Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Electron Heating and Plasma Generation at Electrode Edge - Fluid and Kinetic Modeling SHAHID RAUF, ANKUR AGARWAL, KENNETH COLLINS, Applied Materials, Inc. — Low pressure (< 10 Pa) low electron temperature (< 5 eV) plasmas are widely used for thin film processing in the semiconductor industry. With uniformity requirements become more stringent, it is important to understand the sources of plasma non-uniformity and how these influence the characteristics of plasma species (e.g., ions, neutrals) at the substrate. The electrode edge in a capacitively coupled plasma presents unique challenges in this regard. Electric fields are expected to be higher at sharp corners. Conventional fluid theory therefore predicts that more electron heating occurs near the electrode edge with higher concentration of most plasma species. These theoretical predictions agree with measurements at moderate pressures [e.g., McMillin and Zachariah, J. Appl. Phys. **77**, 5538 (1995)]. As the gas pressure decreases, electron heating and plasma production no longer remain local. The fate of the plasma at the electrode edge is unclear. Do edge effects still enhance the plasma near the electrode edge or does the plasma get weaker due to lack of electrons coming from beyond the electrode edge? We investigate these questions using 2-dimensional fluid and particle-in-cell models over a range of pressures (0.75–75 Pa) and source frequencies (13.56–60 MHz).

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Date submitted: 22 Jul 2011 Electronic form version 1.4