

An electrodynamic process to extract the rotational energy of a Kerr black hole

Wednesday, June 14, 2023 11:00 AM (30 minutes)

It has been thought for decades that rotating black holes (BHs) power the energetic gamma-ray bursts (GRBs) and active galactic nuclei (AGNs), but the mechanism that extracts the BH energy has remained elusive. This problem might be solved when the BH is immersed in an external magnetic field and ionized low-density matter. For a magnetic field parallel to the BH spin, the induced electric field accelerates electrons outward and protons inward in polar regions and vice versa in equatorial regions. For an antiparallel magnetic field, protons and electrons exchange their roles. The particles that are accelerated outward radiate off energy and angular momentum to infinity. The BH powers the process by reducing its energy and angular momentum by capturing polar protons and equatorial electrons that lead to net negative energy and angular momentum. The electric potential allows for negative energy states outside the BH ergosphere, so the latter does not play any role in this electrodynamical BH energy extraction process.

Primary authors: RUEDA HERNANDEZ, Jorge Armando (ICRANet); RUFFINI, Remo (ICRANet, ICRA, INAF)

Presenter: RUEDA HERNANDEZ, Jorge Armando (ICRANet)

Session Classification: Wednesday morning session