Study of the ^{142}Nd($\vec{p},\alpha$)^{139}Pr Reaction.

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In order to investigate the existence of ^{140}Pr states homologous to the low excitation energy states of ^{139}Pr and the spectator role of the unpaired neutron $2f_{7/2}$ of the ^{143}Nd target nucleus, the ^{143,142}Nd($\vec{p},\alpha$)^{140,139}Pr reactions [1,2] have been measured at 23.5 MeV incident proton energy, using the Stern-Gerlach atomic beam source of negative polarized hydrogen ions, in a high resolution measurement.

The angular distributions of cross sections ($\sigma(\theta)$) and analyzing powers ($A_y(\theta)$) of the triton pickup reaction ^{142}Nd($\vec{p},\alpha$)^{139}Pr have been measured from 10^o to 60^o in two different magnetic settings of the Q3D magnetic spectrograph.

A DWBA analysis of $\sigma(\theta)$ and $A_y(\theta)$ has been carried out assuming a semimicroscopic pickup mechanism. The calculations in finite range approximation have been performed with the code TWOFNR [3], using a Gaussian proton-triton interaction potential. The optical model parameters are reported in table 1.

The figure presents the comparison between experimental (dots) and calculated (solid lines) $\sigma(\theta)$ and $A_y(\theta)$ for the population of several ^{139}Pr levels.

References

[1] P. Guazzoni *et al.* Annual report 2002, p. 13.
[2] P. Guazzoni *et al.* Annual report 2002, p. 14.
[3] M. Igarashi, Computer code TWOFNR, (1977).

Table 1:

	V_r (MeV)	r_r (fm)	a_r (fm)	W_v (MeV)	r_v (fm)	a_v (fm)	W_d (MeV)	r_d (fm)	a_d (fm)	V_{so} (MeV)	r_{so} (fm)	a_{so} (fm)	r_c (fm)
p	49.45	1.25	0.696	3.29	1.24	0.51	5.0	1.24	0.51	7.5	1.27	0.467	1.25
α	162.0	1.44	0.6	27.29	1.44	0.6							1.30