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Freezing-in Cannibal Dark Sectors

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Self-Interacting Dark Matter models offer a compelling framework for explaining dark matter production through interactions confined within the dark sector. Introducing a feeble coupling between the dark and visible sectors via a Higgs portal not only opens up new avenues for detection and enriches thermal production dynamics but also provides a potential explanation for the initial dark matter population via the freeze-in mechanism. In this talk, I will examine the freeze-in production of dark matter in scenarios involving self-interactions, focusing on two cases: one with a dark sector consisting solely of unstable dark matter, and another with stable dark matter and an unstable scalar mediator. I will emphasize how variations in dark sector interactions can either tighten or relax cosmological constraints, leading to distinct signatures in long-lived particle searches and indirect detection experiments.

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