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Plasma Physics Seminar

Physics & Astronomy Building (PAB) Room 4-330
Via Zoom: https://ucla.zoom.us/j/92785449357?pwd=SVBTSko3bTdEUW03dzQwNks1Q2lKZz09
Friday, May 3, 2024 at 12:30PM
Lunch will be served at 12:00PM

Experiments on-high-energy-density rotating plasmas: towards laboratory modelling of accretion disks and jets at laser and pulsed-power facilities

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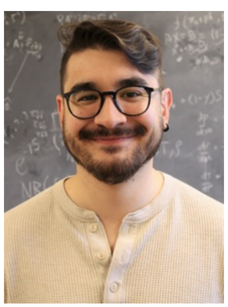

Abstract: Rotating plasma disks orbiting a central object, like a black hole, are ubiquitous in the universe. However, questions regarding their dynamical evolution, such as the mechanisms of angular momentum transport and the role of magnetic fields in seeding instabilities, turbulence and launching jets, remain outstanding.

In this talk I will give an overview of a new generation of laboratory experiments fielded at high-energy-density facilities (the MAGPIE pulsed-power generator at Imperial College London and the OMEGA laser at the University of Rochester), designed to probe plasma physics relevant to accretion disks and jet-launching regions [1-4].

In these experiments, a differentially rotating plasma column is driven and sustained by the collision of multiple inflowing plasma jets. The free-boundary design allows the plasma to expand axially, forming supersonic rotating jets which remain collimated as they propagate through the vacuum chamber. The rotating plasma flows are high magnetic Reynolds plasma flows are high magnetic Reynolds number (ranging from 10^2 to 10^3) and has a quasi-Keplerian stratification. The experiments are supported by 3-D MHD simulations performed on the code Gorgon, which are used to model the formation, evolution and structure of differentially rotating plasmas. I will discuss the potential of these experiments to study the magneto-rotational instability, the Omega-effect, and the overall effect of magnetic fields in high-Rm rotating plasmas on laboratory scales.