

SIGNATURE INVERSION IN DOUBLY ODD $^{124}\text{La}^*$

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The doubly odd nucleus ^{124}La has been populated using the $^{64}\text{Zn}(^{64}\text{Zn},3p1n)$ reaction in order to analyse the characteristic signature inversion [1] that is known to be present in this region. The experiment was performed at the Argonne National Laboratory using a 260-MeV ^{64}Zn beam supplied by the ATLAS superconducting linear accelerator. Gammasphere was used in conjunction with the Microball charged-particle detector, the Neutron Shell and the Fragment Mass Analyser (FMA) to cleanly select the desired evaporation residues. High-spin states of ^{124}La have been observed and the level scheme extended with the addition of two new bands. The spin and parity of many states have been inferred for the first time due to the observation of linking transitions between four of the five observed bands. Two of these bands have been assigned the $\pi h_{11/2} \otimes \nu h_{11/2}$ configuration with the yrast sequence exhibiting signature inversion in its level energies *below* $I=18.5\hbar$ while the excited band exhibits this phenomenon *above* $I=18.5\hbar$. The observation of these $\pi h_{11/2} \otimes \nu h_{11/2}$ near-degenerate twin bands has also been linked to evidence for chirality [2] which is attributed to triaxial deformation of this nucleus. $B(M1)/B(E2)$ ratios of reduced transition probabilities have been measured and display a signature dependence (staggering) in the two $\pi h_{11/2} \otimes \nu h_{11/2}$ bands.

Another band that is not in prompt coincidence with the main structures has been identified in ^{124}La and is believed to be built upon the high-spin isomer observed in previous β -decay studies [3]. The $\Delta I=1$ transitions of this band have angular distributions with positive A_2 coefficients implying positive E2/M1 multipole mixing ratios. Positive mixing ratios are evident in the $\pi g_{9/2} \otimes \nu h_{11/2}$ bands of neighbouring doubly odd antimony and iodine isotopes; this configuration, with $K^\pi = 8^-$, is therefore attributed to the band and it represents the first evidence of the $\pi g_{9/2}$ proton orbital in a doubly odd lanthanum isotope. A rotational alignment of $h_{11/2}$ protons occurs in the band at a similar rotational frequency to those seen in the $\pi g_{9/2}$ bands of neighbouring odd-A lanthanum isotopes; this alignment is blocked in all the other bands of ^{124}La .

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2. K. Starosta et al., Phys. Rev. Lett. **86** (2001) 971.

3. N. Idrissi et al., Z. Phys. **A341** (1992) 427.