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INPP Seminar | Solving the inconsistency between the dB(E1)/dE measured at GSI and RIKEN for 11Be using Halo EFT, April 24

Ohio University College of Arts & Sciences

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The Institute of Nuclear and Particle Physics (INPP) presents Pierre Capel, of Johannes Gutenberg-Universität Mainz (JGU) , on "Solving the inconsistency between the dB(E1)/dE measured at GSI and RIKEN for ^{11}Be using Halo EFT", on Tuesday, April 24, at 4 p.m. in Edwards Accelerator Lab, Roger W. Finlay Conference Room.

Pierre Capel

Abstract: Halo nuclei exhibit an uncommon nuclear structure: their matter radius is much larger than that of stable nuclei. This large size is qualitatively understood as due to their low separation energy for one or two neutrons. These valence neutrons then exhibit a high probability of presence at a large distance from the other nucleons and so form a diffuse "halo" around a compact core. The best known examples are ^{11}Be, with a one-neutron halo, and ^{11}Li, with a two-neutron halo. Due to their short lifetime, these nuclei are mostly studied at RIB facilities through reactions like breakup. In this reaction, the halo neutrons dissociate from the core of the nucleus during the collision with a target. When the collision occurs on a high-Z target, the reaction is dominated by the Coulomb interaction, and, in particular, by an E1 transition from the bound state of the projectile towards its continuum. That transition is characterized by the strength dB(E1)/dE. For ^{11}Be, two major experiments that measure this strength have been performed: One at GSI at 520AMeV on a Pb target and a second one at RIKEN at 68AMeV, also on a Pb target . Unfortunately, the dB(E1)/dE extracted from these two measurements do not coincide.

In this presentation I will describe our recent work, in which this reaction is described within a Halo Effective Field Theory and using eikonal-based reaction models. We obtain excellent agreement with both sets of breakup cross sections, suggesting that the apparent discrepancy is due to the way the data have been analyzed and/or to reaction artifacts. This solves a long-standing problem in the study of exotic nuclear structure away from stability.