Direct reactions with rare isotope beams near ^{132}Sn for nuclear structure and nuclear astrophysics

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Measurements of the single-particle structure of neutron-rich nuclei near shell closures provide tests of shell model predictions of the structure of nuclei far from stability. Many of these nuclei also lie along or near the waiting points of r-process nucleosynthesis. To probe the properties of nuclei near the N=82 shell closure, we have recently measured (d,p) reactions with ≈5-MeV-A exotic beams of ^{132,130}Sn and ^{134}Te interacting with CD_2 targets at the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory. Reaction protons were measured in arrays of silicon-strip detectors, including an early implementation configuration of ORRUBA, a new barrel array of position-sensitive silicon strip detectors. Results from these measurements will be reported and the implications for nuclear structure and nucleosynthesis will be discussed.