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Three-body nonelastic breakup cross-section for weakly bound nuclei

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Halo nuclei are composed by a core of strongly bound nucleons surrounded by a halo of weakly bound neutrons or protons. When scattered by a target nucleus, halo nuclei may undergo into a fragmentation process opening different possible exit channels for detection. For example, the surrounding nucleons can either by capture or emitted during the reaction. With more nucleons in the halo the complexity of the possibilities increase and the distinction between bound and unbound states also becomes present. The extension three-body theories to derive an expression for the fragment yield in the reaction $A(a,b)X$, where the projectile is $a = x_1 + x_2 + b$, was done in Ref.[1]. Based on [1] we treat inclusive non-elastic breakup reactions involving weakly bound projectiles. The inclusive breakup cross section computed as a sum of a generalized four-body form of the elastic breakup cross section plus the inclusive nonelastic breakup cross section that involves the reaction cross section. We consider a three-body projectile and compute the nonelastic breakup cross sections for the two following possible cases: when b and x are emitted and y is absorbed (or y is emitted and x is absorbed) and both x and y are absorbed with just b being detected. All distorted waves are represented by eikonal waves and the Sao Paulo potential is used for modeling the optical interaction potential. The three-body incoming wave function is obtained by the renormalized short-range method. We investigate how the structure effects of two-neutron halo appears in the ^{20C} from the $^{20}C + C =^{18} C + X$ reaction and also reactions of great experimental interest whit heavy target like $^{20}C +^{208} Pb =^{18} C + X$.

[1] B.V. Carlson, T. Frederico, M.S. Hussein; Phys. Lett. B, 767, (2017) 53.

Summary

Author: SOUZA, Lucas (Instituto de Física, Universidade de São Paulo)

Co-authors: CHIMANSKI, Emanuel (Instituto Tecnológico de Aeronáutica); CARLSON , Brett (Instituto Tecnológico de Aeronáutica); FREDERICO, Tobias (Instituto Tecnológico de Aeronáutica); HUSSEIN, Mahir (Instituto de Física, Universidade de São Paulo)

Presenter: SOUZA, Lucas (Instituto de Física, Universidade de São Paulo)

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