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Fractional quantum Hall and nematic liquid crystal phases in a variable density two-dimensional electron system[1] S. BRANDSEN, J. POLLANEN, J.P. EISENSTEIN, Institute for Quantum Information and Matter and Department of Physics, California Institute of Technology, Pasadena, California 91125, L.N. PFIEFFER, K.W. WEST, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544 — At high magnetic field, Coulomb interactions in a two-dimensional electron system (2DES) lead to a wide variety of collective phases, including the fractional quantum Hall fluids and the nematic liquid crystals found at high Landau level occupancy. In order to examine the density dependence of these quantum states, we have developed a new sample architecture consisting of a highly doped, yet transparent, conducting cap layer grown atop a conventional modulation-doped heterojunction where the 2DES resides. Separate contacts to the 2DES and the cap layer allow the latter to function as a gate for tuning the 2DES density both before and after low temperature illumination. After illustrating the basic functioning of this structure, we will report results on the density dependence of various quantum Hall and nematic liquid crystal phases of the 2DES.

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S. Brandsen
Institute for Quantum Information and Matter and Dept of Physics,
California Institute of Technology, Pasadena, California 91125

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