SEARCH FOR HIGH-SPIN STRETCHED STATES IN ^{206}Pb

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Final data have been extracted for IUCF experiment E352, in which the K600 spectrometer was used to measure triton energy spectra for the ($\vec{p}$,t) reaction on ^{208}Pb at 120-MeV proton incident energy. The overall energy resolution of the resulting triton energy spectra, after the replay,[1] was 25–40 keV. The spectra were stripped and yields were extracted in order to calculate cross sections and analyzing powers for as many as possible of the high-spin states in ^{206}Pb.

The objective of this work is to search for low-lying high-spin stretched states (J=6–12) in ^{206}Pb. For example, states such as $J^\pi=8^+$, 10^+, 12^+ and $J^\pi=9^-$, 11^- are expected to be nearly pure $(i_{13/2}^{-1})$ and $(i_{13/2}^{-1}h_{9/2}^{-1})$ neutron pair-hole configurations respectively. These states will provide a test for the residual shell-model interaction and also will calibrate absolute spectroscopic factors and distorting potentials. By measuring energies and spectroscopic factors for as many as possible of these states predicted in a given configuration space,[2] contributions from the central, spin-orbit and tensor parts of the residual interaction may be determined.[3] Analyzing power data will be sensitive to the effects of one and two-step transitions,[4] interference between them, and finite-range processes as well as to nuclear structure.

A secondary goal is to use these data, together with those for the low-spin states at lower proton energies, to test current ideas[5] on modifications of the residual interaction due to meson and nucleon mass reduction in the nuclear medium (an enhancement of the central and spin-orbit parts and a reduction of the tensor part are predicted).

A byproduct of this experiment will be the study of the high-spin structure of deep pair-hole states in the excitation region above the pure one pair-hole states where collective pair-hole modes of inner shells are expected.

Momentum matching considerations indicate that at 120 MeV proton incident energy, the ($\vec{p}$,t) reaction will selectively populate states of total angular momentum J$\sim$qR=11–12 in ^{206}Pb. In the present experiment we are able to resolve, for the first time, those high-spin states and extract angular distribution for cross sections and analyzing powers. Only one (p,t) experiment has been done near this energy,[6] but with an energy resolution of about 140 keV. Thus, most of those states of interest were unresolved and angular momentum transfer assignments were sometimes ambiguous because of their monotonically decreasing cross sections.

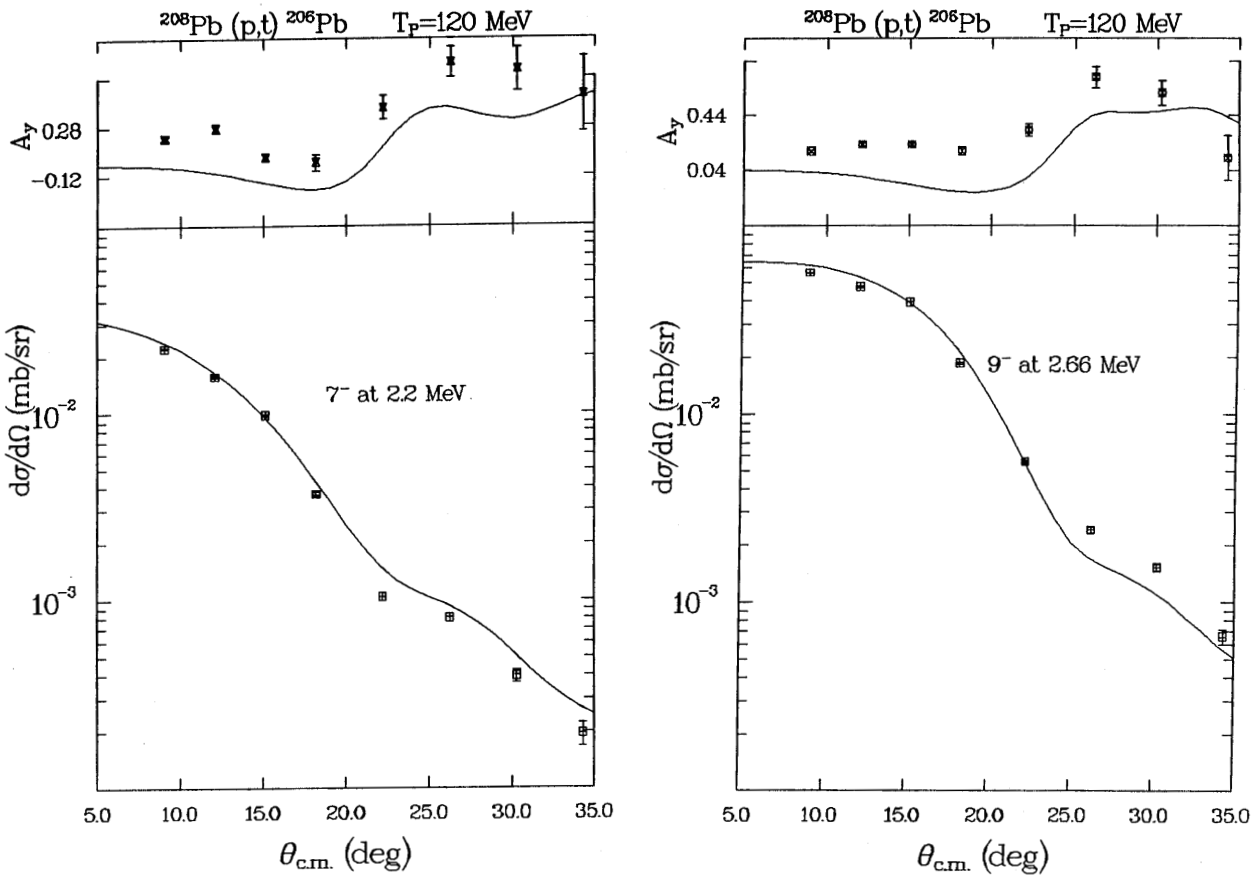

Figure 1. Experimental cross sections (full dots) and analyzing powers (open dots). Zero-range DWBA calculations (full line).

