



Appendix D. Probe Calibration

Miniature Isotropic RF Probe

M/N: ALS-E-020

S/N: 265

2600MHz Body Calibration

NCL CALIBRATION LABORATORIES

Calibration File No.: CP-882

Client.: Quietek

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 2600 MHz

BODY Calibration

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 265

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

Project No: QTKB-ALS-E20-CAL-5335

Calibrated: 9th May 2008
Released on: 9th May 2008

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary
This calibration has been conducted in line with the SCC ISO-IEC 17025 Scope of Accreditation
Accredited Laboratory Number 48

Released By: _____

NCL CALIBRATION LABORATORIES

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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-020 265.

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

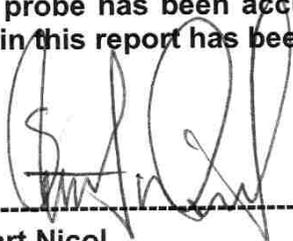
Conditions

Probe 265 was a re-calibration.

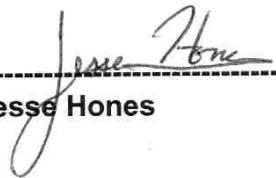
Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C

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



Jesse Hones

Calibration Results Summary

| | |
|-----------------------|---------------------|
| Probe Type: | E-Field Probe E-020 |
| Serial Number: | 265 |
| Frequency: | 2600 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 Measured

Frequency: 2600 MHz

Epsilon: 51.53 (+/-5%) **Sigma:** 2.24 S/m (+/-5%)

ConvF

Channel X: 4.25

Channel Y: 4.25

Channel Z: 4.25

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

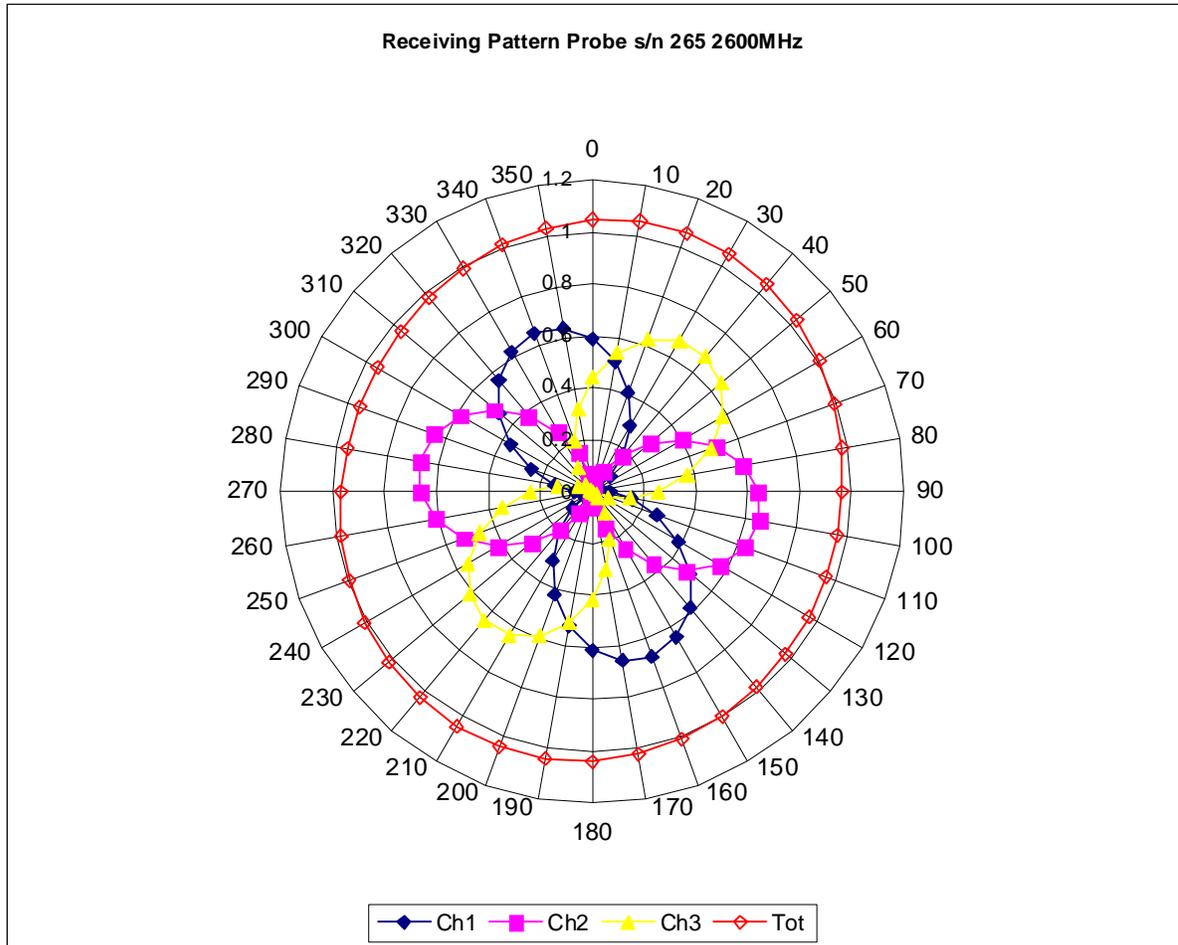
Boundary Effect:

