

Dark Matter Dilution Mechanisms and Large Scale Structure

Friday 14 April 2023 10:48 (22 minutes)

Entropy production is a necessary ingredient for addressing the over-population of thermal relics. It is widely employed in particle physics models for explaining the origin of dark matter. A longlived particle that decays to the known particles, while dominating the universe, plays the role of the dilutor. We point out the impact of its partial decay to dark matter on the primordial matter power spectrum. For the first time, we derive a stringent limit on the branching ratio of the dilutor to dark matter from large scale structure observation using the SDSS data. This offers a novel tool for testing models with a dark matter dilution mechanism. We apply it to the left-right symmetric model and show that it firmly excludes a large portion of parameter space for right-handed neutrino warm dark matter.

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Session Classification: Early Universe, BSM

Track Classification: Early Universe