

Shocks and Wakes in Plasmas



Wednesday
September 19, 2012
4:00 pm
Room 1311
EECS Building

Shocks and wakes are both disturbances produced in a fluid by the passage of an object – usually at very high speeds. Shocks are typically produced ahead of a supersonically propagating “piston-like” object, whereas a wake is a disturbance that trails the moving object. In plasmas both wakes and shocks can be produced by the passage of intense laser pulses or highly relativistic, charged particle bunches. In either case, extremely large electric fields can result from the displacement of the plasma electrons from the ions, and lead to acceleration of ions – in the case of shocks, and electrons - in the case of wakes.

In this talk I will first explain how, even in the absence of collisions, shocks can be excited in plasmas and lead to generation of high energy, mono-energetic ions. I will then present our work on acceleration of electrons to extremely high energies in plasma wakes using ultra-relativistic electron bunches.

About the Speaker: Dr. Chan Joshi is a Distinguished Professor of Electrical Engineering and the Director of the Neptune Facility for Advanced Accelerator Research at UCLA. His research is in the fields of plasma physics, lasers and electromagnetics with special interests in the areas of laser fusion, laser acceleration of particles, nonlinear optics of plasmas, high-power lasers and particle beams, and basic plasma phenomena. Prof. Joshi's group is best known for their work in the field of ultra-high gradient acceleration of charged particles using space charge density waves in plasmas produced by a laser or a particle beam pulse. Work started by Prof. Joshi has now spread worldwide. A large number of former students and postdocs trained in Prof. Joshi's group have gone on to form their own research groups in the advanced accelerator field. Prof. Joshi was awarded the APS-Maxwell Prize (2006), the Advanced Accelerator Concepts Prize (2008), IEEE-Particle Accelerator Science and Technology Award (2009), APS- Excellence in Plasma Physics Award (1996) and USPAS prize for Achievement in Accelerator Physics and Technology (1997). He was the APS Centennial Speaker (1999) and a Distinguished Lecturer in Plasma Physics (2001). He is a Fellow of the APS, IEEE and IoP.