Tuesday, Oct 21, **4:15pm** I PAB 4-708 I Zoom: 517 486 4983

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Gamma Ray Echo from Particle Decays in Supernovae

The hot and dense core of a core-collapse supernova (CCSN) can lead to the production of beyond–Standard Model (BSM) particles such as axions and dark photons. These heavy species, produced during the supernova burst, can generate a sizable positron flux through their direct or indirect decays into positrons. The resulting energetic positrons undergo pair annihilation with ambient electrons in the outer supernova envelope.

In this talk, I will discuss how this process gives rise to a unique 511 keV gamma-ray signature associated with BSM particles produced in the core. We use this signal to set bounds on the G_{aee}–$G_{a\gamma\gamma}$ parameter space based on measurements from the Pioneer Venus Orbiter during SN 1987A. Moreover, I will show that upcoming and future MeV-gap gamma-ray telescopes such as COSI and AMEGO with sensitivity in the 511 keV range, can place strong constraints or provide a complementary pathway for axion discovery. Finally I will emphasize that such an “echo” signal should exist for all species that decay into neutrinos, radiatively, or directly into positrons.