

Measurement of scintillation and ionization of nuclear recoils in noble elements for dark matter searches

Charles Huajie Cao
Princeton University

Monday, October 28 ♦ 4 P.M.
Room 124 Nieuwland Science Hall

Noble liquids are promising targets for direct searches of weakly interacting massive particles (WIMP), thanks to their efficient conversion of energy from WIMP-induced nuclear recoils into ionization and scintillation. As such, knowledge of the light and ionization yield from nuclear recoils is crucial for the determination of the sensitivity of experiments using noble liquid detectors for WIMP searches. We have exposed a dual-phase Liquid Argon Time Projection Chamber (LAr-TPC) to a low energy pulsed narrowband neutron beam, produced at the Notre Dame Institute for Structure and Nuclear Astrophysics to study the scintillation light yield of recoiling nuclei in a LAr-TPC. We report the observation of a significant dependence on drift field of liquid argon scintillation from nuclear recoils of 11-50 keV. This observation is important because, to date, estimates of the sensitivity of noble liquid TPC dark matter searches are based on the assumption that electric field has only a small effect on the light yield from nuclear recoils.

We will continue our study on liquid argon ionization and both scintillation and ionization in liquid xenon using the same highly effective neutron beam technique.