

Abstract Submitted
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Dzyaloshinskii-Moriya Interaction and Spiral Order in Spin-orbit Coupled Optical Lattices¹ CHUANWEI ZHANG, MING GONG, YINYIN QIAN, Department of Physics, the University of Texas at Dallas, Richardson, Texas, 75080 USA, VITO SCAROLA, Department of Physics, Virginia Tech, Blacksburg, Virginia 24061 USA — We show that the recent experimental realization of spin-orbit coupling in ultracold atomic gases can be used to study different types of spiral order and resulting multiferroic effects. Spin-orbit coupling in optical lattices can give rise to the Dzyaloshinskii-Moriya (DM) spin interaction which is essential for spin spiral order. We derive an effective spin model in the deep Mott insulator region at half filling, and demonstrate that the DM interaction in optical lattices can be made extremely strong with realistic experimental parameters. The rich phase diagrams of the effective spin model for fermion and bosons are obtained via classical Monte Carlo simulations.

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Chuanwei Zhang
Department of Physics, the University of Texas at Dallas,
Richardson, Texas, 75080 USA

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