

CORE-CM SEMINAR

Michigan State University

Y. Y. Lau

**Department of Nuclear Engineering and Radiological Sciences
University of Michigan, Ann Arbor**

Magnetohydrodynamic instabilities in planar and cylindrical liners

When a fluid slab of a finite width is accelerated in vacuum, one interface is subjected to the Rayleigh-Taylor instability (RT) while the other interface is stable, intuitively. If the acceleration is provided by a magnetic pressure, the instability is known as the magneto-Rayleigh-Taylor instability (MRT). MRT, because of the presence of magnetic fields, is necessarily anisotropic on the interface. This anisotropy is markedly different from the conventional RT that is driven by a kinetic pressure. MRT is important to peta-watt pulsed-power system development, wire-array z-pinch, magnetized target fusion, equation-of-state studies using flyer plates, and in the study of crab nebulae. This talk outlines our extensive study of MRT in the planar slab, and in a cylindrical liner in which the kink and sausage mode may also come into play. From the exact dispersion relation, we examine various issues including anisotropy, feedthrough, and coupling of MRT, sausage, and kink mode. We identify several stages of MRT-sausage-kink mode evolution on the magnetized liner inertial fusion (MagLIF) experiments at the Sandia National Laboratories. The persistence of the observed helical structures on MagLIF is interpreted in terms of non-axisymmetric eigenmode. Effects of shocks are simulated.

Y. Y. Lau received his SB, SM, and PhD degrees in Electrical Engineering from MIT. He was assistant professor in applied mathematics at MIT, a research physicist at the Naval Research Laboratory, and currently a professor in the Department of Nuclear Engineering and Radiological Sciences at the University of Michigan. He has worked on electron beams, coherent radiation sources, plasmas and discharges. His recent interests include heating phenomenology, physics of quantum and higher dimensional diodes, Thomson X-ray sources, and electrical contacts. He has 11 patents and 230 refereed publications. He served four terms (1994-2005) as an Associate Editor of the Physics of Plasmas. He is an APS Fellow and IEEE Fellow, and received the 1999 IEEE Plasma Science and Applications Award.

Thursday, March 24, 2016

12:00 NOON

Room 1400 – Biomedical & Physical Sciences

Professor John Verboncoeur - Host