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Optimization of the computation of the multidimentional integrals for estimation of the meson lifetime

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To calculate the lifetime of mesons in hot and dense nuclear matter, it is necessary to computate the 5-dimentional integrals with complicated integrand function. This work presents algorithms and methods for calculating complicated integrals based on the Monte-Carlo method. For optimization of computation the algorithm of parallel calculations was implemented in C++ programming language using OpenMP and NVIDIA CUDA technology. Calculations were performed on nodes with multicore CPUs and Intel Xeon Phi coprocessors and NVIDIA Tesla K40 accelerator installed within the heterogeneous cluster of the Laboratory of Information Technologies, Joint Institute for Nuclear Research, Dubna. As a result the lifetime of pion was calculated using all possible pion-pion scattering reactions.

Summary

Primary author: GODERIDZE, Daviti

Presenter: GODERIDZE, Daviti

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