NCL CALIBRATION LABORATORIES

Calibration File No.: CP-310

C E R T I F I C A T E OF 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 2450 MHz

Manufacturer: APREL Laboratories
Model No.: E-010
Serial No.: 163

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

Calibrated: 28th March 2003
Released on: 28th March 2003

Released By: _____

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Introduction

This Calibration Report reproduces the results of the calibration performed in line with the SSI/DRB-TP-D01-032 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-010 163.

References

SSI/DRB-TP-D01-032 E-Field Probe Calibration Procedure
IEEE P-1528 *DRAFT* "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 163 was a new probe calibration at 2450MHz.

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

Calibration Results Summary

Probe Type:	E-Field Probe E-010
Serial Number:	163
Frequency:	2450 MHz
Sensor Offset:	2.38 mm
Sensor Length:	2.5 mm
Tip Enclosure:	Glass*
Tip Diameter:	7 mm
Tip Length:	40 mm
Total Length:	290 mm

*Resistive to recommended tissue recipes per IEEE-P1528

Sensitivity in Air

Channel X:	0.58 $\mu V/(V/m)^2$
Channel Y:	0.58 $\mu V/(V/m)^2$
Channel Z:	0.58 $\mu V/(V/m)^2$
Diode Compression Point:	76 mV

Sensitivity in Body Tissue

Frequency: 2450 MHz

Epsilon: 52.7 (+/-5%) **Sigma:** 1.95 S/m (+/-10%)

ConvF

Channel X: 6.6

Channel Y: 6.6

Channel Z: 6.6

Tissue sensitivity values were calculated using a load impedance of 5 M? .

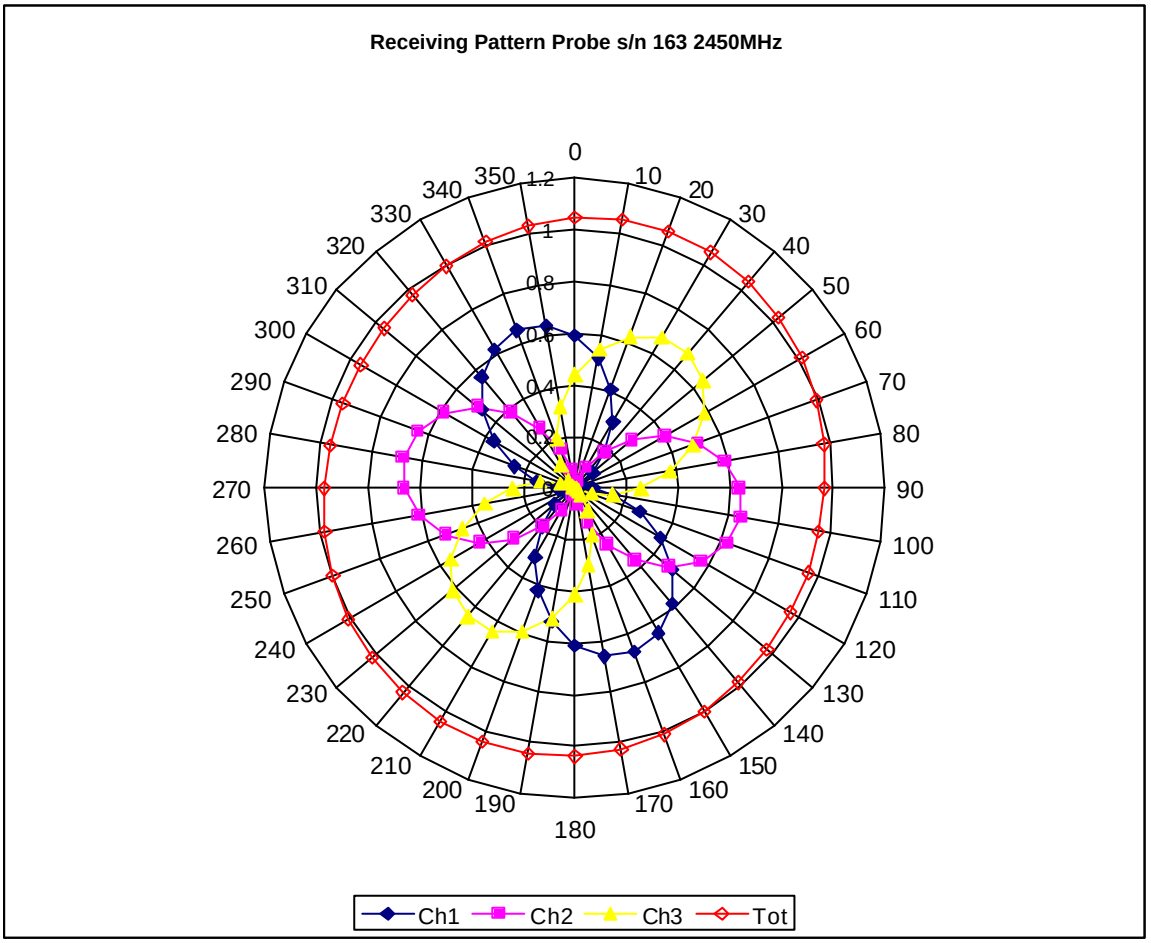
Boundary Effect:

