Contribution ID: **42** Type: **not specified**

Axion-mediated dark matter direct detection

Friday, 7 November 2025 15:20 (20 minutes)

The quantum field theory of dark matter scattering has been extensively explored for numerous direct detection experiments. However, pseudoscalar-mediated interactions, such as those involving axion-like particles, have received comparatively little attention, primarily because they are both spin-dependent and momentum-suppressed. In this talk, I will discuss how several theoretical mechanisms can enhance these otherwise elusive interactions. For instance, loop effects can convert a spin-dependent and momentum-suppressed interaction at tree level into a spin-independent one. Flavor-changing couplings can further increase the scattering rate and thus detectability. I will demonstrate that current experiments, such as XENONnT, are already sensitive to parts of the pseudoscalar-mediated dark matter parameter space.

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Session Classification: Parallel Sessions (III)