Condensate States of Atomic Bose-Fermi Gas Mixtures

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We report on the different types of condensates possible in two-component atomic gas mixtures in one dimension involving both bosons and fermions. When the interactions are attractive, we show there is a rich variety of coherent ground-state phases that vary with their intrinsic and relative strength. We avoid any artefacts of lattice discretization by developing a novel implementation of a continuous matrix-product-state ansatz for mixtures that we first show to systematically converge towards exact results for the Lai-Yang-model integrable case.