NCL CALIBRATION LABORATORIES

Calibration File No.: CP-1145

Client.: IAC

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 835 MHz

Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 273-B

Body calibration

Calibration Procedure: SSI/DRB-TP-D01-032-E020-V2
Project No: SGLB-IAC rep-E020-5538

Calibrated: 13 September 2010
Released on: 17 September 2010

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

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-E020-V2 E-Field Probe Calibration Procedure. The results contained within this report are for APREL E-Field Probe E-020 273-B.

References

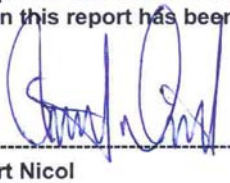
SSI/DRB-TP-D01-032-E020-V2 E-Field Probe Calibration Procedure
IEEE 1528 “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”
SSI-TP-011 Tissue Calibration Procedure
IEC 62209 “Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 1 & 2: Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)”
IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

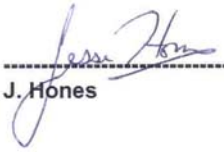
Probe 273-B was a new-calibration.

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:	273-B
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 Measured

Frequency: 835 MHz

Epsilon: 57.19 (+/-5%) **Sigma:** 0.94 S/m (+/-5%)

ConvF

Channel X: 6.

Channel Y: 6.

Channel Z: 6.

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

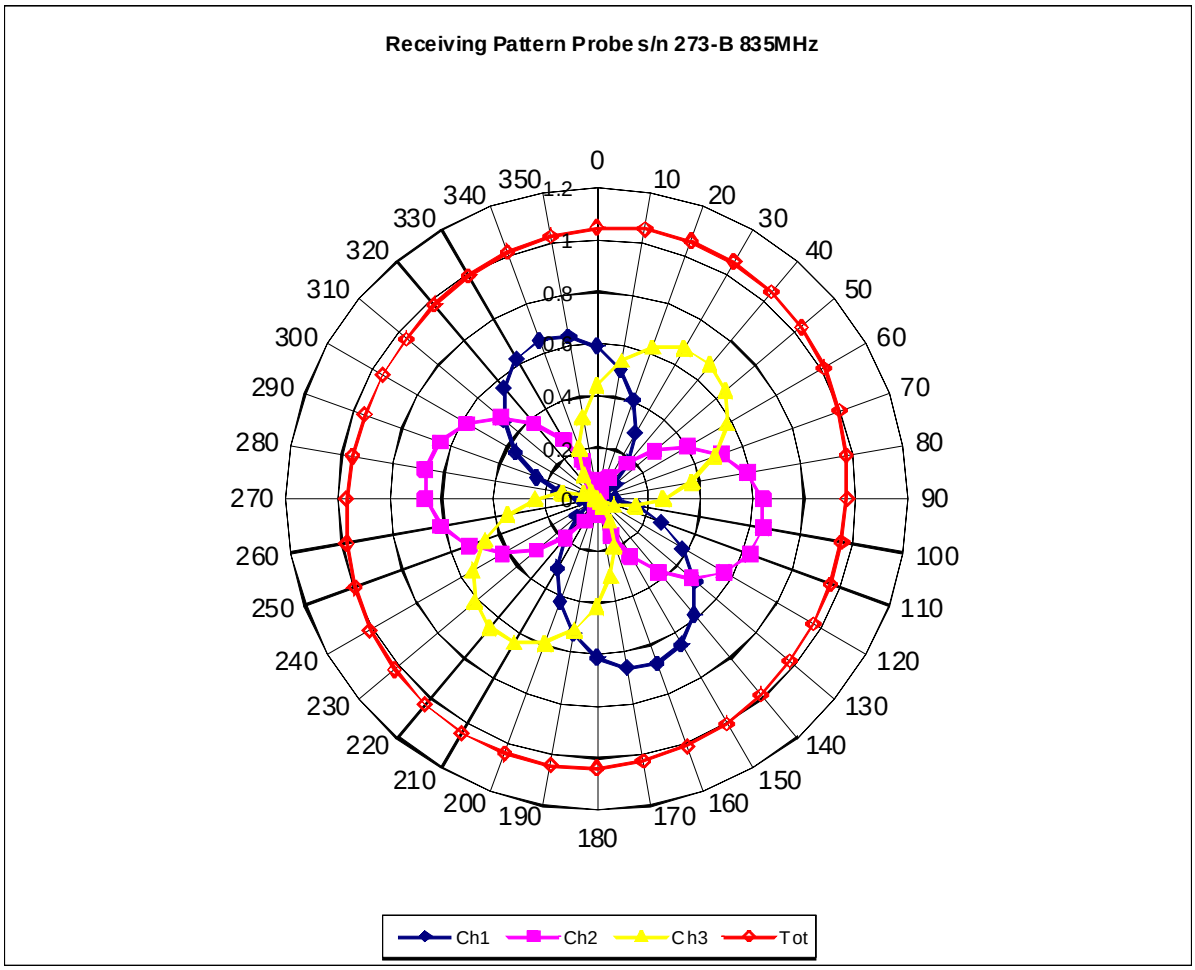
Boundary Effect:

