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Neutrinos and gamma rays from long-lived mediator decays in the Sun

Solar dark matter (DM) searches offer a complementary way of studying the nature of DM particles and their potential interactions with ordinary matter. However, the resulting neutrinos fluxes are significantly attenuated at high energies due to their charged current interactions with the solar material. In this talk, I will present results (in a model-independent manner) from a scenario where DM particles annihilate into a pair of long-lived mediators. These mediators can decay further out in the Sun or outside of the Sun, thereby enhancing the neutrino fluxes. Compared to the standard scenario where DM particles annihilate close to the solar core, here we also obtain fluxes of gamma rays and charged cosmic rays. These are generated using a full 3-dimensional model of the Sun, and includes neutrino interactions and oscillations. In addition, we test the complementarity between neutrino (e.g., IceCube, Super-Kamiokande) and gamma ray (e.g., Fermi-LAT, ARGO, HAWC) telescopes in this scenario.

We find that the neutrino fluxes in this scenario are significantly higher at high energy if the mediators decay further out of the Sun. Moreover, gamma ray searches place strong constraints on this scenario even if the mediators decay mainly inside the Sun. We also release a new version of the WimpSim code for future studies with arbitrary mediator models.

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