Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Coupling mechanisms in inductive discharges with RF substrate bias driven at consecutive harmonics with adjustable relative phase THOMAS STEINBERGER, Department of Physics, West Virginia University, Morgantown, USA, BIRK BERGER, JULIAN SCHULZE, Department of Physics, West Virginia University, Morgantown, USA; Institute for Electrical Engineering, Ruhr-University Bochum, Germany, EDMUND SCHUENGEL, MARK KOEPKE, Department of Physics, West Virginia University, Morgantown, USA — Hybrid combinations of inductive and capacitive RF discharges are commonly used for plasma etching because the inductive coupling ensures a high plasma density, while the capacitive coupling allows the control of the ion bombardment energy at the substrate. We experimentally study the coupling mechanisms between the two driving-voltage sources in such a plasma driven inductively at 13.56 MHz and capacitively at 27.12 MHz in argon and neon at low pressure. We find that the resulting DC self-bias can be controlled via the Electrical Asymmetry Effect by adjusting the relative phase between the two driving harmonics in the E-mode. Langmuir probe measurements and Phase Resolved Optical Emission Spectroscopy (PROES) reveal that the addition of the applied RF-bias in the plasma acts as a catalyst for the transition between E- and H-mode. PROES measurements generally show that the electron power absorption dynamics are affected by the relative phase between the two driving voltage waveforms and by the ratio of the inductive to the capacitive driving powers. Finally, the ion flux-energy distribution function is measured at the RF-powered electrode and found also to be affected by coupling effects.

Thomas Steinberger
Department of Physics, West Virginia University, Morgantown, USA

Date submitted: 06 Jun 2016 Electronic form version 1.4