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RELATIVISTIC MEAN-FIELD EFFECTIVE NN FORCES IN DYNAMICAL MODELING OF HEAVY-ION FUSION

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In the analysis of heavy-ion fusion cross-sections, the relativistic effects are usually ignored [1]. However, it is known that the fastest nucleons in a nucleus have the velocity close to a quarter of the speed of light. The relativistic mean-field (RMF) theory accounting for the effects of high nucleons velocity was successfully applied to reproduce the binding energies and astrophysical S-factors for proton-induced reactions [2].
In the present work, we demonstrate the results of the application of the RMF theory for describing the heavy-ion above-barrier fusion process of complex nuclei. The modeling is performed within the framework of a trajectory model [3-5] based on the double-folding approach and accounting for energy dissipation. We employ six different RMF parameter sets for the effective nucleon-nucleon (NN) forces. The forces as well as the resulting potentials and cross-sections are compared with those obtained using the non-relativistic M3Y NN-forces.
It turned out that several of the RMF parameter sets appeared to be inapplicable for the dynamical calculations of the fusion cross-sections. For the feasible parameter sets, we perform a quantitative comparison of the calculated above-barrier fusion excitation functions with the experimental ones for reactions involving spherical colliding nuclei.

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Primary authors: Dr CHUSHNYAKOVA, Maria (Omsk State Technical University); Prof. GONTCHAR, Igor (Omsk State Transport University); Dr KHMYROVA, Natalya (Omsk State Transport University); Dr KLIMOCHKINA, Anna (Lomonosov Moscow State University)

Presenter: Dr CHUSHNYAKOVA, Maria (Omsk State Technical University)

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