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Michigan Institute for Plasma Science and Engineering

Wednesday
September 23, 2026
3:10 pm
Room 1003 EECS

Prof. Petros Tzeferacos

University of Rochester

Laboratory Experiments of Astrophysical Processes in Magnetized Turbulence

Magnetized turbulence in the interstellar and intergalactic mediums is a key agent affecting or governing the phenomenology observed in such astrophysical environments. In this seminar, I present fundamental science research in magnetized astrophysical plasmas that is accomplished through the concerted application of simulation codes and laboratory plasma astrophysics experiments. I discuss studies in fluctuation dynamo, a ubiquitous astrophysical process thought to be responsible for the present-day magnetization of numerous celestial objects; charged particle diffusive transport and acceleration, in the context of extragalactic and ultra-high energy cosmic rays; and the transport of heat in galaxy clusters. The experiments leverage world-class laser facilities like the Omega Laser Facility at the Laboratory for Laser Energetics, the National Ignition Facility at Lawrence Livermore National Laboratory, and the GSI Helmholtz Centre for Heavy Ion Research in Darmstadt. We detail these experiments, as well as the FLASH simulation campaigns that we executed for their design and interpretation, providing us with new way to validate or falsify our theoretical understanding. The work reflects the efforts of the TDYNO (Turbulent Dynamo) collaboration.

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About the Speaker: Petros Tzeferacos is the Director of Flash Center for Computational Science, a Professor of Physics and Astronomy, and a Senior Scientist at the Laboratory for Laser Energetics of the University of Rochester. He works on plasma physics and astrophysics, combining MHD theory, numerical modeling, and laser-driven laboratory experiments, to study fundamental astrophysical plasma processes with a focus on magnetized turbulence, dynamo, and charged particle acceleration. He is also working on several fundamental topics in inertial fusion energy and high energy density physics. He holds a visiting scientist position with the University of Oxford and the Lawrence Livermore National Laboratory and is a guest scientist at Los Alamos National Laboratory. He received the APS John Dawson Award for Excellence in Plasma Physics Research in 2019, an Early Career Award from the U.S. Department of Energy Office of Science in 2021, and the Presidential Early Career Award for Scientists and Engineers in 2025.