Seminarium Szkoły Doktorskiej NCBJ

Thursday, 10 October 2024, 9:15 room 207, Pasteura 7 https://www.gotomeet.me/NCBJmeetings/phd-seminar https://events.ncbj.gov.pl/e/PhDSeminar2425

Speaker: Aleksander Augustyn (Szkoła Doktorska NCBJ)

Title: Multidimensional Random Walk for Calculating the Fusion/Fission Probabilities of Superheavy Elements

Abstract:

In our recent work [1], we introduced a novel approach, the Dipole-Driven Model (DDM), for characterizing the fusion process of two heavy ions within the entrance channel. The DDM utilizes the dipole variable as an authentic shape parameter to describe the configuration of the colliding heavy ions, with shape parametrization performed at the neck region. This allows for the optimization of the deformation space and the exploration of previously unattainable shapes.

In this talk, a new method for predicting the probability of fusion of superheavy elements will be presented. The approach uses a random walk algorithm, in which the shape evolution is governed by the density of states above the multidimensional potential energy surface (PES). The PESs were calculated within the latest version of the Warsaw macroscopic-microscopic model [1], with rotational energy included.

Three cold fusion reactions will be examined in detail: 48Ca+208Pb, 50Ti+208Pb and 54Cr+208Pb. The calculated probabilities of fusion for these reactions will be shown. The influence of angular momentum and excitation energy on ratios of symmetric and asymmetric divisions will be demonstrated. Future improvements to the method will also be discussed.

[1] T. Cap, A. Augustyn, M. Kowal, and K. Siwek-Wilczyńska, Phys. Rev. C 109, L061603 (2024).

[2] P. Jachimowicz, M. Kowal, and J. Skalski, At. Data. Nucl. Data. Tables. 138, 101393 (2021).