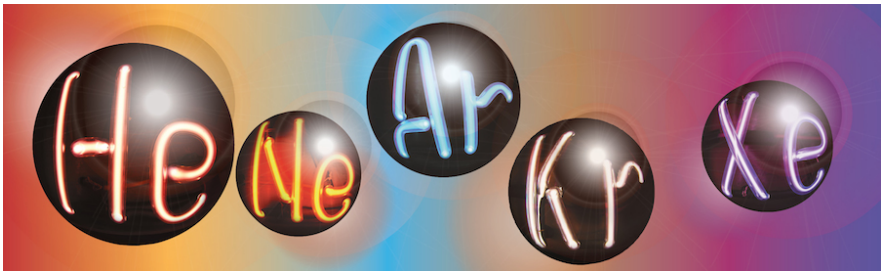

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Performance of the MainzTPC2

The MainzTPC is a dual-phase xenon time projection chamber (TPC) containing roughly 300 g of liquid xenon (LXe) and is dedicated to the study of scintillation and ionization processes in LXe for low-energy electronic and nuclear recoils. It has been designed to be the primary target in Compton and neutron scattering experiments to measure recoil energies in LXe down to 1 keV. To improve position resolution in x and y, the detector was redesigned to accommodate an array of 36 individually read-out, VUV-sensitive Hamamatsu silicon photomultipliers (SiPMs), replacing its monolithic top photomultiplier tube (PMT) and eight avalanche photodiodes. A primary goal of this upgrade is to enable measurements of low-energy nuclear recoils in LXe, with a focus on improving sensitivity to the Migdal effect. For this purpose, a cryogenic amplifier board housing the SiPM array was developed and installed. To address known instabilities in the liquid level, we rebuilt the liquid-level monitoring and control system based on camera observations of the liquid–gas interface. In this talk, we present the performance of the upgraded MainzTPC, with particular emphasis on the SiPM array and Compton scattering measurements performed with gamma-ray sources.

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