Precise dark matter relic abundance in decoupled sectors

Tuesday 22 September 2020 14:15 (13 minutes)

Dark matter (DM) as a thermal relic of the primordial plasma is increasingly pressured by direct and indirect searches, while the same production mechanism in a decoupled sector is much less constrained. We extend the standard treatment of the freeze-out process to such scenarios and perform precision calculations of the annihilation cross section required to match the observed DM abundance. We demonstrate that the difference to the canonical value is generally sizeable, and can reach orders of magnitude. Our results directly impact the interpretation of DM searches in hidden sector scenarios.

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Session Classification: Cosmology and Astroparticles session on Zoom and in Main Auditorium

Track Classification: Cosmology & Astroparticle Physics