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.

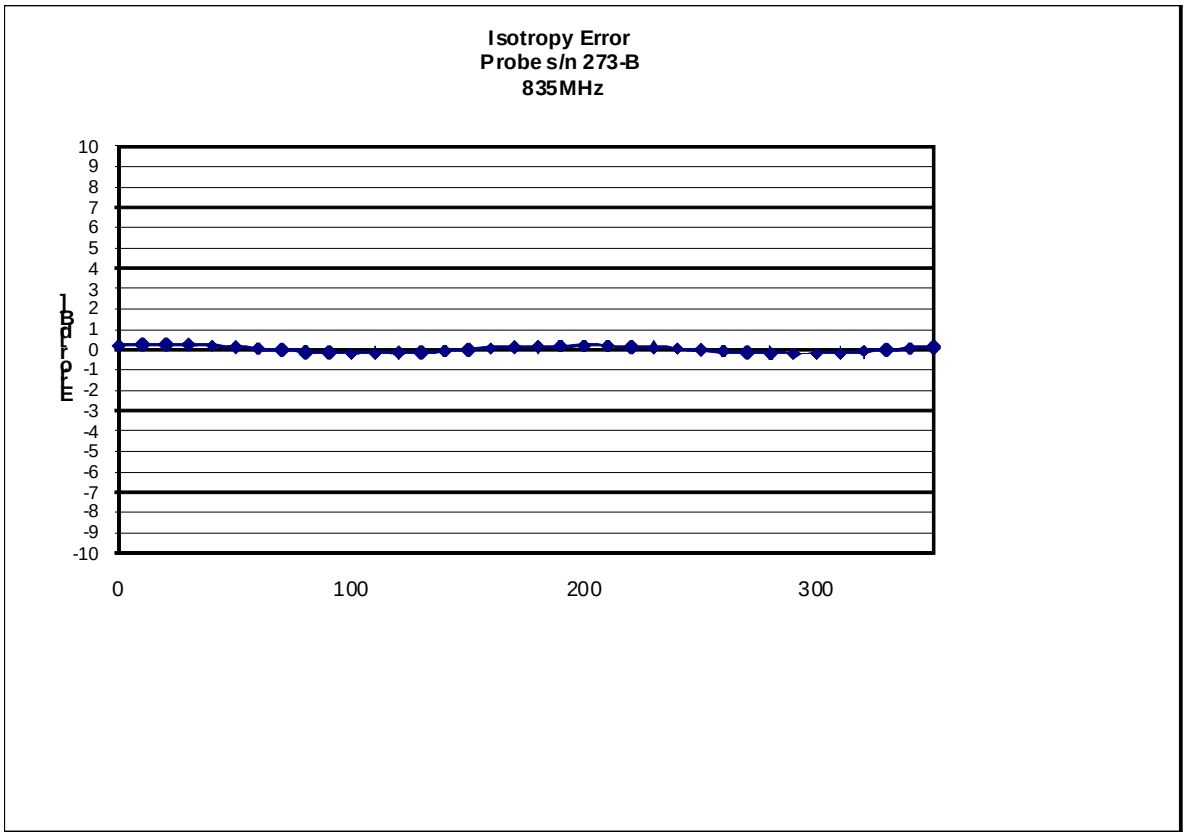
Spatial Resolution:

