

Abstract Submitted
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Gas Temperature Measurement in Atmospheric Nitrogen Discharge by Laser REMPI-LIF Technique¹ STEVEN ADAMS, Air Force Research Laboratory, JAMES WILLIAMSON, UES, Inc. — A remote laser-based technique for measuring the neutral molecule gas temperature in an atmospheric discharge containing nitrogen is presented. It has been demonstrated that the rotational temperature of molecular nitrogen at atmospheric pressure can be determined by direct optical probing of the $N_2(X,v=0)$ ground state with subsequent analysis of the rotational state distribution. A tunable probe laser was used to excite resonant enhanced multi-photon ionization transitions from various $N_2(X,v=0,J'')$ rotational states to $N_2(b,v=6,J')$ states. At atmospheric pressure, the laser photo-ionization has been found to induce nitrogen fluorescence bands. Analysis of the relative $N_2^+(B-X)$ fluorescence as a function of laser wavelength produced a calculated $N_2(X,v=0, J)$ rotation state distribution and the assignment of a rotational temperature. Results of the technique are compared in its application to a heated nitrogen gas flow in thermal equilibrium and a nitrogen gas discharge, both at atmospheric pressure.

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