

# New results concerning the wobbling properties of $^{183,187}\text{Au}$

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## 1 Introduction

Two wobbling sequences have been identified in  $^{183}\text{Au}$  by Nandi et. al. [1]. One sequence has two bands with states of negative parity (built on top of the odd  $h_{9/2}$  proton) and two bands with states of positive parity (built on top of the odd  $i_{13/2}$  proton). Both sequences are considered to have  $n_w = 0$  for the *yrast* band and  $n_w = 1$  for the one-phonon wobbling band.

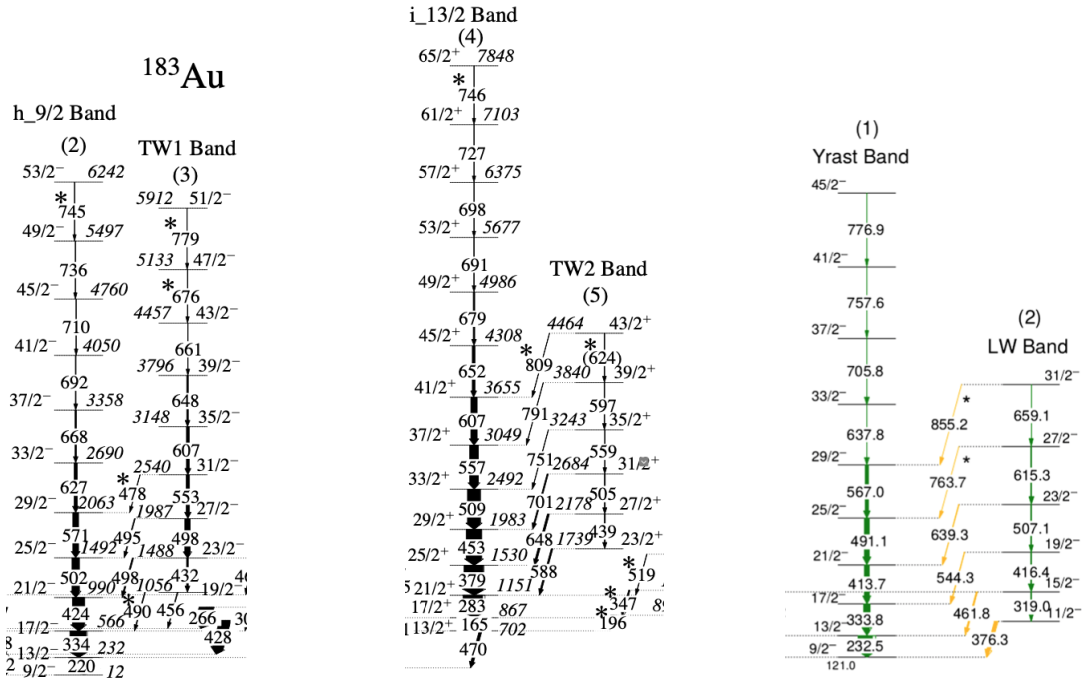


Figure 1: **Left:**  $^{183}\text{Au}$ : negative parity states based on  $j = 9/2$ . **Middle:**  $^{183}\text{Au}$ : positive parity states based on  $j = 13/2$ . **Right:** The wobbling structure in  $^{187}\text{Au}$ .

On the other hand, Sensharma et. al. [2] has confirmed wobbling motion in  $^{187}\text{Au}$ , with the identification of two such bands, show in figure 1.

## 2 Numerical application

By using the same formalism as the one applied for  $^{163}\text{Lu}$  in [3]. Namely, the both positive and negative wobbling sequences from  $^{183}\text{Au}$  were described with the same analytical expressions for the *excitation energies*.

$$E_{\text{exc}}(I) = \varepsilon_j + \mathcal{H}_{\text{min}}(I) + \Omega_1^I (n_{w_1} + 1) + \Omega_2^I (n_{w_2} + 1) , \quad (1)$$

such that  $E_{\text{exc}}(I) = \mathcal{F}(I, j; \mathcal{P})$ , where  $\mathcal{P} = [\mathcal{I}_1, \mathcal{I}_2, \mathcal{I}_3, V, \gamma]$  is the **free parameter set**.

The wobbling frequencies  $\Omega_1$  and  $\Omega_2$  are the solutions of the algebraic equation:

$$\Omega^4 + B\Omega^2 + C = 0 \quad (2)$$

and

$$\Omega_1 = \sqrt{\frac{1}{2} \left( -B + \sqrt{B^2 - 4C} \right)} \quad (3)$$

$$\Omega_2 = \sqrt{\frac{1}{2} \left( -B - \sqrt{B^2 - 4C} \right)}. \quad (4)$$

## References

- [1] S Nandi, G Mukherjee, QB Chen, S Frauendorf, R Banik, Soumik Bhattacharya, Shabir Dar, S Bhattacharyya, C Bhattacharya, S Chatterjee, and et al. First observation of multiple transverse wobbling bands of different kinds in  $^{183}\text{Au}$ . *Physical Review Letters*, 125(13):132501, 2020.
- [2] N Sensharma, U Garg, QB Chen, S Frauendorf, DP Burdette, JL Cozzi, KB Howard, S Zhu, MP Carpenter, P Copp, and et al. Longitudinal wobbling motion in  $^{187}\text{Au}$ . *Physical review letters*, 124(5):052501, 2020.
- [3] R Poenaru and AA Raduta. Parity partner bands in  $^{163}\text{Lu}$ : A novel approach for describing the negative parity states from a triaxial super-deformed band. *International Journal of Modern Physics E*, page 2150033, 2021.