

Abstract Submitted
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Analytic Approximations for the Velocity Suppression of Dark Matter Capture¹ JILLIAN PAULIN, COSMIN ILIE, Colgate University — Compact astrophysical objects have been considered in the literature as dark matter (DM) probes, via the observational effects of annihilating captured DM. In this paper we investigate the role of stellar velocity on the multiscatter capture rates and find that the capture rates of DM by a star moving with respect to the DM halo rest frame are suppressed by a predictable amount. We develop and validate an analytical expression for the capture rate suppression factor. This suppression factor can be used to directly re-evaluate projected bounds on the DM-nucleon cross section, for any given stellar velocity, as we explicitly show using Population III stars as DM probes. Those objects (Pop III stars) are particularly interesting candidates, since they form at high redshifts, in very high DM density environments. We find that previous results, obtained under the assumption of star at rest with respect to the DM rest frame are essentially unchanged, when considering the possible rotational velocities for those central stars.

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