Abstract Submitted
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Origin of Rotating Ring Structures in the Strong Gravity of a Central Object.[1] B. COPPI, MIT — The origin of plasma rotating ring structures forming around a central object whose gravity is prevalent has been identified [1] through the analysis of thin equilibrium configurations that are immersed in a relatively weak external magnetic field and can carry internal toroidal currents. Unlike the case of the "classical" gaseous disk, in which the vertical equilibrium is maintained only by gravity, rings are maintained vertically by the Lorentz force and radially by gravity. The differential rotation is the sustaining factor of these ring structures and of the jets that may emerge from them. The rings are connected with the formation of a periodic sequence [2] of Field Reverse Configurations of the poloidal magnetic field, consisting of pairs of counter-streaming toroidal current channels. In magnetic field configurations that have been considered previously for accretion disks the magnetic field diffusion was assumed to be such that the Ferraro isorotation condition was not valid, while in our case it has a primary role. The relevant equilibria are not described by the Grad-Shafranov equation but by two non-linear coupled equations that have been solved analytically. These provide both the plasma pressure function and the magnetic surface function once a consistent plasma density function is chosen within a relatively narrow class. A two-fluid description of the same equilibria is given differentiating the relative roles of electrons and ions.[1] B. Coppi and F. Rousseau, *to appear in Ap. J.*, April (2006). [2] B. Coppi, *Phys. of Plasmas*, **12**, 057302 (2005).

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Vadim Roytershteyn
MIT

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