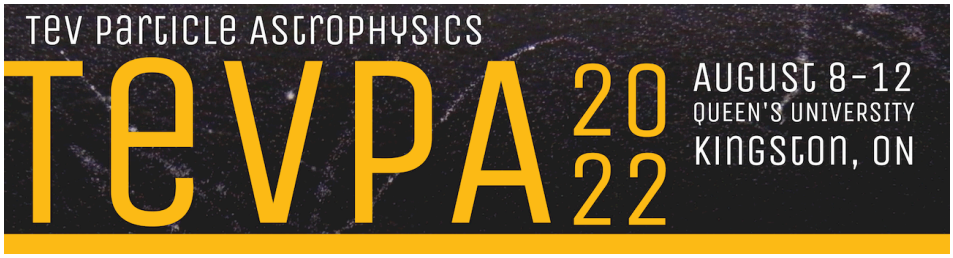

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Searching for Axionlike Particles from Gamma-ray Bursts with Fermi

Wednesday 10 August 2022 16:30 (20 minutes)

Axion-like particles (ALPs) are a well-motivated candidate for constituting a significant fraction of dark matter. They are produced in high-energy environments, such as core-collapse supernovae (CCSNe), and could undergo conversion into gamma-rays in the presence of an external magnetic field, with a characteristic spectrum peaking in the 30–100-MeV energy range. CCSNe are often invoked as progenitors of ordinary long gamma-ray bursts (GRBs), allowing us to conduct a search for potential ALP spectral signatures using GRB observations with Fermi Large Area Telescope (LAT). We conduct a data-driven sensitivity analysis to find the distance limit for a hypothetical ALP detection with the LAT's low-energy (LLE) technique which, in contrast to the standard LAT analysis, allows for a a larger effective area for energies down to 30˜MeV. We select a candidate sample of twenty-four GRBs and carry out a model comparison analysis in which we consider different GRB spectral models with and without an ALP signal component. We also consider any precursor GRB emission in the standard and LLE data. Here, we summarize the statistical methods used in our analysis and the underlying physical assumptions, the feasibility of the upper limits on ALP coupling from our model comparison results, and an outlook on future MeV instruments in the context of ALP searches.

Collaboration name

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