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Recent Progress on D3 - The Directional Dark Matter Detector

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Direction-sensitive WIMP dark matter detection promises to help overcome the challenges faced by direct dark matter detection experiments. In particular, directional detectors should be able to clearly differentiate a dark matter signal from background sources. We are developing a Directional Dark Matter Detector (D3) based on a gas Time Projection Chamber (TPC) using Gas Electron Multipliers (GEMs) for charge amplification and pixel electronics for readout. This approach allows the three-dimensional reconstruction of nuclear recoils in a room-temperature detector with low energy threshold and low noise. We present an overview of our past and ongoing work developing this technology, including the performance measurement of small prototypes, as well as our planned future work constructing a m^3-scale detector to clearly determine whether the signals seen by DAMA, CoGeNT, and CRESST-II are due to low-mass WIMPs or background.

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