

”Illuminating” quantum Hall fluids

Pinczuk, Aron¹

*¹Dept. of Appl. Physics & Appl. Mathematics and Dept. of Physics,
Columbia University, New York, NY, USA and Bell Laboratories,
Lucent Technologies, Murray Hill, NJ, USA*

Electron fluids in the quantum Hall regimes support low-energy excitation modes above the liquid ground states in two-dimensions. The excitations manifest the physics of fundamental interactions in these emergent quantum phases.

Inelastic light scattering methods at very low temperatures (below 1 Kelvin) offer unique experimental venues to study low-lying excitations due to changes in the charge and the spin degrees of freedom of the fluids. The light scattering experiments access directly low-lying ”quasiparticle” excitations above the fluid ground states.

This talk presents an overview of recent results that reveal physics of the electron fluids that is not accessible by other methods.

Light scattering spectra reveal key features of energy vs. momentum relations of quasiparticle excitations. The experiments offer insights on translational symmetry in the quantum fluids, on magnetron excitations and on quasiparticle excitations that are linked to the famous magneto-transport anomalies of the quantized Hall effects. The excitations are probed in diverse states of the electron liquids, to provide insights on quasiparticle properties and on the phase transformations between quantum fluid states.