Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Laser Initiated, RF Sustained Air Plasmas[1] JOHN SCHARER, RYAN GIAR, JASON HUMMELT, JESSE WAY, University of Wisconsin - Madison — Measurements and analysis of air breakdown processes by focusing 193 nm, 260 mJ, 10 MW high power UV laser radiation to 18 cm and 1.3 cm zones are examined. Quantum resonant multi-photon (REMPI) and collisional cascade ionization processes affect the breakdown and plasma formation. Our spectroscopic measurements show that REMPI (2+1) processes on nitrogen play a substantial role at lower pressures due to the high photon energy (6.4 eV). The REMPI process yields high density air plasmas (5 x 10^{16}/cc) for the 18 cm focus with the laser flux three orders of magnitude below the classical breakdown threshold intensity. Measurements of the f = 1.3 cm core laser plasma density (8x10^{17}/cc) and electron temperature decay via two color laser interferometry are made. The 18 cm focal length lens and its ionizing shock wave front are utilized to produce air seed plasma to initiate a large volume (500 cc) RF sustainment discharge coupled by means of a 6 cm diameter helical coil at up to 10 kW power levels.

[1]Research supported by AFOSR Grant No. FA9550-09-1-0357.

Matt Wiebold
University of Wisconsin - Madison

Date submitted: 17 Jul 2009 Electronic form version 1.4