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The Fate of Bose-Einstein Condensate in the Presence of Spin-orbit Coupling QI ZHOU, Department of Physics, The Chinese University of Hong Kong, XIAOLING CUI, Institute for Advanced Study, Tsinghua University, Beijing — We show that spin-orbit coupling can destroy a Bose-Einstein condensate. For non-interacting bosons, some types of spin-orbit coupling destroy a condensate at any finite temperature or even at the ground state, due to the drastic change of single-particle Density of States at low energies. Whereas interaction stabilizes the condensate at zero temperature, condensate depletion is significantly enhanced by spin-orbit coupling. Particularly, thermal depletion becomes divergent when both interaction and spin-orbit coupling become isotropic, leading to the disappearance of a three-dimensional condensate at any finite temperature.

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