Experimental distributions of cross sections and analyzing powers for some of the high-spin states in ^{206}Pb are shown in Fig. 1 and Fig. 2. The full lines represent zero-range DWBA predictions. All of those states were considered to be almost pure neutron pair-hole configurations,[2] and the zero-range normalization constant was determined to be D_0^2=7.4 (in units of 10^4 fm^{3}MeV^2). This value agrees well with that reported in Ref. 6. Finite-range and two-step calculations are currently in progress, in order to investigate why the analyzing power data are not well represented by the present calculations.

1. D.N. Mihailidis, *et al.*, IUCF Sci. and Tech. Report, May 1991-April 1992, p. 65.
2. T.T.S. Kuo and G. Herling, Naval Research Memorandum Report **2258**, 1971, unpublished.
3. D.C. Zheng and L. Zamick, in *The Effects of Spin-orbit and Tensor Interactions in Nuclei*, Rutgers University preprint, October 1990.
4. K. Kubo, private communication.

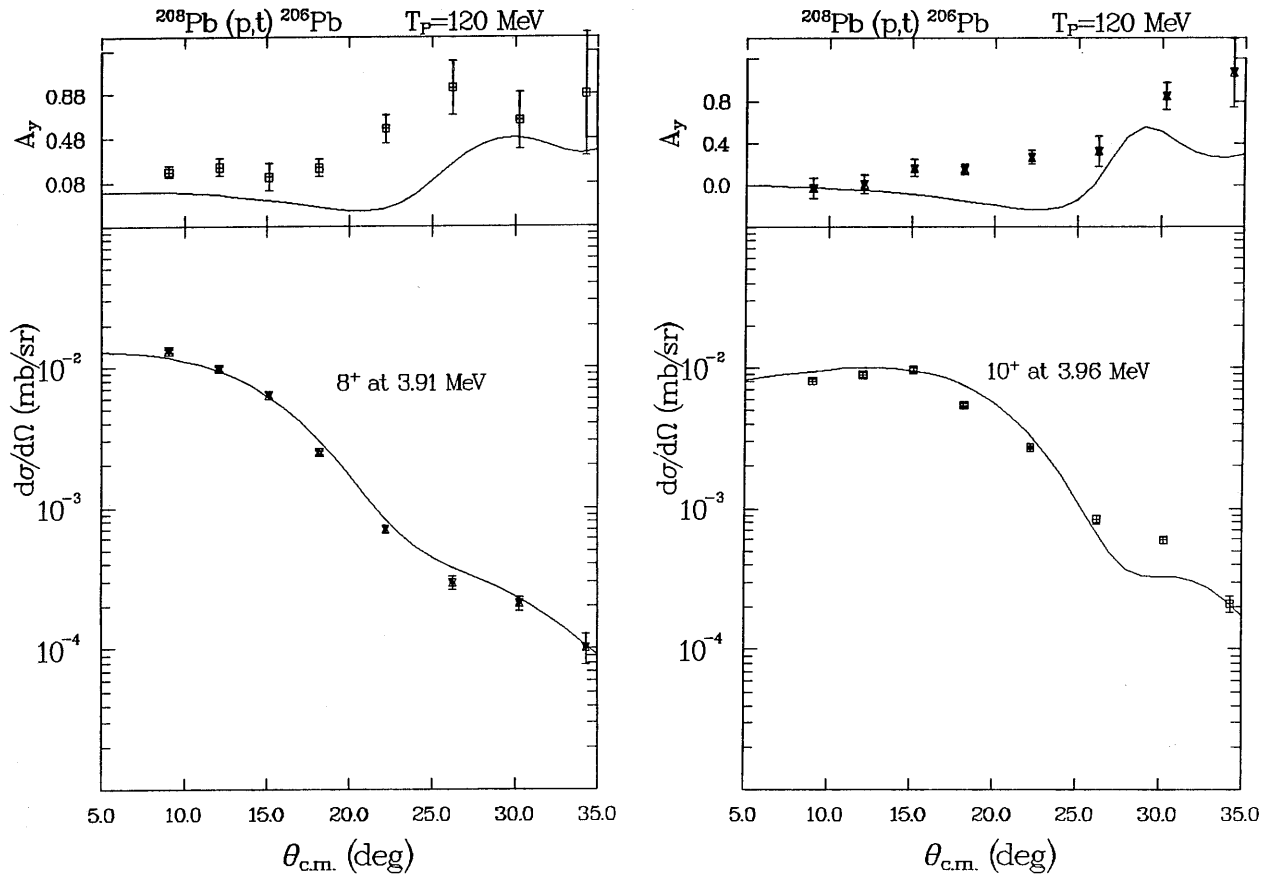

Figure 2. Experimental cross sections (full dots) and analyzing powers (open dots). Zero-range DWBA calculations (full line).

5. G.E. Brown and M. Rho, Phys. Lett. **B237**, 3 (1990); also Phys. Lett. **A222**, 324 (1989).
6. E. Gerlic, *et al.*, Phys. Rev. C **39**, 2190 (1989).