

First Observation of New Isotopes at FRIB: What Comes Next?

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The Facility for Rare Isotope Beams (FRIB) [1] is a US Department of Energy User facility providing primary, heavy-ion beams with energies up to 300 MeV/u (typically 250 MeV/u for most mid-mass beams). Typical beam intensities are 500 pnA with plans to increase to 20,000 pnA. This capability positions FRIB as a pivotal resource for accessing a broad spectrum of rare isotope beams. Herein, we present the first observations of new isotopes at FRIB, achieved through the interaction of a 198Pt beam with a carbon target at 186 MeV/u and a beam power of 1.5 kW, which is equivalent to 41 pnA. This discovery, occurring within FRIB's inaugural year, underscores its potential for research with beams of rare isotopes. We detail the particle identification process for reaction products, employing event-by-event analysis of energy loss, time of flight, magnetic rigidity, and total kinetic energy, and compare these findings to those from the National Superconducting Cyclotron Laboratory (NSCL) with a 198Pt beam at 85 MeV/u [3]. Moreover, we discuss the efficacy of a multi-step reaction scheme for probing the neutron-rich region, highlighting the Abrasion-Ablation model's role in predicting production cross sections for previously unobserved isotopes. This discussion integrates the latest theoretical and experimental insights, alongside computational advancements. The evolution of FRIB's capabilities, marked by the transition to full intensity, heralds a new era for the exploration of rare isotopes, promising significant contributions to nuclear physics.

References:

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3. K. Haak et al., Phys. Rev. C 108, 034608 (2023).

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