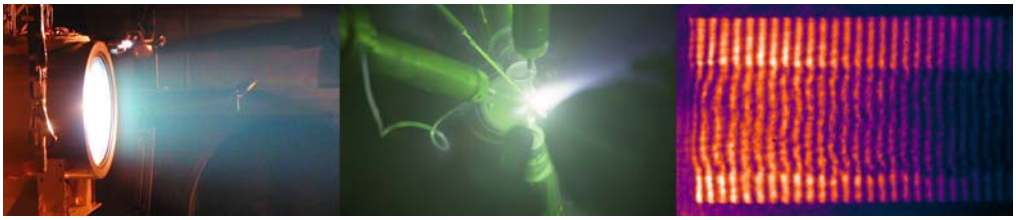

Michigan Institute for Plasma Science and Engineering Seminar

Up Against the Wall: Liquid Lithium for the Chamber Technology Challenge in Fusion Energy

Dr. Robert Kaita

Princeton Plasma Physics Laboratory

3:00 pm, Room 1690 CSE
Tuesday, 28 April 2009
(Refreshments will be served after seminar.)

Abstract

For both inertial and confinement fusion, a critical need is to develop an appropriate "first wall" that will face thermonuclear plasmas. It has been difficult to find a solid material for the high power densities and large neutron fluxes that a plasma-facing component (PFC) must handle for long periods of time. An alternative is to use liquid metals for a fusion reactor PFC. Radiation damage will not be an issue for such PFCs, and since they can flow, they are able to dissipate high heat loads. Furthermore, any material removed by erosion can be readily replenished. At the Princeton Plasma Physics Laboratory (PPPL), there is an active program in small and large-scale magnetic confinement devices to develop a liquid lithium PFC. To simulate high power loads, experiments were conducted with an electron beam directed at a large, free-surface liquid lithium "pool," and effective heat dissipation through convective cooling was demonstrated. Discharges with lithium as a PFC showed a marked reduction in recycling, or the re-introduction of cold fuel gas into the plasma from the chamber wall, and a significant improvement of energy confinement was observed. This talk will describe lithium PFC research on two facilities at PPPL. The Lithium Tokamak Experiment (LTX) is a modest sized toroidal confinement device that is the first to have a conformal liquid lithium wall that encloses the plasma. The National Spherical Torus Experiment (NSTX) is a larger magnetic fusion machine that is the first to have liquid lithium in its divertor region.

About the Speaker:

Dr. Robert Kaita is a physicist in the Princeton Plasma Physics Laboratory (PPPL) at Princeton University. At PPPL, he is Head of Plasma Diagnostic Operations for the National Spherical Torus Experiment (NSTX). He is also Co-Principal Investigator for the Lithium Tokamak Experiment (LTX). On both NSTX and LTX, Dr. Kaita's present research interests focus on plasma-surface interactions and the use of liquid metals as "first-wall" materials for fusion reactors. In the Plasma Physics Program of the Department of Astrophysical Sciences at Princeton University, Dr. Kaita has supervised the research of over two dozen graduate students. His bibliography lists more than 300 publications in nuclear and plasma physics. He is a member of the American Association for the Advancement of Science, a fellow of the American Physics Society, and a member and past president of the Princeton Chapter of Sigma Xi, the Scientific Research Society.