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Thermal decoupling of WIMPS: The link between particle physics properties and the small-scale structure of (dark) matter

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The kinetic decoupling of weakly interacting massive particles
(WIMPs) in the early universe sets a scale that can directly be translated into a small-scale cutoff in the spectrum of matter density fluctuations.
I present a formalism which allows to describe this decoupling process in great detail and to determine the cutoff scale to a high accuracy; with decoupling temperatures of several MeV to a few GeV, depending on the details of the underlying WIMP microphysics, the smallest protohalos to be formed range between 10^−11 and almost 10^−3 solar masses. Observational consequences and prospects to probe this small-scale cutoff, which would provide a fascinating new window into the particle nature of dark matter, are discussed.

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