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Directional Dark Matter Detector Prototype (Time Projection Chamber)[1] KELSEY OLIVER-MALLORY, University of California Berkeley, MAURICE GARCIA-SCIVERES, JOHN KADYK, Lawrence Berkeley National Laboratory, MAYRA LOPEX-THIBODEAUX, Science Undergraduate Laboratory Internship — The time projection chamber is a mature technology that has emerged as a promising candidate for the directional detection of the WIMP particle. In order to utilize this technology in WIMP detection, the operational parameters must be chosen in the non-ideal regime. A prototype WIMP detector with a 10cm field cage, double GEM amplification, and ATLAS FEI3 pixel chip readout was constructed for the purpose of investigating effects of varying gas pressure in different gas mixtures. The rms radii of ionization clusters of photoelectrons caused by X-rays from a Fe-55 source were measured for several gas pressures between 760torr and 99torr in Ar(70)/ CO_2(30), CF_4, He(80)/Isobutane(20), and He(80)/CF_4(20) mixtures. Average radii were determined from distributions of the data for each gas mixture and pressure, and revealed a negative correlation between pressure and radius in Ar(70)/CO_2(30) and He(80)/Isobutane(20) mixtures. Investigation of the pressure-radius measurements are in progress using distributions of photoelectron and auger electron practical ranges (Univ. of Pisa) and diffusion, using the Garfield Monte Carlo program.

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