Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Spatial structure of plasma density and electron temperature in capacitive RF discharges with a single ring-shaped narrow trench of various depths JULIAN SCHULZE, Department of Physics, West Virginia University, Institute for Electrical Engineering, Ruhr-University Bochum, EDMUND SCHUENGEL, Department of Physics, West Virginia University, NAOKI MATSUMOTO, YASUNORI OHTSU, Saga University — Capacitive RF plasmas are used for a variety of technological applications, but suffer from low plasma densities and poor lateral uniformity. This limits the system throughput. Here, the effect of implementing a single narrow trench of 2 mm width and various depths (5 – 15 mm) into the powered electrode on the spatial structure of the electron density and temperature is studied experimentally by probe measurements. The plasma is driven at 13.56 MHz in Argon at a fixed pressure (˜50 Pa) and power (20 W). The plasma density is found to increase in the presence of the trench and its radial profile shows a peak above the trench. The density becomes homogeneous further away from the electrode at all trench depths and the electron temperature distribution remains uniform. The measured radial density profiles are in good agreement with a diffusion model for all trench depths. Under the conditions investigated the trench of 10 mm depth is found to result in the highest density at various axial and radial positions. The results show that the radial uniformity of the plasma density at various axial positions can be improved by using structured electrodes of distinct depths.

Julian Schulze
Department of Physics, West Virginia University, Institute for Electrical Engineering, Ruhr-University Bochum

Date submitted: 07 Jun 2016 Electronic form version 1.4