

## Dynamical Dark Matter at the Lifetime Frontier

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Dynamical Dark Matter (DDM) is an alternative framework for dark-matter physics in which the dark sector consists of large ensembles of dark states which exhibit a broad range of masses and lifetimes. While some of the states in this ensemble must be sufficiently long-lived that they contribute to the dark-matter abundance at present time, other states in the ensemble may have far shorter lifetimes. These latter states could give rise to observable signals at dedicated experiments such as the proposed MATHUSLA detector – a detector capable of resolving the decay signatures of long-lived particles (LLPs) with a broad range of masses and lifetimes. In this talk, I examine the discovery reach of the MATHUSLA detector within the parameter space of DDM scenarios and demonstrate that MATHUSLA may be capable of providing direct confirmation of certain unique aspects of the DDM framework which might be difficult to probe in other ways.

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