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Influence of Gas Heating and Vibrational Kinetics on the Ionization Dynamics of Preformed Air Plasma Channels HAROLD LADOUCEUR, ANDREW BARONAVSKI, Naval Research Laboratory, TZVETELINA PETROVA*, Naval Research Laboratory, NRC — An extensive self-consistent air-plasma model based upon the Boltzmann equation for the electron energy distribution function, coupled with a heavy particle kinetics was developed to study electric discharges in a preexisting air plasma column [1]. Incorporated in the model are the steady-state balance equations for various nitrogen and oxygen species in ground and excited states, as well as atomic and molecular ions. The influence of the gas temperature is accounted for by reduction of the neutral density, collisional processes such as recombination, dissociation, V-V and V-T reactions [2], and by reactions involving electronically excited states of O_2. The model was applied to study the influence of the gas temperature and vibrational kinetics on the breakdown processes in a preformed air plasma channel. Numerical calculations predict that electrical breakdown occurs at relatively low electric field. The calculated self-consistent breakdown electric field is ∼10 kV/cm for gas temperature of 300 K, while at temperature of 600 K it drops to ∼5.7 kV/cm, in excellent agreement with the experimentally determined breakdown electric field [1]. * NRC-NRL Postdoc [1] Tz.B. Petrova, H.D. Ladouceur, and A.P. Baronavski, 58th Gaseous Electronics Conference, 2005; San Jose, California, FM.00062 [2] J. Loureiro and C.M. Ferreira, J. Phys. D: Appl. Phys **19** (1986) 17-35

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