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A Micromegas-based Directional Dark Matter Detector for Use with Negative Ion Gases[1] CATHERINE NICOLOFF, JAMES BATTAT, Wellesley College — Directional dark matter detectors seek to measure the direction of WIMP-induced nuclear recoils. The angular distribution of these recoils provides a unique signature that is not mimicked by any known background population. Low-pressure gas time projection chambers (TPCs) have a long and successful history in directional dark matter searches. The benefit of the low-pressure gas target is that nuclear recoils from dark matter extend long enough to be reliably reconstructed. For the last decade, the DRIFT collaboration has employed a MWPC-based negative-ion TPC for directional dark matter detection. DRIFT recently published the leading limit from a directional detector on the spin-dependent WIMP-proton interaction (1.1 pb at a WIMP mass of 100 GeV/c^2). Although the effective spatial granularity along the drift direction is 60 um, the MWPC wire spacing of 2 mm limits DRIFT's track reconstruction. DRIFT is now exploring TPC readouts that offer higher spatial resolution. Here, we report on one such effort that uses a Micromegas for gas amplification with orthogonal strips for charge signal readout. The detector can be used with both electron drift and negative ion gases. We will describe the detector design and present preliminary commissioning data taken in a surface laboratory.

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