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 2.6mm.

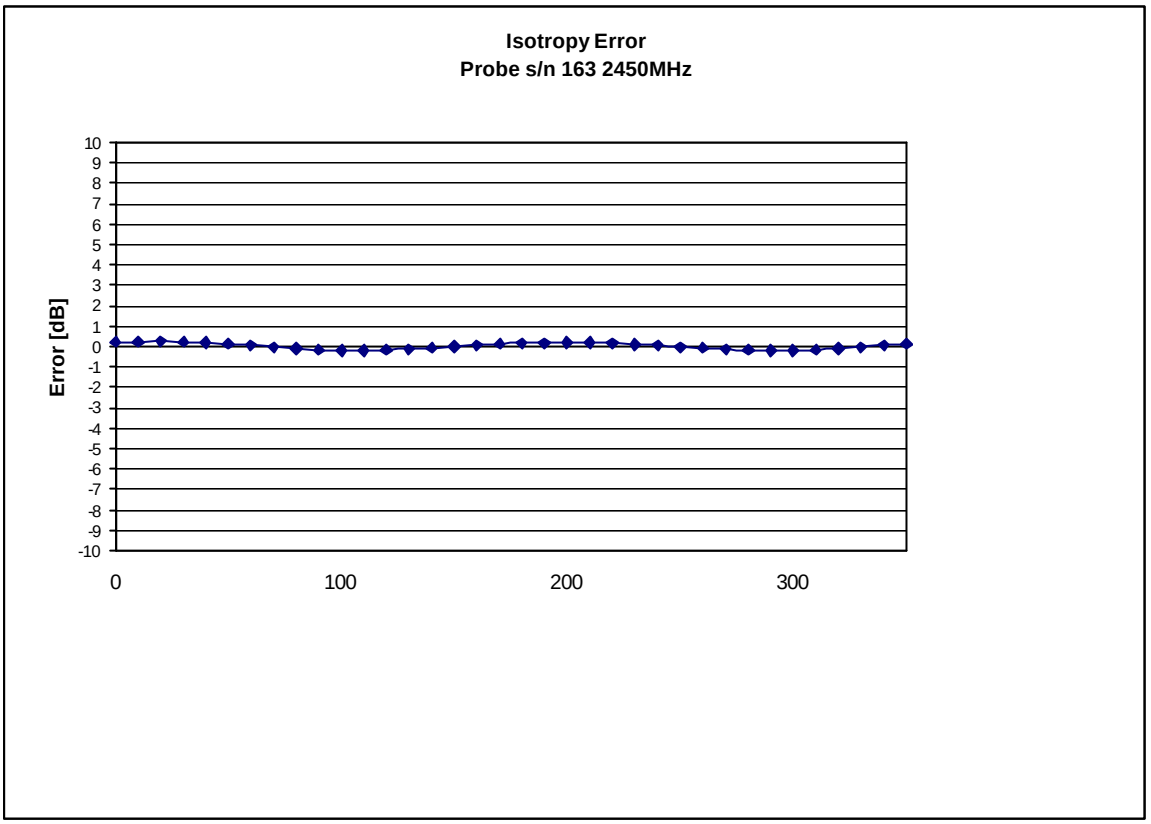
Spatial Resolution:

