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Cosmology with Democratic Initial Conditions

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WIMP Dark Matter generally assumes the Standard Model and Dark Matter form a single thermal bath at early time, with the Dark Matter relic density set by interactions between these two populations. Arguably, a more compelling assumption is that Dark Matter is not part of the Standard Model sector. Even if there are decoupled dark sectors, then it is a natural expectation that the visible and dark sectors should be democratically reheated after inflation. At late time the Dark Matter abundance must be comparable to the baryon abundance, and it is interesting to investigate how to recover Standard Cosmology from these democratic initial conditions. If the Dark Matter is decoupled from the visible sector and does not undergo freeze-out, then without a large injection of entropy to the Standard Model, the Dark Matter will typically carry too much entropy. We ask what it takes for this scenario to be compatible with observations and arrive at a novel picture of dark matter with several interesting consequences.

Summary

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