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Capture of Superheavy Dark Matter by the first stars

In this talk, I will discuss the mechanisms and effects of capture of self-annihilating Superheavy Dark Matter by the first stars (PopIII stars), extending previous analysis on the case of WIMP Dark Matter. Pop III stars form as a consequence of hydrogen cloud collapse at the center of DM halos at redshifts of $z \sim 10-20$. They are typically massive, sometimes exceeding 1000 solar masses, and shine at the Eddington luminosity limit. I find that, if the DM halo environment is sufficiently dense or conversely if the accreting star is sufficiently massive, the luminosity captured DM can exceed the luminosity output via nuclear fusion. More importantly, since the latter is the Eddington limit, this implies that capture of Superheavy DM can lead to a cutoff in the Initial Mass Function of PopIII stars. With the upcoming JWST, one could potentially use this to constrain models of Dark Matter.

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