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Nucleon clustering modelling in heavy nuclei fission taking into account the Coulomb interaction

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Recent experimental and theoretical studies have shown that it is the clustering mechanism that underlies the formation of various fission modes of heavy nuclei [1-4]. The ability to model locally strong and Coulomb interactions of nucleons at the nuclear scale using a new distributed approach and the development of high-performance computing allow a better understanding of the details of the evolution of the cluster structure of heavy nuclei in fission process.
The emergence of the magic clusters within the fissioning nuclei and understanding the various structures they create has been a long-standing area of study. In paper [5] a novel mathematical model of nucleon clustering dynamics that explores networked multi-agent system technique was proposed. Cluster stabilization in this framework corresponds to minimizing the Laplacian potential of particles communication graph [6].
In this paper, we determine particle interaction according to the nearest neighbor rule [7]. Developed algorithm is aimed at modelling the occurrence of collective nucleon aggregation due to short-range mutual interaction taking into account the effect of coulomb interaction. Numerical simulations were performed for ten nuclei in the actinide region.

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