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Spatio-temporal post-discharge analysis of nanosecond scale discharges in atmospheric pressure air[1] AMATH LO, GILLAUME CLEON, ARMELLE CESSOU, PIERRE VERVISCH, CORIA Universite et INSA de Rouen, CORIA TEAM — Nanosecond discharges are envisaged to improve the processes of ignition or assisted combustion. The characterization of energy transfers within the post-discharge is essential for understanding the mechanisms of radical formation and determining the mechanism of temperature increase. The pulse discharge occurs in air between a point-to-plane gap of 6.5mm length. A pulse high voltage of 25kV and 25ns is applied at the repetitive rate of 10Hz. In the range of 150ns to 10ms and at different locations in the gap, radial profiles of $N_2(X)$ vibrational and rotational temperatures have been measured by Spontaneous Raman Scattering. An excitation of high vibrational levels (up to v=16) is observed at 150ns allowing us to observe clearly a strong vibrational non-equilibrium with two vibrational temperatures. The results show that the vibrational temperatures are higher in the first stage of post-discharge and gradually decrease. The rotational temperature increases and reaches a maximum (1900K) at 50μs. The rapid gas heating obtained just after the pulse discharge leads to a propagation of a pressure wave from the axis to the sides. These results will be useful to well-understand physical processes involved in ignition.

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