Contribution ID: **78** Type: **Oral**

IceCube's Sensitivity Prospects to MeV-Scale Axion-Like Particles from Core-Collapse Supernovae

Wednesday 27 August 2025 14:00 (20 minutes)

We present a novel framework to estimate the sensitivity and discovery potential of IceCube to axion-like particles (ALPs) produced in core-collapse supernovae (CCSNe), covering ALP masses from 1 MeV to several hundred MeV. A key feature of this work is the explicit handling of the final-state leptons produced in ALP interactions with 16O nuclei and protons, which can generate Cherenkov light detectable in IceCube. These processes are being fully integrated into a detector-level simulation chain, enabling realistic detector signal modeling beyond existing estimates. The framework enables projections for both direct detection sensitivities and constraints based on time delays relative to the neutrino burst, across a range of ALP emission models. This approach may also extend to other MeV-scale dark sector particles. Preliminary sensitivity estimates are in progress and will be presented.

Collaboration you are representing

Authors: VALTONEN-MATTILA, Nora (Ruhr Universität Bochum); BENZVI, Segev; SHAH, Shlok

Presenter: VALTONEN-MATTILA, Nora (Ruhr Universität Bochum)

Session Classification: Dark Matter and Its Detection

Track Classification: Dark Matter and Its Detection