Magneto-transport in Continuously Doped LSCO in the 60T LP Magnet

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Introduction

For this experiment we examined the transport properties of the high-temperature superconductor $La_{(2-x)}Sr_xCuO_4$ (LSCO) around optimum doping (x ~ 0.16). Extremely high magnetic fields are necessary to destroy superconductivity and examine the field-induced normal state. By varying the composition of the sample along one direction of the film and measuring many different dopings simultaneously we were able to measure high-field magneto-transport properties with a precision yet to be achieved.

Experimental

32 simultaneous electrical-transport measurements were performed in the 60-tesla controlled-waveform magnet at the pulsed field facility in Los Alamos. The samples were grown using Combinatorial Molecular Beam Epitaxy (COMBE). This method of growth creates a gradient in doping along one of the spatial direction of the thin film. By etching a Hall bar with 60 voltage contacts we are able to measure up to 30 different dopings at one time.

Results and Discussion

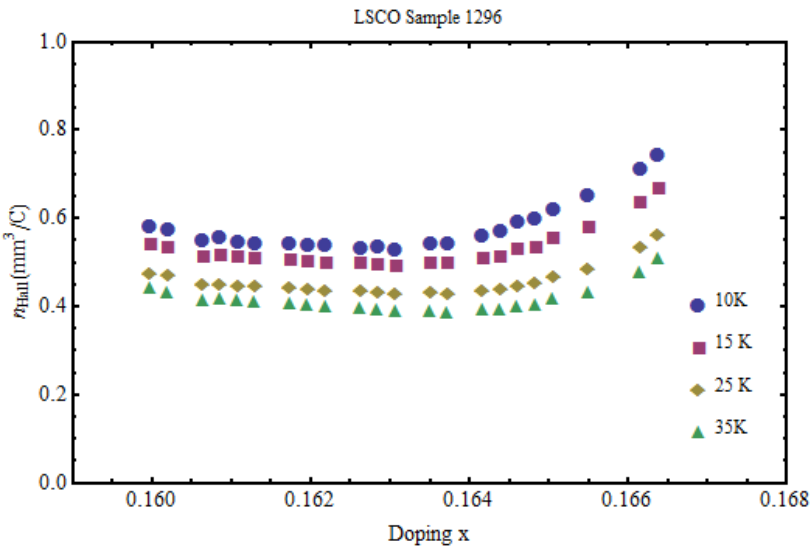

Figure 1: The Hall number at 57 tesla for one of the samples as a function of doping.

Both the longitudinal and Hall resistance were measured for 40 different dopings. As expected the Hall number increases with increased hole doping. **Figure 1** shows the Hall number at 57 tesla as a function of doping for one of the samples measured. The Hall number is the inverse of the Hall coefficient.

Conclusions

In an experiment by Balakirev *et al.* showed a peak in the Hall number around a doping of 0.175 [1]. In our measurements which range from 0.16 < x < 0.175 we did not see such a peak. In the future we will measure more samples at intense fields widening the doping range of our study.

Acknowledgements

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References

[1] F. F. Balakirev *et al.,* Phys. Rev. Lett. **102**, 017004 (2009).