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Spin Hall effects for cold atoms in a light induced gauge potential¹

SHI-LIANG ZHU, South China Normal University, HAO FU, University of Michigan, CONGJUN WU, University of California, Santa Barbara, SHOU-CHENG ZHANG, Stanford University, LUMING DUAN, University of Michigan — We propose an experimental scheme to observe spin Hall effects with cold atoms in a light induced gauge potential. Under an appropriate configuration, the cold atoms moving in a spatially varying laser field experience an effective spin-dependent gauge potential. Through numerical simulation, we demonstrate that such a gauge field leads to observable spin Hall currents under realistic conditions. We also discuss the quantum spin Hall state in an optical lattice.

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