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Determining the Time Evolution of Bose-Einstein Condensate[1]
MERIDETH FREY, Wellesley College — Bose-Einstein condensates (BEC) offer a macroscopic way to analyze the quantum mechanical world. In order to measure most properties of these condensates, the cooled atomic gas must be released from its potential trap and allowed to expand. Oftentimes an analytic solution for the time-evolution of the BEC wavefunction after release from the trap cannot be found and a numerical solution is needed. By applying a recent numerical method for solving the Gross-Pitaevskii equation, the time-evolution for BEC after release from potential traps of various geometries can be found. For this project, spherically and cylindrically symmetric traps are analyzed. When applicable, the numerical results are compared with analytical solutions to evaluate the error in the method. Numerical solutions will also be found for potential trap geometries that produce interesting interference effects due to the quantum behavior of Bose-Einstein condensates.

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Merideth Frey
Wellesley College

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