Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Electric field measurements in moving ionization fronts during plasma breakdown ERIK WAGENAARS, GERRIT KROESEN, Eindhoven University of Technology, The Netherlands, MARK BOWDEN, The Open University, United Kingdom — We have performed time-resolved, direct measurements of electric field strengths in moving ionization fronts during the breakdown phase of a pulsed plasma. Plasma breakdown, or plasma ignition, is a highly transient process marking the transition from a gas to a plasma. Some aspects of plasma breakdown are reasonably well understood, but many details remain unknown, mainly because of a lack of direct measurements of plasma properties. Most of the important processes in breakdown, such as electron multiplication in avalanches and propagation of ionization fronts, are controlled by the electric field distribution in the discharge region. We have developed an experimental laser technique capable of measuring spatially and temporally resolved electric field distributions in both plasma and neutral gas. The technique is based on detecting the Stark shift and mixing of high-lying Rydberg levels of xenon atoms, using a 2+1 photon excitation scheme with fluorescence-dip detection. With this experimental arrangement, we measured absolute, time-resolved electric field strengths during the breakdown phase of a low-pressure plasma between parabolic electrodes. Characteristic features of breakdown, such as a moving ionization front with electric field enhancement and the formation of a plasma sheath, were observed.

Erik Wagenaars
Eindhoven University of Technology, The Netherlands

Date submitted: 20 Jun 2006 Electronic form version 1.4