

Extracting Energy Magnetically from Plunging Region of Black-Hole Accretion Disk

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Abstract: An analytical expression for the jet power extracted from the plunging region between a black hole (BH) horizon and the inner edge of the disk (hereafter the PL power) is derived based on an improved equivalent circuit in BH magnetosphere with a mapping relation between the radial coordinate of the plunging region and that of the remote astrophysical load. It is shown that the PL power is of great importance in explaining jet power and dominates over the BZ and DL powers for a wide value range of the BH spin. In addition, we show that the PL power derived in our model can be fitted with the strong jet powers of several 3CR FR I radio galaxies, which cannot be explained by virtue of the BZ mechanism. Furthermore, the condition for negative energy of the accreting particles in the plunging region is discussed with the validity of the second law of BH thermodynamics.

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Key words: black hole, accretion disk, jet power, radio galaxies

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