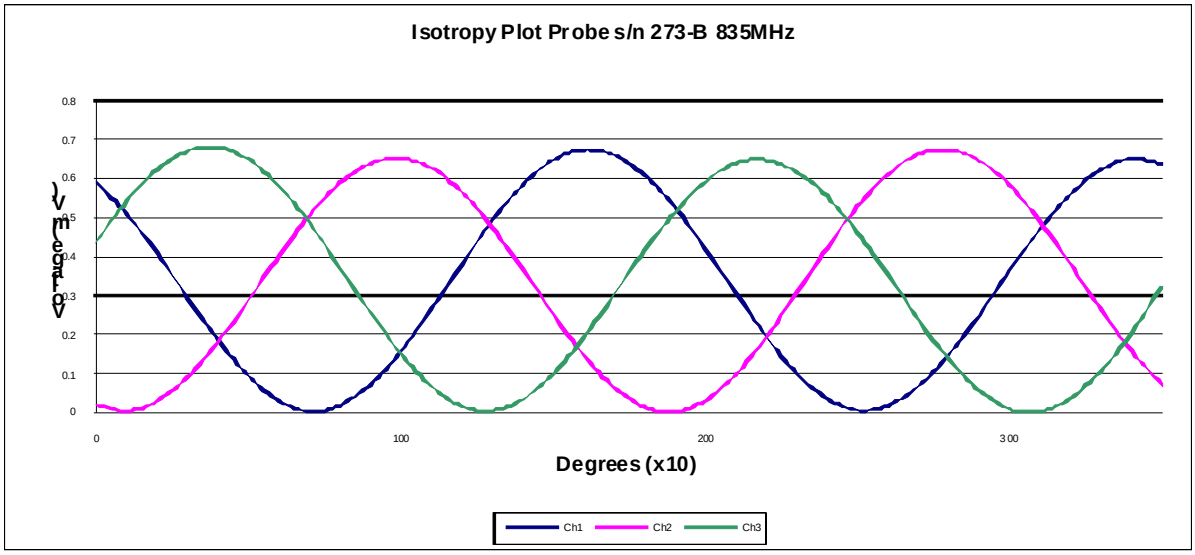
The measured probe tip diameter is 5 mm (+/- 0.01 mm) and therefore meets the requirements of SSI/DRB-TP-D01-032 for spatial resolution.

Receiving Pattern 835 MHz (Air)



