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Negative Ion Drift TPC development for directional dark matter detection[1] CATHERINE NICOLOFF, JAMES BATTAT, Wellesley College — Low-pressure gas time projection chambers (TPCs) have a successful history in directional dark matter (DDM) searches. The benefit of the low-pressure gas target is that the nuclear recoils from dark matter extend several millimeters, long enough to be reliably reconstructed. The low-density target requires an optimization of the detector's WIMP sensitivity per unit volume. The DRIFT collaboration (Directional Recoil Identification From Tracks) employs a MWPC-based negative-ion TPC for DDM detection. DRIFT holds the leading limit from a directional detector on the spin-dependent WIMP-proton interaction. Although the effective spatial granularity along the drift direction is 60 μm (via timing), the MWPC wire spacing of 2 mm limits the tracking resolution. Micro-patterned gas detectors should enhance the detector sensitivity, both through higher gas amplification, and by higher spatial resolution tracking. Here, we report on the use of a Micromegas with orthogonal strip readout. We have demonstrated proportional amplification in the negative-ion drift gas SF_6. In collaboration with a group from Kobe University and KEK in Japan, we have also demonstrated particle tracking in this detector. We will describe the detector design, and present preliminary commissioning data.

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