Multiconfigurational Time-Dependent Hartree-Fock Theory for Identical Bosons in a Double Well[1] DAVID MASIELLO, WILLIAM REINHARDT, University of Washington — Building upon the time-independent study [D. Masiello, *et. al.*, Phys. Rev. A **72**, 063624 (2005)], we have formulated a multiconfigurational time-dependent Hartree-Fock theory for identical bosons to explore the combined effects of the condensate's mean field and atomic correlation on the fragmentation dynamics of a double-well BEC from first principles. Our explicitly time-dependent approach includes the Hartree-Fock orbitals as well as all possible configuration amplitudes allowed within a certain model space as dynamical variables, and applies the time-dependent variational principle to derive balanced and well-defined equations of motion that include the full coupling between these variables. Due to its general formulation and rich mathematical structure, this treatment clarifies many of the principles and approximations that are found in other relevant approaches from the literature and proves to be a powerful theoretical tool in the understanding of recent double-well BEC interference experiments performed at MIT.

David Masiello
University of Washington

Date submitted: 25 Jan 2006

Electronic form version 1.4