

The goal of the Dark Matter Time Projection Chamber experiment that I am a part of is to detect the presence of weakly interacting massive particles (WIMPs), a possible form of the dark matter that comprises much of the universe. Further, the experiment aims to determine the direction of arrival of these particles; this will allow for statistical confirmation that the particles originated where astrophysical observations have determined that they ought to, and from there directly confirm the existence of dark matter itself.

In order to perform this experiment, we use a detector filled with a low-pressure gas called CF_4 . When a particle, such as a WIMP, strikes a molecule inside the detector it generates ionization electrons and photons that can be captured and the data used for analysis. I am preparing our newest detector by developing and testing the parts necessary for the collection of these photons. I will build the field cage that will guide photoelectrons to the amplification region. I am also designing and building the mount for the photomultiplier tubes and camera that will take data, and will test the apparatus to ensure the best possible collection rate and location precision. I will calibrate the detector, using alpha sources at various angles inside the chamber to reconstruct the three-dimensional trajectory of the particles. These efforts will allow the collaboration to begin to use the chamber in their experiment.