Abstract Submitted
for the APR21 Meeting of
The American Physical Society

**Observables for Recoil Identification in Gas Time Projection Chambers**[1] MAJD GHREAR, University of Hawaii — Directional detection of nuclear recoils is appealing because it can confirm the cosmological origin of a dark matter signal and distinguish between different neutrino sources. Gas Time Projection Chambers (TPCs) enable directional recoil detection due to the high spatial granularity with which they can image a recoil's ionization track, especially if micro-pattern gaseous detectors (MPGDs) are utilized. A key challenge in these detectors at low energies is identifying and rejecting background electron recoil events caused by gamma rays from radioactive contaminants in the detector materials and the environment. For gas TPCs with high readout segmentation, we can define observables that can distinguish electron and nuclear recoils, even at keV-scale energies, based on the measured ionization's topology. We define such observables and show that they outperform the traditionally used discriminant, dE/dx, by up to three orders of magnitude. Furthermore, these new observables work well even at ionization energies below 10 keV and remain robust even in the regime where directionality fails.

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Date submitted: 08 Jan 2021                    Electronic form version 1.4