

Abstract Submitted
for the DNP15 Meeting of
The American Physical Society

Electrical properties of various gas mixtures for active target detector application¹ DANIEL YATES, GRIGORY ROGACHEV, EVGENIY KOSHCHIY, ETHAN UBERSEDER, JOSH HOOKER, None — Experiments with rare isotope beams (RIBs) open new opportunities to study properties of exotic nuclei and measure reaction cross sections relevant for nuclear astrophysics with radioactive ions. However, the low intensity of RIBs requires the development of new, more efficient detectors such as the Texas Active Target (TexAT) detector currently being developed at the Cyclotron Institute. With this detector, the target gas is also used as the active medium for tracking and energy loss measurements of charged recoils. Various gas mixtures will be used under different conditions and it is important that drift velocity and gas gain are well established. This study uses a time projection chamber with an applied electric field to measure drift velocity and electron gains of four gases to be used as targets in TexAT. The experimental values are then compared to simulation. Drift velocities of electrons were measured as a function of the electric field for each gas and pressure and then were compared to simulated values obtained from CERN's Garfield++ simulation package. The simulated and experimental drift velocities matched with root-mean-square deviations typically less than 10% for each pressure. These results provide important accuracy verification of the simulation programs and determine systematic uncertainties in track reconstructions with TexAT which rely on these simulations.

¹Supported by NSF Grant No. 1263281

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None

Date submitted: 31 Jul 2015

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