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.

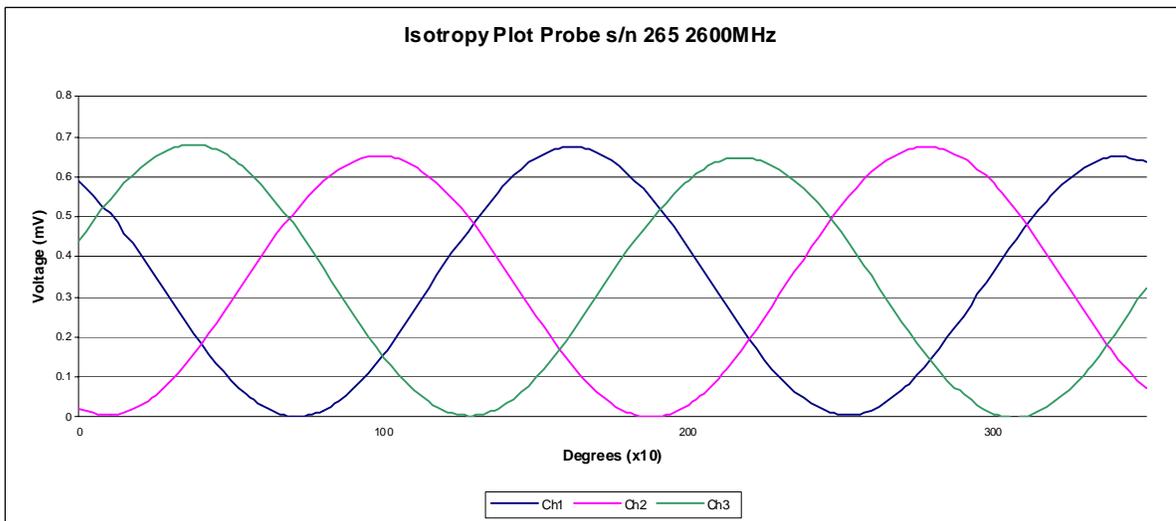
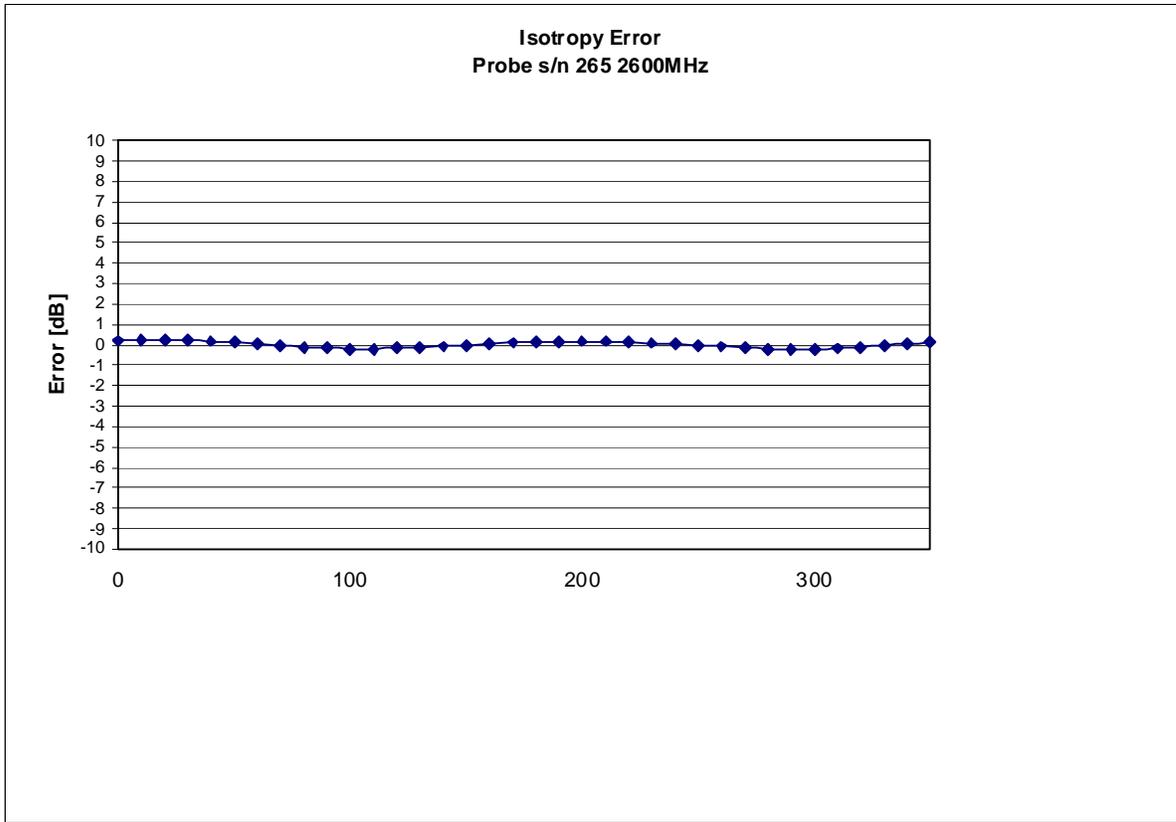
Spatial Resolution:

