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دراسة ميكروسكوبية لقطاعات البروتون الكلية التفاعلية لنظائر الكالسيوم

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Abstract : This thesis presents a microscopic study of proton-nucleus total reaction cross section for Ca isotopes in terms of a recently proposed semi- phenomenological nucleon density distribution which involves only one free parameter. The theoretical framework used for the study is the optical limit approximation of the Coulomb modified Glauber theory which takes the parameters of the nucleon-nucleon scattering amplitude and the nucleon density of the target nucleus as the input information. The main aim of the present work is to see how good the semi-phenomenological nucleon density model is in describing the proton total reaction cross sections for Ca isotopes. The importance of the study lies in the fact that in the semi-phenomenological model the proton and neutron densities both are described by a common half-density radius parameter R that is the sole free parameter of the model, and it can be easily fixed from the experimental charge rms radius. Once R is fixed, the model automatically predicts the neutron density distribution. Thus the density model provides a simple means of obtaining neutron density distribution in nuclei about which the presently available experimental information over a large part of the mass spectrum is rather meagre. In this work we demonstrate that subject to the limitations of the optical limit approximation of the Glauber theory, the semi-phenomenological nucleon density model gives a fairly satisfactory account of the experimental proton total reaction cross sections for Ca isotopes in the energy range of 20 -50 MeV. Thus the model reliably describes at least the gross features of the nucleon density distribution in Ca isotopes to which the reaction cross- section data are sensitive. In addition, based on the Karol model, we also propose a simple method to calculate nucleon-nucleus total reaction cross section in terms of the half -density radius and the nuclear surface-thickness parameters of the semi- phenomenological density model and show that it works reasonably well

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