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Advances in the theoretical description of transfer reactions

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Transfer reactions are often used to infer structure information of nuclei. In particular, the new ISS at ISOLDE provides an excellent experimental setup to measure (d,p) reactions with exotic beams. To properly analyse measurements, its is important to have a good understanding of the reaction process and to which structure observable the transfer reaction is sensitive. In this short talk, I will review recent developments in the analysis of transfer reactions.
First I will review a systematic analysis of transfer reactions on halo nuclei. In particular, I will focus on the 10Be(d,p) reaction that populates the halo nucleus 11Be. I will show how the magnitude of the halo can be probed reliably by selecting data at low energies and forward angles [1].
Second, I will illustrate the importance that optical potentials exhibit in the analysis of transfer reactions. This is particularly well illustrated in the recent paper of Catacora-Rios et al. [2], where the authors perform a very systematic analysis of (nearly) all the potentials entering the usual ADWA model of transfer using a Bayesian approach.
Finally, I will present the recent development of the model of transfer reaction that includes core excitation [3]. This model should enable us to go beyond the simplified few-body model of the nuclei, and hence give us access to more reliable structure information than the usual ADWA.

References:
[1] J. Yang and P. Capel, Phys. Rev. C 98, 054602 (2018).
[2] M. Catacora-Rios, A. E. Lovell, and F. M. Nunes, Phys. Rev. C 108, 024601 (2023).
[3] P. Punta, J. A. Lay, and A. M. Moro, Phys. Rev. C 108, 024613 (2023).

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