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Quantum Nematic Phase in the Emery Model KAI SUN, EDUARDO FRADKIN, UIUC, STEVEN KIVELSON, Stanford University — We investigate one strong coupling regime of the Emery model of a CuO plane in the strong coupling limit first discussed in ref. [1]. In this regime the on-site repulsion energies are much larger than the inter site Coulomb repulsions and the hopping terms. By integrating out the copper sites, we mapped this model into an interacting fermionic model on an effective two-dimensional crossed-chains lattice. We will discuss the simpler case of spinless fermions on this effective lattice in the regime in which the residual interactions are weak. Using a mean-field approach, we discuss the isotropic-nematic phase transition in this system. We show that the nematic phase may exist even for infinitesimally weak interactions. We investigate this phase transition for a range of dopings, temperatures and interactions. For certain choice of parameters, the effective electronic states behave like those of a 2D square lattice model, but for some other choices, its properties are reminiscent of a quasi-one-dimensional system.

[1] Steven A. Kivelson, Eduardo Fradkin, and Ted Geballe, PRB 69, 144505 (2004)

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