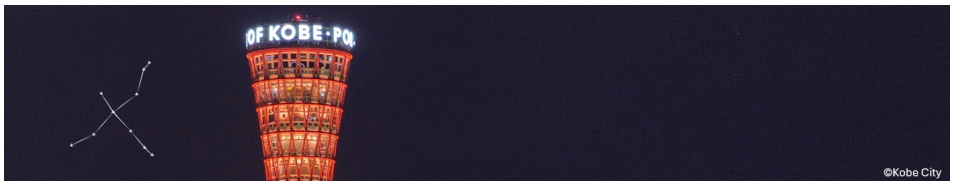

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A 40-L Gaseous TPC with X/Y Strip Readout for Cost-Effective Directional Recoil Detection

Monday, 23 February 2026 10:10 (30 minutes)

Particle detectors with sensitivity to the directions of low-energy nuclear recoils open access to previously unprobed physics. Directional detection of coherent elastic neutrino–nucleus scattering (CEvNS) would enable searches for potential beyond-the-Standard-Model (BSM) effects in this interaction and provide a critical capability for exploring regions of dark-matter parameter space obscured by solar-neutrino backgrounds. At present, the only detectors capable of time-resolved directional recoil imaging are gaseous time-projection chambers (TPCs). Such detectors require large active volumes and highly granular, large-area readout planes, leading to substantial channel counts and associated cost. We report on the status of a 40-L gaseous TPC employing Micromegas amplification and charge readout via orthogonal X/Y strips. The detector is designed to demonstrate a path toward cost-effective scaling of directional detection to much larger target volumes. We also outline near-term plans for operating this detector at the Oak Ridge Spallation Neutron Source.

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