GENERALIZED APPROACH TO THE DESCRIPTION OF MULTI-STEPS DECAYS IN CHAINS OF GENETICALLY RELATED NUCLEI

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Traditional approach [1] to the description of the multi-steps decays in chains of genetically related nuclei suggests sequential character of these decays, which are considered as the following in time one to another allowed by energy one-step basic decays from the ground and excited states of nuclei in the chain under consideration. Such basic decays may include not only nuclear α-, β-, γ- decays and fission, but the decays with the emission of nucleons and clusters (light nuclei). Sequational multi-steps decays are analyzed by solving a system of coupled kinetic equations, which are constructed with taking into account the exponential character of the basic decays, which are due to the independence on time of partial widths of these decays. Development of the theory of double beta- [2] and the two-protons [3] decays of nuclei allowed to introduce the concept of virtual two-steps decays of nuclei, which occur as the two basic one-step processes, the first of which is associated with the decay of the initial nucleus with formation of a virtual states of the intermediate nuclei, and the second corresponds to the decay of the mentioned nuclei with the transition to the real state of the final nucleus.

In this paper the generalized approach to the description of multi-steps decays in chains of the genetically related nuclei with taking into account not only the sequantial decays, but also combinations of these decays with virtual multi-steps (two-steps, three-steps, etc.) decays is developed. It is shown that the taking into account of multi-steps virtual decays becomes necessary not only when the energy ban on some real basic one-step decays occurs, but and for sufficiently small positive energies of a such basic decays.

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3. S.G.Kadmensky, Yu.V.Ivankov // Proc. of Conf "Nucleus-2012", S.-Petersburg, P.34.