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Optimal Observation Strategies for Velocity-Suppressed Dark Matter Annihilation

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Numerous particle models for the cosmological dark matter feature a pair-annihilation rate that scales with powers of the relative velocity between the annihilating particles. As a result, the annihilation rate in the central regions of dark matter halo can be significantly lower than at the halo's periphery for particular ambient gravitational potentials. While this might be offset by an increasing dark matter pair number density in the inner halo, it raises the question: what angular region for dark matter models with velocity-suppressed annihilation rates optimizes signal-to-noise? Here, we consider simplified background models for galactic and extragalactic targets and demonstrate that the optimal observing strategy varies greatly case-by-case. Generally, a bright central source warrants an annular region of interest, while a flatter noise profile warrants as large as possible an angular region, possibly including the central regions.

Summary

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