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## Measurement of the Scintillation Light Yield of $\text{CF}_4$ for a High Pressure TPC Used for Reactor Neutrino Detection

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A 10 atm  $\text{CF}_4$  based Time Projection Chamber (TPC) is under R&D for detecting reactor antineutrinos via neutrino electron elastic scattering ( $\nu - e^- \rightarrow \nu - e^-$ ). The physics goals are to precisely measure the antineutrino spectrum below the inverse  $\beta$  decay threshold and to constrain the neutrino magnetic moment. This requires both high energy resolution and excellent spatial resolution. Three dimensional reconstruction of electron recoil tracks in the TPC relies on the concurrent detection of scintillation light and drifting electrons, with the light yield of  $\text{CF}_4$  being a critical factor in setting the detector energy threshold.

We have built a dedicated setup to characterise the scintillation response of  $\text{CF}_4$  under controlled gas pressure and temperature, using an  $^{241}\text{Am}$   $\alpha$  source (5.49 MeV) and its 59.5 KeV X-ray emission. Our measurements show that the light yield increases with decreasing temperature, with a pronounced enhancement around 250 K. Although the yield generally decreases with rising pressure, cooling to 250 K at 10 atm restores the light yield to a level exceeding that at room temperature. This poster presents the experimental setup and the observed pressure and temperature dependent light yield, demonstrating that cryogenic operation can significantly improve the scintillation performance of high pressure  $\text{CF}_4$  for low energy electron recoil detection in reactor neutrino experiments.

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