量子物理学・ナノサイエンス第 84 回特別セミナー

Uncovering the mysteries of rare isotopes with direct reactions

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日程　：　10 月 24 日（月）14:00-15:30

場所　：　南 5 号館 5 階 503CD 大会議室

概　要

Our Universe has a wide variety of visible matter that embody the beauty of nature's strong force combining protons and neutrons into complex systems. While much has been understood about the stable nuclei, the short-lived nuclei approaching the limits of neutron and proton binding, called the rare isotopes, bring a wealth of new information. Their properties guide our understanding on the state of matter in extreme neutron-rich systems in our Universe. The reactions and decays of these isotopes drive the creation of majority of the heavy elements in our Universe and are the powerhouse of exotic cosmic phenomena.

The presentation will outline how reactions with rare isotope beams at different energy scales are allowing us to unveil unexpected new features in rare isotopes. This is leading to revelation of unconventional forms of nuclei such as nuclear halo and skin, their exotic excitation phenomena, and fundamental changes of nuclear shells that break the bounds of our traditional knowledge.

The exploration of nuclear radii at relativistic energies at GSI (Helmholtz Center for Heavy Ion Research in Germany) and RIKEN will be presented showing the appearance of exotic structures and their relation to shell evolution. The excitation phenomena in these exotic rare isotopes using low-energy transfer and inelastic scattering reactions with solid H2/D2 target at TRIUMF will be presented.

The unusual features of the rare isotopes signal the century-long challenge for a complete understanding of the nuclear force. The presentation will show how experimental observables of rare isotopes are exhibiting sensitivity to the variations from different prescriptions attempting to describe the nuclear force, thereby providing testing grounds for the forces.

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