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Imprints of spin on the solution and emission spectrum of accretion ows around black holes

We investigate accretion flows around rotating black holes (BHs) and obtain self-consistent transonic solutions in full general relativistic prescription. The flow is assumed to be viscous and radiative. Viscosity helps in the removal of angular momentum outwards, allowing matter to get accreted inwards. In addition, viscous heat dissipated makes the matter hotter. On the other hand, radiation mechanisms like bremsstrahlung, synchrotron, and their inverse-Comptonisations cools down the matter. Thus, the solution depends highly on the interplay between heating and cooling processes. In our work we investigate the entire energy–angular momentum parameter space and obtain both shocked and shock-free accretion solutions. Because of the spin in Kerr black holes, the event horizon is dragged to a region $<2GM/c^2$, increasing the efficiency of accretion process. Ample of works showed a rotating BH to yield high temperature solutions compared to a Schwarzschild BH. This suggests higher emission. Interestingly we have found a distinct annihilation line present only in extremely rotating BHs arising from regions very close to the central object. We have investigated further the other effects of spin on the spectrum obtained from accretion flows around BHs. We find efficiencies reaching >30% for maximally rotating BHs.

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