Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Probing valley-valley drag interactions in a sixfold valley-degenerate 2DES on H-Si(111) ROBERT N. MCFARLAND, University of Maryland, College Park, LUYAN SUN, Yale University, TOMASZ M. KOTT, BRUCE E. KANE, University of Maryland, College Park, KEVIN ENG, Sandia National Laboratories — In 2D electron systems with multiple anisotropic valleys, multi-valley effects can significantly decrease the Hall coefficient R_H relative to its classical value in the $B \rightarrow 0$ limit [1]. Valley-valley drag interactions tend to suppress this behavior, making R_H a particularly sensitive probe of electron-electron interactions in such systems. We report systematic measurements of this effect on H-terminated Si(111) surfaces with sixfold valley degeneracy and find that the temperature and density dependence (for 0.07 K $< T <$ 9 K and $2 < n_s < 7 \times 10^{11}/\mathrm{cm}^2$) of the damping rate due to drag agrees well with Fermi liquid theory and possible weak disorder effects. However, we consistently observe a negative drag effect in the $T \rightarrow 0$ limit that is not explained by these models.

[1] R.N. McFarland, T.M. Kott, L. Sun, K. Eng, & B.E. Kane, Phys. Rev. B 80, 161310(R) (2009).

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Date submitted: 28 Nov 2009 Electronic form version 1.4