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Heterostructure Symmetry and the Orientation of the Quantum Hall Nematic Phases[1] J.P. EISENSTEIN, J. POLLANEN, K.B. COOPER[2], S. BRANDSEN, Institute for Quantum Information and Matter and Dept. of Physics, Caltech, Pasadena, CA, L.N. PFEIFFER, K.W. WEST, Dept. of Electrical Engineering, Princeton University, Princeton, NJ — The native symmetry-breaking potential which consistently orients the quantum Hall nematic phases in high mobility 2D electron systems relative to the host semiconductor crystal axes remains unknown. Here we report an extensive set of measurements examining the role of the structural symmetries of the potential confining the 2D system in determining the orientation of the nematics [1]. In single quantum well samples we find that neither the local symmetry of the confinement potential nor the depth of the 2D electron system beneath the sample surface dictates the orientation of the nematic. In contrast, for 2D electrons confined at a single heterointerface between GaAs and AlGaAs, the nematic orientation does depends on the depth of the 2D electron system beneath the sample surface. We relate these results to various theoretical models of the symmetry-breaking potential. [1] J. Pollanen et al., Phys. Rev B 92, 115410 (2015).

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