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Research note

## Study of Nilsson potential at different nuclear deformations

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### Abstract

Using a computing code, Nilsson Hamiltonian energies have been calculated based on the perturbative treatment at different deformation parameters. Special attention is given to the projection of a proton state on the asymptotic basis functions. The calculations show that the spin-orbit and  $\ell^2$  terms couple different asymptotic eigenstates and thus the Nilsson Hamiltonian would not be diagonal in these basis functions. With increasing the deformation, the non-diagonal terms become smaller. Therefore, at enough large deformations  $\varepsilon \geq 0.4$ , the asymptotic quantum numbers will be good quantum numbers.

**Keywords:** Nilsson model, perturbative treatment, deformation parameter, asymptotic eigenstates, good quantum numbers

For full article, refer to the Persian section