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Overview and Current Status of GRAMS (Gamma-Ray and AntiMatter Survey)

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GRAMS (Gamma-Ray and AntiMatter Survey), one of the NASA Physics of the Cosmos missions, is a balloon-borne experiment utilizing a LArTPC (Liquid Argon Time Projection Chamber) detector that is potentially expandable to a future satellite mission. GRAMS aims for both MeV gamma-ray observations and antimatter-based indirect dark matter searches. With a low-cost, large-scale LArTPC detector, GRAMS can provide significantly improved sensitivities to gamma rays in a historically under-explored energy regime often referred to as the MeV Gap. GRAMS can also extensively probe a new dark matter parameter space via low-energy antinuclei measurements, including the regions suggested by the Fermi GCE (Galactic Center Excess) and AMS-02 antiproton excess. We had a successful engineering balloon flight in Japan in 2023 to demonstrate the LArTPC operation in the stratosphere. We are currently preparing for the prototype balloon flight (pGRAMS) from Tucson, Arizona, in late 2025 or early 2026 using a LArTPC that is smaller-scale but still one of the largest Compton telescopes. In this talk, I will present an overview and current status of the GRAMS project.

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