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Ab initio wave function propagation of bosonic ensembles in elongated traps¹ VALENTIN BOLSINGER, SVEN KRÖNKE, PETER SCHMELCHER, Zentrum für Optische Quantentechnologien, Universität Hamburg, Germany — We use the ab initio, numerically exact, Multi-Layer - Multi-Configurational Time Dependent Hartree method for Bosons [1] to simulate correlated bosonic many body system in higher spatial dimensions. This method is based on time-dependent, variational optimized, multi-particle basis. We use the fact that in elongated traps strong spatial correlations are suppressed due to the energy scales in the longitudinal and transversal direction and obtain a linear scaling in the number of grid points in contrast to other methods, using a product grid, with cubic scaling. As an illustrative example, we study perturbed dipole-oscillations for a bosonic many body system in an elongated harmonic trap. The perturbation is created by a Gaussian hump at the trap center. We study time-dependent beyond mean-field effects in many-particle systems in the cross-over from one to three dimensions and focus on transversal excitations created by the hump and its influence of longitudinal propagation.

¹L. Cao et al. JCP 139, 134103 (2013)

Valentin Bolsinger
Zentrum für Optische Quantentechnologien, Universität Hamburg, Germany

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