Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Transient characteristics of a pulsed helium positive column as measured with laser-collision induced fluorescence[1] ED BARNAT, Sandia National Laboratories, VLADIMIR KOLOBOV, CFDRC — The two dimensional laser-collision induced fluorescence (2D LCIF) diagnostic technique is extended to modest pressures (0.1 Torr to 10 Torr) and is then utilized to examine the evolution of helium positive column in response to a pulsed current (up to 1.5 A). Temporally and spatially resolved measurements of the species in the pulsed column such as excited state distributions, electron densities and "effective electron temperatures" are obtained using the LCIF technique. It is observed, that during the initial response of the column to the applied pulse, the radial dependence of excited state species (23P state of helium) tracks that of the electron densities. On the other hand, significant deviation between radial profiles of the excited species and the radial profile of the electron densities is observed as the column evolves in time. While the electron densities remain radially peaked on the axis of the discharge, the excited state distribution flattens out at lower pressures (< 2 Torr) and becomes peaked off axis at the higher pressure bound studied (>3 Torr). Global measurements of discharge current and line-integrated densities obtained with microwave interferometry are used both to calibrate the laser measurements as well as to ascertain reduced electric fields (E/N) and electron temperature. Trends observed in spatially resolved measurements are discussed and compared to simulation results.

[1]This work was supported by the Department of Energy Office of Fusion Energy Science Contract DE-SC0001939.

Ed Barnat
Sandia National Laboratories

Date submitted: 13 Jun 2012 Electronic form version 1.4