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Disorder matters in tilt magnetic field induced anisotropy in the $\nu = 5/2$ fractional quantum Hall effect W. PAN, XIAOYAN SHI, Sandia National Laboratories, K.W. BALDWIN, K.W. WEST, L.N. PFEIFFER, D.C. TSUI, Princeton University — It is known that under a moderate in-plane magnetic field ($B_{\|}$) the even-denominator fractional quantum Hall effect (FQHE) at the Landau level filling $\nu = 5/2$ is destroyed and becomes anisotropic. However, in recent two reports, it was observed that this tilt magnetic field induced anisotropy depends on GaAs crystallographic directions. Electronic transport becomes anisotropic when $B_{\|}$ is parallel to $[\bar{1}10]$ but remains isotropic if $B_{\|}$ parallel to [110]. In this talk, we report a systematic tilt-magnetic field study of the $\nu = 5/2$ FQHE in a series of high quality GaAs/$Al_xGa_{1-x}As$ heterostructure samples, in which the level of disorder is varied continuously by changing the setback distance (d) between the modulation doping layers and the GaAs quantum well. We observed that in highly disordered samples electronic transport is anisotropic in one crystallographic direction but remains more or less isotropic in the other direction, consistent with the recent two reports. In contrast, in less-disordered samples, where d is large, electronic transport is anisotropic in both crystallographic directions. Our results clearly show that disorder matters in tilt magnetic field induced anisotropy in the 5/2 FQHE.

Xiaoyan Shi
Sandia National Laboratories

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