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Multimessenger Searches for Dark Matter Powered Stars

Wednesday, 10 December 2025 14:00 (30 minutes)

Dark matter (DM) annihilation has been proposed as an alternate heat source to fusion in the first stars. These "dark stars" (DS) are modeled to become supermassive and survive for astronomically long timescales. At the end of their lives they are expected to collapse directly to black holes, seeding the supermassive black holes (SMBH) at the centers of modern galaxies. We study the diffuse background of both neutrinos and photons from a population of such objects which maps to the modern abundance of SMBHs while remaining consistent with JWST observations with can both motivate and constrain the DS population. Using Super-K, IceCube, and Fermi-LAT data, we place constraints on the microphysics of DM models powering these stars.

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