Plasma-discharges using nanosecond repetitive high voltage pulses has been very effective for the stabilization of lean flame\(^1\). To explain the chemical mechanisms of active species production by pulsed discharges, a two-step mechanism was proposed to explain the production of high densities of atomic oxygen. This mechanism first creates excited electronic states of nitrogen, which then dissociate molecular oxygen through quenching reactions\(^2\). In this paper, we investigated the temperature of the gas during and after the discharge using Optical Emission Spectroscopy on the second positive system of nitrogen, and simulated spectra from SPECAIR. The spatial profiles of excited nitrogen species densities in the discharge were determined using Abel-inverted spectra of the first and second positive system of nitrogen. The time evolution of the absolute density of N\(_2\)(B) and N\(_2\)(C) was also determined and the quenching rates of N\(_2\)(B) and N\(_2\)(C) by collisions with O\(_2\) were found to be 2.5 (±0.5) x10-10 cm\(^{-3}\)s\(^{-1}\) and 5.2 (±0.5) x10-10 cm\(^{-3}\)s\(^{-1}\) at 2000 K.
