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Prospects for constraining WIMP properties with ton-scale Dark Matter direct detection experiments

We investigate the reconstruction capabilities of Dark Matter properties from future ton-scale direct detection experiments using several targets. Adopting realistic values for the exposure, energy threshold and resolution of Dark Matter experiments which will come online within 10 years, the degree of complementarity between different targets is quantified. While a measurement of the Dark Matter mass and inelastic parameter are promisingly robust, it turns out that the different couplings can only be loosely constrained. In our work, the uncertainty in the astrophysical parameters controlling the local Dark Matter density and velocity distribution is included self-consistently and translates into a significant downgrading of accuracy. However, we show that, under certain assumptions, future direct detection experiments can achieve self-calibration of some astrophysical parameters, and they will be able to constrain the Dark Matter mass with only very weak external astrophysical constraints.

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