Pulsed Magnetic Field Calibration for a User Program Specific Heat Platform Thermometer

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Introduction

A Lakeshore Cernox™ 1030BC thermometer to be used as a platform thermometer on a heat capacity stage was calibrated at temperatures from 50K down to 1.5K in magnetic fields up to 37T using the short pulsed magnet in cell 1 at the NHMFL Los Alamos facility. The resulting heat capacity system will be implemented into the DC Field facility user program for the 35.1 T resistive magnet.

Experimental

The Cernox™ thermometer was mounted with the excitation current perpendicular to the magnetic field. Using the NHMFL digital lock-in amplifier the thermometer was excited with a current ranging from 20 μA to 1.5 μA depending on the temperature at a frequency of 71.13 kHz. The magnet was pulsed to 35 T. The short time of the magnetic field pulse (under a 100 ms total pulse duration) ensures that the thermometer under test remains isothermal while the data is taken. Data is taken for two magnetic field pulses at each temperature the first the 20T and the second to 35T. Overlaying the resulting data ensures that there is no magnetically induced heating effect during the pulse. .

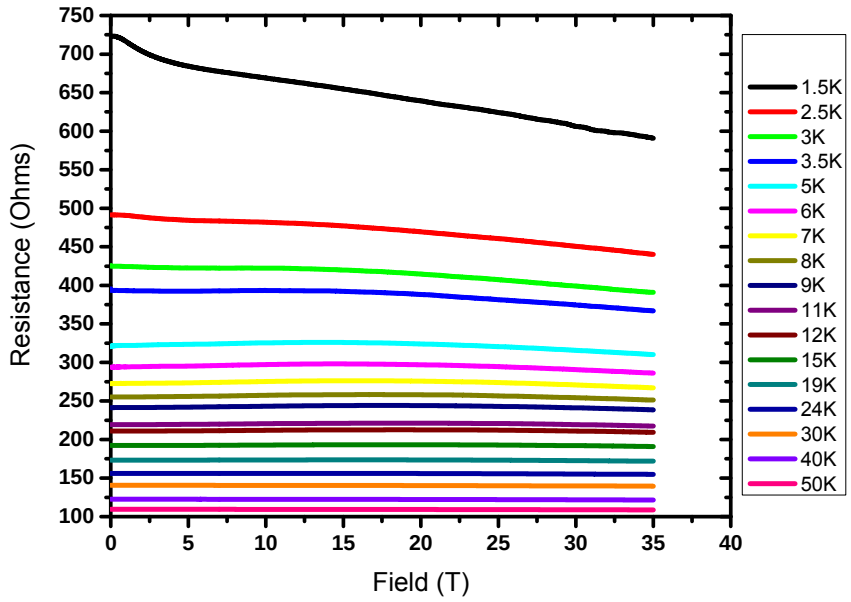

Figure 1: Thermometer 12z135a_R05_C06 resistance versus magnetic field for different temperatures measured in the cell 1 short pulse magnet using the NHMFL high frequency AC lock-in technique. A labview program creates a matrix converting the data magnetoresistance data at fixed temperature into resistance as a function of temperature at fixed magnetic field.

Acknowledgements

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