DMITRY PELINOVSKY, McMaster University

Excited states in the Thomas–Fermi limit

Excited states of Bose–Einstein condensates are considered in the Thomas–Fermi limit, in the framework of the Gross–Pitaevskii equation with repulsive inter-atomic interactions in a harmonic potential. The relative dynamics of dark solitons (density dips on the localized condensates) with respect to the harmonic potential and to each other is approximated using the averaged Lagrangian method and the Lyapunov–Schmidt reductions. This permits a complete characterization of the equilibrium positions of the dark solitons as a function of the chemical potential parameters. It also yields an analytical handle on the oscillation frequencies of dark solitons around such equilibria. The asymptotic predictions are generalized for an arbitrary number of dark solitons and are corroborated by numerical computations for two- and three-soliton configurations.