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

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If the dark sector contains multiple components with similar quantum numbers which only communicate with the visible sector through a mediator, this mediator necessarily gives rise to dark-sector decays, with heavier dark components decaying to lighter components. Such successive decays can even give rise to relatively long dark decay chains with visible matter being produced at each step. In this talk, I discuss the collider signatures of such decay chains in a simple scenario where a multi-component dark sector is connected through a mediator to the Standard Model quarks. The properties of the multi-jet signatures arising in such scenarios are examined at both the parton and detector levels. Within relatively large regions of parameter space, these signatures are not excluded by existing mono-jet and multi-jet searches. Such decay cascades therefore represent a potential discovery route for multi-component dark sectors at current and future collider.

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