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Positive-parity states and electromagnetic transitions of odd-A Pr and Ce isotopes

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Energy levels and electromagnetic transition probabilities of odd-mass $^{129-135}$Pr and $^{127-133}$Ce isotopes have been calculated using the interacting boson fermion model. The even–even $^{128-134}$Ce isotopes have been used as the cores. In the model space, the bosons have angular momentum, $L = 0$ (s-boson) and $L = 2$ (d-boson) have been considered, while the nine protons for $^{129-135}$Pr and 19–25 neutrons for $^{127-133}$Ce are allowed to occupy the $1g_{7/2}, 2d_{5/2}, 2d_{3/2}, 3s_{1/2}$ and $1h_{11/2}$ single particle orbitals. The quasi-particle energies and occupation probabilities have been obtained by solving the BCS equation. According to the model space, the wave function for low-lying states has been investigated. The calculated results are in good agreement with the available experimental data.

Keywords: Nuclear structure; energy levels; interacting boson fermion model.

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1. Introduction

The interacting boson model (IBM) clarifies substantial steps to describe the nuclear structure of several medium and heavy nuclei.[1–10] In order to study low-energy states of even–even nuclei, the Hamiltonian of the model has been written in terms of s-boson with $L = 0$ and d-boson with $L = 2$.[11–16] In the simple version of the model, no distinction is made between proton and neutron bosons, so all states in IBM-1 are symmetric. The U(6) unitary group of the IBM Hamiltonian can be reduced in terms of generators of U(5), SU(3) and O(6) subgroups.[17–19] Therefore, three dynamical symmetries will appear, which can be considered as limiting cases. The spectrum and electromagnetic transition selection rules were appeared

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