



@NASA: Artist conception of NuSTAR fully deployed

The solar axion quest

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Abstract: The nature of dark matter in the universe remains an open question in astrophysics and cosmology. Axions and axion-like particles (ALPs) offer a compelling solution, though ground-based experiments have yet to detect these hypothetical low-mass particles expected to be produced in large quantities in the strong electromagnetic fields within stars. This talk presents a fresh perspective on the quest for axions, including a historical review of helioscope techniques used in SUMICO, CAST, and future IAXO.

Novel approaches to axion searches will also be explored, highlighting that axions/ALPs could provide unique signatures in our Sun's emission spectra from their conversion in the magnetic field of the Sun's atmosphere, rather than in a laboratory magnetic field. The talk will cover radio-Sun axions searches and dedicated spacecraft solar observations in the hunt for these elusive particles.

Data acquired with the Nuclear Spectroscopic Telescope Array (NuSTAR) during solar observations in 2020 allows us to set stringent limits on the coupling of axions to photons by applying validated magnetic field models of the solar atmosphere. We report pioneering limits on the axion-photon coupling strength $g_{a\gamma} < 7 \times 10^{-12} \text{ GeV}^{-1}$ at the 95% C.L. for axion masses $m_a < 5 \times 10^{-7} \text{ eV}$, surpassing current ground-based limits and probing unexplored regions of the axion-photon coupling parameter space

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On-
line



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