— 第889回 九大原子核セミナー —

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演題： Some interesting features of elastic scattering and break-up of loosely bound nuclei and their interpretation in terms of nuclear structure

日時： 9 月 22 日 (木) 16:00〜

場所： 理学部 物理大学院講義室 (理学部 2 号館 2 階 2263 室)

概 要

The study of exotic nuclear structures, like halo nuclei, is usually performed through indirect techniques, such as breakup reactions. Unfortunately, the complexity of the reaction mechanism and the uncertainty in the choice of projectile-target interactions can cause ambiguities in the analysis of reaction measurements. In this work, carried out with P.Capel (Johannes Gutenberg-Universitt Mainz) and F.Nunes (MSU), I present a new way to extract information about the structure of halo nuclei through reactions.

The basic idea of this new technique is to study the ratio of angular distributions for breakup and scattering. These two processes exhibit very similar features that depend mostly on the projectile-target interaction [1]. The adiabatic approximation explains this similarity [2]. It expresses both angular distributions as the product of an elastic-scattering cross section for a point-like projectile times form factors that depend on the projectile wave function. The ratio of angular distributions thus gives access to halo structure by removing the major dependence on the projectile-target interaction.

We have checked the validity of this approach within the dynamical eikonal approximation [3] that does not rely on the adiabatic approximation. These calculations are in excellent agreement with the prediction of the adiabatic approximation. In particular, they give very similar ratios for light and heavy targets. This ratio thus removes most of the dependence on the reaction mechanism. In addition to this feature, the ratio has the advantage that it does not depend on the absolute normalisation of experimental cross sections.

We believe this new technique will open a new era in the study of exotic nuclear structure as it provides a unique way to measure halo wave functions.

参考文献

[1] P. Capel, M. Hussein, and D. Baye, Phys. Lett. B 693, 448 (2010).

[2] R. Johnson, J. Al-Khalili, and J. Tostevin, Phys. Rev. Lett. 79, 2771 (1997).

[3] D. Baye, P. Capel, and G. Goldstein, Phys. Rev. Lett. 95, 082502 (2005).

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