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IceCube as a direct detector of sub-GeV dark matter

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The study of non-gravitational effects of Dark Matter (DM) is a growing field of research, leading to the development of numerous dedicated experiments. Astrophysical and cosmological observations show that the galactic component of DM is non-relativistic; this results in a rapid loss of sensitivity to sub-GeV DM masses in Direct Detection experiments with nuclear targets sensitive to keV-scale recoil energies.

Relying only on the assumption that DM scatters on a Standard Model (SM) target particle, a higher-speed component of the flux arises, originating from the upscattering of the galactic DM on Cosmic Rays, which peaks in the GeV energy range.
Neutrino telescopes like Super-Kamiokande are sensitive to these energies and have been already used as DM detectors, setting world-leading limits. Higher energy telescopes, such as IceCube, are also sensitive to these energies and could be even more promising, given their larger volumes. How to best use them to detect sub-GeV DM?

In this contribution I will address this question, for both spin-independent and spin-dependent DM-SM interactions, and establish sensitivities to the scatterings of sub-GeV DM with nuclei in IceCube.

Collaboration(s)

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