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Unveiling Imprints from Dark Symmetries: Signatures of Axion Portal to Scalar Dark Matter

Tuesday 27 May 2025 14:40 (20 minutes)

If dark matter is blind to standard model gauge interactions, the dark sector might not be totally secluded but connect to the visible sector via the introduction of *portal* interactions. In this talk, I will discuss a novel scenario where an axion-like particle acts as mediator between the SM and a complex scalar singlet dark matter candidate. The identification of physical couplings crucially incorporates a profound connection to the underlying symmetry that stabilizes the dark matter particle. In particular, I will examine the case of non-Abelian discrete symmetries and show how these prevent dark matter portal interactions to be removed via field redefinitions. This choice leaves peculiar imprints on both cosmological evolution and late times phenomenology. I will discuss how dark matter relic abundance is solely determined by freeze-out of semi-annihilations and is independent of portal couplings to the visible sector. While naturally evading direct detection constraints, rich and peculiar indirect detection spectra are uniquely determined by the *one-step cascade DM semi-annihilation rate*, with visible decay channels of the mediator only affecting the spectral shape.

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