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T-invariance and mechanisms of the many particle multistep nuclear reactions and fission

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It has been shown that the coefficients of anisotropies caused by the unified mechanism of their appearance in differential cross sections of the initial and time-reversed many particle multistep nuclear reactions are expressed through common scalar (pseudoscalar) functions depending on the momentum and spin vectors of the particles for the initial and final channels of the analyzed reactions. It has been demonstrated that the T-invariance condition in nuclear systems requires the equality of the investigated coefficients for the initial and time-reversed reactions, when these coefficients transform into each other at the inversion of momentum and spin vectors and the transposition of these vectors in accordance with the reversion of the consecution of reaction stages for the transition from the initial to time-reversed reaction. It has been concluded that the detection of the coefficients of anisotropies for the initial reaction allows to determine the analogous coefficients for the time-reversed reaction without its experimental realization and by usage of the T-invariance condition to select possible mechanisms of these coefficients appearance. The found T-invariance condition was used to analyze mechanisms of the appearance of the possible asymmetries with various P- and T-parities in cross sections of the binary and ternary fission reaction of oriented target-nuclei by cold polarized neutrons. It has been shown that coefficients of analyzed asymmetries for ternary fission satisfy the T-invariance condition if third particles and fission fragments fly from the compound fissile nuclei non-simultaneously but on the sequential stages of this fission. In contrast to the representations of some articles in which the absence of the T-invariance null-test is declared, for example, it has been found that the T-noninvariant asymmetries,which coefficients vanish for all possible T-invariant mechanisms of their appearance. It has been proposed applying of the similar asymmetries experimental analysis for the detection of characteristics of the T-noninvariant interactions in nuclear systems.

Biography

Pavel V. Kostryukov is graduated from Voronezh State University in 2016. Currently he is a post-graduate student of the Department of Nuclear Physics of the VSU. Co-author of 3 publications on the application of T-invariance conditions in the theory of nuclear reactions.

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