Study of Interference Effects in $^{9}Be(^{23}Al\ ,^{22}Mg)$X Breakup Reaction at 40-100 MeV/n Beam Energy

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The development of the RIB has made it possible to analyse the nuclei that are located outside of the beta stability line. The unusual halo nucleus ^{23}Al, which has a large size and a very low proton separation energy, is likewise seen on the proton drip lines. It is crucial to look into the indirect approach in nuclei reaction because these nuclei are a part of the NaNe cycle in stellar reaction. One approach to studying these kinds of unusual nuclei is through the breakup reaction.

Broadly speaking, breakup reactions can be divided into two categories: Coulomb breakup reactions and nuclear breakup reactions. However, the interference effect between these two phenomena is crucial to understand because, if we study Coulomb breakups, it is possible that breakup could also occur as a result of nuclear interaction. For this reason, it is crucial to investigate the interference effect between these two phenomena.

In this study We have investigated the Coulomb nuclear interference effects in breakup reaction $^{9}Be(^{23}Al,^{22}Mg)$X at 40-100 MeV/n beam energy. Here we investigated two types of interference; one is between the total Coulomb(which include both Recoil and Direct term) and Diffraction, and another is between the Recoil and Direct, which is used to calculate the total Coulomb breakup cross-section. Coulomb breakup is calculated using the semi-classical method all order perturbation theory and nuclear breakup using Eikonal approximation in the Glouber model as given in ref. [1, 2, 3].

We have deduced from the results that the percentage interference effect is dependent on the projectile's beam energy and increases with beam energy. As a result, interference effects become more predominate as we move towards higher-energy reactions, which can be advantageous to understand the structure and their significance in the astrophysical reaction of halo nuclei in the future.

References

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