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p-wave Annihilating Dark Matter from a Decaying Predecessor and the Galactic Center Excess

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Dark matter (DM) annihilations have been widely studied as a possible explanation of excess gamma rays from the galactic center seen by Fermi/LAT. However, most such models are in conflict with constraints from dwarf spheroidals. Motivated by this tension, I will show in this talk that p-wave annihilating dark matter can easily accommodate both sets of observations due to the lower DM velocity dispersion in dwarf galaxies. Explaining the DM relic abundance is then challenging. I will outline a scenario in which the usual thermal abundance is obtained through s-wave annihilations of a metastable particle that eventually decays into the p-wave annihilating DM of the present epoch. The couplings and lifetime of the decaying particle are constrained by big bang nucleosynthesis, the cosmic microwave background, and direct detection, but significant regions of parameter space are viable. A sufficiently large p-wave cross section can be found by annihilation into light mediators that also give rise to Sommerfeld enhancement. A prediction of the scenario is enhanced annihilations in galaxy clusters.

Summary

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