Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

An improved description of the vibrational energy transfers in nitrogen discharges VASCO GUERRA, M. LINO DA SILVA, Centro de Física dos Plasmas, Instituto Superior Técnico, 1049-001 Lisboa, Portugal, S. GOCIĆ, Department of Physics, University of Nis,18001 Nis, Serbia, J. LOUREIRO, Centro de Física dos Plasmas, Instituto Superior Técnico, 1049-001 Lisboa, Portugal — The vibrational levels of ground-state $N_2(X)$ molecules are often the main energy reservoirs in nitrogen discharges and their post-discharges. As a consequence, they have a direct and crucial importance in the understanding of several fundamental phenomena occurring in nitrogen, such as dissociation, ionization, gas heating and the nitrogen pink afterglow. In recent years, nitrogen discharges have been modeled assuming the vibrational levels to be described by a Morse oscillator. Accordingly, the resulting number of bound vibrational states is 45. In this work we investigate how the vibrational energy distribution function of $N_2(X)$ molecules and the relaxation of vibrational energy are modified when a more realistic intra-molecular potential is used. To this purpose, the ground-state potential curve has been reconstructed with the RKR method and a total of 59 vibrational bound levels were obtained. The discharge and the afterglow were modeled by solving the electron Boltzmann equation, coupled with a system of rate-balance equations for the creation of the most important heavy- particles. The relevant rate coefficients for vibrational exchanges were obtained using the Forced Harmonic Oscillator theory.

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Date submitted: 14 Jun 2007 Electronic form version 1.4