Dark Matter Burners

Igor V. Mosalenko & Lawrence L. Wai
Introduction

- Dark matter forms clumps
- Highest density expected in galactic centers
- Stars near galactic center could gain even higher densities at their cores
- Particle dark matter (WIMPs) could annihilate at such high densities
- Energy released could affect appearance and evolution of stars
- White Dwarves should have the highest capture rate
WIMP Accumulation in Stars

- Assumes: steady state, effective radius for WIMP annihilation core, Keplerian velocities, Maxwellian WIMP velocity distribution
- Limit on WIMP-nucleon scattering cross section: $\sigma_0 < 10^{-43} \text{ cm}^2$
- For “heavy” white dwarves the geometrical limit dominates
WIMP Capture Rate:
Two White Dwarf Models
WIMP Capture Rate: vs. Distance to Central Black Hole
Observation Potential

- Radius of WIMP burning core $\ll R_\star$ so annihilation manifests as thermal or neutrino emission
- Estimated that $L \sim 10 \, L_{\text{sun}}$, $T \sim 140,000 \, \text{K}$, peaking in the UV
- Since the population of very hot white dwarves is limited, a concentration near galactic center could indicate dark matter burning