Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Laser initiated, RF sustained air plasmas[1] RYAN GIAR, JOHN SCHARER, MATT WIEBOLD, University of Wisconsin — Measurements and analysis of air breakdown processes and plasma production by focusing 193 nm, 260 mJ, 10 MW high power laser radiation inside a 6 cm diameter helical RF coil. We observe quantum resonant multi-photon (REMPI)2 and collisional cascade laser ionization processes that produce high density (ne$\sim$7 $\times$ 1016/cm^3) cylindrical seed plasmas at 760 Torr. The focused laser and associated shock wave produces a seed plasma for sustaining by the RF (1-10 kW, 0.5-1.5 s) pulse. Measurements of the helical RF antenna load impedance obtained by measuring the reflection coefficient with and without the laser pulse and 105 mm wave interferometer density and temperature measurements are made. They demonstrate that the laser formed seed plasma allows RF sustainment at higher initial air pressures (15-30 Torr) than with RF only initiation. Spectroscopic measurements of the plasma and comparison with the SPECAIR code are made to determine rotational and vibrational temperatures. Comparison of the experimental measurements of helical antenna plasma loading with the ANTENAII code will be made and discussed.

[1]Research is supported by an AFOSR grant.

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Date submitted: 15 Jul 2010 Electronic form version 1.4