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Prospects for Discovery of DM Annihilation to Primary Neutrinos with IceCube

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We present sensitivity limits for discovery of dark matter at IceCube/DeepCore from annihilation of solar WIMPs into primary neutrinos. This analysis is motivated by the dominance of prompt neutrino final states in some classes of models beyond the neutralino dark matter. Moreover, solar WIMPs provide the only probe for indirect detection of such models for annihilation rates equal to or below the nominal thermal freeze-out value of $3e-26 \text{ cm}^3/\text{s}$, which yield a negligible neutrino signal from galactic annihilation of dark matter. Taking detector considerations into account, we use optimal energy and angular cuts to find the sensitivity limits for the ν , τ , and W final states. We use the latter as a benchmark for comparison with the published limits by the IceCube collaboration, and find reasonable agreement. We also show that for $100 \text{ GeV} - 1 \text{ TeV}$ WIMP mass, primary neutrinos and their flavors may be distinguished at a statistically significant level with many years of data from IceCube/DeepCore.

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