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Search for new halo states in nuclear ground and excited states with fast rare isotope beams

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The possible appearance of nuclear halos in the ground and excited states close to the particle-decay threshold is of great importance for investigating nuclear structure and few-body correlations at the limit of stability. In this presentation, first I will discuss recent experimental results regarding a moderate halo formation in the ground state of ^{29}Ne. Next, I will introduce a novel method to measure the interaction cross sections of excited states. The former topic aims at finding halo formation in the vicinity of the island of inversion, which is important to study fp-shell intruder configurations at N = 20 magic number. This is accomplished through a combined investigation of nuclear and Coulomb-induced one-neutron removal reactions at 240 MeV/nucleon. The results indicate that the ground state of ^{29}Ne has spin parity of $3/2^-$ and is dominated by a large p-wave component. The discussion will be detailed in the presentation. The latter topic is intended to identify a new halo formation in excited states. The method utilizes a combination of the transmission method and recoil distance method with a plunder device, enabling us to measure the number of reactions of the excited states in a target. I will discuss basic ideas of this method and required experimental setups. This consideration provides a totally-new opportunity to perform reaction studies on the excited states of rare isotopes.

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