Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Determination of Reduced Electric Field in Streamer Discharges in Air at Atmospheric Pressure from Space and Time Integrated Optical Emissions of Excited Nitrogen Molecules and Their Ions ANNE BOURDON, ZDENEK BONAVENTURA, Lab. EM2C, UPR 288 CNRS - Ecole Centrale Paris, 92295 Châtenay-Malabry Cedex, SEBASTIEN CELESTIN, VICTOR PASKO, Penn State University, 227 EE East, University Park, PA, 16801, USA
— The ratio of excitation frequencies of N_2C and N_2^+B is a sensitive function of electric field and is used in experiments for determination of total electric field in the discharge. Usually a quasi-steady-state approximation that assumes the balance between the rate of population of excited levels and emission and quenching is used to interpret space and time integrated experimental data. However, for streamer discharges in air at atmospheric pressure the quasi-steady-state conditions are not fulfilled. This brings some uncertainty in the interpretation of electric field measurements. It is generally believed that estimated values of the electric field are close to the maximum electric field in the streamer heads due to the high emission intensity of streamer heads. In this contribution we present a numerical simulation of optical emissions of a streamer discharge in air at atmospheric pressure and we calculate a correction factor to derive easily the real electric field from the field derived assuming quasi-steady-state of integrated optical emissions usually obtained in experiments.

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Date submitted: 10 Jun 2010 Electronic form version 1.4