Radiation magnetohydrodynamic flows in laboratory astrophysics: from similarity properties to experimental simulation

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Abstract

Radiation magnetohydrodynamic flows are ubiquitous in high-energy astrophysics environments. The dynamics of accretion disks, the astrophysical jets emitted by different types of compact objects and the dynamics of accretion processes in magnetic X-ray binary systems are perfect examples. All these phenomena present high-energy regimes in which intense magnetic field, radiation and hydrodynamic are strongly coupled. Some of them present interesting similarity properties which allow to reproduce them in laboratory. In this work we present the similarity properties of such flows in different radiation regimes (optically thin and optically thick regimes). The associated scaling laws will be established and the link with high-pulsed facilities experiments will be discussed.