
MEASUREMENT OF NEUTRON REACTION CROSS SECTIONS BETWEEN 8 AND 14 MEV

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Cross section measurements were performed with special emphasis on access to the “blind spot” in the neutron energy range between 10 and 13 MeV. The use of a conventional D(d,n) neutron source in combination with detailed TOF measurements of the D(d,np) breakup component, necessary to take the non-monoenergetic contributions into account, allows the precise determination of monoenergetic cross section data. The energy scale of the experiment bases on time-of-flight measurements of the neutrons and yields final uncertainties of 20 keV.

The present measurement comprises cross section data of Zn-64(n,p)Cu-64, Zn-64(n,2n)Zn-63, Cu-63(n,2n)Cu-62 and Cu-65(n,2n)Cu-64. The measurement of the Zn-64(n,p)Cu-64 reaction is the only experiment which completely covers the shape of this cross section between 8 and 14 MeV. The high accuracy of the neutron energy scale allowed the determination of precise cross section data near threshold of the (n,2n) reactions. The reaction products of all of the investigated reactions were strong positron emitters. The radioactivity counting technique has been optimized to guarantee complete annihilation and considers counting losses due to annihilation in flight.

The uncertainties of the data are between 2.5% and 4%. The cross section data of the present work are compared with data of other experiments and of available evaluations.