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A novel way to determine the scale of inflation

Efforts to constrain the inflationary energy scale using the tensor-to-scalar ratio are limited by the minimum upper bound from observations. This still leaves a window of nearly 8 orders of magnitude in energy before the LHC can potentially offer complementary constraints from below. In the Feebly Interacting Massive Particle (FIMP) model of Dark Matter (DM), we find that one may express the inflationary energy scale as a function of three otherwise unrelated quantities: the DM isocurvature perturbation amplitude, its mass and its self-coupling constant, independently of the tensor-to-scalar ratio. In this talk, we will derive this expression for the inflationary energy scale, considering carefully the various astrophysical, cosmological and model constraints as well as accounting for variations in inflationary dynamics and the reheating history. Within the context of FIMP DM, one may thus determine the energy scale reliably from the parameters of the model even in the absence of observable tensor perturbations.

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