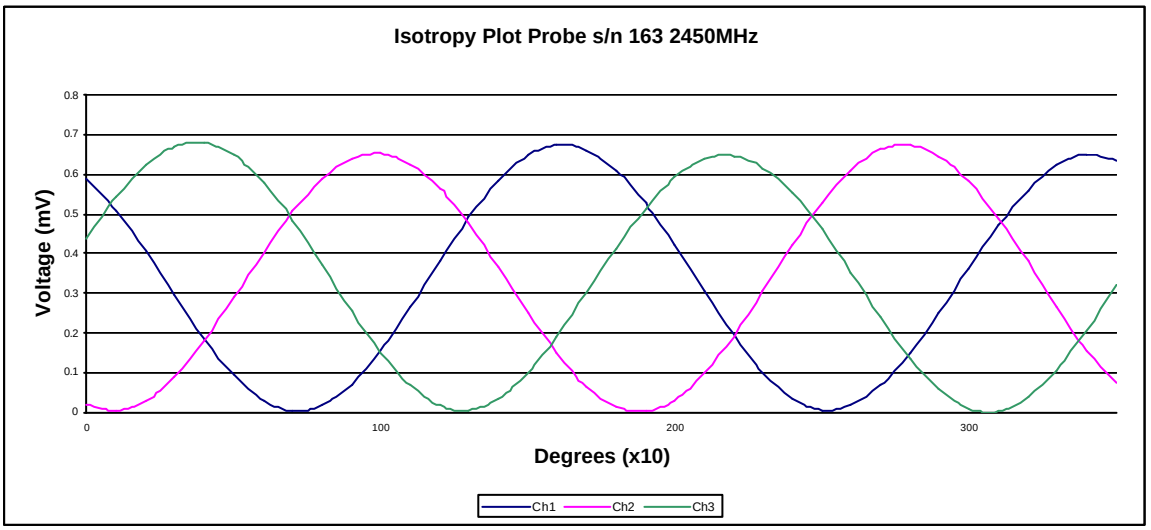
The measured probe tip diameter is 7 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 2450 MHz (Air)



