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Use of a novel off beam axis technique in the test of a High Pressure gas Time Projection Chamber in the CERN T10 beamline

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A High Pressure gas Time Projection Chamber (HPTPC) is a candidate for use as a near detector for future long baseline neutrino experiments such as the Hyper-Kamiokande experiment (Hyper-K) and the Deep Underground Neutrino Experiment (DUNE). Seeking to reduce neutrino-nucleus interaction uncertainties provides the major motivation for researching and developing an HPTPC as a neutrino detector.
An optically read out prototype HPTPC, rated to 5 bar of pressure, was built at Royal Holloway, University of London, to make proton scattering measurements in Argon gas in a test beam, making use of a beam moderator and novel off-axis measurement technique to reduce backgrounds.
A beam test was performed at the CERN East Area T10 beamline from August to September 2018 making measurements of protons in the prototype HPTPC, together with an upstream and downstream time of flight system built by the University of Geneva and University College London respectively. The combination of beam moderator and measurement off the beam-axis allowed for an enhanced ratio of protons to background pions.

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