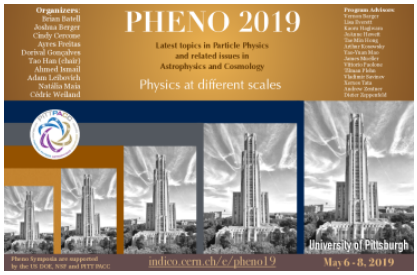

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Non-Minimal Dark Sectors: Mediator-induced Decay Chains and Multi-Jet Collider Signatures

Tuesday 7 May 2019 18:00 (15 minutes)

A preponderance of astrophysical and cosmological evidence indicates that the universe contains not only visible matter but also dark matter. In order to suppress the couplings between the dark and visible sectors, a standard assumption is that these two sectors communicate only through a mediator. In this talk we make a simple but important observation: if the dark sector contains multiple components with similar quantum numbers, then this mediator also necessarily gives rise to dark-sector decays, with heavier dark components decaying to lighter components. This in turn can even give rise to relatively long dark decay chains, with each step of the decay chain also producing visible matter. The visible byproducts of such mediator-induced decay chains can therefore serve as a unique signature of such scenarios. In order to examine this possibility more concretely, we examine a scenario in which a multi-component dark sector is connected through a mediator to Standard-Model quarks. We then demonstrate that such a scenario gives rise to multi-jet collider signatures, and we examine the properties of such jets at both the parton and detector levels. Within relatively large regions of parameter space, we find that such multi-jet signatures are not excluded by existing mono-jet and multi-jet constraints. Such "jet avalanches" therefore represent a potential discovery route for multi-component dark sectors.

Summary

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