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Correlating scattering times with the strength of the ν=5/2 fractional quantum Hall state SUMIT MONDAL, Department of Physics, Purdue University, JOHN WATSON, Birck Nanotechnology Center and Department of Physics, Purdue University, GEOFFREY GARDNER, Birck Nanotechnology Center and School of Materials Engineering, Purdue University, NODAR SAMKHARADZE, GABOR CSATHY, Department of Physics, Purdue University, MICHAEL MANFRA, Department of Physics, Birck Nanotechnology Center and Schools of Materials and Electrical and Computer Engineering, Purdue University —
There is widespread interest in the fractional quantum Hall effect at ν=5/2. Theory predicts that the state at ν=5/2 may possess non-Abelian braiding statistics. Experimental interrogation remains difficult due to the fragility of the excitation gaps requiring both high quality samples and examination at low temperatures. Mounting evidence suggests that the strength of the most fragile fractional quantum Hall states in the 2^{nd} Landau level including ν=5/2 are poorly correlated with the scattering time extracted from zero-field mobility measurements at higher temperatures. It is also unclear if the quantum scattering time derived from analysis of the low-field Shubnikov de-Haas oscillations provides any additional information relevant to prediction of the strengths of the observed fractional states. We report on a systematic attempt to correlate the T=0.3K behavior of the mobility lifetime, quantum scattering time, and an effective high field mobility lifetime evaluated at ν=5/2 with the measured activation gap. We will present results from a number of heterostructure designs over a wide span of zero-field mobility ranging from $\sim$10x10^{6}cm^2/Vs to greater than 20x10^{6}cm^2/Vs.

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