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 2600 MHz (Air)



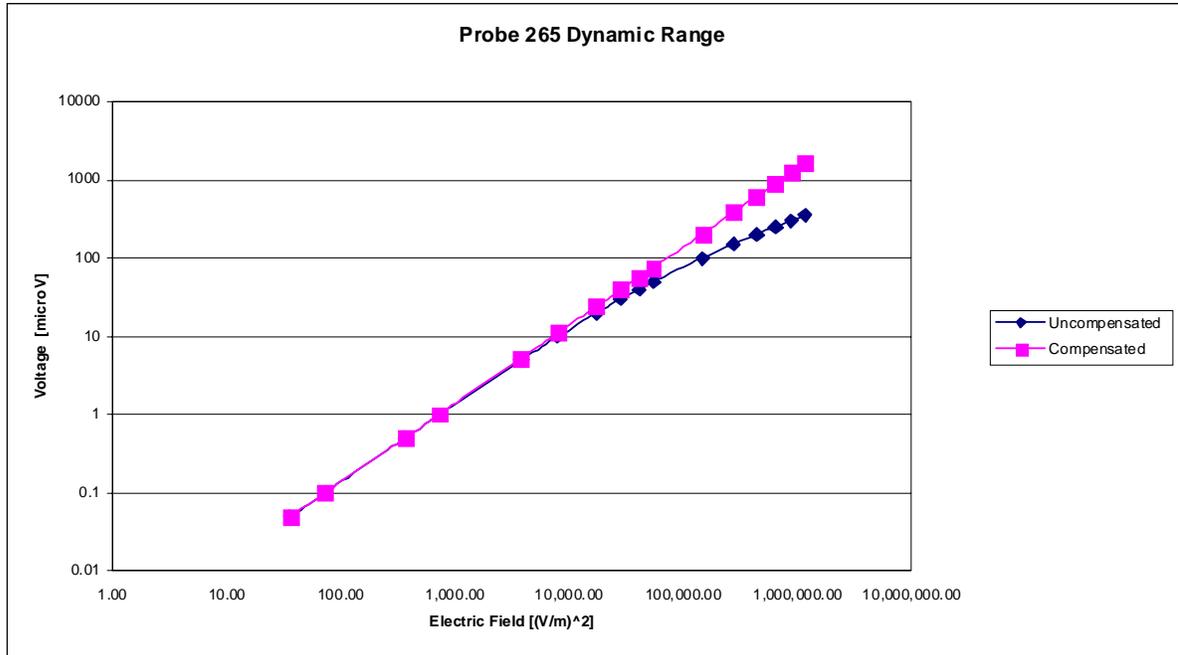
Isotropy Error 2600 MHz (Air)



