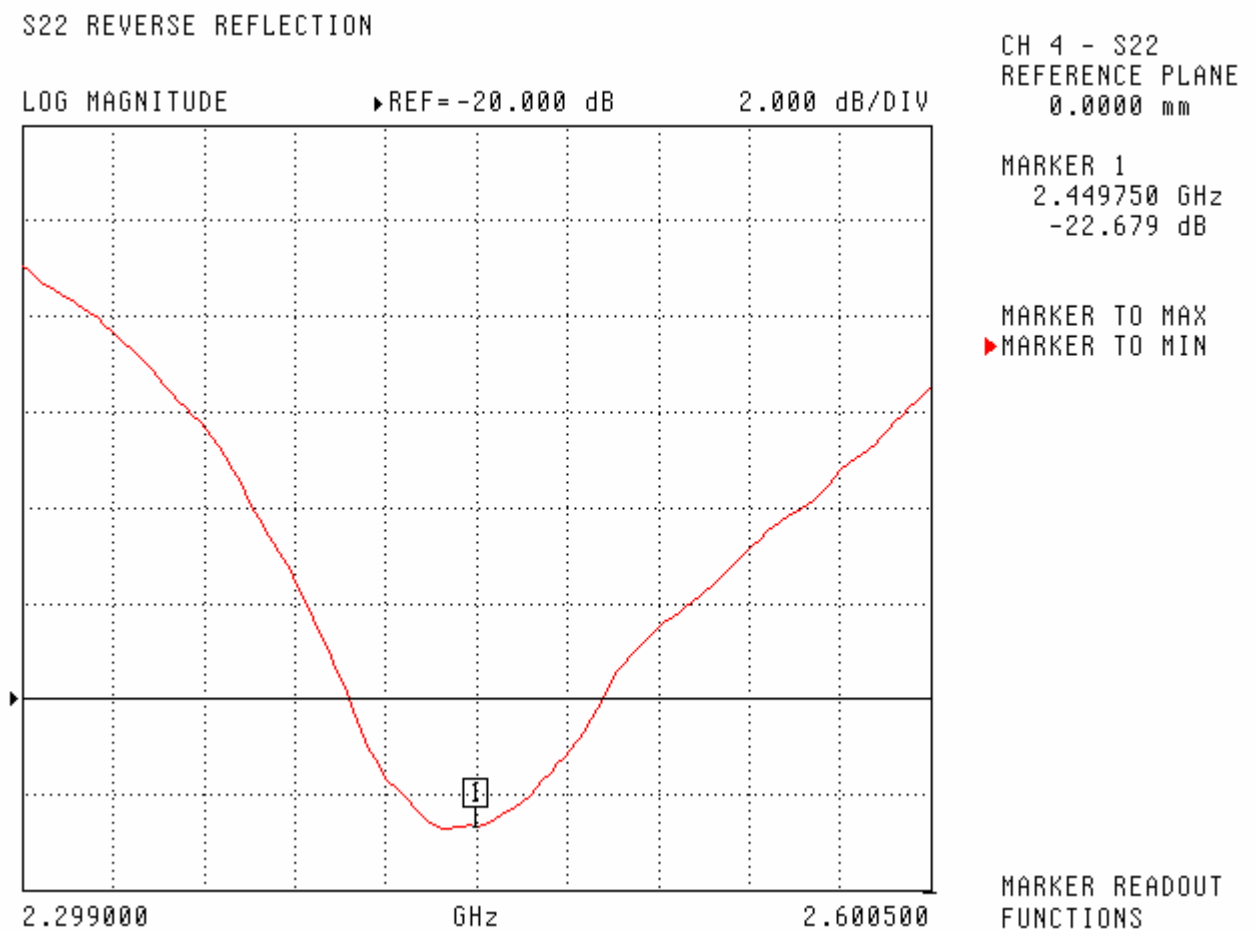
Head Tissue 2450 MHz	Measured
Dielectric constant, ϵ_r	39.2
Conductivity, σ [S/m]	1.80

Electrical Calibration

Test	Result
S11 R/L	-22.7 dB
SWR	1.16 U
Impedance	48.7 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

