Coulomb Breakup of Exotic Nuclei

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Coulomb breakup of nuclei away from the valley of stability have been one of the most successful probes to unravel their structure. However, it is only recently that one is venturing into medium mass nuclei like ^{23}O and ^{31}Ne. This is a very new and exciting development which has expanded the field of light exotic nuclei to the deformed medium mass region.

In this contribution we report an extension of the previously proposed [1] theory of Coulomb breakup within the ambit of post-form finite range distorted wave Born approximation to include deformations of the projectile in a simple manner [2]. The formalism retains the analytical flavour of the calculation with the transition amplitude being factorized into two parts - the dynamics and the structure part. The structure part contains the deformation parameter and the dynamics part of the problem can be expressed in terms of the Bremsstrahlung integral - which can be analytically evaluated. This has therefore opened a route to investigate the breakup of deformed neutron rich projectiles in the Coulomb field of a heavy target.

We have used the theory to investigate the breakup of ^{31}Ne on Pb and Au at 234 MeV/u and have compared our results with the available data, wherever possible [3]. In all calculated reaction observables we have thus identified regions where the effects of deformation of the projectile would play a vital role. We will also present our results for the case of ^{37}Mg, which is reported to be a possible halo candidate [4]. Our calculations, therefore, could also serve as a motivation for future experiments with exotic nuclei in the deformed medium mass region of the nuclear chart.

References

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