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Multi-component dark sectors: the role of asymmetries and conversions

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We study the relic abundance of stable particles from a generic dark sector in the presence and absence of initial dark asymmetries, and our results show that abundances are expected to be of similar magnitude, i.e. multi-component dark matter is quite natural. We first discuss the different possibilities for stabilizing multi-component dark matter and then analyze the final relic abundances of the symmetric and asymmetric dark matter components in the presence of unavoidable conversions between dark matter states. We find an exponential dependence of the asymmetries on annihilation and conversions for the heavier components. We conclude that having similar symmetric and asymmetric components is a quite natural outcome of scenarios with several stable particles. This has novel phenomenological implications, which we discuss.

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