Jacopo Bellazzini (Sassari)

Ground states for dipolar quantum gases in the unstable regime

Abstract

The Aim of the talk is to show the existence and stability/instability properties of standing waves for a nonlinear Schrdinger equation arising in dipolar Bose-Einstein condensate in the unstable regime. Two cases are presented: the first when the system is free, the second when gradually a trapping potential is add. In both cases this leads to the search of critical points of a constrained functional which is unbounded from below on the constraint. In the first case, by showing that the constrained functional has a so-called mountain pass geometry, we prove the existence of ground states and show that any ground state is orbitally unstable. In the second case we prove that, if the trapping potential is small, two different kind of standing waves appears : one corresponds to a local minima of the constrained energy functional and it consists in ground states, the other is again of mountain pass type but now correspond to excited states. We also prove that any ground state is a local minimizer. Despite the problem is mass supercritical and the functional unbounded from below the standing waves associated to the ground states turn to be orbitally stable. Eventually we show that the addition of the trapping potential, however small, create a "gap" in the ground state energy level of the system. Joint work with Louis Jeanjean.