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Determinant Quantum Monte Carlo Study of a Multi-orbital Electronic Model: Application to Nematic and Superconducting Order in FeSe PHILIPP DUMITRESCU, MAKSYM SERBYN, University of California, Berkeley, RICHARD SCALETTAR, University of California, Davis, ASHVIN VISHWANATH, University of California, Berkeley — The iron chalcogenide FeSe has attracted much recent interest due to a high superconducting transition in monolayer samples. In bulk samples, nematic order is seen without the presence of magnetic order, hinting at the importance of nematic order in determining the monolayer properties. We study an effective two band model of the iron-pnictides with interactions that capture the nematic ordering arising from spontaneous symmetry breaking between the two orbitals. These models are sign-problem free and can be simulated in an unbiased fashion using Determinant Quantum Monte Carlo. We find a variety of unexpected orders and consider the effects of the nematic fluctuations on superconductivity.

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