Elastic scattering of neutron from ^{40}Ca at 65 - 225MeV

S.Rafi[1]*, W. Haider [1], Dipti Pachouri[1], Manjari Sharma[1]
[1] *Department of Physics, Aligarh Muslim University, Aligarh, India*
** email:rafiindrabi@gmail.com*

We show the radial behavior of real part and imaginary part of the calculated central optical potential in Fig 1 for n -^{40}Ca elastic scattering at incident energies E_n = 65, 75, 85, 95, 107.5, 127.5, 155, 185, 225MeV using Urbana V-14 [1] and Hamada Johnston realistic interaction[2]..

In the present work, we have analyzed neutron elastic scattering data at 65, 75, 85,107.5, 127.5,155,185,225 MeV from ^{40}Ca using optical model potential calculated in first order Brueckner theory from two sources. We have used Urbana V-14 soft core inter nucleon potential as well as hard core Hamada Johnston inter- nucleon potential. We denote the neutron-nucleus optical potential obtained using soft-core potential by V-14 and for the hard-core potential by HJ.

Nucleon-Nucleus optical potential are obtained mainly in two steps. Firstly one calculates the effective inter-nucleon interactions (g-matrices) at different incident neutron energies.

The optical potentials calculated as described above are then used in a spherical optical model computer code to calculate the differential elastic scattering data and other integrable observables at all the energies mentioned above.

The calculated potential have been scaled by overall normalization parameters λ_r , λ_i , λ_{sor} for the central real ,imaginary and real spin orbit parts to obtain best fit to data by minimizing χ2.The imaginary spin-orbit potential was kept
Our results are shown in figure 1(a) and figure 1(b). The volume integrals and total cross-sections are given in table 1-2.The results shown are the predictions of our model, that is all λ^s are constant. Figures show that the neutron zero at all these energies. differential elastic cross section from ^{40}Ca is nicely reproduced at all energies (65-225 MeV) considered here. Further, Table1-2 show that the χ2 /DF for V-14 case are systematically smaller then those for the HJ potential. Thus we can conclude that the soft core urbana V-14 gives rise to a better description of the data at these energies.

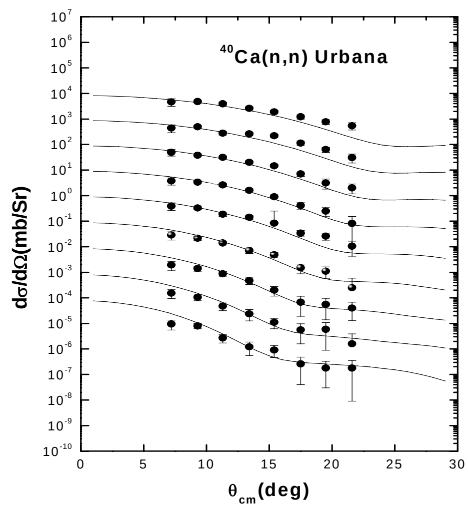

Figure 1(a)

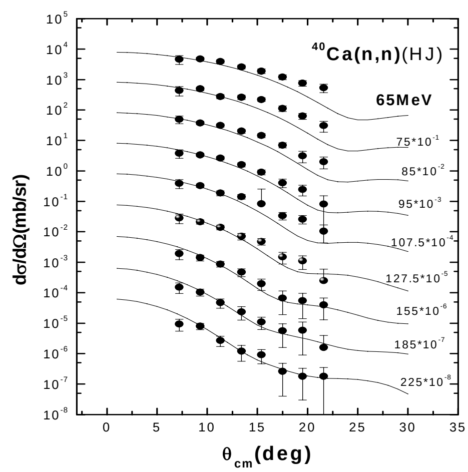

Figure 1(b)

TABLE 1: Integral observables for Neutron- ^{40}Ca elastic scattering for HJ interaction

E_n (MeV)	65	75	85	95	107.5	127.5	155	185	225
σ_{tot} (mb)	1939.859	1788.922	1649.308	1523.156	1397.567	1220.024	1047.891	919.845	849.156
σ_{el} (mb)	1023.328	932.340	842.759	758.624	668.302	544.548	420.653	327.058	271.573
σ_r (mb)	916.530	856.582	806.550	764.532	729.265	675.476	627.237	592.786	577.583
J_v/A Mev*F^3	276.98	258.53	241.98	226.90	211.84	187.04	156.97	125.38	93.02
J_w/A Mev*F^3	153.85	148.23	143.59	139.87	139.63	136.01	135.50	136.79	148.98
χ^2/DF	3.647	5.092	3.613	1.737	2.853	1.261	0.775	0.454	0.881

TABLE 1: Integral observables for Neutron- ^{40}Ca elastic scattering for Uv14 interaction

E_n (MeV)	65	75	85	95	107.5	127.5	155	185	225
σ_{tot} (mb)	1978.432	1851.891	1728.926	1614.445	1486.915	1319.601	1152.515	1035.407	944.030
σ_{el} (mb)	1103.765	1028.772	946.917	865.738	771.068	641.709	508.237	411.266	334.434
σ_r (mb)	874.668	823.118	782.009	748.707	715.847	677.892	644.278	624.141	609.596
J_v/A Mev*F^3	307.63	289.03	272.41	257.32	240.11	215.50	185.85	157.11	123.38
J_w/A Mev*F^3	136.02	134.26	133.32	133.01	133.45	135.73	140.91	149.20	161.92
χ^2/DF	2.685	3.773	1.989	0.899	1.625	1.338	1.593	1.575	2.265

Refrences

[1]. I.E Lagris and V.R Pandharipande Nucl. Phys A 359(1981) 331

[2]. T. Hamada and I. D. Johnston, Nucl. Phys.34 (1962)382