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1.3 Fourier-Bessel-Analysis of $^{52}Cr(\vec{n},n_o)$ Scattering

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In order to check Woods-Saxon (WS)-parametrisation of the nucleon-nucleus-potentials we analysed our elastic scattering data on chromium (E_n = 11 MeV and 13 MeV) /WEI 85/ and argon (E_n = 11 MeV and 13.5 MeV) using the Fourier-Bessel (FB)-expansion in the GOMEL-Code /LEE 83/. The total number of FB-coefficients is limited by two facts: a too large number would increase the error-band of the potential, while a too small number would limit the variability of the shape. One criterion for the minimum number needed is the reproduction of the usual WS-form and its derivative, which needs six and eight coefficients, respectively, with $_{cutoff}$ = 9 fm.

Fig. 1 shows the chromium data with calculations using the set A of Rapaport /RAP 79/ (full curve), a readjustment of only the depth of both V and W_D (dotted) and finally with a search on the real spin-orbit (SO)-potential parameters (dashed-dotted). The fits yield a value for W_D approx. 2 MeV smaller and a_{so} = 0.5 fm. By the FB-analysis of our data we got similar fits. Obviously the WS-form and its derivative are good approximations for chromium in this energy range for the central potentials (fig. 2).

For the analysis of the imaginary SO-potential the argon data /SCH/ are used, since the chromium data turned out to be insensitive to this term. In table 1 different calculations are compared. Here six and eight coefficiences are used for V and W_D, respectively:

Table 1. Dependence of X^2 for sequential substitution of the Woods-Saxon-Potentials (WS) by Fourier-Bessel-expansion (FB) and the influence of the W_{so}-term

	1	2	3	4	5
V	FB	FB	FB	FB	FB
W_D	WS	WS	FB	FB	FB
V_{so}	WS	WS	WS	WS	FB
W_{so}	-	WS	-	WS	-
X^2	2.87	1.46	2.34	1.22	1.59

For each column all parameters were varied until a best fit was obtained. The comparison of column 1 and 2 or 3 and 4 clearly shows that an additional positive imaginary SO-potential reduces X^2 by a factor of nearly two. In column 5 it is shown that this improvement caused by W_{so} cannot be simulated by a free choice of the real SO-potential.

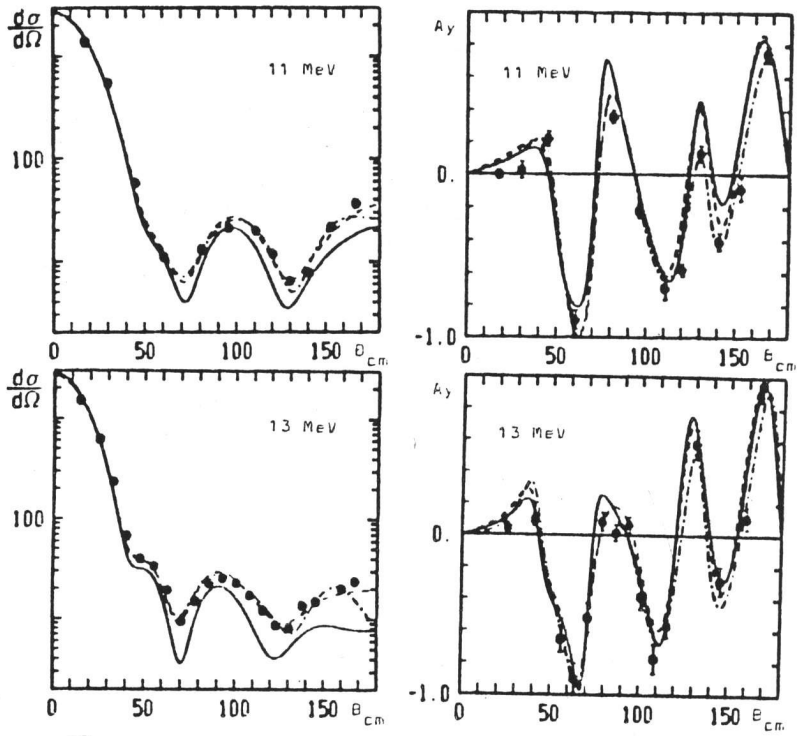

Fig. 1 $^{52}Cr.(n,n_o)$ data and different fits (see text)

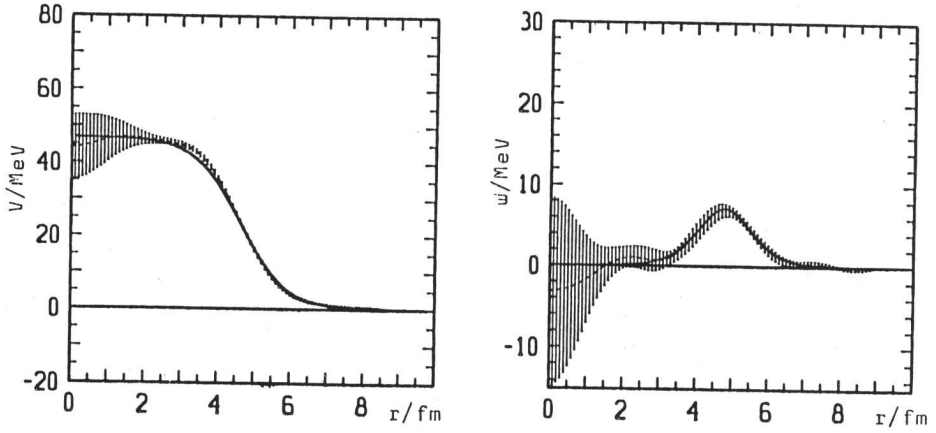

Fig. 2 Best fit results for central potentials by FB-expansion and by WS-analysis (full curve).

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