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Exploring the ALPs throughout cosmological history - A Global Fit with CosmoBit

Determining the nature of dark matter remains an unsolved puzzle of modern day physics. In recent years, the possibility that dark matter consists of several different components has received increased attention. If one of these components consists of particles at the keV-scale, it can have non-negligible impact on cosmological observables.

In this talk, I will present how a decaying keV scale axion-like particle (ALP) can affect the physics of BBN, the recombination history of the CMB, and can even manifest itself as a photon burst in type-II supernovae. I will show that in order to constrain the viability of a keV ALP as a component of dark matter, it is essential to consider the global history by taking the broad phenomenology over many orders of magnitude in the lifetime of the ALP into account.

To this end, I will review the important steps in the cosmological history of the ALP and I will present the resulting viable parameter space by a global fit with CosmoBit, the new module of the Global and Modular Beyond-the Standard Model Inference Tool (GAMBIT).

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