



WPI

Physics Department Colloquium

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Grinnell College

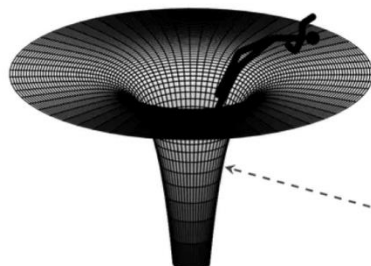
Wednesday, September 18th, 2024

12:00 p.m., SL 411

Energy extraction through magnetic reconnection from a rotating charged black hole in perfect fluid dark matter

Magnetic reconnection is commonly observed in solar flares and the Earth's magnetosphere, where antiparallel magnetic field lines break and reconnect. This mechanism produces thin current sheets and plasmoids that facilitate the rapid conversion of magnetic field energy into kinetic energy carried by released plasma. Recent investigations show that magnetic reconnection is an efficient energy extraction mechanism, which helps explain the base of energetic relativistic jets. In this talk, I will discuss energy extraction through the magnetic reconnection mechanism for a rotating, charged black hole immersed in a perfect fluid dark matter background. Our studies focus on the impact of black hole spin, electric charge, and the dark matter parameter on the horizons, ergoregions, and circular geodesics at the equatorial plane of this black hole, and how these factors further influence the reconnection efficiency and energy extraction rate.

$$ds^2 = -\left(1 - \frac{2GM}{c^2 r}\right) dt^2 + \left(1 - \frac{2GM}{c^2 r}\right)^{-1} dr^2 + r^2 d\Omega^2$$



$$|\Delta F_{grav}| = \frac{2GMmd}{r_0^3}$$

$$r_{Horizon} = \frac{2GM}{c^2}$$

Bio

Dr. Rodriguez received a B.S. in Applied Physics from the University of Science and Technology of China in 2004 and a Ph.D. in Space Physics from the University of Iowa in 2010. After spending 4 years at NASA's Goddard Space Flight Center as a research scientist, she joined the physics faculty at Worcester Polytechnic Institute in 2014 and later became a faculty member in the Physics Department at Grinnell College in 2018. Her research interests include black hole theory and phenomenology, plasma astrophysics, and dualities between gravitational and condensed matter physics.