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Time Projection Chambers for Nuclear Reaction Studies with Fast Beams

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Time Projection Chambers (TPCs) can enable unique experimental programs and extend the scientific reach of fast radioactive beams at current and future facilities. Regardless of whether a TPC is operated as a detector or as an active-target, a TPC can provide a broad (nearly 4π) angular coverage with good energy resolution and particle identification. In active target mode, the TPC counter gas serves as both the target and the detector gas, enabling one to measure low energy particles with good energy resolution while retaining the luminosity advantage of a thick target. In this talk, I will discuss the SAMURAI Pion Reconstruction and Ion-Tracker ($S\pi$ RIT) TPC recently constructed at Michigan State University and its planned experimental program within the SAMURAI dipole at the Radioactive Isotope Beam Factory (RIBF) at RIKEN to constrain the symmetry-energy term in the nuclear Equation of State (EOS). I will also discuss important applications of such TPCs as active targets to measure giant resonances, fission and charge exchange reactions, and present the concept of a solenoidal TPC to perform such experiments using the fast beams at NSCL and later at FRIB.

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