Astro Plasma Seminar

Prof. Zheng Gong

弓正

Chinese Academy of Sciences

Title: Plasma microdynamics in relativistic current filamentation and collisionless shock precursors

Time: 15:00-16:00, 21 October (Monday), Shanghai time

Host: Longqing Yi (易龙卿)

Location: N600

Join Tencent Meeting: https://meeting.tencent.com/dm/nnC23pWTXpjv

Meeting ID: 298367878 (no password)

Abstract:

Current filamentation is an important collective behavior governing various plasma systems. Microscopically, current filamentation modifies energy deposition in inertial confinement fusion and constrains the efficiency of plasma-based accelerators. In astrophysics, current filamentation can mediate the internal structure of collisionless shocks, which are associated with supernova remnants and gamma-ray bursts. In this seminar, we will review relativistic current filamentation and collisionless shock formation and then discuss the kinetic electron slingshot acceleration mechanism in collisionless shock precursors. The slingshot acceleration primarily occurs in the non-turbulent region of relativistic counterstreaming plasma, distinct from the well-known stochastic acceleration in drastically turbulent plasmas. The slingshot mechanism has a favorable acceleration efficiency compared to the stochastic mechanism, which could provide a new perspective on the origin of high-energy cosmic rays.

Biography:

Zheng Gong is an associate professor at the Institute of Theoretical Physics (Chinese Academy of Sciences). He obtained his PhD in nuclear technology at Peking University (China) in 2020. After that, he worked as a postdoc at the Max Planck Institute for Nuclear Physics (Germany) and Stanford University (U.S.) until 2024. Prof. Gong's work mainly focuses on the computational studies of high-energy-density plasmas, including particle acceleration, radiation, instabilities, and kinetic turbulence. He is interested in digging into detailed collective processes of plasmas and utilizing these to understand relevant scenarios such as inertial confinement fusion, plasma accelerators, and astrophysics in extreme conditions. Landmark results in this area include the identification of magnetic islands in laser-driven plasma channels, the conception of topological structures in current filamentation instabilities, and exploring electron slingshot mechanisms in relativistic collisionless shocks. He was awarded the 2022 "Matter and Radiation at Extremes" Young Scientist Award and the 2020 AAPPS-DPP U30 Doctoral Student Award for contributions to high-intensity laser-plasma interaction.

Astronomy and Astrophysics Division
天文与天体物理研究部