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Dark matter direct detection: a closer look at the astrophysical uncertainties

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Although there are great expectations from the LHC to shed light on physics beyond the Standard Model and an eventual embedding of a dark matter candidate within it, a clean handle on the dark matter puzzle will come only from direct or indirect detection signals of dark matter particles within dark matter halos. There are classes of dark matter candidates for which it is indeed feasible to extract such signals, for instance measuring the interaction of a dark matter particle from the local population within a laboratory detector. A direct detection signal scales linearly with the local number density of dark matter particles and depends also on their local velocity distribution. In this talk I will show how Bayesian methods recently reduced considerably the uncertainties on those quantities. For instance, given a Galactic mass model and assuming a spherically symmetric dark matter halo, the local dark matter density can be now determined with an accuracy of approximately the 10%. I will also discuss how such an approach, combined with Eddington's inversion formula for the phase-space density, can be used to determine the dark matter local velocity distribution.

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