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Stellar Cooling, Inelastic Dark Matter, and XENON WAI-YEE KEUNG, University of Illinois at Chicago, DANNY MARFATIA, University of Hawaii, PO-YAN TSENG, Yonsei University, Korea — We consider a novel scenario of dark photon-mediated inelastic dark matter to explain the white dwarf cooling excess suggested by its luminosity function, and the excess in electron recoil events at XENON1T. In the Sun, the dark photon A' is produced mainly via thermal processes, and the heavier dark matter χ_2 is produced by the scattering of halo dark matter χ_1 with electrons. The XENON1T signal arises primarily by solar A' scattering, and A' emission by white dwarfs accommodates the extra cooling while maintaining consistency with other stellar cooling observations. A tritium component in the XENON1T detector is also required. We show for parameters that explain the XENON1T data, but not the white dwarf cooling anomaly, that a second signal peak may be buried in the XENON1T data and revealable at XENON1T. However, the parameters that give the double peak in the spectrum are incompatible with constraints from horizontal branch stars.

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