



## **Appendix - Dipole Calibration**

**Validation Dipole 2600MHz**

**P/N: ALS-D-2600-S-2**

**S/N: QTK-225-00901**

# NCL CALIBRATION LABORATORIES

Calibration File No: DC-720  
Project Number: QTKB-2600-Dipole-5265

## 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.

APREL Validation Dipole

Manufacturer: APREL Laboratories

Part number: ALS-D-2600-S-2

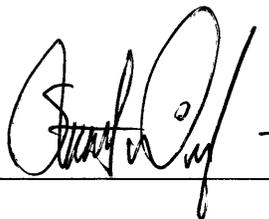
Frequency: 2600 MHz

Serial No: 225-00901

Customer: Quietek

Calibrated: 27<sup>th</sup> December 2006  
Released on: 27<sup>th</sup> December 2006

Released By: \_\_\_\_\_



### **NCL CALIBRATION LABORATORIES**

17 Bentley Avenue  
Ottawa, ONTARIO  
CANADA K2E 6T7

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

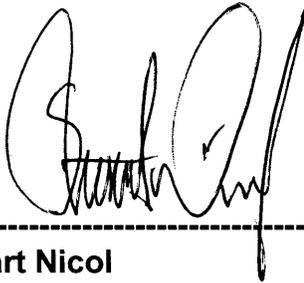
## Conditions

Dipole 225-00901 was new and taken from stock prior to calibration.

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

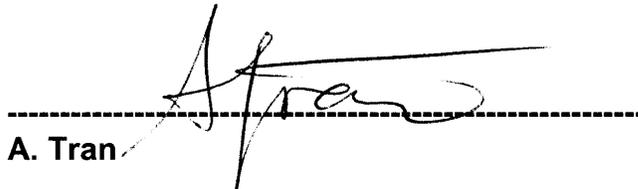
**Temperature of the Tissue:** 21 °C +/- 0.5°C

**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.**



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**Stuart Nicol**



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**A. Tran**

## Calibration Results Summary

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

### Mechanical Dimensions

**Length:** 49.5 mm

**Height:** 30 mm

### Electrical Specification

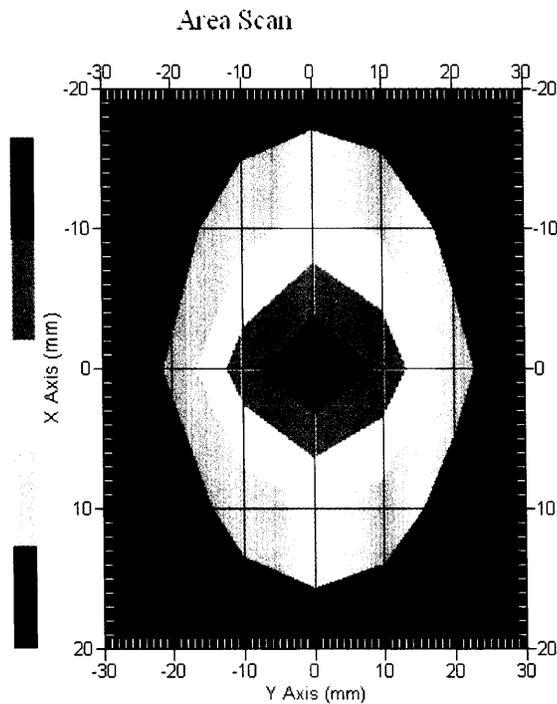
**SWR:** 1.086 U

**Return Loss:** -27.7 dB

**Impedance:** 47.71  $\Omega$

### System Validation Results

Frequency	1 Gram	10 Gram	Peak
2600 MHz	54.0	23.0	119.0



## **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 225-00901. 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 40 MHz to 26 GHz E-Field Probe Serial Number 225.

## **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 225-00901 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

Measured Length	Measured Height
49.5 mm	30 mm

### Tissue Validation

Body Tissue 2600 MHz	Measured
Dielectric constant, $\epsilon_r$	50.18
Conductivity, $\sigma$ [S/m]	2.07

**Electrical Calibration**

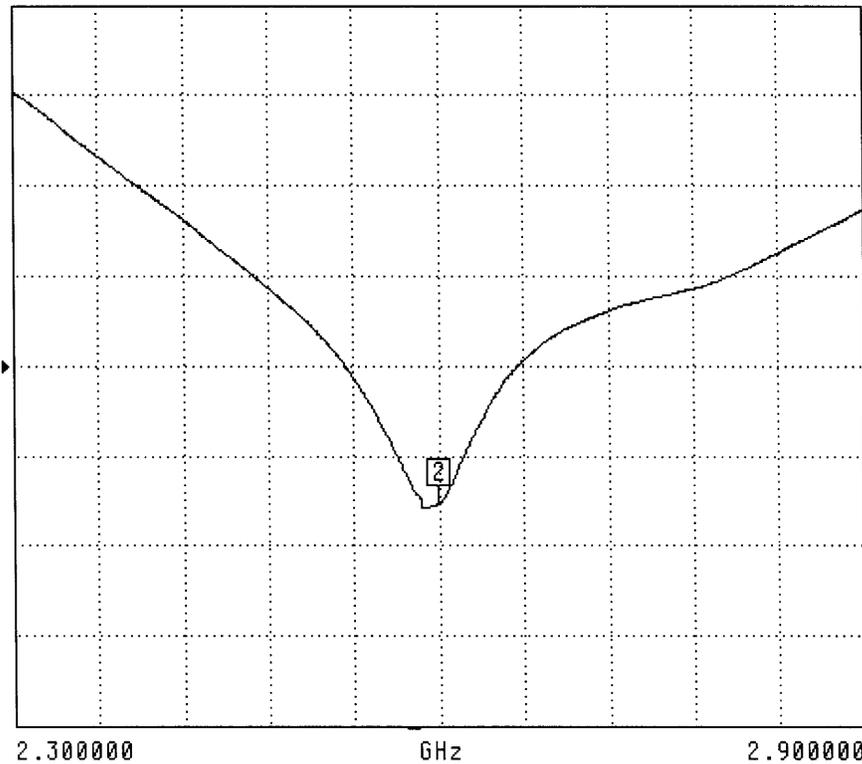
Test	Result
S11 R/L	-27.7 dB
SWR	1.086 U
Impedance	47.71 $\Omega$

