量子物理学・ナノサイエンス第 442 回セミナー

From Nuclear Potentials to Reaction Dynamics: Application to Diverse Nuclear Reactions

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日程　：　6 月 8 日（月）15:00 -

場所　：　本館 2 階 227C 物理学系輪講室

概　要

This talk introduces how nuclear potentials are used to understand low-energy nuclear reaction dynamics. In this energy region, reaction observables are strongly affected by nuclear structure, channel coupling, collective motion, cluster correlations, and breakup or fusion processes. Because many reaction channels can contribute coherently, a simple perturbative description is often insufficient as a complete reaction model. A practical strategy is to separate the reaction space into explicitly treated channels and effectively treated channels. The optical model potential accounts for the loss of elastic flux into non-elastic channels, while coupled-channel methods describe selected important excitations and reaction pathways more directly. Microscopic ingredients, such as folding potentials based on nuclear densities and effective nucleon-nucleon interactions, provide a useful bridge between nuclear structure and reaction observables.

The presentation also discusses how interference among different reaction amplitudes shapes the measured cross sections. Recent visualization approaches based on scattering amplitudes offer an intuitive way to interpret near-side, far-side, internal, and barrier-related components of the reaction. Overall, the talk aims to show how phenomenological, coupled-channel, and microscopic potential models can be combined to extract physical reaction mechanisms from low-energy nuclear scattering data.

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