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Superdeformed triaxial bands in ^{163,165}Lu

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Abstract

An experimental investigation of the nucleus ^{165}Lu, using the reactions ^{138}Ba(^{31}P,4n)^{165}Lu and ^{150}Sm(^{19}F,4n)^{165}Lu at beam energies of E = 155 and 95 MeV, respectively, has been performed. Among other additions to the existing level scheme, a new band, with transition energies almost identical to a strongly deformed ($\beta_2 \sim 0.42$) $\pi i_{13/2}[660\ 1/2^+]$ band recently discovered in ^{163}Lu has been established. A theoretical analysis of the structure of the two Lu isotopes, ^{165}Lu and ^{163}Lu is carried out by detailed calculations of total potential energy surfaces for specific configurations. By a diabatic treatment of crossings specific proton configurations as $\pi i_{13/2}[660\ 1/2^+]$ are identified throughout the deformation space and as a function of spin. It is found as a general feature that well deformed local minima of considerable nonaxial symmetry coexist with a normal deformed global minimum. The depth of these local minima depend on configuration. The structure of the different global and local minima found in these surfaces are analysed and discussed in terms of occupation of available basis configurations and their orientation relative to the rotation axis. The strongly deformed minima are found to belong to a group of superdeformed triaxial structures, expected to appear at low energies for certain favourable combinations of proton and neutron numbers.

Keywords: Nuclear reactions ^{138}Ba(^{31}P,4n)^{165}Lu and ^{150}Sm(^{19}F,4n)^{165}Lu, E = 155 and 95 MeV; measured E_γ, γ-γ coin., I_γ, ^{165}Lu deduced levels, $i_{13/2}[660\ 1/2^+]$ rotational band-structure. Enriched target, array of Compton suppressed Ge-detectors. Calculation of superdeformed highly triaxial local minima in configuration separated total energy surfaces (TES)

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