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MeV Gamma Ray Signatures from Dark Matter Annihilation and Evaporating Primordial Black Holes in the GRAMS Experiment

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The upcoming GRAMS (Gamma-Ray and AntiMatter Survey) experiment aims to provide un- precedented sensitivity to a poorly explored region of the cosmic gamma-ray spectrum from 0.1-100 MeV, often referred to as the "MeV gap". Utilizing Liquid Argon Time Projection Chamber (LArTPC) technology to detect these MeV gamma rays, GRAMS has the potential to uncover crucial details behind a variety of processes in multi-messenger astrophysics. Various theories on particle interactions beyond the standard model predict that dark matter annihilations may contribute to the cosmic gamma spectrum via monochromatic gamma emissions (spectral lines), the annihilation of decay products, and the radiation of electromagnetically charged final states (FSR). MeV gamma rays may also be emitted from primordial black holes (PBHs) which have gained interest in recent years as being potential candidates for dark matter. By looking for Hawking radiation in the MeV gamma-ray regime, GRAMS can likely probe for ultra-light PBHs, which theoretically may comprise a significant portion of dark matter in the Universe. Here, we will describe the MeV gamma-ray detection concept and the current status of the detector development.

In-person or Virtual?

In-person

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