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Quantum Oscillations and Hall Resistivity in YBCO and Tl-2201: Exploring the Fermi Surface of the Cuprates BRAD RAMSHAW, Univ British Columbia — The field of high temperature superconductivity has enjoyed something of a Renaissance in the past two years with the discovery of quantum oscillations in Shubnikov de Haas and de Haas-van Alphen measurements preformed on YBCO and Tl-2201. DC transport measurements around the one eighth hole doping region of high Tc phase diagram have shown a temperature and doping dependence to the Hall coefficient. In this doping region the Hall coefficient changes sign from positive to negative as temperature goes to zero, indicating a competition of mobilities between holes and electrons. In high magnetic fields these measurements also exhibit oscillations in one over the field strength, indicating the existence of small pockets of Fermi surface. This information, coupled with the Hall data, gives rise to the interpretation that the large hole like Fermi surface found in the overdoped region on Tl-2201 reconstructs into smaller electron like Fermi pockets on the underdoped side. Combined with other theoretical and experimental techniques, these experiments are allowing us to develop an understanding of the electronic structure of the cuprates across the entire phase diagram. This understanding is crucial to uncovering the underlying mechanism that gives rise to high temperature superconductivity.

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