Isotropicity Tissue:

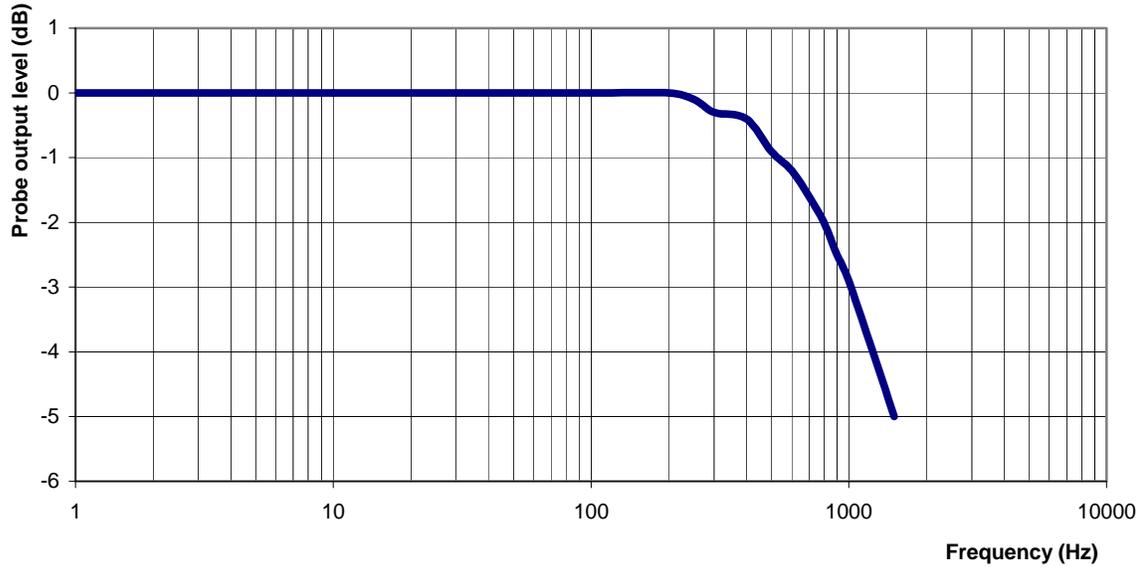
0.10 dB

Dynamic Range



Video Bandwidth

Probe Frequency Characteristics



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

Conversion Factor Uncertainty Assessment Measured

Sensitivity in Body Tissue

Frequency: 2600 MHz

Epsilon: 51.53 (+/-5%) **Sigma:** 2.24 S/m (+/-5%)

ConvF

Channel X: 4.25 7%(K=2)

Channel Y: 4.25 7%(K=2)

Channel Z: 4.25 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 2008.