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Parallel calculations of ground states of 6,7,9,11Li nuclei by Feynman's continual integrals method

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The structure of lithium isotopes and nuclear reactions with their participation are extensively studied both experimentally and theoretically. In this work, the wave functions of the ground states of few-body nuclei 6,7,9,11Li are calculated by Feynman's continual integrals method in Euclidean time. The algorithm of parallel calculations was implemented in C++ programming language using NVIDIA CUDA technology. Calculations were performed on the NVIDIA Tesla K40 accelerator installed within the heterogeneous cluster of the Laboratory of Information Technologies, Joint Institute for Nuclear Research, Dubna. The studied isotopes are considered as cluster nuclei with the following configurations: 6Li (α + n + p), 7Li (α + n + n + p) 9Li (7Li + n + n), and 11Li (9Li + n + n). The results of calculations for the studied nuclei are in good agreement with the experimental energies of separation into clusters and nucleons. The obtained probability densities may be used for the correct definition of the initial conditions in the time-dependent calculations of reactions with the considered nuclei. This work was supported by the Russian Science Foundation (RSF), research project 17-12-01170.

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