

Two quasiparticle k-isomers within the covariant density functional theory

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Abstract

Covariant density functionals provide a powerful phenomenological way to study nuclear structure phenomena. They have been mostly used in describing bulk nuclear properties of ground states and have been also very successful in the description of collective excitations. Nuclear excitations that form due to the inherent structure of nuclei and have a relatively long half-life are called isomers. They present an important phenomenon with interesting medical, technological and industrial applications. They also play a significant role in recent experimental and theoretical studies of nuclei far from stability, in nuclear fission and in the process of nucleosynthesis relative to astrophysics. In this study we concentrate on the single particle excitations of high k isomers that appear mainly at nuclei with well defined axial deformation. We employ the blocking effect to create two quasiparticle states within the relativistic hartree bogoliubov framework. At first we use the Equal filling approximation and then we break the time-reversal symmetry and include the effect of currents induced by the blocked nucleon states. We concentrate our interest in medium mass axially deformed nuclei where there have been several experimentally observed k-isomers and we can compare directly our results.