Contribution ID: **232** Type: **Talk in a parallel session**

Properties of low angular momentum general relativistic MHD flows around black holes

Friday, 12 July 2024 17:50 (20 minutes)

In this work, we investigate the global structure of shock-induced general relativistic magneto-hydrodynamic (GRMHD) accretion flows around a Kerr black hole, where the disk is threaded by the radial (b^r) and the toroidal (b^ϕ) magnetic fields. In doing so, we consider an advective, axisymmetric, and optically thin accretion flow that is confined in the disk mid-plane. In addition, we adopt the relativistic equation of state and obtain the trans-magnetosonic accretion solutions in the ideal MHD limit. In a magnetized flow, the inflowing matter experiences centrifugal repulsion and an additional barrier due to the magnetic pressure that eventually causes a discontinuous shock transition of the flow variables following the necessary shock conditions. With this, we examine the shock dynamics with the variation of radial magnetic flux (Φ) and the iso-rotation parameter (F) rather than the local magnetic fields (b^r, b^ϕ). However, the shock properties and dynamics of the post-shock corona (PSC) are largely driven by the radial magnetic flux (Φ), whereas the effect of F is less significant. It is worth mentioning that the toroidal magnetic field jumps significantly across the shock front, resulting in a highly magnetized PSC. We further identify the effective region of the parameter space for standing fast-MHD shocks and observe that shock forms for a wide range of flow parameters, namely energy (E), angular momentum (L), and radial magnetic flux (Φ), respectively. Meanwhile, we observe that the shocked GRMHD flow fails to achieve the Magnetically Arrested Disk (MAD) state in the mid-plane, yet it sustains a 'SANE' (Standard And Normal Evolution) flux. Finally, we discuss the astrophysical importance of low-angular momentum accretion flows in the realm of GRMHD.

Primary author: MITRA, Samik (Indian Institute of Technology Guwahati)

Co-author: Prof. DAS, Santabrata (Indian Institute of Technology Guwahati)

Presenter: MITRA, Samik (Indian Institute of Technology Guwahati)

Session Classification: Spectral and temporal properties of accretion flows and jets around compact objects and the theoretical models

Track Classification: Accretion (AC): Spectral and temporal properties of accretion flows and jets around compact objects and the theoretical models