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Picosecond-TALIF and VUV absorption measurements of absolute atomic nitrogen densities from an RF atmospheric pressure plasma jet with $He/O_2/N_2$ gas mixtures[1] ANDREW WEST, KARI NIEMI, SANDRA SCHRÖTER, JEROME BREDIN, TIMO GANS, ERIK WAGENAARS, York Plasma Institute, Department of Physics, University of York, York, United Kingdom — Reactive Oxygen and Nitrogen species (RONS) from RF atmospheric pressure plasma jets (APPJs) are important in biomedical applications as well as industrial plasma processing such as surface modification. Atomic oxygen has been well studied, whereas, despite its importance in the plasma chemistry, atomic nitrogen has been somewhat neglected due to its difficulty of measurement. We present absolute densities of atomic nitrogen in APPJs operating with $He/O_2/N_2$ gas mixtures in open air, using picosecond Two-photon Absorption Laser Induced Fluorescence (ps-TALIF) and vacuum ultra-violet (VUV) absorption spectroscopy. In order to apply the TALIF technique in complex, $He/O_2/N_2$ mixtures, we needed to directly measure the collisional quenching effects using picosecond pulse widths (32ps). Traditional calculated quenching corrections, used in nanosecond TALIF, are inadequate due to a lack of quenching data for complex mixtures. Absolute values for the densities were found by calibrating against a known density of Krypton. The VUV absorption experiments were conducted on the DESIRS synchrotron beamline using a unique VUV Fourier-transform spectrometer. Atomic nitrogen densities were on the order of 10^{20} m^{-3} with good agreement between TALIF and VUV absorption.

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