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Phenomenology of GeV-scale dark matter near p-wave resonance

We consider a light scalar dark matter candidate with mass in the GeV range whose p-wave annihilation is enhanced through a Breit-Wigner resonance. The annihilation proceeds in the s-channel via a dark photon mediator. We compute the temperature at which kinetic decoupling between dark matter and the primordial plasma occurs and show that including the effect of kinetic decoupling can reduce the dark matter relic density by orders of magnitude. We also find that μ and y -distortions of the CMB

spectrum and X-ray data from XMM-Newton strongly constrain the model and rule out the region where the dark matter annihilation cross-section is strongly enhanced at small dispersion velocities. Constraints from direct detection searches and the accelerator limits for dark photons offer complementary probes of the model.

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