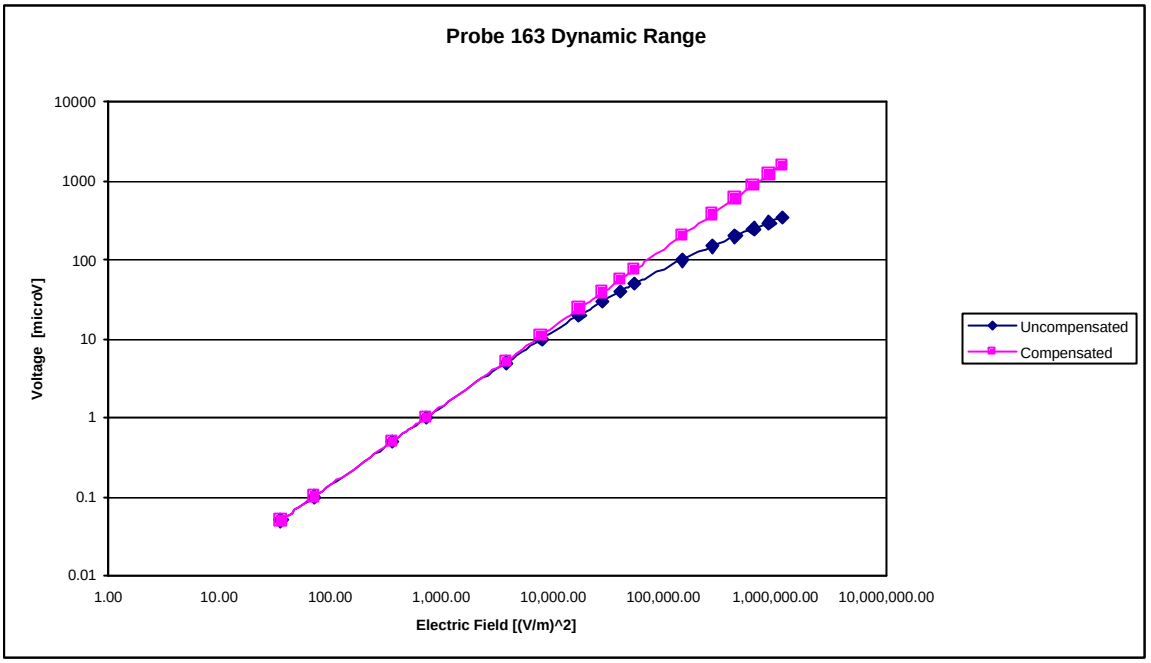
Isotropy Error 2450 MHz (Air)



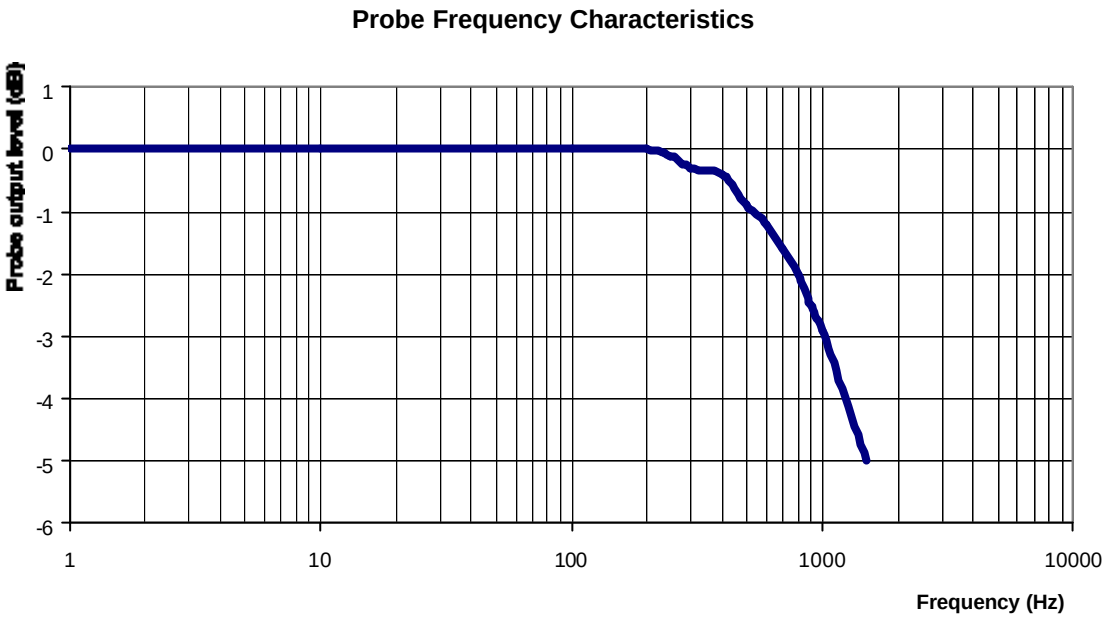


Isotropicity: 0.13 dB

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 (+/-10%)
ConvF			
Channel X:	6.6	7%(K=2)	
Channel Y:	6.6	7%(K=2)	
Channel Z:	6.6	7%(K=2)	

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

Boundary Effect:

For a distance of 2.6mm 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 2002