ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ

Лаборатория высоких энергий

V.S. Pantuyev, M.N. Khachaturyan

D-880

CROSS SECTION FOR 8,3 BeV
NEUTRON INTERACTION WITH NUCLEI

ЖЭТФ, 1962, т 42, в 3, с 909-910.

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Abstract

The total and inelastic cross sections for 8.3 BeV neutron interaction with carbon, aluminium, copper, tin and lead nuclei have been measured.

The total and absorption cross section for the interaction of 8.3 BeV neutrons with carbon, aluminium, copper, tin and lead nuclei were measured at the Joint Institute synchrophasotron.

The measurements were made in 'good' and 'bad' geometry[1] by varying the distance between the target patterns and the detector. For the carbon and lead nuclei, the cross sections were also measured at the intermediate values of the angle θ (see Fig. 1). To reduce the influence of the fluctuations in the apparatus, the measurements were made with a target and without it. The automatic device makes it possible to change the positions with a 'target' and without a 'target' each 10-12 cycles of the accelerator operation.

The carbon, copper and lead targets were 20.33 g/cm^2, 53.47 g/cm^2, and 60.50 g/cm^2 thick, respectively. The results of the experiments are listed in Table 1. A comparison of the magnitudes of the cross sections at the effective energy of 8.3 BeV with the corresponding cross sections at other energies[2,3] .see Table II) éndicates that the cross sections for the inelastic neutron interaction with nuclei are almost the same over a wide range of energies. At the same time, with increasing energy some drop in the magnitude of the cross section due to the decrease of the diffraction scattering cross section is obser ' 'or the total cross sections.

A theoretical consideration of the results of this experiment will be given elsewhere.

Table 1.

Cross sections for neutron interaction with nuclei vs angle (σ mb).

$\theta°$	Pb	Sn	Cu	Al	C
0.111	2257±156				
0.164	2581±126				307±13
0.228	2556±100	1805±57	1217±48	600±23	345±15
0.34	2142±50				
0.5	1919±46				
0.57	1757±43				280±8
1.0					238±4
2.0	1766±125				218±8
3.0	1636±81		626±29		
5.0	1713±66	1218±50		380±13	

Table II.

Energy dependence of the total and inelastic cross sections for neutron interaction with nuclei (σ mb).

energy (Bev)	Pb		Sn		Cu		Al		C	
	σ_a	σ_T	σ_a	σ_T	σ_a	σ_T	σ_a	σ_T	σ_a	σ_T
1.4	1727±45	3209±55	1158±63	2202±62	674±34	1388±39	414±23	703±18	201±13	378±10
4.5	1680±90	2320±130			638±24	1088±22			218±8	354±11
8.3	1713±66	2556±100	1218±50	1805±57	626±29	1217±48	380±13	600±23	218±8	345±15
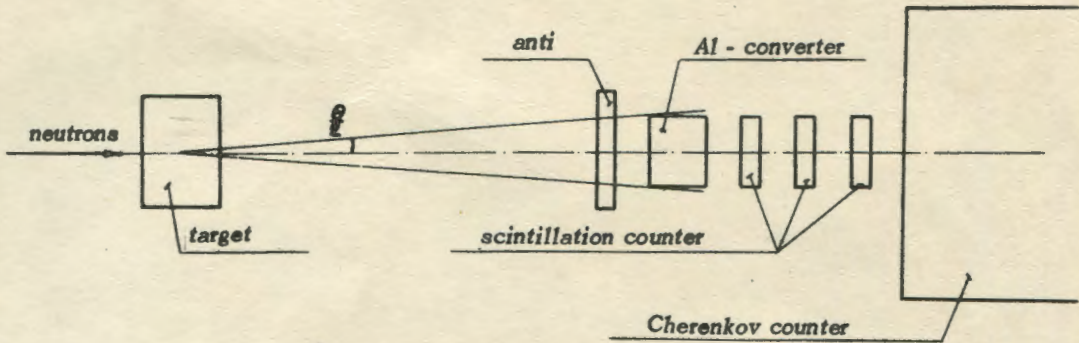
Experiment geometry

Fig. 1.

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