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Paolo Gondolo (University of Utah): The halo-independent approach as a problem of moments

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Halo-independent methods in the analysis of WIMP detection data have up to now provided separate constraints for specific integrals of the WIMP velocity distribution, and have assumed separate velocity distributions for the modulated and unmodulated rates. This has hindered the statistical interpretation of the results and has restricted the analysis to the comparison of experiments. I have recast the halo-independent approach as a moment problem, thus obtaining a proper statistical interpretation, including a profile likelihood with a continuum of nuisance parameters. This has extended the scope of the method to questions beyond the mere comparison of experiments. As a first example of the new method, I show a halo-independent estimate of the unmodulated signal corresponding to the DAMA annual modulation, including proper confidence levels, for spin-independent interactions under the assumption of a velocity distribution that is isotropic in the galactic reference frame.

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