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Dipolar Bose-Einstein condensate of Stationary-Light Dark-state Polaritons GOR NIKOGHOSYAN, Institute of Theoretical Physics, University of Ulm, FRANK ZIMMER, Max Planck Institute for the Physics of Complex Systems, Dresden, MARTIN PLENIO, Institute of Theoretical Physics, University of Ulm
— We put forward and discuss in detail a scheme to achieve BEC of stationary-light dark-state polaritons with dipolar interaction. We extend the works on Bose-Einstein condensation of photons and polaritonic quasiparticles, to the regime of dipolar quantum gases. To this end we introduce a diamond-like coupling scheme in a vapor of Rydberg atoms under the frozen gas approximation. To determine the system's dynamics we employ normal modes and identify the dark-state polariton corresponding to one of the modes. We show that these polaritonic quasiparticles behave in adiabatic limit like Schrödinger particles with a purely dipolar inter-particle interaction. Moreover, we could show, by analyzing the Bogoliubov spectrum of a homogeneous dipolar BEC, that for a special choice of the dipolar interaction parameter the considered dipolar BEC is, in contrast to usual dipolar BEC, very stable.

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