Dipolar bosons: from solitons to rotons

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Bose-Einstein condensates of gases with large magnetic dipole moments, such as erbium or dysprosium, are now experimentally available. In quasi one dimensional trap, like in the contact interacting gas, there are also a dark soliton-like excitations in the dipolar gas. However, unlike their much better known cousins, they interact at a distance and undergo inelastic collisions p1,2].
We have devoted some attention to a study of relation between the mean field approach and a more fundamental multi particle description. Analytic example of noninteracting atoms allowed for a simple interpretation of the famous two types of excitations found by Lieb and Liniger. We have also shown that the dark solitons are represented by a strongly entangles sate [3]. In the numerical analysis we have also found and discussed properties of the roton state [4].

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