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The Quantum Dynamics of a Dilute Gas in a 3D BCC Optical Lattice[1] LINDA REICHL, YINGYUE BORETZ, Univ of Texas, Austin — The classical and quantum dynamics of a dilute gas of rubidium atoms, in a 3D body-centered cubic optical lattice, is studied for a range of polarizations of the laser beams forming the lattice. The relative polarization of the lasers determines the the structure of the potential energy seen by the rubidium atoms. If three pairs of in-phase mutually perpendicular laser beams, with the same wavelength, form the lattice, only a limited range of possible couplings can be realized in the lab. We have determined the band structure of the BCC optical lattice for all theoretically possible couplings, and find that the band structure for lattices realizable in the lab, differs significantly from that expected for a BCC crystal. As coupling is increased, the lattice becomes increasingly chaotic [1] and it becomes possible to produce band structure that has qualitative similarity to a BCC.

[1] Horsley, S. Koppel, and L.E. Reichl, "Chaotic Dynamics in a two-dimensional optical lattice," Phys. Rev. E **89** 012917 (2014).

[1]Welch Foundation

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