Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Electron dynamics in dual frequency operation of a helium-based radio frequency atmospheric discharge LAURA COX, COLM O'NEILL, ANDREW GIBSON, BILL GRAHAM, Centre for Plasma Physics, Queen's University Belfast, UK, TIMO GANS, DEBORAH O'CONNELL, York Plasma Institute, University of York, UK — The effects of dual frequency operation on the electron energies in a capacitively coupled radio frequency discharge of a plasma jet were studied. The device consists of two stainless steel electrodes of area 1 x 30 mm, spaced 1 mm apart. The gap spacing is bounded on each side by quartz glass windows. A gas mixture of 1 slm helium, 5 sccm oxygen and 1 sccm argon is flowed through. The top electrode was operated at a frequency of 13.33 MHz and the lower at 39.99 MHz, each with a voltage of approximately $200V_{p-p}$. The phase relationship between the two was varied in 30 degree steps. Phase and space resolved optical emission spectroscopy was used to observe the spatio-temporal behavior of higher energy electrons involved in excitation throughout one 75.02 ns RF period. Images were taken at 1 ns intervals. Optical filters at 706 nm and 750 nm were used to view emission from the He ($3s^3S - 2p^3P$) and Ar ($2p_1 - 1s_2$) transitions, corresponding to excitation energies above 22 eV and 13 eV respectively. The results show a change in excitation structures and relative intensity dependent on the phase relationship between the two frequencies. The results are compared with simulation results under these conditions, which allows further insight into the plasma behavior.

Laura Cox
Centre for Plasma Physics, Queen's University Belfast, UK

Date submitted: 14 Jun 2013 Electronic form version 1.4