

Characterization of energy levels in the nucleus ^{170}Lu

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Abstract. Configuration assignments are derived for the observed energy levels in the odd-odd deformed nucleus $^{170}\text{Lu}_{99}$ based on the calculations of the two-particle band head energies for a zero range residual interaction, the beta-feeding characteristics, and the observed features for similar bands in the neighbouring nuclei. In particular, specific assignments are given for the $J^\pi = 1^+$ levels at 198.4 keV, 349.0 keV and 785.5 keV. The ambiguities with respect to the assignments for the $K^\pi = 3^-$ bands are discussed. A new isomer with $J^\pi = 7^+$ and half-life of several seconds is predicted around (225 ± 25) keV and experiments are suggested to identify it.

Keywords. Doubly-odd deformed nucleus ^{170}Lu ; energy level Nilsson assignments; $\log ft$ considerations; residual interaction energy calculations.

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1. Introduction

The experimental information on the energy levels of the doubly odd deformed nucleus ^{170}Lu has come primarily from the electron capture of ^{170}Hf studied during the late sixties (Treherne *et al* 1964, 1969; Bjornholm *et al* 1965; Harmatz and Handley 1966; Abou-Leila *et al* 1968; Chu and Reednick 1970). Even though this information is incomplete and the characterization of the identified levels is mostly tentative or speculative, no theoretical or experimental studies on this nucleus have been reported over the past seventeen years (Schmorak and Auble 1975; Lederer and Shirley 1978; Chunmei 1987). On the theoretical side, detailed studies predicting the band head energies of the full spectrum of the two quasi-particle states in the odd-odd nuclei based on a quantitative evaluation of the neutron-proton residual interaction energy are scarce. Matching of the observed states to the expected two-particle configurations is usually attempted on the basis of the summed neutron and proton single particle energies coupled with the empirical Gallagher-Moszkowski (1958) (GM) rule for the relative ordering of the $K^+ = \Omega_p + \Omega_n$ and the $K^- = |\Omega_p - \Omega_n|$ band heads. Whereas the GM splitting energies (Boisson *et al* 1976; Elmore and Alford 1976a) provide a measure of the spin-dependent part of the residual neutron-proton interaction V_{np} , the spin-independent (Wigner) part of this interaction remains undetermined in such studies. Consequently, relative placement of the various two particle bands in a given

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