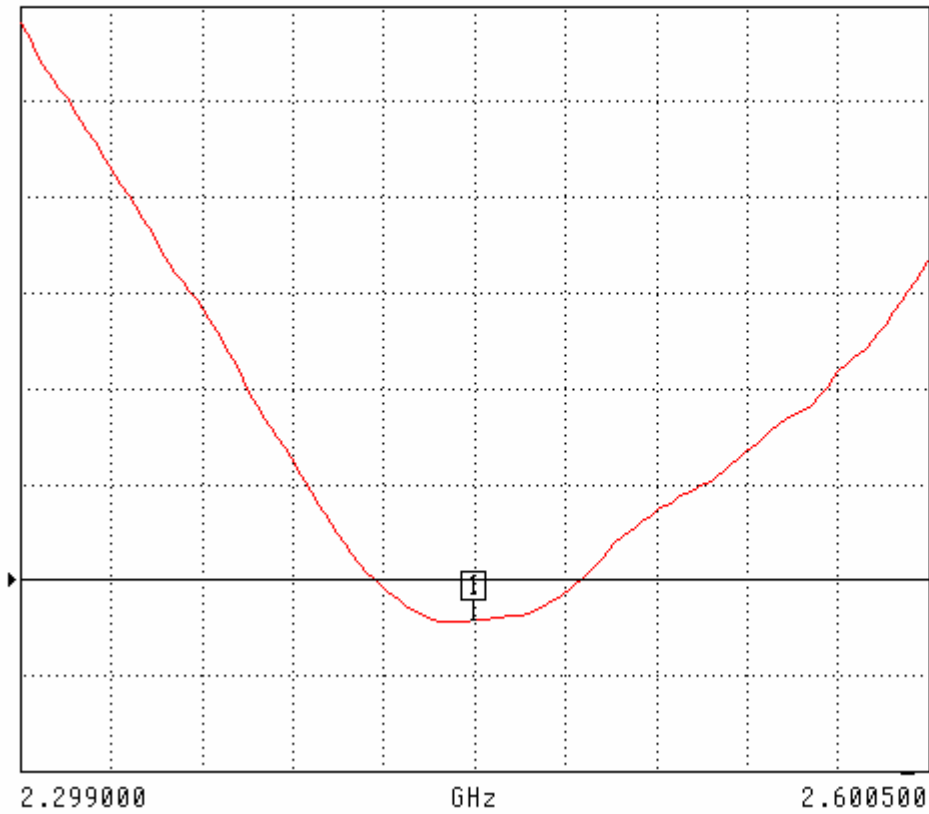
S11 Parameter Return Loss



SWR

S22 REVERSE REFLECTION

SWR REF=1.200 U 100.000 mU/DIV



CH 4 - S22
REFERENCE PLANE
0.0000 mm

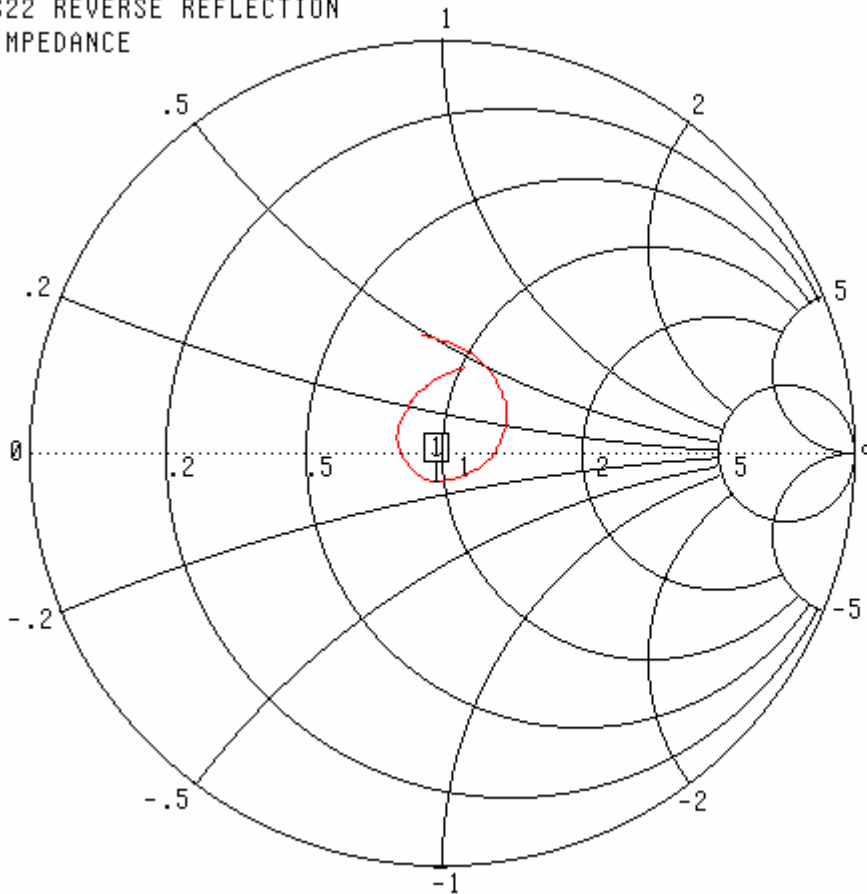
MARKER 1
2.449750 GHz
1.157 U

MARKER TO MAX
▶ MARKER TO MIN

MARKER READOUT
FUNCTIONS

Smith Chart Dipole Impedance

S22 REVERSE REFLECTION
IMPEDANCE



CH 4 - S22
REFERENCE PLANE
0.0000 mm

MARKER 1
2.449750 GHz
48.684 Ω
-7.175 $j\Omega$

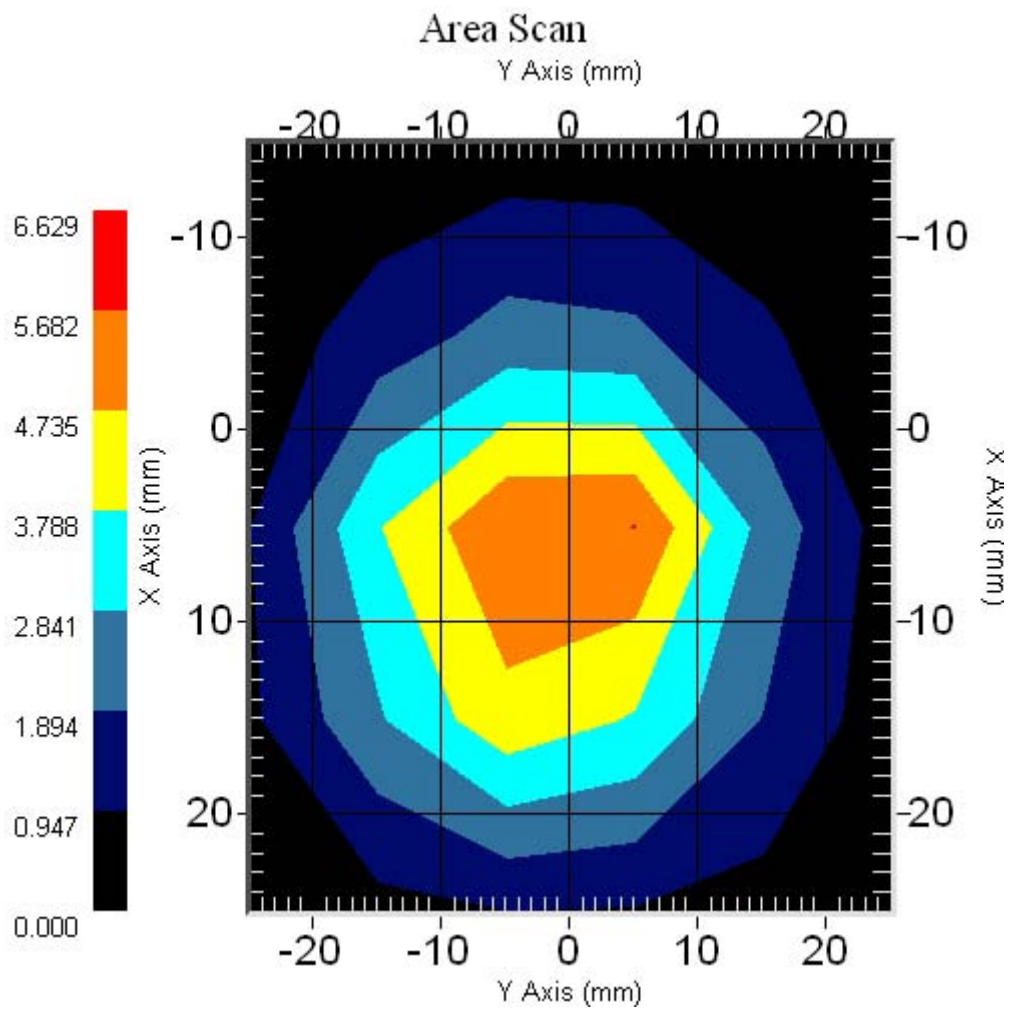
MARKER TO MAX
▶ MARKER TO MIN

MARKER READOUT
FUNCTIONS

2.299000 - 2.600500 GHz

System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
2450 MHz	53.1	24.4	105.8



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 2006.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-598
Project Number: APREL-ALSAS10U

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.

APREL Validation Dipole

Manufacturer: APREL Laboratories

Part number: ALS-D-5800-S-2

Frequency: 5800 MHz

Serial No: 5800-240-00853

Customer: APREL

Calibrated: 4th March 2006
Released on: 4th March 2006

Released By: _____

NCL CALIBRATION LABORATORIES

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4162

NCL Calibration Laboratories

Division of APREL Laboratories.

Conditions

Dipole 5800-240-00853 was new and 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 device has been accurately conducted and that all information contained within this report has been reviewed for accuracy.

Stuart Nicol
Director Product Development

D. Brooks
Member of Engineering Staff
(Calibration Engineer)

Calibration Results Summary

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

Mechanical Dimensions

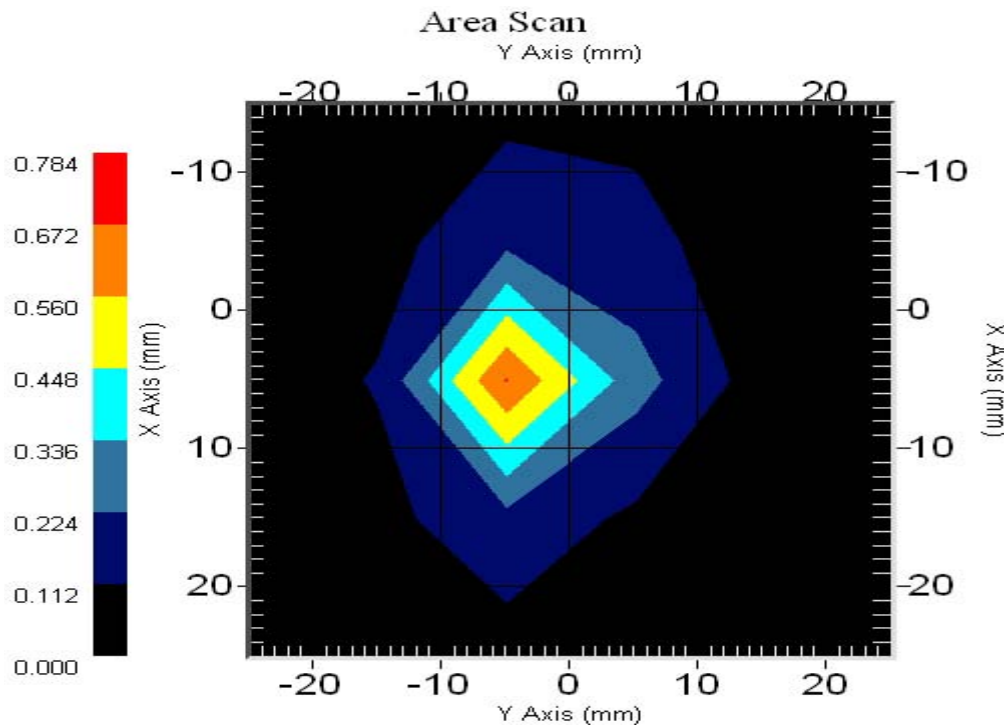
Length: 21.6 mm
Height: 12.6 mm

Electrical Specification

SWR: 1.37 U
Return Loss: -16.2 dB
Impedance: 62.5 Ω

System Validation Results

Frequency	1 Gram	10 Gram	Peak
5800 MHz	58.3	18	207.1



Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 5800-240-00853. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure

SSI-TP-016 Tissue 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"

Conditions

Dipole 5800-240-00853 was new taken from stock.

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

Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
21.6 mm	12.6 mm	21.6 mm	16.0 mm

Tissue Validation

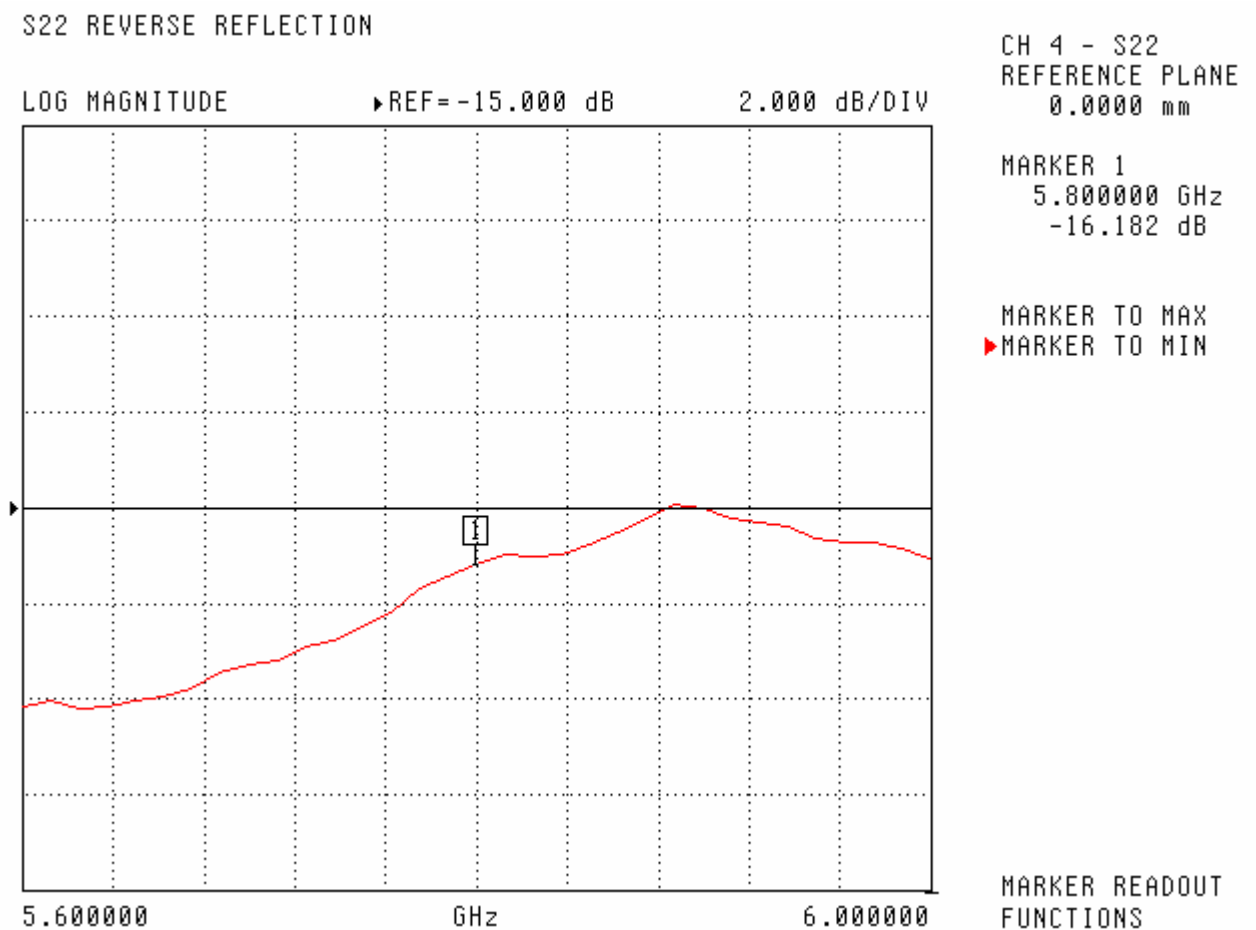
Head Tissue 5800 MHz	Measured
Dielectric constant, ϵ_r	35.3
Conductivity, σ [S/m]	5.3