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

**S11 Parameter Return Loss**

S11 FORWARD REFLECTION

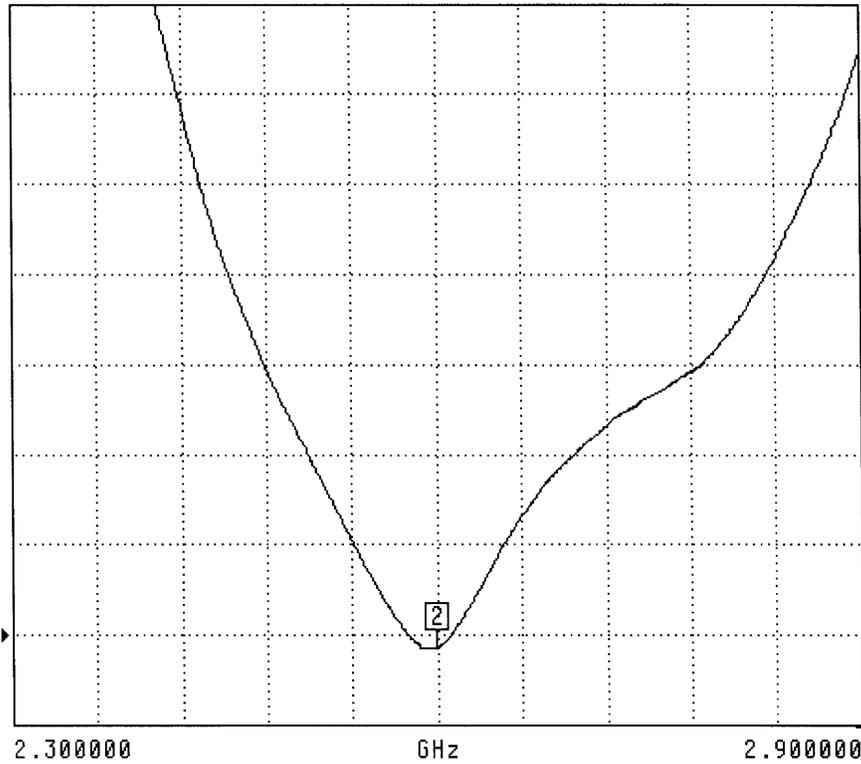
LOG MAGNITUDE      ▶REF=-20.000 dB      5.000 dB/DIV



**SWR**

S11 FORWARD REFLECTION

SWR                      ▶REF=1.100 U                      100.000 mU/DIV



CH 1 - S11  
REFERENCE PLANE  
5.0226 mm

▶MARKER 2  
2.600000 GHz  
1.086 U

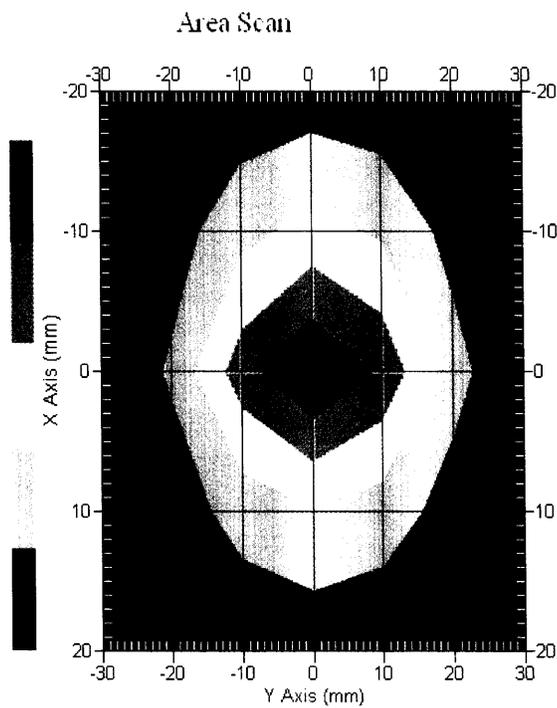
MARKER TO MAX  
MARKER TO MIN

MARKER READOUT  
FUNCTIONS



**System Validation Results Using the Electrically Calibrated Dipole**

<b>Head Tissue Frequency</b>	<b>1 Gram</b>	<b>10 Gram</b>	<b>Peak Above Feed Point</b>
2600 MHz	54.0	23.0	119.0



## **NCL Calibration Laboratories**

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Division of APREL Laboratories.

### **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.