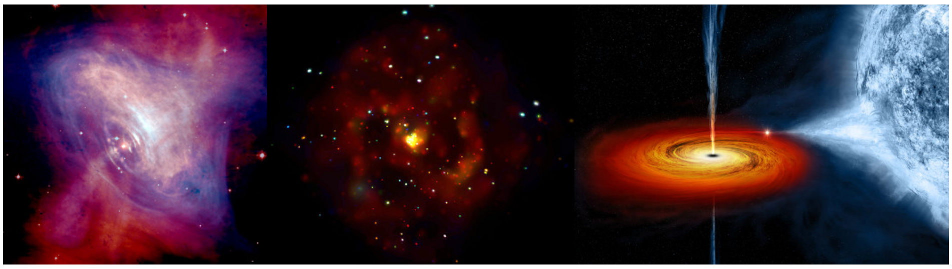

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Study of the relativistic accretion flow in a Kerr-Taub-NUT black-hole with shock

Monday, April 3, 2023 10:15 AM (15 minutes)

We study the relativistic, inviscid accretion flow in a generic stationary axisymmetric Kerr-Taub-NUT (KTN) space-time in presence of the shock waves. Along with the mass, this KTN space-time contains the spin parameter or the Kerr parameter ($a_{\rm k}$) and the NUT parameter (n). Depending on the values of $a_{\rm k}$ and n this space-time represents either black-hole or naked singularity. We obtain the global solutions by solving the governing equations that describe the relativistic accretion flow in KTN black hole. The flow experiences centrifugal repulsion that eventually triggers discontinuous shock transition provided the relativistic shock conditions are satisfied. The post-shock region contains high entropy over the pre shock flow, that prefers the shock-induced solution than the shock free solution. Due to shock compression, the post-shock flow (equivalently post-shock corona, hereafter PSC) becomes hot and dense, and produces high energy radiations after reprocessing the soft photons from the pre-shock flow via inverse Comptonization. Usually, PSC is characterized by shock location (r_s), compression ratio (R), and shock strength (S), which are dependent on the flow parameters, namely energy ($calE$) and angular momentum (λ). Therefore, we identify the effective region of the parameter space in the $\lambda - calE$ plane for shock and observe that shock forms for a wide range of flow parameters. We also find that $a_{\rm k}$ and n act oppositely in determining the shock parameter space. Finally, we calculate the disc luminosity (L) considering free-free emissions and conclude that global shock solutions are energetically preferred as they are relatively more luminous compared to the shock free solutions.

Presentation Type

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Primary author: SEN, GARGI (Indian Institute of Technology Guwahati)

Co-authors: Dr MAITY, Debaprasad (Indian Institute of Technology Guwahati); Prof. DAS, Santabrata (Indian Institute of Technology Guwahati)

Presenter: SEN, GARGI (Indian Institute of Technology Guwahati)

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