Electrical Calibration

Test	Result
S11 R/L	-16.2 dB
SWR	1.37 U
Impedance	62.5 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss



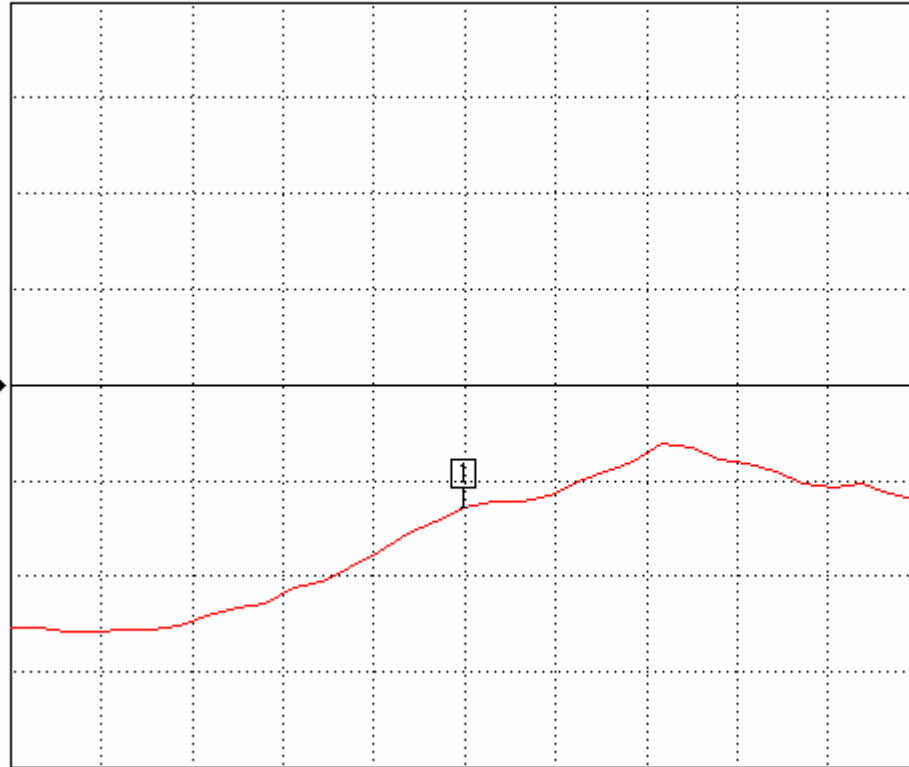
SWR

S22 REVERSE REFLECTION

SWR

REF= 1.500 U

100.000 mU/DIV



CH 4 - S22
REFERENCE PLANE
0.0000 mm

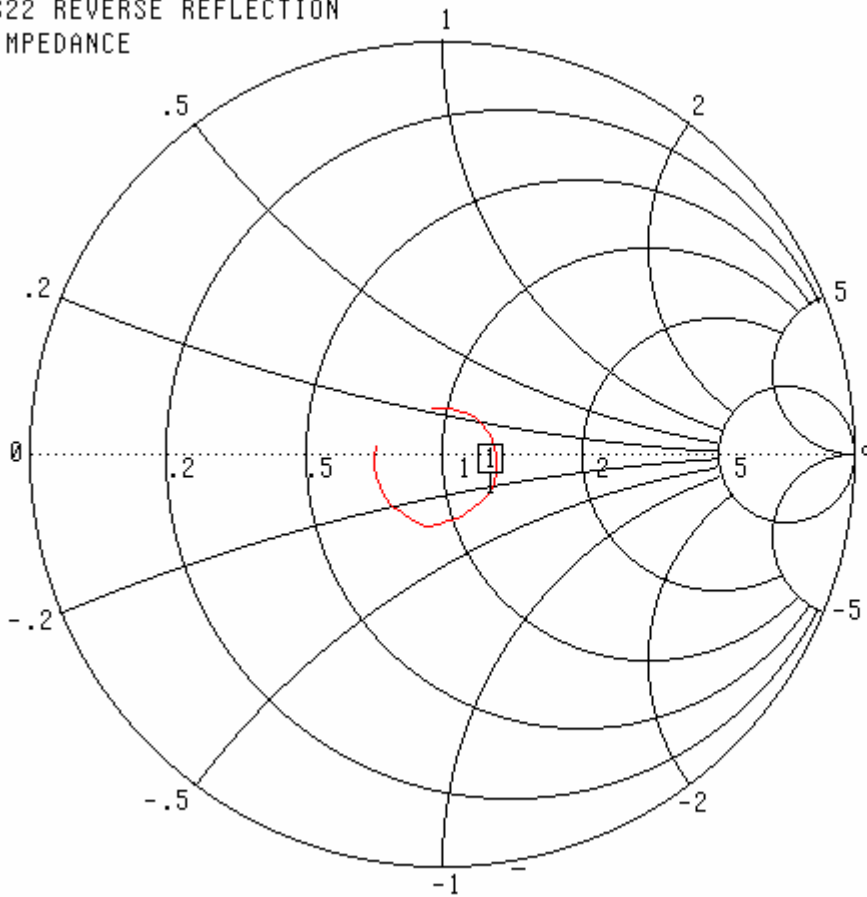
MARKER 1
5.800000 GHz
1.370 U

MARKER TO MAX
▶ MARKER TO MIN

MARKER READOUT
FUNCTIONS

Smith Chart Dipole Impedance

S22 REVERSE REFLECTION
IMPEDANCE



CH 4 - S22
REFERENCE PLANE
0.0000 mm

MARKER 1
5.800000 GHz
62.491 Ω
-12.202 $j\Omega$

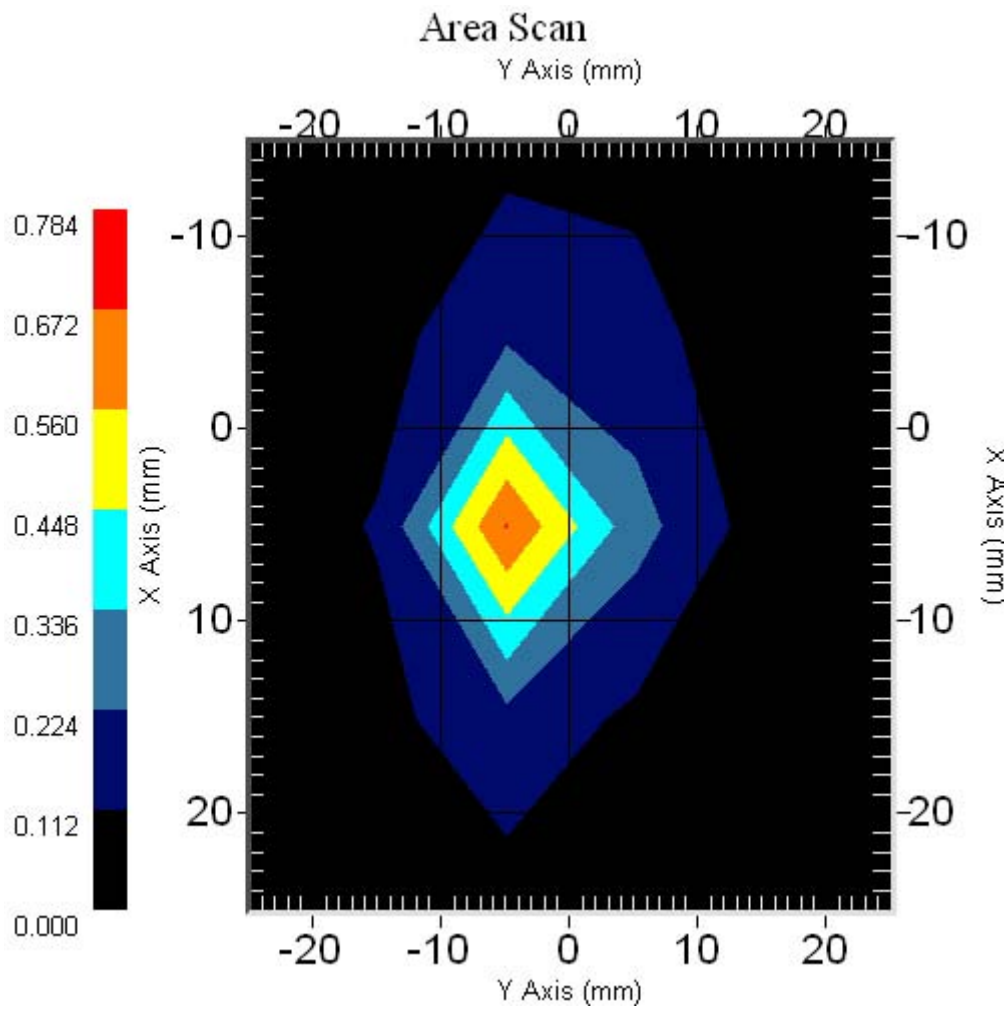
MARKER TO MAX
▶ MARKER TO MIN

5.600000 - 6.000000 GHz

MARKER READOUT
FUNCTIONS

System Validation Results Using the Electrically Calibrated Dipole

Head Tissue Frequency	1 Gram	10 Gram	Peak Above Feed Point
5800 MHz	58.3	18	207.1



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 2006.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-716

Client.: APREL

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 NRC/NIST.

Equipment: Miniature Isotropic RF Probe 2450 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 225

Calibration in Body Tissue

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: APLB-2450-PC-5263

Calibrated: 19th December 2006
Released on: 19th December 2006

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

Released By: _____

