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Application of the residual surface delta interaction in the decay of ${}^{40}_{21}\text{Sc}$ nucleus

A Yarahmadi, V Dehghani, and S A Alavi

Department of Physics, Faculty of Science, University of Sistan and Baluchestan, Zahedan, Iran

E-mail: vdehghani@phys.usb.ac.ir

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Abstract

In this paper, the beta decay of ${}^{40}_{21}\text{Sc}$ has been investigated. By using the eigenfunctions of the spherical oscillator, the eigenvalues and eigenfunctions of the Woods-Saxon potential with spin-orbit and Coulomb terms have been calculated. In order to obtain the more realistic nuclear wave functions, the surface delta interaction potential has been used as the residual interaction between the valence nucleons in the framework of Tamm-Dancoff approximation (TDA) in the case of ${}^{40}_{20}\text{Ca}$ and particle-hole Tamm-Dancoff approximation (pnTDA) in the case of ${}^{40}_{21}\text{Sc}$. The potential constants have been obtained by fitting the results with the experimental data. The half-life and transition probability of the positive beta decay of ${}^{40}_{21}\text{Sc}$ have been calculated. A good agreement with the experimental data was observed.

Keywords: beta decay, Woods-Saxon potential, Tamm-Dancoff approximation (TDA), surface delta interaction, residual interaction

For full article, refer to the Persian section