Disk-Jet Equilibrium Structure Formation from Weakly Rotating Electron-Ion-Photon Gas

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We studied the problem of relativistic disk-powerful jet equilibrium structure formation from relativistic accretion disks applying the Beltrami-Bernoulli equilibrium approach [1-3]. Accretion disk is magnetized consisting of fully ionized relativistic electron-ion plasma and photon gas strongly coupled with electron gas due to Thompson Scattering. The main source of accretion is local viscosity, which we describe with generalized Shakura-Sunyaev α-turbulent dissipation model [4], where we have contributions of both the photon and ion gasses. We ignore the Hall term (easily justified for weakly magnetized disk, while for strongly magnetized disk it can be justified in the disk for studied 3-fluid minimal model) and the self-gravitation in the disk. For weakly magnetized disk we constructed the analytical self-similar solutions for the equilibrium relativistic disk-jet structure characteristic parameters in the field of gravitating central compact object. It is shown, that magnetic field in the jet is several orders greater compared to that of accretion disk, while jet is locally Super-Alfvenic with local Plasma-beta < 1 near jet axis. The derived solutions can be used to analyze the astrophysical jets observed in binary systems during the star formation profess linking the jet properties with the parameters of relativistic disks of electron-ion-photon gas.

References

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The work was partially supported by Shota Rustaveli National Science Foundation Project N FR-22-8273.

The results are published in: ***Katsadze, E.***, *Revazashvili, N., Shatashvili, N. L. Jet Formation Model from Accretion Disks of Electron-Ion-Plasma Gas, 2024,* ***J. High Energy Astrophysics 43****, 20-30.*