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Beltrami state in black-hole accretion disk: A Magnetofluid approach[1] CHINMOY BHATTACHARJEE, Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712, USA, RUPAM DAS, Department of Physical and Applied Sciences, Madonna University, Livonia, Michigan 48150, USA, DAVID J. STARK, S.M. MAHAJAN, Institute for Fusion Studies, The University of Texas at Austin, Austin, Texas 78712, USA — We examine electron-ion Beltrami states in a black hole accretion disk (both Schwarzchild and Kerr) using magnetofluid unification in order to delineate the types of plasma behavior accessible in these geometries. Following the same assumptions as Hall MHD, we find both that the curvature in the spacetime radically alters the magnetic/velocity decay rate and that the predicted geodesic velocity profiles for particles solely constrained by gravity also deviate substantially from our solutions. These departures suggest that these systems are governed by the rich interplay of plasma dynamics and general relativity. Furthermore, the relationship between the helicities of each species introduces a new oscillatory length scale into the system that is strongly influenced by relativistic and thermal effects.

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