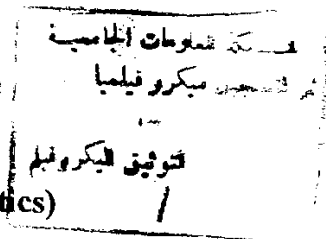


**AN APPROACH
FOR THE THREE-BODY FORCE
EFFECT ON p - ^3He COLLISION**



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THESIS
Submitted for the Degree
of
Doctor of Philosophy
in Science (Applied Mathematics)

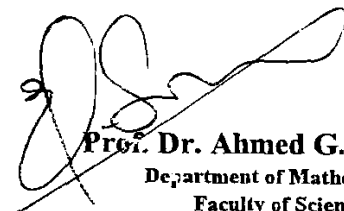


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SUMMARY

This thesis is concerned with the study of three-body force effect on $p-^3\text{He}$ collision at intermediate and high-energies in the framework of Glauber high-energy approximation. A simple approach is used to include the three-body force effect in the Glauber formalism. Using this corrected formalism, different cross sections of $p-^3\text{He}$ collision are calculated.

The thesis consists of four chapters as follows:

Chapter I.

In this chapter, a brief presentation of the three-body force effect on the calculations of the three-nucleon system, specially, of the nucleon-nucleus collision in references are given. Also, a simple formulation of the high energy approximation of Glauber, which is used in calculations, is presented.

Chapter II.

In this chapter, the used approach of the three-body force effect in the framework of Glauber high-energy approximation is presented. The $p-^3\text{He}$ elastic scattering amplitude-including the three-body force effect-is obtained. Using this amplitude the $p-^3\text{He}$ elastic scattering differential cross section at the energies 0.6 and 1 GeV is calculated for different values of the three-body force parameters B and γ . Also, for comparison, is calculated the same quantity at the same energies without the three-body force correction. A good agreement with the experimental data at 0.6 and 1 GeV for the values 0.54 and -0.35 of the three-body force parameter B , respectively, is obtained, with the value $13(\text{GeV}/c)^{-2}$ of the three-body force radius parameter γ . The most contributions of the three-body force correction are coming

from the single-scattering terms, while the three-body force effect on the double-scattering terms can be neglected. We see that, the results of p - ^3He elastic scattering at the used energies, show that, the three-body force effect should be taken into account in the calculations.

Chapter III.

The general form of the differential cross section $\frac{d\sigma_s}{d\Omega}$ of the sum of p - ^3He elastic and inelastic scattering with dissociation of ^3He nucleus into two or three particles, including the three-body force effect, is obtained. This differential cross section $\frac{d\sigma_s}{d\Omega}$ is calculated at 0.6 and 1 GeV for different values of the three-body force parameter B using $\gamma = 13(\text{GeV}/c)^{-2}$. Also, is calculated at the same energies- p - ^3He dissociation differential cross section $\frac{d\sigma_{\text{dis}}}{d\Omega}$ for $B=0.54$ and -0.35 , respectively, with the same value of γ . For both $\frac{d\sigma_s}{d\Omega}$ and $\frac{d\sigma_{\text{dis}}}{d\Omega}$ the clear dependence on the three-body force parameter B is observed for different values of the momentum transfer squared. The three-body force effect leads to increasing the dissociation cross section

Chapter IV.

p - ^3He total cross section is calculated in the range 15–60 (GeV/c) of incident momentum. A clear effect for the three-body force effect on the total cross section is observed. The experimental data of p - ^3He total cross section at 1 GeV is obtained with the value -0.117 for the three-body force parameter B and $\gamma = 13(\text{GeV}/c)^{-2}$.

Therefore, we can say that the three-body force effect plays an important role in the study of $p-^3\text{He}$ collision and must be taken into account, in the calculations.

