ID de Contribution: **35** Type: **Non spécifié**

Axion Relic Pockets —A New Theory of Dark Matter

jeudi 8 août 2024 08:30 (30 minutes)

I will present a new theory of dark matter based on axion physics and cosmological phase transitions.
A first-order phase transition of a so-called dilaton'field that controls the coupling of a hidden-sector gauge theory leads to an exponential change in the mass of the corresponding axion. Following such a transition, cosmologically ambient axions naturally become trapped intoaxion relic pockets': regions of relic false vacua stabilised by the pressure from a kinematically trapped, hot axion gas. Axion relic pockets provide a viable and highly economical theory of dark matter: the macroscopic properties of the pockets depend only on a single parameter (the phase transition temperature). Their sizes range from point-like to astronomical, and their masses from intermediate particle-physics scales to asteroid-like. I will describe the formation, evolution and present-day properties of axion relic pockets, and outline how their phenomenology is distinct from existing dark matter paradigms. I will briefly outline how laboratory experiments and astronomical observations can be used to test the theory. Gamma-ray observations of magnetised, dark-matter-dense environments appear particularly promising.

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