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BCS-BEC crossover in 2D spin-orbit coupled degenerate Fermi gases[1] CHUANWEI ZHANG, GANG CHEN, MING GONG, Department of Physics and Astronomy, Washington State University, Pullman, WA 99164 — The recent experimental realization of spin-orbit coupling for ultra-cold atoms has generated much interest in the physics of spin-orbit coupled degenerate Fermi gases. Although recently the BCS-BEC crossover in 3D spin-orbit coupled Fermi gases has been intensively studied, the corresponding 2D crossover physics has remained unexplored. In this talk, we discuss the BCS-BEC crossover physics in 2D degenerate Fermi gases in the presence of spin-orbit coupling. We derive the zero temperature mean field gap and atom number equations suitable for the 2D spin-orbit coupled Fermi gases, from which the dependence of the ground state properties (pairing gap, chemical potential, etc.) on the system parameters (e.g., binding energy, spin-orbit coupling strength) is obtained, both numerically and analytically. We characterize the dependence of the BKT transition temperature as well as the vortex-antivortex lattice melting temperature on the spin-orbit coupling strength and the external Zeeman field.

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