

# Bounds on Long-lived Dark Matter Mediators from Neutron Stars

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By measuring the flux of Dark Matter (DM) annihilations from a very long distance, Indirect Detection (ID) can be used to investigate Dark Matter (DM) models with very weak couplings and long-lived mediators. And with a large population density and a strong gravitational bound, Neutron Stars (NS) are very effective to collect DM in Galactic Center (GC) to increase DM density, thus enhancing its measured flux. In this paper, using the calculation results of DM annihilation process into a long-lived mediator, we can provide some new limits for the DM-neutron cross-section. Our model of consideration is the Dark Photon model, with an additional U (1) group and a kinetic mixing term in the Lagrangian. The Standard Model (SM) signal for ID is muon neutrino. With experimental results from IceCube and ANTARES, we provide some specific bounds for the Spin-Independent (SI) cross-section down to  $10^{-46}$  cm<sup>2</sup> in the TeV-PeV range for this Dark Photon model.

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