

Can γ -rays be detected from accretion-driven systems?

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Magnetically controlled accreting white dwarf binaries, which includes polars and intermediate polars, provide unique laboratories for high-energy particle acceleration in compact stellar systems. Their strong magnetic fields, rapid accretion flows, and dynamic magnetospheres enable distinct acceleration channels. In polars, which rotate synchronously with strong magnetic locking, unipolar induction under mild asynchronism and episodic diffusive shock acceleration are prime candidates. In intermediate polars, differential rotation can create transient vacuum gaps capable of curvature radiation, with magnetic reconnection at the boundary between the disk and magnetosphere acting as a complementary process. Historical reports of TeV emission from some polars, though not universally confirmed, motivated these models and highlighted the need for sensitive GeV-band searches. We present a Fermi-LAT analysis of accretion-driven systems, applying time-resolved, temporal analysis and TS-gating techniques to isolate transient gamma-ray signals. Although no persistent emission was detected at the >5 sigma level in time-integrated searches, multiple systems exhibit significant gamma-ray excesses that are spatially coincident with the white dwarf. Several exhibit significant periodic modulation at the white dwarf spin, beat, or orbital period, confirming a physical association with the binary. The nonthermal spectra, peaking below approximately 10 GeV, are consistent with predictions from unipolar induction, vacuum gap acceleration, and related inverse Compton, π^0 -decay, and curvature radiation processes. These results demonstrate that magnetic cataclysmic variables can act as low-level yet recurrent gamma-ray sources, with activity governed by accretion geometry, magnetospheric structure, and plasma conditions. Future studies with more sensitive gamma-ray observatories such as CTA, AMEGO, or e-ASTROGAM, complemented by X-ray and optical monitoring, could provide deeper insight into the particle acceleration mechanisms driving emission in these compact binaries.

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