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.: CP-717

Client.: APREL

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 NRC/NIST.

Equipment: Miniature Isotropic RF Probe 5200 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 225

Calibration in IEC Tissue

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: APLB-5200-PC-5264

Calibrated: 19th December 2006
Released on: 19th December 2006

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

Released By: _____

NCL CALIBRATION LABORATORIES

17 Bentley Avenue
NEPEAN, ONTARIO
CANADA K2E 6T7

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-020 225.

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 225 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

J. Hones

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	225
Frequency:	5200 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:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

Sensitivity in IEC Tissue

Frequency: 5200 MHz

Epsilon: 36.0 (+/-10%) **Sigma:** 4.65 S/m (+/-10%)

ConvF

Channel X: 6.24

Channel Y: 6.24

Channel Z: 6.24

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

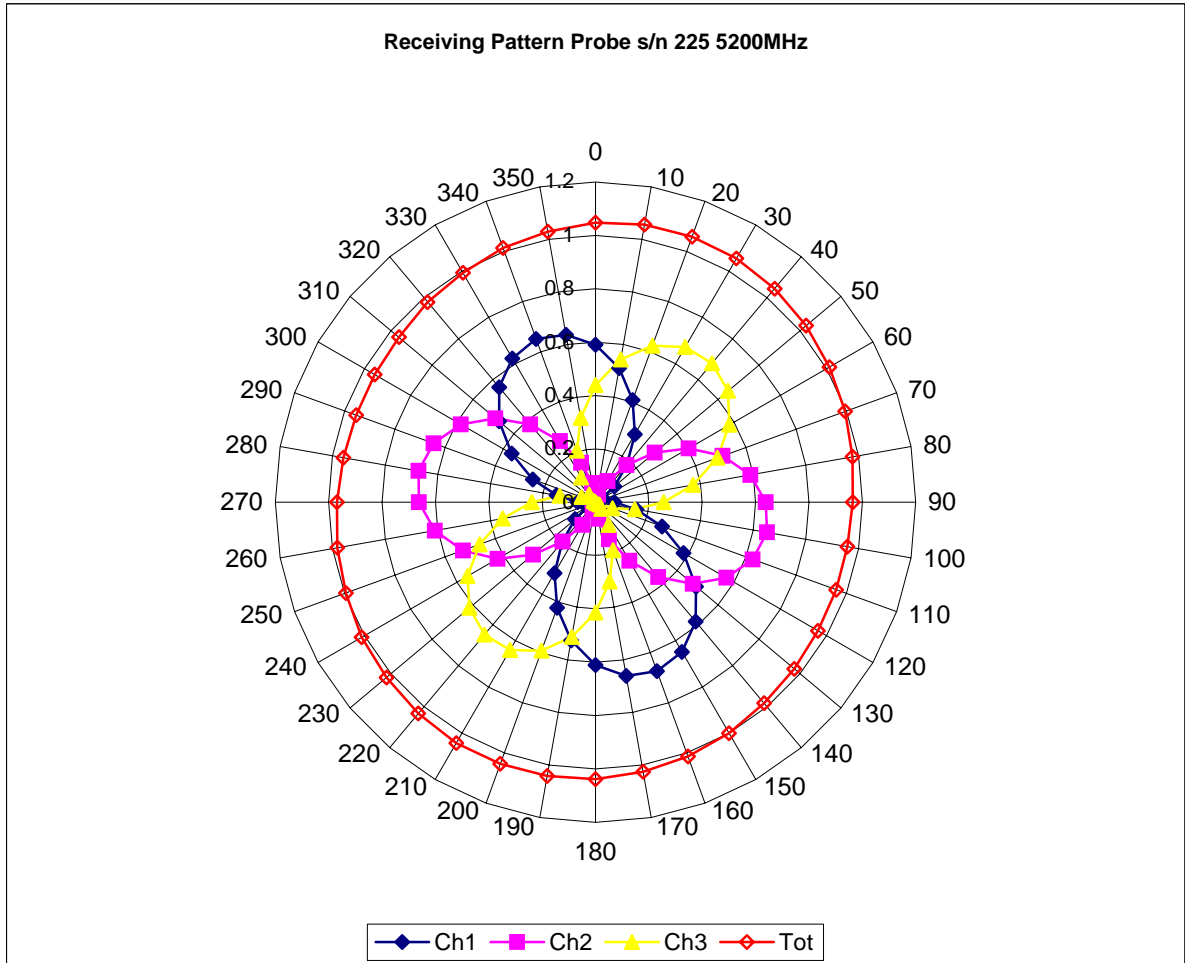
Boundary Effect:

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.

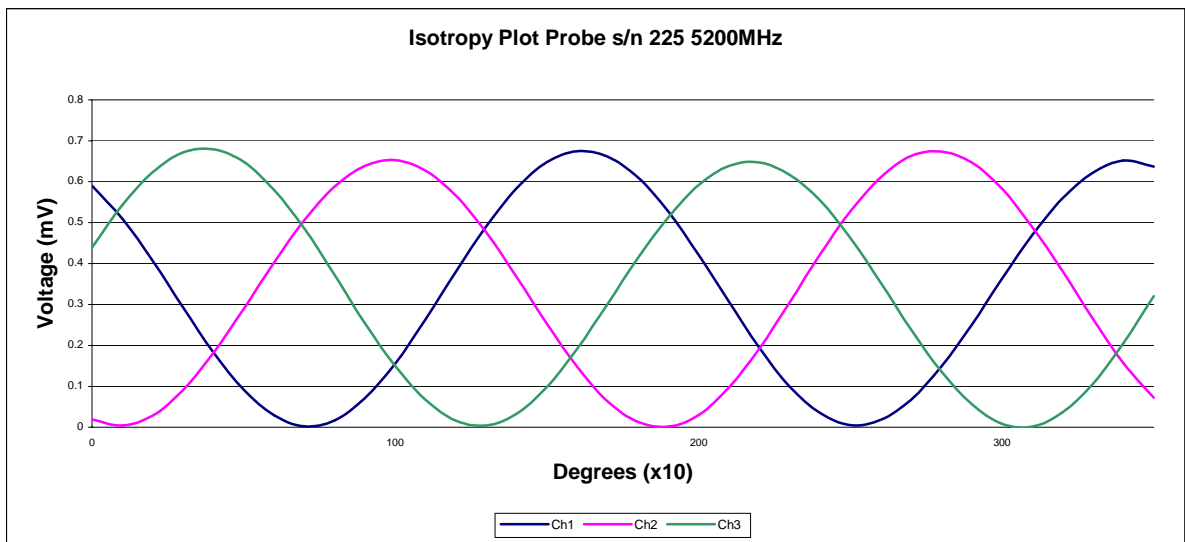
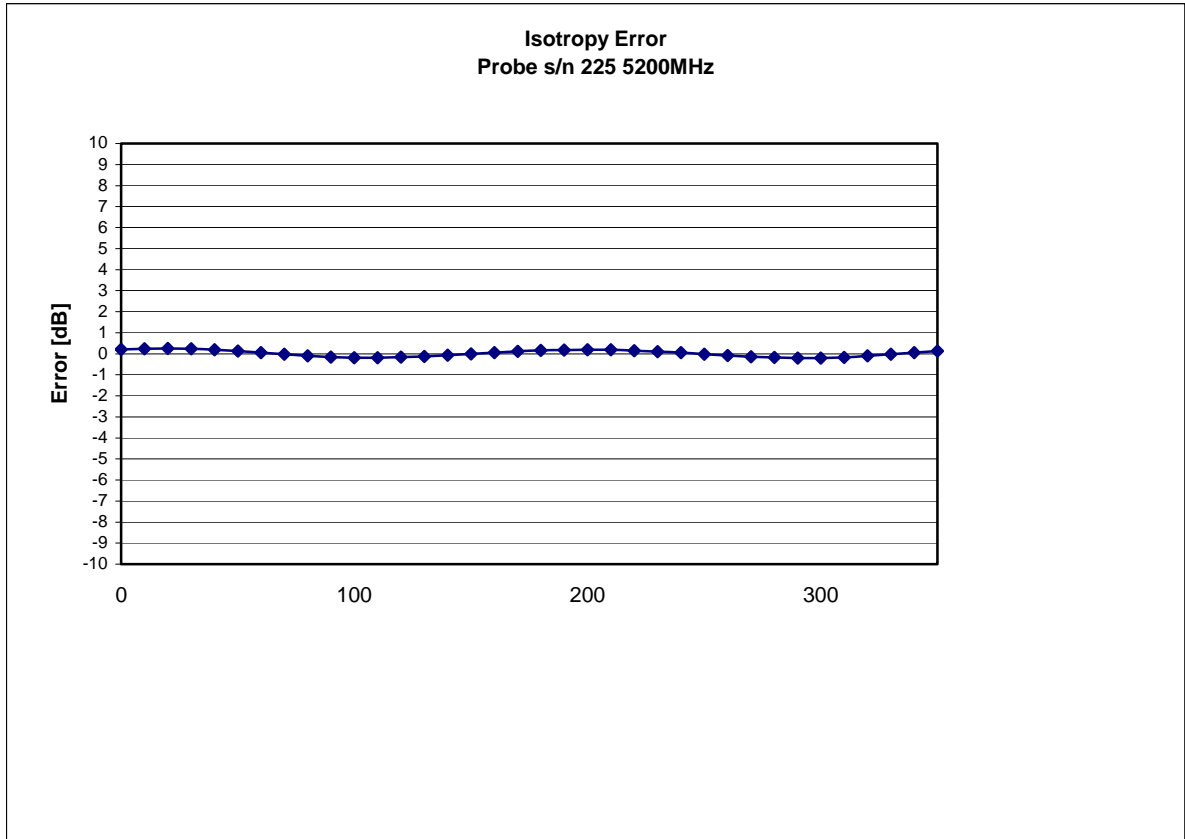
Spatial Resolution:

