

Passive particle detectors read out by light-sheet fluorescence microscopy

Traditional methods for detecting neutrinos and dark matter rely on the collection of charge, prompt scintillation photons, or phonons. PALEOCCENE proposes a novel approach: using light-sheet fluorescence microscopy to read out color centers induced by nuclear recoils in crystals. Key advantages of this method are: i) the re-emission of color centers in the visible range makes them easily detectable; and ii) these defects require low energy (10-50 eV) to form, making them ideal for exploring low-energy particle interactions.

In this talk, I will present the potential of light-sheet microscopy as a scalable read-out of color centers in crystals. I will present its current R&D, including collaborations with experts in scalable microscopy for biological applications, and will discuss its wide range of applications in fields such as dark matter search, CEvNS, geology, paleo-detectors, and nuclear nonproliferation safeguards. Preliminary results from irradiated crystals imaged with the state-of-the-art mesoSPIM microscope will be shared, demonstrating the advancements in the field.

Speaker: Gabriela R. Araujo (University of Zurich) on behalf of the PALEOCCENE collaboration