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Indirect searches for dark matter signals from the Galactic Center with IceCube DeepCore and IceCube Upgrade

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Understanding the nature of dark matter remains one of the central challenges in modern physics. A promising strategy to probe its properties is indirect detection which searches for excesses of Standard Model particles produced by dark matter annihilation or decay in astrophysical objects. The Galactic Center is a particularly compelling target due to its high dark matter density and relative proximity to the Earth. In this work, we report on a search for neutrinos originating from GeV-scale dark matter in the Galactic Center using nearly a decade of data from IceCube DeepCore. We also present sensitivity projections for the upcoming IceCube Upgrade, designed to significantly enhance detection capabilities in the sub-TeV energy range. These efforts expand IceCube's reach toward sub-TeV dark matter masses and yield world-leading limits for some dark matter scenarios.

Primary author(s) : CHAU, Nhan (IIHE, ULB, Brussels)

Presenter(s) : CHAU, Nhan (IIHE, ULB, Brussels)

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