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 5200 MHz (Air)



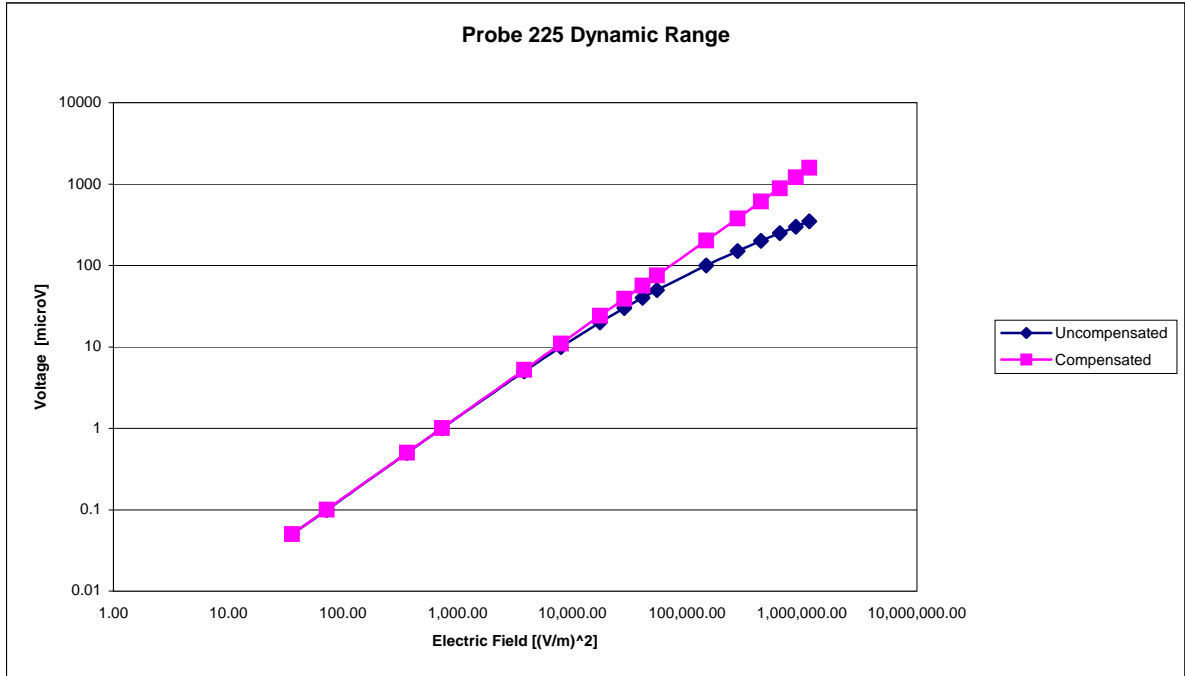
Isotropy Error 5200 MHz (Air)



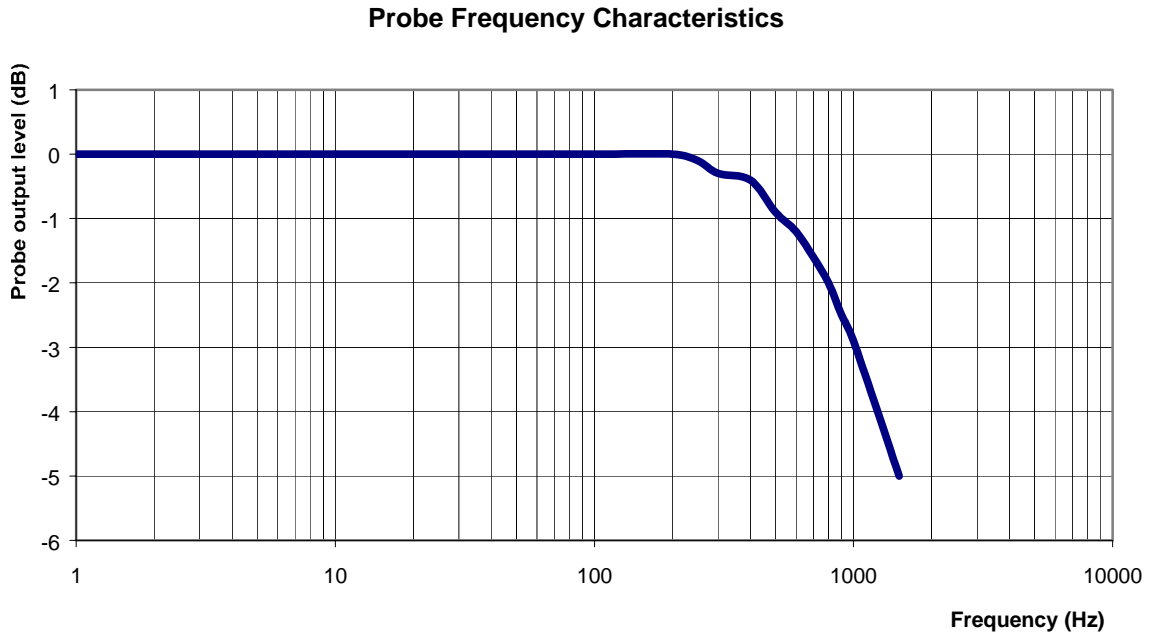
Isotropicity in Tissue:

0.15 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: 5200 MHz
Epsilon: 36.0 (+/-10%) **Sigma:** 4.65 S/m (+/-10%)

ConvF

Channel X: 6.24 7%(K=2)
Channel Y: 6.24 7%(K=2)
Channel Z: 6.24 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 2006.

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-020 225.

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 225 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

J. Hones

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	225
Frequency:	2450 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:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

Sensitivity in Body Tissue

Frequency: 2450 MHz

Epsilon: 52.7 (+/-5%) **Sigma:** 1.95 S/m (+/-5%)

