High Spin Physics 2001, Warsaw, February 6-10, 2001

Abstract No: 037
Submitted on: 11 Jan 2001, 15:00 GMT

Title: **Signature Inversion in Odd-odd Pr Nuclei**

Author(s): L.L. Riedinger,[1,2] D.J. Hartley,[1] A. Galindo-Uribarri,[2] B.H. Smith,[1] C. Baktash,[2] M.P. Carpenter,[3] M. Danchev,[1] M. Devlin,[4] C.J. Gross,[2] R.V.F. Janssens,[2] M. Lipoglavsek,[2] S.D. Paul,[2] D.C. Radford,[2] W. Reviol,[1,4] D.G. Sarantites,[4] D. Seweryniak,[3] C.-H. Yu,[2] and O. Zeidan[1]

Affiliation(s): [1] *Department of Physics and Astronomy, University of Tennessee, Knoxville, TN 37996*
[2] *Physics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831*
[3] *Physics Division, Argonne National Laboratory, Argonne, IL 60439*
[4] *Chemistry Department, Washington University, St. Louis, MO 63130*

A series of experiments have been performed to populate high-spin states in neutron-deficient odd-odd ^{126,128,130}Pr. The ^{40}Ca + ^{92,94}Mo reactions were used to produce these $Z = 59$ isotopes. Rotational structures in ^{126,128}Pr were identified in an experiment utilizing the new Clarion Ge clover and HyBall CsI charged-particle arrays, along with the Recoil Mass Spectrometer, at Oak Ridge National Laboratory. In fact, excited states in ^{126}Pr were observed for the first time, which makes it the lightest known odd-odd Pr isotope. The other experiments used Gammasphere, in conjunction with the Washington University Microball, to extend the sequences to high spins ($\sim$40 $\hbar$).

While many rotational bands were observed in each nucleus, the yrast $\pi h_{11/2} \nu h_{11/2}$ sequences are of particular interest due to the observation of signature inversion [1] at lower spins. Although several attempts have been made to describe signature inversion, an adequate explanation for this behavior is still elusive. The validity of the theories is often tested by how well the model reproduces systematic trends; therefore, establishing these experimental trends is crucial for understanding the mechanism(s) behind signature inversion. With the present work, it is now possible to examine the systematics in the praseodymium nuclei. A trend of increasing initial energy staggering with N is observed in the Pr isotopes. This result is compatible with the idea of triaxial deformation causing the inversion [1], as γ likely increases with N. However, this trend is *opposite* to that found in the nearby Cs ($Z = 55$) nuclei [2], where the initial energy staggering decreases with N. These differing systematics pose a substantial challenge for any model that attempts to describe the signature inversion phenomenon in the mass 130 region.

References

[1] R. Bengtsson *et al.*, Nucl. Phys. **A415**, 189 (1984).

[2] J.F. Smith *et al.*, Phys. Lett. B **406**, 7 (1997).

Invited talk.