Abstract:
Fractional Hall liquids are fascinating states of matter with unusual properties; their excitations are fractionally charged and obey fractional statistics. To explore such unusual properties of quantum Hall liquids, we fabricated single electron transistors, which are the most sensitive electrometers, on top of high quality two-dimensional electron gases with point contacts and etched antidotes. The resistance of the point contact-antidot constriction exhibits Aharonov-Bohm type oscillations as a function of magnetic field. At temperatures below 100 mK and at an integer filling fraction, the integer quantum Hall liquid is found to respond very slowly (~hours) to a changing magnetic field. During this slow response period, we monitored the motion of individual charges in and out of quantum Hall liquids using the single electron transistor. The slow response is found to be associated with the persistent Eddy currents in the quantum Hall liquids. I will discuss various theoretical implications of this finding, including nearly perfect diamagnetism in stacked quantum Hall liquids.