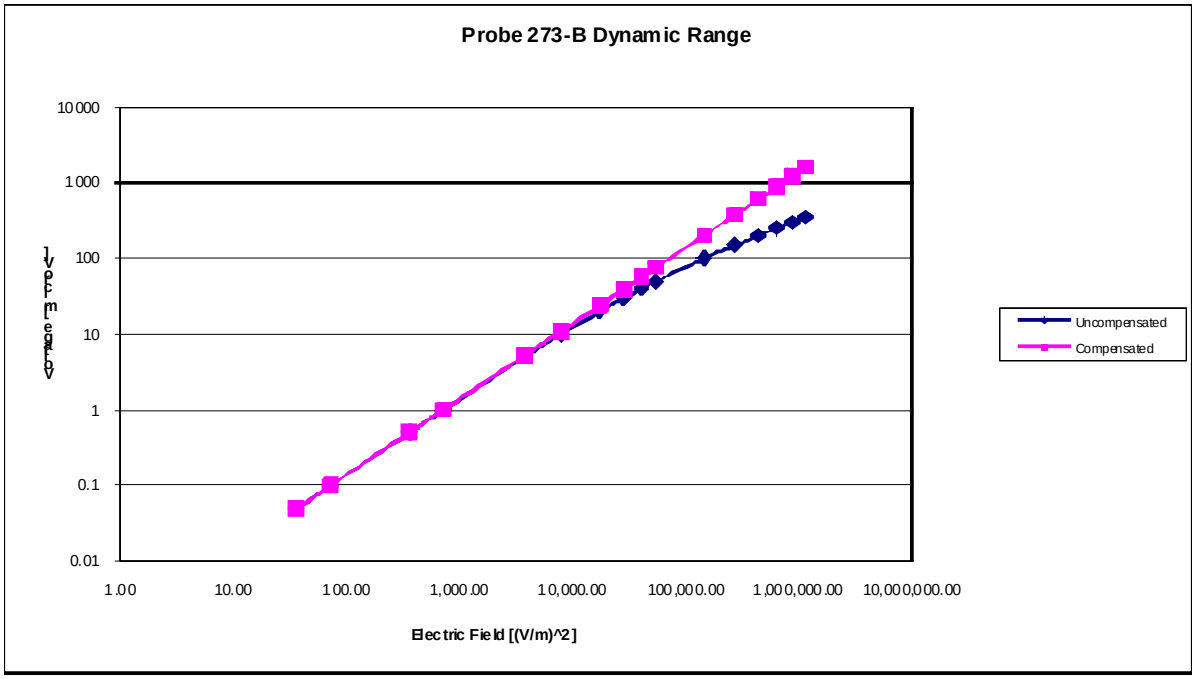
Isotropy Error 835 MHz (Air)



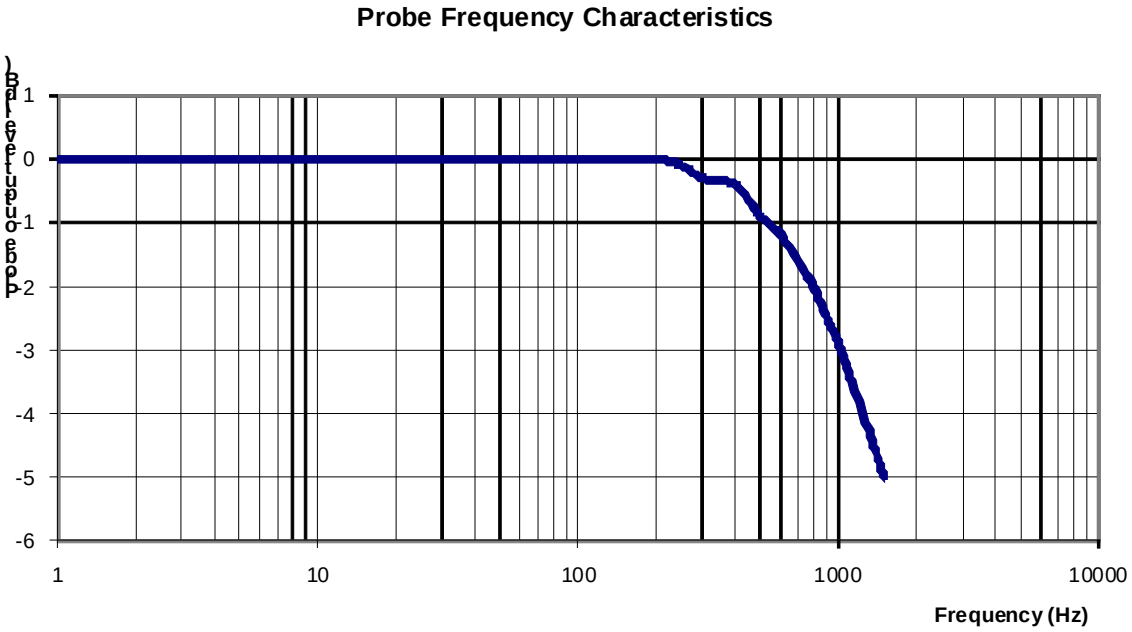


Isotropicity in Tissue: 0.10 dB

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:	57.19 (+/-5%)	**Sigma:**	0.94 S/m (+/-5%)
ConvF			
Channel X:	6.	7%(K=2)	
Channel Y:	6.	7%(K=2)	
Channel Z:	6.	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 2010
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