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Probing phase separation in the fractional quantum Hall fluid at $\nu = 1/3$ JAVIER GROSHAUS[1], IRENE DUJOVNE, YANN GALLAIS, CYRUS HIRJIBEHEDIN, ARON PINCZUK, Physics and Appl. Phys. & Appl. Math. Dept.,Columbia University, BRIAN DENNIS, LOREN PFEIFFER, KEN WEST, Bell-Labs — We report on measurements of low lying collective excitation modes in the fractional quantum Hall (FQH) fluid at $\nu = 1/3$ by resonant inelastic light scattering. While observations of long wavelength modes provide the signature of the presence of the incompressible quantum fluid, evidence of non-uniform fluids in light scattering spectra is found in the observation of magneto-roton modes that require breakdown of wave vector conservation due to loss of translation symmetry. In the energy range of magneto-rotons there are two excitation modes at slightly different energy. One of the modes is clearly identified with the incompressible phase. To interpret the other one we conjecture that due to weak residual-disorder compressible phases coexist with the incompressible phase at $\nu = 1/3$. Within this picture the second magneto-roton is associated with the compressible phases that coexist with the Laughlin fluid. The experimental studies reported here probe non-uniformity in the fluids and offer insights into excitations and mechanisms that are linked to activated transport in the FQH regime.

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