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The GRAMS Experiment: A LAr TPC for Astrophysical Gamma-Ray and Antimatter Detection

The Gamma-Ray and AntiMatter Survey (GRAMS) is a balloon-borne experiment that will use a liquid argon time projection chamber (LAr TPC) to detect both MeV gamma rays and cosmic ray antiparticles. GRAMS exploits the excellent energy and spatial resolution of LAr TPCs to act as a Compton telescope, providing unprecedented sensitivity to gamma rays in the historically under-explored energy regime known as the MeV Gap. At the same time, the LAr TPC will serve as a 3D tracking detector for charged particles, allowing GRAMS to perform a background-free search for low-energy antinuclei, a possible signature of dark matter annihilation. These complementary capabilities will enable GRAMS to probe a wide range of interesting phenomena, from high-energy astronomical objects to physics beyond the Standard Model. The GRAMS detection concept is potentially expandable to a future satellite mission due to the low-cost, scalable nature of the LAr TPC technology. A prototype balloon flight, pGRAMS, has been funded by NASA and is slated to launch from Tucson, Arizona in the summer of 2026. This talk will present an overview of the GRAMS experiment and describe the current status of the project.

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