Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

A strategy to obtain the glow regime of a nanosecond repetitively pulsed discharge in air at atmospheric pressure and ambient temperature FABIEN THOLIN, ANNE BOURDON, CNRS, UPR 288, EM2C, Ecole Centrale Paris, France — For many current applications of atmospheric pressure plasmas, the challenge is to generate a glow discharge with a low gas temperature and a high chemical reactivity. Recent experiments have shown that the use of nanosecond repetitively pulsed (NRP) discharges was an efficient way for producing glow discharges in air at atmospheric pressure. However, so far, for a 10ns voltage pulse with a repetition frequency of 30kHz, a 5mm gap between point electrodes with a radius of curvature of about 200μm, it was possible to generate the NRP glow discharge regime only for temperatures higher than 750K. In this work, we have carried out numerical simulations using a 2D-axisymmetric fluid model of the discharge generated by a single voltage pulse in a point-to-point geometry to study the dynamics of the NRP discharge. Then, we have studied the influence of the electrode geometry, the applied voltage, the pulse duration, and the gas temperature on the discharge characteristics and regimes. The obtained simulation results have been compared to the available experimental results. Finally, we propose a set of conditions to obtain a glow regime of NRP discharges in air at atmospheric pressure and 300K. The authors thank the Agence Nationale de la Recherche for its support of the PREPA project.

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Date submitted: 21 Jul 2011 Electronic form version 1.4