Abstract Submitted
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Laser Initiated, RF Sustained Air Plasmas[1] JOHN SCHARER, JASON HUMMELT, RYAN GIAR, 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)[1] and collisional cascade laser ionization processes in nitrogen, oxygen and air that produce high density (ne$\sim$7 x 10^{16}-10^{18}/cc) cylindrical seed plasmas at 760 Torr. The focused laser and associated shock wave produces a seed plasma that exhibits REMPI processes for oxygen in the air mixture that enhance the breakdown and ionization process. Observation of nitrogen emission spectra provide density and temperature information for the laser formed plasma. The objective is to provide rapid air breakdown with sustainment at lower RF power levels than required for RF breakdown alone. Measurements of the helical RF antenna plasma load impedance obtained by measuring the reflection coefficient and 105 mm wave interferometer density and temperature measurements are made. 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.

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John Scharer
University of Wisconsin

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