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SHAKE AS THE DETERMINING MECHANISM OF THE NEUTRINOLESS DOUBLE ELECTRONIC CAPTURE

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The process of double neutrinoless e-capture is of great interest as a test of the Majorana nature of neutrino. This process is traditionally considered as as a resonance one, since not a single particle is emitted as a result of the nuclear transformation [1]. For this reason, it cannot occur in bare nuclei, even if the energy release $Q > 0$. In contrast, we performed calculations of the probability of shake off and up, with the ionization or excitation of the electron shell during the the nuclear transformation. 152Gd nuclei have the lowest resonance defect among all known nuclei. It is considered as one of the main candidates for discovering the neutrinoless mode of the process [2]. As a result, the contribution of the new mechanism turns out to be smaller than that of the traditional resonance mechanism, thus representing a correction to the decay probability. However, the value of this amendment is high enough, attaining twenty-three percent [3].
It rapidly increases with increasing resonance defect, so that for other nuclei it exceeds the contribution of the resonance mechanism and becomes the main mechanism of the double neutrinoless electron capture. Thus, in the case of 164Er its contribution is already 4.5 times as high as from the traditional resonance mechanism. Therefore, account of the shake mechanism increases the decay rate by an order of magnitude. One can conclude that the double neutrinoless e-capture appears not to be a resonance process at all.

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