

1 EXTENSIVE STUDY OF THE WOBBLING PROPERTIES IN ^{163}Lu BASED ON
2 A PARITY SYMMETRY PROPERTY

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13 *Abstract.* A new interpretation on the wobbling structure in ^{163}Lu is developed,
14 based on the concept of parity symmetry. It is known that four wobbling bands are
15 experimentally observed in this isotope, where three of them are considered as wobbling
16 phonon excitations (namely TSD_2 , TSD_3 , and TSD_4) and the yrast band for the
17 ground state (that is TSD_1). In the present work, the trial function that is used for
18 obtaining the wobbling spectrum is analyzed in terms of its behavior under the rotation
19 operation. Indeed, due to a specific symmetry to rotations with π around the 2-axis
20 of the triaxial system, the parity becomes a good quantum number. As such, the trial
21 function admits solutions with negative parity, which belong to the rotational states
22 in TSD_4 . A unified description of all the triaxial super-deformed bands in ^{163}Lu is
23 achieved with the new formalism.

24 *Key words:* Wobbling Motion, Nuclear Structure, Parity Symmetry.

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1. INTRODUCTION

27 Wobbling motion in nuclei was extensively studied in the recent years, and the
28 scientific community finally shed some light on this elusive phenomenon. This kind
29 of collective motion was firstly predicted by Bohr and Mottelson, more than 50 years
30 ago [1].

2. THEORETICAL BACKGROUND

31 In a previous work, a complete description of the triaxial characteristics of
32 the Lu isotopes was given, where results for the wobbling energies and transition
33 probabilities were presented [2].

34 In this paper, the wobbling spectrum is represented. See Figure 1 for more
35 details.

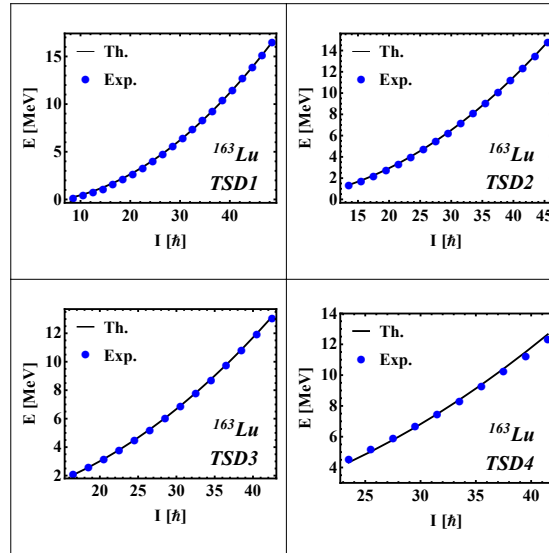


Fig. 1 – The excitation energies for the wobbling spectrum of ^{163}Lu . Comparison with the available experimental data.

36 The trajectories of a rotational state from TSD_1 is graphically represented in
37 Figure 2.

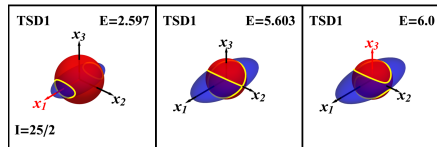


Fig. 2 – The contour plots with the energy function \mathcal{H} of the nucleus, evaluated for the obtained fit parameters.

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