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1.2 Imaginary Spin-Orbit Potential in the case of ^{40}Ar ($\vec{n}$,n_o)-Scattering

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Some results of recent experiments with polarised neutrons require an imaginary spin-orbit potential W_{SO} /FLO 81, TOR 82/. Furthermore, in the analysis of ^{9}Be ($\vec{n}$,n_o)-scattering /BYR 84/, the radius of the imaginary spin-orbit potential was extended to larger values in comparison to the real part.

In order to investigate these problems in more detail the ^{40}Ar ($\vec{n}$,n_o)- and the ^{40}Ar (n,n_1) reactions were measured at E_n=11 and 13.5 MeV /SCH 85/, using the Erlangen multidetector neutron facility /BLA 85/ and a special dewar for liquid argon. The experimental results were corrected for finite geometry, multiple scattering and neutron detection efficiency. The analysis has been made using the codes GOMEL /LEE 83/ and ECIS 79 /RAY 83/. For the best fit all parameters were varied simultaneously.

The parameters for the real and imaginary central potentials obtained from a simultaneous fit at both energies are similar to the global parameter set A of Rapaport et al /RAP 79/. However, we got different results for the depth of the absorbtive potential W_D=5.5 MeV at E_n=11 MeV and the diffuseness of the real spin-orbit potential a_{SO}=0.4-0.5 fm.

Fig. 1 and 2 show the data at E_n=11 MeV and SOM-calculations. The dotted curves correspond to a fit without W_{SO}, the full curves are the results of a separate fit with r_{WSO}=1.38 fm and W_{SO}=1.58$\pm$0.60 MeV. Taking this positive depth W_{SO} into account the X^2 values reduce from 4.7 to 2.8. An additional variation of r_{WSO} away from r_{WSO}=1.0 fm improves X^2 further to 2.0. At 13.5 MeV we obtained W_{SO}=1.39 $\pm$ 0.5 MeV. Coupled channels-calculations with the first 2^+ state coupled to the groundstate give the same results for the elastic channel.

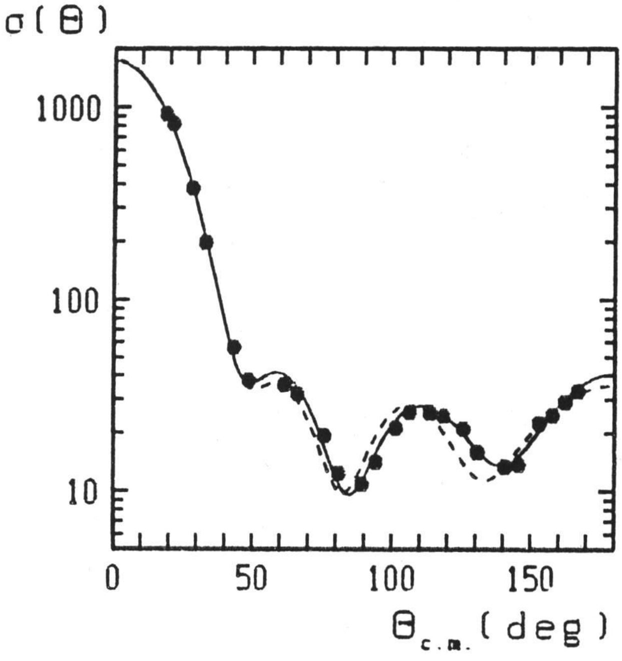

Fig.1 Differential cross section power for ^{40}Ar (n,n_o) at E_n=11MeV. Calculations are best fits: dotted curves without an imaginary spin-orbit potential W_{SO}, full curves with W_{SO}=1.58 MeV.

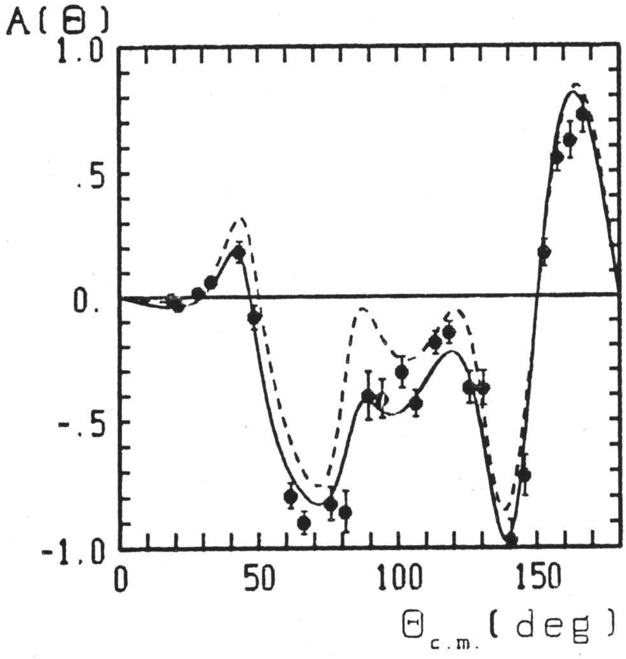

Fig.2. Analysing power for $^{40}Ar(\vec{n},n_o)$ at E_n=11 MeV. Same calculations as in Fig.1.

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