ConvF

Channel X: 4.4

Channel Y: 4.4

Channel Z: 4.4

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

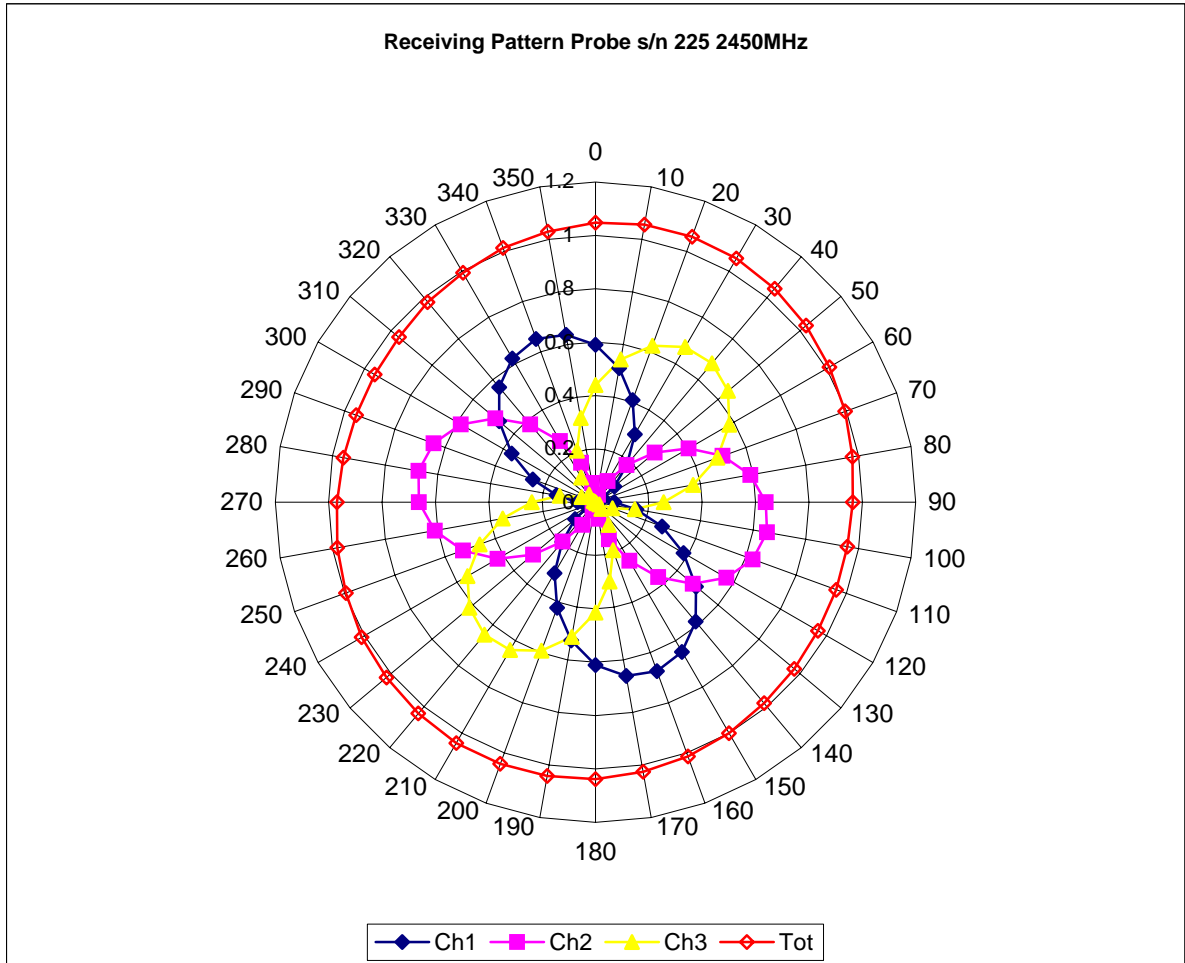
Boundary Effect:

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.

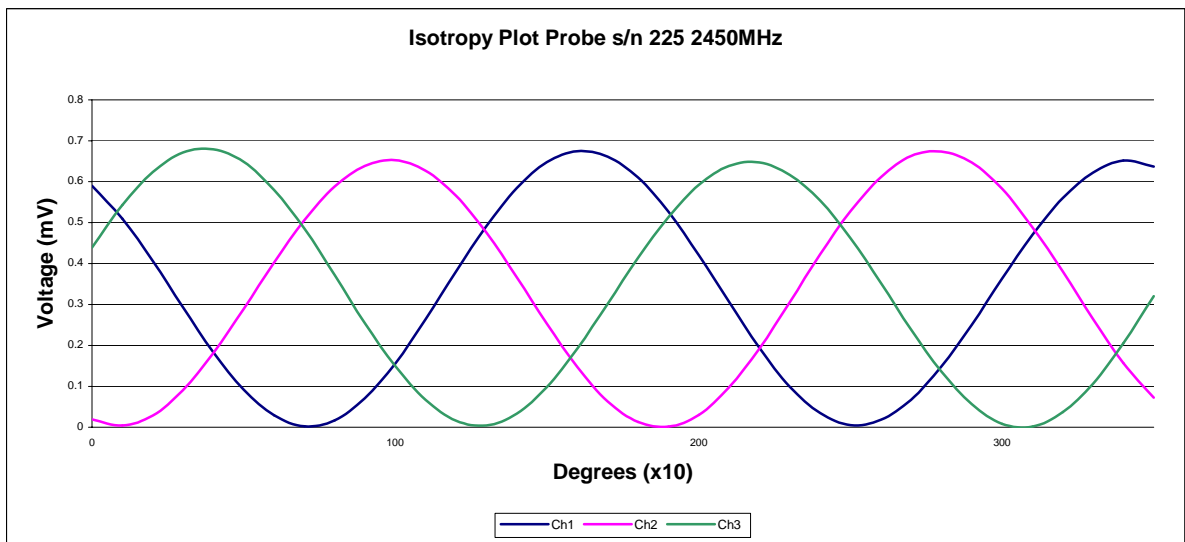
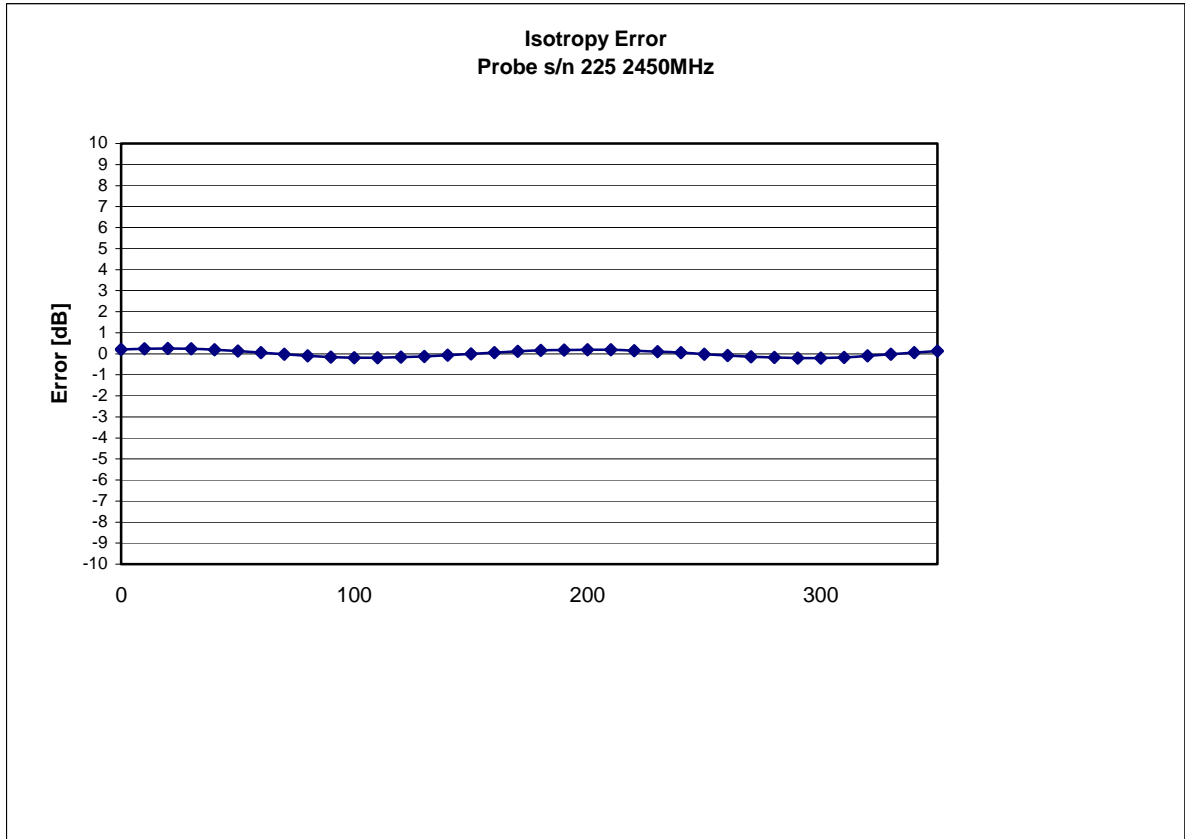
Spatial Resolution:

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 2450 MHz (Air)



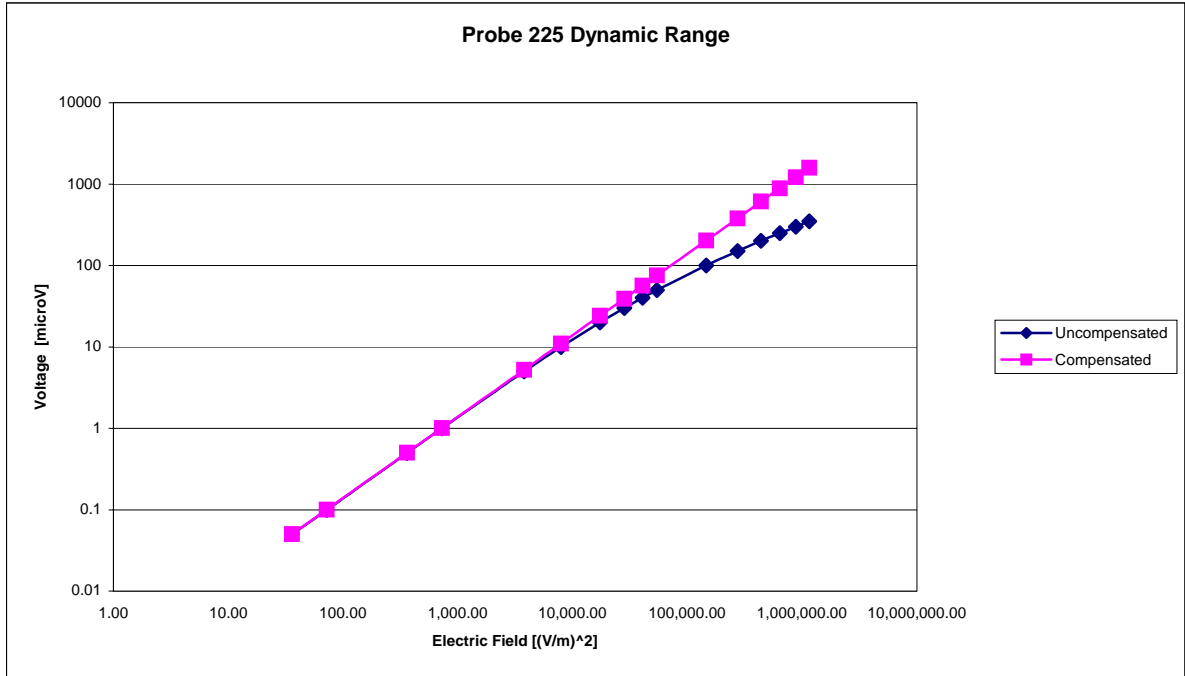
Isotropy Error 2450 MHz (Air)



