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Exploring the cosmological dark matter coincidence using infrared fixed points

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The asymmetric dark matter (ADM) paradigm is motivated by the apparent coincidence between the cosmological mass densities of visible and dark matter, $\Omega_{\rm DM} \simeq 5\Omega_{\rm VM}$. However, most ADM models only relate the number densities of visible and dark matter, and do not motivate the similarity in their particle masses. One exception is a framework introduced by Bai and Schwaller, where the dark matter is a confining state of a dark QCD-like gauge group, and the confinement scales of visible and dark QCD are related by a dynamical mechanism utilising infrared fixed points of the two gauge couplings. We build upon this framework by properly implementing the dependence of the results on the initial conditions for the gauge couplings in the UV. We then reassess the ability of this framework to naturally explain the cosmological mass density coincidence, and find a reduced number of viable models. We identify features of the viable models that allow them to naturally relate the masses of the dark baryon and the proton while also avoiding collider constraints on the new particle content introduced.

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