Bose Einstein Condensates in a Double Well Potential

J. DuBois[1], J. I. Korsbakken[1,2], and K. B. Whaley[1]

Departments of Chemistry[1] and Physics[2]
University of California, Berkeley, CA 94720
USA

We present quantum Monte Carlo studies of Bose Einstein Condensates (BECs) trapped in a three-dimensional potential with a double well in one coordinate. We study the behavior of condensates with both repulsive and attractive scattering lengths, and as a function of the strength of both double well and interparticle interaction parameters, and the number of particles. We examine the conditions under which macroscopic superpositions of condensates may be formed ('cat states'). We also present an analysis of how the effective size of such macroscopic superpositions of BECs can be measured in a system with finite interactions, relating this to the size of the ideal superposition of orthogonal Greenberger-Horne-Zeilinger (GHZ) states.[3]