Microscopic description of the transfer reaction including pairing correlations

G. Scamps,1 D. Lacroix,2 and Y. Hashimoto3

1Department of Physics, Tohoku University, Sendai 980-8578, Japan
2Institut de Physique Nucléaire, IN2P3-CNRS, Université Paris-Sud, F-91406 Orsay Cedex, France
3Center for Computational Sciences, University of Tsukuba, Tsukuba 305-8571, Japan

Heavy ion transfer reactions are an ideal tool to study the pair correlations. New experimental data [1, 2] show that the probability to transfer a pair of neutrons is enhanced compared to the expected value in the uncorrelated limit or pure sequential transfer [3]. In order to understand this enhancement, the Time-dependent Hartree-Fock (TDHF) with BCS pairing is used. The transfer probabilities are determined using a double projection method with the use of the Pfaffian technique. This approach shows that the pairing correlation enhanced the pair transfer [4]. Nevertheless, the TDHF+BCS underestimate the two-neutron transfer probability compared to the experimental results.

To go beyond this approach, we use the Time-dependent Hartree-Fock-Bogoliubov with a Gogny force [5]. A numerical method to solve TDHFB equations by using a hybrid basis of two-dimensional harmonic oscillator eigenfunctions and a one-dimensional Lagrange mesh with the Gogny effective interaction is applied to head-on collisions of superfluid 20O nuclei. Taking the energies around the barrier top, the trajectories, pairing energies, and numbers of transferred nucleons are displayed. Their dependence on the relative gauge angle at the initial time is studied.