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Search for axion-like-particle induced gamma-ray bursts from core-collapse supernovae with the Fermi LAT

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During a core-collapse supernova (SN), axion-like particles (ALPs) could be produced through the Primakoff process and subsequently convert into gamma rays in the magnetic field of the Milky Way. Using a sample of well studied extragalactic SNe at optical wavelengths, we estimate the time of the core collapse and search for a coincident gamma-ray burst with the Fermi Large Area Telescope (LAT). Under the assumption that at least one SN was contained within the LAT field of view, we exclude photon-ALP couplings within a factor of ~5 of previous limits from SN1987A. With the increasing number of SNe observed with optical surveys, our results demonstrate the potential to probe ALP dark matter with combined optical and gamma-ray observations.

Keywords

Axion-like particles; core-collapse supernova; gamma rays

Collaboration

Ferrmi-LAT

other Collaboration

Subcategory

Experimental Results

Primary authors: MEYER, Manuel (Erlangen Center for Astroparticle Physics); Dr PETRUSHEVKSA, Tanja (University of Nova Gorica)

Co-author: FOR THE FERMI-LAT COLLABORATIOIN

Presenter: MEYER, Manuel (Erlangen Center for Astroparticle Physics)

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