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

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Arabic Summary.

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SUMMARY

This thesis is concerned with the study of three-body force effect on $p-^3He$ 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 $p-^3He$ 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 $p-^3He$ elastic scattering amplitude-including the three-body force effect-is obtained. Using this amplitude the $p-^3He$ 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 $(GeV/c)^{-2}$ of the three-body force radius parameter γ. The most contributions of the three-body force correction are coming

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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 $\gamma = 13(GeV/c)^{-2}$. Also, is calculated-at the same energies- $p-^3He$ dissociation differential cross section $\frac{d\sigma^{dis}}{d\Omega}$ for B=0.54 and -0.35, respectively, with the same value of γ. For both $\frac{d\sigma_s}{d\Omega}$ and $\frac{d\sigma^{dis}}{d\Omega}$ 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 $\gamma = 13(GeV/c)^{-2}$.

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

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