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Dark matter and baryogenesis without baryon number violation

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We present a new dark matter (DM) scenario intimately linked to the baryon asymmetry of the visible sector. We question one of the Sakharov conditions: baryon number violation. We provide a framework where the dark sector carries an opposite but precisely compensating baryon asymmetry to that of the visible sector, therefore conserving baryon number at all times. Within an effective field theory approach, we guide ourselves with the principle of baryon number conservation. We show that such a scenario is compatible with all observational constraints. We predict a thermal, light DM candidate with a maximum mass of 5.03 GeV, but various asymmetry transfers can lead to even lighter asymmetric DM masses. By virtue of baryon number conservation, the DM candidate is absolutely stable. The portal between the dark sector and the visible sector is the so-called "neutron portal" and can be efficiently probed at colliders, with a possible link to early matter domination in the early universe. We also provide an explicit realisation of this scenario in a UV complete model, for which the asymmetry within the dark sector is generated by a leptogenesis-inspired mechanism. Generally, this scenario provides a novel way to link baryogenesis to dark matter, without the need of baryon number violation.

Submitted on behalf of a Collaboration?

No

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