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Evolution from BCS to BKT superfluidity in one-dimensional optical lattices MENDERES ISKIN, CARLOS A.R. SA DE MELO[1], Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland, Gaithersburg, Maryland 20899-8423, USA. — We analyze the finite temperature phase diagram of Fermi-Fermi mixtures in one-dimensional optical lattices as a function of fermion-fermion interaction strength. At low temperatures, the Fermi-Fermi mixture evolves from a three-dimensional (3D) Bardeen-Cooper-Schrieffer (BCS) to a two-dimensional (2D) Berezinskii-Kosterlitz-Thouless (BKT) superfluid as the interaction strength increases. We show that the Ginzburg- Landau-Wilson action near the critical temperature is of the Lawrence-Doniach type for all interaction strengths, and explore the phase space of interaction strength versus hopping (or lattice depth) to determine the characteristic line where the behavior of mixture changes from 3D to 2D. Furthermore, we discuss the existence of vortex loop excitations, and how they evolve as a function of interaction strength.

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