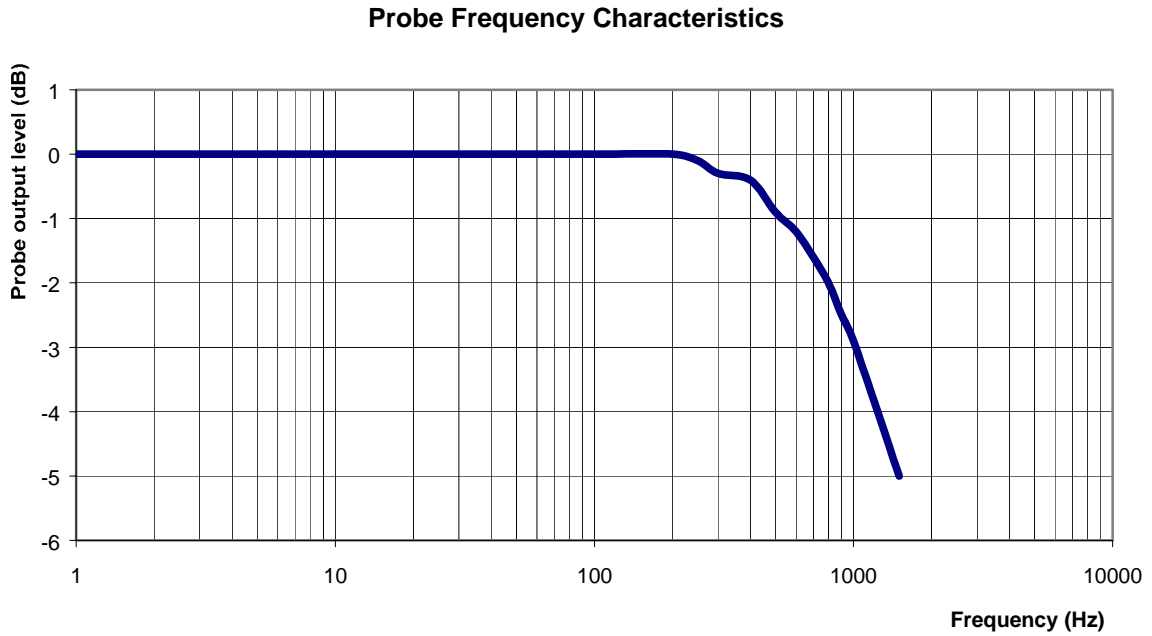
Isotropicity in Tissue:

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: 2450MHz
Epsilon: 52.7 (+/-5%) **Sigma:** 1.95 S/m (+/-5%)

ConvF

Channel X: 4.4 7%(K=2)

Channel Y: 4.4 7%(K=2)

Channel Z: 4.4 7%(K=2)

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

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 2006.

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-718

Client.: APREL

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 NRC/NIST.

Equipment: Miniature Isotropic RF Probe 5800 MHz

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 225

Calibration in IEC Tissue

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2

Project No: APLB-5800-PC-5265

Calibrated: 20th December 2006
Released on: 20th December 2006

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

Released By: _____

NCL CALIBRATION LABORATORIES

17 Bentley Avenue
NEPEAN, ONTARIO
CANADA K2E 6T7

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-020 225.

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 225 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

J. Hones

Calibration Results Summary

Probe Type:	E-Field Probe E-020
Serial Number:	225
Frequency:	5800 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:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

Sensitivity in IEC Tissue

Frequency: 5800 MHz

Epsilon: 35.4 (+/-10%) **Sigma:** 5.27 S/m (+/-10%)

ConvF

Channel X: 6.3

Channel Y: 6.3

Channel Z: 6.3

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

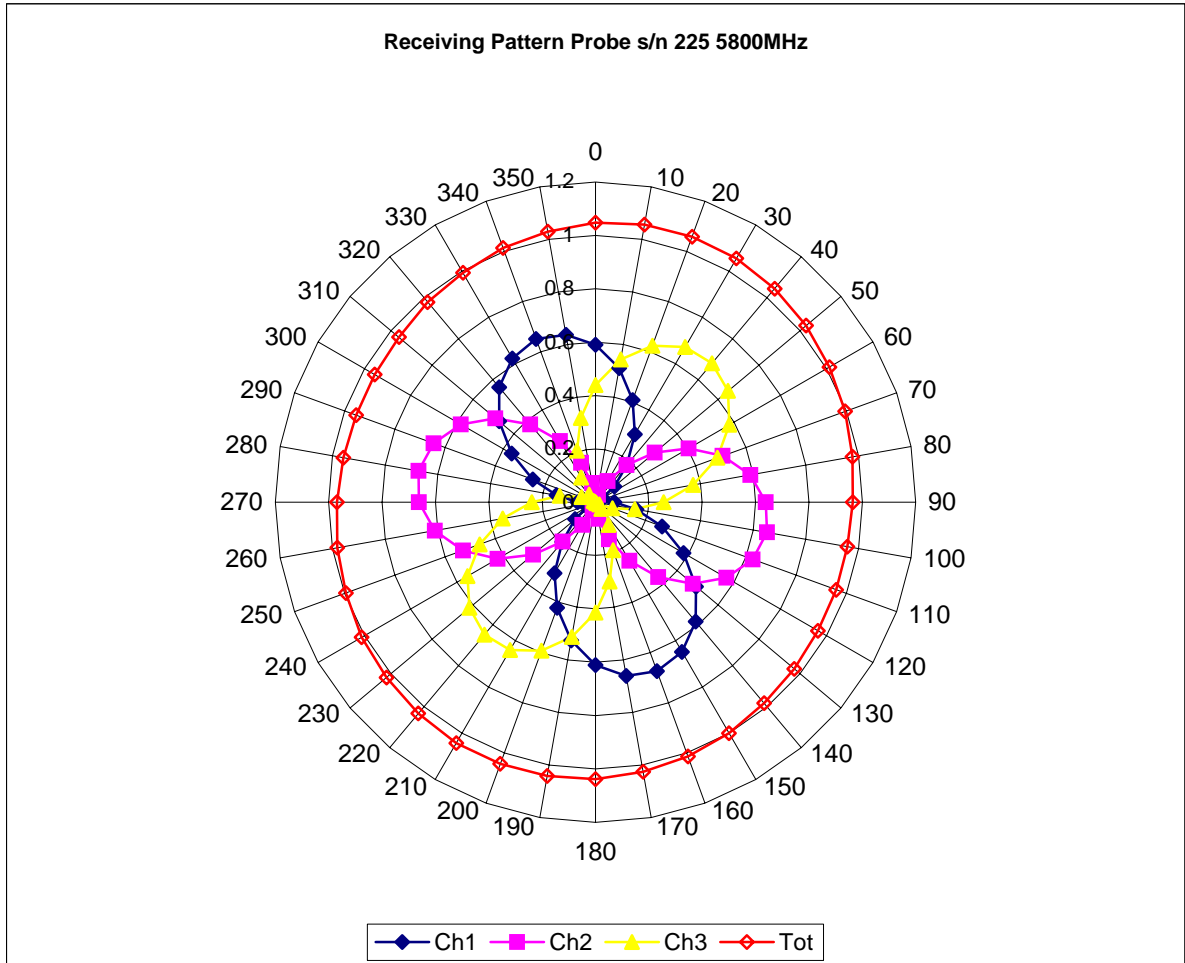
Boundary Effect:

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.

