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Electron Ising Nematic in High Tc Superconductors E.W. CARLSON, Purdue University, K.A. DAHMEN, E.H. FRADKIN, University of Illinois at Urbana-Champaign, S.A. KIVELSON, Stanford University — There is theoretical and experimental evidence that electronic liquid crystal phases can arise in strongly correlated electronic systems. The electron nematic breaks the rotational, but not the translational, symmetry of the host crystal. In the cuprates, Cu-O bonds are often favorable directions for such charge-ordered states. Then the electron nematic has Ising symmetry, corresponding to orienting the easy and hard local directions of conduction along the Cu-O bond directions. Quenched disorder in the host material acts as a random field. Using this mapping to the random field Ising model, we construct a random resistor network model which provides a direct connection between local ordering and local transport properties. Interesting behavior reminiscent of this model has been reported in recent experiments on the cuprates: switching noise with slow time dynamics was observed in the resistivity of YBCO nanowires (Bonetti et al., PRL 2004), and magnetic hysteresis at intermediate field strengths has been reported in LSCO (Panagopoulos et al., PRB 2004).

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