

Penrose process driven by magnetic reconnection

Thursday 19 December 2024 09:45 (15 minutes)

Magnetic reconnection is an ubiquitous astrophysical phenomenon, with a number of astronomical observations, as well as numerical simulations, that are increasingly providing evidence of interesting dynamical effects when occurring around black holes. In this talk we present a general approach to the study of a Penrose process driven by plasmoids that are produced at reconnection sites along current sheets. Our approach is meant to determine the physical conditions that make a plasmoid-driven Penrose process energetically viable, and does not rely on ad-hoc prescriptions for the kinematics of the bulk plasma, that can either be in magnetohydrodynamical or force-free regimes. Moreover the approach we exploit is genuinely multidimensional and allows one to explore configurations outside the already explored equatorial plane. We show this with a concrete example: a magnetised torus, whose portion penetrating the ergosphere, that we dub “ergobelt”, naturally provides a site to self-consistently compute the occurrence of reconnection and to estimate the energetics of a plasmoid-driven Penrose process.

Authors: CAMILLONI, Filippo; Prof. REZZOLLA, Luciano (Goethe University)

Presenter: CAMILLONI, Filippo