DAMOP12-2012-000026

Abstract for an Invited Paper
for the DAMOP12 Meeting of
the American Physical Society

Two dimensional laser-collision induced fluorescence measurements in low pressure plasmas

ED BARNAT, Sandia National Laboratories

Diagnostic techniques that enable the measurement of the temporal and spatial evolution of a plasma discharge provide insight into the mechanisms governing the behavior of a plasma discharge. In this presentation, the development and implementation of a two-dimensional laser diagnostic known as laser-collision induced fluorescence (2D-LCIF) is described. The technique relates the redistribution of laser excited population into nearby states to the electron density and electron energy via a collisional-radiative model (CRM) also described in this work. Central to the successful implementation of this technique is proper knowledge of the energy dependence of electron impact excitation between the various levels of the atomic or molecular system probed. Emphasis is placed on the ability of the technique to provide two dimensional maps of the electron densities in a plasma discharge. Discussion is also offered on the techniques ability to characterize the "effective temperature" of the electrons by observing relative changes in the excitation rates across a plasma discharge. Application of the 2D-LCIF technique to structurally interesting plasmas is demonstrated. While earlier studies have focused on helium, effort is underway to extend the technique to other systems such as argon. This work was supported by the Department of Energy Office of Fusion Energy Science Contract DE-SC0001939