Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Translational Temperature Profiles in Atmospheric Air Microdischarges by Ultraviolet Rayleigh Scattering STEVEN ADAMS, Air Force Research Lab, JAMES CAPLINGER, AMBER HENSLEY, Wright State University, ALLEN TOLSON, UES Inc. — Spatially resolved temperature measurements within a microdischarge in atmospheric pressure air have been conducted using Rayleigh scattering of a pulsed ultraviolet laser. The scatter image intensity along the laser beam axis is proportional to the background gas target density and thus, according to the ideal gas law, is inversely proportional to gas translational temperature. By measuring the scatter image with and without a discharge, the temperature was determined in 1-dimension along the laser beam passing radially through the discharge. The 1-dimensional scattering intensity profiles were then used to generate 2-dimensional cross-sectional slices of temperature by transitioning the height of the laser beam. The cross-sectional temperature profiles exhibited a high degree of cylindrical symmetry with the radial width of the high temperature region expanding with increasing discharge current. Peak temperatures determined by Rayleigh scattering for each current were compared to temperatures derived from standard optical emission spectral analyses of N_2(C-B) bands, where the calculated rotational temperatures from emission were in reasonable agreement with the Rayleigh translational temperature profiles.

James Caplinger
Wright State University

Date submitted: 15 Nov 2013