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TIME: Monday 3:00 PM, Oct 22, 2012 LOCATION: A601 NAOC

Studies of Dynamical, Flowing High-Energy-Density Plasmas

Dr. R Paul Drake (University of Michigan)

R. Paul Drake is the Henry S. Carhart Collegiate Professor of Space Science at the University of Michigan, Ann Arbor. He got the Ph.D. of Physics from Johns Hopkins University in 1979. He has worked as a research physicist at the Lawrence Livermore National Laboratory in California and had visiting professorships at universities around the United States. He was featured in the BBC’s documentary Hyperspace (2001) and the Discovery Channel’s How the Universe Works (2009). Currently, Dr. Drake is also Director of Center for Radiative Shock Hydrodynamics at the University of Michigan. He works primarily in high-energy-density physics and its applications to astrophysics. He is internationally recognized as a pioneer in this field. His work emphasizes the dynamic behavior of such systems, which also may be strongly radiative or magnetized. He is also known for work in laser-plasma interactions, and is a Fellow of the American Physical Society.

Abstract

In our work at the University of Michigan, we study dynamical, flowing plasmas at high energy density. This talk will describe our experiments in three areas and our simulations of these and other experiments. Our research in radiation hydrodynamics is focused on radiative reverse shocks in colliding flows, relevant to open questions regarding the “hot spot” in cataclysmic-variable binary stars. We have recently produced the first laboratory radiative reverse shock and are proceeding toward the production of colliding flows in relevant geometries. We also continue work to assess our ability to predict experiments with driven radiative shocks. Our research in the dynamics of magnetized flows seeks to produce and study a flow-driven, magnetized, accretion disk. We have produced a candidate source plasma jet to drive such a disk. Our goal is to produce a rotating disk with shear flow, as occurs in astrophysical accretion disks. The resulting dynamics will be relevant to disk formation, jet production, and hydrodynamic and MHD turbulence. Our research in HED hydrodynamics is focused on the long-term evolution of hydrodynamic instabilities. This has recently included research on the Kelvin-Helmholtz instability and on the (blast-wave-driven) Rayleigh-Taylor instability, and design work for novel studies of the Richtmyer-Meshkov process, on which we have begun experiments. We use our CRASH code to model these and other HED experiments from laser deposition through long-term radiation-hydrodynamic behavior. This work is funded by the NNSA-DS and SC-OFES Joint Program in High-Energy-Density Laboratory Plasmas, grant number DE-FG52-09NA29548; Predictive Sciences Academic Alliances Program in NNSA-ASC via grant DEFC52- 08NA28616; National Laser User Facility Program, grant number DE-NA0000850; Defense Threat Reduction Agency, grant number DTRA-1-10-0077; and Los Alamos National Laboratory, subcontract number 129021.

All are welcome! Tea, coffee, biscuits will be served at 2:45 P.M.