

THE VIRTUAL CHARACTER OF SPONTANEOUS AND INDUCED
(WITH THE PARTICIPATION OF THERMAL NEUTRONS)
TERNARY FISSION OF NUCLEI WITH THE EMISSION OF PRESSION
NUCLEONS AND LIGHT NUCLEI

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In elementary particle physics there are known virtual reactions and decays associated with the appearance in their amplitudes of Green's functions of intermediate particles corresponding to their virtual states, whose energies and momenta are not related by Einstein's relativistic formula. Such processes include, for example, Compton scattering of γ - quanta on free electrons [1]. In nuclear physics, it is also possible to identify [2] virtual reactions and decays, when intermediate nuclei appear in their amplitudes of Green functions associated with their virtual states, lying in energies outside the mass surfaces of the processes under consideration. These decays include the double β - decay of atomic nuclei [3]. It was demonstrated in [4-5] that two-proton decay [4] and ternary nuclear fission with the emission of alpha-particles [5] can also be described using the conception of their virtuality.

Using the results of [6-7] it is shown that the conception of the virtuality of spontaneous and induced (with the participation of thermal neutrons) ternary nuclear fission with the emission as third particles not only of alpha-particles, but also of precession neutrons, protons, and light nuclei (d, t, ^3He) allows us to successfully describe the most important characteristics of these processes (yields, angular and energy distributions of third particles).

1. A.I. Akhiezer, V.B. Berestetskii, Quantum Electrodynamics (Fizmatgiz, Moscow, 1959).
2. S.G. Kadmsky, A.O. Bulychev, Bull. Russ. Acad. Sci., Phys. **80**, 1009, (2016).
3. L.A. Sliv, JETP **20**, 1035 (1950).
4. S.G. Kadmsky, U.V. Ivankov, Phys. At. Nucl. **77**, 1019 (2014).
5. S.G. Kadmsky, U.V. Ivankov, Phys. At. Nucl. **77**, 1532 (2014).
6. S.G. Kadmsky, L.V. Titova, Bull. Russ. Acad. Sci., Phys. **85** 732 (2021).
7. S.G. Kadmsky, S.V. Kufaev, Y.O. Otvoenko, Bull. Russ. Acad. Sci., Phys. **86** 1332, (2022).