

Abstract Submitted
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Superfluid-insulator transitions of the Fermi gas with near-unitary interactions in a periodic potential¹ EUN-GOOK MOON, Harvard University, PREDRAG NIKOLIC, Rice University, SUBIR SACHDEV, Harvard University — We consider a gas of spin-1/2 fermions with interactions near the unitary limit. In an applied periodic potential, and with a density of an even integer number of fermions per unit cell, there is a second-order quantum phase transition between superfluid and insulating ground states at a critical amplitude of the lattice potential. We map out the universal phase diagram at $N = \infty$ in a model with $\text{Sp}(2N)$ spin symmetry, and compute the universal ratio between the critical lattice amplitude and molecule recoil energy. As the interactions between fermions are varied, the insulator evolves smoothly between a band insulator of fermions and a Mott insulator of fermion pairs. We discuss implications for recent ultra-cold atom experiments.

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