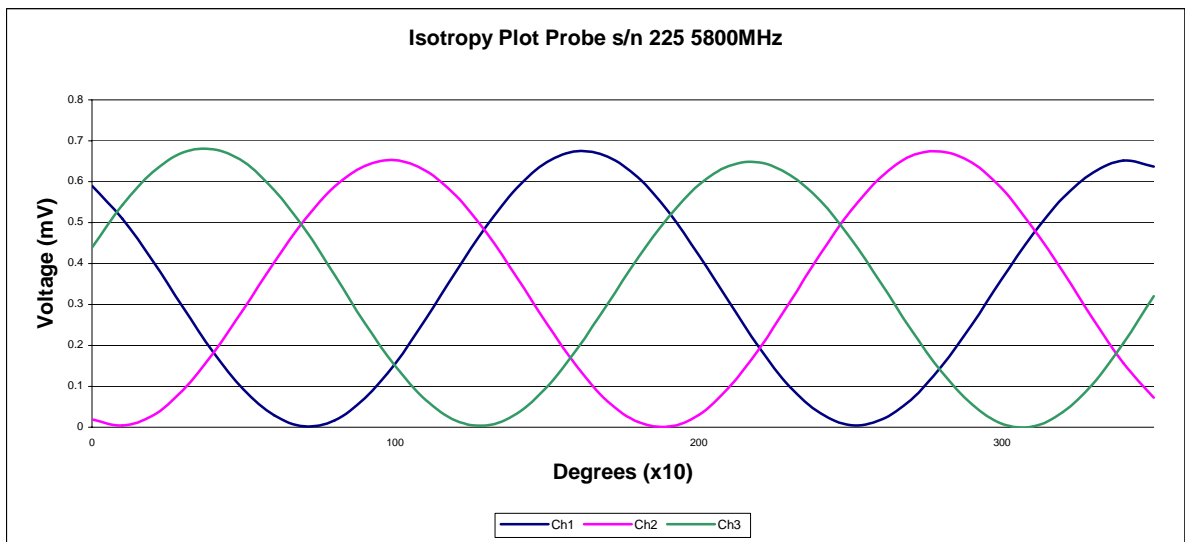
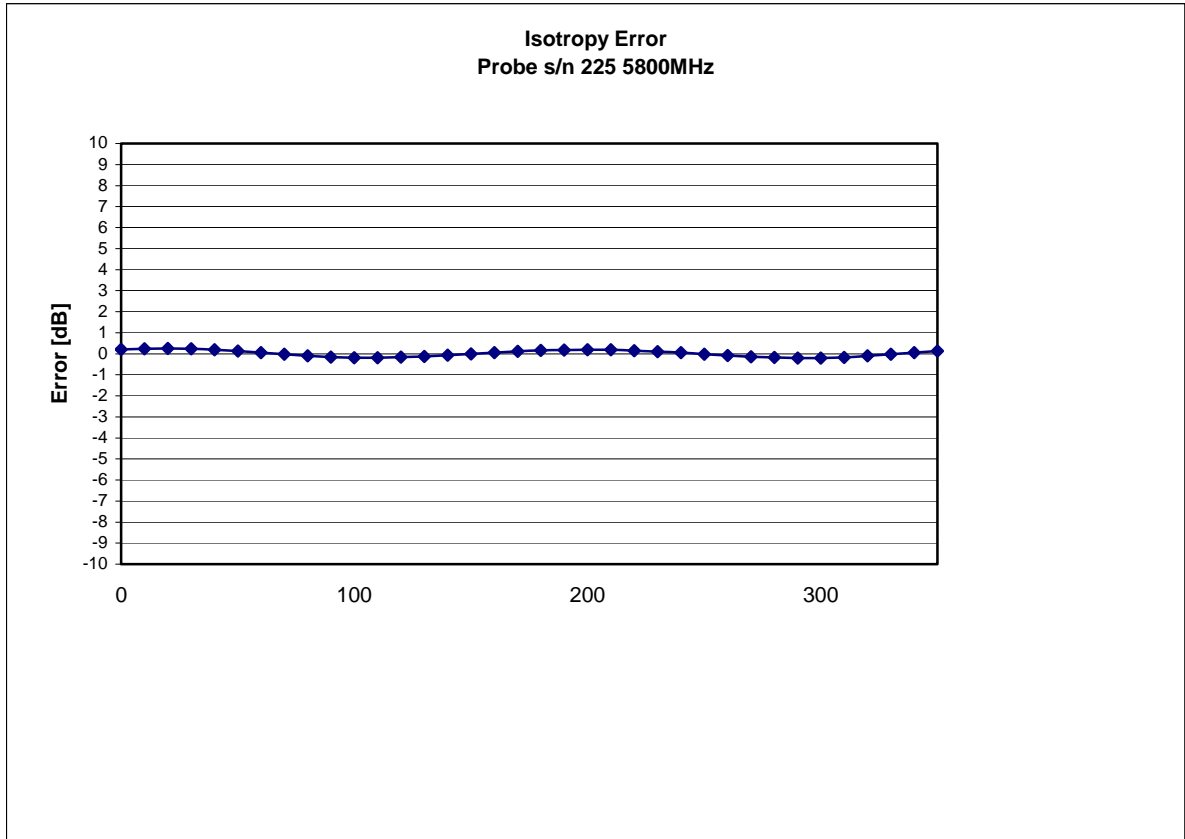
Spatial Resolution:

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 5800 MHz (Air)



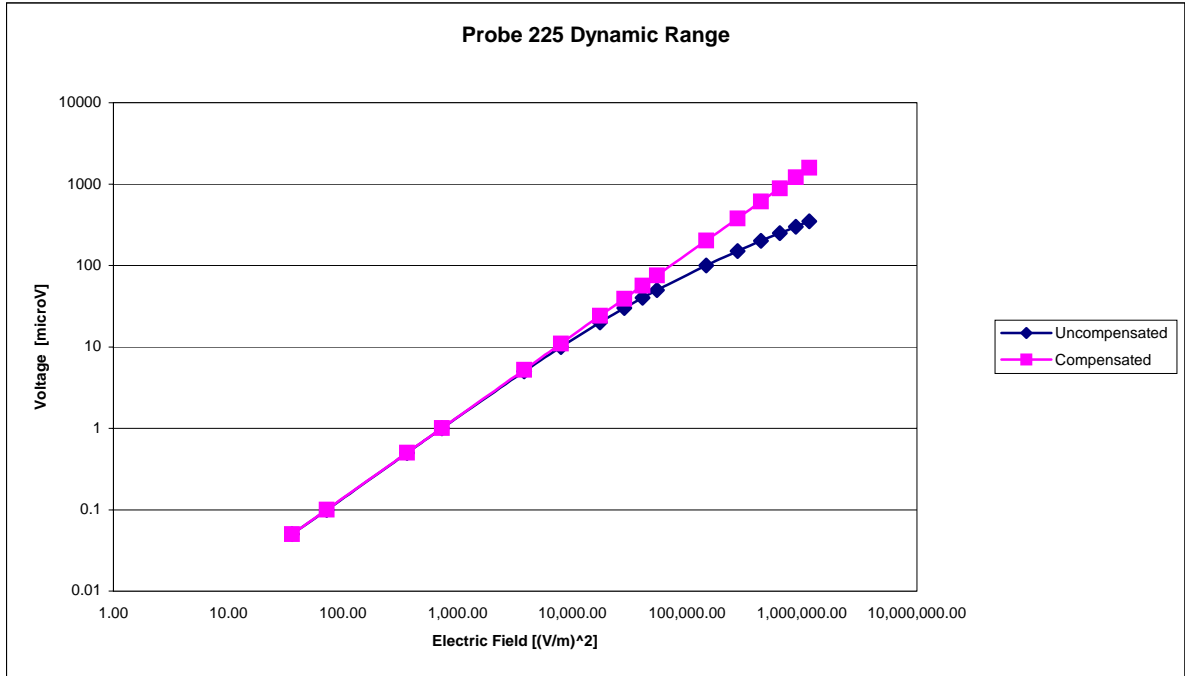
Isotropy Error 5800 MHz (Air)



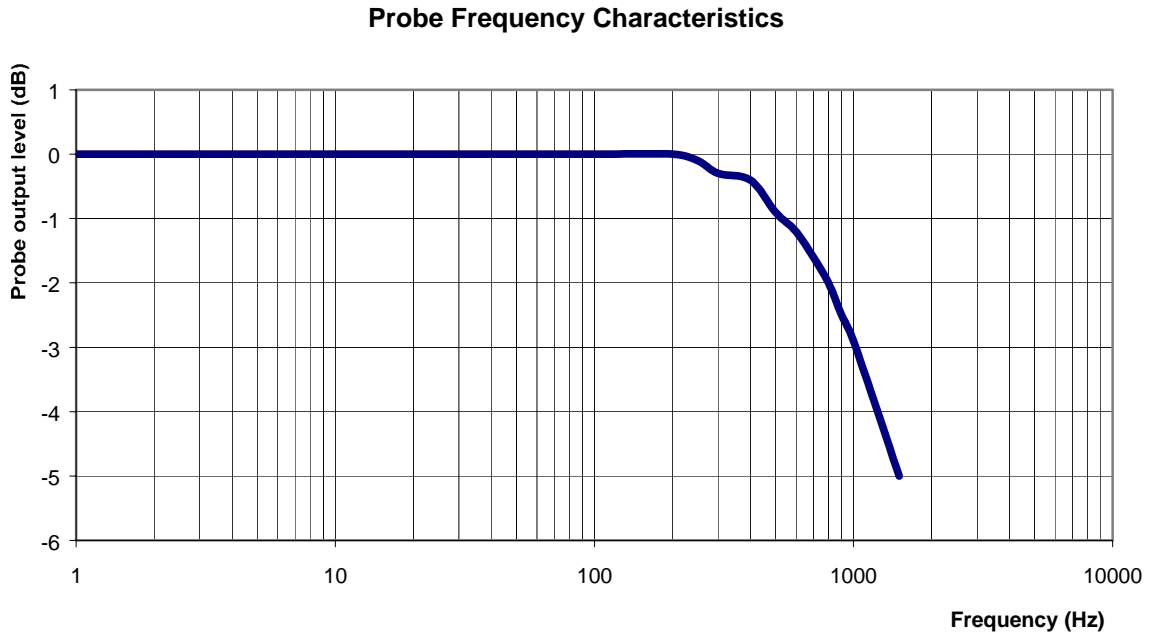
Isotropicity in Tissue:

0.18 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: 5800 MHz
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