

Seminar

(Dr. Parvez Guzdar award talk)

Institute for Plasma Research

Title : Spectroscopic Diagnosis of Magnetic and Electric Field and Plasma Properties in a Relativistic Electron Beam Diode

Speaker : Dr. Subir Biswas

Weizmann Institute of Science, Israel

Date : 04th January 2017 (Wednesday)

Time : 3.30 PM

Venue : Seminar Hall, IPR

Abstract :

We analyzed visible spectra obtained in self-focusing, relativistic-electron diode experiments performed on an accelerator facility [1] at Sandia National Laboratories. An electron beam emitted from the cathode strikes a planar anode surface with high current densities (~ 1 MA/cm²), forming a plasma on the electrodes that expands in the anode-cathode (A-K) gap. Radiation emitted from the plasma is imaged onto a spectrometer input slit via an optical fiber bundle. The spectrometer output is coupled to a gated ICCD camera, yielding spatially resolved (0.5 mm) and temporally resolved (5 ns) spectra. The local electric and magnetic field near the anode surface are measured using the Stark shifting and Zeeman splitting of the spectral lines. In addition, the plasma composition, density gradients, velocities, and temperature are obtained. This was accomplished even though the spectra from the high-density region mainly exhibited continuum. To this end, the continuum was shown to result from blending of many Stark-broadened spectral lines, rather than free-free or free-bound emissions, which allowed for determining plasma composition and density. Data was analyzed using steady state collisional radiative (CR) and detailed line shape calculations.

1. K. D. Hahn, N. Bruner, M. D. Johnston et. al., "Overview of Self-Magnetically Pinched-Diode Investigations on RITS-6," IEEE Trans. Plasma Sci., 38, 2652 (2010).
