

W69a **The performance study for the X-ray Polarimeter Instrument of Gravity and Extreme Magnetism Small Explorer (GEMS)**

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The Gravity and Extreme Magnetism Small Explorer (GEMS) is a NASA small satellite mission, designed to measure linear X-ray polarization from astronomical objects. The X-ray polarization is a strong tool to investigate extreme physical situations in stars, such as the strong gravitational fields of black holes or the strong magnetic fields of neutrons stars. The GEMS X-ray Polarimeter Instrument had a technically successful Preliminary Design Review (PDR), but the GEMS project was canceled due to concerns regarding cost. In the meantime, however, we have been developing the technology of X-ray polarimeters. The GEMS polarimeter, based on the photoelectric effect, has sensitivity for the 2-10 keV energy band. It can image a single photoelectron using a Time Projection Chamber (TPC) technique so that a distribution of photoelectron tracks can be measured, which is sensitive to the polarization of the incident X-ray.

We will present: a) polarization measurements from the engineering test units, b) the performance of the flight-designed Gas Electron Multiplier, which is a key device to multiply electron signals, c) a relationship between the basic performance of the gas detector (e.g., gas gain and energy resolution) and the outgassing from the materials inside detector.