CMP Seminar
Michigan State University

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Low dimensional electrons: On the road to hybrid quantum systems

I will discuss two recent experimental results studying two-dimensional (2d) electron systems. First, I will describe experiments on a class of 2d liquid crystalline states existing in semiconductor heterostructures. These fascinating states, known as quantum Hall nematics, exhibit a mysterious broken rotational symmetry in the 2d plane. We have found that engineering the device structure can experimentally control this symmetry; thereby demonstrating a unique technique for manipulating the orientation of these exotic quantum states. In the second part of my talk I will describe how high frequency surface acoustic waves (SAW) can be used to elucidate the properties of electronic states in two dimensions. Our recent experiments reveal the presence of a metastable conducting phase in the interior of a quantum Hall state.

Finally, I will briefly remark on our efforts at the LHQS to create hybrid quantum systems composed of free electrons floating on the surface of liquid helium coupled to nanoscale structures or topological states of matter. These systems provide a unique platform for studying the fundamental physics of low dimensional electrons and their potential quantum computing applications.

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