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**Self-Consistent Mathieu Equation Approach for Interacting Bosons in Optical Lattices**[1] QIN-QIN LU, DANIEL E. SHEEHY, Louisiana State University — There has been much recent interest in the problem of interacting bosons confined to a periodic optical lattice. Instead of the commonly used tight-binding approach (applicable near the Mott insulating regime of the phase diagram), our theoretical study of this system starts from the exact single-particle states of bosons in an optical lattice, satisfying the Mathieu equation, an approach that can be particularly useful at large boson filling. We treat interaction effects using a self-consistent Hartree-Fock approximation, and make predictions for experimental observables such as the superfluid transition temperature, condensate fraction and boson momentum distribution.

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